Aerolineas Argentinas

PAGE	DATE	CODE
CHAPTER 27 TAB		
FLIGHT CONTROLS		
EFFECTIVE PAGES		
SEE LAST PAGE OF LIST		
FOR NUMBER OF PAGES		
27-CONTENTS		
1	AUG 01/05	ARG
2	AUG 01/06	ARG
R 3	AUG 01/07	ARG.1
R 4	AUG 01/07	ARG.1
R 5	AUG 01/07	ARG.1
R 6	AUG 01/07	ARG.1
R 7	AUG 01/07	ARG.1
R 8	AUG 01/07	ARG.1
9	AUG 01/06	ARG
R 10	AUG 01/07	ARG.1
11	AUG 01/06	ARG
12	AUG 01/06	ARG
13	AUG 01/06	ARG
14	AUG 01/06	ARG
R 15	AUG 01/07	ARG.1
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3	AUG 01/05	01
4	AUG 01/05	01
5	AUG 01/05	01
6	AUG 01/05	01
7	AUG 01/05	01
8	AUG 01/05	07
9	AUG 01/05	15
10	AUG 01/05	12
11	AUG 01/05	17
12	AUG 01/05	16
13	AUG 01/05	09
14	BLANK	
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405	AUG 01/06	01
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27-09-100		
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3	AUG 01/06	01
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PAGE	DATE	CODE
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203	DEC 01/04	01
204	AUG 01/06	02
205	AUG 01/06	02
206	AUG 01/06	02
207	AUG 01/06	02
208	AUG 01/06	02
209	AUG 01/06	04
210	AUG 01/06	04
211	AUG 01/06	04
212	AUG 01/06	05
213	AUG 01/06	03
214	AUG 01/06	02
215	AUG 01/05	03
216	AUG 01/05	04
217	AUG 01/05	03
218	AUG 01/05	03
219	AUG 01/05	06
220	BLANK	
27-09-121		
201	AUG 01/06	01
202	AUG 01/05	01
27-09-122		
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402	DEC 01/04	01
403	DEC 01/04	02
404	DEC 01/04	02
27-09-200		
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3	DEC 01/04	01
4	BLANK	
27-09-200		
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402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-09-200		
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27-09-211		
401	AUG 01/06	01
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403	DEC 01/04	01
404	BLANK	
27-09-211		
501	DEC 01/04	01
502	BLANK	

PAGE	DATE	CODE
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403	DEC 01/04	01
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27-09-221		
501	DEC 01/04	01
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27-09-231		
401	AUG 01/06	01
402	DEC 01/04	01
27-09-241		
401	AUG 01/06	01
402	DEC 01/04	01
27-09-241		
501	DEC 01/04	01
502	BLANK	
27-09-400		
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102	AUG 01/06	01
103	AUG 01/06	01
104	AUG 01/06	01
105	AUG 01/06	01
106	AUG 01/06	01
107	AUG 01/06	01
108	DEC 01/04	01
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501	AUG 01/06	01
502	MAR 18/05	01
503	MAR 18/05	01
504	AUG 01/06	01
505	AUG 01/06	01
506	AUG 01/06	01
507	AUG 01/06	01
508	MAR 18/05	01
509	MAR 18/05	01
510	AUG 01/06	01
511	MAR 18/05	01
512	MAR 18/05	01
513	AUG 01/06	01
514	MAR 18/05	01
515	AUG 01/06	01
516	AUG 01/06	01
517	AUG 01/06	01
518	MAR 18/05	01
519	AUG 01/06	01
520	AUG 01/06	01
521	AUG 01/06	01
522	AUG 01/05	01
523	AUG 01/06	01
524	MAR 18/05	01
525	AUG 01/05	01
526	AUG 01/06	01

R = REVISED, A = ADDED OR D = DELETED
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Aerolineas Argentinas

PAGE	DATE	CODE
27-09-400		CONT.
527	AUG 01/06	01
528	MAR 18/05	01
529	MAR 18/05	01
530	MAR 18/05	01
531	MAR 18/05	01
532	MAR 18/05	01
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604	DEC 01/04	01
605	AUG 01/05	01
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607	DEC 01/04	01
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612	DEC 01/04	01
613	AUG 01/05	01
614	DEC 01/04	01
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616	DEC 01/04	01
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203	DEC 01/04	01
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205	DEC 01/04	01
206	DEC 01/04	01
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203	AUG 01/05	01
204	DEC 01/04	01
205	AUG 01/05	01
206	AUG 01/05	01
207	AUG 01/06	01
208	DEC 01/04	01
209	DEC 01/04	01
210	DEC 01/04	01
211	DEC 01/04	01
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3	DEC 01/04	01
4	DEC 01/04	01
5	DEC 01/04	01
6	DEC 01/04	01

PAGE	DATE	CODE
27-11-0		CONT.
7	DEC 01/04	01
8	DEC 01/04	01
9	DEC 01/04	01
10	DEC 01/04	03
11	DEC 01/04	01
12	DEC 01/04	04
13	DEC 01/04	03
14	DEC 01/04	01
15	DEC 01/04	01
16	DEC 01/04	02
17	DEC 01/04	01
18	BLANK	
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101	AUG 01/06	01
102	AUG 01/06	01
103	AUG 01/06	01
104	AUG 01/06	01
105	AUG 01/06	01
106	DEC 01/04	01
107	DEC 01/04	01
108	DEC 01/04	01
109	DEC 01/04	01
110	DEC 01/04	01
111	DEC 01/04	01
112	DEC 01/04	01
113	DEC 01/04	01
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115	DEC 01/04	01
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117	DEC 01/04	01
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119	DEC 01/04	01
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202	AUG 01/06	01
203	DEC 01/04	01
204	AUG 01/06	01
27-11-0		
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503	DEC 01/04	04
504	DEC 01/04	04
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507	DEC 01/04	04
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509	AUG 01/06	02
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512	AUG 01/06	02
513	DEC 01/04	02
514	DEC 01/04	02
515	DEC 01/04	02
516	AUG 01/06	02

PAGE	DATE	CODE
27-11-0		CONT.
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518	AUG 01/06	03
519	AUG 01/06	03
520	DEC 01/04	03
521	AUG 01/06	03
522	DEC 01/04	01
523	AUG 01/06	01
524	AUG 01/06	03
525	AUG 01/06	11
526	AUG 01/06	04
527	AUG 01/06	14
528	AUG 01/06	15
529	DEC 01/04	11
530	AUG 01/06	08
531	AUG 01/06	11
532	AUG 01/06	11
533	DEC 01/04	09
534	AUG 01/06	09
535	DEC 01/04	08
536	AUG 01/06	08
537	AUG 01/06	09
538	BLANK	
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402	AUG 01/06	01
403	AUG 01/06	01
404	DEC 01/04	03
405	DEC 01/04	01
406	AUG 01/06	01
407	DEC 01/04	05
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409	DEC 01/04	01
410	AUG 01/06	01
411	DEC 01/04	01
412	DEC 01/04	02
413	DEC 01/04	02
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27-11-11		
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602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-11-11		
801	DEC 01/04	02
802	DEC 01/04	02
27-11-21		
R 401	AUG 01/07	02.1
402	DEC 01/04	09
403	DEC 01/04	05
404	DEC 01/04	05
405	DEC 01/04	05
406	DEC 01/04	09

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F = FOLDOUT PAGE

PAGE	DATE	CODE
27-11-21		
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604	DEC 01/04	01
27-11-31		
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27-11-31		
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27-11-41		
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405	AUG 01/06	04
406	DEC 01/04	04
407	AUG 01/06	05
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409	AUG 01/06	05
410	DEC 01/04	03
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413	AUG 01/06	04
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27-11-51		
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602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
27-11-61		
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27-11-71		
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R 405	AUG 01/07	01.1
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27-11-81		
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404	DEC 01/04	04
27-11-81		
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503	DEC 01/04	03
504	DEC 01/04	05
27-11-81		
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604	DEC 01/04	01
27-11-91		
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27-11-91		CONT.
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603	DEC 01/04	01
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27-11-101		
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27-11-101		
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27-11-111		
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27-11-111		
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27-11-121		
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404	DEC 01/04	06
405	DEC 01/04	07
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407	DEC 01/04	04
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Aerolineas Argentinas

PAGE	DATE	CODE
27-11-121		
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27-11-131		
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27-21-0		CONT.
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16	DEC 01/04	08
17	DEC 01/04	09
18	DEC 01/04	02
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103	AUG 01/06	01
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105	AUG 01/06	02
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112	AUG 01/06	02
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206	DEC 01/04	01
27-21-0		
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514	DEC 01/04	02
515	DEC 01/04	02
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521	DEC 01/04	02
R 522	AUG 01/07	05.1
R 523	AUG 01/07	04.101
524	DEC 01/04	02
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27-21-1		
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R 505	AUG 01/07	01.1
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512	AUG 01/06	01
513	AUG 01/06	01
R 514	AUG 01/07	01.1
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523	DEC 01/04	01
524	AUG 01/06	01
R 525	AUG 01/07	01.1
R 526	AUG 01/07	01.1
527	DEC 01/04	01
R 528	AUG 01/07	01.101
R 529	AUG 01/07	01.101
R 530	AUG 01/07	01.101
R 531	AUG 01/07	01.101
R 532	BLANK	

Aerolineas Argentinas

PAGE	DATE	CODE
27-21-11		
401	AUG 01/06	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/06	01
R 407	AUG 01/07	01.101
R 408	AUG 01/07	01.1
27-21-11		
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27-21-12		
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403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/06	01
407	DEC 01/04	01
R 408	AUG 01/07	01.101
R 409	AUG 01/07	01.1
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27-21-12		
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603	DEC 01/04	01
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605	DEC 01/04	01
606	DEC 01/04	01
27-21-21		
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403	DEC 01/04	01
404	DEC 01/04	01
27-21-22		
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402	DEC 01/04	01
403	DEC 01/04	01
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405	DEC 01/04	01
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27-21-31		
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402	DEC 01/04	02
403	DEC 01/04	02
404	DEC 01/04	02
405	DEC 01/04	07
406	DEC 01/04	02
407	DEC 01/04	02
408	BLANK	
27-21-31		
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602	DEC 01/04	01
27-21-41		
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402	DEC 01/04	01
403	DEC 01/04	01
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27-21-51		
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403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/05	01
407	DEC 01/04	01
408	AUG 01/05	02
409	AUG 01/05	02
410	BLANK	
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405	DEC 01/04	02
406	DEC 01/04	02
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602	DEC 01/04	01
27-21-72		
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402	DEC 01/04	02
403	DEC 01/04	02
404	DEC 01/04	02
27-21-72		
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507	DEC 01/04	02
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27-21-72		
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602	DEC 01/04	02
27-21-73		
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402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-21-82		
R 401	AUG 01/07	02.1
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403	DEC 01/04	02
404	DEC 01/04	02
405	DEC 01/04	02
406	BLANK	
27-21-82		
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602	DEC 01/04	20
603	DEC 01/04	01
604	BLANK	
27-21-91		
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402	DEC 01/04	01
403	DEC 01/04	04
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	04
408	DEC 01/04	01
27-21-91		
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27-21-91		
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602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
27-21-92		
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403	AUG 01/06	01
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405	DEC 01/04	01
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407	AUG 01/06	01
408	AUG 01/05	01
409	DEC 01/04	01
410	DEC 01/04	01

R = REVISED, A = ADDED OR D = DELETED
F = FOLDOUT PAGE

Aerolineas Argentinas

PAGE	DATE	CODE
27-21-96		
401	AUG 01/06	01
402	AUG 01/05	01
403	AUG 01/05	01
404	BLANK	
27-21-111		
R 401	AUG 01/07	03.1
402	AUG 01/06	04
403	DEC 01/04	03
404	DEC 01/04	03
405	DEC 01/04	04
406	DEC 01/04	04
27-21-111		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-21-121		
401	DEC 01/04	02
402	DEC 01/04	02
403	DEC 01/04	03
404	DEC 01/04	02
405	DEC 01/04	02
406	DEC 01/04	02
407	DEC 01/04	02
408	DEC 01/04	03
27-21-131		
401	AUG 01/06	01
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-21-131		
501	DEC 01/04	01
502	BLANK	
27-21-141		
401	AUG 01/05	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-21-141		
501	DEC 01/04	01
502	DEC 01/04	01
R 503	AUG 01/07	01.1
R 504	AUG 01/07	01.1
R 505	AUG 01/07	01.101
R 506	AUG 01/07	01.101
R 507	AUG 01/07	02.101
508	BLANK	
27-21-141		
601	DEC 01/04	02
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-21-161		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-31-0		
1	DEC 01/04	01
2	DEC 01/04	01
3	DEC 01/04	01
4	DEC 01/04	01
5	DEC 01/04	01
6	DEC 01/04	01
7	DEC 01/04	01
8	DEC 01/04	01
9	DEC 01/04	01
10	DEC 01/04	02
11	DEC 01/04	01
12	DEC 01/04	01
13	DEC 01/04	01
14	DEC 01/04	01
15	DEC 01/04	01
16	DEC 01/04	01
17	DEC 01/04	09
18	DEC 01/04	01
27-31-0		
101	AUG 01/06	01
102	AUG 01/06	01
103	AUG 01/06	01
104	AUG 01/06	01
105	AUG 01/06	01
106	AUG 01/06	01
107	AUG 01/06	01
108	AUG 01/06	01
109	AUG 01/06	01
110	AUG 01/06	01
111	AUG 01/06	01
112	AUG 01/06	01
113	AUG 01/06	01
114	AUG 01/06	01
115	AUG 01/06	01
R 116	AUG 01/07	01.1
R 117	AUG 01/07	01.1
118	BLANK	
27-31-0		
201	DEC 01/04	01
202	DEC 01/04	01
203	DEC 01/04	01
204	DEC 01/04	01
205	DEC 01/04	01
206	DEC 01/04	01
27-31-0		
501	AUG 01/06	01
502	DEC 01/04	01
503	DEC 01/04	01
504	AUG 01/06	01
505	DEC 01/04	01
R 506	AUG 01/07	02.1
507	AUG 01/06	01
508	DEC 01/04	01
509	DEC 01/04	01
510	DEC 01/04	01
511	AUG 01/06	01
512	DEC 01/04	01
513	AUG 01/06	01
514	AUG 01/06	02
515	DEC 01/04	02
516	AUG 01/06	01
517	AUG 01/06	05
518	DEC 01/04	05
519	AUG 01/06	05
520	AUG 01/06	01
R 521	AUG 01/07	01.1
R 522	AUG 01/07	01.1
523	AUG 01/06	01
524	AUG 01/06	01
R 525	AUG 01/07	01.1
526	AUG 01/06	01
527	DEC 01/04	01
R 528	AUG 01/07	01.1
R 529	AUG 01/07	01.1
530	AUG 01/06	01
531	AUG 01/06	14
532	DEC 01/04	12
533	DEC 01/04	05
534	AUG 01/06	02
535	AUG 01/06	01
536	AUG 01/06	01
537	AUG 01/06	01
538	DEC 01/04	04
539	AUG 01/06	02
540	AUG 01/06	01
541	AUG 01/06	01
542	AUG 01/06	01
543	AUG 01/06	01
544	AUG 01/06	01
545	AUG 01/06	01
546	AUG 01/06	01
547	AUG 01/06	01
548	AUG 01/06	01
27-31-11		
401	DEC 01/04	01
402	AUG 01/06	05
403	DEC 01/04	01
404	DEC 01/04	05
405	DEC 01/04	05
406	DEC 01/04	01
407	DEC 01/04	01
408	DEC 01/04	01

Aerolineas Argentinas

PAGE	DATE	CODE
27-31-11		CONT.
409	AUG 01/06	04
410	DEC 01/04	01
411	AUG 01/06	05
412	DEC 01/04	03
413	DEC 01/04	03
414	DEC 01/04	03
415	DEC 01/04	05
416	DEC 01/04	05
417	AUG 01/06	08
418	AUG 01/06	03
27-31-11		
601	AUG 01/06	01
602	AUG 01/06	20
603	AUG 01/06	01
604	AUG 01/06	01
605	AUG 01/06	01
606	AUG 01/06	01
607	AUG 01/06	01
608	BLANK	
27-31-12		
401	AUG 01/06	02
402	AUG 01/06	02
403	DEC 01/04	01
404	DEC 01/04	02
405	DEC 01/04	01
406	DEC 01/04	02
407	DEC 01/04	02
408	AUG 01/06	02
409	DEC 01/04	02
410	DEC 01/04	02
411	DEC 01/04	02
412	AUG 01/06	02
413	DEC 01/04	02
414	DEC 01/04	02
415	DEC 01/04	02
416	DEC 01/04	02
417	AUG 01/06	01
418	AUG 01/06	01
27-31-12		
601	AUG 01/06	01
602	AUG 01/06	20
603	AUG 01/06	01
604	AUG 01/06	01
605	AUG 01/06	01
606	BLANK	
27-31-21		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	04
407	DEC 01/04	04
408	DEC 01/04	04
27-31-21		CONT.
409	DEC 01/04	03
410	DEC 01/04	01
27-31-21		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
27-31-31		
401	AUG 01/06	01
402	AUG 01/06	03
403	DEC 01/04	01
404	DEC 01/04	02
405	DEC 01/04	05
406	DEC 01/04	01
407	AUG 01/06	03
408	DEC 01/04	10
409	DEC 01/04	02
410	AUG 01/06	04
411	DEC 01/04	03
412	AUG 01/06	02
413	AUG 01/06	03
414	BLANK	
27-31-31		
601	AUG 01/05	01
602	DEC 01/04	01
603	DEC 01/04	08
604	DEC 01/04	02
605	DEC 01/04	02
606	BLANK	
27-31-41		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	BLANK	
27-31-41		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	01
506	BLANK	
27-31-41		
601	DEC 01/04	01
602	DEC 01/04	01
27-31-51		
401	AUG 01/06	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-31-51		CONT.
405	AUG 01/06	01
406	DEC 01/04	01
27-31-61		
401	AUG 01/06	01
402	AUG 01/06	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/06	01
407	DEC 01/04	01
408	AUG 01/06	01
27-31-71		
R 401	AUG 01/07	01.1
402	AUG 01/06	02
403	AUG 01/06	02
404	DEC 01/04	02
405	AUG 01/06	02
406	AUG 01/06	02
407	AUG 01/06	02
408	AUG 01/06	01
27-31-71		
601	DEC 01/04	01
602	DEC 01/04	02
603	DEC 01/04	02
604	DEC 01/04	02
27-31-81		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
27-31-91		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	DEC 01/04	01
27-31-101		
R 401	AUG 01/07	01.1
402	DEC 01/04	02
403	DEC 01/04	02
404	DEC 01/04	02
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	

Aerolineas Argentinas

PAGE	DATE	CODE
27-31-101		
501	DEC 01/04	01
502	DEC 01/04	02
503	DEC 01/04	02
504	DEC 01/04	02
505	DEC 01/04	02
506	DEC 01/04	02
507	DEC 01/04	02
508	DEC 01/04	01
509	DEC 01/04	01
510	DEC 01/04	02
511	DEC 01/04	02
512	BLANK	
27-31-101		
601	DEC 01/04	01
602	DEC 01/04	02
603	DEC 01/04	02
604	DEC 01/04	02
605	DEC 01/04	01
606	BLANK	
27-31-111		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-31-121		
401	DEC 01/04	03
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	02
405	DEC 01/04	02
406	AUG 01/06	03
407	AUG 01/06	03
408	BLANK	
27-31-121		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	08
605	AUG 01/06	01
606	AUG 01/06	01
607	AUG 01/06	01
608	AUG 01/06	01
609	AUG 01/06	08
610	BLANK	
27-31-121		
801	DEC 01/04	01
802	DEC 01/04	01
803	DEC 01/04	01
804	BLANK	

PAGE	DATE	CODE
27-31-131		
401	AUG 01/06	01
402	DEC 01/04	05
403	DEC 01/04	03
404	DEC 01/04	03
405	AUG 01/06	03
406	DEC 01/04	03
407	DEC 01/04	04
408	DEC 01/04	01
409	DEC 01/04	04
410	DEC 01/04	01
411	DEC 01/04	01
412	DEC 01/04	01
413	DEC 01/04	01
414	DEC 01/04	01
415	AUG 01/06	01
416	AUG 01/06	03
27-31-131		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
605	AUG 01/06	01
606	AUG 01/06	01
27-31-141		
401	AUG 01/05	01
402	AUG 01/05	01
403	AUG 01/05	01
404	BLANK	
27-31-151		
401	AUG 01/06	05
402	DEC 01/04	05
403	AUG 01/06	05
404	AUG 01/06	05
405	AUG 01/06	05
406	BLANK	
27-31-151		
601	DEC 01/04	01
602	DEC 01/04	02
603	DEC 01/04	02
604	DEC 01/04	02
605	DEC 01/04	02
606	DEC 01/04	01
27-31-161		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	

PAGE	DATE	CODE
27-31-171		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	20
505	DEC 01/04	01
506	DEC 01/04	01
507	DEC 01/04	01
508	BLANK	
27-31-181		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-31-191		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	AUG 01/06	01
408	AUG 01/06	01
27-31-191		
601	AUG 01/06	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
27-31-201		
401	AUG 01/06	01
402	DEC 01/04	01
403	AUG 01/06	01
404	AUG 01/06	01
27-31-201		
501	AUG 01/06	01
502	DEC 01/04	01
503	AUG 01/06	01
504	AUG 01/06	01
27-31-211		
401	AUG 01/06	01
402	DEC 01/04	01
403	AUG 01/06	01
404	AUG 01/06	01
27-31-212		
201	DEC 01/04	03
202	DEC 01/04	03
203	DEC 01/04	03
204	BLANK	

Aerolineas Argentinas

PAGE	DATE	CODE
27-31-212		
501	DEC 01/04	01
502	DEC 01/04	03
27-32-0		
1	DEC 01/04	01
2	DEC 01/04	01
3	DEC 01/04	01
4	DEC 01/04	01
5	DEC 01/04	01
6	DEC 01/04	01
27-32-0		
101	AUG 01/06	01
102	AUG 01/06	01
103	AUG 01/06	01
104	AUG 01/06	01
105	DEC 01/04	01
106	AUG 01/06	01
107	AUG 01/06	01
108	BLANK	
27-32-0		
501	AUG 01/06	01
502	DEC 01/04	01
503	AUG 01/06	06
504	AUG 01/06	06
505	AUG 01/06	05
506	BLANK	
27-32-11		
401	MAR 18/05	01
402	MAR 18/05	01
403	MAR 18/05	03
404	BLANK	
27-32-11		
601	DEC 01/04	01
602	DEC 01/04	01
27-32-21		
401	DEC 01/04	01
402	BLANK	
27-32-31		
401	DEC 01/04	01
402	DEC 01/04	01
27-41-0		
1	DEC 01/04	01
2	DEC 01/04	01
3	DEC 01/04	01
4	DEC 01/04	02
5	DEC 01/04	01
6	DEC 01/04	04
7	DEC 01/04	01
8	DEC 01/04	01
9	DEC 01/04	01
10	DEC 01/04	01

PAGE	DATE	CODE
27-41-0		CONT.
11	DEC 01/04	01
12	DEC 01/04	01
13	DEC 01/04	05
14	DEC 01/04	01
15	DEC 01/04	01
16	BLANK	
27-41-0		
101	AUG 01/06	01
102	AUG 01/06	02
103	AUG 01/06	02
104	AUG 01/06	02
105	AUG 01/06	02
106	DEC 01/04	02
27-41-0		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	01
506	DEC 01/04	04
507	DEC 01/04	01
508	DEC 01/04	01
509	AUG 01/06	01
510	AUG 01/06	01
511	DEC 01/04	01
512	DEC 01/04	01
513	DEC 01/04	01
514	DEC 01/04	04
515	DEC 01/04	03
516	BLANK	
27-41-11		
401	AUG 01/06	02
402	DEC 01/04	02
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	03
406	DEC 01/04	01
407	DEC 01/04	01
408	DEC 01/04	01
409	DEC 01/04	01
410	DEC 01/04	01
411	DEC 01/04	02
412	DEC 01/04	03
413	DEC 01/04	03
414	DEC 01/04	02
27-41-11		
601	DEC 01/04	01
602	DEC 01/04	01
27-41-21		
401	DEC 01/04	01
402	BLANK	

PAGE	DATE	CODE
27-41-31		
401	AUG 01/06	02
402	AUG 01/06	03
403	AUG 01/06	01
404	AUG 01/06	02
405	DEC 01/04	01
406	DEC 01/04	02
407	DEC 01/04	01
408	AUG 01/06	02
27-41-31		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
27-41-31		
801	AUG 01/06	01
802	AUG 01/06	02
803	AUG 01/06	02
804	AUG 01/06	01
805	AUG 01/06	02
806	AUG 01/06	01
27-41-41		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	
27-41-51		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-41-51		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	01
506	BLANK	
27-41-61		
401	DEC 01/04	01
402	BLANK	
27-41-71		
401	DEC 01/04	01
402	DEC 01/04	01

Aerolineas Argentinas

PAGE	DATE	CODE
27-41-71		
R 501	AUG 01/07	01.101
502	BLANK	
27-41-81		
R 401	AUG 01/07	01.1
R 402	AUG 01/07	02.1
R 403	AUG 01/06	01.101
404	DEC 01/04	04
405	DEC 01/04	02
R 406	AUG 01/07	04.101
R 407	AUG 01/07	04.101
408	AUG 01/06	01
409	DEC 01/04	01
410	DEC 01/04	01
411	DEC 01/04	01
412	AUG 01/06	01
413	AUG 01/06	01
414	AUG 01/06	02
27-41-81		
R 601	AUG 01/07	01.1
602	DEC 01/04	02
603	DEC 01/04	01
604	DEC 01/04	02
605	DEC 01/04	01
R 606	AUG 01/07	01.1
R 607	AUG 01/07	01.1
R 608	BLANK	
27-41-91		
401	DEC 01/04	01
402	DEC 01/04	01
27-41-91		
501	DEC 01/04	01
502	BLANK	
27-41-101		
R 401	AUG 01/07	02.1
402	DEC 01/04	01
403	DEC 01/04	05
404	DEC 01/04	01
R 405	AUG 01/07	01.1
R 406	AUG 01/07	01.1
27-41-101		
501	DEC 01/04	02
502	DEC 01/04	16
503	DEC 01/04	11
504	DEC 01/04	05
505	DEC 01/04	02
506	BLANK	
27-41-111		
401	DEC 01/04	01
402	DEC 01/04	01

PAGE	DATE	CODE
27-41-111		
501	DEC 01/04	01
502	DEC 01/04	01
27-41-121		
301	AUG 01/05	16
302	AUG 01/05	16
27-41-131		
801	DEC 01/04	01
802	AUG 01/06	01
803	DEC 01/04	01
804	DEC 01/04	01
805	DEC 01/04	01
806	DEC 01/04	01
807	DEC 01/04	01
808	DEC 01/04	01
809	DEC 01/04	01
810	DEC 01/04	01
811	DEC 01/04	01
812	DEC 01/04	01
813	AUG 01/06	01
814	DEC 01/04	01
27-51-0		
1	DEC 01/04	01
2	DEC 01/04	02
3	DEC 01/04	12
4	DEC 01/04	02
5	DEC 01/04	02
6	DEC 01/04	03
7	DEC 01/04	03
8	DEC 01/04	03
9	DEC 01/04	03
10	DEC 01/04	03
11	DEC 01/04	03
12	DEC 01/04	03
13	DEC 01/04	10
14	DEC 01/04	02
15	DEC 01/04	02
16	DEC 01/04	02
17	AUG 01/05	02
18	DEC 01/04	02
19	DEC 01/04	05
20	DEC 01/04	05
21	DEC 01/04	10
22	DEC 01/04	12
23	DEC 01/04	04
24	DEC 01/04	03
27-51-0		
101	AUG 01/06	01
102	AUG 01/06	01
103	AUG 01/06	01
104	AUG 01/06	01
105	AUG 01/06	01
106	AUG 01/06	01
107	AUG 01/06	01
108	AUG 01/06	01

PAGE	DATE	CODE
27-51-0		CONT.
109	AUG 01/06	02
110	AUG 01/06	01
111	AUG 01/06	01
112	AUG 01/06	16
27-51-0		
201	AUG 01/06	01
202	DEC 01/04	01
203	DEC 01/04	01
204	BLANK	
27-51-01		
501	AUG 01/06	01
502	DEC 01/04	01
503	DEC 01/04	01
504	AUG 01/06	01
505	AUG 01/06	01
506	DEC 01/04	01
507	DEC 01/04	01
508	DEC 01/04	01
509	AUG 01/06	01
510	DEC 01/04	01
511	AUG 01/06	01
512	AUG 01/06	01
513	AUG 01/06	16
514	DEC 01/04	01
515	AUG 01/06	16
516	AUG 01/06	10
517	AUG 01/06	15
518	AUG 01/06	15
519	DEC 01/04	16
520	AUG 01/06	14
521	AUG 01/06	15
522	AUG 01/06	12
27-51-12		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	DEC 01/04	01
409	DEC 01/04	01
410	DEC 01/04	01
411	DEC 01/04	01
412	DEC 01/04	01
413	DEC 01/04	01
414	DEC 01/04	01
415	DEC 01/04	01
416	DEC 01/04	01
27-51-12		
501	DEC 01/04	02
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	02

Aerolineas Argentinas

PAGE	DATE	CODE
27-51-12		CONT.
505	DEC 01/04	02
506	DEC 01/04	02
27-51-21		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
27-51-21		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-51-31		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	BLANK	
27-51-31		
601	DEC 01/04	01
602	DEC 01/04	01
27-51-41		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	AUG 01/06	01
27-51-41		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-51-51		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-51-51		
601	DEC 01/04	01
R 602	AUG 01/07	01.1
603	DEC 01/04	01
604	BLANK	
27-51-61		
R 401	AUG 01/07	02.1
402	DEC 01/04	01
403	DEC 01/04	02
404	DEC 01/04	02

PAGE	DATE	CODE
27-51-61		CONT.
405	DEC 01/04	02
406	BLANK	
27-51-72		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	05
405	DEC 01/04	01
406	DEC 01/04	02
407	DEC 01/04	01
408	DEC 01/04	01
27-51-72		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	01
506	DEC 01/04	01
507	DEC 01/04	02
508	DEC 01/04	01
509	DEC 01/04	01
510	DEC 01/04	01
511	DEC 01/04	01
512	DEC 01/04	02
513	DEC 01/04	02
514	DEC 01/04	01
515	DEC 01/04	01
516	BLANK	
27-51-72		
601	MAR 18/05	02
602	DEC 01/04	01
27-51-73		
401	AUG 01/06	01
402	AUG 01/06	01
403	AUG 01/06	01
404	DEC 01/04	01
405	AUG 01/06	01
406	AUG 01/06	01
407	AUG 01/06	01
408	DEC 01/04	01
409	AUG 01/05	01
R 410	AUG 01/07	01.1
411	AUG 01/05	01
412	AUG 01/06	01
413	AUG 01/06	01
414	AUG 01/06	01
415	AUG 01/06	01
416	AUG 01/06	01
417	AUG 01/06	01
418	AUG 01/06	01
419	AUG 01/06	01
420	AUG 01/05	01
421	AUG 01/06	01
422	AUG 01/06	01

PAGE	DATE	CODE
27-51-73		CONT.
423	AUG 01/06	01
424	BLANK	
27-51-73		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
605	DEC 01/04	01
606	DEC 01/04	01
607	DEC 01/04	01
608	DEC 01/04	01
609	DEC 01/04	01
610	BLANK	
27-51-81		
R 401	AUG 01/07	05.1
402	DEC 01/04	05
403	DEC 01/04	05
404	DEC 01/04	07
405	DEC 01/04	07
406	DEC 01/04	04
407	DEC 01/04	03
408	DEC 01/04	06
27-51-81		
601	DEC 01/04	01
R 602	AUG 01/07	01.1
R 603	AUG 01/07	05.1
R 604	AUG 01/07	02.1
27-51-81		
R 801	AUG 01/07	06.1
802	DEC 01/04	05
803	DEC 01/04	06
804	DEC 01/04	06
27-51-91		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	DEC 01/04	01
409	DEC 01/04	01
410	DEC 01/04	02
411	DEC 01/04	02
412	DEC 01/04	01
27-51-91		
601	DEC 01/04	01
602	DEC 01/04	01

Aerolineas Argentinas

PAGE	DATE	CODE
27-51-101		
401	DEC 01/04	01
402	DEC 01/04	01
27-51-111		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-51-111		
601	DEC 01/04	01
602	DEC 01/04	01
603	AUG 01/06	01
604	BLANK	
27-51-121		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
27-51-121		
501	DEC 01/04	03
502	DEC 01/04	03
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	02
506	DEC 01/04	02
507	DEC 01/04	01
508	BLANK	
27-51-121		
601	DEC 01/04	01
602	DEC 01/04	04
603	DEC 01/04	06
604	BLANK	
27-51-141		
401	AUG 01/06	01
402	AUG 01/06	01
403	AUG 01/06	04
404	BLANK	
27-51-141		
501	DEC 01/04	01
502	DEC 01/04	04
503	DEC 01/04	01
504	BLANK	
27-51-151		
401	DEC 01/04	08
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	08
405	DEC 01/04	11
406	DEC 01/04	10
407	DEC 01/04	09
408	BLANK	
27-51-151		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	02
27-51-161		
R 401	AUG 01/07	04.1
402	DEC 01/04	13
403	DEC 01/04	07
404	DEC 01/04	06
405	DEC 01/04	06
406	DEC 01/04	06
407	AUG 01/06	08
408	DEC 01/04	08
27-51-161		
601	AUG 01/06	01
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	05
605	DEC 01/04	03
606	DEC 01/04	09
607	DEC 01/04	05
608	DEC 01/04	05
27-51-163		
601	DEC 01/04	03
602	DEC 01/04	03
27-51-171		
401	AUG 01/06	01
402	DEC 01/04	01
27-51-171		
501	AUG 01/06	01
502	BLANK	
27-51-181		
401	AUG 01/06	01
402	DEC 01/04	01
403	AUG 01/06	01
404	DEC 01/04	01
27-51-181		
501	AUG 01/05	01
502	BLANK	
27-51-191		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	BLANK	
27-51-201		
R 401	AUG 01/07	01.1
402	DEC 01/04	02
403	DEC 01/04	03
404	DEC 01/04	01
405	DEC 01/04	02
406	BLANK	
27-51-201		
R 501	AUG 01/07	01.1
502	DEC 01/04	01
503	AUG 01/06	01
504	DEC 01/04	01
505	DEC 01/04	01
506	AUG 01/06	02
507	AUG 01/06	02
508	DEC 01/04	01
509	AUG 01/06	05
510	AUG 01/06	05
511	AUG 01/06	06
512	BLANK	
27-51-211		
R 401	AUG 01/07	02.1
402	DEC 01/04	02
403	DEC 01/04	02
404	DEC 01/04	02
405	AUG 01/06	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	
27-51-211		
501	DEC 01/04	01
502	DEC 01/04	02
503	DEC 01/04	04
504	DEC 01/04	02
505	DEC 01/04	01
506	BLANK	
27-51-211		
801	DEC 01/04	01
802	DEC 01/04	02
27-51-221		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	BLANK	
27-51-222		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	

Aerolineas Argentinas

PAGE	DATE	CODE
27-51-231		
R 401	AUG 01/07	01.1
402	DEC 01/04	02
27-51-231		
501	DEC 01/04	01
502	BLANK	
27-51-241		
R 401	AUG 01/07	01.1
402	DEC 01/04	03
27-51-241		
501	AUG 01/05	01
502	AUG 01/05	01
27-51-251		
R 401	AUG 01/07	02.1
402	DEC 01/04	02
403	DEC 01/04	02
404	BLANK	
27-51-251		
501	DEC 01/04	01
502	BLANK	
27-51-251		
801	DEC 01/04	01
802	DEC 01/04	01
27-51-261		
R 401	AUG 01/07	02.1
402	DEC 01/04	03
403	DEC 01/04	03
404	DEC 01/04	02
405	DEC 01/04	02
406	DEC 01/04	02
27-51-271		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
27-51-281		
R 401	AUG 01/07	02.1
402	DEC 01/04	02
403	DEC 01/04	02
404	DEC 01/04	02
405	AUG 01/06	02
R 406	AUG 01/07	02.1
407	DEC 01/04	02
408	DEC 01/04	02
27-51-281		
R 601	AUG 01/07	01.1
602	DEC 01/04	01
603	DEC 01/04	01
604	DEC 01/04	01
605	DEC 01/04	01
606	DEC 01/04	01
27-51-281		CONT.
607	DEC 01/04	01
608	BLANK	
27-51-291		
R 401	AUG 01/07	02.1
402	DEC 01/04	02
403	DEC 01/04	01
404	BLANK	
27-51-291		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	DEC 01/04	01
505	DEC 01/04	01
506	BLANK	
27-51-321		
401	AUG 01/05	18
402	BLANK	
27-51-321		
501	AUG 01/05	27
502	AUG 01/05	27
27-51-331		
401	AUG 01/05	18
402	AUG 01/05	18
27-51-331		
501	AUG 01/05	18
502	AUG 01/05	18
503	AUG 01/05	18
504	BLANK	
27-51-341		
401	DEC 01/04	01
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-51-351		
401	DEC 01/04	02
402	DEC 01/04	01
403	DEC 01/04	02
404	DEC 01/04	02
405	DEC 01/04	02
406	BLANK	
27-51-361		
401	AUG 01/06	01
402	DEC 01/04	01
403	DEC 01/04	01
404	AUG 01/06	01
27-58-01		
1	AUG 01/05	01
2	DEC 01/04	03
3	DEC 01/04	01
4	BLANK	
27-58-01		
101	DEC 01/04	01
102	DEC 01/04	01
27-58-01		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	BLANK	
27-58-12		
R 401	AUG 01/07	16.1
402	DEC 01/04	16
403	DEC 01/04	14
404	BLANK	
27-58-31		
R 401	AUG 01/07	01.1
402	DEC 01/04	11
27-58-41		
401	DEC 01/04	01
402	DEC 01/04	01
27-61-0		
1	DEC 01/04	01
2	DEC 01/04	01
3	DEC 01/04	01
4	DEC 01/04	01
5	DEC 01/04	01
6	DEC 01/04	01
7	DEC 01/04	01
8	DEC 01/04	01
9	DEC 01/04	01
10	DEC 01/04	01
11	DEC 01/04	01
12	DEC 01/04	01
13	DEC 01/04	02
14	DEC 01/04	02
27-61-0		
101	DEC 01/04	01
102	DEC 01/04	01
103	DEC 01/04	01
104	BLANK	
27-61-0		
201	DEC 01/04	01
202	DEC 01/04	01
203	DEC 01/04	01
204	DEC 01/04	01

Aerolineas Argentinas

PAGE	DATE	CODE
27-61-0		
501	AUG 01/06	01
502	DEC 01/04	01
503	DEC 01/04	01
504	AUG 01/06	01
505	AUG 01/06	01
506	AUG 01/06	01
507	DEC 01/04	01
508	DEC 01/04	01
509	AUG 01/06	01
510	AUG 01/06	01
511	DEC 01/04	01
512	AUG 01/06	01
513	DEC 01/04	01
514	DEC 01/04	01
515	AUG 01/06	01
516	AUG 01/06	01
517	AUG 01/06	01
518	AUG 01/06	01
519	AUG 01/06	01
520	AUG 01/06	01
521	AUG 01/06	01
522	AUG 01/06	01
523	DEC 01/04	01
524	BLANK	
27-61-11		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	BLANK	
27-61-11		
501	DEC 01/04	01
502	DEC 01/04	01
503	DEC 01/04	01
504	BLANK	
27-61-11		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-61-21		
R 401	AUG 01/07	01.1
402	DEC 01/04	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	DEC 01/04	01
407	DEC 01/04	01
408	BLANK	
27-61-21		
501	DEC 01/04	01
502	AUG 01/06	01
503	AUG 01/06	01
504	BLANK	
27-61-31		
R 401	AUG 01/07	01.1
402	AUG 01/06	01
403	DEC 01/04	01
404	DEC 01/04	01
405	AUG 01/06	01
406	AUG 01/06	01
407	AUG 01/06	01
408	AUG 01/06	01
409	AUG 01/06	01
410	DEC 01/04	01
411	AUG 01/06	01
412	BLANK	
27-61-31		
501	AUG 01/05	01
502	AUG 01/05	04
503	AUG 01/05	04
504	AUG 01/05	03
27-61-31		
601	DEC 01/04	01
602	DEC 01/04	01
27-61-41		
401	AUG 01/06	01
402	AUG 01/06	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/06	02
407	DEC 01/04	01
408	BLANK	
27-61-41		
501	DEC 01/04	01
502	DEC 01/04	01
27-61-41		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	BLANK	
27-61-41		
801	DEC 01/04	01
802	DEC 01/04	01
27-61-51		
R 401	AUG 01/07	01.1
R 402	AUG 01/07	01.1
403	DEC 01/04	01
404	DEC 01/04	01
R 405	AUG 01/07	01.101
406	DEC 01/04	01
407	DEC 01/04	01
R 408	AUG 01/07	01.101
27-61-51		
601	DEC 01/04	01
602	DEC 01/04	01
603	DEC 01/04	01
604	AUG 01/05	01
27-61-61		
401	AUG 01/06	01
402	AUG 01/06	01
403	DEC 01/04	01
404	DEC 01/04	01
405	DEC 01/04	01
406	AUG 01/06	01
27-61-61		
501	DEC 01/04	01
502	DEC 01/04	01
27-61-61		
801	DEC 01/04	01
802	DEC 01/04	01
27-62-0		
1	DEC 01/04	01
2	DEC 01/04	01
3	DEC 01/04	02
4	DEC 01/04	11
5	DEC 01/04	03
6	DEC 01/04	03
7	DEC 01/04	01
8	DEC 01/04	02
9	DEC 01/04	01
10	DEC 01/04	03
11	DEC 01/04	04
12	DEC 01/04	04
13	DEC 01/04	03
14	DEC 01/04	03
15	DEC 01/04	16
16	DEC 01/04	20
17	DEC 01/04	20
18	DEC 01/04	07
19	DEC 01/04	05
20	BLANK	
27-62-0		
101	DEC 01/04	01
102	DEC 01/04	01
103	DEC 01/04	01
104	DEC 01/04	01
105	DEC 01/04	01
106	DEC 01/04	01
27-62-0		
201	DEC 01/04	01
202	DEC 01/04	01
203	DEC 01/04	01
204	DEC 01/04	01

R = REVISED, A = ADDED OR D = DELETED
F = FOLDOUT PAGE

Aerolineas Argentinas

PAGE	DATE	CODE	PAGE	DATE	CODE	PAGE	DATE	CODE
27-62-0			27-62-21		CONT.	27-62-61		
501	DEC 01/04	01	409	DEC 01/04	01	501	DEC 01/04	01
502	DEC 01/04	01	410	AUG 01/06	04	502	DEC 01/04	01
503	DEC 01/04	02				503	DEC 01/04	01
R 504	AUG 01/07	03.1	27-62-21			504	BLANK	
505	AUG 01/05	03	501	DEC 01/04	10			
506	AUG 01/05	03	502	DEC 01/04	16	27-62-72		
507	DEC 01/04	01	503	DEC 01/04	17	401	AUG 01/06	03
508	AUG 01/05	02	504	DEC 01/04	08	402	DEC 01/04	03
509	DEC 01/04	01				403	DEC 01/04	03
510	DEC 01/04	01	27-62-31			404	BLANK	
511	DEC 01/04	02	401	DEC 01/04	01			
512	DEC 01/04	02	402	DEC 01/04	08	27-62-72		
513	DEC 01/04	03	403	DEC 01/04	01	501	AUG 01/06	03
514	DEC 01/04	03	404	BLANK		502	DEC 01/04	03
515	AUG 01/05	07				503	DEC 01/04	03
516	DEC 01/04	15	27-62-31			504	BLANK	
517	DEC 01/04	13	501	DEC 01/04	12			
518	DEC 01/04	17	502	DEC 01/04	12	27-62-82		
519	DEC 01/04	15	503	DEC 01/04	10	401	DEC 01/04	03
520	DEC 01/04	15	504	DEC 01/04	08	402	DEC 01/04	03
521	DEC 01/04	19				403	DEC 01/04	03
522	DEC 01/04	16	27-62-31			404	BLANK	
523	DEC 01/04	15	601	DEC 01/04	01			
524	DEC 01/04	14	602	DEC 01/04	01	27-62-82		
525	DEC 01/04	14	603	DEC 01/04	01	601	DEC 01/04	03
526	BLANK		604	BLANK		602	DEC 01/04	03
27-62-0			27-62-41			27-62-91		
601	DEC 01/04	01	R 401	AUG 01/07	01.1	401	DEC 01/04	01
602	DEC 01/04	01	402	DEC 01/04	01	402	DEC 01/04	01
			403	DEC 01/04	01	403	DEC 01/04	01
27-62-12			404	BLANK		404	BLANK	
401	DEC 01/04	03						
402	DEC 01/04	03	27-62-41			27-62-91		
403	AUG 01/06	03	501	DEC 01/04	01	501	DEC 01/04	01
404	BLANK		502	BLANK		502	DEC 01/04	01
						R 503	AUG 01/07	01.1
27-62-12			27-62-51			504	BLANK	
501	DEC 01/04	03	R 401	AUG 01/07	01.1			
502	DEC 01/04	03	402	DEC 01/04	10	27-62-101		
503	DEC 01/04	03	403	DEC 01/04	07	401	AUG 01/06	01
504	DEC 01/04	03	404	DEC 01/04	08	402	DEC 01/04	01
						403	DEC 01/04	01
27-62-12			27-62-51			404	DEC 01/04	01
601	DEC 01/04	01	501	DEC 01/04	01			
602	DEC 01/04	03	502	DEC 01/04	07	27-62-101		
603	DEC 01/04	01	503	DEC 01/04	04	501	AUG 01/06	01
604	BLANK		504	DEC 01/04	03	502	DEC 01/04	01
						503	DEC 01/04	01
27-62-21			27-62-61			504	BLANK	
401	AUG 01/06	01	401	AUG 01/06	02			
402	DEC 01/04	08	402	DEC 01/04	04	27-81-0		
403	DEC 01/04	01	403	DEC 01/04	02	1	DEC 01/04	12
404	AUG 01/06	01	404	BLANK		2	DEC 01/04	13
405	AUG 01/06	01				3	DEC 01/04	13
406	AUG 01/06	01				4	DEC 01/04	13
407	AUG 01/06	03				5	DEC 01/04	13
408	DEC 01/04	01				6	DEC 01/04	14

Aerolineas Argentinas

PAGE	DATE	CODE	PAGE	DATE	CODE	PAGE	DATE	CODE
27-81-0		CONT.	27-81-11		CONT.	27-81-41		
7	DEC 01/04	11	405	AUG 01/05	18	401	DEC 01/04	07
8	DEC 01/04	11	406	AUG 01/05	21	402	DEC 01/04	07
9	DEC 01/04	09				403	DEC 01/04	01
10	DEC 01/04	08	27-81-11			404	AUG 01/05	07
11	DEC 01/04	09	601	DEC 01/04	01	405	AUG 01/05	01
12	DEC 01/04	07	602	DEC 01/04	01	406	BLANK	
13	DEC 01/04	02	603	DEC 01/04	01			
14	DEC 01/04	09	604	DEC 01/04	01	27-81-41		
15	DEC 01/04	08				601	DEC 01/04	01
16	DEC 01/04	01	27-81-12			602	DEC 01/04	01
17	DEC 01/04	12	401	AUG 01/05	19	603	DEC 01/04	01
18	DEC 01/04	05	R 402	AUG 01/07	21.1	604	BLANK	
			R 403	AUG 01/07	18.1			
27-81-0			R 404	AUG 01/07	18.1	27-81-51		
101	AUG 01/06	01	R 405	AUG 01/07	18.1	401	DEC 01/04	01
102	DEC 01/04	01	R 406	AUG 01/07	19.101	402	DEC 01/04	01
103	DEC 01/04	01	R 407	AUG 01/07	18.101	403	DEC 01/04	01
104	DEC 01/04	01	R 408	AUG 01/07	18.101	404	DEC 01/04	01
						405	DEC 01/04	01
27-81-0			27-81-21			406	BLANK	
201	DEC 01/04	01	401	AUG 01/05	10			
202	AUG 01/05	01	402	DEC 01/04	11	27-81-61		
203	AUG 01/05	01	403	DEC 01/04	04	401	AUG 01/06	01
204	DEC 01/04	01	404	DEC 01/04	14	402	DEC 01/04	01
205	AUG 01/05	01	405	DEC 01/04	14			
206	BLANK		406	DEC 01/04	11	27-81-71		
			407	DEC 01/04	14	401	AUG 01/06	01
27-81-0			408	DEC 01/04	12	402	DEC 01/04	01
501	DEC 01/04	01	409	AUG 01/05	14			
502	DEC 01/04	08	410	DEC 01/04	15	27-81-71		
503	DEC 01/04	01	411	DEC 01/04	03	501	DEC 01/04	01
504	DEC 01/04	01	412	DEC 01/04	03	502	BLANK	
505	DEC 01/04	10						
506	DEC 01/04	12	27-81-21			27-81-81		
507	DEC 01/04	10	601	DEC 01/04	01	401	AUG 01/06	01
508	DEC 01/04	11	602	DEC 01/04	01	402	DEC 01/04	01
509	DEC 01/04	11	603	DEC 01/04	01	403	DEC 01/04	01
510	DEC 01/04	14	604	DEC 01/04	01	404	DEC 01/04	01
511	DEC 01/04	13	605	DEC 01/04	01			
512	DEC 01/04	11	606	DEC 01/04	01	27-81-81		
513	DEC 01/04	15	607	DEC 01/04	01	501	DEC 01/04	09
514	DEC 01/04	06	608	BLANK		502	DEC 01/04	01
515	DEC 01/04	14				503	DEC 01/04	01
516	DEC 01/04	07	27-81-31			504	DEC 01/04	09
517	DEC 01/04	07	R 401	AUG 01/07	10.1			
518	DEC 01/04	11	402	AUG 01/05	01	27-81-91		
519	DEC 01/04	13	R 403	AUG 01/07	05.1	401	AUG 01/06	01
520	DEC 01/04	06	404	AUG 01/05	01	402	DEC 01/04	01
521	DEC 01/04	13				403	DEC 01/04	01
522	DEC 01/04	13	27-81-31			404	BLANK	
523	DEC 01/04	11	R 601	AUG 01/07	07.1			
524	DEC 01/04	12	602	DEC 01/04	02	27-81-91		
			603	DEC 01/04	02	501	DEC 01/04	01
27-81-11			604	BLANK		502	BLANK	
401	AUG 01/05	18						
402	AUG 01/05	18						
403	AUG 01/05	18						
404	AUG 01/05	18						

Aerolineas Argentinas

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

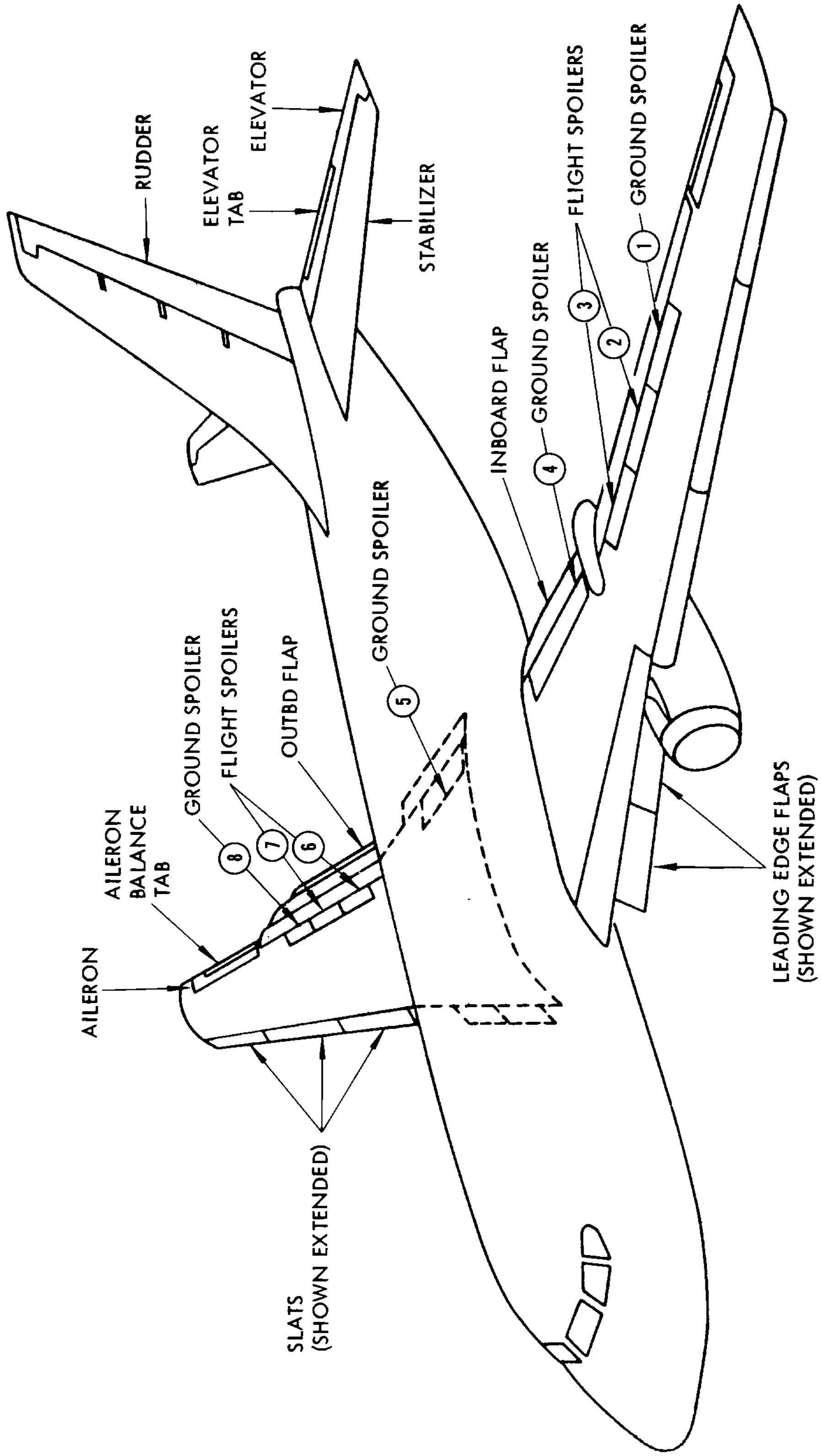
TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

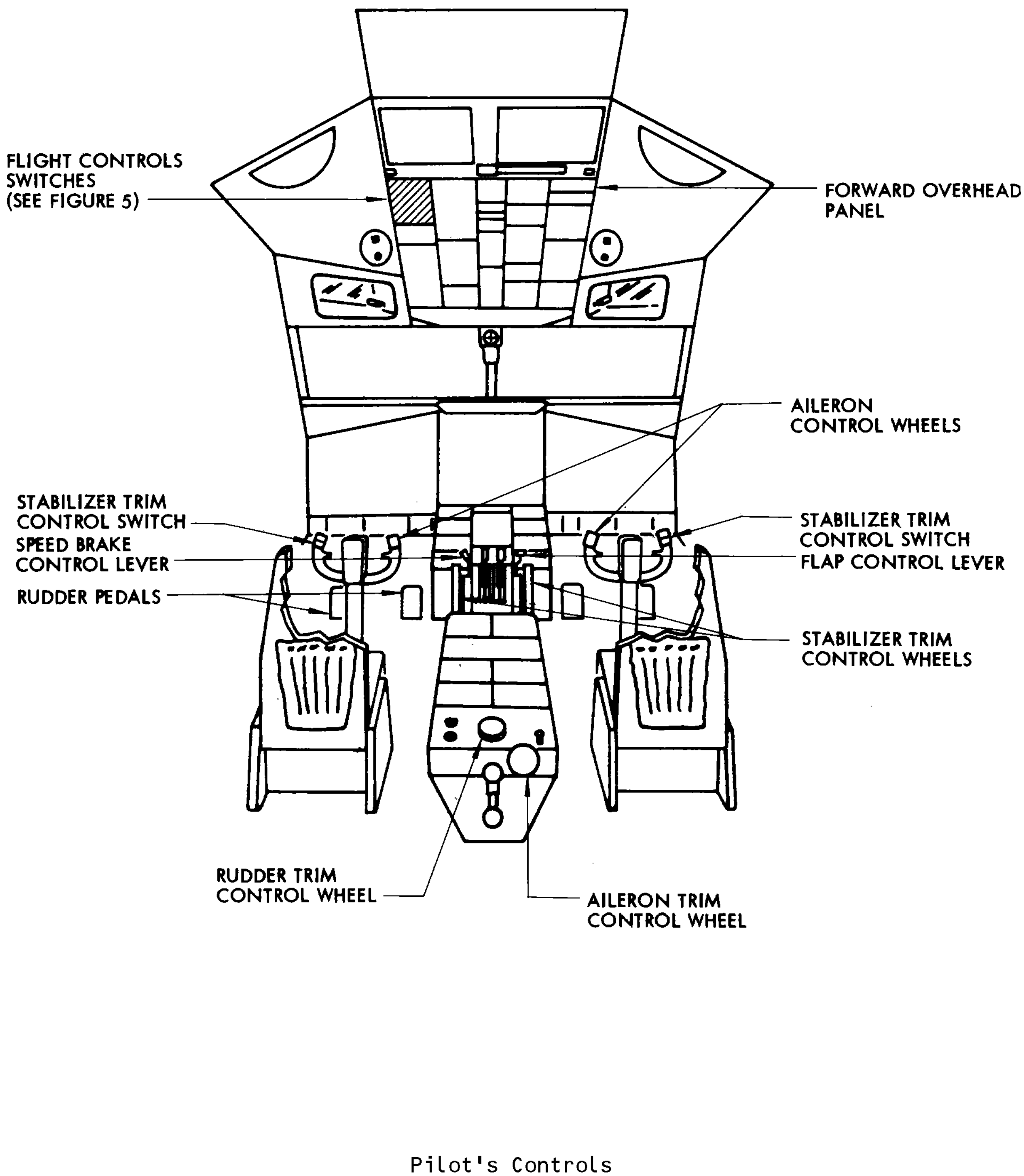
TABLE OF CONTENTS

FLIGHT CONTROLS - DESCRIPTION AND OPERATION

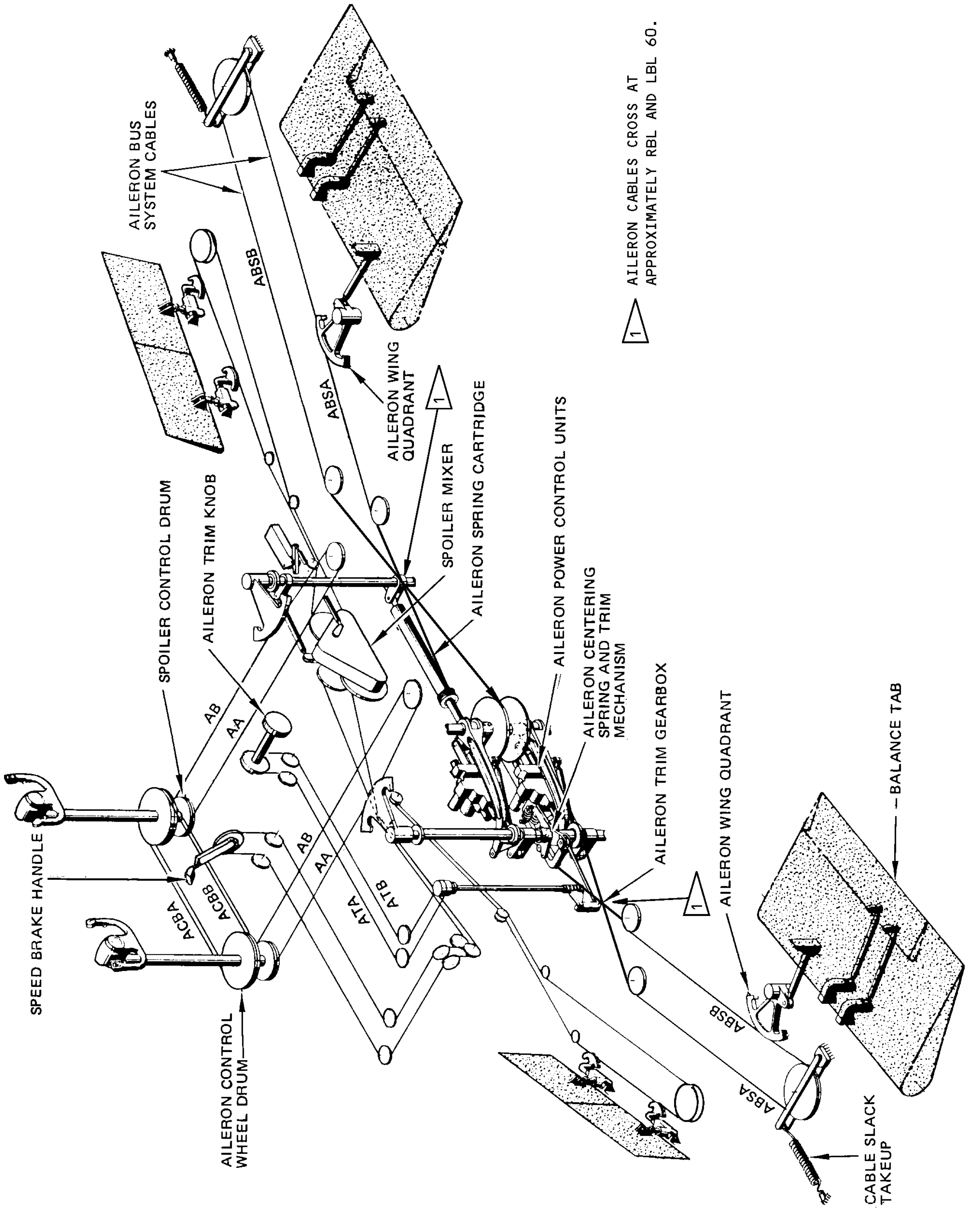
1. General
   A. The primary flight controls are the ailerons, elevators and rudder. (See figure 1.) These hydraulically-powered control surfaces provide flight control in roll, pitch and yaw. The auxiliary flight controls are the trailing edge flaps, leading edge flaps and slats, the spoilers, and an adjustable horizontal stabilizer.
   B. Lateral (roll) trim is provided by repositioning the aileron neutral to deflect the ailerons. Longitudinal (pitch) trim is provided by positioning the adjustable horizontal stabilizer. Directional (yaw) trim is provided by repositioning rudder neutral to deflect the rudder.
2. Roll Control System
   A. The roll (lateral) control surfaces consist of the two ailerons and the four flight spoilers. These surfaces are controlled by rotation of the captain's and first officer's control wheels. (See figure 2.) The control wheel forces are sufficient for pilot feel only, as all these surfaces are normally hydraulically-powered. Control signals from the pilots' control wheels are transmitted through the aileron control system to the control valves on the two aileron power control units. (See figure 3.) These power control units are supplied with hydraulic power, one from system A and the other from system B. Aileron hydraulic supplies are controlled by the flight controls shutoff valve in each flight controls hydraulic modular package. (See figures 4 and 5.) Switches for these valves are on the pilots' overhead panel. The aileron power control units, which are interchangeable with the elevator power control units, are located in the left wheel well. They drive a bus cable system which is connected to the ailerons by quadrants and pushrods. Balance tabs and balance panels aerodynamically reduce the forces required for aileron movement. In the event of hydraulic failure, motion of the pilots' control wheels mechanically positions the ailerons.
   B. Lateral (roll) trim is accomplished by rotating the aileron trim control wheel (figure 2) which is located on the control stand. Motion from this trim wheel is transmitted by cables to the left wheel well where the aileron control system neutral position is shifted. This shift of aileron control system neutral provides trim correction by positioning the ailerons.



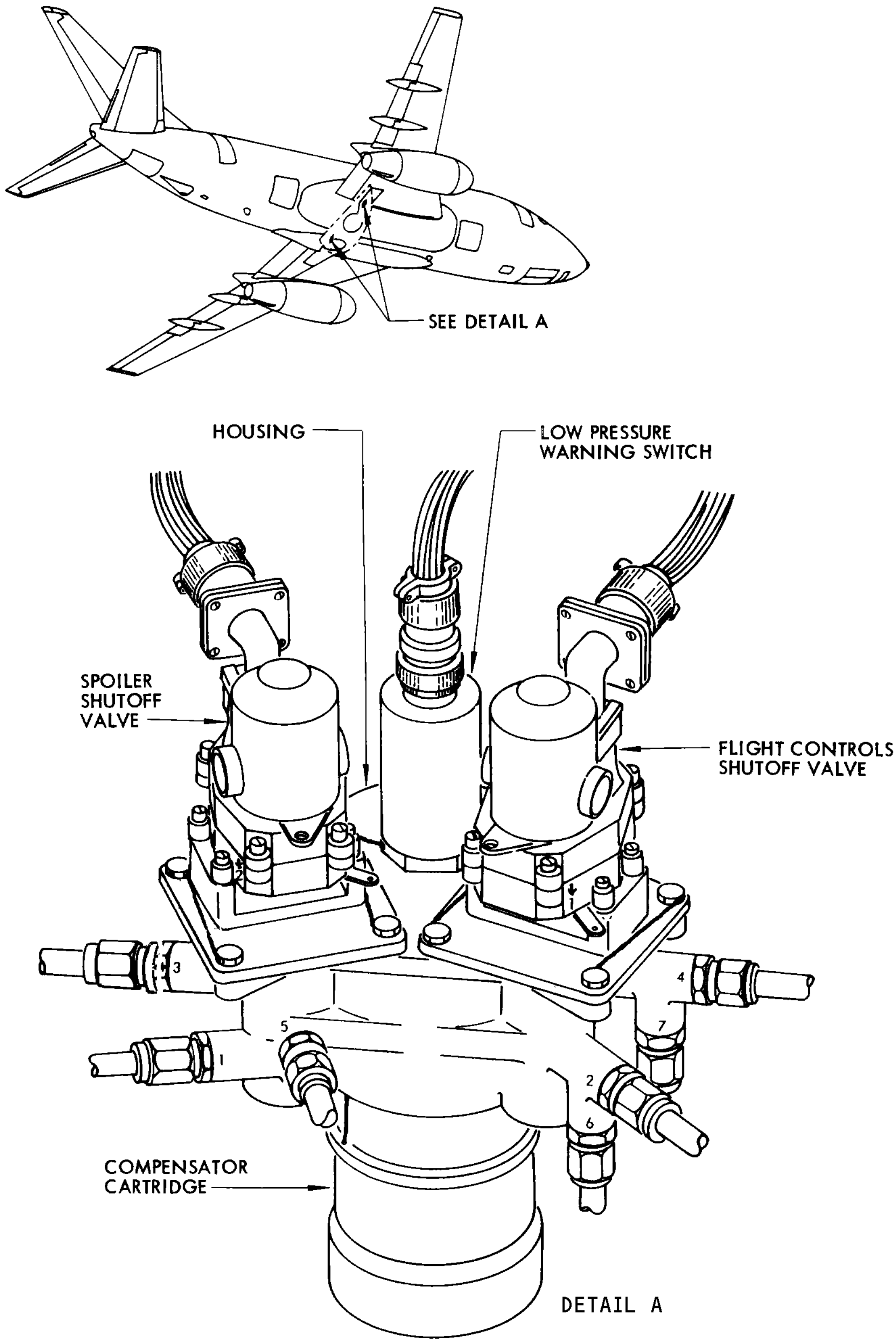
Flight Control Surfaces
Figure 1



Pilot's Controls
Figure 2



Roll Control System Schematic
Figure 3



Flight Controls Hydraulic Modular Package
Figure 4

C. Flight spoilers and ground spoilers are located on the upper surface of the wing. Two flight spoilers are outboard of each nacelle. One ground spoiler is outboard of the flight spoilers, and one ground spoiler is inboard of each nacelle. The flight spoilers are hydraulically actuated in response to inputs from the aileron control system. They rise on the wing with up aileron and remain faired on the wing with down aileron. Flight spoiler motion is in proportion to aileron movement. One spoiler actuator hydraulically positions each flight spoiler panel. Hydraulic system A provides power for spoilers 3 and 6. Hydraulic system B provides power for spoilers 2 and 7. The flight spoilers may be deactivated by the spoiler shutoff valves, in the flight controls hydraulic modular packages. (See figure 4.) These valves are controlled by spoiler system A and B switches on the pilots' overhead panel. (See figure 5.) All flight spoilers may also be used as speed brakes by aft movement of the speed brake control lever. (See figure 2.) The speed brake control lever actuates the spoiler control system to cause all the flight spoiler panels to rise in unison. The flight spoilers will still respond to aileron inputs when being used as speed brakes. With speed brakes on and the airplane on the ground, hydraulic system A will power the ground spoilers to full up position.

3. Pitch Control System

A. The elevators provide primary response of the airplane in pitch control. Fore and aft movement of the captain's and first officer's control columns (figure 2) is transmitted through the elevator control system to the control valves of the two elevator power control units. These power control units are supplied with hydraulic power, one from system A and the other from system B. Elevator hydraulic supplies are controlled by the flight controls shutoff valve in each flight controls hydraulic modular package. (See figure 4.) Switches for these valves are located on the pilots' overhead panel. (See figure 5.) The power control units, which are interchangeable with the aileron power control units, are located in the empennage aft of the stabilizer rear spar. These power control units drive the elevator through pushrods and a torque tube. Balance panels aerodynamically reduce the forces required for elevator movement. In the event of hydraulic failure, motion of the pilots' control column mechanically positions the elevators. Also, the elevator balance tabs, which are hydraulically locked in a fixed position during powered elevator operation, are released to operate. These balance tabs further reduce the forces required to operate the elevator.

B. The adjustable horizontal stabilizer provides pitch (longitudinal) trim. The stabilizer is controlled by stabilizer trim control switches (figure 2) located on the outboard horn of both the captain's and first officer's control wheels. Manual operation of the stabilizer is accomplished by rotating the stabilizer trim control wheels which are located on the control stand. The stabilizer trim control wheels operate a forward mechanism which drives the stabilizer trim indicator and is connected to the stabilizer trim actuator by cables. The trim actuator is a gearbox, jackscrew and ballnut assembly which drives the stabilizer front spar to provide stabilizer motion. The gearbox is driven by an electric actuator, an autopilot actuator, and a cable drum. The autopilot actuator is a two speed reversible electric motor. Stabilizer trim cutout switches, which electrically isolate either of the drive motors, are located on the control stand.

4. Rudder Control

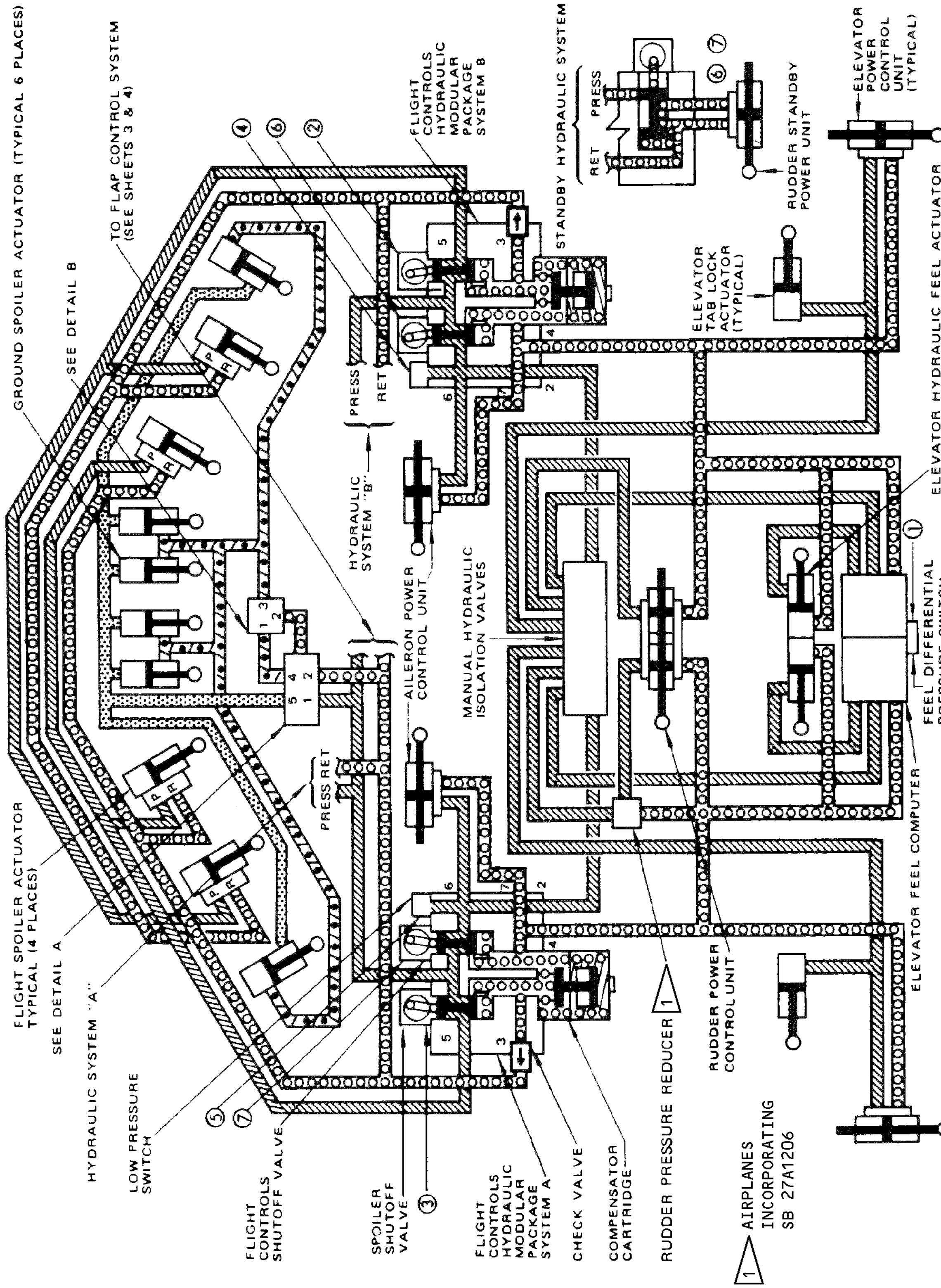
A. The hydraulically-powered rudder is controlled by the captain's and first officer's rudder pedals. (See figure 2.) The rudder pedals are bussed together and are adjustable fore and aft by use of pedal adjustment cranks. The pedals provide input to the rudder power control unit through the rudder control system. The power control unit moves the rudder with hydraulic power from both hydraulic systems A and B. Rudder hydraulic supplies are controlled by the flight controls shutoff valve in the flight controls hydraulic modular packages. (See figure 4.) Switches for these valves are on the pilots' overhead panel. (See figure 5.) In the event of hydraulic system A or B failure, the standby hydraulic system will drive a rudder standby power unit to move the rudder. Control of the standby hydraulic system power is by a shutoff valve on the standby modular package. The flight controls switches on the pilots' overhead panel control this valve. These switches also provide control for pressurizing the standby hydraulic system.

B. Rudder trim is accomplished by rotating the rudder trim control wheel (figure 2) which is located on the control stand. Motion from the trim wheel shifts rudder control system neutral providing trim correction by positioning the rudder.

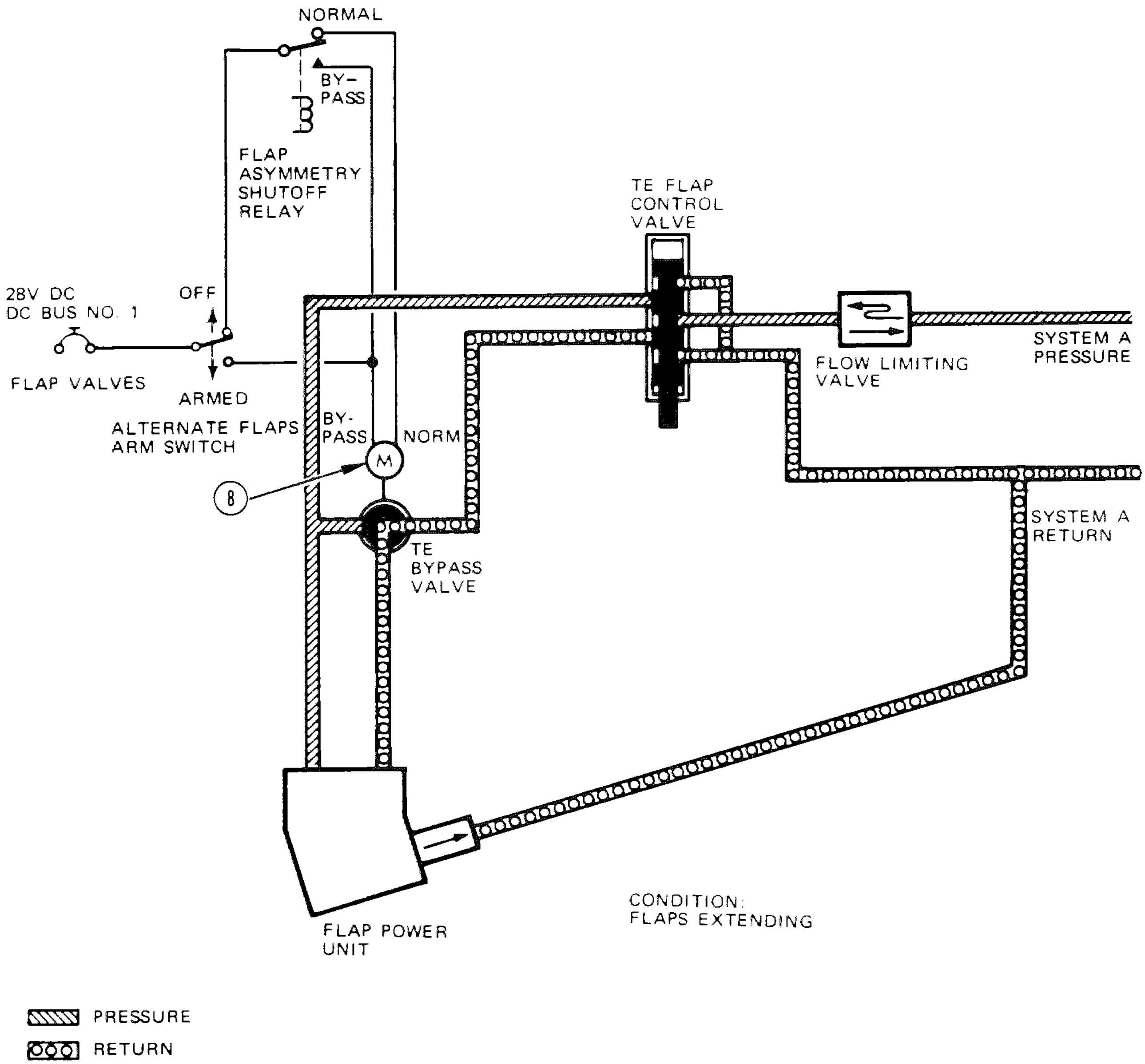
5. Lift Devices

A. The lift devices consist of two pairs of triple slotted trailing edge flaps, three pairs of leading edge slats and two pairs of leading edge flaps. Fore and aft movement of the flap control lever, on the control stand, is transmitted by the flap control system to the flap control valve in the main wheel well. The flap control valve directs power from hydraulic system A to actuate the flap power unit. The rotary motion of the flap power unit is transmitted by the flap drive system to retract or extend the trailing edge flaps. The trailing edge flaps can be located at intermediate angles depending on the positions of the flap control lever. In the event of hydraulic system failure, the trailing edge flaps may be operated electrically. In this case, control of the flaps is accomplished by two switches on the pilots' overhead panel. (See figure 5.) One switch arms the electric flap drive system and the other switch activates the system to extend or retract the flaps. On Cargo Airplanes the trailing edge flap system is protected from excessive airloads by a flap load limiter system. The load limiter system automatically retracts the flaps from 40 to 30 units at airspeeds in excess of 156 knots.

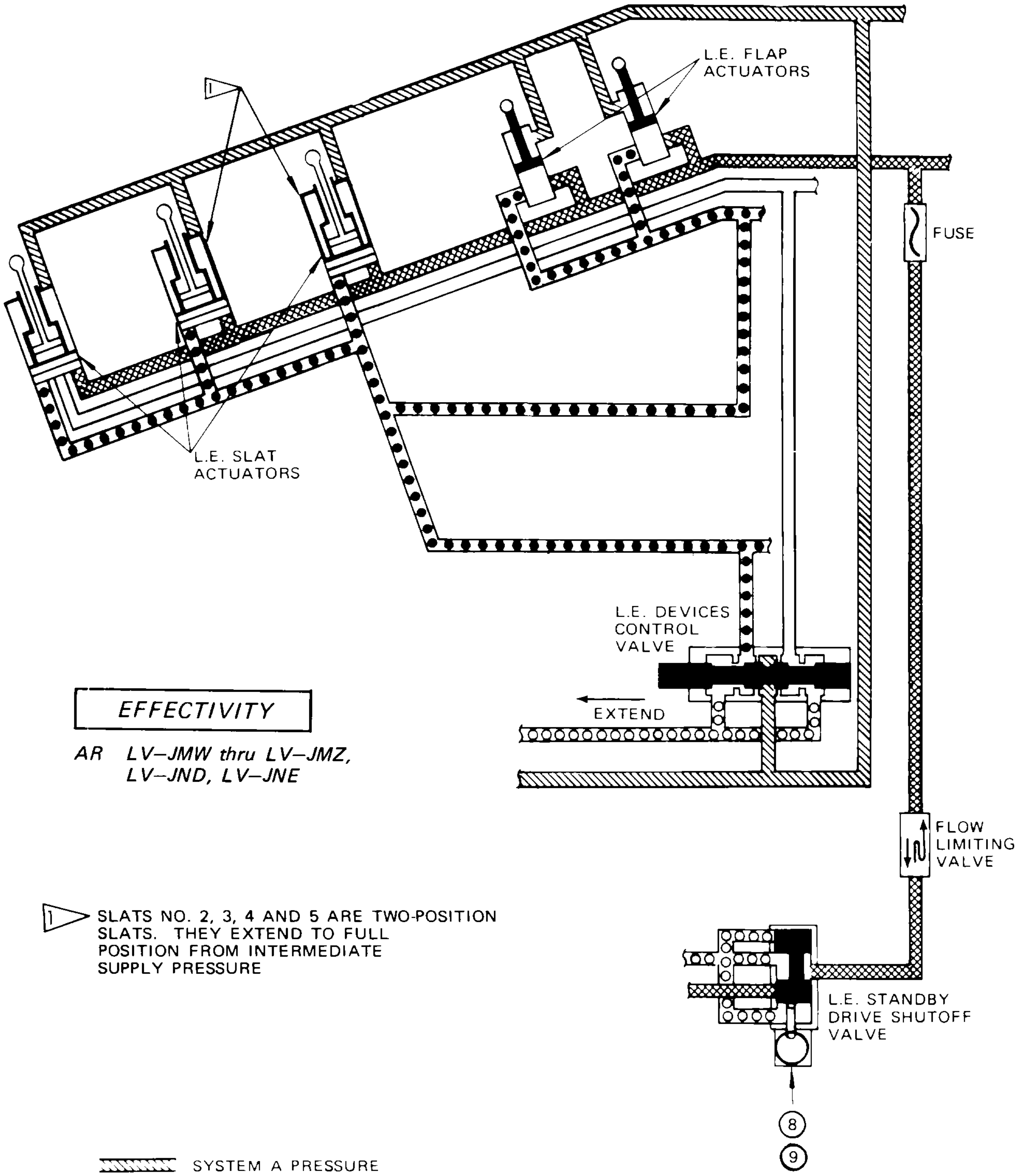
B. The leading edge slats are located outboard of the engines and extend forward from the wing leading edge. The leading edge flaps are located inboard of the engines and extend by rotating downward from the lower surface of the wing leading edge. Motion of the trailing edge flap drive system actuates the leading edge flap and slat control valve. This valve directs hydraulic system A power to drive the leading edge flap and slat actuators. When the trailing edge flaps are positioned in the 1 to 25 unit range the leading edge flaps and slats extend. When the trailing edge flaps are positioned in the 25 to 40 unit range slats 1 and 6 extend an additional amount. In the event of hydraulic system A failure, the leading edge flaps and slats will be driven to the extended position using power from the standby hydraulic system. In this case the leading flaps and slats extend when the electric flap drive system is armed and the control switch is placed in the down position.



Flight Controls System Hydraulic Schematic
Figure 5 (Sheet 1)



Flight Controls System Hydraulic Schematic
Figure 5 (Sheet 2)



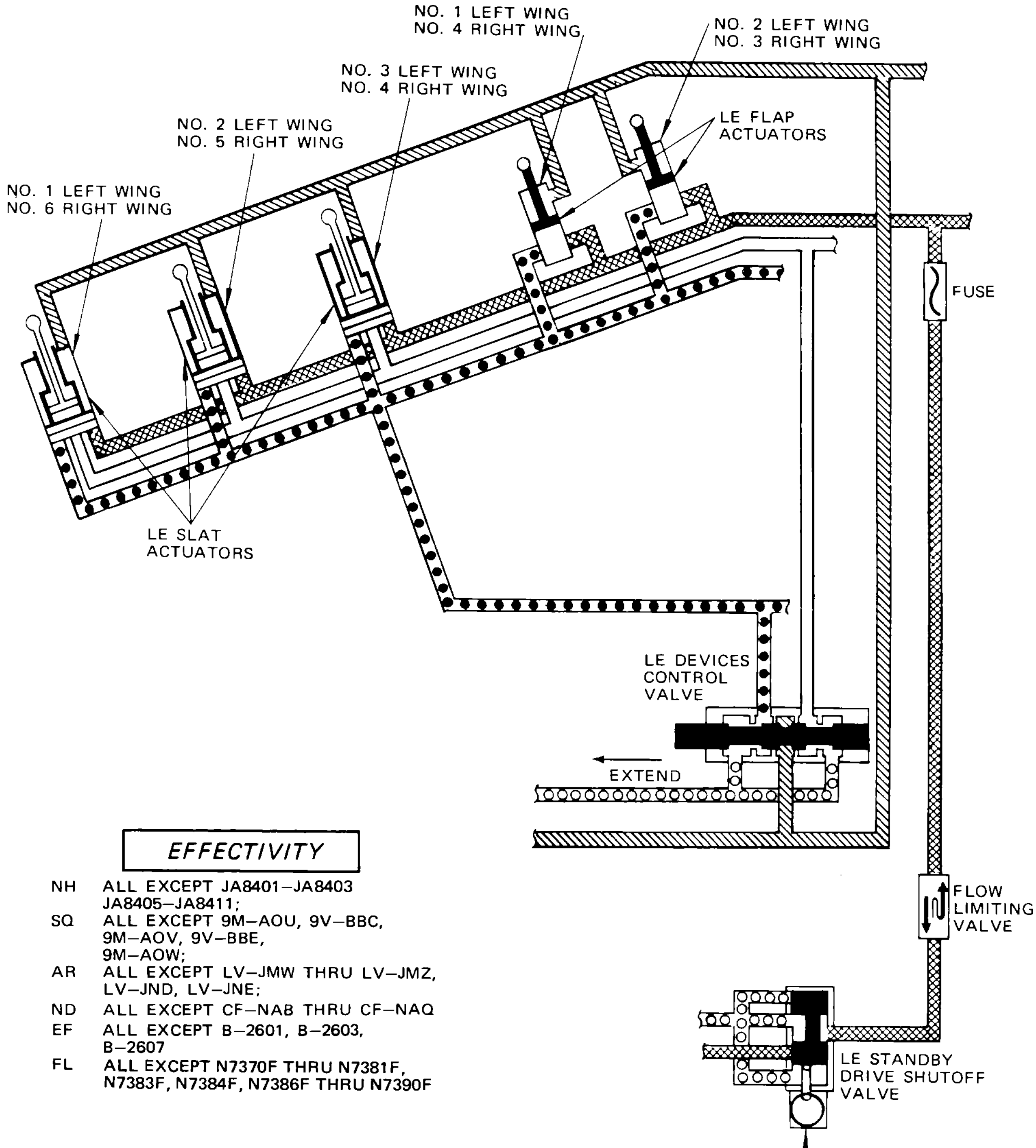
EFFECTIVITY

AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE

1 SLATS NO. 2, 3, 4 AND 5 ARE TWO-POSITION SLATS. THEY EXTEND TO FULL POSITION FROM INTERMEDIATE SUPPLY PRESSURE

SYSTEM A PRESSURE
INTERMEDIATE SUPPLY
FULL EXTEND SUPPLY
STANDBY PRESSURE
RETURN

Flight Controls System Hydraulic Schematic
Figure 5 (Sheet 3)

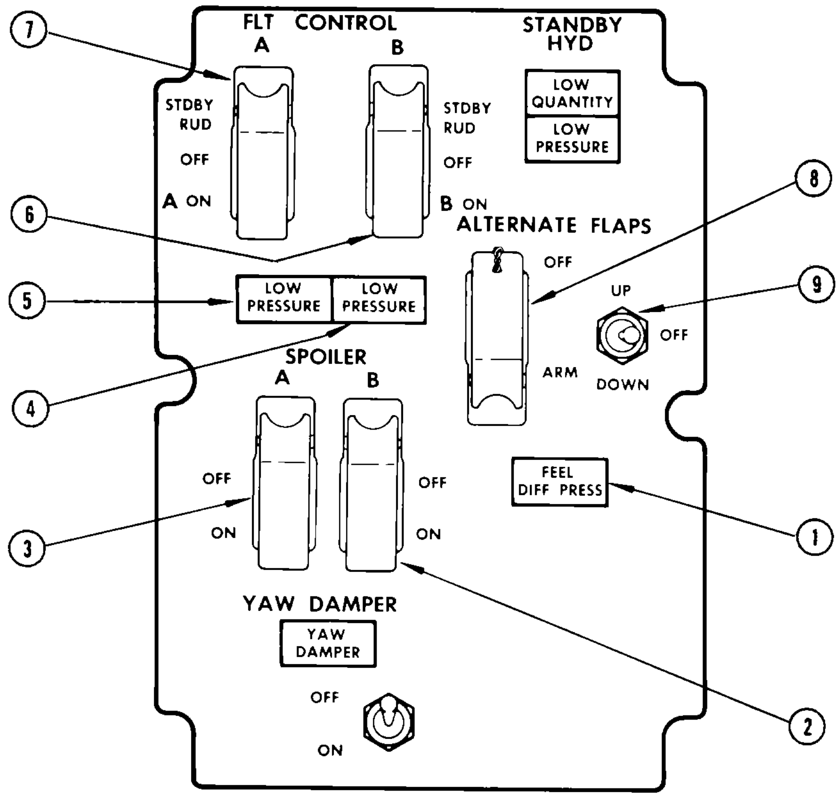


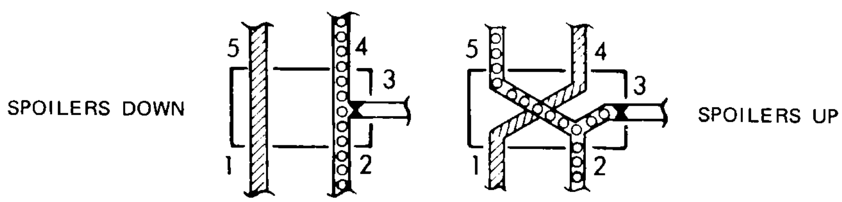
EFFECTIVITY

NH	ALL EXCEPT JA8401–JA8403 JA8405–JA8411;
SQ	ALL EXCEPT 9M–AOU, 9V–BBC, 9M–AOV, 9V–BBE, 9M–AOW;
AR	ALL EXCEPT LV–JMW THRU LV–JMZ, LV–JND, LV–JNE;
ND	ALL EXCEPT CF–NAB THRU CF–NAQ
EF	ALL EXCEPT B–2601, B–2603, B–2607
FL	ALL EXCEPT N7370F THRU N7381F, N7383F, N7384F, N7386F THRU N7390F

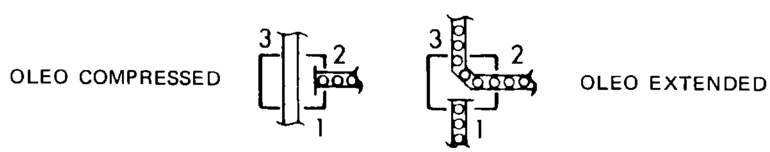
SYSTEM A PRESSURE
INTERMEDIATE SUPPLY
FULL EXTEND SUPPLY
STANDBY PRESSURE
RETURN

Flight Controls System Hydraulic Schematic
Figure 5 (Sheet 4)





GROUND SPOILER CONTROL VALVE
DETAIL A



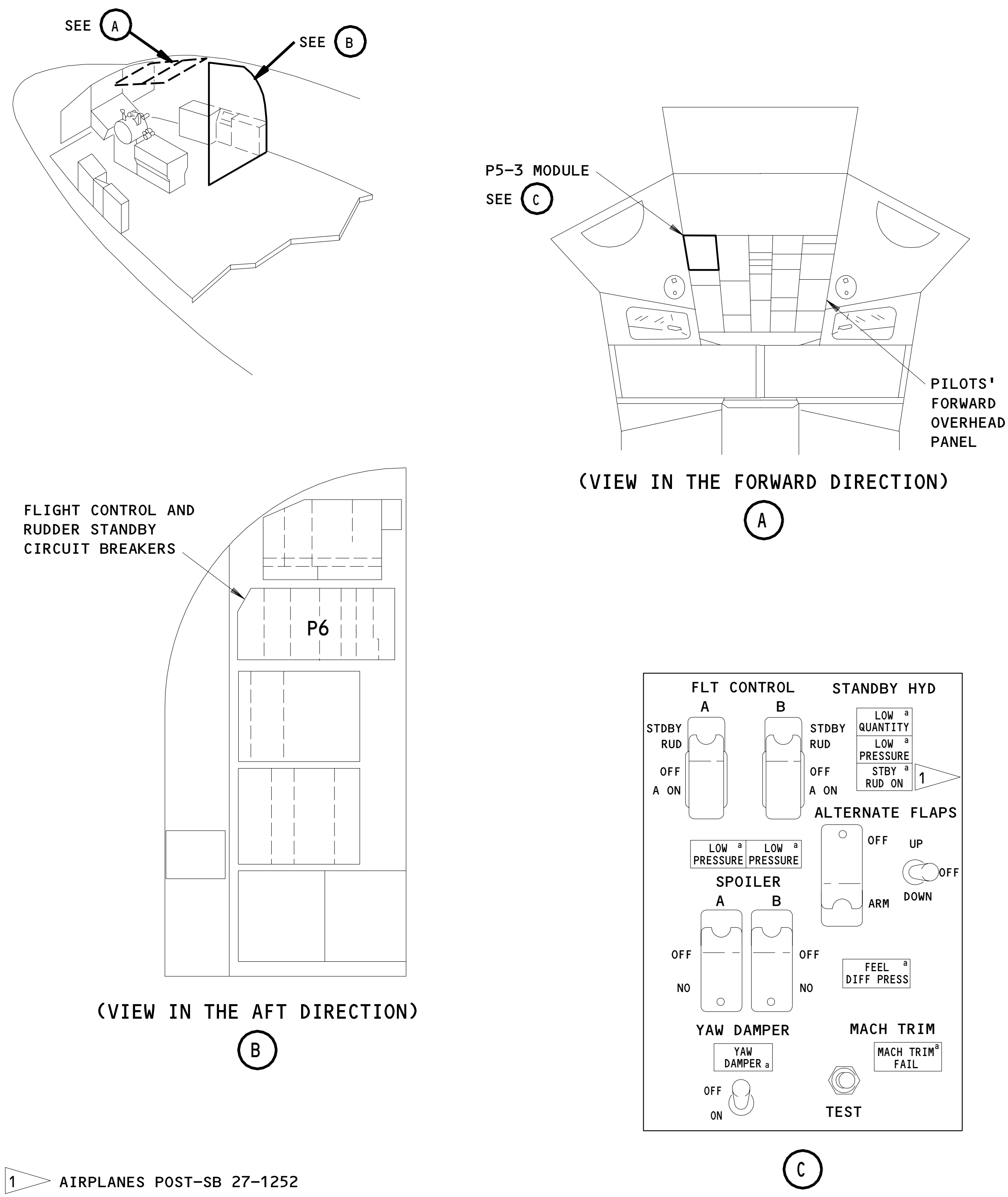
GROUND SPOILER SHUTOFF (LOCKOUT) VALVE
DETAIL B

Flight Controls System Hydraulic Schematic
Figure 5 (Sheet 5)

FLIGHT CONTROLS MODULE (P5-3) - REMOVAL/INSTALLATION

1. General
   A. The P5-3 Module is on the pilot's overhead panel. It contains the lights and switches used by the primary and auxiliary flight control system hydraulic supply valve.
   B. This procedure has these task:
      (1) A removal of the P5-3 Module
      (2) An installation of the P5-3 Module.
2. P5-3 Module Removal (Fig. 401)
   A. References
      (1) AMM 24-22-0/201, MANUAL CONTROL
   B. Access
      (1) Location Zone
          101, 102   Flight Control Cabin

   C. Procedure
      (1) Remove electrical power (AMM 24-22-0/201).
      (2) Open these circuit breakers on the P6 Circuit Breaker Panel and attach DO-NOT-CLOSE tags:
          (a) SHUTOFF VALVES - FLT CONT (2 Locations)
          (b) SHUTOFF VALVES - SPOILER
          (c) SHUTOFF VALVES - STBY RUD
          (d) SHUTOFF VALVES - FLAP
          (e) ALT T.E. FLAP DRIVE AC
          (f) SECT 4
          (g) INDICATOR MASTER DIM BUS -BAT
          (h) INDICATOR MASTER DIM BUS - NO. 1 DC
          (i) INDICATOR MASTER DIM BUS - NO. 2 DC
          (j) MASTER CAUTION - ANNUNCIATOR NO. 1
          (k) MASTER CAUTION - ANNUNCIATOR BAT
          (l) AIRPLANES POST-SB 27-1252;
              FORCE FIGHT MONITOR
          (m) RUDDER LOAD LIMITER
          (n) AUTO PILOT - YAW DAMPER AC
          (o) AUTO PILOT - YAW DAMPER DC
          (p) AUTO PILOT - SYS A AC (2 Locations)
          (q) AUTO PILOT - SYS A DC (2 Locations)
          (r) AUTO PILOT - SYS B AC (2 Locations or NONE)
          (s) AUTO PILOT - SYS B DC (2 Locations or NONE)
          (t) NO. 2 GEN BUS - STBY HYD PUMP (ALT)
          (u) NO. 1 GEN BUS - STBY HYD PUMP NORMAL
      (3) Remove the module.
          (a) Release the fasteners that hold the module.
          (b) Lower the module.
          (c) Disconnect the electrical connectors in the back of the module.



1 AIRPLANES POST-SB 27-1252

Flight Controls Module Assembly (P5-3) Installation
Figure 401

3. P5-3 Module Installation (Fig. 401)
   A. References
      (1) AMM 24-22-0/201, MANUAL CONTROL
      (2) AMM 27-21-0/201, RUDDER AND RUDDER TRIM CONTROL SYSTEM
   B. Access
      (1) Location Zones
          101, 102 Flight Control Cabin

   C. Procedure
      (1) Connect the electrical connectors in the back of the module.
      (2) Push the module into the overhead panel.
      (3) Tighten the fasteners that hold the module.
      (4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 Circuit Breaker Panel:
          (a) SHUTOFF VALVES - FLT CONT (2 Locations)
          (b) SHUTOFF VALVES - SPOILER
          (c) SHUTOFF VALVES - STBY RUD
          (d) SHUTOFF VALVES - FLAP
          (e) ALT T.E. FLAP DRIVE AC
          (f) SECT 4
          (g) INDICATOR MASTER DIM BUS -BAT
          (h) INDICATOR MASTER DIM BUS - NO. 1 DC
          (i) INDICATOR MASTER DIM BUS - NO. 2 DC
          (j) MASTER CAUTION - ANNUNCIATOR NO. 1
          (k) MASTER CAUTION - ANNUNCIATOR BAT
          (l) AIRPLANES POST-SB 27-1252;
              FORCE FIGHT MONITOR
          (m) RUDDER LOAD LIMITER
          (n) AUTO PILOT - YAW DAMPER AC
          (o) AUTO PILOT - YAW DAMPER DC
          (p) AUTO PILOT - SYS A AC (2 Locations)
          (q) AUTO PILOT - SYS A DC (2 Locations)
          (r) AUTO PILOT - SYS B AC (2 Locations or NONE)
          (s) AUTO PILOT - SYS B DC (2 Locations or NONE)
      (5) Supply electrical power (AMM 24-22-0/201).
      (6) Supply hydraulic power to rudder system A and B (AMM 27-21-0/201).
      (7) Do a test of the lights on the P5-3 module:
          (a) Hold the LIGHTS switch on the P2 Pilot Main Panel to the TEST position.
              1) Make sure all the lights on the P5-3 panel come on.

              NOTE: Other lights on the P5 Overhead and adjacent panels will be illuminated while the LIGHTS switch is in the TEST position.

          (b) Release the LIGHTS switch.
              1) Make sure all the lights on the P5-3 panel and adjacent panels go off.

(8) Do a test of these STANDBY HYD lights on the P5-3 module:
 (a) LOW QUANTITY
 (b) LOW PRESSURE
 (c) AIRPLANES POST-SB 27-1252;
 STBY RUD ON
 (d) Push the STANDBY HYD - LOW QUANTITY light switch.
 1) Make sure the LOW QUANTITY light comes on.
 (e) Set the FLT CONTROL A switch to STDBY RUD.
 1) Make sure the LOW PRESSURE light comes on.
 2) AIRPLANES POST-SB 27-1252;
 Make sure the STBY RUD ON light comes on.
 (f) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 Circuit Breaker Panel:
 1) NO. 2 GEN BUS - STBY HYD PUMP (ALT)
 2) NO. 1 GEN BUS - STBY HYD PUMP NORMAL
 (g) Make sure the LOW PRESSURE light goes off.
 (h) Set the FLT CONTROL A switch to ON.
 1) Make sure the LOW PRESSURE light is off.
 2) AIRPLANES POST-SB 27-1252;
 Make sure the STBY RUD ON light goes off.
(9) Do a test of the YAW DAMPER light on the P5-3 module.
 (a) Make sure the FLT CONTROL B switch is ON.
 (b) Turn the YAW DAMPER switch to OFF.
 1) Make sure the YAW DAMPER light comes on.
 (c) Turn the YAW DAMPER switch to ON.
 1) Make sure the YAW DAMPER light goes off.
(10) Do a test of the FLT CONTROL and SPOILER switches.
 (a) Operate the aileron control wheel, control column, and rudder pedal sets.
 1) Make sure the ailerons, rudder, elevators, and spoilers operate satisfactory.
 (b) Set the FLT CONTROL A and B switches and the SPOILER A and B switches to OFF.
 1) Make sure the two LOW PRESSURE lights come on.
 2) Make sure the spoilers do not operate.
 (c) Set the FLT CONTROL A and B switches and the SPOILER A and B switches to ON.
 1) Make sure the two LOW PRESSURE lights go off.
(11) Do a test of the alternate leading edge flaps and slats system.
 (a) Set the FLT CONTROL B switch to STDBY RUD
 1) Make sure the LOW PRESSURE light comes on momentarily then goes off.
 2) AIRPLANES POST-SB 27-1252;
 Make sure the STBY RUD ON light comes on.
 (b) Make sure that the flap control lever is in the FLAP UP detent.

(c) Set the ALTERNATE FLAPS arm switch to ARM.
    1) Make sure that the leading edge flaps and slats do not extend.

WARNING: MAKE SURE THAT PERSONS OR EQUIPMENT ARE CLEAR OF THE LEADING EDGE FLAPS AND SLATS. THE LEADING EDGE CONTROL SURFACES WILL EXTEND. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: MAKE SURE THAT THE INBOARD FAN DUCT COWL AND THE THRUST REVERSERS ARE CLOSED OR COMPLETELY REMOVED BEFORE YOU EXTEND THE LEADING EDGE FLAPS. THERE IS NOT SUFFICIENT CLEARANCE FOR THE LEADING EDGE FLAPS TO EXTEND IF THE INBOARD FAN DUCT COWL AND THE THRUST REVERSER ARE IN THE OPEN POSITION. THIS CAN CAUSE DAMAGE TO EQUIPMENT.

CAUTION: MAKE SURE THAT THE ALTERNATE FLAP DRIVE UNIT IS LIMITED TO 4 MINUTES OPERATION AND 25 MINUTES OFF. FAILURE TO DO THIS CAN CAUSE DAMAGE TO THE DRIVE UNIT.

(d) Set the ALTERNATE FLAPS position switch to DOWN.
    1) Make sure that the leading edge flaps and slats extend.
(e) Set the ALTERNATE FLAPS position switch to UP.
    1) Make sure that the trailing edge flaps retract.
    2) Make sure the leading edge flaps and slats do not retract.
(f) Set the ALTERNATE FLAPS arm switch to OFF.
    1) Make sure that the leading edge flaps and slats fully retract.
    2) Make sure that the trailing edge flaps fully retract.
(g) Set the FLT CONTROL B switch to OFF
    1) AIRPLANES POST-SB 27-1252;
       Make sure the STBY RUD ON light goes off.
(h) Set the ALTERNATE FLAPS arm switch to ARM.
    1) Make sure that the leading edge flaps and slats do not extend.
(i) Set the ALTERNATE FLAPS arm switch to OFF.
(j) Set the FLT CONTROL B switch to ON.

(12) Remove electrical power if it is not necessary (AMM 24-22-0/201).
(13) Remove hydraulic power if it is not necessary (AMM 27-21-0/201).

CONTROL CABLE SYSTEMS - DESCRIPTION AND OPERATION

1. General
   A. The primary function of the control cables in the flight control systems is to transmit the pilots' control inputs to the affected control surfaces. The control cables ar e made from 7 x 7 and 7 x 19 carbon steel flexible wire. A typical control cable system terminates at a drum or quadrant by means of swaged terminals and has turnbuckles to allow tensioning the cable to the proper rigging load. Long cable runs are supported by idler pulleys. Air seals are used to reduce pressure loss when cables are routed through pressure bulkheads.
   B. The control cables for the aileron, aileron trim, spoiler, speed brake and flap control systems are routed, from the control cabin, under the passenger cabin floor to the main wheel well. The cables for the speed brake system pass through air pressure seals in the main wheel wel1 ceiling, however, the other cables terminate at quadrants and drums above the ceiling. Aileron bus cables and spoiler control cables are routed aft of the wing rear spar to direct motion to the aileron and spoiler quadrants in the wing.
   C. The control cables for the elevator, rudder, rudder trim and stabilizer trim control systems are routed from the control cabin, under the passenger cabin, through air seals at the aft pressure bulkhead and into the empennage. The elevator cables are routed under the stabilizer truss. The rudder and rudder trim cables are routed upward ahead of the stabilizer truss.
   D. Control cable runs are identified by coded letter designations. These cable codes identify cable function. Metal-cals showing proper cable routing utilize these codes. These metal-cals are mounted adjacent to the floor beams above the cargo compartment ceiling and in the lower nose compartment. Cable codes are shown in Table 1.

TABLE I

CONTROL SYSTEM	CABLE CODE	CABLE FUNCTION
Aileron	AA	Aileron Control-Left aileron down, Right aileron up
	AB	Aileron Control-Left aileron up, Right aileron down
	ACBA	Aileron Control Bus-Left aileron down, Right aileron up
	ACBB	Aileron Control Bus-Left aileron up, Right aileron down
	ABSA	Aileron Bus System-Left aileron down, Right aileron up
	ABSB	Aileron Bus System-Left aileron up, Right aileron down
Aileron Trim	ATA	Aileron Trim-Left aileron down, Right aileron up
	ATB	Aileron Trim-Left aileron up, Right aileron down
Rudder	RA	Rudder Control-Rudder left
	RB	Rudder Control-Rudder right
Rudder	RTA	Rudder Trim-Rudder right
	RTB	Rudder Trim-Rudder left
Elevator	EA	Elevator Control-Elevator down
	EB	Elevator Control-Elevator up
Stabilizer Trim	STA	Stabilizer Trim-Stabilizer leading edge up
	STB	Stabilizer Trim-Stabilizer leading edge down
Wing Flaps	WFA	Wing Flap Control-Flaps up
	WFB	Wing Flap Control-Flaps down
	WFFA	Wing Flap Follow-up-Flaps up
	WFFB	Wing Flap Follow-up-Flaps down

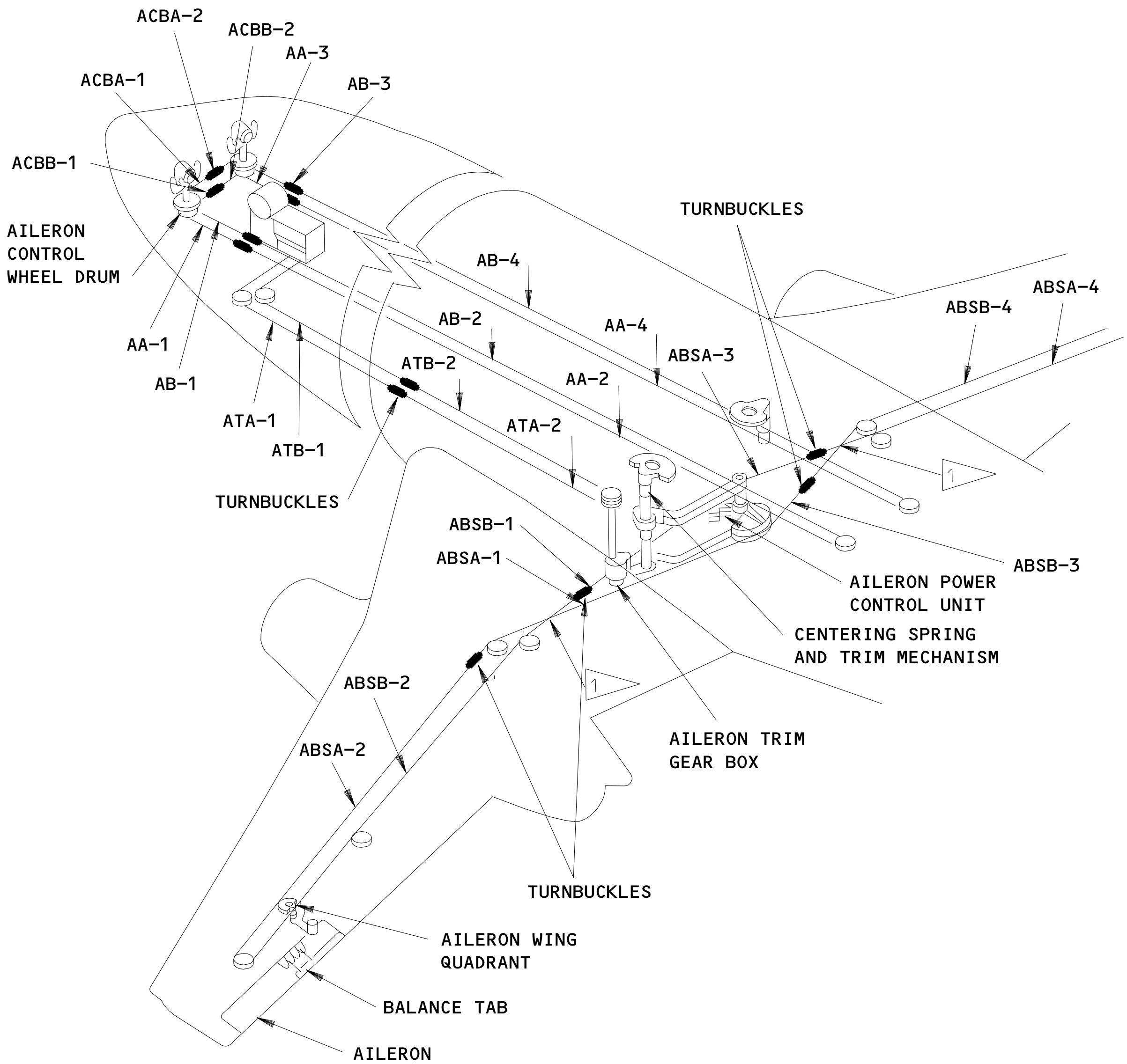
TABLE I		
CONTROL SYSTEM	CABLE CODE	CABLE FUNCTION
Spoilers	WSA1	Wing Spoilers-Outboard spoilers up
	WSB1	Wing Spoilers-Outboard spoilers down
	WSA2	Wing Spoilers-Inboard spoilers up
	WSB2	Wing Spoilers-Inboard spoilers down
Speed Brakes	SBA	Speed Brake Control-Speed Brake on
	SBB	Speed Brake Control-Speed Brake off

FLIGHT CONTROL CABLES - MAINTENANCE PRACTICES

1. General
   A. This subject provides the information necessary to locate and fabricate all flight control cables. See Fig. 201 thru 207 for applicable flight control system cables (AMM Chapter 20, Control Cables for cable removal and installation).
   B. Access to wing flap, aileron, aileron trim, and speedbrake cable pulleys is provided at several places. These places are forward cargo compartment ceiling panels, floor panels over wheel well and wing center section, and by lowering trailing edge flaps. Additional access is found through the wing lower access panel at rear spar, adjacent to aileron, with flap lowered. Access to elevator, stabilizer trim, and rudder control system cable pulleys is provided through forward and aft cargo compartment ceiling panels. Access is also found through floor panels over wing center section and wheel well, center access panel in aft cargo compartment aft end wall, and access door 3701.
2. Control Cable Rigging
   A. When a new control cable is installed, the affected system must be cycled with cables tightened to twice the working tension. Final rigging adjustments are then made. Refer to following table for the number of test cycles required for each system. Refer to applicable system for rigging loads.

CABLE SYSTEM	NUMBER OF TEST CYCLES AT TWICE WORKING TENSION
AILERON	20
AILERON TRIM	20
ELEVATOR	25
TRAILING EDGE FLAPS	25
RUDDER	25
RUDDER TRIM	10
SPEED BRAKE	20
SPOILER	20
STABILIZER TRIM	5

3. Cable Terminal Swaging
   A. Dies for the next large size AN standard terminals are required for swaging all BACT14A terminals.



AILERON CONTROL AND AILERON BUS CABLE SCHEMATIC

1 AILERON CABLES CROSS AT APPROXIMATELY RBL AND LBL 60.

Aileron and Aileron Trim Control Cables
Figure 201 (Sheet 1)

CABLE REF	NO. REQ	LENGTH (in.) *[4]	CABLE SIZE	FITTINGS *[4]	
				1	2
ACBA-1	1	32.1	1/8 - 7x19	MS21260S4LH	BACT14A4
ACBB-1	1	32.1	1/8 - 7x19	MS21260S4RH	BACT14A4
ACBA-2	1	32.1	1/8 - 7x19	MS21260S4RH	BACT14A4
ACBB-2	1	32.1	1/8 - 7x19	MS21260S4LH	BACT14A4
AA-1	1	39.9	1/8 - 7x19	MS21260L4RH	BACT14A4
AB-1	1	27.6	1/8 - 7x19	MS21260L4LH	BACT14A4
AA-3	1	26.2	1/8 - 7x19	MS21260L4LH	BACT14A4
AB-3	1	38.5	1/8 - 7x19	MS21260L4RH	BACT14A4
AA-2	1	463.3	1/8 - 7x19	MS21260L4LH	BACT14A4
AB-2 *[2]	1	505.1	1/8 - 7x19	MS21260L4RH	BACT14A4
AB-2 *[3]	1	504.8	1/8 - 7x19	MS21260L4RH	BACT14A4

CABLE REF	NO. REQ	LENGTH (in.) *[4]	CABLE SIZE	FITTINGS *[4] 1	2
AA-4 *[2]	1	505.1	1/8 - 7x19	MS21260L4RH	BACT14A4
AA-4 *[3]	1	504.8	1/8 - 7x19	MS21260L4RH	BACT14A4
AB-4	1	463.3	1/8 - 7x19	MS21260L4LH	BACT14A4
ABSA-1	1	75.4	3/16 - 7x1	MS21260L6RH	BACT14A6
ABSB-1	1	40.8	3/16 - 7x1	MS21260L6LH	BACT14A6
ABSA-2	1	382.2	3/16 - 7x1	MS21260L6LH	BACT14A6
ABSB-2	1	448.2	3/16 - 7x1	MS21260L6RH	BACT14A6
ABSA-3	1	20.3	3/16 - 7x1	MS21260L6RH	BACT14A6
ABSB-3	1	48.7	3/16 - 7x1	MS21260L6LH	BACT14A6
ABSA-4	1	479.2	3/16 - 7x1	MS21260L6LH	BACT14A6
ABSB-4	1	419.1	3/16 - 7x1	MS21260L6RH	BACT14A6
ATA-1	1	299.9	3/32 - 7x7	MS21260L3LH	BACT14A3
ATB-1	1	302.6	3/32 - 7x7	MS21260L3RH	BACT14A3
ATA-2	1	264.0	3/32 - 7x7	MS21260L3RH	BACT14A3
ATB-2	1	264.0	3/32 - 7x7	MS21260L3LH	BACT14A3

MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781
1/8-INCH CABLES
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

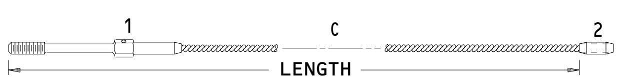
3/32-INCH CABLES
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)

3/16-INCH CABLES
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (PREFERRED)
- CARBON STEEL PER MIL-W-1511 (OPTIONAL)

*[2] Optional length
*[3] Preferred length (will provide more adjustment capability to meet tension requirements)
*[4] Reference only. For specific part number, length, material, and end fittings, refer to the IPC.

NOTE: Zinc-only and tin-over-zinc coated cables are interchangeable, and may be intermixed within a system (aileron, spoiler, stabilizer, etc.) providing opposite cables within a given cable loop are replaced with cables of the same type (for example, cables ABSA-2 and ABSB-2 must be replaced together with both new cables either zinc only or tin-over-zinc). This will prevent asymmetric cable stretch that can degrade system rigging.

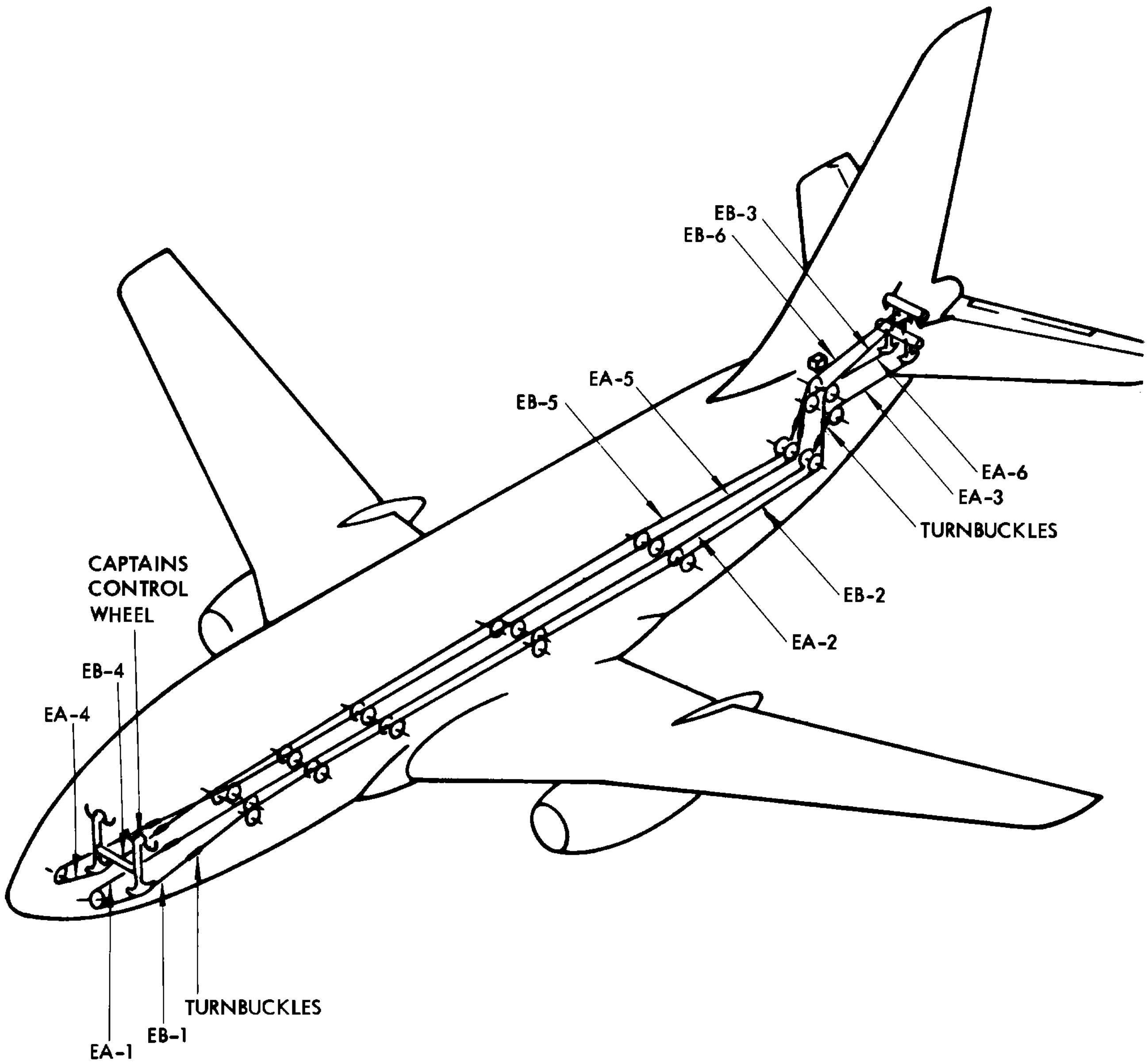
CABLE REF	NO. REQ	LENGTH (IN.)	CABLE SIZE	FITTINGS *[1]	
				1	2
WSA1-1	1	61.4	3/32 - 7x7	MS21260L3RH	BACT14A3
WSA1-2	1	33.8	3/32 - 7x7	MS21260L3LH	BACT14A3
WSA1-3	1	242.8	3/32 - 7x7	MS21260L3LH	BACT14A3
WSA1-4	1	257.2	3/32 - 7x7	MS21260L3RH	BACT14A3
WSA2-1	1	66.3	3/32 - 7x7	MS21260L3LH	BACT14A3
WSA2-2	1	38.5	3/32 - 7x7	MS21260L3RH	BACT14A3
WSA2-3	1	185.3	3/32 - 7x7	MS21260L3RH	BACT14A3
WSA2-4	1	199.9	3/32 - 7x7	MS21260L3LH	BACT14A3
WSB1-1	1	86.4	3/32 - 7x7	MS21260L3RH	BACT14A3
WSB1-2	1	58.5	3/32 - 7x7	MS21260L3LH	BACT14A3
WSB1-3	1	279.4	3/32 - 7x7	MS21260L3LH	BACT14A3



ALL CABLES EXCEPT ACBA-1, -2, ACBB-1, -2

CABLES ACBA-1, -2, ACBB-1, -2

Aileron and Aileron Trim Control Cables
Figure 201 (Sheet 2)



Elevator Control Cables
Figure 202 (Sheet 1)

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CABLE REF	NO. REQ.	LENGTH [3] (INCHES)	CABLE SIZE AND MATERIAL	FITTINGS [3] 1	FITTINGS [3] 2
EA-1	1	97.6	1/8 - 7X19	MS21260L4LH	BACT14A4
EA-4	1	97.6	1/8 - 7X19	MS21260L4LH	BACT14A4
EB-1	1	31.5	1/8 - 7X19	MS21260L4RH	BACT14A4
EB-4	1	31.5	1/8 - 7X19	MS21260L4RH	BACT14A4
EA-2	1	935.2 [1]	1/8 - 7X19	MS21260L4RH	MS21260L4RH
EA-5		935.2 [1]	1/8 - 7X19	MS21260L4RH	MS21260L4RH
EA-2	1	934.7 [2]	1/8 - 7X19	MS21260L4RH	MS21260L4RH
EA-5		934.7 [2]	1/8 - 7X19	MS21260L4RH	MS21260L4RH
EB-2	1	925.5 [1]	1/8 - 7X19	MS21260L4LH	MS21260L4LH
EB-5		925.5 [1]	1/8 - 7X19	MS21260L4LH	MS21260L4LH
EB-2	1	925.0 [2]	1/8 - 7X19	MS21260L4LH	MS21260L4LH
EB-5		925.0 [2]	1/8 - 7X19	MS21260L4LH	MS21260L4LH
EA-3	1	98.9	1/8 - 7X19	MS21260L4LH	BACT14A4
EB-3	1	97.7	1/8 - 7X19	MS21260L4RH	BACT14A4
EB-6	1	97.7	1/8 - 7X19	MS21260L4RH	BACT14A4
EA-6	1	98.9	1/8 - 7X19	MS21260L4LH	BACT14A4

EA AND EB -1, -3, -4, -6

EA AND EB -2, -5

MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

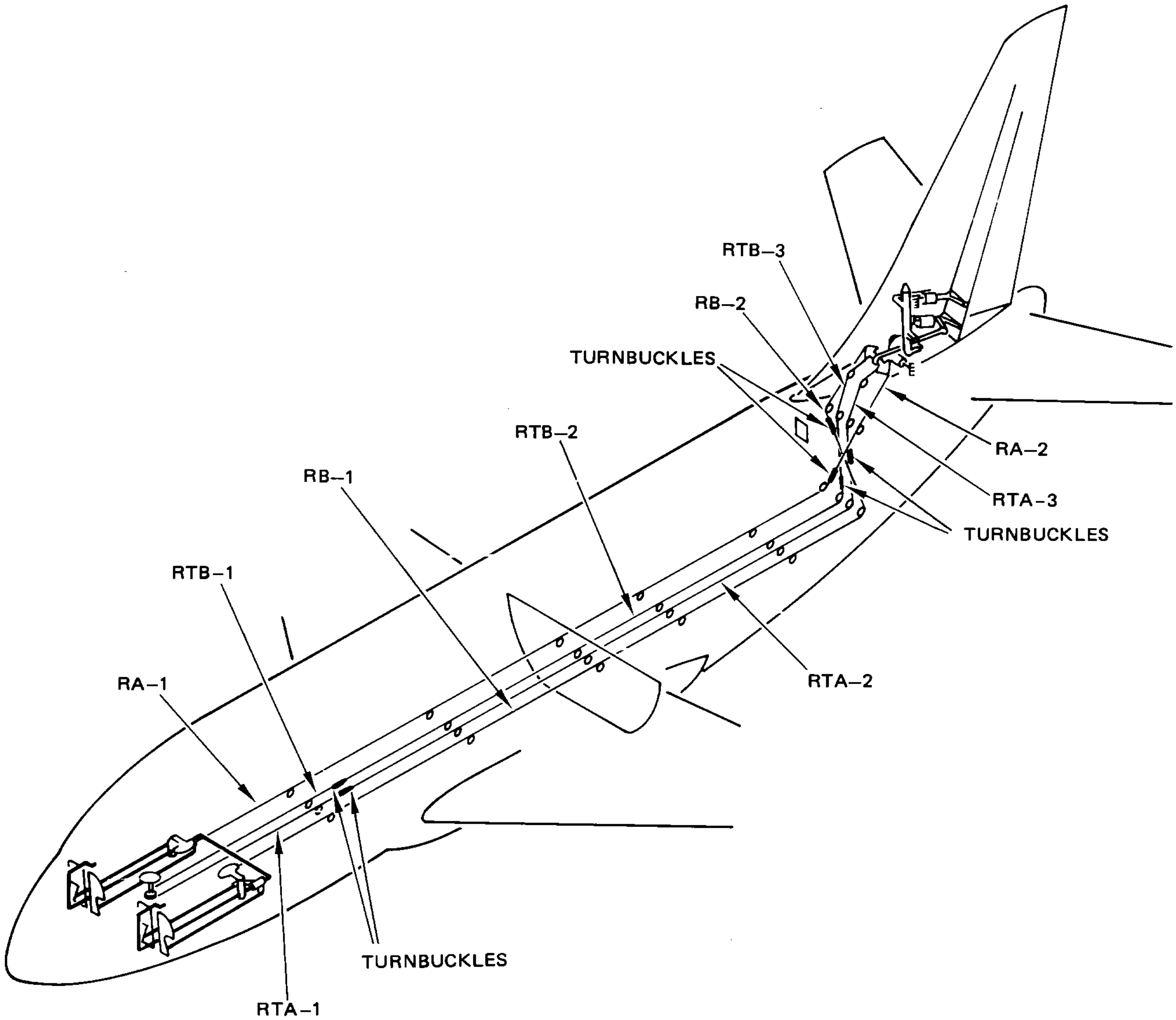
NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

[1] OPTIONAL LENGTH

[2] PREFERRED LENGTH (WILL PROVIDE MORE ADJUSTMENT CAPABILITY TO MEET TENSION REQUIREMENTS)

[3] REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

Elevator Control Cables
Figure 202 (Sheet 2)



Rudder and Rudder Trim Control Cables
Figure 203 (Sheet 1)

CABLE REF	NO. REQ.	LENGTH [3] (INCHES)	CABLE SIZE AND MATERIAL	FITTINGS [3]	
				1	2
RA-1	1	958.5	1/8 - 7X19	MS21260L4RH	BACT14A4
RB-1	1	952.2 [1]	1/8 - 7X19	MS21260L4LH	BACT14A4
RB-1	1	951.2 [2]	1/8 - 7X19	MS21260L4LH	BACT14A4
RA-2	1	66.5	1/8 - 7X19	MS21260L4LH	BACT14A4
RB-2	1	79.4	1/8 - 7X19	MS21260L4RH	BACT14A4
RTB-1	1	251.9	3/32 - 7X7	MS21260L3LH	BACT14A3
RTA-1	1	245.5	3/32 - 7X7	MS21260L3RH	BACT14A3
RTB-2	1	698.6	3/32 - 7X7	MS21260L3RH	MS21260L3RH
RTA-2	1	718.3	3/32 - 7X7	MS21260L3LH	MS21260L3LH
RTA-3	1	126.4	3/32 - 7X7	MS21260L3RH	BACT14A3
RTB-3	1	149.3	3/32 - 7X7	MS21260L3LH	BACT14A3

RA AND RB -1, -2
RTA AND RTB -2, -3

RTA -2 AND RTB -2

MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

1/8-INCH CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

3/32-INCH CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

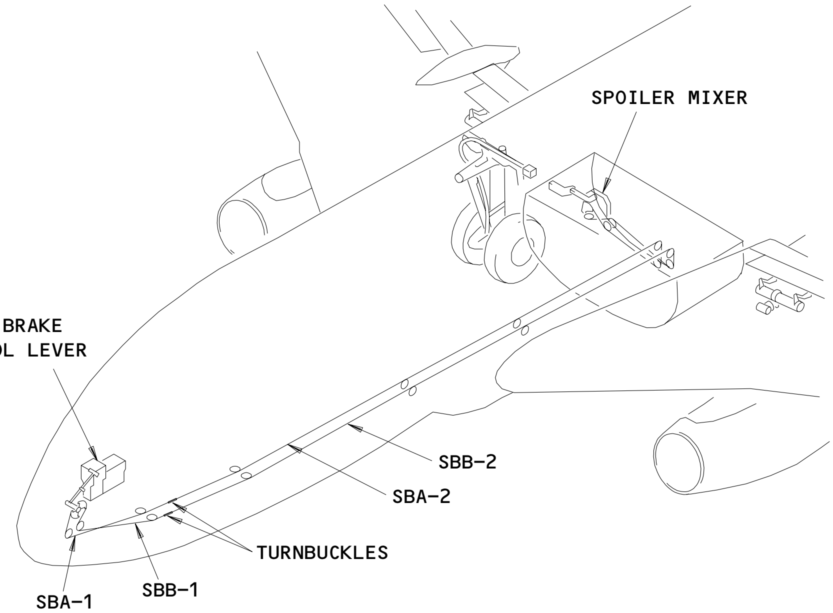
NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

[1] OPTIONAL LENGTH

[2] PREFERRED LENGTH (WILL PROVIDE MORE ADJUSTMENT CAPABILITY TO MEET TENSION REQUIREMENTS)

[3] REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

Rudder and Rudder Trim Control Cables
Figure 203 (Sheet 2)



CABLE REF	NO. REQ.	LENGTH 1 (INCHES)	FITTINGS 1	
			1	2
SBA-1	1	85.8	MS21260-L4RH	BACT14A4
SBA-2	1	521.1	MS21260-L4LH	BACT14A4
SBB-2	1	531.2	MS21260-L4RH	BACT14A4
SBB-1	1	74.4	MS21260-L4LH	BACT14A4

CABLE SIZE: 1/8 - 7X19

MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

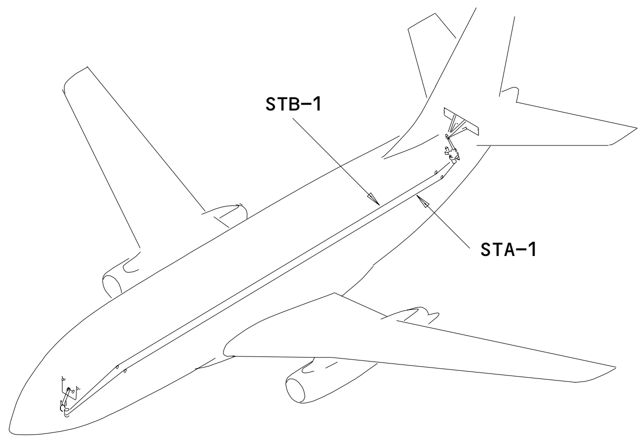
CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

1 REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

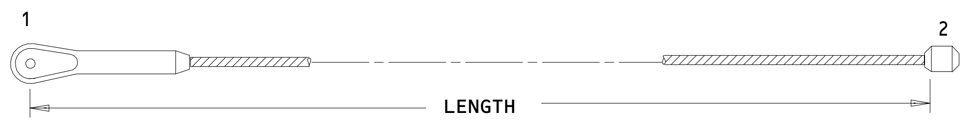
Speed Brake Control Cables
Figure 204

467106



CABLE REF	NO. REQ.	LENGTH [5] (INCHES)	FITTINGS [5]	
			1	2
STA -1 [1]	1	1884.4 [2] [4]	MS20668-4	BACT14A4
	1	1883.4 [3] [4]	MS20668-4	BACT14A4
STB -1 [1]	1	1799.9 [2] [4]	MS20668-4	BACT14A4
	1	1798.9 [3] [4]	MS20668-4	BACT14A4

CABLE SIZE: 1/8 - 7X19



MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

[1] TO ENSURE FULL CABLE PRESTRETCH, LOAD CABLE SMOOTHLY SO THAT A LOAD OF 1200 TO 1260 POUNDS IS REACHED IN NOT LESS THAN 3 SECONDS. HOLD LOAD FOR A MINIMUM OF 5 SECONDS. SMOOTHLY RELEASE LOAD.

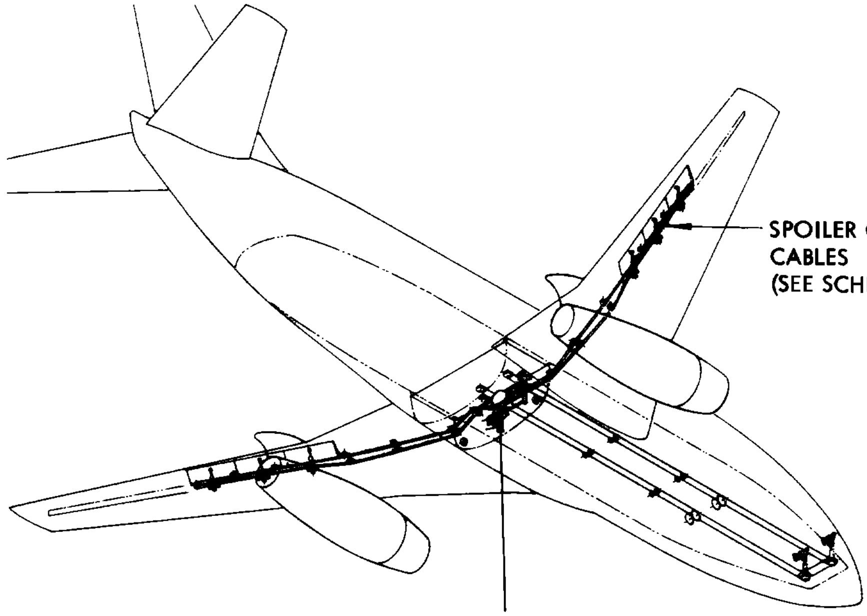
[2] OPTIONAL LENGTH

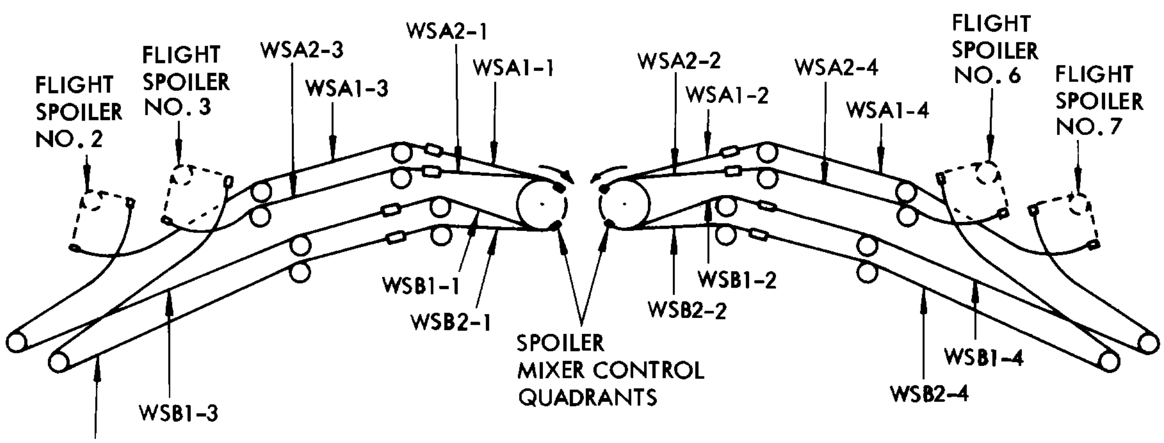
[3] PREFERRED LENGTH (WILL PROVIDE MORE ADJUSTMENT CAPABILITY TO MEET TENSION REQUIREMENTS)

[4] STRETCHED CABLE MAY BE SHORTENED BY REMOVING FITTING AND INSTALLING NEW FITTING ON CABLE USING PORTABLE SWAGING EQUIPMENT. CHECK NEW FITTING WITH GO/NO-GO GAUGES.

[5] REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

Stabilizer Trim Control Cables
Figure 205





Flight Spoiler Control Cables
Figure 206 (Sheet 1)

CABLE REF	NO. REQ	LENGTH (IN.)	CABLE SIZE	FITTINGS *[1] 1	FITTINGS *[1] 2
WSB1-4	1	262.5	3/32 - 7x7	MS21260L3RH	BACT14A3
WSB2-1	1	91.2	3/32 - 7x7	MS21260L3LH	BACT14A3
WSB2-2	1	63.0	3/32 - 7x7	MS21260L3RH	BACT14A3
WSB2-3	1	321.6	3/32 - 7x7	MS21260L3RH	BACT14A3
WSB2-4	1	305.1	3/32 - 7x7	MS21260L3LH	BACT14A3

*[1] Reference only. For specific part number, length, material, and end fittings, refer to the IPC.

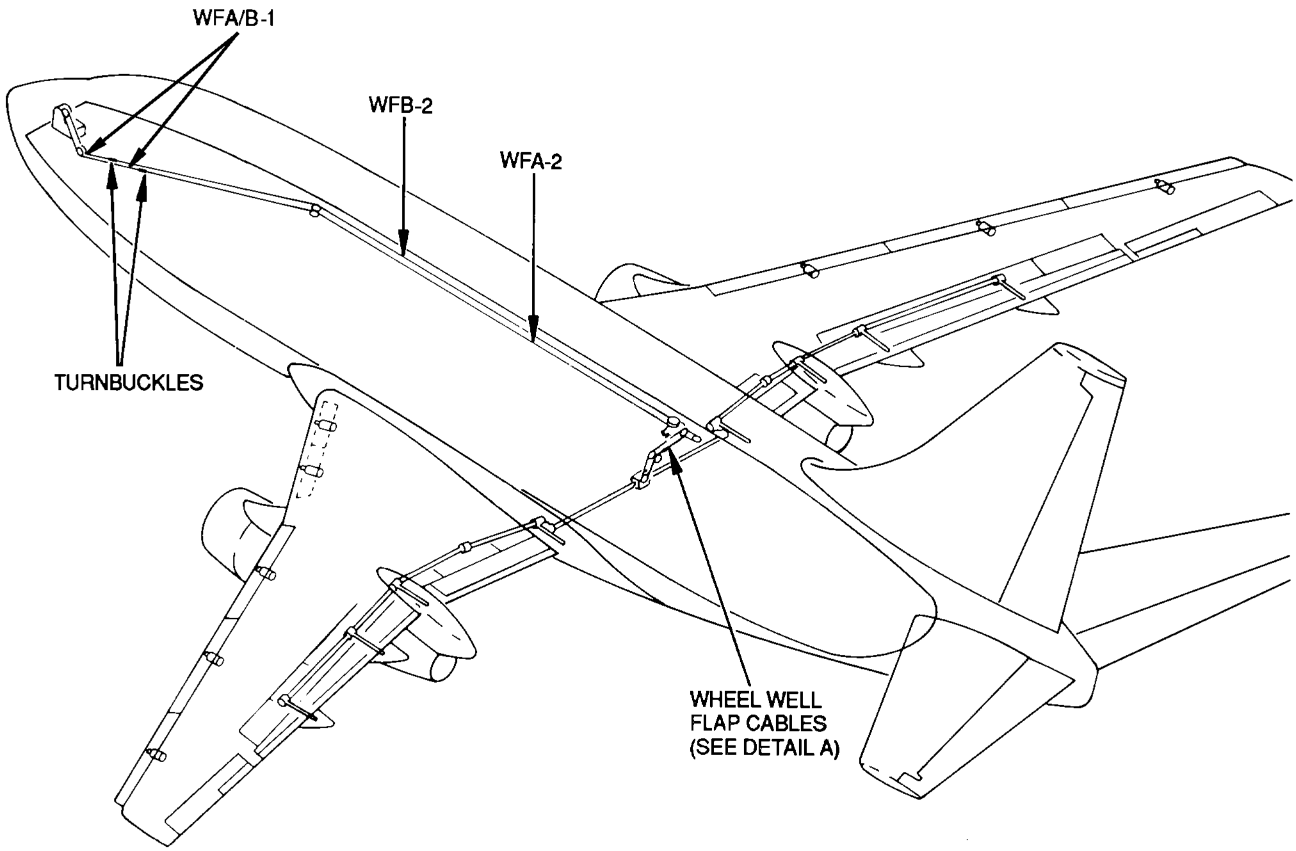
MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781 CABLES
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-1511 (SECOND OPTION)

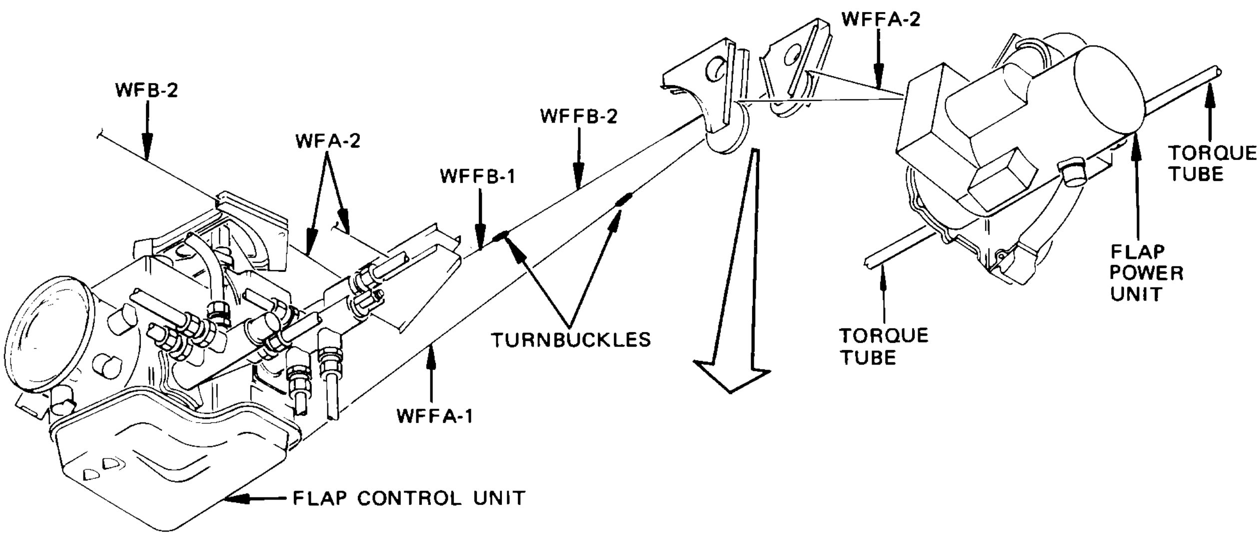
NOTE: Zinc-only and tin-over-zinc coated cables are interchangeable, and may be intermixed within a system (aileron, spoiler, stabilizer, etc.) providing opposite cables within a given cable loop are replaced with cables of the same type (for example, cables EA-2 and EB-2, must be replaced together with both new cables either zinc-only or tin-over-zinc). This will prevent asymmetric cable stretch that can degrade system rigging.

CONTROL CABLE TYPICAL

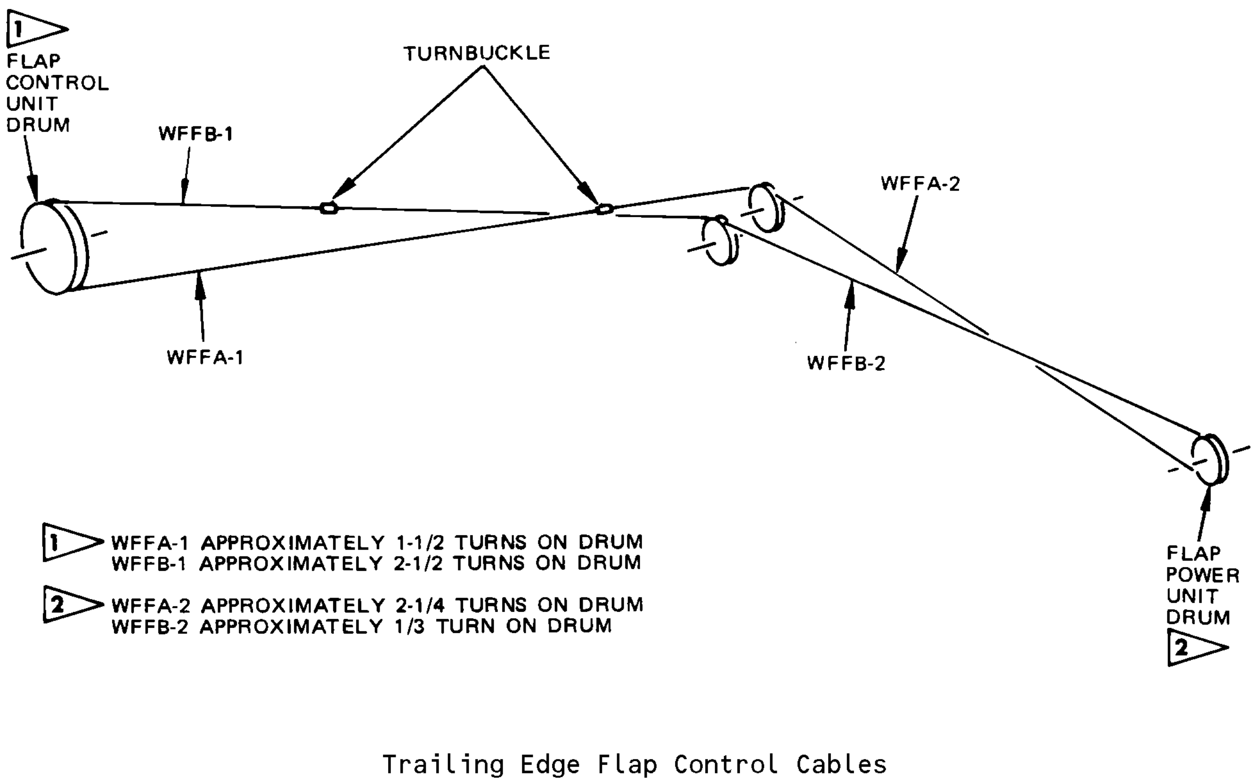
Flight Spoiler Control Cables
Figure 206 (Sheet 2)



Trailing Edge Flap Control Cables
Figure 207 (Sheet 1)



DETAIL A
(LOOKING AFT)

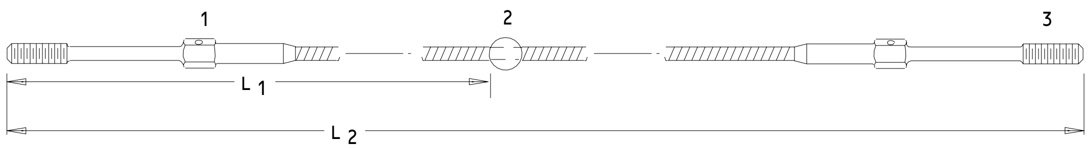


1 WFFA-1 APPROXIMATELY 1-1/2 TURNS ON DRUM
WFFB-1 APPROXIMATELY 2-1/2 TURNS ON DRUM

2 WFFA-2 APPROXIMATELY 2-1/4 TURNS ON DRUM
WFFB-2 APPROXIMATELY 1/3 TURN ON DRUM

Trailing Edge Flap Control Cables
Figure 207 (Sheet 2)

CABLE REF	LENGTH [4] (INCHES)	CABLE SIZE AND MATERIAL	FITTINGS [4]		
			1	2	3
WFA/B-1	L1 - 39.9	3/32 - 7X7	MS21260L3LH	BACT14B3	MS21260L3RH
	L2 - 81.7	3/32 - 7X7	MS21260L3LH	BACT14B3	MS21260L3RH
WFA-2	551.2 [3]	1/8 - 7X19	69-38195-2	BACT14A4	
WFB-2	535.3 [3]	1/8 - 7X19	69-38195-1	BACT14A4	
WFFB-1	40.7	3/32 - 7X7	MS21260S3LH	BACT14A3	
WFFA-1	40.9	3/32 - 7X7	MS21260S3RH	BACT14A3	
WFFB-2	49.3	3/32 - 7X7	MS21260S3RH	BACT14A3	
WFFA-2	49.5	3/32 - 7X7	MS21260S3LH	BACT14A3	



WFA/B-1

WFA-2, WFB-2

WFFA AND WFFB-1, -2

MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

1/8-INCH CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER BMS 7-265, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (SECOND OPTION)
- CARBON STEEL PER MIL-W-1511 (THIRD OPTION)

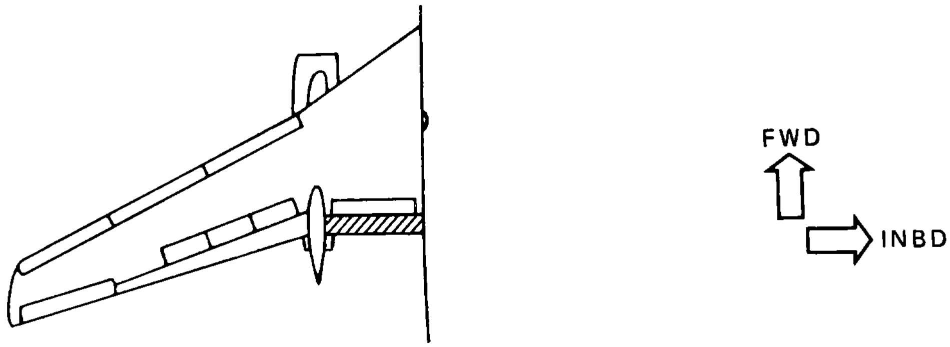
3/32-INCH CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (TZ) (PREFERRED)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-1511 (SECOND OPTION)

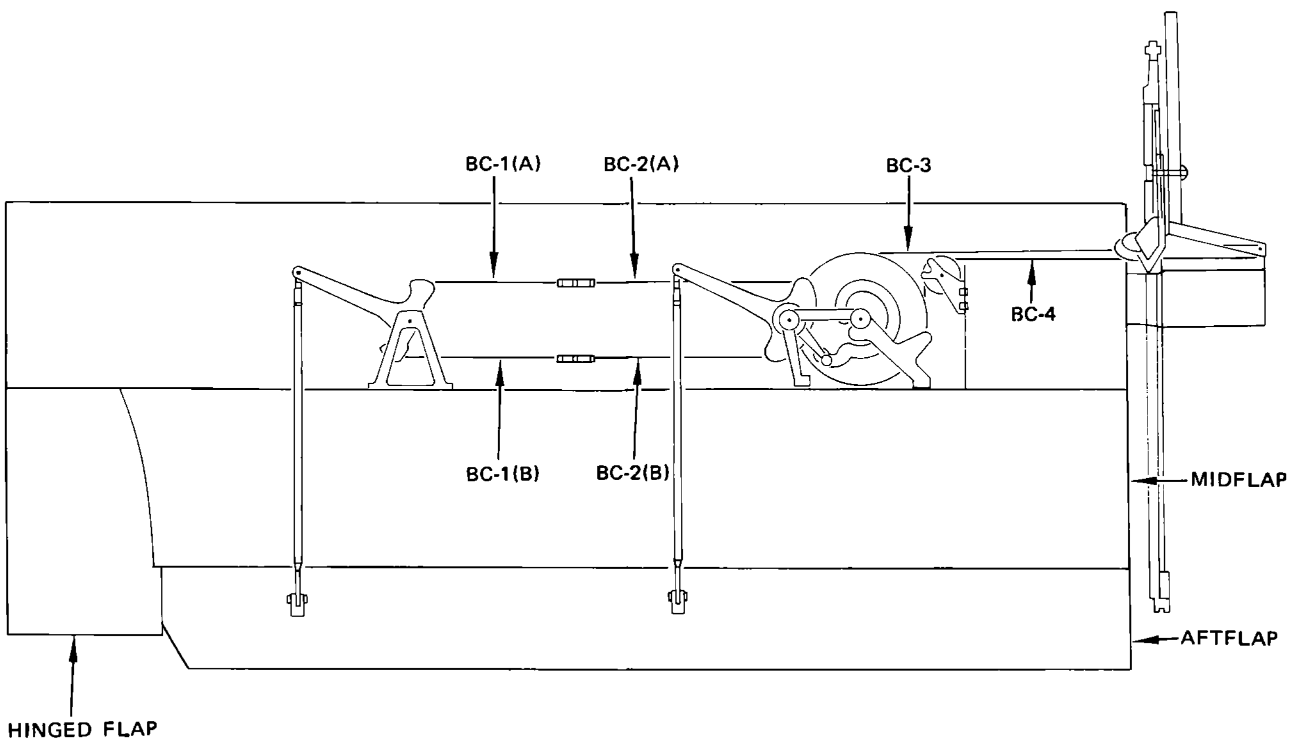
NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

[3] PROOF LOAD AT THE SAME LOAD AS 3/32 INCH CABLES

[4] REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

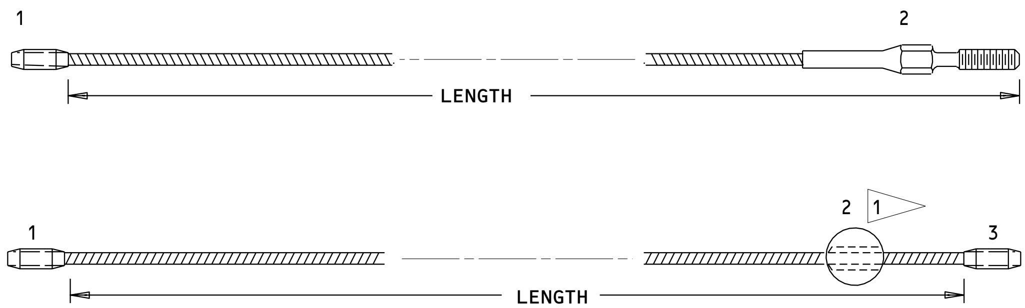
Trailing Edge Flap Control Cables
Figure 207 (Sheet 3)





Trailing Edge Flap Boom Cables
Figure 208 (Sheet 1)

CABLE REF	LENGTH 2 (INCHES)	CABLE SIZE AND MATERIAL	FITTINGS 2 1	2	3
BC-1A/B	20.21	1/8 - 7X19	BACT14A4	MS21260S4LH	
BC-2A/B	26.02	1/8 - 7X19	BACT14A4	MS21260S4RH	
BC-3	69.45	3/32 - 7X19	BACT14A3	69-43546-1	BACT14A3
BC-4	80.25	3/32 - 7X19	BACT14A3	69-43546-1	BACT14A3



MATERIAL

FITTINGS - CORROSION RESISTANT STEEL PER MIL-T-781

1/8-INCH CABLES - CARBON STEEL PER BMS 7-265, TYPE I, COMP A (PREFERRED)
- CARBON STEEL PER MIL-W-83420, TYPE I, COMP A (FIRST OPTION)
- CARBON STEEL PER MIL-W-1511 (OPTIONAL)

3/32-INCH CABLES - STAINLESS STEEL PER MIL-W-83420, TYPE I, COMPOSITION B (PREFERRED)
- STAINLESS STEEL PER MIL-W-5424B (OPTIONAL)

NOTE: ZINC-ONLY AND TIN-OVER-ZINC COATED CABLES ARE INTERCHANGEABLE, AND MAY BE INTERMIXED WITHIN A SYSTEM (AILERON, SPOILER, STABILIZER, ETC.), PROVIDING OPPOSITE CABLES WITHIN A GIVEN CABLE LOOP ARE REPLACED WITH CABLES OF THE SAME TYPE. (FOR EXAMPLE, IN 737 MM 27-09-111 FIGURE 202, CABLES EA-2 AND EB-2 SHOULD BE REPLACED TOGETHER WITH BOTH NEW CABLES EITHER ZINC-ONLY OR TIN-OVER-ZINC.) THIS WILL PREVENT ASYMMETRIC CABLE STRETCH THAT CAN DEGRADE SYSTEM RIGGING.

1 RECEPTACLE FITTING (2) SLIDES DOWN OVER END FITTING (3) FOR INSTALLATION

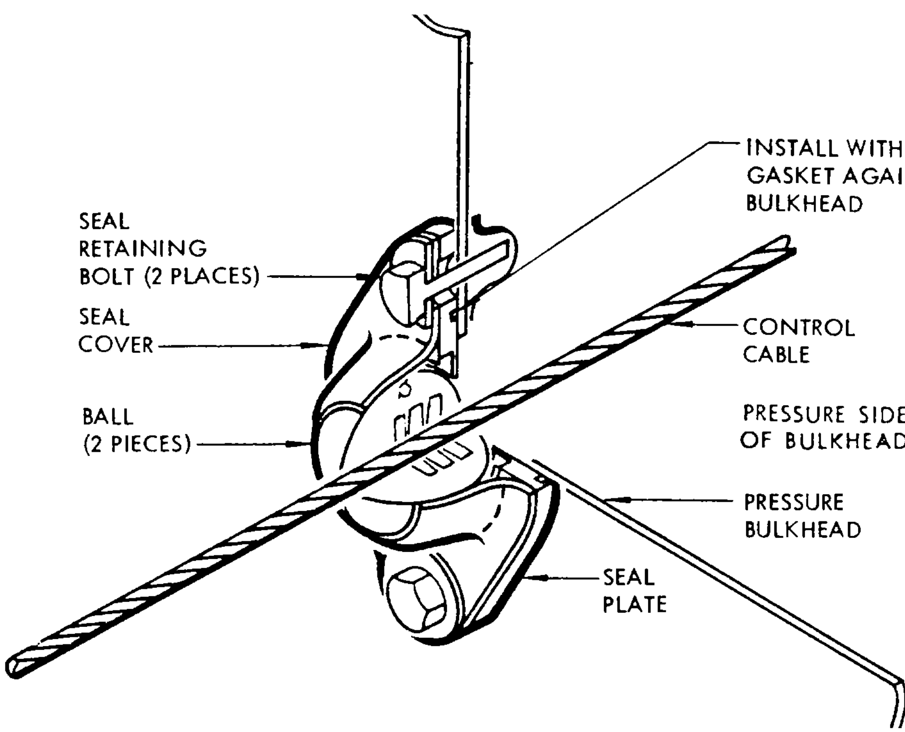
2 REFERENCE ONLY. FOR SPECIAL PART NUMBER, LENGTH, MATERIAL, AND END FITTINGS, REFER TO THE IPC.

Trailing Edge Flap Boom Cables
Figure 208 (Sheet 2)

FLIGHT CONTROL CABLES AIR PRESSURE SEALS - MAINTENANCE PRACTICES

1. General
   A. This subject provides the information necessary to locate all flight control cable air pressure seals. Refer to AMM Chapter 20, Control Cable Air Pressure Seals, for removal and Installation.

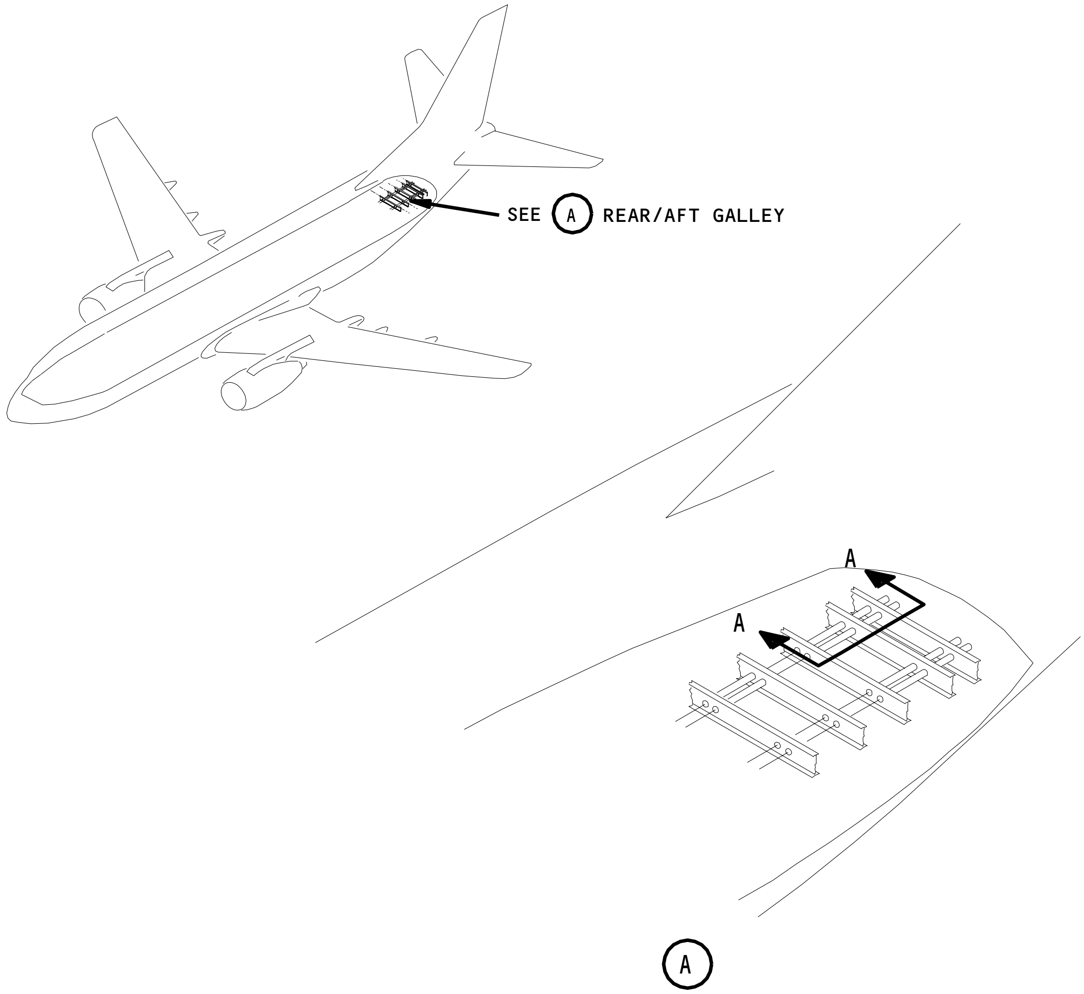
CABLE SYSTEM	NO. OF SEALS	LOCATION	ACCESS PANEL NO.
LH ELEVATOR CABLES	2	AFT PRESSURE BULKHEAD	3701
RH ELEVATOR CABLES	2	AFT PRESSURE BULKHEAD	3701
RUDDER CABLES	2	AFT PRESSURE BULKHEAD	3701
RUDDER TRIM CABLES	2	AFT PRESSURE BULKHEAD	3701
STABILIZER TRIM CABLES	2	AFT PRESSURE BULKHEAD	3701
SPEED BRAKE CABLES	2	LH WHEEL WELL CEILING	WHEEL WELL



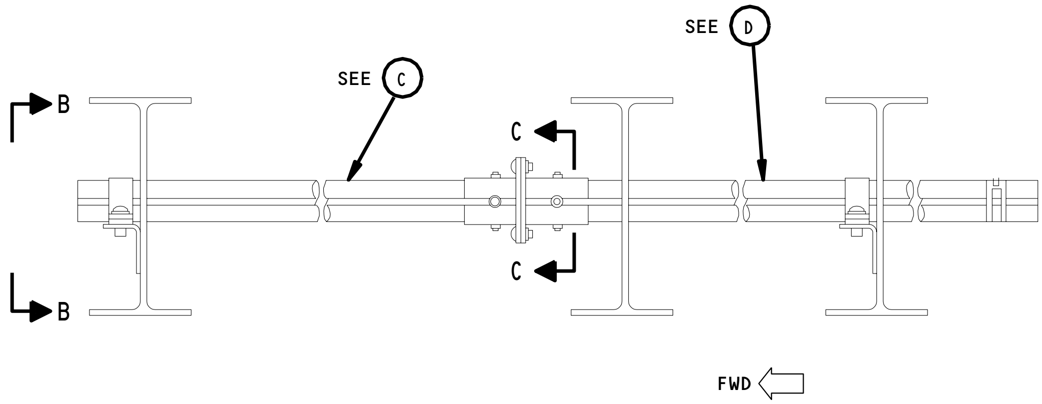
Installation and Location of Flight Control Cable Air pressure Seals
Figure 201

FLIGHT CONTROL CABLE GUARD - REMOVAL/INSTALLATION

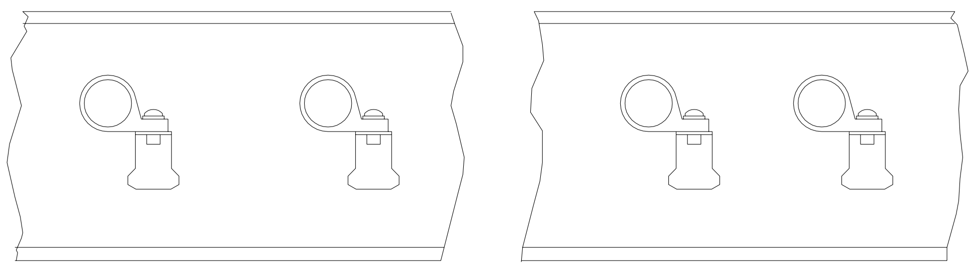
1. Remove Control Cable Guard (Fig. 401)
   A. Attach DO-NOT-OPERATE tags to the control columns.
   B. Get access to the aft cable guards.
      (1) Remove the aft bulkhead lining in the rear/aft cargo area (AMM 25-52-131/401).
   C. Remove the aft cable guards.
      (1) Loosen the clamps and remove the cable guards.
2. Install Control Cable Guard (Fig. 401)
   A. Lubricate the cables in the cable guard area (Ref 12-26-00 SRV).
   B. Install the aft cable guards:
      (1) Put the guard assembly (1) in its position.
      (2) Install the washers on the sleeve of the guard assemblies (1).
         (a) Connect each set of washers with a screw and a nut.
      (3) Put the guard assemblies (2) into the sleeve of the guard assembly (1).
         (a) Install the three bolts on the guard assembly (2) into the slots on the sleeve of the guard assembly (1).
         (b) Tighten the nut until the bolt does not turn easily.
      (4) Put the clamp on the end of the guard assembly (2) between the two rivets.
         (a) Tighten the clamp.
         (b) Install the grommets in holes if you removed it.
   C. Install the rear/aft bulkhead lining in the aft cargo area (AMM 25-52-131/401).
      (1) Put each of the guard assemblies (1 and 2) into position with the slot on each assembly inboard.
         (a) Tighten the clamps to hold the guard assemblies.
   D. Remove the DO-NOT-OPERATE tags from the control columns.
   E. Do a test of the cables to make sure there is free movement (AMM 27-31-0/501).



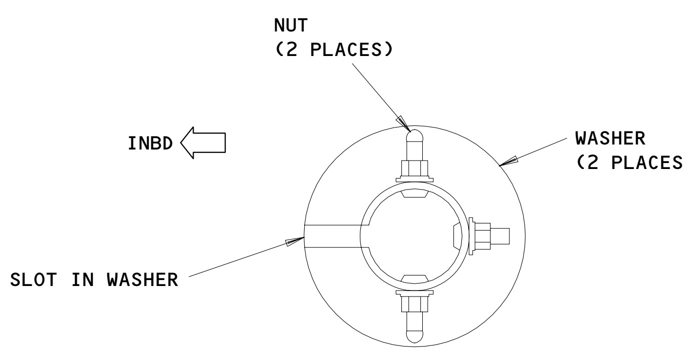
Control Cable Guard Installation
Figure 401 (Sheet 1)



A-A

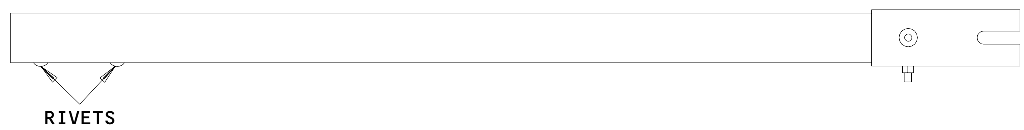


B-B



C-C

Control Cable Guard Installation
Figure 401 (Sheet 2)

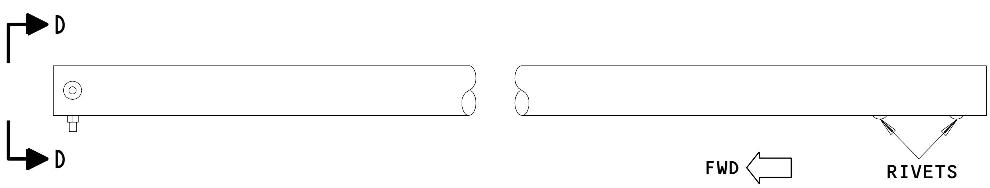


1. CABLE GUARD ASSEMBLY

C

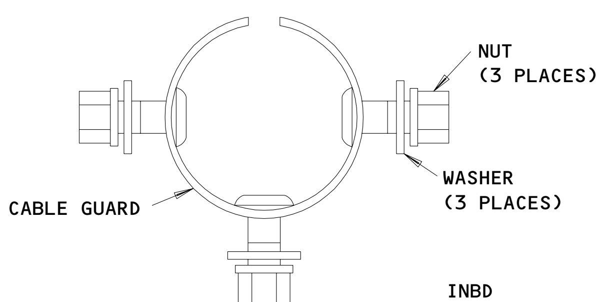
INBD

FWD



2. CABLE GUARD ASSEMBLY

D

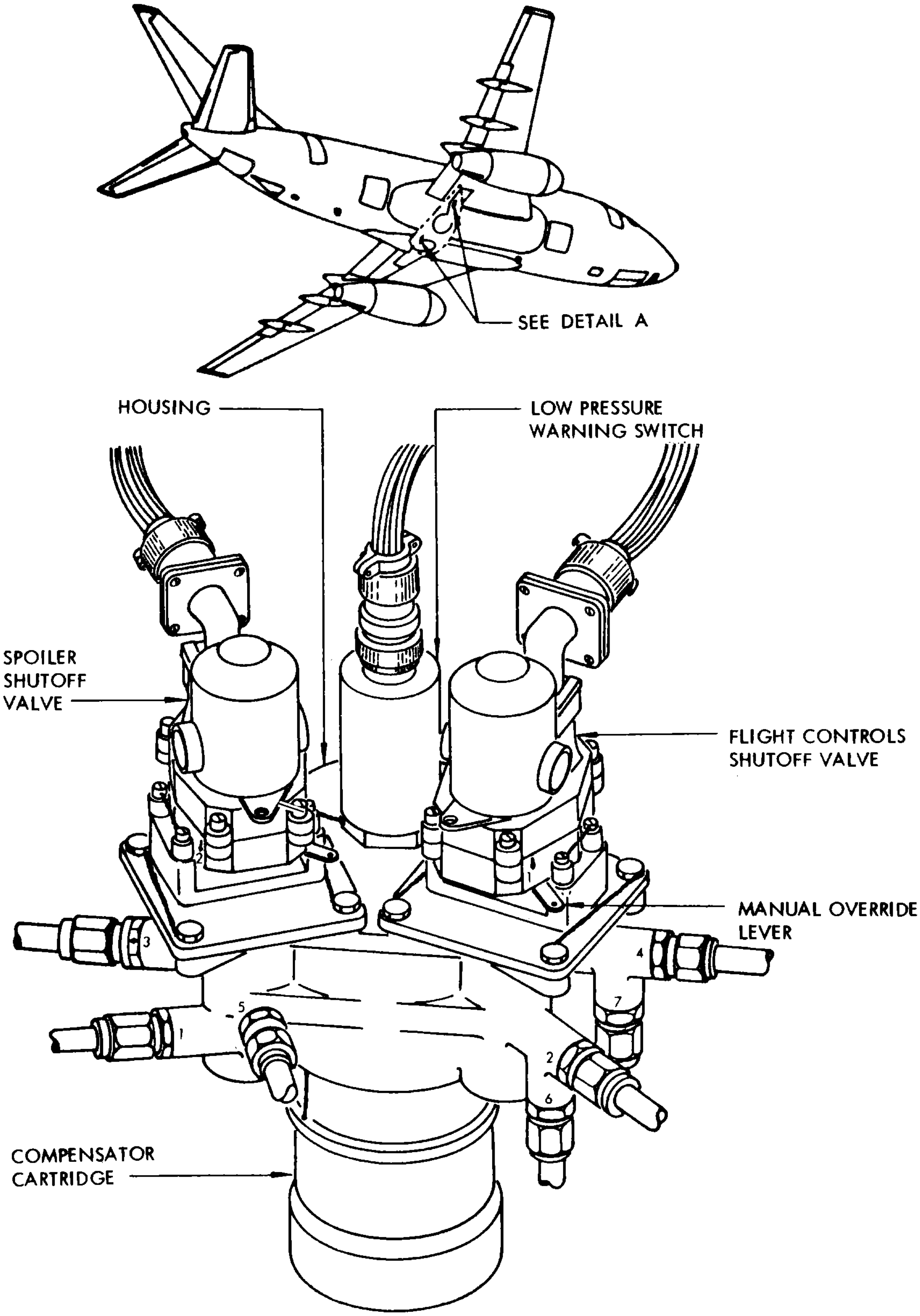


D-D

Control Cable Guard Installation
Figure 401 (Sheet 3)

FLIGHT CONTROLS HYDRAULIC MODULAR PACKAGE - DESCRIPTION AND OPERATION

1. General
    A. The two flight controls hydraulic modular packages are manifold assemblies that contain the components which control hydraulic power for the aileron, rudder, elevator and spoiler control systems. Also low pressure for the aileron, rudder and elevator control systems is indicated through the modular units. The packages are identical and are located on the forward bulkhead of each main gear wheel well (Fig. 1). System A flight control modular package is in the left wheel well and system B in the right wheel well. Each modular package is a seven port housing with drilled passageways and cavities for attached check valve, compensator cartridge , low pressure warning switch and two shutoff valves.
    B. Hydraulic fluid entering the package is routed to the two shutoff valves. When the spoiler valve is in the ON position, fluid is ported out of the modular package to the spoiler control system. When the flight controls valve is in the ON position, fluid is ported to the low pressure warning switch and then out of the package to the aileron, rudder and elevator control systems. Hydraulic return from the spoiler control system does not enter the modular package, but is returned directly to the hydraulic system return. Hydraulic return from the aileron, rudder and elevator control systems enters the modular package and is ported through the compensator cartridge and then through the check valve. From this point, fluid is ported out of the modular package to hydraulic system return. With the shutoff valves OFF, the hydraulic pressure is stopped and the shutoff valve cavity is connected to return allowing pressure in the control systems to equalize with return pressure. The aileron, rudder and elevator return pressure is maintained for gust damping after hydraulic system shutdown by the compensator cartridge. The check valve is incorporated in the modular unit return port to the hydraulic system to prevent reverse flow when hydraulic power is off.
2. Flight Controls and Spoiler Shutoff Valves
    A. The flight controls shutoff valve and the spoiler shutoff valve are identical. Each valve is mounted on the modular package by four bolts. The valves are electrically operated from a 28-volt dc source and consist of a motor spool sleeve and cartridge. The cartridge containing the spool and sleeve fits into a cavity in the modular package. The electric motor is splined to a cam which converts rotary motor action into linear spool travel in the sleeve. The valve is equipped with a manual override lever and position indicator. The manual override allows the valve to be positioned with electrical power off. The valve is on when the lever is in position 1, and off when the lever is in position 2. Electrical control of the flight controls shutoff valve is accomplished by the FLIGHT CONTROLS switch on the forward overhead panel. Electrical control of the spoiler shutoff valve is accomplished by the SPOILER switch on the forward overhead panel.



Flight Controls Hydraulic Modular Package
Figure 1

3. Compensator Cartridge
   A. The hydraulic compensator cartridge maintains aileron, rudder and elevator return pressure after hydraulic system shutdown. The cartridge compensates for volume changes in the hydraulic fluid due to temperature change or minor fluid loss. The compensator cartridge screws into a cavity in the modular package, and consists of a housing with inlet ports and an outlet port, a spring-loaded piston and a poppet valve. The inlet ports receive fluid from the aileron, rudder and elevator return. The outlet port is connected through a check valve to the hydraulic system return line. Thermal expansion of hydraulic fluid or operation of the aileron, rudder or elevator power control packages will cause flow of return fluid to the modular package. This return fluid will displace the spring loaded piston within the compensator housing. When maximum capacity of the compensator cartridge is reached, at 40 to 70 psi, the stops on the piston contacts a poppet valve. This wil1 unseat the poppet valve and allow additional fluid to flow to the hydraulic system return. When the hydraulic power is off, or the flight controls shutoff valve is off, the spring-loaded piston will force hydraulic fluid back into the aileron, rudder and elevator power control packages to compensate for thermal contraction and minor fluid loss. The compensator cartridge is capable of supplying about 8 cubic inches of fluid.
4. Low Pressure Warning Switch
   A. The flight controls hydraulic low pressure warning switch is screwed into a cavity in the modular package. The switch input is aileron, rudder and elevator hydraulic pressure with low pressure indicated on the forward overhead panel adjacent to the flight controls switch. The low pressure warning light will go out at 1200 ±350 psi and will illuminate within 100 psi below the "light out" pressure. The master warning and caution lights and the flight controls warning light also illuminate with the flight controls hydraulic low pressure lights (Ref Chapter 33, Master Warning and Caution Lights).

FLIGHT CONTROLS HYDRAULIC MODULAR PACKAGE - REMOVAL/INSTALLATION

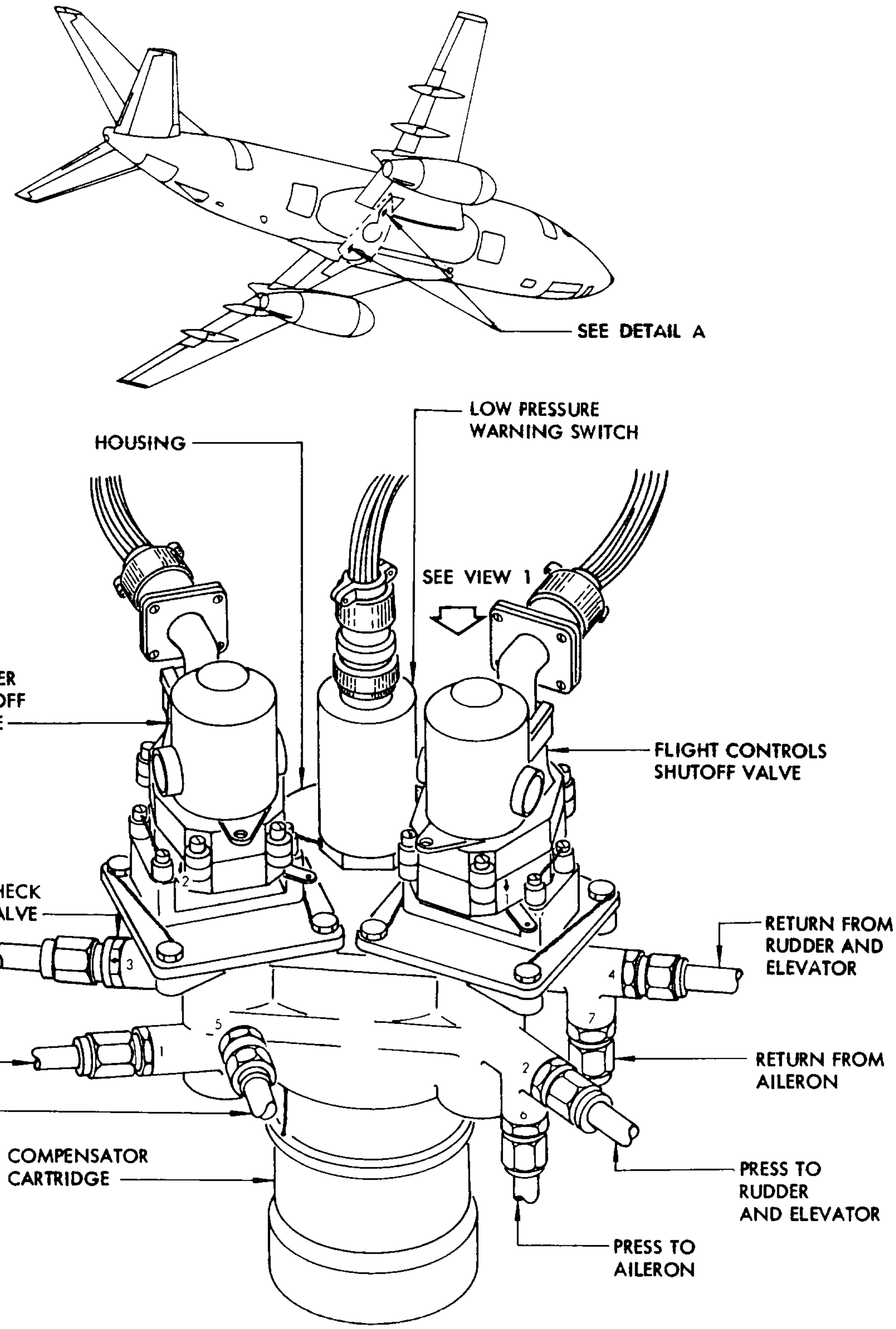
1. General
   A. The flight controls hydraulic modular packages for system A and system B are identical. The system A modular package is located in the left main wheel well on the forward bulkhead. The system B modular package is located in the right main wheel well on the forward bulkhead. Each modular package contains a check valve, low pressure warning switch, compensator cartridge, spoiler shutoff valve and flight controls shutoff valve. The flight controls modular package may be replaced as a unit, or any of the components may be replaced individually. This section covers removal/installation of the entire package. Maintenance practices for the individual components are covered in separate subjects.
2. Remove Modular Package
   A. On panel P6 open the following circuit breakers:
      (1) FLT CONTR SHUT-OFF VALVES
      (2) SPOILER SHUT-OFF VALVES
      (3) IND LIGHTS
   B. If modular package in left wheel well is being removed, depressurize hydraulic system A. If modular package in right wheel well is being removed, depressurize hydraulic system B. Ensure hydraulic reservoirs are depressurized.
   C. Disconnect electrical connectors from motor valves and from low pressure warning switch (Fig. 402).
   D. Remove seven hydraulic tubing connections from modular package.

      CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   E. Remove four mounting bolts attaching modular package to mounting bracket and remove modular package from airplane.
   F. Install protective caps on all hydraulic lines.
   G. Remove check valve and O-ring from port 3 of modular package.
   H. Remove hydraulic unions and O-rings from remaining six ports of modular package.
   I. Install protective caps in open ports.
3. Install Modular Package
   A. Remove protective caps from ports in modular package.
   B. Install O-ring and check valve in port 3. Free flow direction arrow shall point away from modular package. (See figure 401.)

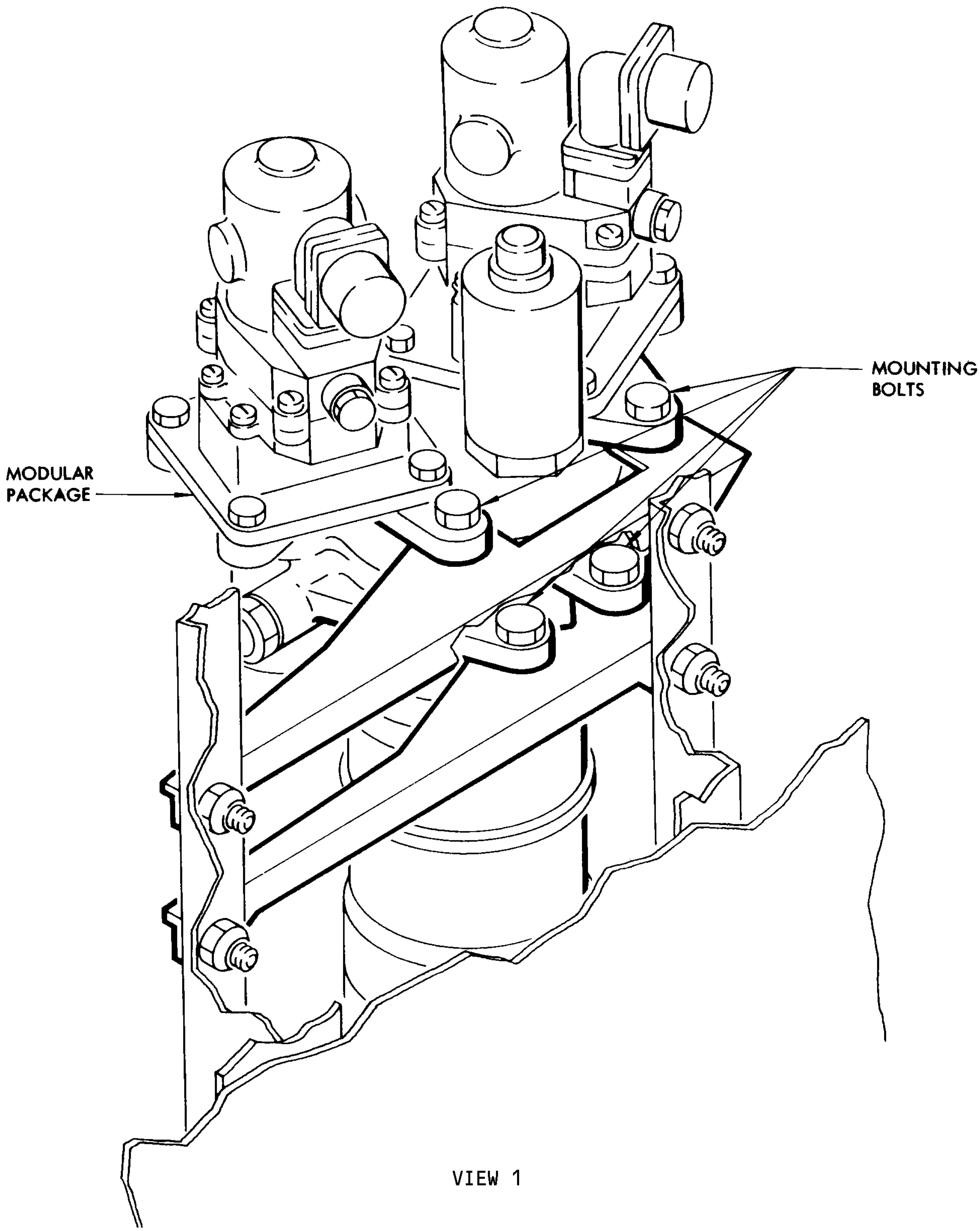
      NOTE: Lightly lubricate O-rings with Skydrol 500 hydraulic fluid or Skydrol assembly lube MCS 352B at installation.

   C. Install O-rings and hydraulic unions in remaining six ports of modular package.



DETAIL A

Flight Controls Hydraulic Modular Package
Figure 401



Flight Controls Hydraulic Modular Package
Figure 402

D. Ensure hydraulic system is depressurized and remove protective caps from hydraulic lines.
E. Locate modular package on mounting bracket and align hydraulic connections.
F. Install four mounting bolts.
G. Connect hydraulic lines to modular package.
H. Install electrical connectors at motor valves and low pressure warning switch.
I. On panel P6 close the following circuit breakers:
   (1) FLT CONTR SHUT-OFF VALVES
   (2) SPOILER SHUT-OFF VALVES
   (3) IND LIGHTS
J. Test modular package. See Flight Controls Modular Package - Adjustment/Test.

FLIGHT CONTROLS HYDRAULIC MODULAR PACKAGE - ADJUSTMENT/TEST

1. General
   A. There are no adjustments to the flight controls hydraulic modular package. This section provides a test which should be used to determine proper operation of the package.
2. Flight Controls Hydraulic Modular Package Test
   A. Prepare Modular Package for Test
      (1) Pressurize hydraulic reservoirs. Refer to Chapter 29, Hydraulic Power.
      (2) Connect external electrical power to airplane.
      (3) Turn on hydraulic system B pump No. 1 or No. 2 to pressurize hydraulic system B.
      (4) If left modular package is being tested, open hydraulic interconnect valve to pressurize hydraulic system A.
   B. Test Modular Package
      (1) Position flight controls and spoiler switches to ON position.

         NOTE: System A switches control modular package in left wheel well and system B switches control modular package in right wheel well.

      (2) Check that indicator levers on both motor valves are at position 1.
      (3) Actuate aileron control wheel, rudder pedals, and control column to bleed hydraulic system.
      (4) Check for hydraulic leakage at modular package.
      (5) Position both spoiler switches to OFF.
      (6) Check that left motor valve indicator lever moves to position 2.
      (7) Rotate aileron control wheel and check that spoilers do not operate.
      (8) Position both flight controls switches to OFF.
      (9) Check that right motor valve indicator lever moves to position 2.
      (10) Check that LOW PRESSURE warning light comes on.
      (11) Position flight controls and spoiler switches to ON.
      (12) Check that LOW PRESSURE warning light goes off.
      (13) Turn off hydraulic system B pump No. 1 or 2 and close hydraulic interconnect valve.
      (14) Check that LOW PRESSURE light comes on and that master warning and caution lights and flight controls warning light come on.
   C. Restore Airplane to Normal Configuration
      (1) Remove electrical power if no longer required.
      (2) Check hydraulic reservoirs and service if required.

FLIGHT CONTROLS SHUTOFF VALVE - REMOVAL/INSTALLATION

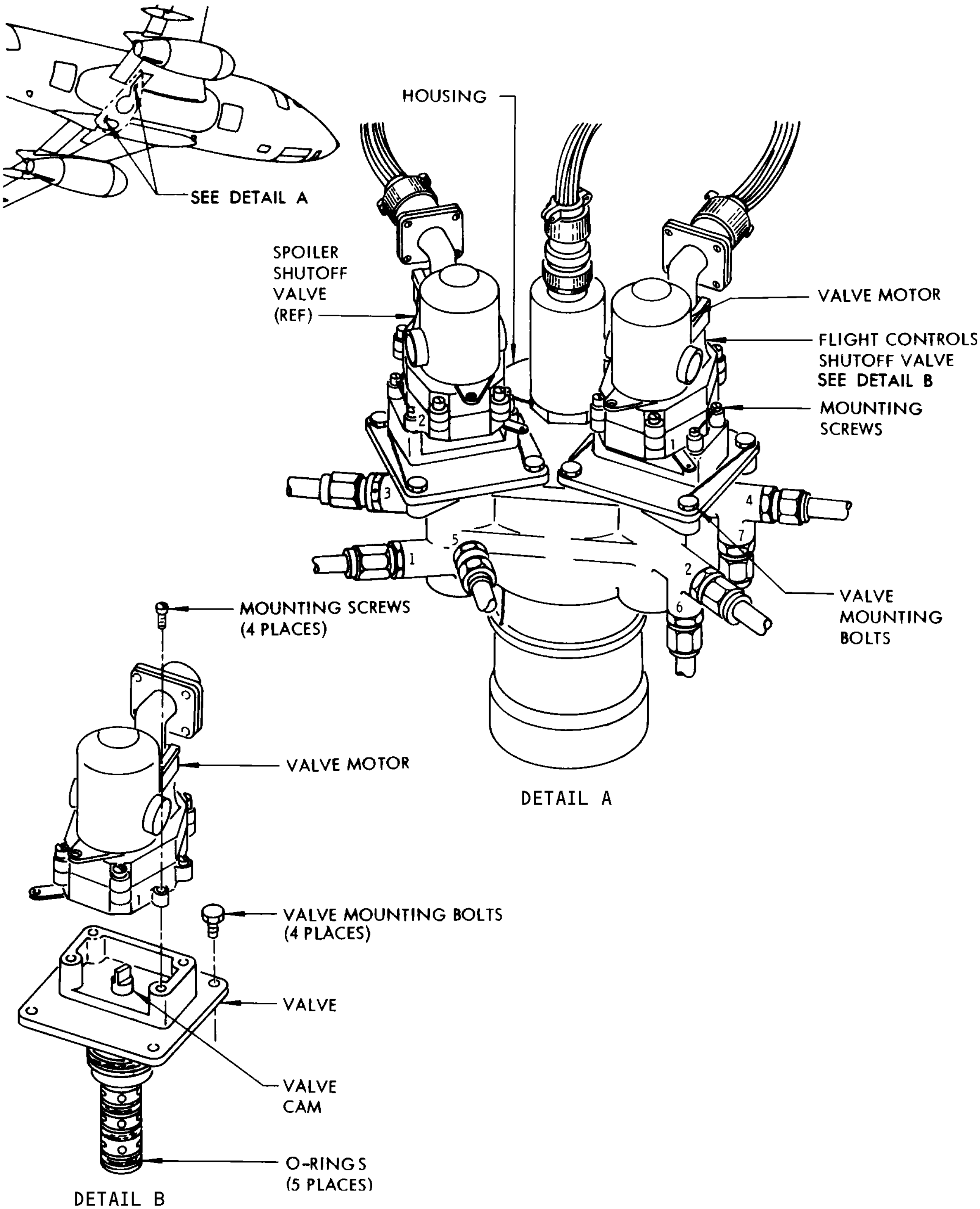
1. General
   A. The flight controls shutoff valve and the spoiler shutoff valve are identical cartridge units. The flight controls shutoff valve is on the right portion of the modular package and the spoiler shutoff valve is on the left portion of the modular package. This procedure provides instructions for replacement of the flight controls shutoff valve. The complete cartridge unit, motor, and valve may be replaced, or the motor only may be replaced without removing the valve body from the modular package. The motor drive and valve cam are indexed to aid correct motor installation.
2. Removal/Installation Flight Controls Shutoff Valve

   NOTE: Use this procedure when replacing the valve assembly consisting of motor and valve. When replacing the motor only, use procedure in par. 3.

   A. Equipment and Materials
      (1) Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   B. Remove Flight Controls Shutoff Valve
      (1) Open FLT CONTR SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
      (2) Remove system A hydraulic power. Ensure hydraulic reservoir is depressurized. Refer to 27-51-0, Trailing Edge Flaps - MP.
      (3) Disconnect electrical connector from valve motor (Fig. 401).
      (4) Remove four valve mounting bolts attaching shutoff valve body to modular package housing.
      (5) Carefully remove shutoff valve from modular package housing by turning slightly and lifting straight up.

          CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

      (6) Take necessary precautions to prevent dirt entering shutoff valve cavity when valve is removed.
   C. Install Flight Controls Shutoff Valve
      (1) Install five O-rings with backup rings on replacement shutoff valve. Lightly lubricate O-rings and backup rings with Hydraulic Fluid or Assembly Lube prior to installation (Fig. 401).
      (2) Carefully insert shutoff valve into modular package housing.
      (3) Install four mounting bolts. Tighten bolts within 30 to 40 pound-inches torque range.
      (4) Install lockwire on four mounting bolts. Make sure that lockwire is installed on low pressure warning switch.



Flight controls Shutoff Valve Installation
Figure 401

(5) Install electrical connector at valve motor.
(6) Close FLT CONTR SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
(7) Test shutoff valve. Refer to Flight Controls Shutoff Valve - A/T.
(8) Check hydraulic reservoirs and service if required.

3. <u>Removal/Installation Flight Controls Shutoff Valve Motor</u>

A. Remove Flight Controls Shutoff Valve Motor
(1) Open FLT CONTR SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
(2) Disconnect electrical connector from valve motor (Fig. 401).
(3) Move manual override lever to position 2.
(4) Remove four mounting screws attaching valve motor to valve. Remove valve motor from valve.

B. Install Flight Controls Shutoff Valve Motor
(1) On replacement of valve motor, move manual override lever to position 2.
(2) Position valve motor on valve and engage motor drive with valve cam (Fig. 401).
(3) Install the four mounting screws.
(4) Install lockwire on mounting screws.
(5) Install electrical connector on valve motor.
(6) Test shutoff valve. See Flight Controls Shutoff Valve - Adjustment/Test.

FLIGHT CONTROLS SHUTOFF VALVE - ADJUSTMENT/TEST

1. Test Flight Controls Shutoff Valve
   A. Connect electrical power to airplane.
   B. Ensure that flight controls switches are ON.
   C. Check that manual override lever on shutoff valve is at position 1.
   D. Turn on hydraulic system B pump No. 1 or 2 to pressurize hydraulic system B.
   E. If shutoff valve in modular package in left wheel well is being tested, open hydraulic interconnect valve to pressurize hydraulic system A.
   F. Check for hydraulic leakage at shutoff valve.
   G. Rotate aileron control wheel to bleed hydraulic system.
   H. Actuate aileron control wheel, control column and rudder pedals to check response of ailerons, elevators and rudder.
   I. Position both flight controls switches to OFF.
   J. Check that manual override lever on shutoff valve is at position 2 for System A and System B.
   K. Cycle rudder pedals and check that pedal forces are higher than in step H.

      NOTE: Rudder must not operate hydraulically during this test. Unpowered rudder will move.

   L. Position flight controls switches to ON.
   M. Turn off hydraulic system B pumps No. 1 and 2 and close hydraulic interconnect valve.
   N. Determine whether there is any further need for electrical power on airplane; if not, disconnect electrical power.

SPOILER SHUTOFF VALVE - REMOVAL/INSTALLATION

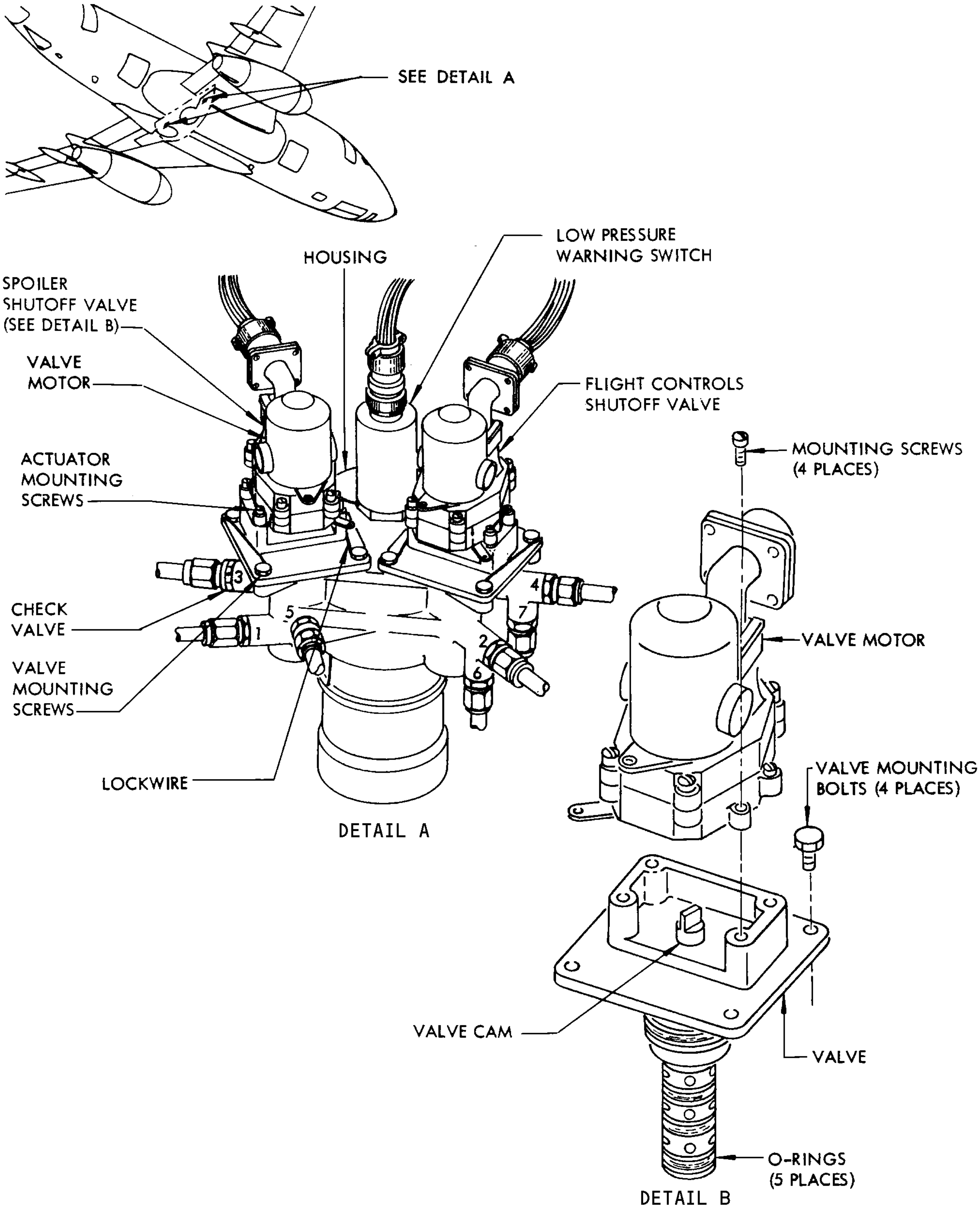
1. General
   A. The spoiler shutoff valve and flight controls shutoff valve are identical cartridge units. The spoiler shutoff valve is on the left portion of the modular package and the flight controls shutoff valve is on the right portion of the modular package. This procedure provides instructions for replacement of the spoiler shutoff valve. The complete cartridge unit, motor and valve, may be replaced, or the motor only may be replaced without removing the valve body from the modular package. The motor drive and valve cam are indexed to aid correct motor installation.
2. Removal/Installation Spoiler Shutoff Valve

   NOTE: Use this procedure when replacing valve assembly consisting of motor and valve. When replacing the motor only, use procedure in par. 3.

   A. Equipment and Materials
      (1) Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   B. Remove Spoiler Shutoff Valve
      (1) Open SPOILER SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
      (2) Remove system A hydraulic power. Check that hydraulic reservoir is depressurized. Refer to 27-61-0, Flight Spoiler Control System - MP.
      (3) Disconnect electrical connector from valve motor (Fig. 401).
      (4) Remove four valve mounting bolts attaching shutoff valve body to modular package housing.
      (5) Carefully remove shutoff valve from modular package housing by turning slightly and lifting straight up.

      CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

      (6) Take necessary precautions to prevent dirt entering shutoff valve cavity when valve is removed.
   C. Install Spoiler Shutoff Valve
      (1) Install five O-rings with backup rings on replacement shutoff valve. Lightly lubricate O-rings and backup rings with hydraulic fluid or assembly lube prior to installation (Fig. 401).
      (2) Carefully insert shutoff valve into modular package housing.
      (3) Install four mounting bolts. Tighten bolts within 30 to 40 pound-inches torque range.
      (4) Install lockwire on four mounting bolts. Check that lockwire is installed on low pressure warning switch.
      (5) Install electrical connector at valve motor.



Spoiler Shutoff Valve Installation
Figure 401

(6) Close SPOILER SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
(7) Test shutoff valve. Refer to Spoiler Shutoff Valve - A/T.
(8) Check hydraulic reservoirs and service if required.

3. <u>Removal/Installation Spoiler Shutoff Valve Motor</u>

A. Remove Spoiler Shutoff Valve Motor
(1) Open SPOILER SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
(2) Disconnect electrical connector from valve motor (Fig. 401).
(3) Move manual override lever to position 2.
(4) Remove four mounting screws attaching valve motor to valve. Remove valve motor from valve.

B. Install Spoiler Shutoff Valve Motor
(1) On replacement of valve motor, move manual override lever to position 2.
(2) Position valve motor on valve and engage motor drive with valve cam (Fig. 401).
(3) Install four mounting screws.
(4) Install lockwire on mounting screws.
(5) Install electrical connector on valve motor.
(6) Test shutoff valve. See Spoiler Shutoff Valve - A/T.

SPOILER SHUTOFF VALVE - ADJUSTMENT/TEST

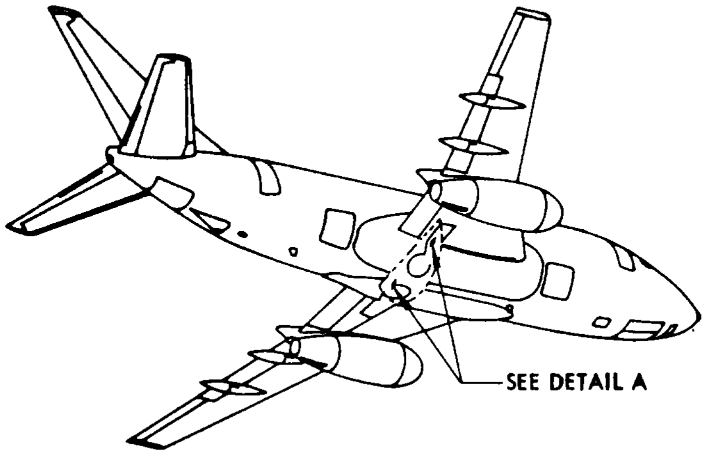
1. Spoiler Shutoff Valve Test
   A. Test Spoiler Shutoff Valve
      (1) Connect electrical power to airplane.
      (2) Check that spoiler switches are ON.
      (3) Check that manual override lever on shutoff valve is at position 1.
      (4) Turn on hydraulic system B pump No. 1 or No. 2 to pressurize hydraulic system B.
      (5) If shutoff valve in modular package in left wheel well is being tested, open hydraulic interconnect valve to pressurize hydraulic system A.
      (6) Check for hydraulic leakage at shutoff valve.
      (7) Rotate aileron control wheel to bleed hydraulic system if required.
      (8) Actuate aileron control wheel and check response of spoilers.
      (9) Position spoiler switches to OFF.
      (10) Check that manual override lever on shutoff valve is at position 2.
      (11) Rotate aileron control wheel and check that spoilers do not operate.
   B. Restore Airplane to Normal Configuration
      (1) Position spoiler switches to ON.
      (2) Turn off hydraulic system B pumps No. 1 and 2 and close hydraulic interconnect valve.
      (3) Determine whether there is any further need for electrical power on airplane; if not, disconnect electrical power.

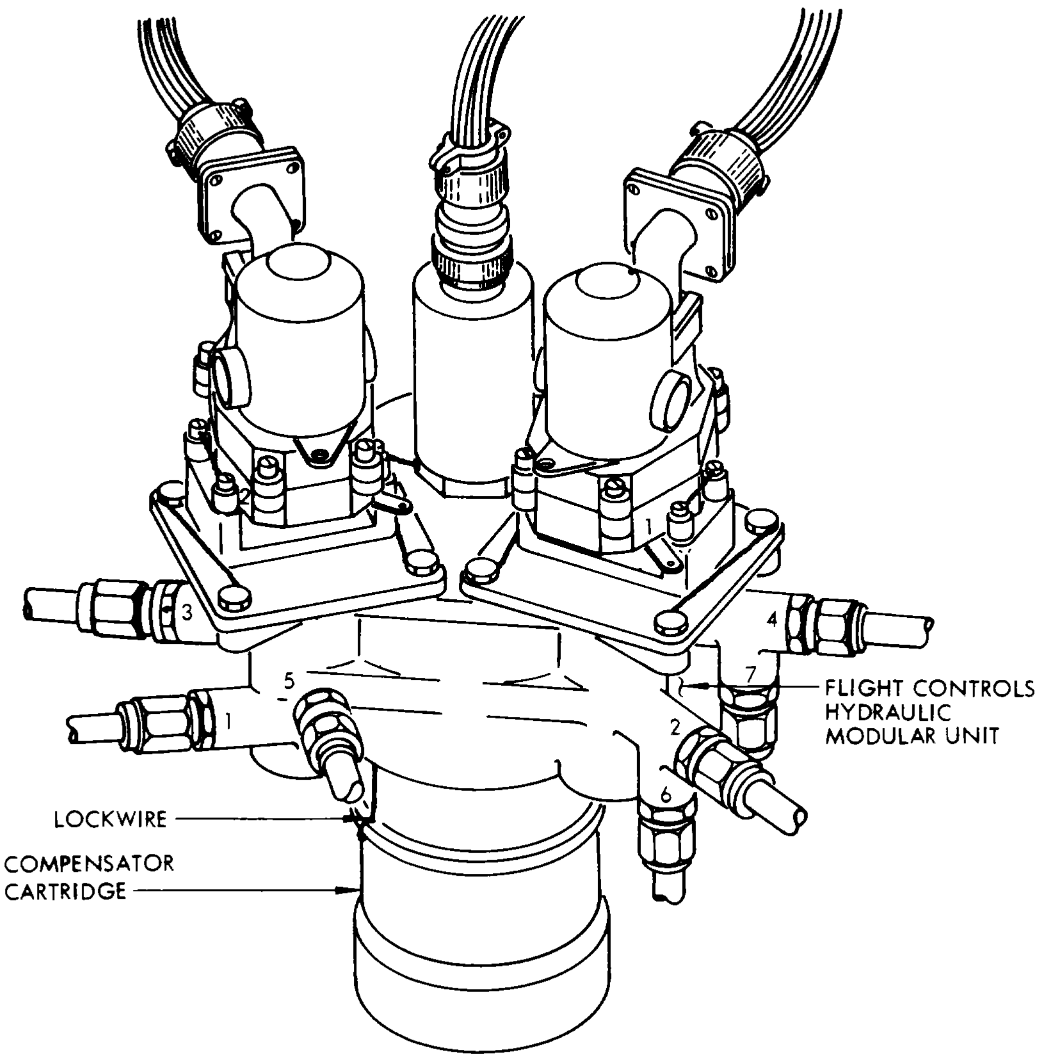
COMPENSATOR CARTRIDGE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Hydraulic Fluid - BMS 3-11 or Assembly Lube - Skydrol MCS 352B (AMM 20-30-21/201)
2. Remove Compensator Cartridge
   A. If compensator cartridge in left wheel well is being removed, remove system A hydraulic power. If compensator cartridge in right wheel well is being removed, remove system B hydraulic power. Check that hydraulic reservoirs are depressurized. Refer to 27-61-0, Speed Brake Control System - MP.
   B. Break lockwire and screw compensator cartridge from modular package.

      CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID. TAKE NECESSARY PRECAUTIONS TO PREVENT DIRT ENTERING COMPENSATOR CARTRIDGE CAVITY WHEN CARTRIDGE IS REMOVED.

3. Install Compensator Cartridge
   A. Lightly lubricate O-rings with hydraulic fluid or assembly lube. Install O-rings on replacement compensator cartridge.
   B. Screw compensator cartridge into modular package and tighten firmly by hand.
   C. Lockwire compensator cartridge to modular package.
   D. Pressurize hydraulic reservoirs. Refer to Chapter 29, Hydraulic Power.
   E. Connect external electrical power to airplane.
   F. Provide system B hydraulic power. Refer to 27-61-0.
   G. If compensator cartridge in left wheel well was replaced, provide system A hydraulic power (Ref to 27-61-0).
   H. Ensure that flight control switches are ON.
   I. Check compensator cartridge for hydraulic leakage.
   J. Remove systems A and B hydraulic power (Ref 27-61-0).
   K. Remove electrical power if no longer required.
   L. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.





DETAIL A

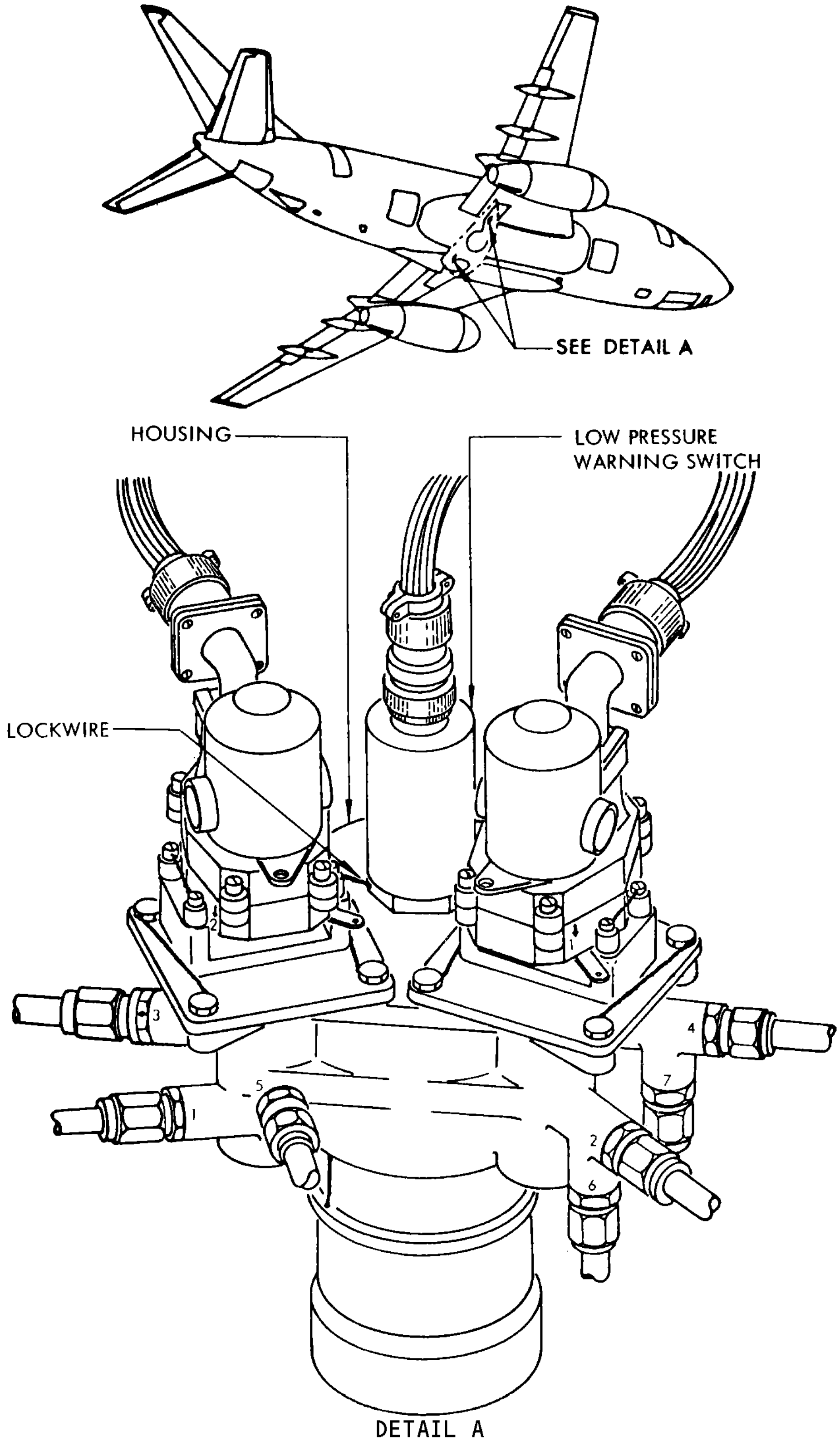
Compensator Cartridge Installation
Figure 401

LOW PRESSURE WARNING SWITCH - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Hydraulic Fluid - BMS 3-11 or Assembly Lube - Skydrol MCS 352B (AMM 20-30-21/201)
2. Remove Low Pressure Warning Switch
   A. On panel P6, open circuit breakers for IND LIGHTS.
   B. If low pressure warning switch in left wheel well is being removed, remove system A hydraulic power. If low pressure warning switch in right wheel well is being removed, remove system B hydraulic power. Check that hydraulic reservoirs are depressurized (Ref 27-51-0 MP).
   C. Disconnect electrical connector from low pressure warning switch (Fig. 401).
   D. Break lockwire and screw low pressure warning switch from modular package.

   CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   E. Take necessary precautions to prevent dirt entering warning switch cavity when switch is removed.
3. Install Low Pressure Warning Switch
   A. Lightly lubricate O-rings and backup rings with hydraulic fluid or assembly lube. Install O-ring and backup rings on replacement low pressure warning switch.
   B. Screw low pressure warning switch into modular package and tighten within 50 to 200 pound-inches torque range (Fig. 401).
   C. Lockwire low pressure warning switch to shutoff valve motor mounting bolt.
   D. Install electrical connector at low pressure warning switch.
   E. On panel P6, close circuit breaker for IND LIGHTS.
   F. Test low pressure warning switch. Refer to Low Pressure Warning Switch - A/T.



Low Pressure Warning Switch Installation
Figure 401

LOW PRESSURE WARNING SWITCH - ADJUSTMENT/TEST

1. Test Low Pressure Warning Switch
   A. Connect electrical power to airplane.
   B. Ensure that flight control switches are ON.
   C. Turn on hydraulic system B pump No. 1 or 2 to pressurize hydraulic system B.
   D. If low pressure warning switch in left wheel well is being tested, open hydraulic interconnect valve to pressurize hydraulic system A.
   E. Actuate aileron control wheel, rudder pedals, and control column to bleed hydraulic system.
   F. Check for hydraulic leakage at modular package.
   G. Check that LOW PRESSURE light is not illuminated.

      NOTE: System A low pressure light is controlled by the low pressure warning switch on the modular package in the left wheel well. System B low pressure light is controlled by the low pressure warning switch on the modular package in the right wheel well.

   H. Turn off hydraulic system B pumps No. 1 and 2 and close hydraulic interconnect valve.
   I. Check that LOW PRESS light is illuminated. Also check that master warning and caution lights and flight controls warning light illuminate.
   J. Determine whether there is any further need for electrical power on the airplane; if not, disconnect electrical power.
   K. Check hydraulic reservoirs and service, if required.

FLIGHT CONTROLS TRIM CORRECTION - TROUBLESHOOTING

1. General
   A. Usually component failure which may cause an inflight lateral trim requirement change is readily detectable. Four items, however, may have significant effect on lateral trim requirements but are not necessarily detectable or repeatable during ground inspection. These items may occur intermittently and require as much as a 20-degree control wheel trim change.
      (1) Unsequenced outboard foreflap
      (2) Asymmetric inboard aftflap extension or retraction
      (3) Leading edge outboard slats skewed
      (4) Fractured carriage spindle
   B. In the following paragraphs these items are analyzed. Also see Flight Controls Trim Correction - Troubleshooting for isolation and remedy of specific trim/control problem situations.
   C. The delivered condition for aileron and rudder trim limits during cruise at normal power and descent at idle power is as follows:

AILERON TRIM		RUDDER TRIM	AIRSPEED	CONDITION
Flaps up	3/4 unit	1/2 unit	Cruise	Cruise
Flaps up	3/4 unit	1/2 unit	250	Descent
Flaps up	1 unit	1/2 unit	190	Descent
Flaps 15	1 unit	1/2 unit	150	Descent
Flaps 40	1 unit	1/2 unit	130	Descent

NOTE: The values listed in the above table are the aileron and rudder trim limits for a new airplane. Flaps should be allowed to reach the selected position before measuring trim. Measured at the aileron trim knob, a tolerance of ± 3/4 aileron trim unit with flaps up or a tolerance of ± 1.0 aileron trim unit for other settings from neutral position is permitted without adjustment of aileron and aileron trim control system. The trim requirement must not exceed 1.0 unit difference between any two adjacent flap settings.

2. Inspection for Causes of Intermittent Excessive Trim

A. Unsequenced Outboard Foreflap

(1) Should an airplane be suspected of having experienced an unsequenced foreflap the first items to be inspected are the toggles. In most cases the damage to toggles and pivot bolts is obvious. In other cases the toggle damage cannot be detected visually on the airplane. For thorough inspection, toggles must be removed from the aircraft and inverted on a surface plate.

(2) The toggle crossbeam can then be inspected for distortion by means of a feeler gage. A further check should be made by inserting a .375 inch dia pin through the three-toggle pivot bolt holes. These holes must be aligned and the toggle free to rotate on the pin. At this time the toggle pivot bolts should be inspected for signs of distress and material displacement. Because the toggle or its bolts must sustain some damage for the foreflap sequencing to malfunction, it is safe to assume no foreflap malfunction if both toggles and bolts show no sign of damage. However, toggle crossbeam distortion and pivot misalignment of as little as .03 inch indicates the airplane has experienced an unsequenced foreflap at some time. The flap system should then be further inspected to determine the cause of toggle malfunction as follows:

(a) Check the foreflap for adequate operating clearance. This is done by shaking the foreflap in the flap retracted position. Access to the foreflap is obtained by raising the spoilers. A small movement of the foreflap should be perceptible. If no movement can be felt, a check for both internal and external interferences must be performed. External interferences may exist, (a) between foreflap leading edge and trailing edge panel support structure; (b) between foreflap trailing edge and midflap upper skin. Internal interference may exist, (a) between foreflap track forward faces and stops located between foreflap track rollers in midflap; (b) between foreflap tracks and midflap structure particularly where the tracks penetrate the rear spar.

(b) Access for inspection is provided by a removable panel located in the center of the inspar lower skin, and by removing sufficient fasteners to allow lower inspar skins to be peeled back at each end of midflap. The flaps should be operated with these panels removed and particular attention paid to interferences occurring during the critical range of flap travel between five units and zero. The foreflap and its tracks are nonadjustable. Components must be repaired or replaced until clearance is obtained and the foreflap is loose. It is desirable that flap rework per Service Bulletin 57-1032 (Trailing Edge Outboard Foreflap Rework) be performed, if applicable, to the airplane.

B. Asymmetric Inboard Aftflap Extension or Retraction
   (1) Visually check for contamination such as ice, snow, mud or sand which could cause binding. Also check for damaged components, structural interference, and misrigged cables. A malfunctioning inboard aftflap clutch could cause asymmetric extension or retraction. The clutch should be adjusted or replaced as required.
C. Leading Edge Outboard Slats Skewed
   (1) Slats No. 1 and 6 are located chordwise in the takeoff position by a system of spring-loaded detents. If these detents are improperly adjusted or have failed, the slat may assume a position skewed relative to the leading edge of the wing. This will cause a change in lateral trim of a magnitude of 6 degrees of wheel. Should this occur, the mispositioned slat can be observed either from the cockpit or on the ground. A rapid check of the detents system may be made by applying a load normal to the leading edge of the slat in the takeoff position. A load in excess of 90 pounds applied at either end should be required to displace the slat from the detents. Should the slat release at a lower load the detent torsion tube should be checked for correct preload and structural integrity, and the detent arm adjusted.
D. Flight Control Surface Trim Required
   (1) A fractured outboard flap carriage spindle may result in an asymmetrical flap condition requiring some in flight corrective action (a combination of aileron or rudder trim to maintain level flight).
   (2) You must inspect the outboard flap carriage spindles for fractures if either of the conditions below are reported as necessary to maintain level flight when the flaps are in transition or the flaps are in any extended position:
      (a) 2.5 units or more of wheel
      (b) 1.0 or more units of rudder
   (3) This inspection is required prior to the next flight.

<u>WARNING</u>: YOU MUST PERFORM THIS INSPECTION PRIOR TO THE NEXT FLIGHT OF THE AIRPLANE. IF YOU DO NOT PERFORM THIS INSPECTION PRIOR TO THE NEXT FLIGHT, INJURY TO PERSONS AND/OR SEVERE DAMAGE TO THE AIRPLANE CAN OCCUR.

(4) See AMM 5-51-191/201 for flap carriage spindle fracture inspection.

3. Lateral Trim/Control Troubleshooting Chart

NOTE: If the following trouble items occur, they will appear abruptly rather than gradually such as with normal wear items.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Intermittent 15 to 20° control wheel requirement in flight at any flap setting other than 0	Unsequenced foreflap-outboard flaps	Check sequencing carriage rubstrips for wear, galling and binding	Replace rubstrips
		Check foreflap track roller for wear and/or binding	Replace roller
		Visually check tracks, rollers, flaps and other areas for contamination which may cause binding	Clean and lubricate
		Check foreflap toggles for damage	Replace toggle
		Check foreflap toggle pivot bolts for damage	Replace bolt
		Check foreflap track for structural interference with midflap	Remove interference

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Intermittent 15 to 20° control wheel requirement in flight at any flap setting	Asymmetric extensioon or retraction of inboard aftflap	Check clutch breakout load	Adjust clutch (OHM 57-53-24)
		Visually check tracks, rollers, flaps and other areas for contamination which may cause binding	Clean and lubricate
		Check drive boom support fitting for damage	Replace or reword fitting
		Check drive cable tension	Adjust tension
		Check aftflap pushrods for damage and/or structural interference	Remove interference
Intermittent 6 to 10° control wheel requirement in flight at any flap setting	Leading edge slats No. 1 or 6 skewed	Check detent arm for damage or misadjust-ment. Visually inspect tracks for contamination	Replace detent or readjust. Clean and lubricate tracks
		Leading edge actuator malfunction	Replace actuator

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Consistent 2 to 10° control wheel requirement in flight at any flap setting	Misrigging	Check aileron, flap and spoiler surface rigging	Rerig, if required, or reshim outboard flaps
	Loose outboard flap track aft support fittings	Check track support fittings for tightness and check track shims	Tighten and/or add shims as required. Recheck WCP alignment with trailing edges
	Outboard aftflap drive mechanism	Check hinge bushing, check for interference between wiring and mechanism, and check support arm roller travel in track	Replace and/or readjust
	Outboard midflap carriage	Check rollers for wear and deterioration	Replace
	Flight director balls	Check leveling of balls	Adjust
	Outboard midflap carriage	Check forward support thrust bearing for wear and deterioration	Replace and recheck WCP alignment with trailing edges
	Leaf spring at outboard flap carriages	Check rigging of leaf springs	Adjust springs and adjust flaps trailing edge alignment

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Consistent trim change, when flaps move from flap 0 to flap 1, of 6 to 12° control wheel	Outboard midflap deflection contro stop outboard roller	Check clearance between ramp and roller	Adjust ramp for proper clearance. Recheck WCP trailing edge alignment
	Rubstrip interference with outboard end of outboard midflap	Check clearance between rubstrip and midflap	Shim flap carriages and adjust deflection ramp. Recheck WCP trailing edge alignment
	Outboard flap screw fairings	Check fairing preload	Readjust
Consistent trim requirements of 6 to 12° control wheel with WCP trailing edge rigging within tolerances and symmetrical	Warped flap or aileron surface	Check surface trailing edges for straightness within .12 inch for full length	Replace warped components
Consistent trim requirements of 6 to 12° control wheel at flaps 15 to 40 only	Drive screw upstop clearance rigging	Check outboard flap screws upstop clearances	Adjust as required
	Flaps 40 mid to aftflap gaps	Check gap symmetry	Adjust symmetry within .05 inch
	Flaps 40 interference between outboard aftflap and screw fairing tailcone	Check fairing tailcone clearance with outboard aftflap at flaps 40 setting	Shim flaps at carriage and/or adjust fairing preload at flaps 0
	Fairing tracks in outboard flaps screw fairings	Check security of track attachments in fairings	Rework or replace fairings if damaged

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Consistent trim required on aileron or rudder with flaps extended	Fractured flap carriage spindle	Remove panels over outboard flap carriage spindle and check for fractured spindle	Replace flap carriage spindle (AMM 27-51-81/401)

FLIGHT CONTROLS TRIM CORRECTION - ADJUSTMENT/TEST

1. Purpose and Scope
   A. The purpose of this procedure is to describe proper methods to correct airplane configuration when flight controls trim discrepancies are excessive.
   B. The major headings are as follows:
      (1) Purpose and Scope
      (2) Adjust Trailing Edge Flaps for FLAP UP Discrepancy
      (3) Adjust Trailing Edge Flaps for 15-Unit Discrepancy
      (4) Adjust Trailing Edge Flaps for FLAP UP and 15-Unit Discrepancy
      (5) Adjust Trailing Edge Flaps for 40-Unit Discrepancy
      (6) Aileron Tab Adjustment to Equalize Lateral Manual Reversion Forces
      (7) Speed Brake Rolloff Discrepancy Correction.
      (8) Rudder Trim Discrepancy Correction.
      (9) Rudder Standby Power Discrepancy Correction
      (10) Elevator Power Off Discrepancy Correction
      (11) Leading Edge Slat Trailing Edge Gap Mismatch
      (12) Flight Controls Surface Mismatch Record
   C. All lateral trim corrections shall be made from control wheel positions reported by pilot, not the aileron trim indicator reading. (One aileron trim unit equals 6 degrees at the control wheel.)
   D. For best results care should be taken to optimize symmetry between left and right wings within given tolerances.
   E. A graphic aid to trim correction is provided (Fig. 506). It is expected that use of this aid will facilitate the process of selecting trim correction adjustments and improve skills in making the proper choice if these steps are followed:
      (1) Plot lateral and record rudder trim.
      (2) Record adjustments to be made.
      (3) Plot and record expected results.
      (4) Plot, record and compare actual results with expected results.
   F. Following any shimming for the purpose of trim correction, the allowable tolerance of 0.00 to -0.25 inch for outboard flap trailing edge and ± 0.25 inch for inboard flap trailing edge mismatch with the wing chord plane may be exceeded.

G. Find the Necessary Flap Adjustment

(1) Do a check of these other systems to make sure they are not the cause of the lateral trim error:

(a) Make sure the ailerons are adjusted correctly. To check the ailerons, do this task: Aileron and Aileron Trim Control System Adjustment (AMM 27-11-0/501).

(b) Make sure the rudder is adjusted correctly. To check the rudder, do this task: Rudder and Rudder Trim Control System Test (AMM 27-21-0/501).

(c) Make sure the outboard trailing edge flaps and aft flaps are adjusted correctly:

1) For the outboard trailing edge flaps, do this task: Outboard Trailing Edge Flap Adjustment (AMM 27-51-72/501).

2) For the outboard aft flap, do this task: Outboard Aft Flap Installation (AMM 27-51-91/401).

(d) Make sure the inboard trailing edge flaps and aft flaps are adjusted correctly:

1) For the inboard trailing edge flaps, do this task: Inboard Trailing Edge Flap Adjustment (AMM 27-51-12/501).

2) For the inboard aft flap, do this task: Aftflap Installation (AMM 27-51-31/401).

(e) Make sure the spoilers are adjusted correctly. To check the spoilers, do this task: Flight Spoiler Adjustment (AMM 27-61-11/501).

(2) Do a test flight to find the lateral trim necessary for straight and level flight for all flight conditions:

NOTE: Use the captains control wheel to find the trim limits. One unit of aileron trim is equal to six degrees of control wheel rotation.

(a) To find the aileron trim necessary during cruise, fly with these conditions:

1) Flight speed: Approximately 0.74 mach.

2) Altitude: 30,000 feet or higher.

3) Fuel load: Balanced in the limit of 50 pounds (23 kilograms).

4) Throttles: Balanced thrust in the limt of 1 percent, with autothrottles OFF.

5) Autopilot OFF.

(b) Apply rudder trim to get zero heading change.

NOTE: Keep this rudder trim position through the rest of the trim conditions.

(c) Apply aileron trim to keep the wings level and maintain zero heading change.

(d) Write down the amount and direction of aileron trim necessary to maintain straight and level flight.

NOTE: This is the trim for the flaps up, cruise condition.

(e) To find the aileron trim necessary for low speed cruise, and with the flaps extended, fly with these conditions:
1) Altitude: Between 10,000 to 17,000 feet.
2) Fuel load: Balanced in the limit of 50 pounds (23 kilograms).
3) Throttles: Balanced thrust in the limt of 1 percent, with autothrottles OFF.
4) Autopilot OFF.
5) Rudder trim in the same position as the cruise condition.

(f) Fly at 250 KIAS, with the flaps retracted.
(g) Apply aileron trim to keep the wings level and maintain zero heading change.
(h) Write down the amount and direction of aileron trim necessary to maintain straight and level flight.

NOTE: This is the trim for the flaps up, 250 knot condition.

(i) Reduce the airspeed to flaps 1 maneuvering speed, 190 KIAS, and extend the flaps to the 1-unit position.
(j) Apply aileron trim to keep the wings level and maintain zero heading change.
(k) Write down the amount and direction of aileron trim necessary to maintain straight and level flight.

NOTE: This is the trim for the flaps 1-unit condition.

(l) Reduce the airspeed to flaps 15 maneuvering speed, 150 KIAS, and extend the flaps to the 15-unit position, and extend the landing gear.
(m) Apply aileron trim to keep the wings level and maintain zero heading change.
(n) Write down the amount and direction of aileron trim necessary to maintain straight and level flight.

NOTE: This is the trim for the flaps 15-unit condition.

(o) Reduce the airspeed to flaps 40 maneuvering speed, 130 KIAS, and extend the flaps to the 40-unit position.
(p) Apply aileron trim to keep the wings level and maintain zero heading change.
(q) Write down the amount and direction of aileron trim necessary to maintain straight and level flight.

NOTE: This is the trim for the flaps 40-unit condition.

(3) If the aileron trim necessary to maintain level flight is not in the limits shown in Fig. 501 for the flaps up cruise condition, then do the steps in Trailing Edge Flaps for FLAPS UP Discrepancy Adjustment below.

(4) If the aileron trim necessary to maintain level flight is not in the limits shown in Fig. 501 for the flaps extended to the 40-unit condition, then do the steps in Trailing Edge Flaps Adjustment for 40-Unit Discrepancy below.

(5) If the aileron trim necessary to maintain level flight is not in the limits shown in Fig. 501 for the flaps extended to the 15-unit condition, then do the steps in Trailing Edge Flaps Adjustment for 15-Unit Discrepancy below.

(6) If the aileron trim necessary to maintain level flight is not in the limits shown in Fig. 501 for multiple flight conditions, then do the steps in Trailing Edge Flaps for FLAPS UP and 15-Unit Discrepancy Adjustment below.

2. Adjust Trailing Edge Flaps for FLAP UP Discrepancy

A. General

(1) The following procedures provide instructions for adjusting the trailing edge flaps to maintain straight and level flight without excessive aileron trim when all lateral control surfaces, flaps, and rudder are rigged within allowable tolerances. The adjustment is made by raising or lowering the outboard flaps by shimming between the flap carriage bearing support fitting and the forging in the midflap structure to which it attaches (Fig. 501), and by compensating adjustments of the outboard torque tubes relative to the inboard torque tubes. Adding shims will lower the flap trailing edge and removing shims will raise the flap trailing edge. The recommended total shim thickness is 0.20 inch and the allowable shim thickness shall not exceed 0.23 inch.

(2) This maximum shim thickness includes shims added for trim correction plus shims installed during assembly and installation of flap. Any increase in shim thickness beyond specified amounts may result in structural damage. The amount of shim or torque tube rotation required for a given amount of trim correction can be determined from Fig. 501. Any raising or lowering of flaps requires checking and rerigging of spoiler to give proper spoiler to flap clearance as required (AMM 27-61-0/501 and AMM 27-62-0/501). Any raising or lowering of flaps also requires checking and readjustment of the outboard flap track fairings (AMM 27-51-121/501). Check flap position indication system provides correct visible indication of angular position of flaps (AMM 27-58-01/501).

B. Equipment and Materials
   (1) Sealant - BMS 5-79, Class C (Ref 20-30-11)

C. It is essential to verify that a misrigged or out of tolerance system is not giving an incorrect trim reading or flight discrepancy. Prior to determining the amount of adjustment required the following checks shal1 be made.
   (1) Check that clearance between deflection control ramp and roller at outboard end of midflap is per Fig. 501. Adjust for correct clearance, if required (AMM 27-51-72/401).
   (2) Check that aileron mismatch at indexes and aileron mismatch at outboard rib are within allowable tolerances. Correct aileron system rigging if necessary (AMM 27-11-0/501).

   NOTE: To refine airplane trim, use aileron and tab positions at indexes rather than at outboard rib. Tolerances at outboard rib include structural tolerances and may be too large to suit the level of adjustments which must be made. Always use indexes when checking aileron tab mismatch.

   (3) Check that aileron trim control rigging is within allowable tolerances. Correct rigging as necessary (AMM 27-11-0/501).
   (4) Check that outboard trailing edge flap mismatch is within allowable tolerances. Correct rigging as necessary (AMM 27-51-72/501).
   (5) Check that spoiler to flap clearance and spoiler pickup points are within allowable tolerances. Correct rigging as necessary (AMM 27-61-0/501 and AMM 27-62-0/501).
   (6) Check that rudder rigging and rudder centering mechanism are within allowable tolerances. Correct rigging as necessary (AIRPLANES PRE-SB 27-1252: AMM 27-21-0/501, AIRPLANES POST-SB 27-1252: AMM 27-21-1/501)
   (7) If any noted discrepancy is corrected, determine the effect on the excessive aileron trim requirement. See Fig. 501 to determine amount of shim required for FLAP UP trim correction.

D. Prepare for Shimming
   (1) Provide system A hydraulic power (AMM 27-51-0/201).
   (2) Position flap control lever to FLAP DOWN (40-unit) detent.

(3) Remove system A hydraulic power (AMM 27-51-0/201).

(4) Remove access panels from upper surface of midflap to gain access to each carriage bearing support.

E. Shim Outboard Flaps

(1) If reported discrepancy is right wing heavy condition requiring excessive left trim, proceed as follows:

(a) Remove bolts attaching left wing carriage bearing support to midflap forging (Fig. 501).

(b) Remove shims from left outboard flap or add shims to right outboard flap or a combination of both to obtain required shim thickness change, determined from Fig. 501. Shims must be added or removed equally from both carriages of a flap.

NOTE: The recommended total shim thickness is 0.20 inch and the allowable total shim thickness shall not exceed 0.23 inch. Total shim thickness includes shims installed during assembly and installation plus shims added for trim correction. Marking and dating total shim thickness on upper access panel will provide a record to aid further adjustments. Following any shimming for the purpose of trim correction, the allowable tolerance of 0.00 to -0.25 inch for outboard flap trailing edge mismatch with the wing trailing edge may be exceeded. Shim thickness between leaf spring and midflap must be changed an equal amount when shim thickness between carriage bearing support and midflap is changed (i.e. add same thickness shim under leaf spring as removed from under carriage bearing support). Tapered filler between leaf spring and midflap may be used individually or at both track locations and may be positioned with thick end forward or aft or reversed relative to each other.

(2) If reported discrepancy is left wing heavy condition requiring excessive right trim, proceed as follows:

(a) Remove bolts attaching right wing carriage bearing support to midflap forging.

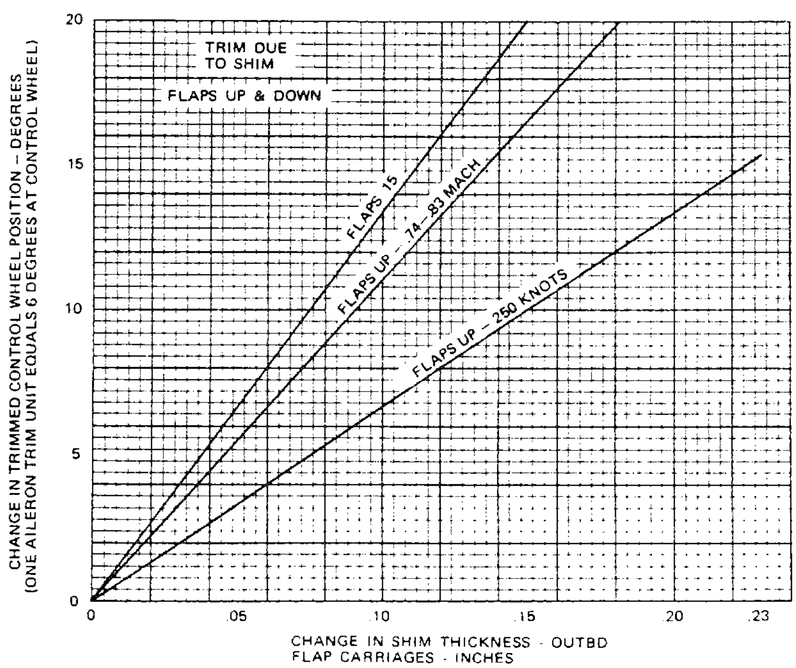
(b) Remove shims from right outboard flap or add shims to left outboard flap or a combination of both to obtain required shim thickness change, determined from Fig. 501. Shims must be added or removed equally from both carriages of a flap.

<u>NOTE</u>: The recommended total shim thickness is 0.20 inch and the allowable total shim thickness shall not exceed 0.23 inch. Total shim thickness includes shims installed during assembly and installation plus shims added for trim correction. Marking and dating total shim thickness on upper access panel will provide a record to aid further adjustments. Following any shimming for the purpose of trim correction, the allowable tolerance of 0.00 to -0.25 inch for outboard flap trailing edge mismatch with the wing trailing edge may be exceeded. Shim thickness between leaf spring and midflap must be changed an equal amount when shim thickness between carriage bearing support and midflap is changed (i.e. add same thickness shim under leaf spring as removed from under carriage bearing support). Tapered filler between leaf spring and midflap may be used individually or at both track locations and may be positioned with thick end forward or aft or reversed relative to each other.

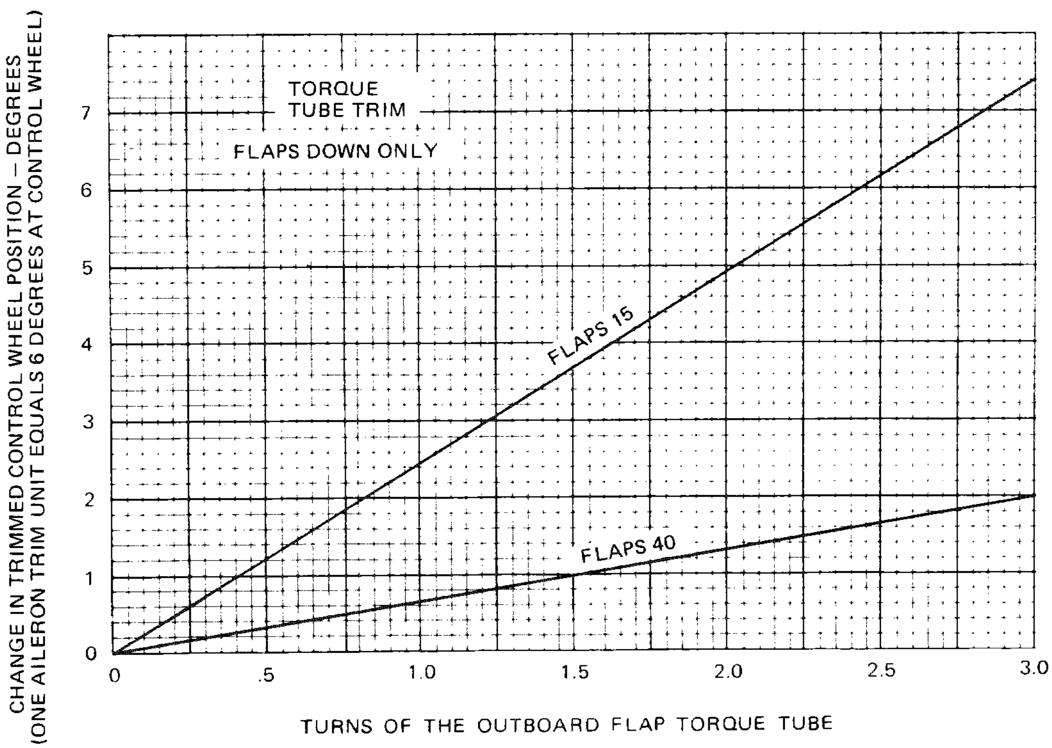
(3) Install bolt with washer and nut (Fig. 501). Tighten 3/8 inch nut 160 to 190 pound-inches and tighten 5/16 inch nut 100 to 140 pound-inches. Install cotter pins.

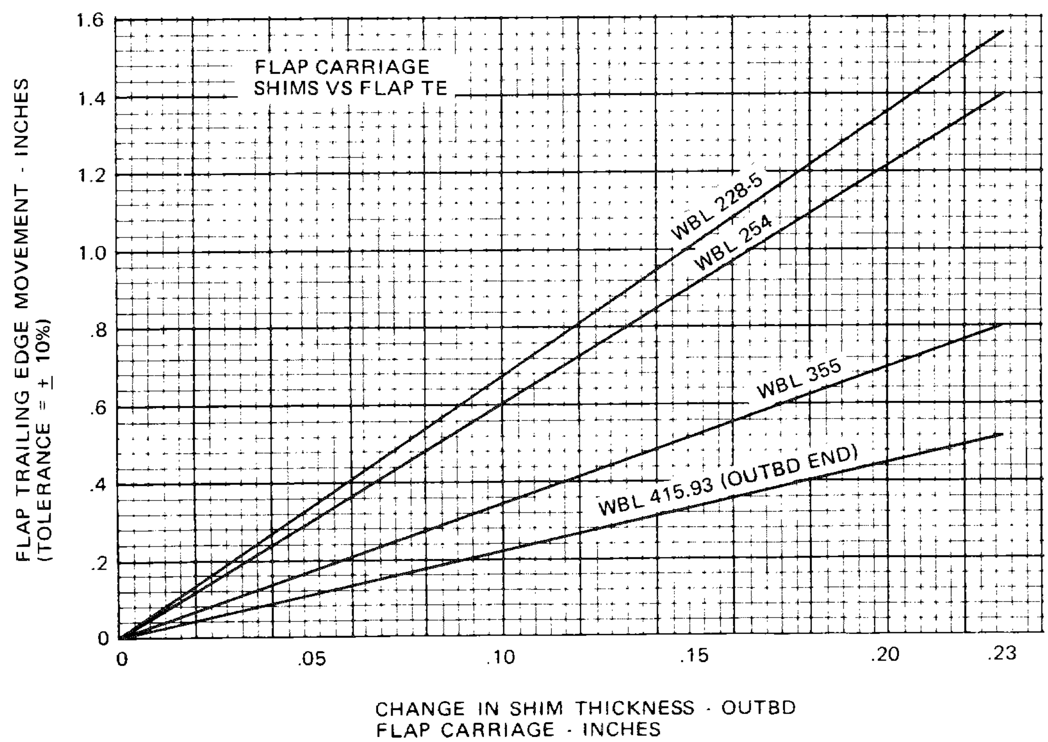
<u>NOTE</u>: A lateral trim correction for flap up position will affect the flaps at the 15-unit position. To ensure that the correction will not result in a 15-unit flap position trim discrepancy a compensating torque tube adjustment may be required. Refer to Fig. 501 to determine the control wheel position change that will occur with flaps in 15-unit position. If this change when added to flaps at 15-unit recorded wheel position exceeds allowable limits then an adjustment is required. Refer to Fig. 501 to determine the compensating torque tube adjustment required. For details of procedure see par. 3. (Adjust trailing edge flaps for 15-unit discrepancy.)

(4) Check spoiler to flap clearance (AMM 27-61-0/501 and 27-62-0/501).
(5) Check that outboard flap leaf springs are deflected 0.42 to 0.62 inch when flaps are retracted.
(a) Position flap control lever in FLAP DOWN (40-unit) detent to extend flaps.
(b) Measure dimension A as shown in Fig. 501.
(c) Position flap control lever in FLAP UP detent to retract flaps.
(d) With flaps in retracted position, check that dimension A is 0.42 to 0.62 inch less than in step (b).



Trailing Edge Flap Adjustment
Figure 501 (Sheet 1)





Trailing Edge Flap Adjustment
Figure 501 (Sheet 2)

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(e) If leaf spring is not properly positioned, add or remove shims to obtain proper deflection.
1) Position flap control lever in FLAP DOWN (40-unit) detent to extend flaps.
2) Remove three fasteners securing leaf spring.
3) Add or remove shims and reposition tapered filler as required.

NOTE: Shim thickness between leaf spring and midflap must be changed an equal amount when shim thickness between carriage bearing support and midflap is changed (i.e. add same thickness shim under leaf spring as removed from under carriage bearing support). Tapered filler between leaf spring and midflap may be used individually or at both track locations and may be positioned with thick end forward or aft or reversed relative to each other.

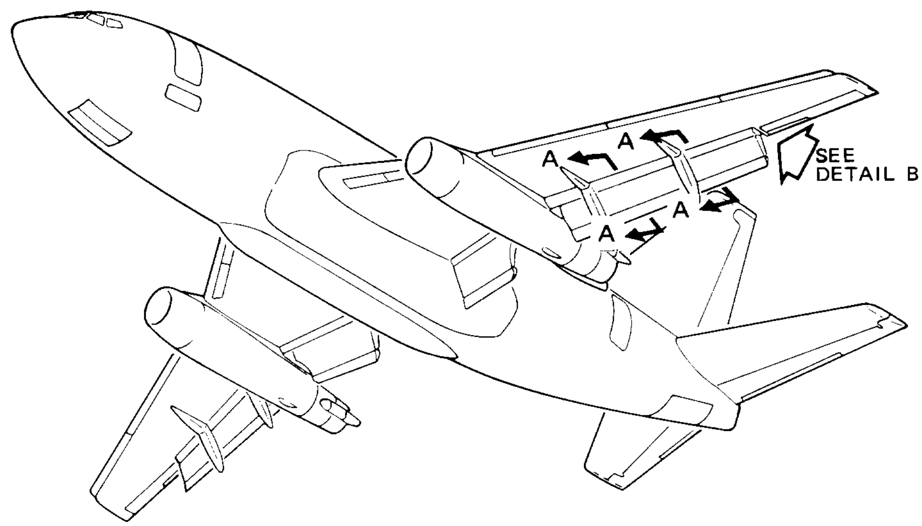
4) Secure leaf spring with bolt at forward attach point.
5) Secure retainer with radius filler, washer and nut at each aft attach point. Tighten 3/8 nut 160 to 190 pound-inches and tighten 5/16 nut 100 to 140 pound-inches. Install cotter pins.
6) Repeat steps (a) thru (d) to check adjustment.

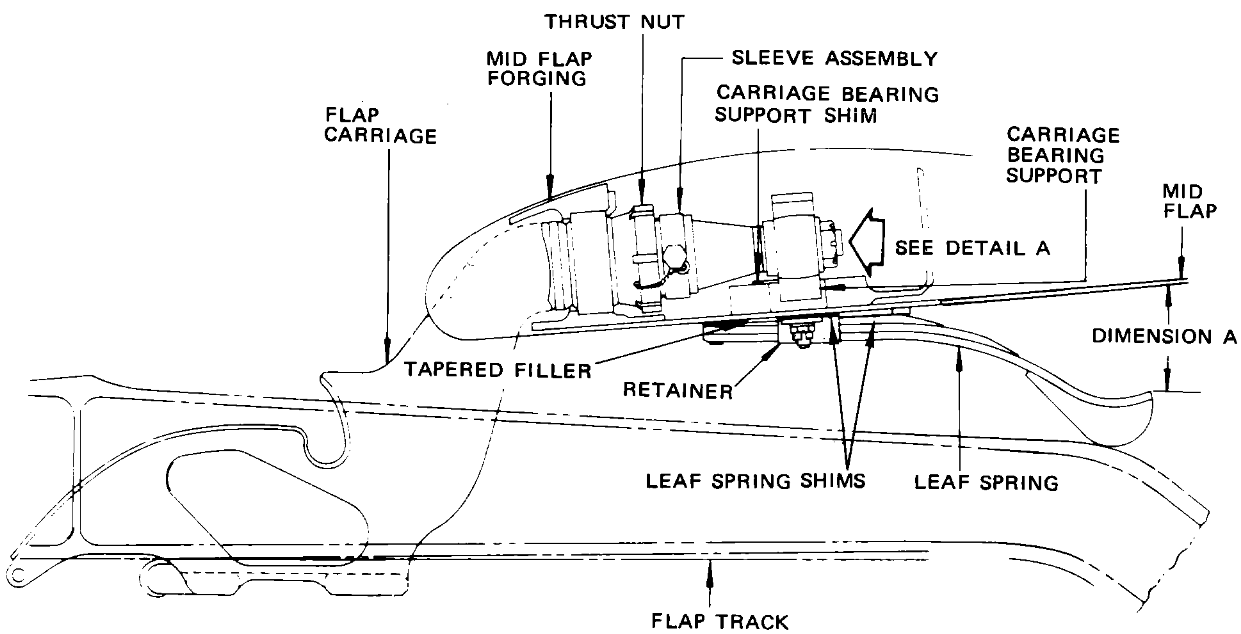
(6) If shim thickness between midflap carriage bearing support and midflap forging has been changed, adjust flap jackscrew preload cup (AMM 27-51-72/501).

CAUTION: ADJUSTMENT OF SHIM THICKNESS BETWEEN MIDFLAP CARRIAGE BEARING SUPPORT AND MIDFLAP FORGING CHANGES PRELOAD CUP ADJUSTMENT. INCORRECT ADJUSTMENT MAY CAUSE DAMAGE TO PRELOAD CUP.

(7) Check adjustment of outboard flap track fairings (AMM 27-51-121/501)
(8) Check that clearance between deflection control ramp and roller at outboard end of midflap is per Fig. 501. Adjust, if required (AMM 27-51-72/401).

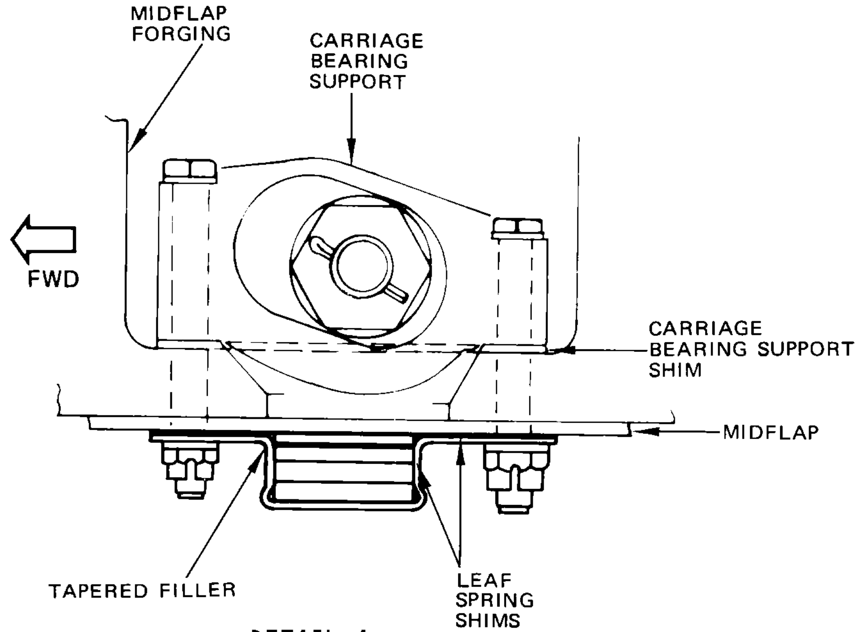
F. Restore Airplane to Normal
(1) Remove system A hydraulic power (Ref 27-51-0 MP).
(2) Apply sealant to carriage access panel and midflap faying surface and install access panels on upper surface of midflap.
(3) The amount of aileron trim required on following flight shall be noted to determine whether or not sufficient correction was made.



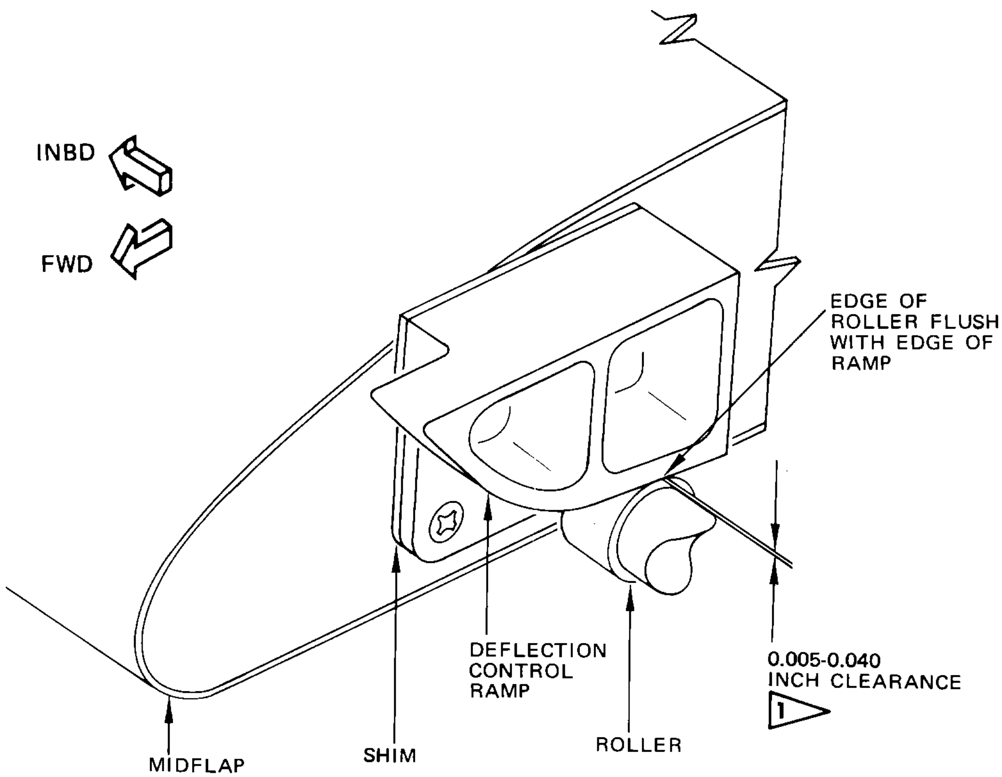


SECTION A-A

Trailing Edge Flap Adjustment
Figure 501 (Sheet 3)



DETAIL A



1 CLEARANCE TO BE SYMMETRICAL BETWEEN OPPOSITE MIDFLAPS

DETAIL B

Trailing Edge Flap Adjustment
Figure 501 (Sheet 4)

3. Adjust Trailing Edge Flaps for 15-Unit Discrepancy
   A. It is essential to verify that a misrigged or out of tolerance system is not giving an incorrect trim reading or flight discrepancy. Prior to determining amount of adjustment required following checks shall be made.
      (1) With flaps in up position, check that each outboard flap transmission is positioned so that angular clearance between stop on ball screw nut and upstop on screw yoke is 170 to 190 degrees (1/2 turn ±10 degrees) turn (1/4 to 5/6 turn if previous trim correction has been made). If not within limits adjust flap transmissions AMM 27-51-01/501).

         CAUTION: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURNS. A MEASUREMENT OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION.

      (2) With flaps in 40-unit position, check gap between trailing edge of midflap to leading edge of aftflap of outboard flaps. Left and right outboard ends shall equal left and right inboard ends within 0.05 inch. If gaps are not within limits, adjust aftflap bellcrank clevis arm. Tighten checknuts and lockwire.
      (3) If any noted discrepancy is corrected, determine effect on excessive aileron trim requirement. See Fig. 501 to determine amount of torque tube rotation required.
   B. Prepare for Adjustment
      (1) Provide system A hydraulic power (AMM 27-51-0/201).
      (2) Position flap control lever in 15-unit detent.
      (3) Remove system A hydraulic power and depressurize hydraulic system A (AMM 27-51-0/201).
   C. Adjust Outboard Flaps
      (1) If reported discrepancy is right wing heavy condition requiring excessive left trim, proceed as follows:
         (a) Remove screws attaching torque tube coupling sleeves to splines to disconnect torque tubes from inboard couplings of No. 2 flap transmission.

(b) Rotate torque tube to lower right outboard flap or raise left outboard flap or some combination of both to obtain the required correction. See Fig. 501 for amount of correction. This correction will have no adverse effect on trim at FLAP UP or FLAP DOWN (40-unit) position.

CAUTION: ALLOWABLE ANGULAR CLEARANCE BETWEEN BALL SCREW UPSTOPS IS 1/4 TO 5/6 TURNS. A MEASUREMENT OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION.

NOTE: If a lateral trim torque tube correction cannot be made with flaps in 15-unit position due to ball screw nut upstop exceeding 1/4 to 5/6 turns from contact at FLAP UP position, a shim correction shall be made. See Fig. 501 to determine control wheel position change that will occur with flaps in 15-unit position. A shim correction for flaps in 15-unit position will affect lateral trim for FLAP UP. See Fig. 501 to determine the control wheel position change that will occur for FLAP UP position.

(2) If reported discrepancy is left wing heavy condition requiring excessive right trim, proceed as follows:

(a) Remove screws attaching torque tube coupling sleeves to splines to disconnect torque tubes from inboard coupling of No. 7 flap transmission.

(b) Rotate torque tube to lower left outboard flap or raise right outboard flap or some combination of both to obtain required correction. See Fig. 501 for amount of correction. This correction will have no adverse effect on trim at FLAP UP or FLAP DOWN (40-unit) position.

CAUTION: ALLOWABLE ANGULAR CLEARANCE BETWEEN BALL SCREW UPSTOPS IS 1/4 TO 5/6 TURNS. A MEASUREMENT OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION.

NOTE: If a lateral trim torque tube correction cannot be made with flaps in 15-unit position due to ball screw nut upstop exceeding 1/4 to 5/6 turns from contact at FLAP UP position, a shim correction shall be made. See Fig. 501 to determine control wheel position change that will occur with flaps in 15-unit position. A shim correction for flaps in 15-unit position will affect lateral trim for FLAP UP. See Fig. 501 to determine the control wheel position change that will occur for FLAP UP position.

(3) Provide system A hydraulic power (AMM 27-51-0/201).
(4) Position flap control lever in FLAP UP detent.
(5) Operate trailing edge flaps by moving flap control lever from FLAP UP to FLAP DOWN (40-unit) position and back to UP. Pause at UP and DOWN positions to allow flap to respond fully. Repeat for at least 2 cycles and check the following:
  (a) The ball screw nut upstop must stop in the range of 1/4 to 5/6 turns from contact at FLAP UP position.
  (b) The ball screw nut downstop must stop at least 1/8 turn from contact at FLAP DOWN (40-unit) position.
(6) If the ball screw upstop exceeds 5/6 turns at FLAP UP position recheck the following:
  (a) The ball screw nut downstop must stop at least 1/8 turn from contact at FLAP DOWN (40-unit) position.
  (b) With flaps in up position, check that clearance of seal support (on wing lower trailing edge panel) with respect to leading edge of midflap is 0.003 to 0.06 inch. If adjustment is necessary, loosen seal support retaining screws, position seal support to obtain clearance, and tighten retaining screws. Fill gap between skin and seal support with pressure, environmental and fuel cavity sealant.
(7) Check adjustment of flap position transmitters (AMM 27-58-01/501).

4. <u>Adjust Trailing Edge Flaps for FLAP UP and 15-Unit Discrepancy</u>
  A. Equipment and Materials
    (1) Sealant - BMS 5-79, Class C (AMM 20-30-11)
  B. It is essential to verify that a misrigged or out of tolerance system is not giving an incorrect trim reading or flight discrepancy. Prior to determining the amount of adjustment required the following checks shall be made:
    (1) Repeat steps (1) thru (5) of 2.B., Adjust Trailing Edge Flaps for FLAP UP Discrepancy.
    (2) Check that each outboard flap transmission is positioned so that the angular clearance between stop on ball screw nut and upstop on screw yoke is 170 to 190 degrees (1/4 to 5/6 turn if previous trim correction has been made). If not within limits, adjust flap transmissions (AMM 27-51-01/501).

      <u>CAUTION</u>: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURNS. A MEASUREMENT OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION.

(3) With flaps in FLAP DOWN (40-unit) position, check gap between trailing edge of midflap to leading edge of aftflap of the outboard flaps. Left and right outboard end gaps shall be equal within 0.05 inch. Left and right inboard end gaps shall be equal between 0.05 inch. If gaps are not within limits, adjust aftflap bellcrank clevis arm. Tighten checknuts and lockwire.

(4) If any noted discrepancy is corrected, determine effect on excessive aileron trim requirement. See Fig. 501 to determine amount of shim required for FLAP UP trim correction.

C. Prepare for Shimming

(1) Provide system A hydraulic power (AMM 27-51-0/201).

(2) Position flap control lever at FLAP DOWN (40-unit) detent.

(3) Remove system A hydraulic power (AMM 27-51-0/201).

(4) Remove access panels from upper surface of midflap to gain access to each carriage bearing support.

D. Shim Outboard Flaps

(1) If reported discrepancy is right wing heavy condition requiring excessive left trim, proceed as follows:

(a) Remove bolts attaching left wing carriage bearing support to midflap forging (Fig. 501).

(b) Remove shims from left outboard flap or add shims to right outboard flap or a combination of both to obtain required shim thickness change determined from Fig. 501. Shims must be added or removed equally from both carriages of a flap.

NOTE: The recommended total shim thickness is 0.20 inch and the allowable total shim thickness shall not exceed 0.23 inch. Total shim thickness includes shims installed during assembly and installation plus shims added for trim correction. Marking and dating total shim thickness on upper panel will provide a record to aid further adjustments. Following any shimming for the purpose of trim correction, the allowable tolerance of 0.00 to -0.25 inch for outboard flap trailing edge mismatch with the wing trailing edge may be exceeded.

(2) If reported discrepancy is left wing heavy condition requiring excessive right trim, proceed as follows:
   (a) Remove bolts attaching right wing carriage bearing support to midflap forging (Fig. 501).
   (b) Remove shims from right outboard flap or add shims to left outboard flap or a combination of both to obtain required shim thickness change, determined from Fig. 501. Shims must be added or removed equally from both carriages of a flap.

      NOTE: The recommended total shim thickness is 0.20 inch and the allowable total shim thickness shall not exceed 0.23 inch. Total shim thickness includes shims installed during assembly and installation plus shims added for trim correction. Marking and dating total shim thickness on upper panel will provide a record to aid further adjustments. Following any shimming for the purpose of trim correction, the allowable tolerance of 0.00 to -0.25 inch for outboard flap trailing edge mismatch with the wing trailing edge may be exceeded.

(3) Install bolt with washer and nut (Fig. 501). Tighten 3/8 inch nut to 160-190 pound-inches and tighten 5/16 nut to 100-140 pound-inches. Install cotter pins.

   NOTE: A lateral trim correction for FLAP UP position will affect the flaps at the 15-unit position. To ensure that correction will not result in a 15-unit flap position trim discrepancy, a compensating torque tube adjustment is required. See Fig. 501 to determine the control wheel position change.

(4) Adjust torque tubes for 15-unit discrepancy as follows:
   (a) Provide system A hydraulic power (AMM 27-51-0/201).
   (b) Position flap control lever in 15-unit detent.
   (c) Remove system A hydraulic power and depressurize hydraulic system A (AMM 27-51-0/201).

(d) If reported discrepancy is right wing heavy condition requiring excessive left trim, proceed as follows:

1) Remove screws attaching torque tube coupling sleeves to splines to disconnect torque tubes from inboard coupling of No. 2 and/or 7 flap transmission.
2) Rotate torque tube to lower right outboard flap or raise left outboard flap or some combination of both to obtain required correction. See Fig. 501 for amount of correction.

<u>NOTE</u>: One turn (360 degrees) equals 96-degree flap transmission rotation. If a lateral trim torque tube correction cannot be made with flaps in 15-unit position due to the ball screw nut upstop exceeding 1/4 to 5/6 turns from contact at FLAP UP position, a shim correction shall be made. See Fig. 501 to determine the control wheel position change that will occur with flaps in 15-unit position. A shim correction for flaps in 15-unit position will affect lateral trim for FLAP UP. See Fig. 501 to determine control wheel position change that will occur for FLAP UP position.

(e) If reported discrepancy is left wing heavy condition requiring excessive right trim, proceed as follows:

1) Remove screws attaching torque tube coupling sleeves to splines to disconnect torque tubes from inboard coupling of No. 7 and/or 2 flap transmission.
2) Rotate torque tube to lower left outboard flap or raise right outboard flap or some combination of both to obtain required correction. See Fig. 501 for amount of correction.

<u>NOTE</u>: One turn (360 degrees) equals 96-degree flap transmission rotation. If a lateral trim torque tube correction cannot be made with flaps in 15-unit position due to the ball screw nut upstop exceeding 1/4 to 5/6 turns from contact at FLAP UP position, a shim correction shall be made. See Fig. 501 to determine the control wheel position change that will occur with flaps in 15-unit position. A shim correction for flaps in 15-unit position will affect lateral trim for FLAP UP. See Fig. 501 to determine control wheel position change that will occur for FLAP UP position.

(f) Connect torque tubes, secure couplings and lockwire heads of torque tube coupling screws.

CAUTION: DO NOT APPLY END LOAD TO TRANSMISSION INPUT SHAFT WHEN INSTALLING TORQUE TUBES.

(5) Provide system A hydraulic power (AMM 27-50-0/201).
(6) Position flap control lever in FLAP UP detent.
(7) Operate trailing edge flaps by moving flap control lever from FLAP UP to FLAP DOWN (40-unit) position and back to UP. Pause at UP and DOWN position to allow flap to respond fully. Repeat for at least 2 cycles and check the following:
 (a) The ball screw nut upstop must stop in the range of 1/4 to 5/6 turns from contact at FLAP UP position.
 (b) The ball screw nut downstop must stop at least 1/8 turn from contact at FLAP DOWN (40-unit) position.
(8) If the ball screw upstop exceeds 5/6 turn at FLAP UP position, recheck the following:
 (a) The ball screw nut downstop must stop at least 1/8 turn from contact at FLAP DOWN (40-unit) position.
 (b) With flaps in up position, check that clearance of seal support (on wing lower trailing edge panel) with respect to leading edge of midflap is 0.003 to 0.06 inch. If adjustment is necessary, loosen seal support retaining screws, position seal support to obtain clearance and tighten retaining screws. Fil1 gap between skin and seal support with pressure, environmental and fuel cavity sealant.
(9) Check flap asymmetry shutoff mechanism (AMM 27-51-301/201).
(10) Check flap position transmitters (AMM 27-58-0/501).
(11) Check spoiler to flap clearance (AMM 27-61-0/501 and 27-62-0/501).
(12) Check that outboard flap leaf springs are deflected 0.42 to 0.62 inch when flaps are retracted.
 (a) Position flap control lever in FLAP DOWN (40-unit) detent to extend flaps.
 (b) Measure dimension A (Fig. 501).

(c) Position flap control lever in FLAP UP detent to retract flaps.
(d) With flaps in retracted position, check that dimension A is 0.42 to 0.62 inch less than in step (b).
(e) If leaf spring is not properly positioned, add or remove shims to obtain proper deflection.
1) Position flap control lever in FLAP DOWN (40-unit) detent to extend flaps.
2) Remove three fasteners securing leaf spring.
3) Add or remove shims and reposition tapered filler as required.

NOTE: Shim thickness between leaf spring and midflap must be changed an equal amount when shim thickness between carriage bearing support and midflap is changed (i.e., add same thickness shim under leaf spring as removed from under carriage bearing support). Tapered filler between leaf spring and midflap may be used individually or at both track locations and may be positioned with thick end forward or aft or reversed relative to each other.

4) Secure leaf spring with bolt at forward attach point.
5) Secure retainer with radius filler, washer and nut at each aft attach point. Tighten 3/8 nut within 160 to 190 pound-inch torque range and tighten 5/16 nut within 100 to 140 pound-inch torque range. Install cotter pin.
6) Repeat steps (a) thru (d) to check adjustment.

(13) If shim thickness between midflap carriage bearing support and midflap forging has been changed, adjust flap jackscrew preload cup (AMM 27-51-72/501).

CAUTION: ADJUSTMENT OF SHIM THICKNESS BETWEEN MIDFLAP CARRIAGE BEARING SUPPORT AND MIDFLAP FORGING CHANGES PRELOAD CUP ADJUSTMENT. INCORRECT ADJUSTMENT MAY CAUSE DAMAGE TO PRELOAD CUP.

(14) Check adjustment of outboard flap track fairing (AMM 27-51-121/501).

(15) Check that clearance between deflection control ramp and roller at outboard end of midflap is per Fig. 501. Adjust, if required (AMM 27-51-72/401).

E. Restore Airplane to Normal

(1) Remove system A hydraulic power (AMM 27-51-0/501).

(2) Apply sealant to carriage access panel and midflap faying surface and install access panels on upper surface of midflap.

5. <u>Adjust Trailing Edge Flaps for 40-Unit Discrepancy</u>

A. Symmetrical gaps between the mid and aftflaps of outboard flaps are critical at FLAP DOWN (40-unit) position. Shimming of carriage bearing support or torque tube adjustment will have little effect at FLAP DOWN position. If a trim discrepancy is reported, proceed as follows:

(1) Provide system A hydraulic power (AMM 27-51-0/201).

(2) Position flap control lever at FLAP DOWN (40-unit) position.

(3) Remove system A hydraulic power and depressurize hydraulic system A (AMM 27-51-0/201).

(4) Measure mid-to-aftflap gap at inboard and outboard ends of aftflap on both wings (Fig. 504). Check that inboard gaps on each wing are equal within 0.05 inch and outboard gaps on each wing are equal within 0.05 inch. If gaps are not within limits, adjust gaps as follows:

(a) Adjust aftflap bellcrank clevis arm (not aftflap pushrod) at both flap track fairings on one or both wings as necessary to obtain correct gaps. Ensure that dimension B at both flap tracks remains with in limits (Fig. 504).

(b) Retract flaps by providing system A hydraulic power (AMM 27-51-0/201), retracting flaps to FLAPS UP position and removing system A hydraulic power (AMM 27-51-0/201).

(c) Check that aftflap leading edge to midflap trailing edge gap is per Fig. 506. If necessary, adjust aftflap pushrods at both flap track fairings to obtain correct gap.

(d) Extend flaps to 40 units and ensure that mid-to-aftflap gaps and dimension B remain unchanged.

(5) Retract flaps.

6. <u>Aileron Tab Adjustment to Equalize Lateral Manual Reversion Forces</u>

A. General

(1) If aileron manual reversion asymmetrical flight control forces exceed the allowable 2 to 1 ratio, the following procedure should be used to adjust the aileron tab (AMM 27-11-0/501 Flight Test to Determine and Correct Asymmetrical Flight Control Forces).

B. Equipment and Materials

(1) Aileron Tab Alignment protractor - F80222-1 (AMM 27-09-700/201)

C. Adjust Aileron Tab

(1) It is essential to verify that a misrigged or out of tolerance condition does not exist prior to determining amount of adjustment required; therefore, do the steps:

(a) Make sure the aileron balance tab is correctly adjusted (AMM 27-11-0/501).

(b) Make sure the aileron control forces, with power off, are not more than the specified limits (AMM 27-11-0/501, "use a torque wrench and control wheel torque and force test adapter to measure the torque necessary to turn the captain's control wheel").

(c) Make sure the step clearances at the quadrants of the power control unit are not out of tolerance (AMM 27-11-0/501).

(d) If flaps up lateral trim exceeds 3/4 unit, manual reversion discrepancy should not be corrected until trim is corrected and manual reversion discrepancy verified by next flight.

WARNING: CHECK THAT HYDRAULIC SYSTEMS A AND B ARE DEPRESSURIZED BEFORE PROCEEDING FURTHER (REF 27-11-0/201).

(2) Excessive Forces Left Discrepancy Correction

(a) Forces are recorded by pilots at approximately 30 degrees clockwise and 30 degrees counterclockwise control wheel position.

NOTE: The forces are measured and recorded in the "Flight Test to determine and correct Asymmetrical Flight Control Forces" (AMM 27-11-0/501).

(b) Get the force ratio by dividing counterclockwise force by clockwise force or else divide clockwise force by counterclockwise force to get a value greater than 1.0.

(c) Forces are corrected by changing tab rod lengths to raise or lower aileron tab relative to aileron.

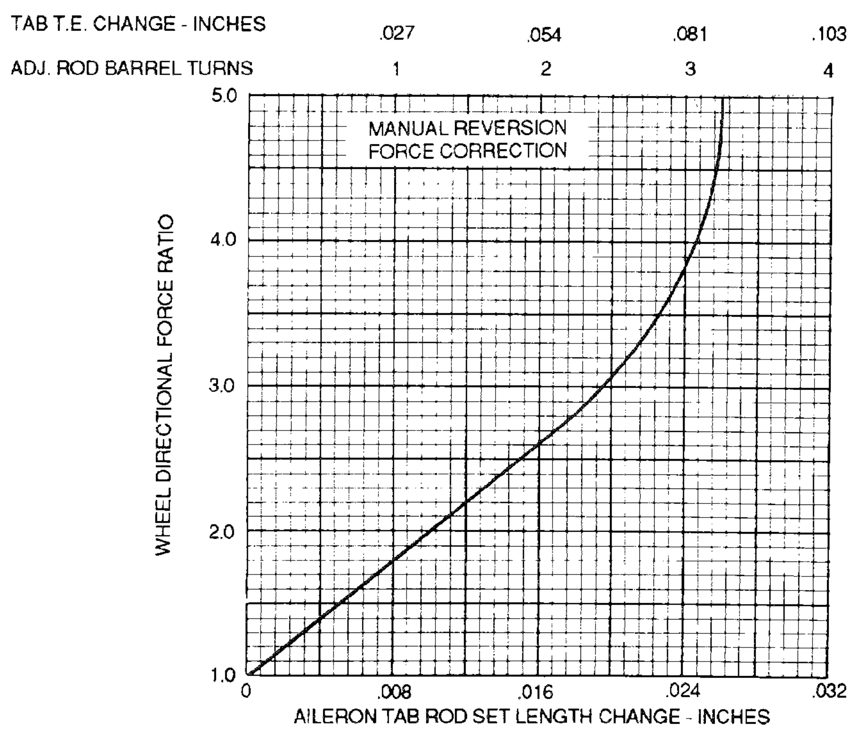
(d) After force ratio is determined, select correct amount of tab rod change from Fig. 502.

NOTE: For either tab, both rods must be changed in sets.

(e) With aileron indexes aligned, measure the tab trailing edge mismatch with the lower aileron surface by using a straightedge or aileron tab alignment protractor positioned at the rod attach points and record this dimension.

NOTE: After aileron tab control rod length adjustments are completed, the aileron tab trailing edge must be within -0.01 to +0.15 inch of the aileron lower surface on airplanes with nonadjustable aileron tab control rods, or within +0.05 to +0.09 inch of the aileron lower surface on airplanes with adjustable aileron tab control rods. These dimensions are applicable at the midpoint of the aileron tab. To complete the adjustment within the required dimensions, it may be necessary to divide the total required control rod adjustment between the left and the right wings (AMM 27-11-0/501).

(f) Either shorten left tab rod set or lengthen right tab rod set or a combination of both to obtain required amount of tab rod change from Fig. 502.
 1) Shorten or lengthen nonadjustable aileron tab rods as follows:
  a) Note amount and direction of required adjustment of tab trailing edge. Take measurements of trailing edge back of tab rod attachment.
  b) Remove bolts attaching tab rods to forward fittings.
  c) Remove aileron tab hinge bolts and remove tab and rods from aileron.
  d) Record rod lengths and drill out two 5/32 inch diameter rivets at forward rod end fitting of each tab set.
  e) Reposition rod end fitting to shorten or lengthen rod as required, and clamp securely in a suitable jig.
  f) Redrill holes and install two 3/16 inch diameter rivets in each forward rod end fitting and tab rod.
 2) Shorten or lengthen adjustable aileron tab control rods as follows:
  a) Note amount and direction of required adjustment of tab trailing edge. Take measurements of trailing edge back of tab rod attachment.



Aileron Tab Adjustment Chart
Figure 502

b) Remove bolts attaching tab rods to aileron hinge fitting on rear spar.
c) Remove aileron tab hinge bolts and remove tab and rods from aileron.
d) Loosen jamnuts on tab rod being careful not to reposition rod end or rod barrel.
e) Turn barrel required number of turns, being careful to restrain rod and rod end angularly.
f) Check that witness holes in barrel are covered. Tighten jamnuts using a torque of 100 to 140 pound-inches for the smaller jamnut and 80 to 100 pound-inches for larger jamnut. Lockwire jamnuts.
g) Reinstall tab and rods on aileron. Attach bolts for tab rods must be inserted with fingers only to ensure there is no binding between rod and bolt or deflection of rods. Readjust length of rod if binding or deflecting occurs.
h) With aileron indexes aligned, measure and record the tab trailing edge mismatch with the lower aileron surface by using a straightedge or aileron tab alignment protractor positioned at the rod attach points.

NOTE: The trailing edge of the aileron balance tab must move in the direction that is necessary. To correct high left forces, the tab trailing edge must move down on the left aileron or up on the right aileron or a combination of the two. To correct the high right forces, the tab trailing edge must move down on the right aileron or up on the left aileron or a combination of the two.

(3) Excessive Forces Right Discrepancy Correction
(a) Forces are recorded by pilots at approximately 30 degrees clockwise and 30 degrees counterclockwise control wheel position.
(b) Obtain force ratio by dividing clockwise force by counterclockwise force.
(c) Forces are corrected by changing tab rod lengths to raise or lower aileron tab relative to aileron.
(d) After force ratio is determined select correct amount of tab rod change from Fig. 502.

NOTE: For either tab, both rods must be changed in sets.

(e) With aileron indexes aligned, measure the tab trailing edge mismatch with the lower aileron surface by using a straightedge or aileron tab alignment protractor positioned at the rod attach points and record this dimension.

<u>NOTE</u>: After aileron tab control rod length adjustments are completed, the aileron tab training edge must be within -0.01 to +0.15 inch of the aileron lower surface on airplanes with nonadjustable aileron tab control rods, or within +.05 to +0.09 inch of aileron lower surface on airplanes with adjustable aileron tab control rods. These dimensions are applicable at the midpoint of the aileron tab. To complete the adjustment within the required dimensions, it may be necessary to divide the total required control rod adjustment between the left and the right wings (AMM 27-11-0/501).

(f) Either shorten right tab rod set or lengthen left tab rod set or a combination of both to obtain the required amount of tab rod change from Fig. 502. Shorten or lengthen aileron tab rods per steps (2) (b) 1) or (2) (b) 2).

(g) With aileron indexes aligned, measure and record the tab trailing edge mismatch with the lower aileron surface by using a straightedge or aileron tab alignment protractor positioned at the rod attach points.

<u>NOTE</u>: Verify that the tab trailing edge moves in the direction required. For correcting excessive forces right the trailing edge should move downward on the right aileron or upward on the left aileron or a combination of the two.

(4) After tab rods are adjusted and with aileron indexes aligned in the rigged position, at the midspan of the tab, measure its trailing edge with respect to lower surface of aileron. The tab shall be within -0.01 to +0.15 inch of aileron tabs with nonadjustable control rods, or +0.05 to +0.09 on aileron tabs with adjustable control rods.

7. <u>Speed Brake Rolloff Discrepancy Correction</u>

A. If a speed brake discrepancy is reported, the spoiler pickups and speed brake symmetry should be checked. Refer to Adjust Spoiler Actuator Input Lever (AMM 27-61-0/501).

8. <u>Rudder Trim Discrepancy Correction</u>

A. If a rudder trim discrepancy is reported, the input to the main rudder power control unit should be checked.
AIRPLANES PRE-SB 27-1252;
Adjust input to Rudder Power Control Unit (AMM 27-21-0/501)
AIRPLANES POST-SB 27-1252;
Adjust the input rods to Rudder Power Control Unit (AMM 27-21-1/501)

B. If slight rudder trim input is consistently required (.2 to .3 units) and system has been checked and found correctly rigged, recenter rudder trim as follows:
   (1) Set rudder trim knob at position required for straight flight (within .2 to .3 unit range).
   (2) Turn on hydraulic systems A and B.

   WARNING: ACTIVATION OF HYDRAULIC SYSTEMS MAY ALSO ENERGIZE OTHER SYSTEMS THAN RUDDER. TO AVOID INJURY TO PERSONNEL, OR DAMAGE TO EQUIPMENT, ISOLATE OR TAG SYSTEMS AS REQUIRED. ENSURE ALL CONTROL SURFACES ARE CLEAR OF OBSTRUCTIONS BEFORE APPLYING POWER.

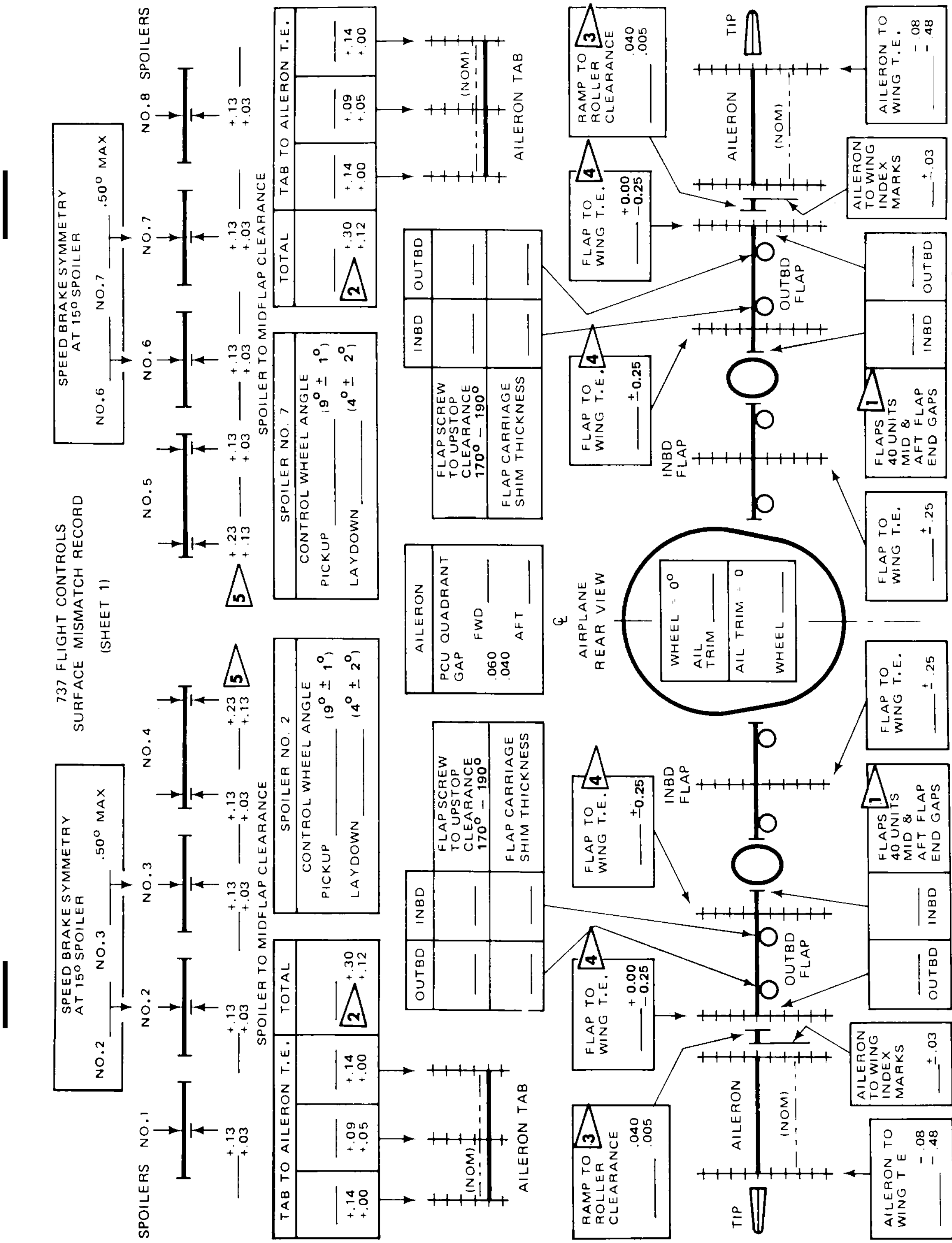
   (3) Loosen two tail cone index plate bolts.
   (4) Reposition index plate so that both sides of rudder trailing edge are within width of tab on index plate.
   (5) Tighten index plate bolts.
   (6) Set rudder trim knob to zero.
   (7) Adjust main and standby power control units input to align rudder with new index position.
   AIRPLANES PRE-SB 27-1252;
   Adjust input to Rudder Power Control Unit (AMM 27-21-0/501)
   Adjust input to standby rudder actuator (AMM 27-21-0/501)
   AIRPLANES POST-SB 27-1252;
   Adjust the input rods to Rudder Power Control Unit (AMM 27-21-1/501)
   Adjust the input rod to the standby rudder actuator (AMM 27-21-1/501)

9. Rudder Standby Power Discrepancy Correction
   A. If a rudder standby power discrepancy is reported, check input to rudder standby power control unit
   AIRPLANES PRE-SB 27-1252;
   Adjust input to standby rudder actuator (AMM 27-21-0/501)
   AIRPLANES POST-SB 27-1252;
   Adjust the input rod to the standby rudder actuator (AMM 27-21-1/501)

10. Elevator Power Off Discrepancy Correction
   A. If an elevator power off discrepancy is reported, check elevator tab rigging (AMM 27-31-0/501).

11. Leading Edge Slat Trailing Edge Gap Mismatch Record
   A. Check that leading edge slat trailing gaps are per Fig. 505.

12. Flight Controls Surface Mismatch Record
   A. Figure 503 conveniently summarizes the control surfaces mismatch dimensions. It should be used to check for mismatch prior to first flight after major overhaul, rigging, or replacement of a control surface. The mismatch record will also be useful for isolating problem areas following flight crew trim discrepancy reports. A continuous mismatch record may be kept for each airplane. This will spotlight possible trouble areas at an early time, rather than after excessive trim problems are encountered.

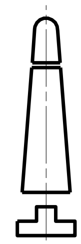


Flight Control Surface Mismatch Record
Figure 503 (Sheet 1)

467200

737 FLIGHT CONTROLS SURFACE MISMATCH RECORD

(SHEET 2)



GENERAL NOTES:

1. INBD FLAP TE SHALL BE SYMMETRICAL WITH OPPOSITE INBD FLAP TE WITHIN 0.10
2. OUTBD FLAP TE SHALL BE SYMMETRICAL WITH OPPOSITE OUTBD FLAP TE WITHIN 0.10
3. (+) INDICATES CONTROL SURFACE ABOVE TE (−) INDICATES CONTROL SURFACE BELOW TE (LINEAR DIMS ARE INCHES)
4. SEE THE APPLICABLE MAINTENANCE MANUAL SECTIONS FOR ASSISTANCE IN OBTAINING CHART DIMENSIONS

FLAGNOTES:

1 LH OUTBD FLAP GAP SHALL EQUAL RH OUTBD FLAP GAP WITHIN 0.05. LH INBD FLAP GAP SHALL EQUAL RH INBD FLAP GAP WITHIN 0.05. IF ADDITIONAL TRIM IS REQUIRED, GAP ON LH INBD AND OUTBD FLAPS MAY BE 0.15-0.20 LESS THAN RH. MANUALLY PULL DOWN ON AFT FLAP WITH APPROX 100 LBS BEFORE MEASURING

2 LH & RH TAB TOTALS SHALL BE EQUAL WITHIN 0.15

3 CLEARANCE BETWEEN DEFLECTION CONTROL RAMP AND ROLLER AT OUTBOARD END OF MIDFLAP

4 TOLERANCE MAY BE EXCEEDED IF SHIMMING FOR TRIM CORRECTION

5 SHOWN FOR AIRPLANE ON GEAR WITH FUEL

FOR AIRPLANE ON GEAR WITHOUT FUEL USE 0.18 / 0.08

FOR AIRPLANE ON JACK WITHOUT FUEL USE 0.13 / 0.03

INDEX LOC TO C_L
____

RUDDER T.E. WITHIN INDEX
_____ YES
_____ NO

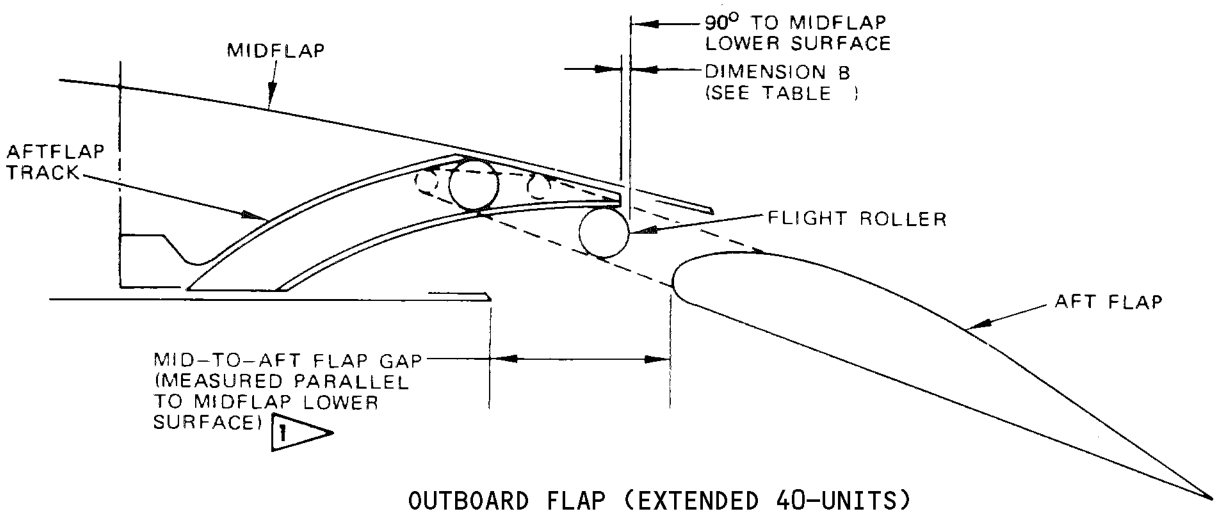
RUDDER TRIM
____

AIRPLANE CONFIGURATION WHEN INSPECTED
________ ON JACKS
________ ON LANDING GEAR, NO FUEL
________ ON LANDING GEAR, WITH FUEL

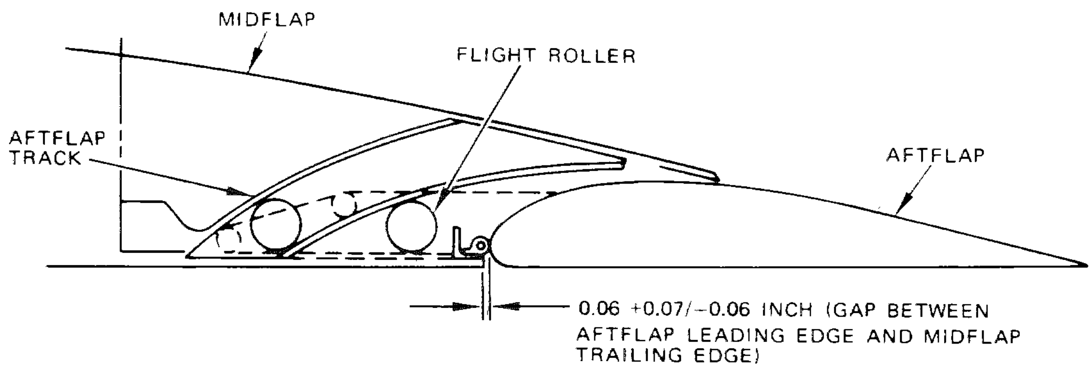
ELEVATORS (INBD END TAB MISMATCH)			
STAB - 3 UNITS (8 - 41.57 ±0.10)			
ELEV INDEX ALIGN ±0.06 ______			
PWR ON	________	±0.03	________
PWR OFF	________	±0.23 ±0.21	________
	LEFT		RIGHT

AIRPLANE NO. ____________________

Flight Control Surface Mismatch Record
Figure 503 (Sheet 2)



OUTBOARD FLAP (EXTENDED 40-UNITS)



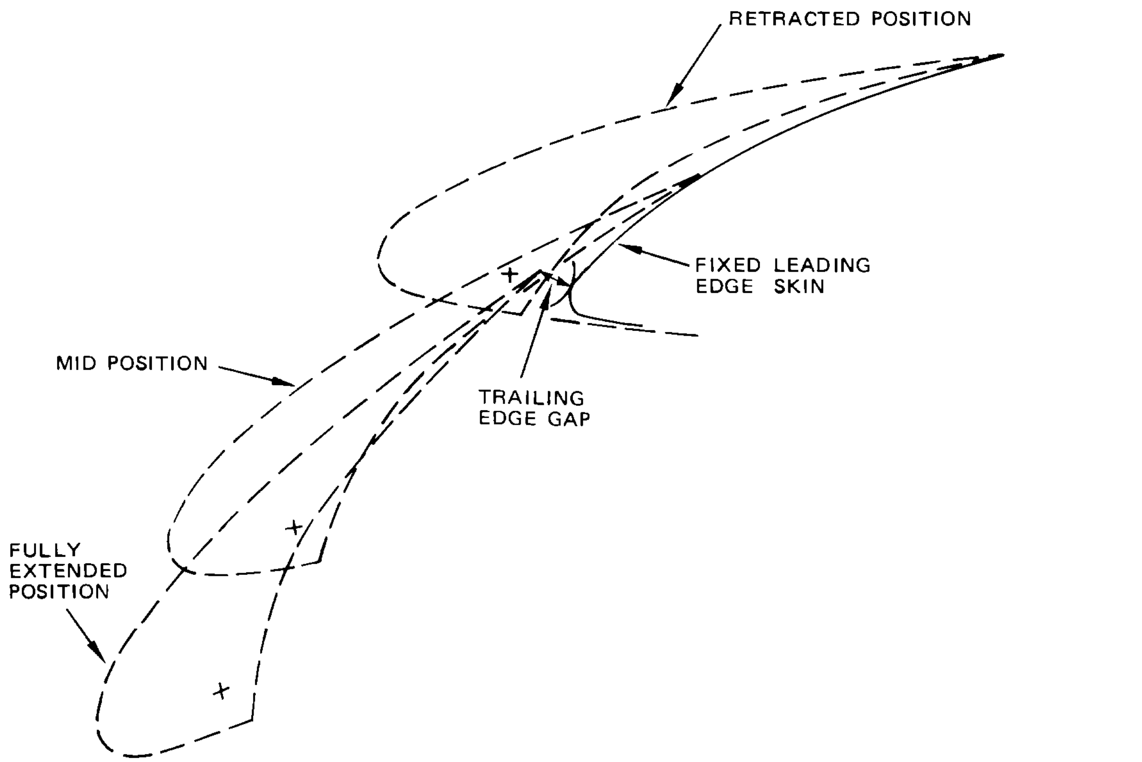
OUTBOARD FLAP (RETRACTED)

FLIGHT ROLLER LOCATION	DIMENSION B (INCHES)
OUTBD TRACKS (LEFT AND RIGHT WINGS)	0.33 +0.08/-0.15
INBD TRACKS (LEFT AND RIGHT WINGS)	0.25 +0.16/-0.25

1 GAPS AT INBD AND OUTBD ENDS OF LEFT WING AFTFLAPS TO BE EQUAL TO CORRESPONDING GAPS ON RIGHT WING AFTFLAPS WITHIN 0.05 INCH.

IF ADDITIONAL TRIM IS REQUIRED, GAPS AT INBD AND OUTBD ENDS OF LEFT WING AFTFLAP MAY BE 0.15-0.20 INCH LESS THAN CORRESPONDING GAPS ON RIGHT WING AFTFLAPS.

Mid-to-Aftflap Gap Measurement
Figure 504



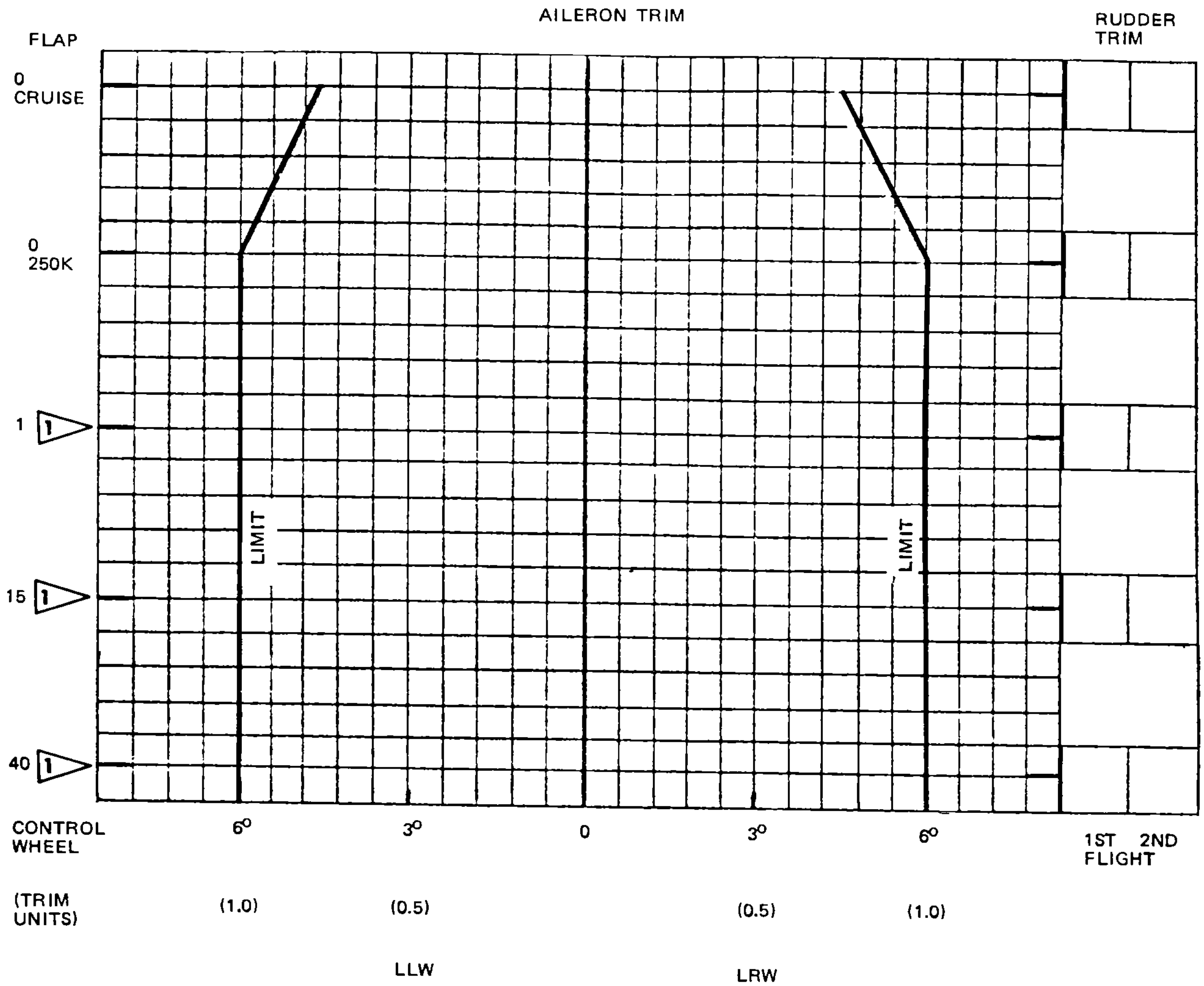
SLOT SYMMETRY

T.E. GAP [1]	T. E. GAP [1] [2]	T.E. GAP [1] [2]
SLAT 1 ________	SLAT 2 ________	SLAT 3 ________
SLAT 6 ________	SLAT 5 ________	SLAT 4 ________
DIFFERENCE ________ (0.25 INCH)	DIFFERENCE ________ (0.25 INCH)	DIFFERENCE ________ (0.25 INCH)

[1] LEADING EDGE SLOT GAP IS THE DISTANCE FROM THE T.E. OF A SLAT (IN THE FULLY EXTENDED POSITION) TO THE FIXED LEADING EDGE SKIN. THE T.E. GAP AT CORRESPONDING ENDS OF OPPOSITE SLATS SHALL BE SYMMETRICAL WITHIN 0.25 INCH.

[2] FULL EXTENSION OF THESE SLATS OCCURS ONLY ON AIRPLANES WITH 3-POSITION ACTUATORS.

Leading Edge Symmetry Mismatch
Figure 505



[1] FLAP SETTING.

PLOT REPORTED TRIM POINTS. RECORD RUDDER TRIM.
RECORD BELOW ANY OTHER RELATED PILOT COMMENT (FEEL FORCE, CENTERING, VIBRATION, ROUGHNESS, ETC.)

STATEMENT OF ACTION TO CORRECT:

Trim Correction Graphic Aid
Figure 506

FLIGHT CONTROL SHEAR RIVETS - MAINTENANCE PRACTICES

1. Shear Rivets
   A. Shear rivets provide a means by which normal operation of essential flight systems can be maintained in the event of failure or jamming of related or interconnected secondary systems. Each shear rivet location is marked by a placard or marker stating Shear Joint and the quantity and type of shear fastener used. The accompanying chart contains a list of all shear joints used in the flight control systems along with part numbers and references to maintenance manual sections where maintenance procedures can be found.

Subject No.	Rivet Type	Part Containing Fastener
27-11-101	BACB30GP6-5	Aileron Bus Drums
27-61-41	MS 20470D	Spoiler Control Quadrant
27-61-61	BACBB4ADAPTER	Flight Spoiler Control Quadrant

FLIGHT CONTROLS SURFACE - INSPECTION/CHECK

1. General
   A. The following section defines the allowable limits for trailing edge movement of flight control surfaces with the airplane on the ground.
   B. Measurement is to be made with control surface in approximate faired position at surface inboard trailing edge unless otherwise noted.
   C. Movement within limits is acceptable provided that the wear at the mechanical parts is distributed evenly throughout the points in the system. However, if inspection and checking reveals that wear is noticeably present at a local area, then that portion of the system should be restored to serviceability.
2. Equipment and Materials
   A. Dial Indicator - Accurate to 0.001 inch
   B. Spring Force Scale, Push Type - Capable of 33 ±0.2 pounds
   C. Mounting Device to hold the dial indicator
3. Ailerons and Aileron Tabs (Fig. 601)
   A. Do a check of the play of one aileron with no movement of the opposite aileron or the control wheel:

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

      (1) Pressurize the aileron trim control hydraulic systems A and B (Ref 27-11-0, MP).
      (2) Make sure the control wheel is centered.
      (3) Attach a mounting device to the top wing structure (outboard of the aileron) and do these steps:
          (a) Attach the dial indicator so you can take measurements from the outboard corner of the aileron trailing edge.
          (b) Center the plunger of the dial indicator within 0.1 of the aileron trailing edge.
          (c) Adjust the dial indicator to zero.

          CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

      (4) Use a force scale and apply a load to the aileron center rib (adjacent to the outboard edge of the aileron tab) and centered within 0.5 inch of the trailing edge.
          (a) Push up with a force of approximately 5 pounds.

(b) Make a record of the travel shown on the dial indicator.
(c) Remove the force.

NOTE: Do not adjust the dial indicator.

(d) Push down with a force of approximately 5 pounds.
(e) Make a record of the travel shown on the dial indicator.
(f) Remove the force.

(5) Make sure the total up-and-down freeplay of the aileron, is not more than 0.125 inch.
(6) Remove the dial indicator.
(7) Remove the mounting device.
(8) Do the same check on the opposite aileron.

B. Do a check of the play of one aileron balance tab with no movement of the aileron:

(1) Make sure the control wheel is centered.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL THE MOUNTING DEVICE. SPECIALLY WITH AN AILERON MADE OF COMPOSITE MATERIALS. THE MOUNTING DEVICE CAN CAUSE DAMAGE TO THE AILERON IF YOU ARE NOT CAREFUL.

(2) Attach a mounting device to the aileron trailing edge and do these steps:
(a) Attach the dial indicator to the aileron.
(b) Center the plunger of the dial indicator within 0.1 and forward of the tab trailing edge.
(c) Adjust the dial indicator to zero.

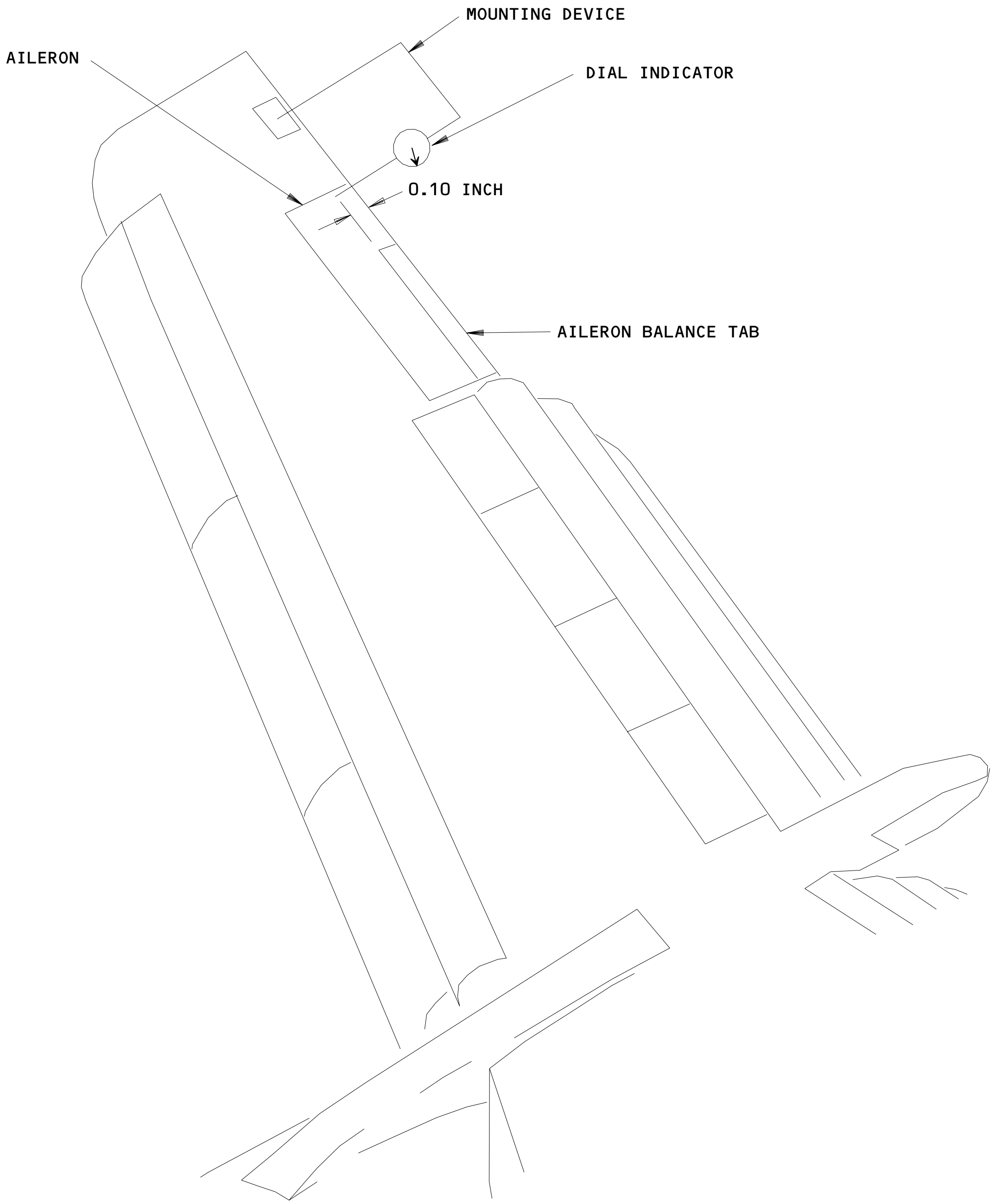
CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(3) Use a force scale and apply force within 0.25 inch of the tab trailing edge and directly opposite to the tab control rods.
(a) Push up with a force of approximately 5 pounds.
(b) Make a record of the travel shown on the dial indicator.
(c) Remove the force.

NOTE: Do not adjust the dial indicator.

(d) Push down with a force of approximately 5 pounds.
(e) Make a record of the travel shown on the dial indicator.
(f) Remove the force.

(4) Make sure the total up-and-down freeplay of the aileron balance tab is not more than 0.063 inch.
(5) Remove the dial indicator.



Aileron Free-Play Check
Figure 601

(6) Remove the mounting device.
(7) Do these steps to make sure the axial play (inboard-outboard direction) of the tab is not more than 0.040 inch.
(a) Hold the aileron tab around the trailing edge and move it outboard using hand pressure.
(b) Use a feeler gage to measure the clearance between the aileron and the outboard end of the aileron tab and make a record of this clearance.

NOTE: It may be necessary to insert a flat metal filler block between the aileron and the aileron tab to help in this measurement. The nominal clearance between the aileron and the aileron tab is 0.15 to 0.25 inch.

(c) Hold the aileron tab around the trailing edge and move it inboard using hand pressure.
(d) Measure the clearance between the aileron and the outboard end of the aileron tab.

NOTE: The axial play is the difference in clearance measurements recorded in this step and the clearance recorded before.

(8) Do the same check on the tab of the opposite aileron.
C. Put the Airplane Back to Its Usual Condition
(1) Release the pressure from the aileron hydraulic systems A and B (Ref 27-11-0, MP).
4. Rudder (Fig. 602)
A. Do a check of the rudder play with no movement of the rudder pedal:

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Pressurize the rudder trim control hydraulic systems A and B (Ref 27-21-0, MP).
(2) Attach a dial indicator to the tail cone in such a way that you can take inboard-outboard readings from the rudder trailing edge.

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(3) Apply force to the rudder surface 1 to 2 inches forward of the trailing edge (approximately 5 inches above the tailcone, measured vertically). Do these steps:
(a) Adjust the dial indicator to zero.
(b) Push the rudder trailing edge to the left with a force of approximately 5 pounds.
(c) Make a record of the travel shown on the dial indicator.
(d) Remove the force.
(e) Push the rudder trailing edge to the right with a force of approximately 5 pounds.

NOTE: Do not adjust the dial indicator.

(f) Make a record of the travel shown on the dial indicator.
(g) Remove the force.
(4) Make sure the sum of the two travel readings is not more than 0.06 inch.

B. Put the Airplane Back to Its Usual Condition
(1) Release the pressure from the rudder trim control hydraulic systems A and B (Ref 27-21-0, MP).

5. Elevator and Elevator Tab (Fig. 603, Fig. 604)

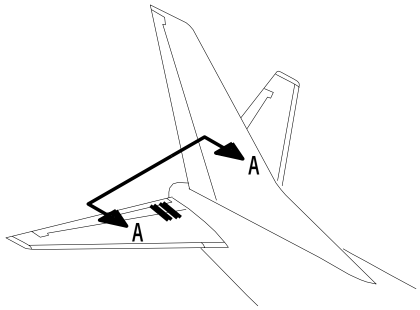
A. Do a check of the bus linkage of the elevator output torque tube:

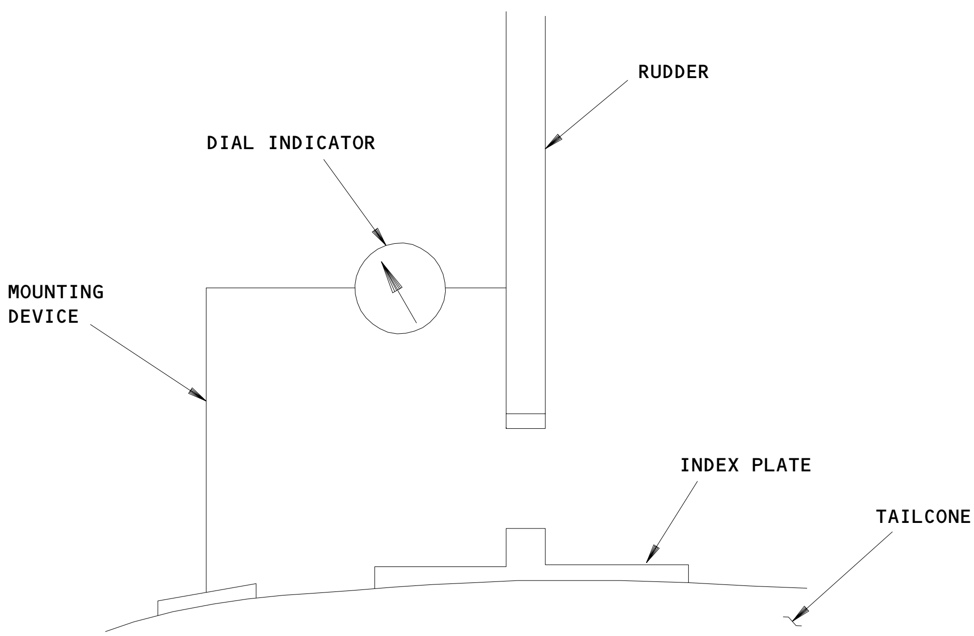
WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Pressurize the elevator control hydraulic system A (Ref 27-31-0, MP).

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(2) Put a piece of tape on the left side of the airplane tailcone adjacent to the elevator trailing edge. Do these steps.
(a) Tape a pointer on the trailing edge of the elevator. The end of the pointer should be close to but not touching the tape.
(b) Apply an upward force of 8 ±0.5 pounds to the left elevator. The force should be applied within 0.5 inch forward of the trailing edge and 1 inch outboard of the inboard edge.
(c) Make a mark on the tape showing the upward limit of elevator travel.





RUDDER

A-A

Rudder Free-Play Check
Figure 602

(d) Apply a downward force of 8 ±0.5 pounds to the left elevator. The force should be applied within 0.5 inch forward of the trailing edge and 1 inch outboard of the inboard edge.
(e) Make a mark on the tape showing the downward limit of elevator travel.
(f) Measure the distance between the upward limit mark and the downward limit mark.
(g) Make sure that the distance does not exceed 0.21 inch.

(3) Release the pressure from the elevator control hydraulic system A (Ref 27-31-0, MP).

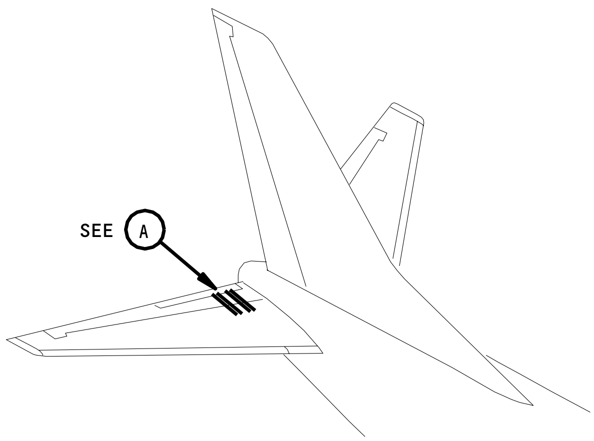
WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

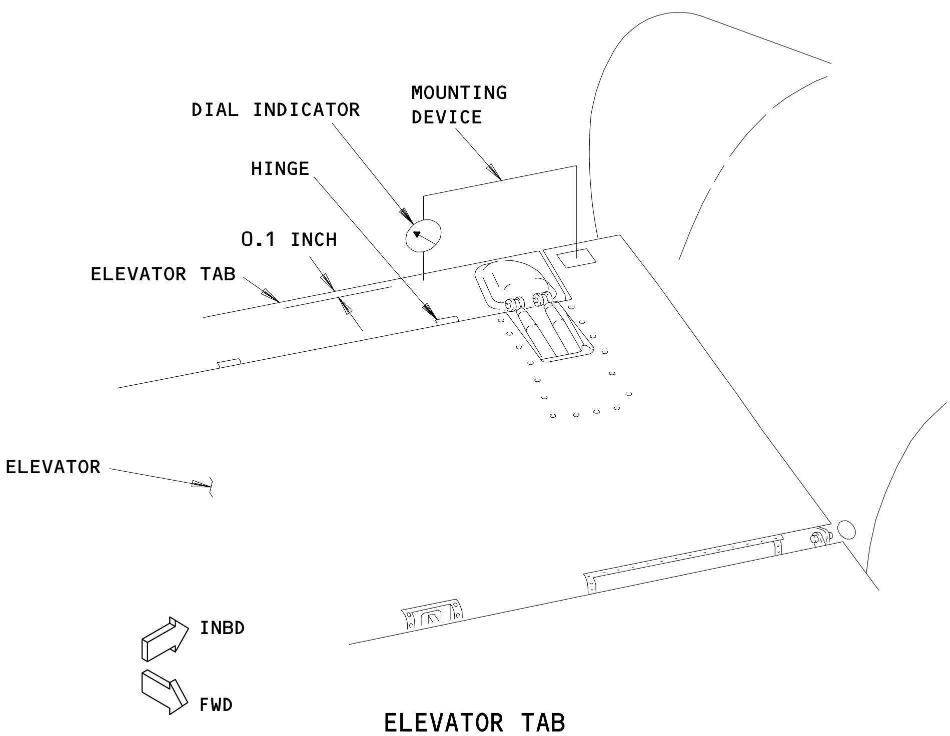
(4) Pressurize the elevator control hydraulic system B (Ref 27-31-0, MP).

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(5) Put a piece of tape on the right side of the airplane tailcone adjacent to the elevator trailing edge. Do these steps.
(a) Tape a pointer on the trailing edge of the elevator. The end of the pointer should be close to but not touching the tape.
(b) Apply an upward force of 8 ±0.5 pounds to the right elevator. The force should be applied within 0.5 inch forward of the trailing edge and 1 inch outboard of the inboard edge.
(c) Make a mark on the tape showing the upward limit of elevator travel.
(d) Apply a downward force of 8 ±0.5 pounds to the right elevator. The force should be applied within 0.5 inch forward of the trailing edge and 1 inch outboard of the inboard edge.
(e) Make a mark on the tape showing the downward limit of elevator travel.
(f) Measure the distance between the upward limit mark and the downward limit mark.
(g) Make sure that the distance does not exceed 0.21 inch.

(6) Release the pressure from the elevator control hydraulic system B (AMM 27-31-0/201).





ELEVATOR TAB
A

Elevator and Elevator Tab Free-Play Checks
Figure 603

B. Do a check of the elevator tab freeplay with the clamped hinge loosened (Fig. 604):

(1) On clamped hinges:

NOTE: A clamped hinge is installed on either the No. 1 or 2 hinge. A flanged bushing should be visible on the inboard side of the elevator hinge bracket.

(a) Remove and discard the cotter pin.

(b) Loosen the castellated nut 2 turns.

(2) Pressurize the elevator control hydraulic systems A and B (AMM 27-31-0/201).

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(3) Set the stabilizer at 3 ±0.5 units of trim.

(4) Use a device that can cause a blockage of the elevator to prevent its motion during the check.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL A DEVICE TO CAUSE A BLOCKAGE OF THE ELEVATOR. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

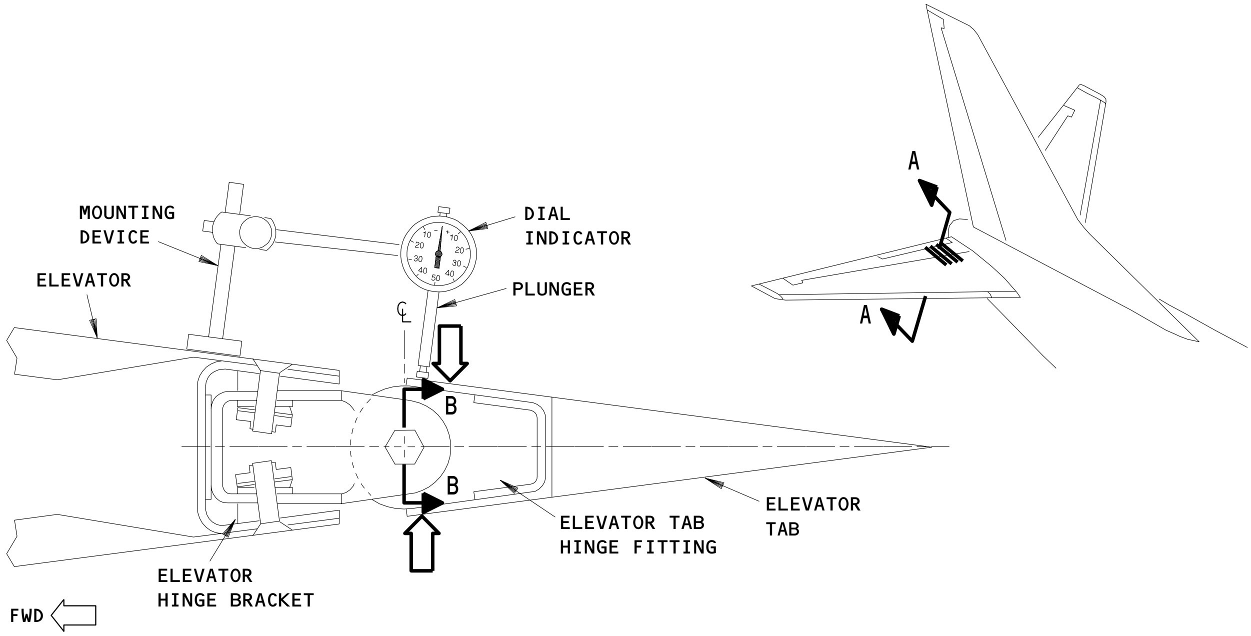
NOTE: You can put a piece of wood between the elevator and the airplane structure to prevent elevator movement.

(5) Attach a mounting device to the elevator in line with the hinge.

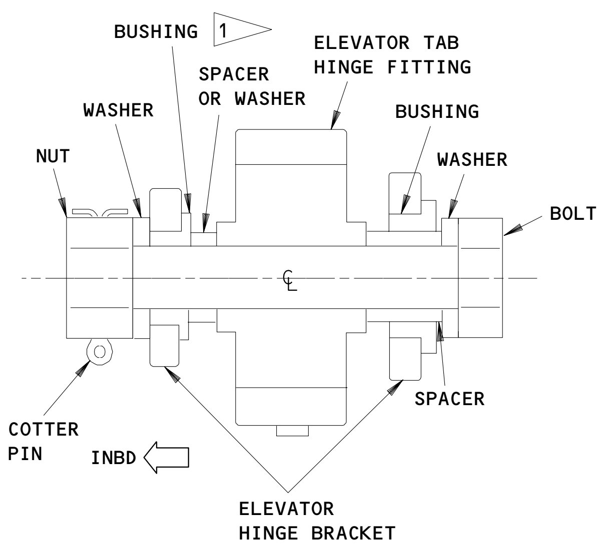
CAUTION: BE VERY CAREFUL WHEN YOU INSTALL THE MOUNTING DEVICE. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE MOUNTING DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

(a) Attach the dial indicator plunger directly over the top of the hinge centerline.

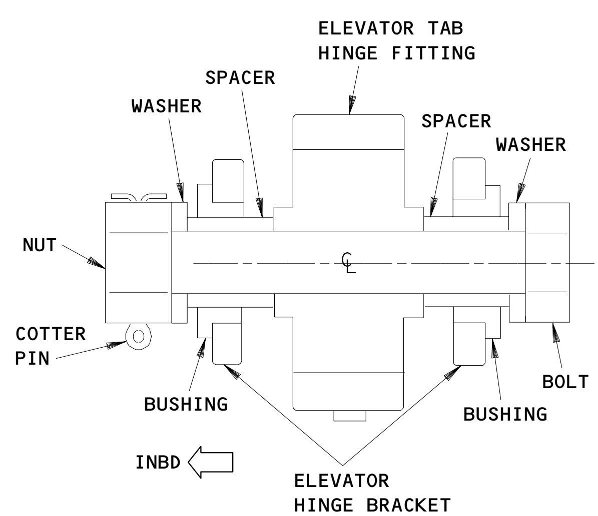
(b) Adjust the dial indicator to zero.



ELEVATOR TAB/ELEVATOR
(TYPICAL ALL HINGES)
A-A



CLAMPED HINGE (TYPICAL)
B-B



SLIP HINGE (TYPICAL)
B-B

1 THIS IS THE FLANGED BUSHING THAT IDENTIFIES THE HINGE AS A CLAMPED HINGE.

Elevator Tab Hinge Free-Play Checks
Figure 604

(6) Use a force scale to apply a force of 7 ±0.5 pounds in the up direction. The force is to be applied in line with the plunger.

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(a) Make a record of the travel shown on the dial indicator.
(b) Slowly remove the force.
(c) Reset the dial indicator to zero.

(7) Use a force scale to apply a 7 ±0.5 pound force in the down direction. The force is to be applied as close as possible to the plunger without disturbing it.

(a) Make a record of the travel shown on the dial indicator.

NOTE: Do not adjust the dial indicator

(b) Slowly remove the force.

(8) FOR AIRPLANES WITH GRAPHITE/COMPOSITE ELEVATOR TAB; make sure the sum of the two travel records is not more than 0.036 inch.
(9) FOR AIRPLANES WITH ALUMINUM FIBERGLASS ELEVATOR TAB; make sure the sum of the two recorded travels is not more than 0.030 inch.
(10) Remove the dial indicator.
(11) Remove the mounting device.
(12) Remove the device that you used to cause a blockage.
(13) Repeat previous 12 steps for remaining hinges.
(14) On Clamped Hinge, tighten the nut to 50-80 inch-pounds. Install cotter pin.

C. Do a check of the elevator tab freeplay with the No. 1 hinge loose (Fig. 604):

(1) Make sure the cotter pin is remove/discarded and nut loosened at least 2 full turn on the no. 1 hinge of the elevator tab.
(2) Pressurize the elevator control hydraulic systems A and B (AMM 27-31-0/201).

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(3) Set the stabilizer at 3 ±0.5 units of trim.

(4) Use a device that can cause a blockage of the elevator to prevent its motion during the check.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL A DEVICE TO CAUSE A BLOCKAGE OF THE ELEVATOR. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

NOTE: You can put a piece of wood between the elevator and the airplane structure to prevent elevator movement.

(5) Attach a mounting device to the elevator trailing edge.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL THE MOUNTING DEVICE. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE MOUNTING DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

(a) Attach the dial indicator plunger on the top of the elevator tab, approximately 0.1 inch forward of the trailing edge and aft of the inboard hinge.
(b) Adjust the dial indicator to zero.

(6) Use a force scale to push the top of the elevator tab with a force of 5 ±0.5 pounds.

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

NOTE: Push this force aft of the inboard hinge, in 0.5 inch or less of the indicator plunger.

(a) Make a record of the travel shown on the dial indicator.
(b) Slowly remove the force.

(7) Push on the bottom surface of the elevator tab with a force of 5 ±0.5 pounds, directly below the force applied before.

NOTE: Do not adjust the dial indicator.

(a) Make a record of the travel shown on the dial indicator.
(b) Slowly remove the force.

(8) FOR AIRPLANES WITH GRAPHITE/COMPOSITE ELEVATOR TAB;
Make sure the sum of the two travel records is not more than 0.036 inch.

(9) FOR AIRPLANES WITH ALUMINUM FIBERGLASS ELEVATOR TAB;
Make sure the sum of the two recorded travels is not more than 0.030 inch.

(10) Remove pressure form elevator hydraulic systems A and B (AMM 27-31-0-201).
(11) Remove the dial indicator.
(12) Remove the mounting device.
(13) Remove the device that you used to cause a blockage.
(14) Install new castellated nut and tighten the nut to 50-80 inch-pounds. Install cotter pin.
(15) Repeat test for the elevator tab on other side.

D. Do a check of the elevator tab freeplay (Fig. 604):

(1) Pressurize the elevator control hydraulic systems A and B (AMM 27-31-0/201).

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(2) Set the stabilizer at 3 ±0.5 units of trim.
(3) Use a device that can cause a blockage of the elevator to prevent its motion during the check.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL A DEVICE TO CAUSE A BLOCKAGE OF THE ELEVATOR. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

NOTE: You can put a piece of wood between the elevator and the airplane structure to prevent elevator movement.

(4) Attach a mounting device to the elevator trailing edge.

CAUTION: BE VERY CAREFUL WHEN YOU INSTALL THE MOUNTING DEVICE. THE ELEVATOR IS MADE OF COMPOSITE MATERIALS. THE MOUNTING DEVICE CAN CAUSE DAMAGE TO THE ELEVATOR IF YOU ARE NOT CAREFUL.

(a) Attach the dial indicator plunger on the top of the elevator tab, approximately 0.1 inch forward of the trailing edge and aft of the inboard hinge.
(b) Adjust the dial indicator to zero.

(5) Use a force scale to push the top of the elevator tab with a force of 5 ±0.5 pounds.

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

NOTE: Push this force aft of the inboard hinge, in 0.5 inch or less of the indicator plunger.

(a) Make a record of the travel shown on the dial indicator.
(b) Slowly remove the force.

(6) Push on the bottom surface of the elevator tab with a force of 5 ±0.5 pounds, directly below the force applied before.

NOTE: Do not adjust the dial indicator.

(a) Make a record of the travel shown on the dial indicator.
(b) Slowly remove the force.

(7) FOR AIRPLANES WITH GRAPHITE/COMPOSITE ELEVATOR TAB;
Make sure the sum of the two travel records is not more than 0.036 inch.
(8) FOR AIRPLANES WITH ALUMINUM FIBERGLASS ELEVATOR TAB;
Make sure the sum of the two recorded travels is not more than 0.030 inch.
(9) Remove the dial indicator.
(10) Remove the mounting device.
(11) Remove the device that you used to cause a blockage.
(12) Repeat previous 11 steps for opposite tab.

E. Do these steps to make sure the axial play (inboard-outboard direction) of the tab is not more than 0.030 inch.

(1) Hold the elevator tab around the trailing edge and move it outboard using hand pressure.
(2) Use a feeler gage to measure the clearance between the elevator and the outboard end of the elevator tab and make a record of this clearance.

NOTE: It may be necessary to insert a flat metal filler block between the elevator and the elevator tab to help in this measurement.

(3) Hold the elevator tab around the trailing edge and move it inboard using hand pressure.

(4) Measure the clearance between the elevator and the outboard end of the elevator tab.

NOTE: The axial play is the difference in clearance measurements recorded in this step and the clearance recorded before.

(5) Do the same check on the tab of the opposite elevator.

F. Put the airplane back to its usual condition.

(1) Release the pressure from the elevator control hydraulic systems A and B (AMM 27-31-0/201).

6. Hinged Flap - Inboard and Outboard

A. Position flap control lever to FLAPS DOWN to detent extend trailing edge flaps.

B. Apply approximately 5 pound upward force to hinged flap trailing edge. Check that hinged flap movement at end next to engine nacelle is not more than 0.250 inch.

NOTE: Hydraulic power is not required for this check.

7. Spoiler

A. Pressurize Hydraulic System A (AMM 27-51-0/201).

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

B. Put the flap control lever to the FLAPS DOWN (40-UNIT) detent to extend trailing edge flaps.

NOTE: You can do a check of the spoilers with hydraulic power on or off.

C. Release the pressure from Hydraulic System A (Ref 27-51-0, MP).

D. Do a check of the play of the spoilers No. 1, 2, 3, 6, 7 and 8:

CAUTION: USE SUFFICIENT PADDING ON THE FORCE SCALE TO PREVENT DAMAGE TO THE CONTROL SURFACE.

(1) Push up with a force of approximately 21 pounds (the spoiler panel weight of 16 pounds plus 5 pounds pull force) on the spoiler trailing edge directly opposite the power control actuator and within 0.5 inch of the trailing edge of the spoiler panel.

(2) Measure the play on the inboard edge of the spoiler not more than 1/2 inch from the trailing edge.
(3) Make sure the spoiler play is not more than 0.10 inch.

E. Do a check of the play of the spoilers No. 4 and 5 (aluminum/fiberglass):
(1) Push up with a force of approximately 33 pounds (the spoiler panel weight of 28 pounds plus 5 pounds pull force) at the midpoint between the two power control actuators of the spoiler, and within 0.5 inch of the panel trailing edge of the spoiler.
(2) Measure the play on the inboard edge of the spoiler not more than 1/2 inch from the trailing edge.
(3) Make sure the spoiler play is not more than 0.20 inch.

F. Do a check of the play of the spoilers No. 4 and 5 (graphic/composite):
(1) Push up with a force of approximately 32 pounds (the spoiler panel weight of 27 pounds plus 5 pounds pull force) at the midpoint between the two spoiler power control actuators, and within 0.5 inch of the spoiler panel trailing edge.
(2) Measure the play on the inboard edge of the spoiler not more than 1/2 inch from the trailing edge.
(3) Make sure the spoiler play is not more than 0.20 inch.

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES AND THE LANDING GEAR WHEN HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, STABILIZER, LANDING GEAR AND THRUST REVERSERS CAN MOVE QUICKLY WHEN SUPPLIED WITH POWER BY THE HYDRAULIC SYSTEMS. INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

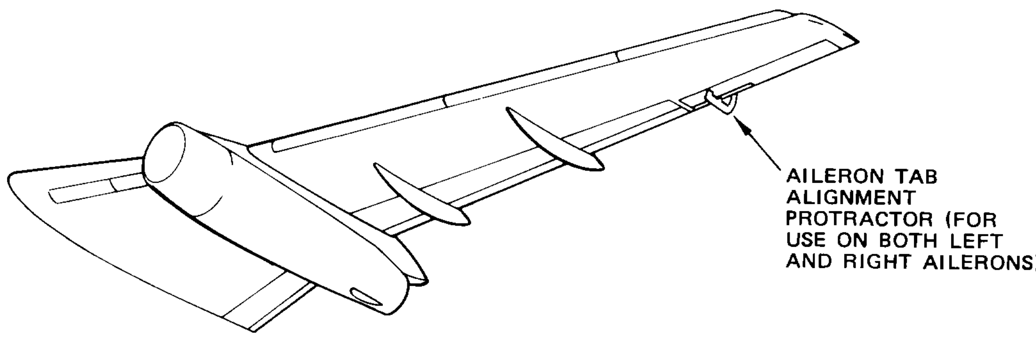
G. Pressurize Hydraulic System A (Ref 27-51-0, MP).
H. Put the flap control lever to the FLAPS UP detent to retract the trailing edge flaps.

8. Restore Airplane to Normal
A. Depressurize Hydraulic Systems:
(1) Aileron and aileron trim control systems A and B (Ref 27-11-0, MP).
(2) Elevator and tab control systems A and B (Ref 27-31-0, MP).
(3) Trailing edge flaps, Hydraulic System A (Ref 27-51-0, MP).
(4) Rudder and rudder trim control systems A and B (Ref 27-21-0, MP).

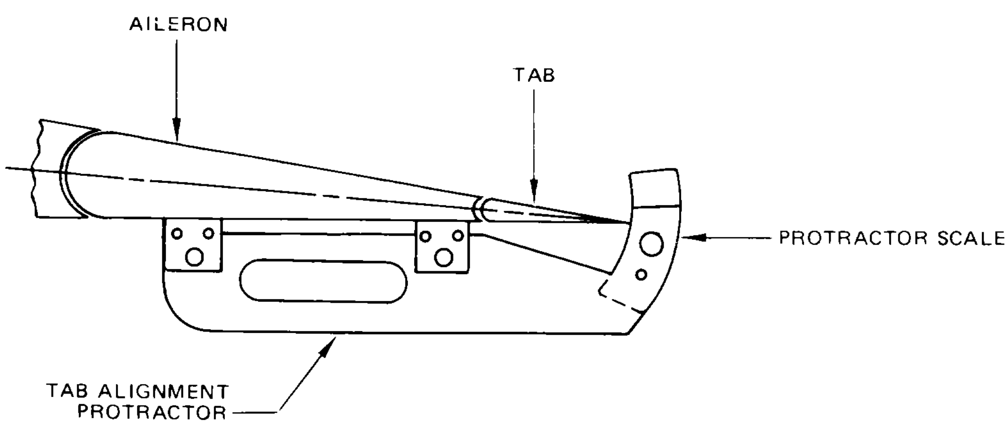
FLIGHT CONTROL SURFACE RIGGING TOOLS - MAINTENANCE PRACTICES

1. General
   A. This subject contains information to use flight control surface rigging tools. These tools are used to locate surface neutral position. Specific adjustment procedures are contained in each flight control surface adjustment procedure.
2. Aileron Tab Alignment Protractor - F80222-1 (Fig. 201)
   A. General
      (1) This tool is a hand-held rigging protractor to locate aileron tab neutral position relative to the aileron. The tool can also be used to check tab deflection.
   B. Alignment Protractor Use for Rigging
      (1) Check that aileron is aligned with index mark on wing within 0.03 inch.
      (2) Position protractor to underside of aileron 0.5 inch in from inboard end of tab.
      (3) Slide protractor forward until scale just touches tab trailing edge.
      (4) Repeat steps (1) thru (3) at tab midpoint and 3.75 ± 0.25 inch in from outboard end of tab.
   C. Alignment Protractor Use for Tab Deflection Check
      (1) Check that aileron is aligned with index mark on wing within 0.03 inch.
      (2) Position protractor at any point along tab. Slide protractor forward until scale just touches tab.
      (3) Adjust scale to align index mark with tab trailing edge.
      (4) Operate aileron while holding protractor in place.
3. Elevator Index Plate Rigging Beam - F80230-1 (Fig. 202)
   A. General
      (1) This tool is only used to install or adjust elevator index plates whenever the tail cone is replaced with a new or different tail cone.
      (2) Tool location paint stripes on the stabilizer will aid in the use of this tool. If paint stripes do not exist, they can be located and applied per Fig. 202.
   B. Rigging Beam Usage
      (1) Use the rigging beam to install or adjust the elevator index plates.
      (2) Use a trammel bar or a scale to set the horizontal stabilizer at the "B" dimension of 41.57 ± 0.01 inches (Ref 27-41-0/501).
      (3) Hold the rigging beam on the bottom side of the stabilizer.
      (4) Set the index slot, located on the front of the rigging beam, to 6.80 inches inboard of the aligned point Q on the stabilizer.

         NOTE: At this position, the index slot of the rigging beam will align with the mark on the stabilizer.



LEFT WING SHOWN
RIGHT WING OPPOSITE



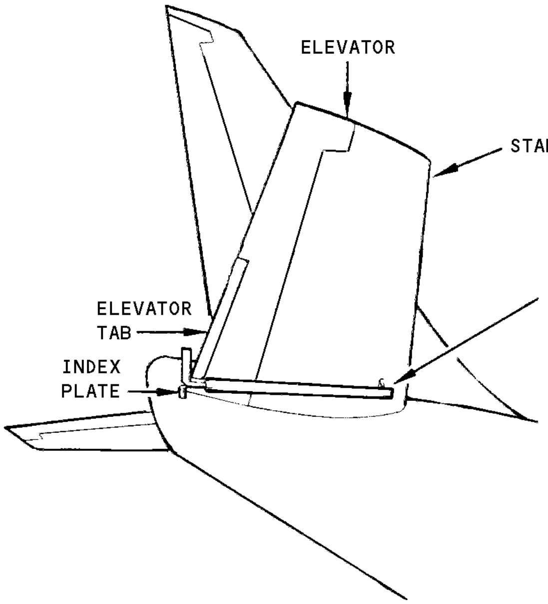
Aileron Tab Alignment Protractor
Figure 201

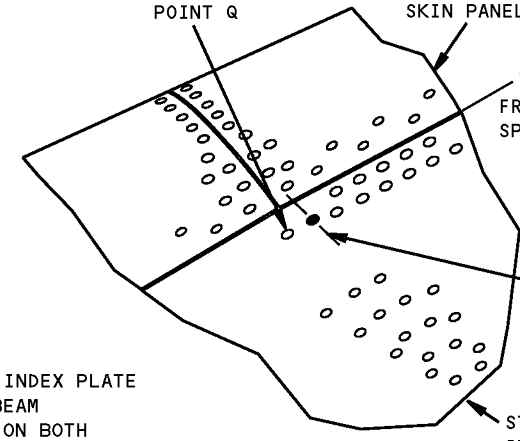
(5) Move the rigging beam forward or aft until the scale of the rigging beam touches the aft edge of the elevator trailing edge.
(6) Make sure that the scale on the rigging beam is 2.25 inches inboard of the inboard end of the elevator tab.
(7) Align the elevator trailing edge with the index mark on the rigging beam.
(8) Hold the elevator at this position.

4. <u>Trailing Edge Flap Rigging Beam Set - F80209-1 (Fig. 203)</u>

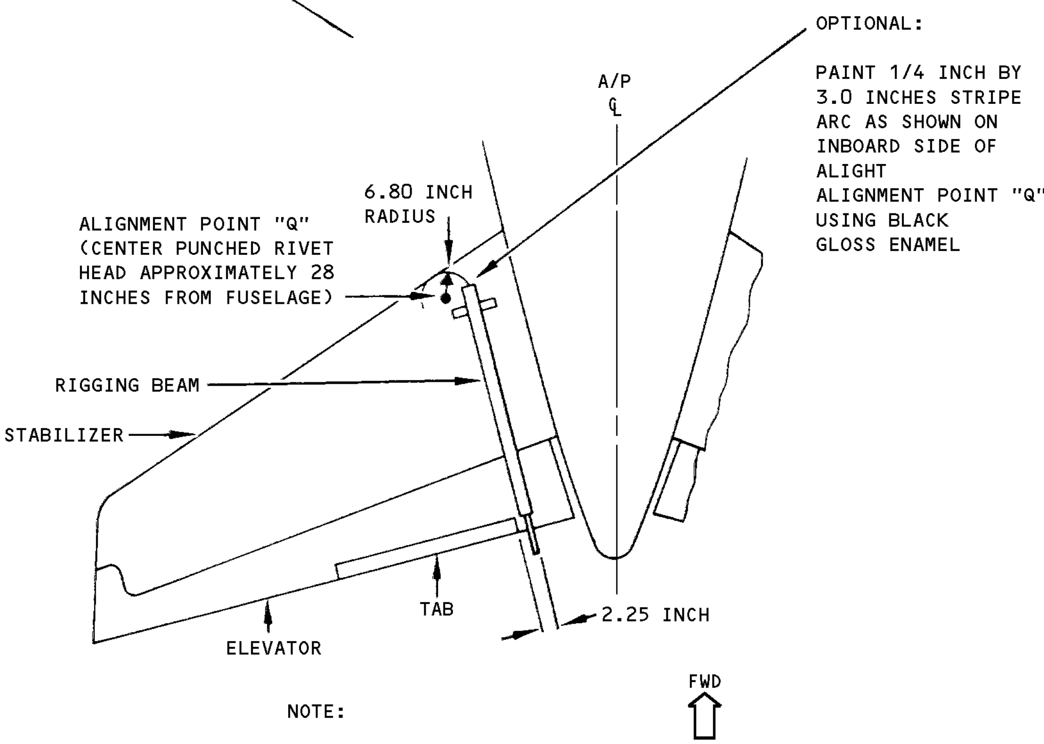
A. General
(1) This tool consists of two separate hand-held tools: inboard flaps rigging beam and outboard flaps rigging beam.
(2) Tool location paint stripes on airplane are necessary to use rigging beams. If paint stripes do not exist, locate and apply stripes per Fig. 203.

B. Inboard or Outboard Flap Rigging Beam Usage
(1) Position flap rigging beam under wing near middle of flap on 0.25 inch wide black stripes. Support beam under nylon pad and nylon rod.
(2) Slide beam forward until scale just touches flap trailing edge.
(3) Align aft nylon pad notch and forward nylon rod with black stripes.





BOTTOM VIEW OF HORIZONTAL STABILIZER-
POINT Q

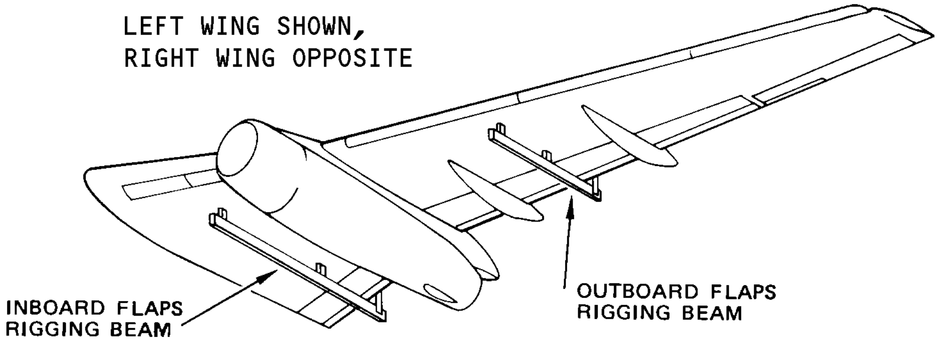


NOTE:

UNDERSIDE OF RIGHT STABILIZER SHOWN LEFT STABILIZER OPPOSITE

DETAIL A

Elevator Index Plate Rigging Beam
Figure 202

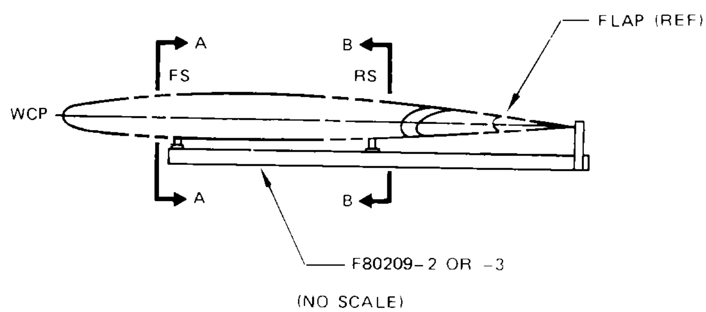


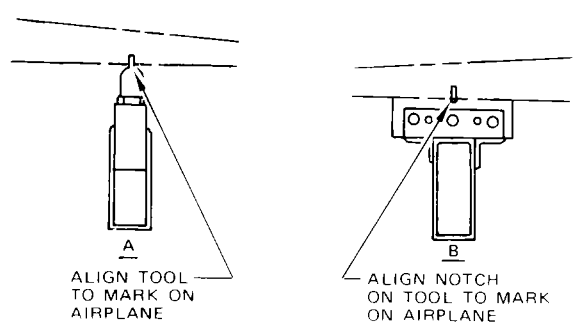
USAGE NOTE:

F80209-1 CONSISTS OF TWO INDEPENDENT BEAMS, 2 & -3. THE HAND HELD BEAMS ARE USED TO ESTABLISH ZERO (NEUTRAL) WHEN RIGGING THE INBD & OUTBD FLAPS, LH & RH. FOR OUTBD FLAP RIGGING, POSITION -2 BEAM UNDER WING NEAR WBL 228.5. SLIDE BEAM FORWARD UNTIL SCALE JUST TOUCHES FLAP. ALIGN NOTCH ON AFT NYLON PAD AND TIP OF FWD NYLON ROD WITH THE 1/4 BY 2 STRIPES ON THE WING.

FOR INBD FLAP RIGGING, POSITION -3 BEAM UNDER WING NEAR WBL 147.2, SLIDE BEAM FORWARD UNTIL SCALE JUST TOUCHES FLAP. ALIGN NOTCH ON AFT NYLON PAD AND TIP OF FWD NYLON ROD WITH THE 1/4 BY 2 STRIPES ON THE WING.

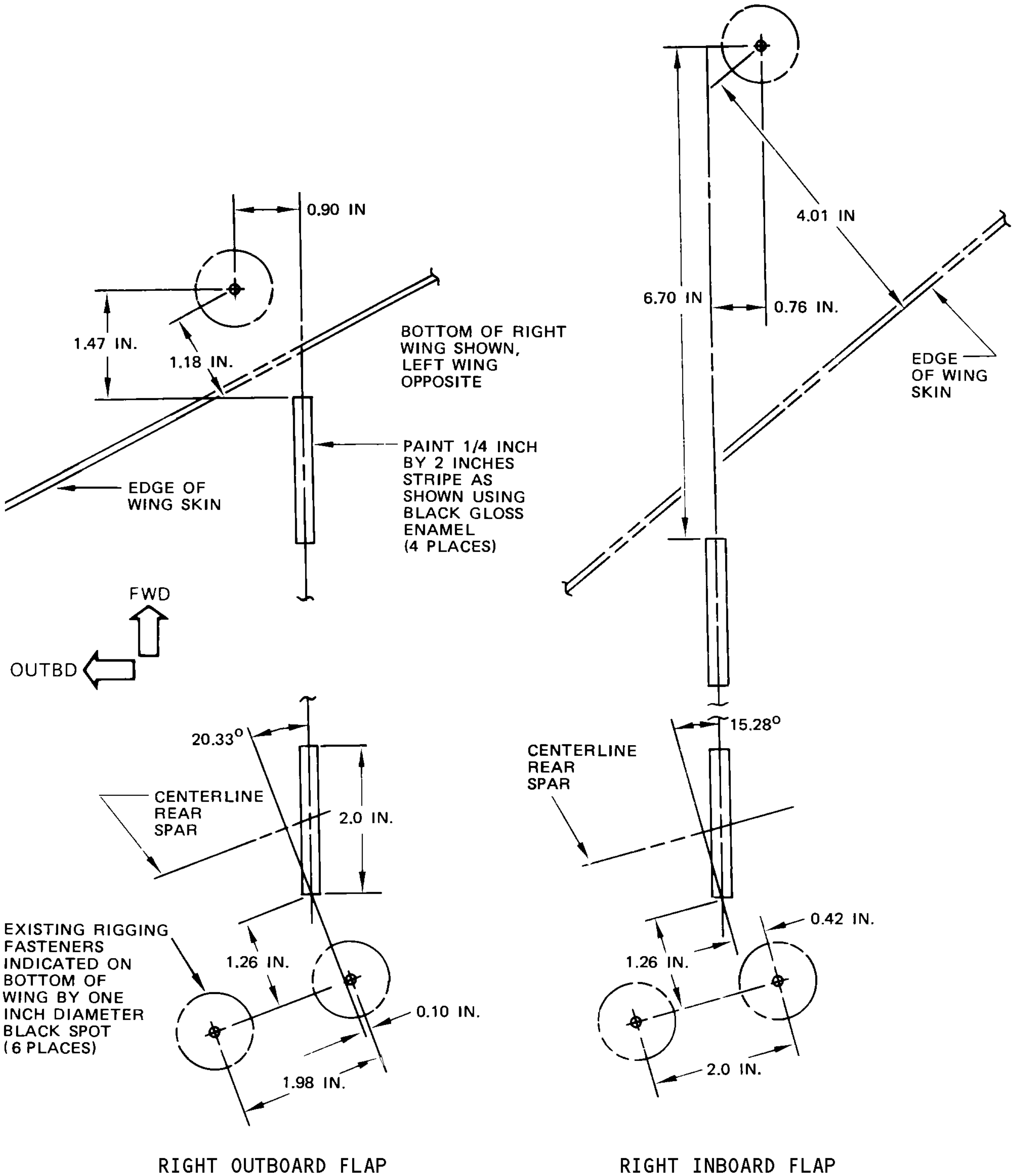
USAGE PICTURE:





TRAILING EDGE FLAPS RIGGING BEAM SET - F80209-1 PLACARD

Trailing Edge Flap Rigging Beam Set
Figure 203 (Sheet 1)



WING PAINT STRIPE MARKINGS

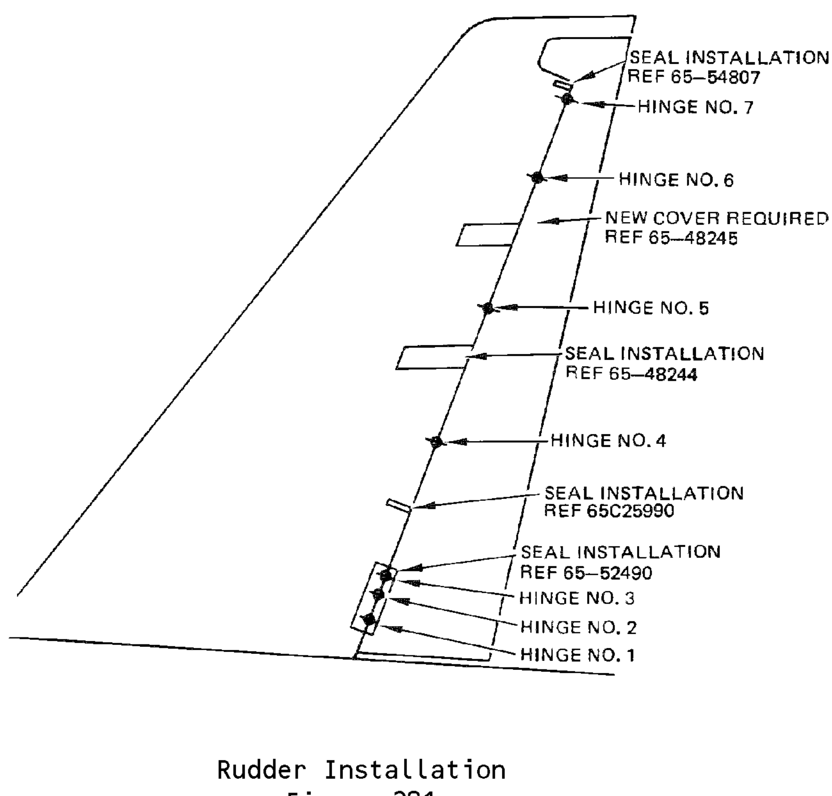
Trailing Edge Flap Rigging Beam Set
Figure 203 (Sheet 2)

FLIGHT CONTROL SURFACE INTERCHANGEABILITY - MAINTENANCE PRACTICES

1. General
   A. The graphite/epoxy control surfaces, aileron, aileron tab, elevator, elevator tab, rudder, and spoilers are interchangeable with the same aluminum control surface components, except in some cases for attaching hardware.

      CAUTION: THE DIFFERENCE IN WEIGHT MUST BE NOTED AND APPROPRIATE WEIGHT AND BALANCE ENTRIES MADE.

   B. The graphite/composite ailerons and aluminum/fiberglass ailerons are interchangeable only as pairs of the same type. An aluminum/fiberglass aileron on one wing with a graphite/composite aileron on the opposite wing is not a permitted configuration. Refer to 27-11-11 for aileron removal and installation. Make sure the aileron is correctly balanced before installation. Refer to SRM 51-80-1 or 51-81-1 for the appropriate balance limits.
   C. The flight spoilers are completely interchangeable between aluminum construction and graphite/epoxy construction. Refer to 27-61-11 for flight spoiler removal and installation.
   D. The ground spoilers are completely interchangeable between aluminum construction and graphite/epoxy construction. Refer to 27-62-91 for ground spoiler removal and installation.
   E. Aluminum/fiberglass and graphite/composite elevators are interchangeable only as pairs of the same type. An aluminum/fiberglass elevator on one horizontal stabilizer with a graphite/composite elevator on the opposite horizontal stabilizer is not a permitted configuration. Refer to 27-31-11 and 27-31-12 for elevator removal and installation. Make sure elevators are correctly balanced before installation. Refer to SRM 51-80-4 and 51-81-4 for the appropriate balance limits.
   F. The rudder is interchangeable between aluminum/fiberglass and graphite/composite. Refer to 27-21-11 and 27-21-12 for rudder removal and installation. Make sure the rudder is correctly balanced before installation. Refer to SRM 51-80-7 and 51-81-7 for the appropriate balance limits.
2. Rudder Interchangeability
   A. Airplanes with Graphite Rudder - Installing Aluminum Rudder
      (1) Remove graphite rudder (Ref 27-21-12).
          (a) Retain all attaching hardware for subsequent use.
      (2) Prepare aluminum rudder for installation (Ref 27-21-11).
      (3) Install aluminum rudder (Ref 27-21-11).
          (a) Attach rudder with previously removed hardware.
          (b) Modify fin for upper balance weight seal installation (Ref drawing 65-48245 and Fig. 201).
          (c) Complete installation of rudder (Ref 27-21-11).



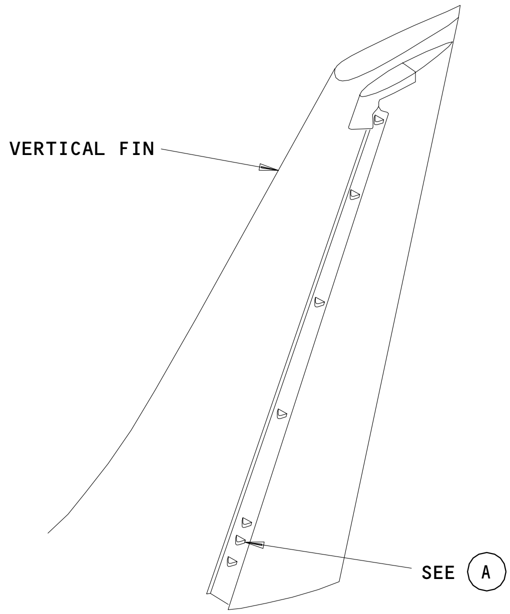
Rudder Installation
Figure 201

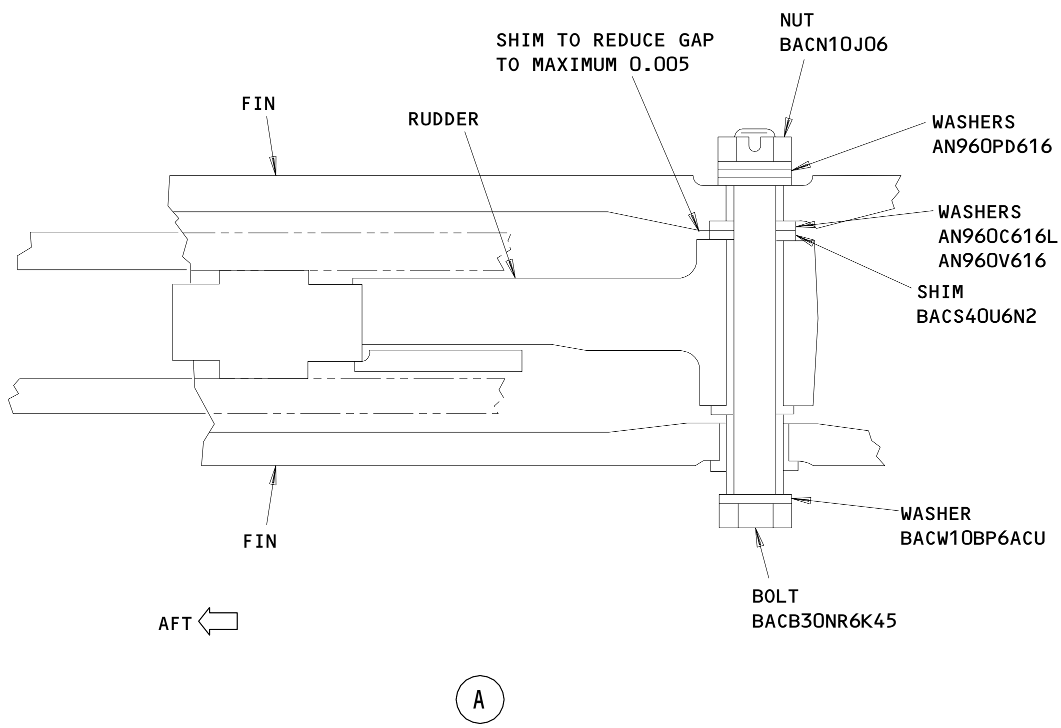
B. Airplanes with Aluminum Rudder - Installing Graphite Rudder
    (1) Remove aluminum rudder (Ref 27-21-11)
        (a) Retain all attaching hardware for subsequent use.
    (2) Prepare graphite rudder for Installation (Ref 27-21-12)
    (3) Install graphite rudder
        (a) Install and tighten hinge bolts at rudder hinges No. 1, 7, 3 and 6 in that order (Ref 27-21-22, R/I). Use attaching hardware from previously removed aluminum rudder. Tighten No. 1 hinge bolt 95 to 110 pound-inches, No. 3, 6 and 7 hinge bolt 60 to 85 pound-inches. Ensure bonding jumper is installed at rudder hinges No. 3 and 7.
        (b) Install bearing bar and attach bolts in hinge No. 2. Use new hardware (Fig. 202) to attach bearing bar. Do not tighten attach bolts. Install rudder hinge bolt using previously removed hardware. Do not tighten rudder hinge bolt.
        (c) Tighten bearing bar attach bolts 95 to 110 pound-inches. Shim hinge to control gap (0.005 maximum) between rudder hinge segment and bearing bar. Tighten hinge bolt 95 to 110 pound-inches.
        (d) Remove rudder sling.
        (e) Install vertical fin hinge segments at rudder hinges No. 4 and 5. Do not tighten attach bolts.
        (f) Install No. 4 and 5 hinge bolts using previously remove attaching hardware. Tighten 60 to 85 pound-inches. Tighten No. 4 and 5 hinge segment bolts 70 to 80 pound-inches.
        (g) Install a new upper balance weight cover (Ref Drawing 65-48245).
        (h) Install a new lower balance weight seal (Ref Drawing 65-48244).
        (i) Install a new trailing edge beam seal (Ref Drawing 65-524290).
        (j) Install a new lower fin air dam seal (Ref Drawing 65C25990).
        (k) Install a new upper fin air dam seal (Ref Drawing 65-54807).
        (l) Restore airplane to normal (Ref 27-21-12, par. 6).

3. <u>Elevator Interchangeability</u>
A. Aluminum Elevator to Graphite Elevator
    (1) Remove aluminum elevator (Ref 27-31-11).

    <u>NOTE</u>: Point of interchangeability is the interface of the balance panel and aft balance panel hinge. The hinge is detached from the balance panel and retained with the replaced elevator. A new hinge must be fitted to the replacement elevator prior to installation of the elevator.

    (2) Retain nuts and bolts for subsequent installation, discard all washers.
    (3) Install aft balance panel hinge on elevator nose and install graphite elevator (Ref 27-31-12) with existing hardware except all washers, bonding jumpers, and bonding jumper hardware should be replaced with new hardware.
    (4) Adjust and test elevator and tab per 27-31-0 A/T.





Rudder Installation Aluminum to Graphite
Figure 202

B. Graphite Elevator to Aluminum Elevator

(1) Remove graphite elevator (Ref 27-31-12).

NOTE: Point of interchangeability is the interface of the balance panel and aft balance panel hinge. The hinge is detached from the balance panel and retained with the replaced elevator. A new hinge must be fitted to the replacement elevator prior to installation of the elevator.

(2) Retain hardware for subsequent installation.

(3) Install aft balance panel hinge on elevator nose and install aluminum elevator (Ref 27-31-11) with existing hardware except delete shims from No. 1 hinge bearing bolt.

(4) Adjust and test elevator and tab per 27-31-0 A/T.

4. Elevator Tab Interchangeability

A. General

(1) The elevator tabs are balanced into the elevator system by adding or removing tab adjust weights on the elevator nose in balance bay No. 1. The number of adjust weights required is a function of tab part number and tab weight. The data plate on each tab is stamped with the tab weight and the number of adjustment weights required. When replacing an elevator tab, the number of tab weights installed on the elevator nose must agree with the number called for on the tab data plate. If data plate is missing or if tab weight is changed (due to structural changes or repainting), see chapter 51 of the structural repair manual for tab adjust weight requirement.

B. Equipment and Materials

(1) Rigging Pin E-5 - 0.309/0.311-inch diameter, 6.7 ±0.25 inches long (MS20392-4)

NOTE: Rigging Pin is part of kit F70207-3, -52, -61, or -84.

(2) Sealant - BMS 5-95 (Ref 20-30-11)

C. Prepare For Removal

(1) Open or remove the following access panels: tail cone access door 3802, tab pushrod access panel (Fig. 203), and tab lock mechanism upper and lower access panels. (Panels are located at elevator inboard leading edge.)

(2) Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).

(3) Install rigging pin E-5 in aft control quadrant.

D. Remove Graphite Tab From Graphite Elevator

(1) Disconnect elevator tab pushrods from elevator tab by removing pushrod aft mounting bolts (Fig. 203).

(2) Disconnect bonding jumpers from elevator tab at inboard and outboard hinge fittings.

(3) Remove hinge bearing bolts.

(4) Remove elevator tab from elevator.

(5) If a different elevator tab is to be installed on the airplane, proceed as follows:
 (a) Remove cotter pin, nut, washers, bushings, and hinge bearing bolt from elevator tab hinge fitting. Withdraw tab hinge fitting.
 (b) Install tab hinge fitting at original location on removed elevator tab. Replace shims in same order as removed. Install dimpled washers under screw heads if installed. Tighten hinge retaining screws 20 to 25 pound-inches.
 (c) Retain hinge bearing nuts, washers, bushings, and bolts for subsequent installation.

E. Prepare For Installation
 (1) Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
 (2) Check that rigging pin E-5 is installed in aft control quadrant.
 (3) Check wear at tab pushrod attach points per 27-31-121, I/C.
 (4) Check data plate on elevator tab for required number of tab adjust weights. Check balance bay No. 2 for number of tab adjust weights installed lower surface of elevator nose.
 (5) Install hinge bearing bolts with boltheads outboard at each tab hinge location. Install bushings facing each other except at inboard hinge location where both bushings face inboard. Install washers and nuts. Tighten nuts to 15 pound-inches.

F. Install Aluminum Tab/Graphite Elevator
 (1) Remove graphite tab (Ref 27-31-31, M/P).
  (a) Discard attaching hardware.
 (2) Install aluminum tab (Fig. 206)
  (a) Install No. 1 hinge fitting using BACB30LJ40425 bolt, washer under bolt head, BACB28AK04-012 bushing (install facing inboard), BACB28AK04-067 bushing on outboard side of fitting, washer and nut.
  (b) Install No. 2, 3 and 4 hinge fittings using BACB30LJ4DU25 bolts, washer under bolthead, one BACB28AK04-047 bushing on each side of fitting, washer and nut.

   NOTE: All four hinge fitting bolts are installed from outboard to inboard.

  (c) At inboard and outboard tab hinge fittings, secure bonding jumper to elevator tab. Fillet seal head and tail of bonding jumper with sealant.
  (d) Connect tab pushrods to elevator tab. Make sure bushings are installed and bolts face each other.
  (e) Adjust elevator tab (Ref 27-31-0, A/T).

G. Install Graphite Elevator Tab/Graphite Elevator
 (1) Manually rotate all hinge fittings through full travel in both directions and check that movement is smooth and without binding.
 (2) Install tab on hinge fittings at elevator rear spar.
 (3) Install hinge retaining screws through upper and lower tab surfaces at each tab hinge location. Tighten screws 20 to 25 pound-inches.
 (4) Deflect tab through full travel in both directions and check that movement is smooth and without binding.

(5) At inboard and outboard tab hinge fittings, secure bonding jumpers to elevator tab and seal with sealant.

(6) Connect tab pushrods to the elevator tab, ensure bushings are installed and that the bolts face each other. Do not install the nuts, washers, and cotter pins until tab alignment is assured.

NOTE: If the tab rod bolts have self-locking, non-castellated nuts, the nuts need to be replaced with new self-locking nuts after being loosened or removed.

(7) Remove rigging pin E-5 from aft quadrant.

(8) Adjust elevator tab (Ref 27-31-0, A/T).

(9) Restore airplane to normal hydraulic configuration (Ref 27-31-0).

(10) Close access door and install all access panels.

H. Install Graphite Tab/Aluminum Elevator

(1) Remove aluminum tab (Ref 27-31-31).

(2) Install graphite tab (Fig. 402).

(a) Install tab using bolts removed from aluminum tab.

(b) Install (2) BACB28AK04-004 bushings (Fig. 402) at hinge fittings No. 1, 3, and 4 to provide 0.040 inch clearance at hinge fitting No. 2.

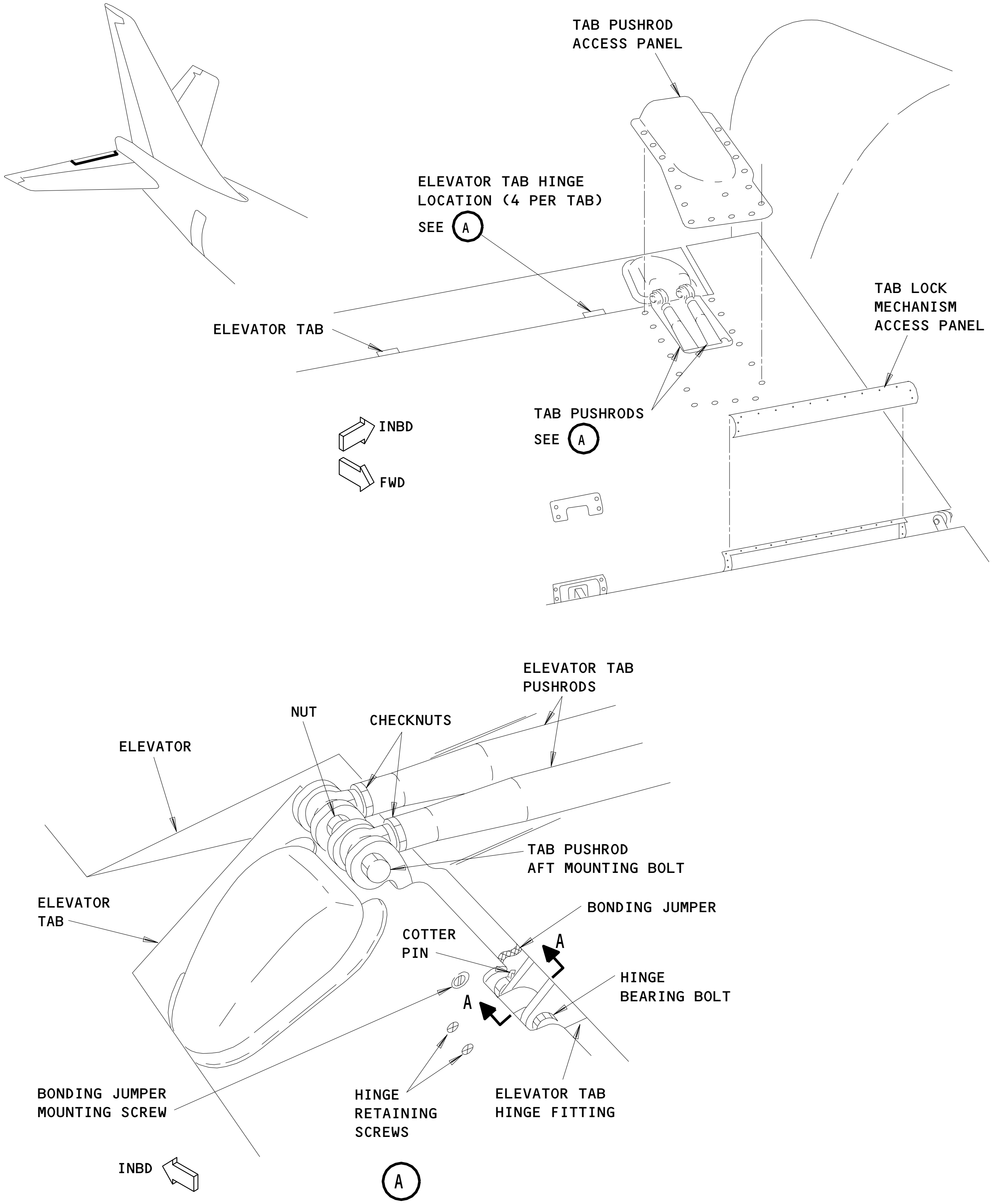
NOTE: All four hinge fitting bolts are installed from outboard to inboard.

(c) Install existing nuts and tighten to within ± .005 inch of fitting surface.

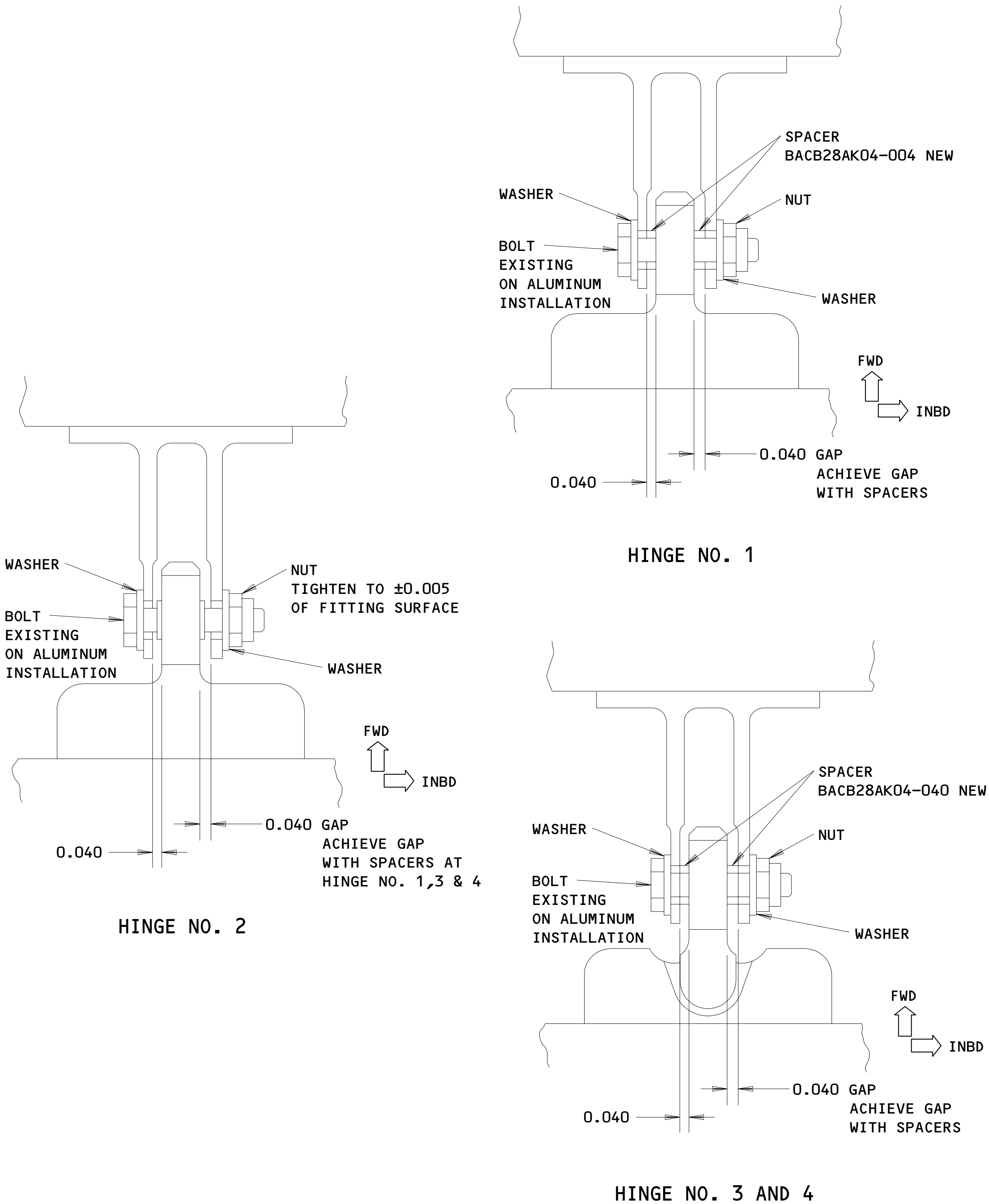
(d) At inboard and outboard tab hinge fittings, secure bonding jumpers to elevator tab. Fillet seal head and tail of bonding jumper with sealant.

(e) Connect tab pushrods to elevator tab. Make sure bushings are installed and bolts face each other.

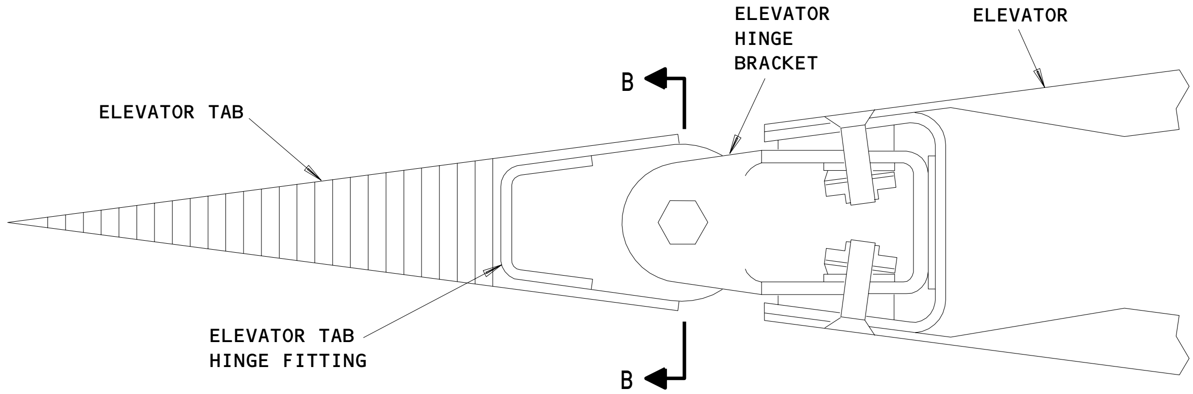
(f) Adjust elevator tab (Ref 27-31-0, A/T).



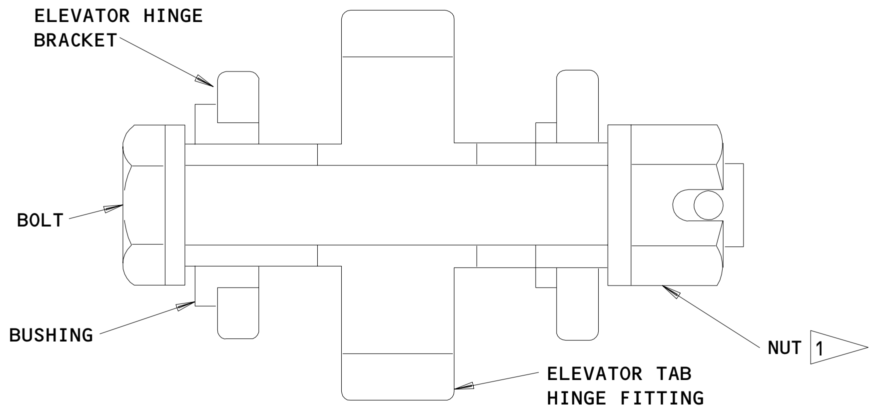
Graphite Elevator/Graphite Tab Installation
Figure 203



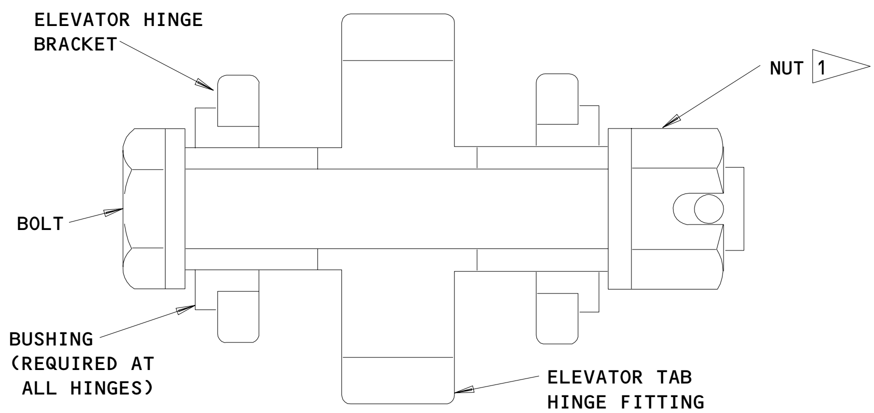
Aluminum Elevator/Graphite Tab Installation
Figure 204



A-A



HINGE FITTING NO. 1



HINGE FITTING NO. 2,3 AND 4
B-B

1 TIGHTEN NUT TO 15 POUND-INCHES

Graphite Elevator/Graphite Tab Installation
Figure 205

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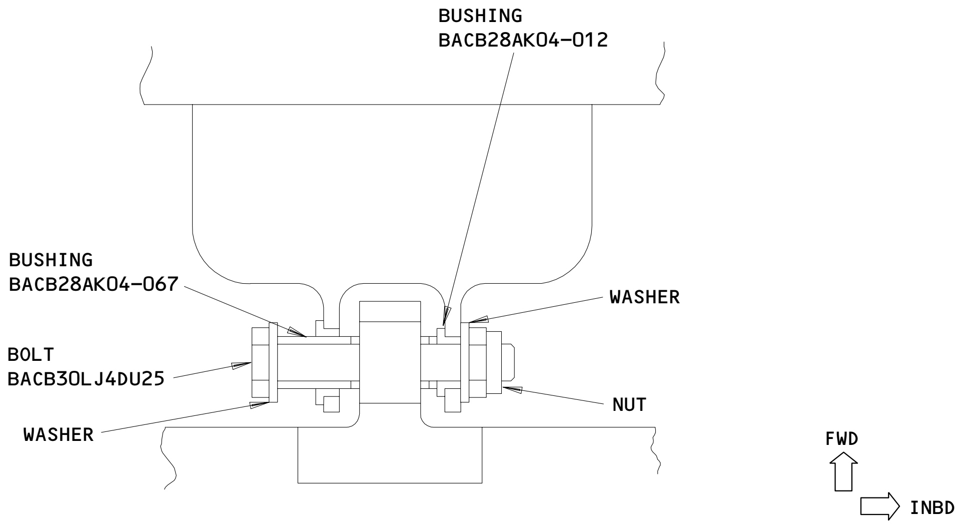

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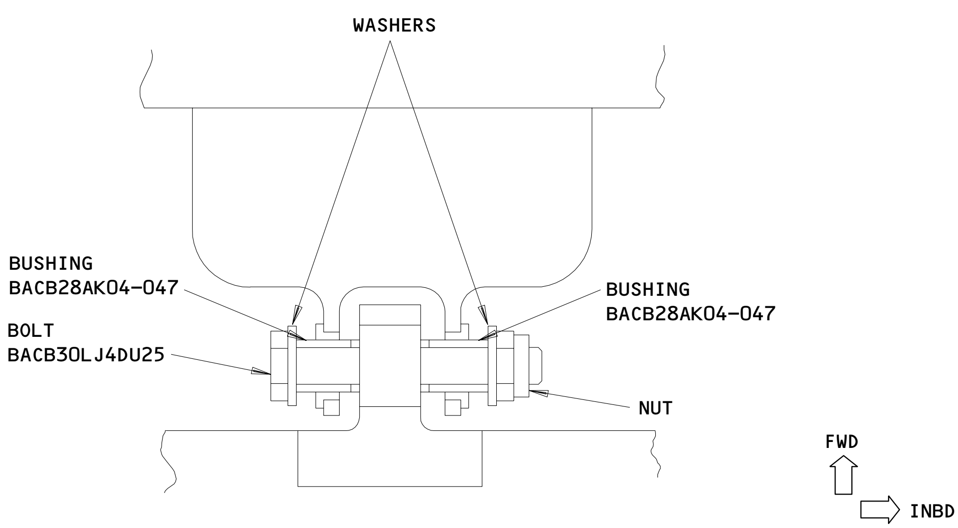
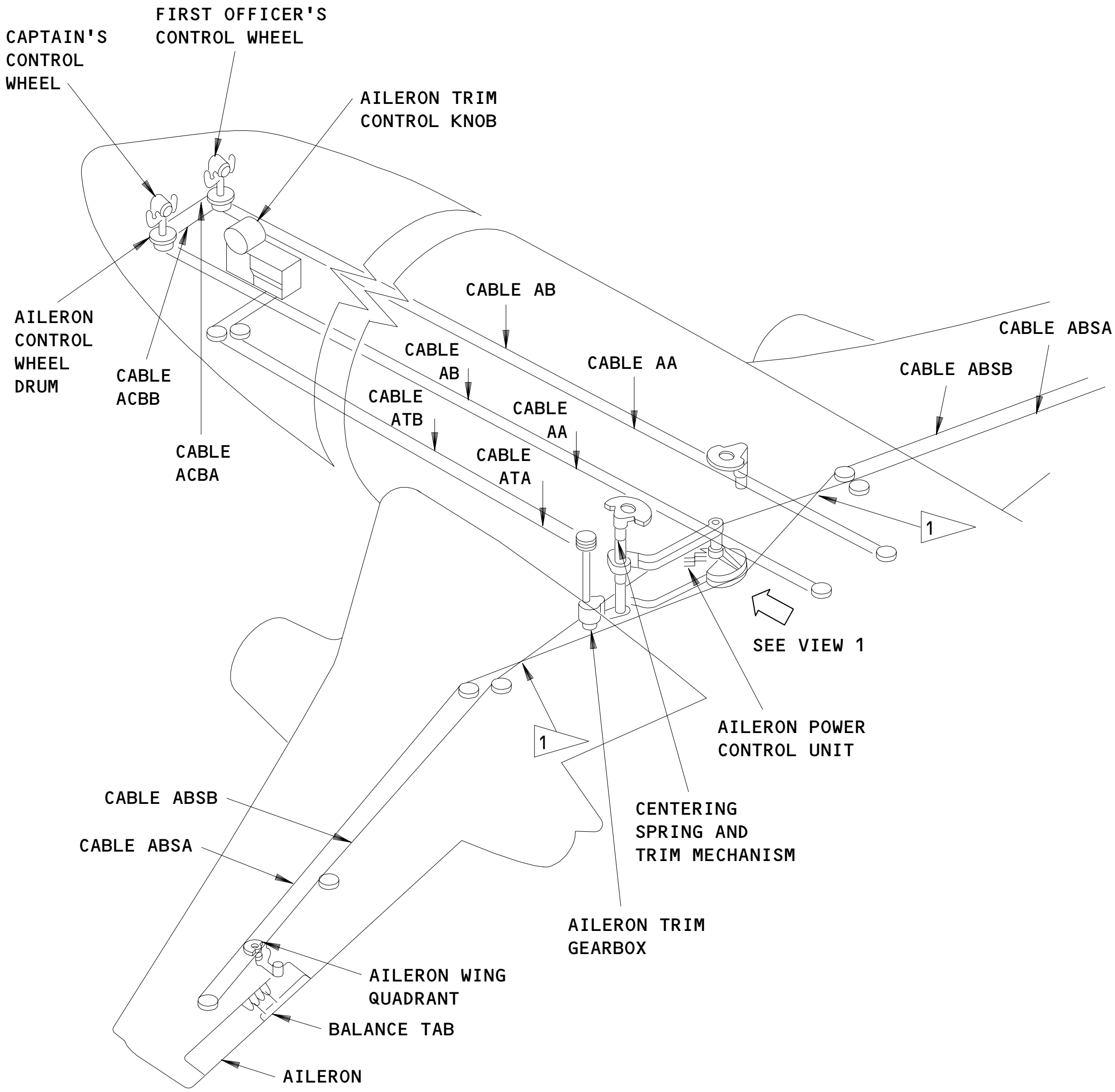


HINGE FITTINGS NO. 2,3 AND 4

Graphite Elevator/Aluminum Tab Installation
Figure 206

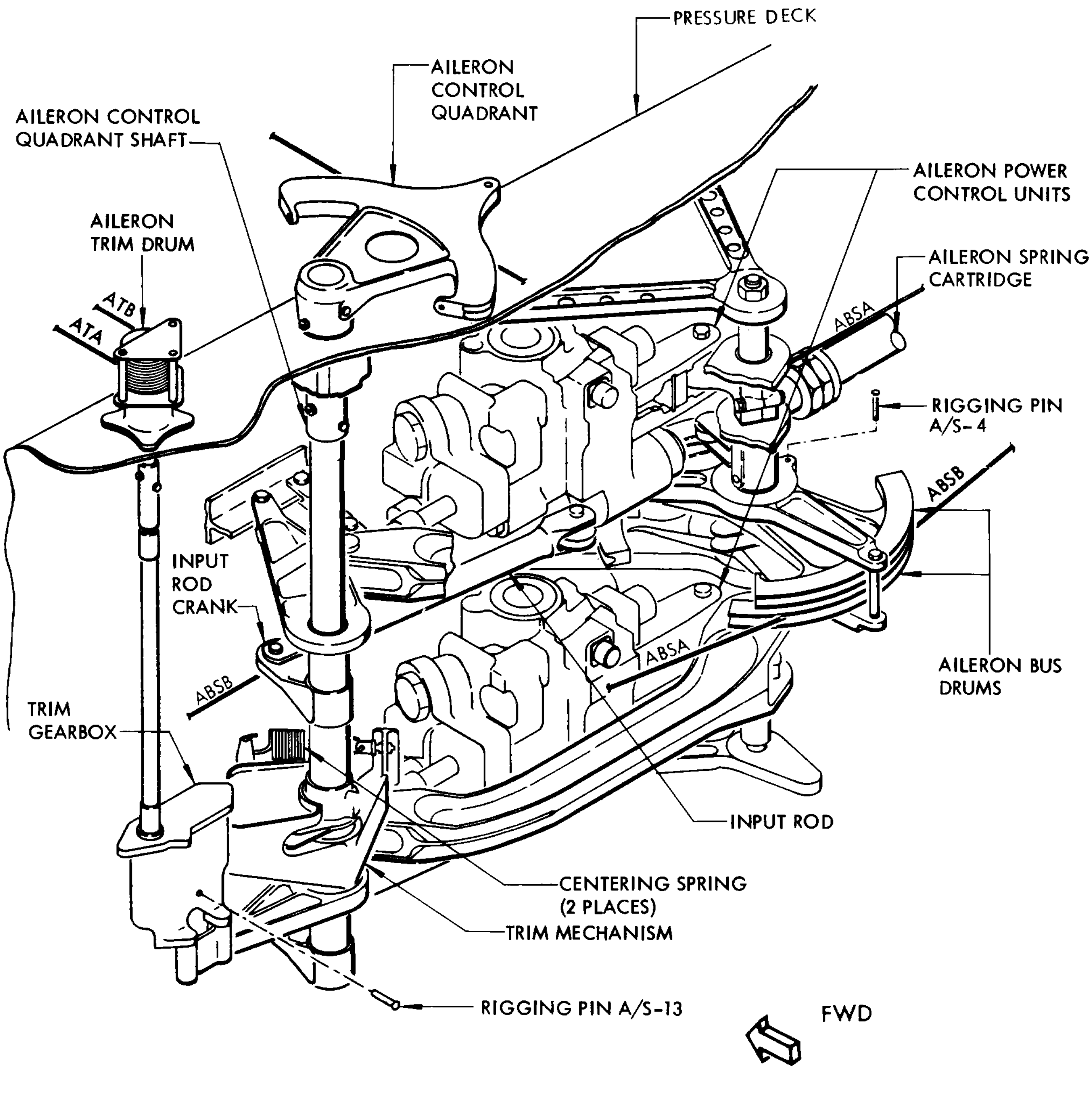
AILERON AND AILERON TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The aileron and aileron trim control system provides airplane lateral control. The ailerons are assisted by the flight spoilers. See 27-61-0. There is one aileron and balance tab on each wing. Rotation of either aileron control wheel results in movement of the ailerons, and movement of the flight spoilers. The ailerons are powered by two independent hydraulic power control units connected to separate hydraulic systems. Either power unit is capable of providing full power control in response to aileron control system inputs. In the event of total hydraulic failure, lateral control is maintained manually. Manual control forces are minimized by aileron balance tabs and hinged balance panels. The balance tabs are mechanically connected by rods to the wing structure.
   B. The aileron control system is actuated by rotation of either the captain's or first officer's aileron control wheel. The control wheels rotate control wheel drum and aileron control bus drums. (See figure 1.) Aileron control bus cables (ACBA & ACBB) between the aileron control bus drums provide an interconnect between the captain's and the first officer's aileron control wheels. Aileron control cables (AA & AB) from the captain's control wheel drum attach to an aileron control quadrant; which through a shaft, drives two cranks and two input rods. Each input rod connects to a power control unit. Also mounted on the control quadrant shaft is a cam which engages with a spring-loaded roller for the purpose of centering and trim. Each aileron power control unit is connected to a crank on a bus drum; to which aileron bus system cables are fastened. The aileron bus system cables (ABSA & ABSB) lead to left and right aileron wing quadrants. The ailerons are actuated through a control rod, by the aileron wing quadrants. During manual operation, the ailerons are manually operated by pilot effort. The forces are transmitted from the control wheel through the power unit input linkage stops. This establishes a direct mechanical link from the control wheel to effect aileron displacement.
   C. Hydraulic power is furnished to the aileron control system by two functionally independent 3000 psi systems. Hydraulic power from both systems is controlled by the flight control shutoff valves in the flight control hydraulic modular packages. Refer to 27-00 Flight Controls. The modular packages are located in the left and right main wheel wells, where the absence of wheel well doors assures quick and convenient access. Two FLT CONTROLS shutoff valve switches together with two low pressure warning lights are located on the overhead panel. System A is powered by two engine-driven pumps and system B by two electric motor pumps.



1 AILERON CABLES CROSS AT APPROXIMATELY RBL AND LBL 60.

Aileron Control System Component Location
Figure 1 (Sheet 1)



VIEW 1

Aileron Control System Component Location
Figure 1 (Sheet 2)

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D. The ailerons consist of two aluminum control surfaces with fiberglass balance tabs. The ailerons with aileron balance tabs are mounted outboard of the outboard flaps behind the rear spar of each wing (Fig. 1 and 2).

E. The aileron bus system cables (ABSA and ABSB), are routed along the rear spar of each wing and connect each of the aileron wing quadrants to the bus drum. The bus system cables are provided with a cable slack take-up device in each wing. This device consists of a spring attached to the axis of the outboard turnaround pulley.

F. The base of the first officer's control column is equipped with a transfer mechanism. The transfer mechanism allows normal control wheel motion to be transmitted through the cables on the captain's control column only. If a malfunction occurs which jams the aileron control system, lateral control is achieved by the spoiler system operated directly by cables from the first officer's control column. When this occurs, the first officer will have to exert a maximum force of 117 pounds, to overcome the spring in the transfer mechanism and operate the spoilers.

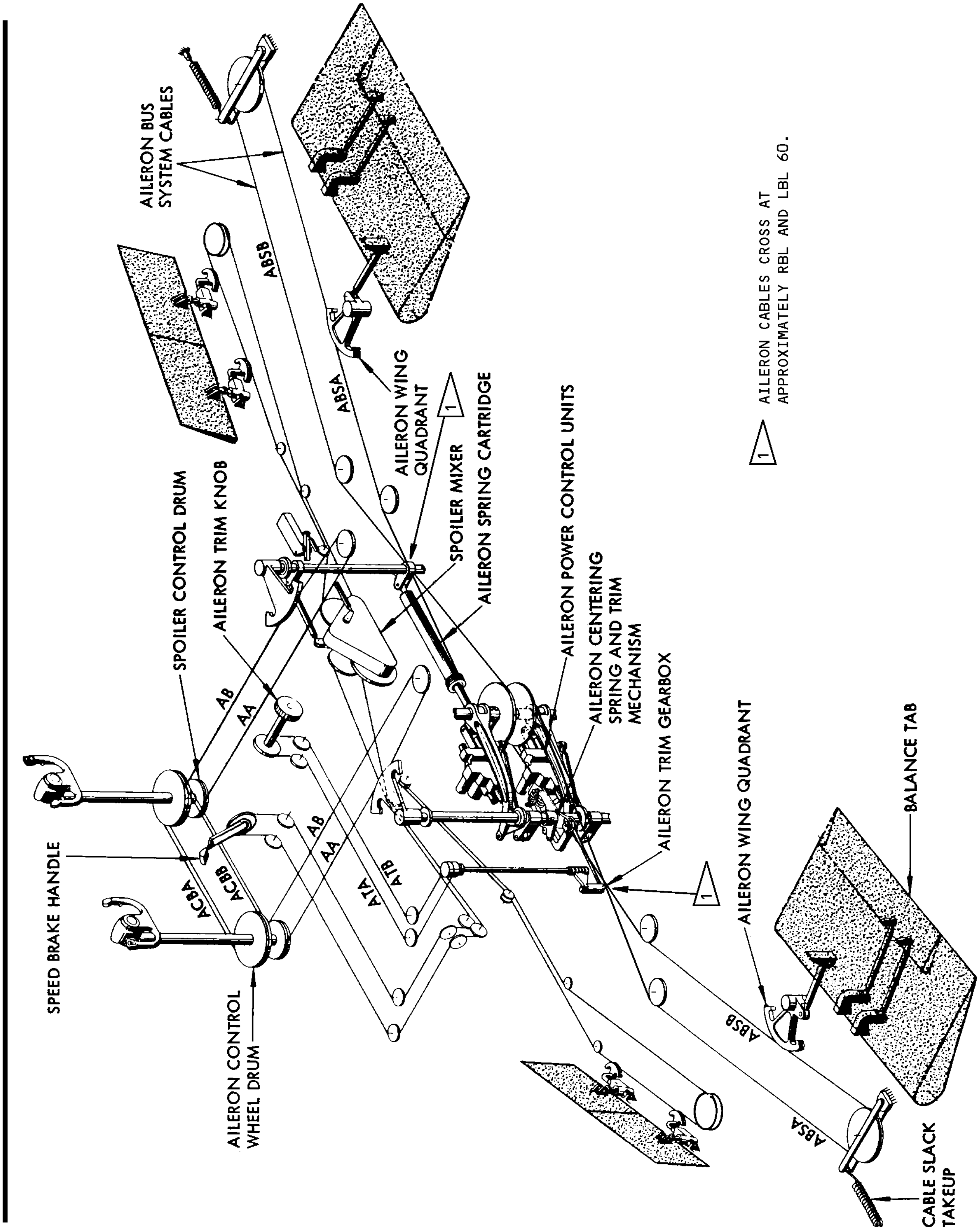
G. Aileron trim is provided by turning an aileron trim control knob on the pilots' control stand. The aileron trim wheel, through cables, adjusts the position of a centering spring and trim mechanism, providing aileron trim. Aileron trim control cables (ATA and ATB) are routed under the cabin floor on the left side of the airplane. The cables connect a control drum on the aileron trim control unit to a drum at the aileron centering spring and trim mechanism. Trim system stops are located within the trim control knob mechanism.

2. Aileron

A. Each aileron is a frame structure consisting mainly of leading and trailing edge spars and ribs, all fabricated from aluminum alloy. A clad aluminum skin is flush-riveted to this structure. On some airplanes, the ailerons are of graphite/epoxy construction with upper and lower skins of graphite/epoxy tape and nomex honeycomb core. An aileron balance tab is attached to the rear spar of the aileron by four hinge bearings. Outboard of the balance tab, the aileron trailing edge is of honeycomb construction. The aileron is provided with four hinge bearings attached to the front spar. Access panels are provided for each hinge bearing. Individual bearings may be replaced without removing the aileron. The aluminum nose of the aileron extends forward between the hinge bearings and is connected to one balance panel in bay No. 3.

B. The aileron control rod attaches the aileron to the aileron wing quadrant. Dual pushrods that connect the balance tab to the wing structure pass through the aileron.

C. The aileron and balance tab are independently balanced. The aileron is statically balanced as a component. The balance tab is statically balanced by adding or installing weights to the balance panel. The number of weights required is subject to the weight of the balance tab.



Lateral Control System Schematic
Figure 2

D. In No. 1, 2, and 4 bays, the aileron nose extension does not have a balance panel, but has a polyamide nylon seal mounted upon the nose extension coming into contact with a seal baffle. These seals along with a similar seal on the balance panel, control the airflow around the front of the aileron. A clearance between the aileron nose and the wing structure provide the controlled airflow area necessary for balance panel operation.

3. Aileron Balance Tab

A. The aileron balance tab functions to reduce the force required to position the aileron. Motion of the tab is controlled by dual tab pushrods which provide attachment between tab and wing structure (Fig. 7). Balance tab travel is opposite to aileron travel, that is, a downward movement of the aileron produces an upward movement of the balance tab.

B. The aileron balance tab is a thin tapered light weight control surface with an aluminum spar, fiberglass honeycomb core, fiberglass skin, and an aluminum alloy nose. On some airplanes, the aileron balance tab is of graphite/epoxy construction with a nomex honeycomb core. It is attached to the aileron rear spar by four hinge bearings. Left and right balance tabs are identical except for mounting of the mast fitting and related fairing.

C. The aileron balance tab may be replaced without rebalancing the aileron. Each tab is furnished with adjust weights that bolt to the balance panel. The required number of adjust weights is stamped on a data plate attached to each balance tab.

4. Aileron Balance Panels and Seals

A. Aileron balance panels reduce the force required to position the ailerons in flight. Each aileron has one balance panel located at number 3 bay. The balance panel is connected to the aileron nose by a continuous hinge at the aft edge. The forward edge of each balance panel is attached to the wing structure by an idler hinge which provides the necessary articulation for movement of the balance panel (Fig. 3). The seals at the hinge points are made of dacron fabric impregnated with silicone rubber. Mylar seals are installed along the inboard and outboard edges of the balance panel.

B. Balance panels may be replaced without altering the control surface balance. The aileron balance tab adjust weights fasten to the lower aft edge of the aileron balance panel.

5. Aileron Trim Control Unit

A. The aileron trim control unit is used to initiate motion in the aileron trim control system. The unit consists of a cable drum attached to a shaft, and a control knob. (See figure 4.) The cable drum is located within the control stand and is rotated by the trim control knob on the aft part of the control stand. Access to the drum is available by removing the right access panel on the control stand.

B. The trim control knob can be manually rotated about 3.55 turns in either direction from neutral. Stops within the trim knob mechanism regulate the amount of cable that may be wound on or off the drum. The aileron trim indicator is part of the trim control knob. The indicator dial is marked in units trim on either side of neutral. The action produced by rotating the control knob to the right raises the right aileron and lowers the left aileron, turning the control knob to the left raises the left aileron and lowers the right aileron.

6. Aileron Centering Spring and Trim Mechanism

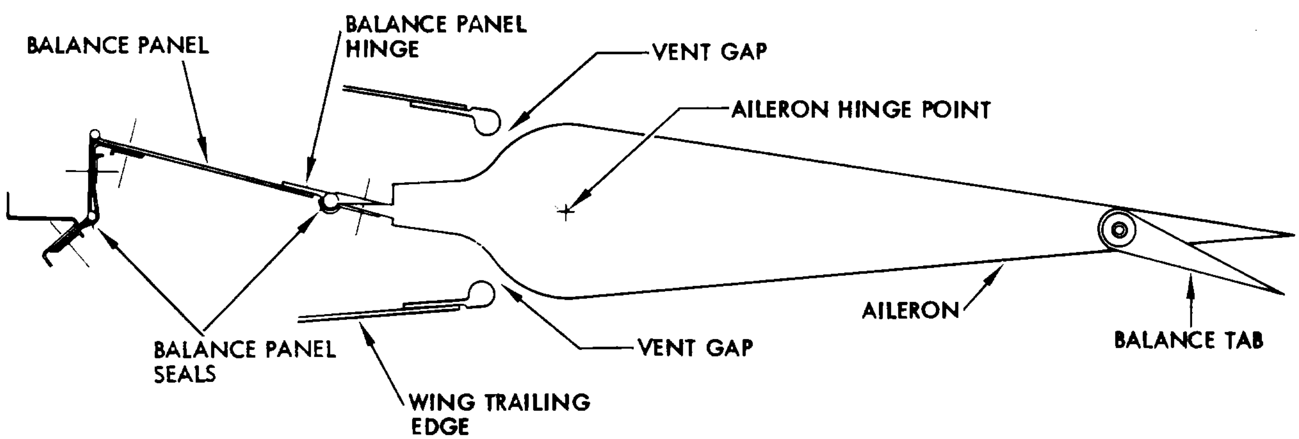
A. The aileron centering spring and trim mechanism provides aileron control system centering, trim, and artificial feel. The aileron centering spring mechanism consists of a cam, roller arm support, and two springs. (See figures 1 and 5.) The centering cam is bolted to the control quadrant shaft. The roller is mounted on the roller arm and the roller arm is mounted on the support. Two springs are attached between the roller arm and the support to provide the force necessary to hold the roller against the cam; thus providing aileron control system centering and artificial feel. The support is positioned by a trim gearbox through a trim drive rod.

B. The aileron trim gearbox contains a worm and a sector gear which positions a trim arm in response to the aileron trim system. The worm is splined to an aileron trim input shaft which is connected to the aileron trim drum located in the floor beam space adjacent to the aileron control quadrant. The trim gearbox is mounted to structure by two forks and a safety tie bar and is connected to the centering mechanism by two bosses which are concentric with the aileron quadrant shaft. The trim arm connects to the centering mechanism by the trim drive rod.

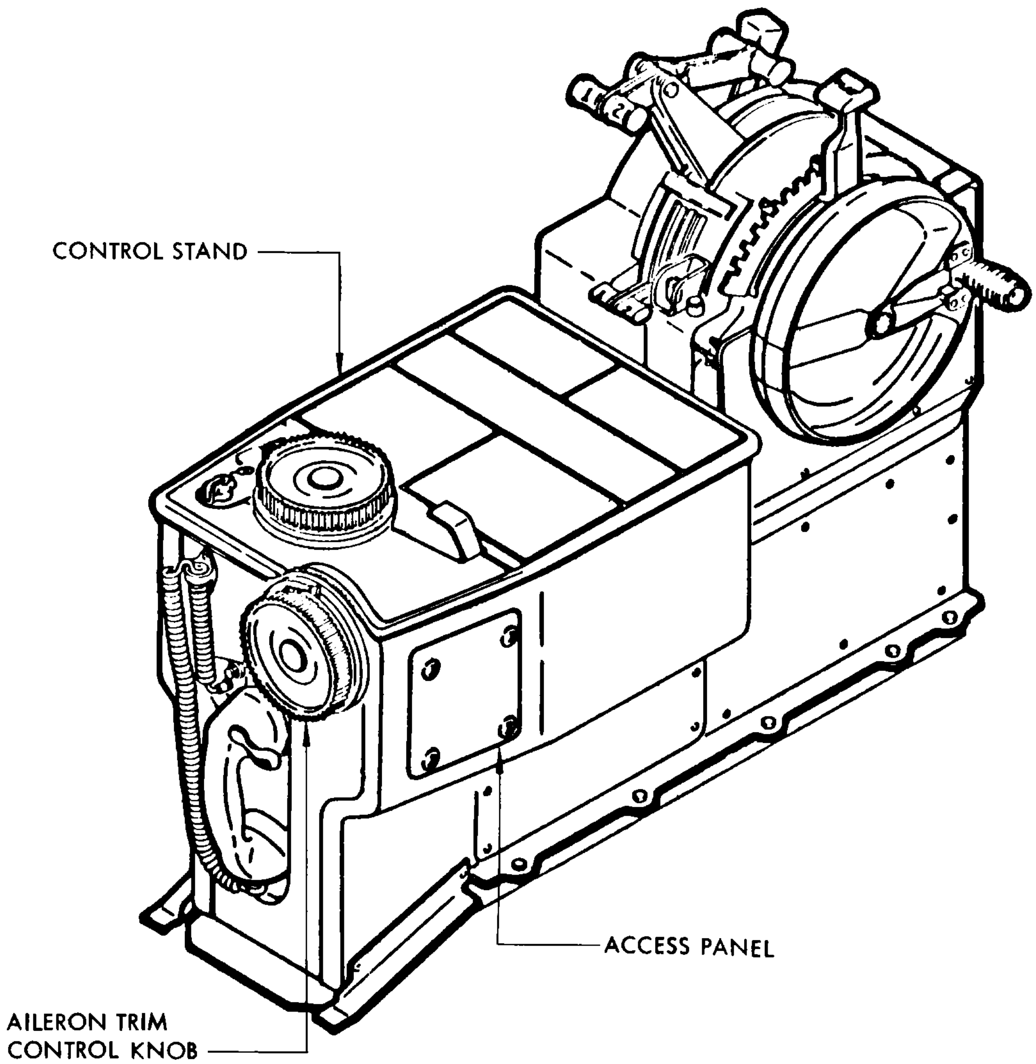
7. Aileron Transfer Mechanism

A. A transfer mechanism is located at the base of the first officer's column. It incorporates both the transfer mechanism and the lost motion device. The transfer device consists basically of a preloaded torsion spring whose ends are held against two identical halves of a spring container. (See figure 6.) The two halves of the spring container are locked to preload the spring.

B. The aileron control bus drum is attached to the upper half of the spring container and the spoiler control drum is attached to the lower half of spring container. In normal operation, motion is transmitted between the two drums through the preloaded torsion spring. If a malfunction occurs, which jams either the aileron or the spoiler control system, the other system could be operated independently. In this case, the captain or the first officer, depending on the jammed system, will have to exert a maximum force of 117 pounds to overcome the spring preload in the transfer mechanism and operate the other system to maintain lateral control of the airplane. In case the aileron cables are jammed, the first officer will have to exert a force to overcome the spring preload in the transfer mechanism and operate the spoilers. When the first officer's control wheel starts turning, it will turn through 12 degrees before motion is picked up by the spoiler control drum through the lost motion device. The control drum then operates the spoilers through the right hand aileron control cables AA and AB (figure 2) to the spoiler mixer.



Aileron Balance Panel
Figure 3



Aileron Trim Control Unit
Figure 4

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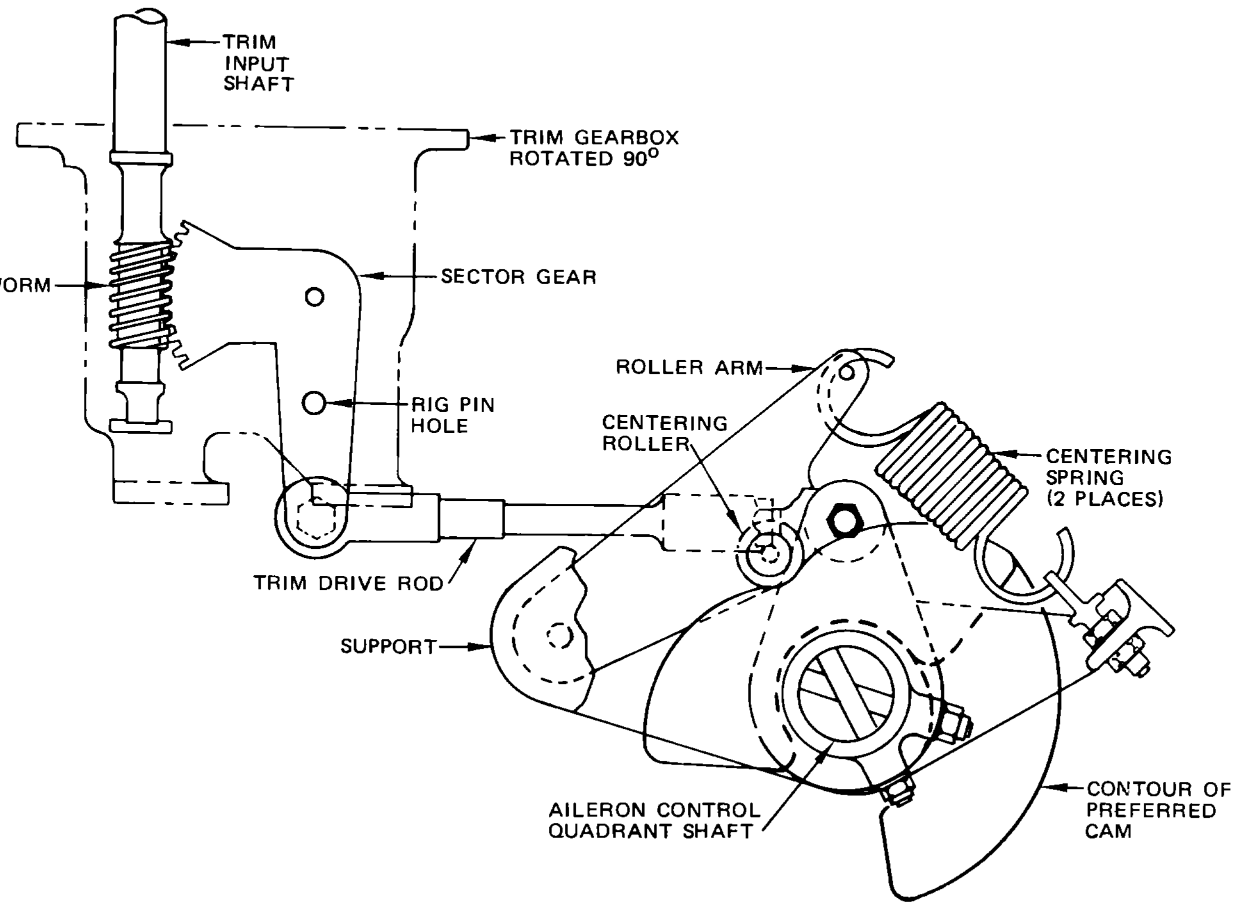


Aileron Control Spring and Trim Mechanism
Figure 5

C. In case the spoiler cables are jammed, the captain will, similarly, have to exert a force to overcome the spring preload in the transfer mechanism and operate the ailerons.

8. Aileron Control Linkage

A. The aileron control linkage connects the centering spring and trim mechanism and the aileron control quadrant to the aileron power control unit. (See figure 1.) The input rod from the aileron control quadrant connects to the input lever of the power control unit. Connected to the output crank on the aileron bus drum is an aileron spring cartridge. The spring cartridge connects to a crank and provides lateral control input signals to the spoiler system.

B. The aileron control linkage furnishes system inputs for the operation of the power control unit, and thus provides aileron action. During manual reversion, the power unit input crank contacts stops on the power unit housing to manually move the power units and operate the aileron.

9. Aileron Wing Quadrant

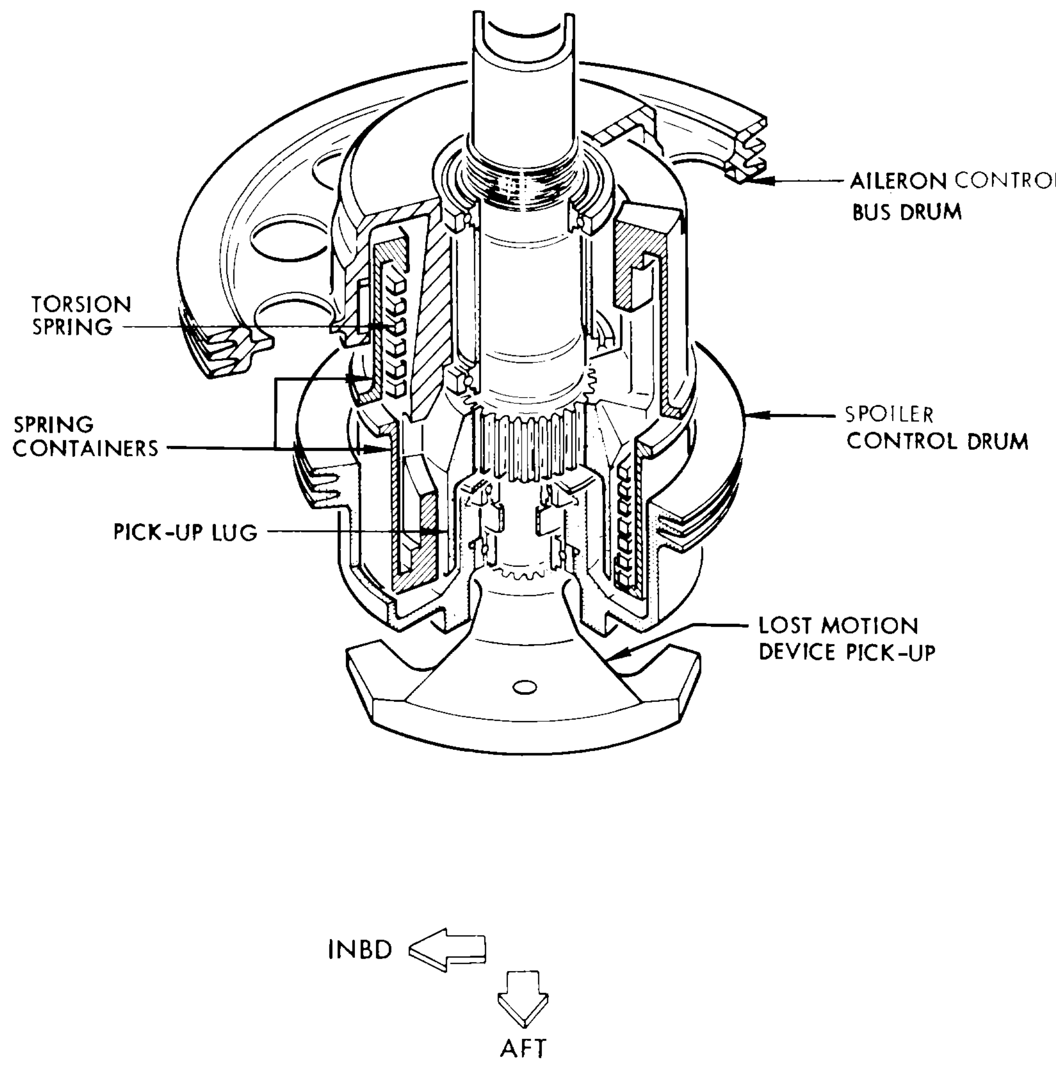
A. An aileron wing quadrant is located within each wing behind the rear spar on the inboard side of each aileron (Fig. 7). Motion of the bus system cables rotates the quadrant about its support shaft. The periphery of the quadrant is grooved to receive two bus system cables and contains clips to secure each end of these cables. The quadrant is attached to a pushrod which is connected to the aileron.

10. Balance Tab Linkage

A. The aileron balance tab linkage connects the aileron tab, through dual pushrods, to the wing structure. The tab motion is controlled by the motion of the ailerons. The tab travel is opposite to aileron travel (Fig. 7).

11. Aileron Power Control Unit

A. Two aileron power control units provide actuation of the ailerons in response to manual inputs from the control columns. The power control units are mounted horizontally in the main wheel well (Fig. 1). The two power control units operate independently from separate hydraulic systems; the lower unit from hydraulic system A pressure and the upper unit from hydraulic system B pressure. Failure of either hydraulic system will render one power control unit inoperative. The remaining unit will continue to operate both ailerons through full range of travel.



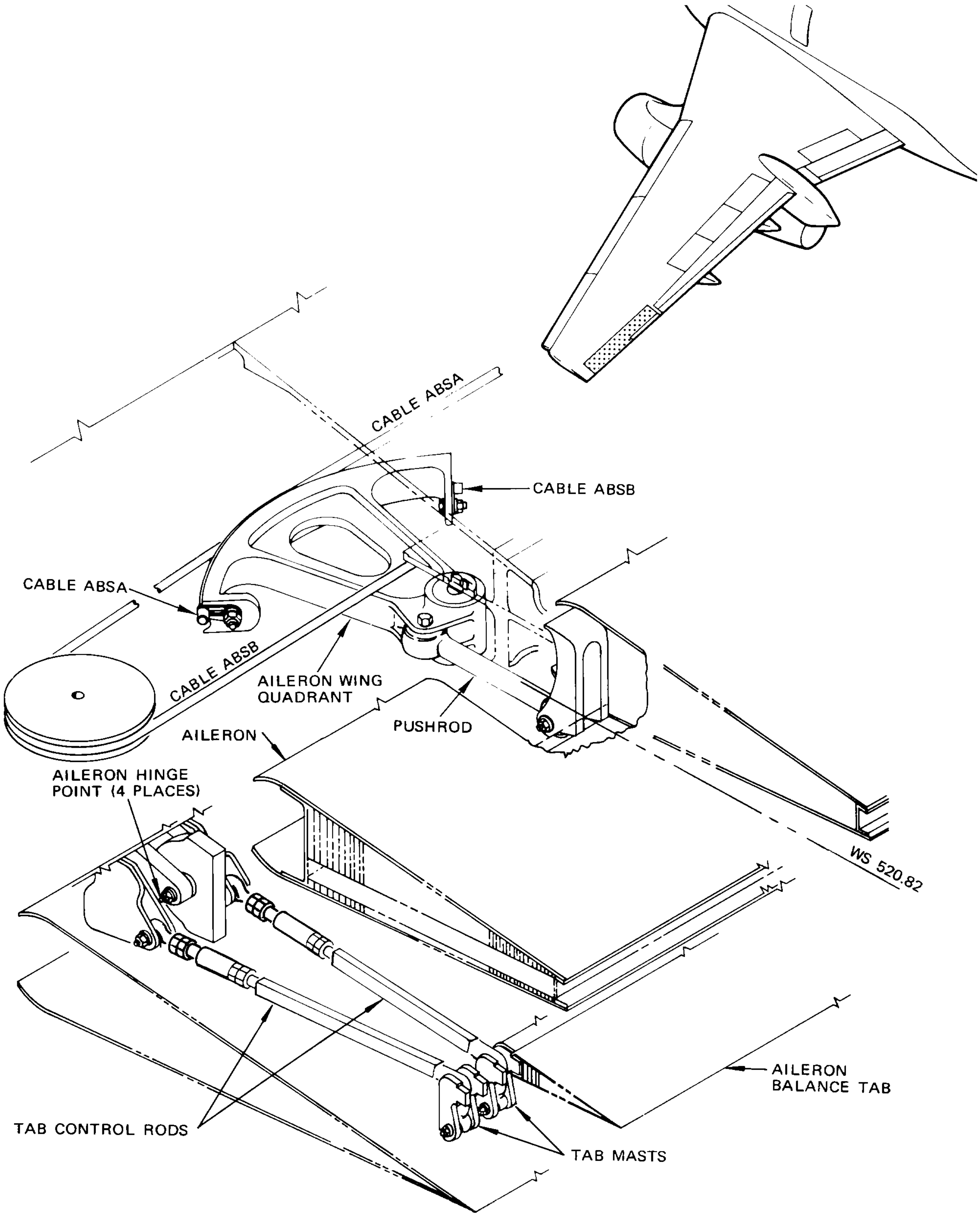
Aileron Transfer Mechanism
Figure 6

B. The aileron power control unit incorporates a main actuator, a gust damping bypass valve, a thermostatic flow control valve (replaced by plug on some airplanes), filters and a dual concentric main control valve operated by a dual input crank (Fig. 8). The main control valve comprises a primary slide acting within a secondary slide. The secondary slide will permit control, should the primary slide become jammed in an open position. An exterior input rod provides actuation of the main control valve from the control system.

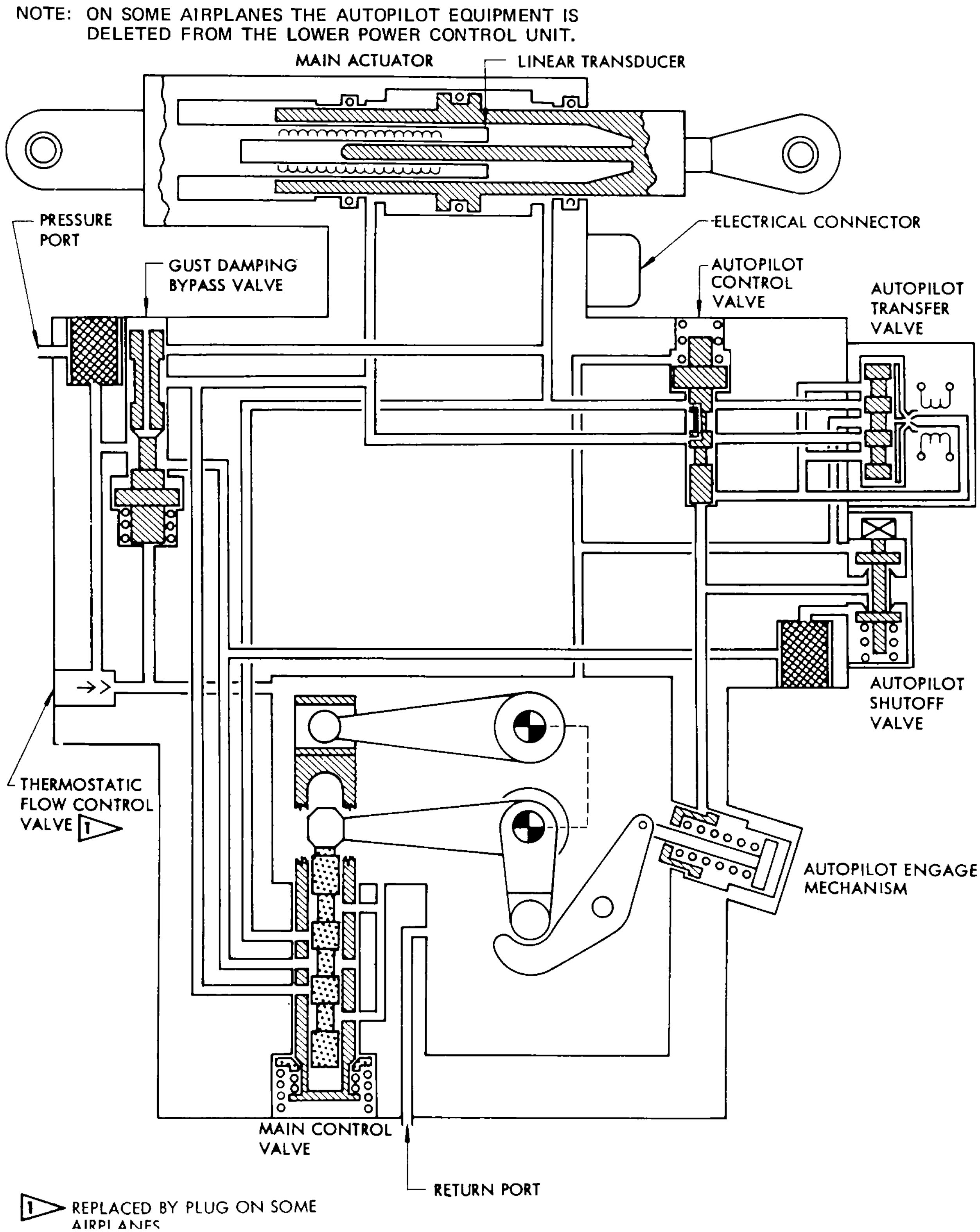
C. Rotation of the control wheels rotates the control quadrant torque tube and applies an input to the power control unit input crank. As the input crank displaces the main control valve slide, hydraulic pressure is directed through the valve to move the main actuator piston. Movement of the input crank in the opposite direction displaces the main control valve slide to route hydraulic pressure to the other side of the main actuator piston. The actuator piston rod end is attached to structure, thereby causing the power control package body to extend or retract. Movement of the power control unit will return the input crank to neutral and close the main control valve. This will equalize the pressures on either side of the actuator piston and arrest further motion.

D. On all airplanes the upper power control unit is equipped to receive input from the autopilot. On some airplanes the lower power control unit is also equipped to receive input from the autopilot. For autopilot equipment on the power control units, refer to Chapter 22, Autoflight. On power control units with equipment to receive autopilot input, the following applies:

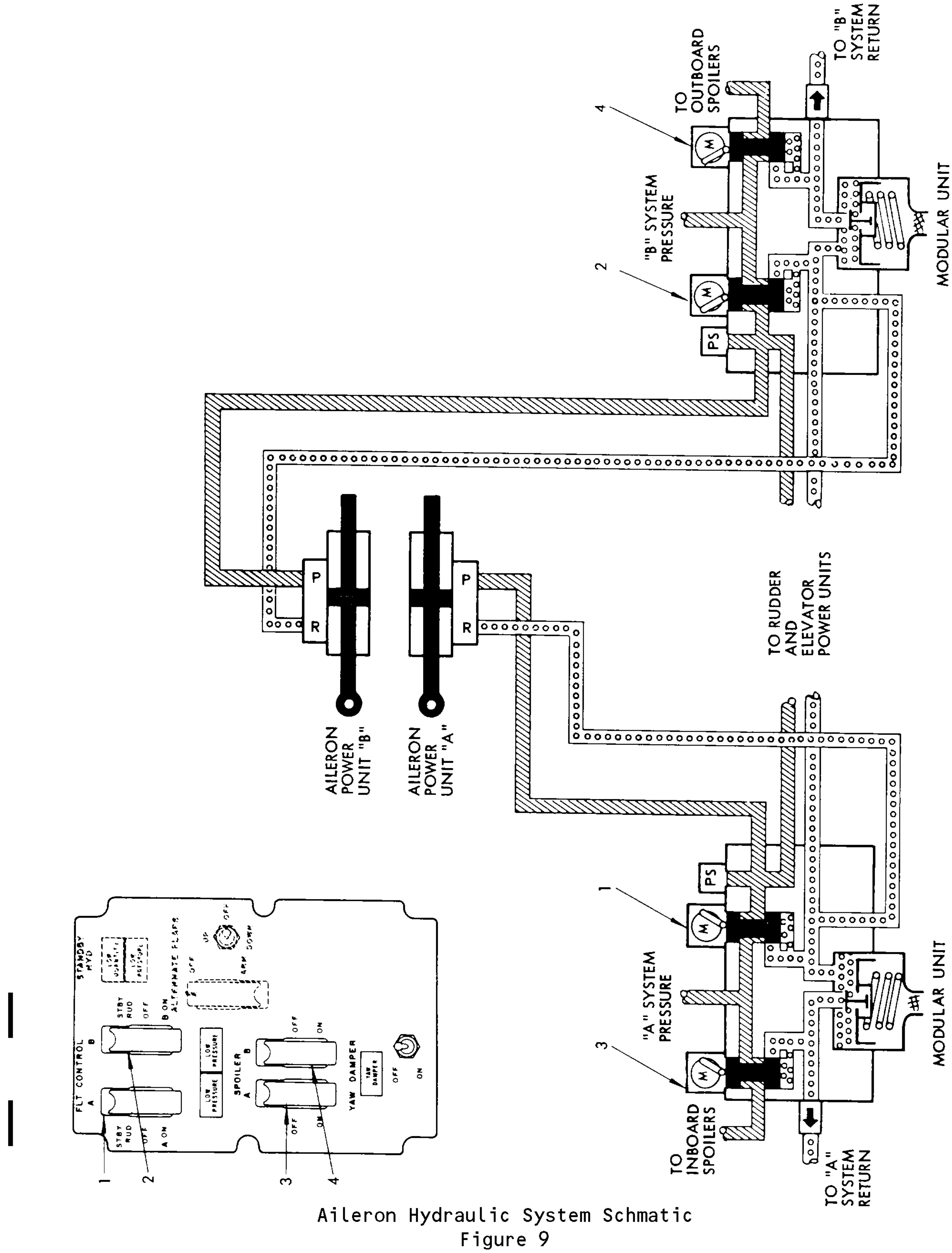
(1) Engaging the autopilot actuates a solenoid to open the autopilot shutoff valve. The shutoff valve directs hydraulic pressure to the autopilot engage mechanism and the autopilot control valve. Actuating the engage mechanism holds the main control valve closed by locking the manual input crank. The engage mechanism is spring-loaded to allow manual override of the autopilot system. A control wheel input will allow the input crank to override the engage mechanism spring pressure. Hydraulic pressure at the autopilot control valve, displaces the spring-loaded control valve slide and applies pressure to the transfer valve. The transfer valve slide is displaced by position signals from the roll channel of the autopilot. Hydraulic pressure is thus directed through the control valve to extend or retract the main actuator piston. When the transfer valve slide moves in the extended direction, the retract port is opened to return. As the main actuator moves, a balancing signal is generated by a linear transducer which assists in nulling the transfer valve electrically. Extension of the main actuator piston displaces hydraulic fluid from the retract side of the piston to return. Disengaging the autopilot de-energizes the solenoid and closes the shutoff valve. Hydraulic bleed at the transfer valve depressurizes the autopilot system and allows the control valve to close. The control valve prevents loss of pressure through the transfer valve when the power control unit is operating with the autopilot disengaged.



Aileron and Tab Control Linkage
Figure 7



Aileron Power Control Unit Schematic
Figure 8



Aileron Hydraulic System Schmatic
Figure 9

12. Operation

A. The ailerons may be actuated either hydraulically or mechanically. For normal operation, hydraulic pressure from both systems A and B is utilized (Fig. 9). Motion is initiated by the aileron control wheels and aileron trim control wheel (Fig. 2). Rotation of either aileron control wheel initiates motion in the aileron control cables which connect the control wheel drum to the aileron control quadrant. The cable motion is transferred from this quadrant through control linkage to the power control units. Motion of the main control valves in the power control units delivers hydraulic power to the actuator pistons which rotate cranks on the shaft connected to the bus drums. Rotation of the bus drums is 40 degrees in each direction from neutral, this is transferred through the bus system cables and aileron bus quadrants to rotate the ailerons 20 degrees in each direction from neutral position. Power control unit movement also provides spoiler system input through the aileron spring cartridge. Movement of the ailerons actuates the balance tabs. Hydraulic system A and B pressures to the aileron power control units are controlled by the flight controls shutoff valves in the flight controls hydraulic modular packages. A shutoff valve switch for each system is located on the overhead panel. Each hydraulic modular package is equipped with a low pressure warning switch which controls an amber light for each hydraulic system on the overhead panel. In the event of failure of either hydraulic system A or B, normal powered operation of the ailerons will be retained. In the event of failure of both hydraulic systems A and B, manual operation wil1 take place. During manual operation, the aileron trim knob will not provide aileron trim.

B. The aileron trim control knob on the control stand is connected by aileron trim cables to the trim gearbox. Rotation of the knob alters the position of the centering spring mechanism through the trim gearbox. This provides an input to the aileron control linkage which changes aileron neutral and thus providing aileron trim. The available aileron trim provides 15 degrees aileron travel in both directions from neutral. The centering spring mechanism also provides artificial feel. The artificial feel force increases as the control wheel is rotated to obtain maximum aileron deflection.

C. If trim is adjusted with both aileron power control units depressurized, the drag of the unpowered aileron system will allow the system to remain out of center. This will force the trim and centering mechanism cam follower out of the cam detent. Then, when hydraulic power is applied, the control wheels and ailerons will rapidly move to the newly trimmed position.

AILERON AND AILERON TRIM CONTROL SYSTEM - TROUBLESHOOTING

1. General
   A. Forces at the control wheels are generated by two areas in the aileron control system during operation with hydraulic power on.
      (1) Left Side
         (a) From the control wheels, through the left body cables AA and AB and the centering spring and trim mechanism, to the two power control unit main control valves. In a control system within rigging tolerance, all control wheel forces are generated by the "left side".
      (2) Right Side
         (a) From the two power control unit actuators, through the spring cartridge and the right body cables AA and AB, to the transfer mechanism lost motion device. A control system out of tolerance on the "right side" will transmit friction to the control wheels if one of the following two conditions exist:
            1) The lost motion device out of adjustment and bottoming out.
            2) Abnormal friction in transfer mechanism lost motion device spoiler control drum bearings.
   B. It is possible to have a defective or misadjusted aileron PCU and still have both ailerons operate within rigging tolerance. If a defective or misadjusted PCU is suspected, test system with one hydraulic system, then with the other to isolate the faulty PCU (AMM 27-11-0/501).

      NOTE: Hydraulic system B powers the upper PCU, system A powers the lower PCU.

   C. Measure control wheel forces per AMM 27-11-0/501 with both hydraulic systems on.
   D. Ensure that aileron cable rig loads are correct.
   E. Ensure that all rig pins can be freely inserted. Note that rig pin A/S-1 is inserted through three parts in the aileron transfer mechanism. Improper lost motion device rigging usually is the cause for excessive wheel forces in one direction only, especially noticeable in flight.
   F. Remove aileron force limiter. The force limiter shaft torque should be 0.5 pound-inch maximum. Also check that the roll force transducer wires do not bind on captain's control column.
   G. Unhook or lift the two centering springs at the trim and feel mechanism to remove centering force. Tie back the roller arm to clear the cam. Wheel torque should be less than 13 pound-inches (2.0 pounds) at breakout, and approximately 26 pound-inches (4.0 pounds) at 75 degrees rotation.

H. Check the aileron spring cartridge by rotating the control wheel full travel with hydraulic power on. If the cartridge can be felt or observed to change in length the source of excessive friction is the flight spoiler control system or in the right side. For troubleshooting the flight spoiler system, refer to AMM 27-61-0/101. For troubleshooting the right side, see below.

I. Disconnect the spoiler ratio changer input rod and the right end of the aileron spring cartridge in the right wheel well to isolate the spoiler system.

J. Verify that aileron PCU bus drum stop bolt gap is 0.05 ±0.010 inch.

K. With hydraulic power on, rotate control wheel approximately 12 degrees in each direction and check for movement of the right aft quadrant. Any movement of the right aft quadrant indicates high friction in the transfer mechanism bearings.

L. Rotate the right aft quadrant and check for binding. Ensure that the control wheel does not rotate (accomplish test within 12 degrees control wheel travel).

2. Troubleshooting Isolation

A. The following steps isolate friction in the left side.

(1) Loosen and disconnect the bus cables ACBA and ACBB to isolate the left cable side.

(2) Disconnect the PCU input rods from the centering mechanism. Measure control wheel torque for changes. With hydraulics on, check rods for binding.

(3) Loosen left body cables AA and AB (less than 20 pounds). Measure control wheel torque for changes. Cable system friction is dependent on the rig load. Relaxing cable load will help identify pulley or bearing problems.

(4) Disconnect left body cables to isolate captain's column and drum. Check for binding in the control column and/or drum.

(5) Lift captain's control column to disengage paddle, keeping the column wiring intact. Check control column for binding. Also check that the paddle bolt torque is between 5-10 pound-inches above run-on torque. The aileron control drum should rotate freely.

(6) Remove floor panels and/or cargo ceiling liners to inspect left cable run. Spin all pulleys, they should spin freely.

(7) Reconnect cable and inspect cable run. Check for hangups, deflecting fairleads or grommets and bent pulley brackets.

B. The following steps isolate friction in the right side.

(1) Loosen and disconnect the bus cables ACBA and ACBB, if still connected to isolate the right cable side.

(2) Disconnect right body cables AA and AB from the right aft quadrant (AMM 27-11-91). Manually rotates the quadrant and check for binding.

(3) Lift first officer's control column to disengage paddle, keeping the column wiring intact. Check control column for binding. Also check that the paddle bolt torque is between 5-10 pound-inches above run-on torque. The aileron transfer mechanism drum should rotate freely.
(4) Remove floor panels and/or cargo ceiling liners to inspect right cable run. Spin all pulleys, they should spin freely.
(5) Reconnect cable and inspect cable run. Check for hangups, deflecting fairleads or grommets and bent pulley brackets.

3. Aileron and Aileron Trim Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Control wheel does not rotate with initial trim knob input and does not re-center within 2° with hydraulic power on	LH body cables AA and AB binding or misaligned, fairleads binding, brackets misaligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per AMM 27-11-0/501	Adjust cables as necessary
	Centering spring and trim mechanism out of adjustment	Check mechanism per AMM 27-11-81/501	Adjust mechanism as necessary
	Roll force transducer wire bundle binding on captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as necessary (AMM 22-11-111/501, Roll Control Wheel Steering Force Transducer)
	Aileron trim mechanism excessive play	Rotate trim knob. Check trim shaft and trim gearbox control rod movement for worn gearbox or worn or loose parts	Replace components as necessary (AMM 27-11-81/401)
At trimmed position, control wheel forces light in one or both directions with hydraulic power on	Transfer mechanism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per AMM 27-11-0/501
	Aileron trim mechanism excessive play	Rotate trim knob. Check trim shaft and trim gearbox control rod movement for worn gearbox or worn or loose parts	Replace components as necessary (AMM 27-11-81/401)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY

3. Aileron and Aileron Trim Trouble Shooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Both ailerons do not move full travel	LH body cables AA and AB slack	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
One aileron does not move full travel	Aileron bus cables ABSA and ABSB slack	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
One aileron does not operate	Aileron bus cables ABSA and ABSB loose or broken	Operate system. If aileron bus drums move together, check applicable bus cables	Replace or adjust cables as neces- sary (27-09-111, Maintenance Practices; 27-11-0, Adjustment/Test)
	Aileron bus cables ABSA and ABSB jammed	Operate system. If aileron bus drum does not move, shear bolts have sheared. An alternate check is to attempt to push a wire through bus drum shear witness hole (27-11-101, Approved Repairs)	Repair cause of jammed cables. Replace shear bolts (27-11-101, Approved Repairs)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel play	LH body cables AA and AB loose or broken	Rotate control wheel. Check if aileron control quadrant operates normally	Replace or adjust cables as necessary (27-09-111, Maintenance Practices; 27-11-0, Adjustment/Test)
	Aileron trim mechanism excessive play	Rotate trim knob. Check trim shaft and trim gearbox control rod movement for worn gearbox or worn or loose parts	Replace components as necessary (27-11-81, Removal/ Installation)
One aileron not in neutral with control wheel in neutral	Aileron bus cables ABSA and ABSB out of adjustment	Check cable adjustment per 27-11-0, Adjustment/Test	Adjust cables as necessary
Both ailerons not in neutral with control wheel in neutral	LH body cables AA and AB out of adjustment	Check cable adjustment per 27-11-0, Adjustment/Test	Adjust cables as necessary
Excessive control wheel force to begin aileron movement in both directions with hydraulic power on	LH body cables AA and AB binding or misaligned, fairleads binding, brackets misaligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
	Centering spring and trim mechanism out of adjustment	Check mechanism per 27-11-81, Adjustment/Test	Adjust mechanism as necessary

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 2)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force to begin aileron movement in both directions with hydraulic power on (Cont)	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181 Removal/ Installation)
	Roll force trans-ducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as neces-sary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)
	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181 Removal/ Installation)
	Abnormal friction in transfer mech-anism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mecha-nism (27-11-61, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control wheel bearings, gears, upper column bearings, or U-joints	An indication of gears out of adjustment is even racheting during control wheel rotation	Replace bearings or adjust as necessary (AMM 27-31-51, AMM 27-31-181, AMM 27-11-41, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 3)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force to begin aileron movement in both directions with hydraulic power on (Cont)	Abnormal friction in aileron control quadrant shaft bearings or quadrant shaft pressure seal	Disconnect LH body cables AA & BB. Disconnect PCU valve control rods. Rotate control quadrant and check for excessive friction	Replace parts as necessary (27-11-91, Removal/ Installation)
	Abnormal friction in PCU input linkage	Check control rod ends for worn, bent, or broken parts	Replace parts as required (27-11-101, Removal/ Installation)
	Abnormal friction in aileron PCU main control valve		Replace PCU (27-11-71, Removal/ Installation)
Excessive control wheel force to begin aileron movement in one direction with hydraulic power on	Transfer mechanism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per 27-11-0, Adjustment/Test
	LH body cables AA and AB binding or misaligned, fairleads binding, bracket misaligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
	Roll force transducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as necessary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 4)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force to begin aileron movement in one direction with hydraulic power on (Cont)	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation
	Abnormal friction in transfer mech- anism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mecha- nism (27-11-61, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control wheel bearings, gears, upper column bearings, or U-joints	An indication of gears out of adjustment is even racheting during control wheel rotation	Replace bearings or adjust as necessary (AMM 27-31-51, AMM 27-31-181, AMM 27-11-41, Removal/ Installation)
	Abnormal friction in aileron con- trol quadrant shaft bearings or quadrant shaft pressure seal	Disconnect LH body cables AA & BB. Disconnect PCU valve control rods. Rotate control quadrant and check for excessive friction	Replace parts as necessary (27-11-91, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 5)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force to begin aileron movement in one direction with hydraulic power on (Cont)	Abnormal friction in PCU input linkage	Check control rod ends for worn, bent, or broken parts	Replace parts as required (27-11-101, Removal/ Installation)
	Abnormal friction in aileron PCU main control valve		Replace PCU (27-11-71, Removal/ Installation)
Control wheel will not center from both directions with hydraulic power on. Wheel force to begin aileron movement OK	LH body cables AA & AB binding or misaligned, fairleads binding, brackets misaligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
	Roll force transducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as necessary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)
	Centering spring and trim mechanism out of adjustment	Check mechanism per 27-11-81, Adjustment/Test	Adjust mechanism as necessary
	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 6)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Control wheel will not center from one direction with hydraulic power on. Wheel force to begin aileron movement OK	Transfer mechanism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per 27-11-0, Adjustment/Test
	Roll force transducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as necessary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)
	Abnormal friction in transfer mechanism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mechanism (27-11-61, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 7)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force in both directions with hydraulic power on. Wheel force to begin aileron movement OK	LH body cables AA & AB binding or misaligned, fair-leads binding, brackets mis-aligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
	Abnormal friction in transfer mechanism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mechanism (27-11-61, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Roll force trans-ducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as neces-sary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)
	Abnormal friction in Captain's or First Officer's control wheel bearings, gears, upper column bearings, or U-joints	An indication of gears out of adjustment is even racheting during control wheel rotation	Replace bearings or adjust as necessary (AMM 27-31-51, AMM 27-31-181, AMM 27-11-41, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 8)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force in both directions with hydraulic power on. Wheel force to begin aileron movement OK (Cont)	Abnormal friction in PCU input linkage	Check control rod ends for worn, bent, or broken parts	Replace parts as required (27-11-101, Removal/ Installation)
	Abnormal friction in aileron PCU main control valve		Replace PCU (27-11-71, Removal/ Installation)
Excessive control wheel force in one direction with hydraulic power on. Wheel force to begin aileron movement OK	Transfer mecha-nism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per 27-11-0, Adjustment/Test
	Roll force trans-ducer wire bundle binding on Captain's control column	Rotate control wheel full CCW. Check that wire bundle is not tight	Loosen as neces-sary (22-11-111, Roll Control Wheel Steering Force Transducer - Adjustment/Test)
	Abnormal friction in transfer mech-anism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mechanism (27-11-61, Removal/ Installation)
	LH body cables AA & AB binding or misaligned, fair-leads binding, brackets mis-aligned, or foreign object obstruction	Check LH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	LH body cables excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 9)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force in one direction with hydraulic power on. Wheel force to begin aileron movement OK (Cont)	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in PCU input linkage	Check control rod ends for worn, bent, or broken parts	Replace parts as required (27-11-101, Removal/ Installation)
	Abnormal friction in aileron PCU main control valve		Replace PCU (27-11-71, Removal/ Installation)
	Centering spring and trim mecha- nism out of adjustment	Check mechanism per 27-11-81, Adjustment/Test	Adjust mechanism as necessary
	Abnormal friction in aileron con- trol quadrant shaft bearings or quadrant shaft pressure seal	Disconnect LH body cables AA & BB. Disconnect PCU valve control rods. Rotate control quadrant and check for excessive friction	Replace parts as necessary (27-11-91, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 10)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Racheting felt at control wheel with hydraulic power on	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control wheel bearings, gears, upper column bearings, or U-joints	An indication of gears out of adjustment is even racheting during control wheel rotation	Replace bearings or adjust as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in transfer mech- anism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mechanism (27-11-61, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 11)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Binding felt at control wheel with hydraulic power on	Transfer mechanism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per 27-11-0, Adjustment/Test
	Abnormal friction in transfer mechanism lost motion device spoiler control drum bearings	Disconnect aileron spring cartridge in wheel well. With hydraulic power on, rotate control wheel CW and CCW 12 degrees. If control wheel force is less, bearing friction is excessive	Replace aileron transfer mechanism (27-11-61, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control wheel bearings, gears, upper column bearings, or U-joints	An indication of gears out of adjustment is even racheting during control wheel rotation	Replace bearings or adjust as necessary (AMM 27-31-51, AMM 27-31-181, AMM 27-11-41, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column U-joint bearings	An indication of high friction U-joint bearings is intermittent racheting during control wheel rotation	Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)
	Abnormal friction in Captain's or First Officer's control column support bearings		Replace bearings as necessary (AMM 27-31-51, AMM 27-31-181, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 12)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Binding felt at control wheel with hydraulic power on (Cont)	Abnormal friction in PCU input linkage	Check control rod ends for worn, bent, or broken parts	Replace parts as required (27-11-101, Removal/ Installation)
	Abnormal friction in aileron PCU main control valve		Replace PCU (27-11-71, Removal/ Installation)
	Abnormal friction in aileron con- trol quadrant shaft bearings or quadrant shaft pressure seal	Disconnect LH body cables AA & AB. Disconnect PCU valve control rods. Rotate control quadrant and check for excessive friction	Replace parts as necessary (27-11-91, Removal/ Installation)
Slow aileron re- sponse to control wheel input with hydraulic power on	Aileron PCU malfunction or filter plugged	Operate system with hy- draulic system A, then with B to isolate faulty PCU. System B is upper PCU, system A is lower PCU	Replace PCU (27-11-71, Removal/ Installation)
	Aileron bus cables ABSA and ABSB binding or misaligned, fair- leads binding, brackets mis- aligned, or foreign object obstruction	Check bus cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	Aileron bus cables ABSA and ABSB excessive tension	Check cable tension per 27-11-0, Adjustment/Test	Adjust cables as necessary
Autopilot fails system BITE test	Worn rivets in autopilot aileron actuator lever assembly	Hold lever assembly and attempt to rotate at shear rivet area	Remove lever assembly and re- place rivets (Ref OHM 27-09-05)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 13)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive control wheel force with hydraulic power off. With hy- draulic power on OK	Aileron bus cables ABSA and ABSB binding or misaligned, fair- leads binding, brackets misa- ligned, or foreign object obstruction	Check bus cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	RH body cables AA and AB binding or misaligned, fair- leads binding, brackets misa- ligned, or foreign objects obstruction	Check RH body cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	Transfer mecha- nism lost motion device out of adjustment	Check if rig pin A/S-1 can be inserted in base of transfer mechanism	Adjust LH & RH body cables AA & AB per 27-11-0, Adjustment/Test
	Aileron balance panel seals dam- aged or out of adjustment	Check balance panel seals for damage and for correct gap (27-11-31, Removal/ Installation)	Repair, replace, or adjust compo- nents as necessary
	Abnormal friction in spoiler ratio changer input linkage	Disconnect RH body cables AA and AB. Disconnect aileron spring cartridge and ratio changer input rod. Rotate control quadrant and check for excessive friction	Replace parts as necessary (27-61-41, Removal/ Installation)
	Abnormal friction in spoiler mixer or spoiler ratio changer		Replace spoiler mixer or ratio changer (27-61-21, Removal/ Installation)

Aileron and Aileron Trim Troubleshooting Chart
Figure 101 (Sheet 14)

AILERON AND AILERON TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General
   A. Hydraulic systems A and B must be depressurized prior to performing maintenance on aileron control system components. This is to prevent injury to personnel, resulting from inadvertent operation of the control system while maintenance is being performed. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of control surface travel.

      WARNING: PRESSURIZING THE AILERON SYSTEM ALSO ACTIVATES FLAPS, GROUND SPOILERS, FLIGHT SPOILERS, RUDDER, AND ELEVATOR HYDRAULIC SYSTEMS. ISOLATE OR TAG ANY SYSTEM NOT BEING TESTED AND ENSURE ALL CONTROL SURFACES ARE CLEAR OF OBSTRUCTIONS BEFORE APPLYING POWER.

   B. When operating hydraulic system B pumps to pressurize hydraulic systems A and B, the following requirements must be observed:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days, or when fuel temperature is known to be above 90°F (32.2°C), monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5-minute period. Following the fifth start, run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. The following procedure cover pressurization of hydraulic systems B and A through operation of electrical-driven hydraulic system B pumps only. Pressurization of hydraulic systems A and B through operation of engine-driven hydraulic system A pumps is not covered.
2. Aileron Hydraulic Systems A and B Pressurization
   A. Equipment and Materials
      (1) Lock Assembly - Ground F72735
   B. Pressurize aileron hydraulic systems A and B.
      (1) Connect electrical power to airplane.
      (2) Ensure that FLT CONTR circuit breaker on P6 circuit breaker panel is closed.
      (3) Set parking brake and install ground lock assembly in nose gear.
      (4) Position GRD INTERCONNECT switch on forward overhead panel to OPEN.
      (5) Position No. 1 or 2 system B HYD PUMPS switches on the forward overhead panel to ON.

(6) Position FLT CONTROLS A and B switches on forward overhead panel to ON.

NOTE: To pressurize system A or B separately, select system by appropriate positioning of FLT CONTROLS A and B switches.

C. Restore Airplane to Normal

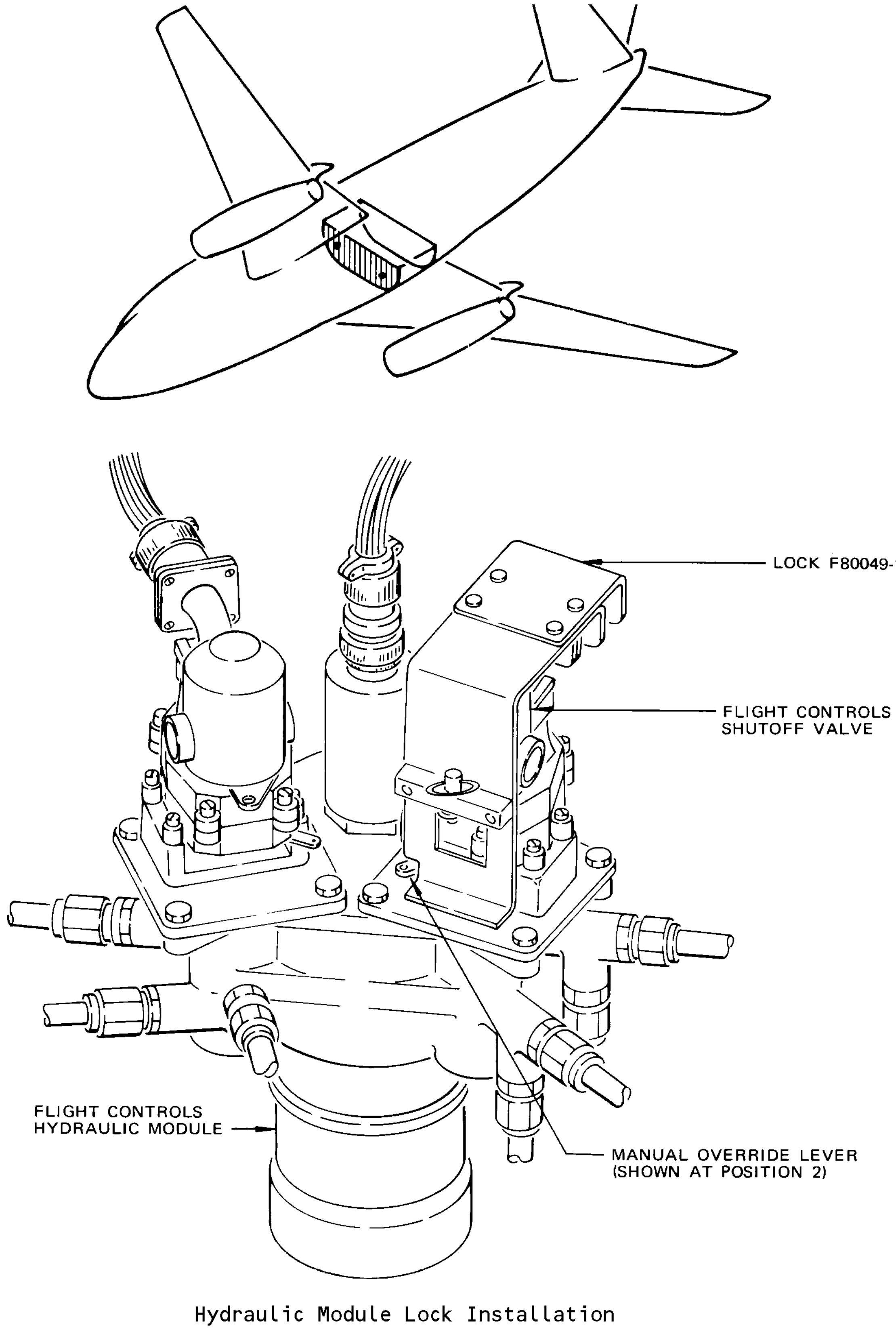
NOTE: Perform the following steps after completing the aileron system maintenance that required pressurization.

(1) Position No. 1 and 2 system B HYD PUMPS switches to OFF.
(2) Position GRD INTERCONNECT switch to CLOSE.
(3) Remove electrical power.
(4) Remove ground lock assembly.

3. Aileron Hydraulic Systems A and B Depressurization

A. Equipment and Materials
(1) Flight Controls - Lock Assembly F80049-12 (Preferred) or F80049-1 (Optional) (2 required)

B. Depressurize aileron hydraulic systems A and B.
(1) Position FLT CONTROLS A and B switches on the forward overhead panel to OFF.
(2) Open all flight control circuit breakers on P6 circuit breaker panel.
(3) Position No. 1 and 2 system B HYD PUMPS switches on forward overhead panel to OFF.
(4) Position GRD INTERCONNECT switch on forward overhead panel to CLOSE.
(5) To dissipate any remaining hydraulic power, cycle rudder pedals.
(6) If any hydraulic connections are to be disturbed, depressurize hydraulic systems A and B reservoirs. Refer to AMM 29-09-300/201, Hydraulic Reservoir Pressurization System.
(7) Install hydraulic module lock (Fig. 201).
(a) Disconnect electrical connector from flight controls shutoff valve at system A flight controls hydraulic module in the left wheel well.
(b) Disconnect electrical connector from flight controls shutoff valve at system B flight controls hydraulic module in right wheel well.
(c) Manually place override lever at both flight controls shutoff valves in position 2.
(d) Install lock on each flight controls shutoff valve and insert attaching lockpins.



Hydraulic Module Lock Installation
Figure 201

C. Restore Airplane to Normal

NOTE: Perform the following steps after completing the aileron system maintenance that required depressurization.

(1) Remove locks from systems A and B flight controls hydraulic module shutoff valves and reconnect electrical connectors.
(2) Position FLT CONTROLS A and B switches on forward overhead panel to ON.
(3) Close all flight control circuit breakers on P6 circuit breaker panel.
(4) Pressurize hydraulic reservoirs as required (AMM 29-09-300).

AILERON AND AILERON TRIM CONTROL SYSTEM - ADJUSTMENT/TEST

1. Aileron and Aileron Trim Control System Adjustment

A. General

(1) Some airplanes have on the aileron control wheels a foil marker calibrated in degrees of control wheel rotation. These foil markers are for flight crew use. Do not use these foil markers when adjusting or testing the aileron control system.

NOTE: Control wheel neutral position for maintenance purposes is determined by rotating the control wheel left and right in decreasing amounts until the neutral position can be determined by feel.

(2) The aileron trim control system must be properly adjusted prior to checking or adjusting the aileron control system.

(3) The aileron and aileron trim control systems are properly adjusted when the following results are obtained: (See Fig. 501 for rigging pin locations and cable tension requirements.)

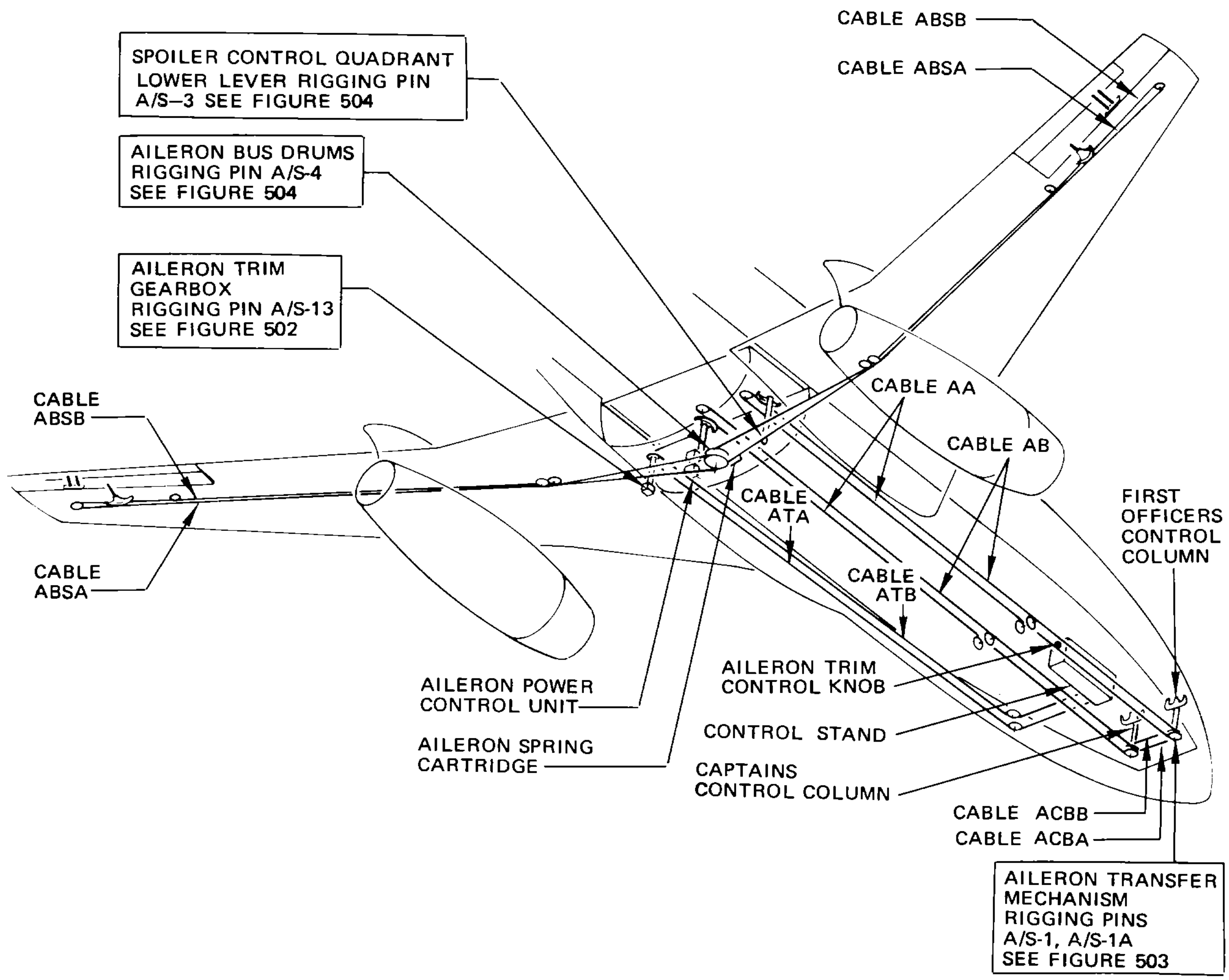
WARNING: ALL FLIGHT CONTROL SYSTEMS ARE FULLY POWERED. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON.

(a) Aileron Trim Cables ATA and ATB

1) With the aileron trim control knob indicator in the zero trim position (Fig. 502), rigging pin A/S-13 shall fit without binding in aileron trim gearbox. Cable tension shall be within limits shown in Fig. 501. If discrepancies exist, adjust the cable turnbuckles in forward cargo compartment as described.

(b) Aileron Control Bus Cables ACBA and ACBB

1) With rigging pin A/S-1A installed and straightedge bearing on the captain's and first officer's control wheel upper ends (Fig. 503), one end of first officer's control wheel may be out of alignment a maximum of 0.20 inch. Cable tension on cables ACBA and ACBB must conform with values shown in Fig. 501. If discrepancies occur, adjust the cables in the lower nose compartment as described.



Aileron System Rigging Pin Location
Figure 501 (Sheet 1)

TABLE I

TEMPERATURE °F (°C) [1]	CABLE TENSION IN POUNDS (NEWTONS)			
	CABLES AA AND AB [2] [4]	CABLES ABSA AND ABSB [2] [4]	CABLES ATA AND ATB [2] [3]	CABLES ACBA AND ACBB [5] [6]
110 (43.3)	133 (591.6)	202 (898.5)	72 (320.3)	93 (413.7)
90 (32.2)	124 (551.5)	184 (818.5)	66 (293.6)	84 (373.7)
70 (21.1)	115 (511.5)	165 (734)	60 (266.9)	75 (333.7)
50 (10)	107 (476)	148 (658.3)	54 (240.2)	70 (311.4)
30 (-1.1)	99 (440.4)	131 (582.7)	48 (213.5)	61 (271.4)
+10 (-12.2)	90 (400.3)	113 (502.6)	42 (186.8)	53 (275.8)
-10 (-23.3)	82 (364.7)	96 (427)	36 (160.1)	49 (218)
-30 (-34.4)	74 (329.2)	77 (342.5)	30 (133.5)	46 (204.6)
-40 (-40)	68 (302.5)	66 (293.6)	27 (120.1)	44 (195.7)

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW MINIMUM OF 1 HOUR AT CONSTANT AMBIENT TEMPERATURE ±5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/-0 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.

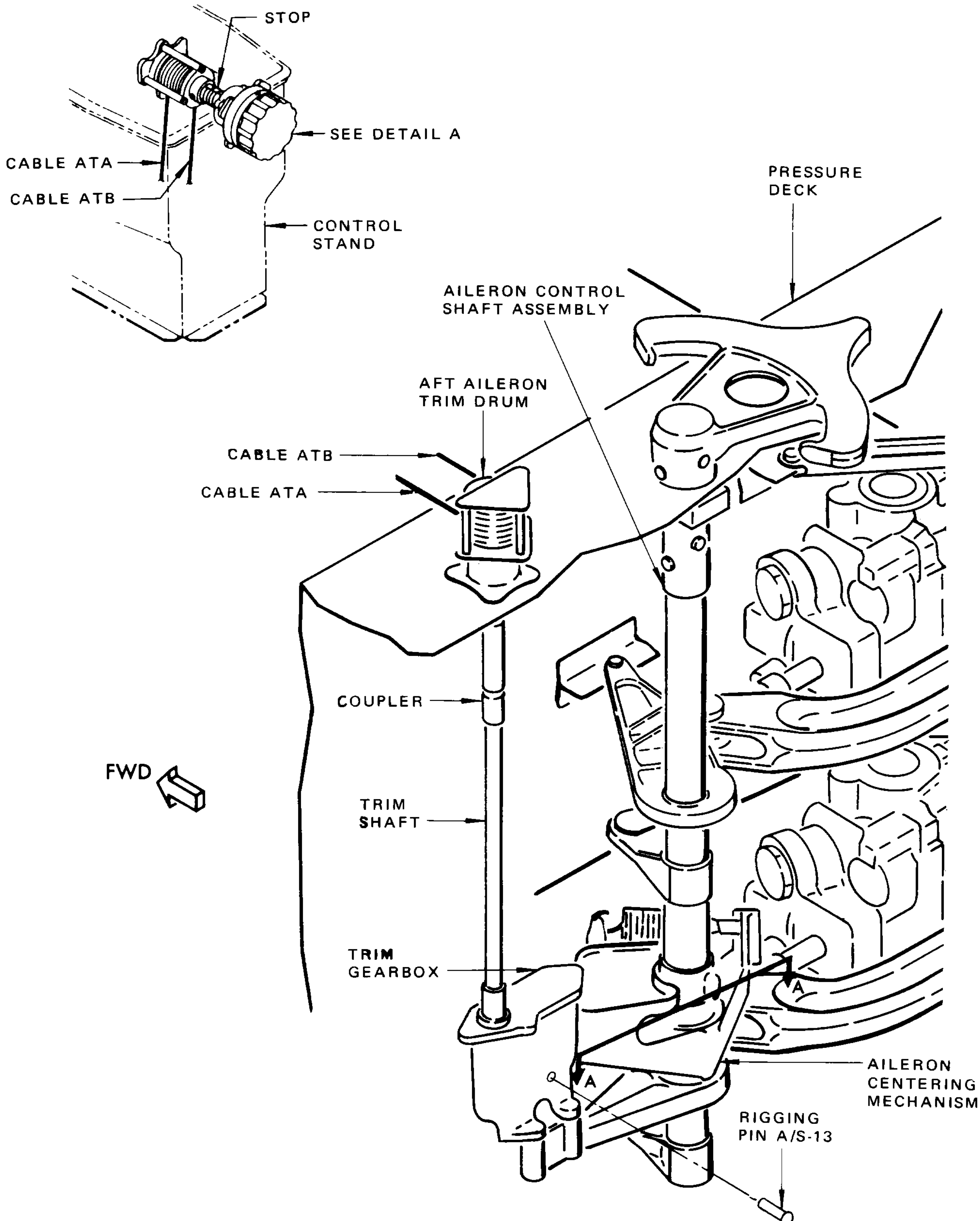
[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-20 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATEE +15/-10 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [2].

[4] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [2].

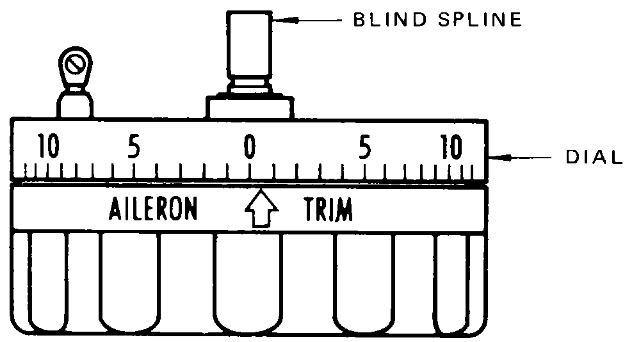
[5] CABLE LOADS MUST BE WITHIN ±15 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.

[6] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [5].

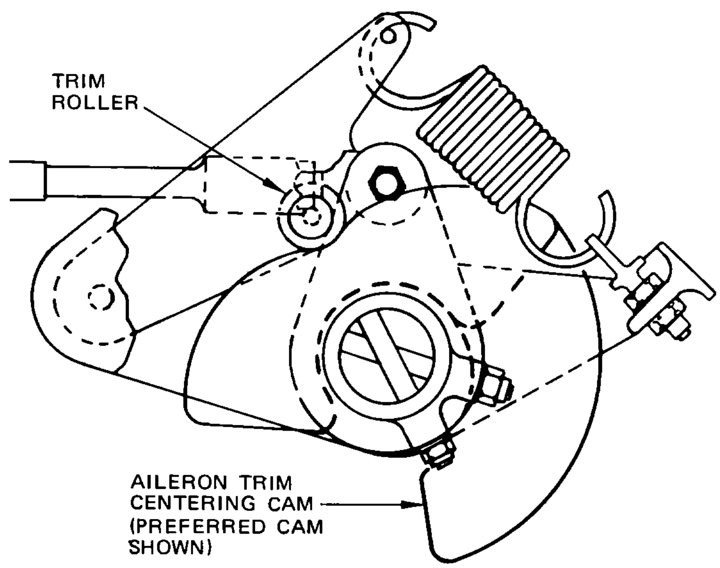
Aileron System Rigging Pin Location
Figure 501 (Sheet 2)



Aileron Trim Control Unit
Figure 502 (Sheet 1)

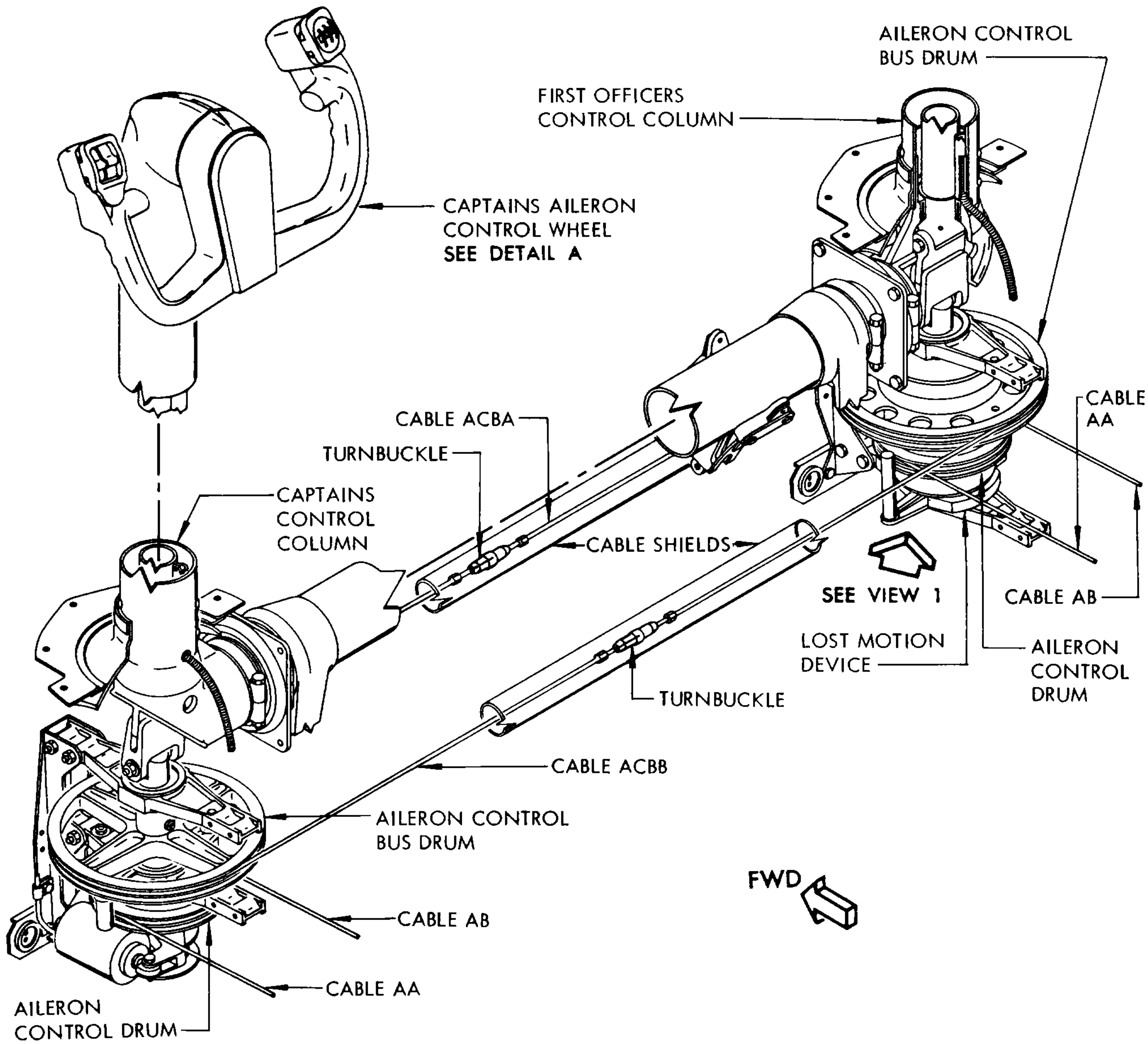


AILERON TRIM CONTROL KNOB
DETAIL A

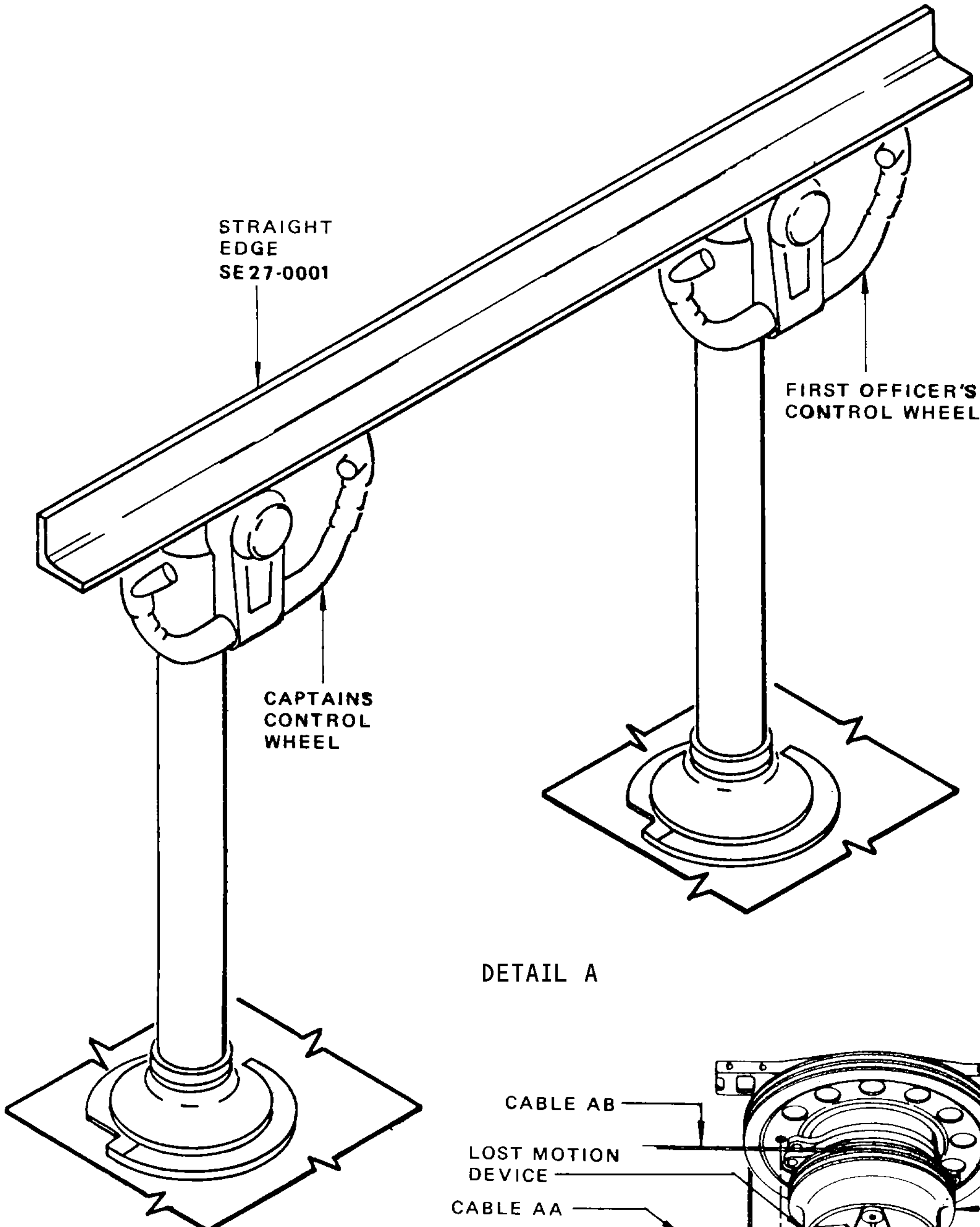


SECTION A-A

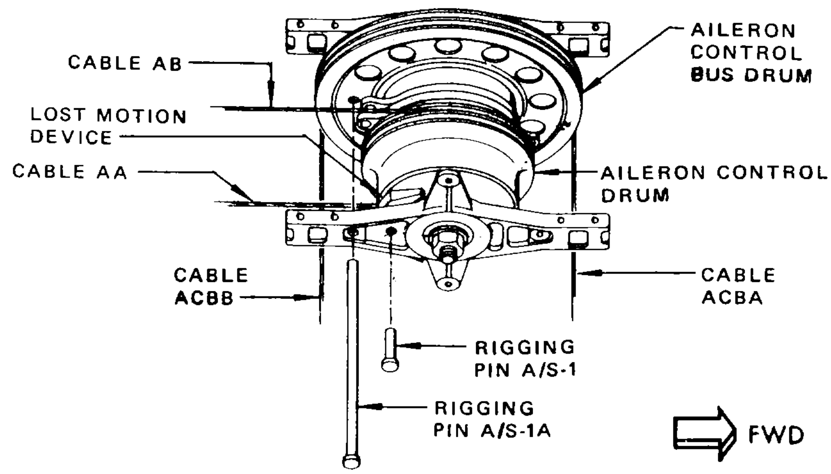
Aileron Trim Control Unit
Figure 502 (Sheet 2)



Aileron Control Wheel Adjustment
Figure 503 (Sheet 1)



DETAIL A



VIEW 1

Aileron Control Wheel Adjustment
Figure 503 (Sheet 2)

(c) Aileron Control Cables AA and AB
1) With rigging pins A/S-1, A/S-1A, and A/S-13 installed, the roller of the aileron trim mechanism should be seated on the cam, and rigging pins A/S-3 shall fit without binding. Cable tension on cables AA, AB (left), AA, AB (right) must conform to values shown in Fig. 501. If discrepancies occur, adjust the cables in the lower nose compartment as described.

(d) Aileron Power Control Unit Valve Rods
1) With aileron trim control wheel in neutral, captain's and first officer's aileron control wheels in neutral, and hydraulic power ON, rigging pin A/S-4 shall fit without binding. If discrepancies exist, adjust power control unit valve rods as described.

(e) Aileron Bus Cables ABSA and ABSB
1) With rigging pin A/S-4 installed, the left and right ailerons shall be in neutral position as defined in Fig. 506. If discrepancies exist, adjust the cables in both wings as described.

(4) Following replacement or reinstallation of an aileron, aileron tab, or aileron tab control rod it is necessary to perform a flight test to determine and correct asymmetrical flight control forces as described.

B. Equipment and Materials
(1) Cable Tensiometer - 0 to 200-pound range
(2) Protractor - Aileron Tab Alignment - F80222-1 which consists of a -2 Protractor Assembly (AMM 27-09-700/201)
(3) Rigging Pins Kit - F70207-84 or -98:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-1	-13	0.309-0.311	2.35 ±0.06	AILERON TRANSFER MECHANISM
A/S-1A	-19	0.309-0.311	8.25 ±0.25	AILERON TRANSFER MECHANISM
A/S-3	-8	0.309-0.311	3.7 ±0.25	SPOILER CONTROL QUADRANT LOWER LEVER
A/S-4	-11	0.309-0.311	6.7 ±0.25	AILERON BUS DRUM
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

NOTE: On all airplanes, upper power control unit is equipped to receive input from autopilot.

On some airplanes lower power control unit is also equipped to receive input from autopilot.

NOTE: If trim is adjusted with both aileron power control units depressurized, the drag of the unpowered aileron system will allow the system to remain out of center. This will force the trim and centering mechanism cam follower out of the cam detent. Then, when hydraulic power is applied, the control wheels and ailerons will rapidly move to the newly trimmed position.

(4) Adjust aileron trim cables ATA and ATB.
  (a) Set aileron trim control knob in zero trim position (Fig. 502).
  (b) Check that rigging pin A/S-13 can be inserted without binding through both walls of aileron trim mechanism gearbox. If rigging pin cannot be inserted freely, accomplish the following steps:
    1) Disconnect coupler from trim shaft by removing nuts, washers and bolts.
    2) Rotate trim shaft to permit insertion of rigging pin A/S-13.
    3) Reconnect trim shaft and coupler.
    4) Remove rigging pin A/S-13.
  (c) Check that cable tension on cables ATA and ATB is within limits shown on Fig. 501.
  (d) If cable tension is not within limits, adjust cables ATA and ATB as follows:
    1) Ensure trim knob indicator is in zero trim position. Tape trim knob to the cockpit control stand (Fig. 502).
    2) Insert rigging pin A/S-13.
    3) Adjust cables to tension specified (Fig. 501).
    4) Remove tape from trim knob.

5) Remove rigging pin A/S-13.
6) Rotate aileron trim knob through maximum travel for several cycles.
7) Check that cable tension is within range specified (Fig. 501) and tension in cables ATA and ATB is balanced.
8) Install rigging pin A/S-13 and check that trim knob indicator is in zero trim position.
9) Install turnbuckle locking clips.

(5) Adjust aileron control bus cables ACBA and ACBB.
(a) Open lower nose compartment access door 1103.
(b) Position captain's and first officer's aileron control wheels in neutral by placing a straightedge across upper ends of each control wheel (Fig. 501). One end of first officer's control wheel may be out of contact with the straightedge by a maximum of 0.20 inch.
(c) Check that cable tension in ACBA and ACBB cables is within limits specified (Fig. 501) as follows:
1) Remove bolts securing aileron bus control cable shield clamps to support brackets and remove shields (Fig. 503).
2) Check cable tension with cable tensiometer.
3) Reinstall cable shields and clamps.
(d) If conditions of steps (b) or (c) cannot be obtained, proceed as follows:
1) If installed, remove bolts securing aileron bus control cable shield clamps to support brackets and remove shields.
2) Insert rigging pin A/S-1A in base of first officer's aileron control wheel.

NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

3) Adjust cables ACBA and ACBB to meet conditions in step (d), and tension specified (Fig. 501).
4) Remove rigging pin A/S-1A. Pin should withdraw freely.
5) Center control wheels and check that control wheels upper ends contact straightedge. One end of first officer's control wheel may be out of contact with straightedge a maximum of 0.20 inch.
6) Install turnbuckle locking clips.

7) Install cable shields and clamps.

(6) Adjust aileron control cables AA and AB.

(a) Remove all rigging pins.

(b) Place control wheels in neutral by clamping a straightedge across upper ends of both control wheels. One end of first officer's control wheel may be out of contact by a maximum of 0.20 inch.

(c) Ensure that aileron trim knob indicator is in zero trim position and that trim roller is properly detented against cam.

(d) Tension right and left AA and AB cables to values specified (Fig. 501).

NOTE: The aileron trim pointers (located on the top of both control wheels) must align with the zero indication on the aileron trim scales (located at the top of each control column) to ± 0.02 inch. Replace pointer if needed.

(e) Remove straightedge from control wheels.

(f) Rotate aileron control wheel through several cycles.

(g) Insert rigging pins A/S-1, A/S-1A, A/S-3 and A/S-13.

(h) Check that tension in right and left AA and AB cables is within values specified (Fig. 501).

(i) Install turnbuckle locking clips.

(j) Remove all rigging pins.

(7) Adjust aileron spring cartridge.

WARNING: HYDRAULIC SYSTEMS MUST NOT BE PRESSURIZED DURING THIS ADJUSTMENT AS INJURY TO PERSONNEL MAY OCCUR.

(a) Install rigging pins A/S-3 and A/S-4 (Fig. 504).

(b) Remove cotter pin, nut and washer from bolt which retains lock end of spring cartridge.

(c) Check bolt which retains lock end of spring cartridge for freedom of movement without binding.

(d) If bolt is found to be binding, adjust spring cartridge as follows:

1) Remove bolt and loosen locknut.

2) Rotate spring cartridge rod end as necessary to insert bolt without binding.

3) Tighten locknut to 10-20 pound-inches.

4) Ensure that antirotation fork and drain holes are down.

5) Install bolt and secure with washer, nut and cotter pin.

(e) Remove rigging pins A/S-3 and A/S-4.

(8) Adjust aileron power control unit valve rods.
  (a) Position aileron control wheels in neutral position by placing a straightedge across the upper ends of the control wheels (Fig. 503). Position aileron trim control knob in zero trim position. Insert rigging pin A/S-13. Ensure that trim roller is properly seated against cam detent.
  (b) Ensure that hydraulic systems A and B are not pressurized.
  (c) Insert rigging pin A/S-4 (Fig. 504).
  (d) Check that valve lever on each power control unit is centered between stops (Fig. 505).

CAUTION: DO NOT REMOVE VALVE LEVER WITH POWER CONTROL UNIT INSTALLED IN AIRPLANE, AS DAMAGE TO COMPONENTS MAY OCCUR.

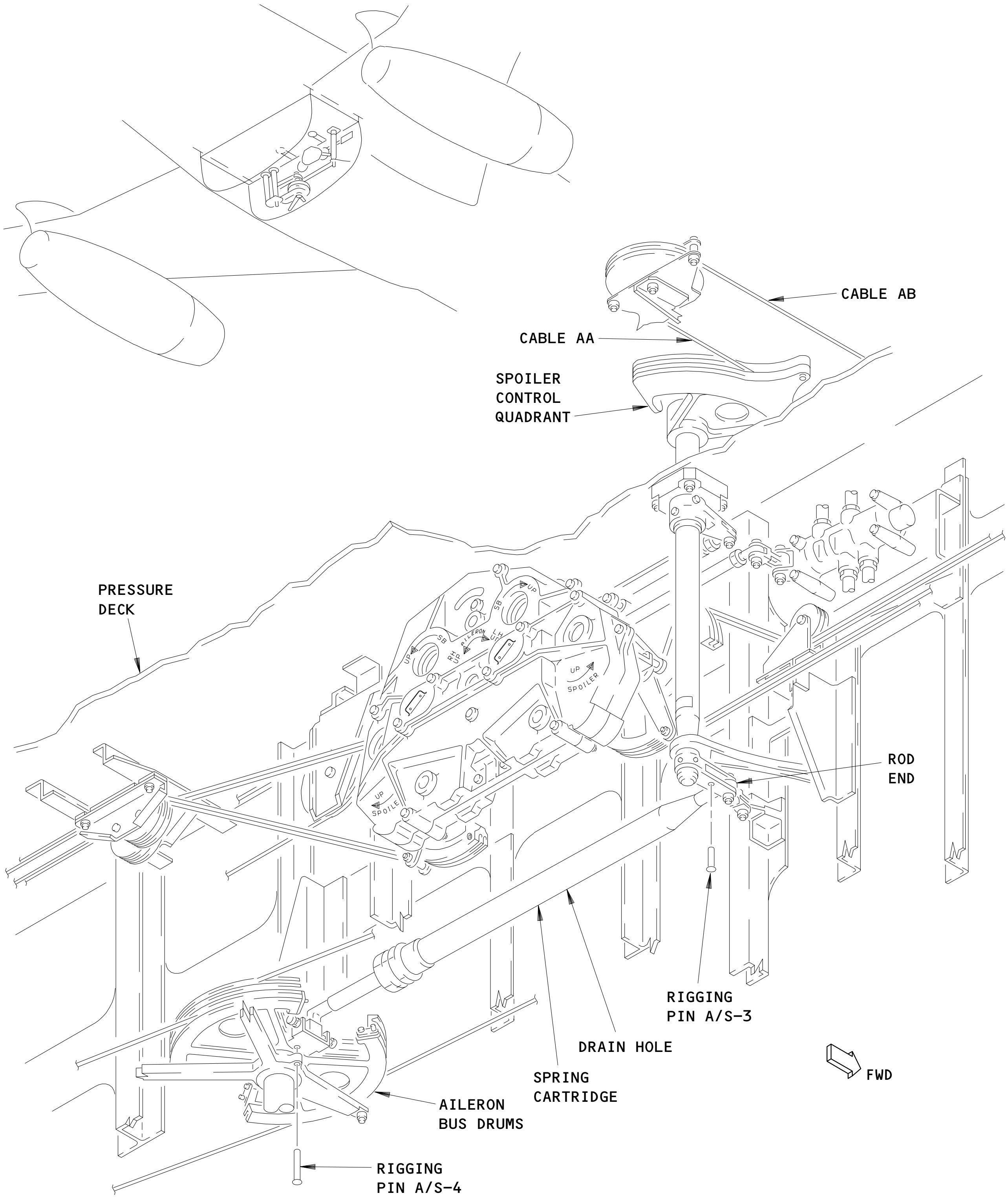
  (e) If valve levers are not centered between stops, proceed as follows:

WARNING: DO NOT REMOVE POWER CONTROL UNITS OR RELATED LINKAGES WITH HYDRAULIC POWER ON, AS INJURY TO PERSONNEL MAY OCCUR.

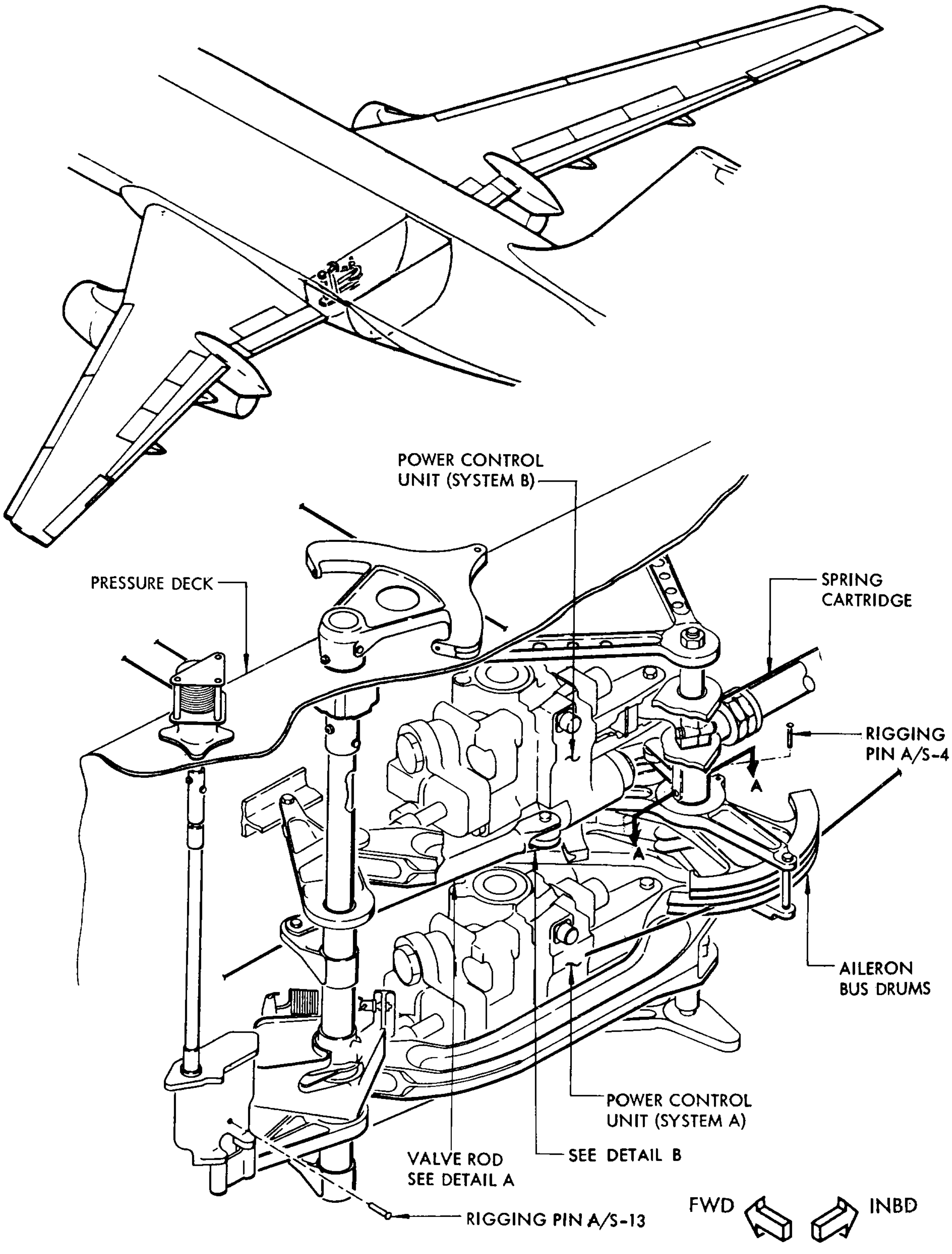
    1) Loosen two locknuts on valve rod and rotate adjusting sleeve (Fig. 505) to center valve lever between stops (Fig. 505).

NOTE: Whenever a valve rod is being replaced, rod should be trial adjusted to meet dimensions specified in Fig. 505.

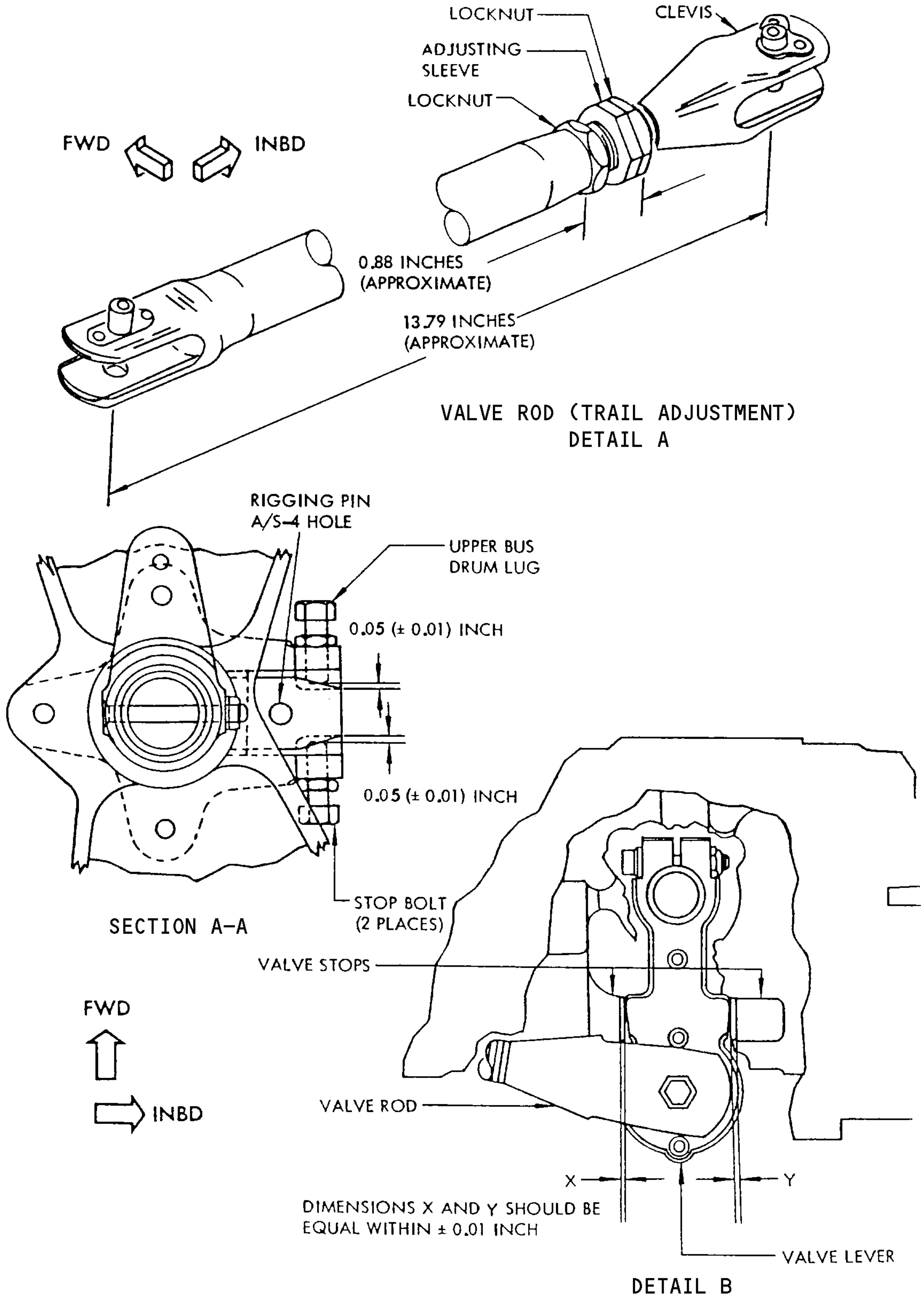
    2) Remove rigging pin A/S-4.
  (f) Provide systems A and B hydraulic power (AMM 27-11-0/201, Aileron and Aileron Control System).
  (g) Position flight controls system A switch to ON and flight controls system B switch to OFF.
  (h) Check that rigging pin A/S-4 fits freely in lower bus drum, if not:
    1) Remove rigging pin A/S-4.



Spring Cartridge Adjustment
Figure 504



Aileron Power Control Unit Adjustment
Figure 505 (Sheet 1)



Aileron Power Control Unit Adjustment
Figure 505 (Sheet 2)

2) Loosen two locknuts on valve rod for lower aileron power unit and rotate adjusting sleeve so that rigging pin A/S-4 will fit.

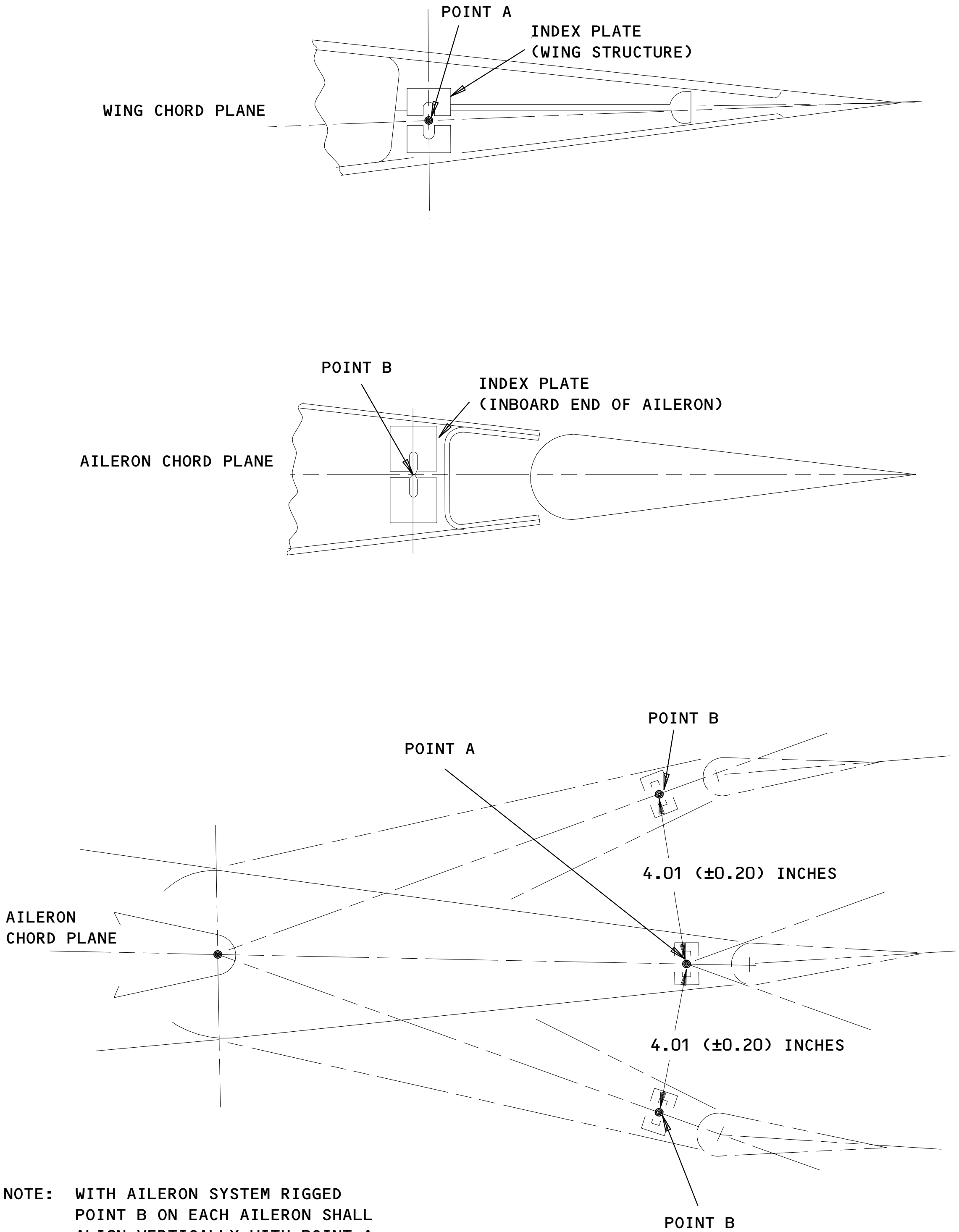
<u>CAUTION</u>: DO NOT INSERT RIGGING PIN A/S-4 WHEN ADJUSTING VALVE ROD, AS DAMAGE TO COMPONENTS MAY OCCUR.

(i) Position flight controls system A switch to OFF, and flight controls system B switch to ON.
(j) Check that rigging pin A/S-4 fits freely in upper bus drum, if not:
  1) Remove rigging pin A/S-4.
  2) Loosen two locknuts on valve rod for upper aileron power unit and rotate adjusting sleeve so that rigging pin A/S-4 will fit.

<u>CAUTION</u>: DO NOT INSERT RIGGING PIN A/S-4 WHEN ADJUSTING VALVE ROD, AS DAMAGE TO COMPONENTS MAY OCCUR.

(k) Position flight controls systems A and B switches to ON.
(l) Check that rigging pin A/S-4 fits freely through both bus drums and gaps between upper bus drum lug and stop bolts on lower drum are within limits (Fig. 505).
(m) If required, slight adjustment of valve rods and adjustments of stop bolts may be accomplished to meet conditions in step (l).
(n) Remove systems A and B hydraulic power (AMM 27-11-0/201).
(o) Tighten valve rod locknuts and install lockwire.
(p) Tighten stop bolt locknuts and install lockwire.
(q) Remove rigging pins A/S-4 and A/S-13.
(r) Remove straightedge from control wheels.

(9) Adjust aileron control bus cables ABSA and ABSB.
(a) Install rigging pin A/S-4 (Fig. 504).
(b) Check that left and right ailerons are in neutral position within 0.03 inch as shown in Fig. 506.
(c) Check that cable tension on cables ABSA and ABSB on left and right wings is within values specified in Fig. 501.
(d) If tension and/or aileron neutral position is not within limits, proceed as follows:
  1) Adjust turnbuckles for each bus cable to permit positioning of ailerons to specified neutral position.
  2) Adjust cables to specified tension as shown in Fig. 501.
  3) Install turnbuckle locking clips.
(e) Check that aileron outboard trailing edge is below wing trailing edge 0.08 to 0.48 inch.
(f) Remove rigging pin A/S-4.



NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN (±0.03) INCHES.

Aileron Deflection Diagram
Figure 506

(10) Adjust aileron tab.

<u>WARNING</u>: HYDRAULIC SYSTEMS MUST NOT BE PRESSURIZED DURING THIS ADJUSTMENT, AS INJURY TO PERSONNEL MAY OCCUR.

<u>NOTE</u>: A flight test to determine and correct asymmetrical flight control forces must be performed following adjustment of the aileron tab control rods.

(a) With index mark on aileron aligned with index mark on wing within 0.03 inch, check mismatch between aileron trailing edge and aileron tab trailing edge. Using a straightedge or aileron tab alignment protractor, measure mismatch from trailing edge of tab to theoretical extension of aileron bottom surface, at three locations. Record measurement for later addition.
  1) Take measurement 0.5 inch in from inboard end of tab. Check that tab trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.
  2) Take measurement 3.75 ±0.25 inches in from outboard end of tab. Check that tab trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.
  3) Take measurement at midpoint along tab. Check that tab trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.

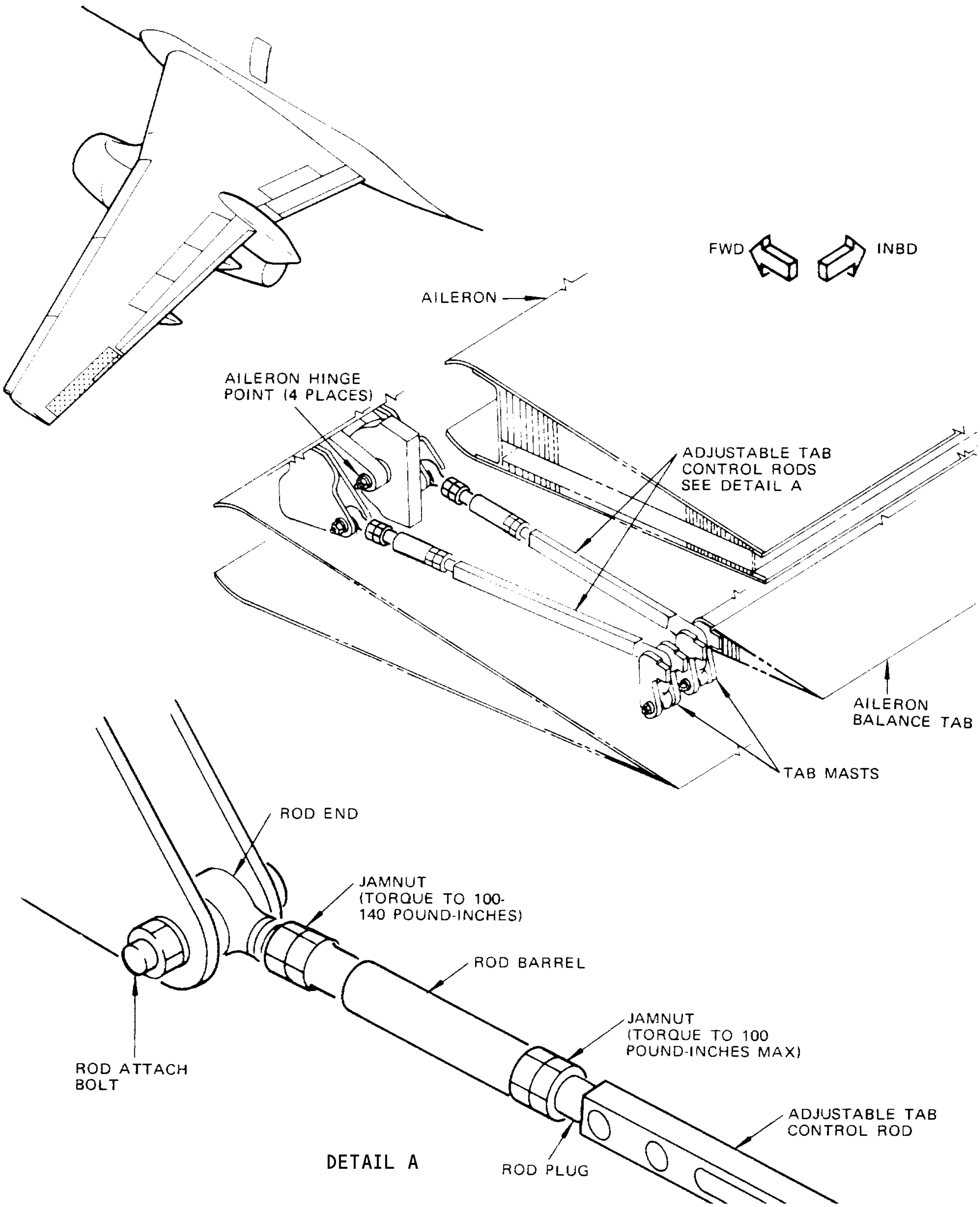
(b) Sum up dimensions taken and recorded in step (a). Sum must be between +0.12 and -0.30 inch.

(c) Aileron balance tabs are repositioned relative to aileron by changing lengths of aileron tab control rods. These rods are shortened or lengthened in tab sets, a tab set being the two control rods which operate each individual tab. Shorten rods to lower tab trailing edge or lengthen rods to raise trailing edge as follows:

Adjustable Rod Barrel Turns	Tab Trailing Edge Change
1	0.027 inch
2	0.054 inch
3	0.081 inch
4	0.108 inch

(d) Shorten or lengthen adjustable aileron tab control rods as follows:
   1) Note amount and direction of required adjustment of tab trailing edge relative to the aileron. Take measurements at trailing edge back of tab rod attachment.
   2) Remove bolts attaching tab rods to forward fittings (Fig. 507).
   3) Remove aileron tab hinge bolts and remove tab and rods from aileron.
   4) Loosen jamnuts on tab rod being careful not to reposition rod end or rod barrel.
   5) Turn the rod barrel the required number of turns being careful to restrain the rod and rod end angularly.
   6) Check that witness holes in barrel are covered. Tighten jamnuts 100-140 pound-inches for the smaller jamnut and 100 pound-inches (maximum) for the larger jamnut. Lockwire jamnuts.
   7) Reinstall tab and rods on aileron. Attach bolts for tab rods must be inserted with fingers only to ensure there is no binding between rod and bolt or deflection of rods. Readjust length of rod if binding or deflection occurs.

(11) Check aileron control system rigging as follows:
   (a) Provide systems A and B hydraulic power (AMM 27-11-0/201).
   (b) Ensure flight controls systems A and B switches are on.
   (c) Ensure that aileron trim knob indicator is in zero trim position. Check that trim roller is properly seated against cam detent.
   (d) Center aileron control wheels by gently moving control wheel within backlash band. The center of this band is control wheels neutral position.
   (e) Check that rigging pins A/S-1, A/S-1A, A/S-3, A/S-4 and A/S-13 may be inserted and removed without binding.
   (f) Check that ailerons align with index marks on wing structure per Fig. 506.



Tab Control Linkage
Figure 507

(g) Check that motion gaps between upper bus drum lug and stop bolts on lower drum are within limits (Fig. 505).
(h) If installed, check that index mark on control wheel hub aligns with zero on control column marker.
(i) Rotate control wheel through several cycles and check that aileron spring cartridge is not compressing and is free from binding.

(12) Test aileron and aileron trim control system.
(13) Return airplane to normal configuration.
(a) Remove systems A and B hydraulic power (AMM 27-11-0/201).
(b) Remove electrical power, if no longer required.
(c) Close access panels and doors.

2. Aileron and Aileron Trim Control System Test

A. General

(1) The following tests of the aileron and aileron trim control systems cover the measurement of residual system friction, operation of transfer mechanism, measurement of aileron deflection, and test of autopilot authority.
(2) Prior to initiating the test, carefully check all accessible mechanical components for condition and security.

B. Equipment and Materials

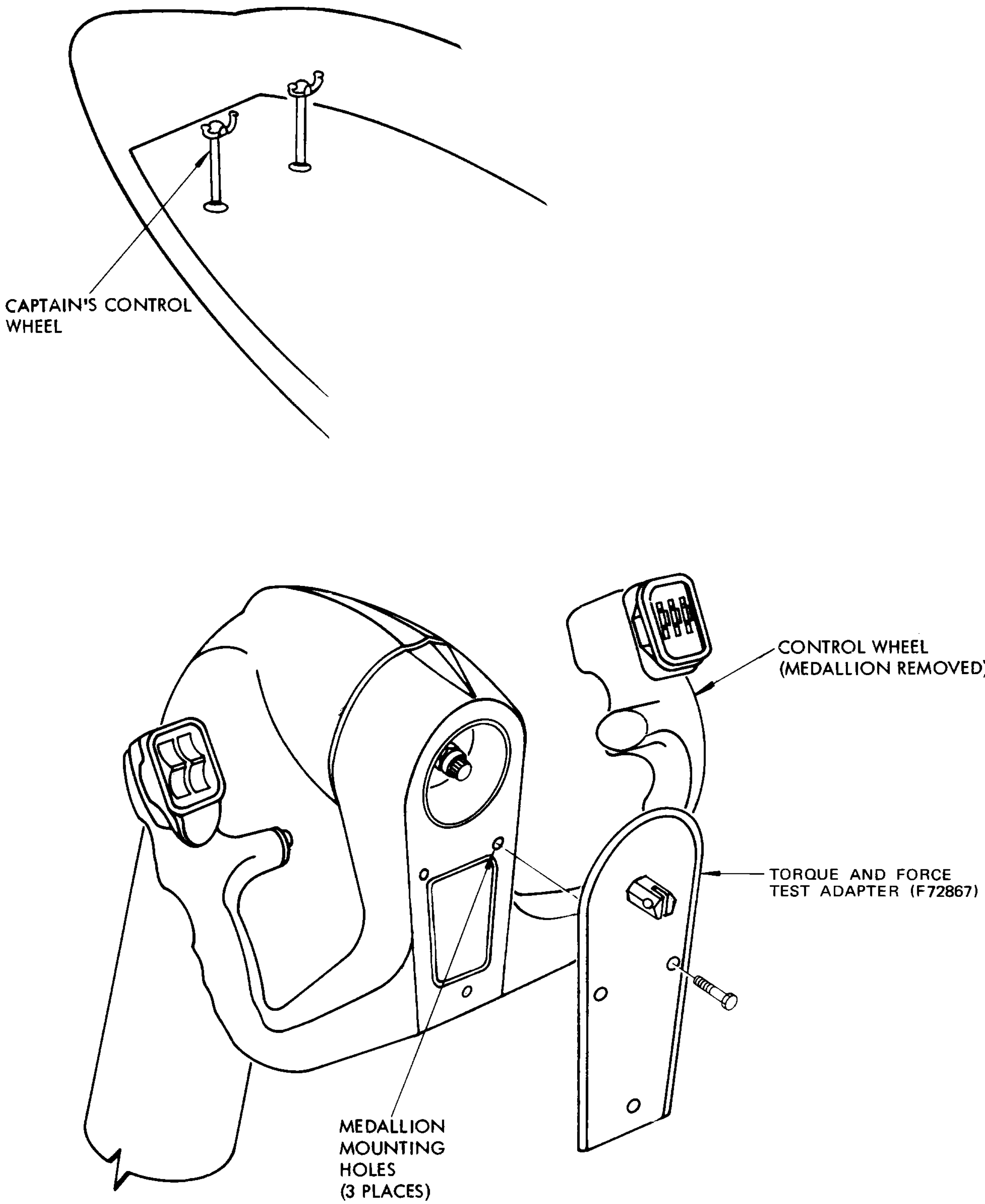
(1) Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
(a) Aileron Control Wheel Protractor Mount - F72790
(b) Forward Thrust Lever Protractor Adapter - F72952-2
(2) Spring Scale - capacity 0 to 150 pounds
(3) Rudder Trim Knob Torque Adapter - SE27-2011 (Preferred) or SE27-2008 (Optional)

NOTE: SE27-2008 Adapter may still be used if it adequately grips the currently used trim knobs.

(4) Voltmeter - General Purpose VTVM
(5) Control Wheel Torque and Force Test Adapter - F72867-1
(6) Protractor - Aileron Tab Alignment - F80222-1 which consists of a -2 protractor assembly (AMM 27-09-700/201)

C. Prepare Aileron and Aileron Trim Control System for Test

(1) Install protractor and protractor mount on first officer's aileron control wheel.
(2) Remove aileron control wheel medallion and install control wheel torque and force test adapter tool (Fig. 508).
(3) Set aileron trim control knob in zero trim position.



Control Wheel Torque and Force Test Adapter
Figure 508

(4) The outboard trailing edge flaps must be properly adjusted, or must be extended 1 to 5 degrees to eliminate possible deflection of point A (Fig. 506) on the wing structure (AMM 27-51-0, Trailing Edge Flap System).

(5) Make sure hydraulic systems A and B are depressurized (AMM 27-11-0/201).

D. Test Aileron and Aileron Trim Control System

(1) Check for control wheel and control column binding.

(a) Move column repeatedly fore and aft between stops and simultaneously move control wheel repeatedly left and right between stops.

(b) Hold control wheel left against stop and move control column fore and aft between stops.

(c) Hold control wheel right against stop and move control column fore and aft between stops.

(d) Hold control column full forward and move control wheel left and right between stops.

(e) Hold control column full aft and move control wheel left and right between stops.

(2) Using torque wrench and control wheel torque and force test adapter tool, measure force required to manually rotate captain's aileron control wheel clockwise and counterclockwise from neutral. If tool is not available, apply force tangentially to captain's control wheel at 6.5-inch radius.

(a) The force required to begin clockwise rotation shall not exceed 192 pound-inches torque or 29.5 pounds.

(b) Rotate control wheel clockwise to 20 degrees. Measured force shall not exceed 220 pound-inches torque or 33.8 pounds.

(c) Continue clockwise rotation to 40 degrees. Measured force shall not exceed 256 pound-inches torque or 39.4 pounds.

(d) Continue clockwise rotation to 75 degrees. Measured force shall not exceed 310 pound-inches torque or 47.7 pounds.

(e) Repeat steps (a) thru (d) in a counterclockwise direction.

(3) Measure first officer's aileron control wheel for lost motion in clockwise and counterclockwise direction from neutral.

(a) Install rigging pin A/S-3 (Fig. 504).

(b) Rotate first officer's control wheel and check right AA and AB cables for initial movement. As initial movement occurs, the control wheel shall have rotated 12 ±1 degrees from neutral.

NOTE: The aileron control drum on the first officer's control column may be used to determine when the lost motion device has reached its stop (Fig. 503).

At approximately 6 degrees of control wheel travel from neutral position, the aileron power control unit slide valve bottoms out and considerably more force is required to turn the control wheel. This is normal and test is to be performed with hydraulic system depressurized.

(c) Remove rigging pin A/S-3.

(4) Measure corresponding movement of captain's and first officer's aileron control wheels.
(a) Rotate captain's aileron control wheel clockwise through full travel.
(b) Check that first officer's and captain's aileron control wheels have rotated a minimum of 105 degrees clockwise.
(c) Repeat procedure in counterclockwise direction from neutral.

(5) Measure relationship of aileron control wheel movement as compared with aileron surface deflection (for static conditions).

NOTE: All measurements are made with the wing trailing edge flaps extended one to five units. No airload condition is necessary for you to get the specified surface deflection.

(a) Pressurize hydraulic systems A and B (AMM 27-11-0/201).
(b) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.
(c) Check that left aileron moves up and right aileron moves down within limits specified in Fig. 506.
(d) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.
(e) Check that left aileron moves down and right aileron moves up within limits specified in Fig. 506.
(f) Release pressure from hydraulic systems A and B (AMM 27-11-0/201).

(6) With index mark on aileron aligned with index mark on wing within 0.03 inch, check mismatch between aileron trailing edge and aileron tab trailing edge. Using straightedge or aileron tab alignment protractor, measure mismatch from trailing edge of tab to theoretical extension of aileron bottom surface at three locations. Record all measurements for later addition. If trailing edge of tab is above theoretical extension of aileron bottom surface, measurement is recorded as a plus (+) dimension. If trailing edge of tab is below theoretical extension of aileron bottom surface, measurement is recorded as a minus (-) dimension.
   (a) Take measurement 0.5 inch in from inboard end of tab. Check that tab trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.
   (b) Take measurement 3.75 ±0.25 inch in from outboard end of tab. Check that trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.
   (c) Take measurement at midpoint along tab. Check that trailing edge aligns with an extension of aileron bottom surface within requirements shown on Fig. 510. Record measurement.

(7) Sum up dimension taken and recorded. Add plus sign dimensions and subtract minus sign dimensions when determining sum. Sum must be between +0.30 and -0.12 inch.

(8) Using straightedge or aileron tab alignment protractor, measure each aileron tab deflection. Take measurement from any point along trailing edge of tab to theoretical extension of aileron bottom surface.
   (a) Manually move aileron 3.81 inches down from index mark on wing. Check that tab moves up 1.25 ±0.07 inches.
   (b) Manually move aileron 3.81 inches up from index mark on wing. Check that tab moves down 1.25 ±0.07 inches.

(9) Provide systems A and B hydraulic power (AMM 27-11-0/201).

(10) Measure effect of power control units.
   (a) With hydraulic systems pressurized, and aileron trim knob in zero position, measure force required to rotate either control wheel clockwise until ailerons begin to move. Force required shall not exceed 29.25 pound-inches torque or 4.5 pounds.
   (b) Continue rotating control wheel to 5 degrees from neutral position. Force required shall not exceed 35.75 pound-inches torque or 5.5 pounds.
   (c) Continue rotating control wheel to 20 degrees from neutral position. Force required shall not exceed 55.25 pound-inches torque or 8.5 pounds.

(d) Continue rotating control wheel clockwise to 40 degrees from neutral position. Force required shall not exceed 87.75 pound-inches torque or 13.5 pounds.
(e) Continue rotating control wheel clockwise to 75 degrees from neutral. Force required shall not exceed 120.25 pound-inches torque or 18.5 pounds.
(f) Release control wheel from 75-degree clockwise direction. Control wheel should return to neutral position within ± 1 degree.
(g) Repeat steps (a) thru (f) in counterclockwise direction.
(h) Position flight controls switch B off and operate control wheel slowly through full range of aileron travel. Check system for smooth operation. Make sure balance tabs operate in opposite direction of aileron movement.
(i) Position flight controls switch A off and switch B on and repeat step (h).
(j) Position flight controls switches A and B on and repeat step (h).

(11) Measure effect of aileron trim knob operation.

NOTE: All measurements are to be made with wing trailing edge flap extended one to five units.

(a) Operate aileron trim knob clockwise to the 10-unit position.
(b) Measure movement of captain's and first officer's aileron control wheels from neutral (zero trim) position. Assist control wheels, as necessary, to new neutral position. Check that control wheel position is 60 ±3 degrees clockwise from original neutral position.

NOTE: Control wheel neutral position for maintenance purposes is determined by rotating the control wheel left and right in decreasing amounts until the neutral position can be determined by feel.

(c) Check that left aileron moves down 3.00 ±0.14 inches.
(d) Check that right aileron moves up 3.00 ±0.14 inches.
(e) Measure force required to rotate aileron control wheel 75 degrees counterclockwise. Force should not exceed 137 pound-inches torque or 21 pounds.
(f) Release aileron control wheel from 75-degree counterclockwise position. Check that control wheel returns to 60 ±3 degrees clockwise position.
(g) Operate aileron trim knob counterclockwise to the 10-unit position.

(h) Measure movement of captain's and first officer's aileron control wheels from neutral position. Control wheels should have rotated 60 ±3 degrees counterclockwise.
(i) Check that left aileron moves up 3.00 ±0.14 inches.
(j) Check that right aileron moves down 3.00 ±0.14 inches.
(k) Measure force required to rotate aileron control wheel 75 degrees clockwise. Force should not exceed 137 pound-inches torque or 21 pounds.
(l) Release aileron control wheel from 75-degree clockwise position. Check that control wheel returns to 60 ±3 degrees counterclockwise position.
(m) Place aileron trim control knob in zero trim position and install rudder trim knob torque adapter on knob.
(n) Measure force required to rotate knob clockwise until stop is contacted, then counterclockwise until opposite stop is contacted, and then back to zero trim position. Force to rotate knob through full travel should not exceed 15 pound-inches torque.
(o) Remove rudder trim knob torque adapter.

(12) Measure force required to operate transfer mechanism.
(a) Hold first officer's aileron control wheel rigid in neutral position.
(b) Rotate captain's aileron control wheel in clockwise direction from neutral.
(c) Force required to initially rotate captain's control wheel from neutral position shall not exceed 436 pound-inches torque or 67 pounds.
(d) Continue to rotate control wheel from neutral through 75 degrees of travel. Force required at this point shall not exceed 676 pound-inches torque or 104 pounds.
(e) Observe, during rotation of control wheel, that the spring cartridge is compressing and is free from binding.
(f) Repeat steps (a) thru (e) for movement of captain's aileron control wheel in counterclockwise direction from neutral.

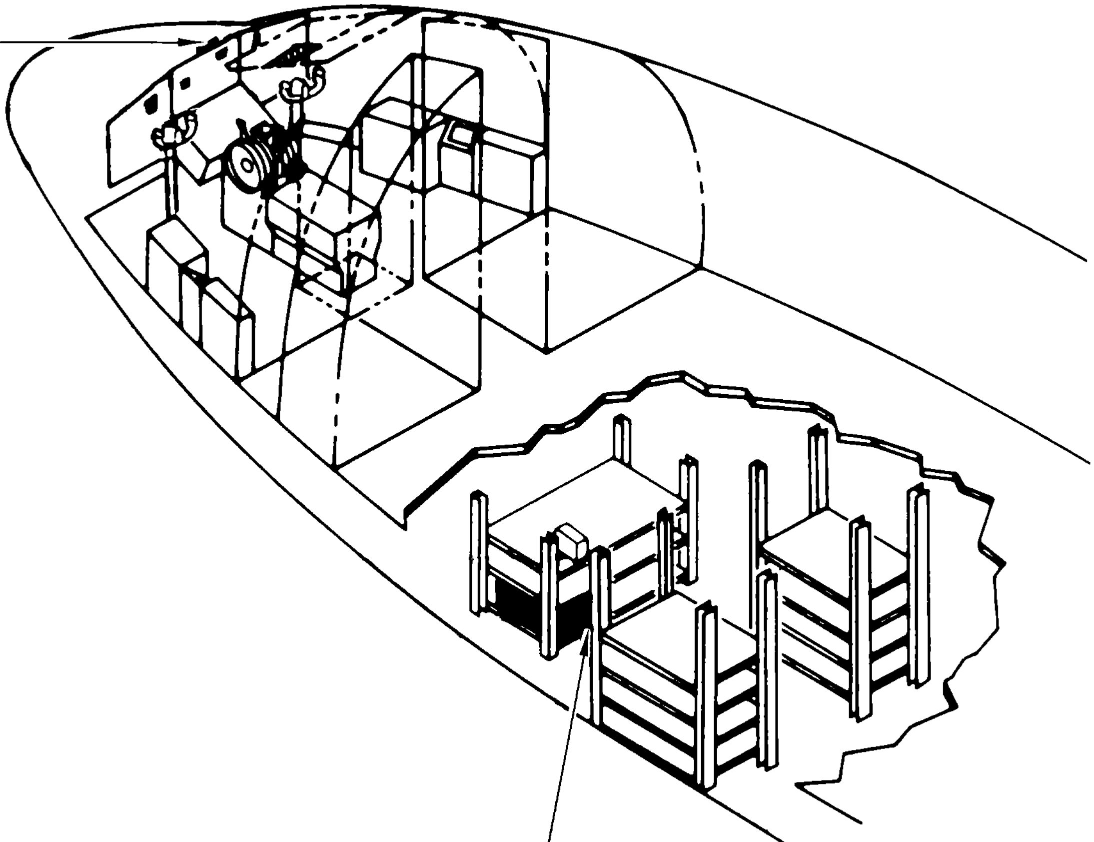
<u>NOTE</u>: Captain's aileron control wheel shall return to neutral within ± 1 degree when released from either direction.

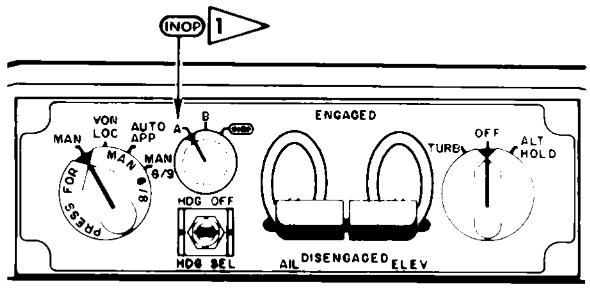
(13) Check operation of transfer mechanism.
(a) On airplanes with 65-54200-4 or 65-54200-5 transfer mechanism assembly:
1) With aileron trim knob in rigged position, hold first officer's aileron control wheel in neutral position.
2) Rotate captain's control wheel 100 to 110 degrees in clockwise direction from neutral and return to neutral.

3) Observe, during rotation of control wheel, that there is no binding or other evidence of roughness in the transfer mechanism.
4) Repeat steps 1), 2), and 3) for movement of captain's aileron control wheel in counterclockwise direction from neutral.

(b) On airplanes with all transfer mechanism assemblies EXCEPT 65-54200-4 and -5:
1) With first officer's control wheel held at 80 degrees in clockwise direction from neutral, rotate captain's control wheel in counterclockwise direction until the transfer mechanism stops are contacted.
2) Check that captain's control wheel has rotated 138 degrees minimum (incremental travel from restrained position).
3) Observe, during rotation of control wheel, that there is no binding or other evidence of roughness in the transfer mechanism.
4) Repeat steps 1), 2), and 3) for movement of captain's control wheel in clockwise direction with first officer's control wheel held at 80 degrees in counterclockwise direction from neutral.
5) With first officer's control wheel held at 80 degrees in clockwise direction from neutral, rotate captain's control wheel 130 degrees in counterclockwise direction (incremental travel from restrained position).
6) Force required to rotate captain's control wheel shall not exceed 800 pound-inches torque or 123 pounds.
7) Repeat steps 5) and 6) for movement of captain's control wheel in clockwise direction with first officer's control wheel held at 80 degrees in counterclockwise direction from neutral.
8) Release pressure from hydraulic systems A and B (AMM 27-11-0/201).

(14) Test autopilot authority.
(a) Ensure that entire roll channel of autopilot system is operational (AMM Chapter 22).
(b) Remove all hydraulic power (AMM 27-11-0/201).
(c) Connect voltmeter to test points TP 3 and TP 4 on the front panel of the autopilot roll control channel (Fig. 509) to measure Linear Variable Displacement Transducer (LVDT) output.
(d) Set autopilot system select switch on glare shield to B.
(e) Ensure right aileron is in rigged position with Point B on aileron index plate aligning vertically with Point A on wing index plate within ± 0.03 inch (Fig. 506).





DETAIL A

1 DECAL INSTALLED ON AIRPLANES WITH B AUTOPILOT MODE ONLY

Autopilot Control Component Location
Figure 509

467282

(f) Position right aileron to obtain best null. Record LVDT output voltage. Check that voltage is less than 0.175 volt when index plates (Fig. 506) are aligned vertically within ± 0.12 inch.
(g) Position right aileron by hand in up position to 1.16 ±0.12 inches (airplanes with 4.12 inches full travel) or 1.01 ±0.10 inches (airplanes with 4.01 inches full travel) between Points A and B.
(h) Record LVDT output voltage.
(i) Check that algebraic sum of voltages obtained in steps (f) and (h) equals +5.0 ±0.50 volts.
(j) Position right aileron by hand in down position to 1.16 ±0.12 inches (airplanes with 4.12 inches full travel) or 1.01 ±0.10 inches (airplanes with 4.01 inches full travel) between Points A and B.
(k) Record LVDT output voltage.
(l) Check that algebraic sum of voltages obtained in steps (f) and (k) equals -5.0 ±0.50 volts.
(m) On airplanes with dual autopilot modes (no INOP decal on autopilot system select switch on glare shield), position switch to A and repeat steps (e) thru (l) with left aileron.

E. Return Airplane to Normal
(1) Turn off systems A and B hydraulic power (AMM 27-11-0/201).
(2) If no longer required, remove electrical power from airplane.
(3) Remove control surface protractor and protractor mount from aileron control wheel.
(4) Remove torque wrench adapter from aileron control wheel.
(5) Replace aileron control wheel medallion.

3. Operational Test - Control Wheel and Control Column

A. General
(1) This test is to check for binding of the control wheel and control column at extreme positions. The cause of the resistance was interference between the control column fitting and the fork in the aileron bus drum. The interference is caused by the buildup of tolerances in the assemblies.

B. Procedure
(1) Do a check for full range of surface travel and for free movement of control column and control wheel. Do the steps that follow:
(a) Move the control column in the longitudinal direction between the stops. At the same time, move the control wheel left and right between the stops.
(b) Make sure the elevators and ailerons move smoothly through their full range of travel.

(c) Hold the control wheel left (counterclockwise from the neutral position)against the stop, and do the steps that follow:
   1) Make sure the trailing edges of the left aileron moves fully up and the aileron tab moves down.
   2) Make sure the trailing edges of the right aileron moves fully down and the aileron tab moves up.

(d) Move the control column in the longitudinal direction between the stops and make sure the elevators move smoothly through their full range of travel.

(e) Hold the control wheel right (clockwise from the neutral position) against the stop, and do the steps that follow:
   1) Make sure the trailing edges of the left aileron moves fully down and the aileron tab moves up.
   2) Make sure the trailing edges of the right aileron moves fully up and the aileron tab moves down.

(f) Move the control column in the longitudinal direction between the stops and make sure the elevators move smoothly through their full range of travel.

(g) Hold the control column full forward and do the steps that follow:
   1) Turn the control wheel to to the full right (clockwise) position.
      a) Make sure that there is no interference when the control wheel is moved between the stops.

         NOTE: If interference is found, examine for interference between the fork assembly and the control column housing. If necessary, make changes to, or replace, the fork assembly in the aileron control drum or the aileron transfer mechanism.

   2) Turn the control wheel to the full left (counterclockwise) position.
      a) Make sure that there is no interference when the control wheel is moved between the stops.

         NOTE: If interference is found, examine for interference between the fork assembly and the control column housing. If necessary, make changes to, or replace, the fork assembly in the aileron control drum or the aileron transfer mechanism.

   3) Return the control wheel to the neutral position.
   4) Make sure the elevators are in the full down position.

(h) Move the control wheel left and right between the stops and make sure the ailerons move smoothly through their full range of travel.

(i) Hold the control column full aft and do the steps that follow:

1) Turn the control wheel to to the full right (clockwise) position.

a) Make sure that there is no interference when the control wheel is moved between the stops.

NOTE: If interference is found, examine for interference between the fork assembly and the control column housing. If necessary, make changes to, or replace, the fork assembly in the aileron control drum or the aileron transfer mechanism.

2) Turn the control wheel to the full left (counterclockwise) position.

a) Make sure that there is no interference when the control wheel is moved between the stops.

NOTE: If interference is found, examine for interference between the fork assembly and the control column housing. If necessary, make changes to, or replace, the fork assembly in the aileron control drum or the aileron transfer mechanism.

3) Return the control wheel to the neutral position.

4) Make sure the elevators are in the full up position.

(j) Move the control wheel left and right between the stops and make sure the ailerons move smoothly through their fuel range of travel.

4. Flight Test to Determine and Correct Asymmetrical Flight Control Forces

A. General

NOTE: This flight test is only to be performed following replacement or reinstallation of an aileron, aileron tab, or aileron tab control rods.

(1) An aileron system flight test is necessary after the maintenance procedures that follow:

(a) Installation of a replacement aileron.

(b) Installation of an aileron which was on-jig rebalanced (refer to SRM Chapter 51, for maintenance actions which require aileron on-jig rebalancing).

(c) Removal or replacement of the aileron front spar hinge bearing nearest the tab control rods.
(d) Installation of a replacement hinge aileron front spar bearing support fitting.

NOTE: Installation of new aileron hinge bearings (except the one nearest the tab control rods) does not make a flight test necessary if the original bearing support fittings are installed in their original locations.

(e) Installation of a replacement aileron rear spar tab hinge bearing support fitting.

NOTE: Installation of new tab hinge bearings does not make a flight test necessary if the original bearing support fittings are installed in their original locations.

(f) Installation of a replacement tab or a repaired tab having a non-flush surface patch.
(g) Installation of a replacement aileron tab front spar hinge.
(h) Installation of replacement bushings on the aileron tab front spar hinge nearest the tab control rods.
(i) Installation of replacement tab control rods.

NOTE: For each aileron tab, if both control rods are adjusted (AMM 27-11-11/401), then flight test is necessary. If only one rod is adjusted and you can verify that the remaining rod has not been replaced or adjusted since the last flight test, then flight test is not necessary. If only one rod is adjusted and you can not verify that the remaining rod has not been replaced or adjusted since the last flight test, then flight test is necessary.

(j) Installation of the original tab control rods if their adjusted lengths were changed.

NOTE: Installation of the original tab control rods does not make a flight test necessary if their adjusted length was not changed and they are installed in their original locations.

(k) Installation of the original tab control rods if the aileron and/or tab were also removed from the airplane.

B. Flight Test Procedure

(1) Equipment and Materials

(a) Push-Pull Scale - 0-50 Pound Capacity (suitably padded to push down on control wheel handgrip knob)

(2) Prepare for Test

(a) In order for the flight test to yield valid data, it is necessary that trim requirements be held to certain limits. Therefore, appropriate system or systems should be readjusted prior to flight test if any of following conditions are known to exist:

1) Aileron trim requirement more than 3/4 unit
2) Rudder trim requirement more than 1/2 unit

(3) Test for Asymmetrical Flight Control Forces

(a) The airplane should be tested under the following straight and level flight conditions:

1) Indicated Airspeed: 250 knots
2) Altitude: 5000 feet above ground level or higher
3) EPR and N1 equal for both engines
4) Wing fuel loads equal
5) Aileron trim requirement 3/4 unit or less
6) Rudder trim requirement 1/2 unit or less
7) Flaps up
8) All personnel seated

(b) After the above flight conditions have occurred, center the control wheel and position spoiler switches A and B to OFF.

(c) Position flight control switch B to ON and A to OFF in that order.

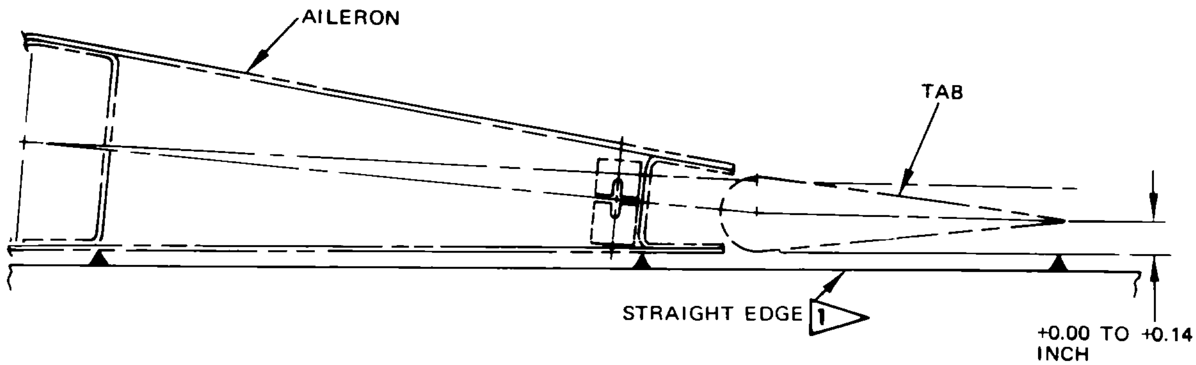
NOTE: Airplane may pitch up or pitch down during the transition.

1) Carefully move elevators, ailerons, and rudder.
2) Make sure that control forces and responses do not change.

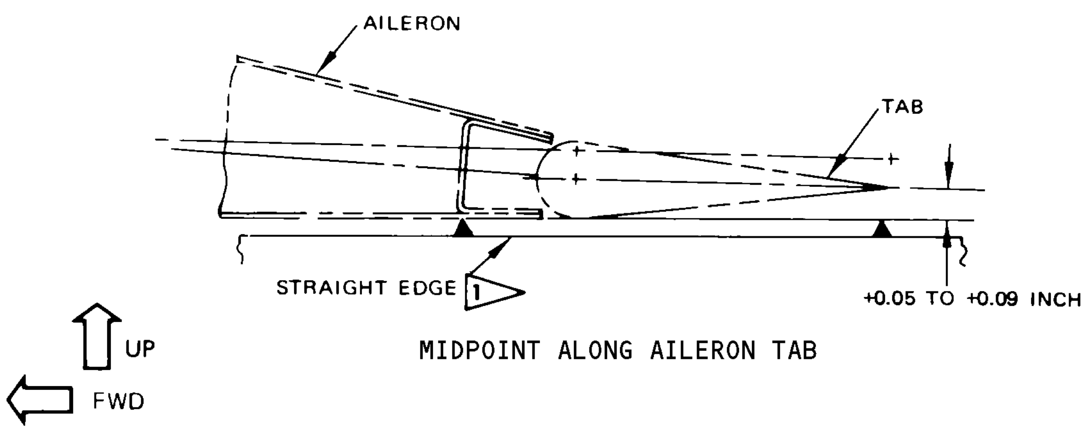
(d) Position flight control switch A to ON and B to OFF in that order.

NOTE: Airplane may pitchup or pitchdown during the transition.

1) Carefully move elevators, ailerons, and rudder.
2) Make sure that control forces and responses do not change.



0.5 INCH FROM INBOARD END OF AILERON TAB
3.75 INCH FROM OUTBOARD END OF AILERON TAB



MIDPOINT ALONG AILERON TAB

1 STRAIGHTEDGE SHOWN, USE OF AILERON TAB ALIGNMENT PROTRACTOR – F80222-1 SIMILAR

Aileron Tab Alignment
Figure 510

(e) Position flight control switch B to STBY RUD and A to OFF in that order. Do the following.

NOTE: Airplane may pitchup or pitchdown during the transition.

1) Check that the airplane pitchup or pitchdown does not exceed three turns of the stabilizer trim wheel. If this value is exceeded, do the following:
   a) Make sure that the Mach trim actuator has been correctly nulled; and that the rigging of the elevator control pushrods, elevator power control unit input rod, the elevator feel and centering unit output rod are correct (AMM 27-31-0/501).
   b) If the rigging checks are satisfactory, then verify that the elevator tab position measuring tool calibration is correct. You do this by verifying that a straight line across the two support pads on the tool projects to a point that is 0.22 inch below the reference point to which the elevator tab is to be aligned.
   c) If the rigging tool calibration is correct then do the adjustment "Adjust the elevator tab pushrods after the flight test" (AMM 27-31-0/501).
2) Trim the airplane using the rudder to keep heading with wing level.
3) Make sure that rudder trim does not change more than 1-1/2 units. If the trim changes by more than 1-1/2 units, do as follows:
   a) Adjust the standby rudder system (AMM 27-21-00/501, "Adjust the input rod of the standby rudder actuator").
   b) If the standby rudder is in adjustment, do a check of the aileron tab adjustment (AMM 27-11-00/501).
4) Monitor any roll tendency. Turn control wheel 30 degrees right and 30 degrees left. If wheel forces are symmetrical, or if not symmetrical only a small quantity, aileron tab rod adjustment is satisfactory. But if forces are not symmetrical at 2 to 1 or more, it is necessary to measure and record forces as follows:
   a) Use a push-pull scale to push down on control wheel handgrip knobs, moving wheel 30 degrees right and 30 degrees left. Record values.
   b) After these measurements, set the spoiler A and B switches and flight control A and B switches back ON.

(f) Repeat step (e), except with B in OFF and A in STBY RUD.
(g) This completes flight test.

C. Tab Control Rod Adjustment

(1) General

(a) If the values obtained above are asymmetrically greater than a 2 to 1 ratio, the aileron control tabs must be repositioned relative to the aileron. The control tabs are repositioned by changing lengths of the tab control rods (Fig. 510).

(2) Adjust tab control rods.

NOTE: You can verify that the adjustments have been accomplished correctly by performing an additional flight test, although one is not necessary.

(a) Depressurize hydraulic systems A and B (AMM 27-11-0/201).

(b) Adjust tab control rods. Refer to Aileron Tab Adjustment to equalize lateral manual reversion forces (AMM 27-09-400/501).

AILERONS - REMOVAL/INSTALLATION

1. General
   A. For interchangeability of graphite/composite ailerons with aluminum/fiberglass ailerons, refer to AMM 27-09-800.
   B. The aileron assembly consists of an aileron, balance tab, and balance panel. The balance tab is balanced by adding a specified number of adjust weights to balance panel. These weights are painted international orange and are installed on lower surface of balance panel hinge. The specific number of weights required for static balancing is marked on balance tab data plate (Fig. 401).
   C. The replacement of a spare aileron may be accomplished using the old balance tab and balance panel. However, the number of adjust weights for balance tab must correspond with the data etched on tab data plate.
2. Equipment and Materials
   A. Straightedge - 6 inches long
   B. Spring Scale - graduated from 0 to 20 pounds
   C. Grease - BMS 3-24 (AMM 20-30-21)
   D. Sealant - BMS 5-95
   E. Primer - BMS 10-11, Type I (AMM 20-30-41)
   F. Enamel - BMS 10-11, Type II
   G. Rigging Pins Kit - F7027-3, -52, -61, or -84:
   H. Bonding Meter - Microhm Bridge, Type 2
   I. Bonding Meter - 477W Antron Meter, Antron Manufacturing, Inc., Cleveland, Ohio

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309 - 0.311	6.7 ±0.25	AILERON BUS DRUM

3. Remove Aileron
   A. Remove four aileron access panels located on lower wing surface adjacent to leading edge of the aileron (Fig. 406).

B. Remove aft balance panel seal retaining bolts and retaining strip (Fig. 402).
C. Remove hinge pin retainer bolt, and extract hinge pins from aft balance panel hinge.
D. Remove aileron hinge access panels (Fig. 406) at four hinge locations.
E. Lift aileron trailing edge up and remove control rod attach bolt (Fig. 404).
F. Disconnect balance tab pushrods (Fig. 401) from wing hinge fitting.
G. Disconnect bonding jumpers at number 1 and 4 hinge locations.
H. Support aileron.
I. Remove cotter pins and nuts from hinge bolts at four hinge locations and remove hinge bolts.
J. Remove aileron from wing.

<u>NOTE</u>: The aileron, balance tab and balance panel weigh approximately 75 pounds as an assembly. The aileron alone weighs approximately 63 pounds.

K. If old balance tab is to be used, remove balance tab from old aileron (AMM 27-11-21/401).

4. <u>Install Aileron</u>
A. Check wear on aileron (Ref Aileron - Inspection/Check).
B. If required, attach balance tab to new aileron (AMM 27-11-21/401).

<u>NOTE</u>: When attaching balance tab to aileron, it may be necessary to adjust forward portion of tab fairing by loosening three attachment screws and shifting its position to provide clearance with aileron fairing at all tab positions.

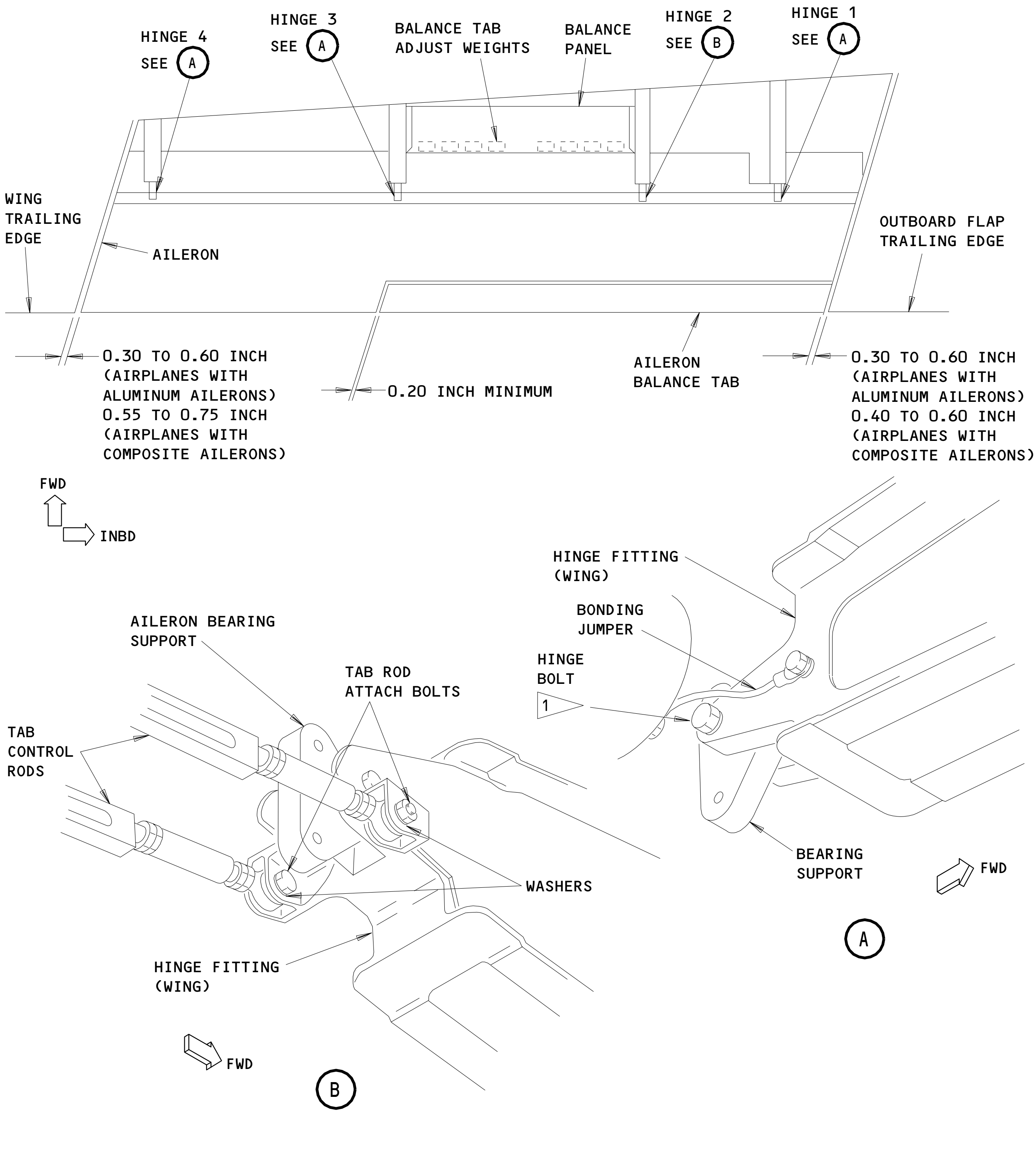
C. Check data plate on balance tab to ensure correct number of tab adjust weights are installed on lower surface of balance panel. Remove or add weights as required. Install bolts in holes not required for weight attachment.
D. Coat aileron hinge bolts and bearing inside diameters with grease.
E. Place aileron in mounting position and align hinges with support fittings.

F. Install hinge bolts with washer under bolthead at hinge locations 2, 3, and 4. Position boltheads as shown in Fig. 401.
G. Secure hinge bolts with washer and nut at hinge locations 2, 3, and 4.
H. Tighten nut 10 to 20 pound-inches.
I. Install cotter pins at hinge bolt locations 2, 3, and 4.
J. Install hinge bolt with washer under bolthead at hinge location 1. Position bolthead as shown in Fig. 401.
K. Secure hinge bolt with washer and nut at hinge location 1 and tighten 100 to 140 pound-inches.
L. Install cotter pin at hinge bolt location 1.
M. Lift aileron to align aft balance panel hinge, install hinge pin and hinge pin retainer (Fig. 401).
N. Install balance panel hinge seal, retaining strip, and bolts.
O. Connect tab pushrods (Fig. 401) to hinge fitting by installing two attach bolts, washers and nuts.
P. Connect bonding jumpers in a manner to avoid interference with moving parts with the steps that follow:
   (1) Clean surface to give electrical bonding.
   (2) Fillet seal fastener and bonding jumper end with sealant.
   (3) Apply primer plus enamel to exposed bare metal not covered by faying surface.
   (4) Make sure the total resistance across the bond is no more than 0.001 ohm.
Q. Using a spring scale, determine hinge friction forces required to rotate the aileron a minimum of 0.67 inch up and down through neutral (zero) position. Aileron travel is measured using index plates shown on Fig. 403. All forces are to be measured at a point 12 inches aft of hinge centerline on each aileron.

   NOTE: The aileron pressure must be applied very slowly and smoothly to prevent erroneous readings resulting from inertia.

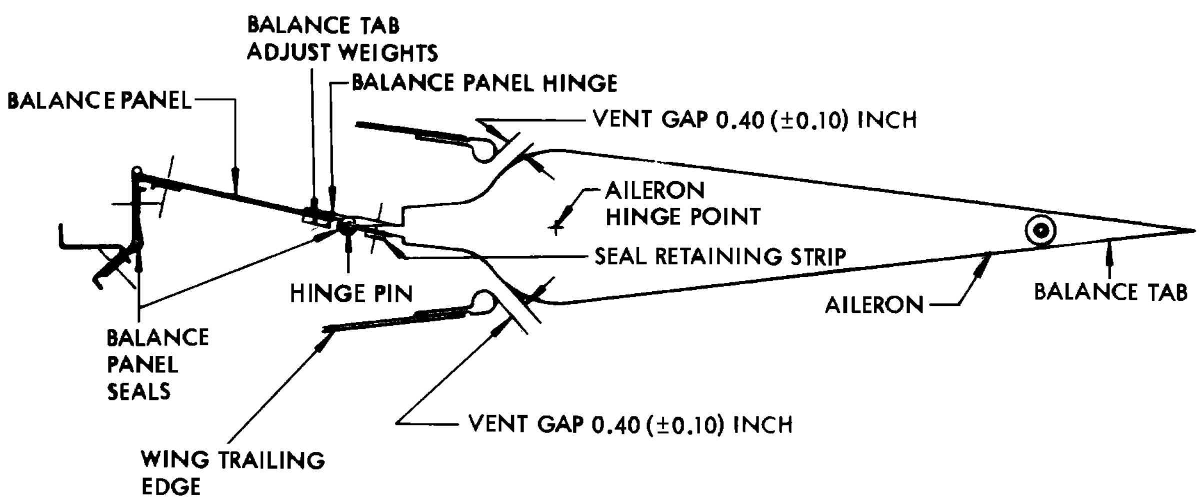
R. Record forces required to move each aileron through neutral position as positive, and forces required to restrain aileron from moving through neutral position as negative.
S. Add forces with similar signs and subtract forces with different signs. Results must not exceed 5 pounds.

   NOTE: If specified result exceeds 5 pounds, the aileron is binding at the hinge attachment points. Ensure all hinge bolts are adequately lubricated and check that hinge bolt torque values are as specified.



1 INSTALL BOLT HEADS OUTBOARD FOR HINGES 2, 3 AND 4. INSTALL BOLT HEAD INBOARD FOR HINGE 1

Aileron Installation
Figure 401



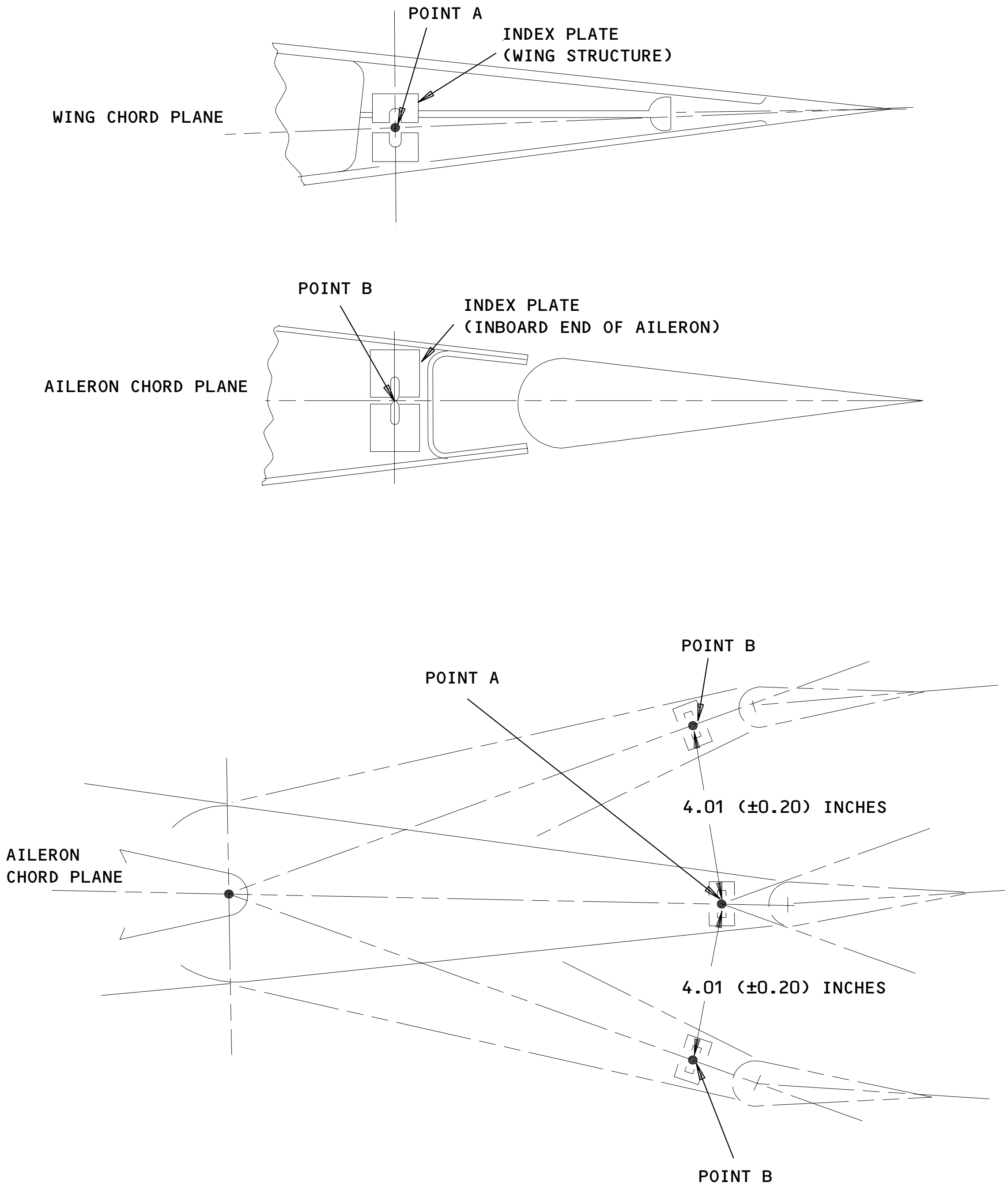
Aileron Balance Panels and Seals
Figure 402

T. Using spring scale, measure force required to move each aileron from neutral position through full travel in each direction, then back to neutral. Apply force perpendicular to aileron chord plane at a point 12 inches aft of aileron hinge centerline. Travel shall be smooth and without binding. Maximum force required shall not exceed 3 pounds up and 13 pounds down.

NOTE: Full travel is not necessarily to the structural stops but rather to the distances shown in Fig. 403.

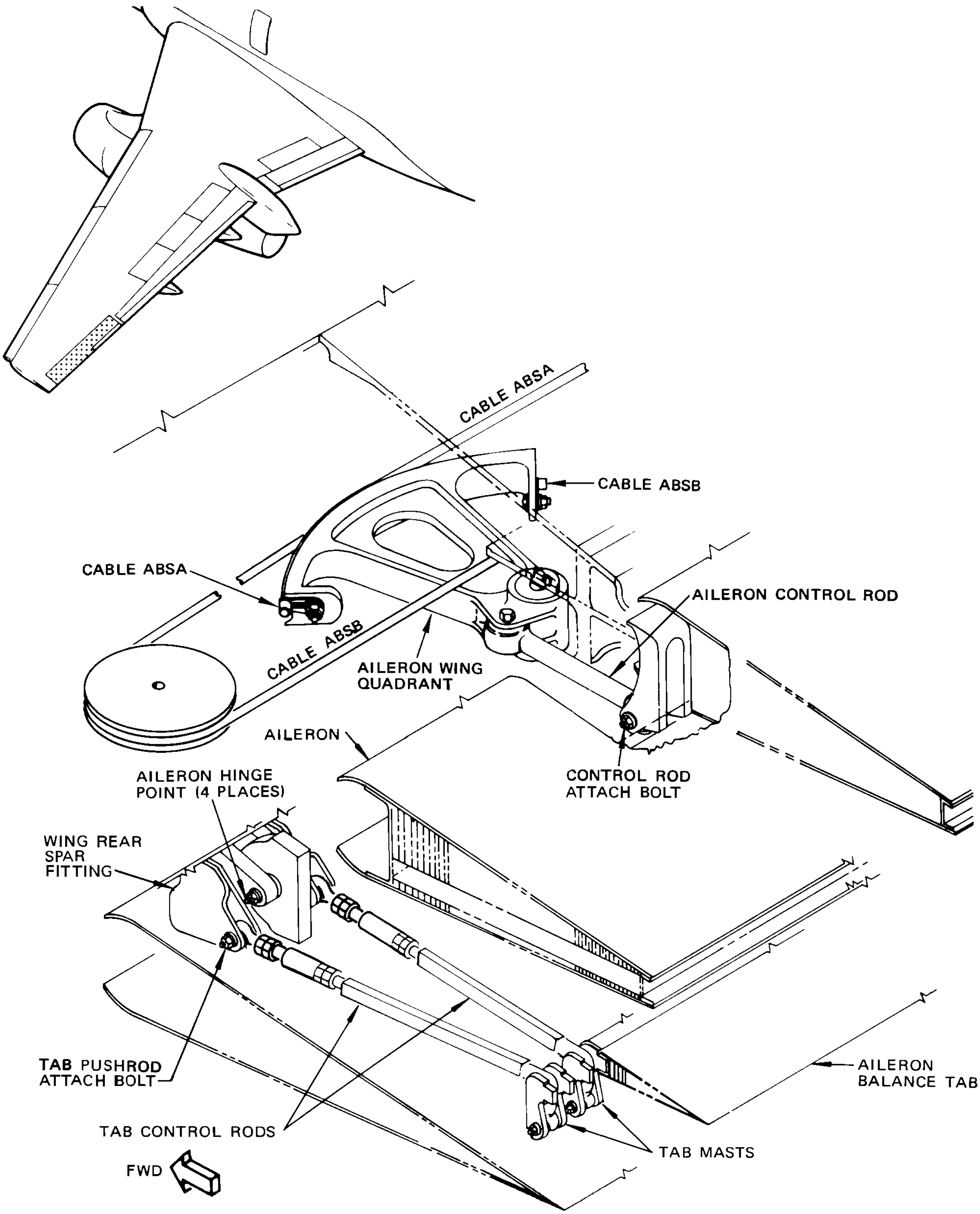
U. Connect aileron control rod to aileron (Fig. 404). Coat control rod bolt with primer and install with head outboard. Secure bolt with washer and nut. Tighten nut within 60 to 85 pound-inch torque range and install cotter pin.
V. Install rigging pin A/S-4 in aileron bus drum (Fig. 405).
W. Check that point B on aileron index plate aligns with point A on wing structure index plate within 0.03 inch, if not adjust ABSA and ABSB cables as follows:
    (1) Remove turnbuckle locking clips.
    (2) Adjust turnbuckle to align index plates and maintain cable tension. See Fig. 407 for temperature-tension chart.
    (3) Install turnbuckle locking clips.
X. Check that aileron outboard trailing edge is below wing trailing edge 0.08 to 0.48 inch.
Y. Remove rigging pin A/S-4.
Z. Use aileron control wheel and manually operate the aileron through several cycles, to full travel, while checking for binding and chafing.
AA. Check that gap between aileron nose and wing trailing edge is 0.30 to 0.50 inch when aileron is in faired position (Fig. 402).
AB. Check that gaps at both ends of aileron are per Fig. 401.
AC. Install four hinge access panels on aileron (Fig. 406) and four aileron access panels on trailing edge of wing surface adjacent to aileron.
AD. Set aileron trim knob in neutral. Operate control wheel to move replaced aileron to full up and down positions. Check that aileron travel is within specified limits as measured between index plate on aileron and index plate on wing structure (Fig. 403).

NOTE: Aileron is in neutral (zero) position when index mark on aileron lines up with index mark on wing structure within 0.03 inch. See Fig. 403 for index plate locations.

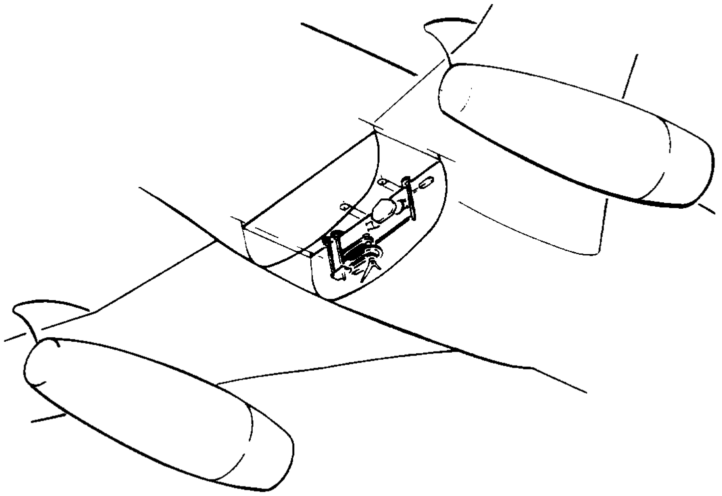


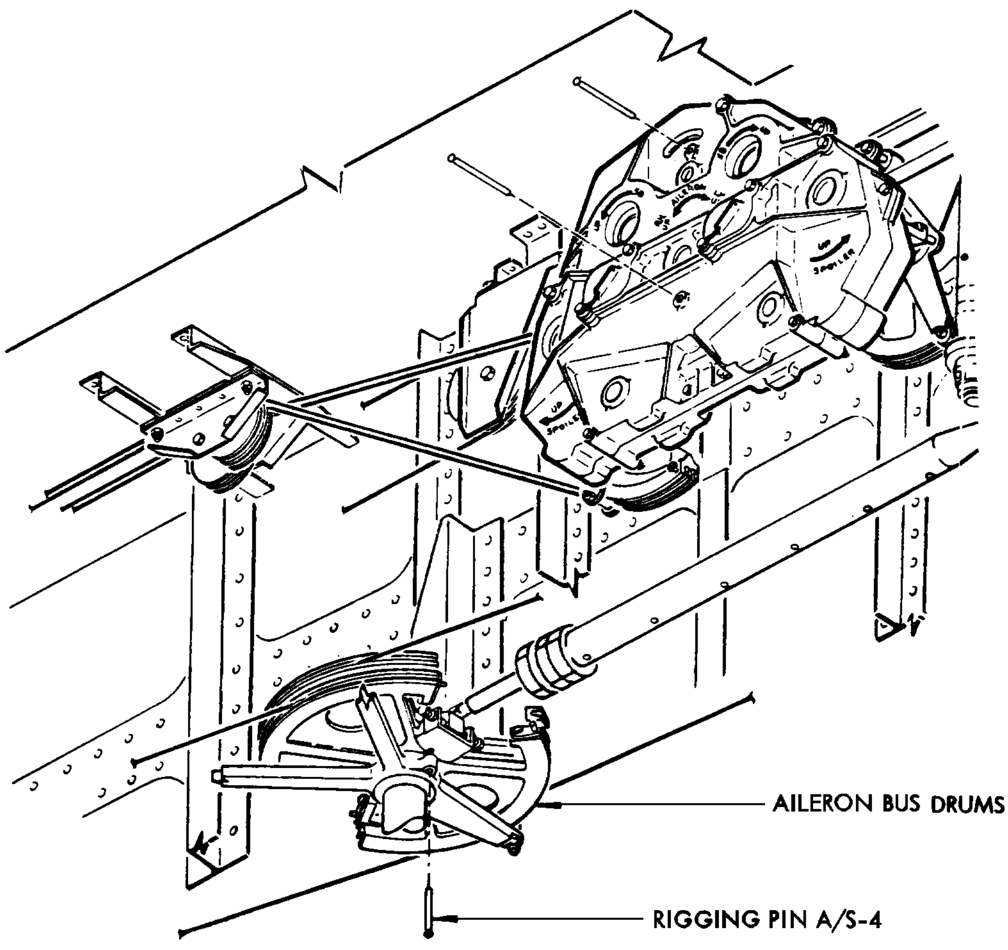
NOTE: WITH AILERON SYSTEM RIGGED
POINT B ON EACH AILERON SHALL
ALIGN VERTICALLY WITH POINT A
WITHIN (±0.03) INCHES.

Aileron Deflection Diagram
Figure 403



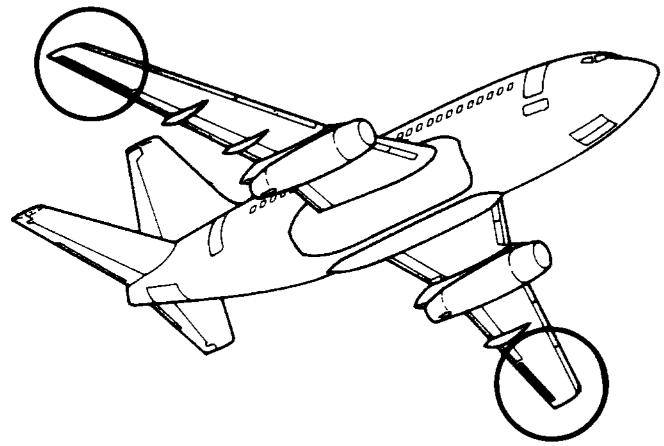
Aileron and Tab Control Linkage
Figure 404

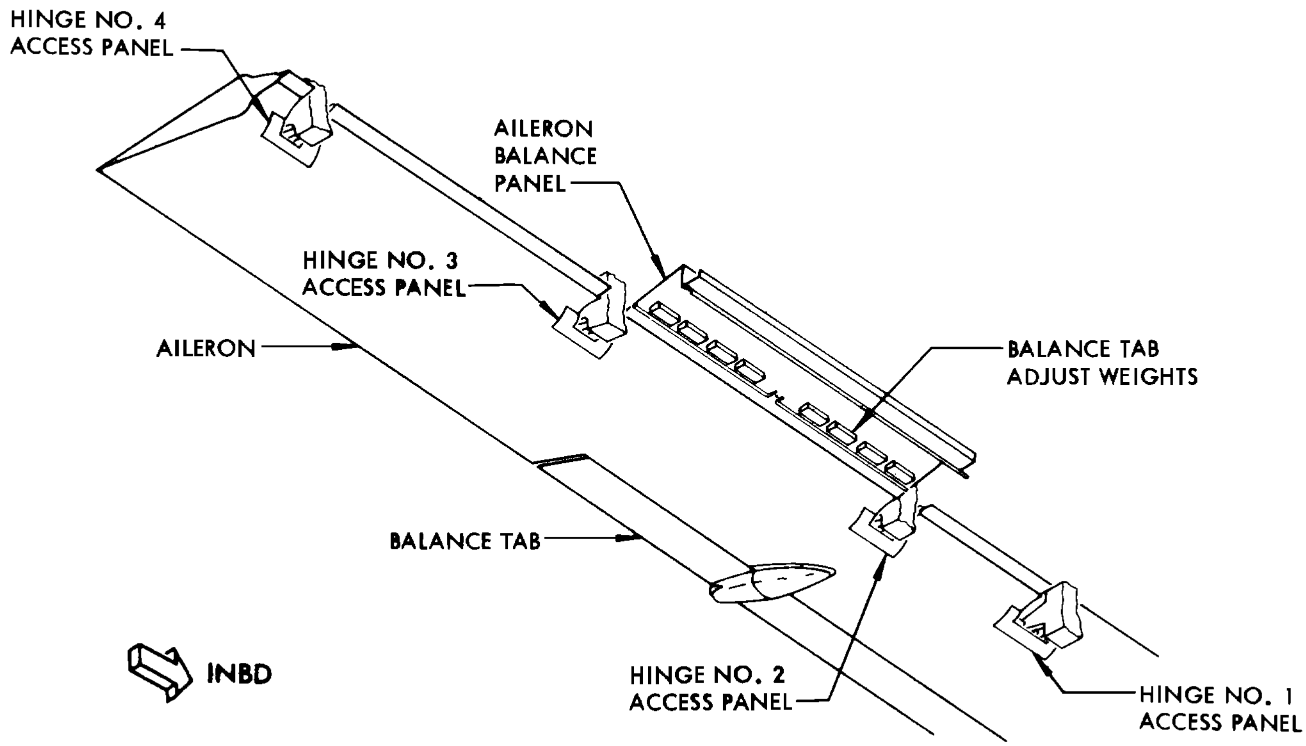




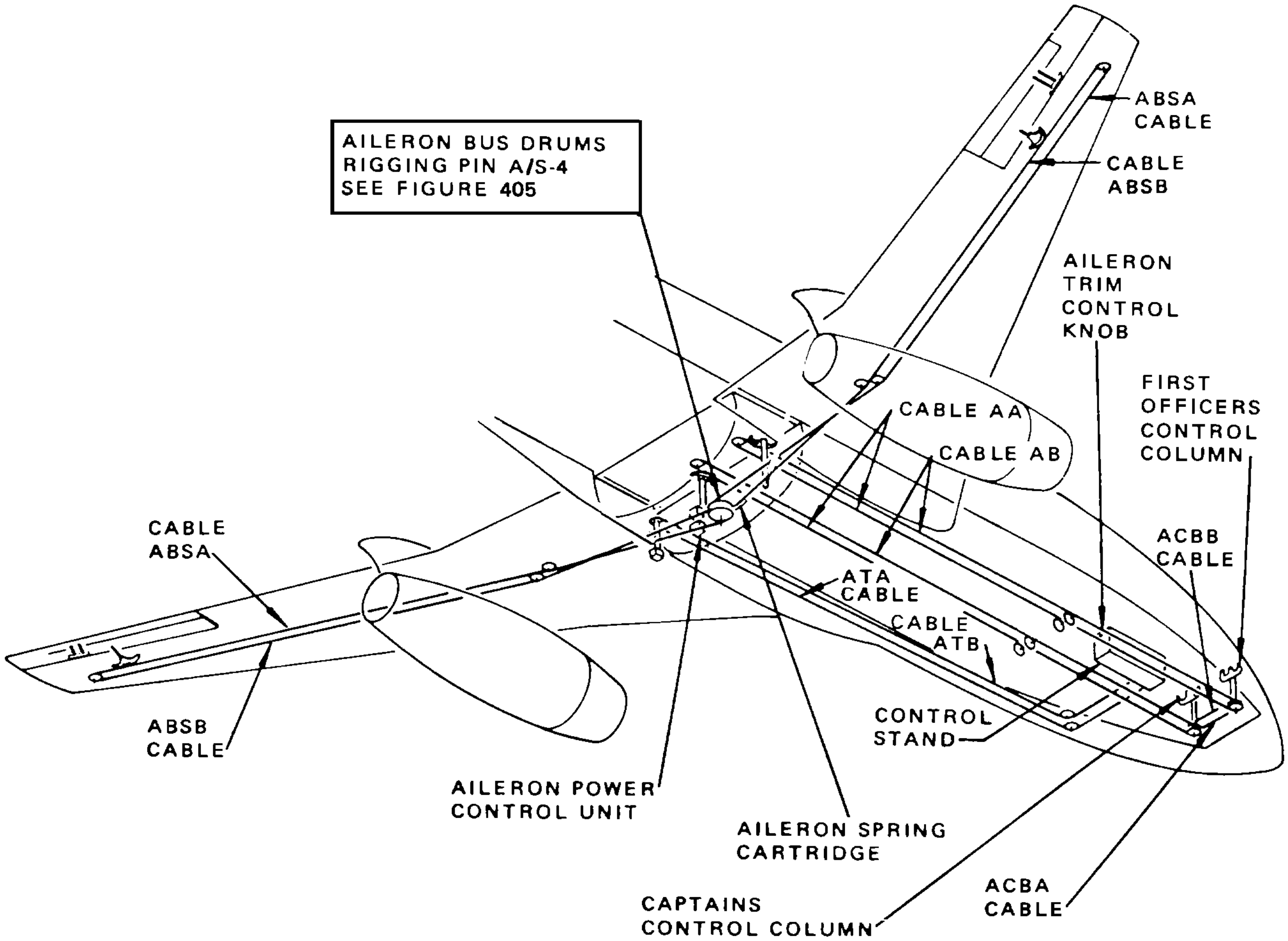
Aileron Bus Drum Rigging Pin Location
Figure 405

AE. Provide systems A and B hydraulic power (AMM 27-11-0/201).
AF. Rotate aileron trim control knob clockwise to the 10-unit position.
AG. Check that left aileron moves down and right aileron moves up per dimensions specified in AMM 27-11-0/501.
AH. Rotate aileron trim control knob counterclockwise to the 10-unit position.
AI. Check that left aileron moves up and right aileron moves down per dimensions specified in AMM 27-11-0/501.
AJ. Set aileron trim control knob in neutral position.
AK. Operate aileron control wheel through full travel in both directions from neutral. Check ailerons for smooth operation throughout entire range of travel.
AL. Remove systems A and B hydraulic power (AMM 27-11-0/201).
AM. Do a check on the aileron/balance tab mismatch and on the movement of the balance tab (AMM 27-11-0/501).
AN. Remove electrical power from airplane if no longer required.
AO. Perform a flight test to determine and correct asymmetrical flight control forces (AMM 27-11-0/501).





Hinge Access Panels Location
Figure 406



Aileron System Cable and Tension Location
Figure 407 (Sheet 1)

TABLE I

TEMPERATURE °F 1	CABLE TENSION (POUNDS)			
	CABLES AA AND AB 2 4	CABLES ABSA AND ABSB 2 4	CABLES ATA AND ATB 2 3	CABLES ACBA AND ACBB 5 6
110	133	202	72	93
90	124	184	66	84
70	115	165	60	75
50	107	148	54	70
30	99	131	48	61
+10	90	113	42	53
-10	82	96	36	49
-30	74	77	30	46
-40	68	66	27	44

1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW MINIMUM OF 1 HOUR AT CONSTANT AMBIENT TEMPERATURE ±5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 CABLE LOADS MUST BE WITHIN +10/-0 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.

3 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-20 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATEE +15/-10 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER 2.

4 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER 2.

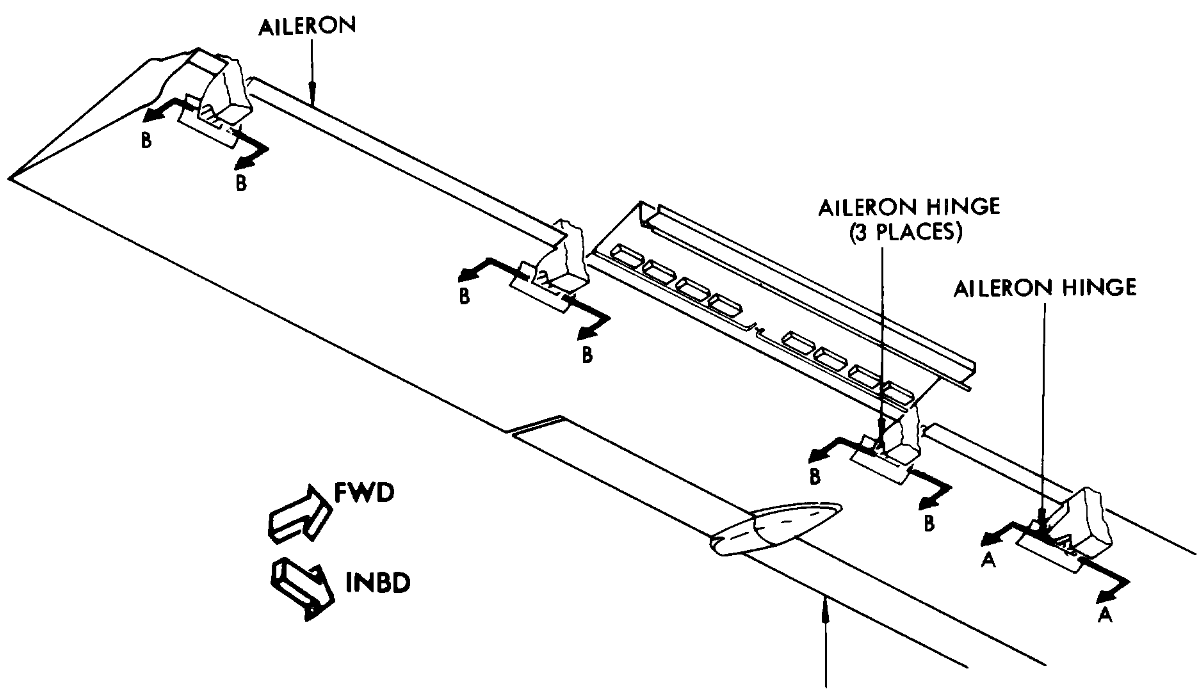
5 CABLE LOADS MUST BE WITHIN ±15 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.

6 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER 5.

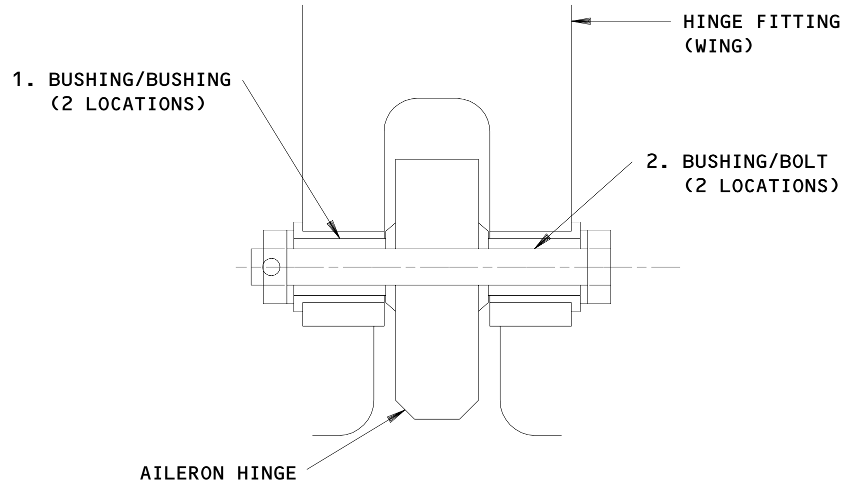
Aileron System Cable and Tension Location
Figure 407 (Sheet 2)

AILERON - INSPECTION/CHECK

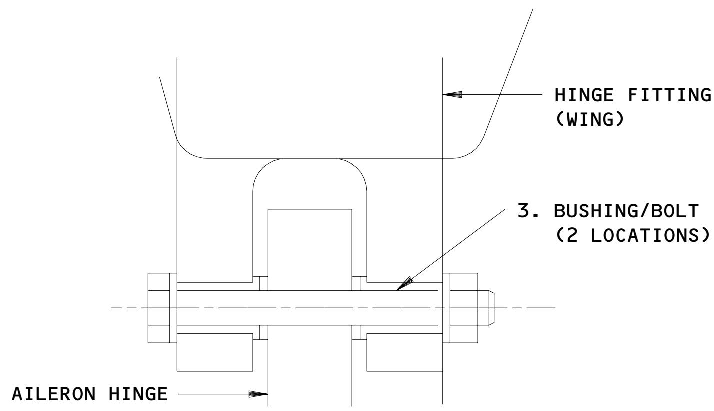
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. Aileron Wear Limits



Aileron Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION B-B

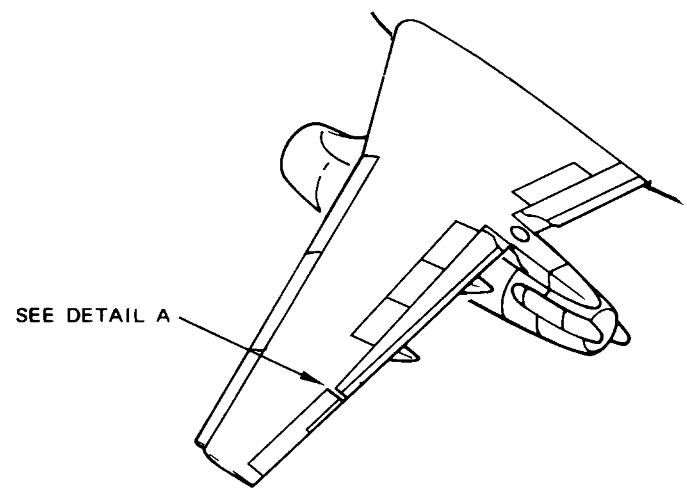
INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.4383	0.4394	0.4414	0.004 [1]	X		
	BUSHING	OD	0.4360	0.4370	0.4350		X		
2	BUSHING	ID	0.3125	0.3140	0.3180	0.006 [1]	X		
	BOLT	OD	0.3115	0.3020	0.3075		X		
3	BUSHING	ID	0.3125	0.3140	0.3180	0.006	X		
	BOLT	OD	0.3115	0.3120	0.3075		X		

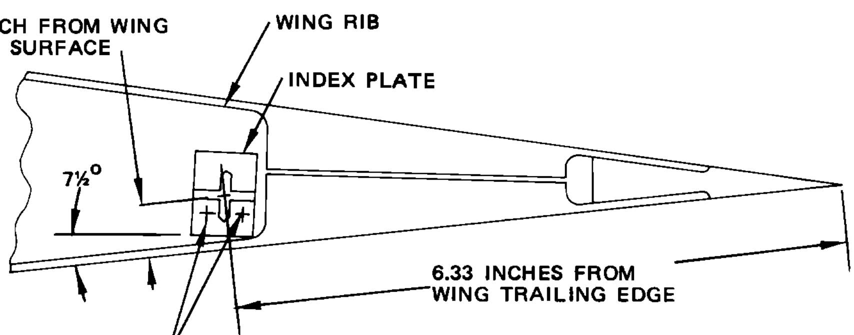
[1] THE SUM OF THE TWO SHALL NOT EXCEED 0.006 INCH.

Aileron Wear Limits
Figure 601 (Sheet 2)

AILERON AND AILERON TRIM CONTROL SYSTEM - APPROVED REPAIRS

1. General
   A. This repair procedure covers replacement of index plate on wing rib facing the inboard end of the aileron. For replacement of index plate on ailerons, refer to OHM 57-50-21.
2. Equipment and Materials
   A. Adhesive - BMS 5-29 (Ref 20-30-11)
   B. Solvent - Final Cleaning of Solvent Resistant Organic Coatings Prior to Non-structural Bonding (Series 90) (Ref AMM/SOPM 20-30-90)
   C. Rivet, blind 100 degree head - MS20605B-3
3. Install Index Plate
   A. Drill out old rivets.
   B. Remove old index plate.
   C. Locate index plate per Fig. 801 and mark rivet locations.
   D. Drill and countersink rivet holes on index plate.
   E. Solvent clean index plate and area to be bonded on rib.
   F. Apply adhesive to index plate and rivet index plate to rib.
   G. Remove excess adhesive.





DETAIL A

Index Plate Location
Figure 801

AILERON BALANCE TAB - REMOVAL/INSTALLATION

1. General
   A. The aileron balance tabs are balanced into the aileron system with tab adjust weights bolted to the lower surface of the aileron balance panel. The number of weights attached depends upon individual weight of each balance tab. A data plate, etched with exact tab weight and number of tab adjust weights required, is attached to the outboard end of the tab.
2. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Sealant - BMS 5-95
   D. Primer - BMS 10-11, Type I
   E. Enamel - BMS 10-11, Type II
   F. Protractor - Aileron Tab Alignment - F80222-1 which consists of a -2 protractor assembly (Ref 27-09-700 MP)
   G. Bonding Meter, Microhm Bridge, Type 2 Bonding Meter - 477W Avtron Meter Avtron Manufacturing, Inc. Cleveland, Ohio
3. Remove Aileron Balance Tab
   A. Remove three screws attaching forward portion of tab fairing to tab and remove fairing (Fig. 402).
   B. Remove two nuts, bolts, and washers attaching tab control rods to tab mast.
   C. Collect and tag bolts, nuts, and washers.
   D. If aileron tab hinge covers are installed, rotate tab to expose screws attaching tab hinge covers to nose cap. Loosen screws and slide tab hinge covers into nose caps to gain access to tab hinge bolts.
   E. Disconnect bonding jumpers near inboard and outboard hinges.
   F. Remove nuts from hinge bolts at four hinge locations.
   G. Support tab and remove four hinge bolts.
   H. Carefully withdraw tab from hinge assemblies and remove from aileron.
4. Install Aileron Balance Tab
   A. Check aileron balance tab wear (Ref 27-11-21 I/C).
   B. Check data plate on outboard end of tab for required number of tab adjust weights. Check balance panel bay for correct number of tab adjust weights. Add or remove weights as required and install bolts in holes not used for weight attachment (Fig. 401, 402).
   C. Lubricate hinge bearings with grease.
   D. Position tab in place and engage four hinge fittings on tab with corresponding fittings on aileron (Fig. 402).

      NOTE: The axial (inboard-outboard) play of the aileron tab should be between 0.010 and 0.020 inch.

   E. Install four hinge bolts with two thin washers under each bolthead and one thick washer under nut.
   F. Tighten nuts 7-17 pound-inches.

G. Install four cotter pins.
H. Connect bonding jumpers in a manner to avoid interference with moving parts with the steps that follow:

NOTE: If installed, slide hinge covers to close hinge bolt access areas. Tighten hinge cover screws.

(1) Clean surface to give electrical bonding.
(2) Fillet seal fastener and bonding jumper end with sealant.
(3) Apply primer plus enamel to exposed bare metal not covered by faying surfaces.
(4) Make sure the total resistance across the bond is no more than 0.001 ohm.

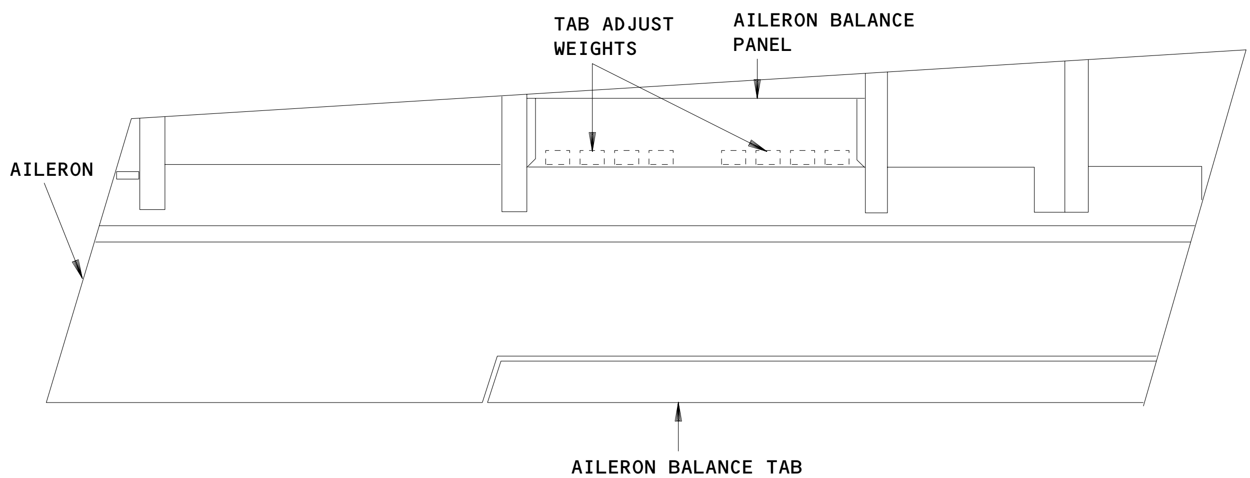
I. Connect tab control rods to tab mast by installing bolts, washers and nuts. Tighten nuts 50-70 pound-inches.

NOTE: Install shims, if required, using AN960C416L washers to limit gap to 0.001-inch maximum with bolts untightened. Tighten nuts 50 to 70 pound-inches after shimming.

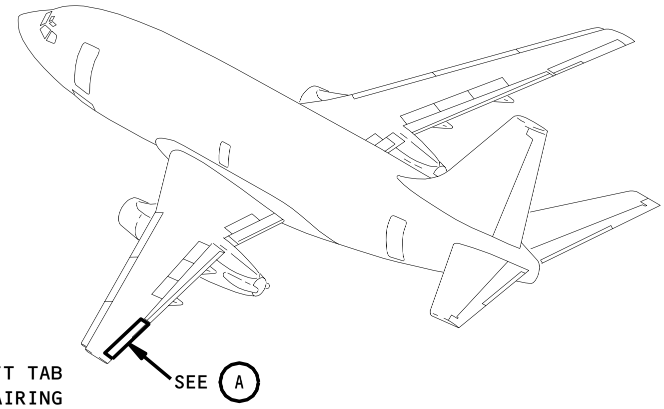
J. Install forward portion of tab fairing.

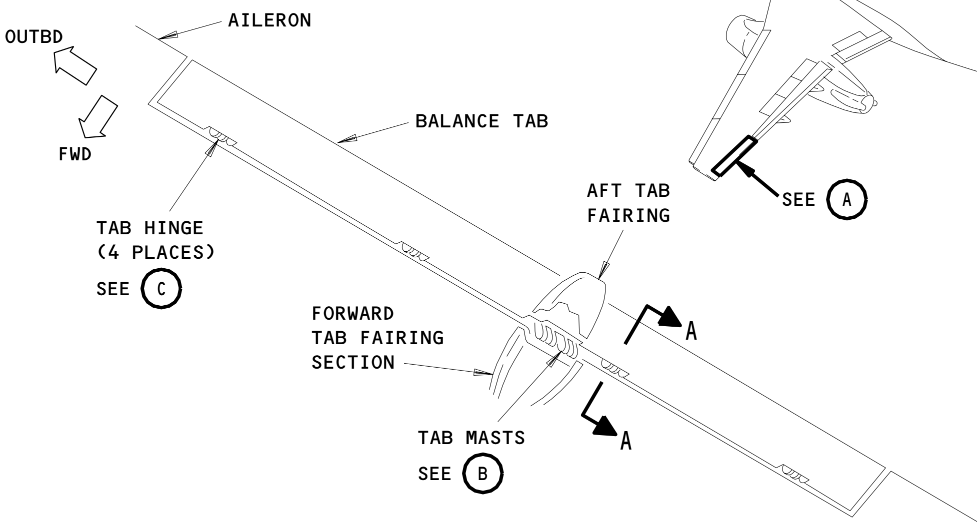
NOTE: It may be necessary to adjust forward portion of tab fairing by loosening the three attachment screws and shifting fairing position to provide clearance with aileron fairing at all tab positions.

K. Operate aileron control wheel through full travel and check that tab moves in opposite direction to aileron without binding.
L. With index mark on aileron aligned with index mark on wing within 0.03 inch, check mismatch between aileron trailing edge and aileron tab trailing edge. Using straightedge or aileron tab alignment protractor, measure mismatch from trailing edge of tab to theoretical extension of aileron bottom surface in three locations as follows:
(1) Take measurement 1/2 inch in from inboard end of tab. Tab trailing edge must align with an extension f aileron bottom surface within +0.00 to +0.14 inch.
(2) Take measurement 3-3/4 ±1/4 inch in from outboard end of tab. Tab trailing edge must align with an extension of aileron bottom surface within +0.00 to +0.14 inch.
(3) Take measurement at midpoint along tab. Tab trailing edge must align with an extension of aileron bottom surface within +0.05 to +0.09 inch.
(4) Sum up dimensions taken and recorded in step N. Sum must be between +0.12 and +0.30 inch.

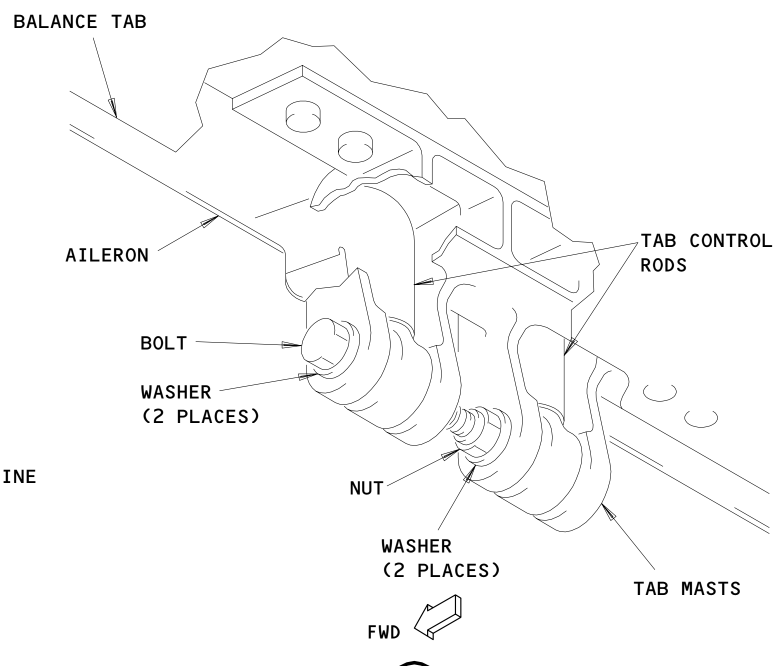


Aileron Balance Tab Adjust Weights Location
Figure 401

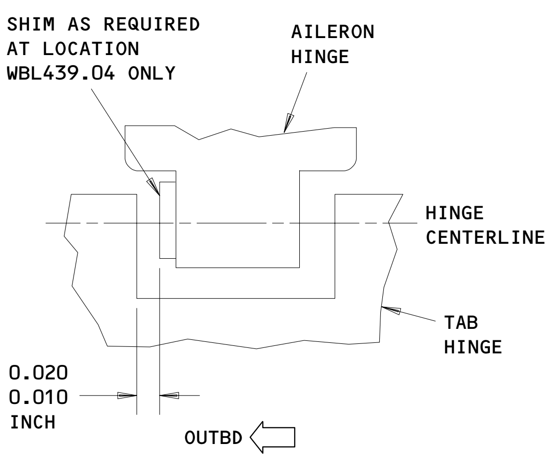




A

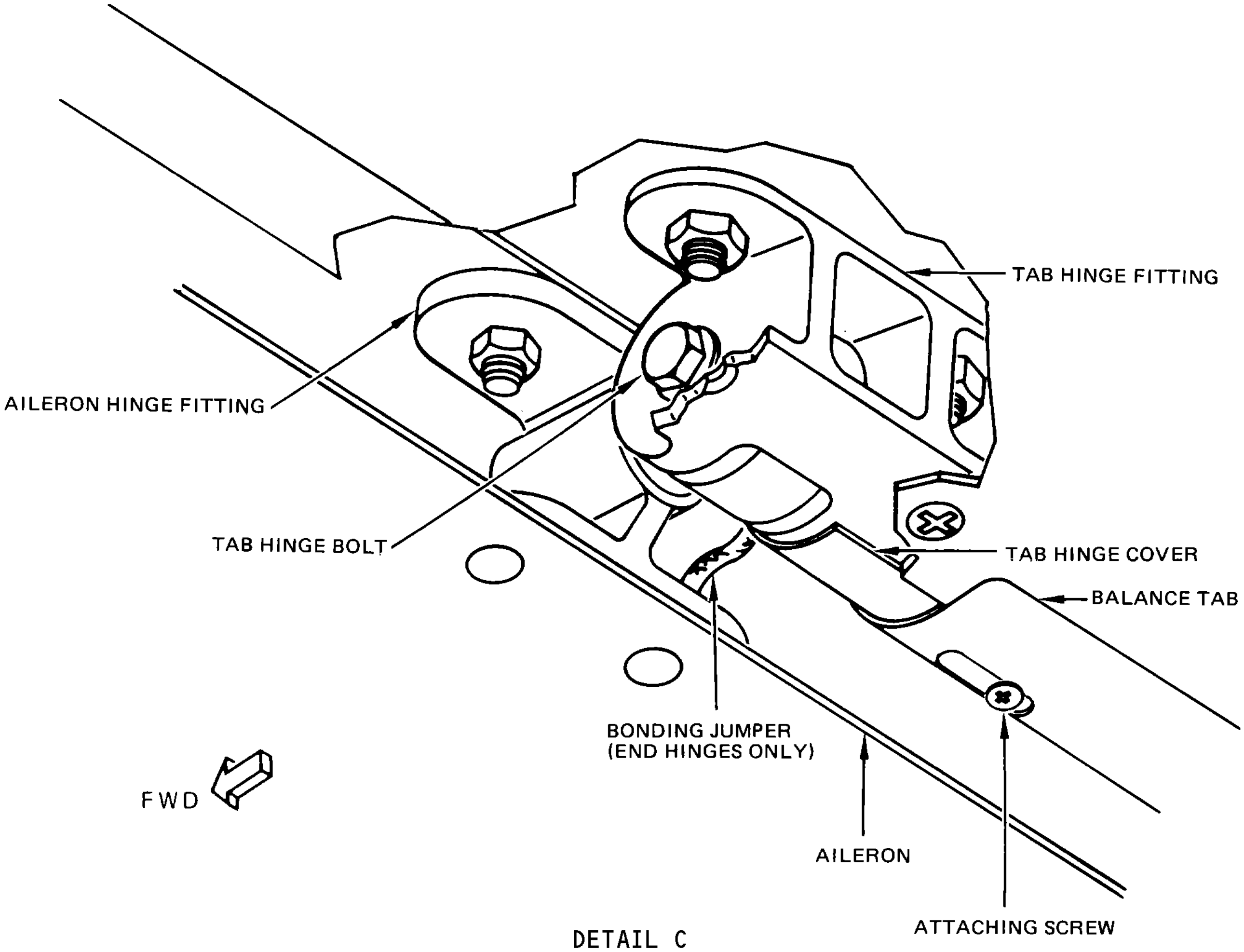


B



A-A

Aileron Balance Tab Installation
Figure 402 (Sheet 1)



DETAIL C

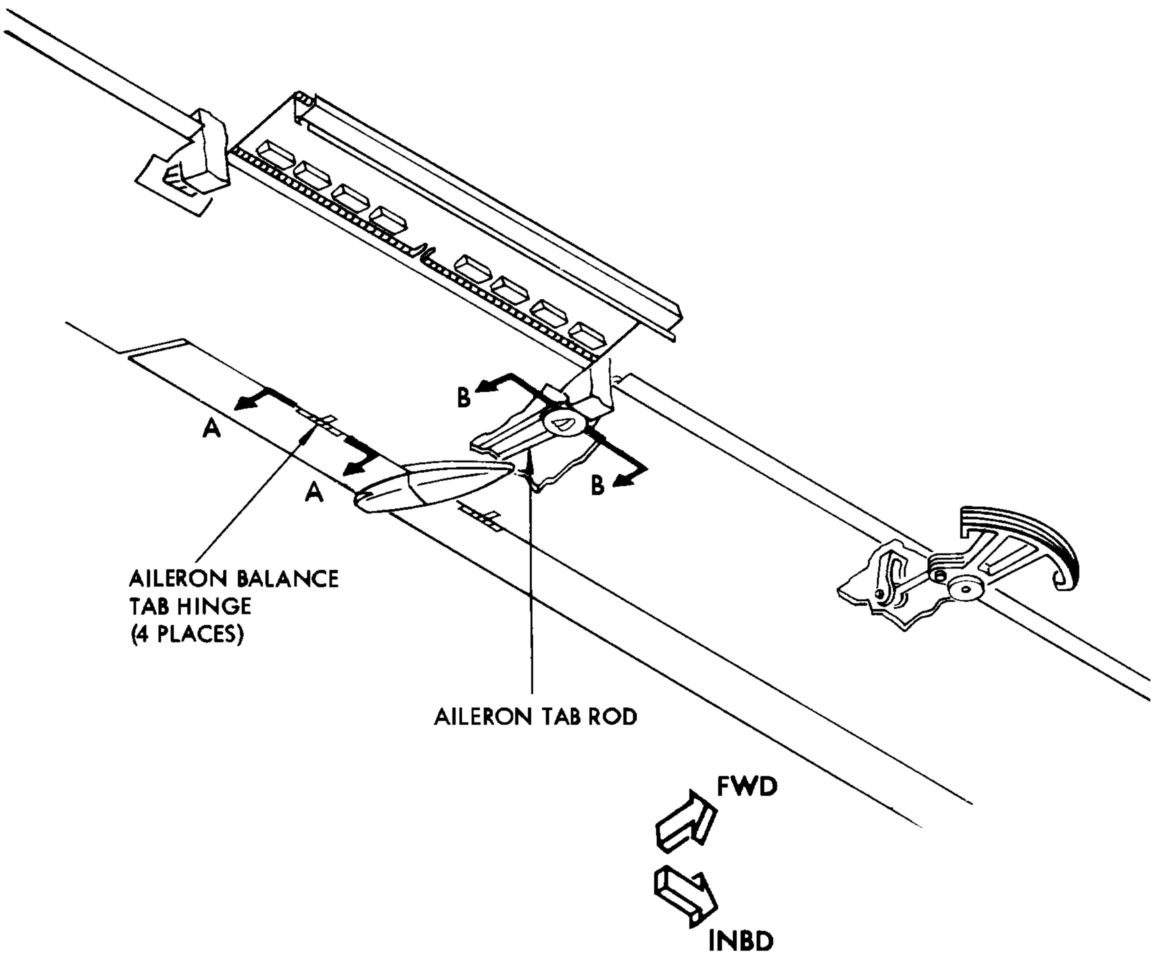
TAB WEIGHT (LBS) FROM	TO	NO. OF WEIGHTS REQUIRED
0	1.90	NONE
1.91	2.00	1
2.01	2.10	2
2.11	2.20	3
2.21	2.30	4
2.31	2.40	5
2.41	2.50	6
2.51	2.60	7
2.61	3.00	8

Aileron Balance Tab Installation
Figure 402 (Sheet 2)

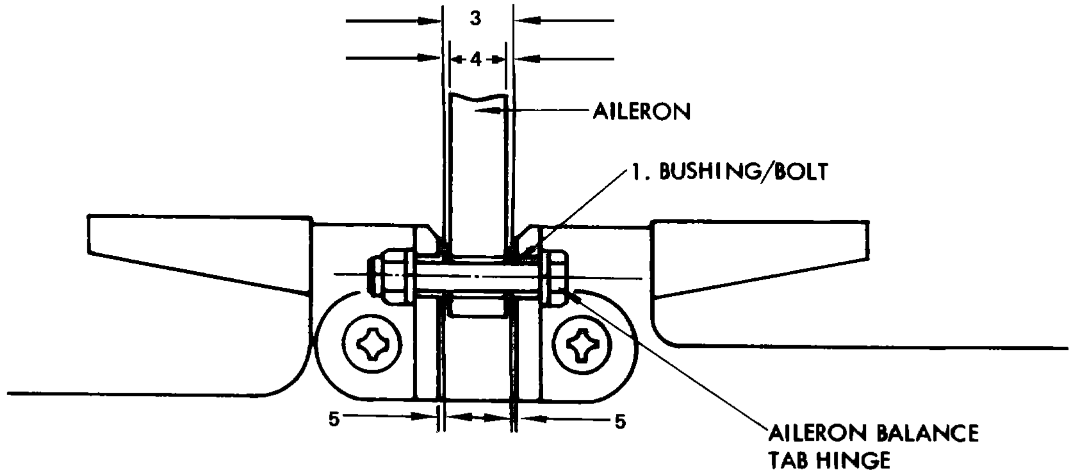
M. Check aileron tab deflection (Ref 27-11-0, A/T).
N. Perform a flight test to determine and correct asymmetrical flight control forces (Ref 27-11-0, A/T).

AILERON BALANCE TAB - INSPECTION/CHECK

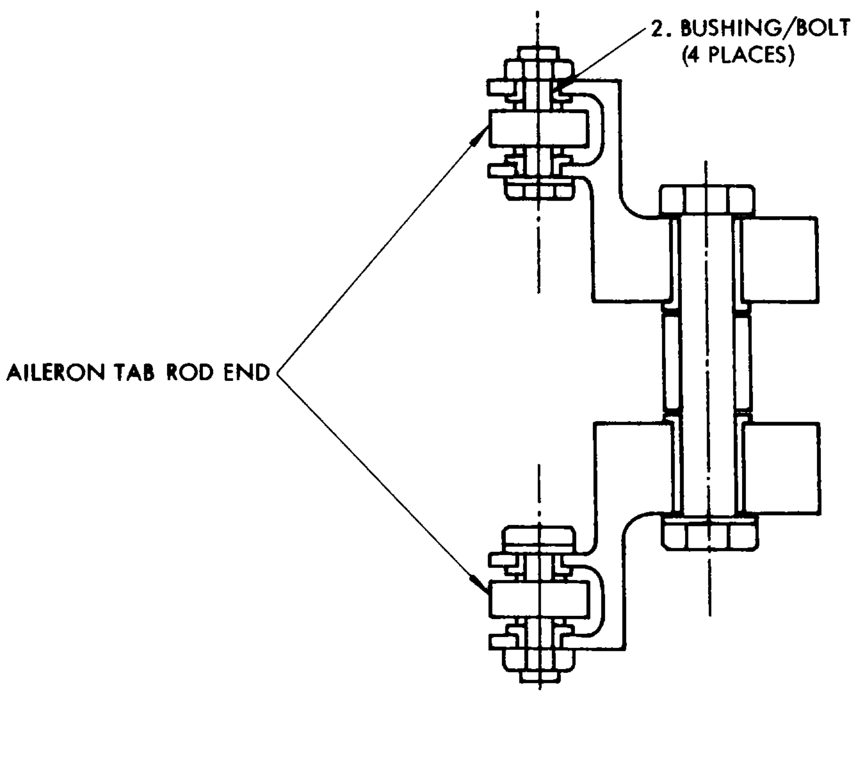
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. Aileron Balance Tab Wear Limits



Aileron Balance Tab Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION B-B
TYPICAL BOTH ENDS

Aileron Balance Tab Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1.	BUSHING	ID	0.2500	0.2515	0.2555	0.006	X		
	BOLT	OD	0.2485	0.2495	0.2445		X		
2.	BUSHING	ID	0.2500	0.2515	0.2555	0.006	X		
	BOLT	OD	0.2490	0.2495	0.2450		X		
3.	BUSHING/BUSHING	*[1]	0.466	0.486	———	0.050 *[4]	X		
	(HINGE ASSY, TAB)								
4.	BEARING, ROD END	*[2]	0.432	0.437	———	———	X		
5.	BUSHING	*[3]	0.057	0.062	———	———	X		

*[1] Dimension between faces of bushings.

*[2] Thickness of bearing flange.

*[3] Thickness of bushing flange.

*[4] At WBL 439.04 at location adjacent to fitting assembly shim using AN960PD416L washers at outboard interface to obtain 0.01-0.02 clearance.

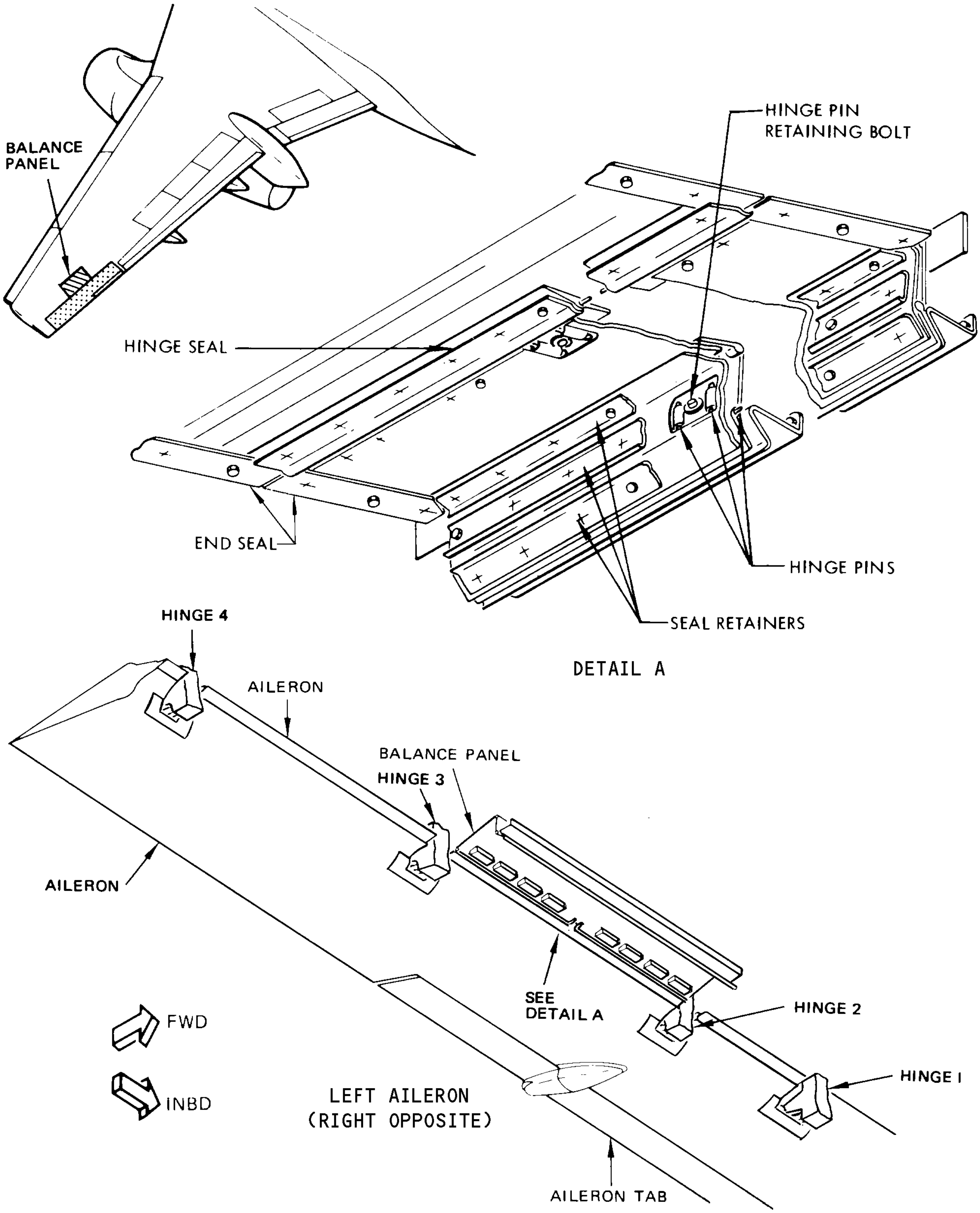
Aileron Balance Tab Wear Limits
Figure 601 (Sheet 3)

BALANCE PANEL AND SEALS - REMOVAL/INSTALLATION

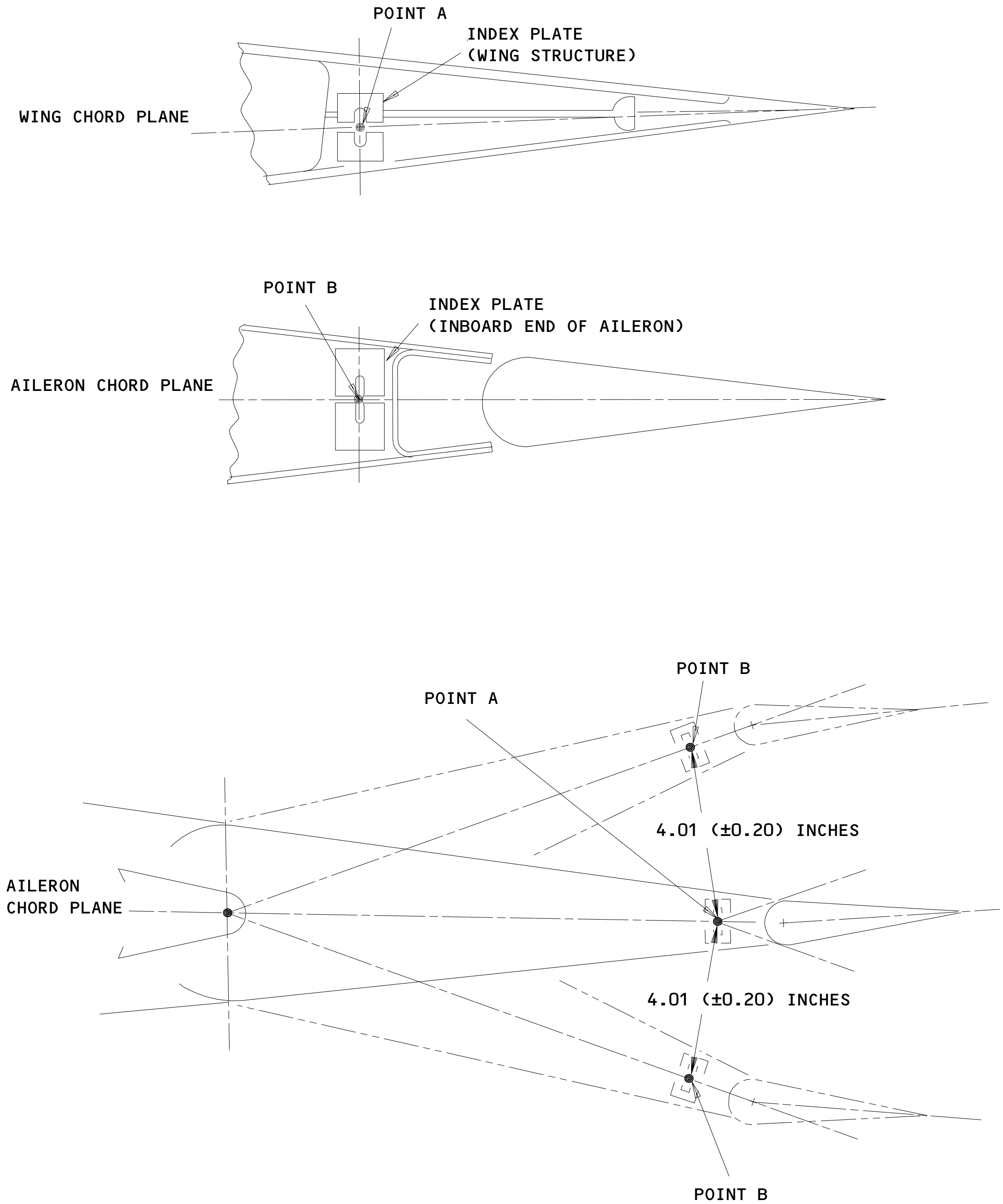
1. General
   A. The removal/installation of balance panel does not effect the static balance of the aileron. However, the aileron tab static balance is effected as the tab balance adjust weights are attached to the balance panel. Therefore, whenever a balance panel is replaced, the same quantity of adjust weights must be installed on the replacement panel. The data plate on each balance tab states the number of adjust weights required.
   B. Seals may be replaced with balance panel assembly installed.
2. Equipment and Materials
   A. Corrosion Preventative Compound - MIL-C-11796
3. Remove Balance Panel and Seals
   A. Remove access panel on lower wing surface at balance panel.
   B. Remove aft hinge pin retaining bolt and remove hinge pins (Fig 40l).
   C. Remove forward hinge pin retaining bolt and remove hinge pins.
   D. Remove bolts and seals at inboard and outboard ends of balance panel.
   E. Remove balance panel assembly from wing structure.
   F. Separate forward hinge seal by removing bolts, and seal retainers.
4. Install Balance Panel and Seals
   A. If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-31, Inspection/Check).
   B. Lubricate forward hinges and hinge pins with corrosion preventive compound.
   C. Place forward hinge seals and seal retainers in position, and secure with bolts (Fig 401).
   D. Place balance panel into position, and install forward and aft hinge pins.
   E. Install hinge pin retaining bolts.
   F. Install seals at inboard and outboard ends of balance panel and secure with bolts to structure. Check that gap between edge of seals and wing structure does not exceed 0.02 inch.
   G. Ensure that correct number of aileron tab adjust weights are installed on balance panel.

      NOTE: Data plate on aileron tab states required number of adjust weights.

   H. Install access panel on lower wing surface and secure with screws.
   I. Measure movement of ailerons to ensure that full travel is obtained without binding as shown in figure 402.



Balance Panels and Seals Installation
Figure 401

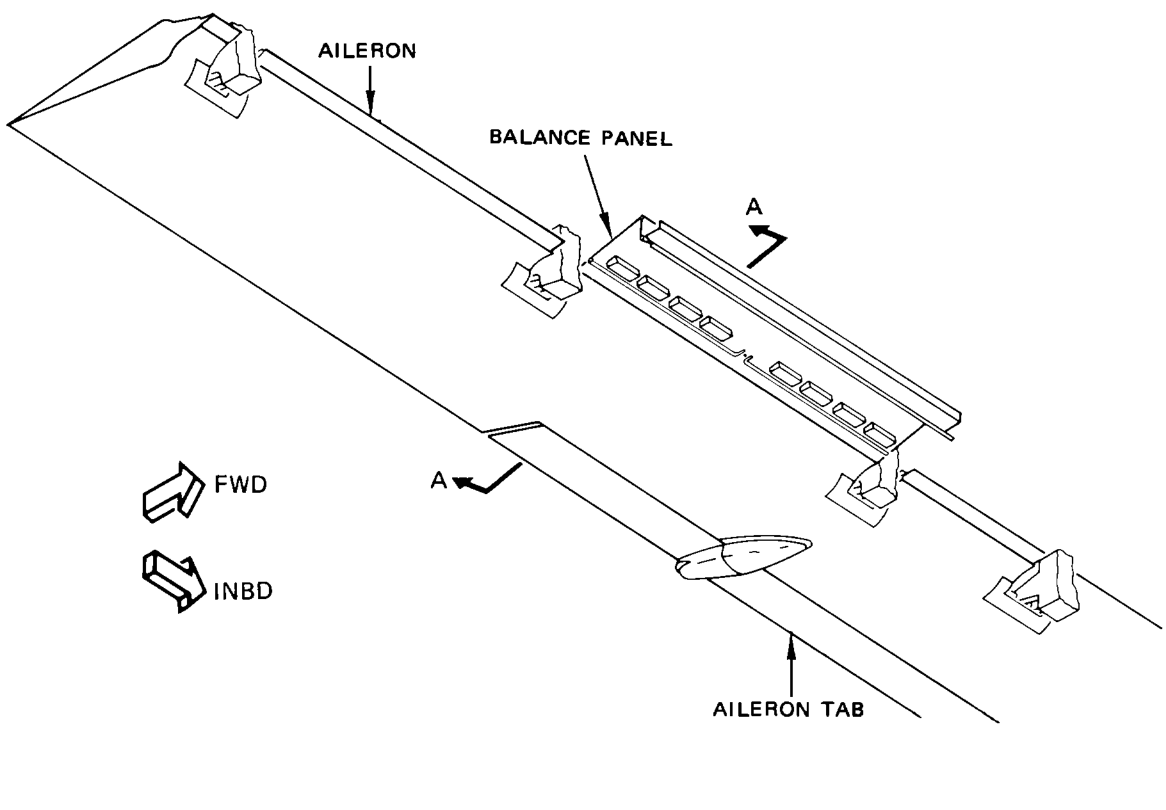


NOTE: WITH AILERON SYSTEM RIGGED
POINT B ON EACH AILERON SHALL
ALIGN VERTICALLY WITH POINT A
WITHIN ±0.03 INCH.

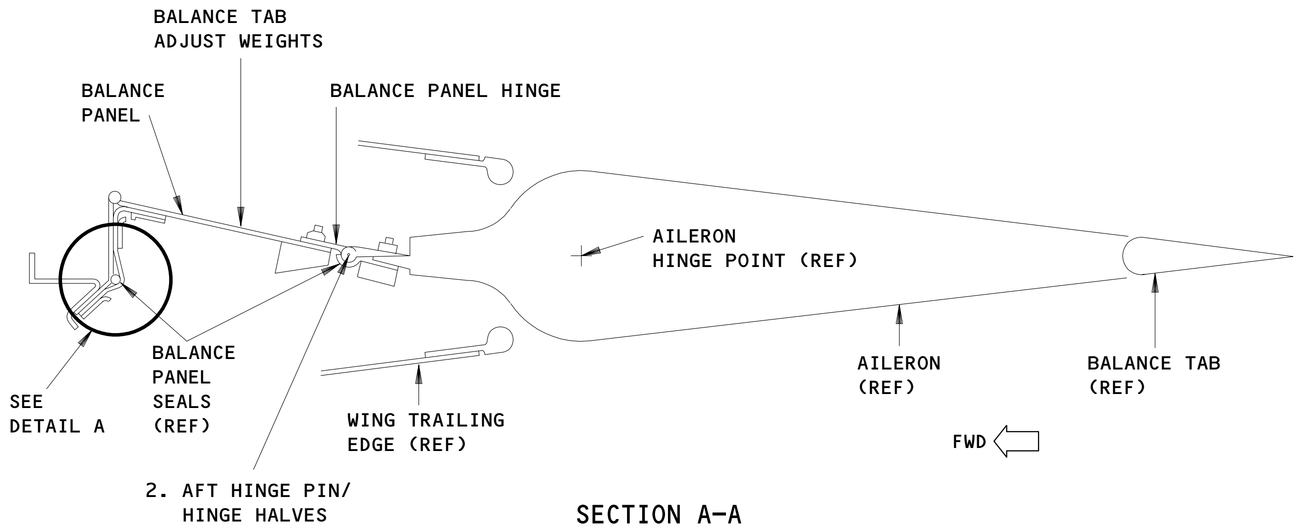
Aileron Deflection Diagram
Figure 402

BALANCE PANEL AND SEALS - INSPECTION CHECK

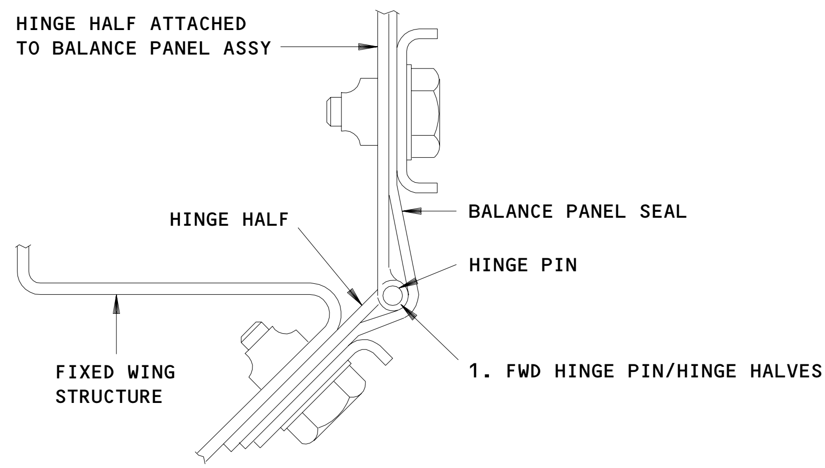
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. Balance Panel Wear Limits



Balance Panel and Seals Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



DETAIL A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	HINGE HALF	ID	0.093	0.098	0.104	0.0165 *[1]	X		
	FWD HINGE PIN	OD	0.089	0.090	0.0875		X		
2	HINGE HALF	ID	0.125	0.127	0.133	0.0175 *[2]	X		
	AFT HINGE PIN	OD	0.117	0.118	0.1155		X		

*[1] REPLACE WHEN TOTAL PLAY IN JOINT EXCEEDS 0.033 INCH.

*[2] REPLACE WHEN TOTAL PLAY IN JOINT EXCEEDS 0.035 INCH.

Balance Panel and Seals Wear Limits
Figure 601 (Sheet 2)

AILERON CONTROL WHEEL - REMOVAL/INSTALLATION

1. General
   A. This procedure does not allow the replacement of the wire bundle in the control column. The replacement control wheel is assumed to be equipped with stabilizer trim switch, terminal block in place, and cover on inboard horn.

      NOTE: If wire bundle requires replacement, refer to overhaul manual for procedure and test.

2. Equipment and Materials
   A. Control Wheel Straightedge - P/N SE27-0001
   B. Rigging Pins Kit - F70207-84, or -98:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-1	-13	0.309-0.311	2.35 ±0.06	AILERON TRANSFER MECHANISM
A/S-1A	-19	0.309-0.311	8.25 ±0.25	AILERON TRANSFER MECHANISM
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

   C. Dow Corning Compound No. 5 (Ref 20-30-21)
   D. Insulation Tester - BIDDLE MODEL 656, MEGGER (500 VOLTS)
3. Remove Aileron Control Wheel
   A. Set aileron trim control knob in zero trim position.
   B. Insert rigging pins No. A/S-1 and A/S-1A in transfer mechanism, and rigging pin No. A/S-13 in aileron trim gearbox (Fig. 401).

      NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

C. Remove medallion from control wheel by removing three bolts.
D. Remove cotter pin, wheel retaining nut and special washer.
E. Mark relative positions of control wheel and gear and sleeve assembly.
F. Carefully remove control wheel from control column, and support wheel until steps G. through N. have been completed.
G. Mark wire bundle to identify clamp location inside control wheel hub and remove clamp.
H. Disconnect the four pairs of stabilizer trim control switch leads at terminal block.
I. Remove retainer from autopilot disconnect switch and carefully pul1 switch assembly from control wheel.
J. Remove two screws which retain microphone switch and trigger assembly, and carefully pull assembly from control wheel.

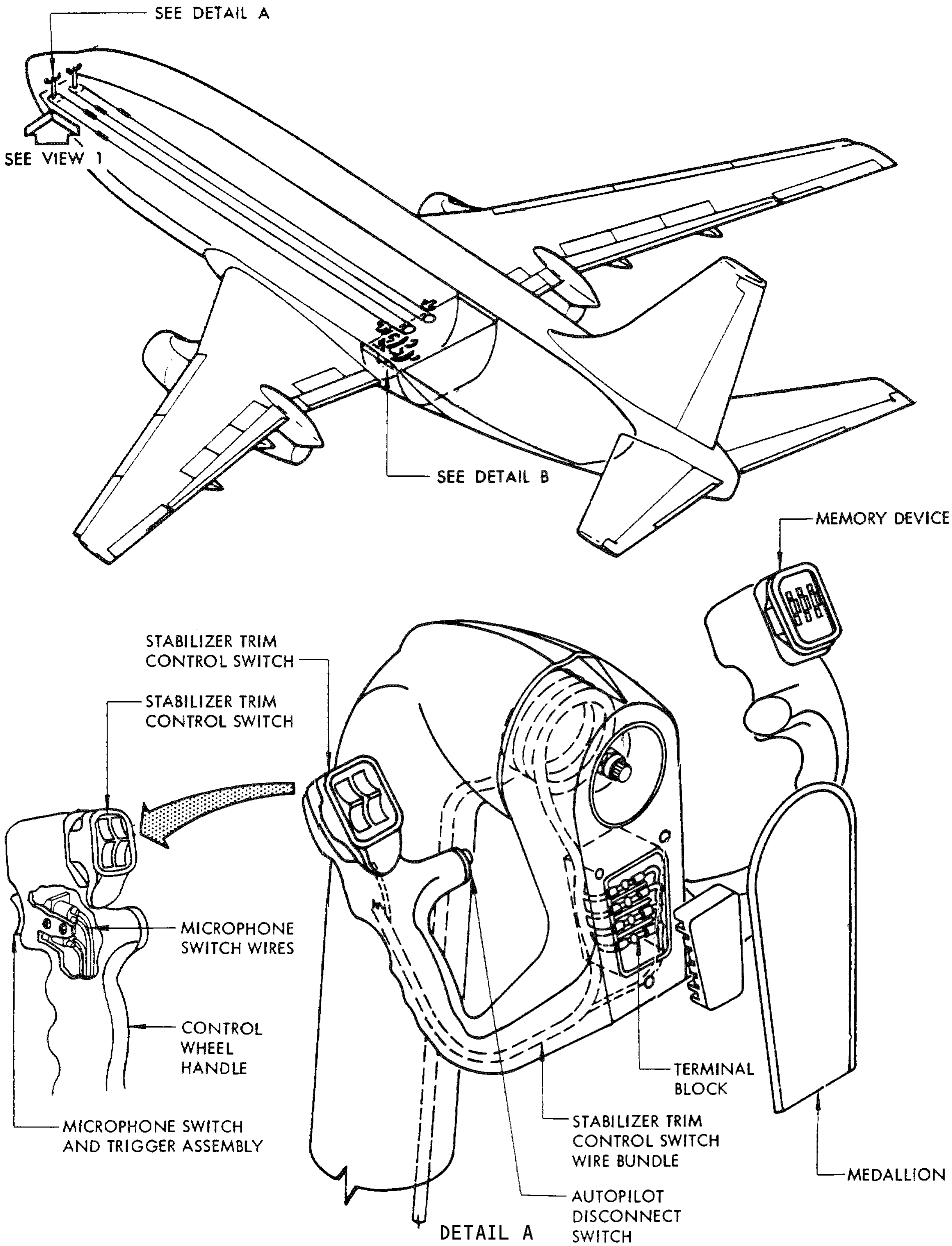
NOTE: The radio transmit switch is part of this assembly, if installed.

K. Remove the two screws which retain the memory device and pull device from control wheel.
L. Disconnect wires from memory device.
M. Note and mark arrangement of color coded wires and disconnect wires from terminals of autopilot disconnect, microphone and radio transmit switches. See figure 402 for wiring configurations.
N. Carefully disengage wire bundle from control wheel.

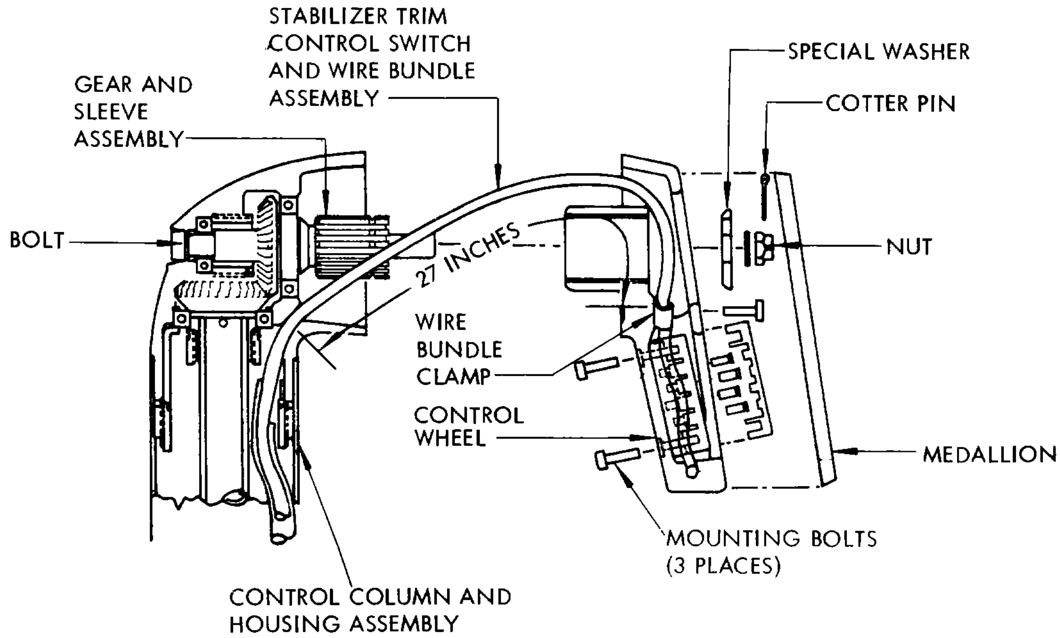
4. Install Aileron Control Wheel
   A. Use a wire leader as required to position electrical wires within control wheel.
   B. Locate and connect proper color coded wires to autopilot disconnect, microphone, radio transmit switches, and memory device. Black-yellow and black-green wires connect to memory device. (See figure 402.)

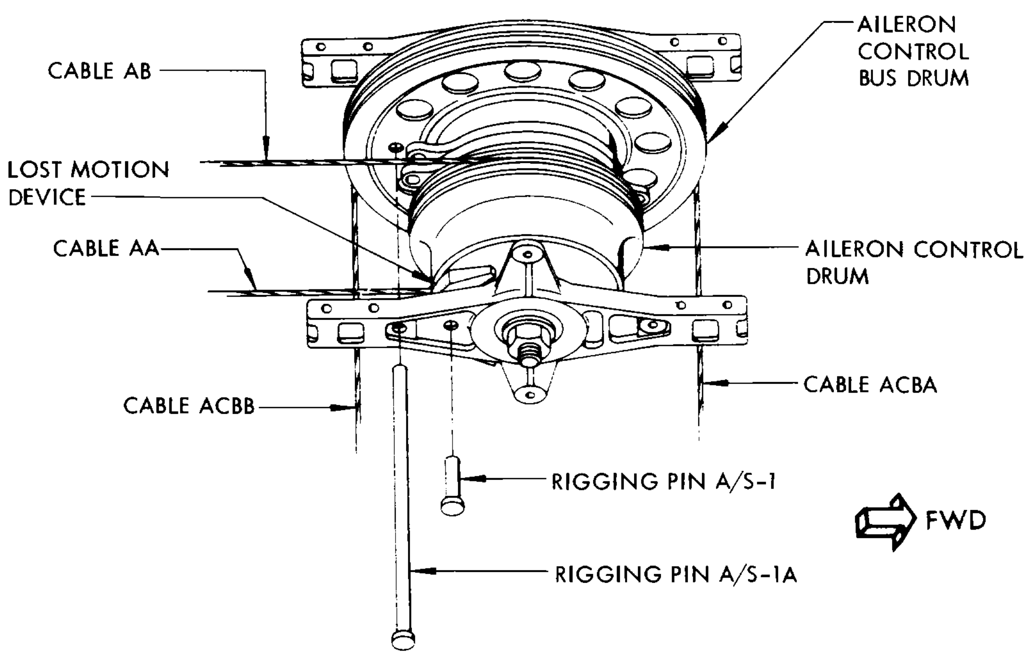
   NOTE: Pull wires away from switch holes and install teflon sleeves before connecting. Tape and stow unused wires.

   C. Position microphone switch and trigger assembly in control wheel and secure with two screws. (See figure 401.)



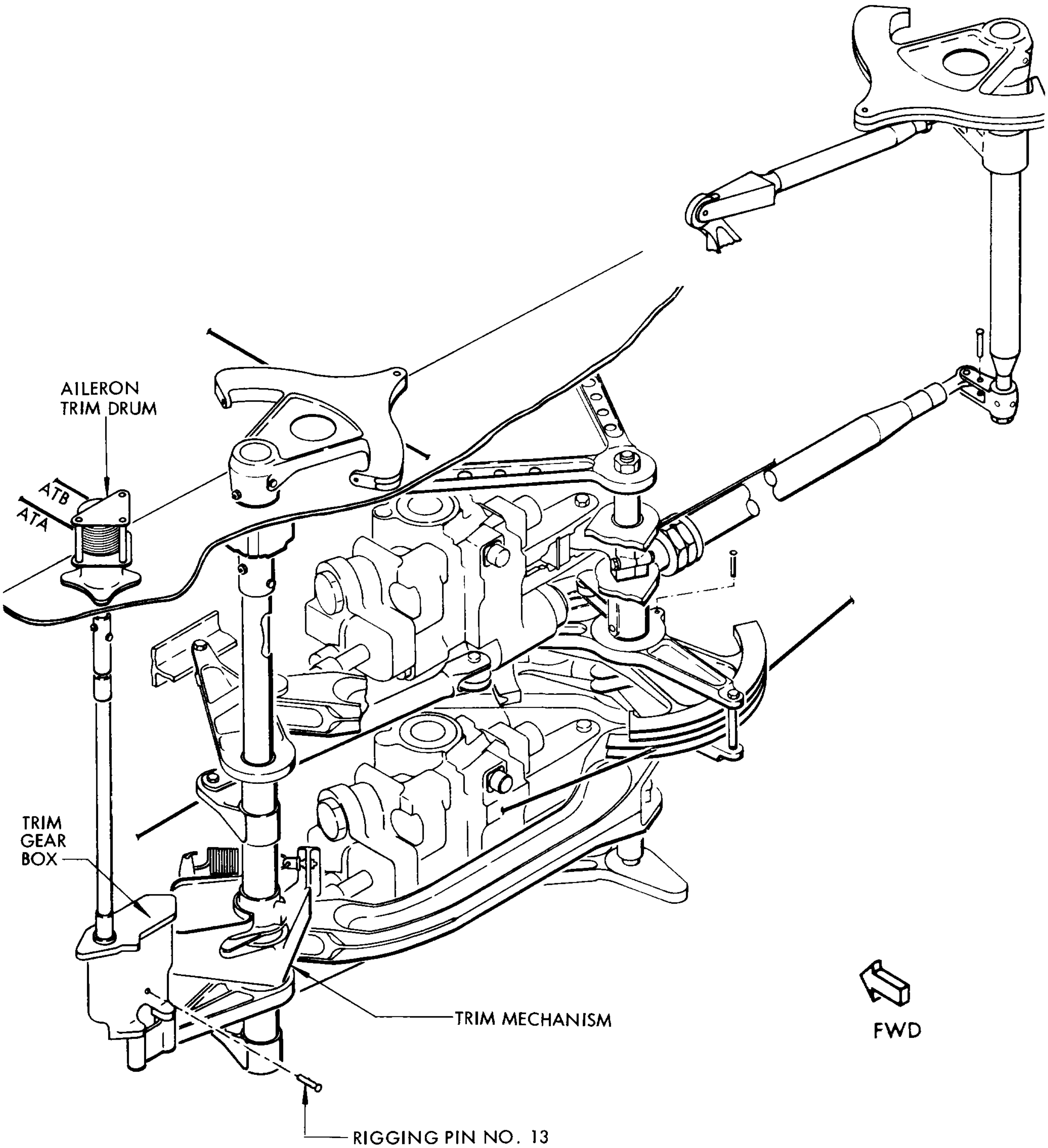
Control Wheel Installation
Figure 401 (Sheet 1)





TRANSFER MECHANISM
VIEW 1

Control Wheel Installation
Figure 401 (Sheet 2)



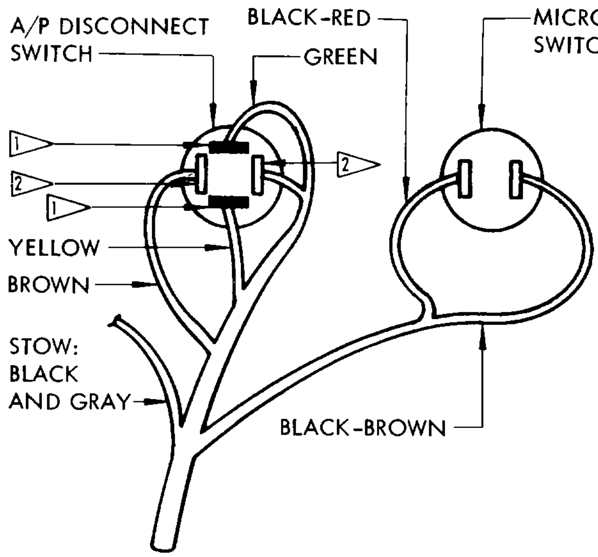
DETAIL B

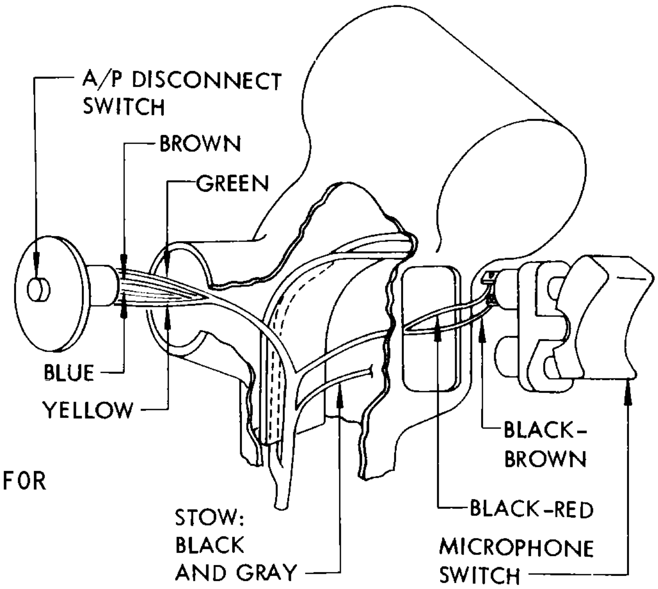
Control wheel Installation
Figure 401 (Sheet 3)

D. Position autopilot disconnect switch in control wheel and secure with retainer and one screw.
E. Position memory device in control wheel and secure with two screws.
F. Coat accessible portions of wire bundle with Dow Corning compound No. 5.
G. Position clamp at mark on wire bundle and secure bundle in control wheel hub with clamp.

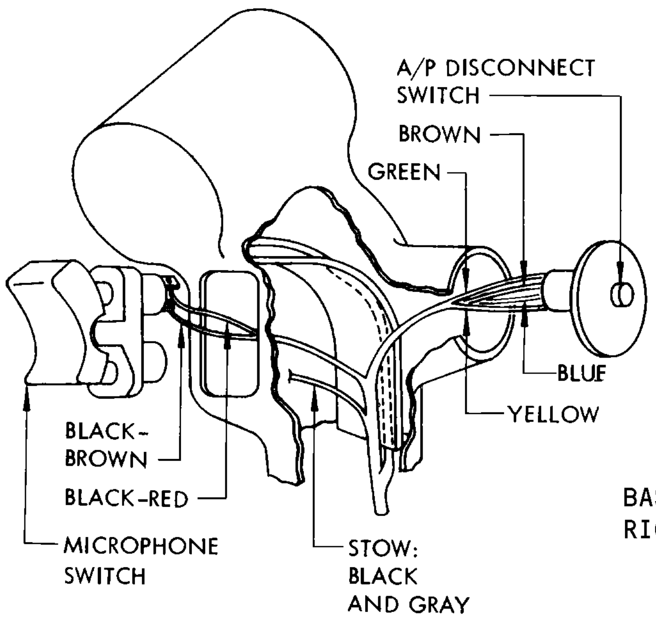
<u>CAUTION</u>: PROPER WIRE BUNDLE LENGTH BETWEEN COLUMN AND WHEEL MUST BE MAINTAINED TO ENSURE UNRESTRICTED CONTROL WHEEL TRAVEL.

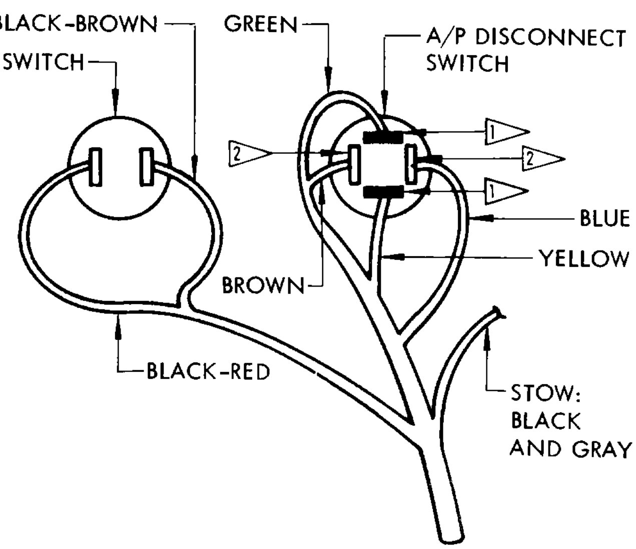
H. Coat control wheel splines with Dow Corning compound No. 5.
I. Wrap wire bundle four turns around control wheel hub and mate splines on control wheel to control column to previously marked positions.
J. Install special washer, and torque retaining nut to 85 to 140 pound-inches range.
K. Secure retaining nut with cotter pin.
L. Check that captain's and first officer's control wheels are in neutral by placing straightedge across upper ends of both wheels. One end of first officer's control wheel may be out of contact with straightedge a maximum of 0.20 inch. (See figure 403.)
M. Remove all rigging pins.
N. Ensure control wheel will rotate at least 105 degrees in each direction from neutral. Operation of wheel must be smooth, and free from binding.
O. Match wire colors and connect the four pairs of stabilizer trim control switch leads at the terminal block. Secure with washer, lockwasher and nut.
P. Test electrical circuits for continuity which were disturbed during removal/installation procedures.
Q. While rotating the control wheel from stop to stop, test terminal block for resistance to ground, or wire to wire for minimum insulation value of 100 megohms at following points:
   (1) Between each wire and ground, and between wires VIOLET to RED, VIOLET to ORANGE, VIOLET to BLACK-ORANGE, RED to BLACK-ORANGE, RED to ORANGE, and BLACK-ORANGE to ORANGE.
R. Install terminal cover and secure with two screws.
S. Install medallion on control wheel by installing three bolts.





BASIC WIRING CONFIGURATION FOR
LEFT-HAND CONTROL COLUMN



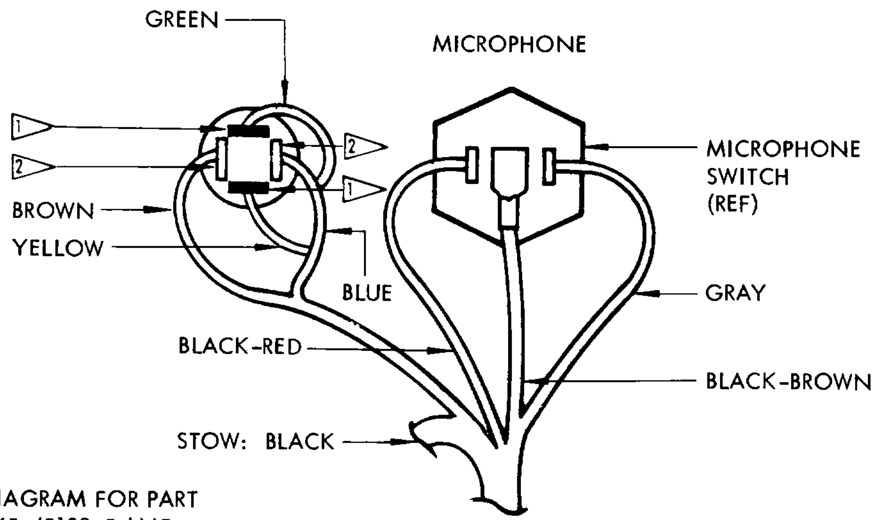


BASIC WIRING CONFIGURATION FOR
RIGHT-HAND CONTROL COLUMN

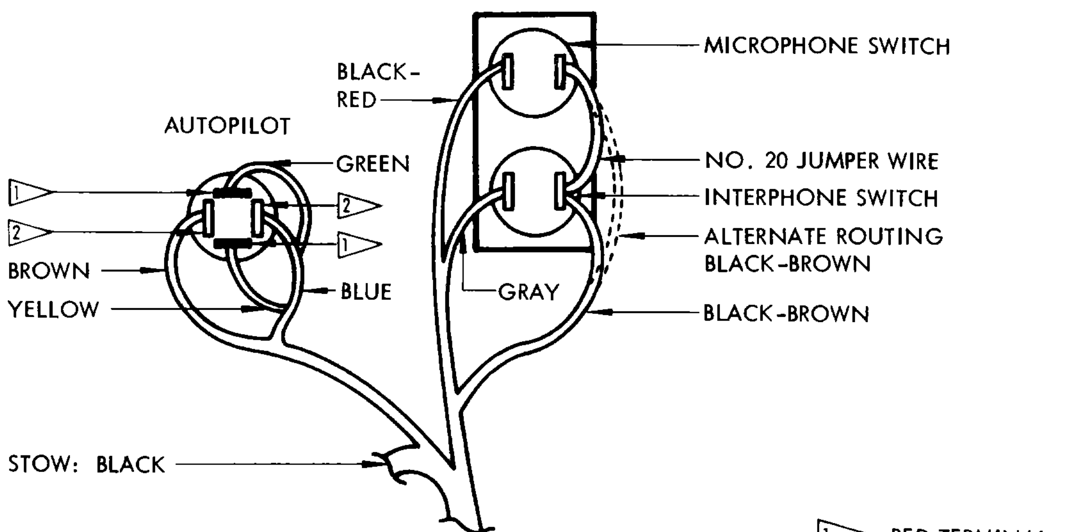
1 RED TERMINAL

2 GREEN TERMINAL

Wiring Diagram
Figure 402 (Sheet 1)



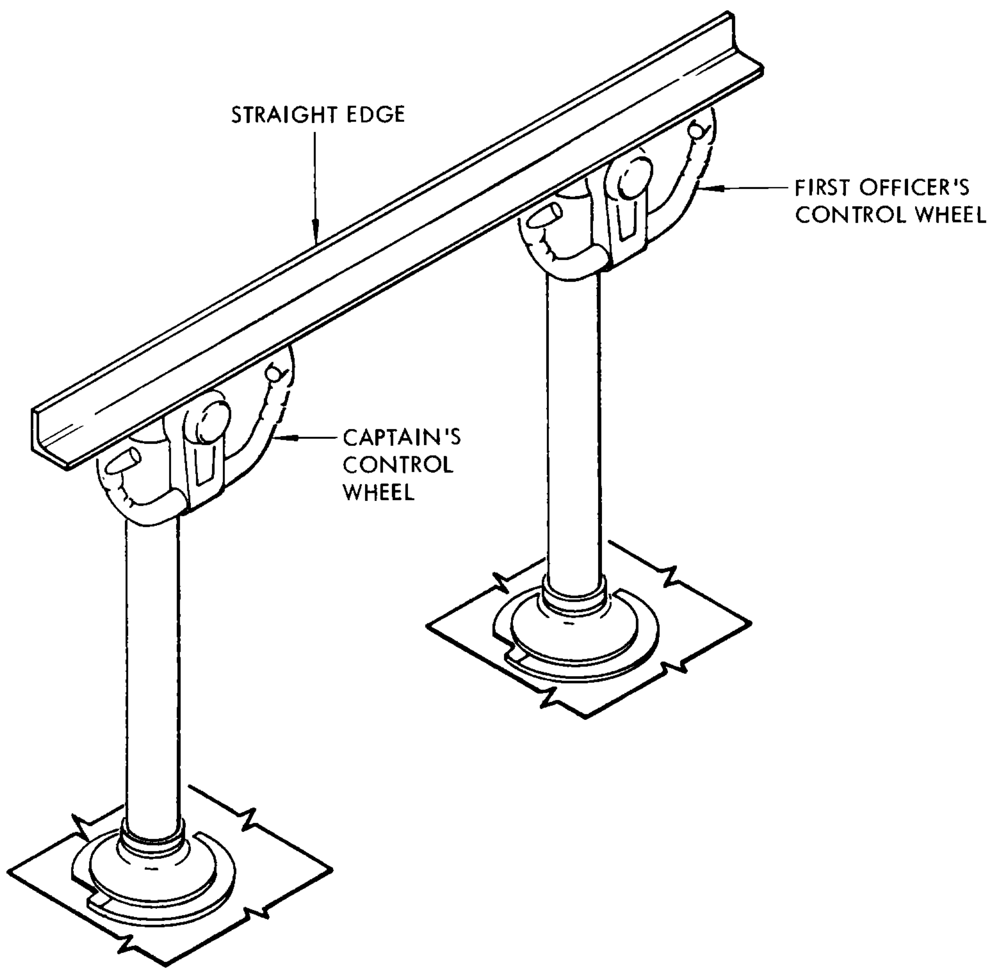
NOTE: WIRING DIAGRAM FOR PART NUMBERS 65-45123-5 AND 65-45123-6.



NOTE: WIRING DIAGRAM FOR PART NUMBERS 65-45123-3 AND 65-45123-4

ALTERNATE SWITCH WIRING FOR LEFT AND RIGHT-HAND CONTROL COLUMN (SEE NOTES) LEFT-HAND SHOWN, RIGHT-HAND OPPOSITE

Wiring Diagram
Figure 402 (Sheet 2)



Aileron Control Wheel Alignment (Neutral Position)
Figure 403

AILERON CONTROL WHEEL DRUM - REMOVAL/INSTALLATION

1. General
   A. The aileron control wheel drum is removed and installed as an assembly. The disassembly and repair instructions are contained in applicable overhaul manual.
   B. Two methods for removal and installation of the aileron control wheel drum are presented. The first method is to remove drum and associated ribs and brackets as an assembly. This requires disconnection of landing gear control cables, landing gear brake control cables, speed brake control cables, and subsequent reconnection and rigging of these cables. The second method is to disconnect ribs and brackets from aileron control wheel drum and leave in vicinity with landing gear control cables, landing gear brake control cables, and speed brake control cables still connected and undisturbed.
2. Equipment and Materials
   A. Vinyl Plastic Tape - 2 inches wide, Permacel Cold Weather Vinyl Tape No. 295
   B. Cleaning Solvent - BMS 3-2
   C. Rigging Pins Kit - F70207-84, or -98:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-1	-13	0.309-0.311	2.35 ±0.06	AILERON TRANSFER MECHANISM
A/S-1A	-19	0.309-0.311	8.25 ±0.25	AILERON TRANSFER MECHANISM
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

   D. Ball and Roller Bearing Grease - MIL-G-25760
   E. Straightedge - SE27-0001, or equivalent
3. Prepare to Remove Aileron Control Wheel Drum
   A. Open lower nose compartment access door.

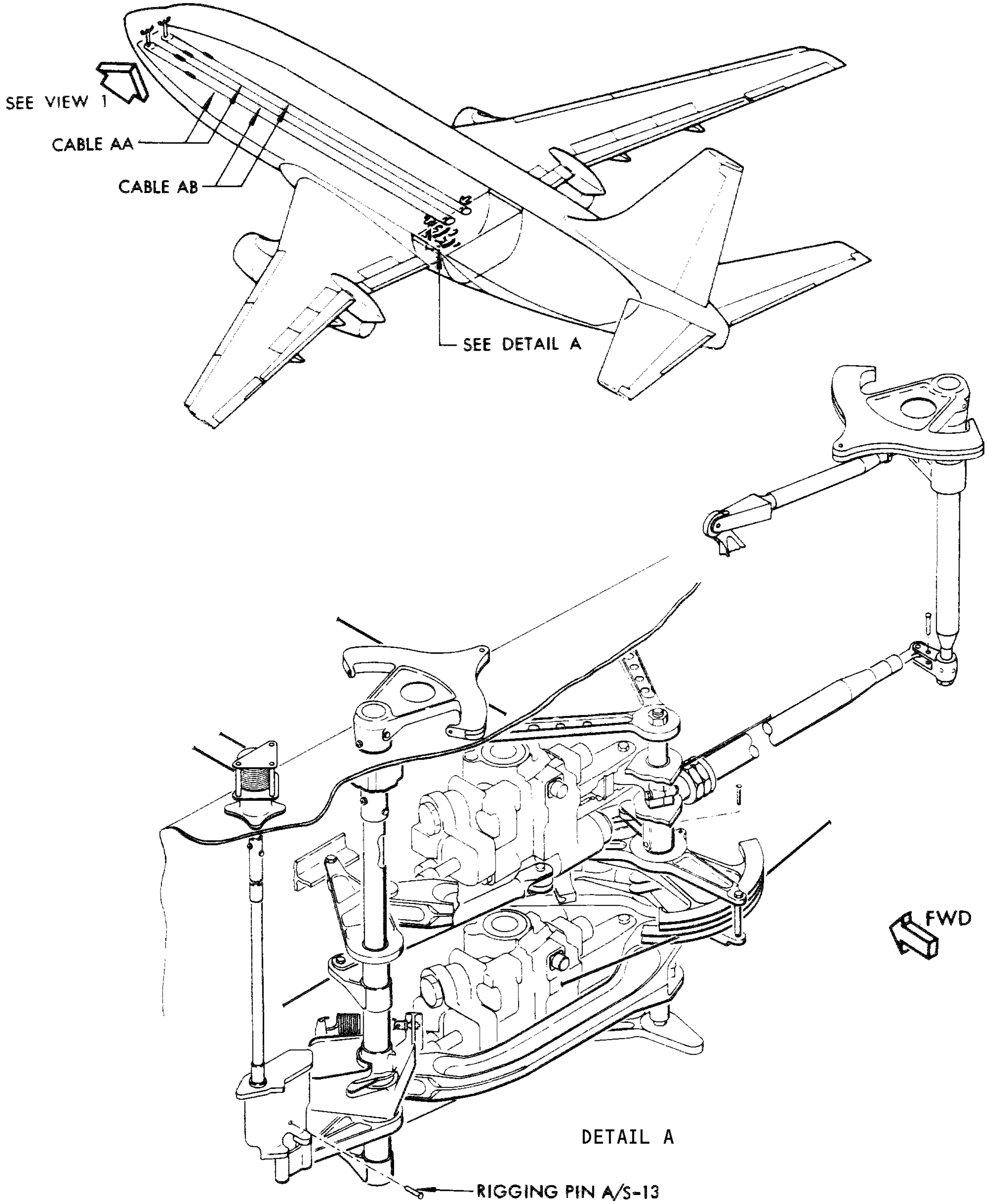
B. Ensure hydraulic systems A and B are depressurized (Ref 27-11-0 MP).
C. Place aileron control wheels in neutral position. Place aileron trim control knob in zero trim position.
D. Insert rigging pins A/S-1 and A/S-1A in aileron transfer mechanism (Fig. 401).

NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

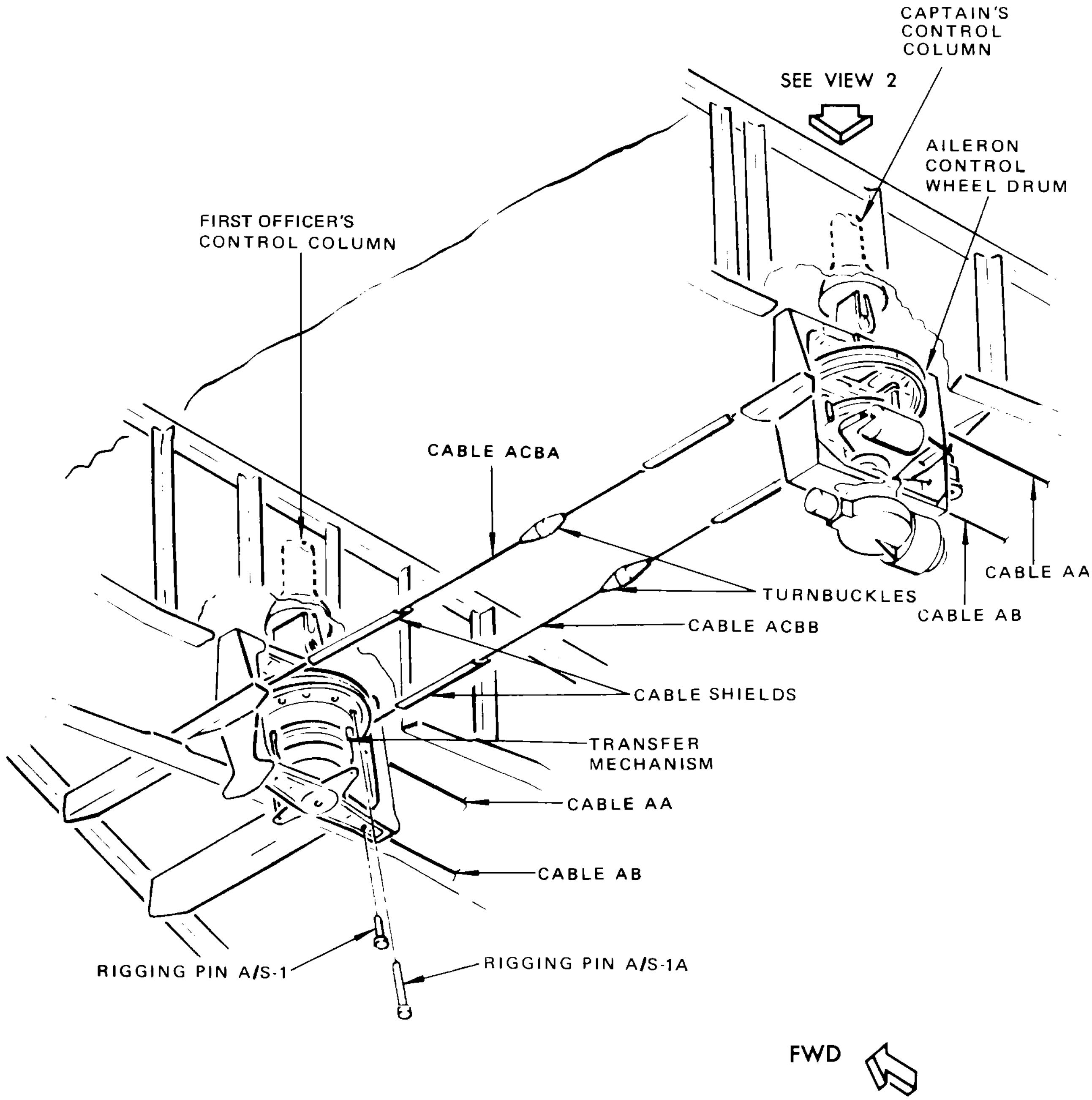
E. Insert rigging pin A/S-13 in aileron trim gearbox.
F. Remove the nose wheel well left access panel 3104.

4. Aileron Control Wheel Drum - Removal/Installation (Drum and associated ribs and brackets removed as an assembly)

A. Remove Aileron Control Wheel Drum
(1) Disconnect roll force transducer electrical connector (Fig. 401).
(2) Disconnect electrical connector at aileron force limiter.
(3) AIRPLANES WITH SB 31-1100;
Disconnect flight recorder transducer electrical connector and input cable.
(4) Remove cable shields and disconnect cables ACBA and ACBB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly.
(5) Disconnect left cables AA and AB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly.
(6) Disconnect landing gear control cables and landing gear brake control cables. Secure and tag cables to facilitate reassembly.
(7) Remove control cabin air duct.
(8) Disconnect speed brake control cables at turnbuckles. Secure and tag cables to facilitate reassembly.
(9) Remove nuts, washers and bolts securing aileron control wheel drum to structure.
(10) Slide aileron control wheel drum assembly downward while guiding cables ACBA and ACBB through cutouts until assembly is separated from structure.
(11) Remove nut, washers and screws securing cable guards, and remove cable guards.
(12) Disengage cables AA and AB from aileron control wheel drum.



Aileron Control Wheel Drum Installation
Figure 401 (Sheet 1)



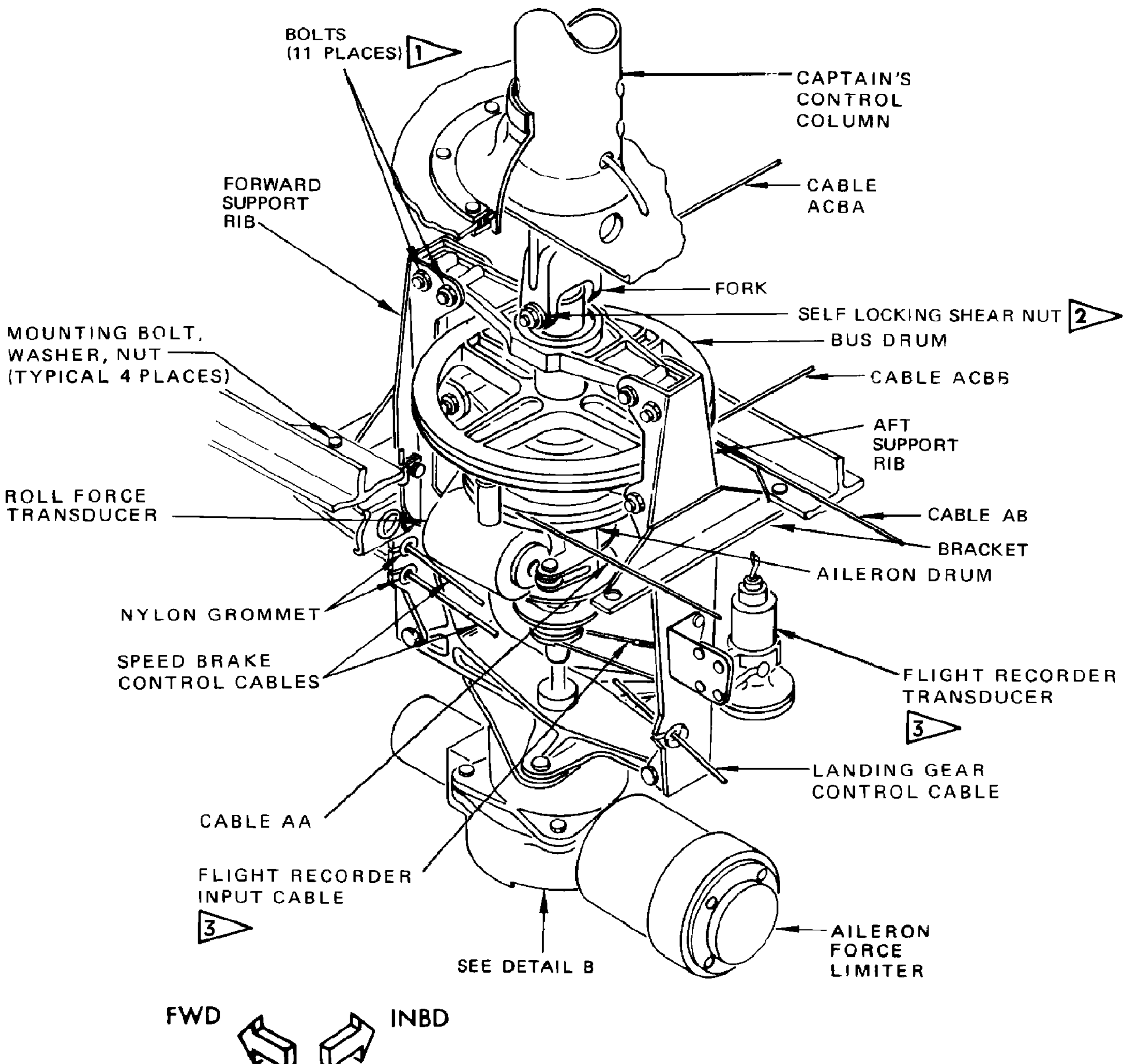
VIEW 1

Aileron Control Wheel Drum Installation
Figure 401 (Sheet 2)

1 BOLTS TO BE REMOVED ONLY WHEN REMOVING AILERON CONTROL WHEEL BY METHOD OUTLINED IN PARAGRAPH 5 (LEAVING SUPPORT RIBS IN VICINITY, WITH LANDING GEAR CONTROL CABLES, LANDING GEAR BRAKE CONTROL CABLES, AND SPEED BRAKE CONTROL CABLES CONNECTED AND UNDISTURBED).

2 COMPLETE BOLT END CHAMFER MUST BE EXPOSED BEYOND END OF NUT

3 AIRPLANES WITH SB 31-1100



VIEW 2

Aileron Control Wheel Drum Installation
Figure 401 (Sheet 3)

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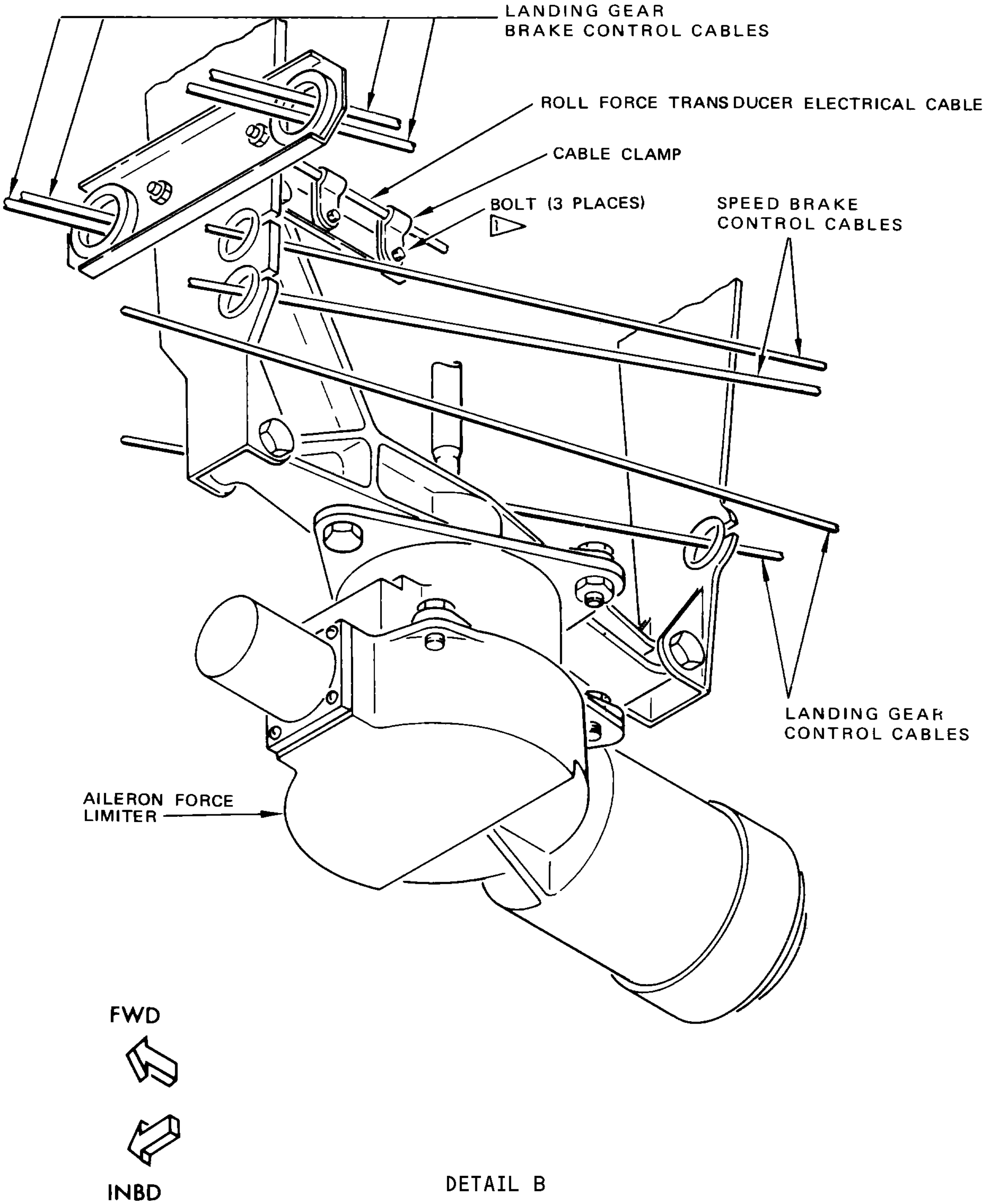


DETAIL B

Aileron Control Wheel Drum Installation
Figure 401 (Sheet 4)

(13) AIRPLANES WITH SB 31-1100;
If required, remove the flight recorder transducer (AMM 31-24-32/401).
(14) If required, remove roll force transducer (AMM 22-11-111/401) and aileron force limiter (AMM 22-11-131/401).

B. Install Aileron Control Wheel Drum
(1) If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-51, Inspection/Check).
(2) Check that fork is secured to drum with self-locking shim nut and complete bolt chamfer is exposed beyond end of nut.

WARNING: IF AN INCORRECT TENSION TYPE SELF-LOCKING IS INSTALLED INSTEAD OF A SELF-LOCKING SHEAR NUT, CAPTAIN'S CONTROL COLUMN COULD BECOME DETACHED FROM FORK, RESULTING IN LOSS OF CONTROL FROM CAPTAIN'S CONTROL WHEEL.

(3) If required, install roll force transducer and aileron force limiter (Ref Chapter 22).
(4) AIRPLANES WITH SB 31-1100;
If removed, install the flight recorder transducer (AMM 31-24-32/401).
(5) Lubricate cables AA and AB with grease and secure to aileron drum. Install cable guards and secure with screws, washers and nuts (Fig. 401).
(6) Guide ends of cables ACBA and ACBB through cutouts, and simultaneously position aileron control wheel drum into place.
(7) Secure aileron control wheel drum assembly with four bolts, washers and nuts.
(8) Connect cables ACBA, ACBB, AA, and AB to their respective turnbuckles. Tighten turnbuckles to remove cable slack but maintaining zero cable tension.
(9) AIRPLANES WITH SB 31-1100;
Connect the electrical connector for the flight recorder transducer.
(10) Connect roll force transducer and aileron force transducer electrical connectors.
(11) Install control cabin air duct as follows:
(a) Join ducts with a minimum of 1/2-inch overlap at each end.
(b) Reconnect mounting brackets, as required.
(c) Clean areas where ducts join with cleaning solvent.
(d) Tape joints with two laps of vinyl tape. Pull tape taut and smooth while applying.
(12) Connect and tension landing gear control cables and landing gear brake control cables (Ref Chapter 32).
(13) Connect and tension speed brake control cables (Ref 27-62-0, Adjustment/Test).
(14) Remove all rigging pins (Fig. 402).
(15) Ensure that aileron trim control knob is in zero trim position. Insert rigging pin A/S-13 into aileron trim gearbox.

TABLE I

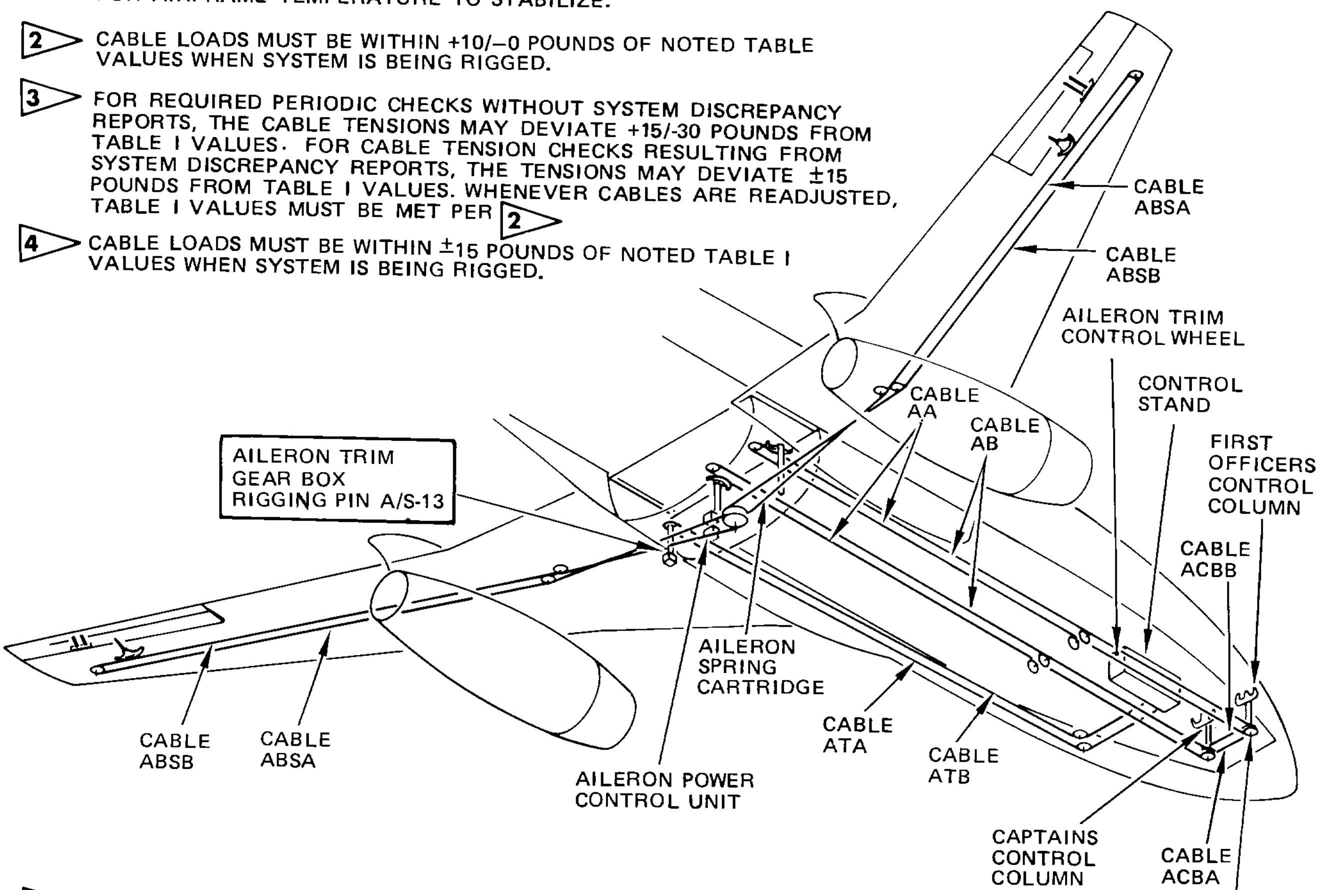
TEMPERATURE °F [1]	CABLE TENSION (POUNDS)	
	CABLES AA, AND AB [2] [3]	CABLES ACBA AND ACBB [4] [5]
110	133	93
90	124	84
70	115	75
50	107	70
30	99	61
+10	90	53
–10	82	49
–30	74	46
–40	68	44

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ±5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/–0 POUNDS OF NOTED TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [2]

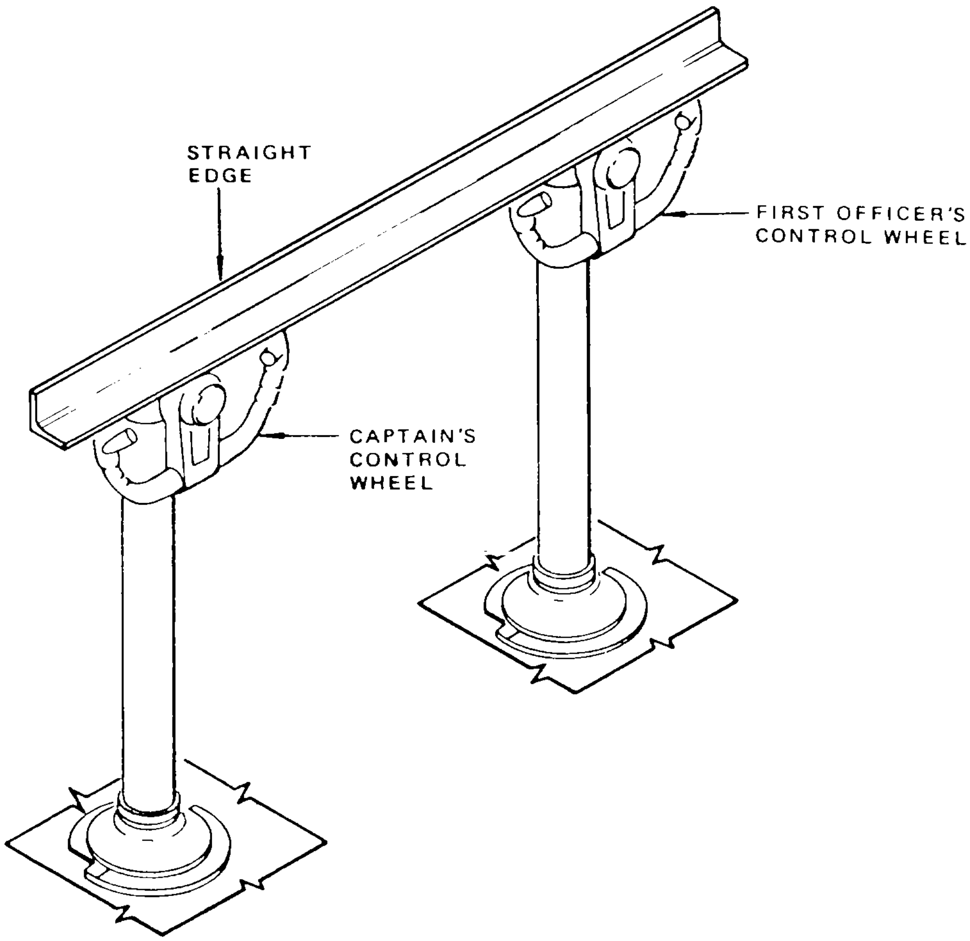
[4] CABLE LOADS MUST BE WITHIN ±15 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.



[5] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [4]

Aileron System Cable Tension Requirements
Figure 402

(16) Position captain's and first officer's aileron control wheels in neutral by placing a straightedge across upper ends of each control wheel. (See figure 403.) One end of first officer's control wheel may be out of contact with the straightedge by a maximum of 0.20 inch. Insert rigging pin A/S-lA.
(17) Adjust cables ACBA and ACBB at turnbuckles to tension specified in figure 402.
(18) Remove rigging pin A/S-1A. Rigging pin should withdraw freely from holes.
(19) Remove straightedge from control wheels and rotate control wheels through several cycles.
(20) Center control wheels and check rigging by placing straightedge across upper ends of control wheels. All four ends of control wheels should contact straightedge. However, one end of first officer's control wheel may be out of contact by 0.20-inch maximum.
(21) Install turnbuckle locking clips.
(22) Install cable shields and clamps.
(23) Adjust left aileron control cables AA and AB.
   (a) Place aileron control wheels in neutral position by clamping straightedge across upper ends of both wheels. One end of first officer's control wheel may be out of contact by 0.20-inch maximum.
   (b) Ensure rigging pin A/S-13 is installed and that trim roller is seated in cam detent.
   (c) Tighten left cables AA and AB to tension specified in Fig. 402.
   (d) Remove rigging pin A/S-13.
   (e) Rotate captain's aileron control wheel through several complete cycles.
   (f) Check cable rigging by reinserting rigging pins A/S-1, A/S-1A and A/S-13.
   (g) Check that cable tension is within values specified in Fig. 402.
   (h) Remove all rigging pins.
   (i) Install turnbuckle locking clips.
(24) Test aileron control wheel drum (AMM 27-11-51/501).
(25) Adjust and test roll force transducer (AMM 22-11-111/501) and aileron force limiter (AMM 22-11-131/501).



Aileron Control Wheel Adjustment
Figure 403

(26) AIRPLANES WITH SB 31-1100;
Do the FDR Adjustment/Test (AMM 31-24-0/501).
(27) Close lower nose compartment access door.
(28) Install the nose wheel well left access panel 3104.

5. <u>Aileron Control Wheel Drum - Removal/Installation (Ribs and brackets disconnected and left in vicinity)</u>

A. Remove Aileron Control Wheel Drum
(1) Disconnect roll force transducer electrical connector (Fig. 401).
(2) Disconnect electrical connector at aileron force limiter.
(3) AIRPLANES WITH SB 31-1100;
Disconnect the electrical connector for the flight recorder transducer.
(4) Remove cable shields and disconnect cables ACBA and ACBB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly.
(5) Disconnect left cables AA and AB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly.
(6) Remove control cabin air duct.
(7) Remove nuts, washers and bolts (4 places) securing aileron control wheel drum assembly to structure.
(8) Disconnect roll force transducer electrical cable from forward support rib and bracket (detail B, Fig. 401).
(9) Remove bolts (11 places) securing forward and aft support ribs to aileron control wheel drum.
(10) Move support ribs either fore or aft sufficiently so that aileron control wheel drum can be removed without interference.
(11) Remove aileron control wheel drum while guiding cables ACBA and ACBB through cutouts.
(12) Remove nut, washers and screws securing cable guards, and remove cable guards.
(13) Disengage cables AA and AB from aileron control wheel drum.
(14) If required, remove roll force transducer (AMM 22-11-111/401) and aileron force limiter (AMM 22-11-131/401).
(15) AIRPLANES WITH SB 31-1100;
If required, remove the flight recorder transducer (AMM 31-24-32/401).

B. Install Aileron Control Wheel Drum
(1) If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-51, Inspection/Check).
(2) Check that fork is secured to drum with self-locking shear nut and complete bolt chamfer is exposed beyond end of nut.

<u>WARNING</u>: IF AN INCORRECT TENSION TYPE SELF-LOCKING IS INSTALLED INSTEAD OF A SELF-LOCKING SHEAR NUT, CAPTAIN'S COLUMN COULD BECOME DETACHED FROM FORK, RESULTING IN LOSS OF CONTROL FROM CAPTAIN'S CONTROL WHEEL.

(3) If required, install roll force transducer and aileron force limiter (Ref Chapter 22).

(4) AIRPLANES WITH SB 31-1100;
If removed, install the flight recorder transducer (AMM 31-24-32/401).

(5) Lubricate cables AA and AB with grease and secure to aileron drum. Install cable guards and secure with screws, washers and nuts (Fig. 401).

(6) Guide ends of cables ACBA and ACBB through cutouts, and simultaneously position aileron control wheel drum into place.

(7) Attach forward and aft support ribs to aileron control wheel drum with bolts (11 places).

(8) Connect roll force transducer electrical cable to forward support rib and bracket (Detail C).

(9) Secure aileron control wheel drum assembly to structure with four bolts, washers and nuts.

(10) Connect cables ACBA, ACBB, AA, and AB to their respective turnbuckles. Tighten turnbuckles to remove cable slack but maintaining zero cable tension.

(11) Connect roll force transducer and aileron force transducer electrical connectors.

(12) Install control cabin air duct as follows:
   (a) Join ducts with a minimum of 1/2-inch overlap at each end.
   (b) Reconnect mounting brackets, as required.
   (c) Clean areas where ducts join with cleaning solvent.
   (d) Tape joints with two laps of vinyl tape. Pull tape taut and smooth while applying.

(13) Remove all rigging pins (Fig 402).

(14) Ensure that aileron trim control knob is in zero trim position. Insert rigging pin A/S-13 into aileron trim gearbox.

(15) Position captain's and first officer's aileron control wheels in neutral by placing a straightedge across upper ends of each control wheel (Fig. 403). One end of first officer's control wheel may be out of contact with the straightedge by a maximum of 0.20 inch. Insert rigging pin A/S-1A.

(16) Adjust cables ACBA and ACBB at turnbuckles to tension specified in figure 402.

(17) Remove rigging pin A/S-1A. Rigging pin should withdraw freely from holes.

(18) Remove straightedge from control wheels and rotate control wheels through several cycles.

(19) Center control wheels and check rigging by placing straightedge across upper ends of control wheels. All four ends of control wheels should contact straightedge. However, one end of first officer's control wheel may be out of contact by 0.20 inch maximum.

(20) Install turnbuckle locking clips.

(21) Install cable shields and clamps.

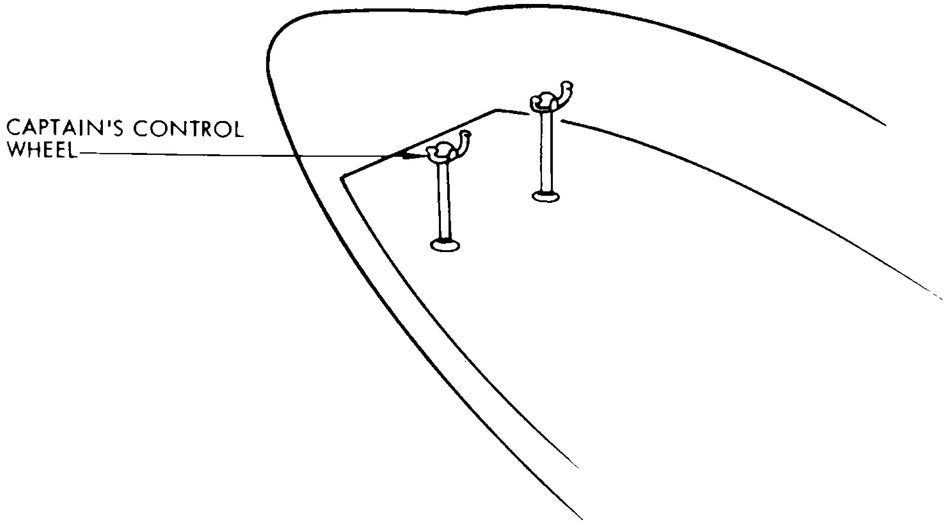
(22) Adjust left aileron control cables AA and AB.
   (a) Place aileron control wheels in neutral position by clamping straightedge across upper ends of both wheels. One end of first officer's control wheel may be out of contact by 0.20-inch maximum.

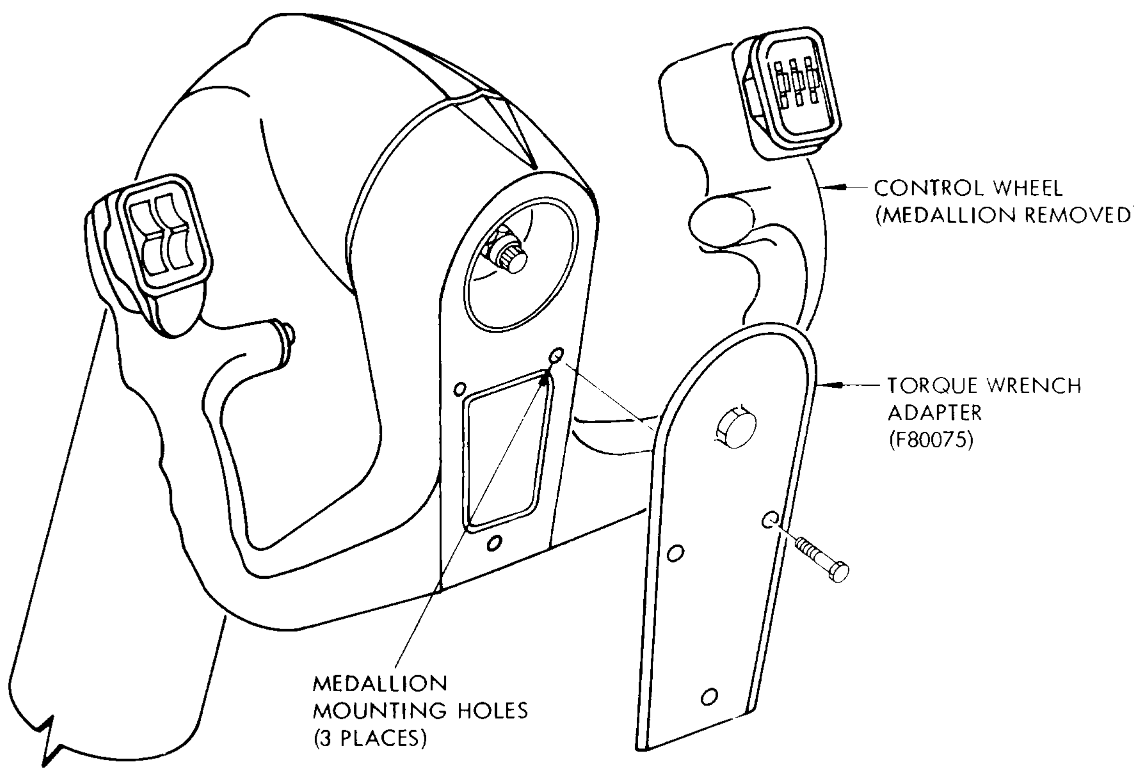
(b) Make sure rigging pin A/S-13 is installed and that trim roller is seated in cam detent.
(c) Tighten left cables AA and AB to tension specified in figure 402.
(d) Remove rigging pin A/S-13.
(e) Rotate captain's aileron control wheel through several complete cycles.
(f) Check cable rigging by reinserting rigging pins A/S-1, A/S-1A and A/S-13.
(g) Check that cable tension is within values specified in Fig. 402.
(h) Remove all rigging pins.
(i) Install turnbuckle locking clips.

(23) Test aileron control wheel drum (AMM 27-11-51/501).
(24) Adjust and test roll force transducer (AMM 22-11-111/501) and aileron force limiter (AMM 22-11-131/501).
(25) AIRPLANES WITH SB 31-1100;
Do the FDR Adjustment/Test (AMM 31-24-0/501).
(26) Close lower nose compartment access door.
(27) Install the nose wheel well left access panel 3104.

AILERON CONTROL WHEEL DRUM - ADJUSTMENT/TEST

1. Aileron Control Wheel Drum Test
    A. Equipment and Materials
        (1) Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
            (a) Control Wheel Protractor Mount-F72790
            (b) Forward Thrust Lever Protractor Adapter-F72952-2
        (2) Torque and Force Test Control Wheel Adapter-F72867-1
    B. Prepare for Test
        (1) Install protractor and protractor mount on first officer's aileron control wheel.
        (2) Remove medallion and install control wheel torque and force test adapter on captain's aileron control wheel (Fig. 501).
        (3) Ensure aileron trim control wheel is in neutral (zero) position.
    C. Test Aileron Control Wheel Drum
        (1) Using control wheel torque and force test adapter, measure force required to manually rotate captain's aileron control wheel clockwise and counterclockwise from neutral. If adapter is not available, apply force tangentially to captain's control wheel at a 6.5-inch radius.
            (a) Measure force required to rotate control wheel clockwise until ailerons begin to move. Force required shall not exceed 192 pound-inches torque or 29.5 pounds.
            (b) Continue rotating control wheel to 20 degrees from neutral. Force required shall not exceed 220 pound-inches torque or 33.8 pounds.
            (c) Continue rotating to 40 degrees. Force required shall not exceed 256 pound-inches torque or 39.4 pounds.
            (d) Continue rotating to 75 degrees. Force required shall not exceed 310 pound-inches torque or 47.7 pounds.
            (e) Repeat steps (a) thru (d) in a counterclockwise direction.
        (2) Measure corresponding movement of captain's and first officer's aileron control wheels.
            (a) Rotate captain's aileron control wheel clockwise through full travel.
            (b) Check that first officer's and captain's aileron control wheels have rotated a minimum of 105 degrees clockwise.
            (c) Repeat procedure in counterclockwise direction from neutral.
        (3) Measure relationship of aileron control wheel movement as compared with aileron surface deflection.
            (a) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.
            (b) Check that left aileron moves up and right aileron moves down within limits specified in figure 502.





Control Wheel Torque Wrench Adapter
Figure 501

(c) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.

(d) Check that left aileron moves down and right aileron moves up within limits specified in figure 502.

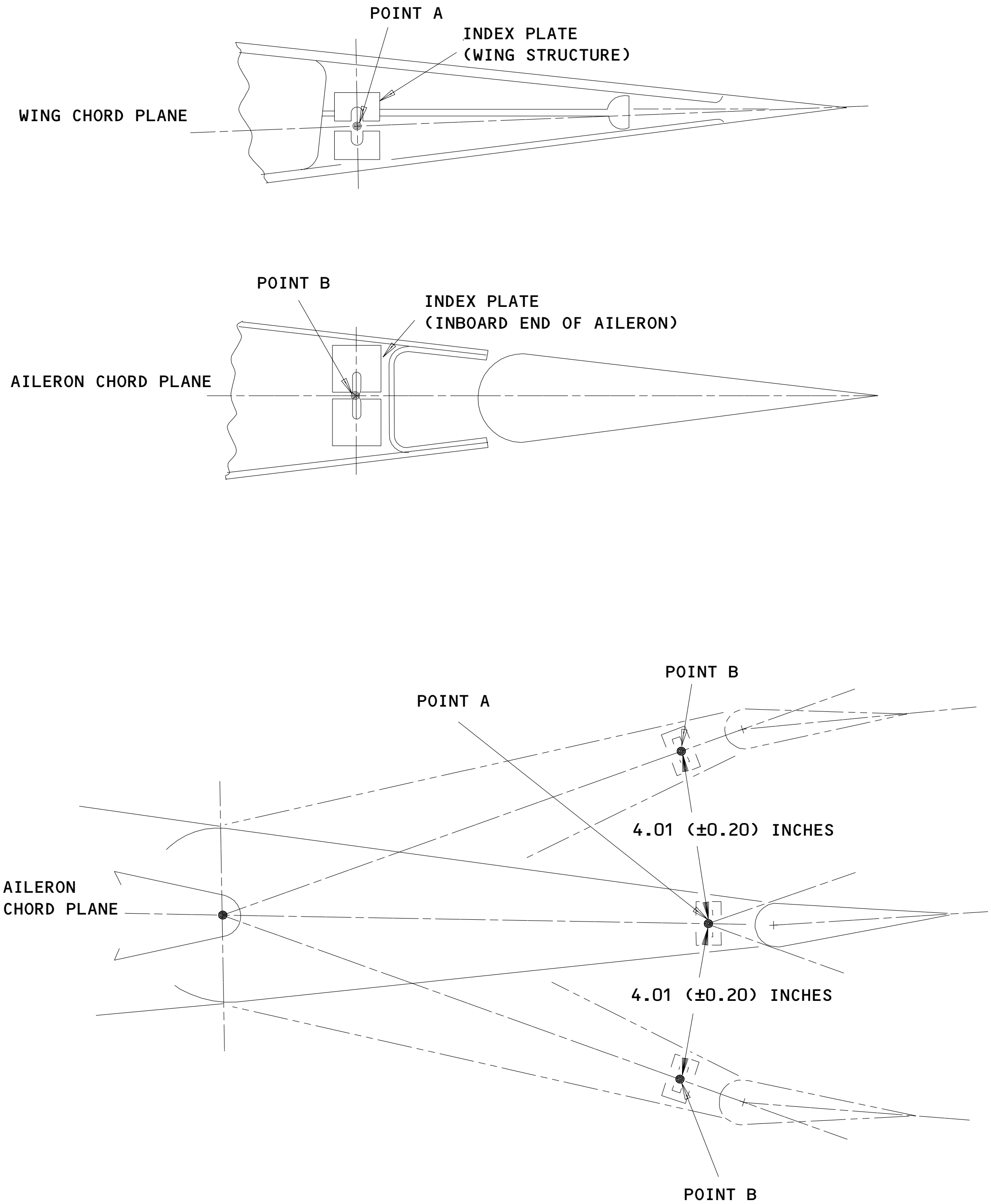
D. Restore Airplane to Normal

(1) Close lower nose compartment access door.

(2) Remove protractor and protractor mount from aileron control wheel.

(3) Remove torque wrench adapter from aileron control wheel.

(4) Replace medallion on aileron control wheel.

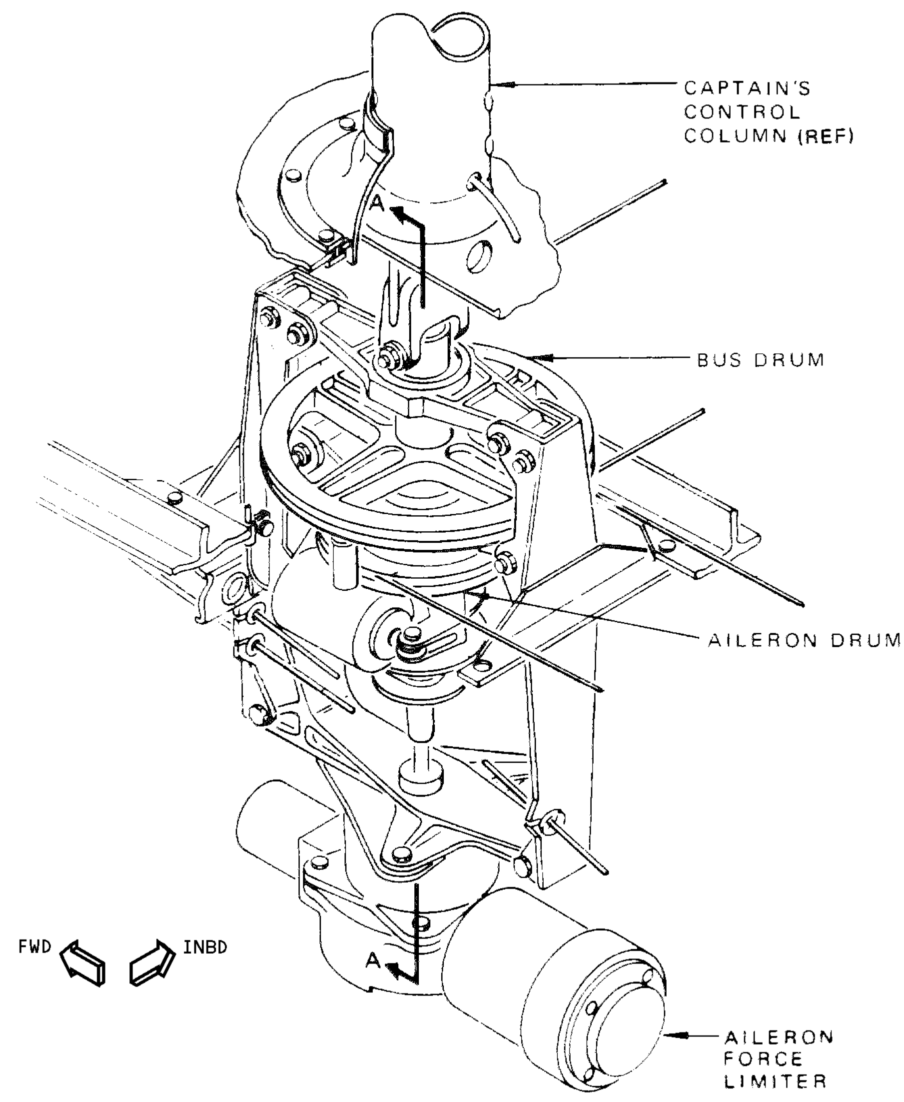


NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH.

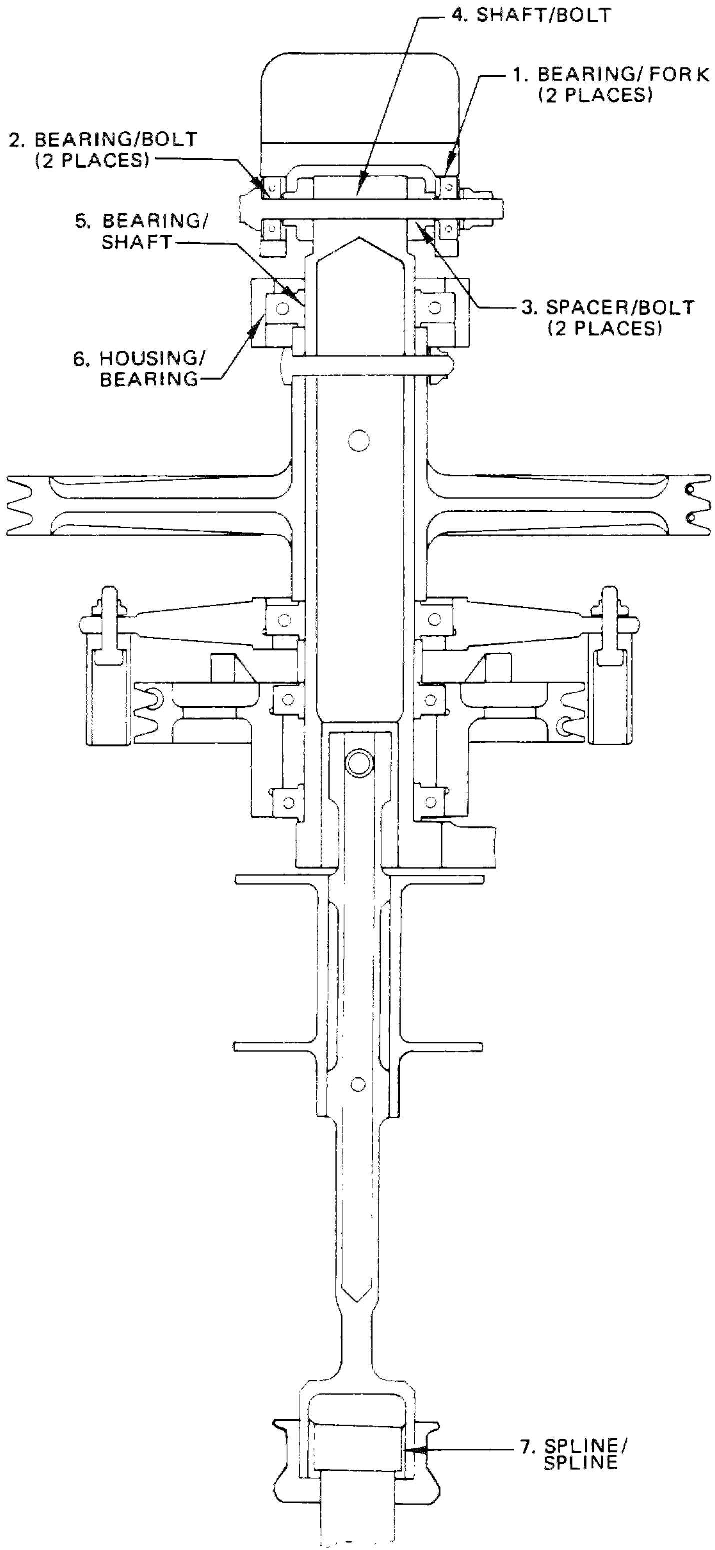
Aileron Deflection Diagram
Figure 502

AILERON CONTROL WHEEL DRUM - INSPECTION/CHECK

1. General
   A. This data consists of illustration and wear limits charts. No procedure is given for gaining access to permit inspection. For this information, refer to component removal/installation.
2. Aileron Control Wheel Drum Wear Limits



Aileron Control Wheel Drum Wear Limits
Figure 601 (Sheet 1)



SECTION A-A

Aileron Control Wheel Drum Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	FORK	ID	0.7498	0.7503	0.7503	0.0008	X		
	BEARING	OD	0.7495	0.7500	0.7495		*[1]		
2	BEARING	ID	0.2495	0.2500	0.2500	0.0019	*[1]		
	BOLT	OD	0.2485	0.2495	0.2481		X		
3	SPACER	ID	0.2500	0.2540	0.2540	0.0055	X		
	BOLT	OD	0.2485	0.2495	0.2485		X		
4	SHAFT	ID	0.2495	0.2505	0.2505	0.0020	X		
	BOLT	OD	0.2485	0.2495	0.2485		X		
5	BEARING	ID	1.3120	1.3130	1.3130	0.0020	*[1]		
	SHAFT	OD	1.3110	1.3120	1.3110		X		
6	HOUSING	ID	2.2500	2.2510	2.2510	0.0020	X		
	BEARING	OD	2.2490	2.2500	2.2490		*[1]		
7	SPLINE	ID	-	-	-	*[2]	X		
	SPLINE	OD	-	-	-		X		

*[1] REPLACE WHEN RADIAL PLAY OR BEARING EXCEEDS 0.0020 INCH.

*[2] REPLACE WHEN BACKLASH EXCEEDS 0.5 DEGREE.

Aileron Control Wheel Drum Wear Limits
Figure 601 (Sheet 3)

AILERON TRANSFER MECHANISM - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
   B. Rigging Pins Kit-F70207-84 or -98

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-1	-13	0.309 - 0.311	2.35 ±0.06	AILERON TRANSFER MECHANISM
A/S-1A	-19	0.309 - 0.311	8.25 ±0.25	AILERON TRANSFER MECHANISM
A/S-3	-8	0.309 - 0.311	3.7 ±0.25	SPOILER CONTROL QUADRANT LOWER LEVER
A/S-4	-11	0.309 - 0.311	6.7 ±0.25	AILERON BUS DRUM

   C. Control Wheel Straightedge-SE27-0001
   D. Grease-Mil-G-25760 (AMM 20-30-21/201)
   E. Torque and Force Test Control Wheel Adapter-F72867-1
   F. Tensiometer, 0- to 200-pound capacity
2. Prepare to Remove Aileron Transfer Mechanism
   A. Ensure that hydraulic systems A and B are depressurized (AMM 27-11-0/201).
   B. Place aileron control wheels and aileron trim control wheel in neutral positions.
   C. Insert rigging pins A/S-1 and A/S-1A in aileron transfer mechanism (Fig. 401).

      NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

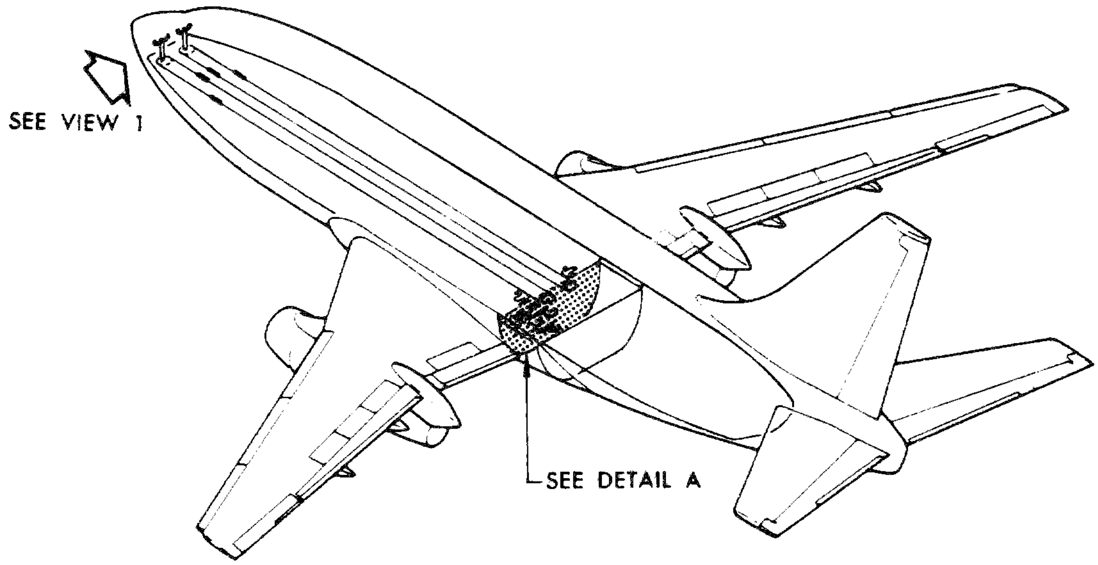
D. Insert rigging pin A/S-4 in aileron bus drums.
E. Insert rigging pin A/S-3 in right aileron control quadrant shaft.
F. Remove the nose wheel well right access panel 3103.

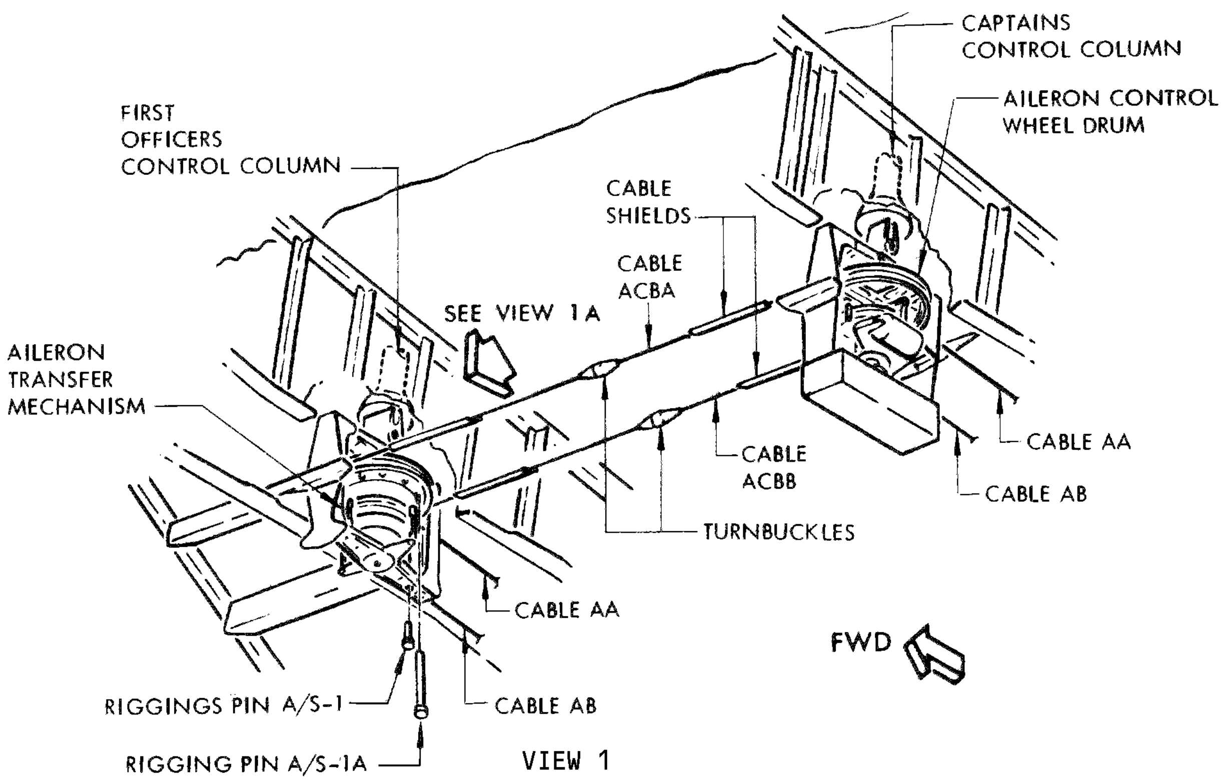
3. Remove Aileron Transfer Mechanism

A. Remove cable shields and disconnect cables ACBA and ACBB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly.
B. Disconnect right cables AA and AB at turnbuckles. Secure disconnected cables and tag cables to facilitate reassembly .
C. Remove nuts, washers and bolts securing transfer mechanism to structure.
D. Slide transfer mechanism downward while guiding cables ACBA and ACBB through cutouts until assembly is separated from structure.
E. Remove nut, washers and screws securing cable guards, and remove cable guards.
F. Disengage cables AA and AB from aileron transfer mechanism.
G. Remove cables ACBA and ACBB from transfer mechanism.

4. Install Aileron Transfer Mechanism

A. Lubricate cables AA and AB with grease and secure to spoiler drum.
B. Install cable guards and secure with screws, washers and nuts (Fig. 401).
C. Lubricate cables ACBA and ACBB and secure cables to bus drum.
D. Guide ends of cables ACBA and ACBB through cutouts, and simultaneously position transfer mechanism into place.
E. Secure transfer mechanism with bolts, washers and nuts.
F. Connect cables ACBA, ACBB, AA, and AB to their respective turnbuckles. Tighten turnbuckles to remove cable slack but maintaining zero tension.
G. Remove rigging pins A/S-1, A/S-3, and A/S-4.
H. Position captain's and first officer's aileron control wheels in neutral by clamping a straightedge across upper ends of both control wheels (Fig. 403). One end of first officer's control wheel may be out of contact with straightedge by 0.20-inch maximum.
I. Tighten cable ACBA and ACBB turnbuckles to correct cable tension as specified in figure 402.
J. Remove rigging pin A/S-1A. Rigging pin should withdraw freely from holes.
K. Remove straightedge from control wheels and rotate control wheel through several cycles.
L. Check rigging by placing a straightedge across upper ends of both control wheels. One end of first officer's control wheel may be out of contact with straightedge by 0.20-inch maximum.





Aileron Transfer Mechanism Installation
Figure 401 (Sheet 1)

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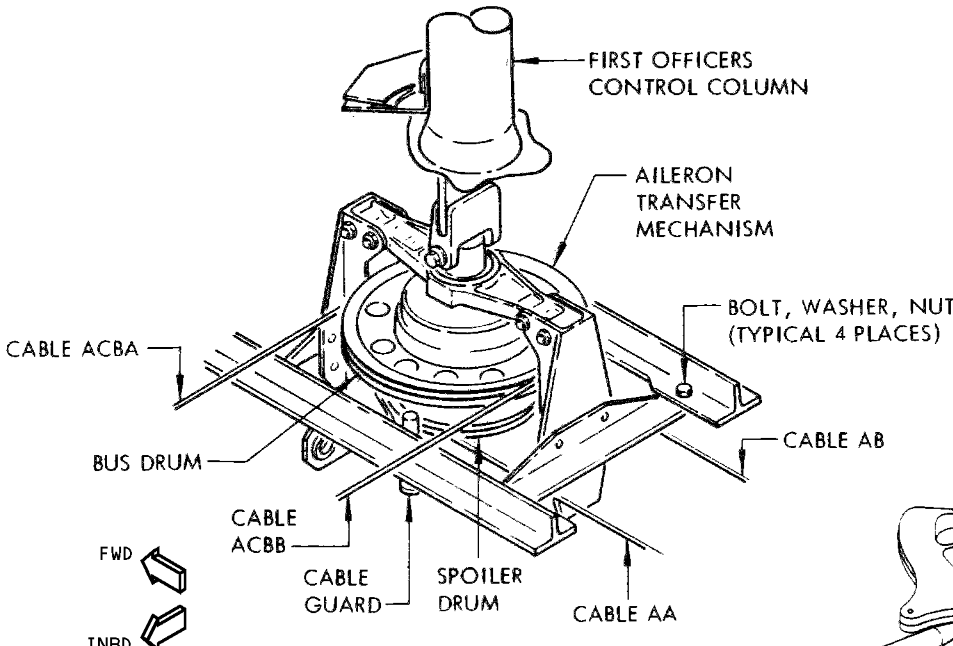
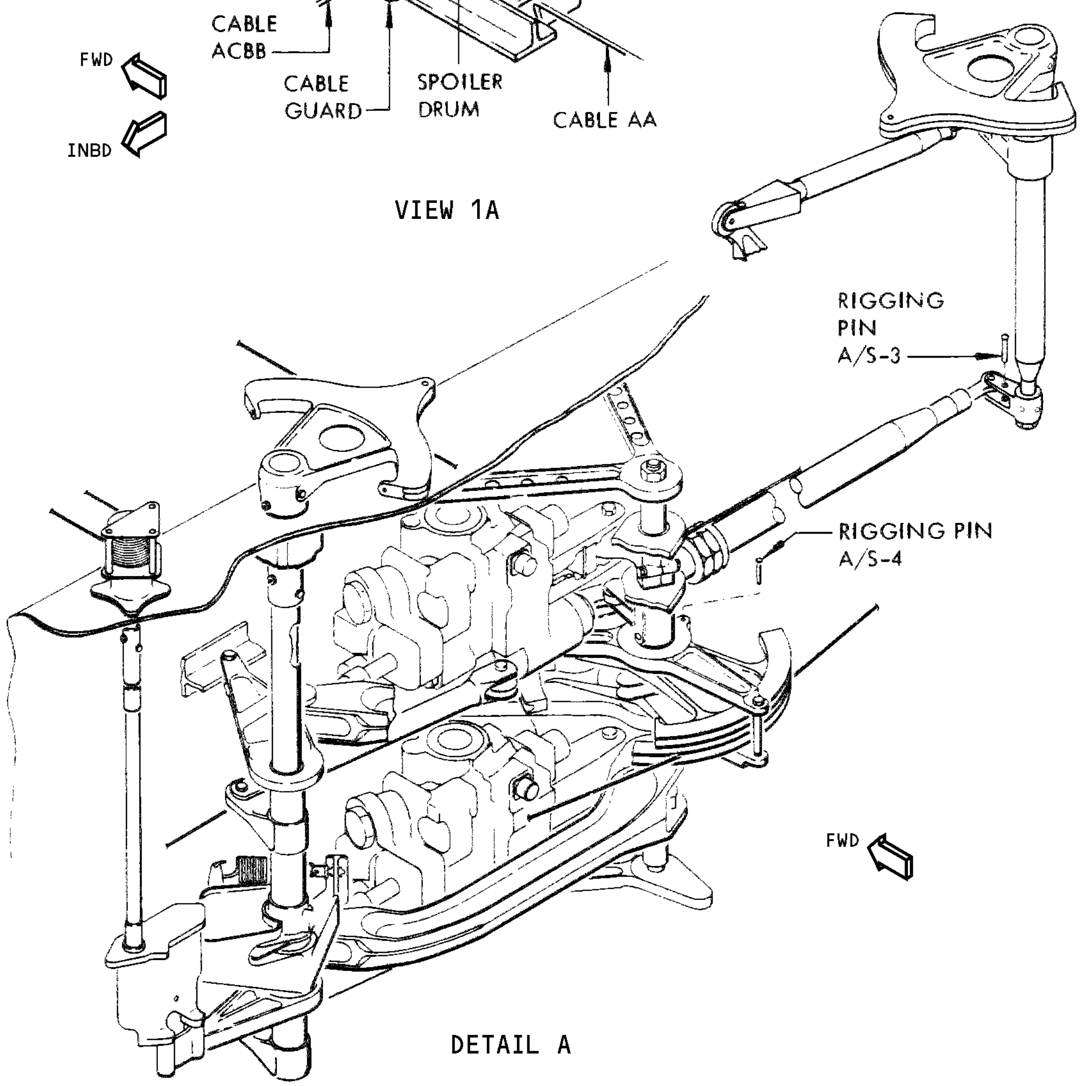


VIEW 1A



DETAIL A

Aileron Transfer Mechanism Installation
Figure 401 (Sheet 2)

TABLE I

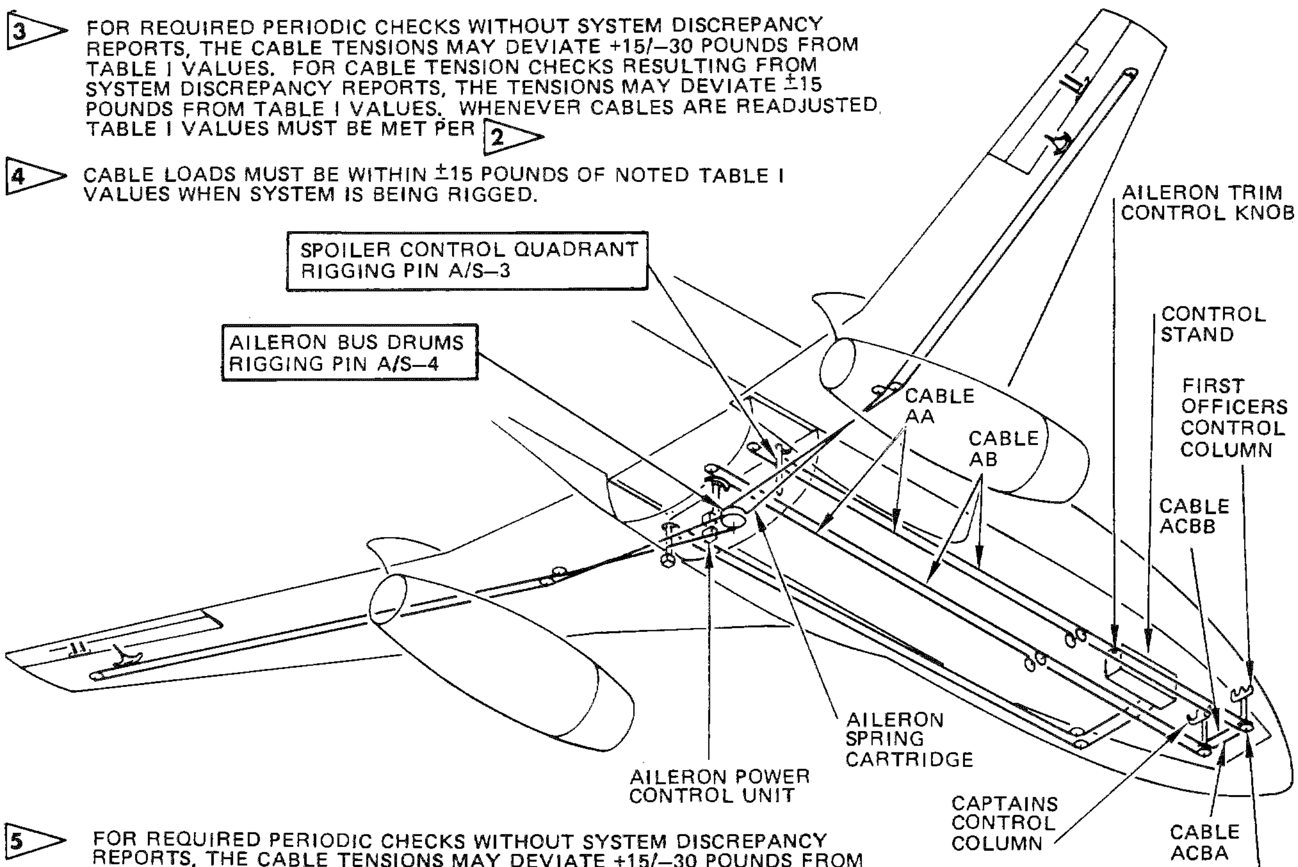
TEMPERATURE °F [1]	CABLE TENSION (POUNDS)	
	CABLES AA, AND AB [2] [3]	CABLES ACBA AND ACBB [4] [5]
110	133	93
90	124	84
70	115	75
50	107	70
30	99	61
+10	90	53
–10	82	49
–30	74	46
–40	68	44

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ±5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/–0 POUNDS OF NOTED TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

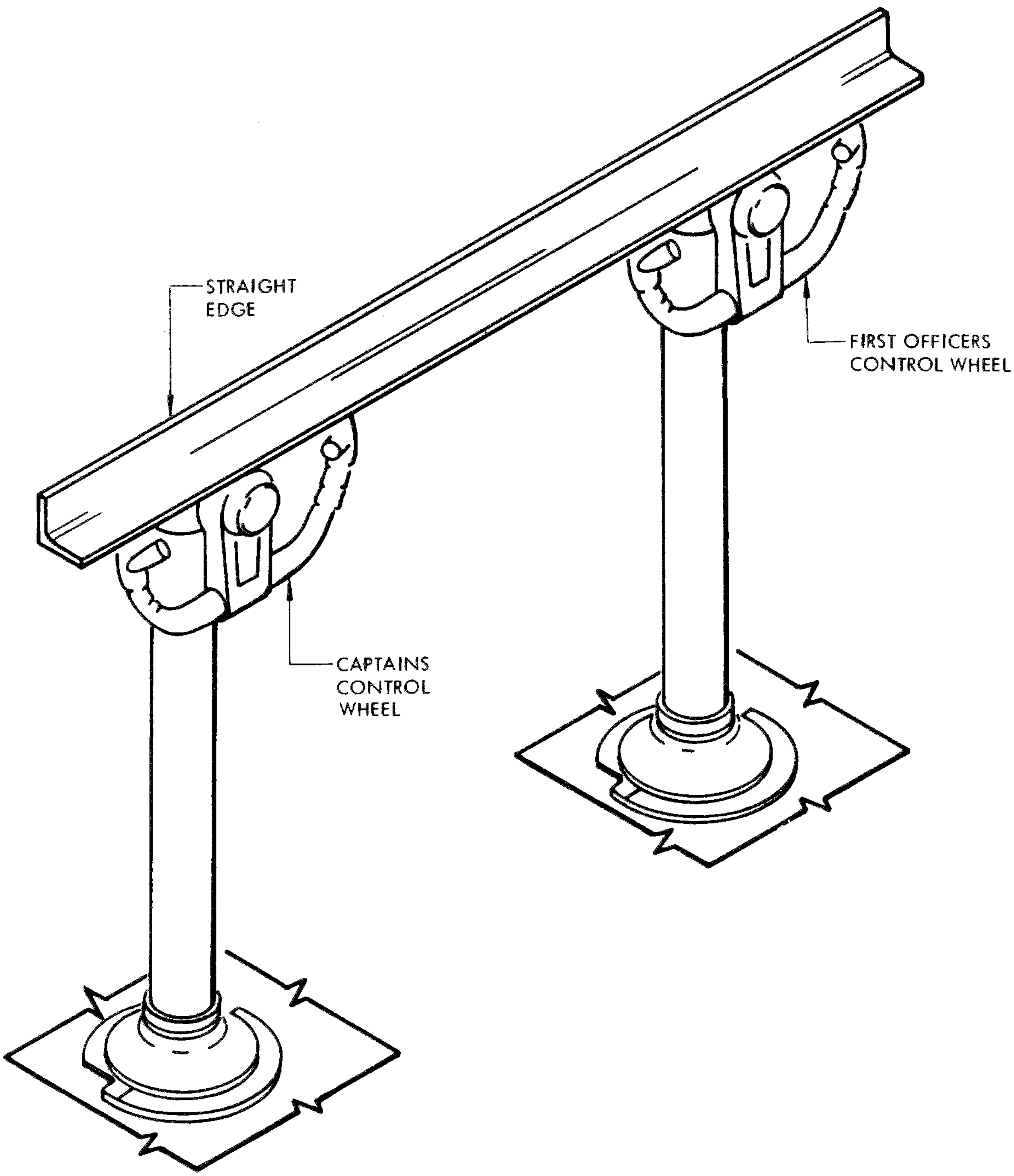
[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [2]

[4] CABLE LOADS MUST BE WITHIN ±15 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.



[5] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [4]

Aileron System Cable Tension Requirements
Figure 402



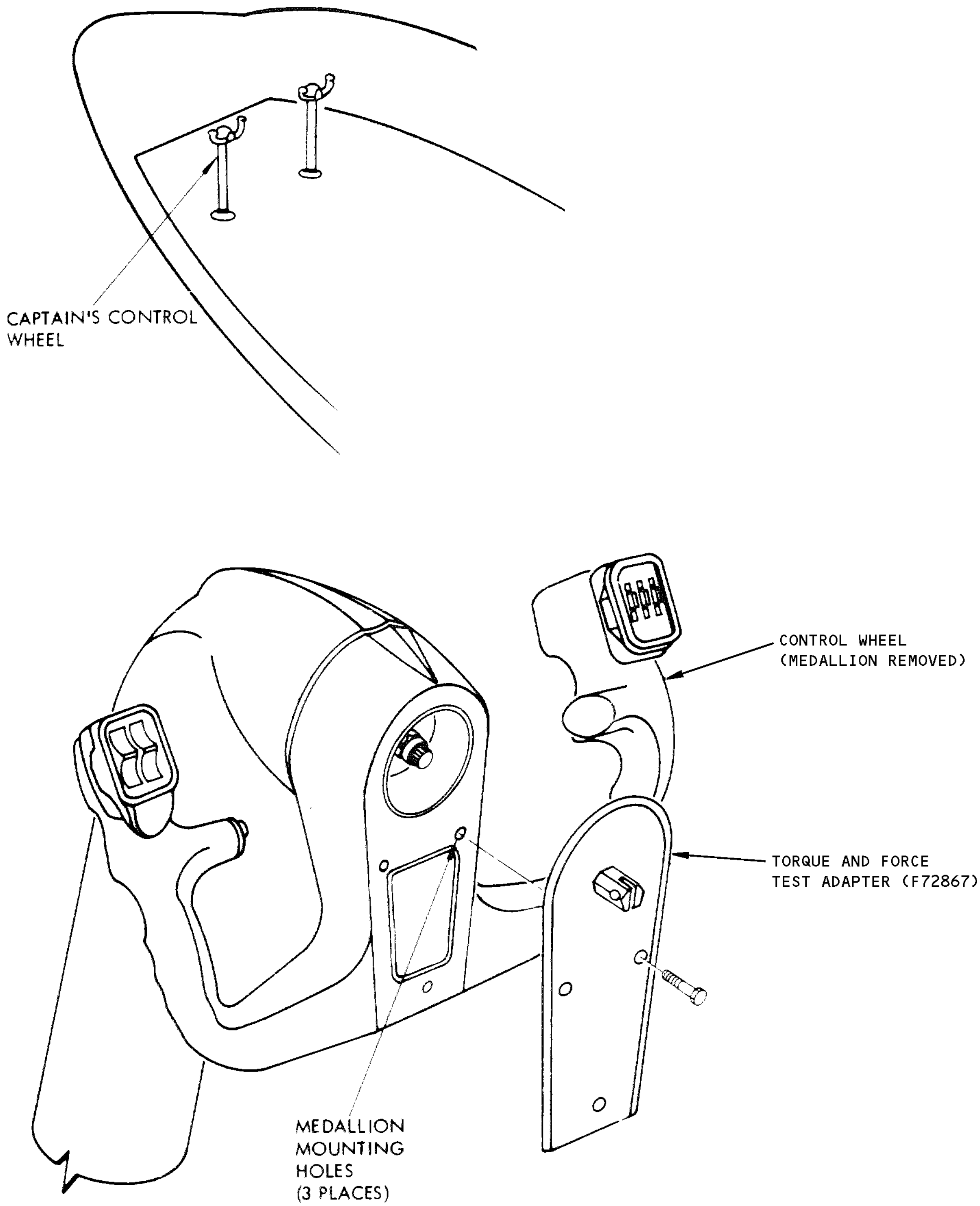
Aileron Control Wheel Adjustment
Figure 403

M. Check that cable tension is within values in Fig. 402.
N. Install cable shields and clamps.
O. Adjust right cables AA and AB.

<u>NOTE</u>: Aileron trim system must be adjusted prior to proceeding with this step.

(1) Place control wheels in neutral by clamping straightedge on upper ends of both control wheels.
(2) Place aileron trim control knob in zero trim position.
(3) Check that trim roller is firmly detented against cam.
(4) Adjust cable tension within required value range on figure 402.
(5) Rotate aileron control wheel through several complete cycles.
(6) Insert rigging pins A/S-1, A/S-A and A/S-3.
(7) Check that cable tension is within required value range on figure 402.
(8) Install turnbuckle locking clips.
(9) Remove all rigging pins.

P. Install protractor and protractor mount on first officer's aileron control wheel.
Q. Remove medallion and install torque wrench adapter tool on captain's control wheel (Fig. 404).
R. Using torque wrench and torque wrench adapter, measure force required to manually rotate captain's aileron control wheel clockwise and counterclockwise from neutral. If torque wrench adapter tool is not available, apply force tangentially to captain's control wheel at a 6.5-inch radius.
(1) Measure force required to rotate control wheel clockwise until aileron begins to move. Force required shall not exceed 192 pound-inches torque or 29.5 pounds.
(2) Continue rotating control wheel to 20 degrees from neutral. Force required shal1 not exceed 220 pound-inches torque or 33.8 pounds.
(3) Continue rotating to 40 degrees. Force required shal1 not exceed 256 pound-inches torque or 39.4 pounds.
(4) Continue rotating to 75 degrees. Force required shal1 not exceed 310 pound-inches torque or 47.7 pounds.



Control Wheel Torque and Force Test Adapter Tool
Figure 404

(5) Repeat steps (1) through (4) in a counterclockwise direction.

S. Measure first officer's aileron control wheel for lost motion in clockwise and counterclockwise direction from neutral.
   (1) Rotate first officer's control wheel and check right AA and AB cables for initial movement. As initial movement occurs, the control wheel should have rotated 12 (±1) degrees from neutral.

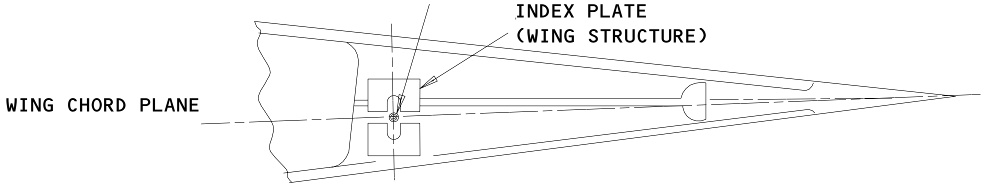
T. Measure force required to operate transfer mechanism.
   (1) Pressurize hydraulic systems A and B. Refer to 27-11-0, Aileron and Aileron Trim Control System - Maintenance Practices.
   (2) Hold first officer's aileron control wheel rigid in neutral position.
   (3) Rotate captain's aileron control wheel in clockwise direction from neutral.
   (4) Force required to initially rotate captain's control wheel from neutral position shall not exceed 436 pound-inches torque or 67 pounds.
   (5) Continue to rotate control wheel from neutral through 75 degrees of travel. Force required at this point shall not exceed 676 pound-inches torque or 104 pounds.
   (6) Repeat steps (2) through (5) for movement of captain's aileron control wheel in counterclockwise direction from neutral.

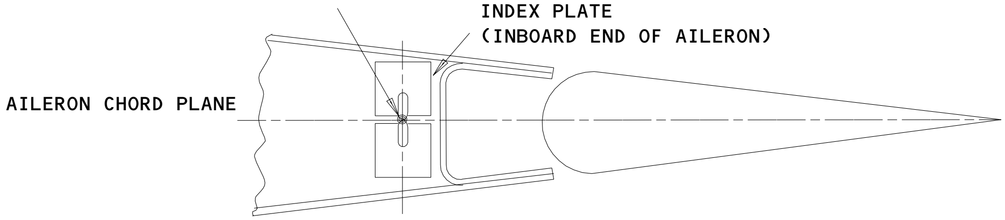
      NOTE: Captain's aileron control wheel shall return to neutral within ± 1 degree when released from either direction.

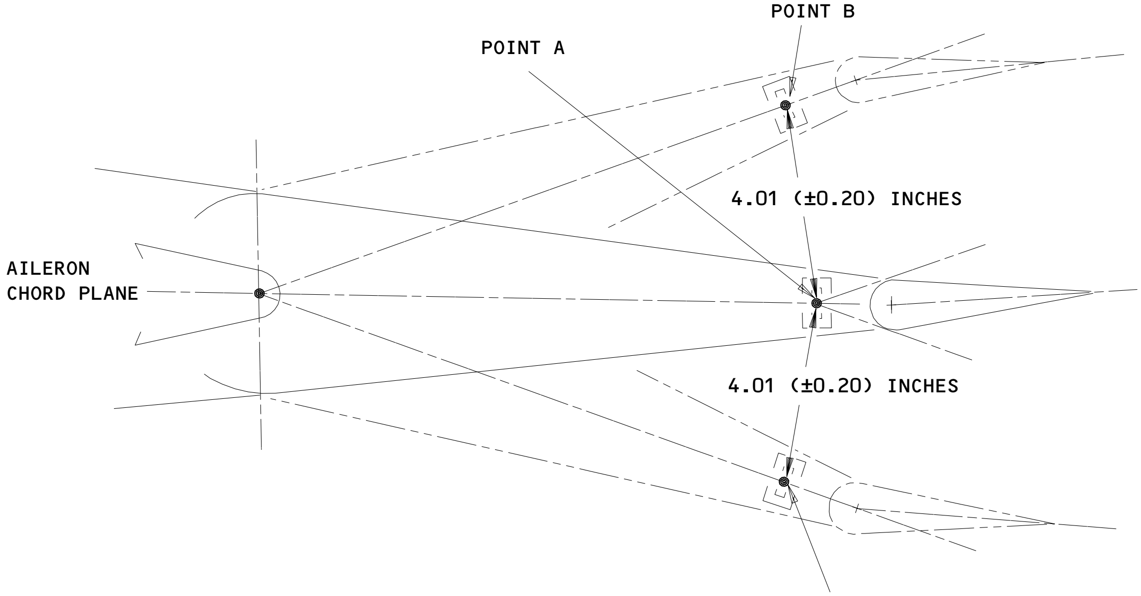
   (7) Depressurize hydraulic systems A and B (AMM 27-11-0/201).

U. Measure corresponding movement of captain's and first officer's aileron control wheels.
   (1) Rotate captain's aileron control wheel clockwise through full travel.
   (2) Check that first officer's and captain's aileron control wheels have rotated a minimum of 105 degrees clockwise.
   (3) Repeat procedure in counterclockwise direction from neutral.

V. Measure relationship of aileron control wheel movement as compared with aileron surface deflection.
   (1) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.







NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH.

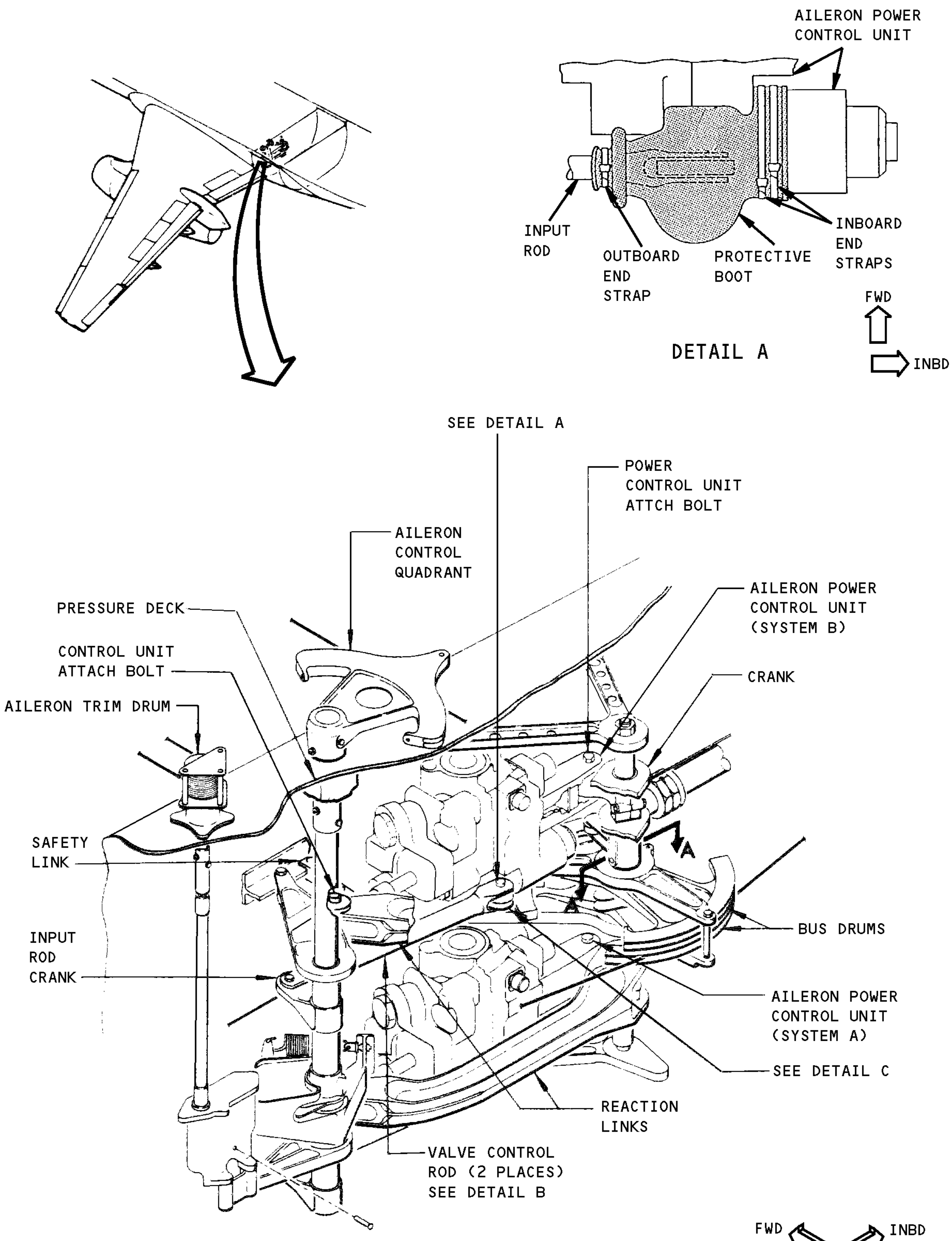
Aileron Deflection Diagram
Figure 405

(2) Check that left aileron moves up and right aileron moves down within limits specified in figure 405.
(3) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.
(4) Check that left aileron moves down and right aileron moves up within limits specified in figure 405.

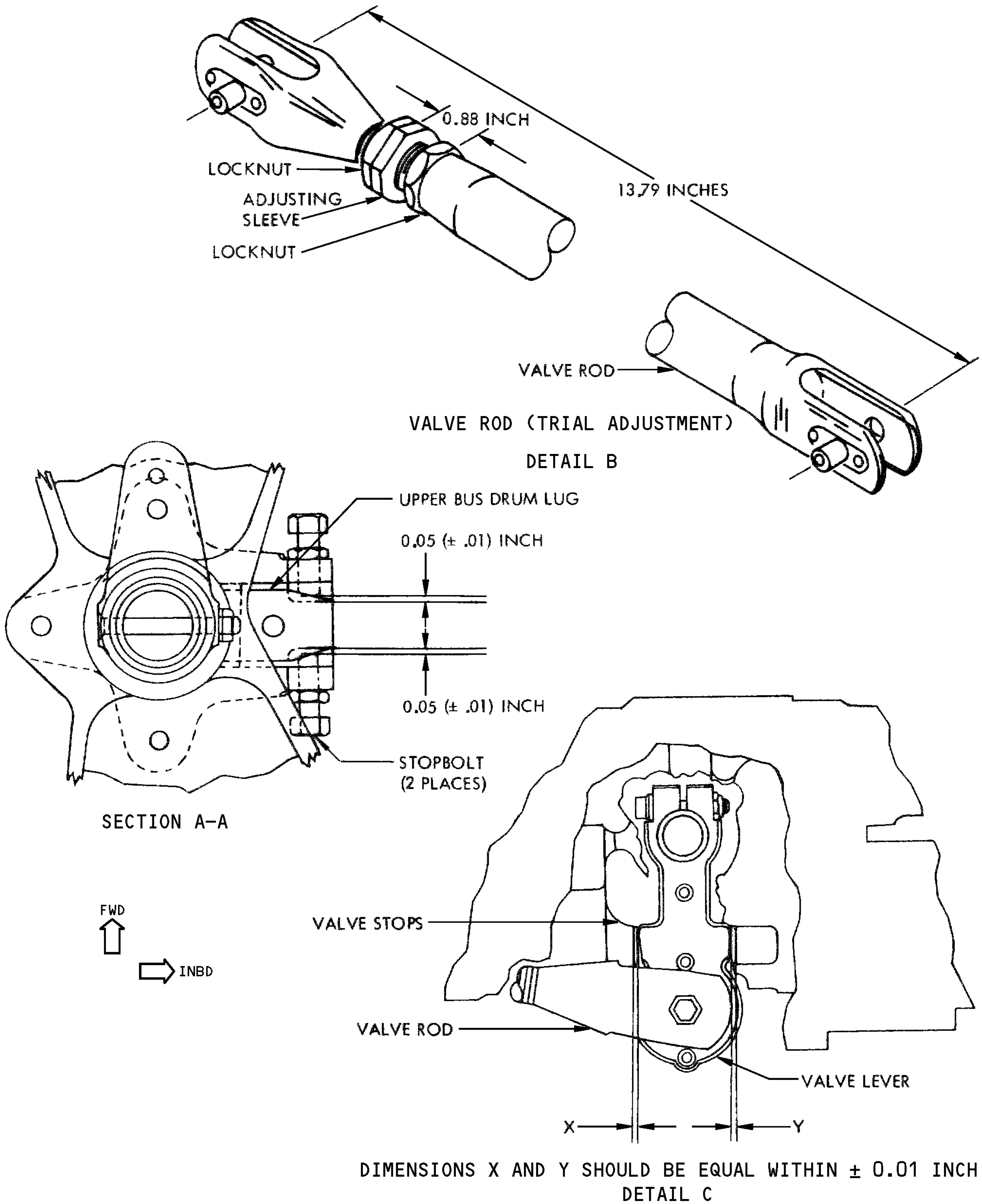
W. Remove control wheel protractor mount and protractor from aileron control wheel.
X. Remove torque wrench adapter tool from aileron control wheel and reinstall medallion.
Y. Install the nose wheel well right access panel 3103.

AILERON POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The ailerons are hydraulically powered by two identical aileron power control units. The lower unit is connected to hydraulic system A, and the upper unit is connected to hydraulic system B. Either power control unit may be replaced without affecting the aileron control system mechanical adjustments. However, the aileron power unit valve control rod may require adjustment to ensure synchronization with the other aileron power control unit. This synchronization of power control units is accomplished with the aileron controls in the neutral position.
   B. After removal of power control unit, for removal of control linkage and bus drums, refer to 27-11-101.
2. Equipment and Materials
   A. Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Aileron Power Control Unit
   A. Depressurize hydraulic systems A and B (Ref 27-11-0, Maintenance Practices).
   B. Disconnect hydraulic hoses at power control unit inlet and outlet ports. Install plugs in hydraulic hoses.
   C. If installed, disconnect electrical connector.
   D. Remove the protective boot (Fig. 401).
      (1) Remove two straps from inboard end of boot and one strap from outboard end of boot.
      (2) Remove protective boot.
   E. Disconnect valve control rod from valve lever (Fig. 401).
      (1) Remove cotter pin, then remove nut.
      (2) Remove bolt and disengage rod from lever.
   F. Disconnect power unit and reaction link.
      (1) Remove cotter pin and remove two nuts.
      (2) Remove power control unit attach bolt at outboard end of reaction link.
      (3) Remove bolt securing safety link to reaction link.
      (4) Swing reaction link aft to provide access to unit.
   G. Disconnect power unit body from crank.
      (1) Remove cotter pin, nut, and bolt.
   H. Remove power unit from airplane.
   I. Remove fittings at inlet and outlet ports, and install plugs in ports.
4. Prepare Aileron Power Control Units for Installation
   A. Install unions in inlet and outlet ports on new unit. Use new O-rings lightly lubricated with hydraulic fluid.
   B. Check that new unit is filled with hydraulic fluid before installation.
   C. Cap unions to prevent loss of hydraulic fluid.
5. Install Aileron Power Control Unit
   A. If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-101, I/C).



Aileron Power Control Unit Installation
Figure 401 (Sheet 1)



Aileron Power Control Unit Installation
Figure 401 (Sheet 2)

B. Position actuator in place and install bolt, washer and nut attaching actuator housing to crank (Fig. 401). Tighten nut to 300 - 410 pound-inches. Install cotter pin.
C. Swing reaction link and position actuator end rod between fork end of reaction link. Install bolt, washer and nut to secure safety link to reaction link.
D. Secure reaction link by installing bolt, washers, and large nut. Tighten nut to 300 - 350 pound - inches.
E. Install small nut and tighten to 170 - 250 pound-inches. Install cotter pin.
F. Remove plugs from hydraulic hoses and caps covering unions on power control unit.
G. Connect hydraulic hoses to actuator.
H. If installed, connect electrical connector.

<u>NOTE</u>: On airplanes with single channel autopilot, the electrical connector is installed only on the upper power control unit.

<u>CAUTION</u>: ROD IS A DUAL LOADPATH COMPONENT. INSPECT INNER AND OUTER RODS FOR DAMAGE PRIOR TO INSTALLATION. DO NOT TIGHTEN THE OUTER BOLT AFTER YOU TIGHTEN THE LOCKNUT. DAMAGE TO EQUIPMENT CAN RESULT.

I. Connect valve control rod to actuator valve lever, install dual loadpath bolt and washers.
   (1) Visually inspect bolts for damage prior to installation.
   (2) Tighten outer bolt to 45-60 pound-inches.
   (3) Install locknut with washer over end of inner bolt and tighten to 12-25 pound-inches.
   (4) Install cotter pin.
J. Provide electrical power.
K. Provide systems A and B hydraulic power (Ref 27-11-0).
L. Operate aileron control wheel to bleed system and check for leaks at actuator connections.
M. Adjust aileron power control unit (Ref 27-11-71, Adjustment/Test).

N. Install the protective boot (Fig. 401).
   (1) Place protective boot on aileron power control unit and input rod.
   (2) Secure inboard end of boot with two straps.

      NOTE: While securing outboard end of boot, make sure that boot and strap do not cause a preload in either direction on the valve input rod to avoid biased input.

   (3) Secure outboard end of boot with one strap.
O. Remove systems A and B hydraulic power (Ref 27-11-0).
P. Determine whether there is any further need for electrical power; if not, remove power.

AILERON POWER CONTROL UNIT - ADJUSTMENT/TEST

1. Aileron Power Control Unit Adjustment
   A. Equipment and Material
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309 - 0.311	6.7 ±0.25	AILERON BUS DRUM

   B. Adjust Aileron Power Control Unit
      (1) Position aileron control wheels and trim control wheel in neutral position.
      (2) Position flight control system A and B switches located on the pilot's overhead panel to OFF.
      (3) Insert rigging pin A/S-4 (Fig. 502).
      (4) Check that valve lever on each power control unit is centered between stops (Detail B).
      (5) If valve levers are not centered between stops, proceed as follows:

WARNING: DO NOT REMOVE POWER CONTROL UNIT VALVE ROD WITH HYDRAULIC POWER ON.

(a) Loosen two locknuts on valve rod and rotate adjusting sleeve (detail A) to center valve lever between stops.

NOTE: Whenever a valve rod is being replaced, rod should be trial adjusted to meet dimensions specified in Detail A.

      (6) Remove rigging pin A/S-4.
      (7) Provide systems A and B hydraulic power (Ref 27-11-0 MP).
      (8) Position flight controls system A switch to ON and flight controls system B switch to OFF.

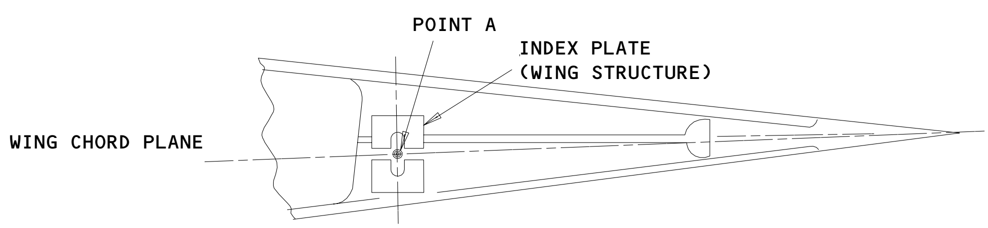
(9) Check that rigging pin A/S-4 fits freely in lower bus drum, if not:
   (a) Remove rigging pin A/S-4.
   (b) Loosen two locknuts on valve rod for lower aileron power unit and rotate adjusting sleeve so that rigging pin A/S-4 will fit.

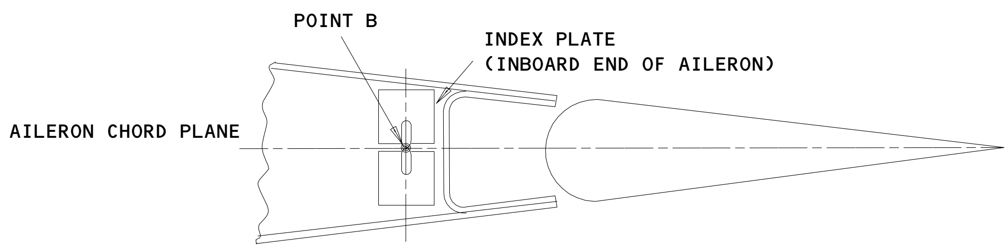
      CAUTION: DO NOT INSERT RIGGING PIN A/S-4 WHEN ADJUSTING VALVE ROD, AS DAMAGE TO COMPONENTS MAY OCCUR.

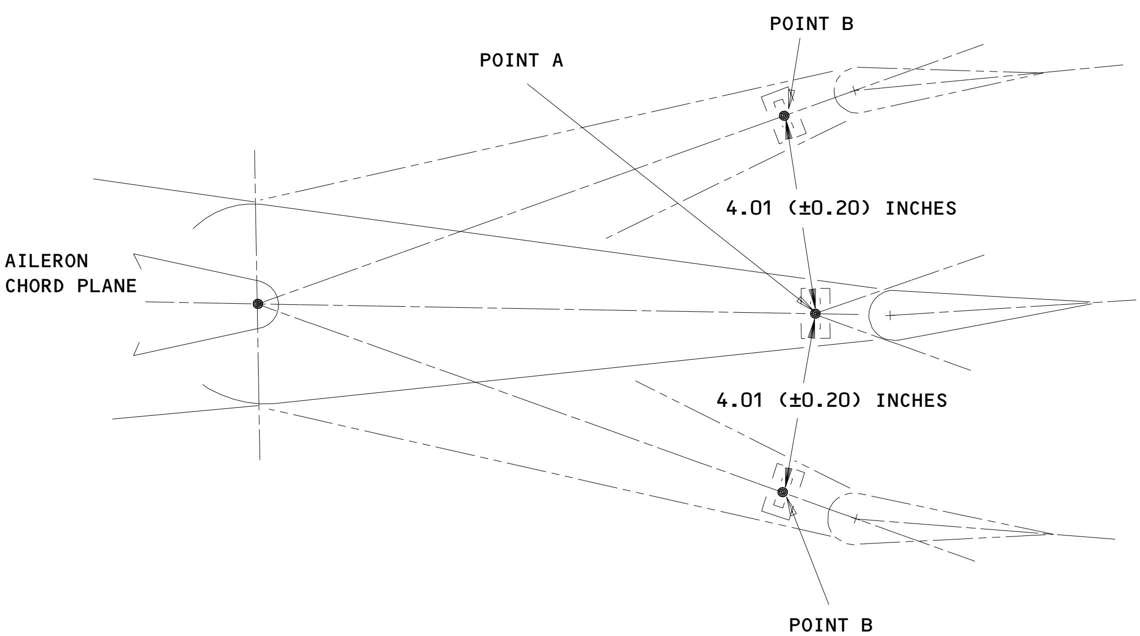
(10) Provide systems A and B hydraulic power (Ref 27-11-0).
(11) Position flight controls system A switch to OFF, and flight controls system B switch to ON.
(12) Check that rigging pin A/S-4 fits freely in upper bus drum, if not:
   (a) Remove rigging pin A/S-4.
   (b) Loosen two locknuts on valve rod for upper aileron power unit and rotate adjusting sleeve so that rigging pin A/S-4 will fit without binding.

      CAUTION: DO NOT INSERT RIGGING PIN A/S-4 WHEN ADJUSTING VALVE ROD, AS DAMAGE TO COMPONENTS MAY OCCUR.

(13) Position flight controls system A and B switches to ON.
(14) Check that rigging pin A/S-4 fits freely through both bus drums, and check that gaps between upper bus drum lug and stopbolts on lower bus drum are within limits (Fig. 503, Section AA).
(15) If required, adjustment of valve rods and stopbolts should be accomplished to meet conditions in step (13).
(16) Remove rigging pin A/S-4.
(17) Rotate aileron control wheel hard over in both direction from neutral and check that ailerons deflect within limits specified in Fig. 501.
(18) Tighten valve rod locknuts.
(19) Tighten stopbolt locknuts and install lockwire.
(20) Check autopilot system for proper roll inputs (Airplanes with rate gyro test switch on autopilot roll computer).
   (a) Check that all autopilot circuit breakers on P6 panel are closed.

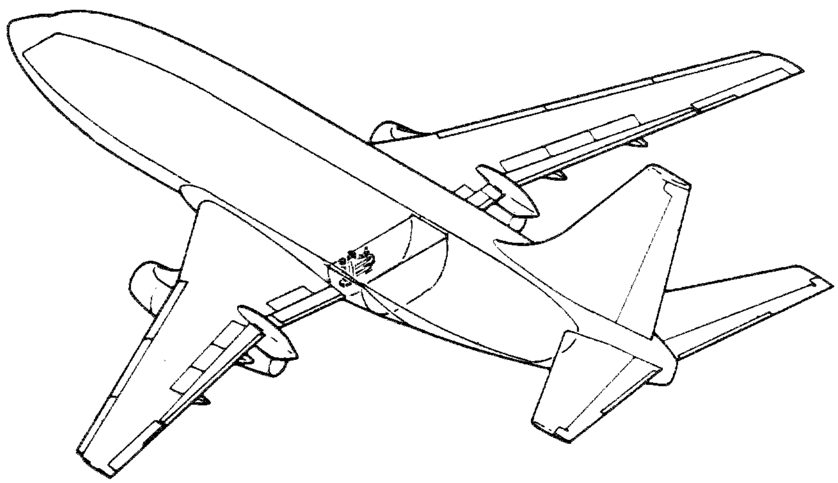


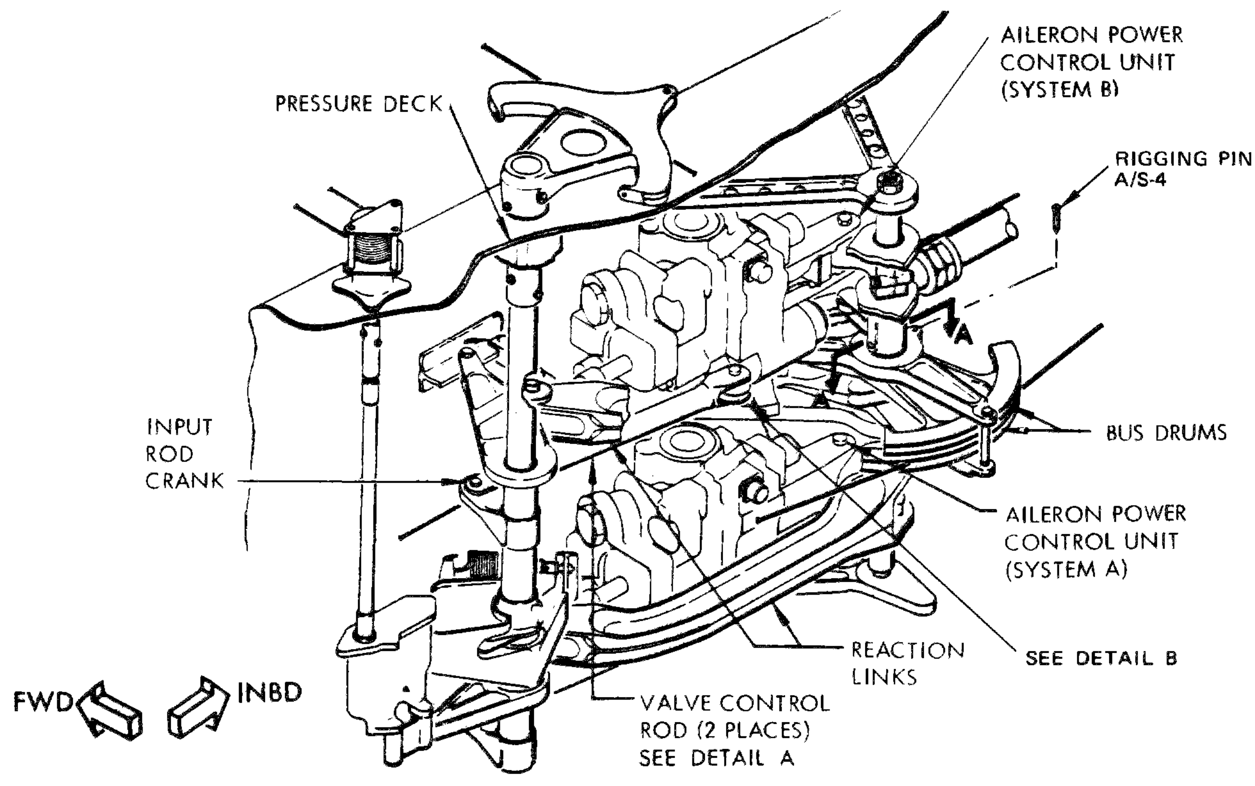




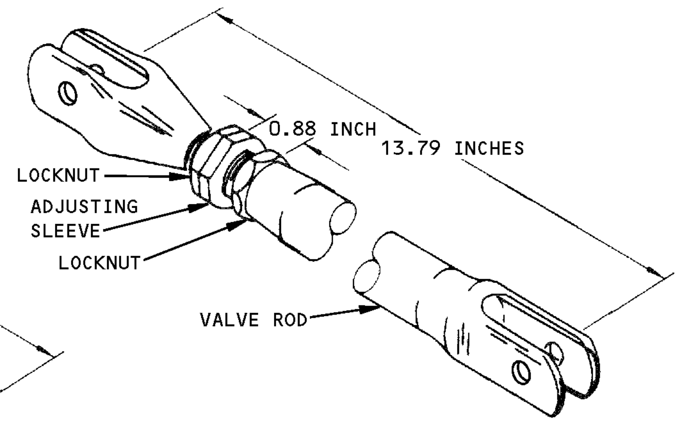
NOTE: WITH AILERON SYSTEM RIGGED
POINT B ON EACH AILERON SHALL
ALIGN VERTICALLY WITH POINT A
WITHIN ±0.03 INCH.

Aileron Deflection Diagram
Figure 501

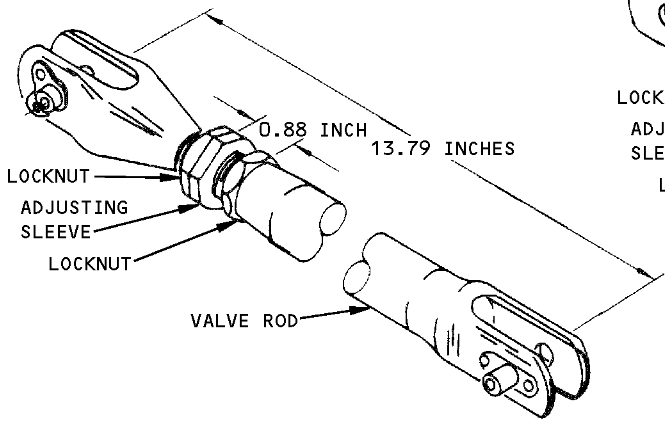




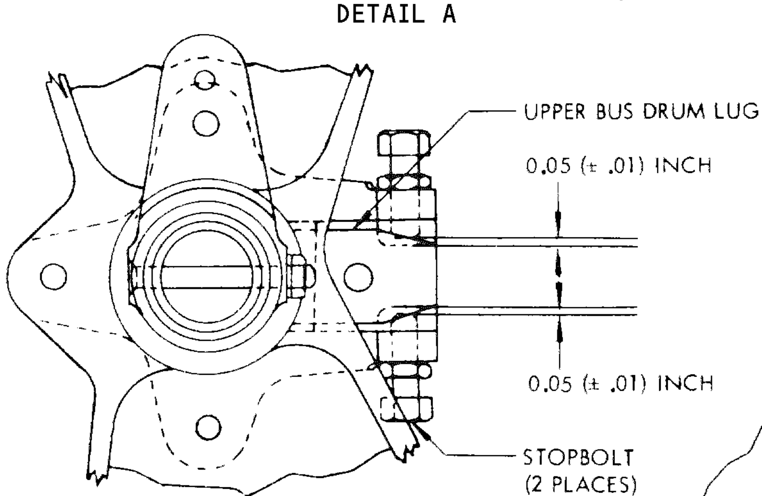
Aileron Power Control Unit Installation
Figure 502



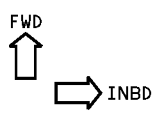
VALVE ROD (TRAIL ADJUSTMENT) 2
DETAIL A

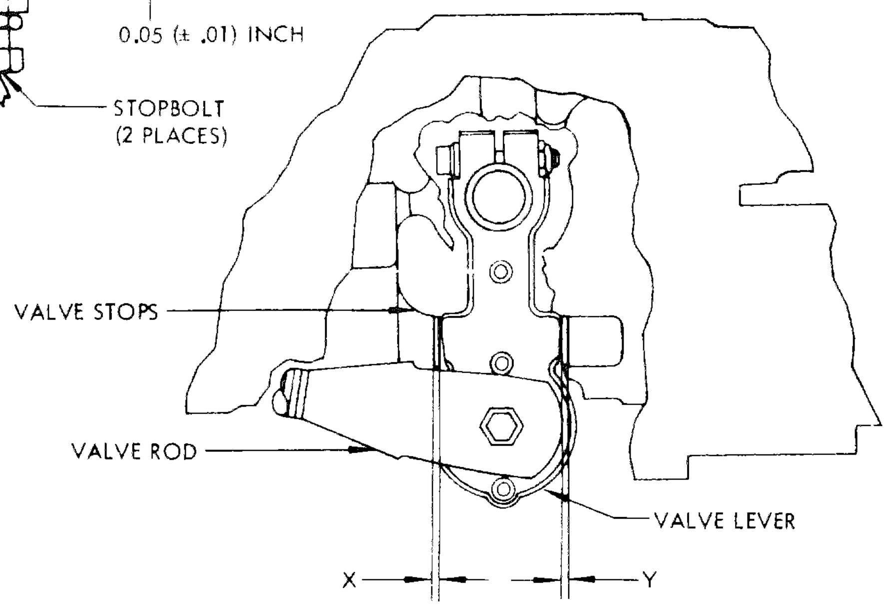


VALVE ROD (TRAIL ADJUSTMENT) 1
DETAIL A



SECTION A-A





1 PRE 27-1207
2 POST 27-1207

DIMENSIONS X AND Y SHOULD BE EQUAL WITHIN ± 0.01 INCH
DETAIL B

Aileron Power Control Unit Adjustment
Figure 503

(b) Place autopilot system select switch in position B. Switch is located on control panel above pilot's center panel.
(c) Place autopilot AIL switch in ENGAGED position.
(d) Position roll rate gyro test switch located on roll control channel to the left.

NOTE: Roll control channel is located on El-3 shelf in electrical and electronics compartment.

(e) Check that control wheel moves counterclockwise.
(f) Position roll rate gyro test switch to the right.
(g) Check that control wheel moves clockwise.
(h) Place autopilot AIL switch in DISENGAGED position.

(21) Check autopilot system for proper roll inputs (Airplanes without rate gyro test switch on autopilot roll computer).
(a) Check that all autopilot circuit breakers on P6 panel are closed.
(b) Place autopilot AIL switch in ENGAGED position.
(c) Rotate control wheel left, then right then center control wheel. Note increase in pressure required to move control wheel and check that left aileron moves up, then down then returns to center with control wheel. Observe that autopilot does not disengage.
(d) Disengage autopilot and check that control wheel moves easily with less pressure required than with autopilot engaged.

(22) On airplanes which have the lower power control unit equipped to receive input from the autopilot, repeat steps (19)(b) thru (19)(h) or (20)(a) thru (20)(d) with the autopilot system select switch in position A.

NOTE: If airplane does not have a lower power control unit that is equipped to receive input from autopilot, test of lower power control unit is not required.

(23) Check autopilot system for proper roll inputs (Airplanes with Flight Control Computers).
(a) Check that all autopilot circuit breakers on P6 panel are closed.

(b) Place A/P ENGAGE A switch to CMD and push HDG SEL button.
(c) Set BANK LIMIT to 10 and HEADING knob to provide an indication of 10 degrees to the right of airplane heading.
(d) Check that control wheel rotates clockwise.
(e) Repeat step (c) to the left.
(f) Check that control wheel rotates counterclockwise.
(g) Disengage autopilot.

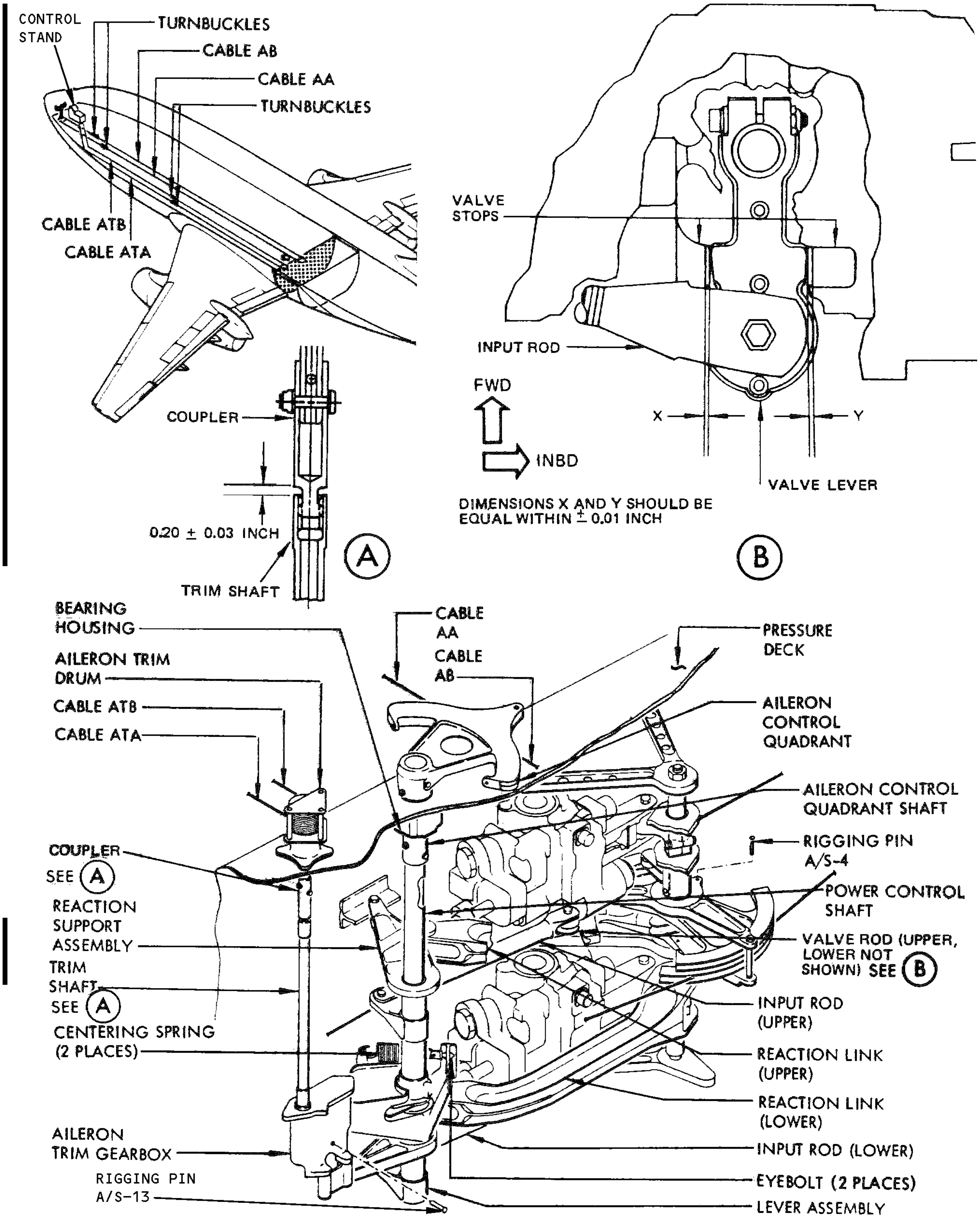
(24) Remove systems A and B hydraulic power (AMM 27-11-0/201).
(25) Remove electrical power if no longer required (AMM 24-22-00/201).

AILERON CENTERING SPRING AND TRIM MECHANISM - REMOVAL/INSTALLATION

1. General
   A. The removal of the centering spring and trim mechanism is accomplished as an assembly. The disassembly instructions are covered in the applicable overhaul manual.
2. Equipment and Materials
   A. Rigging Pins - F70207-3, -52, -61, or -84

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ± 0.25	AILERON BUS DRUM
A/S-13	-8	0.309-0.311	3.7 ± 0.25	AILERON TRIM GEARBOX

   B. Control Wheel Straightedge - SE27-0001
   C. Grease - BMS 3-33 (Preferred)
   D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   E. Compound - MIL-C-11796 (Alternate)
3. Remove Aileron Centering Spring and Trim Mechanism
   A. Depressurize hydraulic systems A and B (Ref 27-11-0 MP).
   B. Set aileron control wheels in neutral position by clamping a straightedge across upper ends of both control wheels. Set aileron trim control knob with pointer in zero trim position.
   C. Insert rigging pin A/S-13 in aileron trim gearbox (Fig. 401).
   D. Insert rigging pin A/S-4 through aileron bus drums.
   E. Disconnect upper and lower reaction links from reaction support assemblies by removing cotter pins, nuts, washers, and bolts.
   F. Disconnect upper and lower input rods from lever assemblies by removing nuts, washers, and bolts.
   G. Disconnect aileron control quadrant shaft from aileron power control shaft by removing nuts, washers, and bolts.
   H. Disconnect upper and lower reaction support assemblies from bulkhead by removing nuts, washers, and bolts.



Aileron Centering Spring and Trim Mechanism Installation
Figure 401

I. Carefully slide centering spring and trim gearbox downward to disengage assembly from trim shaft and aileron power control shaft and remove assembly.
J. Disconnect trim gearbox control rod from centering spring mechanism by removing cotter pin, nut, washer, and bolt.
K. Remove trim gearbox from centering spring mechanism by removing nuts, washers, and bolts.

4. Install Aileron Centering Spring and Trim Mechanism (Fig. 401)
A. Check aileron centering spring and trim mechanism for wear (Ref 27-11-81 I/C).
B. Check aileron trim gearbox for wear (Ref 27-11-141 I/C).
C. Install centering spring and trim gearbox as follows:
(1) Attach trim gearbox to centering spring mechanism bracket with bolts, washers, and nuts.
(2) Attach control rod to centering spring mechanism with bolt, washer, nut, and cotter pin.

NOTE: If BACB30NF4-15 bolt is used, also use AN960PD416 washer under head of bolt.

(a) Ensure that cotter pin does not extend beyond end of bolt.
(b) Check for clearance between bottom of bolt and support fitting.
(3) Lubricate trim shaft with grease or corrosion preventive compound.
(4) Position centering spring and trim gearbox to engage aileron power control shaft and trim shaft simultaneously.
(5) Install bolts to secure aileron control quadrant shaft to power control shaft. Tighten nuts 30 to 35 pound-inches.

NOTE: If power control shaft does not contain bolt holes, drill holes 0.250 +0.004/-0.000 inch diameter in power control shaft using holes in quadrant shaft as a guide.

(6) Secure upper and lower reaction support assemblies to bulkhead by installing bolts, washers, and nuts.
(7) Pre SB 27-1207;
Connect upper and lower input rods to lever assemblies by installing bolt assemblies, washers, and nuts. Tighten large nuts 65 to 90 pound-inches. Tighten small nuts 12 to 15 pound-inches. Check that valve lever on each power control unit is centered between stops (Detail B, Fig. 401). If necessary, adjust input rods (Ref 27-11-0 A/T).

(8) Post SB 27-1207;
Connect upper and lower input rods to lever assemblies by installing bolt assemblies, washers, and nuts. Tighten inner nut to 45-60 pound-inches. Tighten outer nut 12 to 15 pound-inches. Check that valve lever on each power control unit is centered between stops (Detail B, Fig. 401). If necessary, adjust input rods (Ref 27-11-0 A/T).

NOTE: After tightening outer nut, do not retighten inner nut.

(9) Connect upper and lower reaction links to reaction support assemblies by installing bolt assemblies, washers, nuts, and cotter pins. Tighten large nuts to 300-350 pound-inches. Tighten small nuts to 170-200 pound-inches.

(10) Check that dimension at trim shaft splined connection is per detail A. If not refer to 27-11-131, Removal/Installation for shaft replacement.

D. Check that rigging pin A/S-13 passes freely through both walls of aileron trim mechanism. If rigging pin cannot be inserted freely accomplish the following steps:
(1) Disconnect coupler from trim shaft.
(2) Rotate trim shaft to permit insertion of rigging pin A/S-13.
(3) Reconnect trim shaft and coupler.
(4) Remove rigging pin A/S-13.

E. Remove rigging pin A/S-4.

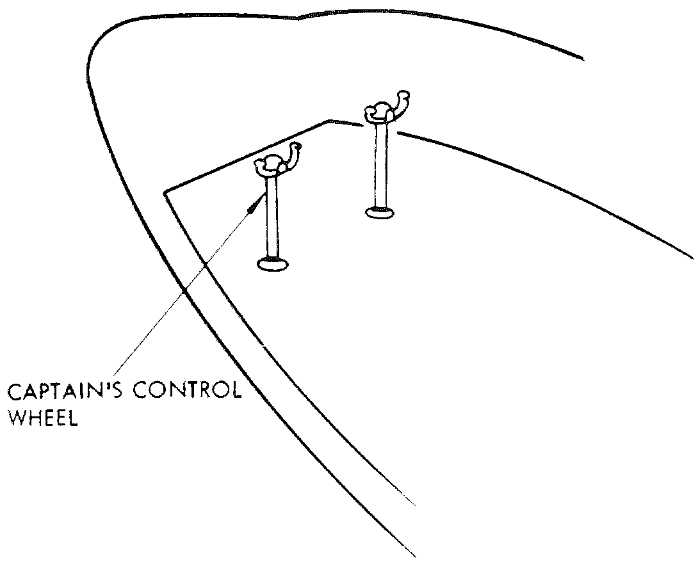
F. Test centering spring and trim mechanism installation (Ref 27-11-81, Adjustment/Test).

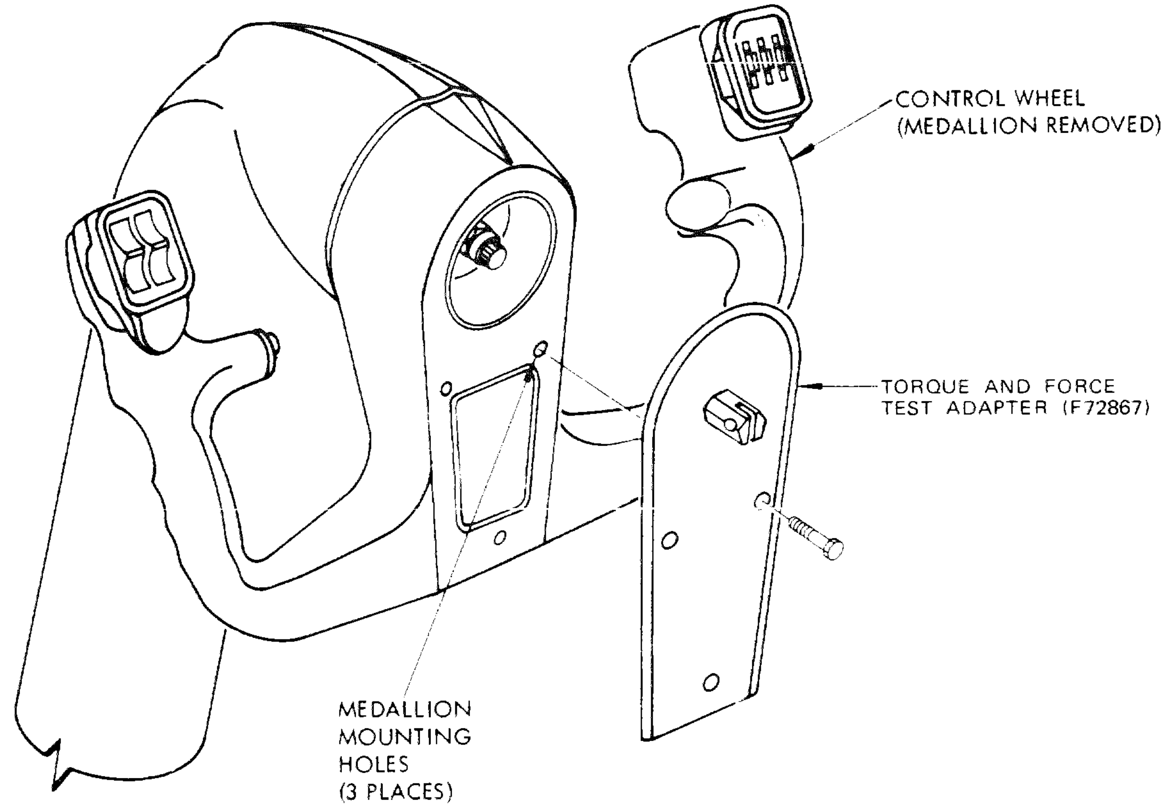
AILERON CENTERING SPRING AND TRIM MECHANISM - ADJUSTMENT/TEST

1. Equipment and Materials
   A. Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
   B. Control Wheel Torque and Force Test Adapter-F72867-1
2. Aileron Centering Spring and Trim Mechanism Adjustment
   A. Install protractor mount and protractor on first officer's control wheel.
   B. Remove medallion from captain's control wheel and install torque wrench adapter (Fig. 501).
   C. Release centering spring tension to eliminate artificial feel input forces.
   D. Provide Systems A and B hydraulic power (Ref 27-11-0 MP).
   E. Set aileron trim control knob in zero trim position. Using control wheel torque and force test adapter, measure force required to rotate captain's control wheel 2 degrees clockwise and counterclockwise from neutral position. If adapter is not available, forces may be measured by applying force tangentially to captain's control wheel at 6.5-inch radius. Measured force should be less than 2.0 pounds or 13 pound-inches torque.
   F. Record force obtained in step E.
   G. Tighten centering springs equally at eyebolts to provide artificial feel input forces.
   H. Measure force required to rotate captain's control wheel 2 degrees clockwise and counterclockwise from neutral position. Measured force should increase value obtained in step E. by 1.5 to 2.0 pounds or 10 to 13 pound-inches torque. Force shall not exceed 4.5 pounds or 29.25 pound-inches torque.
   I. If forces obtained are not within limits as specified in step H., adjust centering spring eyebolts. Adjustment of both centering springs must be accomplished equally. Nuts on each eyebolt should be equally tightened or loosened in 1/2-turn increments.

      NOTE: Centering spring forces are increased by tightening eyebolt and decreased by loosening eyebolts.

   J. Repeat steps H. and I. until correct centering spring tension is obtained.
3. Aileron Centering Spring and Trim Mechanism Test
   A. With hydraulic systems A and B pressurized, do the steps that follow:
      (1) Measure force required to rotate either control wheel 75 degrees clockwise from neutral position. Force should not exceed 120.25 pound-inches torque or 18.5 pounds.





Control Wheel Torque and Force Test Adapter
Figure 501

(2) Release control wheel from 75 degrees clockwise direction. Control wheel should return to neutral position within ± 1 degree.
(3) Repeat steps (1) and (2) in counterclockwise direction.
(4) Operate control wheel slowly through full range of aileron travel. Check system for smooth operation.

B. Repeat step D, but only with hydraulic system B pressurized (AMM 27-11-0/201).

C. Repeat step D, but only with hydraulic system A pressurized (AMM 27-11-0/201).

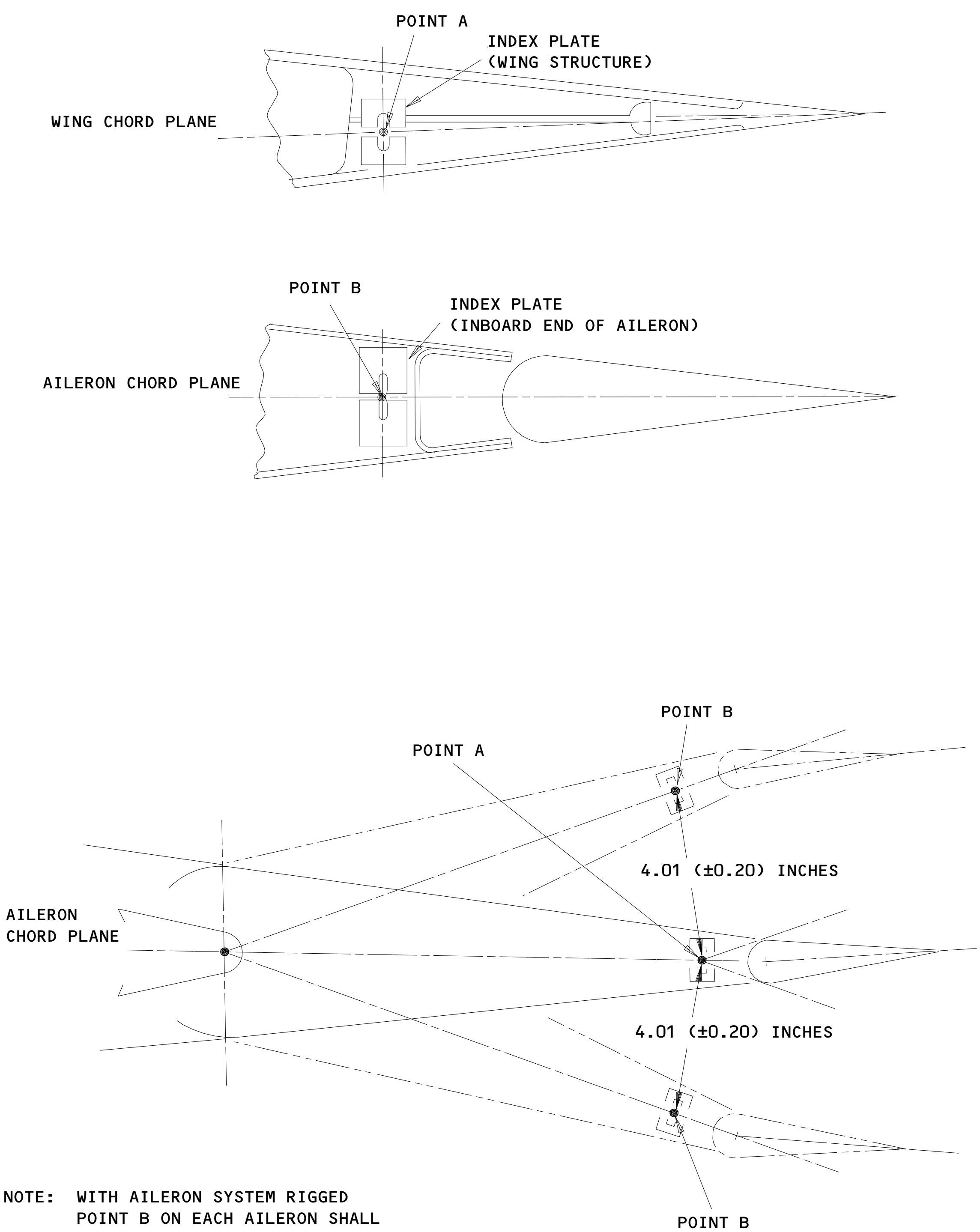
D. With hydraulic systems A and B pressurized, measure force required to manually rotate captain's aileron control wheel clockwise and counterclockwise from neutral.
(1) Measure force required to rotate control wheel clockwise until ailerons begin to move. Force required shall not exceed 29.25 pound-inches torque or 4.5 pounds.
(2) Continue rotating control wheel to 5 degrees from neutral. Force required shall not exceed 35.75 pound-inches torque or 5.5 pounds.
(3) Continue rotating to 20 degrees. Force required should not exceed 55.25 pound-inches torque or 8.5 pounds.
(4) Continue rotating to 40 degrees. Force required should not exceed 87.75 pound-inches torque or 13.5 pounds.
(5) Continue rotating to 75 degrees. Force required should not exceed 120.25 pound-inches torque or 18.5 pounds.
(6) Repeat steps (1) thru (5) in a counterclockwise direction.

E. Measure effect of aileron trim wheel operation (Ref 27-11-0 A/T).

F. Turn off hydraulic system B pumps No. 1 and 2

G. Measure relationship of aileron control wheel movement as compared with aileron surface deflection.
(1) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.
(2) Check that left aileron moves up and right aileron moves down within limits specified in Fig. 502.
(3) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.
(4) Check that left aileron moves down and right aileron moves up within limits specified in Fig. 502.

H. Return airplane to normal.
(1) Turn off Systems A and B hydraulic power.
(2) If no longer required, remove electrical power from airplane.
(3) Remove control wheel protractor and protractor mount from aileron control wheel.
(4) Remove torque wrench adapter tool from aileron control wheel.
(5) Replace medallion on control wheel.

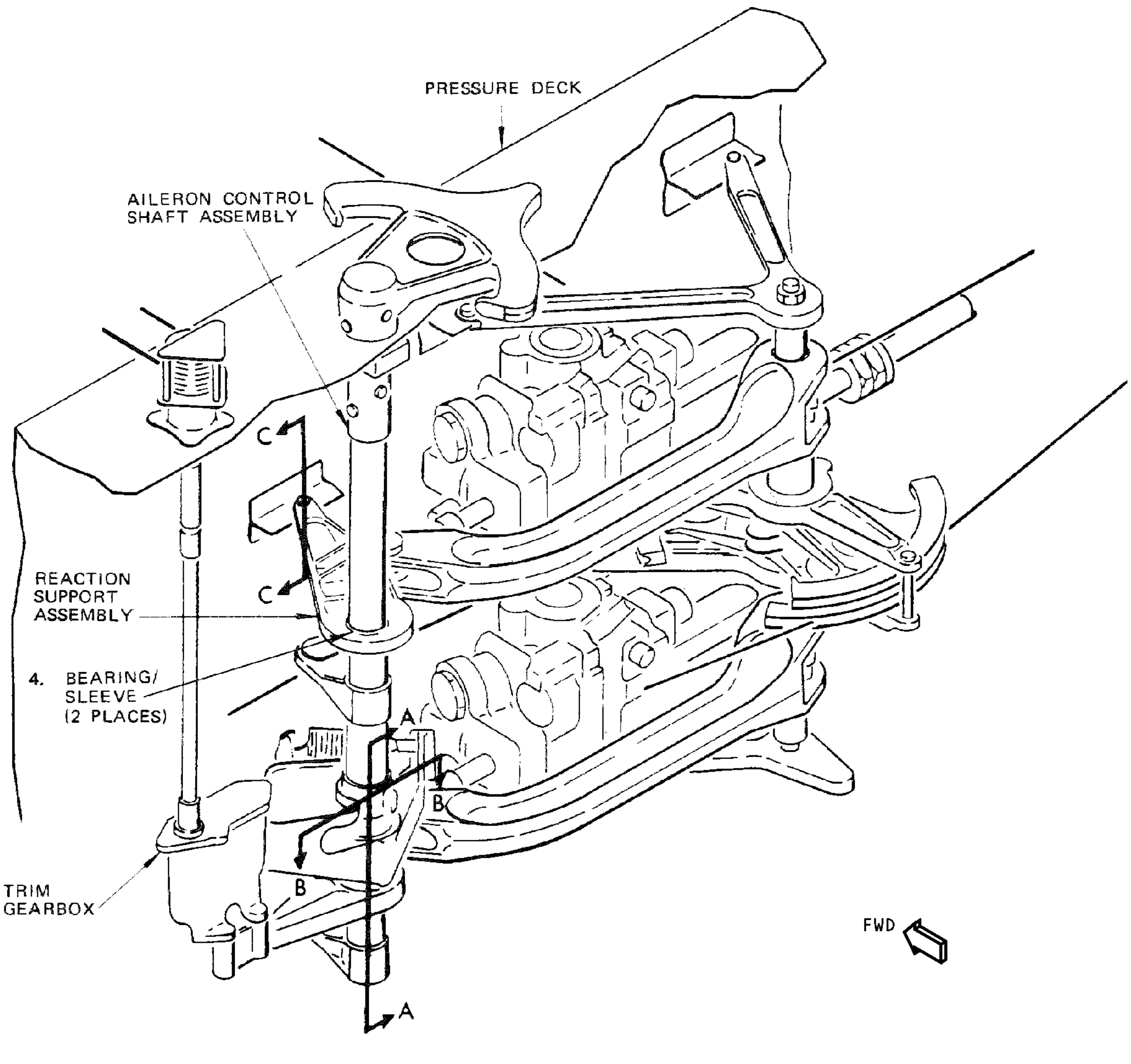


NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH.

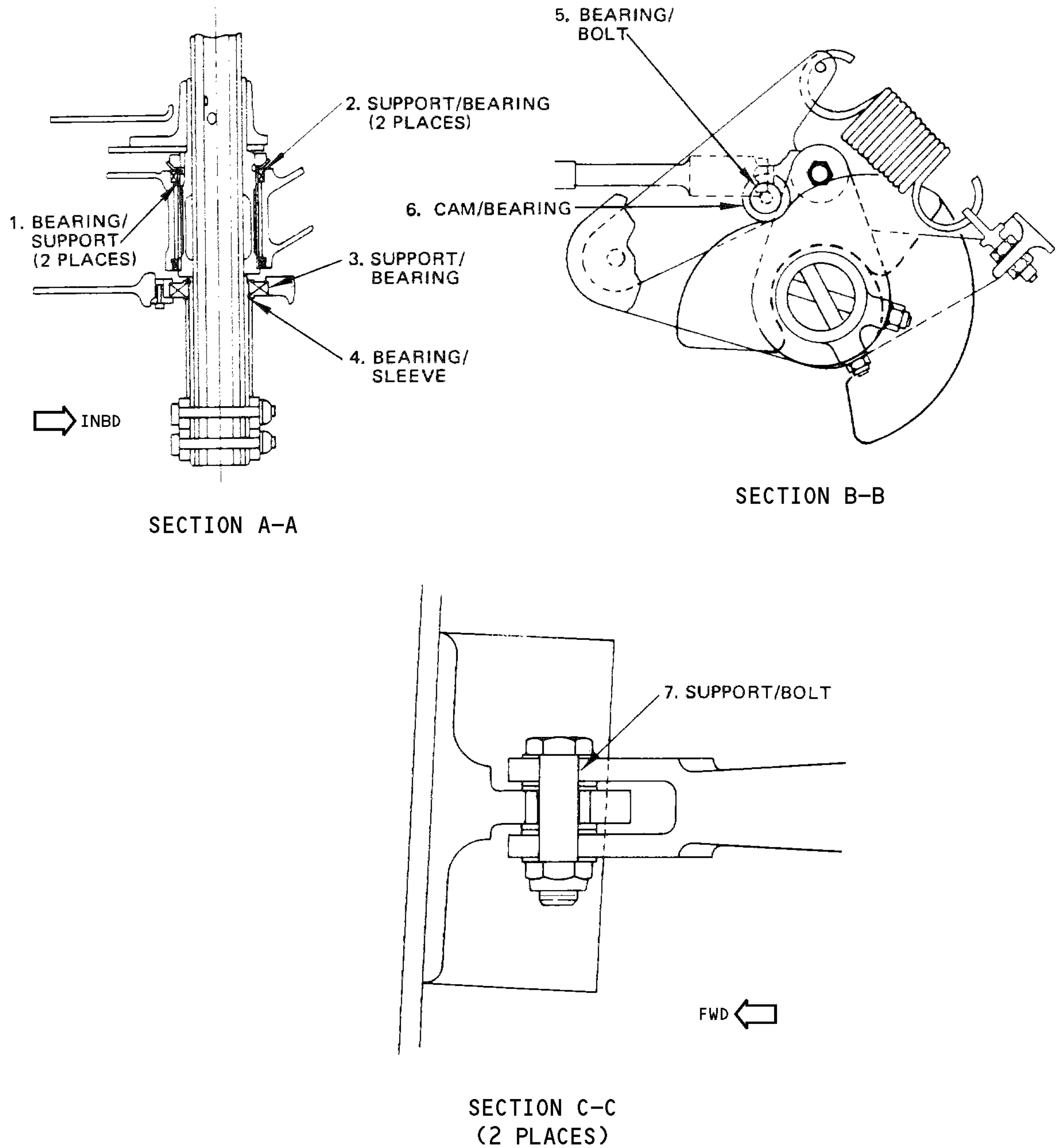
Aileron Deflection Diagram
Figure 502

AILERON CENTERING SPRING AND TRIM MECHANISM - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. No procedure is given in this section for gaining access to permit inspection. For this information, refer to Component Removal/Installation.
2. Aileron Centering Spring and Trim Mechanism Wear Limits



Aileron Centering Spring and Trim Mechanism Wear Limits
Figure 601 (Sheet 1)



Aileron Centering Spring and Trim Mechanism Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	1.8115	1.8135	1.8140	0.0040 *[1]	X		
	SUPPORT	OD	1.8105	1.8115	1.8100		X		
2	SUPPORT	ID	2.2500	2.2510	2.2510	0.0025 *[1]	X		
	BEARING	OD	2.2485	2.2500	2.2485		X		
3	SUPPORT	ID	2.3750	2.3760	2.3760	0.0020 *[1]	X		
	BEARING	OD	2.3740	2.3750	2.3740		X		
4	BEARING	ID	1.4370	1.4380	1.4380	0.0020 *[1]	X		
	SLEEVE	OD	1.4360	1.4370	1.4360		X		
5	BEARING	ID	0.2495	0.2500	0.2500	0.0019 *[1]	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
6	CAM	ID	-	-	*[2]	-	X		
	BEARING	OD	0.8990	0.9010	*[1]		X		
7	SUPPORT	ID	0.2500	0.2570	0.2585	0.0100	X		
	BOLT	OD	0.2485	0.2495	0.2495		X		

*[1] REPLACE BEARING WHEN RADIAL PLAY EXCEEDS 0.0020 INCH.

*[2] REPLACE CAM IF NICKS OR DENTS EXCEED 0.0050 INCH BELOW SURFACE OF CAM.

Aileron Centering Spring and Trim Mechanism Wear Limits
Figure 601 (Sheet 3)

AILERON BODY QUADRANT - REMOVAL/INSTALLATION

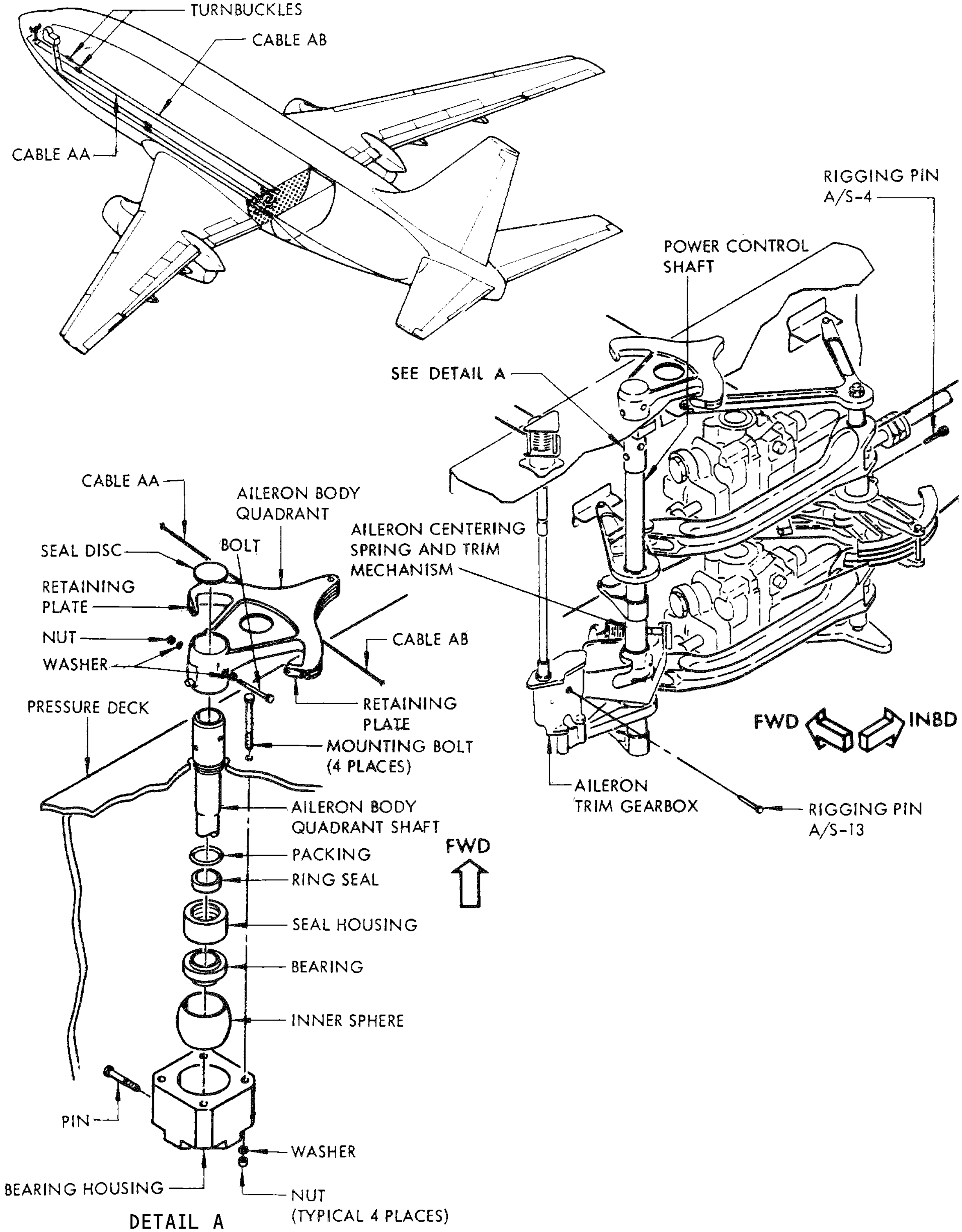
1. General
   A. Removal of the aileron body quadrant cannot be accomplished until the aileron centering spring and trim mechanism has been removed.
2. Equipment and Materials
   A. Cement - BMS 5-14 (AMM 20-30-11/201)
   B. Rigging Pins Kit - F70207-84, or -98:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-1	-13	0.309 - 0.311	2.35 ±0.06	AILERON TRANSFER MECHANISM
A/S-1A	-19	0.309 - 0.311	8.25 ±0.25	AILERON TRANSFER MECHANISM
A/S-4	-11	0.309 - 0.311	6.7 ±0.25	AILERON BUS DRUM
A/S-13	-8	0.309 - 0.311	3.7 ±0.25	AILERON TRIM GEARBOX

   C. Control Wheel Straightedge SE27-0001 (AMM 27-00/201 for fabrication instructions)
   D. Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
   E. Control Wheel Torque and Force Test Adapter-F72867-1
   F. Sealant - BMS 5-95 (AMM 20-30-11/201)
3. Prepare to Remove Aileron Body Quadrant
   A. Remove aileron centering spring and trim mechanism (AMM 27-11-81/401).
   B. Remove seats, carpets and floor panels above aileron body quadrant (Ref Chapter 25, Equipment/Furnishings).
   C. Remove nose wheel well left access panel 3104.
4. Remove Aileron Body Quadrant
   A. Place ailerons in neutral, and insert rigging pin A/S-4 in aileron bus drums (Fig. 401).

B. Disconnect left cables AA and AB at turnbuckles.
C. Remove retaining plates and secure disconnected cables with clamps.
D. Separate cables AA and AB from aileron body quadrant, and tag cables to facilitate reassembly.
E. Remove nuts, washers and bolts retaining aileron body quadrant to aileron body quadrant shaft.
F. Remove bearing housing from aileron body quadrant shaft by removing nuts, washers and bolts.
G. Remove aileron body quadrant shaft from structure.

5. Install Aileron Body Quadrant
   A. Reassemble bearing housing assembly if disassembled (Detail A, Fig. 401).
      (1) Insert inner sphere in bearing housing and secure with pin.
      (2) Insert bearing, seal housing, ring seal, and packing into bearing housing (OHM 27-17-02).
   B. Install aileron body quadrant.
      (1) If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (AMM 27-11-91/601).
      (2) Insert aileron body quadrant shaft into bearing housing.
      (3) Pressure seal shaft and bearing housing by applying a fillet seal between bearing housing and pressure deck (Ref Chapter 51, Seals and Sealing).
      (4) Locate and slide aileron body quadrant shaft through pressure deck, engaging aileron body quadrant with shaft.
      (5) Insert four mounting bolts through pressure deck and bearing housing.
      (6) Secure bolts with washer and locknut. Tighten locknut to 20-25 pound-inches.
      (7) Check that sealant on seal disk at aileron body quadrant shaft top is not damaged. If damage has occurred apply cement to shaft shoulder and push seal disk down firmly on shaft shoulder.
      (8) Place aileron body quadrant in position and install bolts, washers, and nuts to secure quadrant to aileron body quadrant shaft. Tighten nuts to 30-35 pound-inches.
   C. Install aileron centering spring and trim mechanism (Ref 27-11-81 R/I).



Aileron Body Quadrant Installation
Figure 401

D. Reconnect cables AA and AB to aileron control quadrant and remove clamps. Secure with cable retaining plates.

E. Prepare cables AA and AB for installation.

   (1) Position aileron control wheels in neutral by clamping straightedge across the upper ends of each control wheel. One end of first officer's control wheel may be out of contact by 0.20 inch maximum.

   (2) Position aileron trim control knob indicator in zero trim position.

   (3) Ensure that trim roller is seated in cam detent.

   (4) Remove rigging pin A/S-4.

F. Adjust cable tension within values specified in table 1 on Fig. 402.

G. Remove straightedge from control wheels. Move captain's aileron control wheel through several complete cycles.

H. Check that rigging pins A/S-1, A/S-1A and A/S-13 can be inserted and removed without binding.

   NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

I. Check that cable tension is within specified value range on table 1.

J. Install turnbuckle locking clips.

K. Insert rigging pin A/S-4 in aileron bus drums. If rigging pin A/S-4 cannot be inserted without binding, adjust Aileron Power Control Unit (Ref 27-11-71 A/T).

L. Remove rigging pins A/S-1, A/S-1A, A/S-4 and A/S-13.

M. Install protractor and protractor mount on first officer's aileron control wheel.

N. Remove medallion from captain's aileron control wheel.

O. Install torque wrench adapter tool (Fig. 404).

P. Using control wheel torque and force test adapter, measure force required to manually rotate captain's aileron control wheel clockwise and counterclockwise from neutral. If torque wrench adapter tool is not available, apply force tangentally to captain's control wheel at a 6.5-inch radius.

   (1) Measure force required to rotate control wheel clockwise until ailerons begin to move. Force required shall not exceed 192 pound-inches torque or 29.5 pounds.

TABLE I

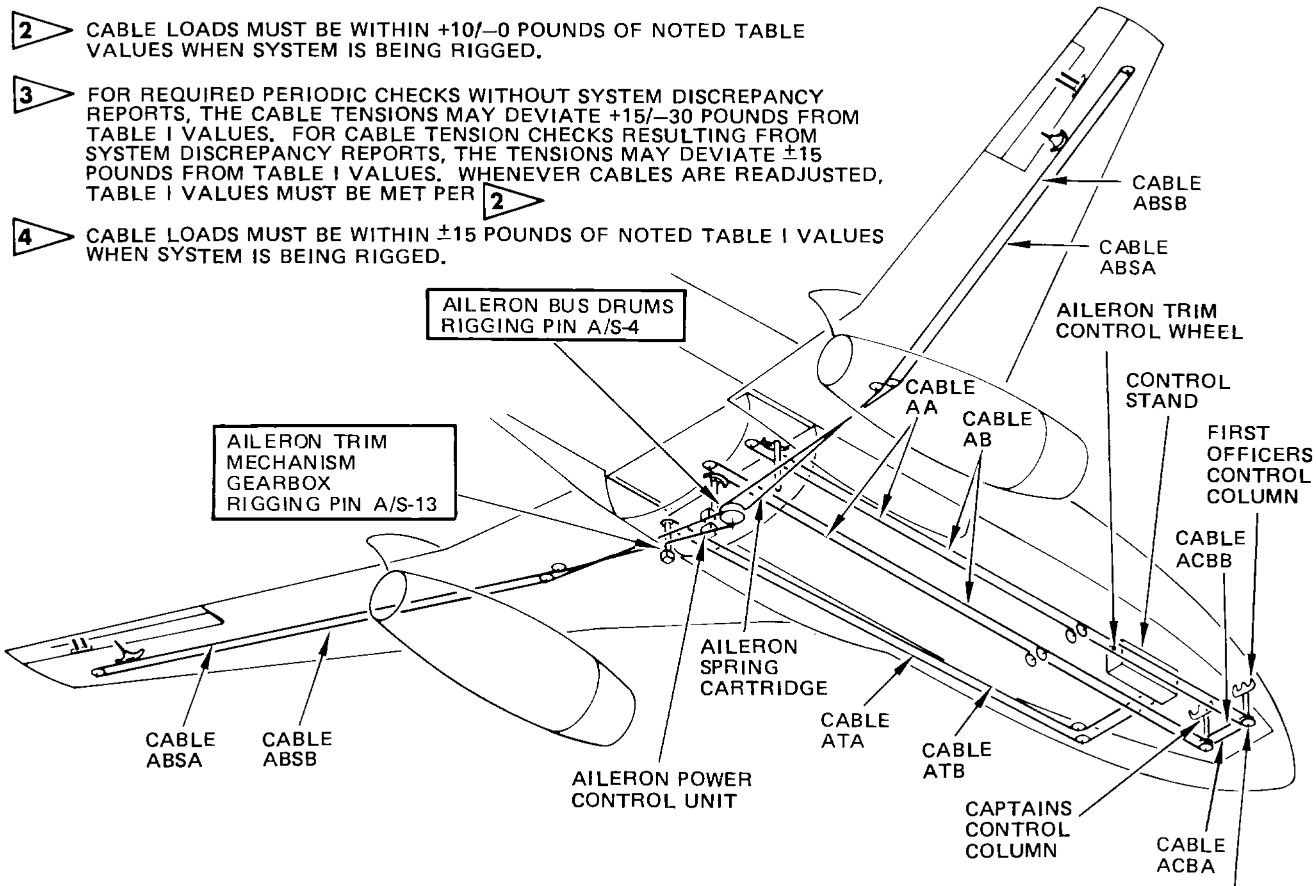
TEMPERATURE °F [1]	CABLE TENSION (POUNDS) CABLES AA, AND AB [2] [3]	CABLE TENSION (POUNDS) CABLES ACBA AND ACBB [4] [5]
110	133	93
90	124	84
70	115	75
50	107	70
30	99	61
+10	90	53
–10	82	49
–30	74	46
–40	68	44

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ±5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/–0 POUNDS OF NOTED TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [2]

[4] CABLE LOADS MUST BE WITHIN ±15 POUNDS OF NOTED TABLE I VALUES WHEN SYSTEM IS BEING RIGGED.



[5] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET PER [4]

Aileron System Cable Tension Requirements
Figure 402

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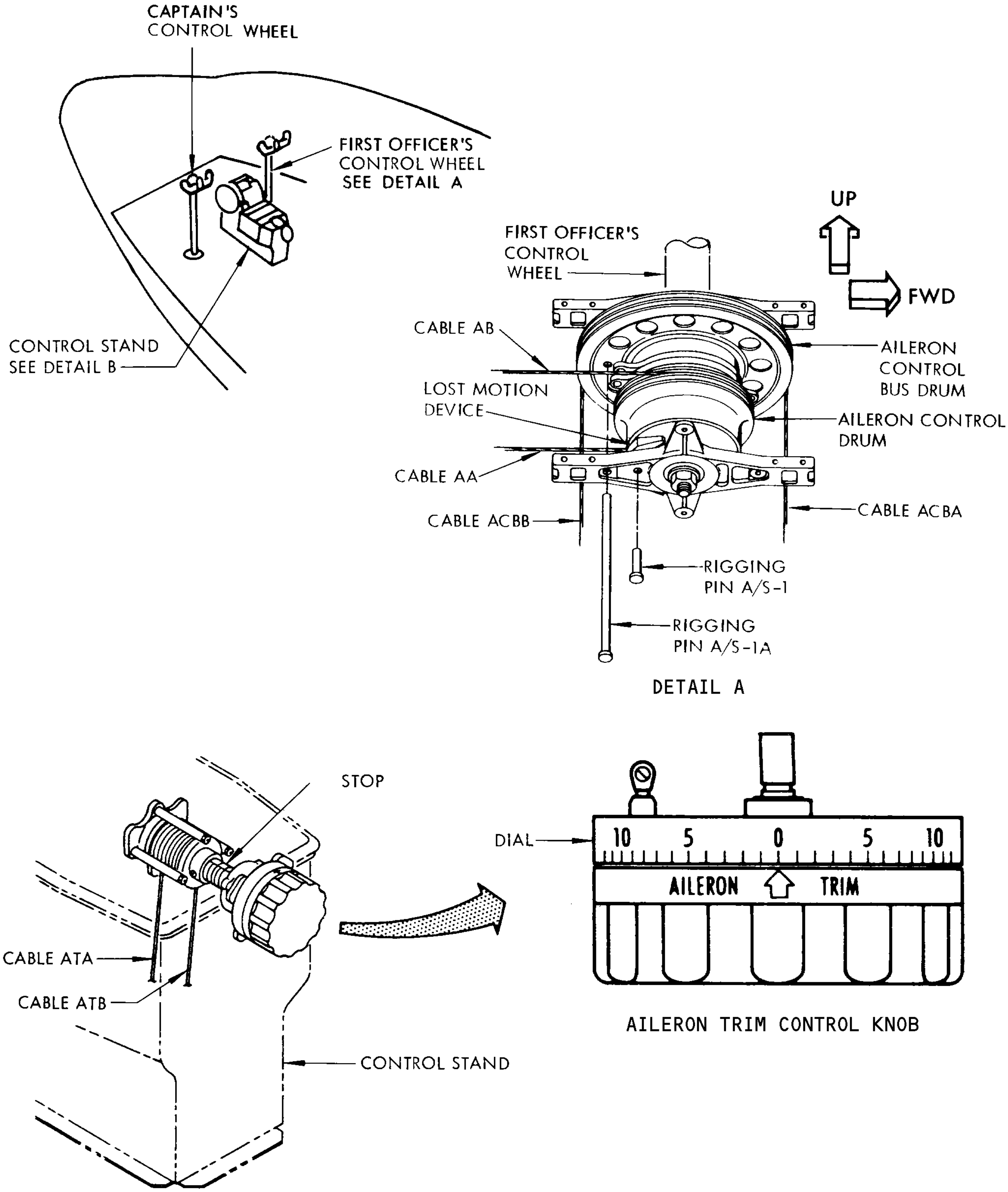
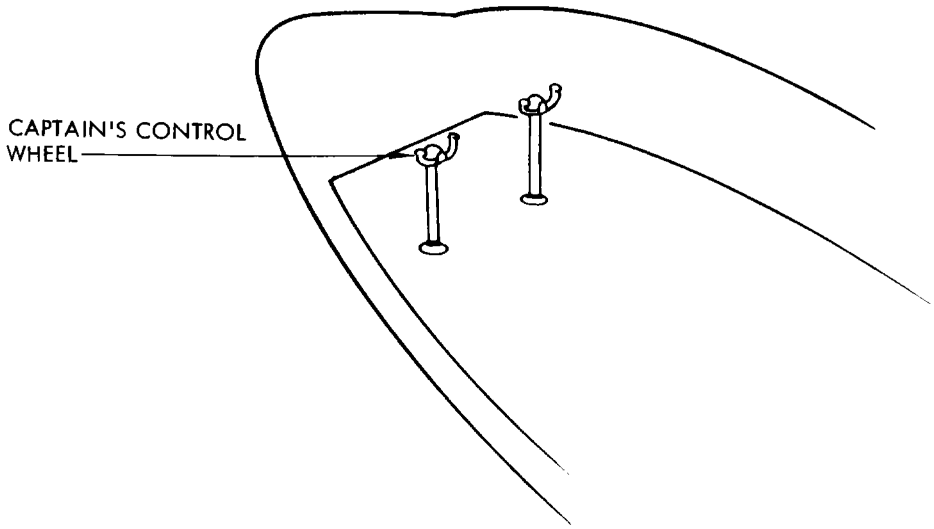
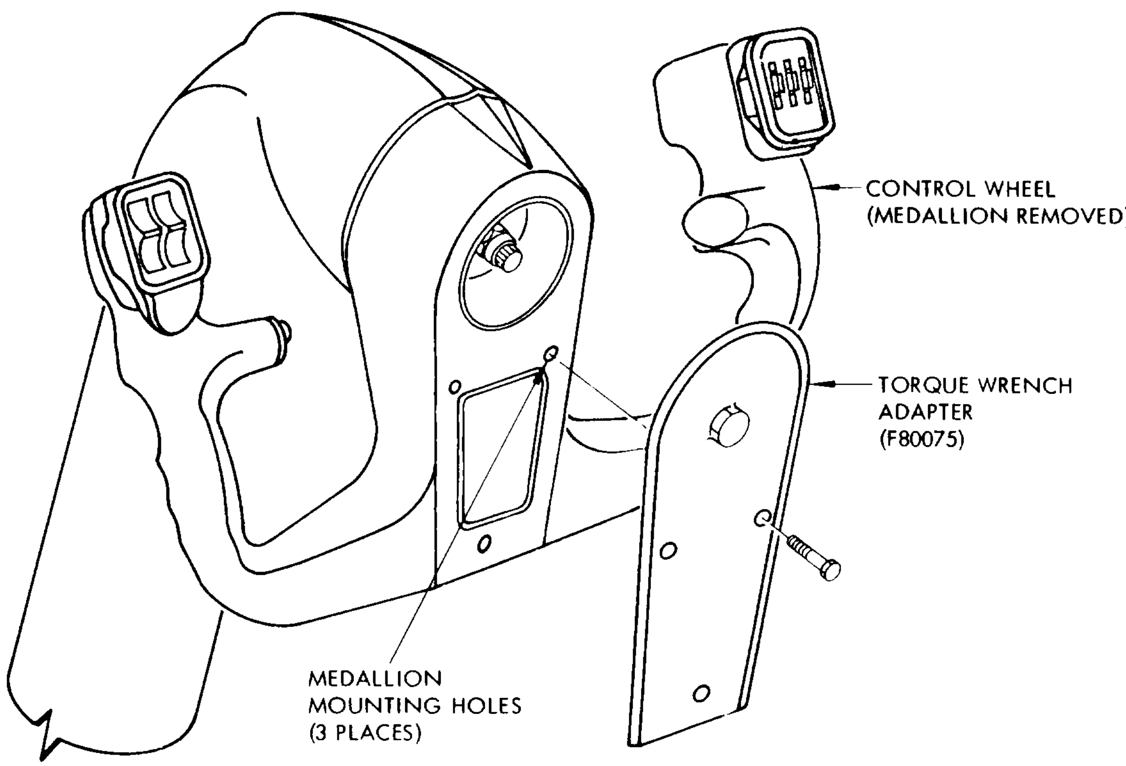


Aileron Control Wheel and Trim Knob Neutral Positions
Figure 403



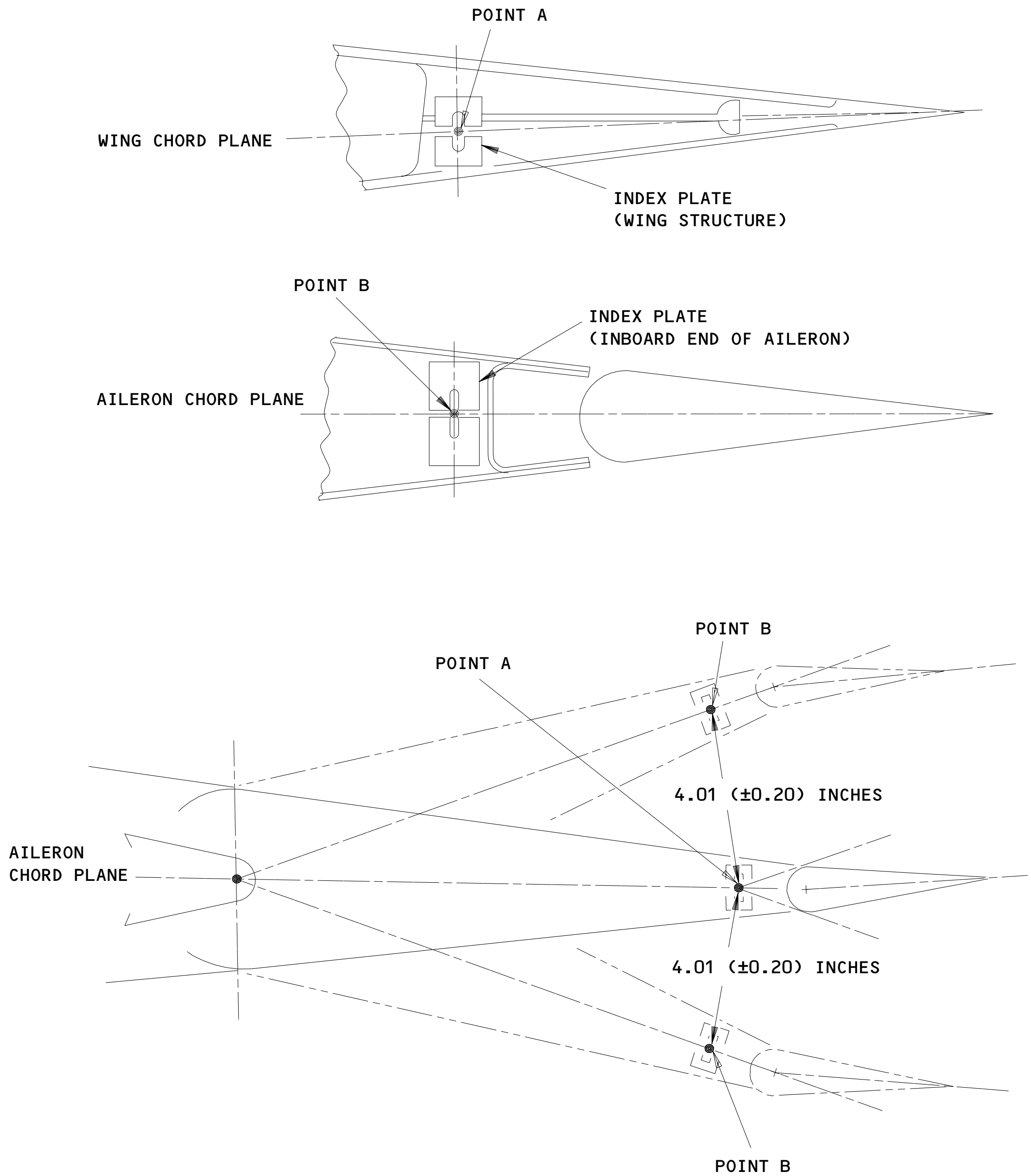


Control Wheel Torque Wrench Adapter
Figure 404

(2) Continue rotating control wheel to 20 degrees from neutral. Force required shall not exceed 220 pound-inches torque or 33.8 pounds.
(3) Continue rotating to 40 degrees. Force required shall not exceed 256 pound-inches torque or 39.4 pounds.
(4) Continue rotating to 75 degrees. Force required shall not exceed 310 pound-inches torque or 47.7 pounds.
(5) Repeat steps (1) through (4) in a counterclockwise direction.

Q. Measure relationship of aileron control wheel movement as compared with aileron surface deflection.
(1) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.
(2) Check that left aileron moves up and right aileron moves down within limits specified in Fig. 405.
(3) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.
(4) Check that left aileron moves down and right aileron moves up within limits specified in Fig. 405.

R. Return airplane to normal.
(1) Remove control surface protractor and protractor mount from aileron control wheel.
(2) Remove control wheel torque and force test adapter from captain's aileron control wheel.
(3) Replace medallion on captain's aileron control wheel.
(4) Replace seats, carpets and floor panels removed (Ref Chapter 25, Equipment and Furnishings).
(5) Install nose wheel well left access panel 3104.

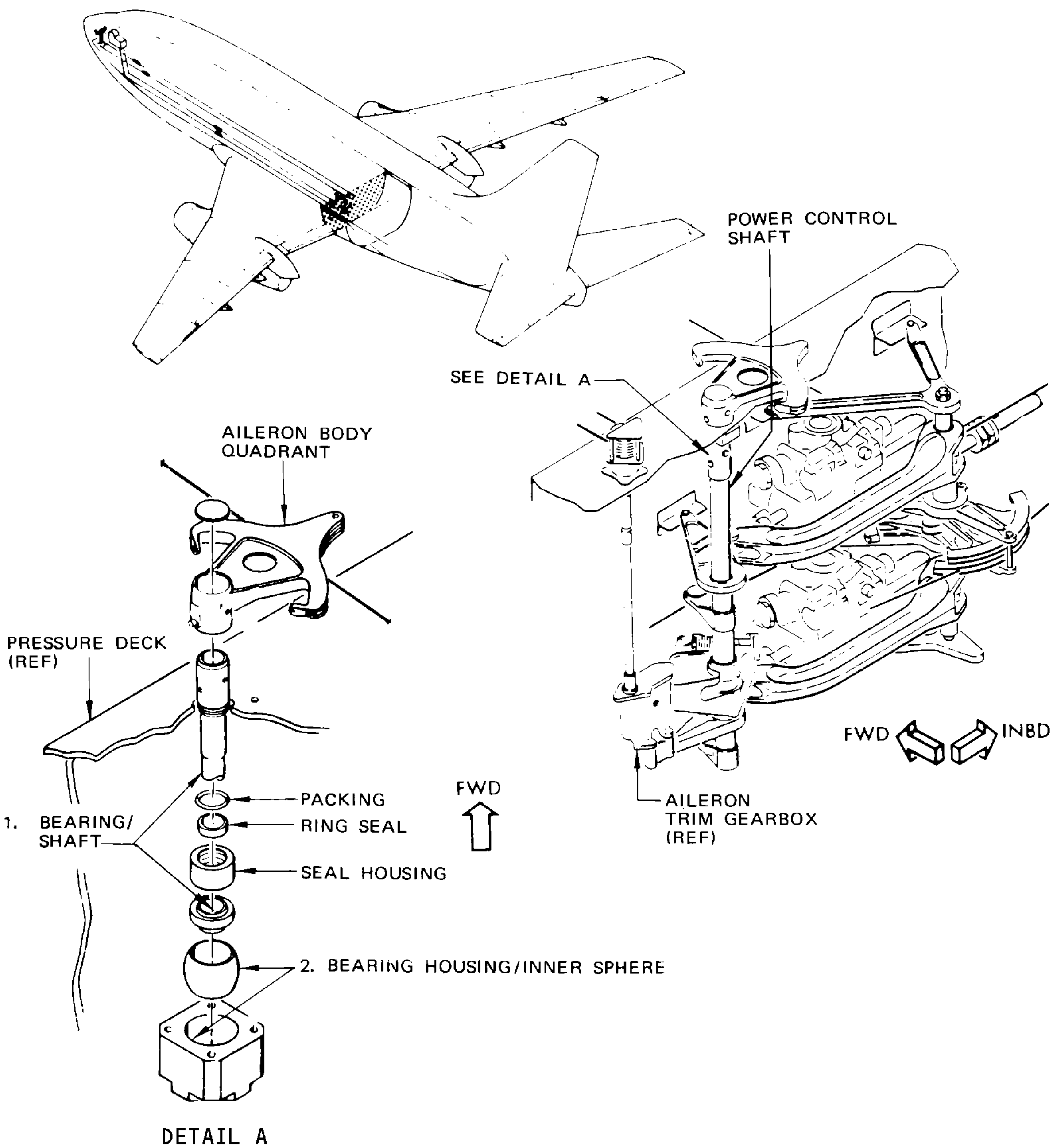


NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH.

Aileron Deflection Diagram
Figure 405

AILERON BODY QUADRANT - INSPECTION/CHECK

1. General
   A. This data consists of illustration and wear limits charts. No procedure is given for gaining access to permit inspection. For this information, refer to component removal/installation.
2. Aileron Body Quadrant Wear Limits



Aileron Body Quadrant Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	1.5620	1.5630	1.5630	0.0030			
	SHAFT	OD	1.5610	1.5620	1.5600				
2	BEARING HOUSING	ID	2.9500	2.9510	2.9530	0.0070			
	INNER SPHERE	OD	2.9480	2.9490	2.9460				

Aileron Body Quadrant Wear Limits
Figure 601 (Sheet 2)

AILERON POWER CONTROL UNIT LINKAGE - REMOVAL/INSTALLATION

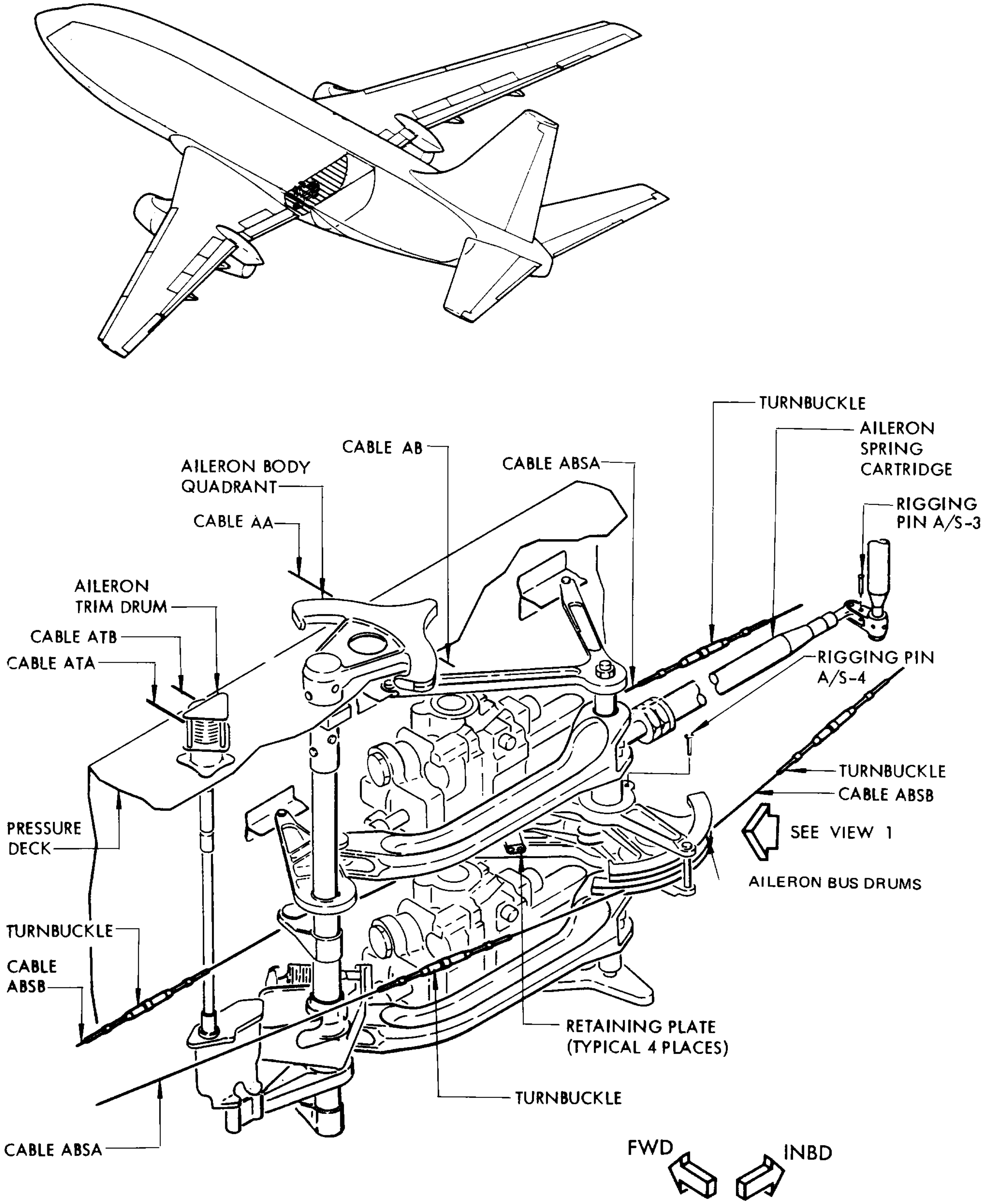
1. General
   A. System A and system B linkage may be removed separately. The following procedure can be used for either linkage.
   B. Prior to removing either aileron power control unit linkage, both power control units must be removed.
2. Equipment and Material
   A. Grease - BMS3-33 (Ref 20-30-21)
   B. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   C. Rigging Pins Kit - F70207-3, -52, -61, -84, or -108:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-3	-8	0.309-0.311 0.311	3.7 ±0.25	SPOILER CONTROL QUADRANT LOWER LEVER
A/S-4	-11	0.309-0.311 0.311	6.7 ±0.25	AILERON BUS DRUM

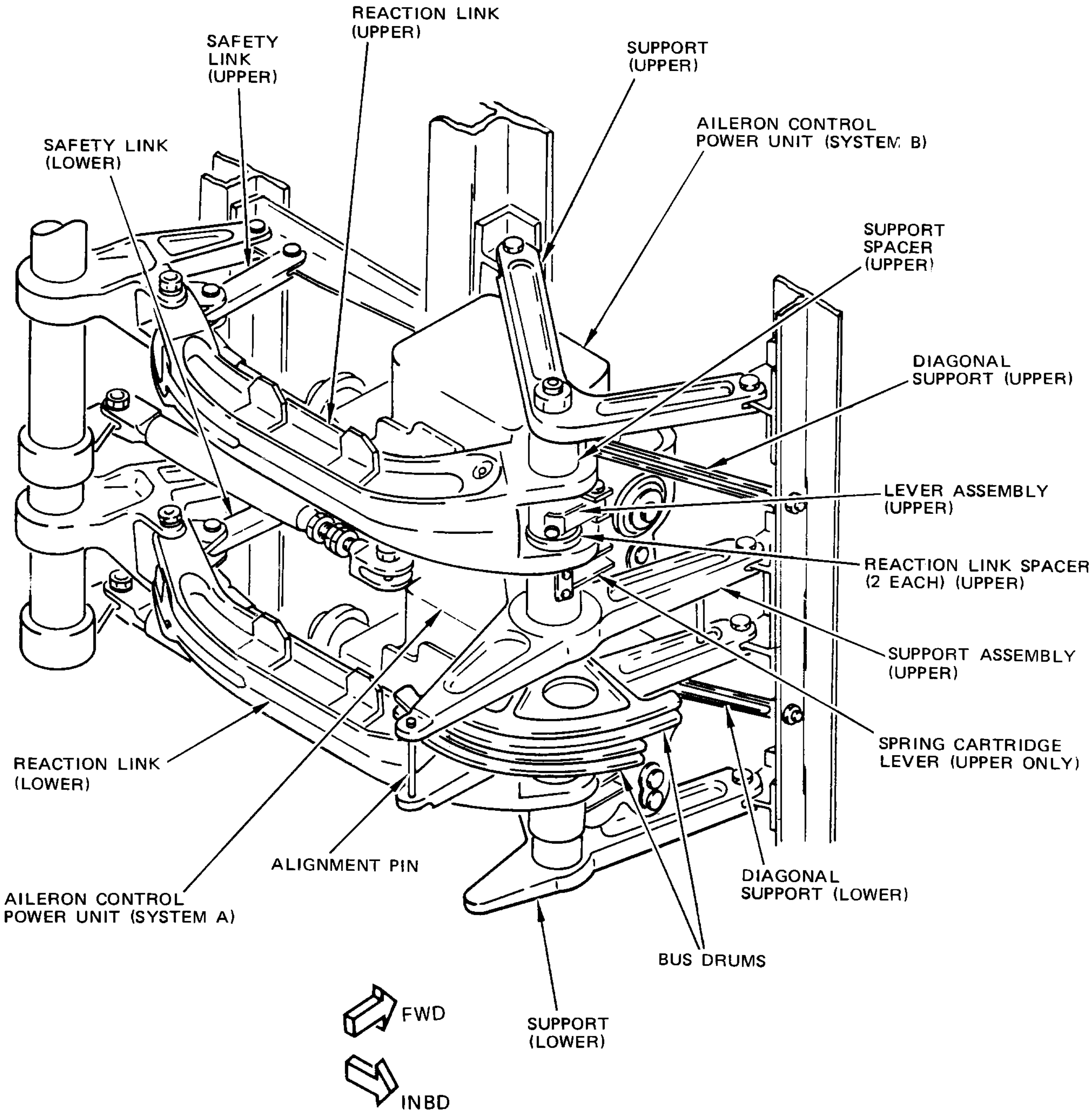
3. Remove Aileron Power Control Unit Linkage
   A. Remove aileron power control units (Ref 27-11-71 R/I).
   B. Disconnect cables ABSA and ABSB at turnbuckles (Fig. 401).
   C. Remove nuts, washers, and screws securing retaining plates to aileron bus drum.
   D. Disengage cables ABSA and ABSB from aileron bus drum.
   E. Secure disconnected cables.
   F. On system B, disconnect spring cartridge at inboard end by removing cotter pin, nut, washer, and bolt.
   G. Remove alignment pins between support assemblies.
   H. Disengage diagonal support from structure by removing nuts, washers, and bolts.

I. Disconnect safety link from outboard end of reaction link by removing nut, washer, spacer, and bolt.
J. Disconnect support from structure by removing nuts, washers, and bolts.
K. Remove linkage from airplane.
L. Disassemble control unit linkage.
   (1) Remove support by removing cotter pin, nut, and washer.
   (2) Remove support spacer.
   (3) Remove clamping nut, washer, and bolt from lever assembly.
   (4) Remove reaction link, spacers, and lever assembly.
   (5) On system B, remove nut, washer, and bolt from spring cartridge lever and remove lever.
   (6) On system A, remove spacer.
   (7) Remove support assembly.
   (8) Remove bus drum from shaft by removing lockbolts and collars.

4. Install Aileron Power Control Unit Linkage
   A. Check aileron power control unit linkage for wear. Refer to Aileron Power Control Unit - Inspection/Check.
   B. Assemble control unit linkage.
      (1) Install bus drum on shaft with lockbolts and collars.
      (2) Install support assembly on shaft. Fill upper exposed area of bearing with grease.
      (3) On system A, cover inside surface of spacer with corrosion preventive compound. Install spacer on shaft. Fill all voids between spacer and shaft with compound.
      (4) On system B, cover inside surface of spring cartridge lever with corrosion preventive compound. Install lever on shaft with bolt, washer, and nut. Fill all voids between lever and shaft with compound.
      (5) Cover spline surfaces of lever assembly with corrosion preventive compound. While holding reaction link horizontal, insert spacers and lever assembly into reaction link.
      (6) Install reaction link, spacers, and lever assembly on shaft with clamping bolt, washer, and nut. Fill upper exposed area of bearings with grease.
      (7) Cover inside surface of support spacer with corrosion preventive compound. Install spacer on shaft. Fill all voids between spacer and shaft with compound.



Aileron Power Control Linkage Installation
Figure 401 (Sheet 1)



Aileron Power Control Linkage Installation
Figure 401 (Sheet 2)

(8) Fill upper exposed area of support bearing with grease. Install support on shaft with washer and nut.
(9) Tighten nut to 400 to 450 pound-inches and install cotter pin.
(10) Lubricate with grease thru lube fitting.

C. Place support into position, and secure with bolts, washers, and nuts (Fig. 401).
D. Connect safety link to outboard end of reaction link, and secure with spacer, bolt, washer, and nut.
E. Connect diagonal support to structure, and secure with bolt, washer, and nut.
F. Install alignment pins between support assemblies.
G. Insert rigging pin A/S-4 through aileron bus drum.
H. On system B, insert rigging pin A/S-3 in right aileron control quadrant shaft.
I. On system B connect inboard end of spring cartridge by installing bolt, washer, nut and cotter pin. Ensure bolt fits freely without compression on spring cartridge. Ensure antirotation fork and drain holes are down.
J. Install cables ABSA and ABSB on aileron bus drum, and secure with retaining plates.
K. Secure retaining plates with screws, washers and nuts.
L. Reconnect cables ABSA and ABSB at turnbuckles. Maintain zero tension on cables.
M. Adjust turnbuckles for each bus cable to permit positioning of aileron so that index point B on inboard end of aileron aligns vertically within + 0.03 inch of index point A on adjacent wing structure (Fig. 403.)
N. Adjust cables to specified tension as shown in Fig. 402.
O. Install turnbuckle locking clips.
P. Remove rigging pins A/S-3 and A/S-4.
Q. Install aileron power control units as specified in 27-11-71, Aileron Power Control Units - Removal/Installation.
R. Manually operate aileron control wheel and check that aileron travel is obtained as shown in Fig. 403.

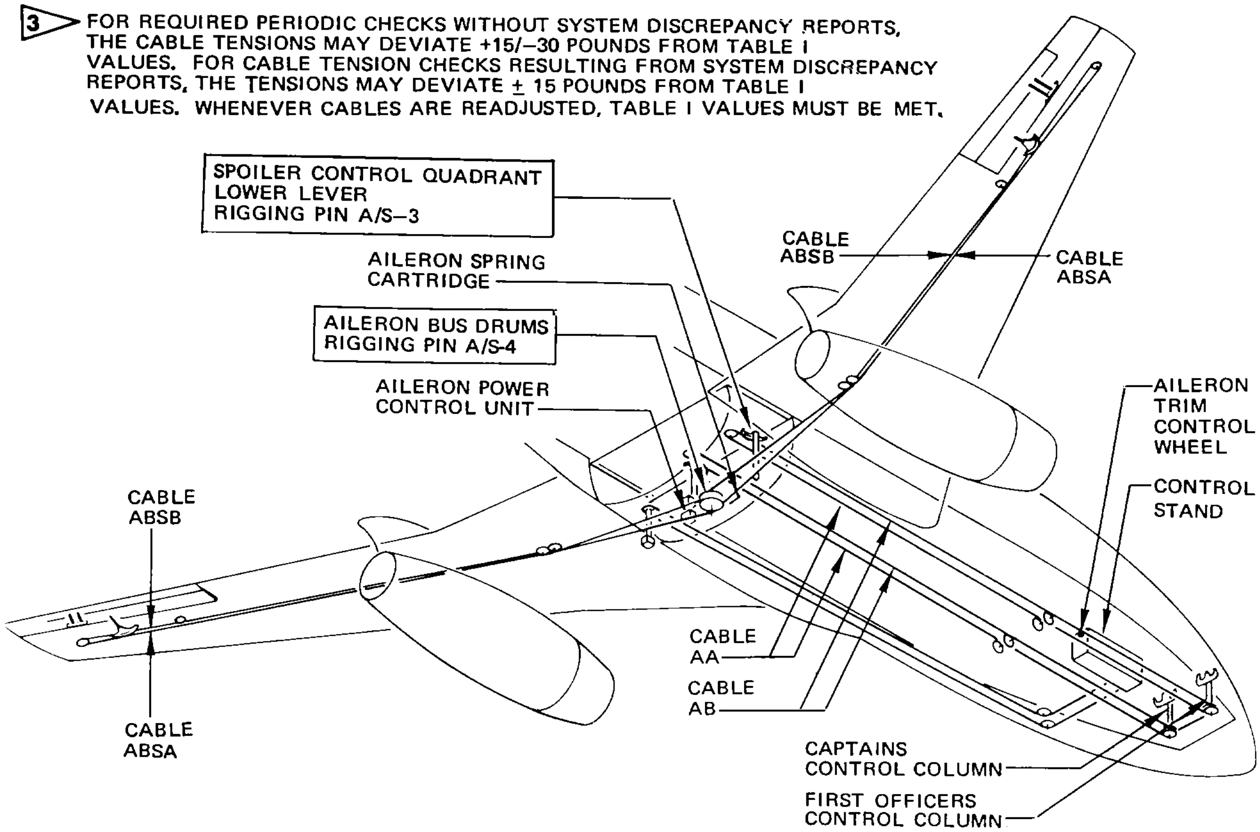
TABLE I

TEMPERATURE °F [1]	CABLE TENSION (POUNDS) CABLES ABSA AND ABSB [2] [3]
110	202
90	184
70	165
50	148
30	131
+10	113
-10	96
-30	77
-40	66

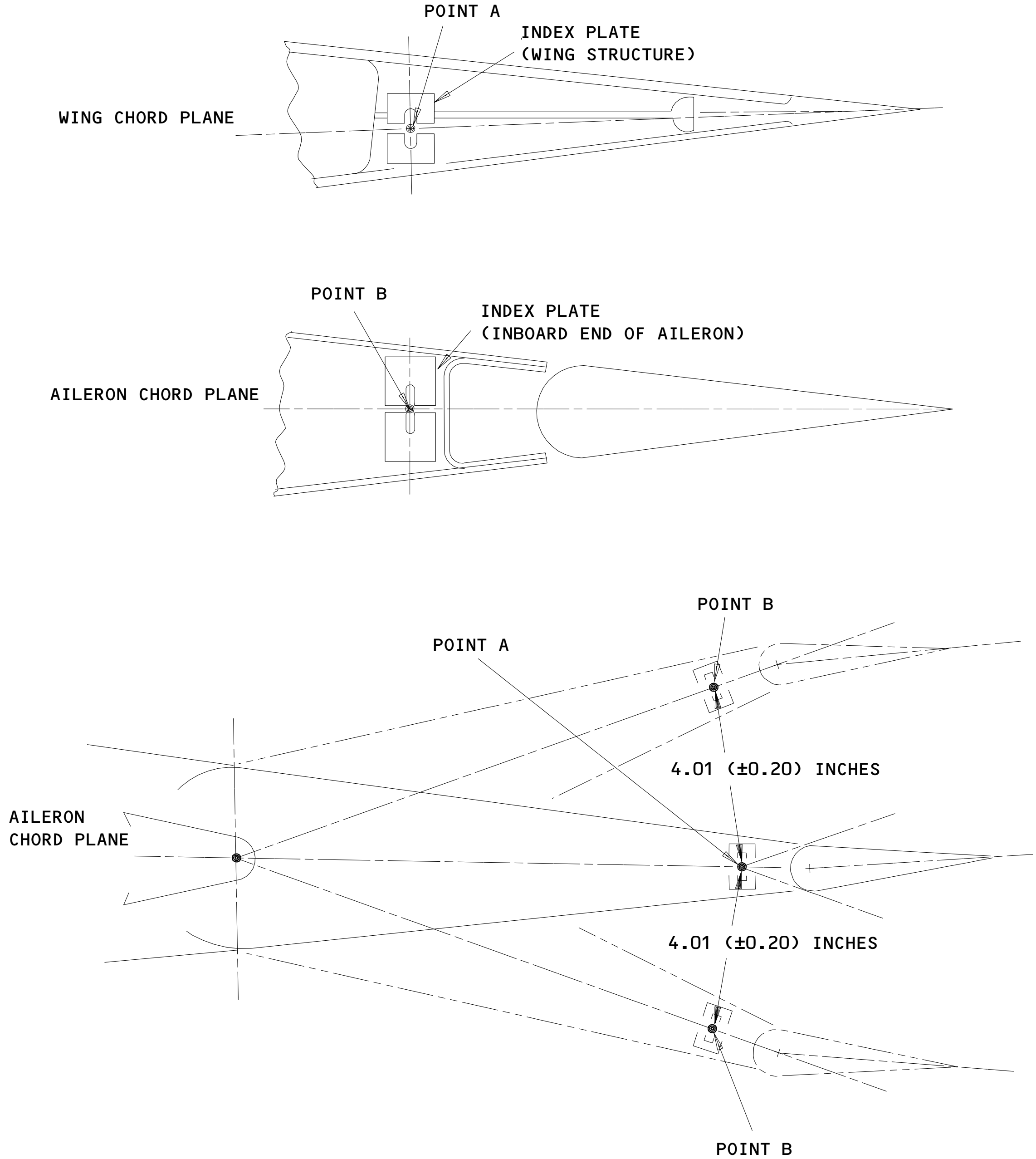
[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ± 5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/–0 POUNDS OF TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.



Aileron System Cable Tension Requirements
Figure 402

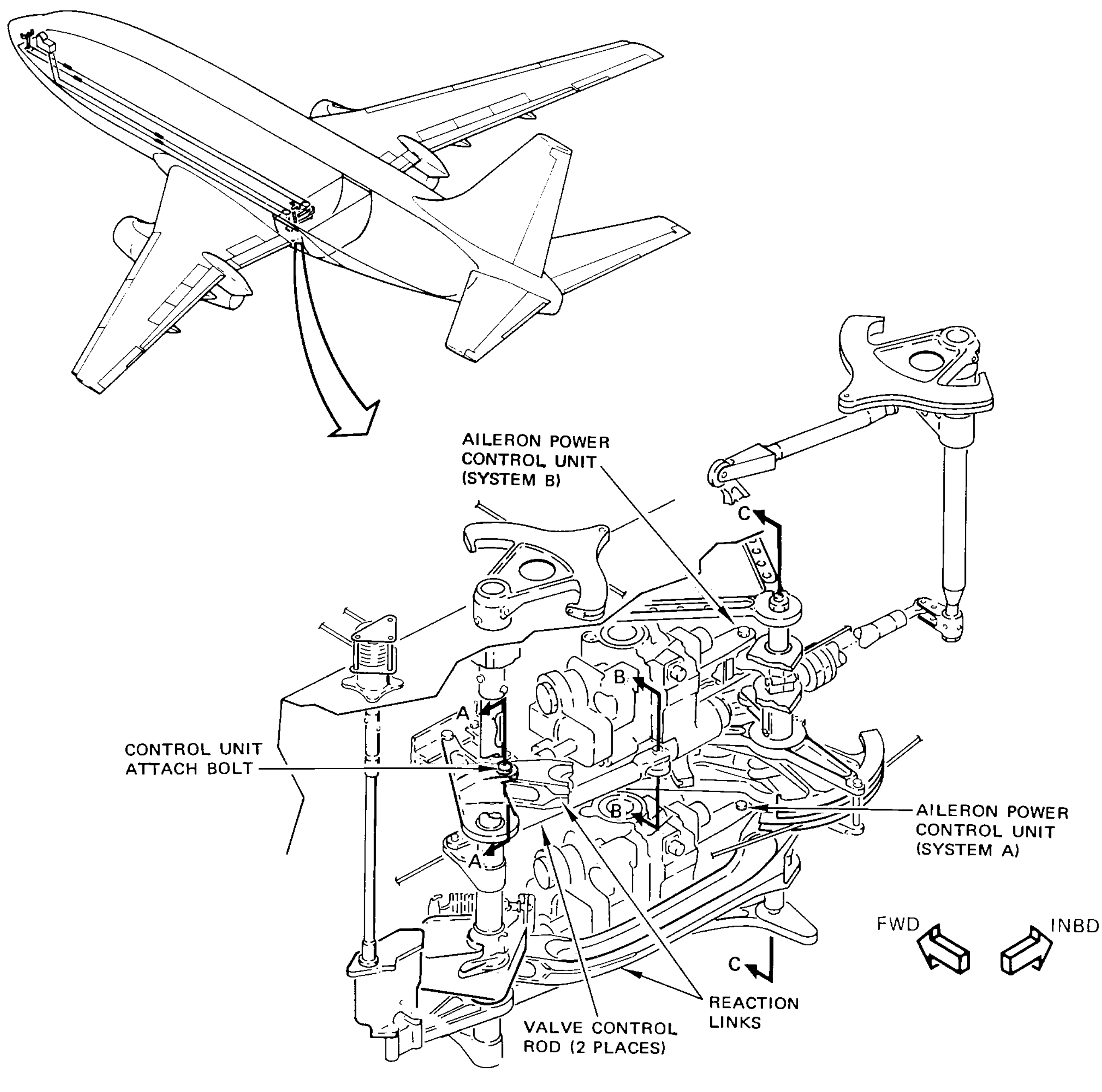


NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH

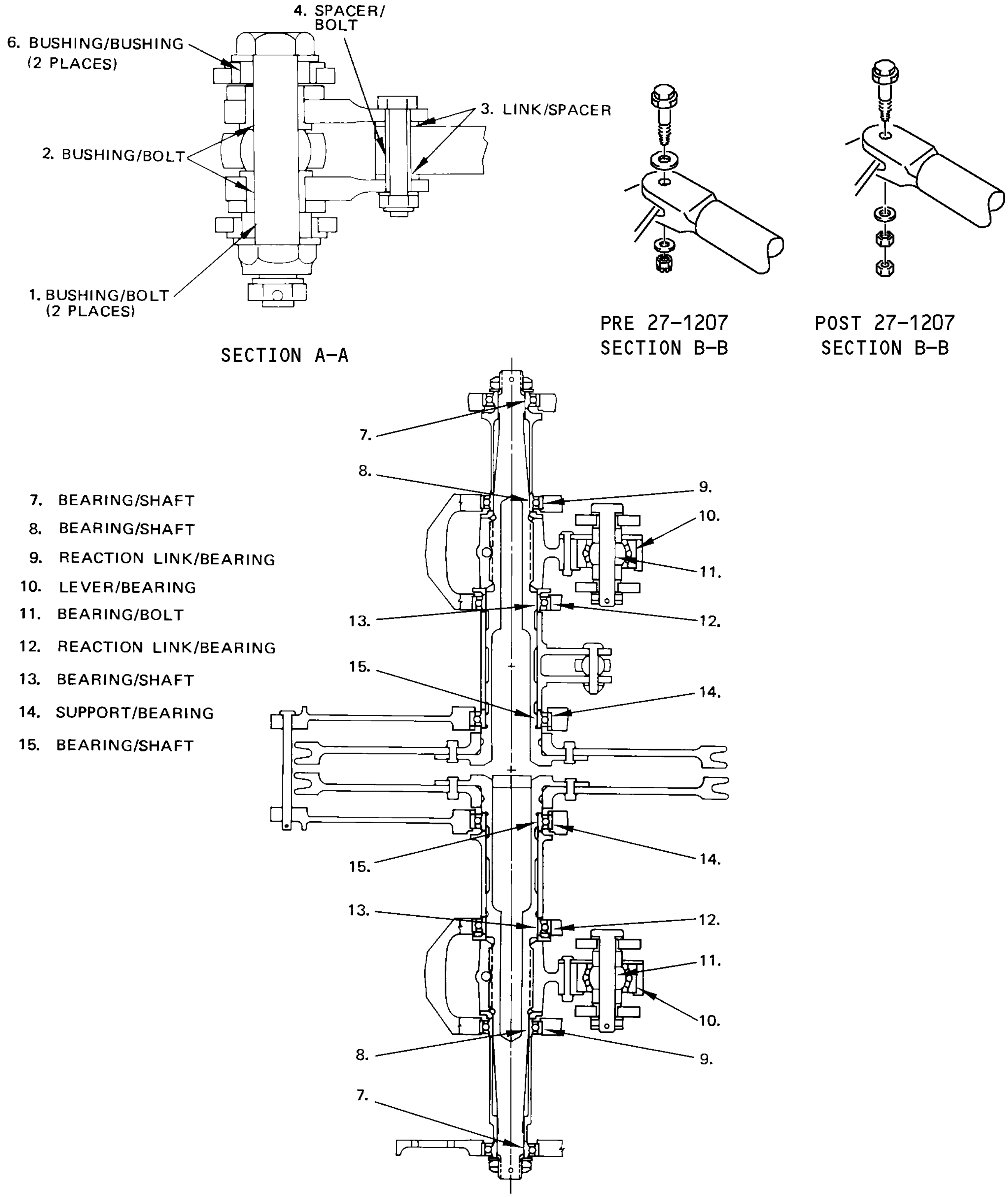
Aileron Deflection Diagram
Figure 403

AILERON POWER CONTROL UNIT LINKAGE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. No procedure is given in this section for gaining access to permit inspection. For this information refer to Component Removal/Installation.
2. Aileron Power Control Unit Wear Limits



Aileron Power Control Unit Linkage Wear Limits
Figure 601 (Sheet 1)



Aileron Power Control Unit Linkage Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.6245	0.6250	0.6250	0.0017	X		
	BOLT	OD	0.6237	0.6242	0.6233		X		
2	BUSHING	ID	0.6245	0.6250	0.6250	0.0017	X		
	BOLT	OD	0.6237	0.6242	0.6233		X		
3	LINK	ID	0.3906	0.3940	0.3940	0.0290	X		
	SPACER	OD	0.3650	0.3850	0.3850		X		
4	SPACER	ID	0.2560	0.2970	0.2970	.0485	X		
	BOLT	OD	0.2485	0.2495	0.2485		X		
5	ROD	ID	0.3120	0.3130	0.3135	0.0030	X		
	BOLT	OD	0.3110	0.3120	0.3105		X		
6	BUSHING	ID	0.0000	1.0005	1.0015	0.0030	X		
	BUSHING	OD	0.9990	0.9995	0.9985		X		
7	BEARING	ID	0.7495	0.7500	0.7500	0.0020 *[1]	X		
	SHAFT	OD	0.7488	0.7495	0.7480		X		
8	BEARING	ID	0.9990	1.0000	1.0000	0.0020 *[1]	X		
	SHAFT	OD	0.9988	0.9995	0.9980		X		
9	REACTION LINK	ID	1.7500	1.7507	1.7510	0.0020 *[1]	X		
	BEARING	OD	1.7490	1.7500	1.7490		X		
10	LEVER	ID	1.6864	1.6870	1.6870	0.0000 *[1]	X		
	BEARING	OD	1.6870	1.6875	1.6870		X		

Aileron Power Control Unit Linkage Wear Limits
Figure 601 (Sheet 3)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
11	BEARING	ID	0.4995	0.5000	0.5000	0.0019 *[1]	X		
	BOLT	OD	0.4985	0.4995	0.4981		X		
12	REACTION LINK	ID	2.1875	2.1882	2.1885	0.0020 *[1]	X		
	BEARING	OD	2.1865	2.1875	2.1865		X		
13	BEARING	ID	1.4370	1.4380	1.4380	0.0030 *[1]	X		
	SHAFT	OD	1.4360	1.4370	1.4350		X		
14	SUPPORT	ID	2.3125	2.3135	2.3145	0.0030 *[1]	X		
	BEARING	OD	2.3115	2.3125	2.3115		X		
15	BEARING	ID	1.5620	1.5630	1.5630	0.0030 *[1]	X		
	SHAFT	OD	1.5610	1.5620	1.5600		X		

*[1] Replace bearing when radial play exceeds 0.0020 inch.

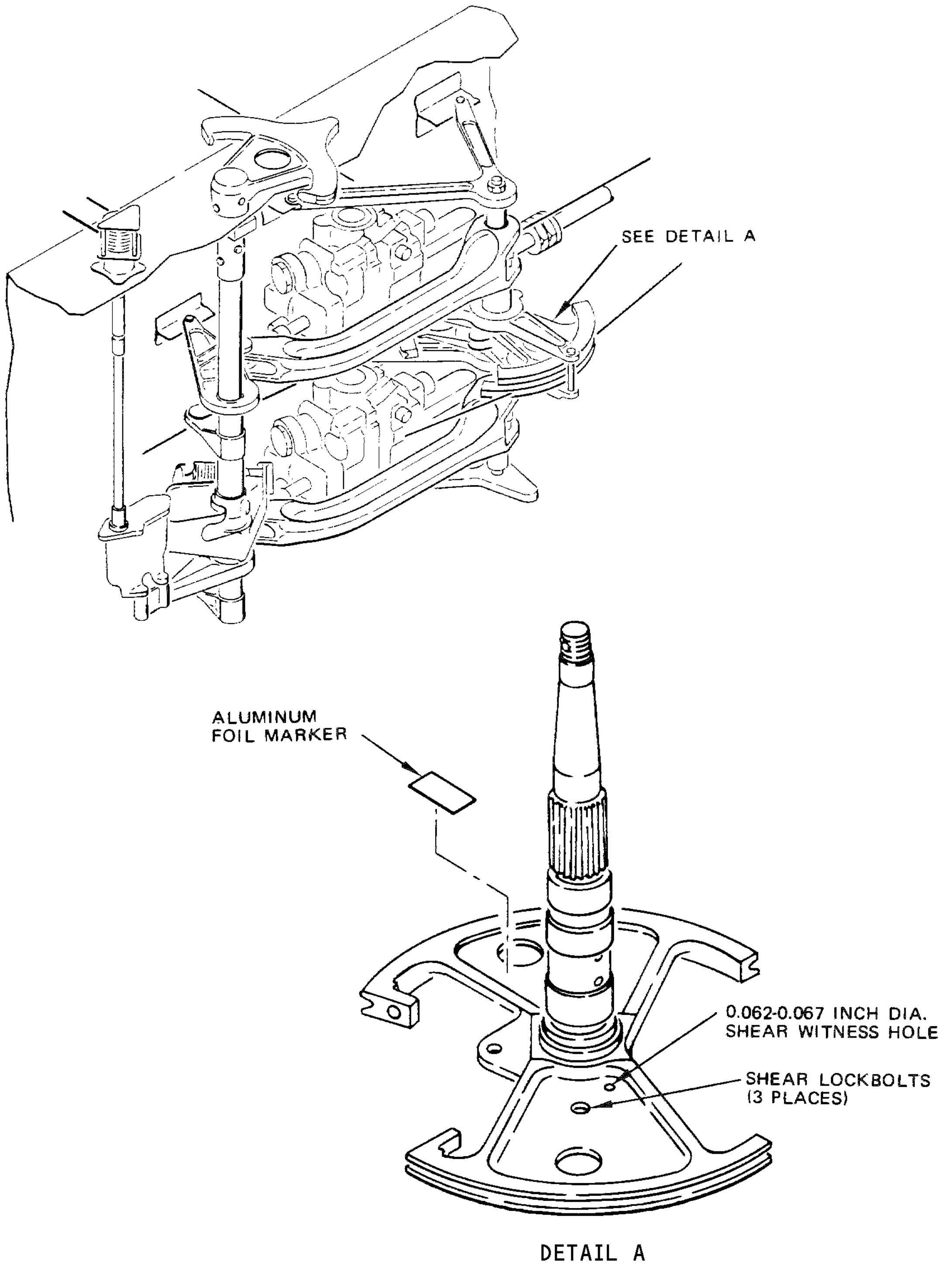
Aileron Power Control Unit Linkage Wear Limits
Figure 601 (Sheet 4)

AILERON POWER CONTROL UNIT LINKAGE - APPROVED REPAIRS

1. General
   A. Shear bolts provide a means by which normal operation of essential flight systems can be maintained in the event of failure or jamming of related or interconnect secondary systems (Ref 27-09-500).
2. Equipment and Materials
   A. Lockbolt Installation Gun - Model 245 Huck International Inc. (or equivalent) 22121 17th Ave. S.E. - Suite 101 Bothell, Wa.
   B. Nose Assembly - 99-2557 (used with Gun Model 245)
   C. Shear Lockbolts - BACB30GP6-5
   D. Aluminum Foil Marker - BACM10L1EKH
3. Replace Sheared Bolts
   A. Remove and disassembly aileron power control unit linkage (Ref 27-11-101, Removal/ Installation).
   B. Remove sheared portions of bolts from holes (Fig. 801).

      WARNING: DO NOT ENLARGE BOLT HOLES.

   C. Install new bolts.
   D. Check aluminum foil marker and replace if damaged or missing.
   E. Assemble and install Aileron Power Control Unit Linkage (Ref 27-11-101, Removal/Installation).



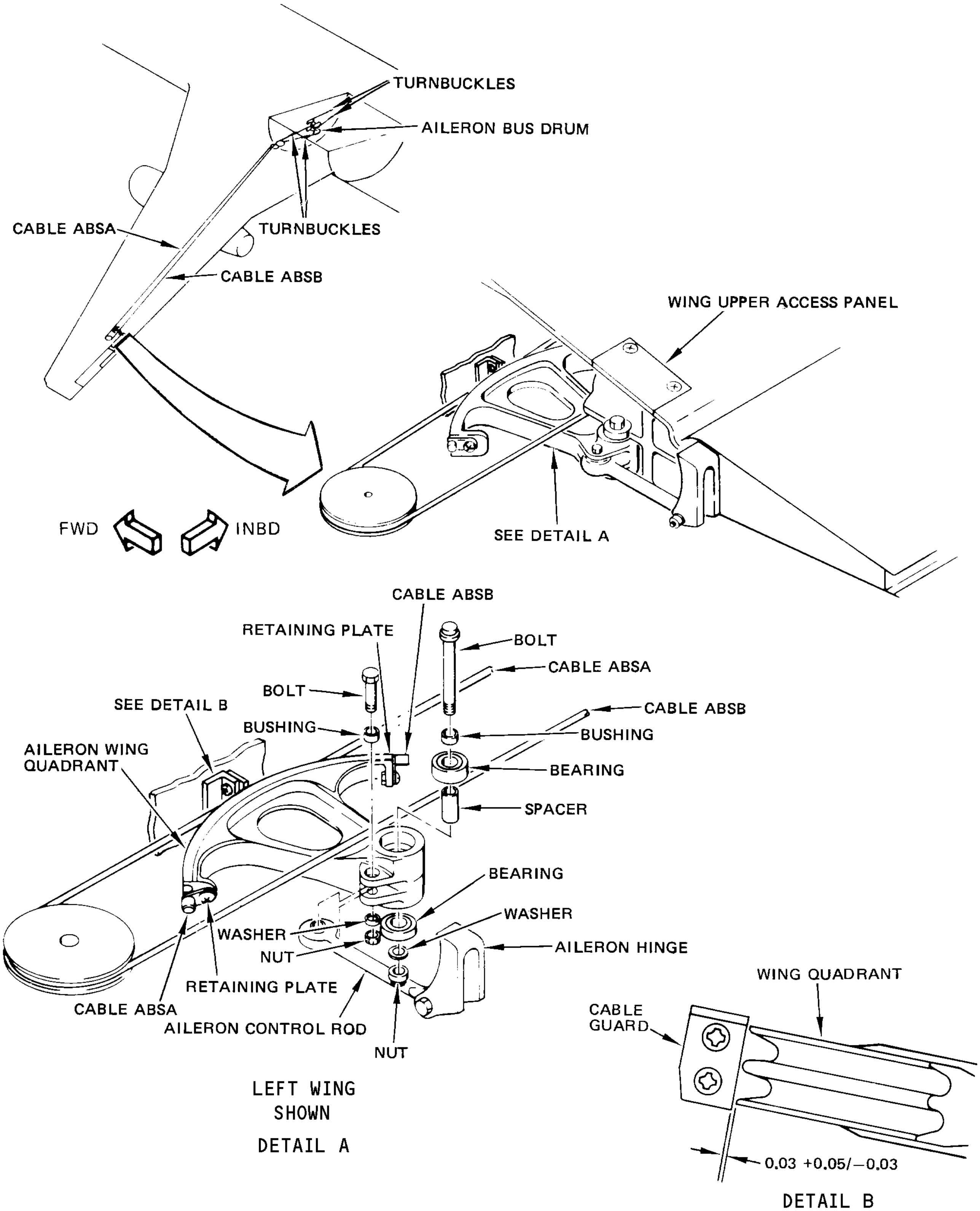
Aileron Bus Drum Control Shaft
Figure 801

AILERON WING QUADRANTS - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, -84, or -108:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	AILERON BUS DRUM

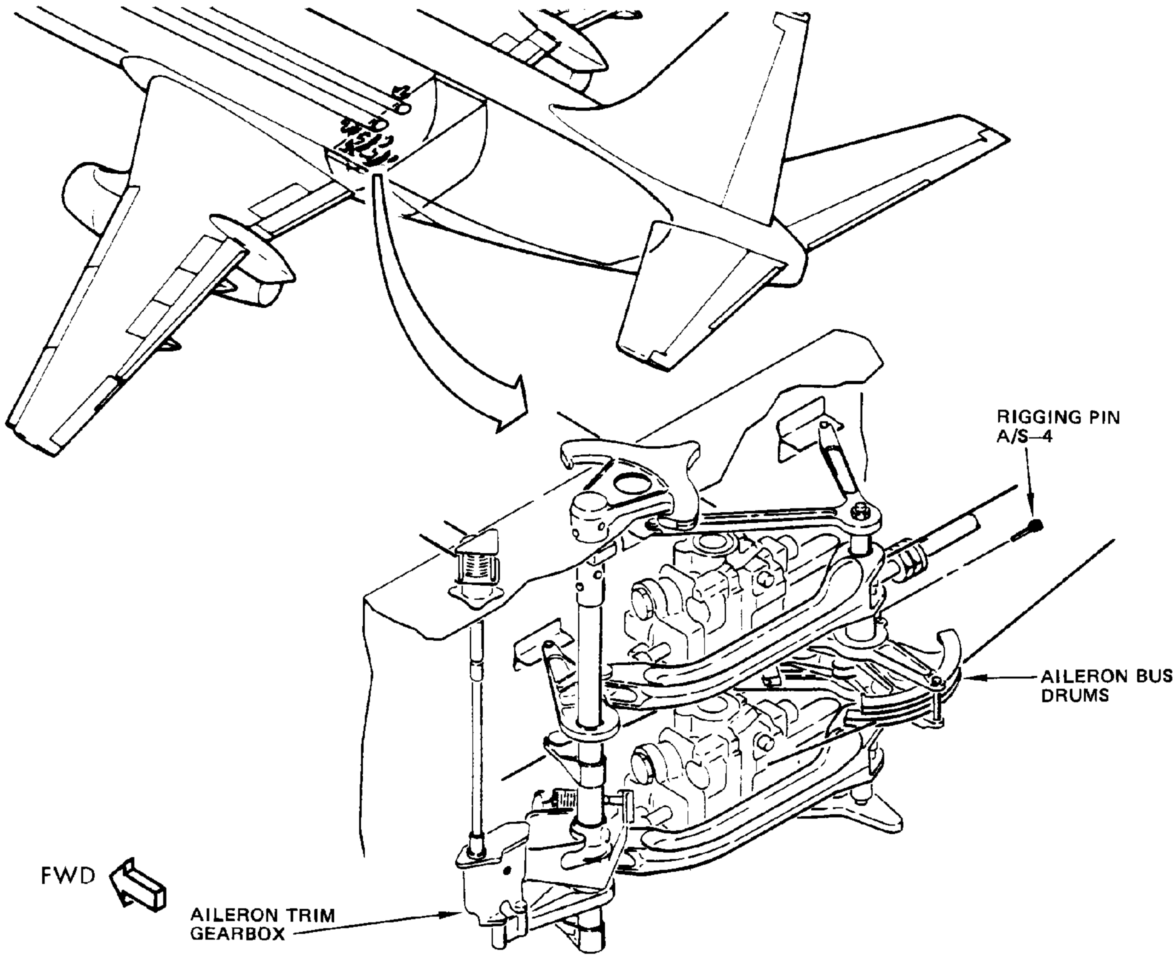
   B. Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
      (3) Cable Tensiometer - 0 to 300 pounds range
2. Prepare to Remove Aileron Wing Quadrants
   A. Depressurize hydraulic systems A and B (Ref 27-11-0 MP).
   B. Insert rigging pin A/S-4 through aileron bus drums (Fig. 402).
   C. Remove access panels.
      (1) For access to left wing quadrant, remove wing lower access panel 7218 and upper access panel 8108.
      (2) For access to right wing quadrant, remove wing lower access panel 7418 and wing upper access panel 8808.
3. Remove Aileron Wing Quadrants (Fig. 401)
   A. Remove cotter pin, nut, washer, and bolt-retaining aileron control rod to aileron wing quadrant.
   B. Disconnect cables ABSA and ABSB at turnbuckles.
   C. Secure disconnected cables.
   D. Remove retaining plates from wing quadrant by removing nuts, washers, and screws.
   E. Remove cable guard from forward edge of wing quadrant.
   F. Disengage cables ABSA, and ABSB from wing quadrant.
   G. Remove cotter pin, nut, washer and bolt retaining wing quadrant to structure and remove quadrant.
   H. Separate bushing from wing quadrant retaining structure if required.



Aileron Wing Quadrants Installation
Figure 401

I. Disassemble wing quadrant as follows:
   (1) Remove bushings from aileron control rod attachment point, if required.
   (2) Remove bearing and spacer from quadrant attachment point, if required.

4. Install Aileron Wing Quadrant
   A. Check aileron wing quadrant for wear. Refer to Aileron Wing Quadrant - Inspection/Check.
   B. Install bearings and spacer in wing quadrant attachment point, if previously removed (Fig. 401).
   C. Install bushing in aileron control rod attachment point, if previously removed.
   D. Place bushing in wing quadrant retaining structure, if previously removed.
   E. Place wing quadrant in position and secure with bolt, washer, and nut. Tighten nut 160 to 200 pound-inches and install cotter pin.
   F. In left wing, place cable ABSA in bottom groove of quadrant and cable ABSB in top groove. In right wing, place cable ABSB in bottom groove of quadrant and cable ABSA in top groove. Secure cable retaining plates with screws, washers, and nuts.
   G. Install cable guard on structure at forward edge of wing quadrant.
   H. Adjust cable guard gap to 0.03 +0.05/-0.03 inch as shown in Detail B.
   I. Connect aileron control rod to wing quadrant by installing bolt, washer, and nut. Tighten nut 60 to 85 pound-inches, then install cotter pin.
   J. Connect cables ABSA and ABSB to turnbuckles, but maintain zero cable tension.
   K. Ensure rigging pin A/S-4 is installed (Fig. 402).
   L. Tighten turnbuckles for each cable (ABSA and ABSB) to permit positioning of ailerons so that index point B on inboard end of each aileron aligns vertically within ±0.03 inch of index point A on adjacent wing structure (Fig. 403).
   M. Continue to tighten cables in equal increments until correct tension is obtained as specified in Fig. 404.
   N. Install turnbuckle locking clips.
   O. Install upper and lower access panels removed for wing quadrant replacement.



Aileron Rigging Pin Locations
Figure 402

P. Install control wheel protractor mount and control wheel protractor on captain's aileron control wheel.

Q. Measure relationship of aileron control wheel movement as compared with aileron surface deflection.

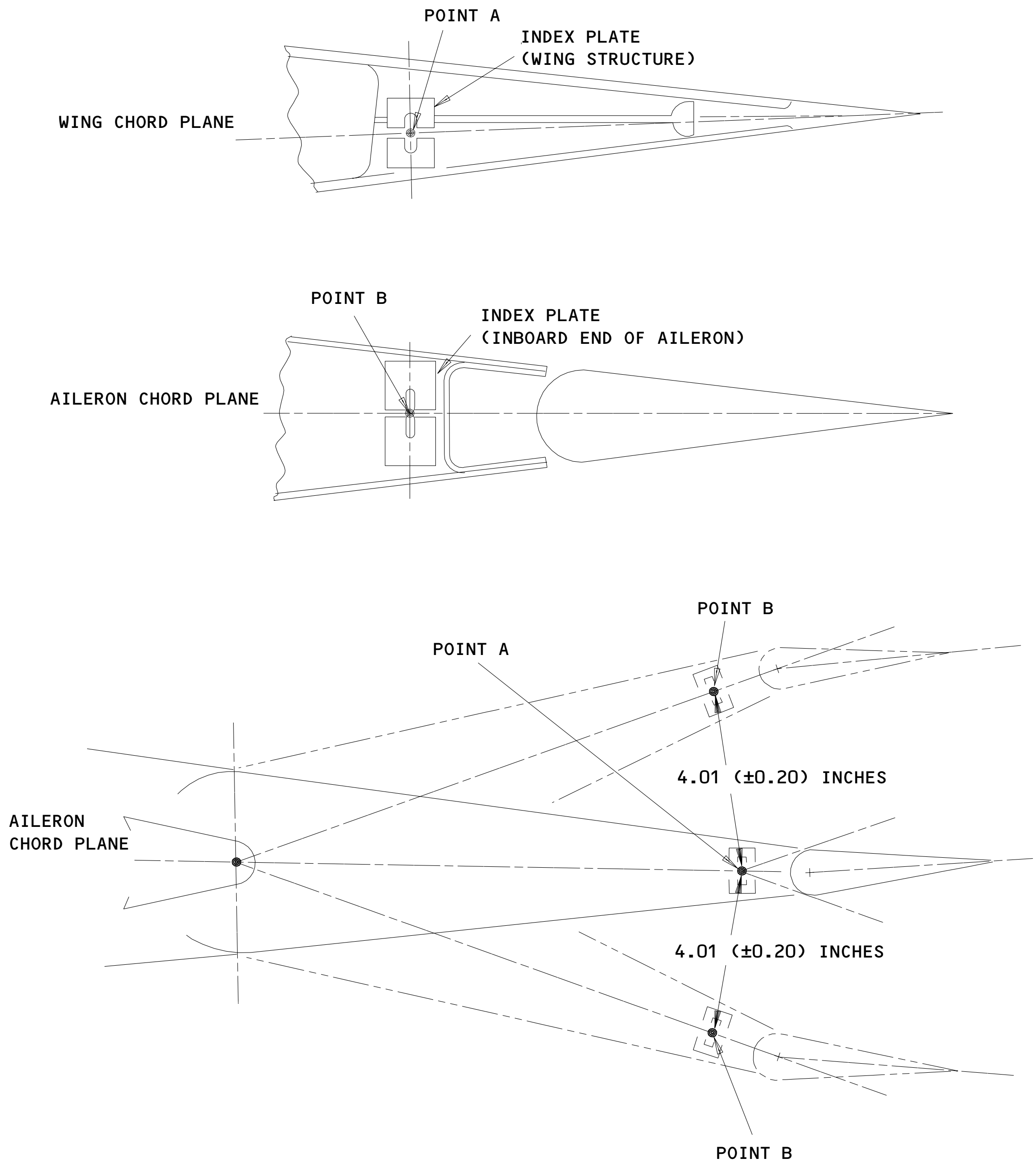
(1) Rotate captain's aileron control wheel 87 degrees minimum counterclockwise from neutral.

(2) Check that left aileron moves up and right aileron moves down within limits specified in Fig. 403.

(3) Rotate captain's aileron control wheel 87 degrees minimum clockwise from neutral.

(4) Check that left aileron moves down and right aileron moves up within limits specified in Fig. 403.

R. Remove control wheel protractor and mount from captain's aileron control wheel.



NOTE: WITH AILERON SYSTEM RIGGED
POINT B ON EACH AILERON SHALL
ALIGN VERTICALLY WITH POINT A
WITHIN ±0.03 INCH

Aileron Deflection Diagram
Figure 403

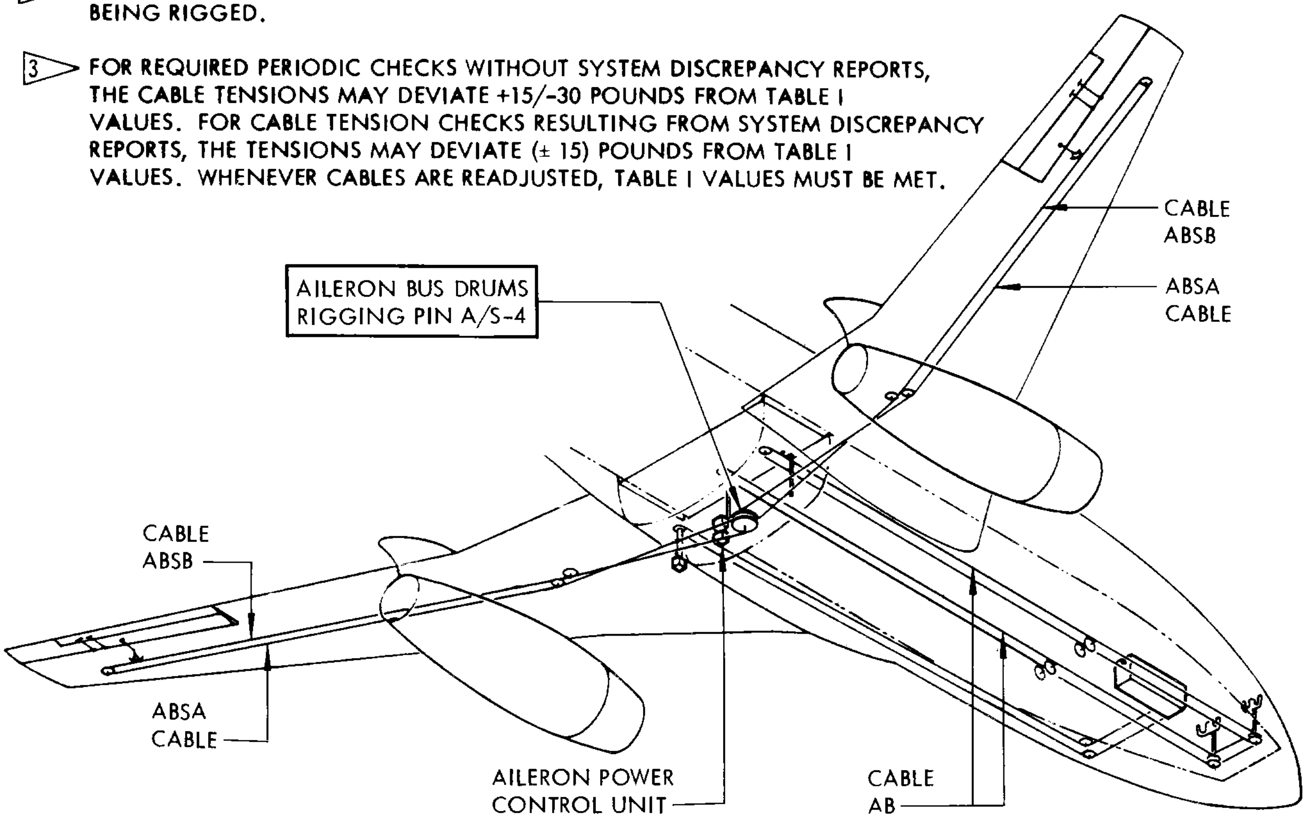
TABLE 1

TEMPERATURE °F [1]	CABLE TENSION (POUNDS)
	CABLES ABSA AND ABSB [2] [3]
110	202
90	184
70	165
50	148
30	131
+10	113
-10	96
-30	77
-40	66

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN +10/-0 POUNDS OF TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

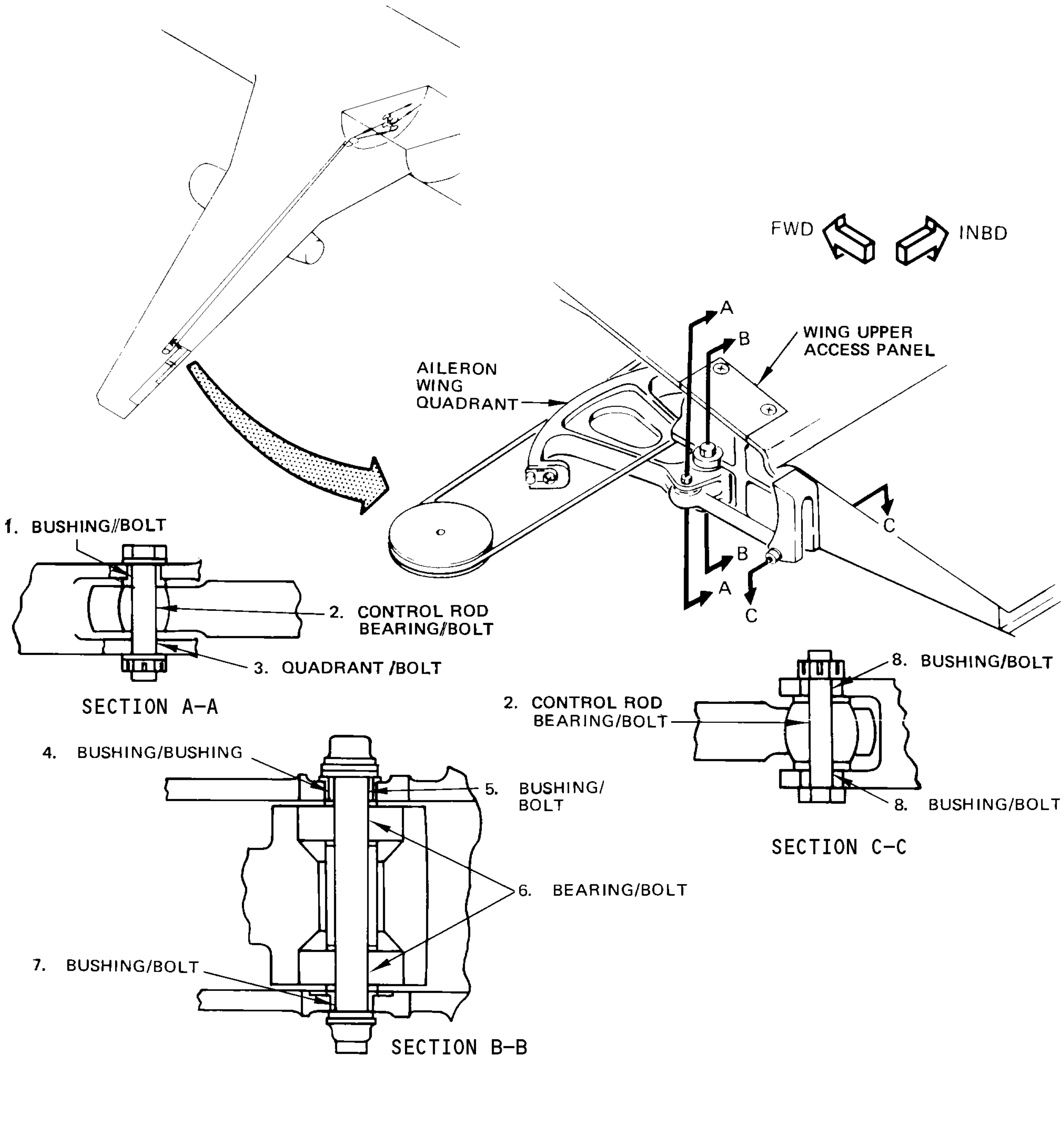
[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE (± 15) POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.



Aileron System Cable Tension Requirements
Figure 404

AILERON WING QUADRANT- INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limit charts. No procedure is given in this section for gaining access to permit inspection for this information, refer to Removal/Installation.
2. Aileron Wing Quadrant Wear Limits



Aileron Wing Quadrant Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3125	0.3140	0.3140	0.0034	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
2	CONTROL ROD BEARING	ID	-	-	-	*[2]	X		
	BOLT	OD	-	-	-		X		
3	QUADRANT	ID	0.3120	0.3130	0.3136	0.0030	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
4	BUSHING	ID	0.5000	0.5015	0.5055	0.0060	X		
	BUSHING	OD	0.4985	0.4995	0.4940		X		
5	BUSHING	ID	0.3750	0.3760	0.3760	0.0029			
	BOLT	OD	0.3735	0.3745	0.3731				
6	BEARING	ID	0.3745	0.3750	0.3750	0.0019 *[1]	X		
	BOLT	OD	0.3735	0.3745	0.3731		X		
7	BUSHING	ID	0.3750	0.3765	0.3805	0.0060	X		
	BOLT	OD	0.3735	0.3745	0.3690		X		
8	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		

*[1] REPLACE BEARING WHEN RADIAL PLAY EXCEEDS 0.0020 INCH.

*[2] REPLACE AILERON CONTROL ROD WHEN BEARING RADIAL PLAY EXCEEDS 0.0020 INCH.

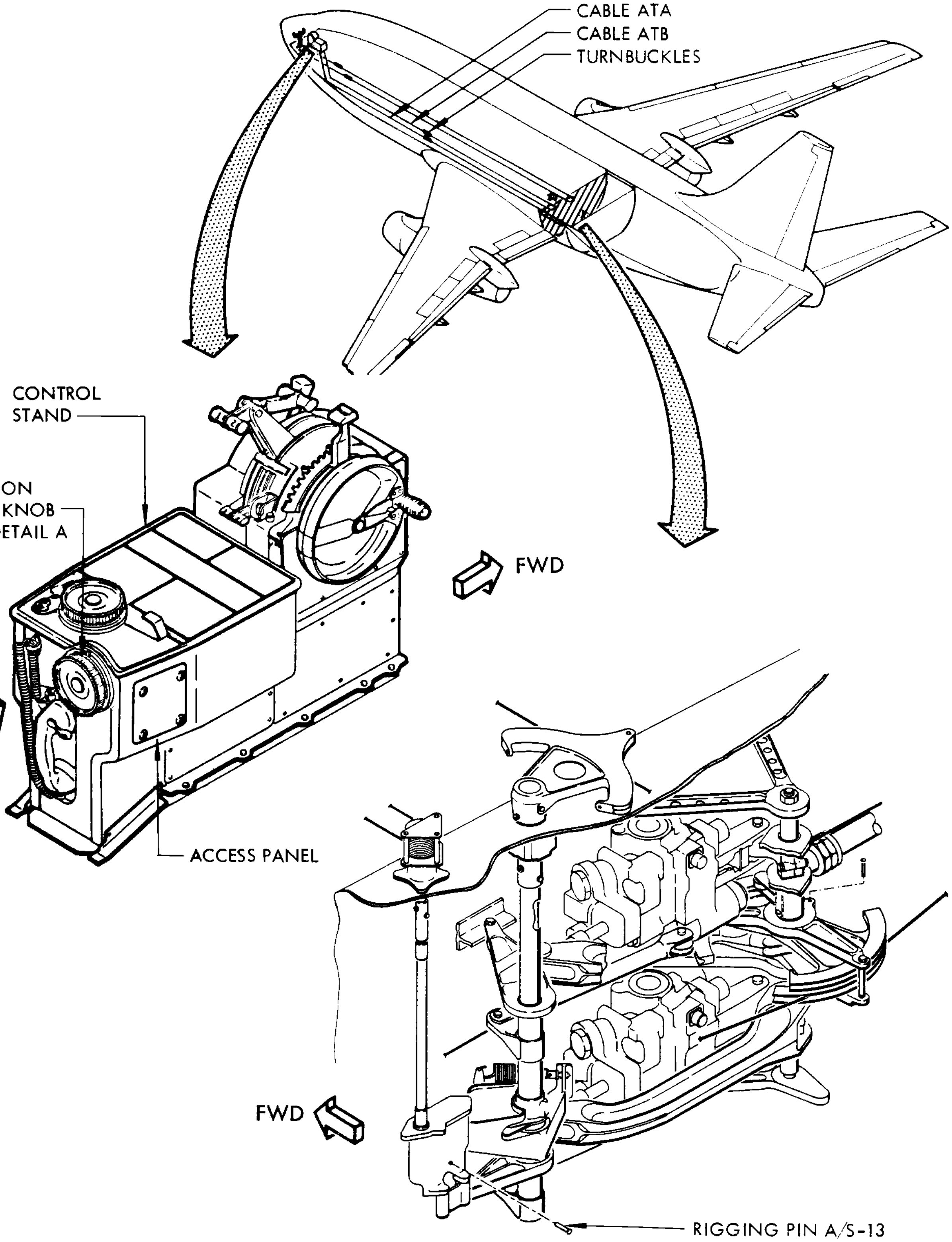
Aileron Wing Quadrant Wear Limits
Figure 601 (Sheet 2)

AILERON TRIM CONTROL UNIT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Tensiometer, 0- to 100-pound capacity
   B. Rigging Pins Kit - F70207-3, -52, -61, -84, or -108:

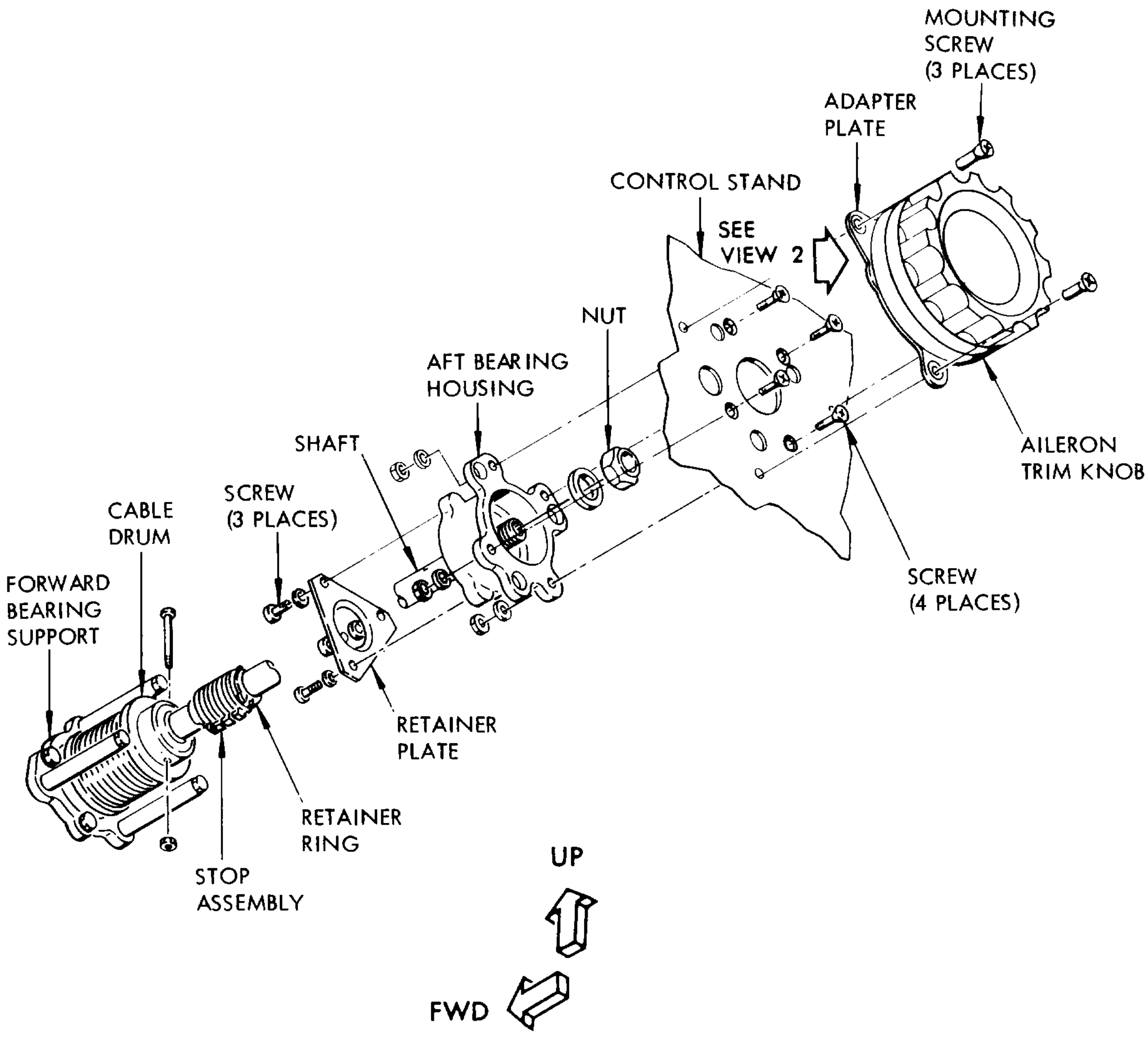
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

2. Remove Aileron Trim Control Unit
   A. Place aileron trim control knob indicator in zero trim position (Fig. 401).
   B. Insert rigging pin A/S-13 in aileron trim gearbox.
   C. Remove access panel from right side of control stand.
   D. Disconnect electrical wires from base of aileron trim wheel.
   E. Disconnect cables ATA and ATB at turnbuckles.
   F. Use phenolic faced clamps and secure aileron trim cables ATA and ATB aft of turnbuckles.
   G. Tag disconnected cables to facilitate reassembly.
   H. Remove aileron trim knob as follows:
      (1) Remove three mounting screws.
      (2) Remove assembly of aileron trim knob and adapter plate from spline on aft bearing housing.
      (3) If relamping or replacement of aileron trim knob is required, remove screws and washers retaining adapter plate to aileron trim knob.
   I. Remove four screws retaining aft bearing housing to control stand structure.
   J. Remove nuts, washers, and screws retaining forward bearing support to structure.
   K. Remove trim control unit from control stand.
   L. Disassemble aileron trim control unit as follows;
      (1) Remove nut and washer to separate aft bearing housing from shaft.



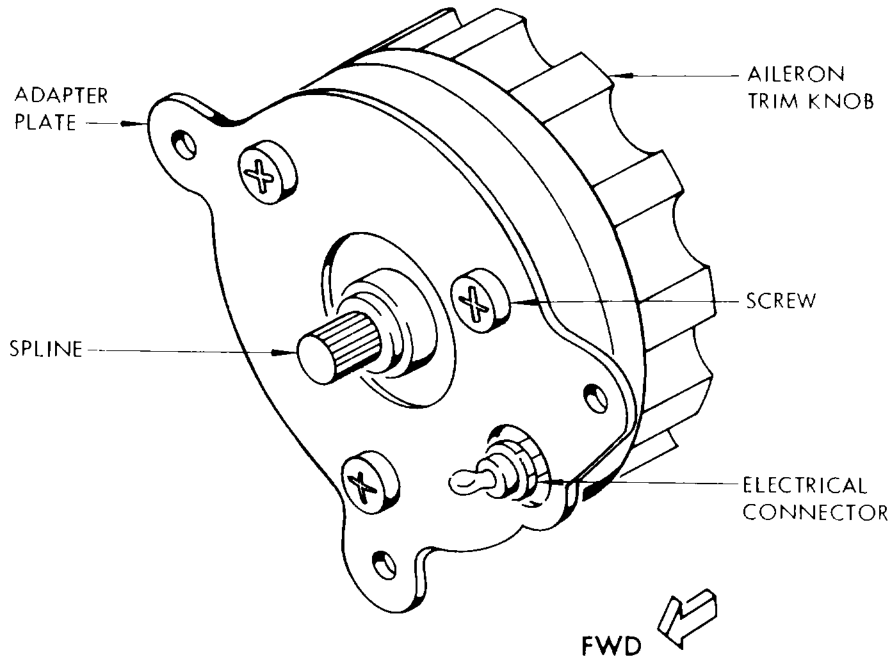
A/S-13 RIGGING PIN LOCATION

Aileron Trim Control Unit Installation
Figure 401 (Sheet 1)

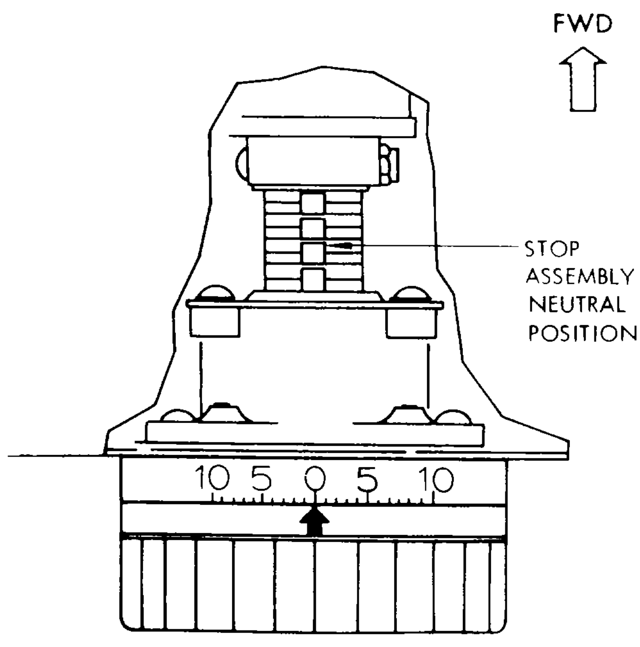


VIEW 1

Aileron Trim Control Unit Installation
Figure 401 (Sheet 2)



VIEW 2



Aileron Trim Control Unit Installation
Figure 401 (Sheet 3)

(2) Remove screws and washers to separate retainer plate from aft bearing housing.
(3) Remove retainer ring and separate stop assembly from shaft.
(4) Remove nut, washer, and screw securing cable drum to shaft and remove sleeve.
(5) Separate forward bearing support from shaft, and remove cable drum.
(6) Remove cables ATA and ATB from cable drum.

3. Install Aileron Trim Control Unit

A. If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-121, Inspection/Check).

B. Reassemble aileron trim control unit as follows: (Fig. 401)
(1) Wrap cable ATA 5-1/4 turns around forward end of cable drum.
(2) Wrap cable ATB 6-1/4 turns around aft end of cable drum.
(3) Use phenolic faced clamps to secure cables in wrapped positions.
(4) Position cable drum and sleeve on shaft, and secure with screw, washer, and nut.
(5) Place stop assembly over sleeve and install retainer ring.
(6) Install retainer plate on aft bearing housing and secure with washers, and screws.
(7) Place aft bearing housing on shaft, and secure with washer and nut.
(8) Place forward end of shaft into forward bearing housing.

C. Place aileron trim control unit assembly into position within control stand.

D. Install four washers and screws to retain aft bearing housing to control stand structure.

E. Install spacers, screws, washers, and nuts to retain forward bearing support to control stand structure.

F. Manually position stop assembly as shown in detail A by rotating shaft.

NOTE: The aileron trim control knob and shaft are each equipped with a blind, mating spline. When the stop assembly and aileron trim control knob are in neutral position, the blind splines are mated at the 12 o'clock position.

G. Position adapter plate on aileron trim knob and secure with three screws.
H. Position aileron trim control knob in neutral and mate with shaft. Secure knob with three mounting screws.
I. Connect wire to base of aileron trim knob.
J. Position aileron trim knob indicator in zero trim position. Tape aileron trim control knob to prevent movement.
K. Reconnect cables ATA and ATB to turnbuckles but maintain zero cable tension.
L. Remove phenolic faced clamps securing cables at cable drum and adjacent to turnbuckles.
M. Ensure rigging pin A/S-13 is installed.
N. Adjust cables ATA and ATB to tension specified in Fig. 402, so that rigging pin A/S-13 may be inserted and removed without binding.
O. Ensure cables ATA and ATB are properly wrapped around cable drum. Cable ATA should be wrapped a minimum of 5-1/4 turns counterclockwise and cable ATB a minimum of 6-1/4 turns clockwise.
P. Remove rigging pin A/S-13 and remove tape from aileron control knob. Cycle system through maximum travel to obtain constant rigging tension.
Q. Insert rigging pin A/S-13. Check that aileron trim control knob is in zero trim position. Check that cable tension is within values shown on Fig. 402.
R. Install turnbuckles locking clips and remove rigging pin A/S-13.
S. Test aileron trim control unit (Ref 27-11-121, Adjustment/Test).
T. Install access panel on right side of control stand, and secure with screws.

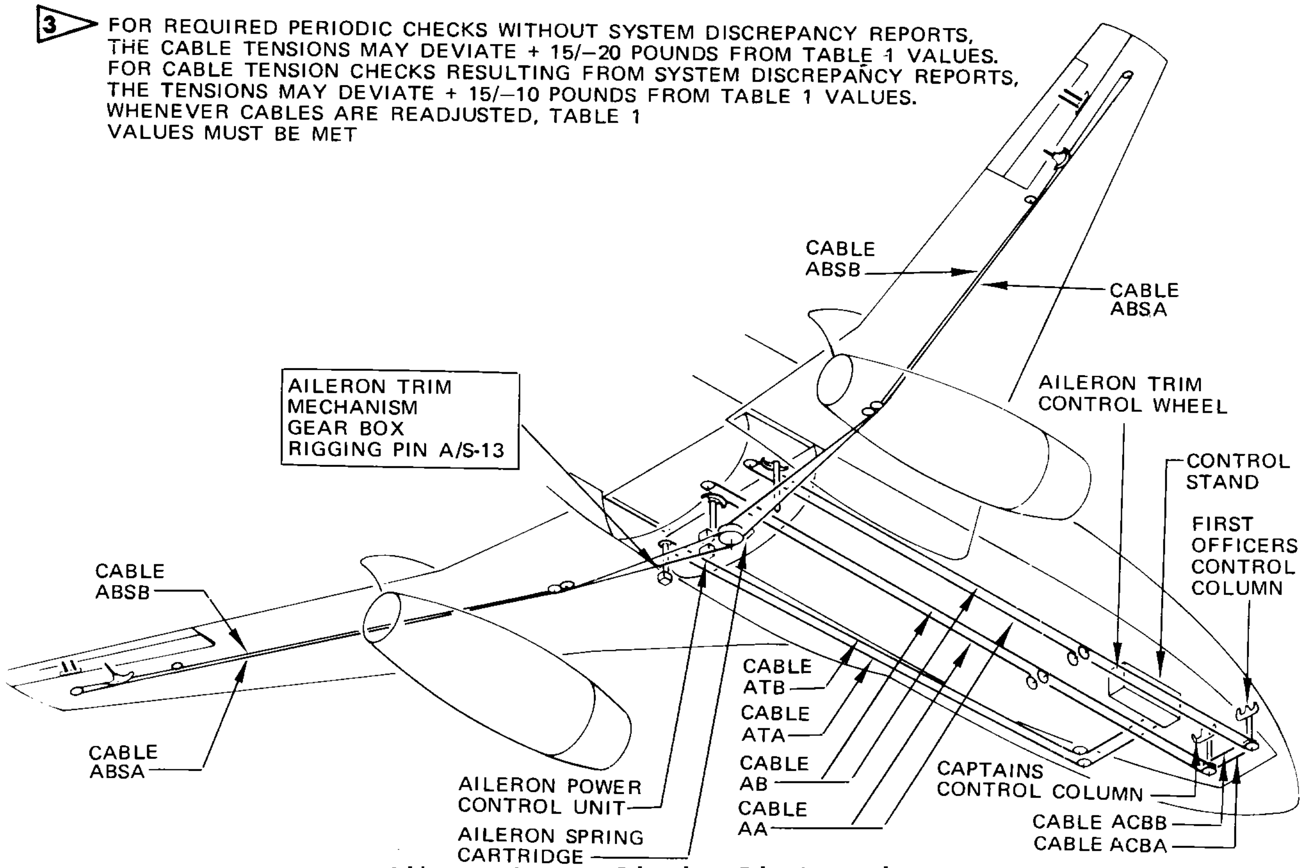
TABLE 1

TEMPERATURE °F [1]	CABLE TENSION (POUNDS) CABLES ATA AND ATB [2] [3]
110	72
90	66
70	60
50	54
30	48
+10	42
-10	36
-30	30
-40	27

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE + 5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] CABLE LOADS MUST BE WITHIN + 10/–0 POUNDS OF TABLE VALUES WHEN SYSTEM IS BEING RIGGED.

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE + 15/–20 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPAÑCY REPORTS, THE TENSIONS MAY DEVIATE + 15/–10 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET



Aileron System Rigging Pin Location
Figure 402

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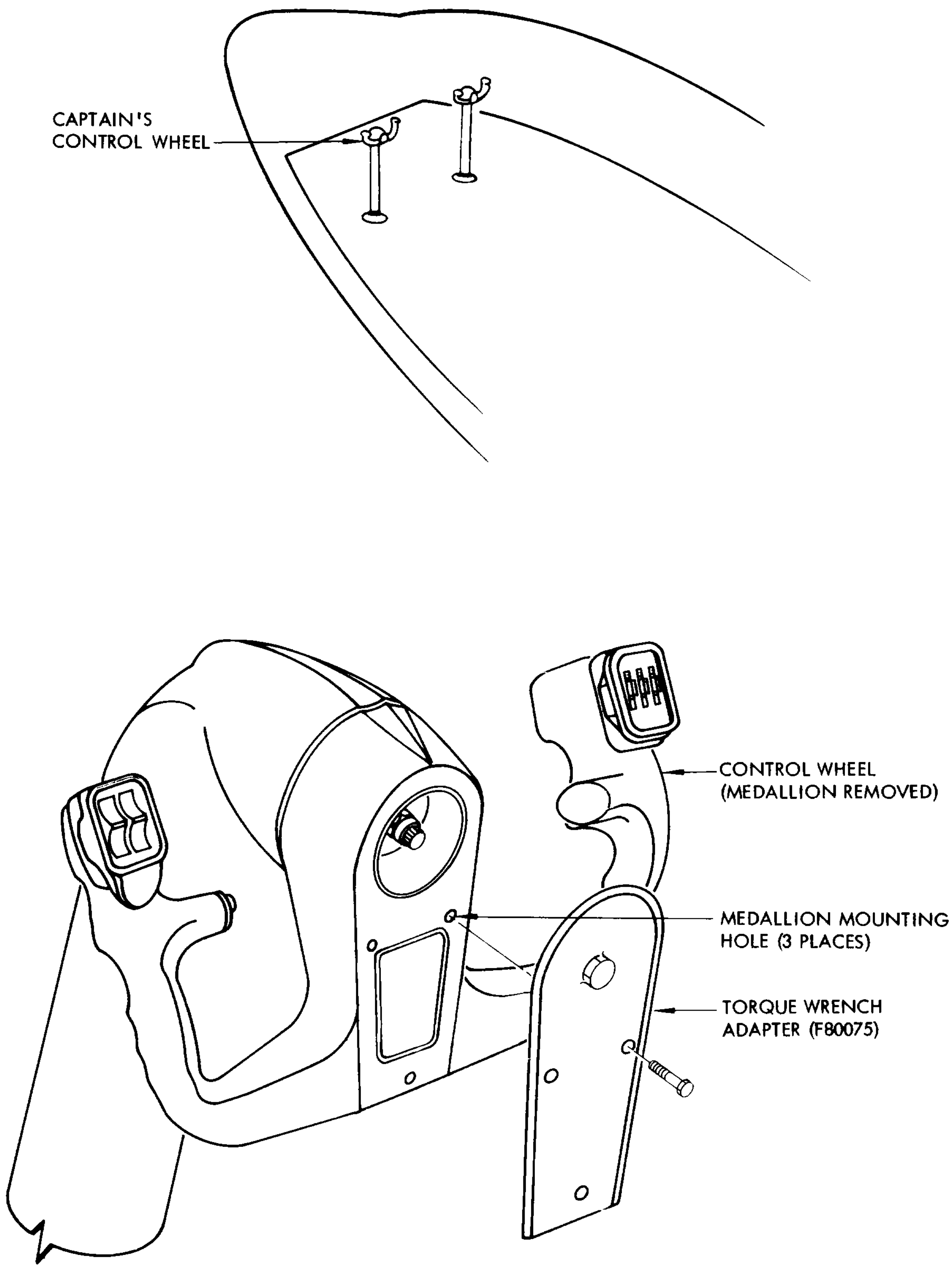
AILERON TRIM CONTROL UNIT - ADJUSTMENT/TEST

1. Equipment and Materials
   A. Control Wheel Protractor Mount, F72790
   B. Rudder trim Knob Torque Adapter -SE27-2008
   C. Control Wheel Torque Wrench Adapter, F72867-1 (preferred), F80075-1 (optional)
2. Aileron Trim Control Unit Test
   A. Install mount and protractor on first officer's control wheel.
   B. Remove medallion from captain's control wheel and install torque wrench adapter (Fig. 501).
   C. Provide system A and B hydraulic power (Ref 27-11-0, Maintenance Practices).
   D. Measure effect of aileron trim knob operation.
      (1) Operate aileron trim knob clockwise to 10 unit position.
      (2) Using torque wrench and torque wrench adapter measure force required to rotate aileron control wheel 75 degrees counterclockwise. If torque wrench adapter is not available, force may be measured by applying force tangentially to captain's control wheel at 6.5 inch radius. Force should not exceed 137 pound-inches torque or 21 pounds.
      (3) Release control wheel from 75° counterclockwise. Check that control wheel returns to 60 ±3 degrees clockwise.
      (4) Repeat steps (1) thru (3) in opposite direction.
      (5) Measure aileron trim knob force.
         (a) Install rudder trim knob torque adapter on aileron trim knob.
         (b) Measure force required to rotate knob clockwise to stop, then counterclockwise to stop, then back to zero. Force should not exceed 15 pound-inches.
         (c) Remove torque adapter.
   E. Return airplane to normal.
      (1) Place aileron trim control knob in neutral position.
      (2) Remove protractor and mount from control wheel.
      (3) Remove torque wrench adapter from control wheel.
      (4) Install the medallion on the control wheel.
      (5) Remove systems A and B hydraulic power (Ref 27-11-0).
      (6) If no longer required, remove electrical power.



Control Wheel Torque Wrench Adapter
Figure 501

AILERON TRIM DRUM - REMOVAL/INSTALLATION

1. General
   A. The removal of aileron trim drum disturbs the sealed surface of the pressure deck. Therefore, the base of the trim drum support must be resealed upon reinstallation (Ref Chapter 51, Seals and Sealing).
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, -84, -108:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

   B. Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Aileron Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
   C. Control Wheel Torque and Force Test Adapter-F72867-1
   D. Drill Jig. Aileron Trim Input Shaft-F80181-1
3. Prepare to Remove Aileron Trim Drum
   A. Depressurize hydraulic systems A and B (Ref 27-11-0 MP).
   B. Set aileron trim control knob indicator in zero trim position (Fig. 402).
   C. Insert rigging pin A/S-13 in aileron trim gearbox (Fig. 401).
4. Remove Aileron Trim Drum
   A. Disconnect cables ATA and ATB at turnbuckles, and secure disconnected cables with phenolic faced clamps (Fig. 401).
   B. Tag disconnected cables to facilitate reassembly.
   C. Mark relative positions of coupler to upper and lower trim shafts.
   D. Remove nuts, washers, and bolts securing coupler to trim shafts, and remove coupler.
   E. Remove screws securing cable drum support to pressure deck, and remove aileron trim drum assembly.

F. Disassemble aileron trim drum as follows:
   (1) Remove cables ATA and ATB from trim drum by removing guards.
   (2) Remove nut and washer from cable drum shaft.
   (3) Separate support from cable drum shaft.
   (4) Remove bearing, spacer, bearing, ring seal and packing from interior of support.

5. Install Aileron Trim Drum

A. If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-131, Inspection/Check).

B. Reassemble aileron trim drum as follows:
   (1) Install packing, ring seal, bearing, spacer and bearing in support (Fig. 401).
   (2) Place support on cable drum shaft, and install washer and nut.
   (3) Equally wrap cables ATA and ATB on cable drum 4-1/4 turns, and install guards (Fig. 402).
   (4) Secure cables with phenolic faced clamps at face of cable drum.

C. Insert cable drum shaft in hole in pressure deck, and position cable drum with centerline of cable slot facing aft. Secure support to pressure deck with screws.

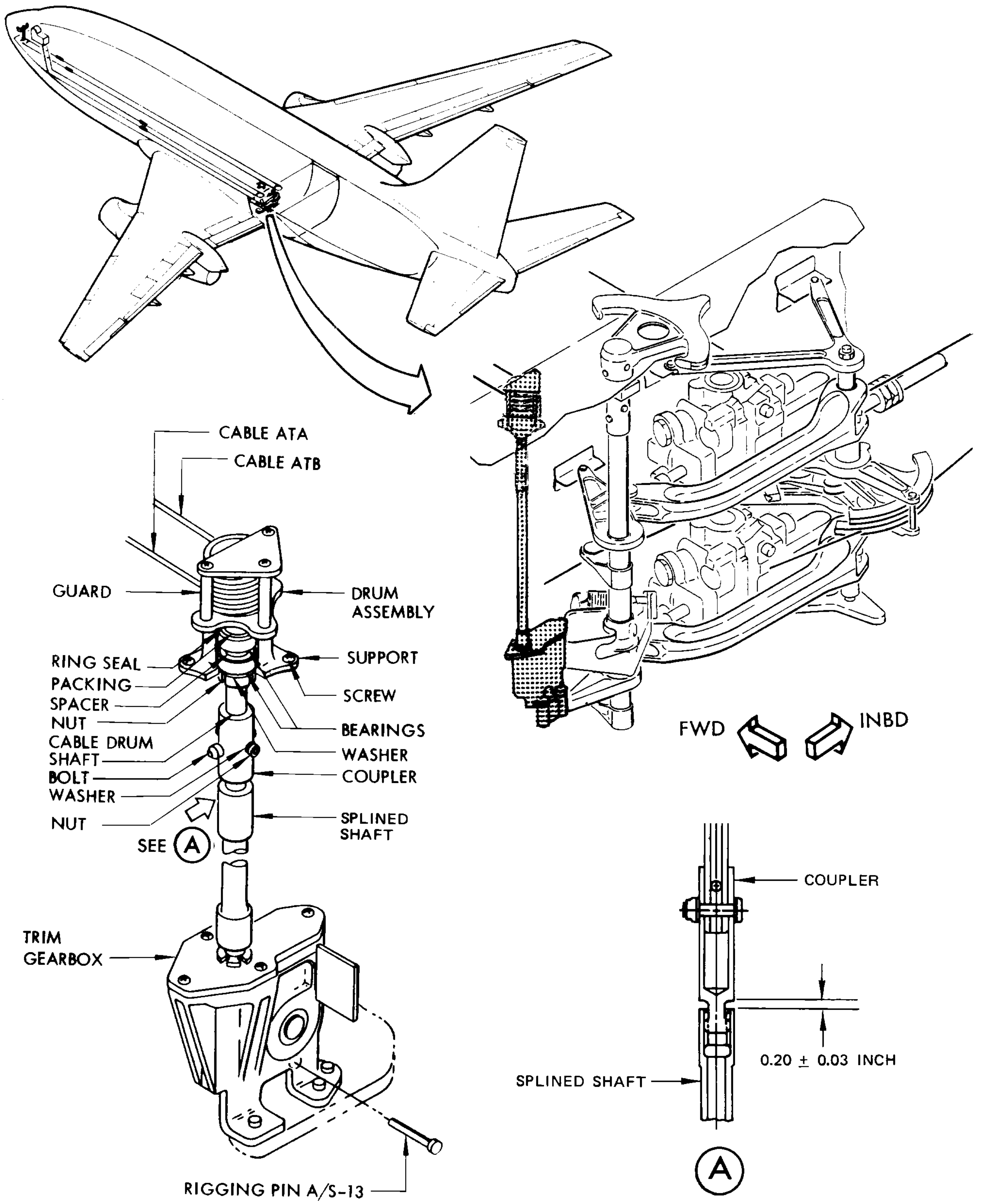
D. Seal base of trim drum support (Ref Chapter 51, Seals and Sealing).

E. If existing parts are being installed, connect cable drum shaft to splined shaft with coupler. Check that dimension at splined connection is per Detail A, Fig. 501. If dimension is not within tolerance, instal1 new drum assembly and coupler. Drill coupler and cable drum shaft per step F.

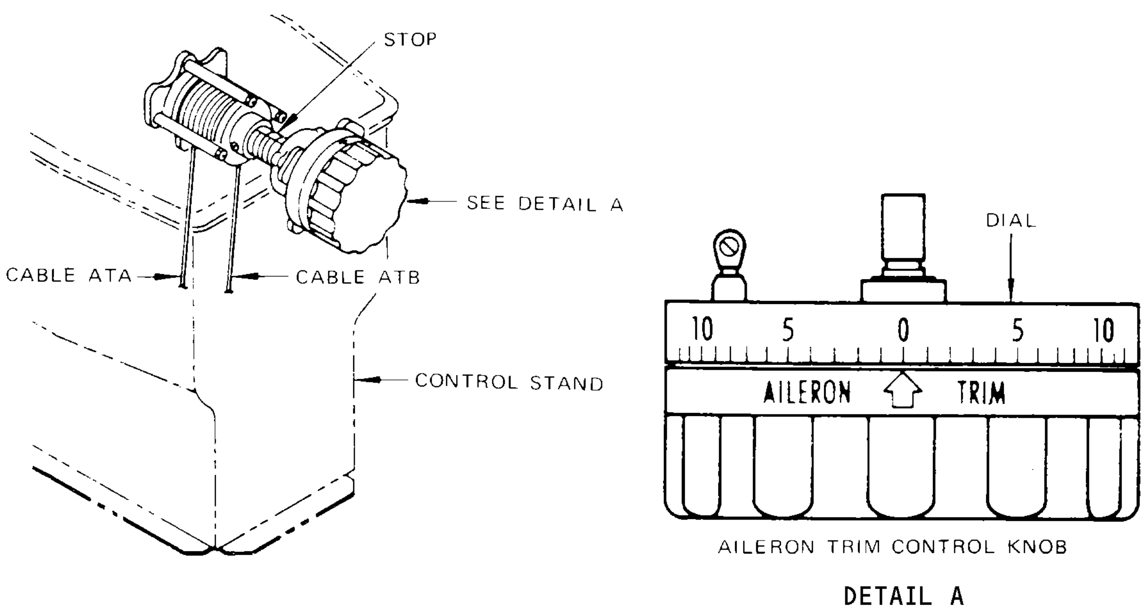
F. If installing new aileron trim drum, install coupler as follows:
   (1) Lift splined shaft from trim gearbox.
   (2) Install drill jig and spacer over coupler.

   NOTE: Spacer is part of drill jig assembly.

   (3) Install coupler on cable drum shaft. Slide coupler up and instal1 splined shaft in trim gearbox.
   (4) Engage coupler with splined shaft with 0.20-inch spacer between shaft and coupler.



Aileron Trim Drum Removal/Installation
Figure 401



Aileron Trim Control Wheel Neutral Position
Figure 402

(5) With coupler resting on spacer, drill holes through coupler and shaft to a 0.250 +0.004/ -0.000 inch dimension.
(6) Remove drill jig by sliding coupler up and removing splined shaft from gearbox.
(7) Reinstall splined shaft in gearbox, engage coupler with splined shaft and install bolts.

G. Remove phenolic faced clamps and reconnect cables ATA and ATB at turnbuckles. Maintain zero tension on cables.
H. Ensure rigging pin A/S-13 is installed in aileron trim gearbox.
I. Ensure aileron trim control knob is set in zero trim position. Tape aileron trim control knob (Fig. 402).
J. Adjust cables ATA and ATB at turnbuckles so that rigging pin A/S-13 fits freely and cable tension is within values specified in Fig. 403.
K. Remove rigging pin A/S-13 and tape from aileron trim control knob.
L. Rotate aileron trim control knob through several complete cycles to obtain constant rigging tension.
M. Install rigging pin A/S-13. Check that aileron trim control knob indicator is in zero trim position. Check that cable tension is within values specified in Fig. 403.
N. Remove rigging pin A/S-13.
O. Install turnbuckle locking clips.
P. Provide systems A and B hydraulic power (Ref 27-11-0).
Q. Install control wheel protractor mount and protractor on first officer's aileron control wheel.
R. Remove medallion from captain's aileron control wheel and install control wheel torque and force test adapter (Fig. 404).
S. Measure effect of aileron trim knob operation (Fig. 405).
   (1) Operate aileron trim knob clockwise to 10-unit position.
   (2) Measure movement of captain's and first officer's aileron control wheels from neutral position. Check that control wheels rotate clockwise per degrees specified in 27-11-0, Adjustment/Test.
   (3) Check that left aileron moves down and right aileron moves up per dimensions specified in 27-11-0.
   (4) Using control wheel torque and force test adapter and torque wrench, measure force required to rotate aileron control wheel 75 degrees counterclockwise. If a torque wrench adapter is not available, force may be applied tangentially to captain's aileron control wheel at 6.5 inch-radius. Force should not exceed 18.5 pounds or 120.25 pound-inches torque

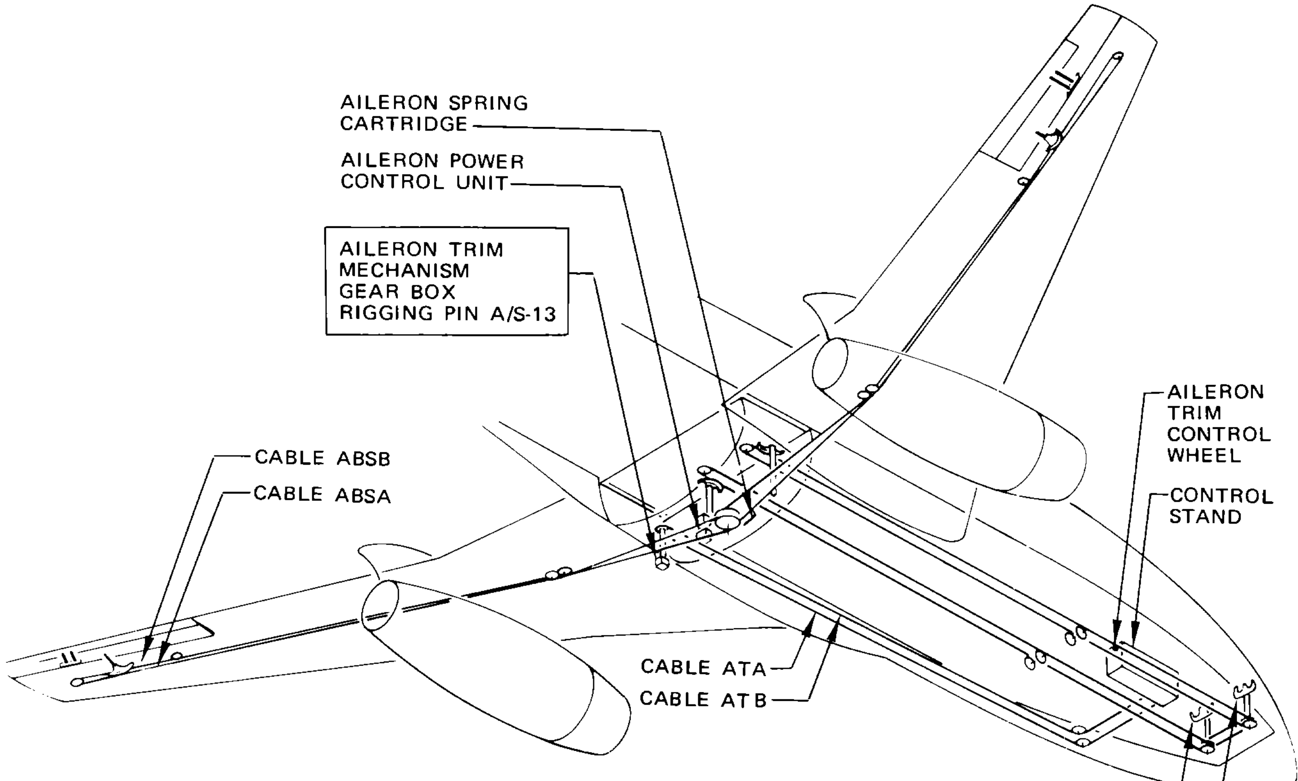


TABLE 1

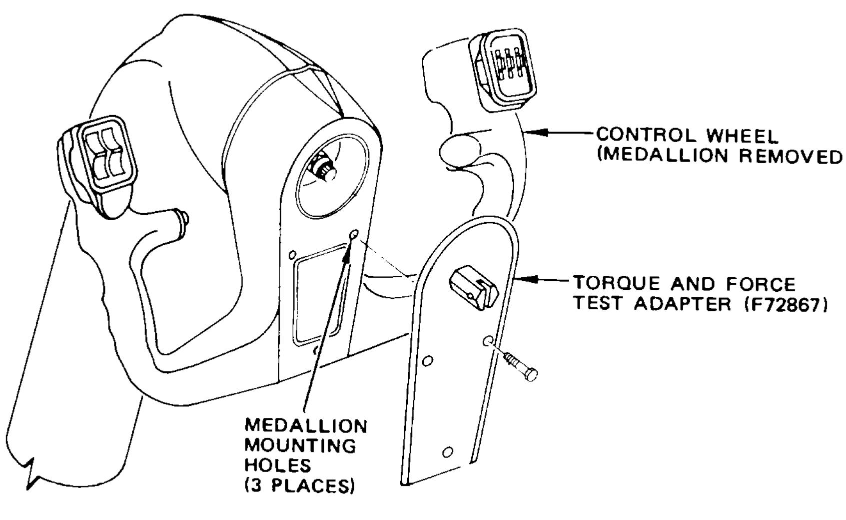
TEMPERATURE °F [1]	CABLE TENSION (POUNDS) CABLES ATA AND ATB [2] [3]
110	72
90	66
70	60
50	54
30	48
+10	42
-10	36
-30	30
-40	27

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ± 5°F FOR AIRFRAME TEMPERATURE TO STABILIZE.

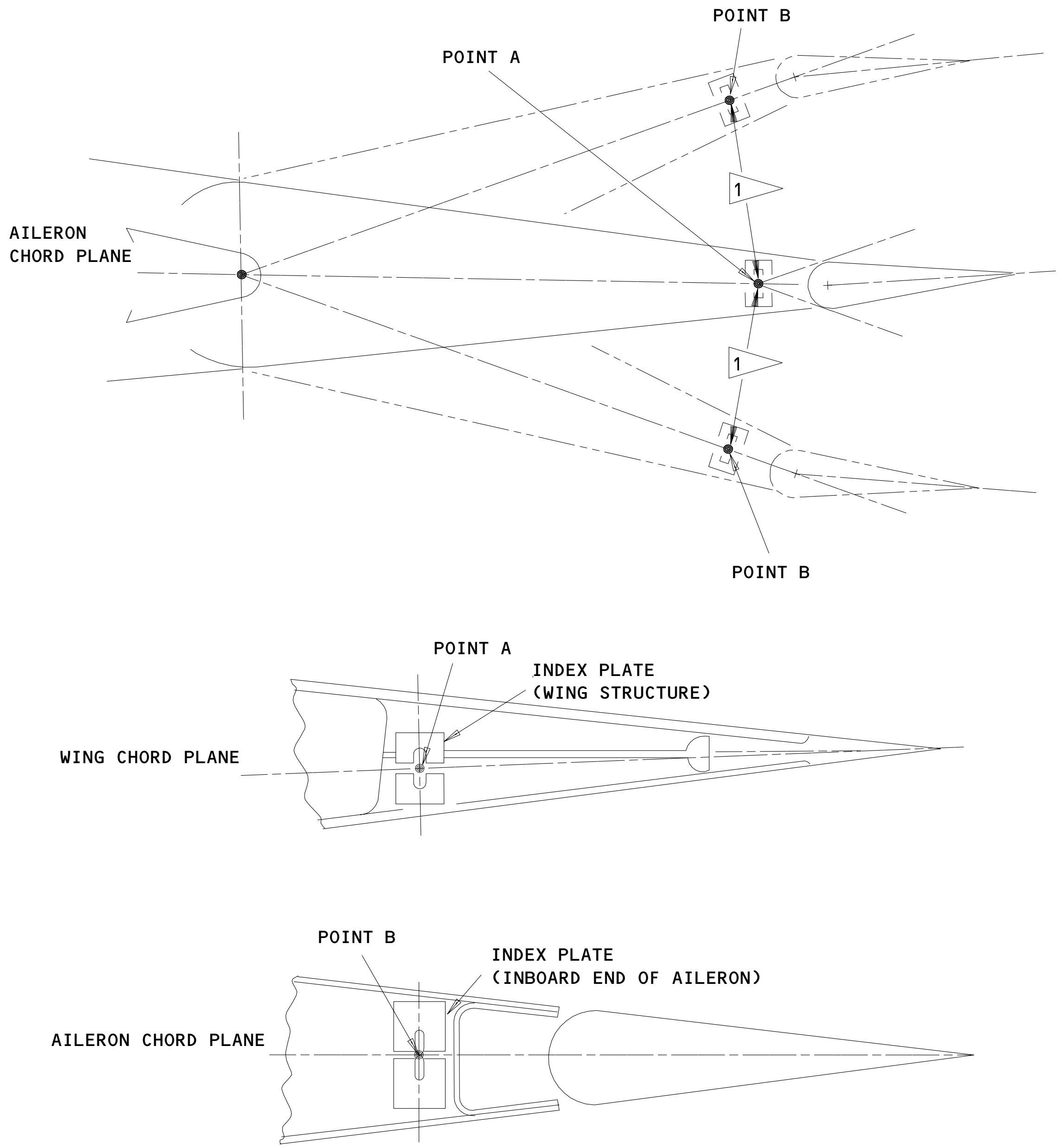
[2] CABLE LOADS MUST BE WITHIN +10/−0 POUNDS OF TABLE VALUES WITH SYSTEM IS BEING RIGGED

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/−20 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE +15/−10 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET

Aileron System Cable Tension Requirements
Figure 403



Control Wheel Torque and Force Test Adapter
Figure 404



NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH

1 AILERON DEFLECTION IS MEASURED BETWEEN POINT A AND POINT B ON INDEX PLATES

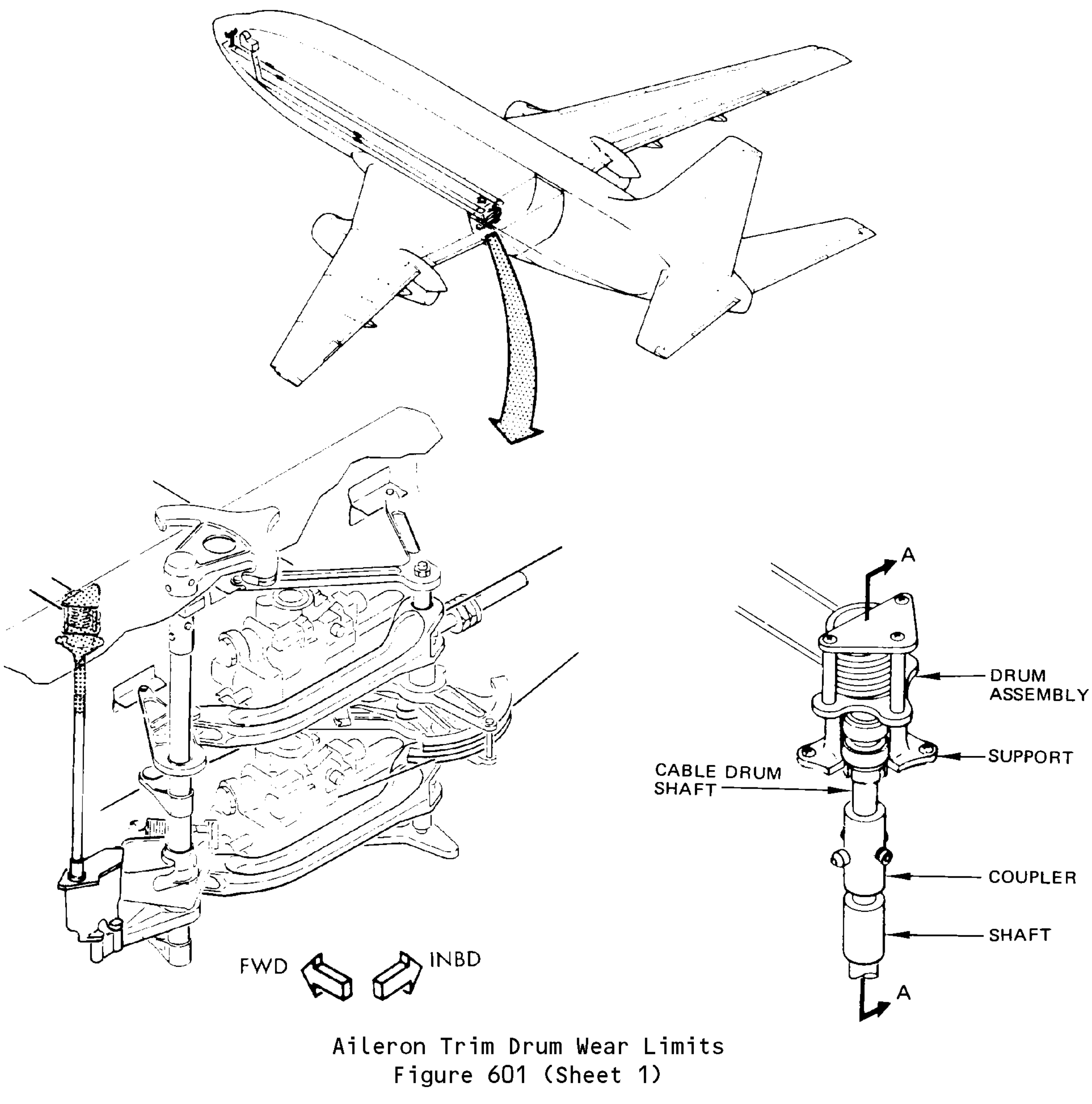
Aileron Deflection Diagram
Figure 405

(5) Release aileron control wheel from 75 degree counterclockwise position. Check that control wheel returns to the clockwise position of degrees specified in 27-11-0.
(6) Operate aileron trim knob counterclockwise to 10-unit position.
(7) Measure movement of captain's and first officer's aileron control wheels from neutral position. Control wheels should have rotated counterclockwise per degrees specified in 27-11-0.
(8) Check that left aileron moves up and right aileron moves down per dimensions specified in 27-11-0.
(9) Measure force required to rotate aileron control wheel 75 degrees clockwise. Force should not exceed 117 pound-inches torque or 18 pounds.
(10) Release aileron control wheel from 75 degrees clockwise position. Check that control wheel returns to the degree counterclockwise position of degrees specified in 27-11-0.
(11) Place aileron trim control knob in zero trim position.

6. <u>Restore Airplane to Normal</u>
   A. Turn off systems A and B hydraulic power.
   B. Remove control wheel protractor mount, and protractor from first officer's control wheel.
   C. Remove torque wrench adapter from captain's aileron control wheel and reinstall medallion.
   D. If no longer required, remove electrical power from airplane.

AILERON TRIM DRUM - INSPECTION/CHECK

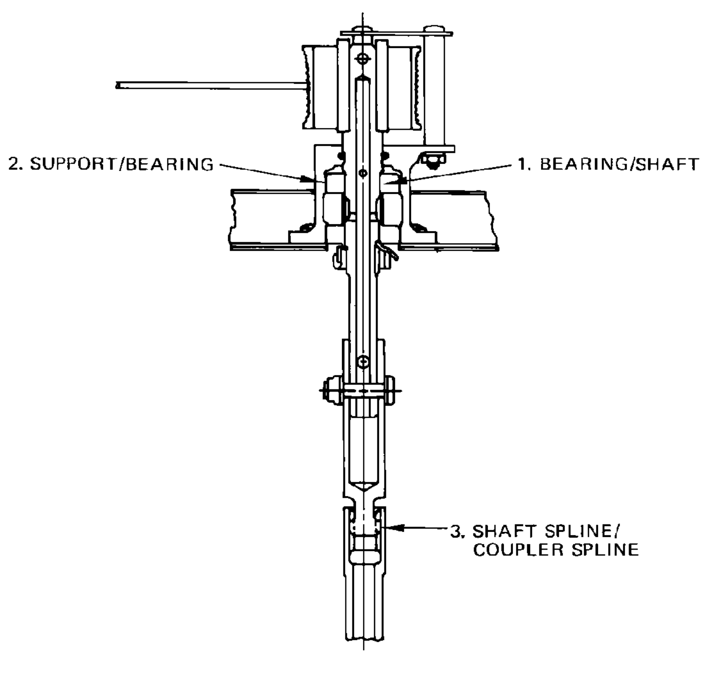
1. General
   A. This data consists of illustration and wear limit charts. No procedure is given for gaining access to permit inspection. For this information, refer to component removal/installation.
2. Aileron Trim Drum Wear Limits



Aileron Trim Drum Wear Limits
Figure 601 (Sheet 1)

			Design Limits		Wear Limits				
			Diameter						
Index No.	Part Name	Dim	Min	Max	Max Wear Dim.	Max Dia. Clear -ance	Replace Worn Part	Repair Worn Part	Repair Instr.
1	Bearing	ID	0.6245	0.6250	0.6250	0.0025	*[1]		
	Shaft	OD	0.6235	0.6245	0.6230		X		
2	Support	ID	1.3748	1.3753	1.3760	0.0020	X		
	Bearing	OD	1.3745	1.3750	1.3740		*[1]		
3	Shaft Spline	ID				*[2]	*[2]		
	Coupler Spline	OD					*[2]		

*[1] Replace when radial Play of bearing exceeds 0.0020 inch.
*[2] Replace when spline backlash exceeds 0.0120 inch.



SECTION A-A

Aileron Trim Drum Wear Limits
Figure 601 (Sheet 2)

			Design Limits		Wear Limits				
			Diameter						
Index No.	Part Name	Dim	Min	Max	Max Wear Dim.	Max Dia. Clear -ance	Replace Worn Part	Repair Worn Part	Repair Instr.
1	Shaft	ID	X	X	X	*[1] 0.12	X		
	Coupler	OD	X	X	X		X		
2	Shaft	ID	X	X	X		X		
	Worm Gear Shaft	ID	X	X	X	*[1] 0.12			
3	Worm Gear Shaft	ID	X	X	X		X		
	Shaft	ID	X	X	X	0.16 *[1]	X		

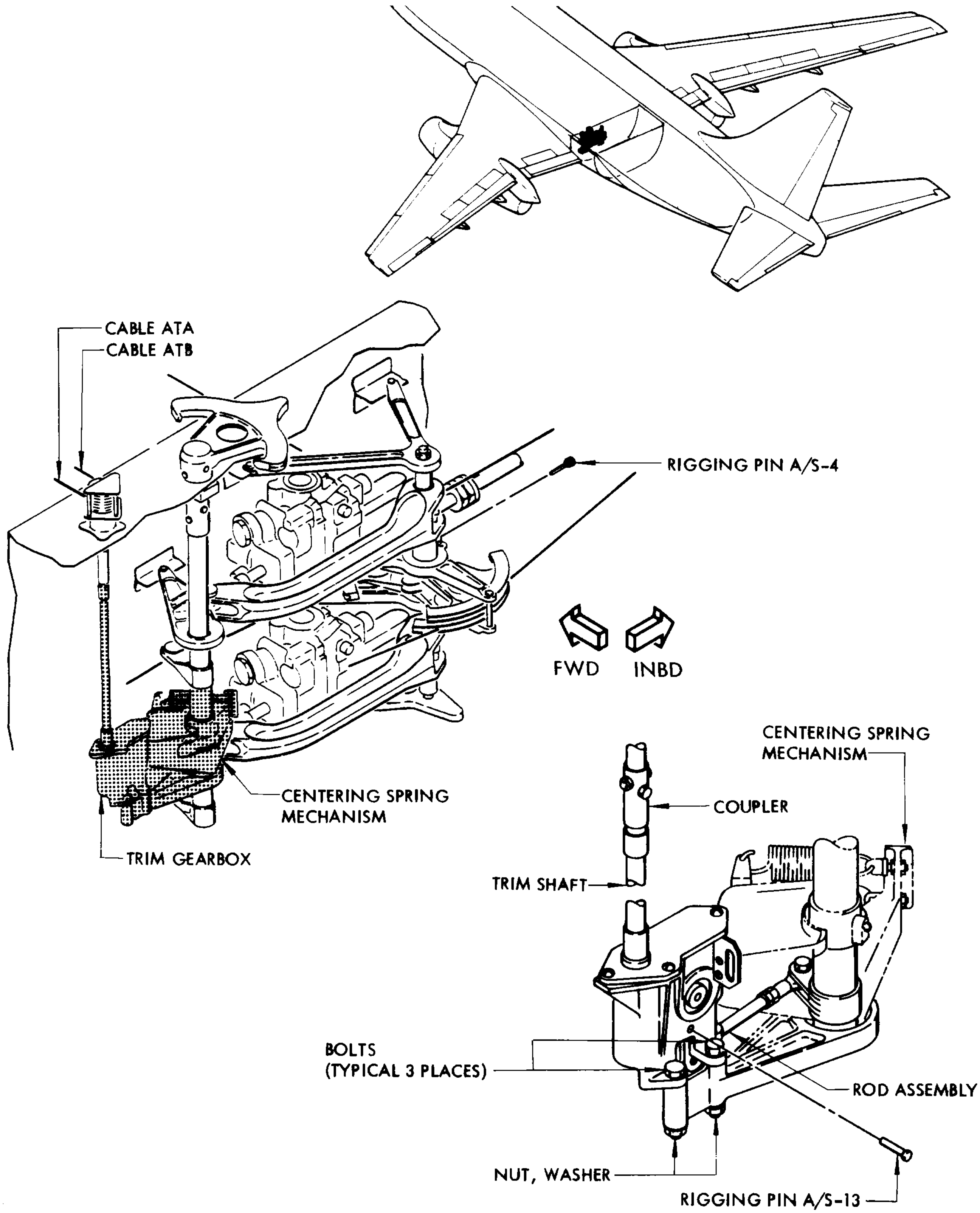
*[1] Spline backlash
*[2] gear backlash: ±1/2 degree measured at 3.75 inch radius on output arm

AILERON TRIM GEARBOX - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional) used with the following adapters:
      (1) Aileron Control Wheel Protractor Mount-F72790
      (2) Forward Thrust Lever Protractor Adapter-F72952-2
   B. Rigging Pins Kit - F70207-3, -52, -61, or -84:

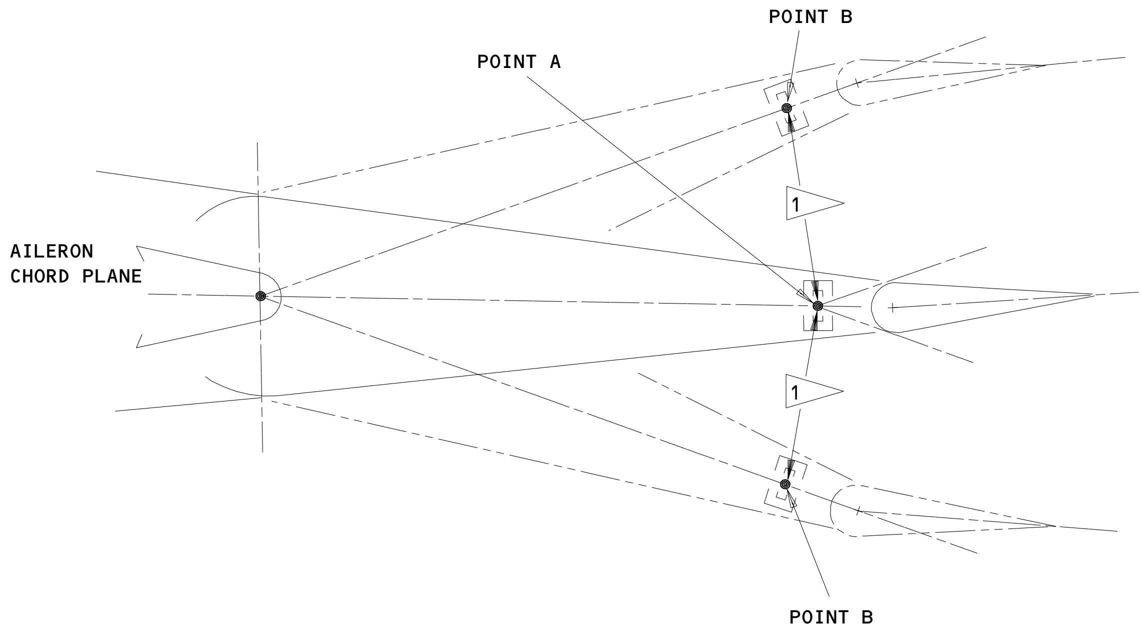
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	AILERON BUS DRUM
A/S-13	-8	0.309-0.311	3.7 ±0.25	AILERON TRIM GEARBOX

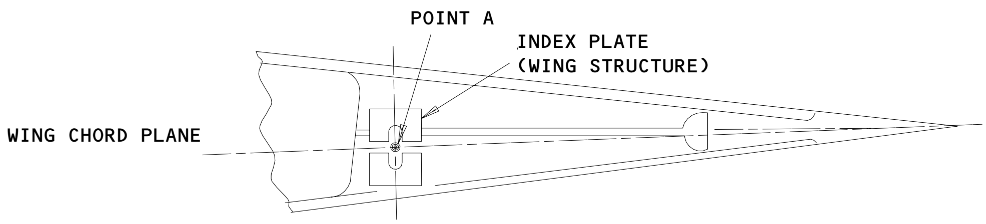
   C. Grease - BMS 3-33 (Preferred)
   D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   E. Compound - MIL-C-11796 (Alternate)
2. Prepare to Remove Aileron Trim Gearbox
   A. Ensure hydraulic systems A and B are depressurized (Ref 27-11-0 MP).
   B. Set aileron trim control knob indicator in zero trim position.
   C. Insert rigging pin A/S-13 in aileron trim gearbox.
   D. Insert rigging pin A/S-4 in aileron bus drums.
3. Remove Aileron Trim Gearbox
   A. Disconnect coupler from trim shaft by removing nuts, washers, and bolts.
   B. Push trim shaft up, and disengage from aileron trim gearbox.
   C. Disconnect rod assembly from centering spring mechanism by removing cotter pin, nut, washer and bolt.
   D. Remove aileron trim gearbox by removing nuts, washers and bolts.
4. Install Aileron Trim Gearbox
   A. Check aileron trim gearbox wear (Ref 27-11-141 I/C).
   B. Ensure rigging pin A/S-13 is inserted in trim gearbox (Fig. 401).
   C. Secure trim gearbox to supporting structure with bolts, washers, and nuts. Attach rod assembly to centering spring mechanism and secure with bolt, washer, nut and cotter pin.

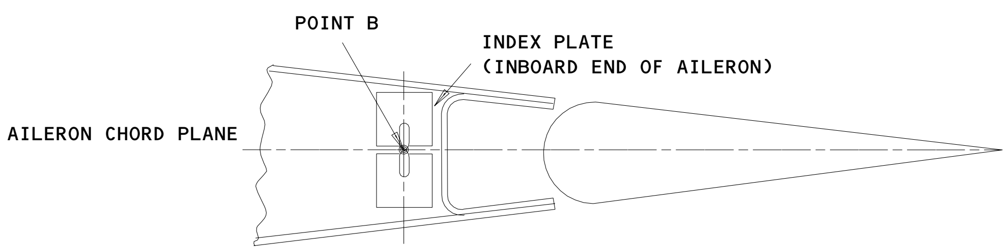


Aileron Trim Gearbox Installation
Figure 401

D. Ensure aileron trim control knob is in zero trim position.
E. Lubricate trim shaft splines with grease or corrosion preventive compound.
F. Install trim shaft and position coupler to permit insertion of bolts. Install washers and nuts.
G. Remove rigging pins A/S-4 and A/S-13.
H. Provide system A and system B hydraulic power.
I. Measure effect of aileron trim knob operation. (See figure 402.)
   (1) Operate aileron trim knob clockwise to 10 unit position.
   (2) Check that left aileron moves down and right aileron moves up per dimensions specified in 27-11-0, Aileron and Aileron Trim Control System - Adjustment/Test.
   (3) Operate aileron trim knob counterclockwise to 10 unit position.
   (4) Check that left aileron moves up and right aileron moves down per dimensions specified in 27-11-0.
   (5) Place aileron trim control knob in zero trim position, and ensure left and right ailerons are in neutral position.
J. Turn off systems A and B hydraulic power.
K. If no longer required, remove electrical power from airplane.







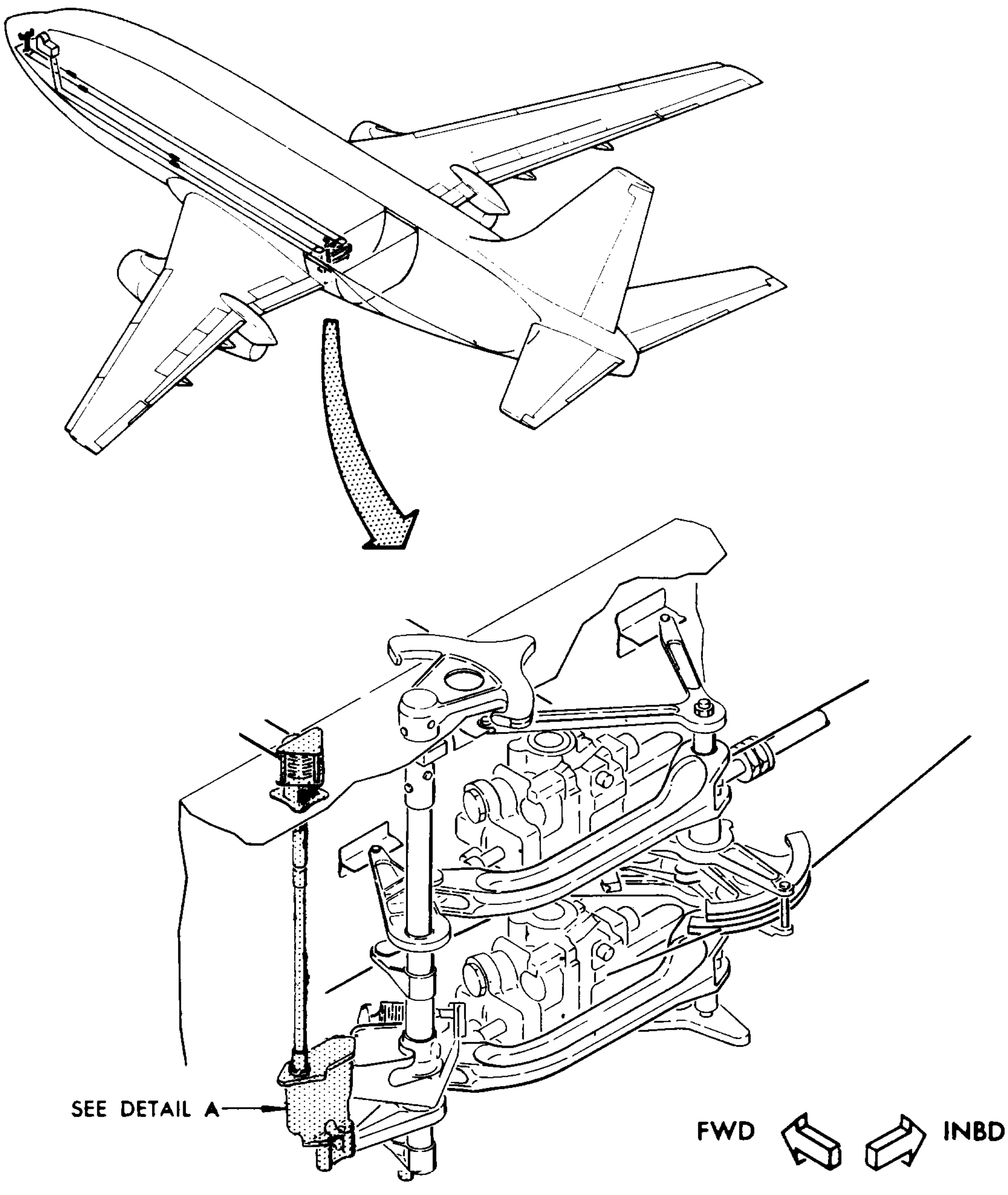
NOTE: WITH AILERON SYSTEM RIGGED POINT B ON EACH AILERON SHALL ALIGN VERTICALLY WITH POINT A WITHIN ±0.03 INCH

1 AILERON DEFLECTION IS MEASURED BETWEEN POINT A AND POINT B ON INDEX PLATES

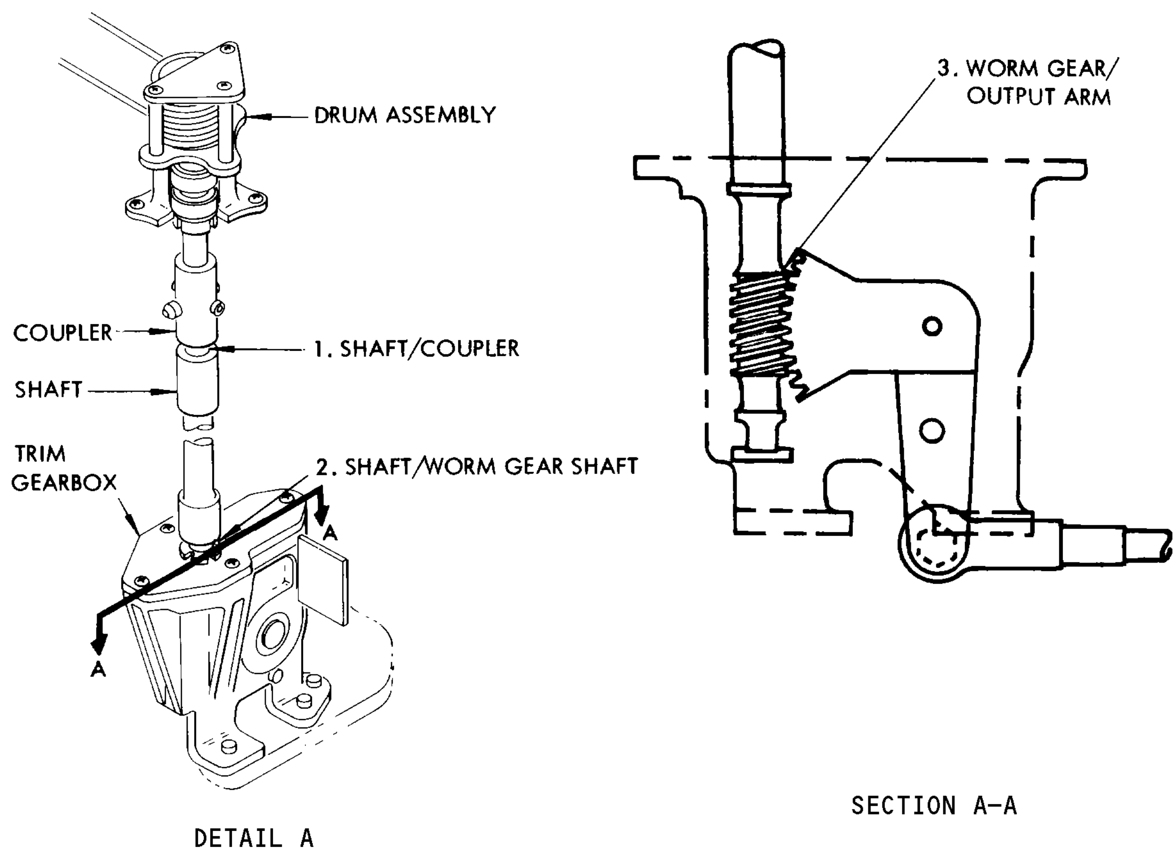
Aileron Deflection Diagram
Figure 402

AILERON TRIM GEARBOX - INSPECTION/CHECK

1. General
   A. This data consist of illustrations and wear limit charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. Aileron Trim Gearbox Wear Limits



Aileron Trim Drum Wear Limits
Figure 601



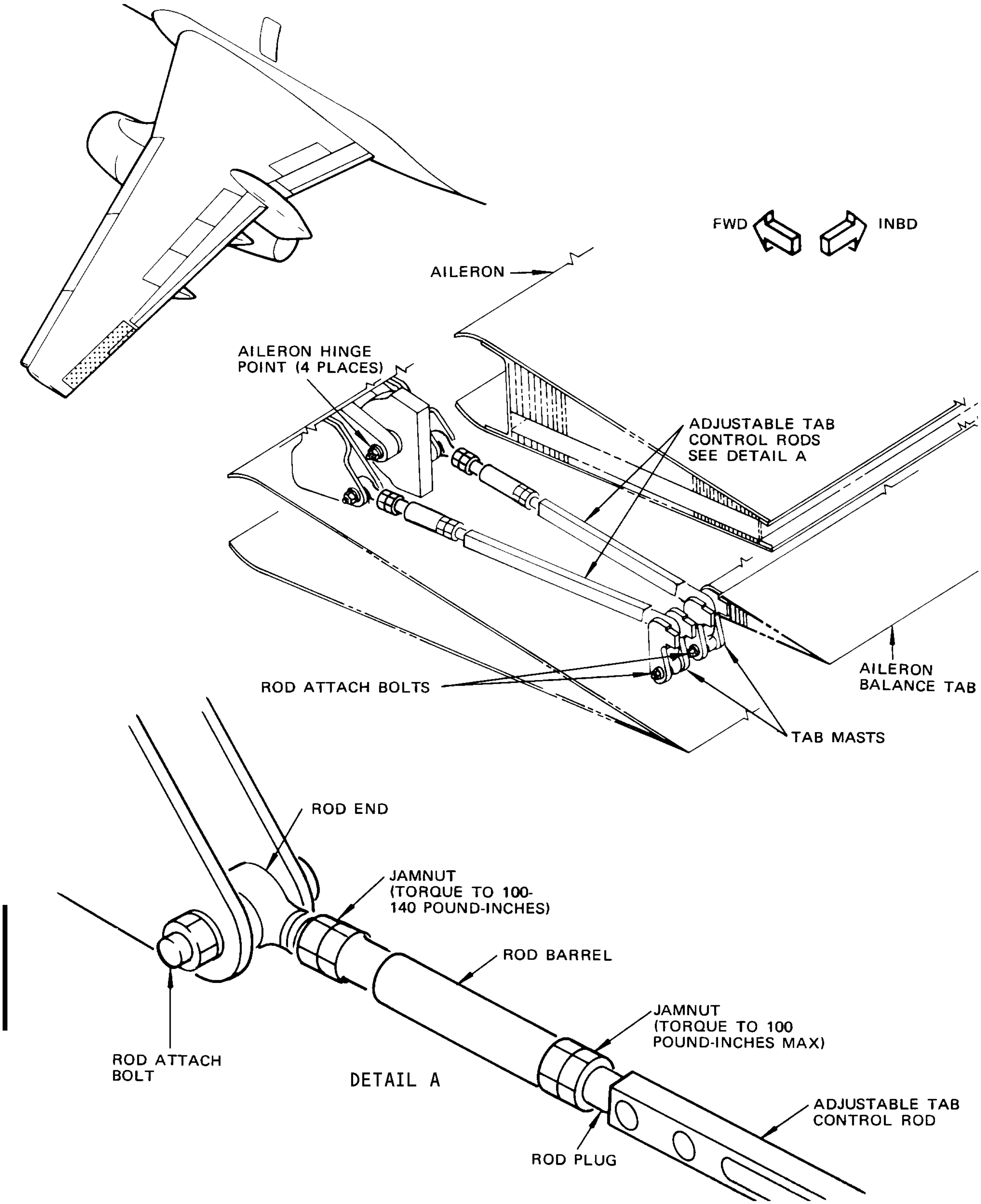
Aileron Trim Gearbox Wear Limits
Figure 602

AILERON TAB CONTROL RODS - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Protractor-Aileron Tab Alignment-F80222-1 which consists of a -2 protractor assembly (Ref 27-09-700, MP).
2. Remove Aileron Tab Control Rods
   A. Remove two aileron access panels at hinge locations 2 and 3 on lower wing surface adjacent to leading edge of aileron (Ref 27-11-11, Removal/Installation).
   B. Remove aft balance panel seal retaining bolts and retaining strip.
   C. Remove hinge pin retainer bolt and extract hinge pins from aft balance panel hinge.
   D. Remove aileron hinge access panel at hinge location 2.
   E. Lift aileron trailing edge up and remove two nuts, bolts and washers connecting tab control rods to forward fittings (Fig. 401).
   F. Remove three screws attaching forward portion of tab fairing to tab and remove fairing (Ref 27-11-21, Removal/Installation).
   G. Remove two nuts, bolts, and washers connecting tab control rods to tab mast.
   H. Remove aileron tab hinge bolts and withdraw tab to clear aileron.
   I. Carefully withdraw tab control rods, remove from aileron and record lengths.
3. Install Aileron Tab Control Rods
   A. If used bolts, bushings, bearings or other components with wear limits are being installed, check for allowable wear (Ref 27-11-151, Inspection/Check).
   B. Lift aileron trailing edge up and place the two tab control rods in mounting position aligning rod ends with attach fittings. Rod lengths must be the same as those recorded. Position tab in place and install tab hinge bolts. Connect tab controls rods to tab mast by installing two bolts, washers, and nuts. Tighten nuts to 50-70 pound-inches (Fig. 401).

      NOTE: Bolts for tab rods must be inserted with fingers only to ensure there is no binding between rod and bolt or deflection of rods. Readjust length of rod if binding or deflection occurs.

   C. Lift aileron to align aft balance panel hinge, install hinge pin and hinge retainer bolt (Ref 27-11-11 R/I).
   D. Install balance panel hinge seal, retaining strip, and bolts.
   E. Connect tab control rods to forward fittings by installing two attach bolts, washers, and nuts.
   F. Install hinge access panel on aileron and aileron access panels on lower wing surface adjacent to aileron.
   G. Install forward portion of tab fairing.
   H. Operate aileron control wheel through full travel and check that tab moves without binding.



Tab Control Rods
Figure 401

I. With index mark on aileron aligned with index mark on wing within 0.03 inch, check mismatch between aileron trailing edge and aileron tab trailing edge. Using straightedge or aileron tab alignment protractor, measure mismatch from trailing edge of tab to theoretical extension of aileron bottom surface at 1/2 inch in from inboard end of tab. Check that tab trailing edge aligns with aileron bottom surface within 0.07 ±0.07 inch.

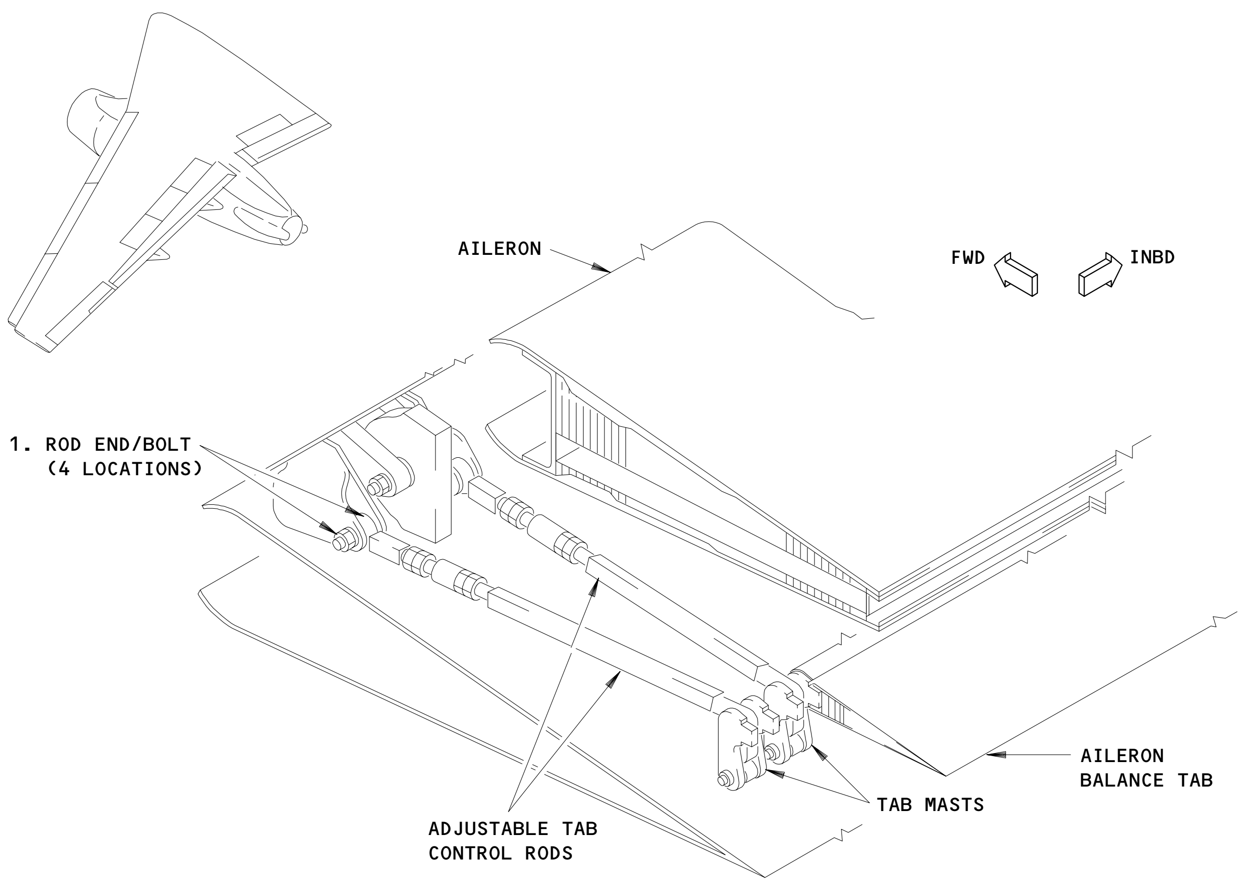
J. Perform a flight test to determine and correct asymmetrical flight control forces (Ref 27-11-0 A/T).

AILERON TAB CONTROL RODS - INSPECTION/CHECK

1. General
   A. This data consists of illustration and wear limits charts. No procedure is given for gaining access to permit inspection. For this information, refer to component removal/installation.
2. Aileron Tab Control Rods Wear Limits

INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER MIN	MAX	WEAR LIMITS MAX WEAR DIM.	MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	Rod End	ID			*[1]		X		
	Bolt	OD					X		

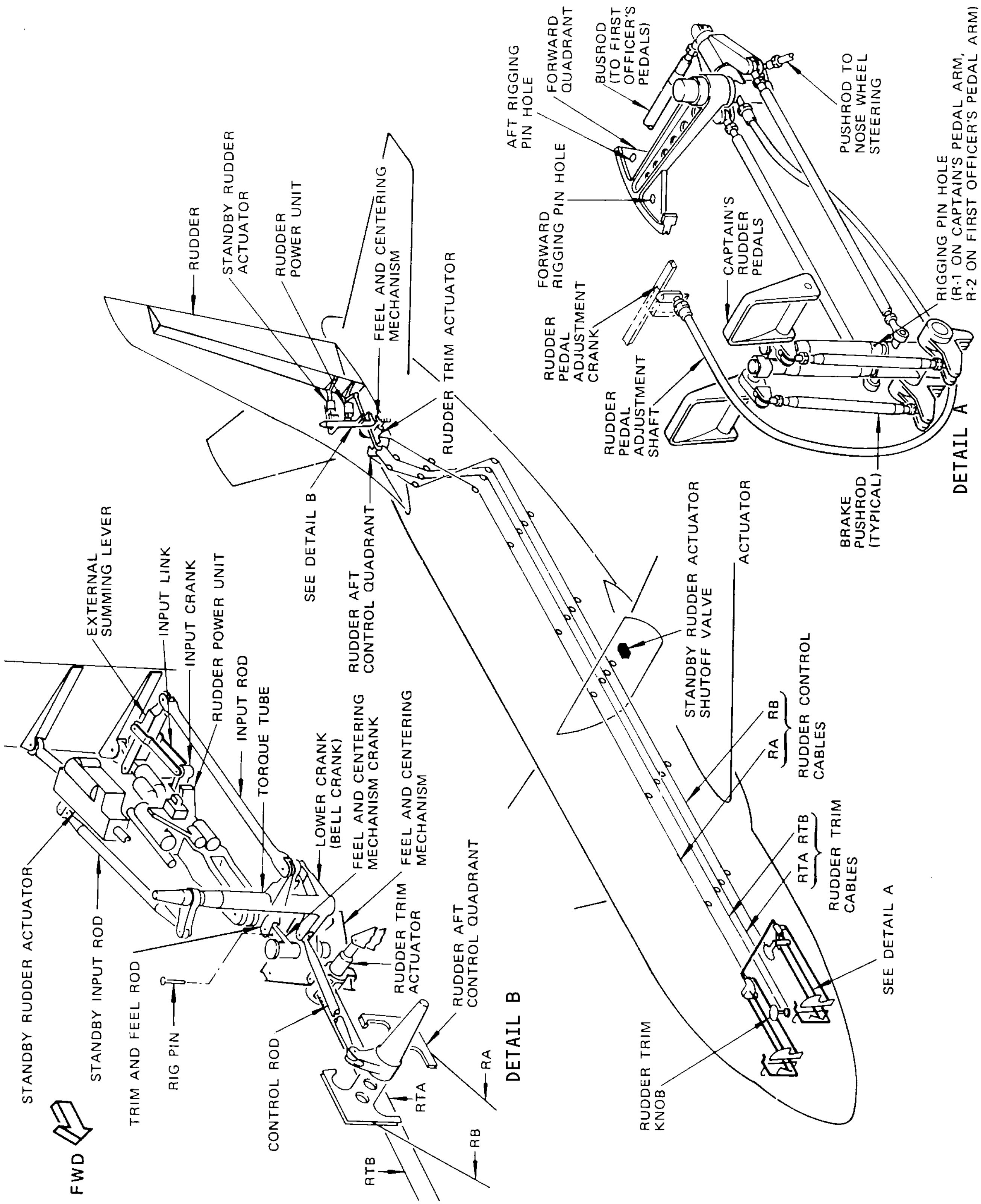
*[1] REPLACE WHEN RADIAL PLAY OF BEARING EXCEEDS 0.0020 INCH.



Tab Control Rods Wear Limits
Figure 601

RUDDER AND RUDDER TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Yaw control of the airplane is provided by a single conventional rudder without tab. There are two separate hydraulic systems powering one main power control unit. Rudder control backup is provided by a standby power unit, which is driven by a third hydraulic system. Any one of the three hydraulic systems will provide effective rudder control. Rudder trim is accomplished by operating a trim control wheel which repositions the rudder.
   B. The rudder control system is pedal operated by the captain or the first officer. (See figure 1.) Pedal movement rotates the forward quadrants, which are cable connected to the aft quadrant. Rotation of the aft quadrant moves a control rod which is connected to a torque tube. Rotation of the torque tube moves a crank connected to the rudder power control unit linkage. This in turn admits hydraulic fluid to the actuating cylinder, which moves the rudder.
   C. Rudder trim is initiated by rotation of the trim wheel located on the aisle stand. (See figure 3.) The trim wheel is attached to the forward cable drum, which is connected by cables to the trim actuator located in the vertical fin. Extension or retraction of the trim actuator jackscrew causes the feel unit housing to rotate. This moves linkages which rotate the torque tube, causing rudder power control unit input.
   D. Rudder feel is provided by a rudder feel unit. The feel unit is connected to the rudder control torque tube, which connects through linkage and cables to the rudder pedals. (See figure 3.)
   E. The rudder is fully power operated through its entire travel. The rudder power control unit is hydraulically operated by hydraulic systems A and B simultaneously. The A and B systems can be independently activated by switches located on the overhead panel. Either of the A and B switches can be used to activate the standby hydraulic system and supply pressure to the standby actuator.
   F. System A pressure is supplied by two engine-driven hydraulic pumps, one being located on each engine. System B pressure is supplied by two electric motor-driven hydraulic pumps. A and B flight control hydraulic modular units are identical in components and operation. Pressurized hydraulic fluid flows through the modular unit which consists of a spoiler shutoff valve, a flight controls shutoff valve, low pressure warning switch, compensator, and check valve. The flight controls shutoff valve controls the flow of hydraulic fluid to the ailerons, elevator, and rudder. When either the A or B flight control switch on the overhead panel is moved to STBY RUD the standby hydraulic system pump will start. The standby rudder actuator shutoff valve located in the standby hydraulic module will also open, porting hydraulic fluid to the standby actuator.



Rudder Control System Component Location
Figure 1

G. A rudder isolation shutoff valve is installed in the system A and the system B hydraulic lines between the respective system A and system B flight controls hydraulic modular units and the rudder power unit. The valve is part of the hydraulic isolation shutoff valves module, which consists of six hydraulic isolation valves. The valves are individually operated and provide a means of isolating individual hydraulic components for ground leakage and flow tests.

2. <u>Rudder</u>

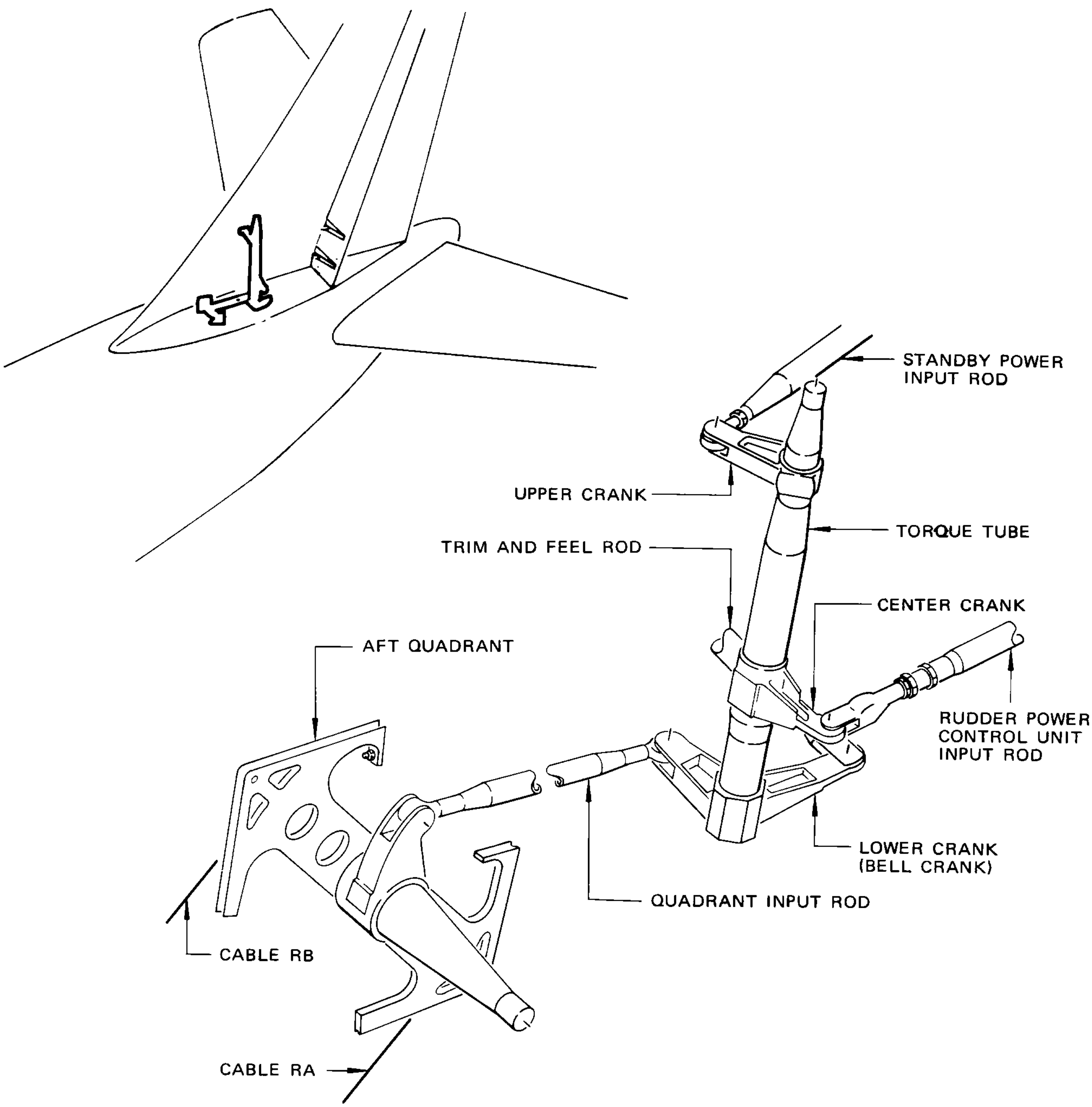
A. The rudder provides yaw control for the airplane. It is a monospar, aluminum alloy structure with chordwise ribs. On some airplanes, the rudder is of graphite/composite construction. The skin is made of honeycomb core fiberglass. On some airplanes, the skin is made of graphite reinforced epoxy. There is no rudder tab. There are seven rudder hinges, the bottom one being a thrust hinge. Balance weights are fastened to the rudder nose. These are aluminum alloy forgings with steel castings attached. On some airplanes, the balance weights are made of tungsten. Refer to Structural Repair Manual, Chapter 51, for rudder balancing. There is a stainless steel body seal attached to the bottom rib of the rudder. On some airplanes, the body seal is made of honeycomb nomex core material. This seals the gap between the rudder and the body.

3. <u>Rudder Pedals</u>

A. The captain and first officer are each provided with a pair of rudder pedals which are used for controlling the airplane about its vertical axis (Fig. 1). Each pair of pedals consist of right and left pedals mounted on a shaft. The pedal shaft is attached to the upper end of the pedal arm assembly. The lower end of the pedal arm assembly is mounted on a support shaft which is attached to the structure below the floor. The rudder pedals are located below the captain's and first officer's instrument panel. Rudder pedal support and quadrant assemblies are accessible through the lower nose compartment.

B. Fore and aft movement of the pedals is transmitted by the two pushrods to the jackshaft yoke. The rotary motion of the jackshaft yoke is passed to the forward quadrant by means of the jackshaft. The two sets of rudder pedals are bussed together by means of a bus pushrod connecting the two jackshaft assemblies. Toe pressure on the rudder pedals causes pedals to rotate about their shafts and initiate braking action.

4. Rudder Pedal Adjustment Crank
   A. The two pairs of rudder pedals can be adjusted independently to suit the captain and first officer. This is accomplished by means of the rudder pedal adjust shaft (Fig. 1). The rudder pedal adjustment mechanism consists of an adjustment crank, adjustment shaft, a jackscrew, and pedal adjustment nut attached to the jackshaft assembly.
   B. The adjustment crank is located on the instrument panel forward of the control wheel. It is connected to a flexshaft routed forward under the instrument panel, then down under the floor, and aft to the universal joint in the rudder control jackshaft assembly. Rotation of the rudder pedal adjustment crank actuates the jackscrew which causes the yoke, containing the pedal adjustment nut, to move fore and aft.
   C. Rudder pedal adjustment crank and crank handle stops are installed to prevent the rudder pedal adjustment screw from being backdriven by heavy foot pressure simultaneously applied to both rudder pedals. The crank incorporates a spring-loaded pin within the knob. The stops are spacers installed beneath the upper two bolts on the crank bearing housing or are incorporated into the crank housing bearing retainer. Rotation of the crank handle is prevented in either direction beyond the stop blocks, by contact of the spring-loaded pin that protrudes from the crank handle. To permit crank rotation for rudder pedal adjustment, the knob must be pulled aft so the pin clears the stops.
5. Rudder Aft Control Quadrant
   A. The rudder aft control quadrant (Fig. 2) transmits the motion of the rudder control cables to the dual path torque tube. The assembly consists of a quadrant bolted to a shaft. The shaft is mounted horizontally in the vertical stabilizer.
   B. Rotation of the quadrant pushes or pulls the quadrant input rod which is attached to a crank on the rudder control torque tube.
6. Rudder Control Torque Tube
   A. The rudder control torque tube provides a dual load path for rudder control linkage inputs. The torque tube (Fig. 2) consists primarily of two aluminum tubes bonded and swaged together. A dual-load-path plug forms each end of the torque tube and is double riveted in place. The torque tube is mounted on two bearings which are retained by two nuts installed on each dual plug. The tube is mounted in a vertical position in the vertical fin. Three cranks are bolted to the tube. The lower crank is connected to the input rod from the aft control quadrant, and to the feel and centering mechanism.
   B. The center crank is connected to the main rudder power control unit linkage. The upper crank is connected to the standby power unit control linkage. The cranks are of dual construction with the two halves bonded and riveted together.
   C. Rudder pedal input or rudder trim input causes the torque tube and cranks to rotate. This provides input to the rudder power unit, the feel and centering unit, and the standby actuator.



Rudder Aft Control Quadrant and Torque Tube
Figure 2

7. Rudder Trim Control Mechanism
   A. The rudder trim control mechanism provides a means for controlling the directional trim of the airplane and indicates the units of rudder trim (Fig. 3). The control mechanism consists of a rudder trim knob and indicator on the aft end of the control stand, and a cable drum attached to the knob through a vertical shaft.
   B. Movement of the trim knob rotates the shaft and drum, which is connected by cables to the rudder trim actuator. Rotation of the knob moves the indicator a proportionate amount on the indicator scale. Maximum rudder trim travel is 12° in both directions. The indicator scale corresponds by being divided in 10 divisions in both directions.
8. Rudder Trim Actuator
   A. The rudder trim actuator converts cable motion into a linear force which is applied to the rudder centering and feel mechanism. The actuator assembly consists of a cable drum and jackscrew nut, actuator housing, screw, compression spring and spring guide. (See figure 3.) The actuator compression spring produces a tension force between the nut and screw to prevent backlash. The jackscrew end of the actuator is attached to fin structure and the actuator housing is connected to the centering and feel mechanism. The jackscrew has a vernier plug for length adjustment.
   B. Rotation of the cable drum causes the drum-and-nut and actuator housing to move linearly on the screw. Jackscrew nut forces are transferred to the actuator housing through a thrust bearing. Movement of the actuator housing causes the centering spring and feel assembly to rotate.
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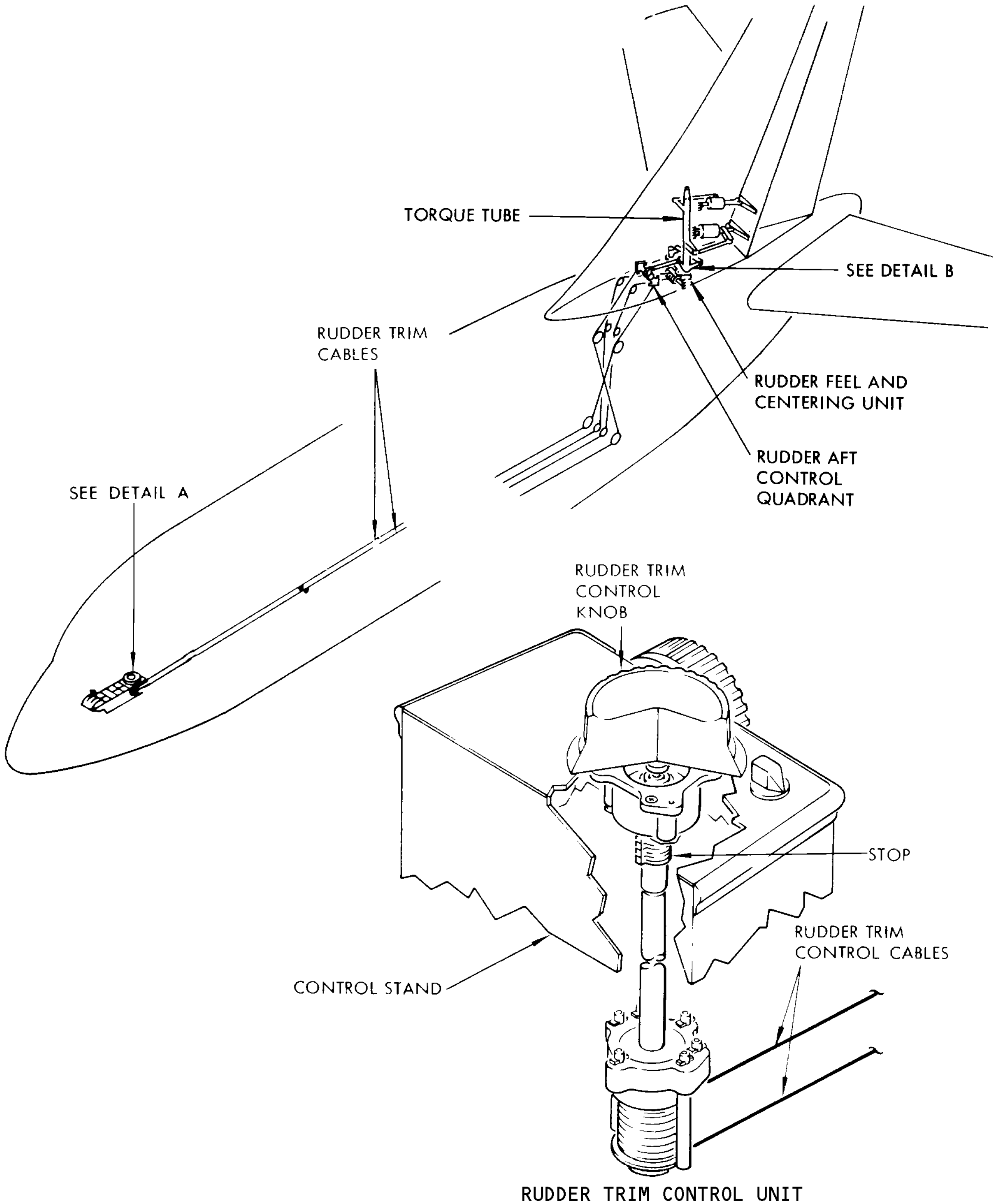
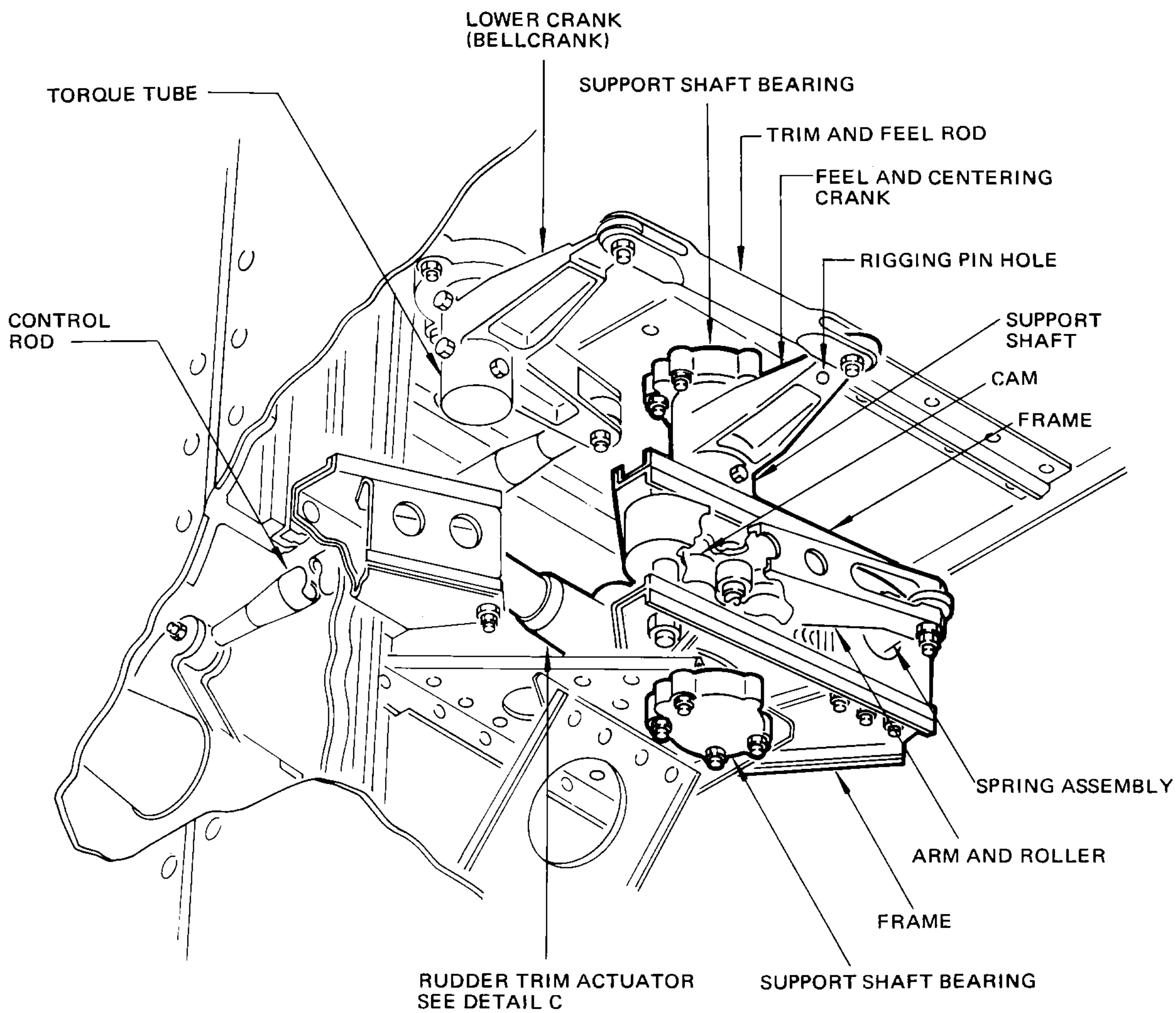
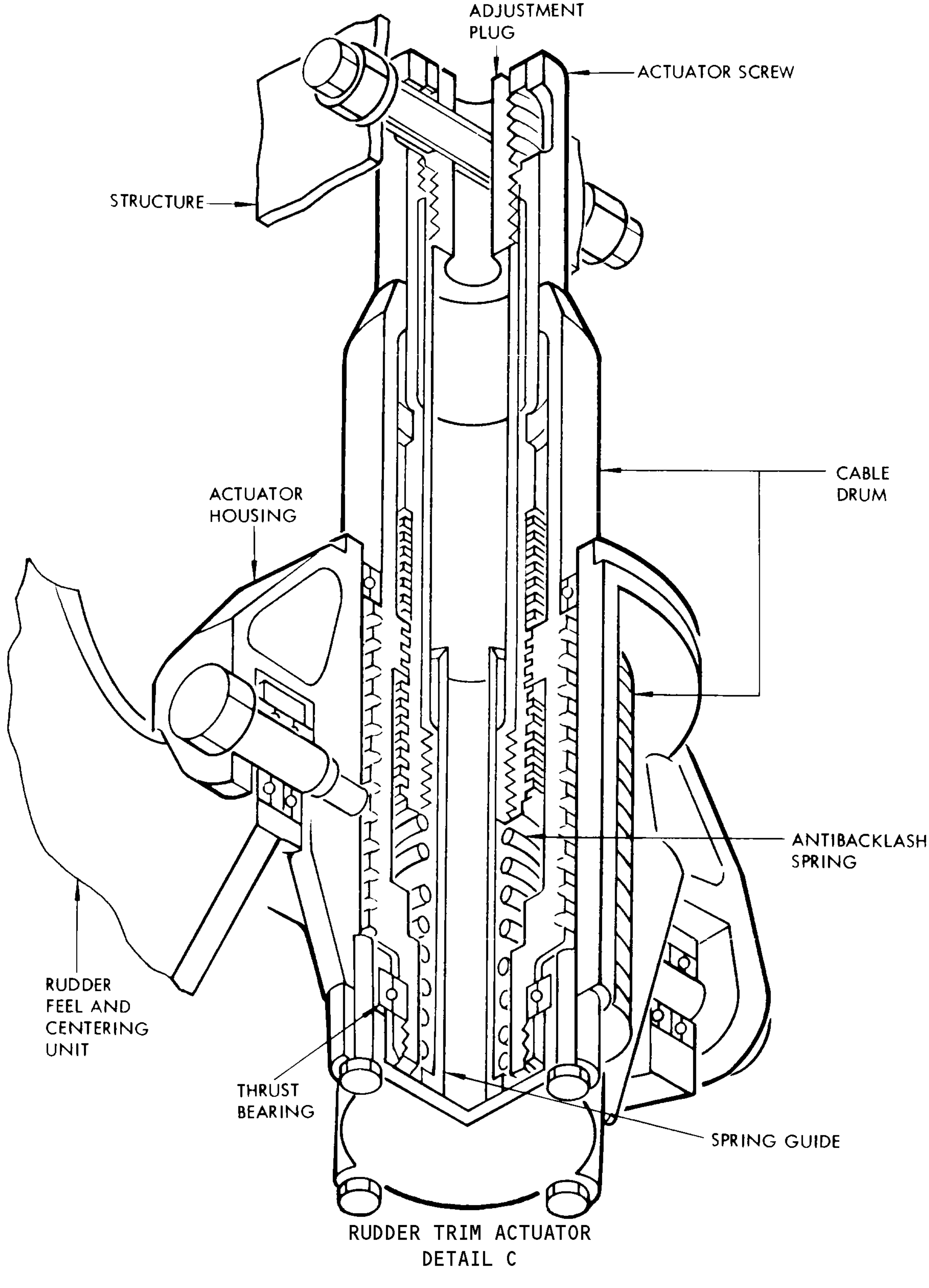


Rudder Trim and Feel System
Figure 3 (Sheet 1)



DETAIL B

Rudder Trim and Feel System
Figure 3 (Sheet 2)



RUDDER TRIM ACTUATOR
DETAIL C

Rudder Trim and Feel System
Figure 3 (Sheet 3)

10. Rudder Feel and Centering Mechanism (Fig. 4)

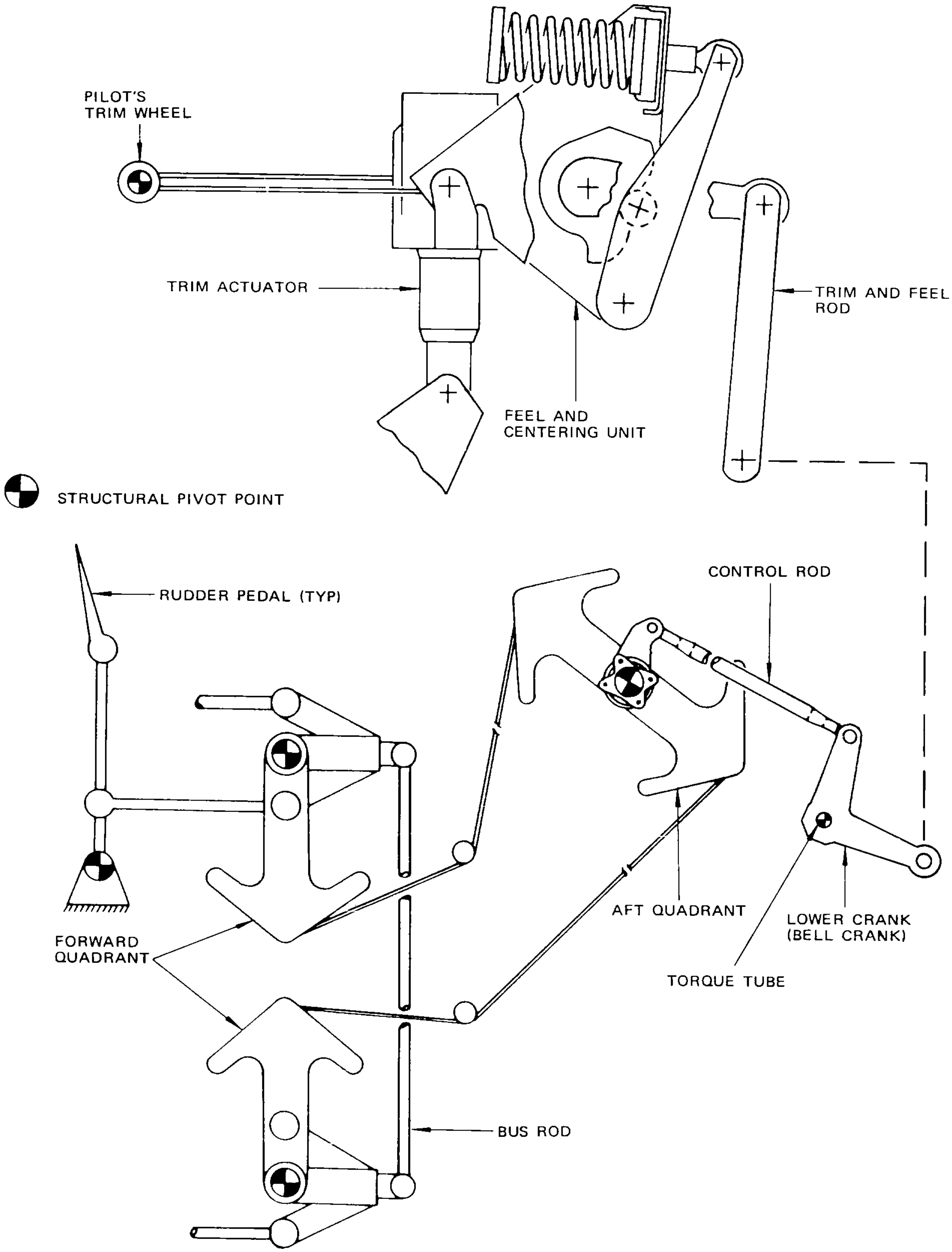
A. The rudder feel and centering mechanism consists of the feel and centering unit which provides artificial feel to the pilots' pedals and centers the rudder. The feel and centering unit is located below the rudder power unit in the vertical fin (Fig. 3). The feel and centering unit has the following parts: A support shaft, a feel and centering crank, two frames, an arm and roller with a spring assembly, and a cam. The support shaft is bearing mounted on structure. The feel and centering crank is fixed to the support shaft and is connected through the trim and feel rod to the lower crank on the torque tube. The two frames are bearing mounted on the support shaft. The arm and roller and the spring assembly attach to and rotate with the two frames. The cam is fixed to and rotates with the support shaft. The cable drum end of the rudder trim actuator is supported by the forward side of the two frames. When the rudder pedals are displaced, the torque tube rotates causing offset of the trim and feel rod and in turn rotation of the feel and centering crank, the support shaft and the cam. As the cam rotates, the arm and roller are displaced out of the detent position to extend the spring assembly and provide artificial feel. Rudder trim input through the rudder trim actuator rotates the two frames with the arm and roller and spring assembly. The force of the spring assembly holds the arm and roller in the cam detent and causes the cam to rotate also. Rotation of cam causes subsequent motion of the support shaft, the feel and centering crank, the trim and feel rod, the lower crank, the torque tube which then causes input to the rudder power unit repositioning the rudder. At the same time the lower crank causes input to the rudder control system with movement of the pilots' pedals.

11. Rudder Power Control Unit (Fig. 5)

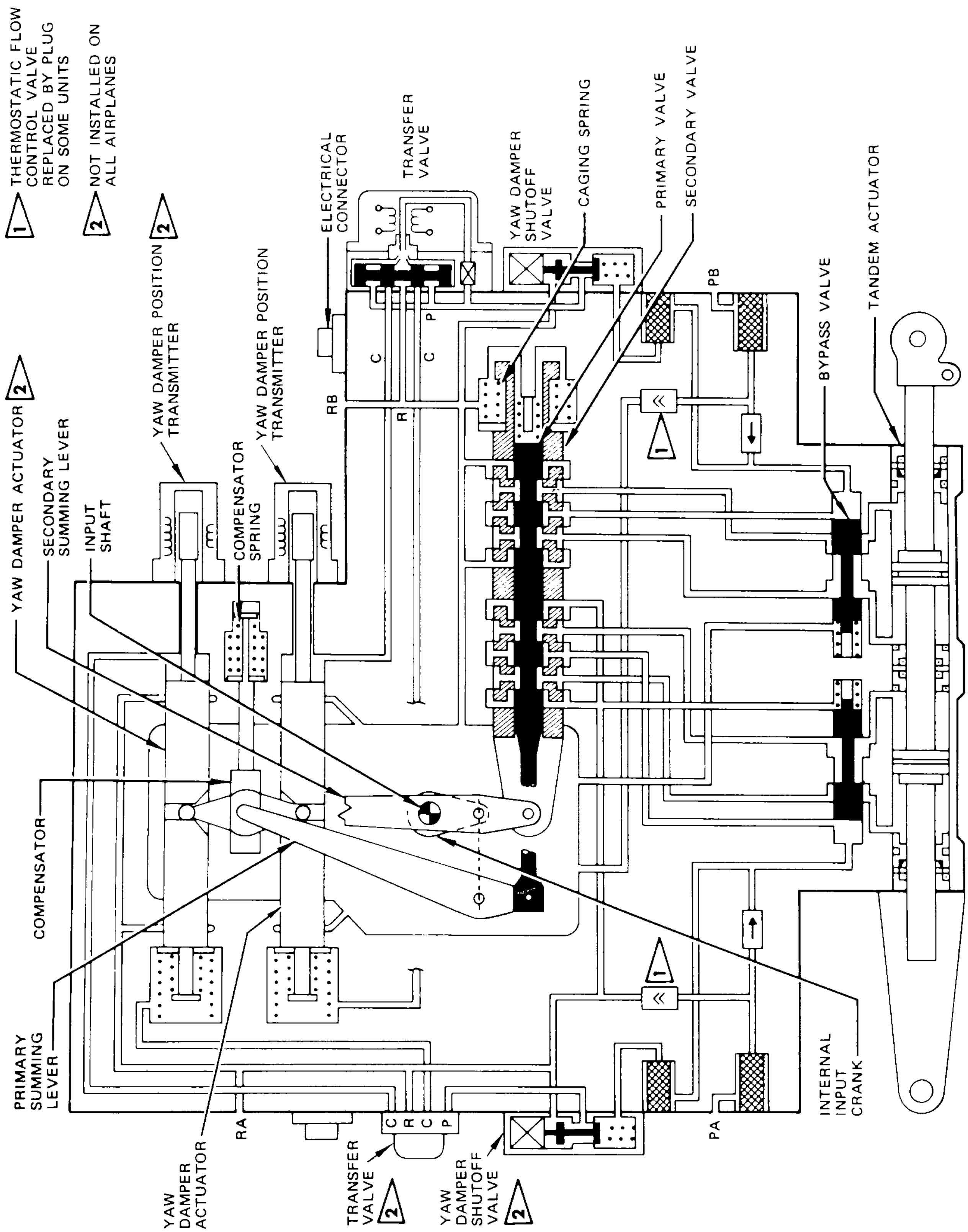
A. The rudder power control unit moves the rudder right or left when actuated by rudder pedal input. It also provides wind gust snubbing when the airplane is parked. The unit is located in the vertical fin (Fig. 1). The body is fixed to fin structure and the power head to the rudder. It is separately powered by hydraulic systems A and B. Either system acting alone will provide full rudder control.

B. Power control unit yaw damper function is to minimize dutch roll during manually and automatically controlled flight. The yaw damper provides rudder displacement proportional to the yaw rate, and opposing the yaw direction of the airplane. The yaw damper input is in series with the pilots' input and is not felt at the rudder pedals.

C. Pilots' input, by rudder pedals or trim wheel, is transmitted through cables and linkages to the power control unit input crank. The input crank rotates and moves the control valve which ports hydraulic pressure to the actuating cylinder. The amount of control valve movement is also governed by the yaw damper input. The pilots' input and yaw damper input are combined algebraically by the summing levers, which connect to the primary and secondary control valves. The power control unit piston rod end is attached to the rudder. Therefore, extension or retraction of the rod moves the rudder left or right. An external summing lever attached to the actuating piston provides feedback to return the control valve to neutral and to stop the rudder at the desired position.

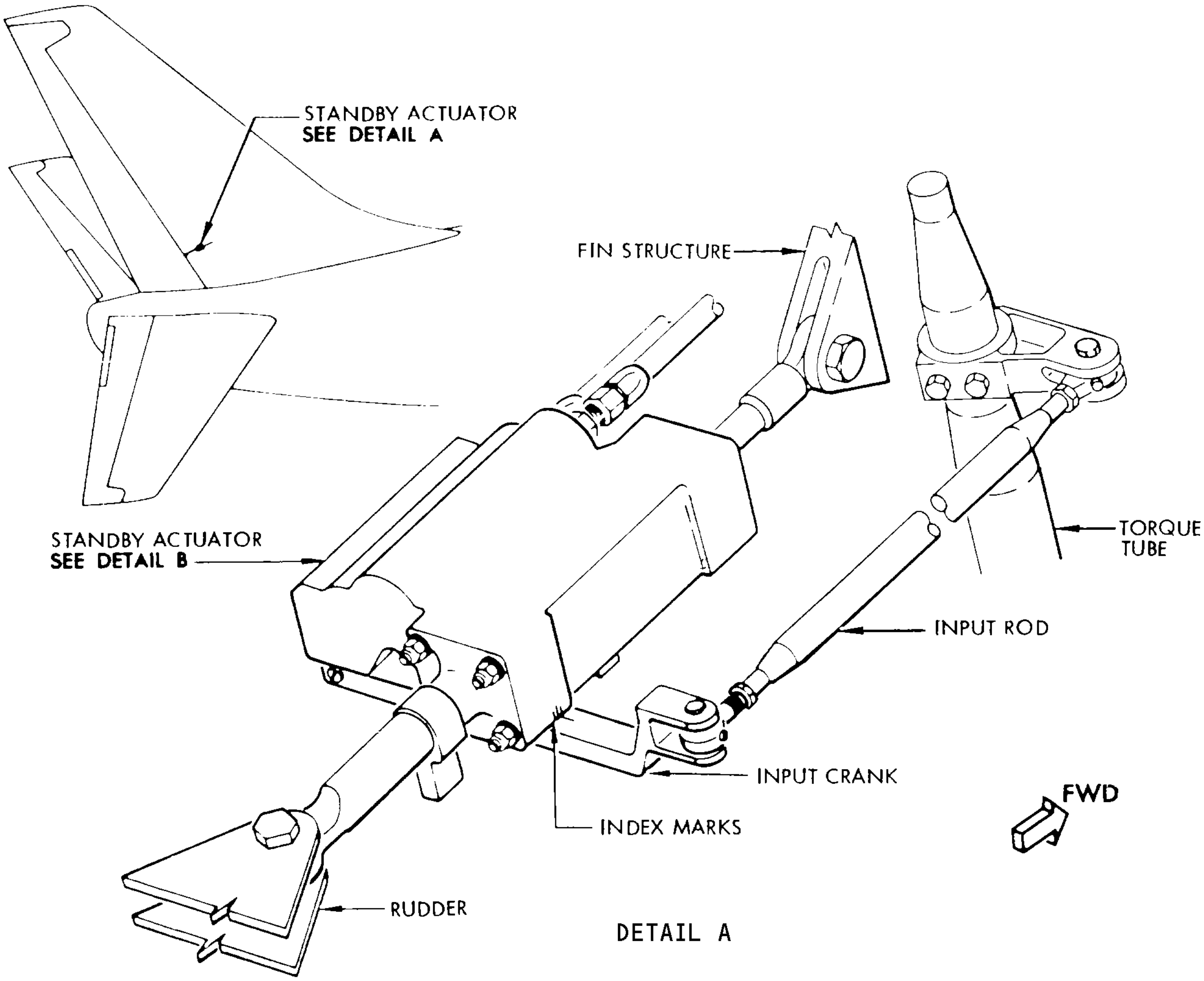


Rudder Feel and Centering Mechanism Schematic
Figure 4

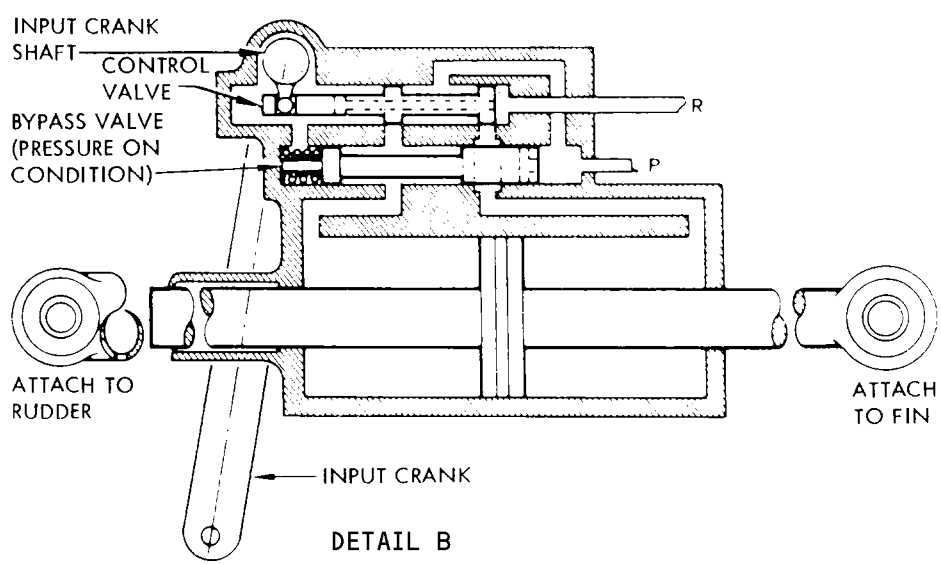


Rudder Power Control Unit Schematic
Figure 5

12. Standby Rudder Actuator Shutoff Valve
    A. The standby rudder actuator shutoff valve is located on the aft bulkhead of the main wheel well (Fig. 7). The unit is mounted on the standby system modular unit by four bolts. The valve is electrically operated from a 28 volt-dc source, and consists of a motor spool sleeve and cartridge. The cartridge containing the spool and sleeve fits into a cavity in the modular package. The electric motor is splined to a cam which converts rotary motor action into linear spool travel in the sleeve. The valve is equipped with a manual override lever and position indicator. The manual override allows the valve to be positioned with electrical power off. The valve is on when the lever is in position 1, and off when the lever is in position 2.
13. Standby Rudder Actuator
    A. The standby rudder actuator (Fig. 6) positions the rudder when hydraulic systems A and B are not available. The actuator consists of a bypass valve, control valve, and the actuating cylinder. Standby hydraulic power for the standby actuator is controlled by system A and B switches on the overhead flight controls panel.
    B. Hydraulic pressure supplied from the standby system operates the actuator. Rotation of the input crank will position the control valve to port fluid to the actuating cylinder.
14. Rudder Pressure Reducer (Airplanes incorporating SB 27A1206)
    A. A rudder pressure reducer is located on the A hydraulic system supply line to the rudder power control unit, which reduces hydraulic system pressure supplied to the rudder power control unit to a specified range. The rudder pressure reducer is located in the upper left-hand side of fuselage STA 1104. System pressure of 3000 psi at the inlet port of the pressure reducer unit is reduced to 1400 psi at the outlet port during conditions other than those listed below.
    B. The rudder pressure reducer will command full system pressure in the following situations:
        (1) Ground operations and takeoff to 1000 ft above ground level (AGL)
        (2) On landing below 700 ft AGL
        (3) When FLT CONTROL B LOW PRESSURE warning lamp is illuminated on the Pilot's Overhead Panel (Fig. 5).

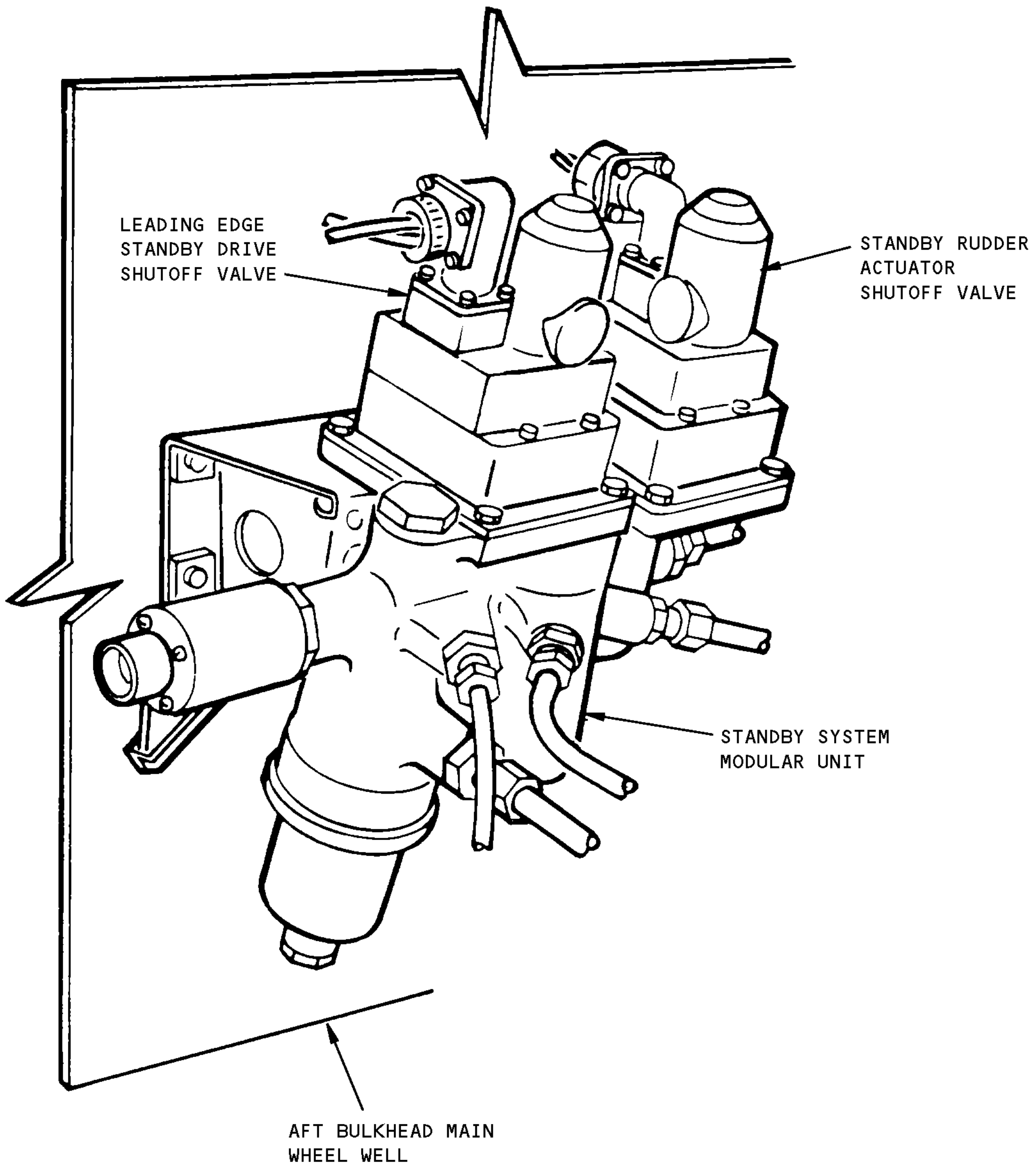


DETAIL A



DETAIL B

Rudder Standby Actuator
Figure 6



Standby Rudder Actuator Shutoff Valve
Figure 7

C. The rudder pressure reducer does not interfere with yaw damper operation, which makes inputs to the half of the main PCU powered by the B hydraulic system. The rudder hydraulic system is monitored by the yaw damper coupler, and failure of the rudder pressure reducer is indicated by illumination of FLT CONTROL A LOW PRESSURE warning lamp on the Pilot's Overhead Panel (Fig. 5). The yaw damper coupler also has BITE on the rudder pressure reducer (Ref 22-12-01, D/O).

15. Operation

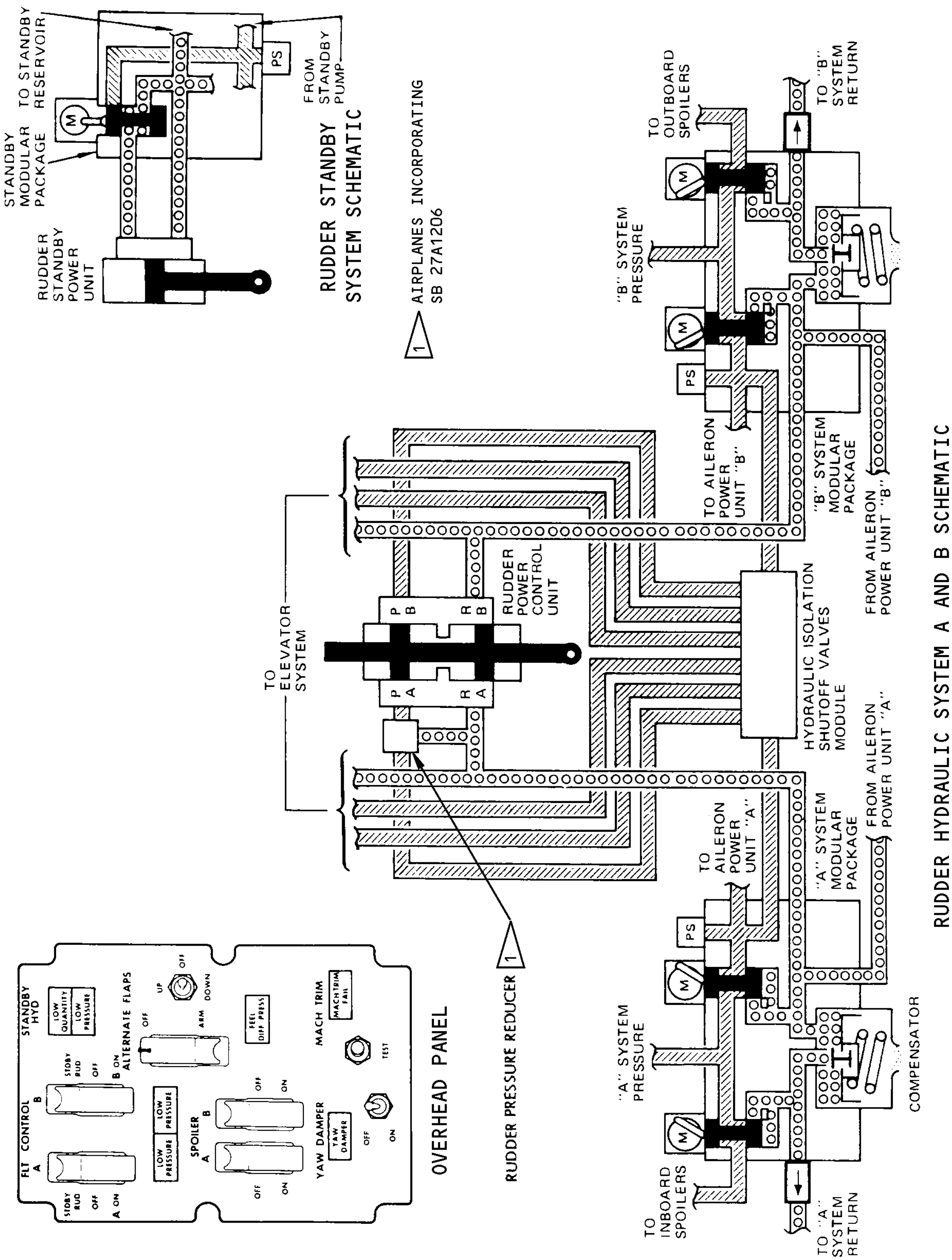
A. The rudder control system is operated by two sets of pedals, one for each pilot. Pedal movement is transmitted to forward quadrants and jackshafts by rods. The two forward quadrants are interconnected by a bus rod. Cables transmit forward quadrant motion to the aft quadrant located in the vertical fin. Rotation of the aft quadrant in turn causes rotation of the rudder control torque tube.

B. The rudder control torque tube, when rotated, provides simultaneous input to the rudder power control unit, the standby rudder actuator, and to the rudder feel and centering mechanism. In normal operation the power control unit is powered by hydraulic systems A and B (Fig. 9). Control input to the power unit occurs when a torque tube-mounted crank rotates. The crank is connected by a rod to the input linkage of the power unit. As the input linkage moves, the control valve opens and ports hydraulic fluid to the actuator cylinder. The actuating piston then moves and causes rudder deflection. Nominal rudder travel is 26 degrees in both directions.

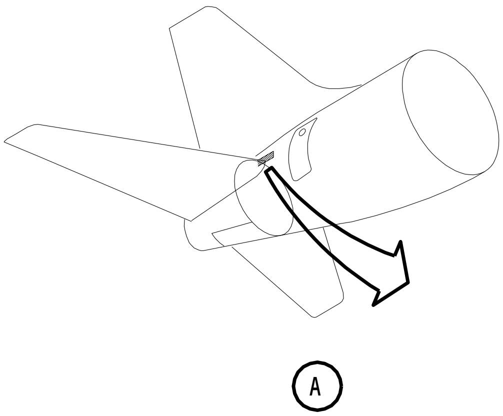
C. If hydraulic systems A and B are not available to power the rudder, then standby power may be turned on, and the rudder operated with the standby actuator. Rudder pedal input positions a servovalve in the actuator which ports fluid to the actuating piston. Movement of the piston closes off the ports when the desired rudder travel is reached.

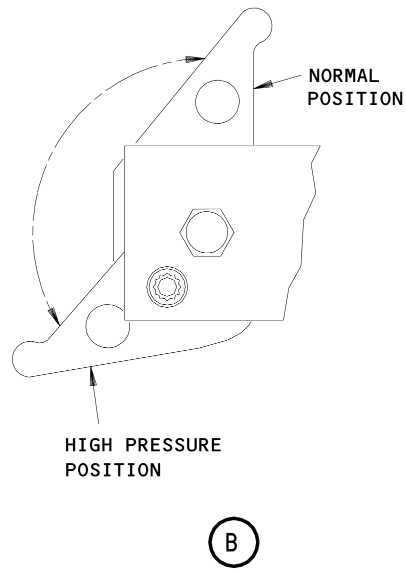
D. In addition to operating the rudder power unit and the standby actuator, the torque tube moves the centering cam in the feel and centering mechanism. When the camshaft is rotated it displaces the spring-loaded cam follower.

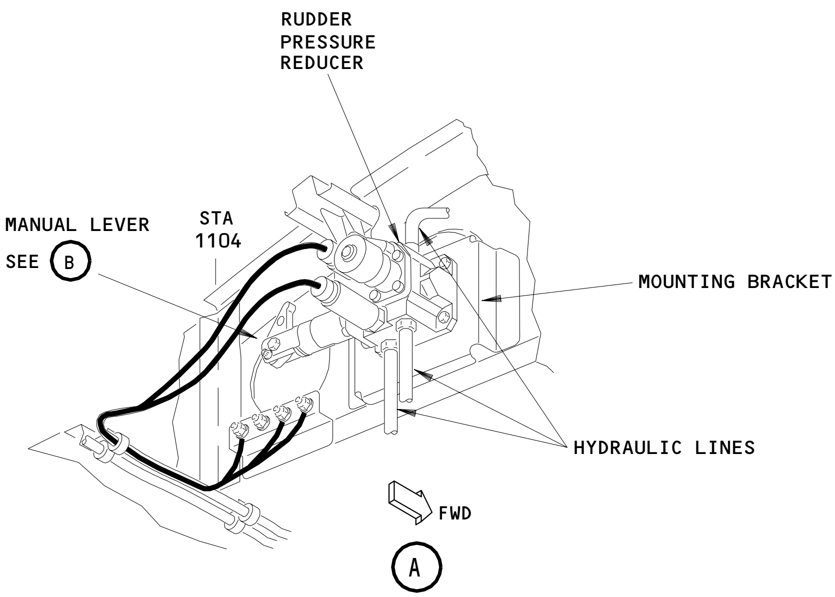
E. If rudder trim is adjusted with the power control unit depressurized, the drag of the unpowered rudder system will allow the system to remain out of center. This will force the rudder feel and centering mechanism cam follower out of the cam detent. Then when hydraulic power is applied, the rudder pedals and rudder will rapidly move to the newly trimmed position.



Rudder Hydraulic System Schematic
Figure 8 (Sheet 1)







Rudder Hydraulic System Schematic
Figure 8 (Sheet 2)

RUDDER AND RUDDER TRIM CONTROL SYSTEM - TROUBLESHOOTING

1. Rudder and Rudder Trim Control System Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Insufficient rudder or rudder pedal travel *[1]	Foreign objects interfering with rudder pedals and forward quadrants	Check for foreign objects in area of rudder pedals and forward quadrants	Remove foreign objects
	Rudder pedals and/or forward quadrants out of rig	Check rudder pedal and/or forward quadrant rigging. (AMM 27-21-0/501 or AMM 27-21-1/501)	Adjust rudder pedals and/or forward quadrants as necessary
	Binding, worn or defective parts in forward quadrants	Check forward quadrant parts	Replace worn or defective parts
	Binding, worn or defective parts in rudder pedal assembly	Isolate rudder pedal assembly and check terminal and bellcrank (AMM 27-21-31/401, Rudder)	Replace worn or defective parts
	Foreign objects interfering with aft rudder quadrant, torque tube in fin or input linkage to power control unit	Check for foreign objects in area of aft quadrants, torque tube and PCU input linkage	Remove foreign object or interference

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Fwd quadrant stops incorrectly installed	Check if quadrant is contacting stops before required travel is obtained	Correct improper installation
	Insufficient clearance between input rods or linkages and cranks or quadrants near full travel positions	With rudder pedals near full travel position, check for clearance between rods and cranks, etc. Fwd stops should be contacted before linkages run out of travel	Remove interference
Excessive pedal forces	<u>NOTE</u>: If excessive force is only in certain portions of rudder pedal travel, probable cause is interference in system or binding due to defective or worn parts. If excessive force is through the entire travel range, probable cause is n the artificial feel system or high system friction due to worn parts.		
	Foreign objects interfering with system components and linkages	Check for foreign objects obstructing movement of system components and linkages	Remove foreign objects
	Binding worn or defective parts in rudder pedals or forward quadrant and jackshaft installation, structural interference in area of rudder pedals	Disconnect RA and RM cables from forward quadrants. Cycle pedals through maximum travel and check for resistance. If binding or resistance is encountered, defective part is in rudder pedal linkage or forward quadrant and jackshaft assembly, or structure in area of rudder pedals	Repair or replace defective parts

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Binding worn or defective parts in rudder aft control quadrant torque tube or feel and centering unit	Remove RA and RB cables from aft quadrant. Disconnect linkages connecting torque tube to rudder aft control quadrant, feel and centering unit, power control unit and standby actuator. Disconnect feel and centering unit output crank from feel rod connection. Rotate feel and entering unit, aft quadrant, and torque tube to check for interference	Repair or replace defective parts
	Binding in power control unit valve input rods or power control units	With rudder power control unit and standby actuator input rods disconnected from torque tube, cycle input rods by hand to check for binding input linkages	Replace defective power control unit
	Excessive system friction	Test rudder centering (AMM 27-21-0/501 or AMM 27-21-1/501). If rudder does not return to neutral, system friction may be excessive. Refer to Faulty Rudder Centering Troubleshooting	
	Defective centering unit	Replace centering unit and recheck forces	Repair or replace defective part

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Rudder pedal forces low	Defective centering unit	Replace centering unit and recheck forces	Repair or replace defective part
Excessive play in pedals	Worn or defective parts in rudder pedals or forward quadrant and jackshaft area	Clamp forward quadrant to structure to prevent motion of quadrant. Check rudder pedals for excessive play	Repair or replace defective parts
	Worn or defective parts in rudder aft quadrant, torque tube or feel and centering unit area	Determine if excessive play occurs with power on but normal with power off. If it does, problem is in centering unit or input linkage to it. If it is determined problem is not in the fwd quadrant area or centering unit, problem is in the linkage between the aft quadrant and torque tube	Repair or replace defective parts
Rudder pedal jams or binds when brakes are applied	Pedal interferes with pedal mechanism cover	Check clearance between pedals and cover thru full travel range with brakes applied	Remove interference
Insufficient pedal adjustment travel	Foreign objects or defective parts in jackshaft assembly	Check for defective parts or foreign objects in jackshaft assembly	Remove foreign object, replace or repair defective parts

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive pedal adjustment forces	Foreign objects or defective parts in jackshaft assembly	Check for defective parts or foreign objects in jackshaft assembly	Remove foreign object, replace or repair defective parts
	Defective or binding flexible shaft	Remove flexible shaft, determine if defective	Replace defective flexible shaft
Pedal adjustment binds in full forward or full aft position	Jackshaft overrotated in adjustment nut	Check that rudder pedals are adjusted fully forward or fully aft	Backdrive rudder pedal adjustment crank up to 100 pound-inches torque to free the bound mechanism
Rudder pedal adjustment moves	Loose, worn or defective parts in jackshaft assembly	Check jackshaft assembly for loose, worn or defective parts	Repair or replace defective parts
Insufficient trim knob travel or rudder trim travel	Foreign objects or structure interfering with rudder trim actuator or centering unit	Check for foreign objects or interference in area of rudder trim actuator and centering unit	Remove foreign object or interference
	Insufficient clearance between input rods or linkages and cranks or quadrants near full travel positions	With rudder trim knob near full travel position, check for clearance between rods and cranks, etc. Fwd stops should be contacted before linkages run out of travel	Remove interference

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Cables on fwd cable drum or rudder trim actuator drum incorrectly wrapped	With rudder trim knob at full travel position, check if cable is completely unwrapped from fwd drum or rudder trim drum. Fwd stops in trim knob should be contacted before cable unwraps from drum	Correct improper installation
	Rudder trim actuator improperly installed or rigged	Check system rigging per (AMM 27-21-0/501 or AMM 27-21-1/501)	Adjust system as necessary
	Stops in rudder trim knob improperly installed	Check if stops in trim knob are contacted before required travel is obtained	Correct improper installation
Rudder trim control system binding, trim knob forces excessive	Rudder trim actuator dry lube worn off	Remove mounting bolt from upper end of trim actuator. Rotate trim actuator screw by hand and check for binding	Apply lubricant MIL-L-23699 to screw and drum interior threads
	Foreign objects interfering with system components and linkages	Check for foreign objects obstructing movement of system components and linkages	Remove foreign objects
	Excessive cable tension	Check cable tension. (AMM 27-21-0/501 or AMM 27-21-1/501)	Adjust cable tension

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Binding, worn or defective bearings in feel and centering unit	Isolate feel and centering unit, examine pivot bearings (AMM 27-21-82/401 Feel and Center Unit)	Replace worn or defective parts
	Rubbing cables, misaligned or defective pulleys or fairleads	Examine cable runs and pulleys	Repair or replace defective parts
	Binding, worn or defective parts in forward trim mechanism	Disconnect cables from trim mechanism drum and cycle mechanism with rudder trim control knob. Excessive force or binding indicates defective trim mechanism	Replace or repair trim mechanism
	Binding, worn or defective parts in trim actuator	Remove mounting bolt from upper end of trim actuator screw by hand and check for binding	Replace defective trim actuator
	Binding, worn or defective parts in torque tube	Disconnect linkages connecting torque tube to rudder aft control quadrant, feel and centering unit, power control unit and standby actuator. Rotate torque tube to check for interference	Repair or replace defective parts

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Binding in power control unit valve input rods or power control units	With rudder power control unit and standby actuator input rods disconnected from torque tube, cycle input rods by hand to check for binding input linkages	Replace defective power control unit

*[1] All troubleshooting to be done with power on, unless otherwise stated. Provide or remove rudder hydraulic systems power per AMM 27-21-0/201, Rudder and Rudder Trim Control System.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Rudder trim control system binding, trim knob forces excessive	Rudder control system jammed or binding	Check rudder pedals for excessive forces. If excessive forces are encountered, rudder control system is binding	Refer to trouble item on binding or jammed rudder control system
Trim knob forces low	Excessive lubrication on rudder trim actuator	Check rudder trim actuator for excessive lubrication	Cycle trim knob thru full travel until knob forces are normal
Rudder centering faulty	Excessive system friction	Check pedal breakout force. If it exceeds 18 lbs, system friction may be too high. Check for loose worn or defective parts. Check for rubbing or misaligned cables. Check for foreign objects interfering with system	Replace worn or defective parts. Remove foreign object
	Defective centering unit	Check pedal breakout force. If it is less than 10 lbs, centering unit may be defective	Replace or repair defective centering unit
	Rudder system out of rig	Check system rigging (AMM 27-21-0/501 or AMM 27-21-1/501)	Adjust as required
Excessive play in rudder surface	Worn or defective parts	Check for worn or defective bearings or hinges in fin area	Replace or repair defective part
Trim drifts from setting during flight	Excessive lubrication on rudder trim actuator	Check rudder trim actuator for excessive lubrication	Cycle trim knob thru full travel until knob forces are normal

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Trim drifts from setting during flight	High system friction and poor centering	Check rudder centering (AMM 27-21-0/501 or AMM 27-21-1/501). If rudder does not return to neutral, system friction may be excessive. Refer to faulty rudder centering troubleshooting	
Excessive yaw when switching from A and B hydraulics to standby or from standby to A or B hydraulics in flight	Standby actuator out of rig	Check rigging (AMM 27-21-0/501 or AMM 27-21-1/501)	Adjust as required
Experiencing high rudder pedal forces OR Rudder pedals kick back or yaw damper backdrives rudder pedals during flight OR Erratic yaw damper operation or rudder oscillates with yaw	Binding within the standby actuator	Shutoff all hydraulics. Disconnect input control rod from the standby input lever. Measure the force required to move the lever throughout its range of motion. This force, when applied tangentially (90°) to the input crank arm and at approximately the bolt/clevis centerline, shall not exceed one pound.	Replace the standby actuator.
	Possible binding or restriction of the input linkage of the Main PCU	Shutoff all hydraulics. Disconnect input pushrod and verify no binding or restriction of linkages of the Main PCU as the input crank is rotated throughout its range of travel (AMM 27-21-0/201)	Verify PCU input crank can move freely. Replace worn or defective parts

2. AIRPLANES POST-SB 27-1252;
<u>STBY RUD ON Light Problems - Fault Isolation</u>

A. Description
   (1) The STBY RUD ON light is on the P5-3 panel.
   (2) There are three different ways that the STBY RUD ON light will be illuminated:
      (a) The flight crew selects STBY RUD on, using system A or B flight control switch on the P5-3 panel
      (b) Auto standby logic detects low pressure on either the A or B hydraulic systems, flaps are not up and either in-air or wheel speed greater than 60 knots.
      (c) Force fight monitor (FFM) detects force fight in the main rudder PCU.

B. Possible Causes
   (1) Wiring problem
   (2) Force Fight Monitor problem
   (3) Auto Standby Circuitry
   (4) P5-3 Flight Control Module
   (5) Rudder Main PCU

C. Initial Evaluation

<u>WARNING</u>: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDER, ELEVATORS, FLAPS, SPOILERS, SLATS, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

   (1) Pressurize the rudder hydraulic systems A, B, and Standby (AMM 27-21-0/201).
      (a) Set the FLT CONTROL A and B switches on the P5-3 panel to the ON positions.
      (b) Push the left rudder pedal forward until it reachs the stop, hold for 10 seconds, then return the left rudder pedal to the neutral position.
      (c) Push the right rudder pedal forward until it reachs the stop, hold for 10 seconds, then return the right rudder pedal to the neutral position.
      (d) If the STBY RUD ON light is illuminated, do the Fault Isolation Procedure D.(2) below.
      (e) If the STBY RUD ON light is not illuminated, do the Fault Isolation Procedure D.(1) below.

D. Fault Isolation Procedure
   (1) If the STBY RUD ON light is not illuminated in the Initial Condition check, do these steps:
      (a) Do this task: System Test of the Standby Hydraulic System (AMM 29-21-0/501).
         1) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
         2) If you do not find a problem, continue with the next step.
      (b) Do a check of the linkages between the Torque Tube and the Main PCU for binding or being disconnected.
         1) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
         2) If you do not find a problem, continue with the next step.
      (c) Make sure that the FLT CONTROL A and B switches on the P5-3 panel are in the ON positions. Measure the voltage between pin 1 and pin 2 of connector D10070 on the EE shelf.
         1) If the voltage measured is not between 2.75 to 7.25 Vdc, adjust the control rod of the rudder main PCU (AMM 27-21-1/501), then do the steps for Repair Confirmation at the end of this task.
         2) If the voltage measured is between 2.75 to 7.25 Vdc, then continue with the next step.
      (d) Do the Rudder Override Operational Test (AMM 27-21-1/501).
         1) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
         2) If you do not find a problem, continue with the next step.
      (e) Do the Internal Leak Check for the Rudder PCU (AMM 29-00-0/601).
         1) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
         2) If you do not find a problem, there was an intermittent fault.
   (2) If the STBY RUD ON light is illuminated in the Initial Condition check, do these steps:
      (a) If the LOW PRESSURE A or B light is illuminated on the P5-3 panel, do these steps:
         1) If the LOW PRESSURE A light is illuminated, do the "Pressure Reducer Test" (AMM 22-12-01/501).
            a) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.

b) If you do not find a problem, continue with the next step.

2) If the LOW PRESSURE B light is illuminated, check the following:
   a) FLT CONTROL B LOW PRESSURE light
   b) Flight control panel, P5-3
   c) Flight control system B pressure switch
   d) Standby rudder valve position relay
   e) FLT CONTROL B switch
   f) Standby rudder PCU shutoff valve
   g) Wiring problem
3) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
4) If you do not find a problem, continue with the next step.

(b) If the LOW PRESSURE A or B light is not illuminated on the P5-3 panel, continue with the next step.

(c) Open this circuit breaker on the P6 panel and attach a DO-NOT-CLOSE tag:
   1) FORCE FIGHT MONITOR

(d) If the STBY RUD ON light is illuminated, do these steps:
   1) Remove the P5-3 overhead panel (AMM 27-09-45/401).
   2) Do a check of the connector pins and sockets for damage.
      a) If you find any pins that are damaged or bended, do the steps to repair the problem, install the P5-3 panel, then do the steps for Repair Confirmation at the end of this task.
      b) If you do not find a problem, continue with the next step.
   3) Do a check between pin 52 and pin 37 on connector D624 of the P5-3 module for open circuit.
      a) If it is not open, do a check of the wiring for damage and repair the wiring. If no damage is found, replace the K1 AUTO STBY RELAY, then do the steps for Repair Confirmation at the end of this task.
      b) If it is open, continue with the next step.
   4) Do a check between pin 52 and pin 37 on connector D630 of the P5-3 module for open circuit.
      a) If it is not open, do a check of the wiring for damage and repair the wiring. If no damage is found, replace the K21 STBY RUDDER ANNUN RELAY, then do the steps for Repair Confirmation at the end of this task.
      b) If it is open, continue with the next step.

5) Do a check between pin 11 on connect D624 and pin 37 on connector D630 of the P5-3 module for open circuit.
   a) If it is not open, do a check of the wiring for damage and repair the wiring. If no damage is found, check the operation of the following switches on the P5-3 module:
      1. S3 FLT CONTROL SYS A SWITCH - CONTACT GROUP 5
      2. S4 FLT CONTROL SYS B SWITCH - CONTACT GROUP 5
      3. S4 FLT CONTROL SYS B SWITCH - CONTACT GROUP 6
   b) If a fault is found on the switch, replace the faulty switch, then do the steps for Repair Confirmation at the end of this task.
   c) If it is open, install the P5-3 panel (AMM 27-09-45/401), then continue with the next step.
6) Disconnect the connector D10197 from the Rudder Main PCU.
7) Do a check of the connector pins and sockets for damage.
   a) If you find any pins that are damaged or bent, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
   b) If you do not find a problem, continue with the next step.
8) Do a check between pin 2 to pin 8 on connector D10197 of the cable for open circuit.
   a) If it is not open, do a check of the wiring for damage and repair the wiring, then do the steps for Repair Confirmation at the end of this task.
   b) If it is open, continue with the next step.
9) Do a check between pin 2 to pin 8 on connector D10194 of the Rudder Main PCU for open circuit.
   a) If it is not open, replace the rudder PCU (AMM 27-21-92/401), then do the steps for Repair Confirmation at the end of this task.
   b) If it is open, connect D10197 on the Rudder Main PCU, then do the steps for Repair Confirmation at the end of this task.

(e) If the STBY RUD ON light is not illuminated, do these steps:
1) Do a check of the linkages between the Torque Tube and the Main PCU for binding or damage.
   a) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
   b) If you do not find a problem, continue with the next step.

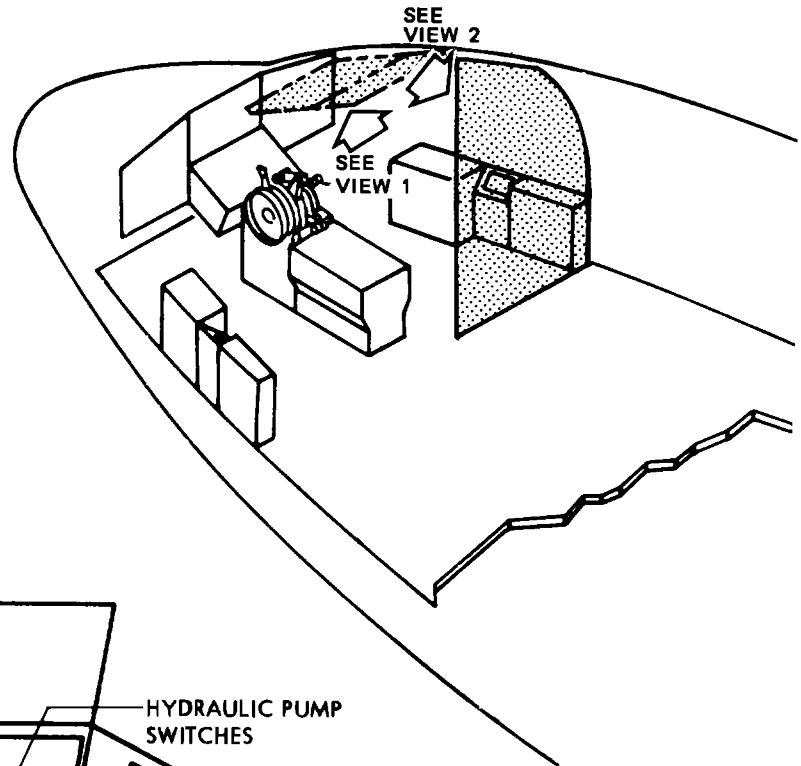
2) Measure the voltage between pins 1 and 2 of connector D10070 on the EE shelf.
    a) If the voltage measured is not between 2.75 to 7.25 Vdc, adjust the rudder main PCU (AMM 27-21-1/501), then do the steps for Repair Confirmation at the end of this task.
    b) If the voltage measured is between 2.75 to 7.25 Vdc, then continue with the next step.
3) Do the Rudder Override Operational Test (AMM 27-21-1/501).
    a) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
    b) If you do not find a problem, continue with the next step.
4) Do the Internal Leak Check for the Rudder PCU (AMM 29-00-0/601).
    a) If you find a problem, do the steps to repair the problem, then do the steps for Repair Confirmation at the end of this task.
    b) If you do not find a problem, replace the rudder PCU (AMM 27-21-92/401), then do the steps for Repair Confirmation at the end of this task.

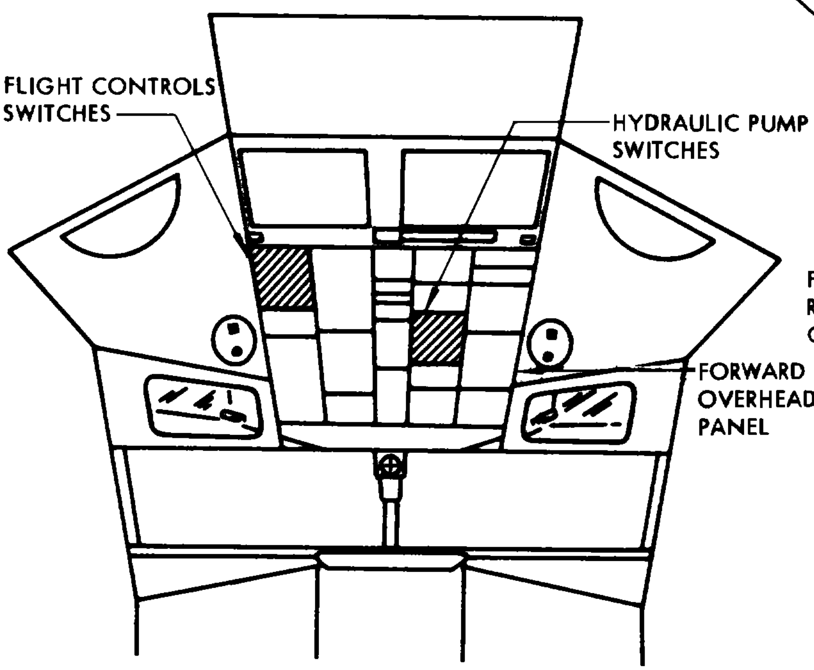
RUDDER AND RUDDER TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General
   A. The rudder hydraulic systems A, B, and standby must be depressurized prior to performing maintenance on rudder control system components. This is to prevent injury to personnel working in the area of the rudder and it's associated control linkages. Work stands and equipment must be placed at a distance to allow full rudder deflection when power-on tests are conducted.

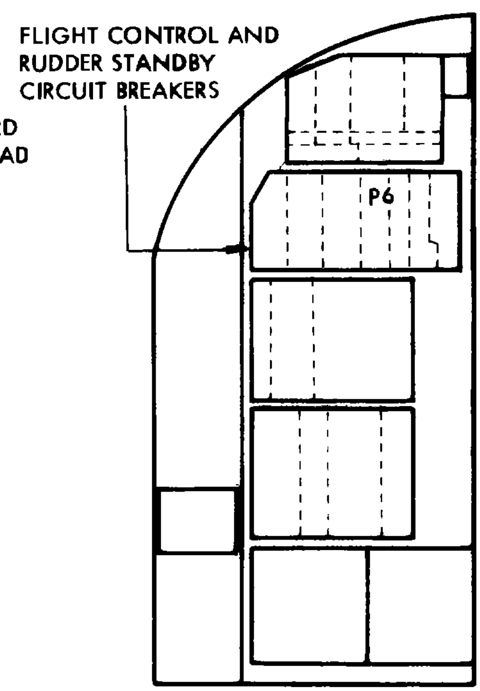
      WARNING: ALL FLIGHT CONTROL SYSTEMS ARE FULLY POWERED. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON. ISOLATE OR TAG ANY SYSTEM NOT BEING TESTED TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.

   B. When operating hydraulic system B pumps to pressurize A and B rudder systems the following precautions must be taken:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days or when fuel temperature is known to be above 90°F, monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5 minute period. Following the fifth start run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. The following procedure covers pressurization of hydraulic systems A and B through operation of electrical driven hydraulic system B pumps only.
2. Rudder Hydraulic Systems A and B Pressurization
   A. Equipment and Materials
      (1) Ground Lock Assembly - F72735
   B. Pressurize rudder hydraulic systems A and B.
      (1) Install ground lock assembly in nose gear.
      (2) Set parking brake.
      (3) Provide electrical power.
      (4) Close FLT CONTR and STDBY RUD circuit breaker on panel P6.
      (5) Position No. 1 or 2 hydraulic system B pump switch, located in forward overhead panel, to ON (Fig. 201)
      (6) Position ground interconnect switch on forward overhead panel to OPEN.





VIEW 1
(LOOKING FORWARD)



VIEW 2
(LOOKING AFT)

Rudder Power Control Switches
Figure 201

(7) Check that flight control switches A and B, located in upper left corner of forward overhead panel, are positioned to ON position.

NOTE: To pressurize system A or system B separately, position flight control switches A and B to ON or OFF as required.

C. Restore airplane to normal.

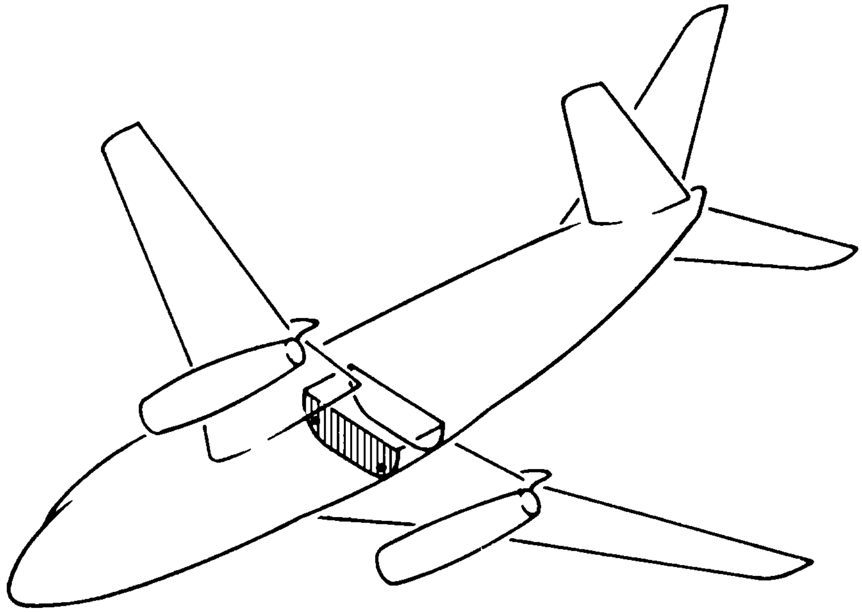
NOTE: Perform following steps after completing rudder control system maintenance that required pressurization.

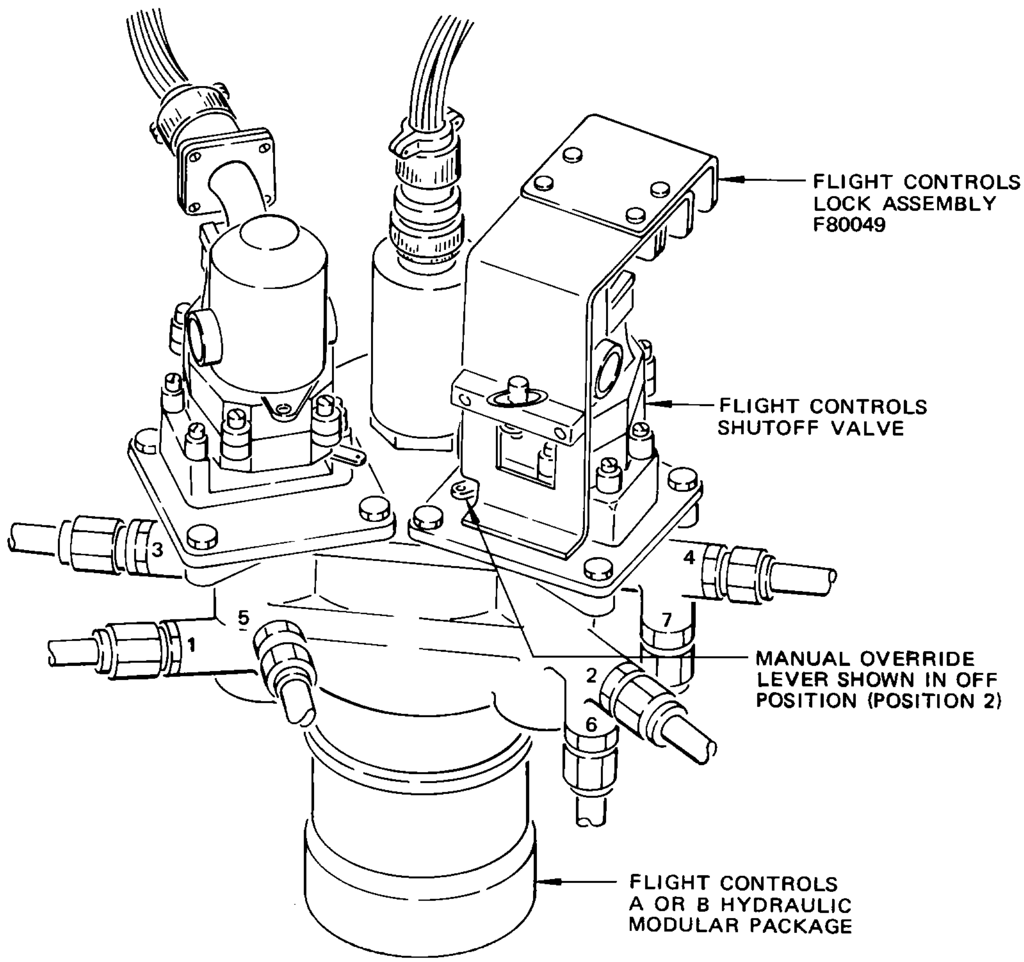
(1) Position No. 1 and 2 system hydraulic system B pump switches to OFF.
(2) Position grd interconnect switch to CLOSE.
(3) Position flight control switches A and B to ON.
(4) Close FLT CONTR and STDBY RUD circuit breaker on panel P6.
(5) Remove electrical power, if no longer required.
(6) Remove ground lock assembly from nose gear.

3. Rudder Hydraulic Systems A, B, and Standby Depressurization

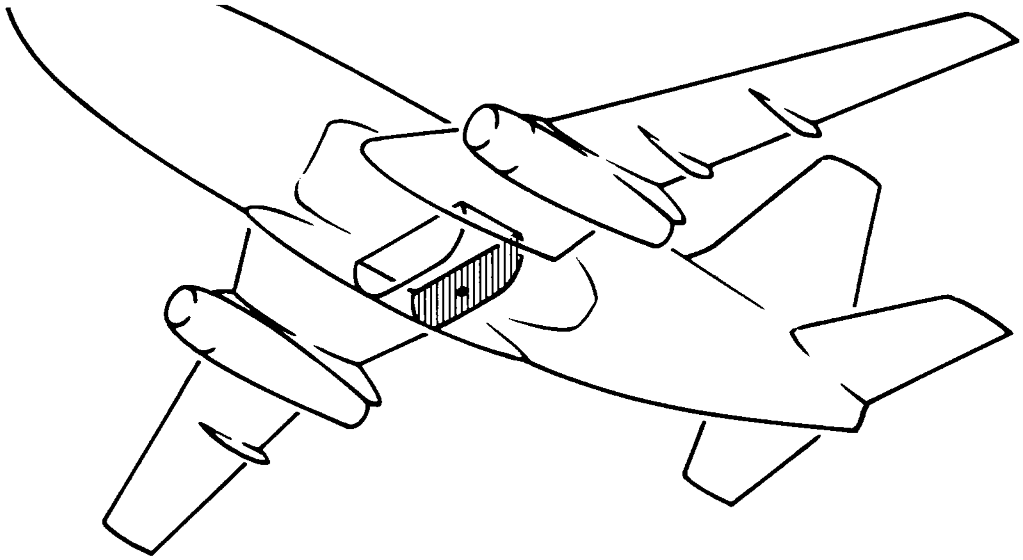
A. Equipment and Materials
(1) Lock Assembly - Flight Controls, F80049-12 (Preferred), F80049-1 (Optional) (3 required).

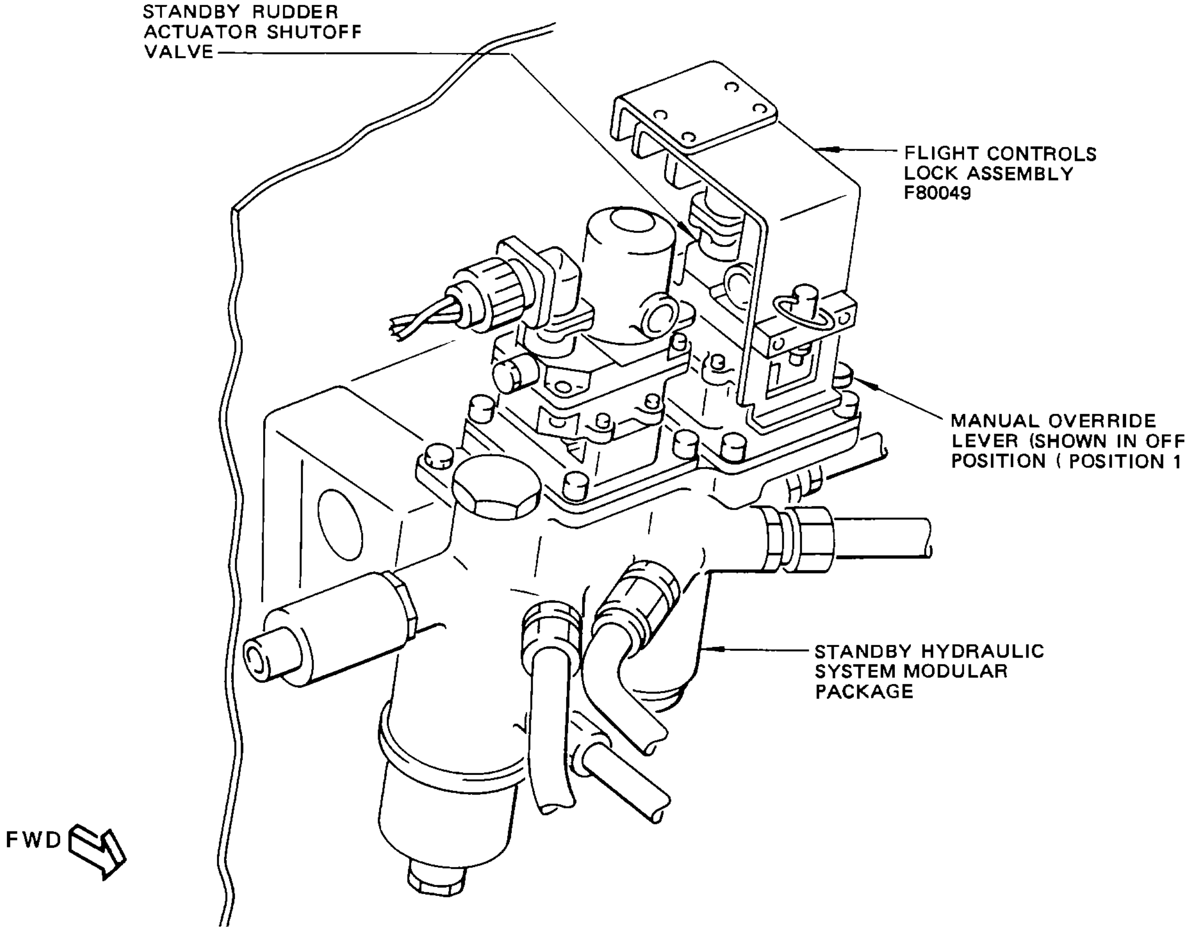
B. Depressurize rudder hydraulic systems A, B, and standby.
(1) Turn hydraulic pump switches A and B, located in center of forward overhead panel, to OFF position (Fig. 201).
(2) Ensure that ground interconnect switch is at CLOSE position.
(3) Turn flight control switches A and B, located in upper left corner of forward overhead panel, to OFF position.
(4) Open FLT CONTR and STBY RUD circuit breakers located on P6-2 load control panel.
(5) If any hydraulic components are to be removed, depressurize hydraulic system reservoirs (Ref 29-09-300, Maintenance Practices).
(6) Cycle rudder pedals until rudders stop operating hydraulically.
(7) Check that manual override levers on flight controls shutoff valve of both flight controls hydraulic modular packages (A and B) is in OFF position (Fig. 202). Check that manual override lever on standby rudder actuator shutoff valve of standby hydraulic modular package is in OFF position (Fig. 203). Manually place levers in OFF position if required
(8) Disconnect electrical connector from flight controls shutoff valve motor on Flight Controls A hydraulic modular package in left wheel well, from flight controls shutoff valve motor on Flight Controls B modular package in right wheel well, and from standby rudder actuator shutoff valve motor on standby hydraulic modular package.
(9) Install lock to each of the two flight controls shutoff valves and to the standby rudder actuator shutoff valve and insert attaching lockpins.





Flight Controls Hydraulic Module Lock Installation
Figure 202





Standby Hydraulic Module Lock Installation
Figure 203

C. Restore airplane to normal.

NOTE: Perform following steps after completing rudder control system maintenance that required depressurization.

(1) Remove locks from System A and System B Flight Controls hydraulic module shutoff valve and from rudder standby actuator shutoff valve on standby hydraulic module, and reconnect electrical connectors.
(2) Position flight control switches A and B on forward overhead panel to ON.
(3) Close FLT CONTR and STDBY RUD circuit breakers on panel P6.
(4) Pressurize hydraulic reservoirs as required. Refer to 29-09-300.

RUDDER AND RUDDER TRIM CONTROL SYSTEM - ADJUSTMENT/TEST

1. Rudder and Rudder Trim Control System Adjustment
   (For airplanes POST-SB 27-1252, see 27-21-1/501)
   A. General
      (1) The rudder system is rigged to synchronize the components of the system. This is accomplished by adjusting all components and cables to neutral position, from forward to aft of the airplane, then adjusting the rudder to neutral position. Five rudder system rigging pins are needed to adjust the system; four in the nose section, and one in the tail section.

         NOTE: If rudder trim is adjusted with the power control unit depressurized, the drag of the unpowered rudder system will allow the system to remain out of center. This will force the rudder feel and centering mechanism cam follower out of the cam detent. Then when hydraulic power is applied, the rudder trim control knob and rudder will rapidly move to the newly trimmed position.

      (2) The rudder trim system is rigged by adjusting components to neutral position, and synchronizing adjustments from forward to aft. One tail section rigging pin, common to the rudder control system, is needed to adjust the system.

         CAUTION: RUDDER, ELEVATOR AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON.

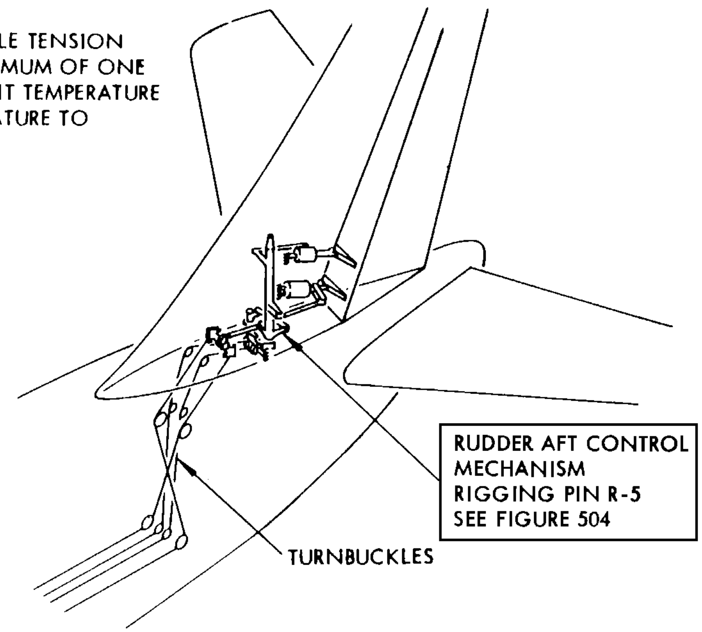
      (3) If an out-of-trim condition exists (Ref 27-09-400, Adjustment/Test).
      (4) The rudder and rudder trim control system is properly adjusted when the individual components are adjusted to meet the following conditions: (See Fig. 501 for rigging pin locations and cable tension requirements.)
         (a) Rudder Forward Quadrants
            1) With rudder pedals positioned to neutral with pedal adjustment crank, and using trim knob, and with rigging pin R-5 installed through feel and centering unit output crank, rudder forward quadrants shall be positioned so that rigging pins R-3 and R-4 fit through forward rigging pin holes in quadrants. If not, quadrants may be adjusted per par. 1.C.(2).

TABLE I

TEMPERATURE °F(± 5°)	RIGGING LOAD RA, RB (+10/-10) POUNDS [1]
110	168
90	159
70	150
50	142
30	134
10	125
-10	117
-30	109
-40	103

[1] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.

NOTE: TO INSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°) FOR AIRFRAME TEMPERATURE TO STABILIZE.



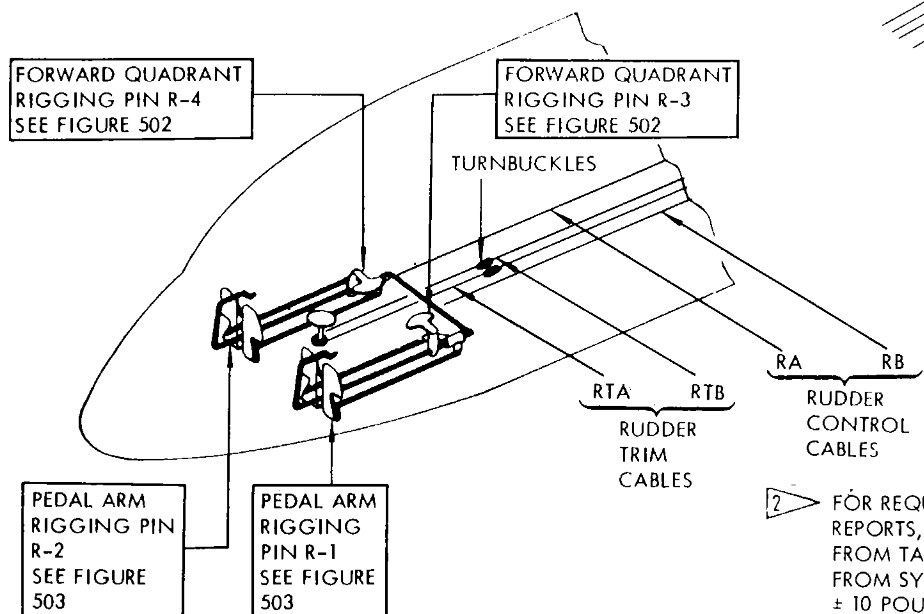


TABLE 2

TEMPERATURE °F (± 5°)	RIGGING LOAD RTA, RTB (+5/-0) POUNDS [2]
110	81
90	75
70	70
50	65
30	59
10	54
0	51
-10	48
-30	43
-40	40

[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +10/-20 POUNDS FROM TABLE 2 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 10 POUNDS FROM TABLE 2 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 2 VALUES MUST BE MET.

Rudder Control System Adjustment
Figure 501

(b) Rudder Pedals
1) With rigging pins R-3 and R-4 in place, rigging pins R-1 and R-2 shall fit through rigging pin holes on pedal arm assembly. If both pins cannot be installed, tension rods and cables may be adjusted per paragraph 1.C.(3).

(c) Rudder Trim Actuator
1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely) cotter pin hole on right side of actuator shall fall within paint mark on housing. Dimension from upper end of actuator drum extension to end of actuator screw shall be 1.92 (+0.03/-0.02) inches. If either of these conditions is not met, actuator may be adjusted per paragraph 1.C.(4).

(d) Forward Rudder Trim Cable Drum
1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely), forward rudder trim cable drum shall be in neutral per detail A, figure 503. If not, cables may be adjusted per paragraph 1.C.(5).

(e) Rudder Trim Control Cables RTA and RTB
1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely), tension in cables RTA and RTB shall be within limits of value for ambient temperature given in table 2, figure 501. If not, tension may be adjusted per paragraph 1.C.(6).

(f) Rudder Control Cables RA and RB
1) With rigging pins R-3, R-4, and R-5 installed (system should be centered and rigging pin should fit freely), tension in cables RA and RB shall be within limits of value for ambient temperature given in table 1, figure 501. If not, tension may be adjusted per paragraph 1.C.(7).

(g) Rudder Power Control Unit
1) With rigging pin R-5 installed and rudder hydraulic system pressurized, rudder trailing edge shall fall within rudder index tab (Fig. 506). If either side of trailing edge falls outside width of index tab, power control unit may be adjusted per par. 1.C.(9).

(h) Standby Rudder Actuator
1) With rigging pin R-5 installed, and rudder hydraulic system pressurized, index marks on standby rudder actuator valve input crank and actuator body shall align (Detail B, Fig. 504). If index marks are not aligned, actuator may be adjusted per par. 1.C.(10).

B. Equipment and Materials
(1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-1	-14	0.309-0.311	12.7 ±0.25	CAPTAIN'S RUDDER PEDAL ARM
R-2	-14	0.309-0.311	12.7 ±0.25	F/O'S RUDDER PEDAL ARM
R-3	-11	0.309 -0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM
R-4	-11	0.309-0.311	6.7 ±0.25	ELEVATOR AND RUDDER FEEL COMPUTER

(2) Cable Tensiometer - 0 to 300 pounds range for 1/8-inch diameter cable

(3) Grease - BMS 3-24 (Ref 20-30-21)

C. Adjust Rudder and Rudder Trim Control System

(1) Remove rudder hydraulic systems A, B, and standby power (Ref 27-21-0 MP).

<u>WARNING</u>: HYDRAULIC SYSTEMS MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON VERTICAL FIN AND RUDDER.

<u>NOTE</u>: After completing adjustment, restore airplane to normal hydraulic configuration (Ref 27-21-0 MP).

If rudder power control unit or standby power control unit only are to be adjusted, do not remove hydraulic power.

(2) Adjust rudder forward quadrants.

(a) Check that rudder hydraulic systems A, B, and standby power are removed (Ref step (1)).

(b) Position jackshaft yoke to midtravel by operating rudder pedal adjustment crank (Fig. 503).

<u>NOTE</u>: Midpoint of yoke travel is determined by counting equal turns of shaft from full forward and full aft adjustment.

(c) Open lower nose compartment door 1103, and remove nose wheel well forward overhead access panels (Ref Chapter 12, Access Doors and Panels).

(d) Insert rigging pins R-3 and R-4 in forward rigging pin holes in forward quadrants (Fig. 502). If rigging pins do not fit, adjust busrod as follows:

1) Loosen RA and RB cables using turnbuckles located in stabilizer jackscrew compartment (Fig. 501).

<u>CAUTION</u>: CABLE TENSION MUST BE RELIEVED BEFORE ADJUSTING BUSROD. RELIEVE TENSION UNIFORMLY IN BOTH CABLES.

2) Remove busrod from jackshaft yoke (Fig. 502).
3) Install rigging pins R-3 and R-4 in forward rigging pin holes in forward quadrants.
4) Adjust length of busrod so that rod end attaching bolts fit freely through jackshaft yoke. Install washers, spacers, nuts, and cotter pins.
5) Adjust rudder control cables RA and RB per par. (7).
6) Check adjustment of pushrod to nose wheel steering (Ref Chapter 32, Landing Gear).

(e) With rigging pins R-3 and R-4 in place, check that gap between cable guard block and quadrant is 0.03 to 0.05 inch (Fig. 502). Add or remove shims if necessary.

(f) Remove rigging pins R-3 and R-4.

(g) Position captain's forward quadrant so that rigging pin R-3 can be inserted through aft rigging pin hole in quadrant. Check that maximum gap between quadrant and quadrant stop is 0.06 inch. Add or remove shims as necessary.

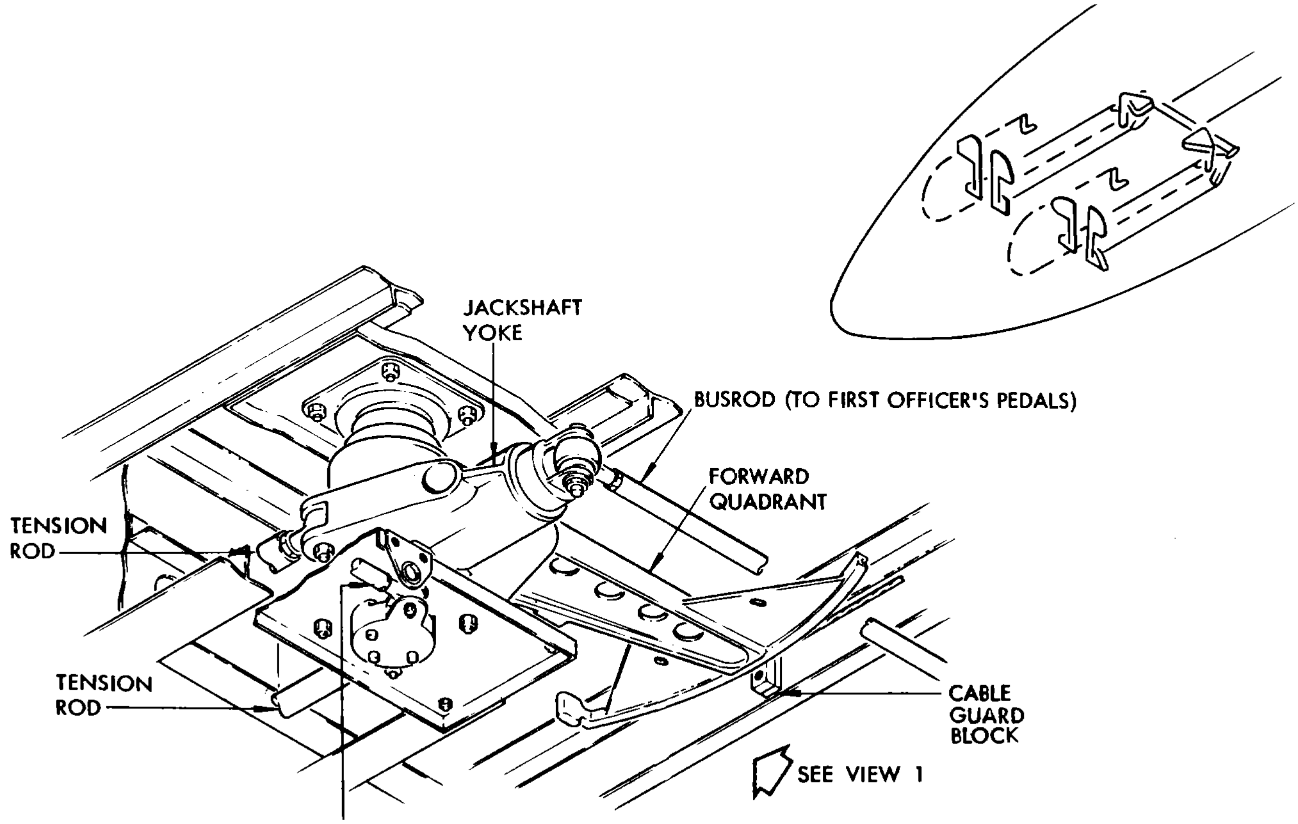
(h) Remove rigging pin R-3. Position first officer's forward quadrant so that rigging pin R-4 can be inserted through aft rigging pin hole in quadrant. Check gap between quadrant and quadrant stop per step (g).

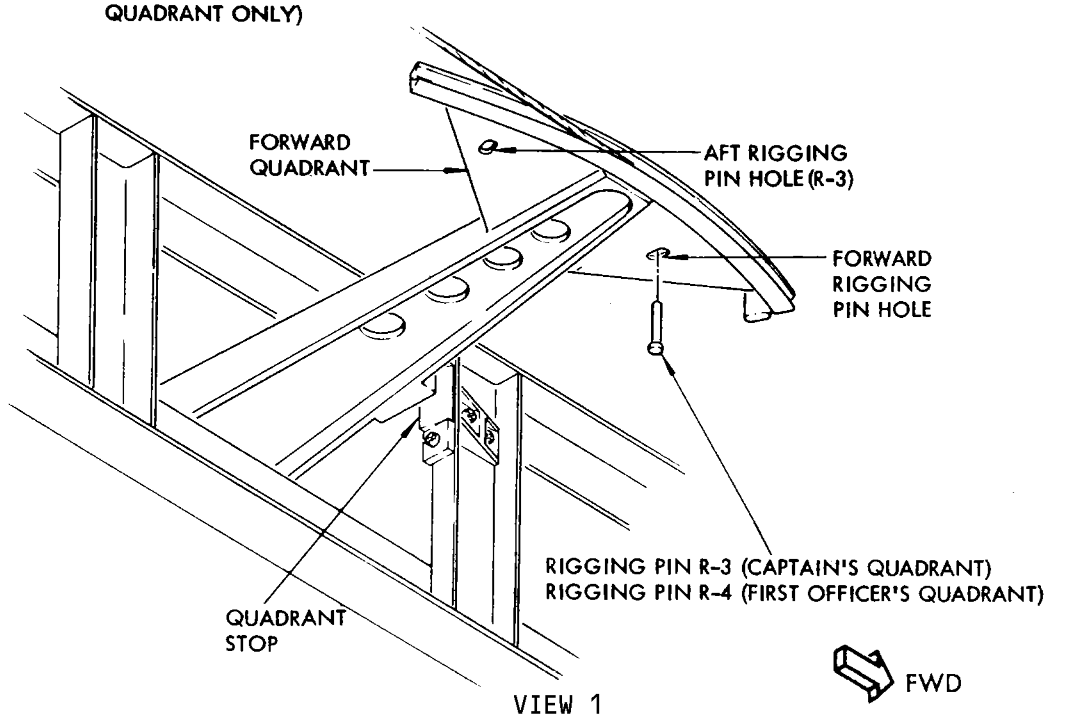
(3) Adjust rudder pedals.

(a) Check that rudder hydraulic systems A, B, and standby power are removed (step (1)).

(b) Insert rigging pin R-5 and position forward quadrants so that rigging pins R-3 and R-4 may be installed in forward rigging pin holes (Fig. 503).

<u>NOTE</u>: Rudder trim knob may be used to aid in positioning forward quadrants.





VIEW 1

Rudder Pedal Adjustment
Figure 502

(c) With rigging pins R-3 and R-4 in place, check that rigging pins R-1 and R-2 fit through rigging pin holes on pedal arm assembly. If one or both pins cannot be installed, adjust tension rods by loosening jamnuts on one or both ends of rod assembly and rotating tube to obtain desired length.

NOTE: Nominal tension rod dimension is 36.50 inches.

(d) When rigging pins fit freely, tighten jamnuts.
(e) Inspect adjustable rod ends for proper thread engagement. Rod ends must be visible through inspection holes in tubing.
(f) Remove rigging pins R-1, R-2, R-3, R-4, and R-5.

(4) Adjust rudder trim actuator.
(a) Check that rudder hydraulic systems A, B, and standby power are removed (step (1)).
(b) Remove access panels 9509 and 9510 from vertical fin and open door 3701 in aft body section.
(c) Disconnect feel and centering unit input rod from torque tube crank (Fig. 504).
(d) Align center of painted index mark on cable drum extension with cotter pin hole on side of actuator housing (installed position) to place rudder trim actuator drum in neutral (Detail A, Fig. 504).
(e) Check that dimension from bottom of actuator drum extension to end of actuator screw is 1.92 +0.03/-0.02 inches and that rigging pin R-5 can be freely inserted. If not, adjust as follows:
1) Disconnect screw from structure and rotate screw to proper length.
2) Connect screw to structure. If mounting holes do not align with rigging pin R-5 installed, remove bushing from threaded plug and rotate plug until mounting holes align. Maintain 1.92 (+0.03/-0.02)-inch dimension. Replace bushing and install bolt assembly.

NOTE: Actuator drum outer periphery may be rotated 0.50 inch maximum if nearest plug adjustment increment does not align mounting holes. Cotter pin hole on actuator housing must not be off paint index mark on actuator drum at zero trim.

(f) Check that trim knob is at zero units and that cable tension is correct. If not, adjust per paragraphs (5) and (6).

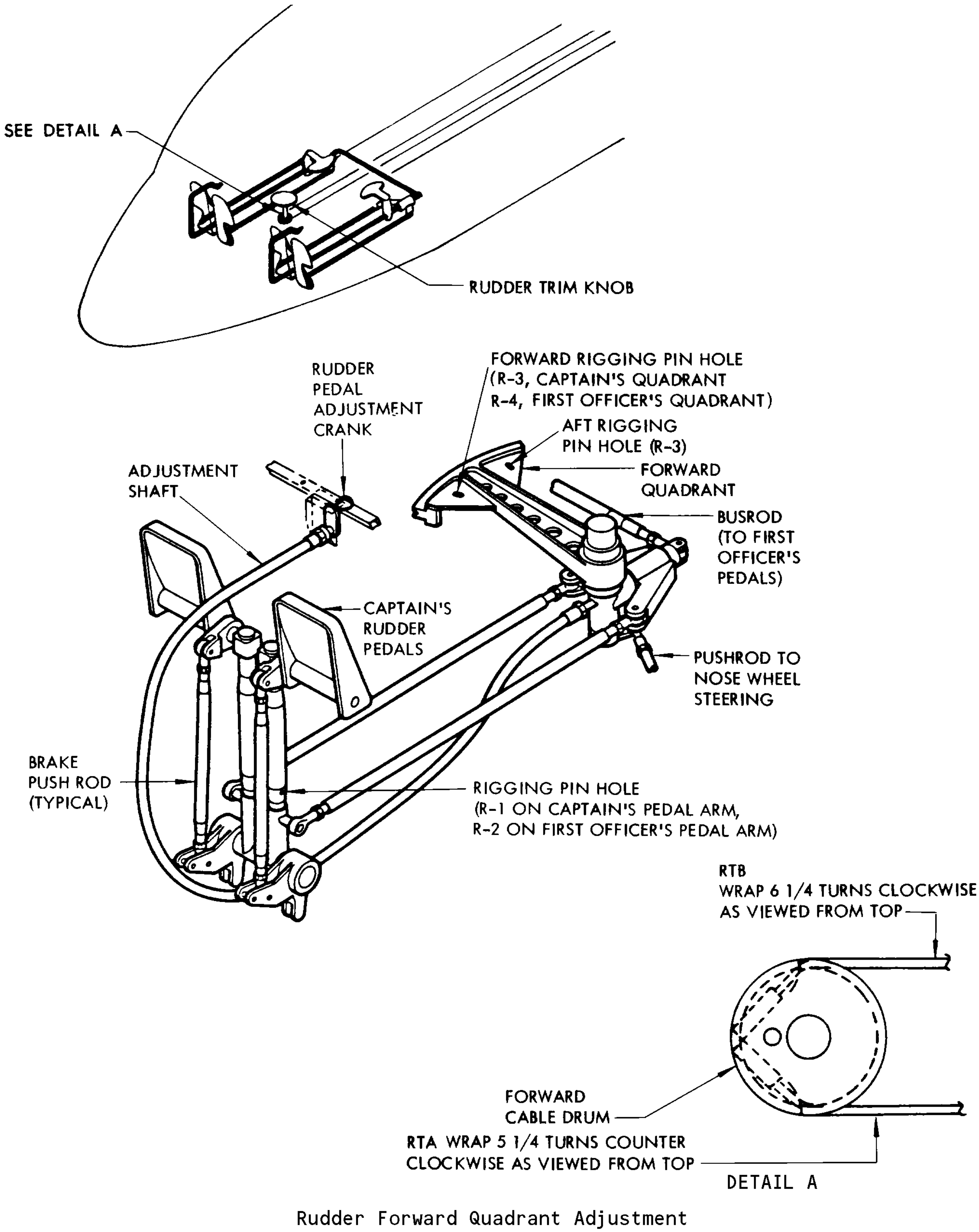
(g) Connect input rod between feel and centering unit and torque tube. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound - inches.

<u>CAUTION</u>: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

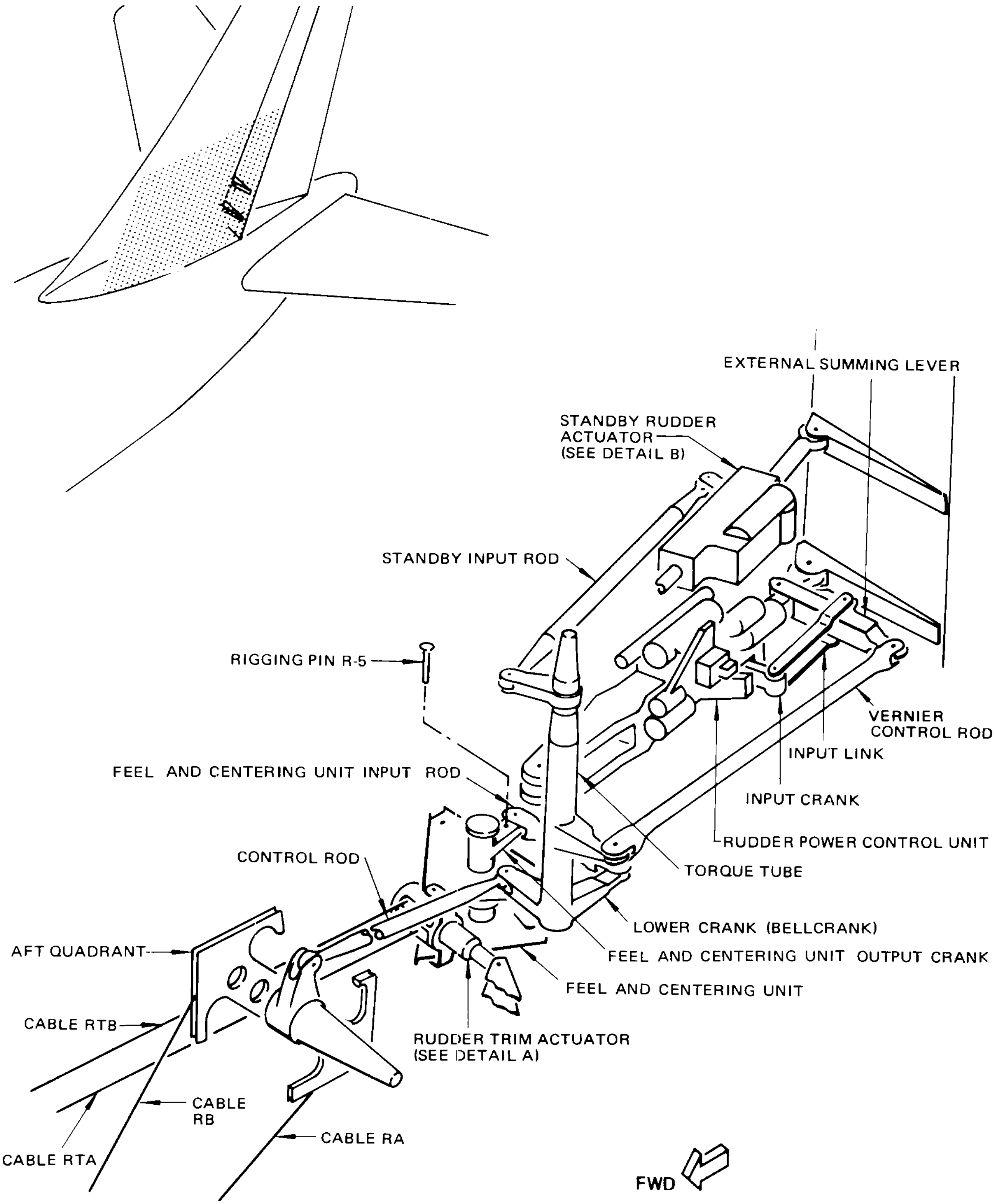
(5) Adjust forward rudder trim cable drum.
- (a) Check that rudder hydraulic systems A, B, and standby power are removed. See step (1).
- (b) Hold trim knob at zero units trim, check that cable is wrapped on forward cable drum as shown in detail A, figure 503. With feel and centering unit input rod disconnected from torque tube crank, check that rigging pin R-5 is easily inserted. If rigging pin R-5 cannot be inserted freely, adjust RTA and RTB cables per paragraph (6).
- (c) Connect input rod between feel and centering unit and torque tube. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

<u>CAUTION</u>: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

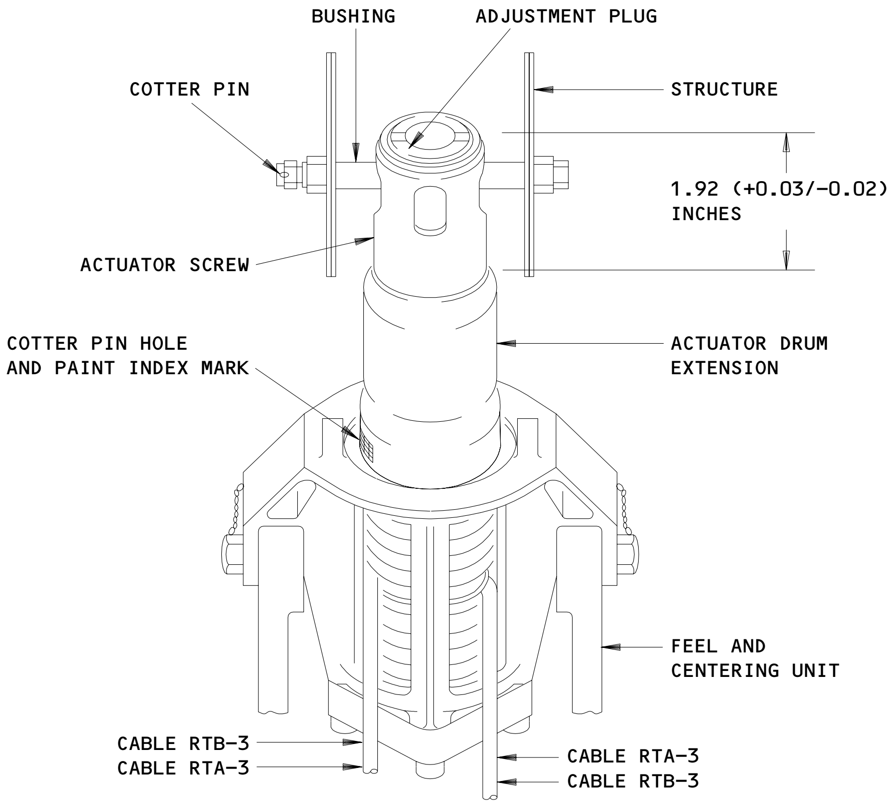
(6) Adjust rudder trim control cables RTA and RTB.
- (a) Check that rudder hydraulic systems A, B, and standby are removed. See step (1).
- (b) Disconnect feel and centering unit input rod from torque tube crank. Move rod to one side and secure (Fig.504).
- (c) Set indicating arrow on rudder trim knob at zero units of trim and hold in that position, with forward cable drum in neutral position per step (5).
- (d) If new cables are installed:
  - 1) Tighten RTA and RTB cables to 100 ±10 pounds tension to prestretch cables using turnbuckles located in stabilizer jackscrew compartment. Tighten turnbuckles on each cable an equal amount. If turnbuckle travel is inadequate for complete adjustment, further adjustment is possible by using turnbuckles located in ceiling of forward cargo compartment at fuselage station 451.
  - 2) (Applicable to new cable installations only. Check that rigging pin R-5 can be installed freely without binding. If adjustment is required, adjust RTA and RTB turnbuckles in opposite direction, maintaining cable tension specified in step (d), until rigging pin can be installed freely.



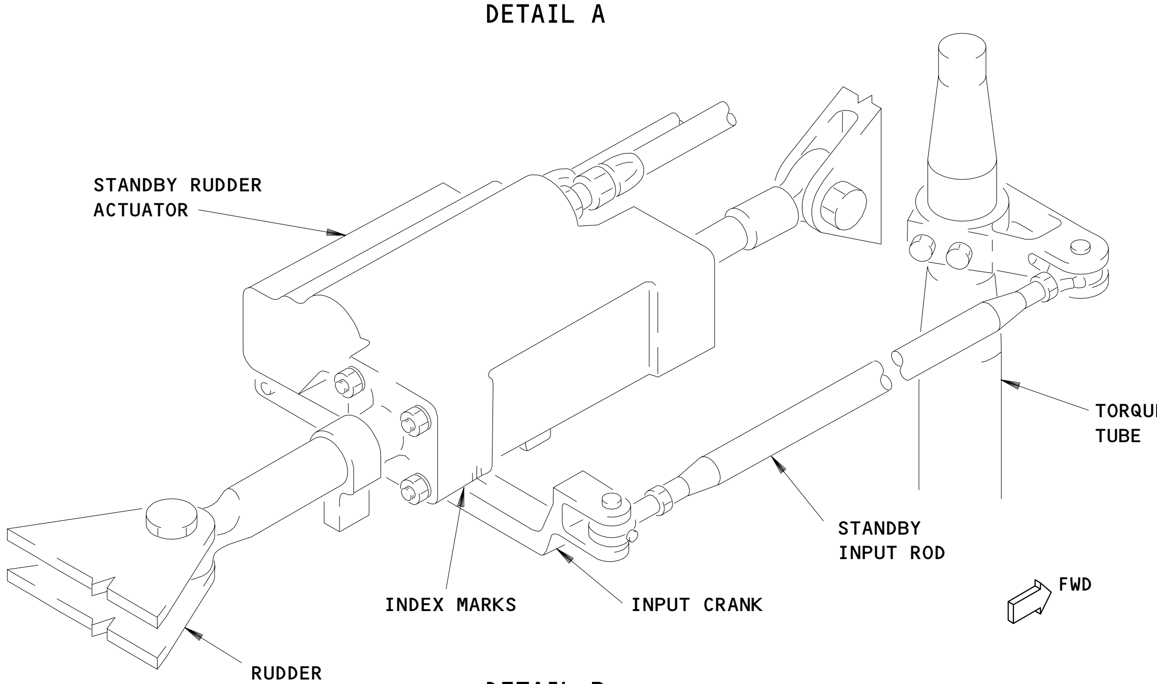
Rudder Forward Quadrant Adjustment
Figure 503



Rudder Aft Control Mechanism Adjustment
Figure 504 (Sheet 1)



DETAIL A



DETAIL B

Rudder Aft Control Mechanism Adjustment
Figure 504 (Sheet 2)

3) Cycle the system 10 times through full travel. Then reduce cable tension to load specified in table 2, Fig. 501 by adjusting turnbuckles on RTA and RTB cables an equal amount.

(e) Operate rudder trim knob through one full travel cycle and check cable tension per table 2, Fig. 501. If necessary, readjust cable tension and repeat.

(f) Set indicating arrow on rudder trim knob at zero units of trim and hold in that position.

(g) Check that rigging pin R-5 can be installed freely without binding. If correction is required adjust RTA and RTB turnbuckles in opposite direction, maintaining cable tension specified, until rigging pin can be installed freely. Also check that cotter pin hole on trim actuator is in center of paint mark on actuator drum.

(h) Remove rigging pin R-5.

(i) Adjust pressure seal at aft pressure bulkhead to align with RTA and RTB cables. Adjust by loosening seal retainer bolts and position seal properly (Ref 27-09-121 and 20-10-101).

(j) Install turnbuckle locking clips, and apply a thin coating of corrosive preventive material to exposed threads.

(k) Connect input rod between feel and centering unit and torque tube. Install bolts, washer, and nuts. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

(7) Adjust rudder control cables RA and RB.

(a) Check that hydraulic systems A, B, and standby power are removed (Ref step (1)).

(b) Check that rudder trim knob is set at zero units of trim and cycle rudder pedals per par. 2.C. to check for full pedal travel.

(c) When installing new forward quadrant busrod, shorten busrod by turning rod end two full turns. Connect busrod by installing bolt with spacers, washers, nut, and cotter pin.

(d) If new cables are installed:

1) Attach RA and RB cables to forward quadrants, then attach cables to aft quadrant and install rigging pin R-5 in feel and centering unit output crank.

2) Adjust turnbuckles on RA and RB cables to 260 ±20 pounds cable tension to prestretch cables. Keep adjustment on both sides of cables equal by checking that rigging pin R-3 can be inserted in captain's forward quadrant.
3) Remove rigging pins R-3 and R-5.
4) Check that cables do not contact pulley or quadrant flanges for total cable travel, that cables lie within 2 degrees of plane of pulley or quadrant, that cables are installed through grommets in structure as required, that cables are not deflected by fairleads, rub strips or grommets from rigged or normal operating position, and that pulleys rotate freely with no interference with guards.
5) Cycle rudder pedals 25 times through full stroke.

(e) Install rigging pin R-5 in feel and centering unit output crank.
(f) Deleted.
(g) Adjust cable tension to value shown in table 1, Fig. 501, using turnbuckles. Check that rigging pins R-3 and R-4 can be installed freely in forward quadrants.
(h) If both rigging pins cannot be inserted freely when cables have specified tension, proceed as follows:
1) Relieve cable tension.
2) Remove bolt through one rod end of forward quadrant busrod.
3) Adjust busrod as required and install bolt with spacers, washers, nut, and cotter pin.
4) Adjust cable tension to valve shown in table 1, Fig. 501, using turnbuckles. Check that rigging pins R-3 and R-4 can be installed freely in forward quadrants.

(i) With rigging pins R-3, R-4, and R-5 installed, check that rigging pins R-1 and R-2 can be installed freely in pedal arms.
(j) If either or both rigging pins R-1 and R-2 cannot be inserted freely in pedal arms, proceed as follows:

<u>NOTE</u>: Steps 1) through 6) may be required on all four tension rods.

1) Establish which pedal arm is out-of-line with rigging pin hole.
2) Loosen both checknuts on tension rod connected to affected pedal arm.
3) Remove bolt through forward tension rod end.
4) Adjust tension rod length until rigging pin R-1 or R-2 can be installed freely by turning rod end and/or rod as required, keeping lube fitting on rod end down.
5) Install tension rod end with bolt, washer, nut, and cotter pin.

6) Tighten checknuts.
(k) Remove rigging pins R-1, R-2, R-3, R-4, and R-5.
(l) Operate rudder pedals through one full travel cycle and check cable loads again.
(m) Adjust pressure seals at aft pressure bulkhead to align with RA and RB cables. Adjust by loosening seal retainer bolts and positioning seal (Ref 27-09-121 and 27-10-101).
(n) Install turnbuckle locking clips and apply a thin coat of grease to exposed threads.
(o) Check for thread engagement on four tension rods and one bus rod. End of rod (10 places) must cover part of inspection hole.

(8) Deleted.
(9) Adjust input to rudder power control unit.
(a) Provide rudder hydraulic systems A and B power (Ref 27-21-0).

<u>CAUTION</u>: PERSONNEL SHOULD STAND CLEAR OF ALL FLIGHT CONTROL SURFACES WHEN HYDRAULIC POWER IS APPLIED.

(b) Check that rudder trim is set at zero units of trim.
(c) Jiggle feel and centering unit input rod to ensure that system is centered.
(d) Insert rigging pin R-5 in fell and centering unit output crank. Rigging pin shall enter easily without movement of arm output crank.
(e) Measure rudder trailing edge deviation from neutral. (Rudder neutral position is defined as the position at which both sides of rudder trailing edge are within width of tab on rudder index plate.)
1) If rudder is at neutral, proceed to step (h).
2) If rudder trailing edge is outside of index tab, but less than 0.50 inch from nearest side of tab proceed to step (f).
3) If rudder trailing edge is more than 0.50 inch from nearest side of index tab proceed to step (g).
4) Figure 505
Deleted
(f) Adjust vernier control rod (fine adjustment) as follows:
1) Loosen both checknuts on rod assembly.
2) Turn adjustable sleeve to obtain rudder neutral position. (See step (e).)
3) Tighten both checknuts.
4) Proceed to step (h).

(g) Adjust vernier control rod (coarse adjustment) as follows:
   1) Position flight control switches A and B on forward overhead panel to OFF.

      CAUTION: RUDDER POWER MUST BE OFF BEFORE DISCONNECTING VERNIER CONTROL ROD FROM ACTUATOR INPUT CRANK.

   2) Loosen both checknuts on rod assembly.
   3) Remove clevis bolt connecting forward end of rod to input crank on torque tube.
   4) Adjust by turning sleeve and rod end together relative to tube, and rod end relative to sleeve an equal number of turns in the same direction, keeping number of threads exposed approximately equal in both parts. The sum of one-half turn of each is equivalent to 1/2 inch approximately at rudder trailing edge. Lengthen rod for right rudder and shorten for left rudder.
   5) Install clevis bolt connecting rod to input crank as follows:
      a) Position clevis of rod over lug on input crank.
      b) Install bolt assembly with washer under bolt head through clevis and tongue. Tighten nut on outer bolt to 50-65 pound-inches.
      c) Install locknut with washer over end of inner bolt and tighten nut to 12-15 pound-inches.

         CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

   6) Position flight control switches A and B to ON.
   7) Repeat fine adjustment starting with step (b).
(h) Check that combined total number of threads visible beyond checknuts on clevis and sleeve does not exceed 27.
(i) Remove rigging pin R-5.

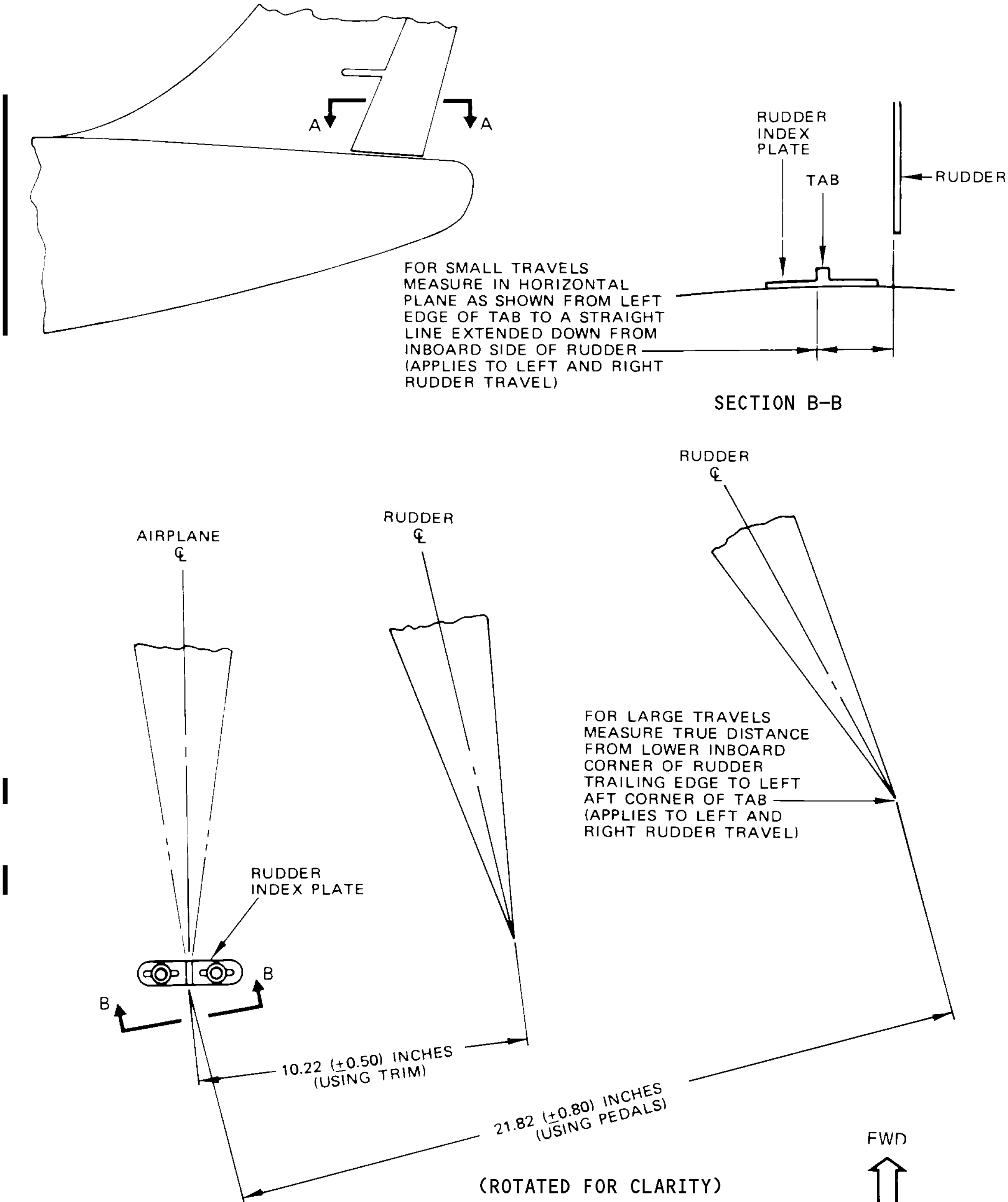
(10) Adjust input to standby rudder actuator.

NOTE: This procedure assumes that main rudder power control unit is correctly adjusted.

(a) Provide rudder systems A and B hydraulic power (Ref 27-21-0).

   WARNING: PERSONNEL SHOULD STAND CLEAR OF ALL FLIGHT CONTROL SURFACES WHEN HYDRAULIC POWER IS APPLIED.

(b) Check that rudder trim is set at zero units of trim.



Rudder Travel and Index Plate
Figure 505

(c) Jiggle feel and centering unit input rod to ensure that system is centered.
(d) Insert rigging pin R-5 in feel and centering unit output crank. Rigging pin shall enter easily without movement of output crank.
(e) Check alignment of index mark on standby actuator valve input crank and center mark on actuator body.
  1) If marks align, proceed to step (h).
  2) If marks do not align but misalignment is less than 0.02 inch, proceed to step (f).
  3) If marks do not align and misalignment is more than 0.02 inch, proceed to step (g).
(f) Adjust control rod (fine adjustment) as follows:
  1) Loosen both checknuts on rod assembly and back them off a few turns.
  2) Turn tube until index marks align. One full turn at tube moves index mark approximately 0.006 inch.
  3) Tighten both checknuts.
  4) Proceed to step (h).
(g) Adjust control rod (coarse adjustment) as follows:
  1) Position flight control switches A and B on forward overhead panel to OFF.

  CAUTION: HYDRAULIC POWER MUST BE OFF FOR THIS PROCEDURE.

  2) Loosen both checknuts on rod assembly.
  3) Remove bolt connecting aft end of rod to actuator.
  4) Turn aft rod end and tube together and/or aft rod end alone in the same direction. Half a turn of one rod end moves index mark approximately 0.015 inch.
  5) Install clevis bolt at aft end of rod.
  6) Position flight control switches A and B to ON.
  7) Repeat fine adjustment starting at step (b).
(h) Check for minimum thread engagement on rod. Rod end threads must be visible through inspection holes in tube at both ends.
(i) Remove rigging pin R-5.
(j) Restore airplane to normal hydraulic configuration. Refer to 27-21-0.
(k) Test rudder and rudder trim control system per paragraph 2.

2. Rudder and Rudder Trim Control System Test

A. General

(1) The test may be performed without removing components, breaking into hydraulic systems, or using rigging pins.

(2) Refer to figure 506 for method of measuring large and small rudder travel. Left and right rudder travel measurements when testing rudder are made with respect to left aft corner of indicator on index tab and lower inboard corner of rudder trailing edge.

(3) The rudder and rudder trim control system must be completely installed and rigged prior to test.

WARNING: RUDDER, ELEVATOR, AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON. ALSO THE RUDDER, RUDDER PEDALS, AND RUDDER TRIM KNOB SHOULD BE IN NEUTRAL AND ALL RIGGING PINS AND OTHER OBSTRUCTIONS REMOVED FROM THE SYSTEM BEFORE TURNING POWER ON. PRECAUTIONS SHOULD BE TAKEN TO PREVENT INADVERTENT APPLICATION OF HYDRAULIC POWER DURING THE POWER OFF PORTIONS OF THIS TEST.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 and 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(4) Rudder neutral position is defined as the position at which both sides of rudder trailing edge are within width of tab on rudder index plate (Fig. 506) and when rudder pedals are adjusted per step 1.C.(3).

B. Equipment and Materials

(1) Rudder Loading Block and Dial Indicator

(a) Loading block to distribute loads over a minimum of 5 square inches of rudder trailing edge. Suggested loading block: 0.125 inch thick (minimum) by 3 inches by 3 inches approximately. Wood or fiberglass, suitably padded to prevent skin damage.

(b) Dial indicator with a minimum range of 0.00 to 0.04 inch plus mounting stand for measuring small rudder movements. Measuring point shall be approximately 46 inches from rudder hinge line at lower end of trailing edge.

(2) Rudder Pedal Force Check Tool - F80212-19 (Preferred) or F80212-1 (Optional)

(3) Scale - 0 to 2 feed, graduated in inches, tenths and hundredths of an inch

(4) Rudder Trim Knob Torque Adapter - SE27-2011

C. Test Rudder and Rudder Trim Control System

(1) Test rudder pedal adjustment and rudder pedal limit travel.

(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).

(b) Set rudder trim knob to zero.

(c) Set rudder pedal to the midposition.

1) Turn the rudder pedal adjustment crank to move the rudder pedals full forward.

2) Turn the rudder pedal adjustment crank to move the rudder pedals full aft. Keep a record of the number of turns.

3) Turn the rudder pedal adjustment crank half of the number turns forward. Measure at pedal pivot point. Mark this as position 1 on the doghouse.

(d) Move captain's pedal adjustment to full forward, then move captain's left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure at pedal pivot point. Mark this as position 2 on rudder pedal doghouse.

(e) Measure total forward travel of left pedal. (From position 1 to position 2). Total forward travel shall be 6.86 inches minimum.

(f) Repeat steps (c) thru (e) with captain's right pedal.

(g) Move captain's pedal adjustment to full aft, then move captain's left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure at right pedal pivot point. Mark this as position 3 on rudder pedal doghouse.

(h) Measure total aft travel of right pedal. (From position 1 to position 3). Total aft travel shall be 6.89 inches minimum.

(i) Repeat steps (g) and (h) moving captain's right pedal forward and measuring total aft travel of captain's left pedal.

(j) Repeat steps (b) thru (i) with first officer's pedals.

(2) Test rudder hinge and power control unit bearing play.

(a) Place rudder, rudder pedals and rudder trim knob in neutral position.

NOTE: Neutral rudder position is defined as position where both sides of rudder trailing edge are within width of tab on rudder index plate (Fig. 506).

(b) Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).

(c) Fix rudder pedals in neutral position, and check that they do not move during the following steps.

(d) Mount dial indicator at lower end of rudder trailing edge.

(e) Use rudder loading block to apply a force of 12 ±4 pounds to left and release slowly.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE, ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 and 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(f) Record rudder position on dial indicator.
(g) Move rudder right with loading block using force of 12 ±4 pounds and release slowly.
(h) Record rudder position on dial indicator.
(i) Distance between rudder positions in steps (f) and (h) shall not exceed 0.04 inch.
(j) Move rudder left with loading block using force of 12 ±4 pounds and release slowly.
(k) Read rudder position on dial indicator. Rudder position shall be within 0.02 inch of step (f).
(l) If difference between rudder positions recorded in steps (f) and (h) is greater than 0.04 inch, rudder hinge bearings and/or power control unit bearings have too much play. Correct this condition and repeat test.

(3) Disconnect pushrod to nose wheel steering (Fig. 503).

NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

(4) Test rudder centering.
(a) Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).
(b) Move captain's left rudder pedal approximately 0.5 inch forward and release. Rudder shall return to neutral position.

NOTE: Neutral position is defined as position at which both sides of rudder trailing edge are within width of tab on rudder index plate.

(c) Move captain's right rudder pedal approximately 0.5 inch forward and release. Rudder shall return to neutral position.
(d) Position flight control switches A and B to OFF, then position either flight control switch A or B to STDBY RUD.
(e) Move captain's left rudder pedal approximately 1 inch forward and release. Rudder shall return to within 1.25 inches from index.

(f) Move captain's right rudder pedal approximately 1 inch forward and release. Rudder shall return to within 1.25 inches from index.
(g) Position flight control switches A and B to A ON and B ON.

(5) Test rudder pedal forces.
(a) Provide rudder systems A and B hydraulic power (Ref 27-21-0).
(b) With rudder pedals in neutral, set captain's and first officer's pedal adjustment to midposition.
(c) Install rudder pedal force checking tool on captain's right rudder pedal (Fig. 507). Push on tool handle. At point where rudders start to move, check compression gauge to see that maximum force is 18.0 pounds.

<u>NOTE</u>: When using rudder pedal force checking tool, multiply compression gauge reading by multiplication factor from Table.

(d) Repeat step (c) with captain's left pedal.
(e) Push on tool handle until captain's left pedal is 3.60 ±0.10 inches forward from neutral and measure force.
1) Check that maximum force is 82 pounds.
2) Check that minimum force is 51 pounds.
(f) Install rudder pedal force checking tool on captain's right pedal. Push on tool handle until captain's left pedal is 3.60 ±0.10 inches forward from neutral and measure force.
1) Check that maximum force is 82 pounds.
2) Check that minimum force is 51 pounds.
(g) Repeat steps (e) and (f) for first officer's pedals.

(6) Test rudder travel.
(a) Set rudder trim control knob to neutral.
(b) Provide rudder systems A and B hydraulic power. Refer to 27-21-0. Position flight control switch B to OFF, leave flight control switch A in ON position.
(c) Move captain's left pedal until forward quadrant stop is contacted. Measure rudder travel. Check that movement is 21.82 ±0.80 inches.
(d) Move captain's right pedal until forward quadrant stop is contacted. Measure rudder travel. Check that movement is 21.82 ±0.80 inches.
(e) Repeat steps (c) and (d) under following conditions:
1) Flight control switch A OFF and flight control switch B ON.
2) Flight control switch A OFF and flight control switch B in STDBY RUD position.

(7) Test rudder trim friction and travel.
(a) Provide rudder systems A and B hydraulic power (Ref 27-21-0).

(b) Use rudder trim knob torque adapter to rotate trim control knob from neutral to full right, and from full right to neutral. Then from neutral to full left and return. Maximum force required shall be 28 pound-inches as measured on trim control knob.
(c) Rotate trim conrol knob from neutral in each direction to stop. Measure knob travel. The total rotation in both directions shall be 4 turns +130 ±22 degrees.
(d) Rotate trim control knob in both directions until indicator is at 10. Check that rudder travel is 10.22 ±0.50 inches in each direction from neutral.

(8) Test Standby Rudder Actuator Deadband
(a) Provide rudder systems A and B hydraulic power (Ref 27-21-0).
(b) Check that trim is at neutral.
(c) Check that rudder is at neutral.
(d) Position flight control switches A and B to OFF, then position flight control switch B to STDBY RUD.
(e) With loading block, push hard on rudder to the right, then slowly ease off load.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS13.33 and 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(f) With hands off rudder, measure rudder position right.
(g) With loading block, push hard on rudder to the left, then slowly ease off load.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 and 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

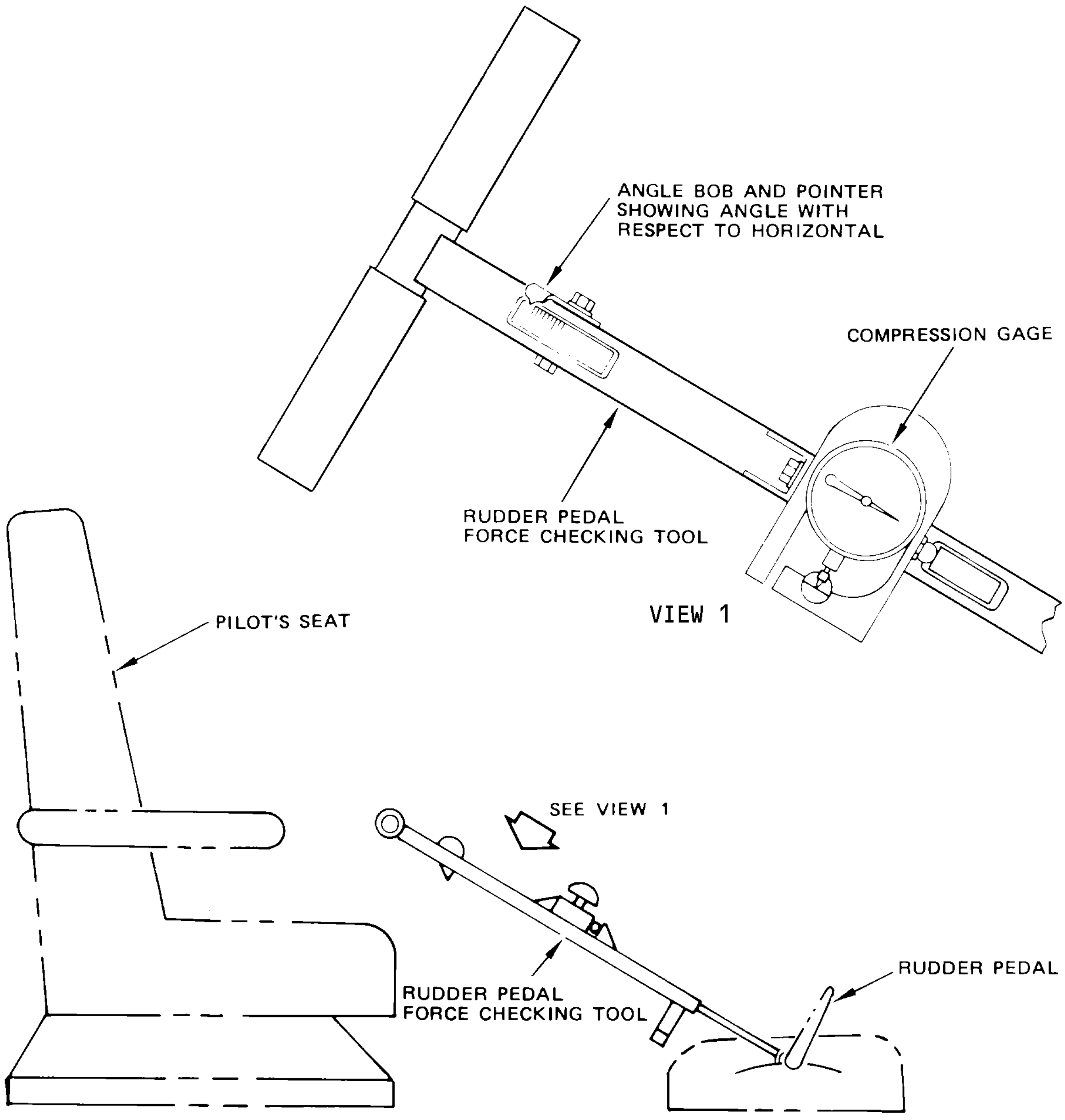
(h) With hands off rudder, measure rudder position left.
(i) Calculate difference between (f) and (h). If difference is greater than 0.2 inch, the standby actuator must be adjusted again.
(j) Position flight control switches A and B to ON.

(9) Do a test of the secondary slide in the dual servo valve of the rudder power control unit:
(a) Supply the rudder hydraulic power systems A and B (Ref 27-21-0/201).
(b) Slowly push the captain's left pedal forward until it touches the stop then release.
(c) As fast as possible, push the captain's right pedal forward. The right pedal should move smoothly forward until it touches the stop.
1) If the right pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).

(d) Release the right pedal.
(e) Slowly push the captain's right pedal forward until it touches the stop then release.
(f) As fast as possible, push the captain's left pedal forward. The left pedal should move smoothly forward until it touches the stop.
    1) If the left pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).
(g) Release the left pedal.
(h) Slowly push the first officer's left pedal forward until it touches the stop then release.
(i) As fast as possible, push the first officer's right pedal forward. The right pedal should move smoothly forward until it touches the stop.
    1) If the right pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).
(j) Release the right pedal.
(k) Slowly push the first officer's right pedal forward until it touches the stop then release.
(l) As fast as possible, push the first officer's left pedal forward. The left pedal should move smoothly forward until it touches the stop.
    1) If the left pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).
(m) Release the left pedal.

(10) Test yaw damper operation (Ref 22-11-0 A/T).
(11) Reconnect pushrod to nose wheel steering, if disconnected.
(12) Restore airplane to normal hydraulic configuration (Ref 27-21-0).
(13) Close all access doors and panels.

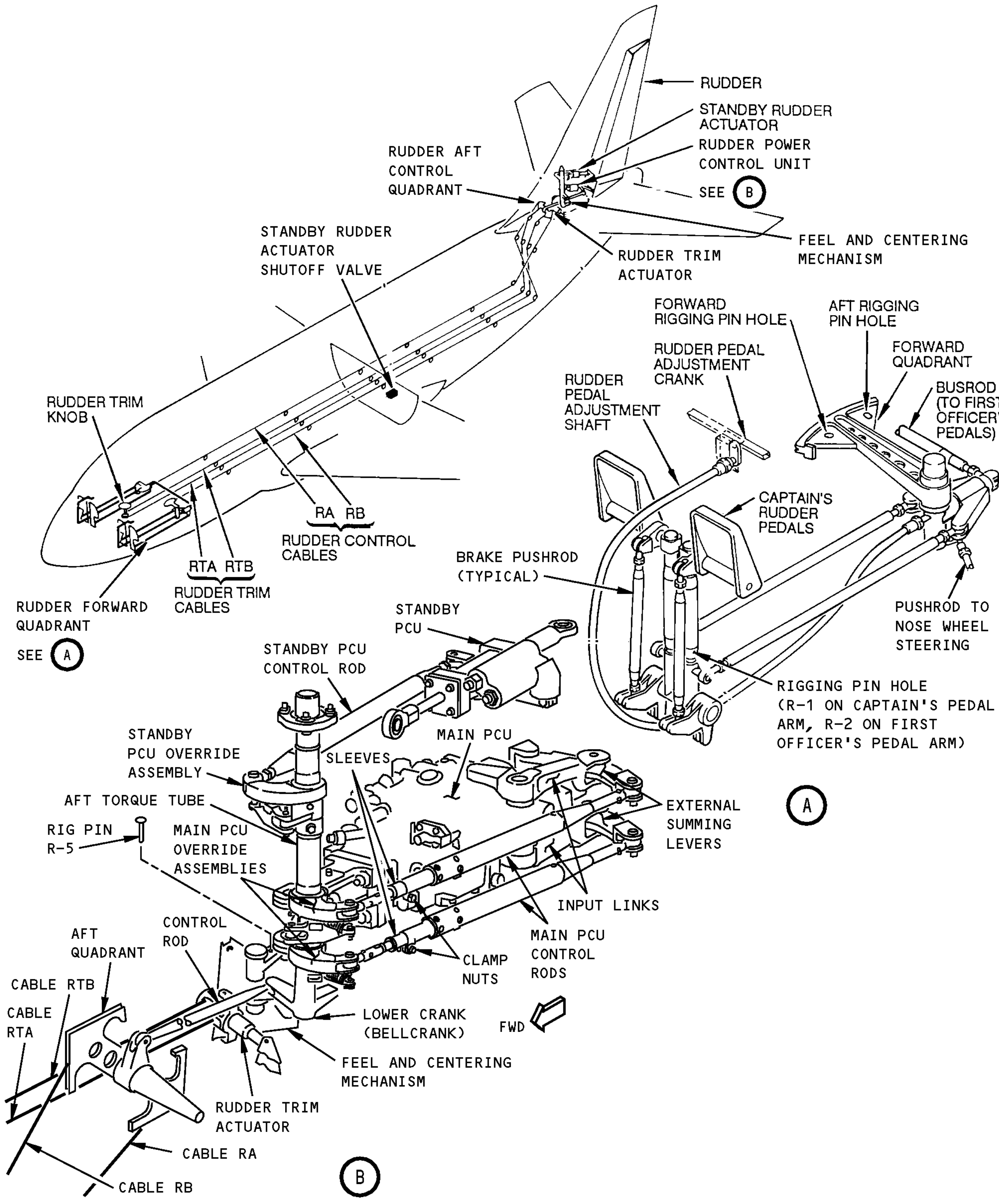
ANGLE WITH RESPECT TO HORIZONTAL	MULTIPLICATION FACTOR	ANGLE WITH RESPECT TO HORIZONTAL	MULTIPLICATION FACTOR
0°	1.0	25°	0.91
5°	1.0	30°	0.87
10°	0.98	35°	0.82
15°	0.97	40°	0.77
20°	0.94	45°	0.71



Rudder Pedal Force Checking Tool
Figure 506

RUDDER AND RUDDER TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Yaw control of the airplane is provided by a single conventional rudder without tab. There are two separate hydraulic systems powering one main power control unit. Rudder control backup is provided by a standby power unit, which is driven by a third hydraulic system. Any one of the three hydraulic systems will provide effective rudder control. Rudder trim is accomplished by operating a trim control wheel which repositions the rudder.
   B. The rudder control system is pedal operated by the captain or the first officer (Fig. 1). Pedal movement rotates the forward quadrants, which are cable connected to the aft quadrant. Rotation of the aft quadrant moves a control rod which is connected to a torque tube. Rotation of the torque tube moves the two cranks connected to the main rudder power control unit linkage. This in turn admits hydraulic fluid to the actuating cylinder, which moves the rudder.
   C. Rudder trim is initiated by rotation of the trim wheel located on the aisle stand (Fig. 3.). The trim wheel is attached to the forward cable drum, which is connected by cables to the trim actuator located in the vertical fin. Extension or retraction of the trim actuator jackscrew causes the feel unit housing to rotate. This moves linkages which rotate the torque tube, causing rudder power control unit input.
   D. Rudder feel is provided by a rudder feel unit. The feel unit is connected to the rudder control torque tube, which connects through linkage and cables to the rudder pedals (Fig. 3.).
   E. The rudder is fully power operated through its entire travel. The main rudder power control unit is hydraulically operated by hydraulic systems A and B simultaneously. The A and B systems can be independently activated by switches located on the P5-3 overhead panel. Either of the A and B switches can be used to activate the standby hydraulic system, open the rudder standby system shutoff valve, and supply pressure to the standby actuator.
   F. System A pressure is supplied by two engine-driven hydraulic pumps, one being located on each engine. System B pressure is supplied by two electric motor-driven hydraulic pumps. A and B flight control hydraulic modular units are identical in components and operation. Pressurized hydraulic fluid flows through the modular unit which consists of a spoiler shutoff valve, a flight controls shutoff valve, low pressure warning switch, compensator, and check valve. The flight controls shutoff valve controls the flow of hydraulic fluid to the ailerons, elevator, and rudder. When either the A or B flight control switch on the overhead panel is moved to STBY RUD, or if the automatic standby function is activated, the standby hydraulic system pump will start. The standby rudder actuator shutoff valve located in the standby hydraulic module will also open, porting hydraulic fluid to the standby actuator.



Rudder Control System Component Location
Figure 1

G. A rudder isolation shutoff valve is installed in the system A and the system B hydraulic lines between the respective system A and system B flight controls hydraulic modular units and the rudder power control unit. The valve is part of the hydraulic isolation shutoff valves module, which consists of six hydraulic isolation valves. The valves are individually operated and provide a means of isolating individual hydraulic components for ground leakage and flow tests.

2. Rudder

A. The rudder provides yaw control for the airplane. It is a monospar, aluminum alloy structure with chordwise ribs. On some airplanes, the rudder is of graphite/composite construction. The skin is made of honeycomb core fiberglass. On some airplanes, the skin is made of graphite reinforced epoxy. There is no rudder tab. There are seven rudder hinges, the bottom one being a thrust hinge. Balance weights are fastened to the rudder nose. These are aluminum alloy forgings with steel castings attached. On some airplanes, the balance weights are made of tungsten. Refer to Structural Repair Manual, Chapter 51, for rudder balancing. There is a stainless steel body seal attached to the bottom rib of the rudder. On some airplanes, the body seal is made of honeycomb nomex core material. This seals the gap between the rudder and the body.

3. Rudder Pedals

A. The captain and first officer are each provided with a pair of rudder pedals which are used for controlling the airplane about its vertical axis (Fig. 1). Each pair of pedals consist of right and left pedals mounted on a shaft. The pedal shaft is attached to the upper end of the pedal arm assembly. The lower end of the pedal arm assembly is mounted on a support shaft which is attached to the structure below the floor. The rudder pedals are located below the captain's and first officer's instrument panel. Rudder pedal support and quadrant assemblies are accessible through the lower nose compartment.

B. Fore and aft movement of the pedals is transmitted by the two pushrods to the jackshaft yoke. The rotary motion of the jackshaft yoke is passed to the forward quadrant by means of the jackshaft. The two sets of rudder pedals are bussed together by means of a bus pushrod connecting the two jackshaft assemblies. Toe pressure on the rudder pedals causes pedals to rotate about their shafts and initiate braking action.

4. Rudder Pedal Adjustment Crank (Fig. 1)

A. The two pairs of rudder pedals can be adjusted independently to suit the captain and first officer. This is accomplished by means of the rudder pedal adjust shaft. The rudder pedal adjustment mechanism consists of an adjustment crank, adjustment shaft, a jackscrew, and pedal adjustment nut attached to the jackshaft assembly.

B. The adjustment crank is located on the instrument panel forward of the control wheel. It is connected to a flexshaft routed forward under the instrument panel, then down under the floor, and aft to the universal joint in the rudder control jackshaft assembly. Rotation of the rudder pedal adjustment crank actuates the jackscrew which causes the yoke, containing the pedal adjustment nut, to move fore and aft.

C. Rudder pedal adjustment crank and crank handle stops are installed to prevent the rudder pedal adjustment screw from being backdriven by heavy foot pressure simultaneously applied to both rudder pedals. The crank incorporates a spring-loaded pin within the knob. The stops are spacers installed beneath the upper two bolts on the crank bearing housing or are incorporated into the crank housing bearing retainer. Rotation of the crank handle is prevented in either direction beyond the stop blocks, by contact of the spring-loaded pin that protrudes from the crank handle. To permit crank rotation for rudder pedal adjustment, the knob must be pulled aft so the pin clears the stops.

5. <u>Rudder Aft Control Quadrant (Fig. 2)</u>

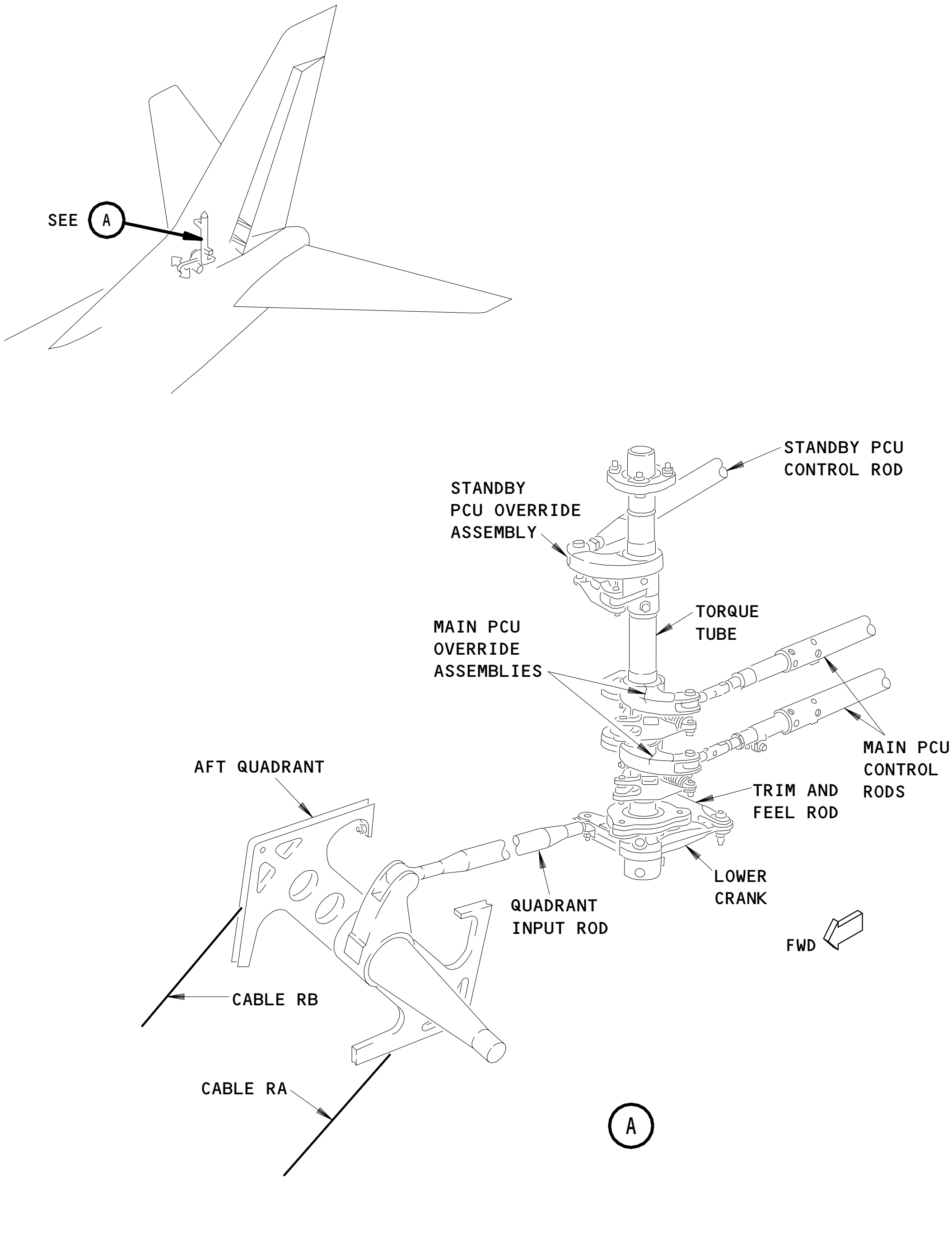
A. The rudder aft control quadrant transmits the motion of the rudder control cables to the dual load path torque tube. The assembly consists of a quadrant bolted to a shaft. The shaft is mounted horizontally in the vertical stabilizer.

B. Rotation of the quadrant pushes or pulls the quadrant input rod which is attached to a crank on the rudder control torque tube.

6. <u>Rudder Control Torque Tube</u>

A. The rudder control torque tube assembly transmits rudder pedal inputs to the rudder feel and centering unit, the main power control unit, and the standby power control unit (Fig. 2). The torque tube assembly consists primarily of a dual load path torque tube, a dual load path lower crank assembly, a lower bearing assembly, and three separate and independent power control unit input override devices.

B. The torque tube consists of two 15-5 CRES tubes bonded and swaged together. The dual load path lower crank is connected to the pushrod from the rudder aft control quadrant, and to the feel and centering mechanism. This crank consists of two halves bonded and riveted together, and attached to the torque tube with multiple fasteners. The three power control unit override devices connect the torque tube to the main and standby rudder PCU input rods (Fig. 2). The two lower override devices connect to the main PCU linkages and the upper override connects to the standby PCU. Each override is a simple spring loaded roller and cam mounted to the torque tube. Each override allows input commands to continue to be transmitted to the remaining free input control rods in the event an input rod or PCU linkage becomes jammed. The breakout force for each override is 18 pounds (80 newtons) applied at the rudder pedals.



Rudder Aft Control Quadrant and Torque Tube
Figure 2

C. The torque tube assembly is mounted vertically within the vertical fin hinge ribs via two bearing assemblies. The lower bearing assembly located on the torque tube attaches to the structure with three bolts. The upper bearing assembly, separate from the torque tube, attaches to the structure with four bolts.

7. Rudder Trim Control Mechanism

A. The rudder trim control mechanism provides a means for controlling the directional trim of the airplane and indicates the units of rudder trim (Fig. 3.). The control mechanism consists of a rudder trim knob and indicator on the aft end of the control stand, and a cable drum attached to the knob through a vertical shaft.

B. Movement of the trim knob rotates the shaft and drum, which is connected by cables to the rudder trim actuator. Rotation of the knob moves the indicator a proportionate amount on the indicator scale. Maximum rudder trim travel is 12 degrees in both directions. The indicator scale corresponds by being divided in 10 divisions in both directions.

8. Rudder Trim Actuator (Fig. 3)

A. The rudder trim actuator converts cable motion into a linear force which is applied to the rudder centering and feel mechanism. The actuator assembly consists of a cable drum and jackscrew nut, actuator housing, screw, compression spring and spring guide (Fig. 3.). The actuator compression spring produces a tension force between the nut and screw to prevent backlash. The jackscrew end of the actuator is attached to fin structure and the actuator housing is connected to the centering and feel mechanism. The jackscrew also has a vernier plug for length adjustment.

B. Rotation of the cable drum causes the drum-and-nut and actuator housing to move linearly on the screw. Jackscrew nut forces are transferred to the actuator housing through a thrust bearing located in the lower end of the actuator. Movement of the actuator housing causes the centering spring and feel assembly to rotate.

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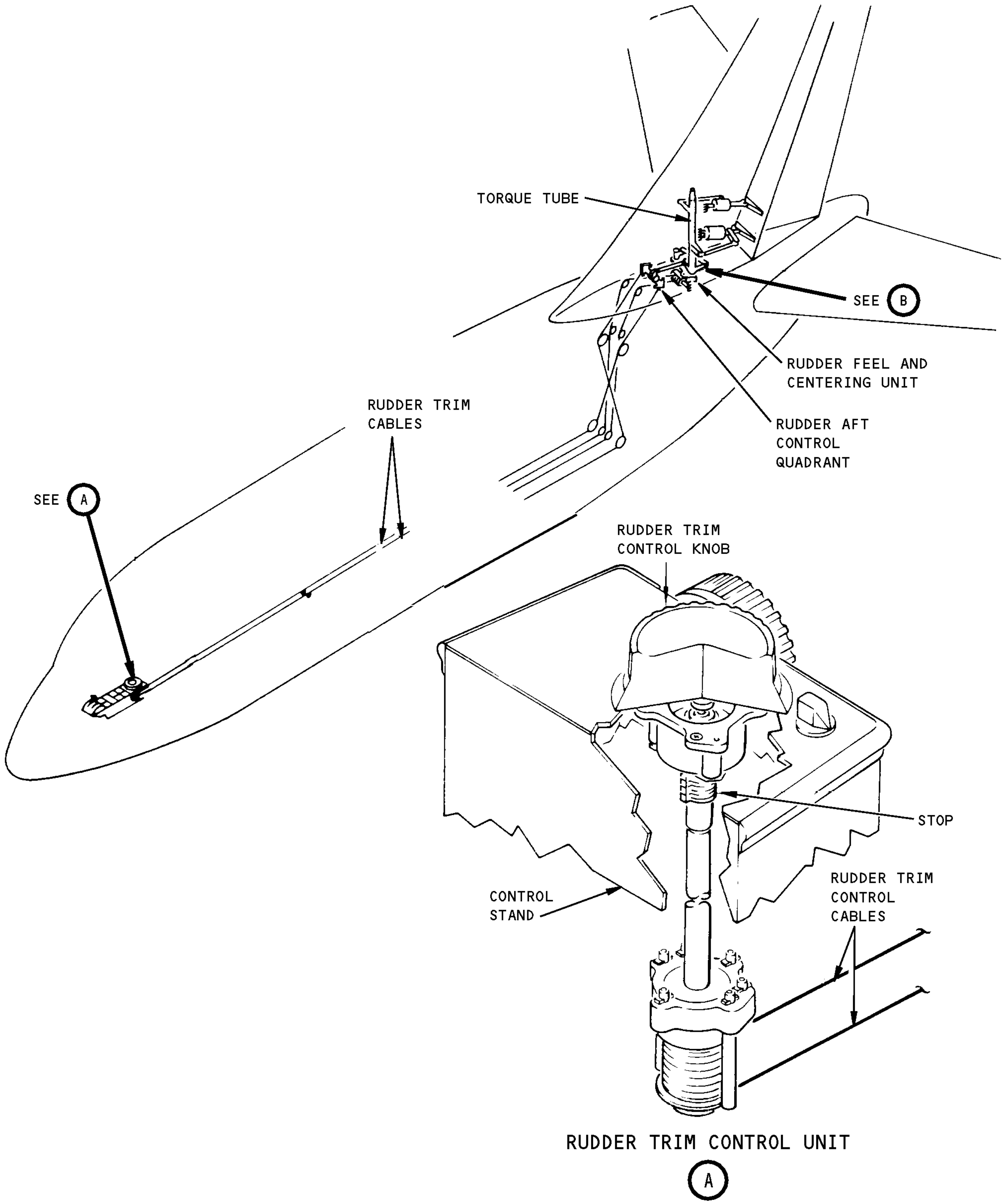
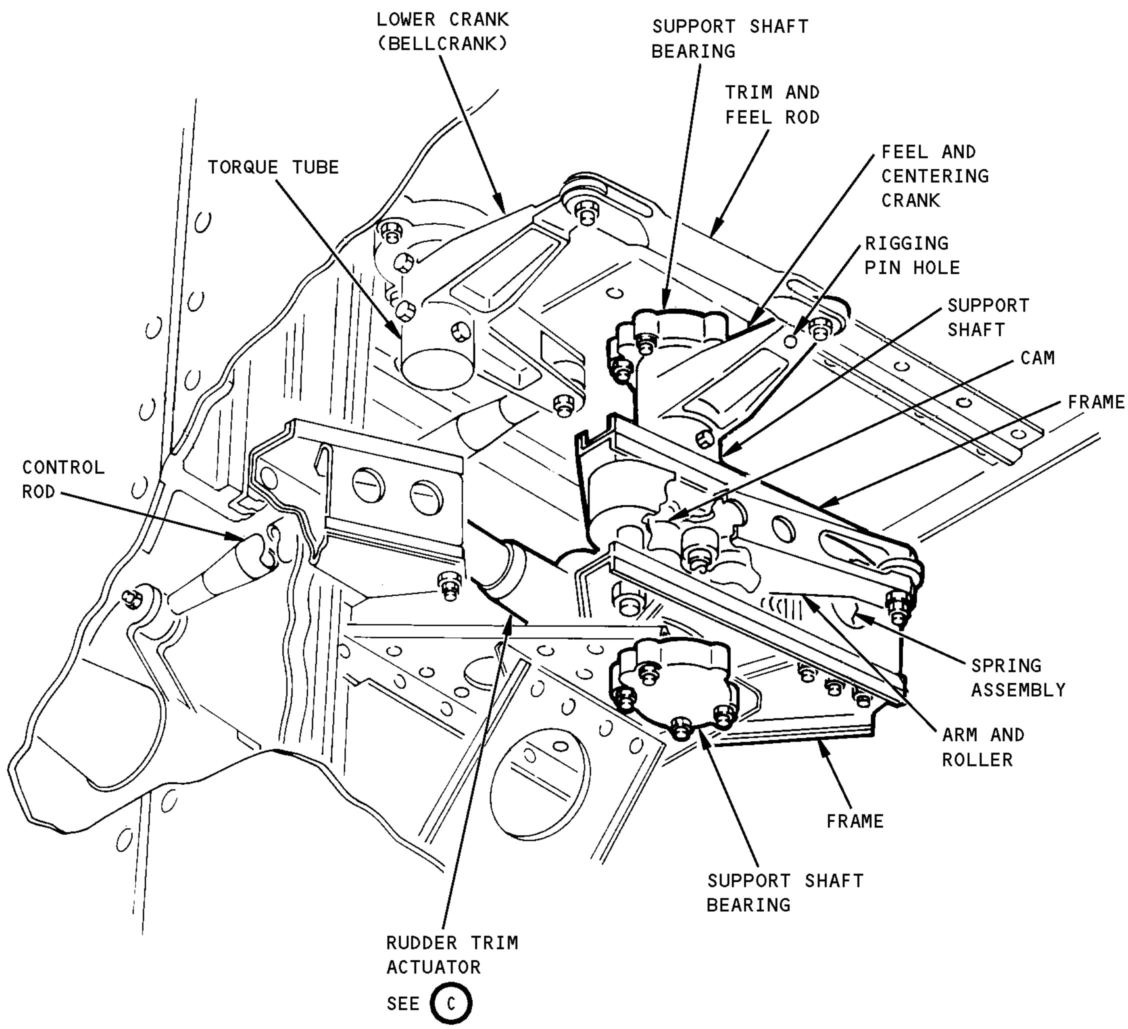
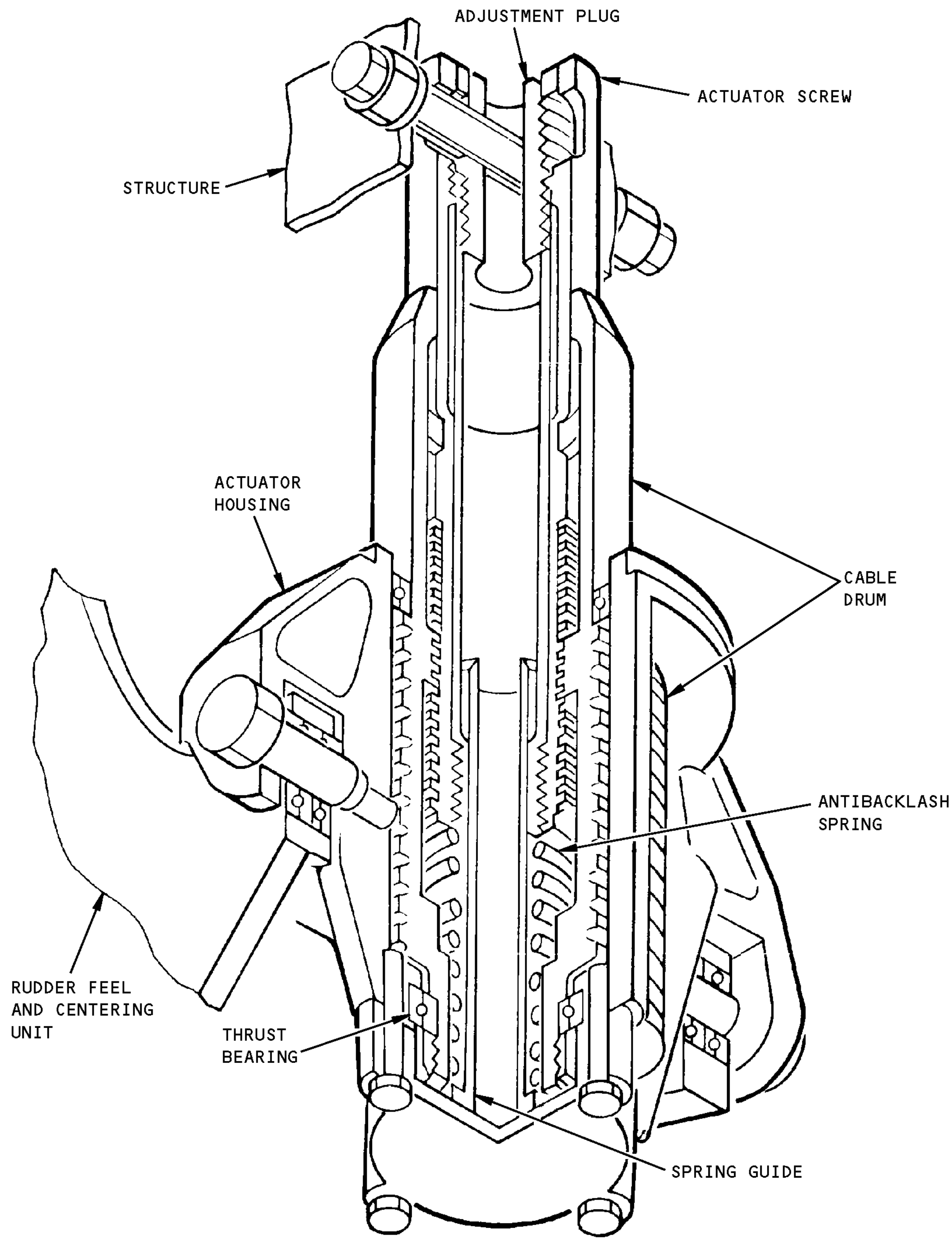


Rudder Trim and Feel System
Figure 3 (Sheet 1)



Rudder Trim and Feel System
Figure 3 (Sheet 2)



RUDDER TRIM ACTUATOR
C

Rudder Trim and Feel System
Figure 3 (Sheet 3)

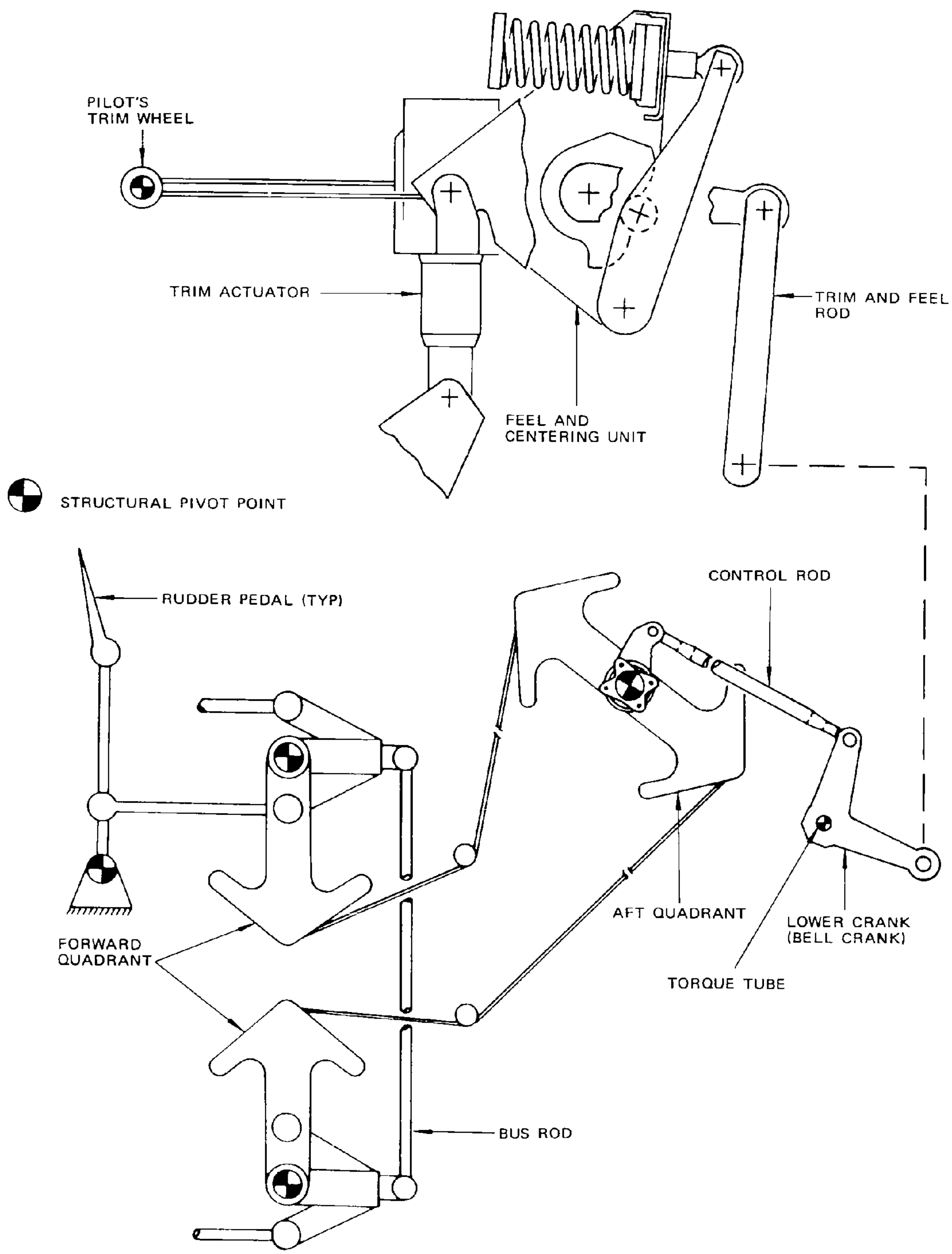
10. Rudder Feel and Centering Mechanism (Fig. 4)

A. The rudder feel and centering mechanism consists of the feel and centering unit which provides artificial feel to the pilots' pedals and centers the rudder. The feel and centering unit is located below the rudder power unit in the vertical fin (Fig. 3). The feel and centering unit has the following parts: A support shaft, a feel and centering crank, two frames, an arm and roller with a spring assembly, and a cam. The support shaft is bearing mounted on structure. The feel and centering crank is fixed to the support shaft and is connected through the trim and feel rod to the lower crank on the torque tube. The two frames are bearing mounted on the support shaft. The arm and roller and the spring assembly attach to and rotate with the two frames. The cam is fixed to and rotates with the support shaft. The cable drum end of the rudder trim actuator is supported by the forward side of the two frames. When the rudder pedals are displaced, the torque tube rotates causing offset of the trim and feel rod and in turn rotation of the feel and centering crank, the support shaft and the cam. As the cam rotates, the arm and roller are displaced out of the detent position to extend the spring assembly and provide artificial feel. Rudder trim input through the rudder trim actuator rotates the two frames with the arm and roller and spring assembly. The force of the spring assembly holds the arm and roller in the cam detent and causes the cam to rotate also. Rotation of cam causes subsequent motion of the support shaft, the feel and centering crank, the trim and feel rod, the lower crank, the torque tube which then causes input to the rudder power unit repositioning the rudder. At the same time the lower crank causes input to the rudder control system with movement of the pilots' pedals.

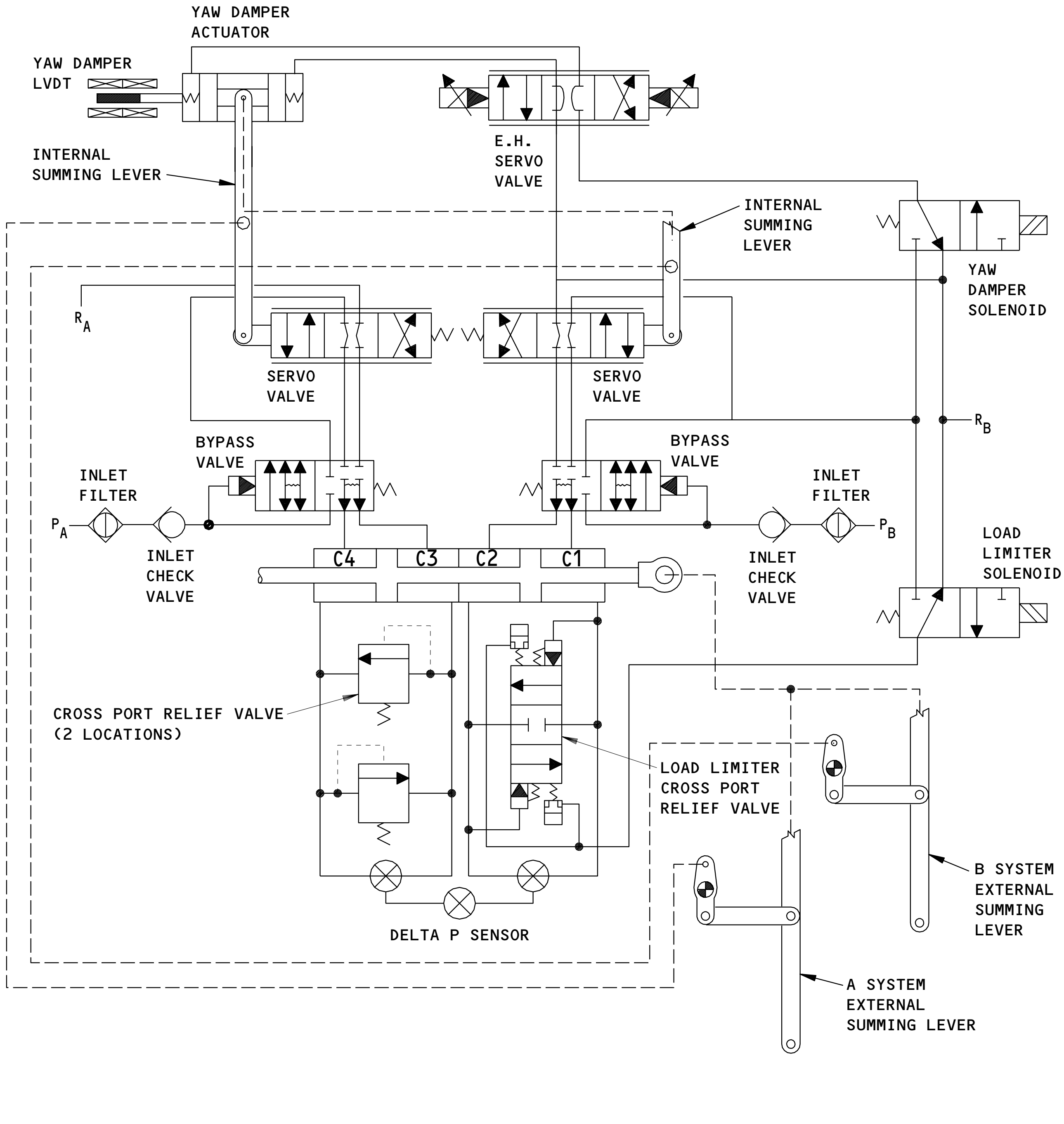
11. Main Rudder Power Control Unit (PCU) (Fig. 5)

A. The PCU moves the rudder right or left when actuated by rudder pedal input, rudder trim, or yaw damper. It also provides wind gust snubbing when the airplane is parked. The unit is located in the vertical fin (Fig. 1). The body is fixed to fin structure and the power head to the rudder.

B. The PCU is a dual tandem hydro-mechanical servo, powered by hydraulic systems A and B. The PCU is internally separated into an A and B side, providing an output force equivalent to two PCUs. Each half of the PCU consists of a balanced actuator, bypass valve, inlet filter and inlet check valve, all contained in a separate manifold for each system. The A and B manifolds are bolted together to make up a single PCU package, controlled by two independent input linkages that drive two independent servo valves which are controlled by externally mounted breakout devices for jam protection.



Rudder Feel and Centering Mechanism Schematic
Figure 4



Main Rudder Power Control Unit Schematic
Figure 5

C. The PCU yaw damper function is to minimize dutch roll during manually and automatically controlled flight. The yaw damper provides rudder displacement proportional to the yaw rate, and opposing the yaw direction of the airplane. The yaw damper input is in series with the pilots' input and is not felt at the rudder pedals.

D. The Force Fight Monitor (FFM) compares the delta pressure of the A system actuator with the delta pressure of the B system. When the delta-delta pressure exceeds 3150 psi for 5 seconds, the FFM provides an electrical ground to the P5-3 panel to command pressure to the standby actuator, open the rudder standby system shutoff valve, and turns on the STBY RUD ON light. The FFM contains a latch that can be reset by following the fault isolation procedure for the STBY RUD ON light (AMM 27-21-0/101).

E. A Rudder Pressure Limiter (RPL) is installed on the main PCU "B" piston to limit output from 3000 psi to 2200 psi when the airplane climbs above 1000 feet above ground level (AGL). Hydraulic pressure is restored from 2200 psi to 3000 psi when the airplane descends through 700 feet AGL. The RPL is controlled by the yaw damper coupler. The RPL defaults to full pressure following loss of electric power.

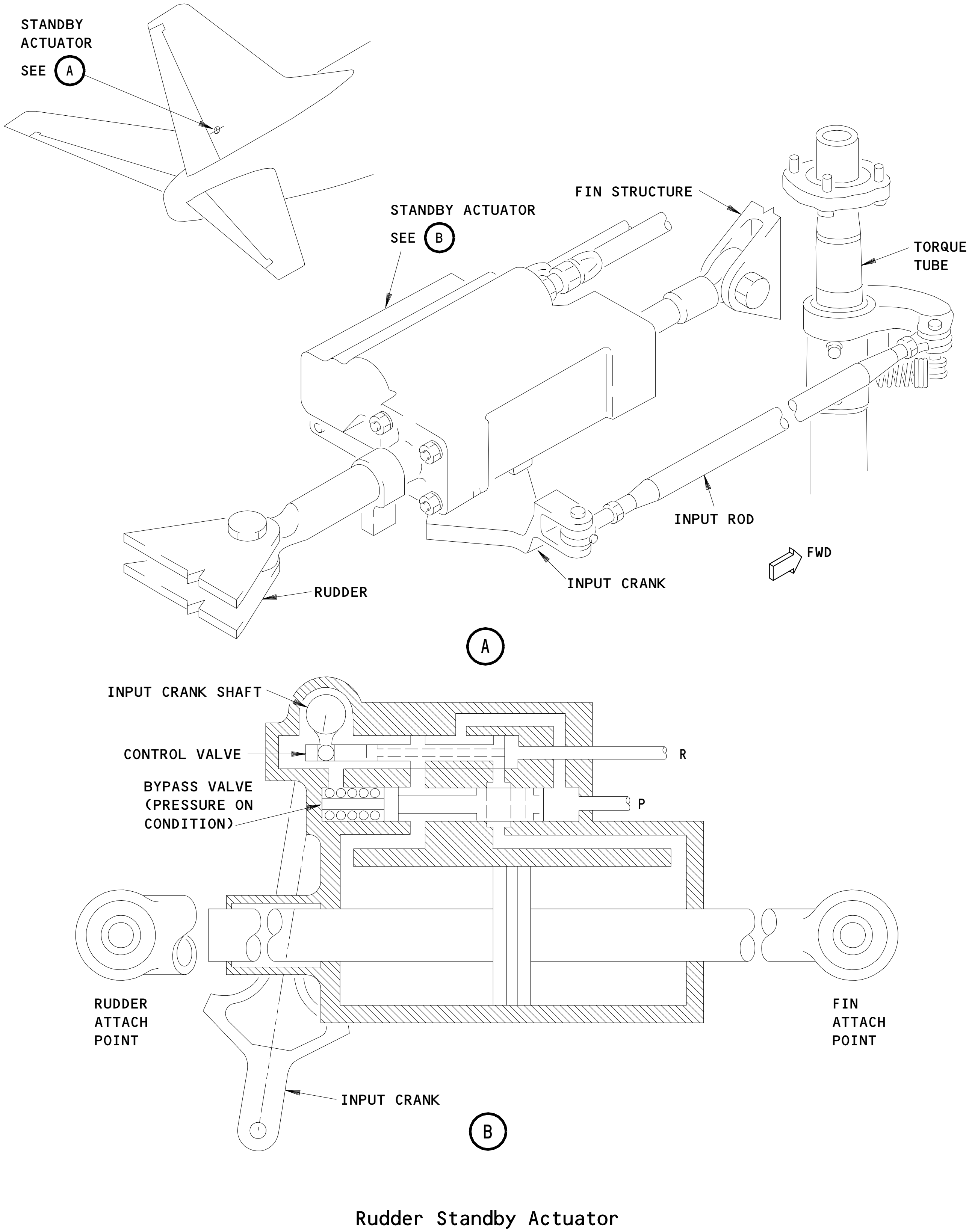
F. Pilots' input, by rudder pedals or trim wheel, is transmitted through cables and linkages to the PCU input cranks. The input cranks rotate and move the control valves which port hydraulic pressure to the actuating cylinder. The amount of control valve movement is also governed by the yaw damper input. The pilots' input and yaw damper input are summed internal to the main PCU. The PCU piston rod end is attached to the rudder. Extension or retraction of the rod moves the rudder left or right. The external summing levers attached to the rod provide feedback to return the control valves to neutral and to stop the rudder at the desired position.

12. Rudder Pressure Reducer (Fig. 8)

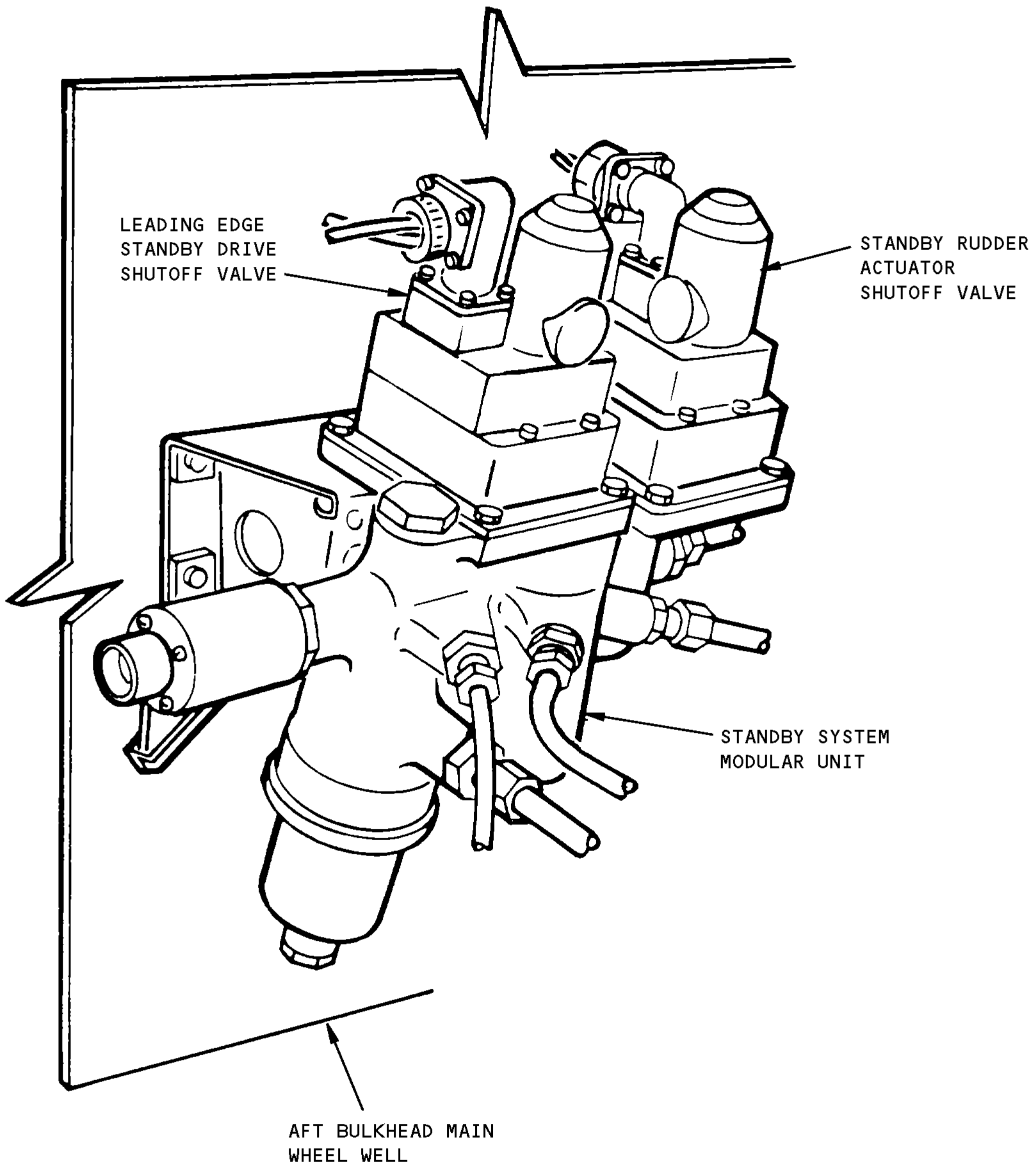
A. A Rudder Pressure Reducer (RPR) is connected to the "A" system hydraulic line upstream of the main rudder PCU. Hydraulic pressure to the rudder is reduced from 3000 psi to 1800 psi when the airplane climbs above 1000 feet above ground level (AGL). Hydraulic pressure is restored from 1800 psi to 3000 psi when the airplane descends through 700 feet AGL. The RPR defaults to high pressure following loss of electric power or loss of B hydraulic system.

B. The same control logic is used for the rudder pressure reducer (RPR) and rudder pressure limiter (RPL) and is located within the yaw damper coupler. The RPL, however, is not disengaged when A hydraulic system is depressurized.

C. The function of the RPR and RPL is to reduce the rudder authority by approximately one-third at higher speed condition. The reduced rudder deflection will permit more effective lateral control in countering rudder inputs, and will give the pilot more time to recover from a full rudder input, regardless of the cause.



Rudder Standby Actuator
Figure 6



Standby Rudder Actuator Shutoff Valve
Figure 7

D. The RPR does not involve the system-B portion of the rudder power and control, and will has no effect on the yaw damper system operation. The RPR is monitored by the yaw damper coupler. Failure of the RPR to disengage when commanded or a failure resulting in reduced pressure less than 500 psi is indicated by illumination of FLT CONTROL A LOW PRESSURE warning lamp on the Pilot's Overhead Panel P5-3 (Fig. 9). The yaw damper coupler also has BITE for the rudder pressure reducer (AMM 22-12-01/001).

E. The RPR can be commanded to high pressure using the manual lever. In this configuration, the RPR will not respond to yaw damper coupler command to reduce pressure.

13. Standby Rudder Actuator Shutoff Valve (Fig 7)

A. The standby rudder actuator shutoff valve is located on the aft bulkhead of the main wheel well. The unit is mounted on the standby system modular unit by four bolts. The valve is electrically operated from a 28 volt-dc source, and consists of a motor spool sleeve and cartridge. The cartridge containing the spool and sleeve fits into a cavity in the modular package. The electric motor is splined to a cam which converts rotary motor action into linear spool travel in the sleeve. The valve is equipped with a manual override lever and position indicator. The manual override allows the valve to be positioned with electrical power off. The valve is on when the lever is in position 1, and off when the lever is in position 2.

14. Standby Rudder Actuator (Fig 6)

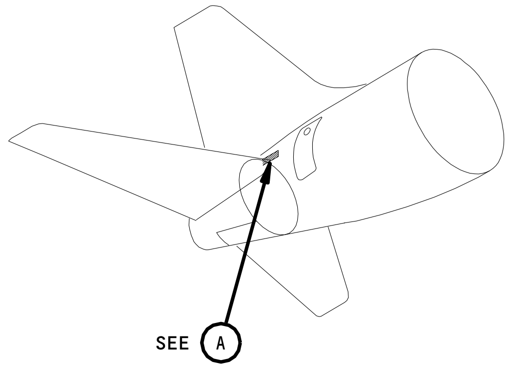
A. The standby rudder actuator positions the rudder when hydraulic systems A and B are not available. The actuator consists of a bypass valve, control valve, and the actuating cylinder. Standby hydraulic power for the standby actuator is controlled by system A and B switches on the overhead flight controls panel.

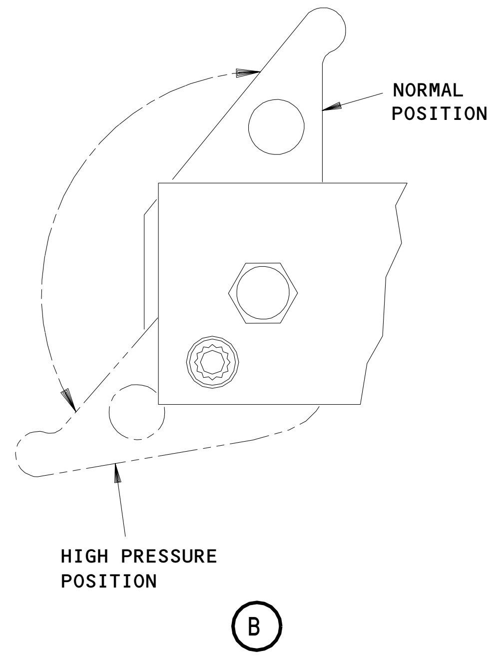
B. The STBY RUD ON light on the P5-3 overhead panel will illuminate when the standby rudder actuator is pressurized. The standby rudder actuator is pressurized when either A or B flight control switch on the P5-3 panel is switched to standby or when the main PCU force fight monitor trips. The Master Caution and the Flight Control annunciators will also illuminate.

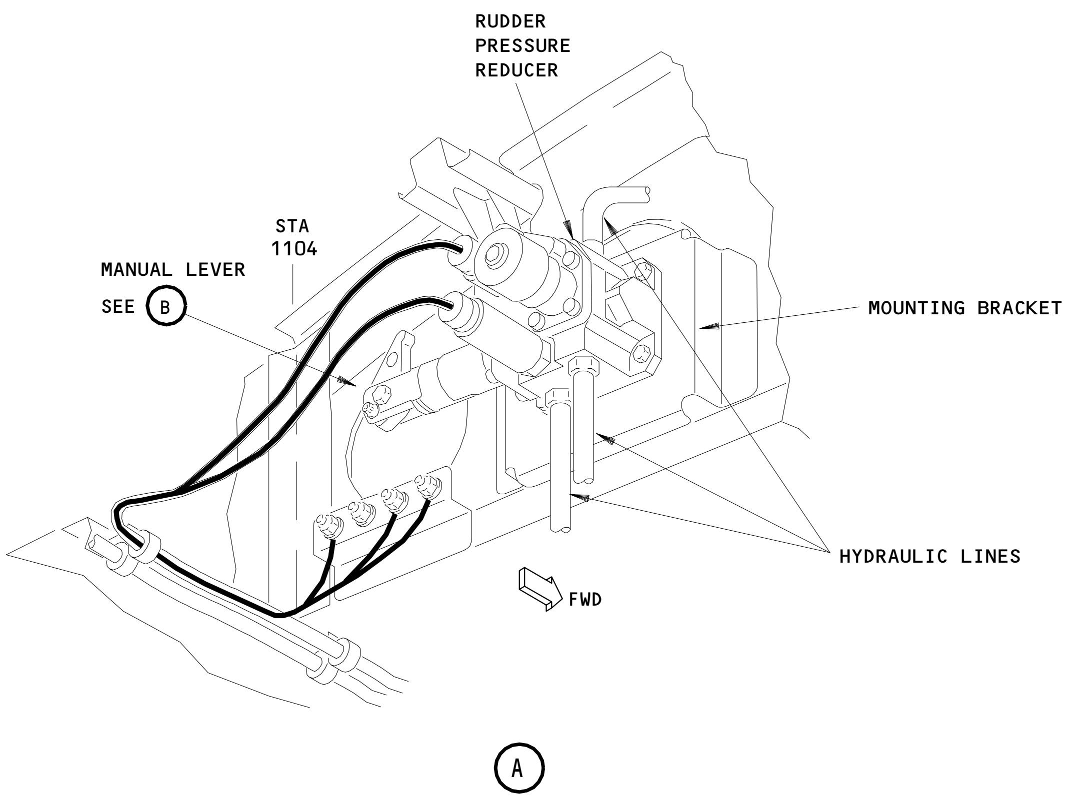
C. Hydraulic pressure supplied from the standby system operates the actuator. Rotation of the input crank will position the control valve to port fluid to the actuating cylinder.

15. Operation

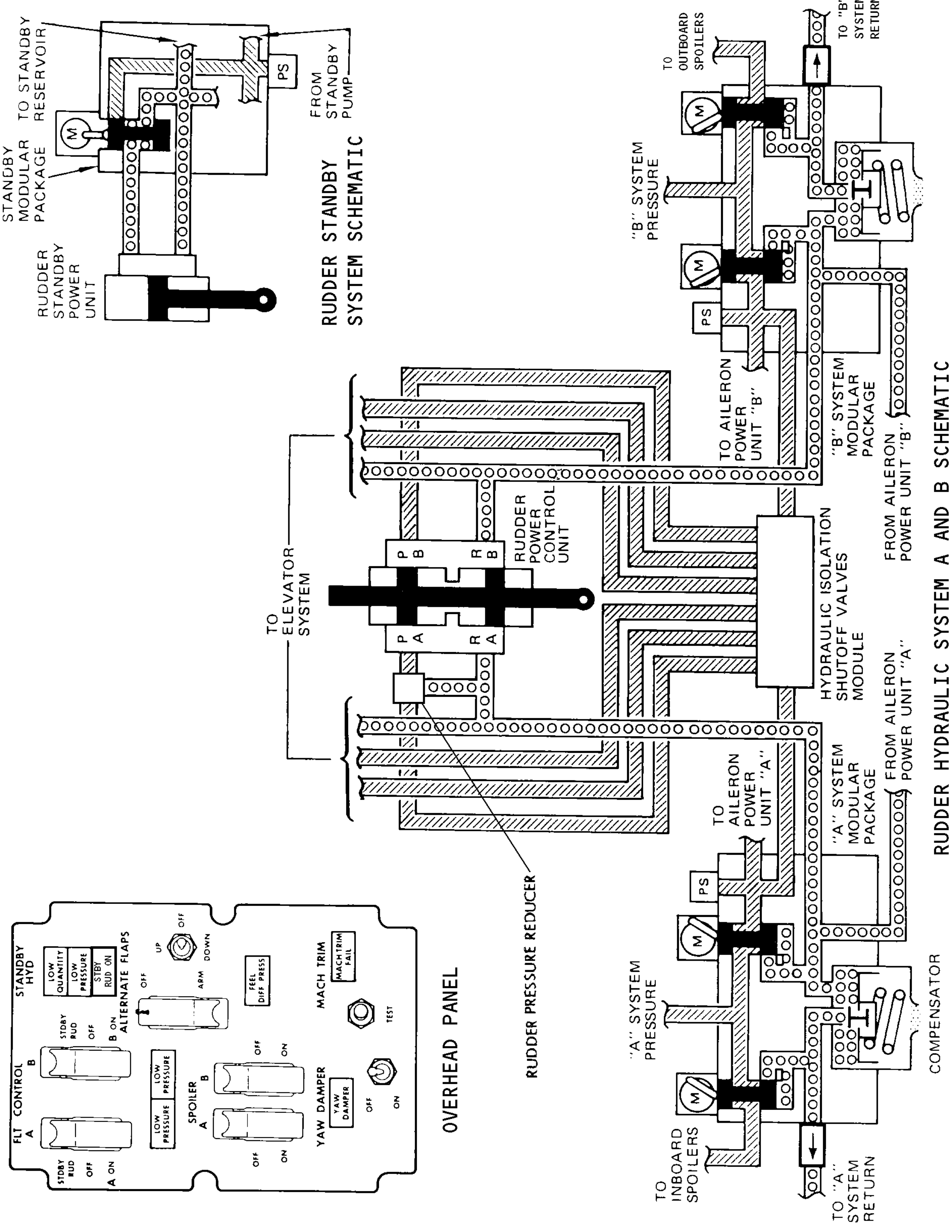
A. The rudder control system is operated by two sets of pedals, one for each pilot. Pedal movement is transmitted to forward quadrants and jackshafts by rods. The two forward quadrants are interconnected by a bus rod. Cables transmit forward quadrant motion to the aft quadrant located in the vertical fin. Rotation of the aft quadrant in turn causes rotation of the rudder control torque tube.







Rudder Pressure Reducer
Figure 8



Rudder Hydraulic System Schematic
Figure 9

B. The rudder control torque tube, when rotated, provides simultaneous input to the rudder power control unit, the standby rudder actuator, and to the rudder feel and centering mechanism. In normal operation the main power control unit is powered by hydraulic systems A and B (Fig. 9). Control input to the main power control unit occurs when a torque tube-mounted crank rotates. The crank is connected by a rod to the input linkage of the power unit. As the input linkage moves, the control valve opens and ports hydraulic fluid to the actuator cylinder. The actuating piston then moves and causes rudder deflection. Nominal rudder travel is 26 degrees in both directions.

C. If hydraulic systems A and B are not available to power the rudder, then standby power may be turned on, and the rudder operated with the standby actuator. Rudder pedal input positions a servovalve in the standby actuator which ports fluid to the actuating piston. Movement of the piston closes off the ports when the desired rudder travel is reached.

D. In addition to operating the rudder power unit and the standby actuator, the torque tube moves the centering cam in the feel and centering mechanism. When the camshaft is rotated it displaces the spring-loaded cam follower.

E. If rudder trim is adjusted with the power control unit depressurized, the drag of the unpowered rudder system will allow the system to remain out of center. This will force the rudder feel and centering mechanism cam follower out of the cam detent. Then when hydraulic power is applied, the rudder pedals and rudder will rapidly move to the newly trimmed position.

RUDDER AND RUDDER TRIM CONTROL SYSTEM - ADJUSTMENT/TEST

1. Rudder and Rudder Trim Control System Adjustment

A. General

(1) The rudder system is rigged to synchronize the components of the system. This is accomplished by adjusting all components and cables to neutral position, from forward to aft of the airplane, then adjusting the rudder to neutral position. Five rudder system rigging pins are needed to adjust the system; four in the nose section, and one in the tail section.

NOTE: If rudder trim is adjusted with the power control unit depressurized, the drag of the unpowered rudder system will allow the system to remain out of center. This will force the rudder feel and centering mechanism cam follower out of the cam detent. Then when hydraulic power is applied, the rudder trim control knob and rudder will rapidly move to the newly trimmed position.

(2) The rudder trim system is rigged by adjusting components to neutral position, and synchronizing adjustments from forward to aft. One tail section rigging pin, common to the rudder control system, is needed to adjust the system.

CAUTION: RUDDER, ELEVATOR AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON.

(3) If an out-of-trim condition exists, refer to AMM 27-09-400/501.

(4) The rudder and rudder trim control system is properly adjusted when the individual components are adjusted to meet the following conditions: (See Fig. 501 for rigging pin locations and cable tension requirements.)

(a) Rudder Forward Quadrants

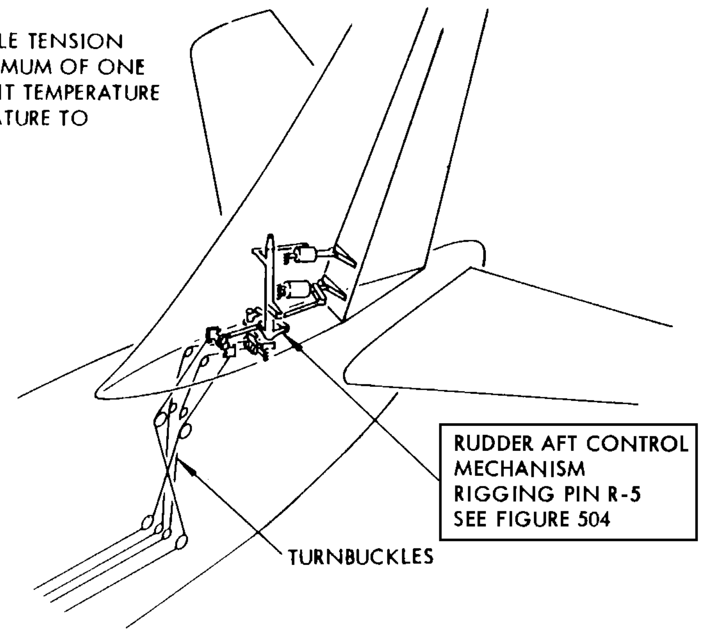
1) With rudder pedals positioned to neutral with pedal adjustment crank, and using trim knob, and with rigging pin R-5 installed through feel and centering unit output crank, rudder forward quadrants shall be positioned so that rigging pins R-3 and R-4 fit through forward rigging pin holes in quadrants. If not, quadrants may be adjusted per par. 1.C.(2).

TABLE 1

TEMPERATURE °F (± 5°)	RIGGING LOAD RA, RB (+10/-10) POUNDS [1]
110	168
90	159
70	150
50	142
30	134
10	125
-10	117
-30	109
-40	103

[1] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

NOTE: TO INSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°) FOR AIRFRAME TEMPERATURE TO STABILIZE.



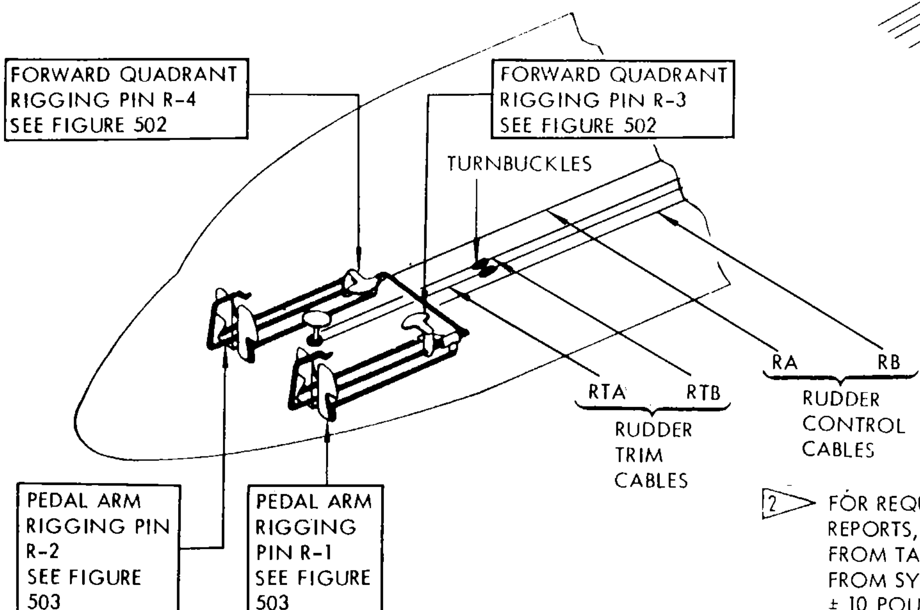


TABLE 2

TEMPERATURE °F (± 5°)	RIGGING LOAD RTA, RTB (+5/-0) POUNDS [2]
110	81
90	75
70	70
50	65
30	59
10	54
0	51
-10	48
-30	43
-40	40

[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +10/-20 POUNDS FROM TABLE 2 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 10 POUNDS FROM TABLE 2 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 2 VALUES MUST BE MET.

Rudder Control System Adjustment
Figure 501

(b) Rudder Pedals
 1) With rigging pins R-3 and R-4 in place, rigging pins R-1 and R-2 shall fit through rigging pin holes on pedal arm assembly. If both pins cannot be installed, tension rods and cables may be adjusted per par. 1.C.(3).
(c) Rudder Trim Actuator
 1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely), cotter pin hole on right side of actuator shall fall within paint mark on housing. Dimension from upper end of actuator drum extension to end of actuator screw shall be 1.92 (+0.03/-0.02) inches. If either of these conditions is not met, actuator may be adjusted per par. 1.C.(4).
(d) Forward Rudder Trim Cable Drum
 1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely), forward rudder trim cable drum shall be in neutral per Fig. 503. If not, cables may be adjusted per par. 1.C.(5).
(e) Rudder Trim Control Cables RTA and RTB
 1) With rigging pin R-5 installed (system should be centered and rigging pin should fit freely), tension in cables RTA and RTB shall be within limits of value for ambient temperature given on Fig. 501, Table 2. If not, tension may be adjusted per paragraph 1.C.(6).
(f) Rudder Control Cables RA and RB
 1) With rigging pins R-3, R-4, and R-5 installed (system should be centered and rigging pin should fit freely), tension in cables RA and RB shall be within limits of value for ambient temperature given on Fig. 501, Table 1. If not, tension may be adjusted per par. 1.C.(7).
(g) Rudder Power Control Unit
 1) With rigging pin R-5 installed and rudder hydraulic system pressurized, rudder trailing edge shall fall within rudder index tab (Fig. 505). If either side of trailing edge falls outside width of index tab, power control unit may be adjusted per par. 1.C.(8).
(h) Standby Rudder Actuator
 1) With rigging pin R-5 installed, and the Standby hydraulic systems pressurized, push the rudder by hand to the left and right side until it stop. If the dimension between left and right is more than 0.20 inch, the actuator may be adjusted per par. 1.C.(9).

B. Equipment and Materials
   (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-1	-14	0.309-0.311	12.7 ±0.25	CAPTAIN'S RUDDER PEDAL ARM
R-2	-14	0.309-0.311	12.7 ±0.25	F/O'S RUDDER PEDAL ARM
R-3	-11	0.309-0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM
E-4	-11	0.309-0.311	6.7 ±0.25	ELEVATOR AND RUDDER FEEL COMPUTER

   (2) Cable Tensiometer - 0 to 300 pounds range for 1/8-inch diameter cable
   (3) Digital Voltmeter
   (4) Grease - BMS 3-24 (AMM 20-30-21)

C. Adjust Rudder and Rudder Trim Control System
   (1) Remove rudder hydraulic systems A, B, and standby power (AMM 27-21-0/201).

      WARNING: HYDRAULIC SYSTEMS MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON VERTICAL FIN AND RUDDER.

      NOTE: After completing adjustment, restore airplane to normal hydraulic configuration (AMM 27-21-0/201).

      If rudder power control unit or standby power control unit only are to be adjusted, do not remove hydraulic power.

   (2) Adjust rudder forward quadrants.
      (a) Check that rudder hydraulic systems A, B, and standby power are removed.
      (b) Position jackshaft yoke to midtravel by operating rudder pedal adjustment crank (Fig. 503).

         NOTE: Midpoint of yoke travel is determined by counting equal turns of shaft from full forward and full aft adjustment.

(c) Open lower nose compartment door 1103, and remove nose wheel well forward overhead access panels (AMM Chapter 12, Access Doors and Panels).

(d) Insert rigging pins R-3 and R-4 in forward rigging pin holes in forward quadrants (Fig. 502). If rigging pins do not fit, adjust busrod as follows:

1) Loosen RA and RB cables using turnbuckles located in stabilizer jackscrew compartment (Fig. 501).

<u>CAUTION</u>: CABLE TENSION MUST BE RELIEVED BEFORE ADJUSTING BUSROD. RELIEVE TENSION UNIFORMLY IN BOTH CABLES.

2) Remove busrod from jackshaft yoke (Fig. 502).
3) Install rigging pins R-3 and R-4 in forward rigging pin holes in forward quadrants.
4) Adjust length of busrod so that rod end attaching bolts fit freely through jackshaft yoke. Install washers, spacers, nuts, and cotter pins.
5) Adjust rudder control cables RA and RB per par. (7).
6) Check adjustment of pushrod to nose wheel steering (AMM Chapter 32, Landing Gear).

(e) With rigging pins R-3 and R-4 in place, check that gap between cable guard block and quadrant is 0.03 to 0.05 inch (Fig. 502). Add or remove shims if necessary.

(f) Remove rigging pins R-3 and R-4.

(g) Position captain's forward quadrant so that rigging pin R-3 can be inserted through aft rigging pin hole in quadrant. Check that maximum gap between quadrant and quadrant stop is 0.06 inch. Add or remove shims as necessary.

(h) Remove rigging pin R-3. Position first officer's forward quadrant so that rigging pin R-3 can be inserted through aft rigging pin hole in quadrant. Check gap between quadrant and quadrant stop.

(3) Adjust rudder pedals.

(a) Check that rudder hydraulic systems A, B, and standby power are removed.

(b) Insert rigging pin R-5 and position forward quadrants so that rigging pins R-3 and R-4 may be installed in forward rigging pin holes (Fig. 503).

<u>NOTE</u>: Rudder trim knob may be used to aid in positioning forward quadrants.

(c) With rigging pins R-3 and R-4 in place, check that rigging pins R-1 and R-2 fit through rigging pin holes on pedal arm assembly. If one or both pins cannot be installed, adjust tension rods by loosening jamnuts on one or both ends of rod assembly and rotating tube to obtain desired length.

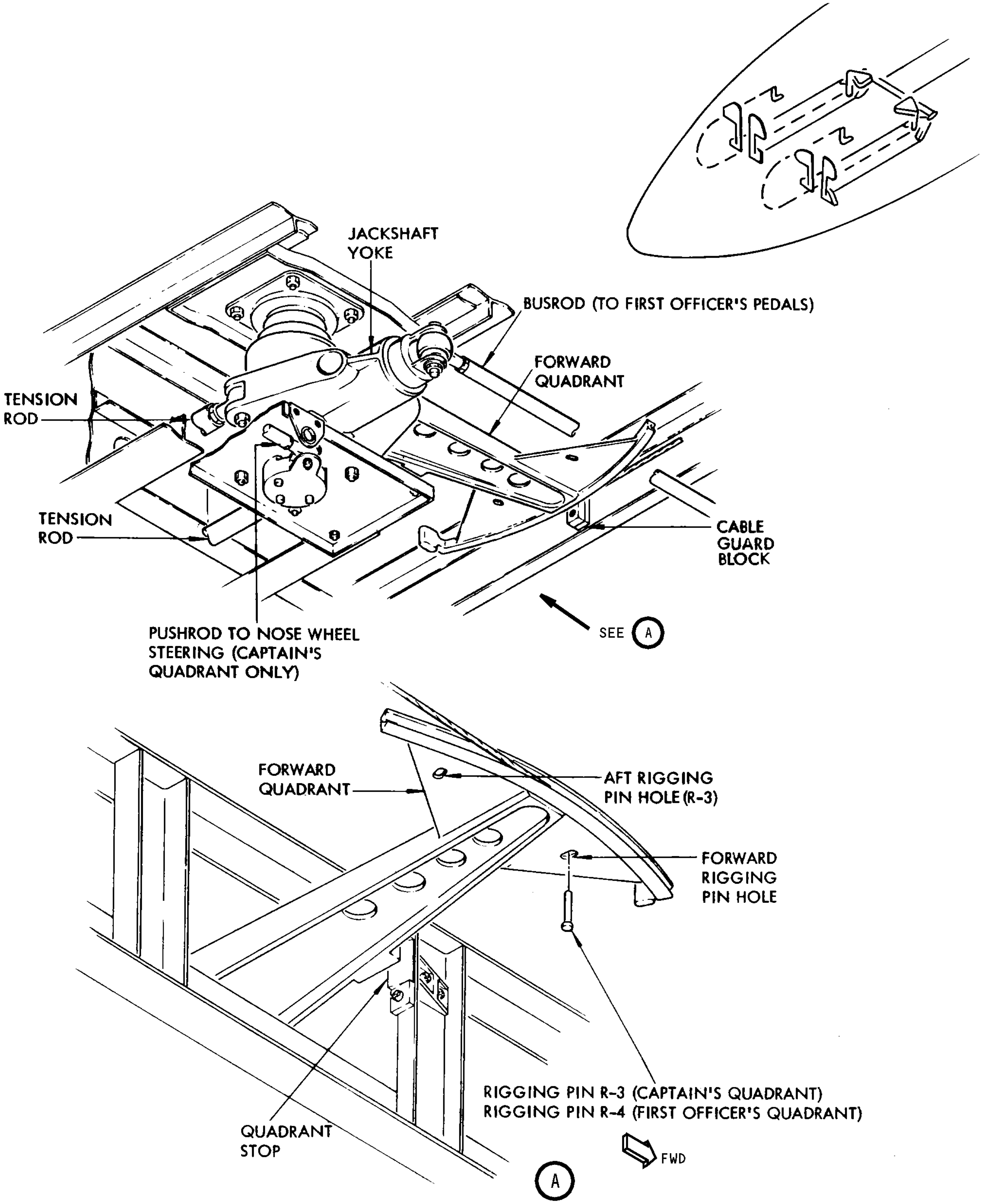
NOTE: Nominal tension rod dimension is 36.50 inches.

(d) When rigging pins fit freely, tighten jamnuts.
(e) Inspect adjustable rod ends for proper thread engagement. Rod ends must be visible through inspection holes in tubing.
(f) Remove rigging pins R-1, R-2, R-3, R-4, and R-5.

(4) Adjust rudder trim actuator.
(a) Check that rudder hydraulic systems A, B, and standby power are removed.
(b) Remove access panels 9509 and 9510 from vertical fin and open door 3701 in aft body section.
(c) Disconnect feel and centering unit input rod from torque tube crank (Fig. 504).
(d) Align center of painted index mark on cable drum extension with cotter pin hole on side of actuator housing (installed position) to place rudder trim actuator drum in neutral (Fig. 504).
(e) Check that dimension from bottom of actuator drum extension to end of actuator screw is 1.92 +0.03/-0.02 inches and that rigging pin R-5 can be freely inserted. If not, adjust as follows:
1) Disconnect screw from structure and rotate screw to proper length.
2) Connect screw to structure. If mounting holes do not align with rigging pin R-5 installed, remove bushing from threaded plug and rotate plug until mounting holes align. Maintain 1.92 (+0.03/-0.02)-inch dimension. Replace bushing and install bolt assembly.

NOTE: Actuator drum outer periphery may be rotated 0.50 inch maximum if nearest plug adjustment increment does not align mounting holes. Cotter pin hole on actuator housing must not be off paint index mark on actuator drum at zero trim.

(f) Check that trim knob is at zero units and that cable tension is correct. If not, adjust per paragraphs (5) and (6).



Rudder Pedal Adjustment
Figure 502

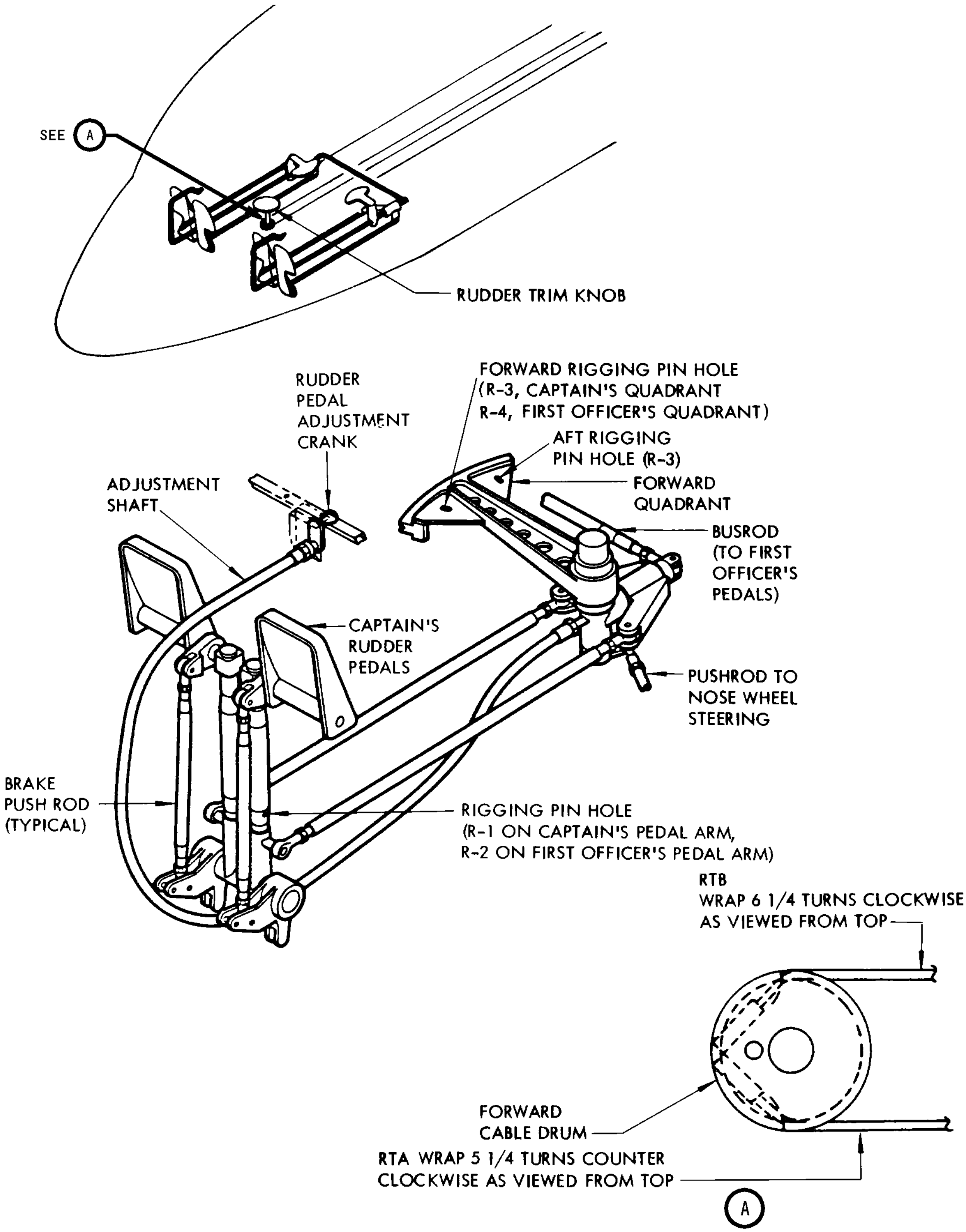
(g) Connect input rod between feel and centering unit and torque tube. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

<u>CAUTION</u>: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

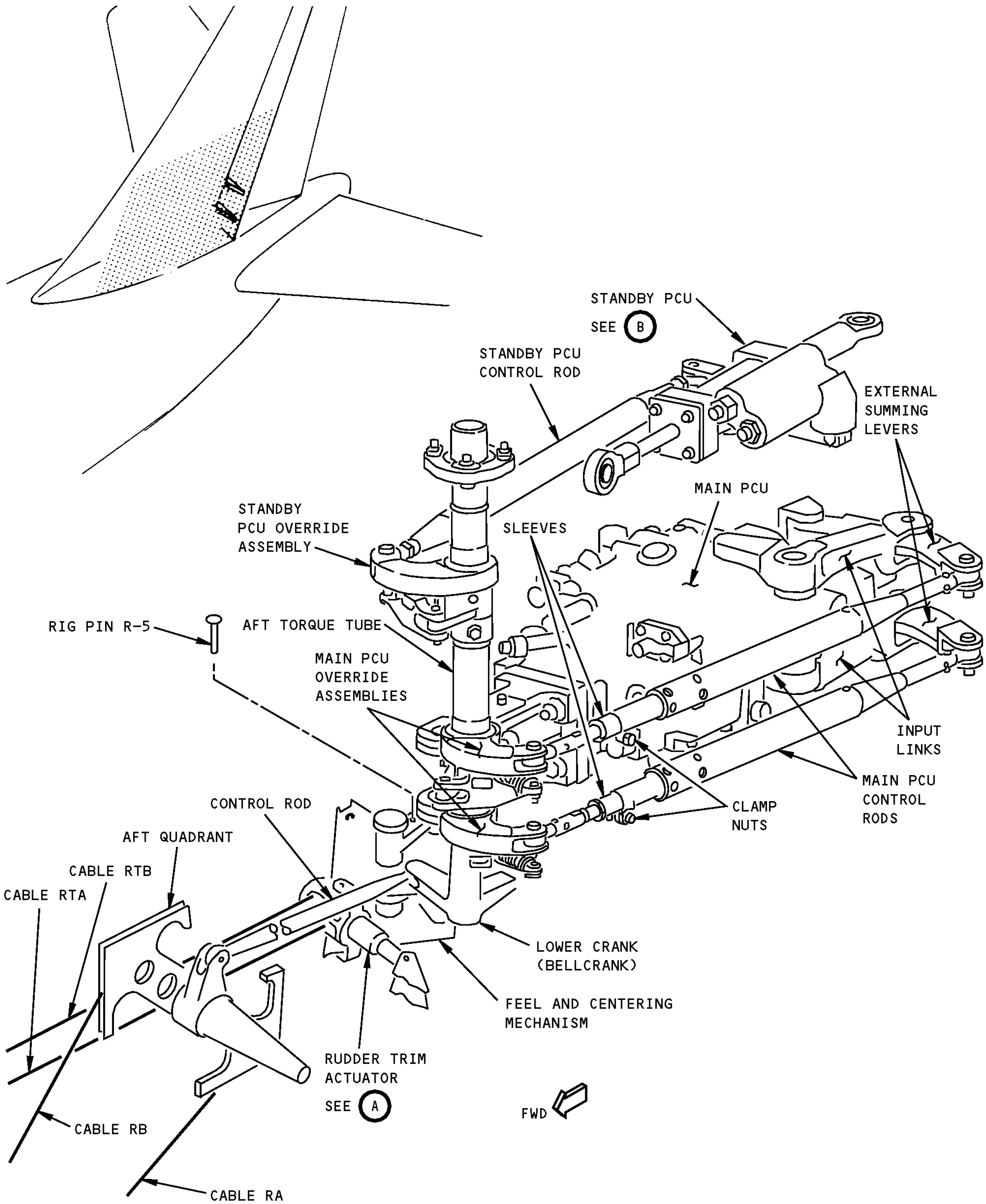
(5) Adjust forward rudder trim cable drum.
  (a) Check that rudder hydraulic systems A, B, and standby power are removed.
  (b) Hold trim knob at zero units trim, check that cable is wrapped on forward cable drum as shown in Fig. 503. With feel and centering unit input rod disconnected from torque tube crank, check that rigging pin R-5 is easily inserted. If rigging pin R-5 cannot be inserted freely, adjust RTA and RTB cables.
  (c) Connect input rod between feel and centering unit and torque tube. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

<u>CAUTION</u>: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

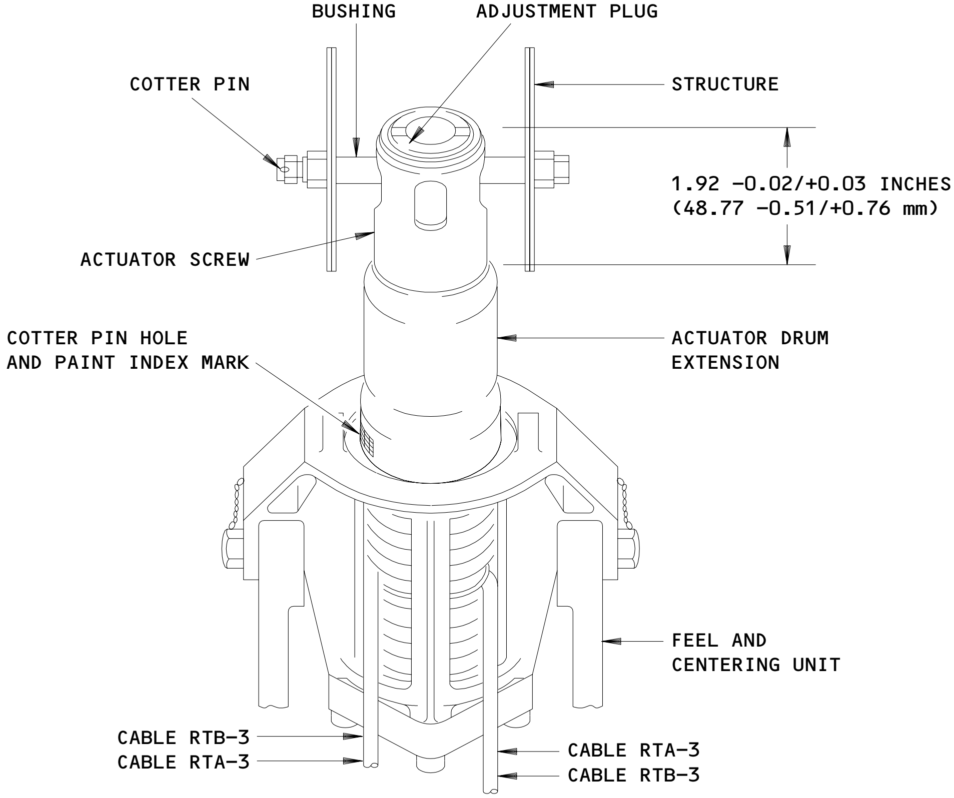
(6) Adjust rudder trim control cables RTA and RTB.
  (a) Check that rudder hydraulic systems A, B, and standby are removed.
  (b) Disconnect feel and centering unit input rod from torque tube crank. Move rod to one side and secure (Fig. 504).
  (c) Set indicating arrow on rudder trim knob at zero units of trim and hold in that position, with forward cable drum in neutral position.
  (d) If new cables are installed:
    1) Tighten RTA and RTB cables to 100 ±10 pounds tension to prestretch cables using turnbuckles located in stabilizer jackscrew compartment. Tighten turnbuckles on each cable an equal amount. If turnbuckle travel is inadequate for complete adjustment, further adjustment is possible by using turnbuckles located in ceiling of forward cargo compartment at fuselage station 451.



Rudder Forward Quadrant Adjustment
Figure 503

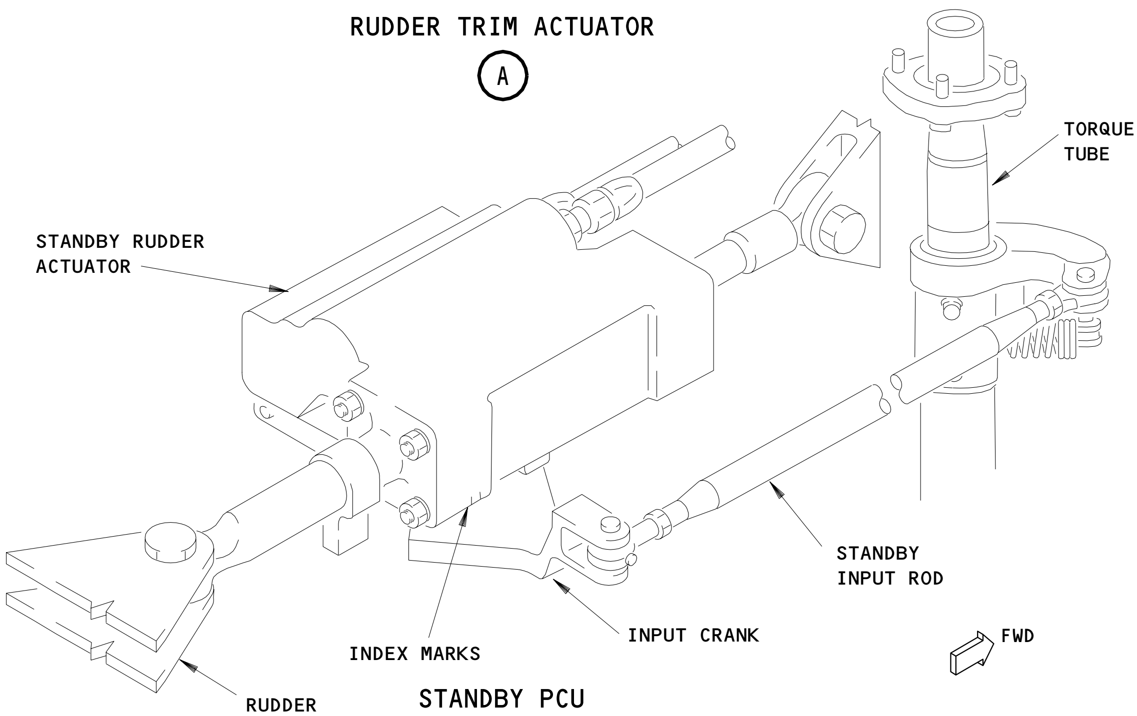


Rudder Aft Control Mechanism Adjustment
Figure 504 (Sheet 1)



RUDDER TRIM ACTUATOR

A



STANDBY PCU

B

Rudder Aft Control Mechanism Adjustment
Figure 504 (Sheet 2)

2) (Applicable to new cable installations only. Check that rigging pin R-5 can be installed freely without binding. If adjustment is required, adjust RTA and RTB turnbuckles in opposite direction, maintaining cable tension specified in step (d), until rigging pin can be installed freely.
3) Cycle the system 10 times through full travel. Then reduce cable tension to load specified on Fig. 501, Table 2 by adjusting turnbuckles on RTA and RTB cables an equal amount.

(e) Operate rudder trim knob through one full travel cycle and check cable tension per Fig. 501, Table 2. If necessary, readjust cable tension and repeat.
(f) Set indicating arrow on rudder trim knob at zero units of trim and hold in that position.
(g) Check that rigging pin R-5 can be installed freely without binding. If correction is required adjust RTA and RTB turnbuckles in opposite direction, maintaining cable tension specified, until rigging pin can be installed freely. Also check that cotter pin hole on trim actuator is in center of paint mark on actuator drum.
(h) Remove rigging pin R-5.
(i) Adjust pressure seal at aft pressure bulkhead to align with RTA and RTB cables. Adjust by loosening seal retainer bolts and position seal properly (AMM 27-09-121 and AMM 20-10-101).
(j) Install turnbuckle locking clips, and apply a thin coating of corrosive preventive material to exposed threads.
(k) Connect input rod between feel and centering unit and torque tube. Install bolts, washer, and nuts. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

(7) Adjust rudder control cables RA and RB.
(a) Check that hydraulic systems A, B, and standby power are removed.
(b) Check that rudder trim knob is set at zero units of trim and cycle rudder pedals to check for full pedal travel.
(c) When installing new forward quadrant busrod, shorten busrod by turning rod end two full turns. Connect busrod by installing bolt with spacers, washers, nut, and cotter pin.

(d) If new cables are installed:
   1) Attach RA and RB cables to forward quadrants, then attach cables to aft quadrant and install rigging pin R-5 in feel and centering unit output crank.
   2) Adjust turnbuckles on RA and RB cables to 260 ±20 pounds cable tension to prestretch cables. Keep adjustment on both sides of cables equal by checking that rigging pin R-3 can be inserted in captain's forward quadrant.
   3) Remove rigging pins R-3 and R-5.
   4) Check that cables do not contact pulley or quadrant flanges for total cable travel, that cables lie within 2 degrees of plane of pulley or quadrant, that cables are installed through grommets in structure as required, that cables are not deflected by fairleads, rub strips or grommets from rigged or normal operating position, and that pulleys rotate freely with no interference with guards.
   5) Cycle rudder pedals 25 times through full stroke.

(e) Install rigging pin R-5 in feel and centering unit output crank.

(f) Adjust cable tension to value shown in table 1, Fig. 501, using turnbuckles. Check that rigging pins R-3 and R-4 can be installed freely in forward quadrants.

(g) If both rigging pins cannot be inserted freely when cables have specified tension, proceed as follows:
   1) Relieve cable tension.
   2) Remove bolt through one rod end of forward quadrant busrod.
   3) Adjust busrod as required and install bolt with spacers, washers, nut, and cotter pin.
   4) Adjust cable tension to valve shown per Fig. 501, Table 1 using turnbuckles. Check that rigging pins R-3 and R-4 can be installed freely in forward quadrants.

(h) With rigging pins R-3, R-4, and R-5 installed, check that rigging pins R-1 and R-2 can be installed freely in pedal arms.

(i) If either or both rigging pins R-1 and R-2 cannot be inserted freely in pedal arms, proceed as follows:

   NOTE: Steps 1) thru 6) may be required on all four tension rods.

   1) Establish which pedal arm is out-of-line with rigging pin hole.
   2) Loosen both checknuts on tension rod connected to affected pedal arm.
   3) Remove bolt through forward tension rod end.

4) Adjust tension rod length until rigging pin R-1 or R-2 can be installed freely by turning rod end and/or rod as required, keeping lube fitting on rod end down.
5) Install tension rod end with bolt, washer, nut, and cotter pin.
6) Tighten checknuts.

(j) Remove rigging pins R-1, R-2, R-3, R-4, and R-5.
(k) Operate rudder pedals through one full travel cycle and check cable loads again.
(l) Adjust pressure seals at aft pressure bulkhead to align with RA and RB cables. Adjust by loosening seal retainer bolts and positioning seal (AMM 27-09-121 and AMM 27-10-101).
(m) Install turnbuckle locking clips and apply a thin coat of grease to exposed threads.
(n) Check for thread engagement on four tension rods and one bus rod. End of rod (10 places) must cover part of inspection hole.

(8) Adjust the input rods to the rudder power control unit.

(a) Open this circuit breaker on the P6 panel and attach a DO-NOT-CLOSE tag:
1) FORCE FIGHT MON

<u>WARNING</u>: RUDDER, ELEVATOR, AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON.

(b) Provide rudder hydraulic systems A and B power (AMM 27-21-0/201).
(c) Set the FLT CONTROL B switch to ON and A switch to OFF.
(d) Make sure the YAW DAMPER switch on the P5-3 panel is in the OFF position and the YAW DAMPER light is illuminated.
(e) Check that rudder trim is set at zero units of trim.
(f) Jiggle the feel and centering unit input rod to ensure that system is centered.
(g) Insert rig pin R-5 in the feel and centering unit output crank (Fig. 504).
1) Make sure you can install the rig pin freely without movement of the arm output crank.

(h) Open this circuit breaker on the P6-2 panel and attach a DO-NOT-CLOSE tag:
1) TRIM CONT RUD

(i) Remove the rig pin R-5.

(j) Do these steps to the lower control rod to put the rudder trailing edge to the left of the index plate:

NOTE: Always start the adjustment of the control rod with the rudder at this position.

1) Loosen the clamp nut on the lower control rod until you can rotate the sleeve.
2) Rotate the sleeve until the rudder trailing edge is between 0.20 to 0.30 inch (5.1 to 7.6 millimeters) to the left of the index plate.

NOTE: One full rotation of the sleeve will move the rudder trailing edge 0.18 degree (0.18 inch). Rotate the sleeve clockwise (looking aft) will move the rudder trailing edge left. Rotate the sleeve counterclockwise (looking aft) will move the rudder trailing edge right.

(k) Set the FLT CONTROL B switch to OFF and A switch to ON.
(l) Move the rudder pedals through 5 cycles of full travel.
1) If necessary, jiggle the rudder pedals to put the pedals to the neutral positions.
(m) Do these steps to the upper control rod to put the rudder trailing edge to the left of the index plate:

NOTE: Always start the adjustment of the control rod with the rudder at this position.

1) Loosen the clamp nut on the upper control rod until you can rotate the sleeve.
2) Rotate the sleeve until the rudder trailing edge is between 0.20 to 0.30 inch (5.1 to 7.6 millimeters) to the left of the index plate.

NOTE: One full rotation of the sleeve will move the rudder trailing edge 0.18 degree (0.18 inch). Rotate the sleeve clockwise (looking aft) will move the rudder trailing edge left. Rotate the sleeve counterclockwise (looking aft) will move the rudder trailing edge right.

(n) Do this adjustment to the upper control rod:
1) Loosen the clamp nut on the upper control rod until you can rotate the sleeve.

2) Rotate the sleeve until the rudder trailing edge is within the center of the index plate.
   a) Make sure that the rudder trailing edge does not go beyond the center of the index plate on to the right side. If this happens, start the adjustment again with the rudder trailing edge positioned to the left of the index plate.
3) Tighten the clamp nut on the upper control rod.

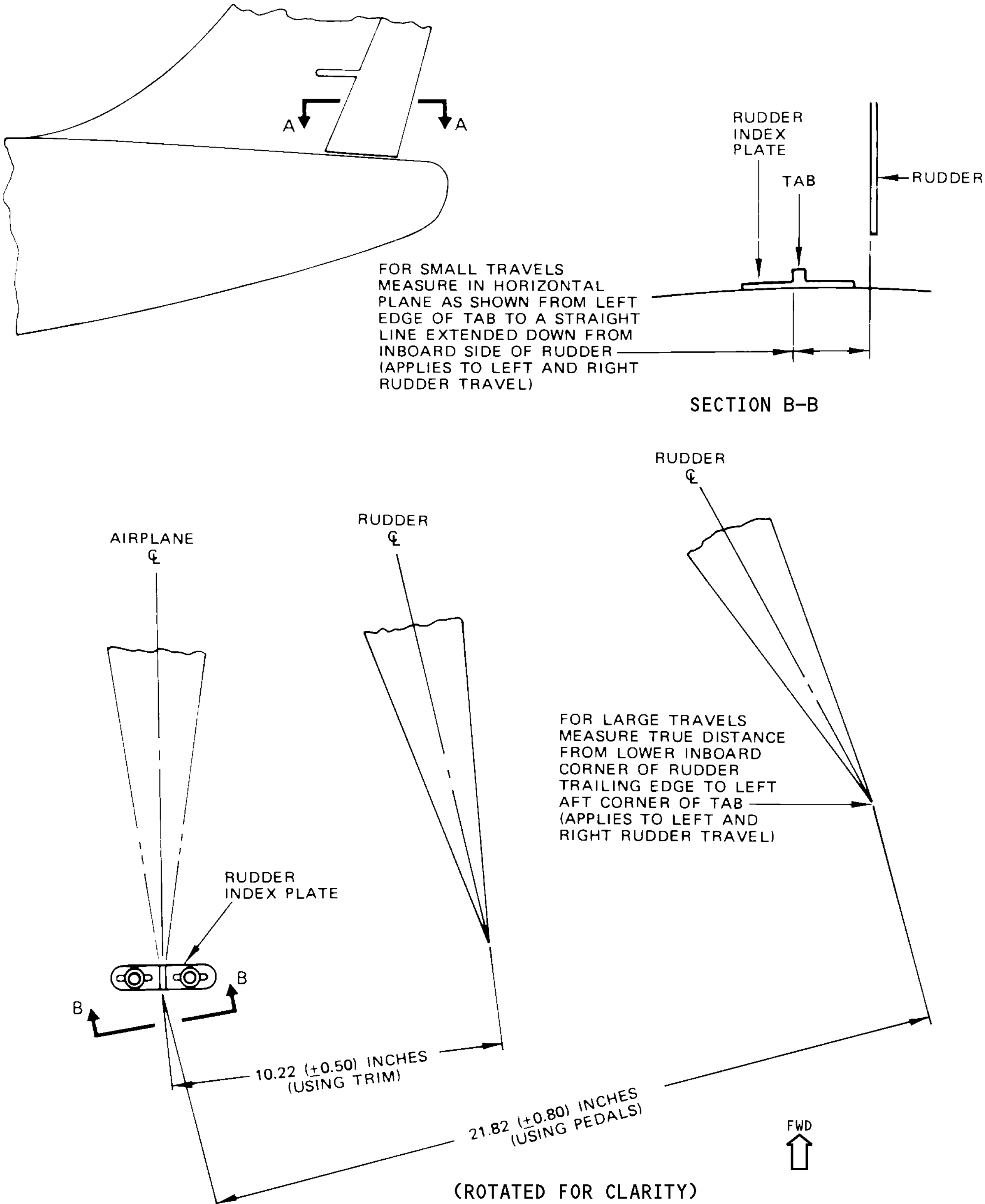
   NOTE: Do not torque the clamp nut at this time.

4) Make sure that the rudder trailing edge is still within the center of the index plate.

(o) Set the FLT CONTROL B switch to ON and A switch to OFF.
(p) Move the rudder pedals through 5 cycles of full travel.
   1) If necessary, jiggle the rudder pedals to put the pedals to the neutral positions.
(q) Do this adjustment to the lower control rod:
   1) Loosen the clamp nut on the lower control rod until you can rotate the sleeve.
   2) Rotate the sleeve until the rudder trailing edge is within the center of the index plate.
      a) Make sure that the rudder trailing edge does not go beyond the center of the index plate on to the right side. If this happens, start the adjustment again with the rudder trailing edge positioned to the left of the index plate.
   3) Tighten the clamp nut on the lower control rod.

      NOTE: Do not torque the clamp nut at this time.

   4) Make sure that the rudder trailing edge is still within the center of the index plate.
(r) Set the FLT CONTROL A switch to ON.
   1) Tap on the rudder pedals lightly to put the rudder pedals to the neutral position.
   2) Make sure that the rudder trailing edge is still within the center of the index plate.
(s) Set the FLT CONTROL B switch to OFF.
   1) Make sure that the rudder trailing edge is still within the center of the index plate.
(t) Set the FLT CONTROL B switch to ON and FLT CONTROL A switch to OFF.
   1) Make sure that the rudder trailing edge is still within the center of the index plate.
(u) Set the FLT CONTROL A switch to ON.



Rudder Travel and Index Plate
Figure 505

(v) Tap on the rudder pedals lightly to put the rudder pedals to the neutral position.
(w) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
1) FORCE FIGHT MON
2) TRIM CONT RUD
(x) Verify voltage between pin 1 and pin 2 of connector D10070 on the EE shelf is between 4.38 VDC and 5.62 VDC.
1) If the voltage measured is not between 4.38 VDC to 5.62 VDC, do the steps to adjust the control rods for the rudder power control unit again.
(y) Tighten the clamp nuts on the upper and lower control rods to 100-150 pound-inches (11.3 to 16.9 newton-meters).

(9) Adjust the input rod to the standby rudder actuator.
(a) Make sure that the main rudder power control unit is adjusted correctly.

<u>WARNING</u>: RUDDER, ELEVATOR, AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON.

(b) Provide rudder hydraulic systems A and B power (AMM 27-21-0/201).
(c) Set the FLT CONTROL A and B switches to the STBY positions.
(d) Move the rudder pedals through 5 cycles of full travel.
1) If necessary, jiggle the rudder pedals to put the pedals to the neutral positions.
(e) Check that rudder trim is set at zero units of trim.
(f) Make sure that you can install the rig pin R-5 freely (Fig. 504).
1) If necessary, jiggle the output crank of the feel and centering unit so that the rig pin R-5 can be installed freely.
(g) Remove the rig pin R-5.
(h) Push the rudder trailing edge to the right side until it stops, then slowly remove the load.
1) Measure the distance from the rudder trailing edge to the index plate (Fig. 505). Record this measurement as A.
(i) Push the rudder trailing edge to the left side until it stops, then slowly remove the load.
1) Measure the distance from the rudder trailing edge to the index plate (Fig. 505). Record this measurement as B.
(j) Compare the rudder right (A) and left (B) measurements.
1) If the difference between A and B is 0.20 inch (5.1 millimeters) or less, no adjustment is necessary.

2) If the difference between A and B is 0.20 to 0.50 inch (5.1 to 12.7 millimeters), do the following steps to adjust the control rod:
   a) Loosen the two checknuts on both ends of the control rod so that you can rotate the sleeve.
   b) If B is greater than A, turn the sleeve on the control rod counterclockwise (looking forward) to make the rod shorter.

      NOTE: One full turn of the sleeve moves the rudder trailing edge approximately 0.095 inch (2.4 millimeters).

   c) If A is greater than B, turn the sleeve on the control rod clockwise (looking forward) to make the rod longer.

      NOTE: One full turn of the sleeve moves the rudder trailing edge approximately 0.095 inch (2.4 millimeters).

   d) Tighten the two checknuts.
   e) Make sure that you can see the threads through the inspection holes at the two ends of the sleeve.
   f) Repeat the steps to measure the right and left distances and perform adjustment if necessary.
3) If the difference between A and B is more than 0.50 inch (12.7 millimeters), do the following steps to adjust the control rod:
   a) Set the FLT CONTROL A and B switches to OFF positions.
   b) Loosen the two checknuts on both ends of the control rod so that you can rotate the sleeve.
   c) Remove the bolt that connect the aft end of the rod to the PCU.
   d) If B is greater than A, turn the sleeve and the rod-end clockwise (looking forward) to make the rod shorter.

      NOTE: Make sure that the sleeve and the rod-end rotate together at the same time. One full turn of the sleeve and rod-end together moves the rudder trailing edge approximately 0.54 inch (13.7 millimeters).

e) If A is greater than B, turn the sleeve and the rod-end counterclockwise (looking forward) to make the rod longer.

NOTE: Make sure that the sleeve and the rod-end rotate together at the same time. One full turn of the sleeve and rod-end together moves the rudder trailing edge approximately 0.54 inch (13.7 millimeters).

f) Install the bolt to connect the rod to the PCU.
g) Set the FLT CONTROL A and B switches to STDBY positions.
h) Repeat the steps to measure the right and left distances and perform adjustment if necessary.
i) If no more adjustment is necessary, tighten the two checknuts on both ends of the control rod.

(k) Set the FLT CONTROL A and B switches to ON positions.
(l) Verify that the STBY RUD ON light on the P5-3 panel is not illuminated after 5 seconds.
(m) Do a test of the rudder and rudder trim control system.

2. Rudder and Rudder Trim Control System Test

A. General

(1) The test may be performed without removing components, breaking into hydraulic systems, or using rigging pins.
(2) See Fig. 505 for method of measuring large and small rudder travel. Left and right rudder travel measurements when testing rudder are made with respect to left aft corner of indicator on index tab and lower inboard corner of rudder trailing edge.
(3) The rudder and rudder trim control system must be completely installed and rigged prior to test.

WARNING: RUDDER, ELEVATOR, AND AILERONS ARE FULLY POWERED SYSTEMS. ALL THREE SYSTEMS ARE POWERED SIMULTANEOUSLY. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING POWER ON. ALSO THE RUDDER, RUDDER PEDALS, AND RUDDER TRIM KNOB SHOULD BE IN NEUTRAL AND ALL RIGGING PINS AND OTHER OBSTRUCTIONS REMOVED FROM THE SYSTEM BEFORE TURNING POWER ON. PRECAUTIONS SHOULD BE TAKEN TO PREVENT INADVERTENT APPLICATION OF HYDRAULIC POWER DURING THE POWER OFF PORTIONS OF THIS TEST.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(4) Rudder neutral position is defined as the position at which both sides of rudder trailing edge are within width of tab on rudder index plate (Fig. 505) and when rudder pedals are adjusted.

B. Equipment and Materials

(1) Rudder Loading Block and Dial Indicator

(a) Loading block to distribute loads over a minimum of 5 square inches of rudder trailing edge. Suggested loading block: 0.125 inch thick (minimum) by 3 inches by 3 inches approximately. Wood or fiberglass, suitably padded to prevent skin damage.

(b) Dial indicator with a minimum range of 0.00 to 0.04 inch plus mounting stand for measuring small rudder movements. Measuring point shall be approximately 46 inches from rudder hinge line at lower end of trailing edge.

(2) Rudder Pedal Force Check Tool - F80212-19 (Preferred) or F80212-1 (Optional)

(3) Scale - 0 to 2 feed, graduated in inches, tenths and hundredths of an inch

(4) Rudder Trim Knob Torque Adapter - SE27-2011

C. Test Rudder and Rudder Trim Control System

(1) Test rudder pedal adjustment and rudder pedal limit travel.

(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).

(b) Set rudder trim knob to zero.

(c) Set rudder pedal to the midposition.

1) Turn the rudder pedal adjustment crank to move the rudder pedals full forward.

2) Turn the rudder pedal adjustment crank to move the rudder pedals full aft. Keep a record of the number of turns.

3) Turn the rudder pedal adjustment crank half of the number turns forward. Measure at pedal pivot point. Mark this as position 1 on the doghouse.

(d) Move captain's pedal adjustment to full forward, then move captain's left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure at pedal pivot point. Mark this as position 2 on rudder pedal doghouse.

(e) Measure total forward travel of left pedal (from position 1 to position 2). Total forward travel shall be 6.86 inches minimum.
(f) Repeat steps (c) thru (e) with captain's right pedal.
(g) Move captain's pedal adjustment to full aft, then move captain's left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure at right pedal pivot point. Mark this as position 3 on rudder pedal doghouse.
(h) Measure total aft travel of right pedal (from position 1 to position 3). Total aft travel shall be 6.89 inches minimum.
(i) Repeat steps (g) and (h) moving captain's right pedal forward and measuring total aft travel of captain's left pedal.
(j) Repeat steps (b) thru (i) with first officer's pedals.

(2) Test rudder hinge and power control unit bearing play.
(a) Place rudder, rudder pedals and rudder trim knob in neutral position.

NOTE: Neutral rudder position is defined as position where both sides of rudder trailing edge are within width of tab on rudder index plate (Fig. 505).

(b) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(c) Fix rudder pedals in neutral position, and check that they do not move during the following steps.
(d) Mount dial indicator at lower end of rudder trailing edge.
(e) Use rudder loading block to apply a force of 12 ±4 pounds to left and release slowly.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE, ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(f) Record rudder position on dial indicator.
(g) Move rudder right with loading block using force of 12 ±4 pounds and release slowly.
(h) Record rudder position on dial indicator.
(i) Distance between rudder positions in steps (f) and (h) shall not exceed 0.04 inch.
(j) Move rudder left with loading block using force of 12 ±4 pounds and release slowly.
(k) Read rudder position on dial indicator. Rudder position shall be within 0.02 inch of step (f).
(l) If difference between rudder positions recorded in steps (f) and (h) is greater than 0.04 inch, rudder hinge bearings and/or power control unit bearings have too much play. Correct this condition and repeat test.

(3) Disconnect pushrod to nose wheel steering (Fig. 503).

NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

(4) Test rudder centering.
(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(b) Move captain's left rudder pedal approximately 0.5 inch forward and release. Rudder shall return to neutral position.

NOTE: Neutral position is defined as position at which both sides of rudder trailing edge are within width of tab on rudder index plate.

(c) Move captain's right rudder pedal approximately 0.5 inch forward and release. Rudder shall return to neutral position.
(d) Set FLT CONTROL switches A and B to OFF, then set either FLT CONTROL switch A or B to STDBY RUD.
(e) Move captain's left rudder pedal approximately 1 inch forward and release. Rudder shall return to within 1.25 inches from index.

(f) Move captain's right rudder pedal approximately 1 inch forward and release. Rudder shall return to within 1.25 inches from index.
(g) Set FLT CONTROL switches A and B to ON.
(5) Test rudder pedal forces.
(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(b) With rudder pedals in neutral, set captain's and first officer's pedal adjustment to midposition.
(c) Install rudder pedal force checking tool on captain's right rudder pedal (Fig. 506). Push on tool handle. At point where rudders start to move, check compression gauge to see that maximum force is 18.0 pounds.

NOTE: When using rudder pedal force checking tool, multiply compression gauge reading by multiplication factor from Table.

(d) Repeat step (c) with captain's left pedal.
(e) Push on tool handle until captain's left pedal is 3.60 ±0.10 inches forward from neutral and measure force.
1) Check that maximum force is 82 pounds.
2) Check that minimum force is 60 pounds.
(f) Install rudder pedal force checking tool on captain's right pedal. Push on tool handle until captain's left pedal is 3.60 ±0.10 inches forward from neutral and measure force.
1) Check that maximum force is 82 pounds.
2) Check that minimum force is 60 pounds.
(g) Repeat steps (e) and (f) for first officer's pedals.
(6) Test rudder travel.
(a) Set rudder trim control knob to neutral.
(b) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(c) Set FLT CONTROL switch A to ON and B to OFF positions.
(d) Move captain's left pedal until forward quadrant stop is contacted.
1) Measure rudder travel.
2) Make sure that movement is 21.82 ±0.80 inches.
(e) Move captain's right pedal until forward quadrant stop is contacted.
1) Measure rudder travel.
2) Make sure that movement is 21.82 ±0.80 inches.
(f) Set FLT CONTROL switch A to OFF and B to ON positions.
1) Perform steps (d) and (e) above.
(g) Set FLT CONTROL switch B to STDBY RUD position.
1) Perform steps (d) and (e) above.

(h) Set FLT CONTROL switches A and B to ON positions.

(7) Test rudder trim friction and travel.

(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).

(b) Use rudder trim knob torque adapter to rotate trim control knob from neutral to full right, and from full right to neutral. Then from neutral to full left and return.

1) Make sure that the force is less than 28 pound-inches as measured on trim control knob.

(c) Rotate trim conrol knob from neutral in each direction to stop.

1) Measure knob travel.

2) Make sure the total rotation in both directions is four turns 130 ±22 degrees.

(d) Rotate trim control knob in both directions until indicator is at 10.

1) Make sure that rudder moves 10.22 ±0.50 inches in each direction from neutral.

(8) Test Standby Rudder Actuator Deadband.

(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).

(b) Check that trim is at neutral.

(c) Check that rudder is at neutral.

(d) Set FLT CONTROL switches A and B to OFF, then set FLT CONTROL switch B to STDBY RUD position.

(e) With loading block, push hard on rudder to the right, then slowly ease off load.

<u>CAUTION</u>: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(f) With hands off rudder, measure rudder position right.

(g) With loading block, push hard on rudder to the left, the slowly ease off load.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(h) With hands off rudder, measure rudder position left.
(i) Calculate difference between (f) and (h).
    1) If difference is greater than 0.2 inch, the standby actuator must be adjusted again.
(j) Set FLT CONTROL switches A and B to ON positions.

(9) Do the Yaw Damper Coupler Installation Test (AMM 22-12-01/401).
(10) Rudder Override Operational Test.

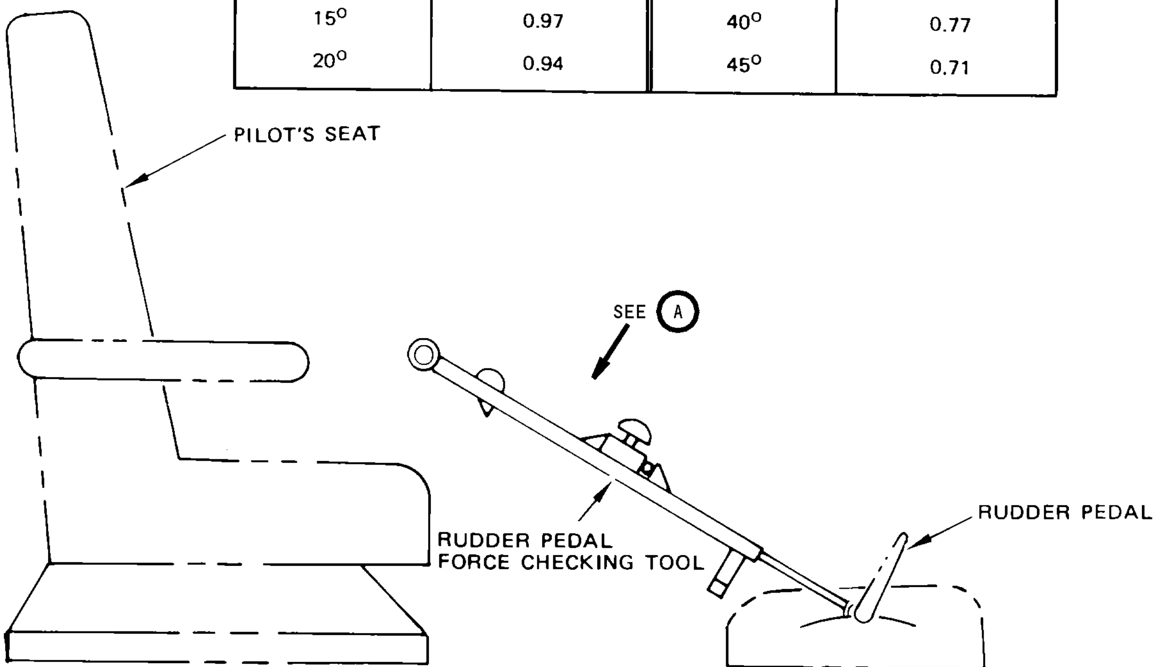
WARNING: DO THE STEPS IN THIS TASK IN THE SEQUENCE THAT THEY ARE WRITTEN. IF YOU DO NOT DO THESE STEPS IN THE CORRECT SEQUENCE, INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

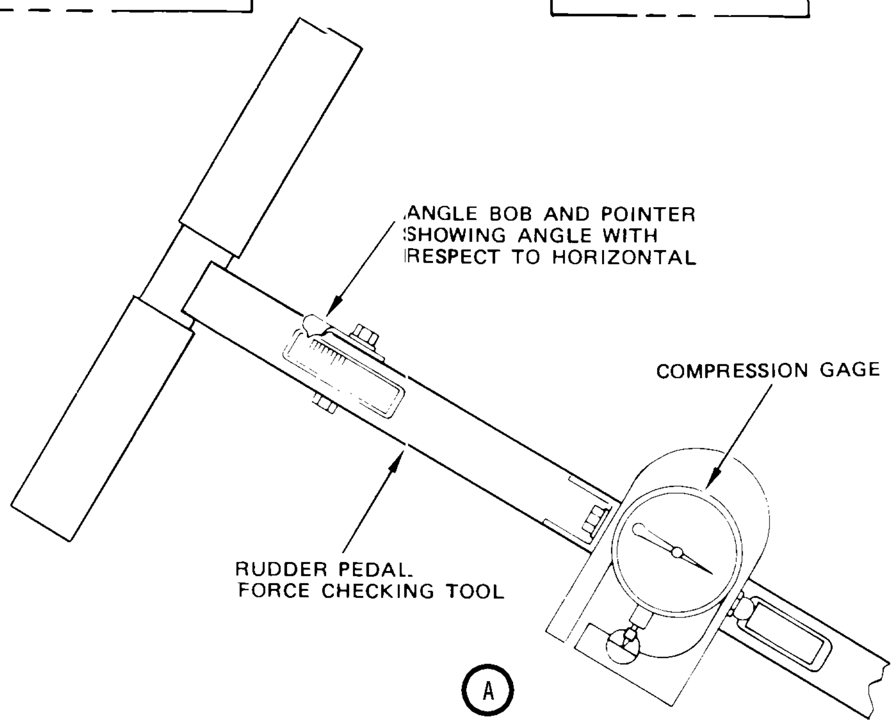
(a) Set FLT CONTROL switches A and B to OFF positions.
(b) Remove access panels 9512 and 9515 (AMM 12-31-51/201).
(c) Do the rudder override operational test:
    1) Make sure the rudder and rudder pedals are in the neutral position.
    2) Manually hold the rudder aft edge in the centered position.
    3) Observe the torque tube override assemblies and do these steps:
        a) Slowly push on the captain's left rudder pedal forward full travel then return the pedal to the neutral position.

        NOTE: It will require more force than normal operation for the override mechanism to break out of the detent position.

        b) Make sure that all three override assemblies break out of their detent positions.
        c) Make sure that there is no sign of binding or interferences.
        d) If binding or excessive friction exist, the override assemblies may be damaged or improperly installed. Correct this condition and repeat this check.

ANGLE WITH RESPECT TO HORIZONTAL	MULTIPLICATION FACTOR	ANGLE WITH RESPECT TO HORIZONTAL	MULTIPLICATION FACTOR
0°	1.0	25°	0.91
5°	1.0	30°	0.87
10°	0.98	35°	0.82
15°	0.97	40°	0.77
20°	0.94	45°	0.71





Rudder Pedal Force Checking Tool
Figure 506

4) Observe the torque tube override assemblies and do these steps:
   a) Slowly push on the captain's right rudder pedal forward full travel then return the pedal to the neutral position.

      NOTE: It will require more force than normal operation for the override mechanism to break out of the detent position.

   b) Make sure that all three override assemblies break out of their detent positions.
   c) Make sure that there is no sign of binding or interferences.
   d) If binding or excessive friction exist, the override assemblies may be damaged or improperly installed. Correct this condition and repeat this check.

(11) Rudder Main PCU Force Fight Monitor Test

NOTE: Use this test to make sure that the STBY RUD ON light on the P5-3 panel is functional.

(a) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(b) Set FLT CONTROL switches A and B to ON positions.
(c) Move the rudder pedals through 5 cycles of full travel.
(d) Verify that the STBY RUD ON light on the P5-3 panel is not illuminated.
(e) Open this circuit breakers on the P6 panel:
    1) SHUTOFF VALVES - FLT CONT
(f) Set FLT CONTROL B switch to STBY RUD position.
(g) Make sure that the STBY RUD ON light on the P5-3 panel is illuminated.

    NOTE: The standby hydraulic pump will activate.

(h) Close this circuit breakers on the P6 panel:
    1) SHUTOFF VALVES - FLT CONT
(i) Open this circuit breaker on the P6 panel:
    1) SHUTOFF VALVES - STBY RUD
(j) Remove access panels 9512 (AMM 12-31-51/201) to get access to the rudder main PCU control rods.
(k) Set FLT CONTROL B switch to ON position.
(l) Do the Force Fight Monitor Test:

    WARNING: DO THE STEPS IN THIS TASK IN THE SEQUENCE THAT THEY ARE WRITTEN. IF YOU DO NOT DO THESE STEPS IN THE CORRECT SEQUENCE, INJURIES TO PERSONNEL AND DAMAGE TO CAN OCCUR.

1) Make sure that the STBY RUD ON and LOW PRESS lights on the P5-3 panel are not illuminated.
2) Move the rudder pedals through two cycles of full travel.

NOTE: This will release the residual pressure from the standby hydraulic system.

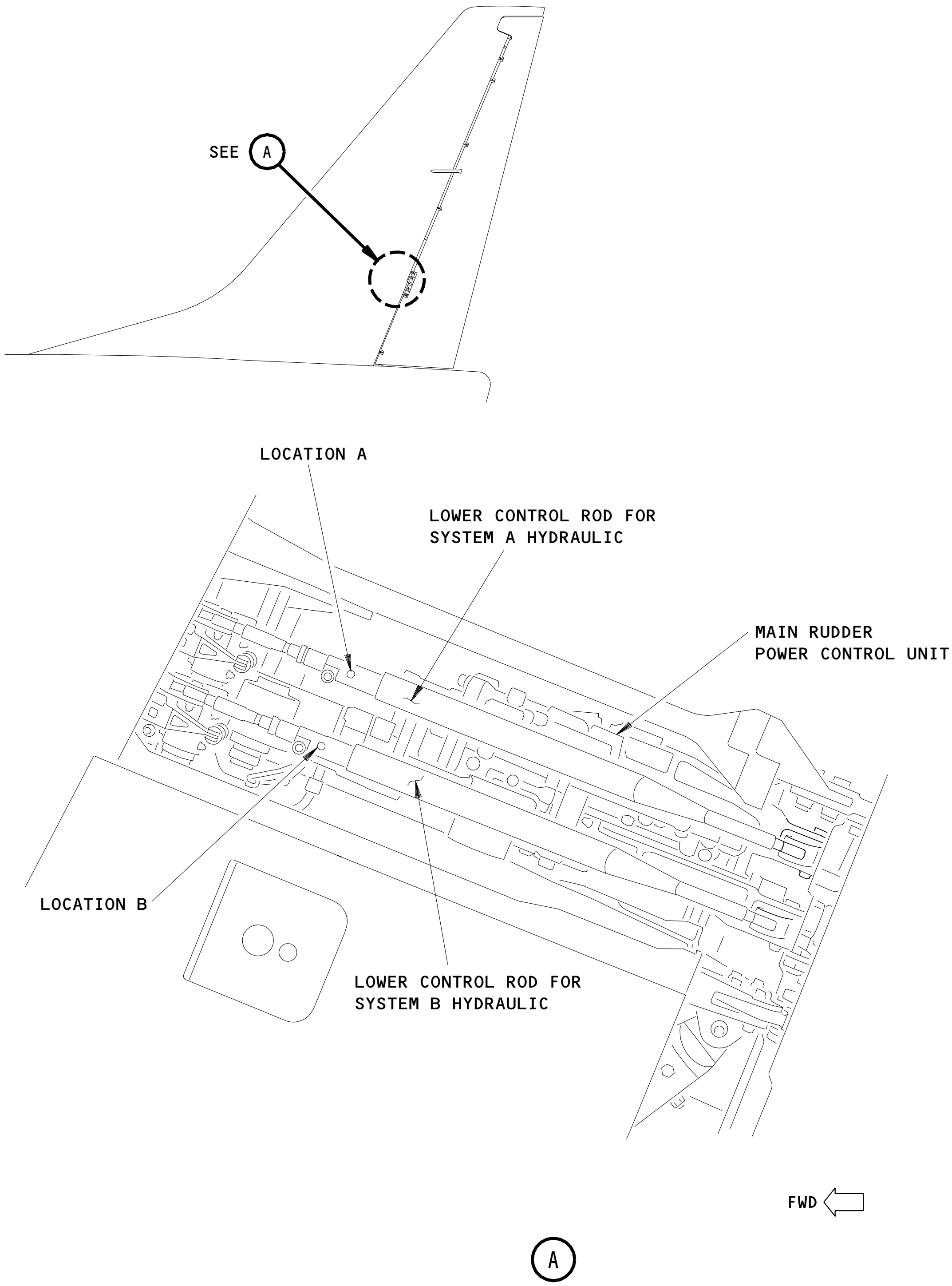
3) Manually hold the rudder main PCU upper control rod at location A (Fig. 507) and pull forward with sufficient force to break out the input override (approximately 30 pounds). Hold the control in this position for at least 7 seconds then release.
4) Make sure that the STBY RUD ON and LOW PRESS lights on the P5-3 panel are illuminated.

NOTE: The standby hydraulic pump will not activate.

5) Close this circuit breaker on the P6 panel:
   a) SHUTOFF VALVES - STBY RUD
6) Make sure that the LOW PRESS light on the P5-3 panel is not illuminated.

NOTE: The standby hydraulic pump will activate.

7) Open this circuit breaker on the P6 panel for at least 2 seconds then close:
   a) FORCE FIGHT MONITOR
8) Make sure that the STBY RUD ON light on the P5-3 panel is not illuminated.
9) Set the FLT CONTROL B switch, on the P5 panel, to the STBY RUD position.
10) Open this circuit breaker on the P6 panel:
   a) SHUTOFF VALVES - STBY RUD
11) Set the FLT CONTROL B switch, on the P5 panel, to the ON position.



Main Rudder PCU Force Fight Monitor Test
Figure 507

12) Move the rudder pedals through two cycles of full travel.
    a) If it is necessary, jiggle the rudder pedals until they are in the neutral position.
13) Manually hold the rudder main PCU upper control rod at location A (Fig. 507) and pull aft with sufficient force to break out the input override (approximately 30 lbs). Hold the control in this position for at least 7 seconds then release.
14) Make sure that the STBY RUD ON and LOW PRESS lights on the P5-3 panel are illuminated.

    NOTE: The standby hydraulic pump will not activate.

15) Close this circuit breaker on the P6 panel:
    a) SHUTOFF VALVES - STBY RUD
16) Make sure that the LOW PRESS light on the P5-3 panel is not illuminated.
17) Open this circuit breaker on the P6 panel for at least 2 seconds then close:
    a) FORCE FIGHT MONITOR
18) Make sure that the STBY RUD ON light on the P5-3 panel is not illuminated.

    NOTE: The standby hydraulic pump will not activate.

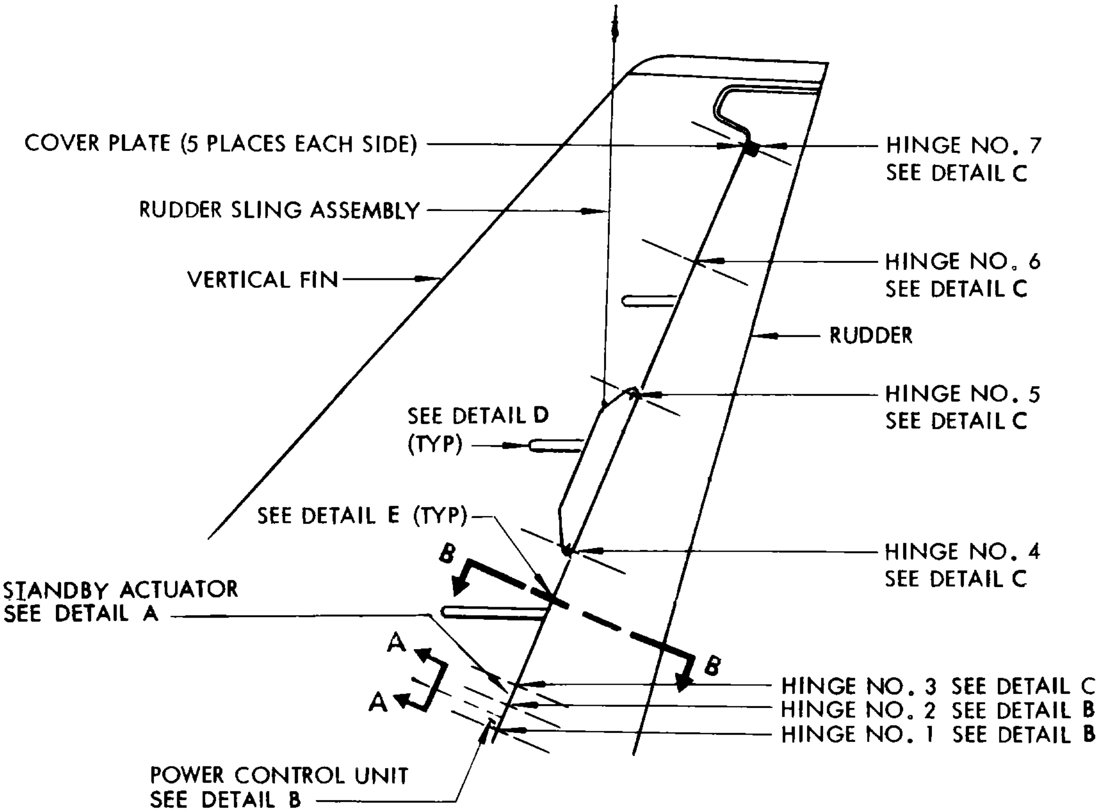
(12) Connect pushrod to nose wheel steering, if disconnected.
(13) Restore airplane to normal hydraulic configuration (AMM 27-21-0/201).
(14) Close all access doors and panels that you removed.

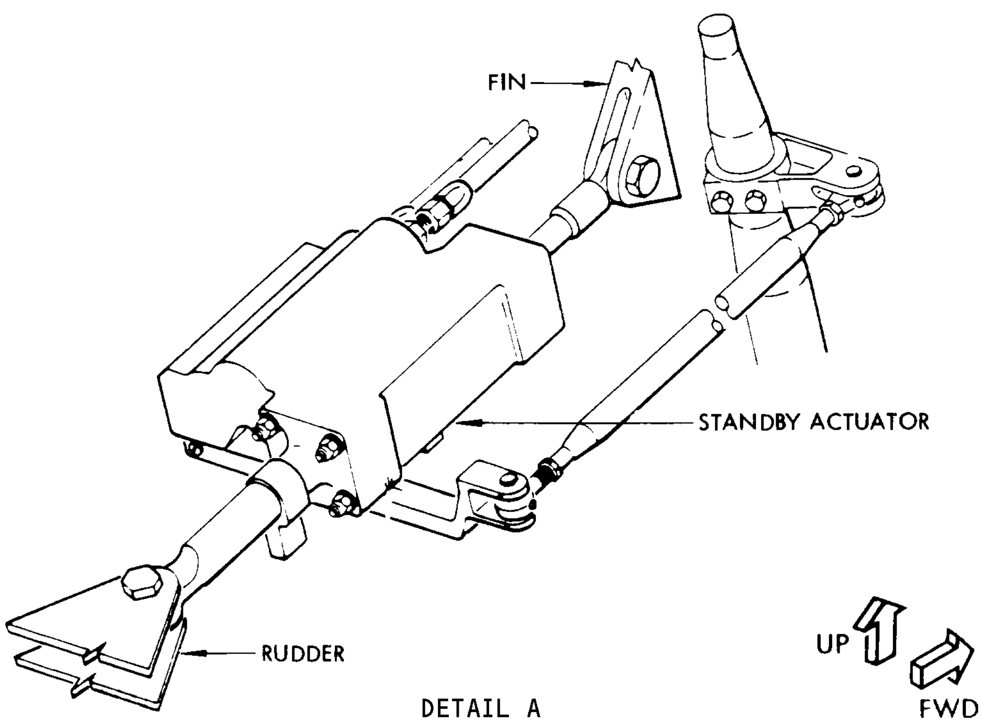
RUDDER - REMOVAL/INSTALLATION

1. General
   A. For interchangeability of graphite/composite rudder with aluminum/fiberglass rudder, refer to AMM 27-09-800/201.
2. Equipment and Materials
   A. Rudder Sling Assembly - F80025-1
   B. Rudder loading block
      (1) Loading block to distribute loads over a minimum of 5 square inches of rudder trailing edge. Suggested loading blocks: 0.125-inch thick (minimum) by 3 inches by 3 inches, approximately. Wood or fiberglass, suitably padded to prevent skin damage.
   C. Corrosion Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-21/201)
   D. Rudder Offset Screwdriver - F80190-1 (Preferred) or SE27-2007 (Optional).
   E. Milliohmmeter - 0 to 0.1 ohm range
3. Prepare for Removal (Fig. 401)
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Remove access panels 9512, 9514, and 9515 from vertical fin.
   C. Remove hinge coverplates and fairings from both sides of rudder.
   D. Remove seals and seal attachment plates from both sides of fin at rudder balance weight slots. Use special offset screwdriver fabricated per SE27-2007, or equivalent to remove screws in radius of seal attachment plates.
   E. Install rudder removal/installation sling.
      (1) Remove vertical fin trailing edge seal segments covering rudder hinge locations No. 4 and 5
      (2) Remove vertical fin hinge segments and rudder hinge bearing bars at hinge locations No. 4 and 5
      (3) Remove sling attachment bolts from stowed positions in sling sides.
      (4) Install sling crossarms on rudder at hinge locations No. 4 and 5 with sling attachment bolts.
      (5) Assemble remainder of sling per Fig. 402.
      (6) Attach crane hook to sling.
4. Remove Rudder (Fig. 401)
   A. Disconnect and remove the vernier control rod between the input crank and the torque tube.

      CAUTION: MAKE SURE THAT YOU REMOVE THE VERNIER CONTROL ROD FROM THE PCU BEFORE YOU DISCONNECT THE PCU FROM THE RUDDER. FAILURE TO REMOVE THE VERNIER CONTROL ROD FIRST CAN CAUSE DAMAGE TO THE VERNIER CONTROL ROD DURING RUDDER TRAVEL CHECK.

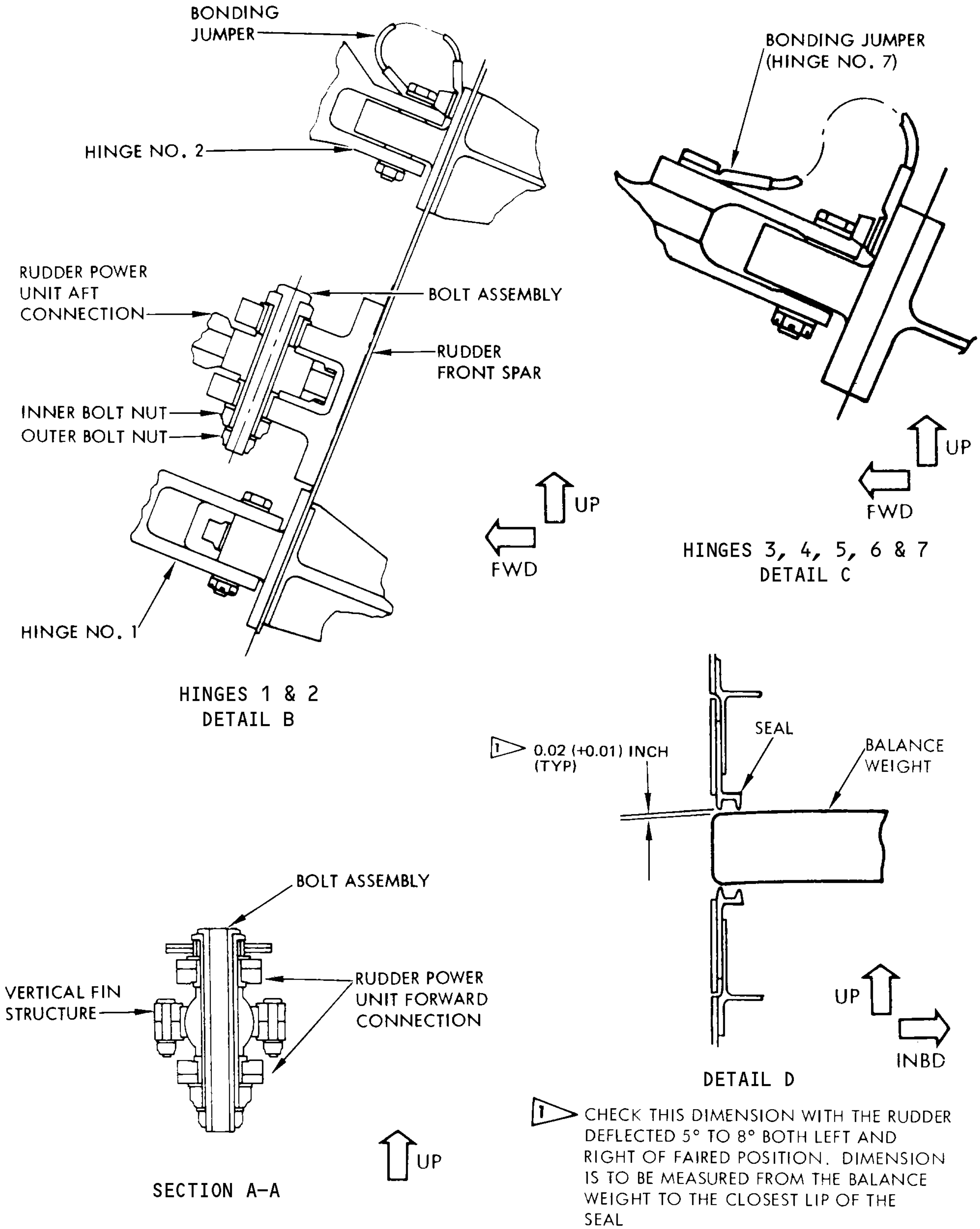
   B. Disconnect rudder power control unit and standby actuator from rudder (details A and B).
   C. Disconnect bonding jumpers from hinges No. 2 and 7. codes
   D. Remove hinge pivot bolts at hinges No. 2, 3, and 6.



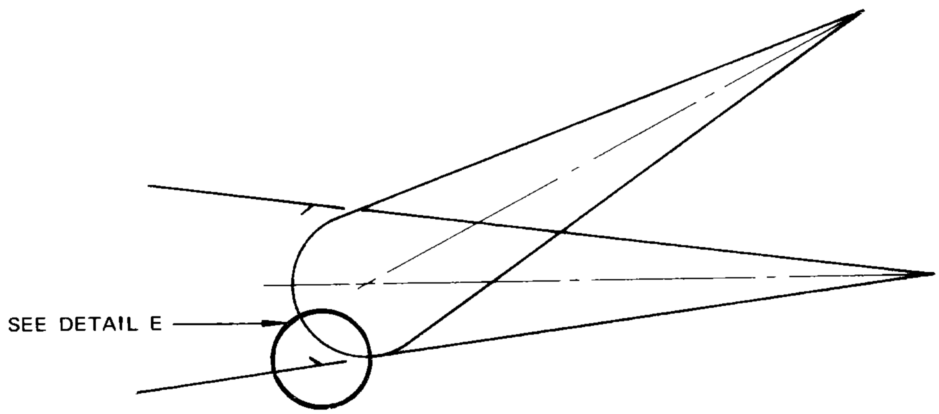


DETAIL A

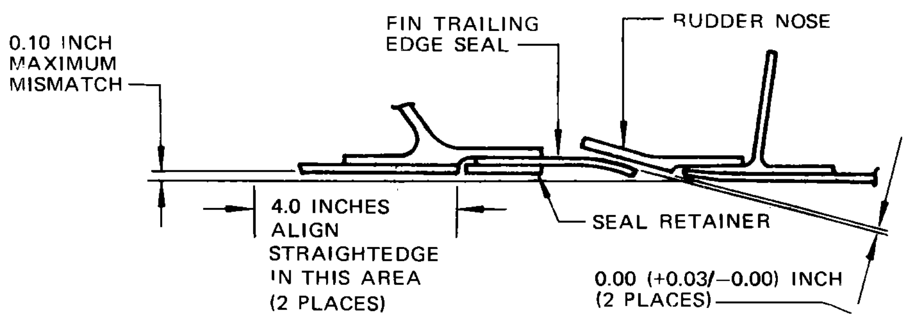
Rudder Installation
Figure 401 (Sheet 1)



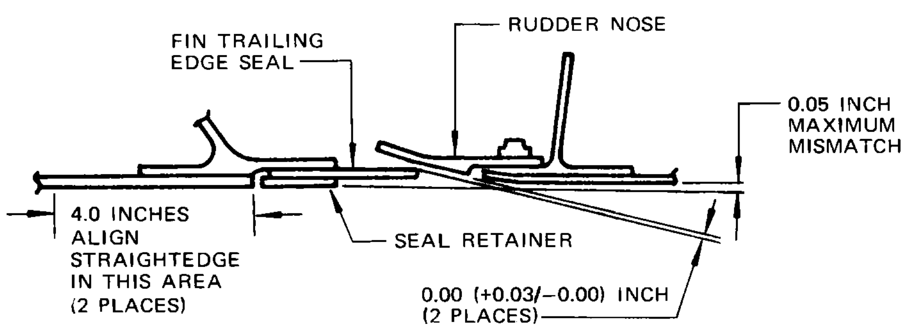
Rudder Installation
Figure 401 (Sheet 2)



SECTION B-B

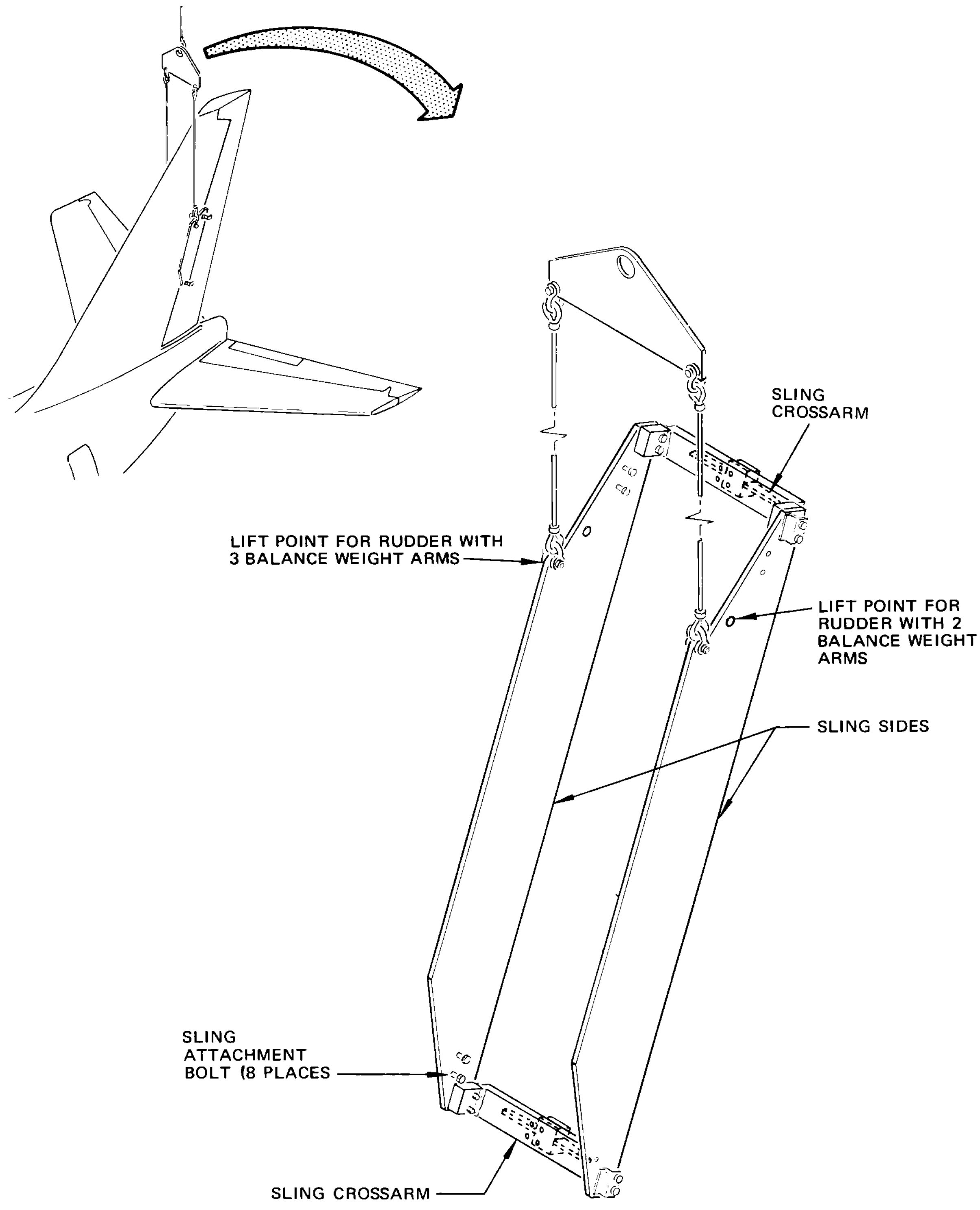


NEGATIVE MISMATCH



POSITIVE MISMATCH
DETAIL E

Rudder Installation
Figure 401 (Sheet 3)



Rudder Sling Assembly
Figure 402

E. Remove hinge pivot bolts at hinges No. 1 and 7.

WARNING: CRANE MUST BE READY TO SUPPORT WEIGHT OF RUDDER STEADILY WHEN HINGE BOLTS ARE REMOVED. SUPPORT UPPER AND LOWER ENDS OF RUDDER TO GUARD AGAINST DAMAGE. PERSONNEL MUST EXERCISE CAUTION AGAINST INJURY.

F. Remove rudder while using guy ropes to keep rudder clear of structure.

NOTE: Approximate weight of rudder is 257 pounds.

G. Hoist rudder onto padded temporary support.

5. Prepare for Installation

A. If a rudder with three balance weights is to be used on an airplane made to accept a rudder with only two balance weights, rework the fin with spares kit 65-90353-1.

B. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).

C. Check that access panels 9512, 9514, and 9515 are removed from vertical fin, and check that hinge coverplates and fairings on both sides of rudder are removed.

D. Check for allowable wear at rudder installation points as follows:

(1) Check for wear at rudder hinges (Ref 27-21-11 I/C).

(2) Check for wear at rudder power control unit attachment to rudder (Ref 27-21-91 I/C).

(3) Check for wear at standby rudder actuator attachment to rudder (Ref 27-21-141 I/C).

E. If not installed, install rudder sling assembly (Fig. 402).

F. Loosen rudder hinge segment internal-wrenching attach bolts on rudder front spar at all rudder hinges except No. 1 (Ref 27-21-21 R/I). Segments should move freely up and down in shear plates.

G. Remove seals and seal attachment plates from both sides of fin at rudder balance weight slots, if not removed in par. 2.D. This is necessary to provide adequate clearance at balance weights when positioning rudder.

H. Loosen all fin trailing edge seals and push seals to maximum forward position.

I. Position rudder to fin using rudder sling. Use guy ropes to keep rudder from striking structure.

J. Coat hinge pivot bolts with corrosion preventive compound.

6. Install Rudder (Fig. 401)

A. Install and tighten hinge pivot bolts at rudder hinges No. 1, 7, 2, 3, and 6, in that order (Ref 27-21-21 R/I).

B. Install bonding jumpers at hinges No. 2 and 7.

C. Tighten rudder hinge segment internal-wrenching attach bolts at rudder hinges No. 2, 3, 6, and 7 (Ref 27-21-21 R/I).

D. Use the milliohmmeter to make sure there is a maximum of 0.01 ohms between the rudder and the vertical fin.

E. Remove rudder sling assembly (Fig. 402).

F. Install fin hinge segments and rudder hinge segments at rudder hinge locations No. 4 and 5. Do not tighten attach bolts.

G. Install and tighten hinge pivot bolts at rudder hinges No. 4 and 5, then tighten fin hinge segment and rudder hinge segment attach bolts (Ref 27-21-21 R/I).

H. Connect the control rod that you disconnected between the input crank and the torque tube.

7. Restore Airplane to Normal (Fig. 401)

A. Install vertical fin trailing edge seal segments covering rudder hinge locations No. 4 and 5.

B. Check rudder hinge friction and rudder limit travel.

(1) If rudder power control unit is installed in fin, disconnect forward end (Section A-A, Fig. 401). Move forward end right and forward so that power unit will clear rudder clevis during friction and travel checks.

(2) Check that all seals clear rudder nose and balance weights (Fig. 401, details D and E). Make this check with the rudder deflected 5 to 8 degrees to left and to right of faired position.

(3) Use rudder loading block to slowly move rudder by hand through full travel left and right. If there is any sign of binding, rough spots, or excessive friction at any point of travel, correct condition and repeat check.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(4) Measure maximum force required to move rudder slowly left from neutral until rudder stops.

(5) Measure maximum force required to move rudder slowly right from neutral until rudder stops.

(6) If force in step (4) or (5) is greater than 25 pounds, bearing friction is too high. Correct this condition and repeat from step (2) on.

(7) Install rudder nose fairings. (It is necessary to install fairings at this point to check for interference with rudder travel in following step.)

(8) Move rudder left and right full travel and measure travel. Minimum required travel is 22.87 inches from neutral. If minimum required travel is not achieved, check rudder nose fairing for interference with rudder hinges per SB 27-1107 (applicable to airplanes specified in SB 27-1107).

(9) Do a visual check to make sure that the fairings do not interfere with other components during the full travel of the rudder.

C. AIRPLANES PRE-SB 27-1252;
Reconnect the rudder power control unit to the fin and to the rudder (AMM 27-21-91/401).

D. AIRPLANES POST-SB 27-1252;
Reconnect the rudder power control unit to the fin and to the rudder (AMM 27-21-92/401).

E. Connect standby actuator to rudder (Ref 27-21-141 R/I).

F. Check that fin to rudder mismatch at each rib location (14 places) along each surface does not exceed allowable tolerances (Fig. 401, detail E).

G. Adjust fin trailing edge seals per detail E of Fig. 401, then tighten down seal retainers.

H. Adjust fin to balance weight seals per detail D of Fig. 401, then tighten down seal retainers.

I. Restore airplane to normal hydraulic configuration (Ref 27-21-0).

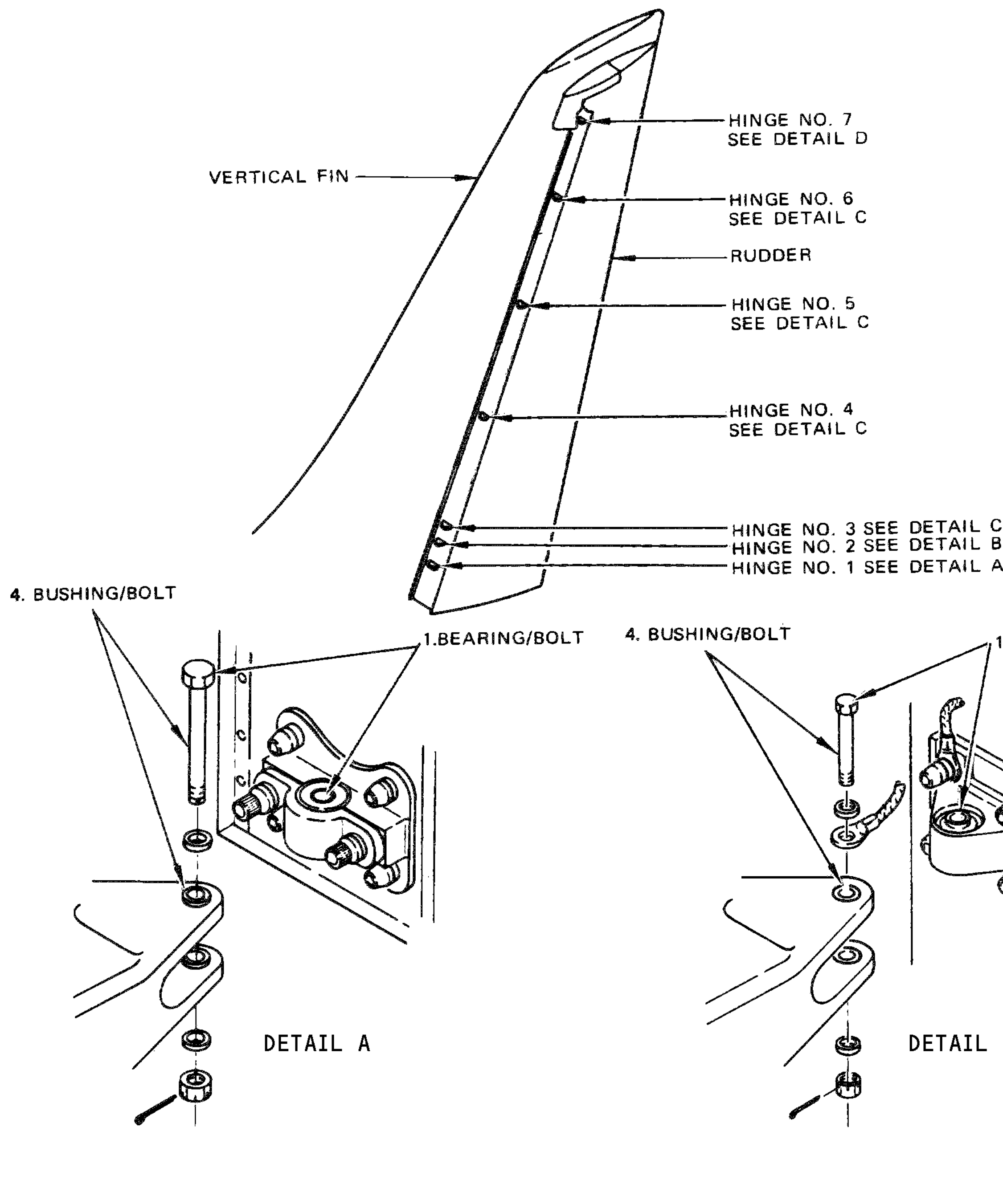
J. AIRPLANES PRE-SB 27-1252;
Test the rudder hinge and the power control unit bearing play, and the rudder travel (AMM 27-21-0/501).

K. AIRPLANES POST-SB 27-1252;
Test the rudder hinge and the power control unit bearing play, and the rudder travel (AMM 27-21-1/501).

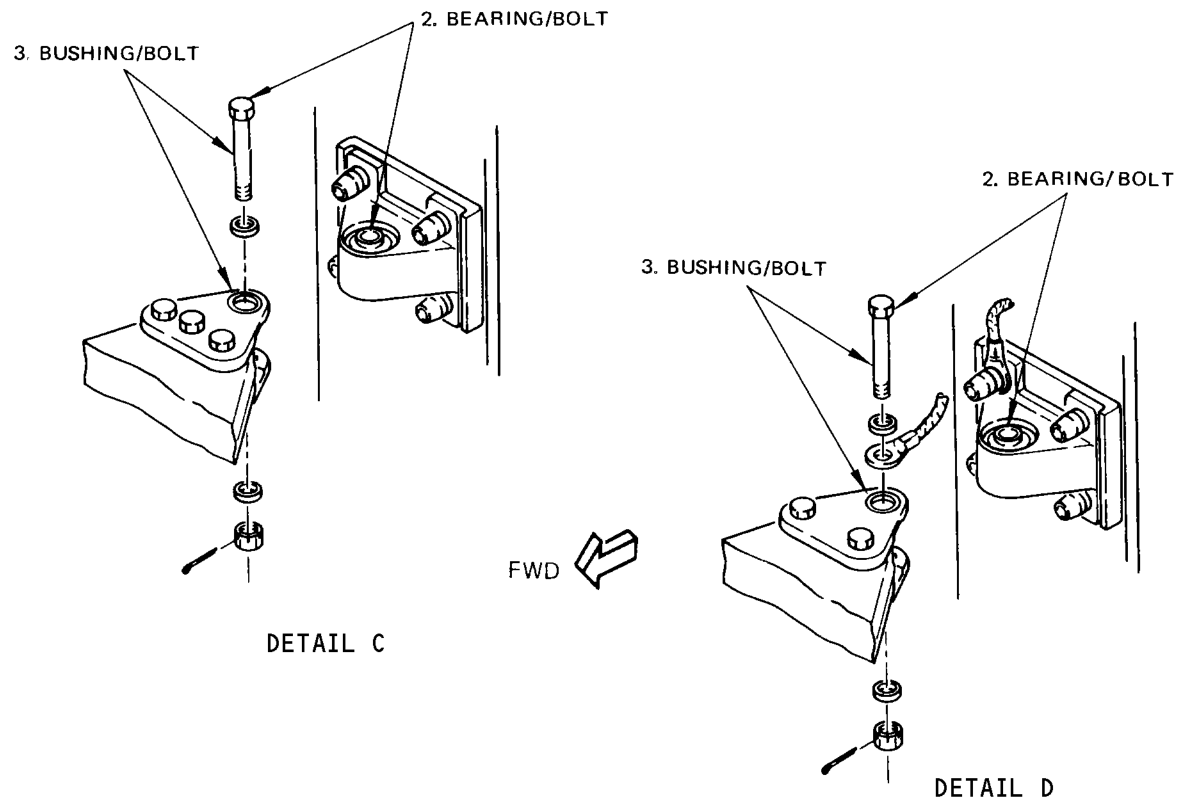
L. Replace all access panels and close access doors.

RUDDER - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Rudder Wear Limits



Rudder Wear Limits
Figure 601 (Sheet 1)



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.3745	0.3750	0.3825	0.0080	X		
	BOLT	OD	0.3735	0.3745	0.3665		X		
2	BEARING	ID	0.3120	0.3125	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3070		X		
3	BUSHING	ID	0.3120	0.3130	0.3150	0.0050	*[1]		
	BOLT	OD	0.3110	0.3120	0.3050		X		
4	BUSHING	ID	0.3745	0.3755	0.3780	0.0070	*[2]		
	BOLT	OD	0.3735	0.3745	0.3710		X		

*[1] BUSHING INTERFERENCE - 0.0006-0.0011 INCHES. REAM TO DESIGN LIMITS.

*[2] BUSHING INTERFERENCE - 0.0003-0.0016 INCHES. REAM TO DESIGN LIMITS.

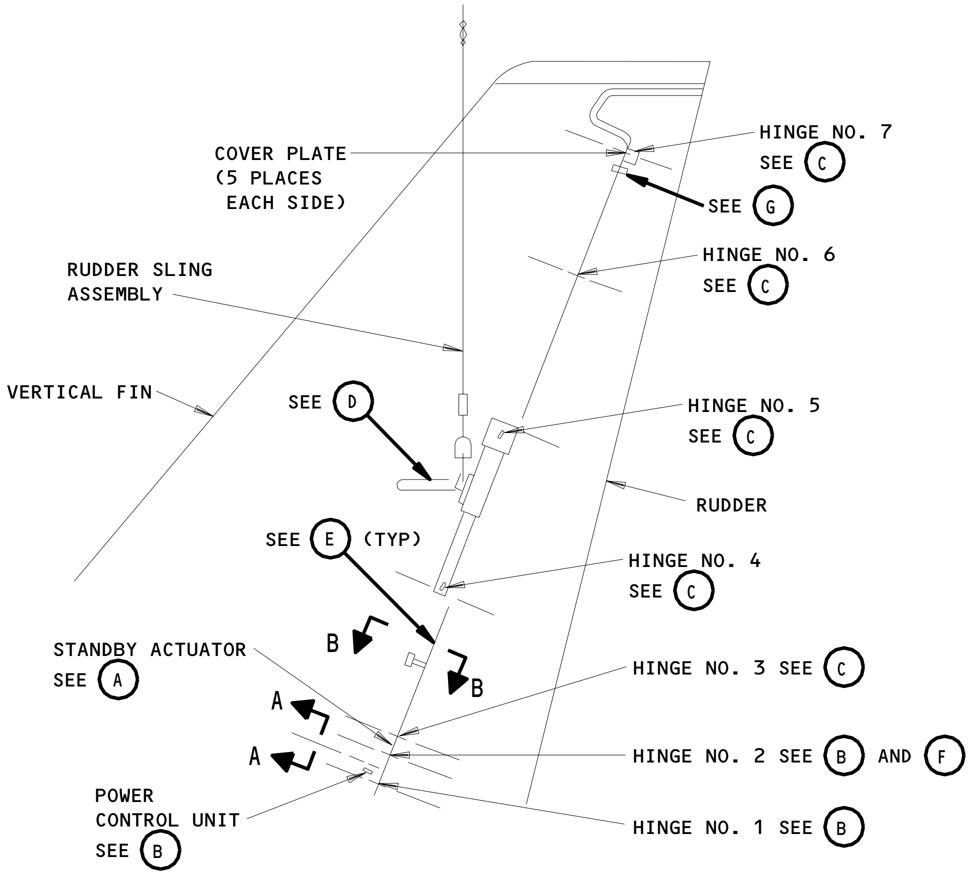
Rudder Wear Limits
Figure 601 (Sheet 2)

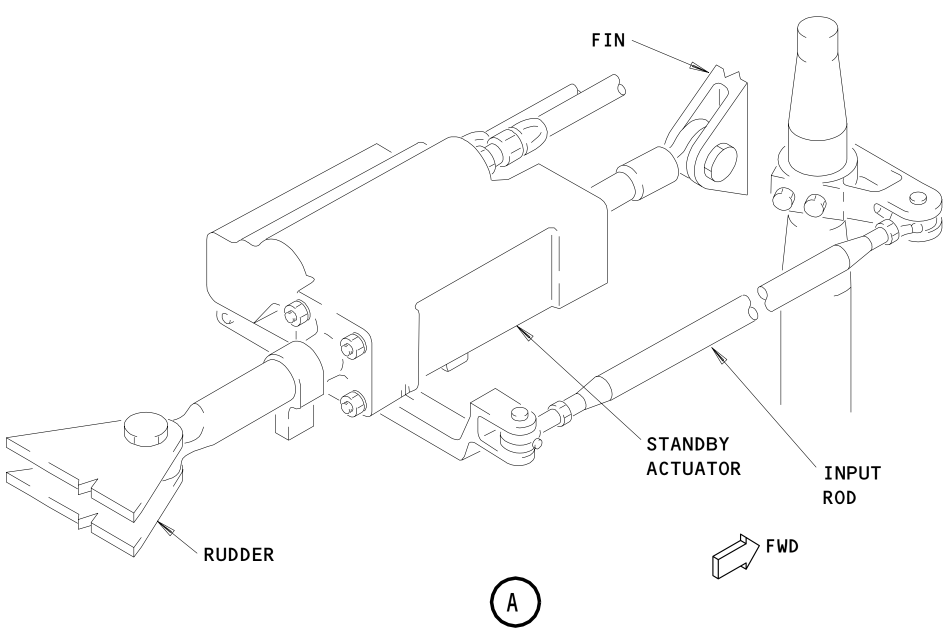
RUDDER - REMOVAL/INSTALLATION

1. Equipment and Materials
    A. Rudder Removal/Installation Sling - C27003-1
    B. Rudder loading block
        (1) Loading block to distribute loads over a minimum of 5 square inches of rudder trailing edge. Suggested loading blocks: 0.125-inch thick (minimum) by 3 inches by 3 inches approximately. Wood or fiberglass, suitably padded to prevent skin damage.
    C. Corrosion Preventive Compound - BMS 3-24 (AMM 20-30-21/201)
    D. Sealant - BMS 5-95 (AMM 20-30-21/201)
    E. Milliohmmeter - 0 to 0.1 ohm range
2. Prepare for Removal (Fig. 401)
    A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
    B. Remove access panels 9512, 9514, and 9515 from vertical fin.
    C. Remove hinge coverplates and fairings from both sides of rudder.
    D. Remove seals and seal attachment plates from both sides of fin at rudder balance weight slot.
    E. Install rudder removal/installation sling.
        (1) Remove vertical fin trailing edge seal segments covering rudder hinge locations No. 4 and 5.
        (2) Remove vertical fin hinge segments and rudder hinge bearing bars at hinge locations No. 4 and 5.
        (3) Remove sling attachment bolts from stowed positions in sling sides.
        (4) Install sling crossarms on rudder at hinge locations No. 4 and 5 with sling attachment bolts.
        (5) Assemble remainder of sling per Fig. 402.
        (6) Attach crane hook to sling.
3. Remove Rudder (Fig. 401)
    A. Disconnect rudder power control unit and standby actuator from rudder.
    B. Disconnect and remove input rod between input crank and torque tube. Removing rod will prevent possible rod damage during rudder travel check.
    C. Before incorporation of SB 51-1011, disconnect bonding jumper from hinge No. 7.
    D. After incorporation of SB 51-1011, disconnect bonding jumper from station 227.57.
    E. Disconnect bonding jumper from hinge No. 3.
    F. Remove hinge bolts at hinges No. 2, 3, and 6. Remove shim at hinge No. 2.

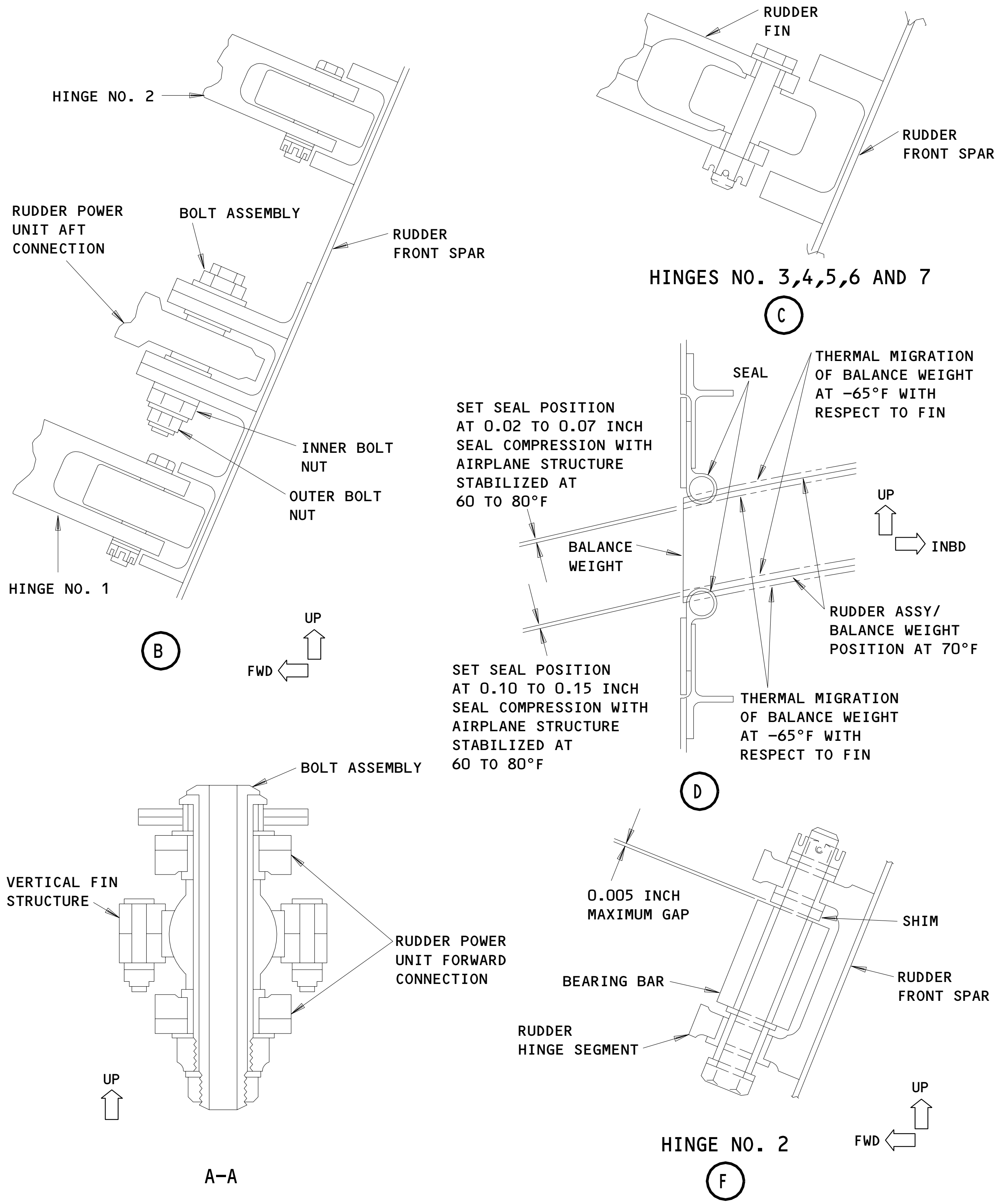
    WARNING: CRANE MUST BE READY TO SUPPORT WEIGHT OF RUDDER STEADILY WHEN HINGE BOLTS ARE REMOVED. SUPPORT UPPER AND LOWER ENDS OF RUDDER TO GUARD AGAINST DAMAGE. PERSONNEL MUST EXERCISE CAUTION AGAINST INJURY.

    G. Remove hinge bolts at hinges No. 1 and 7.

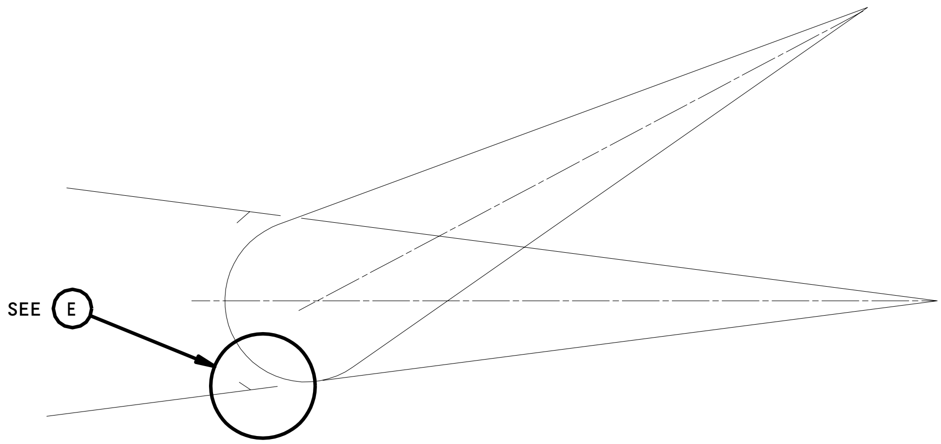




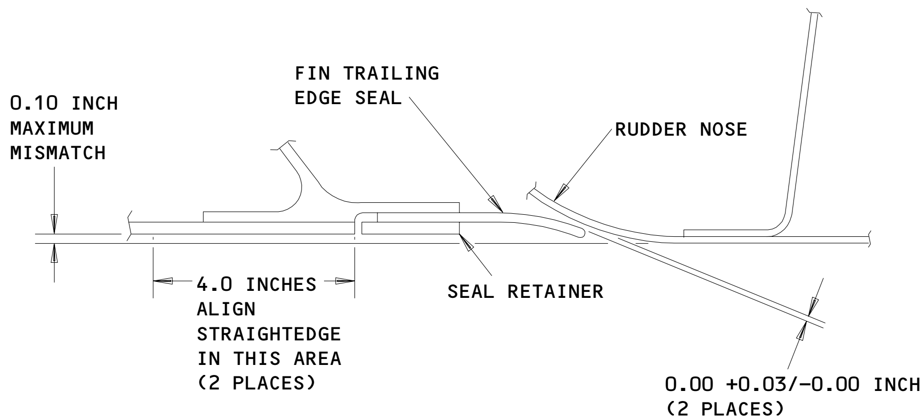
Rudder Installation
Figure 401 (Sheet 1)



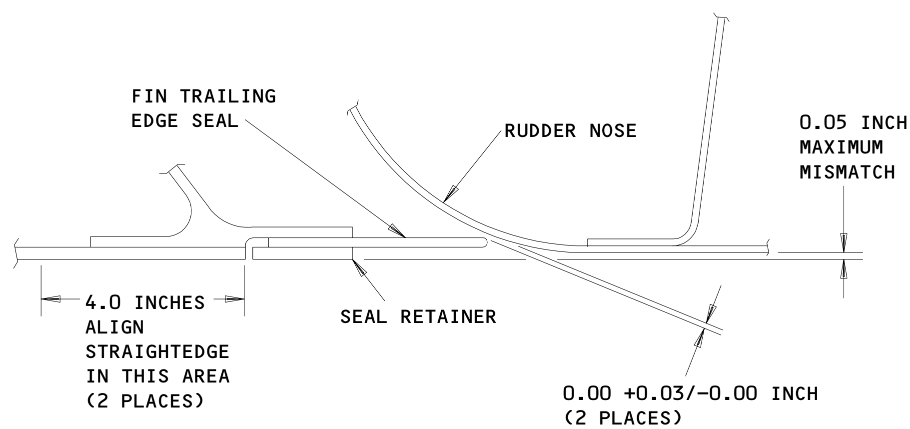
Rudder Installation
Figure 401 (Sheet 2)



B-B



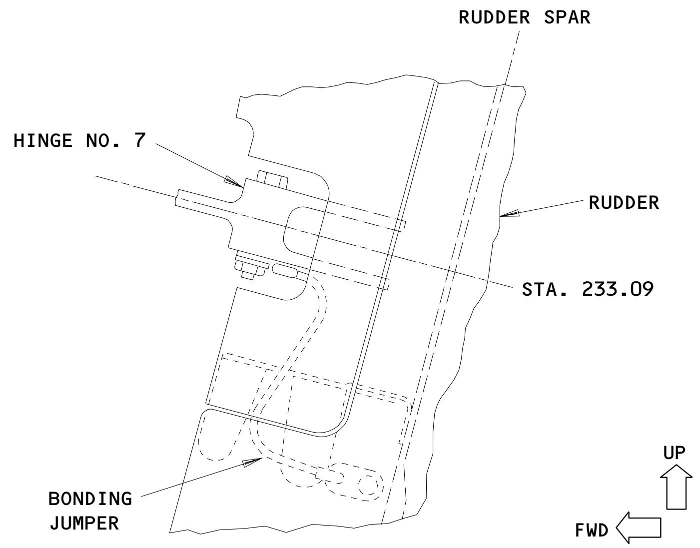
NEGATIVE MISMATCH



POSITIVE MISMATCH

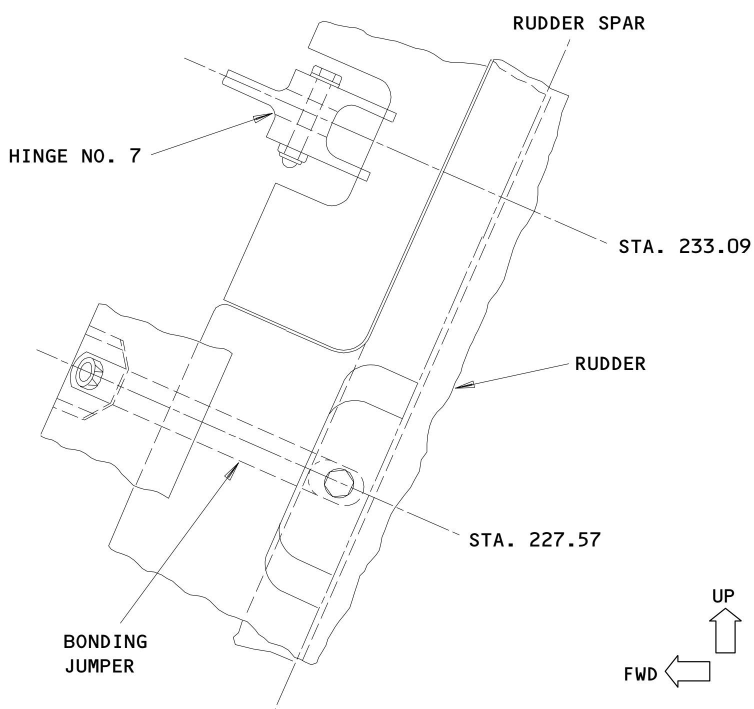
E

Rudder Installation
Figure 401 (Sheet 3)



BEFORE INCORPORATION OF SB 51-1011

G



AFTER INCORPORATION OF SB 51-1011

G

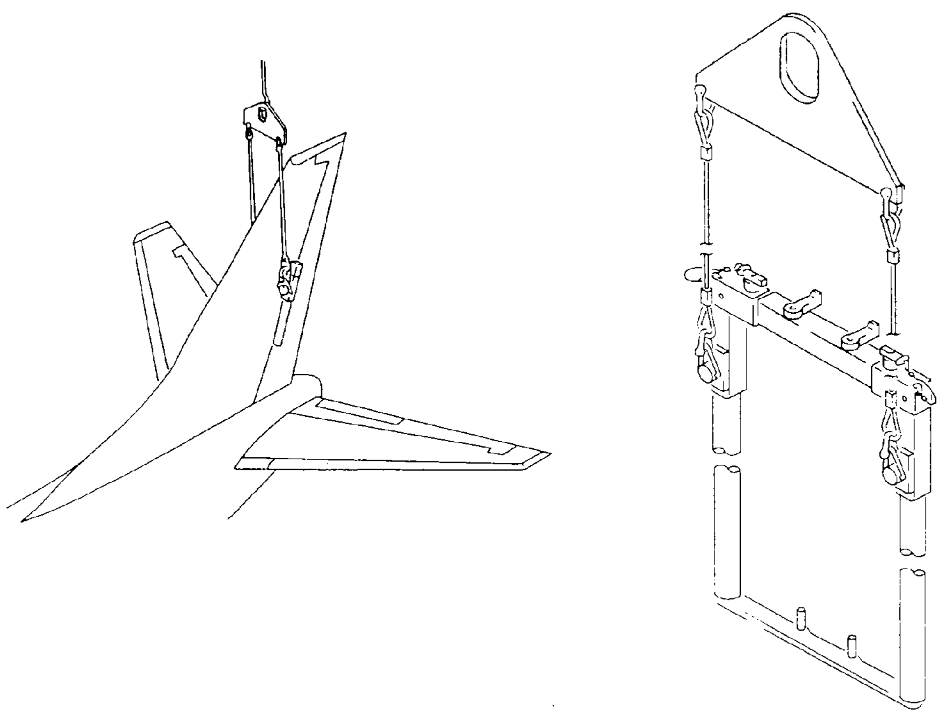
Rudder Installation
Figure 401 (Sheet 4)

H. Remove rudder while using guy ropes to keep rudder clear of structure.

NOTE: Rudder weighs approximately 160 pounds.

I. Hoist rudder onto padded temporary support.

4. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP)
   B. Check that access panels 9512, 9514, and 9515 are removed from vertical fin, and check that hinge coverplates and fairings on both sides of rudder are removed.
   C. Check for allowable wear at rudder installation points as follows:
      (1) Check for wear at rudder hinges (Ref 27-21-12 I/C).
      (2) Check for wear at rudder power control unit attachment to rudder (Ref 27-21-91 I/C).
      (3) Check for wear at standby rudder actuator attachment to rudder (Ref 27-21-141 I/C).
   D. If not installed, install rudder sling (Fig. 402).
   E. Remove seals and seal attachment plates from both sides of fin at rudder balance weight slot, if required. This is necessary to provide adequate clearance at balance weights when positioning rudder.
   F. Loosen all fin trailing edge seals and push seals to maximum forward position.
   G. Position rudder to fin using rudder sling. Use guy ropes to keep rudder from striking structure. Slide bearing bars at hinges No. 3, 6 and 7 up or down as required for engagement with vertical fin clevises.
   H. Coat hinge bolts with corrosion preventive compound.
5. Install Rudder (Fig. 401)
   A. Install and tighten hinge bolts at rudder hinges No. 1, 7, 3, and 6, in that order (Ref 27-21-22 R/I).
   B. Connect the control rod between input crank and torque tube.
   C. Install bonding jumper at hinge No. 3.
   D. Before incorporation of SB 51-1011, install bonding jumper at hinge No. 7. Apply sealant to jumper ends and fasteners.
   E. After incorporation of SB 51-1011, install bonding jumper at station 227.57. Apply sealant to jumper ends and fasteners.
   F. Loosen bearing bar attach bolts at No. 2 hinge. Install rudder hinge bolt. Do not tighten rudder hinge bolt. Tighten bearing bar attach bolts (Ref AMM 27-21-22 R/I). Shim hinge to control gap between rudder hinge segment and nearing bar. Tighten hinge bolt.



Rudder Removal/Installation Sling
Figure 402

G. Use the milliohmmeter to make sure there is a maximum of 0.01 ohms between the rudder and the vertical fin.
H. Remove rudder sling (Fig. 402).
I. Install vertical fin hinge segments and bearing bars at rudder hinges No. 4 and 5. Do not tighten attach bolts.
J. Install and tighten hinge bolts at hinges No. 4 and 5, then tighten vertical fin hinge segments and bearing bar attach bolts (Ref 27-21-22 R/I).

6. Restore Airplane to Normal (Fig. 401)
A. Install vertical fin trailing edge seal segments covering rudder hinge locations No. 4 and 5.
B. Check rudder hinge friction and rudder limit travel.
(1) If rudder power control unit is installed in fin, disconnect forward end. Move forward end right and forward so that power unit will clear rudder clevis during friction and travel checks.
(2) Check that all seals clear rudder nose and balance weights. Make this check with rudder deflected 5 to 8 degrees to left and to right of faired position.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

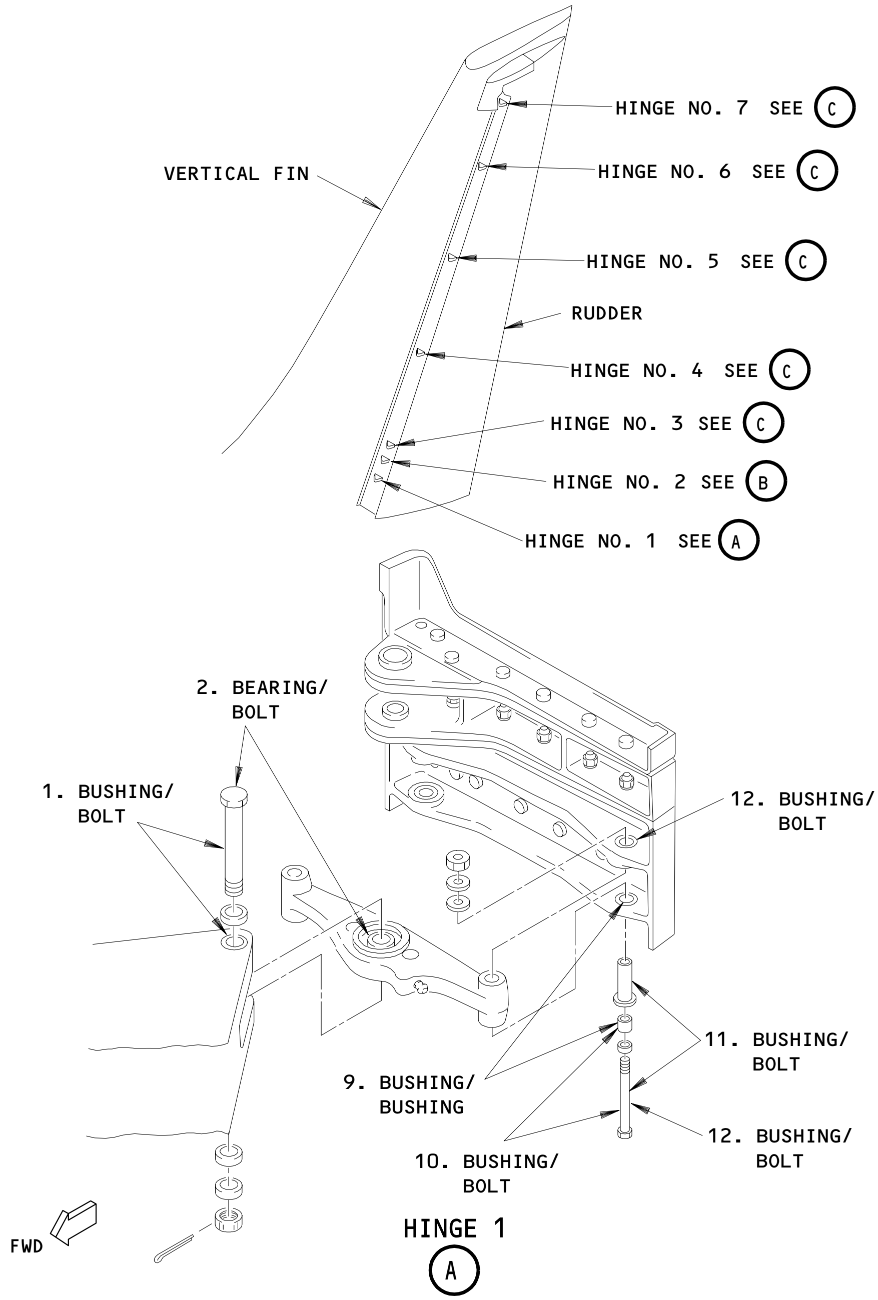
(3) Use rudder loading block to slowly move rudder by hand through full travel left and right. If any sign of binding, rough spots, or excessive friction at any point of travel, correct condition and repeat check.
(4) Measure maximum force required to move rudder slowly left from neutral until rudder stops.
(5) Measure maximum force required to move rudder slowly right from neutral until rudder stops.
(6) If force in step (4) or (5) is greater than 25 pounds, bearing friction is excessive. Correct condition and repeat from step (2) on.
(7) Move rudder left and right full travel and measure travel. Required travel left and right is 23.17 ±0.30 inches from neutral.

C. Connect rudder power control unit to fin and to rudder (Ref 27-21-91 R/I).
D. Connect standby actuator to rudder (Ref 27-21-141 R/I).
E. Install input rod between input crank and torque tube.
F. Check that fin to rudder mismatch at each rib location (14 places) along each surface does not exceed allowable tolerances.
G. Adjust fin trailing edge seals then tighten down seal retainers.
H. Adjust fin to balance weight seals then tighten down seal retainers.

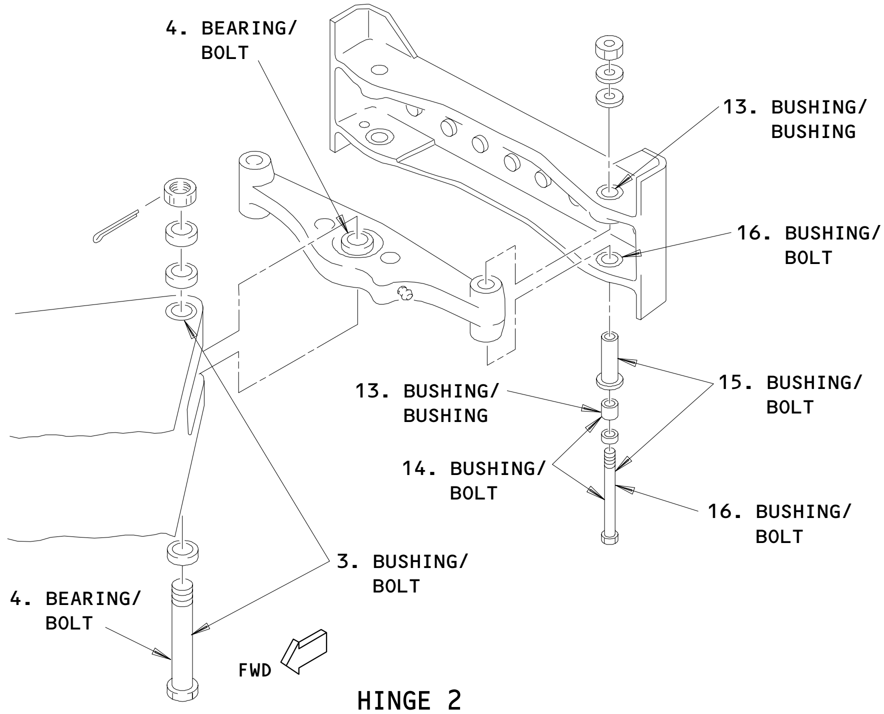
I. Install the fairings.
J. Restore airplane to normal hydraulic configuration (Ref 27-21-0, MP).
K. Do the task "Test Rudder Hinge and Power Control Unit Bearing Play" (AMM 27-21-0/501).
L. Do the task "Test Rudder Travel" (AMM 27-21-0/501).
M. Replace all access panels and close access doors.

RUDDER - INSPECTION/CHECK

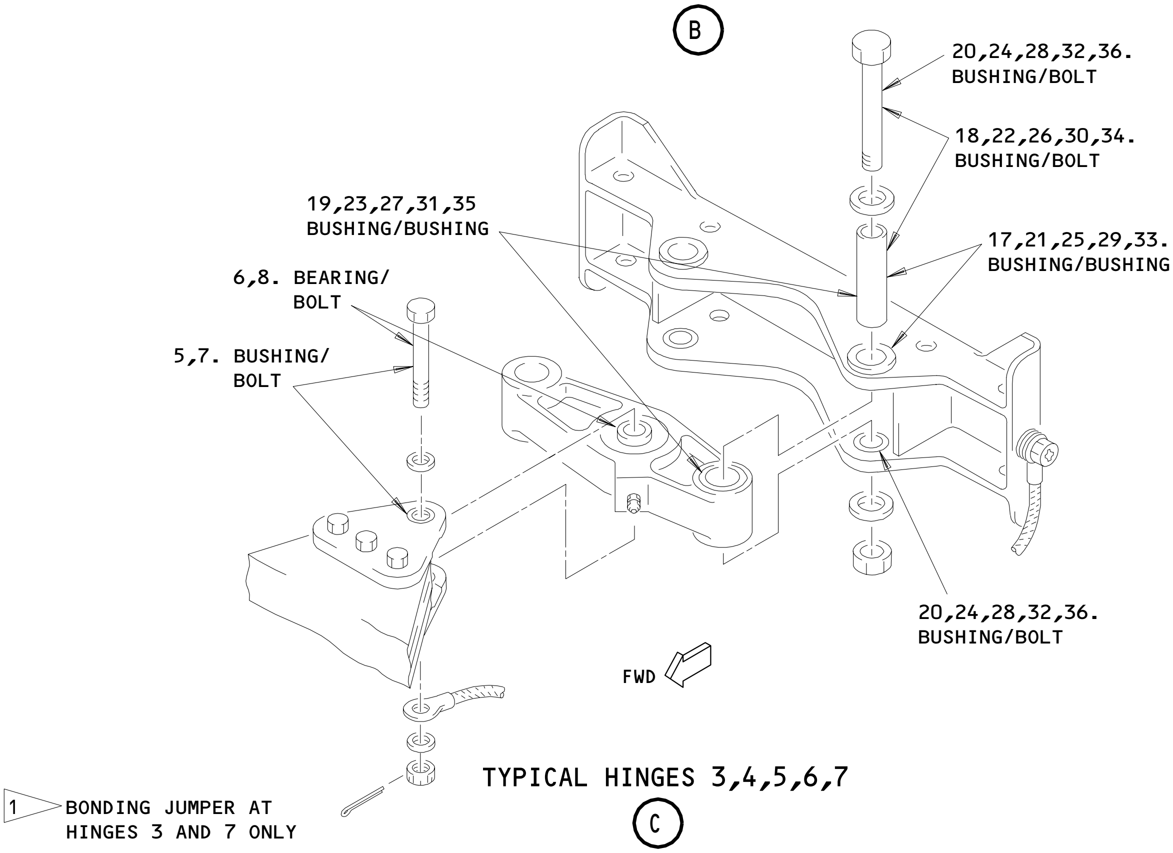
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Rudder Wear Limits (Fig. 601)



Rudder Wear Limits
Figure 601 (Sheet 1)



HINGE 2
B



TYPICAL HINGES 3,4,5,6,7
C

Rudder Wear Limits
Figure 601 (Sheet 2)

467650

INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.3745	0.3755	0.3815	0.0072	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	1
2	BEARING	ID	0.3745	0.3750	0.3772	0.0054			
	BOLT	OD	0.3735	0.3745	0.3695			X	1
3	BEARING	ID	0.3745	0.3755	0.3815	0.0072	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	1
4	BEARING	ID	0.3745	0.3751	0.3773	0.0054			
	BOLT	OD	0.3735	0.3745	0.3695			X	1
5	BUSHING (HINGES 3,4,5,6)	ID	0.3120	0.3130	0.3170	0.0072	X		
	BOLT (HINGES 3,4,5,6)	OD	0.3110	0.3120	0.3070			X	1
6	BEARING (HINGES 3,4,5,6)	ID	0.3120	0.3125	0.3146	0.0054			
	BOLT (HINGES 3,4,5,6)	OD	0.3110	0.3120	0.3170			X	1
7	BUSHING (HINGE 7)	ID	0.3120	0.3130	0.3170	0.0072	X		
	BOLT (HINGE 7)	OD	0.3110	0.3120	0.3070			X	1
8	BEARING (HINGE 7)	ID	0.3120	0.3125	0.3146	0.0054			
	BOLT (HINGE 7)	OD	0.3110	0.3120	0.3070			X	1
9	BUSHING	ID	0.5000	0.5010	0.5030	2 0.0034	X		
	BUSHING	OD	0.4990	0.4995	0.4977		X		
10	BUSHING	ID	0.3760	0.3745	0.3785	2 0.0042	X		
	BOLT	OD	0.3735	0.3765	0.3695				
11	BUSHING	ID	0.3760	0.3765	0.3785	0.0042	X		
	BOLT	OD	0.3735	0.3745	0.3695				
12	BUSHING	ID	0.3760	0.3765	0.3785	0.0042	X		
	BOLT	OD	0.3735	0.3745	0.3695				

Rudder Wear Limits
Figure 601 (Sheet 3)

INDEX NO.	PART NAME	DIM	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
			DIAMETER		MAX WEAR DIM.	MAX DIAM CLEAR-ANCE			
			MIN	MAX					
13	BUSHING	ID	0.5000	0.5010	0.5030	[2] 0.0034	X		
	BUSHING	OD	0.4990	0.4995	0.4977		X		
14	BUSHING	ID	0.3760	0.3765	0.3785	[2] 0.0042	X		
	BOLT	OD	0.3735	0.3745	0.3695				
15	BUSHING	ID	0.3760	0.3765	0.3785	0.0042	X		
	BOLT	OD	0.3735	0.3745	0.3695				
16	BUSHING	ID	0.3760	0.3765	0.3785	0.0042	X		
	BOLT	OD	0.3735	0.3745	0.3695				
17	BUSHING (HINGE 3)	ID	0.4375	0.4381	0.4400	0.0035	X		
	BUSHING (HINGE 3)	OD	0.4365	0.4370	0.4353		X		
18	BUSHING (HINGE 3)	ID	0.3125	0.3130	0.3149	0.0045	X		
	BOLT (HINGE 3)	OD	0.3110	0.3120	0.3070				
19	BUSHING (HINGE 3)	ID	0.4380	0.4385	0.4411	0.0045			
	BUSHING (HINGE 3)	OD	0.4365	0.4370	0.4360		X		
20	BUSHING (HINGE 3)	ID	0.3125	0.3130	0.3149	0.0045	X		
	BOLT (HINGE 3)	OD	0.3110	0.3120	0.3070				
21	BUSHING (HINGE 4)	ID	0.4375	0.4395	0.4414	0.0045	X		
	BUSHING (HINGE 4)	OD	0.4365	0.4370	0.4353		X		
22	BUSHING (HINGE 4)	ID	0.3125	0.3130	0.3149	0.0045	X		
	BOLT (HINGE 4)	OD	0.3110	0.3120	0.3070				
23	BUSHING (HINGE 4)	ID	0.4380	0.485	0.4411	0.0045			
	BUSHING (HINGE 4)	OD	0.4365	0.4370	0.4360		X		
24	BUSHING (HINGE 4)	ID	0.3125	0.3135	0.3149	0.0045	X		
	BOLT (HINGE 4)	OD	0.3110	0.3120	0.3070				

Rudder Wear Limits
Figure 601 (Sheet 4)

INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
25	BUSHING (HINGE 5)	ID	0.4375	0.4395	0.4414	0.0045	X		
	BUSHING (HINGE 5)	OD	0.4365	0.4370	0.4353		X		
26	BUSHING (HINGE 5)	ID	0.3125	0.3130	0.3149	0.0045	X		
	BOLT (HINGE 5)	OD	0.3110	0.3120	0.3070				
27	BUSHING (HINGE 5)	ID	0.4380	0.4385	0.4411	0.0045			
	BUSHING (HINGE 5)	OD	0.4365	0.4370	0.4360		X		
28	BUSHING (HINGE 5)	ID	0.3125	0.3135	0.3149	0.0045	X		
	BOLT (HINGE 5)	OD	0.3110	0.3120	0.3070				
29	BUSHING HINGE 6)	ID	0.4375	0.4395	0.4414	0.0045	X		
	BUSHING (HINGE 6)	OD	0.4365	0.4370	0.4353		X		
30	BUSHING (HINGE 6)	ID	0.3125	0.3130	0.3149	0.0045	X		
	BOLT (HINGE 6)	OD	0.3110	0.3120	0.3070				
31	BUSHING (HINGE 6)	ID	0.4380	0.4385	0.4411	0.0045			
	BUSHING (HINGE 6)	OD	0.4365	0.4370	0.4360		X		
32	BUSHING (HINGE 6)	ID	0.3125	0.3135	0.3149	0.0045	X		
	BOLT (HINGE 6)	OD	0.3110	0.3120	0.3070				
33	BUSHING (HINGE 7)	ID	0.3750	0.3790	0.3808	0.0060	X		
	BUSHING (HINGE 7)	OD	0.3740	0.3745	0.3729		X		
34	BUSHING (HINGE 7)	ID	0.2500	0.2505	0.2525	0.0040	X		
	BOLT (HINGE 7)	OD	0.2485	0.2495	0.2480				
35	BUSHING (HINGE 7)	ID	0.3755	0.3760	0.3784	0.0045			
	BUSHING (HINGE 7)	OD	0.3740	0.3745	0.3735		X		
36	BUSHING (HINGE 7)	ID	0.2500	0.2540	0.2560	0.0080	X		
	BOLT (HINGE 7)	OD	0.2485	0.2495	0.2480				

1 CHROME PLATE THICKNESS 0.0030 INCH

2 SUM OF TWO NOT TO EXCEED 0.0060 INCH

Rudder Wear Limits
Figure 601 (Sheet 5)

RUDDER HINGES - REMOVAL/INSTALLATION

1. General
   A. The rudder is attached to the vertical fin at seven hinge points. Each of the rudder hinge segments may be replaced individually.
   B. The vertical fin contains five removable hinge segments. The two lower hinge points are contained in structural members.
2. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   B. Rigging Pins Kit - F70207-3, -52, -61, or -84.

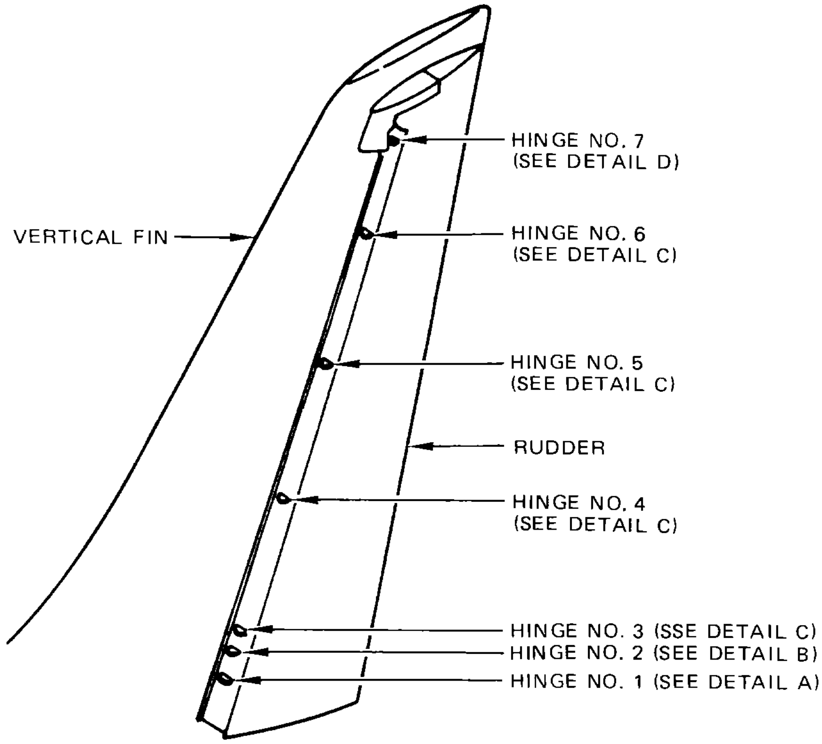
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-3	-11	0.309-0.311	6.7 ±0.25	RUDDER FWD QUADRANT

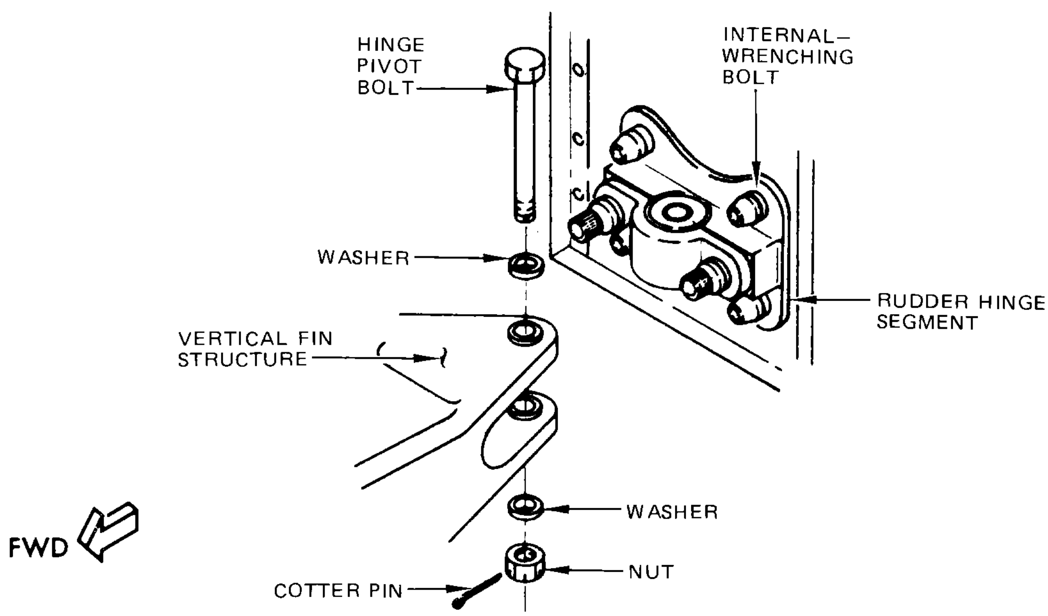
   C. Milliohmmeter - 0 to 0.1-ohm range.
3. Prepare to Remove Rudder Hinge
   A. Place rudder trim control wheel in neutral position.
   B. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   C. Install rigging pin R-3 in forward quadrant.
4. Remove Rudder Hinge (Fig. 401)
   A. Remove selected hinge coverplates from rudder leading edge.
   B. Remove rudder hinge pivot bolt and bonding jumper.

      NOTE: Bonding jumpers are installed on No. 2 and 7 rudder hinges.

   C. Remove internal-wrenching attach bolts and separate rudder hinge segment from rudder structure.
   D. Remove bolts and separate fin hinge segment from vertical fin structure.
5. Install Rudder Hinge (Fig. 401)
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP). Check that rigging pin R-3 is installed in forward quadrant.

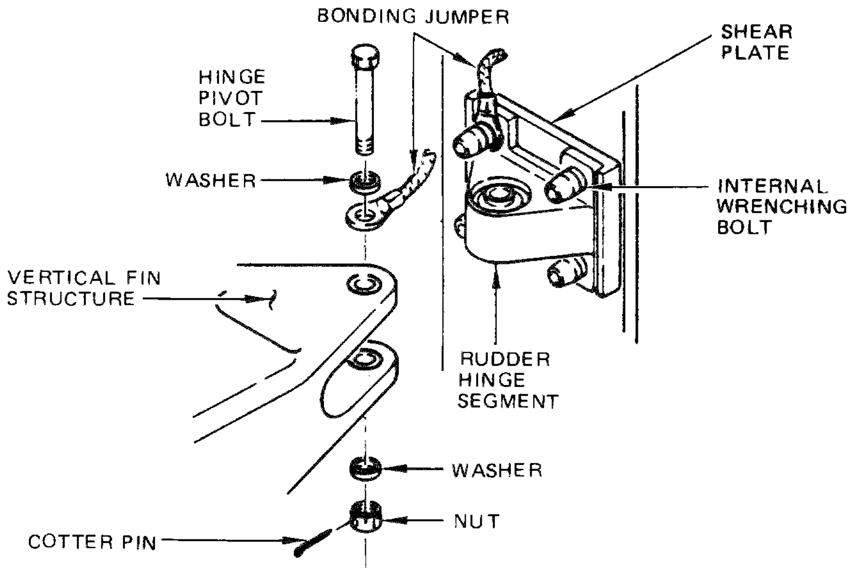
B. Check for allowable wear between rudder hinge and rudder hinge bolt (Ref 27-21-11 I/C).
C. Place fin hinge segment into position and install bolts, washers, and nuts. Tighten bolts 50 to 70 pound-inches.
   (1) At hinge No. 7, install the bonding jumper.
D. Place rudder hinge segment into position and install internal-wrenching bolts with minimum torque.
   (1) At hinge No. 2 or 7, install the bonding jumper.
E. Coat hinge pivot bolt with corrosion preventive compound. Install bolt in hinge pivot point with countersunk washer under head.
   (1) At hinge No. 2, install the bonding jumper.
F. Install washer and nut on hinge pivot bolt hand-tight.
G. Tighten internal-wrenching bolts equally to secure rudder hinge segment to structure. Tighten No. 2 hinge segment bolts 140 to 160 pound-inches and No. 1, 3, 4, 5, 6, and 7 hinge segment bolts 70 to 80 pound-inches.
H. Tighten hinge pivot nut on hinges No. 1 and 2, 95 to 110 pound-inches. Continue to turn nut to align cotter pin hole. Maximum alignment torque permitted is 190 pound-inches. Install cotter pin.
I. Tighten hinge pivot nut on hinges No. 3, 4, 5, 6, 7, 60 to 85 pound-inches. Continue to turn nut to align cotter pin hole. Maximum alignment torque permitted is 140 pound-inches. Install cotter pin.
J. Install hinge coverplates.
K. Remove rigging pin R-3.
L. Use the milliohmmeter to make sure there is a maximum of 0.01 ohms between the rudder and the vertical fin.
M. Restore airplane to normal hydraulic configuration (Ref 27-21-0 MP).





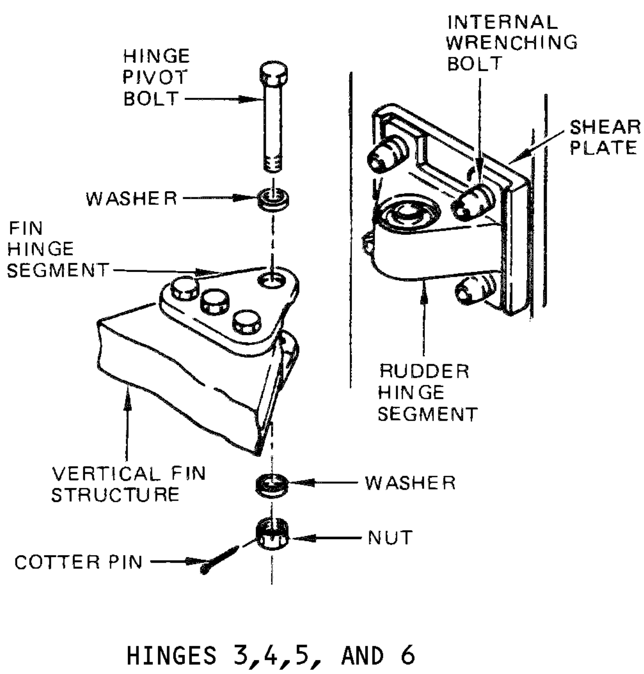
HINGE 1
DETAIL A

Rudder Hinge Installation
Figure 401 (Sheet 1)

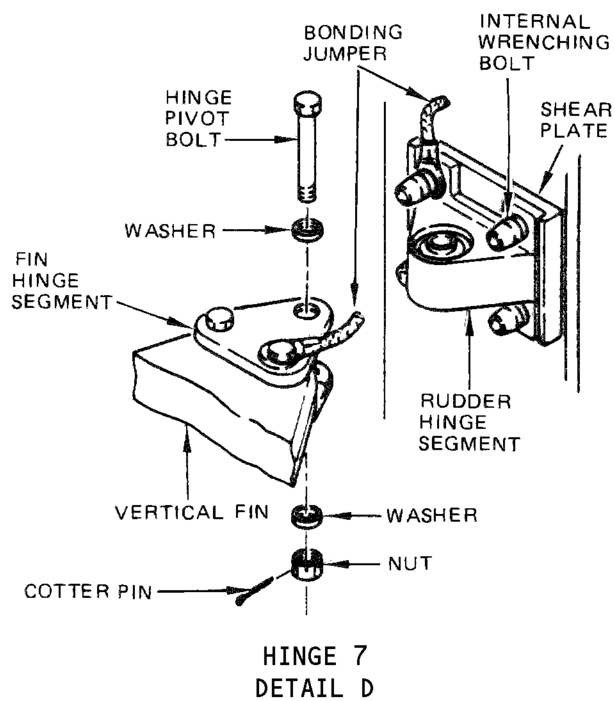


HINGE 2
DETAIL B

FWD



HINGES 3,4,5, AND 6
DETAIL C



HINGE 7
DETAIL D

Rudder Hinge Installation
Figure 401 (Sheet 2)

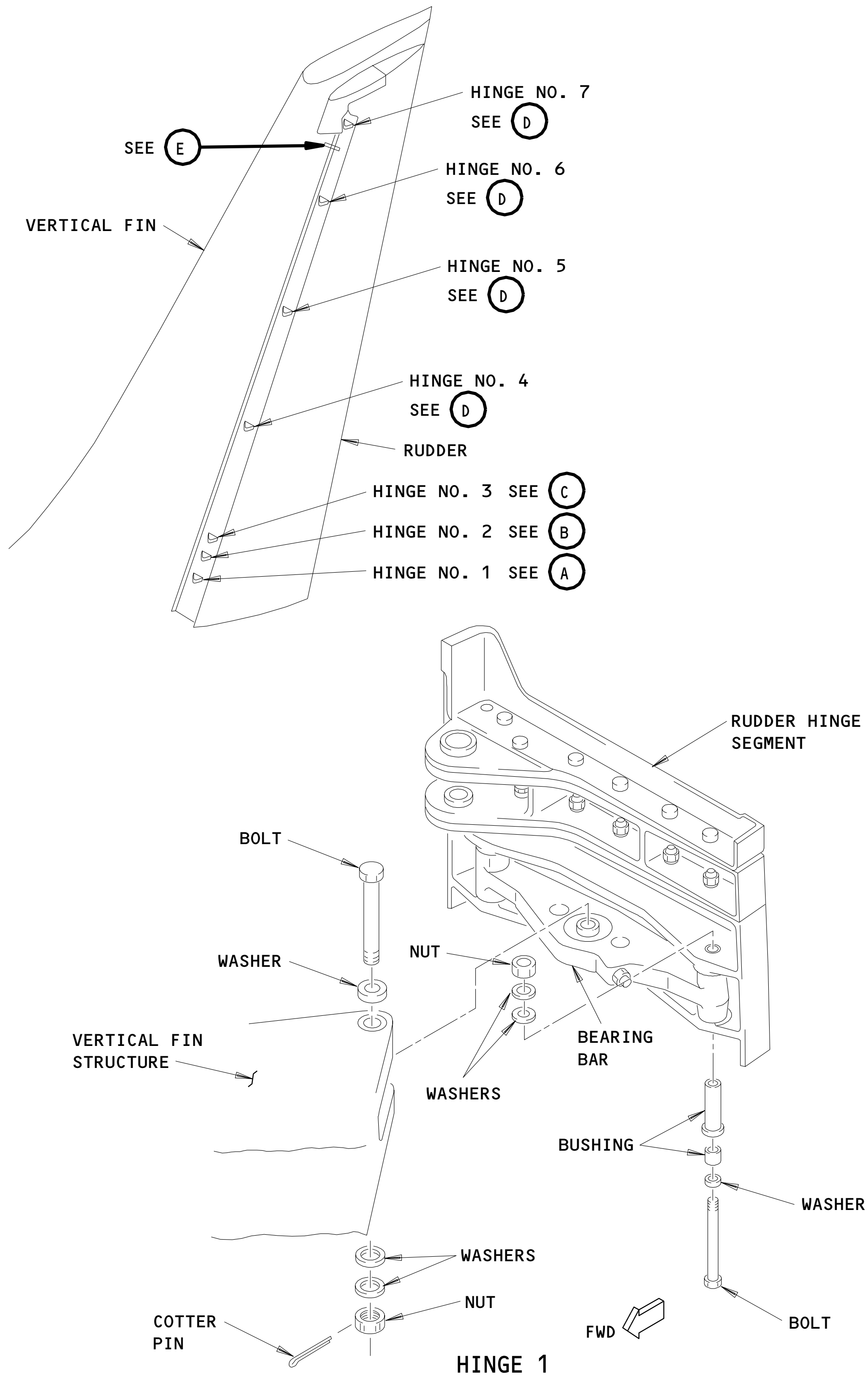
RUDDER HINGES - REMOVAL/INSTALLATION

1. General
   A. The rudder is attached to the vertical fin at seven hinge points. Each of the rudder hinge segments may be replaced individually.
   B. The vertical fin contains five removable hinge segments. The two lower hinge points are contained in structural members.
2. Equipment and Materials
   A. Corrosion Preventive Compound - BMS 3-24 (Ref 20-30-21)
   B. Sealant - BMS 5-95 (Ref 20-30-21)
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84.

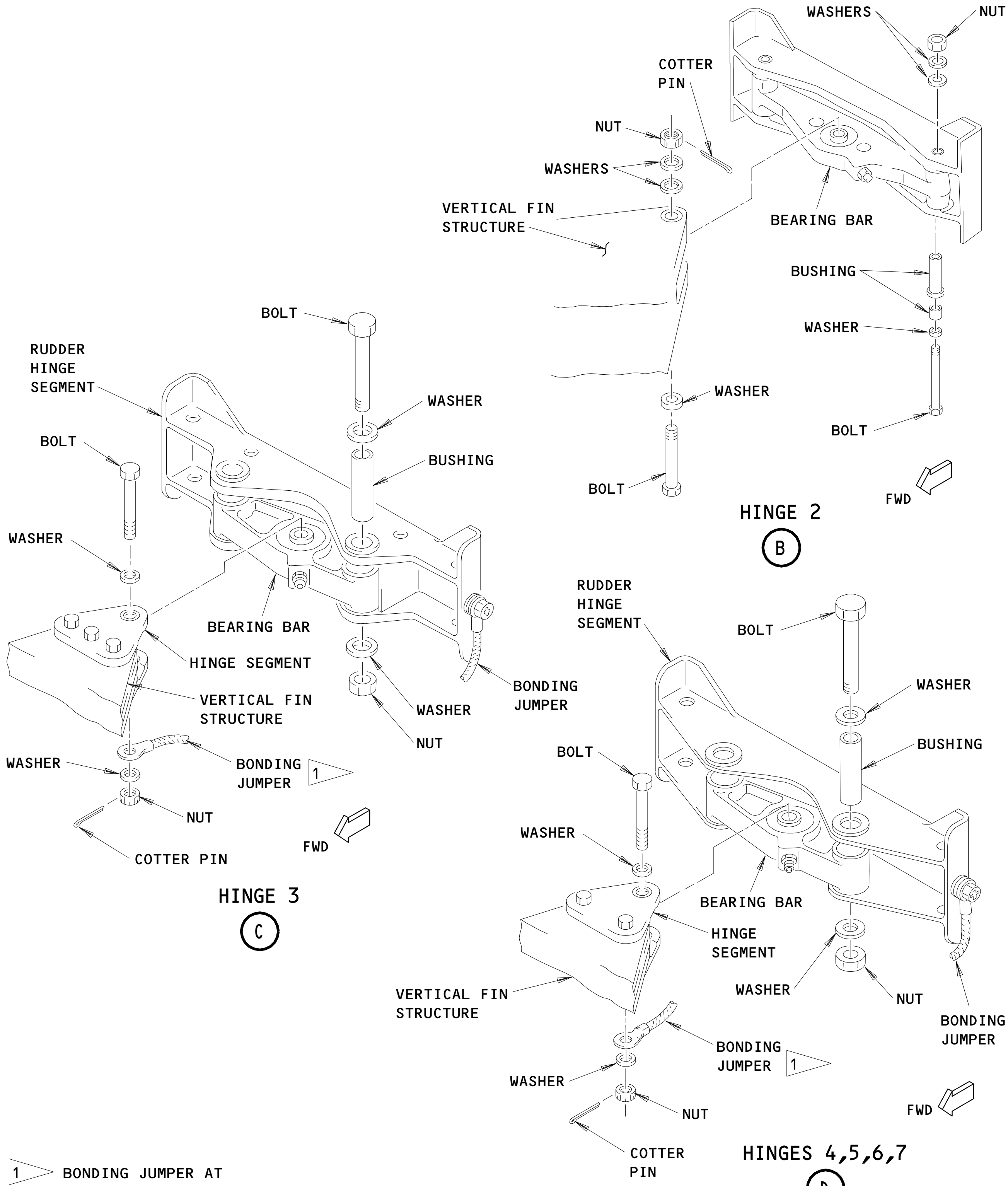
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-3	-11	0.309-0.311	6.7 ±0.25	RUDDER FWD QUADRANT

   D. Milliohmmeter - 0 to 0.1 ohm range.
3. Prepare to Remove Rudder Hinge
   A. Place rudder trim control wheel in neutral position.
   B. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   C. Install rigging pin R-3 in forward quadrant.
4. Remove Rudder Hinge (Fig. 401)
   A. Remove selected hinge coverplates from rudder leading edge.
   B. Disconnect bonding jumper from hinge No. 3.
   C. Before incorporation of SB 51-1011, disconnect bonding jumper from hinge No. 7.
   D. After incorporation of SB 51-1011, disconnect bonding jumper from station 227.57.
   E. Remove rudder hinge bolts.
   F. Remove two bolts and separate bearing bars from rudder hinge segments.
   G. Remove bolts and separate vertical fin hinge segment from fin.
5. Install Rudder Hinge (Fig. 401)
   A. Remove rudder systems A and B hydraulic power (Ref 27-21-0 MP). Check that rigging pin R-3 is installed in forward quadrant.

B. Check for allowable wear between rudder hinge and rudder hinge bolt (Ref 27-21-12 I/C).
C. Place vertical fin hinge segment into position and install bolts, washers, and nuts. Tighten bolts 50 to 70 pound-inches.
D. Place bearing bars in rudder hinge segments and install two bolts and bushings with minimum torque.
E. Install bonding jumper at hinge No. 3.
F. Before incorporation of SB 51-1011, install bonding jumper at hinge No. 7. Apply sealant to jumper ends and fasteners.
G. After incorporation of SB 51-1011, install bonding jumper at station 227.57. Apply sealant to jumper ends and fasteners.
H. Coat hinge bolt with corrosion preventive compound. Install bolt in hinge pivot point with countersunk washer under head.
I. Install washer and nut on hinge pivot bolt hand-tight.
J. Tighten bolts equally to secure rudder bearing bar to structure. Tighten hinge No. 1 and 2 bearing bar bolts 90 to 160 pound-inches and No. 3, 4, 5, 6 and 7 bearing bar bolts 60 to 95 pound-inches.
K. Tighten hinge pivot nut on hinges No. 1 and 2, 95 to 110 pound-inches. Shim hinge No. 2 to control gap (0.005-inch maximum) between fin hinge fitting and rudder bearing bar before tightening nut. Continue to turn nut to align cotter pin hole. Maximum alignment torque permitted is 190 pound-inches. Install cotter pin.
L. Tighten hinge pivot nut on hinges No. 3, 4, 5, 6, and 7 60 to 85 pound-inches. Continue to turn nut to align cotter pin hole. Maximum alignment torque permitted is 140 pound-inches. Install cotter pin.
M. Install hinge coverplates.
N. Remove rigging pin R-3.
O. Use the milliohmmeter to make sure there is a maximum of 0.01 ohms between the rudder and the vertical fin.
P. Restore airplane to normal hydraulic configuration (Ref 27-21-0 MP).

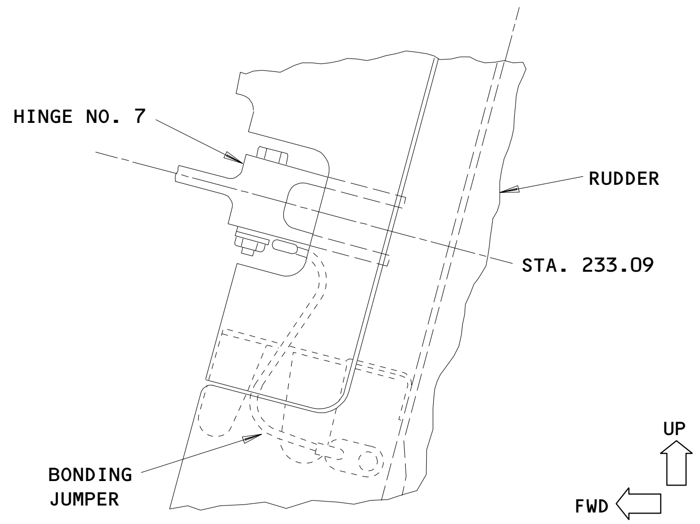


Rudder Hinges Installation
Figure 401 (Sheet 1)



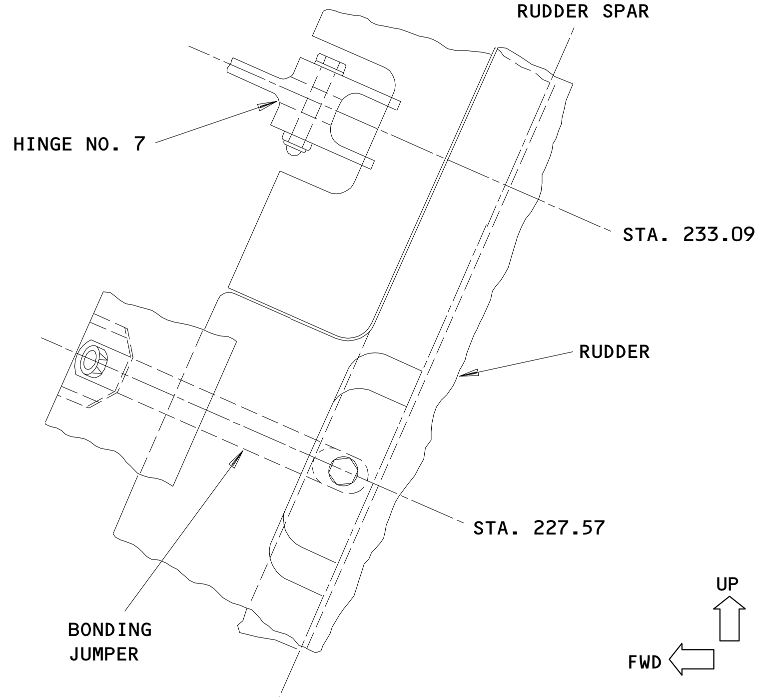
1 BONDING JUMPER AT HINGES 3 AND 7 ONLY

Rudder Hinges Installation
Figure 401 (Sheet 2)



BEFORE INCORPORATION OF SB 51-1011

E



AFTER INCORPORATION OF SB 51-1011

E

Rudder Hinges Installation
Figure 401 (Sheet 3)

RUDDER PEDAL ASSEMBLIES - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-1	-14	0.309-0.311	12.7 ±0.25	CAPTAIN'S RUDDER PEDAL ARM
R-2	-14	0.309-0.311	12.7 ±0.25	F/O'S RUDDER PEDAL ARM
R-3	-11	0.309-0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT

   B. Corrosion Preventive Compound - MIL-C-11796, Class 3
   C. Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
2. Remove Rudder Pedal Assemblies
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP)
   B. Insert rigging pins R-3 and R-4 through rigging pin holes of both forward quadrants.
   C. Open lower nose compartment door 1103 and remove nose wheel well forward overhead access panels.
   D. Disconnect brake pushrods from bellcranks (Fig. 401).
   E. Remove bolts holding upper rudder pedal cover to heel rest and remove pedal cover (Fig. 402).
   F. Airplanes with retainers; remove retainers from pedal arms (Fig. 401)
   G. Disconnect quadrant pushrods from pedal arms (Fig. 401).
   H. Remove four bolts securing rudder pedal support shaft bracket to structure.
   I. Support rudder pedals and remove rudder pedal support shaft.

      CAUTION: ON AIRPLANES WITH AUTOBRAKE SWITCHES INSTALLED, DO NOT STRIKE SWITCHES WHEN REMOVING OR INSTALLING FIRST OFFICER'S RUDDER PEDALS AS SWITCHES MAY BE DAMAGED.

J. Remove pedal assemblies by pulling up through floor. Left and right foot pedal assemblies and shaft support bracket will separate after removal.

NOTE: The outer bearing will be free to fall from pedal bellcrank when pedal assembly is removed from supporting structure.

3. Install Rudder Pedal Assemblies

A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).

B. Position rudder pedal assemblies in supporting structure with pedal assembly shaft support bracket positioned between left foot and right foot pedal assembly bellcranks per Fig. 401.

CAUTION: ON AIRPLANES WITH AUTOBRAKE SWITCHES INSTALLED, DO NOT SRIKE SWITCHES WHEN REMOVING OR INSTALLING FIRST OFFICER'S RUDDER PEDALS AS SWITCHES MAY BE DAMAGED.

C. Coat support shaft with corrosion preventive compound and install with head inboard. Install shaft support bracket fasteners before tightening shaft nut.

NOTE: Use one or more washers at both ends of shaft to ensure that no shaft threads are in bellcrank bearing.

D. Install shaft support bracket to structure as follows:

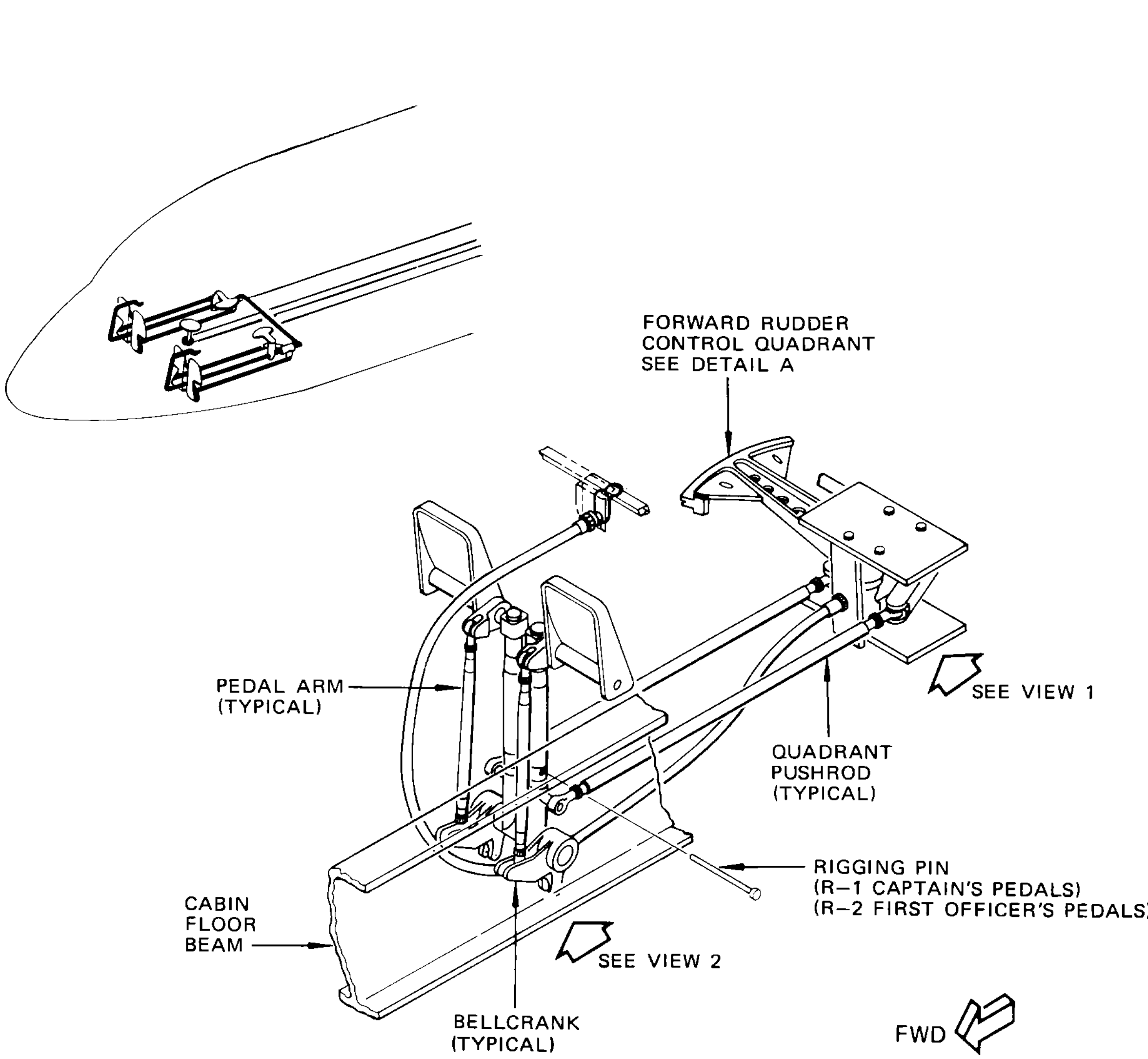
(1) Position solid or laminated shim (3, figure 401) or both as required between underside of bracket and mating structure at forward end mounting holes. With radius fillers (2) in place per figure 401 install two bolts (1), and secure with washers (4) and nuts (5).

(2) At aft end of bracket place radius fillers (2), (3), and (4) in position and install two bolts (2) with washers (4) and nuts (5).

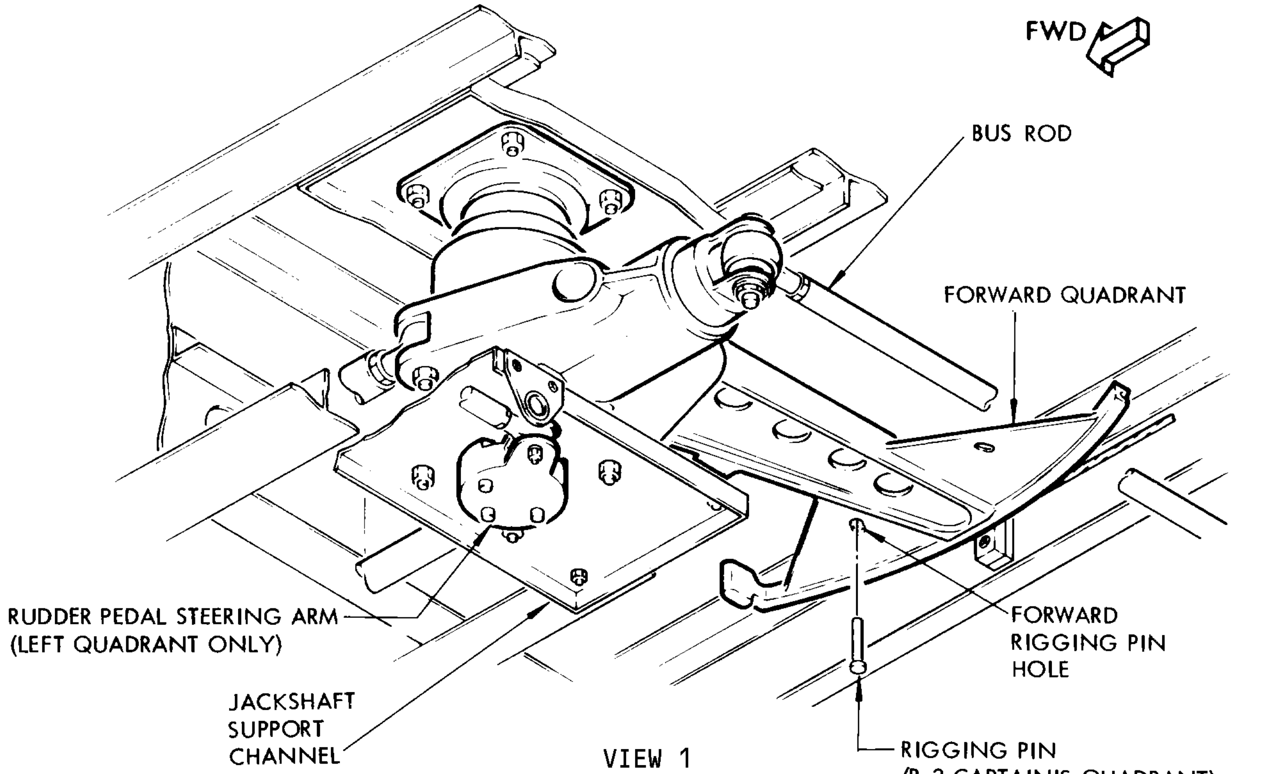
E. Tighten support shaft nut to 200-300 pound-inches torque. Install cotter pin.

F. Insert rigging pins R-3 and R-4 through forward rigging pin holes of both forward quadrants.

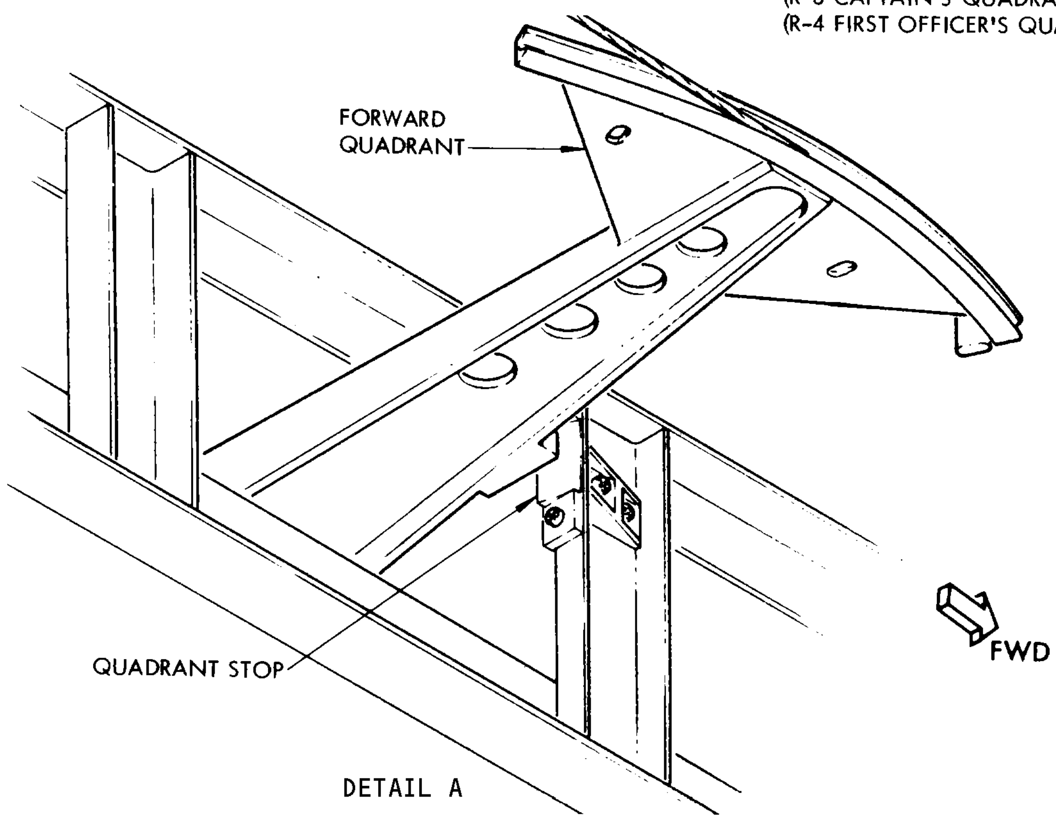
G. Set rudder pedal adjustment at midtravel position.



Rudder Pedal Assemblies Installation
Figure 401 (Sheet 1)

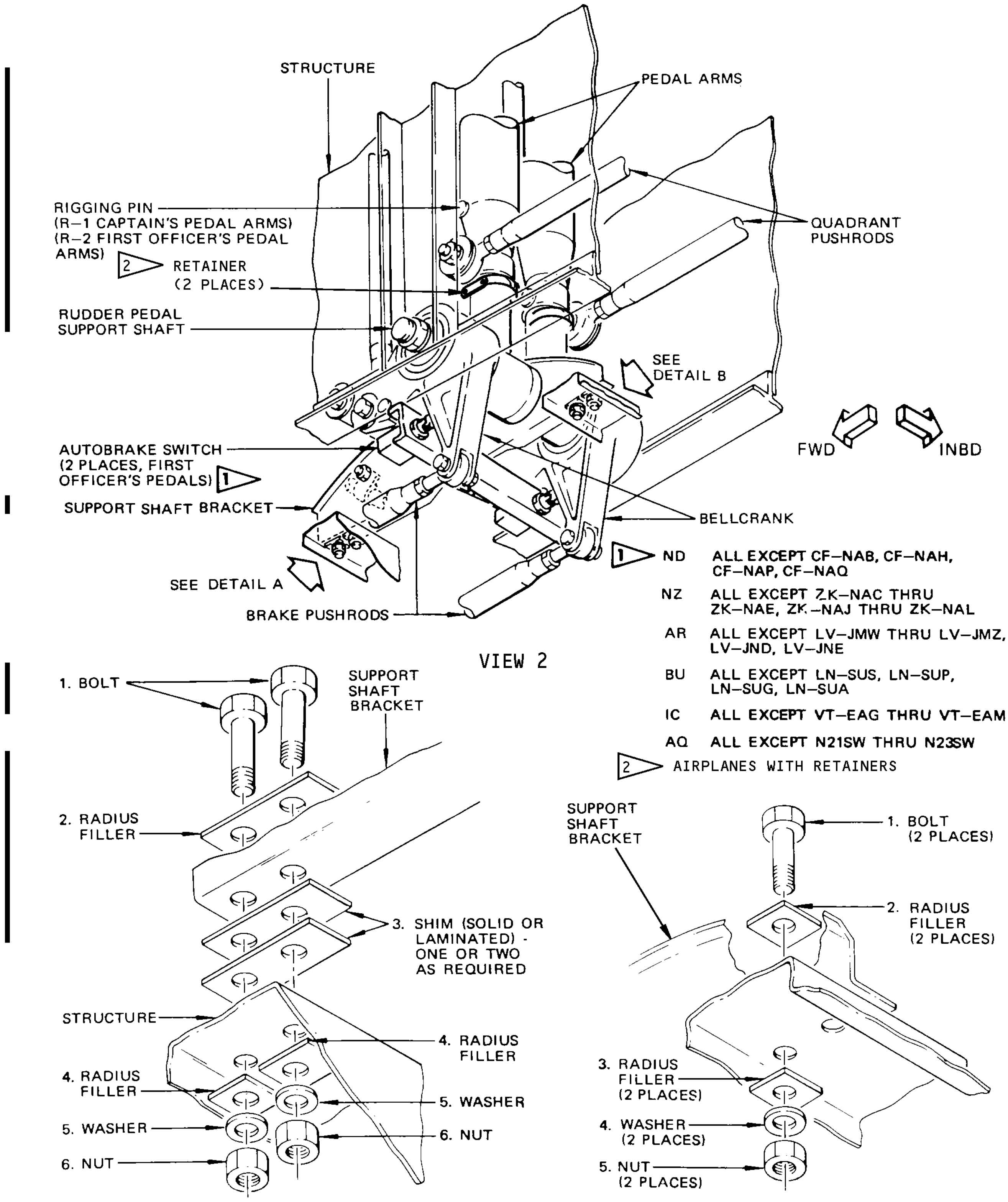


VIEW 1



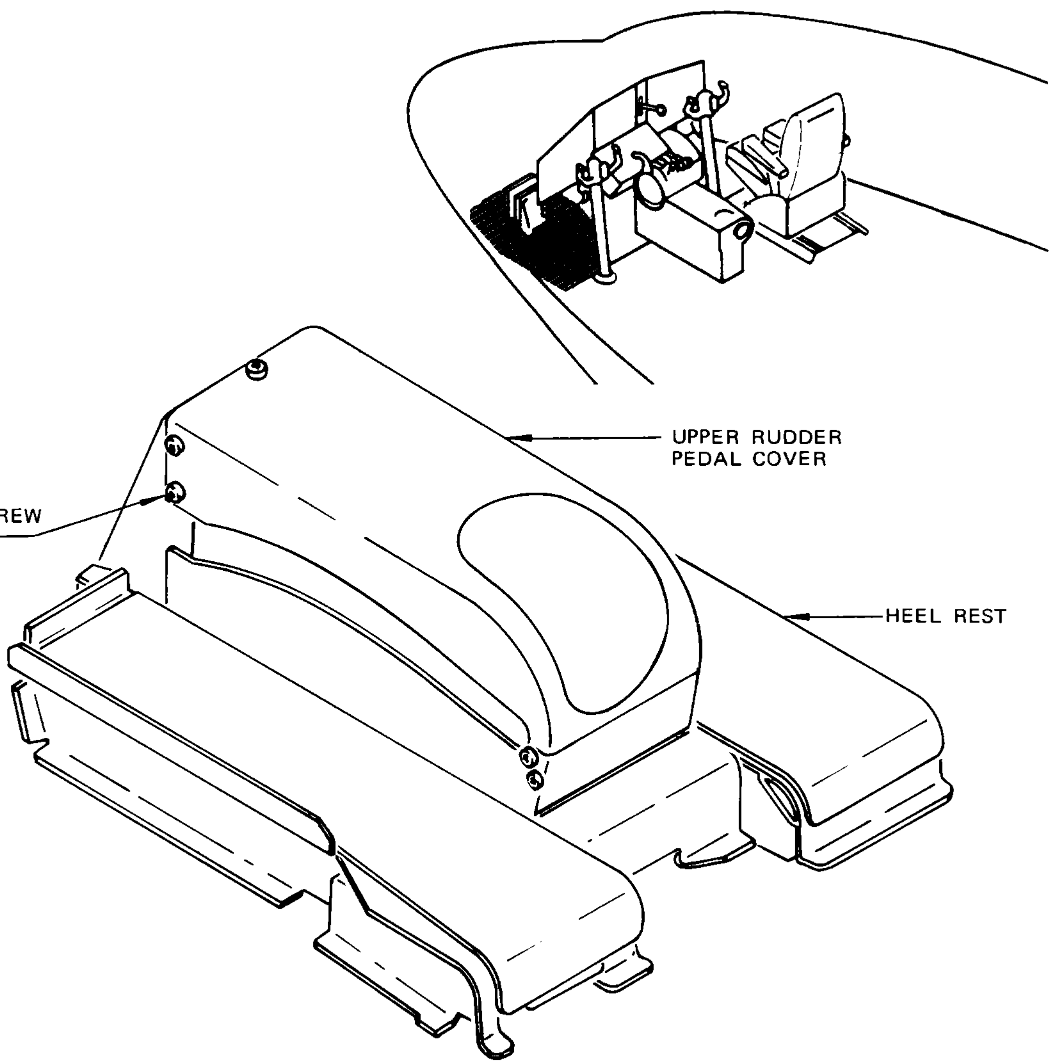
DETAIL A

Rudder Pedal Assemblies Installation
Figure 401 (Sheet 2)



Rudder Pedal Assemblies Installation
Figure 401 (Sheet 3)

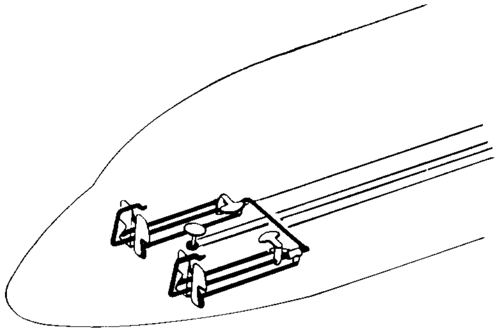
H. Insert rigging pins R-1 and R-2 through rudder pedal arms.
I. Attach quadrant pushrods to rudder pedal arms. Adjust if necessary. Torque nuts and install cotter pins.
J. Airplanes with retainers; install retainers on pedal arms.
K. Attach brake pushrods to bellcrank. Tighten nuts and install cotter pins. Adjust and test the hydraulic brake system (Ref 32-41-0).
L. Position upper rudder pedal cover to heel rest and install bolts (Fig. 402).
M. Remove riggings pins R-1 and R-2 from pedal arms, and R-3 and R-4 from rudder forward quadrants.
N. Provide rudder systems A and B hydraulic power (Ref 27-21-0).
O. Test rudder pedal limit travel.
   (1) Set rudder trim knob to zero and use pedal adjustment crank to locate pedals at midposition.
   (2) Move pedal adjustment to full forward, then move left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure total forward travel of left pedal from midposition of pedal adjustment. Total forward travel shall be 6.86 inches minimum. Measure at pedal pivot point.
   (3) Repeat steps (1) and (2) with right pedal.
   (4) Use pedal adjustment crank to move pedals to midposition.
   (5) Move pedal adjustment to full aft then move left pedal forward until stop at forward quadrant is contacted and hold in that position. Measure total at travel of right pedal from midposition of pedal adjustment. Total aft travel shall be 6.89 inches minimum. Measure at pedal pivot point.
   (6) Repeat steps (4) and (5) moving right pedal forward and measuring total aft travel of left pedal.
P. Restore airplane to normal hydraulic configuration (Ref 27-21-0).
Q. Replace access panels, and close lower nose compartment door.

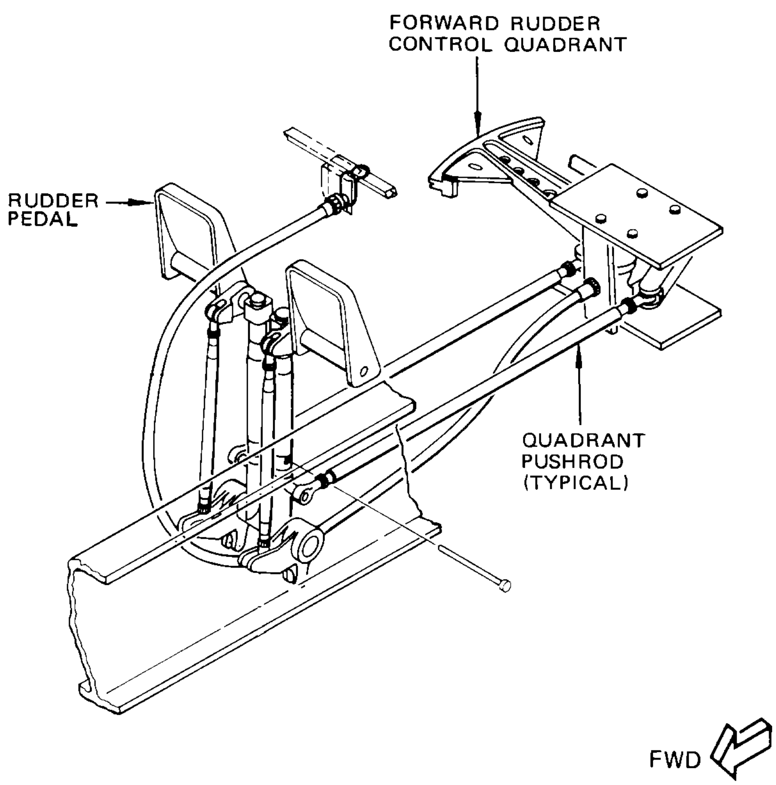


Upper Rudder Pedal Cover Installation
Figure 402

RUDDER PEDAL ASSEMBLIES - INSPECTION/CHECK

1. General
   A. The rudder control quadrant push rods installed under the control cabin floor between the Captain's and First Officer's rudder pedals and the forward cable quadrants can be deformed due to compressive overload. The following provides a check for allowable inservice deformation limits to determine if replacement is required. Corrosion may also result.
2. Check Rudder Control Quadrant Pushrods (Fig. 601)
   A. Check rods for deformation and take action as follows:
      (1) If rods exhibit up to 0.10 inch deviation from straight condition they are considered satisfactory for continued use. This dimension should be measured at the point of maximum deformation when the ends of the rod tube are placed on a flat surface.
      (2) If rods exhibit permanent deformation greater than 0.10 inch but less than 0.25 inch, it is allowable to retain rods in service until the next "C" check, approximately 1800 hours.
      (3) If rods exhibit permanent deformation greater than 0.25 inch, remove from service.
   B. If corrosion exists, refer to Corrosion Prevention Manual for examination for corrosion and cleanup of corrosion.

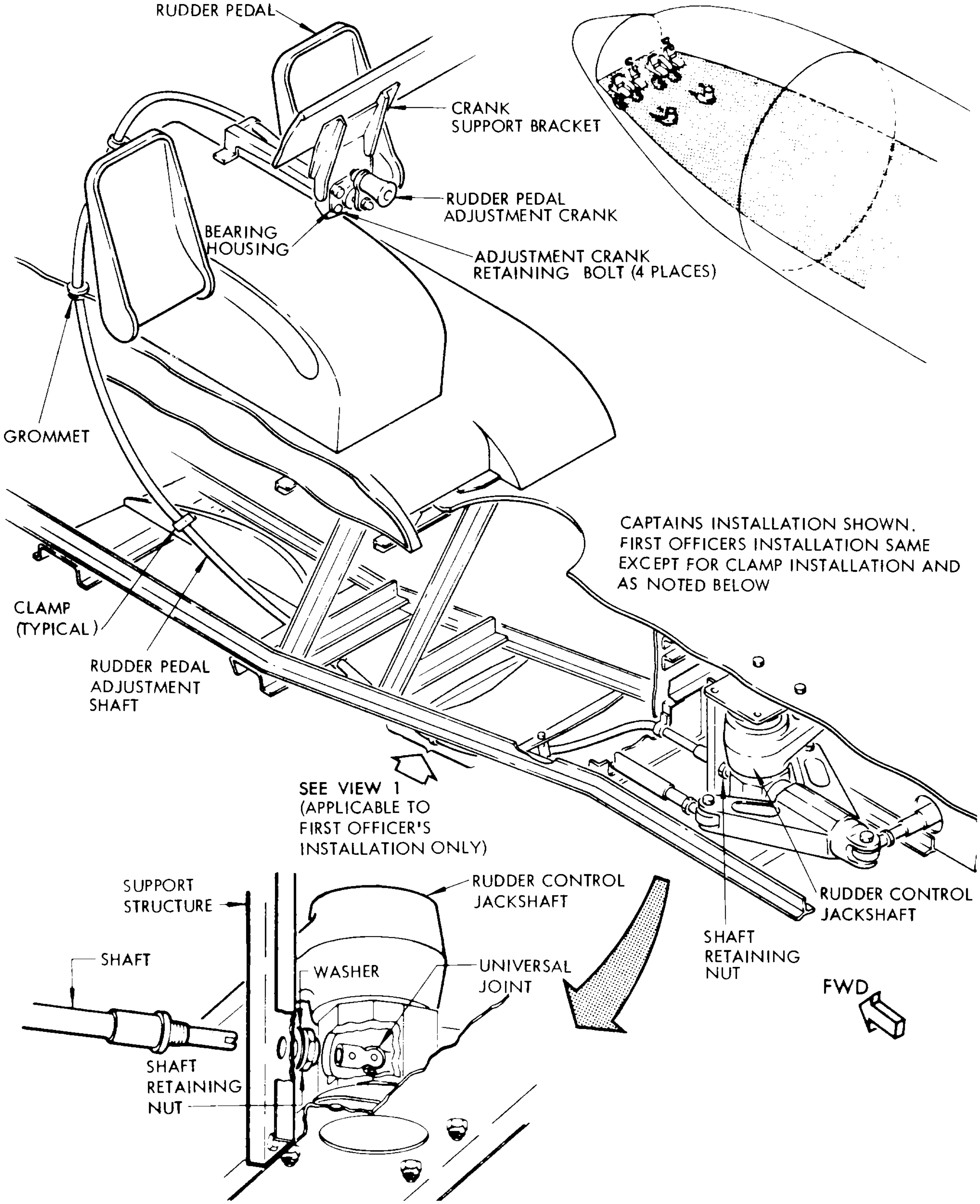




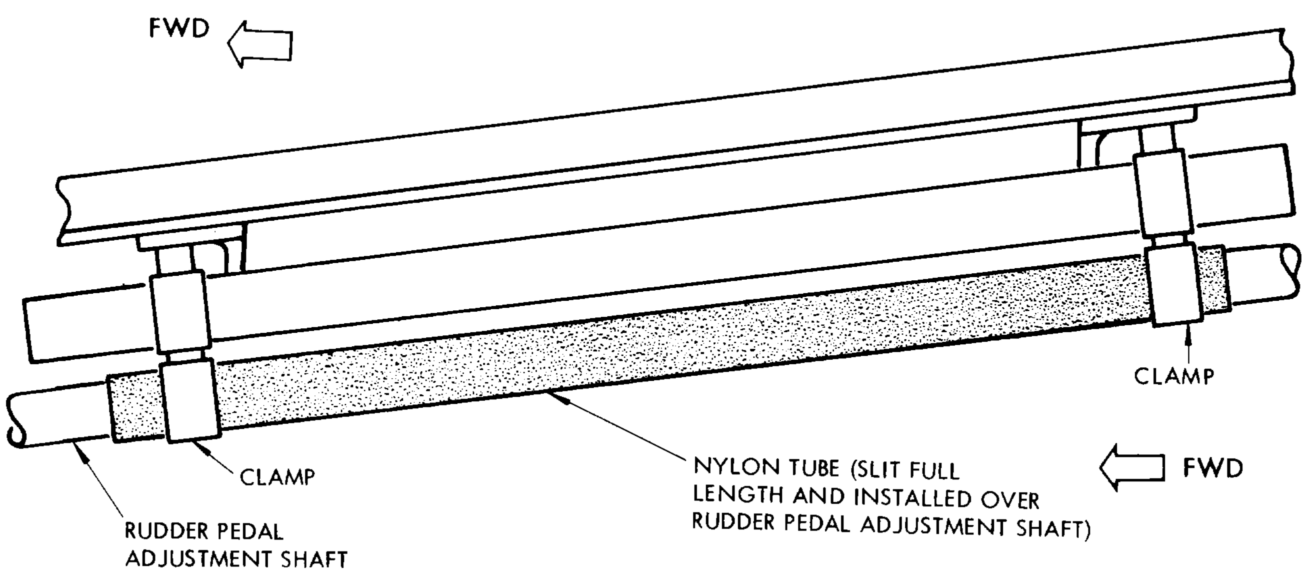
Rudder Pedal Assemblies
Figure 601

RUDDER PEDAL ADJUSTMENT CRANK INSTALLATION - REMOVAL/INSTALLATION

1. Remove Rudder Pedal Adjustment Crank
   A. Open lower nose compartment access door 1103, and remove nose wheel well forward overhead access panels.
   B. Loosen shaft retaining nut (Fig. 401).
   C. Remove all clamps which attach shaft to structure. Note clamp locations for installation. Captain's and first officer's clamp installations are not the same.
   D. Pull shaft forward until end of shaft clears rudder control jackshaft.
   E. Remove shaft retaining nut and washer from end of shaft and pull free of support structure.
   F. Remove four retaining bolts from bearing housing and move rudder pedal adjustment crank down to clear crank support bracket.
   G. Pull crank and shaft free of structure and remove unit.
   H. Remove 13-inch nylon tube from outside of shaft if first officer's shaft is being removed and replaced with new shaft.
2. Install Rudder Pedal Adjustment Crank
   A. Run shaft (Fig. 401) through openings provided in airplane structure from crank support bracket to rudder control jackshaft.
   B. Attach bearing housing and retainer to crank mounting bracket by installing the four retaining bolts with heads of bolts aft. On airplanes using nylon stops, install nylon stops under two upper bolts. On some airplanes the bearing housing, due to its thickness, acts as a crank stop.
   C. Push shaft through hole in support channel and slip nut and washer over end of shaft.
   D. Insert end of shaft in rudder control jackshaft and rotate fork end of shaft until it slips over pin in jackshaft.
   E. Tighten nut on shaft.
   F. If first officer's shaft is being installed, install 13-inch nylon tube on outside of shaft in location shown in Fig. 401. Tube is slit along its length. Install by spreading open along slit and installing over shaft.
   G. Install all clamps attaching shaft to airplane structure. Clamp shaft in such a manner that radius of curvature at any point on shaft will not be less than 5.0 inches. A smaller radius will cause binding of shaft.
   H. Rotate crank through one cycle to check for binding.
   I. Check rudder pedal travel per 27-21-0, Rudder and Rudder Trim Control System - Adjustment/Test.
   J. Close all access doors and panels.



Rudder Pedal Adjustment Crank Installation
Figure 401 (Sheet 1)



(FIRST OFFICER'S INSTALLATION ONLY)
VIEW 1

Rudder Pedal Adjustment Crank Installation
Figure 401 (Sheet 2)

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RUDDER FORWARD QUADRANTS - REMOVAL/INSTALLATION

1. General
   A. The maintenance practices for either quadrant are similar and apply to both quadrants except as noted. The following procedures include rudder forward quadrant removal/installation and quadrant bearing replacement.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, -84, or -108:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-1	-14	0.309-0.311	12.7 ±0.25	CAPTAIN'S RUDDER PEDAL ARM
R-2	-14	0.309-0.311	12.7 ±0.25	F/O'S RUDDER PEDAL ARM
R-3	-11	0.309-0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Cable tensiometer - 0- to 300-pound range for 1/8-diameter cable
   C. Grease - BMS 3-24 (Ref 20-30-21)
3. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Install rigging pin R-5 in feel and centering unit output crank (Fig. 402).
4. Remove Rudder Forward Quadrant
   A. Remove nose wheel well forward overhead access panels and open lower nose compartment door 1103.
   B. Loosen both rudder cables.

      CAUTION: RUDDER CABLES MUST BE LOOSENED OR DISCONNECTED FROM QUADRANTS BEFORE DISCONNECTING BUS ROD. RELIEVE TENSION UNIFORMLY IN BOTH CABLES.

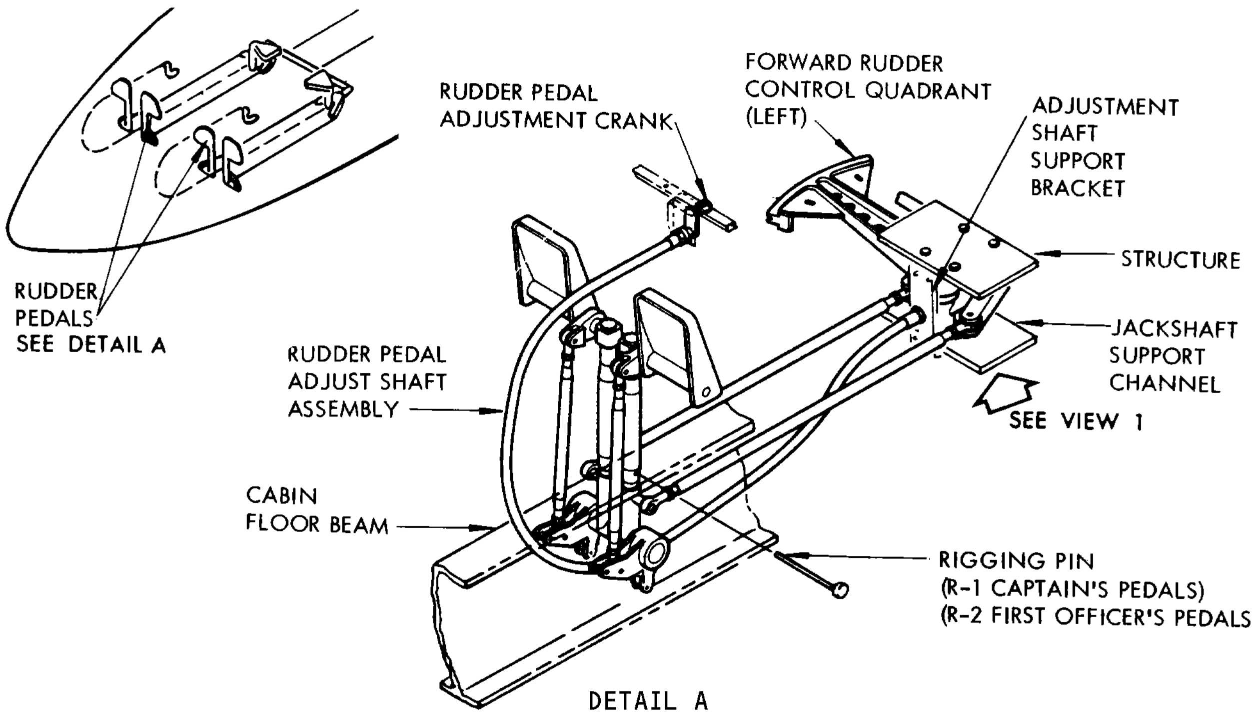
C. Disconnect cable from quadrant to be removed (Fig. 401).
D. Disconnect busrod and tension rods from quadrant.
E. Remove bearing plate from bottom of jackshaft assembly. If removing left quadrant remove rudder pedal steering arm from bottom of jackshaft assembly before removing bearing plate.
F. Remove aft two rudder pedal adjust shaft clamps.
G. Remove bolts holding adjustment shaft support bracket to structure and jackshaft support channel.
H. Disengage adjustment shaft by pulling shaft and support bracket forward.
I. Remove bolts holding jackshaft support channel to structure and remove channel.

NOTE: Support quadrant during this step. It will be free to fall from upper housing. At this point lower bearing may be replaced by removing four bolts holding bearing housing to jackshaft support channel.

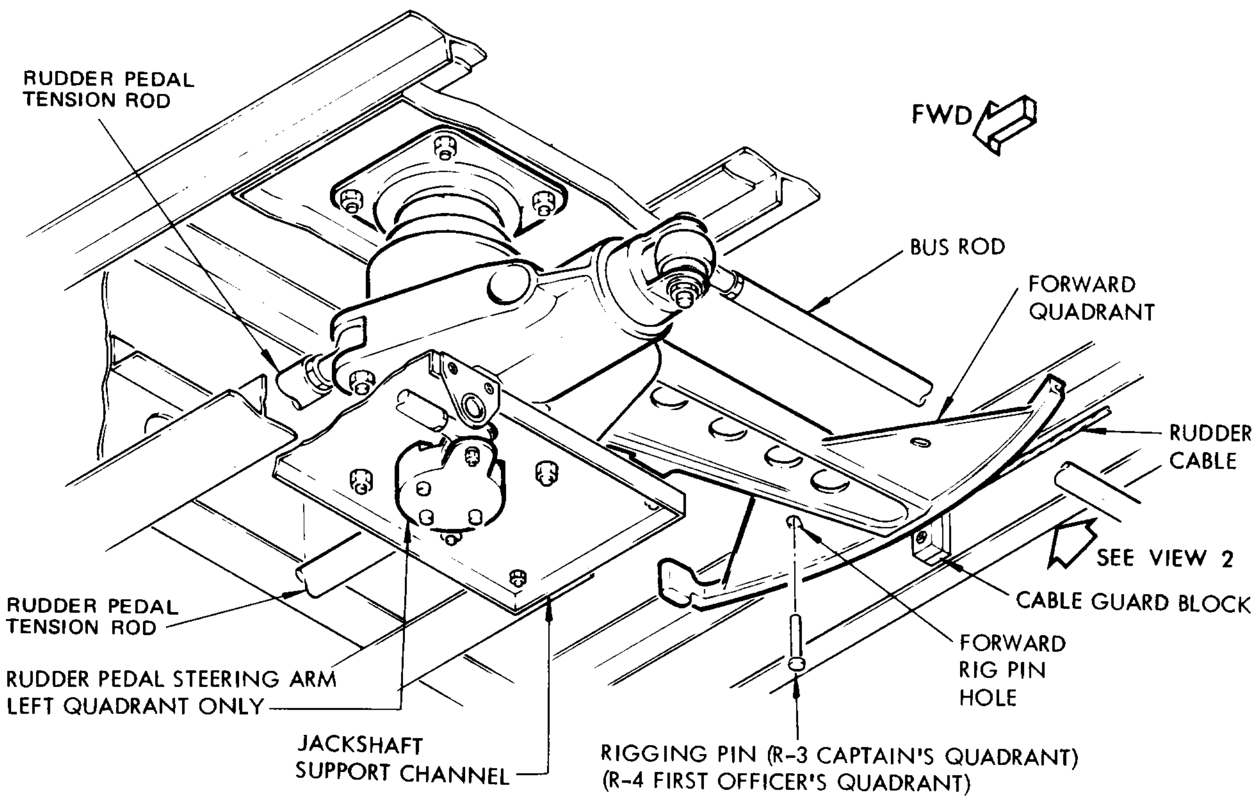
J. Slide jackshaft assembly and quadrant aft and outboard and remove from airplane.

5. Prepare for Installation
A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).
B. Check that rigging pin R-5 is installed in feel and centering unit output crank (Fig. 402).
C. Install rigging pin R-5 in feel and centering unit output crack. (See figure 402.)

6. Install Rudder Forward Quadrant
A. Position jackshaft assembly and quadrant and slide upper end of jackshaft assembly into upper bearing (Fig. 401).
B. Attach jackshaft support channel to structure and torque bolts.
C. On right forward quadrant, and jackshaft assembly, attach bearing plate to bottom of jackshaft assembly with two screws and washers. Lockwire screws together. On left quadrant attach rudder pedal steering arm to bottom of assembly. Install lockwire and cotter pin.
D. Install rigging pins R-3 and R-4 in forward rig pin holes of each quadrant and rigging pins R-1 and R-2 in rudder pedal arms.



DETAIL A

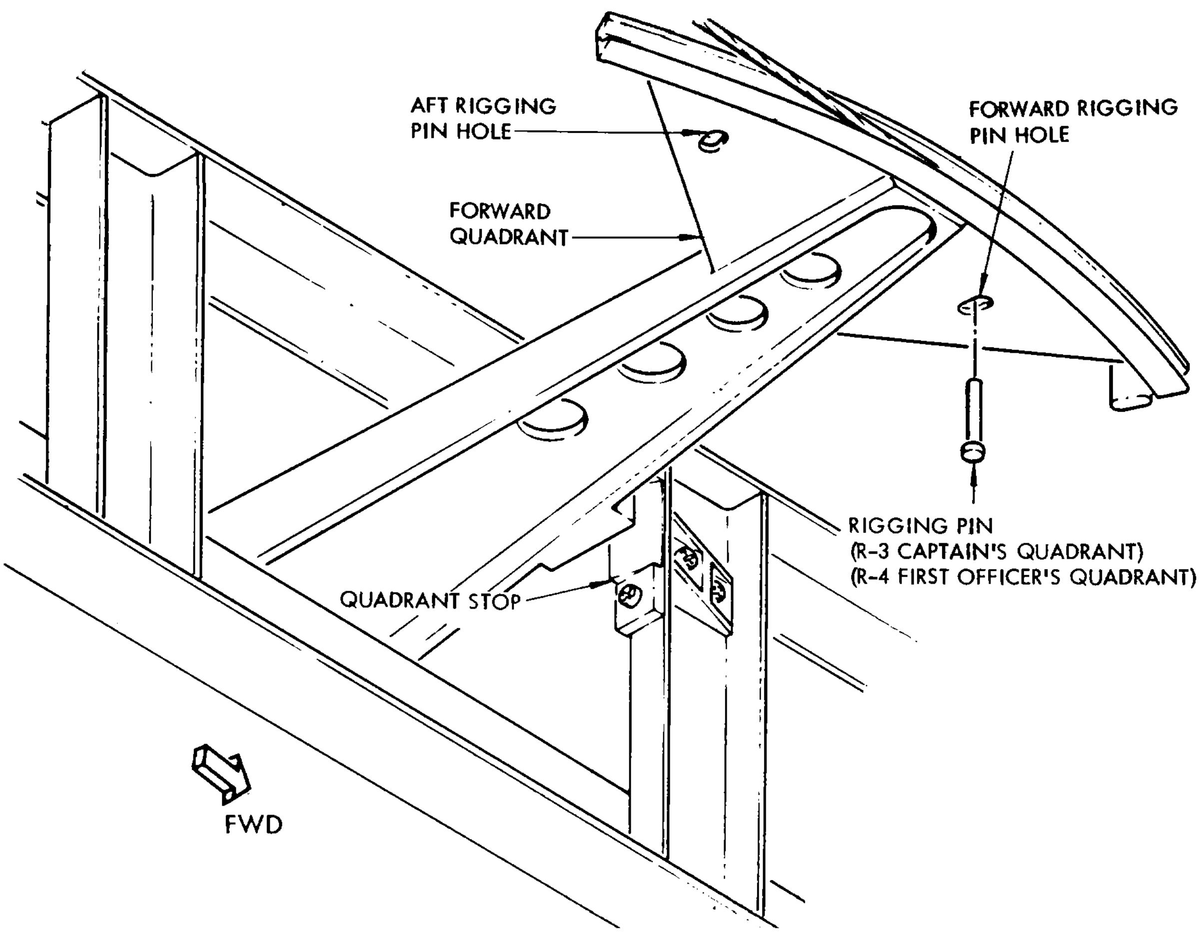


VIEW 1

Rudder Forward Quadrant Installation
Figure 401 (Sheet 1)

467676

E. Connect quadrant busrod. Adjust as necessary so that rig pins R-3 and R-4 fit freely.
F. Check that gap between cable guard block and quadrant is 0.03 to 0.05 inch (See figure 401). Add or remove shims if necessary.
G. Remove rigging pins R-3 and R-4.
H. Position captain's forward quadrant so that rigging pin R-3 can be inserted through aft rigging pin hole in quadrant. Check that maximum gap between quadrant and quadrant stop is 0.06 inch. Add or remove shims as necessary.
I. Remove rigging pin R-3. Position first officer's forward quadrant so that rigging pin R-4 can be inserted through aft rigging pin hole in quadrant. Check gap between quadrant and quadrant stop per step H.
J. Install rigging pins R-3 and R-4 through forward rigging pin holes in both quadrants.
K. Slide rudder pedal adjustment shaft into jackshaft assembly and attach adjustment shaft support bracket to structure. Install tube clamps.
L. Set rudder pedal adjustment shaft to rudder pedal neutral position.
   (1) Turn rudder pedal adjustment crank to full aft position and count number of turns while cranking from full aft to full forward position.
   (2) Turn crank half this number of turns from either end to obtain neutral position.
M. With rudder pedals in neutral position, connect rudder pedal tension rods. If rod length adjustment is required, loosen jamnuts on both ends of rod assembly and rotate tube to obtain desired length. Retighten jamnuts. Rig pins are to fit freely.
N. Inspect adjustable rod ends for proper thread engagement. Rod ends must be visible through inspection holes in rod assembly.
O. Remove rigging pins R-1, R-2, R-3, and R-4.
P. Remove bolt through one rod end of quadrant bus rod. Shorten bus rod by turning rod end two full turns. Connect bus rod.
Q. Attach rudder cable to forward quadrant.
R. Adjust rudder control cables RA and RB to tension shown in table 1 of figure 402. Tension in cables RA and RB should be balanced. Check that rigging pins R-3 and R-4 can be freely installed in forward quadrants.



VIEW 2

Rudder Forward Quadrant Installation
Figure 401 (Sheet 2)

S. If both rigging pins cannot be inserted freely when cables have specified tension, proceed as follows:
   (1) Relieve cable tension.
   (2) Remove bolt through one rod end of forward quadrant bus rod.
   (3) Adjust bus rod as required and install bolt with spacers, washers, nut, and cotter pin.
   (4) Adjust cable tension to valve shown in table 1, figure 402, using turnbuckles. Check that rigging pins R-3 and R-4 can be installed freely in forward quadrants.

T. With rigging pins R-3, R-4, and R-5 installed, check that rigging pins R-1 and R-2 can be installed freely in pedal arms.

U. If either or both rigging pins R-1 and R-2 cannot be inserted freely in pedal arms, proceed as follows:

   NOTE: Steps (1) through (6) may be required on all four tension rods.

   (1) Establish which pedal arm is out-of-line with rigging pin hole.
   (2) Loose n both checknuts on tension rod connected to affected pedal arm.
   (3) Remove bolt through forward tension rod end.
   (4) Adjust tension rod length until rigging pin R-1 or R-2 can be installed freely by turning rod end and/or rod as required, keeping lube fitting on rod end down.
   (5) Install tension rod end with bolt, washer, nut, and cotter pin.
   (6) Tighten checknuts.

V. Remove rigging pins R-1, R-2, R-3, R-4, and R-5.

W. Operate rudder pedals through one full travel cycle and check cable loads again.

X. Install turnbuckle locking clips and apply a thin coat of grease to exposed threads.

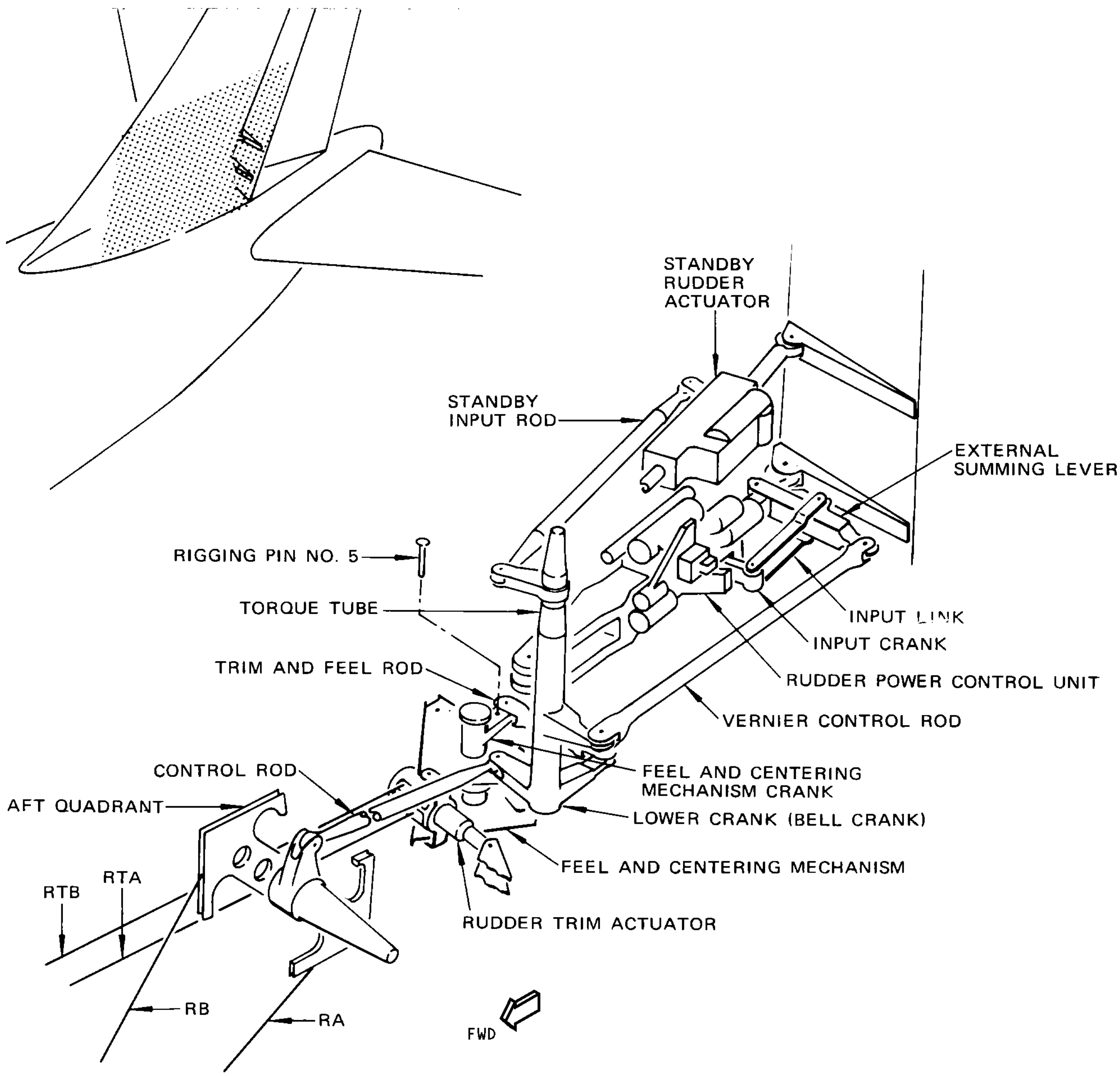
Y. Check for thread engagement on four tension rods and one bus rod. End of rod (10 places) must cover part of inspection hole.

Z. Operate pedals through full travel to check for binding and obstruction.

AA. Restore airplane to normal hydraulic configuration (AMM 27-21-0/201).

AB. Check rudder travel (AMM 27-21-0/501 or AMM 27-21-1/501).

AC. Close all access doors and panels.

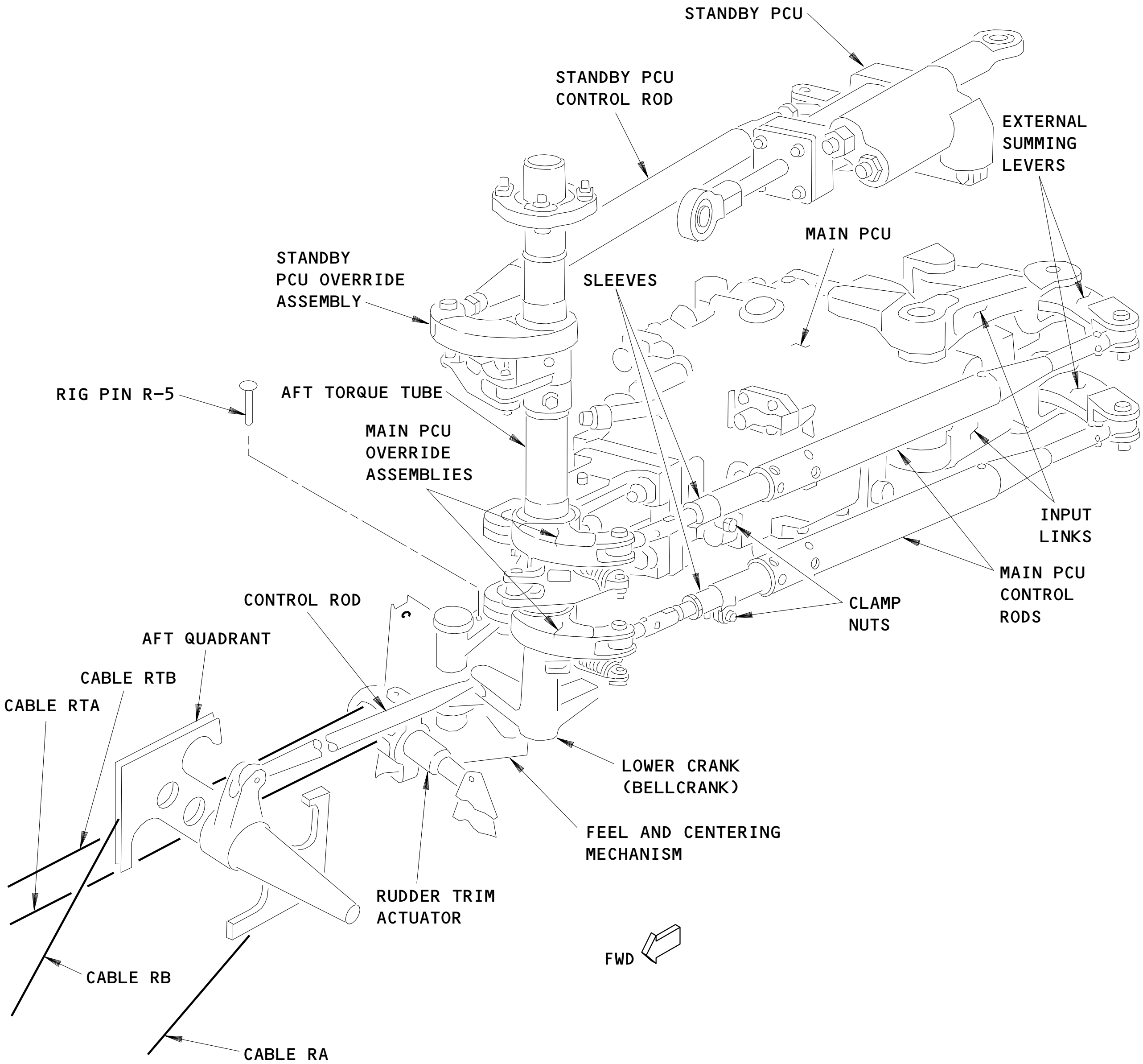


1 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

TABLE 1

TEMPERATURE °F ± 5°	RIGGING LOAD RA, RB (+10/-10) LBS 1
110	168
90	159
70	150
50	142
30	134
10	125
-10	117
-30	109
-40	103

Rudder AFt Control Mechanism Adjustment
Figure 402 (Sheet 1)



Rudder Aft Control Mechanism Adjustment
Figure 402 (Sheet 2)

RUDDER AFT CONTROL QUADRANT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

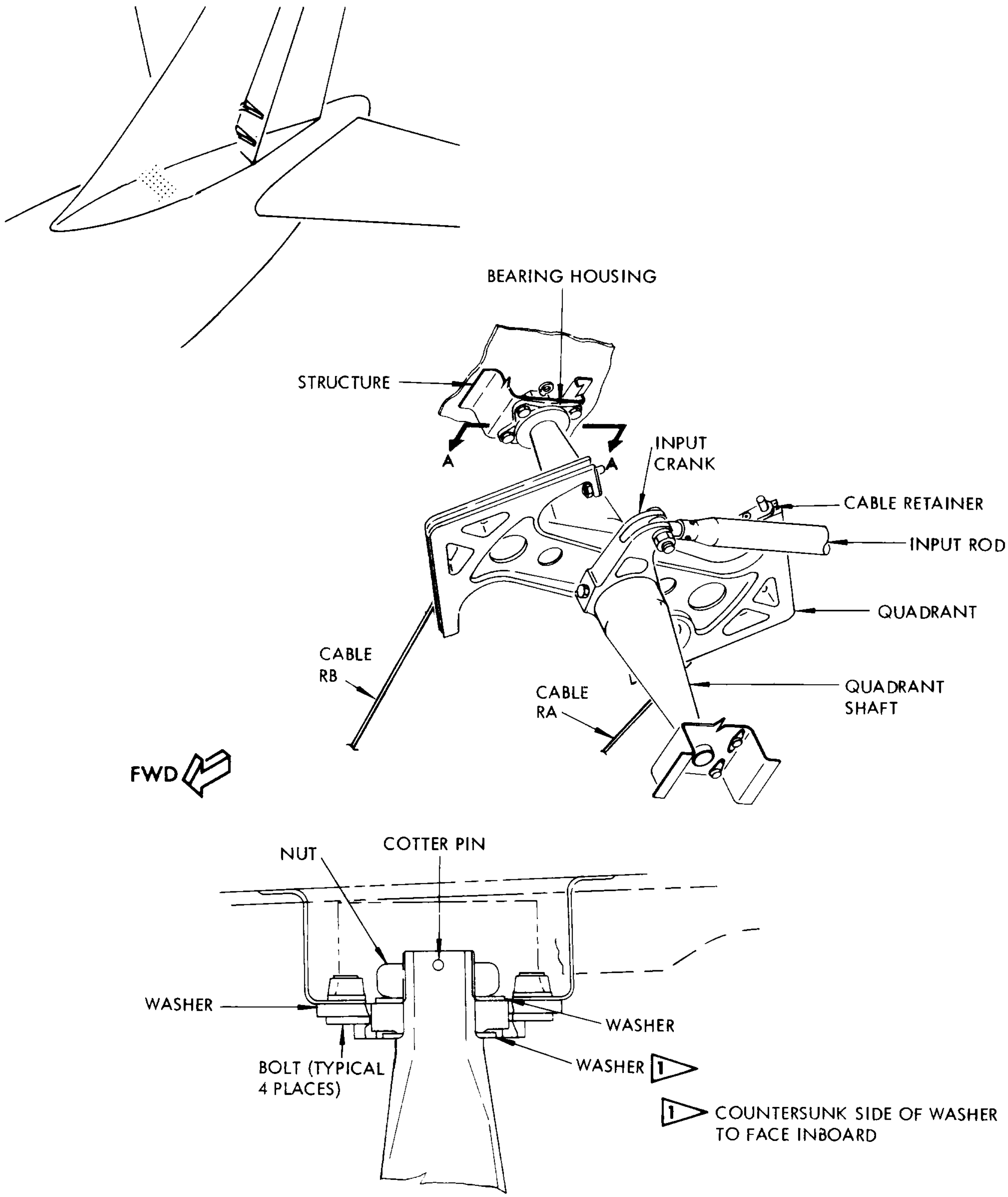
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-1	-14	0.309-0.311	12.7 ±0.25	CAPTAIN'S RUDDER PEDAL ARM
R-3	-11	0.309-0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Cable tensiometer - 0- to 300-pound range for 1/8-diameter cable.
2. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Install rigging pins R-1 and R-5 as shown in Fig. 402.
3. Remove Rudder Aft Control Quadrant
   A. Disconnect cables RA and RB at turnbuckles (Fig. 401). Secure disconnected cables.
   B. Disconnect cables from rudder aft control quadrant by removing cable retainers. Secure disconnected cables.
   C. Disconnect input rod from input crank by removing nut, washers, and bolt.
   D. Remove nuts, washers, and bolts securing quadrant to shaft.
   E. Remove bolts and washers securing each bearing housing to structure and separate left bearing housing from shaft.
   F. Separate quadrant from shaft.
   G. Remove quadrant and shaft from airplane.
   H. Remove cotter pin, nut, and washers from right side of quadrant shaft.
   I. Separate washer and bearing housing from right side of quadrant shaft.

4. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Check that rigging pins R-1 and R-5 are installed as shown in Fig. 402.
   C. Check rudder aft control quadrant at installation points for allowable wear. Refer to Rudder Aft Control Quadrant - Inspection/Check.
5. Install Rudder Aft Control Quadrant
   A. Slide washer and right bearing housing over quadrant shaft (Fig. 401).
   B. Install washer and nut on right side of quadrant shaft. Tighten nut to torque value of 190 to 280 pound-inches. Install cotter pin.
   C. Place shaft inside airplane and position quadrant on shaft with input crank to left.
   D. Install bolts, washers and nuts to secure quadrant to shaft.
   E. Place left bearing housing on shaft, and install bolts and washers to secure both bearing housings to structure.
   F. Rotate quadrant and ensure shaft is not binding in bearing housings.
   G. Connect cables RA and RB to quadrant and install cable retainers using crews, washers, and nuts.
   H. Connect cables RA and RB at turnbuckles. Tighten each cable to remove slack, but maintain zero cable tension.
   I. Connect input rod to input crank using bolt, washers, and nut.
   J. Remove rigging pin R-1.
   K. Adjust cables RA and RB to tension specified in figure 402 which permits simultaneous insertion of rigging pins R-3, R-4, and R-5. The rigging pins must fit without binding.
   L. Remove rigging pins and install turnbuckle locking clips.
   M. Provide rudder systems A and B hydraulic power. Refer to 27-21-0.
   N. Disconnect pushrod to nose wheel steering. (See figure 402.)

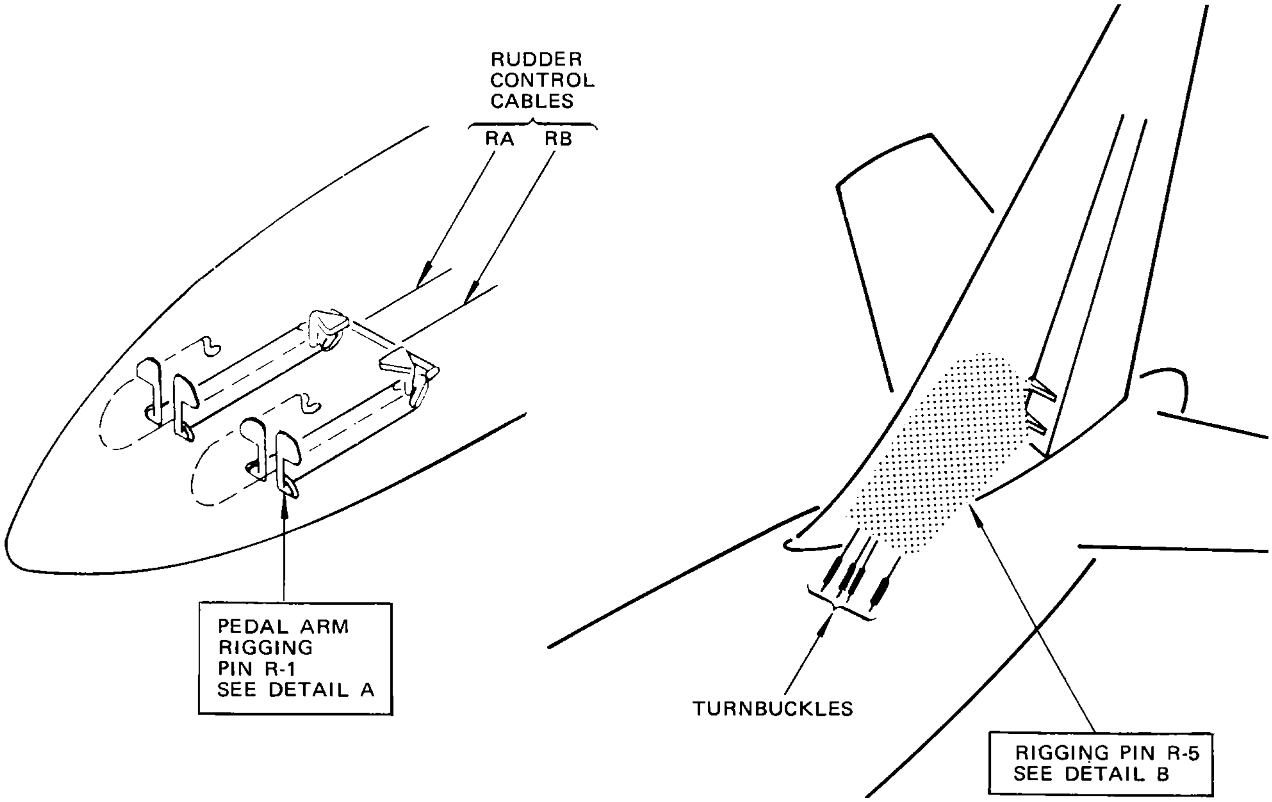
      NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

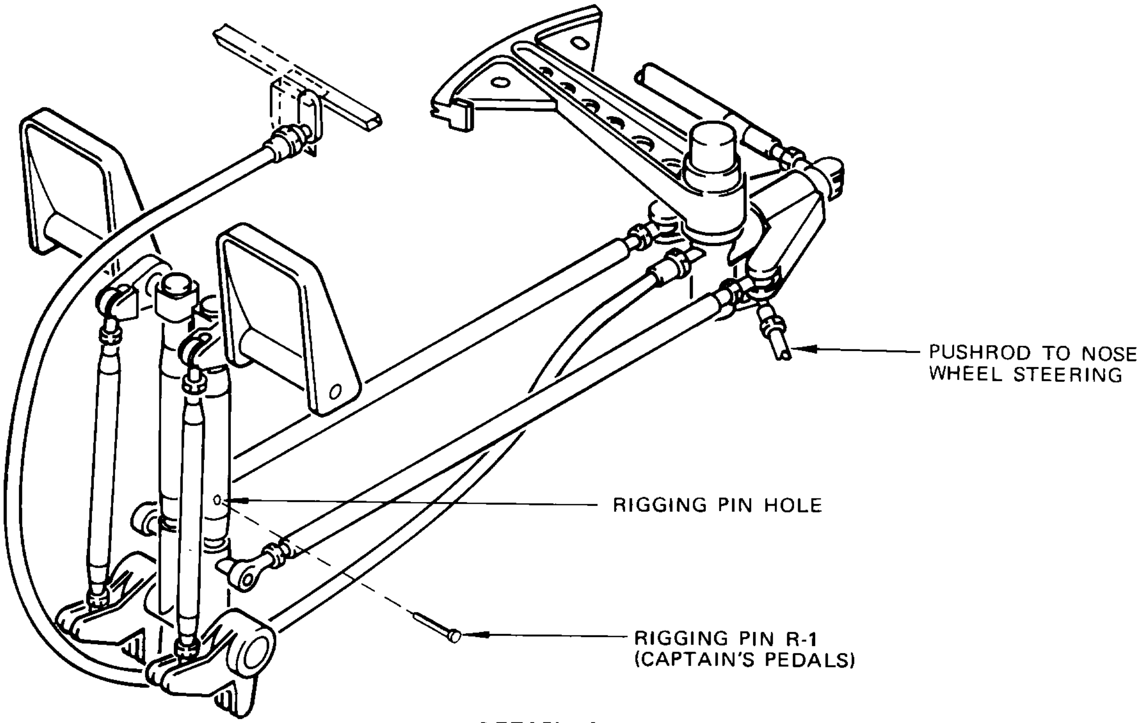
   O. Operate rudder pedals and check rudder for smooth operation and specified travel as shown in figure 403.
   P. Reconnect pushrod to nose wheel steering, if disconnected.
   Q. Remove systems A, B, and standby hydraulic power. Refer to 27-21-0.



Rudder Aft Control Quadrant Installation
Figure 401

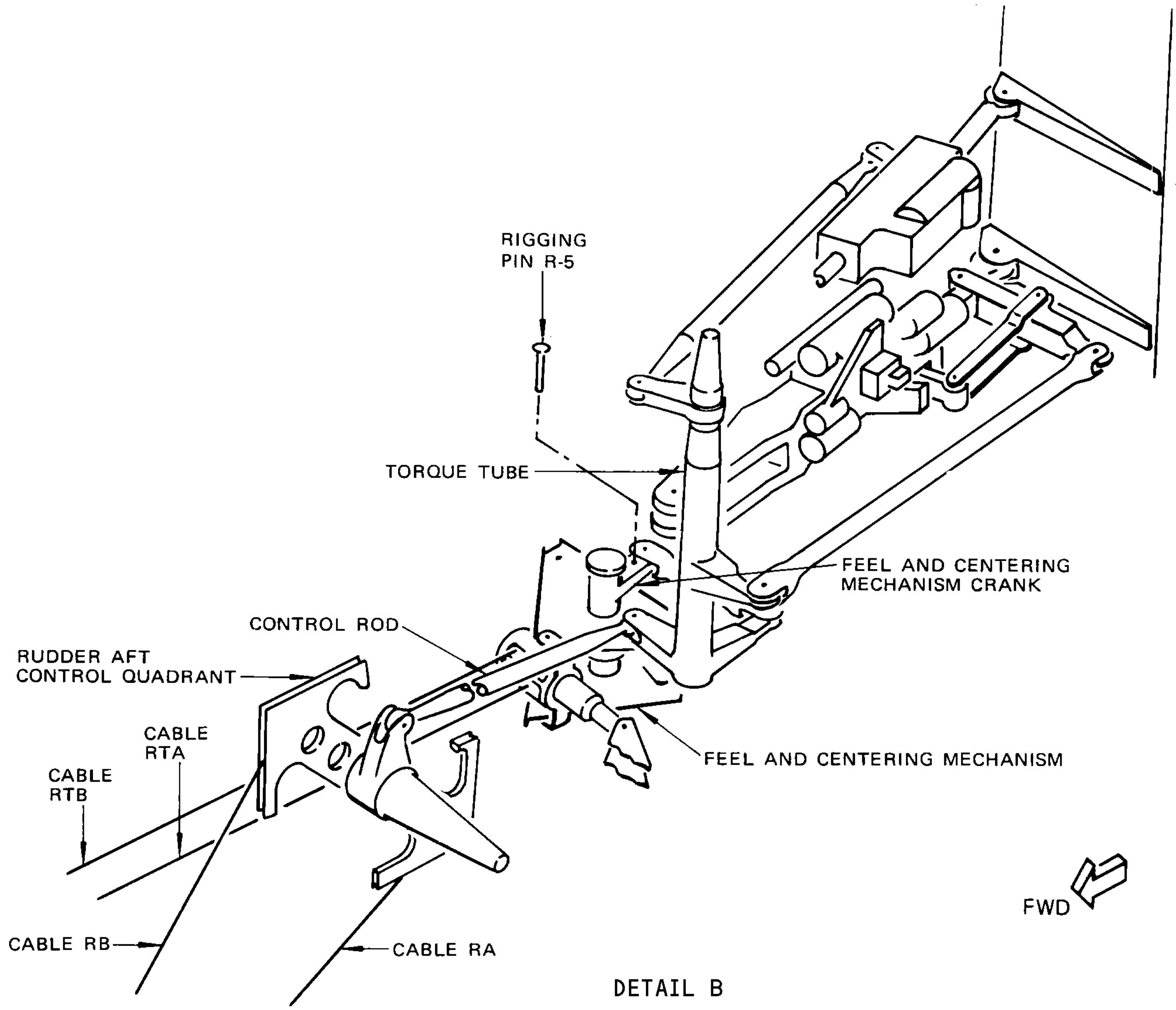
R. Install access panels.





DETAIL A

Rudder Rigging Pin Location
Figure 402 (Sheet 1)

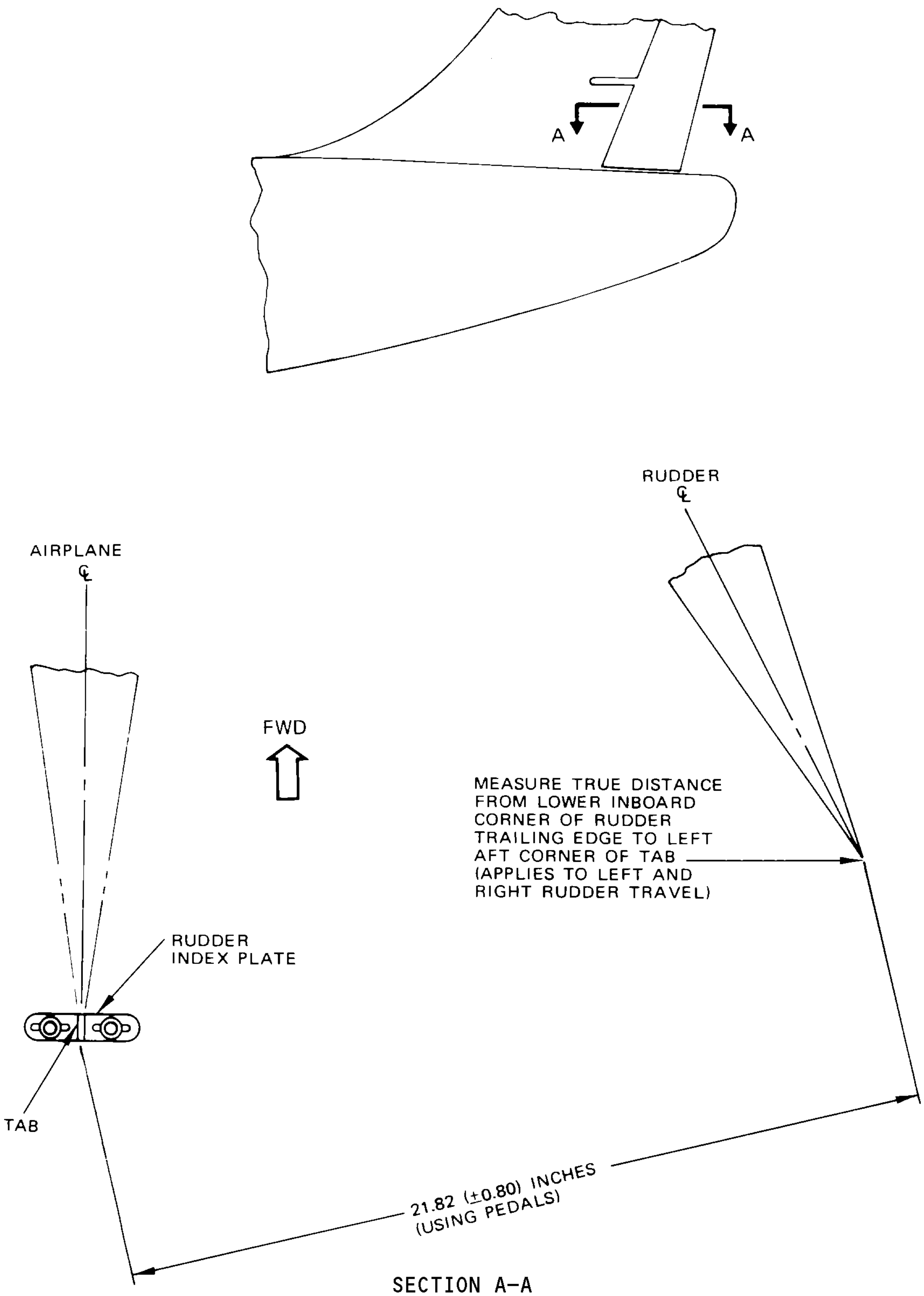


DETAIL B

TABLE 1	
TEMPERATURE °F ± 5°	RIGGING LOAD RA, RB (+10/-10) LBS [1]
110	167
90	158
70	150
50	141
30	133
10	124
0	120
-10	115
-30	107
-40	102

[1] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

Rudder Rigging Pin Location
Figure 402 (Sheet 2)

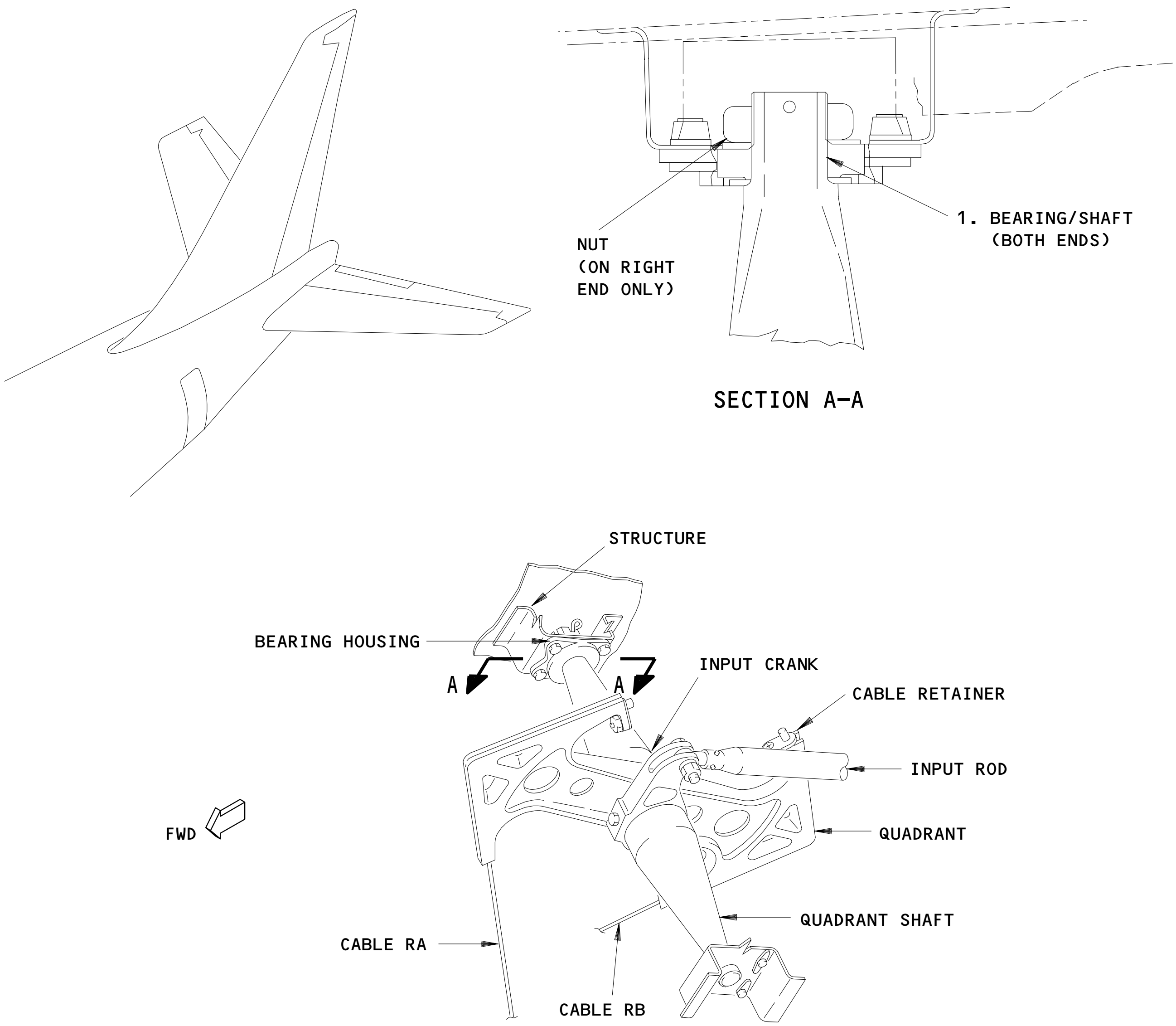


SECTION A-A
(ROTATED FOR CLARITY)

Rudder Deflection Diagram
Figure 403

RUDDER AFT CONTROL QUADRANT - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Rudder Aft Control Quadrant Wear Limits (See figure 601.)



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.999	1.000	1.003	0.004	X		
	SHAFT	OD	0.998	0.999	0.997		X		

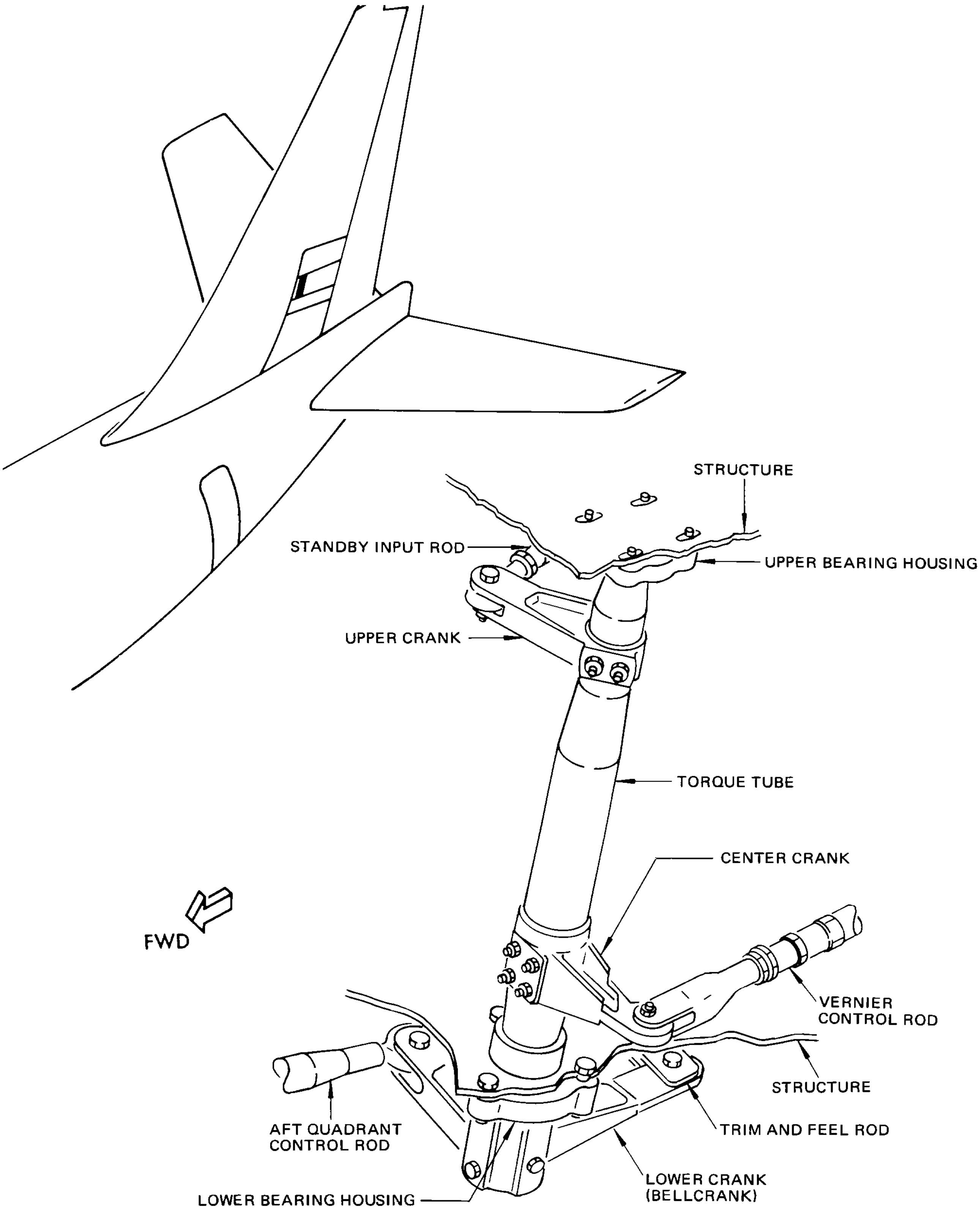
Rudder Aft Control Quadrant Wear Limits
Figure 601

RUDDER CONTROL TORQUE TUBE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   B. Grease - BMS 3-24
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

2. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Install rigging pin R-5 in feel and centering unit output crank. Refer to Rudder Control Torque Tube - A/T for location.
   C. Remove access panels (Fig. 401).
3. Remove Rudder Control Torque Tube
   A. Disconnect standby input rod, vernier control rod, aft quadrant control rod, and trim and feel rod from respective cranks on rudder control torque tube by removing nuts, washers, and bolts (Fig. 401).
   B. Mark relative positions of lower crank, center crank, and upper crank to installed location on rudder control torque tube.
   C. Remove nuts, washers, and bolts securing lower crank to torque tube.
   D. Remove nuts, washers, and bolts securing center crank to torque tube.
   E. Remove nuts, washers, and bolts securing upper crank to torque tube.
   F. Cut lockwire and remove bolts and washers securing upper bearing housing to structure.
   G. Separate lower bearing housing from structure by removing nuts, washers, and bolts.
   H. Slide lower bearing housing downward and remove from torque tube.
   I. Pull torque tube downward and remove upper bearing housing.



Rudder Control Torque Tube
Figure 401

J. Separate torque tube from cranks and remove torque tube and cranks from airplane.

4. Prepare for Installation

A. Remove rudder systems A, B, and standby hydraulic power. Refer to 27-21-0.

B. Check that rigging pin R-5 is installed in feel and centering unit output crank.

C. Check rudder control torque tube for allowable wear. Refer to Rudder Control Torque Tube - Inspection/Check.

5. Install Rudder Control Torque Tube

A. Feed torque tube through structural cutouts and place upper bearing housing, upper crank, and center crank on torque tube. (See figure 401.)

B. Slide lower bearing housing onto torque tube and secure to structure using bolts, washers and nuts.

C. Secure upper bearing housing with washers and bolts. Lockwire bolt heads.

D. Install lower crank on torque tube.

E. Apply coating of corrosion preventive compound to bolts. Install bolts, washers, and nuts to secure lower crank to torque tube. Tighten nuts to 12-15 pound-inches.

F. Apply coating of corrosion preventive compound to center crank bolts. Install bolts, washers, and nuts to secure center crank to torque tube. Tighten nuts to 25-35 pound-inches.

G. Apply coating of corrosion preventive compound to upper crank bolts. Install bolts, washers, and nuts to secure upper crank to torque tube. Tighten nuts to 25-35 pound-inches.

H. Ensure torque tube rotates without binding and/or vertical/horizontal free play.

NOTE: If binding or free play exists, recheck the installation of the upper and lower bearing housings.

I. Connect standby input rod and aft quadrant control rod to their respective cranks by installing bolts, washers, and nuts.

J. Connect trim and feel rod to lower crank by installing bolts, washers and nuts. Tighten large nut to 50-60 pound-inches. Tighten small nut to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING SMALL NUT DO NOT ATTEMPT TO RESET LARGE NUT TORQUE.

K. Connect vernier control rod to center crank by installing bolts, washers and nuts. Tighten large nut to 50-65 pound-inches. Tighten small nut to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING SMALL NUT DO NOT ATTEMPT TO RESET LARGE NUT TORQUE.

L. Apply grease to the top of both the upper and lower torque tube bearings.
   (1) Fill the upper and lower bearing housings until the grease is flush with the surrounding structure.
M. Restore airplane to normal hydraulic configuration (Ref 27-21-0).
N. Adjust system per Rudder Control Torque Tube - A/T.

RUDDER CONTROL TORQUE TUBE - ADJUSTMENT/TEST

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

2. Rudder Control Torque Tube Adjustment
   A. Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).
   B. Adjust rudder power control unit as follows:
      (1) Install rigging pin R-5 in feel and centering unit output crank and place rudder trim control wheel in neutral position.
      (2) Check location of rudder trailing edge with respect to rudder index tab (Fig. 501). Place a straight edge against side of rudder at trailing edge. If both sides of trailing edge fal1 within width of rudder index tab, tighten both checknuts on vernier control rod (Fig. 502). Combined total number of visible threads on sleeve and rod end shall not exceed 27 turns.
      (3) If either side of rudder trailing edge is outside index tab, but less than 0.50 inch from nearest side of tab proceed as follows:
         (a) Loosen both checknuts on vernier control rod.
         (b) Turn sleeve to obtain small amounts of right or left rudder until both sides of trailing edge fall within width of index tab.
         (c) Tighten both checknuts and check that combined total number of visible threads on sleeve and rod end does not exceed 27 turns.
      (4) If either side of rudder trailing edge is outside of index tab more than 0.50 inch from nearest side of index tab, proceed as follows:
         (a) Position flight control switches A and B to OFF.

            CAUTION: RUDDER POWER MUST BE OFF BEFORE DISCONNECTING VERNIER CONTROL ROD.

(b) Loosen both checknuts on vernier control rod and remove clevis bolt from forward end.

(c) Adjust rod assembly length by holding sleeve and rod end together relative to tube. Then turn rod end relative to sleeve an equal number of turns in same direction. One-half turn is equivalent to approximately 1/2 inch of rudder movement at trailing edge. Lengthen assembly for right rudder, and shorten for left rudder.

(d) Position rod end to actuator input crank and install clevis bolt, washers, and nuts. Tighten nut on outer bolt to 50-65 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

(e) Position flight control switches A and B to ON.

(f) Turn vernier control rod sleeve until both sides of rudder trailing edge fall within width of rudder index tab.

(g) Tighten both checknuts on vernier control rod. Combined total number of visible threads on sleeve and rod end shall not exceed 27 turns.

(h) Remove rigging pin R-5.

C. Adjust standby rudder actuator.

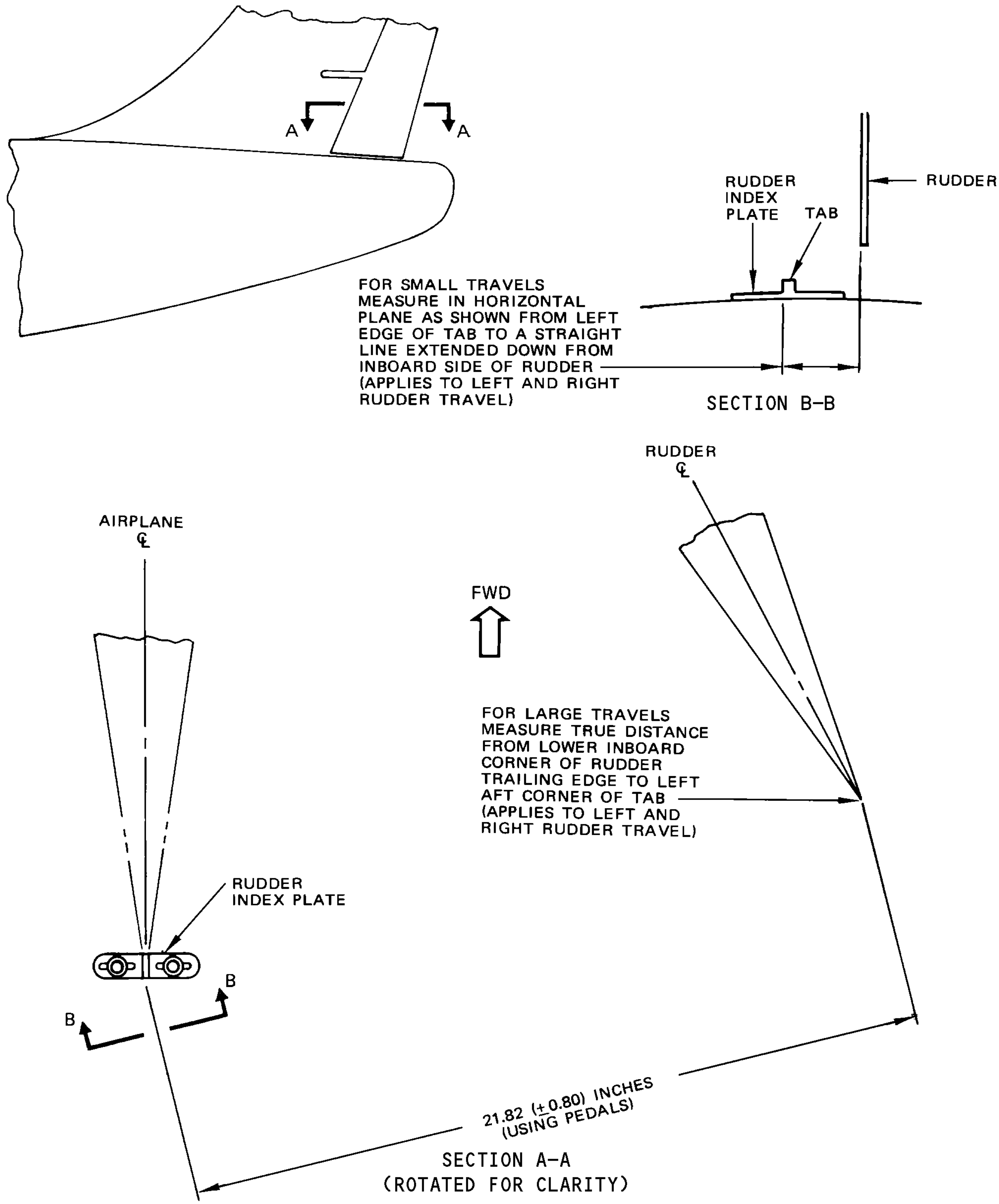
(1) Check that rudder systems A and B hydraulic power is provided and flight control switches A and B are ON. Refer to 27-21-0.

(2) Check that rudder trim is set at zero units of trim.

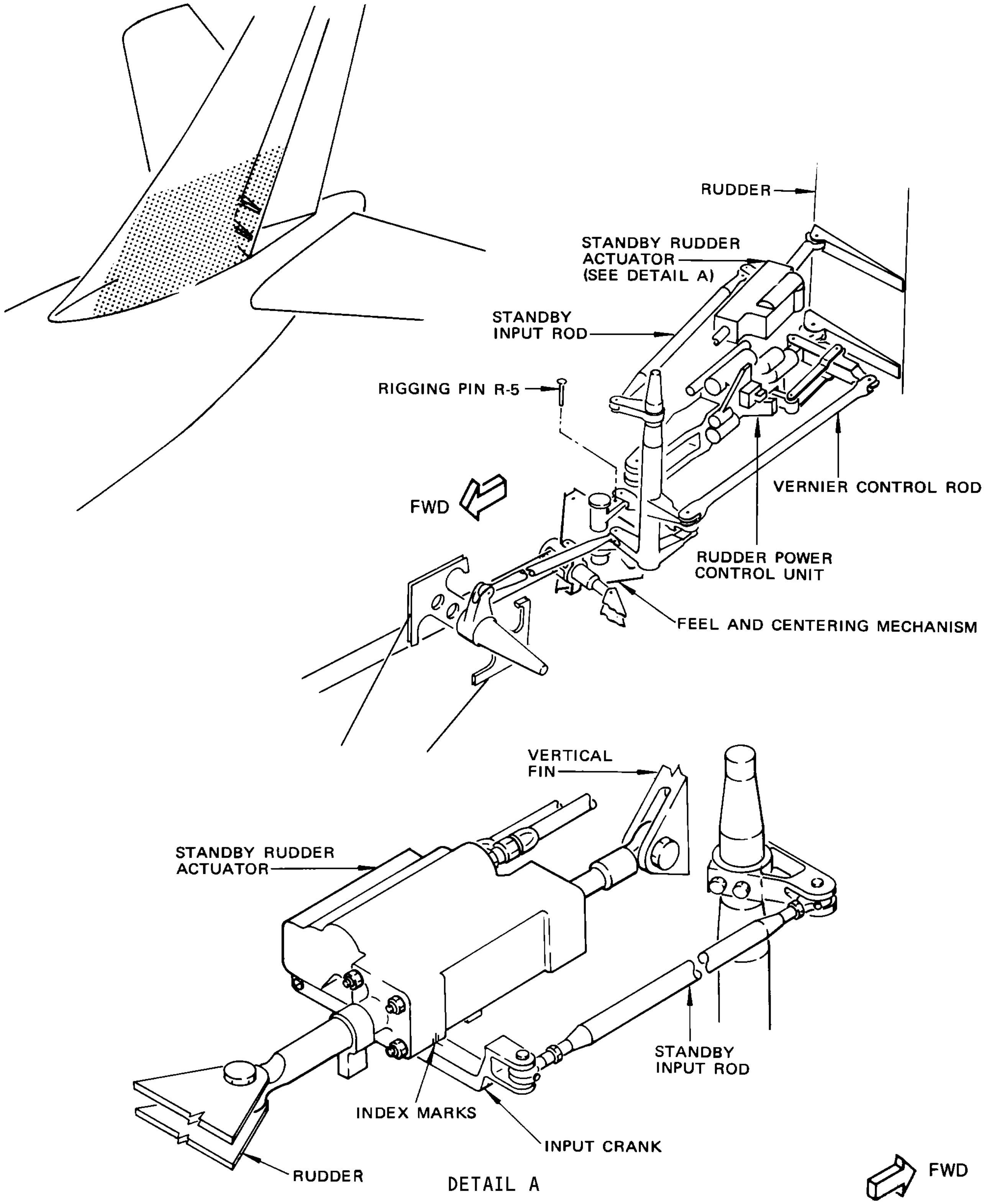
CAUTION: PERSONNEL SHOULD STAND CLEAR OF ALL FLIGHT CONTROL SURFACES WHEN HYDRAULIC POWER IS APPLIED.

(3) Jiggle feel and centering unit input arm (trim and feel rod) to ensure that system is centered.

(4) Insert rigging pin R-5 in centering unit output crank. Rigging pin shall enter easily without movement of output crank.



Rudder Travel and Index Plate
Figure 501



Rudder Aft Control Mechanism Adjustment
Figure 502

(5) Check alignment of index mark on standby actuator valve input crank and center mark on actuator body. (See detail A, figure 502.)
   (a) If marks align, proceed to step (8).
   (b) If marks do not align but misalignment is less than 0.02 inch, proceed to step (6).
   (c) If marks do not align and misalignment is more than 0.02 inch, proceed to step (7).

(6) Adjust control rod (fine adjustment) as follows:
   (a) Loosen both checknuts on rod assembly and back them off a few turns.
   (b) Turn tube until index marks align. One full turn at tube moves index mark approximately 0.006 inch.
   (c) Tighten both checknuts.
   (d) Proceed to step (8).

(7) Adjust control rod (coarse adjustment) as follows:
   (a) Position flight control switches A and B to OFF.

   CAUTION: HYDRAULIC POWER MUST BE OFF FOR THIS PROCEDURE.

   (b) Loosen both checknuts on rod assembly.
   (c) Remove bolt connecting aft end of rod to actuator.
   (d) Turn aft rod end and tube together and/or aft rod end alone in the same direction. Half a turn of one rod end moves index mark approximately 0.015 inch.
   (e) Install clevis bolt at aft end of rod.
   (f) Position flight control switches A and B to ON.
   (g) Repeat fine adjustment starting at step (2).

(8) Check for minimum thread engagement on rod. Rod end threads must be visible through inspection holes in tube at both ends.

(9) Remove rigging pin R-5.

3. Rudder Control Torque Tube Test

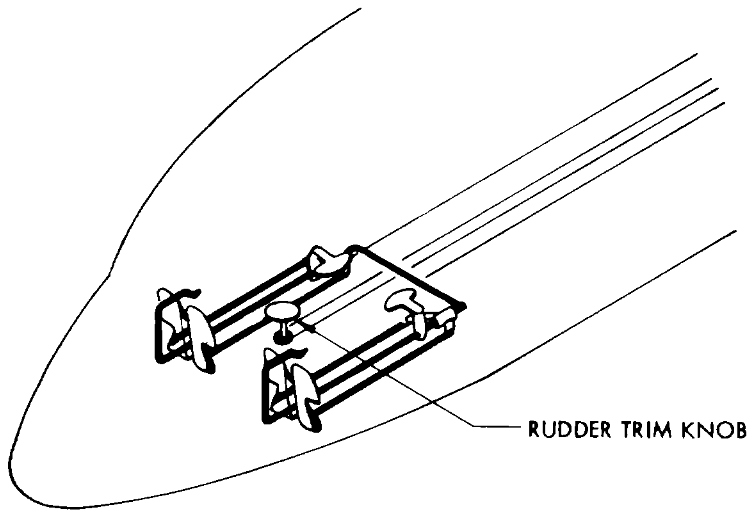
A. Test rudder travel.

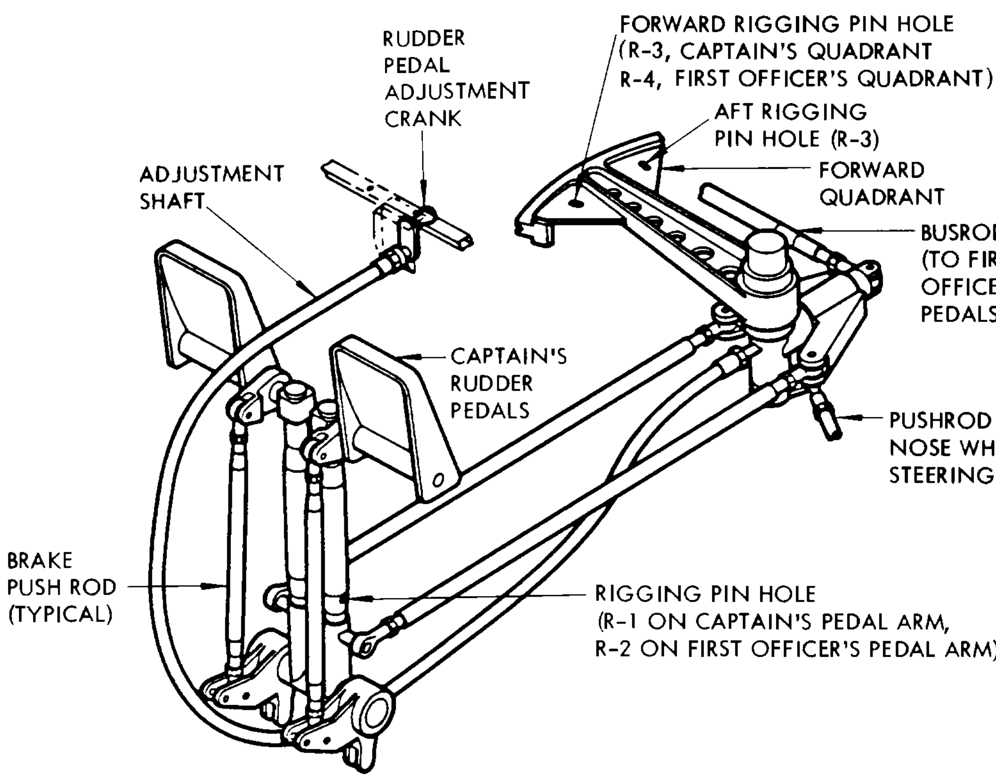
(1) Set rudder trim knob to neutral.

(2) Disconnect pushrod to nose wheel steering (Fig. 503).

NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

(3) Check that rudder hydraulic systems A and B power is provided. Refer to 27-21-0. Position flight control switch A to ON and flight control switch B to OFF.
(4) Move captain's left pedal until forward quadrant stop is contacted. Measure rudder travel. Required movement is 21.82 (±0.80) inches (Fig. 501).
(5) Move captain's right pedal until forward quadrant stop is contacted. Measure rudder travel. Required movement is 21.82 (±0.80) inches.
(6) Repeat steps (4) and (5) under following conditions:
    (a) Flight control switch A OFF and flight control switch B ON.
    (b) Flight control switch A OFF and flight control switch B in STDBY RUD position.
(7) Restore airplane to normal hydraulic configuration. Refer to 27-21-0.
(8) Reconnect pushrod to nose wheel steering, if disconnected.
(9) Close all access doors and install panels.

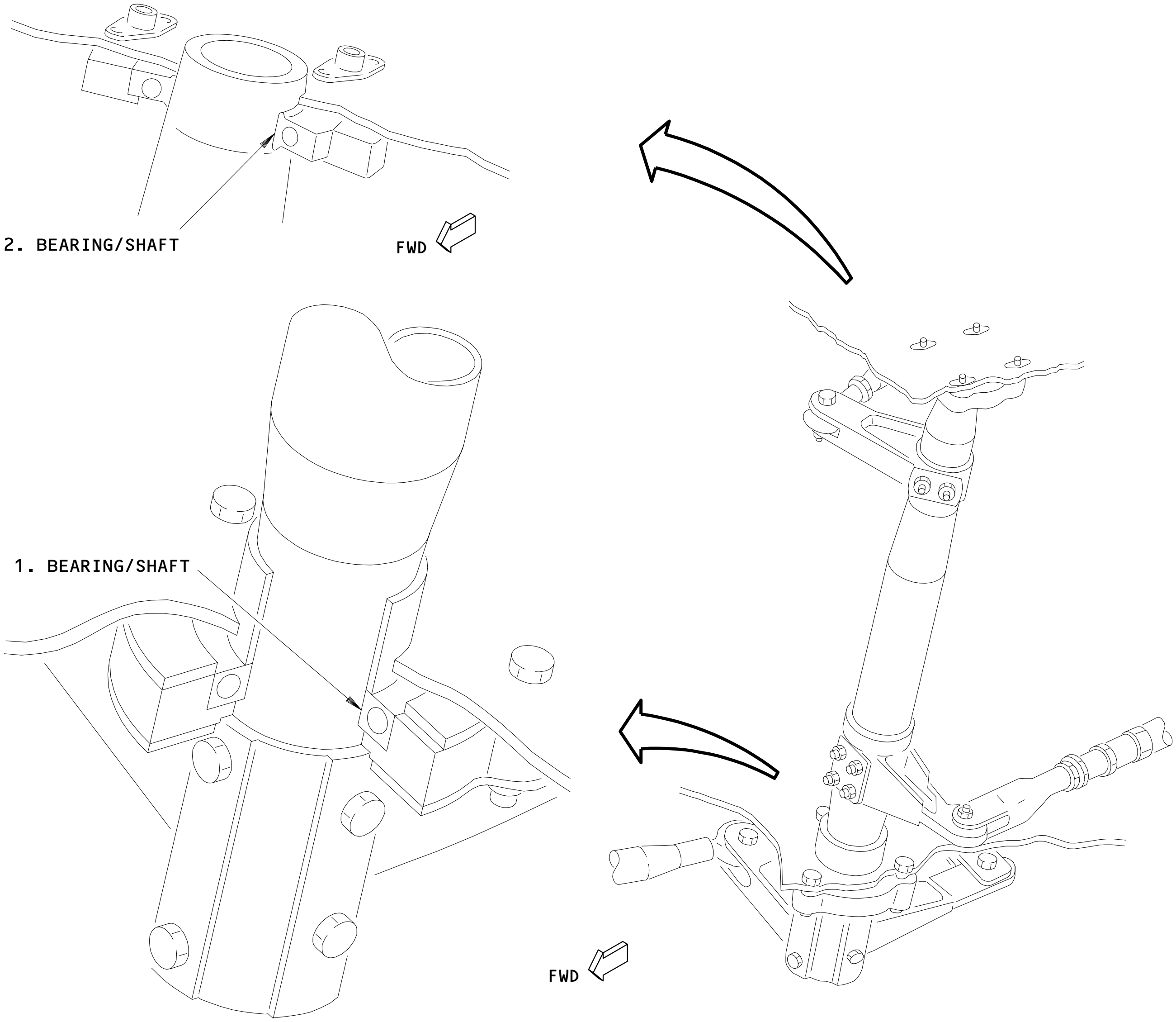




Rudder Forward Quadrant Installation
Figure 503

RUDDER CONTROL TORQUE TUBE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There wil1 be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Rudder Control Torque Tube Wear Limits (See figure 601.)



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	1.812	1.813	1.816	0.0040	X		
	SHAFT	OD	1.811	1.812	1.808		X		
2	BEARING	ID	0.9990	1.0000	1.0030	0.0035	X		
	SHAFT	OD	0.9985	0.9995	0.9955		X		

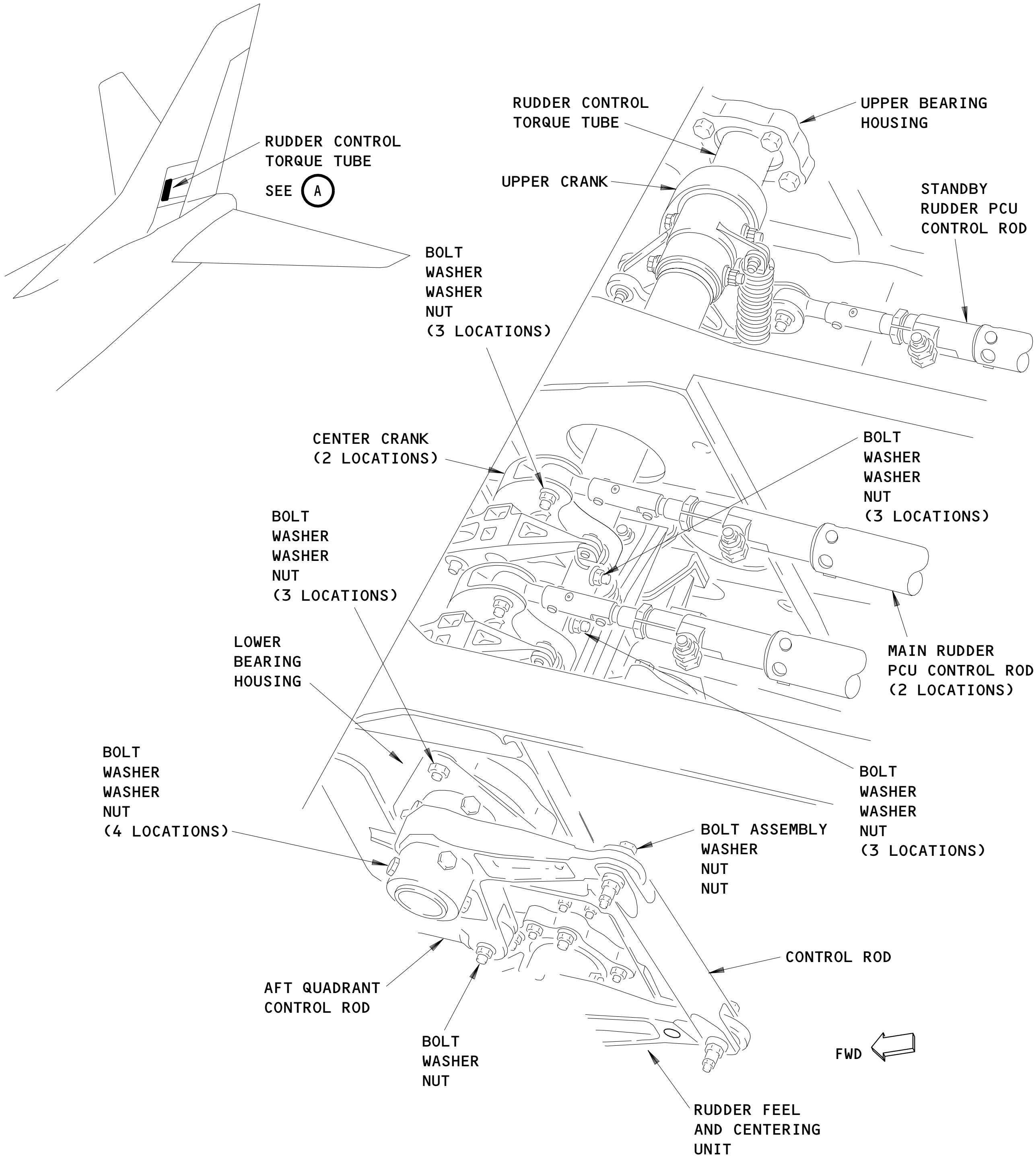
Rudder Control Torque Tube Wear Limits
Figure 601

RUDDER CONTROL TORQUE TUBE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and the installation tasks for the rudder control torque tube.
   B. The rudder control torque tube is referred to as the "torque tube" in this procedure.
2. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class 3
   B. Grease - BMS 3-24
3. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Remove access panels 9512, 9515, and 9514 (AMM 12-31-51/201).
4. Torque Tube Removal (Fig. 401)
   A. Remove the nuts, washers, and bolts to disconnect the standby PCU control rod and main PCU control rods from the upper crank and center cranks.
   B. Remove the nuts, washers, and bolt assemblies to disconnect the aft quadrant control rod and the trim and feel rod from the lower crank.
   C. If you will install the same torque tube that you are removing, then do the following step:
      (1) Use a marker or pen to make marks to identify the installed positions of the center cranks and upper crank on the torque tube.
   D. Remove the nuts, washers, and bolts that attach the upper crank to the torque tube
   E. Remove the nuts, washers, and bolts that attach the center cranks to the torque tube.
   F. Remove the nuts, washers, and bolts that attach the lower bearing housing to the structure.

      NOTE: You do not have to remove the lower crank from the torque tube. The torque tube can be removed with the lower crank installed.

   G. Pull the torque tube down through the upper bearing housing, upper crank, center cranks, and the structural cutouts.
   H. Remove the torque tube, upper crank, and center cranks from the airplane.



RUDDER CONTROL TORQUE TUBE
A

Rudder Control Torque Tube
Figure 401

5. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. If you are installing a new torque tube, then do the following step:
      (1) Use a marker or pen to make marks to identify the installed positions of the center cranks and upper crank on the torque tube.
      (2) Remove the nuts, washers, and bolts that attach the upper crank to the torque tube
      (3) Remove the nuts, washers, and bolts that attach the center cranks to the torque tube.
      (4) Keep the lower crank installed on the torque tube.
6. Torque Tube Installation (Fig. 401)
   A. Make sure that the plate, lower bearing housing, retainer, and plate are in their positions on torque tube.

      NOTE: Align holes in the plate, lower bearing housing, retainer, and plate before installing the torque tube.

   B. Put the torque tube through the structural cutouts, center cranks, upper crank, and upper bearing housing.

      NOTE: Put the center cranks and upper crank in their positions before you put the torque tube through the structural cutouts.

   C. Install the bolts, washers, and nuts to attach the lower bearing housing to the airplane structure.
   D. Install the center cranks on the torque tube at the marked positions:
      (1) Install the bolts, washers, and nuts to attach the center cranks to the torque tube.

         NOTE: The upper bolt on the crank is slightly longer than the lower bolt on the same crank.

      (2) Tighten the nuts to 15-25 pound-inches (1.69-2.82 newton-meters) above the run-on torque.
   E. Install the upper crank on the torque tube at the marked position:
      (1) Install the bolts, washers, and nuts to attach the upper crank to the torque tube.

         NOTE: The upper bolt on the crank is slightly longer than the lower bolt on the same crank.

      (2) Tighten the nuts to 15-25 pound-inches (1.69-2.82 newton-meters) above the run-on torque.

F. Make sure the torque tube turns freely and that there is no play in the horizontal and vertical directions.
   (1) If the torque tube does not turn freely, do a check of the lower bearing housing and upper bearing housing installation.
G. Install the bolt, washer (under the bolt), washer (under the nut), and nut to connect the control rod of the standby PCU to the upper crank.
H. Install the bolts, washers (under the bolts), washers (under the nuts), and nuts to connect the control rods of the main PCU to the center cranks.
I. Install the bolt assemblies, washers, and nuts to connect the aft quadrant control rod and the trim and feel rod to the lower crank.
   (1) Tighten the large nuts to 50-65 pound-inches (5.65-7.34 newton-meters).

   NOTE: Do not tighten the large nut after you tighten the small nut. Movement of the large nut can cause the small nut to come loose.

   (2) Tighten the small nuts to 12-15 pound-inches (1.36-1.69 newton-meters).
J. Apply grease to the top of both the upper and lower torque tube bearings.
   (1) Fill the upper and lower bearing housings until the grease is aligned with the surrounding structure.

7. Torque Tube Installation Test
   A. Do the steps to adjust the input rods of the rudder main PCU (AMM 27-21-1/501).
   B. Do the steps to adjust the input rod of the standby PCU (AMM 27-21-1/501).
   C. Do the test of the rudder travel (AMM 27-21-1/501).
   D. Install the access panels 9512, 9515, and 9514 (AMM 12-31-51/201).

RUDDER FEEL AND CENTERING UNIT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-3	-11	0.309-0.311	6.7 ±0.25	CAPTAIN'S FWD QUADRANT
R-4	-11	0.309-0.311	6.7 ±0.25	F/O'S FWD QUADRANT
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Grease - BMS 3-33 (Preferred)
   C. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   D. Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
2. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Install rigging pins R-3 and R-4 per Fig. 401.
   C. Remove Rudder trim actuator (Ref 27-21-111 R/I). Remove rigging pin R-5.
3. Remove Rudder Feel and Centering Unit
   A. Remove nuts, washers, and dual bolt connecting feel and centering unit crank and trim and feel rod.
   B. Remove upper bearing housing bolts.
   C. Hold feel and centering unit in place while removing bolts attaching two support brackets to bulkhead and removing lower bearing housing bolts.
   D. Remove feel and centering unit and two support brackets, then separate upper and lower bearing housings from unit.
4. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Check feel and centering unit for allowable war (Ref 27-21-82 I/C).

      CAUTION: FEEL OUTPUT ROD IS A DUAL LOAD PATH COMPONENT. INSPECT INNER AND OUTER RODS FOR DAMAGE PRIOR TO INSTALLATION.

C. Lubricate spring slider shaft (Fig. 401) (Ref 12-22-21).

5. Install Rudder Feel and Centering Unit

A. Position two support brackets and feel and centering unit with upper and lower bearing housings, then install bolts attaching two support brackets to bulkhead.

B. Install lower bearing housing bolts.

C. Install upper bearing housing bolts.

D. Install nuts, washer and dual bolt connecting feel and centering mechanism crank and trim and feel rod. First tighten nut on outer bolt to 45-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

E. Install rigging pin R-5, and remove rigging pins R-3 and R-4.

F. Install and adjust rudder trim actuator (Ref 27-21-111, Removal/Installation).

G. Restore airplane to normal hydraulic configuration (Ref 27-21-0).

H. Remove rigging pin R-5, if installed.

I. Test feel and centering unit.

(1) Disconnect pushrod to nose wheel steering outboard of captain's forward quadrant.

NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

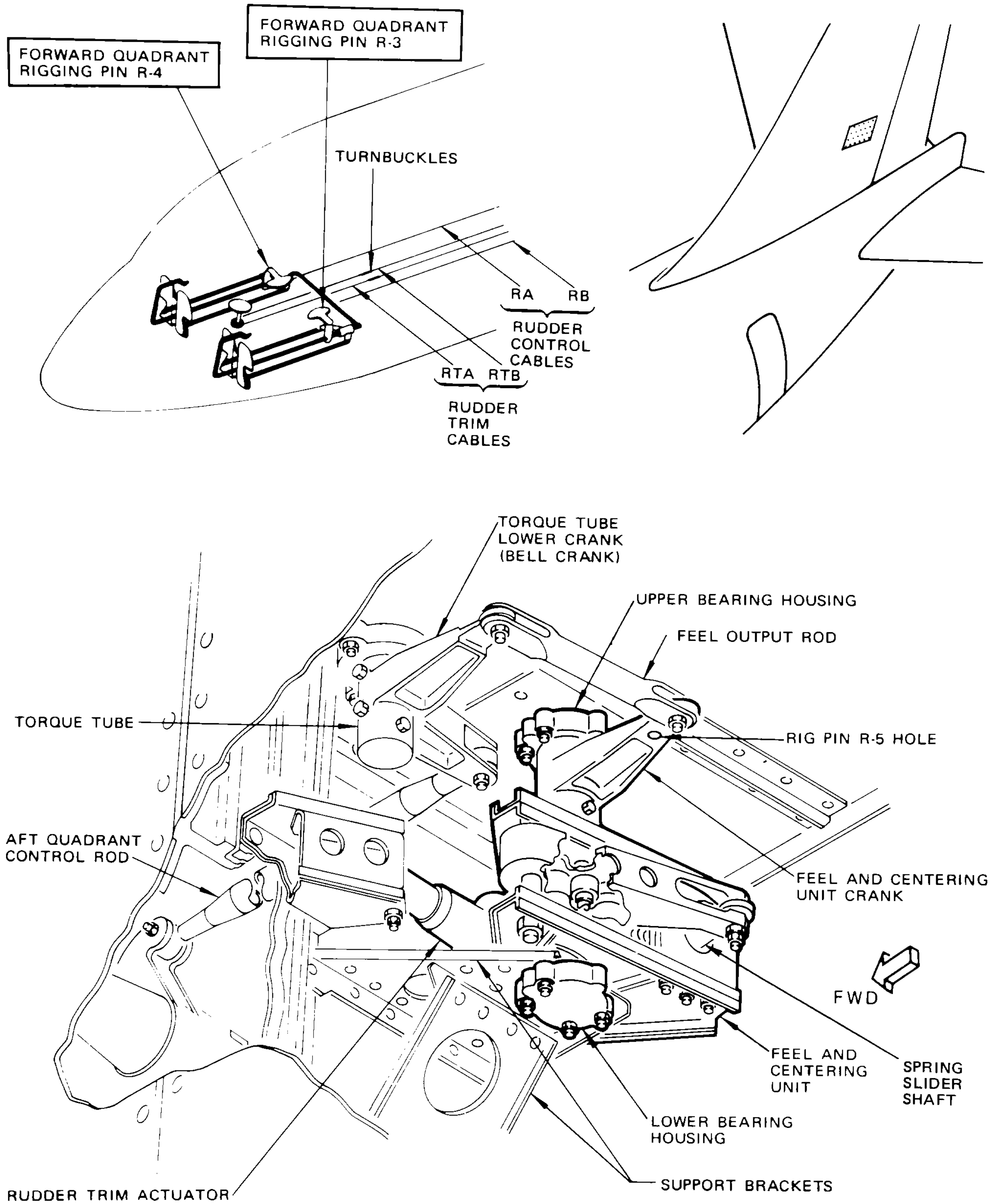
(2) Provide rudder systems A and B hydraulic power (Ref 27-21-0).

(3) Push rudder pedals through at least three full cycles.

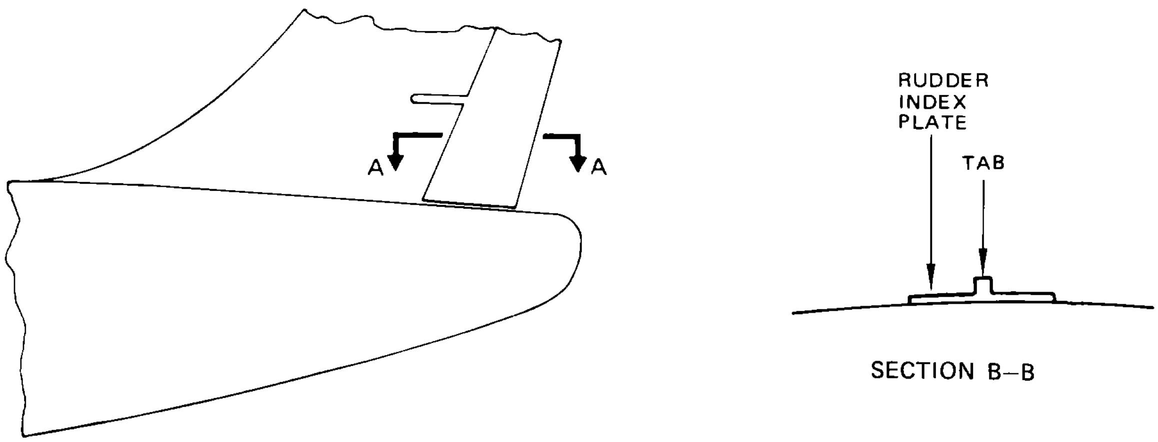
(4) Check that rudder trim knob is in neutral position.

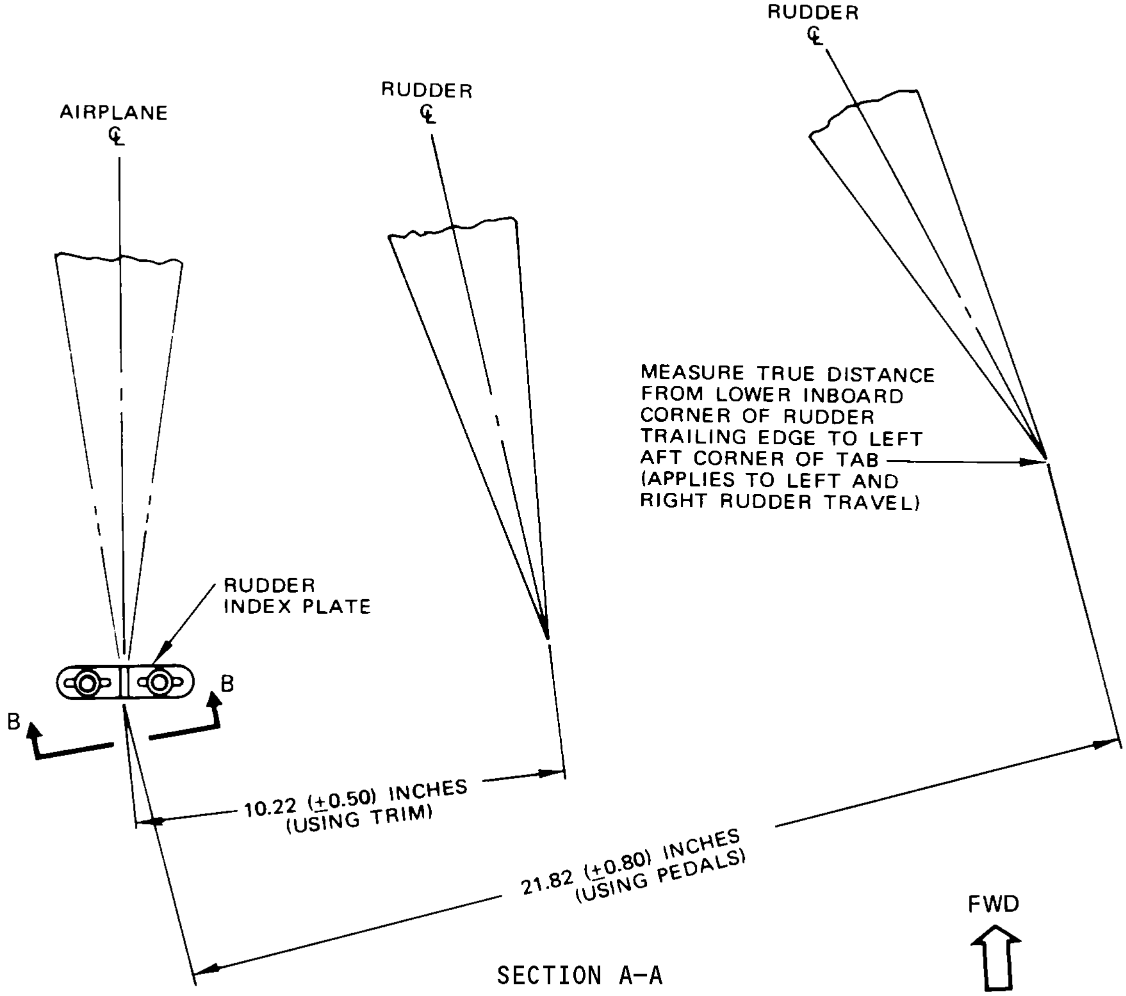
(5) Move captain's left rudder pedal approximately 0.5 inch forward and release. Check that rudder returns to neutral position where both sides of rudder trailing edge are within width of tab on index plate (Fig. 402).

(6) Repeat step (5) with captain's right rudder pedal.



Rudder Feel and Center Unit Installation
Figure 401





SECTION A-A
(ROTATED FOR CLARITY)

Rudder Travel and Index Plate
Figure 402

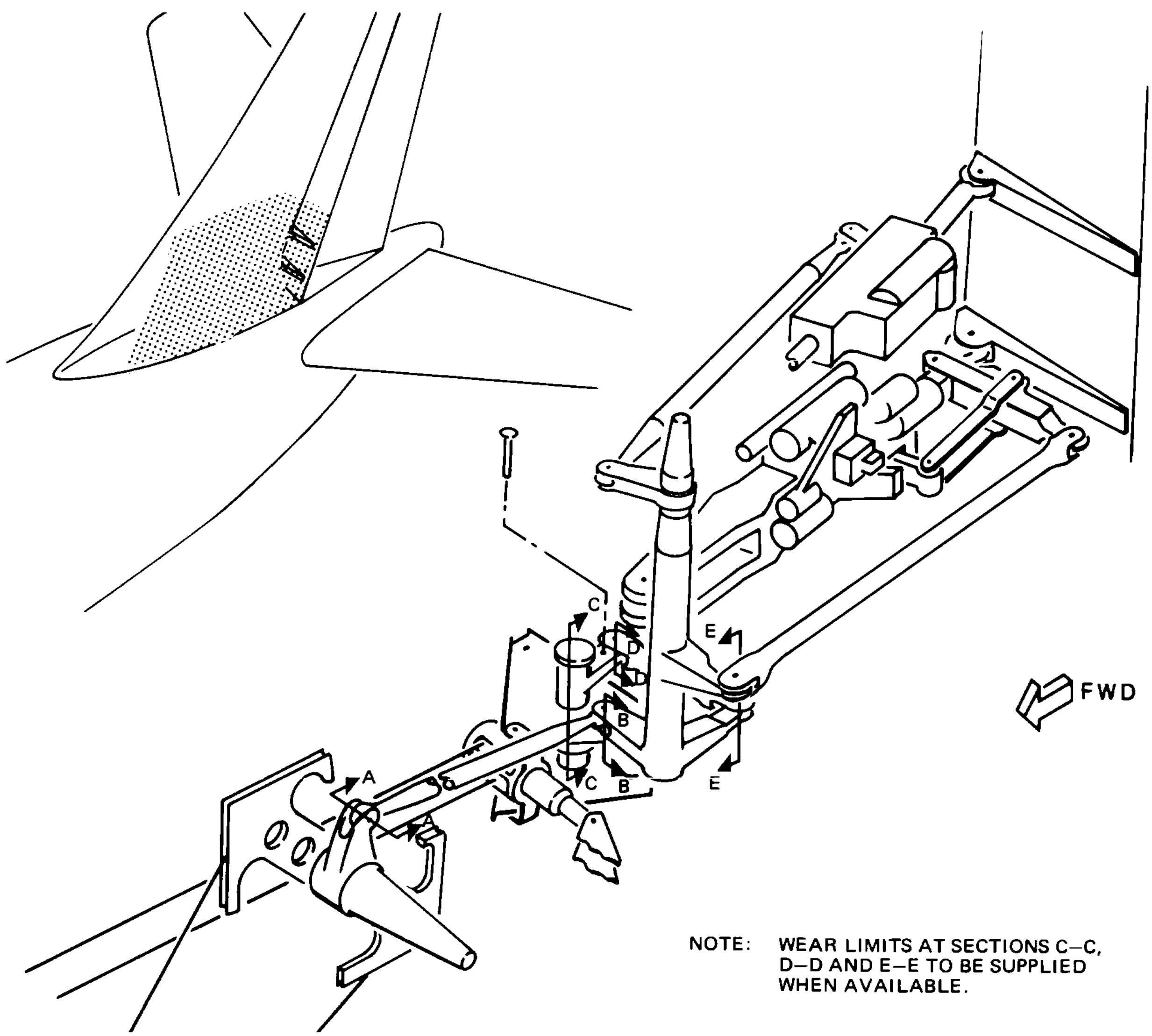
(7) Move captain's left pedal until forward quadrant stop is contacted. Check that rudder movement is per Section A-A, Fig. 402.

NOTE: On airplanes with hydraulic rudder feel and centering unit, with both hydraulic systems A and B on, and rudder pedals are operated at a rapid rate and/or pedal stops are contacted; the feel system pressure differential light may flicker, but check that light does not remain ON.

(8) Repeat step (7) with captain's right pedal.
(9) Move rudder to neutral position.
(10) Rotate rudder trim control knob in both directions until indicator is a 10. Check that rudder travel is per Section A-A, Fig. 402, in each direction from neutral.
(11) If disconnected, connect pushrod to nose wheel steering outboard of captain's forward quadrant.
(12) Remove hydraulic power, if no longer required (Ref 27-21-0).
(13) Install access panels.

RUDDER FEEL AND CENTERING UNIT - INSPECTION/CHECK

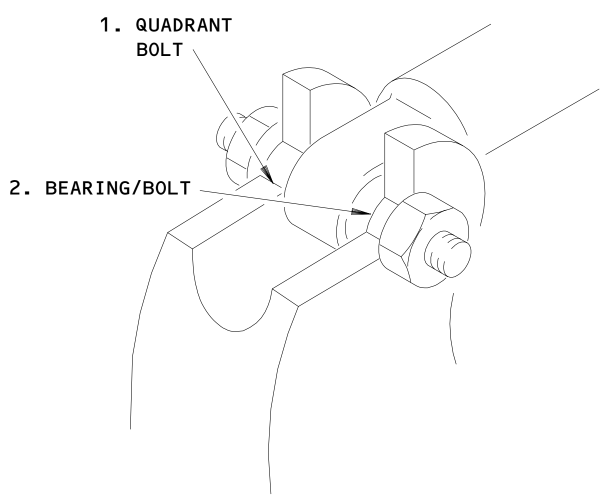
1. Airplanes with Mechanical Rudder Feel System
2. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component for inspection after wear. Refer to component removal/installation for this information.
3. Rudder Feel and Centering Unit Wear Limits



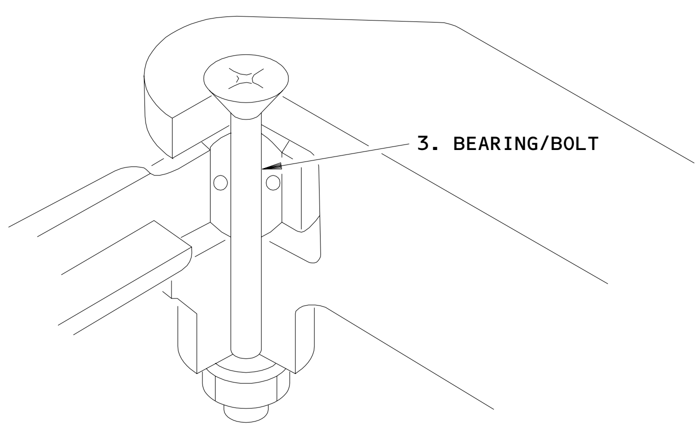
Rudder Feel and Centering Unit Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	QUADRANT	ID	0.2495	0.2505	0.2535	0.0040		X	1
	BOLT	OD	0.2485	0.2495	0.2481		X		
2	BEARING	ID	0.2497	0.2500	0.2530	0.0035	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
3	BEARING	ID	0.2497	0.2500	0.2529	0.0037	X		
	BOLT	OD	0.2483	0.2492	0.2479		X		

1 OBTAIN NAS537B4P OR EQUIVALENT BUSHING. BORE HOLE TO ATTAIN -0.0010 TO 0.0000 INCH INTERFERENCE FIT (0.3754 INCH MAXIMUM). REAM BUSHING TO 0.2495/0.2505 INCH DIAMETER.



SECTION A-A



SECTION B-B

Rudder Feel and Centering Unit Wear Limits
Figure 601 (Sheet 2)

RUDDER POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The rudder power control unit is located in the lower area of the vertical fin (Fig. 401).
   B. For replaceable autopilot components of the rudder power control unit, refer to Chapter 22, Auto Flight. Filter element replacement is accomplished at overhaul.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL CENTERING MECHANISM

   B. Fire Resistant Hydraulic Fluid - BMS 3-11 or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   C. Rudder Lock, PCU Removed - F80150-1
   D. Torque Wrench, Rudder PCU Attachment - C27025-1
3. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Remove access panels 9512 and 9514 (Ref Chapter 12, Access Doors and Panel).
   C. Remove lower section of rudder hinge cover and seal from right side.
   D. Open TE access door 9510 and install rigging pin R-5. (Refer to 27-21-91 A/T for location.)
   E. Open yaw damper circuit breakers on P6.
4. Remove Rudder Power Control Unit

CAUTION: DO NOT REMOVE THE UNIONS AND REDUCER FITTINGS FROM THE PCU PORTS WHEN DISCONNECTING THE HYDRAULIC LINES BECAUSE THAT WILL INCREASE THE POSSIBILITIES FOR CROSS CONNECTION OF THE LINES DURING INSTALLATION.

A. Disconnect the hydraulic lines from the PCU. Install plugs in hydraulic lines and caps on port fittings.
B. Disconnect electrical connectors.

NOTE: Airplanes using single channel yaw damper power control units, have only one electrical connector.

C. Remove main input rod (vernier control rod).

CAUTION: MAKE SURE TO REMOVE THE VERNIER CONTROL ROD BEFORE THE POWER CONTROL UNIT. FAILURE TO REMOVE THE VERNIER CONTROL ROD FIRST CAN CAUSE DAMAGE TO THE ROD.

D. Remove rod end bolt connecting rod assembly to rudder (Fig. 401).
E. Remove clevis bolt connecting forward manifold assembly to structure.

CAUTION: SUPPORT RUDDER PCU TO PREVENT IT FROM FALLING.

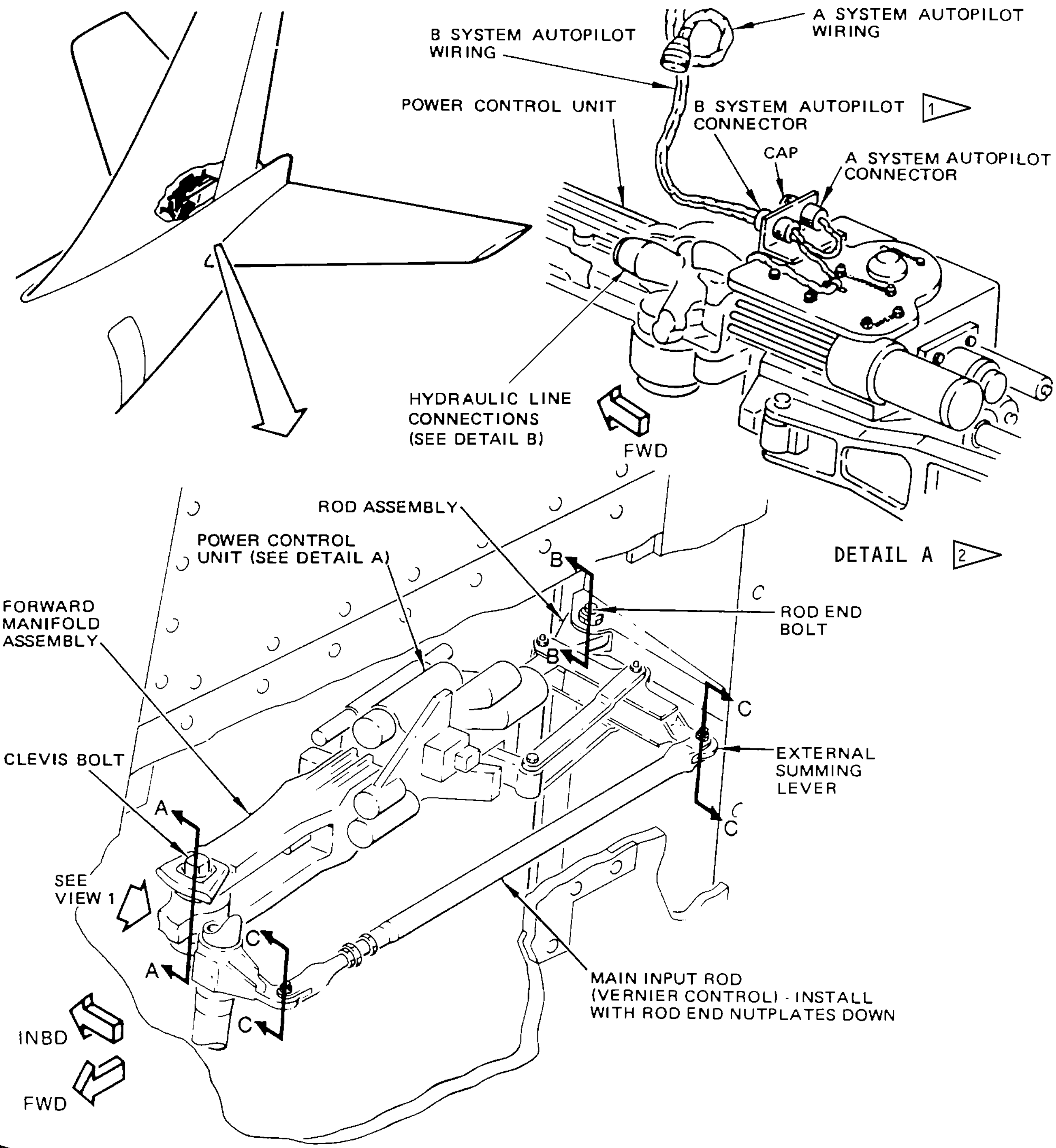
F. Remove power unit from airplane.
G. Install rudder lock.

5. Prepare for Installation
A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).
B. Check that rigging pin R-5 is installed.
C. Check for allowable wear of rudder PCU installation points (Ref 27-21-91 I/C).

CAUTION: MAIN INPUT ROD, MAIN INPUT ROD INSTALLATION BOLT, CLEVIS BOLT AND ROD END BOLT ARE DUAL LOAD PATH COMPONENTS. VISUALLY CHECK INNER AND OUTER RODS/BOLTS FOR DAMAGE PRIOR TO INSTALLATION.

6. Install Rudder Power Control Unit (Fig. 401)

CAUTION: MAKE SURE THAT YOU FOLLOW THE INSTRUCTIONS TO INSTALL THE PCU CAREFULLY AND DO THE PROCEDURE IN THE SPECIFIED SEQUENCE. DAMAGE TO THE VERNIER CONTROL ROD CAN OCCUR IF THE INSTRUCTIONS ARE NOT FOLLOWED CORRECTLY.

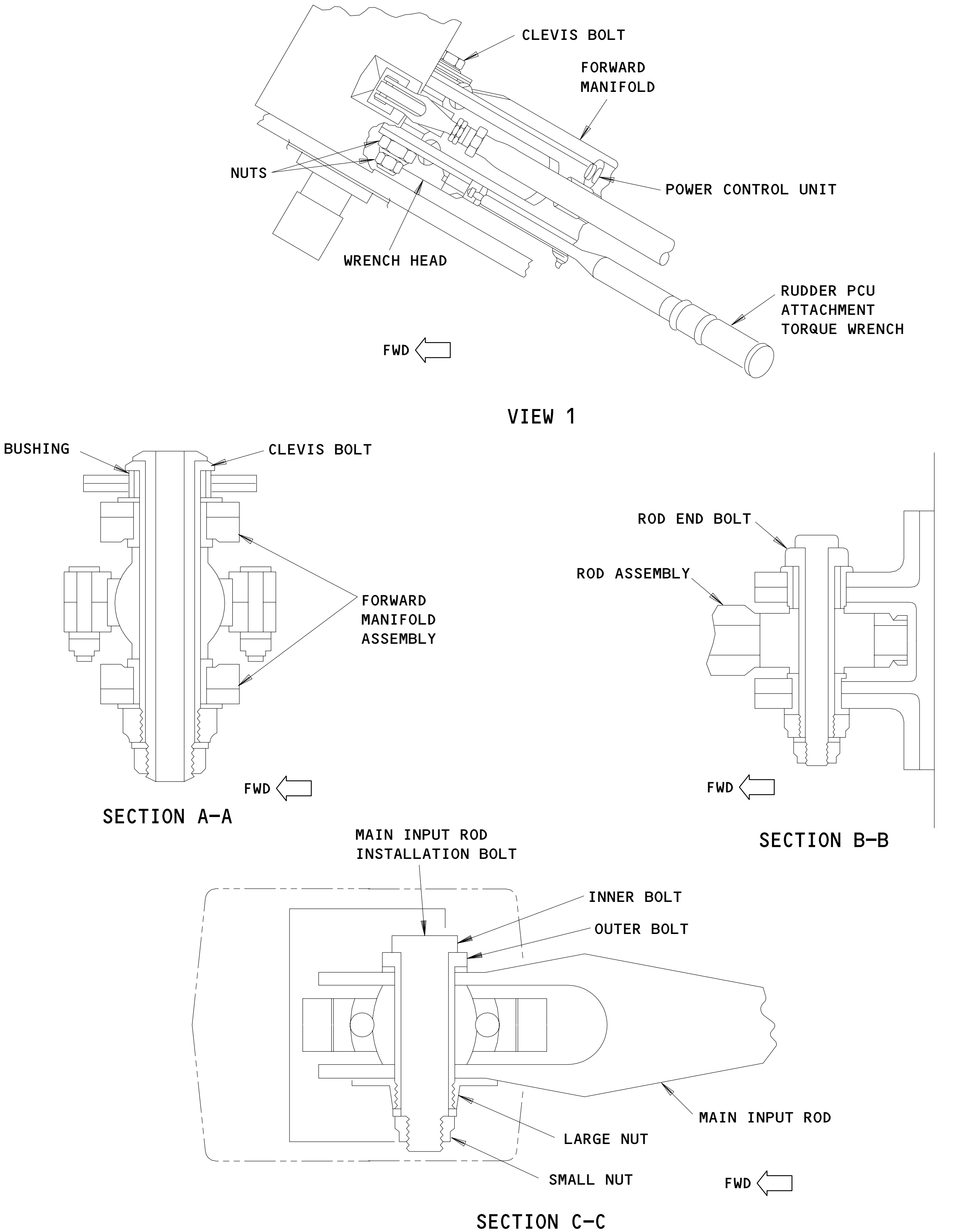


1 1. IF A SINGLE CHANNEL YAW DAMPER POWER CONTROL UNIT IS INSTALLED ON AIRPLANES WITH DUAL CHANNEL AUTOPILOT, INSTALL B SYSTEM AUTOPILOT ELECTRICAL CONNECTOR AS SHOWN, CAP AND STOW A SYSTEM AUTOPILOT ELECTRICAL WIRING, CAP A SYSTEM ELECTRICAL CONNECTOR AS SHOWN, AND INSTALL INOPERATIVE DECAL ON A SYSTEM AUTOPILOT SELECT SWITCH IN COCKPIT.

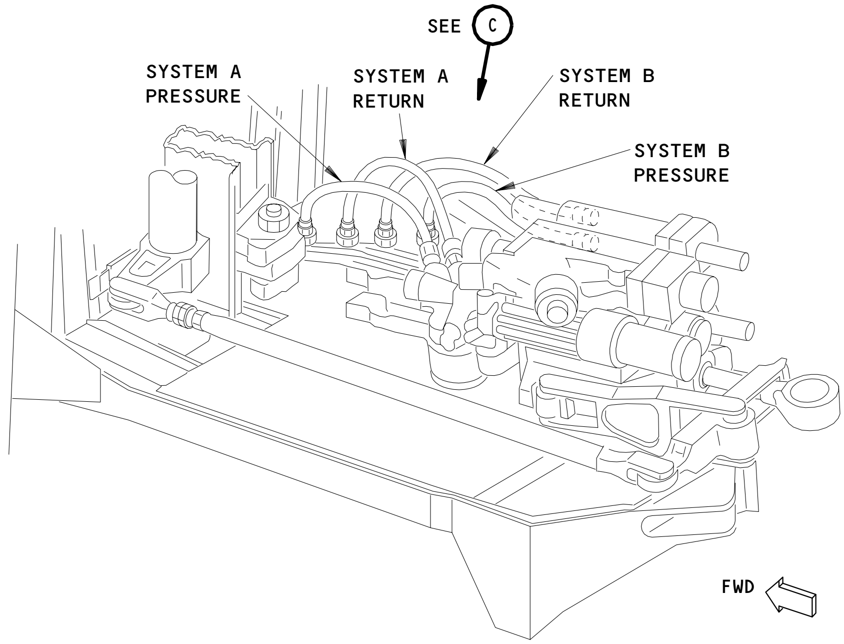
2. ON AIRPLANES WITH SINGLE CHANNEL AUTOPILOT, INSTALL B SYSTEM AUTOPILOT CONNECTOR AS SHOWN AND ENSURE THAT UNUSED CONNECTOR IS CAPPED.

2 3. AIRPLANES INCORPORATING SB 27A1206

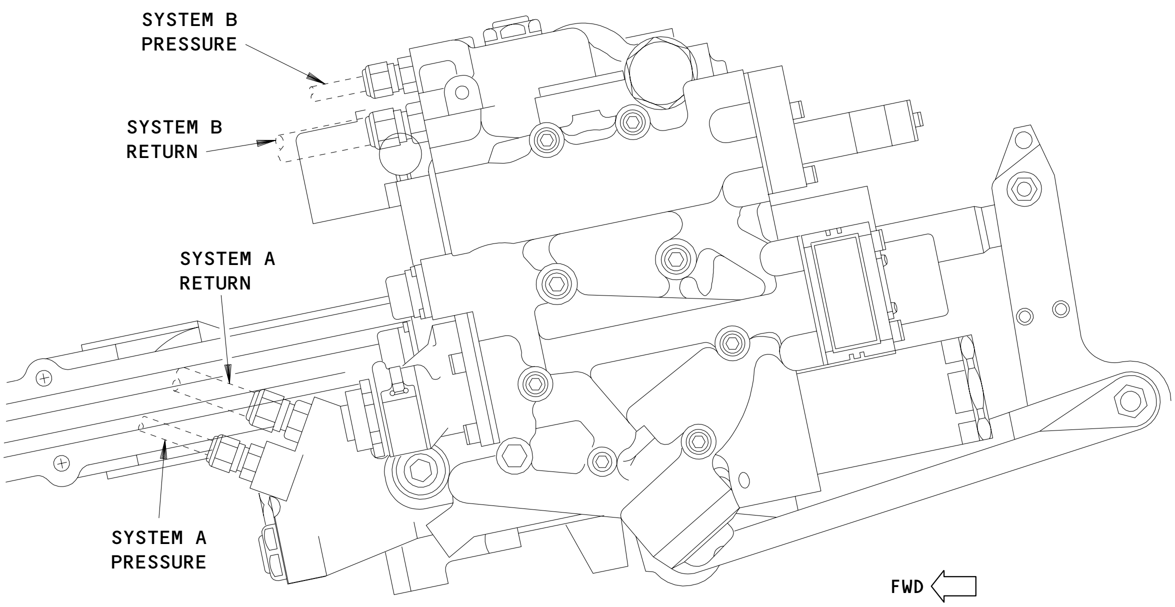
Rudder Power Control Unit Installation
Figure 401 (Sheet 1)



Rudder Power Control Unit Installation
Figure 401 (Sheet 2)



HYDRAULIC LINE CONNECTIONS
B



HYDRAULIC LINE CONNECTIONS
(PLAN VIEW)
C

Rudder Power Control Unit Installation
Figure 401 (Sheet 3)

A. Remove rudder lock.
B. Position rudder PCU in airplane.
C. Align forward manifold assembly bearing hole with beam structure and install bushing, clevis bolt, three washers and two nuts. Using torque wrench C27025-1, tighten larger nut 750 to 900 pound-inches and tighten smaller nut 450 to 590 pound-inches (View 1).

<u>CAUTION</u>: AFTER TIGHTENING SMALLER NUT, DO NOT RESET TORQUE FOR LARGER NUT. SMALLER NUT MAY BECOME LOOSE.

D. Install rod end bolt, two washers and two nuts, connecting rod assembly to rudder. Tighten larger nut 300 to 400 pound-inches and tighten smaller nut 350 to 400 pound-inches (section B-B).

<u>CAUTION</u>: AFTER TIGHTENING SMALLER NUT, DO NOT RESET TORQUE FOR LARGER NUT. SMALLER NUT MAY BECOME LOOSE.

E. Install main input rod as follows:

<u>NOTE</u>: You can install the vernier control rod with the vernier adjustment and in the forward or aft position. For easier adjustment of the control rod, install the vernier adjustment end at the forward position to align it with the access panel 9513.

(1) On forward end of main input rod check that 7 ±1 threads are exposed on rod, and on sleeve.
(2) Position main input rod clevis over tongue on external summing lever (nutplate side down) per C-C Fig. 401 and install bolt assembly with two washers, through clevis and tongue. Tighten large nut on outer bolt to 45-60 pound-inches. Install nut over end of inner bolt. Tighten small nut to 12 to 15 pound-inches.

<u>CAUTION</u>: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR BOLT ON OUTER NUT. NUT ON INNER BOLT MAY BECOME LOOSE.

(3) Position clevis at opposite end of main input rod over lug on torque tube input crank per C-C Fig. 401 and install fasteners per step (2).

F. If the unions and reducer fittings are not installed, apply the hydraulic fluid or the assembly lube to the O-rings and the fittings and install in the hydraulic ports.

CAUTION: TO PREVENT CROSS CONNECTION OF HYDRAULIC LINES, ENSURE THAT UNIONS AND REDUCERS ARE INSTALLED IN THE CORRECT PCU HYDRAULIC PORTS.

G. Connect electrical connectors on airplanes with dual channel autopilot being fitted with a dual channel yaw damper PCU. On airplanes with single channel autopilot and if an airplane with dual channel autopilot is being fitted with a single channel yaw damper PCU, see detail A for electrical wiring connection.

NOTE: Airplanes incorporating SB 27A1206, connect system B autopilot wiring electrical connector to yaw damper PCV (Fig. 401, Detail A).

H. Remove rigging pin R-5.

I. Disconnect nosewheel steering pushrod at forward quadrant.

NOTE: Nose gear steering rod need not be disconnected if airplane is jacked so that nose gear is fully extended.

J. Bleed rudder PCU and check for leakage.
   (1) Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).
   (2) Actuate rudder pedals to exercise rudder PCU until rudder motion is smooth and continuous.
   (3) Check for hydraulic leakage.

K. Adjust and test PCU (Ref 27-21-91 A/T).

7. Restore Airplane to Normal Configuration
   A. Remove rudder systems A and B hydraulic power (Ref 27-21-0 MP).
   B. Replace access panels.

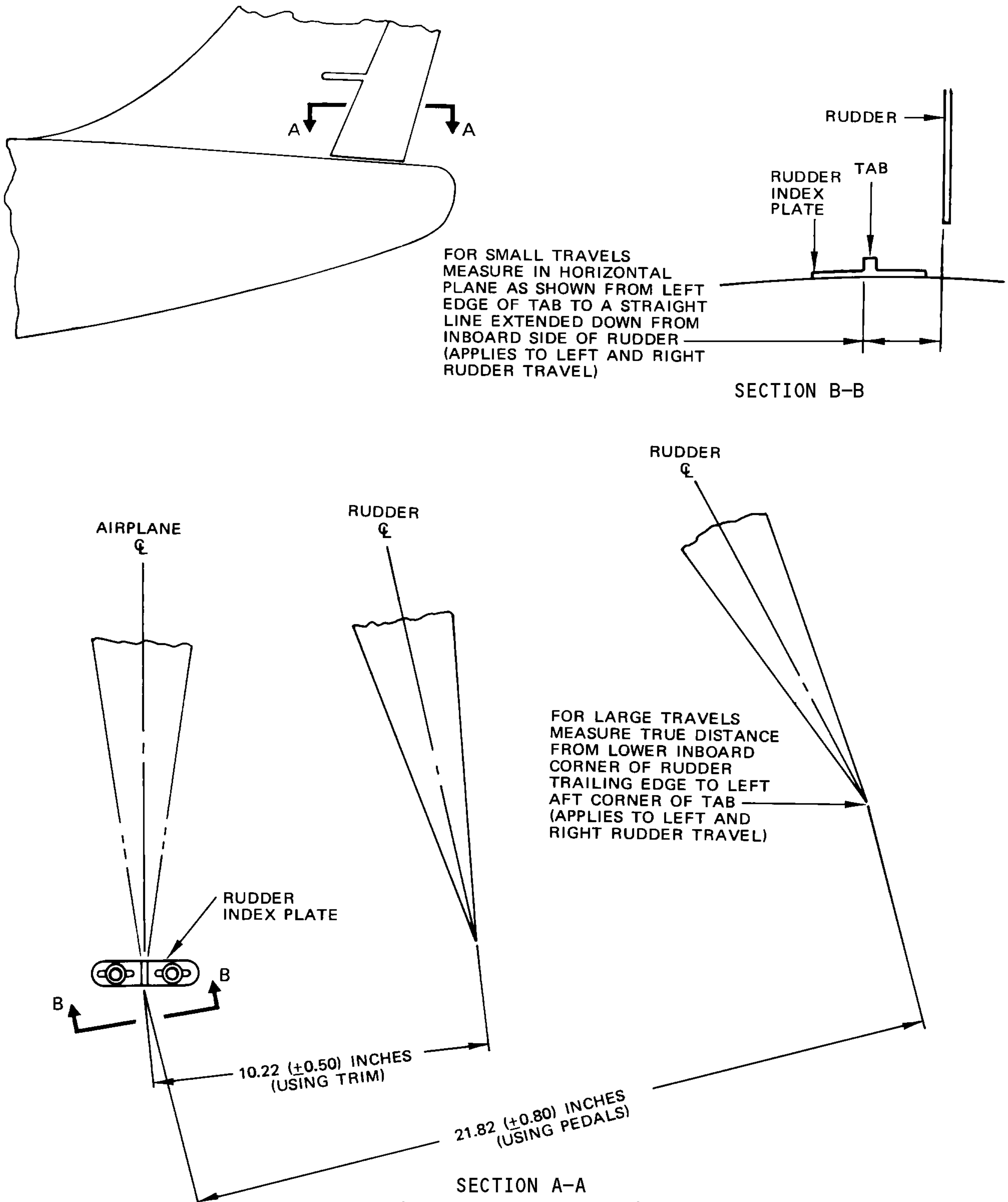
C. Check hydraulic reservoirs and service, if required (Ref Chapter 12, Hydraulic Servicing).

RUDDER POWER CONTROL UNIT - ADJUSTMENT/TEST

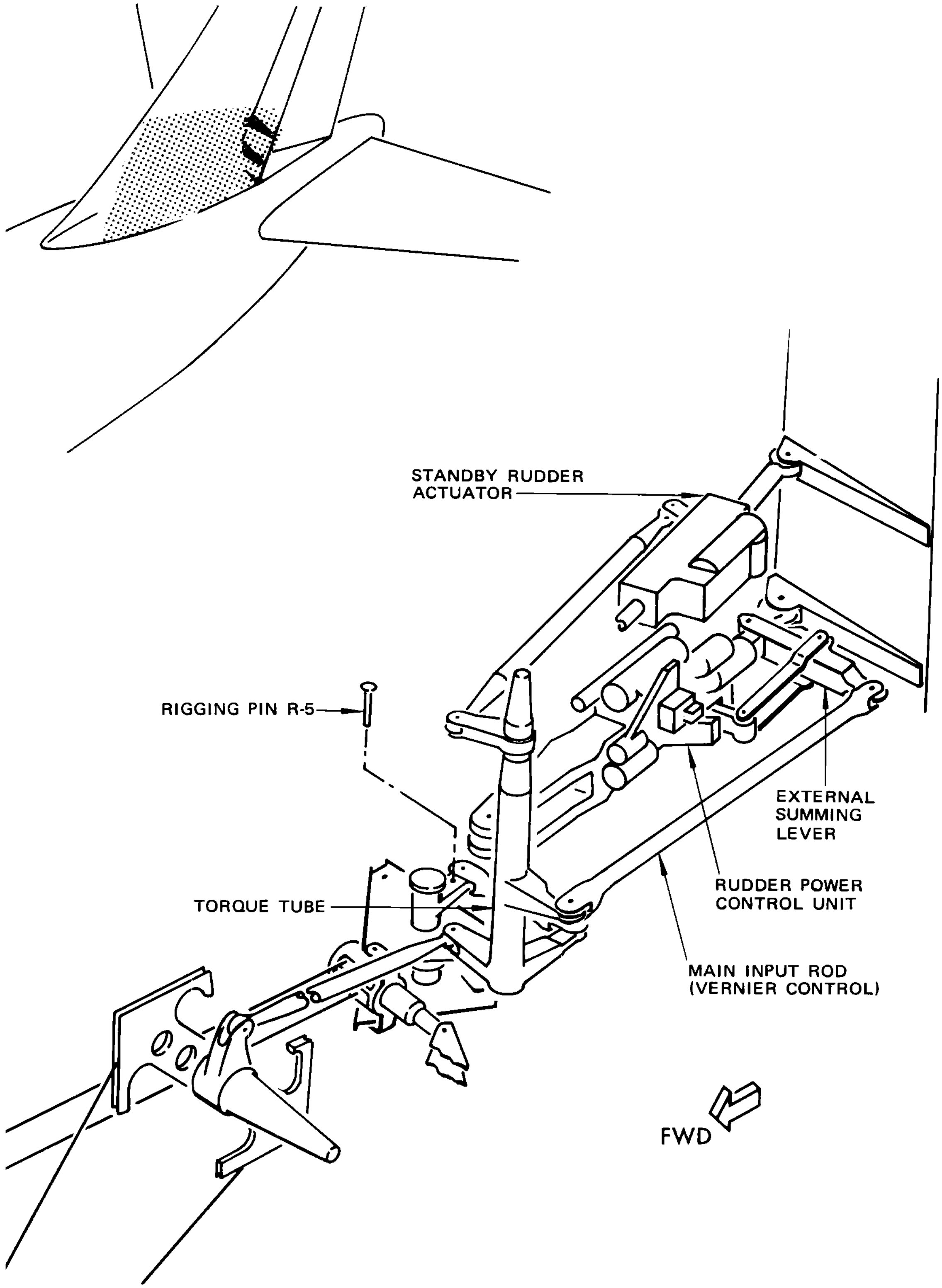
1. Rudder Power Control Unit Adjustment
   A. Equipment and Materials
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Prepare to Adjust Rudder Power Control Unit
      (1) Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).
      (2) Remove access panels 9512 and 9514 (Ref Chapter 12, Access Doors and Panels).
   C. Adjust Rudder Power Control Unit
      (1) Install rigging pin R-5.
      (2) Check location of rudder trailing edge with respect to rudder index tab (Fig. 501). Place a straightedge against side of rudder at trailing edge. If both sides of trailing edge fall within width of rudder index tab, tighten both checknuts on main input (vernier control) rod (Fig. 502). Combined total number of visible threads on sleeve and rod end shall not exceed 27 turns.
      (3) If either side of rudder trailing edge is outside index tab, but less than 0.50 inch from nearest side of tab, proceed as follows:
         (a) Loosen both checknuts on main input (vernier control) rod.
         (b) Turn sleeve to obtain small amounts of right or left rudder until both sides of trailing edge fall within width of index tab.
         (c) Tighten both checknuts, and check that combined total number of visible threads on sleeve and rod end does not exceed 27 turns.
      (4) If either side of rudder trailing edge is more than 0.50 inch from nearest side of index tab, proceed as follows:
         (a) Position flight control switches A and B to OFF.



Rudder Travel and Index Plate
Figure 501



Rudder Power Control Unit Adjustment
Figure 502

(b) Loosen both checknuts on vernier control rod, and remove clevis bolt from forward end of rod assembly.

CAUTION: RUDDER POWER MUST BE OFF BEFORE DISCONNECTING VERNIER CONTROL ROD FROM ACTUATOR INPUT CRANK.

(c) Adjust by turning sleeve and rod end together relative to tube and rod end relative to sleeve an equal number of turns in the same direction, keeping number of threads exposed approximately equal in both parts. One-half turn is equivalent to approximately 1/2 inch of rudder movement at trailing edge. Lengthen assembly for right rudder, and shorten for left rudder.
(d) Position rod end to actuator input crank and install clevis bolt.
(e) Position flight control switches A and B to ON.
(f) Turn vernier control rod sleeve until both sides of rudder trailing edge fall within width of rudder index tab.
(g) Tighten both checknuts on vernier control rod. Combined total number of visible threads on sleeve and rod end shall not exceed 27 turns.
(5) Remove rigging pin R-5.
(6) Test rudder power control unit per paragraph 2.
(7) Replace access panels.

2. Rudder Power Control Unit Test
A. Prepare for Test
(1) Disconnect pushrod to nose wheel steering (Fig. 503).

NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

(2) Provide rudder systems A and B hydraulic power (AMM 27-21-0/201).
(3) Check that there is no leakage at power control unit hydraulic connectors.
(4) Position rudder trim knob to neutral.

(5) Check that rudder is at neutral.

B. Test yaw damper operation. (Airplanes not incorporating SB 27A1206)

(1) Check that yaw damper circuit breakers on P6 are closed.

(2) Place autopilot system select switch to B position and yaw damper engage switch to ON.

(3) Move yaw damper test switch, located on center instrument panel, to the right. Observe yaw damper indicator needle moves to the right. Observe rudder moves approximately 2 to 4 degrees to the right.

CAUTION: DO NOT ACTUATE TEST SWITCH FOR MORE THAN 10 SECONDS.

(4) Move yaw damper test switch to the left. Observe yaw damper indicator needle moves to the left. Observe rudder moves approximately 2 to 4 degrees to the left.

CAUTION: DO NOT ACTUATE TEST SWITCH FOR MORE THAN 10 SECONDS.

(5) If airplane is equipped with autopilot dual channel yaw damper capability, perform steps (6) and (7).

(6) Place autopilot system select switch to A position and leave yaw damper engage switch to ON.

(7) Repeat steps (3) and (4).

(8) Disengage yaw damper.

C. Perform Yaw Damper Coupler Installation Test (AMM 22-12-01/401). (Airplanes incorporating SB 27A1206)

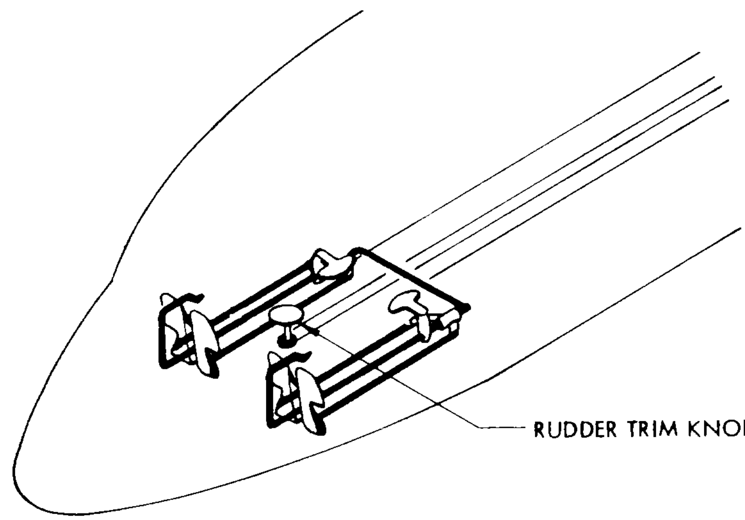
D. Test Rudder Travel (Fig. 501)

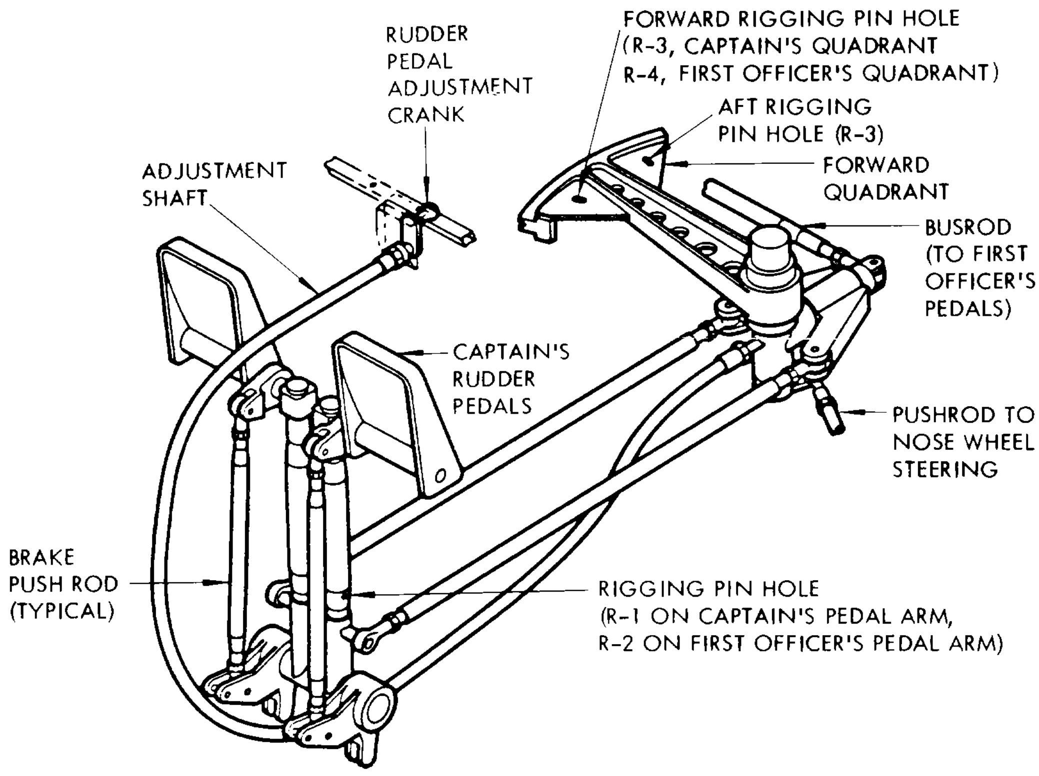
(1) Position flight control switch B to OFF, leave flight control switch A in ON position.

(2) Move captain's left pedal until forward quadrant stop is contacted. Measure rudder travel. Check that rudder travel is 21.82 ±0.80 inches.

(3) Move captain's right pedal until forward quadrant stop is contacted. Measure rudder travel. Check that rudder travel is 21.82 ±0.80 inches.

(4) Position flight control switch A to OFF, and flight control switch B to ON.





Rudder Forward Quadrant Installation
Figure 503

(5) Repeat steps (2) and (3).

E. Do a test of the secondary slide on the dual servo valve of the rudder power control unit:

(1) Supply the rudder hydraulic power systems A and B (Ref 27-21-0/201).

(2) Slowly push the captain's left pedal forward until it touches the stop then release.

(3) As fast as possible, push the captain's right pedal forward. The right pedal should move smoothly forward until it touches the stop.

(a) If the right pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).

(4) Release the right pedal.

(5) Slowly push the captain's right pedal forward until it touches the stop then release.

(6) As fast as possible, push the captain's left pedal forward. The left pedal should move smoothly forward until it touches the stop.

(a) If the left pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).

(7) Release the left pedal.

(8) Slowly push the first officer's left pedal forward until it touches the stop then release.

(9) As fast as possible, push the first officer's right pedal forward. The right pedal should move smoothly forward until it touches the stop.

(a) If the right pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).

(10) Release the right pedal.

(11) Slowly push the first officer's right pedal forward until it touches the stop then release.

(12) As fast as possible, push the first officer's left pedal forward. The left pedal should move smoothly forward until it touches the stop.

(a) If the left pedal moves in the opposite direction of the applied force, replace the rudder power control unit (Ref 27-21-91/401).

(13) Release the left pedal.

F. Restore airplane to normal.

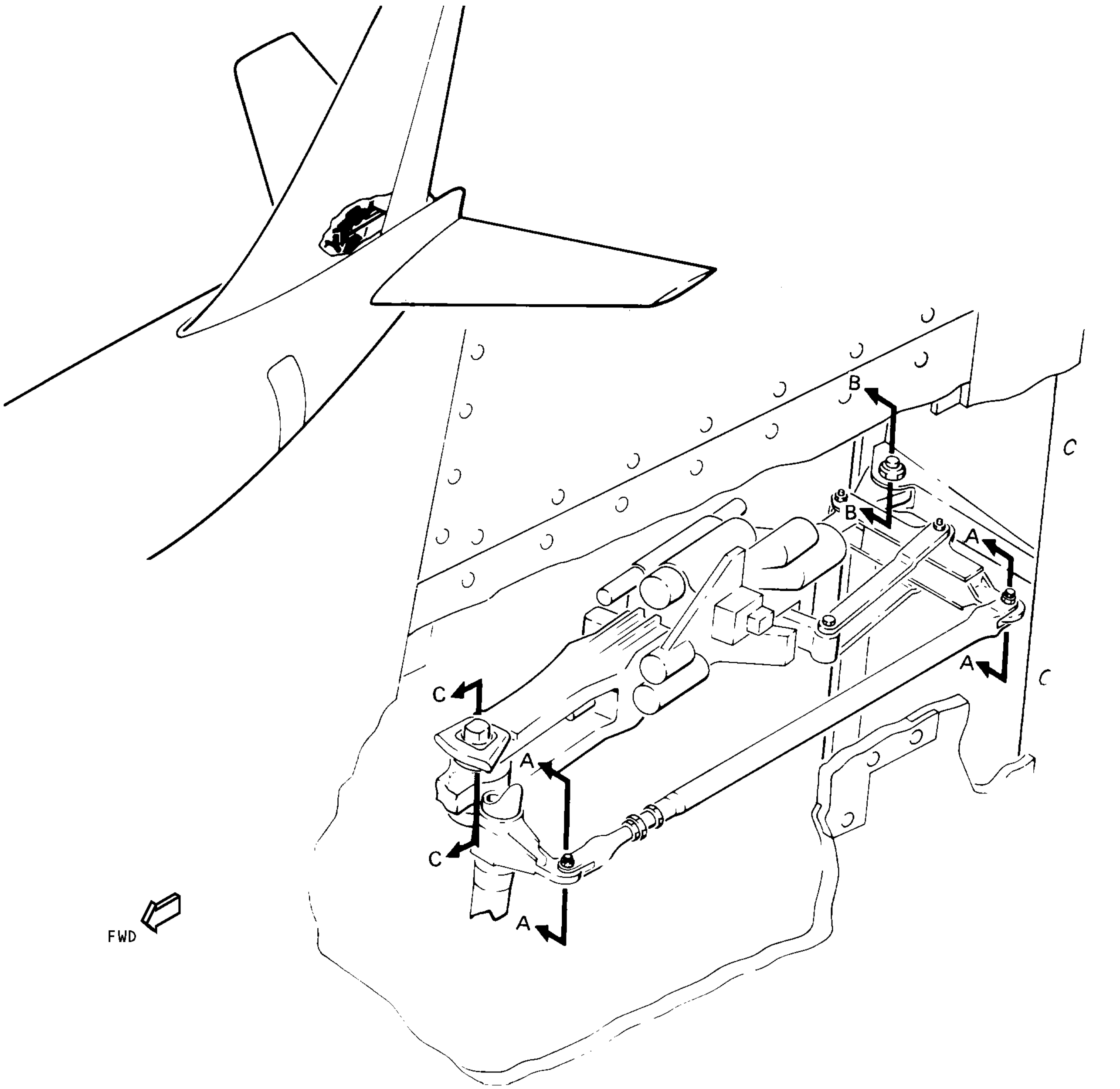
(1) Remove rudder systems A and B hydraulic power (Ref 27-21-0).

(2) Connect pushrod to nose wheel steering, if disconnected.

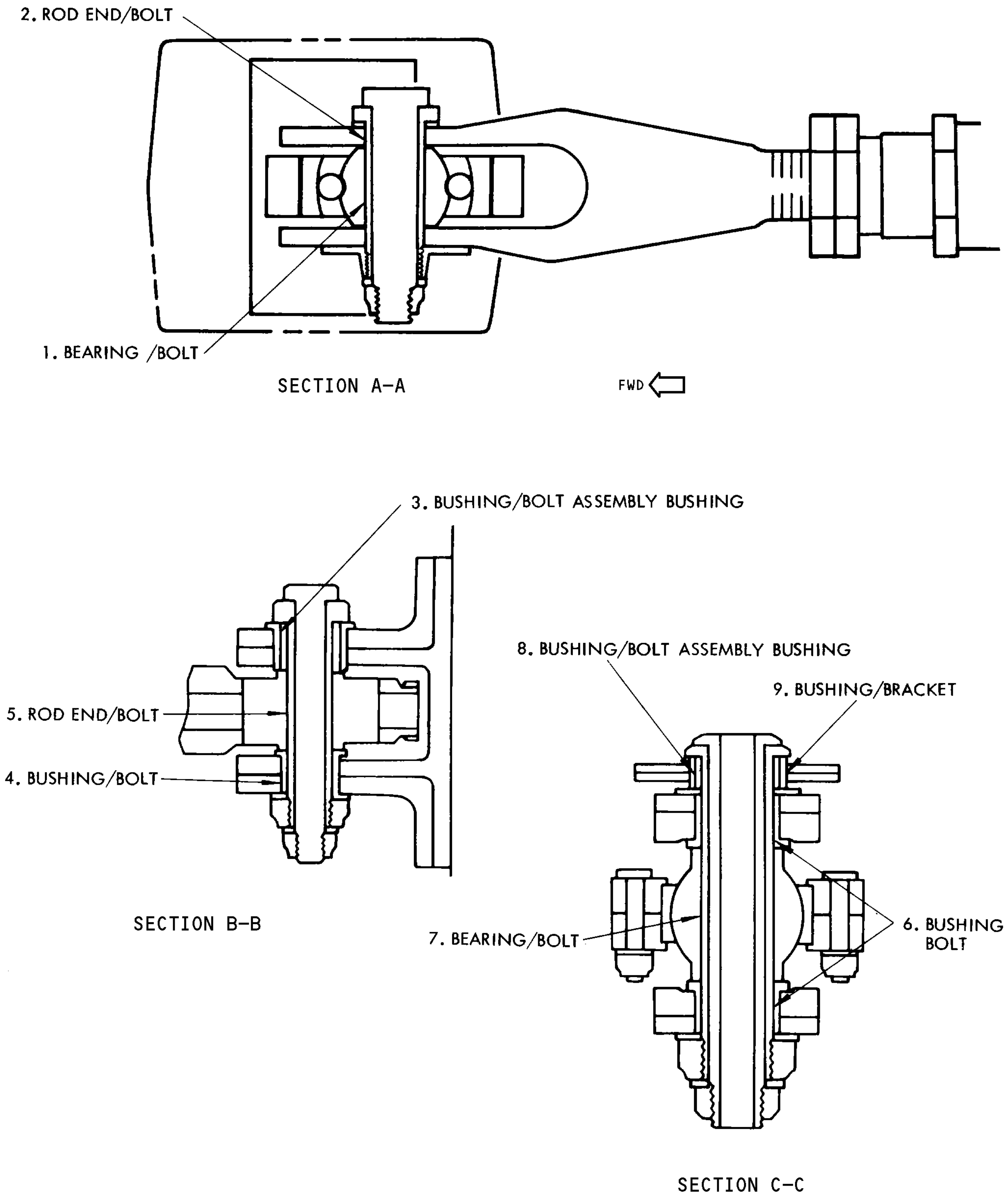
(3) Close access doors and install access panels.

RUDDER POWER CONTROL UNIT - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Rudder Power Control Unit Wear Limits



Rudder Power Control Unit Wear Limits
Figure 601 (Sheet 1)



Rudder Power Control Unit Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.3120	0.3125	0.3155	0.0035	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
2	ROD END	ID	0.3120	0.3130	0.3160	0.0040		X	[1]
	BOLT	OD	0.3110	0.3120	0.3106				
3	BUSHING	ID	0.8735	0.8745	0.8779	0.0041	X		
	BOLT ASSY BUSHING	OD	0.8724	0.8738	0.8720		X		
4	BUSHING	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT	OD	0.6230	0.6240	0.6226		X		
5	ROD END	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT	OD	0.6230	0.6240	0.6226		X		
6	BUSHING	ID	0.9995	1.0000	1.0030	0.0040	X		
	BOLT	OD	0.9980	0.9990	0.9955		X		
7	BEARING [3]	ID	0.9995	1.0000	1.0030	0.0040	X		
	BOLT	OD	0.9980	0.9990	0.9955		X		
8	BUSHING	ID	1.1960	1.1980	1.2080	0.0182	X		
	BOLT ASSY BUSHING	OD	1.1888	1.1898	1.1884		X		
9	MANIFOLD BRACKET	ID	1.356	1.358	1.367	0.014	X		
	BUSHING	OD	1.351	1.353	1.342		[2]		

[1] OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0002 TO 0.0013 INCH INTERFERENCE FIT (04379 INCH MAXIMUM). REAM BUSHING TO 0.3120/0.3130 INCH DIAMETER.

[2] ROTATE BUSHING 90 DEGREES UNLESS THE NEW BEARING SURFACES ARE WORN.

[3] REPLACE BEARING WHEN RADIAL PLAY EXCEEDS 0.005 INCH DUE TO WEAR OF TEFLON FABRIC LINER.

Rudder Power Control Unit Wear Limits
Figure 601 (Sheet 3)

RUDDER POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The rudder power control unit (PCU) is located in the lower area of the vertical fin (Fig. 401).
   B. Replaceable components of the rudder power control unit include three solenoid valves, two transfer valves, two position transducers and four filters.
   C. This procedure has the task to replace the rudder PCU and the load limiter solenoid valve.
   D. Filter element replacement is accomplished at overhaul.
   E. Refer to Chapter 22, Autopilot and Yaw Damper System for Maintenance Practices for the autopilot components of the PCU.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Fire Resistant Hydraulic Fluid - BMS 3-11 or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201).
   C. Rudder Lock, PCU Removed - F80150-1.
   D. Torque Wrench, Rudder PCU Attachment - C27025-1.
3. Prepare for the Removal
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Remove access panels 9512 and 9514 (Ref Chapter 12, Access Doors and Panels).
   C. Remove lower section of rudder hinge cover and seal from right side.
   D. Open TE access door 9510 and install rigging pin R-5 (See 27-21-1/501 for location).

E. Open the YAW DAMPER circuit breakers on P6 and attach the DO-NOT-CLOSE tags.

4. Rudder Power Control Unit Removal (Fig. 401)

CAUTION: MAKE SURE TO REMOVE THE CONTROL RODS BEFORE THE POWER CONTROL UNIT. FAILURE TO REMOVE THE CONTROL RODS FIRST CAN CAUSE DAMAGE TO THE RODS.

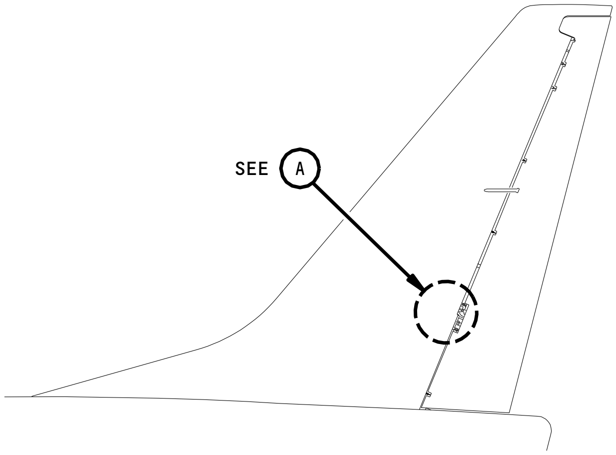
A. Remove the nuts, washers, washers, and bolts to disconnect the control rods from the external summing levers.
B. Remove the nuts, washers, washers, and bolts to disconnect the control rods from the input cranks and remove the control rods from the airplane.

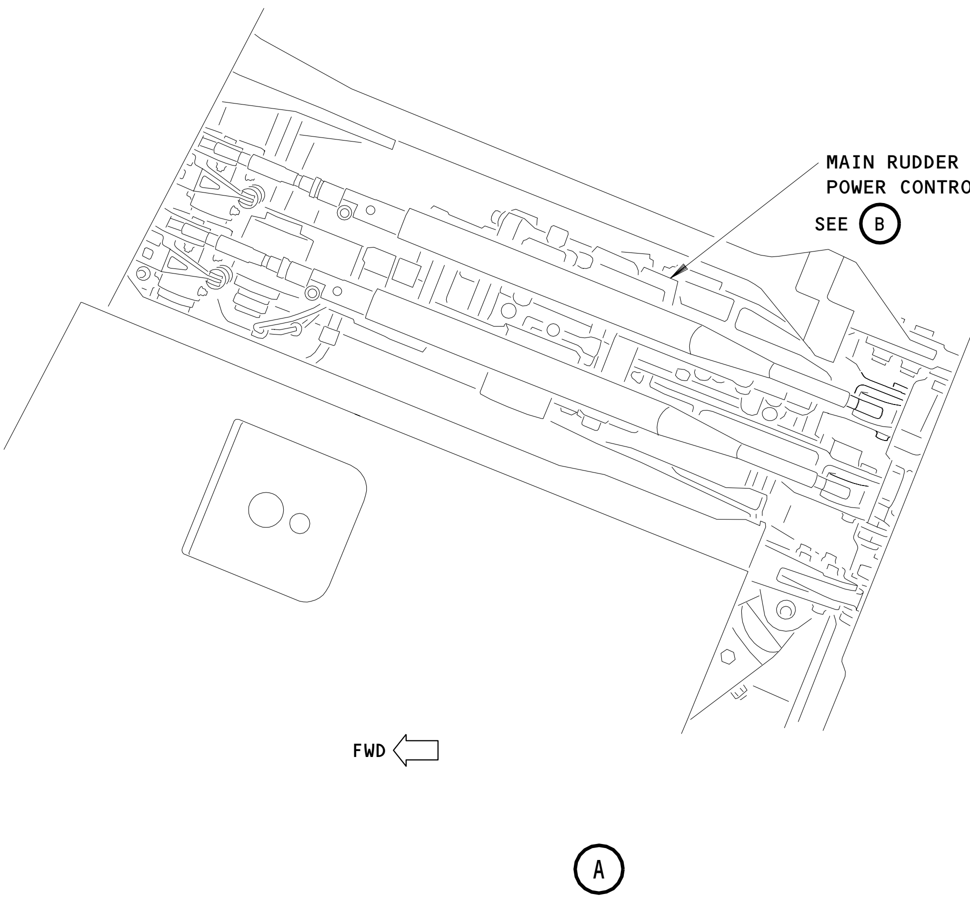
CAUTION: DO NOT REMOVE THE UNIONS AND REDUCER FITTINGS FROM THE PCU PORTS WHEN DISCONNECTING THE HYDRAULIC LINES BECAUSE THAT WILL INCREASE THE POSSIBILITIES FOR CROSS CONNECTION OF THE LINES DURING INSTALLATION.

C. Disconnect the hydraulic lines from the PCU:
   (1) Put a container below the hydraulic connections.
   (2) Disconnect the hydraulic lines from the PCU.
   (3) Install the plugs in the hydraulic lines and caps on the port fittings.
   (4) Install a tag on the hydraulic lines to make sure you install them correctly.
D. Disconnect electrical connectors from the PCU.

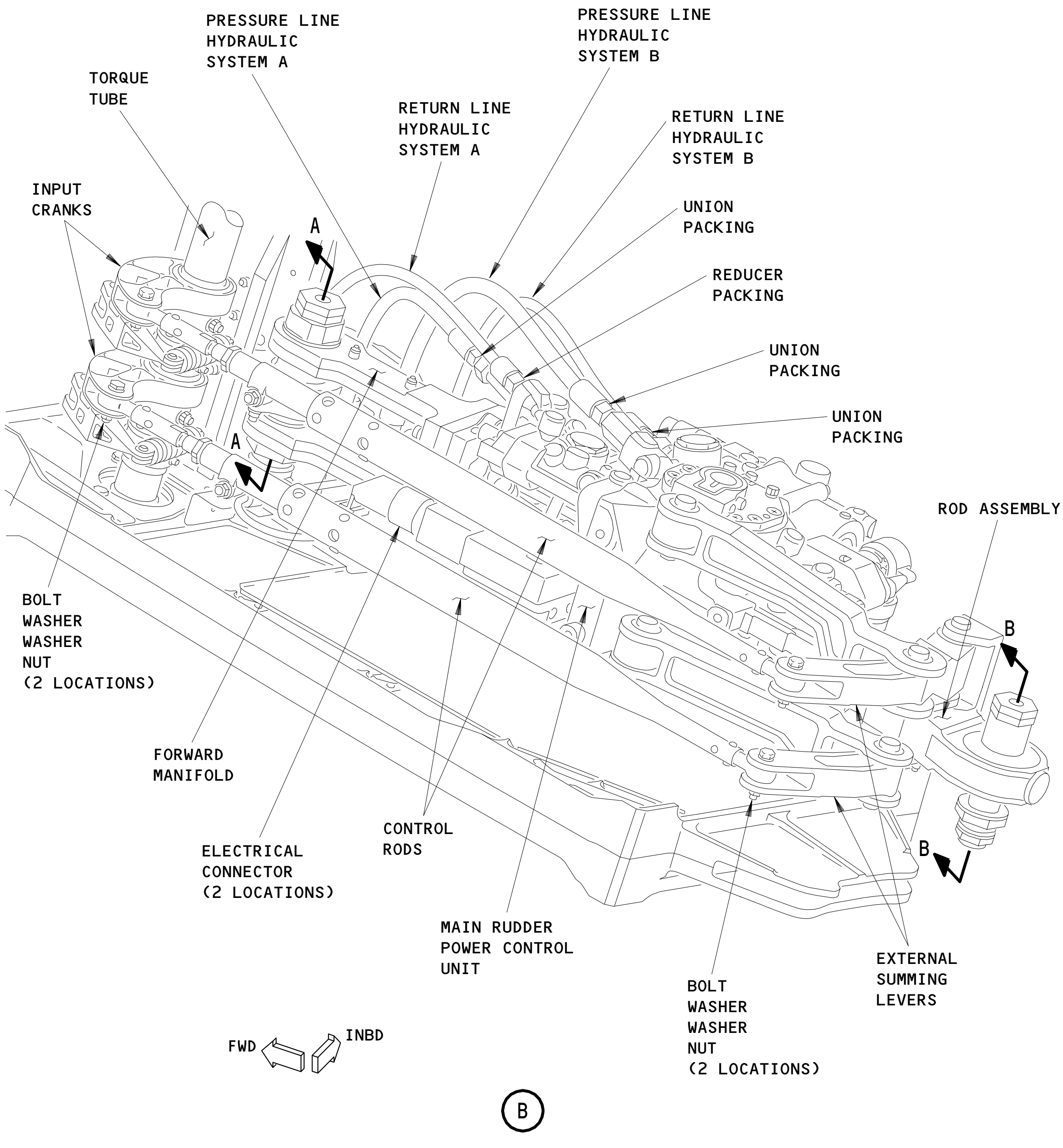
CAUTION: MAKE SURE YOU HOLD THE PCU DURING THE REMOVAL OF THE FORWARD MANIFOLD. THE PCU CAN FALL. THIS CAN CAUSE DAMAGE TO THE PCU.

E. Remove the PCU:
   (1) Remove the nut, washer, nut, washer, washer, bushing, and bolt assembly to disconnect the forward manifold from the vertical fin structure.
   (2) Remove the nut, washer, nut, washer, and bolt assembly to disconnect the rod assembly from the rudder.

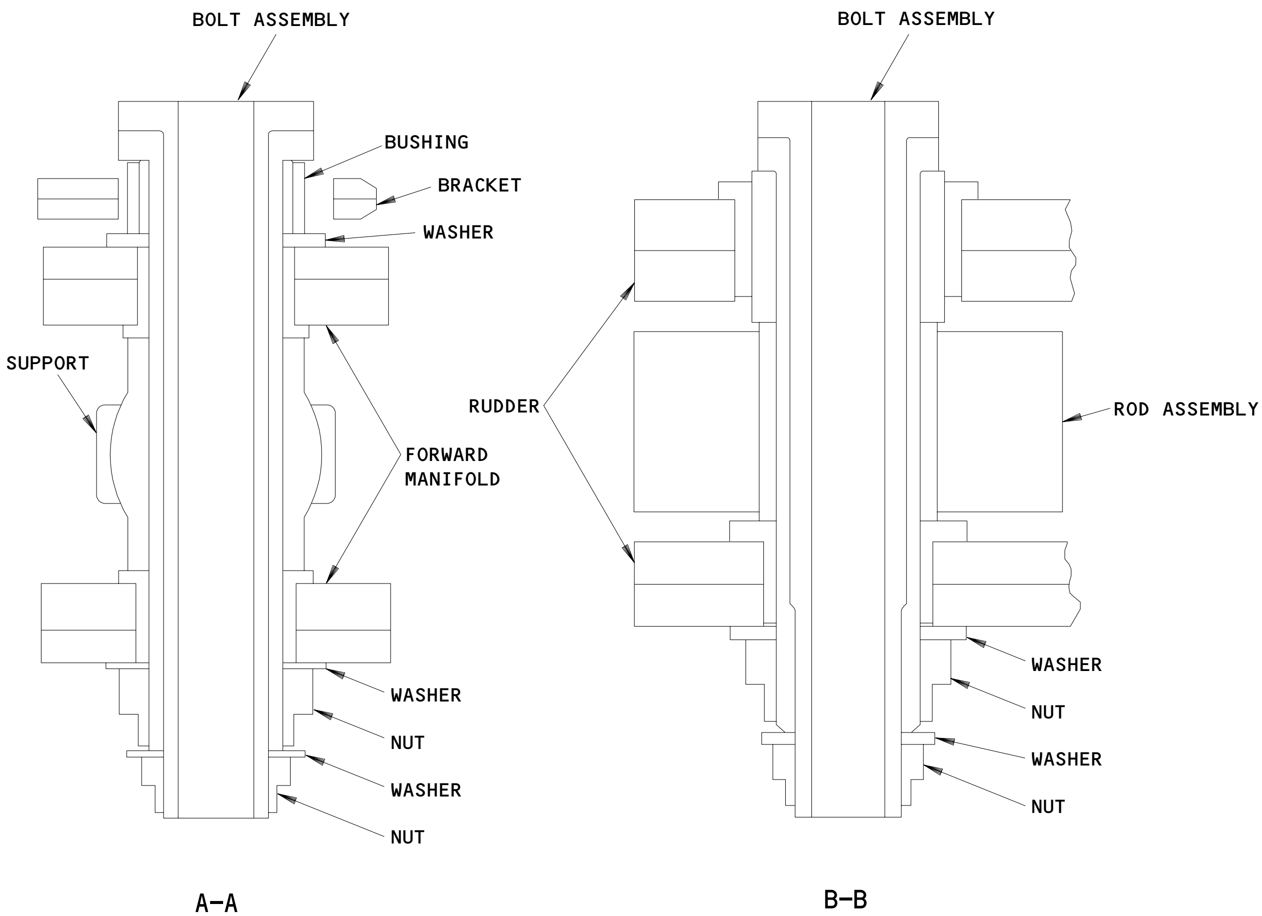




Rudder Power Control Unit Installation
Figure 401 (Sheet 1)



Rudder Power Control Unit Installation
Figure 401 (Sheet 2)



Rudder Power Control Unit Installation
Figure 401 (Sheet 3)

(3) Remove the PCU from the airplane.

F. Install the rudder lock.

5. Rudder Power Control Unit Installation (Fig. 401)

CAUTION: MAKE SURE THAT YOU FOLLOW THE INSTRUCTIONS TO INSTALL THE PCU CAREFULLY AND DO THE PROCEDURE IN THE SPECIFIED SEQUENCE. DAMAGE TO THE CONTROL RODS CAN OCCUR IF THE INSTRUCTIONS ARE NOT FOLLOWED CORRECTLY.

A. Remove rudder lock.

B. Install the PCU:

(1) Put the PCU in its position with the forward manifold on the beam assembly.

(2) Install the bushing, bolt assembly, three washers and two nuts to attach the forward manifold to the vertical fin structure.

CAUTION: DO NOT TIGHTEN THE LARGER NUT AFTER YOU TIGHTEN THE SMALLER NUT. THE SMALLER NUT CAN BECOME LOOSE.

NOTE: You must install the nuts, washers, bolt and bushings as shown in Fig. 401 view A-A or vibration can result in flight.

(a) Use the torque wrench to tighten the larger nut to 750-900 pound-inches (85-102 newton-meters).

(b) Tighten the smaller nut to 450-590 pound-inches (51-67 newton-meters).

(3) Install the bolt assembly, two washers and two nuts to connect the rod assembly to the rudder.

CAUTION: DO NOT TIGHTEN THE LARGER NUT AFTER YOU TIGHTEN THE SMALLER NUT. THE SMALLER NUT CAN BECOME LOOSE.

NOTE: You must install the nuts, washers, and bolt assembly as shown in Fig. 401 view B-B or vibration can result in flight.

(a) Tighten the larger nut to 300-400 pound-inches (34-45 newton-meters).
(b) Tighten the smaller nut to 450-590 pound-inches (51-67 newton-meters).

CAUTION: MAKE SURE YOU CORRECTLY INSTALL THE HYDRAULIC LINES PCU. MAKE SURE THE CORRECT UNIONS ARE INSTALLED IN THE HYDRAULIC PORTS OR YOU CAN CAUSE DAMAGE TO THE PCU.

C. Connect the hydraulic lines:
(1) If the PCU does not have the unions and reducer fittings installed, apply the hydraulic fluid or the assembly lube to the unions and reducer fittings and install them in the hydraulic ports.
(2) Connect the hydraulic lines to the PCU.
D. Connect the electrical connectors to the PCU.
E. Install the control rods:

NOTE: For easier adjustment of the control rods, install the adjustment ends in the forward position.

(1) Before you install the control rods, make sure that they are at the correct lengths:
(a) Loosen the clamp nuts on the rods.
(b) Rotate the extension as necessary to get the length between the centers of the rod end to approximately 26.38 inches (670.1 millimeters).
(c) Lightly tighten the clamp nut.

NOTE: Do not tighten too hard. You will have to loosen the clamp nuts for the adjustment of the control rods.

(2) Connect control rods to the external summing levers:
(a) Install the bolts, washers, washers, and nuts.
(b) Tighten the nuts to 100-150 pound-inches (11.3-16.9 Nm).
(3) Connect the forward end of the control rods to the input cranks:
(a) Install the bolts, washers, washers, and nuts.

(b) Tighten the nuts to 100-150 pound-inches (11.3-16.9 Nm).

F. Install the lockout pin on the nose gear steering (AMM 32-00-01/201).

NOTE: It is not necessary to disconnect the steering if the airplane is on jack and the nose landing gear is fully extended.

G. Remove the DO-NOT-CLOSE tags and close the YAW DAMPER circuit breakers on the P6 panel.

H. Supply the rudder systems A and B hydraulic power (AMM 27-21-0/201).

I. Move the rudder pedals to bleed the rudder PCU until the movement of the rudder is smooth.

J. Examine the hydraulic connections for leakage.

K. Do the steps to adjust the input rods to the main PCU and Standby PCU (AMM 27-21-1/501).

L. Do the Rudder Main PCU Force Fight Monitor Test (AMM 27-21-1/501).

M. Do the Main Rudder PCU Internal Hydraulic Leakage Test (AMM 29-00/601).

N. Do the Rudder Pedal Forces Test (AMM 27-21-1/501).

O. Do the Rudder Hinge and Bearing Play of the Power Control Unit (AMM 27-21-1/501).

P. Do the Rudder Centering Test (AMM 27-21-1/501).

Q. Do the Rudder Travel Test (AMM 27-21-1/501)

6. Load Limiter Solenoid Valve Removal (Fig. 402)

A. Remove rudder systems A, B, and Standby hydraulic power (AMM 27-21-0/201).

B. Remove lower section of rudder hinge cover and seal from the right side.

C. Open the YAW DAMPER circuit breakers on P6 and attach the DO-NOT-CLOSE tags.

D. Remove the Solenoid Valve:

(1) Remove the bolts that attach the solenoid valve to the main rudder PCU.

(2) Remove the seal plate.

(3) Remove the O-ring. Discard the O-ring.

(4) Remove the solenoid valve.

(5) Put plugs on the main rudder PCU ports.

7. Load Limiter Solenoid Valve Installation (Fig. 402)

A. Remove rudder systems A, B, and Standby hydraulic power (AMM 27-21-0/201).

B. Install the Solenoid Valve:

(1) Remove the plugs on the main rudder PCU ports.

(2) Clean the seal plate

(3) Lubricate the new O-ring with hydraulic fluid.

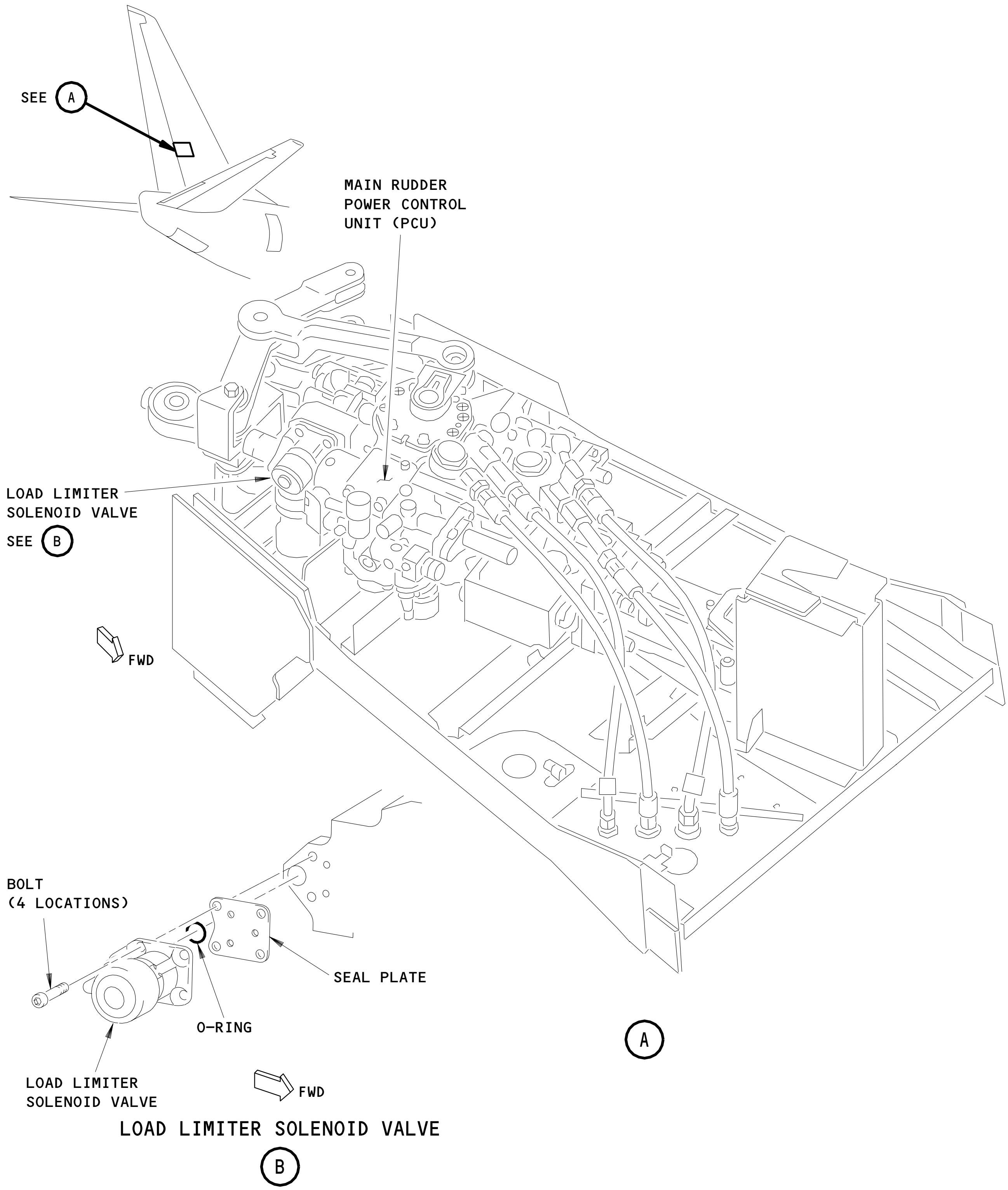
(4) Install the new O-ring.

(5) Install the seal plate.
(6) Install the solenoid valve.
(7) Install the bolts that attach the solenoid valve to the main rudder PCU.
(8) Tighten the bolts to 50-70 pound-inches (5.6-7.9 newton-meters).

C. Remove the DO-NOT-CLOSE tags and close the YAW DAMPER circuit breakers on the P6 panel.

8. Restore Airplane to Normal Configuration

A. Remove rudder systems A, B, and Standby hydraulic power (AMM 27-21-0/201).
B. Remove the lockout pin on the nose gear steering (AMM 32-00-01/201).
C. Install the access panels that you removed.
D. Check hydraulic reservoirs and service, if required (Ref Chapter 12, Hydraulic Servicing).



Main Rudder PCU Load Limiter Solenoid Valve Installation
Figure 402

RUDDER PRESSURE REDUCER - REMOVAL/INSTALLATION

1. General
   A. The Rudder Pressure Reducer is located in the upper left section of the tail compartment (STA 1104) (Fig. 401).
2. Equipment and Materials
   A. Fire Resistant Hydraulic Fluid - BMS 3-11 (G00062).
   B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
3. Prepare for Removal
   A. Remove rudder systems A, B and Standby hydraulic power (Ref 27-21-0, MP).
   B. Release pressure from the hydraulic reservoirs (Ref 29-09-300, MP).
   C. Open these circuit breakers on P6:
      (1) STABILIZER TRIM ACTUATOR
      (2) STABILIZER TRIM CONT
   D. Open these circuit breakers on P18:
      (1) Yaw Damper AC
      (2) Yaw Damper DC
   E. Remove access panel 3701.
   F. Close No. 5 manual shutoff valve.
4. Remove Rudder Pressure Reducer
   A. Disconnect the hydraulic lines from the rudder pressure reducer.
   B. Disconnect the electrical connectors.
   C. Remove the rudder pressure reducer from the mounting bracket.
5. Install Rudder Pressure Reducer
   A. Install the rudder pressure reducer to the mounting bracket.
   B. Connect the electrical connectors to the rudder pressure reducer.
   C. Connect the hydraulic lines to the rudder pressure reducer.
   D. Open No. 5 manual shutoff valve.
   E. Perform the following steps to ensure rudder pressure reducer is serviceable:
      (1) Pressurize the hydraulic reservoirs (Ref 29-09-300, MP).

      WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. THE AILERONS , RUDDERS, ELEVATORS, FLAPS, SLATS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

      (2) Supply pressure to rudder systems A, B, and Standby hydraulic power (Ref 27-21-0, MP).
      (3) Move the rudder pedals through their full travel three times and make sure the rudder moves correctly.
      (4) Make sure the rudder pressure reducer hydraulic connections do not leak.

(5) Close these circuit breakers on P18:
(a) Yaw Damper AC
(b) Yaw Damper DC

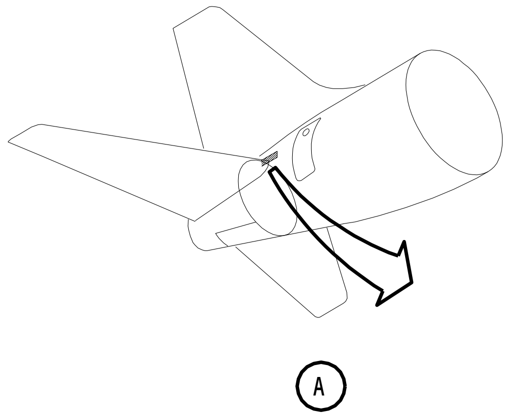
F. Perform the Pressure Reducer Test (AMM 22-12-01/401).

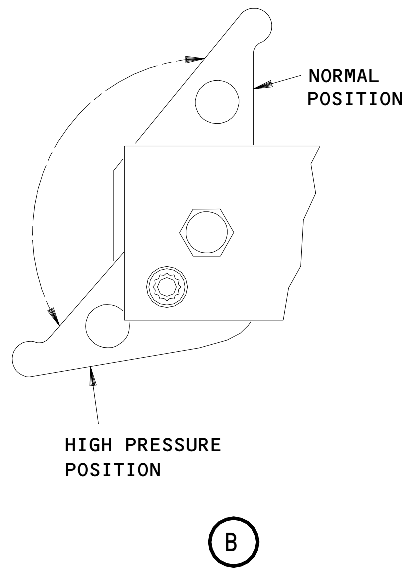
6. Restore Airplane to Normal Configuration

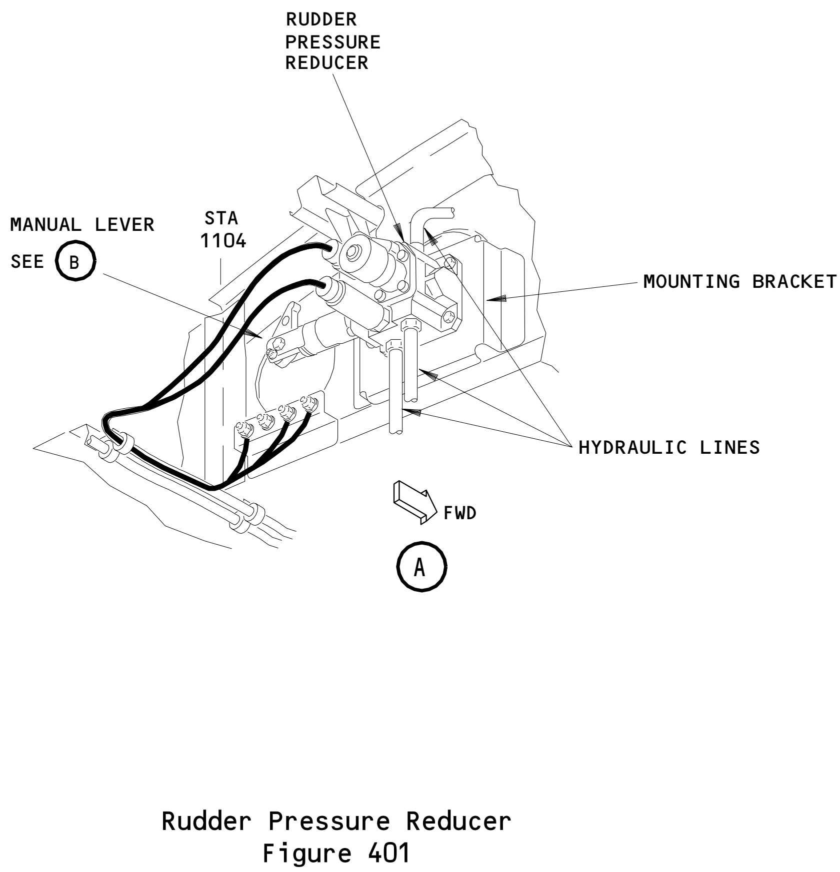
A. Replace access panel 3701.

B. Close circuit breakers on P6.
(1) STABILIZER TRIM ACTUATOR
(2) STABILIZER TRIM CONT

C. Fill the hydraulic reservoirs if it is necessary (Ref 29-09-300, MP).







Rudder Pressure Reducer
Figure 401

RUDDER TRIM ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Corrosion Preventive Compound - MIL-C-11796, class 3 (Ref 20-30-21)
   C. Grease - BMS 3-33 (Preferred)
   D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   E. Line - two lines to guide rudder trim actuator cables RTA-3 and RTB-3 through cable run when installing rudder trim actuator (Ref 27-09-111 MP for cable specifications)
   F. Rudder Trim Knob Torque Adapter - SE27-2011
   G. Scale - 0 to 2 feet (in inches, tenths and hundredths of an inch)
   H. Lubricant - MIL-L-23699 or BMS 3-24 optional to BMS 3-33 (Ref 20-30-21)
   I. Lubricant - MIL-L-23699 or PWA 521 Turbine Engine Lubricating Oil (Ref 20-30-21)
2. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0 MP).
   B. Place rudder pedals and trim control wheel in neutral position.
   C. Insert rigging pin R5 in feel and centering unit (Fig. 401).
   D. Remove access panels 9509L, 9512, 9514, and 3701.
3. Remove Rudder Trim Actuator
   A. Disconnect cables RTA and RTB at aft turnbuckles and tie a line of suitable length (Ref par. 1) to each of the actuator cables (RTA-3 and RTB-3) at the terminals. Clamp cables at actuator end to maintain cable wrap when removing actuator.

      NOTE: Lines are to be pulled through with actuator cables when removing actuator so as to be used as a guide for pulling through cables on actuator being installed.

B. Remove actuator to structure mounting bolt and bushing.
C. Remove actuator to feel and centering unit mounting bolts.
D. Remove actuator (including cables) from airplane.
   (1) Remove by pulling actuator and cables out and aft from airplane being careful to avoid damage to cables.
   (2) When cables are pulled through, disconnect lines from cable ends and connect to terminal end fittings of actuator being installed or secure in place until actuator is to be installed.

4. Prepare for Installation
   A. Apply lubricant, MIL-L-23699, by oil can, between outside diameter of actuator screw and inside diameter of drum, with actuator screw in extended position. Apply oil at drain holes in cable drum. BMS 3-33 grease may be used intead of MIL-L-23699 oil. Extend and retract actuator screw several times to assure lubricant coats screw threads.
   B. Apply lubricant, MIL-L-23699 or PWA 521 turbine engine lubricating oil, by oil can to outside diameter of actuator cable drum.
   C. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).
   D. Check that rigging pin R-5 is installed in feel and centering unit.
   E. Check for allowable wear at rudder trim actuator installation points (Ref Rudder Trim Actuator - Inspection/Check).
   F. Prior to positioning cables and actuator in airplane, ensure that cables RTA and RTB are equally wrapped 4-3/4 turns on cable drum per Detail C, Fig. 401. Secure cables to hold in place during installation.

5. Install Rudder Trim Actuator
   A. Connect lines pulled through with old cable to ends of cables RTA-3 and RTB-3 on ruddder trim actuator being installed. Using two men, one man support actuator and the other man pull cables through from stabilizer jackscrew compartment by pulling on the lines connected to the cables. Untie lines from cables when cables are in place.
   B. Align center of painted index mark on cable drum extension with cotter pin hole on side of actuator housing (installed position) to place rudder trim actuator drum in neutral.
   C. Place trim actuator in position and install actuator to feel and centering unit mounting bolts (if bearing sleeve is not flush with bearing, install washer between actuator and bearing). Tighten bolts to torque value of 35 to 45 pound-inches and lockwire.
   D. Manually rotate actuator screw until dimension of 1.92 +0.03/-0.02 inches is obtained as shown in Fig. 401.
   E. Using only threaded adjustment plug in upper end of actuator screw, adjust until mounting holes align.

   NOTE: If nearest increment of adjustment with plug is insufficient to align mounting boltholes, trim drum may be rotated a small amount. Cotter pin hole on actuator housing must not be off paint index mark on trim actuator drum at 0-degree trim.

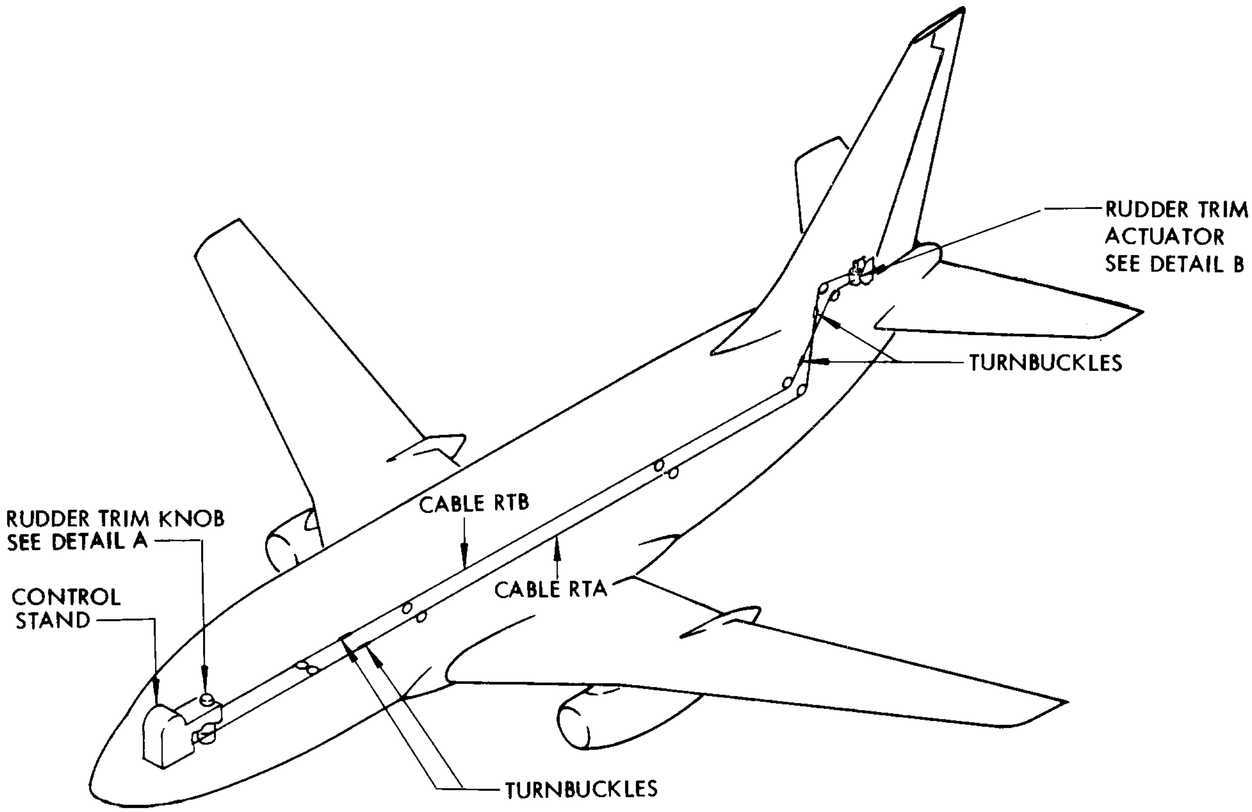
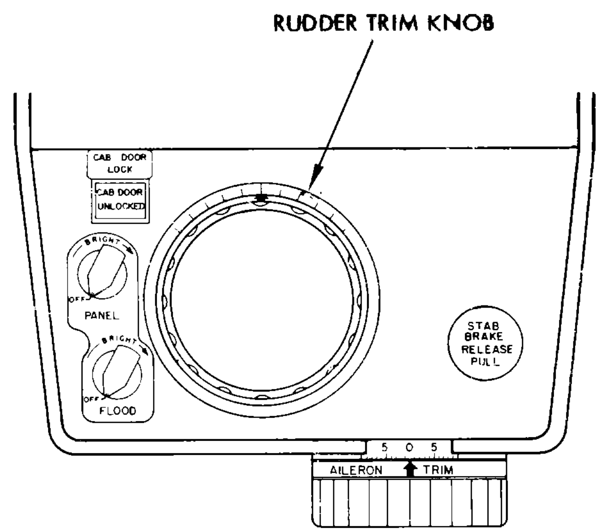


TABLE I

TEMPERATURE °F (± 5°)	RIGGING LOAD RTA, RTB (+5/-0) POUNDS [1]
110	81
90	75
70	70
50	65
30	59
10	54
0	51
-10	48
-30	43
-40	40

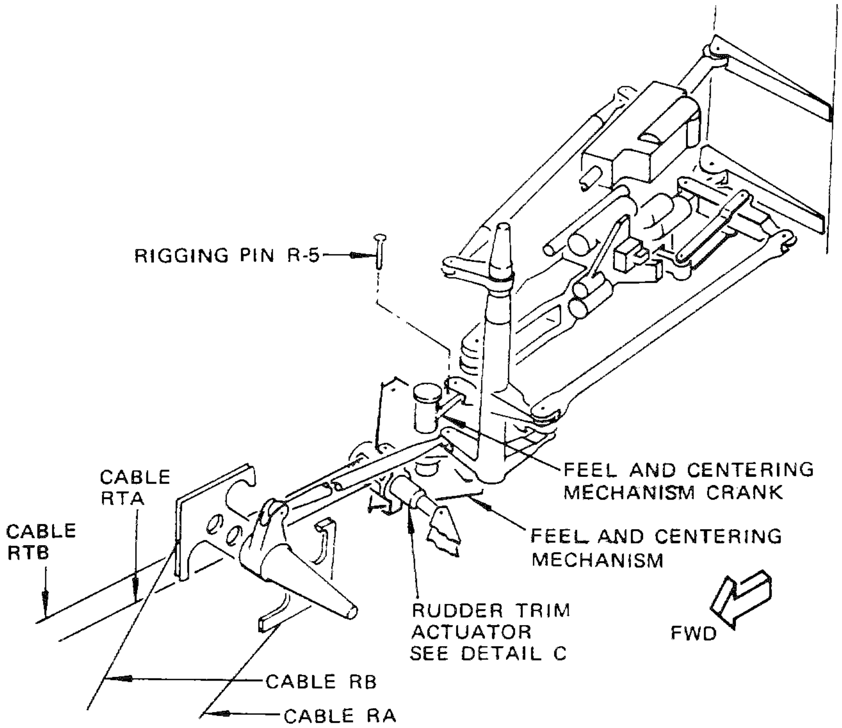
[1] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +10/-20 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 10 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.

NOTE: TO INSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°) FOR AIRFRAME TEMPERATURE TO STABILIZE

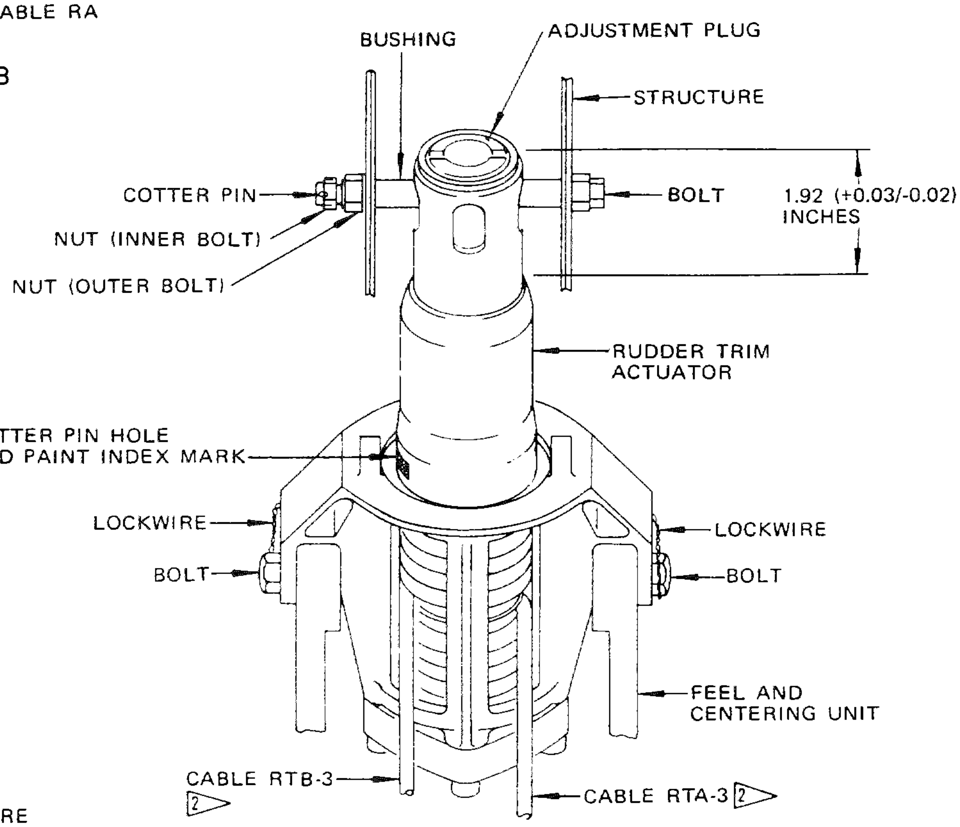


DETAIL A

Rudder Trim Actuator Installation
Figure 401 (Sheet 1)



DETAIL B



2 THE CABLE SEGMENTS RTA-3 AND RTB-3 COMPRISING THE AFT SEGMENTS OF CABLE RUNS RTA AND RTB ARE PART OF THE RUDDER TRIM ACTUATOR ASSEMBLY.

FRONT VIEW
DETAIL C

Rudder Trim Actuator Installation
Figure 401 (Sheet 2)

F. Apply a coat of grease to actuator to structure mounting bolt and bushing.
G. Install bushing and actuator to structure mounting bolt to secure upper end of trim actuator to structure.
H. Install nut on actuator to structure outer mounting bolt, and tighten nut 45 to 60 pound-inches.
I. Install nut on actuator to structure inner mounting bolt, and tighten nut 12 to 15 pound-inches. Install cotter pin.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR NUT ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

J. Reconnect cables RTA and RTB at turnbuckles. Maintain zero tension on cables.
K. Disconnect control rod between torque tube and feel and centering unit output crank at torque tube.
L. Remove rigging pin R5 from feel and centering unit.
M. Tighten turnbuckles equally to tension cables RTA and RTB to values shown in Fig. 401. Check that rudder trim control wheel is in neutral position, and rigging pin R5 fits without binding into feel and centering unit.

NOTE: If rigging pin R5 cannot be inserted or binds, readjust cables RTA and RTB until requirements are met. If turnbuckle travel is inadequate for complete adjustment, additional adjustment is possible using turnbuckles located in ceiling in forward cargo compartment at fuselage station 451.

N. Connect control rod between torque tube and feel and centering unit output crank. Tighten nut on outer bolt 45 to 60 pound-inches, then tighten nut on inner bolt 12 to 15 pound-inches.

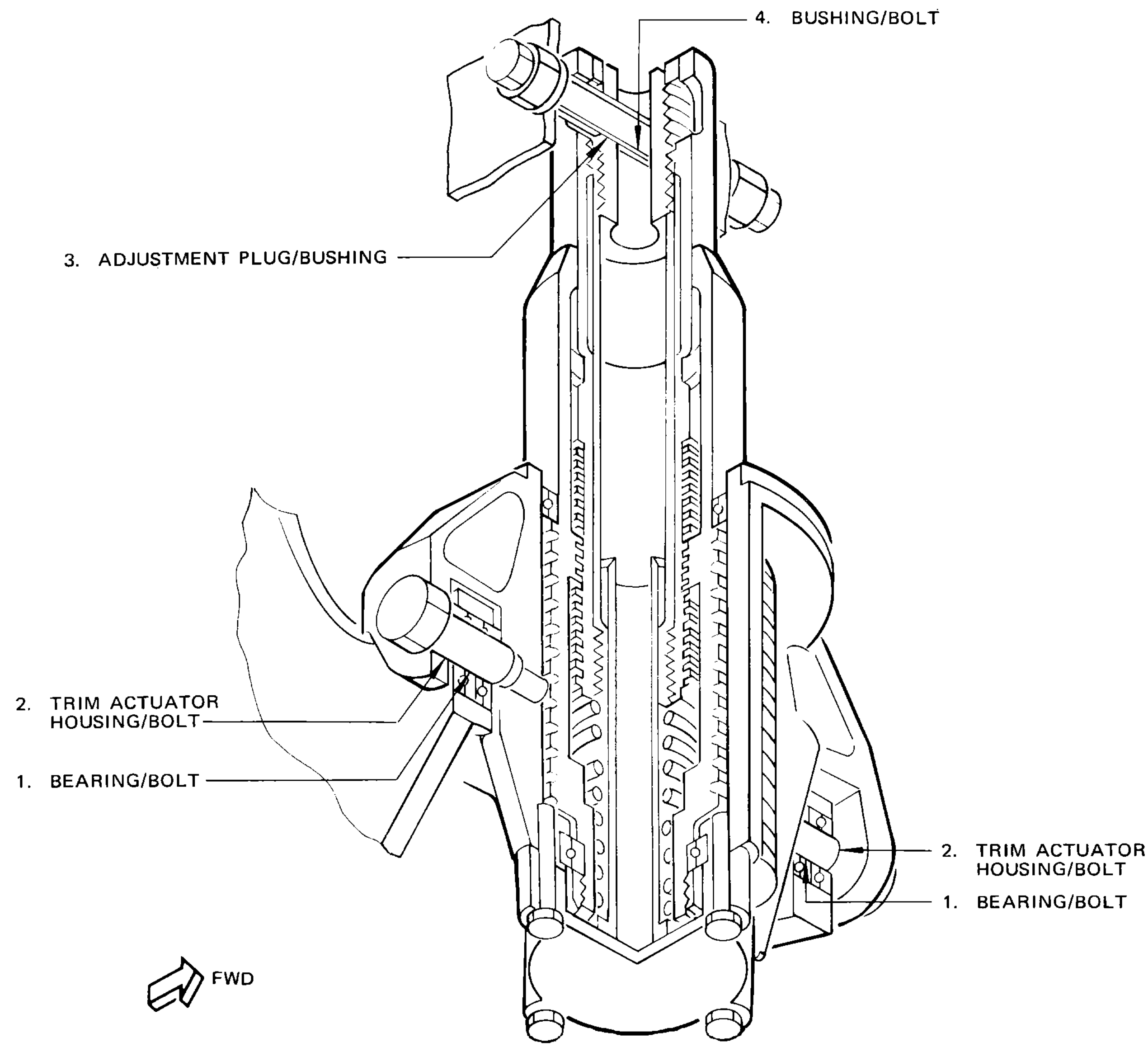
CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE ON OUTER BOLT. NUT ON INNER BOLT MAY BECOME LOOSE.

O. Install turnbuckle locking clips and coat exposed turnbuckle threads with corrosion preventive compound.
P. Remove rigging pin R-5.
Q. Provide rudder systems A and B hydraulic power (Ref 27-21-0).
R. Use rudder trim knob torque adapter to rotate trim knob from neutral to full right, and from full right to neutral. Then from neutral to ful1 left and return. Maximum force required shall be 28 pound-inches.
S. Rotate trim knob in both directions until indicator is at 10. Check that rudder travel is 10.22 (+ 0.50) inches in each direction.

6. Restore Airplane to Normal
A. Restore airplane to normal hydraulic configuration. Refer to 27-21-0.
B. Close all access doors and install panels.

RUDDER TRIM ACTUATOR - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component for inspection after wear. Refer to component removal/installation for this information.
2. Rudder Trim Actuator Wear Limits



Rudder Trim Actuator Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.3120	0.3125	0.3140	0.0020	X		
	BOLT	OD	0.3115	0.3120	0.3085		X		
2	ACTUATOR HOUSING	ID	0.4700	0.4706	0.4721	0.0021	X		
	BOLT	OD	0.4695	0.4700	0.4665		X		
3	ADJUST-MENT PLUG	ID	0.4355	0.4365	0.4385	0.0030	X		
	BUSHING	OD	0.4345	0.4355	0.4325		X		
4	BUSHING	ID	0.3120	0.3130	0.3150	0.0030	X		
	BOLT	OD	0.3110	0.3120	0.3090		X		

Rudder Trim Actuator Wear Limits
Figure 601 (Sheet 2)

RUDDER TRIM CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The removal of the rudder trim control unit cannot be accomplished as a complete assembly. The control knob and cable drum/lower bearing housing are removed as subassemblies. The upper bearing housing, shaft and mechanical stop are removed as the last subassembly.
   B. The rudder trim knob can be removed and installed from the outside of the control stand by removing or installing three screws that secure the knob assembly at the attach plate to the control stand, after disconnecting an electrical wire from the bottom of the trim knob. The wire connection is accessible through the access panels on either side of the control stand.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Rudder Trim Knob Torque Adapter - SE27-2011
   C. Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
3. Prepare for Removal
   A. Place rudder trim knob in neutral position.
   B. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).
   C. Open ELECTRONICS PANEL LIGHTS circuit breaker C284 on load control center P6.
   D. Insert rigging pin R-5 in feel and centering mechanism (Fig. 401).
4. Remove Rudder Trim Control Unit
   A. Remove rudder trim knob as follows:
      (1) Remove access panels (6), Fig. 401 on left and right sides of control stand.

(2) Disconnect wire from electrical terminal (3).
(3) Remove three screws (37) securing trim knob to control stand and pull trim knob up and off end of shaft (18).
(4) Separate trim knob from mounting plate (36) if required, by removing three screws (38) that secure mounting plate to knob.

B. Disconnect cables RTA and RTB at forward turnbuckles.
C. Secure disconnected cables.
D. Remove cable guards (24) from lower bearing housing (23) by removing screws (25).
E. Disengage cables RTA (29) and RTB (28) from cable drums (32).
F. Remove screws (34) and washers (35) securing lower bearing housing (23) to structure (22).
G. Remove nut (26), washers (27 and 30) and screw (31) securing cable drum (32) to tab shaft (21).
H. Slide cable drum (32), spacer (33) and lower bearing housing (23) downward from tab shaft (21).
I. Support lower end of tab shaft (21) and remove screws (12), nuts (12A) and washers (11) securing upper bearing housing (10) to control stand (7).
J. Remove upper bearing housing (10), and attached components through right access panel (6).

<u>CAUTION</u>: EXERCISE CAUTION IN REMOVING THIS SUBASSEMBLY TO PREVENT DAMAGE TO ELECTRICAL WIRES WITHIN CONTROL STAND.

K. Disassemble upper bearing housing (10), tab shaft (21) and related components as follows:
(1) Remove nut (8) and washer (9) securing upper bearing housing (10) to coupling shaft (18), and remove upper bearing housing.
(2) Separate retaining plate (13) from bearing housing (10) by removing screws (15) and washers (14).
(3) Disengage lockring (l6) and remove mechanical stop rings (17) from coupling shaft (18).
(4) Disengage coupling shaft (18) from tab shaft (21) by removing bolts (20) and collars (19).

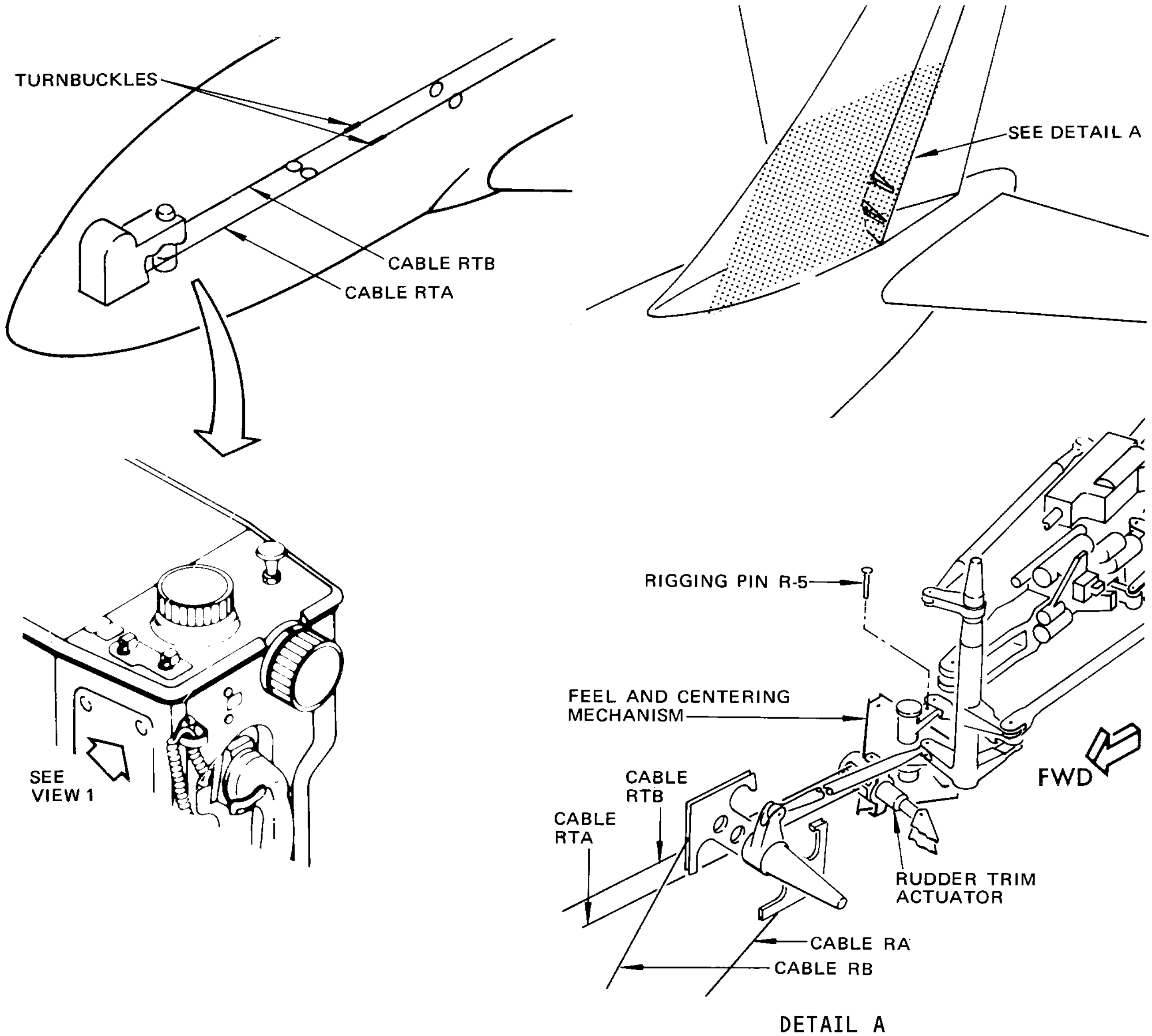
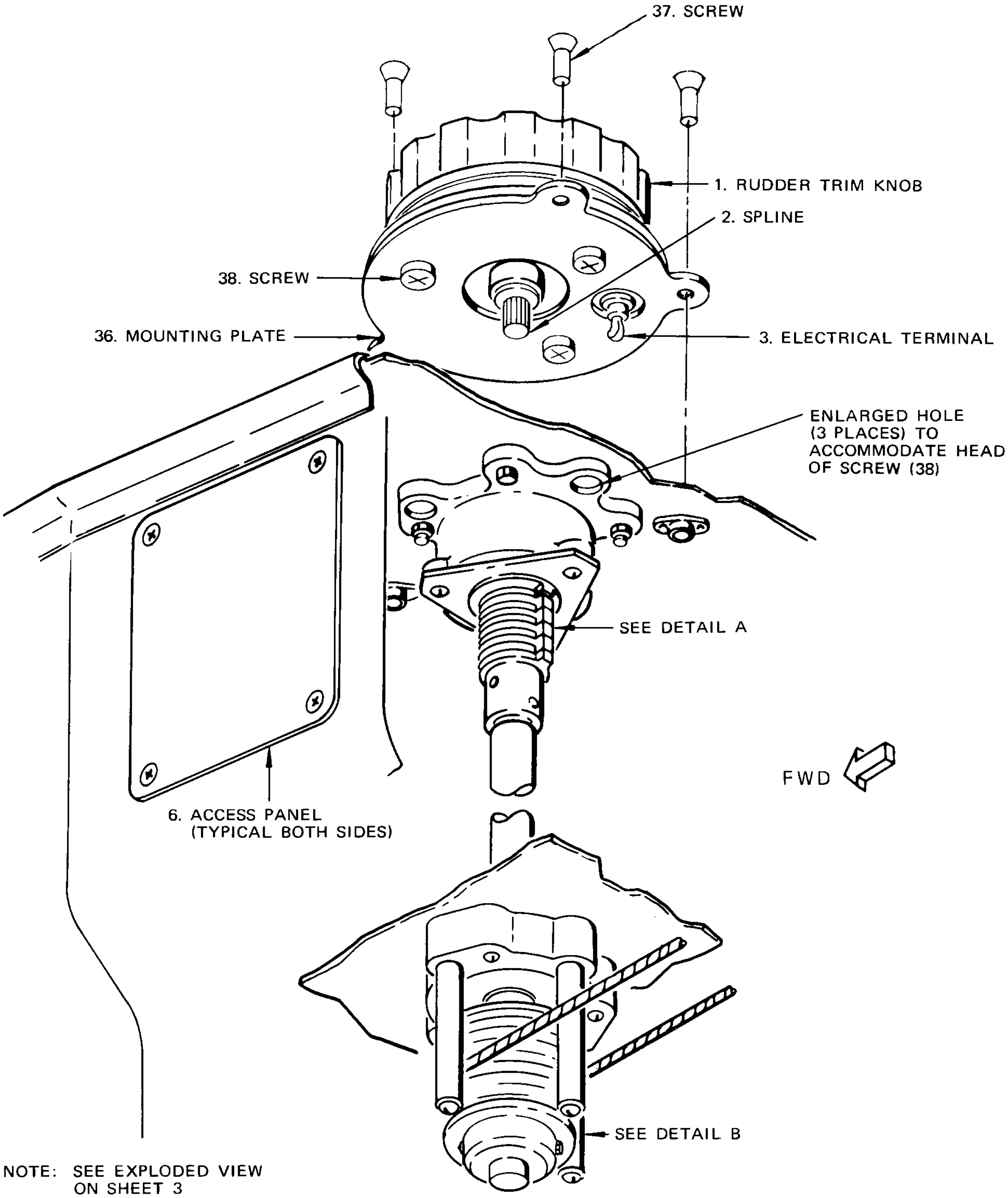


TABLE 1	
TEMPERATURE °F (± 5°)	RIGGING LOAD RTA RTB (+5/-0) POUNDS [1]
110	81
90	75
70	70
50	65
30	59
10	54
0	51
-10	48
-30	43
-40	40

[1] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +10/-20 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 10 POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

NOTE: TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE ± 5 DEGREES FOR AIRFRAME TEMPERATURE TO STABILIZE

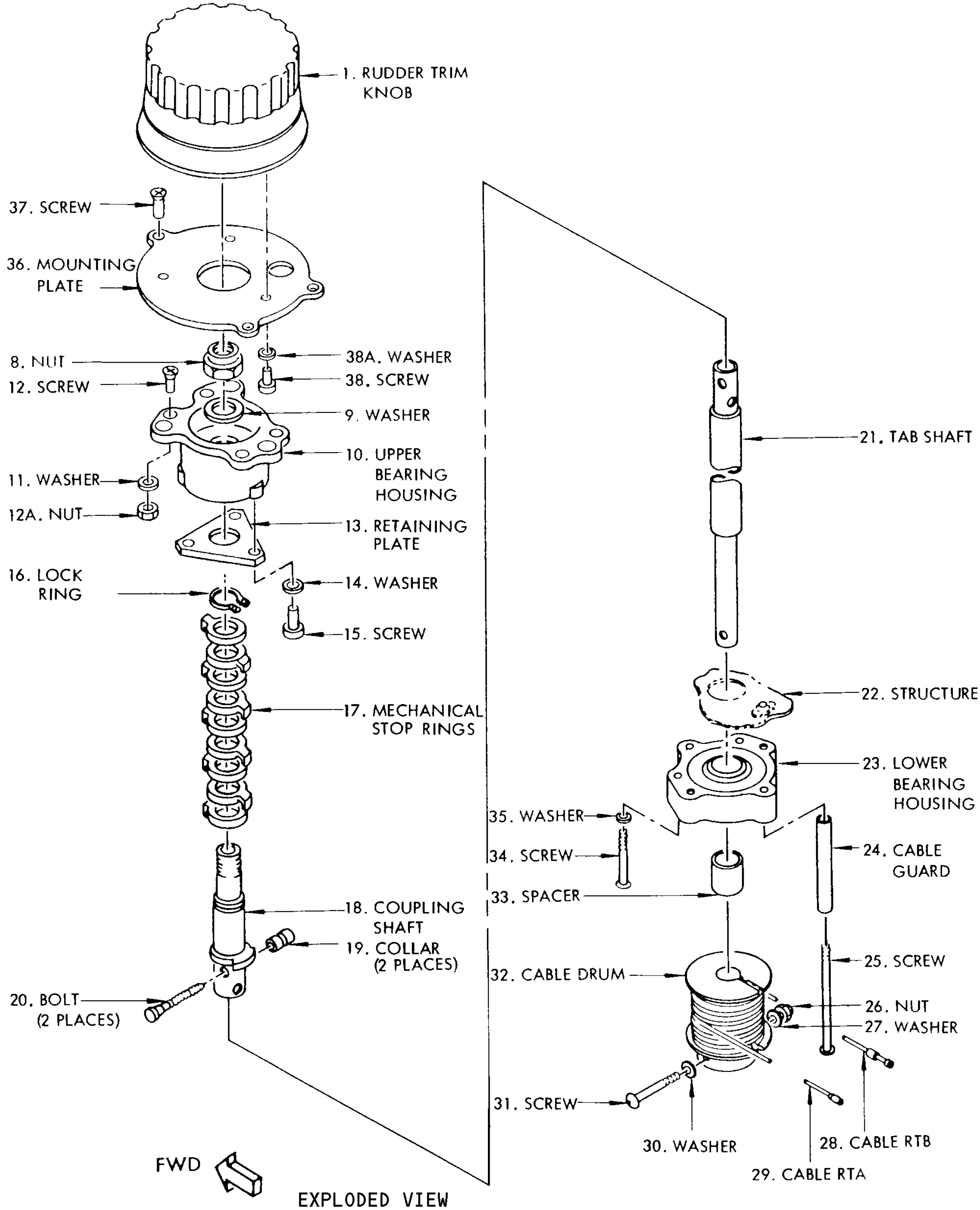
Rudder Trim Mechanism Installation
Figure 401 (Sheet 1)



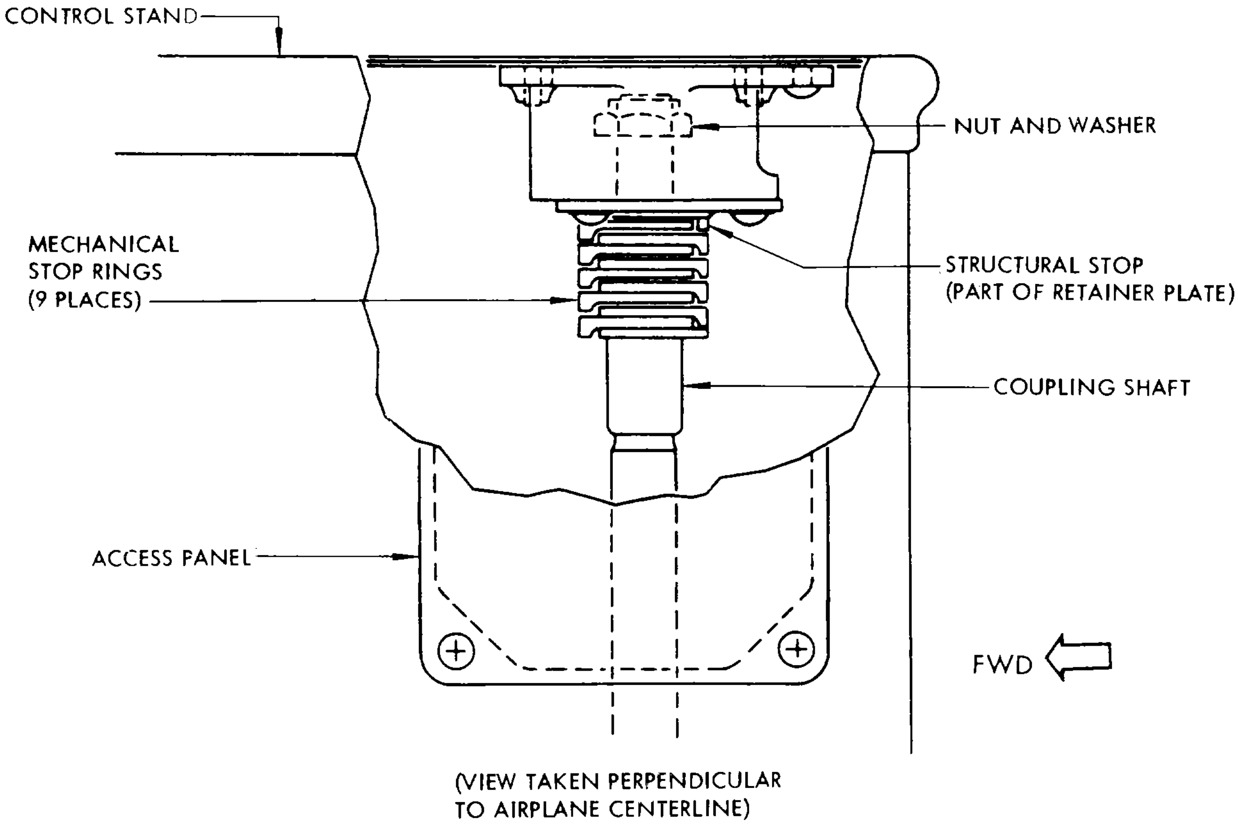
NOTE: SEE EXPLODED VIEW ON SHEET 3

VIEW 1

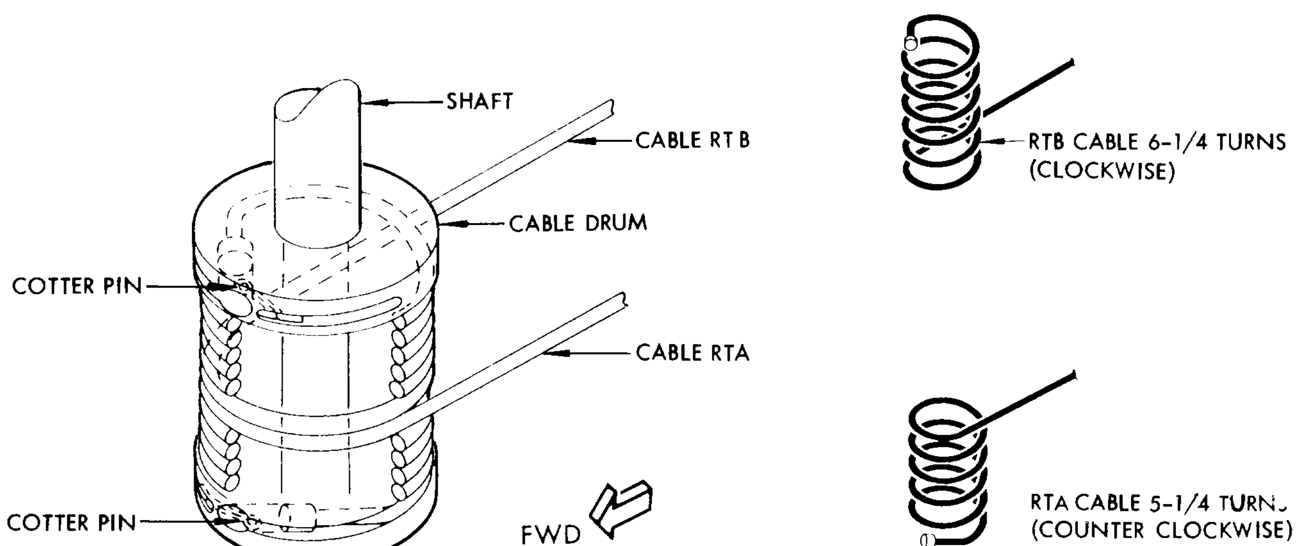
Rudder Trim Mechanism Installation
Figure 401 (Sheet 2)



Rudder Trim Mechanism Installation
Figure 401 (Sheet 3)



DETAIL A



DETAIL B

Rudder Trim Mechanism Installation
Figure 401 (Sheet 4)

5. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (Ref 27-21-0).
   B. Check that rudder trim knob is in neutral position and that rigging pin R-5 is installed in feel and centering unit.
   C. Open ELECTRONIC PANEL LIGHTS circuit breaker C284 on load control center P6.
6. Install Rudder Trim Control Unit
   A. Reassemble upper bearing housing (10, Fig. 401) tab shaft (21), and related components as follows:
      (1) Secure tab shaft (21) to coupling shaft (18) by installing bolts (20) and collars (19).
      (2) Place mechanical stop rings (17) on coupling shaft (18) and instal1 lockring (16).
      (3) Secure retaining plate (13) to upper bearing housing (10) by installing washers (14) and screws (15).
      (4) Secure coupling shaft (18) to upper bearing housing (10) with washer (9) and nut (10).
      (5) Manually rotate coupling shaft to align mechanical stop rings as shown in detail A.
   B. Place upper bearing housing (10), and attached components into position in control stand.
   C. Install washers (11), screws (12) and nuts (12A) to secure upper bearing housing (10) to control stand (7).
   D. Slide lower bearing housing (23) on tab shaft (21), and secure housing to structure (22) with washers (35) and screws (34).
   E. Slide spacer (33) and cable drum (32) on tab shaft (21), and secure with screws (31), washers (30 and 27), and nut (26).
   F. Engage cables RTA and RTB on cable drum (detail B). Wrap cable RTA 5-1/4 turns counterclockwise, and cable RTB 6-1/4 turns clockwise. Secure cables to drum with phenolic faced clamps.
   G. Secure cable guards (24) to lower bearing housing (23) with screws (25).
   H. Visually check mechanical stop rings for position shown in detail A.
   I. If mounting plate (36) is not installed on trim knob, secure plate to trim knob with three screws (38). Orient plate to knob per figure 401.
   J. Position trim knob to indicate neutral (zero) trim.

K. Position trim knob over cutout in control stand and mate trim knob splines (2) with splines in coupling shaft (18). With splines engaged, rotate trim knob mounting plate as necessary so that heads of screws (38) drop into three mating holes in control stand and upper bearing housing.

NOTE: The coupling shaft and rudder trim control wheel are each equipped with a blind spline.

L. Secure trim knob to control stand by installing three screws (37) through mounting plate lugs and mating holes on control stand.
M. Reconnect wire to electrical terminal (3).
N. Remove cable clamps.
O. Reconnect cables RTA and RTB at turnbuckles, but maintain zero cable tension.
P. Disconnect control rod between torque tube and feel and centering unit at torque tube.
Q. Remove rigging pin R-5.
R. Tighten cables RTA and RTB equally to tension specified in Fig. 401, so that rigging pin R-5 may be freely inserted; then remove rigging pin.
S. Connect control rod between torque tube and feel and centering unit. Tighten nut on outer bolt to 50-60 pound-inches, then tighten nut on inner bolt to 12-15 pound-inches.

CAUTION: AFTER TIGHTENING NUT ON INNER BOLT, DO NOT RESET TORQUE FOR BOLT ON OUTER NUT. NUT ON INNER BOLT MAY BECOME LOOSE.

T. Install turnbuckle locking clips.
U. Replace control stand and rudder centering feel mechanism access panels.
V. Provide rudder hydraulic systems A and B power (Ref 27-21-0).
W. Using rudder trim knob torque adapter, rotate trim knob from neutral to full right, and from full right to neutral. Then from neutral to ful1 left and return. Maximum force required shall be 28 pound-inches.
X. Rotate trim knob in both directions until indicator is at 10. Check that rudder travel is 10.22 ±0.50 inches in each direction.
Y. Restore airplane to normal hydraulic configuration (Ref 27-21-0).
Z. Close all access doors and install access panels.
AA. Close ELECTRONIC PANELS LIGHT circuit breaker C284 on P6 panel.

STANDBY RUDDER ACTUATOR SHUTOFF VALVE - REMOVAL/INSTALLATION

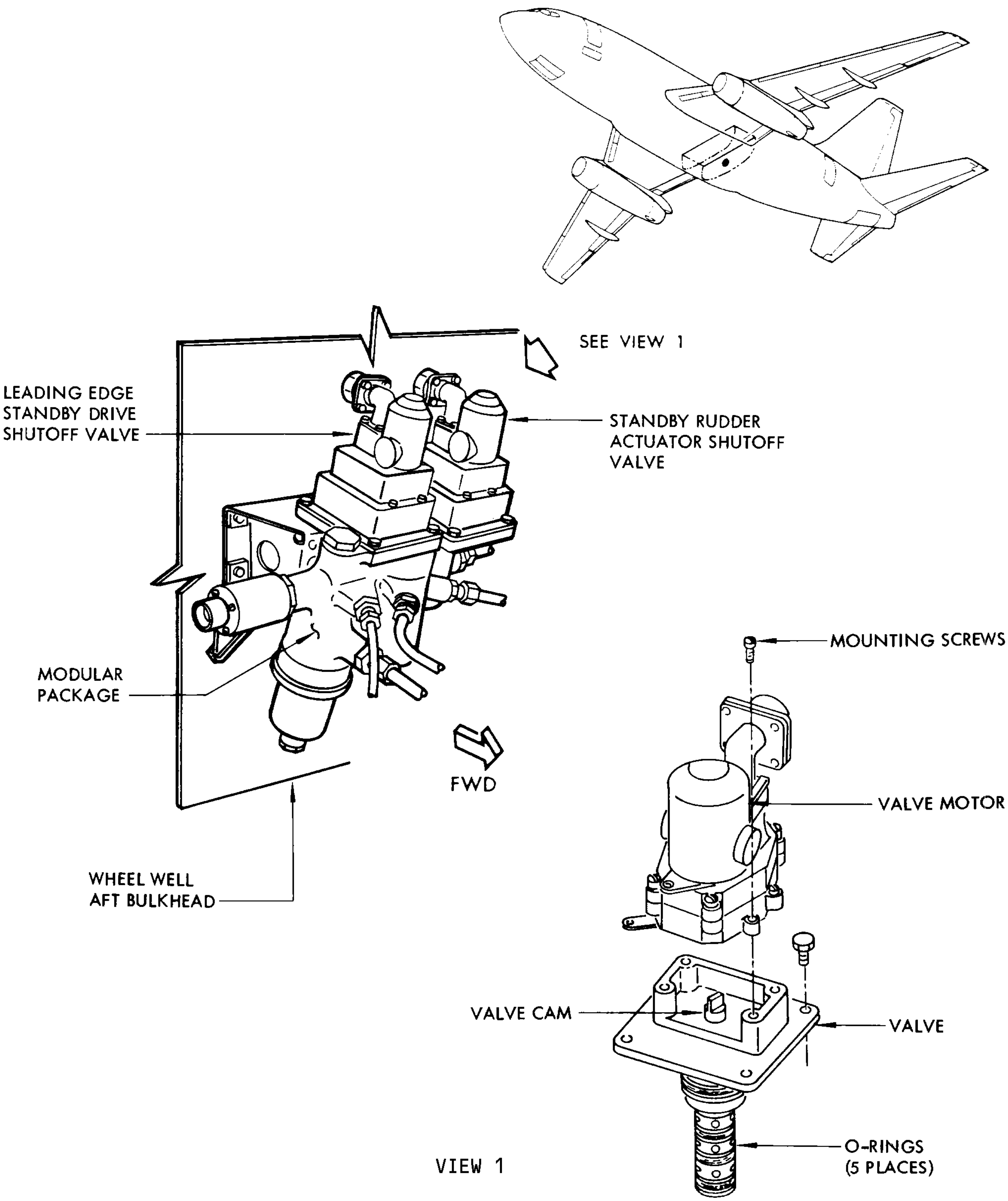
1. General
   A. The standby rudder actuator shutoff valve and the leading edge standby drive shutoff valve (figure 401) are identical units. This procedure provides instructions for replacement of the standby rudder actuator motor and valve, and for the motor only. Both replacement procedures may be accomplished without removing the valve body from the modular package. The motor drive and valve cam have been indexed to aid in correct motor installation.
2. Removal/Installation Standby Rudder Actuator Valve

   NOTE: Use this procedure when replacing assembly of motor and valve. When replacing the motor only use the procedure in paragraph 3.

   A. Equipment and Materials
      (1) Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   B. Prepare for Removal
      (1) Remove rudder standby system hydraulic power. Refer to 27-21-0, Rudder and Rudder Trim Control System - Maintenance Practices.
      (2) Open FLT CONTR and STBY RUD circuit breakers on load control panel P6.
   C. Remove Standby Rudder Actuator Shutoff Valve
      (1) Disconnect electrical connector from valve motor.
      (2) Remove four valve mounting bolts attaching shutoff valve body to modular package housing.
      (3) Carefully remove shutoff valve from modular package housing by turning slightly and lifting straight up.

         CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

      (4) Take necessary precautions to prevent dirt entering shutoff valve cavity when valve is removed.
   D. Prepare for Installation
      (1) Remove rudder standby system hydraulic power. Refer to 27-21-0.
      (2) Check that FLT CONTR and STBY RUD circuit breakers on panel P6 are open.
   E. Install Standby Rudder Actuator Shutoff Valve
      (1) Install five O-rings with backup rings on replacement valve. (See figure 401.) Lightly lubricate O -rings and backup rings with hydraulic fluid or Skydrol assembly lube at installation.
      (2) Carefully insert shutoff valve into modular package housing.
      (3) Install four mounting bolts. Tighten bolts within 30 to 40 pound-inch torque range.
      (4) Install lockwire on four mounting bolts.



Standby Rudder Actuator Shutoff Valve Installation
Figure 401

(5) Install electrical connector at valve motor.
(6) Restore airplane to normal hydraulic configuration. Refer to 27-21-0.
(7) Test shutoff valve. Refer to Standby Rudder Actuator Shutoff Valve - Adjustment/Test.
(8) Check hydraulic reservoir and service, if required.
(9) Close all access doors and install access panels.

3. Removal/Installation Standby Rudder Actuator Shutoff Valve Motor

NOTE: Use this procedure when replacing the valve motor only. When replacing the motor and valve use the procedure in paragraph 2.

A. Prepare for Removal
(1) Remove rudder system standby hydraulic power. Refer to 27-21-0.
(2) Open FLT CONTR and STBY RUD circuit breakers on panel P6.

B. Remove Standby Rudder Actuator Shutoff Valve Motor
(1) Disconnect electrical connector from valve motor.
(2) Move manual override lever to position 2.
(3) Remove four mounting screws (figure 401) attaching valve motor to valve. Remove valve motor from valve. Remove valve motor from valve.

C. Prepare for Installation
(1) Remove rudder hydraulic system standby power. Refer to 27-21-0.
(2) Check that FLT CONT and STBY ROD circuit breakers on panel P6 are open.

D. Install Standby Rudder Actuator Shutoff Valve Motor
(1) On replacement of valve motor, move manual override lever to position 2.
(2) Position valve motor on valve and engage motor drive with valve cam. (See figure 401.)
(3) Install the four mounting screws.
(4) Install lockwire on mounting screws.
(5) Install electrical connector on valve motor.
(6) Restore airplane to normal hydraulic configuration. Refer to 27-21-0.
(7) Test Shutoff valve. See Standby Rudder Actuator Shutoff Valve - Adjustment/Test.
(8) Close all access doors and install access panels.

STANDBY RUDDER ACTUATOR SHUTOFF VALVE - ADJUSTMENT/TEST

1. Standby Rudder Actuator Shutoff Valve Test
   A. Connect electrical power to airplane.
   B. Make sure the Hydraulic Power is on.
   C. Check that FLT CONTR and STBY RUD circuit breakers on load control panel P6-2 are closed.
   D. Check that flight control switches A and B, located in upper left corner of forward overhead panel, are positioned to ON.
   E. Check that manual override lever on valve is at position No. 1.
   F. Move flight control switch A to STBY RUD position.
   G. Check that manual override lever on valve is at position 2.
   H. Move rudder pedals full left then full right five times. Check that rudder moves accordingly.

      WARNING: ALL PERSONNEL AND OBSTRUCTIONS MUST BE CLEAR OF RUDDER SURFACE BEFORE MOVING PEDALS.

   I. Move flight control switch B to STBY RUD position.
   J. Check that manual override lever on valve is at position 2.
   K. Move rudder pedals full left then full right five times. Check that rudder moves accordingly.

      WARNING: ALL PERSONNEL AND OBSTRUCTIONS MUST BE CLEAR OF RUDDER SURFACE BEFORE MOVING PEDALS.

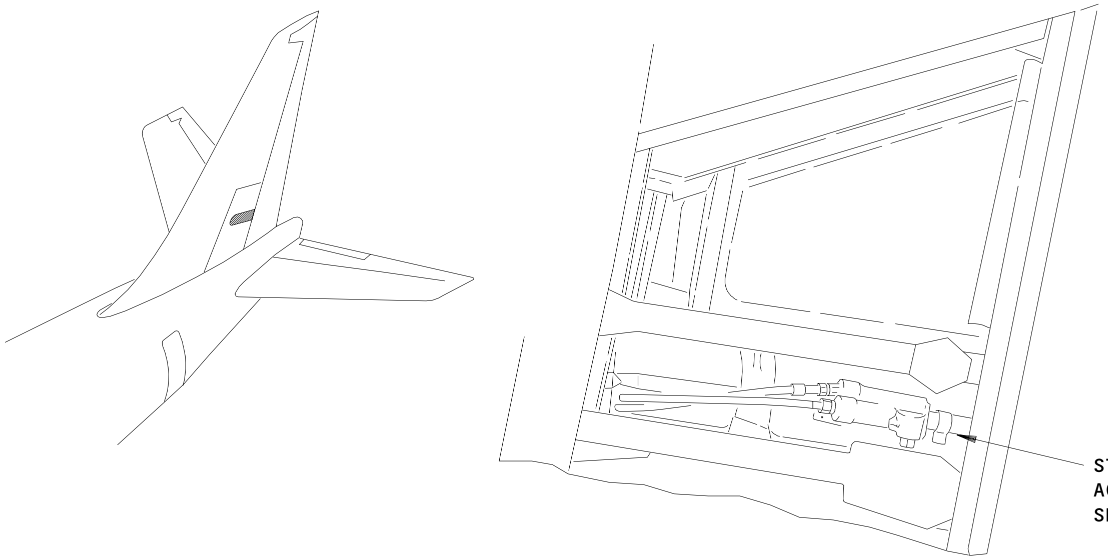
   L. Move flight control switches A and B to ON position.
   M. Check that manual override lever on valve is at position No. 1.
   N. Determine whether there is any further need for electrical power. If not, disconnect electrical power.

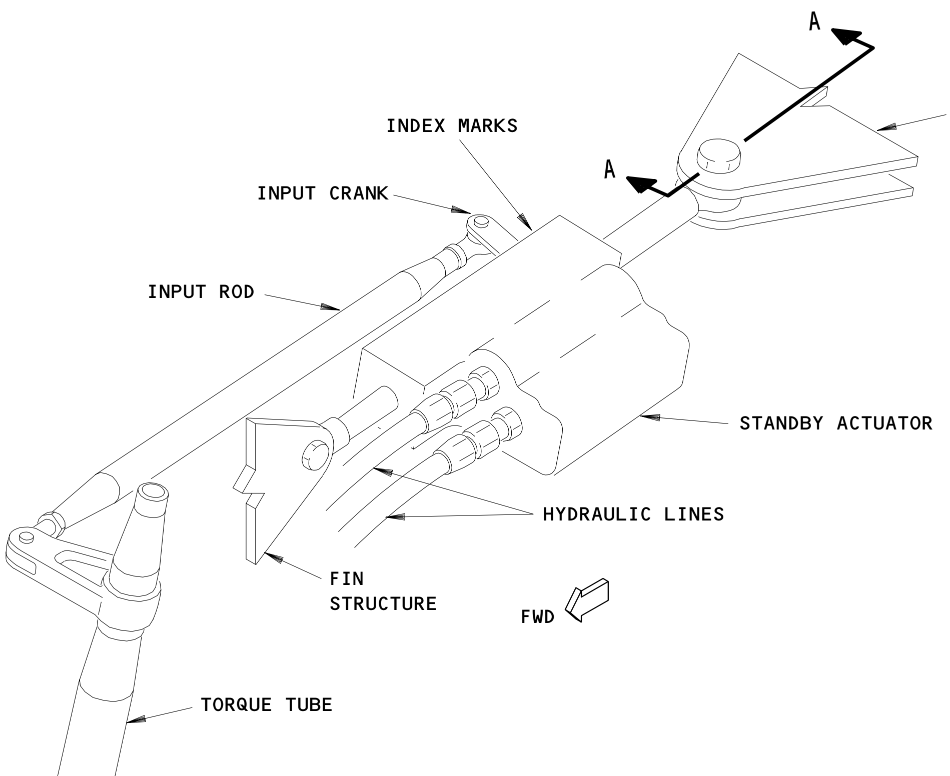
STANDBY RUDDER ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Fire Resistant Hydraulic Fluid - BMS 3-11 (AMM 20-30-21/201)
2. Prepare for Removal
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Remove access panels on left side of vertical stabilizer as shown in Fig. 401.
   C. Install the rigging pin R-5 in the rudder feel and centering unit (AMM 27-21-82/401).
3. Remove Standby Rudder Actuator
   A. Disconnect hydraulic lines from standby rudder actuator (Fig. 401).
   B. Cap hydraulic lines and ports to prevent contamination.
   C. Disconnect input rod at aft attachment point by removing nut, washer, and bolt.
   D. Disconnect forward end of actuator from structure by removing cotter pin, nut, washers, and bolt.
   E. Disconnect aft end of actuator from structure by removing cotter pin, nut, washers and bolts.
   F. Disengage actuator from structure attachment points, and remove from airplane.
4. Prepare for Installation
   A. Remove rudder systems A, B, and standby hydraulic power (AMM 27-21-0/201).
   B. Check that rigging pin R-5 is installed in feel and centering unit.
   C. Check standby rudder actuator at installation points for allowable wear (AMM 27-21-141/601).





VIEW 1

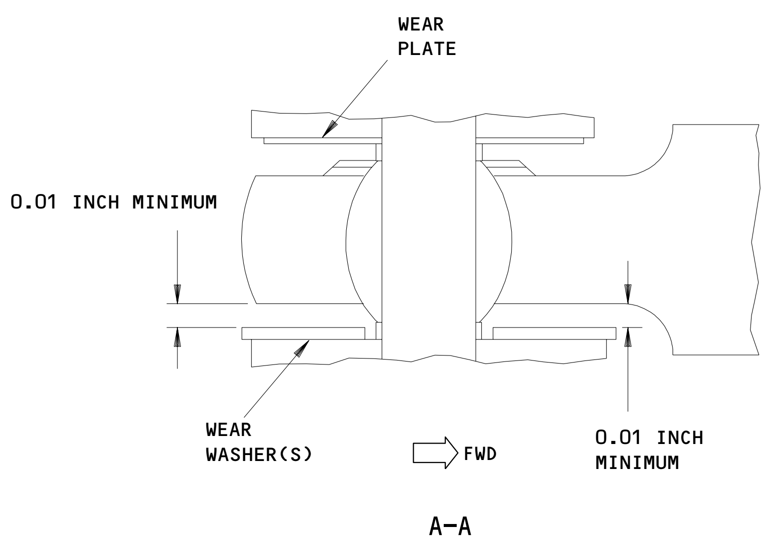
Standby Rudder Actuator Installation
Figure 401 (Sheet 1)

5. Install Standby Rudder Actuator

A. Place standby rudder actuator in position and install bolts, washers, nylon wear washers (installed on the aft end of the actuator only) and nuts to secure forward and aft ends of actuator to structure. When installing aft bolt, observe gap per Fig. 401, Section A-A.

NOTE: The quantity of the wear washers is as the clearance allows. The maximum number of washers allowed is 3.

B. Tighten aft nut to 400-500 pound-inches for self locking nuts and 130-180 pound-inches for castellated nuts. Install cotter pin if castellated nut is used.
C. Tighten forward nut to 500-600 pound-inches and install cotter pin.
D. Remove caps from hydraulic lines and ports and connect hydraulic lines to actuator.
E. Connect rod assembly to actuator crank and secure with bolt, washer and nut.
F. Restore airplane to normal hydraulic configuration (AMM 27-21-0/201).
G. Adjust and test rudder standby actuator (Ref Standby Rudder Actuator - Adjustment/Test).
H. Check hydraulic reservoirs and service if required (AMM 12-12-0/201).



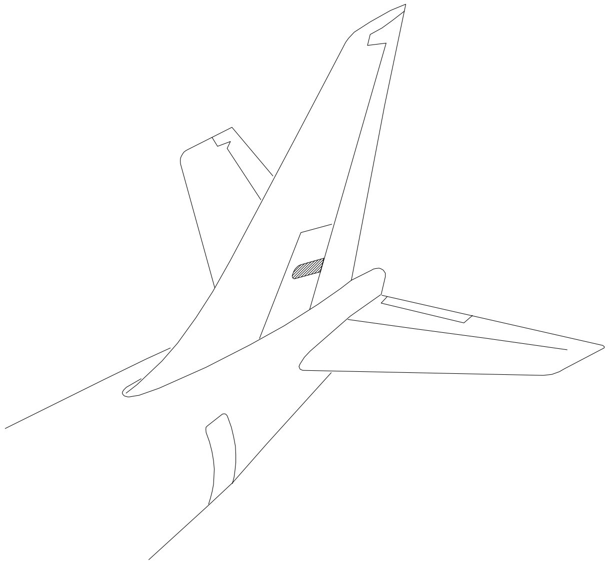
Standby Rudder Actuator Installation
Figure 401 (Sheet 2)

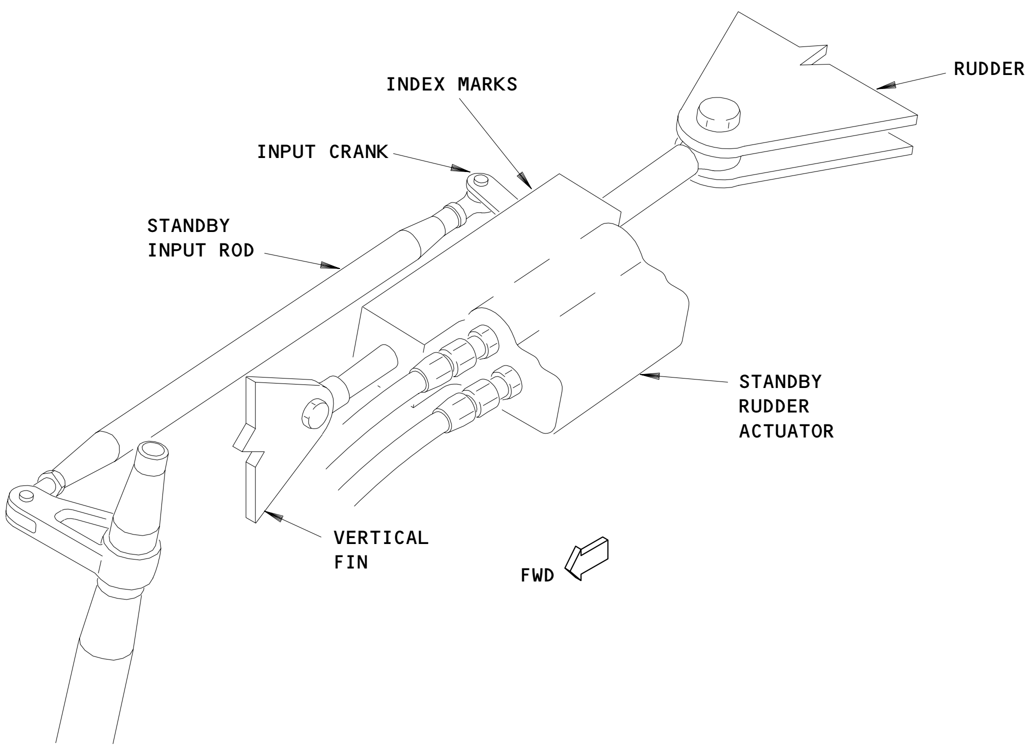
STANDBY RUDDER ACTUATOR - ADJUSTMENT/TEST

1. Standby Rudder Actuator Adjustment
   A. Equipment and Materials
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
R-5	-11	0.309-0.311	6.7 ±0.25	FEEL AND CENTERING MECHANISM

   B. Prepare for Adjustment
      (1) Supply power to the standby hydraulic system (Ref 27-21-0 MP).
      (2) Move the rudder pedals through ten cycles to flush and bleed the standby rudder actuator.
      (3) Remove power from the standby hydraulic system (Ref 27-21-0 MP).
      (4) Provide rudder systems A and B hydraulic power (Ref 27-21-0 MP).
      (5) Remove access panel on left side of vertical stabilizer to gain access to rudder standby actuator.
      (6) Check that rudder trim is set at zero units of trim.
      (7) Jiggle feel and centering unit input arm (trim and feel rod) to ensure that system is centered.
      (8) Insert rigging pin R-5 in centering unit output crank. Rigging pin shall enter easily without movement of output crank.
   C. Adjust Standby Rudder Actuator (Fig. 501).
      (1) Check alignment of index mark on standby actuator valve input crank and center mark on actuator body.
         (a) If marks align, proceed to step (4).
         (b) If marks do not align and misalignment is less than 0.02 inch, proceed to step (2).
         (c) If marks do not align and misalignment is more than 0.02 inch, proceed to step (3).





Standby Rudder Actuator Adjustment
Figure 501

(2) Adjust control rod (fine adjustment) as follows:
  (a) Loosen both checknuts on rod assembly and back them off a few turns.
  (b) Turn tube until index marks align. One full turn at tube moves index mark approximately 0.006 inch.
  (c) Tighten both checknuts.
  (d) Proceed to step (4).
(3) Adjust control rod (coarse adjustment) as follows:
  (a) Position flight control switches A and B to OFF.

  CAUTION: HYDRAULIC POWER MUST BE OFF FOR THIS PROCEDURE.

  (b) Loosen both checknuts on rod assembly.
  (c) Remove bolt connecting aft end of rod to actuator.
  (d) Turn aft rod end and tube together and/or aft rod end alone in the same direction. Half a turn of one rod end moves index mark approximately 0.015 inch.
  (e) Install clevis bolt at aft end of rod.
  (f) Position flight control switches A and B to ON.
  (g) Repeat fine adjustment starting at step 1.B.(3).
(4) Check for minimum thread engagement on rod. Rod end threads must be visible through inspection holes in tube at both ends.
(5) Remove rigging pin R-5.
(6) Test standby actuator per paragraph 2.

2. Standby Rudder Actuator Test
A. Equipment and Materials
  (1) Rudder Loading Block
    (a) Loading block to distribute loads over a minimum of 5 square inches of rudder trailing edge. Suggested loading block: 0.125 inch thick (minimum) by 3 inches. Wood of fiberglass, suitably padded to prevent skin damge.
B. Prepare for Test
  (1) Disconnect pushrod to nose wheel steering (Fig. 503).

  NOTE: Nose gear steering need not be disconnected if airplane is jacked so that nose gear is fully extended.

  (2) Provide rudder systems A and B hydraulic power. Refer to 27-21-0.
  (3) Check that rudder trim knob is at neutral position.
  (4) Check that rudder is at neutral.
  (5) Put the flight control switches A and B to the OFF positions.

(6) Verify the flight controls A and B system LOW PRESSURE lights are illuminated.
(7) Put the flight control switch A or B to the STDBY RUD position.
(8) Check that there is no leakage at standby actuator hydraulic connections.

C. Test Standby Rudder Actuator Deadband

(1) With loading block, push hard on rudder to the right, then slowly ease off load.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE LINE BETWEEN RUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(2) With hands off rudder, measure rudder position in inches to the right.
(3) With loading block, push hard on rudder to the left, then slowly ease off load.

CAUTION: WHEN MOVING RUDDER SURFACE BY EXTERNAL FORCE ALWAYS USE LOADING BLOCK TO PREVENT DAMAGE TO RUDDER. APPLY EXTERNAL FORCE APPROXIMATELY 46.9 INCHES FROM RUDDER HINGE BETWEENRUDDER STATIONS 13.33 AND 31.65. DO NOT EXCEED A LOAD OF 50 POUNDS ON RUDDER AT ANY TIME.

(4) With hands off rudder, measure rudder position in inches to the left.
(5) Calculate difference between (2) and (4). If difference is greater than 0.2 inch, the standby actuator input control rod must be adjusted again.

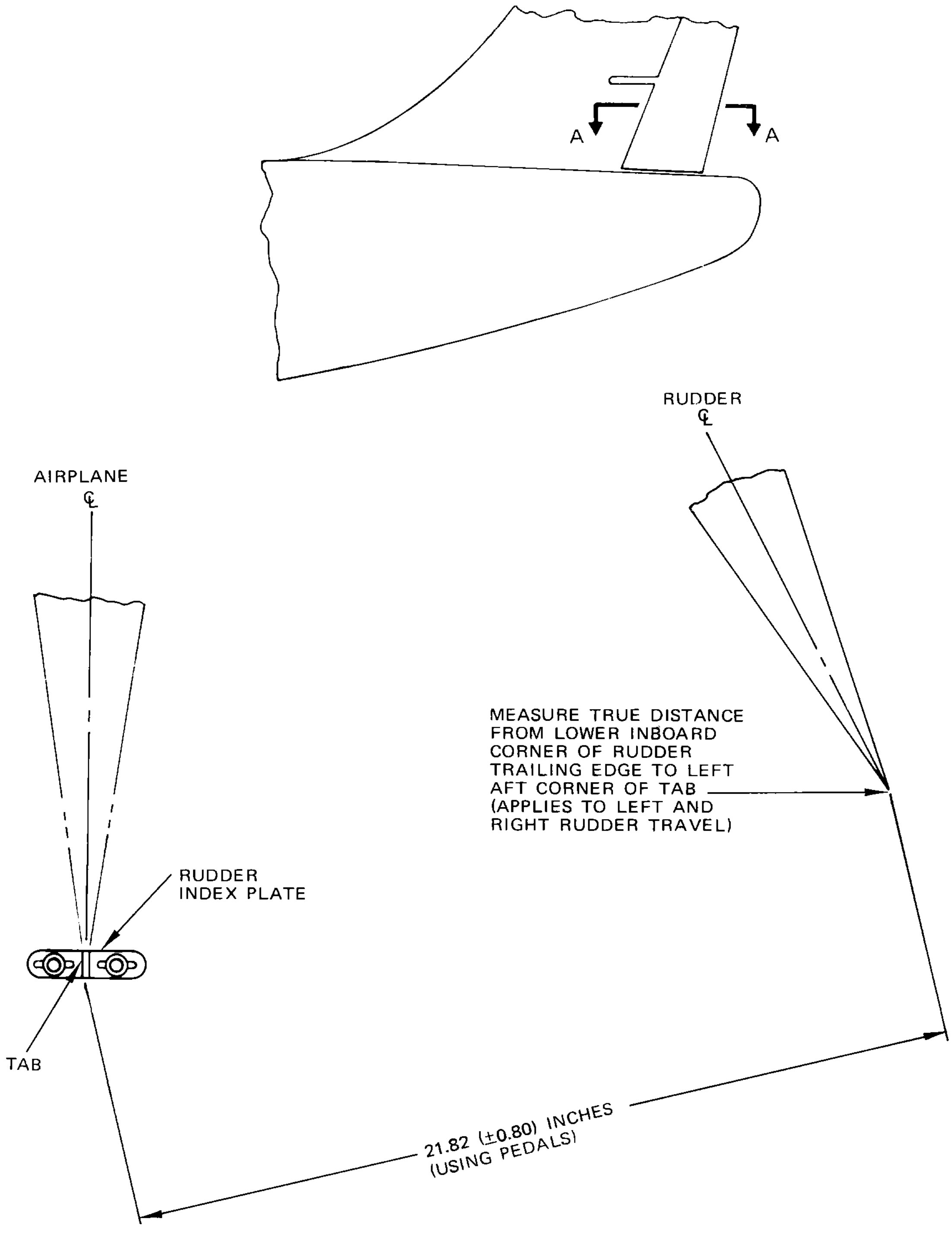
D. Test rudder travel (Fig. 502).

(1) Move captain's left pedal until forward quadrant stop is contacted. Measure rudder travel. Required movement is 21.82 +0.80 inches (Fig. 502).
(2) Move captain's right pedal until forward quadrant stop is contacted. Measure rudder travel. Required movement is 21.82 ±0.80 inches.
(3) Quickly move the captain's left and right rudder pedals to the forward stops and release.
    (a) Repeat this step 5 times.
(4) Slowly move the Captain's left pedal full forward then release.
    (a) Make sure that the pedal returns to the centered position.
(5) Slowly move the Captain's right pedal full forward then release.
    (a) Make sure that the pedal returns to the centered position.

(6) Do a visual check of the rudder control surface:
   (a) Make sure that rudder returns to the neutral position, within the deadband of the standby rudder power control unit.

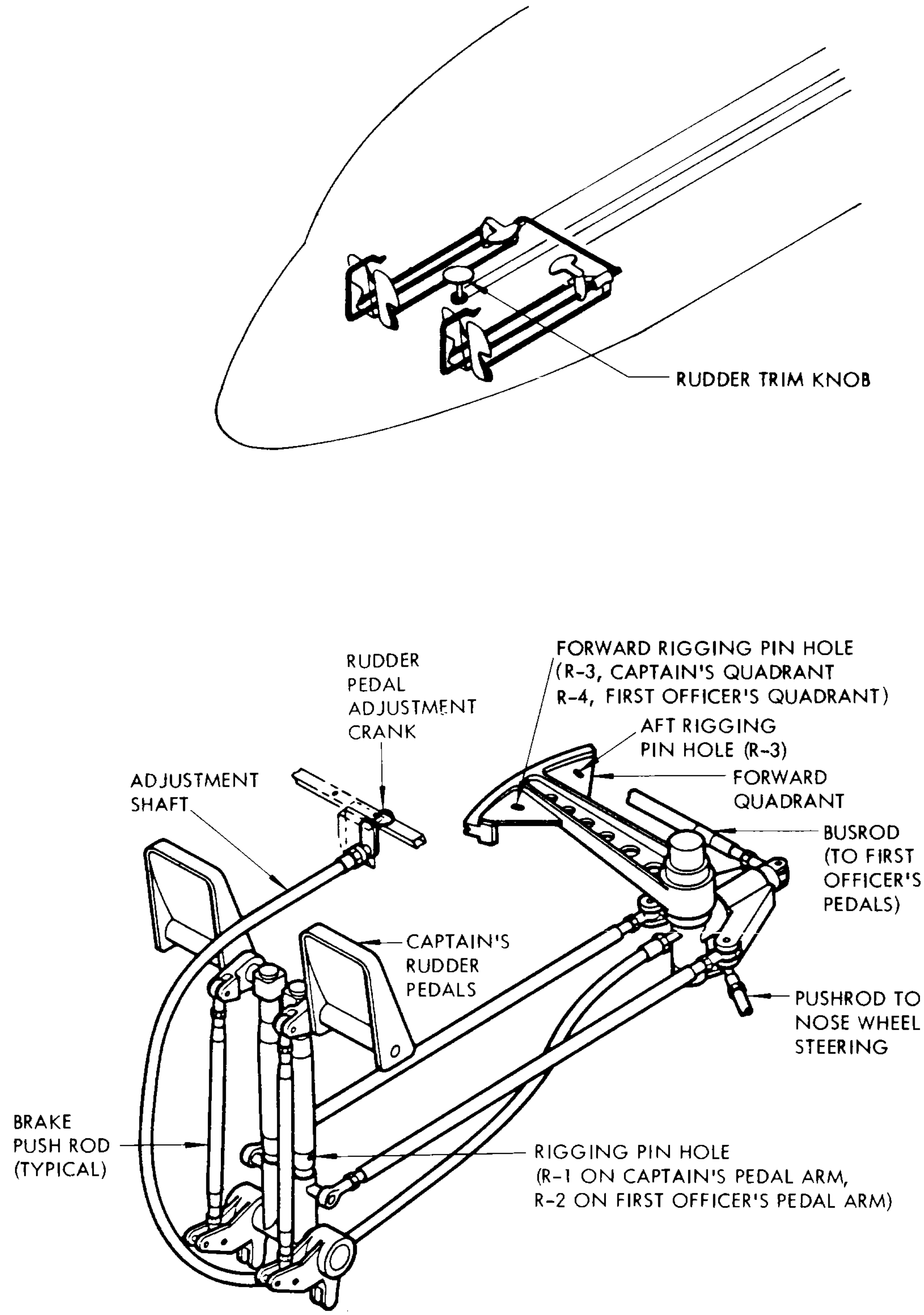
      NOTE: The purpose of the visual centering check is to inspect for a large rudder offset resulting from a failure in the input linkage to the standby rudder power control unit. It is intended that the inspection be completed visually from ground level and without a physical measurement of surface position.

E. Restore Airplane to Normal
   (1) Remove systems A, B and standby hydraulic power (Ref 27-21-0).
   (2) Reconnect pushrod to nose wheel steering, if disconnected.
   (3) Close all access doors and install access panels.



SECTION A-A
(ROTATED FOR CLARITY)

Rudder Travel and Index Plate
Figure 502



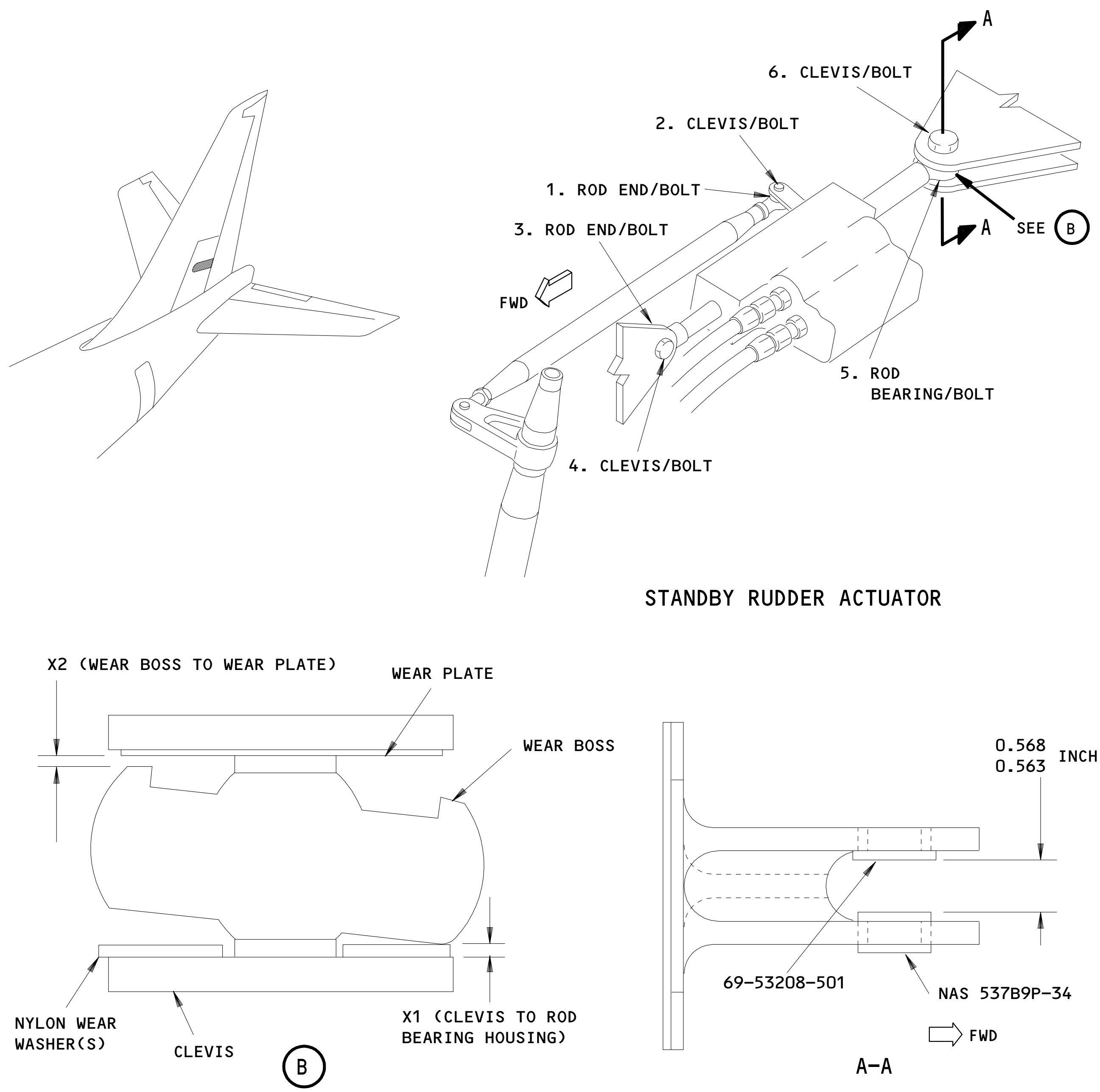
Rudder Forward Quadrant Installation
Figure 503

STANDBY RUDDER ACTUATOR - INSPECTION/CHECK

1. General
   A. This data consists of illustrations, wear limits charts and instructions on measuring wear limits. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Standby Rudder Actuator Wear Limits
   A. Standard Tools and Equipment
      (1) Micrometer
      (2) Vernier Caliper
      (3) Feeler gages
   B. Procedure
      (1) Measure the two clearances, X1 and X2, shown in Fig. 601, View B.
         (a) Calculate the difference in clearance.

            NOTE: X1-X2 = Difference in clearance.

         (b) If the difference in clearance is less than 0.015 inch, replace the rod bearing housing.
      (2) Remove the standby rudder actuator (Ref 27-21-141 R/I).
      (3) Measure the parts of the standby rudder actuator for worn areas.
      (4) Compare the dimensions that you measured with the permitted dimensions shown in Fig. 601.
      (5) Replace or repair the parts that are not in the tolerance.
      (6) Install the standby rudder actuator (Ref 27-21-141 R/I).



Standby Rudder Actuator Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS: DIAMETER MIN	DESIGN LIMITS: DIAMETER MAX	WEAR LIMTS: ALLOWED WEAR DIM.	WEAR LIMTS: MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	ROD END	ID	0.2495	0.2500	0.2530	0.0035	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
2	CLEVIS	ID	0.2500	0.2505	0.2535	0.0040		X	1
	BOLT	OD	0.2485	0.2495	0.2481		X		
3	ROD END	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT	OD	0.6230	0.6240	0.6190		X		
4	CLEVIS	ID	0.6250	0.6265	0.6305	0.0065		X	2
	BOLT	OD	0.6230	0.6240	0.6190		X		
5	ROD BEARING	ID	0.5620	0.5625	0.5655	0.0040	X		
	BOLT	OD	0.5605	0.5615	0.5665		X		
6	CLEVIS	ID	0.5620	0.5625	0.5655	0.0040		X	3
	BOLT	OD	0.5605	0.5615	0.5665		X		

1 OBTAIN BUSHING. BORE HOLE TO ATTAIN -0.0010 TO 0.0000 INCH INTERFERENCE FIT (0.3754 INCH MAXIMUM). REAM BUSHING TO 0.2500/0.2505 INCH DIAMETER.

2 REPLACE WORN BUSHING

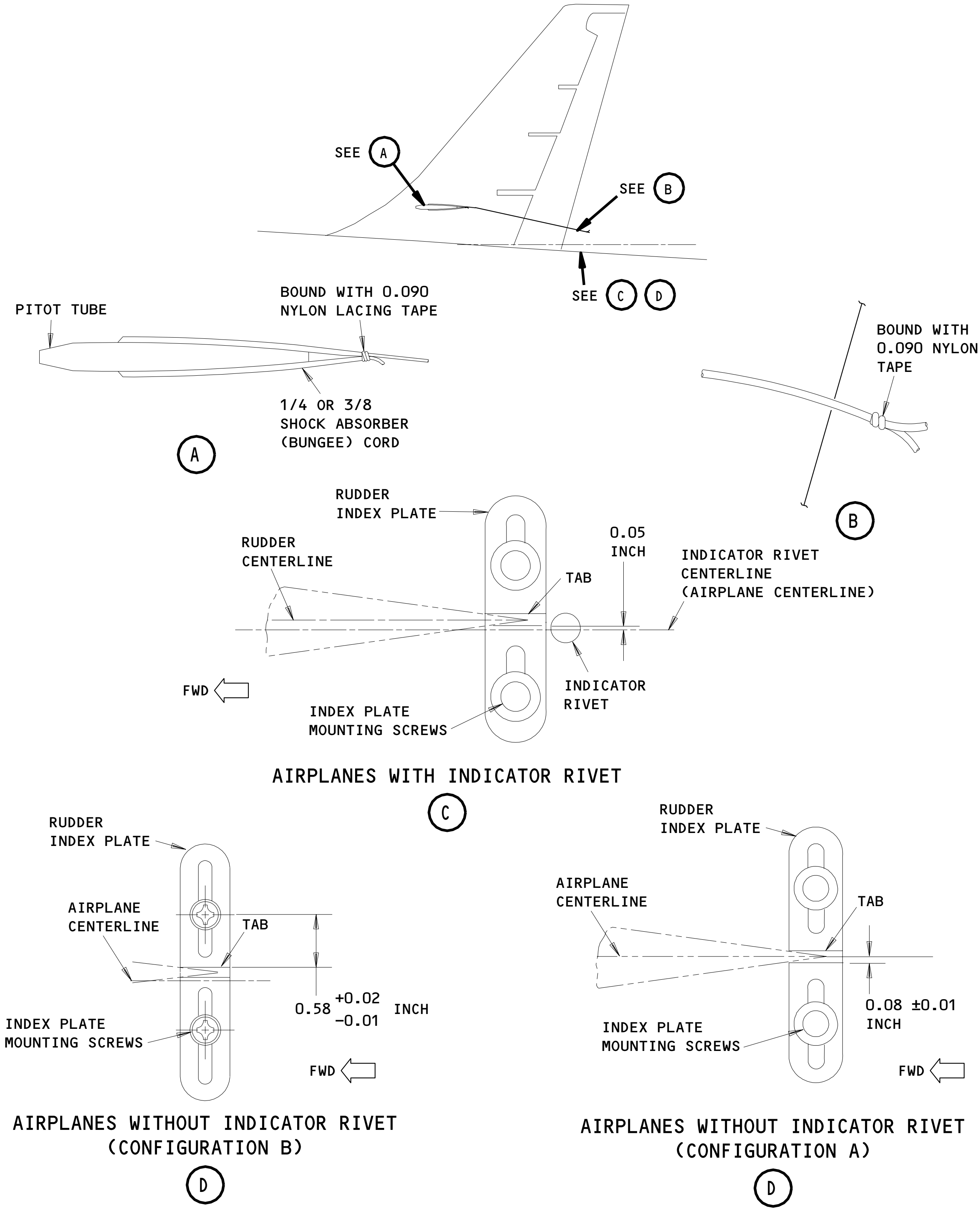
3 REPLACE WORN BUSHING (SEE SECTION A-A). SHRINK FIT INSTALLATION (REF OVERHAUL MANUAL, 20-50-03). IF SPECIAL STEEL WEAR PLATE IS INSTALLED UNDER UPPER BUSHING FLANGE, REPLACE WITH NEW STEEL WEAR PLATE APPLIED WITH SEALANT BMS 5-95.

Standby Rudder Actuator Wear Limits
Figure 601 (Sheet 2)

RUDDER INDEX PLATE - REMOVAL/INSTALLATION

1. General
   A. The rudder index plate is installed with screws in inserts on top of tail cone at airplane centerline.
   B. Airplanes with Centerline Position Indicator Rivet
      (1) On some airplanes, a single indicator rivet is installed just aft of rudder index plate. The rivet is installed on body buttock line 0.00 to within 0.015 inch. On airplanes with centerline position indicator rivet, remove and install rudder index plate per Par. 2.
   C. Airplanes without Centerline Position Indication Rivet
      (1) On airplanes without centerline position indicator rivet, remove and install rudder index plate per Par. 3.
   D. On all airplanes, if an out-of-trim condition exists, rudder index plate may be adjusted per 27-09-400, Flight Controls Trim Correction - A/T.
2. Rudder Index Plate Removal/Installation on Airplanes with Centerline Position Indicator Rivet
   A. Remove Rudder Index Plate (Fig. 401)
      (1) If existing tail cone will be reinstalled, place a piece of tape on tail cone next to rudder index plate and mark exact position of index plate tab.
      (2) Remove screws and washers and remove index plate.
   B. Install Rudder Index Plate
      (1) On existing tail cone, install new index plate with washers and screws such that index plate tab aligns with mark on tape. Remove tape from tail cone.
      (2) If new tail cone has been installed, install index plate with washers and screws such that left edge of tab is 0.05 ±0.01 inch right of centerline of indicator rivet.
3. Rudder Index Plate Removal/Installation on Airplanes without Centerline Indicator Rivet
   A. Equipment and Materials
      (1) Shock Absorber (Bungee) Cord - 1/4 or 3/8 inch diameter, MIL-C-5651, Type I (Ref 20-30-51)
      (2) Nylon Lacing Tape 0.090 inch thick - MIL-T-43435 (Ref 20-30-51)
   B. Remove Rudder Index Plate (Fig. 401)
      (1) If existing tail cone will be reinstalled, place a piece of tape on tail cone next to rudder index plate and mark exact position of index plate tab.
      (2) Remove screws and washers and remove index plate.

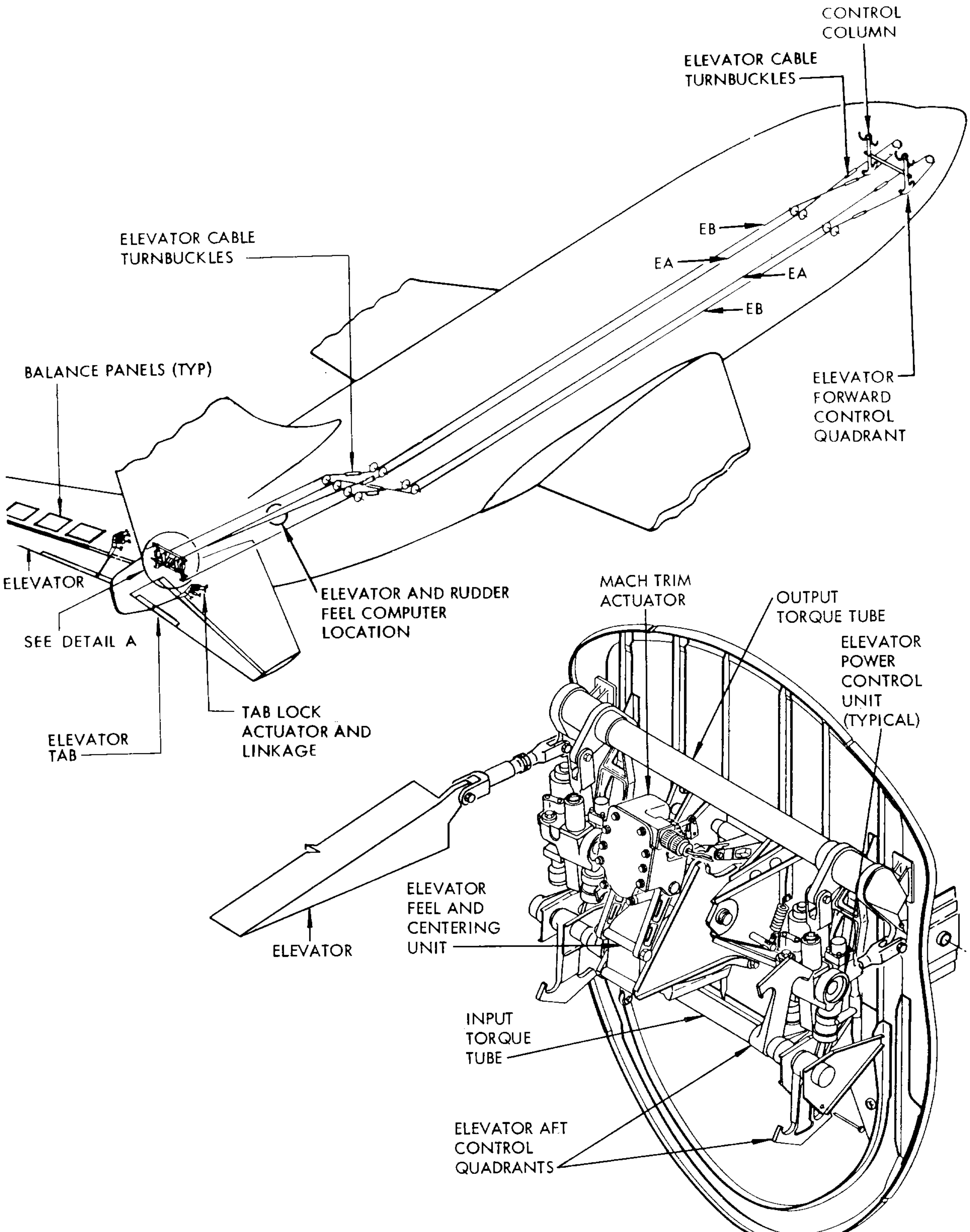
C. Prepare to Install Rudder Index Plate
   (1) Faired position of rudder is found by using a bungee cord arrangement as shown on Fig. 401. Two cords of equal length, each having a loop at one end, are tied together at opposite end. Strung on each side of rudder and fin, 1oops are hooked around pitot tubes, giving cords a fair amount of tension to ensure cords do not sag.
   (2) By viewing rudder and cords from behind rudder trailing edge, moving rudder slowly back and forth by hand, it is possible to determine rudder location left and right where cord is separating from rudder and fin surface. Project rudder trailing edge onto tail cone and mark at these two locations. Halfway distance between marks is airplane centerline.
D. Install Rudder Index Plate (Fig. 401)
   (1) On existing tail cone, install new index plate with washers and screws such that index plate tab aligns with mark on tape. Remove tape from tail cone.
   (2) If new tail cone has been installed, install index plate with washers and screws such that left edge of tab is 0.08 ±0.01 inch left of airplane centerline (Configuration A) or install index plate with washers and screws such that right edge of tab is 0.58 +0.02/-0.01 inch from centerline of right mounting screw (Configuration B).



Rudder Index Plate Installation
Figure 401

ELEVATOR AND TAB CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The elevators provide primary pitch control of the airplane about its lateral axis and respond to control column inputs through two independent hydraulic systems. In the event of dual hydraulic failure, a manual reversion mode will allow the elevators to be driven directly through a mechanical control system. Aerodynamic elevator tabs are provided to assist elevator movement during manual reversion mode. Air loads on the system are further reduced by aerodynamic balance panels attached to each elevator.
   B. The elevator control system is activated by fore and aft motion of the captain's and first officer's control columns. A torque tube, with a forward control quadrant mounted at each end, interconnects the control columns. A pair of elevator control cables attach to each forward control quadrant. The elevator up cables (EB) are secured at the quadrants and then routed aft under the floor to the aft control quadrants (Fig. 1). The elevator down cables (EA) are routed forward from the control quadrants, around a pair of pulleys, then aft along the fuselage to the aft control quadrants. The control cables are rigged over pulleys to minimize flexing and prevent chafing. The aft quadrants are mounted on the input torque tube in the empennage, aft of the stabilizer rear spar. The elevator hydraulic power control units for left and right elevators are linked between the input torque tube and the output torque tube and provide power to rotate the elevators during power mode.
   C. The elevator control system is also activated by the autopilot (Ref Chapter 22, Autoflight).
   D. Hydraulic power is supplied to the elevator control system from hydraulic systems A and B at a pressure of 3000 psi. Hydraulic fluid flow is controlled by flight control shutoff valves located in the flight controls modular packages in the main wheel well.
   E. Elevator feel is provided by a feel computer and a feel and centering unit. The feel computer provides varying hydraulic system A and hydraulic system B pressure inputs to the feel and centering unit. The feel and centering unit then applies a resistance at the aft control quadrants to simulate elevator aerodynamic forces.
   F. The power control units respond to control system inputs to rotate the elevators. The control units provide the stops which limit elevator rotation and tab displacement and also provide snubbing action on the ground to protect the elevators from wind gust damage.
   G. A tab lock actuator in each stabilizer locks the elevator tab faired with the elevator chord plane during power mode. In the manual reversion mode with the actuator depressurized, the tab acts to assist elevator movement.



Elevator Control System Component Location
Figure 1

H. A flight controls hydraulic low pressure warning system provides an indication of elevator, aileron and rudder low pressure. Common warning lights are displayed on the forward overhead control panel and on the lightshield. A feel pressure differential amber light is provided on the forward overhead control panel. The light will illuminate when an undesirable pressure difference exists between the feel computer output pressures. A stall warning shaker is fitted to the captain's control column.

I. Additional reliability is provided by duplication of certain mechanical and hydraulic components within the elevator and tab control system.

2. <u>Elevator</u>

A. Each elevator is an aluminum alloy frame structure consisting of leading and trailing edge spars, ribs, and a fiberglass skin or of graphite/epoxy construction with upper and lower skins of graphite/epoxy tape and Nomex honeycomb core. A rectangular cutout is provided towards the inboard portion of the elevator trailing edge for installation of the tab. A balance horn is incorporated forward of the hinge line at the outboard tip of each elevator for the purpose of installing balance weights.

B. Each elevator is attached to the stabilizer by means of six hinge fittings, the second hinge from inboard serving as a thrust hinge. The leading edge of each elevator extends forward between the hinge fittings and connects to the three balance panels. The two elevators are physically linked together through the output torque tube.

C. The elevator and elevator tab are independently balanced. The elevator is statically balanced as a component. The elevator tab is balanced into the elevator by adding or removing tab adjust weights on the elevator nose. The number of weights required is a function of the weight of the elevator tab.

D. Seals are situated along each elevator inboard rib, between the elevator and tail cone. The seals are a dacron and silicone rubber composition, and are used to minimize airflow between the upper and lower surfaces of the elevator.

3. <u>Elevator Tabs</u>

A. The elevator tabs are of fiberglass honeycomb or of graphite/epoxy construction (Fig. 1). Each tab has an aluminum alloy (fiberglass on early tabs) leading edge spar which provides the mounting for the four hinge fittings and the tab mast. No balancing is required for the tabs.

B. During manual reversion mode the tab lock actuators are depressurized and the tabs travel in a balance direction to assist elevator movement. During power mode the actuators extend to change the geometry of the tab lock linkages. This places the tabs in a faired position relative to the elevator for any elevator position. (See figure 6.)

C. The elevator tab may be replaced without rebalancing the elevator. Each tab is furnished with adjust weights that bolt to the elevator nose. The required number of tab adjust weights is stamped on a data plate attached to each elevator tab. The number of weights required is a function of the weight of the elevator tab.

4. <u>Elevator Balance Panels and Seals</u>

A. The elevator balance panels (figure 2) assist elevator movement by utilizing aerodynamic forces created when the elevators are displaced from neutral. The three balance panels are attached by means of hinges to the leading edge of each elevator. An idler hinge panel interconnects the forward edge of each balance panel to structure within the stabilizer and provides the necessary articulation of the panel. The panels are fabricated from clad aluminum sheet. Each balance panel is located in a separate bay between the ribs within the stabilizer.

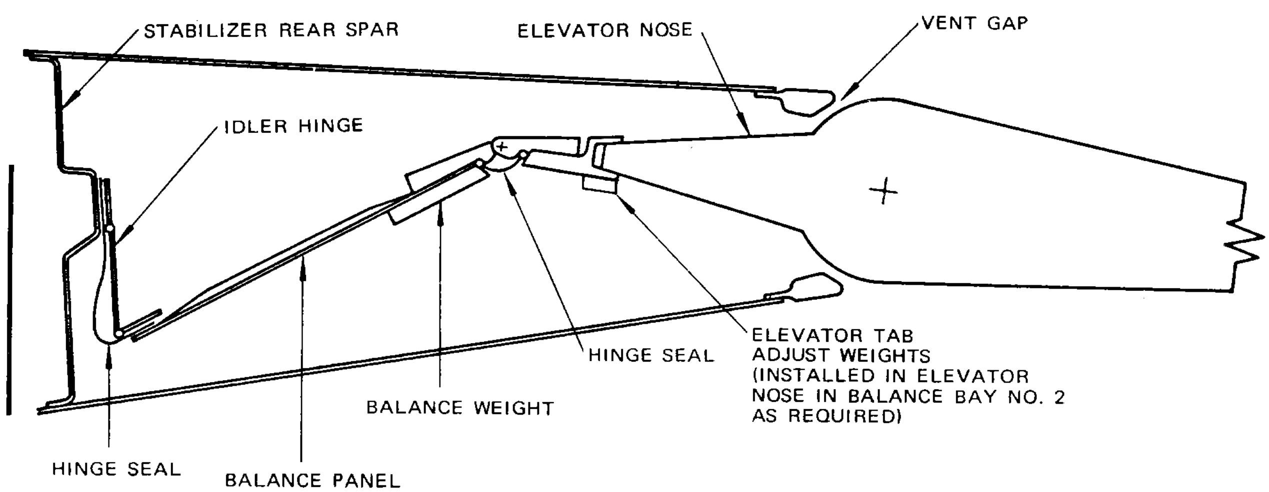
B. Movement of the elevator during flight in either direction from faired, causes a pressure differential between upper and lower balance bays. This pressure acts upon the balance panels to assist elevator movement.

C. Access to the balance panels is through the balance bay access panel on the underside of the stabilizer. Balance weights are attached to the aft surface of each balance panel.

D. Seals are situated around the periphery of the balance panels and idler hinge panels and across the lower surfaces of the hinges. The seals are a dacron and silicone rubber composition and are used to minimize air flow from one side of the balance panel bay to the other.

5. <u>Control Columns</u>

A. The two control columns (Fig. 3) provide primary control of the airplane about the pitch and roll axes. Forward and aft motion of either control column actuates the elevators to provide control of the airplane about its lateral axis. Rotating a control wheel on either column operates the ailerons and spoilers to provide control about the longitudinal axis.



Elevator Balance Panel Schematic
Figure 2

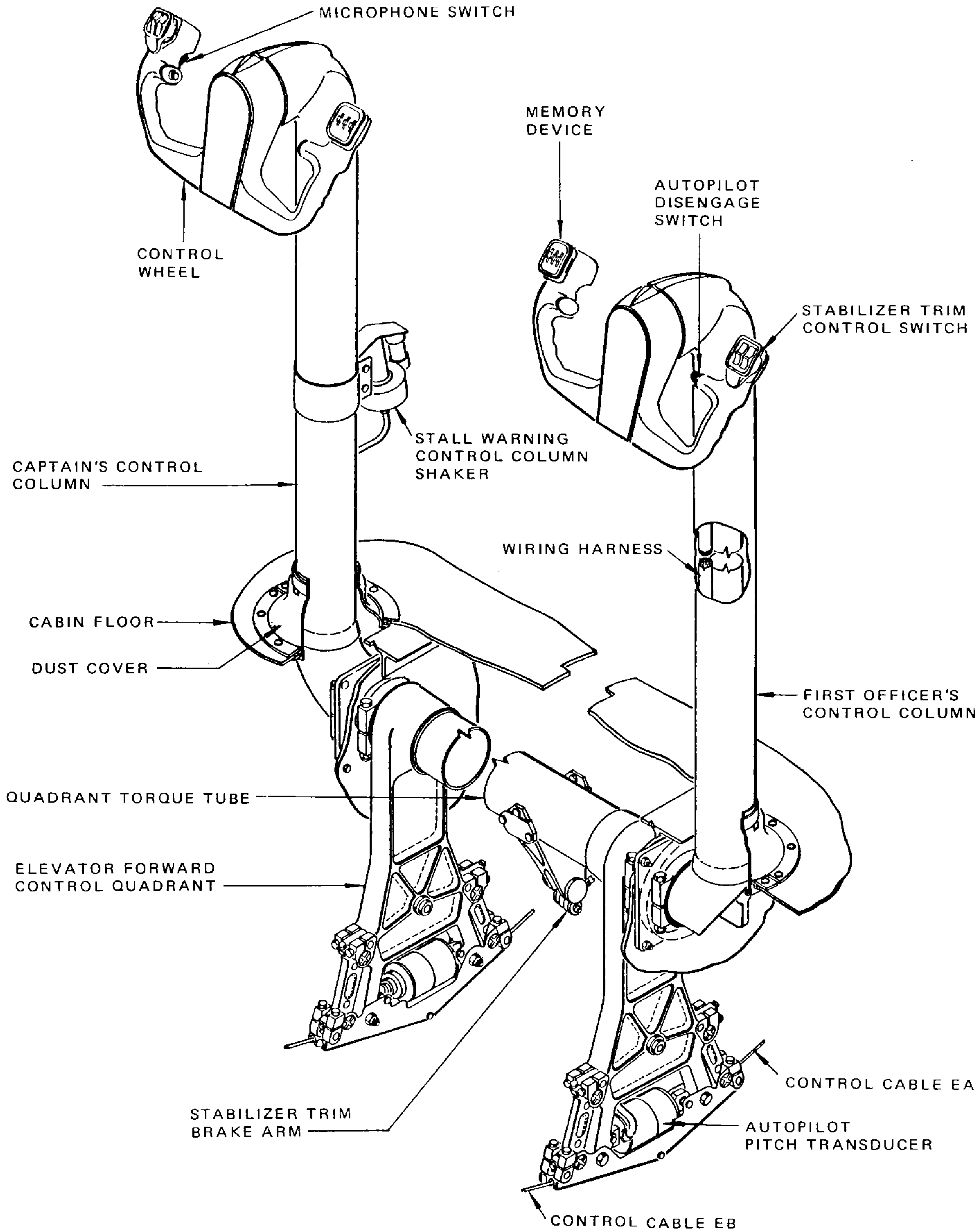
B. The control columns are mounted at each end of the quadrant torque tube. Motion is transmitted from the column to the torque tube through mating face splines. The lower end of a shaft inside each column outer housing is connected to the aileron and spoiler control systems through a spade universal. A bevel gear located at the upper end of this shaft is driven by a mating bevel gear connected to the control wheel. The control column wiring harness originates at a terminal block in the lower nose section and is routed up through a conduit inside the control column outer housing. At the top of the column the wire bundle is wrapped loosely four times around the hub of the control wheel bevel gear and then routed inside the control wheel. The wires for the stabilizer trim control switch, autopilot disengage switch, and microphone switch, are routed to the outboard horn of the control wheel. At the outboard horn, the wires are then connected to the appropriate switches. The wires for the stabilizer trim control switch are first routed to a terminal block in the control wheel spoke and then to the control switch. A memory device, consisting of three rotatable digital readout discs, is incorporated in the inboard horn of the control wheel. The wires for the memory device light are routed through the inboard horn of the control wheel. A stall warning shaker is mounted on the forward face of the captain's control column. Wiring provisions for the stall warning shaker are also included in the control column. Felt dust seals are fastened to the control cabin floor. A spherical dust cover fastened to the column, contacts these seals to restrict airflow around the base of the control column.

6. Elevator Forward Control Quadrants

A. The elevator forward control quadrants are aluminum alloy forgings, suspended from the quadrant torque tube and located in the lower nose section (Fig. 3). The elevator control cables are located in grooves along the lower surface of each forward control quadrant. Each cable is secured at the quadrant. A pitch transducer is installed in each forward control quadrant. For more detailed information, refer to Chapter 22, Auto Flight. Access to the forward control quadrants is through the forward access door at station 211, just forward of the nose wheel well door.

7. Elevator Aft Control Quadrants

A. The elevator aft control quadrants are four individual segments mounted on the input torque tube in the empennage. (See figure 1.) The two upper segments are connected to the elevator up cables (EB) and the lower segments to the elevator down cables (EA). Aft movement of the control column will displace the elevator up cables (EB) forward, and forward movement of the control column will displace the elevator down cables (EA) forward.



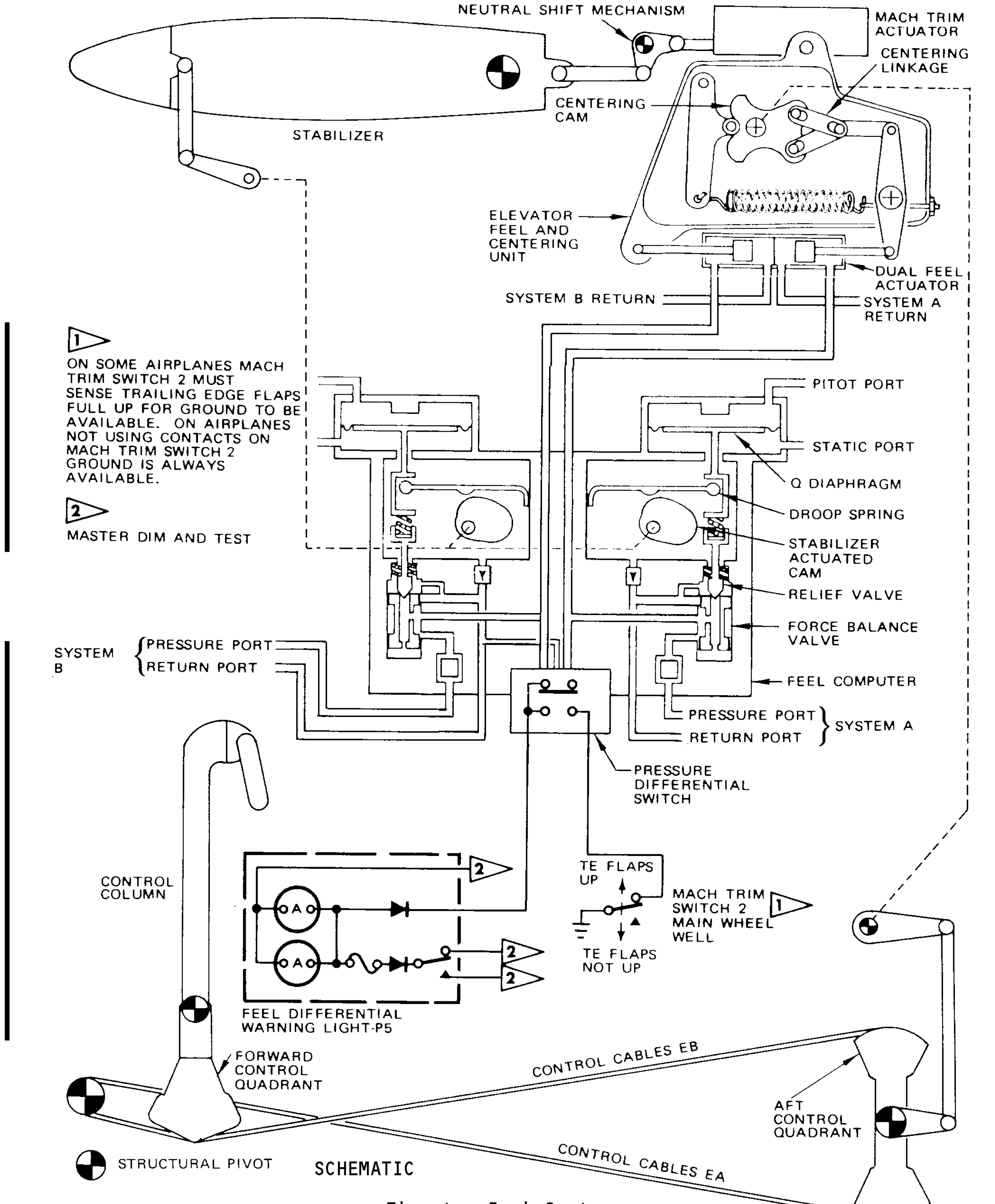
Control Columns
Figure 3

8. Elevator Feel Computer

A. The elevator feel computer supplies controlled system A and system B hydraulic pressures to the elevator feel control unit. The feel computer is mounted to structure within the empennage, adjacent to the stabilizer front spar. (See figure 4.) The computer is a dual unit, its housing divided to accommodate identical components for system A as for system B. Internal components for each system include a Q-diaphragm, force balance valve, relief valve and a stabilizer actuated cam. Also housed within the unit body is a feel differential pressure switch.

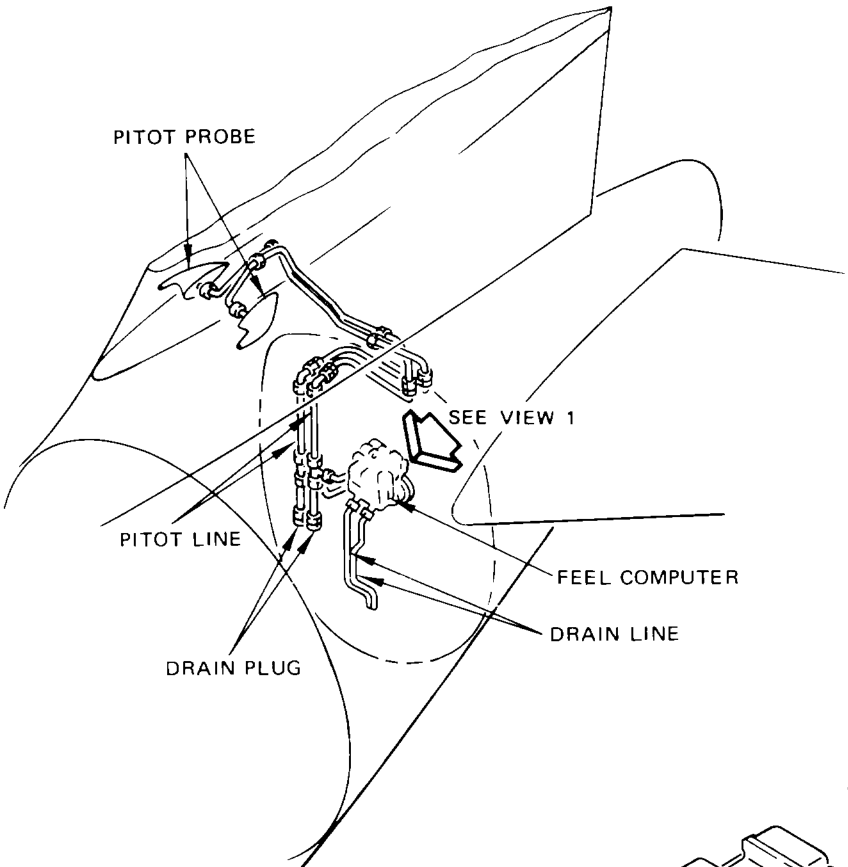
B. Inputs to the feel computer are hydraulic system A and hydraulic system B pressure at 3000 psi, pitot pressure, static pressure and a stabilizer position mechanical input. Pitot pressures are directed to each system from individual pitot tubes on the vertical stabilizer. The outputs from the feel computer are two controlled hydraulic pressures, 200 to 2100 psi, to the feel control unit. The internal feel differential pressure switch illuminates an amber light on the overhead panel when an undesirable pressure difference exists between the two feel computer output pressures.

C. The two output pressures from the computer are controlled by pitot pressure and stabilizer position. With the feel system pressurized, the force balance valve is hydraulically displaced to limit system pressure. Pitot pressure acting upon the Q-diaphragm, meters the flow by displacing the force balance valve until it contacts the droop spring and stabilizer actuated cam. As pitot pressure increases, the Q-diaphragm will deflect the droop spring and move the force balance valve to increase pressure to the feel control unit. Changes in stabilizer position will rotate the stabilizer actuated cam and reposition the droop spring. A relief valve provides protection against excessive pressure in the feel system. The valve will relieve at 40% above computer demand pressure.

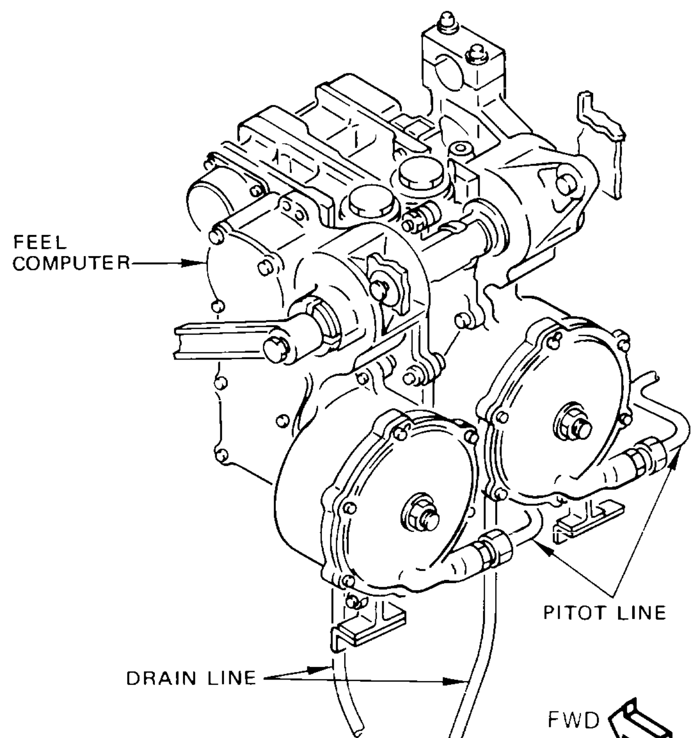


SCHEMATIC

Elevator Feel System
Figure 4 (Sheet 1)



PITOT STATIC SYSTEM



VIEW 1

Elevator Feel System
Figure 4 (Sheet 2)

9. Elevator Feel and Centering Unit

A. The elevator feel and centering unit (Fig. 4) provides artificial feel to the pilot and centering for the elevator control system. The feel and centering unit is mounted to structure aft of the stabilizer rear spar and pivots about a lateral axis. The unit consists of a centering cam and roller assembly, centering linkage and an externally mounted dual feel actuator. The feel and centering unit receives two hydraulic inputs from the feel computer. The inputs act upon pistons within the free-floating dual feel actuator. A rod from one piston attaches to the feel and centering unit body. A rod from the opposing piston attaches by means of centering linkage to the feel control centering cam and roller assembly. The feel and centering unit neutral position changes as stabilizer attitude varies. Variations in stabilizer attitude are transmitted through the neutral shift mechanism to rotate the feel and centering unit about its lateral axis. A mach trim actuator is mounted on top of the feel and centering unit. The actuator output rod is linked to the horizontal stabilizer through the neutral shift mechanism. The mach trim actuator and rod function as part of the neutral shift linkage except when the mach trim system is operating. Mach trim command signals extend or retract the actuator output rod. This action provides a mechanical input to rotate the feel and centering unit and thereby reposition the elevators. If the autopilot system is engaged, a neutral shift sensor driven by movement of the feel and centering unit provides electrical signals to the autopilot system which causes the elevators to be repositioned.

B. Actuation of the control columns in either direction will rotate the centering cam and force the roller up the face of the cam. A change in stabilizer position with the control columns held fixed, will rotate the feel and centering unit body and also force the roller up the face of the cam. Either action places a load on the control system and artificially provides feel at the control columns. The resulting load is removed by rotating the control columns forward or aft to run the roller back into the cam detent. A change in stabilizer position with the control columns free to move, will allow the roller to remain in the cam detent and cause the control columns to move to the neutral position.

10. Elevator Power Control Unit

A. Two elevator power control units (Fig. 5) provide actuation of the elevators in response to manual inputs from the control columns. The control units are mounted vertically in the empennage above the aft elevator control quadrant torque tube (Fig. 1). The two control units operate independently from separate hydraulic systems, the left unit from hydraulic system A pressure and the right unit from hydraulic system B pressure. The lower mounting terminals of each unit are attached to structure. The upper mounting terminals attach to lugs on the output torque tube, which is directly linked by pushrods to each elevator. Failure of either hydraulic system will render one control unit inoperable. The remaining unit will then drive both elevators through the full range of travel.

B. Each elevator power control unit (Fig. 5) incorporates a main actuator, a gust damping bypass valve, a thermostatic flow control valve (replaced by plug on later units), filters, and a dual concentric main control valve operated by a dual input crank. The main control valve comprises a primary slide acting within a secondary slide. The secondary slide will permit control, should the primary slide become jammed in an open position. An exterior input rod provides actuation of the main control valve from the aft elevator quadrant torque tube.

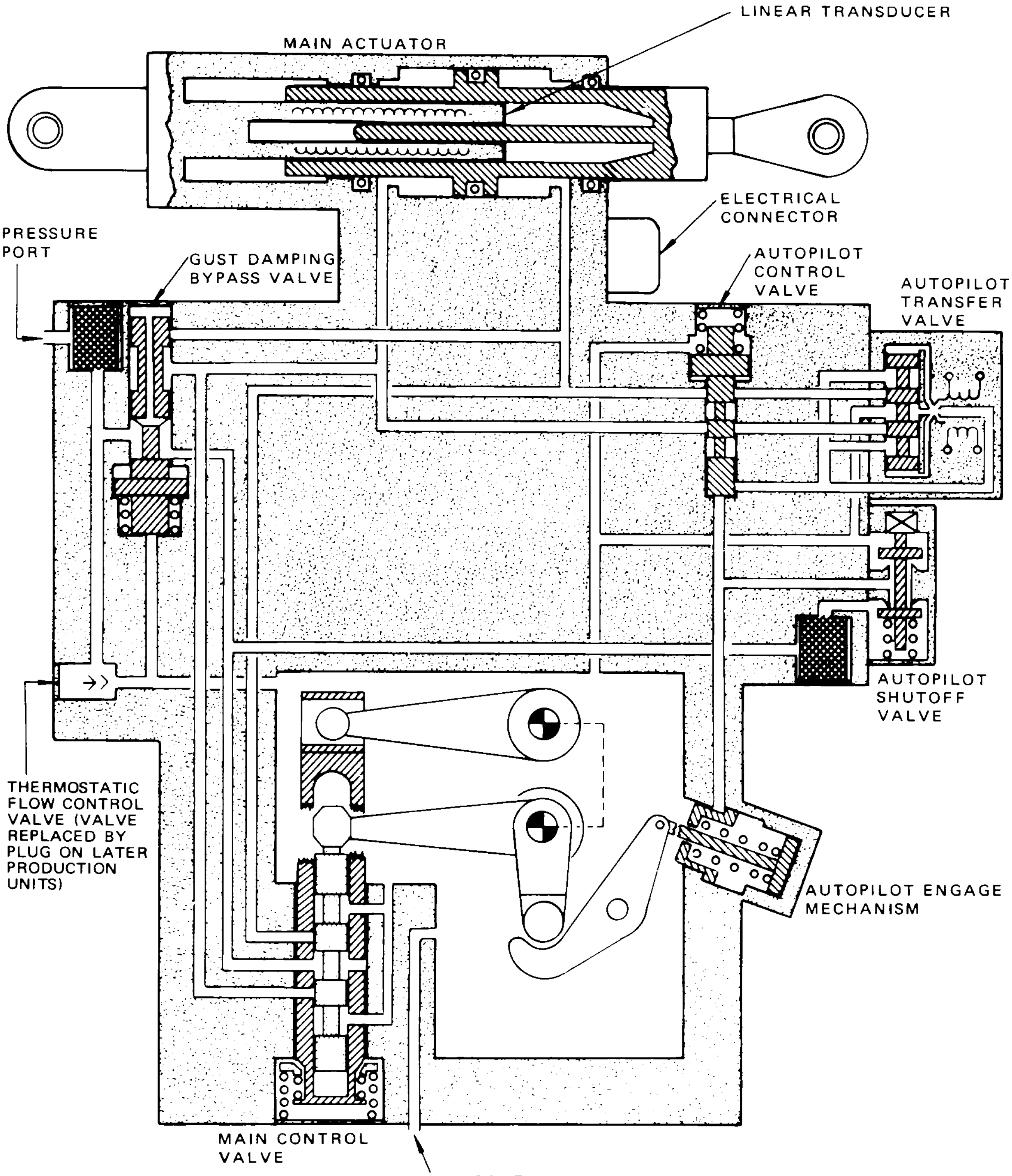
C. Forward or aft movement of the control columns rotates the input torque tube and applies an input to the power control unit input crank. As the input crank displaces the main control valve slide, hydraulic pressure is directed through the valve to move the main actuator piston. Movement of the input crank in the opposite direction displaces the main control valve slide to route hydraulic pressure to the other side of the main actuator piston. The actuator piston rod end is attached to structure, thereby causing the power control unit body to extend or retract. Movement of the power control unit will return the input crank to neutral and close the main control valve.

D. On all airplanes, the right power control unit is equipped to receive input from the autopilot. The left power control unit also is equipped to receive input from the autopilot on some airplanes, on other airplanes the autopilot equipment is deleted from the left power control unit. For autopilot equipment in the power control units, refer to Chapter 22, Autoflight. On power control units with equipment to receive autopilot input, the following applies:

(1) Engaging the autopilot actuates a solenoid to open the autopilot shutoff valve. The shutoff valve directs hydraulic pressure to the autopilot engage mechanism and the autopilot control valve. Actuating the engage mechanism holds the main control valve closed by locking the manual input crank. The engage mechanism is spring loaded to allow manual override of the autopilot system. A control column or feel control unit input, equal to 23-pound control column force, will allow the input crank to override the engage mechanism spring pressure. Hydraulic pressure at the autopilot control valve, displaces the spring-loaded control valve slide and applies pressure to the transfer valve. The transfer valve slide is displaced by position signals from the pitch channel of the autopilot. Hydraulic pressure is thus directed through the control valve to extend or retract the main actuator piston. As the transfer valve slide moves in the extend direction, the retract port is opened to return. Extension of the main actuator piston displaces hydraulic fluid from the retract side of the piston to return. Disengaging the autopilot de-energizes the solenoid and closes the shutoff valve. Hydraulic bleed at the transfer valve depressurizes the autopilot system and allows the control valve to close. The control valve prevents loss of pressure through the transfer valve when the power control package is operating with the autopilot disengaged.

11. <u>Elevator Tab Lock Mechanism</u>

A. The elevator tab lock linkage provides tab-assisted elevator movement when the elevators are operated in the manual mode and provides lockout of the tab in faired position when the elevators are operated in the power mode (Fig. 6). There are two tab lock linkage mechanisms, one for each elevator, consisting of a pushrod bellcrank mechanism and lock actuator. The mechanism is located inside the horizontal stabilizer elevator balance bays aft of the stabilizer rear spar. The mechanism is attached at the forward end to the inside lower surface structure of the stabilizer and is hinged at the aft end to the elevator front spar. The forces are transmitted by the bellcranks and pushrods to the elevator tab.



NOTE: ON SOME AIRPLANES, THE AUTOPILOT EQUIPMENT IS DELETED FROM THE LEFT POWER CONTROL UNIT.

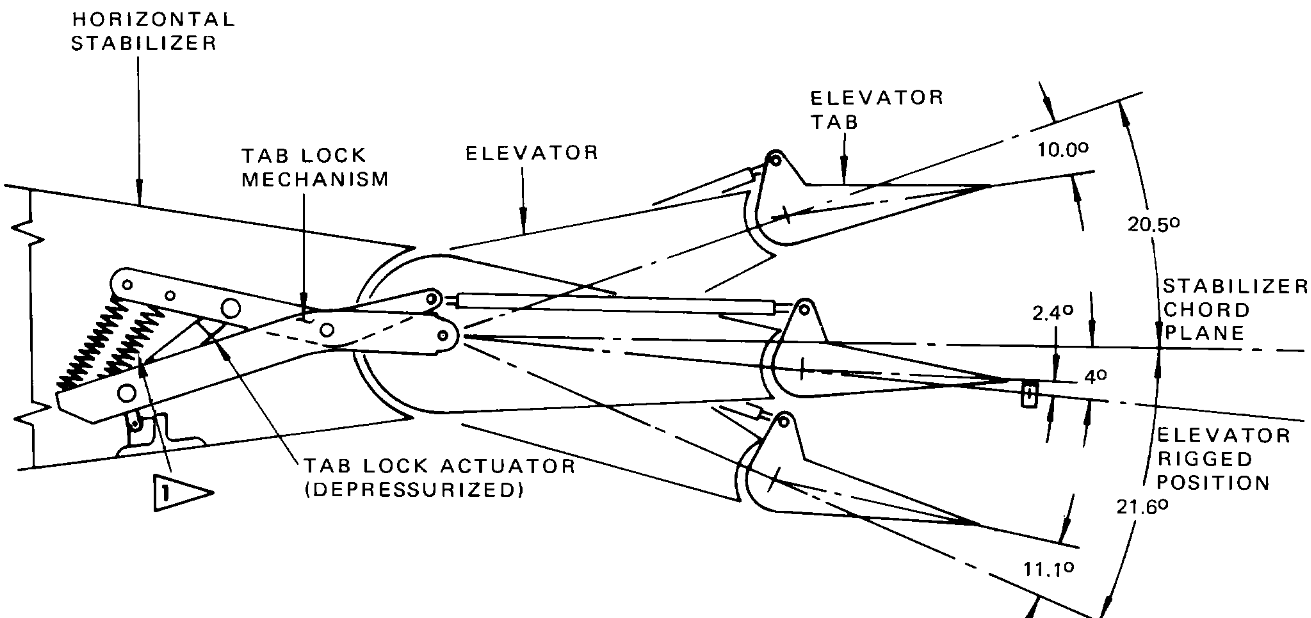
Elevator Power Control Unit Schematic
Figure 5

B. During power mode operation, the lock actuator is extended by hydraulic power to position the tab lock mechanism against the spring force so that the centerline of the tab pushrods forward attachments are in alignment with the elevator hinge centerline. This causes the elevator tabs to remain faired with the elevator as the elevator and tab pushrods rotate about a common hinge centerline when the elevators are deflected. During manual mode operation, hydraulic power is removed from the tab lock actuator and the springs on the lock linkage mechanism compress to reposition the bellcranks and the pushrods with respect to the elevator hinge centerline so that elevator movement will cause tab deflection.

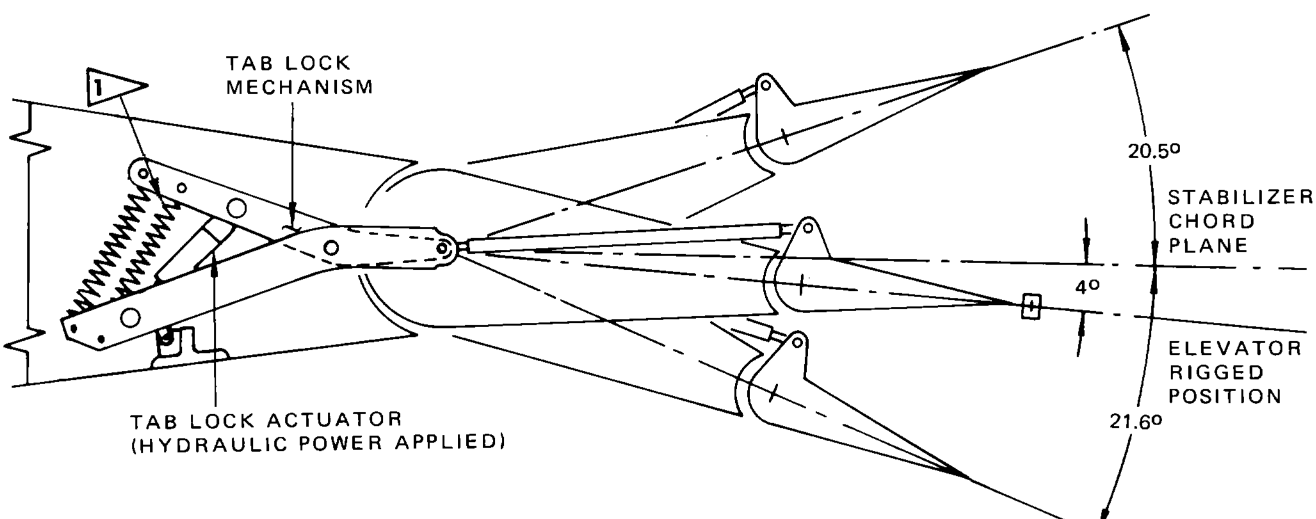
12. Operation

A. The elevators may be operated manually by means of mechanical linkage, or hydraulically using system A and system B hydraulic pressure (Fig. 7). Forward or aft movement of the control columns transmits motion through two sets of control cables to the aft control quadrants. Motion is then transmitted through a pair of input rods and cranks to the power control units. This mechanical linkage from the control columns is utilized during either manual or hydraulic operation. During manual operation, the power control unit input cranks contact stops and use the power control units to mechanically drive the linkage to the elevators. Elevator neutral position relative to stabilizer is determined by stabilizer attitude. The range of elevator neutral shift varies with mach trim actuator position. With the stabilizer at 3 units of trim, the elevator neutral position is 4 degrees down from faired. As the stabilizer leading edge moves down the elevator neutral position moves up. When the stabilizer moves to 13 units of trim, the elevator neutral is at zero degrees, and with the stabilizer at 17 units of trim, the elevator neutral is 2-3/4 degrees up. Elevator maximum travel with the stabilizer at zero units is 20 degrees up and 22 degrees down.

B. Hydraulic system A and B pressures to the power control units, feel computer and tab lock actuators are regulated by the flight controls hydraulic modular units, located in the main wheel well. The modular units are electrically operated by two switches on the overhead panel, one switch serves system A, the other switch, system B. Pilots' input causes a rotation of the input crank, which in turn moves the main control valve. Operation of the main control valve allows fluid to pressurize one side of the main actuator piston, causing the power control unit to extend or retract, thereby rotating the elevators up or down. Movement of the control unit in either direction returns the input crank to neutral which closes the main control valve. Elevator feel forces are provided by the dual feel actuator and a spring-loaded centering cam in the elevator feel and centering unit. Feel forces developed are directly proportional to elevator displacement from neutral. Engaging the autopilot will allow autopilot position signals to activate the elevator control system (Ref Fig. 5 and Chapter 22, Autoflight).



MANUAL REVERSION MODE



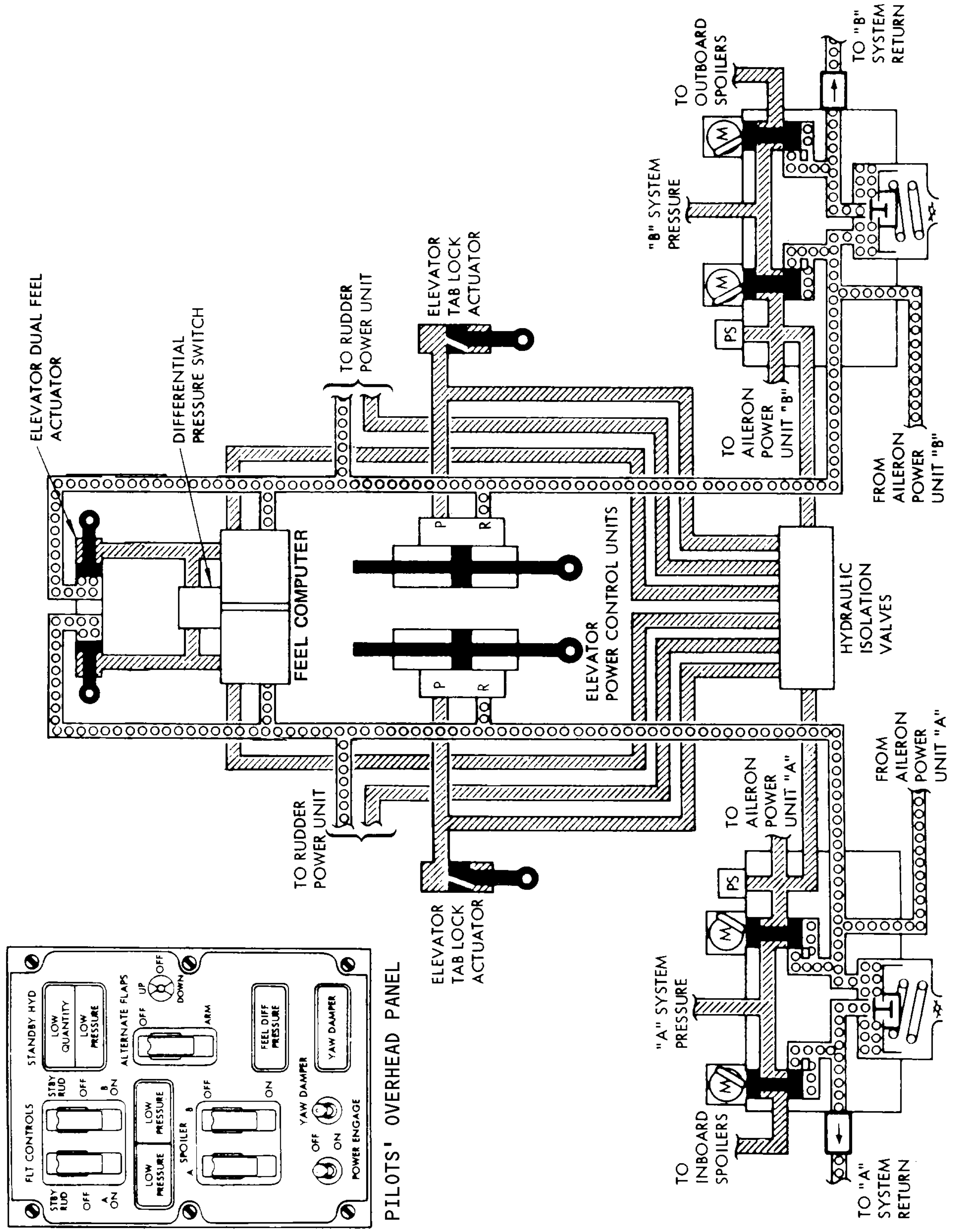
POWER MODE

NOTE 1: ELEVATOR MAXIMUM TRAVELS SHOWN WITH STABILIZER AT ZERO DEGREES

NOTE 2: ANGULAR DIMENSIONS ARE APPROXIMATE

1 NOT INSTALLED ON ALL AIRPLANES

Tab Lock Actuator and Tab Travel Schematic
Figure 6



Elevator Hydraulic System Schematic
Figure 7

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C. In the event of a failure of either hydraulic system A or B, the remaining system is capable of sustaining normal elevator control. A mechanical input from the control columns will be transmitted through the control system to both power control units. The control unit receiving hydraulic pressure will respond when the main control valve is displaced. The depressurized power control unit will be driven by the operating control unit through the output torque tube linkage.

D. In the event of failure of both hydraulic system A and hydraulic system B, a manual reversion mode will allow full elevator control by mechanical means. A noticeable deadband exists when the elevator system is controlled manually. During manual operation, an input to the control system moves the elevator PCU input crank until the crank contacts system stops. Then the PCU serves as a link to drive the elevator. In the manual reversion mode, elevator movement is assisted by tabs and aerodynamic balance panels. With loss of hydraulic pressure, the tab lock actuator is retracted by return springs. This action changes the geometry of the tab lock linkage to allow tab movement in a balance direction, which provides an aerodynamic force to assist elevator movement. As the elevator is displaced from neutral, a pressure differential is generated across the balance panels to reduce elevator control forces. The use of autopilot is not possible when the airplane is in manual reversion mode.

E. A modular assembly consisting of six hydraulic isolation valves is mounted to structure in the empennage, aft of the pressure bulkhead. An isolation valve is installed in each of the system A and B hydraulic lines to the feel computer, the elevator power unit and tab actuator, and the rudder power unit. The valves are manually operated and provide a means of isolating individual hydraulic components for ground leakage and flow tests.

ELEVATOR AND TAB CONTROL SYSTEM - TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Insufficient elevator travel	Elevator control system out of rig	Check for proper rigging of elevator control system (AMM 27-31-0/501)	Rig elevator control system as required
	Foreign objects interfering with elevator system components	Check for foreign objects in area of column, forward and aft quadrants, output torque tube and centering unit. To determine if problem is in centering unit, disconnect centering unit input rod and check elevator travel	Remove foreign objects or interference
	Forward quadrant stops incorrectly installed	With hydraulic power on, first check that column forces are not excessive. Check if quadrant is contacting stops before required travel is obtained	Correct improper installation
	Excessive system feel forces	Refer to troubleshooting item: Excessive force required to move control columns, power on	
Elevator tab travel not within limits Power off *[1]	Improper shimming in tab lockout mechanism	Refer to AMM 27-31-121/401 with power off, check 0.625-inch dimension between tab lock linkage bellcrank in power-on and power-off position	Shim as required to obtain 0.625 ±0.01 inch dimension

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive or low force required to move control columns. Power on (determine forces with elevator force checks AMM 27-31-0/ 501)	<u>NOTE</u>: If excessive force is only in certain portions of elevator travel, probable cause is interference in system or binding due to defective or worn poarts. If excessive force is through the entire travel range, probable cause is in the artificial feel system friction due to worn parts.		

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Column force below minimum tolerance and autopilot travel excession	1) Air pressure leakage in pitot system and/or test equipment	Test pitot lines for leakage (AMM 27-31-212/501)	Repair or seal leaking part
	2) Feel computer computer misrigged due to misindexed feel computer input arm	Inspect input arm alignment with shaft in feel computer by removing input arm retaining bolt. Index pin in shaft should align with missing spline tooth on input arm	Replace feel computer
	3) Hydraulic pressure from feel computer low	Disconnect flexible hydraulic pressure lines and return lines from feel actuator located on feel and centering unit. Attach a hydraulic pressure gage to each of the four lines (range 0-1500 psi). Plug open ports in feel actuator. Set stabilizer B dimension at 41.57 ±0.01 inches. Pressurize pitot system to 0.50 ±0.05 psi. Pressure at pressure lines should be 435 ±35 psi above return line pressure	Replace feel computer
	4) Defective feel actuator	Replace and rerun test per AMM 27-31-0/501, Elevator and Tab Control System	Replace feel actuator
	5) Defective feel and centering unit	Replace and rerun test per AMM 27-31-0/501, Elevator and Tab Control System	Replace feel and centering unit

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Column force excessive	Bad check valve in the flight controls hydraulic modular package	Do a check of hydraulic leakage from the flight controls hydraulic modular package	Replace the flight controls hydraulic modular package (AMM 27-09-200/401)
Column force excessive and autopilot travel below minimum tolerance	1) Feel computer misrigged due to misindexed feel computer input arm	Same as 2) troubleshooting item: Column force below minimum tolerance and autopilot travel excessive	Replace feel computer
	2) System friction excessive	Check elevator centering per AMM 27-31-0. If elevator does not return to neutral, system friction may be excessive. Refer to troubleshooting item: Faulty elevator centering. Check for chafing cables, misaligned or defective pulleys or fairleads foreign objects interfering with cable or control linkage movement. Check for excessive stiffness in the elevator input Torque Tube/Feel and centering unit without binding or rough	Repair or replace defective parts. Remove foreign objects
	3) Hydraulic pressure from feel computer high	Same as 3) troubleshooting item: Column force below minimum tolerance and autopilot travel excessive	Replace feel computer

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	4) Stabilizer trim brake control linkage jammed or binding	Check for interference in operation of stabilizer trim brake or foreign object in trim brake linkage. Disconnect rod between stab trim brake and control column and recheck column force.	Repair or replace defective parts. Remove foreign objects
	5) Defective feel actuator	Replace and rerun test per AMM 27-31-0/501	Replace feel actuator
	6) Defective feel and centering unit	Replace and rerun test per AMM 27-31-0/501	Replace feel and centering unit
Column force and autopilot travel out of limits on one hydraulic system only	Hydraulic pressure from feel computer	Check if feel computer differential pressure switch light is on. If light is not on, check hydraulic pressure from feel computer. Check per 3) troubleshooting item: Column force below minimum tolerance and autopilot travel excessive	Replace feel computer
Column force normal, autopilot travel not within limits	Defective power control unit.	Examine data from Autopilot Authority. Check AMM 27-31-0/501. If travel is not within system A on and B off, problem is with left PCU. If travel is not within limits with hydraulic system A off and B on, problem is with right PCU	Replace power control unit

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive force required to move control columns, power off	Excessive elevator friction or elevators out of balance	Test elevator feel forces balance per instructions in AMM 27-31-0/501 and AMM 27-31-41/401	Replace elevators per instructions in AMM 27-31-41, adjust elevator balance panels, or replace components showing excessive friction
	Binding elevator tab lock linkage	Disconnect elevator tab pushrods and check for worn or defective components	Replace components as necessary, AMM 27-31-121/401. When you install the tab pushrods, discard the old tab rod nuts and install new nuts
Excessive force required to move control columns, power off	Faulty PCU	Individually disconnect lower PCU rod end at structure and manually cycle yoke	Replace faulty PCU as required (AMM 27-31-101/401)
Faulty elevator centering, power on	Excessive friction in elevator control system	Check elevator breakout force at column. If it exceeds 7 pounds for up elevator, or 7.5 pounds for down elevator, system friction may be too high. Check for loose worn or defective parts. Check for rubbing or misaligned cables. Check for foreign objects interfering with system. Check for excessive stiffness in the elevator input Torque Tube/Elevator feel and centering unit support bearings	Replace worn or defective parts. Remove foreign objects

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Defective centering unit	Check elevator breakout force at column. If it is less than 3 pounds for up elevator or 3.5 pounds for down elevator, centering unit may be defective. Disconnect centering unit input rod from lower torque tube. Check breakout force required to move centering unit input crank. Rod force at breakout is 10 pounds minimum and 14 pounds maximum. Move centering unit input crank by hand up and down. Centering of crank should feel stiff with no backlash.	Replace defective feel and centering unit AMM 27-31-151/401
	Elevator control system out of rig	Check for proper rigging of elevator control system (AMM 27-31-0/501)	Rig elevator control system per AMM 27-31-0/501
	Excessive play in elevator surface	Refer to troubleshooting item: Moderate vertical vibration in aft and forward fuselage	
Faulty neutral shift operation, power on	Neutral shift mechanism out of rig	Check for proper rigging of neutral shift mechanism (AMM 27-31-0/501)	Rig neutral shift mechanism per AMM 27-31-0/501
	Defect in neutral shift mechanism	Check neutral shift mechanism for worn or defective components	Replace or repair components as required

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Interference or binding of centering unit	Disconnect centering unit input rod from lower torque tube and mach trim actuator rod end from neutral shift crank (disconnect backlash springs if installed). Rotate centering unit by hand. Movement should be smooth with little effort	Remove interference, replace or repair defective centering unit
	Defective centering unit	Check elevator centering per AMM 27-31-0/501. Refer to troubleshooting item: Faulty elevator centering, power on	
Excessive airplane pitchup or pitchdown when both A and B flight control switches are moved to STBY RUD	Elevator tab out of rig	Check power off tab rig position per AMM 27-31-0/501	Correct improper rigging
Moderate vertical vibration in aft and fwd fuselage, usually above 250 knots indicated airspeed	Excessive play in elevator tab	Check for loose tab hinge fitting, tab horn fitting, worn bushings and/or bearings	Replace worn or defective bearings and/or bushings. Tighten all loose bolts
		Check for insufficient torque on hinge fitting bolts	Tighten all hinge fitting bolts and hinge bolts per AMM 27-31-31/401, Elevator Tabs

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
		Check tab rods for loose or worn rod ends, loose checknuts or loose bolt to rod end connection	Replace worn or defective rod ends. Tighten bolts and checknuts per AMM 27-31-0/501, Elevator and Tab Control System. If you removed the tab pushrods, discard the old tab rod nuts and install new nuts
		Check for loose or worn tab linkage, bearings, bushings and bolts	Replace worn or defective parts
		Check tab free play per AMM 27-31-0/501, Elevator and Tab Control System. Maximum shall not exceed 0.030 inch (measured at inboard end of tab TE)	Replace bushings, bearings and/or bolts as necessary
Moderate vertical vibration in aft and fwd fuselage, usually above 250 knots indicated airspeed	Excessive play in elevator surface	Check elevator free play per AMM 27-31-0/501. Difference between elevator up and down positions shall not exceed 0.160 inch (AMM 27-31-11/601, AMM 27-31-191/601)	
		Check for loose connection in the center of the output torque tube where the inner and outer tubes are connected. To determine if connection is loose, observe if there is relative motion between output crank and outer torque tube	Replace the eight center bolts in the output torque tube with oversize bolts and reduced clearance holes

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Moderate vertical vibration	Excessive play in elevator surface	Check for worn or defective bearings, bushing and bolts at each end of elevator pushrod	Replace worn or defective bearings, bushings and bolts
		Check for worn or defective bushings and/or bearings in the output torque tube, lower torque tube, centering unit input rod, neutral shift linkage and mach trim actuator	Replace worn or defective bearings and bushings
		Check for worn or defective elevator hinge bearings	Replace worn or defective bearings
	Loose or missing vortex generators	Check for loose or missing vortex generators	Repair or replace as required
	Damaged or delaminated tail cone	Check for damaged or delaminated tail cone	Replace or replace as required
	Loose or missing fairings, doors, seals, etc.	Check entire airplane for loose, damaged or missing parts	Repair or replace as required
Elevator feel differential hydraulic pressure light illuminates	Hydraulic system A or B return filters clogged	Disassemble filter and check for debris (AMM Chapter 29) NOTE Clogged hydraulic system return filters can cause illumination of the feel differential hydraulic pressure light by actuation of any hydraulic component.	Clean or replace filter, as applicable (AMM Chapter 29)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Hydraulic system A or B pressure too low or too high	Refer to AMM Chapter 29, Troubleshooting	
	Pitot line to system A or B side of feel computer clogged or leaking		Flush and test pitot lines (AMM 27-31-212, Maintenance Practices and Adjustment/Test)
	Elevator feel computer defective		Replace elevator feel computer (AMM 27-31-131/401)
Oversensitive pitch control in control wheel steering mode (airplane over-reacts to column input)	Cable rig load incorrect	Check rig load on elevator control system	Rerig cables (AMM 27-31-0/501)
	Excessive friction in cable system	Disconnect lower end of pushrods at elevator aft quadrant to power control units and feel and centering unit. If column force exceeds 4 pounds at mid-travel fwd or aft, check that cables clear all structure and do not contact pulley rims	Adjust as required
	Interference at air pressure seals (pressure bulkhead, STA 1020)	Disconnect system as above. With column force exceeded per above check for interference at seals	Replace air pressure seals and align cable thru seals and lubricate (AMM 20-10-101)
	Foreign objects interfering with elevator system components	Disconnect system as above. With column force exceeded per above, check for interference from foreign objects	Locate and remove objects

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Pulley binding on cable guard or bracket	Release tension in elevator control system cables. Check pulleys to see if they rotate freely (pay special attention to pulley installations at STA 1064)	Rework to clear or replace assembly
	Fwd elevator quadrant binding or interfering with floor beam	Release tension in elevator control system cables. Inspect for interference	Eliminate interference
	Fwd elevator quadrant bearings binding	Release tension in elevator control system cables. Check for rough and binding bearings	Replace bearings
	Pitch control wheel steering force transducer misrigged	Check rigging procedure per AMM 22-11-91/501	Rerig
	Sticky flexural pivot on force transducer installation	Remove pivot from installation and inspect for binding	Replace pivot if binding
	Aft quadrant support defective	Release tension in elevator control system cables. Check for rough or binding bearings	Replace bearings

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Elevator power control unit valves sticking	Release tension in elevator control system cables. Check for roughness and binding at input cranks	Replace elevator power control unit (AMM 27-31-101/401)
	Elevator feel and centering unit has excessive play	Check input crank for backlash	Replace feel and centering unit (AMM 27-31-151/401)
Autpilot fails system bite test	Worn rivets in autopilot elevator actuator lever assembly NOTE: Refer to AMM 22-11-0/101, for further autopilot troubleshooting related to oversensitive pitch control in control wheel steering mode.	Hold lever assembly and attempt to rotate at shear rivet area	Remove assembly and replace rivets (OHM 27-09-05)
Control cable tension repeatedly checks low after flight following normal rig procedures	Excessive cable tension relaxation	Check control cable tension (AMM 27-31-0/501). If cable rig load is repeatedly more than 15 pounds below value listed in cable tension chart, cable is worn, or requires rerigging	Rerig control cable as follows: 1. Increase cable rig load listed in cable tension chart (AMM 27-31-0/501) 2. Cycle system 25 times while maintaining increased rig load

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
			3. Reduce cable rig load listed in cable tension chart (AMM 27-31-0/501)
			4. Cycle system 25 times while maintaining normal rig load (Step 3)
			NOTE: Do not allow cable rig load to relax below rig load established in Step 3.
Control cable tension repeatedly checks low after flight following normal rig procedures (Cont)			5. After approx 1 week of service, rig cable to normal rig load (Step 3)
			6. Cycle system 25 times while maintaining normal rig load (Step 3)
		Check control cable for broken wires (AMM 20-20-31/601)	Replace control cable (AMM 20-10-91/401)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Porpoising; During cruise with autopilot engaged, while flying straight and level, oscillation in rate of climb of more than 250 feet per minute & Stabilizer Trim Wheel movement occurs at intervals less than 25 seconds	Related to Autopilot System		Refer to AMM Chapter 22
Occurs on either A or B	Elevator System Friction	Disconnect the Elevator Feel and Centering Unit input rod at the input	Refer to AMM Chapter 22
		Repeat the static friction measurement with the elevator trailing edge positioned 0.10, 0.20 and 0.30 inch above and then below the index mark	Check elevator system friction per AMM 27-31-00/500 System Test elevator surface friction & balance (Task 27-31-00 737-012)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Porpoising on both A and B autopilot static friction force measurement more than 4.5 pounds	Faulty Autopilot Service	Disconnect autopilot servo control rods at lower torque tube, use force necessary to start rotation of each autopilot servo output shaft that is more than 1 inch-pound	Replace autopilot servo that exhibits too much friction force
Use force necessary to start rotation of each autopilot	Faulty bearings	Disconnect elevator PCU input rods at lower torque tube. The attach bearings in the lower torque tube do	Replace faulty bearings
	Cable System	Disconnect all 4 elevator control cables from the forward quadrant, using tool F70321, measure control column static friction which is the minimum force necessary to start a small movement approximately 0.01 inch. Measure the static friction force near the normal column neutral position. Do static friction measurement again with the control column displaced approximately 0.25 and 0.50 inch forward and then aft of the normal neutral position. All friction force mersure-ments have the same value as 0.8 lb.	Make sure pulleys and cable guides, including those over the wings and seals in the aft pressure bulkhead, allow free movement of the cables

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Faulty autopilot servo shear rivets	Check the shear rivets installed in each autopilot servo output arm by passing a lockwire freely through the center of the rivets	
	Contamination	Check elevator balance bays to be sure the seals are adjusted per AMM 27-31-41/501. Make sure that there is no contamination of the walls of the balance bays with grease or anticorrosion compounds	

*[1] Applies to airplanes with four return springs on elevator tab lock linkage (AMM 27-31-121/401),

On all airplanes, right PCU is equipped to receive autopilot signals. Left PCU is also equipped to receive autopilot signals on some airplanes, on other airplanes autopilot equipment is deleted from left PCU.

ELEVATOR AND TAB CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General
   A. The elevator hydraulic systems A and B must be depressurized prior to performing maintenance on elevator control system components. This is to prevent possible injury to personnel working in the area of the elevator and its associated control linkage. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of elevator travel.

      WARNING: PRESSURIZING THE HYDRAULIC SYSTEM ALSO ACTIVATES THE RUDDER, SPOILERS, TRAILING EDGE FLAPS, LEADING EDGE FLAPS, AND AILERON HYDRAULIC SYSTEMS. ISOLATE OR TAG ANY SYSTEM NOT BEING TESTED TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO AIRPLANE AND EQUIPMENT.

   B. When operating hydraulic system B pumps to pressurize A and B elevator systems the following precautions must be taken:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days or when fuel temperature is known to be above 90°F, monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5 - minute period. Following the fifth start run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. During several of the elevator system adjustment and test procedures, it is required that the mach trim actuator be set to the null position. The electrical positioning procedure specified in par. 5 is to be used.
   D. The following procedure covers pressurization of hydraulic systems A and B through operation of electrical-driven hydraulic system B pumps only.
2. Equipment and Materials
   A. Flight Controls Lock Assembly - F80049-12 (Preferred) or F80049-1 (Optional) (2 required for depressurization of elevator hydraulic systems A and B)
   B. Ground Lock Assembly - F72735 (required for pressurization of elevator hydraulic systems A and B)
   C. Elevator Mach Trim Actuator Checking Bar - F80196-1 (required for checking that actuator is in null position.
3. Elevator Hydraulic Systems A and B Depressurization
   A. Depressurize elevator hydraulic systems A and B.
      (1) Position hydraulic pump switches A and B, located in center of forward overhead panel, to OFF. (See figure 201.)
      (2) Check that ground interconnect switch is at CLOSE position.

(3) Position flight controls hydraulic systems A and B switches, located in upper left corner of forward overhead panel, to OFF. (See figure 201.)
(4) Open flight controls circuit breakers located on panel P6.
(5) If any hydraulic components are to be removed, depressurize hydraulic system reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
(6) Move control column fore and aft through full travel to relieve hydraulic system pressure.
(7) Check that manual override lever on flight controls shutoff valve on both flight controls A and B hydraulic modular packages is in position 2. (See figure 202.) Manually place levers in position 2 if required.
(8) Disconnect electrical connector from flight controls shutoff valve motor on flight controls A hydraulic modular package in left wheel well, and from flight controls shutoff valve motor on flight controls B modular package in right wheel well.
(9) Install lock to each of the two flight controls shutoff valves and insert attaching lockpins.

B. Restore airplane to normal.

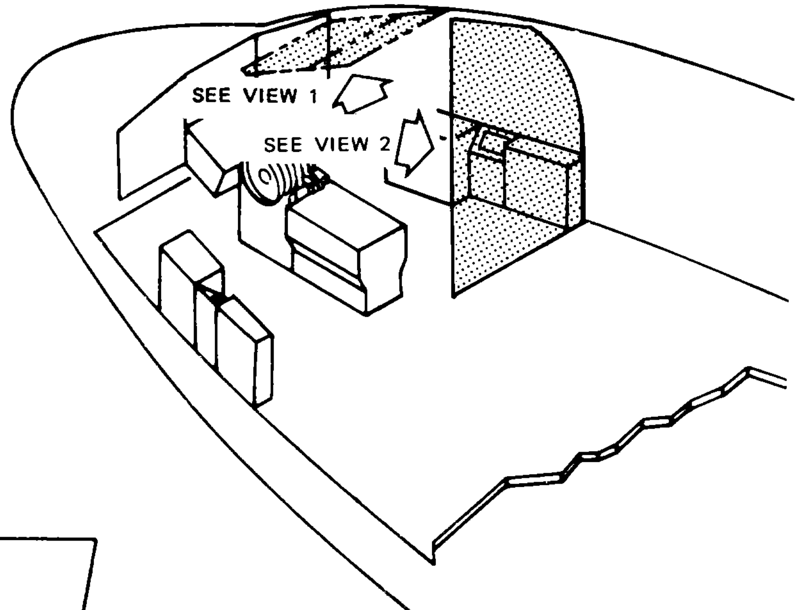
<u>NOTE</u>: Perform following steps after completing elevator control system maintenance that required depressurization.

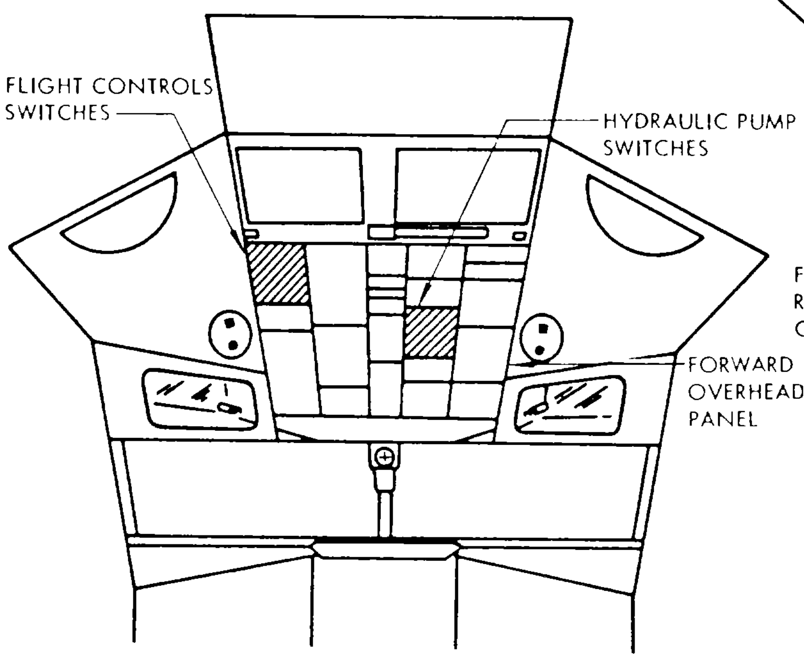
(1) Remove locks from systems A and B flight controls hydraulic module shutoff valve and reconnect electrical connectors.
(2) Position flight controls hydraulic systems A and B switches on forward overhead panel to ON.
(3) Close flight controls circuit breakers on panel P6.
(4) Pressurize hydraulic reservoirs as required. Refer to 29-09-300.

4. <u>Elevator Hydraulic Systems A and B Pressurization</u>

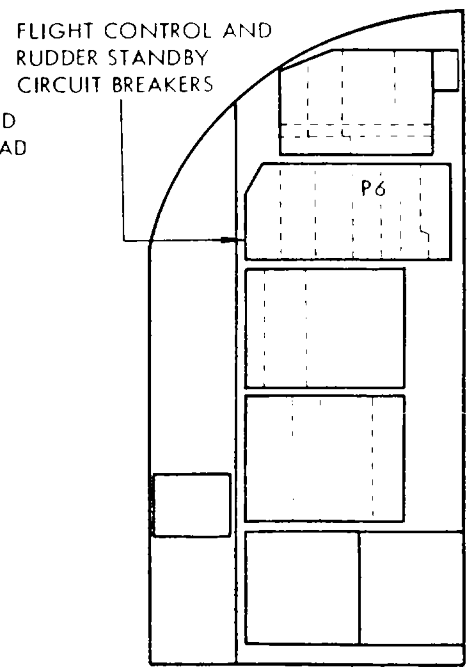
A. Pressurize elevator hydraulic systems A and B.
(1) Install ground lock assembly in nose gear.
(2) Set parking brake.
(3) Provide electrical power.
(4) Position No. 1 or 2 hydraulic system B pump switch, located in center of forward overhead panel to ON.
(5) Position ground interconnect switch on forward overhead panel to OPEN.
(6) Close flight controls circuit breakers on panel P6.
(7) Position flight controls hydraulic systems A and B switches on overhead panel to ON.

<u>NOTE</u>: To energize only one elevator hydraulic system, select by positioning of these switches.





VIEW 1
(LOOKING FORWARD)



VIEW 2
(LOOKING AFT)

Elevator Power Control Switches
Figure 201

B. Restore airplane to normal.

NOTE: Perform following steps after completing elevator control system maintenance that required pressurization.

(1) Position No. 1 and 2 hydraulic system B pump switches to OFF.
(2) Position ground interconnect switch to CLOSE.
(3) Position flight controls hydraulic systems A and B switches to ON.
(4) Remove electrical power, if no longer required.
(5) Remove ground lock assembly from nose gear.

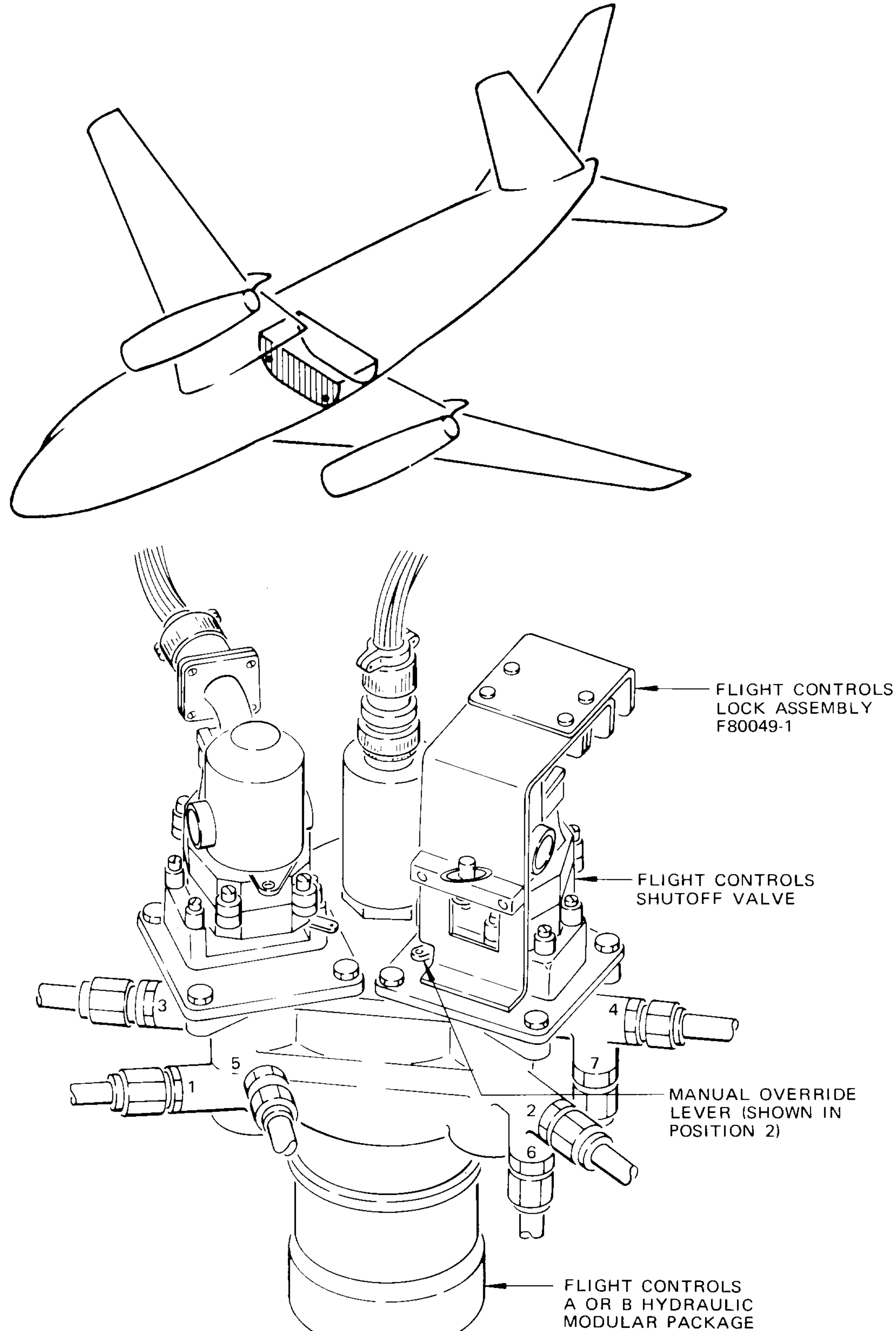
5. Mach Trim Actuator Null Procedure (for elevator system rigging)

A. Insert one mach trim actuator checking bar pin into hole in actuator and rest other pin in bolt head dimple as shown in Fig. 203. If pin can be inserted, actuator is in null position. If actuator is not in null position, use steps B thru J to null actuator.
B. Provide electrical power.
C. Check that mach trim and air data No. 1 circuit breakers on panel P6 are closed.
D. Check that electrical connector is connected to mach trim actuator.
E. On E1-2 shelf in electrical and electronics compartment, connect VTVM to TP-6 (linear synchro feedback) and TP-4 (signal ground) on mach trim coupler with VTVM set to 10-volt ac scale.
F. Place self-test switch of mach trim coupler to position 1 for minimum of 10 seconds. Check that VTVM indicates a reading greater than 4.5 volts ac.
G. Position self-test switch to OFF.
H. Press RESET button on mach trim coupler, intermittently if necessary, to obtain a null on VTVM (100 mv ac maximum).

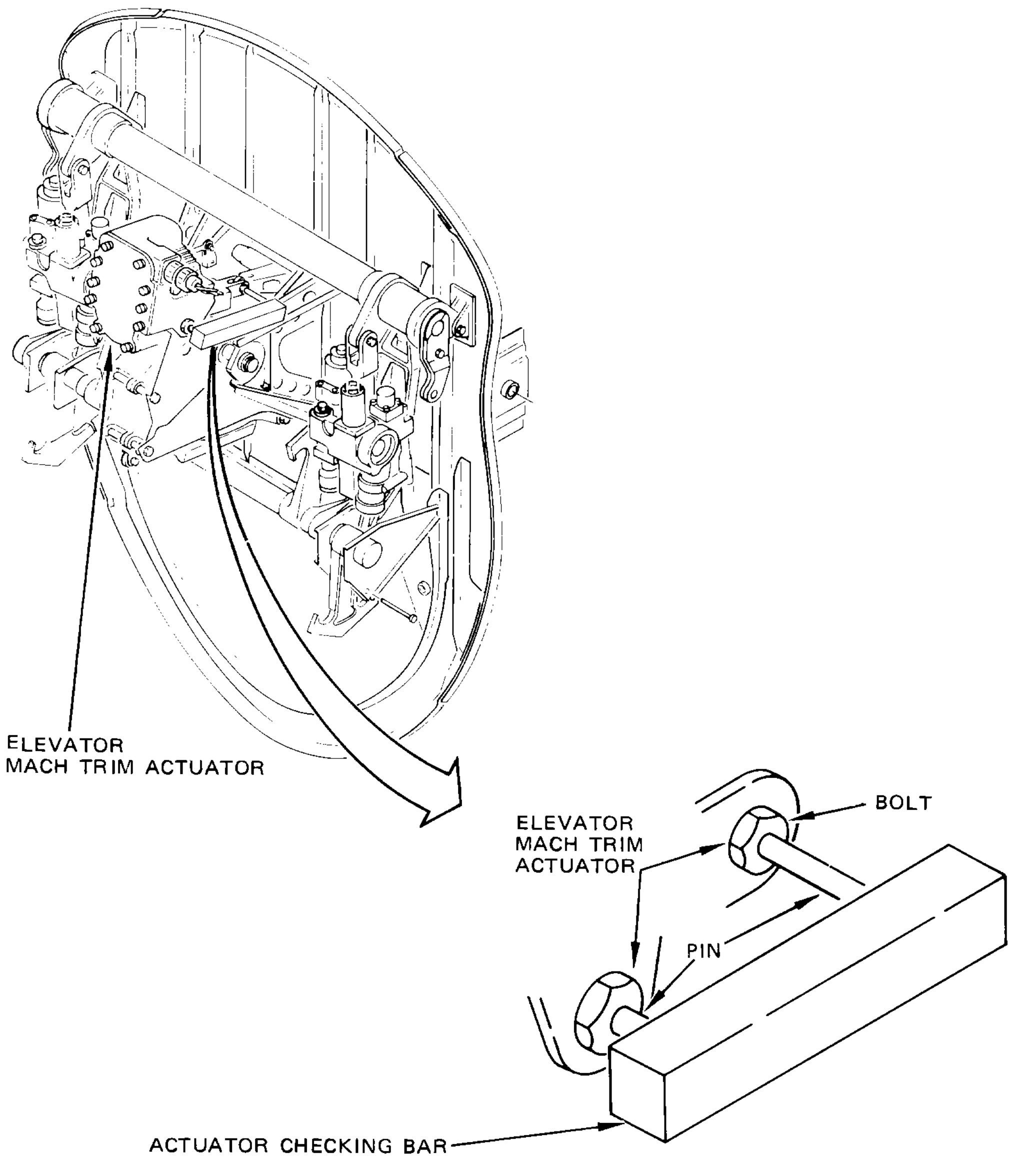
NOTE: If overshoot should occur, repeat the above procedure. Mach Trim Actuator null position can be verified by inserting mach trim actuator checking bar pins into actuator hole as shown in Fig. 203. If the mach trim actuator checking bar pin does not align with the bolt head dimple, it can be necessary to replace the mach trim actuator or the M412 mach trim coupler.

I. Disconnect VTVM from mach trim coupler.
J. Open all circuit breakers closed in step C.

NOTE: Following maintenance practices during which circuit breakers in step C were left open, ensure that same circuit breakers are closed.



Flight Control Hydraulic Modular Lock Installation
Figure 202



Elevator Mach Trim Actuator Checking Bar Installation
Figure 203

ELEVATOR AND TAB CONTROL SYSTEM - ADJUSTMENT/TEST

1. Elevator and Tab Control System Adjustment

A. General

(1) The elevator control system (Fig. 501) is adjusted to synchronize control surfaces and components to the neutral position. Rigging pins assist adjustment of the control system by locking the forward and aft control quadrants in their respective neutral positions. The following procedures adjust the system from fore to aft, giving precedence to major components within the system.

WARNING: ALL FLIGHT CONTROL SYSTEMS ARE FULLY POWERED. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON.

(2) When new elevator control cables are installed in the airplane, cables should be overtensioned and cycled to assist seating in pulleys and quadrants. Tension cables to twice the value specified in Fig. 501 and cycle system 25 times through full travel.

(3) With horizontal stabilizer B dimension set at 41.57 ±0.05 inches and the mach trim actuator in the null position per AMM 27-31-0/201, the elevator and tab control system will be adjusted correctly when the following conditions have been satisfied.

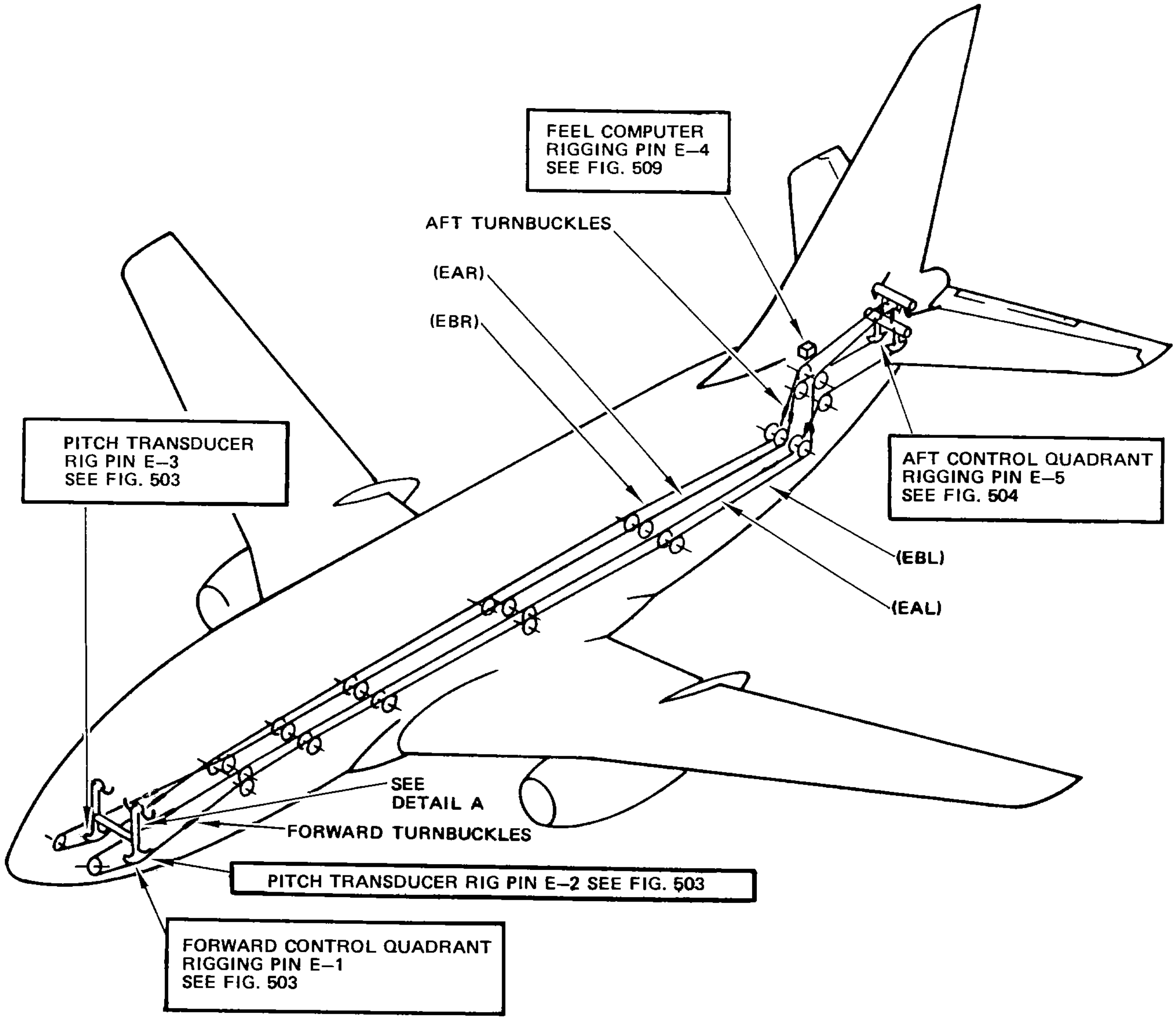
NOTE: The horizontal stabilizer B dimension tolerance requirement is ± 0.04 inch for neutral shift mechanism input rods and ± 0.01 inch for feel computer input rod.

(a) Elevator Control Cables EA and EB and Pitch Force Transducers

1) With rigging pin E-5 installed and easily movable, rigging pins E-1, E-2 and E-3 shall fit easily, cable tension shall be within limits specified in Fig. 501 and pitch force transducer signals shall be as specified in AMM Chapter 22, Pitch Control Wheel Steering Force Transducer - Adjustment/Test. These conditions may be met by adjusting turnbuckles in aft unpressurized compartment or adjusting pitch force transducers per instructions in AMM Chapter 22.

(b) Elevator Control Pushrods

NOTE: This step is required if elevators or the output torque tube have been removed; or if the elevators are not synchronized at neutral.



TEMP °F	RIGGING LOAD LBS ± 10 LBS
+ 110	168
+ 90	159
+ 70	150
+ 50	142
+ 30	134
+ 10	125
- 10	117
- 30	109
- 40	103

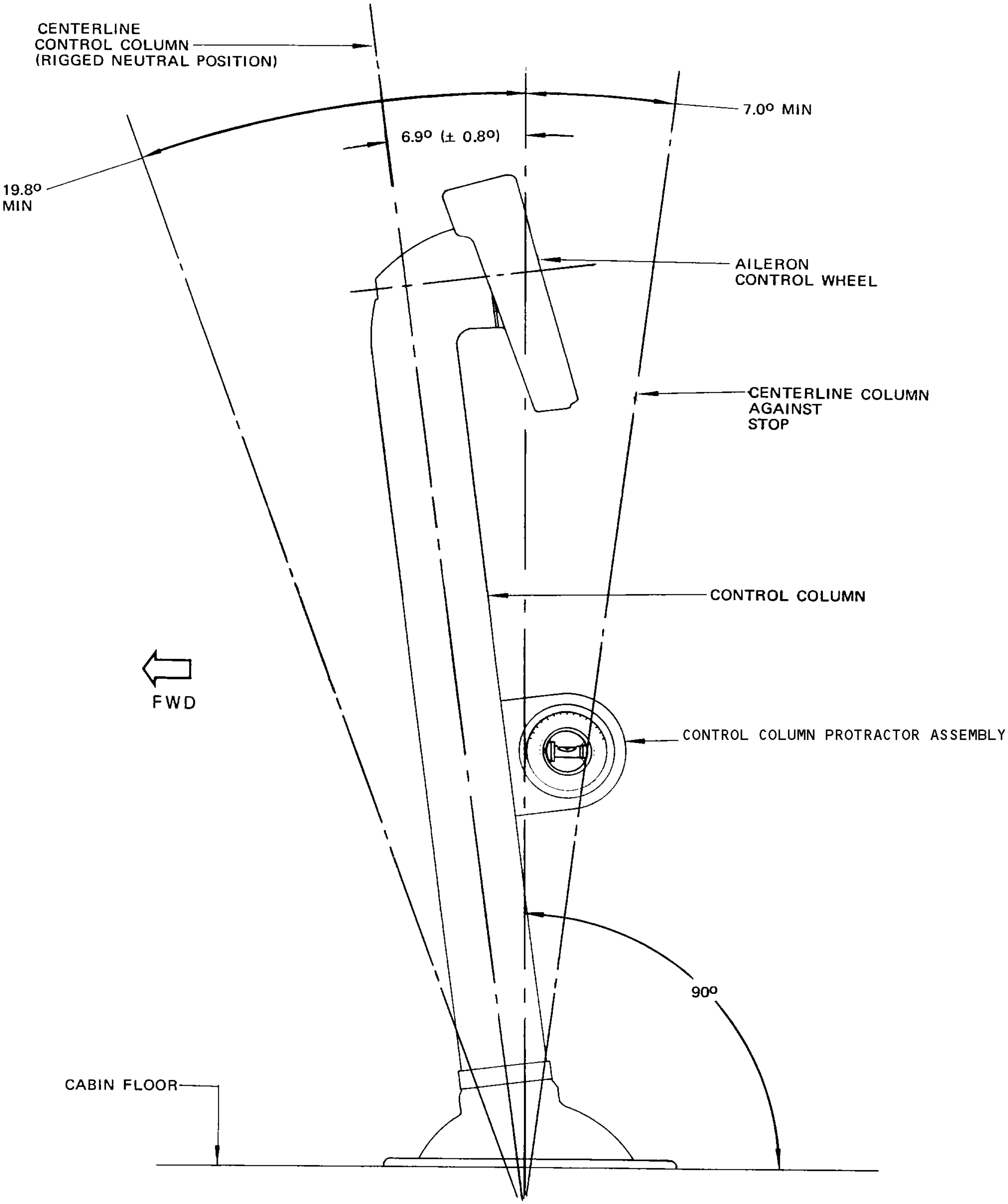
CABLE CODE	FUNCTION
EAL	CAPTAIN'S ELEVATOR DOWN
EBL	CAPTAIN'S ELEVATOR UP
EAR	FIRST OFFICER'S ELEVATOR DOWN
EBR	FIRST OFFICER'S ELEVATOR UP

NOTE:

FOR CABLE TENSION CHECKS THE TENSION MAY DEVIATE ± 15 POUNDS FROM TABLE VALUES. WHENEVER CABLES ARE READJUSTED, TABLE VALUES MUST BE MET.

TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

Elevator Tab Control System Adjustment
Figure 501



DETAIL A

Elevator and Tab Control System Adjustment
Figure 502

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1) With right elevator trailing edge held aligned with tail cone index mark, left elevator trailing edge should align with index mark within 0.12 inch. Alignment may be obtained by adjusting elevator control pushrod per par. C.(2).

(c) Elevator Power Control Unit Input Rod

1) With rigging pin E-5 installed and hydraulic system B pressurized, right elevator trailing edge should align with index mark on tail cone within 0.06 inch. Alignment may be obtained by adjusting right power control unit input rod per par. C.(3).

2) With rigging pin E-5 installed and hydraulic system A pressurized, right elevator trailing edge should align with index mark on tail cone within 0.06 inch. Alignment may be obtained by adjusting left power control unit input rod per par. C.(3).

3) With rigging pin E-5 installed and hydraulic systems A and B pressurized, synchronized operation of the power control units may be verified by alternately switching each system off. Elevator trailing edge shall not deviate more than 0.02 inch. This condition may be met by adjusting input rod per par. C.(3).

(d) Neutral Shift Mechanism Input Rods

1) Dimension between neutral shift crank and bulkhead should be 1.25 ±0.03 inch. Correct dimension may be obtained by adjusting neutral shift input rods per par. C.(4).

(e) Feel and Centering Unit Output Rod

1) With rigging pin E-5 installed, lower bolt hole in feel and centering unit output rod should align with bolthole in aft control quadrant crank. Alignment may be obtained by adjusting feel and centering unit output rod per par. C.(5).

(f) Elevator Tab Pushrods

1) With elevator hydraulic system A and B depressurized and with elevator trailing edge aligned with index mark on tail cone, tab trailing edge should be displaced 0.22 ±0.01 (0.24 ±0.01 composite elevator) inch up from elevator trailing edge. Displacement may be obtained by adjusting tab dual pushrods per par. C.(6).

2) With elevator hydraulic system A pressurized and with left elevator trailing edge aligned within 0.06 inch of index mark on tail cone, left tab trailing edge should align with left elevator trailing edge within 0.03 inch. With elevator hydraulic system B pressurized and with right elevator trailing edge aligned within 0.06 inch of index mark on tail cone, right tab trailing edge should align with right elevator trailing edge within 0.03 inch. Alignment may be obtained by adjusting tab dual pushrods per par. C.(6).

(g) Feel Computer Input Rod

1) Rigging pin E-4 should fit easily through rig pin holes in computer input arm and feel computer housing. Alignment of parts may be obtained by adjusting input rod per par. C.(7).

B. Equipment and Materials

(1) Tensiometer - 0 to 320 pounds capacity

(2) Scale - 0 to 2 feet, graduated in inches and hundredths of an inch

(3) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
E-2	-66	0.4937-0.4945	3.7 ±0.25	FWD CONTROL QUADRANT
E-3	-66	0.4937-0.4945	3.7 ±0.25	FWD CONTROL QUADRANT
E-4	-11	0.309-0.311	6.7 ±0.25	FEEL COMPUTER INPUT ARM
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

(4) Spring Scale - 0 to 30 pounds capability, graduated in 1-pound increments
(5) Trammel Bar - F80055-1 (AMM 27-00/201 for fabrication instructions)
(6) Elevator Rigging and Restraining Tool - F80063-501 (Preferred) or F80063-500 (Optional)
(7) Grease - BMS 3-33 (Preferred)
(8) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
(9) Rigging Fixture, Elevator Tab - C27028 (preferred) (airplanes with metal-fiberglass or composite elevators)
(10) Rigging Fixture, Elevator Tab - F80248-8 (Preferred) or F80248-1 (Optional) (airplanes with metal-fiberglass or composite elevators)
(11) Rigging Fixture, Elevator Tab, Inboard Locations - TE27T-31001-15 (airplanes with composite elevators)
(12) Rigging Fixture, Elevator Tab, Outboard Locations - TE27T-31001-17 (airplanes with composite elevators)

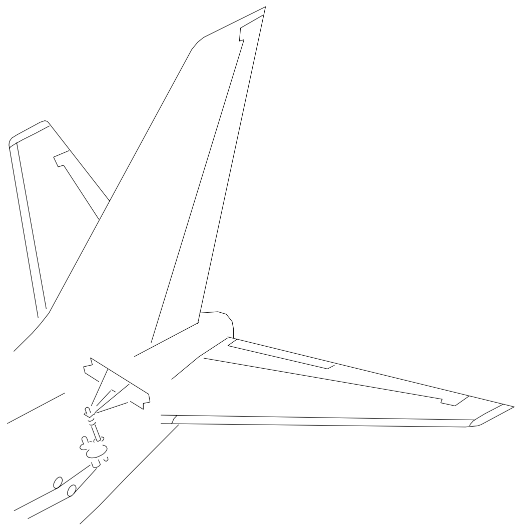
C. Adjust Elevator and Tab Control System
(1) Adjust elevator control cables EA and EB and pitch force transducers.
(a) Set horizontal stabilizer B dimension at 41.57 ±0.05 inches, using trammel bar (Fig. 502).
(b) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
(c) Make sure that mach trim actuator is in null position (AMM 27-31-0/201).
(d) Insert rigging pin E-5 in elevator right aft quadrant and ensure that rigging pin is easily movable. If holes do not align, move elevator surface by hand, up or down, until they align. Elevator surface should stay in this position.
(e) Insert rigging pin E-1 in elevator left forward quadrant. Check that rigging pin fits easily.
(f) Remove shoulder bolt from both column quadrants and check that rigging pins E-2 and E-3 fit easily through shoulder bolt installation holes. See Fig. 503 for locations.
(g) Check that tension in cables EAR, EBR, EAL, and EBL is within value required for ambient temperature per table on Fig. 501.
(h) If new cables are installed:
1) Adjust turnbuckles on the EA and EB cables to 300 ±20 pounds to prestretch cables.

2) Adjust all seals during rigging to eliminate bending of cables.
3) Remove rigging pins E-1 and E-5.
4) Cycle control column 25 times through full travel.
5) Accomplish steps (d) thru (g).

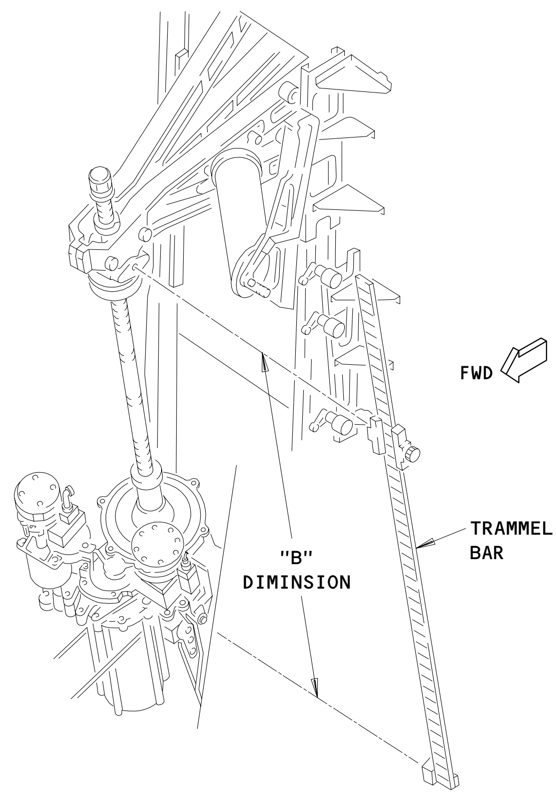
(i) If the conditions of steps (d), (e), (f), or (g) are not met or if step (h) was accomplished, remove bolts from adjustable ends of pitch force transducer and use turnbuckles to adjust cable tension to value for ambient temperature per table on Fig. 501.
(j) Rigging pins E-1, E-2, E-3, and E-5 must all be easily movable after final adjustment.
(k) If steps (h) or (i) were accomplished, adjust and connect pitch force transducers per AMM Chapter 22, Pitch Control Wheel Steering Force Transducer - A/T.
(l) Remove rigging pins E-2 and E-3 and install shoulder bolts.
(m) Install locking clips on all turnbuckles.
(n) Remove rigging pins E-1 and E-5.

(2) Adjust Elevator Control Pushrods
(a) Check that elevators are synchronized at neutral as follows:
1) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
2) Ensure that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches and that mach trim actuator is in null position per AMM 27-31-0/201.
3) Hold right elevator with trailing edge aligned with index mark on tail cone (Fig. 505).
4) Check that left elevator trailing edge aligns with index mark on tail cone within 0.12 inch.

(b) If elevators or the output torque tube have been replaced, or if the elevators are not synchronized at neutral, see Fig. 505 and proceed as follows:
1) Install rigging pin E-5 in aft control quadrant.
2) Remove right power control unit using the procedures given in AMM 27-31-101/401.
3) Install rigging and restraining tool in place of right power control unit.
4) Check that right elevator trailing edge aligns with index mark on tail cone within 0.12 inch.

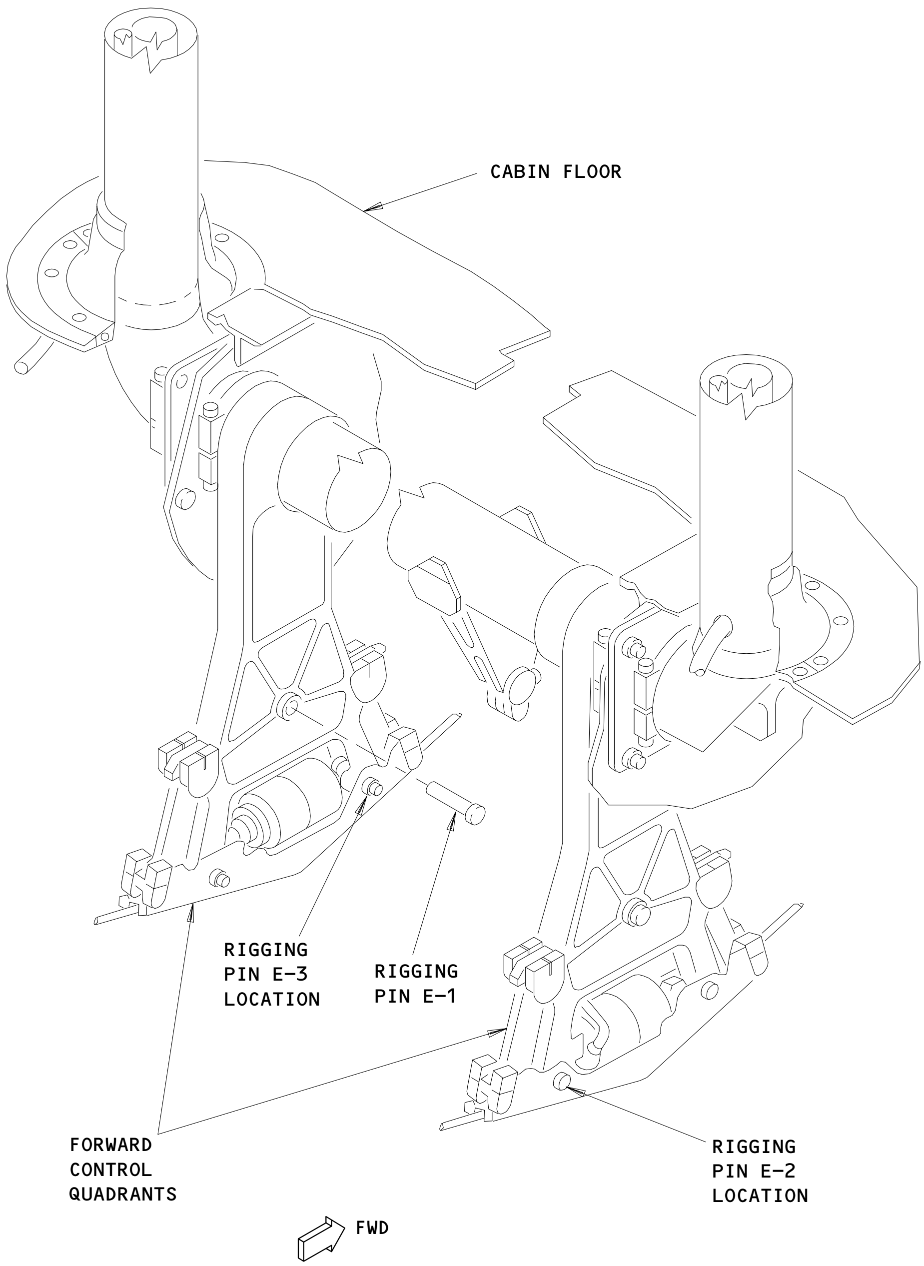


TRIM UNITS	STAB LE POSITION	"B" DIM
0	3° UP	45.84 (REF) BALLNUT AGAINST STOP
1	2° UP	44.42
2	1° UP	43.00
3	0°	41.57
4	1° DOWN	40.15
5	2° DOWN	38.71
6	3° DOWN	37.28
7	4° DOWN	35.84
8	5° DOWN	34.40
9	6° DOWN	32.96
10	7° DOWN	31.51
11	8° DOWN	30.06
12	9° DOWN	28.61
13	10° DOWN	27.16
14	11° DOWN	25.70
15	12° DOWN	24.24
16	13° DOWN	22.79
17	14° DOWN	21.32 (REF) BALLNUT AGAINST STOP

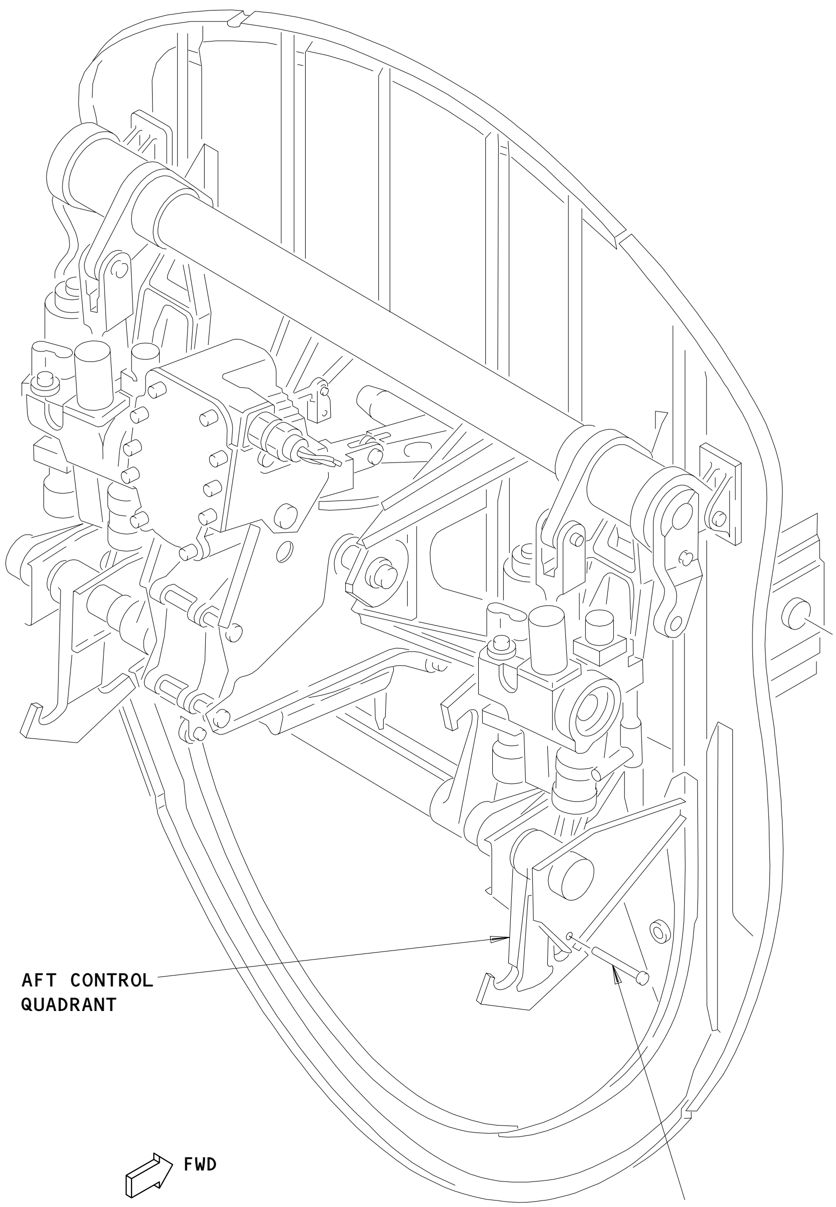


STABILIZER TRIM JACKSCREW
SHOWN WITH STABILIZER LEADING
EDGE AT ZERO DEGREES

Stabilizer Trim Jackscrew Setting
Figure 503



Forward Control Quadrant and Pitch Transducer Rigging Pin Locations
Figure 504



Aft Control Quadrant Rigging Pin Location
Figure 505

5) If elevator does not align, release locknuts and remove bolt attaching forward end of right elevator control pushrod to output torque tube crank.

<u>CAUTION</u>: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK BEARING TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

6) Back off checknut and adjust rod end fitting. Right elevator trailing edge must align with index mark on tail cone within 0.12 inch with control pushrod bolt installed.

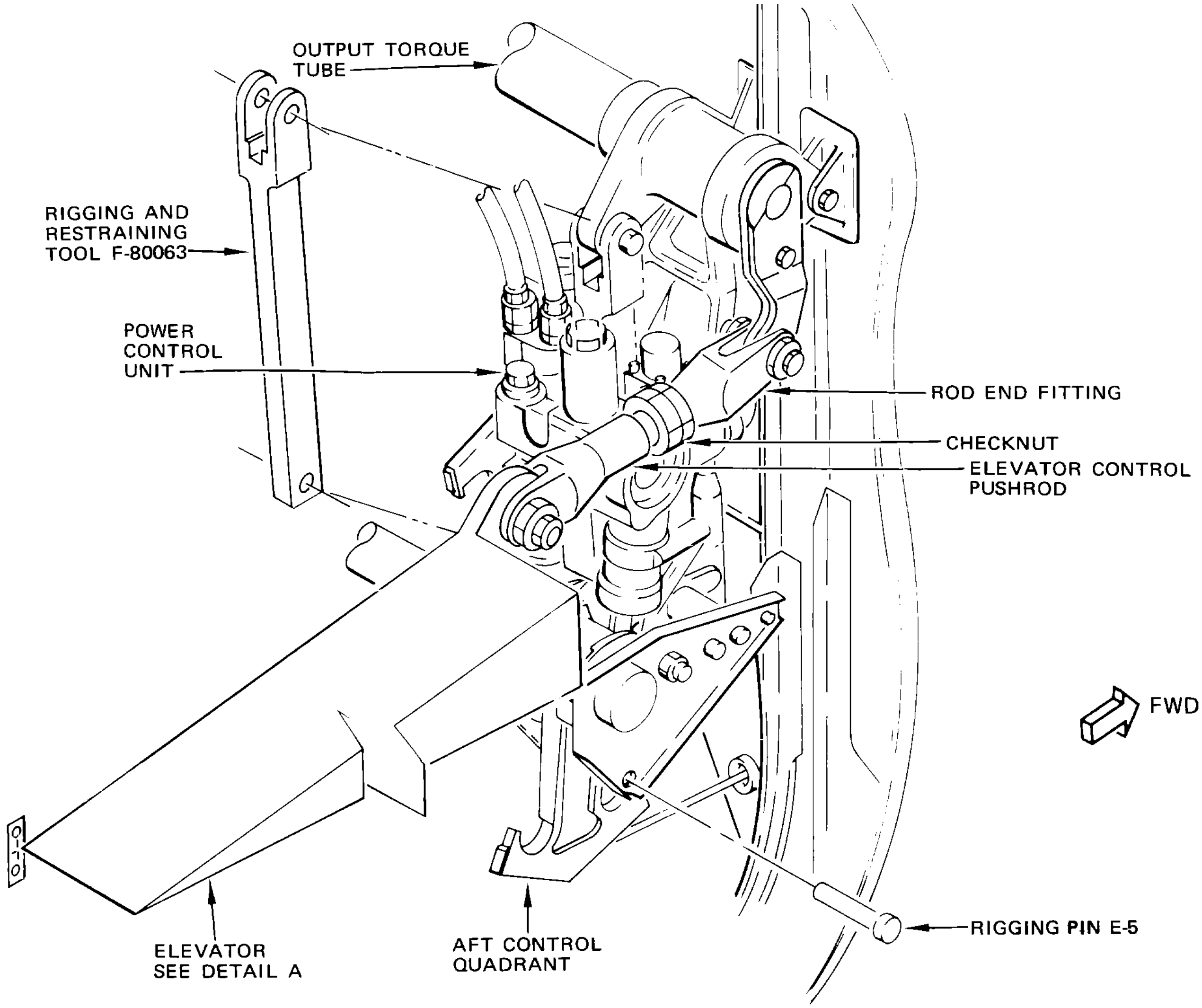
<u>NOTE</u>: One-half turn of rod end fitting equals 0.2 inch at elevator trailing edge.

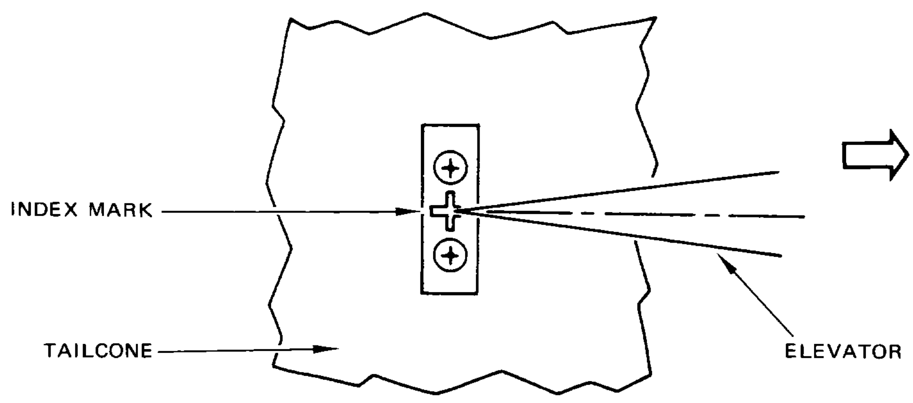
7) Check that left elevator trailing edge aligns with index mark on tail cone within 0.12 inch.
8) If elevator does not align, release locknuts and remove bolt attaching forward end of left elevator control pushrod to output torque tube.
9) Back off checknut and adjust rod end fitting. Left elevator trailing edge must align with index mark on tail cone within 0.12 inch with control pushrod bolt installed.
10) Check that mismatch between left and right elevators does not exceed 0.12 inch. If necessary, readjust right elevator control pushrod to obtain this requirement.
11) Grease checknut threads, then tighten checknuts on left and right control pushrod end fittings 750 to 900 pound-inches, and lockwire.
12) Install bolt securing elevator control pushrods to output torque tube.
13) Install first locknut and tighten 500 to 600 pound-inches, then install second locknut and tighten 150 to 220 pound-inches.

<u>CAUTION</u>: AFTER SETTING TORQUE ON SECOND LOCKNUTS, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUTS.

14) Remove rigging and restraining tool and install power control unit.

(c) Adjust elevator power control unit input rod per par. C.(3).





DETAIL A

Elevator Control Pushrod Adjustment
Figure 506

(3) Adjust Elevator Power Control Unit Input Rod

NOTE: Elevator control pushrod adjustment must be satisfactory before proceeding. Gain access to elevator power control unit input rods through tail cone access panels.

(a) Ensure that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches, that mach trim actuator is in null position per AMM 27-31-0/201, and install rigging pin E-5 in aft control quadrant.
(b) Provide hydraulic power as follows:
1) Provide elevator systems A and B hydraulic power (AMM 27-31-0/201).
2) Position flight controls hydraulic system A switch to OFF, leave system B switch ON.
(c) Measure right elevator trailing edge deviation from index mark on tail cone (Fig. 505).
(d) Position flight controls hydraulic system B switch to OFF.
(e) Loosen checknuts on right power control unit input rod, but do not change rod length. If required, remove rigging pin E-5 and push elevator trailing edge down for access to checknuts, then restore elevator to neutral as follows:
1) Push elevator back to align trailing edge with index mark, position flight controls hydraulic system B switch to ON, shake control column lightly fore and aft to ensure system is centered, then release. Position flight controls hydraulic system B switch to OFF, and install rigging pin E-5.
(f) If deviation is less than 0.4 inch, proceed to step (g) for fine adjustment. If deviation is greater than 0.4 inch, carry out coarse adjustment as follows:
1) Check that flight controls hydraulic system B switch is positioned to OFF.

WARNING: HYDRAULIC POWER MUST BE OFF BEFORE DISCONNECTING INPUT ROD.

2) Disconnect lower end of input rod from quadrant crank (Fig. 506).
3) Adjust input rod to bring elevator trailing edge within 0.4 inch from index mark on tail cone. See Fig. 506 for adjustment between clevis, sleeve, and rod.
4) Install lockbolt assembly with washer under bolthead through lower end of power control unit input rod and aft control quadrant crank and into nutplate on input rod. Tighten outer bolt 45 to 60 pound-inches.

5) Install locknut with washer over end of inner bolt and tighten 15 to 20 pound-inches.

CAUTION: AFTER SETTING TORQUE ON LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE OF OUTER BOLT.

6) Proceed to following step to make fine adjustment.

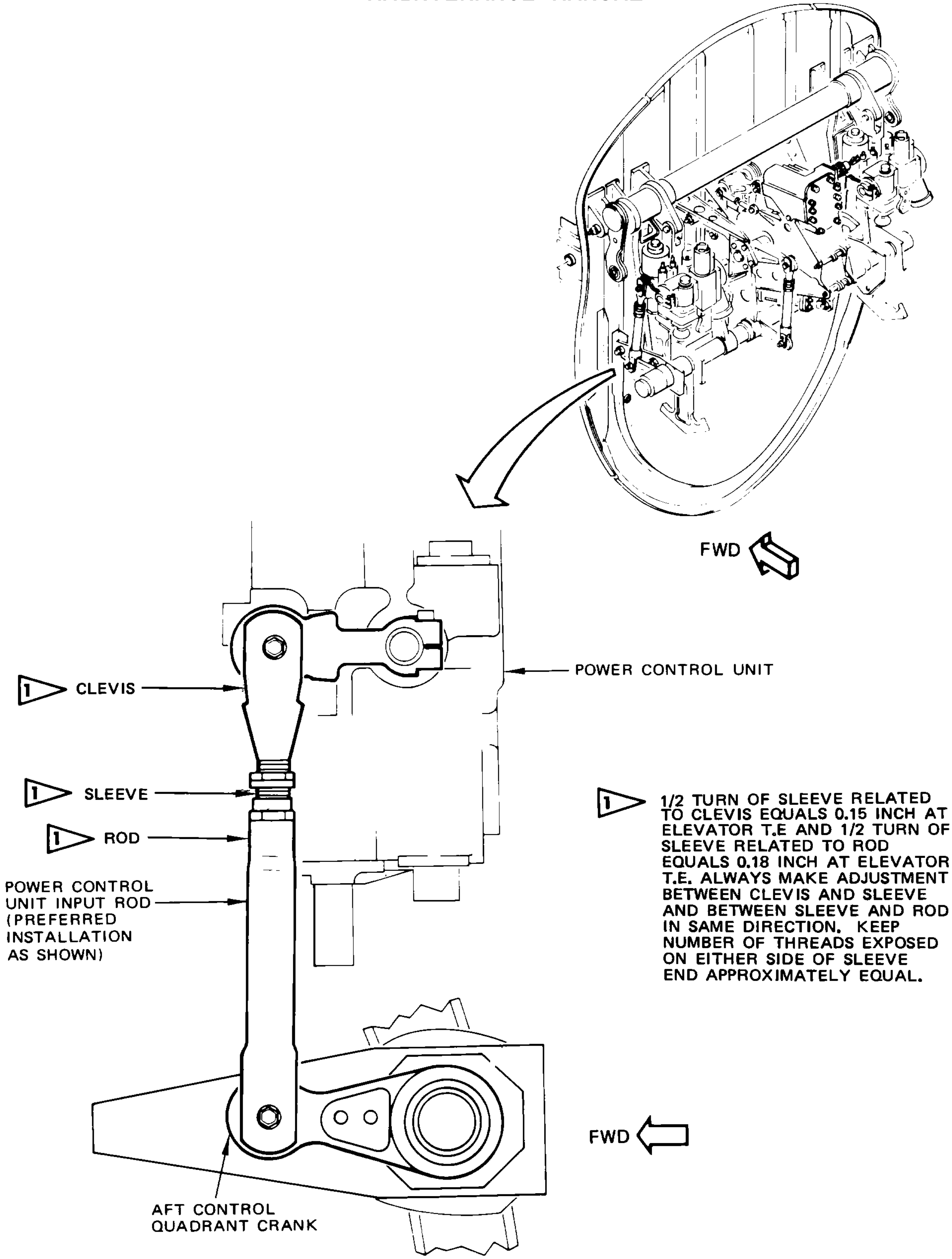
(g) Carry out fine adjustment as follows (Fig. 506):
   1) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
   2) Rotate sleeve on right elevator power control unit input rod until right elevator trailing edge is aligned with index mark on tail cone within 0.06 inch.
   3) Tighten both checknuts on input rod. If required for access to checknuts, position flight controls hydraulic system B switch to OFF, remove rigging pin E-5, and push elevator trailing edge down, then restore elevator to neutral as follows:
      a) Push elevator back to align with index mark, position flight controls hydraulic system B switch to ON, shake control column fore and aft lightly to ensure system is centered, then release. Position flight controls hydraulic system B switch to OFF and install rigging pin E-5.

(h) Position flight controls hydraulic system A switch to ON and system B switch to OFF, if not done previously.

(i) Measure right elevator trailing edge deviation from index mark on tail cone (Fig. 505).

(j) Position flight controls hydraulic system A switch to OFF.

(k) Loosen checknuts on left power control unit input rod, but do not change rod length. If required, remove rigging pin E-5 and push elevator trailing edge up for access to checknuts, then restore elevator to neutral as follows:
   1) Push elevator back to align trailing edge with index mark, position flight controls hydraulic system A switch to ON, shake control column lightly fore and aft to ensure system is centered, then release. Position flight controls hydraulic system A switch to OFF and install rigging pin E-5.



Elevator Power Control Unit Input Rod Adjustment
Figure 507

(l) If deviation is less than 0.4 inch, proceed to step (m) for fine adjustment. If deviation is greater than 0.4 inch, carry out coarse adjustment as follows:
  1) Check that flight controls hydraulic system A switch is positioned to OFF.

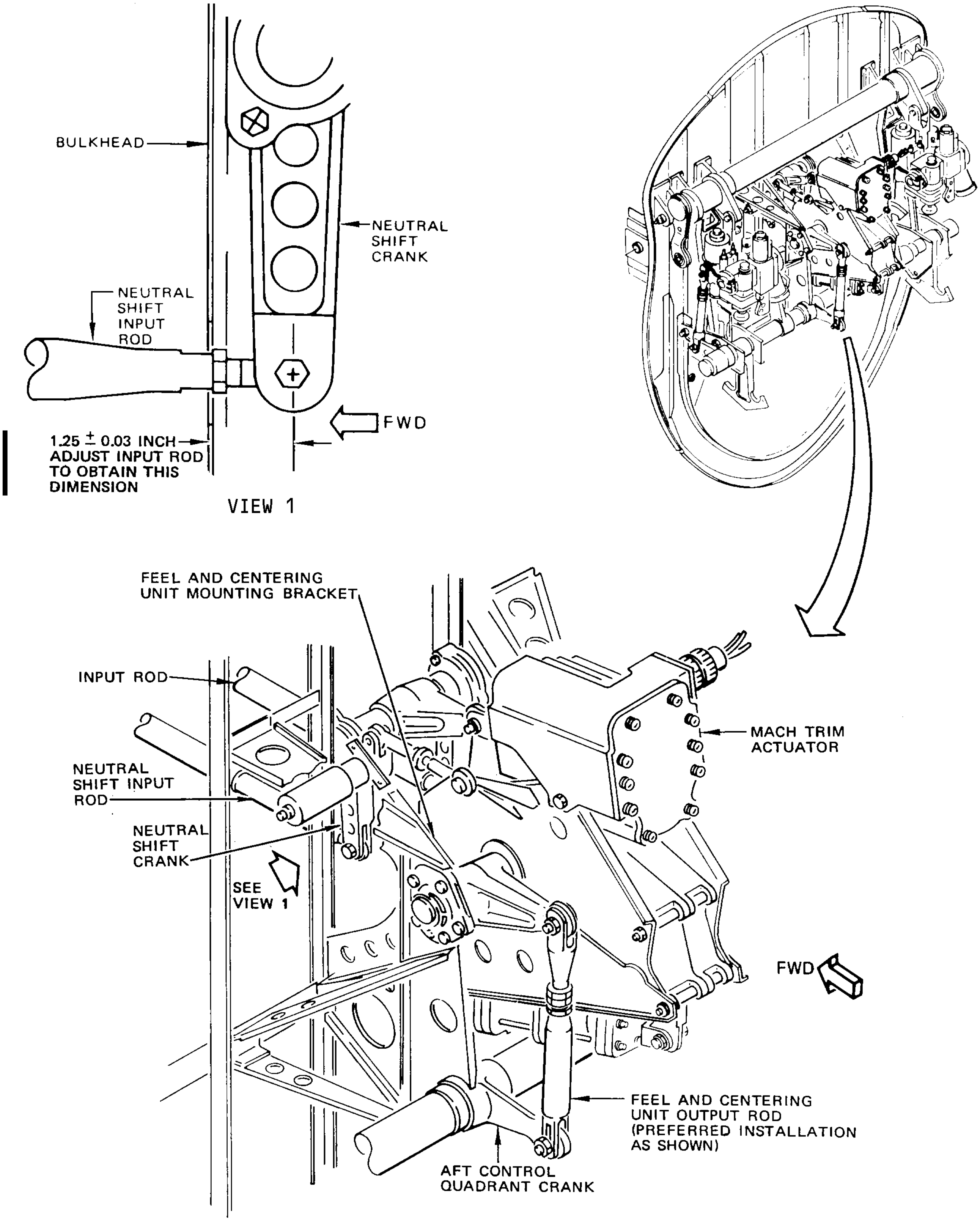
  WARNING: HYDRAULIC POWER MUST BE OFF BEFORE DISCONNECTING INPUT ROD.

  2) Repeat steps (f)2) thru (f)6) on left power control unit input rod, taking measurements at right elevator.
(m) Carry out fine adjustment as follows:
  1) Position flight controls hydraulic system switch A to ON and system B switch to OFF.
  2) Repeat step (g)2) on left power control unit input rod.
  3) Tighten both checknuts on input rod. If required for access to checknuts, position flight controls hydraulic system A switch to OFF, remove rigging pin E-5 and push elevator trailing edge up, then restore elevator to neutral as follows:
    a) Push elevator back to align trailing edge with index mark, position flight controls hydraulic system A switch to ON, shake control column lightly fore and aft to ensure system is centered, then release. Position flight controls hydraulic system A switch to OFF and install rigging pin E-5.
  4) Position flight controls hydraulic system A switch to OFF, if not done previously.
(n) Check both left and right power control unit input rods for minimum thread engagement. Combined number of threads visible on clevis and sleeve shall not exceed 32 for each input rod.
(o) Check that power control units are synchronized as follows:
  1) Position flight controls hydraulic systems A and B switches to ON.
  2) Alternately switch each system off and then on. Deflection of elevator at inboard end of trailing edge shall not exceed 0.02 inch.
  3) If necessary, repeat fine adjustment of power control unit input rods by repeating steps (g) and (m).
(p) Remove rigging pin E-5.
(q) If power control unit input rod required a coarse adjustment, the neutral shift sensor must be readjusted per AMM Chapter 22, Elevator Neutral Shift Sensor - A/T.

(4) Adjust Neutral Shift Input Rods
  (a) Remove elevator systems A and B hydraulic power per AMM 27-31-0 and check that horizontal stabilizer B dimension is set at 41.57 ±0.04 inches.
  (b) Ensure that mach trim actuator is set in null position (AMM 27-31-0/201).
  (c) Check for 1.25 ±0.03-inch dimension between centerline of neutral shift crank and vertical bulkhead (Fig. 507). If required dimension does not exist, adjust per the following steps:
  (d) Disconnect feel and centering unit output rod from aft control quadrant crank.
  (e) Break lockwire from checknuts at aft end of both neutral shift input rods and back off index washer and checknut. Remove aft mounting bolts and detach rods from neutral shift crank.
  (f) Adjust length of left neutral shift input rod until 1.25 ±0.03-inch dimension is obtained between centerline of neutral shift crank and aft side of vertical bulkhead. Alternately rotate rod end fitting, and insert mounting bolt, until dimension is obtained.
  (g) Adjust other neutral shift input rod until mounting bolt can be easily installed. Tighten rod end checknuts on both rods and lockwire.
  (h) Attach input rods to neutral shift crank.
  (i) Adjust feel and centering unit output rod per par. C.(5).

(5) Adjust Feel and Centering Unit Output Rod
  (a) Remove elevator systems A and B hydraulic power per AMM 27-31-0/201 and check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches.
  (b) Set mach trim actuator in null position (AMM 27-31-0/201).
  (c) Install rigging pin E-5 in aft control quadrant.
  (d) Loosen two checknuts on feel and centering unit output rod (Fig. 507).
  (e) Remove locknut from bolt assembly and detach output rod from aft control quadrant crank by removing bolt assembly.
  (f) Check relationship between bolthole in output rod and bolthole in aft control quadrant crank.
  (g) If mismatch is greater than 0.06 inch, rotate clevis in sleeve 1/2 turn and/or sleeve in rod 1/2 turn (coarse adjustment). Repeat, if required, to reduce mismatch to below 0.06 inch.

      NOTE: Always turn clevis and sleeve in the same direction, keeping number of threads exposed approximately equal in both parts.



Feel and Centering Unit Input and Output Rod Adjustment
Figure 508

(h) If mismatch is less than 0.06 inch, rotate sleeve until bolt can be easily installed (fine adjustment).
(i) Install bolt assembly and tighten outer bolt 75 to 85 pound-inches torque, then install locknut over end of inner bolt and tighten 15 to 20 pound-inches.

CAUTION: AFTER SETTING TORQUE ON LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON OUTER BOLT.

(j) Check output rod for minimum thread engagement. Combined number of threads visible on clevis and sleeve shall not exceed 27.
(k) Remove rigging pin E-5.
(l) If feel and centering unit output rod required a coarse adjustment, adjust neutral shift sensor per AMM Chapter 22, Elevator Neutral Shift Sensor - A/T.

(6) Adjust Elevator Tab Pushrods (Airplanes with Metal-Fiberglass Elevators)

NOTE: Measure tab position from inboard edge of trailing edge.

(a) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
(b) Check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches and that mach trim actuator is in null position per AMM 27-31-0/201.
(c) Hold elevator trailing edge in line with index on tail cone within 0.04 inch and check that both elevator tabs are displaced 0.22 ±0.01 inch up from elevator trailing edge. If this condition is not met, adjust tab pushrods per following steps (d) thru (u).
(d) Remove lower inboard hinge cover located on lower forward inboard edge of elevator by removing 19 bolts (Fig. 508).
(e) Remove lower aerodynamic seal located on lower aft edge of horizontal stabilizer by removing attach bolts (Fig. 508). It is not necessary to remove all bolts in order to access tab pushrods.
(f) Remove tab pushrod access panel at upper inboard end of elevator.
(g) On airplanes with a 1/2-inch diameter bushing installed in each tab mast fitting, fabricate tool using the dimensions given in detail B. Insert tool over bushing as shown, between rod end and tab mast fitting whenever tab pushrod checknuts are loosened or tightened.
(h) On right tab, loosen checknuts at each end of the two tab pushrods.

(i) Hold right elevator trailing edge in line with index on tail cone within 0.04 inch.
(j) Adjust right tab pushrods as follows to deflect tab trailing edge 0.22 ±0.01 inch up from elevator trailing edge.
  1) Coarse Adjustment
    a) Remove bolts through aft rod ends.
    b) Turn rod ends as required (half turn at rod end equals approximately 0.1 inch at tab trailing edge).
    c) Reinstall bolts.
  2) Fine Adjustment
    a) Turn tubes (turnbuckle style) as required (half turn at tube equals approximately 0.02 inch at tab trailing edge).
    b) To check that tab rods are not preloaded, loosen nut on one bolt at rear end of tab pushrods.

NOTE: If you loosen the tab rod nut, you must replace the nut with a new nut that is torqued to the proper value.

    c) Check that bolt is without binding (like a rigging pin). If bolt cannot be easily rotated with finger, make some fine adjustment of one rod only until bolt is free without binding.
    d) Tighten the new nut on bolt at rear end of tab rod.
(k) Do these steps to install the checknuts:
  1) Tighten the checknuts to 150-200 pound-inches (to make sure that there is sufficient thread preload).
  2) Apply BMS 8-45 inspection putty to the checknuts.

NOTE: It is not necessary to install lockwire.

    a) Provide hydraulic power as follows:
  3) Provide elevator systems A and B hydraulic power (AMM 27-31-0).
  4) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
(l) Right tab shall be faired with elevator within ±0.03 inch. If necessary adjust tab pushrods per above procedure. Check that power off adjustment tolerance is not exceeded.

CAUTION: DO NOT ATTEMPT TO CHANGE RIGGING BY CHANGING SHIMS IN TAB MECHANISM.

(m) Position flight controls hydraulic system B switch to OFF.
(n) On left tab loosen checknuts (four total) on the two tab pushrods.
(o) Hold left elevator trailing edge in line with index on tail cone within ±0.04 inch.
(p) Adjust left tab rods as follows to deflect tab trailing edge 0.22 ±0.01 inch up from elevator trailing edge. For coarse and fine adjustment procedure, refer to step (h).

(q) Do these steps to install the checknuts:
1) Tighten the checknuts to 150-200 pound-inches (to make sure that there is sufficient thread preload).
2) Apply BMS 8-45 inspection putty to the checknuts.

NOTE: It is not necessary to install lockwire.

(r) Position flight controls hydraulic system A switch to ON.
(s) Left tab shall be faired with elevator within ± 0.03 inch. If necessary, adjust tab pushrods per above procedure. Check that power off adjustment tolerance is not exceeded.

CAUTION: DO NOT ATTEMPT TO CHANGE RIGGING BY CHANGING SHIMS IN TAB MECHANISM.

(t) Position flight controls hydraulic system A switch to OFF.
(u) Check for minimum thread engagement on all four tab pushrods. End of rod shall cover at least 50% of inspection (eight places total).

(7) Adjust Elevator Tab Pushrods (Airplanes with Composite Elevators)

NOTE: Measure tab position from bottom of trailing edge to top of straight edge as shown in Fig. 510.

(a) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).

CAUTION: ELEVATORS AND TABS MAY MOVE ABRUPTLY WHEN HYDRAULIC POWER IS APPLIED. MAKE CERTAIN THAT ALL PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ELEVATOR AND TAB SURFACES.

(b) Check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches and mach trim actuator is in null position per AMM 27-31-0/201.
(c) Remove lower inboard hinge cover located on lower forward inboard edge of elevator by removing 19 bolts (Fig. 508).
(d) Remove lower aerodynamic seal located on lower aft edge of horizontal stabilizer by removing attach bolts. It is not necessary to remove all bolts in order to access tab pushrods.
(e) Remove tab pushrod access panel at upper inboard end of elevator.
(f) Loosen checknuts (four total) on right elevator tab rods.

(g) Hold right elevator trailing edge in line with index on tail cone within ± 0.04 inch.

NOTE: If using TE27T-31001-15 and -17 rigging fixtures to obtain X dimension, proceed to step (i). If using C27028 or F80248-( ) rigging fixture, perform the following:

(h) Adjust right tab rods as follows to obtain X dimension using rigging fixture C27028 or F80248-( ) (Fig. 510):

1) Locate and hold fixture below and along elevator rib at second tab hinge.

NOTE: Fixture should only contact elevator at spacers. Spacer thickness should be within 0.005 inch of each other.

2) Measure X dimension perpendicular to fixture at tab trailing edge as shown in Fig. 510.

3) Calculate X dimension (power off) per Table 1.

TABLE 1
Initial Elevator Tab Position

Condition	Airplane Temperature °F	°C	Tab Position "a" ± 0.01 Required	Spacer Thickness "t"	X Dimension X = a + t ± 0.01
Power off	120	49	0.203		
	110	43	0.210		
	100	38	0.218		
	90	32	0.225		
	80	27	0.233		
	70	21	0.240		
	60	16	0.247		
	50	10	0.255		
	40	4	0.262		
	30	-1	0.270		
	20	-7	0.277		
	10	-12	0.284		
	0	-18	0.291		
	-10	-23	0.298		
	-20	-29	0.306		
	-30	-34	0.312		
	-40	-40	0.320		

TABLE 1 Initial Elevator Tab Position					
Condition	Airplane Temperature °F	°C	Tab Position "a" ± 0.01 Required	Spacer Thickness "t"	X Dimension X = a + t ± 0.01
	-50	-46	0.327		
	-60	-51	0.335		

NOTE: Elevator tab moves 0.0073 inch for each 10°F temperature change.

EXAMPLE: Tab position "a" is 0.24 inch at 70°F, spacer thickness "t" is 0.50 inch, then required X dimension is 0.74 ±0.01 inch.

NOTE: Elevator tab adjustment should be accomplished according to temperature noted or interpolated from Table 1. To ensure that proper adjustment is obtained allow a minimum of 1 hour at constant ambient temperature ± 5°F for airplane temperature to stabilize.

NOTE: The following is an optional method for measuring the elevator trailing edge position at four places. When using this method, the resulting number may differ slightly from the single point method. Only one method should be used for consistency, the single point method or the four point method.

(i) Measure the X dimension as described in step (h)1), except at four places (two inboard and two outboard locations) using rigging fixtures TE27T-31001-15 and -17.
(j) Obtain the average of the four X dimensions recorded in steps (h)1) and (i). Subtract this average value from the required nominal X dimension. Record the difference and determine whether the value was positive or negative.
(k) Readjust the tab rigged position obtained in step (h)1) by adding the value obtained in step (j) to the actual X dimension recorded in step (h)1). This will be the final tab rigged X dimension. Note that a positive value in step (h)1), and a negative value in step (j) will result in a lower X dimension.
    1) Coarse adjustment:
        a) Remove bolts through aft rod ends.

b) Turn rod ends as required (half turn at rod end equals approximately 0.1 inch at tab trailing edge).
c) Install bolts.
2) Fine adjustment:
a) Turn tubes (turnbuckle style) as required (full turn at tube equals approximately 0.035 inch at tab trailing edge).
b) To check that tab rods are not preloaded, loosen nut on one bolt at rear end of tab pushrods.

NOTE: If you loosen the tab rod nut, you must replace the nut with a new nut that is torqued to the proper value.

c) Check bolt is without binding. If bolt cannot be easily rotated with finger, make some fine adjustment of one rod only until bolt is free without binding.
d) Tighten the new nut on bolt at rear end of tab rod.

(l) Do these steps to install the checknuts:
1) Tighten the checknuts to 150-200 pound-inches (to make sure that there is sufficient thread preload).
2) Apply BMS 8-45 inspection putty to the checknuts.

NOTE: It is not necessary to install lockwire.

(m) Adjust left tab rods as follows to obtain X dimension.
1) Position tab-rigging fixture below and along elevator rib at second tab hinge.

NOTE: Fixture edge should only contact elevator at spacers. Spacer thickness should be within 0.005 inch of each other.

2) Measure X dimension perpendicular to fixture at tab trailing edge as shown in Fig. 510.

(n) Check that left and right tab positions are within ±0.02 inch of each other.
(o) Do these steps to install the checknuts:
1) Tighten the checknuts to 150-200 pound-inches (to make sure that there is sufficient thread preload).
2) Apply BMS 8-45 inspection putty to the checknuts.

NOTE: It is not necessary to install lockwire.

(p) Check for minimum thread engagement on all four-tab pushrods. End of rod shall cover at least 50% of inspection hole (eight places).
(q) Install tab pushrod access panels and stabilizer access panels.

(8) Adjust the elevator tab pushrods after the flight test.

<u>NOTE</u>: Do this adjustment only when the number of turns of the stabilizer trim control wheel exceeds the limits during the AMM 27-11-0 flight test. A flight test is only required following certain maintenance actions on the ailerons. A flight test is not required following any maintenance action involving the elevator or elevator tab mechanisms.

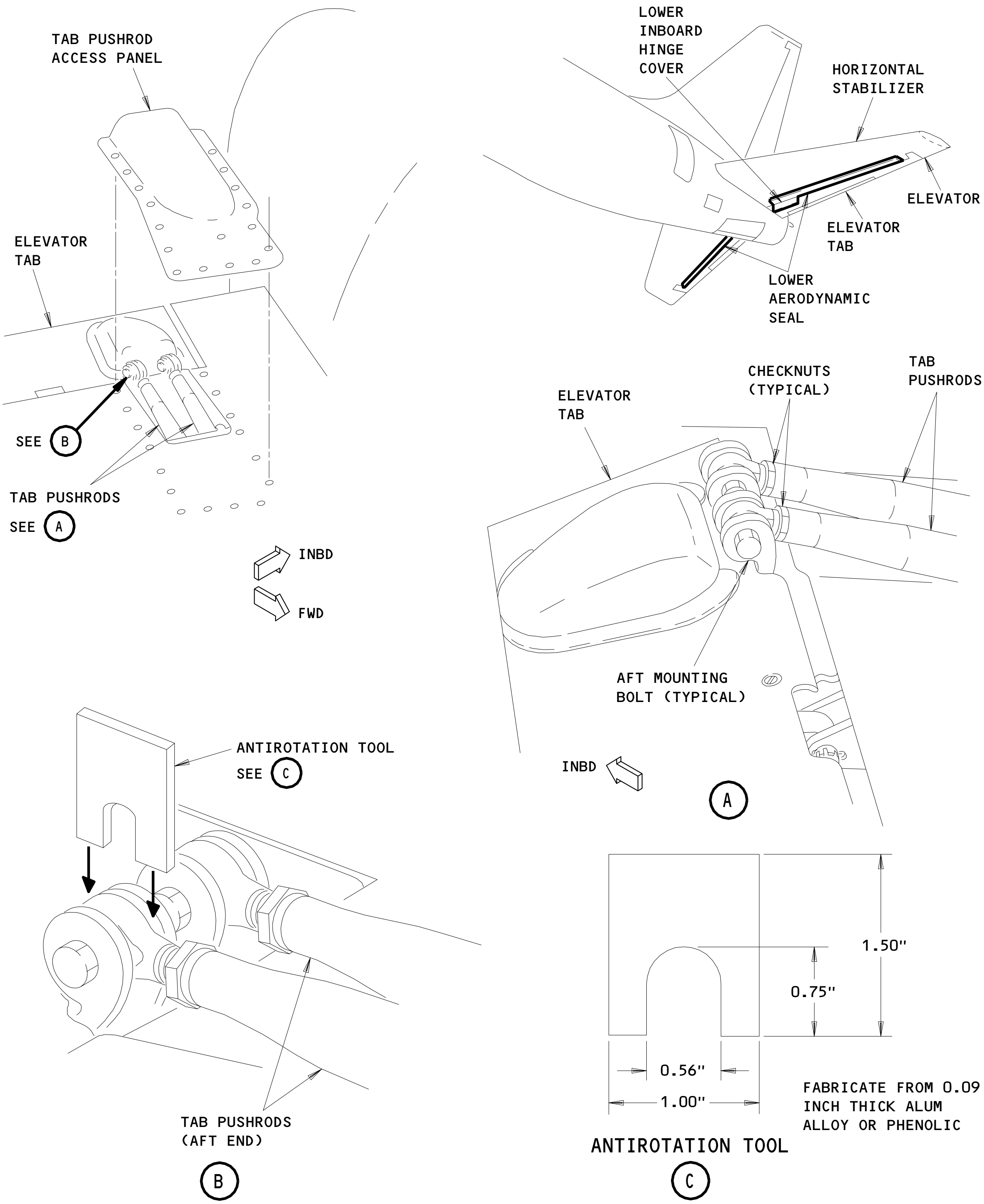
(a) Compare the number of turns of the stabilizer trim control wheel from the flight test data with the limits in Fig. 511.
(b) Make sure that the B dimension is at 41.57 ±0.01 inches.
(c) Set the mach trim actuator at the NULL position.
(d) Remove the elevator systems A and B hydraulic power.
(e) Align the right elevator with the index mark in ± 0.04 inch or less.

<u>NOTE</u>: Keep the elevators at this point while you adjust the tab pushrods.

(f) Remove the access panel 9105 or 9205.
(g) Remove the access panel for the tab pushrods.
(h) Set the tab rigging fixture below and along the elevator rib at the second tab hinge.

<u>NOTE</u>: Use the same method (single or four point method) that you used to adjust the tab pushrods before the flight test. The fixture must only touch the elevator at the spacers. The permitted difference in thickness of the spacers is 0.005 inch.

(i) Adjust the tab pushrods until they agree with the tab adjustment determined in Fig. 511 (± 0.01 inch).
   1) Coarse adjustment of the elevator tab trailing edge.
      a) One half turn of the 3/8 inch rod end moves the tab trailing edge by 0.089 inch.
      b) One half turn of the 7/16 inch rod end moves the tab trailing edge by 0.10 inch.
   2) Fine adjustment of the elevator tab trailing edge.
      a) One half turn of the rod barrel moves the tab trailing edge by approximately 0.017 inch.
(j) Make sure that the right elevator trailing edge aligns with the index mark in ± 0.04 inch.
(k) Calculate the final tab position "a" after the flight test:



Elevator Tab Pushrod Adjustment
Figure 509

TABLE 2 - ELEVATOR TAB POSITION AFTER FLIGHT TEST							
Airplane Temp		Initial Tab Dimension Before Flight Test TABLE 1 and Fig. 510	Tab Adjustment After Flight Test Fig. 511	Final Tab Dimension -Xf- After Flight Test (Xf=Xi+Delta X)	Spacer Thick- ness -t-	Permitted Tab Position -a- After Flight Test (a=Xf-t)	
F	C	Xi+/-0.01	Delta X	Xf+/-0.01	-t-	-a- inch	
						Metal- Fiberglass	Composite
120	49					0.120-0.360	0.083-0.323
110	43					0.120-0.360	0.090-0.330
100	38					0.120-0.360	0.098-0.338
90	32					0.120-0.360	0.105-0.345
80	27					0.120-0.360	0.113-0.353
70	21					0.120-0.360	0.120-0.360
60	16					0.120-0.360	0.127-0.367
50	10					0.120-0.360	0.135-0.375
40	4					0.120-0.360	0.142-0.382
30	-1					0.120-0.360	0.150-0.390
20	-7					0.120-0.360	0.157-0.397
10	-12					0.120-0.360	0.164-0.404
0	-18					0.120-0.360	0.172-0.412
-10	-23					0.120-0.360	0.179-0.419
-20	-29					0.120-0.360	0.186-0.426

TABLE 2 - ELEVATOR TAB POSITION AFTER FLIGHT TEST							
Airplane Temp		Initial Tab Dimension Before Flight Test TABLE 1 and Fig. 510	Tab Adjustment After Flight Test Fig. 511	Final Tab Dimension -Xf- After Flight Test (Xf=Xi+Delta X)	Spacer Thick- ness -t-	Permitted Tab Position -a- After Flight Test (a=Xf-t)	
F	C	Xi+/-0.01	Delta X	Xf+/-0.01	-t-	-a- inch	
						Metal- Fiberglass	Composite
-30	-34					0.120-0.360	0.193-0.433
-40	-40					0.120-0.360	0.200-0.440
-50	-46					0.120-0.360	0.208-0.448
-60	-51					0.120-0.360	0.215-0.454

EXAMPLE: The initial tab dimension "Xi" is 0.74 inch at 70°F, the spacer thickness "t" is 0.50 inch, the stabilizer trim control wheel turns required during the flight test was 4 turns airplane nose up. A tab adjustment of -0.075-inch tab trailing edge down is determined from Fig. 511. The final tab dimension "Xi" is 0.74-0.075=0.665 inch. The tab position "a" is 0.665-0.500=0.165 inch, which is within the after flight test limits of TABLE 2.

NOTE: To make sure you get the correct Xf for the tab pushrod, let the airplane stay at a constant ambient temperature ± 5°F for a minimum of 1 hour.

(9) Adjust Feel Computer Input Rod
   (a) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
   (b) Check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches.
   (c) Open stabilizer trim actuator circuit breakers on panel P6.

(d) Check that rigging pin E-4 fits freely through rig pin holes in computer input arm and feel computer housing. If rig pin E-4 does not fit freely adjust input rod per following:

<u>WARNING</u>: FEEL COMPUTER MAY BE DAMAGED IF COMPUTER INPUT ARM IS FORCED TO ROTATE BEYOND INTERNAL STOPS. BOTTOMING OF COMPUTER INPUT ARM AGAINST CAM STOPS MUST THEREFORE BE AVOIDED. DAMAGE TO CAM SHAFT SHEAR PINS MAY OCCUR IF TORQUE APPLIED TO COMPUTER INPUT ARM EXCEEDS 300 POUND-INCHES. A FAILURE OF SHEAR PINS MAY CHANGE STABILIZER INPUT PROGRAM TO COMPUTER AND AFFECT AUTOPILOT AUTHORITY.

1) Remove bolt attaching stabilizer input rod to computer input arm (Fig. 509).
2) Install rigging pin E-4 in computer input arm.
3) Check that bolt can be easily installed through input rod and computer input arm. If bolt does not fit, loosen checknut on input rod and rotate rod end fitting until bolt can be easily installed.
4) Tighten checknut and secure stabilizer input rod to computer input arm.
5) Check stabilizer input rod for minimum thread engagement. End of rod end must cover at least 50% of inspection hole.

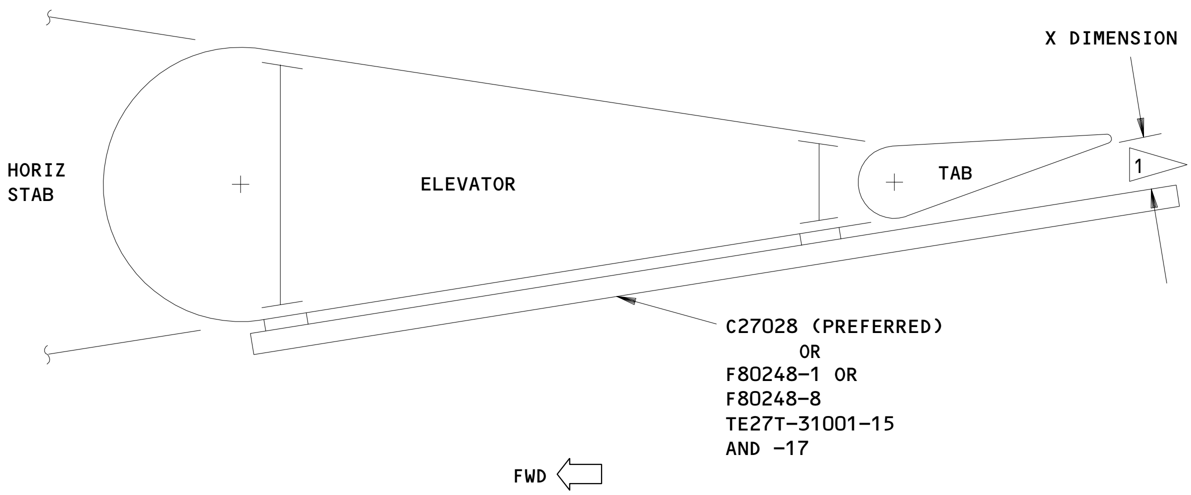
(e) Remove rigging pin E-4.
(f) Close stabilizer trim actuator circuit breakers.
(g) Adjust stabilizer trim potentiometer per AMM Chapter 22, Stabilizer Trim Potentiometer - A/T.

(10) Restore airplane to normal hydraulic configuration (AMM 27-31-0/201).
(11) Test Elevator and Tab Control System.

2. <u>Elevator and Tab Control System Test</u>

A. Equipment and Materials

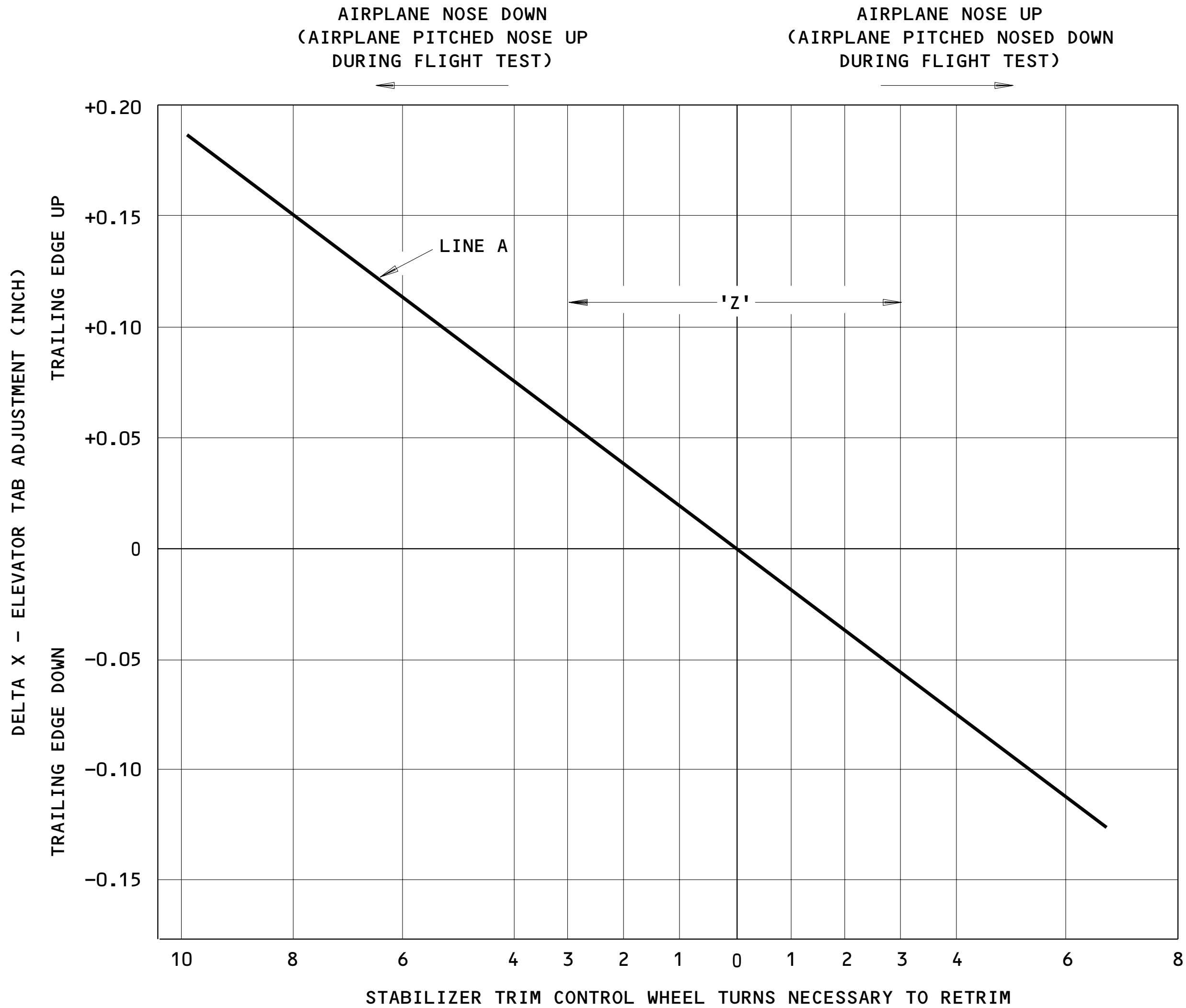
(1) Trammel Bar - F80055-1
(2) 0- to 50-pound push-pull spring scale with scale graduations of 0.5 pounds or smaller, use Chatillon 50 x 0.50 Model DPP-50



NOTE: FOR AIRPLANES WITH ALUMINUM/FIBERGLASS ELEVATORS, USE THE AMM 27-11-0 FLIGHT TEST PROCEDURE.

1 TAKE X DIMENSION FROM BOTTOM OF TAB TO TOP OF TOOL.

Elevator Tab Adjustment Measurement
Figure 510



NOTE: THE FLIGHT TEST PROCEDURES LEADING TO USE OF THIS FIGURE CAN BE FOUND IN AMM 27-11-0.

USE OF GRAPH

1. FIND THE POINT ALONG THE HORIZONTAL AXIS WHICH AGREES WITH THE NUMBER OF TURNS NECESSARY DURING THE FLIGHT TEST.

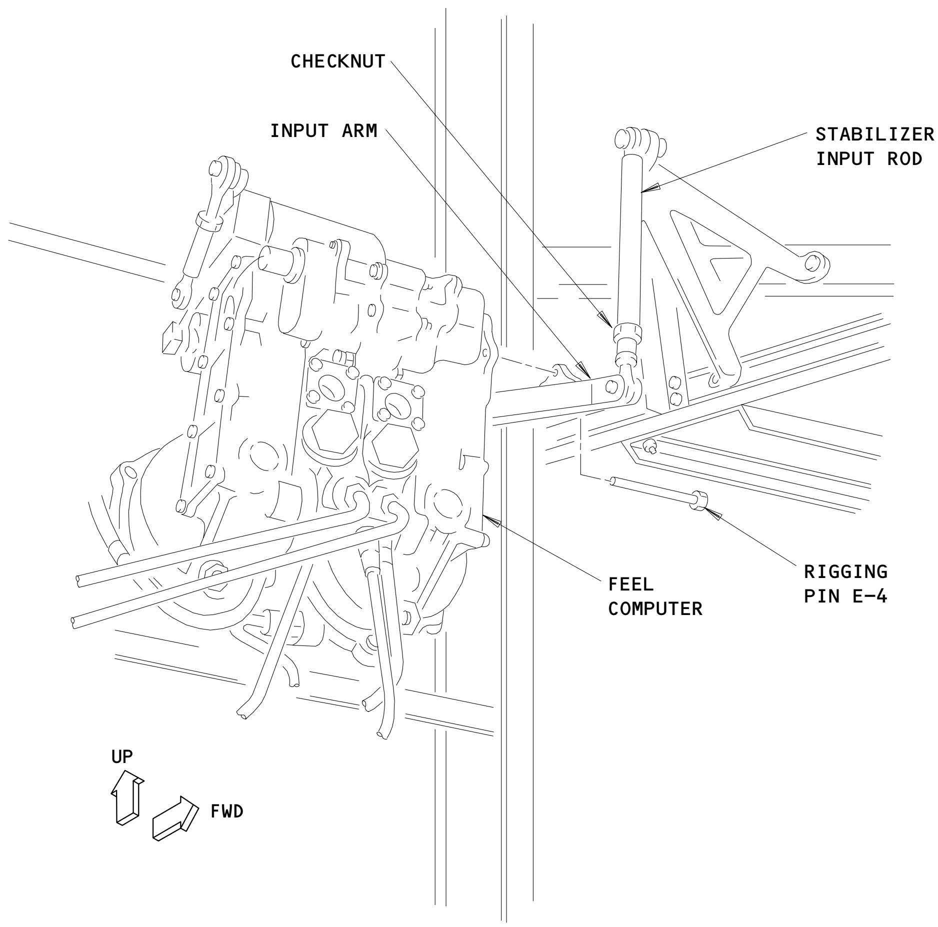
2. IF THE POINT IS IN THE LIMITS OF 'Z', NO ELEVATOR TAB ADJUSTMENT IS NECESSARY.

3. IF THE POINT IS OUT OF THE LIMITS, MAKE A VERTICAL LINE FROM THE POINT TO GO THROUGH LINE A.

4. FROM THIS POINT ON LINE A, MAKE A HORIZONTAL LINE TO GO THROUGH THE VERTICAL AXIS.

5. THIS POINT ON THE VERTICAL AXIS IS THE ADJUSTMENT NECESSARY AT THE ELEVATOR TAB PUSHRODS.

Elevator Tab Adjustment After Flight Test
Figure 511



Feel Computer Input Rod Adjustment
Figure 512

(3) Load measuring device, to measure elevator loads, perpendicular to the elevator surface at the trailing edge, consisting of loading block (17 inches long, 2 x 4 wood block, or equivalent) and push-pull spring scale in par. (2)
(4) Load measuring device, to measure elevator tab loads, perpendicular to the tab surface at the trailing edge consisting of loading block (6 inches long, 2 x 4 wood block, or equivalent) and push-pull spring scale in par. (2).
(5) Device for measuring control column loads consisting of push-pull spring scale in par. (2) and a fitting for attachment of spring scale to control wheel
   (a) Control Wheel Adapter Fitting - F72867-1
(6) Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
(7) Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional)
(8) Air Pressure Regulator - F72928-53 (preferred), -52 (alternate), or make to specification D6-32356

B. Test Elevator and Tab Control System
(1) Test Elevator Surface Friction and Balance
   (a) Remove elevator systems A and B hydraulic power (AMM 27-31-0).
   (b) Set horizontal stabilizer B dimension at 41.57 ±0.05 inches, using trammel bar (Fig. 502).
   (c) Set mach trim actuator in null position (AMM 27-31-0/201).
   (d) Move the control columns fore and aft through full travel at least 20 times.
   (e) Measure breakaway forces required to move elevator. Use spring scale and a loading block and apply force to elevator rear spar, adjacent to inboard rib.

   CAUTION: DO NOT EXCEED 65-POUND LOAD DURING TEST.

   1) Hold control columns fixed in neutral.
   2) Move right elevator by hand until trailing edge aligns with index mark on tail cone, then release (Fig. 505).
   3) If elevator trailing edge moves down from index, elevators are out of balance. Correct these conditions before proceeding. Refer to SRM Chapter 51 for balancing of elevators.
   4) If elevator trailing edge moves up from index, measure force required to restrain elevator at index position. Subtract this force from force required to move elevator trailing edge down 0.75 ±0.15 inch from index mark. The difference of forces should not exceed 16 pounds.
   5) If elevator trailing edge remains aligned with index mark, measure force required to move elevator trailing edge up 0.75 ±0.15 inch. Measure force required to move elevator trailing edge down 0.75 ±0.15 inch. If down force is less than up force, elevators are unbalanced. Correct these conditions before proceeding.

6) If values determined in step 4) exceed 16 pounds, determine whether excessive friction is in elevator hinges or elevator power unit or both (AMM 27-31-21, Test Elevator Hinges and AMM 27-31-101, Test Elevator Power Control Unit).

(2) Test Elevator Limit Travel

(a) Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).

(b) Check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches.

(c) Check that mach trim actuator is set in null position (AMM 27-31-0/201).

(d) Measure elevator limits of travel in both directions. Use a loading block and apply force to elevator rear spar, between inboard rib and tab cutout.

CAUTION: DO NOT EXCEED 65-POUND LOAD DURING TEST.

NOTE: Use approximately a 10-pound force.

1) Release control columns and allow them to move freely.

2) Move left elevator down against stop. Check that elevator deflects 10.55 +0.60/-0.30 inches from index mark on tail cone.

3) Move left elevator up against stop. Check that elevator deflects 14.60 +0.30/-0.55 inches from index mark on tail cone.

4) Move right elevator down against stop. Check that elevator deflects 10.55 +0.60/-0.30 inches from index mark on tail cone.

5) Move right elevator up against stop. Check that elevator deflects 14.60 +0.30/-0.55 inches from index mark on tail cone.

(3) Check elevator output torque tube bus linkage.

(a) Check that system B hydraulic power is on and system A is off (AMM 27-31-0/201).

(b) Apply a force of 15 ±5 pounds to right elevator trailing edge in up direction and release slowly. Record elevator position after removing force.

(c) Perform step (b) in down direction and record position.

(d) Distance between right elevator up and down positions shall not exceed 0.160 inch.

(e) Turn off system B hydraulic power and turn on system A (AMM 27-31-0/201).

(f) Apply a force of 15 ±5 pounds to left elevator trailing edge in up direction and release slowly. Record elevator position after removing force.
(g) Perform step (f) in down direction and record position.
(h) Distance between left elevator up and down positions shall not exceed 0.160 inch (AMM 27-31-11/601, AMM 27-31-191/601).

(4) Test Elevator Tab Linkage

<u>NOTE</u>: Make sure that control columns are not moved during this test and are in centered position.

This test verifies the elevator tab control system integrity (components are correctly installed and operating correctly).

(a) Provide elevator systems A and B hydraulic power (AMM 27-31-0).
(b) Jiggle left tab up and down by hand to determine if tab is loose. Looseness shall not exceed 0.030-inch total movement at inboard trailing edge.
(c) Repeat step (b) for right tab.
(d) Turn off elevator hydraulic systems A and B.
(e) Check that stabilizer jackscrew B dimension is set at 41.57 ±0.05 inches.
(f) Set mach trim actuator in null position (Ref Elevator and Tab Control System MP).
(g) With elevators held at index within 0.04 inch, measure tab position.
(h) Check that both the right and left elevator tabs are displaced 0.22 ±0.01 inch up from elevator trailing edge.
(i) Restore airplane to normal hydraulic configuration and provide elevator systems A and B hydraulic power (AMM 27-31-0).
(j) Measure tab positions. Check that both tabs are faired with their respective elevator within 0.03 inch.

(5) Test Manual Mode Operation
(a) Remove elevator systems A and B hydraulic power (AMM 27-31-0).
(b) Check that horizontal stabilizer B dimension is set at 41.57 ±0.05 inches.
(c) Set mach trim actuator in null position (AMM 27-31-0 201).
(d) Check, as follows, that control columns and control wheels are without interference.
1) Move column repeatedly fore and aft between stops and simultaneously move control wheel repeatedly left and right between stops.
2) Hold control wheel left against stop and move column fore and aft between stops.
3) Hold control wheel right against stop and move column fore and aft between stops.

4) Hold column full forward and move control wheel left and right between stops.
5) Hold column full aft and move control wheel left and right between stops.

(e) Measure elevator and elevator tab deflections with captain's control column at extremities of travel.

1) With bubble protractor attached to captain's control column, move control column aft until column stops are contacted and hold while measuring. Right elevator trailing edge shall deflect 14.60 +0.30/-0.85 inches up from index mark on tail cone. Tab trailing edge shall deflect 0.92 +0.10/-0.14 inch down from elevator trailing edge for airplanes with metal-fiberglass elevators and 0.89 +0.10/-0.14 inches down for airplanes with composite elevators.

NOTE: A hand assist at the elevator surface may be required to obtain a true deflection.

2) Check that captain's control column position is aft of vertical 7 degrees minimum (Fig. 501).
3) With bubble protractor still attached, move captain's control column forward until stops are contacted and hold while measuring. Right elevator trailing edge shall deflect 10.55 ±0.60 inches down from index mark on tail cone (hand assist may be required). Tab trailing edge shall deflect 1.03 ±0.10 inches up from elevator trailing edge for airplanes with metal-fiberglass elevators and 1.06 ±0.10 inches up for airplanes with composite elevators.
4) Check that captain's control column position is forward of vertical 19.8 degrees minimum.
5) Check that total travel of captain's column determined by adding values in steps 2) and 4) above is 28.4 degrees minimum.

(6) Test Power Mode Operation

(a) Set horizontal stabilizer B dimension at 41.57 ±0.05 inches.
(b) Set mach trim actuator in null position (AMM 27-31-0/201).
(c) Provide elevator systems A and B hydraulic power (AMM 27-31-0).
(d) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.
(e) With bubble protractor attached to captain's control column, check that captain's column position is 6.9 ±0.8 degrees forward of vertical.

(f) With bubble protractor attached to first officer's control column, check that control column position is 6.9 ±0.8 degrees forward of vertical.

(g) While moving captain's control column slowly between forward and aft stops, check for possible interference in system. Column operation should be smooth and free of any sudden buildup or irregular column forces.

(h) Move captain's control column approximately 2 degrees in forward direction and release. Check that right elevator trailing edge aligns with index mark on tail cone within 0.12 inch. Then move control column about 2 degrees aft and release. Check that right elevator trailing edge aligns with index mark within 0.12 inch. In both cases, tab shall be aligned with elevator within 0.07 inch.

(i) Shake control column lightly fore and aft to ensure system is centered. Check that right elevator trailing edge aligns with index mark on tail cone within 0.06 inch.

(j) Apply masking tape on tail cone along direction of right elevator trailing edge travel.

NOTE: Elevator travel measuring tool may be used in lieu of tape method.

(k) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.

NOTE: Ensure that control columns are not disturbed from this position during the next step.

(l) Mark actual elevator trailing edge neutral position on masking tape.

(m) Using actual elevator trailing edge neutral position as a reference, mark elevator positions in steps (n) and (o) on masking tape.

(n) Move captain's column slowly aft and hold at indicated elevator position. The following conditions shall be met:

CAPTAIN'S CONTROL COLUMN AFT	
Right elevator position	Required column force - pounds
Breakout *[1]	5.0 ±2.0
1.95 ±0.05 in. up	12.5 ±2.0
5.10 ±0.05 in. up	21.0 ±2.0
9.45 ±0.05 in. up	28.0 ±3.0

*[1] Measure column force when elevator starts to move.

(o) Move captain's control column slowly forward. The following conditions shall be met:

CAPTAIN'S CONTROL COLUMN FORWARD	
Right elevator position	Required column force - pounds
Breakout *[1]	5.5 ±2.0
1.95 ±0.05 in. dn	13.5 ±2.0
5.10 ±0.05 in. dn	22.0 ±2.0
9.45 ±0.05 in. dn	29.5 ±3.0

*[1] Measure column force when elevator starts to move.

(p) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.

(q) Move captain's control column aft until column stops are contacted and hold while measuring. The following conditions shall be met:

1) Right elevator trailing edge shall deflect 14.60 +0.30/-0.55 inches up from index mark.

2) Right tab trailing edge shall deflect 0.92 +0.10/-0.14 inch down from right elevator trailing edge for airplanes with metal-fiberglass elevators and 0.89 +0.10/-0.14 inch down for airplanes with composite elevators.
3) Left tab trailing edge shall be faired with left elevator trailing edge within 0.07 inch for airplanes with metal-fiberglass and 0.03 ±0.07 inch up for airplanes with composite elevators.

(r) Move captain's control column forward until column stops are contacted and hold while measuring. The following conditions shall be met:
1) Right elevator trailing edge shall deflect 10.55 +0.20/-0.30 inches down from index mark on tail cone.
2) Right tab trailing edge shall deflect 1.03 ±0.10 inches up from right elevator trailing edge for airplanes with metal-fiberglass elevators and 1.06 ±0.10 inches up for airplanes with composite elevators.
3) Left tab trailing edge shall be faired with left elevator trailing edge within 0.07 inch for airplanes with metal-fiberglass elevators and up 0.03 ±0.07 inch for airplanes with composite elevators.

(s) Position flight controls hydraulic system A switch to OFF and system B switch to ON.

(t) Move captain's control column aft until column stops are contacted and hold while measuring. The following conditions shall be met:
1) Right elevator trailing edge shall deflect 14.60 +0.30/-0.55 inches up from index mark on tail cone.
2) Right tab trailing edge shall be faired with right elevator trailing edge within 0.07 inch for airplanes with metal-fiberglass elevators and up 0.03 ±0.07 inch for airplanes with composite elevators.
3) Left tab trailing edge shall deflect 0.92 +0.10/-0.14 inch down from left elevator trailing edge for airplanes with metal-fiberglass elevators and 0.89 +0.10/-0.14 inch down for airplanes with composite elevators.

(u) Move captain's control column forward until column stops are contacted and hold while measuring. The following conditions shall be met:
1) Right elevator trailing edge shall deflect 10.55 +0.20/-0.30 inches down from index mark on tail cone.
2) Right tab trailing edge shall be faired with right elevator trailing edge within 0.07 inch for airplanes with metal-fiberglass elevators and up 0.03 ±0.07 inch for airplanes with composite elevators.

3) Left tab trailing edge shall deflect 1.03 ±0.10 inches up from left elevator trailing edge for airplanes with metal-fiberglass elevators and 1.06 ±0.10 inches up for airplanes with composite elevators.

(v) Position flight controls hydraulic system B switch to OFF.

(7) Test Neutral Shift Operation

(a) Set horizontal stabilizer B dimension at 21.32 ±0.05 inches (ball nut against lower stop).

(b) Set mach trim actuator in null position (AMM 27-31-0/201).

(c) Provide elevator systems A and B hydraulic power (AMM 27-31-0/201).

(d) Shake control column lightly fore and aft to ensure system is centered, and release.

(e) Check that right elevator position is 16.00 +0.50/-0.10 inches up from index mark on tail cone.

(f) Set horizontal stabilizer B dimension at 45.84 ±0.05 inches (ballnut against upper stop).

(g) Shake control column lightly fore and aft to ensure system is centered, and release.

(h) Check that right elevator position is 2.60 +0.40/-0.20 inches down from index mark on tail cone.

(8) Test Feel Force System and Autopilot Authority

(a) Test differential pressure switch as follows:

1) Airplanes POST-SB 27-1072;
Set trailing edge flaps to full up position.

2) Check that MASTER DIM C311, C312, C316, and MASTER CAUTION circuit breakers on panel P6 are closed.

3) Provide elevator systems A and B hydraulic power (AMM 27-31-0/201), and position flight controls hydraulic system B switch to OFF, leave system A switch ON.

4) Check that following lights come on: FEEL DIFF PRESS light on P5 overhead panel, FLIGHT CONTROL on Master Caution annunciator on P7 lightshield and both MASTER CAUTION lights on P7.

5) Position the flight controls hydraulic system B switch to ON.

6) Reset the MASTER CAUTION light and annunciator.
7) Check that the FEEL DIFF PRESS, FLIGHT CONTROL, and MASTER CAUTION lights are off.
8) Position the flight controls hydraulic system A switch to OFF and leave the system B switch ON.
9) Check that FEEL DIFF PRESS, both MASTER CAUTION and FLIGHT CONTROL lights come on.
10) Position the flight controls hydraulic system A switch to ON.
11) Reset the MASTER CAUTION light and annunciator.
12) Check that the FEEL DIFF PRESS, FLIGHT CONTROL, and MASTER CAUTION lights are off.
13) With both systems on, operate captain's control column at a constant rate, starting from full forward to full aft to full forward in approximately 2 seconds (27.5 degrees per second).

NOTE: FEEL DIFF PRESS light may come on when stops are contacted, for up to 1 second but should extinguish within 0.5 seconds after input motion ceases.

14) On airplanes with flap position switch in differential pressure switch circuit for effectivity, perform the following checks:
   a) Set flaps to 5-unit position.
   b) Position flight controls hydraulic system B switch to OFF and check that FEEL DIFF PRESS light is off.
   c) Position flight controls hydraulic system B switch to ON and system A switch to OFF, and check that FEEL DIFF PRESS light is off.
   d) Raise flaps to full up position.
15) Position flight controls hydraulic systems A and B switches to OFF.

(b) Check for pressure leakage in feel pitot system as follows:
1) Seal drain hole in each feel pitot tube located on fin.
2) Remove drain plugs from systems A and B pitot lines located below feel computer.
3) Attach pressure gage lines from air pressure regulator to pitot systems A and B drain holes located below feel computer.
4) Attach regulated air pressure line from air pressure regulator to both pitot tubes on fin and pressurize pitot system to 5.0 ±0.1 psi (437 ±4 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST.

5) Cut off pressure source by turning shutoff valve in air pressure regulator to off.
6) Pressure shall not drop more than 0.3 psi (12 knots) during a 2-minute period.

7) Reduce pitot pressure to zero.

(c) Check feel forces as follows:

NOTE: Ensure that elevator and feel computer are properly adjusted before proceeding.

1) Set horizontal stabilizer B dimension at 41.57 ±0.01 inches.
2) Set mach trim actuator in null position (AMM 27-31-0/201).
3) Position flight controls hydraulic systems A and B switches to ON.
4) Using air pressure regulator, pressurize pitot system to 3.50 ±0.05 psi (370 ±3 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6.0 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

5) Apply masking tape on tail cone along direction of right elevator trailing edge travel.

NOTE: Elevator travel measuring tool may be used in lieu of tape method.

6) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.

NOTE: Ensure that control columns are not disturbed from this position during the next step.

7) Mark actual elevator trailing edge neutral position on masking tape.
8) Using actual elevator trailing edge neutral position as a reference, mark elevator positions in steps 9) and 10) on masking tape.

NOTE: Pitot system check per step (b) must be satisfactory prior to proceeding.

In the following column force checks, jiggle control column prior to each reading.

In the following column force checks, elevator position refers to actual elevator travel as measured from an actual elevator neutral position.

9) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. The required column force shall be 37.5 ±4.0 pounds.

10) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. The required column force shall be 38.5 ±4.0 pounds.
11) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.
12) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. The required column force shall be 37.5 ±4.0 pounds.
13) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. The required column force shall be 38.5 ±4.0 pounds.
14) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
15) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. The required column force shall be 37.5 ±4.0 pounds.
16) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. The required column force is 38.5 ±4.0 pounds.
17) Position flight controls hydraulic system A switch to ON.
18) Reduce 3.50 ±0.05 psi (370 ±3 knots) dynamic pressure being applied to pitot tubes to zero pressure. Then increase pressure to 0.50 ±0.05 psi (145 ±7 knots).

<u>CAUTION</u>: DO NOT RAISE TEST PRESSURE ABOVE 6.0 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

19) Move captain's control column slowly aft and hold at indicated elevator position. The following conditions shall be met:

CAPTAIN'S CONTROL COLUMN AFT	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED - POUNDS
1.95 ±0.05 in. up	18.0 ±2.0
6.95 ±0.05 in. up	35.0 ±3.5

20) Move captain's control column slowly forward and hold at indicated elevator position. The following conditions shall be met.

CAPTAIN'S CONTROL COLUMN FORWARD	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED - POUNDS
1.95 ±0.05 in. dn	19.0 ±2.0
6.15 ±0.05 in. dn	35.0 ±3.5

21) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.
22) Move captain's control column slowly aft and hold at the elevator positions shown in CAPTAIN'S CONTROL COLUMN AFT (above):
    a) The forces must be within the values shown in the table above: CAPTAIN'S CONTROL COLUMN AFT
23) Move captain's control column slowly forward and hold at elevator positions shown in this table (above): CAPTAIN'S CONTROL COLUMN FORWARD
    a) The forces must be within the values shown in this table: CAPTAIN'S CONTROL COLUMN FORWARD
24) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
25) Move captain's control column slowly aft and hold at the elevator positions shown in CAPTAIN'S CONTROL COLUMN AFT (above):
    a) The forces must be within the values shown in the table above: CAPTAIN'S CONTROL COLUMN AFT
26) Move captain's control column slowly forward and hold at elevator positions shown in this table (above): CAPTAIN'S CONTROL COLUMN FORWARD
    a) The forces must be within the values shown in this table: CAPTAIN'S CONTROL COLUMN FORWARD

27) Move captain's control column slowly aft and hold at the elevator positions shown in CAPTAIN'S CONTROL COLUMN AFT (above):
    a) The forces must be within the values shown in the table above: CAPTAIN'S CONTROL COLUMN AFT
28) Move captain's control column slowly forward and hold at elevator positions shown in this table (above): CAPTAIN'S CONTROL COLUMN FORWARD
    a) The forces must be within the values shown in this table: CAPTAIN'S CONTROL COLUMN FORWARD
29) Position flight controls hydraulic system B switch to OFF.

(d) Test autopilot authority as follows:

NOTE: Make sure that entire pitch channel of autopilot system is operational before proceeding.

Make sure that elevator and feel computer are properly adjusted before proceeding.

1) Make sure that horizontal stabilizer B dimension is set at 41.57 ±0.01 inches and mach trim actuator is in null position.
2) Make sure that the following circuit breakers involved with autopilot pitch channel operation are engaged:
    a) Central Air Data Computer
    b) Vertical Gyro No. 1
    c) Pitch Channel
    d) Autopilot Interlock
3) Open stabilizer trim circuit breakers.
4) Loosen vertical gyro No. 1 from mounting in electronics bay.
5) Using air pressure regulator, reduce pitot pressure to zero, then increase pressure to 3.50 ±0.05 psi (370 ±3 knots).

CAUTION: DO NOT EXCEED 6 PSI (474 KNOTS) TO PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

6) Position flight controls hydraulic system B switch to ON. Make sure flight controls system A switch is OFF.
7) Select system B on the autopilot control panel.
8) Wait 10 seconds and then engage the pitch axis on the autopilot control panel.
9) Tilt the vertical gyro approximately 20 degrees front end down and hold.
    a) Measure and record right elevator trailing edge displacement with respect to index mark.

10) Tilt vertical gyro approximately 20 degrees front end up and hold.
    a) Measure and record right elevator trailing edge displacement with respect to index mark.
11) Relevel the vertical gyro.
12) Disengage the pitch axis.
13) Add the displacements of steps 10) and 12). The total displacement shall be 3.51 ±0.56 inches.
14) Turn on the hydraulic system A flight controls switch.
15) Repeat steps 8) thru 14) above.
16) The total displacement of steps 10) and 12) shall be 2.88 ±0.46 inches.
17) Select system A on the autopilot control panel.

NOTE: Steps 19) thru 24) apply only to airplanes with dual autopilot select modes.

18) Repeat steps 8) thru 14) above.
19) The total displacement of steps 10) and 12) shall be 2.88 ±0.46 inches.
20) Turn off hydraulic system B flight controls switch.
21) Repeat steps 8) thru 14) above.
22) The total displacement of steps 10) and 12) shall be 3.51 ±0.56 inches.
23) Set stabilizer jackscrew B dimension at 42.28 ±0.01 inches.
24) Reduce 3.50 ±0.05 psi (370 ±3 knots) pitot pressure to zero. Then increase pressure to 2.80 ±0.05 psi (334 ±3 knots).

CAUTION: DO NOT EXCEED 6 PSI (474 KNOTS) TO THE PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

25) Repeat steps 8) thru 14) above.

NOTE: Steps 27) thru 31) apply only to airplanes with dual autopilot select modes.

26) The total displacement of steps 10) and 12) shall be 3.07 ±0.49 inches.
27) Turn on the hydraulic system B flight controls switch.
28) Repeat steps 8) thru 14) above.
29) The total displacement of steps 10) and 12) shall be 2.43 ±0.39 inches.
30) Select system B on the autopilot control panel.
31) Repeat steps 8) thru 14) above.
32) The total displacement of steps 10) and 12) shall be 2.43 ±0.39 inches.
33) Turn off the hydraulic system A flight controls switch.
34) Repeat steps 8) thru 14) above.

35) The total displacement of steps 10) and 12) shall be 3.07 ±0.49 inches.

36) Reduce pitot pressure to zero.

C. Restore Airplane to Normal

(1) Ensure that all tools used during testing are removed.

(2) Remove all masking tape.

(3) Remove seals from drain holes in each vertical fin pitot tube.

CAUTION: MAKE SURE SEALS ARE REMOVED FROM PITOT TUBES.

(4) Remove pressure gage lines from systems A and B drain lines located below feel computer.

(5) Install drain plugs on systems A and B drain lines located below feel computer.

(6) Remove regulated air pressure lines from both vertical fin pitot tubes.

(7) Open the vertical gyro circuit breaker and wait 10 minutes before remounting gyro.

(8) Close all circuit breakers opened during testing.

(9) Restore airplane to normal hydraulic configuration (AMM 27-31-0).

(10) Remove electrical power if no longer required.

ELEVATORS - REMOVAL/INSTALLATION

1. General
   A. For interchangeability of graphite/epoxy elevator with aluminum/fiberglass elevator, refer to 27-09-800.
   B. Balancing requirements are a function of elevator part number and elevator tab part number. Ensure that balancing requirements for elevator-elevator tab combination to be installed have been met per Chapter 51 of the Structural Repair Manual. Elevator rebalancing is required after structural repairs or after repainting.
   C. If an elevator control tab is being installed on the elevator during elevator installation, it is necessary to check that the number of elevator control tab adjust weights installed on the elevator nose corresponds with the required number of adjust weights marked on the elevator tab data plate (Ref 27-31-31 MP).
2. Equipment and Materials
   A. Elevator Hoisting Adapter - F80026-1
   B. Hoist capable of lifting 200 pounds at a height of 20 feet
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   D. Trammel Bar - F80055-1
   E. Corrosion Preventive Compound - MIL-C-11796, class 3 (Ref 20-30-21)
   F. Loading block - 17 inches long, 2 x 4 wood block
   G. Spring scale - 0- to 50-pound capability, graduated in 1-pound increments
   H. Milliohmmeter - 0- to 0.1-ohm range
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Remove or open the following access panels: Tail cone access panels 3801 and 3802, aft compartment access door 3701, stabilizer access panels 9105, 9107, 9108 and 9109 on left stabilizer or 9205, 9207, 9208 or 9209 on right stabilizer, elevator tab lock mechanism upper and lower access panels 9143 and 9142 on left elevator or 9243 and 9242 on right elevator (panels are located at elevator inboard leading edge, Fig. 401), tab pushrod access panel 9313 on left elevator or 9413 on right elevator, elevator hinge fitting upper and lower access panels 9128 thru 9141 on left elevator or 9228 thru 9241 on right elevator, and elevator control pushrod aft bolt access panel 3806 left or 3807 right (panel is located in tail cone adjacent to bolthead).

C. Set horizontal stabilizer B dimension at 41.57 ±0.01 inches, using trammel bar (Fig. 407).
D. Install rigging pin E-5 in aft control quadrant (Fig. 405).
E. Remove the bolt that connects the elevator position sensor control rod to the bracket on the elevator (Fig. 410).

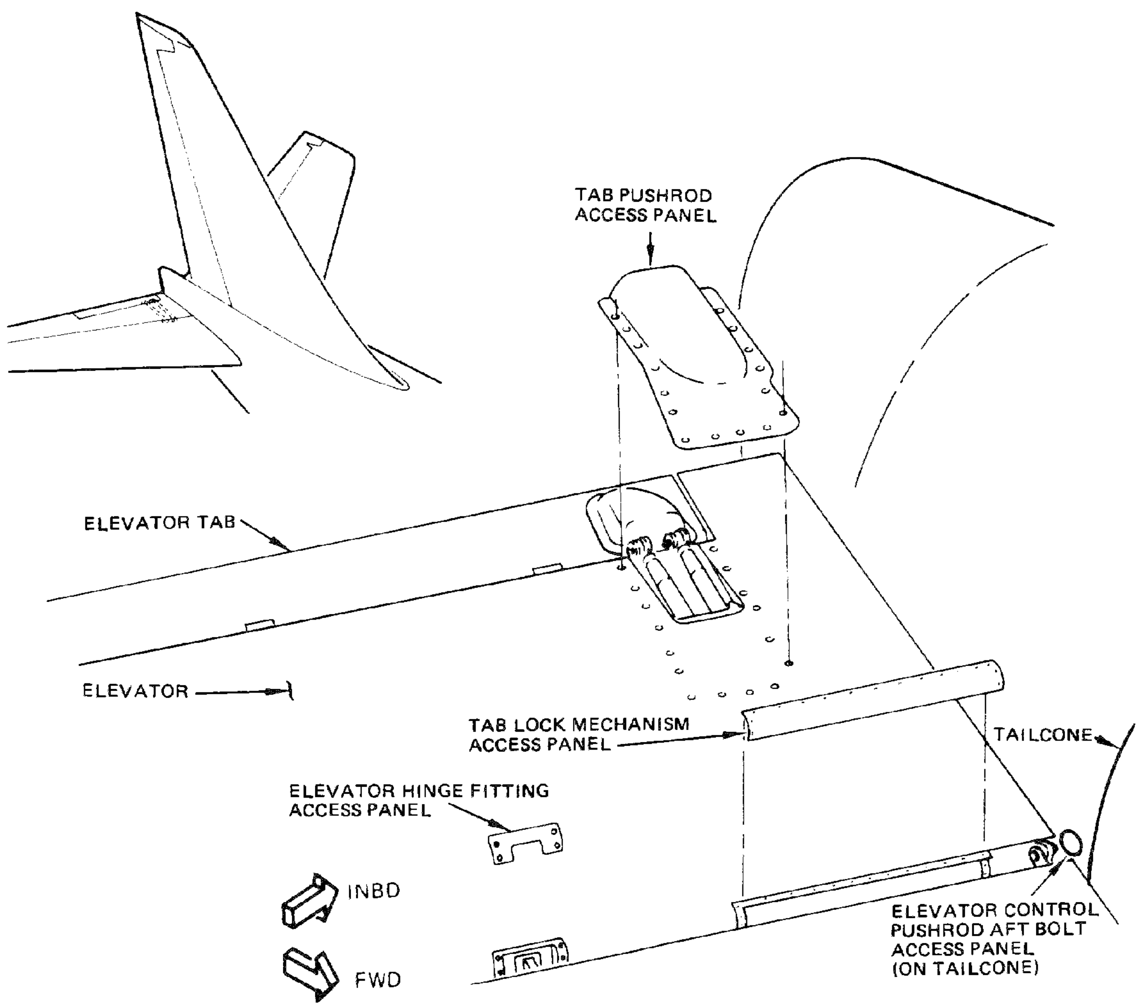
4. Remove Elevator

A. Detach elevator control pushrod from elevator (Fig. 405). Remove bolts through circular access opening in tail cone adjacent to bolthead.

CAUTION: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK AND ELEVATOR MAST FITTING BEARINGS TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE. IF ELEVATOR CONTROL PUSHRODS ARE REMOVED FROM AIRPLANE, THE PUSHRODS MUST BE INSTALLED WITH THE FORE/AFT ORIENTATION SHOWN IN FIG. 405. IF PUSHRODS ARE DISASSEMBLED, SUITABLY IDENTIFY EACH INDIVIDUAL ITEM TO AVOID MISMATCHING PARTS DURING ASSEMBLY.

B. Disconnect tab pushrods and tab lockout mechanism as follows (Fig. 408):
   (1) Remove elevator tab lock linkage bolt retainer shield to obtain access for removal of frame attach bolts.
   (2) Remove tab pushrod aft mounting bolt (2 places).
   (3) Remove two bolts securing aft end of frame to elevator front spar.
      (a) Disconnect tab lock mechanism return springs if clearance is not adequate to remove bolts.
C. At stabilizer trailing edge ribs No. 1 thru 6, remove elevator to stabilizer gap seals (Fig. 402).
D. Remove six bolts securing aft portion of each balance panel hinge to elevator nose. Detach balance panels from elevator (Fig. 406).
E. Remove elevator hinge fitting No. 4 from elevator front spar and from stabilizer trailing edge (Fig. 403).
F. Secure elevator hoisting adapter to elevator front spar at front hinge fitting No. 4 location (Fig. 404).
G. Attach sling to elevator hoisting adapter and take up slack in line.
H. Remove elevator hinge fitting No. 1 thru 3, No. 5 and 6 from elevator front spar (Fig. 403).
I. Remove elevator from airplane.

NOTE: Weight of elevator with tab and balance panels installed, is approximately 225 pounds.



Access Panel Locations
Figure 401

J. If a different elevator is to be installed, perform the following steps: For installing original elevator, proceed to step 5.A.
   (1) Separate elevator hinge fittings from stabilizer hinge fittings by removing hinge bearing bolts from all hinge fittings. Retain bolts, nuts, washers and bonding jumpers for subsequent installation.
   (2) Detach hoisting adapter from elevator front spar.
   (3) Insert hinge mounting bolts finger-tight and install elevator hinge fittings at original locations on elevator front spar (Fig. 403).
   (4) Install elevator to stabilizer gap seals adjacent to hinge fittings and along edge of elevator nose at stabilizer trailing edge ribs No. 1 thru 6 (Fig. 402).
   (5) Refer to figure 401 and replace the following access panels: Tab pushrod access panel, elevator tab lock mechanism upper and lower access panels, and elevator hinge fitting upper and lower access panels.

5. <u>Prepare for Installation</u>
   A. Check elevator hinge bearings, hinge bearing bolts, and elevator control linkage for allowable wear (Ref Elevator - Inspection/Check).

   <u>CAUTION</u>: ELEVATOR CONTROL PUSHROD, PUSHROD BOLT AND ROD END BOLT ARE DUAL LOAD PATH COMPONENTS. INSPECT INNER AND OUTER RODS/BOLTS FOR DAMAGE PRIOR TO INSTALLATION.

   B. If new elevator is being installed, perform the following steps on new elevator. If original elevator is being installed, proceed to step 5.C.
      (1) Refer to Fig. 401 and remove the following access panels: Elevator tab lock mechanism upper and lower access panels. Panels are located at elevator inboard leading edge, tab pushrod access panel, and elevator hinge fitting upper and lower access panels.
      (2) Remove elevator to stabilizer gap seals adjacent to hinge fitting and along edge of elevator nose at stabilizer trailing edge ribs No. 1 thru 6 (Fig. 402).
      (3) Referring to Fig. 403, remove all hinge halves from front spar of replacement elevator and assemble to stabilizer trailing edge as follows:
         (a) Lightly coat hinge bearing bolts with corrosion preventive compound.

(b) Al elevator hinge fitting No. 1 location, install hinge bearing bolt with head outboard. Place washer under bolt head and washer and bonding jumper under nut. Clean surface to provide electrical bonding. Tighten nut to 95-100 pound-inches torque. Align nut with cotter pin hole without exceeding 190 pound-inches torque, then install cotter pin.

(c) At elevator hinge fitting No. 2, install hinge bearing bolt with head inboard. Place washer under bolthead and nut, then tighten nut 90 to 100 pound-inches. Align nut with cotter pin hole without exceeding 190 pound-inches, then install cotter pin.

(d) At elevator hinge fittings locations No. 3 and 5, instal1 hinge bearing bolt with heads outboard. Place washer under bolthead and under nut. At elevator hinge fitting No. 6 location, install hinge bearing bolt with head outboard. Place washer under bolthead and washer and bonding jumper under nut. Clean surface to provide electrical bonding. At all three hinge locations, tighten nut 60 to 85 pound-inches. Align nut with cotter pin hole without exceeding 140 pound-inch, then install cotter pin.

(4) Secure elevator hoisting adapter to elevator front spar at hinge fitting No. 4 location (Fig. 404).

C. Remove elevator systems A and B hydraulic power (Ref 27-31-0).

D. Check that rigging pin E-5 is installed in aft control quadrant (Fig. 405).

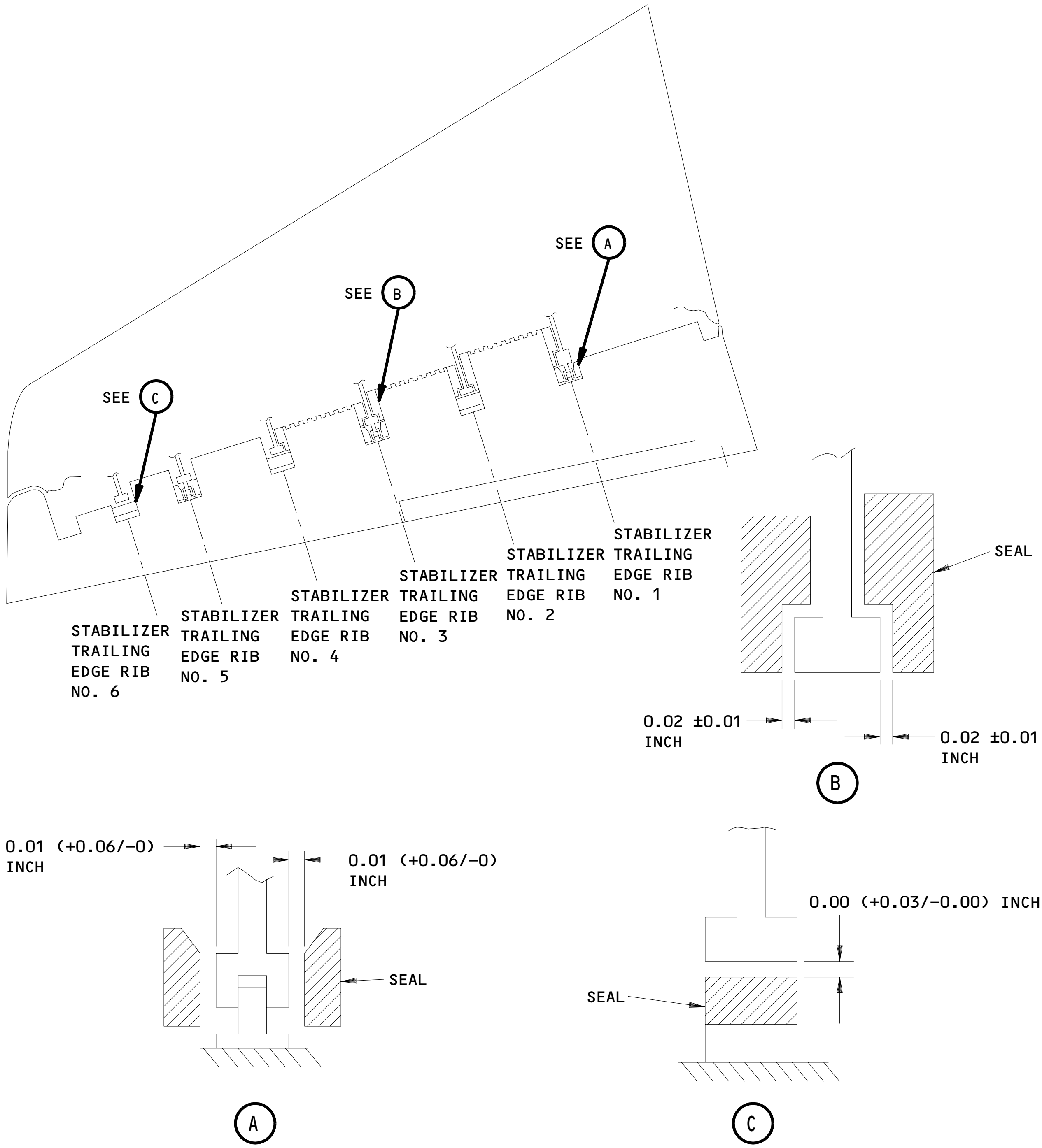
6. Install Elevator

A. Refer to Fig. 403 and attach elevator to stabilizer as follows:

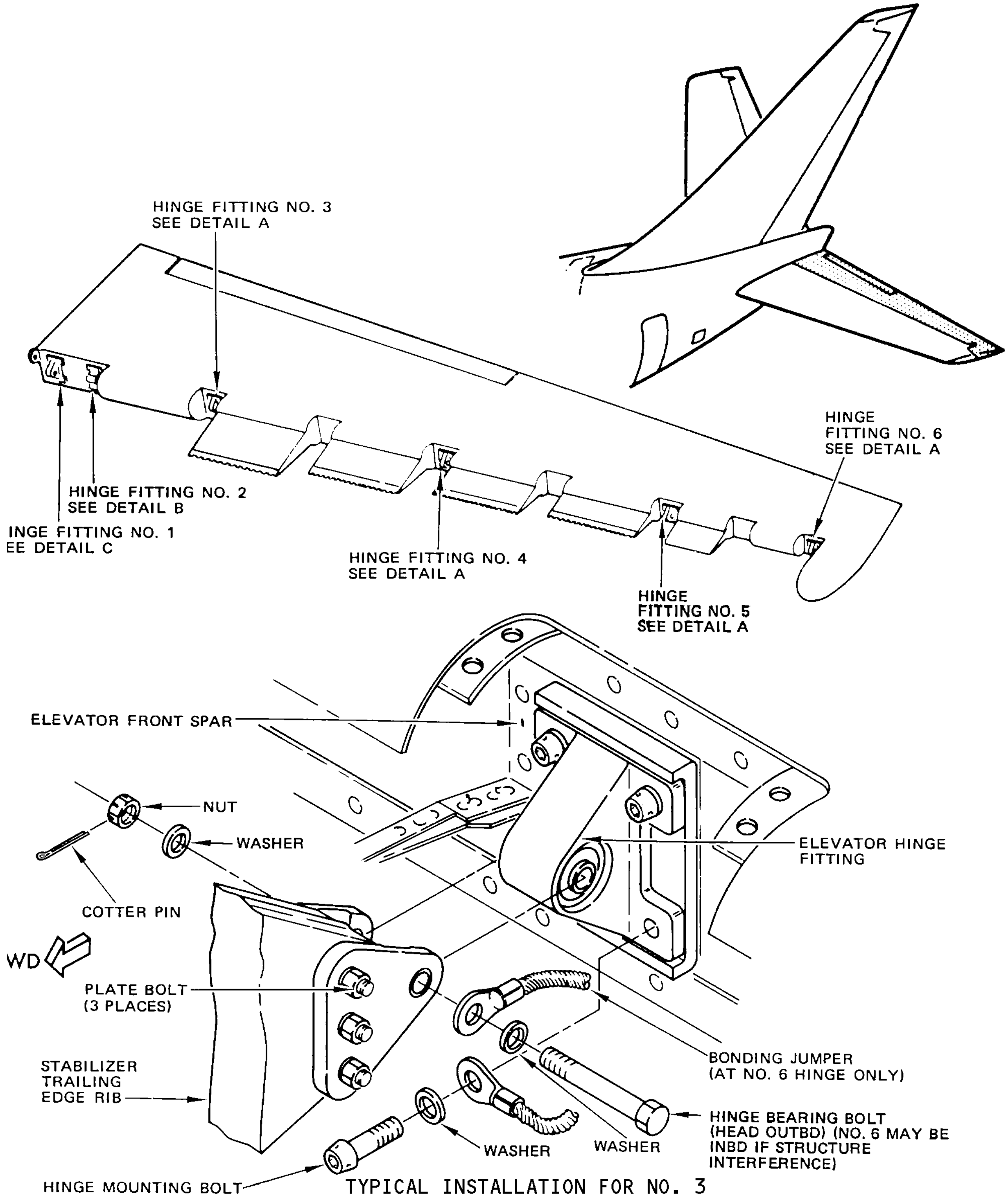
NOTE: All bolts attaching elevator hinge fitting halves to elevator front spar are to be tightened 70 to 80 pound-inches.

(1) Position elevator at stabilizer trailing edge.
(2) Insert washer under head of each hinge fitting mounting bolt.
(3) Clean surfaces to provide electrical bonding and place bonding jumper under lower inboard bolthead at hinge fitting No. 1 and lower outboard bolthead at hinge fitting No. 6.
(4) Install hinge fitting mounting bolts (four places each fitting). Tighten mounting bolts 70 to 80 pound-inches.

B. Remove hoisting adapter from elevator front spar.

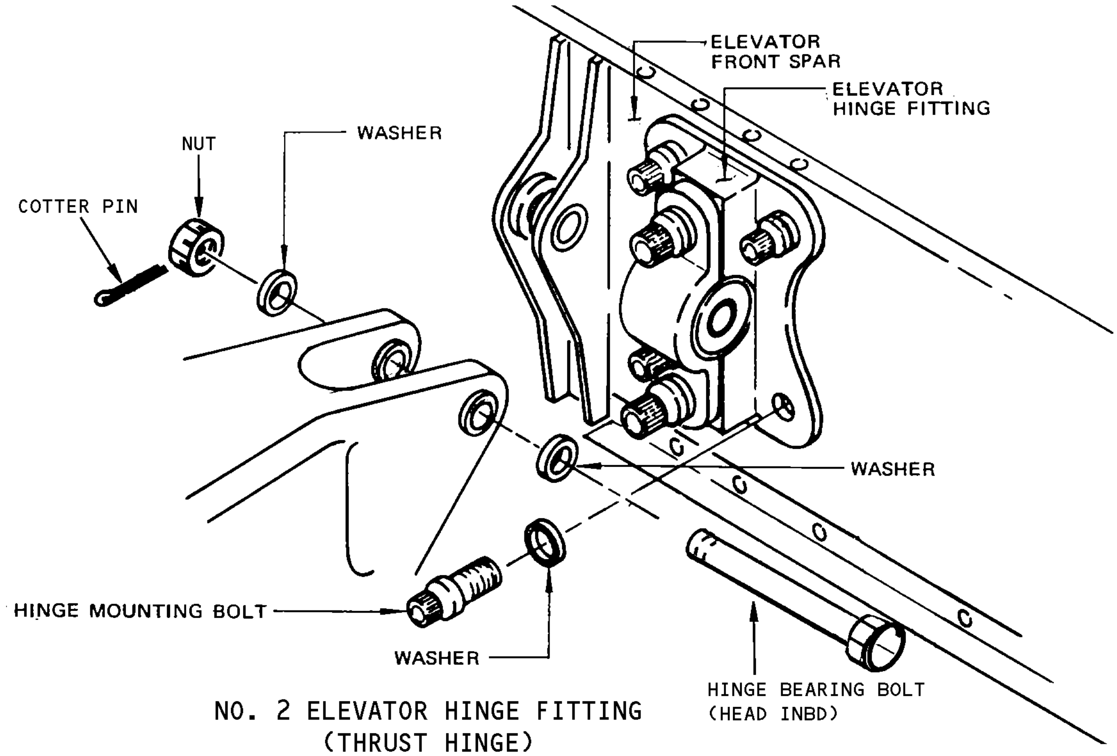


Elevator to Stabilizer Seal Adjustment
Figure 402

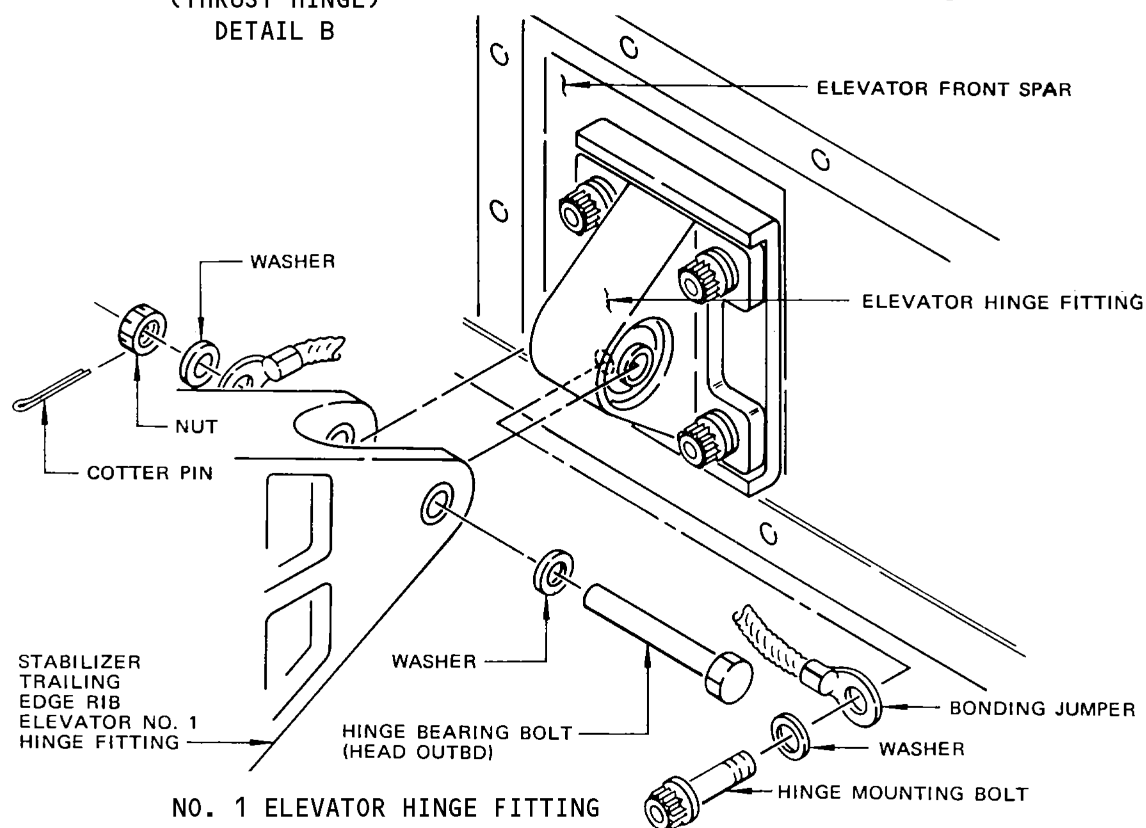


TYPICAL INSTALLATION FOR NO. 3
THRU NO. 6 ELEVATOR HINGE FITTINGS
DETAIL A

Elevator Hinge Locations
Figure 403 (Sheet 1)



NO. 2 ELEVATOR HINGE FITTING
(THRUST HINGE)
DETAIL B



NO. 1 ELEVATOR HINGE FITTING
DETAIL C

Elevator Hinge Locations
Figure 403 (Sheet 2)

C. At elevator hinge fitting No. 4 location, attach hinge fitting to elevator front spar and stabilizer trailing edge. Tighten bolts attaching hinge fitting to elevator front spar 70 to 80 pound-inches (Fig. 403). Install plate attach bolts to stabilizer trailing edge rib with heads inboard. Tighten nuts 50 to 70 pound-inches.

NOTE: Ensure hinge fitting No. 4 is installed with head of hinge bearing bolt facing outboard.

D. Install seals adjacent to hinge fittings and along edge of elevator nose at stabilizer trailing edge ribs No. 1 through No. 6. Adjust seals as follows:
(1) Position and hold elevator faired with stabilizer during seal adjustment.
(2) At stabilizer trailing edge ribs No. 1, No. 3 and No. 5, adjust flat seal to maintain 0.01 (+0.06/-0.000)-inch clearance between seal and hinge fitting. (See detail A, figure 402.)
(3) At stabilizer trailing edge ribs No. 1, 2, 3, and 4, adjust bulb seal to maintain 0.02 ±-0.01-inch clearance between seal and side of stabilizer trailing edge rib (Detail B).
(4) At stabilizer trailing edge ribs No. 2, 4 and 6, adjust bulb seal to maintain +0.03/-0.00-inch interference between seal and aft face of stabilizer trailing edge rib (Detail C).

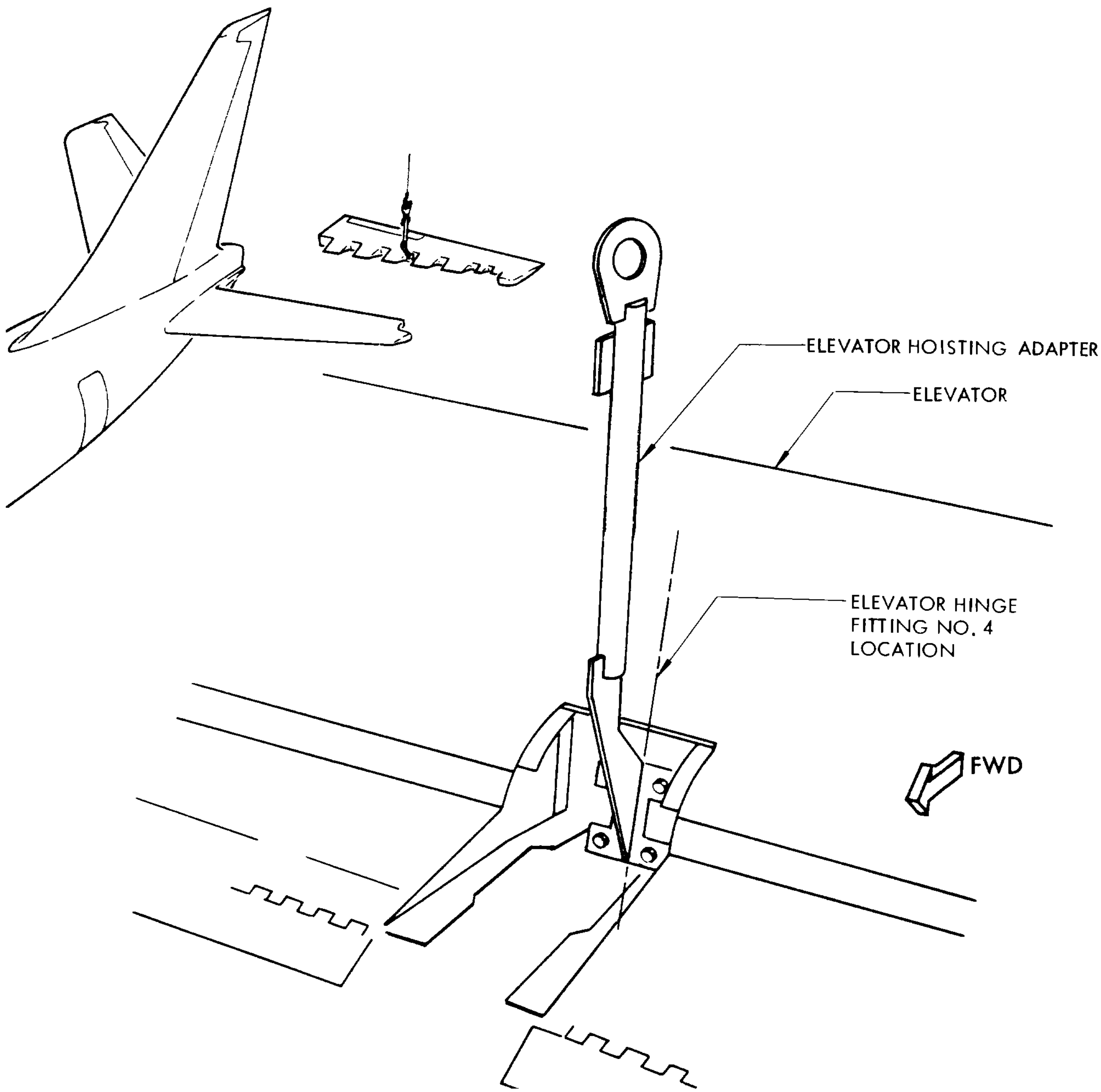
E. Attach balance panels to elevator by installing six bolts up through each elevator nose. Ensure each hinge seal is properly installed before tightening bolts (Fig. 406).

CAUTION: WHEN ATTACHING BALANCE PANEL TO ELEVATOR, ENSURE IDLER HINGE IS DEFLECTED DOWNWARD FROM STABILIZER SUPPORT BEAM.

F. Connect tab pushrods and tab lockout mechanism as follows (Fig. 408):
(1) Secure aft end of frame to elevator front spar. Install inboard bolt with head facing outboard, and outboard bolt with head facing inboard, with washers as required. Tighten nut on inboard bolt 40 to 55 pound-inches.

CAUTION: IF PUSHROD NUTS ARE NOT TORQUED PROPERLY, THE PUSHRODS CAN BECOME DETACHED AND CAUSE DAMAGE TO THE ELEVATORS AND STABILIZERS.

(2) See Detail A, Fig. 408, and install tab pushrods as follows:
(a) Install tab pushrod aft mounting bolts. Install outboard bolt with head facing outboard and inboard bolt with head facing inboard.
(b) Install a new nut and a washer on each tab pushrod aft mounting bolt.



Elevator Hoisting Adapter
Figure 404

(c) If castellated nuts are used, torque nuts 30 to 50 inch-pounds. Ensure the torque remains at 30 to 50 inch-pounds after alignment of cotter pin holes. If new, self-locking non-castellated nuts are used, run-on torque must be between 3.5 and 30 inch-pounds. Replace any self-locking nut that does not meet this requirement (even if it is a new nut). Torque nut 50 to 80 inch-pounds.

(3) Install retainer shield.
(4) On airplanes with four return springs, check that dimension given in Detail B, Fig. 408 is observed.
(5) Connect tab lock mechanism return springs if disconnected.

G. Measure breakaway forces required to move elevator. Use spring scale and loading block and apply force to elevator rear spar, adjacent to inboard rib.
(1) Slowly rotate elevator by hand through full travel up and down and check for roughness or binding.
(2) If the elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position (Fig. 405).
(3) Record the force at the time the elevator reaches the neutral position.
(4) The difference between these forces shall not exceed 1.0 pound.

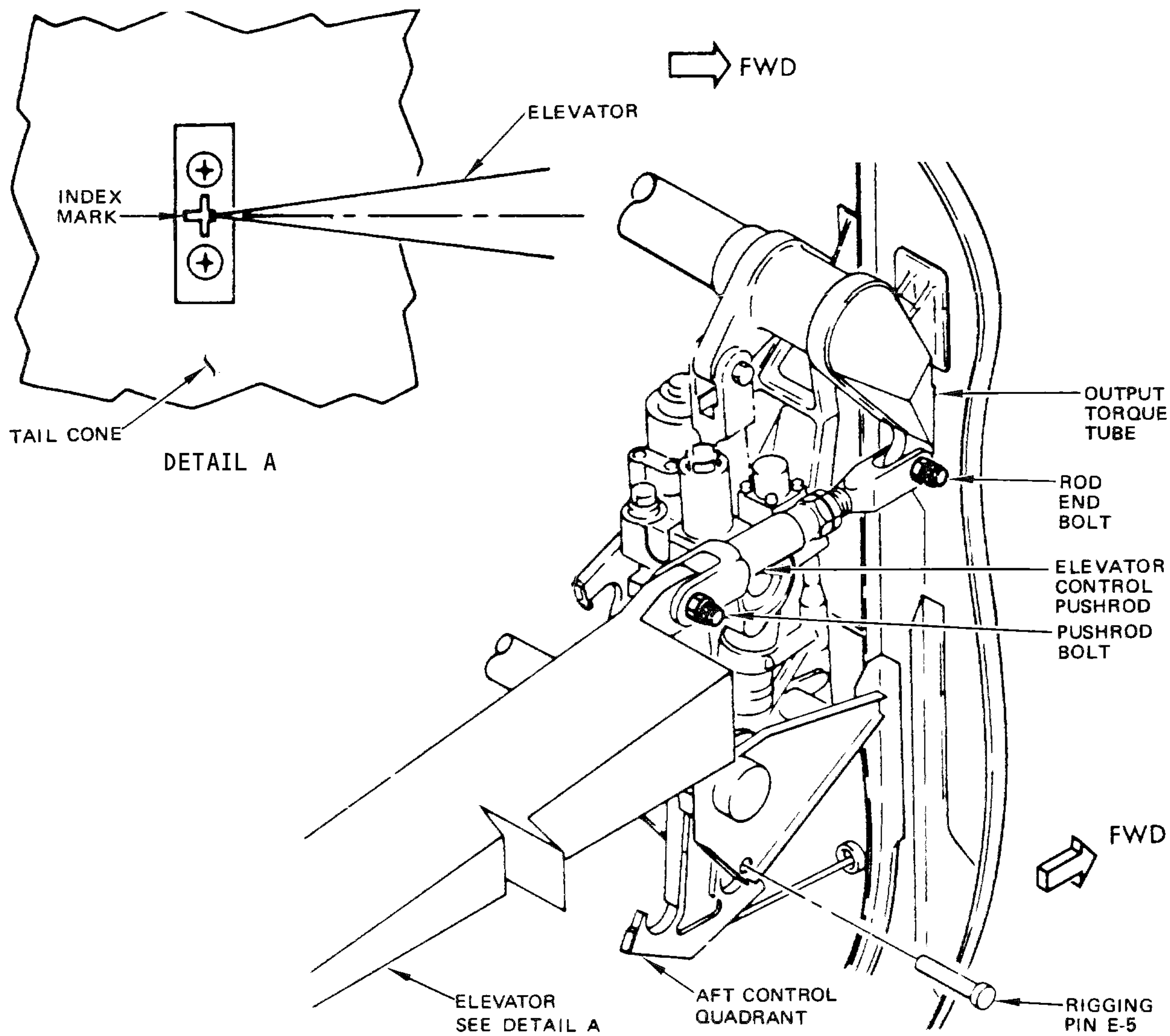
H. Attach elevator control pushrod to elevator as follows (Fig. 405):

<u>CAUTION</u>: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK AND ELEVATOR MAST FITTING BEARINGS TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

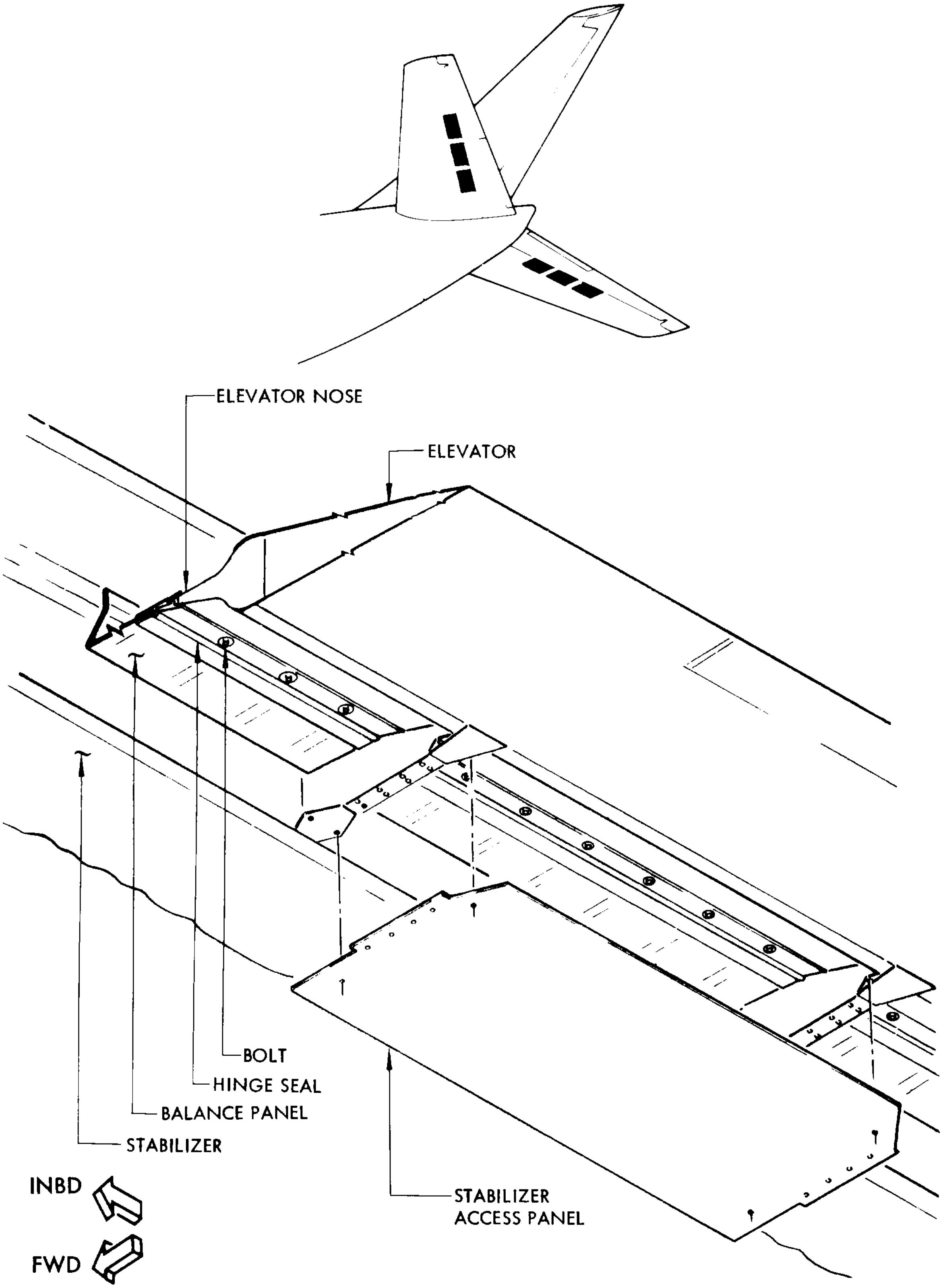
(1) Return elevators to neutral position.
(2) With head facing inboard, insert bolt from inside tail cone through circular access opening, through control pushrod and elevator lug.
(3) Tighten first locknut 500 to 600 pound-inches torque, then tighten second locknut 150 to 220 pound-inches torque.

<u>CAUTION</u>: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUT.

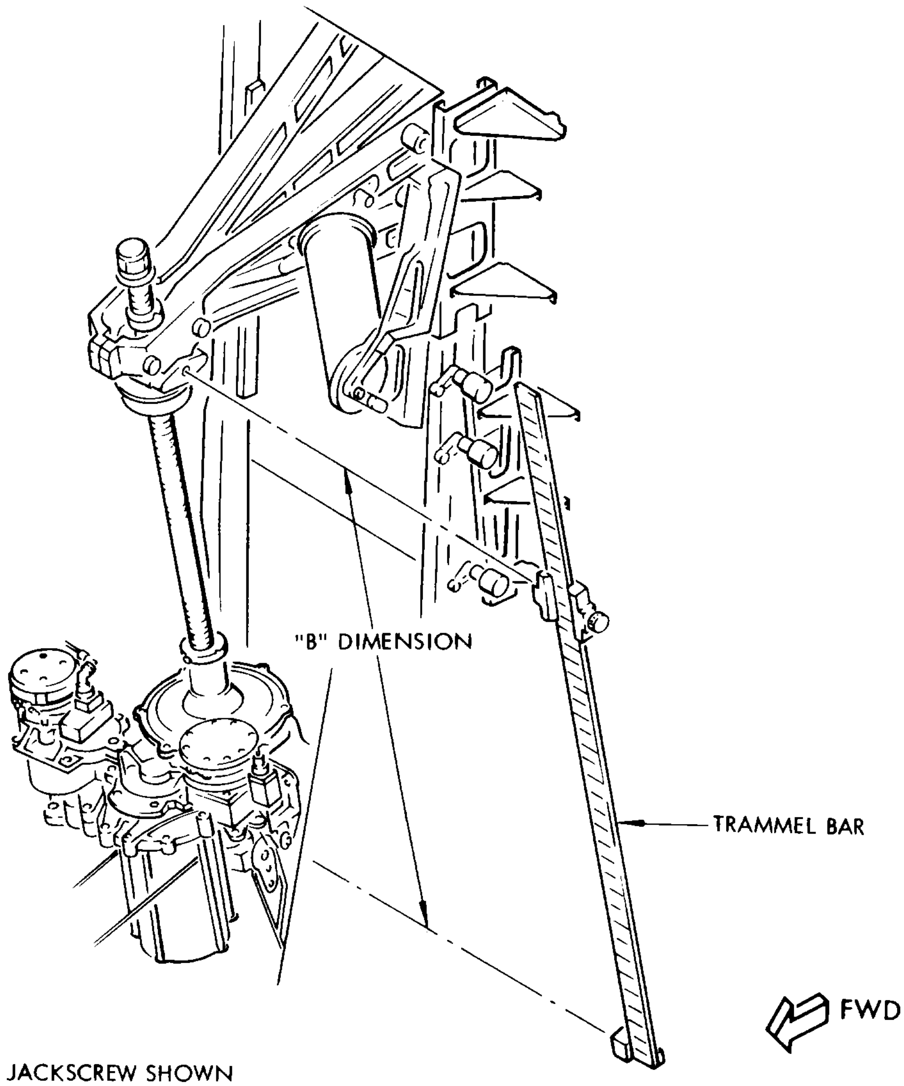
I. Remove rigging pin E-5 from aft control quadrant.
J. Restore airplane to normal hydraulic configuration (Ref 27-31-0).
K. Adjust and test elevator and tab per 27-31-0, A/T.
L. Close or replace all access doors and panels.



Elevator Control Linkage
Figure 405

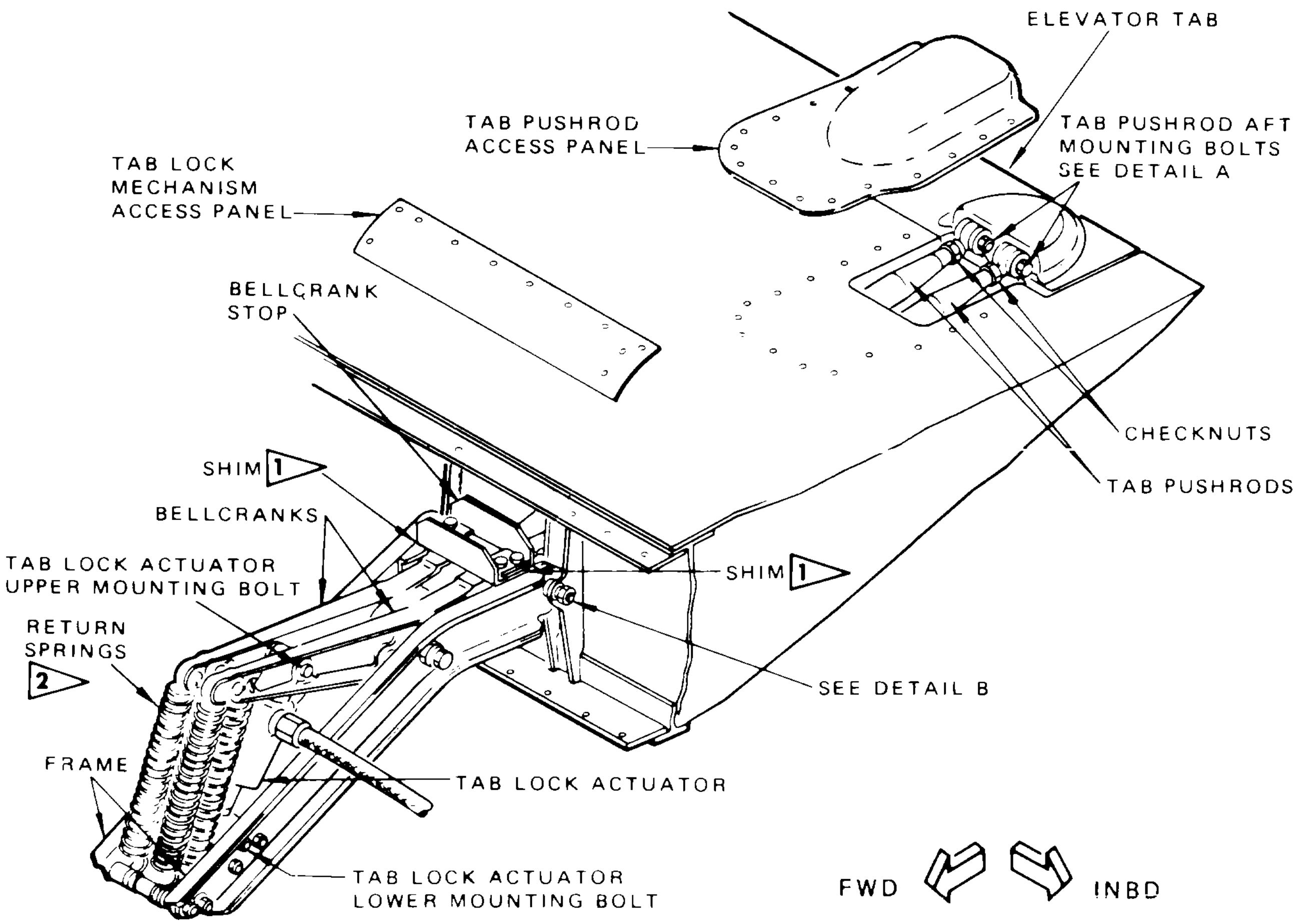


Balance Panel Installation
Figure 406



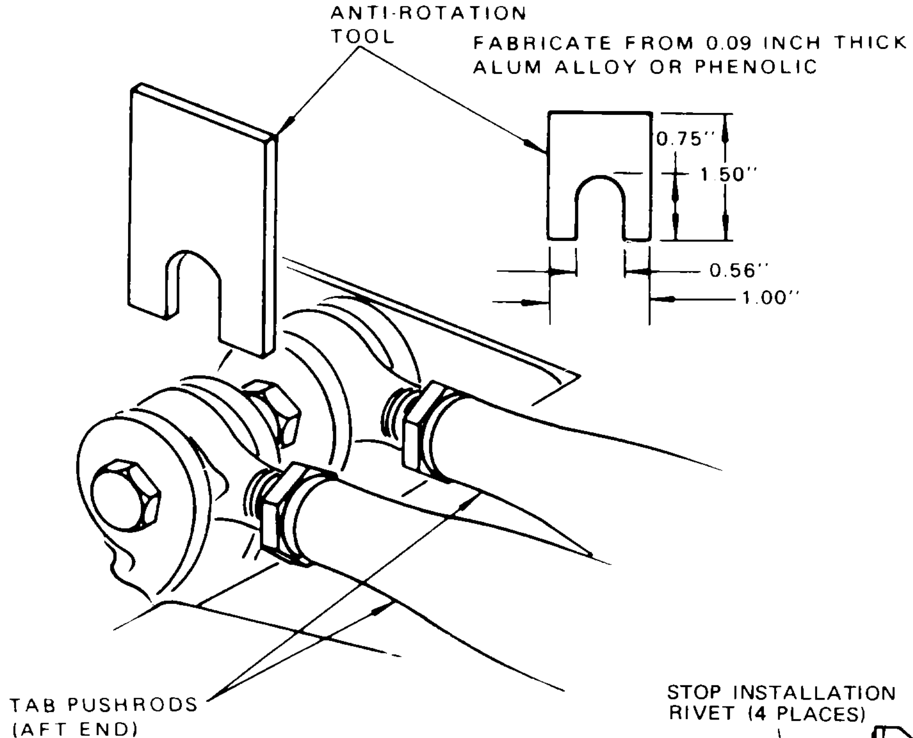
NOTE: STABILIZER TRIM JACKSCREW SHOWN
WITH STABILIZER LEADING EDGE
AT ZERO DEGREES

Stabilizer Trim Jackscrew Setting
Figure 407



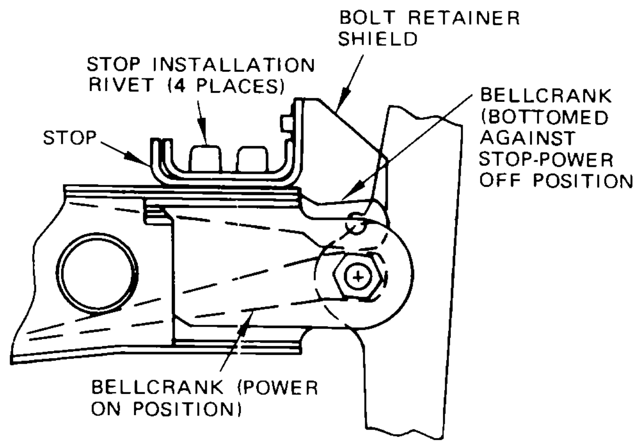
2 ON SOME AIRPLANES ONLY TWO FORWARD RETURN SPRINGS ARE INSTALLED.

Elevator Tab Lock Linkage Installation
Figure 408 (Sheet 1)

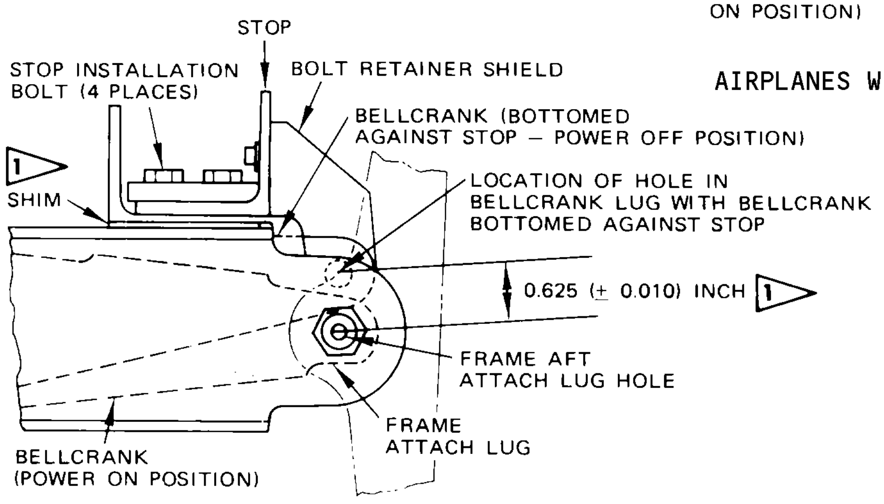


DETAIL A

1 POSITION SHIMS ON BOTH SIDES OF STOP AS REQUIRED TO OBTAIN DIMENSION

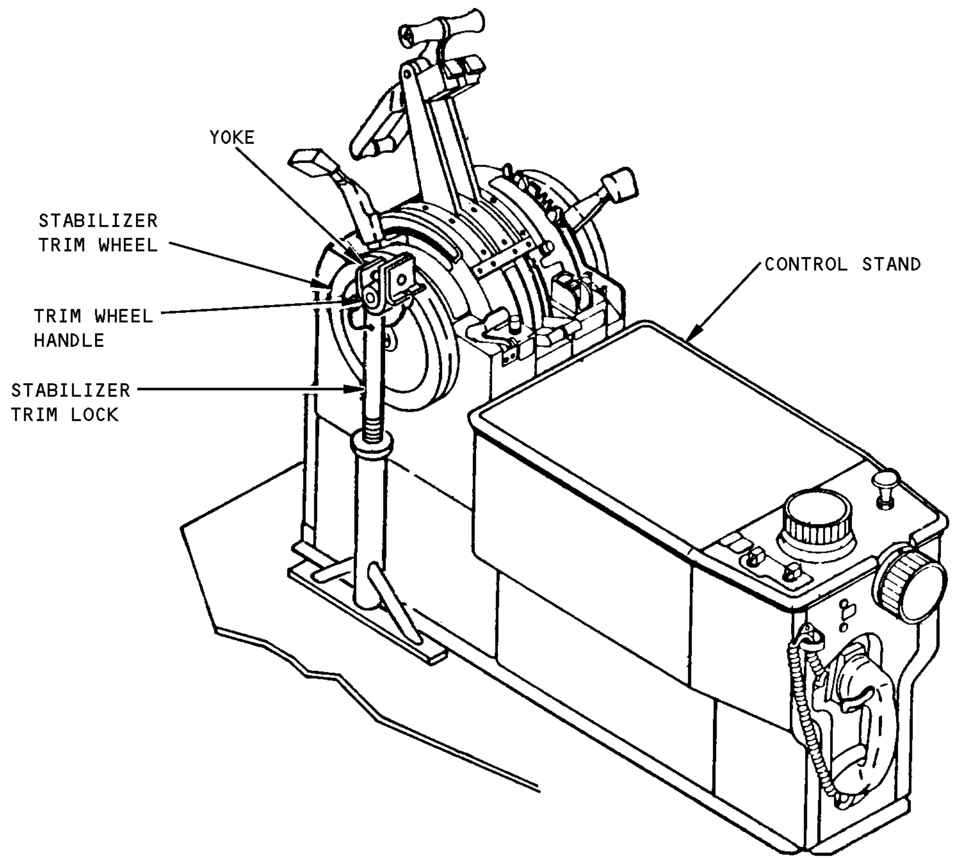


AIRPLANES WITH 2 RETURN SPRINGS
DETAIL B

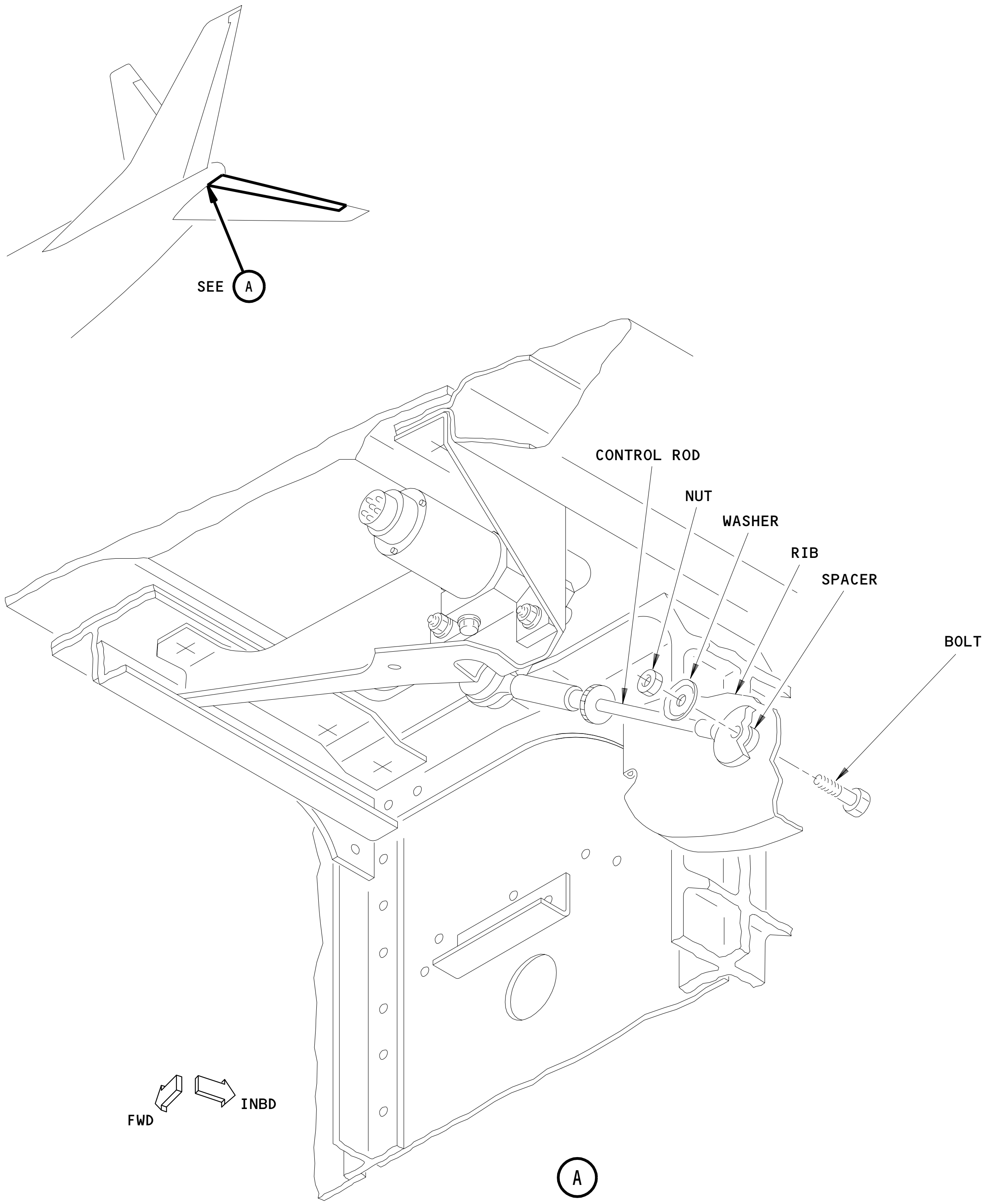


AIRPLANES WITH 4 RETURN SPRINGS
DETAIL B

Elevator Tab Lock Linkage Installation
Figure 408 (Sheet 2)



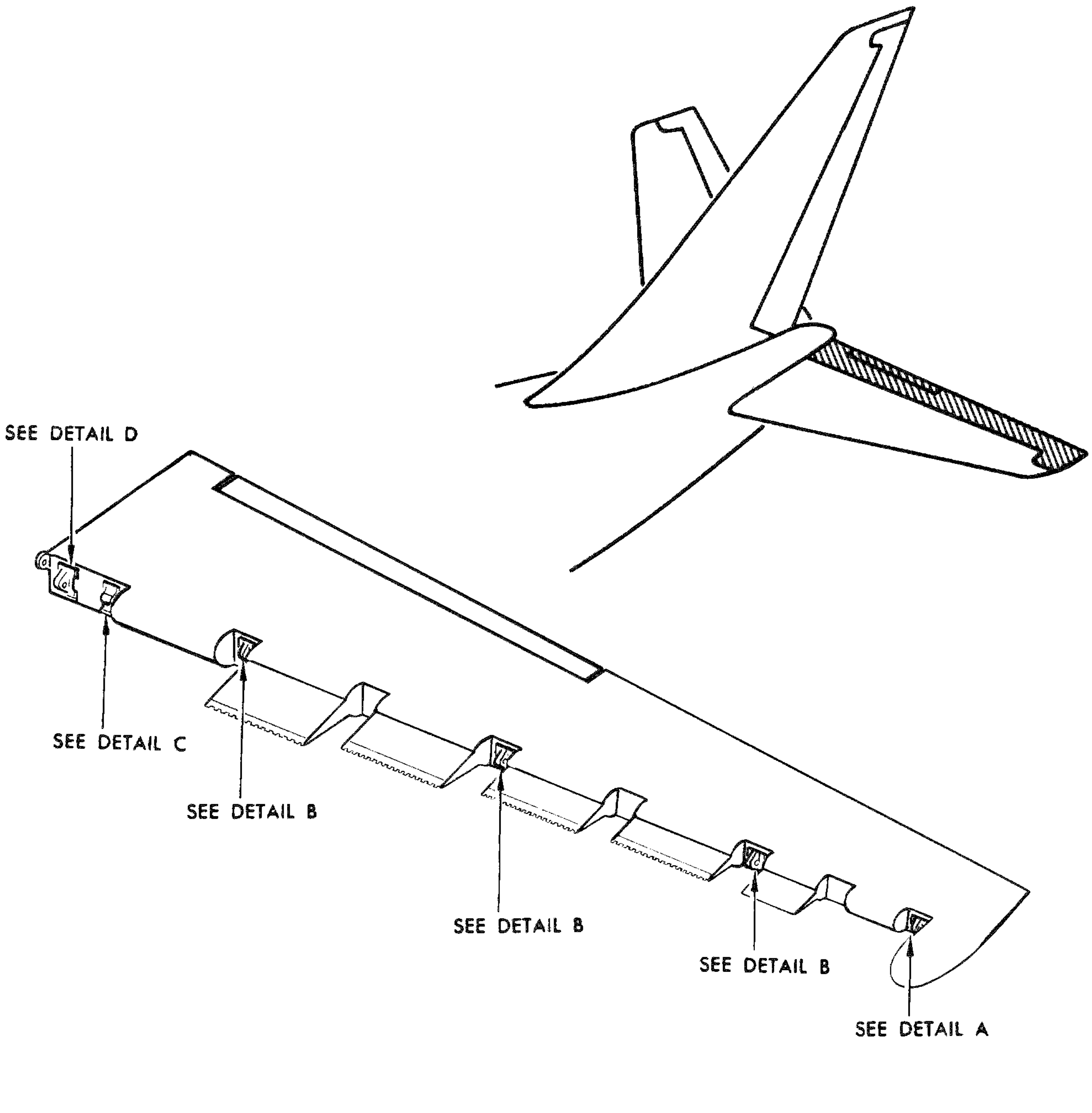
Stabilizer Trim Lock Installation
Figure 409



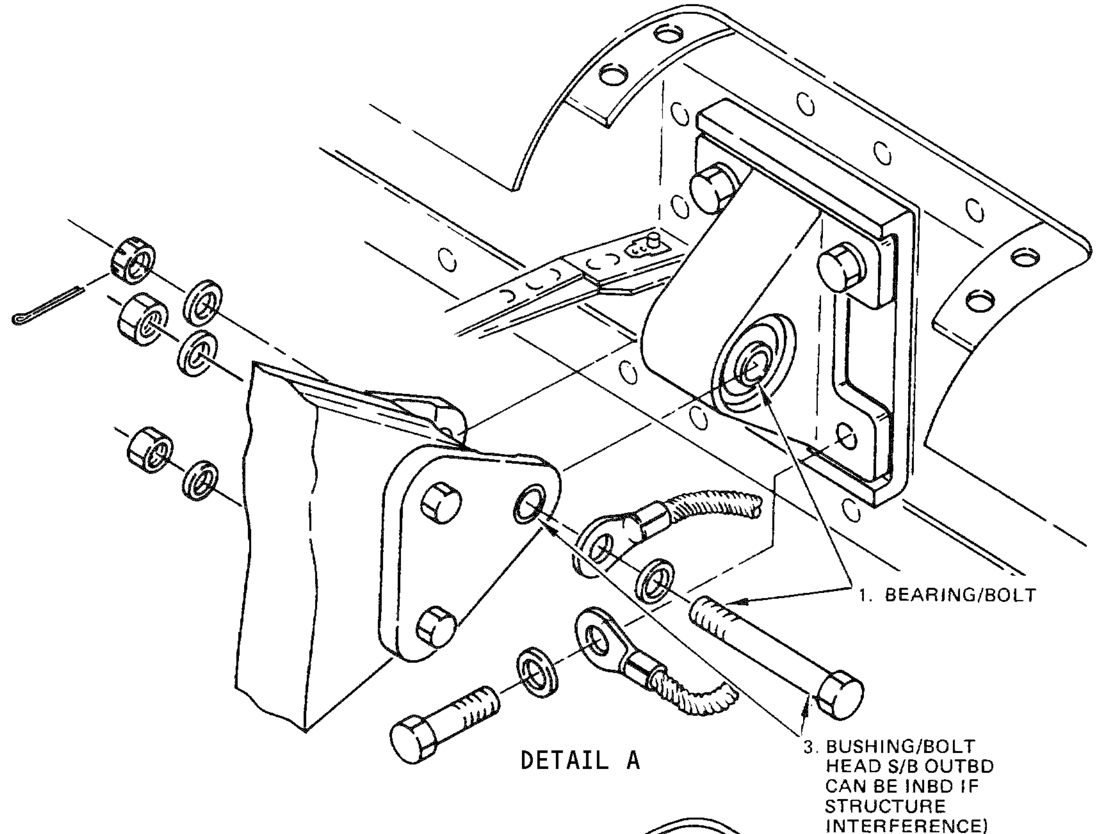
Elevator Position Transmitter Installation
Figure 410

ELEVATOR - INSPECTION/CHECK

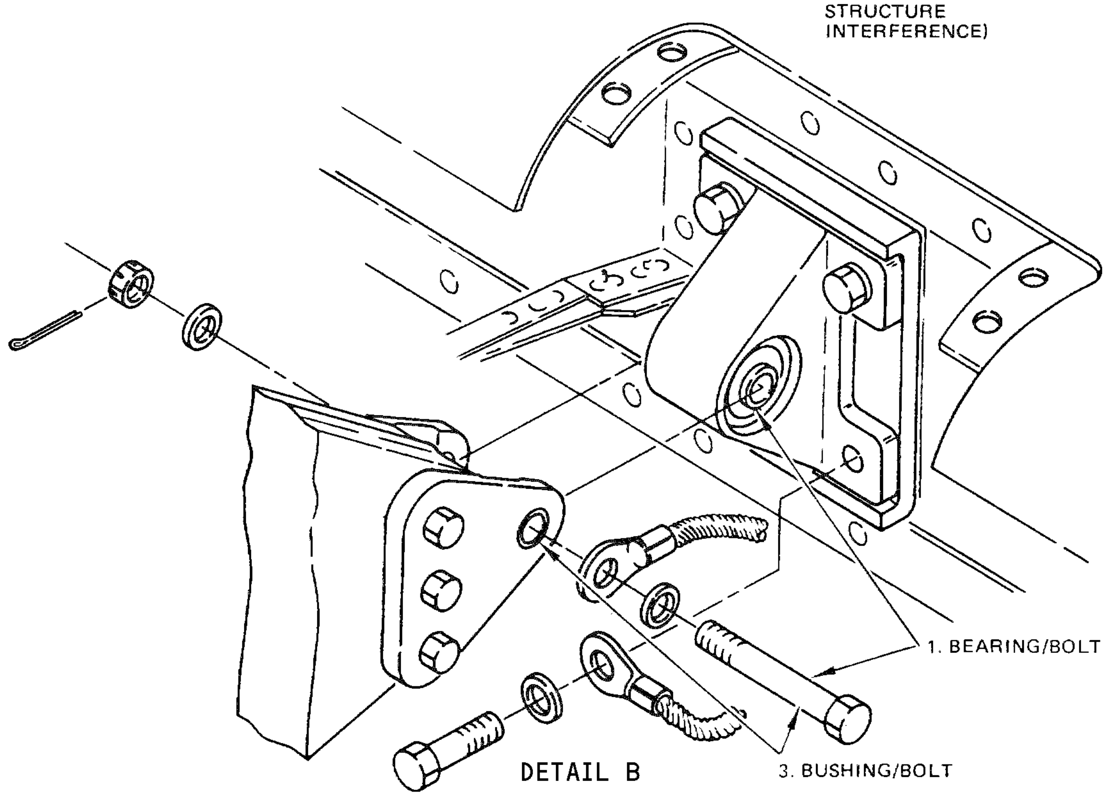
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Elevator Hinge Wear Limits



Elevator Hinge Wear Limits
Figure 601 (Sheet 1)

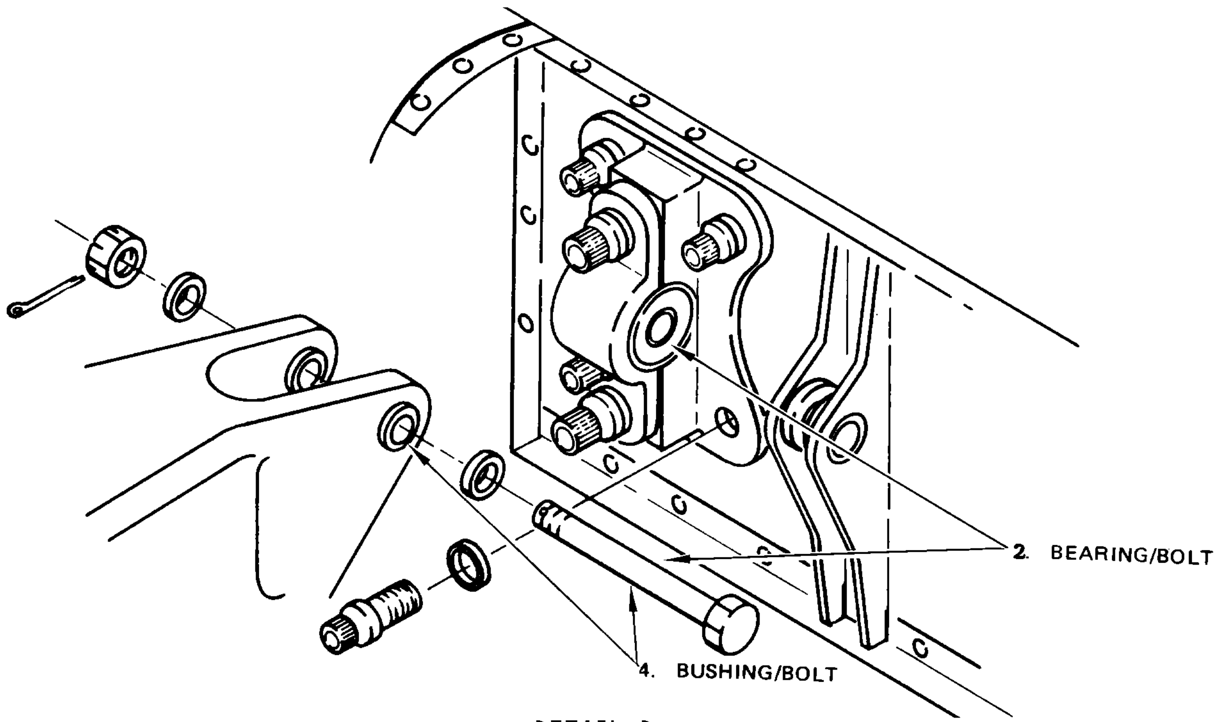


DETAIL A

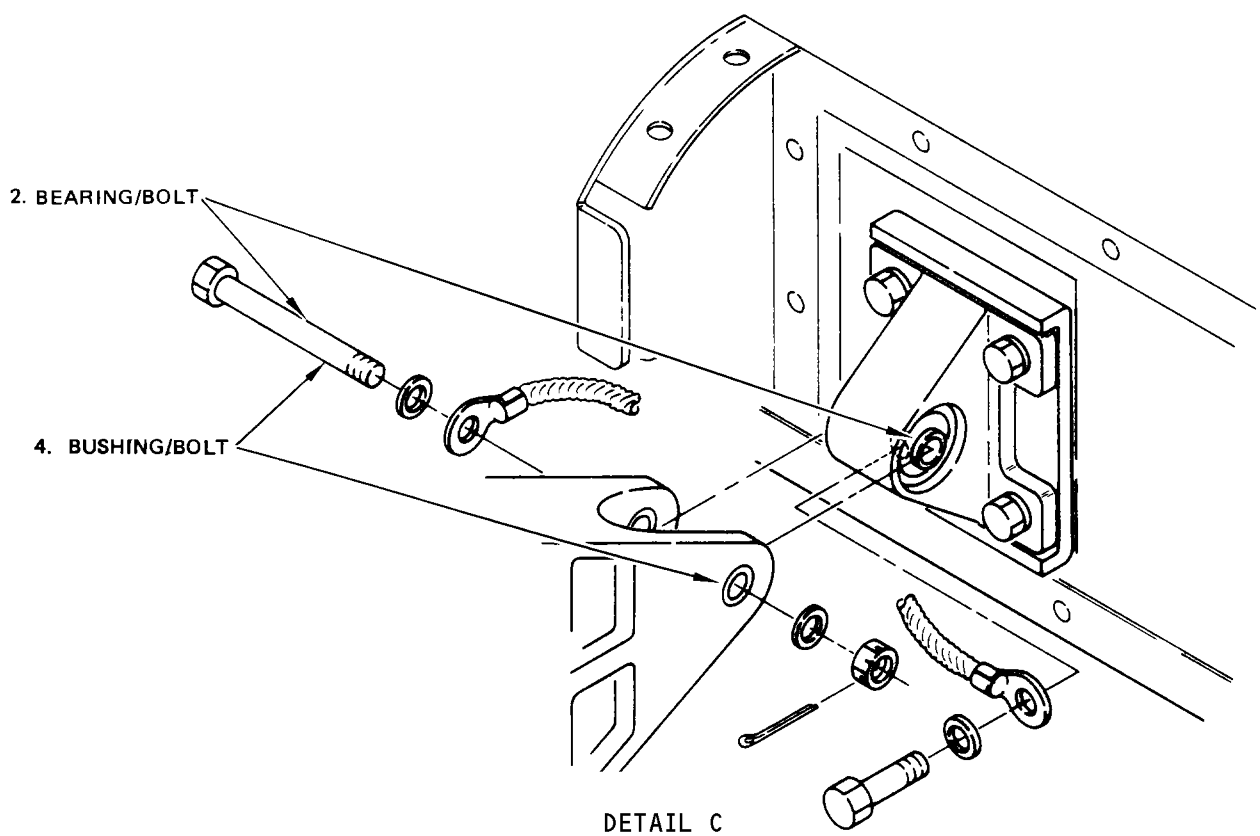


DETAIL B

Elevator Hinge Wear Limits
Figure 601 (Sheet 2)



DETAIL D



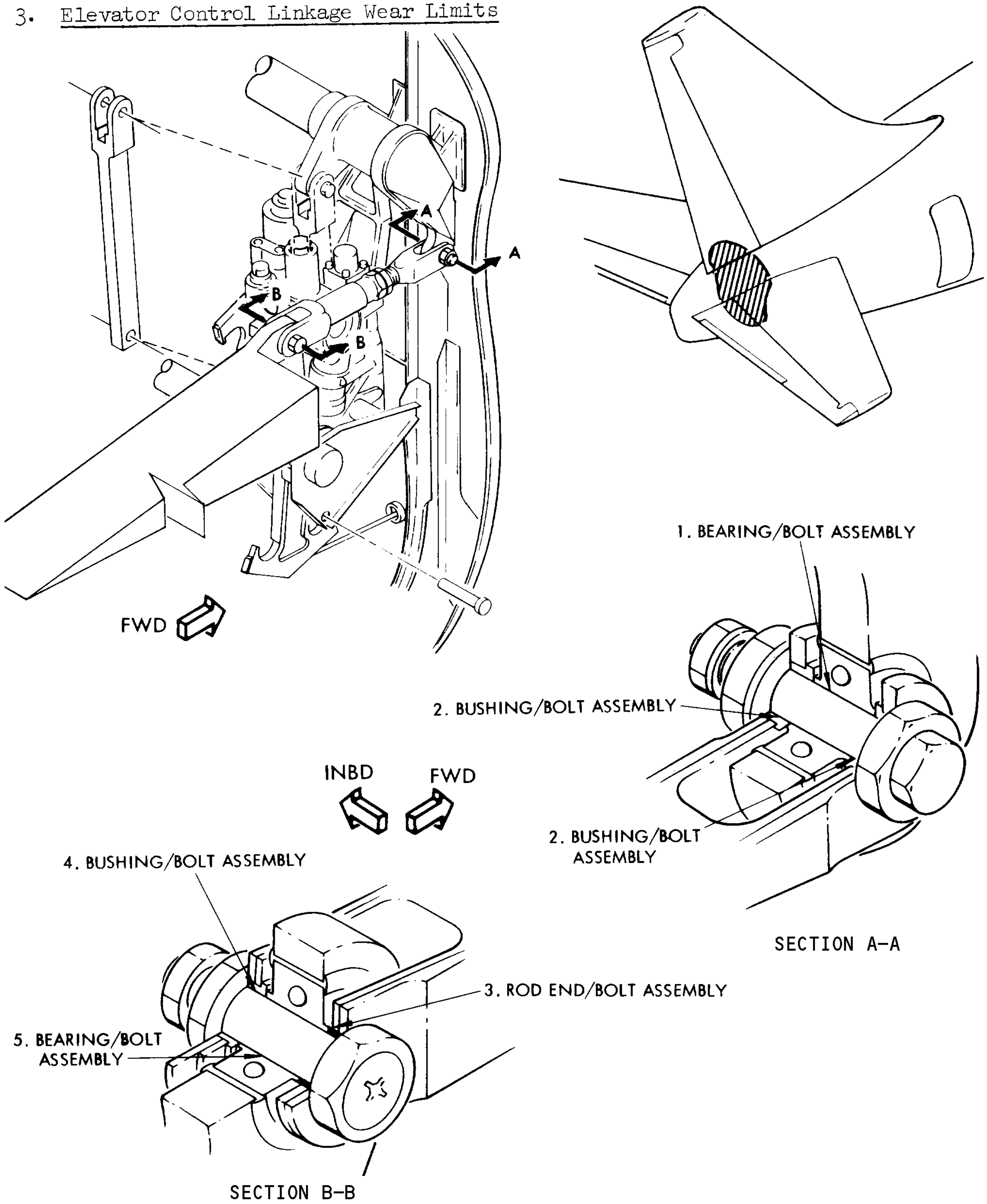
DETAIL C

Elevator Hinge Wear Limits
Figure 601 (Sheet 3)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
			DIAMETER		MAX WEAR DIM.	MAX DIAM CLEAR-ANCE			
			MIN	MAX					
1	BEARING	ID	0.3120	0.3125	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3070		X		
2	BEARING	ID	0.3745	0.3750	0.3825	0.0080	X		
	BOLT	OD	0.3735	0.3745	0.3665		X		
3	BUSHING	ID	0.3120	0.3130	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3070		X		
4	BUSHING	ID	0.3745	0.3755	0.3825	0.0080	X		
	BOLT	OD	0.3735	0.3745	0.3675		X		

Elevator Hinge Wear Limits
Figure 601 (Sheet 4)

3. Elevator Control Linkage Wear Limits



Elevator Control Linkage Wear Limits
Figure 602 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT ASSEMBLY	OD	0.6230	0.6240	0.6226		X		
2	BUSHING	ID	0.6250	0.6265	0.6295	0.0055	X		
	BOLT ASSEMBLY	OD	0.6230	0.6240	0.6226		X		
3	BUSHING	ID	0.8147	0.8157	0.8187	0.0045	X		
	BOLT ASSEMBLY	OD	0.8132	0.8142	0.8128			X	1
4	BUSHING	ID	0.6250	0.6265	0.6295	0.0055	X		
	BOLT ASSEMBLY	OD	0.6230	0.6240	0.6226		X		
5	BEARING	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT ASSEMBLY	OD	0.6230	0.6240	0.6226		X		

1 REPLACE WORN BUSHING ON BOLT ASSEMBLY

Elevator Control Linkage Wear Limits
Figure 602 (Sheet 2)

ELEVATORS - REMOVAL/INSTALLATION

1. General
   A. For interchangeability of aluminum/fiberglass elevator with graphite/epoxy elevator, refer to 27-09-800.
   B. Balancing requirements are a function of elevator part number and elevator tab part number. Ensure that balancing requirements for elevator-elevator tab combination to be installed have been met per Chapter 51 of Structural Repair Manual. Elevator rebalancing is required after structural repairs or after repainting.
   C. If an elevator control tab is being installed on the elevator during elevator installation, it is necessary to check that the number of elevator control tab adjust weights installed on the elevator nose corresponds with the required number of adjust weights marked on the elevator tab data plate (Ref 27-31-31, MP).
2. Equipment and Materials
   A. Elevator Sling - C55001
   B. Hoist capable of lifting 200 pounds at a height of 20 feet
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

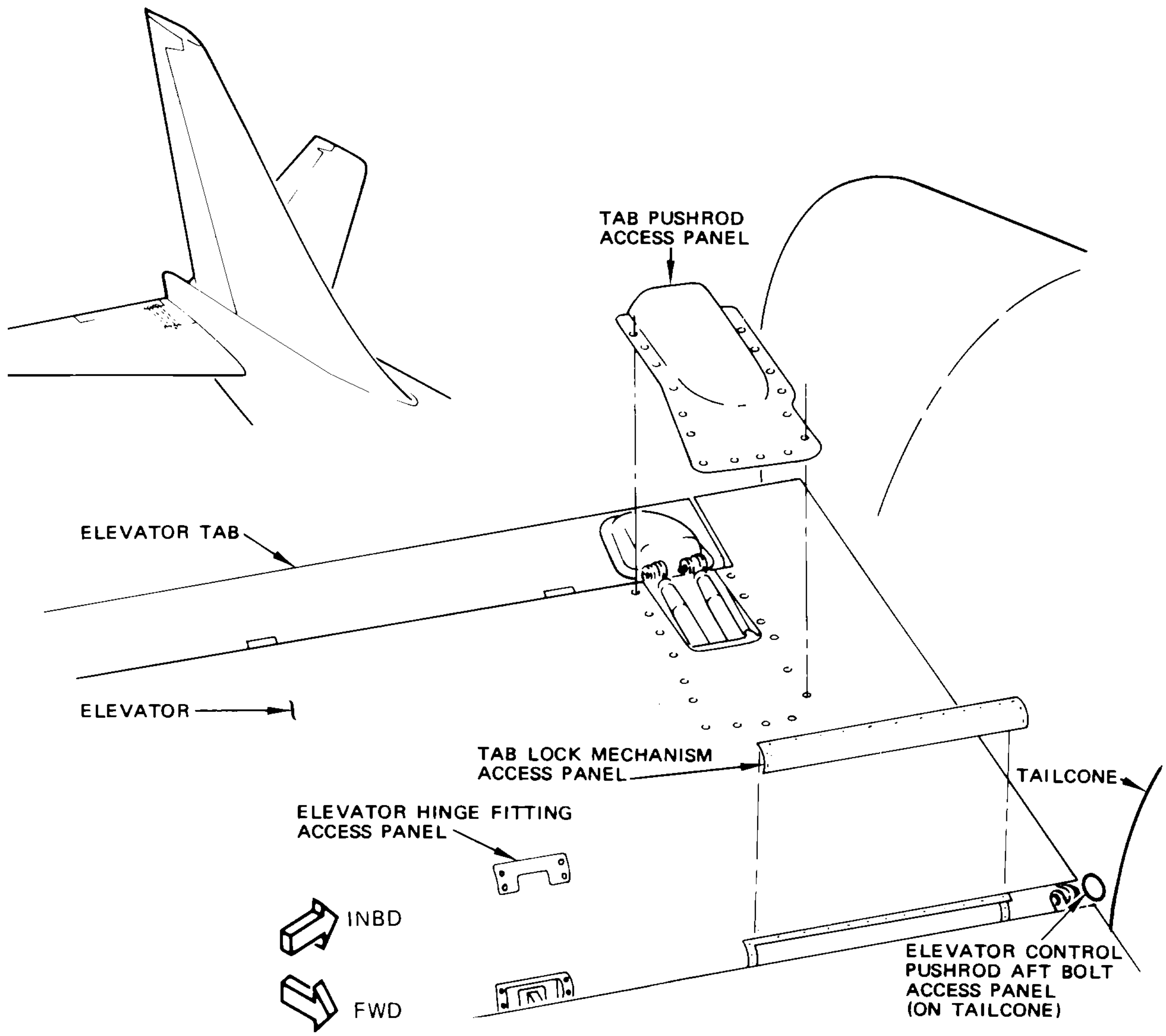
   D. Trammel Bar - F80055-1
   E. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   F. Loading block - 17 inches long, 2 x 4 wood block
   G. Spring seals - 0- to 50-pound capability, graduated in 1-pound increments
   H. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-00, MP).
   B. Remove or open the following access panels:
      (1) Tail cone access panels 3801 and 3802

(2) Aft compartment access door 3701
(3) Stabilizer access panels 9105, 9107, 9108, and 9109 for left stabilizer
(4) Stabilizer access panels 9205, 9207, 9208 and 9209 for right stabilizer
(5) Elevator tab lock mechanism upper and lower access panels 9143 and 9142 on left elevator or 9243 and 9242 on right elevator
(6) Tab pushrod access panel 9313 on left elevator or 9413 on right elevator
(7) Elevator hinge fitting upper and lower access panels 9128 thru 9141 for left elevator
(8) Elevator hinge fitting upper and lower access panels 9228 thru 9241 for right elevator and elevator control pushrod aft bolt access panel 3806 left or 3807 right (panel is located in tail cone adjacent to bolthead)

C. Set horizontal stabilizer B dimension at 41.57 ±0.05 inches using trammel bar (Fig. 407).
D. Install rigging pin E-5 in aft control quadrant (Fig. 406).
E. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 409).
(1) Rotate trim wheel to place handle at top of wheel.
(2) Adjust height of trim lock to position trim wheel handle snugly at the bottom of the yoke.
(3) Insert pin through yoke and install safety pin.
(4) Remove the bolt that connects the elevator position sensor control rod to the bracket on the elevator (Fig. 410).

4. Remove Elevator

A. Detach elevator control pushrod from elevator (Fig. 401 and 406). Remove bolts through circular access opening in tail cone adjacent to bolthead.
B. Disconnect tab pushrods and tab lockout mechanism as follows (Fig. 408):
(1) Remove elevator tab lock linkage bolt retainer shield to obtain access for removal of frame attach bolts.
(2) Remove tab pushrod aft mounting bolt (two places).
(3) Remove two bolts securing aft end of frame to elevator front spar.
(4) At stabilizer trailing edge ribs No. 1 thru 4, remove elevator to stabilizer gap seals (Fig. 402).
(5) Remove six bolts securing aft portion of each balance panels from elevator (Fig. 407).
(6) Remove elevator hinge fitting bolt and hinge link bolts and bushing from No. 3 and 4 hinges (Fig. 405).
(7) Secure elevator hoisting adapter to elevator front spar at hinge fitting No. 3 and 4 locations (Fig. 403).
(8) Attach sling to elevator hoisting adapter and take up slack in line.



Access Panel Location
Figure 401

(9) Remove elevator hinge fitting bolts 1, 2, 5, and 6 from elevator hinge (Fig. 404 and 405).
(10) Remove elevator from airplane.

NOTE: Weight of elevator with tab and balance panels installed is approximately 180 pounds.

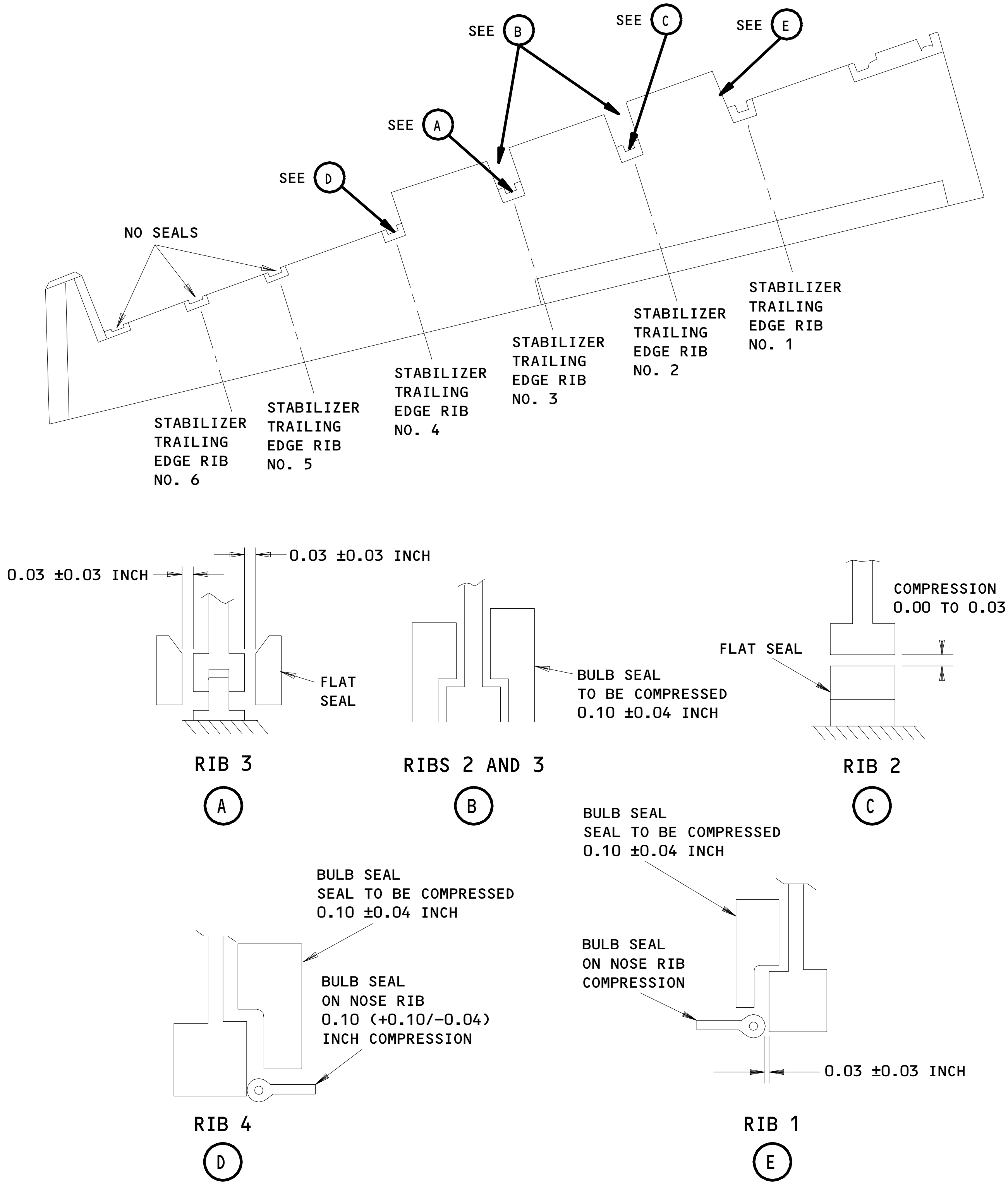
(11) If a different elevator is to be installed, perform the following steps:
(a) Detach hoisting adapter from elevator front spar.
(b) Install elevator to stabilizer gap seals adjacent to hinge fittings and along edge of elevator nose at stabilizer trailing edge ribs No. 1 thru 6 (Fig. 402).

5. Prepare for Installation

CAUTION: ELEVATOR CONTROL PUSHROD, PUSHROD BOLT, AND ROD END BOLT ARE DUAL LOAD PATH COMPONENTS. INSPECT INNER AND OUTER RODS/BOLTS FOR DAMAGE PRIOR TO INSTALLATION.

A. Check elevator hinge bearings, hinge bearing bolts, and elevator control linkage for allowable wear (Ref Elevators - I/C).
B. If new elevator is being installed, perform the following steps on new elevator. If original elevator is being installed, proceed to step 5.E.
C. Remove the following access panels (Fig. 401): Elevator tab lock mechanism upper and lower access panels (panels are located at elevator inboard leading edge), tab pushrod access panels, and elevator hinge fitting upper and lower access panels.
D. Remove elevator to stabilizer gap seals adjacent to hinge fitting and along edge of elevator nose at stabilizer trailing edge ribs No. 1 thru 4 (Fig. 402).
E. Secure elevator hoisting adapter to elevator front spar at hinge fittings No. 3 and No. 4 locations (Fig. 403).
F. Lightly coat hinge bearing bolts with corrosion preventive compound.
G. Check that rig pin E-5 is installed in aft control quadrant (Fig. 406).

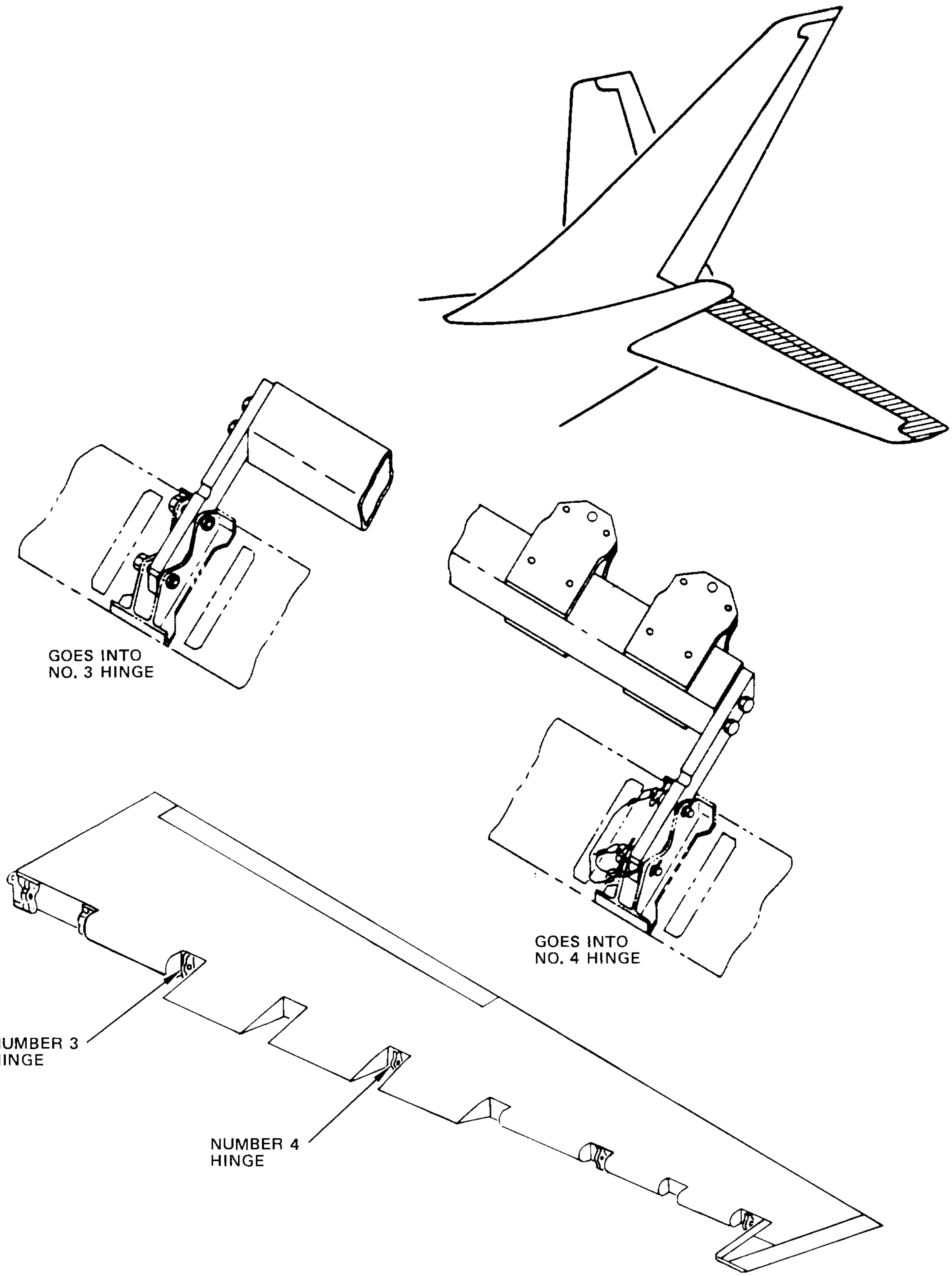
6. Install Elevator
A. Attach elevator to stabilizer as follows (Fig. 404 and 405):
(1) Position elevator at stabilizer trailing edge.
(2) At elevator hinge No. 1 location, install hinge bearing bolt with head outboard. Place washer under bolthead, bonding jumper next to washer, shims inside clevis and a washer under nut. Tighten nut 90 to 100 pound-inches. Align nut with cotter pin hole without exceeding 190 pound-inches, then install cotter pin.



Elevator to Stabilizer Seal Adjustment
Figure 402

(3) At elevator hinge No. 2, install hinge bearing bolt with head outboard. Place washer under bolthead and nut, then tighten nut 90 to 100 pound-inches. Align nut with cotter pin hole without exceeding 190 pound-inches, then install cotter pin.
(4) At elevator hinge fitting location No. 5, install hinge bearing bolt with head outboard. Place washer under bolthead and under nut. At elevator hinge fitting No. 6 location, install hinge bearing bolt with head inboard or outboard. Place washer under bolthead, bonding jumper next to washer and washer under nut. At both hinge locations, tighten nut 60 to 85 pound-inches. Align nut with cotter pin hole without exceeding 140 pound-inches, then install cotter pin.
(5) Remove hoisting adapter from elevator front spar.
(6) Install No. 3 and 4 hinge links. Ensure bushings are installed simultaneously with bolts.
(7) At elevator hinges No. 3 and 4, install hinge bolt with head outboard. Install washer under bolthead and nut. Tighten nut 60 to 85 pound-inches. Align nut with cotter pin hole without exceeding 140 pound-inches, then install cotter pin.
(8) Install seals adjacent to hinge fittings and along edge of elevator nose at stabilizer trailing edge ribs No. 1 thru 4. Adjust seals as follows:
   (a) Position and hold elevator faired with stabilizer during seal adjustment.
   (b) At stabilizer trailing edge rib No. 3, adjust flat seal to maintain 0.03 ±0.03 inch clearance between seal and hinge fitting (Fig. 402, Detail A).
   (c) At stabilizer trailing edge rib No. 2, adjust flat seal to maintain compression of 0.00 to 0.03 inch (Fig. 402, Detail C).
   (d) At stabilizer trailing edge ribs No. 1, 2, 3, and 4, adjust bulb seals to maintain compression of 0.10 ±0.04 inch (Fig. 402, Details B, D and E). At ribs No. 1 and 4, adjust bulb seals on nose ribs to maintain a gap of 0.03 ±0.03 inch with rib (Fig. 402, Detail E). At rib No. 4, adjust bulb seals on nose ribs to maintain compression of 0.10 +0.10/-0.04 inch.
   (e) Attach balance panels to elevator by installing six bolts up through each elevator nose. Ensure each hinge seal is properly installed before tightening bolts (Fig. 407).

   CAUTION: WHEN ATTACHING BALANCE PANEL TO ELEVATOR, ENSURE IDLER HINGE IS DEFLECTED DOWNWARD FROM STABILIZER SUPPORT BEAM.



Elevator Hoisting Adapter
Figure 403

(f) Connect tab push rods and tab lockout mechanism as follows (Fig. 408):

1) Secure aft end of frame to elevator front spar. Install inboard bolt with head facing outboard and outboard bolt with head facing inboard, with washers as required. Tighten the new nut on the inboard bolt 40 to 55 pound-inches.

<u>CAUTION</u>: IF PUSH ROD NUTS ARE NOT TORQUED PROPERLY, THE PUSH RODS CAN BECOME DETACHED AND CAUSE DAMAGE TO THE ELEVATORS AND STABILIZERS.

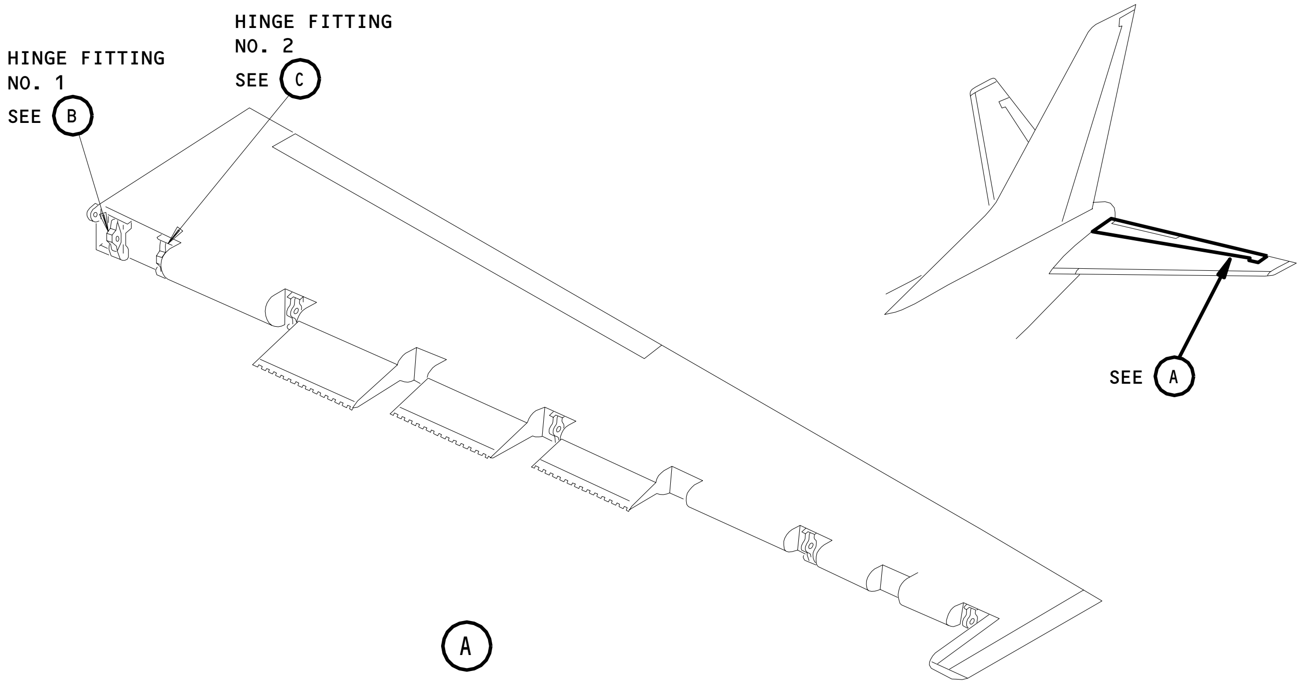
2) Install tab push rods as follows (Detail A, Fig. 408).
   a) Install tab push rod aft mounting bolts. Install outboard bolt with head facing outboard and inboard bolt with head facing inboard.
   b) Install nut and washer on each tab push rod aft mounting bolt.
   c) If castellated nuts are used, torque nuts 30 to 50 inch-pounds. Ensure the torque remains at 30 to 50 inch-pounds after alignment of cotter pin holes. If new self-locking, non-castellated nuts are used, run-on torque must be between 3.5 and 30 inch-pounds. Replace any self-locking nut that does not meet this requirement (even if the nut is new). Torque nut 50 to 80 inch-pounds.
3) Install retainer shield.
4) On airplanes with four return springs, check that dimension given in Detail B, Fig. 408 is observed.
5) Connect the elevator position sensor control rod to the bracket on the elevator with the bolt, washer, and spacer (Fig. 410).

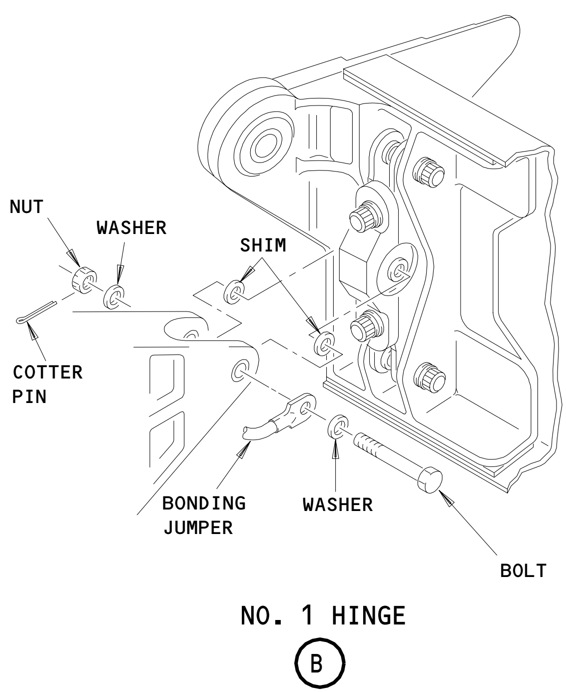
(9) Measure breakaway forces required to move elevator. Use spring scale and rib block and apply force to elevator rear spar, adjacent to inboard rib.
   (a) Slowly rotate elevator by hand through full travel up and down and check for roughness or binding.
   (b) If the elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position (Fig. 406).
   (c) Record the force at the time the elevator reaches the neutral position.
   (d) Difference between these forces shall not exceed 1.0 pound.

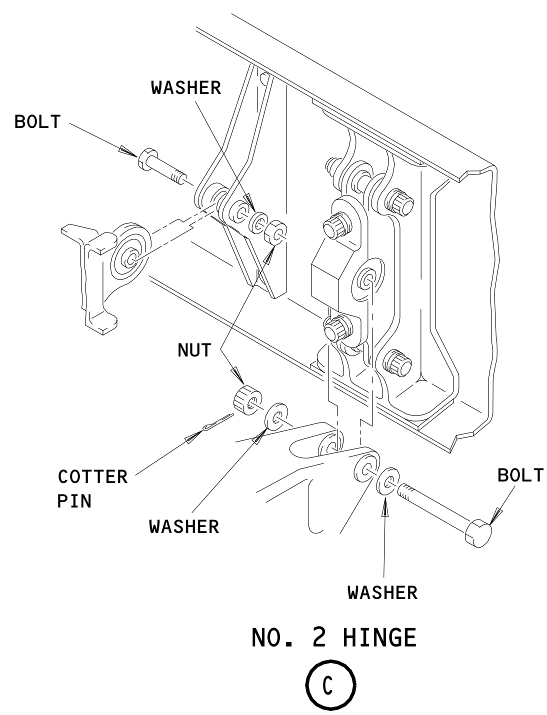
(10) Attach elevator control pushrod to elevator as follows (Fig. 406):

<u>CAUTION</u>: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK AND ELEVATOR MAST FITTING BEARINGS TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

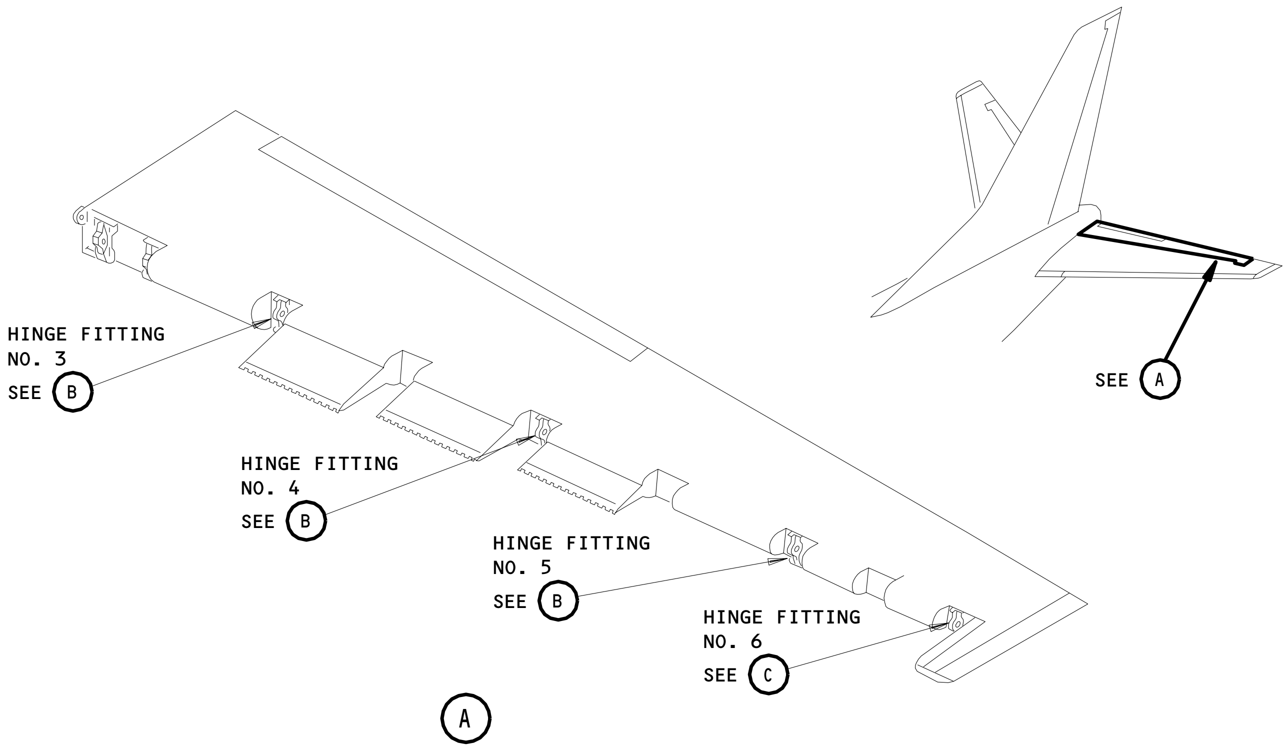
   (a) Return elevators to neutral position.

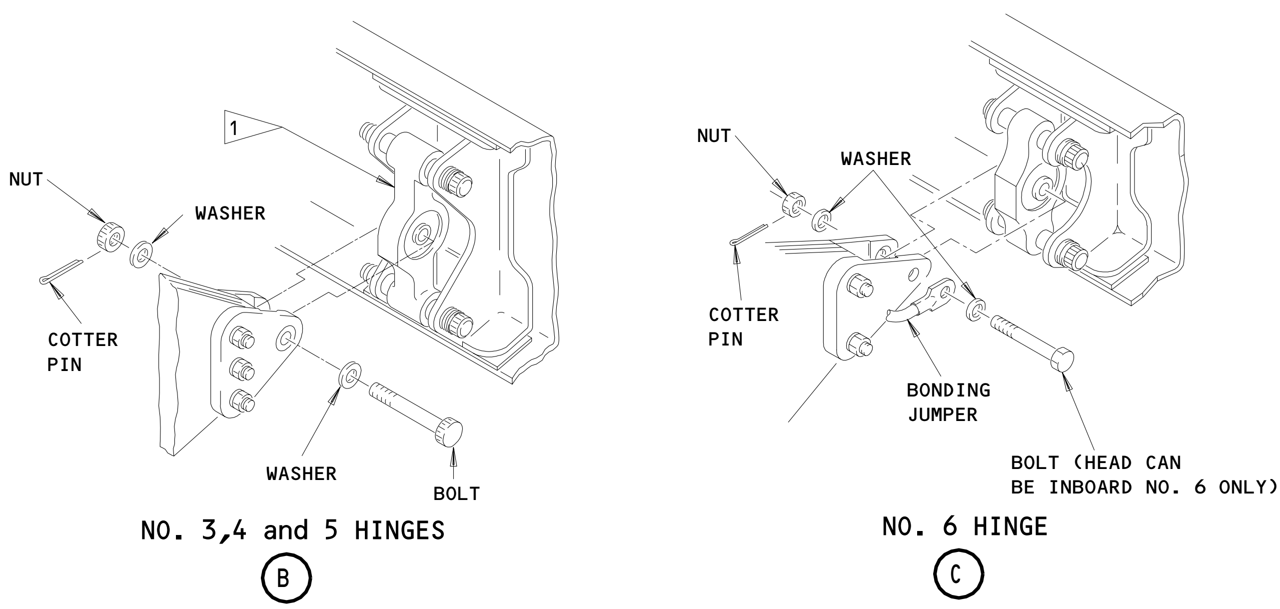






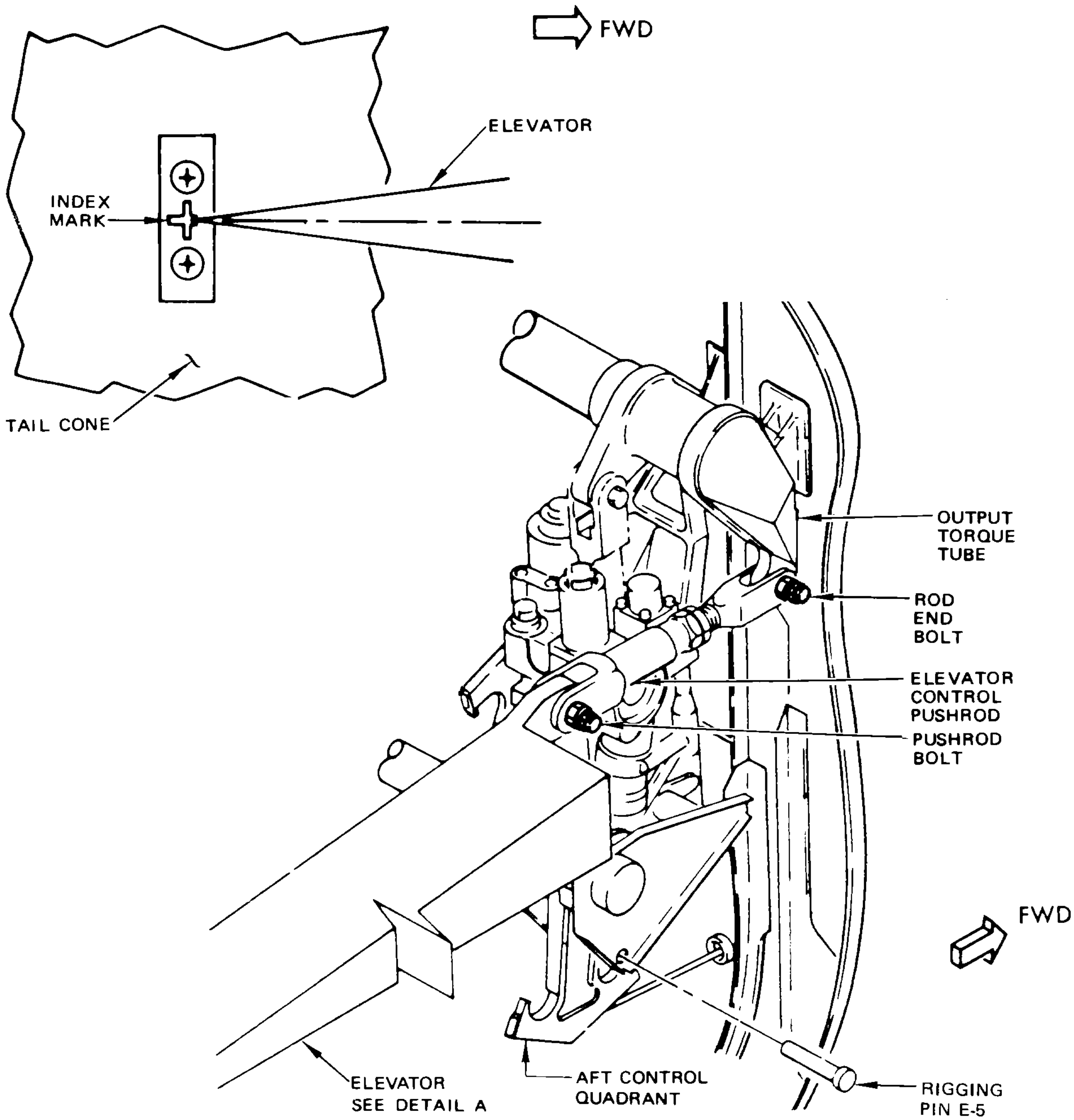
Elevator Hinges
Figure 404 (Sheet 1)





1 HINGE LINK TO BE REMOVED NO.3 and 4 HINGES FOR HOIST ADAPTER.

Elevator Hinges
Figure 404 (Sheet 2)

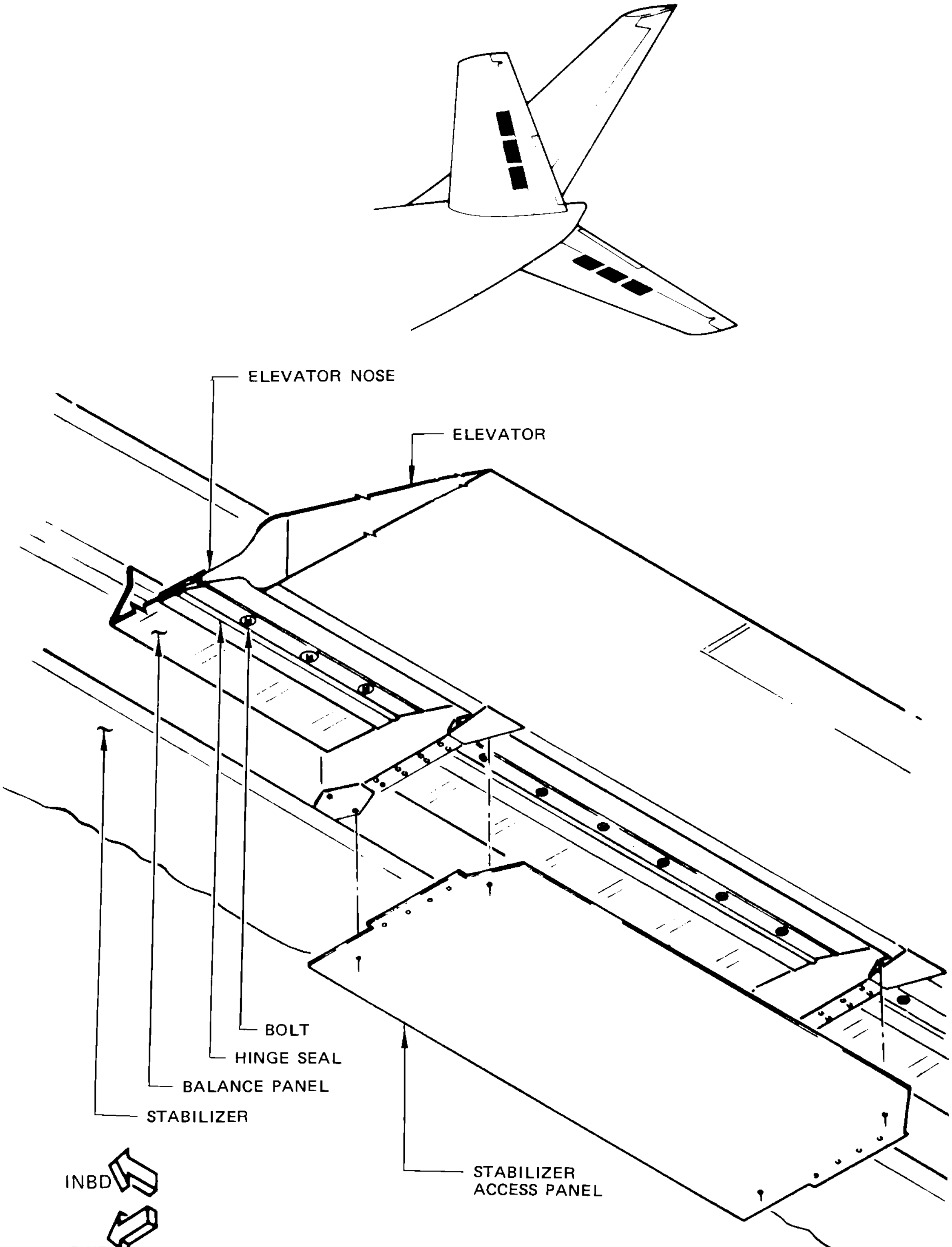


Elevator Control Linkage
Figure 405

(b) With head facing inboard, insert bolt from inside tail code through circular access opening, through control pushrod and elevator lug.
(c) Tighten first locknut 500 to 600 pound-inches, then tighten second locknut 150 to 220 pound-inches.

CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUT.

(d) Remove rigging pin E-5 from aft control quadrant.
(e) Restore airplane to normal hydraulic configuration (Ref 27-31-0).
(f) Adjust and test elevator and tab per 27-31-0, A/T.
(g) Perform the Control Column and Elevator Position Sensor portion of the DFDR Adjustment/Test (AMM 31-24-0/501).
(h) Close or replace all access doors and panels.
(i) Remove stabilizer trim lock (Fig. 409).



Balance Panel Installation
Figure 406

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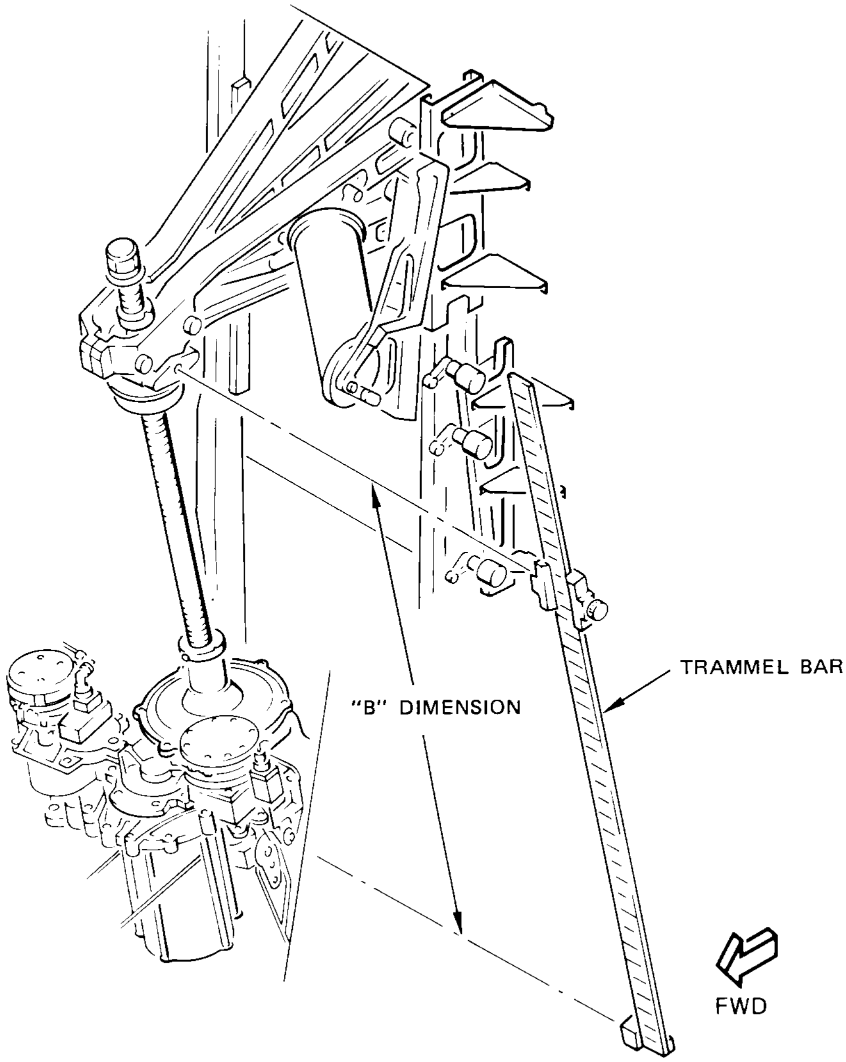
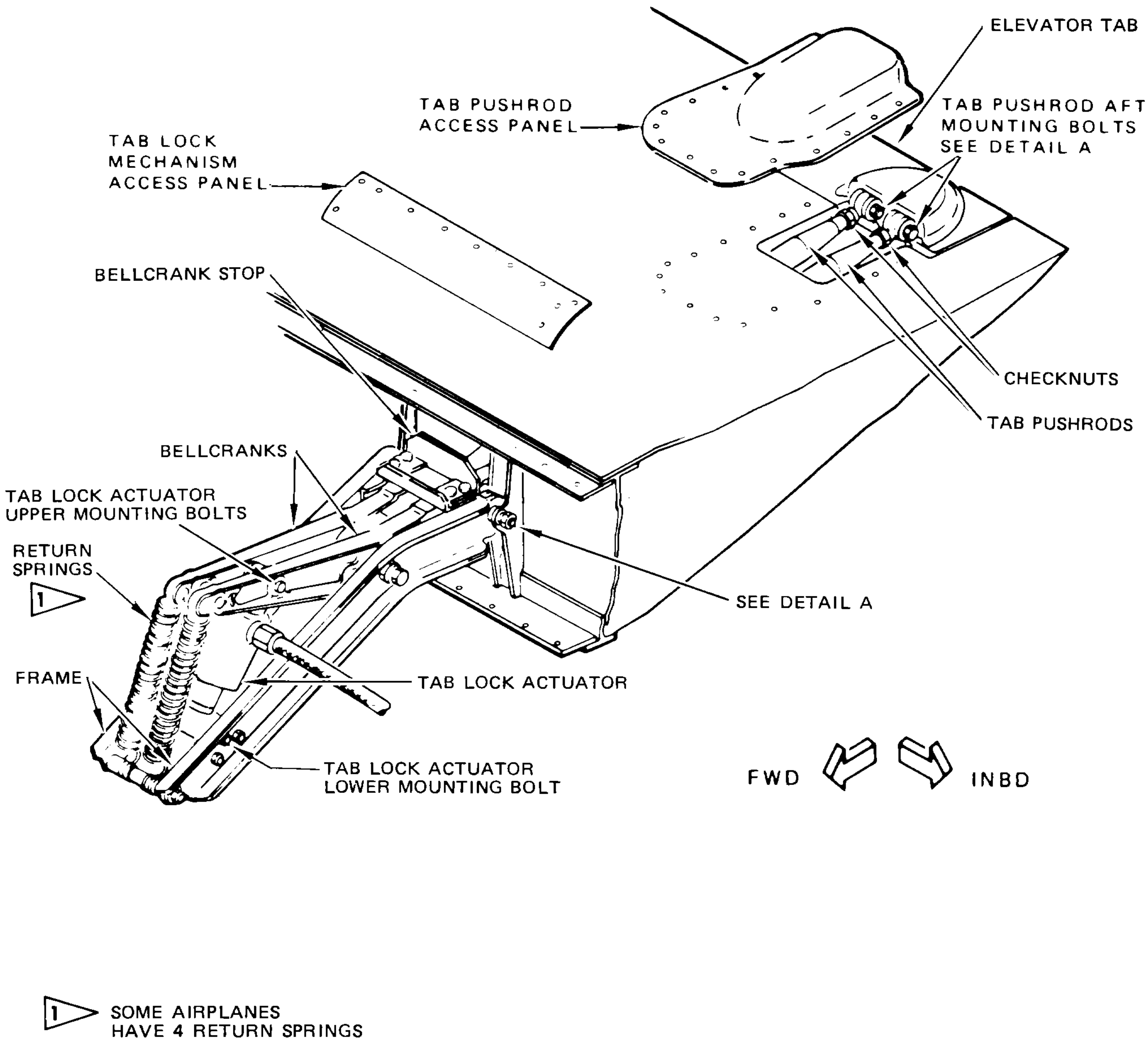
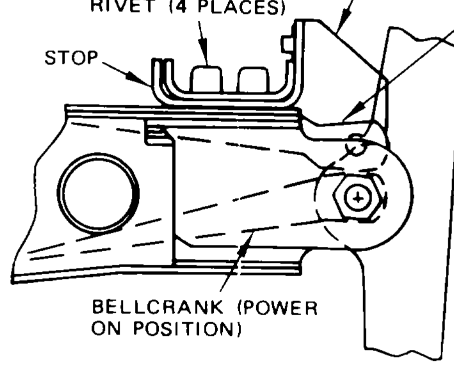


NOTE: STABILIZER TRIM JACKSCREW SHOWN WITH STABILIZER LEADING EDGE AT ZERO DEGREES

Stabilizer Trim Jackscrew Setting
Figure 407

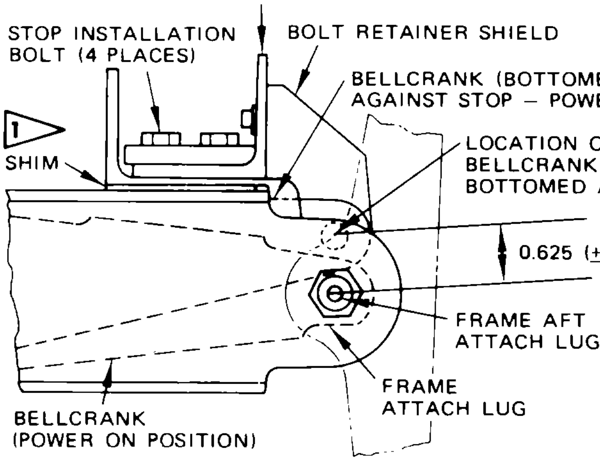


Elevator Tab Lock Linkage Installation
Figure 408 (Sheet 1)



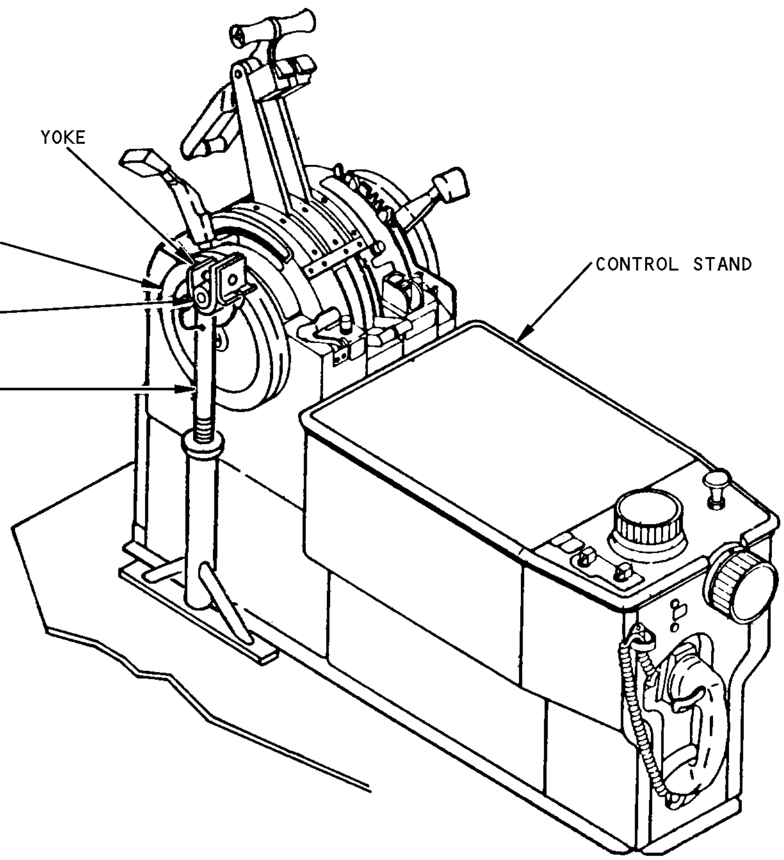
1 POSITION SHIMS ON BOTH SIDES OF STOP AS REQUIRED TO OBTAIN DIMENSION

AIRPLANES WITH 2 RETURN SPRINGS
DETAIL A

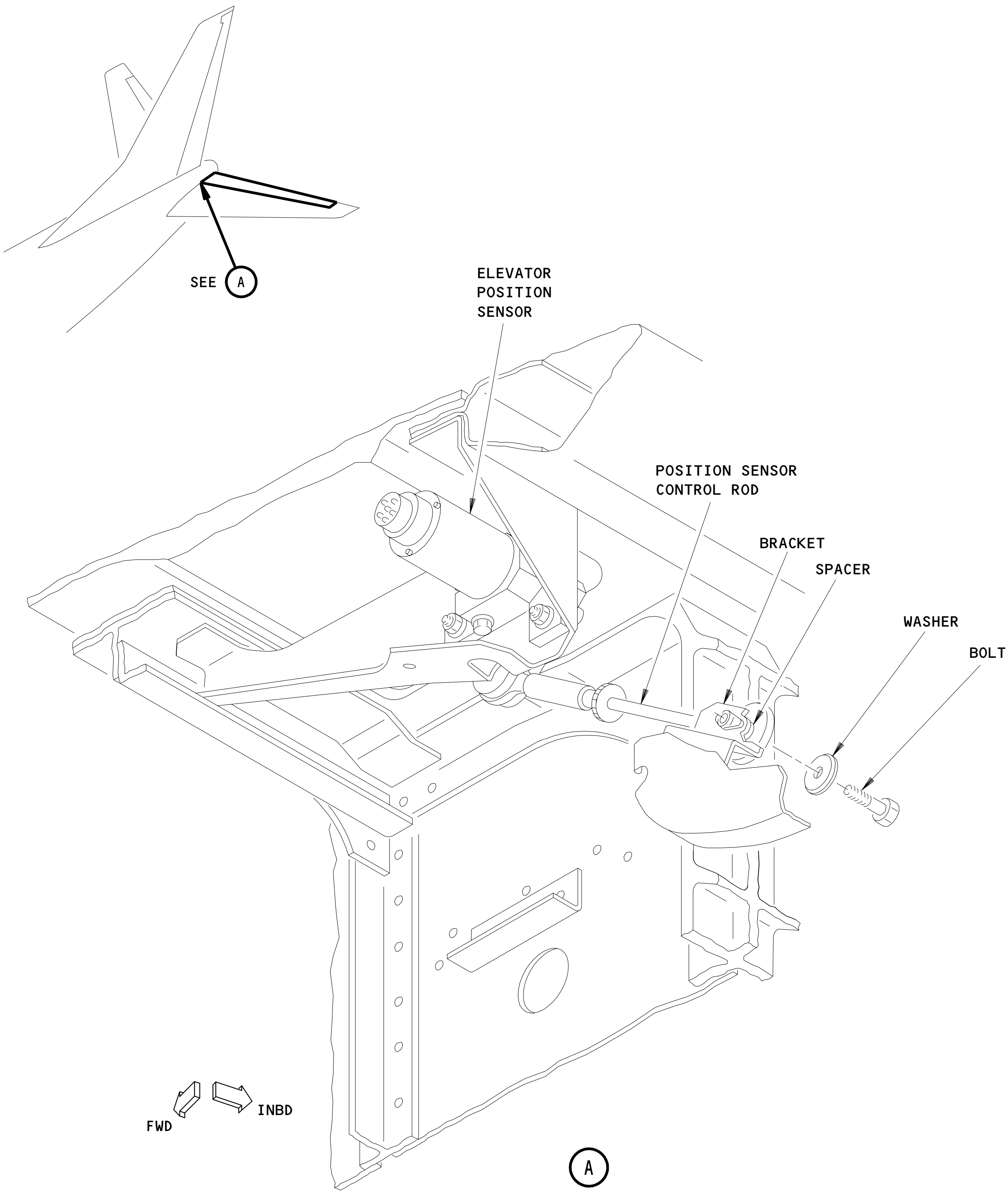


AIRPLANES WITH 4 RETURN SPRINGS
DETAIL B

Elevator Tab Lock Linkage Installation
Figure 408 (Sheet 2)



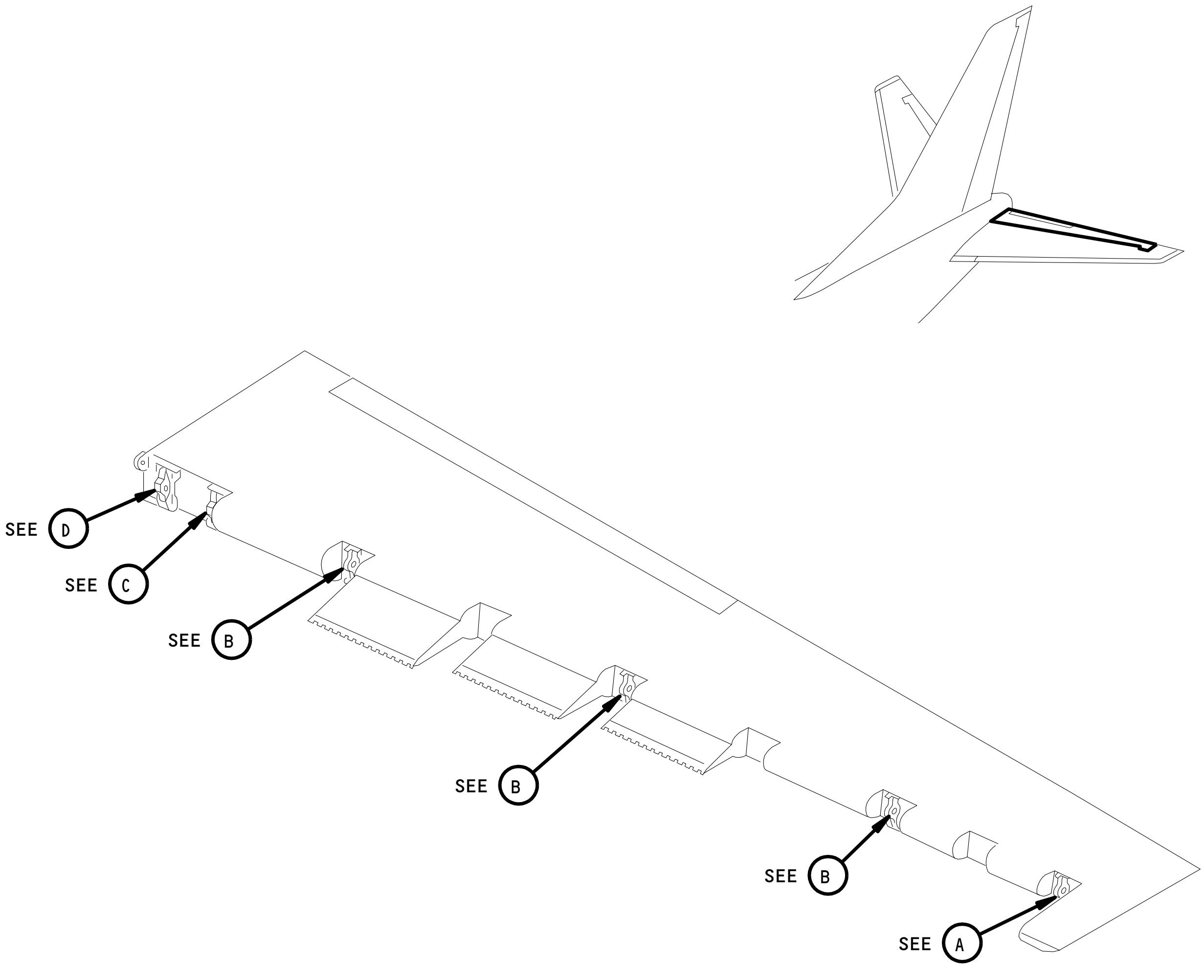
Stabilizer Trim Lock Installation
Figure 409



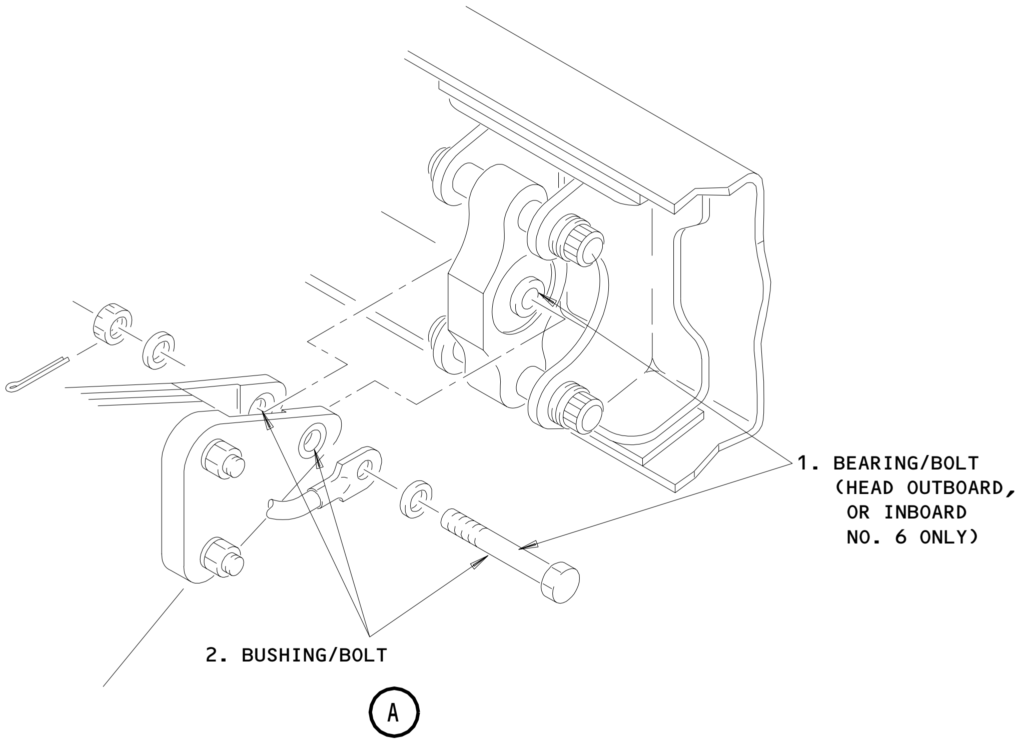
Elevator Position Transmitter Installation
Figure 410

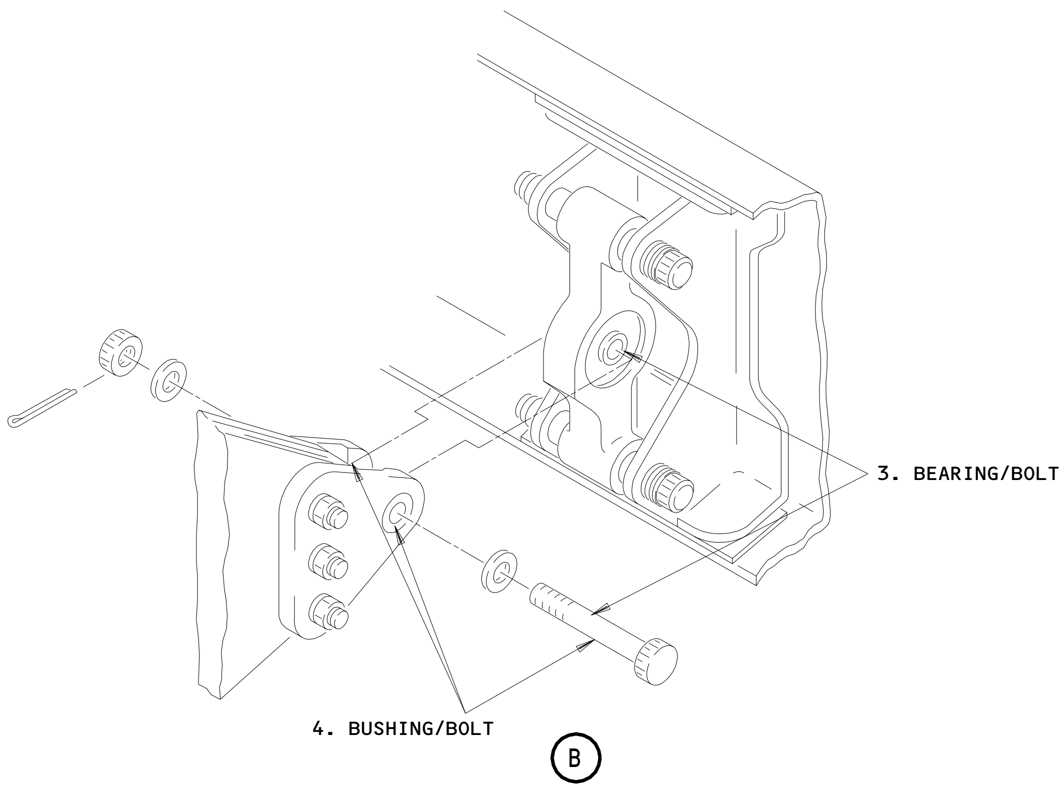
ELEVATOR - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information. For the elevator linkage wear limits, refer to AMM 27-31-11/601.
2. Elevator Hinge Wear Limits

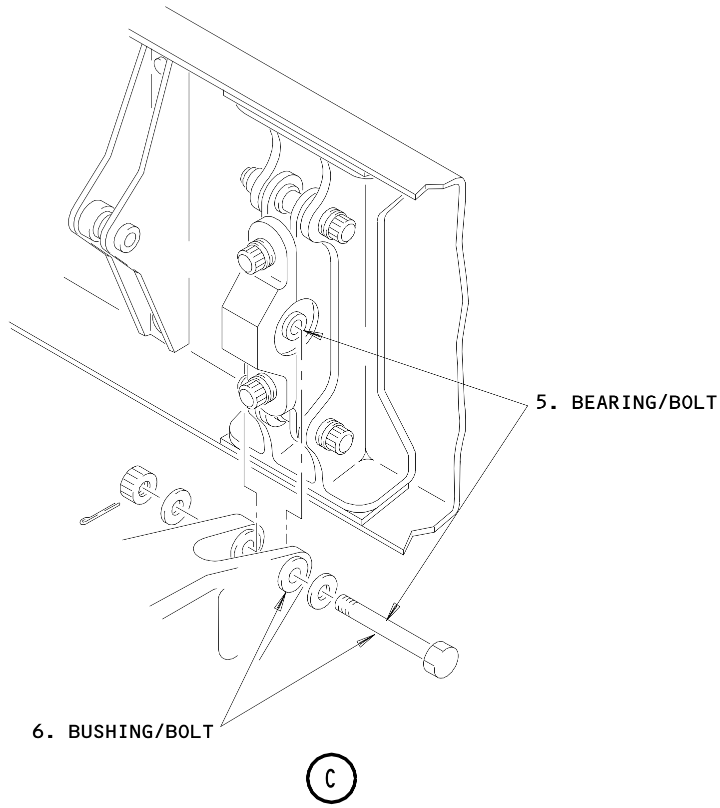


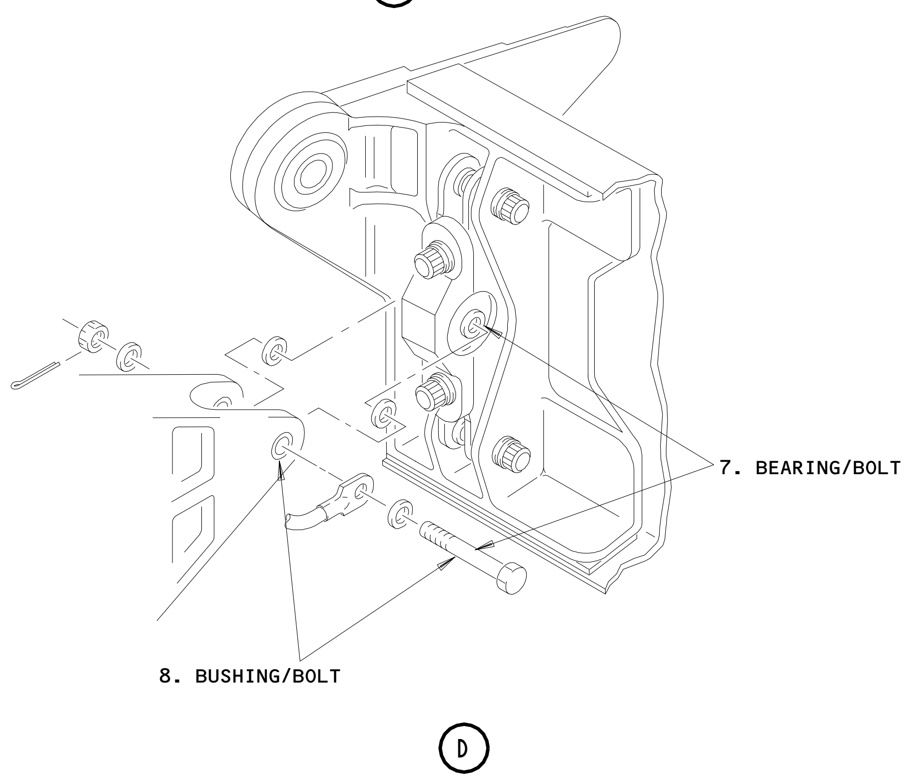
Elevator Hinge Wear Limits
Figure 601 (Sheet 1)





Elevator Hinge Wear Limits
Figure 601 (Sheet 2)





Elevator Hinge Wear Limits
Figure 601 (Sheet 3)

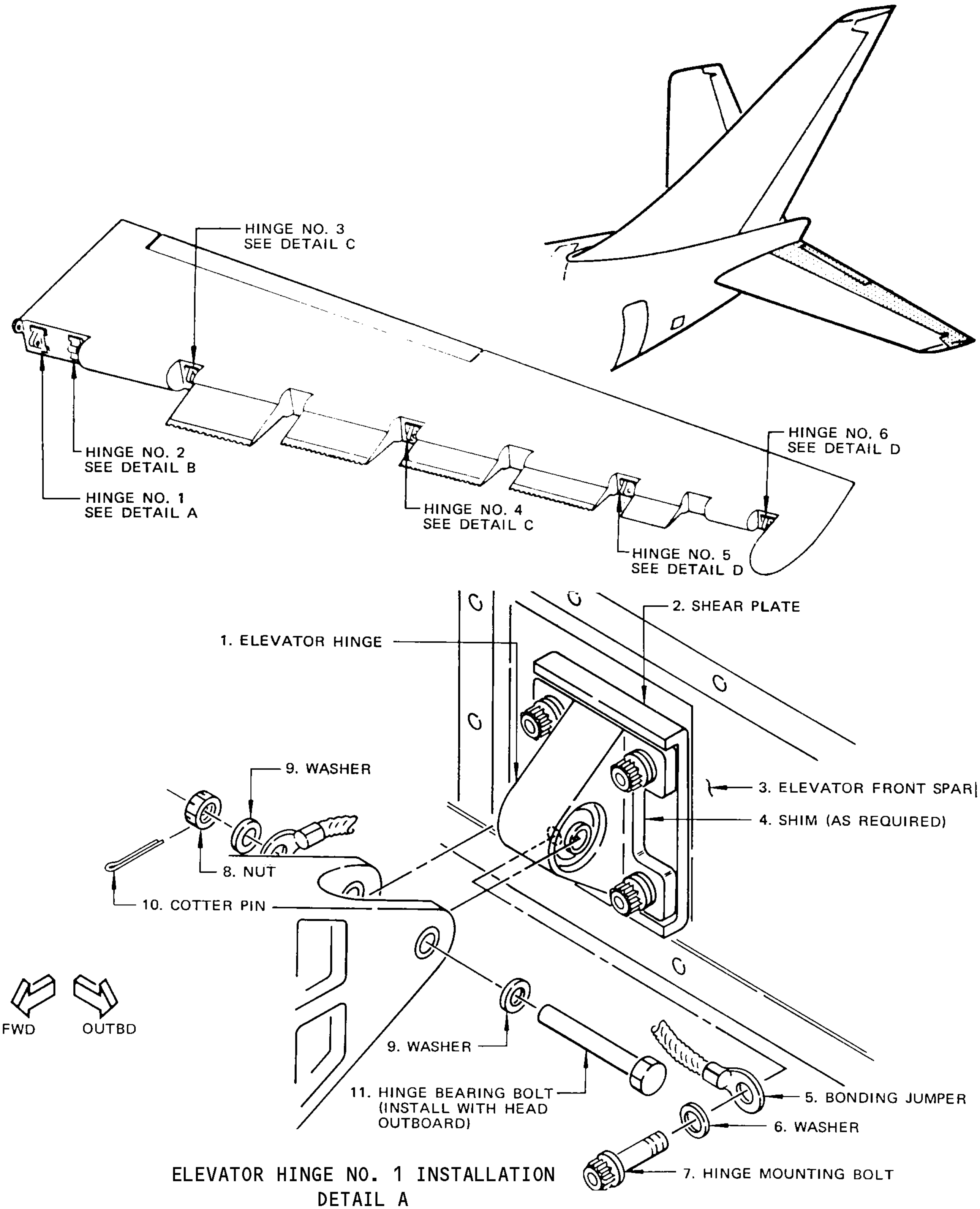
Elevator Hinge Wear Limits Table 601									
			DESIGN LIMITS		WEAR LIMITS				
			DIAMETER		MAX WEAR DIM.	MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
INDEX NO.	PART NAME	DIM	MIN	MAX					
1	BEARING	ID	0.3120	0.3125	0.3146	0.0054	X		
	BOLT	OD	0.3110	0.3120	0.3070			X	*[1]
2	BUSHING	ID	0.3120	0.3130	0.3170	0.0072	X		
	BOLT	OD	0.3110	0.3120	0.3170			X	*[1]
3	BEARING	ID	0.3120	0.3125	0.3146	0.0054	X		
	BOLT	OD	0.3110	0.3120	0.3070			X	*[1]
4	BUSHING	ID	0.3120	0.3130	0.3170	0.0072	X		
	BOLT	OD	0.3110	0.3120	0.3070			X	*[1]
5	BEARING	ID	0.3745	0.3750	0.3772	0.0054	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	*[1]
6	BUSHING	ID	0.3745	0.3755	0.3615	0.0072	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	*[1]
7	BEARING	ID	0.3745	0.3750	0.3772	0.0054	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	*[1]
8	BUSHING	ID	0.3745	0.3755	0.3815	0.0072	X		
	BOLT	OD	0.3735	0.3745	0.3695			X	*[1]

*[1] REF OVERHAUL MANUAL FOR REPAIR

NOTE: ELEVATOR TRAILING EDGE PLAY LIMITS (REF 27-09-600) TAKE PRECEDENCE OVER ABOVE WEAR LIMITS.

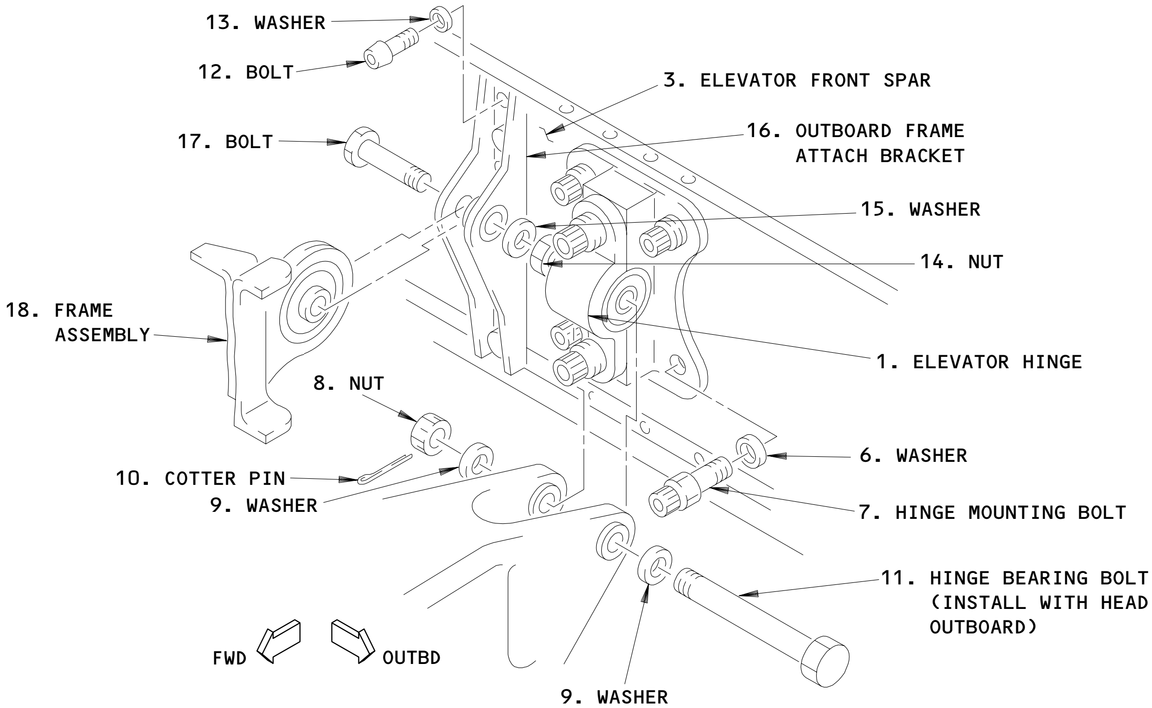
ELEVATOR HINGES - REMOVAL/INSTALLATION

1. General
   A. Each of the elevator hinges, including the thrust hinge, may be replaced individually. It is recommended that two or more adjacent hinges be replaced one at a time. Also, not more than two nonadjacent hinges should be removed at any one time.
2. Removal/Installation Elevator Hinge No. 1
   A. Equipment and Materials
      (1) Solvent - Final Cleaning of Metal Prior to Painting (Series 84) (Ref AMM/SOPM 20-30-84)
      (2) Adhesive - Epon 901 (Ref 20-30-11)
      (3) Primer - BMS 10-11, type 1 (Ref 20-30-41)
      (4) Corrosion Preventive Compound - MIL-C-11796, class 3 (Ref 20-30-21)
   B. References
      (1) CMM 55-20-16, Composite Type Elevator Hinge Removal/Installation.
   C. Prepare for Removal
      (1) Position flight controls hydraulic systems A and B switches to OFF.
      (2) Tag control columns to avoid injury to personnel by unexpected movement of the elevator surfaces.
      (3) Remove tab lock mechanism upper and lower access panels located at elevator inboard leading edge.
   D. Remove Elevator Hinge No. 1.
      (1) Remove four-hinge mounting bolts (7) securing elevator hinge (1) to elevator front spar (3) (Detail A, Fig. 401).
      (2) Remove cotter pin (10), then remove hinge bearing bolt (11), nut (8), washers (9), and bonding jumper (5) to separate hinge assembly.
      (3) If hinge bolt will not clear rib on elevator front spar, a 0.75-inch hole can be drilled in rib. Hole should be 4.02 inches up from bottom of rib and 1.06 inches from elevator spar. Hole will over lap edge of rib stiffener. Hole should be left unplugged for future use.
      (4) Remove elevator hinge (1) from airplane.
   E. Prepare for Installation
      (1) Position flight controls hydraulic systems A and B switches to OFF.
      (2) Check that inner race of bearing may be manually rotated in either direction with the fingers. Check that race can be manually misaligned in either direction at any position. Also check bearing and hinge bearing bolt for allowable wear (Ref 27-31-11, Elevator - Inspection/Check).
   F. Install Elevator Hinge No. 1
      (1) Position hinge (1) against elevator front spar (3) with lubrication fitting down (below hinge centerline) and temporarily install hinge bearing bolt (11) (Detail A, Fig. 401).

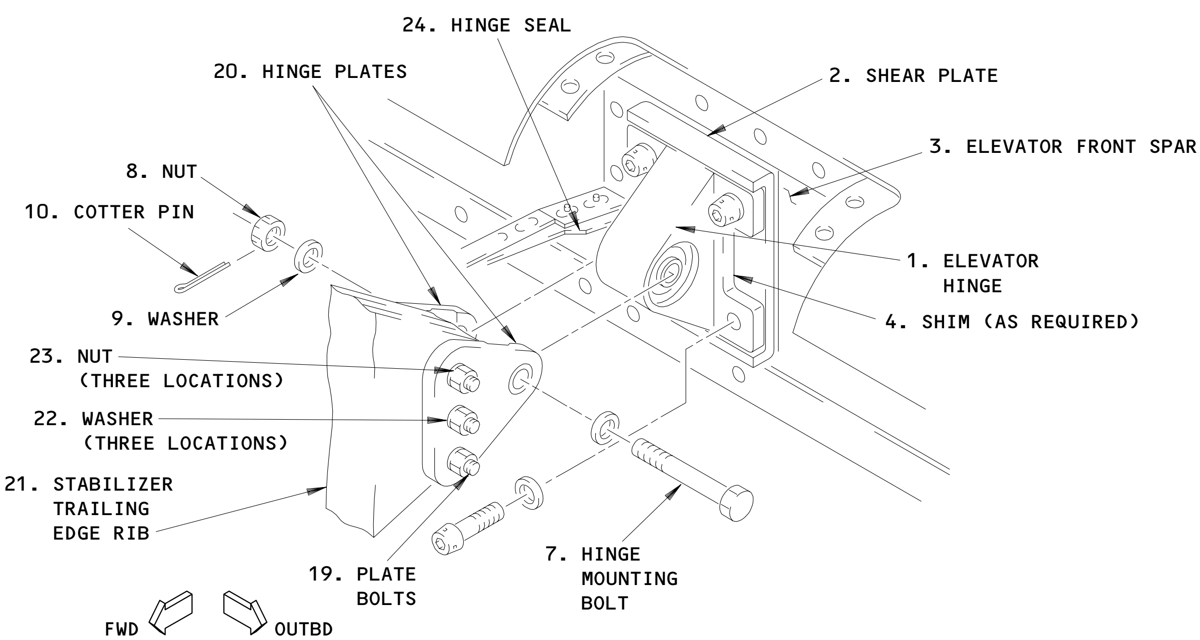


ELEVATOR HINGE NO. 1 INSTALLATION
DETAIL A

Elevator Hinge Installation
Figure 401 (Sheet 1)

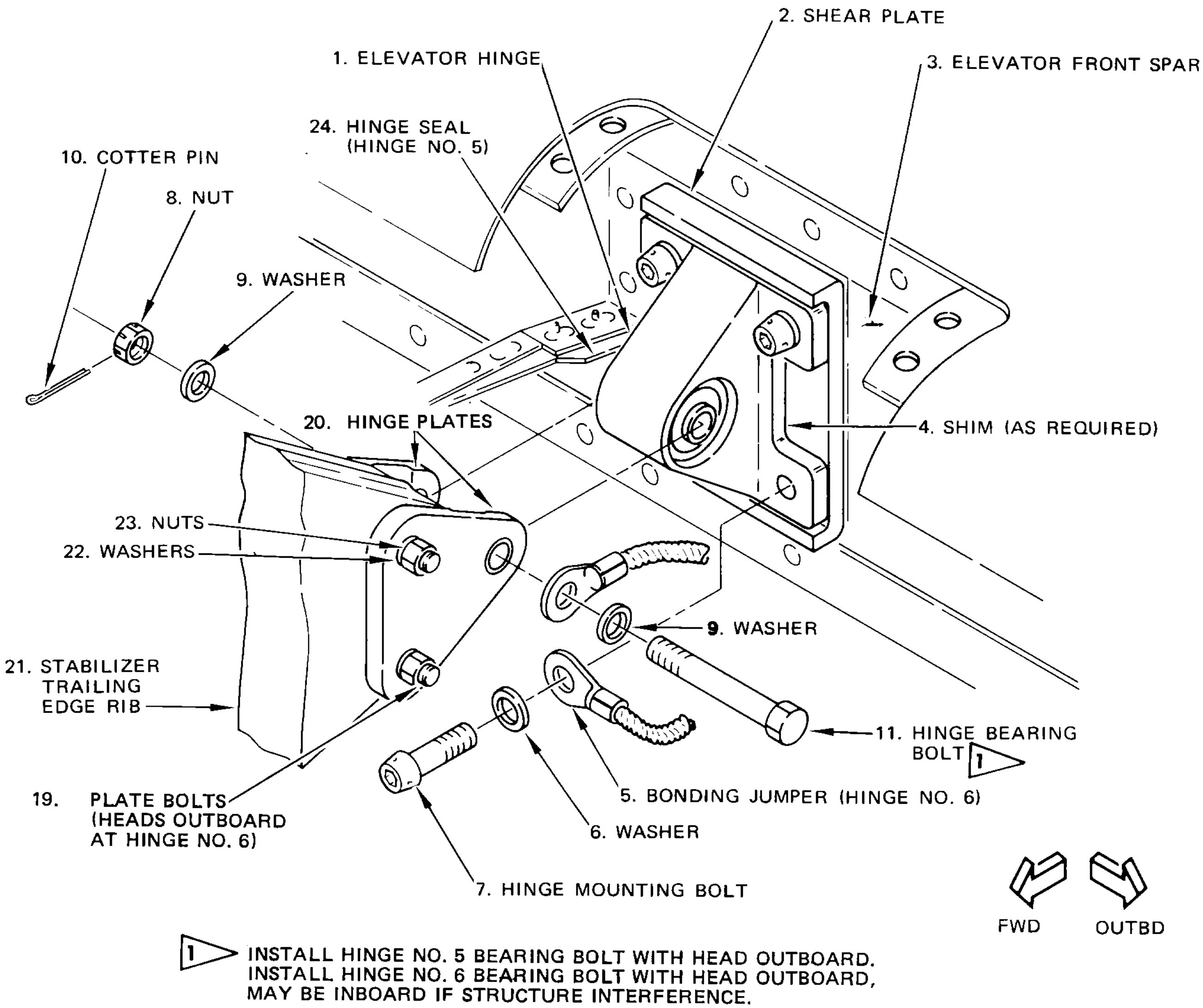


ELEVATOR HINGE NO. 2 INSTALLATION
DETAIL B



ELEVATOR HINGES NO. 3 AND NO. 4 INSTALLATION
DETAIL C

Elevator Hinge Installation
Figure 401 (Sheet 2)



ELEVATOR HINGE NO. 5 AND NO. 6 INSTALLATION
DETAIL D

Elevator Hinge Location
Figure 402

(2) Check that elevator hinge (1) fits flush with shear plate (2) at elevator front spar (3) within 0.015 inch. If not, add or remove shim (4) as required.

(3) If shim (4) is required, proceed as follows:

NOTE: Maximum allowable shim thickness is 0.033 inch.

(a) Trim shim as required to fit between hinge (1) and shear plate (2).

(b) Withdraw hinge bearing bolt (11) and remove hinge from airplane.

(c) Thoroughly clean both faces of shim and face of shear plate using cleaning solvent, Series 84 (Ref AMM/SOPM 20-30-84).

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(d) Bond required thickness of shim to shear plate at elevator front spar using adhesive.

(4) If step E.(3) was not accomplished, withdraw hinge bearing bolt (11) and remove hinge (1) from airplane.

(5) Thoroughly clean face of shim using cleaning solvent, Series 84 (Ref AMM SOPM 20-30-84), then apply primer and allow to dry before installing hinge.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(6) Position hinge (1) at elevator front spar (3) with lubrication fitting down (below hinge centerline) and loosely install four hinge mounting bolts (7), and washers (6). At lower inboard bolt location, clean surface to provide electrical bonding and place bonding jumper (5) under washer.

(7) Install hinge bearing bolt (11) as follows:

(a) Lightly coat shank and threads of bolt with corrosion preventive compound.

(b) Install bolt with head outboard, place washer (9) under bolthead and other end of bonding jumper (5) and a washer (9) under nut (8). Clean surface to provide electrical bonding.

(c) Tighten nut (8) 90 to 100 pound-inches. Align nut with cotter pin hole without exceeding 190 pound-inches, then install cotter pin (10).

(8) Tighten four hinge mounting bolts (7) 70 to 80 pound-inches.

(9) Perform test procedure (Ref 27-31-21, A/T).

G. Restore Airplane to Normal Configuration

(1) Install tab lock mechanism access panel.

(2) Remove tags from control columns.

3. <u>Removal/Installation Elevator Hinge No. 2 (Thrust Hinge)</u>

A. Equipment and Materials

(1) Corrosion Preventive Compound - MIL-C-11796, class 3 (Ref 20-30-21)

B. Prepare for Removal

(1) Position flight controls hydraulic systems A and B switches to OFF.

(2) Tag control columns to avoid injury to personnel by unexpected movement of elevator surfaces.

(3) Remove tab lock mechanism upper and lower access panels located at elevator inboard leading edge.

C. Remove Elevator Hinge No. 2

(1) Remove bolt retainer shield from tab lock mechanism (Ref 27-31-121, Removal/Installation).

(2) Remove bolt (17, Detail B, Fig. 401) securing aft end of tab lock mechanism frame assembly (18) to outboard frame attach bracket (16) at elevator front spar (3).

(3) Remove six bolts (12) and washers (13) securing outboard frame attach bracket (16) to elevator front spar (3). Remove bracket from airplane.

(4) Remove four-hinge mounting bolts (7) securing hinge (1) to elevator front spar (3).

(5) Remove cotter pin (10), then remove hinge bearing bolt (11), nut (8), and washers (9) to separate hinge assembly.

(6) Remove elevator hinge (1) from airplane. If structural interference prevents removal of hinge, remove elevator (Ref 27-31-11, Removal/Installation).

D. Prepare for Installation

(1) Position flight controls hydraulic systems A and B switches to OFF.

(2) Check hinge bearing and hinge bearing bolt for allowable wear (Ref 27-31-11, Inspection/Check).

E. Install Elevator Hinge No. 2

(1) If elevator was removed, install elevator and hinge No. 2 (Ref 27-31-21, Removal/Installation). Adjust and test elevator per 27-31-0, Adjustment/Test.

(2) If elevator was s not removed, install hinge No. 2 as follows:

(a) Position thrust hinge against elevator front spar (3, Detail B, Fig. 401) and loosely install four hinge mounting bolts (7) and washers (6). Hinge should be installed with grease fitting down (below hinge centerline).

(b) Install hinge bearing bolt (11) as follows:
1) Lightly coat shank and threads of bolt with corrosion preventive compound.
2) Install bolt with head inboard, a washer (9) under bolthead and a washer (9) under nut (8).
3) Tighten nut 90 to 100 pound-inches. Align nut with cotter pin hole without exceeding 190 pound-inches, then install cotter pin (10).

(c) Tighten the four hinge mounting bolts (7) 70 to 80 pound-inches.
(d) Install outboard frame attach bracket (16) to elevator front spar (3). Secure bracket with six bolts (12) and washers (13).
(e) Secure aft end of frame assembly (18) to frame attach bracket (16) at elevator front spar (3). Install bolt (17) with head inboard and a washer (15) under nut (14).
(f) Perform test procedure (Ref 27-31-21, A/T).
(g) Install bolt retainer shield on tab lock mechanism (Ref 27-31-121, R/I).

F. Restore Airplane to Normal Configuration
(1) Install tab lock mechanism access panels.
(2) Remove tags from control columns.

4. <u>Removal/Installation Elevator Hinges No. 3 thru 6</u>

<u>NOTE</u>: The following procedure describes the removal and installation of an individual elevator hinge. This procedure is identical for all hinges No. 3 thru 6, except where stated otherwise.

A. Equipment and Materials
(1) Same as par. 2.A.

B. Prepare for Removal
(1) Position flight controls hydraulic systems A and B switches to OFF.
(2) Tag control columns to avoid injury to personnel by unexpected movement of elevator surfaces.
(3) Remove elevator hinge access plates (at each location requiring hinge removal).

C. Remove Elevator Hinges No. 3 thru 6
(1) At elevator hinge location No. 3, 4, or 5, remove hinge seals (24, Details C and D, Fig. 401) from both sides of elevator hinge (1).
(2) Remove four hinge mounting bolts (7) securing hinge to elevator front spar (3).
(3) Remove plate bolts (19), nuts (23) and washers (22) attaching elevator hinge to stabilizer trailing edge rib (21), (three bolts at hinges No. 3 and 4, two bolts at hinges No. 5 and 6).
(4) Remove hinge assembly from airplane.
(5) Separate hinge assembly by removing cotter pin (10), nut (8), washers (9), and at hinge No. 6 location, a bonding jumper (5).

D. Prepare for Installation
   (1) Position flight controls hydraulic systems A and B switches to OFF.
   (2) Check that inner race of bearing may be manually rotated in either direction with the fingers. Also check that race can be manually misaligned in either direction at any position. Also check bearing and hinge bearing bolt for allowable wear (Ref 27-21-11, I/C).
E. Install Elevator Hinges No. 3 thru 6
   (1) Assemble elevator hinge as follows:
      (a) Lightly coat shank and threads of hinge bearing bolt (11, Details C and D, Fig. 401) with corrosion preventive compound.
      (b) Install bolt (11) through hinge plates (20) and elevator hinge (1). Install bolt with head outboard at hinge No. 3, 4, 5, and 6. Install bolt with head inboard at hinge No. 6 if clearances between structures and hinge fitting prevent installation from outboard side. Place a washer (9) under bolthead and a washer (9) under nut (8). For elevator hinge No. 6, place bonding jumper (5) and washer under nut and a washer under bolthead. At hinge No. 6 clean surface to provide electrical bonding. Also, hinge should be assembled so that lubrication fitting on elevator hinge is down (below hinge centerline) when installed.

      WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

      (c) At all four hinges, tighten nut (8) 60 to 85 pound-inches. Align nut with cotter pin hole without exceeding 140 pound-inches, then install cotter pin (10).
   (2) Position hinge assembly at elevator front spar (3) with boltheads oriented per step (l) and temporarily install three plate bolts (19) at hinge location No. 3 or 4, or two plate bolts (19) at hinge location No. 5 or 6.
   (3) Check that hinge fits flush with shear plate (2) at elevator front spar (3) within 0.015 inch. If not, add or remove shim (4) as required.
   (4) If shim is required, proceed as follows:

      NOTE: Maximum allowable shim thickness is 0.033 inch.

      (a) Trim shim as required to fit between elevator hinge (l) and shear plate (2).
      (b) Withdraw plate bolts (19) and remove hinge assembly from airplane.

(c) Thoroughly clean both faces of shim and face of shear plate using cleaning solvent.
(d) Bond required thickness of shim to shear plate at elevator front spar using adhesive.

(5) If step E.(4) was not accomplished, withdraw plate bolts (19) and remove hinge assembly from airplane.
(6) Thoroughly clean face of shim using cleaning solvent, then apply primer and allow to dry before installing hinge.
(7) Position hinge assembly at elevator front spar (3) and secure to stabilizer trailing edge rib (21) as follows:

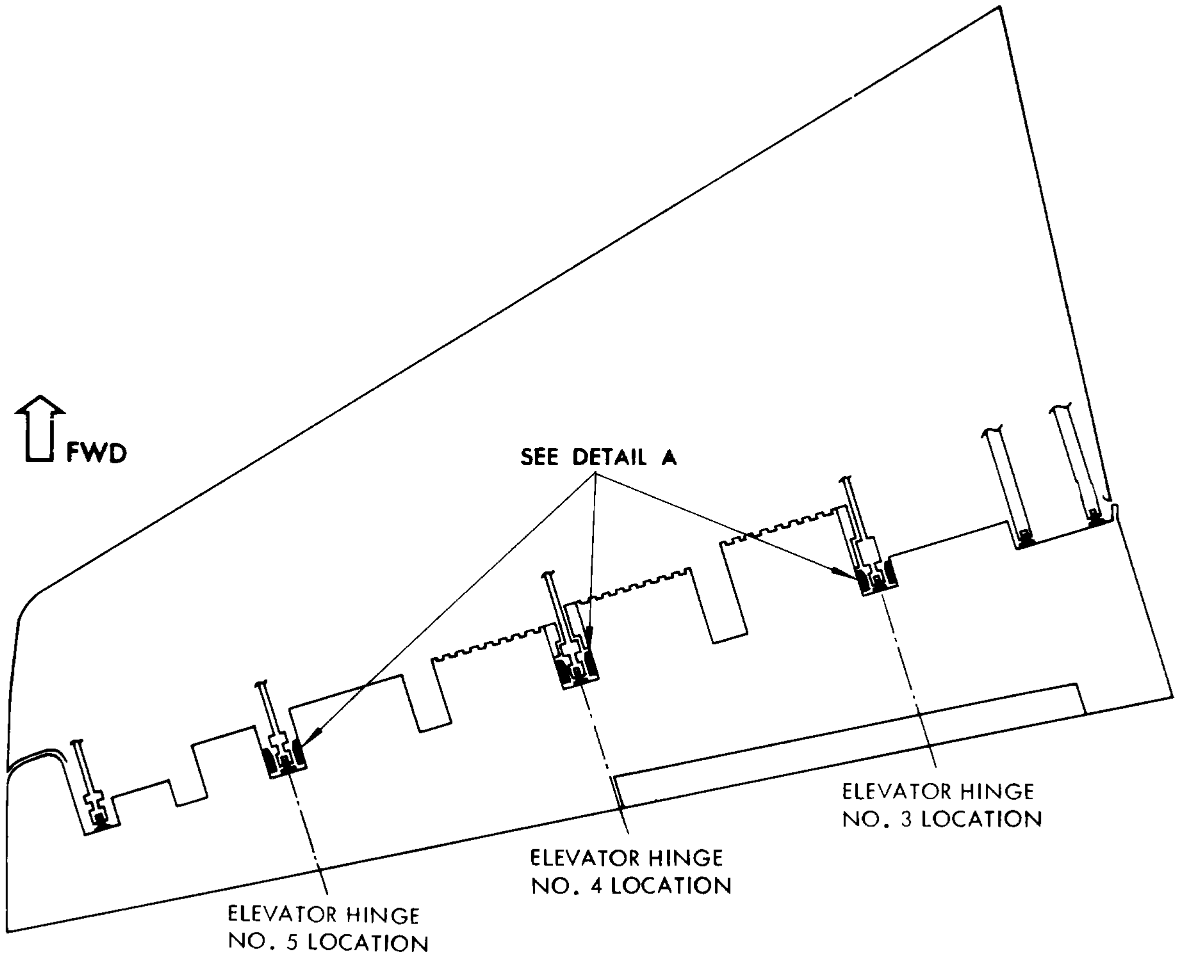
NOTE: When positioning hinge assembly, check that head of hinge bearing bolt (11) faces outboard at hinge No. 3 thru 6 (No. 6 can be inboard).

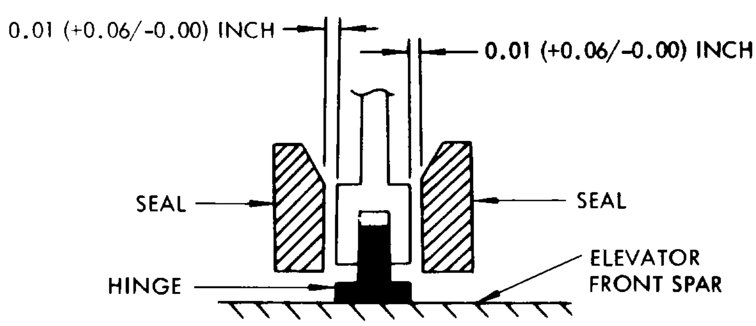
(a) At hinge location No. 3 or 4, install three plate bolts (19) with heads inboard. Place washer (22) under nut (23) and tighten nut 50 to 70 pound-inches (detail C).
(b) At hinge location No. 5, install two plate bolts (19) with heads inboard. Place washer (22) under nut (23) and tighten nut to 50-70 pound-inches torque. (See detail D.)
(c) At hinge location No. 6, install two plate bolts (19) with heads outboard. Place washer (22) under nut (23) and tighten nut to 50-70 pound-inches torque. (See detail D.)

(8) Install four-hinge mounting bolts (7) with washers (6). At elevator hinge No. 6 location, clean surface to provide electrical bonding and place other end of bonding jumper (5) under washer at lower outboard bolt.
(9) Secure hinge assembly to elevator front spar by tightening hinge mounting bolts (7) to 70-80 pound-inches.
(10) At hinge location No. 3, 4, or 5, see figure 402 and install hinge seals (24, details C and D, figure 401) as follows:
(a) Position seal each side of hinge assembly and loosely instal1 two bolts and washers up through each seal.
(b) Adjust seal to maintain 0.01 (+0.06/-0.00)-inch clearance between seal and hinge fitting.
(c) Tighten seal retaining bolts.

(11) Perform test procedure. Refer to Elevator Hinges, Adjustment/Test.

F. Restore Airplane to Normal Configuration.
(1) Replace elevator hinge access plates.
(2) Remove tags from control columns.





DETAIL A

Elevator Hinge Seal Adjustment
Figure 403

ELEVATOR HINGES - ADJUSTMENT/TEST

1. Elevator Hinges Test
   A. Equipment and Materials
      (1) Trammel Bar - F80055-1
      (2) Spring scale - 0- to 15-pound capability, graduated in 1-pound increments
      (3) Loading block - 17 inches long, 2 x 4 wood block
      (4) Scale - 0 to 6 inches
   B. Prepare for Test
      (1) Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
      (2) Set horizontal stabilizer B dimensions at 41.57 ±0.05 inches, using trammel bar (Fig. 501).
      (3) Rotate control columns fully forward and secure in this position. Tag the columns.
      (4) Remove bolts securing aft end of each elevator control pushrod to its respective elevator (Fig. 502).
      (5) Rotate control columns fully aft to withdraw each elevator control pushrod clevis from the elevator lugs. When column aft stops are contacted, secure control columns in this position. Tag the columns.
   C. Test Elevator Hinges
      (1) Measure breakaway forces required to move elevator. Use spring scale and a loading block and apply force to elevator rear spar adjacent to elevator inboard rib.
         (a) Move elevators by hand until trailing edges align with index marks on tail cone, then release (Detail A, Fig. 502).
         (b) If the right elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position. Record the force at the time the elevator reaches the neutral position. Record the difference between these two forces.
         (c) If right elevator trailing edge remains at the index mark, measure force required to move trailing edge up to 2.0 (±1.0) inches from index mark. Add this force to force required to move trailing edge down 2.0 (±1.0) inches from index mark. Record sum of these two forces.
         (d) If the left elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position. Record the force at the time the elevator reaches the neutral position. Record the difference between these two forces.

(e) If left elevator trailing edge remains at index mark, measure force required to move trailing edge up 2.0 (±1.0) inches from index mark. Add this force to force required to move trailing edge down 2.0 (±1.0) inches from index mark. Record sum of these two forces.

(f) The forces recorded in steps (b), (c), (d), or (e) shall not exceed 1 pound.

(g) Move each elevator by hand through full travel in both directions. Movement shall be smooth and without binding.

D. Restore Airplane to Original Configuration

(1) Connect each elevator control pushrod to its respective elevator as follows:

(a) Ensure both elevators are positioned with trailing edge fully down.

(b) Release the control columns. Slowly rotate control columns fully forward and secure in this position. Tag the columns.

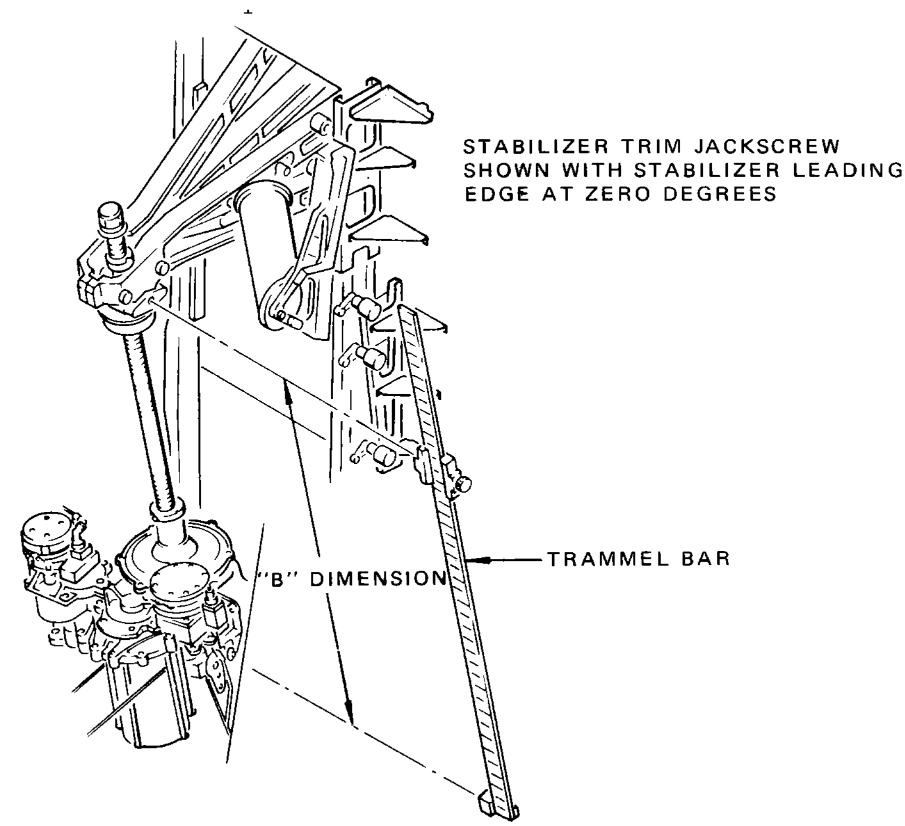
CAUTION: PROVIDE ASSISTANCE AT EACH ELEVATOR TO GUIDE ELEVATOR CONTROL PUSHROD CLEVIS ONTO ELEVATOR LUG AS CONTROL COLUMNS ARE ROTATED.

(c) Connect each elevator control pushrod to its respective elevator. Install each mounting bolt with head facing inboard. Tighten first locknut to 500-600 pound-inches, then tighten second locknut to 150-220 pound-inches.

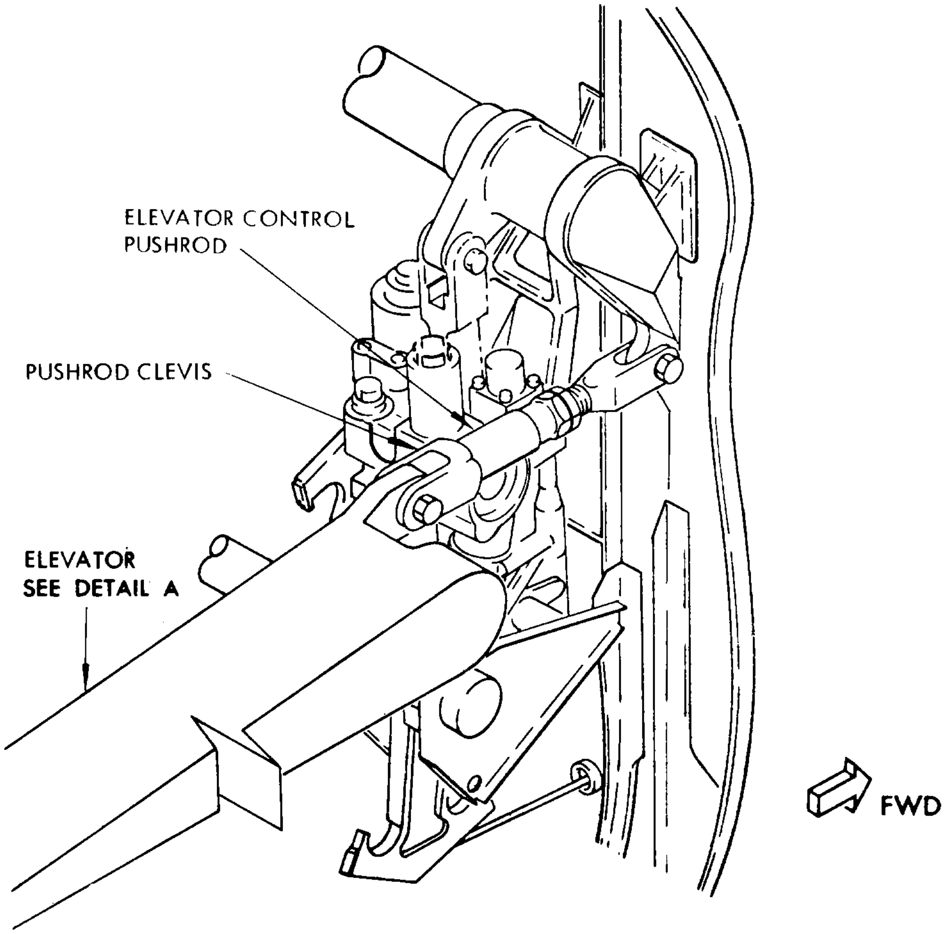
CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUT.

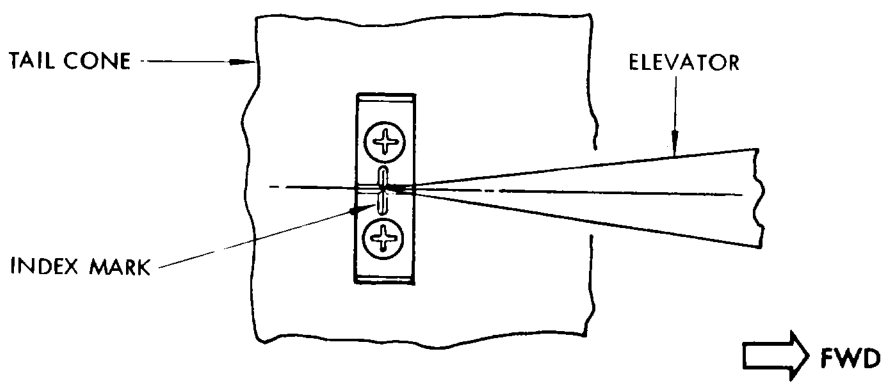
(2) Release control columns and allow columns to return to neutral position.

(3) Restore airplane to normal hydraulic configuration. Refer to 27-31-0.



Stabilizer Trim Jackscrew Setting
Figure 501





DETAIL A

Elevator Control Pushrod Attachment
Figure 502

ELEVATOR TABS - REMOVAL/INSTALLATION

1. General
   A. The elevator tabs are balanced into the elevator system by adding or removing tab adjust weights on the elevator nose in balance bay No. 2 (Fig. 402). The number of adjust weights required is a function of tab part number and tab weight. The data plate on each tab is stamped with the tab weight. When replacing an elevator tab, the number of tab weights installed on the elevator nose must agree with the number shown on Fig. 402. If data plate is missing or if tab weight is changed (due to structural changes or repainting), check Chapter 51 of the Structural Repair Manual for tab adjust weight requirement.

      WARNING: (REF SRM 51-80-6 FOR METAL AND FIBERGLASS AND SRM 51-81-6 FOR GRAPHITE COMPOSITE) FAILURE TO COMPLY WITH ELEVATOR TAB BALANCING PROCEDURES CAN PRODUCE UNDESIRABLE FLUTTER AND DYNAMIC INSTABILITY WHICH COULD EFFECT FLIGHT SAFETY.

   B. Elevator tab part numbers are separated into groups. Refer to group listing and possible elevator balancing requirements per Chapter 51 of the Structural Repair Manual if a tab with a different part number than the part number of the removed tab will be installed.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Grease - BMS 3-24 (Ref 20-30-11)
   C. Sealant - BMS 5-95 (Ref 20-30-11)
   D. Milliohmmeter - 0- to 0.1-ohm range.
   E. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Open or remove these access panels:
      (1) Tail cone access door, 3802

(2) Tab pushrod access panel
(3) Tab lock mechanism upper and lower access panels (panels are located at elevator inboard leading edge)
(4) Tab control mechanism lower access panels

B. Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).

4. Remove Elevator Tab (Airplanes with Metal-Fiberglass Elevators)

A. Disconnect elevator tab pushrods from elevator tab by removing pushrod aft mounting bolts (Fig. 401).

B. Detach bonding jumpers from elevator tab at inboard and outboard hinge fittings.

C. Remove hinge retaining screws from upper and lower surfaces of elevator tab at each tab hinge fitting location. Note arrangement of shims, if installed, and retain with tab. Retain tab inboard hinge bolt retainer at upper tab surface.

D. Remove elevator tab from elevator.

E. If a different elevator tab is to be installed on the airplane, proceed as follows:

(1) Remove cotter pin, nut and hinge bearing bolt from elevator tab hinge fitting. Withdraw tab hinge fitting.
(2) Install tab hinge fitting at original location on removed elevator tab. Replace shims in same order as removed. Install tab inboard hinge bolt retainer at upper tab surface. Install dimpled washers under screw heads. Tighten hinge retaining screws 20 to 25 pound-inches.
(3) Retain hinge bearing bolts and nuts for subsequent installation.

5. Remove Elevator Tab (Airplanes with Composite Elevators)

A. Disconnect elevator tab pushrods from elevator tab by removing pushrod aft mounting bolts.

B. Detach bonding jumpers from elevator tab at inboard and outboard hinge fittings.

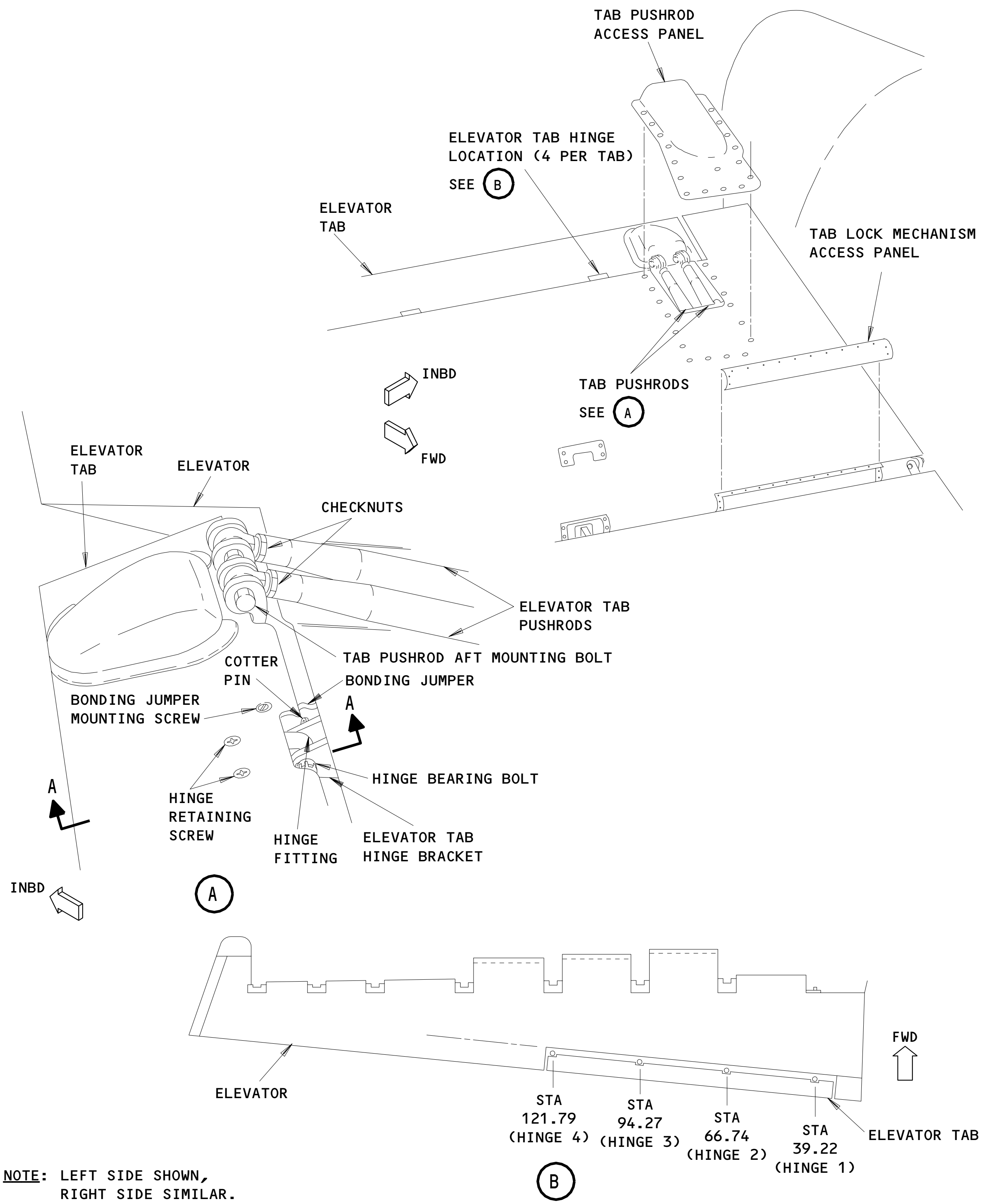
C. Remove hinge bearing bolts from tab hinge half.

D. Remove elevator tab from elevator.

6. Replace Hinge Bearing

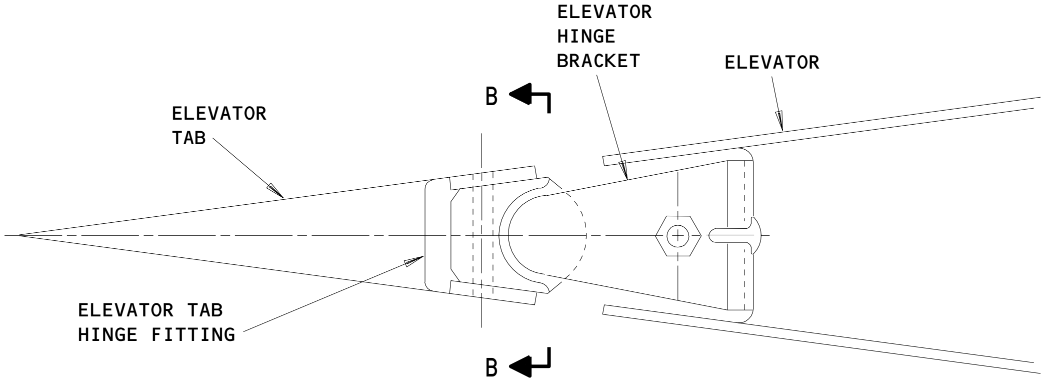
A. Remove hinge bearing (Airplanes with Metal-Fiberglass Elevator Tab)

(1) Remove elevator tab (Ref par. 4).
(2) Remove elevator tab hinge fitting:
(a) Remove cotter pin, nut and hinge bearing bolt from hinge fitting.

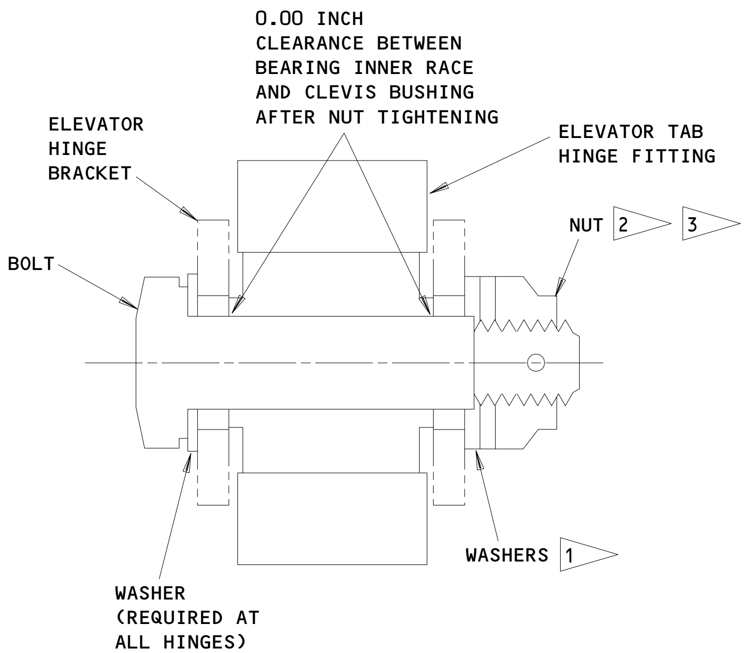


NOTE: LEFT SIDE SHOWN,
RIGHT SIDE SIMILAR.

Elevator Tab Installation
Figure 401 (Sheet 1)



A-A



B-B

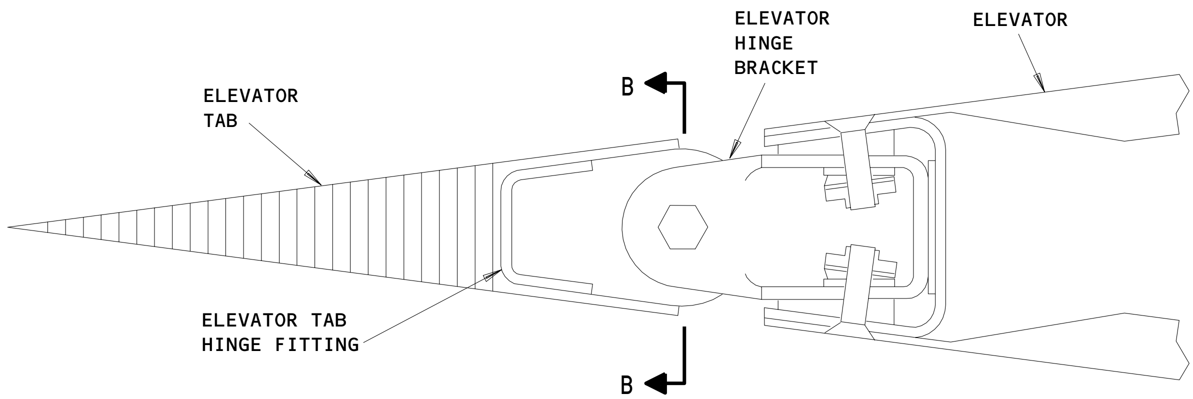
1 ON AIRPLANES NOT INCORPORATING SERVICE BULLETIN 27-1056: USE TWO THICK WASHERS. ONE THIN WASHER MAY BE USED IN ADDITION TO THE TWO THICK WASHERS IF NECESSARY FOR COTTER PIN INSTALLATION

2 ON AIRPLANES NOT INCORPORATING SERVICE BULLETIN 27-1056: TIGHTEN TO 15 POUND-INCHES. APPLY MINIMUN ADDITIONAL TORQUE (60 POUND-INCHES MAX) TO ROTATE NUT FOR COTTER PIN INSTALLATION

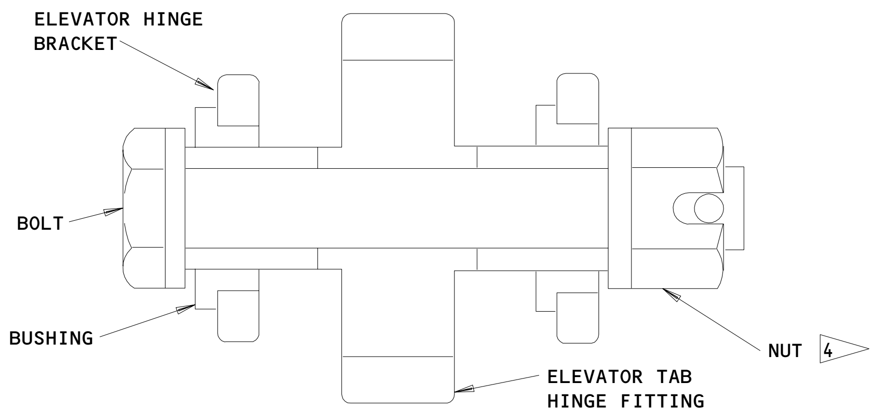
3 ON AIRPLANES INCORPORATING SERVICE BULLETIN 27-1056: INSTALL ONE THIN WASHER UNDER NUT AND TIGHTEN NUT TO 50-60 POUND-INCHES

METAL/FIBERGLASS

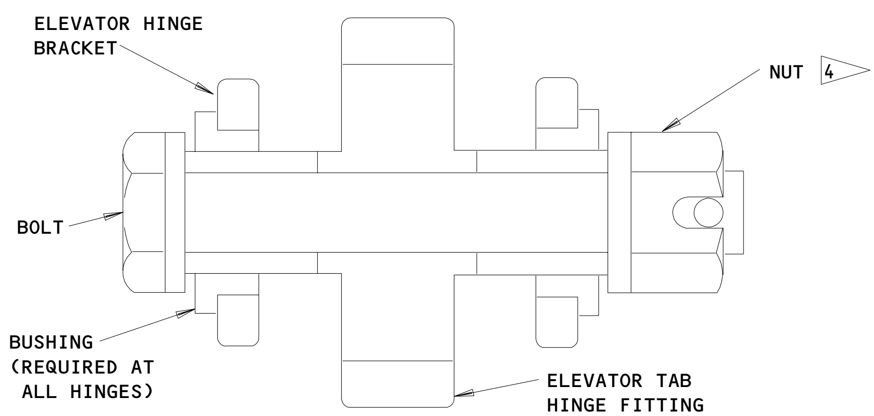
Elevator Tab Installation
Figure 401 (Sheet 2)



A-A



HINGE FITTING NO. 1
B-B



HINGE FITTINGS NO. 2,3 AND 4
B-B

GRAPHITE/COMPOSITE

4 TIGHTEN NUT TO 15 POUND-INCHES

Elevator Tab Installation
Figure 401 (Sheet 3)

(b) Withdraw the hinge fitting.
(3) Remove the hinge bearing from the hinge fitting.

B. Remove hinge bearing (Airplanes with Composite Elevator Tab)
(1) Remove elevator tab.
(2) Remove elevator tab hinge fitting:
(a) Remove the hinge retainer screws from the upper and lower surfaces of elevator tab.
(b) Remove as much sealant as possible from around the hinge fitting (AMM 51-31-0/201), using care not to damage the spar.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(c) Place a thermocouple on the hinge fitting, and heat the fitting to 240 ±10°F using a heat gun. Hold at this temperature for 15 minutes minimum.
(d) Remove the hinge fitting.

CAUTION: DO NOT HIT THE HINGE FITTING TO BREAK IT FREE. YOU CAN CAUSE DAMAGE TO ELEVATOR TAB.

NOTE: If it is necessary, reheat and allow to remain at 250°F until you can remove hinge fitting.

(3) Remove the hinge bearing from the hinge fitting.

C. Install hinge bearing (Airplanes with Metal-Fiberglass Elevator Tab)
(1) Install hinge bearing with grease to the hinge fitting.
(2) Install hinge fitting to the elevator:
(a) Place the hinge fitting into the elevator.
(b) Install hinge bearing bolt, nut and cotter pin.
(3) Install elevator tab.

D. Install hinge bearing (Airplanes with Composite Elevator Tab)
(1) Install hinge bearing with grease to the hinge fitting.
(2) Install hinge fitting to the elevator tab:
(a) Lubricate the hinge fitting.

(b) Temporarily install hinge fitting and shims in the elevator tab rear spar.
(c) Drill holes in shims and hinge fitting to match existing locations in tab.
(d) Remove the elevator tab and disassemble shims and fittings.
(e) Install nut plates on the hinge fittings.
(f) Apply parting agent to elevator tab spar in the fitting area.
(g) Install shims and fitting with sealant on faying surfaces.
(h) Install retaining screws and washers.
(i) Use sealant to seal existing nut plate and apply fillet seal on edge of elevator tab skin and hinge fitting.

(3) Install elevator tab.

7. Prepare for Installation

A. Accomplish following:
(1) Remove elevator systems A and B hydraulic power (Ref 27-31-0).
(2) Check that rigging Pin E-5 is installed in aft control quadrant (Fig. 403).
(3) Check for allowable wear at elevator tab hinges (Ref 27-31-31 I/C). Check wear at tab pushrod attach points per 27-31-121 I/C.
(4) Check Fig. 402 for required number of tab adjust weights. Check balance bay No. 2 for number of tab adjust weights installed on lower surface of elevator nose (Fig. 402).

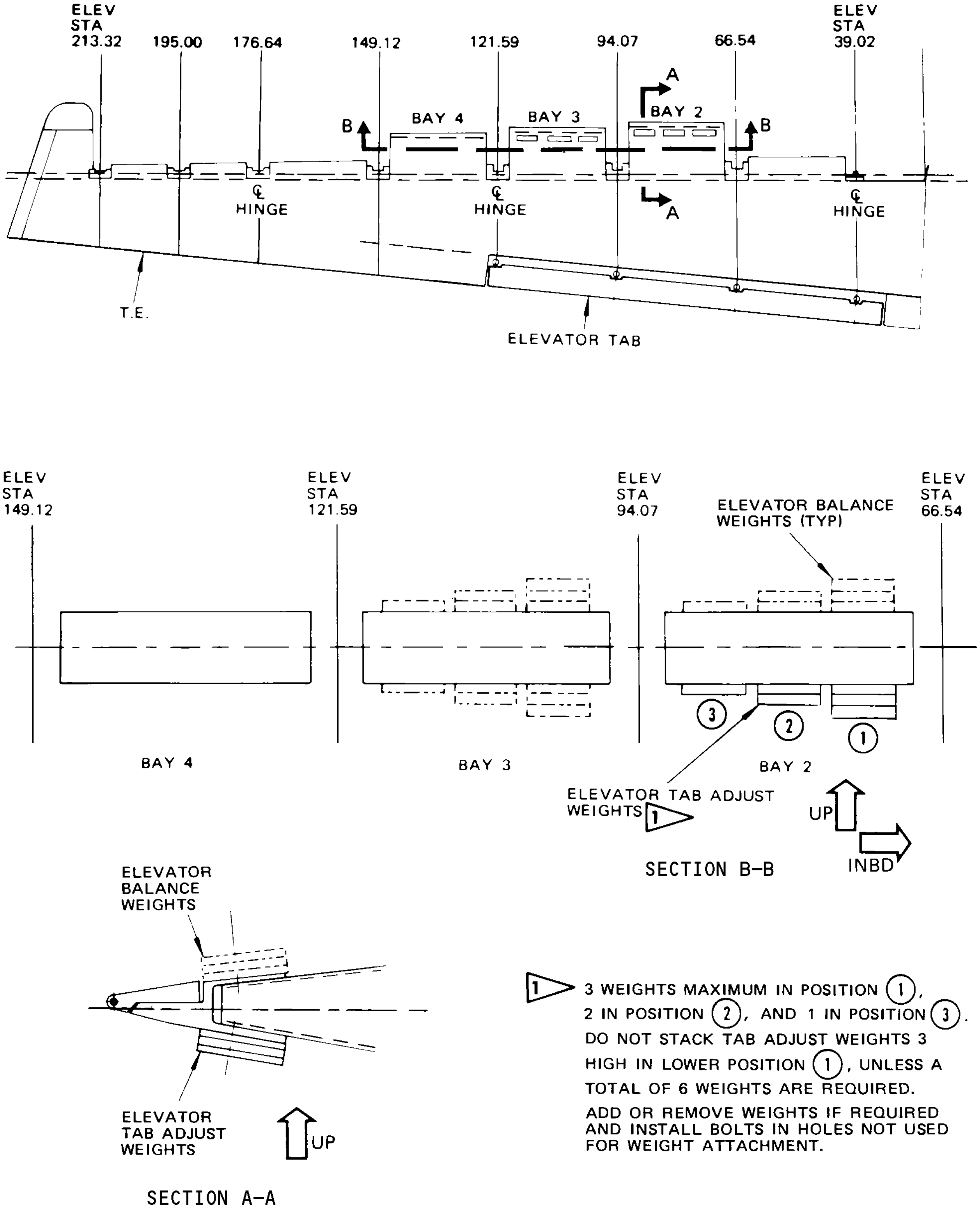
B. On airplanes with metal-fiberglass elevator tab, if a different elevator tab is being installed on the airplane, see Fig. 401 and proceed as follows:
(1) Remove hinge-retaining screws from upper and lower surfaces of replacement elevator tab at each tab hinge fitting location. Retain tab inboard hinge bolt retainer at upper tab surface.
(2) Withdraw each tab hinge fitting and assemble to mating hinge fitting at elevator rear spar.
(3) Install hinge-bearing bolts with bolt heads outboard, at each tab hinge location. Install washers and nuts. Tighten nuts to torque specified in Fig. 401.

CAUTION: LONGER OR SHORTER BOLT CAN NOT BE SUBSTITUTED.

C. On airplanes with metal-fiberglass elevator tab, if a different elevator tab is being installed or if any tab hinge fittings on elevator rear spar were disturbed, check tab to elevator alignment as follows:
   (1) Install tab on hinge fittings at elevator rear spar.
   (2) Check that hinge-retaining screws can be inserted in upper and lower tab surfaces at each tab hinge location.
   (3) If screw holes at any hinge location are misaligned proceed as follows:
      (a) Withdraw hinge retaining screws and remove tab from elevator.
      (b) Back off four-hinge bracket attach bolts common to fitting and rear spar from misaligned tab hinge fitting at elevator rear spar.
      (c) Refit tab to elevator and install hinge retaining screws at all tab hinge locations except at hinge that is misaligned.
      (d) Lightly tap misaligned hinge fitting inboard or outboard until hinge retaining screws can be easily inserted.
      (e) Remove all hinge retaining screws, detach tab from elevator and tighten the four hinge bolts.

8. Install Elevator Tab (Airplanes with Metal-Fiberglass Elevators)
   A. Manually rotate all hinge fittings through full travel in both directions and check that movement is smooth and without binding.
   B. Install tab on hinge fittings at elevator rear spar. Shim as necessary for snug fit at hinge fitting. Maximum sum total of shims is 0.050 inch. Maximum allowable shim at either surface is 0.050 inch. Maximum allowable gap at one surface is 0.003 inch.
   C. Install hinge retaining screws through upper and lower tab surfaces at each tab hinge location. Install dimpled washers under screw heads. Install tab inboard hinge bolt retainer at upper tab surface.
   D. Deflect tab through full travel in both directions and check that movement is smooth and without binding.
   E. At inboard and outboard tab hinge fittings, secure bonding jumpers to elevator tab. Clean mating surfaces. Use the milliohmmeter to make sure that the maximum electrical resistance of the bonding jumper connection is 0.010 ohms.

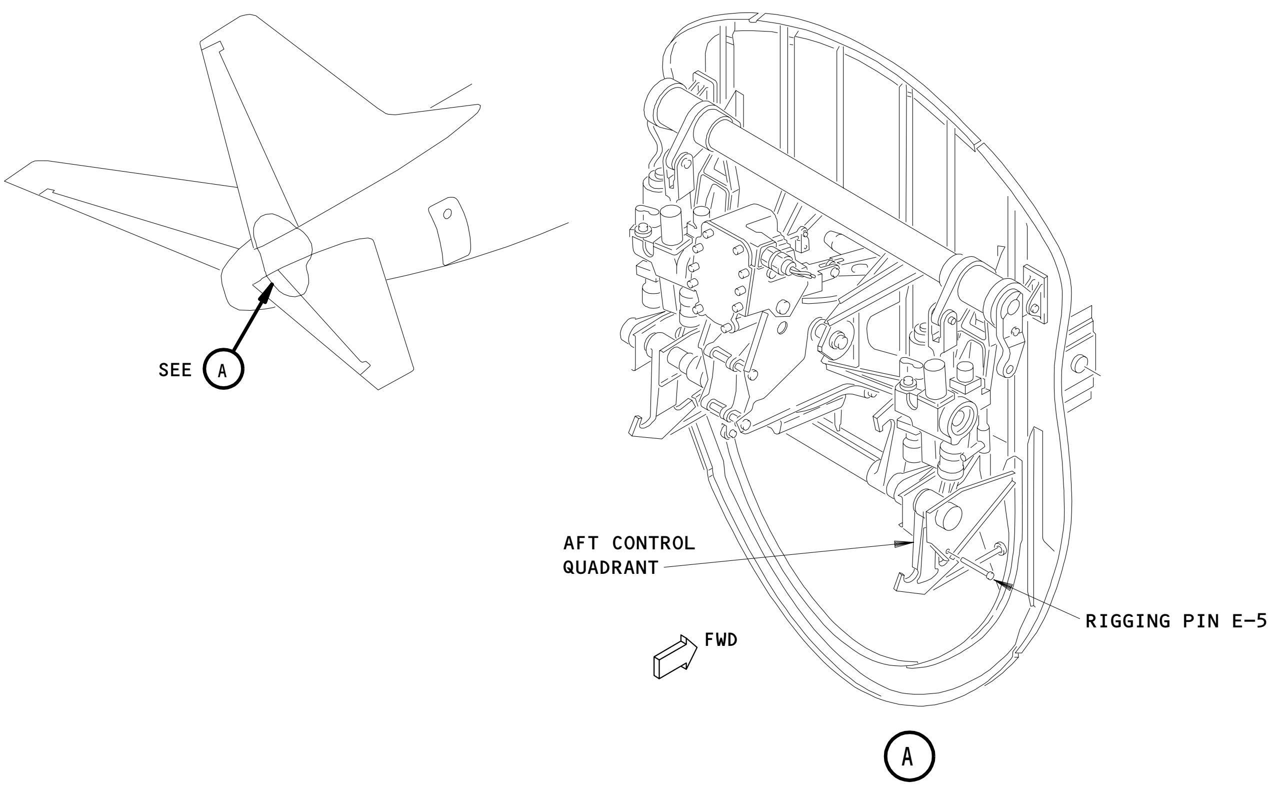
   CAUTION: TIGHTEN THE NUTS TO THE CORRECT TORQUE. THE INCORRECT TORQUE CAN CAUSE THE PUSHRODS TO COME OFF. THIS WILL CAUSE CAUSE DAMAGE TO THE ELEVATORS AND STABILIZERS.



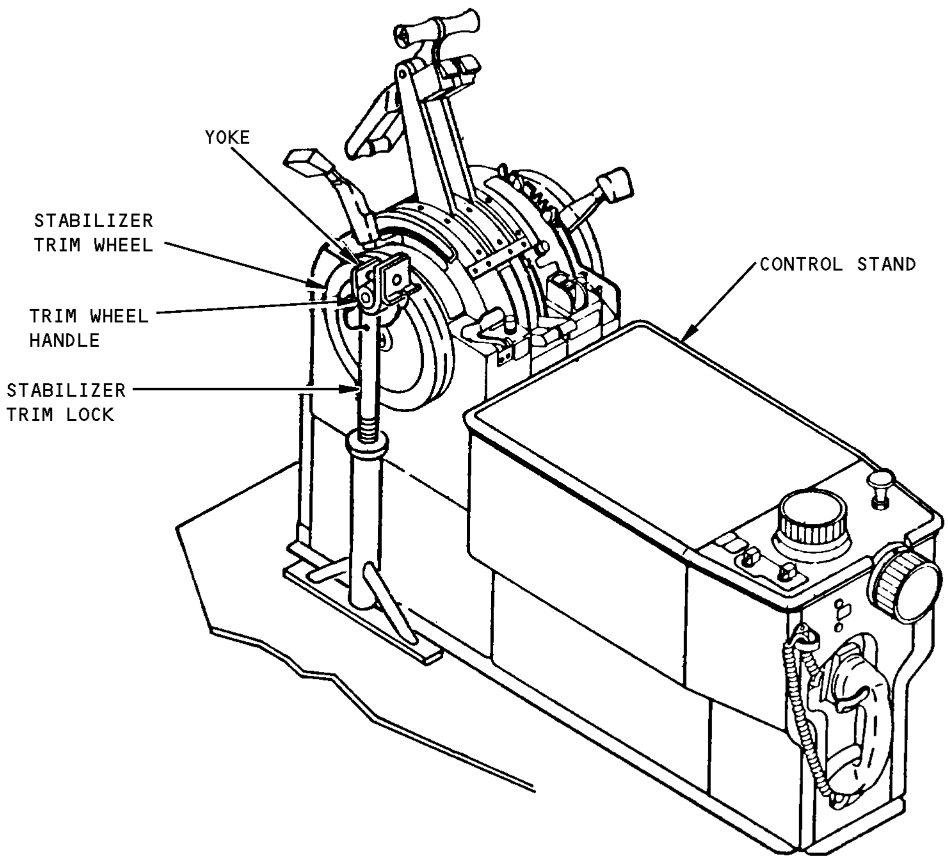
Elevator Tab Adjust Weights Location Diagram
Figure 402

F. Connect tab push rods to elevator tab. Place head of inboard bolt facing inboard and head of outboard bolt facing outboard. Do not install nut and washer until tab alignment is assured.
   (1) If castellated nuts are used, torque nuts 30 to 50 inch-pounds. Ensure the torque remains at 30 to 50 inch-pounds after alignment of the cotter pin holes. Use only new self-locking nuts, discard the old nuts. If new, self-locking, non-castellated nuts are used, run-on torque must be between 3.5 and 30 inch-pounds (even if the nuts are new). Replace any self-locking nut that does not meet this requirement. Torque nut 50 to 80 inch-pounds.
G. Remove rigging pin E-5 from aft control quadrant.
H. Remove stabilizer trim lock (Fig. 404).
I. Adjust elevator tab and test tab linkage (Ref 27-31-0 A/T).

9. Install Elevator Tab (Airplanes with Composite Elevators)
   A. Manually rotate all hinge fittings through full travel in both directions and check that movement is smooth and without binding.
   B. Install tab on hinge fittings at elevator rear spar and tighten bolts to 15 pound-inches.
   C. Deflect tab through full travel in both directions and check that movement is smooth and without binding.
   D. At inboard and outboard tab hinge fittings, secure bonding jumpers to elevator tab and seal with BMS 5-95 sealant. Clean mating surfaces. Use the milliohmmeter to make sure that the maximum electrical resistance of the bonding jumper connection is 0.010 ohms.
   E. Connect tab push rods to elevator tab; ensure bushings are installed and bolts face each other. Do not install nut, washer and cotter key until tab alignment is assured.
   F. Remove rigging pin E-5 from aft quadrant.
   G. Remove stabilizer trim lock (Fig. 404).
   H. Adjust elevator tab and test tab linkage (Ref 27-31-0 A/T).



Rigging Pin E-5 Location
Figure 403



Stabilizer Trim Lock Installation
Figure 404

TAB WEIGHT (POUNDS)	NUMBER OF ADJUST WEIGHTS REQUIRED
6.30 TO 6.40	0
6.41 TO 6.60	1
6.61 TO 6.80	2
6.81 TO 7.00	3
7.01 TO 7.20	4
7.21 TO 7.40	5
7.41 TO 7.60	6

AIRPLANES WITH FIBERGLASS ELEVATOR TABS
AIRPLANES WITH GRAPHITE/COMPOSITE ELEVATOR TABS

TAB WEIGHT (POUNDS)	NUMBER OF ADJUST WEIGHTS REQUIRED
5.00 TO 5.10	0
5.11 TO 5.30	1
5.31 TO 5.50	2
5.51 TO 5.70	3
5.71 TO 5.90	4
5.91 TO 6.10	5
6.11 TO 6.30	6

AIRPLANES WITH METAL ELEVATOR TABS

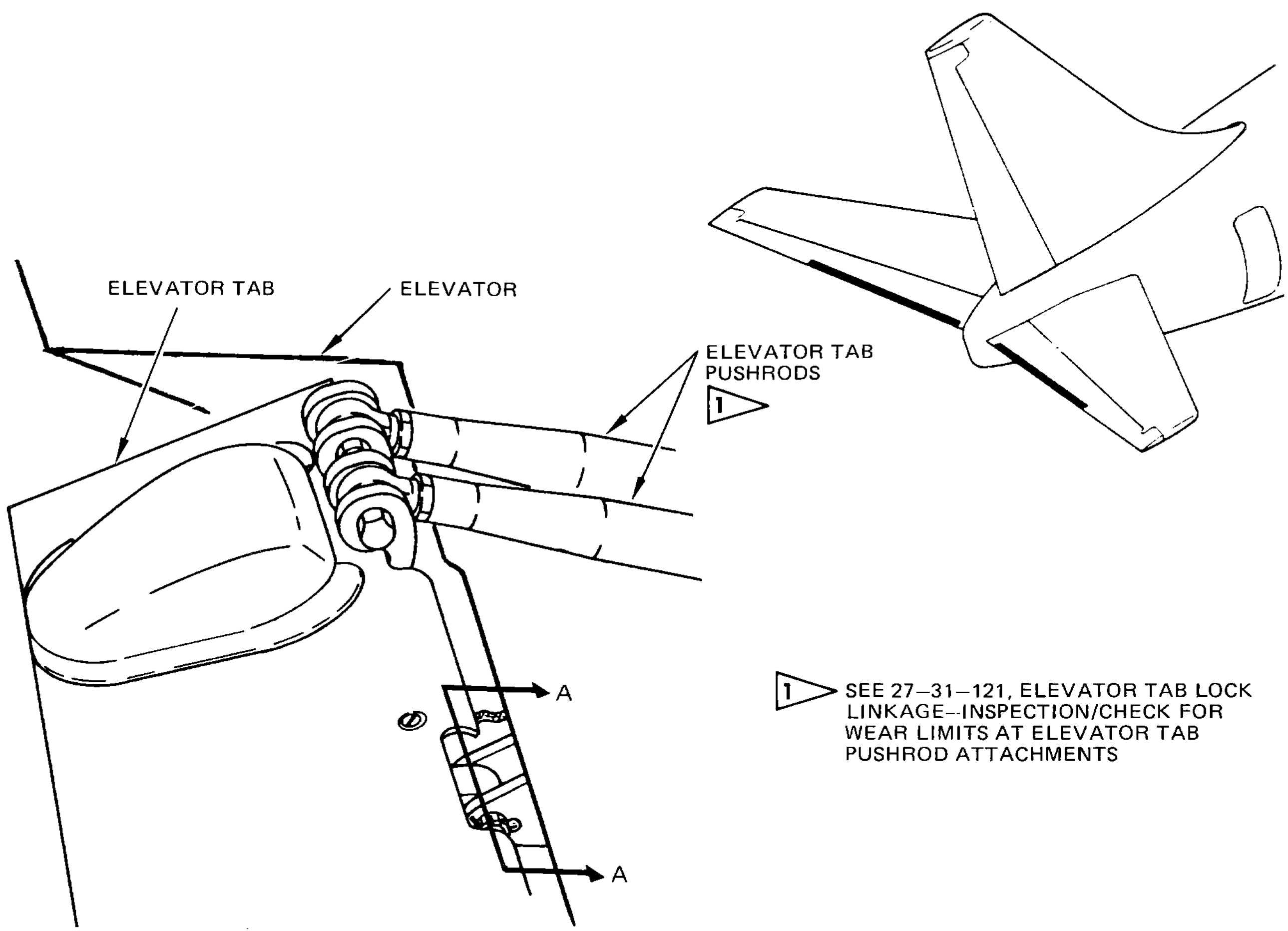
10. Restore Airplane to Normal Configuration
    A. Restore airplane to normal hydraulic configuration (AMM 27-31-0/201).
    B. Close access doors and install all access panels.

ELEVATOR TABS - INSPECTION/CHECK

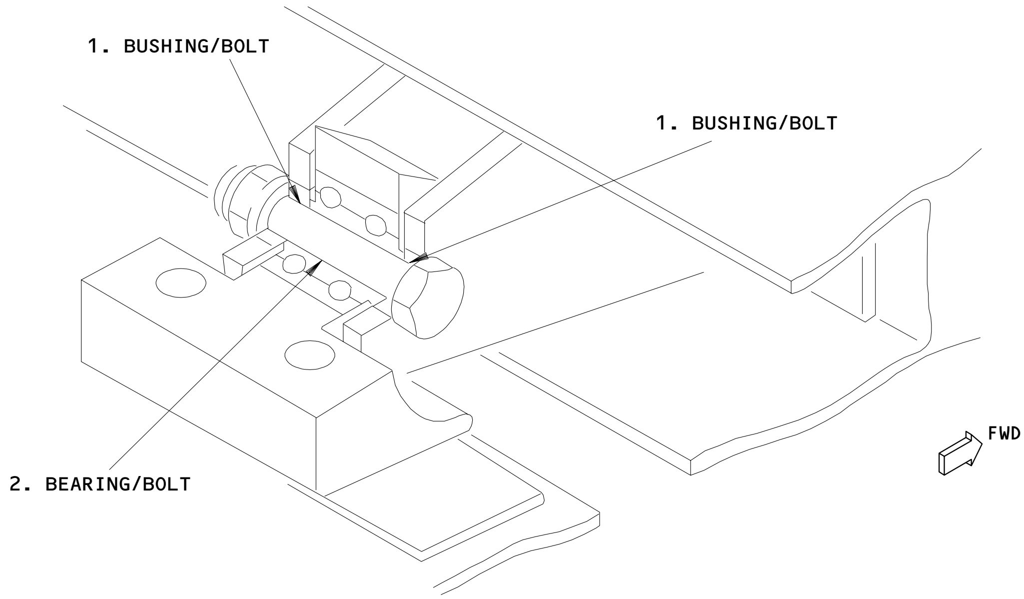
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Elevator Tabs Fasteners Inspection
   A. On fasteners which attach the elevator hinge bracket to the elevator rear spar, tighten fastener until seated. Loosen fastener and re-tighten to within torque range 65-75 pound-inches.

      CAUTION: DO NOT TIGHTEN THE FASTENER TO MORE THAN 90 POUND-INCHES. TOO MUCH TORQUE CAN CAUSE DAMAGE TO FASTENER.

   B. On fasteners which attach the mast fitting assembly to the elevator tab, tighten fastener until seated. Torque range for fastener is 20-25 pound-inches.
3. Elevator Tabs Wear Limits
   A. Figure 601 covers aluminum/fiberglass elevator tab wear limits and Fig. 602 covers graphite/composite elevator tab wear limits.



Elevator Tab Wear Limits
Figure 601 (Sheet 1)



TYPICAL 4 PLACES EACH ELEVATOR TAB
SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1 *[3]	BUSHING	ID	0.2500	0.2515	0.2545	0.0050	X		
	BOLT	OD	0.2485	0.2495	0.2450		X		
1 *[4]	BUSHING	ID	0.2495	0.2500	0.2503	0.0012	X		
	BOLT	OD	0.2492	0.2495	0.2489			X	*[1]
2 *[3]	BEARING	ID	0.2495	0.2500	0.2545	0.0050	X		
	BOLT	OD	0.2485	0.2495	0.2440		X		
2 *[4]	BEARING	ID	0.2495	0.2500	0.2503	0.0012 *[2]	X		
	BOLT	OD	0.2492	0.2495	0.2489			X	*[1]

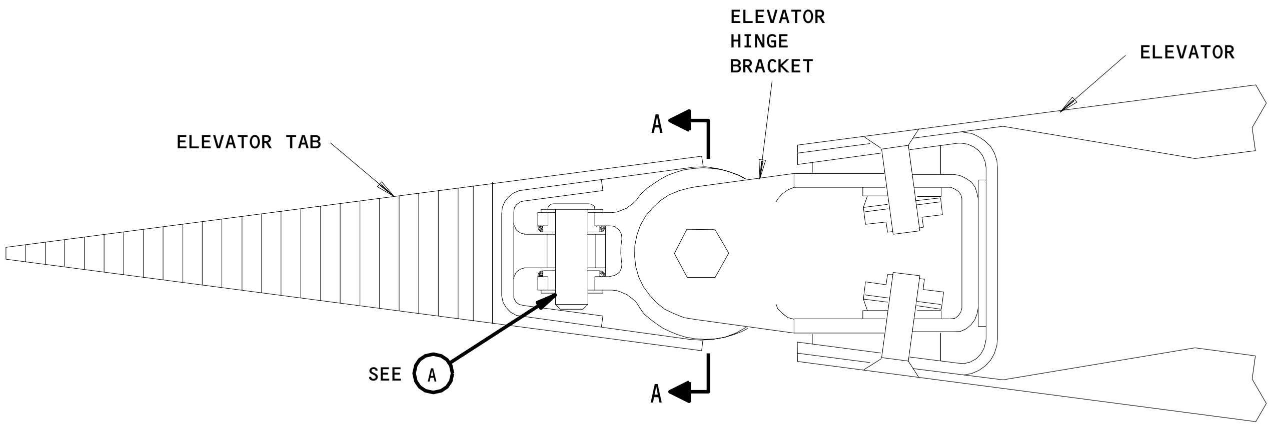
*[1] WORN PART IS REPARABLE. REFER TO OVERHAUL MANUAL FOR REPAIR INFORMATION.

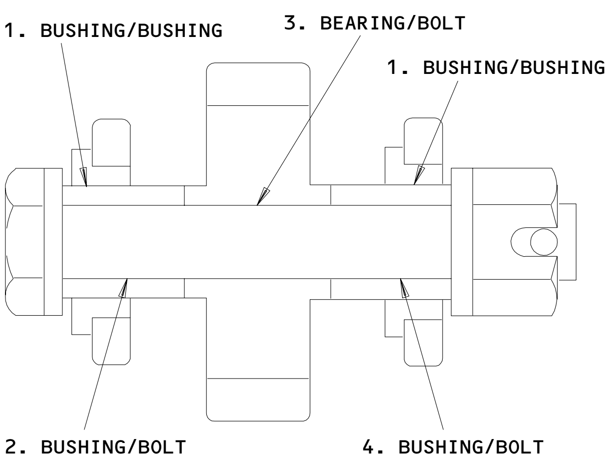
*[2] MAXIMUM RADIAL PLAY 0.0006 INCH

*[3] IN EI-ASA THRU EI-ASH
BU LN-SUA, LN-SUG, LN-SUP, LN-SUS
IR EP-IRF THRU EP-IRH
AR LV-JMW THRU LV-JMZ, LV-JND, LV-JNE, LV-JTD, LV-JTO
SV HZ-AGA THRU HZ-AGE
VM TH-CBA

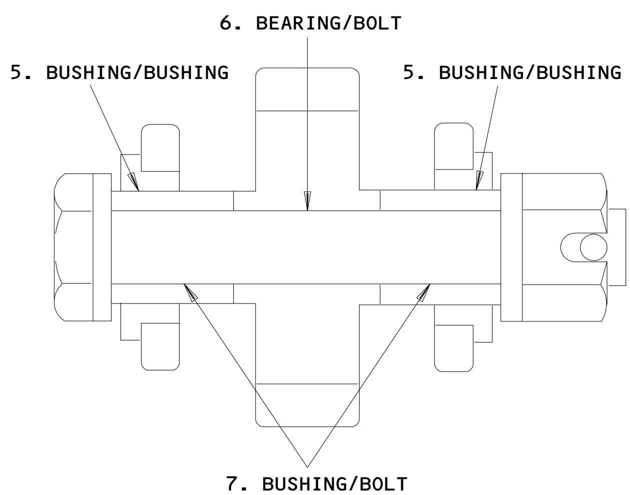
*[4] ALL EXCEPT *[3]

Elevator Tab Wear Limits
Figure 601 (Sheet 2)

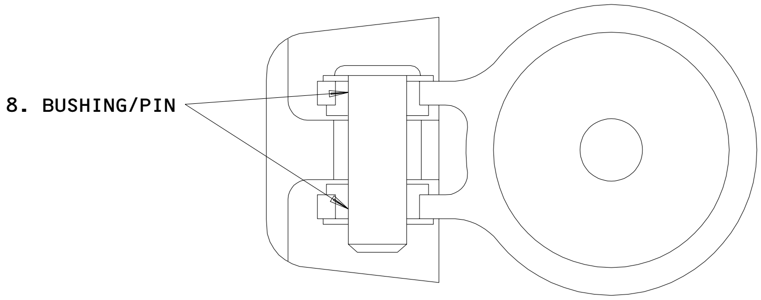




HINGE FITTING NO. 1
A-A



HINGE FITTINGS NO. 2,3 AND 4
A-A



A

Graphite/Composite Elevator Tab Wear Limits
Figure 602 (Sheet 1)

467972

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3750	0.3756	0.3800	0.0050	X		
	BUSHING	OD	0.3740	0.3745	0.3728		X		
2	BUSHING	ID	0.2500	0.2505	0.2518	0.0050	X		
	BOLT	OD	0.2494	0.2497	0.2445			X	*[1]
3	BEARING	ID	0.2495	0.2500	0.2513	0.0050	X		
	BOLT	OD	0.2494	0.2497	0.2445			X	*[1]
4	BUSHING	ID	0.2500	0.2505	0.2518	0.0050	X		
	BOLT	OD	0.2494	0.2497	0.2445			X	*[1]
5	BUSHING	ID	0.3750	0.3756	0.3800	0.0050	X		
	BUSHING	OD	0.3740	0.3745	0.3728		X		
6	BEARING	ID	0.2495	0.2500	0.2513	0.0050	X		
	BOLT	OD	0.2494	0.2497	0.2445			X	*[1]
7	BUSHING	ID	0.2500	0.2505	0.2518	0.0050	X		
	BOLT	OD	0.2494	0.2497	0.2445			X	*[1]
8	BUSHING	ID	0.2493	0.2498	0.2511	0.0025	X		
	PIN	OD	0.2490	0.2493	0.2475		X		

*[1] REF OVERHAUL MANUAL FOR REPAIR

NOTE: ELEVATOR TAB TRAILING EDGE PLAY LIMITS (27-09-600) SHALL TAKE PRECEDENCE OVER ABOVE WEAR LIMITS.

Graphite/Composite Elevator Tab Wear Limits
Figure 602 (Sheet 2)

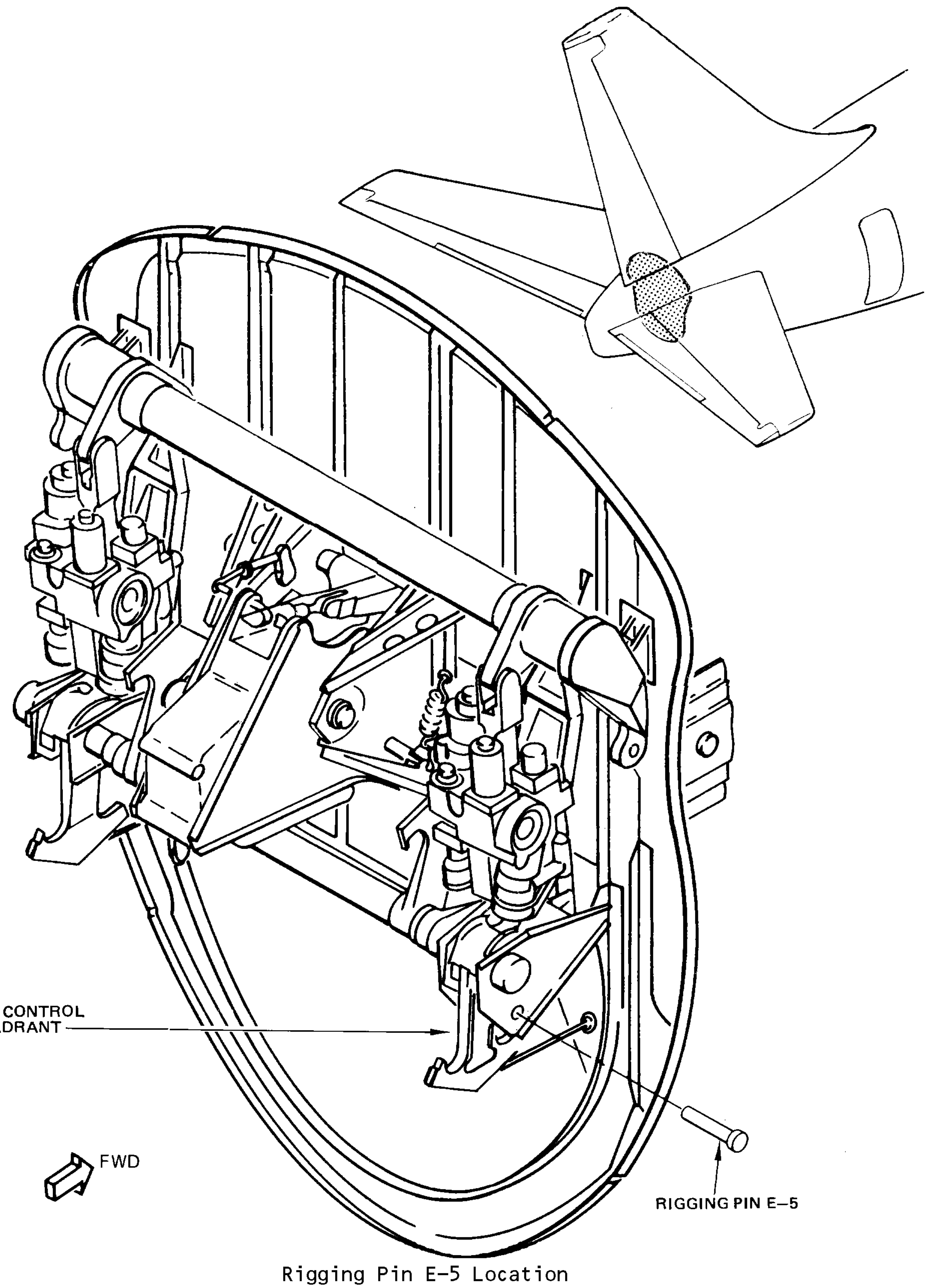
ELEVATOR BALANCE PANELS - REMOVAL/INSTALLATION

1. General
   A. The following procedure describes the removal and installation of an individual balance panel and its associated seals. This procedure may be used for all balance panels except where otherwise stated. A replacement balance panel must meet weight requirement per Chapter 51 of the Structural Repair Manual.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

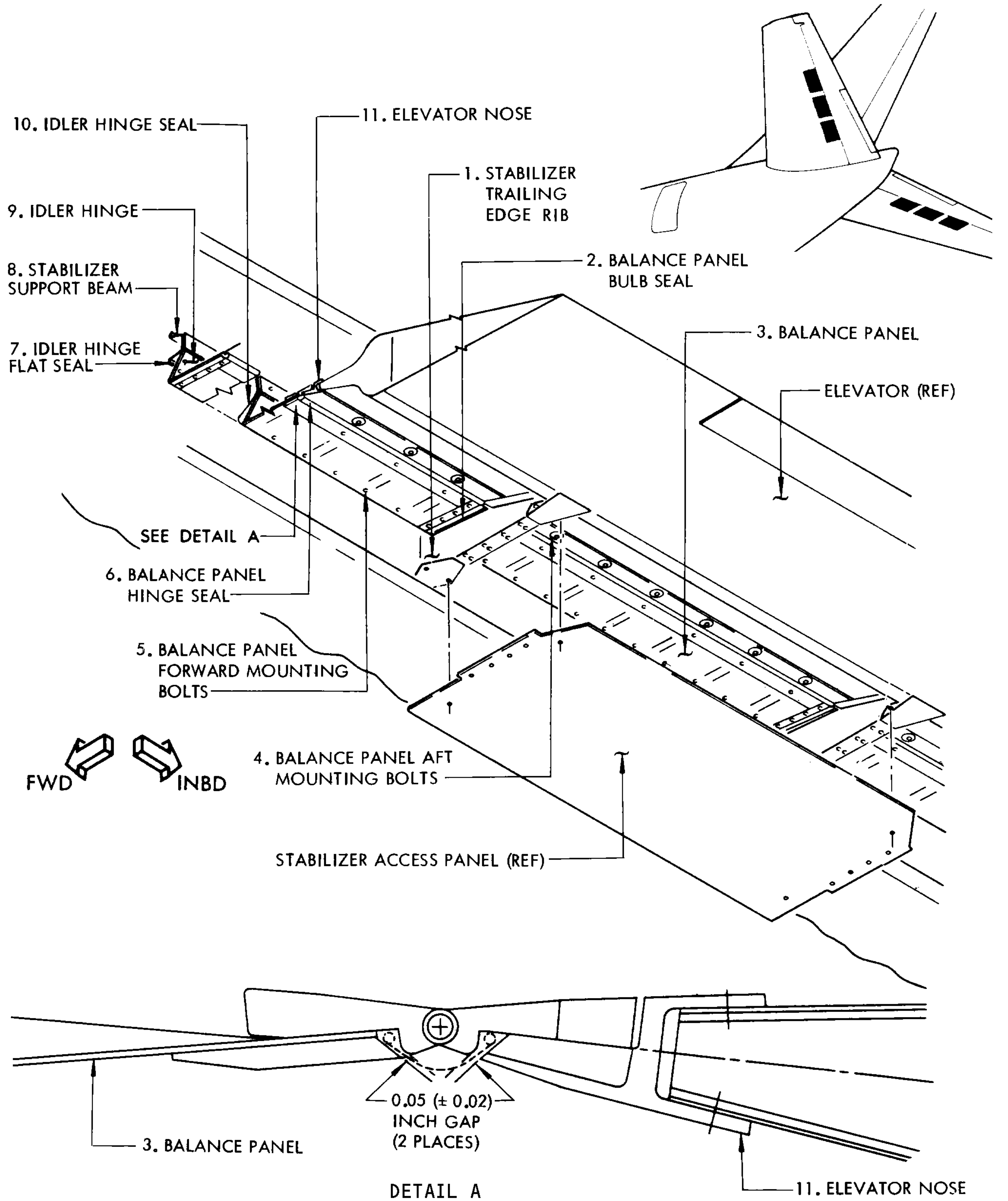
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Scale - 0 to 6 inches graduated in tenths and hundredths of an inch
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Open or remove the following access doors and panels.
      (1) Tail cone access door 3802.
      (2) Stabilizer access panels 9107, 9108 and 9109 for left elevator balance panels, or 9207, 9208 and 9209 for right elevator balance panels.
   C. Install rigging pin E-5 in aft control quadrant (Fig. 401).
4. Remove Elevator Balance Panel
   A. Remove bolts securing bulb seals (2, Fig. 402) at inboard and outboard ends of balance panel (3). Remove the seals.
   B. Remove 11 bolts (5) attaching forward end of balance panel (3) to idler hinge (9).

      CAUTION: PROVIDE SUPPORT TO BALANCE PANEL (3) DURING BOLT REMOVAL TO PREVENT EXCESSIVE LOADING OF REMAINING BOLTS. ALSO, AVOID DAMAGE TO IDLER HINGE SEAL (10) DURING BOLT REMOVAL.



Rigging Pin E-5 Location
Figure 401



Elevator Balance Panel Installation
Figure 402

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C. Remove six bolts (4) attaching aft end of balance panel (3) to elevator nose (11). Remove balance panel and balance panel hinge seal (6) from airplane.

NOTE: On some balance panel installations, it may be necessary to remove balance weights in order to gain access to aft mounting bolts (4).

D. Remove screws securing flat seals (7) at inboard and outboard ends of idler hinge (9). Remove the seals.
E. Remove 15 nuts and bolts attaching idler hinge (9) to stabilizer support beam (8). Remove idler hinge and idler hinge seal (10) from airplane.

5. Install Elevator Balance Panel
   A. Check for allowable wear at balance panel hinge. Refer to Elevator Balance Panels - Inspection/Check; then install idler hinge (9, Fig. 402) and idler hinge seal (10) to stabilizer support beam (8).
   B. Install flat seals (7) at inboard and outboard ends of idler hinge (9) as follows:
      (1) Loosely install bolts up through flat seal (7), idler hinge seal (10) and idler hinge (9).
      (2) Position each flat seal until 0.01 +0.06/-0.000-inch clearance exists between seal and stabilizer trailing edge rib (1).
      (3) Before tightening bolts, deflect idler hinge (9) to ensure idler hinge seal (10) remains slack for any elevator position. Tighten flat seal bolts.
   C. Install balance panel as follows:
      (1) Position balance panel (3) inside balance bay.
      (2) Loosely install six bolts (4) up through elevator nose (11) into hinge half at aft end of balance panel.
      (3) Carefully insert balance panel hinge seal (6) between elevator nose (11) and hinge half.
      (4) Maintain 0.05 ±0.02 inch clearance between elevator nose and hinge half, then tighten bolts (4) (Detail A, Fig. 402).
      (5) Loosely install eleven bolts (5) up through forward end of balance panel (3), idler hinge seal (10) and idler hinge (9).
      (6) Ensure idler hinge seal remains slack for any elevator position, then tighten bolts.

      CAUTION: WHEN CONNECTING BALANCE PANEL TO IDLER HINGE, ENSURE IDLER HINGE IS DEFLECTED DOWNWARD FROM STABILIZER SUPPORT BEAM.

D. Install bulb seals (2) at inboard and outboard ends of balance panel (3) as follows:
   (1) Loosely install bolts up through bulb seal and balance panel.
   (2) Airplanes with composite elevators, install each bulb seal with a clearance of 0.02 ±0.01 inch between seal and rib.
   (3) Airplanes with fiberglass aluminum elevators,install each bulb seal with a clearance of 0.02 ±0.01 inch between seal and stabilizer trailing edge rib (1).
   (4) Maintain 0.20 inch gap between forward end of balance panel bulb seal (2) and aft end of idler hinge flat seal (7).

      NOTE: If necessary, loosen idler hinge flat seal bolts and reposition flat seal to obtain gap, then repeat steps 5.B.(2) and (3).

   (5) Tighten balance panel bulb seal bolts.
E. Remove rigging pin E-5 from aft control quadrant.
F. Perform test procedure (Ref 27-31-41 A/T).
G. Close or replace all access doors and panels.

ELEVATOR BALANCE PANELS - ADJUSTMENT/TEST

1. Elevator Balance Panels Test
   A. Equipment and Materials
      (1) Trammel Bar - F80055-1, or equivalent
      (2) Spring scale - 0- to 15-pound capability, graduated in 1-pound increments
      (3) Loading block - 17 inches long, 2 x 4 wood block or equivalent
      (4) Scale - 0 to 2 feet, graduated in inches and tenths of an inch
      (5) Scale - 0 to 6 inches, graduated in tenths and hundredths of an inch
   B. Prepare for Test
      (1) Remove elevator systems A and B hydraulic power (Ref 27-31-0, Maintenance Practices).
      (2) Set horizontal stabilizer B dimension at 41.57 ±0.05 inches, using trammel bar (Fig. 501).
      (3) Rotate control columns fully forward and secure in this position. Tag the columns.
      (4) Remove bolts securing aft end of each elevator control pushrod to its respective elevator (Fig. 502).

CAUTION: DO NOT PERMIT INNER RACE OF ELEVATOR MAST FITTING CRANK BEARING TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

      (5) Rotate control columns fully aft to withdraw each elevator control pushrod clevis from the elevator lugs. When column aft stops are contacted, secure control columns in this position. Tag the columns.
   C. Test Elevator Balance Panels
      (1) Measure breakaway forces required to move elevator. Use spring scale and a loading block and apply force to elevator rear spar adjacent to elevator inboard rib.
         (a) Move elevators by hand until trailing edges align with index marks on tail cone, then release (Detail A, Fig. 502).
         (b) If the right elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position. Record the force at the time the elevator reaches the neutral position. Record the difference between these two forces.
         (c) If right elevator trailing edge remains at the index mark, measure force required to move trailing edge up to 2.0 (±1.0) inches from index mark. Add this force to force required to move trailing edge down 2.0 (±1.0) inches from index mark. Record sum of these two forces.

(d) If the left elevator moves after releasing it at the neutral position (index mark), record the maximum force required to slowly move it back to the neutral position. Record the force at the time the elevator reaches the neutral position. Record the difference between these two forces.
(e) If left elevator trailing edge remains at index mark, measure force required to move trailing edge up 2.0 (±1.0) inches from index mark. Add this force to force required to move trailing edge down 2.0 (±1.0) inches from index mark. Record sum of these two forces.
(f) The forces recorded in steps (b), (c), (d), or (e) shall not exceed 1 pound.
(g) Move each elevator by hand through full travel in both directions. Movement shall be smooth and without binding.

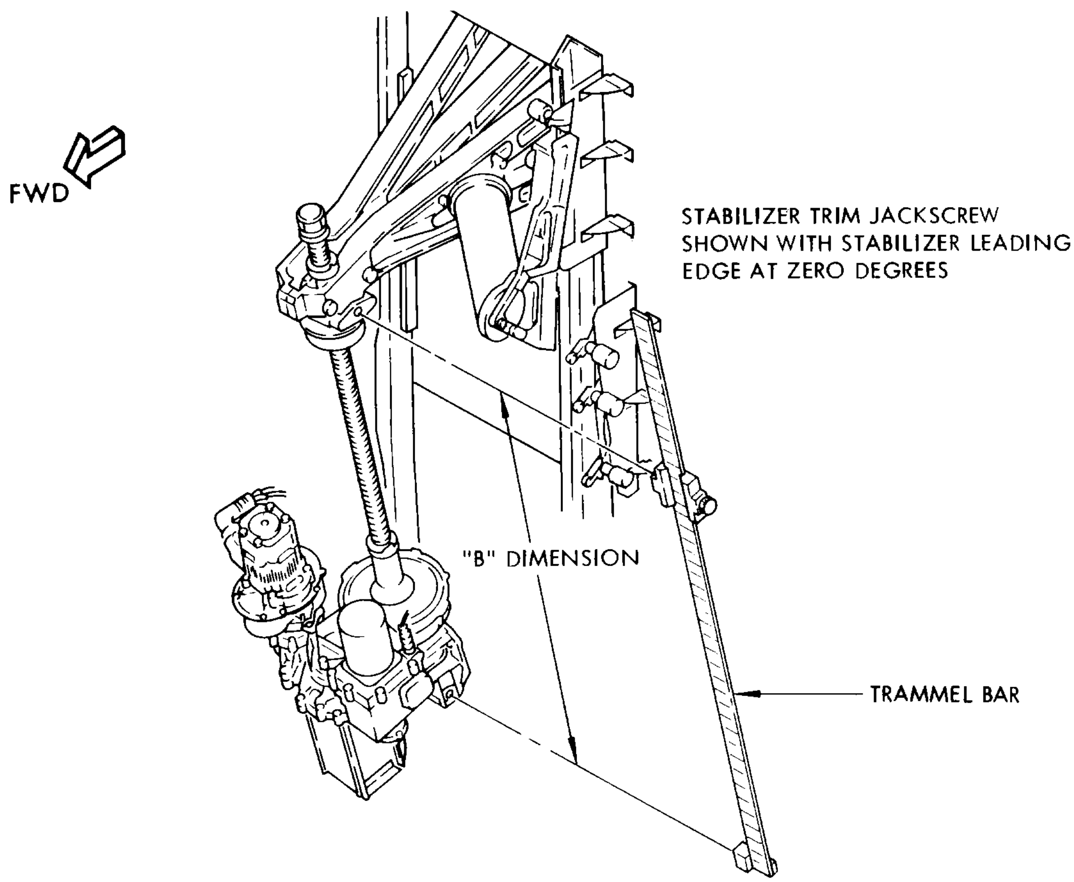
(2) Measure elevator limits of travel in both directions.
(a) Move right elevator up through full travel. Elevator trailing edge shall deflect 14.60 +0.30/-0.55 inches from index mark on tail cone.
(b) Move right elevator down through full travel. Elevator trailing edge shall deflect 10.55 +0.60/-0.30 inches from index mark on tail cone.
(c) Move left elevator up through full travel. Elevator trailing edge shall deflect 14.60 +0.30/-0.55 inches from index mark on tail cone.
(d) Move left elevator down through full travel. Elevator trailing edge shall deflect 10.55 +0.60/-0.30 inches from index mark on tail cone.

(3) Connect each elevator control pushrod to its respective elevator as follows:

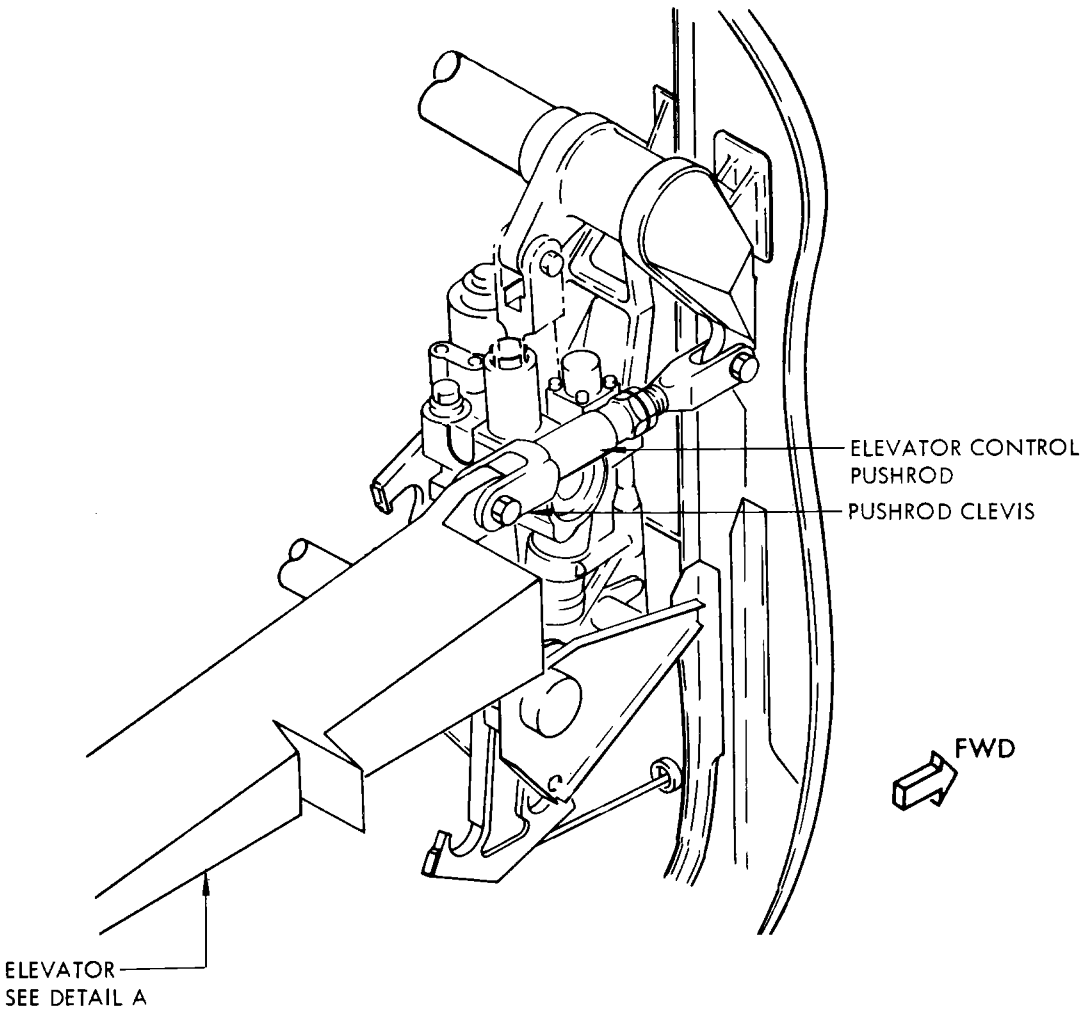
CAUTION: DO NOT PERMIT INNER RACE OF ELEVATOR MAST FITTING BEARING TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

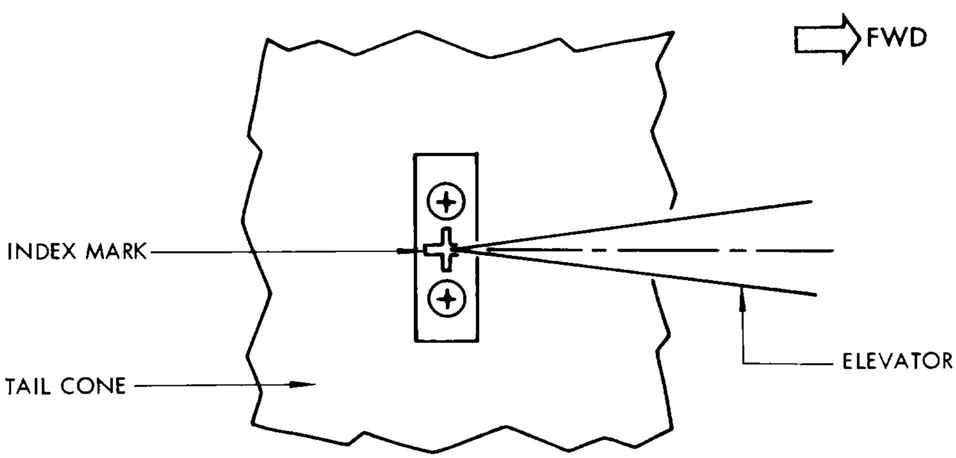
(a) Check that both elevators are positioned with trailing edge fully down.
(b) Release the control columns. Slowly rotate control columns fully forward and secure in this position. Tag the columns.

CAUTION: PROVIDE ASSISTANCE AT EACH ELEVATOR TO GUIDE ELEVATOR CONTROL PUSHROD CLEVIS ONTO ELEVATOR LUG AS CONTROL COLUMNS ARE ROTATED.



Stabilizer Trim Jackscrew Setting
Figure 501





DETAIL A

Elevator Control Pushrod Attachment
Figure 502

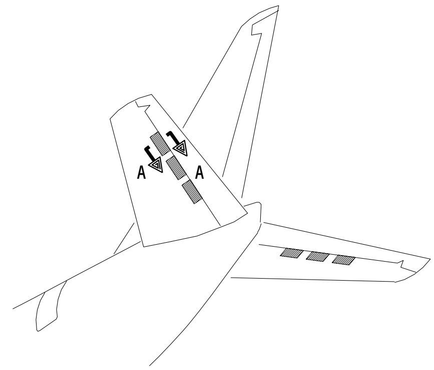
(c) Connect each elevator control pushrod to its respective elevator. Install each mounting bolt with head facing inboard. Tighten first locknut within 500 to 600 pound-inch torque, then tighten second locknut within 150 to 220 pound-inch torque.

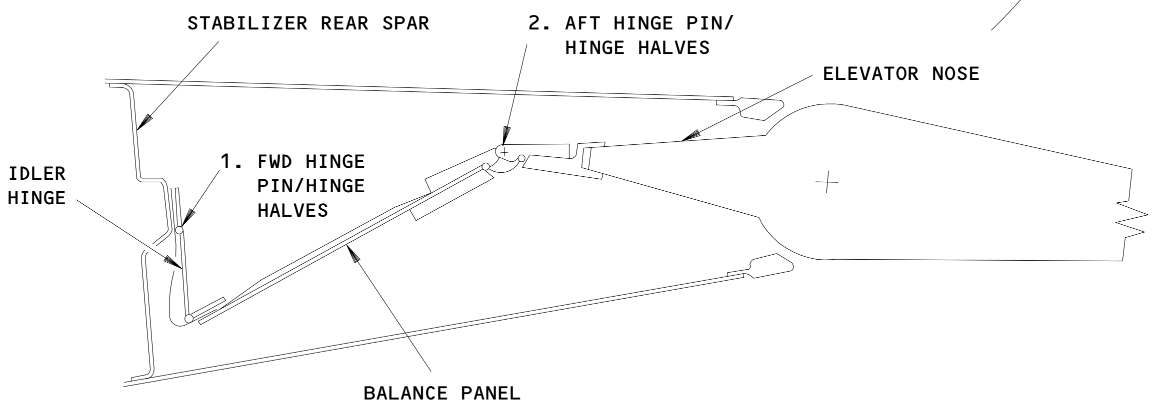
CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUT.

(4) Release control columns and allow columns to return to neutral position.

ELEVATOR BALANCE PANELS - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits. There will be no procedure given in this section for gaining access to, or removing and replacing the components after inspection for wear. Refer to Component Removal/Installation for this information.
2. Elevator Balance Panel Wear Limits





SECTION A-A (TYPICAL)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	HINGE HALF	ID	0.093	0.098	0.104	0.0165 *[1]	X		
	FWD HINGE PIN	OD	0.089	0.090	0.0875		X		
2	HINGE HALF	ID	0.183	0.188	0.194	0.0175 *[2]	X		
	AFT HINGE PIN	OD	0.179	0.180	0.1775		X		

*[1] TOTAL PLAY IN JOINT 0.033 INCH.

*[2] TOTAL PLAY IN JOINT 0.035 INCH.

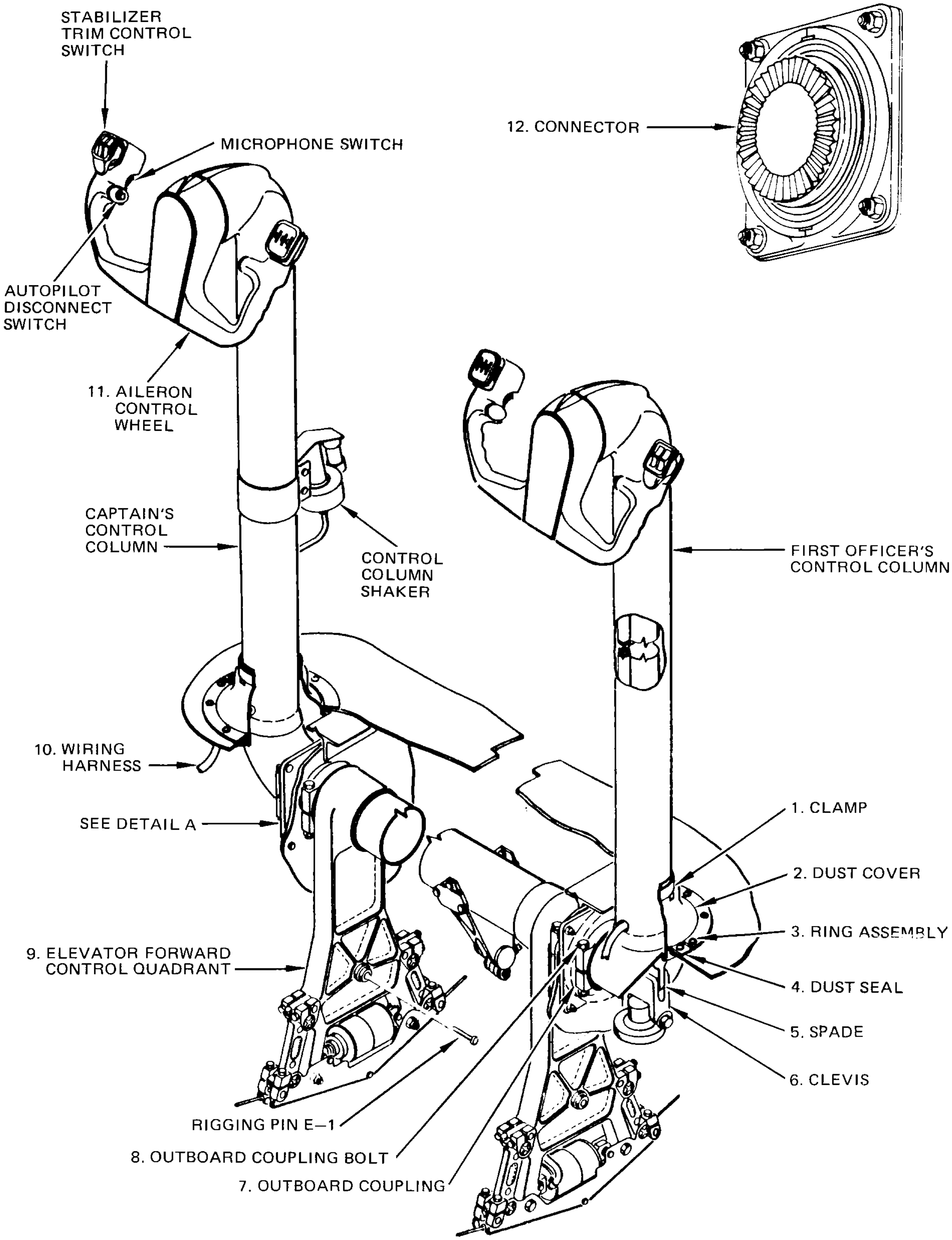
Elevator Balance Panel Wear Limits
Figure 601

CONTROL COLUMN - REMOVAL/INSTALLATION

1. General
   A. The procedure herein should not be enlarged upon. Further disassembly of the control column, while installed in the airplane, could result in damage to the equipment and restriction of the control system. Instructions for complete disassembly of the control column are contained in the Overhaul Manual.
   B. For replacement of the control wheel refer to AMM 27-11-41/401.
2. Equipment and Materials
   A. Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Aileron Control Wheel Protractor Mount - F72790
      (2) Forward Thrust Lever Protractor Adapter - F72952-2
   B. Hole Filling Compound - BMS 5-16 (AMM 20-30-11)
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT

3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
   B. Open flight controls circuit breakers on circuit breaker panel P6 and stall warning circuit breakers on circuit breaker panel P18.
   C. Open lower nose compartment access door 1103 (AMM Chapter 12, Access Doors and Panels).
   D. Check that rigging pin E-1 can be installed in left forward control quadrant (9, Fig. 401), but do not leave rigging pin installed.
4. Remove Control Column
   A. Remove ring assembly (3, Fig. 401) and dust seal (4).
   B. Install rigging pin E-1 in elevator left forward control quadrant (9).



Control Column Installation
Figure 401

C. Disconnect wiring harness (10) at terminal strip in lower nose compartment. Remove clamps where necessary to release harness.
D. If a control column shaker is installed, remove electrical connector from shaker motor and detach connector from end of cable.
E. Remove outboard coupling bolts (8) and remove outboard coupling (7).

CAUTION: CONTROL COLUMN IS FREE TO FALL AS COUPLING IS REMOVED AND MUST BE SUPPORTED FROM TIME THE NUTS ARE LOOSENED UNTIL COLUMN IS REMOVED.

F. Lift control column clear of control well. Simultaneously thread control column shaker electrical cable down through column, removing clamps where necessary to release cable.

5. Install Control Column
A. Check that rigging pin E-1 is installed in left forward control quadrant.
B. Check that dust cover on control column is oriented per Fig. 402 and lower column into position. Set aileron control wheel at neutral to assure engaging spade (5, Fig. 401) with clevis (6).
C. Position control column forward of a perpendicular line taken from the floor of the airplane per Fig. 402.
D. Maintaining angle obtained in previous step, engage face splines on control column with splines on forward control quadrant connector (12, Fig. 401).
E. Install outboard coupling (7) and coupling retaining bolts (8). Tighten bolts within range of driving torque, then alternately tighten bolts to 50-70 pound-inches torque in approximately 10 pound-inch increments to achieve gaps equal within 0.03 inch at each end of coupling clamp.

NOTE: Check bolt length to ensure that the proper bolt is installed. Improper length bolts can cause interference, which prevents achieving full control wheel and control column travel. Substitution of next bolt length and use of washers must be identical at each end of coupling clamp.

F. Check control column angle is as specified in step C.

G. Connect wiring harness (10) to terminal strip in lower nose compartment. Install harness clamps where removed.
H. If applicable, thread control column shaker electrical cable up through column. Refit connector on cable end and plug connector into shaker motor. Install cable clamps where removed.
I. Install dust seal (4) and ring assembly (3). Fill gaps between dust seal halves with hole filling compound. Also fill gap between notch in dust seal and cutout in floor with hole filling compound.
J. Adjust dust cover (2) as required to position edge of dust seal (4) extended slightly upward against dust cover. Loosen clamp (1) to adjust dust cover.

CAUTION: DUST COVER MAY CONTACT WIRE BUNDLE BUT MUST NOT PINCH, OR BE FORCED AGAINST, ELECTRICAL CABLE.

INSTALLING DUST COVER TOO HIGH ON CONTROL COLUMN MAY CAUSE BINDING OF THE CONTROL COLUMN AND/OR DAMAGE TO THE DUST COVER.

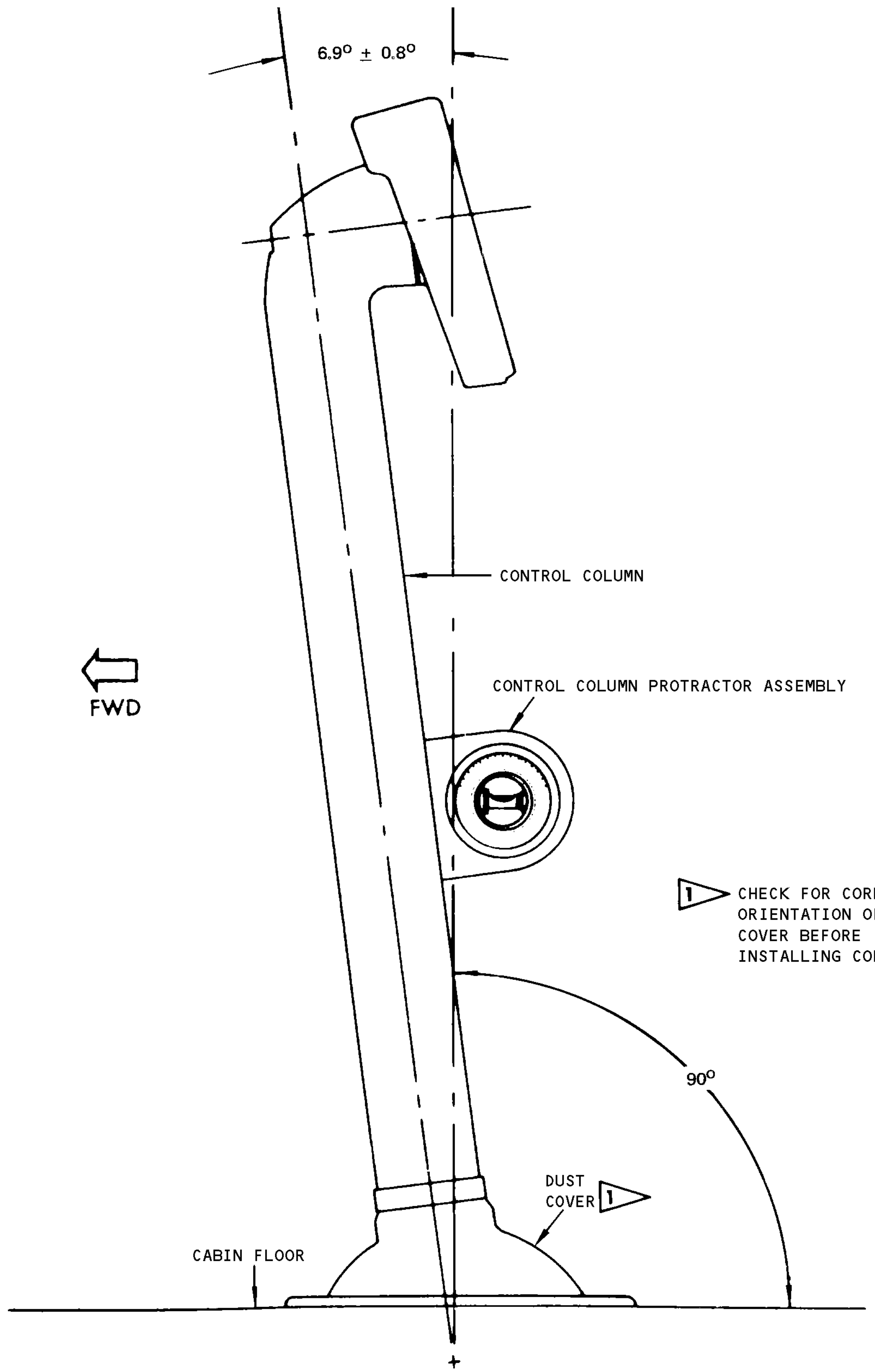
K. Remove rigging pin E-1 from elevator forward control quadrant.
L. Close access doors and replace access panels.
M. Close circuit breakers.
N. Move the control column forward and aft and rotate the aileron control wheel (11) through full travel and check for satisfactory operation.
O. Test manual mode operation (column travel and elevator and tab deflection) per AMM 27-31-0/201.
P. Check control wheel microphone switch.
   (1) Check that all interphone and interphone dual power source circuit breakers on panel P6 are closed.
   (2) Turn on both flight interphone loudspeakers.
   (3) At captain's, first officer's, and observer's audio selector panels, push and turn on INT audio switch, push INT mic selector switch.
   (4) Using boom microphone/headset assemblies or handheld microphone, establish communication between flight compartment stations by actuating each pilot's control wheel microphone switch to INT position. Check that audio is loud and clear between stations.

Q. Test stabilizer trim control switch.
   (1) Move STAB TRIM CUTOUT switch to NORMAL position.
   (2) Provide electrical power.
   (3) Close stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.
   (4) Actuate stabilizer trim control switch to AIRPLANE NOSE UP and to AIRPLANE NOSE DOWN. Check that stabilizer responds in correct direction.

R. Test autopilot disconnect switch (AMM 22-11-411/501).

S. Perform Elevator and Tab Control System Power Made Operation Test (AMM 27-31-0/501).

T. Restore airplane to normal hydraulic configuration (AMM 27-31-0/201).



Control Column Adjustment
Figure 402

ELEVATOR FORWARD CONTROL QUADRANT - REMOVAL/INSTALLATION

1. General
   A. The following procedure describes the removal of the forward control quadrant without removing the control columns. Adequate support must be provided at each column to prevent it from falling. To remove a control column refer to 27-31-51 R/I.
2. Equipment and Materials
   A. Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
      (1) Aileron Control Wheel Protractor Mount - F72790
      (2) Forward Thrust Lever Protractor Adapter - F72952-2
   B. Tensiometer - 0- to 320-pound capacity
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT
ST-1	-16	0.182-0.186	2.7 ±0.25	STABILIZER TRIM BRAKE ARM

   D. Steel scale - 0 to 2 feet, graduated in inches and tenths of an inch
   E. Stabilizer Trim Lock - F71336-501
3. Remove Elevator Forward Control Quadrant
   A. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 404).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
   B. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   C. Open autopilot pitch control channel, flight controls and spoiler circuit breakers on circuit breaker panel P6.
   D. Open lower nose compartment access door 1103 and aft compartment access door 3701. Remove tail cone access door 3802.
   E. Install rigging pin E-1 in left forward control quadrant and rigging pin E-5 in aft control quadrant (Fig. 401 and 402).

F. Release tension in elevator control cables at turnbuckles in aft unpressurized compartment. Do not disconnect turnbuckles.
G. Install clamps on elevator control cables to prevent cables running aft through bulkhead.
H. Remove cables EA and EB from forward control quadrants by removing retainer pin from each cable end. Tag cables.
I. Remove screws securing cable support fairlead to each quadrant.
J. Disconnect cables B and C on the control column position sensor (AMM 31-24-51/401).
K. Disconnect pitch transducer (5) electrical cable at electrical connector.
L. Disconnect stabilizer trim brake pushrod (6) from fork on quadrant torque tube and disconnect forward end of brake release cable from arm on stabilizer trim brake.
M. Remove ring assembly (3) and dust seal (4) from the base of one control column (1).

NOTE: Control column connectors (13) and forward control quadrant shoulders may be lightly scribe marked to facilitate alignment of control column during quadrant installation.

N. Remove rigging pin E-1.
O. Release two inboard coupling bolts (9) from each inboard coupling (8). Remove couplings.

CAUTION: BOTH CONTROL COLUMNS AND FORWARD CONTROL QUADRANT MUST BE SUPPORTED TO PREVENT THEM FROM FALLING.

P. Slide control column outboard until teeth on connector (13) are disengaged from control quadrant (7).
Q. Remove elevator forward control quadrant from airplane.
R. If new forward quadrant assembly is to be installed remove pitch transducer with electrical cable and clamps from each quadrant and install with new forward quadrant assembly.

4. Prepare to Install Forward Control Quadrant
   A. If BAC27DCT135 marker is not installed on both quadrants, install marker as follows:
      (1) Locate marker for installation per location of marker on removed quadrant.

(2) Install per applicable instructions in Chapter 20.

B. Remove elevator systems A and B hydraulic power. Refer to 27-31-0.

C. If installing new elevator forward control quadrant assembly, or if pitch transducers (5, Fig. 401) have been removed, install pitch transducers on control quadrants per Chapter 22, Pitch Control Wheel Steering Force Transducer - R/I. Part of installation may be accomplished prior to installation of quadrant in airplane.

5. Install Elevator Forward Control Quadrant

A. Position and support elevator forward control quadrant (7, Fig. 401) in lower nose compartment.

B. Install rigging pin E-1 in left forward control quadrant.

C. Using a bubble protractor, position each control column 6.9 ±0.8 degrees forward of a perpendicular line from floor of airplane (Fig. 403.)

D. With both control wheels at neutral, slide control columns inboard and simultaneously engage teeth on both connectors (13, Fig. 401) with mating faces on control quadrant (7).

E. Position inboard coupling (8) on control quadrant and install coupling bolts (9). Tighten bolts within range of driving torque, then alternately tighten bolts to 50-70 pound-inches torque in approximately 10 pound-inch increments to achieve gaps equal within 0.03 inch at each end of coupling clamp.

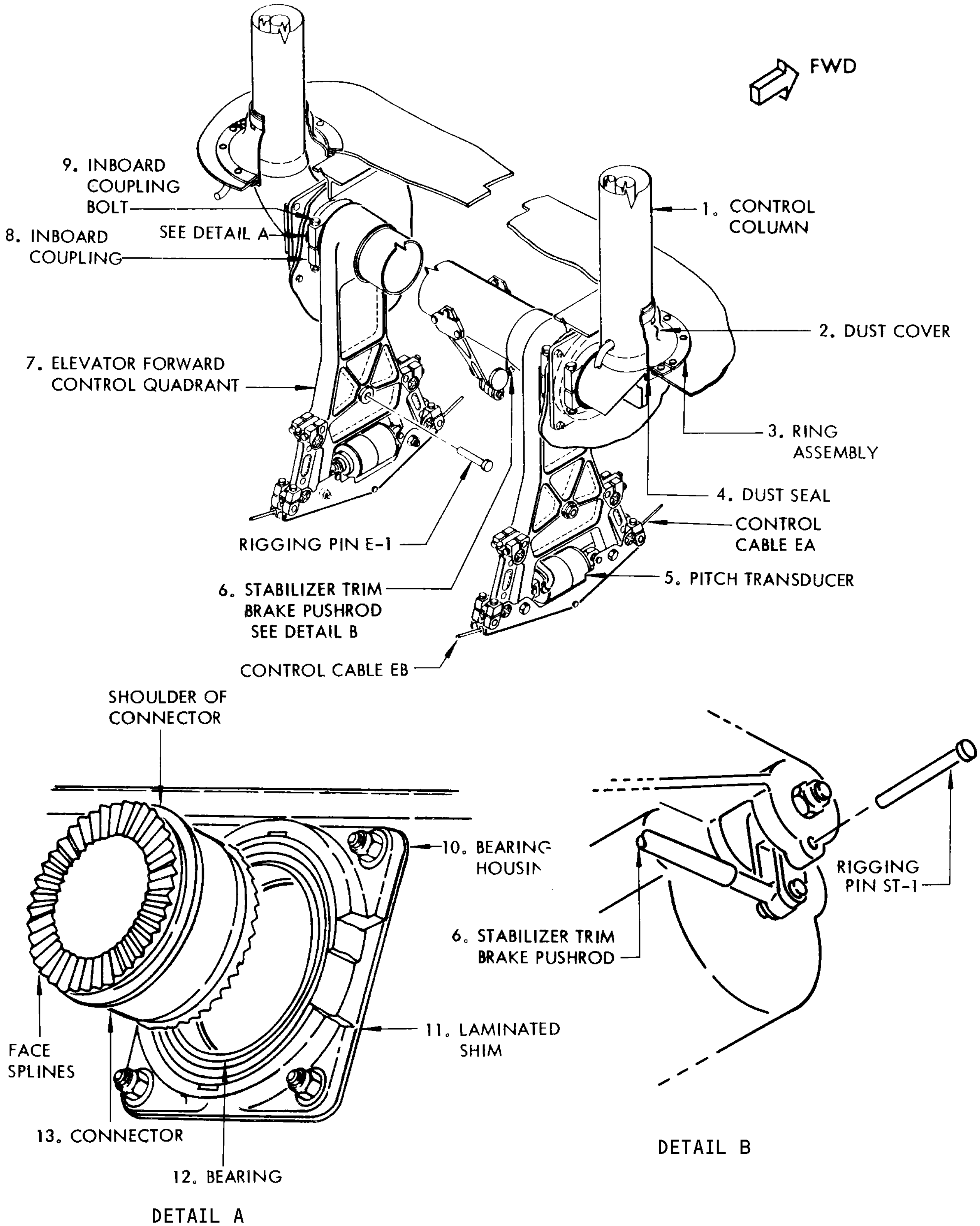
NOTE: Check bolt length to ensure that proper bolt is installed. Improper length bolts can cause interference, which prevents achieving full control wheel and control column travel. Substitution of next bolt length and use of washers must be identical at each end of coupling clamp.

F. Repeat step E for opposite control column.

G. Adjust shims (11) under left and right bearing housings (10) as required to obtain following clearances:

(1) Quadrant assembly is to be centered between floor beam lower chords so that each quadrant will clear respective floor beam lower chord by 0.06 inch minimum through full travel of quadrants.

(2) Total clearance (sum of clearances of both quadrants) between bearing (12) inner race shoulder and connector (13) shoulder shal1 be 0.01 to 0.02 inch. Measure clearance at either quadrant with connector shoulder against bearing at other quadrant.



Elevator Forward Control Quadrant Installation
Figure 401

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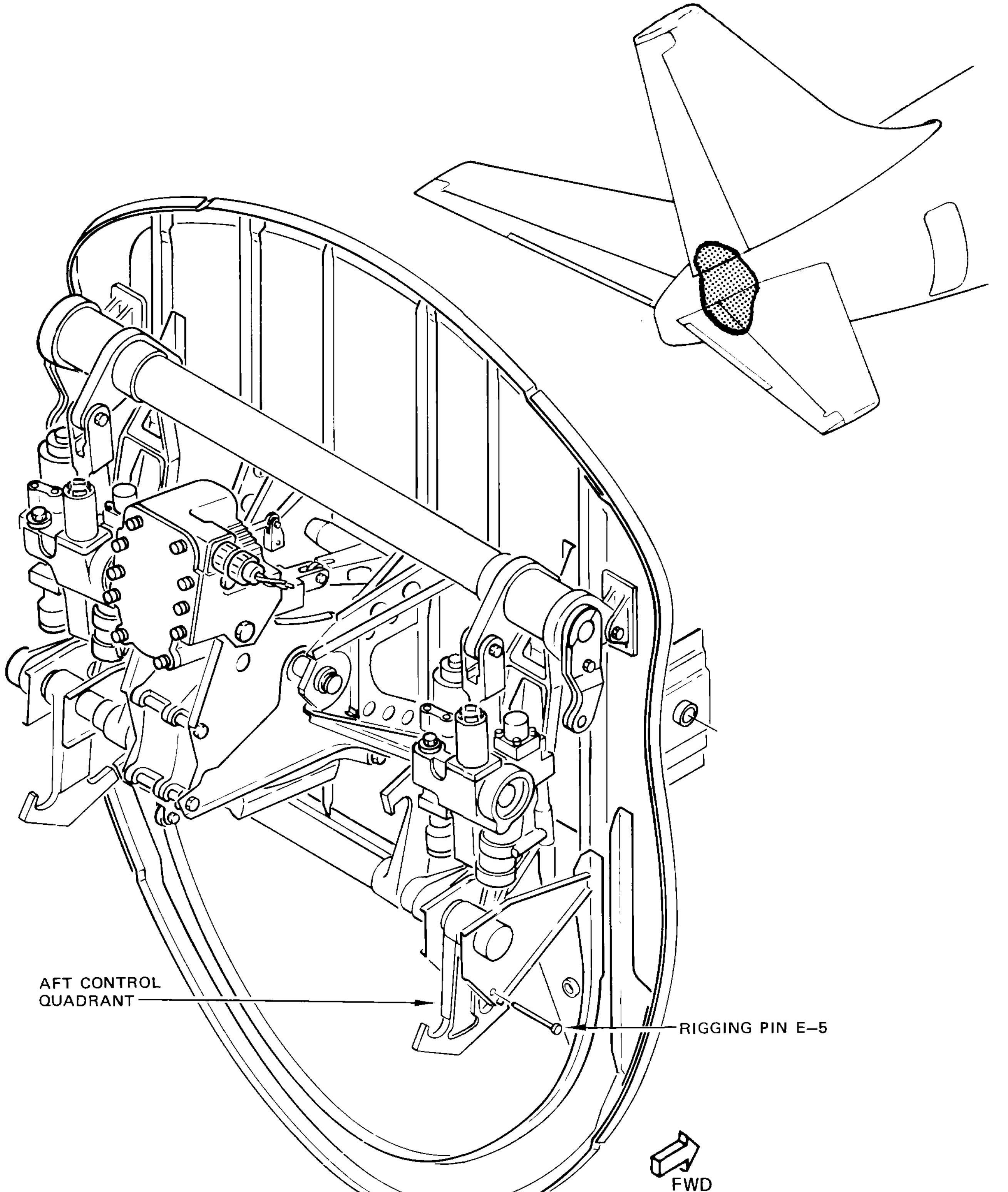


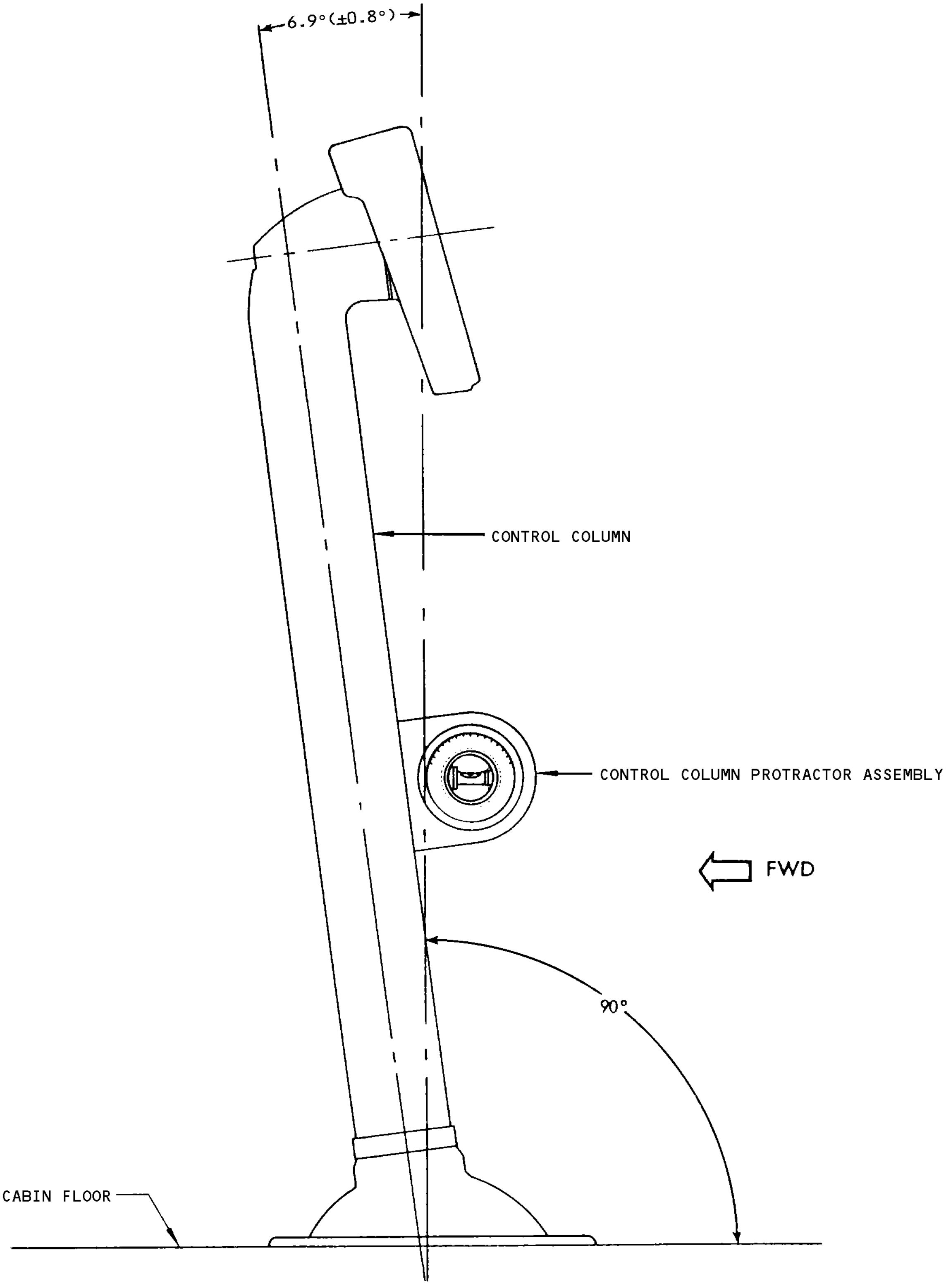
Rigging Pin E-5 Location
Figure 402

(3) Total side play of control column assembly is 0.01 to 0.03 inch.
(4) Outboard end of stop on left elevator forward quadrant shall clear inboard face of E-1 rig pinhole bracket by 0.07-inch minimum and 0.24 inch maximum.

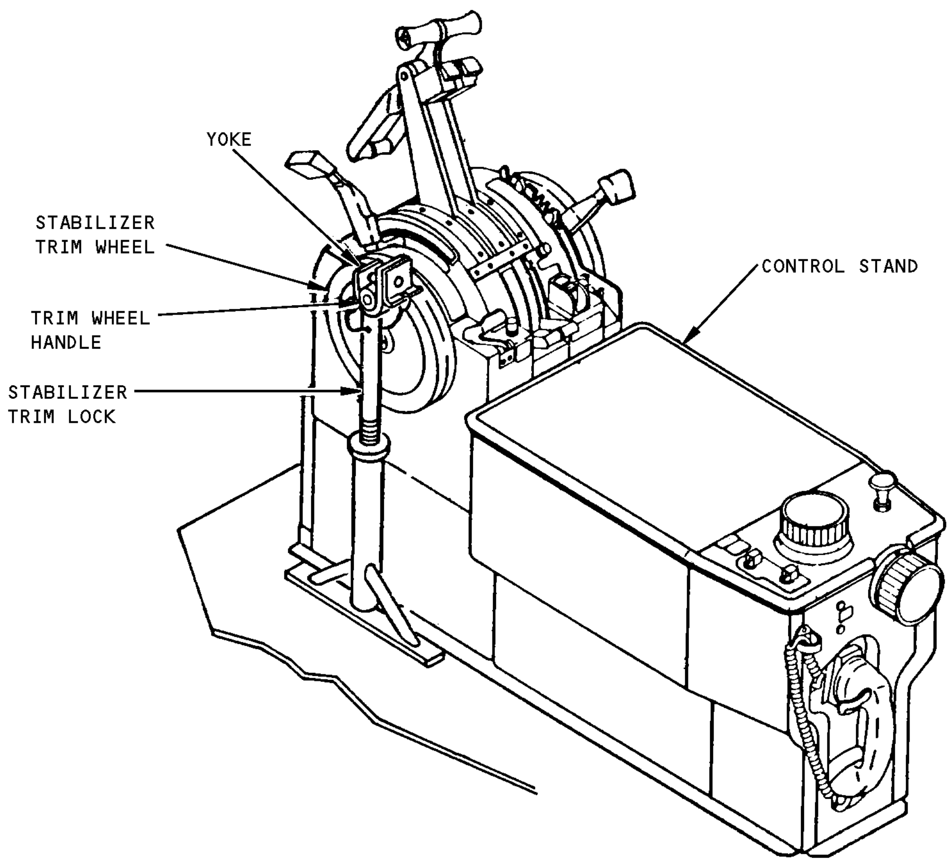
H. Secure cable support fairlead to each quadrant.
I. Install ring assembly (3) and dust seal (4). Adjust dust cover (2) as required to position edge of dust seal extended slightly upward against dust cover.
J. Remove rigging pin E-1 from forward control quadrant.
K. Rotate control columns forward and aft through full travel and check for roughness or binding.
L. Connect control cables EA and EB to quadrants and install retainer pins. Remove cable clamps.
M. Connect cables B and C on the control column position sensor (AMM 31-24-51/401).
N. Remove rigging pin E-5.
O. Reconnect electrical connectors at pitch transducer (5).
P. Connect brake release cable to arm on stabilizer trim brake.
Q. With rigging pin E-1 installed, install rigging pin ST-1.

<u>WARNING</u>: WITH RIGGING PIN ST-1 INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. A DEFORMED LEAF SPRING MAY RESULT IN UNWANTED ENGAGEMENT OF COLUMN ACTUATED STABILIZER TRIM BRAKE.

R. Check that bolt connecting stabilizer trim brake pushrod (6) to fork on forward control quadrant torque tube can be easily inserted.
S. If bolt cannot be inserted, adjust length of pushrod (6) until bolt fits freely. Secure bolt.
T. Remove rigging pins E-1 and ST-1.
U. Adjust control cables and test manual mode operation (column travel and elevator and tab deflection) per 27-31-0, A/T.
V. Close circuit breakers.
W. Close access doors and replace access panels.
X. Remove stabilizer trim lock (Fig. 404).
Y. Restore airplane to normal hydraulic configuration (Ref 27-31-0).



Control Column Adjustment
Figure 403



Stabilizer Trim Lock Installation
Figure 404

ELEVATOR INPUT TORQUE TUBE - REMOVAL/INSTALLATION

1. General
   A. The elevator aft control quadrant is an assembly consisting of a torque tube, four quadrants, three input cranks, bearings and supporting hardware. The quadrant assembly is removed from the airplane as a unit.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
E-2	-8	0.4937-0.4945	3.7 ±0.25	FWD CONTROL QUADRANT
E-3	-8	0.4937-0.4945	3.7 ±0.25	FWD CONTROL QUADRANT
E-4	-11	0.309-0.311	6.7 ±0.25	FEEL COMPUTER INPUT ARM
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Trammel Bar - F80055-1
   C. Grease - BMS 3-33 (Preferred)
   D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   E. Drill bits - 0.187/0.190 - 0.263/0.266
   F. Drill centering guide
   G. Lockbolt installation tool
   H. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Remove elevator system A and B hydraulic power (Ref 27-31-0 MP).
   B. Open aft compartment access door 3701 (Ref 12-31-41).
   C. If it is necessary, remove tail cone from airplane (Ref 53-53-0 R/I).

      NOTE: Removal of the tail cone is not necessary, but gives better access for the removal of the torque tube.

D. Set horizontal stabilizer at 3 units of trim.
E. Install rigging pin E-5 in aft control quadrant (Fig. 401).
F. Remove locking clips and loosen turnbuckles for elevator cables EAL, EBL, EAR, and EBR.
G. Install the stabilizer trim lock to the stabilizer trim wheel at the control stand (Fig. 402).
   (1) Rotate the trim wheel to place the handle at the top of the wheel.
   (2) Adjust the height of the trim lock to position the trim wheel handle snugly in the bottom of the yoke.
   (3) Insert the pin through the yoke and install the safety pin.

4. Remove Input Torque Tube
   A. Remove EAL, EBL, EAR, and EBR control cables (5) from quadrants on input torque tube. Install clamps on cables to prevent cables going through bulkhead.
   B. Disconnect power control input rods (10) for left and right power control units at lower rod ends.
   C. Disconnect feel and centering unit output rod (1) at lower rod end.
   D. Using drill bit 0.187/0.190 and drill centering guide, drill out four BACB30GW lockbolts (11) securing center bearing retainer ring (after drilling knock out with punch).

      NOTE: Use care to ensure holes are not elongated.

   E. Remove rig pin E-5.
   F. Remove the bolt shrouds (if installed) from the mounting bolts (8) of the reaction link.
   G. Remove four bolts from left and right side plate (9) assemblies. Remove and secure bushings.

      NOTE: This will leave lower mount of power control units (7) and reaction links (8) loose.

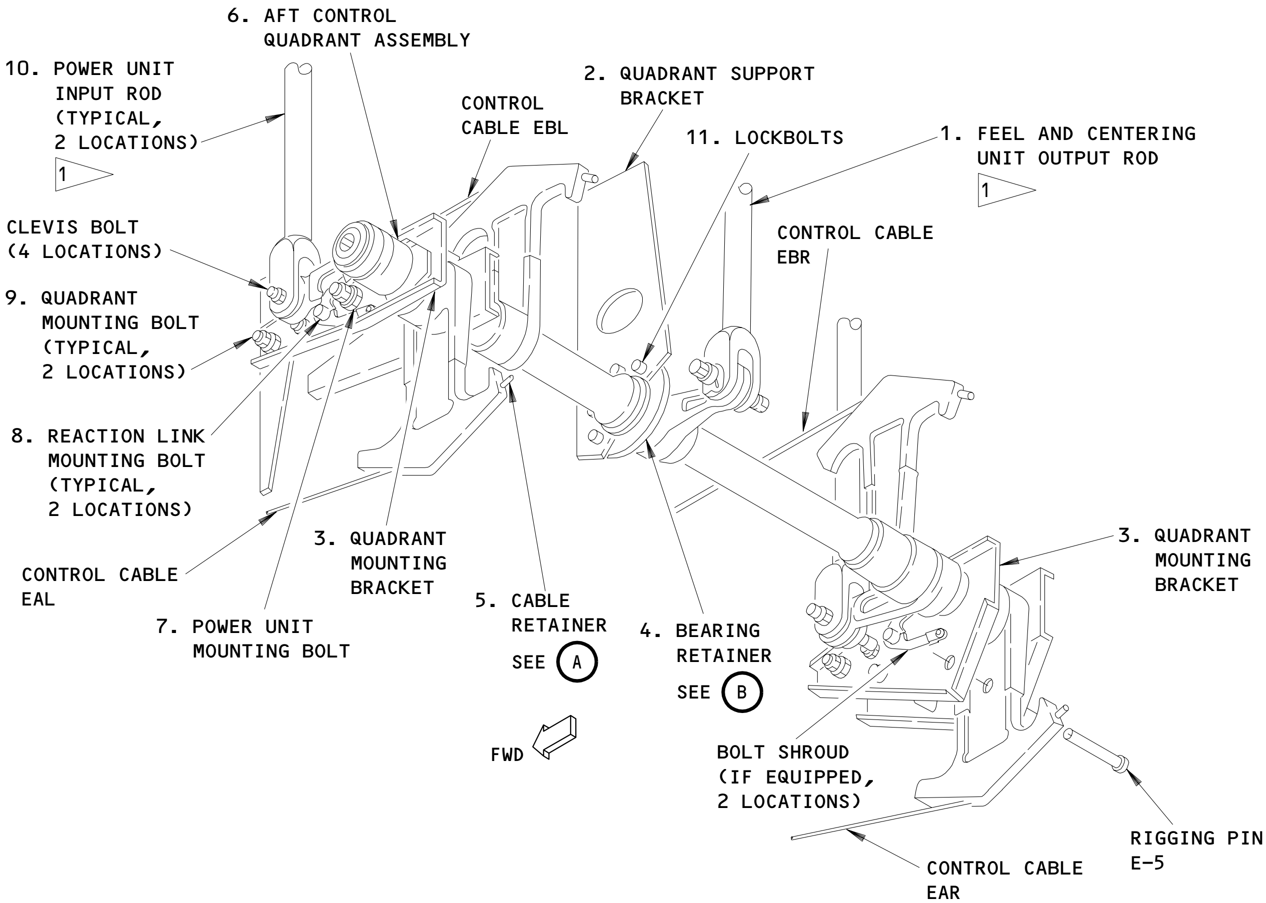
   H. Remove input torque tube from airplane.
   I. If attached, remove/retain counter weights from lever (14).

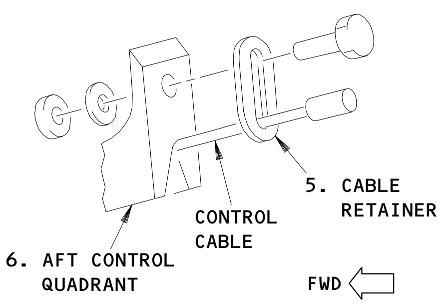
      NOTE: Further disassembly of aft input torque tube should be accomplished in accordance with component maintenance manual.

5. Prepare for Installation
   A. Remove elevator system A and B hydraulic power (Ref 27-31-0 MP).
   B. Check that horizontal stabilizer is set at 3 units of trim.
   C. Apply grease to entire shank of all bolts.

6. Install Input Torque Tube
   A. Position and support input torque tube by installing second bolt from forward end in left and right side plate assemblies.
      (1) If applicable, install retained weights on lever (14).

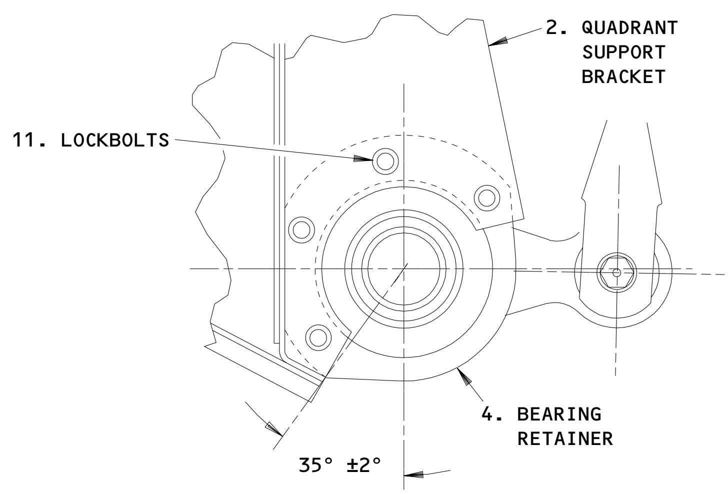
         CAUTION: POWER UNIT INPUT RODS, CLEVIS BOLTS, AND ROD END BOLTS ARE DUAL LOAD PATH COMPONENTS. INSPECT INNER AND OUTER RODS/BOLTS FOR DAMAGE PRIOR TO INSTALLATION.





CABLE RETAINER

A

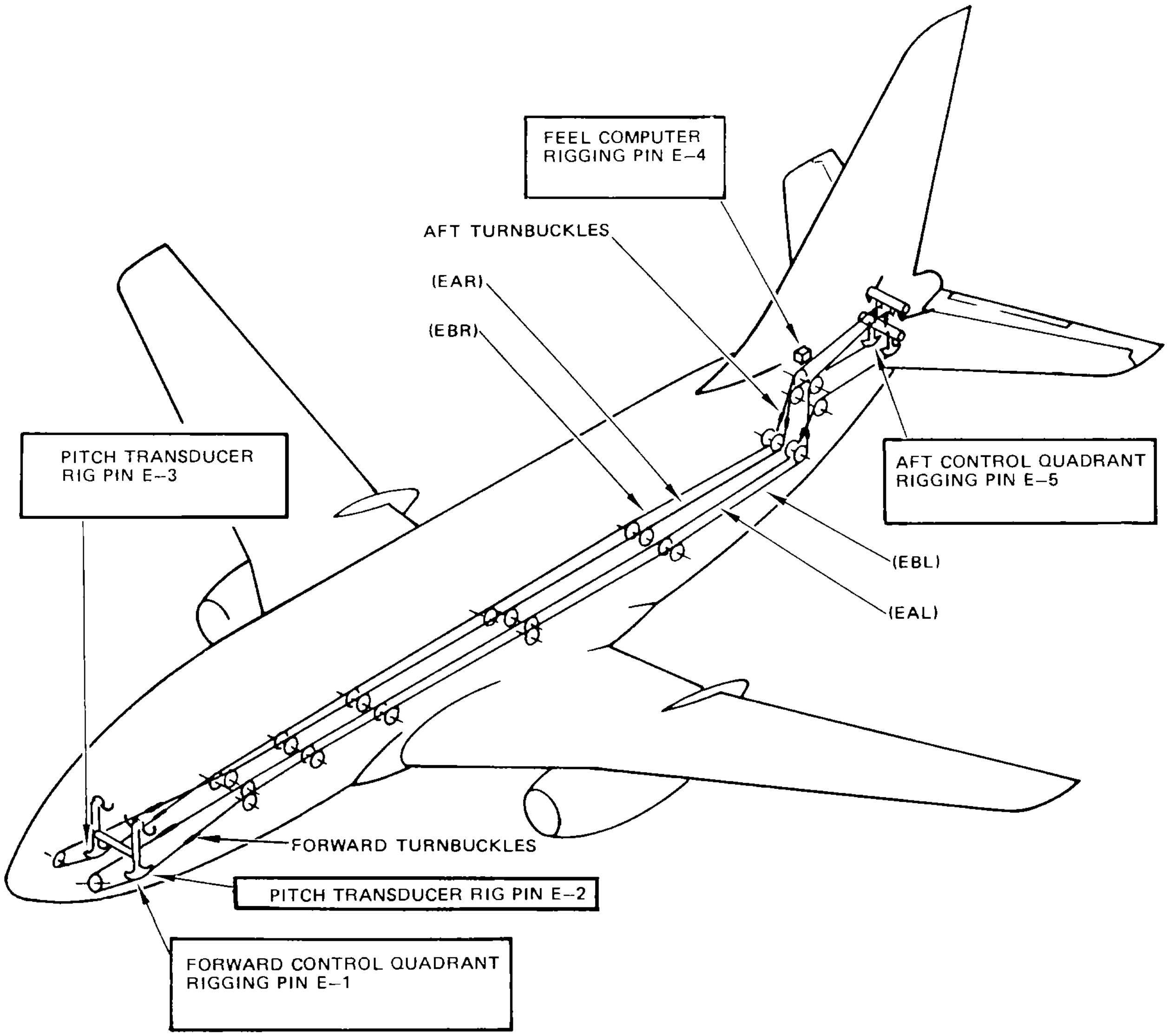


BEARING RETAINER

B

1 ADJUSTABLE END UP PREFERRED INSTALLATION

Elevator Input Torque Tube Installation
Figure 401 (Sheet 1)



TEMP °F	RIGGING LOAD LBS ± 10 LBS
+ 110	168
+ 90	159
+ 70	150
+ 50	142
+ 30	134
+ 10	125
- 10	117
- 30	109
- 40	103

CABLE CODE	FUNCTION
EAL	CAPTAIN'S ELEVATOR DOWN
EBL	CAPTAIN'S ELEVATOR UP
EAR	FIRST OFFICER'S ELEVATOR DOWN
EBR	FIRST OFFICER'S ELEVATOR UP

NOTE:

FOR CABLE TENSION CHECKS THE TENSION MAY DEVIATE ± 15 POUNDS FROM TABLE VALUES. WHENEVER CABLES ARE READJUSTED, TABLE VALUES MUST BE MET.

TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

Elevator Input Torque Tube Installation
Figure 401 (Sheet 2)

B. Install remaining 3 mount bolts in side plates. Ensure bushings are installed in 1st, 3rd and 4th bolts from forward end and lower mount for power control units (7) and reaction links (8) are picked up by 3rd and 4th bolts.

NOTE: Forward side plate bolts installed with heads inboard on left and right side. All other side plate bolts installed with boltheads outboard on right side and inboard on left side.

C. Tighten side plate aft bolt nut 550 to 600 pound-inches. Tighten run on nut 225 to 250 pound-inches.
D. Tighten side plate forward bolt nut 90 to 105 pound-inches. Tighten run on nut 30 to 35 pound-inches.
E. Over size the 4, holes in the center bearing retainer ring from 0.247/0.250 to 0.263/0.266. Use drill centering guide adapter to ensure holes are nut elongated.
F. Secure retaining ring to bracket with BACB30CU8-8 lockbolts or BACB30FP8-8 hi-lock fasteners.
G. Connect left and right power control unit input rods (10). Tighten outer bolt 45 to 60 pound-inches and nut 15 to 20 pound-inches.

NOTE: Ensure output rod assembly is installed clevis end up.

H. Connect feel and centering unit output rod. Tighten outer bolt 45 to 60 pound-inches and nut 15 to 20 pound-inches.

NOTE: Ensure output rod assembly is installed clevis end up.

I. Connect EAL, EBL, EAR, and EBR control cables to quadrants on input torque tube.
J. Install the bolt shrouds (if installed) over the mounting bolts (8) of the reaction link.
K. Install tail cone (Ref 53-53-0 R/I).
L. Set stabilizer B dimension to 41.57 ±0.05 inches and mach trim actuator in null position per 27-31-0 MP.
M. Install rigging pins E-1, E-2, E-3, and E-5 and rig EAL, EBL, EAR, and EBR control cables to proper cable tension Fig. 401 using aft turnbuckles.

NOTE: Ensure turnbuckle-locking clips are installed at completion of rigging.

N. Remove rigging pins E-1, E-2, E-3, and E-5.
O. Slowly rotate elevator by hand through full travel up and down and check for roughness or binding.
P. With rigging pin E-5 installed and hydraulic system B pressurized, right elevator trailing edge should align with index mark on tail cone within 0.06 inch. Alignment may be obtained by adjusting right power control unit input rod per 27-31-0 A/T.
Q. With rigging pin E-5 installed and hydraulic system A pressurized, right elevator trailing edge should align with index mark on tail cone within 0.06 inch. Alignment may be obtained by adjusting left power control unit input rod per 27-31-0 A/T.
R. With rigging pin E-5 installed and hydraulic system A and B pressurized, synchronized operation of power control units may be verified by alternately switching each system off. Elevator trailing edge shall not deviate more than 0.02 inch. This condition may be met by adjusting input rods per 27-31-0 A/T.
S. Check feel and centering unit output rod with rig pin E-5 installed, lower bolthole in feel and centering unit output rod should align with bolthole in aft control quadrant crank. Alignment may be obtained by adjusting feel and centering unit output rod per 27-31-0 A/T.
T. Check that rig pin E-4 will fit freely through rig pinholes in computer input arm and feel computer housing.
U. Test power mode operation.
   (1) Ensure stabilizer B dimension is set at 41.57 ±0.05 inches and all rigging pins are removed.
   (2) Set mach trim actuator in null position (Ref 27-31-0 MP).
   (3) Provide elevator system A and B hydraulic power (Ref 27-31-0 MP).
   (4) Shake captain's control column lightly fore and aft to ensure that system is centered.
   (5) Mark actual elevator trailing edge neutral position.
   (6) Turn flight controls hydraulic system B to off and move captain's control column aft until stops are contacted. Right elevator trailing edge shall deflect 14.60 +0 30/-0.55 inches up from index mark. Right tab trailing edge shall deflect 0.92 +0.10/-0.14 inch down from right trailing edge. Left tab trailing edge shall be faired with left elevator trailing edge within 0.07 inch.

(7) Move captain's control column forward until stops are contacted. Right elevator trailing edge shall defect 10.55 +0.20/-0.30 inches down from index mark. Right tab trailing edge shall deflect 1.03 ±0.10 inches up from right trailing edge. Left tab trailing edge shall be faired with left elevator trailing edge within 0.07 inch.

(8) Position flight controls hydraulic system A switch to off and system B switch to on.

(9) Move captain's control column aft until stops are contacted. Right elevator trailing edge shall deflect 14.60 +0.30/-0.55 inches up from index mark. Right tab trailing edge shall be faired with right elevator trailing edge within 0.07 inch. Left tab trailing edge shall deflect 0.92 +0.10/-0.14 inch down from left elevator trailing edge.

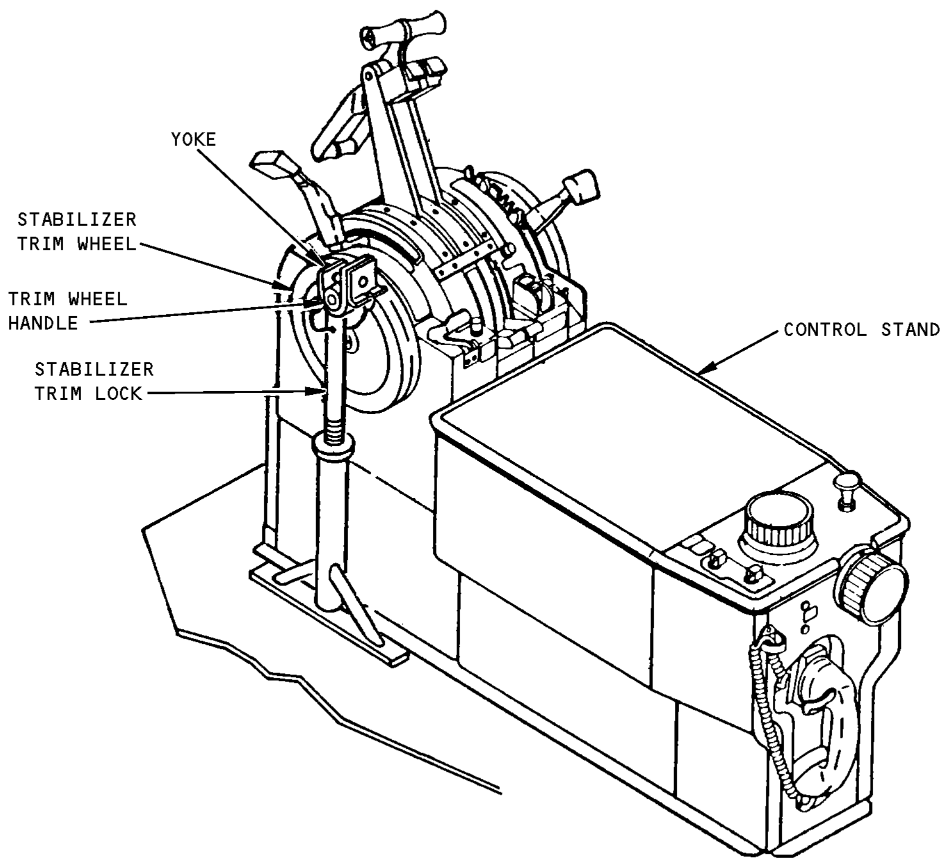
(10) Move captain's control column forward until stops are contacted. Right elevator trailing edge shall deflect 10.55 +0.20/-0.30 inches down from index mark. Right tab trailing edge shall be faired with right elevator trailing edge within 0.07 inch. Left tab trailing edge shall deflect 1.03 ±0.10 inches up from left elevator trailing edge.

(11) Position flight controls hydraulic system B switch to off.

V. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).

W. Remove the stabilizer trim lock (Fig. 402).

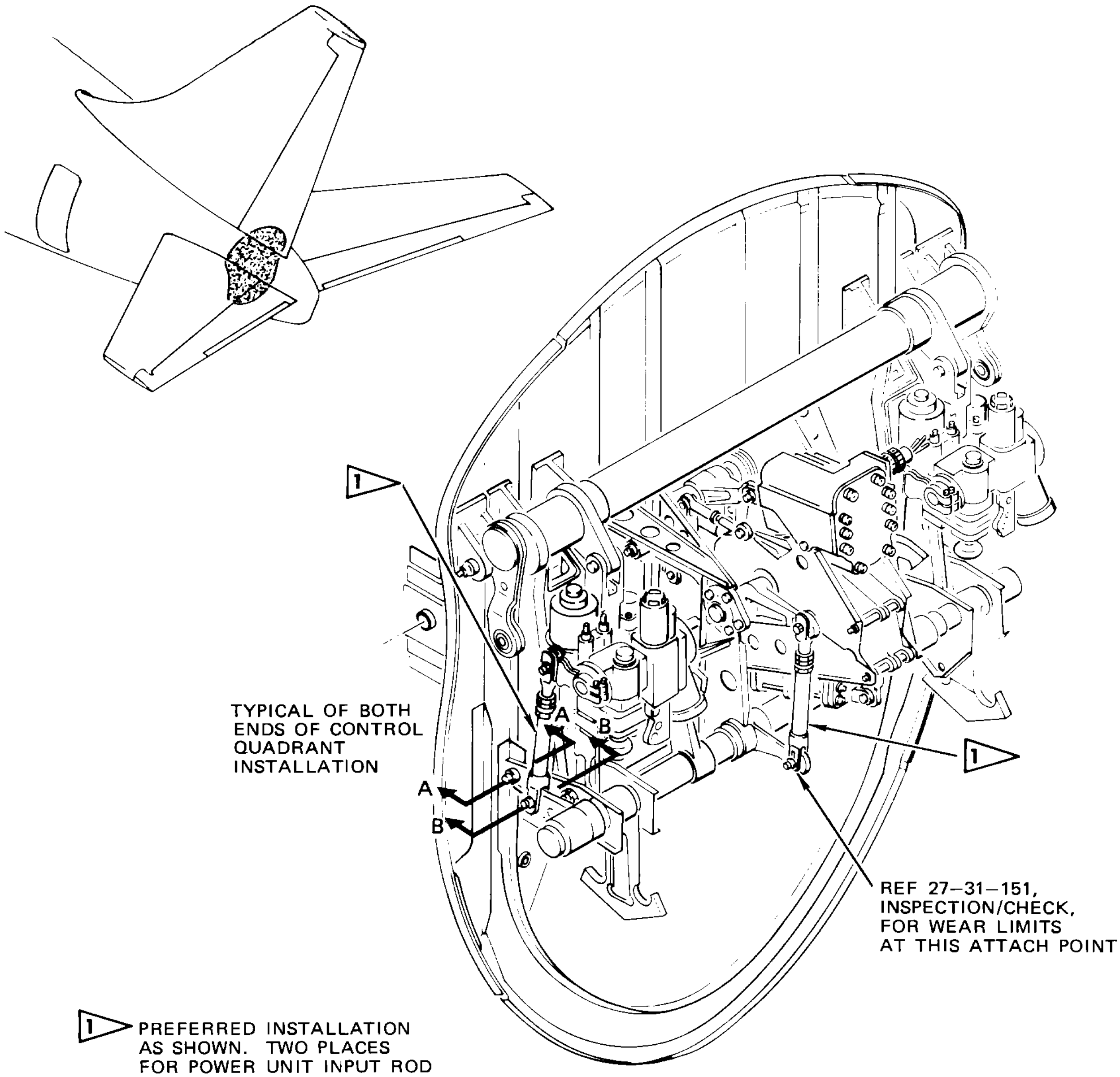
X. If no longer required, remove electrical power from airplane.



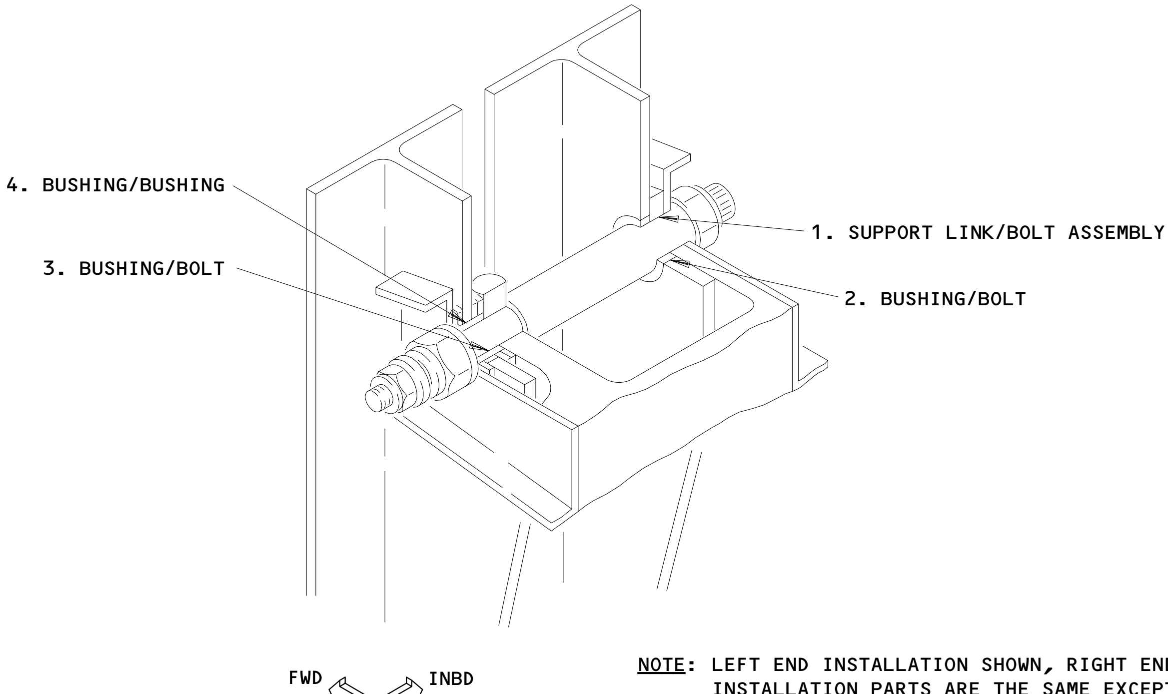
Stabilizer Trim Lock Installation
Figure 402

ELEVATOR AFT CONTROL QUADRANT - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to component removal/installation for this information.
2. Elevator Aft Control Quadrant Wear Limits

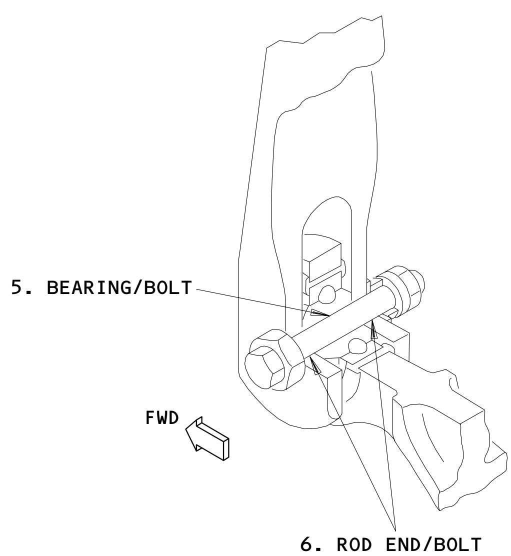


Elevator Aft Control Quadrant Wear Limits
Figure 601 (Sheet 1)



NOTE: LEFT END INSTALLATION SHOWN, RIGHT END INSTALLATION PARTS ARE THE SAME EXCEPT DIRECTION OF BOLT INSTALLATION IS OPPOSITE AND MATING PARTS OPPOSITE.

A-A



B-B

Elevator Aft Control Quadrant Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	SUPPORT LINK	ID	0.4995	0.5005	0.5035	0.0040		X	1
	BOLT ASSEMBLY	OD	0.4985	0.4995	0.4981		X 2		
2	BUSHING	ID	0.4995	0.5005	0.5035	0.0040	X		
	BOLT ASSEMBLY	OD	0.4985	0.4995	0.4981		X 2		
3	BUSHING	ID	0.3745	0.3750	0.3770	0.0025	X		
	BOLT ASSEMBLY	OD	0.3735	0.3745	0.3731		X		
4	BUSHING	ID	0.4995	0.5005	0.5020	0.0025	X		
	BUSHING	OD	0.4990	0.4995	0.4986		X		
5	BEARING	ID	0.3120	0.3125	0.3155	0.0035	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
6	ROD END	ID	0.3120	0.3130	0.3160	0.0040		X	3
	BOLT	OD	0.3110	0.3120	0.3106		X		

1 OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0003 TO 0.0018 INCH INTERFERENCE FIT (0.6254 INCH MAXIMUM). REAM BUSHING TO 0.4995/0.5005 INCH DIAMETER.

2 REPLACE WORN BUSHING ON BOLT ASSEMBLY.

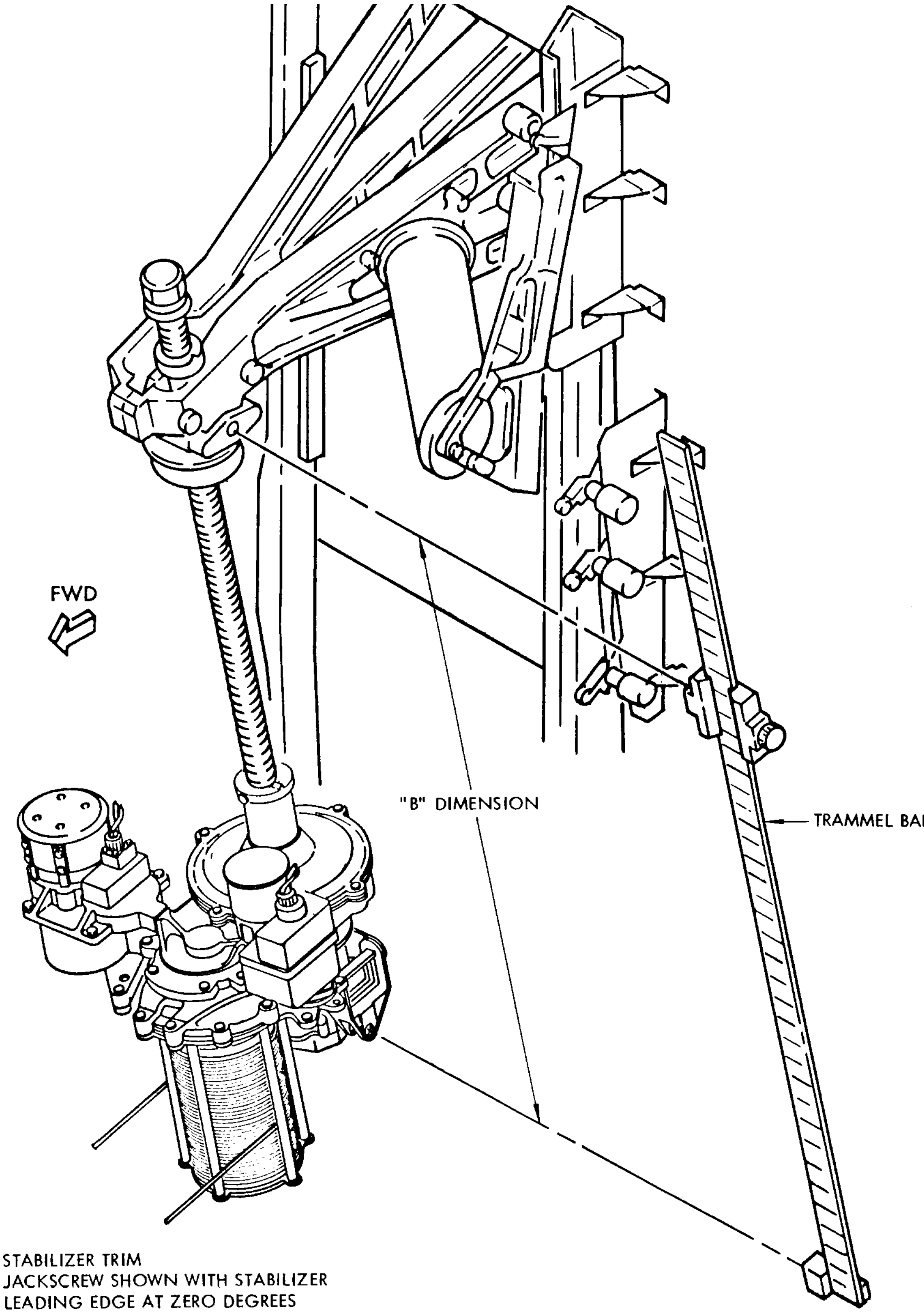
3 REPLACE WORN BUSHING BORE HOLE TO ATTAIN 0.0002 TO 0.0013 INCH FIT (0.4379 INCH MAXIMUM). REAM BUSHING TO 0.3120/0.3130 INCH DIAMETER.

Elevator AFt Control Quadrant Wear Limits
Figure 601 (Sheet 3)

ELEVATOR INDEX PLATES - REMOVAL/INSTALLATION

1. General
   A. The following procedure must be performed whenever the tail cone is removed and replaced with a new or different tail cone.
2. Removal/Installation Index Plates
   A. Equipment and Materials
      (1) Trammel Bar Assembly, Stabilizer Trim Actuator F80055-1
      (2) Control Column Protractor Assembly-4MIT65B80307-1(Preferred) or F52485-500 (Optional) which is used with the following adapters:
         (a) Aileron Control Wheel Protractor Mount-F72790
         (b) Forward Thrust Lever Protractor Adapter-F72952-2
      (3) Elevator Index Plate Rigging Beam - F80230-1 (Preferred)(Ref 27-09-700)
   B. Remove Index Plates
      (1) Remove tail cone from airplane (Ref Chapter 53, Tail Cone - R/I).
      (2) Break lockwire and remove two nuts, washers and screws from each index plate. Remove index plates from tail cone (Fig. 403).
   C. Prepare for Installation
      (1) Install replacement tail cone on airplane (Ref Chapter 53, Tail Cone - R/I).
      (2) Open aft compartment access door 3701 and remove tail cone access panel 3802 (Ref Chapter 12, Access Doors and Panels).
      (3) Set horizontal stabilizer B dimension at 41.57 ±0.04 inches, using trammel bar (Fig. 401).
      (4) Set mach trim actuator at fully extended position per 27-31-0 MP.
      (5) Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
      (6) Tag control columns to prevent injury to personnel by unexpected movement of elevator surfaces.
      (7) If using elevator and tab travel protractor:
         (a) Remove screws A thru D from underside of right stabilizer and screws E and F from underside of right elevator. Screws C and D are first and third screws inboard of seam in stabilizer leading edge (Fig. 402).
         (b) Attach protractor to underside of right stabilizer using screw holes vacated in previous step.
         (c) Position elevator trailing edge 4.00 + 0.05 degrees down as indicated on protractor.

            NOTE: With horizontal stabilizer B dimension set at 41.57 ±0.04 inches and elevator trailing edge at 4.00 ±0.05 degrees down, elevator is in neutral position.
            As shown on MIT65-73715-1, protractor zero graduation is elevator zero degree position with elevator trailing edge lying in horizontal stabilizer chord plane.



Stabilizer Trim Jackscrew Setting
Figure 401

(8) If using elevator index plate rigging beam: (Fig. 402)
  (a) Use a trammel bar or scale to set the horizontal stabilizer at the "B" dimension of 41.57 ±0.01 inches (Ref 27-41-0/501).
  (b) Hold the rigging beam on the bottom side of the stabilizer.
  (c) Set the index slot, located on the front of the rigging beam, to 6.80 inches inboard of the aligned point Q on the stabilizer.

  NOTE: At this position, the index slot of the rigging beam will align with the mark on the stabilizer.

  (d) Move the rigging beam forward or aft until the scale of the rigging beam touches the aft edge of the elevator trailing edge.
  (e) Make sure that the scale on the rigging beam in 2.25 inches inboard of the inboard end of the elevator tab.
  (f) Align the elevator trailing edge with the index mark on the rigging beam.
  (g) Hold the elevator at this position.
  (h) Remove rigging beam.

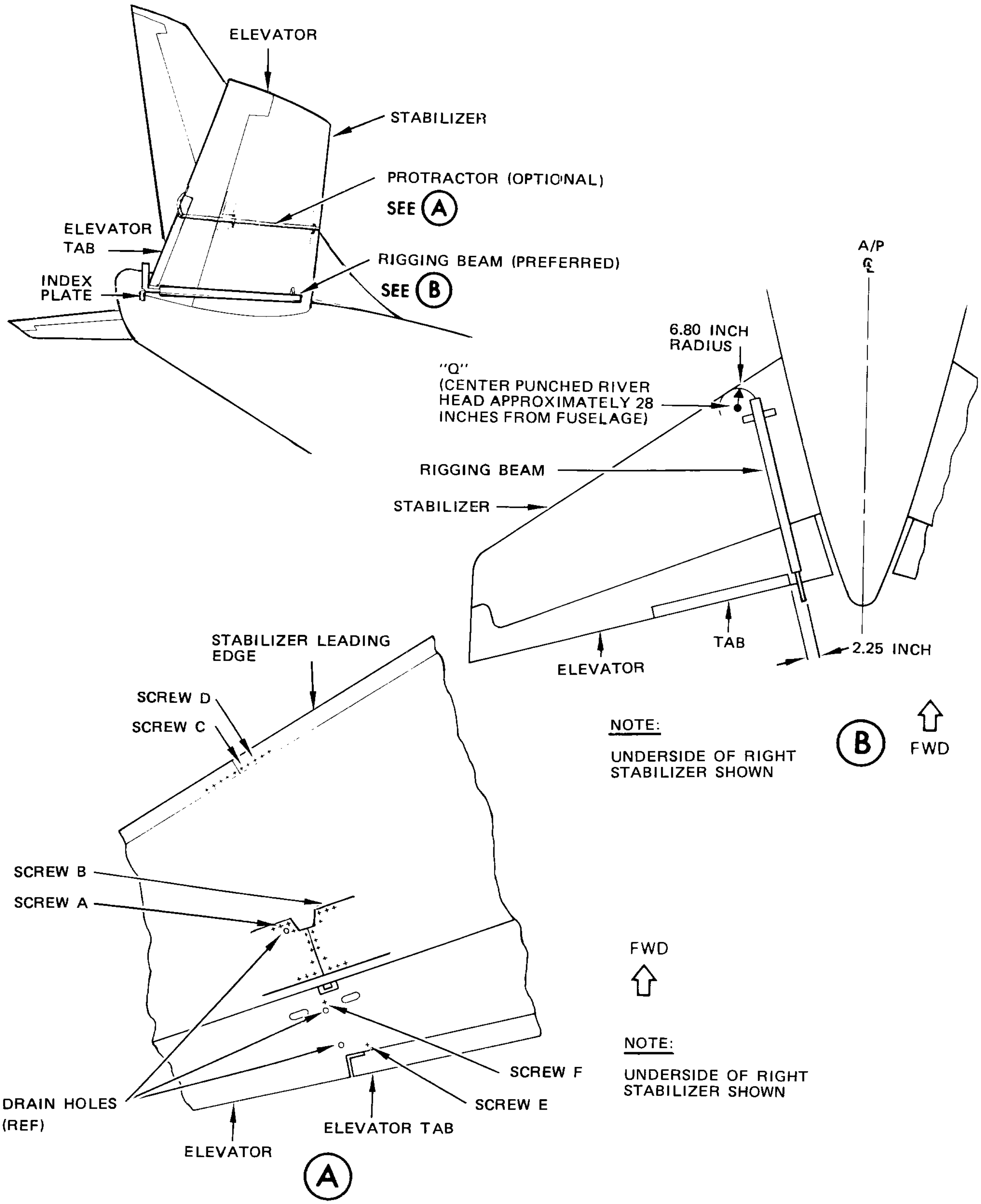
D. Install Index Plates
  (1) Position index plate against right side of tail cone aligning index mark with a theoretical extension of elevator trailing edge (Fig. 403).
  (2) Drill two 0.190 +0.004/-0.000-inch diameter holes through tail cone from index plate. Countersink 100 degrees for bolthead.
  (3) Attach index plate to tail cone using two screws, washers and nuts. Install lockwire between the two nuts.
  (4) If using protractor, remove protractor from underside of stabilizer and install screws removed in step C.(7).

  CAUTION: PROVIDE ADEQUATE SUPPORT FOR PROTRACTOR WHILE REMOVING ATTACHING SCREWS. ENSURE THAT ALL SCREWS ARE REMOVED BEFORE RELAXING SUPPORT.

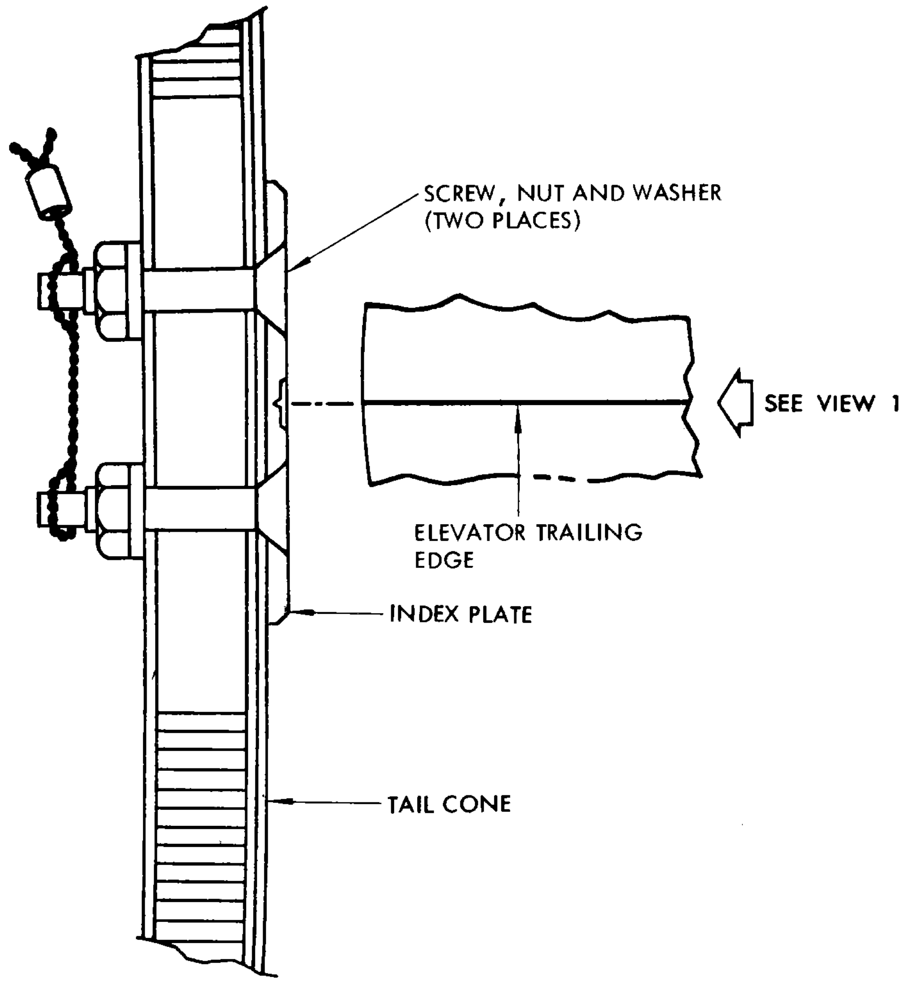
  (5) Repeat steps 2.C.(7) thru 2.D.(4) to install index plate on left side of tail cone.
  (6) Adjust elevator control system (elevator control pushrods, elevator power control unit input rod, elevator tab pushrods and determine if neutral shift sensor must be adjusted) (Ref 27-31-0, Elevator and Tab Control System - A/T).

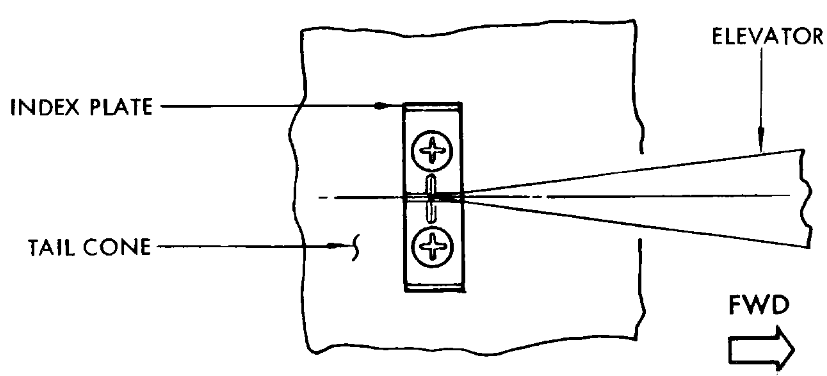
E. Restore Airplane to Normal Configuration
  (1) Close aft compartment access door and replace tail cone access panel.
  (2) Remove tags from control columns.

(3) Restore airplane to normal hydraulic configuration (Ref 27-31-0 MP).



Protractor Installation
Figure 402





VIEW 1

Elevator Index Plate Installation
Figure 403

ELEVATOR NEUTRAL SHIFT MECHANISM - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Trammel Bar - F80055-1
   C. Stabilizer Trim Lock - F71336-501
   D. Primer - BMS 10-11, type 1 (Ref 20-30-41)
2. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Remove or open the following access panels (Ref Chapter 12, Access Doors and Panels):
      (1) Tail cone access panel 3802
      (2) Aft compartment access door 3701
   C. Open stabilizer trim actuator, stabilizer trim control, and autopilot stabilizer trim servo circuit breakers in panel P6.
   D. Disconnect stabilizer trim actuator and autopilot trim servo electrical connectors at the stabilizer trim actuator (Fig. 403).
   E. Install stabilizer trim lock to stabilize trim wheel at the control stand (Fig. 404).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
   F. Install rigging pin E-5 in aft control quadrant (Fig. 405).
3. Remove Elevator Neutral Shift Mechanism
   A. Remove dual bolt and locknuts to disconnect neutral shift crank from mach trim actuator terminal (Fig. 402).

B. Disconnect aft ends of input rods from neutral shift crank.
C. Disconnect forward ends of input rods from horizontal stabilizer center section. Withdraw both input rods and remove from airplane.
D. Remove three bolts, nuts, and washers attaching each end of neutral shift crank to feel and centering unit support bracket. Remove neutral shift crank and spacers from airplane.

4. Prepare for Installation

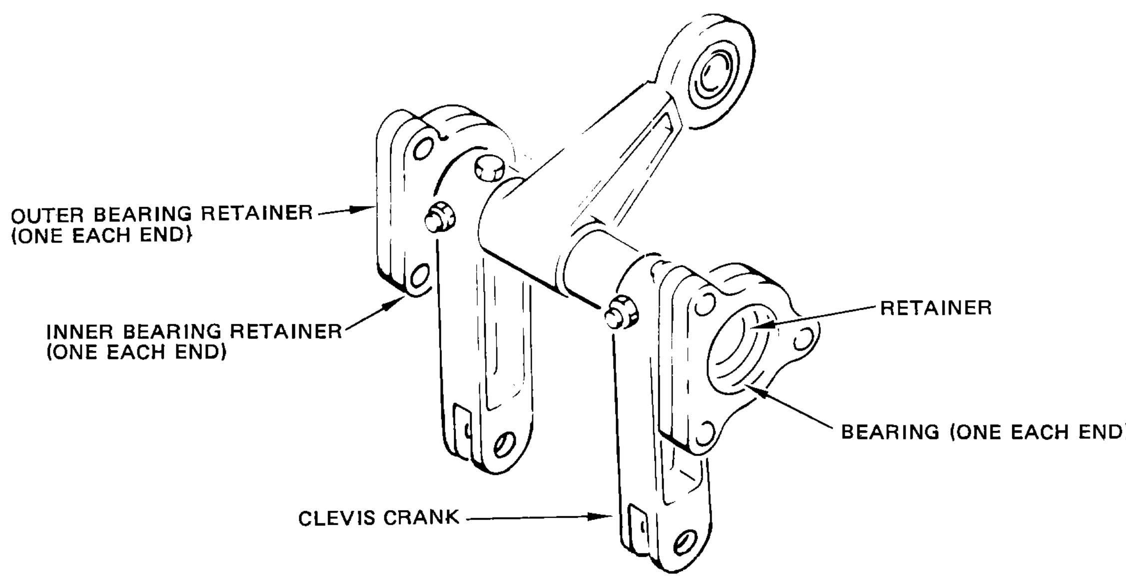
A. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
B. Check that rigging pin E-5 is installed in aft control quadrant (Fig. 405).
C. If neutral shift crank support bearings are to be replaced, proceed as follows:
(1) Withdraw bearing complete with inner and outer bearing retainers from short end of neutral shift crank (Fig. 401).
(2) Remove two nuts, bolts, and washers from clevis crank at long end of neutral shift crank. Withdraw retainer.
(3) Withdraw bearing with inner and outer bearing retainers from long end of neutral shift crank.
(4) Separate bearings from bearing retainers.
(5) Apply primer between each bearing and its respective bearing retainers. Press new bearings into bearing retainers.

WARNING: BMS 10-11, TYPE 1, PRIMER IS TOXIC AND FLAMMABLE. USE ONLY IN WELL-VENTILATED AREA. DO NOT GET IN EYES OR ON SKIN.

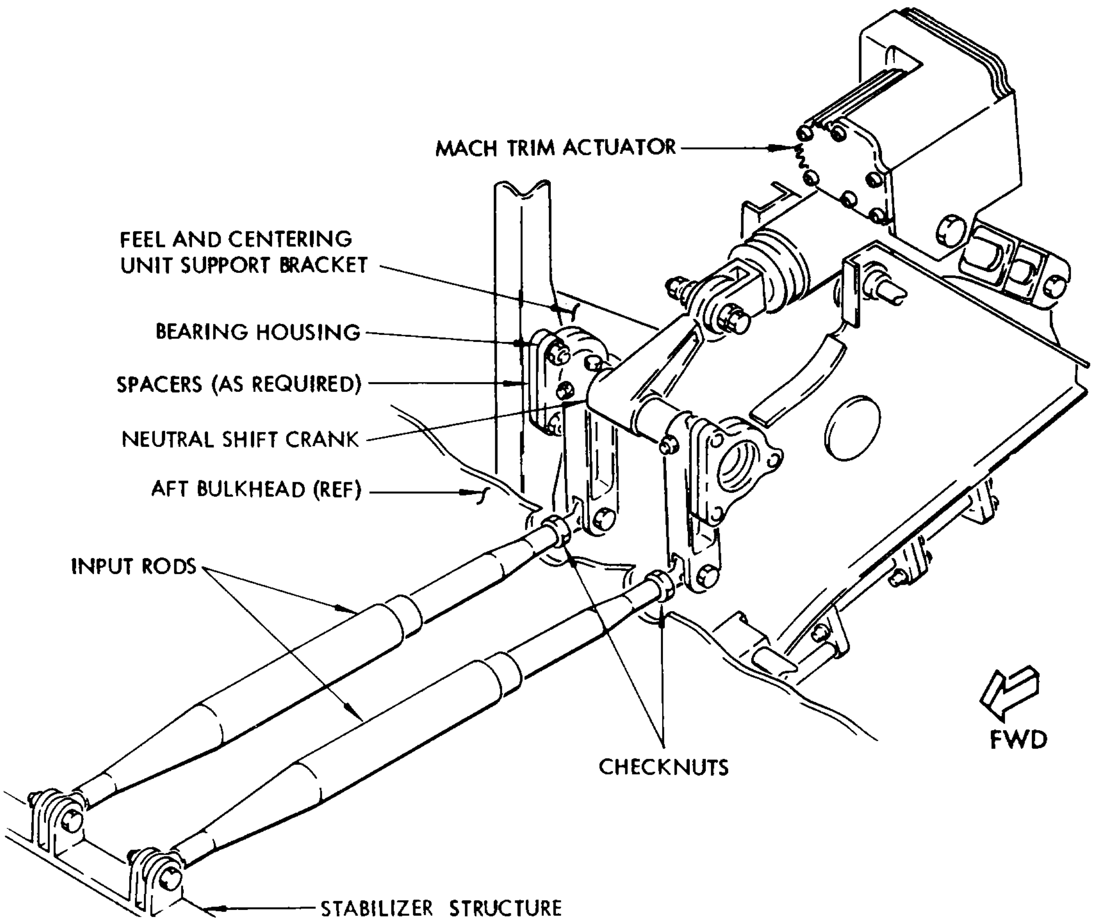
(6) Apply primer to inside diameter of bearings and install bearing each end of neutral shift crank.
(7) Slide retainer inside long end of neutral shift crank and install two nuts, bolts and washers through clevis crank.

5. Install Elevator Neutral Shift Mechanism

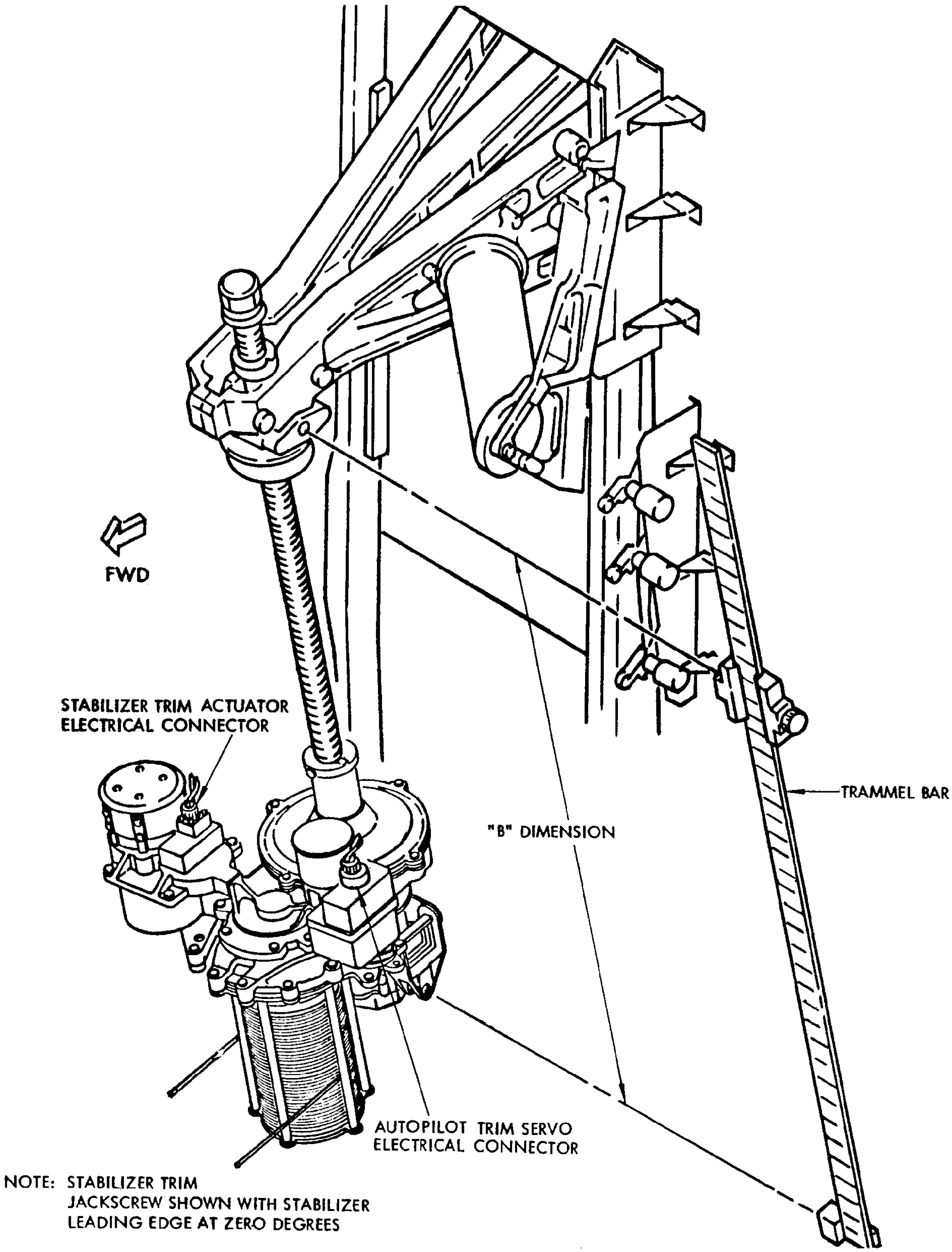
A. Install neutral shift crank (Fig. 402).
(1) Position neutral shift crank between feel and centering unit support bracket.
(2) Install spacers as required between each bearing housing and support bracket, to align crank with mach trim actuator terminal.



Neutral Shift Crank Support Bearing Installation
Figure 401



Elevator Neutral Shift Mechanism
Figure 402



Stabilizer Trim Actuator
Figure 403

(3) Secure neutral shift crank to support bracket using six bolts, nuts and washers. Install bolts with heads outboard. Ensure longer bolt is used through position transmitter collar bracket.

B. Install input rods.

(1) Attach forward ends of input rods to horizontal stabilizer center section using two bolts, nuts and washers.

(2) Attach aft (adjustable) ends of input rods to horizontal stabilizer center section using two bolts, nuts and washers.

C. Attach neutral shift crank to mach trim actuator.

(1) Insert dualbolt from left to right.

(2) Install first locknut and tighten within 85 to 100 pound-inches.

CAUTION: ENSURE THAT ELEVATOR NEUTRAL SHIFT POSITION TRANSMITTER CRANK IS CORRECTLY ORIENTED IN THE UP DIRECTION. INCORRECT ORIENTATION COULD CAUSE UNCOMMANDED STABILIZER OPERATION WHEN AUTOPILOT IS ENGAGED.

(3) Install second locknut and tighten within 30 to 35 pound-inches.

CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE VALUE ON FIRST LOCKNUT.

D. Remove rigging pin E-5.

E. Adjust and test neutral shift mechanism per 27-31-0, A/T.

6. Restore Airplane to Original Configuration

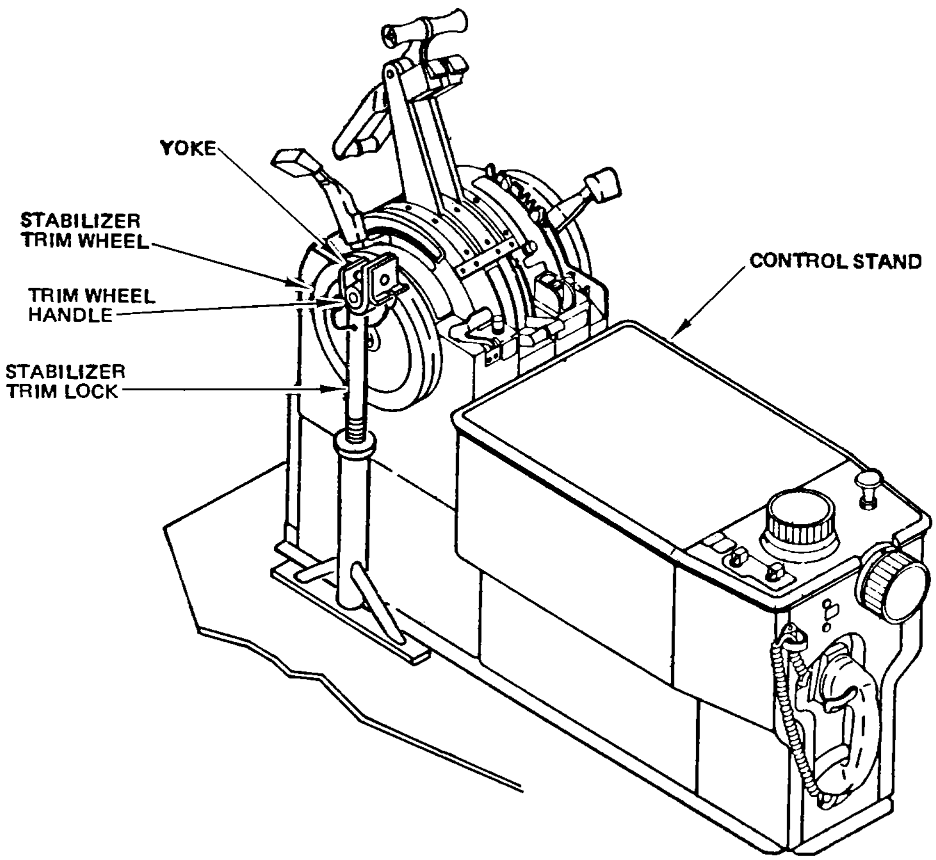
A. Close circuit breakers.

B. Remove stabilizer trim lock.

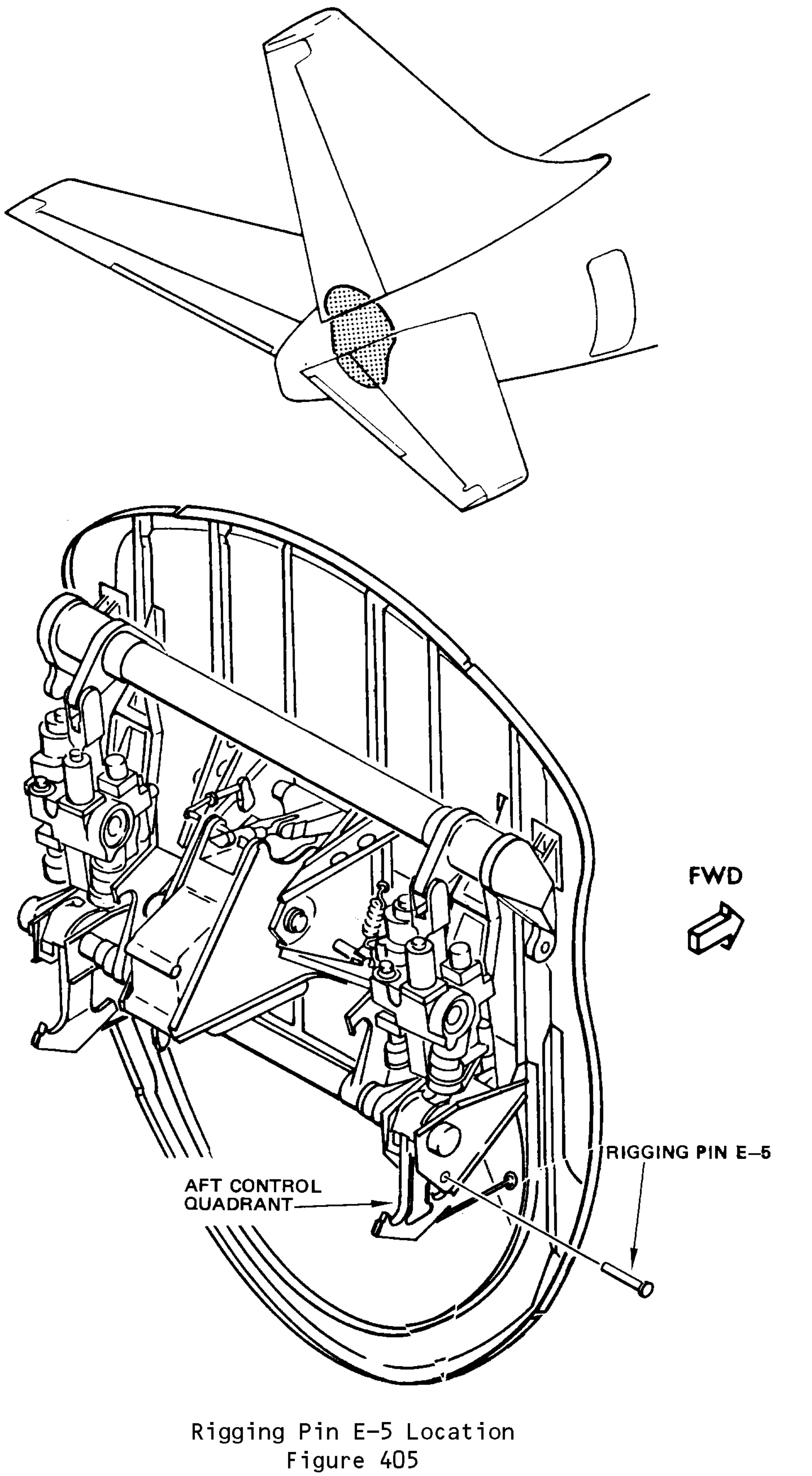
C. Connect stabilizer trim actuator and autopilot trim servo electrical connectors to stabilizer trim actuator.

D. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).

E. Close or install access doors and panels.



Stabilizer Trim Lock Installation
Figure 404



Rigging Pin E-5 Location
Figure 405

ELEVATOR POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. Maintenance Practices for power control unit autopilot components are contained in Chapter 22, Auto Flight.
2. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   D. Elevator Rigging and Restraining Fixture - F80063-501 (Preferred) or F80063-500 (Optional)
   E. Trammel Bar - F80055-1
3. Remove Elevator Power Control Unit
   A. Set horizontal stabilizer B dimension at 41.57 ±0.05 inches (Fig. 402).
   B. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   C. Remove tail cone access panels 3801 and 3802 (Ref Chapter 12).
   D. Install rigging pin E-5 in aft control quadrant (Fig. 401).
   E. Disconnect electrical connector from power control unit.

      CAUTION: WHEN DISCONNECTING HYDRAULIC PRESSURE OR RETURN LINE, RELEASE CONNECTION SLOWLY AND ALLOW SYSTEM PRESSURE TO DROP BEFORE COMPLETELY REMOVING LINE. BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

      NOTE: On some airplanes, there is no autopilot input to left power control unit.

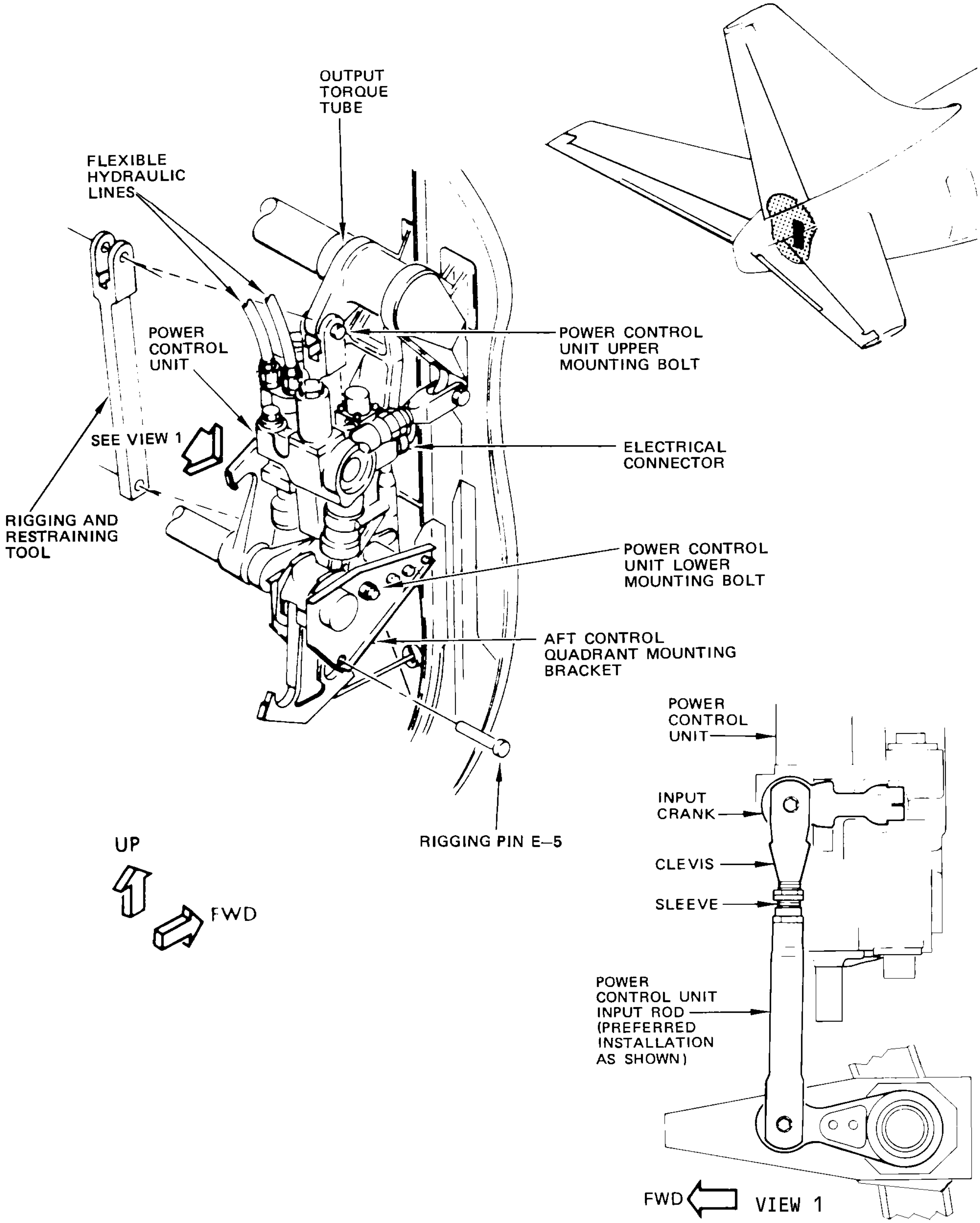
F. Disconnect two flexible hydraulic lines from power control unit. Cap and plug open ports and hydraulic lines.
G. Disconnect input rod from power control unit input crank.
H. Remove power control unit lower mounting bolt from aft control quadrant mounting bracket.
I. Remove power control unit upper mounting bolt from output torque tube.
J. Remove power control unit from airplane.
K. Install rigging and restraining tool, if required.

NOTE: If both power control units are removed at the same time, install elevator rigging and restraining tool in place of right power control unit.

4. Install Elevator Power Control Unit
A. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
B. Check that rigging pin E-5 is installed in aft control quadrant.
C. Check for allowable wear at elevator power control unit attachment points (Ref 27-31-101, I/C).
D. If installed, remove elevator rigging and restraining tool.
E. Position power control unit in aft compartment and install upper mounting bolt in output torque tube.
(1) Apply grease to entire shank of bolt.
(2) Install bolt with head facing inboard.
(3) Install nut and washer (Fig. 401).
F. Attach power control unit rod end to aft control quadrant mounting bracket as follows:
(1) Apply grease to entire shank of bolt and install bolt from right to left.
(2) Install first locknut and tighten 550 to 600 pound-inches.

CAUTION: AFTER TIGHTENING SECOND LOCKNUT, DO NOT ATTEMPT TO RETIGHTEN FIRST LOCKNUT.

(3) Install second locknut and tighten 225 to 250 pound-inches.
G. Move power control unit to fully retracted position. Check for interference between power control unit and reaction link per Fig. 403 and eliminate interference if necessary.



Elevator Power Control Unit Installation
Figure 401

H. Attach input rod to power control unit input crank as follows:

NOTE: Ensure rod assembly is installed with clevis end up.

(1) Visually inspect the dual loadpath bolts for damage prior to installation.
(2) PRE-SB 27-1207;
  (a) Apply grease to entire shank of bolt assembly and install bolt assembly with washer under bolthead from left to right through input rod, input crank and into nutplate on input rod.
  (b) Tighten outer bolt to 45-60 pound-inches.

  CAUTION: AFTER TIGHTENING LOCKNUT, DO NOT RETIGHTEN OUTER BOLT.

  (c) Install locknut with washer over end of inner bolt and tighten to 15-20 pound-inches.
(3) POST-SB 27-1207;
  (a) Apply grease to entire shank of bolt assembly and install bolt assembly from right to left through input rod and input crank.
  (b) Tighten inner nut to 45-60 pound-inches.
  (c) Tighten outer nut to 15-20 pound-inches.

  CAUTION: AFTER TIGHTENING NUT, DO NOT RETIGHTEN INNER NUT.

  (d) Visually inspect for clearance between the control rod dual-loadpath bolts and surrounding structures.

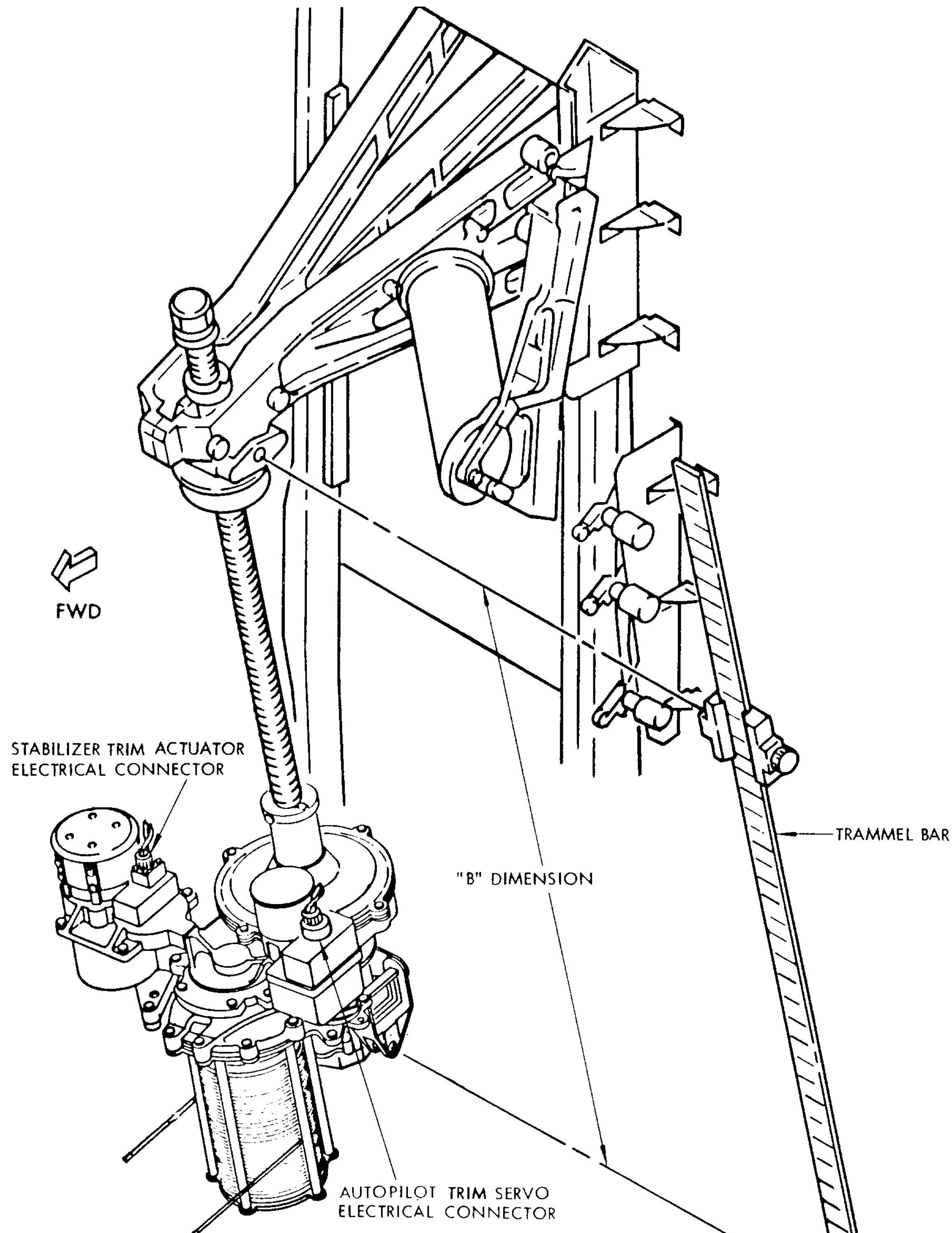
I. Remove protective plugs and caps and connect two flexible hydraulic lines to power control unit.

CAUTION: ENSURE THAT ELECTRICAL CONNECTOR IS INSTALLED IN AN APPROXIMATE VERTICAL POSITION GIVING MAXIMUM CLEARANCE TO ADJACENT STRUCTURE.

J. If installed, attach electrical connector to power control unit receptacle.

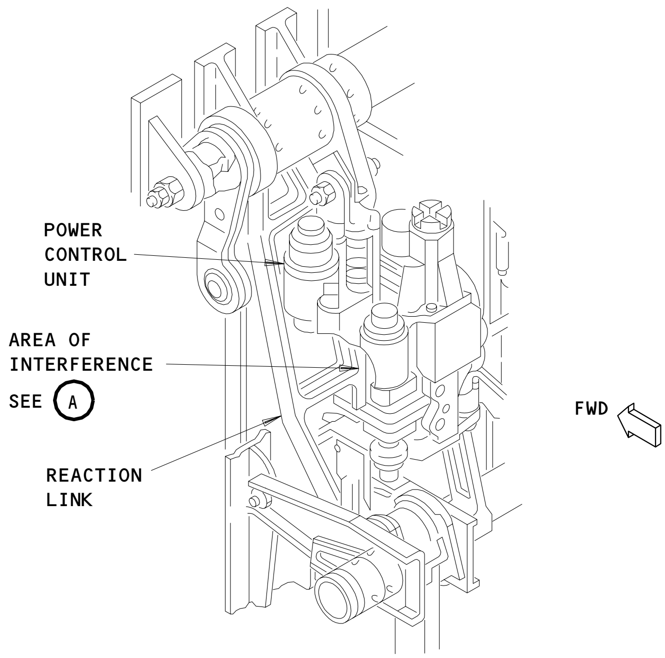
NOTE: On airplanes with single channel autopilot, there is no autopilot input to left power control unit. When installing a power control unit on right side on airplanes with single channel autopilot, ensure that the unit has autopilot capability and that electrical connector is installed.

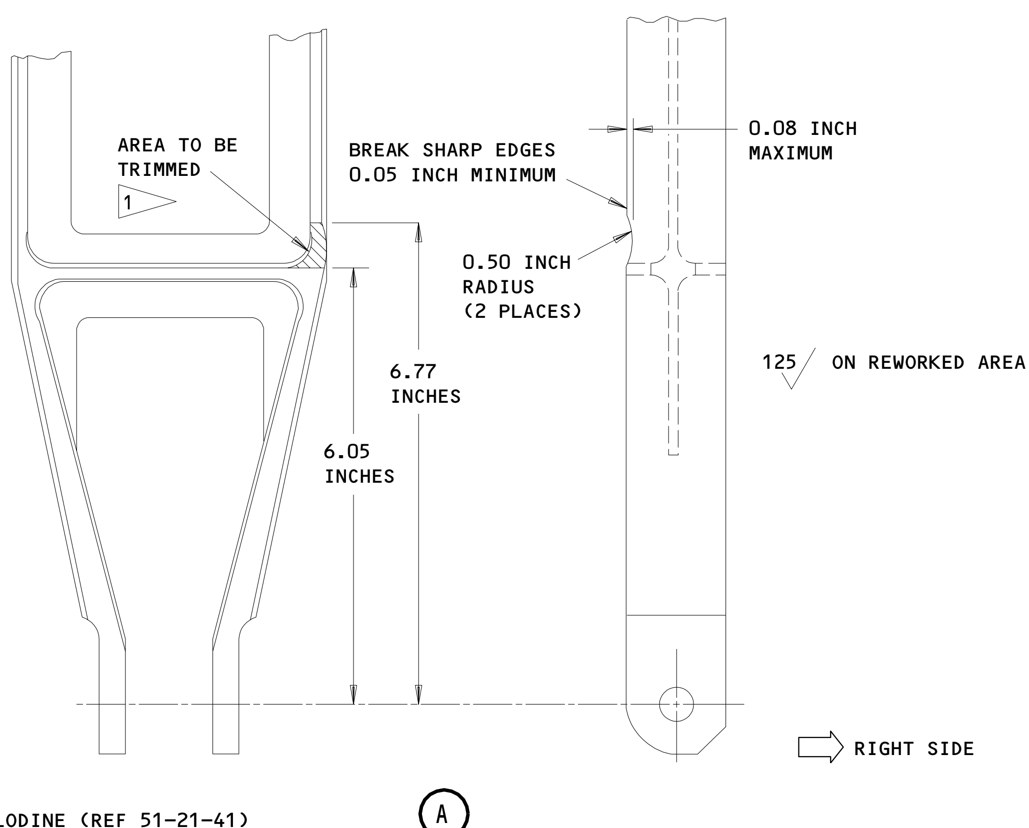
K. Remove rigging pin E-5 from aft control quadrant.
L. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).
M. Adjust and test elevator power control unit (Ref 27-31-101, A/T).



NOTE: STABILIZER TRIM
JACKSCREW SHOWN WITH STABILIZER
LEADING EDGE AT ZERO DEGREES

Stabilizer B Dimension
Figure 402





1 APPLY BRUSH ALODINE (REF 51-21-41) AND BMS 10-11, TYPE 1 PRIMER (REF 51-21-51) AFTER TRIMMING.

Elevator Power Control Unit Reaction Link Inspection
Figure 403

ELEVATOR POWER CONTROL UNIT - ADJUSTMENT/TEST

1. Elevator Power Control Unit Adjustment (Fig. 501)
   A. Equipment and Materials
      (1) Trammel Bar - F80055-1
      (2) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

      (3) Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
   B. Prepare for Adjustment
      (1) Ensure that horizontal stabilizer B dimension (Fig. 502) is set at 41.57 ±0.05 inches, that mach trim actuator is in null position per 27-31-0 MP, and install rigging pin E-5 in aft control quadrant.
      (2) Gain access to power control unit input rods through tail cone access panels.
      (3) Provide hydraulic power as follows:
         (a) Provide elevator systems A and B hydraulic power (Ref 27-31-0 MP).
         (b) Position flight controls hydraulic system A switch to OFF, leave system B switch ON.
   C. Adjust Elevator Power Control Unit
      (1) Measure right elevator trailing edge deviation from index mark on tail cone (Fig. 501).
      (2) Position flight controls hydraulic system B switch to OFF.
      (3) Loosen checknuts on right power control unit input rod, but do not change rod length. If required, remove rigging pin E-5 and push elevator trailing edge down for access to checknuts, then restore elevator to neutral as follows:
         (a) Push elevator back to align trailing edge with index mark, position flight controls hydraulic system B switch to ON, shake control column lightly fore and aft to ensure system is centered, then release. Position flight controls hydraulic system B switch to OFF, and install rigging pin E-5.

(4) If deviation is less than 0.4 inch, proceed to step (5) for fine adjustment. If deviation is greater than 0.4 inch, carry out coarse adjustment as follows:

(a) Check that flight controls hydraulic system B switch is positioned to OFF.

WARNING: HYDRAULIC POWER MUST BE OFF BEFORE DISCONNECTING INPUT ROD.

(b) Disconnect lower end of input rod from quadrant crank (Fig. 501).

(c) Adjust input rod to bring elevator trailing edge within 0.4 inch from index mark on tail cone. See Fig. 501 for adjustment between clevis, sleeve, and rod.

(5) PRE-SB 27-1207;

(a) Install lockbolt assembly with washer under bolthead through lower end of power control unit input rod and aft control quadrant crank and into nutplate on input rod. Tighten outer bolt 75 to 85 pound-inches.

(b) Install locknut with washer over end of inner bolt and tighten 15-20 pound-inches.

CAUTION: AFTER SETTING TORGUE ON LOCKNUT, DO NOT ATTEMP TO RESET TORQUE OF OUTER NUT.

(6) POST-SB 27-1207;

(a) Install bolt assembly through lower end of power control unit input rod and aft control quadrant crank and into input rod.

(b) Tighten inner nut to 45-60 pound-inches.

(c) Tighten outer nut to 15-20 pound-inches.

CAUTION: AFTER TIGHTENING NUT, DO NOT RETIGHTEN INNER NUT.

(d) Move control columns fore and aft through two full travels while visually inspecting for clearance between the control rod dual-loadpath bolts and surrounding structures.

(e) Proceed to following step to make fine adjustment.

(7) Carry out fine adjustment as follows:

(a) Position flight controls hydraulic system A switch to OFF and system B switch to ON.

(b) Rotate sleeve on right elevator power control unit input rod until right elevator trailing edge is aligned with index mark on tail cone within 0.06 inch.

(c) Tighten both checknuts on input rod. If required for access to checknuts, position flight controls hydraulic system B switch to OFF, remove rigging pin E-5, and push elevator trailing edge down, then restore elevator to neutral as follows:

1) Push elevator back to align with index mark, position flight controls hydraulic system B switch to ON, shake control column fore and aft lightly to ensure system is centered, then release. Position flight controls hydraulic system B switch to OFF and install rigging pin E-5.

(8) Position flight controls hydraulic system A switch to ON and system B switch to OFF, if not done previously.

(9) Measure right elevator trailing edge deviation from index mark on tail cone (Fig. 501).

(10) Position flight controls hydraulic system A switch to OFF.

(11) Loosen checknuts on left power control unit input rod, but do not change rod length. If required, remove rigging pin E-5 and push elevator trailing edge up for access to checknuts, then restore elevator to neutral as follows:

(a) Push elevator back to align trailing edge with index mark, position flight controls hydraulic system A switch to ON, shake control column lightly fore and aft to ensure system is centered, then release. Position flight controls hydraulic system A switch to OFF and install rigging pin E-5.

(12) If deviation is less than 0.4 inch, proceed to step (11) for fine adjustment. If deviation is greater than 0.4 inch, carry out coarse adjustment as follows:

(a) Check that flight controls hydraulic system A switch is positioned to OFF.

<u>WARNING</u>: HYDRAULIC POWER MUST BE OFF BEFORE DISCONNECTING INPUT ROD.

(b) Repeat steps (4)(b) thru (4)(f) on left power control unit input rod, taking measurements at right elevator.

(13) Carry out fine adjustment as follows:

(a) Position flight controls hydraulic system switch A to ON and system B switch to OFF.

(b) Repeat step (5)(b) on left power control unit input rod.

(c) Tighten both checknuts on input rod. If required for access to checknuts, position flight controls hydraulic system A switch to OFF, remove rigging pin E-5, and push elevator trailing edge up, then restore elevator to neutral as follows:

1) Push elevator back to align with index mark, position flight controls hydraulic system A switch to ON, shake control column fore and aft lightly to ensure system is centered, then release. Position flight controls hydraulic system A switch to OFF and install rigging pin E-5.

(d) Position flight controls hydraulic system A switch to OFF, if not done previously.

(14) Check both left and right power control unit input rods for minimum thread engagement. The combined number of threads visible on clevis and sleeve shall not exceed 32 for each input rod.

(15) Check that power control units are synchronized as follows:

(a) Position flight controls hydraulic systems A and B switches to ON.

(b) Alternately switch each system off and then on. Check that deflection of elevator at inboard end of trailing edge does not exceed 0.02 inch.

(c) If necessary, repeat fine adjustment of power control unit input rods by repeating steps (5) and (11).

(16) Remove rigging pin E-5.

(17) If power control unit input rod required a coarse adjustment, the neutral shift sensor must be readjusted per Chapter 22, Elevator Neutral Shift Sensor - A/T.

(18) Test elevator power control unit.

2. Elevator Power Control Unit Test (Fig. 501)

NOTE: If left power control unit on airplanes with single autopilot channel was replaced, the feel pitot system pressure leakage check and the autopilot authority test are not required.

NOTE: On airplanes with dual autopilot channel, if left power control unit was replaced perform steps of autopilot authority test related to system A autopilot selection and if right power control unit was replaced perform steps of autopilot authority test related to system B autopilot selection.

A. Equipment and Materials
   (1) Trammel Bar - F80055-1
   (2) Scale - 0 to 2 feet, graduated in inches, tenths and hundredths of an inch
   (3) Air Pressure Regulator - F72928-53 (Preferred), or F72928-52 (Optional)

B. Prepare for Test
   (1) Set horizontal stabilizer B dimension (Fig. 502) at 41.57 +0.05 inches.
   (2) Set mach trim actuator in null position (AMM 27-31-0/201).
   (3) Provide elevator systems A and B hydraulic power (AMM 27-31-0/201).

C. Test Elevator Power Control Unit
   (1) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.
   (2) Move captain's control column approximately 2 degrees in forward direction and release. Check that right elevator trailing edge aligns with index mark on tail cone within 0.12 inch. Then move control column about 2 degrees aft and release. Check that right elevator trailing edge aligns with index mark within 0.12 inch. In both cases, check that tab is aligned with elevator within 0.07 inch.
   (3) Shake control column lightly fore and aft to ensure system is centered. Check that right elevator trailing edge aligns with index mark on tail cone within 0.06 inch.
   (4) Check that power control units are synchronized as follows:
      (a) Alternately switch each flight controls hydraulic systems A and B switches off and then on. Check that deflection of elevator at inboard end of trailing edge does not exceed 0.02 inch.
   (5) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.
   (6) Move captain's control column aft until column stops are contacted and hold while measuring. Check that following conditions are met:
      (a) Right elevator trailing edge deflects 14.60 +0.30/-0.55 inches up from index mark.
      (b) Right tab trailing edge deflects 0.92 +0.10/-0.14 inch down from right elevator trailing edge.

(c) Left tab trailing edge is faired with left elevator trailing edge within 0.07 inch.

(7) Move captain's control column forward until column stops are contacted and hold while measuring. Check that following conditions are met:

(a) Right elevator trailing edge deflects 10.55 +0.60/-0.30 inches down from index mark on tail cone.

(b) Right tab trailing edge deflects 1.03 ±0.10 inches up from right elevator trailing edge.

(c) Left tab trailing edge is faired with left elevator trailing edge within 0.07 inch.

(8) Position flight controls hydraulic system A switch to OFF and system B switch to ON.

(9) Move captain's control column aft until column stops are contacted and hold while measuring. Check that following conditions are met:

(a) Right elevator trailing edge deflects 14.60 +0.30/-0.55 inches up from index mark on tail cone.

(b) Left tab trailing edge deflects 0.92 +0.10/-0.14 inch down from left elevator trailing edge.

(c) Right tab trailing edge is faired with right elevator trailing edge within 0.07 inch.

(10) Move captain's control column forward until column stops are contacted and hold while measuring. Check that following conditions are met:

(a) Right elevator trailing edge deflects 10.55 +0.60/-0.30 inches down from index mark on tail cone.

(b) Left tab trailing edge deflects 1.03 ±0.10 inches up from left elevator trailing edge.

(c) Right tab trailing edge is faired with right elevator trailing edge within 0.07 inch.

(11) Position flight controls hydraulic system B switch to OFF.

(12) Check for pressure leakage in feel pitot system as follows:

(a) Seal drain hole in each feel pitot tube located on fin.

(b) Remove drain plugs from system A and system B pitot lines located below feel computer.

(c) Attach pressure gage lines from air pressure regulator to pitot system A and B drain holes, located below feel computer.

(d) Attach regulated air pressure line from air pressure regulator to both pitot tubes on fin and pressurize pitot system to 5.0 ±0.1 psi (437 ±4 knots).

<u>CAUTION</u>: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST.

(e) Cut off pressure source by turning shutoff valve in air pressure regulator to off.
(f) Pressure shall not drop more than 0.3 psi (12 knots) during a 2-minute period.
(g) Reduce pitot pressure to zero.

(13) Test autopilot authority as follows:

<u>NOTE</u>: Ensure that entire pitch channel of autopilot system is operational before proceeding.

<u>NOTE</u>: Ensure that elevator and feel computer are properly adjusted before proceeding.

(a) Set horizontal stabilizer B dimension at 41.57 ±0.01 inches.
(b) Make sure that the following circuit breakers involved with autopilot pitch channel operation are engaged.
   1) Central Air Data Computer
   2) Vertical Gyro No. 1
   3) Pitch Channel
   4) Autopilot Interlock
(c) Open the stabilizer trim circuit breakers to disengage the stabilizer from electric operation.
(d) Loosen vertical gyro No. 1 from its mounting in the electronics bay.
(e) Using air pressure regulator, increase pitot pressure to 3.50 ±0.05 psi (370 ±3 knots).

<u>CAUTION</u>: DO NOT EXCEED 6 PSI (474 KNOTS) TO THE PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

(f) Position flight controls hydraulic system B switch to ON. Make sure flight controls system A switch is OFF.
(g) Select system B on the autopilot control panel.
(h) Wait 10 seconds and then engage the pitch axis on the autopilot control panel.
(i) Tilt the vertical gyro approximately 20 degrees front end down and hold.

(j) Measure and record right elevator trailing edge displacement with respect to index mark.
(k) Tilt the vertical gyro approximately 20 degrees front end up and hold.
(l) Measure and record right elevator trailing edge displacement with respect to index mark.
(m) Relevel the vertical gyro.
(n) Disengage the pitch axis.
(o) Add the displacements of steps (j) and (l). Check that total displacement is 3.51 ±0.56 inches.
(p) Turn on hydraulic system A flight controls switch.
(q) Repeat steps (h) thru (n) above.
(r) Check that total displacement of steps (j) and (l) is 2.88 ±0.46 inches.
(s) Select system A on the autopilot control panel.

NOTE: Steps (s) thru (y) apply only to airplanes with dual autopilot select modes.

(t) Repeat steps (h) thru (n) above.
(u) Check that total displacement of steps (j) and (l) is 2.88 ±0.46 inches.
(v) Turn off hydraulic system B flight controls switch.
(w) Repeat steps (h) thru (n) above.
(x) Check that total displacement of steps (j) and (l) is 3.51 ±0.56 inches.
(y) Set stabilizer jackscrew B dimension at 42.28 ±0.01 inches.
(z) Reduce 3.5-psi (370 ±3 knots) pitot pressure to zero. Then increase pressure to 2.80 ±0.05 psi (334 ±3 knots).

CAUTION: DO NOT EXCEED 6 PSI (474 KNOTS) TO THE PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

(aa) Repeat steps (h) thru (n) above.

NOTE: Steps (ab) thru (af) apply only to airplanes with dual autopilot select modes.

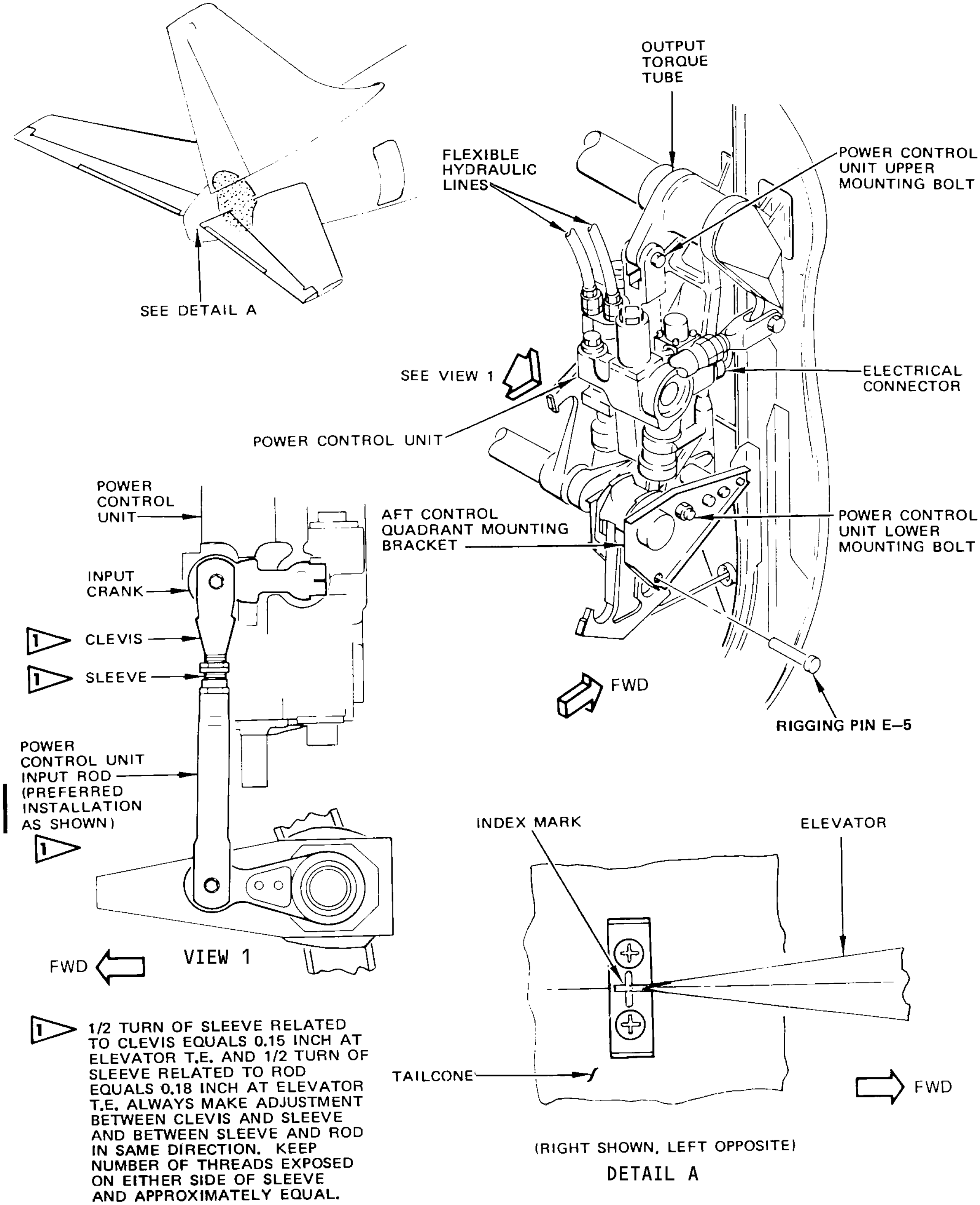
(ab) Check that total displacement of steps (j) and (l) is 3.07 ±0.49 inches.
(ac) Turn on hydraulic system B flight controls switch.
(ad) Repeat steps (h) thru (n) above.
(ae) Check that total displacement of steps (j) and (l) is 2.43 ±0.39 inches.
(af) Select system B on the autopilot control panel.

(ag) Repeat steps (h) thru (n) above.
(ah) Check that total displacement of steps (j) and (l) is 2.43 ±0.39 inches.
(ai) Turn off hydraulic system A flight controls switch.
(aj) Repeat steps (h) thru (n) above.
(ak) Check that total displacement of steps (j) and (l) is 3.07 ±0.49 inches.
(al) Reduce 2.8-psi (334 knots) pitot pressure to zero.

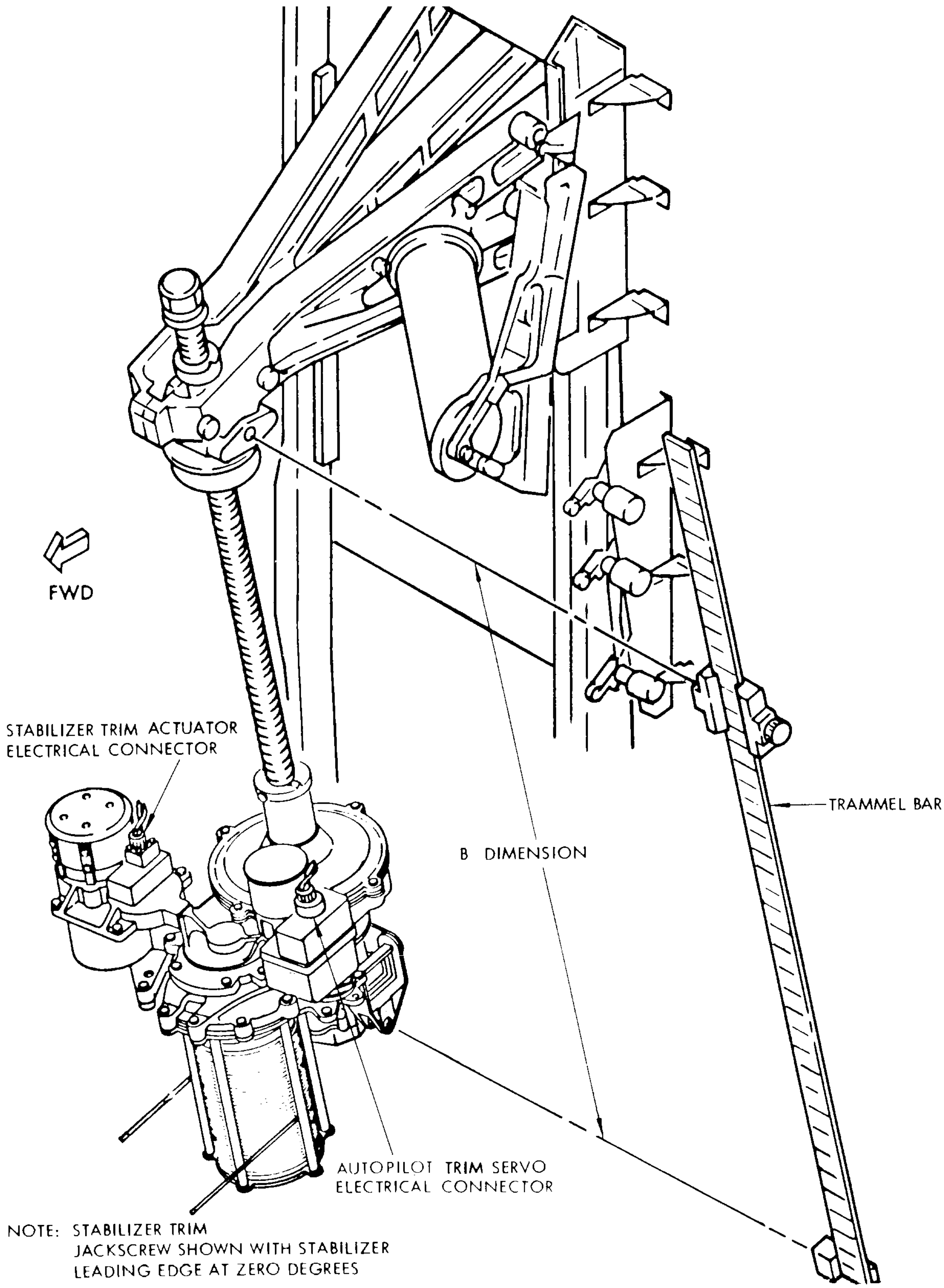
D. Restore Airplane to Normal
(1) Ensure that all tools used during testing are removed.
(2) Remove seals from drain holes in each vertical fin pitot tube.

CAUTION: MAKE SURE SEALS ARE REMOVED FROM PITOT TUBES.

(3) Remove pressure gage lines from systems A and B drain lines located below feel computer.
(4) Install drain plugs on system A and B drain lines located below feel computer.
(5) Remove regulated air pressure lines from both vertical fin pitot tubes.
(6) Open the vertical gyro circuit breaker and wait 10 minutes before remounting gyro.
(7) Close all circuit breakers opened during testing.
(8) Restore airplane to normal hydraulic configuration (Ref 27-31-0).
(9) Remove electrical power if no longer required.



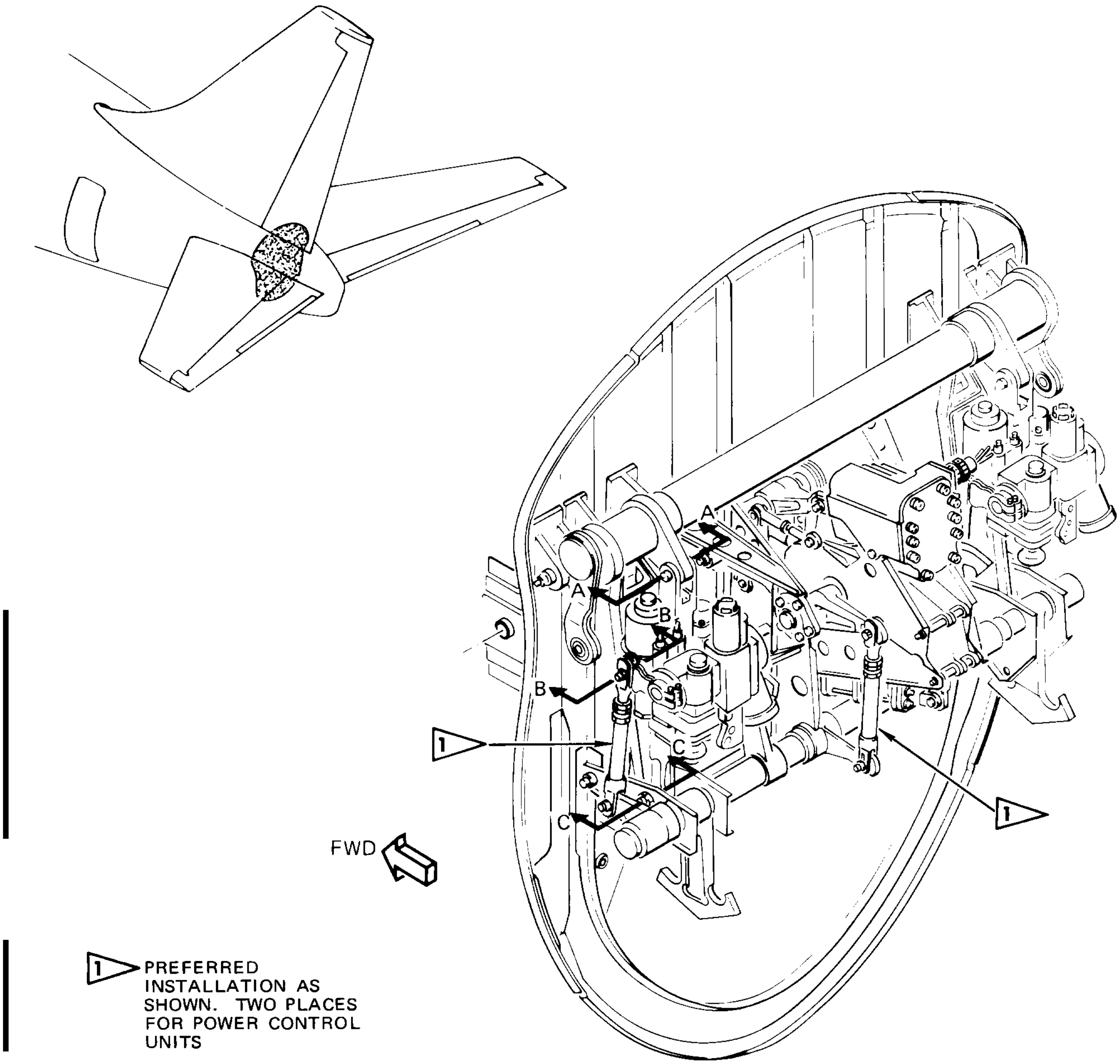
Elevator Power Control Unit Adjustment/Test
Figure 501



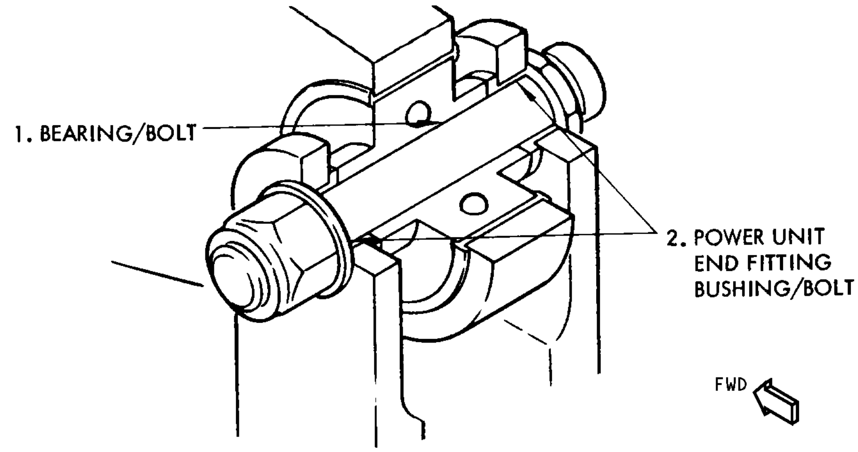
Stabilizer B Dimensions
Figure 502

ELEVATOR POWER CONTROL UNIT - INSPECTION/CHECK

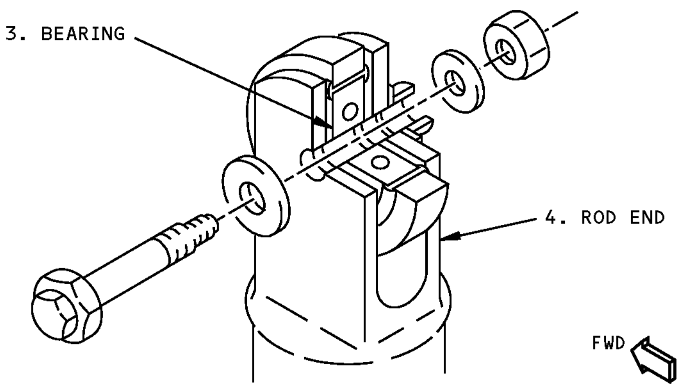
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. Elevator Power Control Unit Wear Limits



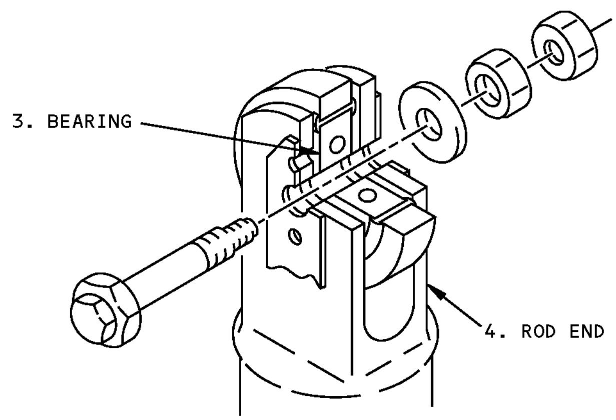
Elevator Power Control Unit Wear Limits
Figure 601 (Sheet 1)



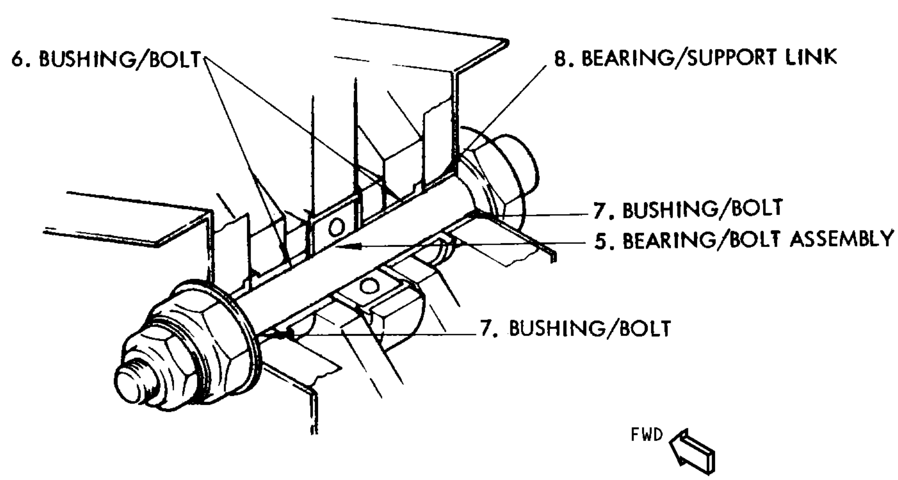
SECTION A-A



SECTION B-B 1



SECTION B-B 2



1 PRE SB 27-1207
2 POST SB 27-1207

SECTION C-C

Elevator Power Control Unit Wear Limits
Figure 601 (Sheet 2)

468041

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.4995	0.5000	0.5030	0.0035	X		
	BOLT	OD	0.4985	0.4995	0.4981		X		
2	BUSHING	ID	0.4995	0.5000	0.5030	0.0035		X	1
	BOLT	OD	0.4985	0.4995	0.4981		X		
3	BEARING	ID	0.3122	0.3125	0.3155	0.0035	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
4	ROD END FITTING	ID	0.3120	0.3130	0.3160	0.0040		X	2
	BOLT	OD	0.3110	0.3120	0.3106		X		
5	BEARING	ID	0.6245	0.6250	0.6275	0.0033	X		
	BOLT ASSEMBLY	OD	0.6237	0.6242	0.6212		X		
6	BUSHING	ID	0.6245	0.6250	0.6275	0.0033	3 X		
	BOLT	OD	0.6237	0.6242	0.6212		X		
7	BUSHING	ID	0.6245	0.6250	0.6265	0.0023	X		
	BOLT	OD	0.6237	0.6242	0.6212		3 X		
8	SUPPORT LINK	ID	0.7500	0.7507	0.7522	0.0022		X	4
	BUSHING	OD	0.7495	0.7500	0.7491		X		

1 REPLACE WORN BUSHING, INSTALL NEW BUSHING WITH WET PRIMER (BMS 10-11, TYPE 1) AND MACHINE TO 0.4995/0.5000-INCH DIAMETER. HOLES THROUGH BOTH BUSHINGS ARE TO BE IN LINE WITHIN 0.0001 INCH.

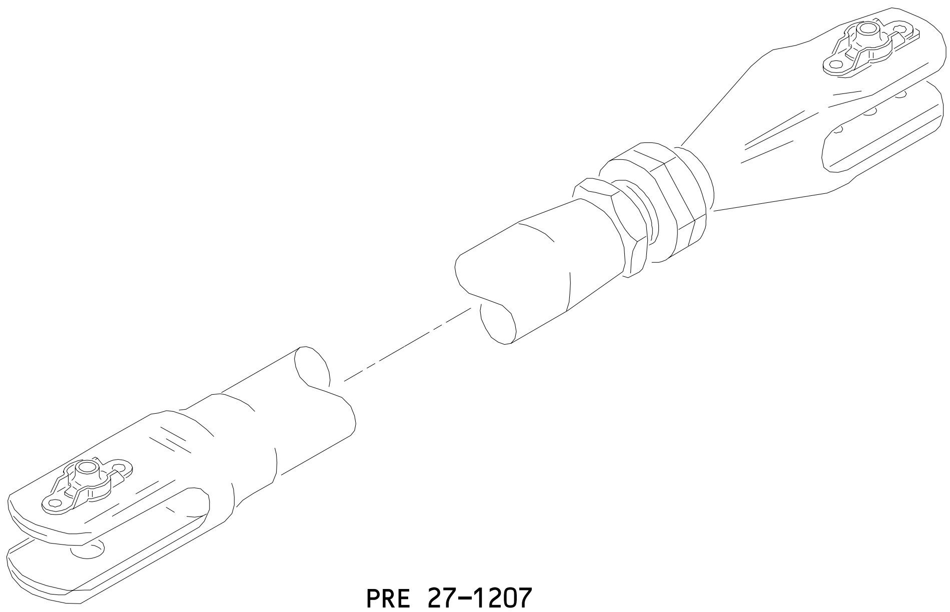
<u>WARNING</u>: BMS 10-11, TYPE 1, PRIMER IS TOXIC AND FLAMMABLE USE ONLY IN WELL VENTILATED AREA. DO NOT GET IN EYES OR ON SKIN.

2 OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0002 TO 0.0013-INCH INTERFERENCE FIT (0.4379 INCH MAXIMUM). REAM BUSHING TO 0.3120/0.3130-INCH DIAMETER.

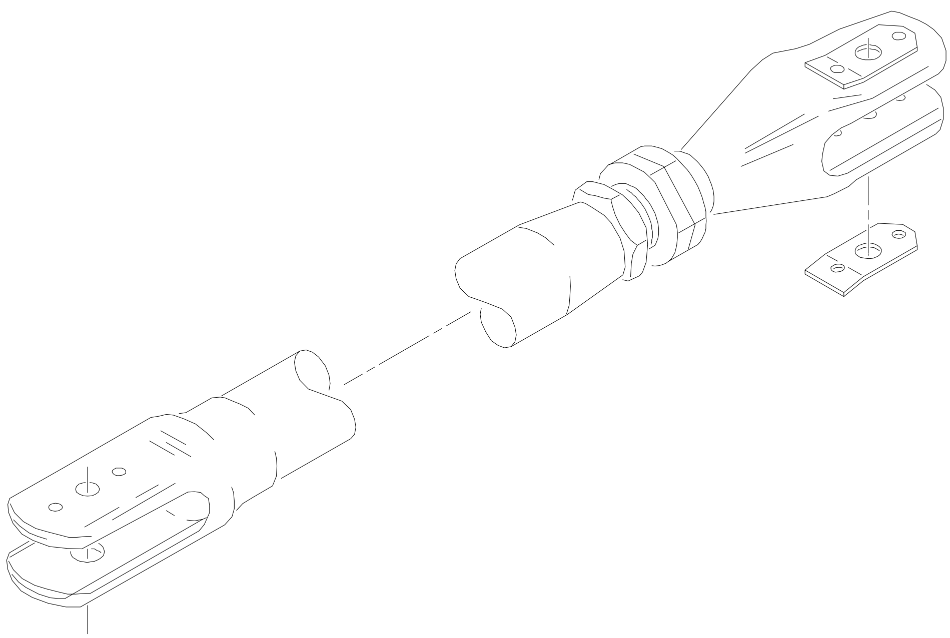
3 REPLACE WORN BUSHING.

4 OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0004 TO 0.0023-INCH INTERFERENCE FIT (0.9379 INCH MAXIMUM). REAM BUSHING TO 0.7500/0.7507-INCH DIAMETER.

Elevator Power Control Unit Wear Limits
Figure 601 (Sheet 3)



PRE 27-1207



POST 27-1207

Elevator Power Control Unit Wear Limits
Figure 601 (Sheet 4)

ELEVATOR TAB LOCK ACTUATOR - REMOVAL/INSTALLATION

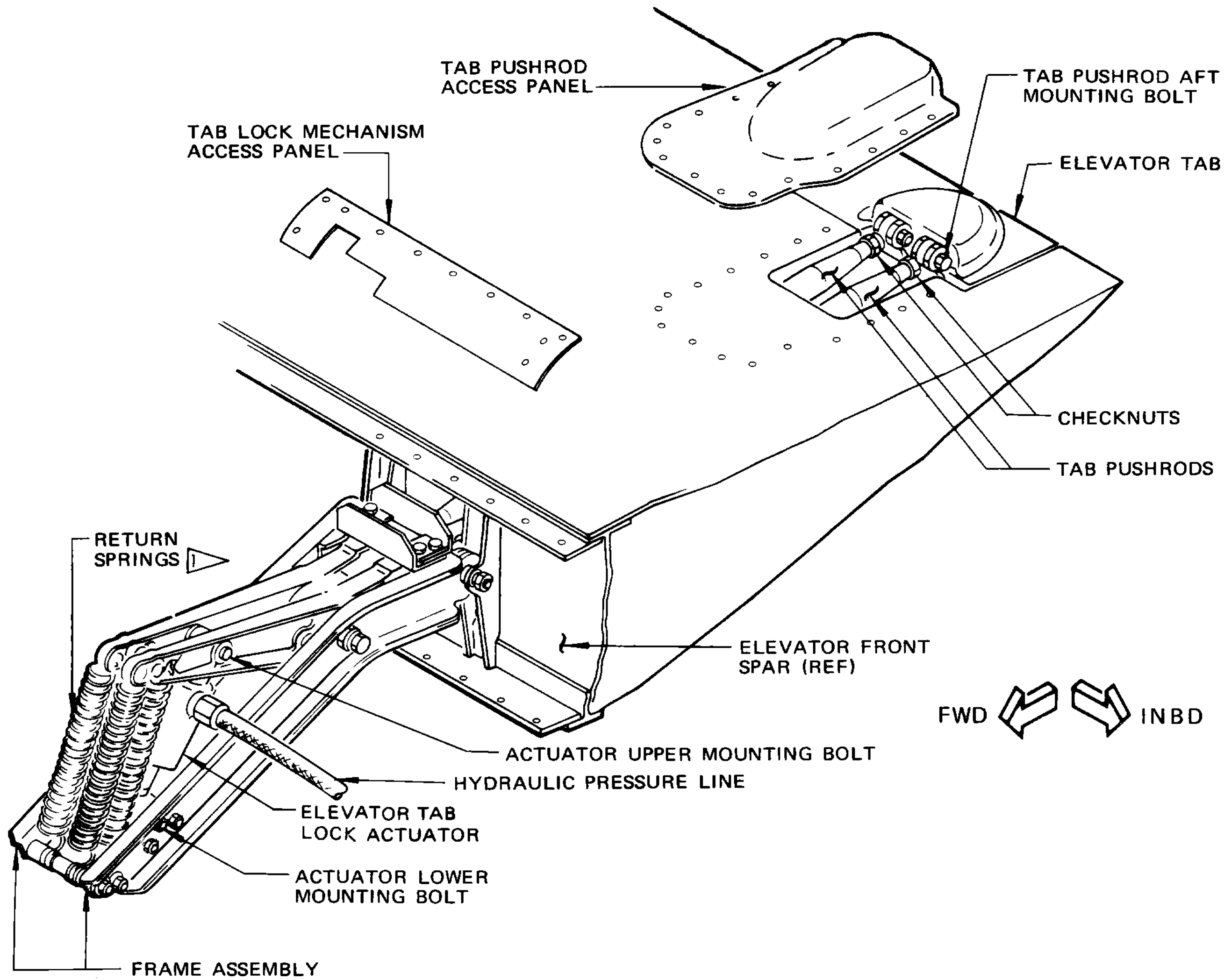
1. General
   A. The following procedure describes the removal and installation of the elevator tab lock actuator. Further disassembly of the tab lock actuator should be accomplished using procedures given in the overhaul manual.
2. Equipment and Materials
   A. Hydraulic Fluid - BMS 3-11 (Ref 20-30-21)
   B. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Remove stabilizer access panels 9105 (left) and 9205 (right).
   C. Install rigging pin E-5 in aft quadrant.
4. Remove Elevator Tab Lock Actuator (Fig. 401)
   A. Remove hydraulic pressure line from elevator tab lock actuator. Cap and plug open port and hydraulic line.

      CAUTION: RELEASE HYDRAULIC PRESSURE CONNECTION SLOWLY AND ALLOW SYSTEM PRESSURE TO RELIEVE BEFORE COMPLETELY REMOVING LINE. BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   B. Remove actuator upper and lower mounting bolts.
   C. Remove actuator from airplane.
5. Prepare for Installation
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
   B. Check that rigging pin E-5 is installed in aft quadrant.
   C. Check for allowable wear at elevator tab lock actuator attach points (Ref 27-31-121, I/C).



1 ON SOME AIRPLANES ONLY TWO FORWARD RETURN SPRINGS ARE INSTALLED.

Elevator Tab Lock Actuator Installation
Figure 401

D. Remove cap and plug from actuator and hydraulic pressure line.
E. Ensure that actuator and hydraulic pressure line are filled with hydraulic fluid. Connect hydraulic pressure line to actuator.

CAUTION: EXERCISE CARE TO AVOID TRAPPING AIR IN HYDRAULIC SYSTEM WHILE MAKING CONNECTION.

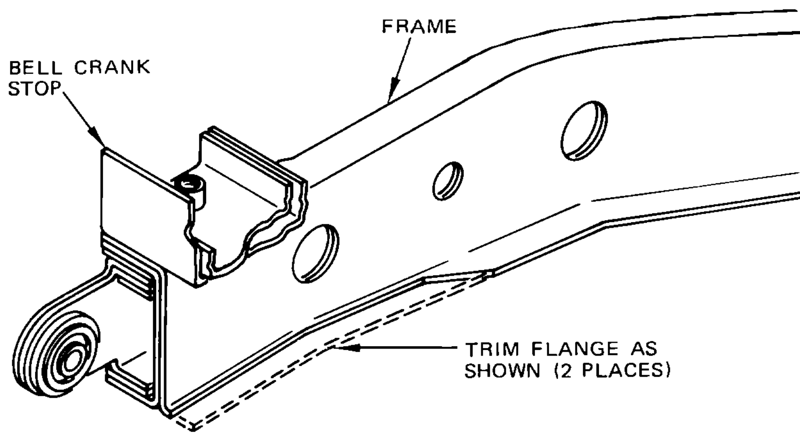
6. Install Elevator Tab Lock Actuator
   A. Insert actuator upper mounting bolt with head facing inboard. Place washer under nut and bolthead and special washer on inboard side of actuator mounting terminal (Fig. 401). Install bushing in inboard bellcrank flange if removed.
   B. Insert actuator lower mounting bolt with head facing outboard. Place washer under nut only.
   C. Remove rigging pin E-5.
   D. Provide elevator system A hydraulic power for left tab lock actuator or system B power for right tab lock actuator (Ref 27-31-0, MP).
   E. Visually check hydraulic connection to actuator for signs of leakage.
   F. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).
   G. Test elevator tab (manual mode and power mode) per 27-31-0, A/T.
7. Restore Airplane to Normal
   A. Close or replace all access doors and panels.
   B. Service hydraulic reservoirs, if required (Ref Chapter 12).

ELEVATOR TAB LOCK LINKAGE - REMOVAL/INSTALLATION

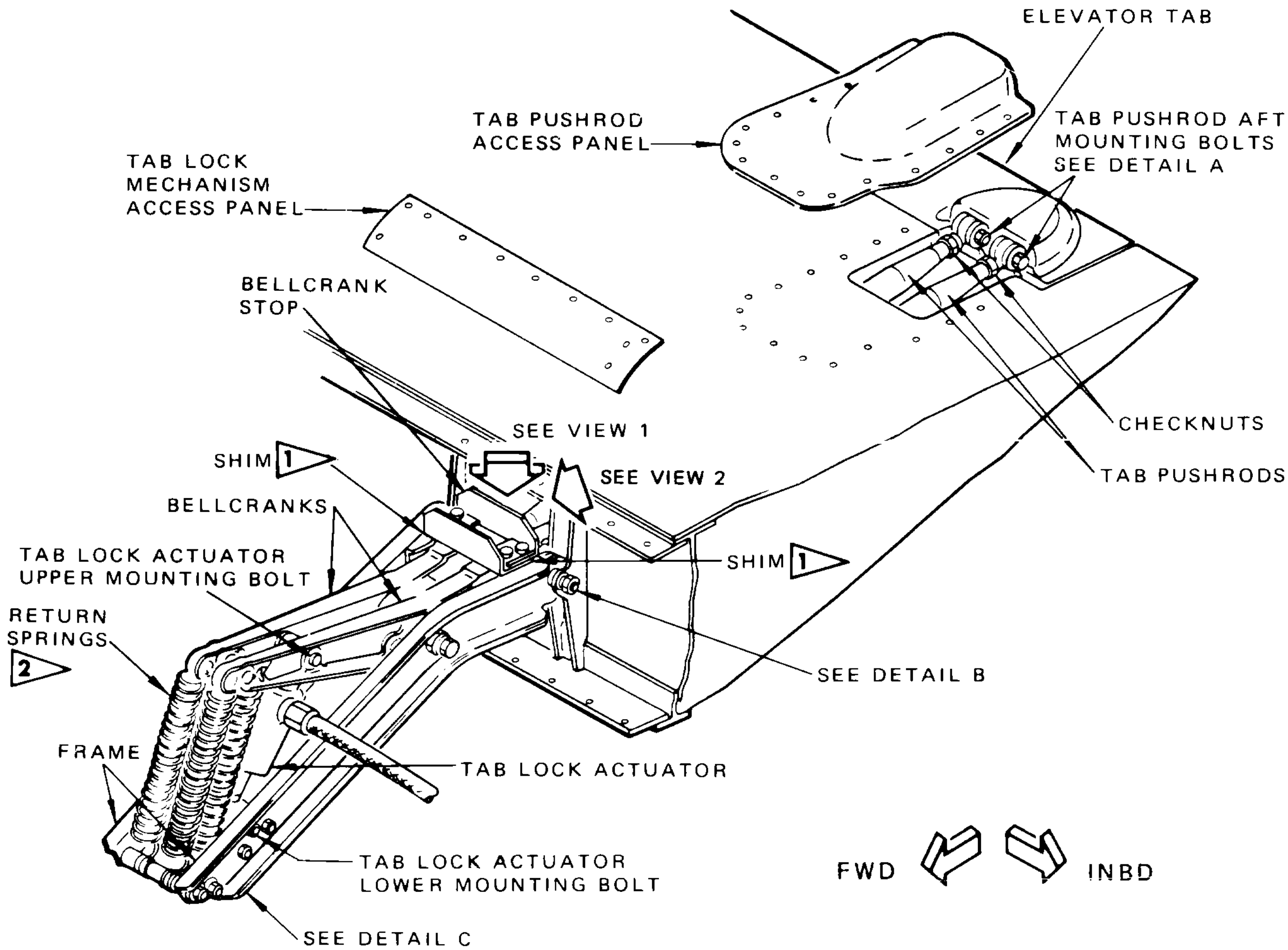
1. Equipment and Materials
    A. Trammel Bar - F80055-1
    B. Scale - 0 to 6 inches, graduated in inches, tenths and hundredths of an inch
    C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

2. Prepare for Removal
    A. Remove elevator system A and B hydraulic power (Ref 27-31-0 MP).
    B. Remove or open following access panels (Ref Chapter 12):
        (1) Stabilizer jackscrew compartment access door.
        (2) Tail cone access panel 3802.
        (3) Stabilizer access panel 9105 on left stabilizer or 9205 on right stabilizer.
        (4) Elevator tab lock mechanism upper and lower access panels. Panels are located at elevator inboard leading edge (Fig. 401).
        (5) Tab pushrod access panel (Fig. 401).
    C. Set horizontal stabilizer B dimension at 41.57 ±0.05 inches, using trammel bar (Fig. 402).
    D. Install rigging pin E-5 in aft quadrant.
3. Remove Elevator Tab Lock Linkage
    A. Remove elevator tab lock actuator upper and lower mounting bolts (Fig. 401).
    B. Withdraw actuator from tab lock linkage. Tie actuator to adjacent structure to prevent interference when removing linkage.
    C. Remove elevator tab lock linkage bolt retainer shield to obtain access for removal of frame attach bolts.



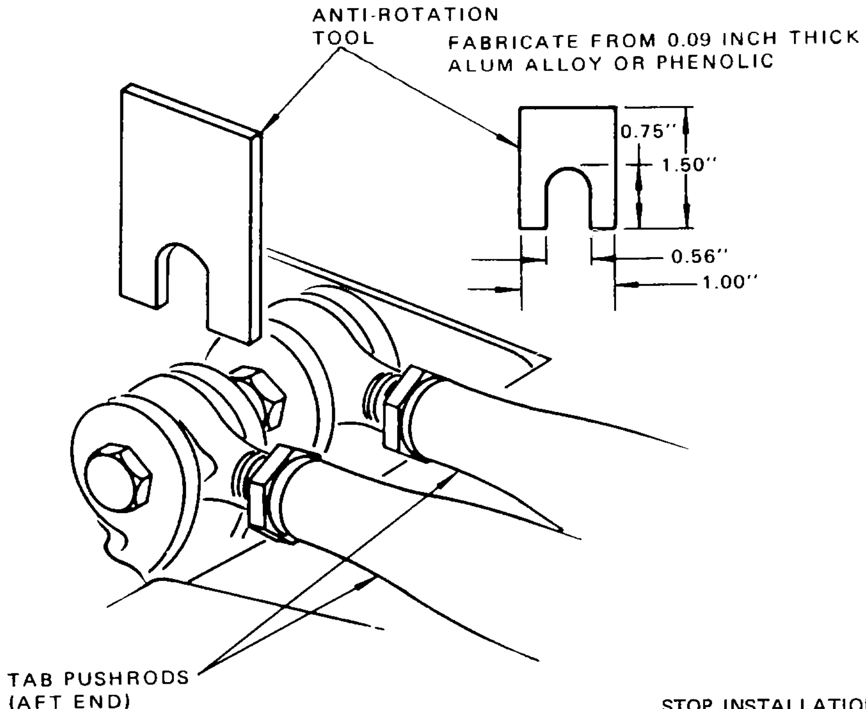
VIEW 2



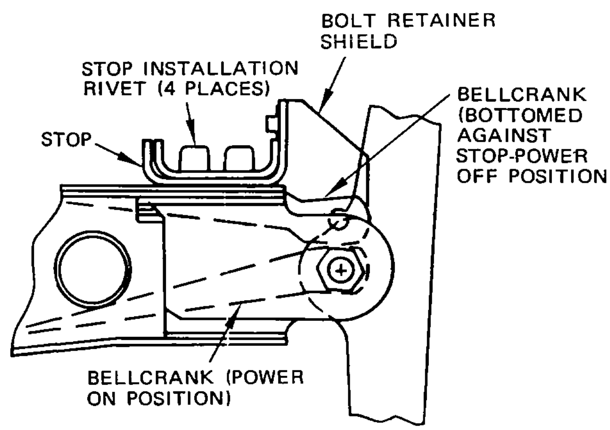
1 POSITION SHIMS ON BOTH SIDES OF STOP AS REQUIRED TO OBTAIN DIMENSION

2 ON SOME AIRPLANES ONLY TWO FORWARD RETURN SPRINGS ARE INSTALLED

Elevator Tab Lock Linkage Installation
Figure 401 (Sheet 1)

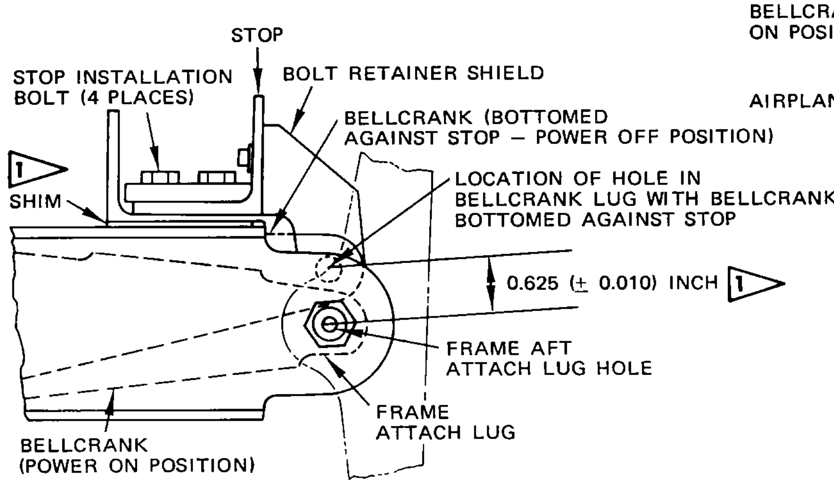


DETAIL A



AIRPLANES WITH 2 RETURN SPRINGS

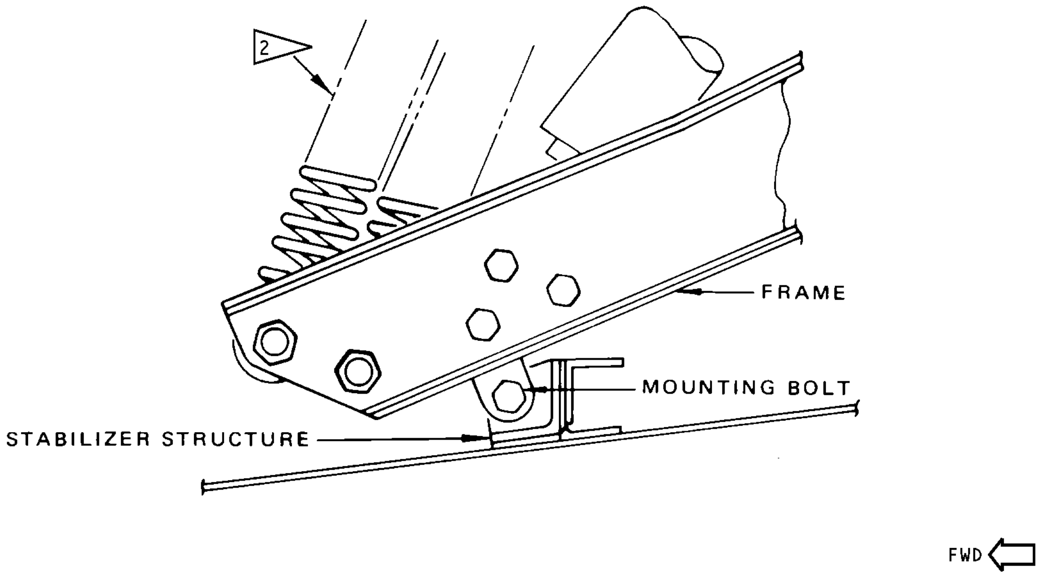
DETAIL B



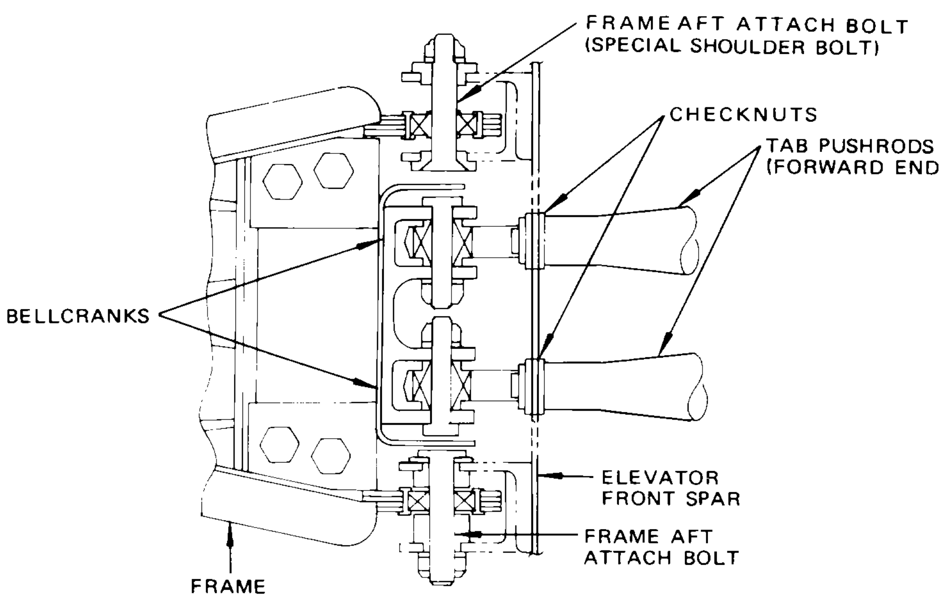
AIRPLANES WITH 4 RETURN SPRINGS

DETAIL B

Elevator Tab Lock Linkage Installation
Figure 401 (Sheet 2)

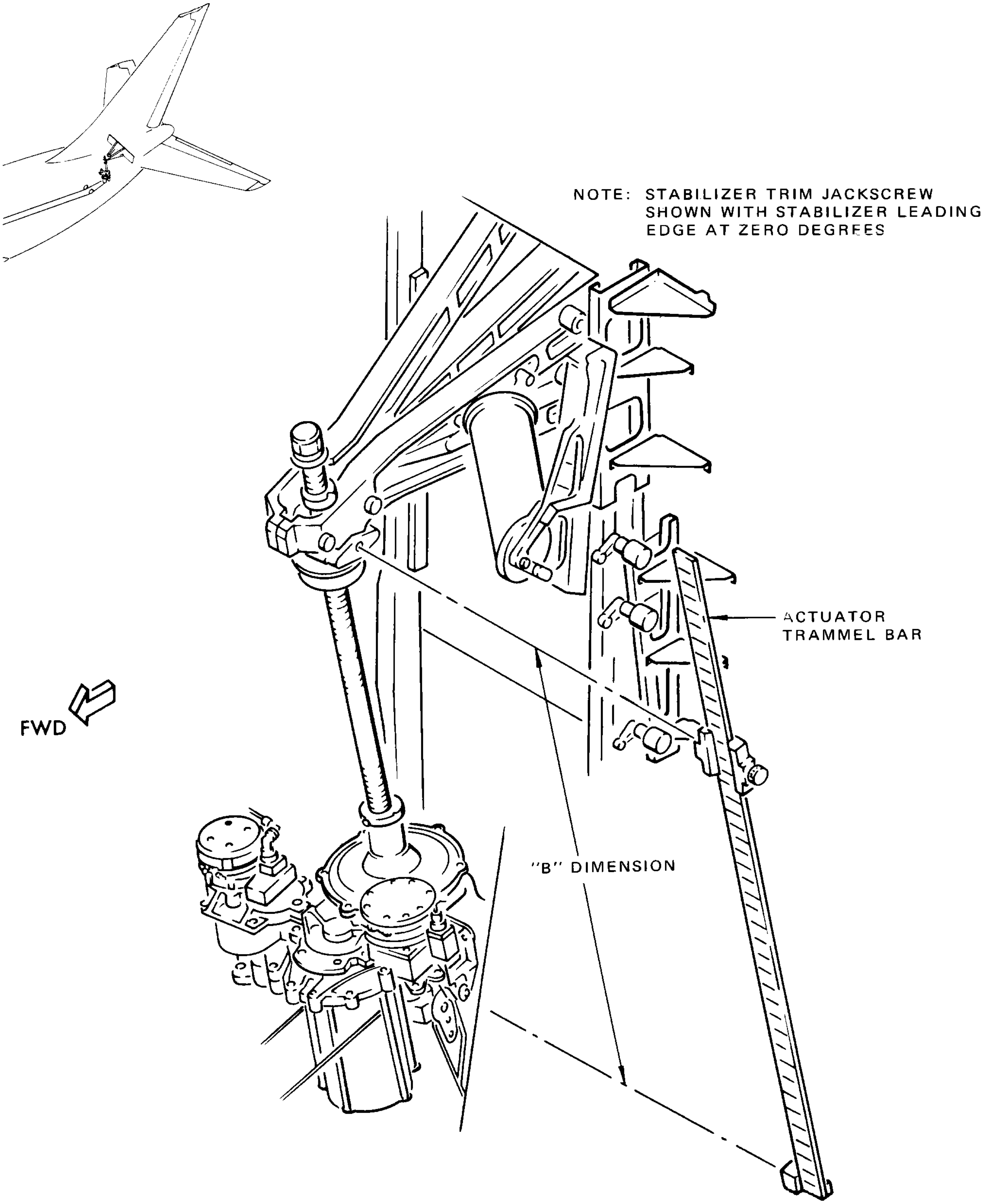


DETAIL C



VIEW 1

Elevator Tab Lock Linkage Installation
Figure 401 (Sheet 3)



Stabilizer Trim Jackscrew Setting
Figure 402

D. Remove tab pushrod aft mounting bolt (2 places).
E. On airplanes with two return springs, disconnect return springs.
F. If not done previously, trim frame flanges per View 2, Fig. 401.
G. Remove two mounting bolts securing forward end of frame to stabilizer structure.
H. Remove two bolts attaching aft end of frame to elevator front spar (View 1, Fig. 401).
I. Remove elevator tab lock linkage with tab pushrods attached.

4. Prepare for Installation
   A. On airplanes with four return springs, check following:
      (1) With aft end of bellcrank bottomed underneath stop, measure dimension between centerline of attach holes in lugs in aft end of bellcrank and centerline of hole through frame aft attach lugs. If dimension exceeds limits given in detail B, Fig. 401, add or remove shims between underside of stop and frame as required. This dimensional check need not be accomplished, if done previously during overhaul.
   B. On airplanes with two return springs, check that return springs are disconnected.
   C. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
   D. Check that rigging pin E-5 is installed in aft quadrant.
   E. Check for allowable wear at elevator tab lock linkage installation points (Ref 27-31-121, I/C).

5. Install Elevator Tab Lock Linkage

   CAUTION: IF THE NUTS ARE NOT TORQUED PROPERLY, THEN THE PUSHRODS CAN BECOME DETACHED AND CAUSE DAMAGE TO THE ELEVATORS AND STABILIZERS.

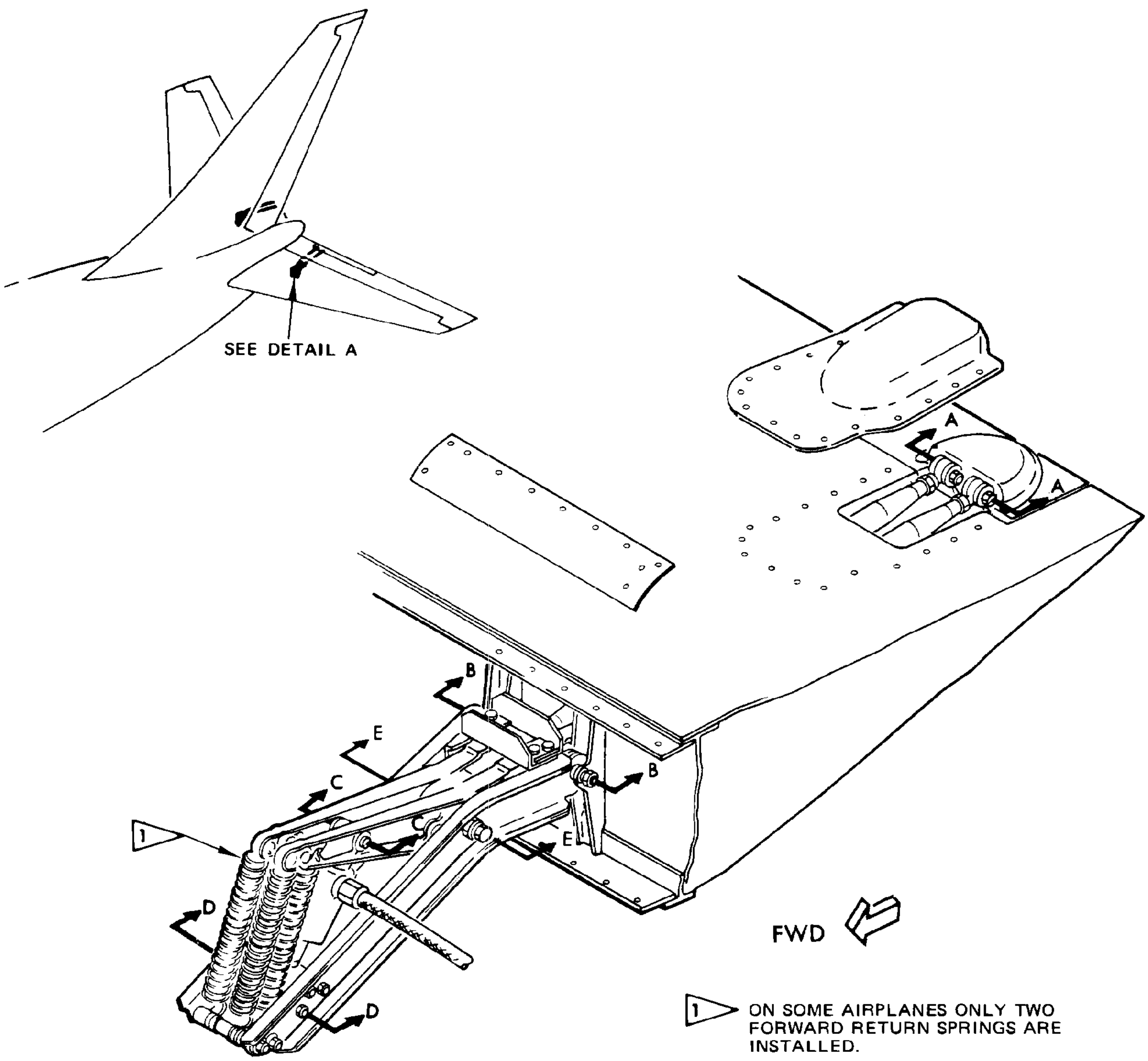
   A. Position linkage with tab pushrods installed inside horizontal stabilizer (Fig. 401).
      (1) If castellated nuts are used, torque nuts to 30 to 50 inch-pounds. Make sure torque remains at 30-50 pound-inches after alignment of the nut castellations and bolt cotter pin holes. If self-locking, non-castellated nuts are used, run-on torque of the new nuts must be between 3.5 and 30 inch-pounds. Replace any self-locking nut that does not meet this requirement. Torque the nuts 50 to 80 inch-pounds.
   B. Secure aft end of frame to elevator front spar. Install inboard bolt with head facing outboard, and outboard bolt with head facing inboard, with washers as required. Tighten nut on inboard bolt 40 to 55 pound-inches (View 1, Fig. 401).

C. Attach forward end of frame to stabilizer structure. Install mounting bolts with a washer under each nut (Detail C, Fig. 401).
D. Refer to detail A, Fig. 401 and install tab pushrods as follows:
   (1) Install tab pushrod aft mounting bolts. Install outboard bolt with head facing outboard and inboard bolt with head facing inboard.
   (2) Install nut and washer on each tab pushrod aft mounting bolt.
   (3) If castellated nuts are used, torque nuts 30 to 50 inch-pounds. Ensure torque remains at 30 to 50 inch-pounds after alignment of the bolt cotter pin holes with the nut castellations. If new, self-locking, non-castellated nuts are used, run-on torque must be between 3.5 and 30 inch-pounds. Replace any self-locking nut that does not meet this requirement, even if it is new. Torque nuts 50 to 80 inch-pounds.
E. Install retainer shield.
F. On airplanes with four return springs, check that dimension given in detail B, Fig. 401 is observed.
G. On airplanes with two return springs, connect return springs.
H. Install tab lock actuator, shown in Fig. 401 as follows:
   (1) Position actuator within tab lock linkage.
   (2) Install upper mounting bolt with head facing outboard. Place special washer on inboard side of actuator upper terminal and a standard washer under nut and bolthead.
   (3) Install lower mounting bolt with head facing inboard and a washer placed under the nut.
I. Remove rigging pin E-5.
J. Adjust and test elevator tab pushrods and linkage per 27-31-0 A/T.

6. Restore Airplane to Normal
   A. Close or replace all access panels.
   B. Restore airplane to normal hydraulic configuration (Ref 27-31-0 MP).

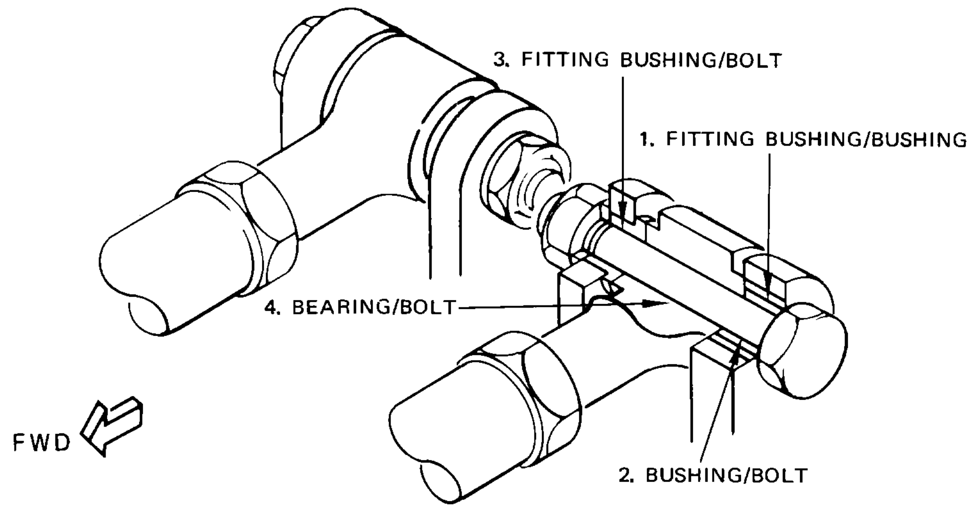
ELEVATOR TAB LOCK LINKAGE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component for inspection after wear. Refer to Component Removal/Installation for this information.
2. Elevator Tab Lock Linkage Wear Limits

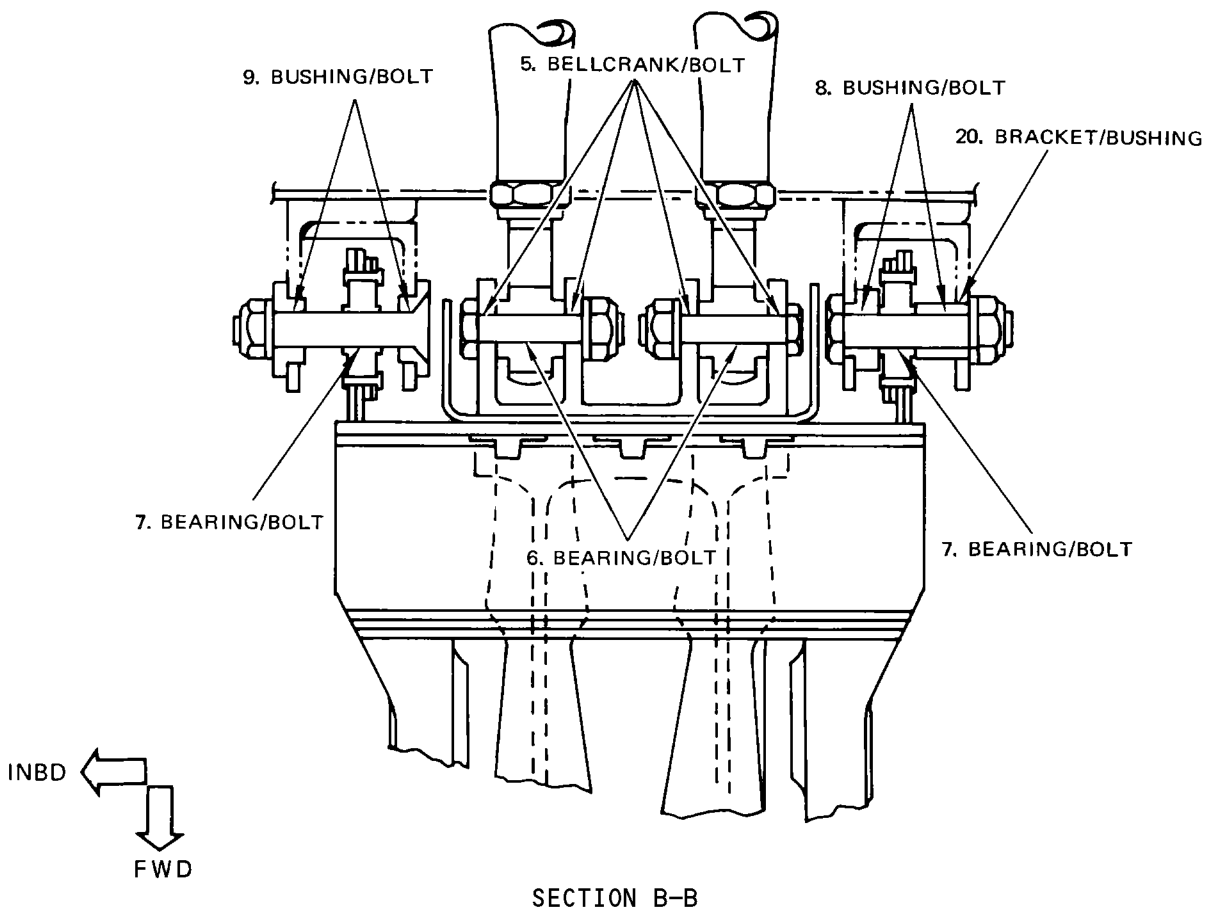


DETAIL A

Elevator Tab Lock Linkage Wear Limits
Figure 601 (Sheet 1)



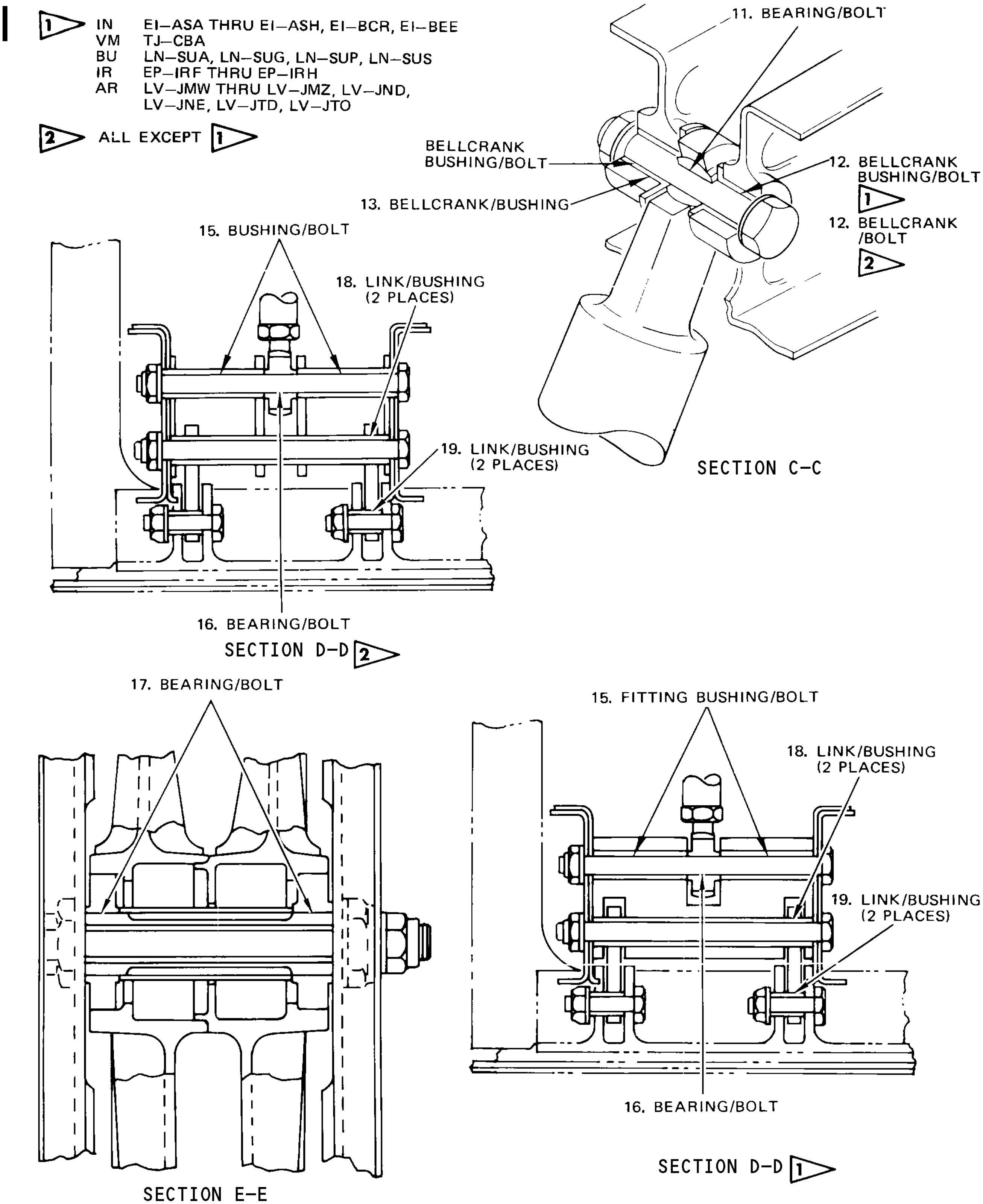
SECTION A-A



SECTION B-B

Elevator Tab Lock Linkage Wear Limits
Figure 601 (Sheet 2)

468059



Elevator Tab Lock Linkage Wear Limits
Figure 601 (Sheet 3)

468065

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clear-ance	Replace Worn Part	Repair Part	Repair Instr
1 *[8]	Fitting Bushing	ID	0.3771	0.3781	0.3796	0.0035	X		
	Bushing	OD	0.3756	0.3761	0.3750		X		
1 *[9]	Fitting Bushing	ID	0.3761	0.3766	0.3769	0.0013	X		
	Bushing	OD	0.3756	0.3761	0.3753		X		
2 *[8]	Bushing	ID	0.2500	0.2515	0.2535	0.0011	X		
	Bolt	OD	0.2485	0.2495	0.2481			X	
2 *[9]	Bushing	ID	0.2497	0.2502	0.2505	0.0011	X		
	Bolt	OD	0.2494	0.2497	0.2491			X	*[1]
3 *[8]	Fitting Bushing	ID	0.2505	0.2515	0.2545	0.0050	X		
	Bolt	OD	0.2485	0.2495	0.2481		X		
3 *[9]	Fitting Bushing	ID	0.2497	0.2502	0.2505	0.0011	X		
	Bolt	OD	0.2494	0.2497	0.2491			X	*[1]
4 *[8]	Bearing	ID	0.2497	0.2500	0.2530	0.0035	X		
	Bolt	OD	0.2485	0.2495	0.2481		X		
4 *[9]	Bearing	ID	0.2497	0.2500	*[5] 0.2503	0.0010	X		
	Bolt	OD	0.2494	0.2497	0.2491			X	*[1]
5 *[8]	Bellcrank	ID	0.2495	0.2505	0.2503	0.0040		X	*[2]
	Bolt	OD	0.2485	0.2497	0.2495		X		
5 *[9]	Bellcrank	ID	0.2497	0.2500	0.2503	0.0010		X	*[6]
	Bolt	OD	0.2494	0.2497	0.2491			X	*[1]

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clear-ance	Replace Worn Part	Repair Part	Repair Instr
6 *[8]	Bearing	ID	0.2497	0.2500	0.2530	0.0035	X		
	Bolt	OD	0.2495	0.2495	0.2481		X		
6 *[9]	Bearing	ID	0.2497	0.2500	*[5] 0.2503	0.0010	X		
	Bolt	OD	0.2494	0.2497	0.2491			X	*[1]
7 *[8]	Bearing	ID	0.3120	0.3125	0.3155	0.0035	X		
	Bolt	OD	0.3110	0.3120	0.3106		X		
7 *[9]	Bearing	ID	0.3120	0.3125	0.3128	0.0011	X		
	Bolt	OD	0.3117	0.3120	0.3114			X	*[1]
8 *[8]	Bushing	ID	0.3125	0.3140	0.3146	0.0050		X	*[3]
	Bolt	OD	0.3117	0.3120	0.3106		X		
8 *[9]	Bushing	ID	0.3120	0.3123	0.3126	0.0010	X		
	Bolt	OD	0.3117	0.3120	0.3114			X	*[1]
9 *[8]	Bushing	ID	0.3125	0.3120	0.3146	0.0040	X		
	Bolt	OD	0.3110	0.3140	0.3106		X		
9 *[9]	Bushing	ID	0.3120	0.3123	0.3126	0.0010	X		
	Bolt	OD	0.3117	0.3120	0.3114			X	*[1]
10	Deleted								
	Deleted								

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clear-ance	Replace Worn Part	Repair Part	Repair Instr
11 *[8]	Bearing	ID	0.3120	0.3125	0.3155	0.0035	X		
	Bolt	OD	0.3110	0.3120	0.3070		X		
11 *[9]	Bearing	ID	0.3120	0.3125	0.3155	0.005	X		
	Bolt	OD	0.3110	0.3120	0.3070		X		
12 *[8]	Bellcrank	ID	0.3120	0.3130	0.3160	0.0040	X		
	Bolt	OD	0.3110	0.3120	0.3170		X		
12 *[9]	Bellcrank	ID	0.3120	0.3130	0.3160	0.005		X	*[7]
	Bolt	OD	0.3110	0.3120	0.3070		X		
13	Bellcrank	ID	0.4995	0.5005	0.5035	0.0055		X	*[4]
	Bushing	OD	0.4960	0.4980	0.4956		X		
14 *[8]	Bellcrank Bushing	ID	0.3120	0.3135	0.3139	0.0035	X		
	Bolt	OD	0.3110	0.3120	0.3070		X		
14 *[9]	Bellcrank Bushing	ID	0.3120	0.3135	0.3165	0.0050	X		
	Bolt	OD	0.3110	0.3120	0.3070		X		

Index No.	Part Name	Dim	Design Limits: Diameter Min.	Design Limits: Diameter Max.	Wear Limits: Max Wear Dim.	Wear Limits: Max Dia. Clear- ance	Replace Worn Part	Repair Part	Repair Instr
15 *[8]	Bushing	ID	0.2500	0.2515	0.2545	0.0050	X		
	Bolt	OD	0.2485	0.2495	0.2480		X		
15 *[9]	Bushing	ID	0.2500	0.2515	0.2545	0.0050	X		
	Bolt	OD	0.2485	0.2495	0.2455		X		
16 *[8]	Bearing	ID	0.2495	0.2500	0.2530	0.0035	X		
	Bolt	OD	0.2485	0.2495	0.2480		X		
16 *[9]	Bearing	ID	0.2495	0.2500	0.2530	0.0050	X		
	Bolt	OD	0.2485	0.2495	0.2455		X		
17	Bearing	ID	0.7495	0.7500	0.7530	0.0040	X		
	Bolt	OD	0.7480	0.7490	0.7476		X		
18	Link	ID	0.377	0.382	0.384	0.0080	X		
	Bushing	OD	0.3756	0.3761	0.3740		X		
19	Link	ID	0.377	0.382	0.384	0.0080	X		
	Bushing	OD	0.3756	0.3761	0.3740		X		
20 *[9]	Bracket	ID	0.5622	0.5628	0.5631	0.0012	X		
	Bushing	OD	0.5619	0.5622	0.5616		X		

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clear-ance	Replace Worn Part	Repair Part	Repair Instr

*[1] Worn part is repairable. Refer to the overhaul manual for repair.
*[2] Enlarge hole to 0.3754-inch maximum diameter and install NAS537B4P bushing (or equivalent) to 0.0002-0.0013-inch interference. Machine bushing to design ID limits.
*[3] Replace worn bushing. Bond new bushing to bracket per procedure in Elevator Tab Lock Linkage - Approved Repair.
*[4] Enlarge hole to 0.6254-inch maximum diameter and install oversize bushing to 0.0003-0.0018-inch interference. Machine bushing to design ID limits.
*[5] Maximum radial play 0.0006 inch.
*[6] Enlarge hole to 0.3754-inch maximum diameter and install BACB28U4D16 bushing (or equivalent) to 0.0002-0.0013 inch interference. Machine bushing to design ID limits.
*[7] Enlarge hole to 0.4379-inch maximum diameter and install BACB28U5D45 bushing (or equivalent) to 0.0002-0.0013 inch interference. Machine bushing to design ID limits.
*[8] BU LN-SUA, LN-SUG, LN-SUP, LN-SUS
IR EP-IRF thru EP-IRH
AR LV-JMN thru LV-JMZ, LV-JND, LV-JNE, LV-JTD, LV-JTO
VM TJ-CBA IN EI-ASA thru EI-ASH, EI-BCR, EI-BEE
*[9] ALL EXCEPT *[8]

ELEVATOR TAB LOCK LINKAGE - APPROVED REPAIRS

1. General
   A. This procedure covers bonded installation of bushings at elevator tab lock linkage frame mechanism aft attachment brackets when bushings are being replaced at these locations.
2. Equipment and Materials
   A. Adhesive - BMS 5-126, Type II, Class 1 (Ref 20-30-11)
   B. Primer - EC-776 (or EC-776R also called EC-1309 or EC-776-SS), Minnesota Mining and Manufacturing Company, St. Paul, Minnesota
   C. Solvent - Final Cleaning of Composites Prior to Non-structural Bonding (Series 91) (Ref AMM/SOPM 20-30-91)
3. Prepare to Replace Bushing
   A. Remove old bushing by applying force evenly to bushing to break adhesive bond and force bushing out of hole (Fig. 801).
   B. Clean all faying surfaces of bracket and bushing.

   WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FROM PROPER HANDLING PROCEDURES.

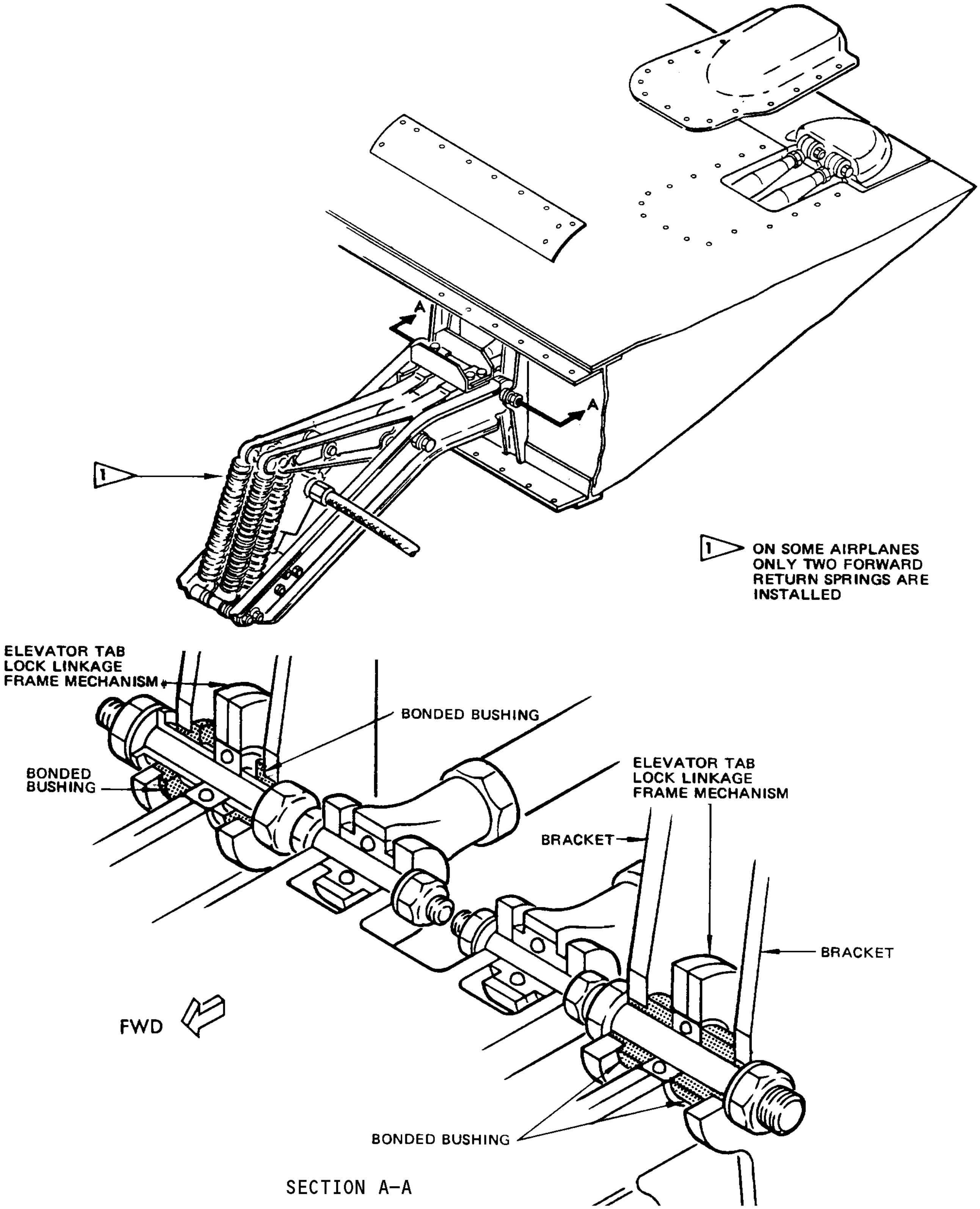
   C. Apply a thin even coat of primer to faying surfaces of bracket and bushing. Dry not less than 1 hour at 80 ±10°F.

   WARNING: PRIMER IS TOXIC AND FLAMMABLE. USE ONLY IN WELL-VENTILATED AREA. DO NOT GET IN EYES OR ON SKIN.

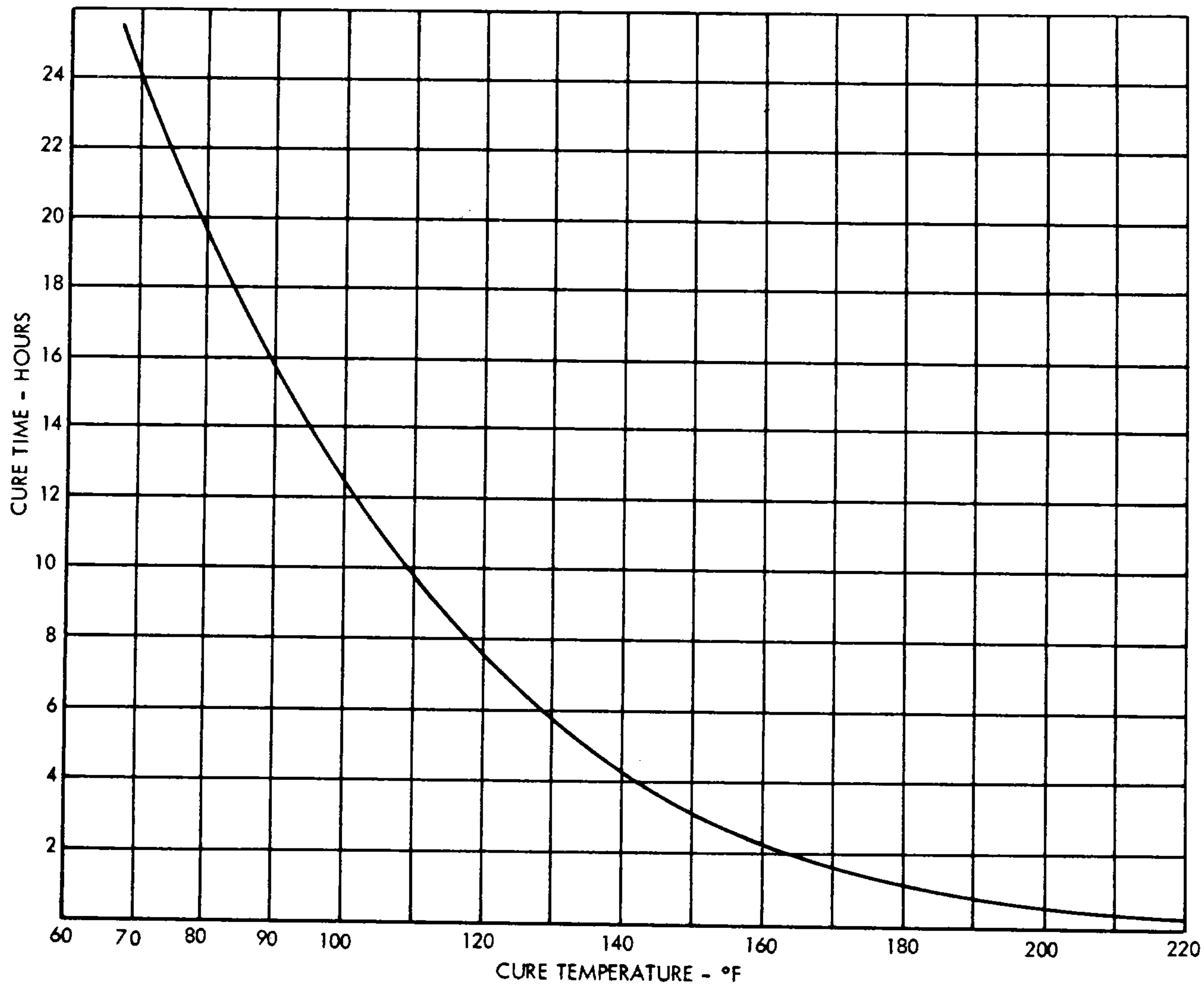
   D. Prepare adhesive by blending thoroughly equal parts by weight of the two components of the adhesive.

   NOTE: Blending is to be accomplished only immediately before use. Pot life of blended adhesive is 1.5 hours below 100°F.

4. Replace Bushing
   A. Apply a thin even coat of adhesive to each faying surface.
   B. Press bushing into bracket hole, applying firm uniform pressure to ensure complete contact of the faying surfaces.
   C. Wipe off excess adhesive before it has cured, using a clean cloth moistened with solvent, Series 91 (Ref AMM/SOPM 20-30-91). Do not allow solvent to flow into bond line.
   D. Cure under contact pressure at ambient temperature. See figure 802 for required cure time, based on temperature. If shorter drying period is required use blower type heater and apply heat locally to bushing area. After cure, cool parts below 100°F before removing pressure.



Elevator Tab Lock Linkage Bonded Bushing Replacement
Figure 801



Elevator Tab Lock Linkage Bonded Bushing
Figure 802

ELEVATOR FEEL COMPUTER - REMOVAL/INSTALLATION

1. General
   A. The elevator feel computer should be removed from the airplane to replace the differential pressure switch or any other computer components requiring replacement. Refer to Chapter 22, Auto Flight for Autopilot Potentiometer Maintenance Practices.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-4	-11	0.309-0.311	6.7 ±0.25	FEEL COMPUTER INPUT ARM

   B. Trammel Bar - F80055-1
   C. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   D. Elevator Feel Computer Safety Pin - F80153-1
   E. Air Pressure Regulator - F72928-53 (Preferred), or -52 (Optional)
   F. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
   B. Open aft compartment access door 3701.
   C. Position horizontal stabilizer at B dimension of 41.57 ±0.01 inches (Fig. 403).
   D. Open following circuit breakers on panel P6: Autopilot stabilizer trim servo, stabilizer trim actuator, stabilizer trim control, master dim, autopilot pitch a/c.
   E. Install and secure safety pin in input arm (3, Fig. 401) and feel computer (4).

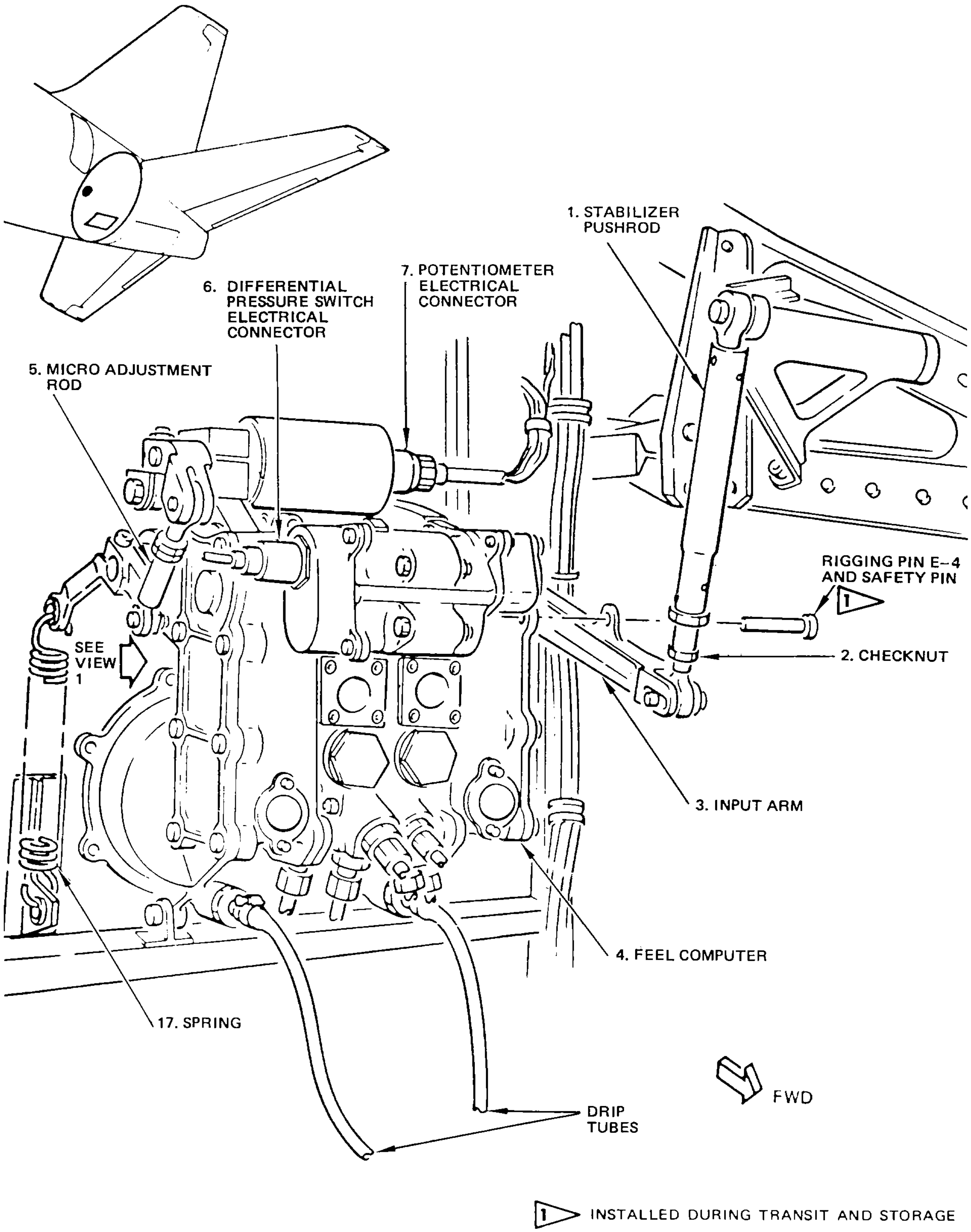
      WARNING: SAFETY PIN MUST BE INSTALLED IN FEEL COMPUTER (4) RIGGING PIN HOLES TO RESTRAIN INPUT ARM (3) FROM ROTATION DURING HANDLING, SHIPPING AND STORAGE. DO NOT LIFT COMPUTER (4) BY INPUT ARM (3). DO NOT APPLY TORQUE EXCEEDING 300 POUND-INCHES TO INPUT ARM (3). DAMAGE MAY OCCUR TO COMPUTER (4) AFFECTING AUTOPILOT AUTHORITY.

4. Remove Feel Computer (Fig. 401)
   A. Disconnect stabilizer trim potentiometer return spring (17), from feel computer (4).
   B. Remove bolt attaching stabilizer pushrod (1) to input arm (3).
   C. Discount differential pressure switch electrical connector (6) and autopilot potentiometer electrical connector (7) and install caps.
   D. Release two pneumatic pitot lines (13) from feel computer (4) and install plugs.
   E. Release two hydraulic supply pressure lines (10), two return lines (12) and two computer pressure lines (11) from feel computer (4) and install plugs.

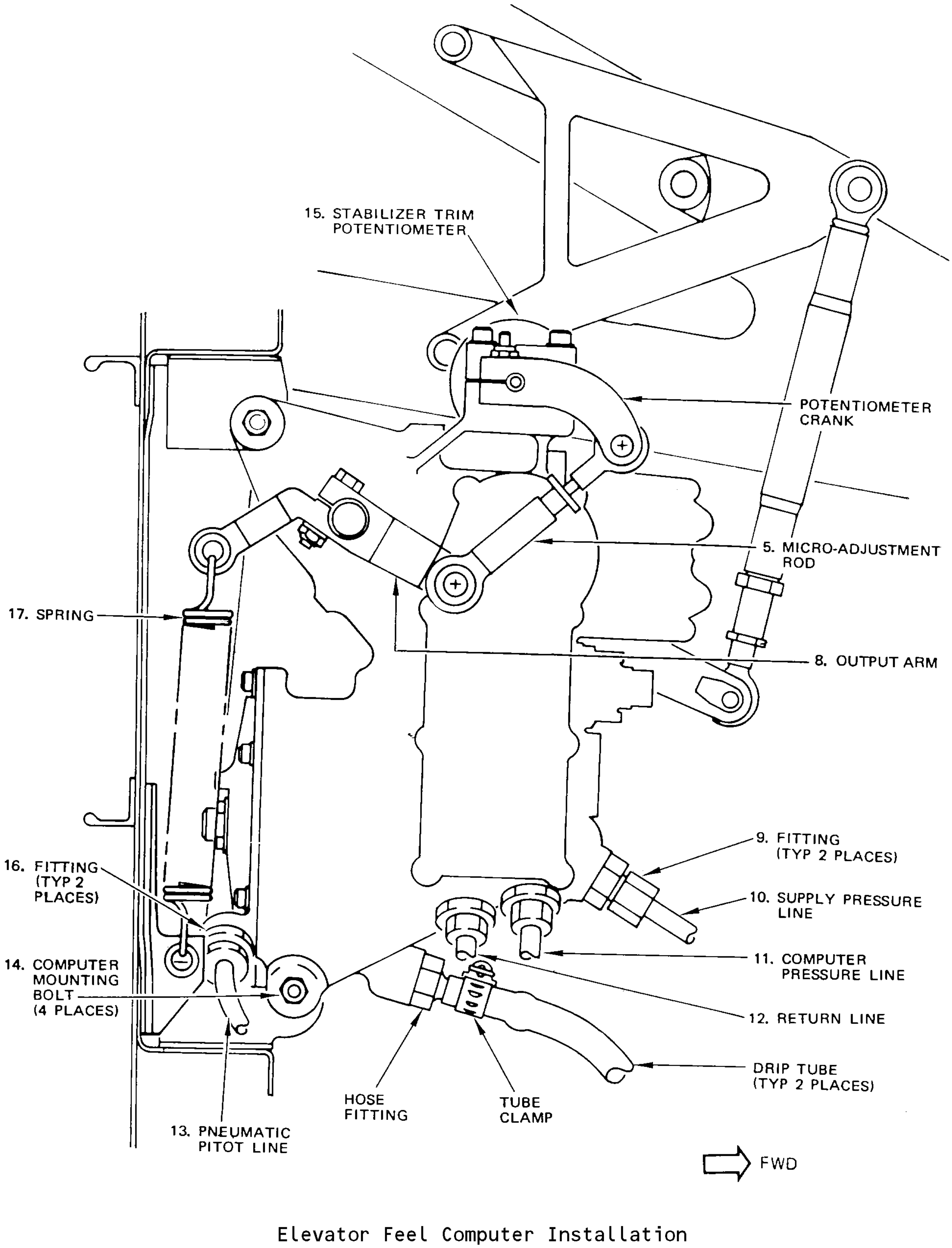
      CAUTION: WHEN DISCONNECTING HYDRAULIC PRESSURE ON RETURN LINE, RELEASE CONNECTION SLOWLY AND ALLOW SYSTEM PRESSURE TO DROP BEFORE COMPLETELY REMOVING LINE. BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   F. Release drip tubes (2 places) from fittings on feel computer.
   G. Cap and plug all open ports, hydraulic lines and pneumatic lines.
   H. Release four computer mounting bolts (14), and remove feel computer from airplane.
   I. If replacement computer is to be installed, perform the following steps on removed feel computer:
      (1) If replacement computer does not have input arm (3) installed, remove input arm (3) from shaft on old computer and retain for subsequent installation.

         WARNING: IF INPUT ARM (3) CANNOT BE EASILY REMOVED, DO NOT ATTEMPT REMOVAL WITH TOOLS. INTERNAL SHEAR PINS MAY BE SHEARED BY ATTEMPTING TO REMOVE IMPROPERLY ALIGNED INPUT ARM (3), WHEN REMOVING PLUG FROM COMPUTER ARM (3), HOLD COMPUTER ARM (3) AGAINST TORQUE APPLIED TO PLUG. DO NOT ALLOW TORQUE APPLIED TO PLUG TO REACT AGAINST INTERNAL STOPS. DAMAGE MAY OCCUR TO COMPUTER (4) AFFECTING AUTOPILOT AUTHORITY.



Elevator Feel Computer Installation
Figure 401 (Sheet 1)



Elevator Feel Computer Installation
Figure 401 (Sheet 2)

(2) Detach micro-adjustment rod (5) from computer output arm (8) and potentiometer crank. If required, remove output arm (8).
(3) Remove stabilizer trim potentiometer (15) (Ref Chapter 22, Auto Flight).
(4) Remove pneumatic and hydraulic fittings (9) and (16) from computer housing. Install shipping plugs in open ports.

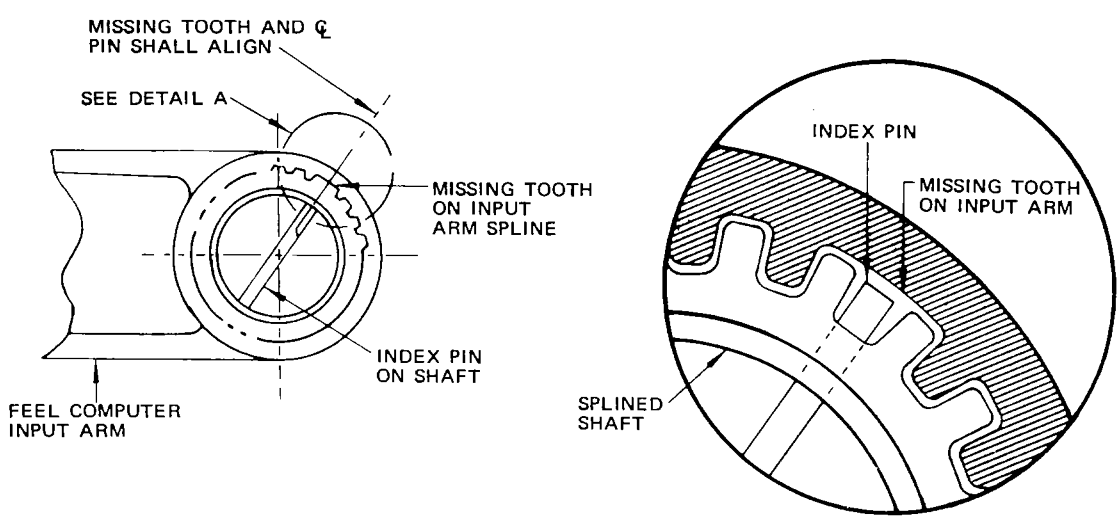
NOTE: Shipping plugs may be obtained from replacement computer.

5. Prepare for Installation
A. Check for allowable wear at elevator feel computer installation linkage attachment points (Ref 27-31-131, Inspection/Check).
B. If input arm (3) is installed on feel computer (4), check that safety pin is installed and secured in input arm (3) and feel computer rigging pin holes (Fig. 401).

WARNING: DO NOT LIFT OR HANDLE FEEL COMPUTER (4) BY INPUT ARM (3). SAFETY PIN MUST BE USED TO RESTRAIN INPUT ARM (3) FROM ROTATION DURING SHIPPING, HANDLING, AND STORAGE. DO NOT APPLY TORQUE EXCEEDING 300 POUND-INCHES TO INPUT ARM (3). DAMAGE MAY OCCUR TO FEEL COMPUTER (4) AFFECTING AUTOPILOT AUTHORITY.

C. If replacement feel computer is being installed, refer to Fig. 401 and install parts from removed computer on replacement computer as follows:
(1) Lightly lubricate O-rings with Skydrol Assembly Lube MCS 352B, then install pneumatic and hydraulic fittings (9) and (16) in feel computer (4).
(2) Accomplish following checks:
(a) If replacement computer has input arm (3) installed, check that arm is installed per Fig. 402.
(b) If replacement computer does not have input arm (3) installed, remove shipping sleeve from end of computer input arm shaft, install input arm (3) on shaft with washer and plug per Fig. 402.
(c) Tighten plug within 150 to 200 pound-inches, and install and secure safety pin per par. B.

WARNING: ENSURE THAT INDEX PIN ON SHAFT SPLINE IS LINED UP WITH MISSING TOOTH ON INPUT ARM SPLINE. TIGHTENING PLUG WITH IMPROPERLY ALIGNED INPUT ARM CAN DAMAGE PIN AND SHAFT. WHEN TIGHTENING PLUG, HOLD COMPUTER ARM (3) AGAINST TORQUE APPLIED TO PLUG. DO NOT ALLOW TORQUE APPLIED TO PLUG TO REACT AGAINST INTERNAL STOPS. DAMAGE MAY OCCUR TO COMPUTER (4) AFFECTING AUTOPILOT AUTHORITY.



DETAIL A

Elevator Feel Computer Input Arm Installation
Figure 402

(3) Install stabilizer trim potentiometer (15) (Ref Chapter 22, Auto Flight).

<u>CAUTION</u>: IT IS POSSIBLE TO INSTALL POTENTIOMETER CRANK BACKWARD (REVERSED 180 DEGREES). CRANK MUST BE INSTALLED AS SHOWN IN FIG. 401 FOR PROPER AUTO STABILIZER TRIM OPERATION.

(4) Attach micro-adjustment rod (5) to feel computer output arm (8) and to potentiometer crank. If output arm (8) is not installed, install as required.

(5) Manually set horizontal stabilizer B dimension at 41.57 ±0.01 inches (Fig. 403).

D. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).

E. Check that following circuit breakers on panel P6 are open. Autopilot stabilizer trim servo, stabilizer trim actuator, stabilizer trim control, master dim and autopilot pitch a/c.

F. Remove safety pin and install rigging pin E-3 in input arm (3) and feel computer (4).

6. <u>Install Feel Computer</u>

A. Position feel computer (4, Fig. 401) in airplane and install four mounting bolts (15), nuts, and washers.

B. With rigging pin E-4 installed, check that bolt can be easily installed through stabilizer pushrod (1) and feel computer input arm (3).

C. If bolt does not fit, loosen checknut (2) on stabilizer pushrod and rotate rod end fitting until bolt can be easily installed.

D. Tighten checknut and secure stabilizer pushrod to computer input arm.

E. Check stabilizer pushrod for minimum thread engagement. At least 50% of inspection hole shall be blanked by rod end fitting.

F. Connect stabilizer trim potentiometer return spring (17), to feel computer.

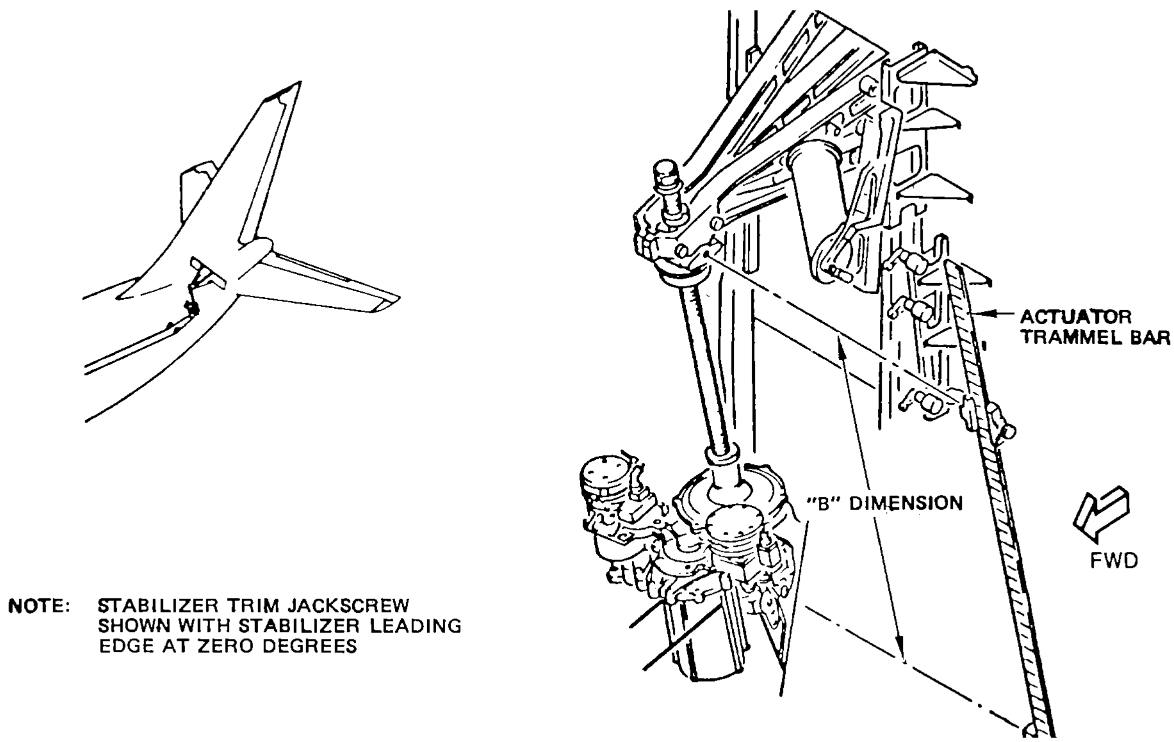
G. Remove rigging pin E-4.

H. Remove caps and plugs from pneumatic ports and lines.

I. Refit two pneumatic pitot lines (13) to feel computer (4).

J. Remove plugs and refit two hydraulic supply pressure lines (10), two return lines (12) and two computer pressure lines (11) to feel computer housing.

<u>CAUTION</u>: ENSURE HYDRAULIC PRESSURE AND RETURN LINES ARE PROPERLY CONNECTED TO THEIR RESPECTIVE PORTS. IMPROPER MATING OF HOUSING.



Stabilizer Trim Jackscrew Setting
Figure 403

K. Remove plugs and connect drip tubes (two places) at fittings on feel computer and tighten clamps.
L. Remove caps and install differential pressure switch electrical connector (6) and autopilot potentiometer electrical connector (7).
M. Provide elevator systems A and B hydraulic power (Ref 27-31-0 MP).
N. Move control column fore and aft through full range of travel until movement is smooth and artificial feel is normal to bleed air from system. As air is bled out, artificial feel forces increase.
O. Check hydraulic connections at feel computer for signs of leakage.
P. Close circuit breakers on panel P6.
Q. Perform adjustment of stabilizer trim potentiometer (Ref Chapter 22, Auto Flight) and check visually that electrical connector (7) is properly installed.
R. Test feel force system and autopilot authority.
   (1) Test differential pressure switch.
      (a) Set TE flaps to full up position.
      (b) Check that feel differential pressure light is OFF.
      (c) Position flight controls hydraulic system A switch to OFF. Check that feel differential pressure light is ON.
      (d) Position flight controls hydraulic system A switch to ON and system B switch to OFF. Check that feel differential pressure light is ON.
      (e) Position flight controls hydraulic system B switch to ON.
      (f) Operate captain's control column at a constant rate from ful1 forward to full aft to full forward in approximately 2 seconds (27.5°/sec). The feel differential pressure light may flicker when stops are contacted, but check that light does not remain ON.
   (2) Check for pressure leakage in feel pitot system as follows:
      (a) Seal drain hole in each feel pitot tube located on fin.
      (b) Remove drain plugs from system A and system B pitot lines, located below feel computer.
      (c) Attach pressure gage lines from air pressure regulator to pitot system A and B drain holes, located below feel computer.
      (d) Attach regulated air pressure line from air pressure regulator to both pitot tubes on fin and pressurize pitot system to 5.0 ±0.1 psi (437 ±4 knots).

         CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST.

(e) Cut off pressure source by turning shutoff valve in air pressure regulator to off.
(f) Pressure shall not drop more than 0.3 psi (12 knots) during a 2-minute period.

(3) Check feel forces as follows:

NOTE: Ensure that elevator and feel computer are properly adjusted before proceeding.

(a) Set the horizontal stabilizer B dimension at 41.57 ±0.01 inches.
(b) Set mach trim actuator null position (Ref 27-31-0 MP).
(c) Check that flight controls hydraulic systems A and B switches are positioned to ON.
(d) Using air pressure regulator, pressurize pitot system to 3.50 ±0.05 psi (370 ±3 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

(e) Apply masking tape on tail cone along direction of right elevator trailing edge travel.

NOTE: Elevator travel measuring tool may be used in lieu of tape method.

(f) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.

NOTE: Ensure that control columns are not disturbed from this position during the next step.

(g) Mark actual elevator trailing edge neutral position on masking tape.

(h) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.

NOTE: Pitot system check per step (2) must be satisfactory. Jiggle control column prior to each reading. Elevator position refers to actual elevator travel as measured from actual elevator neutral position. Using actual elevator trailing edge neutral position as a reference, mark elevator positions on masking tape.

(i) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.
(j) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.
(k) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.
(l) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.
(m) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
(n) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.
(o) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.
(p) Position flight controls hydraulic system A switch to ON.
(q) Reduce 3.5 ±0.05 psi (370 ±3 knots) dynamic pressure being applied to pitot tubes to zero pressure. Then increase pressure to 0.50 ±0.05 psi (145 ±7 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

(r) Move captain's control column slowly aft and hold at indicated elevator position. Check that following conditions are met:

CAPTAIN'S CONTROL COLUMN AFT	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED - POUNDS
1.95 ±0.05 in. up	18.0 ±2.0
6.95 ±0.05 in. up	35.0 ±3.5

(s) Move captain's control column slowly forward and hold at indicated elevator position. Check that following conditions are met:

CAPTAIN'S CONTROL COLUMN AFT	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED - POUNDS
1.95 ±0.05 in. up	19.0 ±2.0
6.15 ±0.05 in. up	35.0 ±3.5

(t) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.
(u) Perform test of step (r).
(v) Perform test of step (s).
(w) Position flight controls hydraulic system A switch to OFF and system B switch to ON.

(x) Perform test per step (r).
(y) Perform test per step (s).
(z) Position flight controls hydraulic system B switch to OFF.

(4) Check autopilot authority as follows:

NOTE: Ensure that entire pitch channel of autopilot system is operational before proceeding.

Ensure that elevator and feel computer are properly adjusted before proceeding.

(a) Set horizontal stabilizer B dimension at 41.57 ± 0.01 inches.
(b) Make sure that the following circuit breakers involved with autopilot pitch channel operation are engaged.
 1) Central Air Data Computer
 2) Vertical Gyro No. 1
 3) Pitch Channel
 4) Autopilot Interlock
(c) Open the stabilizer trim circuit breakers to disengage the stabilizer from electric operation.
(d) Loosen vertical gyro No. 1 from its mounting in the electronics bay.
(e) Using air pressure regulator, increase pitot pressure to 3.50 ±0.05 psi (370 ±3 knots).

CAUTION: DO NOT EXCEED 6 PSI (474 KNOTS) TO THE PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

(f) Position flight controls hydraulic system B switch to ON. Make sure flight controls system A switch is OFF.
(g) Select system B on the autopilot control panel.
(h) Wait 10 seconds and then engage the pitch axis on the autopilot control panel.
(i) Tilt the vertical gyro approximately 20 degrees front end down and hold.

(j) Measure and record right elevator trailing edge displacement with respect to index mark.
(k) Tilt the vertical gyro approximately 20 degrees front end up and hold.
(l) Measure and record right elevator trailing edge displacement with respect to index mark.
(m) Relevel the vertical gyro.
(n) Disengage the pitch axis.
(o) Add the displacements of steps (j) and (l). Check that total displacement is 3.51 ±0.56 inches.
(p) Turn on hydraulic system A flight controls switch.
(q) Repeat steps (h) thru (n) above.
(r) Check that total displacement of steps (j) and (l) is 2.88 ±0.46 inches.
(s) Select system A on the autopilot control panel.

NOTE: Steps (s) thru (y) apply only to airplanes with dual autopilot select modes.

(t) Repeat steps (h) thru (n) above.
(u) Check that total displacement of steps (j) and (l) is 2.88 ±0.46 inches.
(v) Turn off hydraulic system B flight controls switch.
(w) Repeat steps (h) thru (n) above.
(x) Check that total displacement of steps (j) and (l) is 3.51 ±0.56 inches.
(y) Set stabilizer jackscrew B dimension at 42.28 ±0.01 inches.
(z) Reduce 3.5 psi (370 ±3 knots) pitot pressure to zero. Then increase pressure to 2.80 ±0.05 psi (334 ±3 knots).

CAUTION: DO NOT EXCEED 6 PSI (474 KNOTS) TO THE PITOTS AT ANY TIME DURING THIS TEST. OVERPRESSURE MAY DAMAGE FEEL COMPUTER.

(aa) Repeat steps (h) thru (n) above.

NOTE: Steps (ab) thru (af) apply only to airplanes with dual autopilot select modes.

(ab) Check that total displacement of steps (j) and (l) is 3.07 ±0.49 inches.
(ac) Turn on hydraulic system B flight controls switch.
(ad) Repeat steps (h) thru (n) above.
(ae) Check that total diplacement of steps (j) and (l) is 2.43 ±0.39 inches.
(af) Select system B on the autopilot control panel.
(ag) Repeat steps (h) thru (n) above.
(ah) Check that total displacement of steps (j) and (l) is 2.43 ±0.39 inches.
(ai) Turn off hydraulic system A flight controls switch.
(aj) Repeat steps (h) thru (n) above.

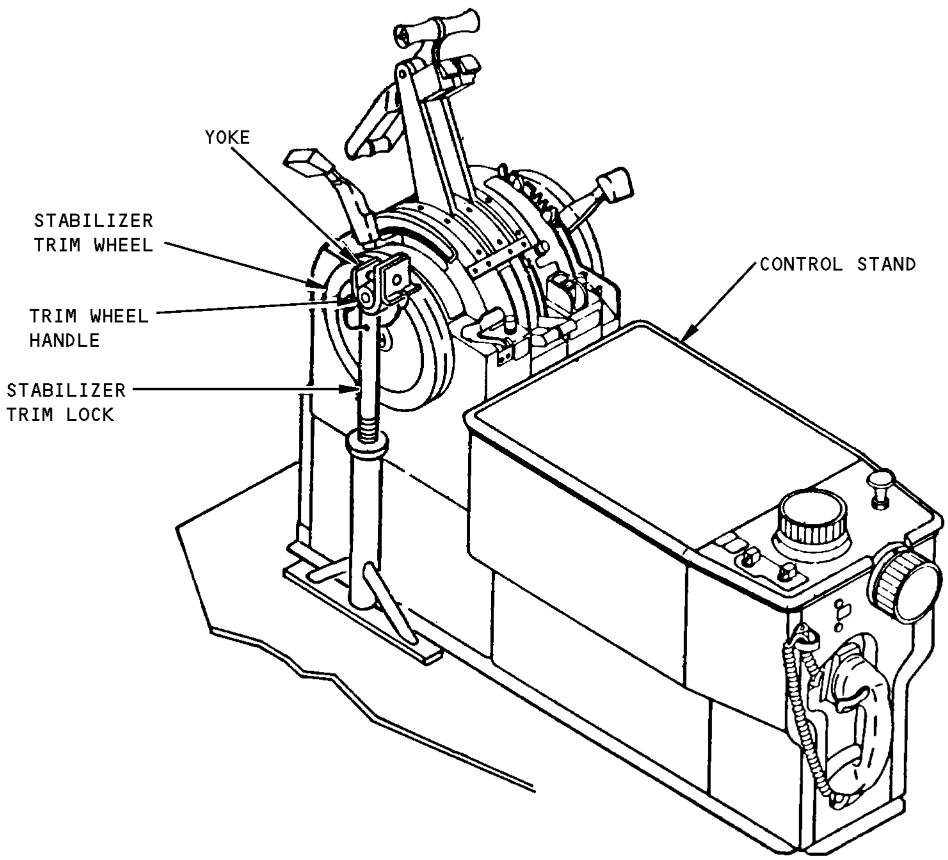
(ak) Check that total displacement of steps (j) and (l) is 3.07 ±0.49 inches.
(al) Reduce 2.8 psi (334 ±3 knots) pitot pressure to zero.

S. Restore Airplane to Normal

(1) Ensure that all tools used during testing are removed.
(2) Remove all masking tape.
(3) Remove seals from drain holes in each vertical fin pitot tube.

CAUTION: MAKE SURE SEALS ARE REMOVED FROM PITOT TUBES.

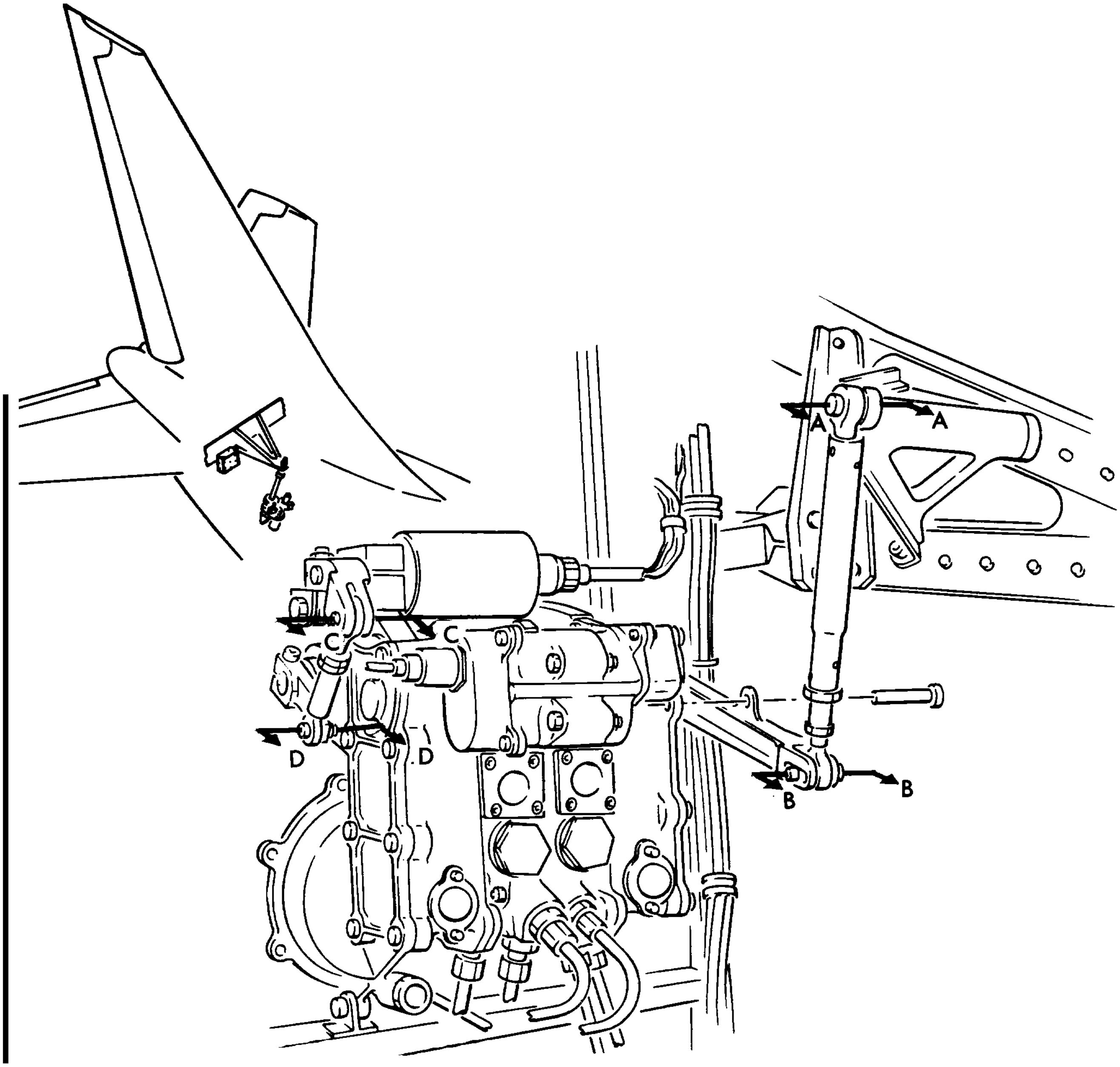
(4) Remove pressure gage lines from systems A and B drain lines located below feel computer.
(5) Install drain plugs on systems A and B drain lines located below feel computer.
(6) Remove regulated air pressure lines from both vertical fin pitot tubes.
(7) Open the vertical gyro circuit breaker and wait 10 minutes before remounting gyro.
(8) Close all circuit breakers opened during testing.
(9) Install access panels.
(10) Remove stabilizer trim lock (Fig. 404).
(11) Restore airplane to normal hydraulic configuration (Ref 27-31-0).
(12) Service hydraulic reservoirs, if required (Ref Chapter 12, Hydraulic Servicing).
(13) Remove electrical power if no longer required.



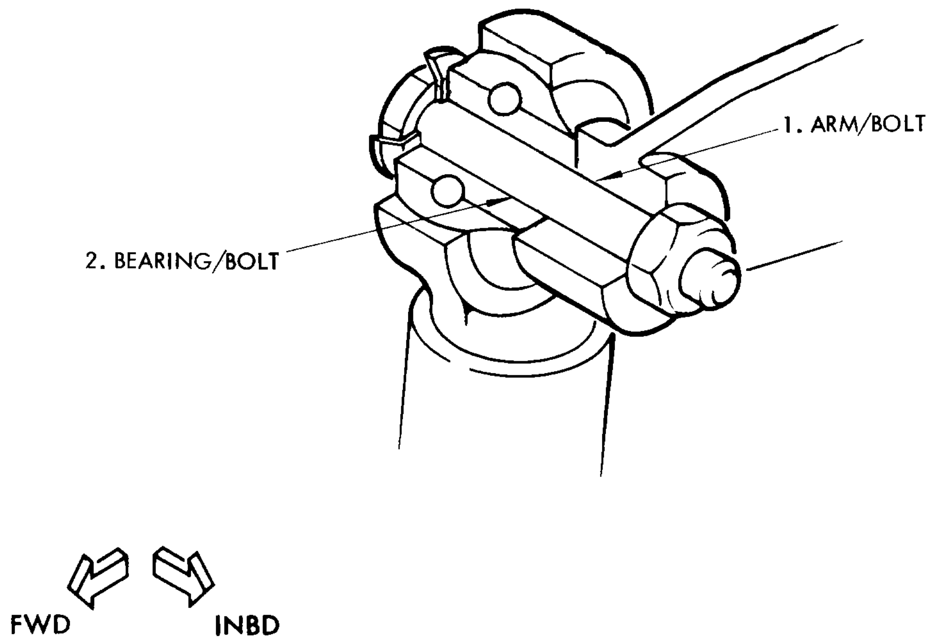
Stabilizer Trim Lock Installation
Figure 404

ELEVATOR FEEL COMPUTER - INSPECTION/CHECK

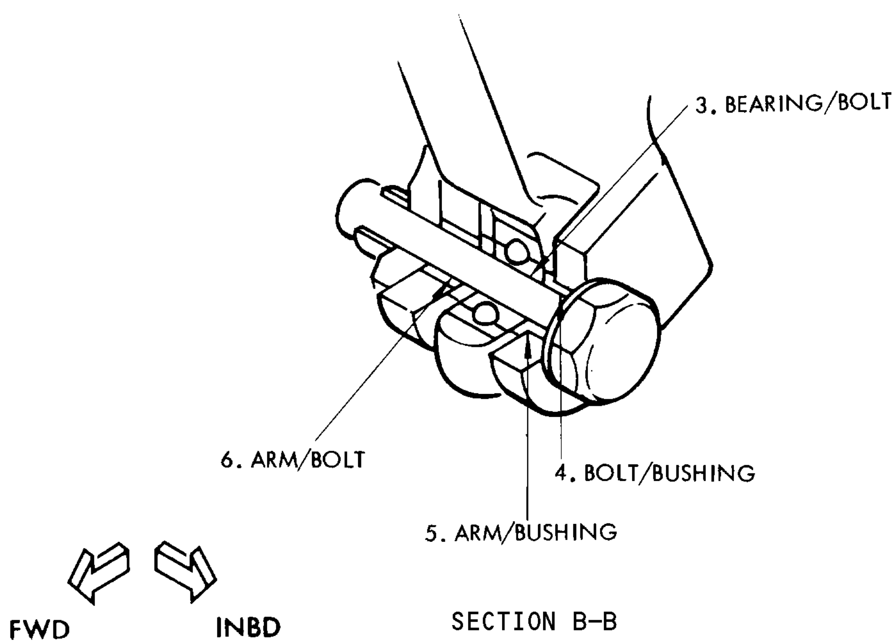
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the components after inspection for wear. Refer to Component Removal/Installation for this information.
2. Elevator Feel Computer Wear Limits



Elevator Feel Computer Wear Limits
Figure 601 (Sheet 1)

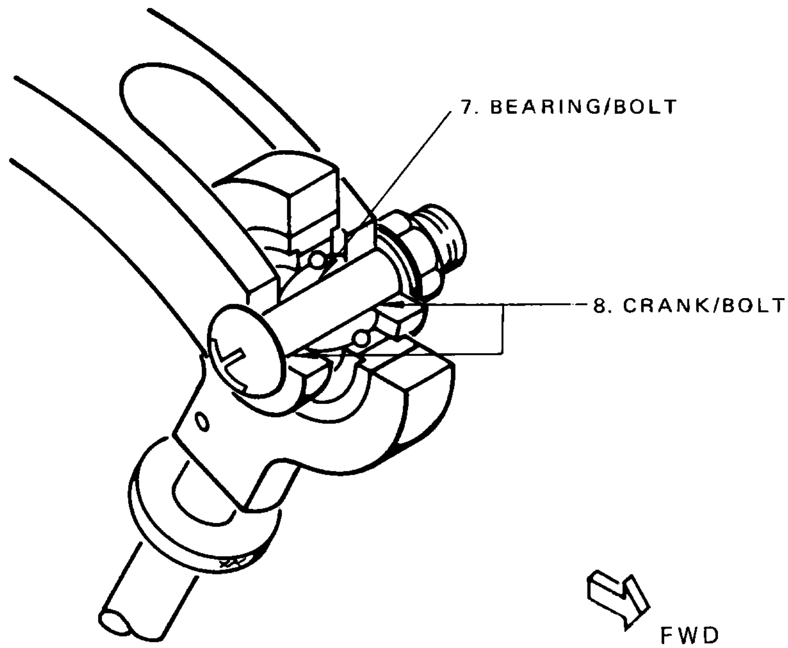


SECTION A-A

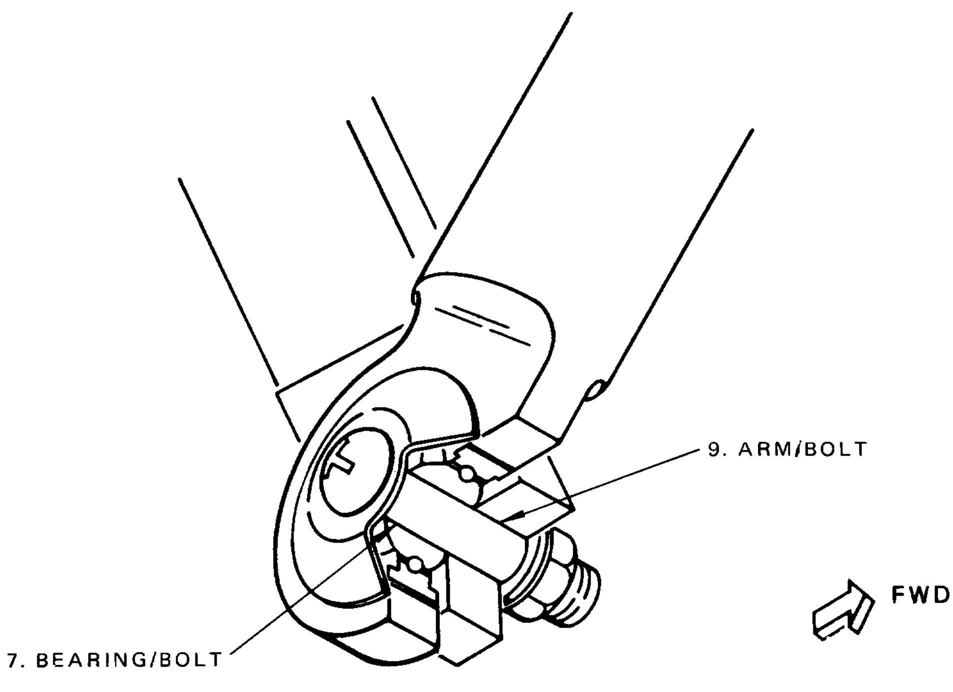


SECTION B-B

Elevator Feel Computer Wear Limits
Figure 601 (Sheet 2)



SECTION C-C



SECTION D-D

Elevator Feel Computer Wear Limits
Figure 601 (Sheet 3)

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clearance	Replace Worn Part	Repair Part	Repair Instr
1	ARM	ID	0.2495	0.2505	0.2535	0.0040		X	*[1]
	BOLT	OD	0.2485	0.2495	0.2481		X		
2	BEARING	ID	0.2497	0.2500	0.2530	0.0035	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
3	BEARING	ID	0.2495	0.2500	0.2530	0.0035	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
4	BUSHING	ID	0.2495	0.2505	0.2525	0.0035	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
5	ARM	ID	0.3762	0.3767	0.3785	0.0040		X	*[2]
	BUSHING	OD	0.3754	0.3761	0.3745		X		
6	ARM	ID	0.2495	0.2505	0.2535	0.0040	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
7	BEARING	ID	0.1895	0.1900	0.1945	0.0050	X		
	BOLT	OD	0.1870	0.1895	0.1866		X		
8	CRANK	ID	0.1895	0.1905	0.1950	0.0055	X		
	BOLT	OD	0.1870	0.1895	0.1866		X		

Index No.	Part Name	Dim	Design Limits Diameter Min.	Design Limits Diameter Max.	Wear Limits Max Wear Dim.	Wear Limits Max Dia. Clearance	Replace Worn Part	Repair Part	Repair Instr
9	ARM	ID	0.1895	0.1900	0.1945	0.0050		X	*[3]
	BOLT	OD	0.1870	0.1895	0.1866		X		

NOTE: ALL DIMENSIONS ARE IN INCHES.

*[1] OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0002 TO 0.0013 INCH INTERFERENCE FIT (0.3754 INCH MAXIMUM). REAM BUSHING TO 0.2495/0.2505 INCH DIAMETER.

*[2] INSTALL NEW 65-51237-4 BUSHING TO MAXIMUM DIAMETER OVERSIZE OF 0.4000. MATERIALWIDTH REMAINING BETWEEN EDGE OF HOLE AND OUTER EDGE OF ARM MUST NOT BE LESS THAT 0.14 INCH.

*[3] OBTAIN BUSHING. BORE HOLE TO ATTAIN 0.0002 TO 0.0013 INCH INTERFERENCE FIT (0.3129 INCH MAX). REAM BUSHING TO 0.1895 TO 0.1900 INCH DIAMETER.

FEEL SYSTEM PITOT TUBE - REMOVAL/INSTALLATION

1. Prepare for Removal
   A. Position PITOT HEAT switches on the forward overhead panel to OFF. Tag switches.

      CAUTION: ALLOW SUFFICIENT TIME FOR PITOT TUBE TO COOL BEFORE HANDLING, OTHERWISE SERIOUS BURNS MAY RESULT.

   B. Remove vertical stabilizer access panel 9525 (Ref Chapter 12).
2. Remove Pitot Tube
   A. Disconnect pitot heater electrical connector and pitot air connector from back of pitot tube (Fig. 401).
   B. Support pitot tube and remove three mounting bolts.
   C. Remove pitot tube and gasket.
   D. Install protective cap on pitot air line.
3. Install Pitot Tube
   A. Equipment
      (1) Ohmmeter - M-1 Micro-ohm, Automatic, Stores 128 readings, RS-232 Data Port, Range: 0.01-19,999.0 Milliohms, 4 1/2 Digit Display Accy: 0.1% of Readings (recommended)
          Barberree Custom Design , 1401 Laurier House, 1600 Beach Avenue, Vancouver, BC Canada V6G 1Y6
      (2) Ohmmeter - C15292 Electrical Bonding (Model T477W) (alternative)
          Avtron Manufacturing, Inc, 7900 E. Pleasant Valley Road, Independence, OH 44131.
      (3) Ohmmeter - Micro, Autoranging/Autotest, 10 Micro Ohms to 200 Ohms, Accuracy: 0.05% (alternative)
          Barberree Custom Design, 1401 Laurier House, 1600 Beach Avenue, Vancouver, BC Canada V6G 1Y6
      (4) Ohmmeter - Measures 0.010 ohms with a precision of +/- 0.001 ohm (alternative).
   B. Inspect probe (Ref 34-11-11 I/C).
   C. To ensure good electrical ground, thoroughly clean area inside vertical fin contacted by pitot tube mounting bolts.
   D. Position pitot tube gaskets and wedge on vertical fin (Fig. 401).
   E. Apply a bead of RTV 174 adhesive (Ref 20-30-11) around tube tongue, tighten mounting bolts and remove excess sealant.
   F. RTV 174 adhesive can be used in place of gasket between pitot tube and wedge.

      NOTE: Do not use adhesive in place of gasket between wedge and fin.

   G. Remove protective cap and attach pitot air connector to pitot tube.
   H. Refit electrical connector to pitot tube.

      CAUTION: WHEN MATING CONNECTOR TO PITOT HEATER PINS, CONNECTOR SHOULD BE PUSHED STRAIGHT ON WITHOUT "WALKING," TO AVOID SOCKET ENLARGEMENT.

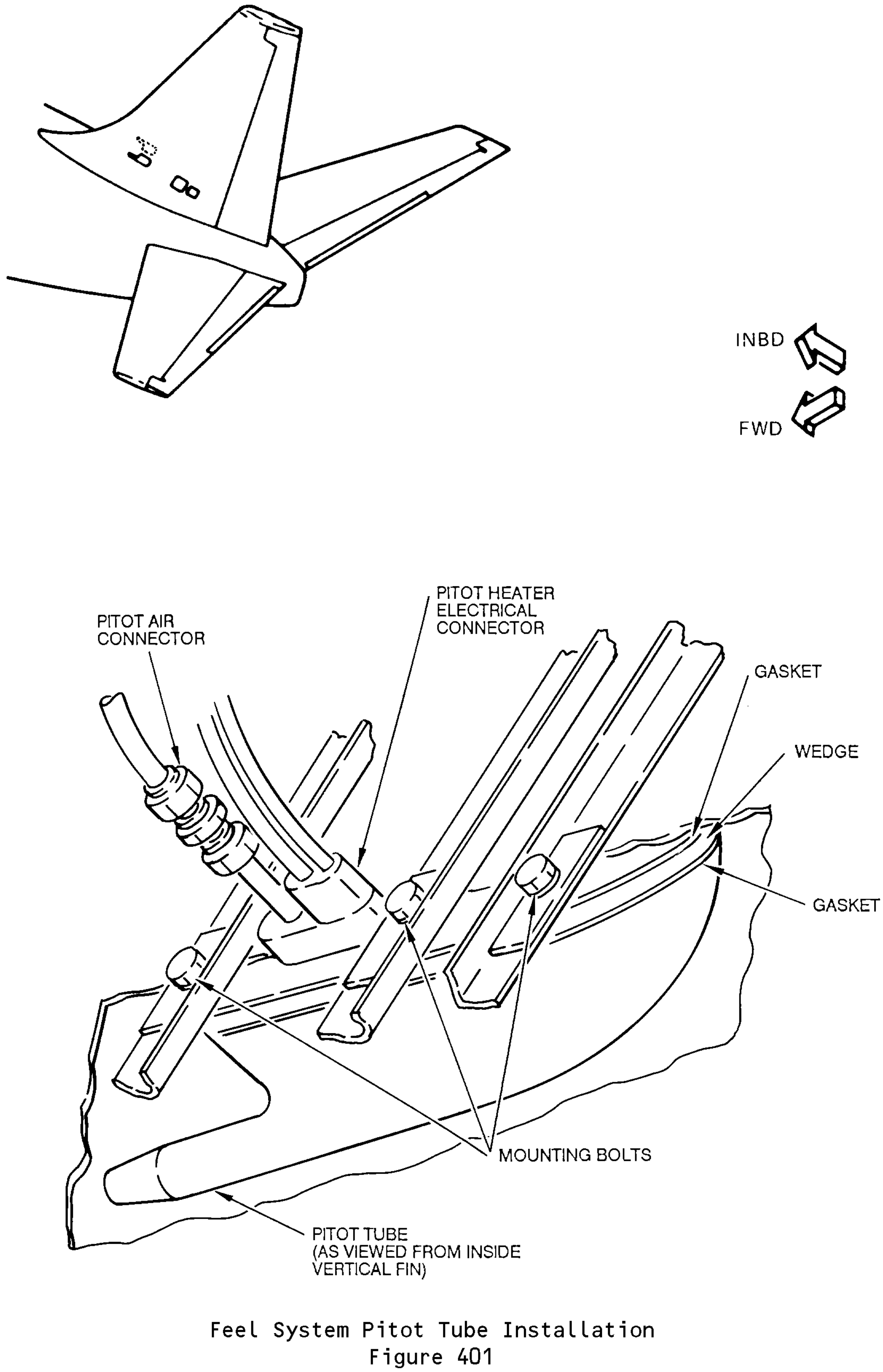
I. Measure the resistance between the bottom of the pitot probe and the airplane skin with an ohmmeter.
   (1) If the resistance is more than 0.010 ohm, do these steps:
      (a) Remove the pitot probe.
      (b) Clean the bonding surfaces of the pitot probe (SWPM 20-20-00).
      (c) Inspect the mounting bolts and internal threaded surfaces of the pitot probe to determine the source of the additional resistance and clean as required.
      (d) Re-install the pitot probe.
      (e) Measure the resistance between the base of the pitot probe and the airplane skin with an ohmmeter.
      (f) If the resistance is more than 0.010 ohm, do these steps:
         1) Remove the pitot probe.
         2) Replace the existing mounting bolts that attach the pitot probe.
         3) Re-install the pitot probe and make sure the bonding resistance is not more than 0.010 ohm.

J. Install access panel.

K. Remove tag from PITOT HEAT switches.

L. Test for pressure leakage in feel pitot system per 27-31-212 A/T.

M. Test pitot heater in accordance with procedure in Chapter 30, Pitot Static and Temperature Probe Anti-icing System - A/T.



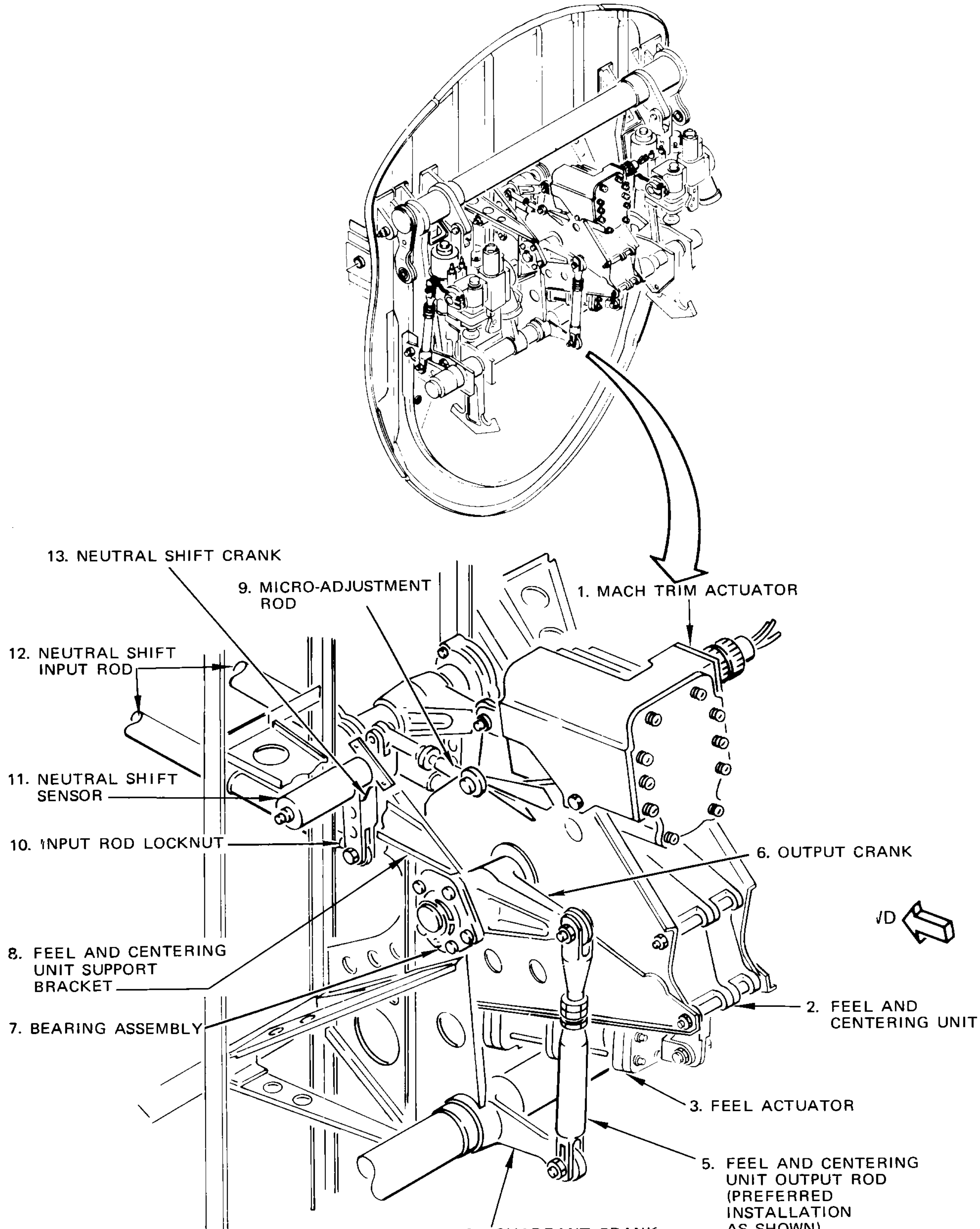
Feel System Pitot Tube Installation
Figure 401

FEEL AND CENTERING UNIT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Trammel Bar - F80055-1
   C. Stabilizer Trim Lock - F71336-501
2. Prepare for Removal
   A. Open aft compartment access door 3701 and remove tail cone access panel 3802.
   B. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   C. Install rigging pin E-5 in aft control quadrant.
   D. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 402).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
3. Remove Feel and Centering Unit (Fig 401)
   A. Remove two mounting bolts attaching feel actuator (3) to feel and centering unit (2). Tie feel actuator to adjacent structure to avoid damage to flexible hydraulic lines.
   B. Disconnect feel and centering unit output rod (5) from aft control quadrant crank (4).
   C. Remove mach trim actuator (1) from feel and centering unit (Ref Chapter 22, Mach Trim Actuator - R/I).
   D. Disconnect microadjustment rod (9) from feel and centering unit.
   E. Remove four bolts securing each bearing assembly (7) to feel and centering unit support bracket (8).
   F. Remove feel and centering unit from airplane. Remove retainer nut, bearing housing assembly (7), and output crank (6) with feel and centering unit output rod (5) attached from feel and centering unit shaft, and retain for installation with new feel and centering unit.



Feel and Centering Unit Installation
Figure 401

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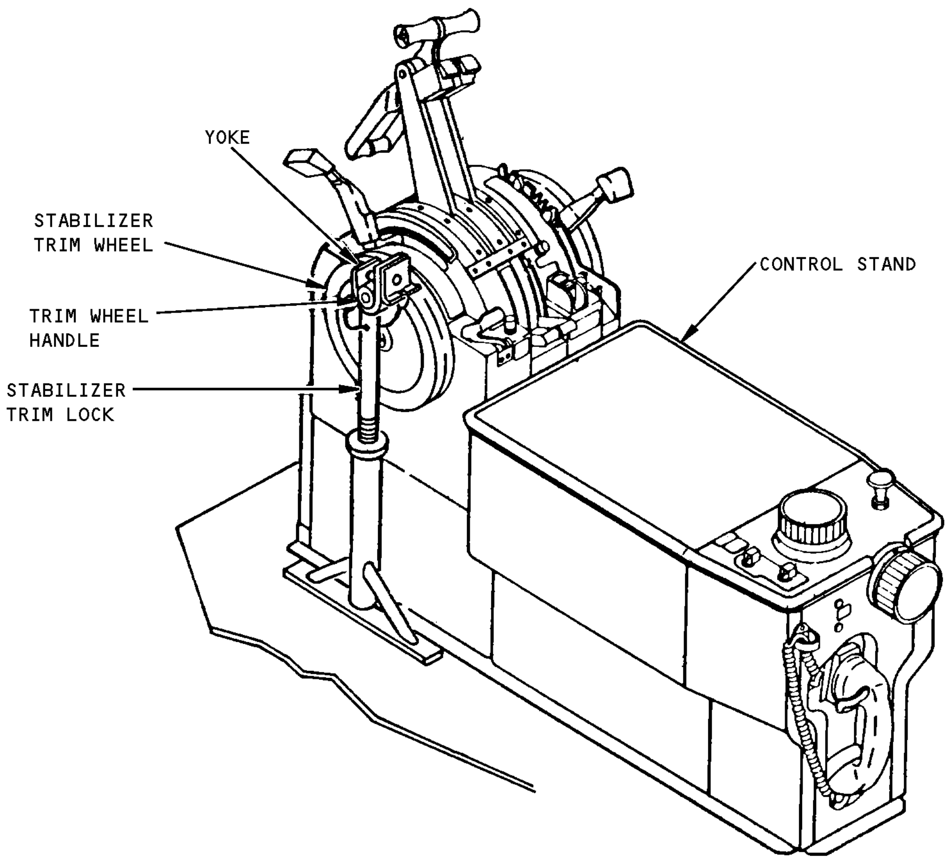


Stabilizer Trim Lock Installation
Figure 402

U58377

4. Prepare for Installation
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
   B. Check that rigging pin E-5 is installed in aft control quadrant.
   C. Check for allowable wear at feel and centering unit installation points (Ref 27-31-151, I/C).

      CAUTION: NEUTRAL SHIFT TUBE AND CRANK ASSEMBLY, FEEL AND CENTERING UNIT OUTPUT ROD AND DUAL CONCENTRIC BOLTS ARE DUAL LOAD PATH COMPONENTS. INSPECT INNER AND OUTER RODS/BOLTS FOR DAMAGE PRIOR TO INSTALLATION.

   D. Adjust neutral shift linkage per 27-31-0, A/T.
   E. Assemble output crank (6) to feel and centering unit as follows:
      (1) Line up spline indices on output crank (6) and feel and centering unit shaft and slide crank onto shaft.
      (2) Install two clamp bolts, nuts, and washers in output arm. Tighten nuts 30 to 40 pound-
          inches.
   F. Install assembly of bearing and housing over end of shaft on feel and centering unit. Install retainer nut and tighten 150 to 200 pound-inches.
5. Install Feel and Centering Unit
   A. Position feel and centering unit (2, Fig. 401) on support bracket.
   B. Position feel and centering unit between flanges of mounting bracket and line up bolt installation holes in bearing housings and bracket.
   C. Install four bolts through each bearing assembly (7) into support bracket (8).

      NOTE: Ensure that short bolts are used in left bearing assembly and long bolts are used in right bearing assembly.

   D. Install feel actuator (3) on feel and centering unit as follows:
      (1) With feel actuator (3) positioned beneath feel and centering unit, install both mounting bolts from left to right.
      (2) Install first locknut on forward bolt and tighten 120 to 140 pound-inches.
      (3) Install second locknut and tighten 60 to 85 pound-inches.
      (4) Install first locknut on aft bolt and tighten 85 to 100 pound-inches.

         CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUTS, DO NOT ATTEMPT TO RESET TORQUE VALUE ON FIRST LOCKNUTS.

      (5) Install second locknut and tighten 30 to 35 pound-inches.
   E. Install mach trim actuator (1) on feel and centering unit, then set actuator to null position (Ref Chapter 22, Mach Trim Actuator - R/I, and 27-31-0, MP).

F. Attach micro-adjustment rod (9) on feel and centering unit (neutral shift sensor crank should be up).
G. Attach feel and centering unit output rod as follows:

NOTE: Install output rod with clevis end up.

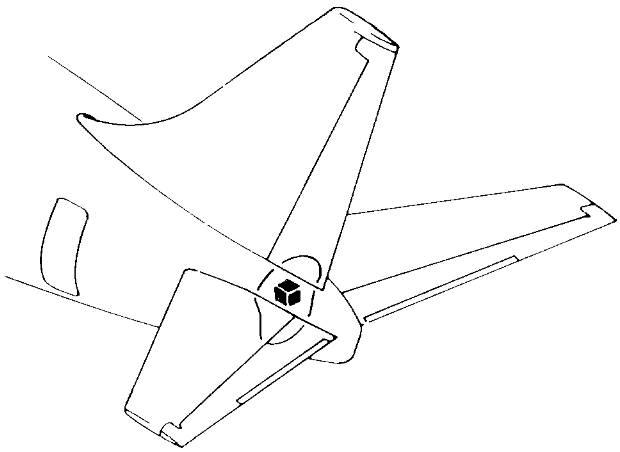
(1) Visually inspect dual loadpath components for damage prior to installation.
(2) Connect output rod (5) to output crank (6) and aft control quadrant crank (4) utilizing dual loadpath bolts, nuts and washers.
(3) Tighten nuts 75 to 85 pound-inches.

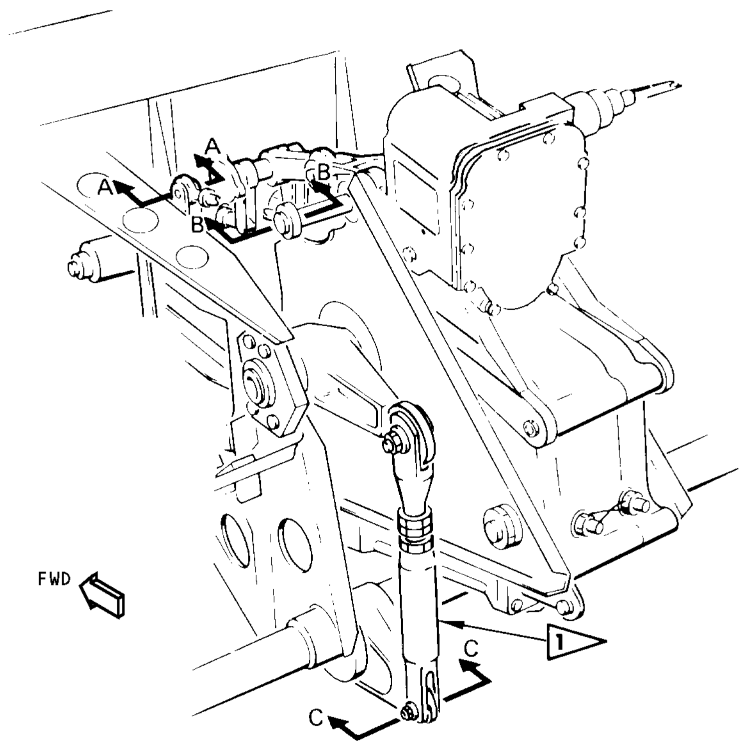
H. Check that neutral shift sensor (11) is nulled (Ref Chapter 22, Elevator Neutral Shift Sensor - A/T).
I. Remove rigging pin E-5 from aft control quadrant.
J. Move control column fore and aft through full range of travel and check that movement is smooth.
K. Adjust feel and centering unit output rod (5) per 27-31-0, A/T.
L. Perform test of feel force system and autopilot authority (Ref 27-31-0, A/T).
M. Check hydraulic connections at feel actuator for signs of leakage.

6. Restore Airplane to Normal
A. Replace access panels and close access doors.
B. Remove stabilizer trim lock (Fig. 402).
C. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).
D. Service hydraulic reservoirs, if required (Ref Chapter 12, Hydraulic Servicing).

ELEVATOR FEEL AND CENTERING UNIT - INSPECTION/CHECK

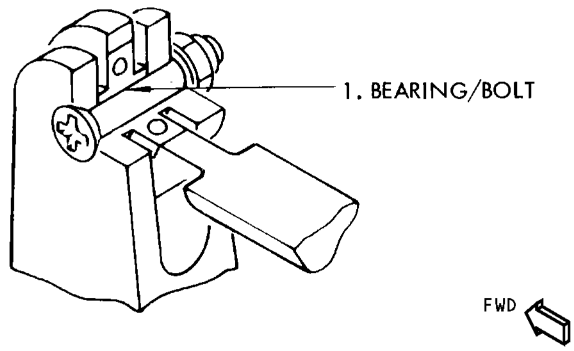
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the components after inspection for wear. Refer to Component Removal/Installation for this information.
2. Elevator Feel and Centering Unit Wear Limits



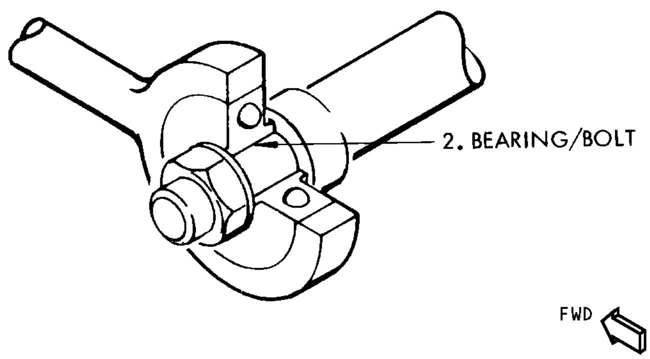


1 PREFERRED INSTALLATION SHOWN

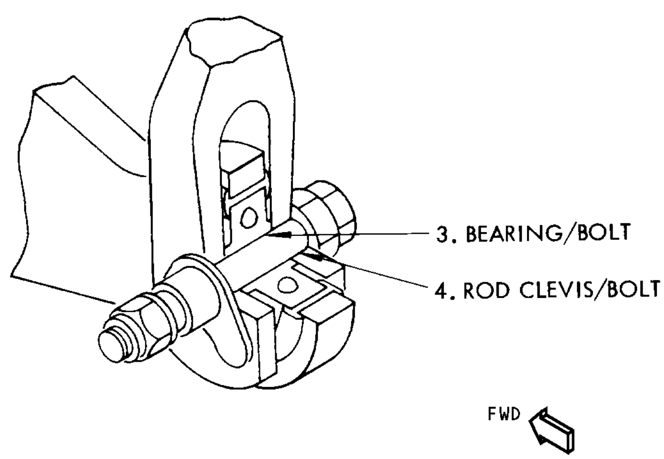
Elevator Feel and Centering Unit Wear Limits
Figure 601 (Sheet 1)



SECTION A-A

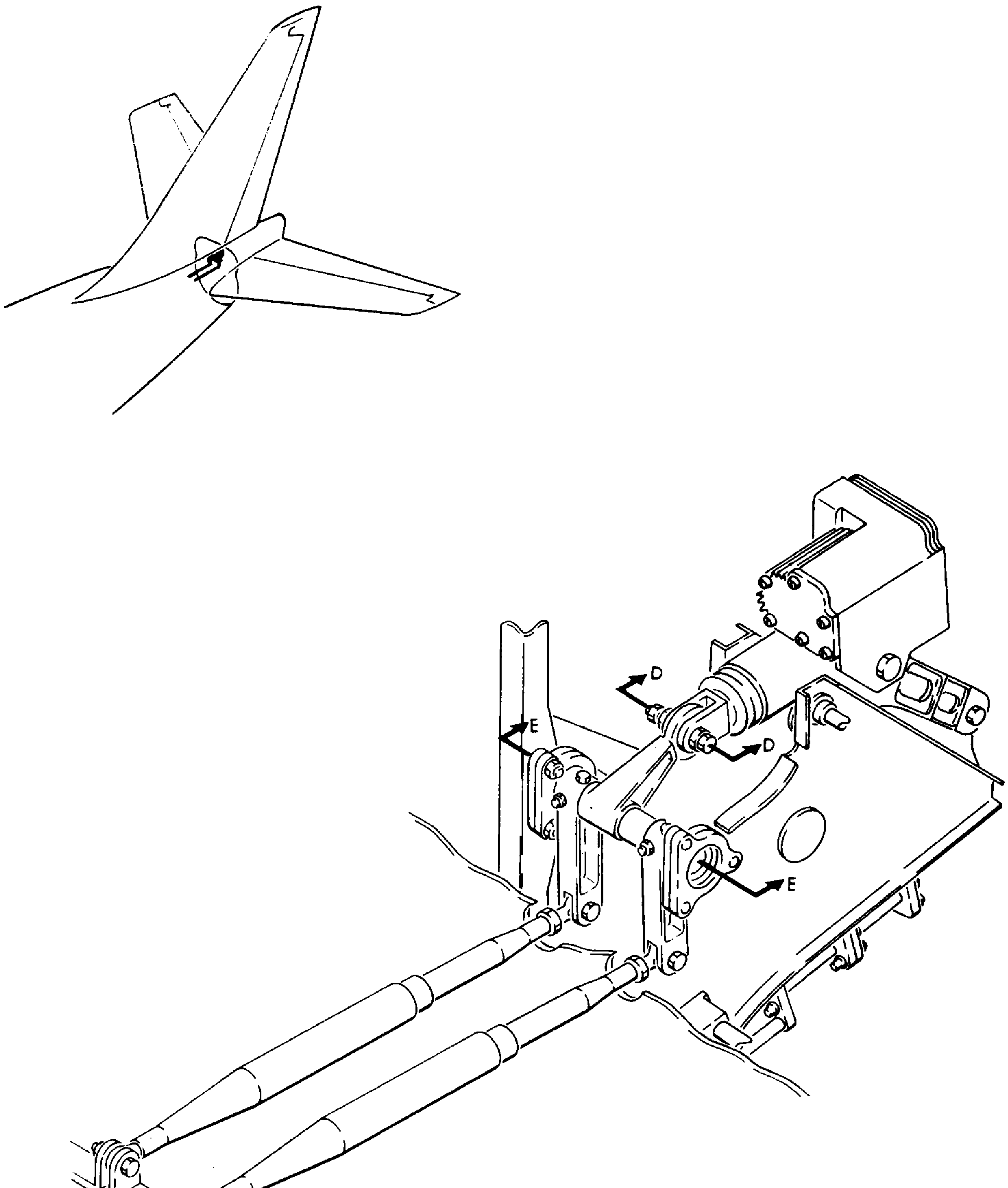


SECTION B-B

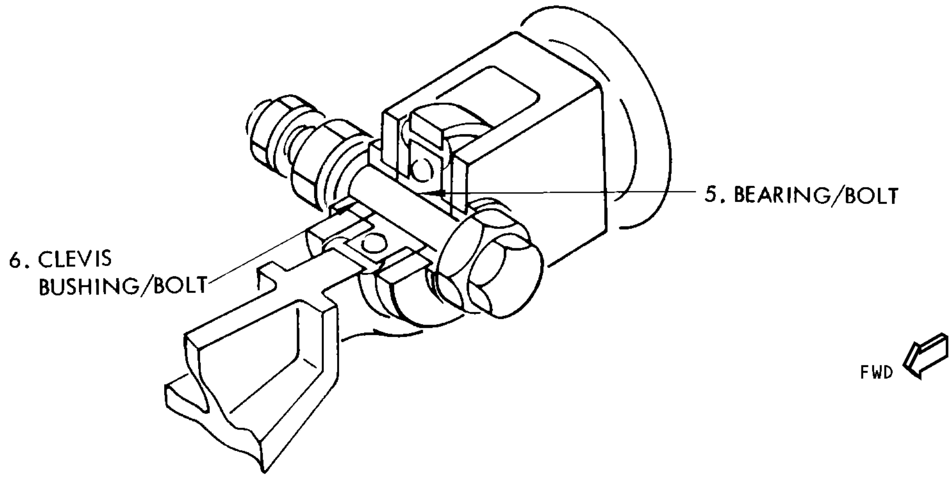


SECTION C-C

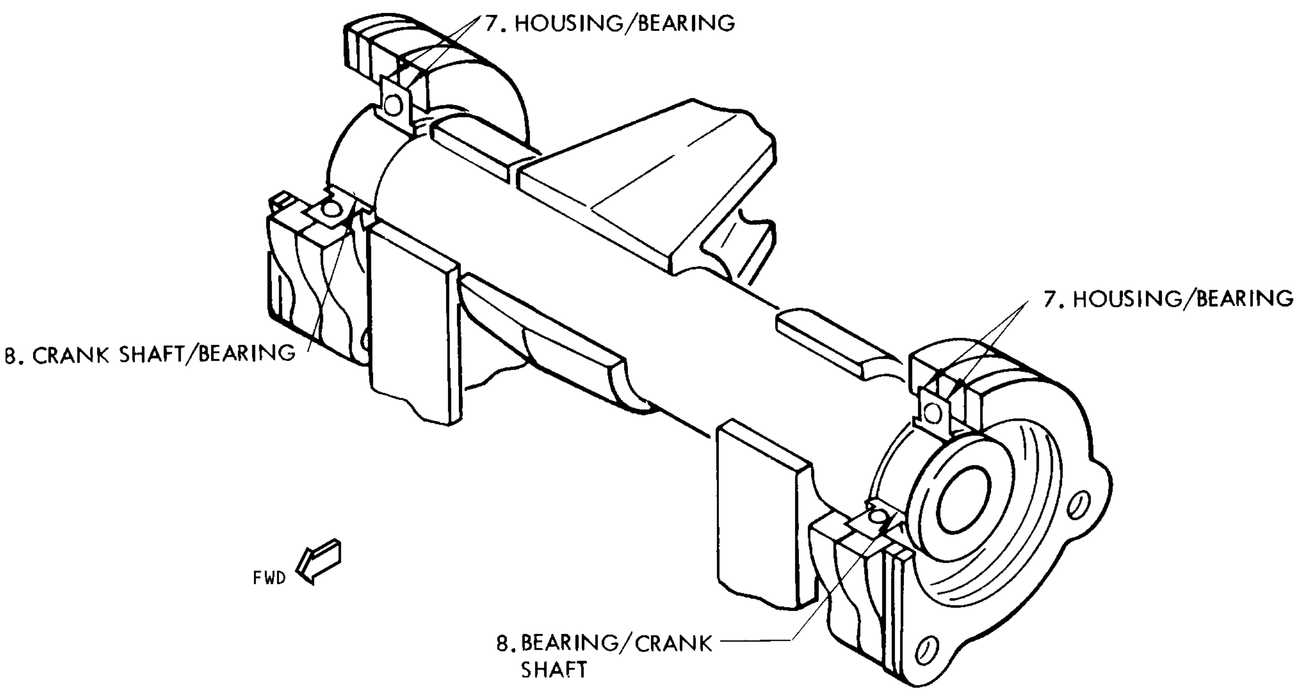
Elevator Feel and Centering Unit Wear Limits
Figure 601 (Sheet 2)



Elevator Feel and Centering Unit Wear Limits
Figure 601 (Sheet 3)



SECTION D-D



SECTION E-E

Elevator Feel and Centering Unit Wear Limits
Figure 601 (Sheet 4)

INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMTS MAX WEAR DIM.	WEAR LIMTS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.1895	0.1900	0.1930	0.0035	X		
	BOLT	OD	0.1885	0.1895	0.1881		X		
2	BEARING	ID	0.3120	0.3125	0.3155	0.0037	X		
	BOLT	OD	0.3108	0.3118	0.3104		X		
3	BEARING	ID	0.3120	0.3125	0.3155	0.0035	X		
	BOLT	OD	0.3110	0.3120	0.3106		X		
4	ROD CLEVIS	ID	0.3120	0.3130	0.3160	0.0040		X	1
	BOLT	OD	0.3110	0.3120	0.3106		X		
5	BEARING	ID	0.3745	0.3750	0.3780	0.0035	X		
	BOLT	OD	0.3735	0.3745	0.3731		X		
6	CLEVIS BUSHING	ID	0.3750	0.3765	0.3795	0.0050	X	2	
	BOLT	OD	0.3735	0.3745	0.3732		X		
7	HOUSING	ID	1.9375	1.9385	1.9415	0.0040	X		
	BEARING	OD	1.9365	1.9375	1.9360		X		
8	BEARING	ID	0.9990	1.0000	1.0025	0.0035	X		
	CRANK SHAFT	OD	0.9985	0.9990	0.9965		X		

1 OBTAIN BUSHING. BORE HOLE TO ATTAIN -0.0002 TO 0.0013 INCH INTERFERENCE FIT (0.4379 INCH MAXIMUM). REAM BUSHING TO 0.3120/0.3130 INCH DIAMETER.

2 REPLACE WORN BUSHING.

Elevator Feel and Centering Unit Wear Limits
Figure 601 (Sheet 5)

FEEL ACTUATOR - REMOVAL/INSTALLATION

1. General
   A. Further disassembly of the feel actuator should be accomplished using procedures given in the Overhaul Manual.
2. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Trammel Bar - F80055-1
   C. Masking Tape (AMM 20-30-51/201)
   D. Air Pressure Regulator - F72928-53 (Preferred), or -52 (Optional)
3. Remove Feel Actuator
   A. Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
   B. Remove tail cone access door 3802.
   C. Install rigging pin E-5 in aft control quadrant.
   D. Disconnect four flexible hydraulic lines from the feel actuator (Fig. 401). Cap and plug open ports and hydraulic lines.

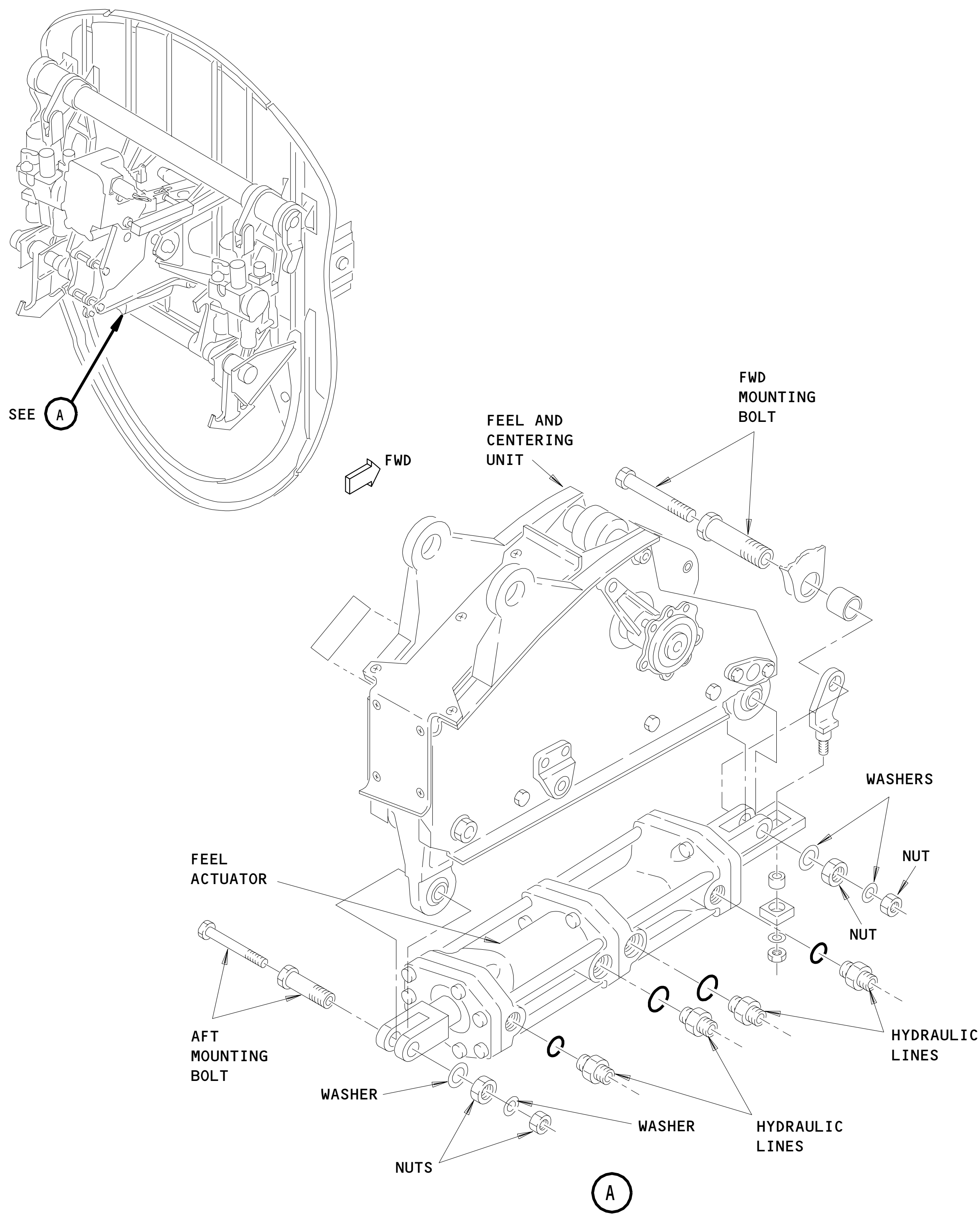
      CAUTION: HYDRAULIC PRESSURE OF 70 PSI MAY BE PRESENT IN SYSTEM A AND SYSTEM B PRESSURE AND RETURN LINES. WHEN DISCONNECTING HYDRAULIC LINES, RELEASE CONNECTION SLOWLY AND ALLOW SYSTEM PRESSURE TO BLEED OFF BEFORE COMPLETE REMOVAL.

   E. Detach feel actuator forward and aft mounting bolts and remove feel actuator from airplane.
4. Install Feel Actuator
   A. Remove elevator systems A and B hydraulic power (AMM 27-31-0/201).
   B. Check that rigging pin E-5 is installed in aft control quadrant.

C. Install feel actuator forward and aft mounting bolts as follows:
   (1) With feel actuator positioned beneath feel and centering unit, install both mounting bolts from left to right (Fig. 401).
   (2) Install first locknut on forward bolt and tighten 120 to 140 pound-inches.
   (3) Install second locknut and tighten 60 to 85 pound-inches.
   (4) Install first locknut on aft bolt and tighten 85 to 100 pound-inches.
   (5) Install second locknut and tighten 30 to 35 pound-inches.

   CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUTS, DO NOT ATTEMPT TO RESET TORQUE VALUE ON FIRST LOCKNUTS.

D. Remove protective plugs and caps and refit four flexible hydraulic lines to feel actuator.
E. Remove rigging pin E-5 from aft control quadrant.
F. Provide elevator systems A and B hydraulic power (Ref 27-31-0, MP).
G. Move control column fore and aft through full range of travel until movement is smooth and artificial feel is normal to bleed air from system. As air is bled out, artificial feel forces increase.
H. Check hydraulic connections at feel actuator for signs of leakage.
I. Test feel force system.
   (1) Test differential pressure switch.
      (a) Set TE flaps to full up position.
      (b) Check that feel differential pressure light is OFF. pressure light is ON.
      (c) Position flight controls hydraulic system A switch to ON and system B switch to OFF. Check that feel differential pressure light is ON.
      (d) Position flight controls hydraulic system B switch to ON.
      (e) Operate captain's control column at a constant rate from full forward to full aft to full forward in approximately 2 seconds (27.5°/sec). The feel differential pressure light may flicker when stops are contacted, but check that light does not remain ON.



Feel Actuator Installation
Figure 401

(2) Check for pressure leakage in feel pitot system as follows:
(a) Seal drain hole in each feel pitot tube located on fin.
(b) Remove drain plugs from system A and system B pitot lines, located below feel computer.
(c) Attach pressure gage lines from air pressure regulator to pitot system A and B drain holes, located below feel computer.
(d) Attach regulated air pressure line from air pressure regulator to both pitot tubes on fin and pressurize pitot system to 5.0 ±0.1 psi (437 ±4 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST.

(e) Cut off pressure source by turning shutoff valve in air pressure regulator to off.
(f) Pressure shall not drop more than 0.3 psi (12 knots) during a 2-minute period.
(g) Reduce pitot pressure to zero.

(3) Check feel forces as follows:

NOTE: Ensure that elevator and feel computer are properly adjusted before proceeding.

(a) Set the horizontal stabilizer B dimension at 41.57 ±0.01 inches.
(b) Set mach trim actuator in null position (Ref 27-31-0 MP).
(c) Check that flight controls hydraulic systems A and B switches are positioned to ON.
(d) Using air pressure regulator, pressurize pitot system to 3.50 ±0.05 psi (370 ±3 knots).

CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

(e) Apply masking tape on tail cone along direction of right elevator trailing edge travel.

NOTE: Elevator travel measuring tool may be used in lieu of tape method.

(f) Shake captain's control column lightly fore and aft to ensure that system is centered, and release.

NOTE: Ensure that control columns are not disturbed from this position during the next step.

(g) Mark actual elevator trailing edge neutral position on masking tape.

(h) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.

NOTE: Pitot system check per step (2) must be satisfactory. Jiggle control column prior to each reading. Elevator position refers to actual elevator travel as measured from actual elevator neutral position. Using actual elevator trailing edge neutral position as a reference, mark elevator positions on masking tape.

(i) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.

(j) Position flight controls hydraulic system B switch to OFF, leave system A switch ON.

(k) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.

(l) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.

(m) Position flight controls hydraulic system A switch to OFF and system B switch to OFF.
(n) Move captain's control column slowly aft and hold at indicated elevator position of 1.95 ±0.05 inches up on right elevator. Check that force to hold column is 37.5 ±4.0 pounds.
(o) Move captain's control column slowly forward and hold at indicated elevator position of 1.95 ±0.05 inches down on right elevator. Check that force to hold column is 38.5 ±4.0 pounds.
(p) Position flight controls hydraulic system A switch to ON.
(q) Reduce 3.50 ±0.05 psi (370 ±3 knots) dynamic pressure being applied to pitot tubes to zero pressure. Then increase pressure to 0.50 ±0.05 psi (145 ±7 knots).

<u>CAUTION</u>: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST. OVERPRESSURE MAY DAMAGE COMPUTER.

(r) Move captain's control column slowly aft and hold at indicated elevator position. Check that following conditions are met:

CAPTAIN'S CONTROL COLUMN AFT	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED POUNDS
1.95 ±0.05 in. up	18.0 ±2.0
6.95 ±0.05 in. up	35.0 ±3.5

(s) Move captain's control column slowy forward and hold at indicated elevator position. Check that following conditions are met:

CAPTAIN'S CONTROL COLUMN AFT	
RIGHT ELEVATOR POSITION	COLUMN FORCE REQUIRED POUNDS
1.95 ±0.05 in. up	19.0 ±2.0
6.95 ±0.05 in. up	35.0 ±3.5

(t) Position flight control hydraulic syste B switch to OFF, leave sytstem A switch A ON.
(u) Perform test of step (n).
(v) Perform test of step (s).
(w) Position flight controls hydraulic system A switch to OFF and system B switch is ON.
(x) Perform test per step (r).
(y) Perform test per step (s).
(z) Position flight controls hydraulic system B switch to OFF.

J. Restore Airplane to Normal
(1) Ensure that all tools used during testing are removed.
(2) Remove all masking tape.
(3) Remove seals from drain holes in each vertical fin pitot tube.

CAUTION: MAKE SURE SEALS ARE REMOVED FROM PITOT TUBES

(4) Remove pressure gage lines from systems A and B drain lines located below feel computer.
(5) Install drain plugs on system drain lines located below feel computer.
(6) Remove regulated air pressure lines from both vertical fin pitot tubes,
(7) Install access panels.
(8) Restore airplane to normal dydraulic configuration (Ref 27-31-0).
(9) Service hydraulic reservoirs, if required (Ref Chapter 13 Hydraulic Servicing).
(10) Remove electrical power if no longer required.

ELEVATOR SEALS - ADJUSTMENT/TEST

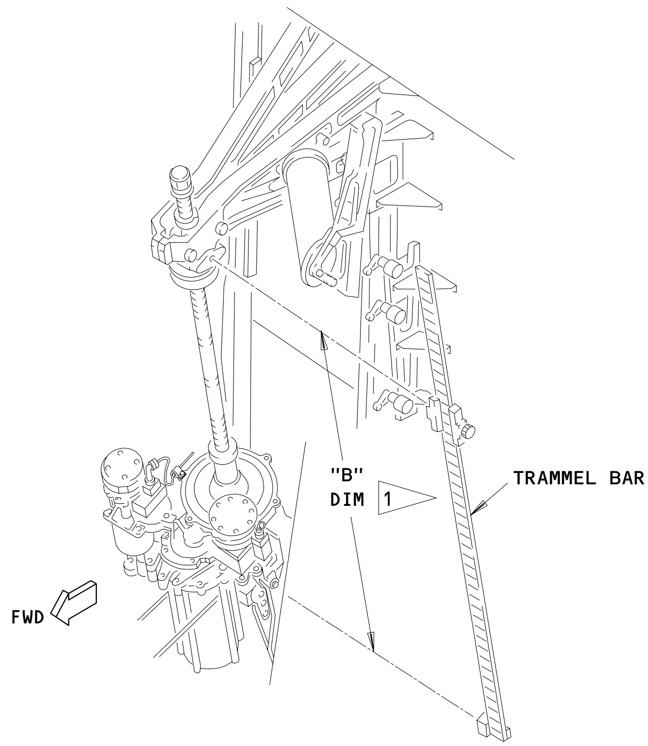
1. Elevator Seals Adjustment
   A. Equipment and Materials
      (1) Trammel Bar - F80055-1 (Ref 27-00 MP)
   B. Prepare for Adjustment
      (1) Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
      (2) Set horizontal stabilizer B dimension at 41.57 ±0.01 inches using trammel bar (Fig. 501).
      (3) Tag the control columns to avoid injury to personnel by unexpected movement of the elevator surfaces.
      (4) Remove the following access panels (Ref 12-31-81):
         (a) Stabilizer access panels 9107, 9108 and 9109 left stabilizer or 9207, 9208 and 9209 right stabilizer.
         (b) Elevator leading edge access panel located on elevator leading edge at stabilizer trailing edge ribs No. 1 thru 6 (Fig. 502).
   C. On Airplanes with Aluminum/Fiberglass Elevators; Adjust Elevator Seals (Fig. 502, Sheet 1)

      NOTE: During each seal adjustment, elevator trailing edge must align with index mark on tail cone within 0.06 inch.

      (1) At stabilizer trailing edge ribs No. 1, 3 and 5, adjust flat seals each side of elevator hinge as follows (Fig. 502, View A):
         (a) Loosen seal mounting bolts and adjust seal to provide 0.01 +0.06/-0.00-inch clearance between seal and elevator hinge.
         (b) Tighten seal mounting bolts and recheck seal clearance.
      (2) At stabilizer trailing edge ribs No. 1, 2, 3, and 4, adjust bulb seals along edge of elevator nose as follows (Fig. 502, View B):
         (a) Loosen seal mounting bolts and adjust seal to provide 0.02 ±0.01-inch clearance between the seal and rib.
         (b) Tighten seal mounting bolts and recheck seal clearance.
      (3) At stabilizer trailing edge ribs No. 2, 4 and 6, adjust bulb seals at elevator front spar as follows (Fig. 502, View C):
         (a) Loosen seal mounting bolts and adjust seal to provide +0.03/-0.00-inch interference between seal and aft face of stabilizer trailing edge rib.
         (b) Tighten seal mounting bolts and recheck seal tolerance.
      (4) At stabilizer trailing edge ribs No. 1, 2, 3 and 4, adjust bulb seals between balance panel and stabilizer trailing edge rib as follows (Fig. 502, View D):
         (a) Loosen seal mounting bolts and adjust seal to provide 0.02 ±0.01-inch clearance between seal and rib.
         (b) Tighten seal mounting bolts and recheck seal clearance.

(5) At stabilizer trailing edge ribs No. 1, 2, 3 and 4, adjust flat seals between balance panel idler hinge and stabilizer trailing edge rib as follows (Fig. 502, View D):
   (a) Loosen seal mounting bolts and adjust seal to provide 0.01 (+0.06/-0.00)-inch clearance between seal and rib.
   (b) Before tightening seal mounting bolts, check 0.20-inch gap exists between idler hinge flat seal and balance panel bulb seal.
   (c) Tighten seal mounting bolts and recheck seal clearances.
(6) At elevator inboard rib, adjust elevator to body seals between elevator and tail cone as follows (Fig. 502, View E):
   (a) Loosen seal mounting bolts and adjust seal to provide 0.00 (+0.03/-0.00)-inch clearance between seal and tail cone.
   (b) Tighten seal mounting bolts and recheck seal clearance.
(7) Test elevator surface friction and balance (Ref 27-31-0 A/T).

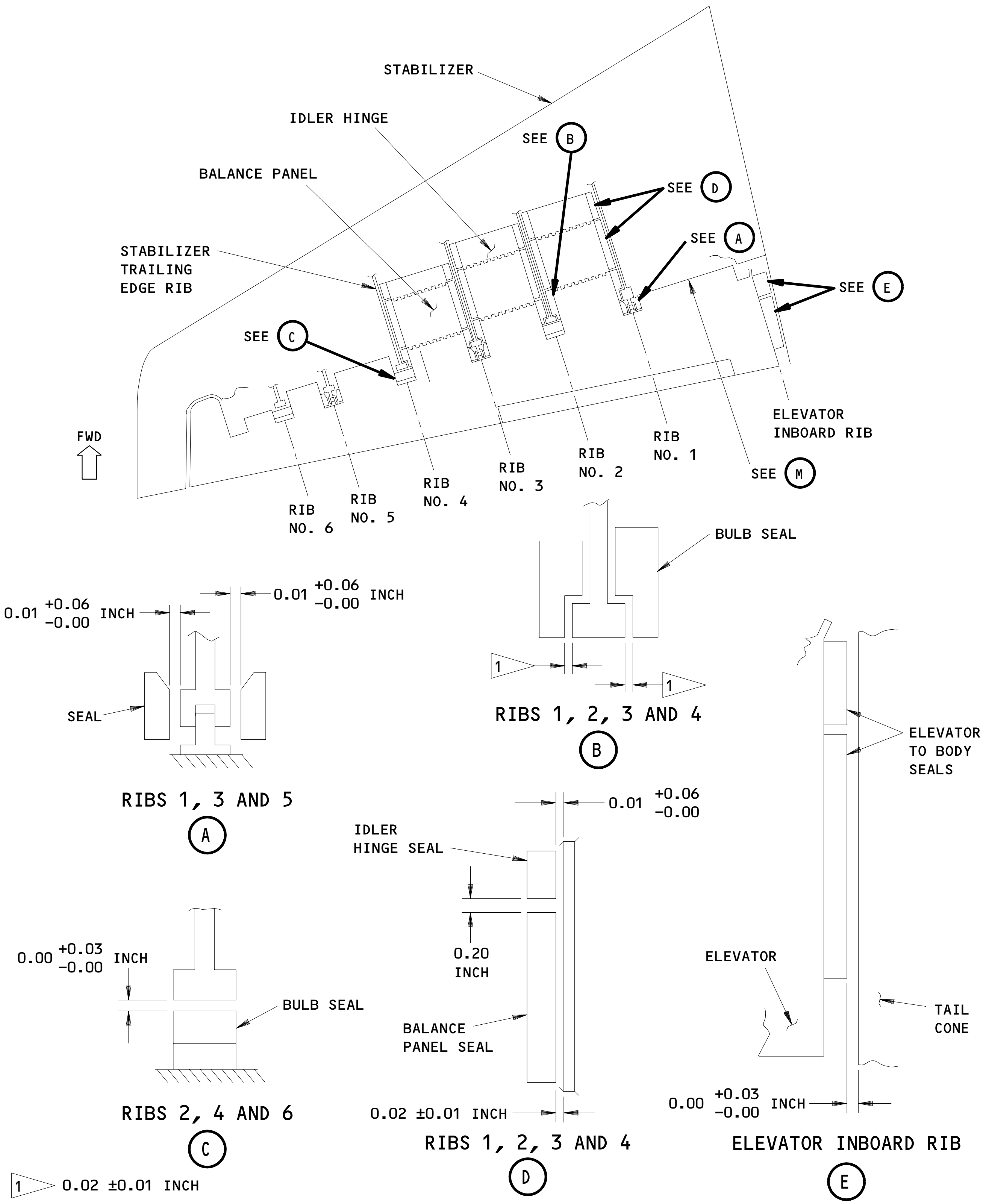
D. On Airplanes with Graphite/Composite Elevators;
Adjust Elevator Seals (Fig. 502, Sheet 2)
(1) Position and hold elevator faired with stabilizer during seal adjustment.
(2) At stabilizer trailing edge rib No. 3, adjust flat seal to maintain 0.03 ±0.03 inch clearance between seal and hinge fitting (Fig. 502, View F).
(3) At stabilizer trailing edge rib No. 2, adjust bulb seal to maintain compression of 0.00 to 0.03 inch (Fig. 502, View H).
(4) At stabilizer trailing edge ribs No. 1, 2, 3 and 4, adjust bulb seals to maintain compression of 0.10 ±0.04 inch (Fig. 502, Views G, I and J).
(5) At stabilizer trailing edge rib No. 1 adjust bulb seal on nose rib to maintain compression of 0.1 +0.10/-0.040 inch (Fig. 502, View I).
(6) At stabilizer trailing edge rib No. 4 adjust bulb seal on nose rib to maintain compression of 0.03 ±0.03 inch (Fig. 502, View J).
(7) At stabilizer trailing edge ribs No. 1, 2, 3 and 4 adjust bulb seals between balance panel and stabilizer trailing edge rib as follows (Fig. 502, View L):
   (a) Loosen seal mounting bolts and adjust seal to provide 0.02 ±0.01-inch clearance between seal and rib.
   (b) Tighten seal mounting bolts and recheck seal clearances.
(8) At stabilizer trailing edge ribs No. 1, 2, 3 and 4 adjust flat seals between balance panel idler hinge and stabilizer trailing edge rib as follows (Fig. 502, View L).
   (a) Loosen seal mounting bolts and adjust seal to provide 0.01 (+0.06/-0.00) inch clearance between seal and rib.
   (b) Before tightening seal mounting bolts, check 0.20-inch gap exists between idler hinge flat seal and balance panel bulb seal.



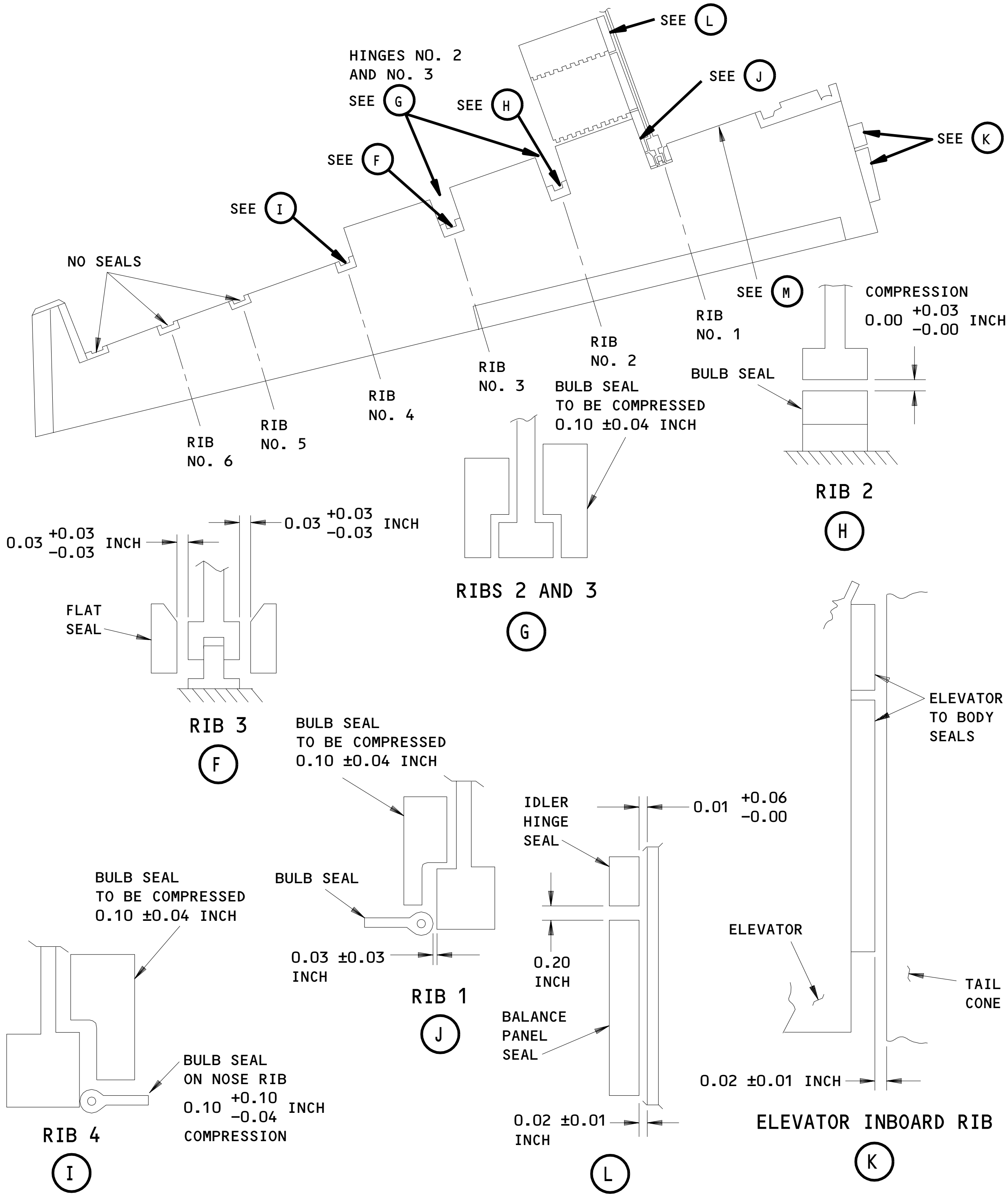
NOTE: THE STABILIZER TRIM JACKSCREW IS SHOWN WITH THE STABILIZER LEADING EDGE AT ZERO DEGREES

1 THE "B" DIMENSION IS MEASURED BETWEEN THE CENTER OF THE UPPER AND LOWER GIMBAL PINS

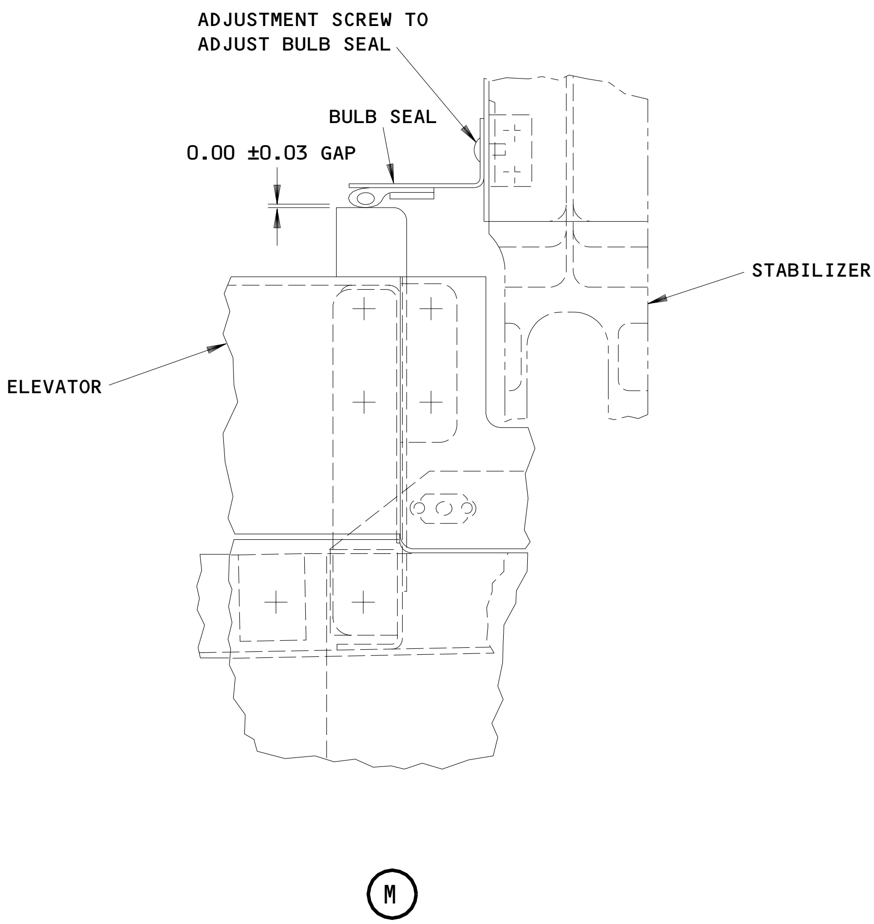
Stabilizer Trim Jackscrew Setting
Figure 501



Elevator Seal Adjustment
Figure 502 (Sheet 1)



Elevator Seal Adjustment
Figure 502 (Sheet 2)



Elevator Seal Adjustment
Figure 502 (Sheet 3)

(c) Tighten seal mounting bolts and recheck seal clearances.

(9) At the elevator inboard rib, adjust elevator to body seals between elevator and tail cone as follows (Fig. 502, View K).

(a) Loosen seal mounting bolts and adjust seal to provide 0.02 ±0.01 inch clearance between seal and tail cone.

(b) Tighten seal mounting bolts and recheck seal clearance.

E. At the elevator inboard rib No. 1; adjust the gap between the bulb seal on the stabilizer and the elevator (Fig. 502, Sheet 3):

(1) Loosen the adjustment screw.

(2) Adjust the screw to have a clearance of 0.00 ±0.03 inch gap between the bulb seal on the stabilizer and the elevator.

(3) Tighten the screw.

(4) Make sure the clearance between the bulb seal on the stabilizer and the elevator is 0.00 ±0.03 inch.

F. Restore Airplane to Normal

(1) Install access panels removed in steps B.(4).

(2) Restore airplane to normal hydraulic configuration (Ref 27-31-0).

CONTROL COLUMN SUPPORT BEARING - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Riggings Kit - F70207 -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

2. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Remove control column adjacent to support bearing requiring removal (Ref 27-31-51 R/I)
   C. If not installed, install rigging pin E-1 in forward quadrant and E-5 in aft quadrant.
   D. Open stabilizer jackscrew compartment access door.
3. Remove Control Column Support Bearing
   A. Release tension in elevator control cables at turnbuckles in stabilizer jackscrew compartment. Do not disconnect turnbuckles.
   B. Support elevator forward control quadrant and remove inboard coupling by removing two coupling bolts (Fig. 401).

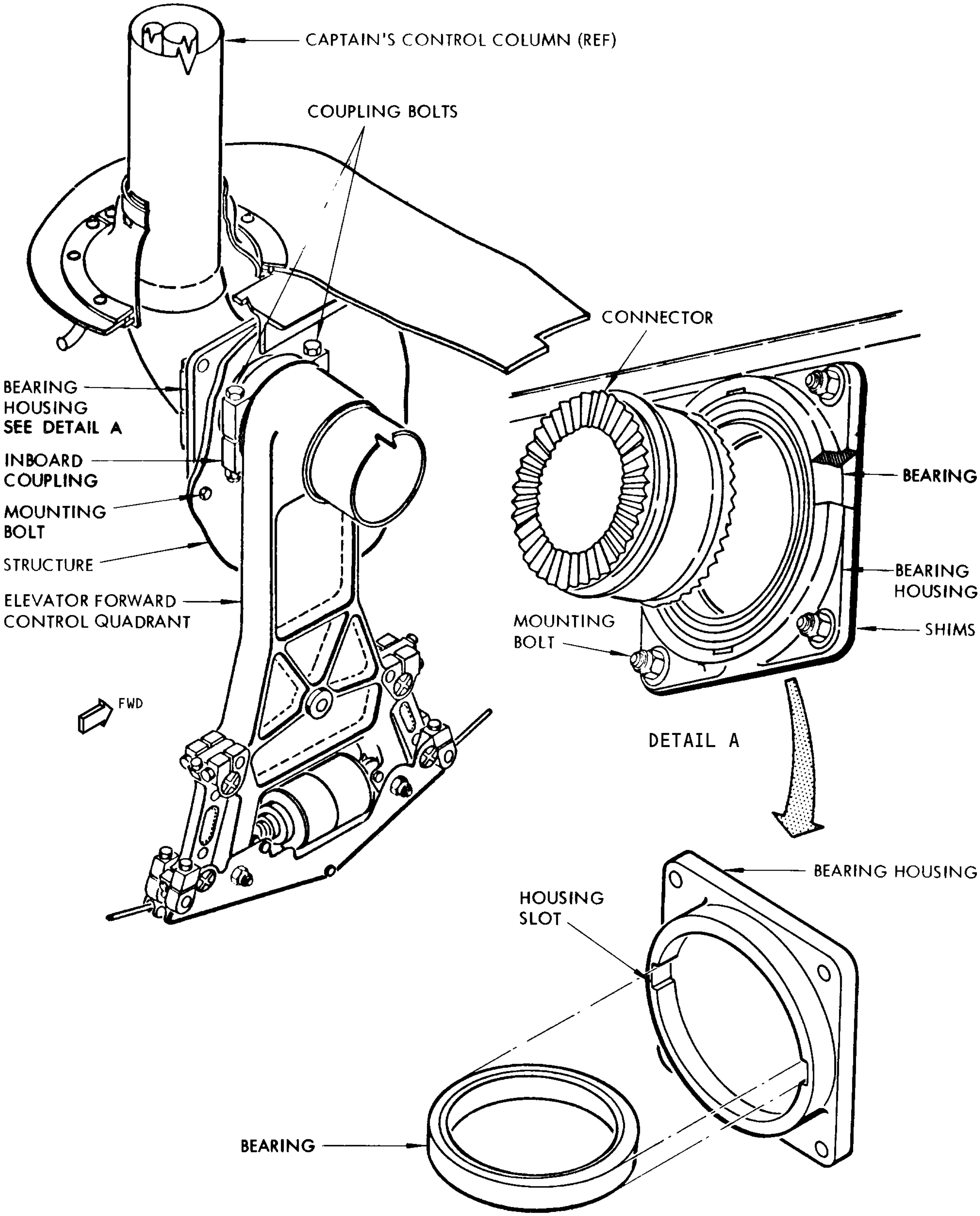
      CAUTION: ENSURE THAT FORWARD QUADRANT IS ADEQUATELY SUPPORTED BEFORE AND AFTER COUPLING IS REMOVED OTHERWISE STRUCTURAL DAMAGE MAY RESULT.

   C. Withdraw connector from bearing housing (detail A).
   D. Remove four mounting bolts attaching bearing housing to structure.
   E. Remove bearing housing and shims from airplane (detail A).
   F. Rotate bearing at right angles to housing. Align bearing with slots in housing and withdraw bearing.

4. Prepare for Installation
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0 MP).
   B. Check that rigging pin is installed in forward quadrant and that rigging pin E-5 is installed in aft quadrant.
5. Install Control Column Support Bearing
   A. Position replacement bearing at right angles to housing. Slide bearing into housing slots and turn into position (Fig. 401).
   B. Position bearing housing and shims against structure and install four mounting bolts with heads inboard. Place a washer under heads of two lower mounting bolts and a washer under each of four nuts, then secure.
   C. Align forward control quadrant, then insert connector through bearing housing to engage splines on quadrant.
   D. Install inboard coupling and coupling retaining bolts. Tighten bolts within range of driving torque, then alternately tighten bolts 50 to 70 pound-inches in approximately 10 pound-inch increments to achieve gaps equal within 0.03 inch at each end of coupling clamp.

      NOTE: Substitution of next bolt length and use of washers must be identical at each end of coupling clamp.

   E. Check clearance between shoulder of connector and inner race of bearing. Clearance must be 0.01 to 0.03 inch to prevent connector from binding against bearing. Measure clearance with shoulder of opposite connector against bearing.
   F. If necessary, adjust clearance between shoulder of connector and inner race of bearing by adding or removing shim under bearing housing.
   G. Remove forward control quadrant supports.
   H. Install control column (Ref 27-31-51, R/I).
   I. Remove rigging pins E-1 and E-5.
   J. Rotate control columns forward and aft through full travel and check for roughness or binding.
   K. Adjust elevator control cables and check control column forces per 27-31-0, A/T.
   L. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).



Control Column Support Bearing Installation
Figure 401

ELEVATOR OUTPUT TORQUE TUBE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-5	-11	0.309-0.311	6.7 ±0.25	AFT CONTROL QUADRANT

   B. Elevator Rigging and Restraining Fixture F80063-501 (Preferred) or F80063-500 (Optional)
   C. Trammel Bar - F80055-1
   D. Scale - 0 to 6 inches, graduated in tenths and hundredths of an inch
   E. Alignment pins - 0.620 +0.004/-0.000-inch diameter, 0.96 +0.03/-0.00-inch long - (2 required)
   F. Grease - BMS 3-33 (Preferred)
   G. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   H. Stabilizer Trim Lock - F71336-501
2. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
   B. Open aft compartment access door 3701 (Ref 12-31-0).
   C. Remove tail cone from airplane (Ref 53-53-0 R/I).
   D. Set horizontal stabilizer at 3 units of trim.
   E. Install rigging pin E-5 in aft control quadrant (Fig. 401).
   F. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 403).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
3. Remove Output Torque Tube
   A. Detach forward ends of left and right elevator control pushrods from output torque tube crank (Fig. 401).

      CAUTION: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE AND ELEVATOR MAST FITTING BEARINGS TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE. IF ELEVATOR CONTROL PUSHRODS ARE REMOVED FROM AIRPLANE, IDENTIFY ENDS AS FORE OR AFT PRIOR TO REMOVAL. IF PUSHRODS ARE DISASSEMBLED, SUITABLY IDENTIFY EACH INDIVIDUAL ITEM TO AVOID MISMATCHING PARTS DURING REASSEMBLY.

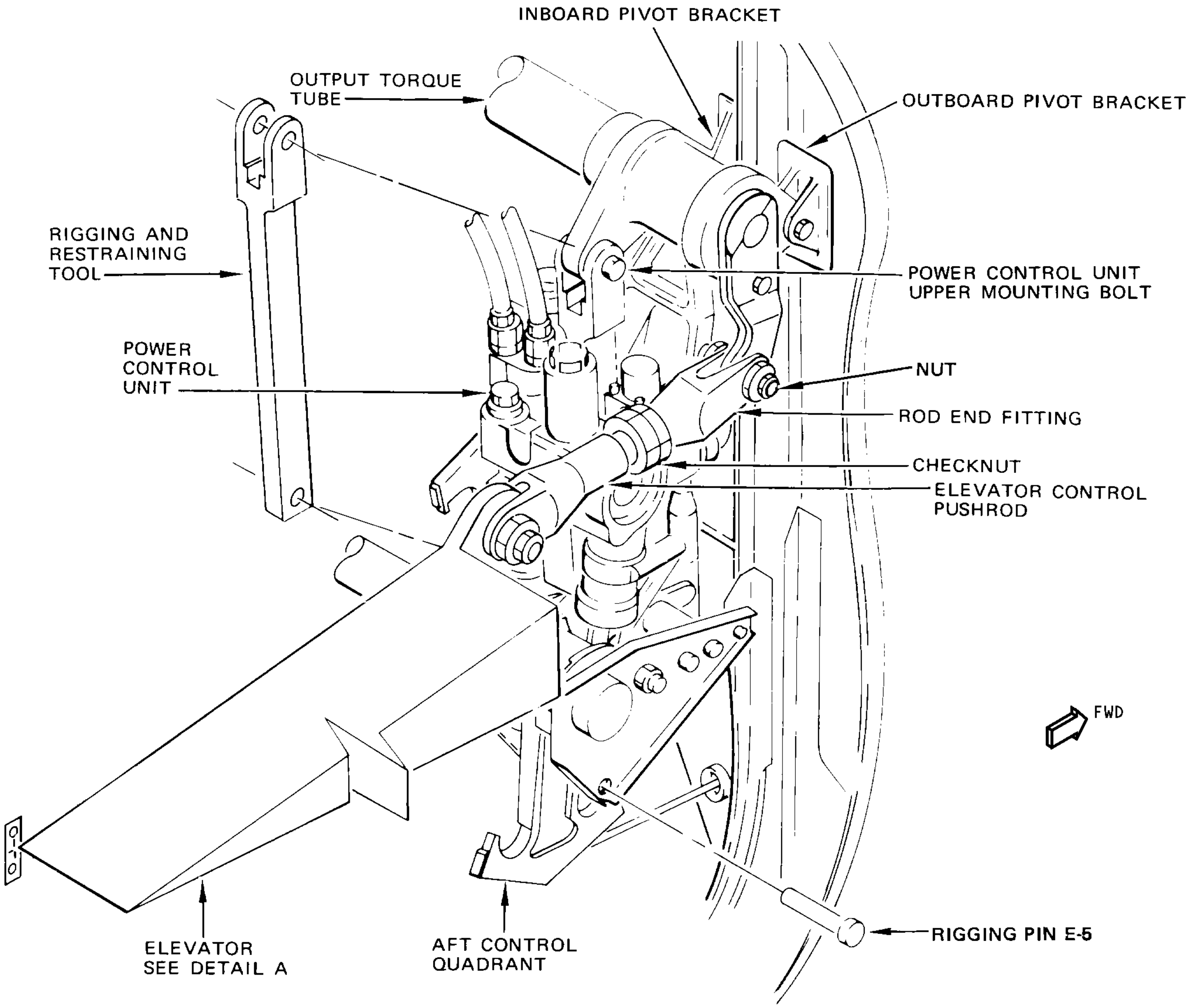
B. Remove left and right power control unit upper mounting bolts from output torque tube. Allow power units to rotate away from aft bulkhead until input crank bottoms.
C. Remove two pivot bolts attaching output torque tube to inboard pivot brackets at aft bulkhead.
D. Support output torque tube and remove two pivot bolts attaching torque tube to outboard pivot brackets at aft bulkhead.
E. Remove output torque tube from airplane.

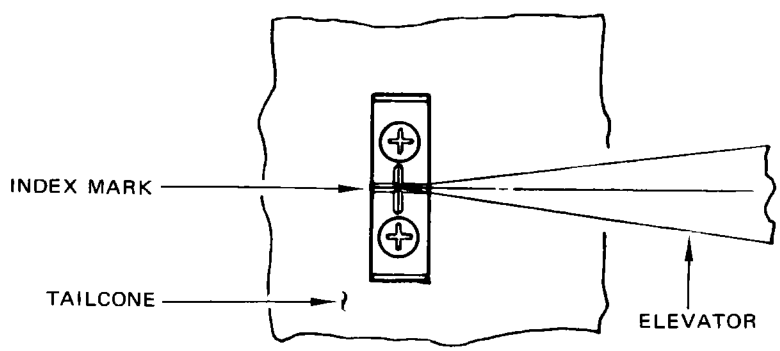
4. Prepare for Installation
   A. Check for allowable wear at output torque tube installation points and at eight connections between inner and outer torque tubes (Ref 27-31-191, I/C).
   B. Remove elevator systems A and B hydraulic power (Ref 27-31-0, MP).
   C. Check that horizontal stabilizer is set at 3 units of trim.
   D. Check that rigging pin E-5 is installed in aft control quadrant.
   E. Fabricate alignment pins to dimensions given in par. 1.E. Install pins to retain bearing components in torque tube outboard pivot clevis fittings.

5. Install Output Torque Tube
   A. Position and support output torque tube at aft bulkhead.
   B. Refer to Fig. 401 and install pivot bolts in outboard pivot brackets as follows:
      (1) Apply grease to entire shank of each bolt and install bolts with heads inboard.
      (2) Install nut and washer at each bolt and tighten using standard torque.
   C. Install pivot bolts in inboard pivot brackets as follows:
      (1) Apply grease to entire shank of each bolt and install bolts with heads inboard.

      CAUTION: LIGHTLY TAP INBOARD PIVOT BOLTS INTO PLACE. TAKE CARE TO AVOID DAMAGE TO BEARING COMPONENTS. RETAIN ALIGNMENT PINS.

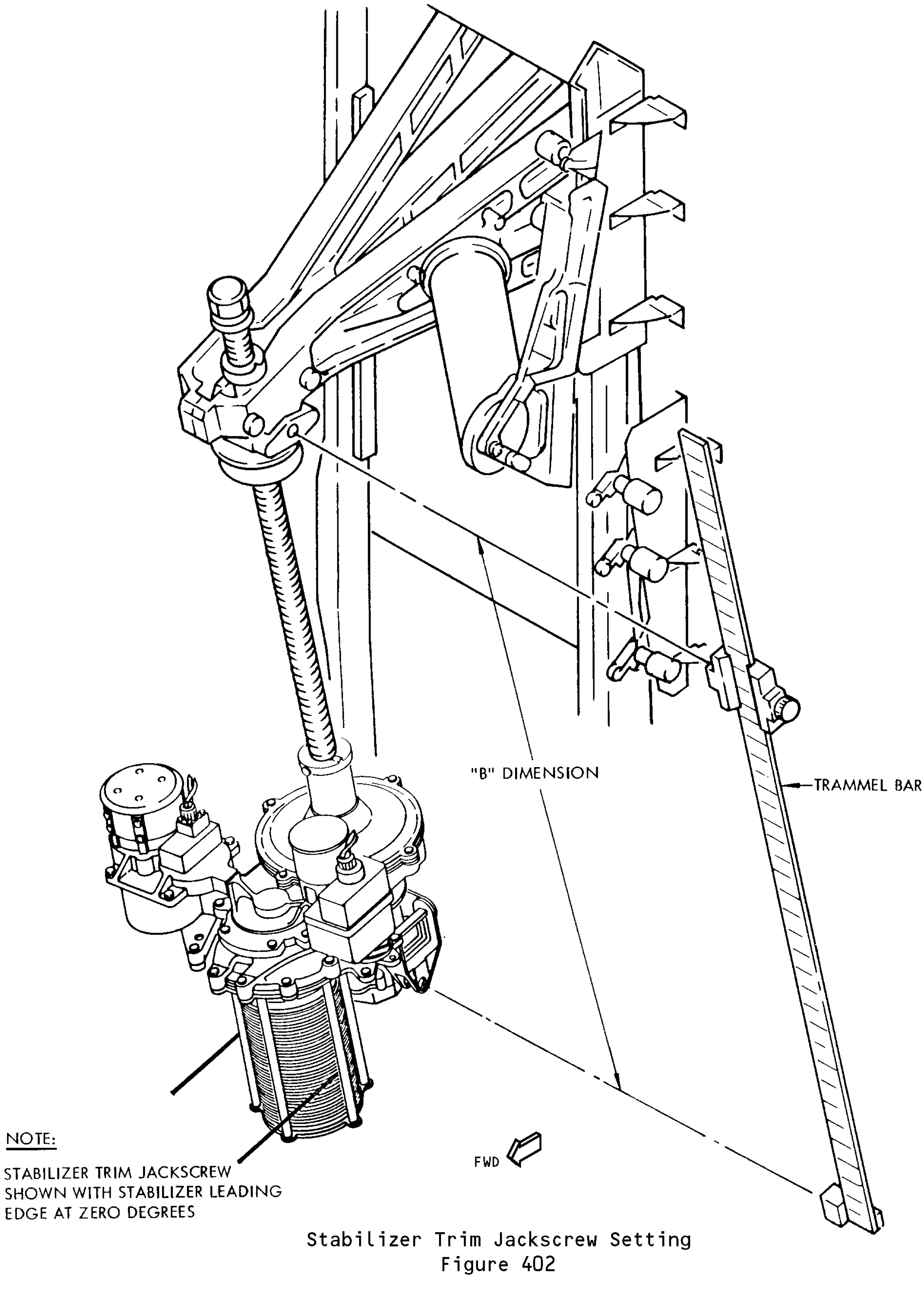
      (2) Install washer and first locknut and tighten 500 to 600 pound-inches.





DETAIL A

Elevator Output Torque Tube Installation
Figure 401



Stabilizer Trim Jackscrew Setting
Figure 402

(3) Install washer and second locknut and tighten 150 to 220 pound-inches.

CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUTS, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUTS.

D. Install tail cone (Ref 53-53-0, R/I).
E. Remove right power control unit (Ref 27-31-101, R/I), and install rigging and restraining tool in place of right power control unit using power control unit upper and lower mounting bolts (Fig. 401).
F. Set stabilizer B dimension at 41.57 ±0.05 inches using trammel bar (Fig. 402).
G. Loosely install bolt to connect forward end of right elevator control pushrod to output torque tube.
H. Check right elevator trailing edge aligns with index mark on tail cone within 0.12 inch (Detail A, Fig. 401).
I. If right elevator does not align, adjust right elevator control pushrod as follows:
(1) Remove pushrod forward mounting bolt.

CAUTION: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK BEARING TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH OLE IN INNER RACE.

(2) Back off checknut and adjust rod end fitting until elevator trailing edge aligns with index mark within 0.12 inch, with pushrod forward mounting bolt installed.

NOTE: One-half turn of rod end fitting equals 0.20-inch movement at elevator trailing edge.

J. Loosely install bolt to connect forward end of left elevator control pushrod to output torque tube.
K. Check left elevator trailing edge aligns with index mark on tail cone within 0.12 inch.

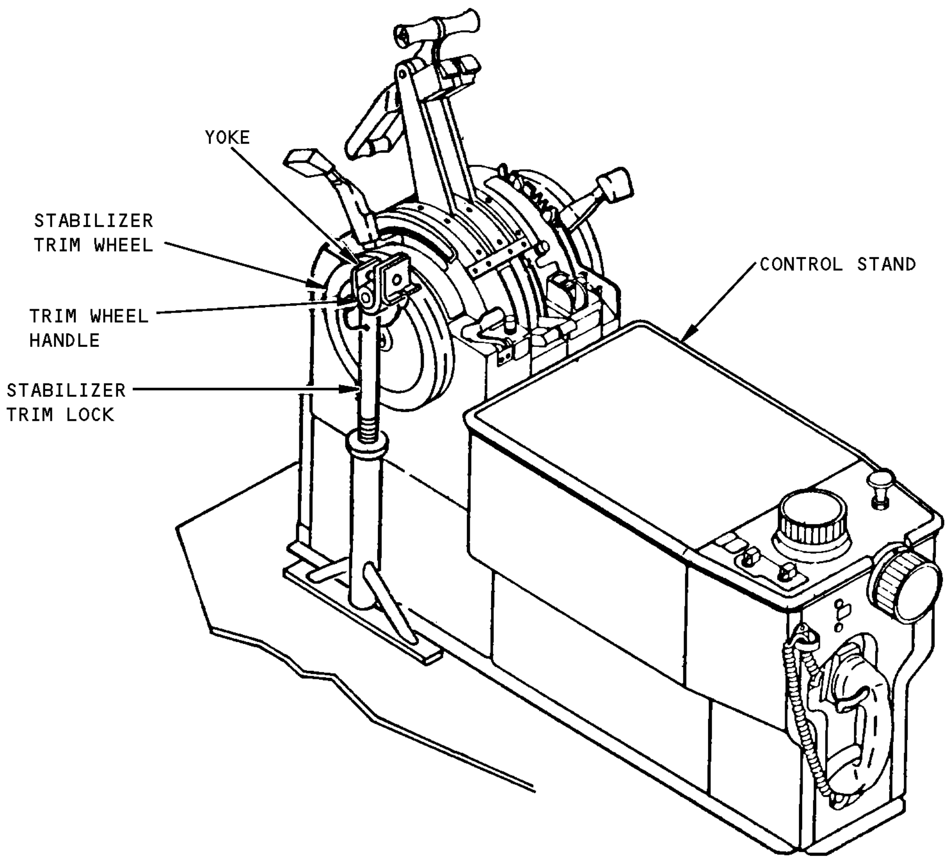
L. If left elevator does not align, adjust left elevator control pushrod as follows:
   (1) Remove pushrod forward mounting bolt.

      CAUTION: DO NOT PERMIT INNER RACE OF OUTPUT TORQUE TUBE CRANK BEARING TO ROTATE TO A POSITION WHERE ROLLERS MAY DROP OUT THROUGH HOLE IN INNER RACE.

   (2) Back off checknut and adjust rod end fitting until elevator trailing edge aligns with index mark within 0.12 inch, with pushrod forward mounting bolt installed.
M. Check left elevator trailing edge aligns with right elevator trailing edge within 0.12 inch, as measured from each elevator trailing edge to adjacent index mark. If necessary, readjust either left or right elevator control pushrods to obtain this requirement.
N. Grease checknut threads, then tighten checknuts on left and right elevator control pushrod end fittings 750 to 900 pound-inches, and lockwire.
O. Attach left and right elevator control pushrods to output torque tube as follows:
   (1) Ensure bolt is installed with head inboard.
   (2) Install two washers under first locknut and tighten 500 to 600 pound-inches.
   (3) Install one washer under second locknut and tighten 150 to 220 pound-inches.

      CAUTION: AFTER SETTING TORQUE ON SECOND LOCKNUTS, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUTS.

P. Remove rigging and restraining tool from right elevator power control unit location.
Q. Install right elevator power control unit (Ref 27-31-101, R/I).
R. Install left power control unit upper mounting bolt with head inboard. Install washer and nut and tighten using standard torque.
S. Remove rigging pin E-5 from aft control quadrant.

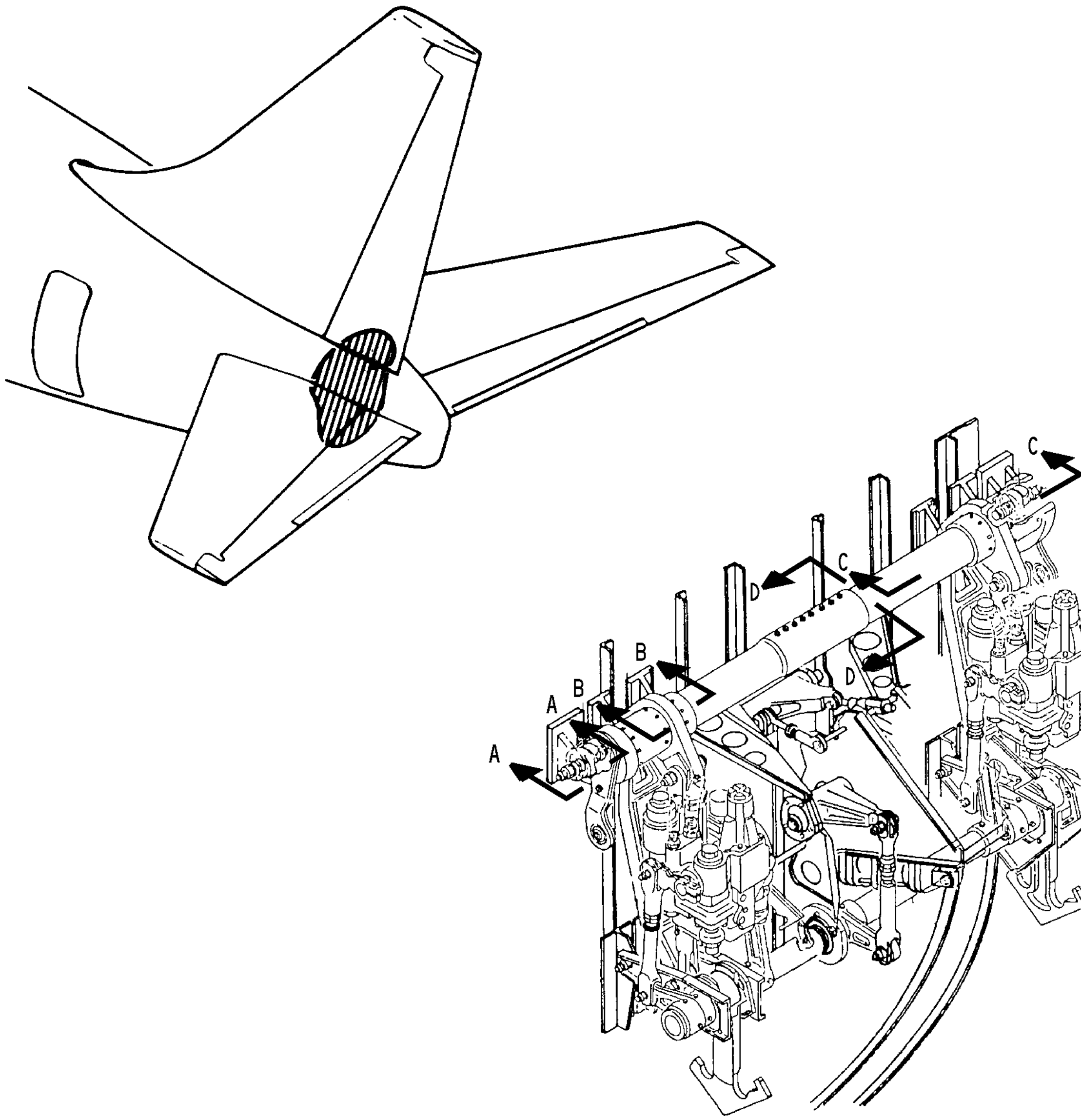


Stabilizer Trim Lock Installation
Figure 403

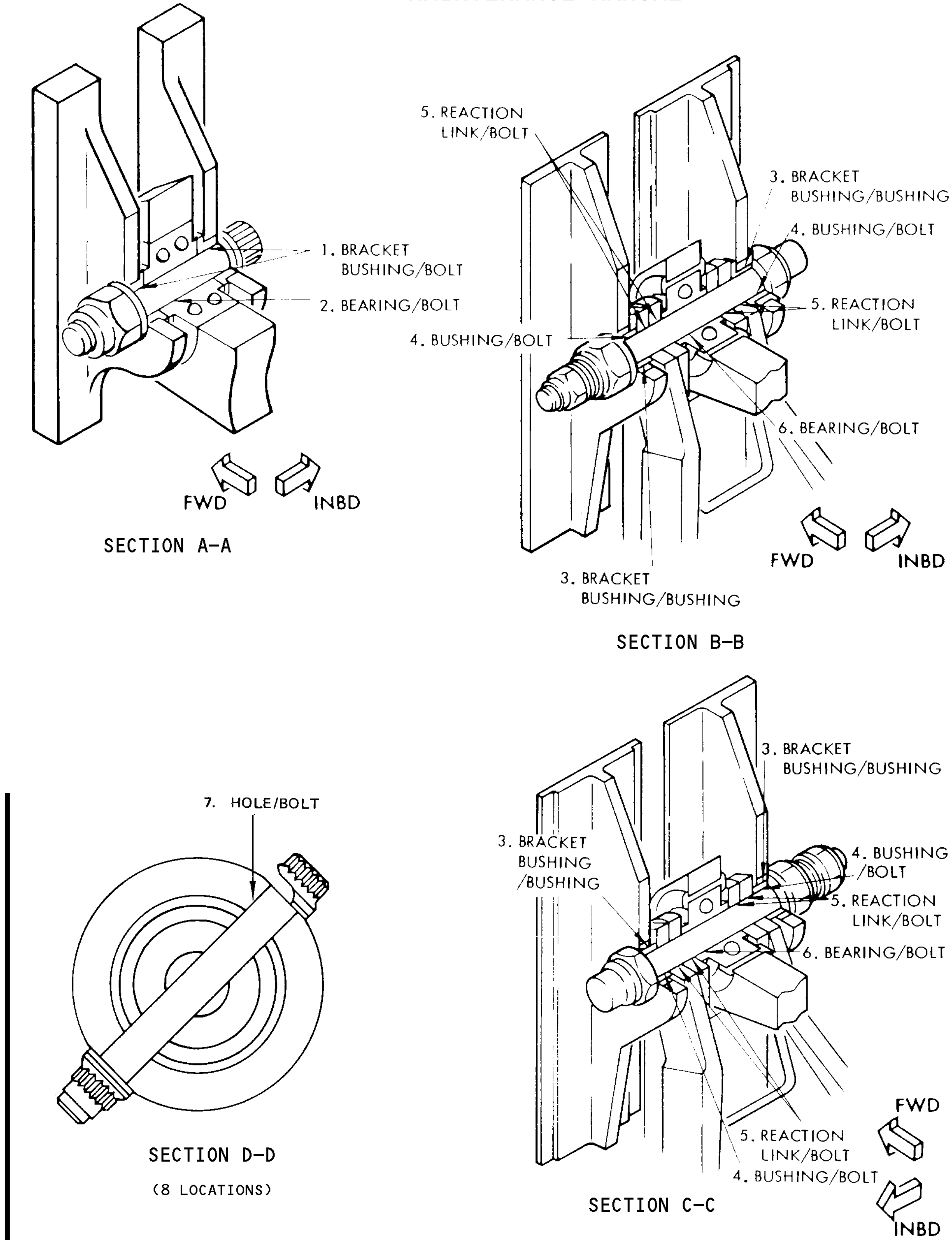
T. Adjust elevator power control unit input rods per 27-31-0, A/T. (Adjust Elevator Power Control Unit Input Rod).
U. Remove stabilizer trim lock (Fig. 403).
V. Restore airplane to normal hydraulic configuration (Ref 27-31-0, MP).
W. Close aft compartment access door 3701.

ELEVATOR OUTPUT TORQUE TUBE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the components for inspection after wear. Refer to Component Removal/Installation for this information.
2. Elevator Output Torque Tube Wear Limits



Elevator Output Torque Tube Wear Limits
Figure 601 (Sheet 1)



Elevator Output Torque Tube Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BRACKET BUSHING	ID	0.4995	0.5005	0.5035	0.0040	X*[1]		
	BOLT	OD	0.4985	0.4995	0.4981		X		
2	BEARING	ID	0.4995	0.5000	0.5030	0.0035	X		
	BOLT	OD	0.4985	0.4995	0.4981		X		
3	BRACKET BUSHING	ID	0.7495	0.7505	0.7520	0.0025	X*[1]		
	BUSHING	OD	0.7490	0.7495	0.7470		X		
4	BUSHING	ID	0.6245	0.6250	0.6256	0.0030	X		
	BOLT	OD	0.6230	0.6240	0.6226		X		
5	REACTION LINK	ID	0.6245	0.6255	0.6285	0.0045		X	*[2]
	BOLT	OD	0.6230	0.6240	0.6226		X		
6	BEARING	ID	0.6245	0.6250	0.6280	0.0040	X		
	BOLT	OD	0.6230	0.6240	0.6226		X		
7	HOLE	ID	0.4370	0.4380	0.4381	0.001			*[3]
	BOLT BACB30MT7-46	OD	0.4360	0.4370	0.4359				*[3]
7	HOLE	ID	0.4365	0.4370	0.4375	0.001			*[3]
	BOLT BACB30LE7U46	OD	0.4365	0.4370	0.4360				*[3]
7	HOLE	ID	0.4521	0.4526	0.4531	0.001			*[4]
	BOLT BACB30LE7U46X	OD	0.4521	0.4526	0.4516				*[4]

NOTE: ALL DIMENSIONS ARE IN INCHES.

[1] REPLACE WORN BUSHING

[2] OBTAIN BUSHING. BOLE HOLE TO ATTAIN 0.0003 TO 0.0022 INCH INTERFERENCE FIT (0.8129 INCH MAXIMUM). REAM BUSHING TO 0.6245/0.6255 INCH DIAMETER.

[3] BORE HOLE OVERSIZE TO WITHIN 0.4521 TO 0.4526 INCH. USE BACB30LE7U46X (SIZE 0.4521 TO 0.4526 INCH) BOLT.

[4] BORE HOLE OVERSIZE TO WITHIN 0.4677 TO 0.4682 INCH. USE BACB30LE7U46Y (SIZE 0.4677 TO 0.4682 INCH) BOLT.

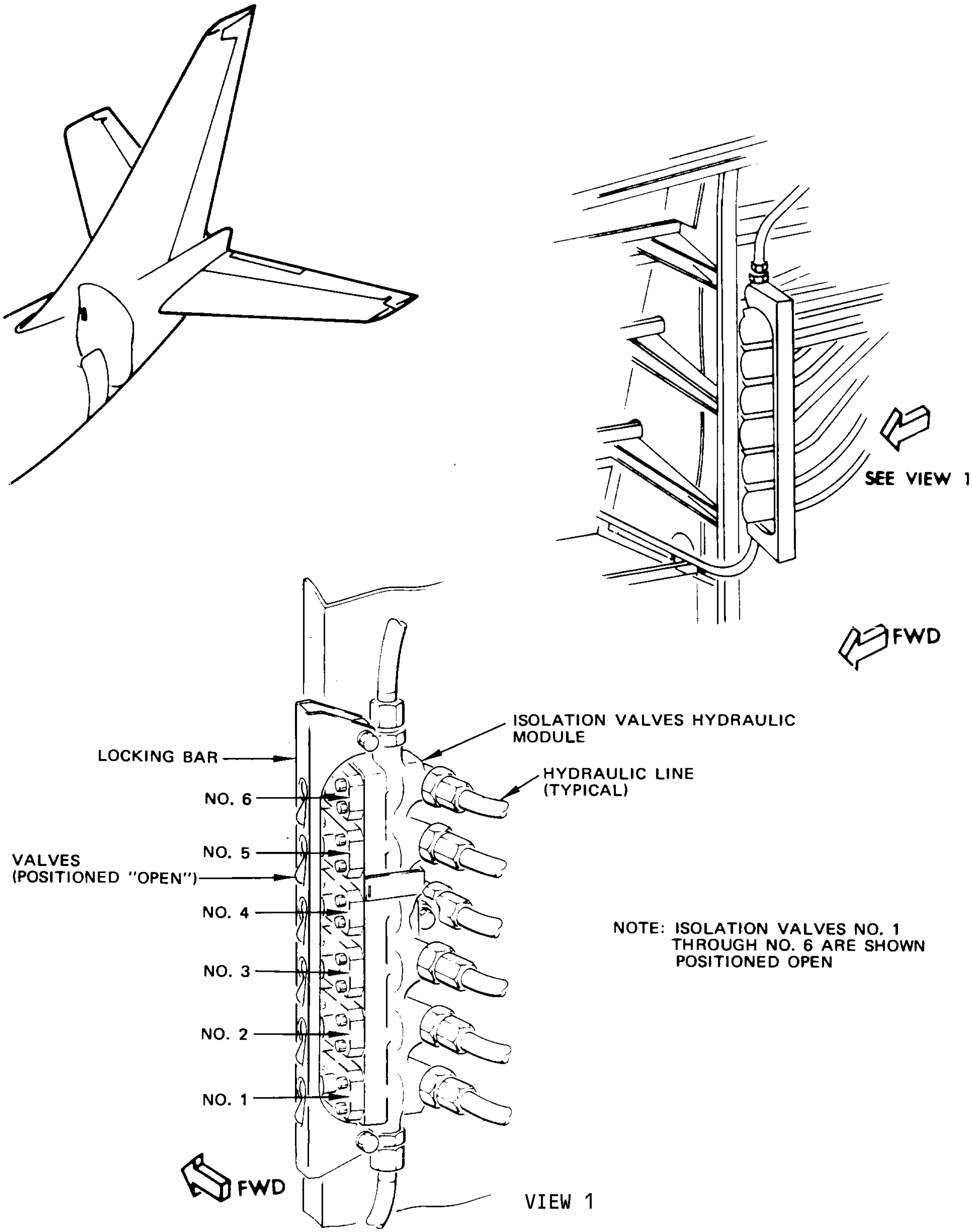
Elevator Output Torque Wear Limits
Figure 602

ISOLATION VALVES HYDRAULIC MODULE - REMOVAL/INSTALLATION

1. General
   A. The isolation valves hydraulic module consists of a housing and six manual isolation valves. The following procedure provides removal and installation instructions for the module. The valves may be removed and installed individually per 27-31-211.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid, Fire Resistant - BMS 3-11 (AMM 20-30-21/201)
   B. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power. Refer to 27-31-0, Elevator and Tab Control System - Maintenance Practices.
   B. Open aft compartment access door 3701. Refer to Chapter 12, Access Doors and Panels.
   C. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 402).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
4. Remove Isolation Valves Hydraulic Module
   A. Remove eight hydraulic lines from isolation valves module. Cap and plug all open ports and hydraulic lines. (See figure 401.)

      CAUTION: RELEASE HYDRAULIC LINE CONNECTORS SLOWLY AND ALLOW POSSIBLE TRAPPED PRESSURE TO RELIEVE BEFORE COMPLETELY DISCONNECTING HYDRAULIC LINE. BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

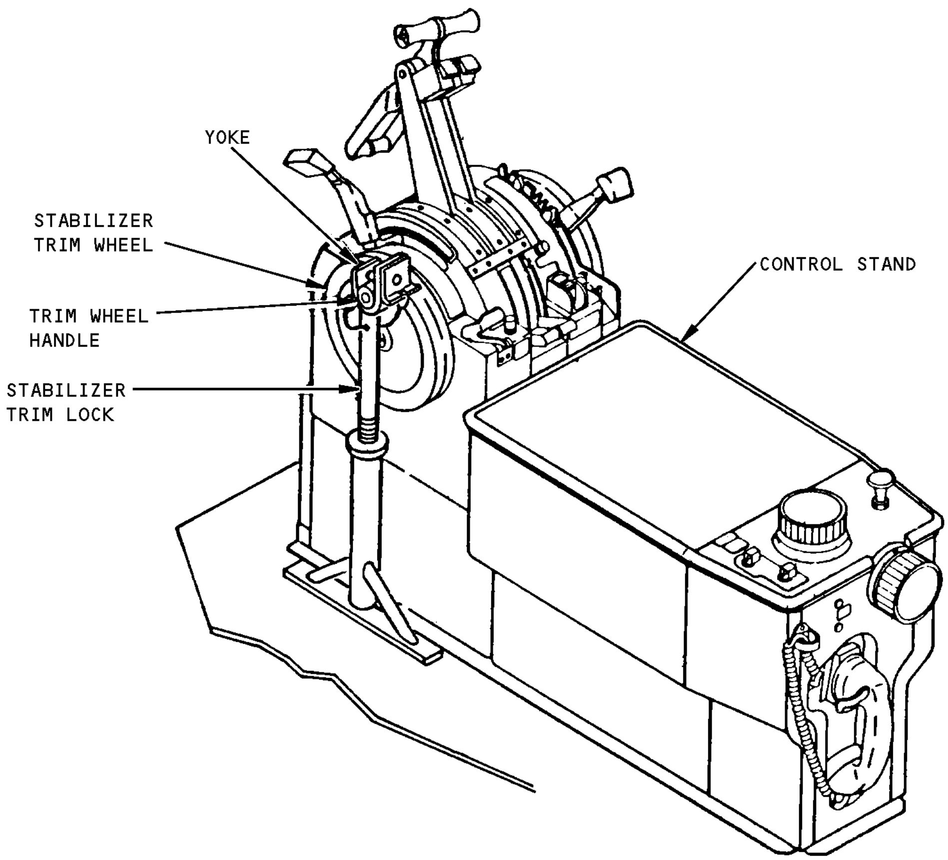
   B. Remove bolts, washers, nuts and spacer securing module to structure. Remove module from airplane.
   C. Remove locking bar from module as follows:
      (1) Remove cotter pin from upper mounting bolt.
      (2) Remove upper and lower mounting bolts, washers and nut.
      (3) Withdraw locking bar from module.
5. Install Isolation Valves Hydraulic Module
   A. Remove elevator systems A and B hydraulic power. Refer to 27-31-0.
   B. Install locking bar on module as follows (see figure 401):
      (1) Ensure all valves are positioned OPEN.
      (2) Position locking bar on module and install lower mounting bolt with head aft. Install washer under bolt head and either side of module.
      (3) Install upper mounting bolt with head aft. Place washer under bolt head, under nut and either side of module. Tighten nut finger-tight and install new cotter pin.
   C. Position module in airplane and install upper and lower mounting bolts with heads forward and a washer under each nut.
   D. Install center mounting bolt with head aft. Place filler and spacer between module and structure and install washer under nut.
   E. Remove protective caps and plugs from module and hydraulic lines. Be prepared to catch spilled fluid.



Isolation Valves Hydraulic Module Installation
Figure 401

F. Lubricate fittings with assembly lube or hydraulic fluid. Attach eight hydraulic lines to module.
G. Provide elevator systems A and B hydraulic power. Refer to 27-31-0.
H. Exercise control column and rudder pedals to bleed hydraulic lines.
I. Visually check hydraulic connections to module for signs of leakage.
J. Test module. Refer to Isolation Valves Hydraulic Module - Adjustment/Test.

6. Restore Airplane to Normal Configuration
A. Restore airplane to normal hydraulic configuration. Refer to 27-31-0.
B. Close aft compartment access door.
C. Remove stabilizer trim lock (Fig. 402).
D. Service hydraulic reservoirs, if required. Refer to Chapter 12, Hydraulic Servicing.



Stabilizer Trim Lock Installation
Figure 402

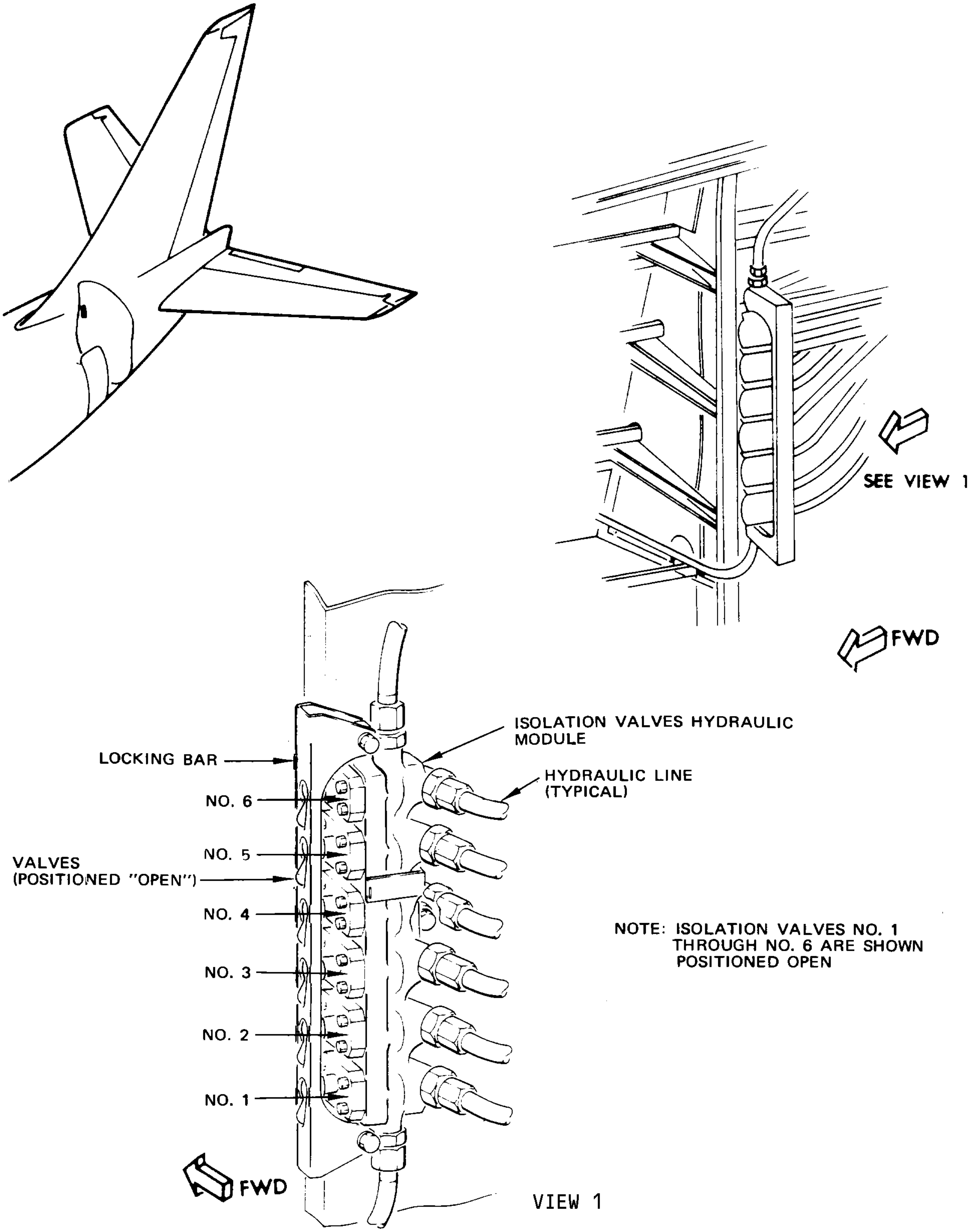
ISOLATION VALVES HYDRAULIC MODULE - ADJUSTMENT/TEST

1. Hydraulic Module Test
   A. General
      (1) The following procedure provides instructions for testing the six manual isolation valves. If testing the module, perform the entire test. If testing an individual valve, perform the steps applicable to that valve only.
   B. Equipment and Materials
      (1) Scale - 0 to 6 inches, graduated in tenths and hundredths of an inch
      (2) Stabilizer Trim Lock - F71336-501
   C. Prepare for Test
      (1) Provide elevator systems A and B hydraulic power (Ref 27-31-0 MP).
      (2) Open aft compartment access door 3701 and remove tail cone access panel 3802 (Ref Chapter 12, Access Doors and Panels).
      (3) Remove lower mounting bolt securing locking bar to module. Pivot locking bar upward to gain access to valve handles.
      (4) Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 502).
         (a) Rotate trim wheel to place handle at top of wheel.
         (b) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
         (c) Insert pin through yoke and install safety pin.
   D. Test Hydraulic Module
      (1) Close isolation valve No. 1 (Fig. 501).
      (2) Close isolation valve No. 4.
      (3) Open isolation valve No. 1. Check that feel actuator body moves forward 1.0 to 1.73 inches.

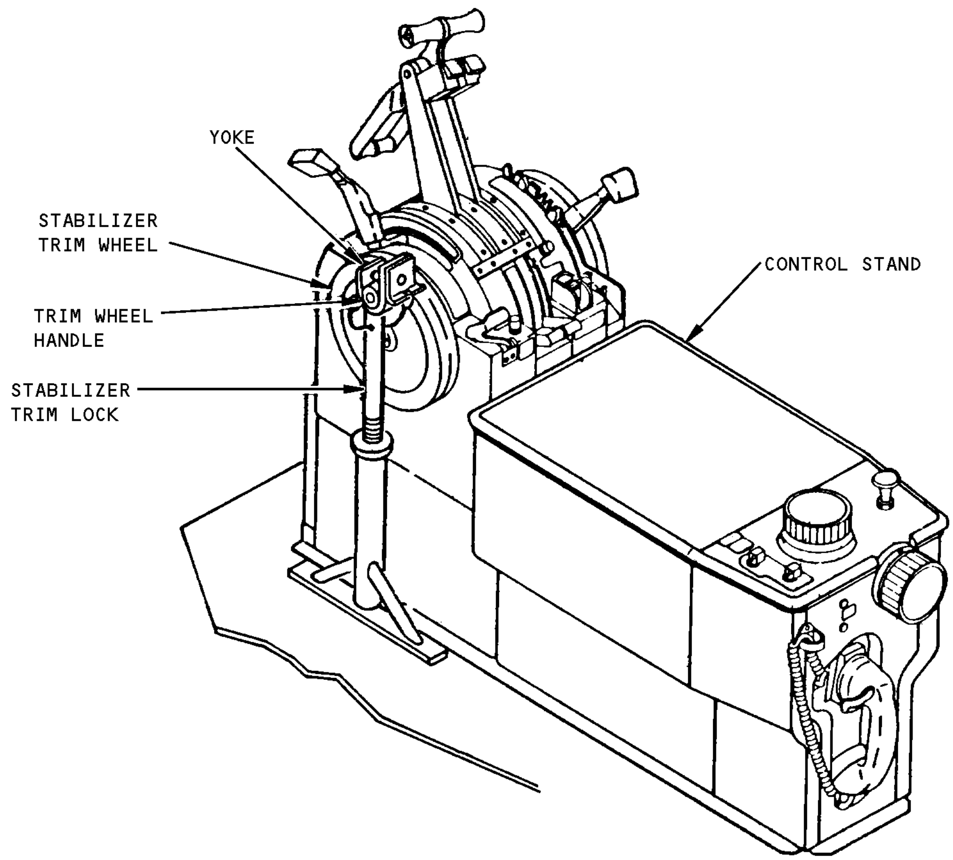
         NOTE: Feel actuator body movement may, at times, take 10 to 15 minutes to occur during this test.

      (4) Close isolation valve No. 1.
      (5) Open isolation valve No. 4. Check that feel actuator body moves aft 1.0 to 1.73 inches.
      (6) Open isolation valve No. 1.
      (7) Rotate control columns aft until stops are contacted and hold or tie in this position.
      (8) Close isolation valve No. 3. Check that left elevator tab moves down.
      (9) Open isolation valve No. 3. Check that left tab moves up to fair with left elevator.
      (10) Close isolation valve No. 6. Check that right elevator tab moves down.
      (11) Open isolation valve No. 6. Check that right tab moves up to fair with right elevator.
      (12) Test isolation valve No. 2.

         NOTE: Isolation valve No. 2 supplies hydraulic system A power to rudder.



Isolation Valves Hydraulic Module Test
Figure 501



Stabilizer Trim Lock Installation
Figure 502

(a) Position flight controls hydraulic system B switch to OFF and system A switch to ON.
(b) Close isolation valves No. 2 and 5.
(c) Cycle rudder pedals and check rudder is not powered.

NOTE: Non-hydraulically powered rudder will move.

(d) Open isolation valve No. 2.
(e) Move rudder pedals and check rudder is powered.
(f) Open isolation valve No. 5.

(13) Test isolation valve No. 5.

NOTE: Isolation valve No. 5 supplies hydraulic system B power to rudder.

(a) Position flight controls hydraulic system A switch to OFF and system B switch to ON.
(b) Close isolation valves No. 2 and 5.
(c) Move rudder pedals and check that rudder does not move.
(d) Open isolation valve No. 5.
(e) Move rudder pedals and check that rudder is powered.
(f) Open isolation valve No. 2.

E. Restore Airplane to Normal Configuration

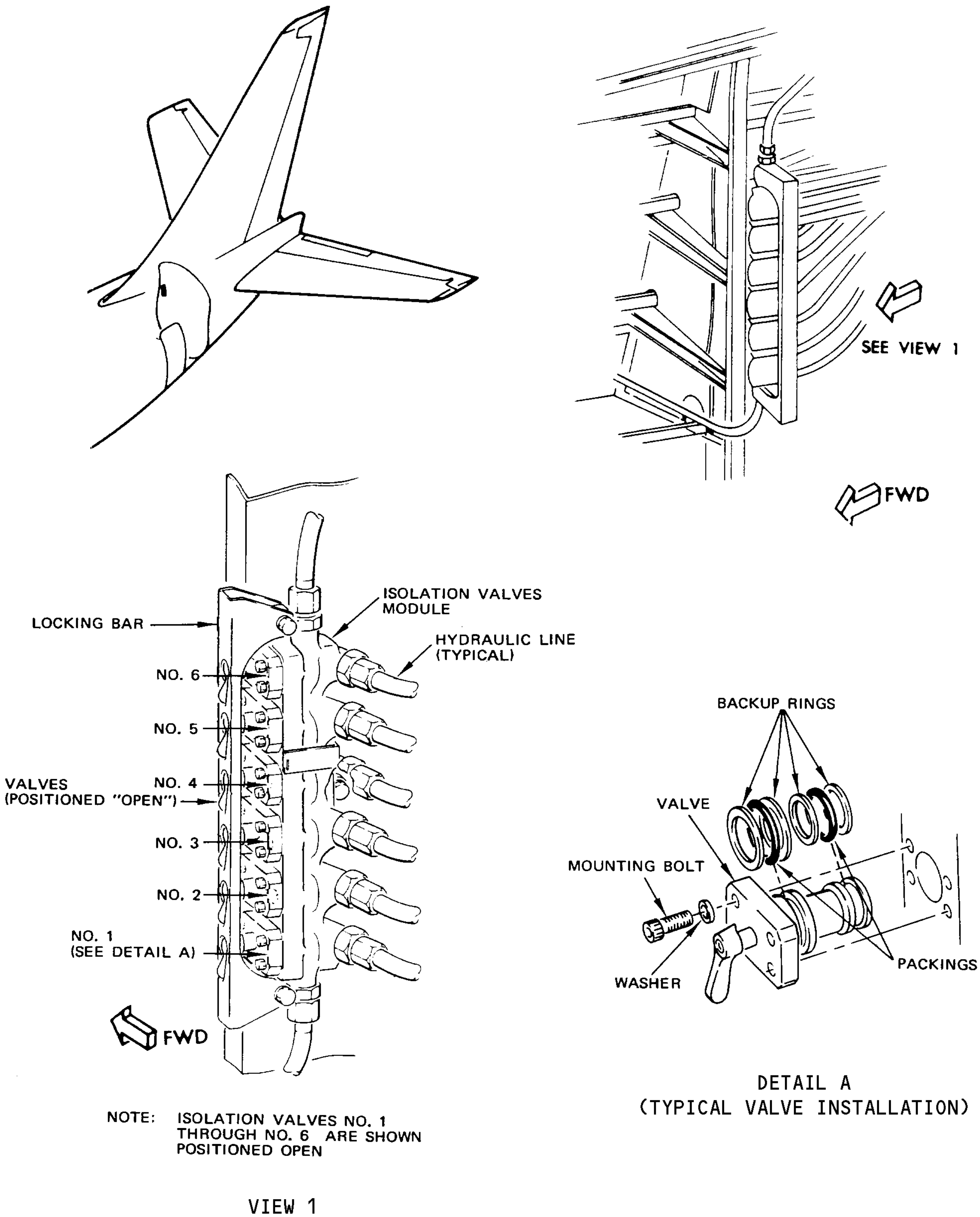
(1) Return control columns to neutral position.
(2) Restore airplane to normal hydraulic configuration (Ref 27-31-0).
(3) Ensure all valve handles are positioned OPEN.
(4) Pivot locking bar down and secure to module. Install lower mounting bolt with head aft. Place washer under bolt head on either side of module.
(5) Close access door and install access panel.
(6) Remove stabilizer trim lock (Fig. 502).
(7) Service hydraulic reservoirs, if required (Ref Chapter 12, Hydraulic Servicing).

MANUAL ISOLATION VALVES - REMOVAL/INSTALLATION

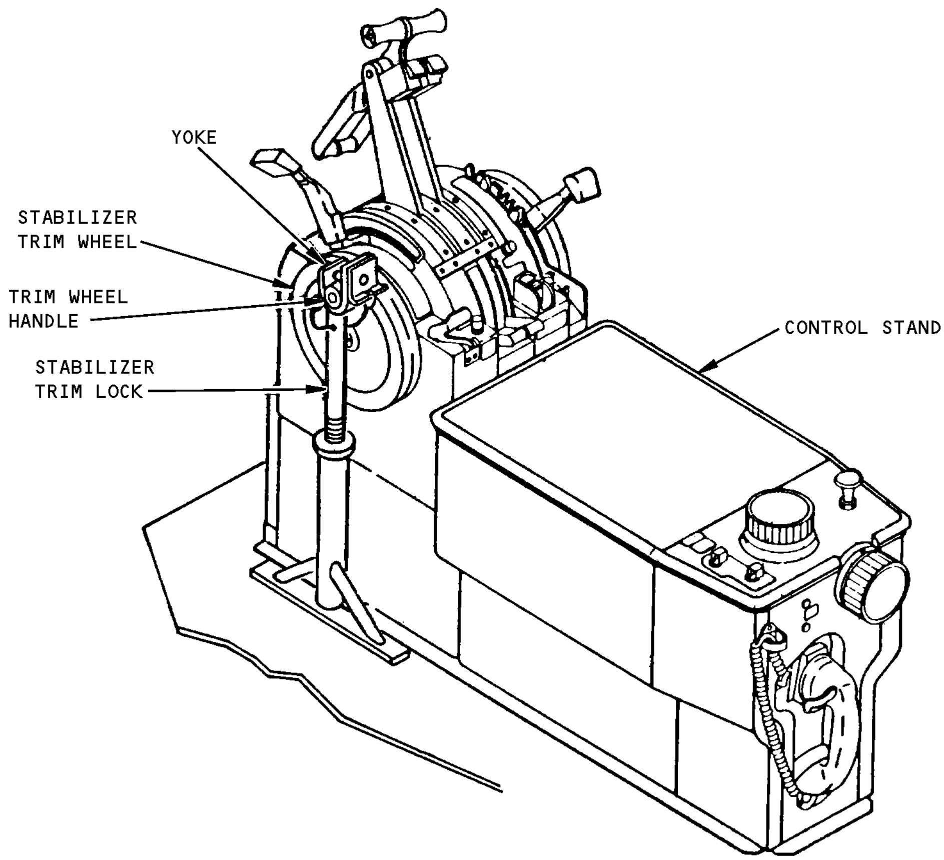
1. General
   A. There are six manual isolation valves in the isolation valve hydraulic module. The following procedure provides instructions for removing and installing any individual valve. Isolation valve No. 2 supplies hydraulic system A power to rudder, and isolation valve No. 5 supplies hydraulic system B power to rudder.
2. Equipment and Materials
   A. Skydrol Assembly Lube MCS 352B, or Hydraulic Fluid, Fire-Resistant, BMS 3-11 (AMM 20-30-21/201)
   B. Stabilizer Trim Lock - F71336-501
3. Prepare for Removal
   A. Remove elevator systems A and B hydraulic power. Refer to 27-31-0, Elevator and Tab Control System - Maintenance Practices.
   B. Open aft compartment access door 3701. Refer to Chapter 12, Access Doors and Panels.
   C. Install the stabilizer trim lock to the stabilizer trim wheel at the control stand (Fig. 402).
      (1) Rotate the trim wheel to place the handle at the top of the wheel.
      (2) Adjust the height of the trim lock to position the trim wheel handle snugly in the bottom of the yoke.
      (3) Insert the pin through the yoke and install the safety pin.
4. Remove Manual Isolation Valve
   A. Remove lower mounting bolt securing locking bar to module. Pivot locking bar upward to gain access to valve. (See figure 401.)
   B. Break lockwire and remove four mounting bolts.
   C. Remove valve from module.
   D. Plug valve chamber in module.
5. Install Manual Isolation Valve

   NOTE: Do not interchange Ronson and Whittaker valve handles. If these valve handles are interchanged on a valve, position of handle will not correspond with position of valve and loss of hydraulic power will occur.

   A. Remove elevator systems A and B hydraulic power (Ref 27-31-0).
   B. Lubricate packings and valve lightly with assembly lube or hydraulic fluid (Fig. 401).
   C. Install packings and backup rings on valve.
   D. Remove plugs from module and install valve. Secure with four mounting bolts.
   E. Provide elevator systems A and B hydraulic power (Ref 27-31-0).
   F. Exercise control column or rudder pedals to bleed hydraulic lines.
   G. Visually check valve for hydraulic leakage.
   H. Test valve (Ref 27-31-201, Adjustment /Test).
   I. Ensure all valve handles are positioned OPEN.
   J. Pivot locking bar down. Install lower mounting bolt and washers.
6. Restore Airplane to Normal
   A. Restore airplane to normal hydraulic configuration (Ref 27-31-0).
   B. Close aft compartment access door.



Manual Isolation Valve Installation
Figure 401



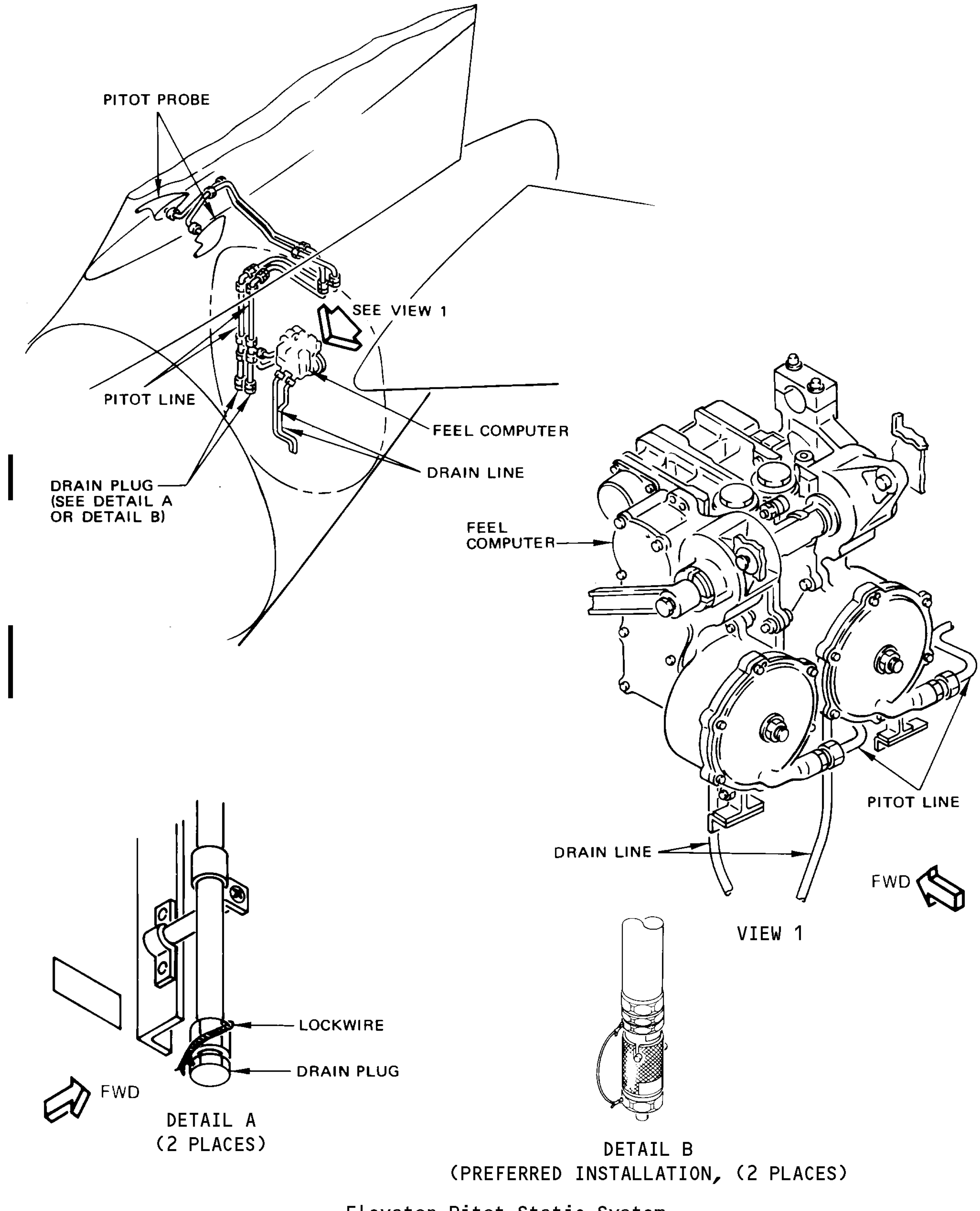
Stabilizer Trim Lock Installation
Figure 402

C. Remove the stabilizer trim lock (Fig. 402).

D. Service hydraulic reservoirs, if required (Ref Chapter 12, Hydraulic Servicing).

ELEVATOR PITOT - STATIC SYSTEM - MAINTENANCE PRACTICES

1. General
   A. Par. 2 covers Elevator Pitot -Static System Flushing.
   B. Par. 3 covers Pitot System Drainage Inspection/Check.
   C. Par. 4 covers Static System Drainage Inspection/Check.
   D. Par. 5 covers Pitot System Drainage Plug.
   E. Par. 6 covers Pitot Probe Inspection/Check.
2. Elevator Pitot-Static System Flushing
   A. Equipment and Materials
      (1) Dry air pressure source - 0 to 15 psi (gage) with filter and gage for measuring pressure.
   B. Flush Elevator Pitot-Static System (Fig. 201)
      (1) Disconnect pitot lines from pitot probes and feel computer.
      (2) Remove drain plugs from pitot lines.
      (3) Flush left pitot line with dry filtered air (not exceeding 15 psig) for 3 minutes. Flush separately from probe end, feel computer end, and drain plug end.
      (4) Repeat step (3) for right pitot line.
      (5) Disconnect drain lines from feel computer and flush both lines from each end with dry filtered air (not exceeding 15 psig) for 3 minutes.
      (6) Connect all pitot lines and drain lines.
      (7) Install drain plugs per detail A or B, Fig. 201. If required, lockwire.
      (8) Ensure that no deposit or roughness exists in any port associated with pitot-static system.
      (9) If required, perform leakage test of pitot static system (Ref 27-31-212, Adjustment/Test).
3. Pitot System Drainage Inspection/Check (Fig. 201)
   A. Equipment and Materials
      (1) Solvent - Trichlor per BMS 11-6 (Ref 20-30-31)
   B. Check Pitot System Drainage
      (1) On airplanes with drain plug per detail A, Fig. 201, periodically remove drain plugs (Ref par. 5). Clean orifices in drain plugs with compressed air. If required, flush and test pitot lines (Ref par. 2 and Adjustment/Test). Install drain plugs (Ref par. 5).
      (2) On airplanes with drain plug per detail B, Fig. 201, periodically remove drain plugs (Ref par. 5). Drain sump on drain plug by inserting raised, hexagonal portion of cap into drain body. If required, flush and test pitot lines (Ref par. 2 and Adjustment/Test). Clean drain plugs with solvent. Install drain plugs (Ref par. 5).



Elevator Pitot Static System
Figure 201

4. Static System Drainage Inspection/Check (Fig. 201)
   A. Check Static System Drainage
      (1) Periodically disconnect static system drain lines and check for proper drainage. If required, flush drain lines (Ref par. 2).
5. Pitot System Drain Plug - Removal/Installation (Fig. 201)
   A. Remove drain plug.
      (1) Remove plug per detail A or B, Fig. 201. If required remove lockwire.
   B. Install drain plug.
      (1) Install plug per detail A or B, Fig. 201. If required, instal1 lockwire.
6. Pitot Probe Inspection/Check
   A. Get access to the pitot tube.
   B. Examine the pitot tube for damage.

   NOTE: The pitot tube does not need to be removed for normal erosion/corrosion of the pitot tip.

      (1) If the pitot tube is bent or the electrical heater is damaged, install a new pitot tube (Ref 27-31-141/401).
      (2) Make sure the maximum tip bluntness of the pitot tube is not more than 0.04 inch.

ELEVATOR PITOT-STATIC SYSTEM - ADJUSTMENT/TEST

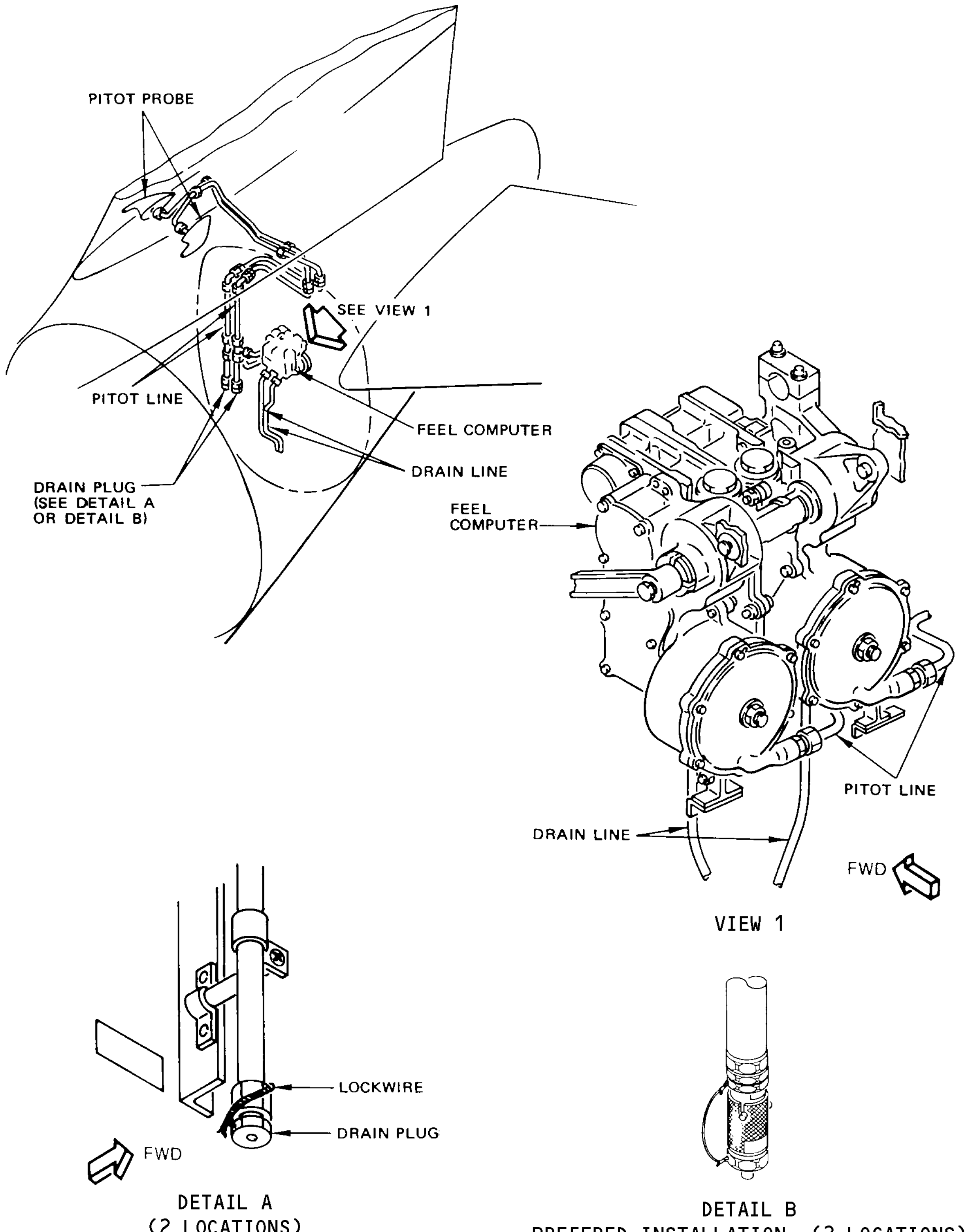
1. Equipment and Materials
   A. Air Pressure Regulator - F72928-53 (Preferred) or -52 (Optional)
2. Elevator Pitot-Static System Test (Fig. 501)
   A. Seal drain hole in each pitot probe on fin.
   B. Remove drain plugs from pitot lines.
   C. Attach pressure gage lines from air pressure regulator to drain holes.
   D. Attach regulated air pressure lines from air pressure regulator to both pitot probes on fin and pressurize pitot system to 5.0 ±0.1 psi (437 ±4 knots).

      CAUTION: DO NOT RAISE TEST PRESSURE ABOVE 6 PSI (474 KNOTS) AT ANY TIME DURING TEST, FEEL COMPUTER MAY BE DAMAGED.

   E. Cut off pressure source by turning shutoff valve in air pressure regulator to OFF.
   F. Check that pressure does not drop more than 0.3 psi (12 knots) during a 2-minute period.
   G. Reduce pitot pressure to zero.
   H. Remove seals from drain holes in each pitot probe.

      NOTE: Ensure seals are removed from drain holes.

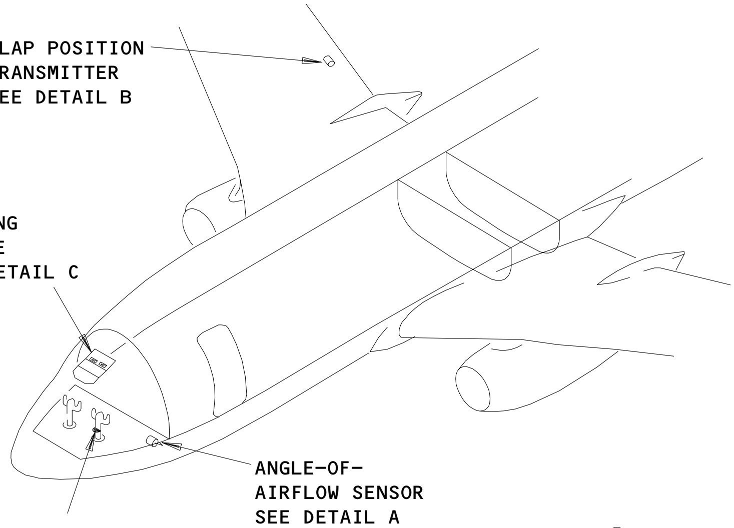
   I. Remove pressure gage lines from pitot system drain holes.
   J. Install drain plugs per Detail A or B, Fig. 501. If required, install lockwire.
   K. Remove regulated air pressure lines from both pitot probes on fin.

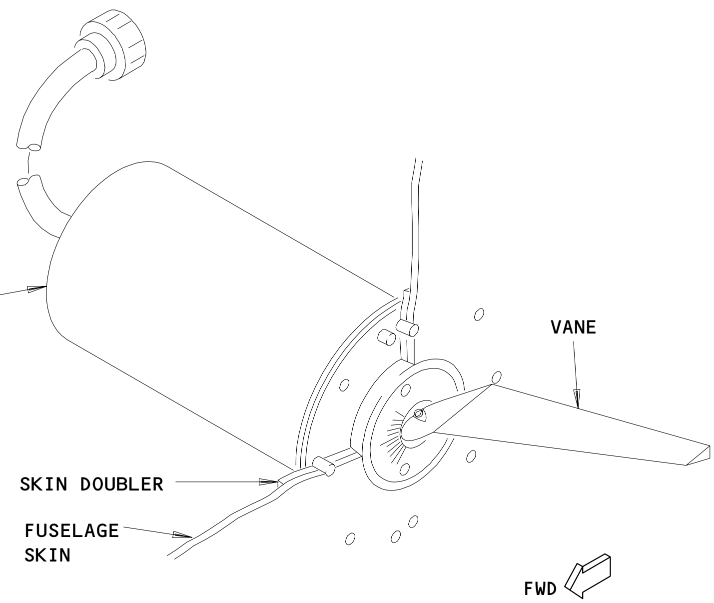


Elevator Pitot Static System
Figure 501

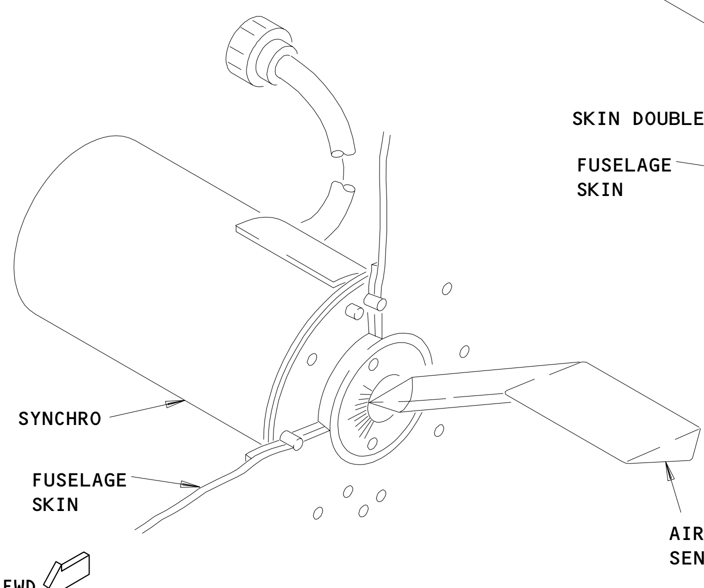
STALL WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. A stall warning system (Fig. 1) is provided to alert the pilots of an approaching stall condition. The warning is accomplished by applying vibrations to the captain's control column. Interconnection of the control columns enable the vibrations to be transferred to the first officer's column. The system consists of an angle of airflow sensor, flap position transmitter, stall warning module and a control column shaker. The angle of airflow sensor measures the airplane angle of attack. An electrical position signal from the airflow sensor is modified by the flap position transmitter synchro and then fed into the stall warning module. At predetermined combinations of flap position and airplane angle of attack, a stall-warning signal is emitted from the module to activate the control column shaker.
2. Angle of Airflow Sensor
   A. The angle of airflow sensor provides a signal which represents airplane angle of attack. The sensor is located on the outside of the fuselage below the captain's side window (Fig. 1). The sensor consists of an aerodynamic vane that positions a synchro. The counterbalanced vane is free to rotate from stop to stop and in flight it will assume a position parallel to the airflow passing over it.
   B. A heater is installed in the sensor vane to provide anti-icing. The vane is heated by 115 volts ac as soon as the No. 1 engine is started. Heater power switching is provided by two relays in the stall warning module. One relay is actuated by the No. 1 engine starter cutout switch; the other relay is actuated by the main landing gear relays. The heater power is obtained from the No. 1 electronics bus through the STALL WARN 115 volts ac circuit breaker.
3. Flap Position Transmitter
   A. The flap position transmitter receives the synchro signal from the airflow sensor and modifies it for trailing edge flap position. The combined signal is then passed to the stall warning module. Two flap position transmitters are mounted in the flap drive train (Fig. 1). One cam and synchro in the right transmitter only serves the stall warning system.



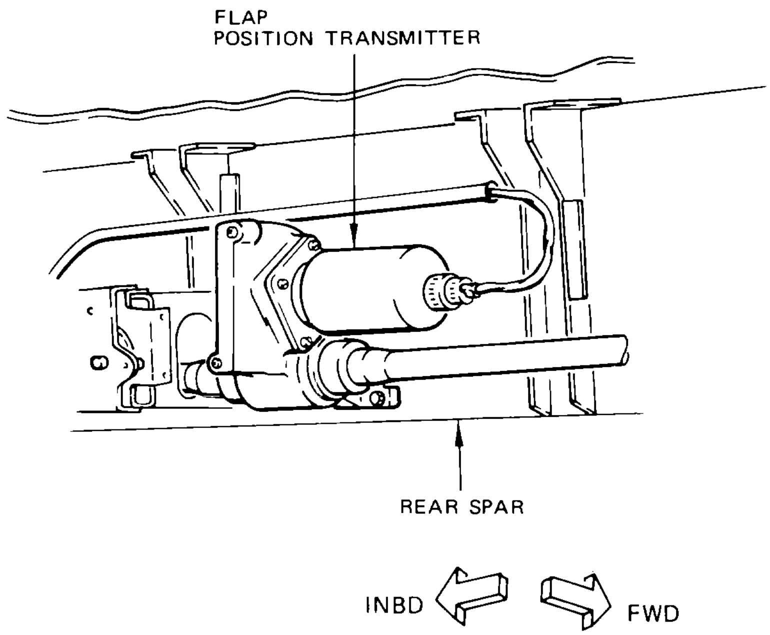


ROSEMOUNT ANGLE-OF-AIRFLOW SENSOR
DETAIL A

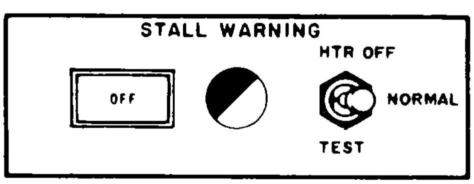


CONRAC ANGLE-OF-AIRFLOW SENSOR
DETAIL A

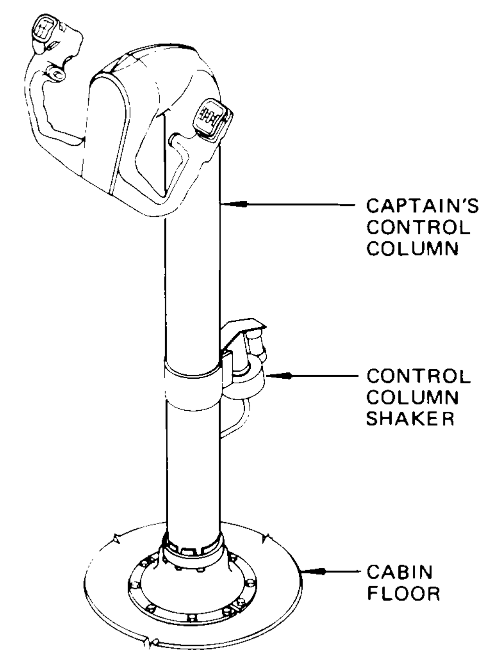
Stall Warning System Component Location
Figure 1 (Sheet 1)



DETAIL B



DETAIL C



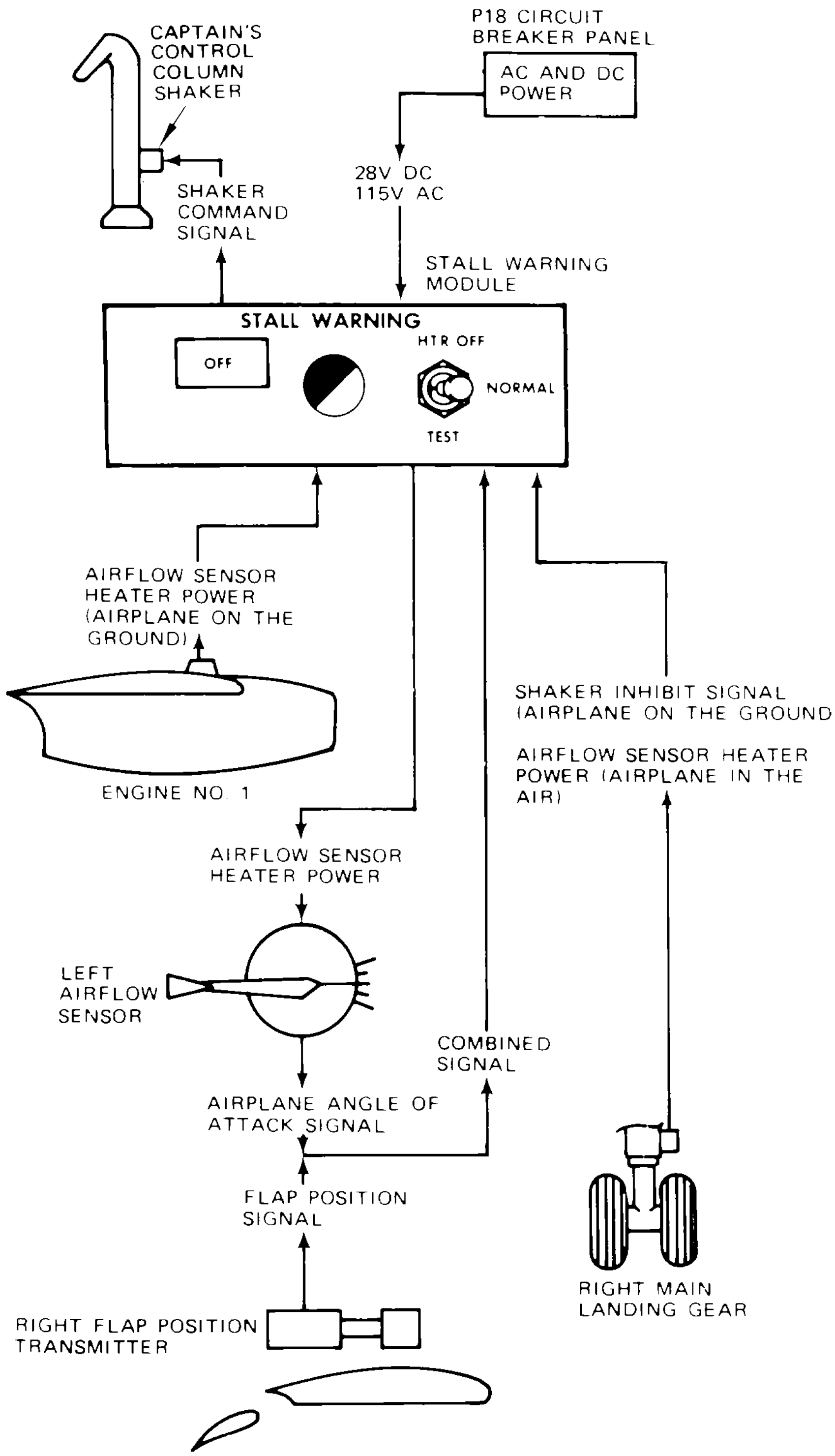
DETAIL D

Stall Warning System Component Location
Figure 1 (Sheet 2)

4. Stall Warning Module
   A. The stall warning module utilizes the combined output from the angle of airflow sensor and the flap position transmitter to control the operation of the control column shaker. (See figure 2.) The module is located in the P5 aft overhead panel. The module contains two amplifiers, a demodulator, a failure sensing circuit, a test circuit, an air/ground relay and a shaker test switch. A failure light labeled OFF on the face of the module will illuminate when system power failure or vane heater failure occurs. The test circuit is controlled from a three position toggle switch on the face of the module. The toggle switch has a positive NORMAL mode, a positive HTR OFF mode and a momentary TEST mode. The shaker test switch is located on the back of the module. This test switch may be used as a ground check to isolate a system failure to the control column shaker motor.
   B. With the stall warning system activated and with the engines not running, the OFF light will be illuminated. Operating the three position toggle switch to the TEST position will provide a check of the stall warning system operation. Depressing the switch will activate the control column shaker, extinguish the OFF light and actuate the motor-driven test indicator. Failure of the OFF light to extinguish or the test indicator to rotate, indicates a failure within the stall warning system. Releasing the switch from TEST position will illuminate the OFF light, deactivate the shaker motor and stop rotation of the test indicator. Placing the toggle switch in HTR OFF mode will isolate the power source to the airflow sensor vane heater. This will enable handling of the airflow sensor while the system is in a simulated flight condition. With the toggle switch in HTR OFF mode the OFF light will stay illuminated.
   C. The air/ground relay in the stall-warning module is actuated by two relays located in the E3 electronics compartment (Fig. 2). These relays are controlled by proximity switches on the right main gear oleo. Compressing or extending the landing gear actuates the switches. The primary function of the air/ground relay in the stall warning module is to provide an inhibit signal to prevent operation of the shaker prior to liftoff and after touchdown.
5. Control Column Shaker
   A. The control column shaker applies vibrations to the control column when energized by a signal from the stall warning module (Fig. 1 and 2). The shaker is clamped to the forward face of the captain's control column. The unit comprises a motor and a coaxially-mounted weighted ring assembly. Energizing the dc motor rotates the out-of-balance ring assembly. The resulting vibrations are transferred to the control column to give the required shaking action. Power to the shaker motor is obtained from the No. 1 dc electronics bus through the STALL WARN DC circuit breaker on panel P18.

6. Operation

A. With the airplane on the ground and the No. 1 engine running, electrical power applied at the circuit breakers and with the stall warning circuit breakers closed, the stall warning system is energized and 115 volts ac is applied to the vane heater. Depressing the toggle switch on the overhead panel to TEST, will activate the control column shaker and rotate the test indicator to verify a functional system. Releasing the TEST switch will deactivate the shaker and de- energize the test indicator motor (Fig. 1 and 2). At the point of liftoff, the landing gear relays de- energize the air/ground relay in the stall warning module which removes the inhibit signal to provide normal system operation. At any time after liftoff, should a signal representing an approaching stall condition develop, the stall-warning module will apply 28 volts dc to the control column shaker to provide the necessary warning. The stall warning system is designed to provide a warning at a minimum of 7 percent above airplane stall speed.



Stall Warning System Schematic
Figure 2

STALL WARNING SYSTEM - TROUBLESHOOTING

1. General
   A. In the following troubleshooting charts, all possible failures are listed under TROUBLE column. The PROBABLE CAUSE column lists failures in airplane wiring and failures of whole components only. The component assumed most likely to fail is the P5-18 stall warning module, therefore in troubleshooting the system it should be replaced first.
   B. The continuity checks listed are from one component to another. It may be easier or necessary to check continuities to the connectors between the listed points. In that case the wiring diagram should be used to determine what connector and pin to check. Refer to wiring diagram 27-32-11 in Wiring Diagram Manual for pin numbers and part numbers referred to in troubleshooting chart.
   C. The troubleshooting procedure is divided into several charts to cover system failures occurring under various airplane conditions as follows:
      (1) Airplane on ground, No. 1 engine not running, system toggle switch in NORMAL position.
      (2) Airplane on ground, No. 1 engine off, system toggle switch in TEST position.
      (3) Airplane on ground, No. 1 engine running, system toggle switch in NORMAL position.
      (4) Airplane in air, system toggle switch in NORMAL position.
   D. Before any extensive component and airplane wire troubleshooting, examine system power at circuit breakers, bent or loose connector pins, metallic or other contamination in connectors, etc.
2. Troubleshooting Charts (Stall Warning System)
   A. Airplane Condition: Airplane on ground, No. 1 engine not running, switch (S1) in NORMAL position.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
OFF indicator does not illuminate	P5-18 stall warning module		Replace module
	No voltage at pin 20 (disconnect D213)	Assure power through circuit breaker C313 on P6 panel and continuity from load side to pin 20 (D213)	Replace circuit breaker or repair wiring

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Burned out indicator light bulbs		Pull out top of OFF indicator. Replace bulbs
	No short circuit continuity between pins 14 and 15 of D213	Establish wire continuity per Wiring Diagram 27-32-11	Replace landing gear module M338 on shelf E2-2 if necessary
	Not ground on pin 4 of D213		Establish ground
OFF indicator comes on but master caution lights do not	P5-18 stall Warning module		Replace module
	No short circuit continuity between P5-18 pin 21 (D213) and P5-19 pin 27 (D483)		Establish continuity
	P5-19 Test Module		Replace P5-19 module
	Master caution system		Troubleshoot master caution system (Chapter 31)
Shaker shakes	P5-18 stall warning module		Remove and replace

B. Airplane Condition: Airplane on ground, No. 1 engine off, switch (S1) in TEST position.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
OFF indicator does not go off	P5-18 stall warning module		Replace module
	No 28 volts dc at pin 3 (D213)	Check for voltage at load side of circuit breaker Stall Warning-DC - C350 (P18). Check continuity between circuit breaker and pin 3 (D213)	Establish continuity
	No ac power at pin 27 (D213)	Check for ac voltage at load side of Stall Warning-AC circuit breaker - C351 (P18). Check continuity between circuit breaker and pin 27 (D213)	Establish continuity
	No ground at pin 26 (D213)		Establish continuity
	No short circuit continuity between pin 7 (D213) and pin 2 (D65)		Establish continuity
	No ground at pin 1 (D365) (airflow sensor)		Establish continuity
	Heater element open	Check pin 7 D213 and airplane ground	Establish continuity

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	High resistance in element	Check sensor pins 1 & 2 for approx 30 ohms	Replace sensor
	Faulty AOA sensor	Check continuity between pins 6 and 7 on stall warning module	Replace AOA sensor and stall warning module
OFF indicator does not come on when master test switch (P2-1) is in TEST position	P5-18 stall warning module		Replace module
	Open circuit in wiring		Check and correct master dim and master test circuit for stall warning system Ref WDM 33-18-14
The test indicator does not spin	P5-18 stall warning module		Replace module
	Defective synchro on airflow sensor	Check continuity between pins 4, 5, and 6 of D365. Check continuity between pins 7, 8, and 9 of D365	Replace airflow sensor if necessary
	Defective synchro in flap position transmitter	Check continuity between pins 4, 5, and 6 of D229. Check continuity between pins 7, 8, and 9 of D229	Replace the transmitter if necessary
	Open circuit in airplane wiring	Check continuity between the following:	Repair wiring

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
		Pin 16 (D213) to pin 5 (D365)	
		Pin 17 (D213) to pin 6 (D365)	
		Pin 18 (D213) to pin 4 (D365)	
		Pin 8 (D365) to pin 4 (D229)	
		Pin 7 (D365) to pin 5 (D229)	
		Pin 9 (D365) to pin 6 (D229)	
		Pin 7 (D229) to pin 24 (D213)	
		Pin 8 (D229) to pin 22 (D213)	
Shaker does not shake	P5-18 stall warning module		Replace module
	Defective shaker motor		Replace shaker
	Open circuit in airplane wiring	Check continuity between pin 5 (D213) and pin A (D281), pin B (D281) and airplane ground	Establish continuity

C. Airplane Condition: Airplane on ground, No. 1 engine running, switch (S1) in NORMAL position.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
OFF indicator does not go off	See like trouble in par. B.		See par. B.
	No ground at pin 12 (D213) while engines are on	Check for continuity between pin 12 (D213) and pin C (D422) M119 engine No. 1 cutout switch. Check for ground at pin A (D422)	Establish continuity. Replace the cutout switch if necessary

D. Airplane Condition: Airplane in air, switch (S1) in normal position.

NOTE: Perform troubleshooting on the ground.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Shaker shakes during normal flight or at incorrect airplane speed (Open stall warn dc curcuit breaker from each system in turn to isolate system causing both shakers to shake)	Refer to probable cause for trouble "OFF indicator does not turn on when the master test switch (P2-1) is in TEST position" in par. B. TROUBLE chart		See par. B
	The angle of airflow sensor may be out of alignment or bent		Check and assure correct installation
	Flap position transmitter out of alignment		Check and assure proper installation

STALL WARNING SYSTEM - ADJUSTMENT/TEST

1. Stall Warning System Test
   A. Equipment and Materials
      (1) Portable Calibrator - F72786-101 or -1 [for CONRAC sensor vane, part number 10-60878-( )]

         NOTE: F72786-101 replaces F72786-1 for future procurement.

      (2) Adapter Kit Assembly - F72786-183 [for Rosemount sensor vane, part number 10-62047-( )] -183 adapter used in conjunction with -101 calibrator makes a -181 calibrator which can be used on Conrac and Rosemount sensor vanes
   B. Prepare Stall Warning System for Test
      (1) Apply external electrical power to airplane.
      (2) Make sure that circuit breakers on P6 and P18 circuit breaker panels are closed and position LIGHTS switch on P2 circuit breaker panel to DIM.
   C. Test Stall Warning System
      (1) Perform confidence test.
         (a) Check that OFF light on stall warning module is illuminated.
         (b) If MASTER CAUTION lights are illuminated, press and release either light to reset master caution circuit. MASTER CAUTION lights shall extinguish.
         (c) Hold stall warning module switch in TEST position. Check that the following occurs:
            1) Stall warning module OFF light extinguishes.
            2) MASTER CAUTION and the OVHD annunciator lights shall be disregarded.
            3) Test indicator on stall warning module shall spin at a minimum of two revolutions per second.
            4) Control column shaker operates.
         (d) Release switch and allow switch to return to NORMAL position. Check that the following occurs:
            1) Stall warning module OFF light illuminates.
            2) Two MASTER CAUTION lights illuminate.
            3) OVHD master caution annunciator light illuminates.
            4) Stall warning module test indicator stops rotating.
            5) Control column shaker stops shaking.

            NOTE: With switch held in TEST position, angle of airflow sensor vane is heated with 115 volts ac and OFF light will be extinguished. With switch returned to NORMAL position, there will be no power to vane heater and OFF light will remain illuminated until airplane engines are started.

(2) Test failure sensing circuit.
 (a) Open STALL WARN - DC circuit breaker at circuit breaker panel P18-2.
 (b) Hold stall warning module switch in TEST position. Check that OFF light remains illuminated.
 (c) Close STALL WARN - DC circuit breaker.
 (d) Hold stall warning module switch in TEST position. Check that OFF light extinguishes.

(3) Test master caution, master test and master dim.
 (a) Hold LIGHTS switch at P2-1 panel in TEST position. At same time hold stall warning module switch in TEST position. Check that the following occurs:
  1) Stall warning module OFF light remains illuminated.
  2) Stall warning module test indicator rotates.
  3) Control column shaker operates.
 (b) Release LIGHTS switch. Check that all lights in step (a)1) go off.
 (c) Release stall warning module TEST switch. Check that the following occurs:
  1) Stall warning module OFF light comes on.
  2) Two MASTER CAUTION lights come on.
  3) OVHD master caution annunciator light comes on and other master caution annunciator lights may come on.
  4) Stall warning module test indicator stops rotating.
  5) Control column shaker stops shaking.
 (d) Press and release either of two MASTER CAUTION lights. Check that the following occurs:
  1) Both MASTER CAUTION lights go off.
  2) OVHD master caution annunciator light goes off.
  3) Stall warning module OFF light remains on.
 (e) Press and release OVHD master caution annunciator light. Check that the following occurs:

  NOTE: Do not cancel MASTER CAUTION light.

  1) Both MASTER CAUTION lights come on.
  2) OVHD master caution annunciator light comes on.
  3) Stall warning module OFF light remains on.
 (f) Place LIGHTS switch at P2-1 panel in BRT position. Check that stall warning module OFF light brightens.
 (g) Return LIGHTS switch to DIM. Check that OFF light becomes dim.

(4) Test system performance.
  (a) Check angle-of-airflow sensor.
    1) On airplanes with CONRAC sensor, slowly rotate sensor vane through 360 degrees using light finger pressure. Check that vane rotates without binding or variations in torque and that shaker does not shake. Check that 0.090-inch diameter drain hole is open and clear of obstructions.

       WARNING: SENSOR VANE COULD CAUSE BURNS. ALLOW SUFFICIENT TIME TO COOL BEFORE HANDLING.

       CAUTION: DO NOT SPIN VANE. DAMAGE TO SYNCHROS MAY OCCUR.

    2) On airplanes with Rosemount sensor, slowly rotate sensor vane between stops using light finger pressure. Check that vane rotates without binding or variations in torque and that shaker does not shake.
  (b) Place stall warning module switch to HTR OFF position. Check that stall warning module OFF light comes on and OVHD master caution light remains on.
  (c) Attach portable calibrator or adapter kit assembly on angle-of-airflow sensor.

TABLE I		
FLAP POSITION (Flap Lever Detent Position)	VANE ANGULAR POSITION (Vane UP is positive) (±0.7 degree)	
	*[1]	*[2]
0	-1.0° CW - AERODYNAMIC OFFSET	-0.5° CW - AERODYNAMIC OFFSET
1	+6.5° CCW + AERODYNAMIC OFFSET	+6.4° CCW + AERODYNAMIC OFFSET
2		+6.4° CCW + AERODYNAMIC OFFSET
5	+5.0° CCW + AERODYNAMIC OFFSET	+6.4° CCW + AERODYNAMIC OFFSET
10		+6.4° CCW + AERODYNAMIC OFFSET
15	+3.5° CCW + AERODYNAMIC OFFSET	+6.4° CCW + AERODYNAMIC OFFSET
25	+3.5° CCW + AERODYNAMIC OFFSET	+6.4° CCW + AERODYNAMIC OFFSET
30	+3.5° CCW + AERODYNAMIC OFFSET	+5.0° CCW + AERODYNAMIC OFFSET
40	+2.0° CCW + AERODYNAMIC OFFSET	+3.0° CCW + AERODYNAMIC OFFSET

NOTE: Aerodynamic offset is on trailing edge of rosemount sensor vane only.

*[1] NH JA8403 thru JA8411; MD 5R-MFA; IC VT-EAG thru VT-EAM; TM CR-BAA, CR-BAB; PV CF-EPL, CF-EPO, CF-EPR; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE
*[2] ALL EXCEPT *[1]

(d) Set vane trailing edge down approximately 20 degrees from zero position on calibrator. Check that shaker does not shake. Rotate vane slowly up from the no-shake position unit control column shakes. Slowly rotate vane 10 degrees into shake region. Check that shaker continues to shake control column.

(e) Set flap to each position shown in Table I. For each flap setting; rotate vane slowly up from no-shake position until control shaker shakes control column. Check that shaker actuates within tolerance specified in Table I.

(5) Test landing gear relay.
  (a) Place sensor vane in a position that actuates control column shaker, then lock vane in this position using portable calibrator.

  WARNING: WHEN HANDLING SENSOR VANE DURING THIS TEST, ENSURE VANE IS COLD. VANE COULD CAUSE BURNS.

  (b) Open AURAL WARN circuit breaker on panel P6.
  (c) Place stall warning module switch to NORMAL position. Check that control column shaker stopes shaking and stall warning module OFF light illuminates.
  (d) Depress and hold GRD SENSING TEST switch on landing gear electrical module located in electrical/electronic equipment compartment. Check that control column shaker shakes and stal1 warning module OFF light extinguishes.
  (e) Release GRD SENSING TEST switch. Check that control column shaker stops shaking and stall warning module OFF light illuminates.
  (f) Depress and hold AIR SENSING TEST switch on landing gear electrical module located in electrical equipment compartment. Check that control column shaker shaker and stall warning module OFF light extinguishes.
  (g) Release AIR SENSING TEST switch. Check that control column shaker stops shaking and stall warning module OFF light illuminates.
  (h) Place stall warning module switch to HTR OFF position.
  (i) Remove portable calibrator from angle-of-airflow sensor.
  (j) Place stall warning module switch to NORMAL position. Check that stall warning module OFF light remains illuminated.
  (k) Close AURUL WARNING circuit breaker on P6.

D. Remove external power, if no longer required.

ANGLE-OF-AIRFLOW SENSOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Adhesive - BMS 5-95 (Ref 20-30-11)
2. Remove Angle-of-Airflow Sensor (Fig. 401)
   A. Open stall warning, circuit breakers on P18.
   B. Remove eight mounting screws surrounding sensor.

      CAUTION: DO NOT APPLY ANY FORCE TO SENSOR VANE.

   C. Remove sidewall panel alongside captain's position.
   D. Disconnect electrical connector.
   E. Lightly rock sensor body to break adhesion, then remove sensor.

      CAUTION: EXERCISE CARE TO AVOID DAMAGING VANE DURING REMOVAL.

3. Install Angle-of-Airflow Sensor (Fig. 401)
   A. Carefully insert sensor vane through fairing from inside.

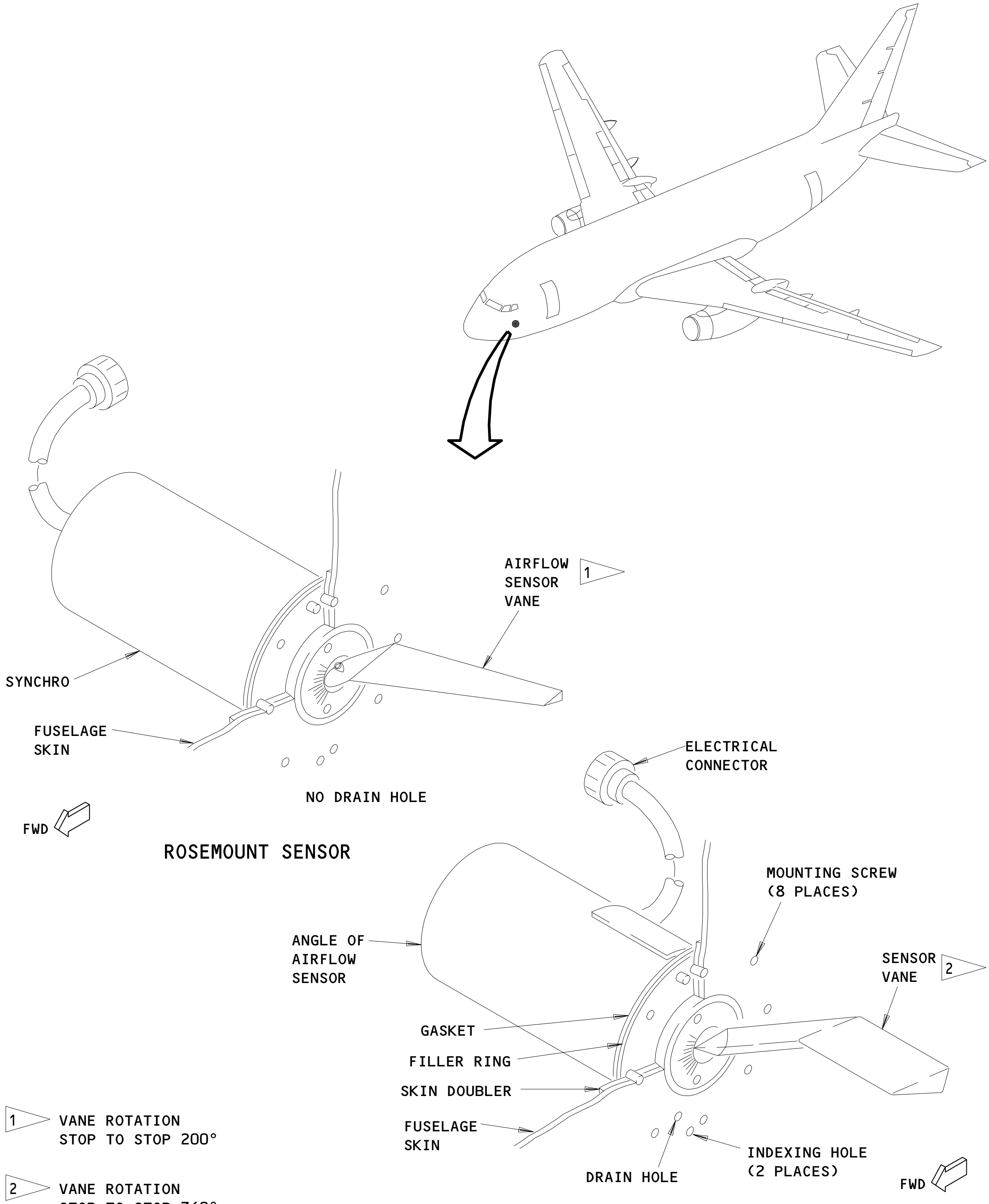
      NOTE: Conrac and Rosemount angle-of-airflow sensors are physically and functionally interchangeable.

   B. Locate sensor with gasket and filler ring, and install eight mounting screws. Check that drain hole in body skin is aligned with drain hole in gasket and filler ring (drain hole Conrac only).
   C. Check that face of sensor is flush with outside fuselage skin within ± 0.02 inch. To obtain required flushness, delaminate or replace filler ring. If new filler ring is installed, bond to inside face of skin doubler.

      S 764-001
      (1) Use an ohmmeter to measure the resistance between the base of the AOA sensor and the airplane skin.
         (a) If the resistance is more than 0.010 ohm, do these steps:
            1) Remove the angle of airflow sensor.

2) Clean the bonding surfaces for the angle of airflow sensor (SWPM 20-20-00).
3) Replace the gasket and filler ring.
4) Replace the existing screws with new screws.
5) Re-install the angle of airflow sensor.
6) Measure the resistance between the body of the angle of airflow sensor and the airplane skin with an ohmeter.
7) If the resistance is more than 0.010 ohms, do these steps:
   a) Remove the angle of airflow sensor.
   b) Replace the nutplates and rivets that attach the angle of airflow sensor (SRM 51-40-02).
   c) Re-install the angle of airflow sensor and make sure the bonding resistance is not more than 0.010 ohm.

D. Reconnect electrical connector.
E. Refit sidewall panel.
F. Close circuit breakers opened for sensor removal (Ref par. 2.A.).
G. Check that sensor drain hole is not plugged by dirt or due to incorrect installation of gasket and/or filler ring (drain hole Conrac only).
H. Carry out system performance test (AMM 27-32-00/501).



Angle of Airflow Sensor Installation
Figure 401

ANGLE-OF-AIRFLOW SENSOR - INSPECTION/CHECK

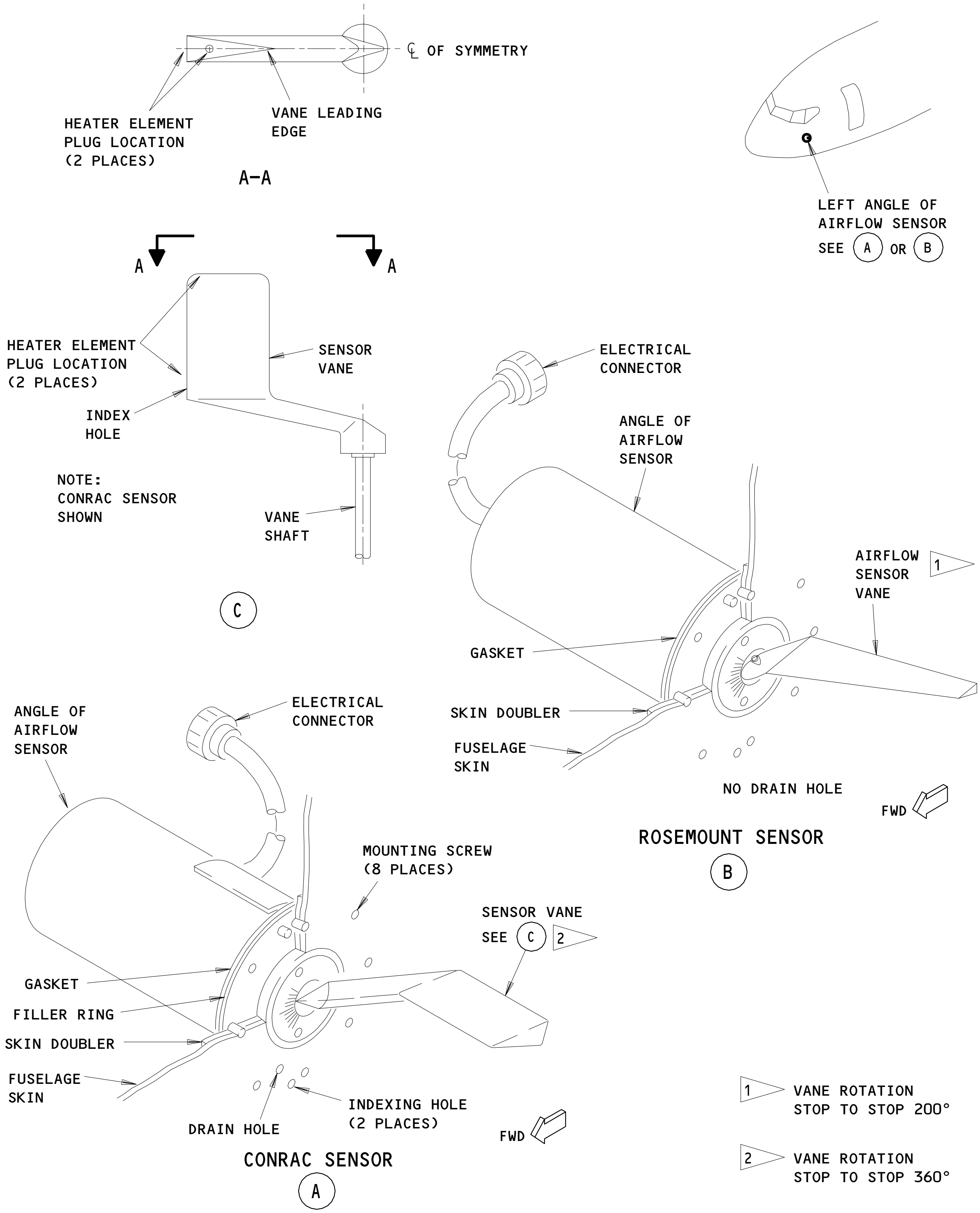
1. Check Angle-of-Airflow Sensor (Fig. 601)

NOTE: Any vane which shows signs of heater plug migration, deteriorated index hole, bent vane shaft, or other deformation must not be reworked. Any repairs of sensor must not be done without consulting the vendor overhaul manual.

A. Check vane for heater plug migration evidenced by heater plugs not flush with surface plane.
B. Replace sensor showing evidence of heater plug migration.
   (1) Check vane for deformation, nicks, and pitting of leading edge, generally heavier on inboard portion of vane.

   NOTE: Some erosion of vane leading edge is to be expected after a few thousand flight hours and will not adversely affect sensor performance.

   (2) Replace sensor with obvious asymmetrical erosion patterns between vane upper and lower surfaces, asymmetrical patterns of nicks, deteriorated index hole, and bent vane shaft.
C. Check vane for excessive rotational friction.
   (1) Rotate vane slowly and check that only light pressure is required to turn vane. If friction is excessive, replace vane.
D. Check that sensor drain hole is free of obstructions. Remove any obstruction (drain hole Conrac only).



Angle of Airflow Sensor Check
Figure 601

STALL WARNING MODULE - REMOVAL/INSTALLATION

1. Remove Stall Warning Module
   A. Open the STALL WARNING circuit breakers at the P18 circuit breaker panel.
   B. Support module and release four fasteners securing module to aft overhead panel.
   C. Lower module, disconnect electrical connector and remove module from airplane.
2. Install Stall Warning Module

   WARNING: USE ONLY A STALL WARNING MODULE BOEING PART NO. 69-37339-XX, CONRAC CO. PART NO. 305-2600-XX OR UNITED CONTROLS PART NO. 965-0197-XX AS REPLACEMENT FOR AN EXISTING MODULE, BECAUSE NOT ALL MODULES ARE FUNCTIONALLY INTERCHANGEABLE.

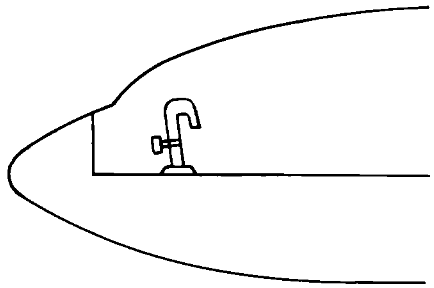
   A. Connect electrical connector to receptacle on back of module.
   B. Install module in aft overhead panel and secure the four fasteners.

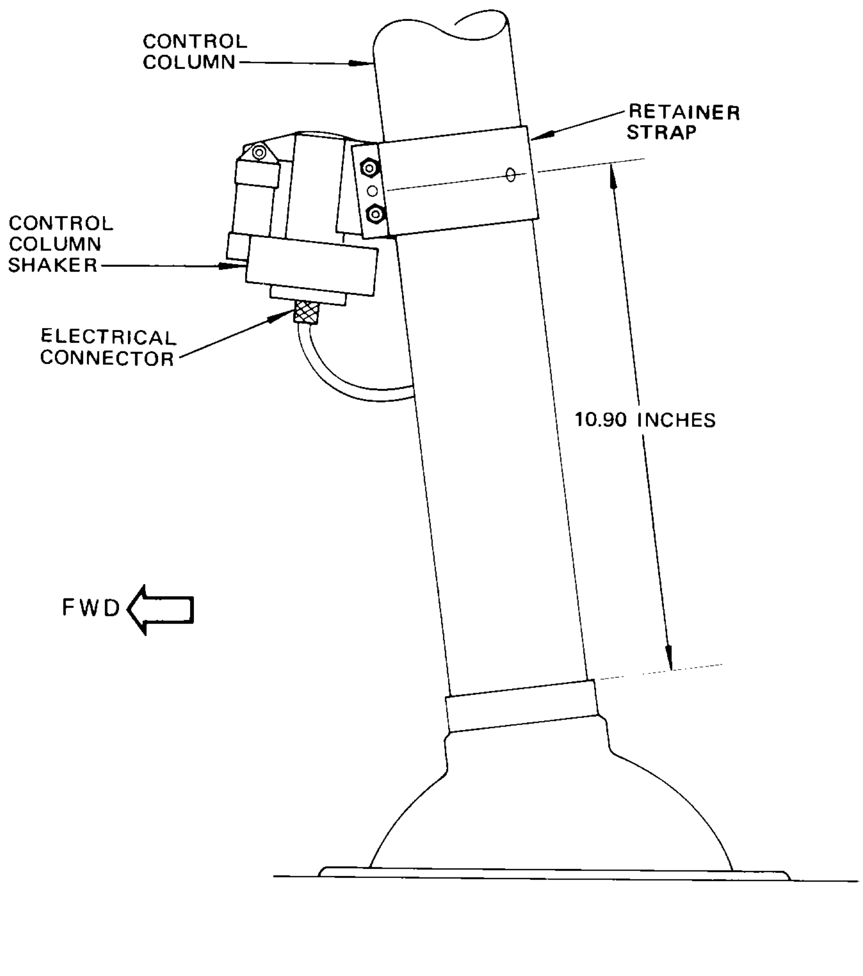
      NOTE: Ensure module is installed with STALL WARNING callout located aft.

   C. Close STALL WARNING circuit breakers.
   D. Perform stall warning system test. Refer to 27-32-0, Stall Warning System - Adjustment/Test.

CONTROL COLUMN SHAKER - REMOVAL/INSTALLATION

1. Remove Control Column Shaker
   A. Open the STALL WARN circuit breakers at the P18 circuit breaker panel.
   B. Disconnect electrical connector from shaker unit (Fig. 401).
   C. Remove two nuts and bolts attaching shaker unit to control column retainer strap.
   D. Remove shaker unit from airplane.
2. Install Control Column Shaker
   A. Attach shaker unit to control column retainer strap, maintaining 10.90 inches between center of strap and top of clamp at base of control column (Fig. 401).
   B. Tighten bolts within 20 to 25 pound-inches torque range. Add or remove shims as required between shaker unit and retainer strap.
   C. Connect electrical connector to receptacle on underside of shaker unit.
   D. Close STALL WARN circuit breakers.
   E. Depress the toggle switch on the face of the stall warning module to TEST position. Check to ensure control column shaker operates, then return toggle switch to NORMAL position.

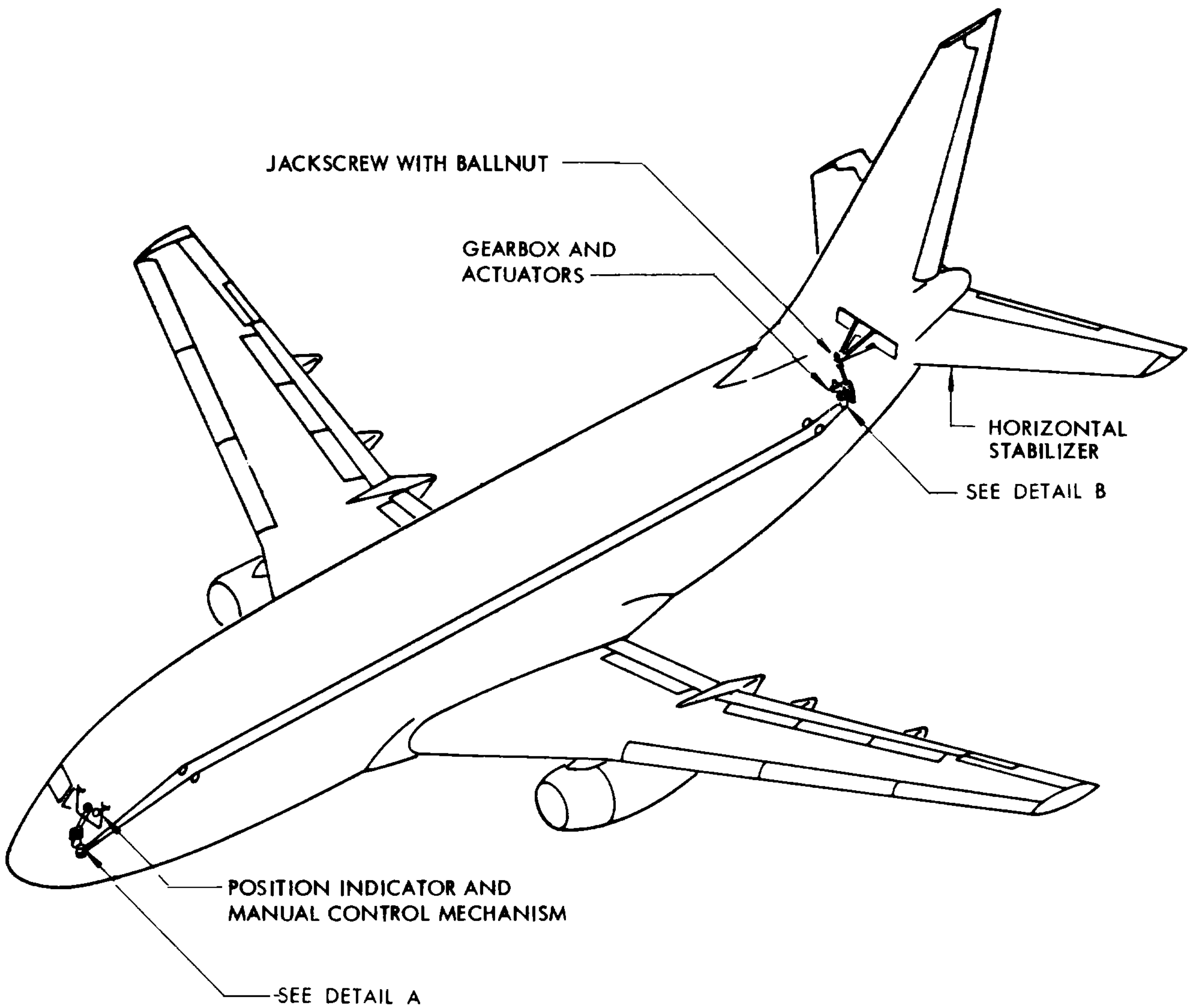




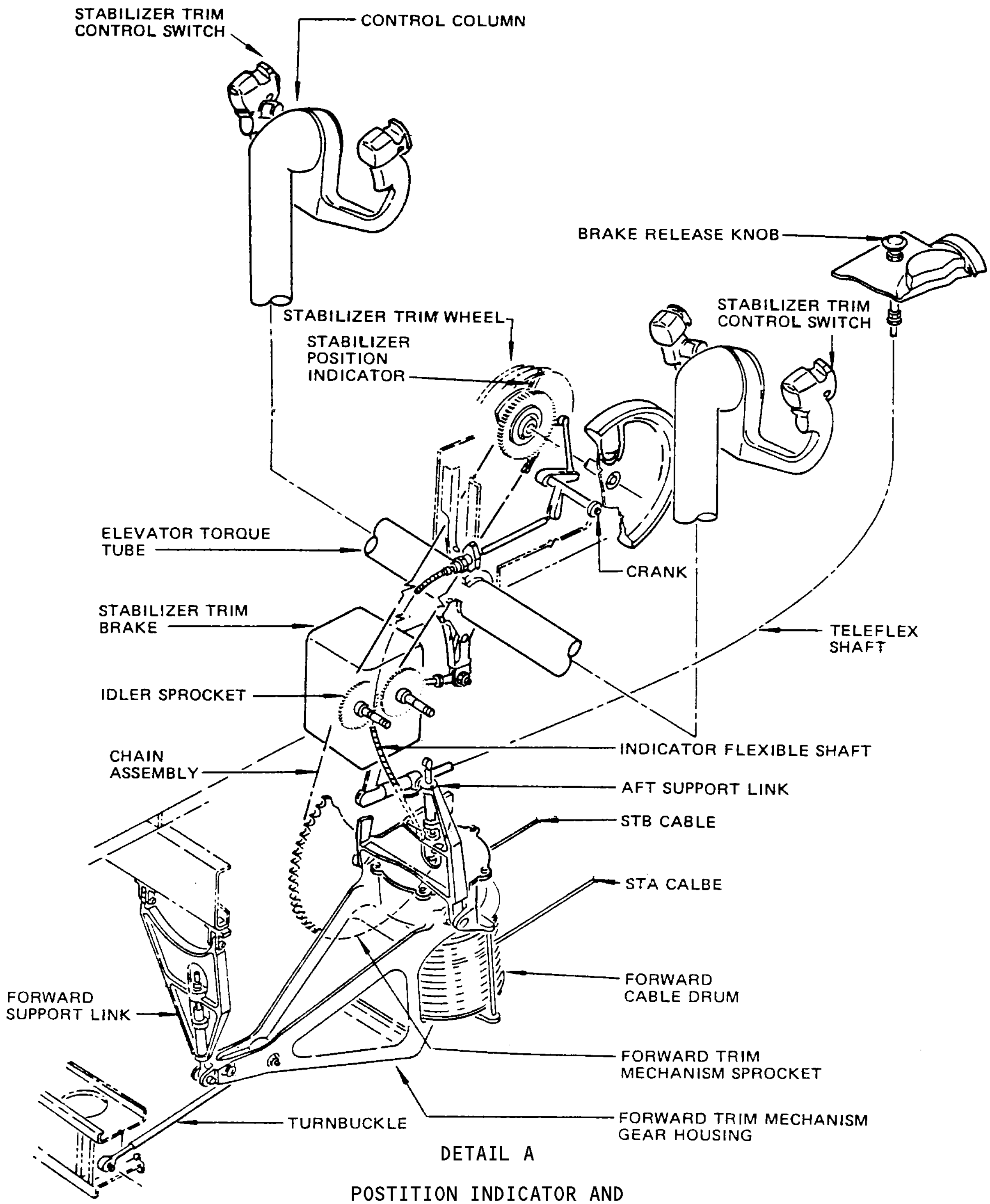
Control Column Shaker Installation
Figure 401

HORIZONTAL STABILIZER TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The horizontal stabilizer trim control system provides longitudinal trim of the airplane by varying the angle of attack of the horizontal stabilizer. The horizontal stabilizer is moved through 17.0 degrees of travel by means of a jackscrew with ball nut (Fig. 1). Two actuators and a cable drum on the jackscrew gearbox provide for trim control from three separate control systems. The normal control is an electrical system which actuates the jackscrew through the main electric actuator. Autopilot control is provided by the autopilot actuator on the gearbox. A manual control system drives through cables to the cable drum on the jackscrew gearbox. The manual system remains engaged at all times and is therefore back-driven by the main electric actuator or autopilot actuator during normal operation. Manual system operation will disengage both the normal electrical and autopilot actuators if these systems become jammed. A continuous indication of stabilizer position is provided by trim position indicators adjacent to trim wheels on the control stand. The indicator s are positioned by the manual system. A takeoff warning system indicates any unsafe stabilizer position for takeoff (Ref 31-26-0, Description and Operation). A stabilizer trim brake unit, located under the control stand, arrests the motion of stabilizer system during trimming when opposed by the motion of the elevator control.
   B. The normal electrical trim control system consists of control switches, cutout switches, limit switches, trim control relays, a stabilizer trim on warning light and the electric actuator (Fig. 2). The electric actuator contains two electromagnetic clutches, an electric motor, and the output shaft to drive the jackscrew gearbox. The motor is operated by ac power and the electromagnetic clutches by dc power. The stabilizer actuator is controlled through the trim control relays by the control switches, the limit switches and the cutout switches. The stabilizer-trim-on warning light indicates that the trim motor is operating. The control switches are located on the outboard horn of each control wheel and have two momentary on positions, NOSEUP and NOSEDOWN, and are spring-returned to the center OFF position. Two stabilizer limit switches located on the bulkhead aft of the jackscrew gearbox are actuated by a striker to limit the UP and DOWN leading edge travel of the stabilizer. The cutout switches on the control stand, are used to remove power from the main electrical actuator or the autopilot actuator.
   C. During use of the autopilot actuator trimming is done at one of two rates. The high speed winding of the autopilot servomotor provides trimming at 1/3 of the rate of the normal electric actuator. The low speed winding of the autopilot servomotor provides trimming at 1/18 of the rate of the normal electric actuator. The actual autopilot trimming rate is controlled by the position of the flaps.



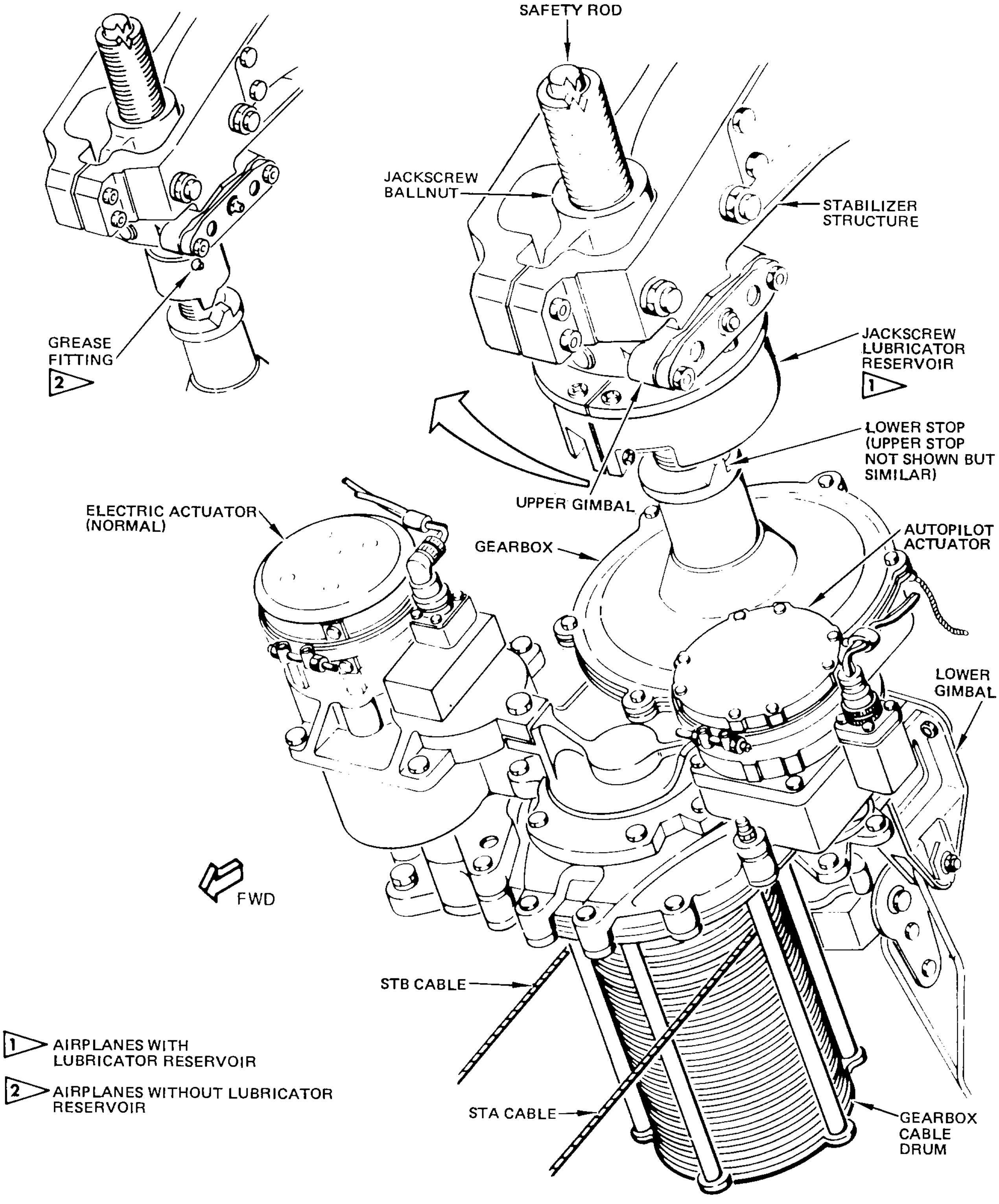
Horizontal Stabilizer Trim Control System Component Location
Figure 1 (Sheet 1)



DETAIL A

POSTITION INDICATOR AND
MANUAL CONTROL MECHANISM

Horizontal Stabilizer Trim Control System Component Location
Figure 1 (Sheet 2)



STABILIZER ACTUATOR MECHANISM
DETAIL B

Horizontal Stabilizer Trim Control System Component Location
Figure 1 (Sheet 3)

2. Horizontal Stabilizer

   A. The horizontal stabilizer assembly consists of a left and a right section attached to a center section (Fig. 3). The center section jackscrew support, hinge supports, front spar and rear spar members are all truss-type forgings. Good accessibility for maintenance is provided by the use of a star-shaped pattern of beams for the center section.

3. Stabilizer Forward Control Mechanism

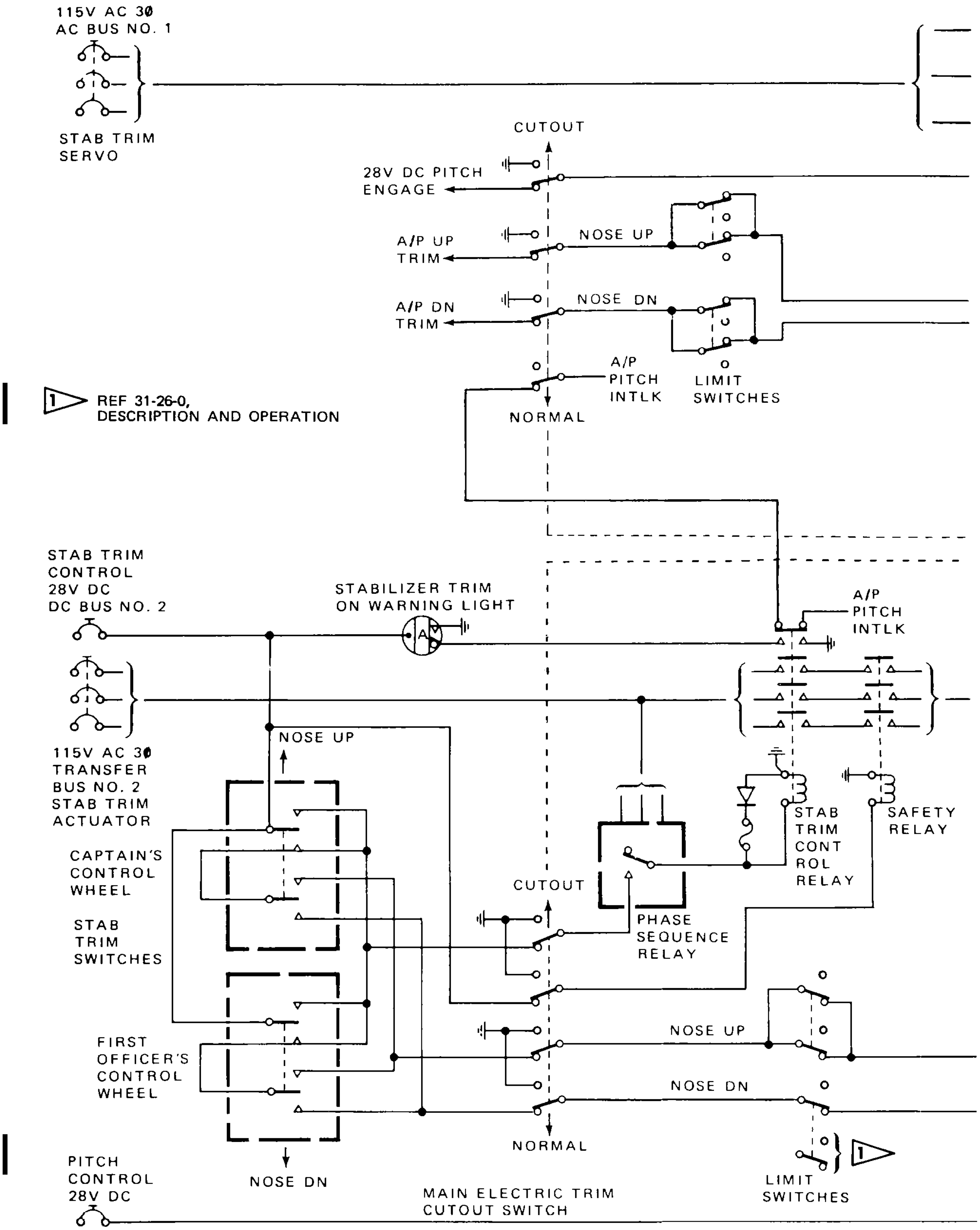
   A. The stabilizer forward control mechanism provides the means of manual control for the stabilizer in the event of electrical malfunction. The forward control mechanism extends from a stabilizer trim wheel on each side of the control stand to a forward trim mechanism in the lower nose compartment (Fig. 1). The stabilizer trim wheels and a sprocket are splined to a control wheel shaft that extends through the control stand. Rotation of the stabilizer trim wheels transmits motion to a forward trim mechanism sprocket by a chain assembly. The forward trim mechanism sprocket drives the forward cable drum which is cable connected to the stabilizer jackscrew gearbox cable drum. The stabilizer jackscrew gearbox cable drum drives the jackscrew to position the stabilizer. The forward trim mechanism is attached to the lower nose compartment by support linkages which can be adjusted to align the trim mechanism and obtain proper chain and cable tension.

4. Stabilizer Position Indicator

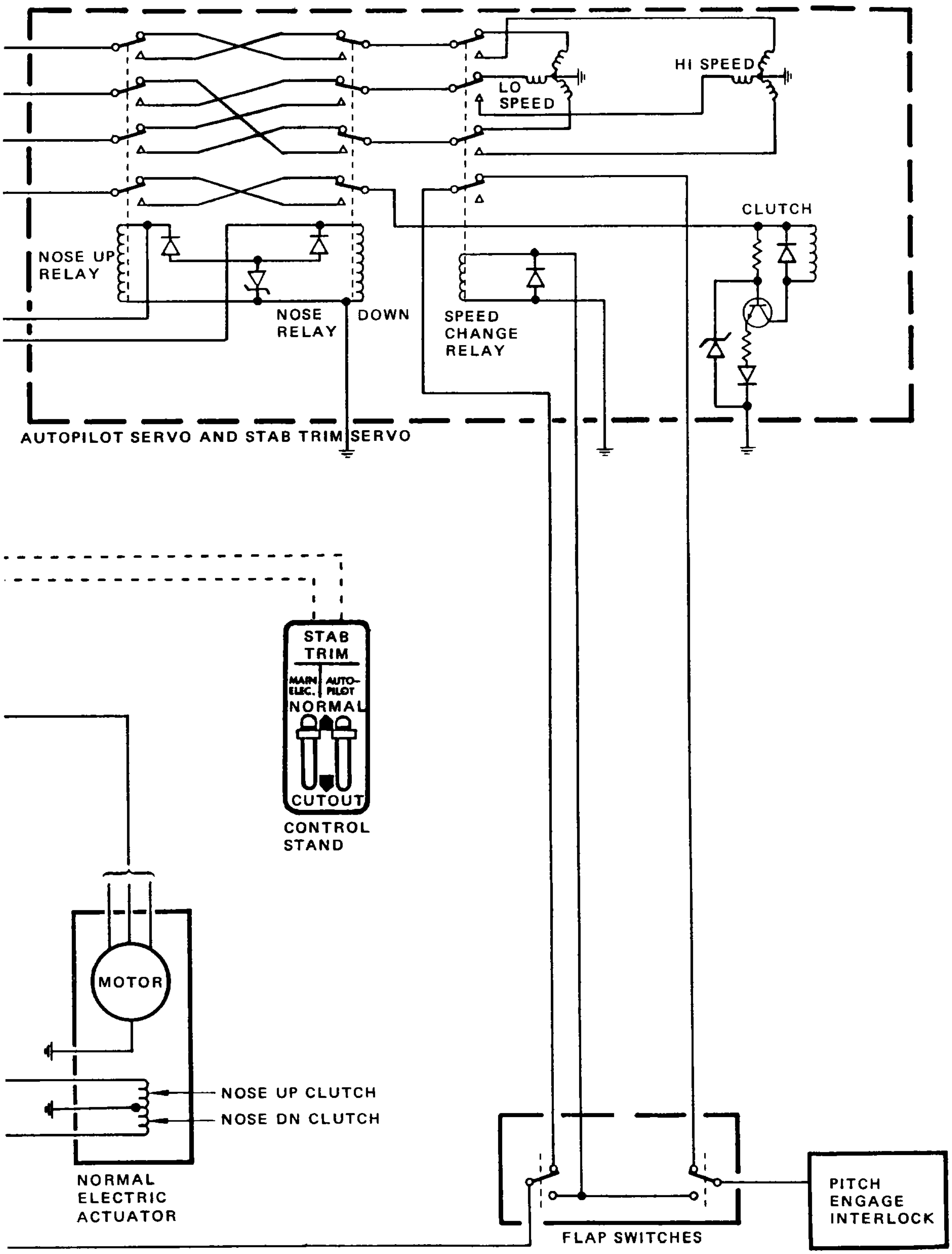
   A. A stabilizer position indicator provides continuous indication of stabilizer trim (Fig. 1). The stabilizer position indicator operates through a flexible shaft connected to the forward trim mechanism, a jackshaft, and a linkage to the indicator. The flexible shaft transmits motion to the indicator linkage through the jackshaft and positions the indicator. During normal electrical operation the stabilizer trim cables drive the forward trim mechanism which operates the trim position indicator and rotates the trim wheels. A scale on the control stand is calibrated in units of trim to indicate the position of the stabilizer. A green area on the scale indicates the proper takeoff stabilizer range and is referred to as the GREEN RANGE.

5. Stabilizer Trim Brake System

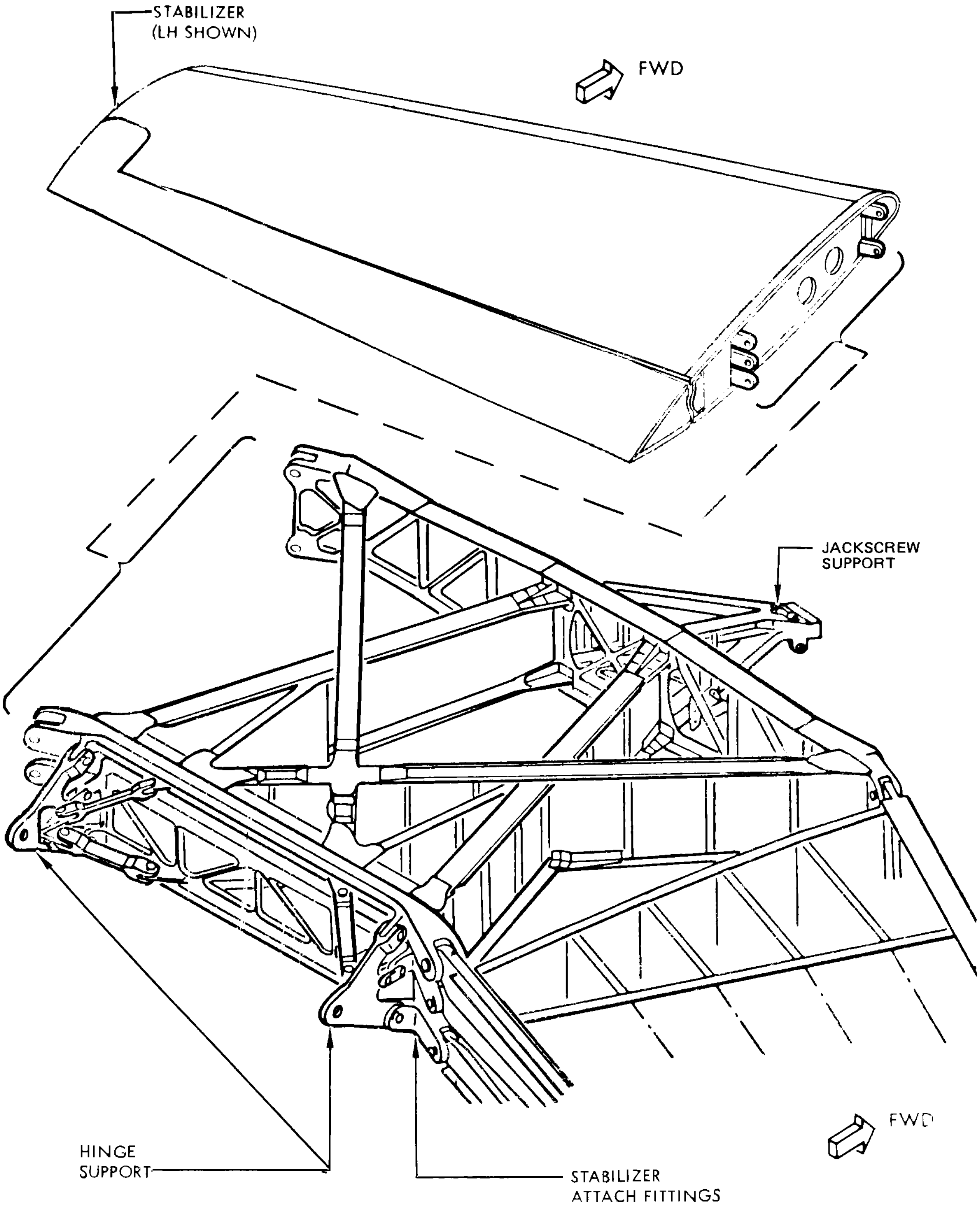
   A. A stabilizer trim brake system (Fig. 4) arrests out-of-trim stabilizer motion when the control column is moved in the direction opposing the stabilizer motion. The stabilizer trim brake is a self-contained mechanical unit, located in the forward nose compartment of the airplane under the aisle control stand. The unit is provided with mounting provisions to be attached independently, and consists of the following rotating shafts: elevator input, stabilizer input, and override input.



Horizontal Stabilizer Trim Control System Circuit
Figure 2 (Sheet 1)



Horizontal Stabilizer Trim Control System Circuit
Figure 2 (Sheet 2)



Horizontal Stabilizer
Figure 3

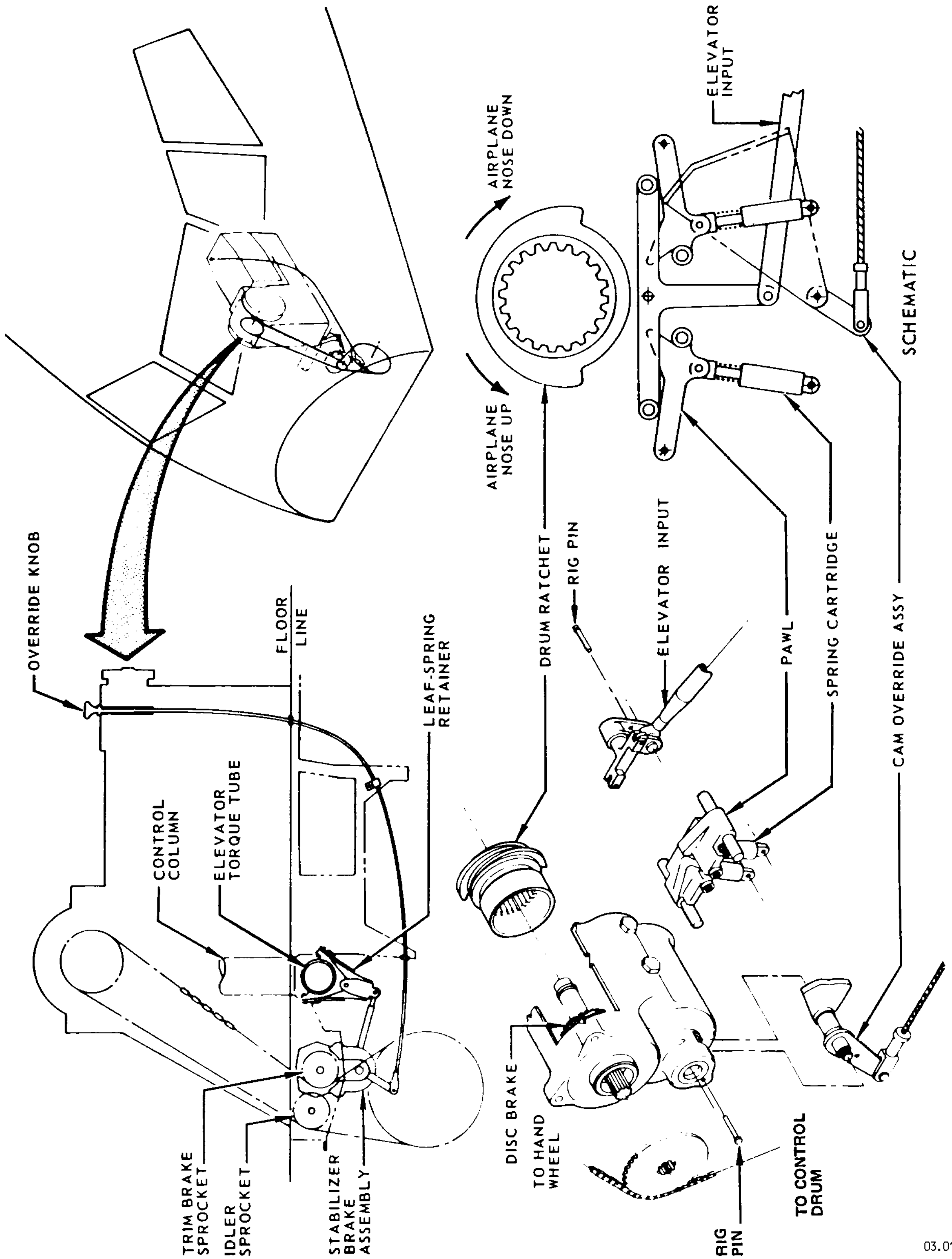
B. The unit operates in such a way that whenever a rotation in one direction is introduced by the elevator control system, the elevator input shaft will prevent the stabilizer input shaft from rotating in the same direction but will allow free rotation in the opposite direction as elevator input shaft. Should a runaway stabilizer cause an AIRPLANE NOSEDOWN or AIRPLANE NOSEUP pitch, moving the elevator control column backward or forward, respectively, will stop the stabilizer from further travel in the out-of-trim direction and allow operation in the opposite direction. The override input shaft is used for releasing the brake mechanism in the unit. The shaft has 2 positions, OFF and OVERRIDE and is spring loaded to OFF. When the override shaft is turned to OVERRIDE position, the brake mechanism wil1 be released regardless of elevator input shaft position. When released from OVERRIDE position the shaft will automatically return to OFF position and restore the brake mechanism to the position called for by the elevator input shaft.

6. <u>Stabilizer Jackscrew and Gearbox Assembly</u>

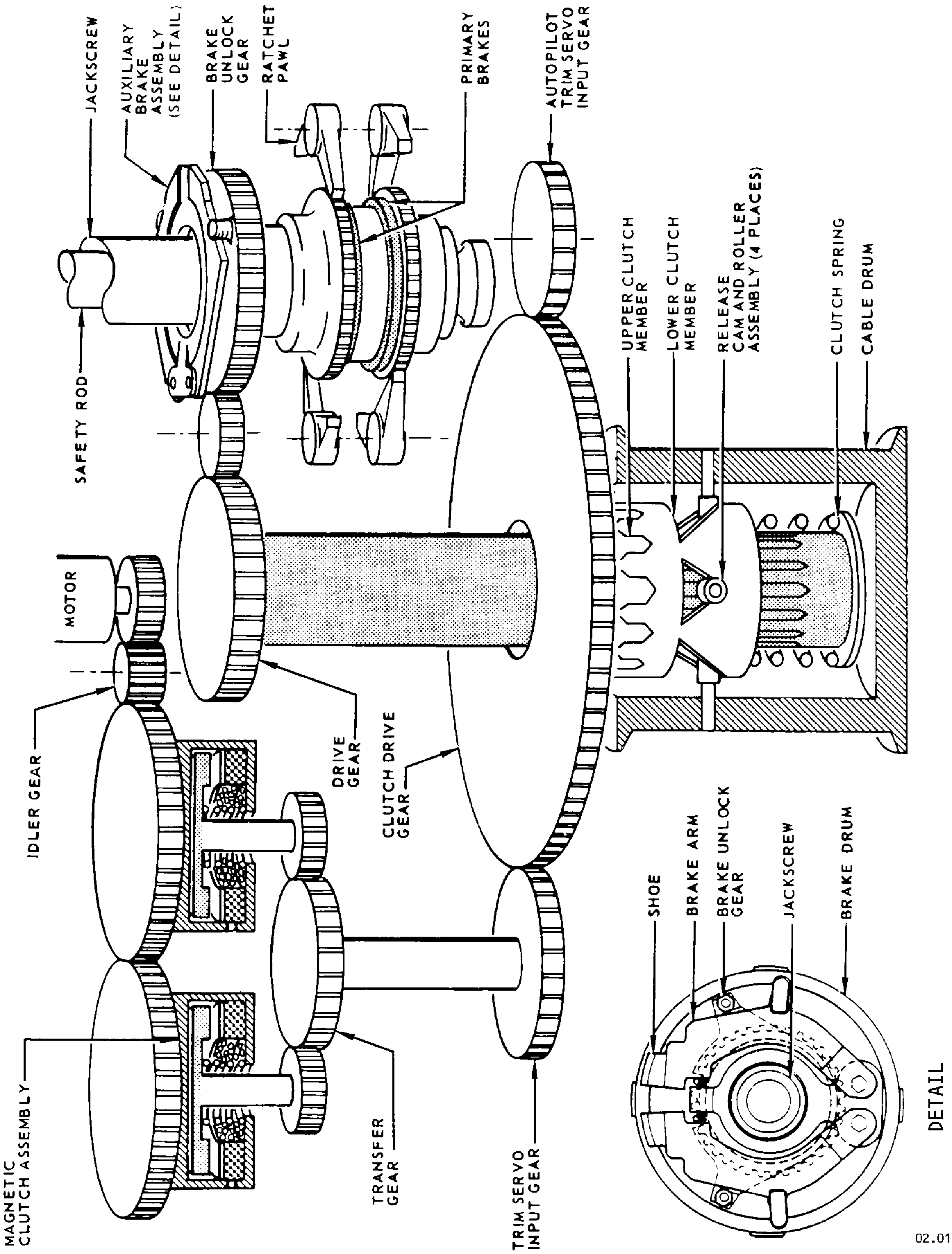
A. The stabilizer jackscrew and gearbox assembly positions the stabilizer by converting electric actuator, autopilot actuator or cable drum rotary motion to linear motion (Fig. 1 and 5). The stabilizer jackscrew and gearbox assembly consists of a ball nut and jackscrew, a gimbal assembly, a cable drum, and the gearbox consisting of gearing and brakes. The gearbox is connected to a bulkhead in the fuselage by a lower gimbal which allows fore and aft angular motion as the stabilizer is positioned. A upper gimbal connects the ball nut to the stabilizer front spar fitting. This gimbal prevents any binding of the screw while the ball nut positions the stabilizer. A safety rod is installed in the jackscrew shaft to support the stabilizer in the event of jackscrew failure.

B. The primary brake system in the stabilizer trim gearbox prevents any aerodynamic loads on the stabilizer from rotating the jackscrew when the control system is not being operated. When the jackscrew shaft is driven by the jackscrew gearbox in a direction which increases the airloads on the stabilizer, a brake plate rotates through a ratchet producing a clicking sound in the assembly.

C. The auxiliary brake system i s provided in case of primary brake system failure. When the jackscrew is turned by the jackscrew gearbox, the auxiliary brake system is released through a gear driven by the gearbox. If the primary brake system fails, the jackscrew shaft rotation applies the auxiliary brake to prevent any additional shaft rotation.

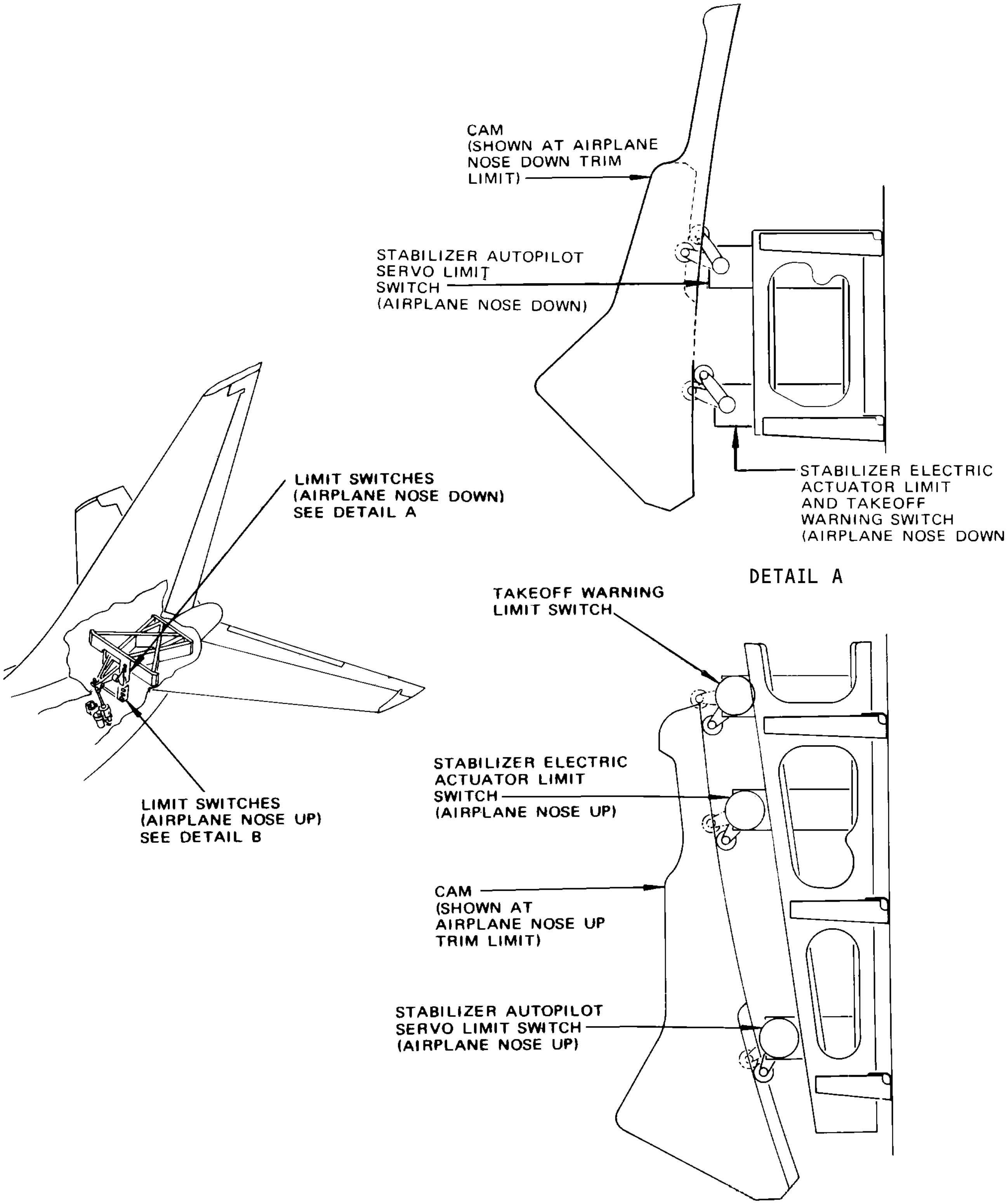


Stabilizer Trim Brake
Figure 4



Stabilizer Jackscrew and Gearbox Assembly
Figure 5

7. Electric Actuator
   A. The main electric actuator provides power to actuate the stabilizer during normal operation (Fig. 1). The unit consists of a three-phase induction motor, two electromagnetic clutches and the output shaft to drive the jackscrew and gearbox assembly. The trim motor is energized by 115 volt, three-phase, 400-Hz ac power and is capable of emergency operation on two-phase supply. The electromagnetic clutches control the direction of rotation of the trim motor output shaft and are energized by 28 volts dc.
8. Autopilot Actuator
   A. The autopilot actuator provides an electrical means for actuating the stabilizer. Control is provided by the autopilot. The autopilot actuator consists of a three-phase reversible two speed induction servomotor, an electromagnetic clutch with a gear reduction, and an output shaft to drive the jackscrew gearbox. The servomotor is energized by 115 volt, three-phase, 400-Hz ac power and is capable o f emergency operation by a two-phase supply. Reversing is accomplished by phase reversing through the use of a direction relay. Separate servomotor windings provide a speed change ratio of six to one. Selection of the servomotor speed is by a speed change relay. The high speed mode is selected when an input signal is received from the flap switches and the low speed mode is selected with no flap switch input. The flap switches are actuated when flaps are at 2 degrees or more. The electromagnetic clutch and the control relays are energized by 28-volt dc power.
9. Stabilizer Trim Limit Switches
   A. Four stabilizer trim limit switches limit the up and down travel of the horizontal stabilizer leading edge during either normal electric actuator trimming operation or autopilot trimming operation of the horizontal stabilizer (Fig. 6). The four lever operated microswitches are mounted in a vertical row on brackets on the stabilizer jackscrew compartment aft bulkhead.
   B. All switches are operated by the same cam. The cam is mounted by a support tube to the horizontal stabilizer center section jackscrew attach fitting. The cam moves with the stabilizer to actuate the limit switches to the open position at the desired stabilizer travel limits. Opening of the switches removes power to the respective actuator to terminate stabilizer travel.
   C. Refer to 31-26-0 D&O and Fig. 6 for takeoff warning limit switches.
10. Stabilizer Trim Relays
   A. Stabilizer trim relays include the phase sequence relay, trim control relay and trim safety relay (Fig. 2). With power applied, the phase sequence relay contacts close and the safety relay holds the contacts in closed position allowing the trim control relay to control switching power directly to the motor for normal operation.



Stabilizer Trim Limit Switches
Figure 6

B. The stabilizer trim relays are mounted in the J5 junction box located immediately to the right of the nose gear wheel well in the forward lower equipment compartment and can be accessed through the aft right nose wheel well wall panel (panel 3105).

11. Operation

A. Normal control and operation of stabilizer trim is accomplished with electrical power. Control power for the relays, the electromagnetic clutches and the indicator light is 28 volts dc. The actuating power for the stabilizer trim motor is 115 volt, three-phase ac (Fig. 2). When the three-phase power source has the correct phase sequence, assuring correct direction of motor rotation, the phase sequence relay contacts will be closed. The clutch and relay control circuits are ready for normal electrical operation only when the main electric trim cutout switch is at the NORMAL position. With power supplied and the trim cutout switch at the NORMAL position, the stabilizer safety relay coil will be supplied 28-volt dc power to hold its contacts closed. This will allow the trim control relay to control switching power directly to the motor for normal operation. The actuation of either trim control switch will switch control power to energize the trim control relay and the appropriate electromagnetic clutch. This action connects three phase power to the motor, which rotates in one direction only, and engages the clutch which controls the direction of actuator drive. The stabilizer trim on warning light is also turned on when the trim control relay energizes, indicating electrical trim actuation. With the electrical trim motor actuating the jackscrew, the trim wheels will be turning and the trim indicators positioned through the manual system as it is driven from the cable drum on the jackscrew gearbox. The trim actuator will continue to drive the jackscrew in the direction selected until the trim control switch is released, the limit switch is actuated, or the cutout switch is positioned to CUTOUT. Limit switch actuation interrupts power to the clutch which disengages the motor. The motor will not be de-energized by limit switch actuation. The trim wheel rotation will stop and trim position indicator will show that the trim action has stopped at the extreme end of travel. Release of trim control switch will cause the control relay to drop out, interrupting motor power and extinguishing the stabilizer-trim-on warning light. Switching trim cutout switch to the CUTOUT position disconnects al1 normal control circuits, shorts all relay and clutch solenoids to ground, and de-energizes the safety relay to open the trim motor power circuit.

B. In event of simultaneous actuation of the trim control switches for opposite directions of trim, the switching will cause both electromagnetic clutches to engage and result in motor stall which may damage motor due to overheating.

C. Prior to takeoff, with the throttles advanced, and with the stabilizer not within the green range, the takeoff warning system will cause a warning horn to sound, indicating unsafe takeoff condition.

D. Manual control is accomplished by rotating either trim wheel on the control stand. The trim wheels are splined to a common shaft which has a sprocket. Rotation of the trim wheels transmits motion to the forward trim mechanism sprocket by a chain assembly. The forward trim mechanism sprocket drives the cable drum which is cable connected to the jackscrew gearbox cable drum. The jackscrew gearbox cable drum drives the jackscrew to position the stabilizer. The jackscrew gearbox cable drum and cable assembly provides a dual purpose system. During normal electrical operation it drives the forward mechanism to provide stabilizer position indication, and during manual operation it positions the stabilizer. If the electrical system is jammed, initial actuation of the trim wheel operates a clutch which disconnects both motors. The stabilizer trim brake system under the control stand arrests out-of-trim stabilizer motion. The system is actuated by elevator control column deflection which introduces the braking force.

HORIZONTAL STABILIZER TRIM CONTROL SYSTEM - TROUBLESHOOTING

1. Stabilizer Trim Control System - Troubleshooting

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Stabilizer trim system binding or inoperative	Foreign objects in cable drum, sprockets, forward mechanism, or ball nut and jackscrew gearbox	Check force required to operate stabilizer trim control wheel AMM 27-41-0, Test Stabilizer Trim System	Remove object and repair damage
	Loose wire connections or damaged motor on main electric actuator	Check for continuity and for 115 volts ac at main electric actuator. If 115 volts ac is present, main electric actuator is defective	Tighten loose connections, repair circuit as required, or replace main electric actuator
	Loose wire connections or damaged electromagnetic clutches	Check for continuity and for 28 volts dc at electromagnetic clutches. If 28 volts dc is present, main electric actuator is defective	Tighten loose connections, repair circuit as required, or replace main electric actuator
	Damaged jackscrew gearbox assembly or bent jackscrew	Check jackscrew gearbox and jackscrew for smooth operation. If excessive chatter is present, unit is defective	Replace jackscrew gearbox and jackscrew unit
	Defective safety relay or electric circuit	Check safety relay circuit for continuity. If 28 volts dc is present, safety relay is defective	Repair circuit as required or replace safety relay

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	Defective trim control relay or electric circuit	Check trim control relay circuit for continuity. If 28 volts dc is present, trim control relay is defective	Repair circuit as required or replace trim control relay
	Defective phase sequence relay or electric circuit	Check for voltage at input and output side of phase sequence relay. If 28 volts dc is present, phase sequence relay is defective	Repair circuit as required or replace phase sequence relay
Excessive force required for manual operation	Excessive chain tension	Check chain tension (AMM 27-41-41)	Adjust chain tension
	Excessive cable tension	Check cable tension, misalignment, rubbing or chafing (AMM 27-41-41/401)	Adjust cable tension. Repair damage or replace cable as required
	Defective auxiliary brake	Test auxiliary brake (AMM 27-41-0/501)	Repair or replace auxiliary brake as required
Warning horn fails to sound	Defective electric warning circuit	Manually operate warning switch to actuate warning horn. If horn does not sound, circuit is defective	Repair electric warning circuit as required
	Defective warning switch	Operate stabilizer outside of green range and position No. 1 or 2 thrust lever full forward. If warning switch does not actuate horn, warning switch is defective	Replace warning switch (AMM 31-26-24/401 for airplane noseup switch and AMM 24-41-101/401 for airplane nosedown switch)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Stabilizer moves in one direction only electrically and in both directions manually	Defective electromagnetic clutches in main electric actuator	Check for voltage at main electric ac actuator electromagnetic clutch. If voltage is present, main electric actuator is defective	Replace main electric actuator
	Defective limit switch	Check applicable limit switch for continuity. If voltage is present, limit switch is defective	Replace limit switch
	Defective electric circuit	Check for continuity at applicable limit switch and at electromagnetic clutch	Repair applicable circuit as required
	Defective safety relay	Check control switches and circuit for continuity through light and safety relay. If continuity checks out and light illuminates, safety relay is defective	Repair applicable circuit or replace safety relay

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Control cable tension repeatedly checks low after flight following normal rig procedures	Excessive cable tension relaxation	Check control cable tension (AMM 27-41-0/501). If cable rig load is repeatedly more than 15 pounds below value listed in cable tension chart, cable is worn, or requires rerigging	Rerig control cable as follows: 1. Increase cable rig load to twice rig load listed in cable tension chart (AMM 27-41-0/501) 2. Cycle system 5 times while maintaining increased rig load 3. Reduce cable rig load to rig load listed in cable tension chart (AMM 27-41-0/501) 4. Cycle system 5 times while maintaining normal rig load (step 3) NOTE: Do not allow cable rig load to relax below rig load established in step 3. 5. After approx 1 week of service rig cable to normal rig load (step 3) 6. Cycle system 5 times while maintaining normal rig load (step 3)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
		Check control cable for broken wires (AMM 20-20-31/601)	Replace control cable (AMM 20-10-01/401)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Stabilizer trim will not hold position in flight	Defective jack-screw gearbox and jackscrew assembly	Check auxiliary brake. If brake is working properly, jackscrew gear-box and jackscrew assembly are defective	Replace jackscrew gearbox and jack-screw assembly
Light inopera-tive	Defective light bulb	Press to test light bulb	Replace light bulb
	Defective light circuit	Press to test light bulb. If bulb illuminates, cir-cuit is defective	Repair light cir-cuit as required
Stabilizer moves in one direction only	Rusty and/or corroded jack-screw	Check visually	Lubricate jack-screw. (Ref 27-41-121, Unit Servicing, or Chapter 12, Servicing)
Stabilizer in-operative in nose down direc-tion only	Defective trim control switch	Disconnect trim control switch assembly (Ref 27-41-111, Remove stabi-lizer Trim Control Switch). Check for continuity. If there is no continuity, switch assembly is defec-tive	Replace trim control switch assembly
Stabilizer trim wheel coasts more than 2 turns	Defective elec-tromagnetic clutches in main electric actua-tor	Check for continuity and for 28 volts dc at elec-tromagnetic clutches. If 28 volt dc is present, main electric actuator is defective	Replace main electric actuator
	Defective elec-tromagnetic clutches in autopilot actu-ator	With autopilot engaged, check for continuity and for 28 volts dc at auto-pilot electromagnetic clutches. If 28 volts dc is present, autopilot actu-ator is defective	Replace auto-pilot actuator

Horizontal Stabilizer Trim Control System - Troubleshooting
Figure 101

HORIZONTAL STABILIZER TRIM CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. Adjustment and testing of the stabilizer trim system should be avoided with the stabilizer exposed to strong tail winds. Tail winds may cause loading of control surfaces that could be misinterpreted as erratic operation of one or more of the stabilizer trim control systems.

      CAUTION: DO NOT OPERATE RIGHT AND LEFT STABILIZER TRIM SWITCHES SIMULTANEOUSLY AND IN OPPOSITE DIRECTIONS. APPLICATION OF THIS PROCEDURE ENERGIZES BOTH ELECTROMAGNETIC CLUTCHES IN THE TRIM ACTUATOR, RESULTING IN MOTOR STALL. IT IS POSSIBLE DURING THIS CONDITION TO DAMAGE THE MOTOR DUE TO OVERHEATING. DO NOT EXCEED MAIN ELECTRICAL ACTUATOR DUTY CYCLE OF 2 MINUTES ON AND 13 MINUTES OFF.

      NOTE: A failure in which the motor has been damaged due to overheating may be recognized immediately since the manual trim wheel will not rotate when a stabilizer trim switch is actuated. Manual and autopilot operation of the trim system will not be affected.

   B. External painted markings on fuselage and leading edge of horizontal stabilizer are convenience-type reference points for stabilizer trim operations. Markings are for use by personnel to obtain a convenient ground visual indication of direction and extent of travel of stabilizer. Markings are not to be used as indexes for rigging of stabilizer.
   C. Stabilizer trim control wheels must be installed so that handles on the captain's and first officer's wheels are 90 (±15) degrees apart. This positioning of the wheels places the handles to allow continuous torque when two men are manually trimming the stabilizer.
2. Horizontal Stabilizer Trim System Adjustment
   A. General
      (1) The stabilizer trim control system is properly adjusted when the individual components are adjusted to meet the following conditions:
         (a) Stabilizer Trim System Cables
            1) With approximately an equal number of turns of STA and STB cable on forward drum, cable tension is within limits of the required value. See figure 501, Table 1, for cable tension requirements. If not, these conditions may be met by adjusting turnbuckle in lower forward body section per paragraph 2.D.(3).

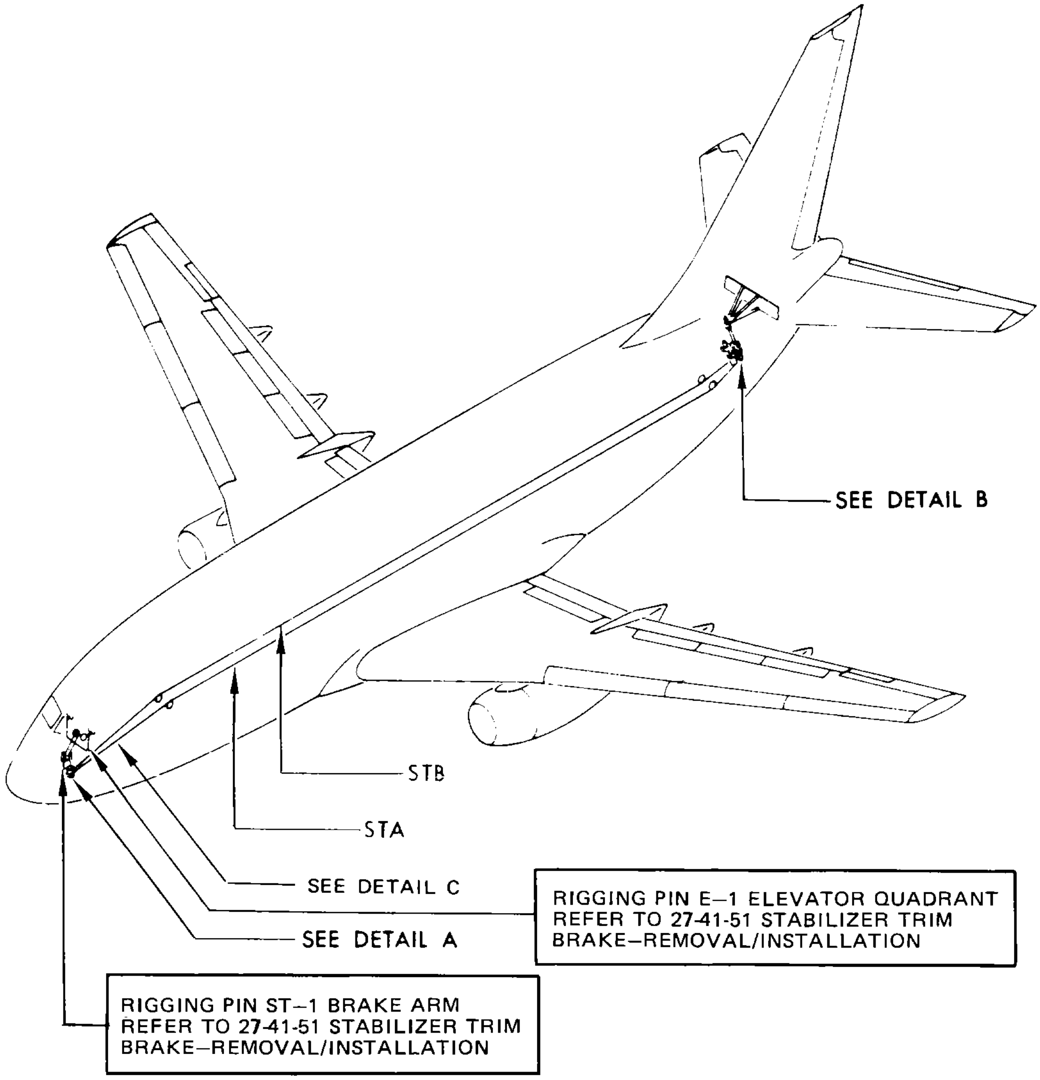
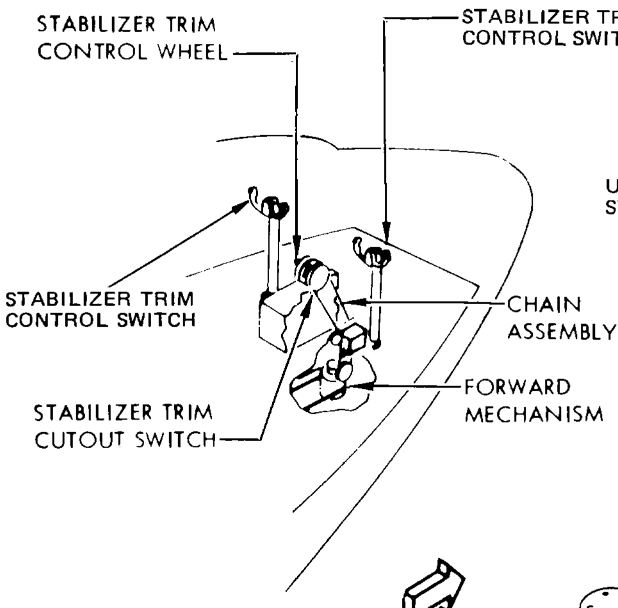


TABLE I	
TEMP °F	CABLE RIGGING LOAD (+20/-10) POUNDS STA AND STB CABLES [1]
110	148
90	139
70	130
50	122
30	114
10	105
-10	97
-30	89
-40	84

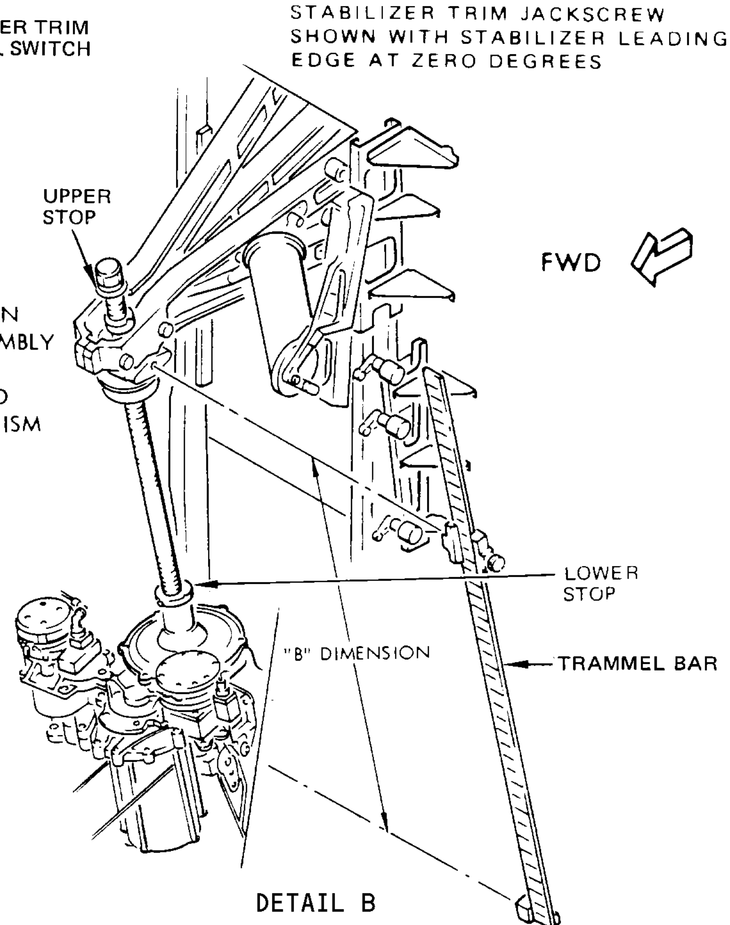
[1] CABLE LOADS MUST BE WITHIN (+20/-10) POUNDS OF TABLE I VALUES WHEN THE SYSTEM IS BEING RIGGED. WHEN THE SYSTEM IS NOT BEING RIGGED, CABLE LOADS MUST NOT DEVIATE MORE THAN (+20/-15) POUNDS FROM TABLE I VALUES

NOTE: TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5) DEGREES FOR AIRFRAME TEMPERATURE TO STABILIZE.

Horizontal Stabilizer Trim System Adjustment
Figure 501 (Sheet 1)



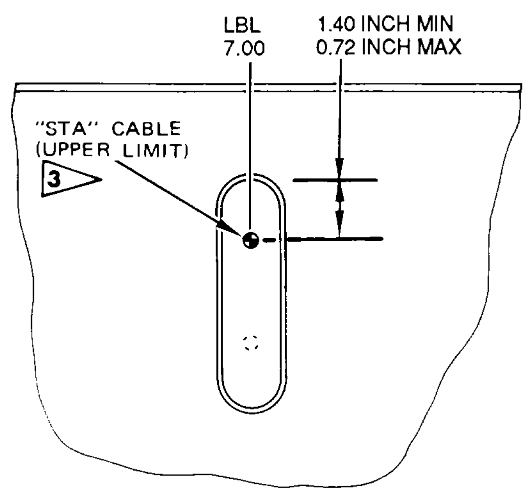
DETAIL A



DETAIL B

2 B DIMENSION IS MEASURED BETWEEN CENTER OF UPPER AND LOWER GIMBAL PINS

TABLE II		
TRIM UNITS	STAB. LE POS.	"B" DIM
0	3° UP	45.84 (REF) BALLNUT AGAINST STOP
1	2° UP	44.42
2	1° UP	43.00
3	0°	41.57
4	1° DOWN	40.15
5	2° DOWN	38.71
6	3° DOWN	37.28
7	4° DOWN	35.84
8	5° DOWN	34.40
9	6° DOWN	32.96
10	7° DOWN	31.51
11	8° DOWN	30.06
12	9° DOWN	28.61
13	10° DOWN	27.16
14	11° DOWN	25.70
15	12° DOWN	24.24
16	13° DOWN	22.79
17	14° DOWN	21.32 (REF) BALLNUT AGAINST STOP



DETAIL C

3 CLEARANCE SHOWN WITH STA CABLE IN UPPER POSITION. SAME CLEARANCE REQUIRED AT LOWER POSITION.

Horizontal Stabilizer Trim System Adjustment
Figure 501 (Sheet 2)

(b) Stabilizer Trim Forward Mechanism Chain
   1) With cables properly adjusted, chain tension requirements are met when a perpendicular force of 5 pounds to the chain produces a deflection of 0.25 ±0.07 inch per method and conditions defined in par. 2.D.(3).
(c) Stabilizer Trim Position Indicator
   1) With stabilizer B dimension (Fig. 501) at 41.57 ±0.05 inches, stabilizer position indicator indicates 3 ±1/4 units trim. If not, this condition may be met by repositioning the flexible drive shaft (1, Fig. 502) per par. 2.D.(7).

B. Equipment and Materials
   (1) Tensiometer - 0- to 400-pound capacity
   (2) Actuator Trammel Bar - F80055-1
   (3) Spring scale - 0- to 60-pound capacity

C. Prepare for Adjustment
   (1) Remove stabilizer forward mechanism access panel 1103.

D. Adjust Stabilizer Trim System
   (1) Manually operate stabilizer to full AIRPLANE NOSEDOWN position (stabilizer leading edge up). Make sure stabilizer jackscrew upper stop is contacted, then check that forward drum has approximately 4-1/2 wraps of STB cable from top of drum and approximately 28-1/2 wraps of STA cable from bottom of drum (Fig. 502).

   CAUTION: DO NOT OPERATE STABILIZER ELECTRICALLY UNTIL LIMIT SWITCHES HAVE BEEN INSTALLED AND RIGGED.

   (2) If new cables are installed:
      (a) Loosen chain by adjusting forward support link (5, Fig. 502) and aft support link (2).
      (b) Tighten forward turnbuckle (4) to obtain cable tension of 250 ±25 pounds. Run stabilizer system through one full cycle. Center cables on drums and check cable tension. Repeat step till tension of 250 ±25 pounds is maintained.
      (c) Cycle system five times at 250 ±25 pounds.
   (3) Check and adjust cable and chain tension.
      (a) Operate system until STA and STB cables have approximately same number of turns on forward drum.
      (b) If new cables are installed, loosen chain by adjusting forward and aft support links, and proceed to step (d).
      (c) If new cables are not installed:
         1) Check cable tension with tensiometer and compare to temperature tension chart (Table 1, Fig. 501).
         2) If tension is as required, proceed to step (e).

3) If tension is not as required, loosen chain by adjusting forward support link (5, Fig. 502) and aft support link (2) and proceed to step (d).

(d) Adjust turnbuckle (4, Fig. 502) until rigging load as shown in temperature chart (Table 1, Fig. 501) is obtained. Lockwire turnbuckle.

NOTE: Minimum turnbuckle length is 9.5 inches between attachment bolts. If proper adjustment cannot be achieved, shorten cable by cutting off old terminal and swaging on a new terminal with same part number using portable equipment. A GO/NO-GO gage may be used in lieu of pull testing.

(e) Apply a 5-pound force perpendicular to chain assembly approximately 4.5 ±1.0 inches along chain from tangency of chain and forward trim mechanism sprocket (3, Fig. 502). Check for 0.25 ±0.07-inch lateral deflection of chain assembly.

(f) Measure eyebolt thread extension or dimension A to adjust support linkage for the required amount of chain deflection.

1) Measure eyebolt thread extension.
   a) On forward support link, measure length of eyebolt thread extension above the adjustable nuts.
   b) On aft support link, measure length of two eyebolts thread extension below the adjustable nuts.
   c) Make sure that the three thread extensions are the same within 0.12 inch.

2) Measure the A dimensions of the support links:
   a) On the aft support links, measure from the center of the aft support bolts to the threaded stud on the left and right aft support links.
   b) On the forward support link, measure from the center of the mounting bolt to the center the bolt through the lower end of the eyebolt.
   c) Make sure the three dimensions are the same within ± 0.06 inch.

(g) Manually operate stabilizer through full travel in each direction. Center cables on forward drum and check cable tension. Repeat step (3) as required until correct rigging load is obtained. Lockwire as required.

(4) Manually operate stabilizer to full AIRPLANE NOSEUP position (stabilizer leading edge nose down). Make sure stabilizer jackscrew lower stop is contacted.

(5) Adjust cable-grommet clearance.

(a) Check that clearance between cable STA and forward grommet is per Detail C, Fig. 501.

NOTE: Forward grommet is located at station 259.5 in first bulkhead through which cable passes after leaving forward cable drum.

(b) If clearance between grommet and cable is not within specified limits, release tension in cable and chain assembly by adjusting forward and aft support links. Disconnect chain assembly at connector link and add or remove links from chain as necessary to obtain correct clearance. Install cotter pins on outboard side of chain per Detail A, Fig. 502.

NOTE: Adding or removing a chain link will change clearance at grommet 0.22 inch.

(c) Adjust cables and chain assembly as required per step (3).

(6) Check that there is a minimum of 3/4-inch clearance between aileron bus control cable and sprocket chain.

(7) Adjust position indicator.

(a) Manually operate stabilizer until B dimension is 41.57 ±0.05 inches. Disconnect flexible drive shaft (1, Fig. 502) from forward mechanism if required.

(b) Rotate flexible drive shaft until stabilizer position indicator is at 3 ±1/4 units trim.

(c) Connect flexible drive shaft to forward trim mechanism. Check for positive engagement of flexible drive shaft with spline in forward mechanism before tightening nut.

(8) Adjust stabilizer trim limit switches (Ref 27-41-101, Adjustment/Test).

(9) Adjust stabilizer takeoff warning airplane nose up switch per 31-26-0, Adjustment/Test. The takeoff warning airplane nose down switch is combined with the stabilizer airplane nose down trim limit switch and is adjusted per previous step.

(10) Adjust stabilizer trim brake (Ref 27-41-51, Adjustment/Test).

(11) Test system per par. 3.

E. Restore Airplane to Normal Configuration

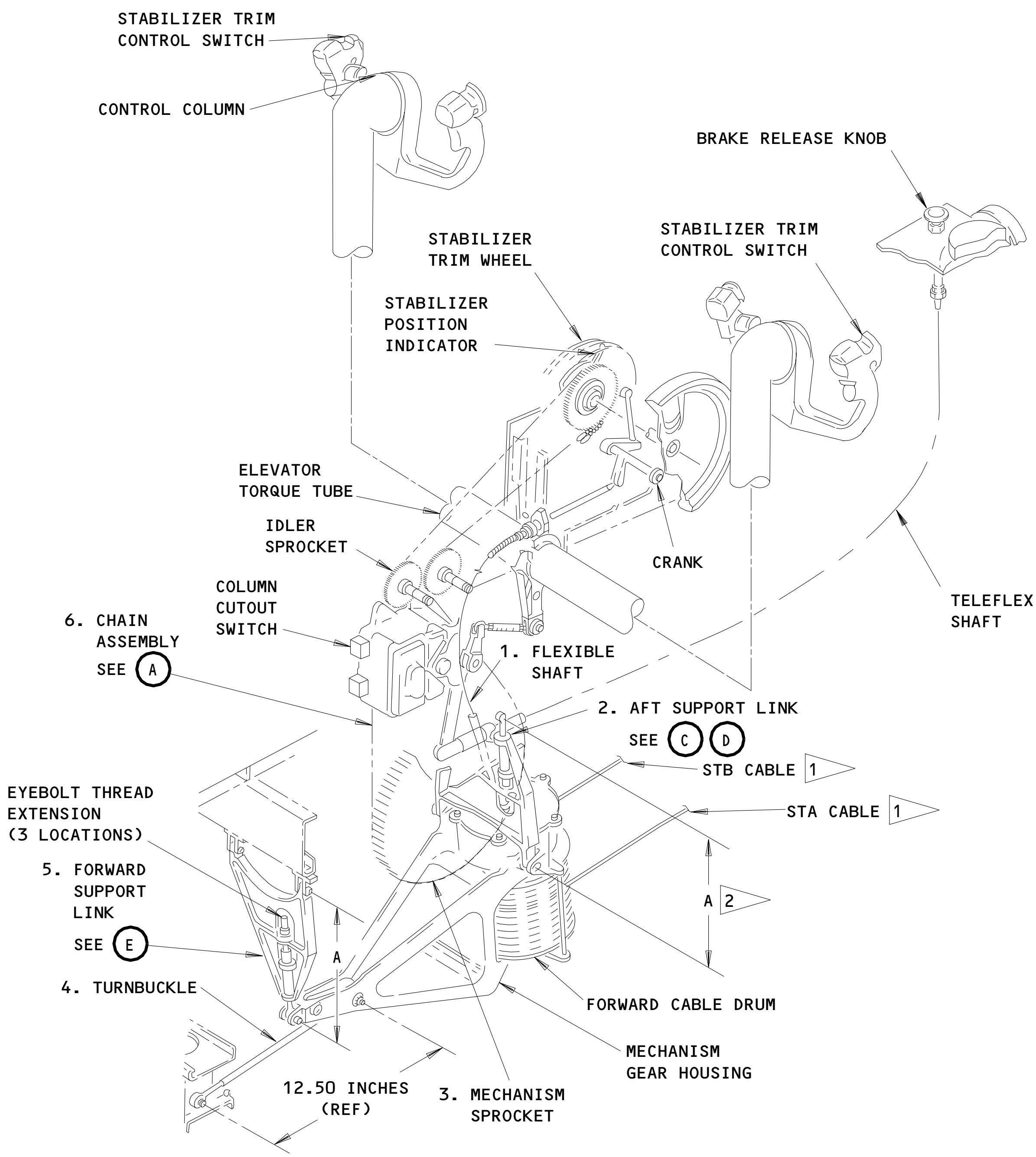
(1) Remove electrical power, if no longer required.

(2) Install access panel.

3. Horizontal Stabilizer Trim System Test

A. Equipment and Materials

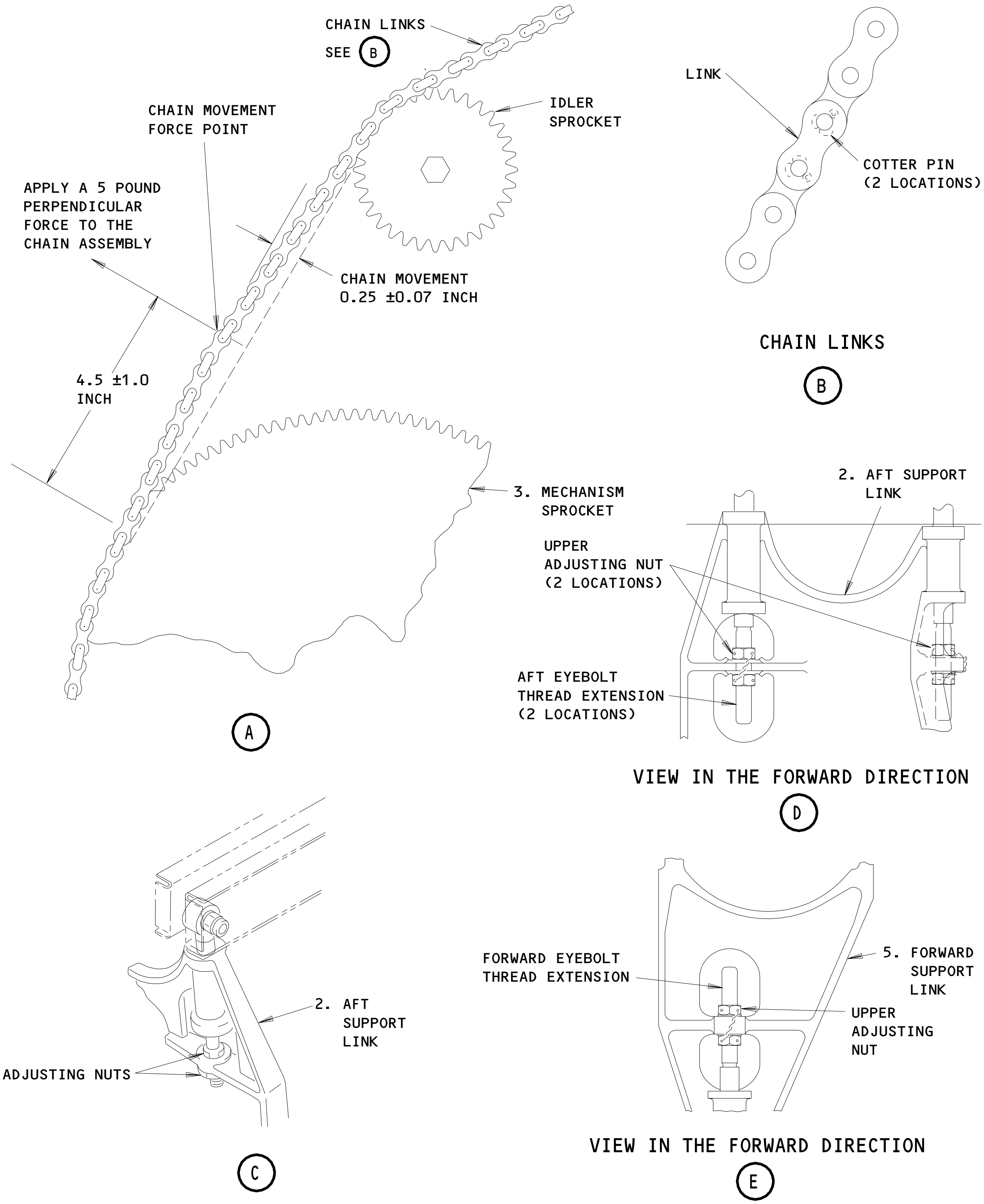
(1) Actuator Trammel Bar - F80055-1



1 APPROXIMATELY 4-1/2 TURNS OF STB CABLE FROM THE TOP OF THE DRUM AND 28-1/2 TURNS OF STA CABLE FROM THE BOTTOM OF THE DRUM WITH THE STABILIZER AT THE FULL AIRPLANE NOSEDOWN

2 ON THE TWO SIDES OF THE CABLE DRUM

Chain Assembly Adjustment
Figure 502 (Sheet 1)



Chain Assembly Adjustment
Figure 502 (Sheet 2)

(2) Adapter - F71252 or Pinion Gear Wrench Assembly, F71267

NOTE: F71267 performs same function as F71252 - but has retaining handle which locates in gearbox housing, thus eliminating necessity of using wrench to prevent rotation.

(3) Torque Wrench Adapter - F70326-1 (preferred), TE65-20804 (optional)

B. Test Stabilizer Trim System

(1) Open stabilizer trim access door 3701 (Ref Chapter 12).

(2) Check that control column is in neutral and is unrestrained.

(3) Test stabilizer manual travel limits.

(a) Rotate captain's stabilizer trim wheel counterclockwise until stabilizer trim jackscrew up stop is just contacted.

(b) Check that B dimension is 45.84 ±0.10 inches (Fig. 501).

(c) Check that stabilizer trim indicator indicates 0.0 ±1/2 units AIRPLANE NOSEDOWN trim.

(d) Turn captain's stabilizer trim wheel clockwise until lower stop is just contacted and check that B dimension is 21.32 ±0.10 inches.

(e) Check that stabilizer trim indicator indicates 17 ±1/2 units AIRPLANE NOSE UP trim.

(f) Check that position indicator on right side agrees with indicator on left side at all stabilizer positions within 1/2 trim unit.

(4) Check maximum force required during manual trimming at several places from one extreme of travel to other in both directions. Check that force does not exceed 14.7 pounds (60 pound-inches torque) measured at trim wheel handle.

NOTE: If the torque wrench adapter is used, remove the adapter and install the tie rod and nuts before you do the system test.

(5) Manually operate system through one complete cycle and check that system runs smoothly without binding.

(6) Test clutch friction.

(a) Dynamic Test

1) Remove stabilizer trim electric actuator (Ref 27-41-71, R/I).

2) Insert pinion adapter or pinion gear wrench assembly into female spline on gearbox. Hold adapter to prevent rotation.

3) Rotate one of the two stabilizer trim wheels airplane nose down to disengage the manual clutch. After the manual clutch disengages, continue rotating the trim wheel (travel is accomplished by ratcheting of the clutch) and make sure the force required to maintain trim wheel rotation does not exceed 45 pounds (184 pound-inches). Do not measure the force required to initially disengage the manual clutch. Repeat this test in the airplane nose up direction.

4) Remove adapter and install stabilizer trim electric actuator (Ref 27-41-71, R/I).

(b) Static Test (Optional to Dynamic Test)

1) Remove stabilizer trim electric actuator (Ref 27-41-71, R/I).

2) Insert pinion adapter or pinion gear wrench assembly into female spline on gearbox. Hold adapter to prevent rotation.

3) Move one of the two stabilizer trim wheels airplane nose down until the manual clutch disengages. Make sure the maximum force required to disengage the clutch is between 39 pounds (160 pound-inches) and 52 pounds (215 pound-inches). Repeat this step 4 more times. Repeat this test in the airplane nose up direction.

4) Remove adapter and install stabilizer trim electric actuator (Ref 27-41-71, R/I).

(7) Test stabilizer trim auxiliary brake (Fig. 503).

(a) At pilots' control stand, rotate captain's stabilizer trim control wheel several turns clockwise, as viewed from captain's side.

(b) Apply 500 pound-inches torque to stabilizer jackscrew clockwise, as viewed from above jackscrew, and hold. Apply torque to flats on upstop, not to safety rod nut.

(c) Mark a single reference line on both gearbox coverplate and umbrella assembly.

(d) Release torque. Apply 500 pound-inches torque counterclockwise to jackscrew and hold.

(e) Mark a reference line on umbrella in line with mark made on coverplate in step (c). Release torque.

(f) At outer edge of umbrella, use a flexible scale to measure arc distance between reference marks made in steps (c) and (e).

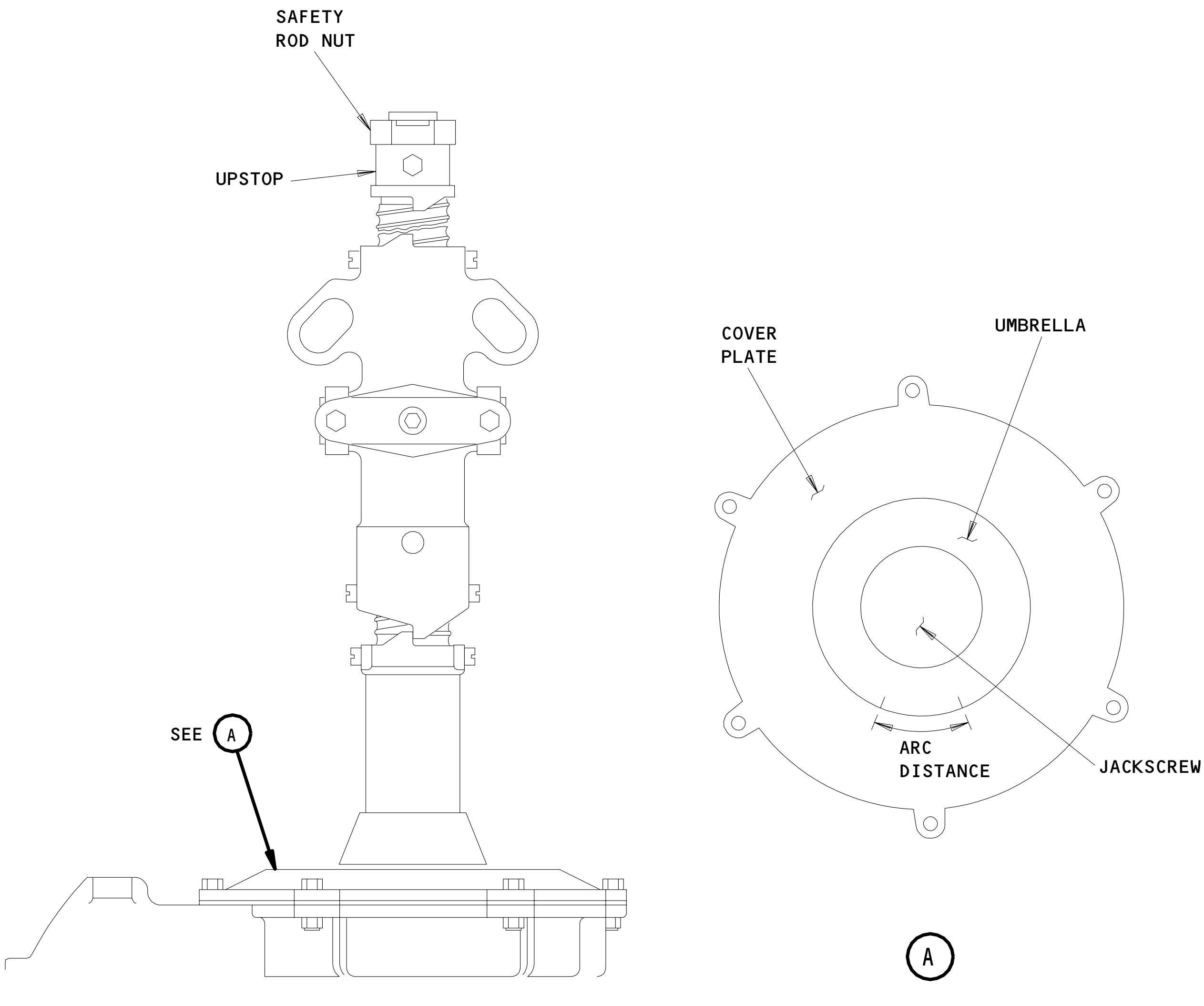
1) On 65-49970-1 thru -24 stab trim actuators, make sure that arc distance dimension is not more than 0.52 inch (17.6 degrees).

2) On 65-49970-25 and subsequent stab trim actuators, and 65-49970-1 thru -24 actuators with SB 27-1176, make sure that arc distance dimension is not more than 0.62 inch (21.0 degrees).

(g) Repeat steps (a) thru (f) except rotate captain's stabilizer trim control wheel counterclockwise and apply torques in directions opposite of those in steps (b) and (d).

(8) Test electrical trim system.

(a) Open stabilizer trim actuator and close stabilizer trim control circuit breakers on panel P6, and reverse any two 115-volt power leads to main electric stabilizer trim control relay at circuit breakers on panel P6.



Stabilizer Trim Auxiliary Brake System Test
Figure 503

(b) Close stabilizer trim actuator circuit breaker on panel P6 and provide electrical power.
(c) Position main electric actuator cutout switch to NORMAL.
(d) Position left stabilizer trim switch to AIRPLANE NOSEUP and then to AIRPLANE NOSEDOWN. Check that stabilizer does not operate.
(e) Repeat step (d) with right stabilizer trim switch.
(f) Open stabilizer trim actuator circuit breaker on panel P6 and restore power leads to normal. Close stabilizer trim actuator circuit breaker on panel P6.
(g) Position left stabilizer trim switch momentarily to AIRPLANE NOSEDOWN and check that stabilizer leading edge moves up.
(h) Position left stabilizer trim switch momentarily to AIRPLANE NOSEUP and check that stabilizer leading edge moves down.
(i) Repeat steps (g) and (h) with right stabilizer trim switch to ensure correct direction of operation.
(j) Separately move each lever on each stabilizer trim switch and check that stabilizer does not move.
(k) Open stabilizer trim control circuit breaker on panel P6. Move each stabilizer trim switch in both nose up and nose down direction. Check that stabilizer does not move. Release trim switch and close circuit breaker.
(l) Check that stabilizer trim on warning light illuminates when each stabilizer trim switch is actuated in each direction.
(m) Test stabilizer trim limit switch adjustment per 27-41-101, Adjustment/Test, and stabilizer takeoff warning switch adjustment per 31-26-0, Adjustment/Test.
(n) Operate stabilizer through one complete cycle from AIRPLANE NOSEUP to AIRPLANE NOSEDOWN and return to AIRPLANE NOSEUP.

CAUTION: DO NOT EXCEED MAIN ELECTRICAL ACTUATOR DUTY CYCLE OF 2 MINUTES ON AND 13 MINUTES OFF.

(o) Check that time required to operate system through full travel in either direction is 13 to 19 seconds. Check that operation is smooth and free from chatter.

NOTE: Initial surges or chatter may be experienced due to cable stretch and mass of front end system.

(p) Perform several consecutive actuations of approximately 3 seconds duration in stabilizer leading edge up (airplane nosedown) direction. Check that operation is smooth and free from chatter.

(q) Actuate in AIRPLANE NOSEUP direction until system comes up to full trim speed, then return trim switch to OFF position for approximately 0.2 seconds and actuate in opposite direction.

NOTE: Initial surges or chatter may be experienced due to cable stretch and mass of front end system.

(r) Check that response in reverse direction is immediate.
(s) Repeat steps (q) and (r) for AIRPLANE NOSEDOWN direction.
(t) With stabilizer trim operating, using captain's stabilizer trim switch, place main electrical stabilizer trim cutout switch in CUTOUT position. Check that stabilizer stops immediately and does not operate in either direction with either captain's or first officer's stabilizer trim switch. Return main electrical stabilizer trim cutout switch to NORMAL position and check that stabilizer operates.

(9) Test stabilizer trim wheel coast.
(a) Actuate a stabilizer trim switch in AIRPLANE NOSEUP direction until system comes up to full trim speed, release stabilizer trim switch and observe coast of stabilizer trim wheel.
(b) Repeat step (a) for AIRPLANE NOSEDOWN direction. Check that maximum coast in either direction is two revolutions.

(10) Test stabilizer trim brake.
(a) Provide elevator hydraulic systems A and B power (Ref 27-31-0, Maintenance Practices).
(b) Check that stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6 are closed.

NOTE: During following tests, neutral position of control column will be defined as an angle of 6.90 degrees forward of a station plane, unless otherwise specified.

(c) Use captain's stabilizer trim switch to operate system in AIRPLANE NOSEUP direction.
(d) While system is in operation, push control column rapidly forward until brake stops stabilizer system and then immediately return control column to neutral.

WARNING: BEFORE MOVING ELEVATOR CONTROL COLUMN, CHECK THAT RIGGING PIN ST-2 IS REMOVED FROM BRAKE ARM ON STABILIZER TRIM BRAKE. IF RIGGING PIN ST-2 IS LEFT IN BRAKE MECHANISM AND CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. A DEFORMED LEAF SPRING MAY RESULT IN UNWANTED ENGAGEMENT OF COLUMN ACTUATED STABILIZER TRIM BRAKE.

(e) With control column in neutral, check that system resumes trimming in AIRPLANE NOSEUP direction.
(f) Use captain's stabilizer trim switch to operate system in AIRPLANE NOSEDOWN direction.
(g) While system is in operation, pull control column rapidly aft until brake stops stabilizer system and then immediately return control column to neutral.
(h) With control column in neutral, check that system resumes trimming in AIRPLANE NOSEDOWN direction.
(i) Use captain's stabilizer trim switch to operate system in AIRPLANE NOSEUP direction.
(j) While system is in operation, push control column rapidly forward until brake stops system. While holding control column in this position, immediately release trim switch. Check that control column is between 0.70 and 2.48 degrees forward from neutral position.
(k) With control column held in this position, actuate captain's stabilizer trim switch in AIRPLANE NOSEDOWN position. System should operate freely in AIRPLANE NOSEDOWN direction.
(l) Use captain's stabilizer trim switch to operate system in AIRPLANE NOSEDOWN direction.
(m) While system is in operation, pull control column aft rapidly until brake stops system. While holding control column in this position, immediately release trim switch. Check that control column is between 2.42 and 4.21 degrees from neutral position.
(n) With control column held in this position, actuate captain's stabilizer trim switch in AIRPLANE NOSEUP direction. System should operate freely in AIRPLANE NOSEUP direction.
(o) Pull stabilizer brake release handle and pull control column from neutral in aft direction until quadrant stops are contacted. Stabilizer trim system should be operable in either direction.
(p) Pull stabilizer brake release handle and push control column from neutral in forward direction until quadrant stops are contacted. Stabilizer trim system should be operable in either direction.

(q) Restore airplane to normal hydraulic configuration (Ref 27-31-0).

(11) Close access door.

(12) Remove electrical power, if no longer required.

HORIZONTAL STABILIZER - REMOVAL/INSTALLATION

1. General
   A. The horizontal stabilizer consists of two identical, but opposite, outboard sections connected by the stabilizer center section. This procedure may be used to perform the removal/installation for either left or right outboard stabilizer sections. A hoisting sling allows the horizontal stabilizer outboard sections to be removed or installed with or without the elevators and elevator tabs installed. However, certain parts of the elevator control system, located aft of the stabilizer outboard section rear spar, must be removed.
2. Equipment and Materials
   A. Hoist - capable of lifting 700 pounds at a height of 20 feet
   B. Support Stand - suitable for supporting stabilizer after removal
   C. Horizontal Stabilizer Sling Assembly - F80006-51 or -67 (preferred), F80006-34 or -38 (optional), -2 cable assembly is used to remove or install stabilizer without the elevator attached and -51 cable assembly is used to remove or install stabilizer with the elevator attached.
   D. Horizontal Stabilizer Trim Lock - F71336-501
   E. Horizontal Stabilizer Pin Removal Tool - F80177-14 (Preferred) or F80177-1 (Optional)
   F. Alignment and Guide Pins - F80255-10 (Preferred) or F80255-1 (Optional)
   G. Grease - BMS 3-24 (AMM 20-30-21/201).
   H. Horizontal Stabilizer Pin Removal Equipment C55005-11 (Preferred) or C55005-1 (Optional)
   I. Corrosion Preventive Compound - BMS 3-27
   J. Anti-Seize Compound - BMS 3-28
3. Prepare for Removal of Horizontal Stabilizer
   A. Remove elevator hydraulic systems A and B power (Ref 27-31-0 MP).
   B. Position horizontal stabilizer trim cutout switches to CUTOUT.
   C. On circuit breaker panel P6, open following circuit breakers:
      (1) Autopilot stabilizer trim servo
      (2) Stabilizer trim actuator
   D. Set horizontal stabilizer at zero degrees (3 units of trim) using stabilizer trim wheel on control stand.
   E. Install horizontal stabilizer trim lock assembly on stabilizer trim wheel as follows (Fig. 404):
      (1) Ensure that horizontal stabilizer is positioned per step 3.D.

(2) Rotate trim wheel the shortest route to place handle at top of wheel.
(3) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
(4) Insert pin through yoke and install safety pin.

F. Remove tail cone access panels 3801, 3802, and elevator control pushrod bolt access plate in tail cone. Remove outboard stabilizer section front and rear spar gap covers (upper and lower). Refer to Chapter 12, Access Doors and Panels.

NOTE: The rear spar gap cover forms the aft stabilizer-to-body sliding seal.

G. If different stabilizer is to be installed, remove stabilizer-to-body seals, all remaining gap covers, and, if installed, vortex generator plate bolted by common fasteners with one of the gap covers to stabilizer lower surface. (See figure 405).

H. Remove upper and lower trailing edge bracket assemblies and inspar No. 5 bracket assembly in outboard stabilizer section rear spar gap cover area. (See figure 403, detail B.)

I. Disengage the forward stabilizer-to-body sliding seal (figure 403, detail A), at the stabilizer front spar as follows:
(1) Disconnect pin at link-to-pedestal assembly (four places).
(2) Slide upper and lower seal plate assembly to extreme positions.

4. Remove Horizontal Stabilizer

A. Disconnect elevator tab hydraulic line located aft of stabilizer rear spar. (See figure 403, detail B.)

CAUTION: WHEN DISCONECTING HYDRAULIC PRESSURE LINE, RELEASE CONNECTION SLOWLY AND ALLOW SYSTEM PRESSURE TO DROP BEFORE COMPLETELY REMOVING LINE. BE PREPARED TO CATCH SPILLED HYRAULIC FLUID.

B. Disconnect elevator control pushrod from elevator (Fig. 402).

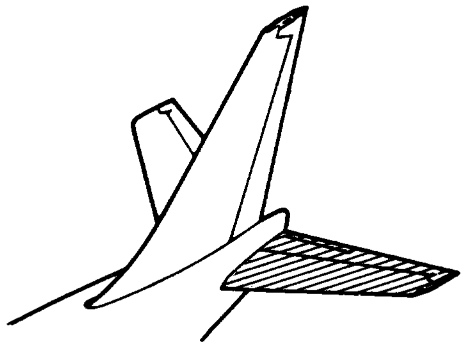
C. Install horizontal stabilizer sling (Fig. 401) as follows:
(1) Locate attachment points on upper surface of stabilizer and install sling attachment fittings.
(2) Attach sling to spreader bar.

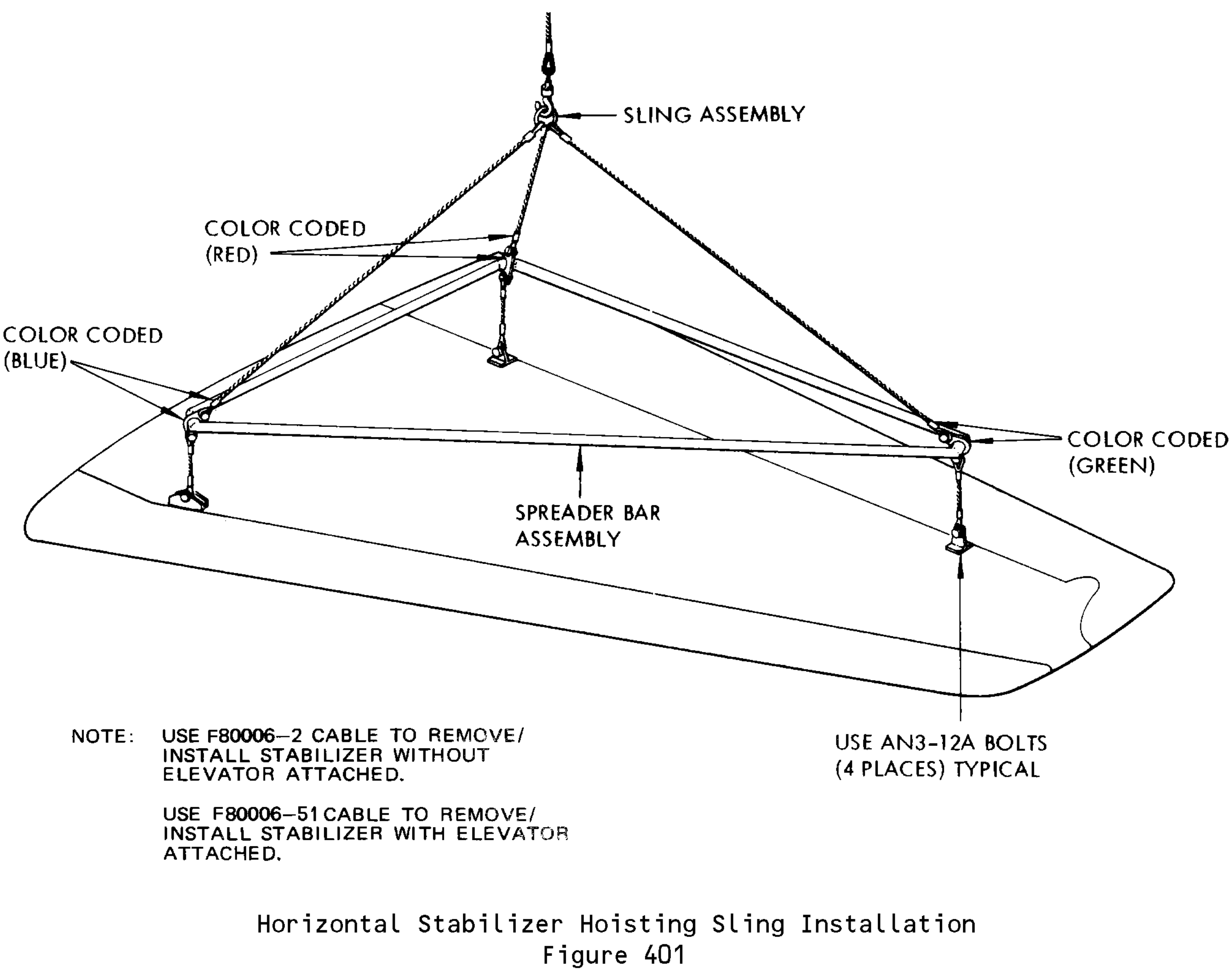
CAUTION: USE F80006-2 CABLE TO REMOVE STABILIZER WITHOUT ELEVATORS INSTALLED. USE F80006-51 CABLE TO REMOVE STABILIZER WITH ELEVATORS INSTALLED. SUDDEN SHIFT OF STABILIZER MAY OCCUR.

(3) Attach hoist to sling. Lift sling into position and fasten to attachment fittings.

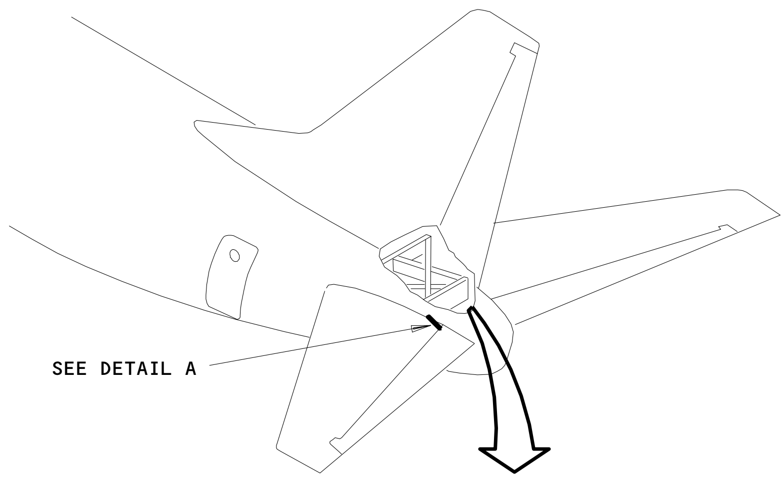
CAUTION: TAKE PRECAUTION NOT TO DAMAGE STABILIZER BY SUDDEN OR UNCONTROLLED MOVEMENTS OF SLING.

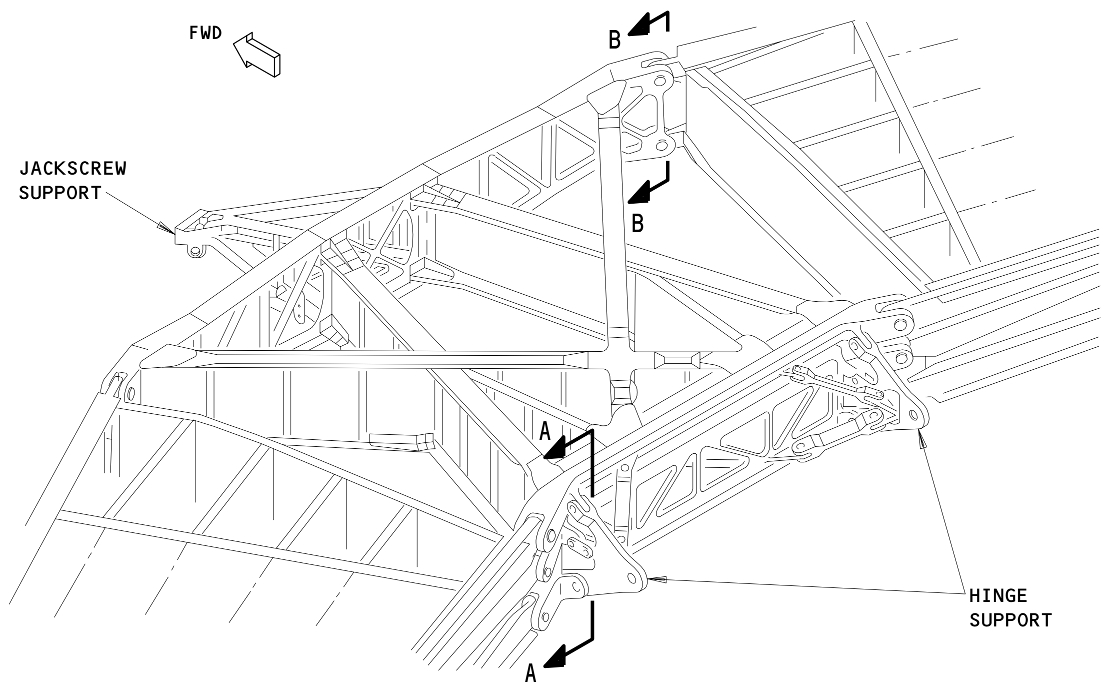
D. Apply sufficient tension to sling to support weight of horizontal stabilizer.



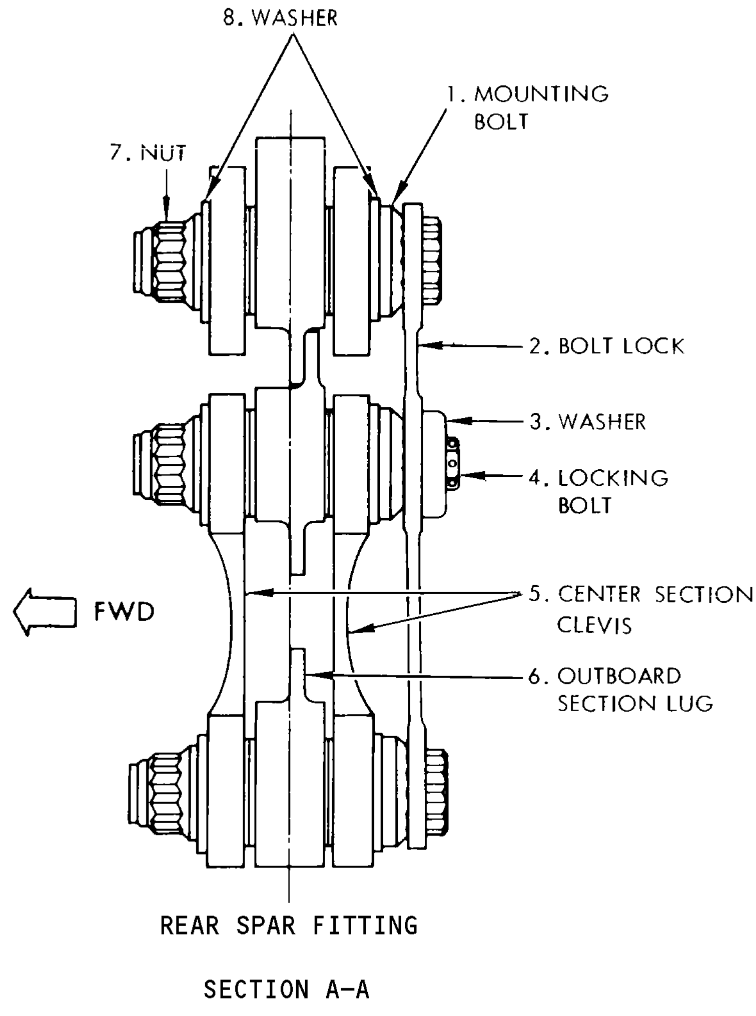


Horizontal Stabilizer Hoisting Sling Installation
Figure 401

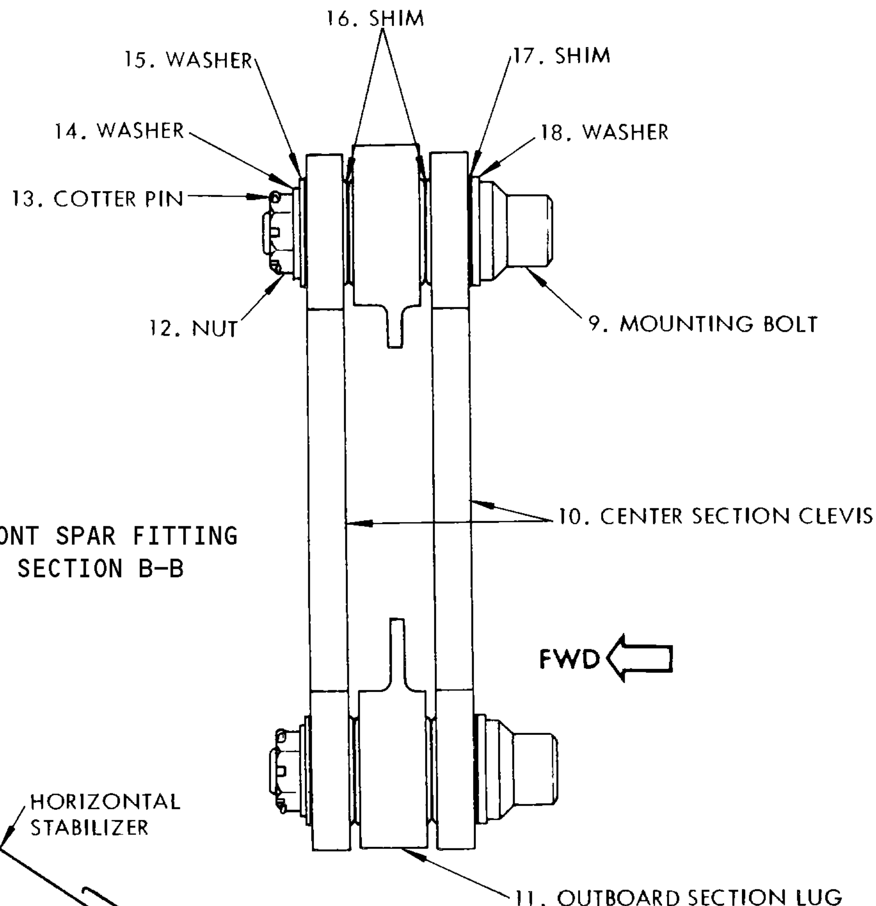




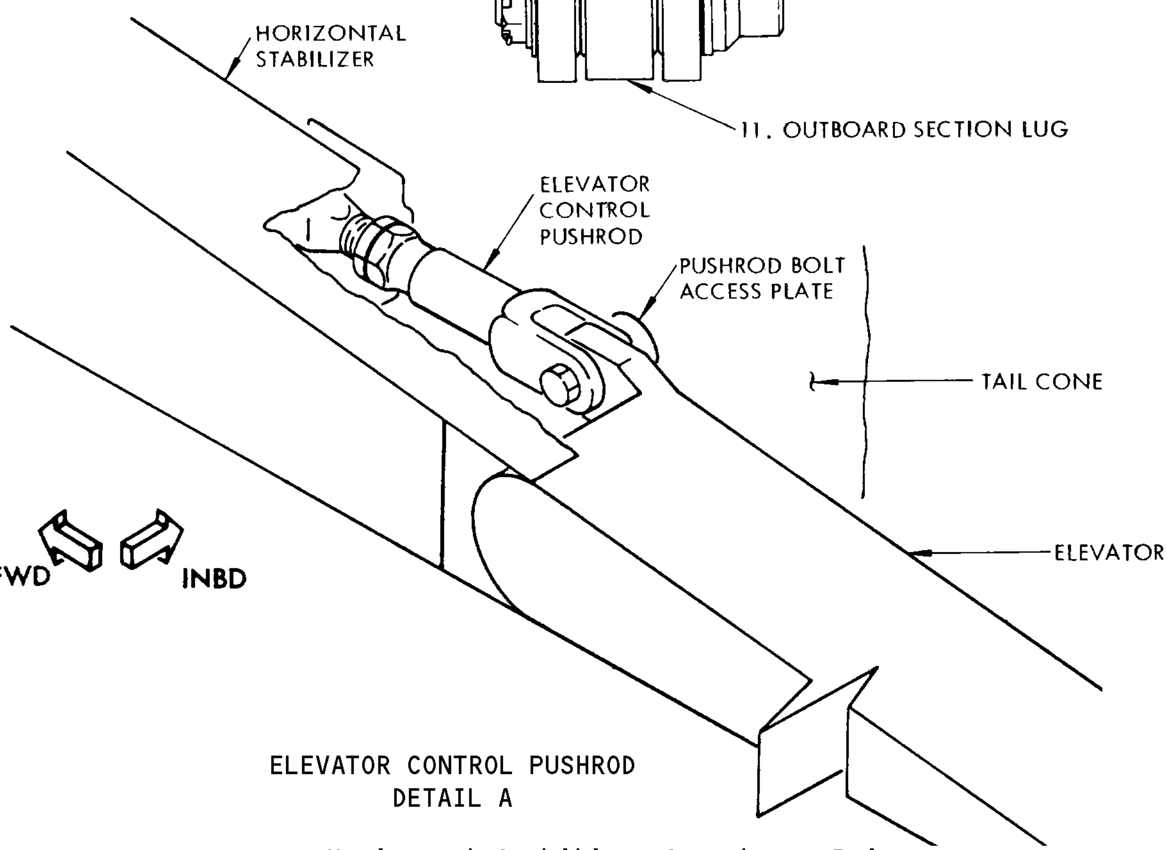
Horizontal Stabilizer Attachment Points
Figure 402 (Sheet 1)



Horizontal Stabilizer Attachment Points
Figure 402 (Sheet 2)

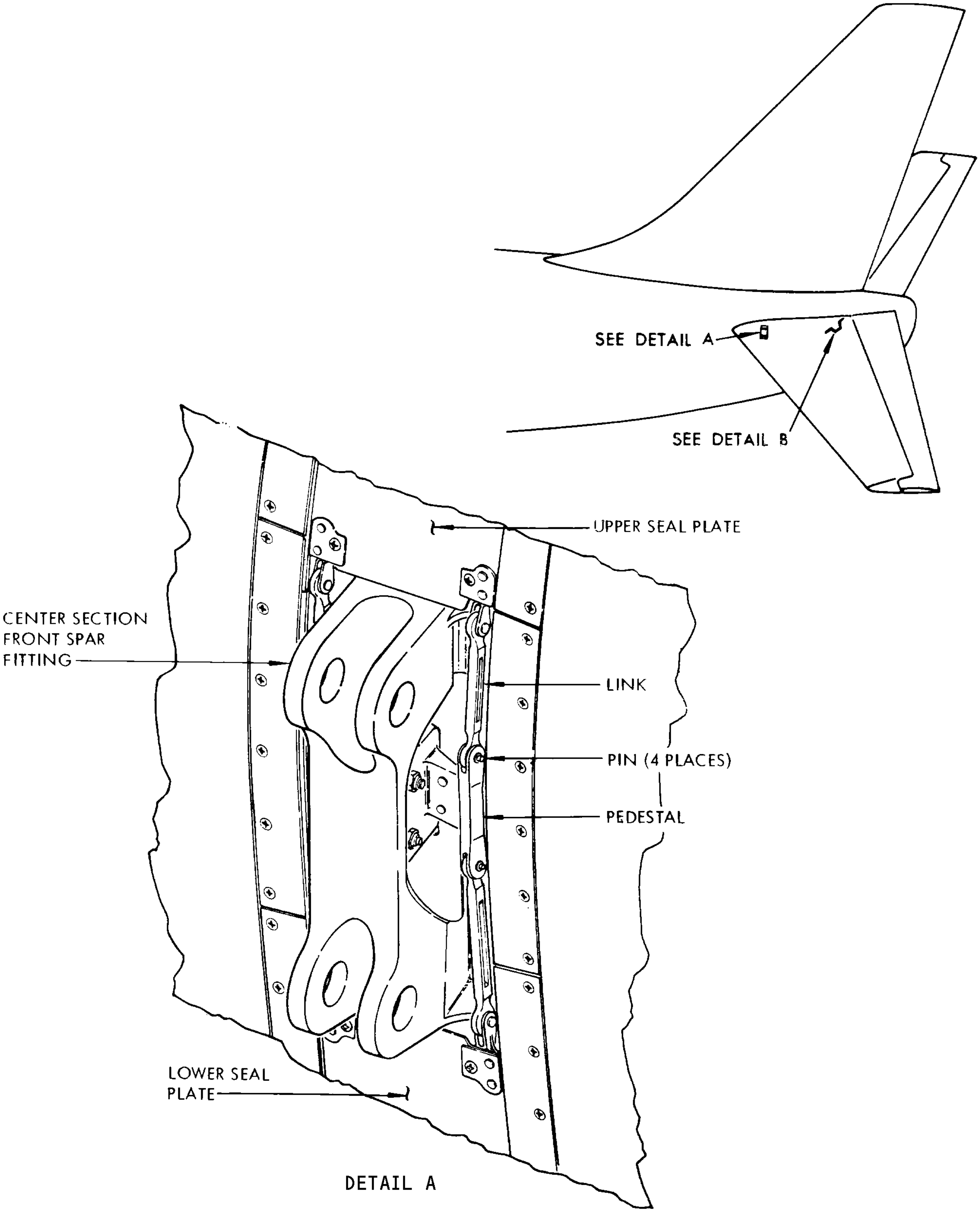


FRONT SPAR FITTING
SECTION B-B

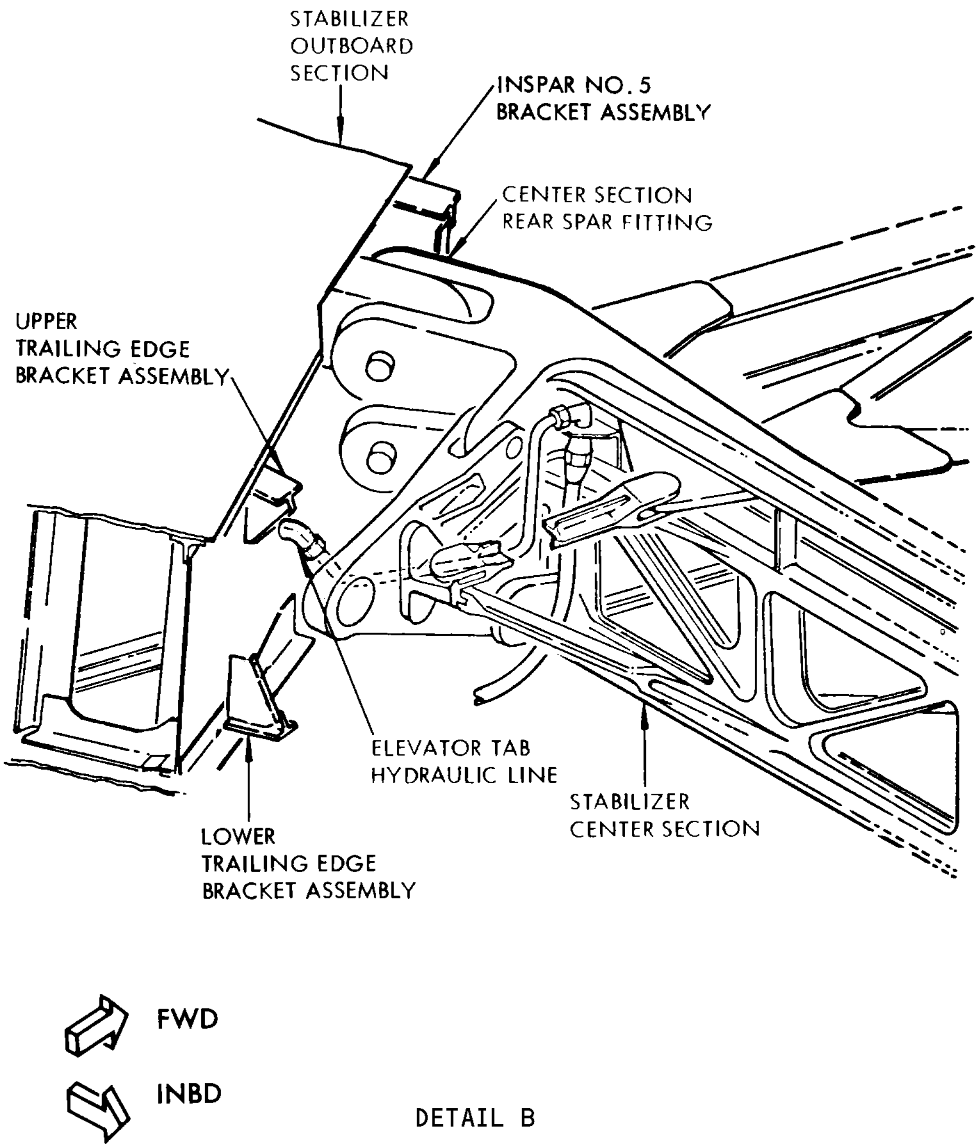


ELEVATOR CONTROL PUSHROD
DETAIL A

Horizontal Stabilizer Attachment Points
Figure 402 (Sheet 3)



Horizontal Stabilizer Installation Details
Figure 403 (Sheet 1)



DETAIL B

Horizontal Stabilizer Installation Details
Figure 403 (Sheet 2)

E. Detach stabilizer outboard section from center section as follows:

NOTE: If mounting bolts are frozen, use C55005-11 to assist in removal. Approximate weight of stabilizer without elevator, elevator tab and balance panels is 570 pounds. Elevator, with tab and balance panels installed, weighs approximately 173 pounds.

(1) Remove locking bolt (4, Fig. 402), washer (3), and bolt lock (2) from mounting bolts (1) at rear spar. On some airplanes, the bolt lock (2) is not used. Remove nut retainers (4) from mounting bolts (1) instead.
(2) Remove three mounting bolts (1), washers (8), and nuts (7) from center section clevis (5) at stabilizer rear spar.

CAUTION: BOLTS ARE DIFFERENT IN LENGTH, NOTE PROPER LOCATION FOR REINSTALLATION.

NOTE: If necessary, adjust tension in sling to facilitate removal of mounting bolts.

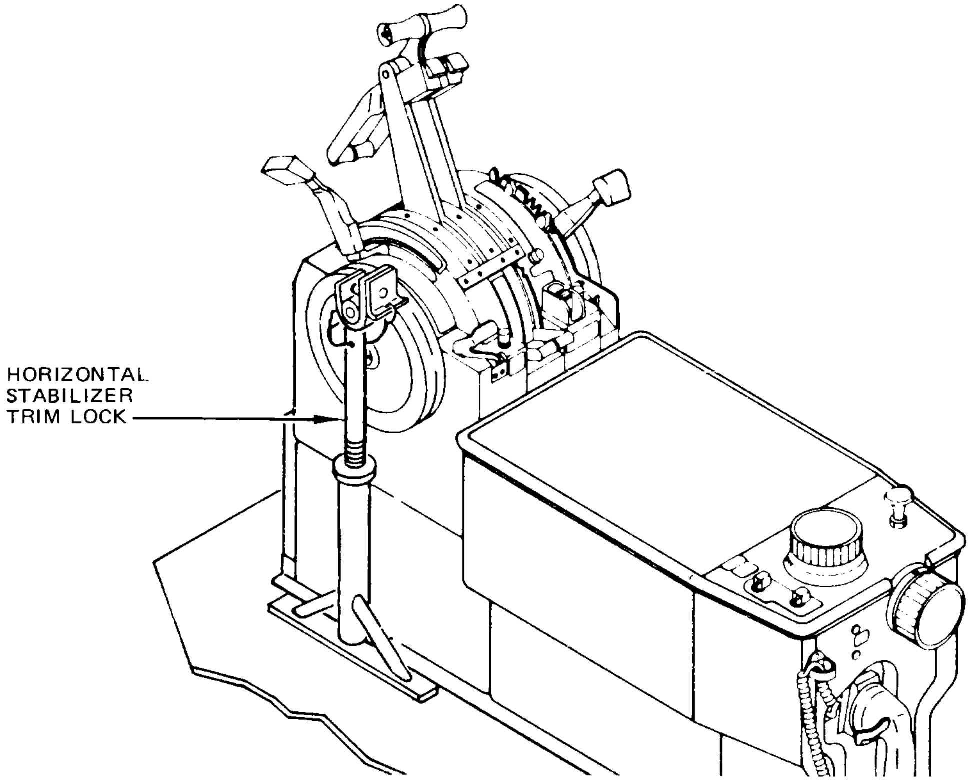
(3) Remove cotter pins (13), nuts (12), and washers (14 and 15) from two mounting bolts, (9) at stabilizer front spar. Withdraw mounting bolts, shims (16 and 17), and washers (18).

F. Hoist stabilizer outboard section clear of airplane, moving it horizontally outward, then lower onto support stand.

5. Prepare for Installation of Horizontal Stabilizer
A. Remove elevator systems A and B hydraulic power. Refer to 27-31-0, Elevator and Tab Control System - Maintenance Practices.
B. Ensure that the following circuit breakers on panel P6-are open:
(1) Autopilot stabilizer trim servo
(2) Stabilizer trim actuator
C. Ensure horizontal stabilizer is set at zero degrees (3 units of trim), that horizontal stabilizer trim wheel lock is installed, and that horizontal stabilizer trim cutout switches are positioned to CUTOUT.

6. Install Horizontal Stabilizer
A. Install horizontal stabilizer sling (Fig. 401) as follows:'
(1) Locate attachment points on upper surface of stabilizer and install sling attachment fittings.
(2) Attach sling to spreader bar.

CAUTION: USE F80006-2 CABLE TO INSTALL STABILIZER WITHOUT ELEVATORS INSTALLED. USE F80006-51 CABLE TO INSTALL STABILIZER WITH ELEVATORS INSTALLED.



Horizontal Stabilizer Trim Lock Installation
Figure 404

(3) Attach hoist to sling. Lift sling into position and fasten to attachment fittings.

CAUTION: TAKE PRECAUTION NOT TO DAMAGE STABILIZER BY SUDDEN OR UNCONTROLLED MOVEMENTS OF THE SLING.

B. Do these steps for the front and rear spar bolts and fittings:
(1) Apply light coat of grease to bore and flange surfaces of bushings in front and rear spar fittings (outboard and center section).
(2) Apply BMS 3-27 corrosion preventive compound on bolt shanks, washers, and all mating surfaces.
(3) Apply BMS 3-28 anti-seize compound on bolt threads and nut threads.

C. Raise horizontal stabilizer to position mounting lugs parallel to center section clevis.

D. Move stabilizer inward and position to align front and rear spar fittings.

CAUTION: TAKE PRECAUTION NOT TO DAMAGE ADJACENT STRUCTURE BY SUDDEN OR UNCONTROLLED MOVEMENTS OF HORIZONTAL STABILIZER.

E. Attach stabilizer outboard section to center section as follows:
(1) Apply a light film of grease to bore and flange surfaces of bushings in rear spar joint fittings and to attachment bolts (1) and washers.
(2) With stabilizer hoisted into position and with front and rear spar joints properly mated, install bolts (1) (heads facing aft), washers (8), and nuts (7) in rear spar joints.
(3) Temporarily insert bolts (9) in forward spar joints.
(4) Measure gaps between bushing faces of male and female lugs at rear spar joint. Maximum allowable gap for each clevis (sum of two gaps) is 0.014 inch. If gap is greater than maximum do one of these:
(a) Install a CRES laminated shim to make sure the clearance is correct before you reinstall the bolt.
(b) Replace flanged bushings with new bushings of flange thickness necessary to obtain correct gap limit.
(5) Tighten nuts (7) at rear spar joints 3300 to 4300 pound-inches.

NOTE: Due to the configuration of the rear spar failsafe lug, the bolts (1) may be loose while the airplane is on the ground.

(6) Align bolts (1) with serrated cutouts in bolt lock (2) without exceeding specified torque. Install bolt lock and secure with locking bolt washer (3) and locking bolt (4), tighten to 660-980 pound-inches. Install lockwire securely between locking bolt and bolt lock.

(7) Fit shims (16) to gaps between spar lug (11) and clevis lugs (10) of front spar joint. Peel lamination as required to provide fit-up of 0.005-inch maximum gap per side (maximum of 0.010 gap per clevis).
(8) Apply a light film of grease to bore and flange surfaces of bushings in front spar joint fittings, to attachment bolts (9), washers, and shims.
(9) Install shims (16), bolts (9), washers (14, 15, 18), and nuts (12) in front spar joints. Tighten nuts at front spar joints 800 to 1000 pound-inches.
(10) Measure gap between washers (14) and (15) at front spar fittings. Fit shims (17) as required to maintain a 0.003- to 0.012-inch gap.
(11) Back off nuts at front spar joints to align with nearest pair of cotter pin holes and install cotter pins.

F. Remove sling and sling attachment fittings from horizontal stabilizer and install original fasteners in sling attachment fitting holes.

G. If applicable, attach elevator to stabilizer. Refer to 27-31-11, Elevators - Removal/Installation.

H. Connect elevator tab hydraulic line located aft of stabilizer rear spar (Fig. 403).

I. If step G was not applicable, connect elevator control pushrod to elevator as follows:
(1) Move elevators by hand to neutral position.
(2) Insert bolt with head inboard through control pushrod and elevator lug (Fig. 402).
(3) Torque first locknut to 500-600 pound-inches, then torque second locknut to 150-220 pound-inches.

<u>CAUTION</u>: AFTER SETTING TORQUE ON SECOND LOCKNUT, DO NOT ATTEMPT TO RESET TORQUE ON FIRST LOCKNUT.

J. Connect forward stabilizer-to-body sliding seal (Fig. 403) at the stabilizer front spar as follows:
(1) Slide upper and lower seal plate assembly to align pin holes (four places) at link-to-pedestal assembly.
(2) Install pin at link-to-pedestal assembly.

K. Install upper and lower trailing edge bracket assemblies and inspar No. 5 bracket assembly in outboard stabilizer section rear spar gap cover area.

L. Install outboard stabilizer section front and rear spar gap covers (upper and lower). If removed, or if new horizontal stabilizer is being installed, install all remaining stabilizer-to-body gap covers and seals. Install vortex generator plate, if removed, with gap cover on stabilizer lower surface. If vortex generator is a built-up assembly, apply aerodynamic smoother all around base of vortex generator plate. If vortex generator is a one-piece unit with beveled edges at baseplate, aerodynamic smoother is not required.

M. Install access panels 3801, 3802 and elevator control pushrod access plate.

N. Remove the stabilizer trim lock assembly from the control stand (Fig. 404).

O. Adjust stabilizer to body seal.
   (1) Set horizontal stabilizer at 0 degree trim (three trim units).
   (2) Check that gap between stabilizer-to-body blade seals and body along upper and lower stabilizer edge is as shown in section A-A, Fig. 405. Adjust seals in or out as required.

   NOTE: Bulb seals installed at several locations are normally in contact with body and depressed. Gap requirements do not apply to these seals.

   (3) Position stabilizer leading edge to fall down position (ball nut against downstop).
   (4) Check that gap between stabilizer-to-body blade seal that is installed at leading edge of stabilizer running from upper to lower surface is as shown in section A-A, Fig. 405. Check for this gap also at seal segment adjacent to upper spar gap cover. Adjust seals as required.
   (5) Manually trim stabilizer and check that clearance between vortex generator plate (if installed) and body as specified in section B-B is maintained.
   (6) Check gap between elevator and body as follows:
      (a) Position stabilizer at 3 units of trim and elevator in neutral. Check elevator-to-body seal gap per section C-C. Adjust as required.
      (b) Manually move stabilizer leading edge to full up position (ball nut against upstop), and manually move elevator trailing edge 8.8 ±0.05 inches up from index plate on tail cone. Check that elevator-to-body gaps are as shown in section C-C.

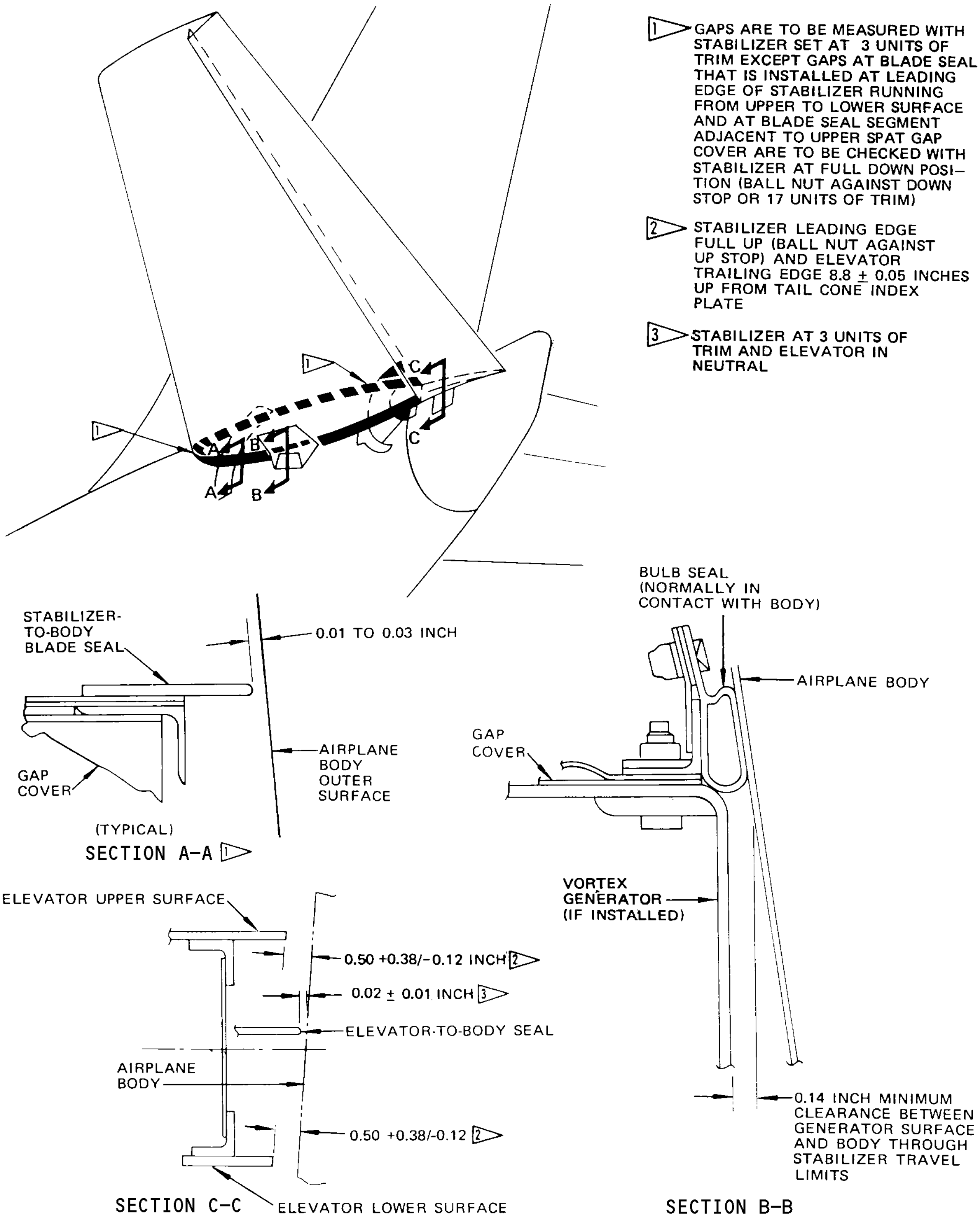
P. Position horizontal stabilizer trim cutout switches to NORMAL. Provide electrical power.

Q. On circuit breaker panel P6, close the following circuit breakers:
   (1) Autopilot stabilizer trim servo
   (2) Stabilizer trim actuator
   (3) Stabilizer trim control

R. Adjust and test elevator (Ref 27-31-0, Adjustment/Test).

S. Using stabilizer trim control wheel check that stabilizer will operate through full travel between jackscrew stops.

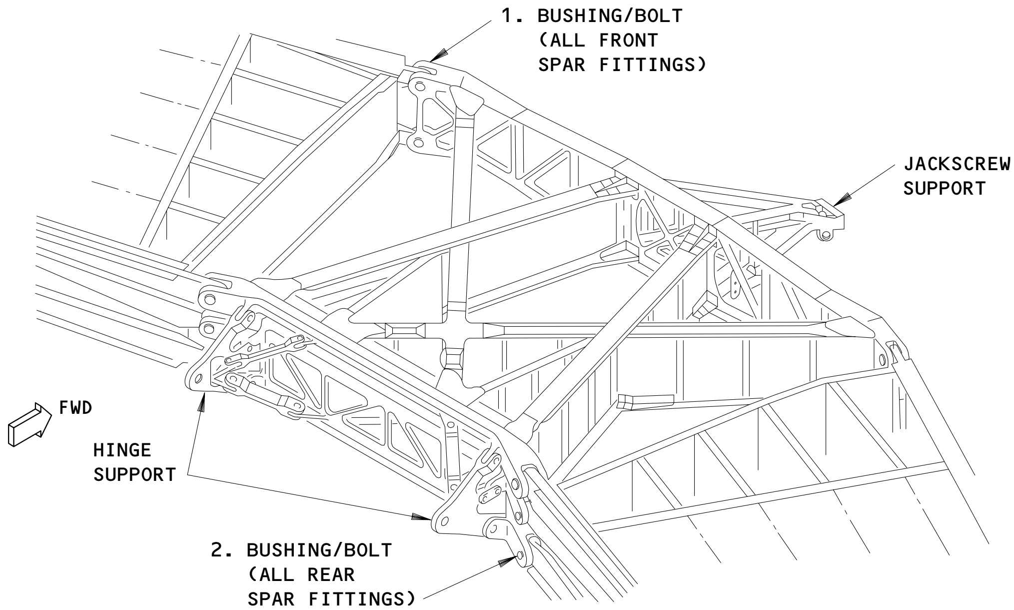
T. Remove electrical power, if no longer required.



Stabilizer to Body Seal Adjustment
Figure 405

HORIZONTAL STABILIZER - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and spar fitting bushing/bolt wear limits chart. Additional wear limits and repair are given in Component Overhaul Manual - Horizontal Tail Center Section Assembly, 55-10-05. For gaining access to, or removing and replacing the component after inspection refer to component removal/installation.
2. For aerodynamic smoothness, refer to SRM 51-70.
3. Horizontal Stabilizer Wear Limits (Fig. 601)



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
1	BUSHING	ID	0.8780	0.8795	0.8840	0.010	1		
	BOLT	OD	0.8730	0.8740	0.8680			2	
2	BUSHING	ID	1.2530	1.2541	1.2590	0.010	1		
	BOLT	OD	1.2480	1.2490	1.2450			2	

ALL DIMENSIONS ARE IN INCHES

1 REPLACE WITH BUSHING HAVING SAME PART NUMBER.

2 STRIP EXISTING FINISH AND CHROME PLATE TO DESIGN DIMENSIONS.

Horizontal Stabilizer Wear Limits
Figure 601

HORIZONTAL STABILIZER LEADING EDGES - REMOVAL/INSTALLATION

1. Remove Horizontal Stabilizer Leading Edge
   A. Remove bolts attaching lower surface of leading edge to front spar.
   B. Remove bolts attaching upper surface of leading edge to front spar.

   CAUTION: DO NOT ALLOW LEADING EDGE TO SLIP OFF FRONT SPAR UNTIL ALL ATTACHING BOLTS ARE REMOVED.

   C. Support each end of leading edge.
   D. Remove leading edge.
2. Install Horizontal Stabilizer Leading Edge
   A. Place leading edge in position on stabilizer front spar.
   B. Install bolts attaching upper surface of leading edge to front spar.
   C. Install bolts attaching lower surface of leading edge to front spar.

   NOTE: Tighten bolts within torque range of 23 to 28 pound-inches.

HORIZONTAL STABILIZER CENTER SECTION HINGE FITTING - REMOVAL/INSTALLATION

1. General
   A. The design of horizontal stabilizer permits removal of horizontal stabilizer center section hinge fitting without removal of the outboard stabilizer sections.
   B. The following procedure covers removal of both right and left hinge fitting with exceptions noted where applicable. Installation of hinge fitting on one side should be completed before attempting work on opposite side.
2. Equipment and Materials
   A. Horizontal Stabilizer Hinge Pin Removal Tool - F80047-1
   B. Horizontal Stabilizer Thread Protector - F80183-1
   C. Stabilizer Trim Lock - F71336-501
   D. Dial Indication Depth Gage
   E. Grease - BMS 3-24 (Ref 20-30-21)
   F. Corrosion Preventative Compound (AMM 20-30-21/201)
      (1) Corrosion Preventative Compound - BMS 3-27
      (2) Grease - BMS 3-33 (Alternative for BMS 3-27)
3. Prepare Horizontal Stabilizer Center Section Hinge Fitting for Removal
   A. Position stabilizer to maximum leading edge down position.
   B. Position horizontal stabilizer trim cutout switches to CUTOUT.
   C. On circuit breaker panel P6, open following circuit breakers:
      (1) Autopilot stabilizer trim servo
      (2) Stabilizer trim actuator
   D. In area of jackscrew gearbox, disconnect electrical plug from electric actuator and autopilot actuator.
   E. Install stabilizer trim lock assembly (Fig. 401).
   F. Open aft unpressurized compartment and stabilizer trim access door 3701.
   G. Remove stabilizer access panel 9105 or 9205 and end side door (detail A).
   H. Remove lower rear spar and trailing edge gap covers to permit access to the hinge.
   I. Provide adequate support of stabilizer structure and center section assembly (Fig. 402) in area of hinge components to ensure holding of all components in proper alignment during removal and replacement.

J. For the left stabilizer, disconnect the electrical connector from the elevator position sensor and position the wire harness clear of the stabilizer hinge pin (AMM 31-24-46/401 or AMM 31-24-56/401).

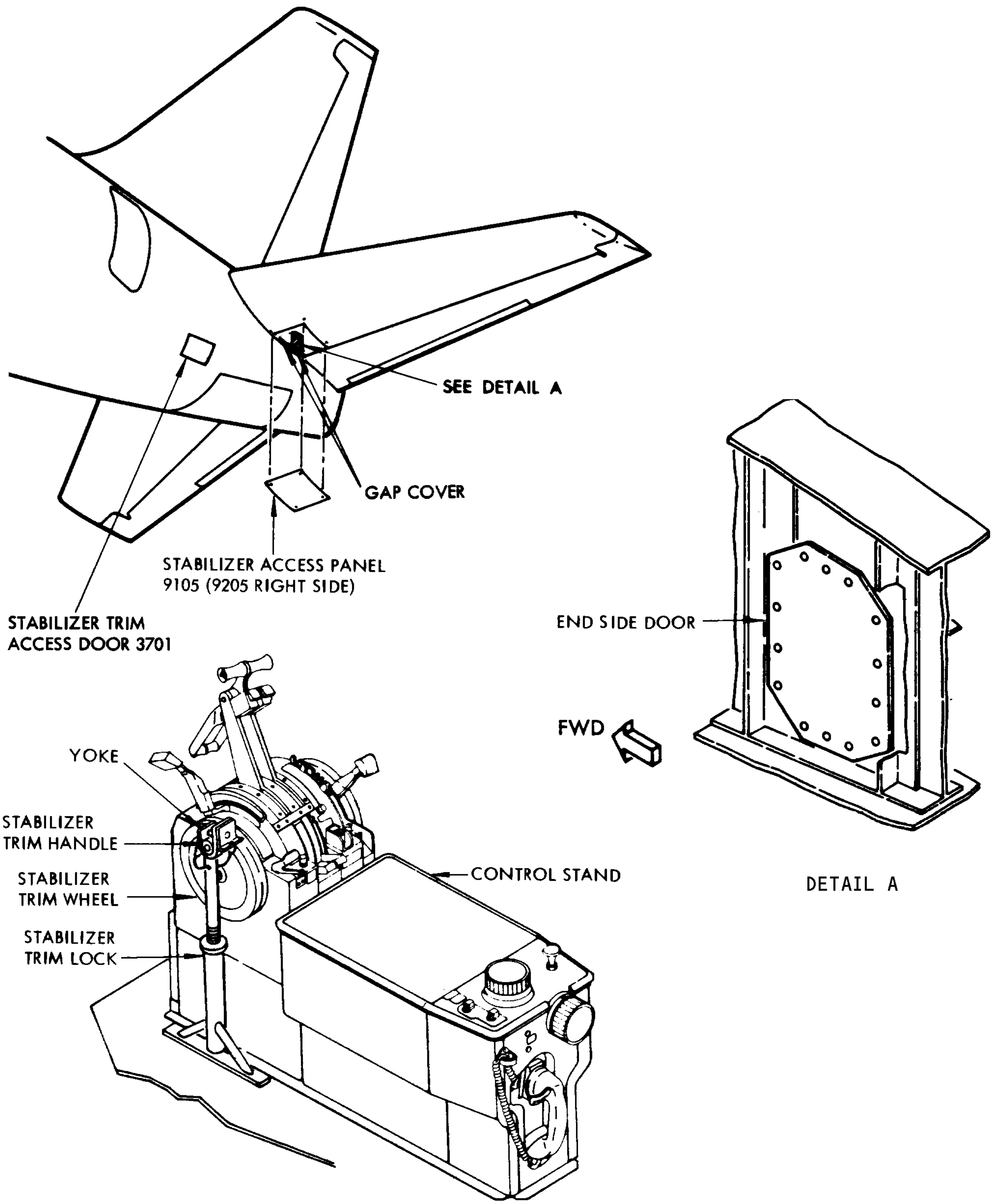
4. <u>Remove Horizontal Stabilizer Center Section Hinge Fitting</u>
   A. Remove both cotter pins, nut (8, Fig. 402), and washer (9).
   B. Remove nut (7) and bushing spacer (6).
   C. Remove locking plate (11).
   D. Install washer (9) and nut (8).
   E. Attach horizontal stabilizer hinge pin removal tool and push hinge pin (1), bushing retainer (17), and hinge pin (2) out.
   F. Remove both positioning hinge bushings (10 and 16). A bushing spacer (3), if used, will come off with adjustable positioning hinge bushing (16) when removing the hinge fitting on the right side.
   G. Remove outboard hinge fitting (12) by removing 14 bolts.

5. <u>Install Horizontal Stabilizer Center Section Hinge Fitting</u>
   A. Install outboard hinge fitting (12) except omit forward bolt under center section hinge.
   B. Use a dial indication depth gage through bolt hole in outboard hinge fitting (12) to check and record dimension between center section (5) and outboard hinge fitting.

   <u>CAUTION</u>: STABILIZER IS TO BE IN A FREE STATE TO PREVENT PRELOAD ON BEARING. STABILIZER SUPPORT EQUIPMENT MUST PREVENT INTRODUCTION OF A SIDE LOAD ON STABILIZER.

   C. Install the bushing (16):
      (1) For the right-hand hinge, install the bushing spacer (3) and the bushing (16).
      (2) For the left-hand hinge, install the bushing (16).
      (3) Finger-tighten the bushing (16) until a snug contact is made with faying surface of bearing (4).
      (4) Check dimension previously recorded in step B. with dial indication depth gage to ensure proper contact between bushing (16) and bearing (4).

      <u>NOTE</u>: If required dimension is not obtained, disassemble and adjust positioning hinge bushing to obtain desired gap.



Horizontal Stabilizer Center Section Hinge Fitting - Preparation for Removal
Figure 401

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(5) Lubricate bushing (16) inside and outside prior to installation.

D. Insert positioning hinge bushing (10). Lubricate bushing on inside and outside prior to installation. Bushings with locking feature must engage lock feature of bearing. See section A-A.

E. Use horizontal stabilizer thread protector to install hinge pin (2).
   (1) Lubricate hinge pin and thread protector with with corrosion-preventative compound before you install it (Fig. 402).

F. Install bushing spacer (6) and nut (7). Finger-tighten nut.

G. Install locking plate (11).

H. Install bushing retainer (17) over adjustable positioning hinge bushing in a position to allow locating bosses to engage over webs of body hinge structure. Rotate adjustable positioning bushing from original setting the minimum amount to provide for mating of bushing head with retainer notches. The bushing retainer is not used with installations using bearings with lock engage features. See section A-A.

I. Temporarily remove bushing retainer (17), if used, and tighten nut (7) 300 to 600 pound-inches. If cotter pin holes do not align, tighten nut further to a maximum of 30 degrees rotation to first cotter pin hole.

CAUTION: DO NOT APPLY TORQUE TO BOLTHEAD.

J. Use dial indication depth gage to check dimension previously recorded in step B. between center section assembly (5) and outboard hinge fitting (12). Dimension must be within ± 0.005 inch. If so, install outboard hinge fitting forward bolt under center section hinge.

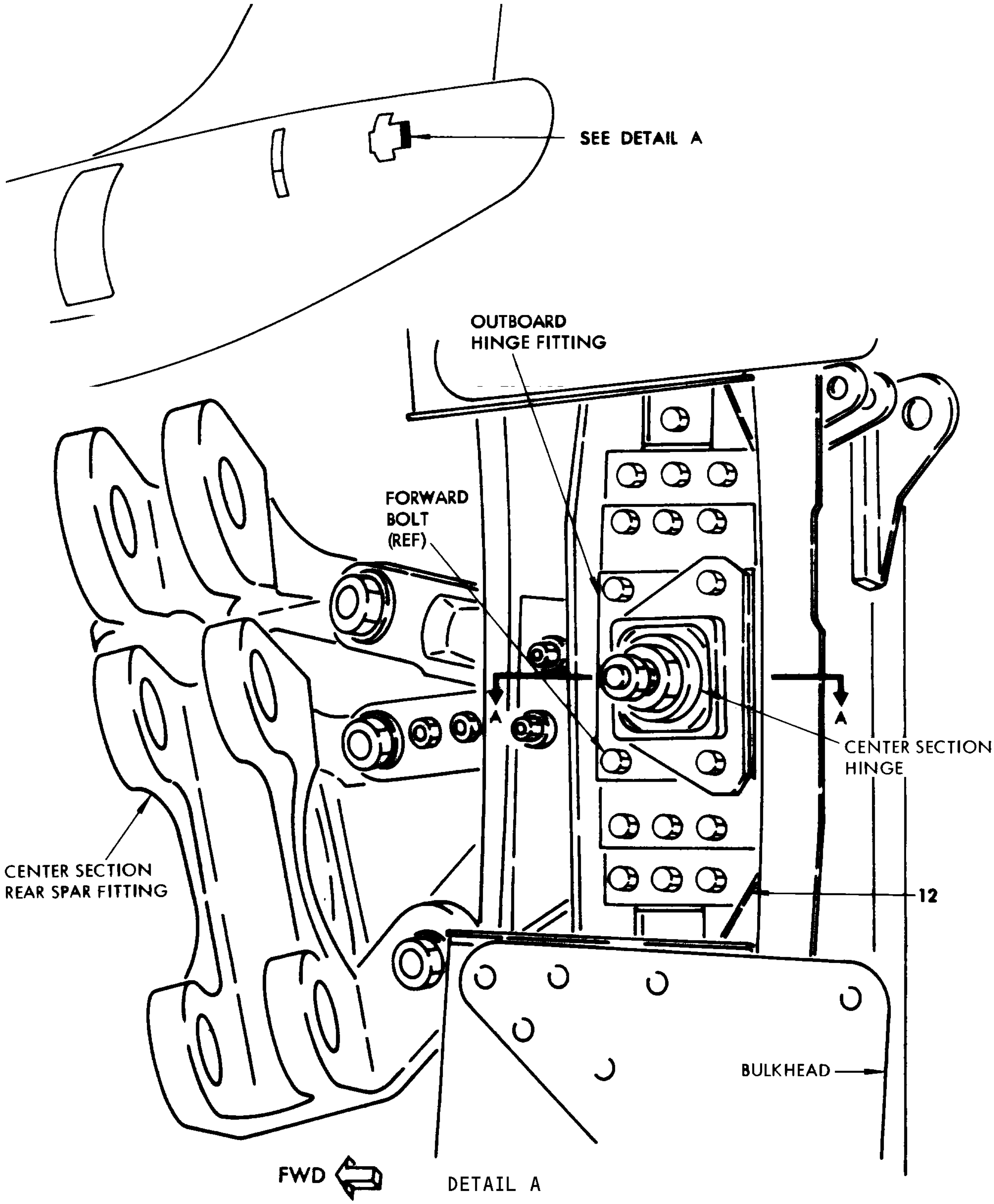
K. Remove locking plate (11) and check gap between body structure and positioning hinge bushing (10). This gap must be 0.12 +0.07/-0.08 inch. If so, reinstall locking plate. If the 0.12 +0.07/-0.08 gap is not met, perform the following:
   (1) Remove existing bushing spacer (3).
   (2) Fabricate new bushing spacer from 2024-T4 with thickness sized to gap. New bushing spacer thickness is 0.12 ±0.06 inch.
   (3) Install new bushing spacer (3) per above instructions.

L. Reinstall bushing retainer (17) if used, with hinge insert pin (1). Rotate hinge insert pin until cotter pin hole is aligned with cotter pin hole defined in step M.

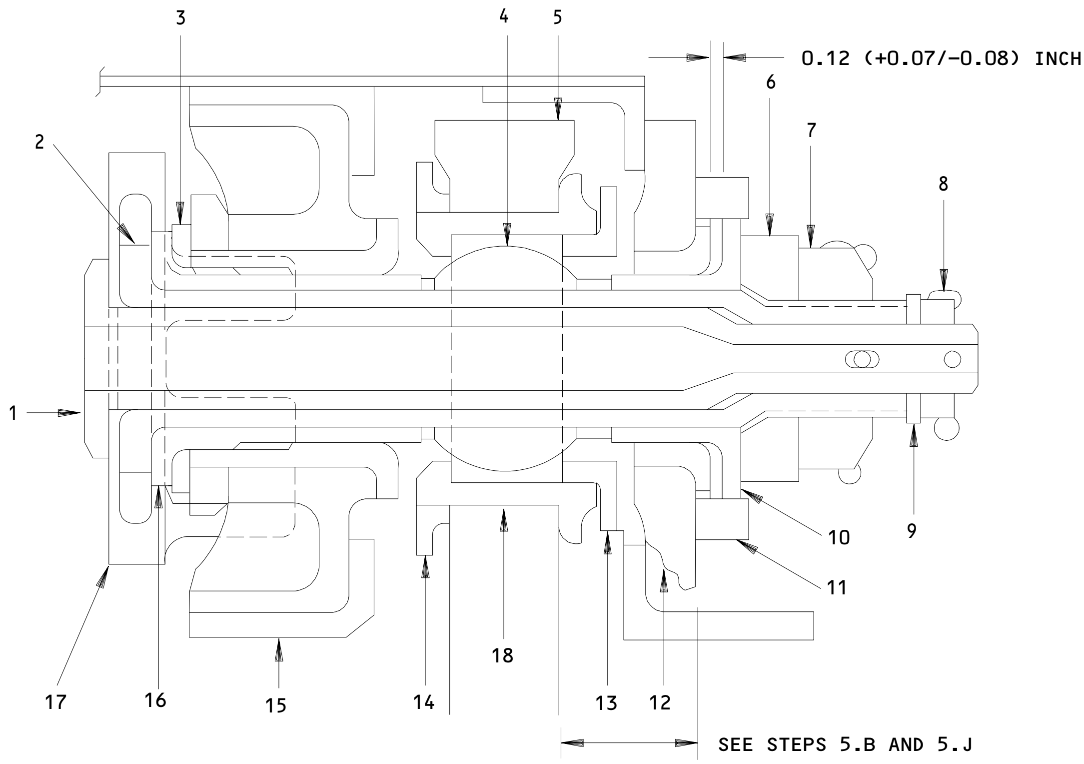
M. Install washer (9) and nut (8) and tighten a maximum of 50 pound-inches. If cotter pin hole does not align, back off a maximum of 30 degrees to first cotter pin hole.

CAUTION: DO NOT TURN BOLTHEAD.

N. Install cotter pins in nuts (7) and (8).



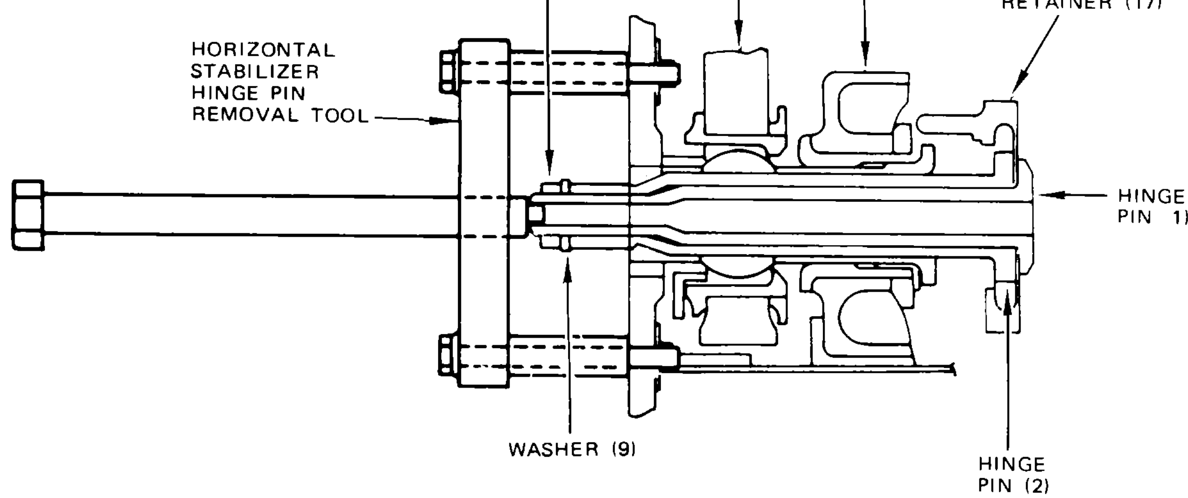
Horizontal Stabilizer Center Section Hinge Fitting Installation
Figure 402 (Sheet 1)



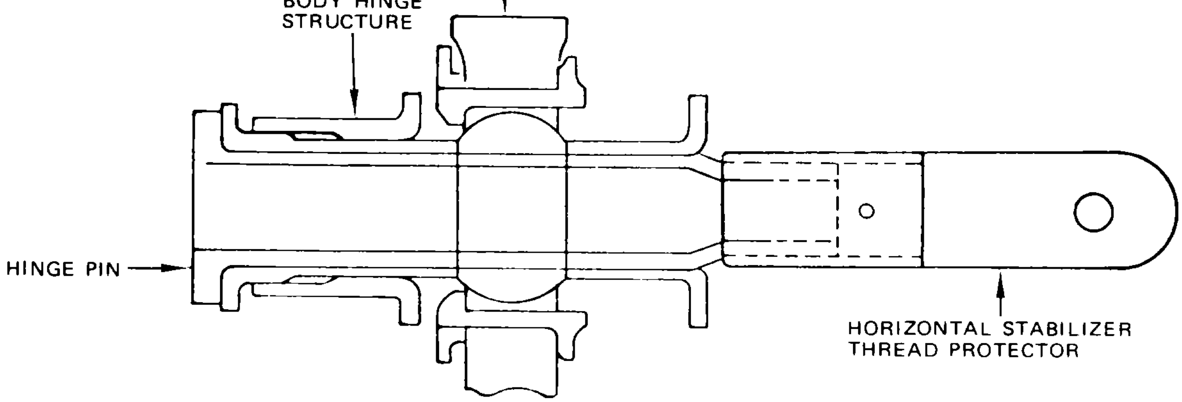
SECTION A-A

1. HINGE INSERT PIN
2. HINGE PIN
3. BUSHING SPACER (RIGHT SIDE ONLY)
4. BEARING
5. CENTER SECTION ASSEMBLY
6. BUSHING SPACER
7. NUT
8. NUT
9. WASHER
10. POSITIONING HINGE BUSHING
11. LOCKING PLATE
12. OUTBOARD HINGE FITTING
13. BEARING RETAINER NUT
14. SLEEVE BEARING RETAINER NUT
15. BODY HINGE STRUCTURE
16. ADJUSTABLE POSITIONING HINGE BUSHING
17. BUSHING RETAINER
18. BEARING RETAINER

Horizontal Stabilizer Center Section Hinge Fitting Installation
Figure 402 (Sheet 2)



HORIZONTAL STABILIZER HINGE PIN REMOVAL



HORIZONTAL STABILIZER HINGE PIN INSTALLATION

Horizontal Stabilizer Center S3ection Hinge Fitting Installation
Figure 403

O. For the left stabilizer, reconnect the electrical connect on the elevator position sensor (AMM 31-24-46/401 or AMM 31-24-56/401).
P. Remove all support equipment in vicinity of hinge.
Q. Remove stabilizer trim lock assembly.
R. Using stabilizer trim control wheel check that stabilizer will smoothly operate through full travel between jackscrew stops.
S. Check that gap between jackscrew support fitting and fuselage structure just aft of jackscrew is 0.01 to 0.05 inch on both sides of stabilizer.

6. Restore Airplane to Normal
A. Replace end side door and stabilizer access panel. Close stabilizer trim access door.
B. Replace lower rear spar and trailing edge gap covers.
C. Reconnect electric plugs of electric actuator and autopilot actuator.
D. Position horizontal stabilizer trim cutout switches to NORMAL.
E. Close all circuit breakers opened on panel P6.

HORIZONTAL STABILIZER CENTER SECTION HINGE FITTING - INSPECTION/CHECK

1. General
   A. This procedure is a method of determining the amount of horizontal stabilizer free play. Total free play of the stabilizer is the accumulation of free play of the jackscrew and hinge mechanisms.
2. Equipment and Materials
   A. Two persons each weighing 200 ±25 pounds. Measure and record weight of each person and the total (Wt). The difference between the two person's weight should not exceed ± 10 lbs. During the test, apply and remove the weight of the persons slowly. Alternately, two dead weights, such as bags of shot, may be used in place of two persons.
   B. Dial indicator gage - with any suitable equipment for attachment to airplane such as suction cup
3. Horizontal Stabilizer Center Section Hinge Fitting Wear Limit
   A. Measure stabilizer center section hinge joint free play (referred to in following as X for left joint and Y for right joint):
      (1) Set stabilizer at 3 units of trim (stabilizer neutral position).
      (2) Attach dial indicator to left side of fuselage at body station 1154, so that plunger on indicator is depressed at least 1/8 inch and is touching stabilizer lower surface (Fig. 601).

      NOTE: Any suitable method for attaching dial indicator may be used.

      (3) Let two persons apply and remove their weight first on left stabilizer tip near front spar. Set dial indicator to zero. Then move the two persons to right stabilizer tip and record dial indicator reading. Remove weight of the two persons. Compute left hinge fitting free play as follows:

      X = D - W
      Where D = Dial Reading
      W = 0.0000155 multiplied by the applied weight
      (of the two persons)

      NOTE: If the quantity is negative, X = 0.

      (4) Attach dial indicator to right side as in step (2). Set dial indicator to zero.

(5) Apply weight of the two persons to left stabilizer tip near front spar. Record dial indicator reading. Remove weight of the two persons. Compute right hinge fitting free play as follows:

```
X = D - W
Where D = Dial Reading
W = 0.0000155 multiplied by the applied weight
    (of the two persons)
```

NOTE: If the quantity is negative, Y = 0.

B. Determine stabilizer jackscrew joint free play (referred to in following as Z):
(1) Check that stabilizer is at 3 units of trim and open stabilizer jackscrew compartment access door.
(2) Position the two men on upper surface of stabilizer, adjacent to fuselage, aft of body station 1156, one man each on left and right stabilizer. Remove weight of the two men.
(3) Attach dial indicator to body station 1088 bulkhead structure so that plunger is touching stabilizer center section front spar fitting lower surface and is depressed at least 1/8 inch (View 1, Fig. 601). Set indicator to zero.

NOTE: Any suitable method for attaching dial indicator may be used.

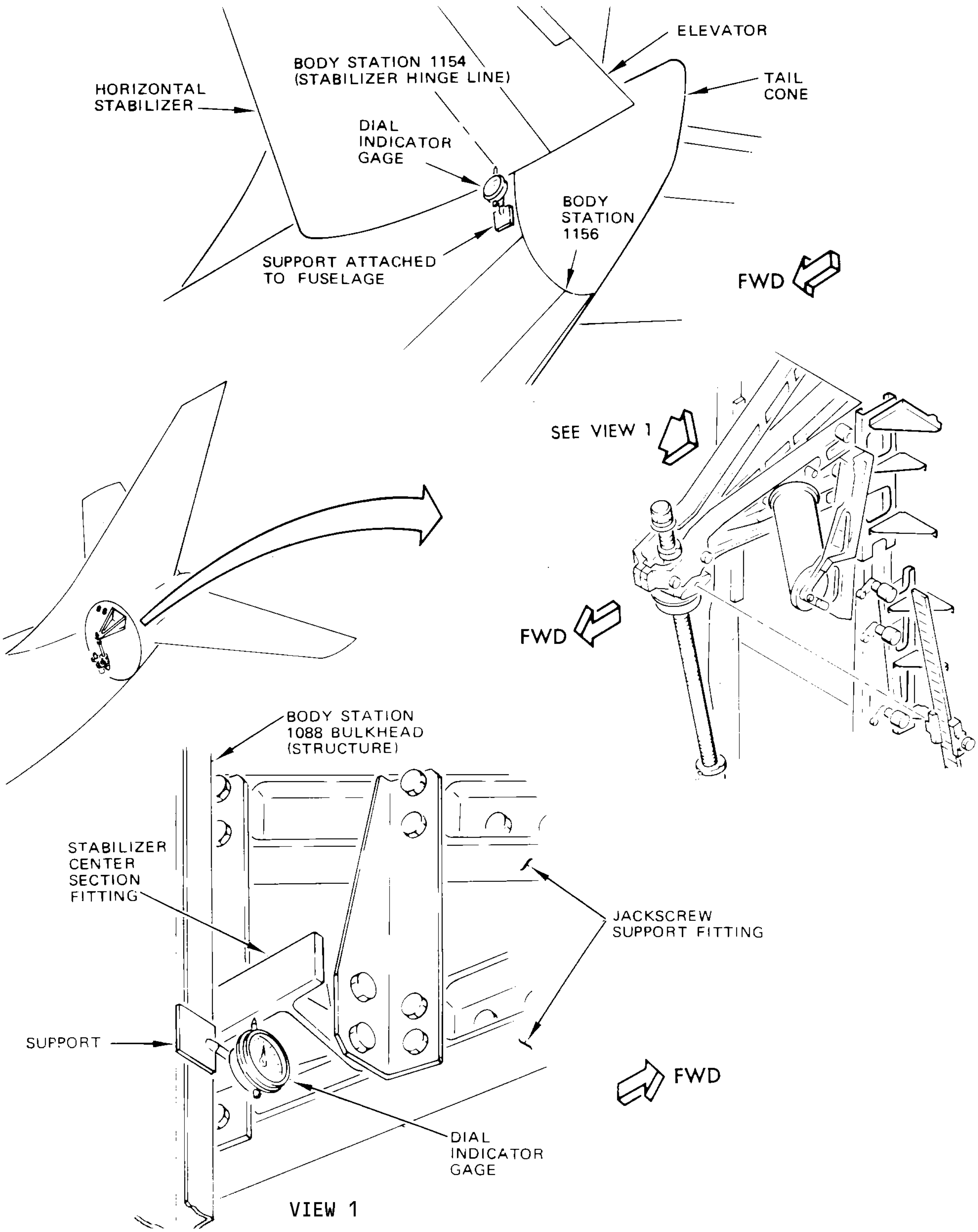
(4) Position the two men on upper surface of left and right stabilizer adjacent to fuselage along stabilizer front spar.
(5) Record reading on dial indicator. Remove weight of the two men. Compute jackscrew free play as follows:

```
Z = (D multiplied by 1.25) - (Wt multiplied by 1.25)
Where D = Dial Reading
      W = 0.0000255 multiplied by the applied weight
          (of the two persons)
```

NOTE: If the quantity is negative, Z = 0.

C. Determine total stabilizer free play (referred to in following as H):
(1) Apply values X, Y, and Z from steps A and B to following equation:

$$H = \frac{X + Y}{2} + Z$$



Dial Indicator Gage Locations
Figure 601

(2) 2

D. Determine if replacement of stabilizer center section hinge fitting and/or disassembly of jackscrew is required.
   (1) If value X exceeds 0.060 inch, replace left hinge bearing.
   (2) If value Y exceeds 0.060 inch, replace right hinge bearing.
   (3) If value Z exceeds 0.05 inch, disassemble jackscrew (AMM 27-41-81/401) and repair as required.
   (4) In addition, if value H is greater than 0.0505 inch, replace stabilizer center section hinge fitting (AMM 27-41-31/401) and/or disassemble jackscrew (AMM 27-41-81/401) and repair as required, because total combined free play allowed has been exceeded.

E. Remove weights (if used), dial indicator, and equipment for attaching dial indicator.

F. Close stabilizer jackscrew compartment access door.

HORIZONTAL STABILIZER CENTER SECTION HINGE FITTING - APPROVED REPAIRS

1. General
   A. The lockwire installed in the horizontal stabilizer center section hinge fitting retainer nuts must be installed to prevent the retainer nuts from backing off. Several cases of bearing surface damage to the center section bulkhead area have been reported. It is not recommended that replacement of the lockwire be deferred until the next scheduled overhaul.
2. Equipment and Material
   A. Dial Indication Depth Gage
   B. Stabilizer Trim Lock - F71336-501
   C. Grease - BMS 3-24 (Ref 20-30-21)
3. Remove Outboard Hinge Fitting (Fig. 801)
   A. Position stabilizer to maximum leading edge down position.
   B. Position horizontal stabilizer trim cutout switches to CUTOUT.
   C. Open following circuit breakers on circuit breaker panel P6:
      (1) Autopilot stabilizer trim servo
      (2) Stabilizer trim actuator
   D. Install the stabilizer trim lock assembly (Figure 802).
   E. Open aft unpressurized compartment and stabilizer trim access door 3701.
   F. Remove stabilizer access panel 9105 or 9205 and end side door (detail A).
   G. Remove lower rear spar and trailing edge gap covers to permit access to the hinge.
   H. Provide adequate support of stabilizer structure and center section assembly in area of hinge components to ensure holding of all components in proper alignment during removal and replacement.
   I. Remove both cotter pins, nut (8), and washer (9).
   J. Remove nut (7) and bushing spacer (6).
   K. Remove locking plate (11).
   L. Install washer (9) and nut (8).
   M. Remove positioning hinge bushing (10).
   N. Remove outboard hinge fitting (12) by removing 14 bolts.
4. Replace Lockwire
   A. Station one person inside airplane at hinge and one outside.
   B. Remove old lockwire.
   C. Install new lockwire and lockwire nuts to center section per double-twist method.
5. Install Outboard Hinge Fitting (Fig. 801)
   A. Install outboard hinge fitting (12) except omit forward bolt under center section hinge.

B. Use a dial indication depth gage through bolthole in outboard hinge fitting (12) to check and record dimension between center section (5) and outboard hinge fitting.

<u>CAUTION</u>: STABILIZER IS TO BE IN A FREE STATE TO PREVENT PRELOAD ON BEARING. STABILIZER SUPPORT EQUIPMENT MUST PREVENT INTRODUCTION OF A SIDE LOAD ON STABILIZER.

C. Insert positioning hinge bushing (10). Lubricate bushing on inside and outside prior to installation.
D. Install bushing spacer (6) and nut (7). Finger-tighten nut.
E. Install locking plate (11).
F. Temporarily remove bushing retainer (17) and apply torque to nut (7) of 300 to 600 pound-inches. If cotter pin holes do not align, tighten nut further to a maximum of 30 degrees rotation to first cotter pin hole.

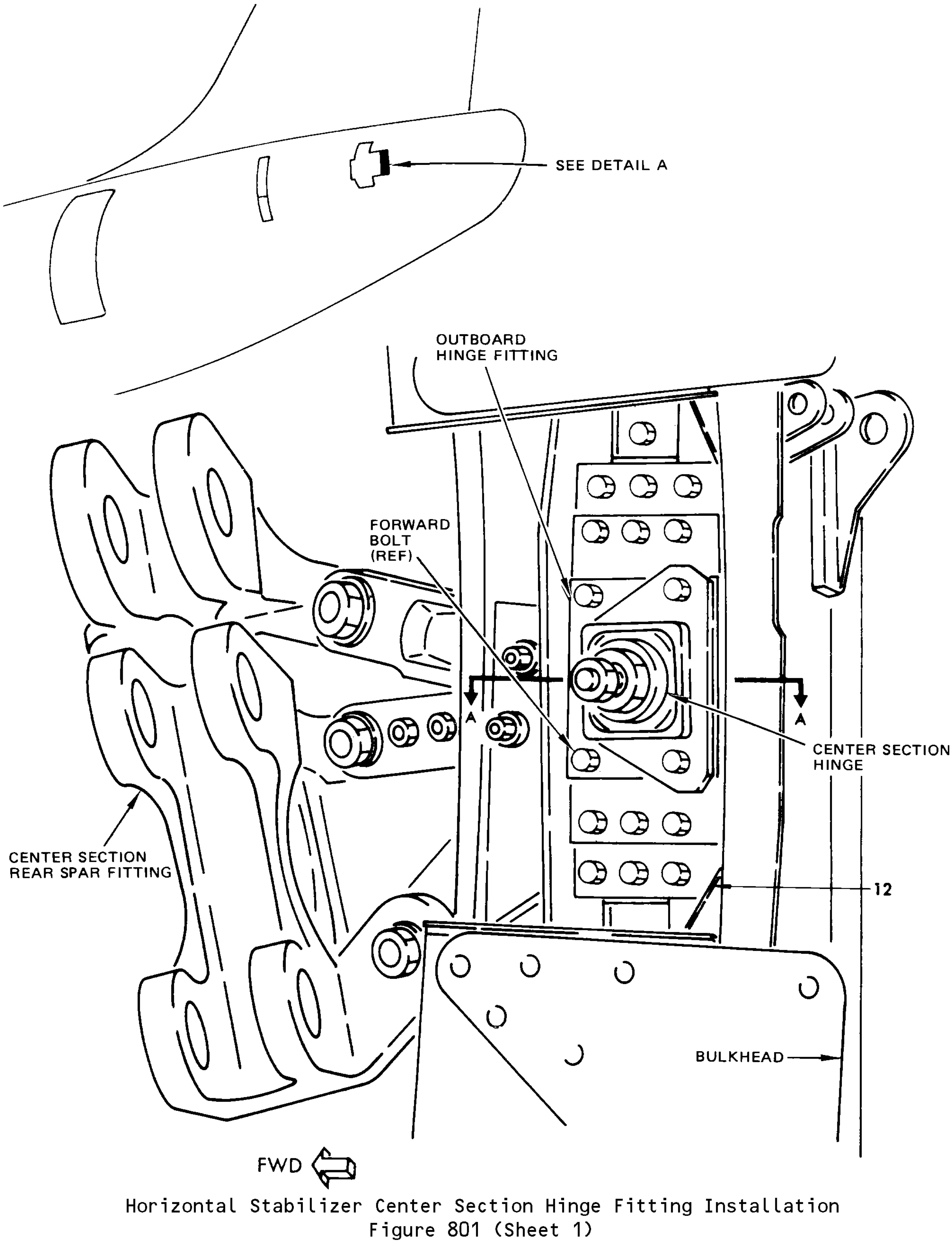
<u>CAUTION</u>: DO NOT APPLY TORQUE TO BOLT HEAD.

G. Use dial indication depth gage to check dimension (previously recorded) between center section (5) and outboard hinge fitting (12). Dimension must be within ±0.005 inch. If so, install outboard hinge fitting forward bolt under center section hinge.
H. Remove locking plate (11) and check gap between body structure and positioning hinge bushing (10). This gap must be 0.12 +0.07/-0.08 inch. If so, reinstall locking plate.
I. Reinstall bushing retainer (17) with hinge insert pin (1). Rotate hinge insert pin until cotter pin hole is aligned with cotter pin hole.
J. Install washer (9) and nut (8) and tighten a maximum of 50 pound-inches. If cotter pin hole does not align, back off a maximum of 30 degrees to first cotter pin hole.

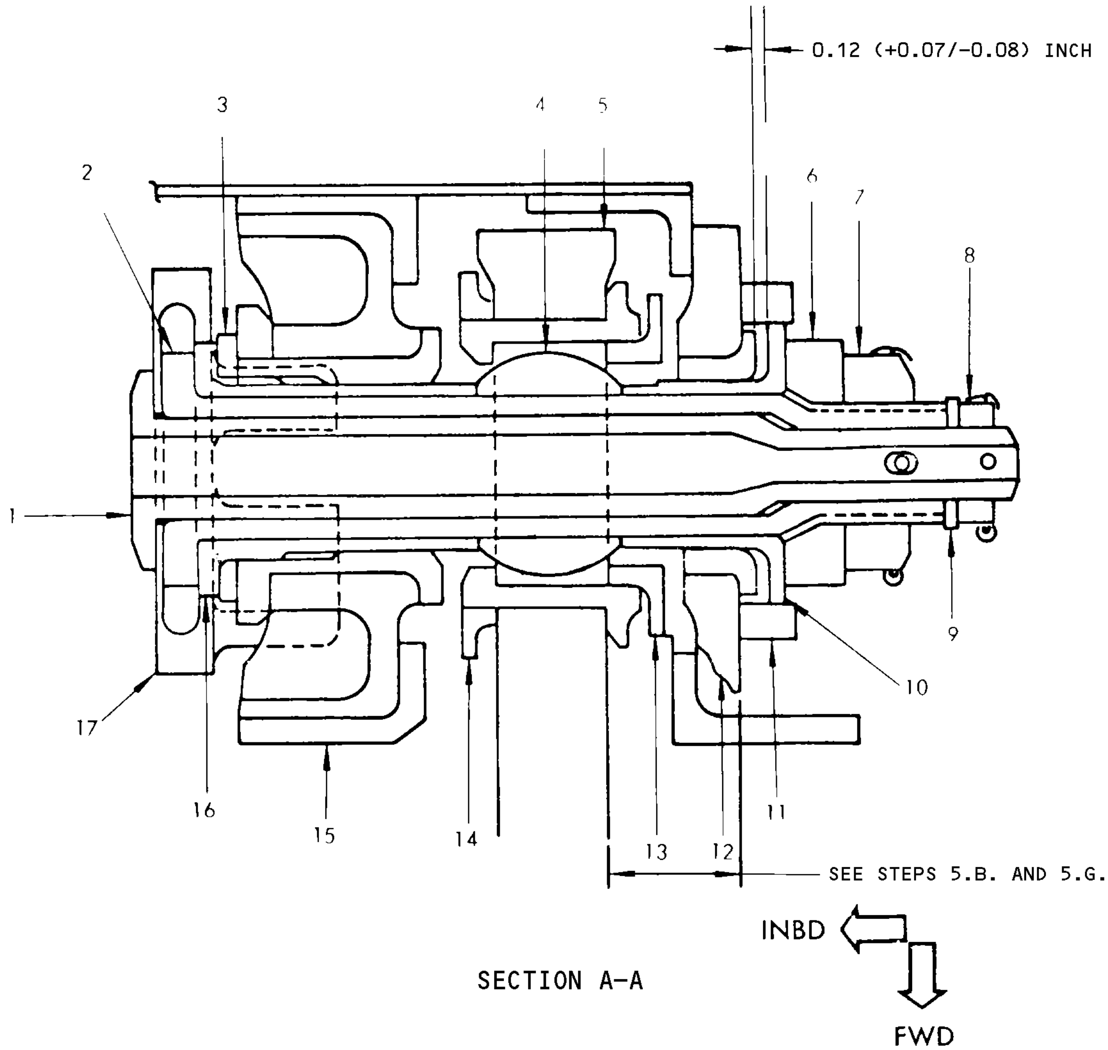
<u>CAUTION</u>: DO NOT TURN BOLTHEAD.

K. Install cotter pins in nuts (7) and (8).
L. Remove the stabilizer trim lock assembly (Figure 802).

M. Using stabilizer trim control wheel check that stabilizer will smoothly operate through full travel between jackscrew stops.
N. Check that gap between jackscrew support fitting and fuselage structure just aft of jackscrew is 0.01 to 0.05 inch on both sides of stabilizer.
O. Replace end side door and stabilizer access panel. Close stabilizer trim access door.
P. Replace lower rear spar and trailing edge gap covers.
Q. Reconnect electric plugs of electric actuator and autopilot actuator.
R. Position horizontal stabilizer trim cutout switches to NORMAL.
S. Close all circuit breakers opened on panel P6.



Horizontal Stabilizer Center Section Hinge Fitting Installation
Figure 801 (Sheet 1)



SECTION A-A

1. HINGE INSERT PIN
2. HINGE PIN
3. BUSHING SPACER (RIGHT SIDE ONLY)
4. BEARING
5. CENTER SECTION ASSEMBLY
6. BUSHING SPACER
7. NUT
8. NUT
9. WASHER
10. POSITIONING HINGE BUSHING
11. LOCKING PLATE
12. OUTBOARD HINGE FITTING
13. BEARING RETAINER NUT
14. SLEEVE BEARING RETAINER NUT
15. BODY HINGE STRUCTURE
16. ADJUSTABLE POSITIONING HINGE BUSHING
17. BUSHING RETAINER

Horizontal Stabilizer Center Section Hinge Fitting Installation
Figure 801 (Sheet 2)

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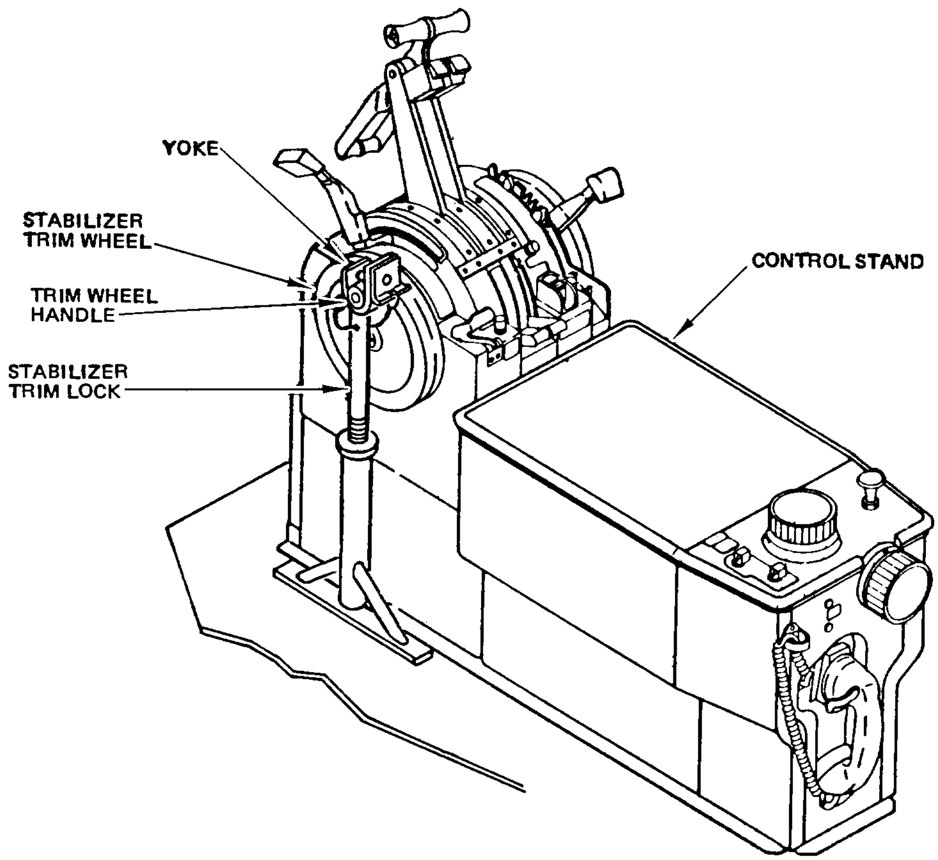


Stabilizer Trim Lock Installation
Figure 802

STABILIZER FORWARD CONTROL MECHANISM - REMOVAL/INSTALLATION

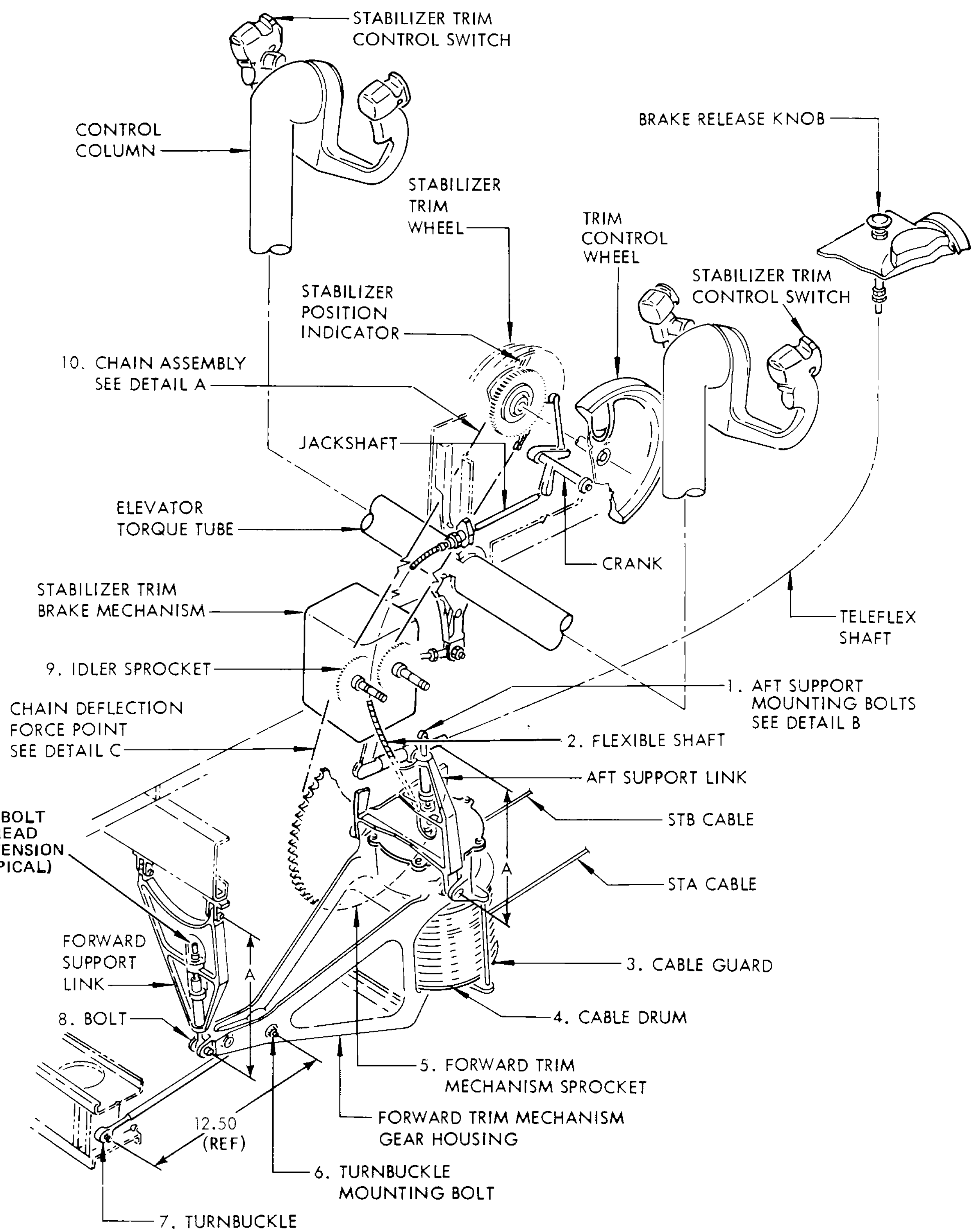
1. Equipment and Materials
   A. Tensiometer - 0 to 200 pounds capacity
   B. Spring scale - 0 to 50 pounds capacity
   C. Primer - BMS 10-11, Type I (Ref 20-30-41)
   D. Actuator Trammel Bar - F80055-1
2. Remove Forward Mechanism
   A. Provide electrical power.
   B. Close stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.
   C. Actuate stabilizer to full AIRPLANE NOSEUP.
   D. Open stabilizer trim actuator and autopilot stabilizer trim servo circuit breakers on panel P6.
   E. Adjust forward mechanism aft support linkage to provide slack in chain (Fig. 401).

      CAUTION: SLACK IN CHAIN IS NECESSARY BEFORE RELEASING CABLE TENSION TO AVOID EXCESSIVE RIGGING LOADS IN CHAIN.

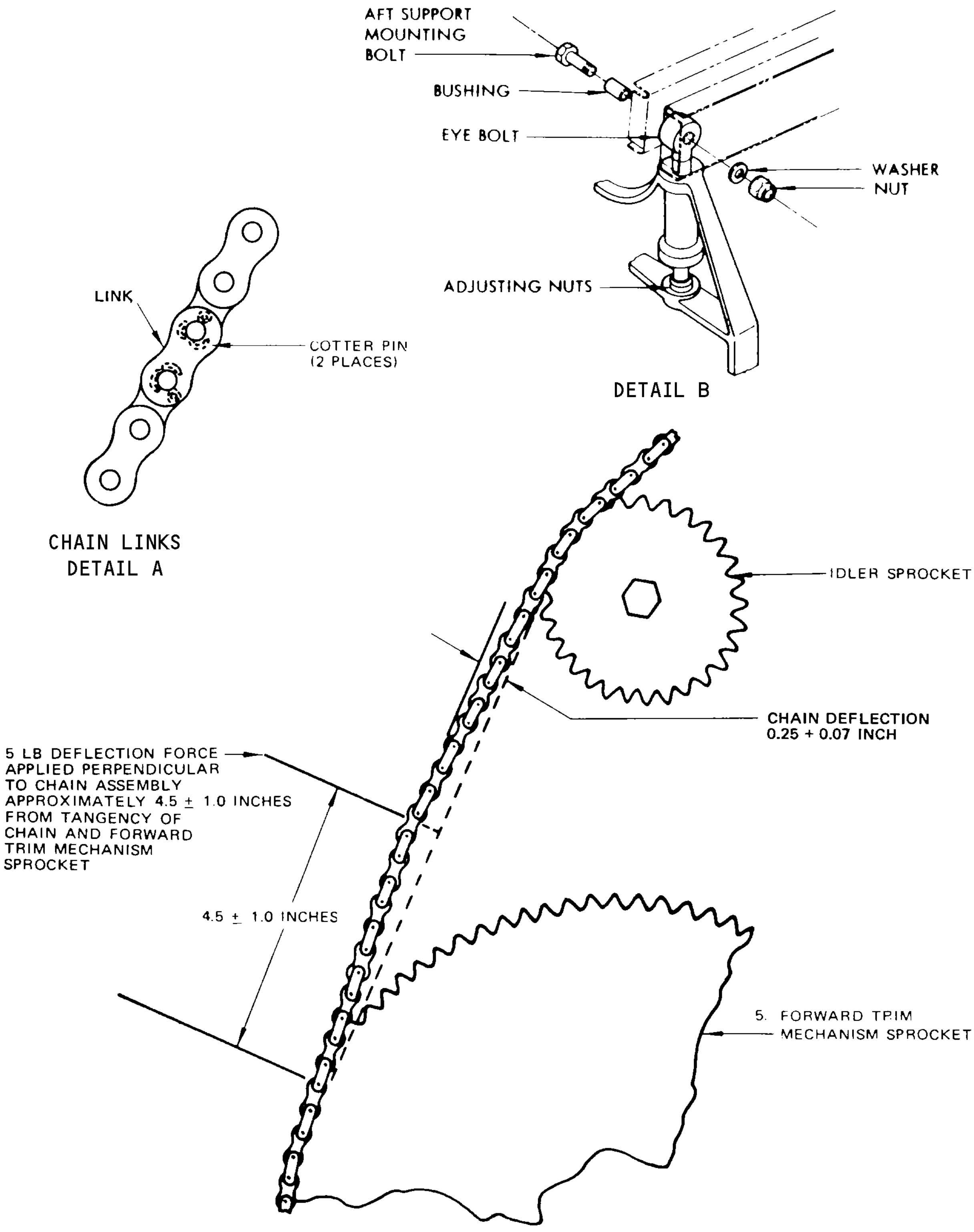
   F. Release cable tension by loosening turnbuckle (7).
   G. Deleted
   H. Remove cable guards (3).
   I. Remove STA cable from bottom edge of drum (4) and tag for installation.

      NOTE: A 50-pound load may be applied to stabilizer trim control wheel to stretch STB cable to facilitate detachment of STA cable.

   J. Disconnect position indicator flexible drive shaft from forward mechanism.
   K. Rotate stabilizer trim control wheel until chain connector link is between idler sprocket (9) and forward mechanism sprocket (5).
   L. Disconnect chain assembly (10) at connector link and secure loose ends of chain clear of forward mechanism (Detail A).
   M. Remove STB cable from top edge of drum (4) and tag for installation.
   N. Remove aft turnbuckle mounting bolt (6).
   O. Support forward mechanism assembly and detach from aircraft structure.
      (1) Remove support mounting bolts (1), bushings, washers, and nut from aft support link assembly.
      (2) Remove bolt (8), bushing, washers from lower end of forward support link assembly and remove forward mechanism.
3. Install Forward Mechanism
   A. Position forward mechanism.



Forward Mechanism and Chain Installation
Figure 401 (Sheet 1)



Forward Mechanism and Chain Installation
Figure 401 (Sheet 2)

B. Install mounting bolts (l, Fig. 401), bushings, washers, and nuts through aft support linkage assembly and aircraft structure.

NOTE: Bushings, installed in left and right eyebolts on aft support link assembly are of different diameters. Larger bushing installed in right eyebolt.

C. Install bolt (8), washers, bushing, and nut through lower end of forward support link assembly eyebolt and forward mechanism casting. Apply primer to contact surface areas of forward mechanism casting just prior to installation of bolt.

WARNING: PRIMER IS TOXIC AND FLAMMABLE. USE ONLY IN WELL VENTILATED AREA. DO NOT GET IN EYES OR ON SKIN.

NOTE: Install washers in following order: Bolthead, washer, support mechanism casting, washer, eyebolt, washer, support mechanism casting, washer, and nut.

D. Position turnbuckle (7) and install bolt, washers, bushing, and nut. Apply primer to contact surface area of forward mechanism casting just prior to installation of bolt.

NOTE: Install washers in following order. One washer between head of bolt and forward mechanism casting and one washer between forward mechanism casting and nut.

E. Adjust turnbuckle (7) to approximately 12.50 inches between centers.

NOTE: To facilitate further adjustment, adjust turnbuckle to provide approximately equal extension of screws on each side of sleeve.

F. Position chain (10) on sprockets and connect chain at connector link. Install cotter pins on outboard side of chain per Detail A, Fig. 401.

NOTE: Support link assemblies may be adjusted at eyebolts to facilitate chain installation.

G. Apply a force perpendicular to chain assembly and check for lateral deflection of chain assembly per Detail C, Fig. 401.

H. Measure eyebolt thread extension or dimension A to adjust support linkage for the required amount of chain deflection.
   (1) Measure eyebolt thread extension.
      (a) On the forward support link, measure the length of the eyebolt thread extension above the adjustable nuts.

(b) On the aft support link, measure the length of the two eyebolts thread extension below the adjustable nuts.
(c) Make sure that the three thread extensions are the same within 0.12 inch.

(2) Measure dimension A.

I. Check that A dimension of support link assemblies are equal to within ± 0.06 inch of each other (measure at three places) to ensure proper alignment of forward mechanism (Fig. 401).

NOTE: Measurement is taken from center of aft support bolts and threaded stud on aft support link assembly (right and left side) and center to center of forward support link mounting bolts and bolt through lower end of eyebolt.

J. Attach STA cable eye in slot in bottom of drum.

CAUTION: TO PRECLUDE CRACKING DRUM FLANGES, DO NOT TIGHTEN NUT MORE THAN 60 POUND-INCHES.

K. Rotate stabilizer trim control wheel to wind STA cable 28-1/2 turns on front drum. Hold STB cable taut as it winds on rear drum as STA cable winds on front drum.
L. Wind STB cable approximately 4-1/2 turns on front drum and attach.

CAUTION: TO PRECLUDE CRACKING DRUM FLANGES, DO NOT TIGHTEN NUT MORE THAN 60 POUND-INCHES.

NOTE: A 50-pound load may be applied to the stabilizer trim control wheel to stretch STA cable to facilitate attachment of STB cable.

M. Loosen chain by adjusting support link assembly eyebolts.
N. Adjust cable to specified tension with turnbuckle (7). See Fig. 402 for cable tension loads.

CAUTION: CABLE TENSION MUST BE ADJUSTED BEFORE FINAL ADJUSTMENT OF CHAIN.

O. Repeat steps G. and H.
P. Close stabilizer trim actuator and autopilot stabilizer trim servo circuit breakers on panel P6.
Q. Rotate stabilizer to full travel in both directions and then center cables on drum. Check that system operates freely and without binding in either direction through full travel.
R. Check that cable tension is within limits specified in Fig. 402. If tension is not within limits, repeat steps G., H., and M.

S. Set stabilizer B dimension at 41.57 ±0.05 inches (Fig. 402).
T. Check each end of core of flexible shaft for visible lubrication.
U. Rotate flexible drive shaft until stabilizer trim indicators align with 3 ±1/4 stabilizer trim units on control stand metal-cal.
V. Insert flexible drive shaft into drum shaft in forward mechanism. Check for positive engagement of splines on shaft before tightening union.
W. Make sure that the clearance between the chain and the adjacent wire bundles is as follows:

<u>CAUTION</u>: IF YOU DO NOT KEEP SUFFICIENT CLEARANCE, WIRES CAN BE DAMAGED.

(1) The lateral clearance must be not less than 0.5 inch.
(2) The vertical clearance (measured parallel to the chain) must be not less than 1.5 inches.

X. Remove electrical power, if no longer required.

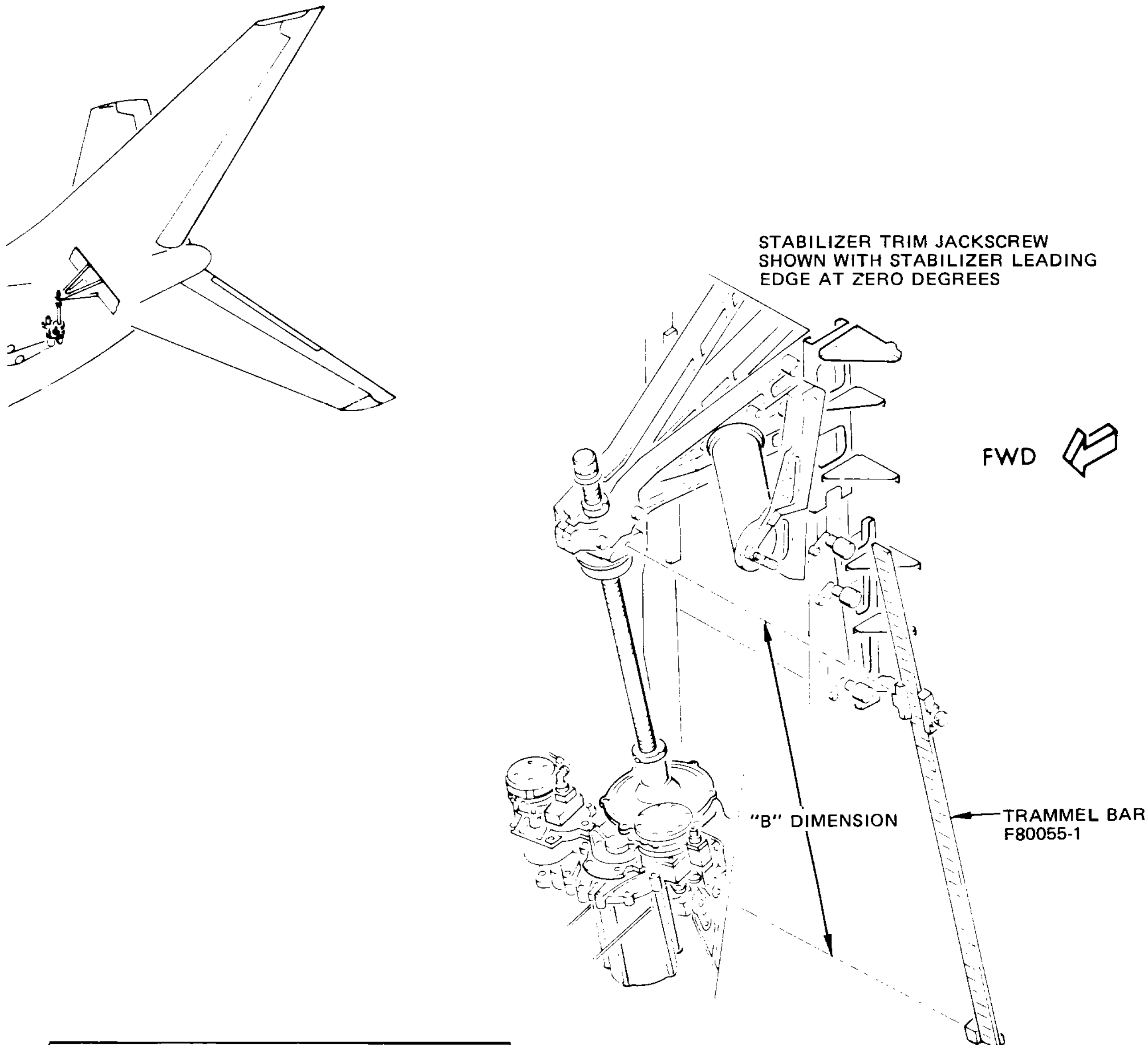


TABLE I	
TEMP °F	CABLE RIGGING LOAD (+20/-10) POUNDS STA AND STB CABLES
110	148
90	139
70	130
50	122
30	114
10	105
-10	97
-30	89
-40	84

NOTE: TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5) DEGREES FOR AIRFRAME TEMPERATURE TO STABILIZE.

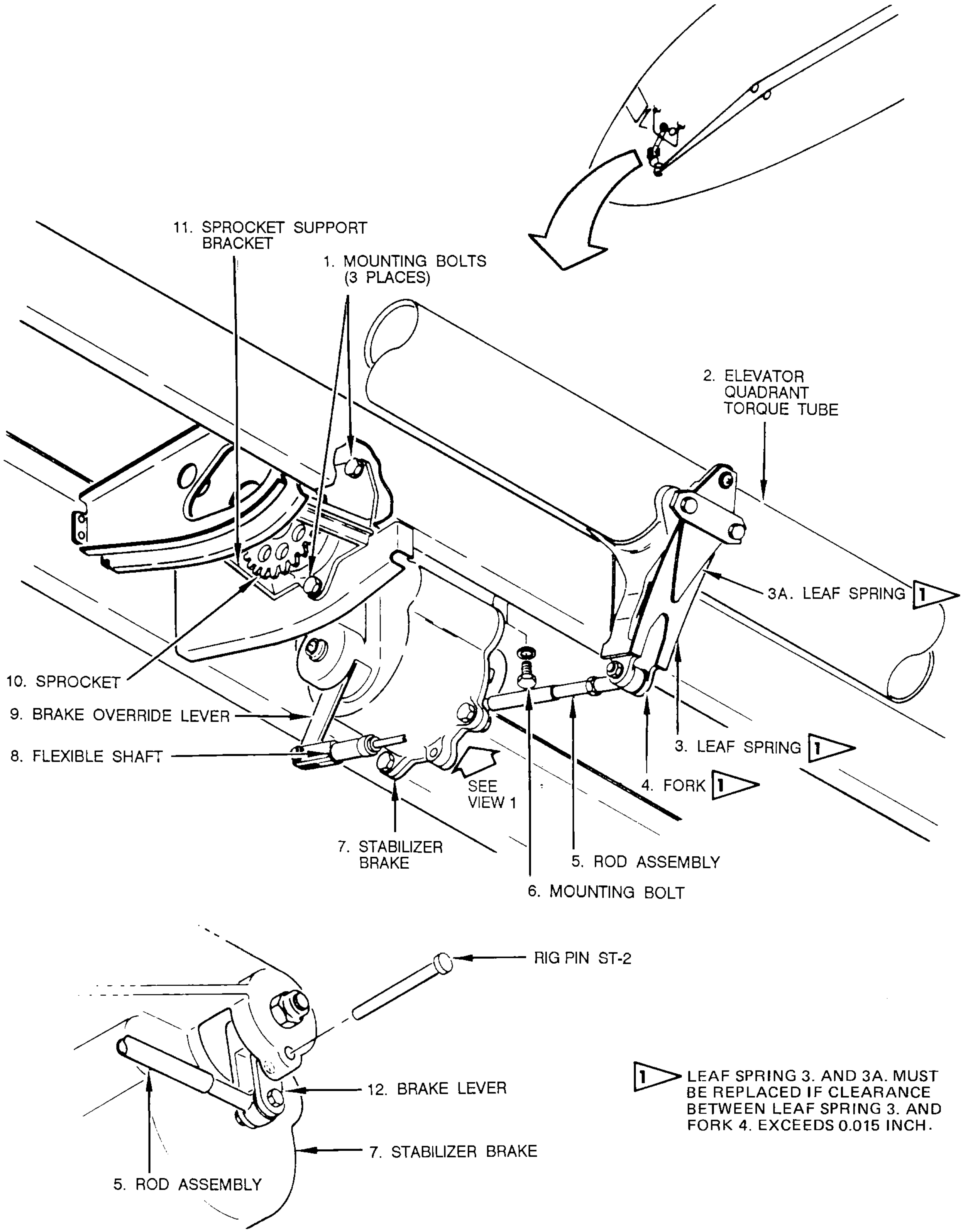
Stabilizer Cable Tension and Trim Jackscrew Setting
Figure 402

STABILIZER TRIM BRAKE - REMOVAL/INSTALLATION

1. Equipment and Material
   A. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
ST-2	-16	0.182-0.186	2.7 ±0.25	STABILIZER TRIM BRAKE ARM

   B. Corrosion Preventive Compound - MIL-C-16173, Grade 2 (Ref 20-30-21)
   C. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
2. Remove Stabilizer Trim Brake
   A. Remove lower nose compartment access door 1103.
   B. Disconnect rod assembly (5, Fig. 401) from fork (4) on elevator quadrant torque tube (2) by removing nut, washer, and bolt.
   C. Disconnect flexible shaft (8) from brake override lever (9) by removing cotter pin, nut, washers, and bolt.
   D. Remove three mounting bolts (1) attaching stabilizer brake (7) to sprocket support bracket (11).
   E. Remove mounting bolt (6) attaching stabilizer brake to support bracket, and pull brake assembly outboard to disengage splined shaft from sprocket support shaft.
   F. Disconnect rod assembly (5) from brake lever (12) on right side of brake.
3. Install Stabilizer Trim Brake
   A. Connect rod assembly (5, Fig. 401) to brake lever (12). Install one washer on each side of rod and one under nut. Tighten nut.
   B. For magnesium corrosion control, coat all faying surfaces of stabilizer brake (7) with corrosion preventive compound, MIL-C-16173.
   C. Engage stabilizer trim brake splined shaft with internal spline on sprocket support shaft such that dowel pin on left side of brake assembly is inserted through hole in web of mounting bracket and sprocket support bracket (11).



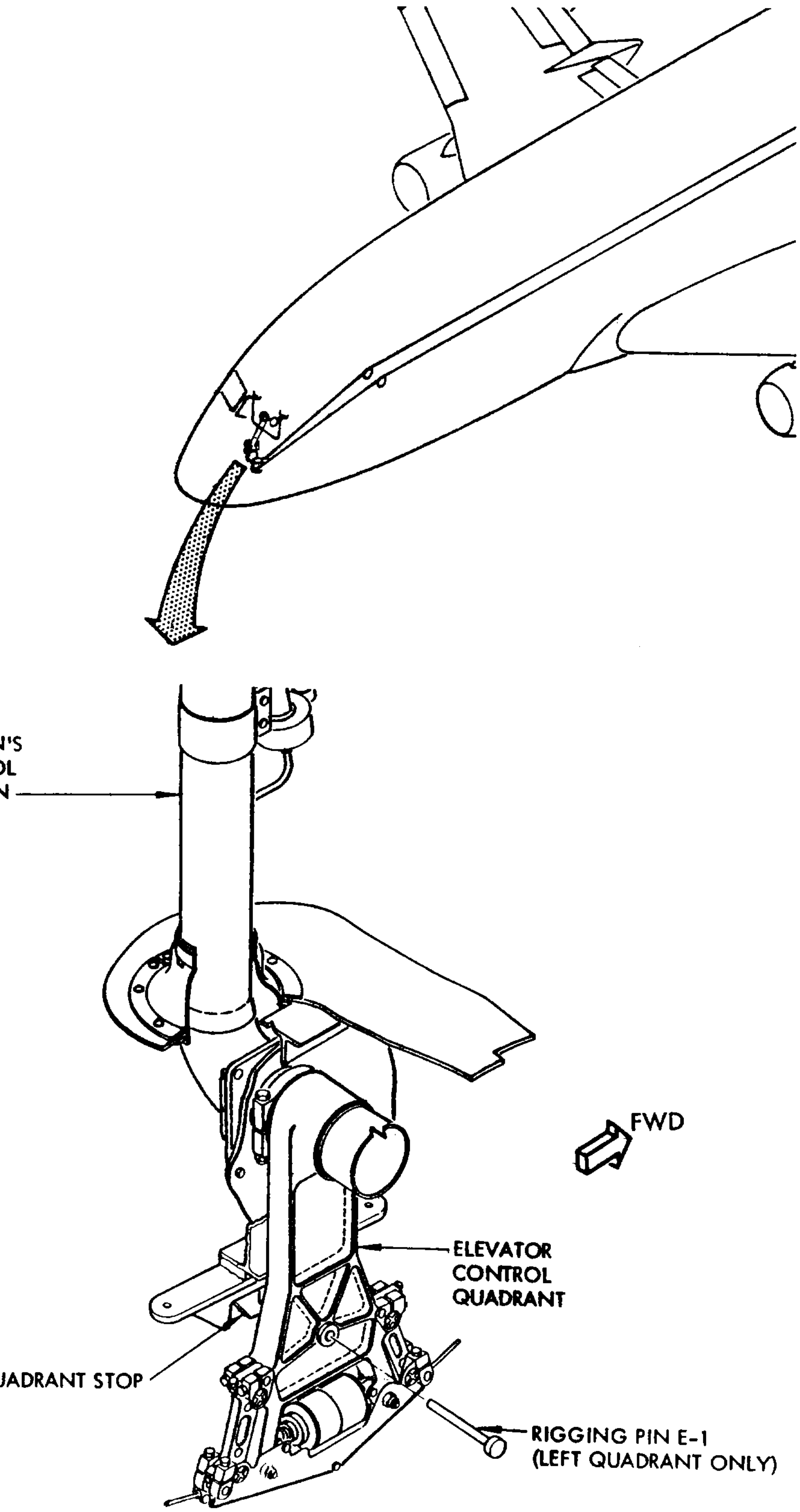
1 LEAF SPRING 3. AND 3A. MUST BE REPLACED IF CLEARANCE BETWEEN LEAF SPRING 3. AND FORK 4. EXCEEDS 0.015 INCH.

Stabilizer Trim Brake Assembly Installation
Figure 401

D. Coat mounting bolts (1) with corrosion preventive compound, MIL-C-11796, and install bolts.
E. Place washer on mounting bolt (6) and install bolt.
F. Install rigging pin E-1 through left forward elevator quadrant (Fig. 402).
G. Install rigging pin ST-2 through brake lever (12) on stabilizer brake (7) (Fig. 401).

<u>WARNING</u>: WITH RIGGING PIN ST-2 INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. A DEFORMED LEAF SPRING MAY RESULT IN UNWANTED ENGAGEMENT OF COLUMN ACTUATED STABILIZER TRIM BRAKE.

H. Adjust rod assembly (5, Fig. 401) to fit between fork (4) on elevator quadrant torque tube (2) and brake lever on stabilizer brake without binding rigging pins. Adjust rod so that thread engagement for each rod end is equal within 0.05 inch.
I. Connect rod assembly to fork using mounting screw, washer, and nut. Tighten nut.
J. Push stabilizer brake release handle on control stand down and brake override lever (9) full forward.
K. Adjust flexible shaft (8) to match brake override lever.
L. Attach flexible shaft (8) to brake override lever using mounting screw, washer, nut, and cotter pin. Tighten nut finger tight.
M. Remove rigging pins from elevator quadrant and brake lever.
N. Test stabilizer trim brake (Ref Stabilizer Trim Brake - Adjustment/Test).
O. Install lower nose compartment access door.



Forward Elevator Control Quadrant
Figure 402

STABILIZER TRIM BRAKE - ADJUSTMENT/TEST

1. Stabilizer Trim Brake Adjustment
   A. Equipment and Materials
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
E-1	-11	0.309-0.311	6.7 ±0.25	FWD CONTROL QUADRANT
ST-2	-16	0.182-0.186	2.7 ±0.25	STABILIZER TRIM BRAKE ARM

   B. Adjust Stabilizer Trim Brake
      (1) Remove lower nose compartment access door 1103.
      (2) Install rigging pin E-1 through left forward elevator control quadrant (Fig. 502).
      (3) Attempt to install rigging pin ST-2 through brake arm on stabilizer trim brake (7, Fig. 501). If rigging pin cannot be installed without binding, disconnect rod assembly (5) and adjust rod assembly as required to install rigging pin. Connect rod assembly to brake arm (12) with washer on each side of brake arm and under nut. Tighten nut.

      WARNING: WITH RIGGING PIN ST-2 INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. A DEFORMED LEAF SPRING MAY RESULT IN UNWANTED ENGAGEMENT OF COLUMN ACTUATED STABILIZER TRIM BRAKE.

      (4) Remove bolt attaching flexible shaft (8) to brake override lever (9).

(5) Push brake override lever full forward and push stabilizer brake release handle on control stand down.
(6) Adjust flexible shaft to match override lever. Attach shaft and lever together with mounting screw, washer, nut, and cotter pin.
(7) Remove rigging pins from brake arm and elevator quadrant, and close lower nose compartment access door 1103.
(8) Test stabilizer trim brake per par. 2.A.

2. Stabilizer Trim Brake Test

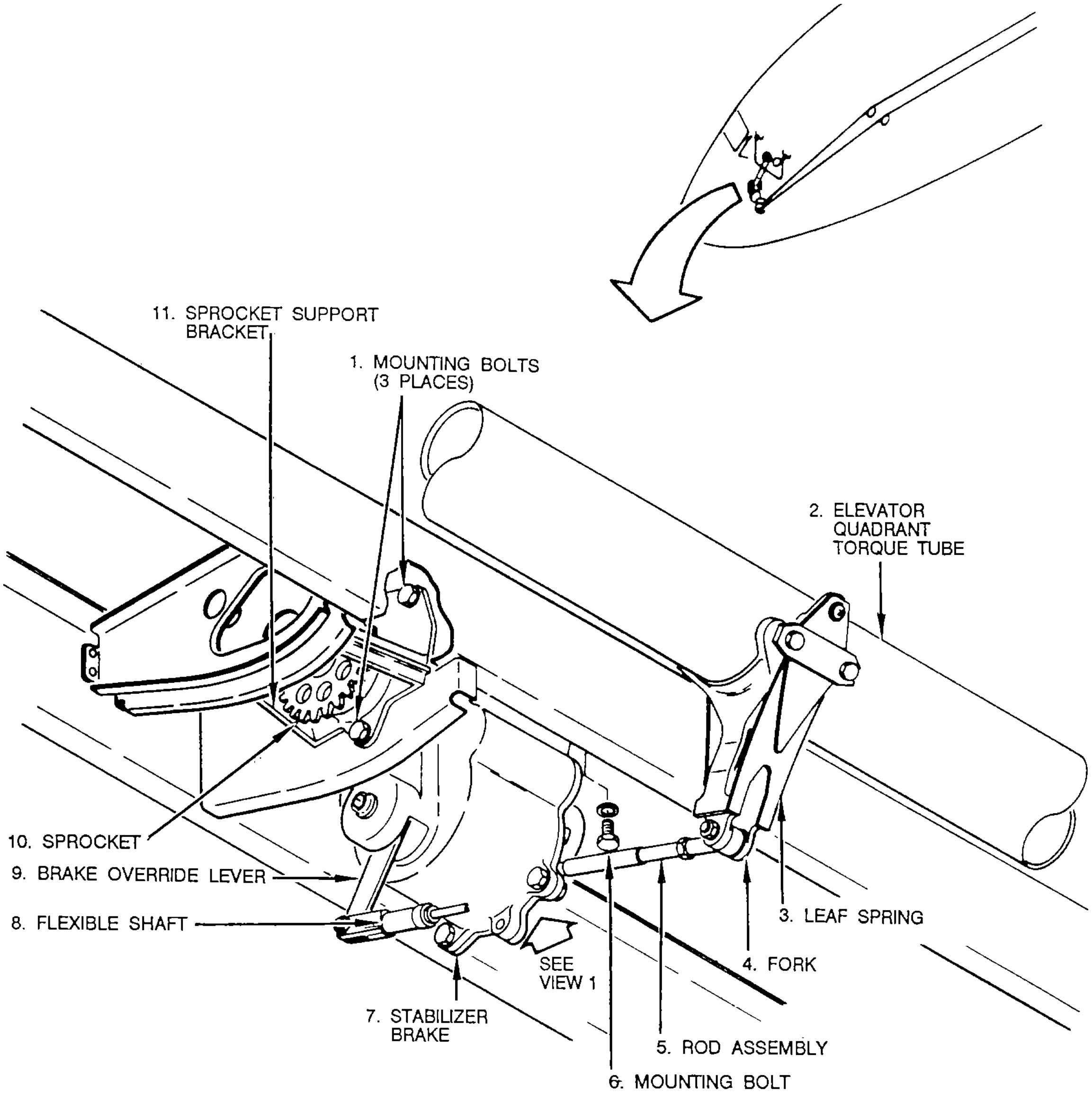
A. Test Stabilizer Trim Brake

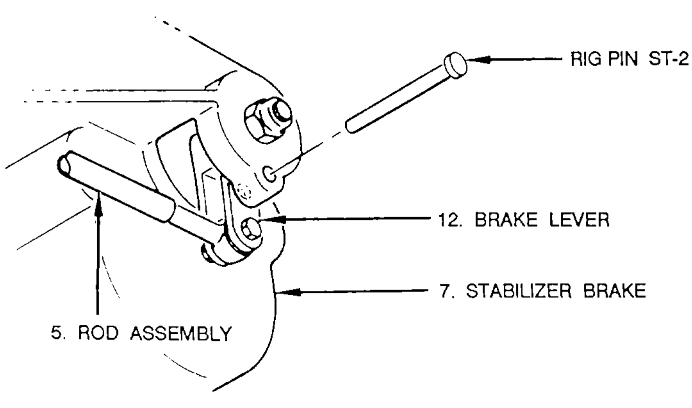
NOTE: If brake test is part of a general functional test of entire stabilizer trim system, accomplish functional test per 27-41-0 A/T.

(1) Check that rigging pin ST-2 is removed from brake arm on stabilizer trim brake.

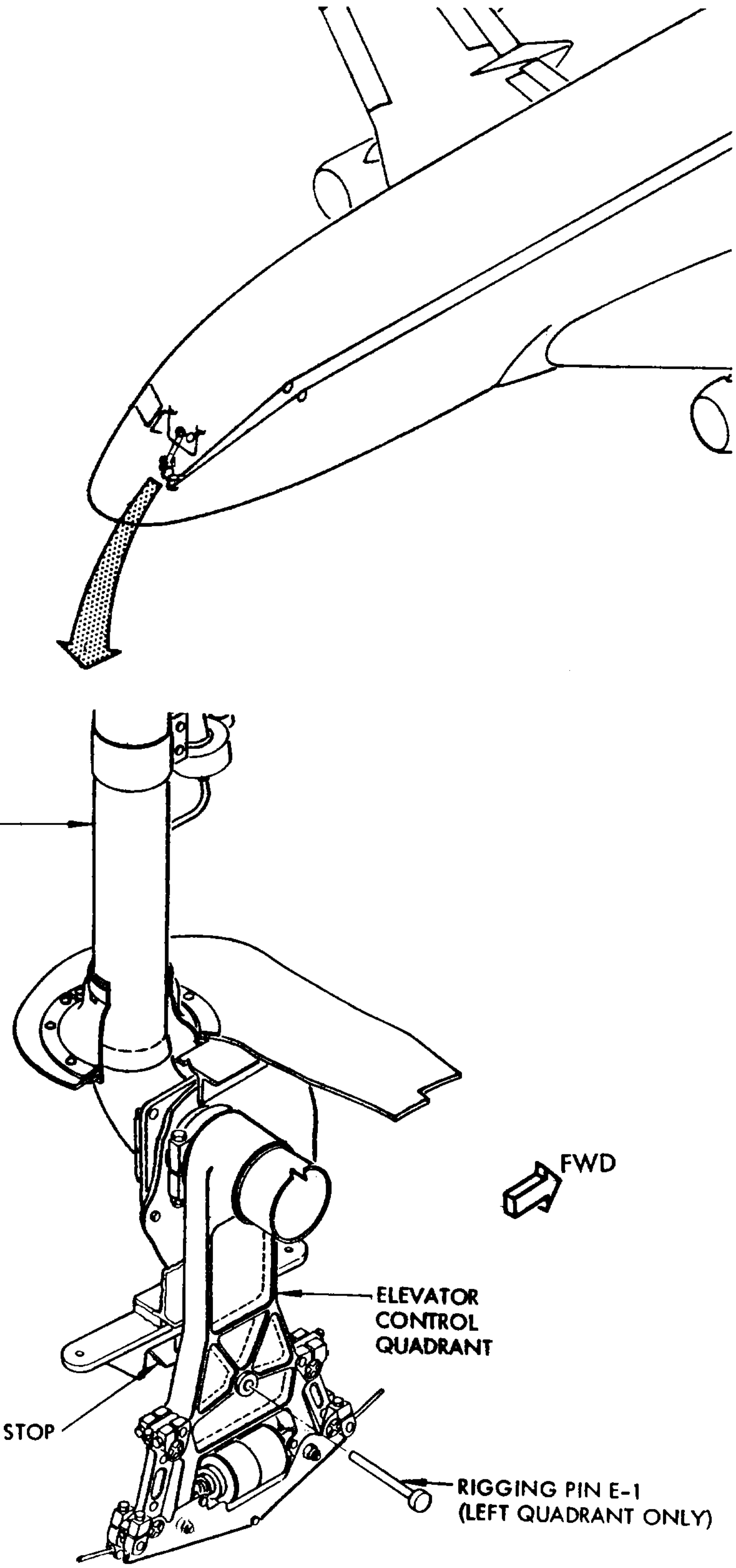
WARNING: DO NOT MOVE CONTROL COLUMN WITH RIGGING PIN ST-2 INSTALLED. DAMAGE MAY OCCUR TO BRAKE LEAF SPRINGS. A DEFORMED LEAF SPRING MAY RESULT IN UNWANTED ENGAGEMENT OF COLUMN ACTUATED STABILIZER TRIM BRAKE.

(2) Operate stabilizer trim wheel in AIRPLANE NOSE UP direction, and while rotating trim wheel, push control column forward until brake prevents rotation of trim wheel.
(3) With control column held in position preventing AIRPLANE NOSE UP trim, check that stabilizer trim wheel is operable in AIRPLANE NOSE DOWN direction.
(4) Return control column to neutral and check that stabilizer trim wheel is operable in both directions.
(5) Operate stabilizer trim wheel in AIRPLANE NOSE DOWN direction, and while rotating trim wheel pull control column aft until brake prevents rotation of trim wheel.
(6) With control column held in position preventing AIRPLANE NOSE DOWN TRIM, check that stabilizer trim wheel is operable in AIRPLANE NOSE UP direction.





Stabilizer Trim Brake Assembly Installation
Figure 501



Forward Elevator Control Quadrant
Figure 502

(7) Return control column to neutral and check that stabilizer trim wheel is operable in both directions.
(8) Pull stabilizer brake release handle and push control column full forward. Check that stabilizer trim wheel is operable in both directions.
(9) Pull stabilizer brake release handle and pull control column full aft. Check that stabilizer trim wheel is operable in both directions.

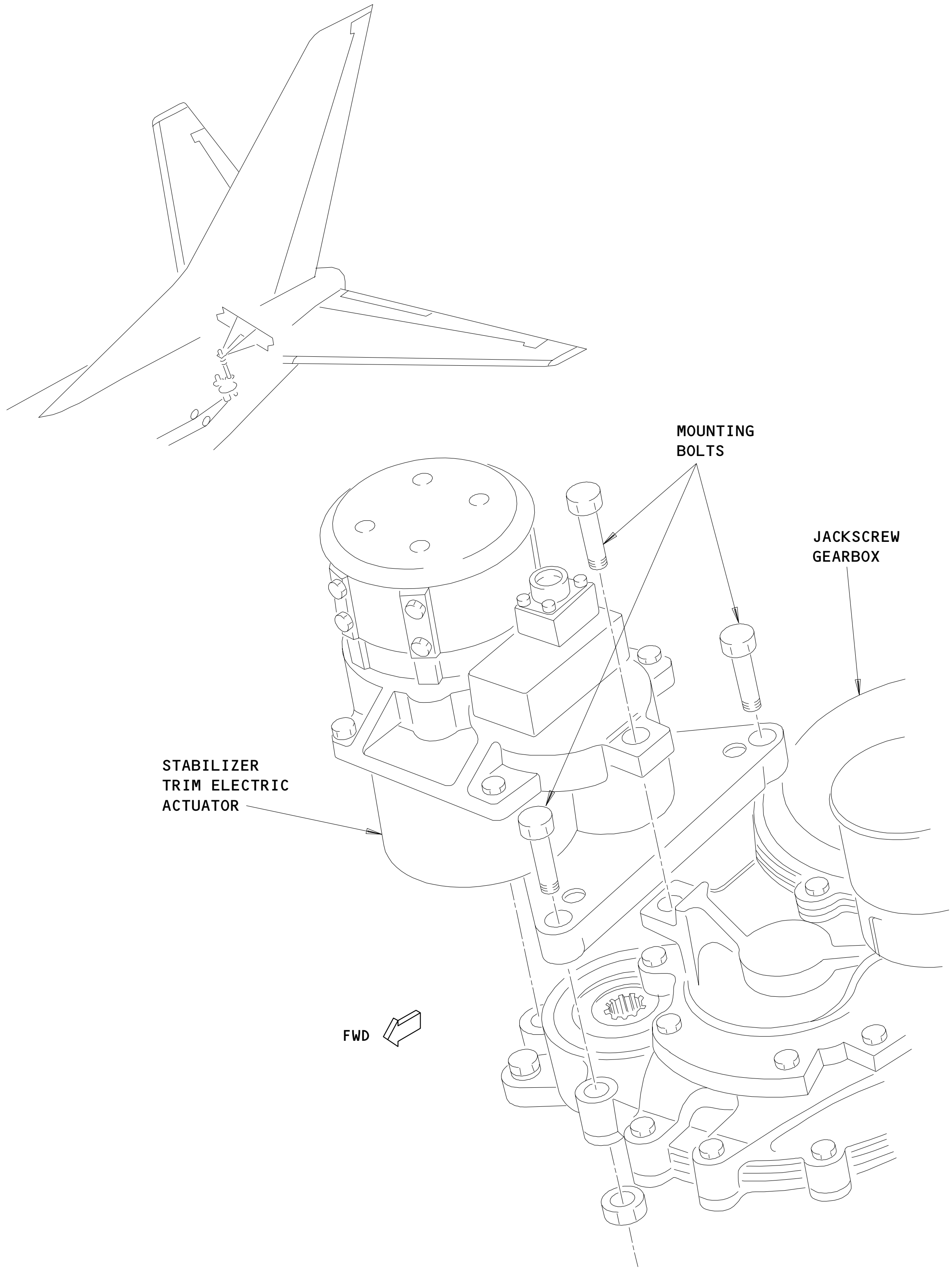
STABILIZER TRIM CONTROL CABLES - REMOVAL/INSTALLATION

1. General
   A. To remove a stabilizer trim control cable, it is necessary to position the stabilizer to either extreme end of travel to minimize the amount of cable on the jackscrew gearbox cable drum. Cable tension is released and the cable guards are removed for access to the cable terminal. The forward end of the cable at the forward drum is removed, the stabilizer is manually operated in the opposite direction, and the cable is pulled as it unwinds from the aft drum. Then the aft end of the cable is disconnected from aft drum and the cable removed. Refer to Chapter 20, Control Cables, for cable removal and installation. Refer to 27-09-111 for cable lengths and fittings.

      NOTE: Make note of cable left on drum before disconnecting cable ends. (Number of turns and/or fractions of turns.) Approximately the same amount of cable should be installed on drum when replacing cable. A 50-pound force may be applied to the stabilizer trim control wheel to attach STB cable eye to front drum.

STABILIZER TRIM ELECTRIC ACTUATOR - REMOVAL/INSTALLATION

1. Remove Stabilizer Trim Electric Actuator
   A. Open stabilizer trim access door 3701.
   B. Open stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.
   C. Remove electrical connector from actuator (Fig. 401).
   D. Remove three mounting bolts attaching actuator to jackscrew gearbox.
   E. Remove actuator.
   F. Cover mounting pad to prevent foreign matter from entering jackscrew gearbox.
2. Install Stabilizer Trim Electric Actuator
   A. Check that stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6 are open.
   B. Remove cover from mounting pad.
   C. Ensure that mating surfaces of actuator and jackscrew gearbox are clean and free of foreign material.
   D. Clean mating surfaces at forward attach bolt to provide electrical bonding.
   E. Engage actuator splined shaft with internal spline of jackscrew gearbox and position the electric actuator for fastening (Fig. 401).
   F. Install actuator mounting bolts, washers, and nuts.
   G. Install electric connector.
   H. Close stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.
   I. Test actuator (Ref Stabilizer Trim Actuator - Adjustment/Test).
   J. Close access door.



Electric Stabilizer Trim Actuator Installation
Figure 401

STABILIZER TRIM ELECTRIC ACTUATOR - ADJUSTMENT/TEST

1. Stabilizer Trim Electric Actuator Test
   A. Test Stabilizer Trim Electric Actuator
      (1) Provide electrical power.
      (2) Check that stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6 are closed.
      (3) Position left stabilizer trim switch momentarily to AIRPLANE NOSE DOWN and check that stabilizer leading edge moves up.
      (4) Position left stabilizer trim switch momentarily to AIRPLANE NOSE UP and check that stabilizer leading edge moves down.
      (5) Repeat (4) and (5) with right stabilizer trim switch to ensure correct direction of operation.
      (6) Operate stabilizer through one complete cycle from stabilizer NOSE UP to stabilizer NOSE DOWN.

      CAUTION: DO NOT EXCEED ELECTRIC ACTUATOR DUTY CYCLE OF 2 MINUTES ON AND 13 MINUTES OFF.

      (7) Check that time required to operate system through full travel in either direction is 13 to 19 seconds. Check that operation is smooth and free from chatter.
      (8) Perform several consecutive actuations of approximately 3-second duration in stabilizer leading edge up and leading edge down. Check that operation is smooth and free from chatter.
      (9) Actuate in stabilizer NOSE UP direction until system comes up to full trim speed, then return trim switch to OFF position for approximately 0.2 seconds and actuate in opposite direction.

      NOTE: Initial surges or chatter may be experienced due to cable stretch and mass of front end system.

      (10) Check that response in reverse direction is immediate.
      (11) Repeat steps (10) and (11) for stabilizer NOSE DOWN direction.
      (12) Remove electrical power, if no longer required.

STABILIZER BALL NUT AND JACKSCREW GEARBOX - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Stabilizer Jackscrew Handling Equipment - F80014-16 (Preferred) 1r -1 (Optional)
   B. Hoist capable of handling 150 pounds
   C. Horizontal Stabilizer Lock Assembly - F80027-13
   D. Adapter - 16/32-inch Spline, 3/4-inch Male Hex - F71252, or Pinion Gear Wrench Assembly - F71267
   E. Spool or reel with capacity for 100 feet 1/8-inch cable
   F. Grease - BMS 3-33 (Preferred)
   G. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   H. Primer - BMS 10-11, Type I (Ref 20-30-41)
   I. Oil - MIL-L-7870 (Ref 20-30-21)
   J. Milliohmmeter - 0 to 0.1-ohm range
   K. Stabilizer Trim Lock - F71336-501
   L. Actuator Trammel Bar - F80055-1
2. Prepare to Remove Gearbox
   A. Position stabilizer leading edge to maximum down position.
   B. On circuit breaker panel P6, open following circuit breakers:
      (1) Autopilot stabilizer trim servo
      (2) Stabilizer trim actuator
      (3) Stabilizer trim control
   C. Open stabilizer trim access door 3701 and lower nose compartment access door 1103 (Ref Chapter 12).
3. Remove Stabilizer Trim Jackscrew Gearbox
   A. Adjust forward mechanism aft support link adjusting nuts (Detail A, Fig. 402) to relieve tension of chain (14).

      NOTE: Slack in chain is necessary to prevent excessive loads on chain when cable tension is relieved.

   B. Release tension in cables by loosening turnbuckle (11) about 25 turns.
   C. Remove electric actuator (18, Fig. 401) and autopilot actuator (9) from jackscrew gearbox (8).
      (1) Disconnect electric connector (11) at actuator.
      (2) Remove bolt (12), two places, that secures wire bundle clamp support clip to jackscrew gearbox cover.
      (3) Remove three actuator mounting bolts (15) and remove actuator from jackscrew gearbox.
   D. Remove cable guards from cable drum (24).
      (1) Remove four forward cable guards (26) and support plate (25) by removing four bolts securing cable guards between support plate (25) and gearbox housing, and nut securing bottom of aft cable guard (23) to support plate.
      (2) Remove aft cable guard (23) by removing three bolts.

E. Disconnect STB cable (17) from cable drum.

NOTE: The spline adapter may be needed to get additional slack to remove the initial cable coil.

F. At the stab trim gearbox, pull the STA and STB cables aft to remove slack and install cable clamps at the pulley just aft of the pressure bulkhead.
G. Insert adapter into jackscrew gearbox internal spline. Actuate jackscrew to full stabilizer leading edge up position. As stabilizer is moved, pull STB cable into tail compartment and wind onto spool or reel keeping the cable coils stacked in the same order as they were when on the drum.
H. With ball nut and jackscrew upper stops in contact, note and record number of turns of STA cable (16) on drum. Tag cable terminal with this information. Disconnect cable from drum, and secure so the coil does not unwind.
I. Install lower horizontal stabilizer lock. Actuate jackscrew in stabilizer leading edge down direction until stabilizer truss contacts lock. Install upper horizontal stabilizer lock. Tag stabilizer trim control system wheel to prevent further system operation.

NOTE: Before installing the lower and upper horizontal stabilizer locks, the stabilizer may have to be moved as close to neutral (3 units of trim), to correctly position the locks.

J. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Figure 405).
   (1) Rotate trim wheel to place handle at top of wheel.
   (2) Adjust height of trim lock to position trim wheel handle securely in the bottom of the yoke.
   (3) Insert pin through yoke and install safety pin.

NOTE: If nutplates for locks are occupied by wire bundle clamps, remove wire bundle clamps to allow installation of locks.

K. Connect hoist to jackscrew gearbox.
   (1) Install hoist adapter on sleeve (7) at base of jackscrew (2).
   (2) Install hoisting bar between frames at top of compartment above access door.
   (3) Support hoist on hoisting bar and connect to hoist adapter.
L. If installed, remove lubricator reservoir (6) from ball nut by removing two reservoir retaining screws (19).
M. Disconnect bonding jumper (10) from jackscrew gearbox. Retain bonding jumper bolt with jackscrew gearbox.
N. Remove safety straps (14) at lower gimbal.
O. Remove two safety bolts (4) from jackscrew fitting (3) on stabilizer truss.

P. Disconnect jackscrew from stabilizer.

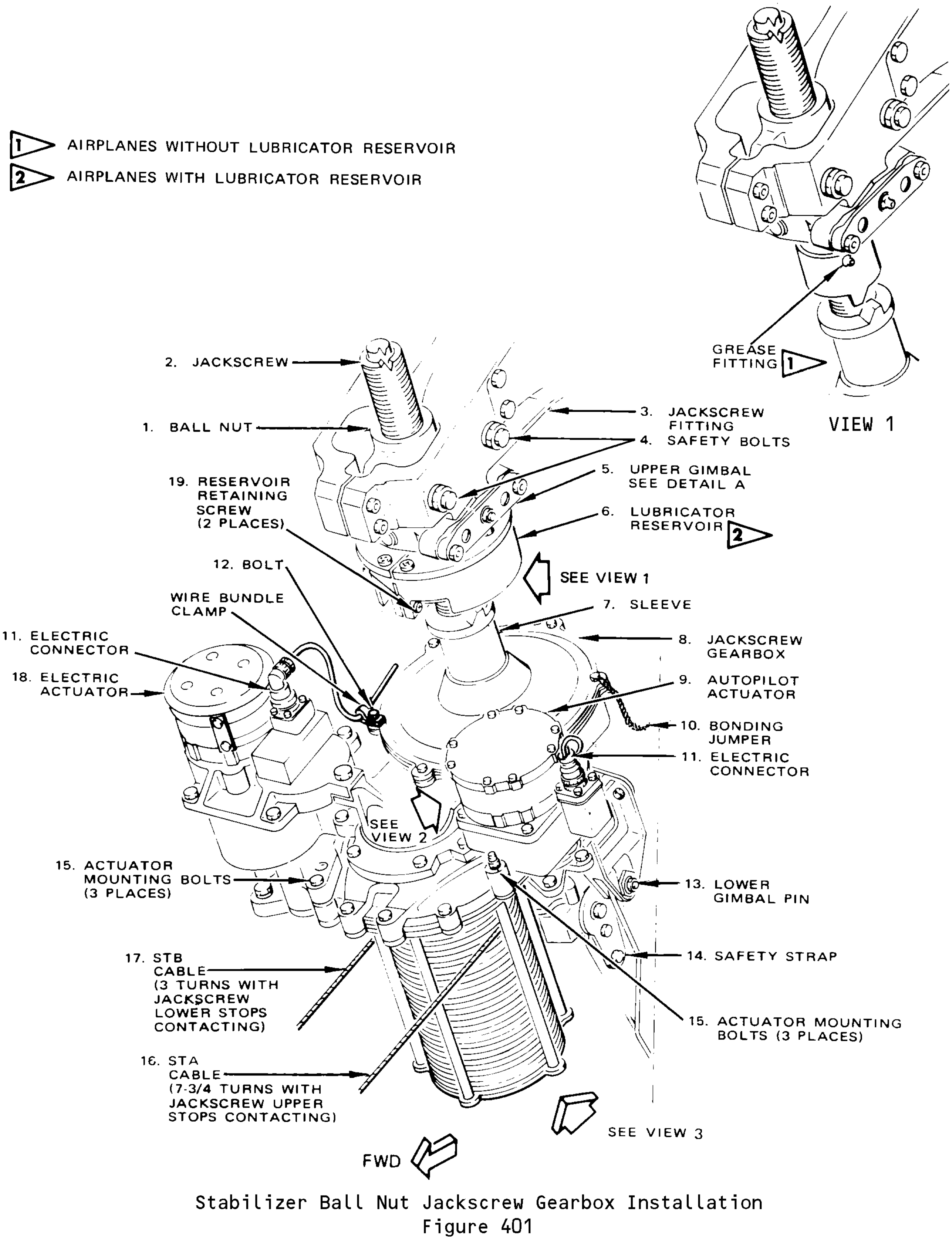
<u>CAUTION</u>: STABILIZER IS BALANCED SO THAT 230-POUND FORCE IS REQUIRED TO RESTRAIN UPWARD MOTION OF LEADING EDGE. ENSURE THAT LOCK IS INSTALLED.

Q. Remove four bolts and pull two upper gimbal pins (20) from upper gimbal (5).
R. Move ball nut (1) downward to clear jackscrew fitting by rotating jackscrew.
S. Install two upper gimbal pins (20) and secure with four bolts.
T. Remove cotter pin, nut and washer from each lower gimbal pin (13) and remove the two pins.

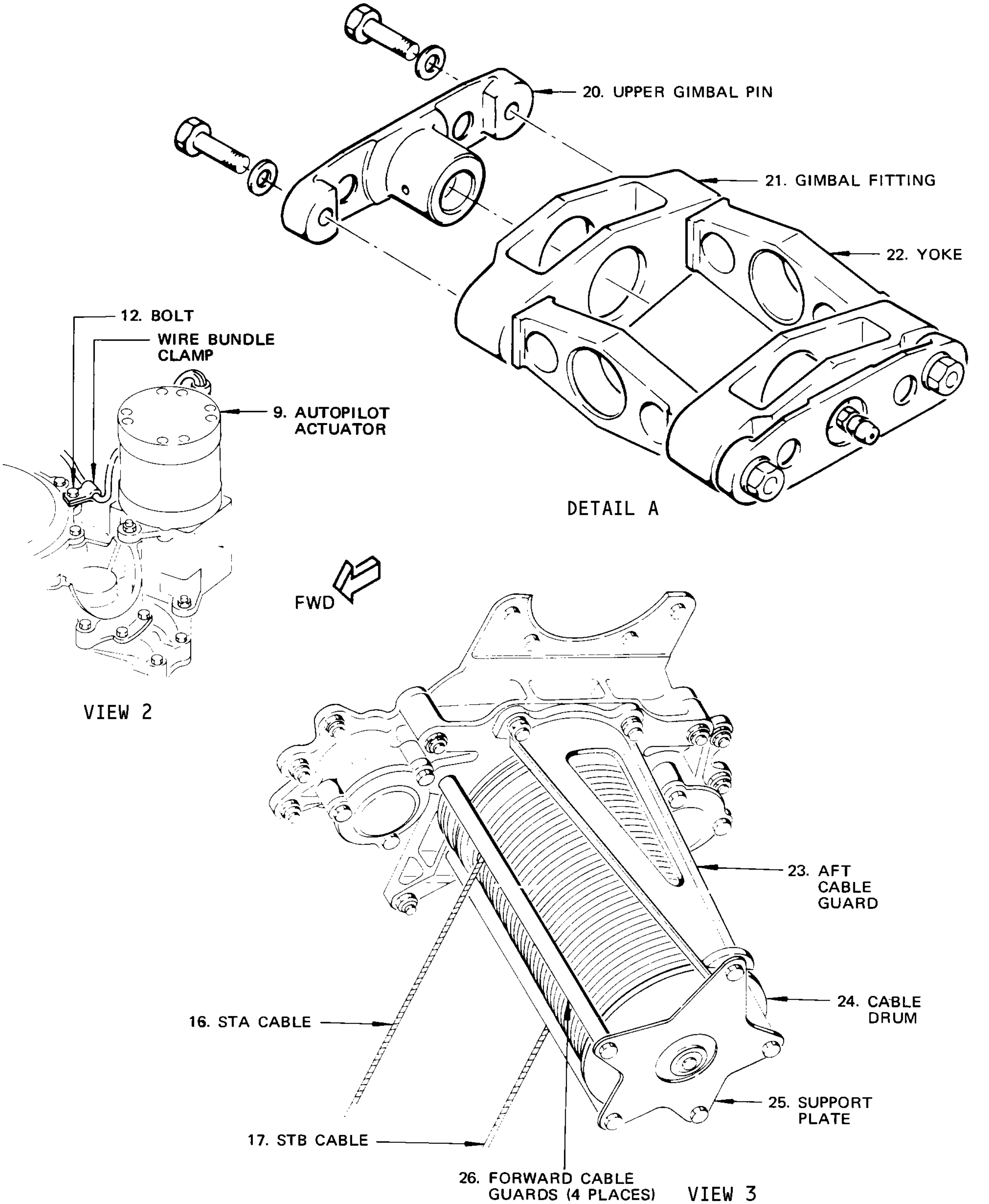
<u>CAUTION</u>: SUPPORT JACKSCREW VERTICALLY WHILE REMOVING PINS.

U. Lower jackscrew to clear fitting on stabilizer truss and lower jackscrew with gearbox and ball nut from airplane.
V. Remove hoist adapter from jackscrew gearbox.
W. Remove spline adapter from jackscrew gearbox.
X. Install cable guards (23 and 26) and support plate (25) on jackscrew gearbox.

4. <u>Prepare Stabilizer Jackscrew for Installation</u>
   A. Check that autopilot stabilizer trim servo, stabilizer trim actuator, and stabilizer trim control circuit breakers on panel P6 are open.
   B. Remove electric actuator (18, figure 401) and autopilot actuator (9), if installed.
      (1) Remove three actuator mounting bolts and lift actuator to disengage splines from gearbox.
   C. Install hoist adapter on sleeve (7) at base of jackscrew.
   D. Remove cable guards (23 and 26) from cable drum (24).
      (1) Remove upper and lower cable guard bolts, nuts and washers.
      (2) Remove support plate (25) and cable guards.
   E. Check applicable parts for allowable wear tolerances. Refer to Stabilizer Ball Nut and Jackscrew Gearbox - Inspection/Check.
5. <u>Install Stabilizer Trim Jackscrew Gearbox</u>
   A. Hoist jackscrew with ball nut and gearbox (8, Fig. 401) into airplane. Insert jackscrew through jackscrew fitting on stabilizer truss.
   B. Align jackscrew gearbox with lower gimbal.
   C. Install lower gimbal pins (13).
      (1) Install pin with grease fitting outboard.
      (2) Secure pin with washer and nut.
      (3) Install cotter pin.
   D. Install safety straps (14, two places).
      (1) Position strap to engage pin on jackscrew gearbox.
      (2) Install each strap with two bolts with head outboard to secure straps.
      (3) Secure each bolt with washer and locknut.
   E. Connect jackscrew to stabilizer.
      (1) Remove four bolts and pull two upper gimbal pins (20) from upper gimbal (5).



Stabilizer Ball Nut Jackscrew Gearbox Installation
Figure 401



Stabilizer Ball Nut and Jackscrew Gearbox Installation
Figure 402

(2) Disassemble gimbal fittings (21) and yokes (22) from ball nut.
(3) Using grease lubricate yoke bushings and faying surfaces between yoke and gimbal fittings.
(4) Install yokes on ball nut and engage gimbal fittings on yokes.
(5) Rotate jackscrew to move ball nut upward to engage gimbal fittings (21) with jackscrew fitting (3) on stabilizer truss.
(6) Install two upper gimbal pins (20) to connect jackscrew to stabilizer.
(7) Secure pins to gimbal fittings (21) by installing four bolts with washers.
(8) Lockwire adjacent boltheads on each upper gimbal pin together.

F. Install two safety bolts (4) in jackscrew fitting (3) on stabilizer truss.
(1) Brush or swab all areas of safety bolthole with primer.

WARNING: PRIMER IS TOXIC AND FLAMMABLE. USE ONLY IN WELL-VENTILATED AREA. DO NOT GET IN EYES OR ON SKIN.

(2) Install safety bolt washer under bolthead. Position bolthead to right.
(3) Secure bolt with washer and nut.
(4) Tighten nut finger-tight, then back off nut to nearest cotter pin hole.
(5) Install new cotter pin.

G. Install bonding jumper (10).
(1) Remove upper left aft bolt on jackscrew gearbox (8).
(2) Clean area around bolt to provide electrical bonding.
(3) Install bolt with bonding jumper under head and securing with washer and locknut.
(4) Use the milliohmmeter to make sure that the maximum electrical resistance of the bonding jumper connection is 0.010 ohm.

H. Install jackscrew lubricator reservoirs (6) if applicable. (See Fig. 401 for airplane effectivity.)
(1) Remove covers from lubricator reservoirs and fill with oil. Allow packings to become thoroughly saturated.
(2) Replace reservoir covers. Install center screws on each cover with head down. Secure screws with locknuts.
(3) Wipe all jackscrew threads with a clean dry rag to remove foreign material.
(4) Saturate a second clean dry rag with oil and coat all jackscrew threads.
(5) Position lubricator reservoirs around lower portion of ball nut such that wicks fit into holes in ball nut. Align wick with centerline and pitch of jackscrew threads. Ensure that wick contacts jackscrew threads.
(6) Insert lubricator reservoir retaining screws (19) and secure.

NOTE: Lubricator reservoirs will not fit flush, gap between reservoirs permits drainage.

I. Remove hoist adapter from jackscrew and remove hoisting bar and hoist from airplane.
J. Remove upper and lower stabilizer locks. If wire bundle clamps were removed to allow use of locks, secure wire bundles.
K. Remove stabilizer trim lock (Figure 405).
L. Lubricate upper and lower gimbals at grease fittings.
M. Insert adapter and operate jackscrew to move stabilizer to full leading edge up position.
N. Apply a light coat of grease to unused jackscrew threads between ball nut and jackscrew upstop.
O. Connect STA cable (16) to cable drum (24).
   (1) Wrap cable onto drum approximately 7-3/4 turns.

      NOTE: Check number of turns STA cable had on original cable drum, information is on tag attached to cable.

   (2) Insert cable terminal into lower terminal slot of drum.
   (3) Install lockwire to secure terminal. Insert ends of lockwire into terminal slot.
P. Remove STA cable clamp.
Q. Using adapter operate jackscrew to move stabilizer to full leading edge down position. Guide STA cable one coil at a time, onto drum during operation. Maintain tension on STB cable as it unwinds from spool or reel.
R. Apply a light coat of grease to unused jackscrew threads between ball nut and jackscrew downstop.
S. Remove cable clamp STB and connect STB cable (17) to drum.

   NOTE: A 50-pound load may be applied to stabilizer trim control wheel to stretch STA cable to facilitate attachment of STB cable.

   (1) Wrap cable three turns on drum. This will fill drum so that only the 1/2 groove between STA and STB cables is empty.
   (2) Insert cable terminal into upper terminal slot of drum.
   (3) Install lockwire to secure terminal. Insert ends of lockwire into terminal slot.
T. Install cable guards.
   (1) Secure aft cable guard (23) to jackscrew gearbox with two bolts, nuts, and washers.
   (2) Locate four forward cable guards (26) on support plate (25) and secure to jackscrew gearbox with bolts, nuts, and washers.
   (3) Attach aft cable guard to support plate with bolt, nut, and washer.

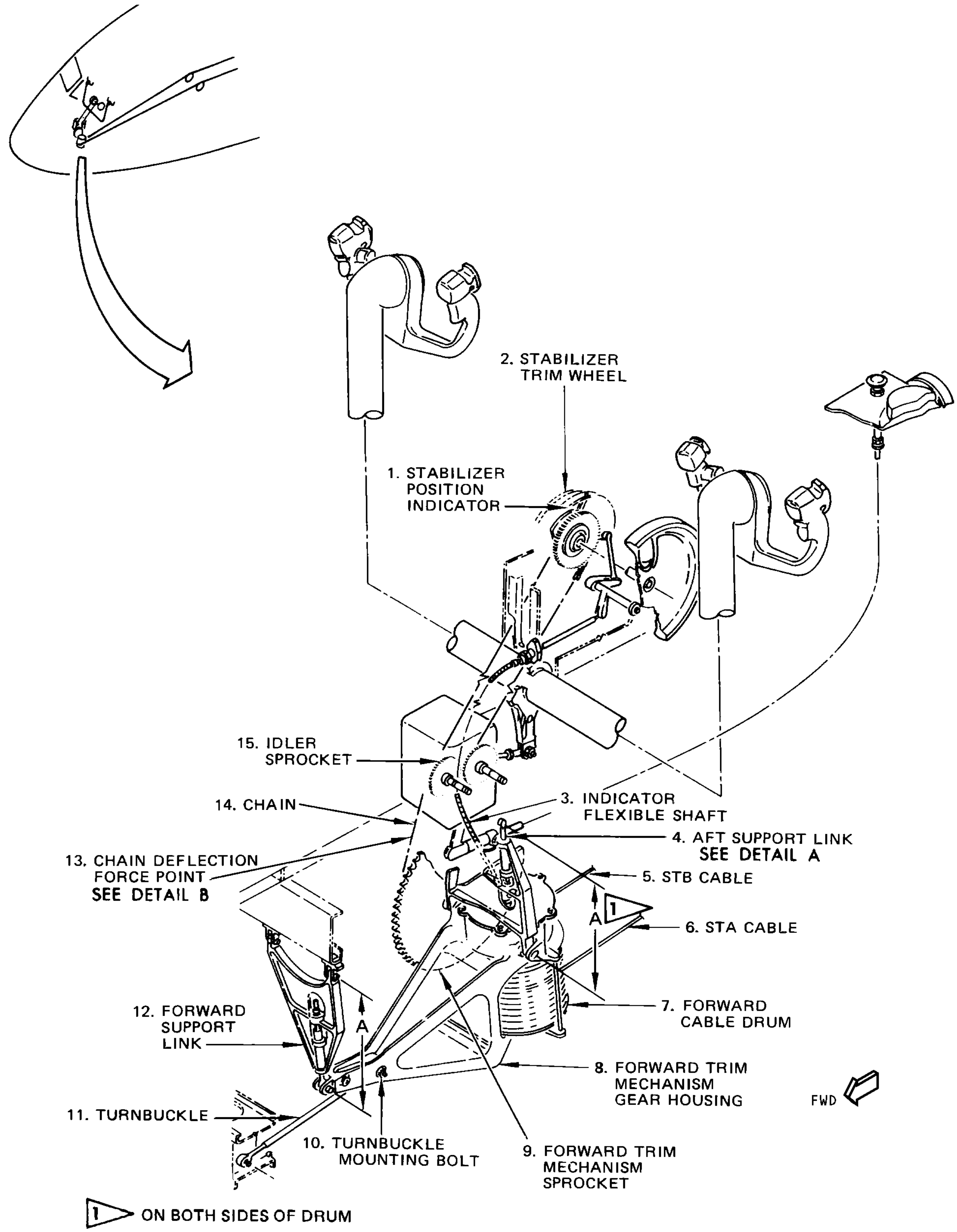
      NOTE: Make sure the bearing assembly of the support plate is on the same side as the cable drum.

   (4) Carefully tighten the central retaining nut by hand and secure with cotter pin.

U. Adjust stabilizer trim cables STA and STB.
   (1) Adjust turnbuckle (11, Fig. 402) on forward mechanism to remove slack from cables.
V. Adjust stabilizer trim chain.
   (1) Operate manual control wheel until STA and STB cables have approximately the same number of turns on forward cable drum (7).
   (2) Adjust turnbuckle to tension cables per tension chart in Fig. 402.
   (3) Adjust forward mechanism aft support links (4) to tension chain (14) so that chain will deflect as follows:
      (a) Apply 5-pound force perpendicular to chain at chain deflection force point (13) (4.5 ±1.0 inches along chain from tangency of chain and forward trim mechanism sprocket (9)). Check that deflection of chain is 0.25 ±0.07 inch.
   (4) Check that dimension A of support link assemblies are equal to within 0.06 inch of each other (measure at three places) to ensure proper alignment of forward mechanism.

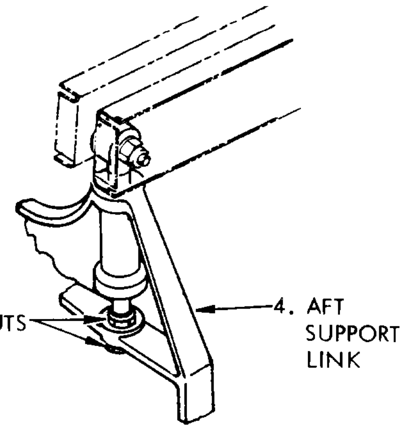
      NOTE: Measurement is taken from center of aft support bolts and threaded stud on aft support link assembly (right and left side) and center to center of forward support link mounting bolts and bolt through lower end of eyebolt.

W. Manually operate stabilizer through full travel in both directions. Center cables and check cable tension. If cable tension requires adjustment, remove tension from chain and repeat steps T and U.
X. Operate stabilizer until B dimension is 41.57 ±0.05 inch (Fig. 403).
Y. Check that stabilizer position indicator (1, Fig. 402) is at 3 ±1/4 units trim. If not:
   (1) Disconnect indicator flexible shaft (3) from forward mechanism.
   (2) Check flexible shaft is lubricated over entire length. If necessary to remove shaft from conduit for lubrication, remove as follows:
      (a) Unscrew cable housing ferrule nuts from position indicator shaft couplings on each end of housing.
      (b) Remove cable by pressing out pin holding splined end to flexible shaft on one end and pull cable out from the opposite end.
      (c) Apply grease to entire length of cable.
      (d) Install cable into housing and press in pin to hold splined end in place.
      (e) Tighten cable housing ferrule nuts onto position indicator shaft couplings. Make sure that splines are engaged at both ends before tightening.
   (3) Rotate flexible driveshaft until stabilizer position indicator is at 3 ±1/4 units trim.

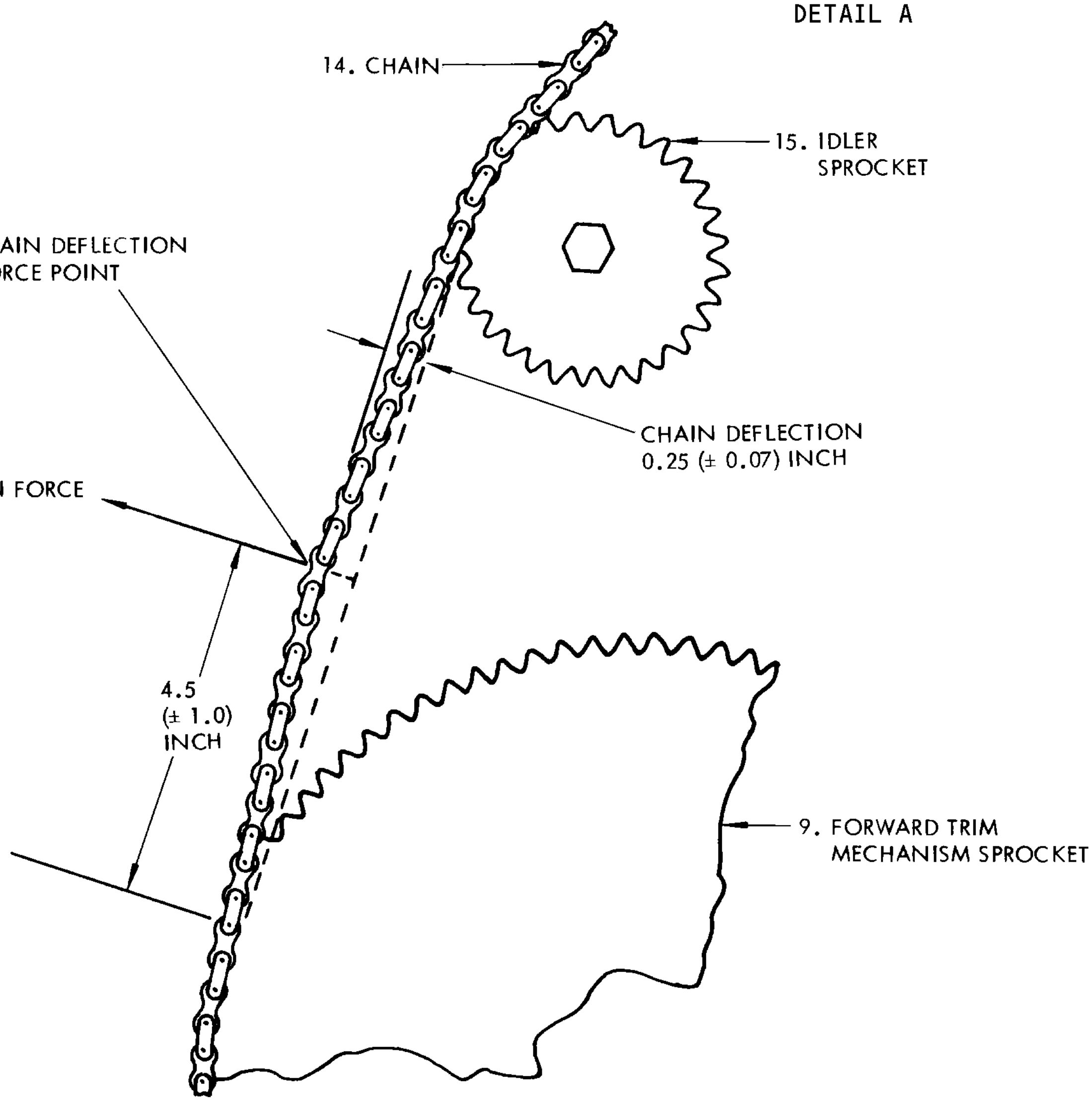


Forward Mechanism Adjustment
Figure 403 (Sheet 1)

TEMP °F	CABLE RIGGING LOAD (+20/-10) LB. STA AND STB CABLES
110	148
90	139
70	130
50	122
30	114
10	105
-10	97
-30	89
-40	84



DETAIL A



DETAIL B

Forward Mechanism Adjustment
Figure 403 (Sheet 2)

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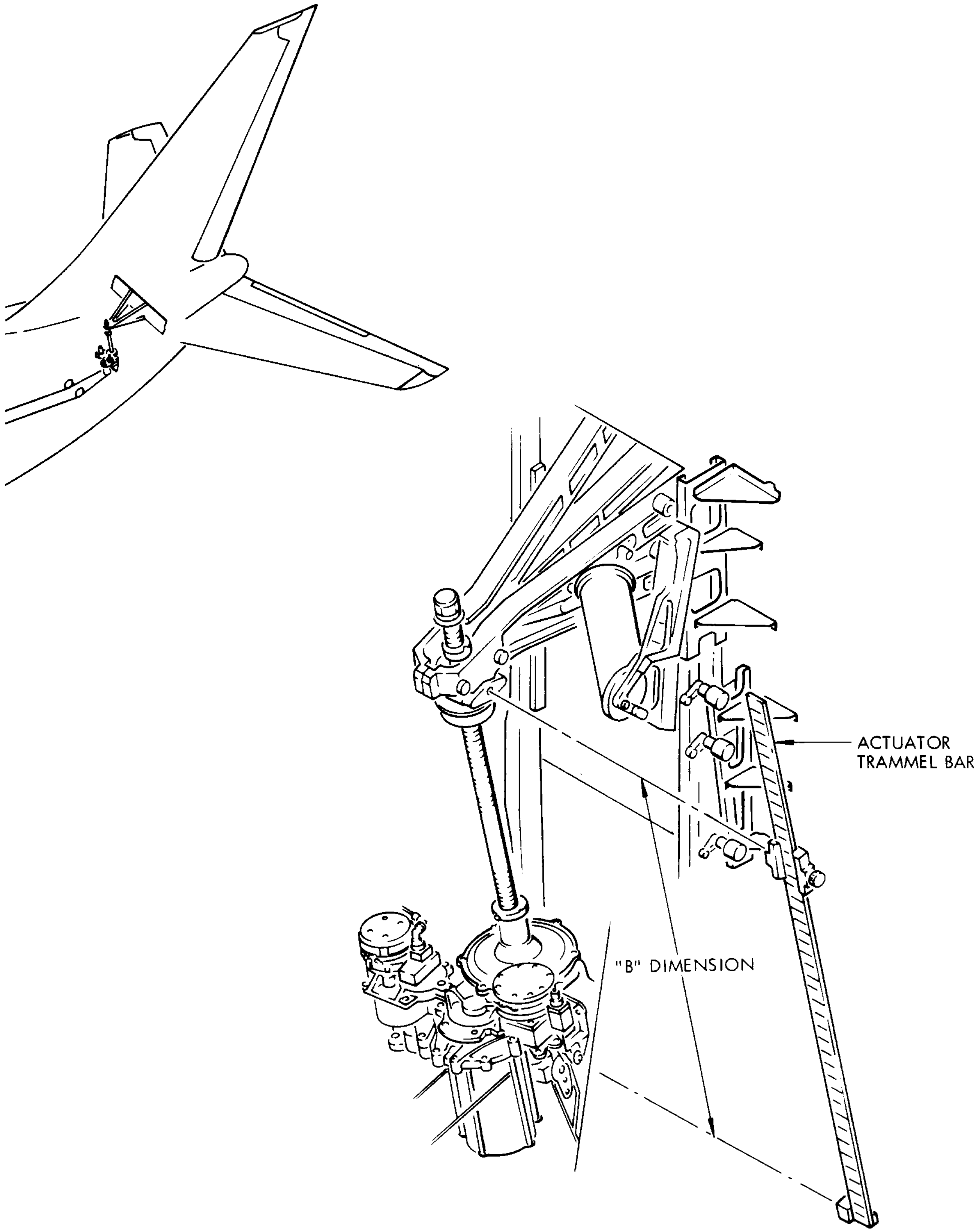
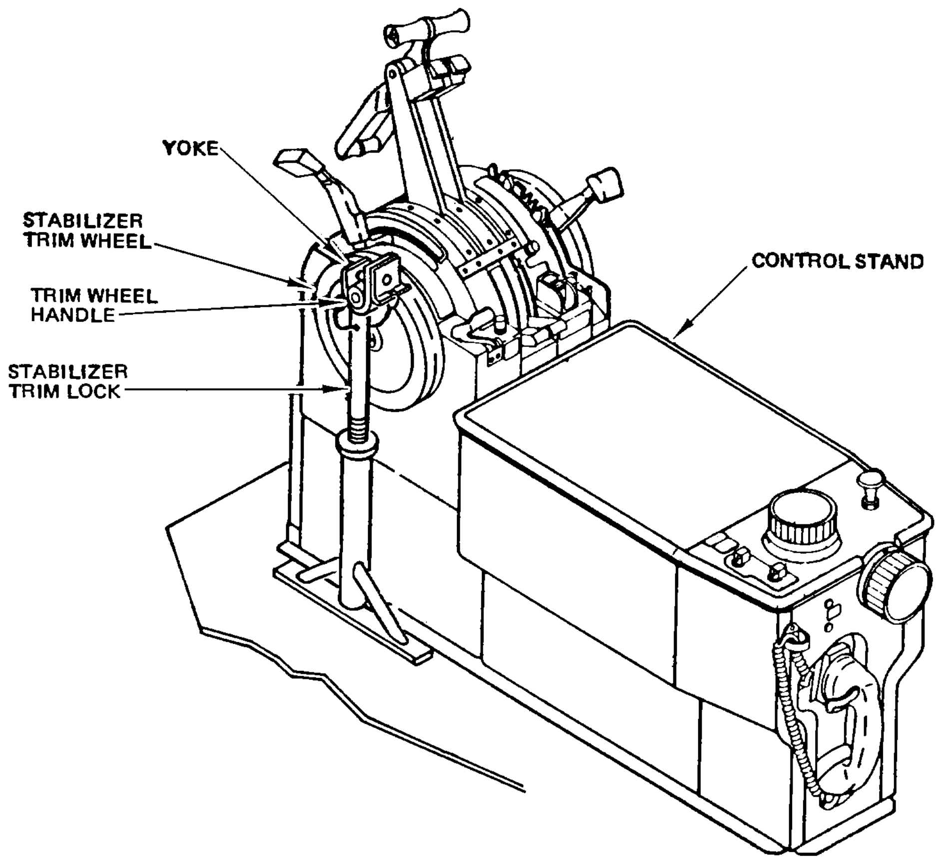


Stabilizer Trim Jackscrew Setting
Figure 404



Stabilizer Trim Lock Installation
Figure 405

(4) Connect indicator flexible shaft to forward mechanism. Check for positive engagement of flexible shaft with spline in forward mechanism before tightening nut.

Z. Remove adapter from gearbox.

AA. Install electric actuator (18) and autopilot actuator (9) on jackscrew gearbox (Fig. 401).

(1) Ensure that mating surfaces of actuator and jackscrew gearbox are clean and free of foreign material.

(2) Clean mating surfaces at forward attach bolt to provide electrical bonding.

(3) Engage actuator splined shaft with internal spline of jackscrew gearbox and position the actuator for fastening.

(4) Install actuator mounting bolts (15) and secure with washers and locknuts. Install forward mounting bolt for autopilot actuator with head down.

(5) Install clamp to bolt clip at bolt (12) on gearbox cover.

(6) Install electric connector (11).

(7) Check that electrical resistance between actuator housing and airplane structure is 0.0025 ohm maximum.

AB. Test stabilizer trim system.

(1) Check that control column is in neutral and is unrestrained.

(2) Test stabilizer manual travel limits.

(a) Rotate captain's stabilizer trim wheel counterclockwise until stabilizer trim jackscrew up stop is just contacted.

(b) Check that B dimension is 45.84 ±0.10 inches (Fig. 403).

(c) Check that stabilizer trim indicator indicates 0.0 ±1/2 units AIRPLANE NOSEDOWN trim.

(d) Turn captain's stabilizer trim wheel clockwise until lower stop is just contacted and check that B dimension is 21.32 ±0.10 inches.

(e) Check that stabilizer trim indicator indicates 17 ±1/2 units AIRPLANE NOSE UP trim.

(f) Check that position indicator on right side agrees with indicator on left side at all stabilizer positions within 1/2 trim unit.

(3) Check maximum force required during manual trimming at several places from one extreme of travel to other in both directions. Check that force does not exceed 14.7 pounds (60 pound-inches torque) measured at trim wheel handle.

(4) Manually operate system through one complete cycle and check that system runs smoothly without binding.

(5) Provide electrical power.

(6) Check that all stabilizer trim control circuit breakers on P6 are closed.

(7) Position left stabilizer trim switch to AIRPLANE NOSE DOWN and check that stabilizer leading edge moves up until limit switch is actuated. Check that stabilizer B dimension is between 42.04 to 42.40 on airplanes with stabilizer electric actuator limit switch adjusted to actuate at 42.14 ±0.05 inches, or is between 41.71 to 41.99 on airplanes with stabilizer electric actuator limit switch adjusted to actuate at 41.85 ±0.05 inches.

CAUTION: DO NOT EXCEED ELECTRIC ACTUATOR DUTY CYCLE OF 2 MINUTES ON AND 13 MINUTES OFF.

(8) Position left stabilizer trim switch to AIRPLANE NOSE UP and check following:
(a) Stabilizer leading edge moves down until limit switch is actuated.
(b) Stabilizer B dimension is between 27-62 and 27-98 inches after limit switch actuation.
(c) Time to operate system from upper limit switch to lower limit switch is 13 to 19 seconds and that operation is smooth and free from chatter.

NOTE: Initial surges or chatter may be experienced due to cable stretch and mass of front end system.

(9) Position left stabilizer trim switch to AIRPLANE NOSE DOWN and check that time for stabilizer to move to upper limit switch actuation point is 13 to 19 seconds and that operation is smooth and free from chatter (Ref NOTE, step (8)(c)).
(10) Repeat step (8)(a) with right stabilizer trim switch., except check only that stabilizer leading edge moves down.
(11) Repeat step (7), except check only that stabilizer leading edge moves up.
(12) Position stabilizer at neutral.
(13) Close stabilizer trim access door (AMM 12-31-41/201).

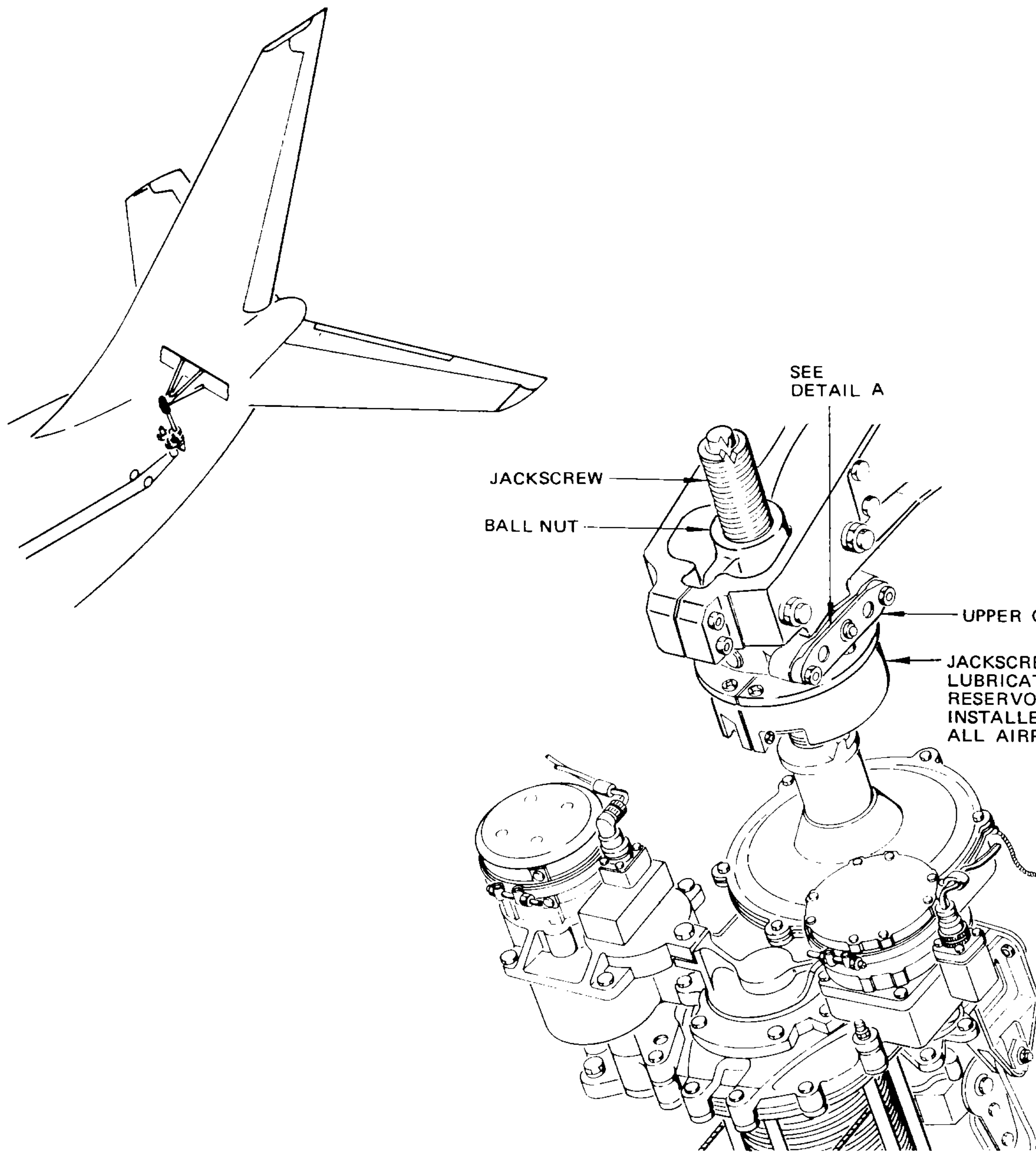
AC. Remove electrical power if no longer required.

STABILIZER BALL NUT AND JACKSCREW GEARBOX - INSPECTION/CHECK

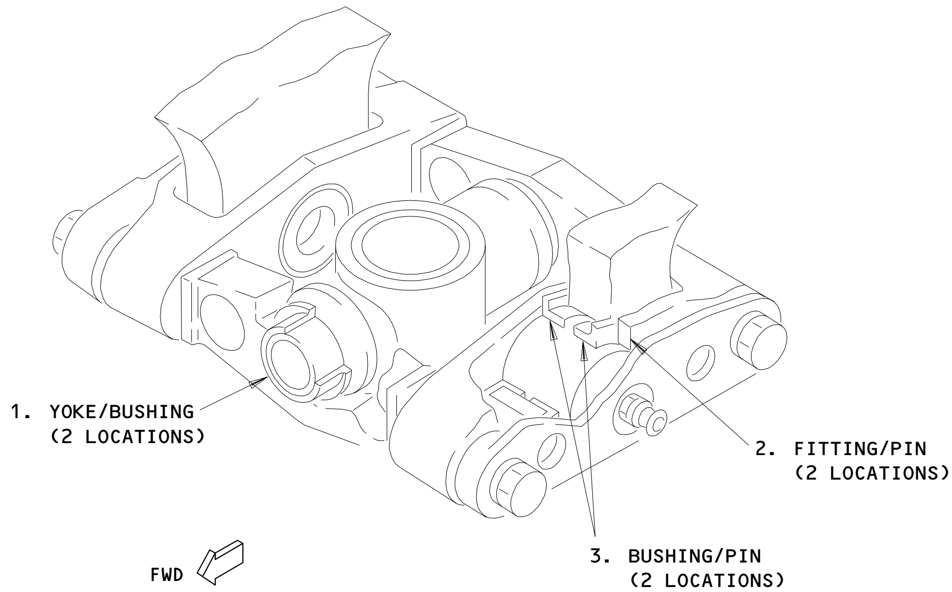
1. General
   A. This procedure contains these tasks:
      (1) Upper and lower gimbal wear limits inspection.
      (2) Detail visual inspection of the horizontal stabilizer trim actuator ballscrew and ballnut.
2. Upper and Lower Gimbal Wear Limits Inspection
   A. Standard Tools and Equipment
      (1) Micrometer - 0-1, 1-2 inches
      (2) Vernier Caliper
   B. References
      (1) AMM 27-41-81/401, Stabilizer Ball Nut and Jackscrew Gearbox
   C. Access Panels
      (1) 3701 Stabilizer Trim Access Door
   D. Procedure
      (1) Do this task: "Stabilizer Ball Nut and Jackscrew Gearbox Removal" (AMM 27-41-81/401).
      (2) Examine the parts for worn areas:
         (a) Inspect the upper and lower gimbal for cracks or damage. if you find any parts with damage, remove, repair, or replace the damaged parts (AMM 27-41-81/401).
         (b) Use a micrometer or a vernier caliper to measure the parts for the worn area.
         (c) Compare the dimensions you measured with the permitted dimensions shown in Figure 601 and Figure 602.
         (d) Replace the parts that are not in the tolerance.
      (3) Do this task: "Stabilizer Ball Nut and Jackscrew Gearbox Installation" (AMM 27-41-81/401).

         NOTE: If you replace a damaged Horizontal Stabilizer Trim Actuator with a serviceable Horizontal Stabilizer Trim Actuator that is not new or not overhauled, then you must do the Detailed Inspection for the replacement Horizontal Stabilizer Trim Actuator, and the Horizontal Stabilizer Gearbox Backlash Inspection as given in AMM 27-41-81/606.

3. Lower Gimbal Wear Limits (Fig. 602)
4. Stabilizer Ball Nut and Jackscrew Detailed Inspection
   A. References
      (1) AMM 24-22-0/201, Supply Electrical Power
   B. Access Panels
      (1) 3701 Stabilizer Trim Access Door



Upper Gimbal Wear Limits
Figure 601 (Sheet 1)



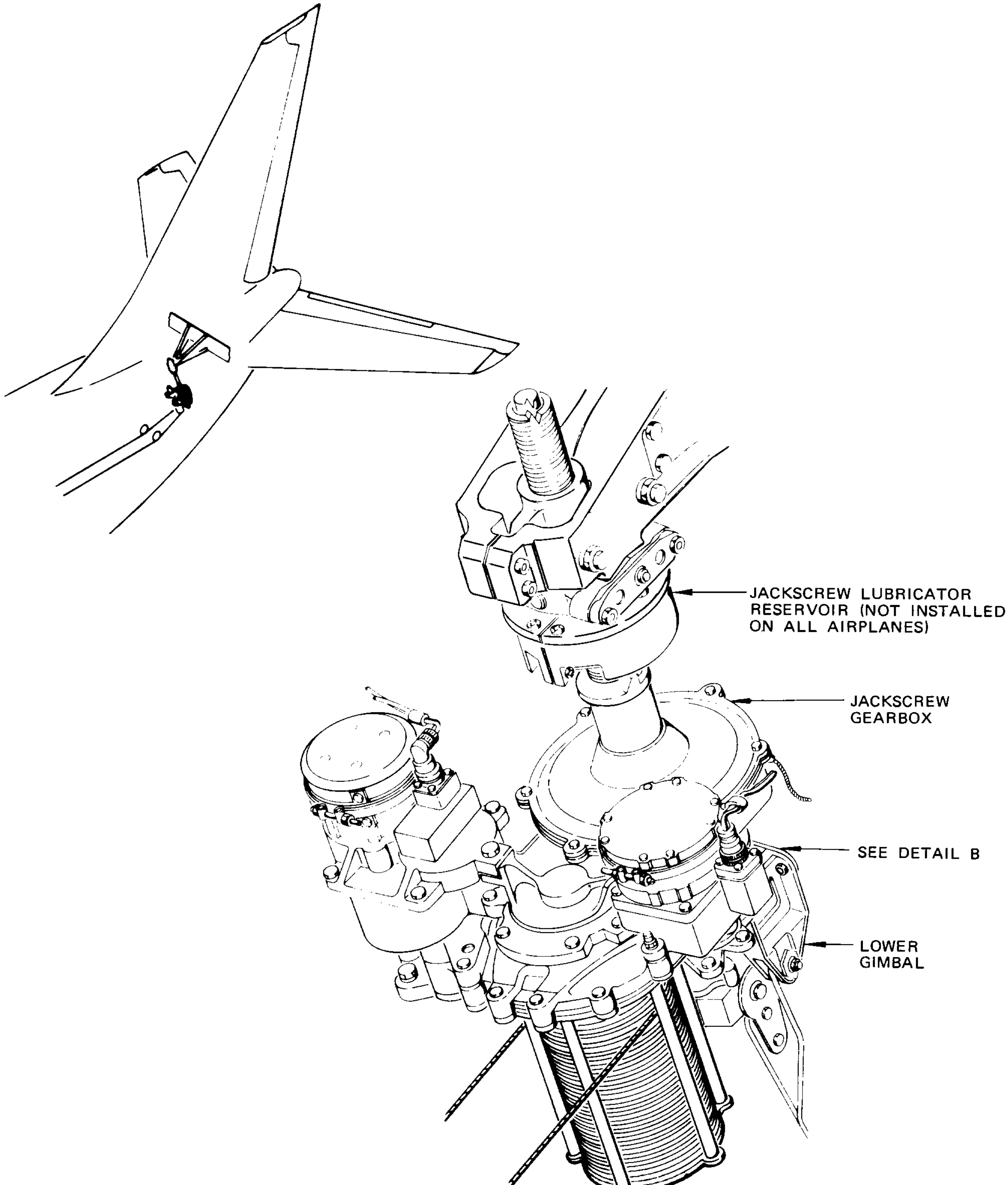
DETAIL A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
			DIAMETER		PER-MITTED WEAR DIM.	MAX DIA CLEAR-ANCE			
			MIN	MAX					
1	YOKE	ID	1.000	1.001	1.002	0.005		X	1
	BUSHING	OD	0.998	0.999	0.996		X		
2	FITTING	ID	1.000	1.001	1.002	0.005		X	1
	PIN	OD	0.998	0.999	0.997			X	1
3	BUSHING	ID	1.000	1.001	1.003	0.005	X		
	PIN	OD	0.998	0.999	0.997			X	1

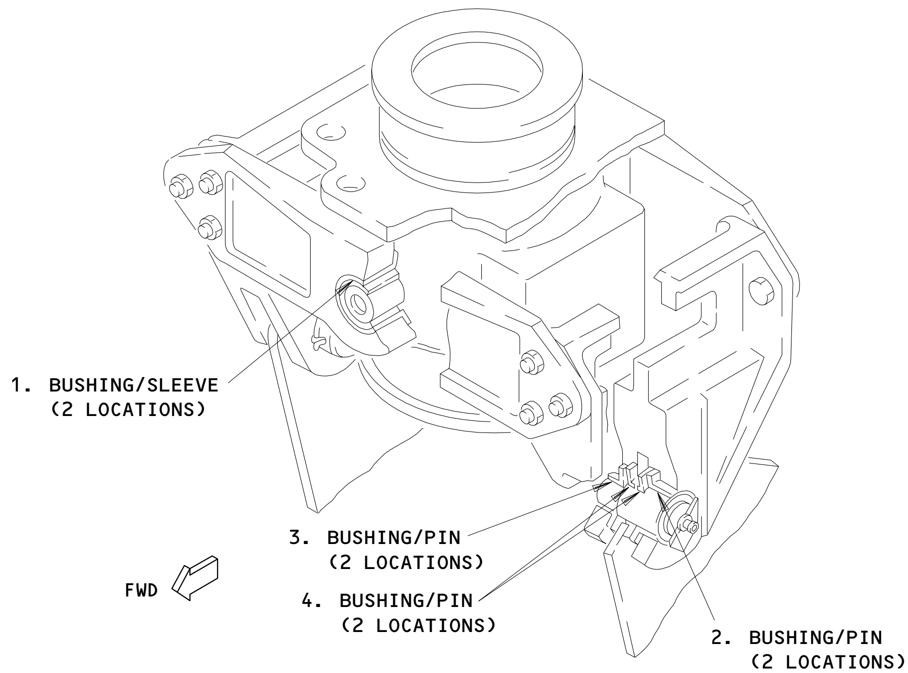
1 WORN PART IS REPAIRABLE. REFER TO OVERHAUL MANUAL FOR REPAIR INFORMATION

Upper Gimbal Wear Limits
Figure 601 (Sheet 2)

3. Lower Gimbal Wear Limits (Fig. 602)



Lower Gimbal Wear Limits
Figure 602 (Sheet 1)



DETAIL B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS PER-MITTED WEAR DIM.	WEAR LIMITS MAX DIA CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
1	BUSHING	ID	1.100	1.101	1.104	0.005	X		
	SLEEVE	OD	1.098	1.099	1.097		X		
2	BUSHING	ID	1.000	1.001	1.004	0.005	X		
	PIN	OD	0.998	0.999	0.997		X		
3	BUSHING	ID	0.750	0.751	0.754	0.005	X		
	PIN	OD	0.748	0.749	0.747		X		
4	BUSHING	ID	1.000	1.001	1.004	0.005	X		
	PIN	OD	0.998	0.999	0.997		X		

Lower Gimbal Wear Limits
Figure 602 (Sheet 2)

C. Procedure
  (1) Open access door 3701.
  (2) Inspect the ballscrew and ballnut for signs of corrosion.
    (a) Look for metallic dust particles on or around the ballscrew and ballnut.
    (b) Examine the grease on the ballscrew for metal debris.

      NOTE: Metallic debris in the grease may indicate degradation of the balls in the ballnut.

    (c) If you find metal debris or corrosion, replace the stabilizer trim actuator (AMM 27-41-81/401).
  (3) Inspect the area under, on, and around the ballscrew assembly to see if grease is coming out from the ballnut.

    NOTE: Large amount of grease present around the ballscrew assembly indicates that a faulty seal or raised return tube may be present on the ballnut.

    (a) If you find a large amount of grease, replace the stabilizer trim actuator before further flight (AMM 27-41-81/401).
  (4) Inspect the exterior of the ballnut, stabilizer actuator, and area below the actuator for ball bearings.

    NOTE: The ballnut bearings used inside the ballnut are 0.218 inch (5.6 mm) in diameter.

    (a) If ballnut bearings are found, replace the stabilizer trim actuator (AMM 27-41-81/401).
  (5) Inspect the ballnut return tubes for the following:
    (a) Visually inspect the ballnut tube retainers for corrosion and to see if they have lifted from the ballnut or are damaged in a way that would restrict free movement of the ball bearings.
      1) If any of the return tubes have lifted from the ballnut, dented, damaged, or have corrosion, replace the stabilizer trim actuator (AMM 27-41-81/401).
  (6) Clean the ballscrew by wiping any old grease and dirt from the ballscrew threads.

    NOTE: Use a clean, dry, non-abrasive cloth.

  (7) Inspect the stabilizer ballscrew for the following:
    (a) Check the ballscrew threads for cross-threading, distortion, or stripping.
    (b) Check the ballscrew threads for metal debris, pitting, gouging, corrosion, spalling, or brinelling.
    (c) Check the ballscrew for obvious differences in thread shape between thread grooves in the lower, middle, and upper portions of the ballscrew.
    (d) Check the ballscrew for damage or cracking.

(e) Move the stabilizer to a different position.

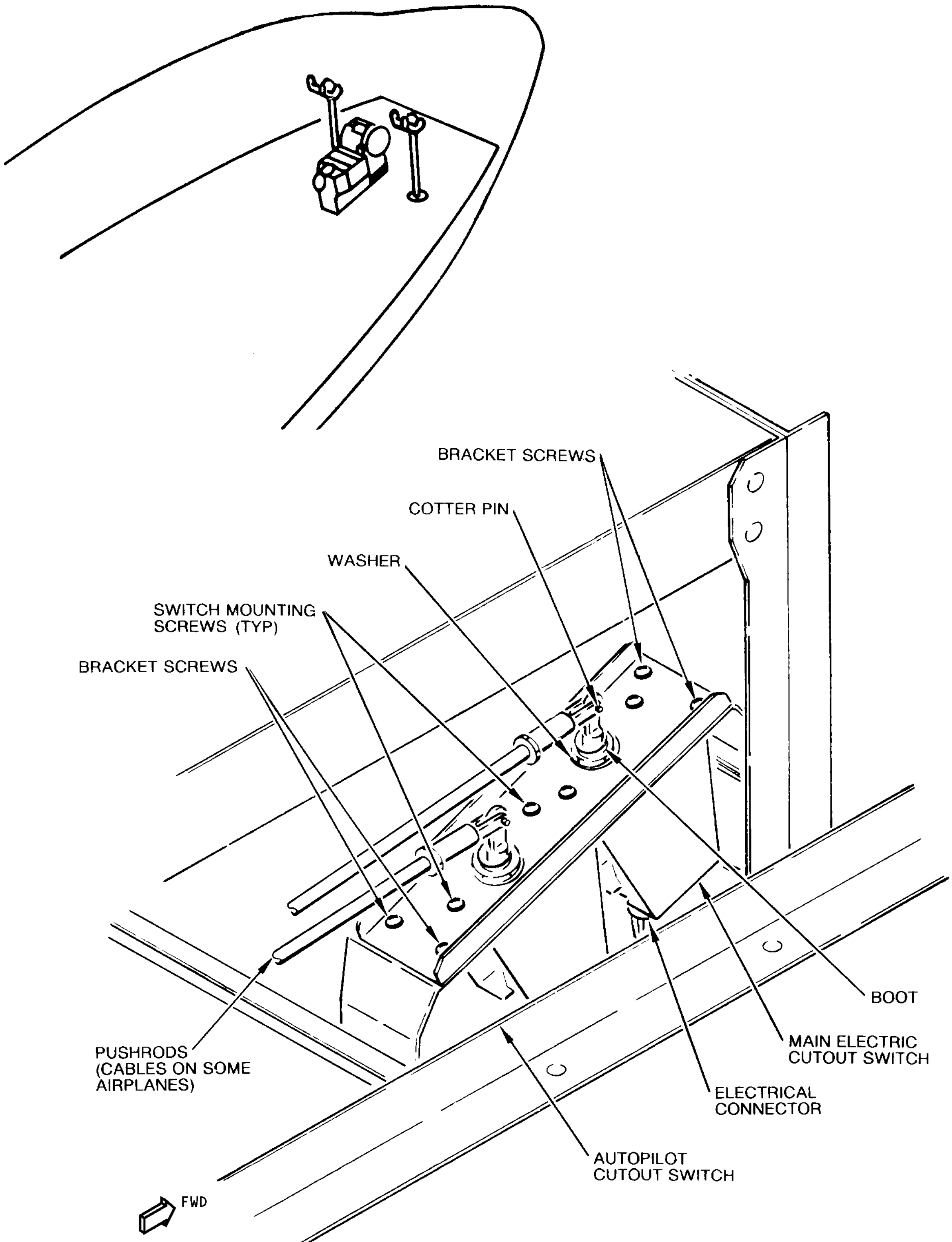
NOTE: This will expose the covered threads of the ballscrew.

(f) Repeat the steps above to examine the newly exposed threads of the ballscrew.
(g) If you find any problems listed above, replace the stabilizer trim actuator (AMM 27-41-81/401).

(8) For any grease removed from the ballscrew prior to examining the threads for damage, corrosion, and contamination, do the Stabilizer Trim Ballscrew Lubrication step (AMM 12-22-41/201).
(9) Inspect the stabilizer attachment points for damage.
(a) If you find damage, do the steps necessary to repair the damage.
(10) Inspect the upper and lower gimbals for signs of damage or cracks.
(a) If you find damage, do the steps necessary to repair the damage.
(11) If you finished the Wear Limits Check (AMM 27-41-81/601), Lubricate the Ballscrew, Upper and Lower Gimbal (AMM 12-22-41/201).

STABILIZER TRIM CUTOUT SWITCHES - REMOVAL/INSTALLATION

1. General
   A. The following removal and installation procedure is applicable to both the main electric cutout switch and the autopilot cutout switch.
2. Remove Stabilizer Main Electric or Autopilot Cutout Switches (Fig. 401)
   A. Open STABILIZER TRIM CONTROL and STABILIZER TRIM ACTUATOR circuit breakers on panel P6.
   B. Remove lower right access panel from control stand.
   C. Disconnect pushrod (cable on some airplanes) and remove boot from switch.
   D. Remove bracket screws.
   E. Remove switch mounting screws.
   F. Disconnect electrical connector and remove switch.
3. Install Stabilizer Main Electric or Autopilot Cutout Switches
   A. Check that STABILIZER TRIM CONTROL and STABILIZER TRIM ACTUATOR circuit breakers on panel P6 are open.
   B. Position switch and install switch mounting screws.
   C. Connect electrical connector.
   D. Install bracket screws.
   E. Install boot and pushrod (cable on some airplanes) to switch.
   F. Position cutout switch lever on control stand to NORMAL then to CUTOUT. Check for switch operation and adjust pushrod (cable on some airplanes) as required.
   G. Test switch (Ref 27-41-91 A/T).
   H. Install access panel.



Stabilizer Trim Cutout Switch Installation
Figure 401

STABILIZER TRIM CUTOUT SWITCHES - ADJUSTMENT/TEST

1. Stabilizer Trim Cutout Switch Test
   A. General
      (1) Testing for the stabilizer trim main electric cutout switch is covered in following paragraph B. Testing for the stabilizer trim autopilot cutout switch is covered in paragraph C.
   B. Stabilizer Trim Main Electric Cutout Switch Test
      (1) Provide electrical power.
      (2) Close stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.
      (3) Position main electric cutout switch to NORMAL.
      (4) Actuate stabilizer trim switch to AIRPLANE NOSE UP and then to AIRPLANE NOSE DOWN.
      (5) Check that stabilizer moves in proper direction and that stabilizer trim light illuminates during operation.
      (6) Position main electric cutout switch to CUTOUT.
      (7) Actuate stabilizer trim switch to AIRPLANE NOSE UP, and then to AIRPLANE NOSE DOWN.
      (8) Check that system does not operate and stabilizer trim light does not illuminate.
      (9) Restore main electric cutout switch to NORMAL. Repeat steps (4) and (5).
      (10) Remove electrical power, if no longer required.
   C. Stabilizer Trim Autopilot Cutout Switch Test
      (1) Provide electrical power.
      (2) Close all autopilot circuit breakers on panel P6.
      (3) Position stabilizer trim autopilot cutout switch to NORMAL.
      (4) Engage autopilot and tilt control column in nose up and then in nose down position.
      (5) Check that stabilizer moves in proper direction.
      (6) Position stabilizer trim autopilot cutout switch to CUTOUT. Check that autopilot disengages.
      (7) Tilt control column in nose up and then in nose down position.
      (8) Check that system does not operate.
      (9) Restore stabilizer trim autopilot cutout switch to NORMAL. Repeat steps (4) and (5).
      (10) Disengage autopilot.
      (11) Remove electrical power, if no longer required.

STABILIZER TRIM LIMIT SWITCHES - REMOVAL/INSTALLATION

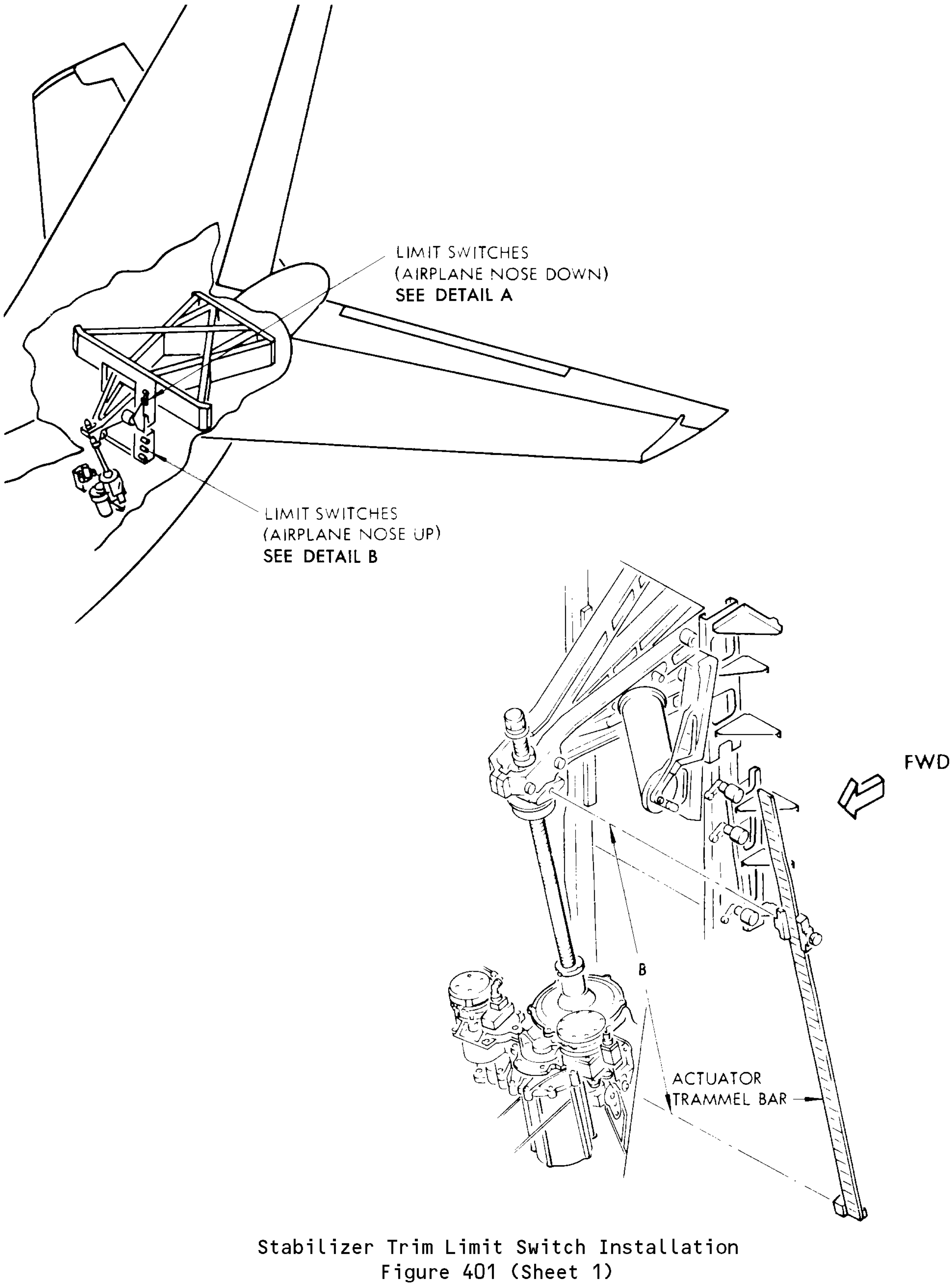
1. General
   A. Four stabilizer trim limit switches are installed on brackets along the stabilizer jackscrew aft compartment bulkhead (Fig. 401). Refer to 31-26-0 for coverage of the stabilizer takeoff warning switches. The stabilizer electric actuator airplane nose down limit switch and takeoff warning airplane nose down switch are combined in one switch.
   B. The stabilizer trim limit switches terminate up and down travel of the horizontal stabilizer leading edge at predetermined limits. The switches are actuated to terminate stabilizer up and down travel by a cam mounted on the stabilizer center section jackscrew attach fitting.
2. Equipment and Materials
   A. Actuator Trammel Bar - F80055-1
   B. Stabilizer Trim Lock - G71336-501
3. Remove Stabilizer Trim Limit Switches
   A. Install stabilizer trim lock to stabilizer trim wheel at the control stand (Fig. 402).
      (1) Rotate trim wheel to place handle at top of wheel.
      (2) Adjust height of trim lock to position trim wheel handle snugly in bottom of yoke.
      (3) Insert pin through yoke and install safety pin.
   B. Open stabilizer trim access door 3701.
   C. Open stabilizer trim control circuit breaker on P6, and, if required, aural warning system circuit breaker on P6.
   D. Disconnect limit switch wires from airplane wiring at splice connection.
   E. Remove locknut securing switch arm to switch and pull arm off end of shaft.
   F. Remove lockwire from switch attachment nut and remove nut while supporting switch. Pull switch free from bracket.
4. Install Stabilizer Trim Limit Switches
   A. Check that stabilizer trim control circuit breaker on panel P6 is open. If required, check that aural warning system circuit breaker on P6 is open.
   B. Position switch at appropriate bracket with switch body on correct side of bracket depending on switch location as shown in Fig. 401 and insert shaft through mounting hole in bracket. Secure switch in position with hexnut. Lockwire hexnut to bracket.

      NOTE: Lead-in wires on switch are to point down on installation as shown in Fig. 401.

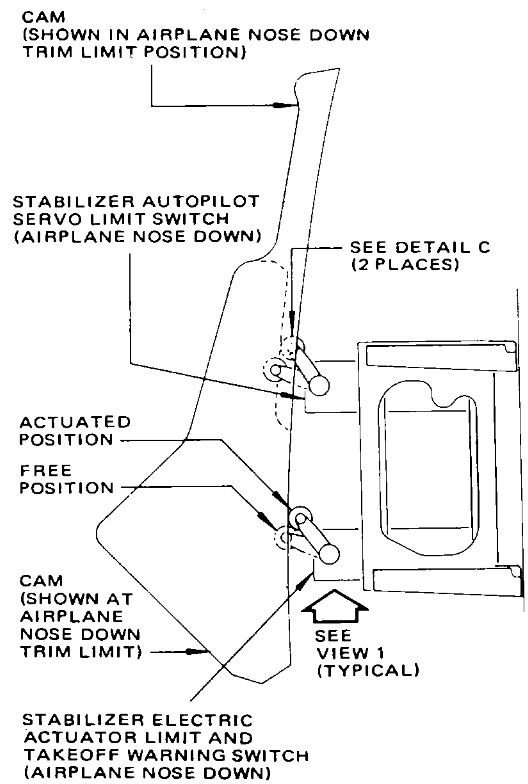
   C. Orient switch lever arm to approximate position for installation as shown in Fig. 401 and place lever on shaft, engaging serrations. Tighten hexagon locking nut finger-tight making sure washer has been installed.

      NOTE: Hexagon locking nut will be tightened after switch is adjusted.

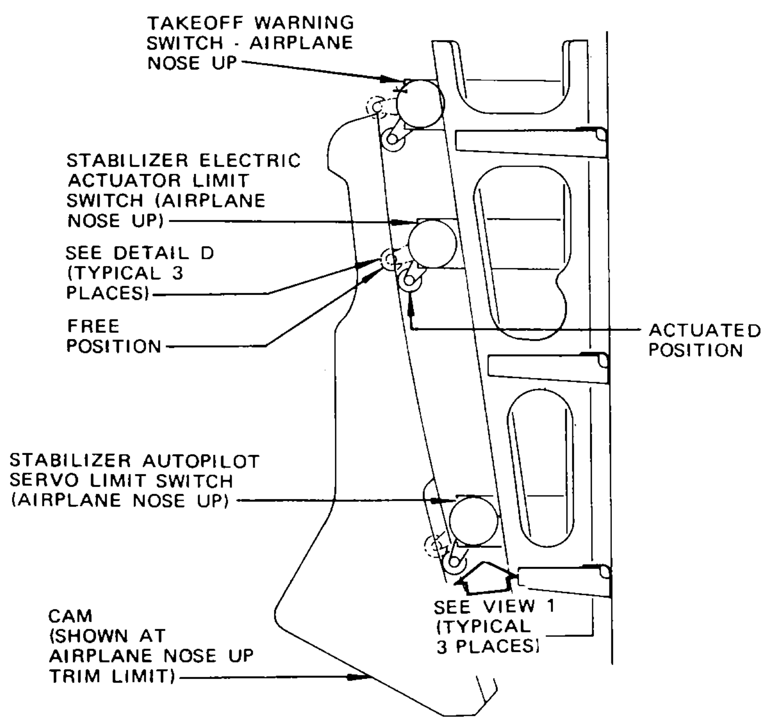
   D. Connect switch wires to airplane wiring at splice connection (Ref Wiring Diagram).



Stabilizer Trim Limit Switch Installation
Figure 401 (Sheet 1)

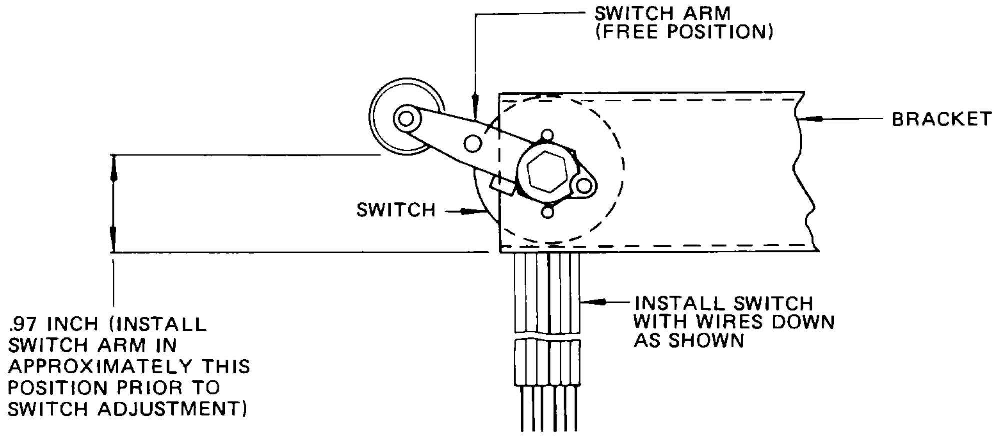


DETAIL A

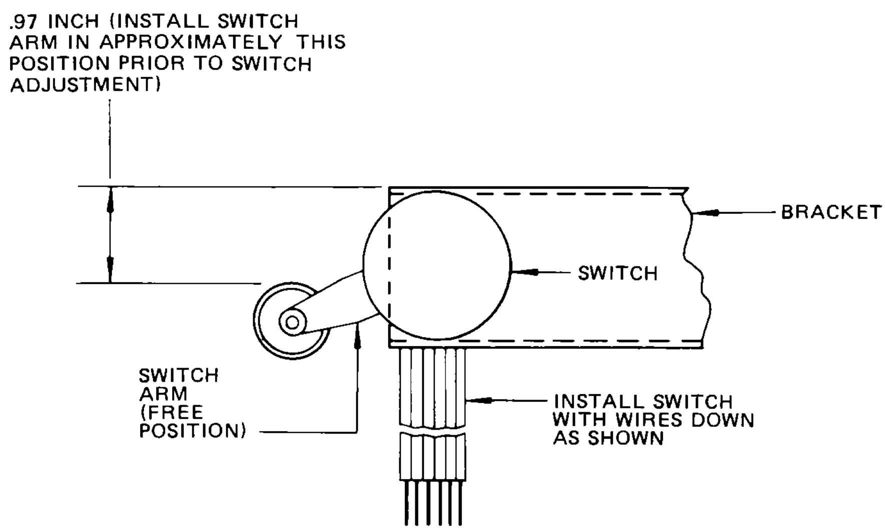


DETAIL B

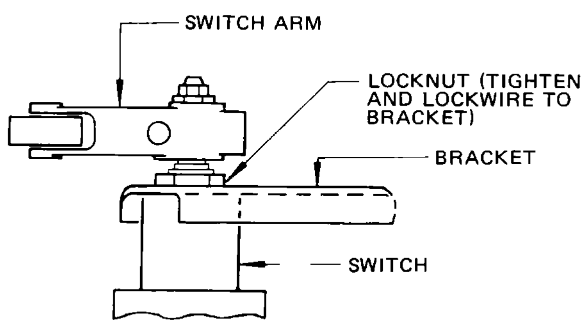
Stabilizer Trim Limit Switch Installation
Figure 401 (Sheet 2)



DETAIL C

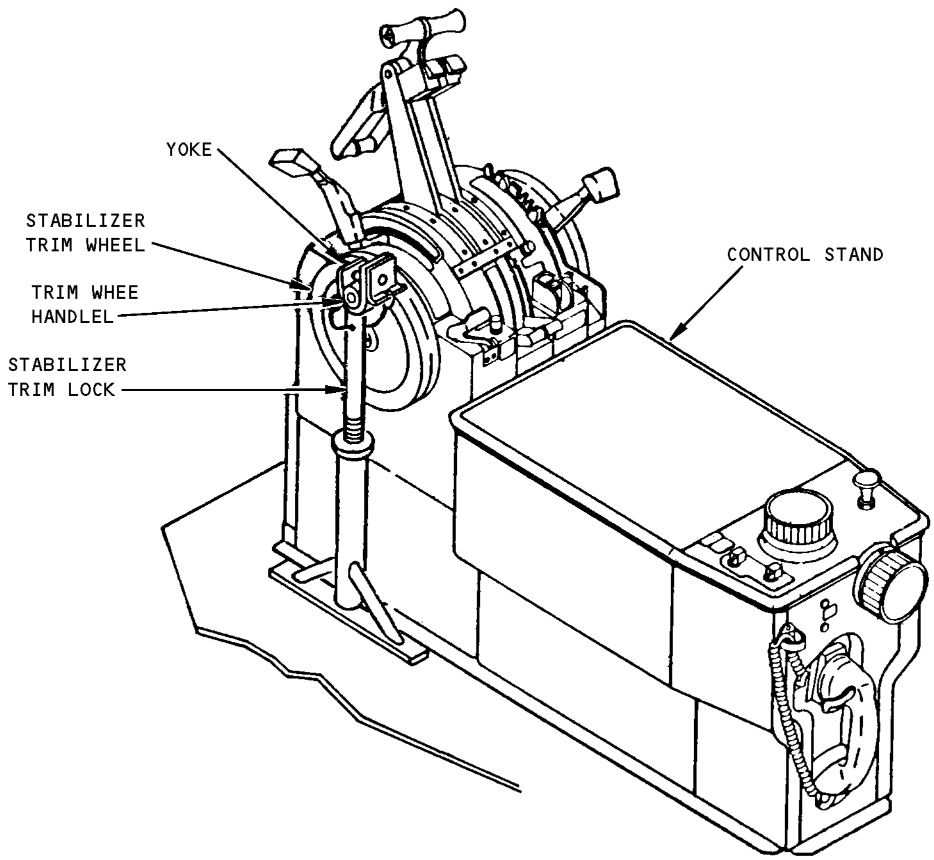


DETAIL D



VIEW 1

Stabilizer Trim Limit Switch Installation
Figure 401 (Sheet 3)



Stabilizer Trim Lock Installation
Figure 402

E. Close stabilizer trim control circuit breaker on P6, and , if required, aural warning system circuit breaker on P6.
F. Adjust and test switch installation per instructions in 27-41-101, Adjustment/Test.
G. Close stabilizer trim access door 3701.
H. Remove stabilizer trim lock (Fig. 402).

STABILIZER TRIM LIMIT SWITCHES - ADJUSTMENT/TEST

1. General
   A. The stabilizer trim limit switches terminate up and down travel of the horizontal stabilizer leading edge at predetermined limits. The switches are actuated by a cam mounted on the horizontal stabilizer center section support structure near the jackscrew attach fitting. The cam moves with the stabilizer to actuate the switches thus terminating travel at the limits for either normal electric stabilizer operation or autopilot operation depending on which system is being used for stabilizer trim.
   B. Adjustment of the switches is accomplished by loosening a hexagon locking nut, a lockscrew and turning a gear until roller lever is in desired position with cam in proper switch actuation position. The lockscrew is tightened to positively lock roller lever in position and lockwired in position. The hexagon nut is then tightened.
   C. The stabilizer electric actuator airplane nose down limit switch and the takeoff warning airplane nose down switch are both included in the same switch (Fig. 501). Refer to 31-26-0 A/T for adjustment of the stabilizer takeoff warning airplane nose up switch and for test of stabilizer takeoff warning switches.
2. Equipment and Materials
   A. Actuator Trammel Bar - F80055-1
3. Stabilizer Trim Limit Switches Adjustment (Fig. 501)
   A. Adjust Stabilizer Trim Limit Switches
      (1) Open stabilizer trim access door 3701.
      (2) Set stabilizer B dimension at switch actuation setting for switch being adjusted. See Table I, Fig. 501 for required B dimension.
      (3) Loosen, but do not remove hexagon locking nut securing switch arm to switch.

      CAUTION: IF LOCKING NUT IS NOT LOOSENED, DAMAGE TO WORM GEAR MECHANISM CAN OCCUR DURING ADJUSTMENT.

      (4) Loosen lockscrew from worm gear on switch arm. Turn worm gear until limit switch is preloaded against cam to open position as denoted by a click.
      (5) Tighten and lockwire lockscrew. Tighten hexagon locking nut to 20-25 pound-inches.
      (6) Test limit switches per par. 4.
      (7) Close access door.

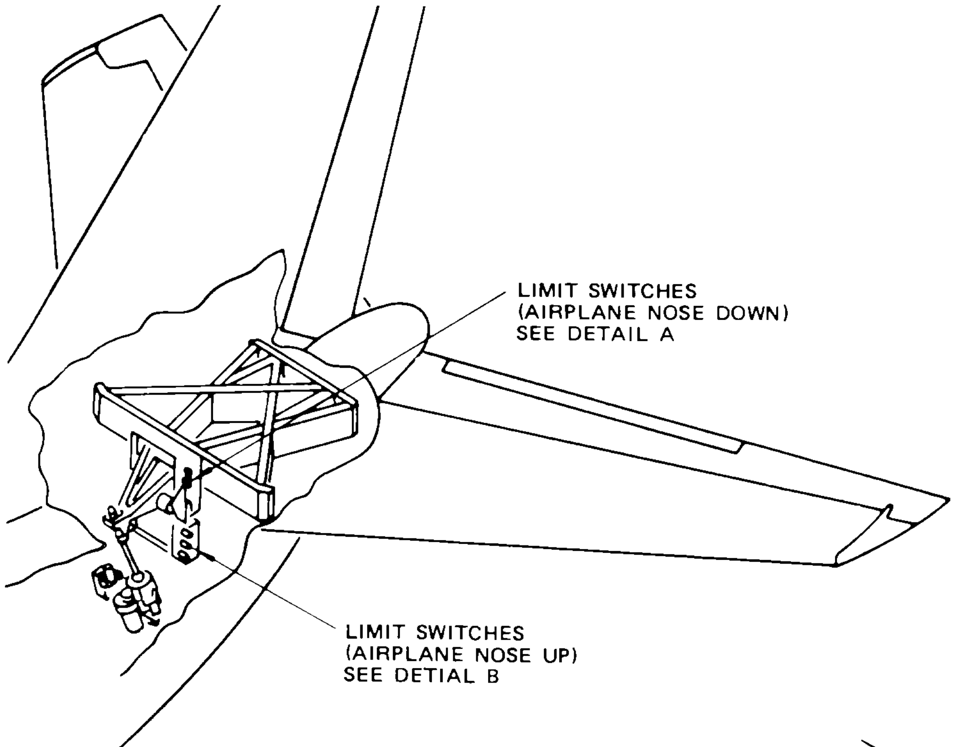
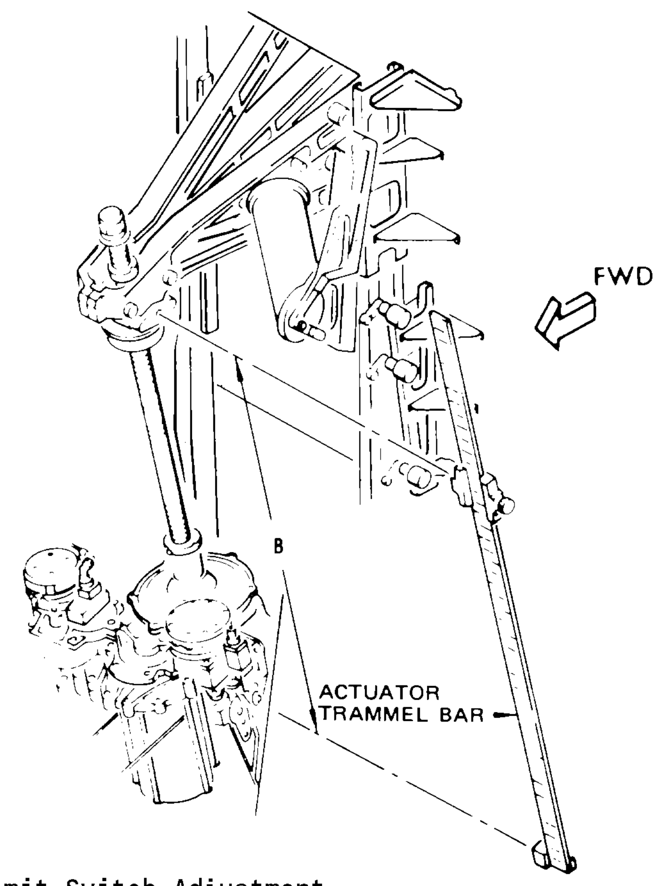


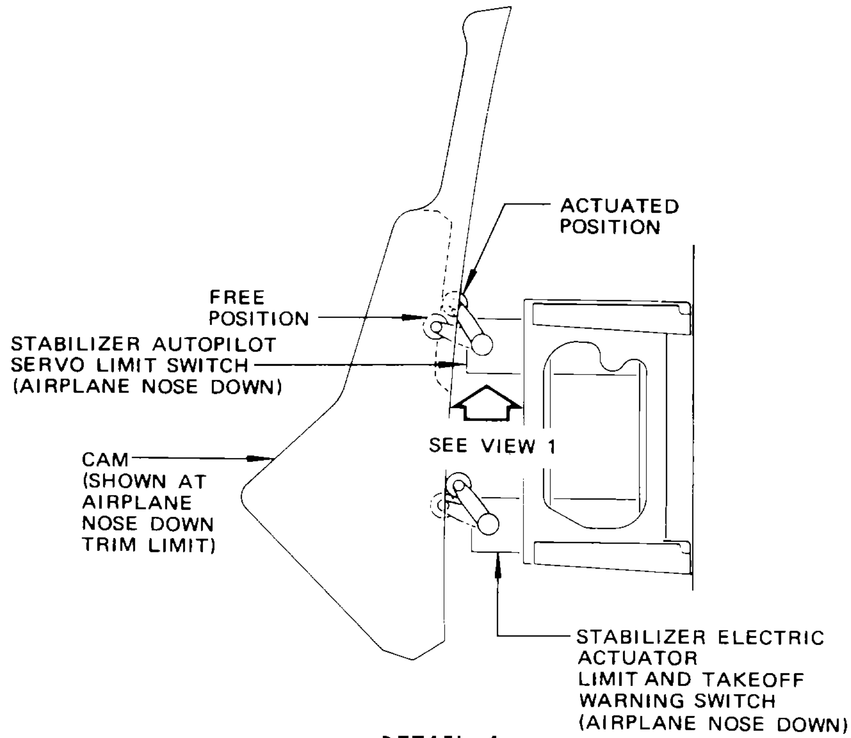
TABLE 1	
SWITCH	"B" DIMENSION (INCHES)
STABILIZER AUTOPILOT SERVO LIMIT SWITCH AIRPLANE NOSE DOWN	42.57 ± 0.05
STABILIZER ELECTRIC ACTUATOR LIMIT SWITCH AIRPLANE NOSE DOWN	42.14 ± 0.05 [1] 41.85 ± 0.05 [2]
STABILIZER ELECTRIC ACTUATOR LIMIT SWITCH AIRPLANE NOSE UP	27.88 ± 0.05
STABILIZER AUTOPILOT SERVO LIMIT SWITCH AIRPLANE NOSE UP	27.16 ± 0.05



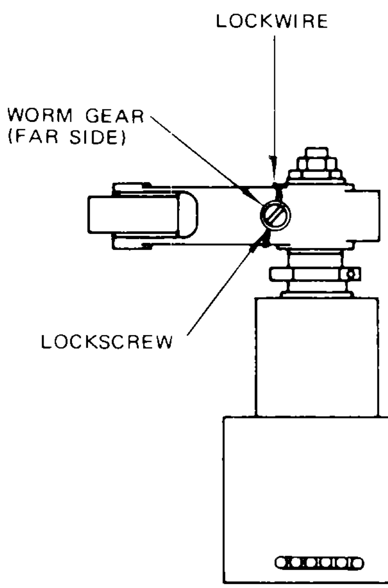
[1] AIRPLANES PRIOR TO INCORPORATION OF SB 27-1102

[2] AIRPLANES AFTER INCORPORATION OF SB 27-1102

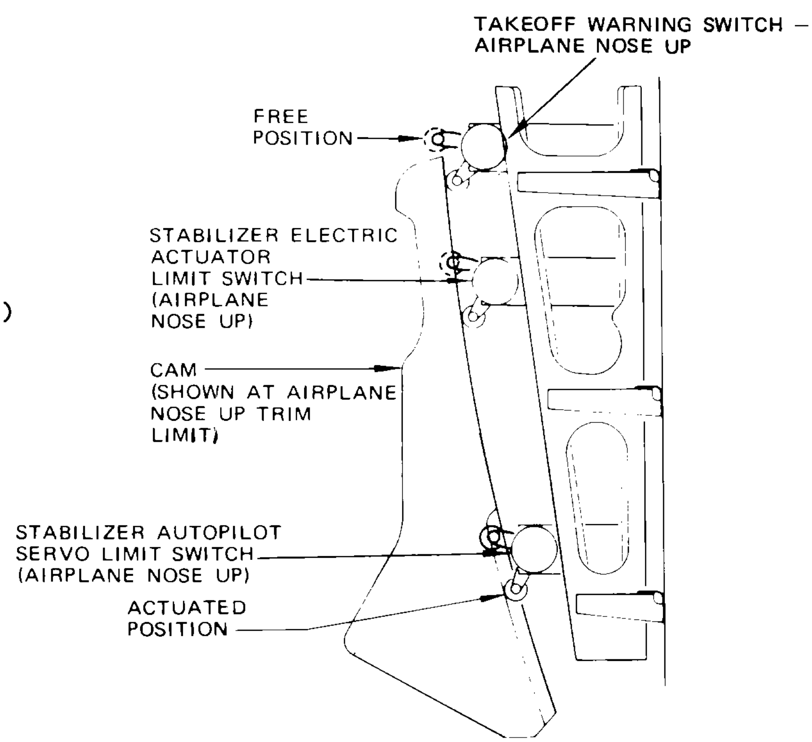
Stabilizer Trim Limit Switch Adjustment
Figure 501



DETAIL A



(TYPICAL ALL SWITCHES)
VIEW 1



DETAIL B

Stabilizer Trim Light Switch Adjustment
Figure 502

4. <u>Stabilizer Trim Limit Switch Test</u>

A. General

(1) If the stabilizer system runs beyond the limits given in the following test, the overcoasting may be caused by electric actuator powder settled in the clutches. This usually occurs after overnight storage and/or setting of the powder when operating through full stroke to check limits. The condition is completely safe in flight as the in-flight loads on the actuator are more than ample to stop the actuator at the limit switches. Overcoasting may be corrected by operating the stabilizer as follows:

(a) Trim the stabilizer to approximately two units away from limit. Operate stabilizer trim by alternately energizing trim switch a total of four actuations (two nose down and two nose up).

(b) Recheck stabilizer trim limit switches per paragraph B.

<u>NOTE</u>: Dimension B tolerances are greater during test, than adjustment, to allow for system coast.

(2) Refer to 22-11-0, Autopilot and Yaw Damper System - Adjustment/Test, for test of autopilot limit switches.

B. Test Stabilizer Trim Limit Switches

(1) Open stabilizer trim access door 3701.

(2) Provide electrical power.

(3) Check that stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6 are closed.

(4) Inch stabilizer to maximum leading edge down (airplane nose up) position. Check that 1imit switches prevent further attempts of stabilizer leading edge down travel by captain's stabilizer trim switch but allow stabilizer leading edge up (airplane nose down) travel.

(5) Back off from maximum stabilizer leading edge down position and using captain's stabilizer trim switch run stabilizer leading edge down until limit switches are actuated. When system stops, check that dimension B is between 27.62 and 27.98 inches.

(6) Inch stabilizer to maximum leading edge up (airplane nose down) position. Check that 1imit switches prevent further attempts of stabilizer leading edge up travel by captain's stabilizer trim switch but allow stabilizer leading edge down (airplane nose up) travel.

(7) Back off from maximum stabilizer leading edge up position and using captain's stabilizer trim switch run stabilizer leading edge up until limit switches are actuated. When system stops, check "B" dimension is as follows:
Between 42.04 to 42.40 inches on airplanes with stabilizer electric actuator limit switch (airplane nose down) adjusted to actuate at 42.14 ±0.05 inches (Fig. 501, Table 1).
Between 41.71 to 41.99 inches on airplanes with stabilizer electric actuator limit switch (airplane nose down) adjusted to actuate at 41.85 ±0.05 inches (Fig. 501, Table 1).
(8) Remove electrical power, if no longer required.
(9) Close access door.

STABILIZER TRIM CONTROL SWITCH - REMOVAL/INSTALLATION

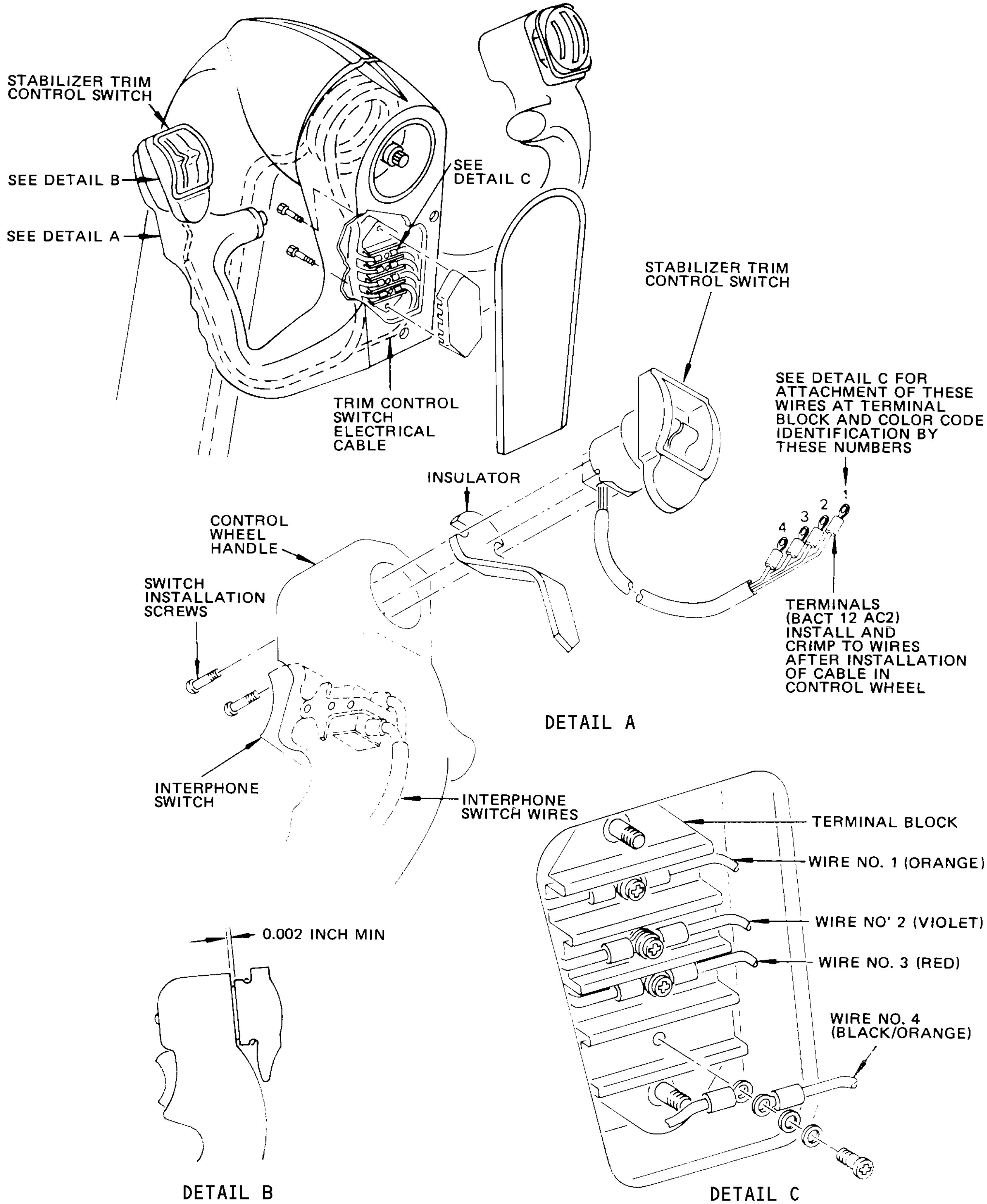
1. General
   A. The stabilizer trim control switch assembly includes an electrical cable routed through the control wheel handle to a terminal block in the control wheel. If a switch becomes defective the electrical cable and switch are replaced as an assembly.
2. Equipment and Materials
   A. Talc
3. Remove Stabilizer Trim Control Switch
   A. Open stabilizer trim control circuit breaker on panel P6.
   B. Remove terminal block cover (Fig. 401).
   C. Disconnect the stabilizer trim control switch leads from terminal block.
   D. Remove crimped terminals from leads to facilitate withdrawal.
   E. Disconnect stabilizer trim switch from handle.
   F. Attach wire guide to end of switch electrical cable and withdraw cable through core and through stabilizer trim switch hole. Disconnect cable and allow guide to remain in control wheel handle.
4. Install Stabilizer Trim Control Switch
   A. Check that stabilizer trim control circuit breaker on panel P6 is open.
   B. Apply talc to exterior of electrical cable.
   C. Attach electrical cable to wire guide and pull cable through trim control switch hole and core of control wheel. Disconnect cable from guide.

      CAUTION: DO NOT DAMAGE INSULATION. DO NOT PULL EXCESSIVELY AS WIRE CONNECTION AT SWITCH MAY BE DAMAGED.

   D. Insert insulator between trim switch and interphone switch wires (Fig. 401).
   E. Pull electrical cable through control wheel until trim control switch and guard assembly can be seated in control wheel. Install pan head screws and tighten to 4 (±1/2) pound-inches torque. Verify a minimum of 0.002 inch clearance between control wheel handle and control switch (detail B).

      CAUTION: DO NOT OVERTORQUE SCREWS.

   F. Remove insulation and install terminals on wires to fit terminals on terminal block. See figure 401 for color code identification of wires for terminal matching.
   G. Attach control switch wires to terminal block per figure 401.
   H. Close stabilizer trim control circuit breaker on panel P6.
   I. Test switch installation. Refer to Stabilizer Trim Control Switch - Adjustment/Test.
   J. Replace terminal block cover.



Stabilizer Trim Control Switch Installation
Figure 401

STABILIZER TRIM CONTROL SWITCH - ADJUSTMENT/TEST

1. Stabilizer Trim Control Switch Test
   A. Equipment and Materials
      (1) Insulation tester
   B. Test Stabilizer Trim Control Switch
      (1) Rotate aileron control wheel through 5 cycles of full travel 108 degrees each side of neutral.
      (2) Open STAB TRIM CONTROL circuit breaker on P6-2 panel.
      (3) Move STAB TRIM CUTOUT switch on control stand to CUTOUT position.
      (4) Airplanes without FDAU or DFDAU, Test all wires and switch for electrical insulation between wire and ground and electrical isolation between wires VIOLET to RED, VIOLET to ORANGE, VIOLET to BLACK-ORANGE, RED to BLACK-ORANGE, RED to ORANGE, and BLACK-ORANGE to ORANGE. Using insulation tester, test that all wires and switch have a resistance of 2 Megohms or greater. Airplanes with FDAU or DFDAU, Disconnect connector D1241A from M675 (FDAU/DFDAU). Perform wire and switch insulation/isolation between wires VIOLET to RED, VIOLET to ORANGE, VIOLET to BLACK-ORANGE, RED to BLACK-ORANGE, RED to ORANGE, and BLACK-ORANGE to ORANGE. Using insulation tester, test that all wires and switch have a resistance of 2 Megohms or greater. Reconnect D1241A to M675. Perform a visual check of D1241A and mating connector for bent and/or push back pins prior to reconnect.

         NOTE: Some airplanes may not have the M675 interface (REF WDM 27-41-01, STABILIZER TRIM CONTROL) then perform 1.B(4) only.

         (a) Do the steps that follow to make sure you did not bend or damage the pins.

            NOTE: This step is necessary because the pins are most likely to be damaged the first time an electrical connector is connected.

            1) Disconnect the electrical connector.
            2) Make sure pins are not bent or damaged.
            3) Make sure electrical connector is not damaged.

               NOTE: The pins can cause damage to the connector if the pins do not enter the electrical connector receptacles.

      (5) Move STAB TRIM CUTOUT switch to NORMAL position.
      (6) Provide electrical power.
      (7) Close stabilizer trim actuator and stabilizer trim control circuit breakers on panel P6.

(8) Actuate stabilizer trim control switch to AIRPLANE NOSE UP and to AIRPLANE NOSE DOWN. Check that stabilizer responds in correct direction.

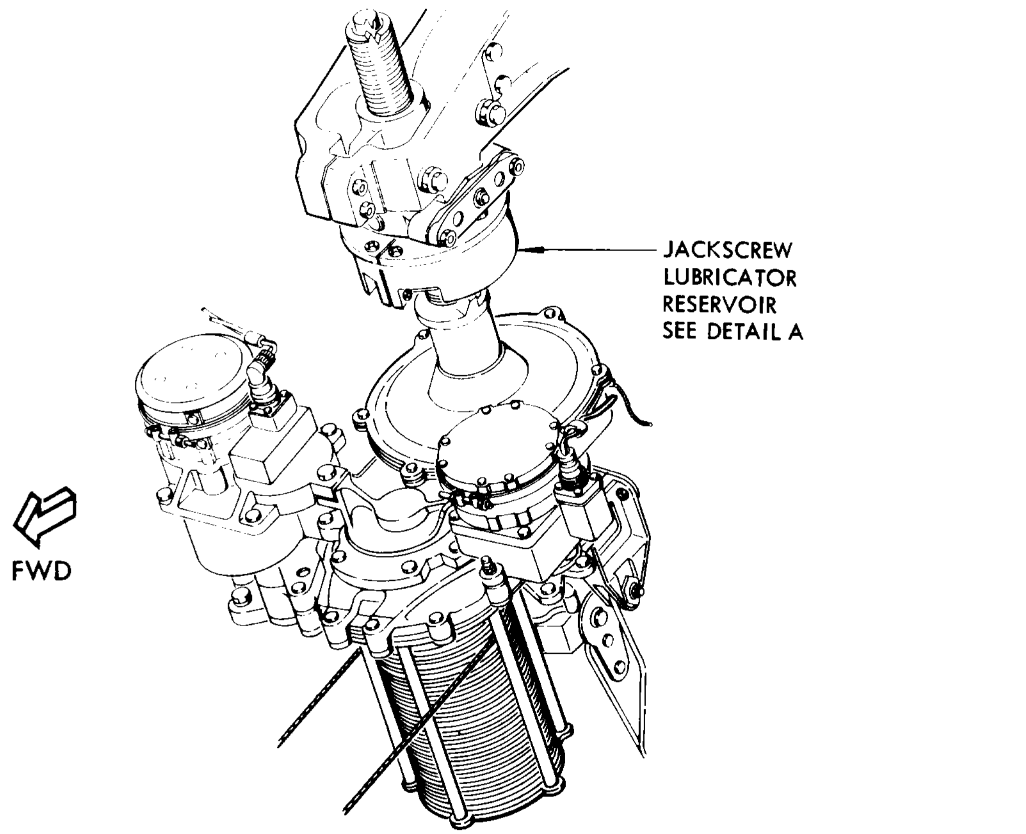
(9) Remove electrical power, if no longer required.

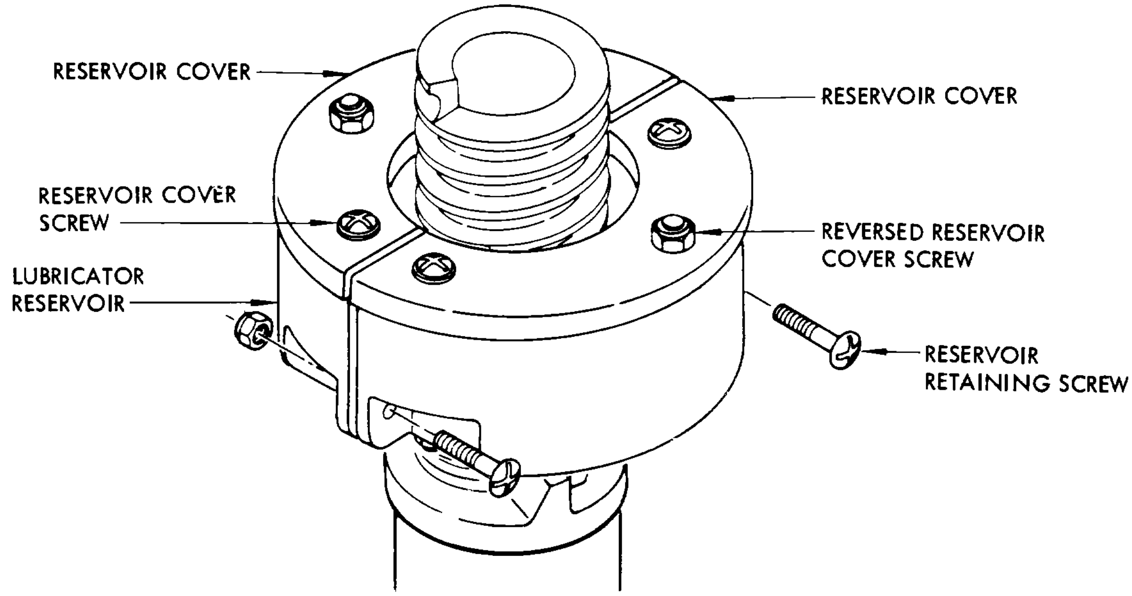
JACKSCREW LUBRICATOR RESERVOIRS - UNIT SERVICING

1. General
   A. The paired lubricator reservoirs are tightly closed and cannot be serviced until the covers are removed. Three cover screws attached the cover to the reservoir, the center screw on each reservoir being reversed upon installation and inserted from the bottom of the reservoir. In order to remove each center cover screw, the lubricator reservoirs first must be disassembled from each other and the ball nut.
2. Equipment and Materials
   A. Lubricating Oil - MIL-L-7870 (Ref 20-30-21)
3. Service Lubricator Reservoirs
   A. Open stabilizer trim access door 3701.
   B. Remove two reservoir retaining screws holding lubricator reservoirs together (Fig. 301).
   C. Remove two reservoirs.
   D. Remove reservoir cover screws and cover.
   E. Remove wick assemblies and check that they are clean.
   F. Soak wick assemblies in oil and reinstall.
   G. Fill reservoirs with oil and allow sufficient time for packings to become completely oil saturated.
   H. Replace reservoir covers; insert and secure cover screws.
   I. Carefully wipe all jackscrew threads with a clean, dry rag to remove dust and accumulated dirt.
   J. Saturate a second clean, dry rag with oil and coat all jackscrew threads.
   K. Position lubricator reservoirs around lower portion of ball nut so that wick assemblies fit into holes in ball nut. Align wick with centerline and pitch of jackscrew threads. Ensure that wick contacts jackscrew threads.
   L. Insert lubricator reservoir retaining screws and secure.

      NOTE: Lubricator reservoirs will not fit flush; gap between reservoirs permits drainage.

   M. Close access door.





DETAIL A

Jackscrew Lubricator Reservoir Installation
Figure 301

HORIZONTAL STABILIZER ATTACH FITTINGS - APPROVED REPAIRS

1. General
   A. Corrosion of vertical and horizontal stabilizer attachment lug bushings has been found on some airplanes. The corrosion is due to moisture collection and retention in the lugs of the attach fittings. Unchecked corrosion could result in cracked lugs or loose bushings requiring extensive unscheduled manhours and downtime to repair. This procedure is released to provide a bushing replacement procedure for individual bushings specified in SB 55-1028 if corrosion is found when inspecting bushings and lugs per the service bulletin. For replacement of vertical stabilizer bushings, refer to 55-30-11, Approved Repairs.
   B. This procedure provides special locating tooling to establish and maintain centerline location of hole in bushing being removed so that special reamers also provided can be used to ream hole in replacement bushing with identical hole centerline location as removed bushing. This is necessary because the bushings may have eccentric outer and inner diameters. Be careful when removing bolts to avoid bushing rotation. If a bushing is loose or rotates, it is necessary to accomplish the alternative bushing replacement procedure per SB 55-1028, unless the bolt hole centerline can be established. If at any time during bushing removal the bushing rotates, or it is suspected that the bushing has rotated, it is necessary to perform the alternative bushing replacement per SB 55-1028.
2. Equipment and Materials
   A. Horizontal Stabilizer and Fin Bushing Replacement Kit - F80231
   B. Wet Primer - BMS 10-11, Type 1 (Ref 20-30-41)
   C. Sealant - BMS 5-95 (Ref 20-30-11)
3. Replace Horizontal Stabilizer Front Spar Lug or Clevis Individual Bushing (Fig. 801)
   A. Remove horizontal stabilizer (Ref 27-41-11).
   B. Prepare tooling for reaming operation (potting of reamer bushings).
      (1) Set up -501 frame assembly on front spar lugs or clevis so that end of frame assembly through which -508 potting pin will be installed is located at clevis or lug at which replacement bushing is to be installed.
      (2) Align opposite end of -501 frame assembly with other end of lug or clevis and secure with -510 bolt, -218 and -505 spacers.
      (3) Install -508 potting pin and P80-16-.8780 and P-40-16-3/8 potting bushings at lug or clevis as shown.
      (4) Apply potting compound through port hole in -501 frame to fill in around potting bushings.
      (5) Remove tool assembly after potting compound is cured and firmly set.

C. Ream oversize holes in clevis or lug.
   (1) Remove existing defective bushing. Use CJ107 slide hammer and either -126 or -525 slide hammer adapter. If bushing is being removed from clevis, remove bushing using -125 bushing removal drive pin.
   (2) Mask or shield structure to prevent contamination with abrasive materials during abrasive blast cleaning or with shot during shot peening.

   CAUTION: FOREIGN PARTICLES MAY CAUSE CORROSION TO STRUCTURE.

   (3) Clean and deburr holes and adjacent surfaces thoroughly.
   (4) Oversize hole with Quickset reamer to minimum oversize in 0.010 inch increments up to maximum allowable to achieve corrosion removal (Fig. 803). Contact Boeing if corrosion still exists.
   (5) Spotface the forward and aft faces of the lug fittings to provide a seat for the bushing flange to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Spotface the inner faces of the clevis to provide a seat for the bushing flange to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Spotface the outer faces of the clevis flanges to provide a seat for the bolt head or the washer to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Contact Boeing if corrosion still exists in the lug holes or on spotfaced surfaces. Remove the corrosion products from other areas of the lug per Structural Repair Manual, Chapter 51. Do not use chemical removal if the solution can penetrate the fay surfaces. Use chemical or dry abrasive surface.
   (6) Shot peen holes and spotfaced surfaces as follows:
      (a) Shot peen (flap peen optional) minimum flat diameter of spot face per Overhaul Manual, Section 20-10-03. On aluminum parts, use shot number 230 to 550, intensity 0.014A, coverage 2.0. On steel parts, use shot number 170 to 460, intensity 0.016A, coverage 2.0.
      (b) Shot peen (flap peen optional) hole in clevis or lug per Overhaul Manual, Section 20-10-03. For aluminum parts, use shot number 230 to 550, intensity 0.014A, coverage 2.0. For steel parts, use shot number 170 to 460, intensity 0.016A, coverage 2.0.
      (c) Hone inside diameter maximum of 0.0004 inch with 63 microinch finish to achieve final hole size.
   (7) Finish hole of steel parts with two coats of primer or chemically treat hole in aluminum parts to meet requirements of MIL-C-5541 (colored film) and apply one coat of primer. Allow to dry one hour minimum.
   (8) Finish spotface and reworked surfaces of lugs (except holes) with manual application of colored chemical coating per BAC5719 and apply two coats of primer.

D. Ream inside diameter of new flanged bushing.
    (1) Fabricate oversize bushing per Fig. 803 for interference fit with lug or clevis inside diameter.
    (2) Shrink fit bushing in lug with wet primer. Use -130 bushing installation tool.
    (3) Secure -501 tool frame assembly in position at front spar clevis or lug as shown with -508 potting pin at the location with the original bushing.
    (4) Ream bushings from aft side of spar with -208 arbor with -207 dowel and -206 shell reamer. Continue to ream bushing using -220 and -217 standard reamer provided.
    (5) Hone internal diameter of bushing to diameter of 0.8780 to 0.8790 inch with machine finish 63 microinches AA. Use standard Sunnan hones.
    (6) Fillet seal around flange outside diameter and void at end of bushing with sealant. Apply primer topcoat over sealant.

E. Install horizontal stabilizer (Ref 27-41-11).

4. <u>Replace Horizontal Stabilizer Rear Spar Individual Terminal Clevis and Lug Bushing (Fig. 802)</u>

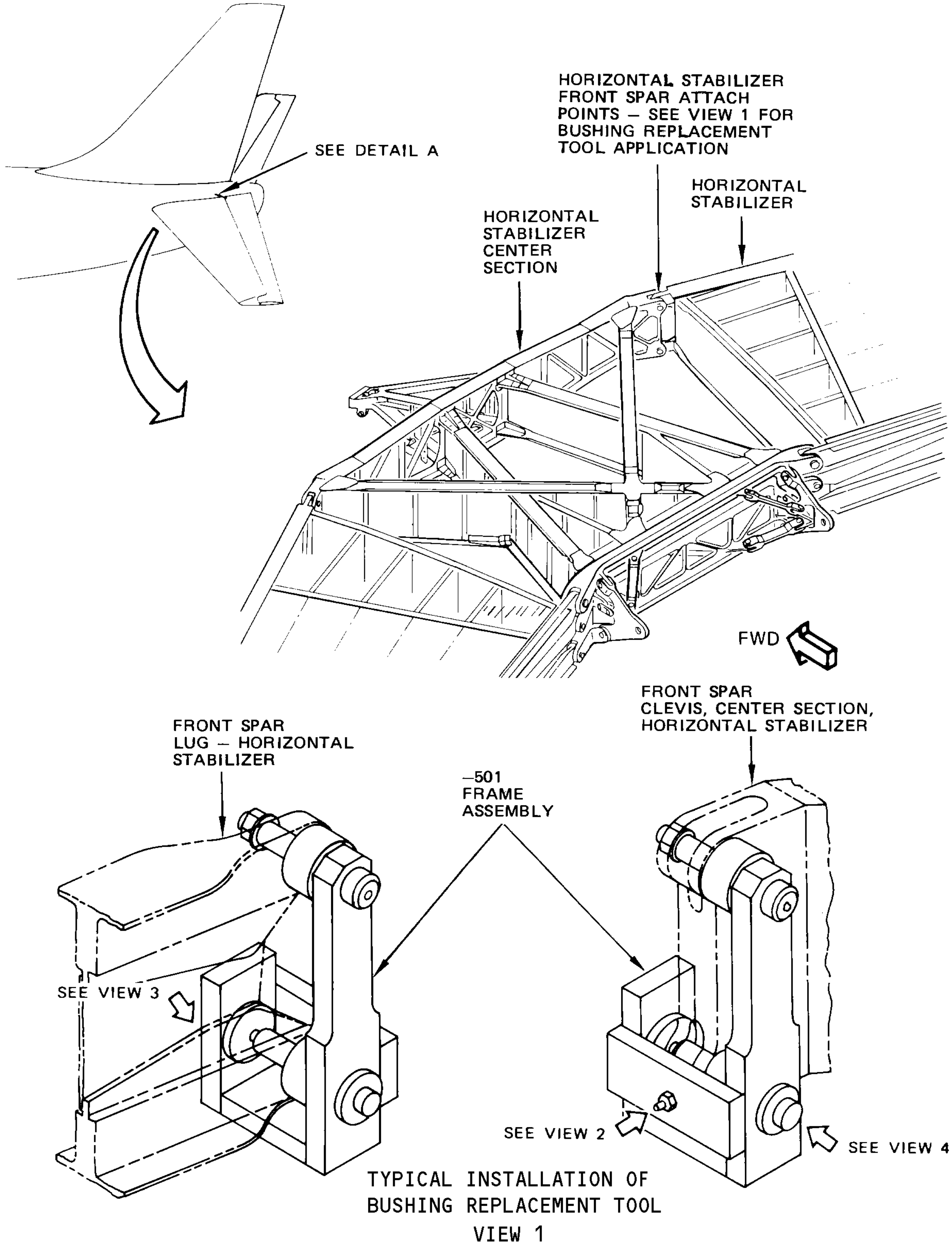
A. Remove horizontal stabilizer (Ref 27-41-11).

B. Prepare tooling for reaming operation (potting of bushings).
    (1) Position -601 frame assembly at horizontal stabilizer body center section rear spar clevis joints or horizontal stabilizer rear spar terminal lugs and install -609 potting pins three places. Secure potting pins with -118 screws (3 places).
    (2) Clamp -601 tool frame assembly with C-clamp to body clevis or fin lug at replacement location.
    (3) Apply potting compound around P-112-16-1.2530 and P48-16-1/2 bushings through port holes in washers under head of -609 potting pins and through slots in frame under screws securing potting pins on opposite side of frame assembly until cavities are filled.

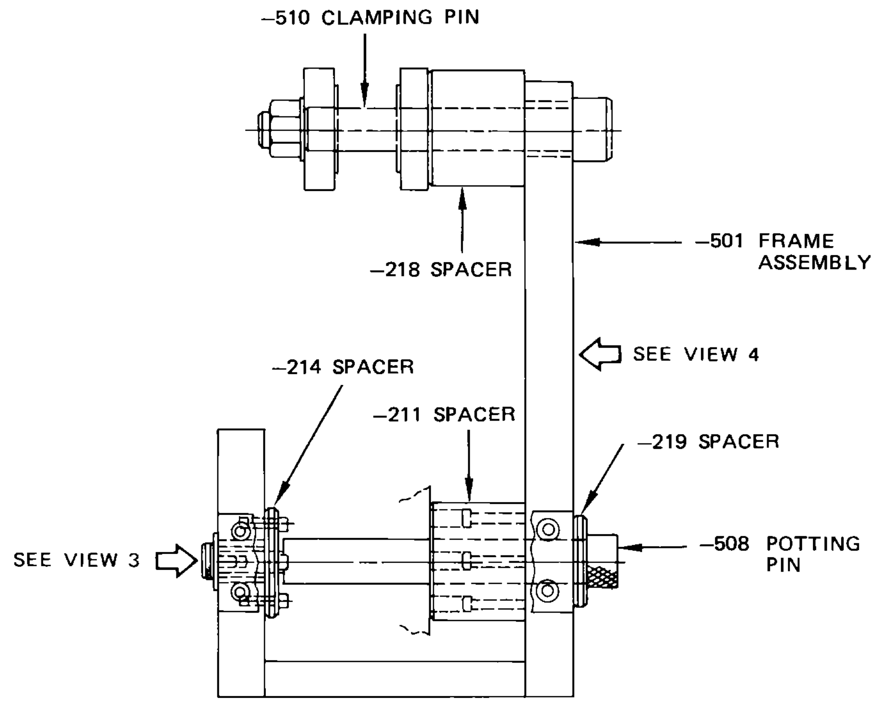
    <u>NOTE</u>: If bushings are to be replaced in lug and clevis at same location, tool need only to be potted to spar lug or clevis, then used for its mate.

    (4) Remove tool assembly after potting compound is cured and firmly set.

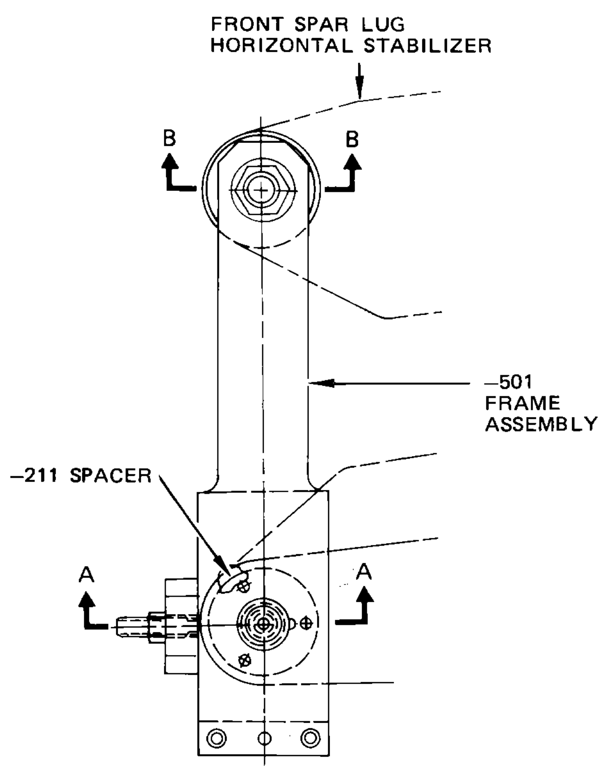
C. Ream oversize holes in clevis or lug.
    (1) Before removing existing defective bushings, measure and record the distance between the defective flange bushing face and clevis or lug. Mark the location of this measurement on the clevis or lug so that a repeated measurement can be obtained for the new bushing.
    (2) Remove existing defective bushing from production part. Use CJ107 slide hammer and either -126 or -525 slide hammer adapter. If bushing is being removed from clevis, remove remaining bushing using -125 bushing removal pin.



Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 1)



VIEW 2



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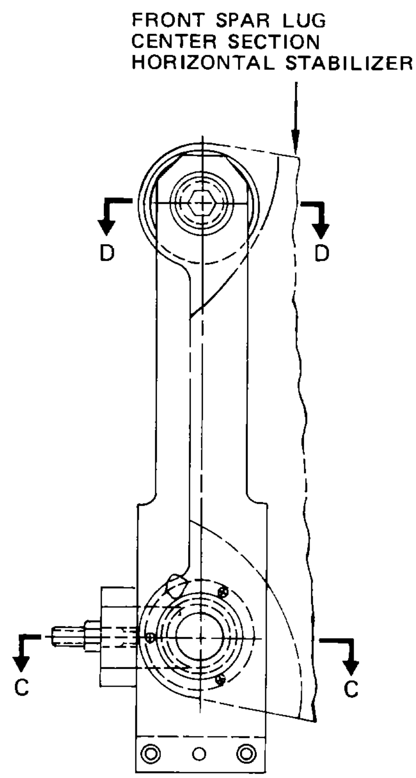
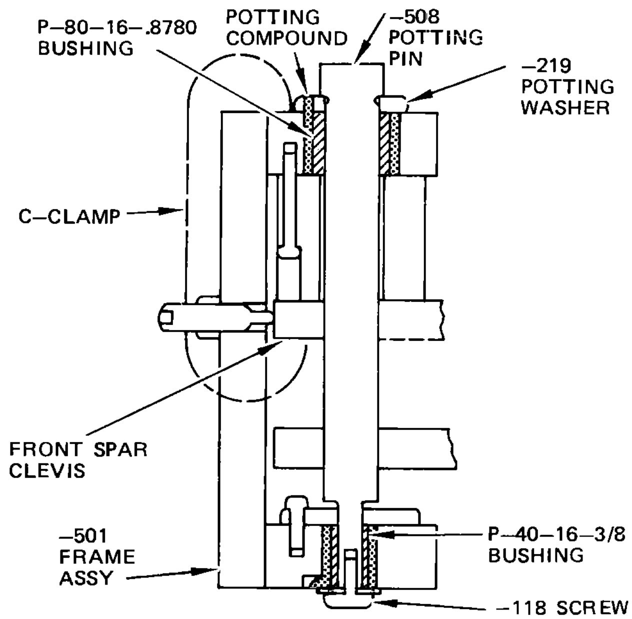
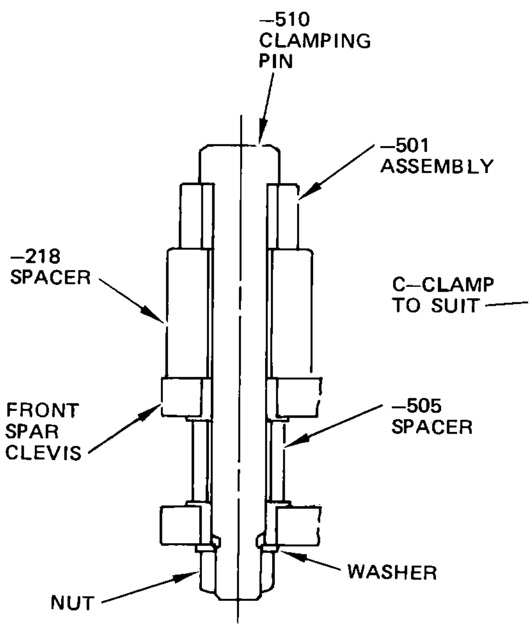


VIEW 4

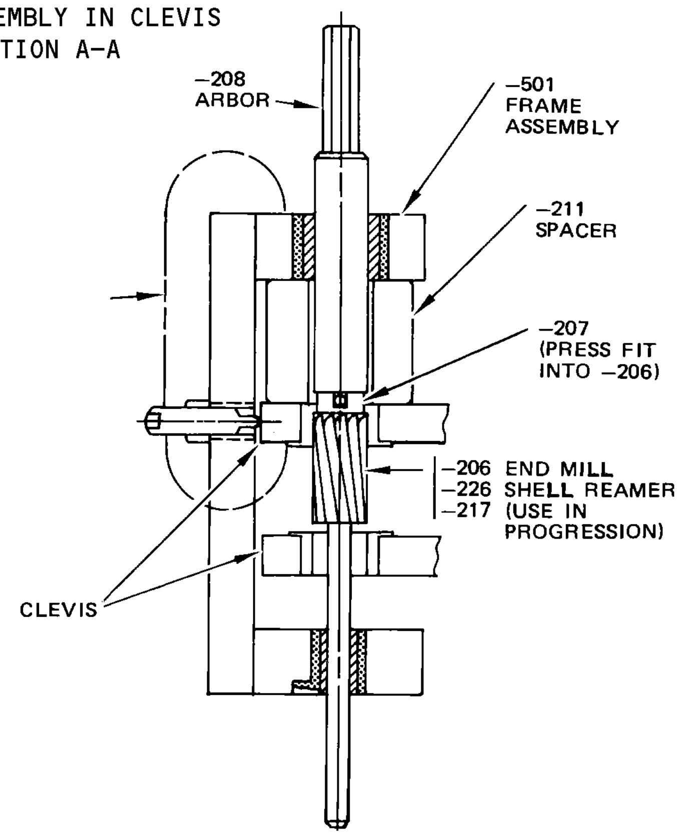
Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 2)



POTTING OF BUSHINGS IN
FRAME ASSEMBLY IN CLEVIS
SECTION A-A

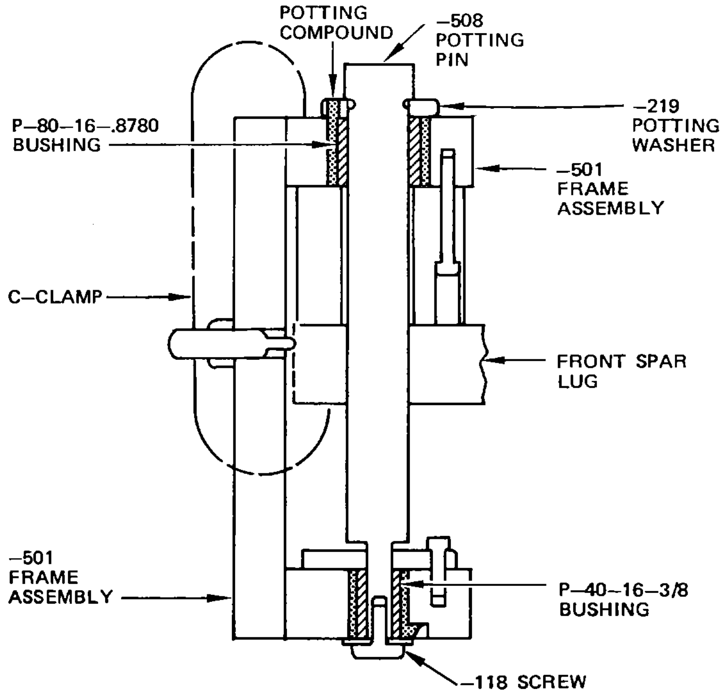


(VIEW SHOWING END HELD
IN PLACE FOR CLEVIS)
SECTION B-B

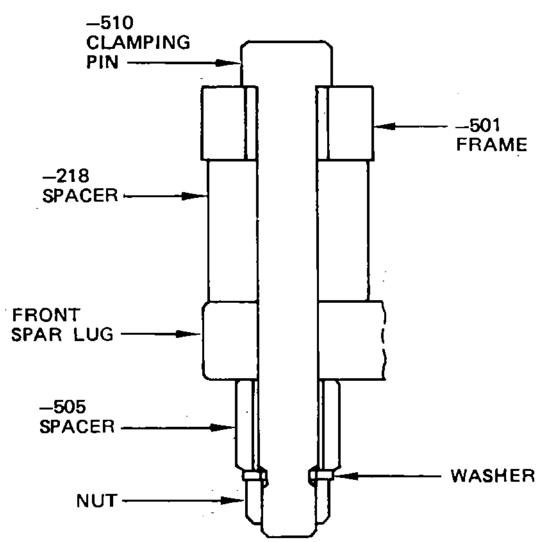


REAMING OF NEW FLANGE BUSHING IN
LUG OR CLEVIS - CLEVIS SHOWN
SECTION A-A

Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 3)

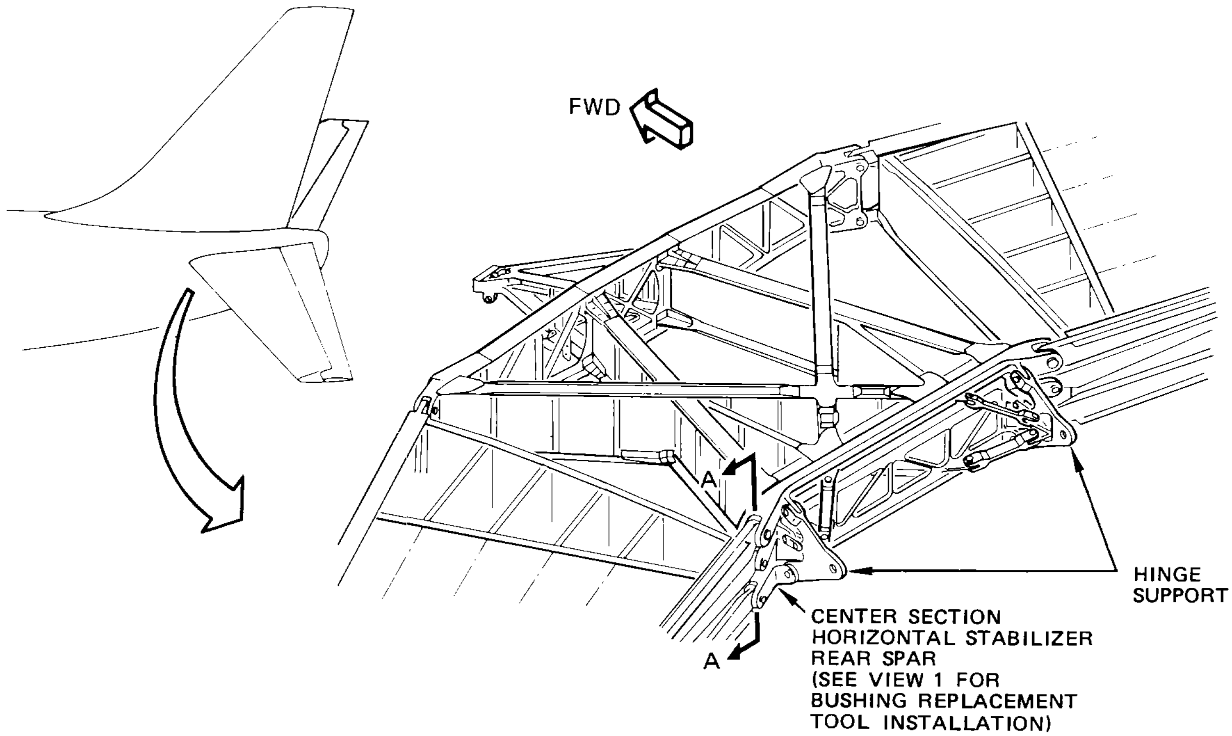


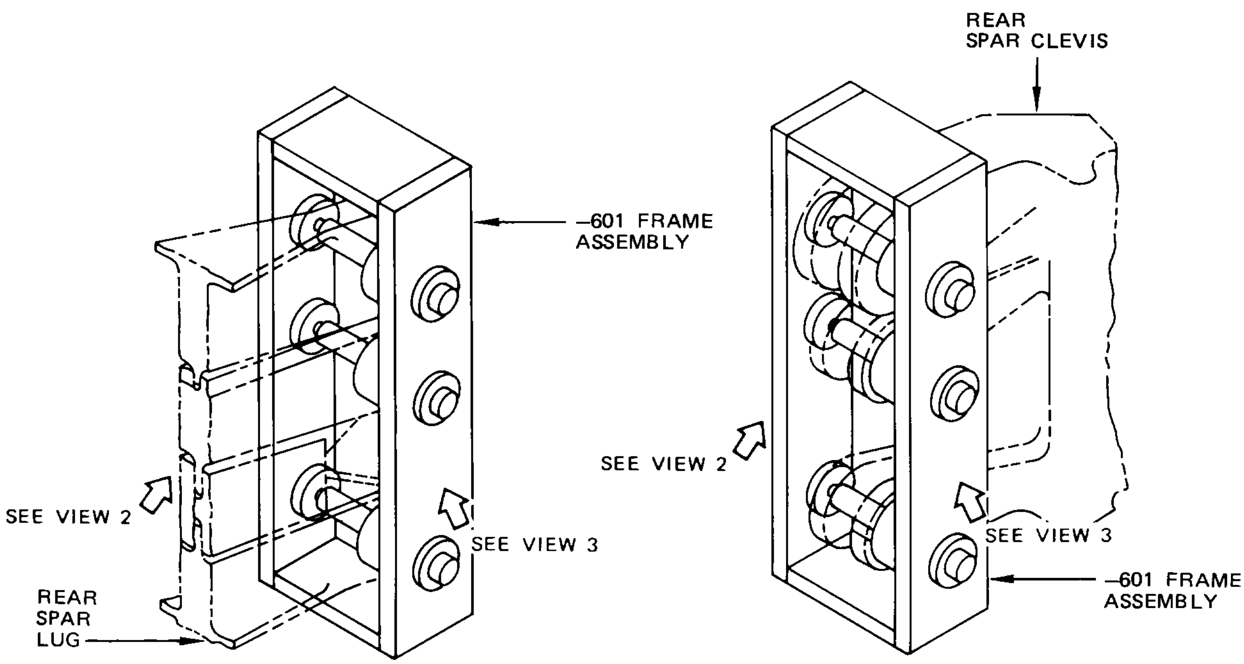
(POTTING OF BUSHINGS P-40-16-3/8
AND P-80-16-.8780 IN FRAME
ASSEMBLY FOR CLEVIS)
SECTION C-C



(VIEW SHOWING END
HELD IN PLACE FOR LUG)
SECTION D-D

Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 4)

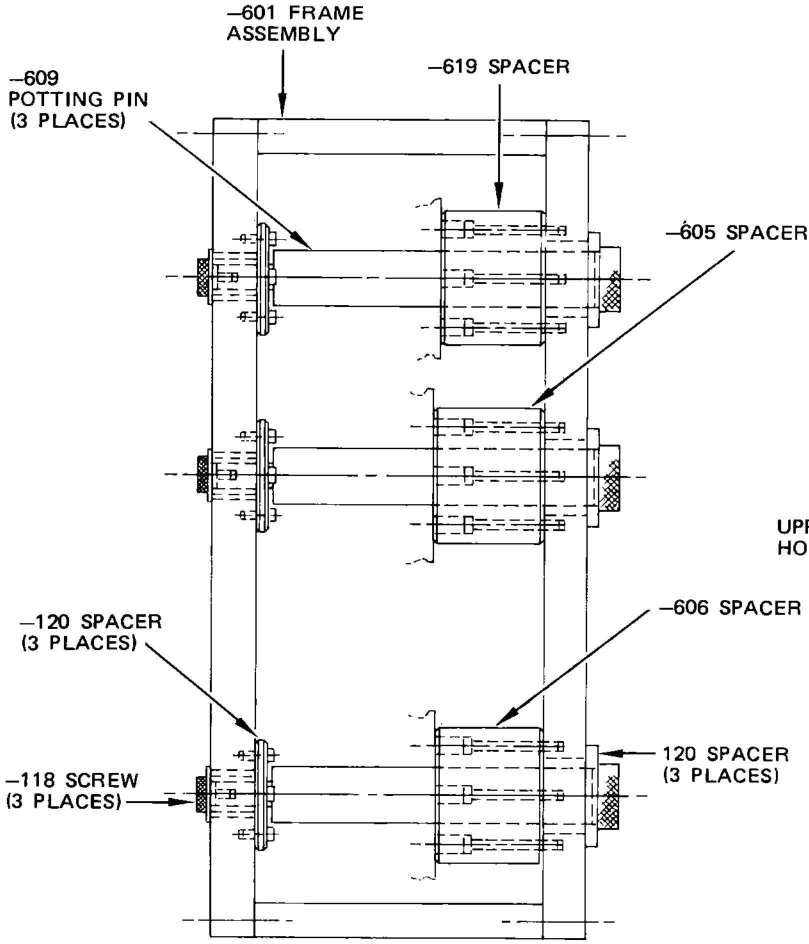




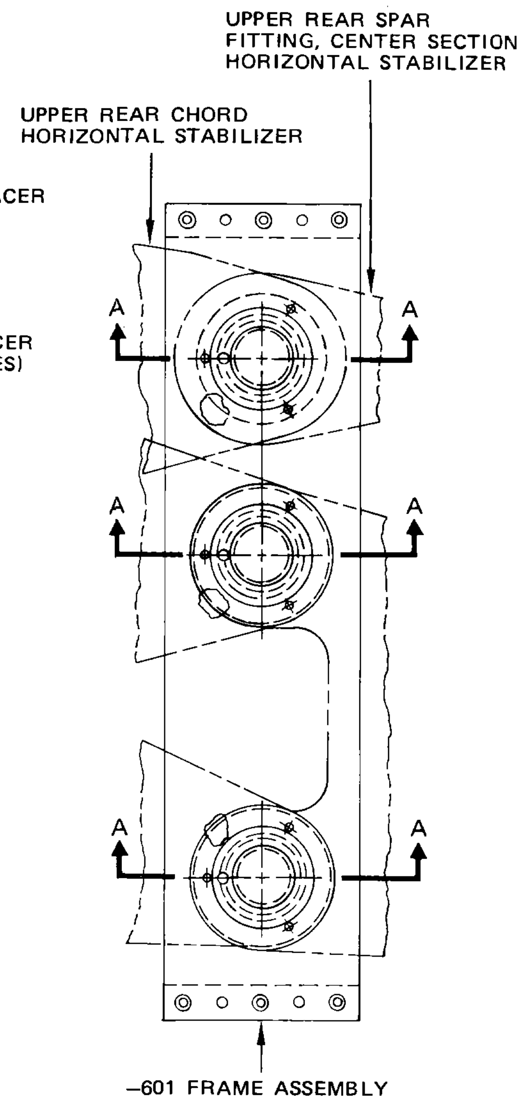
TYPICAL INSTALLATION OF
BUSHING REPLACEMENT TOOL

VIEW 1

Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 5)

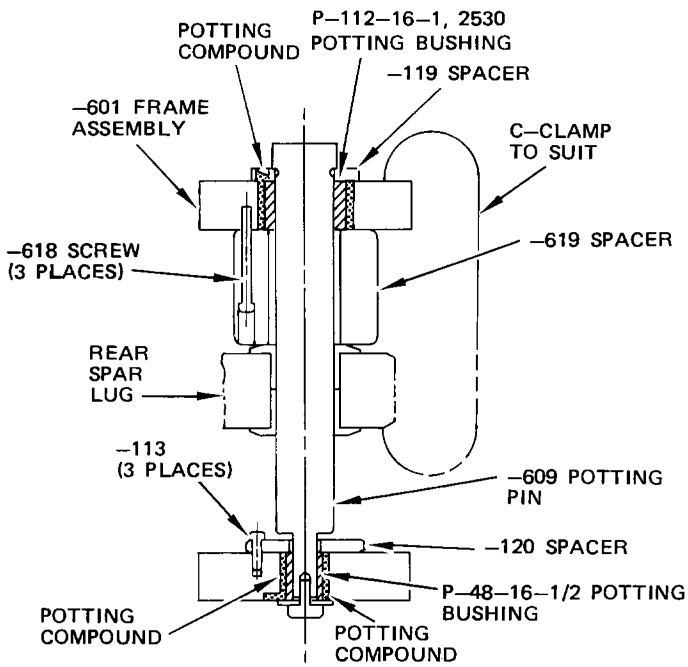


VIEW 2

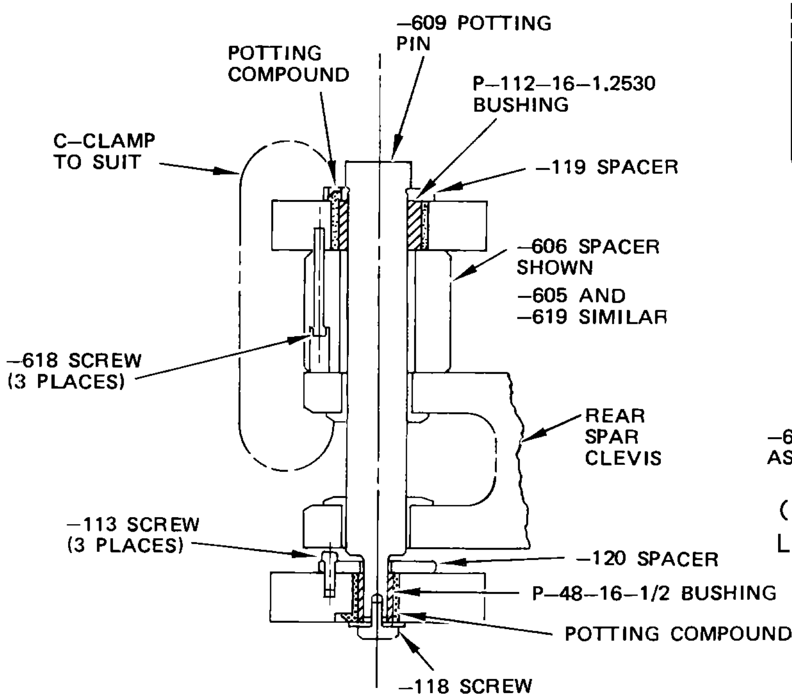


VIEW 3

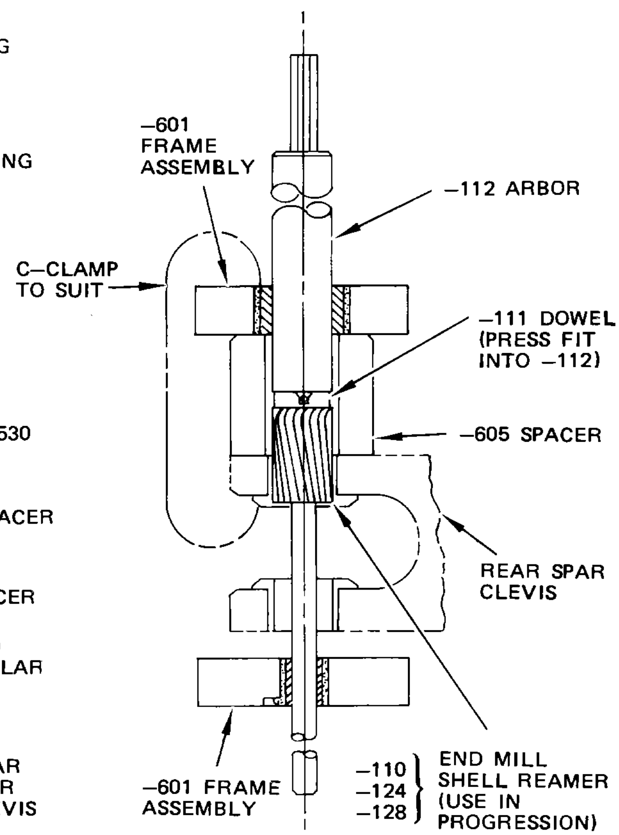
Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 6)



(POTTING OF BUSHINGS IN -601 FRAME FOR LUG FITTING)
SECTION A-A

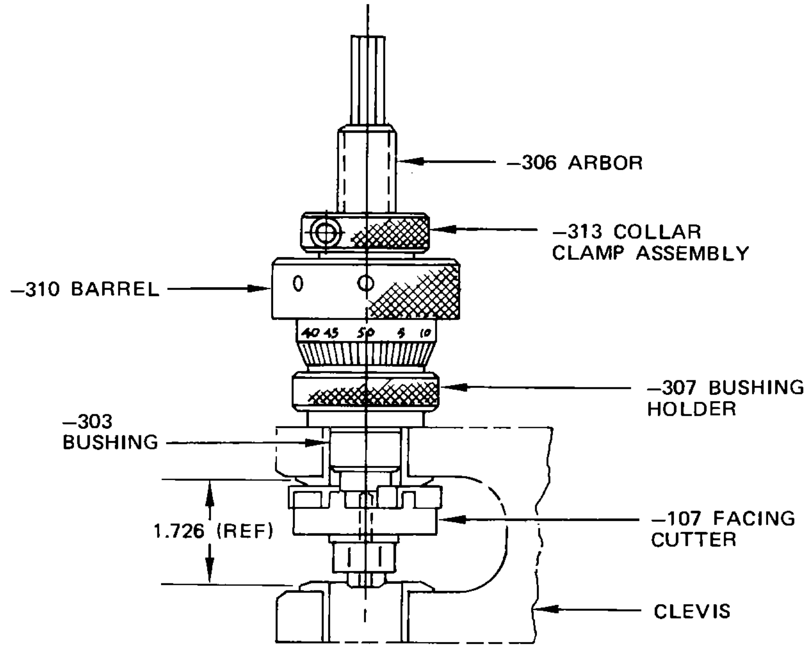


(POTTING OF BUSINGS IN -601 FRAME FOR CLEVIS FITTING)
SECTION A-A

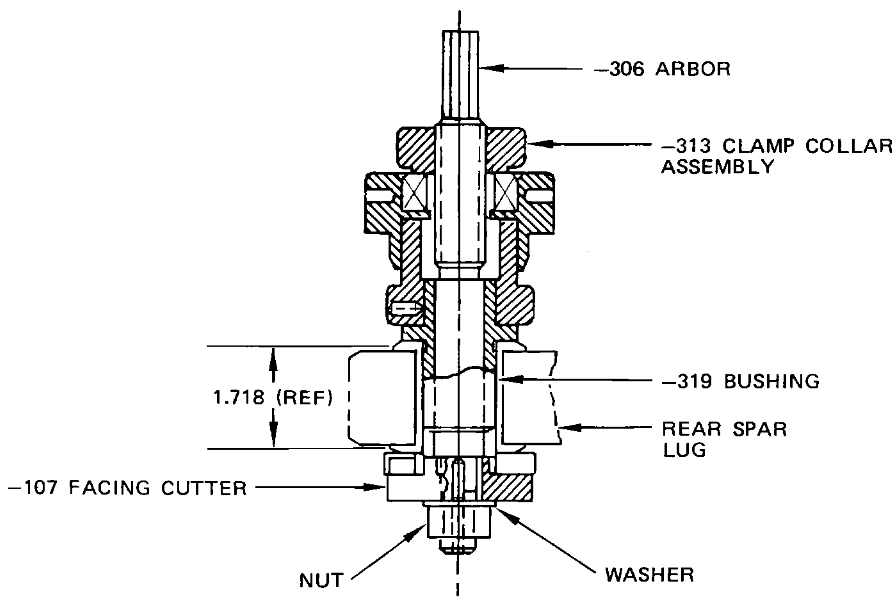


(REAMING OF NEW BUSHING IN LUG OR CLEVIS - CLEVIS SHOWN)
SECTION A-A

Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 7)



(VIEW SHOWING MACHINING
NEW BUSHING FLANGE IN CLEVIS)
SECTION A-A

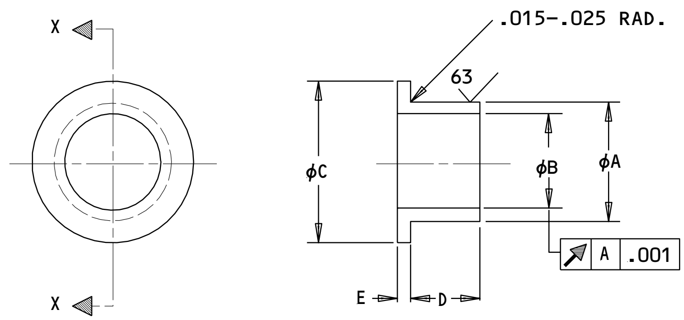


(VIEW SHOWING MACHINING
NEW BUSHING FLANGE IN LUG)
SECTION A-A

Horizontal Stabilizer to Body Center Section
Figure 801 (Sheet 8)

LOCATION	DIA A	DIA B	DIA C	DIM D	DIM E	MATERIAL	FITTING BORE	REPLACES PART NO.	FITTING PART NO.
STAB.F.SPAR-UPP.& LWR. 3 5 6 7	1.1272 1.1265	0.787 0.786	1.71 1.69	0.525 0.520	0.06 0.055	CRES. 2	1.1258 1.1250	69-38967 -9	65-50581 65-50582
STAB.R.SPAR-UPR CTR & LWR. 3 5 6 7	1.5026 1.5017	1.162 1.161	2.31 2.29	0.740 0.735	0.16 0.14	CRES. 2	1.5008 1.5000	69-38967 -10	65-50578 65-50579 65-50580
CTR.SECT.R.SPAR-UPP. 4 6 7	1.5026 1.5017	1.162 1.161	2.31 2.29	0.847 0.842 0.695 0.690 8	0.16 0.14	AL.NI.BR. 1	1.5008 1.5000	69-38967 -502	65-49925
CTR.SECT.R.SPAR-CTR. 4 6 7	1.4714 1.4705	1.162 1.161	2.31 2.29	0.695 0.690	0.16 0.14	AL.NI.BR. 1	1.4696 1.4688	-4	65-49927
CTR.SECT.R.SPAR-LWR. 4 6 7	1.5026 1.5017	1.162 1.161	2.31 2.29	0.765 0.760	0.16 0.14	AL.NI.BR. 1	1.5000	69-38967 -11	65-49927
CTR.SECT.F.SPAR-UPP & LWR. 4 6 7	1.1272 1.1265	0.787 0.786	1.71 1.69	0.520 0.515	0.046 0.041	AL.NI.BR. 1	1.1258 1.1250	69-38967 -501	65-47596

NOTE: ALL DIMENSIONS ARE IN INCHES.



SECTION X-X

1 AL.NI.BR.- AMS 4640

2 CRES 15-5PH PER AMS5659 SOLUTION TREATED

3 HEAT TREAT CRES BUSHINGS TO 180-200 KSI PER BAC5619

4 PENETRANT INSPECT AL.NI.BR. BUSHINGS PER BAC5423 PRIOR TO PLATING

5 MAGNETIC PARTICAL INSPECT CRES BUSHINGS PER BAC5424 CL.C

6 CADMIUM PLATE ALL SURFACES, BORE OPTIONAL, TO MEET THE REQUIREMENTS OF QQ-P-416 (REF OVERHAUL MANUAL, 20-42-05)

7 MACHINE FINISH 125M INCHES AA EXCEPT AS NOTED

8 ON EARLY AIRPLANES

Replacement Bushing Fabrication
Figure 802

(3) Mask or shield structure to prevent contamination with abrasive materials during abrasive blast cleaning or with shot during shot peening.

CAUTION: FOREIGN PARTICLES MAY CAUSE CORROSION TO STRUCTURE.

(4) Clean and deburr holes and adjacent surfaces thoroughly.
(5) Oversize hole with Quickset reamer to minimum oversize in 0.010 inch increments up to maximum allowable to achieve corrosion removal (Ref Fig. 803 for maximum bore oversize). Contact Boeing if corrosion still exists.
(6) Spotface the forward and aft faces of the lug fittings to provide a seat for the bushing flange to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Spotface the inner faces of the clevis to provide a seat for the bushing flange to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Spotface the outer faces of the clevis flanges to provide a seat for the bolt head or the washer to a maximum depth of 0.015 inch and a corner radius of 0.12 to 0.13 inch. Contact Boeing if corrosion still exists in the lug holes or on spotfaced surfaces. Remove the corrosion products from other areas of the lug per Structural Repair Manual, Chapter 51. Do not use chemical removal if the solution can penetrate the fay surfaces. Use chemical or dry abrasive surface.
(7) Shot peen holes and spotfaced surfaces as follows:
   (a) Shot peen (flap peen optional) minimum flat diameter of spot face per Overhaul Manual, Section 20-10-03. On aluminum parts, use shot number 230 to 550, intensity 0.014A, coverage 2.0. On steel parts, use shot number 170 to 460, intensity 0.016A, coverage 2.0.
   (b) Shot peen (flap peen optional) hole in clevis or lug per Overhaul Manual, Section 20-10-03. For aluminum parts use shot number 230 to 550, intensity 0.014A, coverage 2.0. For steel parts, use shot number 170 to 460, intensity 0.016A, coverage 2.0.
   (c) Hone inside diameter maximum of 0.0004 inch with 63 microinch finish to achieve final hole size.
(8) Finish hole of steel parts with two coats of primer or chemically treat hole in aluminum parts to meet requirements of MIL-C-5541 (colored film) and apply one coat of primer. Allow to dry one hour minimum.
(9) Finish spotface and reworked surfaces of lugs (except holes) with manual application of colored chemical coating per BAC5719 and apply two coats of primer.

D. Ream inside diameter of new flanged bushing.
(1) Fabricate oversize bushing per Fig. 803 for interference fit with lug or clevis inside diameter.
(2) Shrink fit bushing in lug with wet primer. Use -230 bushing installation tool.

(3) Secure -601 tool frame assembly to rear spar as shown with -619 potting pin installed per View 1 or View 2 at the two unaltered holes and C-clamp as shown.
(4) Proceed to ream new bushings with -112 arbor (-111 dowel press fit into -112 arbor) and -110 shell reamer. Continue to ream bushing using -124 reamer and -128 standard reamer provided.
(5) Hone internal diameter of bushing to diameter of 1.2530 to 1.2540 inches with machine finish 63 microinches AA. Use - 610 hone for this location.

E. Machine new bushing flanges.
(1) Remove -610 tool frame assembly from rear spar.
(2) After completion of bushing replacement per par. D, measure and record the distance between the new bushing flange face and clevis or lug in the same marked location. Subtract the previous measurement from this new measurement to obtain the amount of material to remove from the flange.
(3) Set up flange machining operation as shown and proceed as follows:
(a) Rotate -310 micrometer barrel assembly counterclockwise from bottomed out position to the "40" mark (or 10 graduations = 0.10 inch travel).
(b) With -107 facing cutter in place, rotate cutter by hand and advance -313 collar clamp assembly until cutter makes contact with highest point on the new bushing flange. Tighten setscrew in -313 collar clamp assembly to hold arbor firmly.
(c) Rotate micrometer barrel clockwise back to bottomed setting (this will give an additional 0.10 inch of clearance).
(d) Proceed to spotface by backing off (counterclockwise) barrel assembly until amount of material determined in step E (2) is removed.

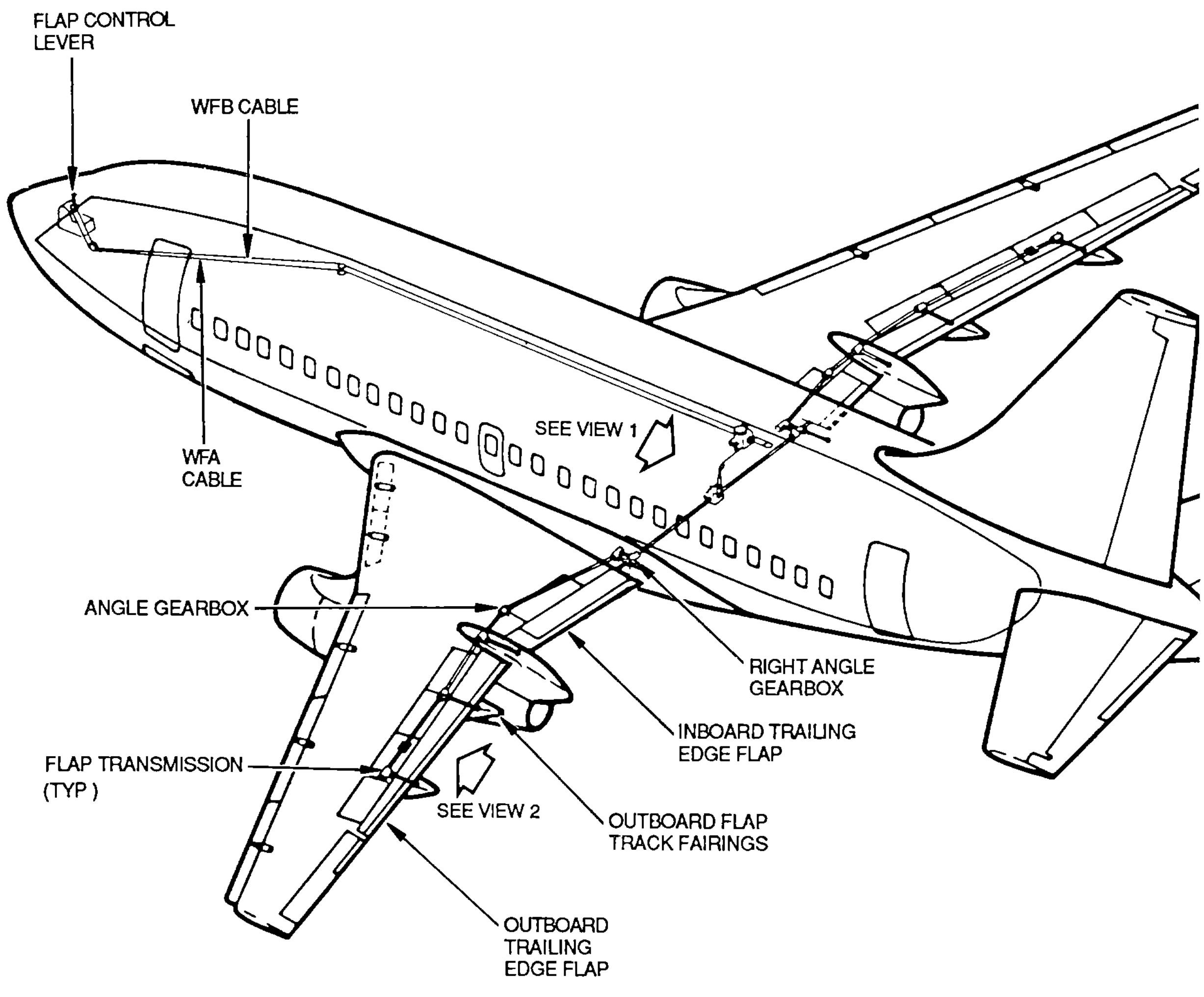
NOTE: Make readings periodically to prevent overtravel.

(e) Reverse set-up to spotface opposing flange to engineering specified dimension between bushing faces.
(f) Finish spotface surfaces per Fig. 803.
(4) Fillet seal around flange outside diameter and void at end of bushing with sealant. Apply primer topcoat over sealant.

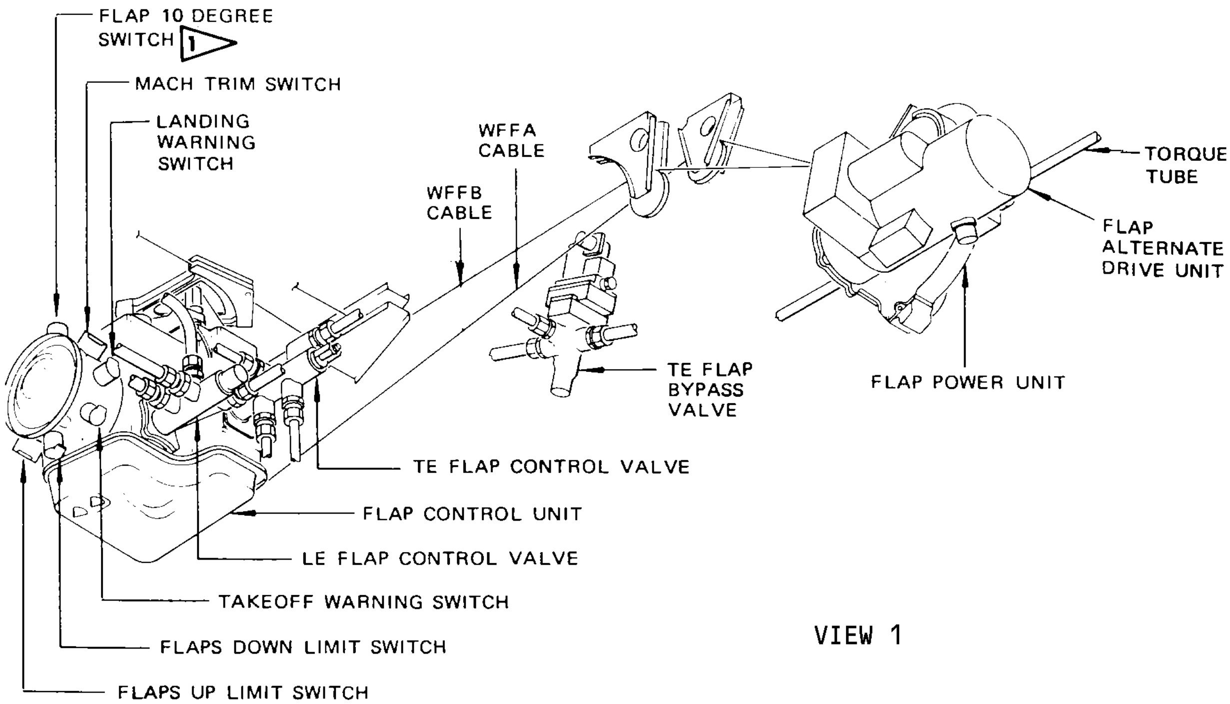
F. Install horizontal stabilizer (Ref 27-41-11).

TRAILING EDGE FLAP SYSTEM - DESCRIPTION AND OPERATION

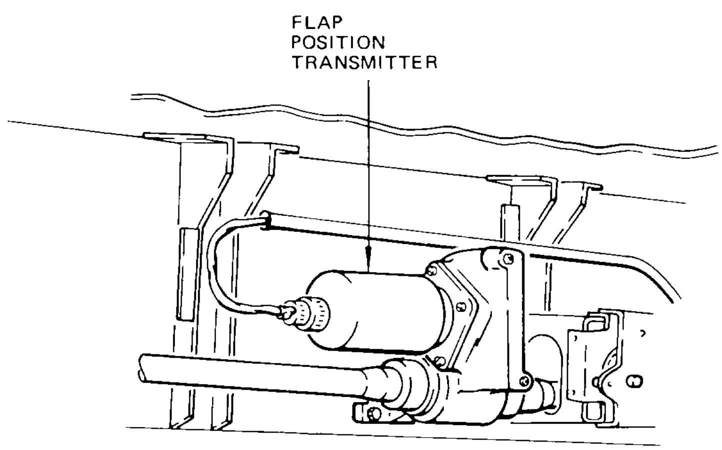
1. General
   A. The trailing edge flap system provides additional lift during takeoff and landing by increasing the camber of the wing. This is accomplished with four triple-slotted trailing edge flaps operating in conjunction with four leading edge flaps and six leading edge slats. (See figure 1.) Refer to 27-81-0, Leading Edge Flaps and Slats, for details of the leading edge devices.
   B. Each trailing edge flap is a triple-slotted structure consisting of a foreflap, a midflap and an aftflap. Each midflap is connected to two flap carriages that travel on tracks attached to the lower wing surface. The flaps are faired with the wing when retracted and are mechanically separated to form slots when extended. The slots provide increased lift by reducing stagnation of air flowing over the flap surface. With the flaps extended, the area of the flaps is greatly increased.
   C. The trailing edge flaps are actuated either hydraulically or electrically by one drive system (Fig. 1). During normal operation, the flap drive system is hydraulically powered. During alternate flap operation, the drive system is electrically powered. Each trailing edge flap is actuated by two flap transmission assemblies. A friction brake installed in the inboard transmission assembly on each flap prevents flap retraction due to airloads. Eight transmission assemblies are connected through torque tubes and gearboxes to a flap power unit. Both the hydraulic and electric drive motors are attached to the power unit. The flap system is normally controlled by a manually operated flap lever on the pilots' control stand. The lever operates a cable system connected to a quadrant on a control valve mechanism. The control valve supplies system A hydraulic fluid to the flap hydraulic motor to drive the flap system. A flow limiting valve installed upstream of the control valve regulates the speed of the hydraulic motor by limiting fluid flow. Mechanical follow-up is incorporated in the flap system to close the control valve when the flaps reach the desired position.
   D. The flap alternate drive system may be used if the flaps cannot be operated hydraulically. Flap alternate system operation is controlled by the alternate flaps arm switch and control switch on the overhead panel. Energizing the alternate flaps arm switch supplies power to actuate a motor operated bypass valve. Actuating the valve to the bypass position interconnects the inlet ports on the flap hydraulic motor. This allows fluid to circulate within the motor, thus preventing a hydraulic lock opposing alternate flap operation. The alternate flaps control switch is used to actuate the flaps down and up electrically.



Trailing Edge Flap System Component Location
Figure 1 (Sheet 1)



VIEW 1



VIEW 2

1 AR LV-JTD, LV-JTO, LV-LEB AND ON

EF ALL EXCEPT B2601, B2603, B2607

NA ZK-NAM AND ON

Trailing Edge Flap System Component Location
Figure 1 (Sheet 2)

2. Trailing Edge Flap

A. Each trailing edge flap consists of a midflap, a foreflap and an aftflap. The three flap segments are mechanically separated during flap extension. Each trailing edge flap is supported by two flap carriages which travel on tracks mounted under the wing. The trailing edge flap is driven by two transmission assemblies that attach to the midflap.

B. Inboard Midflap

(1) The inboard midflap consists of ribs, three spars, a honeycomb trailing edge and clad aluminum skins. A hinged flap segment is attached to the outboard edge of the midflap. Four tracks mounted on the rear spar of the midflap support the aftflap. A drive mechanism for the aftflap is contained in the midflap. The drive mechanism consists of a cable drum with cam slot, a bellcrank with cam follower, a slave bellcrank, two pushrods, an actuating mechanism boom, an actuating cable support fitting and connecting cables (Fig. 2). The actuating mechanism boom, which pivots about a bracket on the inboard flap track, is not structurally attached to the midflap. The actuating cable support fitting is mounted on the inboard midflap carriage. The remaining components of the drive mechanism are contained in the midflap between the front spar and midspar. A cable mounted at each end of the boom passes over the actuating cable support fitting and attaches to the inboard cable drum. A cam follower on the inboard bellcrank rides in the cable drum cam slot. The slave bellcrank is connected to the inboard bellcrank by two cables. As the midflap moves, the aftflap drive mechanism is actuated by the change in relative position between the actuating mechanism boom and the actuating cable support fitting. The inboard bellcrank and slave bellcrank provide aft flap motion through the aftflap pushrods.

(2) The midflap is supported by two flap carriages which ride on the main flap tracks. A tubular support at each end of the flap attaches the flap to the carriages. The carriages are steel forgings to which roller bearings are attached. Four rollers on each carriage support the flap on the flap track. Two side load rollers provide lateral alignment of the carriage on the flap track. A cam track in which the foreflap toggle assembly rides is attached to the carriage.

C. Outboard Midflap

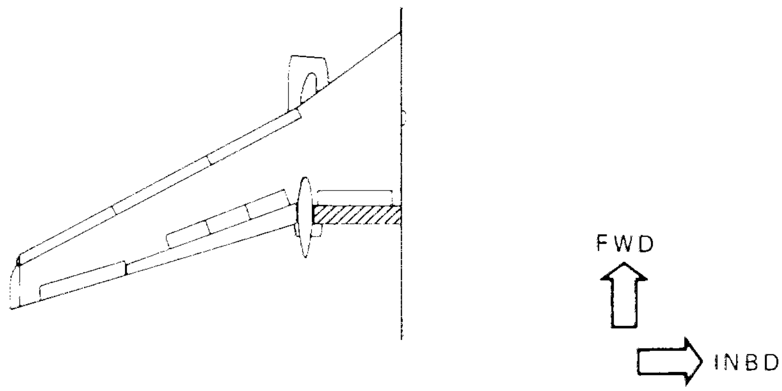
(1) The outboard midflap consists of ribs, two spars, a trailing edge beam, two honeycomb trailing edge panels and clad aluminum skins. A hinged flap segment is attached to the inboard edge of the midflap. Four tracks mounted on the rear spar protrude through the trailing edge beam to support the aftflap. (See figure 3.)

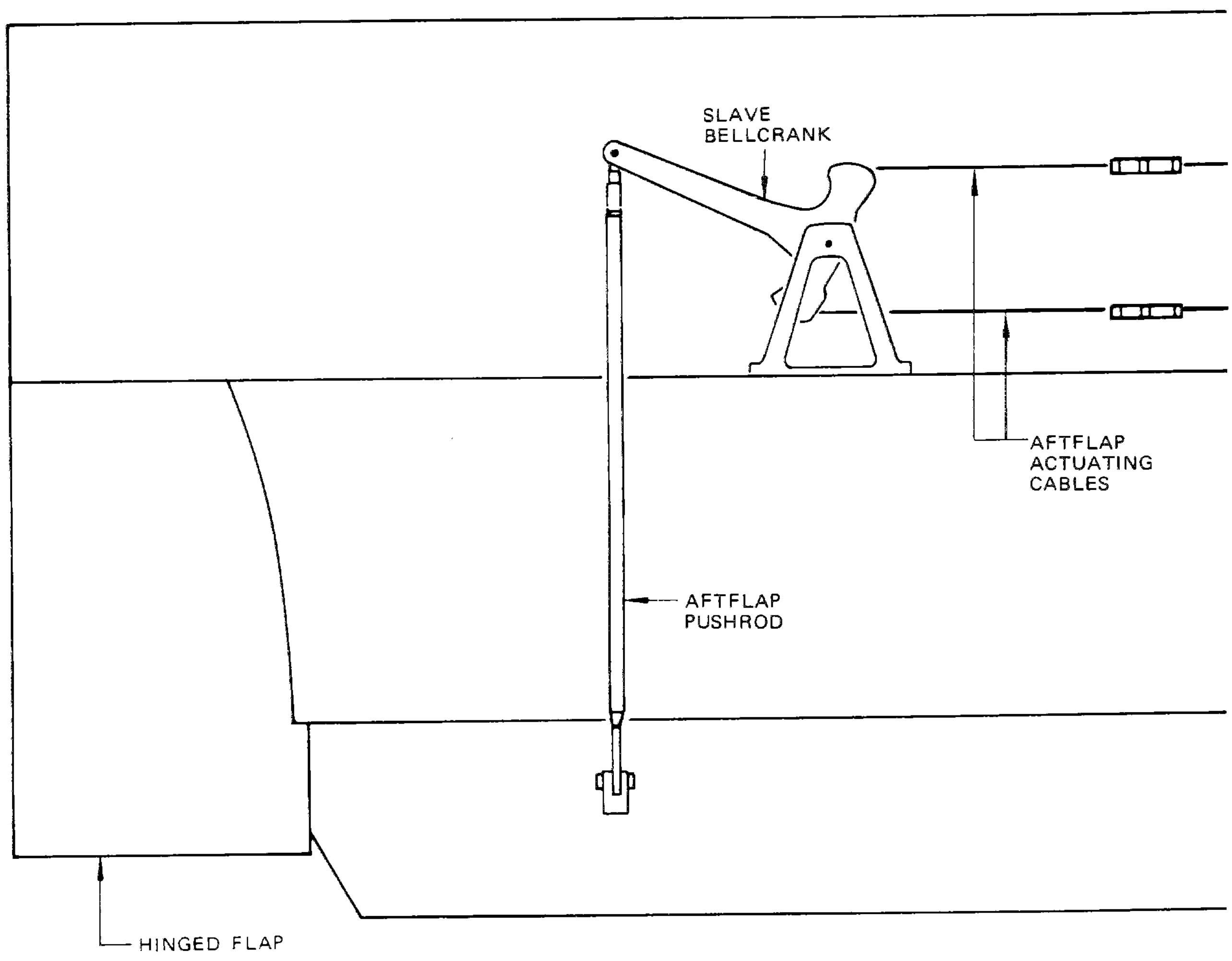
(2) Carriage support fittings located between the two flap spars connect the midflap to two flap carriages. The carriages are steel forgings to which roller bearings are attached. Four rollers on each carriage assembly support the flap on the flap track. Two side load rollers provide lateral alignment of the carriage on the flap track. A detent on each side of the carriage retains the foreflap toggle during the first segment of flap extension. A flap track fairing support fitting is mounted on the lower surface of the carriage. Roller bearings on the support fitting engage a track on the flap track fairing.

D. The foreflap is a monospar structure with a honeycomb trailing edge panel and clad aluminum skins. Three curved support beams extend through the lower surface and connect to three foreflap tracks. The foreflap tracks slide on roller bearings mounted to midflap structure. On the inboard foreflap, a toggle assembly is attached to a torque tube at each end of the foreflap. On the outboard foreflap, two toggle assemblies attach to fittings on the lower surface.

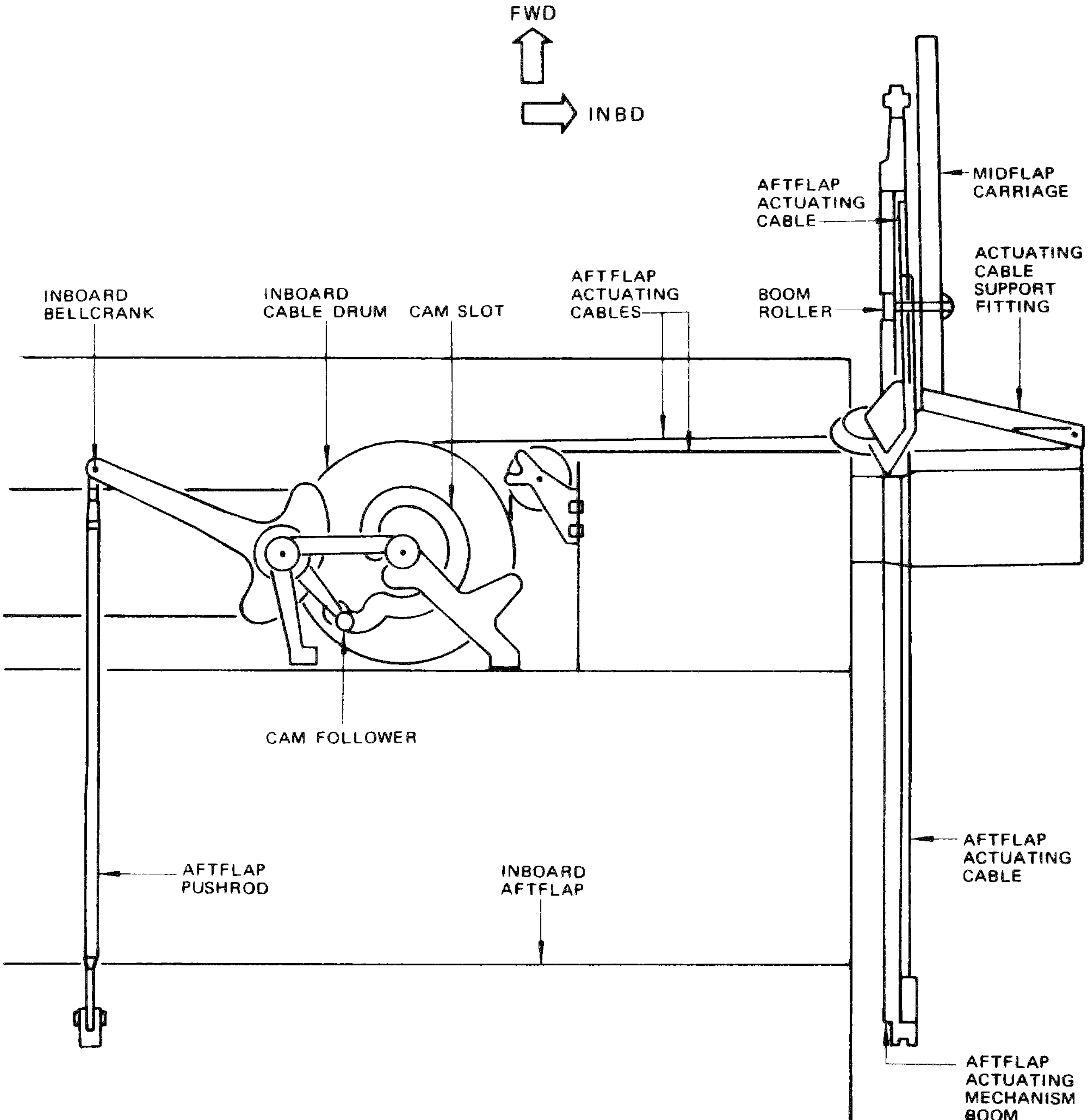
E. The aftflap is also a monospar structure with a honeycomb trailing edge panel and clad aluminum skins. Four carriages are installed on the leading edge of the aftflap. Each carriage consists of two roller supports, four eccentric bushings and eight roller bearings. The carriages roll along curved tracks mounted on the rear spar of the midflap. Four of the roller bearings are supported by the eccentric bushings. Two aftflap drive mechanism pushrods attach to the leading edge of the aftflap.

F. Each trailing edge flap is driven by two transmission assemblies attached to the midflap. (See figure 1.) As the flaps extend, the aftflap immediately moves relative to the midflap to form a slot between the two segments. The inboard aftflap is actuated by the drive mechanism contained in the midflap. (See figure 2.) Midflap extension rotates the aftflap drive mechanism cable drum. Rotation of the cable drum moves the bellcranks to which the aftflap pushrods are attached, thus positioning the aftflap. The outboard aftflap is actuated by a drive mechanism contained in each of the two flap track fairings. (See figure 3.) Each drive mechanism consists of a fairing support arm with cam follower, two fairing cam tracks, a bellcrank cam track, a bellcrank with cam follower and an aftflap pushrod. The fairing support arm is rigidly attached to the midflap carriage. The bellcrank is mounted on, and pivots about, the fairing support arm. The bellcrank cam track, and the fairing cam tracks are mounted in the flap track aft fairing. Motion of the midflap moves the fairing support arm cam follower in the fairing cam tracks, causing the flap track aft fairing to pivot.

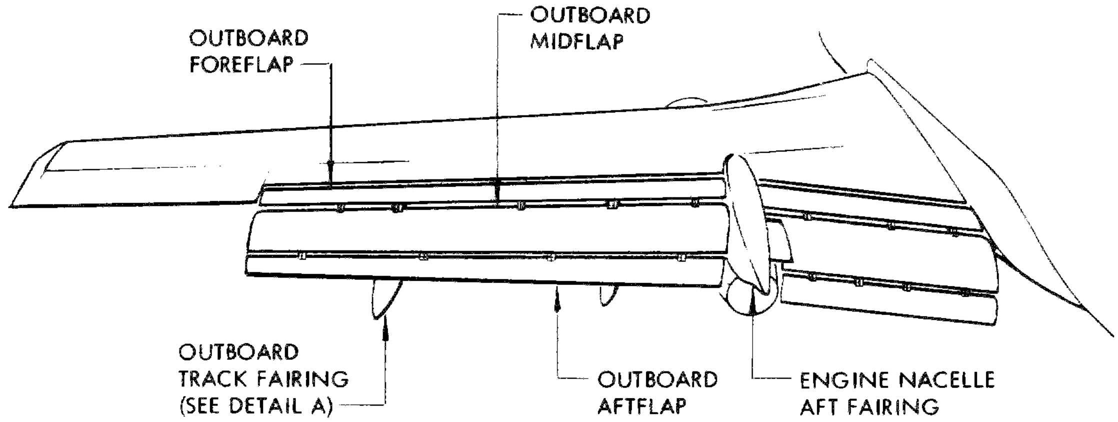


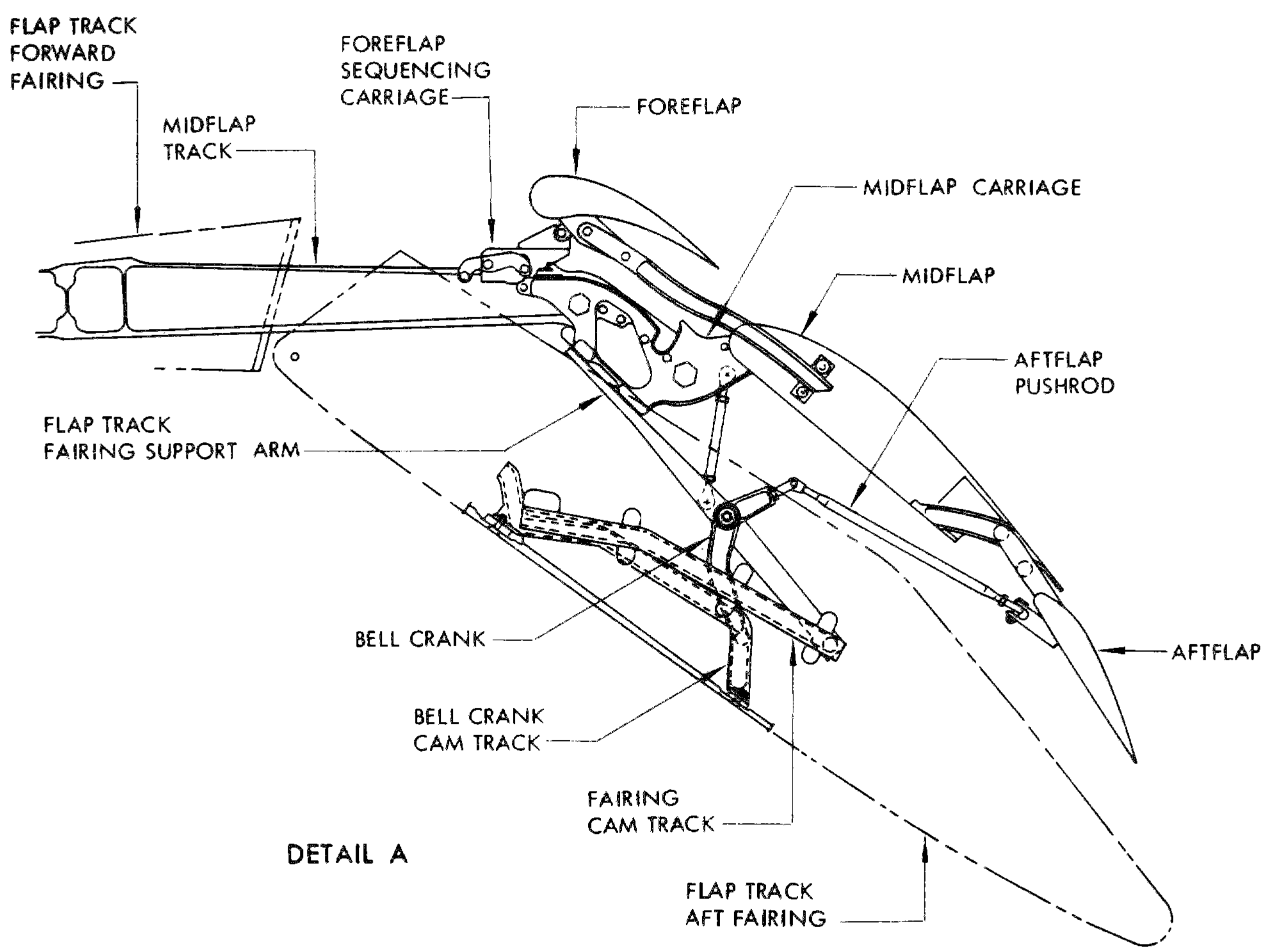


Inboard Trailing Edge Aftflap Drive Mechanism
Figure 2 (Sheet 1)



Inboard Trailing Edge Aftflap Drive Mechanism
Figure 2 (Sheet 2)





Outboard Trailing Edge Aftflap Drive Mechanism
Figure 3

G. Fairing pivots, the bell crank cam track repositions the bell crank. This moves the aftflap pushrod to actuate the aftflap. The foreflap is actuated by foreflap toggle assemblies. The toggle assemblies ride on the corresponding midflap carriages until the midflap reaches the 8 unit position. At this point, aft movement of the toggle assembly is stopped by a lug protruding from the upper surface of the flap track. The forward roller bearing on the toggle assembly drops in a detent on the flap track locking the foreflap into position. As the midflap continues to extend, a slot forms between the foreflap and midflap. As the midflap approaches full travel, the aftflap again moves relative to the midflap increasing the slot between the two segments.

H. The angle of flap extension is measured relative to the wing chord plane. When the flaps are fully retracted, the trailing edge of the aftflap is aligned with the wing chord plane. When the flaps are extended to 40 units, the angle between the wing chord plane and the midflap is approximately 43 degrees. Since the aftflap moves relative to the midflap, the aftflap rotates to an angle of approximately 69 degrees from the wing chord plane.

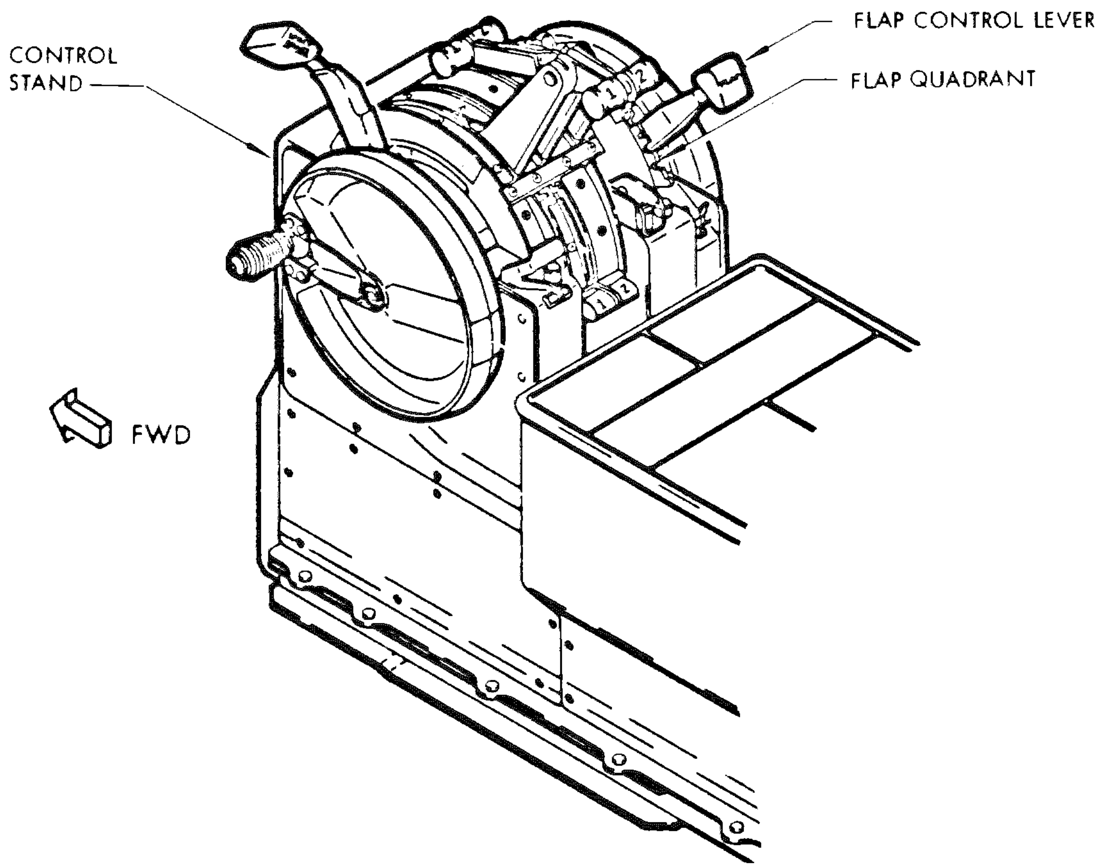
3. <u>Flap Tracks and Fairings</u>

A. The flap tracks are curved forged steel beams which are mounted on the lower surface of the wing. A flap transmission assembly is mounted on each flap track. (See figure 7.) The tracks and the transmission assemblies are housed in aerodynamic fairings.

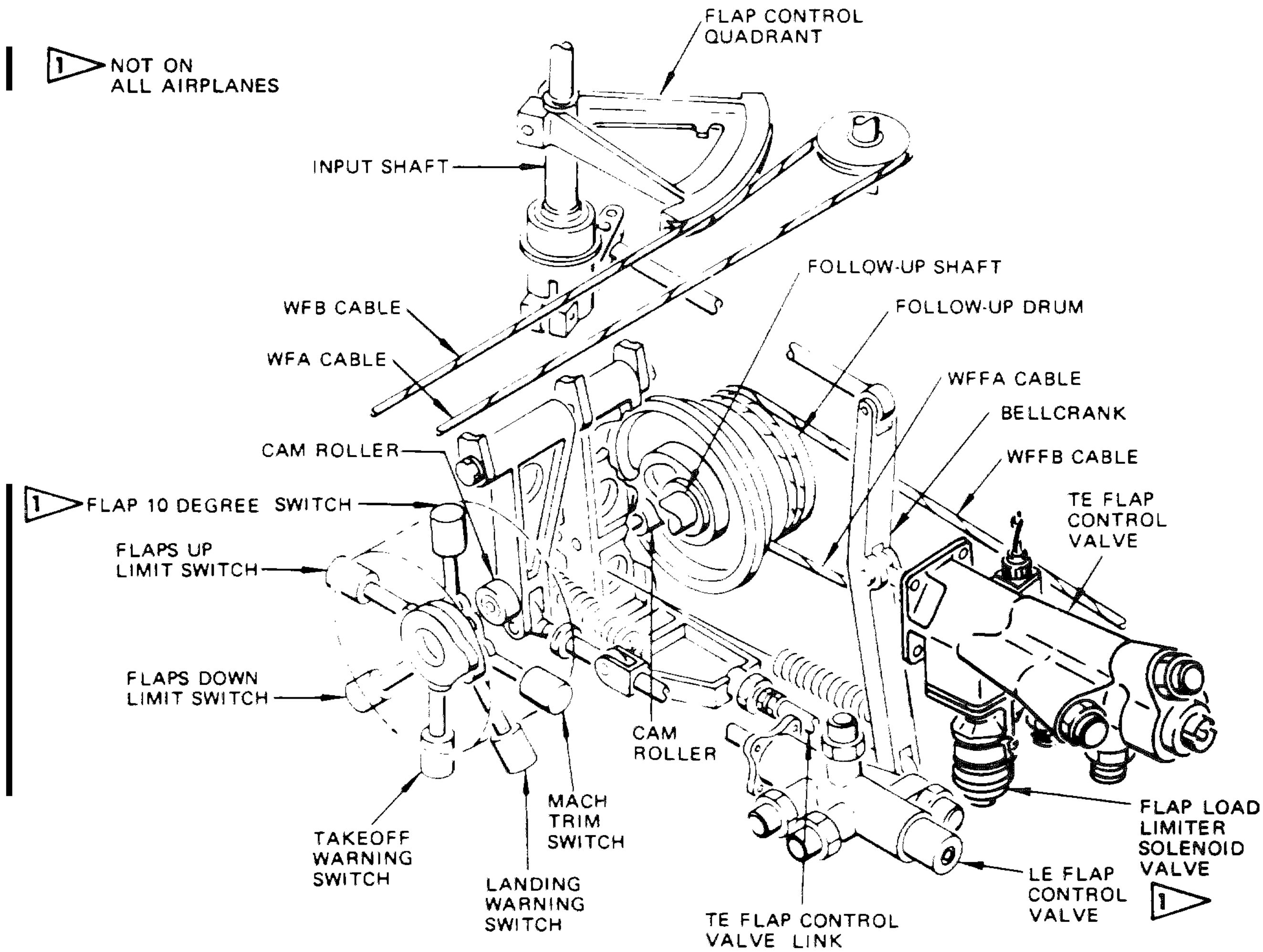
B. Each outboard flap track is contained in a two piece fairing made from aluminum frames covered with fiberglass skins. The forward section of the fairing is rigidly attached to the wing. The aft fairing section rotates about a hinge support mounted on the main flap track. Two fairing actuator tracks and an aftflap sequencing track are mounted in the aft fairing section. Rollers on a support arm on the midflap carriage engage in the two fairing actuator tracks. The tracks act as cams which rotate the aft fairing downward as the outboard flap extends. A retractable landing light mounted in the aft outboard fairing extends as the fairing rotates downward. The aftflap sequencing track is used as a cam for the aftflap actuating mechanism. The rear portion of the aft fairing is detachable.

C. The tracks for the inboard flap are contained in fixed fairings. The inboard flap outboard track is contained in the engine nacelle fairing. The inboard flap inboard track is contained in the wing to body fairing. Tubular supports between the midflap carriages and the midflap pass through openings in the fairings. The openings are curved slots which allow fore and aft motion of the midflap.

4. Flap Control Lever
   A. A flap control lever located on the upper right side of the control stand regulates the position of the trailing edge flaps (Fig. 4). The lever assembly consists of a spring-loaded telescoping handle and a cable drum. The cable drum rotates around a shaft in the control stand. A flap control cable attaches to the cable drum. The lever rotates around a quadrant, which has detents at the flap positions. The lever is spring loaded to lock in each detent. Lifting the lever about 1/4 inch releases the lock and allows rotation. The quadrant contains gates at the 1- and 15-unit detents, which prevent inadvertent lever movement past the detent position. The lever must be lowered into the detent and passed under the gate before further rotation can occur. The flap control lever actuates the cable system to drive a cable drum and flap control quadrant in the right wheel well.
5. Flap Control Unit
   A. The flap control unit contains the mechanical linkage that operates the flap control valves. The control unit consists basically of an input linkage, two cams connected by a shaft and a cable drum (Fig. 5).
   B. A flap control quadrant located directly above the flap control unit transfers cable motion through a shaft, a link and a bellcrank to position the trailing edge flap control valve slide. Pressurized fluid from the control valve drives the flap hydraulic motor. As the hydraulic motor drives the flap system, it also drives the power unit follow-up drum. Follow-up motion is transmitted by flap follow-up cables (WFFA and WFFB) to the control valve follow-up drum. Rotation of the control valve follow-up drum transmits motion through a cam, cam roller, and link to the bellcrank. Rotary motion from the bellcrank returns the control valve to the neutral position preventing fluid flow to the flap hydraulic motor. The control valve follow-up drum also transmits motion through a second cam and cam roller to control the leading edge flap control valve.
   C. The flap control unit is mounted on the right wheel well ceiling near the aft bulkhead. Mounted on the forward end of the follow-up shaft is an actuating cam for the flap limit switches, the landing gear warning horn switches, the takeoff warning switch, the mach trim switch, and on some airplanes, the flap 10-degree switch.
6. Flap Control Valve
   A. The flap control valve is a mechanically operated slide valve used to control directional movement of the trailing edge flaps. The valve is attached to the flap control unit located in the right wheel well. The control valve is driven by the control unit linkage.



Flap Control Lever
Figure 4



Flap Control Unit
Figure 5

B. The control valve consists of a housing, a sleeve and a slide assembly. Ports are provided in the housing and sleeve for passage of fluid to and from the flap hydraulic motor. Moving the valve slide outboard from its neutral position pressurizes valve port B and connects valve port A to the hydraulic system A return line. This allows the flaps to retract. When the valve slide is moved inboard from its neutral position, valve port A is pressurized and valve port B is connected to the return line. In this valve slide position, the flaps will extend. When the valve slide is in the neutral position, the flow of hydraulic fluid to the flap hydraulic motor is blocked.

C. On Cargo Airplanes;
The control valve includes a hydraulic solenoid valve activated by the flap load limiter system. The solenoid valve, when energized, repositions the flap control valve to the 30-unit position from the 40-unit position.

7. Flow Limiting Valve

A. The operating speed of the trailing edge flaps is controlled by a flow limiting valve which is installed in the pressure line to the flap control valve upstream from the valve. The valve controls the rate of fluid flow to the flap hydraulic motor. At normal temperatures with a hydraulic pressure between 200 and 3000 psi, fluid flow to the motor is regulated at 9.0 to 10.5 gpm.

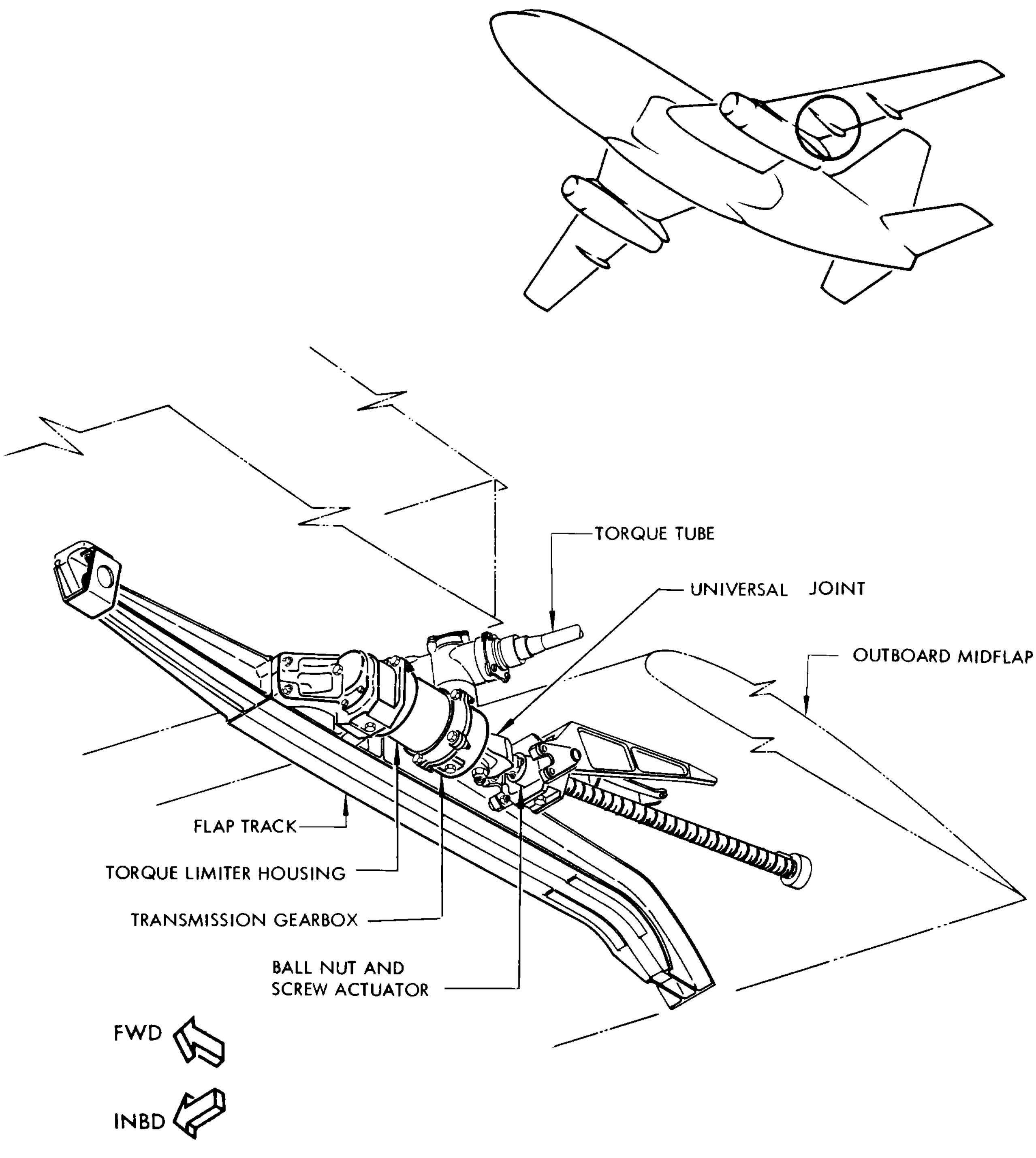
8. Flap Bypass Valve

A. The flap bypass valve is a motor-operated two position valve used to interconnect the flap hydraulic motor ports during operation of the flap alternate drive system (Fig. 1). The valve consists of a three port aluminum housing with drilled passageways and a cavity for the motor-operated valve. The flap bypass valve is mounted on the aft bulkhead in the right wheel well. Hydraulic lines extend from the bypass valve to the flap control valve and to the flap hydraulic motor. The alternate flaps arm switch located on overhead panel P5 supplies 28 volt dc power to the bypass valve. Moving the alternate flaps arm switch to ON actuates the valve to the bypass position. In this position the down line from the flap control valve is blocked and the flap hydraulic motor ports are connected together to allow fluid circulation within the motor. Moving the alternate flaps arm switch to OFF actuates the bypass valve to its normal position and restores hydraulic operation of the flap system.

B. The bypass valve is also controlled by the flap asymmetry shutoff relay which moves the valve to the bypass position to stop flap movement when left and right wing flap extension or retraction is not symmetric (Fig. 8B and 9).

9. Flap Hydraulic Motor
   A. A reversible hydraulic motor attached to the flap power unit drives the flap system during normal operation. The nine cylinder, piston type motor converts hydraulic pressure to mechanical energy. The externally splined motor driveshaft mates with the power unit input shaft. Two hydraulic lines from the flap control valve connect to inlet ports on the motor. A case drain line connecting the motor to the hydraulic return system through a check valve allows lubrication of the motor. The flow of pressurized fluid through the motor actuates the pistons and rotates the output shaft. Rotation of the output shaft drives the power unit.
10. Flap Power Unit
   A. The flap power unit transfers mechanical energy from the flap hydraulic motor and alternate drive unit to the flap drive system (Fig. 1). The power unit is an aluminum housing containing a reduction gear, two pinion gears, an output shaft with a worm gear, a worm wheel and a worm wheel shaft. The reduction gear is splined to the output shaft. Attached to the power unit is the flap hydraulic motor and the flap alternate drive unit. During normal flap system operation, power from the hydraulic motor is transmitted through a pinion gear to the reduction gear. During flap alternate drive operation, power from the alternate drive unit is transmitted through a second pinion gear to the reduction gear. Rotation of the reduction gear drives the flap system through the power unit output shaft.
11. Flap Drive Gearboxes
   A. General
      (1) There are four flap drive gearboxes, two are angle gearboxes and two are right angle gearboxes.
      (2) The gearboxes are nonvented housings, with sealed ball bearings and butter lubricated bevel gears.
   B. Angle Gearboxes
      (1) The angle gearboxes are mounted on the aft side of the landing gear beam forward of the ground spoiler panels. The torque tubes attaching to the angle gearbox provide the flap drive between the inboard flap transmissions.
   C. Right Angle Gearboxes
      (1) The right angle gearboxes are mounted on the wheel well aft bulkhead aft of the inboard flap inboard transmissions. The gearboxes provide a 90-degree change in torque tube direction in the flap drive between the flap power unit and inboard flap inboard transmissions. The right angle gearbox in the right wheel well is a reversing gearbox which reverses torque tube rotation for the right wing.

12. Flap Transmission Assembly
    A. The flap transmission assembly converts flap torque tube rotation into linear motion to extend or retract the trailing edge flaps. Each transmission assembly consists of a transmission gearbox, a universal joint and a ball nut and screw actuator. (See figure 7.)
    B. The transmission assemblies are mounted on the flap tracks just aft of the landing gear support beam and the wing rear spar. (See figure 1.) Each transmission assembly is enclosed in a flap track fairing. Flap drive system torque tubes attach to the input shafts on the transmission gearbox.
    C. The transmission gearbox contains mating bevel gears and a torque limiter. The inboard transmission assembly on each flap incorporates a no-back friction brake. The torque limiter consists basically of two springs wound together, an internal shaft with two bevel gears, an output shaft and a housing. If a flap jams, excessive torque on the screw actuator will cause the springs to expand and bind against the torque limiter housing. The torque limiter is designed to operate in either direction of flap travel. Excessive torque is absorbed by the torque limiter until the flap hydraulic motor stalls. At extended flap positions, the no-back friction brake prevents flap retraction due to airloads. The brake consists of a brake disk, ratchet wheel and two pawls. At extended flap positions, uploads transmitted to the jackscrew force the brake disk against the ratchet wheel resulting in a braking action. The brake action does not oppose flap extension since the pawls do not engage the ratchet wheel in this direction of rotation. As the flap is retracted, a tension load exerted on the actuator screw disengages the brake disk from the ratchet wheel. This action allows the jackscrew to rotate. The transmission gearbox is a sealed unit filled with MIL-H-5606 hydraulic oil.
    D. The ball nut and screw actuator consists of a jackscrew, a downstop nut and recirculating ball bearing nut. The universal joint attaches the jackscrew to the transmission gearbox. The universal joint allows angular deflection of the jackscrew during flap operation. The bal1 bearing nut is attached to the midflap through a gimbal assembly. During flap operation, the ball bearing nut is restrained from turning and travels fore and aft on the rotating screw to extend and retract the flaps. Total jackscrew travel is restricted by upstops and downstops on the ball nut and screw actuator. Upstop lugs on the ball bearing nut and on the universal joint limit flap travel when the flaps are retracted. Downstop lugs on the ball bearing nut and on the downstop nut limit flap travel when the flaps are extended. The ball bearing nut has drilled passages and externally mounted tubes that allow recirculation of the steel balls. Scrapers and wipers are incorporated at each end of the ball nut to remove foreign material from the jackscrew. An oil reservoir in the ball bearing nut provides lubrication of the nut and screw actuator.



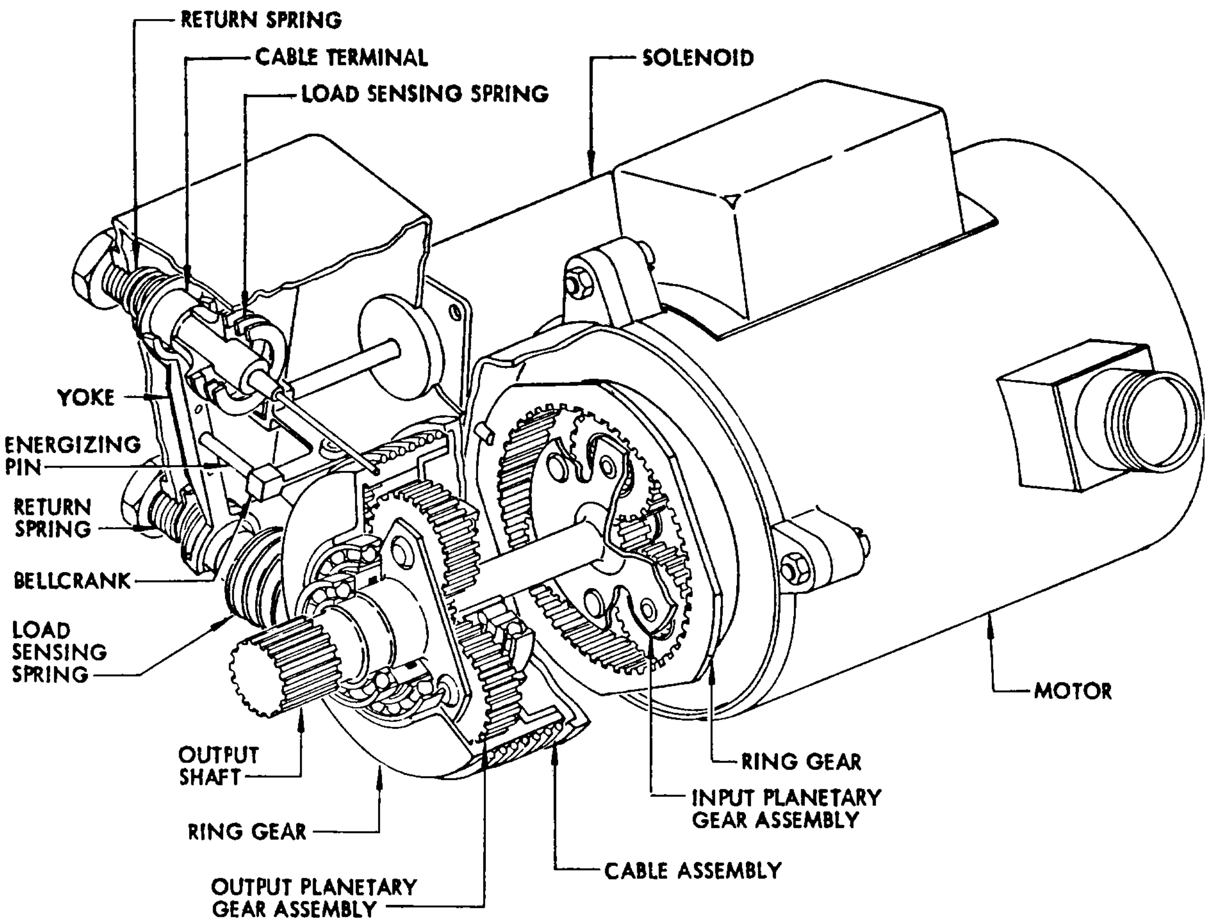
Flap Transmission Assembly
Figure 6

13. Flap Alternate Drive Unit

A. The flap alternate drive unit uses electrical power to drive the flap system if a failure prevents normal hydraulic operation of the flap system. The unit is mounted on the flap power unit which is located on the aft bulkhead in the right wheel well. The alternate drive unit is energized by actuating the alternate flaps arm switch and control switch located on overhead panel. A 115/200 volt ac motor and a gearbox are the primary alternate drive unit components. The gearbox incorporates a double planetary reduction gear train and a disconnect and overload clutch.

B. The reduction gear train consists of a double planetary (epicyclic) gear. (See figure 8.) The ring gear of the first planet system is fixed to the motor housing. The input planet system carrier gears rotate around an input sun gear cut on the motor drive shaft. Attached to the input planet system carrier gears is the output sun gear. Rotation of the output sun gear drives the second planet system carrier gears to which the output shaft is attached. The output ring gear is a floating gear which is held fixed by a cable assembly during motor operation. The two terminals on the cable assembly are held by spring mechanisms which consist of a sensing spring, return spring and a spring collar. A threaded collar is provided to adjust spring tension. Since the normal spring load on the cable is not sufficient to prevent rotation of the output ring gear, a mechanism is provided to accomplish this function. The mechanism consists of a yoke, energizing pin, bellcrank and a solenoid. One arm of the bellcrank is attached to the solenoid and the energizing pin is inserted into a hole in the other arm of the bell crank.

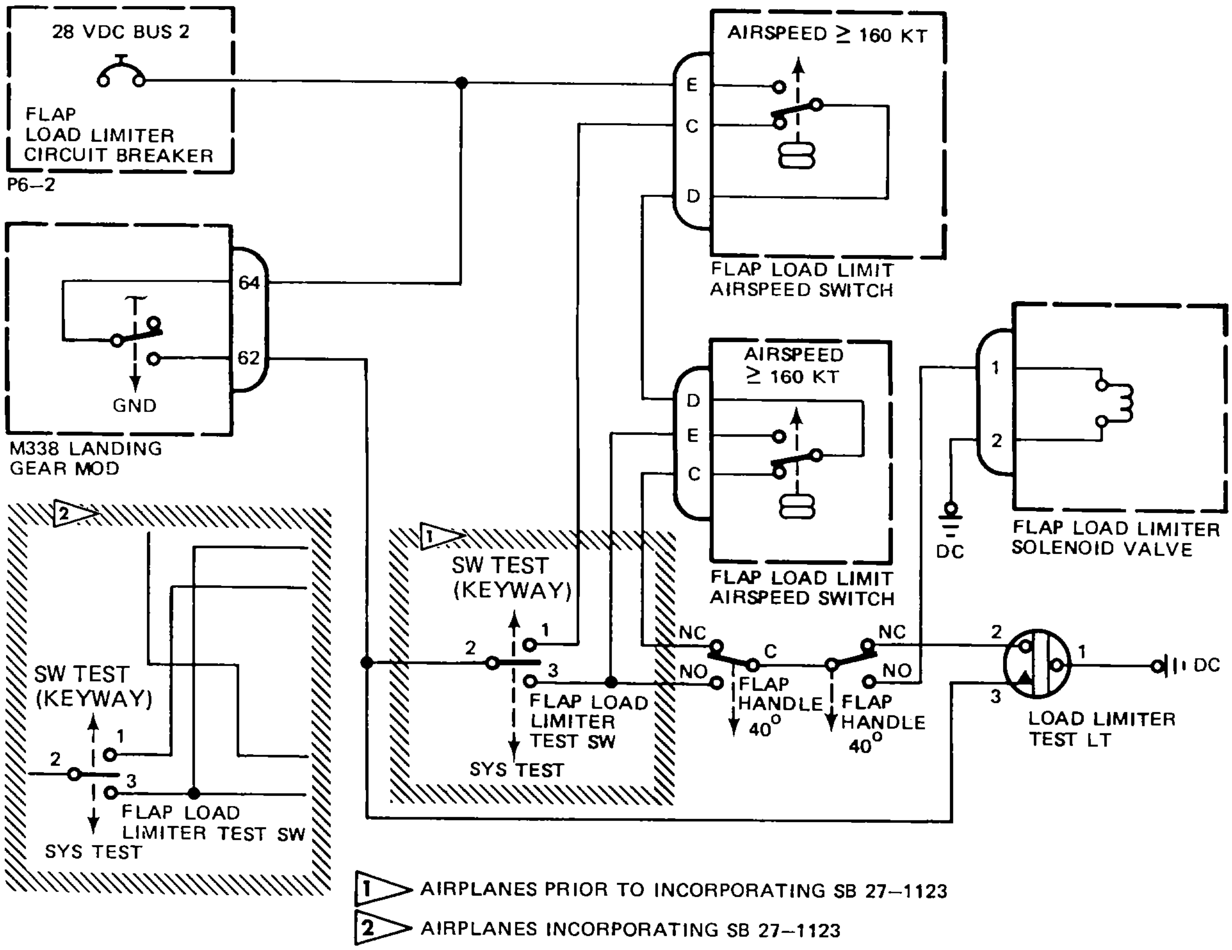
C. The opposite end of the energizing pin is attached to the yoke. The ends of the yoke are attached to the cable terminals. The electric motor and solenoid are energized simultaneously from 115 volt rectified ac power. Energizing the solenoid places the cable under tension by mechanically increasing the distance between the yoke and the output ring gear. The increased cable tension locks the output ring gear, allowing the motor to drive the output shaft. If binding occurs in the gear train, an overload clutch prevents damage to the unit. The output ring gear will slip when the load exceeds 1200 pound-inches. This is accomplished through the load sensing spring, which compresses to relieve tension in the cable. When the flap system is being driven hydraulically, a reduction gear in the power unit drives the output shaft. In this mode, neither the electric motor nor the solenoid is energized. With the solenoid de-energized, the cables are not under tension and the output ring gear is allowed to rotate with the carrier gears. This action prevents transmission of motion to the electric motor shaft.



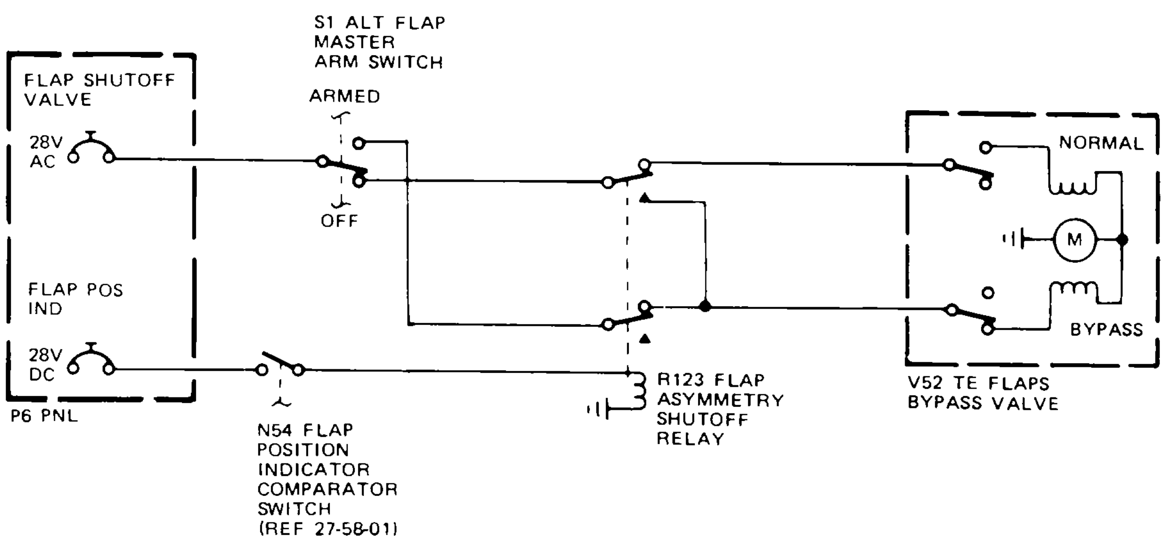
Alternate Flap Electric Drive Unit
Figure 7

14. Limit Switches
    A. Limit switches are used to open the circuit to the flap alternate drive unit at either extreme of flap travel. The limit switches are located on the forward side of the flap control unit (Fig. 1). The switches are actuated by cams mounted on the control valve follow-up mechanism drum shaft.
15. Flap Asymmetry Control System
    A. The flap asymmetry control system stops operation of the trailing edge flaps when a specified difference exists between the position of the left and right flaps. The system consists essentially of two-position transmitters mounted in the outboard flap drive system (Fig. 1), a dual synchro-type position indicator with comparator switch (Ref 27-58-01, D&O), and a flap asymmetry shutoff relay (see Fig. 8B for system circuit). An asymmetry test circuit, consisting of test switch and light mounted on the E-3 electronic equipment rack in the electronics bay, is an integral part of the position indicating system (Ref 27-58-01, D&O).
16. Flap Takeoff Warning Switch
    A. A flap takeoff warning switch is mounted to the flap control unit (Fig. 1). The switch is actuated by a cam mounted on the control valve follow-up drum shaft. The switch is adjusted to actuate with the flaps in a position other than the takeoff range. With the airplane on the ground and the throttle advanced, a warning horn will sound intermittently if the flaps are not in the takeoff range (Ref 31-26-0, Aural Warning Systems).
17. Flap Load Limiter System
    A. On airplanes with flap load limiter system, the trailing edge flap system is protected from excessive airloads by a flap load limiter system (Fig. 8A). The load limiter system automatically retracts the flaps from 40 to 30 units at airspeeds in excess of 152 to 162 knots.
    B. With the flap control lever positioned to the 40-unit detent and the airplane off the ground, the load limiter system is armed. When the airspeed switches sense an airspeed in excess of 152 to 162 knots, the hydraulic solenoid valve attached to the trailing edge flap control valve is energized. Energizing the solenoid valve positions the trailing edge flap control valve to the 30-unit position, allowing pressurized fluid to flow to the hydraulic motor. As airspeed decreases to below 147 to 157 knots the solenoid valve is de-energized, the control valve is positioned to the 40-unit position and the flaps extend to 40 units.
    C. The load limiter system consists of the trailing edge flap control valve and solenoid valve, two airspeed switches, and two flap 40-unit switches.
18. Airspeed Switches
    A. Two airspeed switches are installed in the lower compartment just below the flight compartment floor on the right-hand side forward of the station line common to the forward bulkhead of the nose wheel well. One airspeed switch is connected to the No. 1 auxiliary pitot static system and one to the No. 2 auxiliary pitot static system.

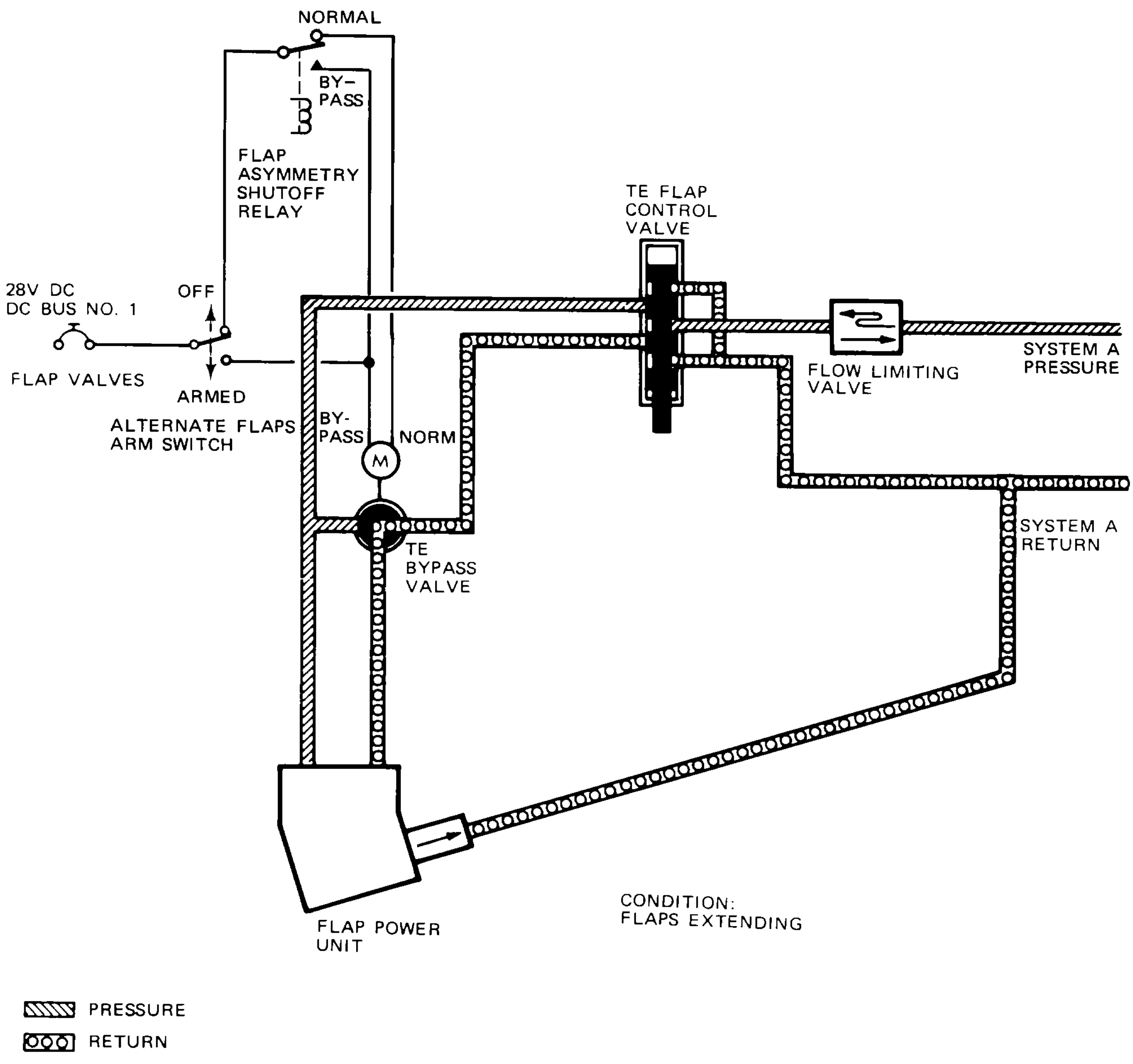
19. Flap-40-Unit Switches
    A. Two flap-40-unit switches are installed on the flap control quadrant. The switches are actuated with the flap control lever positioned to 40 units, and complete a segment of the flap load limiter electrical circuit.
20. Operation
    A. The trailing edge flaps are normally actuated by a hydraulically operated drive system (Fig. 9). The drive system is controlled by a manually operated flap control lever located on the upper right side of the control stand. When the control lever is rotated, flap control cables displace the flap control unit linkage. This positions the trailing edge flap control valve to port pressurized fluid from hydraulic system A to the flap hydraulic motor. The hydraulic motor drives a torque tube system through a reduction gear train. The torque tubes drive two transmission assemblies at each flap. Ball bearing nuts and gimbal assemblies transfer rotary motion from the flap transmission assemblies into linear motion to extend the flaps. As the flaps extend, cables from the flap power unit follow-up cable drum rotate a flap control valve follow-up mechanism. A cam in the follow-up mechanism then displaces the trailing edge flap control valve slide. When the desired flap position is reached, the control valve closes to prevent flow of pressurized fluid to the flap hydraulic motor.
    B. Retraction of the flaps due to airloads is prevented by a no-back friction brake in the inboard transmission assembly at each flap. If a transmission assembly should fail, a torque limiter in the remaining transmission assembly on that flap will stall the flap drive system to prevent structural damage. Stopping the drive system also prevents operation of the remaining flaps, thus maintaining the airplane in a normal flight attitude.
    C. The flap segments are mechanically separated during extension. As the flaps start to extend, an actuating mechanism moves the aftflap to form a slot between the aftflap and midflap. At about 8 units of midflap extension, the foreflap sequencing toggles contact stops on the main flap tracks. The stops prevent additional aft movement of the foreflap. Continued midflap extension creates a slot between the foreflap and midflap. As the midflap approaches full travel, the aftflap again moves relative to the midflap, increasing the width of the slot between the two segments.



Flap Load Limiter System Circuit
Figure 8A



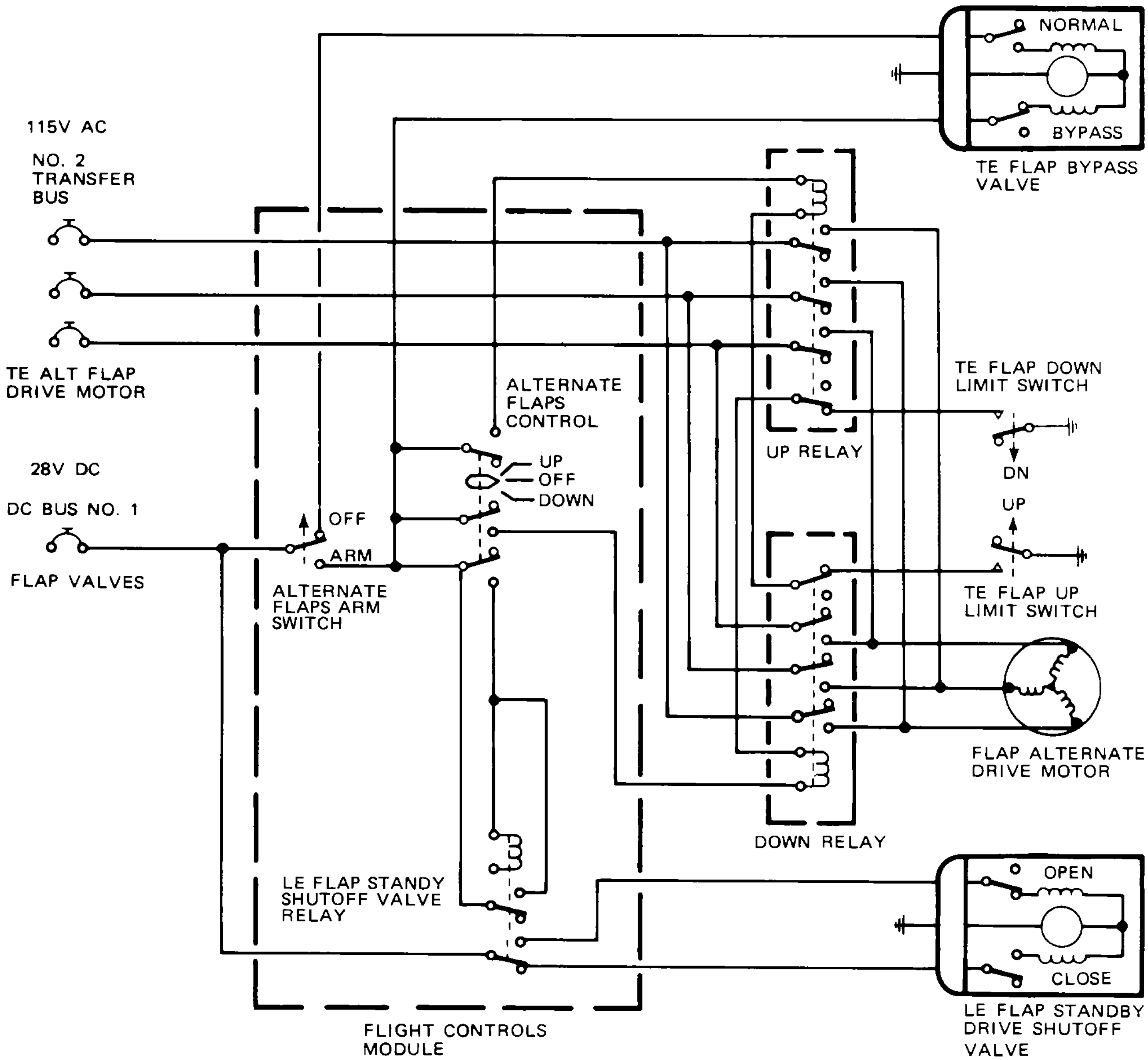
Trailing Edge Flap Electric Asymmetry System Circuit
Figure 8



Trailing Edge Flap System Hydraulic Schematic
Figure 9

D. A flap alternate drive unit is provided to operate the trailing edge flaps electrically if a failure prevents normal hydraulic operation. The flap alternate drive unit is controlled from two switches located on the overhead panel (Fig. 10). The alternate flaps arm switch and control switch operate the system. Actuation of the alternate flaps arm switch to ARM supplies 28 volt dc power to the alternate flaps control switch. Simultaneously, 28 volt dc power is supplied to position the trailing edge flap bypass valve to BYPASS. This interconnects the flap hydraulic motor ports to allow circulation of hydraulic fluid and prevents fluid flow from the control valve to the hydraulic motor. Actuation of the alternate flaps control switch to DOWN energizes the alternate flap down relay to complete a circuit which extends the flaps. When the flaps are fully extended, a down limit switch opens to break circuit continuity. Positioning the alternate flaps control switch to UP closes the alternate flap up relay to complete a circuit to retract the flaps. When the flaps are fully retracted, an up limit switch opens to break circuit continuity. The trailing edge flaps may be stopped in any intermediate position by returning the alternate flaps control switch to OFF.

E. An electrical asymmetry system will stop operation of the flap drive system when a certain separation of left and right indicator pointers occurs. The separation closes a comparator switch in the indicator which operates the flap asymmetry relay, causing the hydraulic bypass valve to stop operation of the flap drive hydraulic motor.



Flap Alternate Drive System Circuit
Figure 10

TRAILING EDGE FLAP SYSTEM - TROUBLESHOOTING

1. General
   A. Flap Drive System Stalling/Lockout In-Flight Problems
      (1) In order to minimize occurrence of flap drive system stalling or lockouts in service, proper maintenance procedures, proper flap operating procedures, and system pilot reporting procedures are required. Flap components should be kept as clean as possible and lubricated at regular intervals to minimize friction. Drive system loads are greatly increased by excessive airspeed since loads vary as the velocity squared and overplacard speeds will always cause lockout. Therefore, flaps should be operated at speeds recommended in the 737 Pilots' Training Manual. Pilots reporting a flap drive lockout should record the following information to assist troubleshooting:
         (a) Airspeed
         (b) Extension or retraction
         (c) Flap setting
         (d) Whether flaps can be positioned electrically
         (e) Whether flaps can be reversed hydraulically
         (f) Note any lateral trim change during lockout
      (2) Some component failures and jamming can increase drivescrew load but require multiple failures to increase loads into the lockout range. Other components are especially effective in causing lockout due to system geometry and transmission torque brake settings. The following items can cause lockout when acting alone (i.e., no other components failed or jammed):
         (a) Power unit gearbox, angle gearbox, or right angle gearbox jam
         (b) Flap drive transmission jam
         (c) Flap drive ball nut failure
         (d) Structural failure and/or interference
         (e) Number 2, 3, 4, 5, 6 or 7 midflap carriage aft or forward flight roller jam
         (f) Transmission output bearing jam at any location
         (g) Flap transmission torque brake setting too low
         (h) Asymmetry shutoff due to drive system shearout or misrig of asymmetry system

         NOTE: Flap jackscrews and carriages are identified from left to right across the wing. For example, flap jackscrew No. 1 is outboard screw of left outboard flap.

(3) The flap drive system is most susceptible to lockouts in the flaps 30 to 40 range where the highest airloads exist. If the lockout occurs in the flaps 0 to 25 range structural interference, drive gearing failure, jammed transmissions, foreign object damage or hydraulic system failure are the most probable causes. If a lockout occurs, proceed to check the airplane according to the troubleshooting chart under the trouble headings, "Flaps will not extend hydraulically or electrically in flaps 0 to 25 range in flight," and "Flaps will not extend hydraulically or electrically in flaps 25 to 40 range in flight."

(4) The items are listed in the troubleshooting chart in descending order of effectiveness for causing lockout but also weighted in order of probability of occurrence. If airline experience shows that a particular item is a chronic problem, that item should be checked first.

(5) If the flaps fail to extend hydraulically but will extend at the same airspeed electrically, the hydraulic system should be checked.

(6) Icing conditions during cold weather operation can cause lockout if procedures for operating during these conditions are not followed (AMM Chapter 12, Cold Weather Maintenance).

(7) If a lateral trim change is noted when lockout occurs, the probable cause may be failure in the inboard or outboard aft flap mechanisms, a drive failure which causes the flap asymmetry shutoff system to function, or an unsequenced foreflap.

B. For trouble items not related to flap drive system inflight lockout, refer to appropriate trouble headings in troubleshooting chart.

2. Trailing Edge Flap System Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flaps will not extend hydraulically or electrically in Flaps 0-25 range in flight	Structural failure and/or interference	Visually inspect all flap and flap drive components where relative motion occurs, for structural failure or foreign object damage	Repair as required
	Power unit gearbox binding	Disconnect gearbox and check for free rotation	Replace gearbox if binding
	Angle gearboxes binding	Disconnect gearboxes and check for free rotation	Replace gearbox if binding
	Right angle gearboxes binding	Disconnect gearboxes and check for free rotation	Replace gearbox if binding
	Transmission internal jam	Disconnect transmissions from forque tubes and jackscrews and check for free rotation	Replace transmission if binding

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flaps will not extend hydraulically or electrically in Flaps 25-40 range in flight	The following items are listed in descending order of effectiveness for causing flap drive system lockout but also weighted in order of probability of occurrence. The flap system should be inspected in the sequence listed. The items 1 thru 8 will cause lockout if found discrepant, therefore, if condition discovered and corrected, no further checks are required. Items 9 thru 15 will not cause lockout when acting alone, but require some combination with other items. The possible combinations of these items to cause lockout are:		
	Items 9 + 10, 11, 12 or 14 Items 9, dual roller jam Items 10 + 9, 11, 12 or 14 Items 11 + 9, 10, 12 or 14 Items 12 + 9, 10, 11 or 14 Items 14 + 9, 10, 11, 12		
	1. Midflap carriage forward and aft flight rollers jammed and skidding at flap jackscrews 2,3,4, 5,6,7 (single roller)	Inspect rollers for free rotation. Inspect tracks for evidence of skidding. Inspect roller OD for signs of skipping/skidding	Replace roller if binding or there are signs of the roller skipping/ skidding. Lubricate all midflap carriage rollers, AMM Chapter 12
	2. Outboard flap drive transmission output bearing jammed and/or excessively corroded	Disconnect transmission from torque tubes and jackscrews and check for free rotation by rotating the output shaft with a small side lode on it. Check that bearing ID does not rotate relative to shaft. Check for signs of rust at the edges of the bearing seal. Inspect in this order: 2,7,1,8	Replace transmission if bearing defective

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	3. Jackscrew ball nut jammed or binding	Disconnect ball nuts. Clean ball screws. Check for free rotation and signs of gouging in ball nut grooves. Check for grease contamination in the ball nut	Replace jackscrew assembly if binding
	4. Structural failure and/or interference	Visually inspect all flap and flap drive components where relative motion occurs, for structural failure or foreign object damage	Repair as required
	5. Power unit gearbox binding	Disconnect gearbox and check for free rotation	Replace gearbox if binding
	6. Transmission internal jam	Disconnect transmissions from the torque tubes and jackscrews and check for free rotation	Replace transmission if binding
	7. Angle gearboxes binding	Disconnect gearboxes and check for free rotation	Replace gearbox if binding
	8. Right angle gearbox binding	Disconnect gearboxes and check for free rotation	Replace gearbox if binding
	9. Midflap carriage forward and aft flight rollers jammed and skidding at flap jackscrews No. 1 and 8	Inspect rollers for free rotation. Inspect tracks for evidence of skidding. Inspect roller OD for signs of skipping/skidding	Replace roller if binding or there are signs of the roller skipping/ skidding, relube all main carriage rollers

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
	10. Outboard aftflap drive mechanism failure or jam	Inspect drive mechanism in outboard screw fairings	Repair or replace damaged parts
	11. Outboard foreflap sequencing carriage toggle failure (unsequenced foreflap) plus galled or damaged foreflap carriage rubstrips	Inspect outboard foreflap toggles and sequencing carriages for failure or binding and rubstrips for galling	Replace damaged parts
	12. Outboard aftflap track rollers jammed	Inspect rollers for free rotation. Inspect tracks for evidence of skidding	Replace roller if binding
	13. Inboard aftflap drive mechanism jam or failure	Inspect mechanism for failed parts. Check drive clutch setting	Replace parts or readjust clutch
	14. Outboard foreflap track rollers	Inspect rollers for free rotation. Inspect tracks for evidence of skidding	Replace roller if binding
	15. Transmission torque brake setting too low	Disconnect transmissions and check torque brake settings in the following order: No. 2 and 7 (630 in-lbs min) No. 3 and 6 (324 in-lbs min) No. 4 and 5 (330 in-lbs min) No. 1 and 8 (582 in-lbs min) (AMM 21-51-281/601, Flap Transmission)	Replace transmission if torque brake settings not correct

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive force required to position flap control lever	Excessive cable tension	Check cable tension per AMM 27-51-0, Fig. 501	Adjust cable tension
	Rubbing cables, misaligned or defective pulleys	Check that pulleys align with cables within 2 degrees. Check cable runs for free-running pulleys, and foreign objects	Repair or replace defective parts. Remove foreign objects
	Binding flap control valve	Remove lower pan from flap control unit and disconnect trailing edge cam link from bellcrcrank. Actuate bellcrank to check freedom of valve slide	Replace trailing edge flap control valve (AMM 27-51-211/401)
	Binding flap control quadrant	Disconnect WFA and WFB cables from flap control quadrant. Remove lower pan from flap control unit and disconnect trailing edge cam link from bellcrank. Manually rotate quadrant to check freedom of quadrant bearings	Replace defective bearings (AMM 27-51-191/401)
	Dry ballscrew assemblies	Check ballscrews for proper lubrication	Lubricate ballscrew (AMM 12-22-51)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
During takeoff/ approach additional rudder or aileron trim is required to maintain level flight	Outboard TE flap carriage midflap spindle broken	Remove access panels from upper surface of midflap to gain access to the carriage. Remove inboard then outboard panel	Replace flap carriage, AMM 27-51-81/401
		Check the tapered section of the carriage spindle for a fracture	
		NOTE: If L or R aileron trim was required, inspect opposite side first for suspect carriage.	

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flap jackscrew dimensions X2-X1 are not within tolerance	Excessive friction in flap control system	Check that flap control lever operating forces are within tolerance. See Trailing Edge Flap System - A/T	See Excessive Force Required to Position Flap Control Lever in this Trouble Shooting Chart
	Defective flap control unit	Check that flap system is properly adjusted	Replace flap control unit (Ref 27-51-201 R/I)
	Flap lever rigging out of adjustment or low tension on WFA, WFB cables		Check rigging and cable tension (Ref 27-51-01 A/T)
Flaps operate electrically but not hydraulically	Flap bypass valve in bypass position (Position 2)	Check that FLAP VALVES circuit breaker is closed and that alternate flap master switch is OFF. With switch OFF, check for power at flap bypass valve. If power is present, valve is defective	Replace bypass valve (Ref 27-51-181 R/I)
	Defective flap hydraulic motor	Check for hydraulic system pressure at motor. If pressure is present, motor has malfunction	Replace flap hydraulic motor (Ref 27-51-231 R/I)
	No hydraulic pressure	Check hydraulic pressure supply trouble shooting	
	Broken control cable	Check cable run for broken cable	Replace broken cable

Trailing Edge Flap System - Troubleshooting
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flaps operate hydraulically but alternate drive not electrically	Defective flap alternate drive unit	Check for power at flap alternate drive unit. If power is present, drive	Replace flap alternate drive unit AMM 27-51-241
	Flap bypass valve in normal position (Position 1)	Check that FLAP VALVES circuit breaker is closed and that alternate flap master switch is at ARM. With switch at ARM, check for power at flap bypass valve. If power is present, valve is defective	Replace bypass valve AMM 27-51-181/401
	Defective flap limit switch	Check circuit continuity through flap limit switch	Replace flap limit switch AMM 27-51-291/401
	No dc power at alternate flap switches	Check circuit from alternate flap switches through circuit breakers for continuity	Repair wiring or replace defective switch or circuit breaker
	No dc power	AMM Chapter 24, Electrical Power - Troubleshooting	
Slow flap operation	Binding gearbox or transmission assembly	Disconnect torque tubes on tubes on each side of gearbox or flap transmission and check for free rotation	See flaps will not operate hydraulically or electrically (in this trouble-shooting
Slow or fast flap operation	Defective flow limiting valve	Check trailing edge flaps normal operating time (AMM 27-51-171/501)	Replace flow limiting valve, AMM 27-51-171/401

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Loose control cables	Low cable tension	Check cable tension per AMM 27-51-01, Fig. 501	Adjust cable tension
	Broken control cable	Check cable run for broken cable	Replace broken cable
Flap position indicator pointers stop between 15 and 25 units, when 25 units of flaps is selected; but continue toward 40 units when 40 units is selected	Flap position indicator system out of rig	Check that trailing edge flap position indicating system is in adjustment	Rerig flap position indicating system, AMM 27-58-01/501
	Faulty flap position indicator	Both Flap position indicator pointers do not indicate selected units of flap position	Replace flap position indicator, AMM 27-58-41/401
	Faulty flap position transmitter	One flap position indicator pointer does not indicate selected units of flap position	Replace flap position transmitter, AMM 27-58-12/401

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
[1] Flaps do not retract automatically from 40- to 30-units when airspeed exceeds 152 to 162 knots	Flap load limiter circuit breaker open		Reset circuit breaker on panel P6
	Faulty airspeed switches	Verify squat switch is operating. Press-to test LOAD LIMITER TEST LIGHT. Check that test light illuminates	Replace squat switch
		Position flap handle to 40-units. Hold flap load limiter test switch in SYSTEM TEST. Check that flaps retract. Release switch and check that flaps extend	Perform test 27-51-321 to determine which airspeed switch is defective. Replace defective switch
[1] Flaps do not retract automatically	Faulty flap load limiter solenoid valve (V94)		Replace valve
Flaps position indicator points left and right are split and at the same time the primary flap drive system continues to update	Faulty flap position indicator	Perform flap asymmetry shutoff system test (Ref 27-51-001501)	Replace flap position indicator (Ref 27-58-41/401)
	Faulty flap asymmetry shutoff relay (R123)		Replace flap asymmetry shutoff relay, R123

[1] AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JTD, LV-JTO, LV-LEB
IR ALL EXCEPT EP-IRF, EP-IRG
TZ ALL EXCEPT CF-TAN, CF-TAO
TS ALL EXCEPT N73711 thru N73713, N73715, N73717

Trailing Edge Flap System - Troubleshooting
Figure 101 (Sheet 2)

TRAILING EDGE FLAPS - MAINTENANCE PRACTICES

1. General
   A. System A hydraulic system must be depressurized prior to performing maintenance on trailing edge flaps. This is to prevent injury to personnel, resulting from inadvertent operation of the control system while maintenance is being performed. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of travel of trailing edge flaps and leading edge flaps and slats.

      WARNING: PRESSURIZING HYDRAULIC SYSTEMS TO OPERATE THE TRAILING EDGE FLAPS ALSO ACTIVATES THE LEADING EDGE FLAPS AND SLATS, RUDDER, ELEVATOR, AND AILERON HYDRAULIC SYSTEMS. ISOLATE OR TAG ANY SYSTEM NOT BEING TESTED AND ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF CONTROL SURFACES BEFORE APPLYING HYDRAULIC POWER. OPERATING THE TRAILING EDGE FLAPS WILL AUTOMATICALLY OPERATE THE LEADING EDGE FLAPS.

   B. When operating hydraulic system B pumps to pressurize hydraulic systems A and B, the following requirements must be observed:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days, or when fuel temperature is known to be above 90°F (32.2°C), monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5-minute period. Following the fifth start, run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. The following procedure covers pressurization of hydraulic system A through operation of electric driven hydraulic system B pumps only. Pressurization of hydraulic system A through operation of engine driven hydraulic system A pumps is not covered. Refer to (AMM 29-11-0/201).
2. Trailing Edge Flaps Hydraulic System A Pressurization
   A. Equipment and Materials
      (1) Ground Lock Assembly - F72735
   B. Pressurize Trailing Edge Flaps Hydraulic System A
      (1) Install ground lock assembly in nose gear.
      (2) Provide electrical power.
      (3) Set parking brake.
      (4) Position GRD INTERCONNECT switch on forward overhead panel to OPEN.
      (5) Close FLAP circuit breaker on P6 circuit breaker panel.
      (6) Position No. 1 or 2 system B HYD PUMPS switches on forward overhead panel to ON, to pressurize hydraulic systems A and B.

C. Restore Airplane to Normal

NOTE: Perform following steps after completing system maintenance that required pressurization.

(1) Position No. 1 and 2 system B HYD PUMPS switches to OFF.
(2) Position GRD INTERCONNECT switch to CLOSE.
(3) Remove electrical power if no longer required.
(4) Remove ground lock assembly from nose gear.

3. Trailing Edge Flaps Hydraulic System A Depressurization

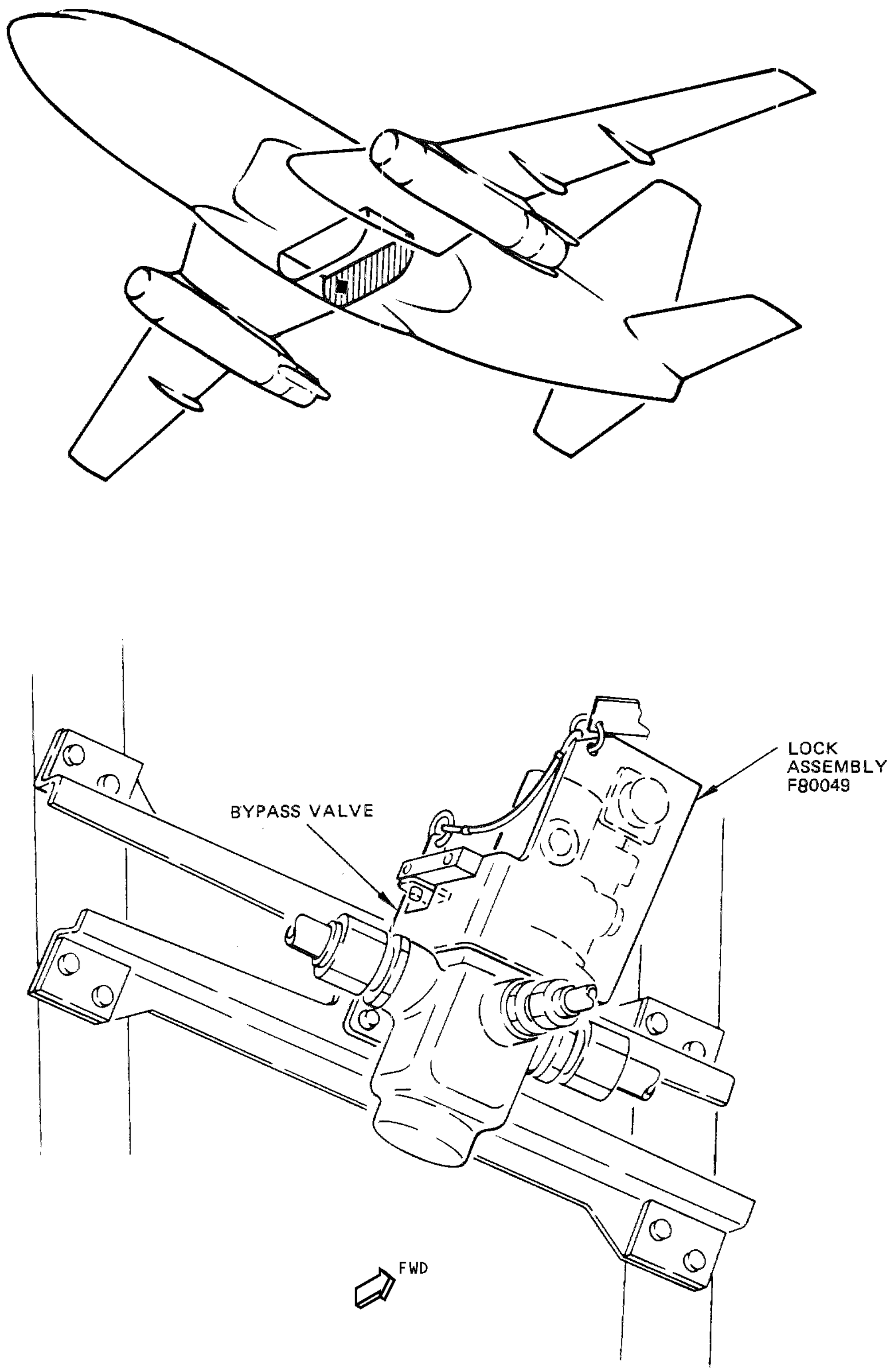
A. Equipment and Materials
(1) Lock Assembly - Flight Controls F80049-12 (Preferred) or F80049-2 (Optional)

B. Depressurize Trailing Edge Flaps Hydraulic System A
(1) Open FLAP circuit breaker on P6 circuit breaker panel.
(2) Position ALTERNATE FLAPS switch on forward overhead panel to OFF.
(3) Position No. 1 and 2 system B HYD PUMPS switches on forward overhead panel to OFF.
(4) Position GRD INTERCONNECT switch on forward overhead panel to CLOSE.
(5) To dissipate remaining hydraulic power, cycle rudder pedals until rudder stops moving.
(6) If any hydraulic connections are to be disturbed, depressurize hydraulic system A reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
(7) Install flap bypass valve lock as follows: See figure 201.
(a) Disconnect electrical connector from trailing edge flap bypass valve located in right wheel well.
(b) Place manual override lever on bypass valve to position 2.
(c) Install lock on bypass valve and insert attaching lock pin.

C. Restore Airplanes to Normal

NOTE: Perform following steps after completing system maintenance requiring depressurization.

(1) Remove lock from trailing edge flap bypass valve.
(2) Connect electrical connector to bypass valve.
(3) Close FLAP circuit breaker on P6 circuit breaker panel.



Trailing Edge Flap Bypass Valve Lock Installation
Figure 201

TRAILING EDGE FLAP SYSTEM - ADJUSTMENT/TEST

1. Trailing Edge Flap System Adjustment

A. General

(1) The flap drive system may creep for several minutes after initially stopping at a selected position. To minimize measurement error, it is necessary to wait 2 minutes at each flap position before taking measurements.

(2) With flaps hydraulically retracted, the trailing edge flap system is properly adjusted when the individual components meet the following conditions. See Fig. 501 for rigging pin locations and cable tension requirements.

(a) Flap Control Cables WFA and WFB

1) The flap control lever shall spring back 0.187 ±0.005 inch from the FLAP UP detent. Tension of WFA and WFB cables shall be within limits of that specified in temperature-tension chart (Fig. 501). These conditions may be obtained by adjusting turnbuckles in fuselage lower nose compartment.

(b) Trailing Edge Flap Control Valve

1) Rigging pin F-1 shall fit freely in the flap control unit. This condition may be obtained by adjusting trailing edge flap cam link in flap control unit.

(c) Flap Follow-up Cables WFFA and WFFB

1) With rigging pin F-1 installed, index mark on drum shall align within ± 0.03 inch with matching mark on flap power unit housing. Tension in WFFA and WFFB cables shall be within limits of that specified in temperature-tension chart (Fig. 501). These conditions may be obtained by adjusting turnbuckles in right wheel well.

(d) Flap Transmissions

1) At each flap transmission, angular clearance between ball screwnut and upstop on jackscrew yoke shall be 170 to 190 degrees (1/2 turn ±10 degrees) turn of jackscrew and seal support on aft lower wing panel should contact midflap nose.

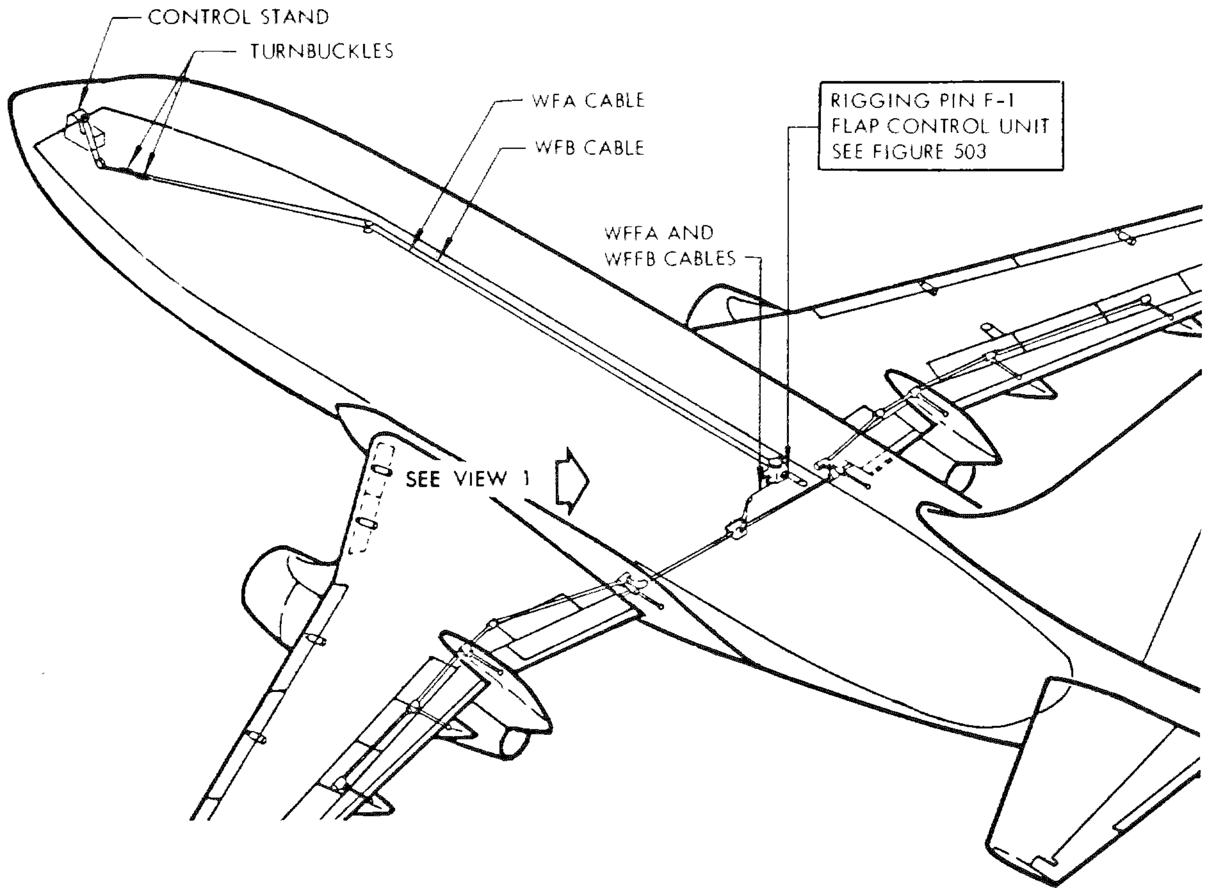
B. Equipment and Materials

(1) Rigging Pin F-1 - 0.311 +0.000/-0.002 inch diameter, 2.35 ±0.06 inches long (MS20392-4)

NOTE: Rigging pin is part of kit F70207-3, -52, -61, or -84.

(2) Flap Drive Adapter - F70300-1 (Preferred) or ST2583-1 (Optional)

(3) Control Column Protractor Assembly 4MIT65B80307-1 (Preferred) or F52485-500 (Optional)



CABLE CODE	FUNCTION
WFA	WING FLAPS UP
WFB	WING FLAPS DOWN
WFFA	WING FOLLOW-UP FLAPS UP
WFFB	WING FOLLOW-UP FLAPS DOWN

TEMP °F [1]	RIGGING LOAD 3/32 AND 1/8 INCH DIA CABLES [2] WFA AND WFB [4] +10/-0 POUNDS	RIGGING LOAD 3/32 INCH DIA CABLES WFFA AND WFFB [3] +10/-0 POUNDS
110	117	71
90	108	65
70	100	60
50	91	55
30	83	49
+10	74	44
-10	65	38
-30	57	33
-40	52	30

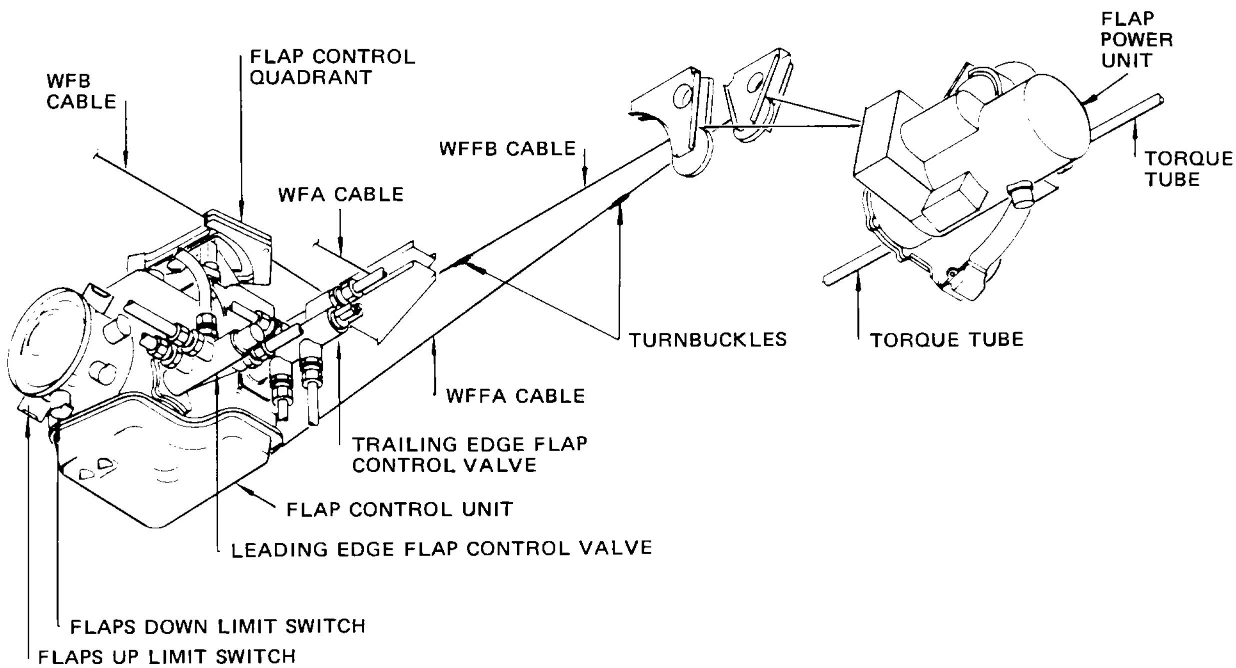
[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (±5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE VALUES. WHENEVER CABLES ARE READJUSTED, TABLE VALUES MUST BE MET.

[3] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +20/-20 POUNDS FROM TABLE VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE VALUES. WHENEVER CABLES ARE READJUSTED, TABLE VALUES MUST BE MET.

[4] CABLES FORWARD OF TURNBUCKLES ARE 3/32 INCH DIAMETER AND CABLES AFT OF TURNBUCKLES ARE 1/8 INCH DIAMETER.

Trailing Edge Flap System Adjustment
Figure 501 (Sheet 1)



VIEW 1

Trailing Edge Flap System Adjustment
Figure 501 (Sheet 2)

C. Adjust Trailing Edge Flap System

(1) Retract trailing edge flaps and depressurize hydraulic system.

CAUTION: IF MAINTENANCE HAS BEEN PERFORMED ON FLAP CONTROL OR FLAP DRIVE SYSTEM, FLAP RETRACTION SHOULD BE CLOSELY MONITORED TO PREVENT DAMAGE DUE TO IMPROPERLY ADJUSTED COMPONENTS.

(a) Connect electrical power to airplane.
(b) Provide system A hydraulic power (AMM 27-51-0/201).
(c) Set flap control lever in FLAP UP detent.

NOTE: If asymmetry shutoff mechanism is not properly adjusted, flaps may not operate. Manually positioning asymmetry shutoff valve will allow flap operation.

(d) After flaps are fully retracted, wait 2 minutes then depressurize system A hydraulic power (AMM 27-51-0/201).

(2) Adjust flap control cables WFA and WFB.

(a) Lift flap control lever and clamp so that index dog is disengaged from detent plate.
(b) Place shims between flap control lever riveted on drum and telescoping handle to prevent relative fore and aft movement of handle. Shims should be placed in aft gap between lever and handle.

NOTE: Shims are used to compensate for wear between lever and handle.

(c) Position flap control lever all the way forward and then release lever.
(d) Check that lever springs back to rigging position (Fig. 502).
(e) Open lower nose compartment access door 1103.
(f) Check that tension in WFA and WFB cables is within limits of that specified in temperature-tension chart (Fig. 501).
(g) If conditions in steps (d) and (f) are not within limits:
1) Remove forward right ceiling panel in aft cargo compartment (AMM Chapter 25, Cargo Compartment Ceiling Lining).

2) Clamp flap control quadrants against quadrant stop (Fig. 503).

NOTE: Ensure that no foreign matter is on contacting surface of quadrant stop.

3) Remove turnbuckle locking clips from WFA and WFB turnbuckles in lower nose compartment.
4) Adjust turnbuckles so that flap control lever springs back to rigging position (Fig. 502). Adjust so that cable tension is within limits of that specified in temperature-tension chart (Fig. 501).
5) Install turnbuckle locking clips.
6) Remove clamp from flap control quadrant.
7) Install aft cargo compartment ceiling panel (AMM Chapter 25, Cargo Compartment Ceiling Lining).

(h) Remove clamp and shims from flap control lever.
(i) Position flap control lever in FLAP UP detent.

(3) Adjust flap follow-up cables WFFA and WFFB.

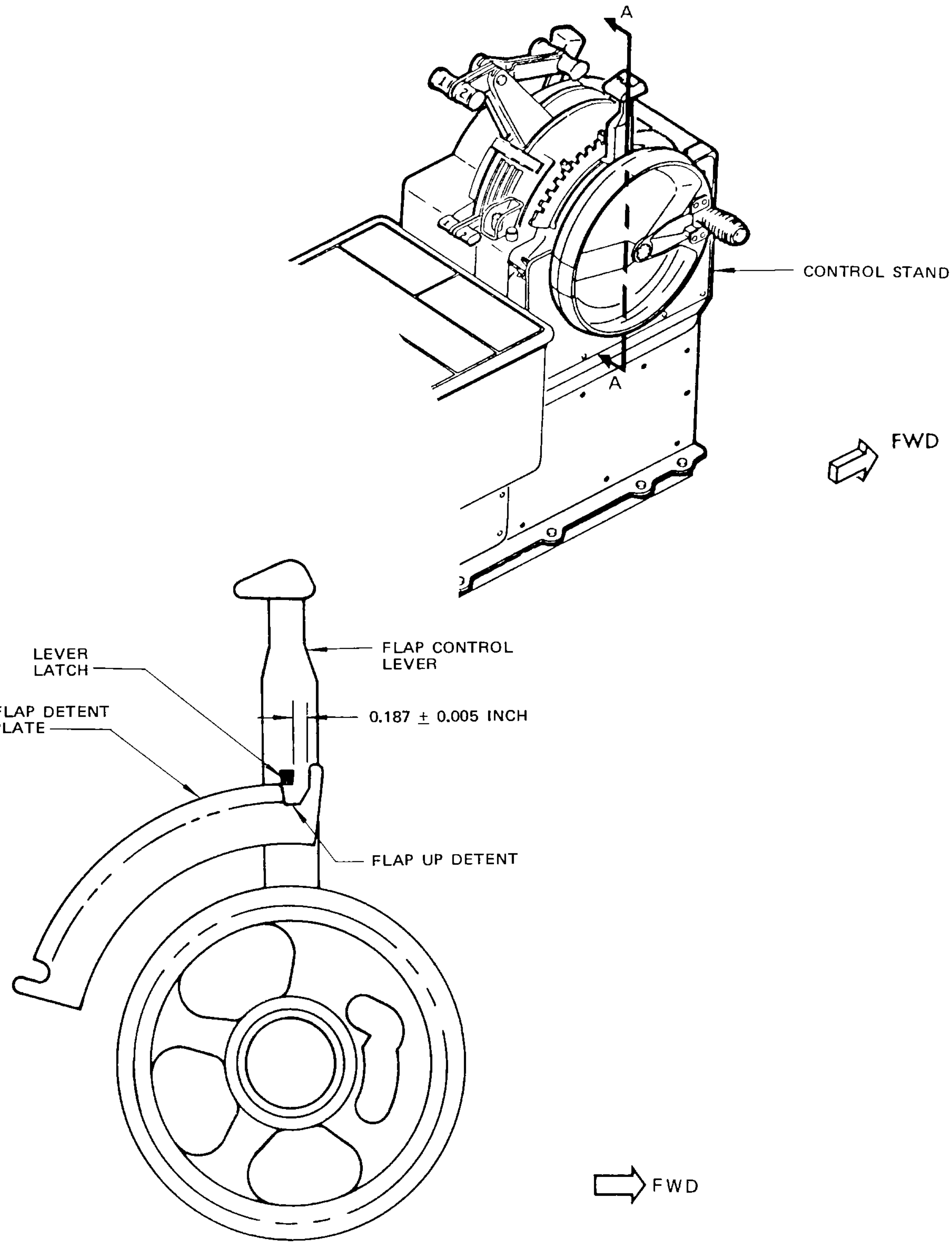
(a) Check that index mark on drum and matching mark on flap power unit housing align within ± 0.03 inch (Fig. 504). If index marks do not align:

1) If flap transmission upstops are not in contact, position flap bypass valve to BYPASS (position 2) and manually rotate flap torque tubes. Rotate torque tubes until index mark on drum aligns with index mark on housing within ± 0.03 inch.
2) If flap transmission upstop contact prevents rotation of torque tubes, disconnect both torque tubes from flap power unit, position flap bypass valve to BYPASS (position 2) and manually rotate power unit output shaft. Rotate output shaft until index mark on drum aligns with index mark on housing within ± 0.03 inch. Connect torque tubes and lockwire heads of coupling screws together.

(b) Remove lower pan from flap control unit (Fig. 503).
(c) Check that rigging pin F-1 fits freely in flap control unit.
(d) Check that tensions in WFFA and WFFB cables are within limits of that specified in temperature-tension chart in Fig. 501.
(e) If conditions in steps (c) and (d) are not within limits:

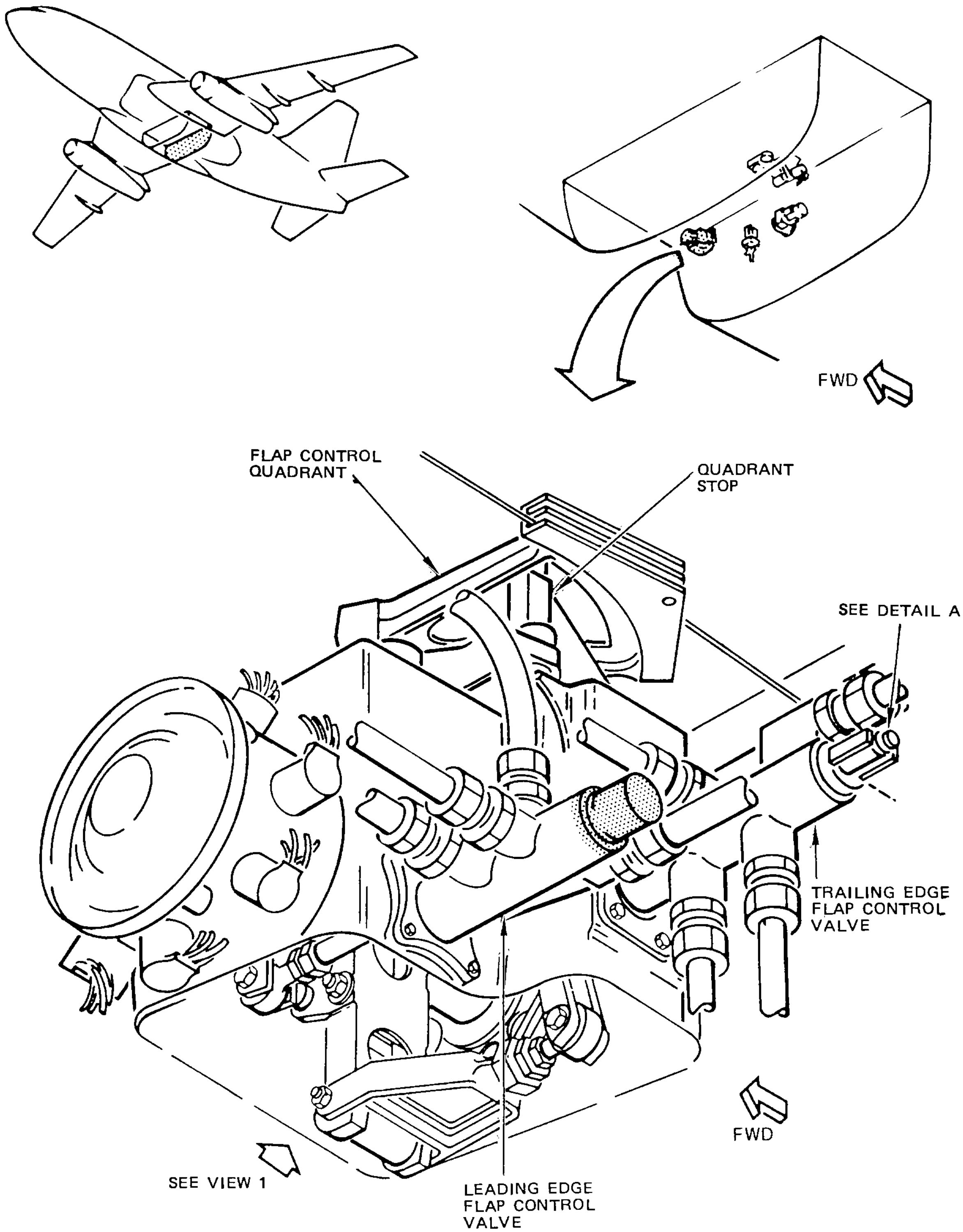
1) Remove turnbuckle locking clips from WFFA and WFFB turnbuckles.
2) Adjust turnbuckles so that rigging pin F-1 fits freely. Adjust so that cable tension is within limits of that specified in temperature-tension chart (Fig. 501).
3) Install turnbuckle locking clips.

(f) At flap power unit check that WFFA cable has approximately 2-1/4 turns on cable drum, and that WFFB cable has approximately 1/3 turn on cable drum.
(g) At flap control unit check that WFFA cable has approximately 1-1/2 turns on cable drum, and that WFFB cable has approximately 2-1/2 turns on cable drum.



SECTION A-A

Flap Control Lever Rigging Position
Figure 502



NOTE: FLAP CONTROL UNIT SHOWN WITH LOWER PAN REMOVED

Flap Control Unit Adjustment
Figure 503 (Sheet 1)

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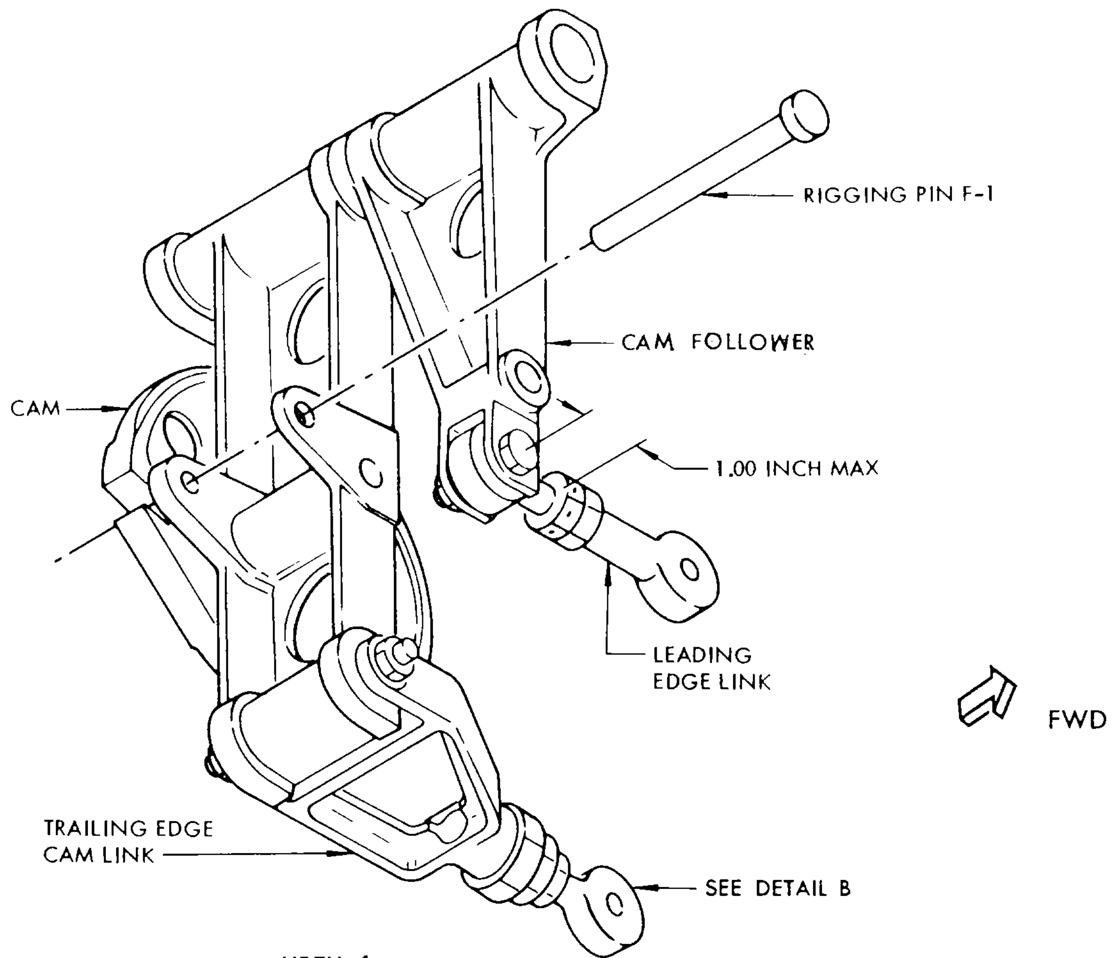
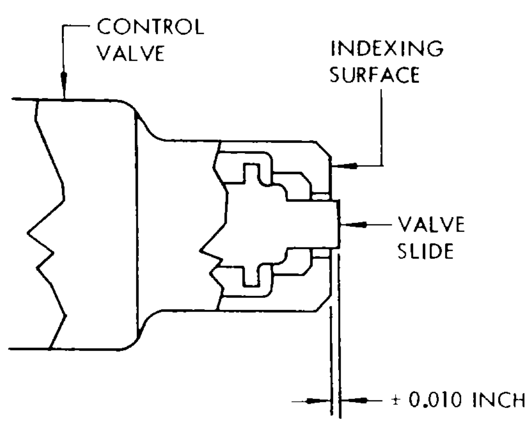
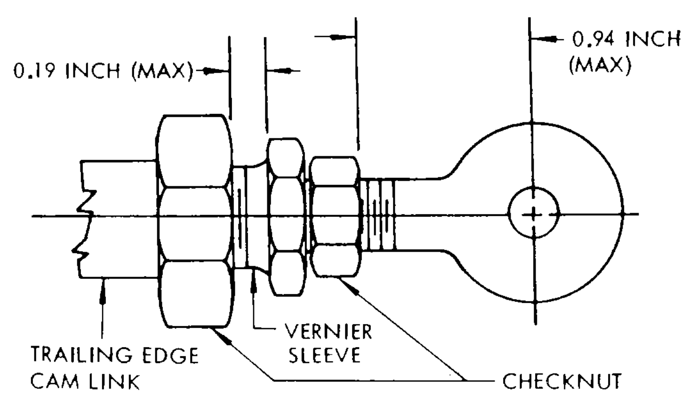


VIEW 1



DETAIL A



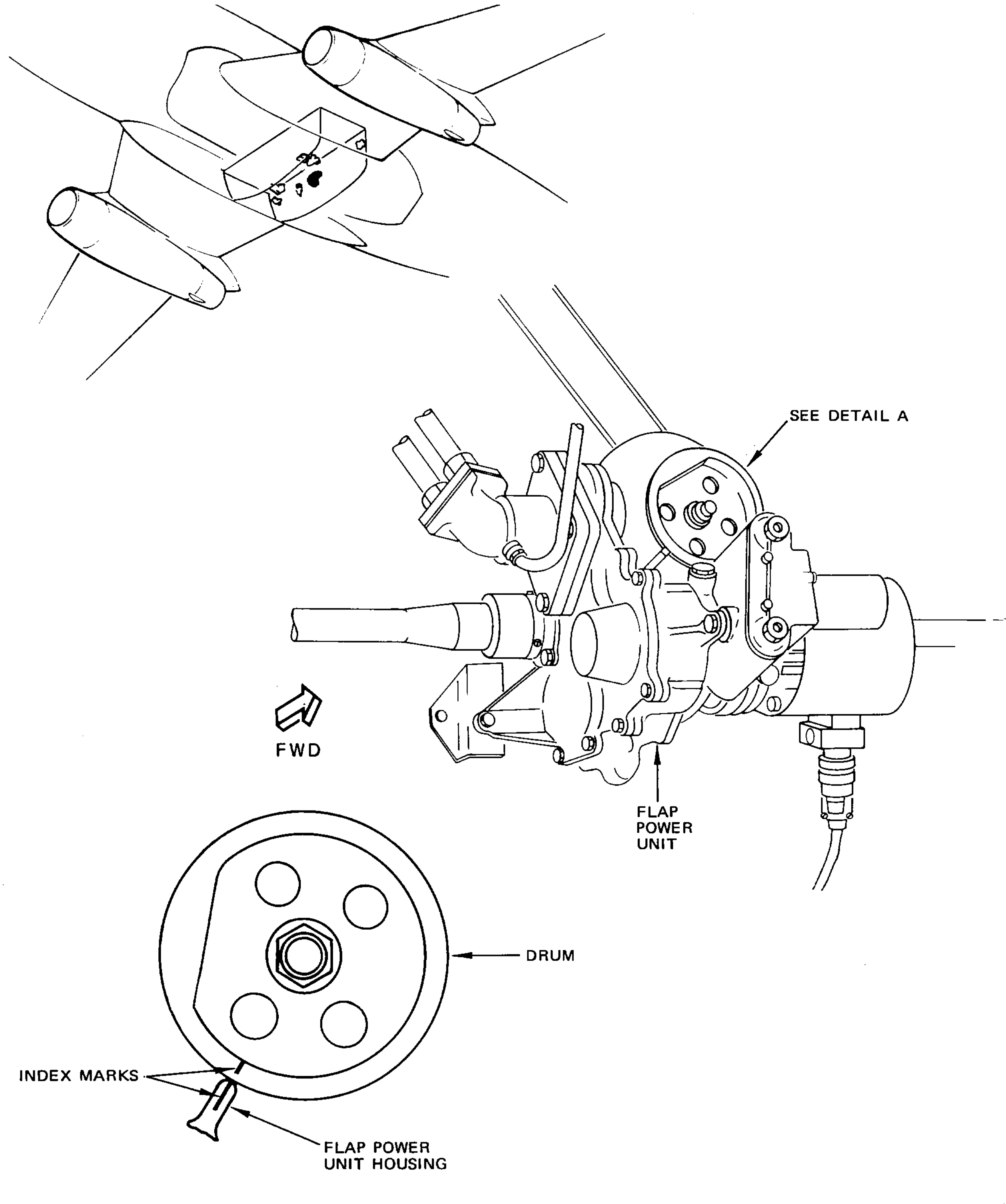
DETAIL B

Flap Control Unit Adjustment
Figure 503 (Sheet 2)

(4) Adjust trailing edge flap control valve.
  (a) Ensure that flap control lever is in FLAP UP detent.
  (b) Install rigging pin F-1 in flap control unit (Fig. 503).
  (c) Check that valve slide and indexing surface of trailing edge flap control valve align within ± 0.010 inch. If not, adjust trailing edge cam link as follows:
    1) Remove lockwire and loosen two checknuts.
    2) Adjust sleeve to align valve slide and indexing surface within ± 0.010 inch.
    3) Tighten checknuts and install lockwire, two places.
    4) Ensure that thread engagement of rod end and vernier sleeve is within limits.
    5) If thread engagement is not within limits:
      a) Remove rod end bolt.
      b) Loosen checknut and turn rod end at one-half turn increments to obtain approximate adjustment.
      c) Install rod end bolt and secure with washer and locknut.
      d) Repeat steps 1) thru 4).
  (d) With rigging pin F-1 still installed, check that valve slide and indexing surface of leading edge flap control valve align within ± 0.010 inch. If not, adjust leading edge link as follows:
    1) Remove lockwire and loosen checknut.
    2) Remove rod end bolt at cam follower arm.
    3) Turn rod end at one-half turn increments to obtain adjustment.
    4) Install rod end bolt and check that valve slide and indexing surface align within ± 0.010 inch.
    5) Secure rod end bolt with washer and locknut.
    6) Tighten checknut and install lockwire.
    7) Ensure that thread engagement of rod end is within limits.
  (e) Remove rigging pin F-1.

  CAUTION: IF NOT REMOVED, RIGGING PIN F-1 MAY DAMAGE FLAP CONTROL UNIT WHEN HYDRAULIC POWER IS APPLIED.

  (f) Provide system A hydraulic power (AMM 27-51-0).



Flap Power Unit Adjustment
Figure 504

(g) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.

CAUTION: MONITOR FLAP RETRACTION CLOSELY TO PREVENT DAMAGE DUE TO IMPROPERLY ADJUSTED OR DISCONNECTED COMPONENTS.

NOTE: If asymmetry shutoff mechanism is not properly adjusted, the flaps may not operate. Manually positioning asymmetry shutoff valve will allow flap operation.

(h) If flap drive system creeps, wait 2 minutes before removing system A hydraulic power (AMM 27-51-0).
(i) Check that rigging pin F-1 fits freely in flap control unit. If rigging pin does not fit freely, adjust trailing edge cam link as follows:
1) Remove lockwire and loosen two checknuts.
2) Remove rigging pin F-1.
3) Provide system A hydraulic power (AMM 27-51-0/201).
4) Adjust sleeve to align rigging pin holes for rigging pin F-1.

CAUTION: DO NOT INSTALL RIGGING PIN F-1 WITH HYDRAULIC POWER ON.

NOTE: If rigging pin slot in follow-up cam must be rotated downward, cam link must be shortened. This is accomplished by rotating sleeve clockwise.

5) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.
6) After 2-minute wait, remove system A hydraulic power (AMM 27-51-0/201).
7) Check that rigging pin F-1 fits freely. If not, repeat steps 2) thru 6).
8) Tighten checknuts and install lockwire, two places.
9) Ensure that thread engagement of rod end and sleeve is within limits.

(j) Remove rigging pin F-1.
(k) Provide system A hydraulic power (AMM 27-51-0/201).
(l) Operate flap control system by moving flap control lever from FLAP UP to FLAP DOWN (40-unit) position and back to UP. Pause at UP and DOWN positions to allow flap drive unit to respond. Repeat for at least two cycles.

(m) Position flap control lever in FLAP UP detent.
(n) After waiting 2 minutes, remove system A hydraulic power (AMM 27-51-0/201).
(o) Check that rigging pin F-1 fits freely in flap control unit. If rigging pin does not fit freely, repeat steps (i) thru (n).
(p) Install lower pan on flap control unit.

(5) Adjust flap transmissions.
(a) With trailing edge flaps retracted to FLAP UP position per step 1.C.(1), check that each transmission is positioned so that angular clearance between stop on ball screw nut and upstop on screw yoke is 170 to 190 degrees (1/2 turn ± 10 degrees) turn (Fig. 505).

NOTE: When you turn the flap drive torque tubes to get 1 turn of the inboard flap jackscrews, you will get a 1/2 turn of the outboard flap jackscrews.

(b) Check that seal supports on aft lower wing panels have full span contact with nose of each midflap.
(c) If requirements in steps (a) and (b) are not met, adjust flap transmissions as follows:
1) If all transmissions on one wing require similar adjustment, disconnect torque tube from flap power unit. Rotate torque tube until transmission upstop and midflap seal support requirements are obtained.
2) If individual transmissions require adjustment, disconnect torque tubes at both sides of each transmission to be adjusted. Rotate transmission input shaft until upstop and midflap seal support requirements are obtained.
(d) Connect torque tubes at all transmissions and at flap power unit.

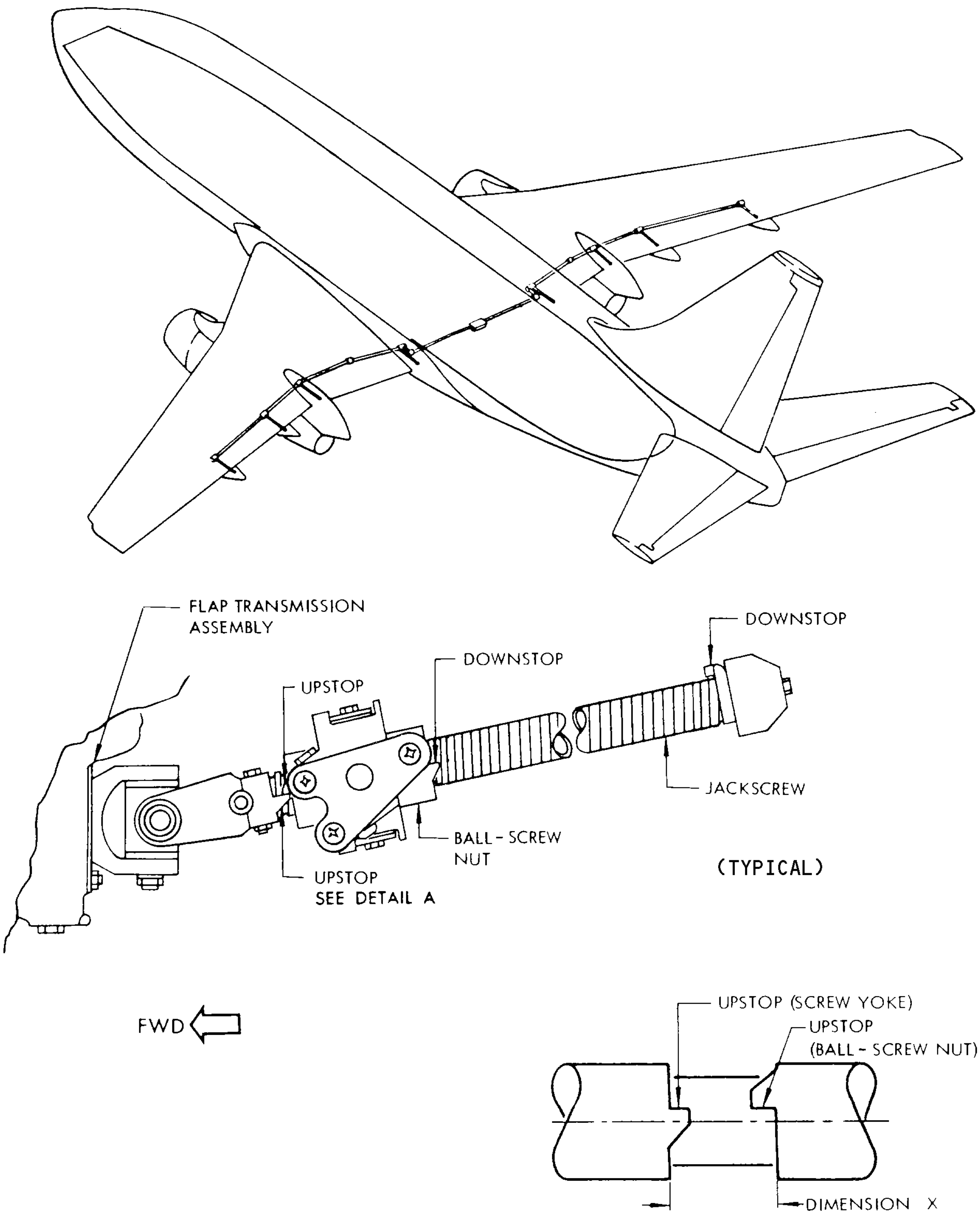
NOTE: Ensure that position of transmissions and flap power unit are not disturbed as torque tubes are connected.

1) Secure torque tubes by installing screws through sleeve and coupling.
2) Lockwire heads of screws together.

(e) Provide system A hydraulic power (AMM 27-51-0/201).
(f) Operate trailing edge flaps by moving flap control lever from FLAP UP to FLAP DOWN (40-unit) position and back to UP. Pause at UP and DOWN positions to allow flaps to respond fully. Repeat for at least two cycles and check the following:
1) The ball screw nut upstop must stop in the range of 170 to 190 degrees (1/2 turn ± 10 degrees) turns from contact at FLAP UP position.
2) The ball screw nut downstop must stop at least 1/4 turn from contact at FLAP DOWN (40-unit) position.
(g) Extend flaps to FLAP DOWN (40-unit) position and check that angles of opposite midflaps are symmetrical within 1 degree. Measure along lower surface of midflap at midspan for inboard flaps, and at outboard flap track for outboard flaps using protractor. Lift outboard flap trailing edge so that main carriage flight load rollers contact flap track.
(h) If angles of opposite flaps are not within limits, correct by disconnecting appropriate flap drive torque tubes and adjusting flap transmissions to obtain symmetry. Connect torque tubes, secure couplings and lockwire heads of torque tube coupling screws.
(i) If flap transmissions are adjusted per step (h), check jackscrew and seal clearance per steps (a) and (b).
(j) Retract trailing edge flaps to FLAP UP position, then remove system A hydraulic power (AMM 27-51-0/201).
(6) Adjust flap limit switches (AMM 27-51-291, Adjust Flap Limit Switches).
(7) Adjust flap position transmitters (AMM 27-58-01, Adjust Trailing Edge Flap Position Indicating System).
(8) Test trailing edge flap system.

2. <u>Trailing Edge Flap System Test</u>

A. Test Trailing Edge Flap System
(1) Test left asymmetry shutoff system.
(a) Provide system A hydraulic power (AMM 27-51-0).
(b) Position flap control lever in 15-unit detent.
(c) After waiting 2 minutes, remove system A hydraulic power (AMM 27-51-0).
(d) Remove left flap position transmitter (AMM 27-58-12/401).
(e) If electrical connector was removed from transmitter during transmitter removal, install electrical connector on transmitter.
(f) Rotate flap position indicator input shaft clockwise until flap bypass valve red indicator lever point moves to position 2.
(g) Check that angle of separation between flap position indicator needles is between 8 to 20 degrees (chordal dimension of 0.11 to 0.26 inch for position indicator configuration 1 or 0.08 to 0.21 inch for position indicator configuration 2 Fig. 506).



Flap Transmission Assembly Adjustment
Figure 505

(h) Rotate flap position transmitter input shaft counterclockwise until flap bypass valve red indicator lever point moves to position 1.
(i) Check that angle of separation between flap position indicator needles is between 5 to 17 degrees (chordal dimension of 0.07 to 0.22 inch for position indicator configuration 1 or 0.05 to 0.18 inch for position indicator configuration 2 Fig. 506).
(j) Rotate flap position indicator input shaft counterclockwise until flap bypass valve red indicator lever point moves to position 2.
(k) Check that angle of separation between flap position indicator needles is between 8 to 20 degrees (chordal dimension of 0.11 to 0.26 inch for position indicator configuration 1 or 0.08 to 0.21 inch for position indicator configuration 2 Fig. 506).
(l) Rotate flap position transmitter input shaft clockwise until flap bypass valve red indicator lever point moves to position 1.
(m) Check that angle of separation between flap position indicator needles is between 5 to 17 degrees (chordal dimension of 0.07 to 0.22 inch for position indicator configuration 1 or 0.05 to 0.18 inch for position indicator configuration 2 Fig. 506).
(n) Rotate flap position transmitter input shaft clockwise until left flap position indicator needle lines up with right position indicator needle.
(o) Install left flap position transmitter (AMM 27-58-12/401).

(2) Test right asymmetry shutoff system.
(a) Repeat steps (1)(a) thru (1)(o) except substitute right where left is noted.

(3) Test flap asymmetry checking circuit.
(a) Place flap control lever in FLAP UP detent.
(b) Provide system A hydraulic power to retract flaps (AMM 27-51-0/201). Hold for 2 minutes.
(c) Position flap asymmetry test switch in electronics bay, E-3 electronics equipment rack, to test L position (Fig. 506).
1) Check that test light (Fig. 506) illuminates.
2) Check that left pointer on flap position indicator has moved 22 ±5 degrees between left and right pointer tips (Fig. 506).
3) Check that flap bypass valve has moved to position 2.
4) Release test switch and check that light has extinguished, indicator needles are together, and flap bypass valve has returned to position 1.
(d) Position test switch to Test R position.
1) Check that test light illuminates.

2) Check that right pointer on flap position indicator has moved 22 ±5 degrees between left and right pointer tips (Fig. 506).
3) Check that flap bypass valve has moved to position 2.
4) Release test switch and check that light has extinguished, indicator needles are together, and flap bypass valve has returned to position 1.

(4) Test trailing edge flap indexing.
(a) Provide system A hydraulic power (AMM 27-51-0/201).
(b) Place flap control lever in FLAP UP detent to retract flaps hydraulically.
(c) After waiting 2 minutes, remove system A hydraulic power (AMM 27-51-0/201).
(d) At each flap jackscrew, check that angular clearance between stop on ball screw nut and upstop on jackscrew yoke is 170 to 190 degrees (1/2 turn ±10 degrees) turn.
(e) At No. 4 jackscrew, measure dimension X (Fig. 505). Record value and label as dimension X1.

NOTE: To allow for flap drive system creep, wait 2 minutes before measuring X dimension.

(5) Test trailing edge flap positioning.
(a) Position flap control lever in FLAP UP detent to retract flaps and then in the 1-unit detent to extend trailing edge flaps.
(b) Measure X2 dimension at number 4 jackscrew. Record value in Table I (EXTEND column).

NOTE: If flap drive system creeps, wait 2 minutes before measuring X2 dimension.

(c) Repeat step (c) with flap control lever in 2, 5, 10, 15, 25, 30, and 40-unit detents.

TABLE I					
FLAP CONTROL LEVER POSITION -INCHES-	NO. 4 FLAP JACKSCREW POSITION -INCHES-				
	REQUIRED X2 - X1	ACTUAL X2 EXTEND	ACTUAL X2 - X1 EXTEND	ACTUAL X2 RETRACT	ACTUAL X2 - X1 RETRACT
1	3.90 to 5.00				
2 *[1]	13.45 to 14.80				
5	17.84 to 19.34				
10 *[1]	22.49 to 23.15				
15 *[1]	24.11 to 24.81				
15 *[2]	24.23 to 24.93				
25 *[1]	25.26 to 25.94				
25 *[2]	25.23 to 25.91				
30	27.12 to 27.78				
40	29.82 to 30.48				

*[1] TZ C-GTAQ and on *[2] ALL EXCEPT *[1]
PV CF-EPP, CF-EPU, C-GEPA and on
AR LV-JTD, LV-JTO, LV-LEB and on
AQ N24SW and on
TS ALL EXCEPT N73711 thru N73713, N73715, N73717
PW 735 thru 761, 763 thru 771, 773 and on

(d) Position flap control lever in 30-unit detent to retract trailing edge flaps.

(e) Measure X2 dimension at number 4 jackscrew. Record value in Table I (RETRACT column).

NOTE: If flap drive system creeps, wait 5 minutes before measuring X2 dimension.

(f) Repeat step (f) with flap control lever in 25, 15, 10, 5, 2, and 1-unit detents per Table I.

(g) Using X1 dimension, perform necessary subtraction to obtain X2 - X1 dimensions in Table I. These dimensions must be within required tolerances.

(6) Check normal trailing edge flap operating time.

NOTE: Hydraulic service cart set at 20 gpm and 3000 psig or operation of at least one engine-driven pump is required to perform this portion of test.

(a) Move flap control lever from FLAP UP detent to FLAP DOWN (40-unit) detent.
(b) Check that time for flaps to extend is 35 ±5 seconds.

NOTE: Operating time should be measured from start of flap motion in up position until downstop on number 4 ball screw nut is 1.50 ±0.20 inches from downstop on the jackscrew.

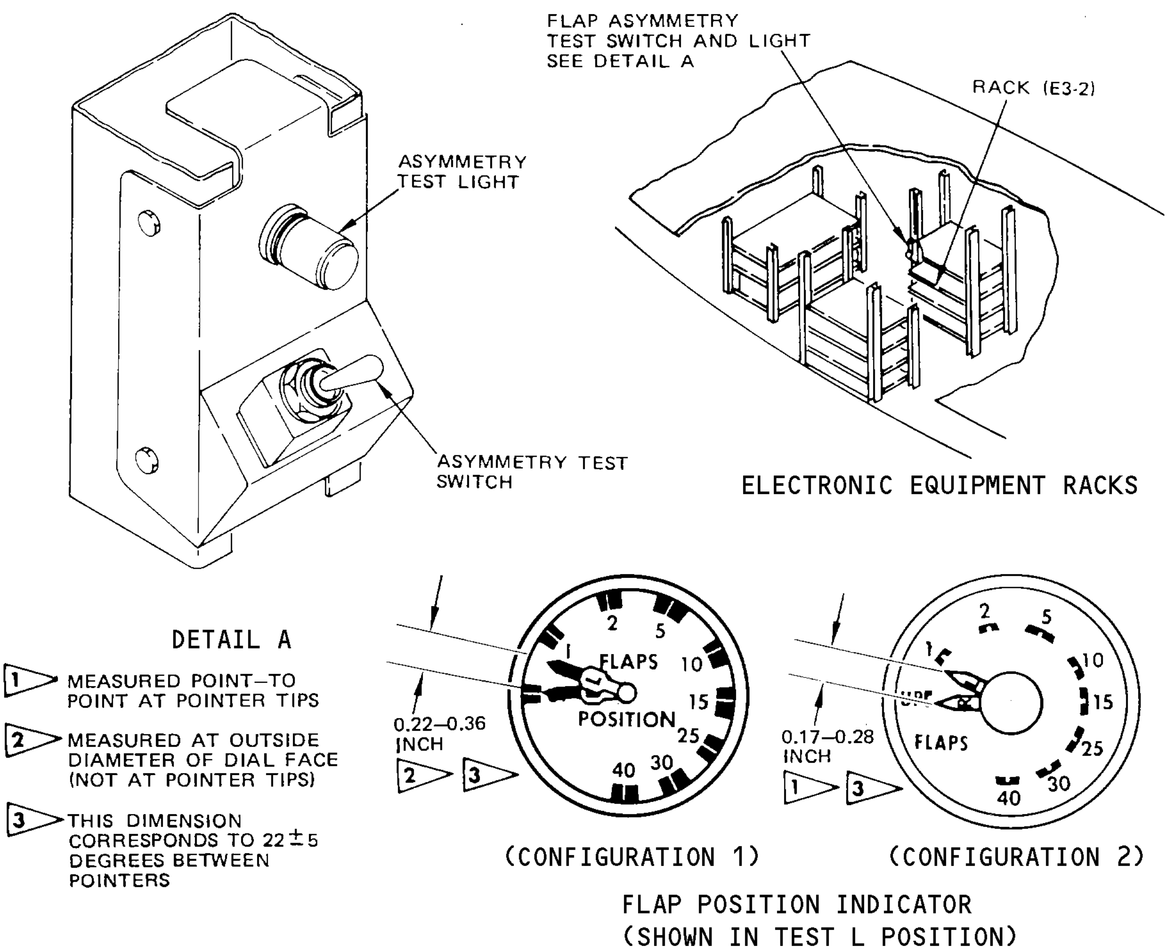
(c) Position flap control lever in FLAP UP detent.
(d) Check that time for flaps to retract is 35 ±5 seconds.

(7) Test trailing edge flap alternate drive operation.
(a) On circuit breaker panel (P6-2):
1) Open TE ALT FLAP DRIVE MOTOR circuit breaker.
2) Check that FLAP VALVES circuit breaker is closed.
(b) Provide system A hydraulic power (AMM 27-51-0/201).
(c) Position alternate flaps arm switch at ARM.

NOTE: Actuation of alternate flaps arm switch to ARM energizes standby hydraulic pump motor.

(d) Operate flap control lever and check that trailing edge flaps do not respond.
(e) Close TE ALT FLAP DRIVE MOTOR circuit breaker.
(f) Move flap control lever to FLAP DOWN (40-unit) detent.

NOTE: Flap control lever is moved to FLAP DOWN position as a standard procedure to minimize load on flap hydraulic motor when system A hydraulic power is pressurized.



Flap Asymmetry Test Equipment
Figure 506

(g) Actuate alternate flaps control switch to DOWN position. Hold switch in this position until trailing edge flap motion stops.

WARNING: LEADING EDGE CONTROL SURFACES WILL EXTEND. ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR.

CAUTION: DO NOT OPERATE ALTERNATE FLAPS DRIVE MOTOR FOR MORE THAN 4 MINUTES IN A 25-MINUTE TIME SPAN. DRIVE MOTOR MAY OVERHEAT.

NOTE: Extension of trailing edge flaps is controlled by limit switches.

(h) Check that time for flaps to extend is 146 +10/-20 seconds.

(i) At number 4 jackscrew, measure dimension X2. Check that X2 - X1 is 29.65 to 30.18 inches. Use X1 dimension recorded in step (3)(e).

(j) Actuate alternate flaps control switch to UP position. Hold switch in this position until trailing edge flap motor stops.

CAUTION: DO NOT OPERATE ALTERNATE FLAPS DRIVE MOTOR FOR MORE THAN 4 MINUTES IN A 25-MINUTE TIME SPAN. DRIVE MOTOR MAY OVERHEAT.

NOTE: Retraction of trailing edge flaps is controlled by limit switches.

(k) Check that time for flaps to retract is 146 +10/-20 seconds.

(l) At number 4 and 5 jackscrews, check that angular clearance between upstop on ball screw nut and upstop on jackscrew yoke is between 1-3/4 to 2-1/4 turns (this corresponds to a Dimension X of 0.87 to 1.03 inch).

(m) Position flap control lever in FLAP UP detent.

(n) Position both alternate flaps switches to OFF.

WARNING: LEADING EDGE CONTROL SURFACES WILL RETRACT. ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR.

(8) Check Flap Control Lever Operating Force

(a) Check that tangential force required to move flap control lever between detents does not exceed 2.5 pounds, excluding cable cushion. Measure force at end of lever.

B. Restore Airplane to Normal

(1) Remove system A hydraulic power (AMM 27-51-0/201).

(2) Remove electrical power if no longer required.
(3) Lockwire alternate flaps arm switch.

3. AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JTD, LV-JTO, LV-LEB;
CF ALL EXCEPT CF-CPB thru CPZ;
IC ALL EXCEPT VT-EAG thru VT-EAK, VT-ECP thru VT-ECS;
PI ALL EXCEPT N734N thru N747N;
SA ALL EXCEPT ZS-SBL thru ZS-SBR;
Flap Load Limiter Test

A. Equipment and Materials
   (1) A vacuum source and barometer, or equivalent, capable of measuring a differential pressure of up to 1.5 inches of mercury to an accuracy of ± 0.015 inch of mercury

B. Prepare to test flap load limiter system.

CAUTION: TO PREVENT DAMAGE TO EQUIPMENT AND INSTRUMENTS, CHECK FOLLOWING PRECAUTIONS BEFORE APPLYING PRESSURE TO THE PITOT-STATIC SYSTEM.

   (1) Ensure that pitot-static probe heaters remain off during testing.
   (2) Apply pitot line pressure with a suitable connection to the auxiliary pitot tubes.

CAUTION: THE PITOT PRESSURE SHALL ALWAYS EQUAL OR EXCEED STATIC LINE PRESSURE AND DIFFERENCE (DIFFERENTIAL PRESSURE) SHALL NOT EXCEED 10.00 INCHES OF MERCURY.

   (3) Apply static absolute pressure to auxiliary static system by connecting vacuum source to drain fittings located in electronics bay or to pitot-static probe ports.

CAUTION: INSTRUMENTS WILL BE DAMAGED IF STATIC PRESSURE EXCEEDS PITOT PRESSURE EVEN MOMENTARILY. STATIC PRESSURE SHALL NOT EXCEED 8000 FEET ABOVE ACTUAL AIRPORT ALTITUDE AND APPLICATION OR RELEASE OF VACUUM SHALL BE MADE AT A RATE OF CLIMB OR DESCENT OF APPROXIMATELY 3000 FEET PER MINUTE OR LESS.

   (4) Seal all unused auxiliary system static ports in such a way that removal of seal will be complete leaving no deposits or roughness in or about static ports.
   (5) Close the FLAP LOAD LIMITER circuit breaker on the P6 panel.
   (6) Connect external electrical power to the airplane.
   (7) Provide system A hydraulic power (AMM 27-51-0/201).
   (8) Position flap control lever to FLAPS UP detent.
   (9) Check that flaps retract to FLAP UP position.
   (10) Position flap control lever to 40-unit detent.
   (11) Check that flaps extend to 40-unit position.

TABLE IV					
PITOT PRESSURE VALUES					
ACTUAL ΔP1	REQUIRED ΔP1	ACTUAL ΔP2	REQUIRED ΔP2	ACTUAL ΔP1-ΔP2	REQUIRED ΔP1-ΔP2
	1.121 in.Hg (152 kts) to 1.274 in.Hg (162 kts)		1.046 in.Hg (147 kts) to 1.197 in.Hg (157 kts)		0.075 in.Hg (5 kts) min.

C. Test flap load limiter system.
   (1) Increase pressure in pitot-static system until flaps start to retract.
   (2) Check that actual differential pressure (ΔP1) is within required range in Table IV. Record actual ΔP1 in table.
   (3) Check that flaps retract to 30-unit position.
   (4) Decrease differential pressure in pitot-static system until flaps start to extend.
   (5) Check that actual differential pressure (ΔP2) is within required range in Table IV. Record actual ΔP2 in table.
   (6) Check that actual ΔP1-ΔP2 agrees with required ΔP1-ΔP2 in Table IV.
   (7) Check that flaps extend to 40-unit position.
   (8) Depressurize pitot-static system and return to normal.
   (9) Position flap load limiter test switch on equipment bay light panel in electronics compartment to SYSTEM TEST position and check that flaps retract to approximate 30-unit position.

   NOTE: If airplane is on jacks compress right-hand main gear strut approximately 5 inches to ground position.

   (10) Release test switch, and check that flaps extend to 40-unit position.
   (11) Position flap control lever to 30-unit detent.
   (12) Check that flaps retract to 30-unit position.
   (13) Position flap load limiter test switch to SWITCH TEST position.
   (14) Check that test lamp lights and extinguishes upon release of switch.
   (15) Position flap control lever to FLAP UP (0-unit) detent.
D. Return airplane to it's normal condition.
   (1) Remove system A hydraulic power (AMM 27-51-0/201).
   (2) Remove electrical power if no longer required.

INBOARD TRAILING EDGE FLAP - REMOVAL/INSTALLATION

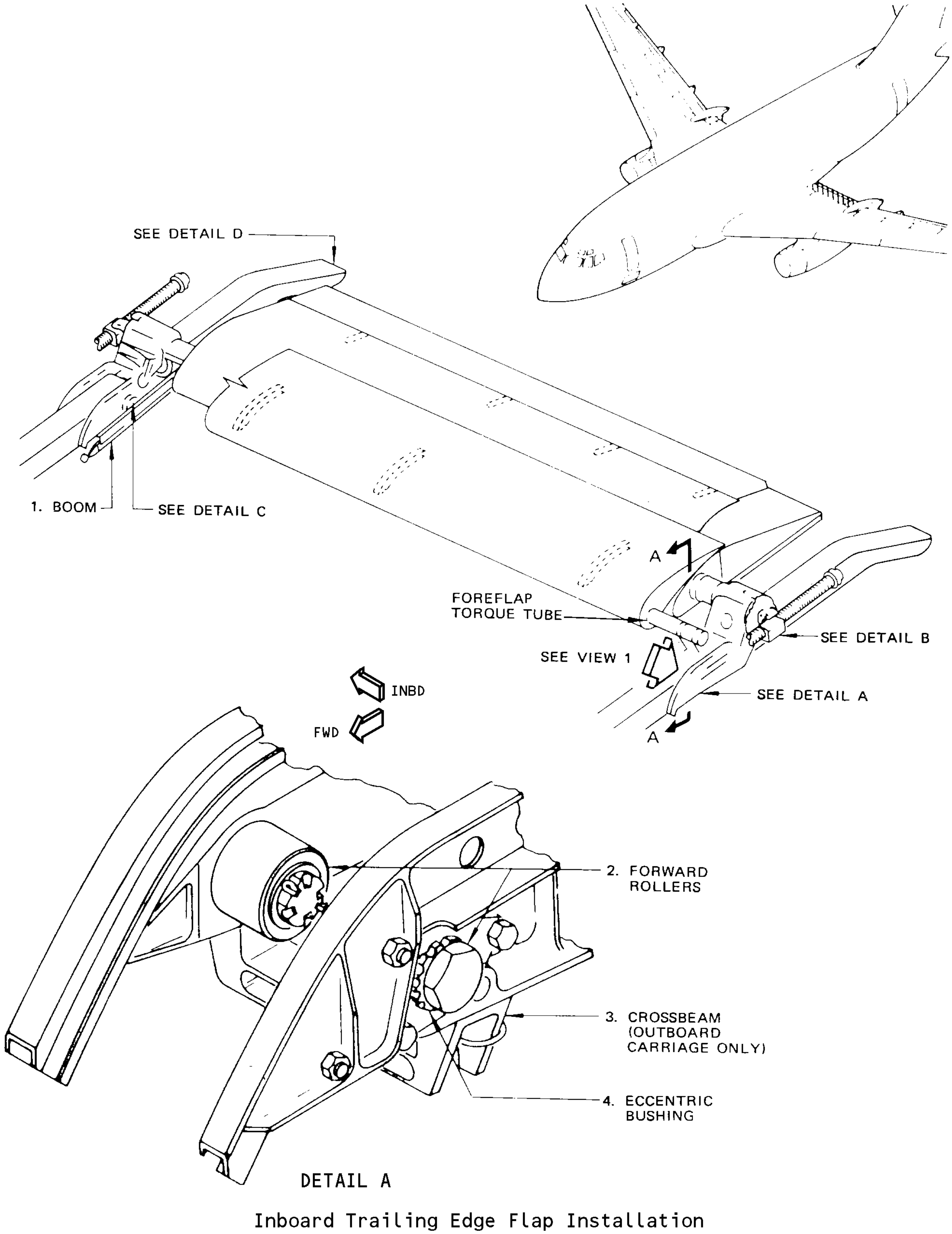
1. General
   A. Each trailing edge flap consists of a foreflap, a midflap, and an aftflap.
   B. The upper leading edges of the foreflap and midflap are finished with an abrasion resistant teflon coating. For repair of teflon coating, refer to Chapter 51, Abrasion Resistant Teflon Finishes.
   C. The midflap carriage forward rollers are mounted in eccentric bushings. Rotation of these bushings will raise or lower the flap trailing edge. These bushings are adjusted to fair flap trailing edge with wing chord plane.
2. Equipment and Materials
   A. Inboard Flap Rigging Tools:
      (1) Inboard Flap Rigging Beam - F80209-3 (Preferred) (Ref 27-09-700)

      NOTE: Rigging Beam is a part of F80209-1.

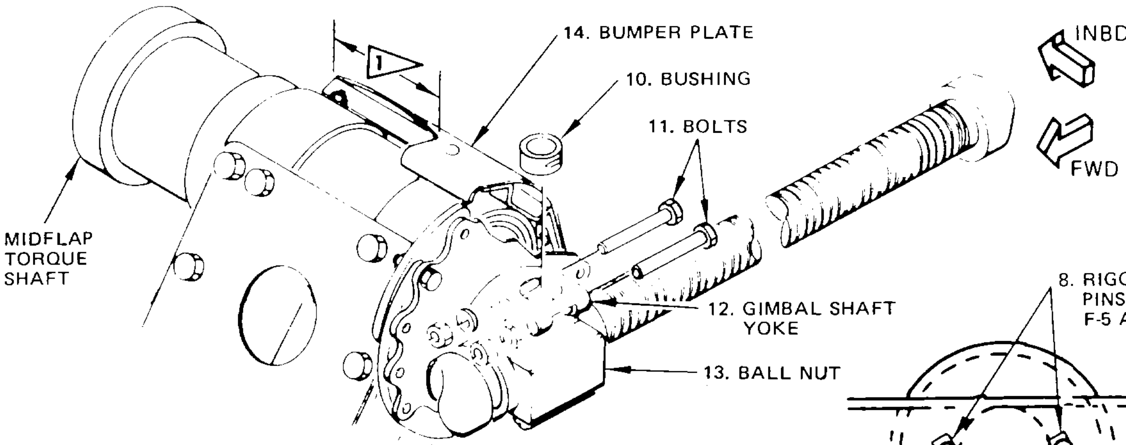
      (2) Inboard Flap Rigging Tool - 2TE65-73720-1, -2 (Optional)
   B. Flap Drive Adapter - F70300-1 (Preferred) or ST2583-1 (Optional)
   C. Rigging Pins, F-5 and F-6 - 0.248 +0.000/-0.002-inch diameter, 3.7 ±0.25 inches long (MS20392-3)

   NOTE: Rigging pins are a part of kit F70207-3, -52, -61, or -84.

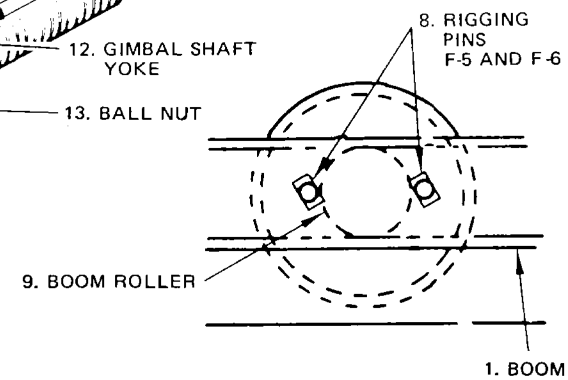
   D. Control Column Protractor Assembly 4MIT65B80307-1 (Preferred) or F52485-500 (Optional)
   E. Protractor Stand Assembly - F71292-17
   F. Primer - BMS 10-11, Type I (Ref 20-30-41)
   G. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
   H. Pressure, Environmental and Fuel Cavity Sealant - BMS 5-79 (Ref 20-30-11)
   I. Trailing Edge Flaps Sling Assembly - F80213-73
   J. Flap Drive Screw Support Assembly - F80057-1
3. Prepare for Removal
   A. Remove engine (Ref Chapter 71, Power Plant) or remove thrust reverser and tailpipe extension (Ref Chapter 78, Thrust Reverser).
   B. Remove pan from lower surface of engine-to-wing aft fairing, remove access panel from rear bulkhead of engine-to-wing aft fairing, access cover from forward overhead engine-to-wing aft fairing (Ref Chapter 54, Engine-to-Wing Fairing).
   C. Remove inboard flap track fairing (Ref 27-51-141 R/I).
   D. Provide system A hydraulic power (Ref 27-51-0 MP).
   E. Position flap control lever in FLAP DOWN (40-unit) detent.
   F. Remove hydraulic system A power and depressurize system (Ref 27-51-0).
4. Remove Inboard Trailing Edge Flap
   A. Remove hinged flap (Ref 27-51-51 R/I).



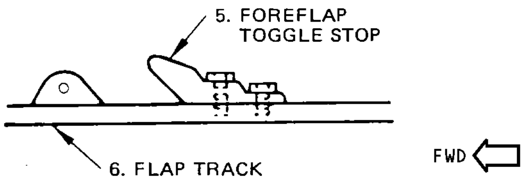
Inboard Trailing Edge Flap Installation
Figure 401 (Sheet 1)



DETAIL B

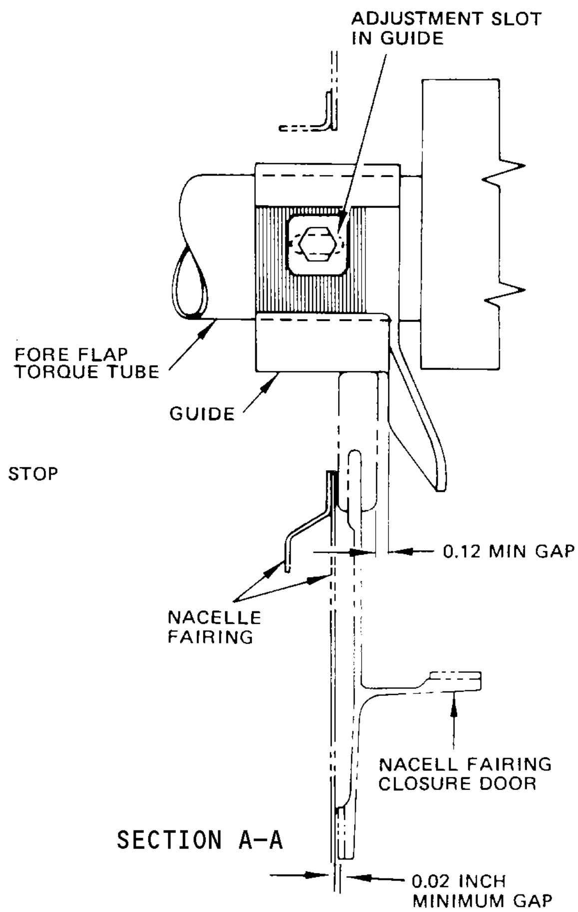


DETAIL C

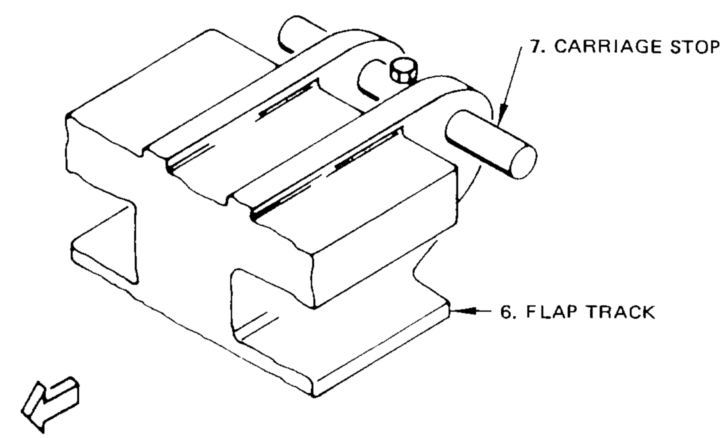


VIEW 1

[1] BEND THIS AREA OF BUMPER PLATE DOWN AS REQUIRED TO ELIMATE CONTACT WITH NACELLE FAIRING MIDFLAP TORQUE SHAFT CLEARANCE DOOR SKIN (0.12-INCH BEND RADIUS)



SECTION A-A



DETAIL D

Inboard Trailing Edge Flap Installation
Figure 401 (Sheet 2)

B. Remove inboard foreflap (Ref 27-51-41 R/I).
C. Remove four bolts (11, figure 401) from each gimbal shaft yoke (12). Secure bushings to prevent them from working free.
D. Provide system A hydraulic power (Ref 27-51-0).
E. Position flap control lever at FLAP UP detent to retract flaps.
F. Remove hydraulic system A power (Ref 27-51-0).
G. Support flap so that weight of flap is off trunnions and remove four bushings (10), two from each side of gimbal shaft.

NOTE: The mid and aft flap assembly weighs approximately 276 pounds. Make sure flap is supported before disconnecting.

H. Support flap and push ball nut (13) away from gimbal at each end of flap. Secure ball nut to prevent rotation of nut on jackscrew. Support jackscrew using flap drive screw support assembly.
I. Disconnect forward end of aft flap drive boom (1) from fixed structure.
J. Remove foreflap toggle stop (5) from top of each flap track (6).
K. Remove midflap carriage stop (7) from aft end of inboard flap track (6).
L. Support flap and move aft to 40-unit position. Support flap in this position.
M. Mark position relative to pin of each forward roller eccentric bushing (4). Remove forward roller (2) from each side of midflap inboard and outboard carriages.

NOTE: When flap is reinstalled, eccentric bushings should be installed in same position to simplify adjustment.

N. Remove crossbeam (3) from bottom of midflap outboard carriage.
O. Using sling or other suitable means of supporting flap, roll flap aft and off flap tracks.

CAUTION: USE CARE IN REMOVING AND HANDLING FLAP ASSEMBLY TO PREVENT DAMAGE.

P. Install rigging pins F-5 and F-6 in holes in outboard side of boom so that boom roller (9) is trapped between rigging pins.
Q. Retain forward rollers and crossbeam with flap.
R. Retain toggle stop and carriage stop with airplane.

5. Install Inboard Trailing Edge Flap

A. Make certain that aftflap drive mechanism is properly adjusted and that rigging pins F-5 and F-6 can be installed in boom.

NOTE: If any part of aftflap drive mechanism has been disconnected, it must be readjusted as outlined in Inboard Trailing Edge Flap - Adjustment/Test.

B. Remove forward roller (2, Fig. 401) from each side of midflap inboard and outboard carriages.
C. Remove crossbeam (3) from bottom of midflap outboard carriage.
D. Using sling, or other suitable means of supporting flap, align midflap carriages with flap tracks and roll flap forward on tracks to retracted position.
E. Install foreflap toggle stop (5) on top of each flap track (6).
F. Install midflap carriage stop (7) in end of inboard flap track (6). Dip bolt in corrosion preventive compound before installation. Install nut finger-tight and tighten just enough more to allow installation of cotter pin. Install cotter pin.

NOTE: Pull nacelle fairing closure door down and secure with tape to prevent interference when installing flap.

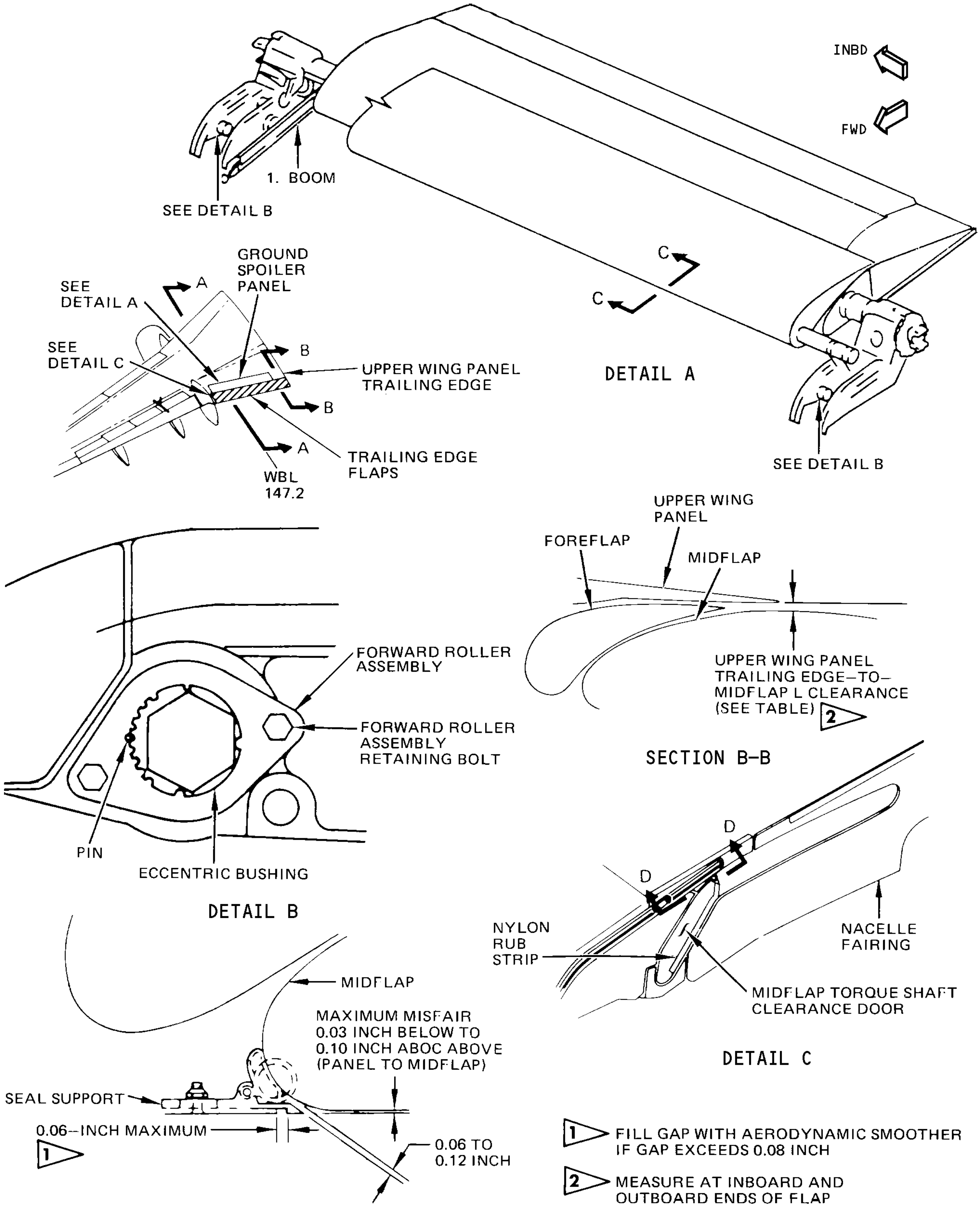
G. Remove flap restraining support and roll flap down to fully extended position.

CAUTION: USE CARE IN ROLLING FLAP TO END OF TRACK TO AVOID STRIKING STOP WITH EXCESSIVE FORCE.

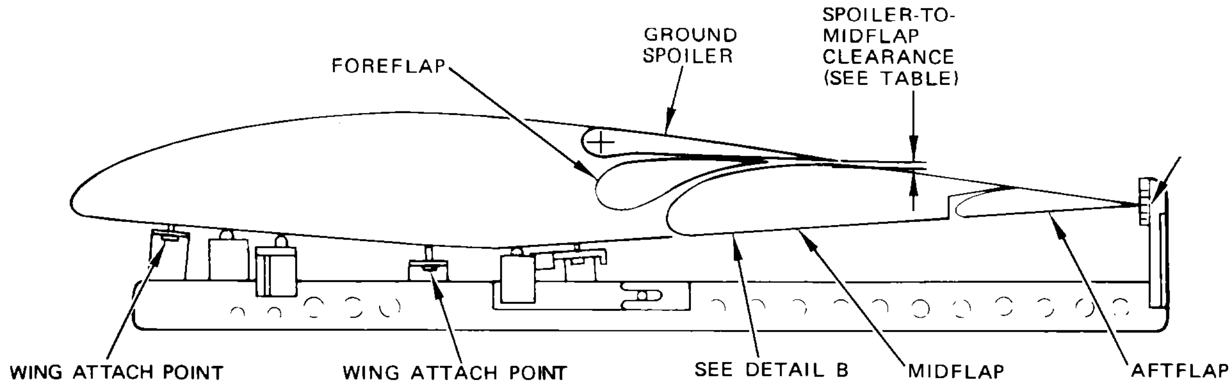
H. Install crossbeam (3) on bottom of midflap outboard carriage. Install bolts with wet primer and lockwire.
I. Install forward rollers on midflap inboard and outboard carriages. Make sure that eccentric bushings (4) are installed in position noted and marked at flap removal. All eccentric bushings on a flap must be installed in same position. If a used bolt or bushing is being installed, check for allowable wear (Ref AMM 27-51-21).

NOTE: Forward rollers may be removed during installation adjustments outlined in step R. It is not necessary to tighten retaining bolts at this time.

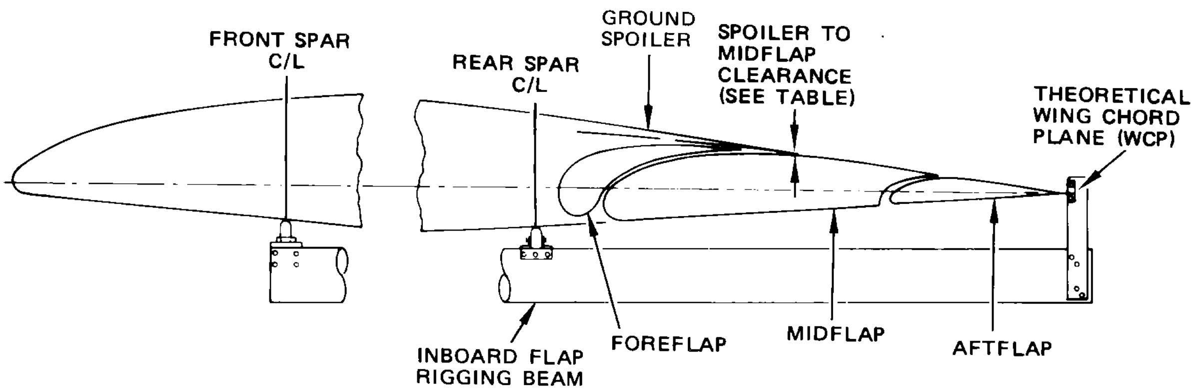
J. Roll flap to retract position.
K. Position ball nut (13) in gimbal shaft yoke (12) at each end of flap. Install ball nut with oil reservoir away from gimbal yoke. Make sure that clearance between ball nut upstops is not less than 3/4 turn of jackscrew.
L. Support flap so that weight of flap is off trunnions and install bushings (10) in each side of each gimbal shaft.
M. Provide hydraulic system A power (Ref AMM 27-51-0).
N. Position flap control lever at 40-unit detent to extend flaps.
O. Remove hydraulic system A power (Ref AMM 27-51-0).



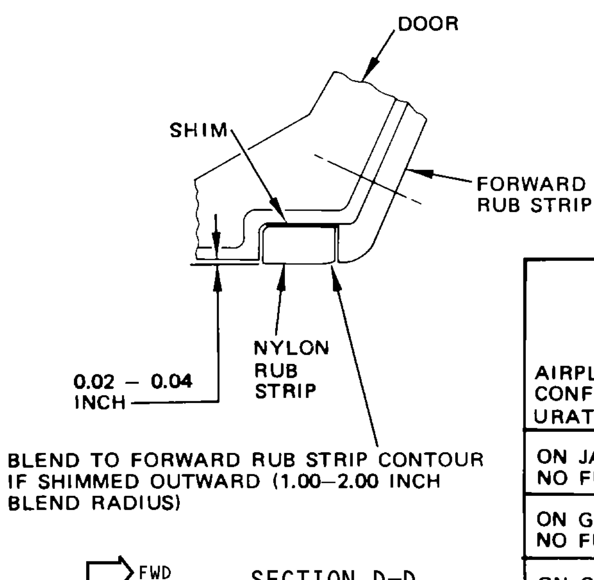
Inboard Trailing Edge Flap to Wing Adjustment
Figure 402



SECTION A-A



SECTION A-A



SECTION D-D

AIRPLANE CONFIG-URATION	SPOILER-TO-MIDFLAP CLEARANCE (INCHES) AT OUTBOARD ACTUATOR	AT INBOARD ACTUATOR	UPPER WING PANEL TRAILING EDGE-TO-MIDFLAP CLEARANCE [2] (INCHES)
ON JACKS NO FUEL	0.03 +0.10/-0.00	0.03 (+0.10/-0.00)	0.03 +0.10/-0.00
ON GEAR NO FUEL	0.03 +0.10/-0.00	0.08 (+0.10/-0.00)	0.08 +0.10/-0.00
ON GEAR FULL FUEL	0.03 +0.10/-0.00	0.13 (+0.10/-0.00)	0.13 +0.10/-0.00

Inboard Tailing Edge Flap to Wing Adjustment
Figure 403

P. Install two bolts (11) in each side of each gimbal shaft yoke. Coat each bolt with corrosion preventive compound. Tighten nuts to standard torque at inboard gimbal, and to between 30 and 40 pound-inches torque at outboard gimbal.

Q. Install inboard foreflap (Ref AMM 27-51-41, Inboard Foreflap - Removal/Installation).

R. Perform installation adjustments as follows:
   (1) Slowly retract flaps as follows:
      (a) Position ALTERNATE FLAPS arm switch at ARM.
      (b) Slowly retract flaps by operation of ALTERNATE FLAPS control switch to UP. Manually guide disconnected boom assembly to prevent interference with structure.
      (c) Position flap control lever at FLAP UP detent.
      (d) With flaps fully retracted electrically, position arming switch at OFF.
      (e) Provide hydraulic system A power (Ref AMM 27-51-0 MP).
      (f) After two minutes, remove system A hydraulic power (Ref AMM 27-51-0 MP).
   (2) Check that angular clearance between upstops on ball nut (13) and jackscrew is 90 to 135 degrees (3/8 turn -45 degrees) turn of jackscrew. If clearance is not within limits (Ref AMM 27-51-01 A/T).
   (3) Check adjustment of aftflap actuating mechanism boom cables as follows:
      (a) Provide hydraulic system A power (Ref AMM 27-51-0 MP).
      (b) Position flap control lever to FLAP DOWN to fully extend trailing edge flaps.
      (c) Remove system A hydraulic power (Ref AMM 27-51-0 MP).
      (d) Disconnect two pushrods from aftflap.
      (e) Disconnect boom assembly at forward end if not previously disconnected.
      (f) Provide hydraulic system A power (Ref AMM 27-51-0 MP).
      (g) Partially retract flaps sufficiently to allow movement of boom assembly aft to rigging position.
      (h) Move boom assembly aft to rigging position.
      (i) Insert rigging pins F-5 and F-6.
      (j) Check that cable tension is 100 +10 pounds.

         NOTE: Cables should be adjusted to 100-pound tension at temperature of approximately 70°F. As temperature decreases, tension should be decreased and as temperature increases, tension should be increased. However, the 10-pound tolerance should not be exceeded.

      (k) If cable tension is incorrect, adjust inboard trailing flap assembly (Ref AMM 27-51-12 A/T).

(l) If cable tension is correct, remove rigging pins F-5 and F-6.
(m) Provide hydraulic system A power (Ref AMM 27-51-0 MP).
(n) Extend trailing edge flaps and move boom assembly forward to forward attach point.

NOTE: Before moving trailing edge flaps, check that rigging pins F-5 and F-6 are removed.

(o) Temporarily attach boom assembly at forward end.
(p) Connect pushrods to aftflap.
(q) Retract trailing edge flaps.
(r) Disconnect boom assembly at forward attach point.
(s) After two minutes, remove hydraulic system A power (Ref AMM 27-51-0 MP).

(4) With rigging pins F-5 and F-6 installed to trap boom roller, connect forward end of boom (1) to inboard fairing support fitting. Adjust boom end fitting as necessary to make connection. Install bolt with corrosion preventive compound with head on inboard side. Tighten checknut on end fitting and lockwire.
(5) Remove rigging pins F-5 and F-6 from boom.
(6) Provide hydraulic system A power (AMM 27-51-0/201).
(7) Move flap control lever to FLAP DOWN (40-unit) detent and back to FLAP UP detent. Carefully check operation of flap for any indication of interference or rough operation.
(8) Remove hydraulic system A power (AMM 27-51-0/201).
(9) Remove plug screws and attach inboard flap rigging tool at location marked by black arrows at WBL 147.2 or hand position inboard flap rigging beam to black stripes located at WBL 147.2 on front and rear spar (Section A-A, Fig. 402). Check that flap trailing edge is within ± 0.25 inch of theoretical wing chord plane (WCP) and is symmetrical with opposite inboard flap trailing edge within 0.10 inch. If you have made trim corrections with the inboard TE flaps, the limits can be more than 0.25 inch. Measurements to be made with aftflap dead-weight rollers contacting. If adjustment is required, proceed as follows:
(a) Remove forward roller assemblies from each flap carriage.
(b) Loosen nut on each roller assembly enough to allow rotation of eccentric bushing.

(c) Rotate bushings as necessary to fair flap trailing edge with wing chord plane. Rotate all bushings on a flap to the same position. Tighten nuts as bushings are adjusted. Tighten nuts to 200-500 pound-inches and install cotter pins.

NOTE: Rotating bushings one notch will shift flap trailing edge approximately 0.10 inch.

(d) With all bushings adjusted, reinstall carriage front rollers. Lockwire bolts.
(e) Recheck position of flap trailing edge in relation to wing chord plane.
(f) Remove inboard flap rigging tool and install plug screws if required.

(10) Provide system A hydraulic power (Ref 27-51-0), extend flaps to FLAP DOWN (40-unit) position and check the following:
(a) Check that opposite midflaps are symmetrical within 1 degree. Measure along lower surface at midspan of midflap using protractor. If angles are not within limits adjust flap transmissions (Ref 27-51-01, Adjust Flap Transmissions).

NOTE: If flaps are readjusted repeat step (8) thru (9).

(11) Extend trailing edge flaps then position flap control lever in FLAP UP detent to retract flaps so that angular clearance between ball screw upstop and jackscrew upstop is 170 to 190 degrees (1/2 turn +10 degrees) turn of jackscrew.
(12) After waiting 2 minutes, remove hydraulic system A power (Ref 27-51-0).
(13) Check that misfair between wing lower trailing edge panel and lower surface of midflap does not exceed limits shown in section C-C. If misfair exceeds limits, adjust trailing edge panel tie rods to reduce it to as near zero as possible.
(14) With flaps in full up position, check that clearance of seal support (on wing lower trailing edge panel) with respect to leading edge of midflap is per section C-C. If adjustment is necessary, loosen seal support retaining screws, position seal support to obtain clearance, and tighten retaining screws. Fill gap between skin and seal support with aerodynamic smoother.

NOTE: If gap between edge of trailing edge panel and bottom surface of seal support is more than shown in section C-C, it should be filled with aerodynamic smoother. If existing gap is filled, smoother must be removed before adjustment.

(15) Check that clearance between nacelle fairing closure door and guide on foreflap torque tube is per section A-A, Fig. 401. If adjustment is necessary loosen bolt on guide and position guide to required clearance.

S. Install hinged flap (Ref AMM 27-51-51, Removal /Installation).

T. Adjust flap drive screw preload as follows (Fig. 403):

(1) Provide hydraulic system A power (Ref AMM 27-51-0).

(2) Place flap control lever at 1-unit detent, wait 5 minutes, then remove system A hydraulic power (Ref AMM 27-51-0).

(3) Check fit of flap outboard drive screw end fitting (1) in preload pad (2). Check that radial gap between screw end fitting and preload pad is as shown in view 1 (Fig. 403) for entire surface of pad. If necessary, adjust preload as follows:

(a) Remove retaining two bolts (3) from gimbal shaft (5).

(b) Rotate and shift indexing plate (4) as necessary to position drive screw end fitting. Rotate indexing plate to the nearest aligning hold with the bearing support fitting (7).

(c) Adjust thickness of shims (6) to fill gap between indexing plate (4) and bearing support fitting (7) and install bolts (3).

(d) Recheck that clearance between pad and screw end fitting is as shown in View 1.

(4) With flaps at 1-unit position, check position of flap inboard drive screw (jackscrew) end fitting (11) as follows:

(a) Check location of jackscrew as follows (Fig. 404):

1) Locate point A on outside diameter of drive screw by measuring aft from ball bearing nut.

2) Check that distance from point A to midflap rib fitting is as shown.

(b) If necessary, relocate jackscrew as follows:

1) Remove gimbal shaft retaining bolts (14, Fig. 403) from end of inboard midflap torque shaft (12). Pull gimbal shaft (13) inboard just enough to free shims (15).

2) Adjust total thickness of shims (15) to position point A as shown on Fig. 404.

3) Replace bolts (14) and recheck position as in step (a).

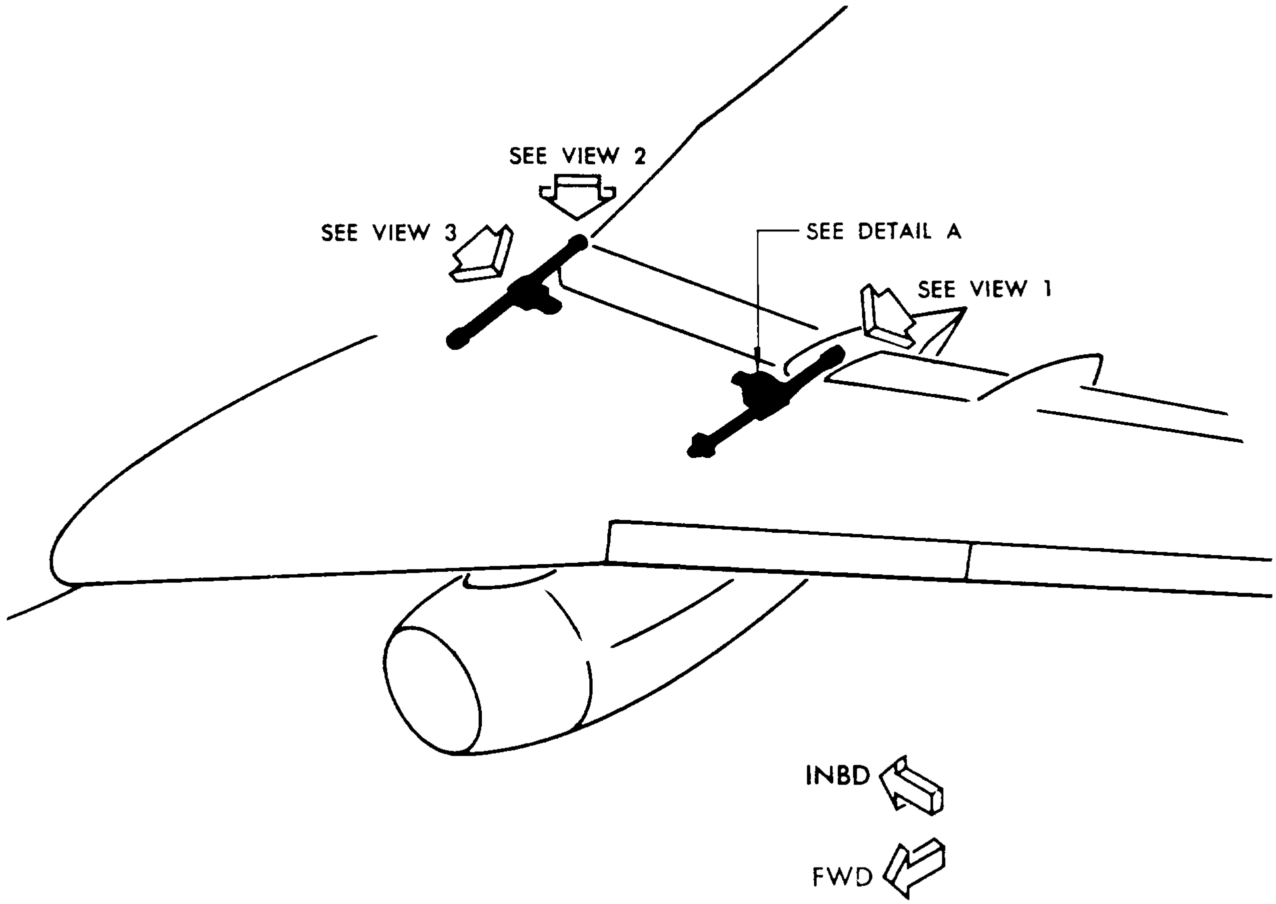
(c) Check for clearance of 0.13 to 0.15 inch between jackscrew end fitting (11, Fig. 403) and preload pad (10). If necessary, adjust clearance as follows:

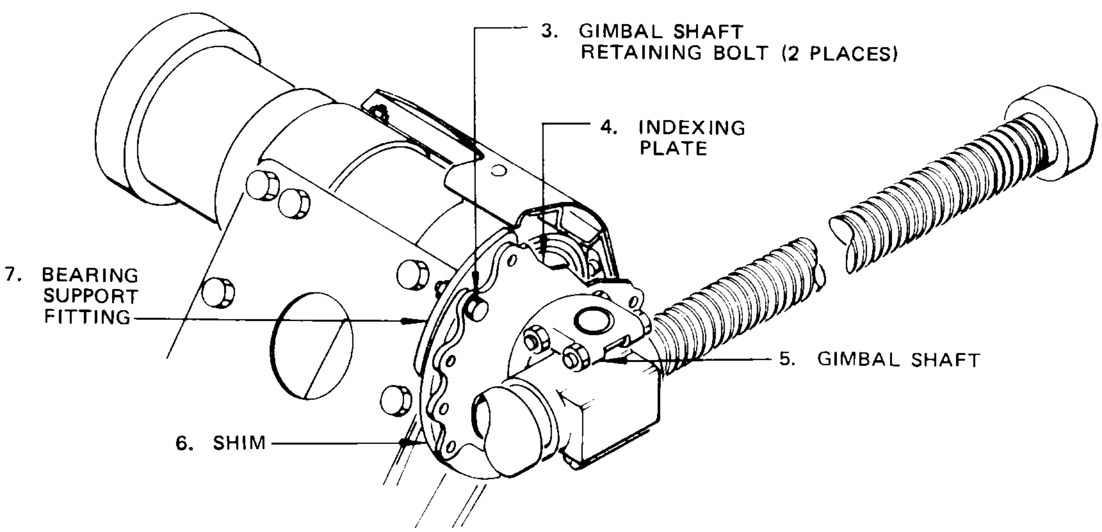
1) Loosen preload pad retaining bolts (9).

2) Shift preload pad vertically to obtain clearance between pad and jackscrew end fitting as shown in view 2.

3) Tighten bolts (9).

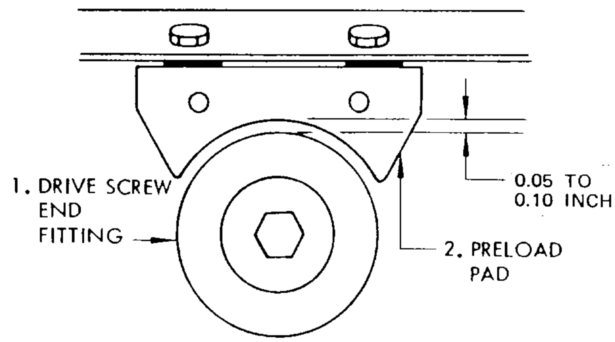
(5) Provide hydraulic system A power (Ref AMM 27-51-0).





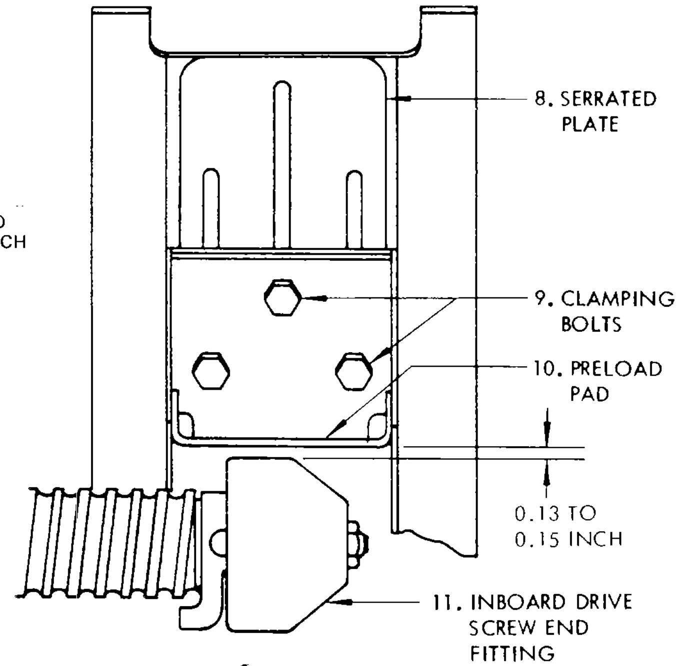
OUTBOARD GIMBAL SHAFT INSTALLATION
DETAIL A

Inboard Flap Drive Screw Preload Adjustment
Figure 404 (Sheet 1)



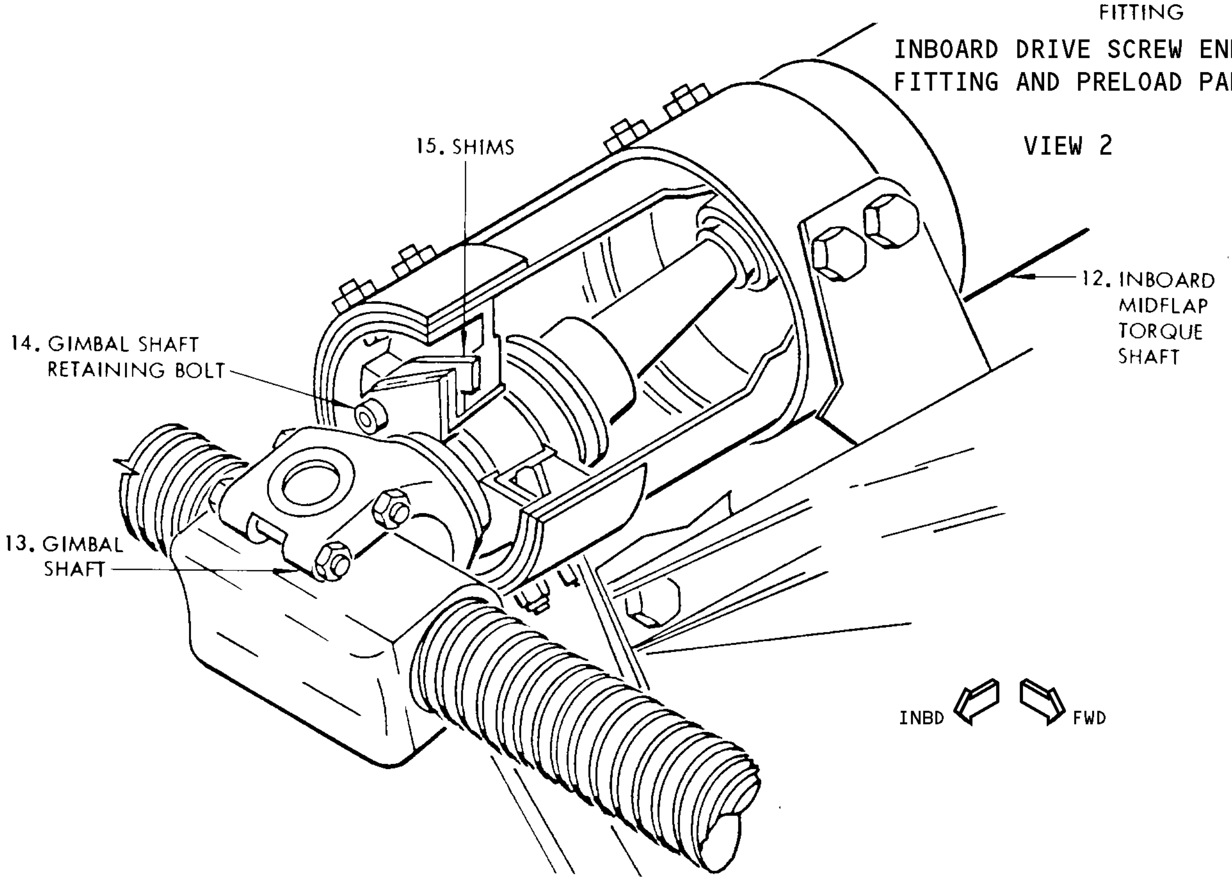
OUTBOARD DRIVE SCREW END FITTING AND PRELOAD PAD

VIEW 1



INBOARD DRIVE SCREW END FITTING AND PRELOAD PAD

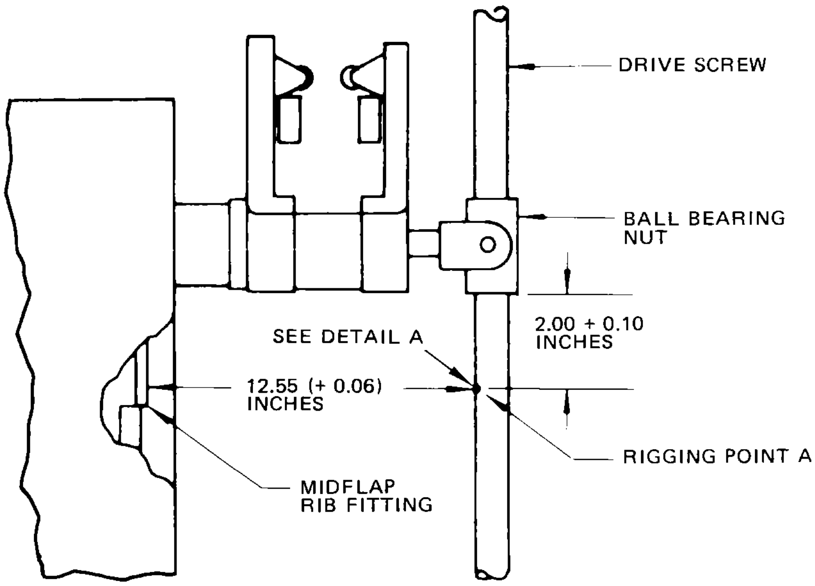
VIEW 2

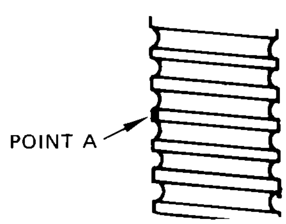


INBOARD GIMBAL SHAFT INSTALLATION

VIEW 3

Inboard Flap Drive Screw Preload Adjustment
Figure 404 (Sheet 2)





DETAIL A

Inboard Drive Screw Rigging
Figure 405

(6) Retract flaps and check that seal on lower trailing edge panel contacts full span of midflap, if not:
  (a) Support outboard flap.
  (b) Disconnect flap drive torque tubes at both sides of inboard flap outboard transmission.
  (c) Using flap drive adapter, rotate transmission input to position outboard end of flap to contact seal. Do not exceed flap jackscrew stop clearance of 170 to 190 degrees (1/2 +10 degrees) turn.
  (d) Connect torque tubes to transmission. Secure screws with lockwire.
  (e) Remove support from outboard flap.

(7) Extend and retract flaps through full travel and remove hydraulic system A power (Ref AMM 27-51-0). During flap travel, check the following:
  (a) Check that flap drive screws clear all other linkage, structure, and components by 0.25 inch minimum.
  (b) Check that flap outboard drive screw end fitting enters preload pad slightly before full up flap position.
  (c) Ensure that flap inboard and outboard drive screw end fittings seat firmly against preload pads when flap is fully retracted.

(8) Recheck flap adjustment as in step R. Ensure that all adjustments remain within limits.

(9) Provide system A hydraulic power (Ref 27-51-0).

(10) Position flap control lever to FLAP DOWN (40-unit) position to extend flaps.

(11) Check flap at full down position. Check that down stops clear by at least 1/4 turn of jackscrew.

(12) Retract flaps and check for binding, interference, or other malfunction.

(13) Remove system A hydraulic power (Ref 27-51-0).

U. Check that clearance between inboard ground spoiler panel and top of midflap is per section A-A. Adjust if required (Ref 27-62-0, Speed Brake Control System).

V. With flaps in normal up position, check that bulb seal on lower forward edge of ground spoiler with respect to upper edge of foreflap is compressed 0.10 to 0.20 inch. If seal compression is not within limits adjust seal retainer to obtain compression.

W. Check that clearance between upper wing panel trailing edge and top of midflap is per section B-B. Adjust by adding or removing shims at panel attach points. Adjust panel trailing edge on outboard end by adjusting bracket.

X. Provide system A hydraulic power (Ref 27-51-0), extend flaps to 1 degree setting.
   (1) Check that aft bulb seal on spoiler and fixed upper panel is in contact with foreflap. If not, install tapered filler between seat attach surface and seal to provide contact 80 percent of seal with 0.02 inch gap allowed for remainder.
Y. Extend flaps to FLAP DOWN (40-unit) position and check the following:
   (1) Check that opposite aftflaps extend symmetrically within 0.12 inch. Measure between aft edge of midflap lower skin and aftflap nose at both ends of aftflap.
   (2) If aftflap extension is not symmetrical, adjust aftflap pushrods to obtain symmetry. If pushrods are adjusted secure rod ends and recheck aftflap position per Inboard Trailing Edge Flap - Adjustment/Test.
Z. Check that bumper plate (Detail B, Fig. 401) did not contact skin of clearance door in nacelle fairing (Detail C, Fig. 402) at any point throughout travel in which the two were in contact. Shim nylon rub strip on clearance door per section D-D and/or bend bumper plate per Detail B, Fig. 401 as required to eliminate door skin contact.
AA. Extend and retract flaps. Check all seals and clearances during flap travel and that there is no evidence of binding or interference.
AB. Remove hydraulic system A power (Ref AMM 27-51-0 MP).
AC. Install inboard flap track fairing (Ref AMM 27-51-141 R/I).
AD. Install pan on lower surface of engine-to-wing aft fairing, access panel on rear bulkhead of engine-to-wing aft fairing and access cover on forward overhead engine-to-wing aft fairing (Ref Chapter 54, Engine-to-Wing Fairing).
AE. Adjust inboard midflap seal plate (Ref AMM 27-51-341 R/I).
AF. Install engine (Ref Chapter 71, Power Plant) or install thrust reverser (Ref Chapter 78, Thrust Reverser).
AG. Check gap between wing lower trailing edge and bottom of seal support (Section C-C, Fig. 402). If gap exceeds 0.06 inch, fill gap with aerodynamic smoother.

INBOARD TRAILING EDGE FLAP - ADJUSTMENT/TEST

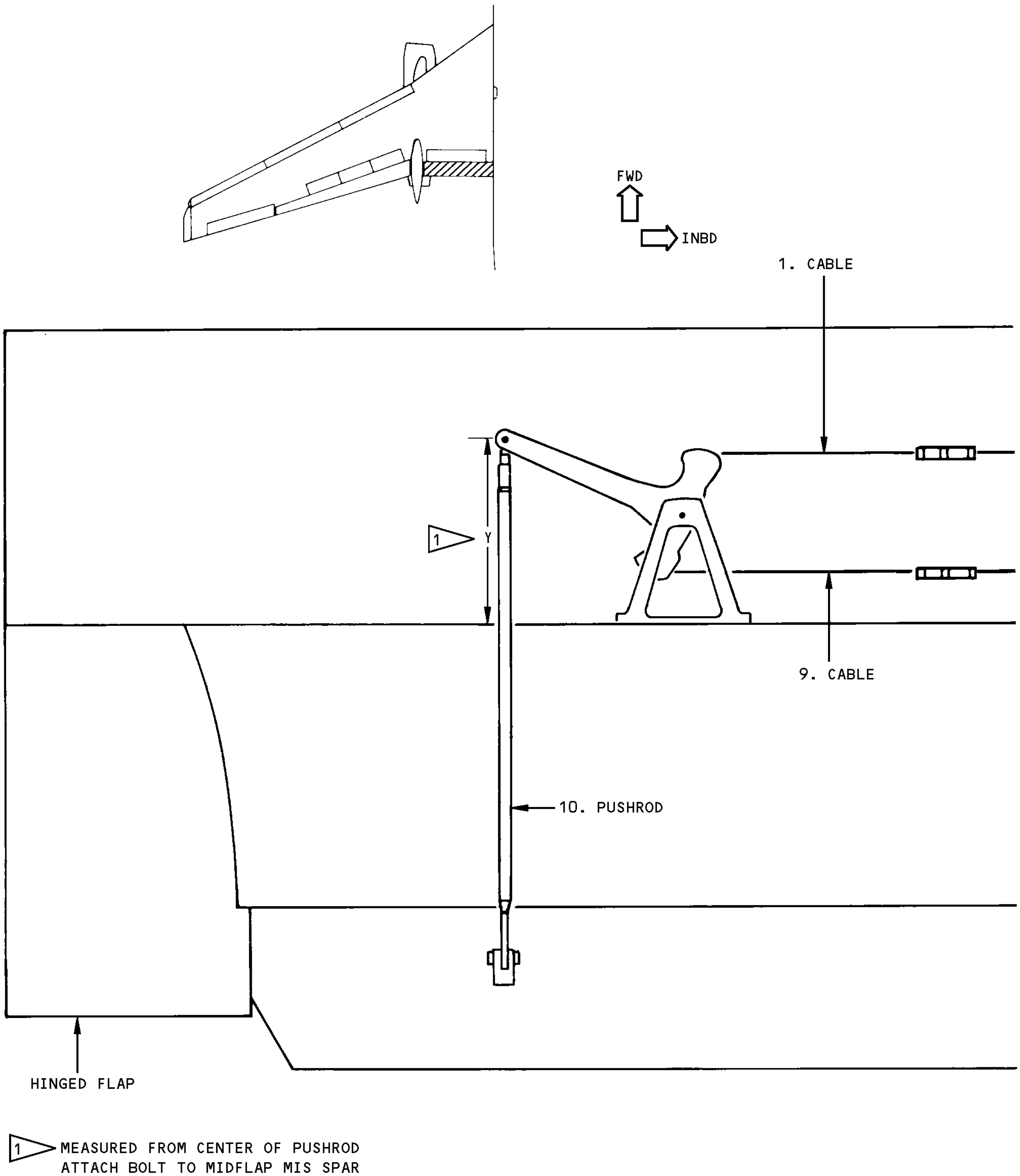
1. Inboard Trailing Edge Flap Adjustment
   A. General
      (1) The inboard trailing edge flap assembly consists of foreflap, midflap, aftflap, hinged flap, aftflap drive boom and aftflap drive mechanism. Adjustment of the inboard trailing edge flap consists of adjusting the aftflap.
      (2) The inboard trailing edge flap may be adjusted while installed on the airplane or before installation. If adjustment is done before installation, the rigging pins must remain in the boom until the flap is installed and the boom is connected to wing structure.
   B. Equipment and Materials
      (1) Rigging Pins F-5 and F-6, 0.248 +0.000/-0.002 inch diameter, 3.7 ±0.25 inches long (MS20392-3)

      NOTE: Rigging pins are a part of Kit F70207-3, -52, or -61, or -84.

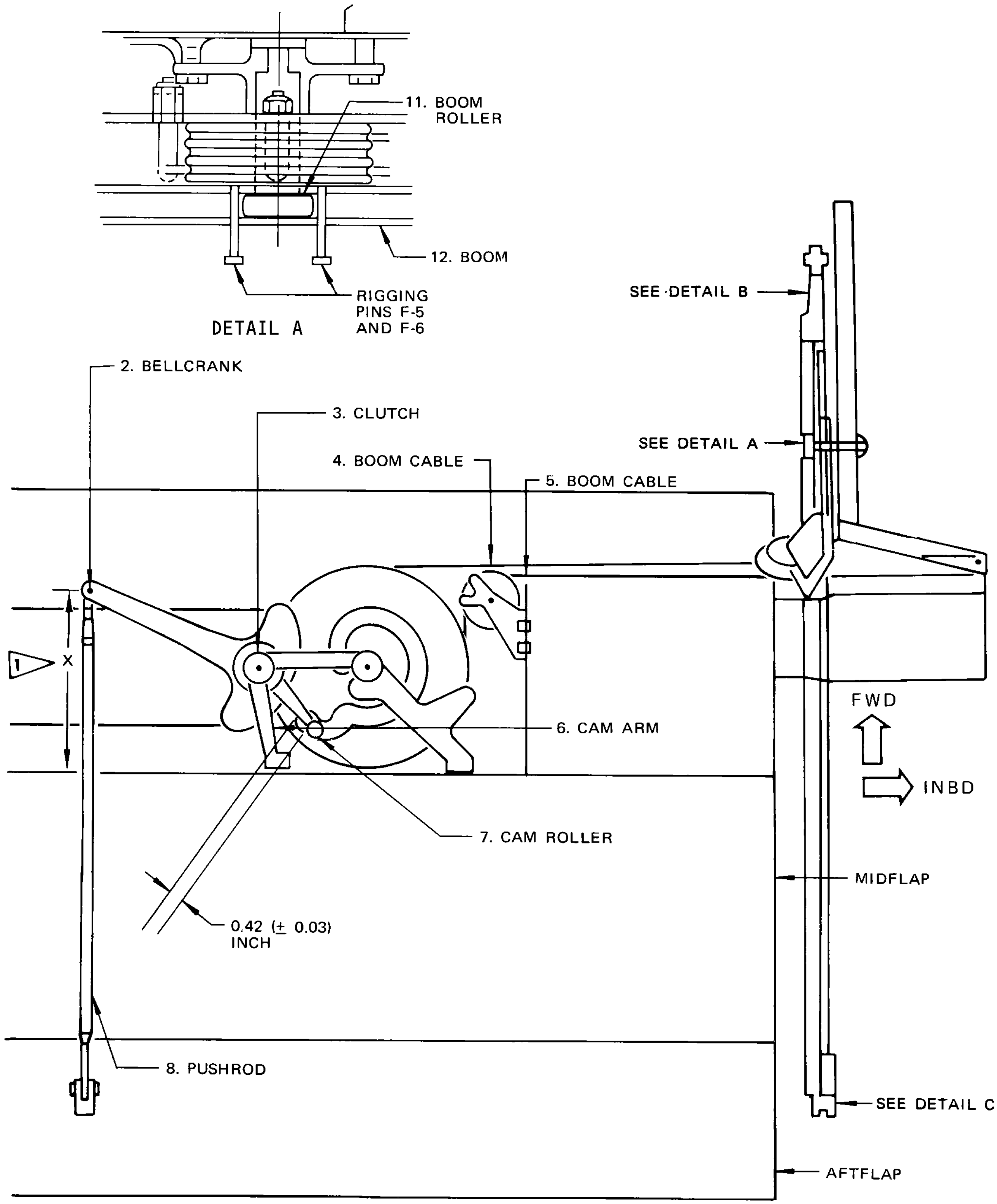
   C. Adjust Inboard Trailing Edge Flap
      (1) If adjustment is being performed with flap installed, remove inboard flap track fairing (Ref AMM 27-51-141, Inboard Flap Track Fairings).
      (2) Install rigging pins F-5 and F-6 through inboard side of boom (12, Fig. 501) trapping boom roller (11) between pins. If flap is installed on airplane, pressurize hydraulic system A (Ref AMM 27-51-0 MP), retract flaps, and depressurize hydraulic system A before inserting rigging pins.
      (3) Remove access panels from lower surface of midflap.
      (4) Check position of bellcrank (2) and cam arm (6). With clutch (3) engaged, bellcrank and arm will form an angle of approximately 157 degrees. If clutch is not engaged, push bellcrank to position illustrated so that clutch engages.

      NOTE: A load of 350 pounds at outboard end of bellcrank is required to disengage clutch. A relatively light force is required to re-engage clutch. If clutch is disengaged in normal operation, next operation will cause re-engagement.

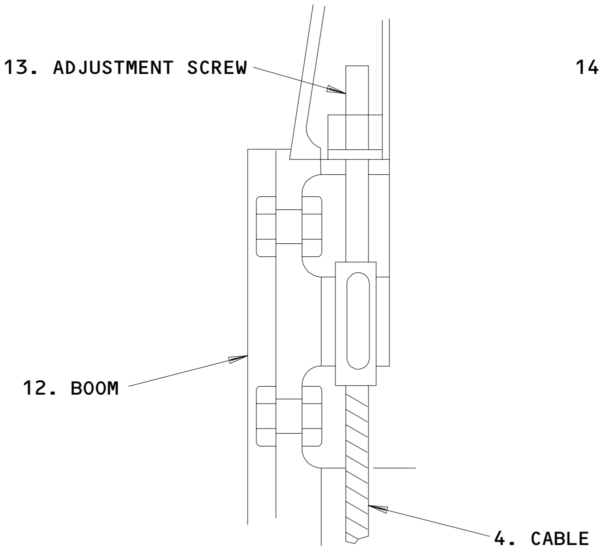
      (5) Adjust boom cables (4 and 5), at adjusting screws (13 and 14), to position cam arm roller (7) 0.42 ±0.03 inch from forward end of slot as shown (Ref AMM 27-51-61 R/I).
         (a) If difficulty in obtaining 0.42-inch dimension is experienced, a rigging block of 2.25-inch plastic (or equivalent) shaped to curvature of cam slot and cut to required positioning dimension can be made.



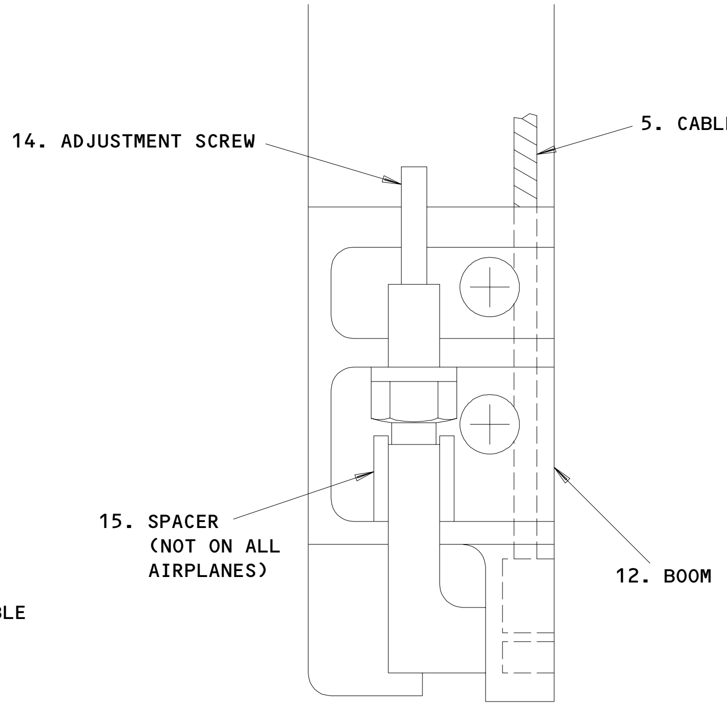
Inboard Trailing Edge Flap Adjustment
Figure 501 (Sheet 1)



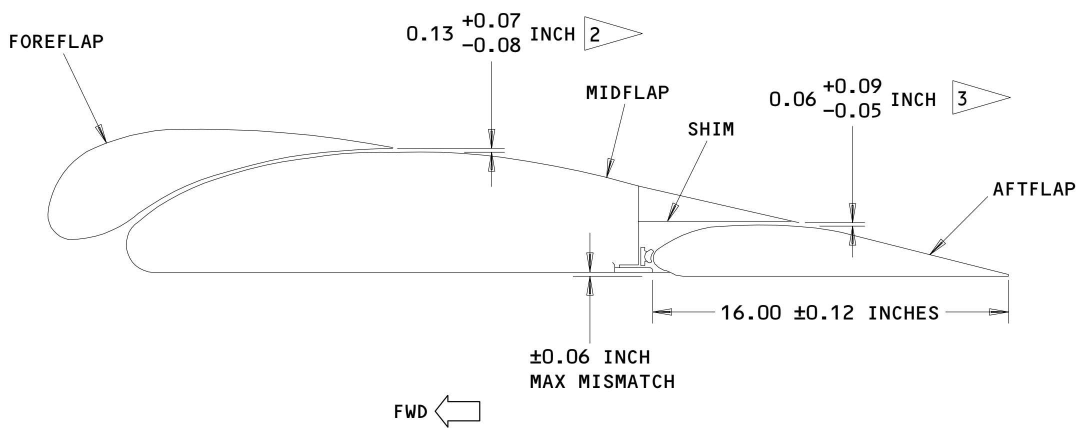
Inboard Trailing Edge Flap Adjustment
Figure 501 (Sheet 2)



ADJUSTMENT POINT A
DETAIL B



ADJUSTMENT POINT B
DETAIL C



A-A

2 ALLOWABLE GAP WITH FLAPS RETRACTED. MINIMUM GAP THROUGHOUT EXTEND/RETRACT CYCLE TO BE 0.02 INCH

3 NOT CONSIDERED ADJUSTABLE. HOWEVER, DIMENSION MAY BE VARIED BY CHANGING SHIM THICKNESS BETWEEN MIDFLAP AND MIDFLAP TRAILING EDGE LOWER ATTACH POINT (0.066 INCH MAXIMUM SHIM ALLOWED). REPLACE MALFORMED OR DEFECTIVE PART

Inboard Trailing Edge Flap Adjustment
Figure 501 (Sheet 3)

(b) Position rigging block in cam slot with cam roller against block, then tape block to cam drum.

(6) Adjust boom cables to tension of 100 ±10 pounds while maintaining dimension obtained in step (5) (Ref AMM 27-51-61 R/I).

NOTE: Cables should be adjusted to 100-pound tension at temperature of approximately 70°F. As temperature decreases, tension should be decreased and as temperature increases, tension should be increased. However, 10-pound tolerance should not be exceeded (AMM 27-51-01, Fig. 501).

(7) Adjust cables (1 and 9) at turnbuckles so that difference between dimension X and dimension Y does not exceed 0.06 inch. Dimensions should be as near equal as possible.

(8) Maintain dimensions X and Y and tighten cables (1 and 9) to tension of 200 ±20 pounds.

NOTE: Cable tension should be 200 pounds at 70°F. Tension may be increased as temperature increases and decreased as temperature decreases. However, tension should not be decreased to less than 180 pounds nor increased to more than 220 pounds.

(9) Adjust pushrods (8 and 10) to obtain 16.00 ±0.12 inch dimension between midflap lower skin and aftflap trailing edge as shown in section A-A. Measure dimension at aftflap pushrod locations. When adjustment is obtained, tighten checknut to engage key and install lockwire.

(10) Check seal at leading edge of aftflap. When fully retracted, aftflap leading edge shall be 0.15 ±0.03 inch aft of seal retainer. Determine position and adjust as follows:

(a) With aftflap extended, mark a line on lower surface of aftflap 2.00 inches aft of leading edge.

(b) Retract aftflap then mark a line on lower surface of midflap 2.15 inches forward of line marked in step (a).

(c) Extend aftflap and check that aft face of seal retainer vertically aligns with line marked in step (b).

(d) If seal retainer does not align, add or remove shims under seal retainer at each fastener to obtain correct position.

(11) Check that gap between trailing edge of foreflap and top of midflap is per section A-A between ends of flap. If required, shim between foreflap and foreflap track attach fitting to obtain correct gap (Ref AMM 27-51-41, Removal/Installation).

(12) Check that gap between trailing edge of midflap and top of aftflap is 0.06 +0.09/-0.05 inch.

NOTE: Gap between midflap trailing edge and top of aftflap is not considered as adjustable. It may be possible to adjust shim thickness at midflap trailing edge attach point or to make slight adjustment by adjusting pushrods (11 and 14), however, the 16.00 ±0.12 inch dimension must be held. If proper gap cannot be obtained, defective or malformed parts must be replaced.

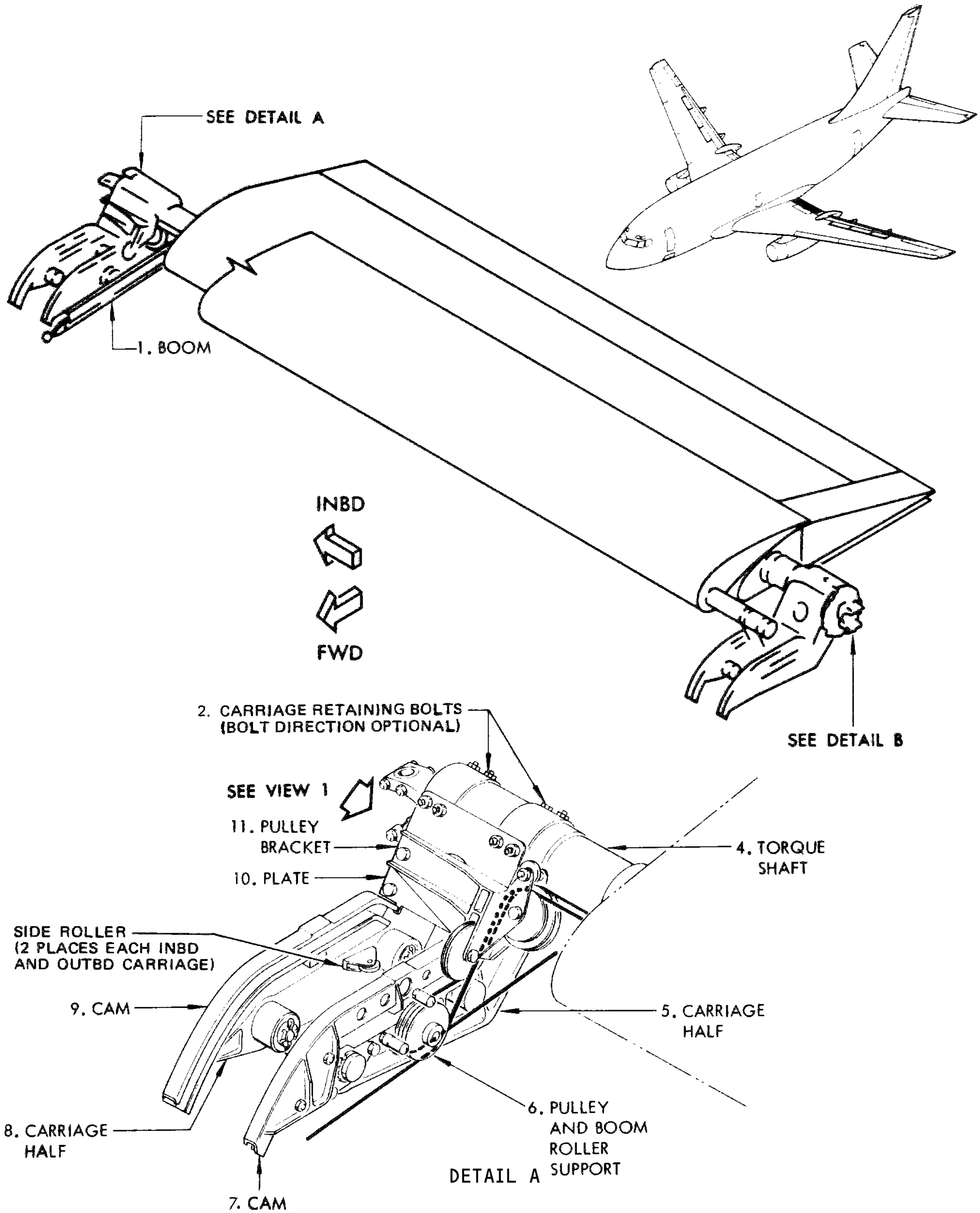
(13) Check that phenolic rub strip on nacelle fairing closure door contacts lower surface of hinge flap for its entire surface. If adjustment is necessary loosen nut on pivot bolt and rotate eccentric bushing to obtain contact. If necessary, rotate eccentric one notch to align notch in eccentric with roll pin.

(14) Install access panels in lower surface of midflap.

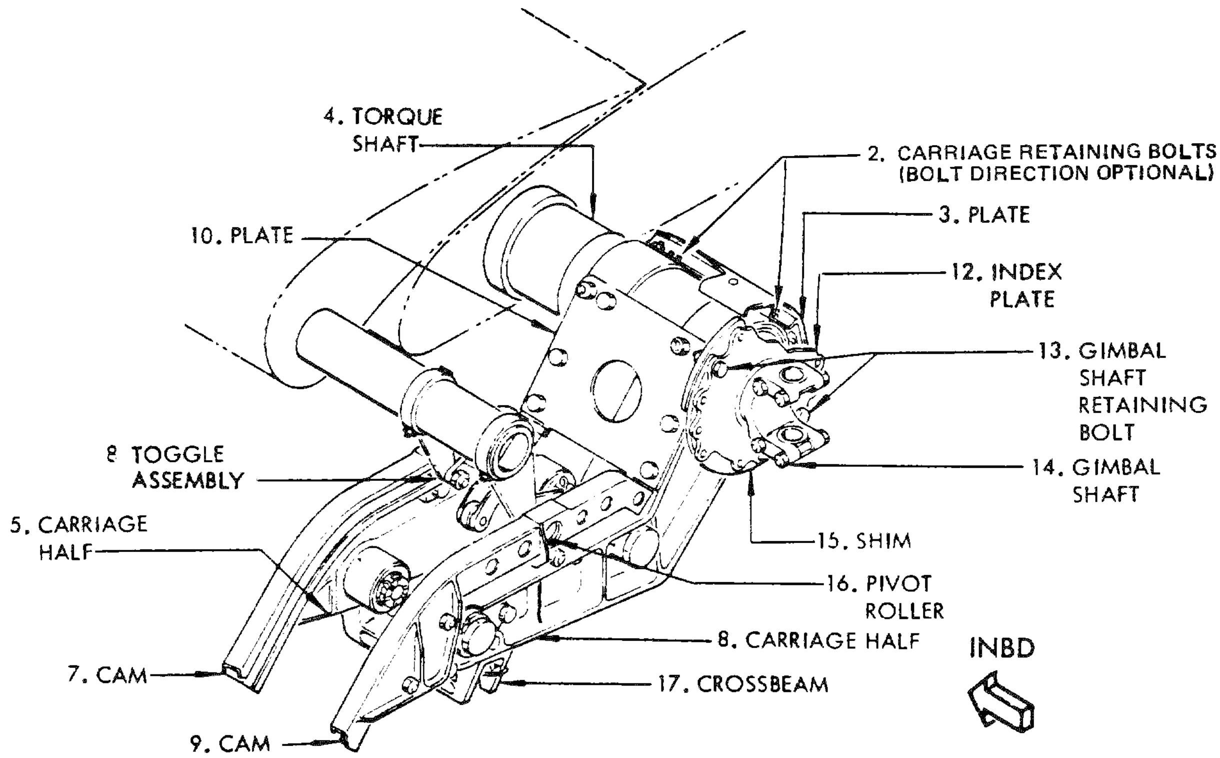
(15) If flap is installed, install inboard flap track fairing (Ref AMM 27-51-141, Inboard Flap Track Fairings).

INBOARD MIDFLAP CARRIAGES - REMOVAL/INSTALLATION

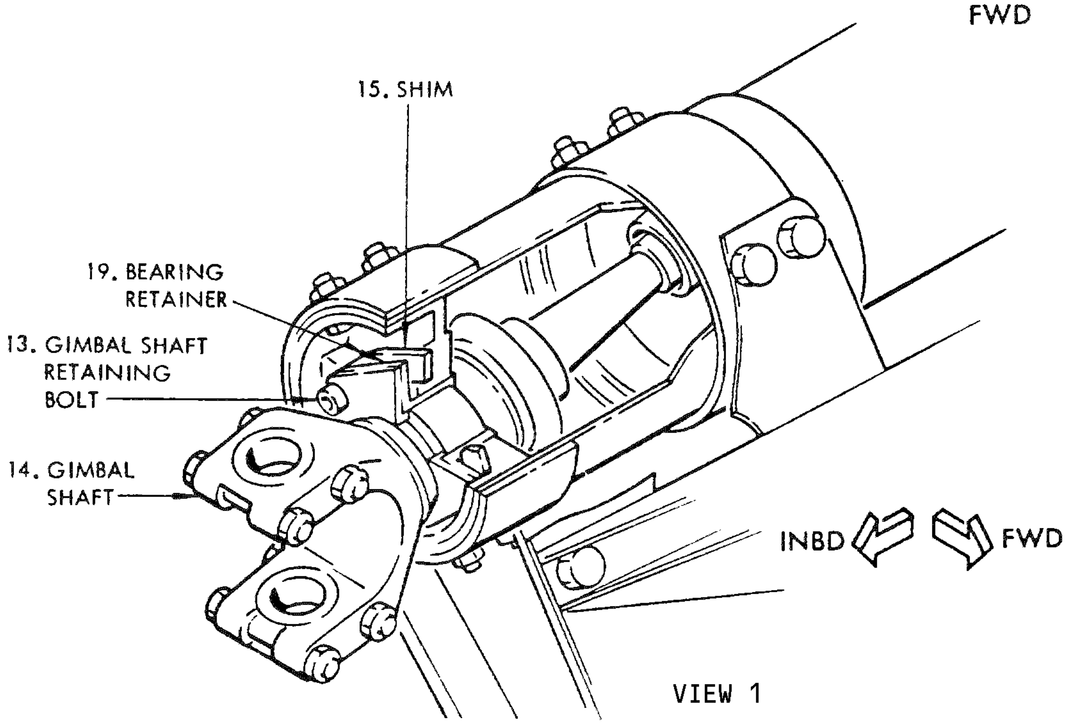
1. General
   A. Removal of any inboard midflap carriage half requires removal of the applicable flap from the airplane. Removal of the flap requires removal of inboard track fairing and engine nacelle aft fairing.
   B. The flap drive gimbal shaft assembly must be removed from the midflap torque shaft to allow removal of carriage retaining bolts. The gimbal shaft is shimmed to provide proper flap drive screw preload. When any gimbal shaft is removed and replaced, the drive screw preload must be checked as outlined in AMM 27-51-12, Inboard Trailing Edge Flap - Removal/Installation.
2. Equipment and Materials
   A. Primer - BMS 10-11, Type 1 (Ref 20-30-41)
   B. Grease - MIL-G-21164 (Ref 27-30-21)
   C. Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref AMM 20-30-21)
3. Remove Inboard Midflap Carriage
   A. Remove inboard trailing edge flap from airplane (Ref AMM 27-51-12, Removal/Installation).
   B. For removal of inboard carriage: (Fig. 401)
      (1) Install clamping device on boom cables where they pass through midflap end rib to prevent slack inside midflap when boom cables are loosened.
      (2) Remove rigging pins from boom, loosen cables at each end of boom, and replace rigging pins; install one rigging pin on each side of boom roller.
      (3) Dismount pulley bracket (11). Do not remove cable guards or cables from pulley and bracket assembly. Suspend assembly from flap torque shaft (4) during carriage removal and replacement.
      (4) For removal of inner carriage half (5), dismount pulley and boom roller support (6) with attached boom (1). Suspend assembly from midflap torque shaft.
   C. For removal of outboard carriage:
      (1) Mark position of index plate (12) to simplify installation and adjustment.
      (2) Remove crossbeam (17) from underside of carriage.
   D. Remove two gimbal shaft retaining bolts (13).



Inboard Midflap Carriage Installation
Figure 401 (Sheet 1)



DETAIL B



VIEW 1

Inboard Midflap Carriage Installation
Figure 401 (Sheet 2)

E. Pull gimbal shaft (14) from end of torque shaft (4). Carefully note total thickness of shims (15) under index plate (12) or under bearing retainer (19), as applicable.

NOTE: Flap drive screw preload is adjusted by increasing or decreasing thickness of shims (15) as described in AMM 27-51-12, Inboard Trailing Edge Flap - Removal/Installation. Normally, no readjustment will be required if total thickness of shims installed with gimbal shaft is identical to total thickness of shims removed with gimbal shaft.

F. At outboard carriage, remove outer plate (3).
G. Position foreflap to align pivot rollers (16) with access holes in cams (7) and (9). Remove pivot rollers.

NOTE: If inner carriage half (5) is not being removed, removal of inner pivot roller will not be necessary.

H. Remove remaining carriage retaining bolts (2) nearest to end of torque shaft and two bolts through plate (10) and carriage half (8). Remove carriage half.
I. If carriage half (5) is to be replaced, remove remaining bolts (2). Rotate carriage half to clear foreflap toggle assembly and pull carriage half from torque shaft (4). Remove plate (10) from carriage half.

NOTE: Removal of both carriage halves is necessary only when the second carriage half is to be replaced. Carriage halves are not matched parts and are individually replaceable.

J. Remove cam (7) or (9) and all rollers from carriage half being replaced. Retain shims used under side roller assembly.

4. Install Midflap Carriage (Fig. 401)
A. On replacement carriage half (5 or 8), install cam (7) or (9) and carriage rollers removed from old carriage. Install cam and rollers as follows:
(1) Install aft roller, bolt and nut. Tighten nut to between 200 and 500 pound-inches torque. Shims may be installed between roller and carriage half if necessary to align cotter pin holes. Install cotter pin and bend ends of pin around sides of nut. Cotter pin must not be bent over end of bolt.
(2) Attach forward and side rollers and retaining bolts to carriage half for later installation.
(3) Mount foreflap actuating cam on top of carriage half. Coat bolt and contacting surfaces of cam and carriage with a thin film of grease. Tighten bolts to between 10 and 30 pound-inches torque and install cotter pins.

B. Install carriage halves (5) and (8) on torque shaft (4). Dip attaching bolts in primer and install while primer is wet. Install plate (10), and, at outboard carriage, install inner plate (3). Install nuts on retaining bolts.

NOTE: Inner plate (3) and the top edge of plate (10) are retained by carriage half retaining bolts.

C. At outboard carriage, install outer plate (3).
D. Position foreflap so that toggle assembly is aligned with access. Coat all surfaces of pivot roller and shaft with a thin film of grease. Install spacer on roller shaft and install roller through access hole in foreflap cam. Install washer between foreflap arm and toggle assembly. Install washer and nut on roller shaft and tighten to between 50 and 100 pound-inches torque. Install cotter pin.
E. Install gimbal shaft (14) in end of torque shaft (4). Coat outside diameter of index plate or bearing retainer with corrosion preventive compound. Install same total thickness of shims (15) under index plate (12), or bearing retainer (19), as were removed with gimbal shaft. Refer to paragraph 3, step E.
F. For outboard gimbal shaft only; set index plate (12) at position marked prior to removal.
G. Install two gimbal shaft retaining bolts (13).
H. For outboard carriage only, attach crossbeam (17) to carriage for installation when flap is installed on airplane.
I. For carriage half (5) of inboard carriage, mount pulley and boom roller support (6) on outboard side of carriage half and install side roller assembly, with shims, on inboard side. Install side roller assembly with roller pin head down to facilitate lubrication. Dip bolts in primer and install while primer is wet. Install cotter pins in two forward bolts.
J. For carriage half (5) of outboard carriage and for either carriage half (8), install shims and side roller with roller pin head down for easy access to lubrication fitting. Install bolts with wet primer.
K. Check and adjust side rollers as follows:
   (1) Tighten two roller mounting bolts to between 30 and 40 pound-inches torque.
   (2) Locate midpoint between carriage halves (5) and (8) at side rollers.
   (3) Check that distance between side rollers is 1.40 to 1.41 inches.
   (4) Check that distance between each roller and midpoint between carriage halves is 0.70 to 0.71 inch.
   (5) If dimension checked in (3) and/or (4) is not correct, add or remove shim laminations under side rollers to obtain correct dimension.
   (6) Tighten side roller mounting bolts to between 30 and 40 pound-inches torque and lockwire bolts to each other.

L. On inboard carriage installation:
   (1) Mount pulley bracket (11) on top of carriage halves. Dip bolts in primer and install while primer is wet.
   (2) Adjust position of pulley bracket (11) to align cables with opening in end of midflap. Tighten mounting bolts to maintain pulley bracket position.

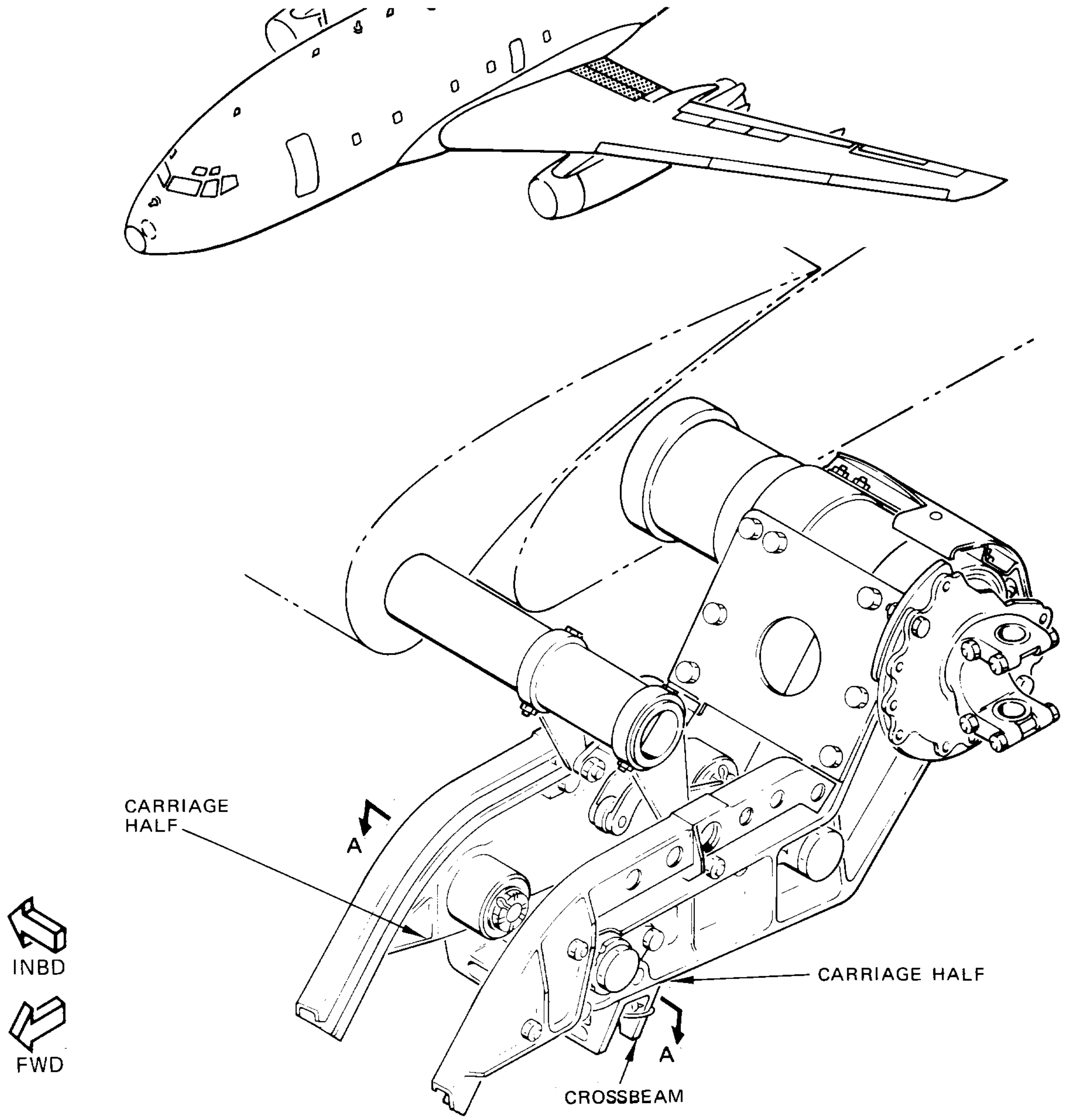
M. Tighten boom cables just enough to remove slack and remove clamping device from cables.

N. Adjust boom cables as directed in AMM 27-51-61, Aft Flap Actuating Mechanism Boom - Removal/Installation. Check that boom cables do not rub in midflap end rib. If cables rub, loosen cables, reposition pulley bracket, and readjust.

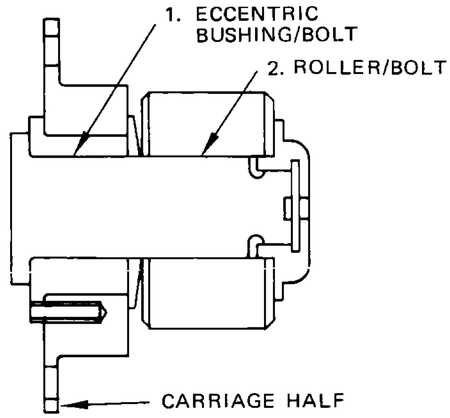
O. Install inboard trailing edge flap. Refer to AMM 27-51-12, Inboard Trailing Edge Flap - Removal/Installation.

INBOARD MIDFLAP CARRIAGE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. Here will be no procedure iven in this seciton for gaining access to, or removing and replacing the component after inspection for wear. Refer to AMM 27-51-21 Component - Removal/Inspection procedure for this information.
2. Inboard Midflap Carriage Wear Limits



Inboard Midflap Carriage Wear Limits
Figure 601



SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	ECCENTRIC BUSHING	ID	0.8745	0.8781	0.8825	0.0080	X		
	BOLT	OD	0.8740	0.8745	0.8665		X		
2	ROLLER	ID	0.8743	0.8750	0.8765	0.0020	X		
	BOLT	OD	0.8740	0.8745	0.8723		X		

Inboard Midflap Carriage - Wear Limits
Figure 602

INBOARD AFTFLAP - REMOVAL/INSTALLATION

1. Remove Aftflap
   A. Provide hydraulic system A power (Ref AMM 27-51-0, Maintenance Practices).

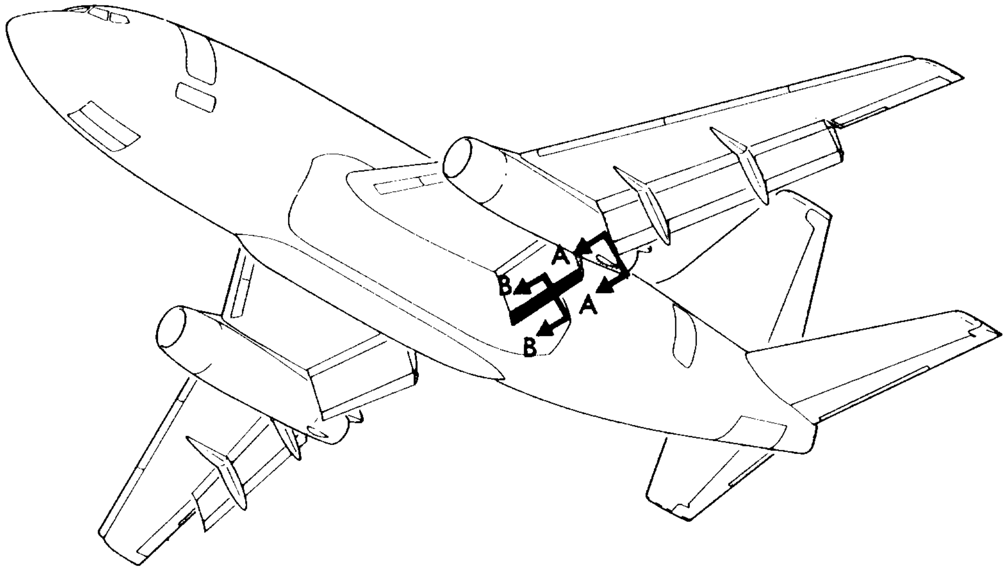
      NOTE: If trailing edge flap assembly has been removed from airplane, steps A, B, and C will not apply, however, it will then be necessary to remove rigging pins F-5 and F-6 from boom assembly to allow manual extension of aftflap.

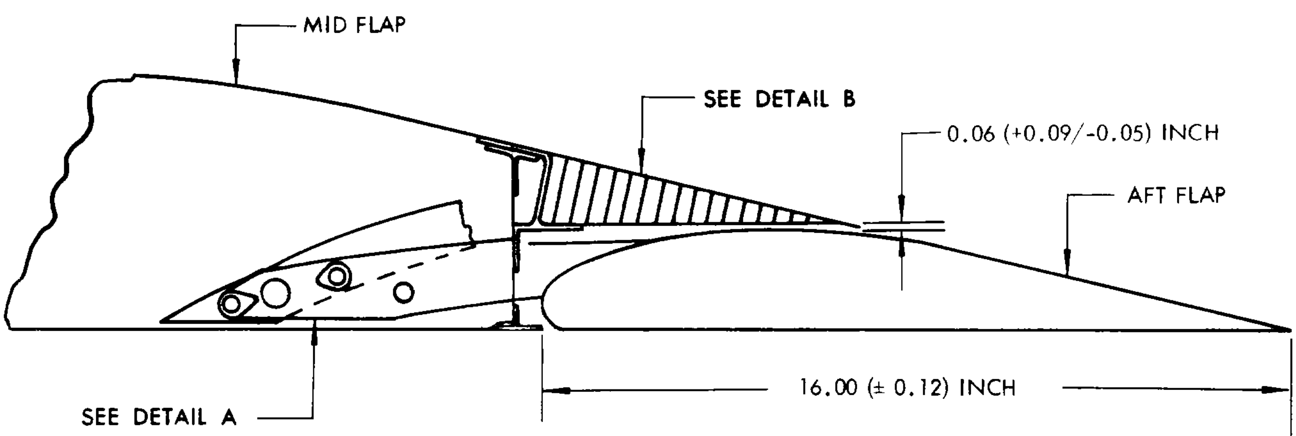
   B. Move flap control lever to FLAP DOWN (40-unit) detent.
   C. Remove hydraulic system A power (Ref AMM 27-51-0).
   D. With aftflap extended, remove midflap trailing edge (Fig. 401).
   E. Remove bottom flight rollers from aftflap carriages.
   F. Disconnect pushrods from leading edge of aftflap.
   G. Roll aftflap aft, lift trailing edge, and remove from flap tracks.
   H. If aftflap will not be immediately reinstalled, install midflap trailing edge. It is not necessary to install or tighten all retaining screws.

      CAUTION: DO NOT RETRACT FLAPS. PUSHRODS MAY DAMAGE OPENINGS IN MIDFLAP REAR SPAR.

2. Install Aftflap
   A. If existing bushings and bolts are to be used, check allowable wear (Ref AMM 27-51-31, Inspection/Check).
   B. Remove midflap trailing edge, if installed.
   C. If installed, remove bottom flight rollers from each carriage and position aftflap on tracks in midflap (Fig. 401).
   D. Install bottom flight rollers. Locate two rollers in each carriage and install bolt. Secure with two washers, nut and cotter pin.
   E. With aftflap extended, adjust eccentric bushings so that with flight rollers touching track, dead-weight rollers are against track, as shown in detail A. Tighten nuts on dead-weight rollers at 0 to 5 pound-inches and install cotter pins. If necessary, back off eccentric to first detent to engage lock.

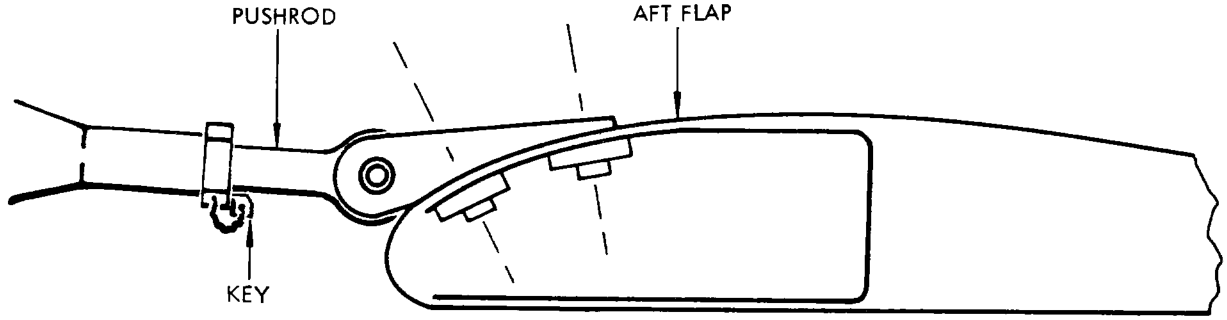
      NOTE: There are four aftflap carriages. Each side of each carriage includes one top dead-weight roller, one top flight roller, one bottom dead-weight roller, and one bottom flight roller.



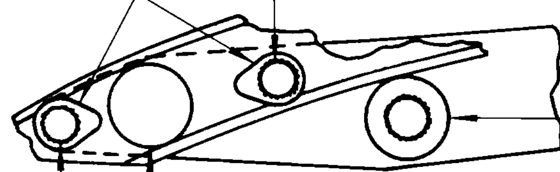


SECTION A-A

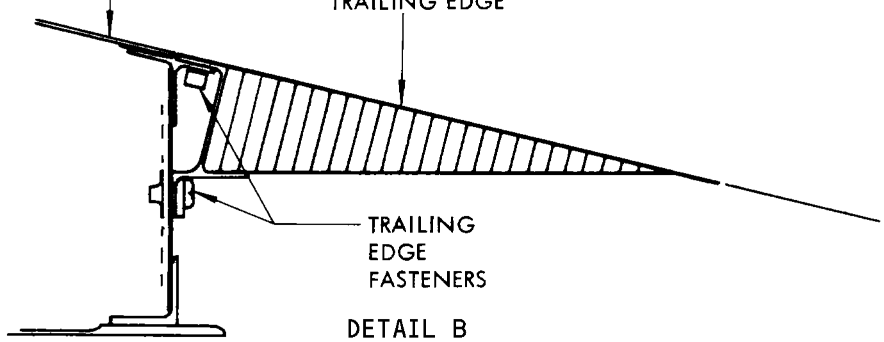
Inboard Trailing Edge Aft Flap Installation
Figure 401 (Sheet 1)



SECTION B-B



DETAIL A



DETAIL B

Inboard Trailing Edge Aft Flap Installation
Figure 401 (Sheet 2)

F. Roll aftflap slowly forward to retracted position and back to extended position. Check for binding or other evidence of incorrect installation.

NOTE: Pushrods should be held clear of aftflap while flap installation is checked for binding or other defects.

G. Install bolts and nuts to connect pushrods to leading edge of aftflap. Do not tighten nuts.

NOTE: Rod ends are connected temporarily for flap retraction and so that retracted position of aftflap may be checked.

H. Position ALTERNATE FLAPS arm switch at ARM. Use ALTERNATE FLAPS control switch to retract flaps slowly. Position flap control lever in FLAP UP detent. Position arm switch at OFF.
I. With flaps fully retracted electrically, check clearance between leading edge of aftflap and trailing edge of midflap bottom skin. Clearance must be large enough to permit retraction of flaps hydraulically to normal retracted position. If necessary, adjust pushrods to increase this clearance.
J. Provide hydraulic system A power. Refer to AMM 27-51-0. Maintain system pressure for 5 minutes.
K. Remove hydraulic system A power. Refer to AMM 27-51-0.
L. Check that distance from bottom trailing edge of midflap to trailing edge of aftflap is 16.00 (±0.12) inches as shown in Fig. 401. Adjust pushrod ends to obtain required dimension. Tighten checknut to engage key and install lockwire. Extend and retract flaps as necessary to make adjustments and check dimensions.
M. Check seal at leading edge of aftflap. When fully retracted, aftflap leading edge shall be 0.15 (±0.03) inch aft of seal retainer. Determine position and adjust as follows:
   (1) With aftflap extended mark a line on lower surface of aftflap 2.00 inches aft of leading edge.
   (2) Retract aftflap then mark a line on lower surface of midflap 2.15 inches forward of line marked in step (l).
   (3) Extend aftflap and check that aft face of seal retainer vertically aligns with line marked in step (2).
   (4) If seal retainer does not align, add or remove shims under seal retainer at each fastener to obtain correct position.
N. With rod ends and seal retainer properly adjusted, install bolts, washers, and nuts to connect pushrods to leading edge of aftflap. Tighten nuts and install cotter pins.
O. Pressurize hydraulic system A, extend flaps, and remove system A hydraulic power. Refer to AMM 27-51-0.
P. Install midflap trailing edge.

Q. Check gap between midflap trailing edge and top of aftflap with flaps fully retracted. Gap shall be no less than 0.01 inch and no more than 0.15 inch. Adjust rod ends within limits of step L., or replace aftflap or midflap trailing edge to obtain proper gap. Seal compression shall remain within limits of step M.

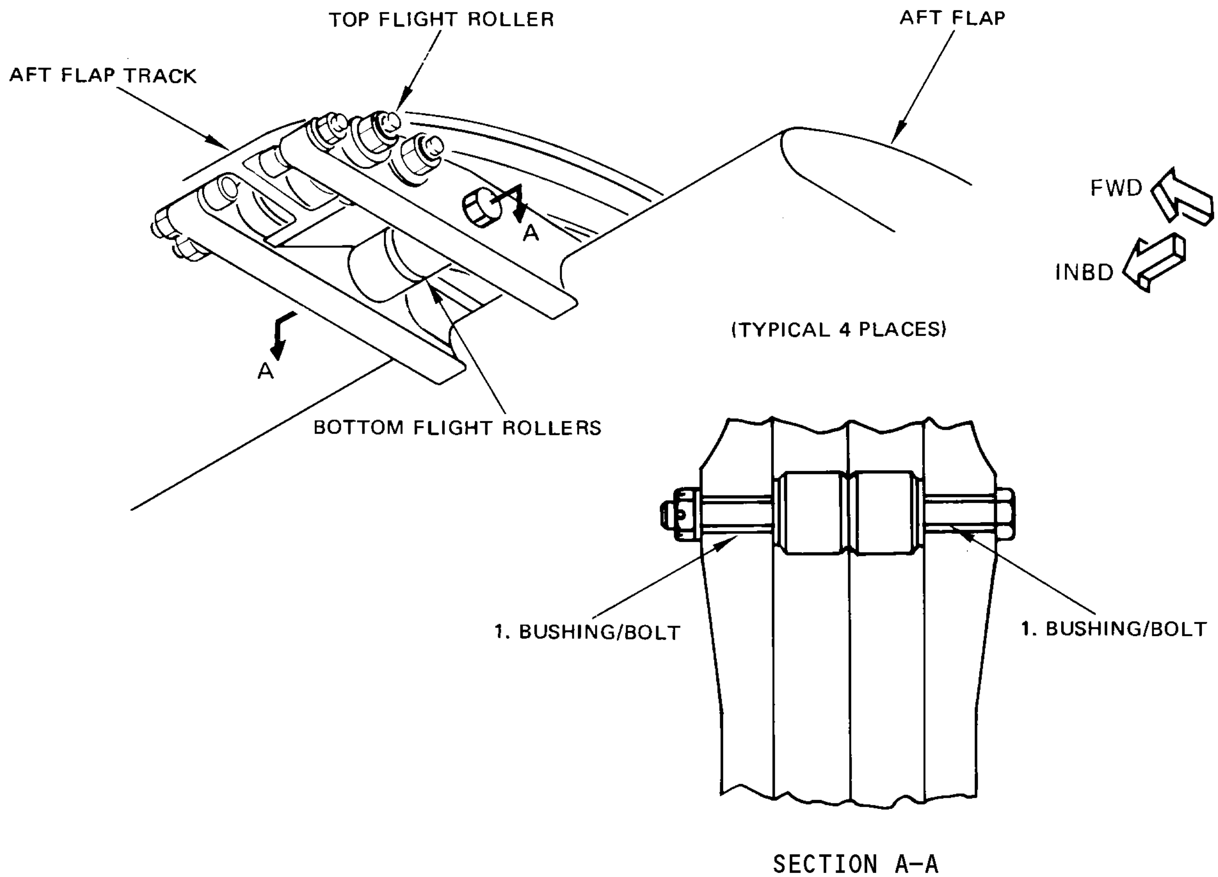
R. Provide hydraulic system A power. Refer to AMM 27-51-0.

S. Operate flaps through one complete cycle. Check aftflap for binding or other evidence of faulty installation.

T. With flaps retracted, remove hydraulic system A power. Refer to AMM 27-51-0.

INBOARD TRAILING EDGE AFT FLAP - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There will be no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Inboard Trailing Edge Aft Flap - Removal/Installation for this information.
2. Inboard Trailing Edge Aft Flap Wear Limits (Fig. 601)

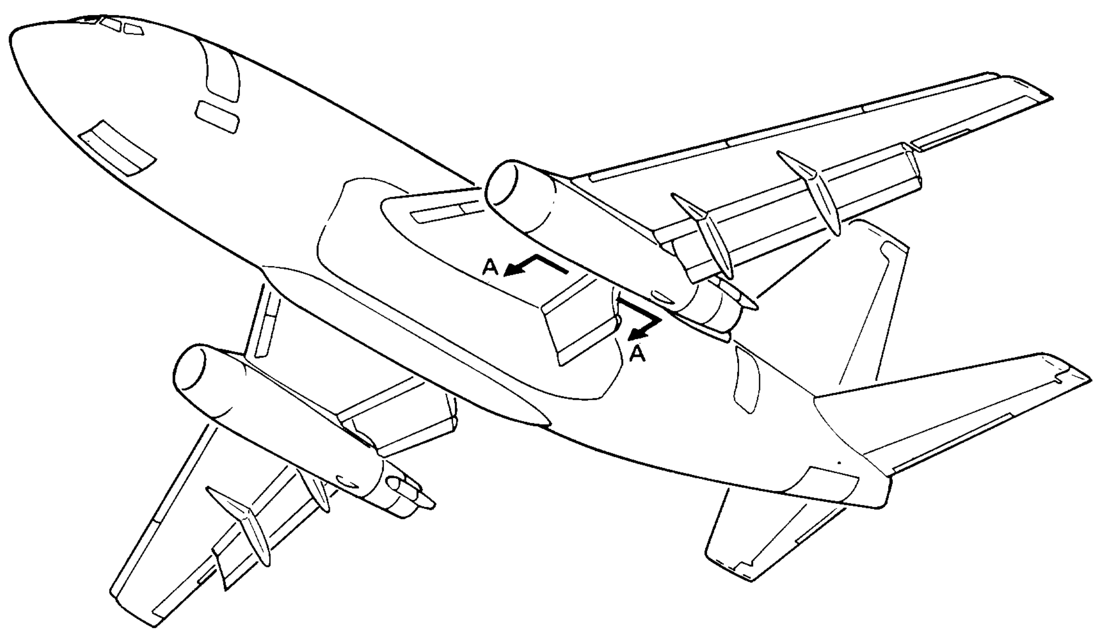


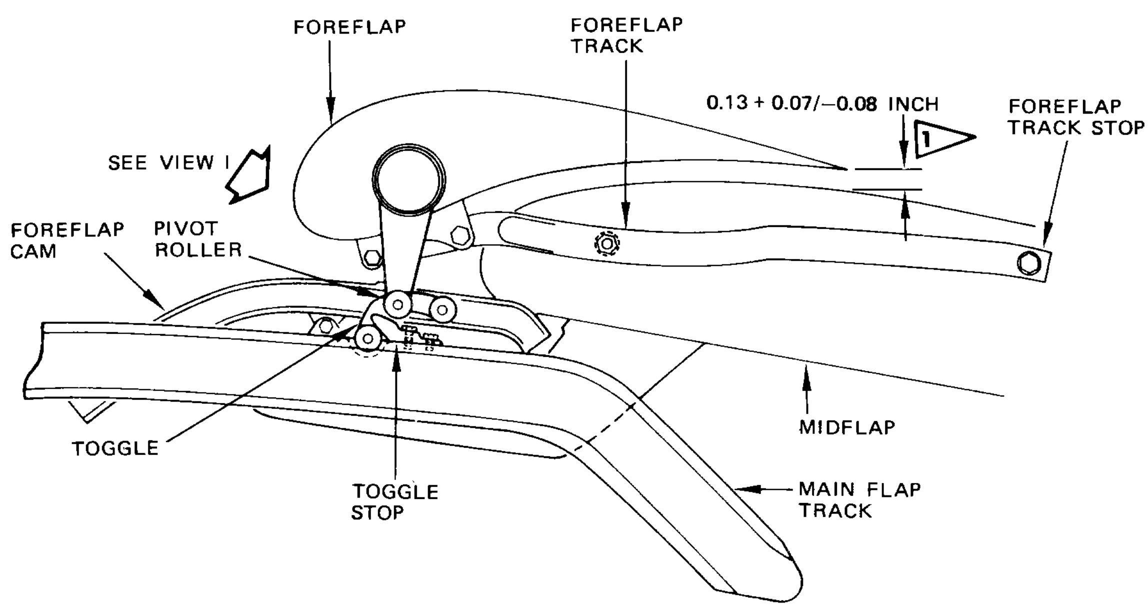
INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.2493	0.2500	0.2626	0.0034	X		
	BOLT	OD	0.2483	0.2592	0.2459		X		

Inboard Trailing Edge Aft Flap Wear Limits
Figure 601

INBOARD FOREFLAP - REMOVAL/INSTALLATION

1. General
   A. The inboard foreflap may be removed from the airplane when the flaps are partially extended, or it may be removed from the flap assembly after the flap assembly is removed from the airplane.
   B. For removal of the foreflap, the foreflap tracks must be disconnected from the foreflap, or, the foreflap track stops must be removed to permit removal of tracks with foreflap. Removal of foreflap track stops requires removal of the midflap lower surface panels. It is recommended that, with flap assembly on the airplane, tracks be disconnected from the foreflap.
   C. Access holes in the foreflap cams, on top of the midflap carriage, are provided to allow removal of the foreflap pivot rollers.
2. Equipment and Materials
   A. Primer - BMS 10-11, Type I (Ref 20-30-41)
   B. Grease - BMS 3-33 (Preferred)
   C. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
3. Remove Inboard Foreflap
   A. Remove inboard flap track fairing (Ref 27-51-141 R/I).
   B. Deleted
   C. Pressurize hydraulic system A (Ref 27-51-0 MP).
   D. Position flap control lever to 15-unit detent.
   E. Depressurize hydraulic system (Ref 27-51-0 MP).
   F. Check alignment of pivot rollers with access holes in sides of foreflap cams (Fig. 401). If rollers and access holes are not aligned, proceed as follows:
      (1) On circuit breaker panel P6, close FLAP VALVES and TE ALT FLAP DRIVE MOTOR circuit breakers.
      (2) Position ALTERNATE FLAPS arm switch at ARM.
      (3) Operate ALTERNATE FLAPS control switch to UP or DOWN as necessary to align pivot rollers with access holes.
   G. Remove two track attach bolts at each foreflap track to disconnect track from foreflap. Note location of shims and retain shims for installation.
   H. Operate ALTERNATE FLAPS control switch to DOWN as necessary to extend the trailing edge flaps.



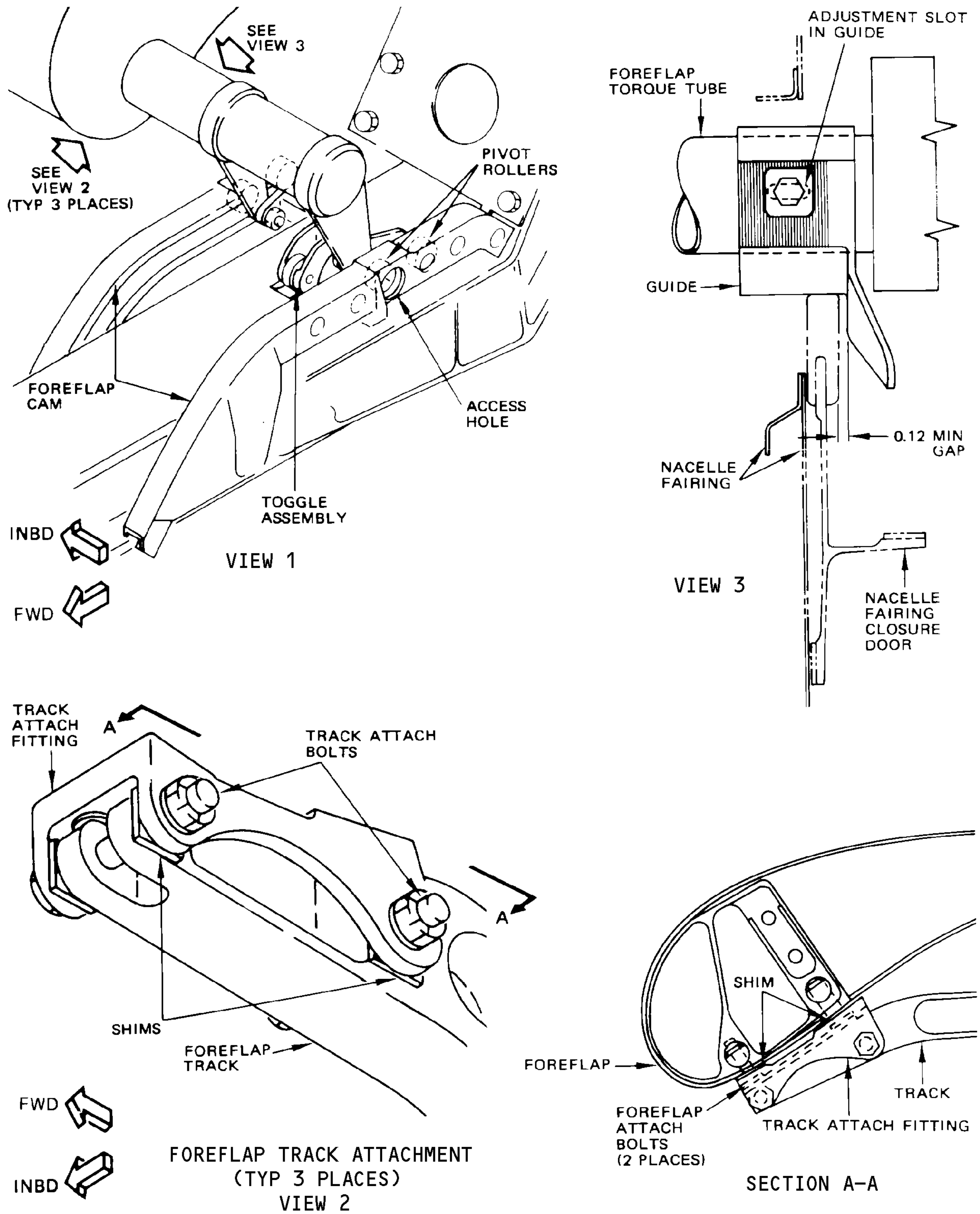


1 ALLOWABLE GAP WITH FLAPS RETRACTED, MINIMUM GAP THROUGHOUT EXTEND/RETRACT CYCLE TO BE 0.02 INCH

SECTION A-A

FWD

Inboard Foreflap Installation
Figure 401 (Sheet 1)



Inboard Foreflap Installation
Figure 401 (Sheet 2)

CAUTION: DO NOT ALLOW DISCONNECTED TRACKS TO FALL INTO MIDFLAP. LOWER TRACKS GENTLY TO AVOID DAMAGE IN MIDFLAP.

I. Remove four pivot rollers and lift foreflap away from toggle and flap.

4. Install Inboard Foreflap

A. If existing bushings or bearings are to be used, check allowable wear (Ref 27-51-41, Inspection/Check).

B. Position foreflap on toggle so that pivot rollers may be installed through access holes in sides of foreflap cams (Fig. 401) and install pivot rollers as follows:
   (1) Position bushing in pivot roller.
   (2) Secure with washer and nut. Tighten nut to 50-100 pound-inches.
   (3) Install cotter pin.

C. Connect foreflap tracks to foreflap (3 places).
   (1) Trim shims to fit gaps between foreflap track and track attach fitting. Maximum allowable gap between track and fitting is 0.002 inch after shimming.
   (2) Install shims with wet primer.
   (3) Install two track attach bolts to secure track to fitting.
      (a) Coat bolt with grease.
      (b) Install forward bolt and secure with washer and nut. Tighten nut to 30-40 pound-inches.
      (c) Install aft bolt and secure with washer and nut. Tighten nut to 50-100 pound-inches.

D. Install the bolt that attaches the exhaust gate actuation mechanism to the foreflap.
   (1) Tighten the nut.

E. Provide system A hydraulic power (Ref 27-51-0).

F. Position flap control lever to FLAP UP detent.

CAUTION: WITH ENGINE-TO-WING FAIRING TAIL CONE REMOVED, ENSURE THAT HINGED FLAP SEGMENT FENCE DOES NOT INTERFERE WITH STRUCTURE WHEN FLAPS RETRACT.

G. Extend ground spoilers (Ref 27-62-0), Speed Brake Control System).

H. Remove system A hydraulic power (Ref 27-51-0).

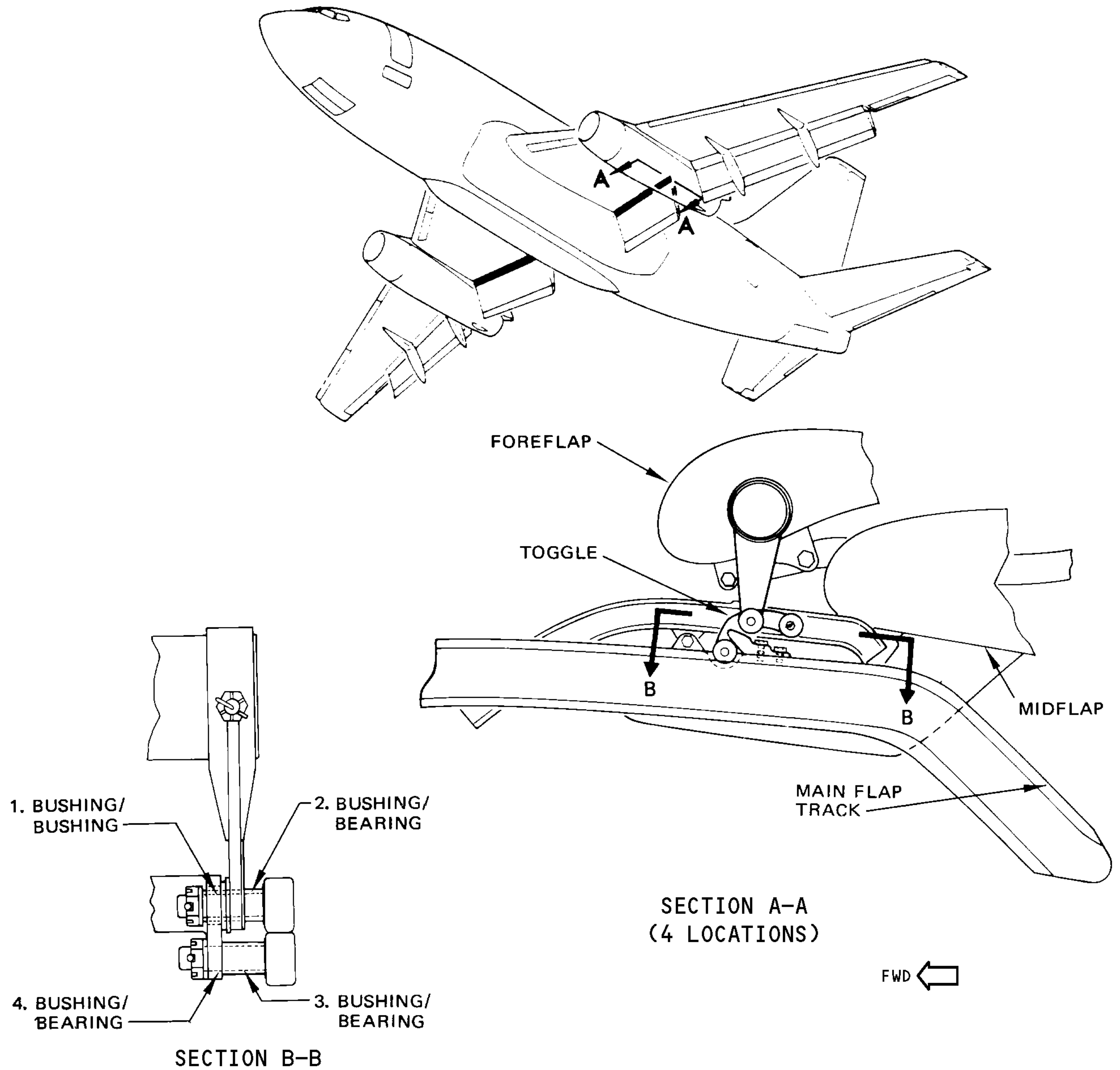
I. Check gap between trailing edge of foreflap and top of midflap as shown in Fig. 401. If gap is not within limits, add or delaminate shims between foreflap and track attach fitting (section A-A), as required to obtain correct gap. Apply primer to bare areas on shims.

J. With flaps in normal up position, check that bulb seal on lower forward edge of ground spoiler with respect to upper edge of foreflap is compressed 0.10 to 0.20 inch. If seal compression is not within limits adjust seal retainer to obtain compression.

K. Install inboard flap track fairing (Ref 27-51-141, Removal/Installation).

INBOARD FOREFLAP - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There will be no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Inboard Foreflap - Removal/Installation for this information.
2. Inboard Foreflap Wear Limits (Fig. 601)



Inboard Foreflap Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.5030	0.5040	0.5085	0.0072	X		
	BUSHING	OD	0.5006	0.5013	0.4958		X		
2	BUSHING	ID	0.3750	0.3765	0.3800	0.0050	X		
	BEARING	OD	0.3740	0.3750	0.3700		X		
3	BUSHING	ID	0.3750	0.3765	0.3800	0.0050	X		
	BEARING	OD	0.3740	0.3750	0.3700		X		
4	BUSHING	ID	0.3750	0.3765	0.3800	0.0050	X		
	BEARING	OD	0.3740	0.3750	0.3700		X		

Inboard Foreflap Wear Limits
Figure 601 (Sheet 2)

HINGED FLAPS - REMOVAL/INSTALLATION

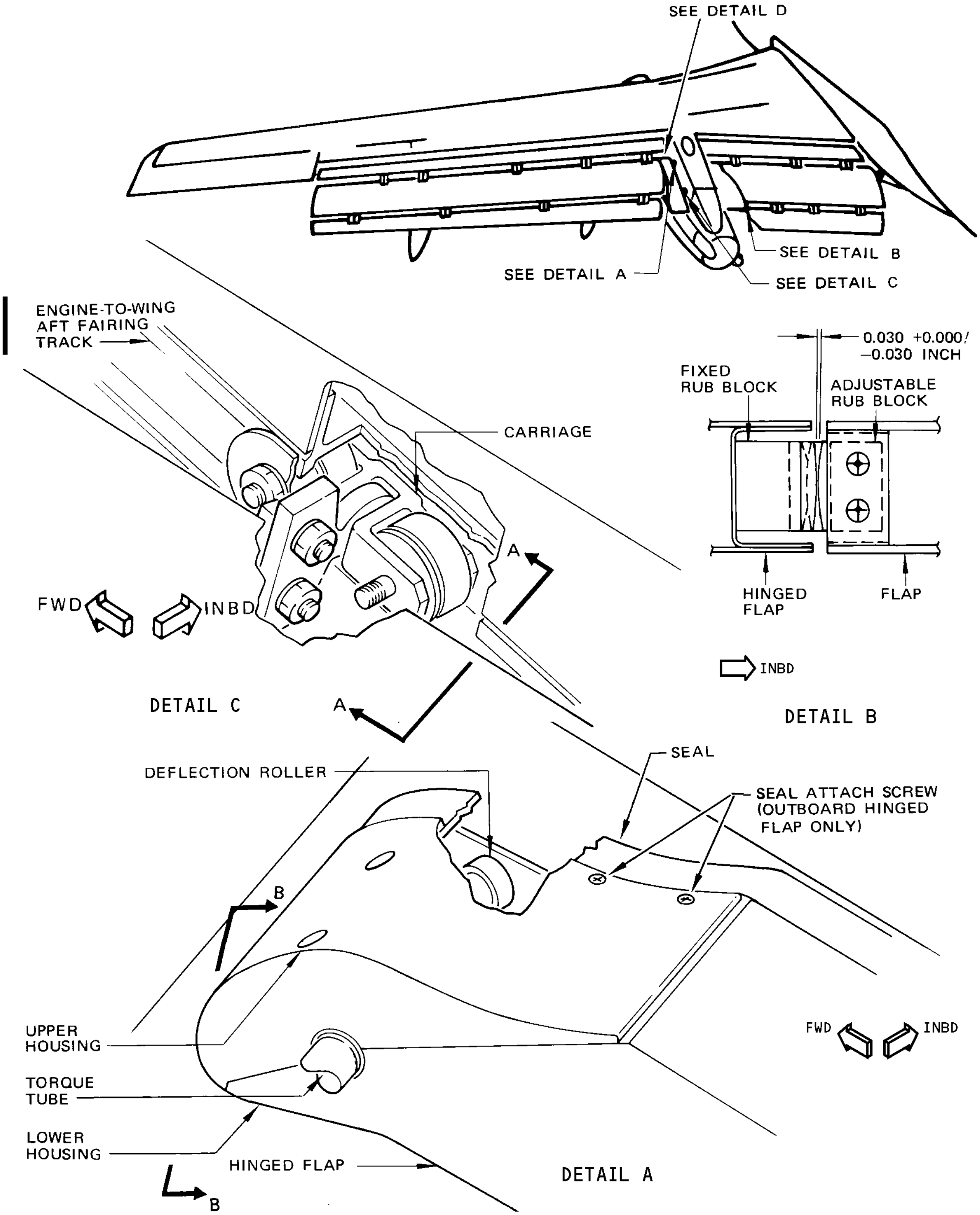
1. General
   A. This procedure applies to both inboard and outboard hinged flaps.
2. Equipment and Materials
   A. Primer - BMS 10-11, type 1 (Ref 20-30-41)
3. Prepare for Removal
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Position flap control lever in FLAP DOWN (40-unit) detent.
   C. Remove system A hydraulic power (Ref 27-51-0).
4. Remove Hinged Flap
   A. Remove four screws and remove lower aft seals and retainers from flap. (Section A-A, Fig. 401).
   B. On outboard hinged flap, remove two screws and retainer attaching upper seal to upper housing (Detail A, Fig. 401).
   C. Remove bolts connecting carriage in engine-to-wing aft fairing track to flap actuator support.

      NOTE: Support trailing edge of hinged flap to prevent dropping when bolts are removed.

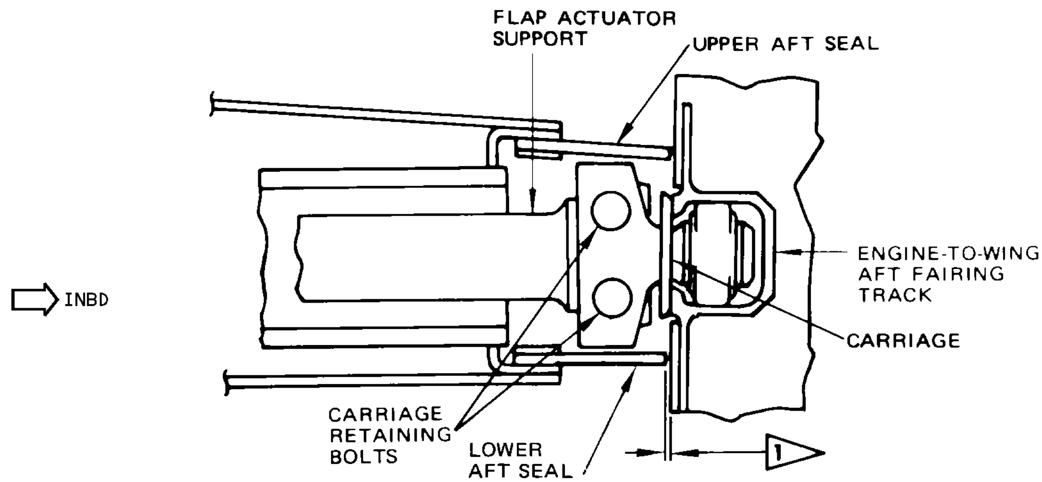
   D. Support flap and remove four bolts connecting upper housing to hinged flap (Section B-B).

      NOTE: Bearings and seals may drop to ground unless supported manually.

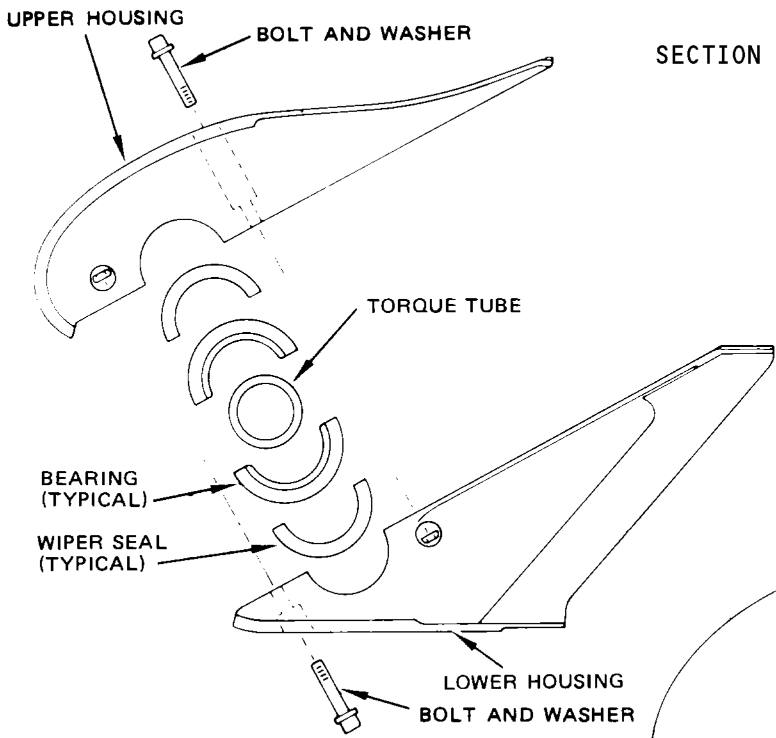
   E. Remove hinged flap from airplane.
5. Install Hinged Flap
   A. Install wiper seals and bearings in flap upper and lower housings.
   B. Position flap upper and lower housings on torque tube and install four bolts (Section B-B, Fig. 401). Dip bolts in primer and install while wet.
   C. Move carriage in engine-to-wing aft fairing track until it is adjacent to flap actuator support.
   D. Align holes in carriage with holes in actuator and install bolts with washer under head, countersunk side toward head. Install nuts and temporarily tighten finger-tight (section A-A).
   E. On outboard hinged flap, install seal retainer and two screws attaching upper seal to upper housing (Detail A, Fig. 401).
   F. Provide system A hydraulic power (Ref 27-51-0).
   G. Raise flaps to FLAP UP position.
   H. Remove system A hydraulic power (Ref 27-51-0).
   I. Align trailing edge of hinged flap with trailing edge of aft flap within ± 0.10 inch. Check that bearing support housing does not protrude above midflap surface on outboard flap. Tighten nuts connecting carriage and flap support to 65-90 pound-inches



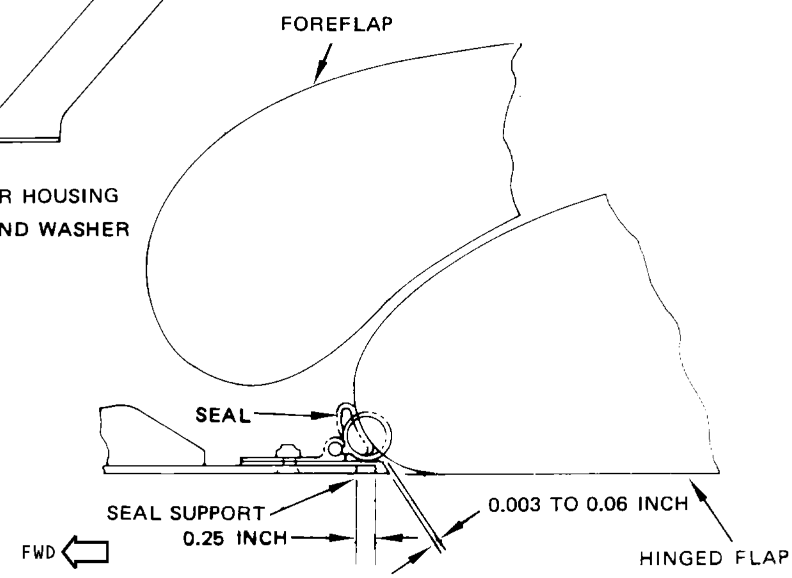
Hinged Flap Installation
Figure 401 (Sheet 1)



SECTION A-A



SECTION B-B
EXPLODED FOR CLARITY



DETAIL D

1 ADJUST UPPER AND LOWER BLADE SEALS TO ENSURE CONTACT WITH FAIRING WITH FLAP IN STOWED POSITION

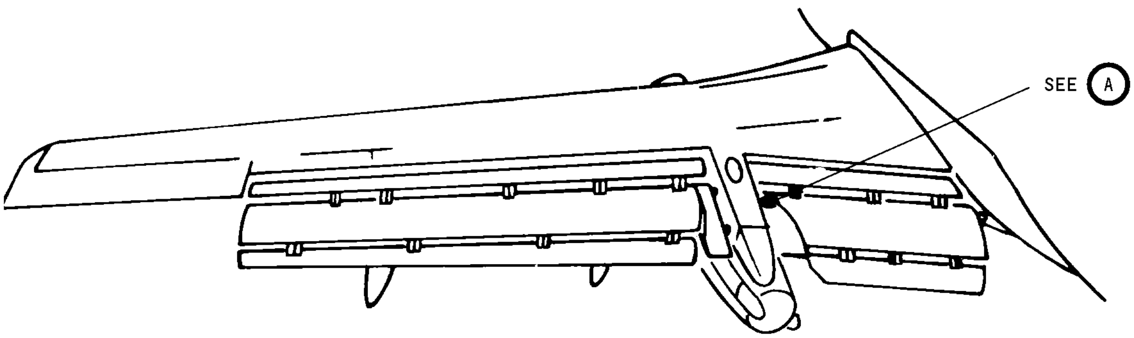
Hinged Flap Installation
Figure 401 (Sheet 2)

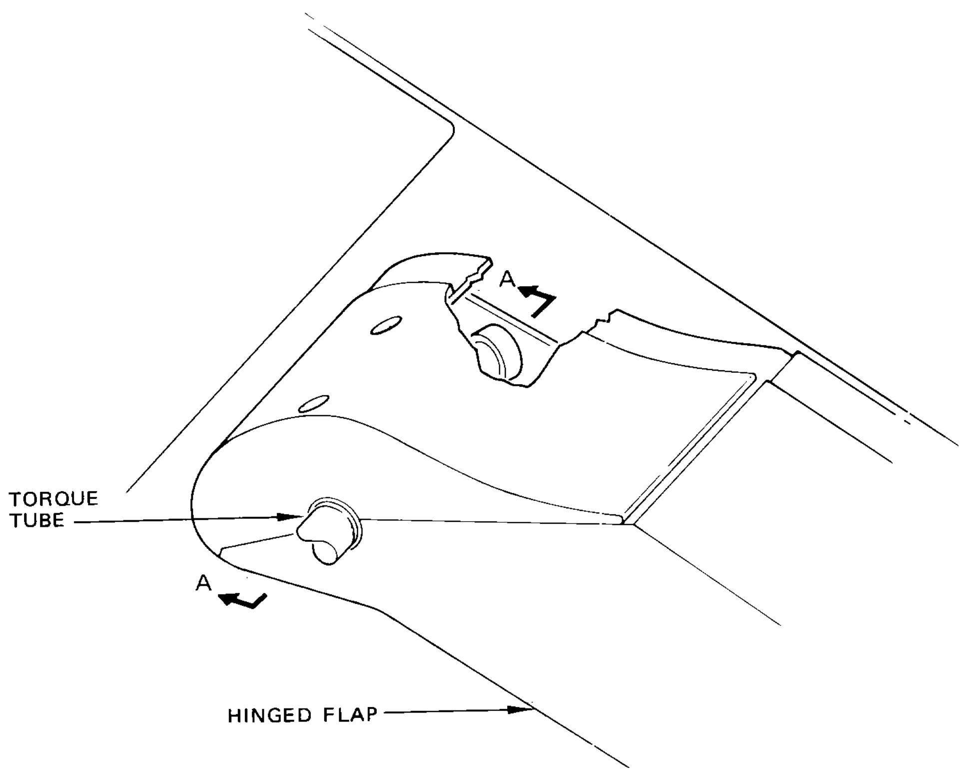
468534

J. Adjust rub block on inboard or outboard midflap to fixed rub block on hinged flap to gap specified in detail B. On outboard flap, maintain a minimum of 0.010 inch clearance between hinged flap an d midflap throughout full travel.
K. Install aft lower seal and retainers on flap (section A-A).
L. Adjust blade seals on hinged flap per section A-A.
M. Provide system A hydraulic power (Ref 27-51-0).
N. Cycle flaps ending with flaps up.
O. On inboard flap, check that phenolic rub strip on nacelle fairing closure door contacts lower surface of hinge flap for its entire length. If adjustment is necessary loosen nut on pivot bolt located on the forward end of the closure door and rotate eccentric bushing to obtain contact. If necessary rotate eccentric one notch to align notch in eccentric with roll pin.
P. On inboard hinged flap, check that gap between nacelle fairing closure door and nacelle fairing side wall is 0.02 inch minimum throughout flap travel. If not, add washer at forward pivot to obtain clearance.
Q. On inboard hinged flap, check that clearance between nacelle fairing closure door and guide on foreflap torque tube is 0.12 inch minimum throughout flap travel. If not, loosen bolt and reposition serrated slotted guide to obtain required clearance.
R. On outboard hinged flap, adjust seal and seal support between hinged flap and wing trailing edge lower panel per detail D, Fig. 401.
S. Fill gap between support fitting and upper skin with sealant.
T. Remove system A hydraulic power (Ref 27-51-0).

HINGED FLAP - INSPECTION/CHECK

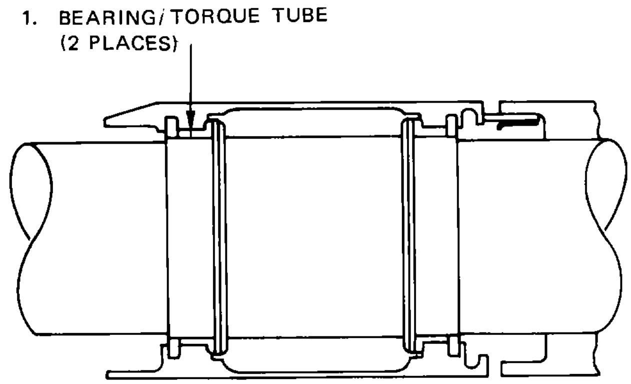
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component - Removal/Inspection for this information.
2. Hinged Flap Wear Limits





INBOARD HINGE FLAP
(OUTBOARD HINGED FLAP IS SIMILAR)
A

Hinged Flap Wear Limits
Figure 601



SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	3.653	3.655	3.658	0.011	1		
	TORQUE TUBE	OD	3.649	3.650	3.647			X	2

1 REPLACE BUSHING WHEN RADIAL WEAR ON BUSHING LINER EXCEEDS 0.005 INCH IN ANY DIRECTION

2 REFER TO OVERHAUL MANUAL

Hinged Flap - Wear Limits
Figure 602

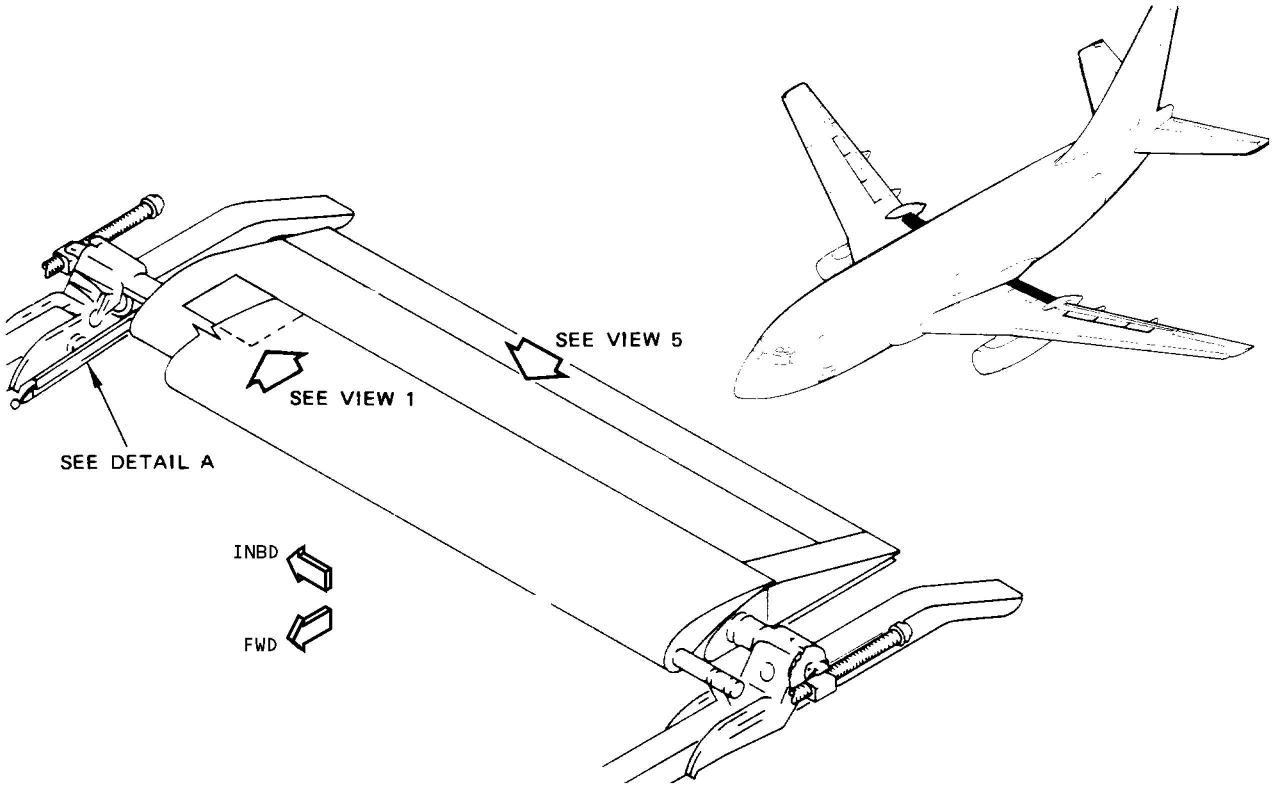
468536

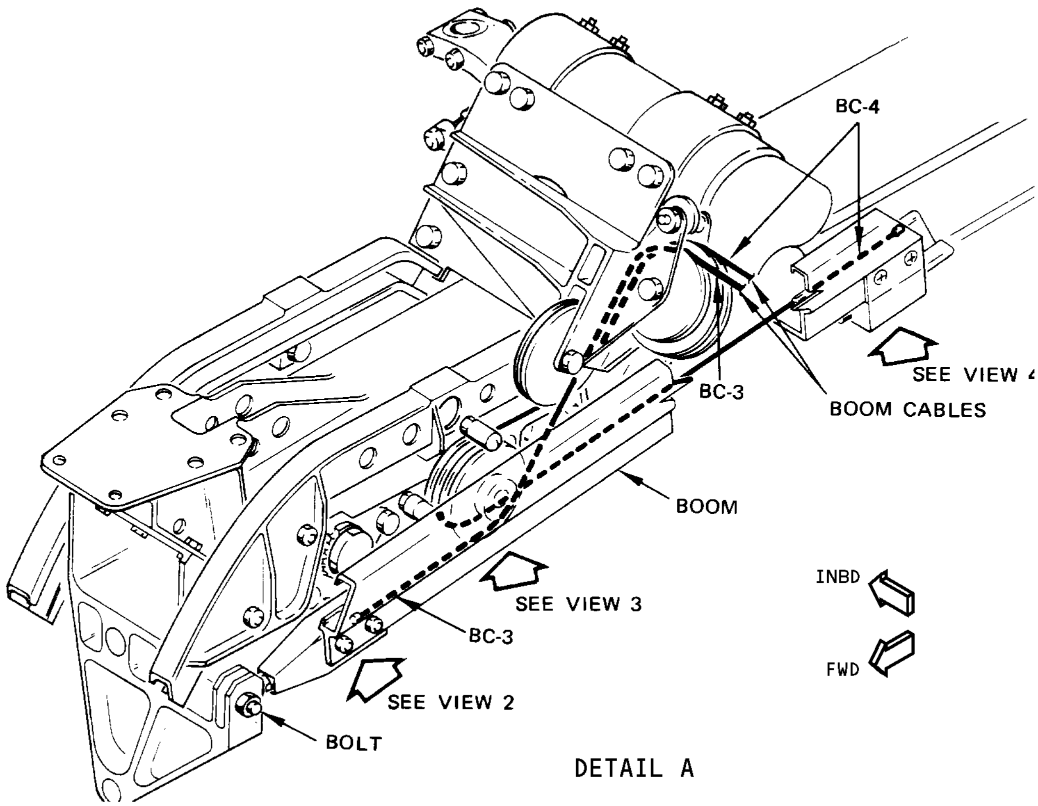
AFTFLAP ACTUATING MECHANISM BOOM - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Rigging Pins - F-5 and F-6, 0.248 +0.000/-0.002 inch diameter, 3.7 ±0.25 inches long (MS20392-3)

      NOTE: Rigging pins are a part of Kit F70207-3, -52, or -61, or -84.

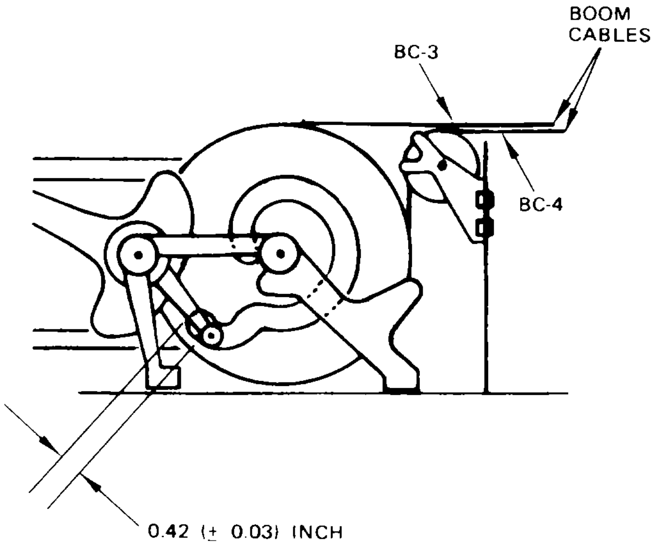
   B. Protective cover - to fit aftflap
   C. Support - to support aftflap (with protective cover)
   D. Grease - BMS 3-33 (Preferred)
   E. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
2. Remove Aftflap Actuating Mechanism Boom
   A. Remove inboard flap track fairing (Ref 27-51-141 R/I).
   B. Provide system A hydraulic power (Ref 27-51-0 MP).
   C. Position flap control lever at 0-unit detent.
   D. Install rigging pins F-5 and F-6 in boom to trap boom roller between pins (Fig. 401).
   E. Remove system A hydraulic power (Ref 27-51-0 MP).
   F. Install protective cover on aftflap and position support under flap so that aftflap will not move when boom is disconnected.
   G. Install cable clamps on boom cables where they pass through midflap end rib. This will maintain some tension on cables in midflap to keep cables in proper drum grooves.
   H. Remove rigging pins F-5 and F-6.
   I. Remove bolt to disconnect boom from structure.
   J. Loosen cable adjusting nuts and disconnect cables from boom cable fittings.
   K. Pull boom aft and off of boom roller.
3. Install Aftflap Actuating Mechanism Boom
   A. Extend trailing edge flaps.
   B. Disconnect both rods from inboard flap aft segment.
   C. Disconnect boom assembly forward end.
   D. Position boom aft of boom roller and roll boom forward onto roller (Fig. 401). Partially retract trailing edge flaps sufficiently for clearance to move boom assembly.
   E. Make sure that cables are properly positioned in pulleys and cable ends are connected to boom cable sockets.
   F. Install rigging pins F-5 and F-6 through inboard side of boom so that boom roller is trapped between pins.
   G. Tighten adjusting nuts just enough to remove slack from cables.
   H. Remove access panel from forward half of lower surface of midflap.



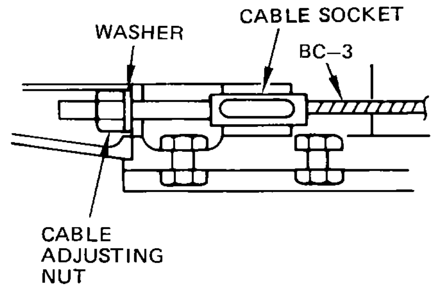


DETAIL A

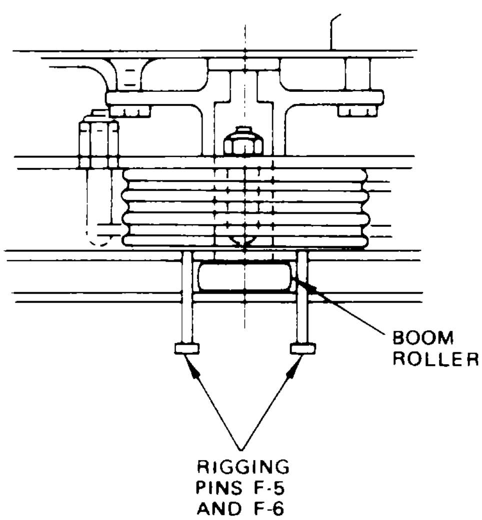
Aft Flap Actuating Mechanism Boom Installation
Figure 401 (Sheet 1)



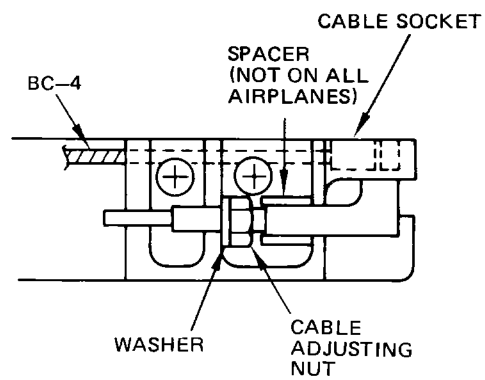
VIEW 1



VIEW 2

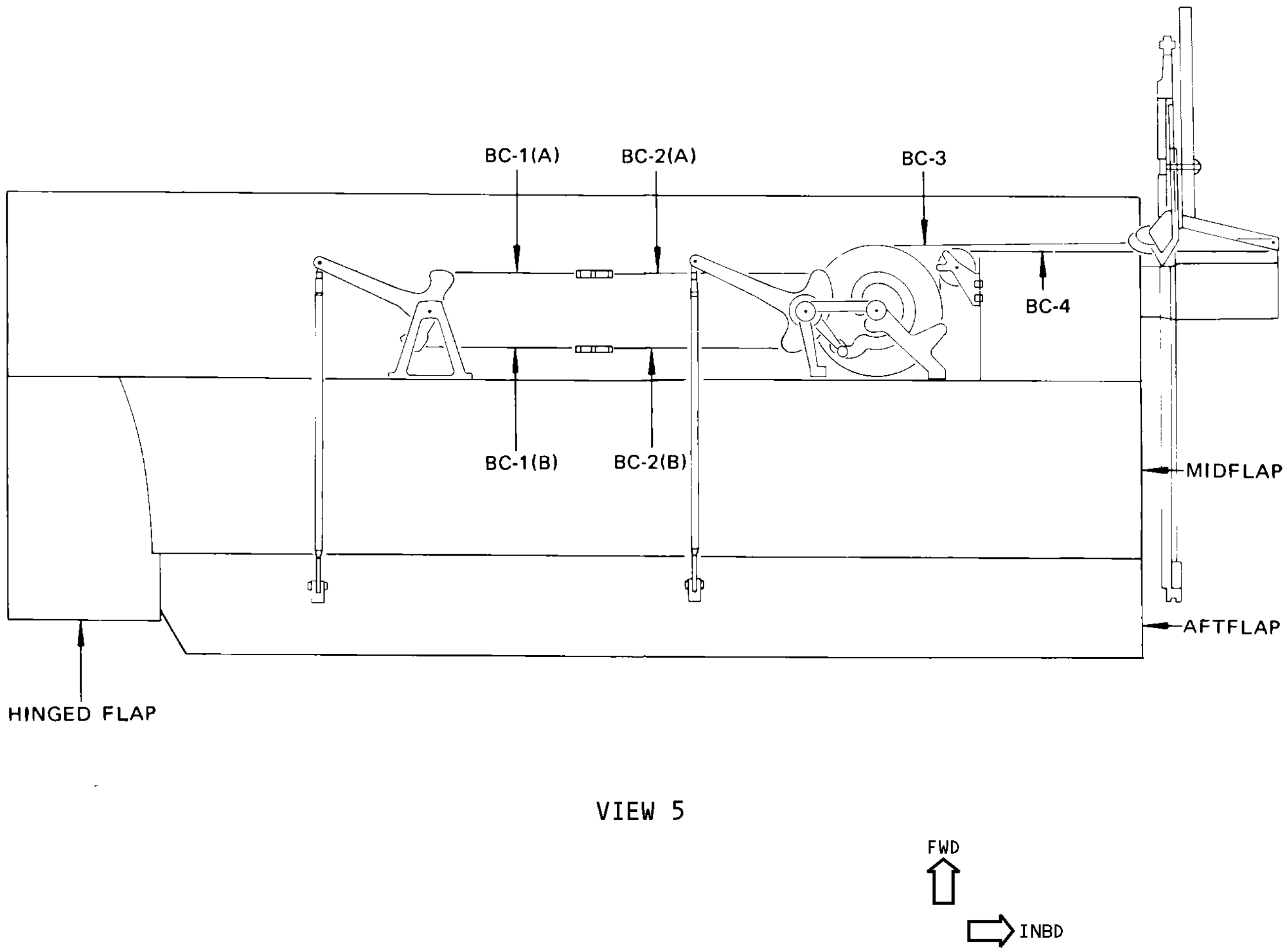


VIEW 3



VIEW 4

Aft Flap Actuating Mechanism Boom Installation
Figure 401 (Sheet 2)



Aft Flap Actuating Mechanism Boom Installation
Figure 401 (Sheet 3)

I. Tighten adjusting nuts to position cam roller 0.42 ±0.03 inch from forward end of cam slot in cable drum.
   (1) If difficulty in obtaining 0.42 inch dimension is experienced, a rigging block of 0.25-inch thick plastic (or equivalent) shaped to curvature of cam slot and cut to required positioning dimension can be made.
   (2) Position rigging block in cam slot with cam roller against block, then tape block to cam drum.

J. Tighten adjusting nuts as necessary to obtain cable tension of 100 ±10 pounds while maintaining 0.42-inch dimension obtained in step I.

   NOTE: Cables should be adjusted to 100-pound tension at temperature of approximately 70°F. As temperature decreases, tension should be decreased and as temperature increases, tension should be increased. However, 10-pound tolerance should not be exceeded. Check cable tension by applying tensiometer to cable where exposed on boom assembly.

K. Remove rigging pins F-5 and F-6 and adjust boom position if necessary to check cable tension.

   NOTE: Rigging pins F-5 and F-6 must be installed while adjusting cable tension.

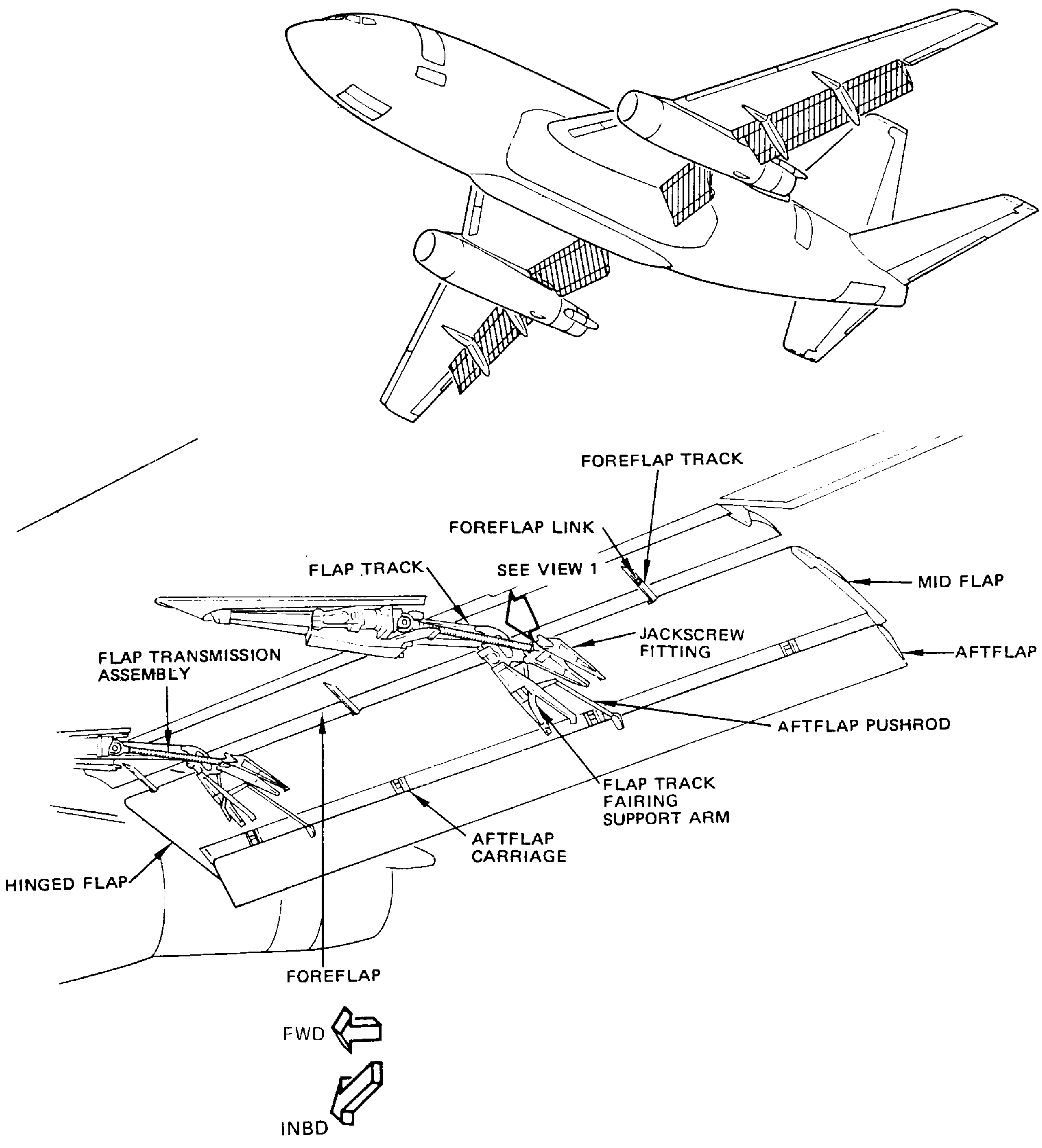
L. Remove rigging pins F-5 and F-6 from boom.
M. Install bolt with head on inboard side to connect boom end fitting to fixed structure. Install bushing on outboard side of bolt on airplanes having provisions for bushing. Adjust boom end fitting as necessary to make connection. Coat bolt with grease. Tighten and lockwire checknut.
N. Connect both rods to inboard flap aft segment.
O. Remove aftflap support and protective cover.
P. Provide system A hydraulic power (Ref 27-51-0).
Q. Extend and retract flaps. Check for proper operation of aftflap drive mechanism.
R. Remove system A hydraulic power (Ref 27-51-0).
S. Install access panel in lower surface of midflap.
T. Install inboard flap track fairing (Ref 27-51-141 R/I).

OUTBOARD TRAILING EDGE FLAP - REMOVAL/INSTALLATION

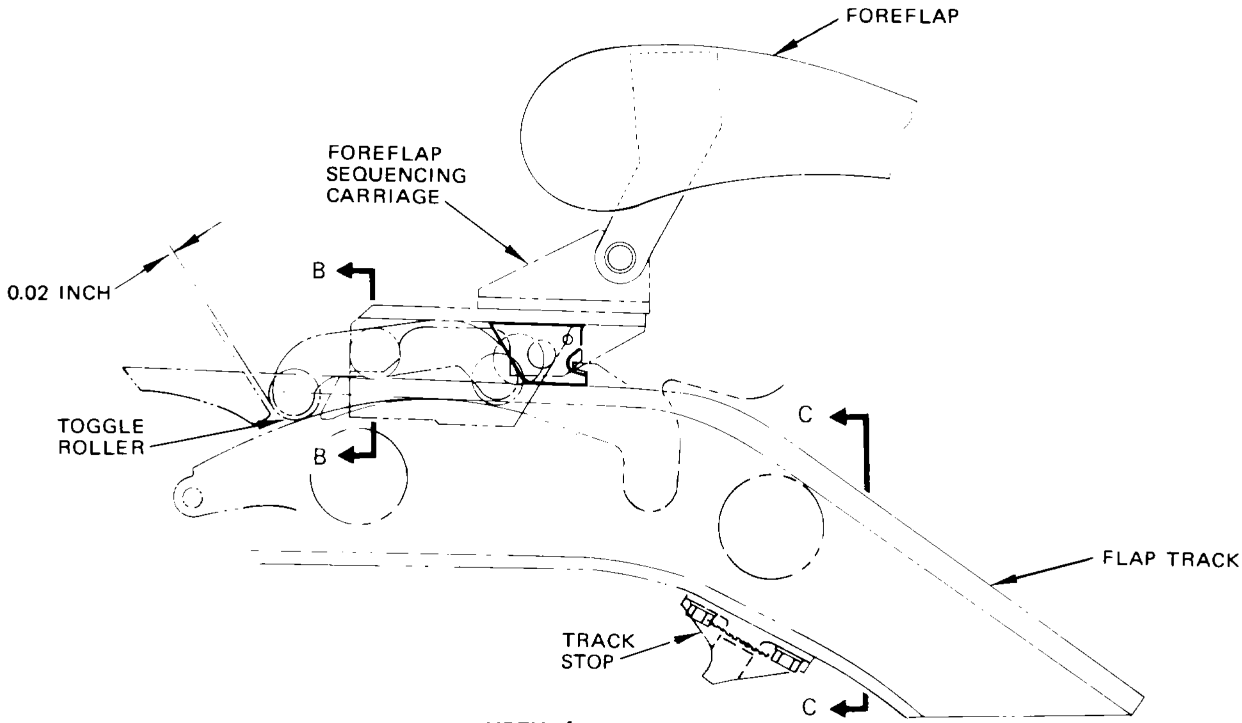
1. General
   A. A sling assembly is available for removing and installing the outboard flap. Install sling over outboard midflap access panel 8204 left wing, or 8704 right wing.
   B. The upper leading edges of the foreflap and midflap are finished with an abrasion resistant teflon coating. If repair of teflon coating is required, refer to Chapter 51, Abrasion Resistant Teflon Finish System.
2. Equipment and Materials
   A. Trailing Edge Flaps Sling Assembly - F80213-78
   B. Flap Drive Screw Support Assembly - F80057-1
   C. Flight Spoiler Ground Lock - F80017-23
   D. Grease - MIL-G-21164
   E. Corrosion Preventive Compound - MIL-C-11796, Class 3
3. Prepare for Removal
   A. Provide system A and B hydraulic power (Ref 27-51-0 MP).
   B. Position flap control lever to 40-unit detent.
   C. Position speed brake control lever in UP position to raise spoilers.
   D. Block spoilers above outboard flaps with flight spoiler ground locks.
   E. Turn off system A and B hydraulic power and depressurize hydraulic system A and B (Ref 27-51-0).
   F. Remove fairing from each main flap track (Ref 27-51-121 R/I).
4. Remove Outboard Trailing Edge Flap
   A. Remove bolt attaching foreflap to foreflap sequencing carriage at each flap track (View 1, Fig. 401).
   B. Deleted
   C. Deleted
   D. Remove bolts attaching each foreflap link assembly to foreflap track and remove flap (Fig. 401).

      NOTE: Foreflap weighs approximately 55 pounds.

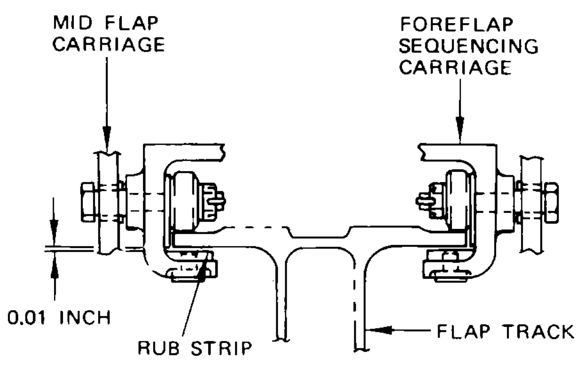
   E. Remove hinged flap (Ref 27-51-51 R/I).
   F. With flap supported so that weight of flap is off trunnions, remove four bolts through each jackscrew fitting and remove gimbal bushings and retainers from fitting (Fig. 403). Note location and number of shims to ensure proper installation. Maintain position of ball nut on jackscrew to retain transmission adjustment. Support jackscrew using flap drive screw support assembly.
   G. Remove carriage stop from lower surface of flap track (Fig. 401).



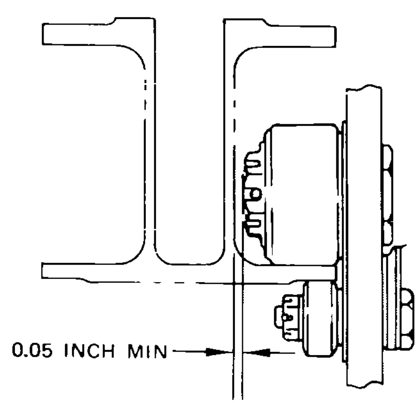
Outboard Trailing Edge Flap Installation
Figure 401 (Sheet 1)



VIEW 1



SECTION B-B



SHOWN IN CARRIAGE STOWED POSITION

SECTION C-C

Outboard Trailing Edge Flap Installation
Figure 401 (Sheet 2)

H. Using sling or other suitable means of supporting flap, roll flap aft and down off flap tracks.

CAUTION: DO NOT ALLOW SLING CABLES TO CUT TRAILING EDGE OF SPOILERS. DISCONNECT SPOILERS AND FOLD FORWARD IF NECESSARY TAKING CARE THAT THEY DO NOT FOUL WITH ESCAPE ROPE ATTACHMENT FITTING.

NOTE: The mid and aft flap assembly weighs approximately 250 pounds.

I. If a different midflap is to be installed on airplane:
   (1) Remove bolts connecting aftflap pushrods to aftflap (Fig. 401).
   (2) Remove bolts connecting carriage support pushrods to flaptrack fairing support arms (Fig. 402).
   (3) Remove bolts connecting flap track fairing support arms, to flap carriages.
   (4) Remove access panels from upper surface of midflap to gain access to each carriage bearing support.
   (5) Remove bolts attaching carriage bearing support to midflap forging.
   (6) Remove and record thickness of shims installed between each carriage bearing support and forging. If shims removed are intact, save for installation on replacement flap.

5. Install Outboard Trailing Edge Flap
   A. If a replacement midflap is to be installed:
      (1) Position flap track fairing support arms on flap carriages and install attaching bolts (Fig. 401 and 402).
      (2) Position fairing support pushrods on fairing support arms, secure each with bolt washer and nut. Tighten nut and install cotter pin.
         (a) Make sure the starting length of the fairing support pushrods is 7.40 ±0.10 inch.
      (3) Connect aft pushrods to aftflap with boltheads up. Tighten nuts and install cotter pins.

      CAUTION: BOLTS MUST BE INSTALLED WITH HEADS UP TO PREVENT BOLTS FROM DAMAGING MIDFLAP AND/OR AFTFLAP PUSHRODS AND AFTFLAP.

      (4) Apply grease liberally around slotted hole and on bearing periphery at aft end of carriage spindle.

(5) Position carriage bearing support over end of flap carriage with shims installed between carriage bearing support and midflap forging, install bolt with washer and nut (Fig. 402). Tighten 3/8-inch nut 160 to 190 pound-inches. Tighten 5/16-inch nut 100 to 140 pound-inches.

NOTE: Use shims removed in step 4.I.(6) or shims of equivalent thickness.

B. Using sling or other suitable means of supporting flap, and with toggle forward roller down in track detent, start flap carriages together on flap track and roll forward. With flap carriages near aft end of tracks, check that clearance between flap track web and end of each of the four carriage track roller bolts is 0.050 inch minimum (Section C-C, Fig. 401). If clearance is less than 0.050 inch, correct as follows:

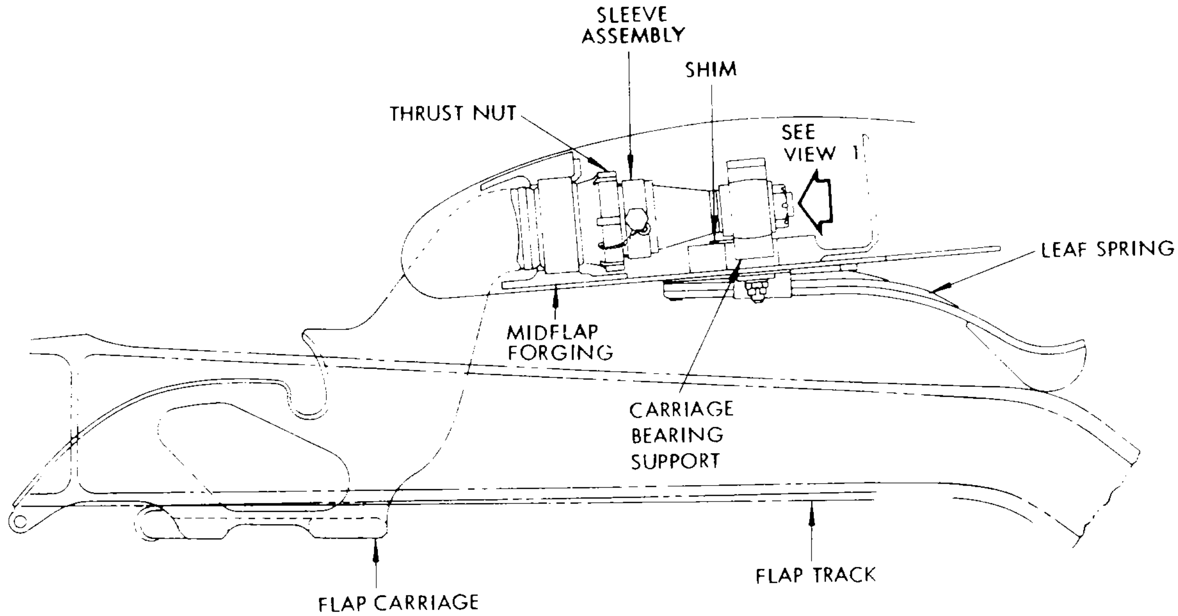
CAUTION: DO NOT ALLOW SLING CABLES TO CUT TRAILING EDGE OF SPOILERS. DISCONNECT SPOILERS AND FOLD FORWARD IF NECESSARY TAKING CARE THAT THEY DO NOT FOUL WITH ESCAPE ROPE ATTACHMENT FITTING.

(1) Remove flap from tracks.
(2) Remove track roller bolts and add shims under head of bolt as required to increase clearance between bolt and track web. Install cotter pin so it does not extend beyond end of roller bolt.

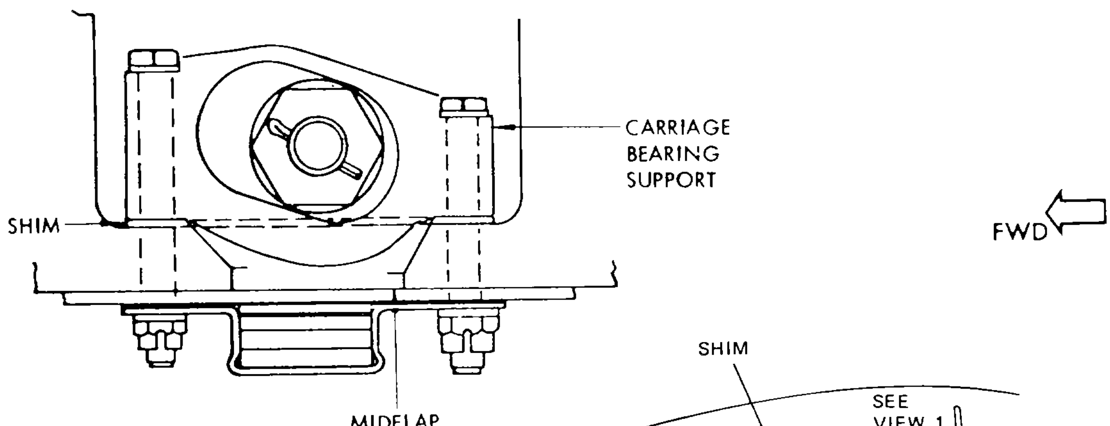
C. Roll flap forward on tracks.
D. Install carriage stops on lower flange of flap track as follows.
(1) Locate stop and install bolts.
(2) Roll flaps aft and check clearance between carriage and carriage stop is 0.06 inch minimum with airload rollers contacting flap track.

NOTE: Flaps must be lifted for airload rollers to contact flap track.

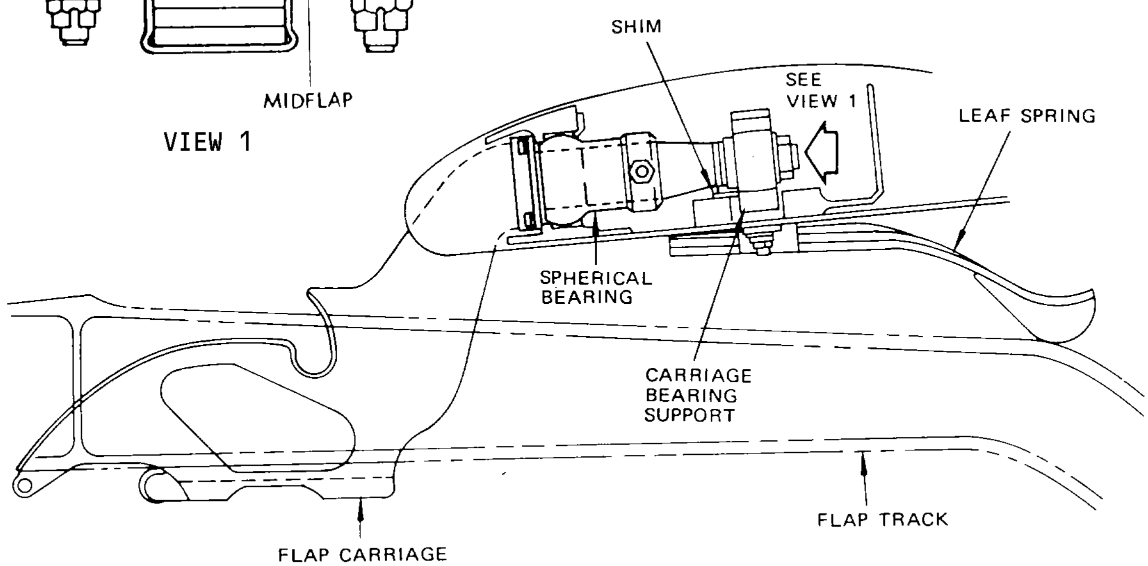
(3) Fully extend flaps. Check engagement between carriage and carriage stop is 0.05 inch minimum with deadweight rollers contacting flap track.
(4) Roll flaps forward to clear stops.
(5) Lockwire adjacent bolts.



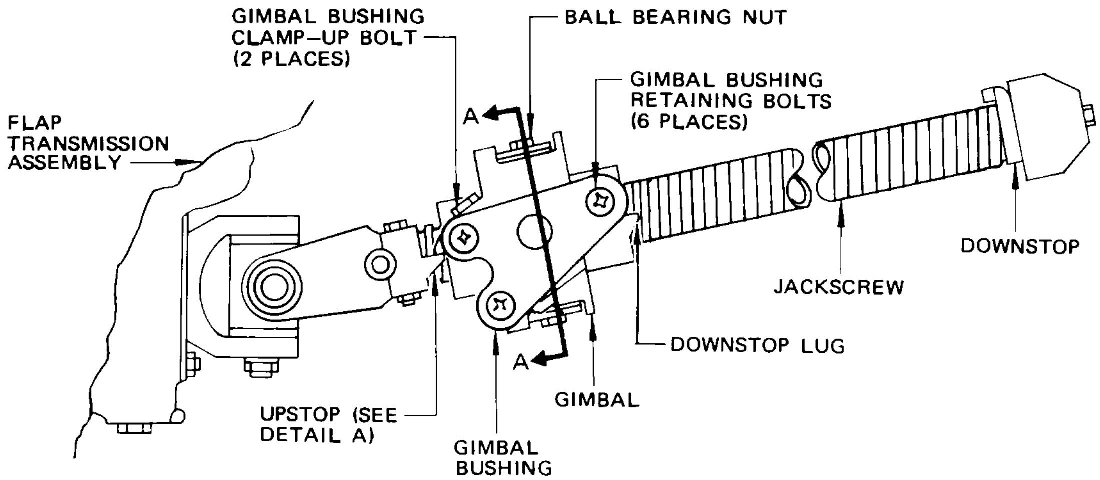
AIRPLANES WITH THRUST NUT

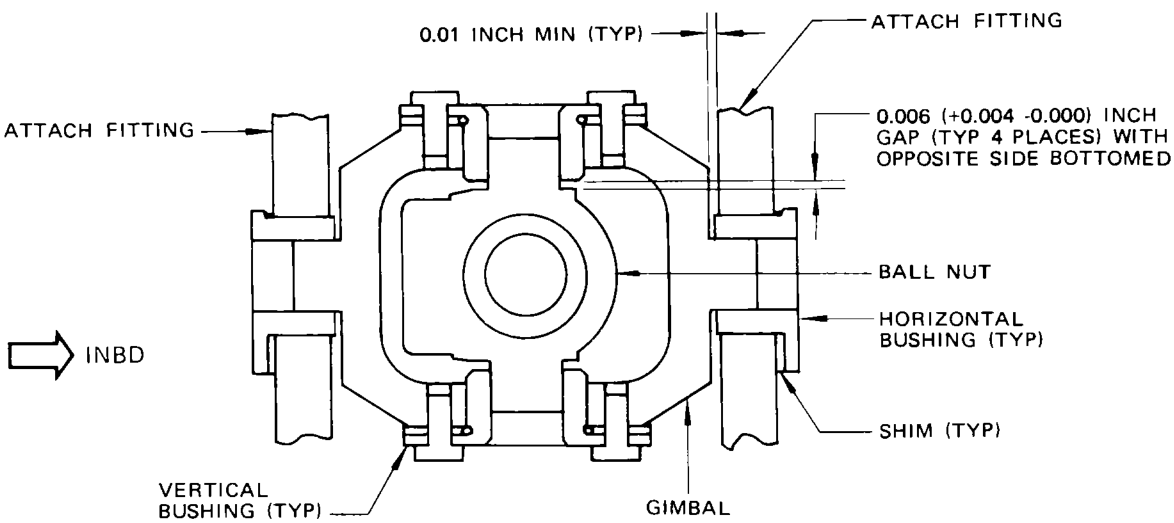


VIEW 1

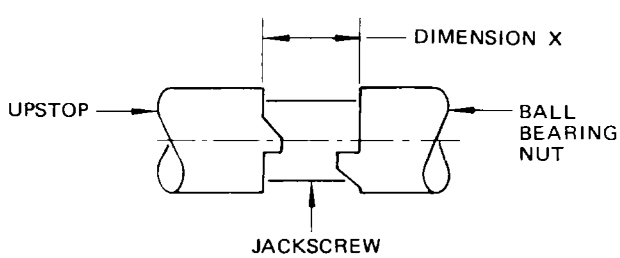


Outboard Trailing Edge Flap Positioning
Figure 402





SECTION A-A



DETAIL A

Flap Transmission Assembly Adjustment
Figure 403

E. Align foreflap fitting with lugs on sequencing carriage and install bolt. Secure bolt with washer and nut. Tighten nut to 60-85 pound-inches and install cotter pin.

NOTE: One hundred forty pound-inches maximum torque range allowed for alignment of nut and hole for cotter pin.

F. Remove flap restraining support and roll flap fore and aft to check operation of toggle. Check that foreflap is loose and free in all positions between 0 and 5 degrees on retract cycle. If no play is evident check that minimum clearance between foreflap sequencing carriage rubstrips and track surface throughout carriage cycle is per Section B-B, Fig. 401.
G. Align foreflap link assemblies with foreflap tracks and install bolts and tighten nuts.
H. With sequencing carriage engaged to stop on track and deadweight rollers contacting track upper surface, check that minimum clearance between outside diameter of toggle roller and forward slope of slot is per View 1, Fig. 401.
I. With ball nut position maintained and flap supported so that weight of flap is off trunnions, install gimbal bushings on jackscrew fitting (Fig. 403). Coat outer surface of bushings with corrosion preventive compound before installation. Ensure that shims are installed in position noted during removal, and that there is proper clearance between bushings and gimbal (Section A-A, Fig. 403).
J. Install three bolts to secure each gimbal bushing.
K. Install and tighten gimbal bushing clamp-up bolts to 60-85 pound-inches.
L. Remove flap drive screw support assembly from flap track.
M. Install hinged flap (Ref 27-51-51, Removal/Installation).
N. Provide system A hydraulic power (Ref 27-51-0).
O. Modulate hydraulic pressure and flow to slowly retract flaps. Hold in retracted position for 2 minutes.
P. Remove system A hydraulic power (Ref 27-51-0).
Q. Check that upstops on ball bearing nuts are 170 to 190 degrees (1/2 turn +10 degrees) turns from upstops on jackscrews.
R. Connect torque tubes to couplings on transmission assembly. Lockwire heads of torque tube screws together.
S. Check that speed brake control lever is in UP position.
T. Check that flap control lever is in 40-unit detent.
U. Remove flight spoiler ground locks.
V. Provide system A and B hydraulic power (Ref 27-51-0).
W. Position speed brake control lever to DOWN position to lower spoilers.
X. Remove system A and B hydraulic power (Ref 27-51-0).
Y. Adjust flap (Ref AMM 27-51-72, Adjustment/Test).

OUTBOARD TRAILING EDGE FLAP - ADJUSTMENT/TEST

1. Outboard Trailing Edge Flap Adjustment
   A. Equipment and Materials
      (1) Flap Drive Adapter - F70300-1 (Preferred) or ST2583-1 (Optional)
      (2) Outboard Flap Rigging Tools:
         (a) Outboard Flap Rigging Beam - F80209-2 (Preferred) (Ref 27-09-700)

            NOTE: Rigging Beam is a part of F80209-1.

         (b) Outboard Flap Rigging Tool - TE65-73720-1 and -2 (Optional)
      (3) Control Column Protractor Assembly 4MIT65B80307-1 (Preferred) or F52485-500 (Optional)
      (4) Protractor Stand Assembly - F71292-17
      (5) Primer - BMS 10-11, Type I (Ref 20-30-41)
      (6) Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
      (7) Pressure, Environmental and Fuel Cavity Sealant - BMS 5-79 (Ref 20-30-11)
      (8) Modeling Clay (Ref 20-30-51)
   B. Prepare for Adjustment
      (1) Install flap track fairing (Ref 27-51-121 R/I).
      (2) Position flap control lever to FLAPS UP detent.
      (3) Provide system A hydraulic power (Ref 27-51-0 MP).
      (4) Modulate hydraulic pressure and flow to slowly retract flaps. Hold in retracted position for 2 minutes.
      (5) Turn off system A hydraulic power and depressurize hydraulic system A (Ref 27-51-0 MP).
   C. Adjust Outboard Trailing Edge Flap

      NOTE: When you turn the flap drive torque tubes to get 1 turn of the inboard flap jackscrews, you get a 1/2 turn of the outboard flap jackscrews.

      (1) Check that upstops on ball bearing nuts are 170 to 190 degrees (1/2 turn +10 degrees) turns from upstops on jackscrews.
      (2) Connect torque tubes to coupling on transmission assembly. Lockwire heads of torque tube screws together.

(3) Remove plug screws and attach flap rigging tool at location marked by black arrows at WBL 228.5 or hand position outboard flap rigging beam to black stripes located at WBL 228.5 on front and rear spar (Section A-A, Fig. 501).

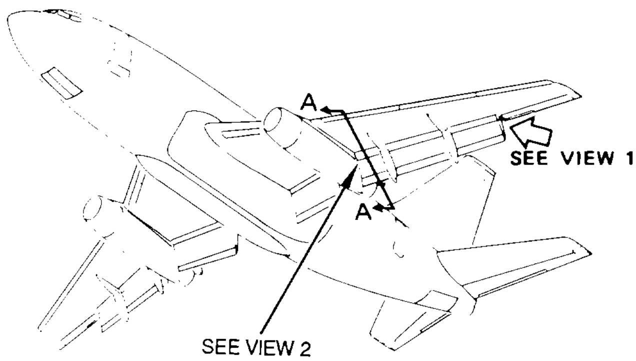
NOTE: If black stripes are not on airplane, stencil 0.25-inch wide stripes per tool drawing F80209. If shim between carriage bearing support and midflap has been lost or altered so that it is impossible to determine shim thickness on flap that was removed, both outboard flaps must be rigged per the following procedure. This procedure locates flap trailing edge relative to wing chord plane and requires the use of flap rigging tool.

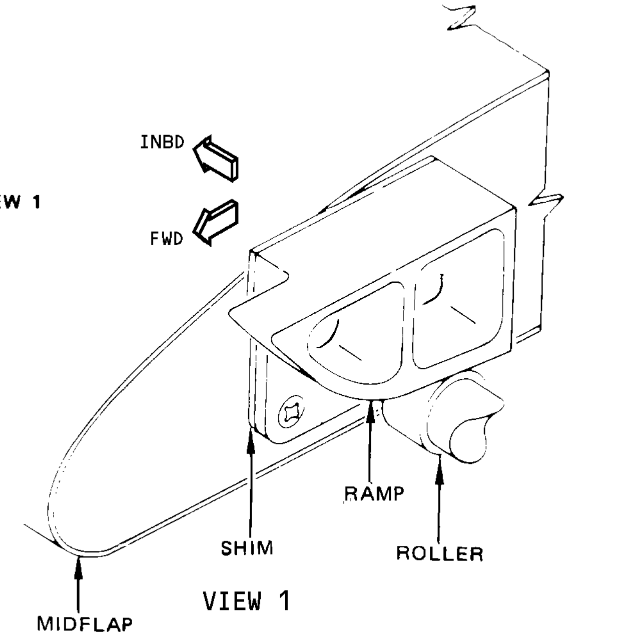
(4) Apply 30-pound upward force against a minimum 4.0 by 6.0-inch aluminum plate at aft edge of aftflap near the aftflap track rollers to hold aftflap in retracted position and measure flap position at flap rigging tool and fixed rib at outboard end of flap. Check that aftflap trailing edge is 0.00 to 0.25 inch below wing chord plane with aftflap airload rollers contacting flap track. Check that flap is symmetrical within 0.10 inch of opposite flap wing chord plane alignment.

NOTE: If this dimension cannot be achieved without exceeding the 0.23-inch maximum allowable shim thickness, use a 0.23-inch shim regardless of the flap position relative to the wing chord. If you have made trim corrections with the outboard TE flaps, the dimension can be more than the 0.00 to 0.25-inch limit. The aftflap is in the retracted position when the clearance between the lower trailing edge of the midflap and the leading edge of the aftflap is 0.00 to 0.13 inch for the full length of the aftflap.

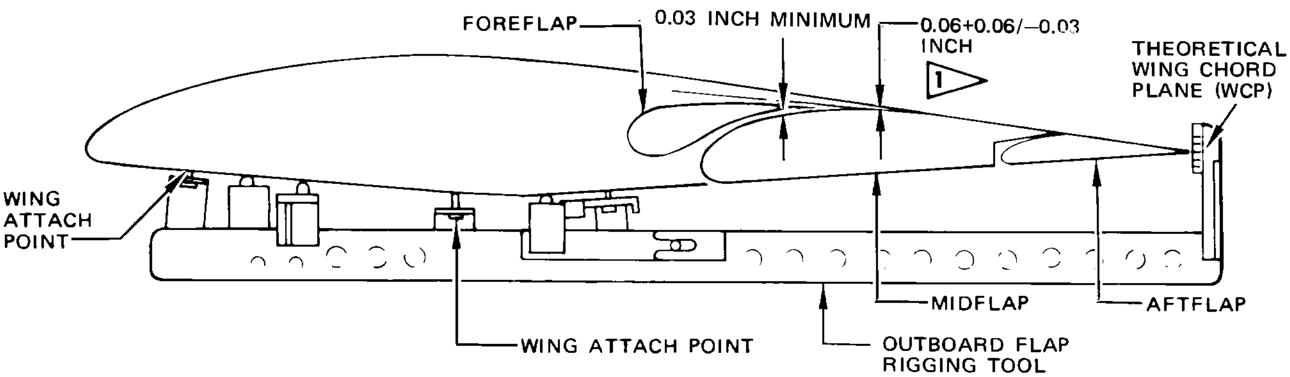
(5) If flap trailing edge is not within limits, refer to chart (Fig. 501) and determine shim thickness required to position aftflap trailing edge 0.00 to 0.25 inch below wing chord plane. Inboard and outboard carriage shims should be equal within 0.12 inch.

(6) Remove access panels from upper surface of midflap and remove bolts attaching carriage bearing support to midflap forging (Fig. 503).

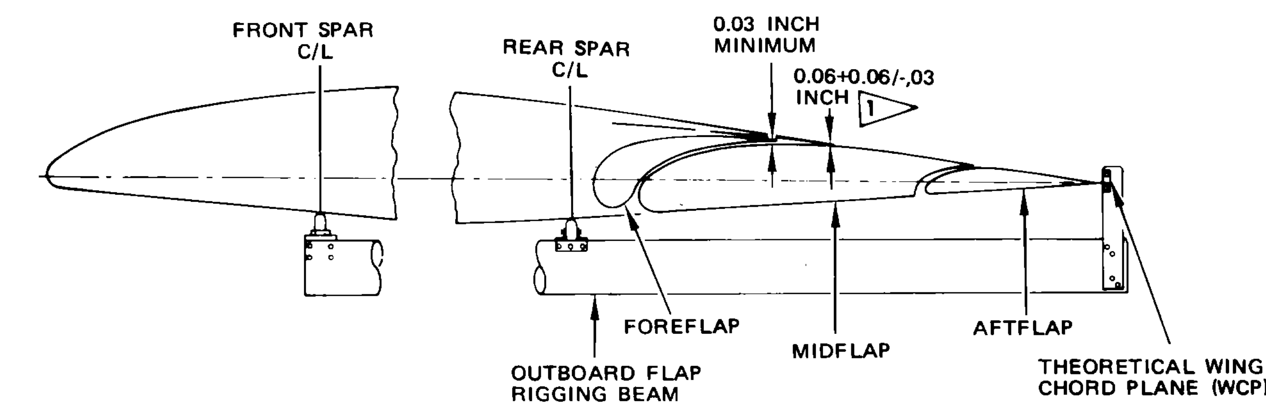




VIEW 1



SECTION A-A



1 MEASURED AT EACH END OF FLAP

SECTION A-A

Outboard Trailing Edge Flap Positioning
Figure 501 (Sheet 1)

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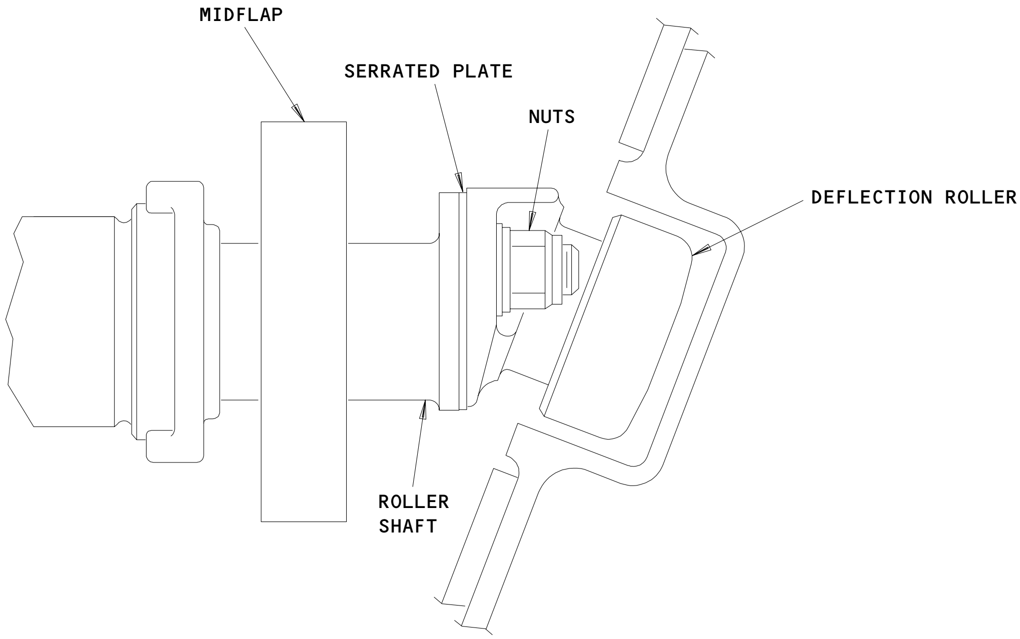
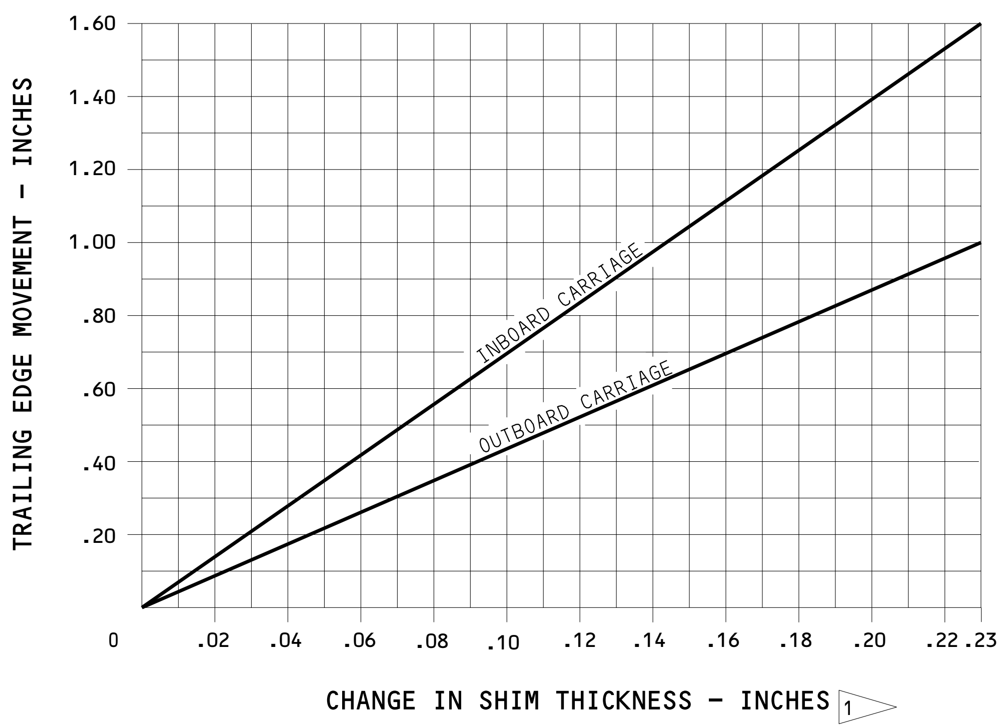


VIEW 2



1 REFER TO AMM 27-51-151/401 FOR SHIM REMOVAL/INSTALLATION PROCEDURES

Outboard Trailing Edge Flap Positioning
Figure 501 (Sheet 2)

(7) Position carriage bearing support over end of flap carriage with correct shim thickness installed between carriage support and midflap forging, install bolt with washer and nut. Tighten 3/8-inch nut 160 to 190 pound-inches. Tighten 5/16-inch nut 100 to 140 pound-inches.
(8) Remove outboard flap rigging tool and install plug screws if required (Fig. 501).

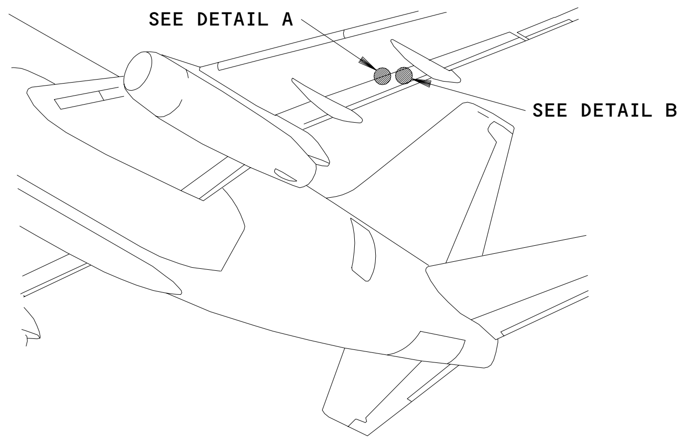
CAUTION: SHIM THICKNESS ADJUSTMENT BETWEEN MIDFLAP CARRIAGE BEARING SUPPORT AND MIDFLAP FORGING CHANGES PRELOAD CUP ADJUSTMENT. INCORRECT ADJUSTMENT COULD CAUSE DAMAGE TO PRELOAD CUP.

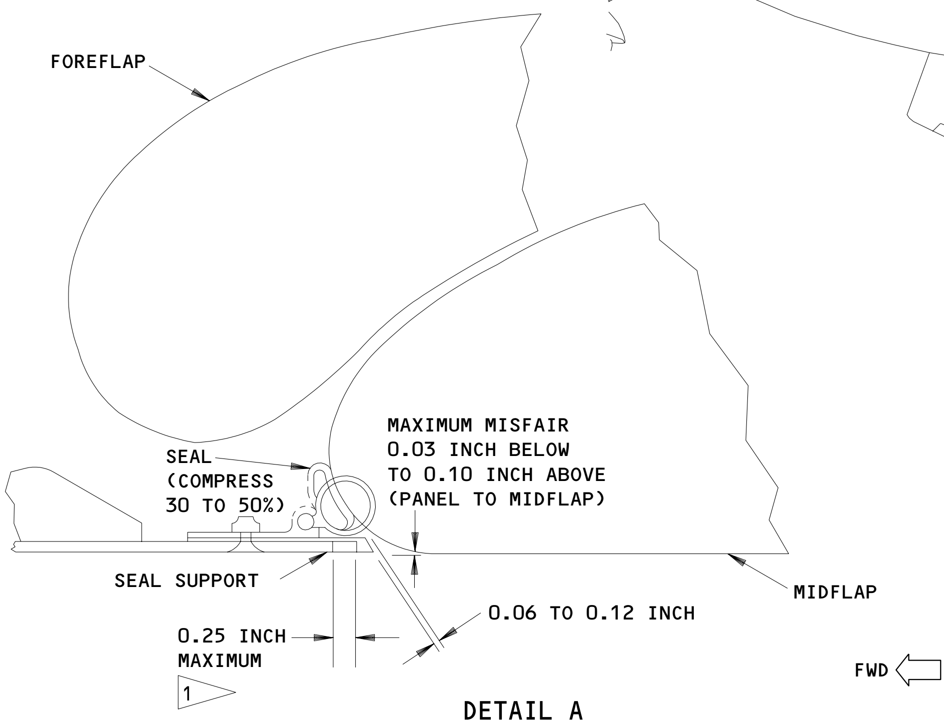
NOTE: Shim or tapered filler thickness between leaf spring and midflap should be changed when shim thickness between carriage bearing support and midflap is changed (i.e., remove same shim thickness above leaf spring as was added under carriage bearing support).

(9) If shim thickness between carriage bearing support and midflap has been changed, re-adjust leaf spring deflection as required per step 1.C.(17).
(10) Provide system A hydraulic power (Ref 27-51-0).
(11) Position flap control lever to FLAP DOWN (40-unit) detent to lower flaps, then to FLAP UP detent to retract flaps to normal up position. The ballscrew nut upstop must stop in the range of 170 to 190 degrees (1/2 turn ±10 degrees) turns from contact at FLAP UP position. Check dimension X (Fig. 504).

CAUTION: THE MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURNS IF LATERAL TRIM CORRECTION HAS BEEN MADE. A VALUE FOR (X) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

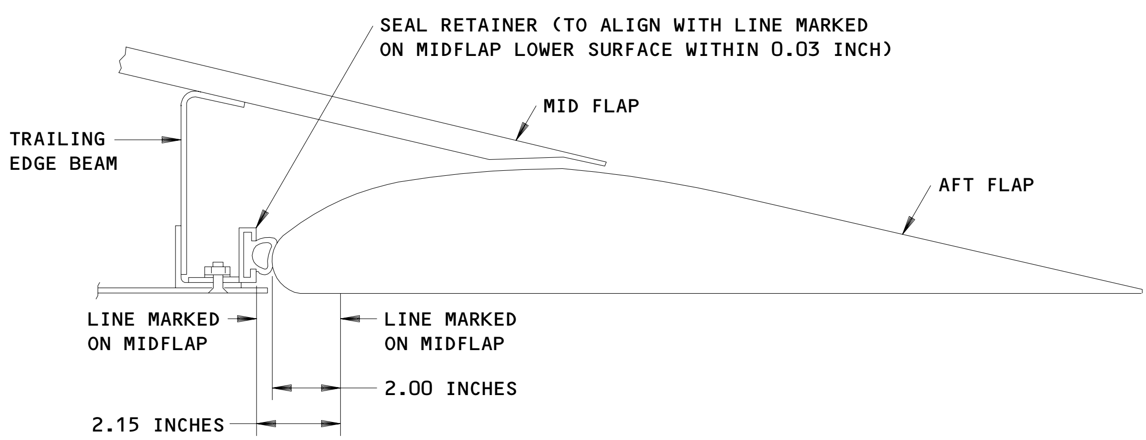
(12) Position flap control lever to 40-unit detent to extend flaps.
  (a) Check that ballscrew nut downstop is not less than 1/4 turn from contact.
  (b) Check that opposite midflaps are symmetrical within 1 degree. Measure along lower surface of midflap at outboard flap track using protractor.
(13) If ballscrew upstop clearance or midflap symmetry in steps (10) and (11) are not within limits proceed as follows:
  (a) Depressurize hydraulic system A (Ref 27-51-0).





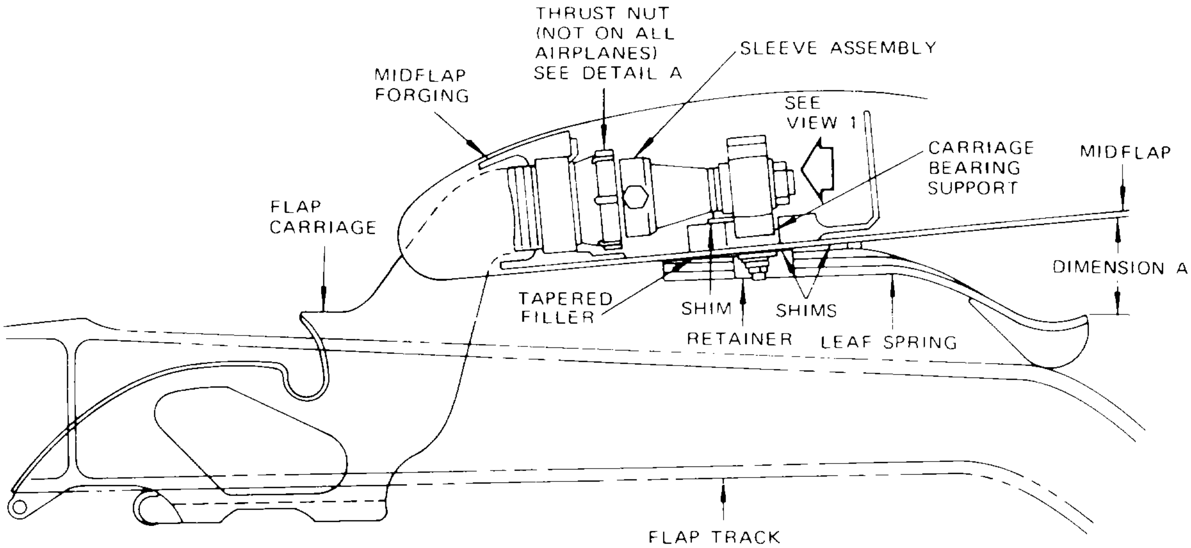
DETAIL A

1 FILL GAP WITH AERODYNAMIC SMOOTHER

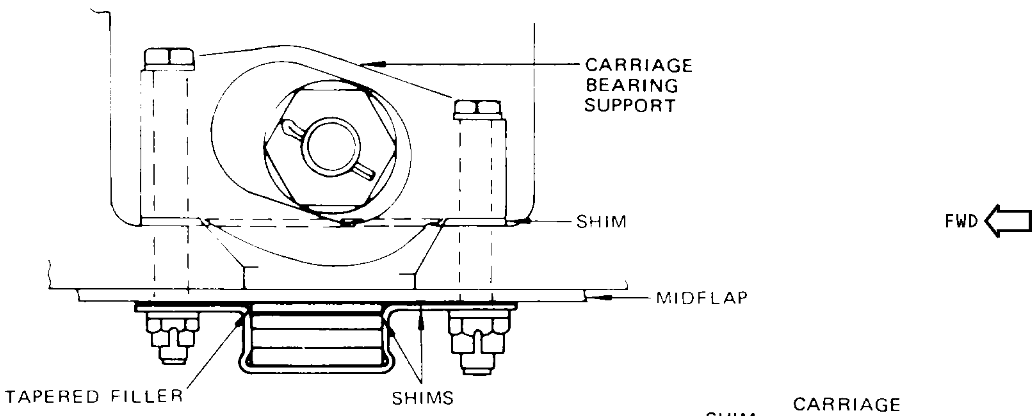


DETAIL B

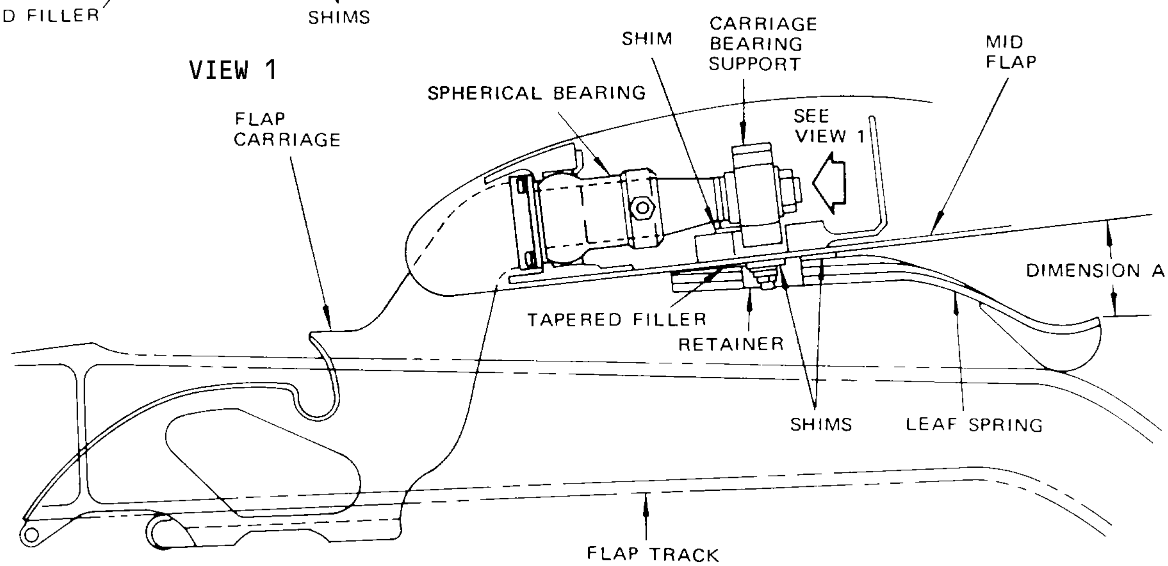
Flap Gap and Misfair Requirements
Figure 502



AIRPLANES WITH THRUST NUT

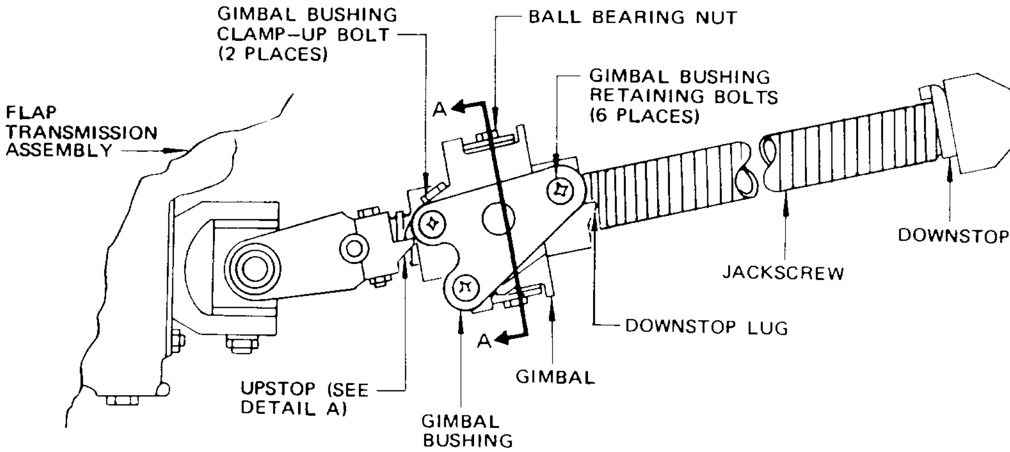


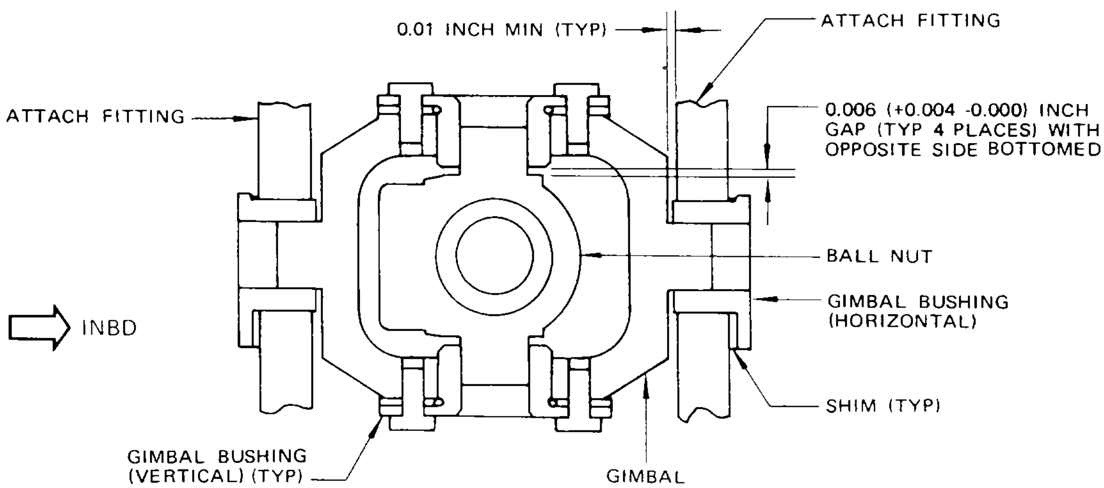
VIEW 1



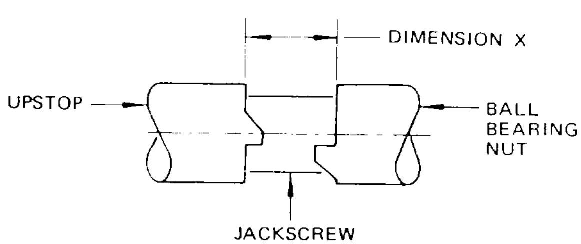
AIRPLANES WITH SPHERICAL BEARING

Outboard Trailing Edge Flap Positioning
Figure 503





SECTION A-A



DETAIL A

Flap Transmission Assembly Adjustment
Figure 504

(b) Disconnect torque tubes from transmission assemblies and rotate transmissions as required to obtain adjustment.
(c) Connect torque tubes to transmission assemblies. Lockwire heads of torque tube screws together.
(d) Provide system A hydraulic power (Ref 27-51-0).
(e) Recheck ballscrew upstop clearance and midflap symmetry per steps (10) and (11).

(14) At outboard end of midflap, ensure that outboard face of roller and outboard edge of ramp are flush within 0.05 inch (View 1, Fig. 501). If they are not flush, remove ramp and adjust shim thickness as required (0.15 inch maximum shim). Adjust for 0.005- to 0.040-inch clearance between roller and ramp.

(15) At the inboard end of the midflap, make sure there is clearance between the deflection roller and the upper and the lower surfaces of the fairing pocket (View 2, Fig. 501).
(a) Adjust the deflection roller if it touches the fairing pocket:
1) Extend the trailing edge flaps.
2) Loosen the nuts that attach the deflection roller and the serrated plate to the roller shaft.
3) Move the deflection roller up or down as necessary for clearance.
4) Tighten the nuts.
5) Retract the flaps and check for clearance.

(16) Adjust outboard flap track fairing (Ref 27-51-121 A/T).

(17) Set flap control lever in FLAP UP detent to retract flaps to normal up position. Check misfair between wing lower trailing edge panel and lower surface of midflap is per Fig. 502. If misfair exceeds limits, adjust trailing edge panel tie rods, and lower panel angle support at inboard end of flap, to reduce misfair to as near zero as possible.

(18) With flaps in full up position, adjust seal retainer to compress seals per Fig. 502. Check clearance of seal support (on wing lower trailing edge panel) with respect to leading edge of midflap is per Fig. 502. If adjustment is necessary, loosen seal support retaining screws, position seal support to obtain clearance, and tighten retaining screws. Fill gap between skin and seal support with aerodynamic smoother.

(19) Measure the deflection of the leaf springs on the outboard flap (Fig. 503).
(a) Measure the dimension A.
(b) Move the flap control lever to the 40-unit detent to extend the flaps.
(c) Measure the dimension A again.
(d) Make sure the dimension A in the retracted position is 0.42 to 0.82 inch less than the dimension A in the extended position.

(e) If the change in the dimension A is not in the tolerance, adjust the leaf springs:
1) Remove the access panels from the top surface of the midflap.
2) Remove the fasteners that attach the leaf spring.
3) Change or move the tapered fillers until the deflection is in the tolerance.

NOTE: You can install the tapered fillers independently or at each track location. You can put the thick end forward or aft. It is not necessary for the thick end of the tapered fillers to be in the same location.

4) Attach the leaf spring with the bolt at the forward attach point.
5) Attach the retainer and the radius filler:
a) Install the shims between the retainer and the midflap to keep a 0.005 to 0.015-inch clearance between the leaf spring and the retainer.

NOTE: If you change the shims below the carriage bearing support, change the thickness of the shims at the leaf springs (i.e., if you add a 0.01 inch shim below the carriage bearing support, remove a 0.01 inch shim below the leaf spring retainer).

b) Install the four washers and nuts.
c) Tighten the 1/4-inch nuts to 50-70 pound-inches.
d) Tighten the 5/16-inch nuts to 100-140 pound-inches.
e) Install the cotter pins in the nuts.
6) Install the access panels.

(20) Adjust flap jackscrew preload cup (Fig. 505).
(a) If installed, remove aft fairing.
(b) Remove flap jackscrew preload cup from aftflap.
(c) With flaps retracted, measure dimension B. If dimension B is within limits, proceed to step (d) if not, adjust shims in gimbal as follows:
1) Position flap control lever to FLAP DOWN detent.

2) Support flap so that weight of flap is not on trunnions. Loosen gimbal bushing clamp-up bolts. Remove gimbal bushing retaining bolts and slightly withdraw horizontal bushings to free shims. Adjust shim laminations to attain dimension B (Section A-A, Fig. 504).

NOTE: A 0.003-inch shim lamination will change dimension B 0.0167 inch. Transfer shim equally to maintain 0.006- to 0.010-inch clearance between bushings and gimbal. Also clearance between inner faces of midflap gimbal attach fitting and gimbal shall be 0.01 inch minimum.

3) Install gimbal bushing retaining bolts, and tighten gimbal bushing clamp-up bolts to 60-85 pound-inches.

(d) With flaps extended, check that jackscrew end fitting has 0.03-inch minimum vertical clearance with fitting on midflap. If clearance is not adequate, adjust ball nut shims as follows:

1) Support flap so that weight of flap is not on trunnions. Remove ball nut bushing retaining bolts and slightly withdraw vertical bushings to free shims. Adjust shims laminations to attain clearance.

NOTE: Transfer shims equally to maintain 0.006 to 0.010 inch between bushings and ball nut.

2) Install ball nut bushing retaining bolts in gimbal.

(e) Position flap control lever to FLAP UP detent to retract flaps.

(f) During retraction check that flap jackscrew clears all linkage and structure.

(g) With flaps retracted place up load on aftflap and measure dimension A.

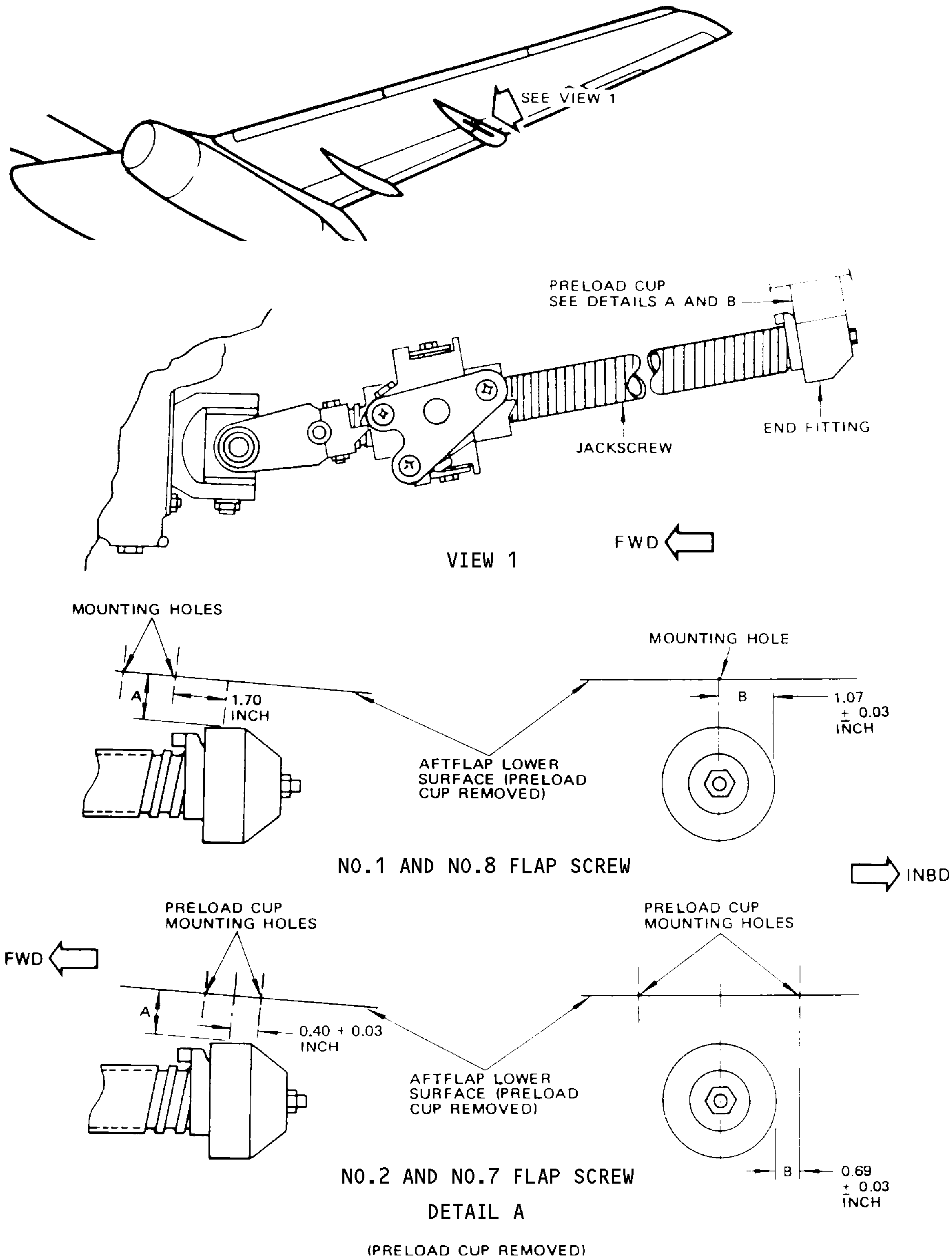
(h) Position flap control lever to 1-unit position to partially extend flaps.

(i) Install flap jackscrew preload pad and shim so that dimension C is as specified in Detail B, Fig. 505.

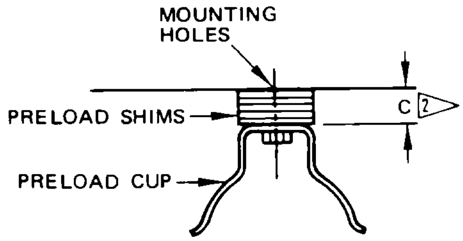
NOTE: If dimension C is greater than specified when no shims are installed, dimension A may be increased, as required, per step (d).

(j) Position flap control lever to FLAP UP detent.

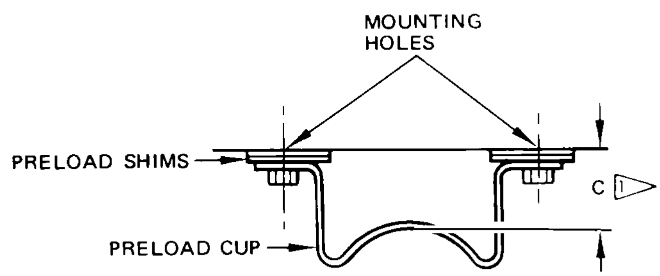
(k) Check that flap jackscrew end fitting enters preload pad slightly before flap full up position and seats firmly against preload pad when flap is retracted.



Flap Jackscrew Preload Cut Adjustment
Figure 505 (Sheet 1)



NO.1 AND NO.8 FLAP SCREW
PRELOAD CUP



NO.2 AND NO.7 FLAP SCREW
PRELOAD CUP

1 DIMENSION C MUST EQUAL DIMENSION A PLUS 0.04 TO 0.08 INCH (SEE DETAIL A FOR MEASUREMENT OF DIMENSION A)

2 DIMENSION C MUST EQUAL DIMENSION A MINUS 0.52 TO 0.56 INCH

INBD

DETAIL B

Flap Jackscrew Preload Cut Adjustment
Figure 505 (Sheet 2)

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(l) Position aft fairing on center fairing and install attaching screws.
(m) Check aftflap operates smoothly with no binding or structural interference.

(21) With flap in normal retracted position, measure and record dimension X from ball bearing nut to upstop on jackscrew for inboard transmission assembly of outboard flap. This dimension will be called X1.
(22) Provide system A hydraulic power (Ref 27-51-0).
(23) Position flap control lever to FLAP DOWN (40-unit) detent.
(24) Two minutes after flaps are extended, measure dimension X2 from ball bearing nut to upstop on jackscrew on inboard transmission assembly. Check that dimension X2-X1 is 21.48 to 21.95 inches and that jackscrew and ball bearing nut do not contact. If X2-X1 is not within limits, adjust ballscrew (Ref 27-51-01 A/T).
(25) Check seal at leading edge of aftflap. When fully retracted, aftflap leading edge shall be 0.15 ±0.03 inch aft of seal retainer. Determine position and adjust as follows:
(a) With aftflap extended mark a line on lower surface of aftflap 2.00 inches aft of leading edge.
(b) Retract aftflap then mark a line on lower surface of midflap 2.15 inches forward of line marked in step (a).
(c) With aftflap extended check that aft face of seal retainer vertically aligns with line marked in step (b).
(d) If seal retainer does not align , loosen screws and adjust to obtain correct position. Tighten screws when adjustment is obtained.

(26) With flap fully extended, check that clearance between aftflap trailing edge and track fairing cone is 0.25 inch minimum.
(27) Check that A frame clears flap track and carriage stop by 0.08 inch minimum with flaps raised against flight rollers between flap setting detents 2 thru 10.
(28) Position flap control lever to FLAP UP detent.
(29) Remove system A hydraulic power (Ref 27-51-0).
(30) Check that gap between midflap trailing edge and hinge flap is 0.01 inch minimum.
(31) Check that gap between outboard end of aftflap and wing rib is 0.50 ±0.25 inch.
(32) Check that minimum gap between trailing edge of foreflap and top of midflap is per Section A-A, Fig. 501. If gap is not within limits, defective foreflap or (midflap) is indicated.
(33) Check that gap between upper wing panel fixed trailing edge and midflap upper surface is per Section A-A, Fig. 501.
(34) Check that gap between hinged flap and nacelle fairing is 0.90 to 1.25 inch.

(35) Check that gap between ground spoiler actuator and top of foreflap is 0.12 inch minimum.

(36) Apply sealant to carriage access panel and midflap faying surface and install access panels on upper surface of midflap.

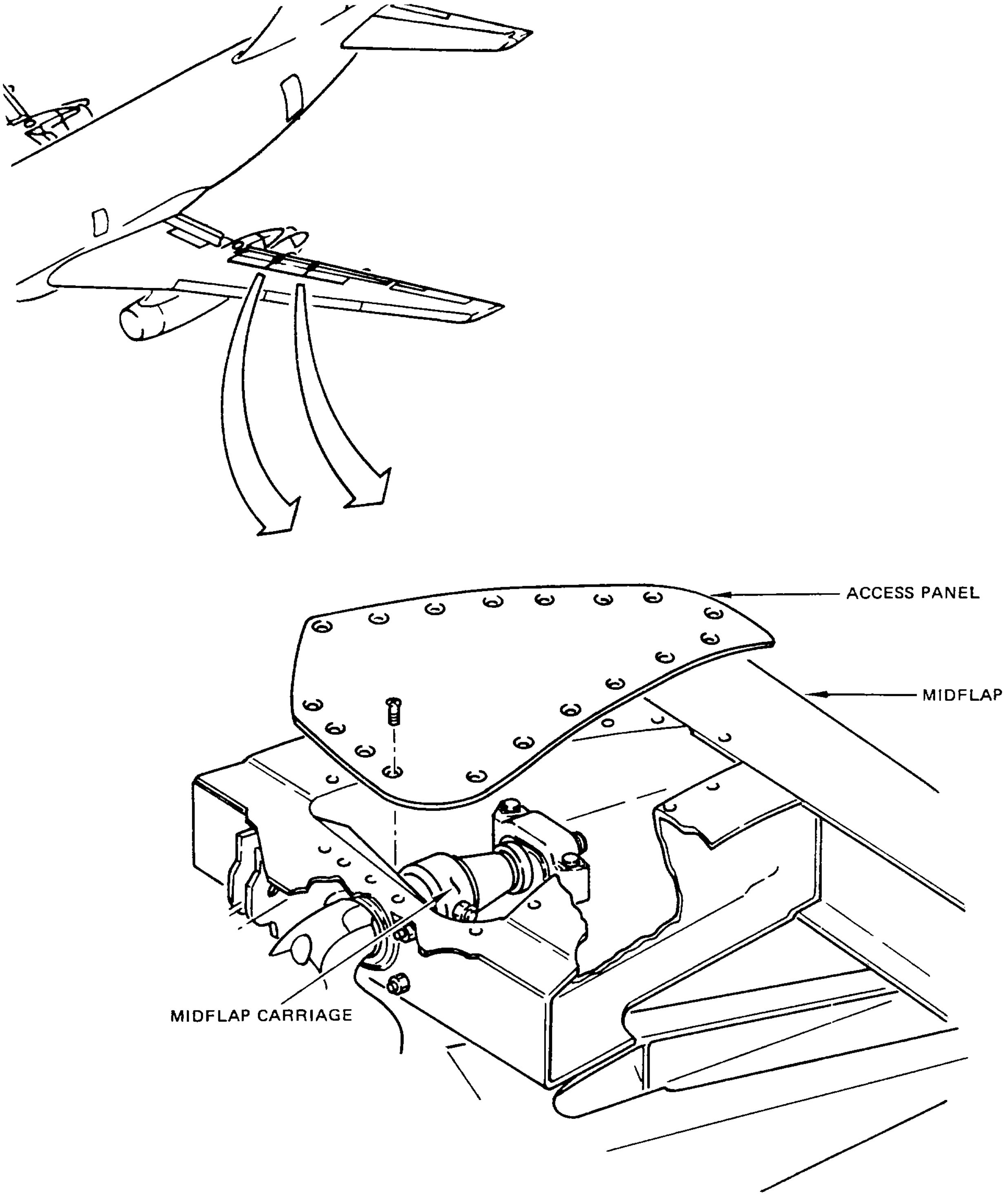
(37) Install all remaining access panels.

OUTBOARD TRAILING EDGE FLAP - INSPECTION/CHECK

1. General
   A. The following provides a method of checking midflap carriage thrust bearing wear without flap removal.
2. Prepare for Inspection
   A. Pressurize hydraulic system A (Ref 27-51-0, Maintenance Practices).
   B. Extend flaps fully.
   C. Depressurize hydraulic system A (Ref 27-51-0).
   D. Remove access panels on upper surface of midflap (Fig. 601).
3. Inspect Midflap Carriage Thrust Bearing (Fig. 601)
   A. Manually move the midflap carriage in fore and aft direction and measure axial movement of carriage relative to midflap.

      NOTE: All relative movement must take place at bearing. Ensure that midflap is stationary during measurement.

   B. If movement exceeds 0.005 inch, replace midflap carriage or on airplanes with spherical bearing, replace spherical bearing (Ref 27-51-81, Removal/Installation).
   C. Replace access panel.
      (1) Apply BMS 5-79 faying surface sealant between access panel and midflap.
      (2) Secure access panels with fasteners.



Outboard Trailing Edge Flap Inspection
Figure 601

FLAP DRIVESCREW - REMOVAL/INSTALLATION

1. General
   A. This procedure gives instructions for the removal and installation of one drivescrew from each TE flap at one time.
2. Flap Drivescrew Removal
   A. Special Tools and Equipment
      (1) C27001-10 or -16, Ground Lock Set (for spoilers 1 and 8)
      (2) F800040-( ), Ground Lock Assy (for spoilers 4 and 5)

         NOTE: F80040-15 is used on airplanes having ground roll spoilers with single actuators. F80040-2 is used on airplanes having ground roll spoilers with double actuators.

      (3) F80017-33 (Preferred), F80017-23 (Optional), Ground Lock Assy (for spoilers 2, 3, 6, and 7 with chamfered spoiler clevis)
      (4) C27047-16, Ground Lock Set (for spoilers 2, 3, 6, and 7 with rounded spoiler clevis)
   B. References
      (1) AMM 27-51-0/201, Trailing Edge Flaps
   C. Access
      (1) Location Zones

101,102	Control Cabin - Left, Right
307,407	Wing Trailing Edge Outboard Flap and Spoiler
309,409	Wing Trailing Edge Inboard Flap and Spoiler

      (2) Access Panels

5735,5835	Forward Access Panel, Inbd Flap Outbd Track Fairing
5736,5836	Aft Access Panel, Inbd Flap Outbd Track Fairing

   D. Prepare for Drivescrew Removal
      (1) Do these steps to fully retract the trailing edge flaps:

         WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

         (a) Supply system B hydraulic power (AMM 27-51-0/201).

            WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF THE LE AND TE FLAPS AND FLAP DRIVE MECHANISMS BEFORE YOU MOVE THE FLAP CONTROL HANDLE. AN ACCIDENTAL FLAP MOVEMENT CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

         (b) Set the FLAP control lever to the FLAP UP detent to retract the flaps.

(c) Make sure that the flaps are fully retracted.
(d) Remove system B hydraulic power (AMM 27-51-0/201).

(2) Remove the applicable access panels as specified below:
(a) For drivescrews of the outboard flap transmissions, remove the access panel on the lower side of the movable fairing.
(b) For the drivescrew of the No. 3 transmission, remove access panels 5735 and 5736.
(c) For the drivescrew of the No. 6 transmission, remove access panels 5835 and 5836.
(d) Get access to the drivescrews of the No. 4 and 5 transmissions.
1) Remove the applicable access panel from the wheel well, to permit access to the drivescrew from the inboard side.

(3) Measure the angular or linear clearance between the ballnut and the screw yoke at the ballscrew to be removed:
(a) Measure the angular clearance between the upstops on the ballnut and the screw yoke:
1) At the drivescrews of the inboard flaps, make sure that the angular clearance is 170 to 190 degrees (approximately 1/2 turn).
2) At the drivescrews of the outboard flaps, make sure that the angular clearance is as shown:
a) 170 to 190 degrees (approximately 1/2 turn) for a flap without a torque tube adjustment to correct lateral trim.
b) 90 to 300 degrees (1/4 to 5/6 turn) for a flap with a torque tube adjustment to correct lateral trim.
3) Make a record of the angular clearance dimension.
(b) Measure the linear clearance.
1) Measure the "X" dimension (Fig. 401) at the drivescrew to be removed.
2) Make a record of the "X" dimension.

<u>WARNING</u>: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(4) Supply system B hydraulic power (AMM 27-51-0/201).

(5) For the removal of a drivescrew at the outboard flap transmissions, do these steps:
(a) Move the FLAP control lever on the control stand to the 40-unit detent.

(b) Install a support to hold the flap when a drivescrew is removed.

(6) For the removal of a drivescrew at the inboard flap transmissions, move the FLAP control lever to the 1-unit detent.

(7) Do this task: "Lock Trailing Edge Flap Bypass Valve" (AMM 27-51-0/201).

(8) If the drivescrew removal is at the No. 1, 2, 3, 6, 7, or 8 locations, install spoiler ground locks.

(a) Supply system A hydraulic power (AMM 27-51-0/201).

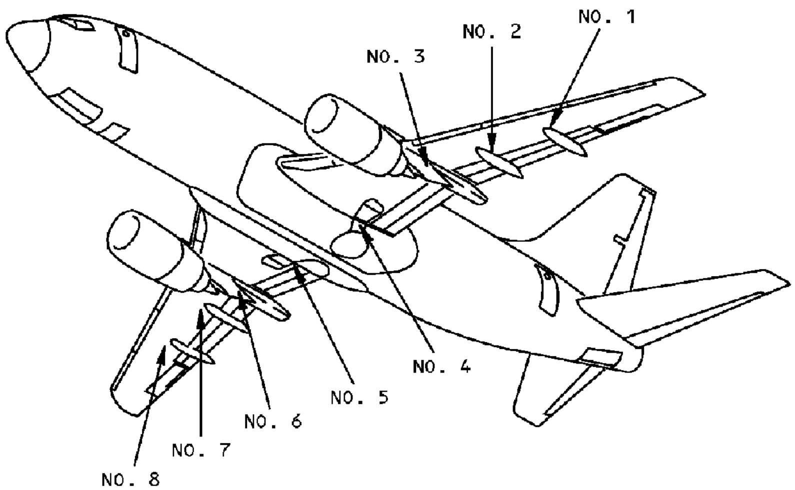
(b) Move the SPEED BRAKE lever on the control stand to the UP detent.

(c) Remove systems A and B hydraulic power after all spoilers are in the extended position (AMM 27-51-0/201).

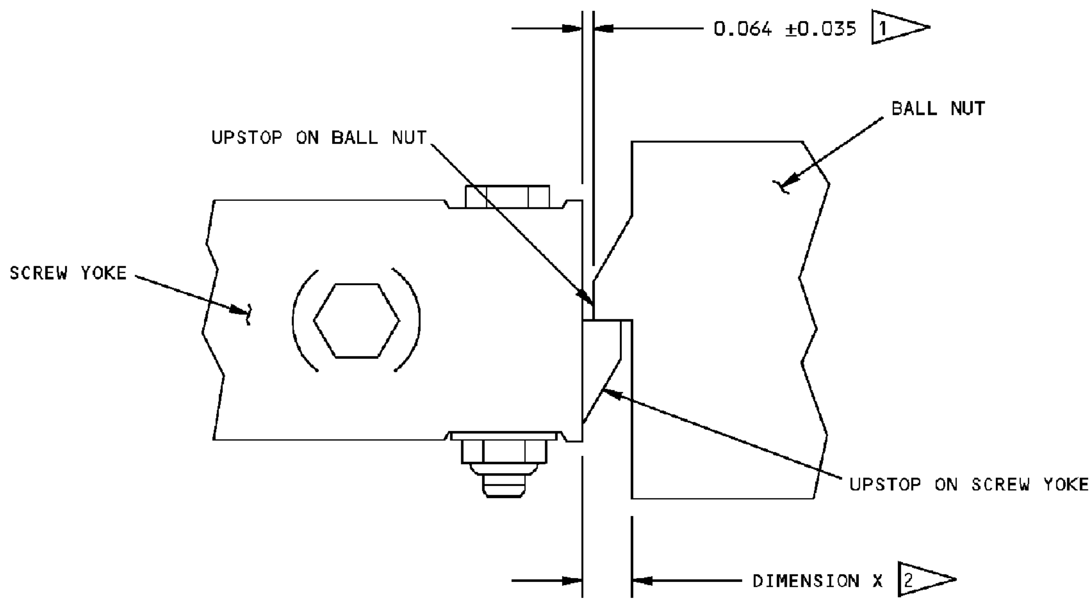
(d) Install spoiler ground locks as follows:

DRIVESCREW TO BE REMOVED	TOOL NO.	SPOILER NO.
1	C27001-( )	1
2	*[1] F80017-( ) *[2] C27047-( )	2 and 3
3	*[1] F80017-( ) *[2] C27047-( )	3
	F80040-( )	4
6	F80040-( )	5
	*[1] F80017-( ) *[2] C27047-( )	6
7	*[1] F80017-( ) *[2] C27047-( )	6 and 7
8	C27001-( )	8

*[1] Airplanes with chamfered clevis
*[2] Airplanes with rounded clevis



TRANSMISSION LOCATIONS



DEFINITION OF DIMENSION X

1 THIS DIMENSION IS BETWEEN THE FACE OF THE SCREW YOKE AND THE FORWARD END OF THE UPSTOP ON THE BALL NUT. THIS DIMENSION IS SEEN ONLY WHEN:
1. THE SCREW IS CORRECTLY ATTACHED TO THE SCREW YOKE
2. THE UPSTOPS ON THE BALL NUT AND SCREW YOKE ARE IN CONTACT

2 THIS DIMENSION IS BETWEEN THE FACE OF THE SCREW YOKE AND THE FACE OF THE BALL NUT, WITH THE BALL NUT AT ANY LOCATION ON THE SCREW

Transmission Locations and Definition of Dimension X
Figure 401

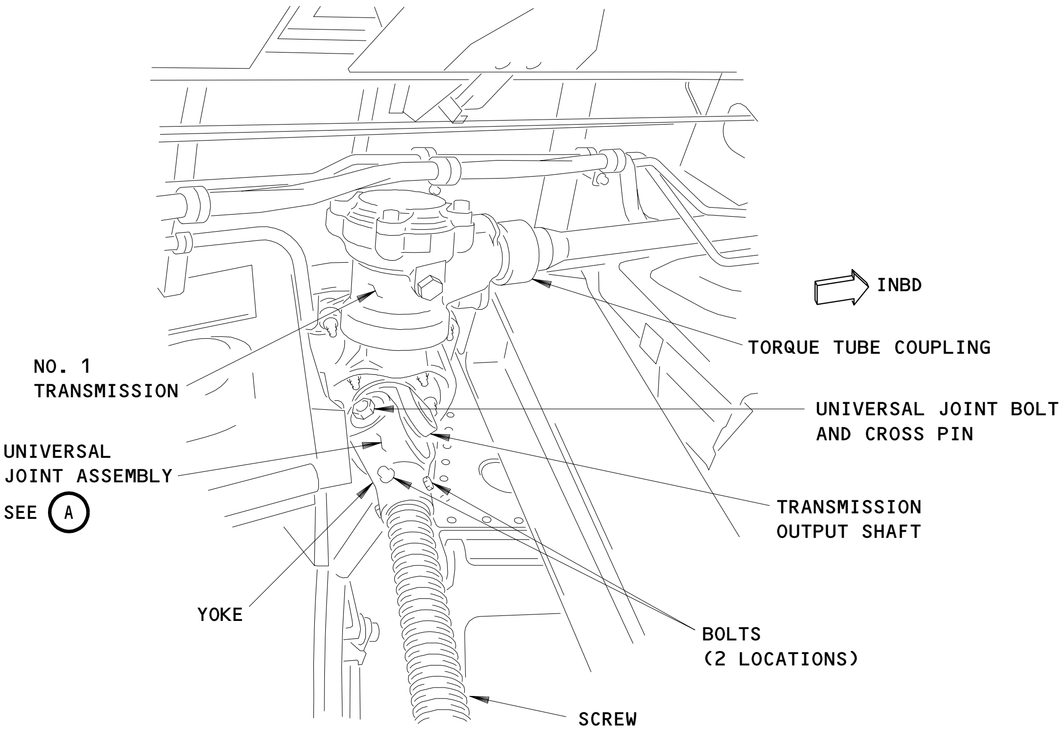
(9) At the drivescrew to be removed, do these steps (which will help with the installation task):
  (a) Measure and write down the "X" dimension.
    1) Make a note of the position of the upstop on the screw yoke in relation to the transmission output shaft.
  (b) If the drivescrew removal is at the outboard transmissions, make a note of the position of the lubrication reservoir on the ballnut.

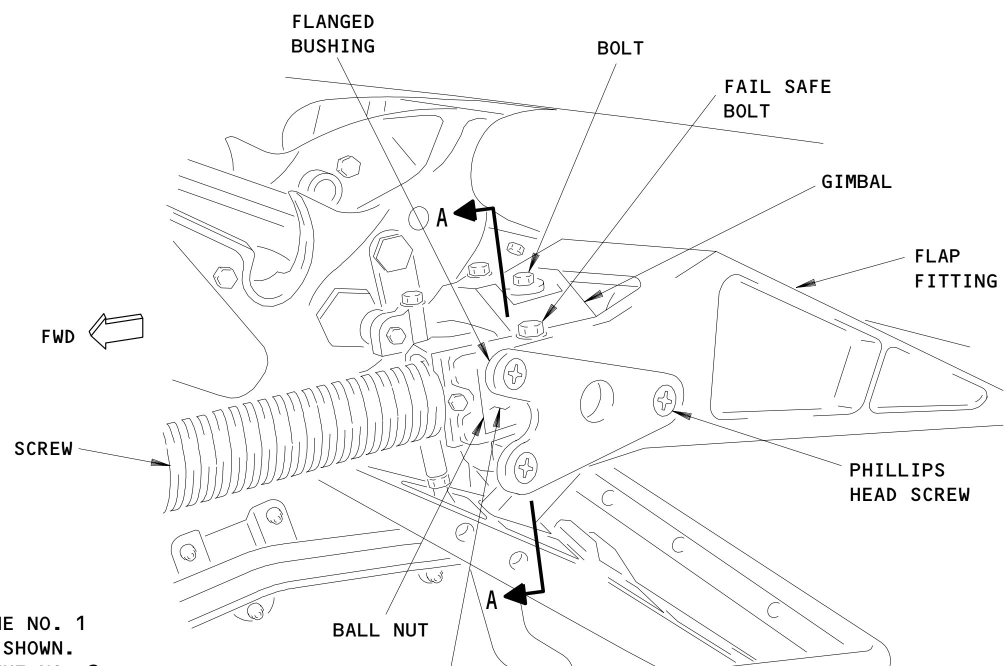
  NOTE: The lubrication reservoir can be inboard or outboard. The same position must be kept after installation.

E. Remove the Drivescrew of an Outboard Flap Transmission (Fig. 402).
  (1) Disconnect the gimbal from the fitting on the midflap (Fig. 402).
    (a) On each side of the fitting on the midflap, remove the failsafe bolts.
    (b) On each side of the gimbal, remove the three fasteners, and the flanged bushings with the adjacent shims.
    (c) Make a record of the shim thickness.

    NOTE: Always keep shims with the flanged bushing that they were initially installed with. This is necessary to keep initial lateral position adjustment of the drivescrew.

  (2) Disassemble the universal joint (Fig. 402).
  (3) AIRPLANES PRE-SB 27-1265;
  Remove the universal joint bolt, nut, and spacer.
  (4) AIRPLANES POST-SB 27-1265;
  Remove the universal joint bolt, nut, cotter pin, washers, shim and spacer.
    (a) Move the screw yoke apart from the transmission output shaft and remove the trunnion cross.
  (5) Remove the drivescrew, with the screw yoke and the gimbal, from the airplane.





NOTE: DRIVESCREW OF THE NO. 1 TRANSMISSION IS SHOWN. DRIVESCREWS OF THE NO. 2, NO. 7, AND NO. 8 TRANSMISSIONS ARE ALMOST THE SAME.

Drivescrew of the Outboard Flap Transmission
Figure 402 (Sheet 1)

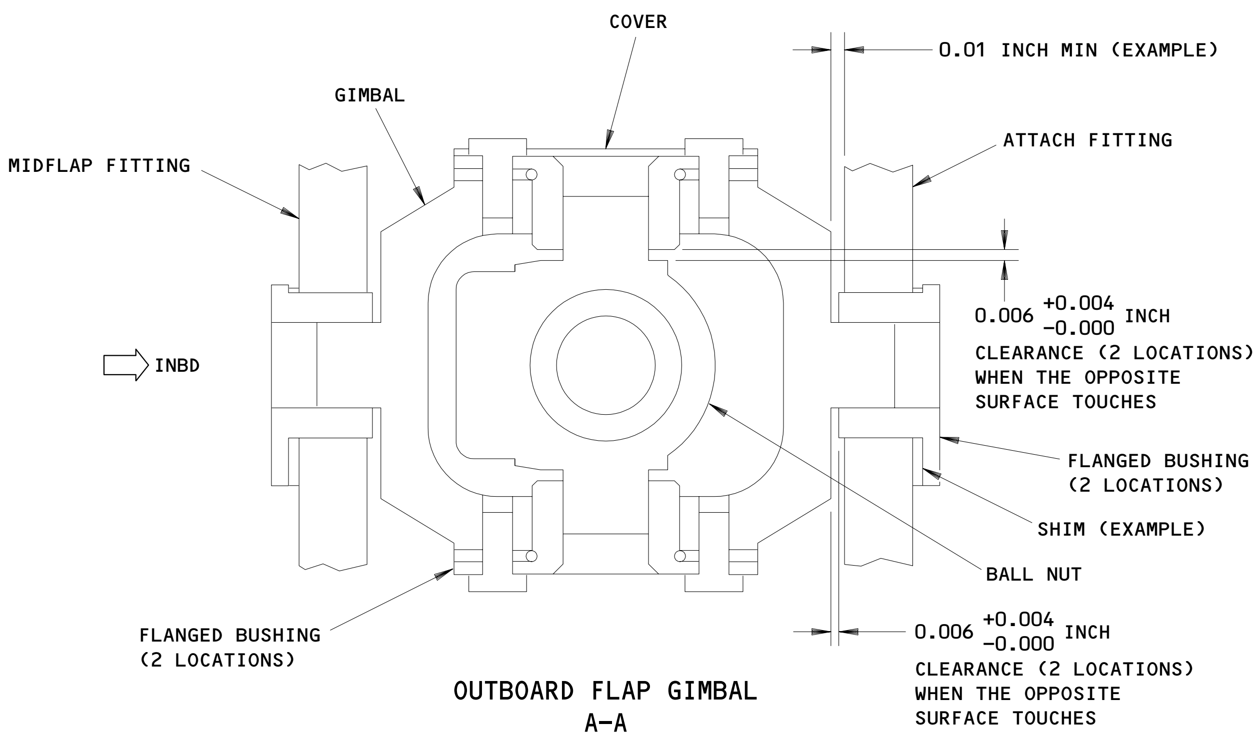
(6) Remove the gimbal from the ballnut.
 (a) On the bottom side of the gimbal, remove the two bolts, the flanged bushing and shims.
 (b) Make a record of the shim thickness.
 (c) On the top side of the gimbal, remove the two bolts, the flanged bushing, the cover, and shims.
 (d) Make a record of the shim thickness.
 (e) Remove the gimbal from the ballnut.
(7) Remove the end fitting from the end of the drivescrew.
(8) Remove the bolts that attach the screw to the screw yoke.
(9) Remove the screw yoke from the screw.

F. Remove the Drivescrew of an Inboard Flap Transmission (Fig. 403)
(1) Disconnect the ballnut from the gimbal at the midflap.
 (a) On the lower side of the gimbal, remove the two bolts and the bushing.
 (b) On the top side of the gimbal, remove the two bolts and the bushing.
 (c) Hold the ballnut and screw to make sure they are not damaged or do not cause damage to parts during the removal.
(2) Disassemble the universal joint (Fig. 402).
(3) AIRPLANES PRE-SB 27-1265;
Remove the universal joint bolt, nut, and spacer.
(4) AIRPLANES POST-SB 27-1265;
Remove the universal joint bolt, nut, cotter pin, washers, shim and spacer.
 (a) Move the screw yoke apart from the transmission output shaft and remove the trunnion cross.
(5) Remove the drivescrew with the screw yoke from the airplane.
(6) Remove the end fitting from the end of the screw.
(7) Remove the bolts that attach the screw to the screw yoke.
(8) Remove the screw yoke from the screw.

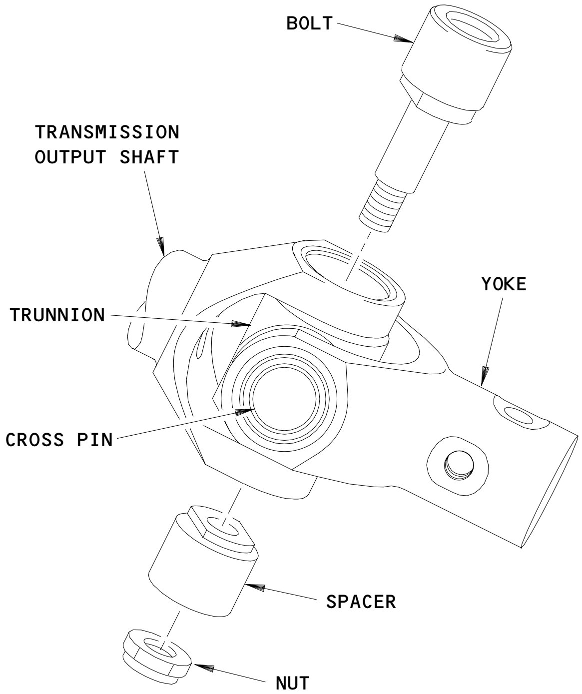
3. <u>Flap Ballscrew Installation</u>

A. Equipment
(1) C27001-10 or -16, Ground Lock Set (for spoilers 1 and 8)
(2) F800040-( ), Ground Lock Assy (for spoilers 4 and 5)

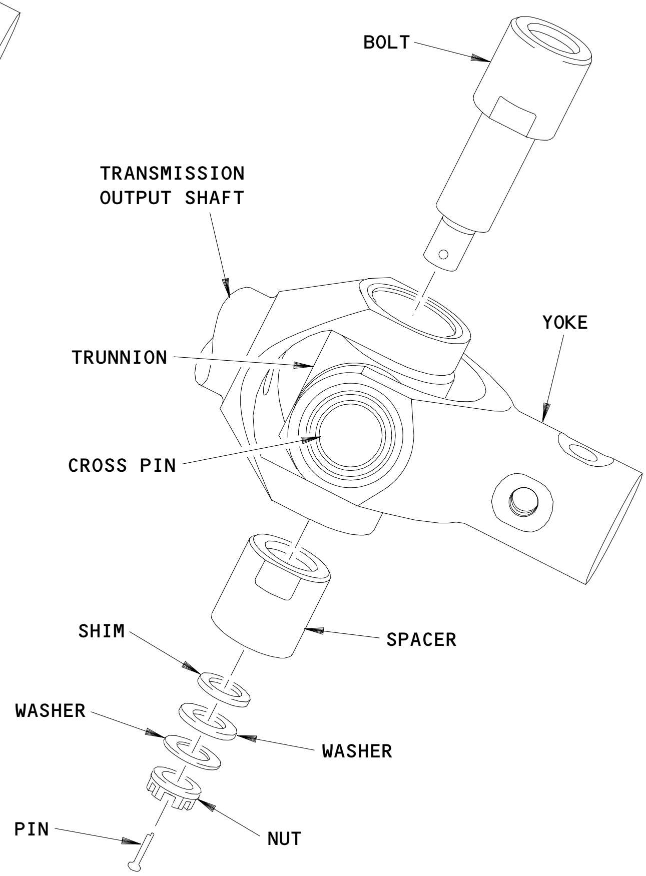
<u>NOTE</u>: F80040-15 is used on airplanes having ground roll spoilers with single actuators. F80040-2 is used on airplanes having ground roll spoilers with double actuators.



Drivescrew of the Outboard Flap Transmission
Figure 402 (Sheet 2)



UNIVERSAL JOINT ASSEMBLY
(AIRPLANES PRE-SB 27-1265)
A



UNIVERSAL JOINT ASSEMBLY
(AIRPLANES POST-SB 27-1265)
A

Drivescrew of the Outboard Flap Transmission
Figure 402 (Sheet 3)

(3) F80017-33 (Preferred), F80017-23 (Optional), Ground Lock Assy (for spoilers 2, 3, 6, and 7 with chamfered spoiler clevis)
(4) C27047-16, Ground Lock Set (for spoilers 2, 3, 6, and 7 with rounded spoiler clevis)

B. Consumable Materials
(1) Sealant - BMS 5-95
(2) Grease - BMS 3-33 (Preferred)
(3) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
(4) Corrosion Preventive Compound - MIL-C-11796, Class 3
(5) Lubricating Oil - General Purpose MIL-L-7870

C. References
(1) AMM 12-22-51/201, Trailing Edge Flap System Lubrication
(2) AMM 24-22-0/201, Manual Control
(3) AMM 27-51-0/201, Trailing Edge Flap System
(4) AMM 27-51-73/601, Flap Ballscrew

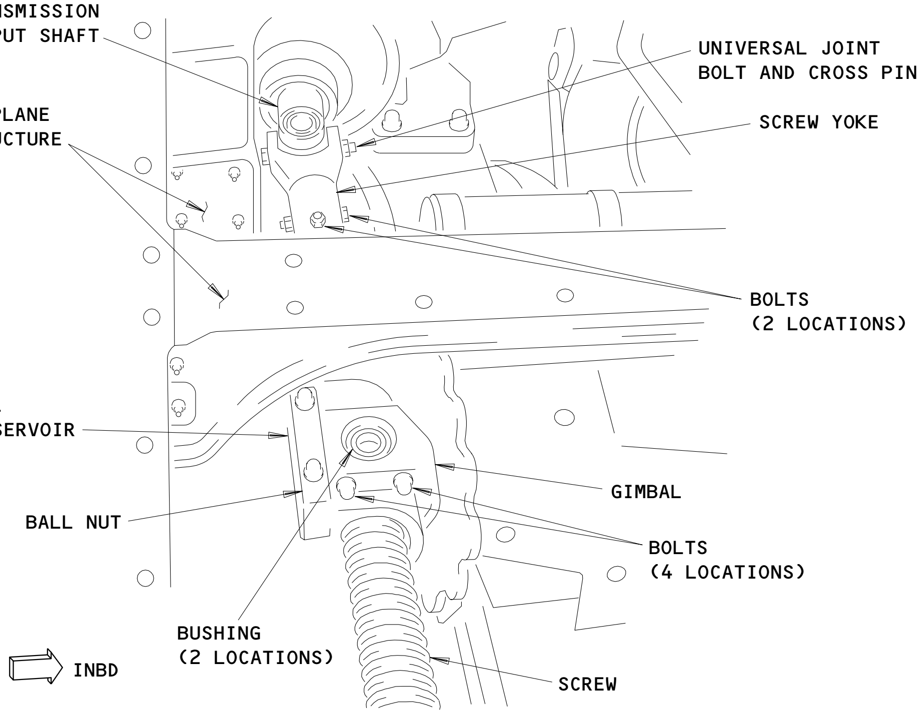
D. Access
(1) Location Zones

101,102	Control Cabin - Left, Right
307,407	Wing Trailing Edge Outboard Flap and Spoiler
309,409	Wing Trailing Edge Inboard Flap and Spoiler

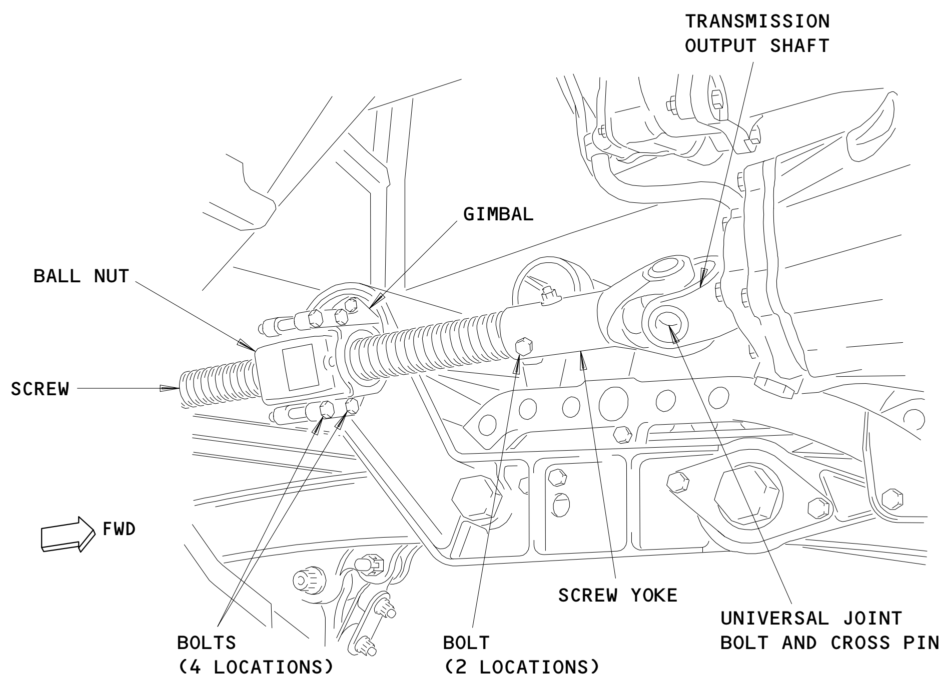
(2) Access Panels

5735,5835	Forward Access Panel, Inbd Flap Outbd Track Fairing
5736,5836	Aft Access Panel, Inbd Flap Outbd Track Fairing

E. Prepare for the Installation of the Drivescrew
(1) If the bushings used to attach the ballnut are not new, do a check of the worn areas of these bushings (AMM 27-51-73/601).
(2) Install the end fitting on the end of the drivescrew.
(3) Apply a layer of BMS 5-95 to the threads of the stud at the end of the drivescrew.
(4) Install the nut on the stud at the end of the drivescrew.
(5) Find the correct position of the screw yoke in relation to the screw:
(a) Move the ballnut near the forward end of the screw (the end opposite the end fitting).



DRIVESCREW OF THE NO. 3 TRANSMISSION 1



1 DRIVESCREW OF THE NO. 6 TRANSMISSION IS ALMOST THE SAME

2 DRIVESCREW OF THE NO. 5 TRANSMISSION IS ALMOST THE SAME

DRIVESCREW OF THE NO. 4 TRANSMISSION 2

Drivescrews of the Inboard Flap Transmissions
Figure 403

(b) Assemble the screw yoke with the drivescrew.

NOTE: At this time, do not install the fasteners that attach the screw to the screw yoke.

(c) Move the ballnut to make sure the upstops on the ballnut and the screw yoke touch.
(d) Turn the ballnut and the screw yoke together until the conditions are as follows:
1) There is .064 ±.035 inch of clearance between the face of the screw yoke and the upstop on the ballnut (Fig. 401).
2) The fastener holes in the screw yoke and the screw align.
(e) On the forward end of the screw, make a mark of the position of the upstop on the screw yoke.
(6) Remove the screw yoke from the screw.
(7) Move the ballnut away from the forward end of the screw.
(8) Clean the screw yoke to prepare it for the sealant and the assembly with the screw.
(9) Apply BMS 5-95 sealant to the mating surfaces of the screw yoke and the screw.
(10) Do these steps to complete the assembly of the screw with the screw yoke:

CAUTION: MAKE SURE THAT THE SCREW YOKE IS CORRECTLY INSTALLED ON THE DRIVESCREW. IF THE SCREW YOKE IS NOT CORRECTLY INSTALLED, THE MECHANICAL STOPS ON THE BALLNUT AND SCREW YOKE WILL NOT OPERATE CORRECTLY.

(a) Turn the screw yoke to align the upstop on the screw yoke with the mark on the screw end.
(b) Align the fastener holes in the screw yoke and the screw.
(c) Install the two sets of fasteners that attach the drivescrew to the screw yoke.
1) Apply a layer of BMS 5-95 sealant to the threads and shanks of the two bolts.

2) Install the bolts in the holes.
3) Install a washer and nut on each bolt.
4) Tighten the nut on each bolt to 60-85 pound-inches.

F. Install the Drivescrew of an Outboard Flap Transmission (Fig. 402)

(1) Turn the ballnut until the "X" dimension of the drivescrew is the same as at the time of removal.
(2) With the tangs on the gimbal in the direction of the screw yoke, put the aft end of the drivescrew through the gimbal.
(3) Turn the ballnut until the oil reservoir is in the same position it was before the drivescrew removal (the initial position in relation to inboard or outboard).
(4) Move the drivescrew back through the gimbal until the ballnut is in the gimbal.
(5) Attach the gimbal to the ballnut:
(a) On the top side of the gimbal, attach the top flanged bushing:
1) Apply a layer of MIL-C-11796, Class 3, corrosion preventive compound to the outer surface of the flanged bushing.
2) If shims were installed with the flanged bushing when you removed it, install the same thickness of shims on the bushing.
3) Apply a thin layer of the BMS 5-95 sealant around the edge of the cover that is installed with the flanged bushing.
4) Put the flanged bushing, with the cover and the shims, on the gimbal.

NOTE: Make sure that the flanged bushing engages the journal on the ballnut.

5) Install the two bolts.
(b) On the bottom side of the gimbal, attach the bottom flanged bushing:
1) Apply a layer of MIL-C-11796, Class 3, corrosion preventive compound to the outer surface of the flanged bushing.
2) If shims were installed with the flanged bushing when you removed it, install the same thickness of shims on the bushing.

3) Put the flanged bushing, with the shims, on the gimbal.

NOTE: Make sure that the flanged bushing engages the journal on the ballnut.

4) Install the two bolts.

(c) Do a check that the total clearance is .006 +.004/-.000 inch between the flanged bushings and the ballnut (Fig. 402).

(d) If it is necessary, adjust the thickness of the shims at the flanged bushings to get the .006 +.004/-.000 inch of total clearance.

(e) On the top and bottom sides of the gimbal, install the lockwires.

(6) Put the drivescrew with the screw yoke and the gimbal in its installed position on the airplane.

NOTE: Make sure the oil reservoir is in its initial position (in relation to inboard or outboard).

(7) Attach the gimbal to the fitting on the midflap:

(a) On each gimbal, attach the flanged bushing to the gimbal.

1) Install the shims with the flanged bushing that the shims were initially installed with.

NOTE: This is necessary to keep the initial lateral position adjustment of the ballscrew.

2) Apply a layer of MIL-C-11796, Class 3, corrosion preventive compound to the outer surface of the flanged bushing.

3) Put the flanged bushing, with the shims, on the fitting of the midflap.

NOTE: Make sure that the flanged bushing engages the journal on the gimbal.

4) Install the three screws with washers and nuts.

(b) Do a check that the total clearance is .006 +.004/-.000 inch between the flanged bushings and the gimbal (Fig. 402).

(c) If it is necessary, adjust the thickness of the shims at the flanged bushings to get the .006 +.004/-.000 inch of total clearance.

(d) On each side of the fitting on the midflap, install the failsafe bolts.

(8) Turn the ballnut on the screw so that the "X" dimension of the ballscrew is the same as it was at removal.

(9) Put the upstop on the screw yoke in the same position it was at the time of removal.

NOTE: This is the initial position of the upstop on the screw yoke in relation to the output shaft. Installation of a drivescrew with the upstop on the screw yoke in this initial position will help to decrease subsequent adjustment.

(10) At the outboard flap transmissions, assemble the universal joint:

(a) Assemble and align the transmission output shaft, the screw yoke and the trunnion cross.

(b) Apply a layer of BMS 3-24 grease to the cross pin, the universal joint bolt and the spacer.

CAUTION: ASSEMBLE THE UNIVERSAL JOINT CAREFULLY. IF YOU DO NOT FOLLOW THE STEPS, INTERFERENCE BETWEEN THE NUT ON THE UNIVERSAL JOINT BOLT AND THE TRANSMISSION HOUSING CAN OCCUR.

(c) Put the cross pin through the screw yoke and the trunnion cross.

(d) Put the universal joint bolt through the output shaft, the trunnion cross, and the cross pin.

(e) Put the spacer on the universal joint bolt.

(f) AIRPLANES PRE-SB 27-1265;
Do these steps:

NOTE: Make sure that the run on torque of the nut is between 34-150 inch-pounds (3.84-16.95 Nm).

1) Clean the threads of the universal joint bolt.

2) Apply a layer of BMS 5-95 sealant to the threads of the universal joint bolt.
3) Install a new self-locking nut on the universal joint bolt.
4) Torque the nut to 170-200 inch-pounds (19.20-22.59 Nm).

(g) AIRPLANES POST-SB 27-1265;
Do these steps:

NOTE: Make sure that the run on torque of the nut is between 25-100 inch-pounds (2.82-11.29 Nm).

1) Measure the dimension from the spacer to the edge of the cotter pin hole. If the dimension is 0.150 inch (3.81 mm) or less, install the laminated shim only. If the dimension is more than 0.150 inch (3.81 mm), install the laminated shim and one or both of the washers as required.
2) Install the shim with the peelable laminations against the spacer.
3) Install a new castellated nut on the universal joint bolt.
4) Torque the nut to 170 inch-pounds (19.2 Nm) minimum.
5) Check the alignment of the castellated nut slots with the cotter pin hole. If you can not get alignment, increase the torque to a maximum of 230 inch-pounds (25.98Nm).
6) If you can not get alignment, remove laminations from the shim to allow the slots in the nut to align with the cotter pin hole.

(h) Make sure that all the chamfer of the bolt shows when the nut is fully tightened.

G. Install the Drivescrew of an Inboard Flap Transmission (Fig. 403)

(1) Turn the ballnut on the drivescrew so that "X" dimension is approximately the same as it was at removal.
(2) Put the drivescrew together with the screw yoke in the installed position on the airplane.

CAUTION: MAKE SURE THAT THE DRIVESCREWS ARE INSTALLED ON THE CORRECT TRANSMISSIONS. A NO. 3 DRIVESCREW CAN ATTACH TO A NO. 5 TRANSMISSION, AND A NO. 4 DRIVESCREW CAN ATTACH TO A NO. 6 TRANSMISSION. THESE DRIVESCREWS ARE NOT INTERCHANGEABLE, AND CAN CAUSE OPPOSITE MOVEMENT OF THE INBOARD FLAPS. DAMAGE CAN OCCUR.

(3) Attach the ballnut to the gimbal.
 (a) On the No. 3 or 6 transmission, make sure that the ballnut is installed with the oil reservoir on the outboard side.
 (b) On the No. 4 or 5 transmission, make sure that the ballnut is installed with the oil reservoir on the inboard side.
 (c) On the top and bottom sides of the gimbal, attach the ballnut to the gimbal.
  1) Apply a layer of BMS 5-95 sealant to the outer surface of the bushing.
  2) Put the bushing on the gimbal.

   NOTE: Make sure that the bushing engages the journal on the ballnut.

  3) Install the two bolts that attach the bushing to the gimbal.
   a) Fill each of the two fastener holes used for the bushing fasteners with BMS 5-95 sealant.
   b) Install bolts in each of the two fastener holes for a bushing.
   c) Install a washer and nut on each of the two bolts.
   d) Tighten the nut on each bolt to 30-40 pound-inches.
(4) Turn the ballnut on the drivescrew so that the "X" dimension is the same as it was at the time of removal.
(5) Put the upstop on the screw yoke in the same position it was at the time of removal.

 NOTE: This is the initial position of the upstop on the screw yoke in relation to the output shaft. Installation of a drivescrew with the upstop on the screw yoke in this initial position will help to decrease subsequent adjustment.

(6) Assemble the universal joint:
 (a) Assemble and align the transmission output shaft, the screw yoke and the trunnion cross.
 (b) Apply a layer of BMS 3-24 grease to the cross pin.
 (c) Put the cross pin through the screw yoke and the trunnion cross.
 (d) Apply a layer of the BMS 3-24 grease to the universal joint bolt.
 (e) Put the universal joint bolt through the output shaft, the trunnion cross, and the cross pin.
 (f) Apply a layer of BMS 3-24 grease to the spacer.
 (g) Put the spacer on the universal joint bolt.
 (h) AIRPLANES PRE-SB 27-1265;
  Do these steps:

  NOTE: Make sure that the run on torque of the nut is between 25-100 inch-pounds (2.82-11.29 Nm).

  1) Clean the threads of the universal joint bolt.

2) Apply a layer of BMS 5-95 sealant to the threads of the universal joint bolt.
3) Install a new self-locking nut on the universal joint bolt.
4) Torque the nut to 170-200 inch-pounds (19.20-22.59 Nm).
5) On the No. 2 or 7 transmission, tighten the nut to 270-300 inch-pounds (30.50-33.89 Nm).
6) On the No. 1 or 8 transmission, tighten the nut to 170-200 inch-pounds (19.20-22.59 Nm).

(i) AIRPLANES POST-SB 27-1265;
Do these steps:

NOTE: Make sure that the run on torque of the nut is between 25-100 inch-pounds (2.82-11.29 Nm).

1) Measure the dimension from the spacer to the edge of the cotter pin hole. If the dimension is 0.150 inch (3.81 mm) or less, install the laminated shim only. If the dimension is more than 0.150 inch (3.81 mm), install the laminated shim and one or both of the washers as required.
2) Install the shim with the peelable laminations against the spacer.
3) Install a new castellated nut on the universal joint bolt.
4) Torque the nut to 170 inch-pounds (19.2 Nm) minimum.
5) Check the alignment of the castellated nut slots with the cotter pin hole. If you can not get alignment, increase the torque to a maximum of 230 inch-pounds (25.98 Nm).
6) If you can not get alignment, remove laminations from the shim to allow the slots in the nut to align with the cotter pin hole.

(j) Clean the threads of the universal joint bolt.
(k) Apply a layer of BMS 5-95 sealant to the threads of the universal joint bolt.
(l) Install a new self-locking nut on the universal joint bolt.
(m) Tighten the nut to 170-200 pound-inches.
(n) Make sure that all the chamfer of the bolt shows when the nut is fully tightened.

(7) Fill the ballnut reservoir (AMM 12-22-51/201).

H. Do an Initial Check of the Operation of the Trailing Edge Flaps

(1) If the drivescrew removal and installation was at the outboard flap transmissions, remove the support.

(2) Do a check of the operation of the trailing edge flaps and the adjustment of the drivescrews:

NOTE: This initial check of the operation of the trailing edge flaps is completed with the alternate (electric) mode of operation. Operation of the flaps is slower with this mode of operation than with the primary (hydraulic) mode. This can help to prevent damage if there is a problem during the initial operation of the flaps.

(a) Supply electrical power (AMM 24-22-0/201).

(b) Set the arming switch of the ALTERNATE FLAPS to the ARM position.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF THE LE AND TE FLAPS AND FLAP DRIVE MECHANISMS BEFORE YOU OPERATE THE TRAILING EDGE FLAPS. AN ACCIDENTAL FLAP MOVEMENT CAN CAUSE INJURY OR DAMAGE TO EQUIPMENT.

CAUTION: DURING THE INITIAL OPERATION OF THE TRAILING EDGE FLAPS, MONITOR THE OPERATION CAREFULLY. STOP THE OPERATION IMMEDIATELY IF THERE IS INDICATION OF A PROBLEM. FIND AND CORRECT THE CAUSE OF THE PROBLEM BEFORE YOU CONTINUE OPERATION OF THE TRAILING EDGE FLAPS. IF YOU DO NOT FOLLOW THESE STEPS, DAMAGE CAN OCCUR.

(c) Move the control switch of the ALTERNATE FLAPS to the UP position and hold until the flaps are fully retracted.

1) Make sure that the movement of the trailing edge flaps is smooth.

2) Make sure that the trailing edge flaps retract symmetrically.
3) Make sure that the drivescrew does not touch the adjacent structure.
4) Make sure that the screw and fitting goes into the screw preload pad immediately before the flaps are fully retracted.
5) Make sure that the screw and fitting engages the screw preload pad when the flaps are fully retracted.

(d) Move the control switch of the ALTERNATE FLAPS to the DOWN position and hold until the flaps are fully extended.
1) Make sure that the movement of the trailing edge flaps is smooth.
2) Make sure that the trailing edge flaps extend symmetrically.
3) Make sure that the drivescrew does not touch the adjacent structure.

(e) Set the arming switch of the ALTERNATE FLAPS to the OFF position.

(3) Do a check of the adjustment of the drivescrew:

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Supply system B hydraulic power (AMM 27-51-0/201).

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF THE LE AND TE FLAPS AND FLAP DRIVE MECHANISMS BEFORE YOU MOVE THE FLAP CONTROL HANDLE. AN ACCIDENTAL FLAP MOVEMENT CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: DURING THE INITIAL OPERATION OF THE TRAILING EDGE FLAPS, MONITOR THE OPERATION CAREFULLY. STOP THE OPERATION IMMEDIATELY IF THERE IS INDICATION OF A PROBLEM. FIND AND CORRECT THE CAUSE OF THE PROBLEM BEFORE YOU CONTINUE OPERATION OF THE TRAILING EDGE FLAPS. IF YOU DO NOT FOLLOW THESE STEPS, DAMAGE CAN OCCUR.

(b) Set the FLAP control lever to the FLAP UP detent to retract the flaps:
   1) Make sure that the trailing edge flaps move smoothly.
   2) Make sure that the trailing edge flaps retract symmetrically.

(c) Remove system B hydraulic power after the flaps are fully retracted (AMM 27-51-0/201).

(d) At the drivescrew that you removed, do a check of the clearance between the ballnut and screw yoke.

(e) Make a record of the clearance.

(f) Compare the clearance before the removal of the drivescrew with the clearance after the installation of the drivescrew.
   1) If the two values for clearance are different, adjust the clearance.
      a) Disconnect the torque tube(s) from the transmission.

         NOTE: For access to the outboard torque tube coupling at the No. 3 and 6 transmissions, remove the access panel outboard of the transmission.

      b) Turn the input shaft of the transmission in the direction necessary to adjust the clearance to its initial value.
      c) Align and engage the coupling sleeve with the splined couplings of the torque tube and the transmission.
      d) Install the three screws that attach the coupling sleeve to the coupling.
      e) Install a lockwire to connect the three screws together.
      f) If it is necessary, install the outboard access panel of the No. 3 and 6 transmissions.
   2) If the clearance after the installation of the transmission is the same as the clearance before the removal, no adjustment is necessary.

I. Do an Operational Test of the Flaps

   WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Supply system B hydraulic power (AMM 27-51-0/201).

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF THE LE AND TE FLAPS AND FLAP DRIVE MECHANISMS BEFORE YOU MOVE THE FLAP CONTROL HANDLE. AN ACCIDENTAL FLAP MOVEMENT CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Set the FLAP control lever to the 40-unit detent to extend the flaps.
  (a) Make sure the trailing edge flaps move smoothly.
  (b) Make sure that the trailing edge flaps extend symmetrically.
(3) Set the FLAP control lever to the FLAP UP detent to retract the flaps.
  (a) Make sure that the movement of the trailing edge flaps is smooth.
  (b) Make sure that the trailing edge flaps retract symmetrically.
(4) Remove system B hydraulic power (AMM 27-51-0/201).
(5) Clean the unwanted corrosion preventive compound from the forward and aft ends of the screw.
(6) Apply a layer of the lubricating oil to the length of the screw.

J. Put the Airplane Back to Its Usual Condition
(1) Install the applicable access panels as specified below.
  (a) At the outboard flap transmissions, install the access panel on the lower side of the movable fairing.
  (b) At the No. 3 transmission, install access panels 5735 and 5736.
  (c) At the No. 6 transmission, install access panels 5835 and 5836.
  (d) At the No. 4 and 5 transmissions, install the access panel for the transmission on the inboard side.
(2) Remove the spoiler locks you installed for the removal and installation of the drivescrew.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Supply systems A and B hydraulic power (AMM 27-51-0/201).
(b) Move the SPEED BRAKE lever on the control stand to the DOWN detent.
(c) Remove systems A and B hydraulic power after all spoilers are retracted (AMM 27-51-0/201).

(3) Remove electrical power, if it is not necessary (AMM 24-22-0/201).

FLAP DRIVESCREW - INSPECTION/CHECK

1. General
   A. This procedure gives instructions for a check of these items at all transmissions:
      (1) The wear on the journals of the ballnut of a drivescrew.
      (2) The wear on the flanged bushings that attach a ballnut to a gimbal.
   B. This procedure gives instructions for the check of these items at the transmissions of the outboard trailing edge flaps:
      (1) The wear on the journals of the gimbals.
      (2) The wear on the flanged bushings that attach a gimbal to the fitting on the midflap.
   C. This procedure gives the instructions to do a check of the Flap Drivescrew Backlash.
2. Flap Drivescrew Inspection
   A. Standard Tools and Equipment
      (1) Micrometer - 0 to 1 inch
      (2) Vernier Caliper
      (3) C27030-33 - Flap Screw Backlash Tool
   B. References
      (1) AMM 27-51-73/401, Flap Drivescrew
   C. Access
      (1) Location Zone 307, 407 Wing Trailing Edge Outboard Flap and Spoiler 309, 409 Wing Trailing Edge Inboard Flap and Spoiler
   D. Procedure
      (1) Remove the parts at each transmission of the outboard trailing edge flaps (AMM 27-51-73/401).
         (a) Put the flap control lever at the 25-unit position (there will be tension at the drivescrew).
         (b) Install the backlash test tool, C27030-33.
            1) Install the clamp on the shaft of the drivescrew.

               NOTE: Use the lever tool to put the clamp in position on the shaft.

            2) To keep the clamp in position, apply a maximum of 100 inch-pounds of torque to the locking bolt.
            3) Install the magnetic dial indicator.
            4) Make sure the dial indicator is at 0.
            5) Install the lever tool.
            6) Apply 40-80 pounds to the handle of the lever tool.

               NOTE: When you apply the load to the handle of the lever tool, it causes an 800-pound axial load at the ballnut.

7) Make sure there is less than 0.0095 inch of axial backlash between the ballnut and the screw.
   a) If there is more than 0.0095 inch of axial backlash, remove and replace the units that are not in tolerance.

(c) Disconnect the gimbal from the fitting on the midflap.
(d) Disconnect the ballnut from the gimbal.
(e) Do a check of the wear surfaces of the parts with a micrometer or vernier caliper as applicable (Fig. 601).
(f) Compare the dimensions measured with the permitted dimensions shown in Fig. 601.
(g) Repair or replace the parts that are not in the tolerance specified in Fig. 601.
(h) Connect the ballnut to the gimbal.
(i) Connect the gimbal to the fitting on the midflap.

(2) Remove the parts at each transmission of the inboard trailing edge flaps (AMM 27-51-73/401).
(a) Put the flap control lever at the 25-unit position (there will be tension at the drivescrew).
(b) Install the backlash test tool, C27030.
1) Install the clamp on the shaft of the drivescrew.

NOTE: Use the lever tool to put the clamp in position on the shaft.

2) To keep the clamp in position, apply a maximum of 100 inch-pounds of torque to the locking bolt.
3) Install the magnetic dial indicator.
4) Make sure the dial indicator is at 0.
5) Install the lever tool.
6) Apply 40-80 pounds to the handle of the lever tool.

NOTE: When you apply the load to the handle of the lever tool, it causes an 800-pound axial load at the ballnut.

7) Make sure there is less than 0.0095 inch of axial backlash between the ballnut and the screw.
   a) If there is more than 0.0095 inch of axial backlash, remove and replace the units that are not in tolerance.

(c) Disconnect the ballnut from the gimbal.
(d) Do a check of the wear surfaces of the parts with a micrometer or vernier caliper as applicable (Fig. 601).
(e) Compare the dimensions measured with the permitted dimensions shown in Fig. 601.
(f) Repair or replace the parts that are not in the tolerance specified in Fig. 601.

(g) Connect the ballnut to the gimbal.

3. Flap Drivescrew Backlash Test (Fig. 602)

A. Special Tools and Equipment
(1) C27030-33 - Flap Drivescrew Backlash Tool

B. References
(1) AMM 24-22-0/201, Manual Control
(2) AMM 27-51-0/201, Trailing Edge Flaps
(3) AMM 27-51-141/401, Inboard Flap Track Fairing
(4) AMM 27-51-121/401, Outboard Flap Track Fairings
(5) AMM 27-51-73/401, Flap Drivescrew

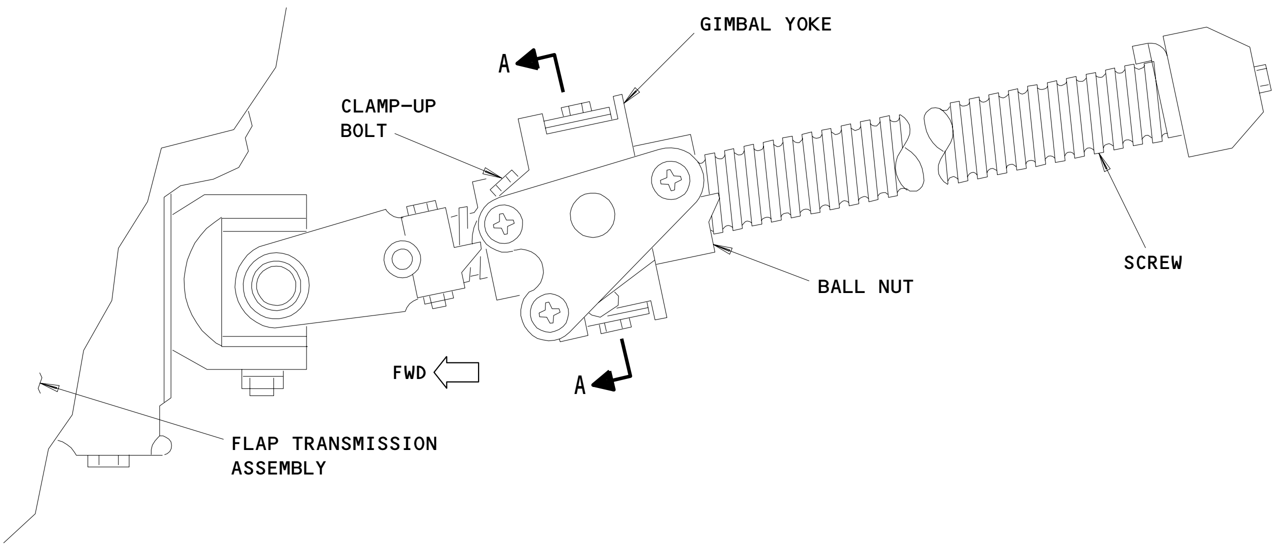
C. Access
(1) Location Zones

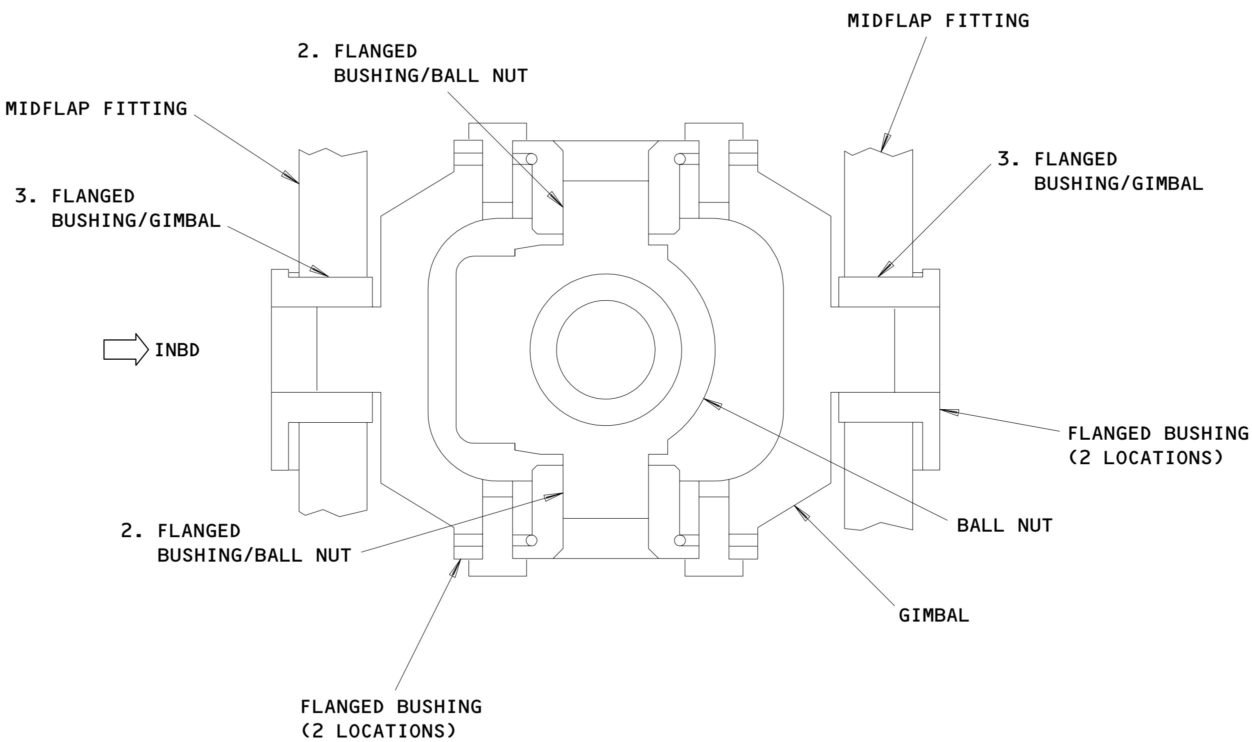
307,407	Wing Trailing Edge Outboard Flap and Spoiler
309,409	Wing Trailing Edge Inboard Flap and Spoiler

D. Prepare for the Flap Drivescrew Backlash Check
(1) Supply electrical power (AMM 24-22-0/201).
(2) Do the applicable steps that follow to get access to the flap drivescrew:
(a) Remove the center fairing (AMM 27-51-121/401) to get access for the positions that follow:
1) Position No. 1
2) Position No. 2
3) Position No. 7
4) Position No. 8
(b) Remove the tailcone assembly (the aft part of the fairing for the outboard track of the inboard flap) to get access to the positions that follow:
1) Position No. 3
2) Position No. 6
(c) Remove the fairing for the inboard track of the inboard flap to access for the positions that follow (AMM 27-51-141/401):
1) Position No. 4
2) Position No. 5
(3) Supply hydraulic power (AMM 27-51-0/201).
(4) Do the steps that follow to put the flaps in the correct position to do the check of the flap drivescrew backlash:

NOTE: You must have approximately 4 inches of the drivescrew aft of the ballnut to let you install the lever and clamp tool (these are part of the drivescrew backlash test tool kit).

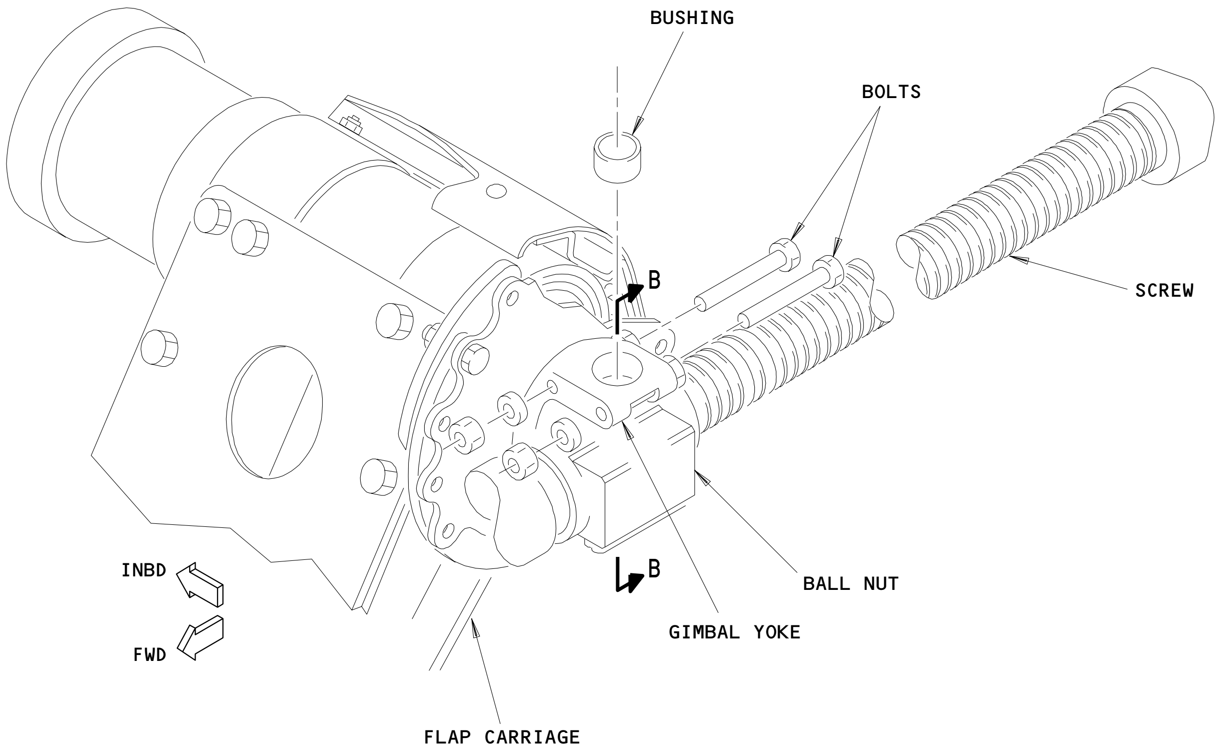
(a) To do the check at the No. 1, 2, 7 or 8 position, do the steps that follow to put the flaps at the 25-unit position:
1) Move the flap handle on the control stand to the 25-unit position.
2) Make sure the flaps move to the 25-unit position.



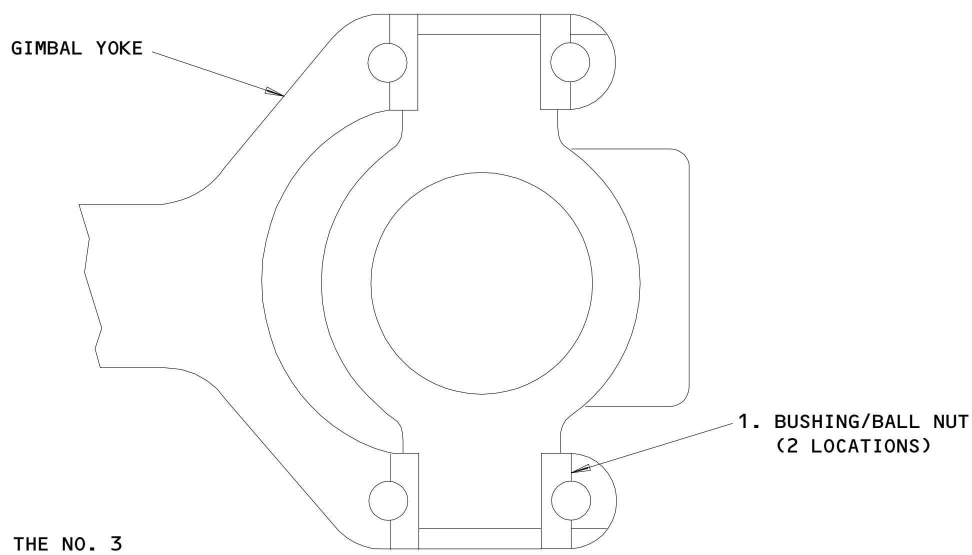


A-A

Flap Drivescrew Wear Limits
Figure 601 (Sheet 1)



EXAMPLE INBOARD FLAP GIMBAL



NOTE: DRIVESCREW AT THE NO. 3 TRANSMISSION IS SHOWN, DRIVESCREW AT THE NO. 4, NO. 5, AND NO. 6 TRANSMISSIONS ARE ALMOST THE SAME.

B-B

Flap Drivescrew Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS PERMITTED WEAR DIM.	WEAR LIMITS MAX DIA. CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.7490	0.7500	0.7570	0.0094	1		
	BALLNUT	OD	0.7476	0.7481	0.7476			X	2
2	FLANGED BUSHING	ID	0.7490	0.7500	0.7570	0.0094	1		
	BALLNUT	OD	0.7476	0.7481	0.7476			X	2
3	FLANGED BUSHING	ID	0.7490	0.7500	0.7570	0.0099	1		
	GIMBAL	OD	0.7476	0.7481	0.7471			X	2
4 3	BALLNUT	ID							
		OD							

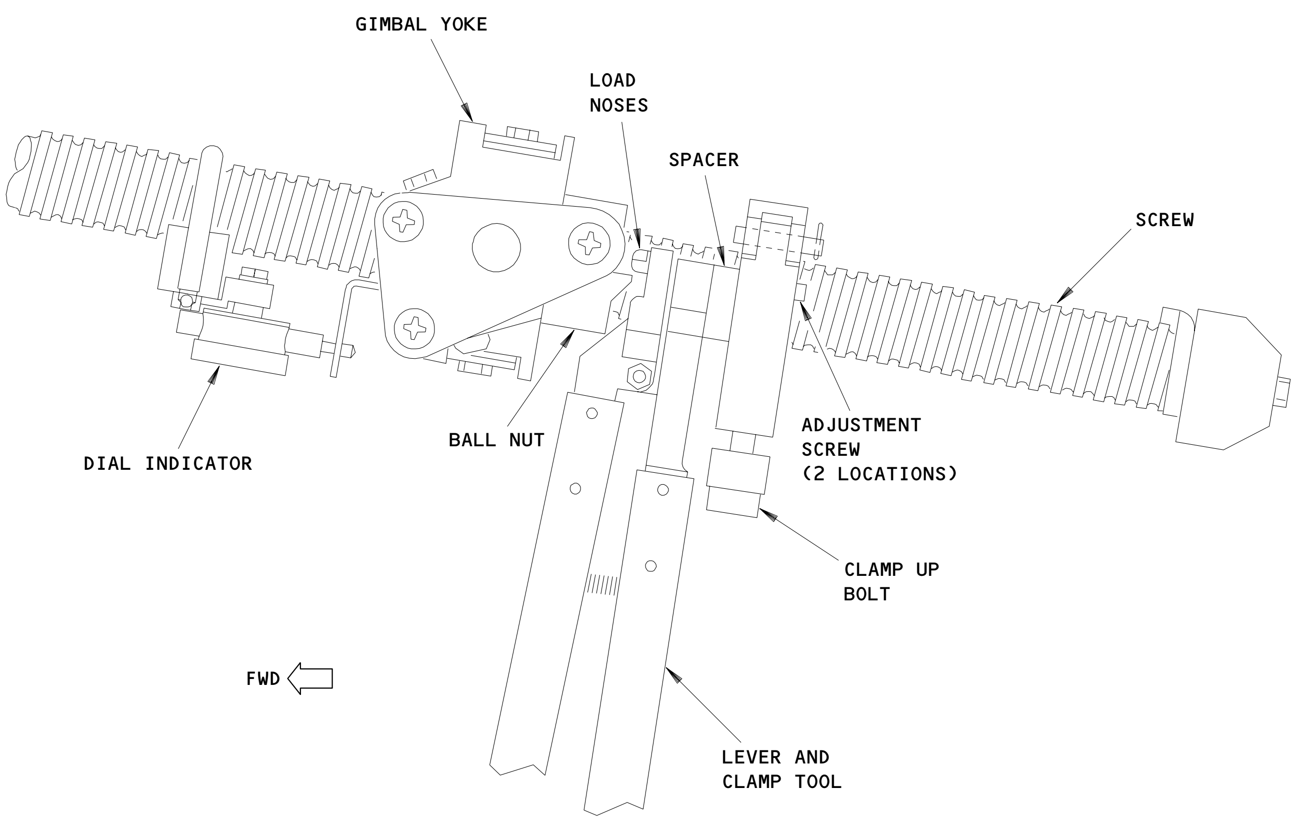
1 REPLACE THE BUSHING WHEN THE ID IS MORE THAN 0.7570 INCH MEASURED ACROSS ANY DIAMETER.

2 VENDOR ITEM - REFER TO OVERHAUL MANUAL.

3 AIRPLANES WITH THOMSON SAGINAW OR BEAVER PRECISION DRIVESCREWS; 0.0095-INCH MAXIMUM AXIAL BACKLASH BETWEEN THE BALLNUT AND THE SCREW WITH A 50-POUND FORCE ON THE END.

AIRPLANES WITH UMBRA CUSCINETTI BALLSCREWS; 0.0057-INCH MAXIMUM AXIAL BACKLASH BETWEEN THE BALLNUT AND THE SCREW WITH A 50-POUND FORCE ON THE END.

Flap Drivescrew Wear Limits
Figure 601 (Sheet 3)



Flap Drivescrew Backlash Tool, C27030-33
Figure 602

(b) To complete a check at the No. 3 or 6 position, do the steps that follow to put the flaps to the 30-unit position:
1) Move the flap handle on the control stand to the 30-unit position.
2) Make sure that the flaps move to the 30-unit position.

(c) To complete the check at the No. 4 or 5 position, do the steps that follow to put the flaps to the 25 or the 30-unit position:
1) Move the flap handle on the control stand to the 25 or the 30-unit position.
2) Make sure that the flaps move to the specified position.

(5) Remove the hydraulic power (AMM 27-51-0/201).

(6) Do the locking procedure for the drive system of the trailing edge flaps (AMM 27-51-0/201).

E. Procedure

(1) Do the steps that follow to install the lever and clamp tool on the applicable drivescrew:

NOTE: The lever and clamp tool is part of the C27030-33 tool. The lever and clamp tool is a one-piece tool. There is an adjustment screw which connects the clamp and the lever together. This screw can be loosened to adjust the two tools so the load noses fit correctly on the drivescrew.

(a) With a rag, clean the oil and the dirt from the surface of the drivescrew where the clamp of the lever and clamp tool will be attached.

NOTE: If it is necessary, you can put a mild solvent on the rag.

(b) Attach the lever and clamp tool on the drivescrew, aft of the ballnut.
1) Move the lever and clamp along the drivescrew until the load noses of the tool touch the aft end of the ballnut.

NOTE: Make sure the load noses of the tool are set so that the handles of the tool are approximately in line with the ballnut trunnions.

2) Tighten the clamp to 200-300 pound-inches.

NOTE: Make sure the handles of the lever assembly are in the relaxed position.

(2) Install the dial indicator forward of the ballnut so that the extension of the indicator touches the forward end of the ballnut.
    (a) Put the dial indicator to zero.
(3) Move the handles of the lever tool together until the movement on the dial indicator stops.
    (a) Make sure the lever and clamp tool do not move along the length of the drivescrew when you move the handles together.
        1) If the lever and clamp tool move, do the steps again to install the lever and clamp tool.

        NOTE: It can be necessary to use a higher torque value if the tool moves but do not use a torque greater than 300 pound-inches.

    (b) Write down the value which is shown on the dial indicator.

    NOTE: The value shown on the dial indicator is the value for the backlash of the drivescrew.

    (c) Do these steps a total of five times to make sure the dial indicator movement is repeatable and consistent.
(4) If the backlash value is more than 0.0095 inch for Thomson Saginaw or Beaver Precision drivescrews, or more than 0.0057 inch for Umbra Cuscinetti drivescrews, install a new drivescrew (AMM 27-51-73/401).
(5) Remove the lever and clamp tool from the drivescrew.
(6) Remove the dial indicator from the drivescrew.

F. Put the Airplane Back to Its Usual Condition
(1) Do the activation procedure for the drive system for the trailing edge flaps (AMM 27-51-0/201).
(2) Do the applicable steps that follow to close the access for the drivescrews:
    (a) At the positions No. 1, 2, 7 or 8, install the center fairing (AMM 27-51-121/401).
    (b) At the No. 3 or 6 position, install the tailcone assembly (AMM 27-51-141/401).
    (c) At the No. 4 or No. 5 position, install the fairing for the inboard track of the inboard flap (AMM 27-51-141/401).
(3) Remove the electrical power if it is not necessary (AMM 24-22-0/201).

OUTBOARD MIDFLAP CARRIAGE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Spanner Wrench - ST2580-229
   B. Corrosion Preventive Compound - BMS 3-27
   C. Corrosion Preventive Compound - MIL-C-11796, Class 3
   D. Grease - MIL-G-21164
   E. Sealant - BMS 5-95, Class B
   F. Primer - BMS 10-11, Type 1
   G. Gray Gloss Enamel - BMS 10-60
   H. Teflon Filled Coating - BMS 10-86, Type II
2. Remove Outboard Midflap Carriage
   A. Remove outboard trailing edge flap (Ref Outboard Trailing Edge Flap - R/I).
   B. Remove access panels from upper surface of midflap to gain access to carriage bearing support.
   C. Remove bolt attaching safety link to inboard side of each flap carriage (Fig. 401).
   D. Remove special bolt attaching retainer sleeve or spherical bearing to carriage.
   E. If installed, loosen thrust nut.
   F. Slide carriage out of flap. If installed, remove thrust nut and sleeve assembly from airplane. If carriage binds, first remove two bolts attaching carriage bearing support to midflap forging. Remove shims from area between carriage support and midflap. Stow shims for reinstallation then remove carriage.
   G. If spherical bearing requires replacement, remove bearing.
      (1) Remove bearing retainer.
      (2) Remove bearing.
      (3) If loose or damaged, remove seal.
3. Install Outboard Midflap Carriage
   A. If existing bushings and bolts are to be used, check allowable wear (Ref 27-51-81).
   B. Check and adjust side rollers as follows:
      (1) Check that two bolts through each mounting bracket are tight.
      (2) Check that shims under roller mounting bracket and opposite bracket are equal thickness.
      (3) Check that dimension between side rollers is 1.340 to 1.350 inches.
      (4) If dimension between side rollers is not correct, add or remove shim laminations under side roller mounting bracket to obtain correct dimension. Install bare shims with wet or dry primer. Maintain equal shim thickness under roller bracket on opposite side of carriage.

(5) If bolts were removed, install bolts with wet primer and tighten and lockwire boltheads together.

C. On airplanes with spherical bearing perform following:

(1) Check for coating of sealant per View 3, Fig. 401. If required, apply sealant as follows:

(a) Apply BMS 5-95 sealant per view 3 with a minimum thickness equal to bearing sleeve (0.030 inch).

(b) Allow sealant to cure.

(c) Apply primer and teflon filled coating over sealant and spindle.

(2) If a new spherical bearing is being installed:

(a) Install bearing on carriage with boltholes aligned.

(b) Line ream bolthole to 0.312-0.313 inch.

(c) Remove bearing from carriage.

(d) Coat bearing with corrosion preventive compound.

(e) Apply BMS 3-27 (Mastinox 6856K) between the carriage support fitting and the outer race of spherical bearing.

WARNING: USE NITRILE GLOVES FOR SKIN PROTECTION AGAINST BMS 3-27 (MASTINOX 6856K). IF MASTINOX GETS ON YOUR SKIN, IMMEDIATELY REMOVE IT WITH WATER. IF THIS MATERIAL GETS IN YOUR EYES, IMMEDIATELY FLUSH YOUR EYES WITH WATER AND GET MEDICAL AID. THIS MATERIAL CONTAINS VERY POISONOUS AND FLAMMABLE AGENTS WHICH CAN CAUSE INJURIES TO PERSONS.

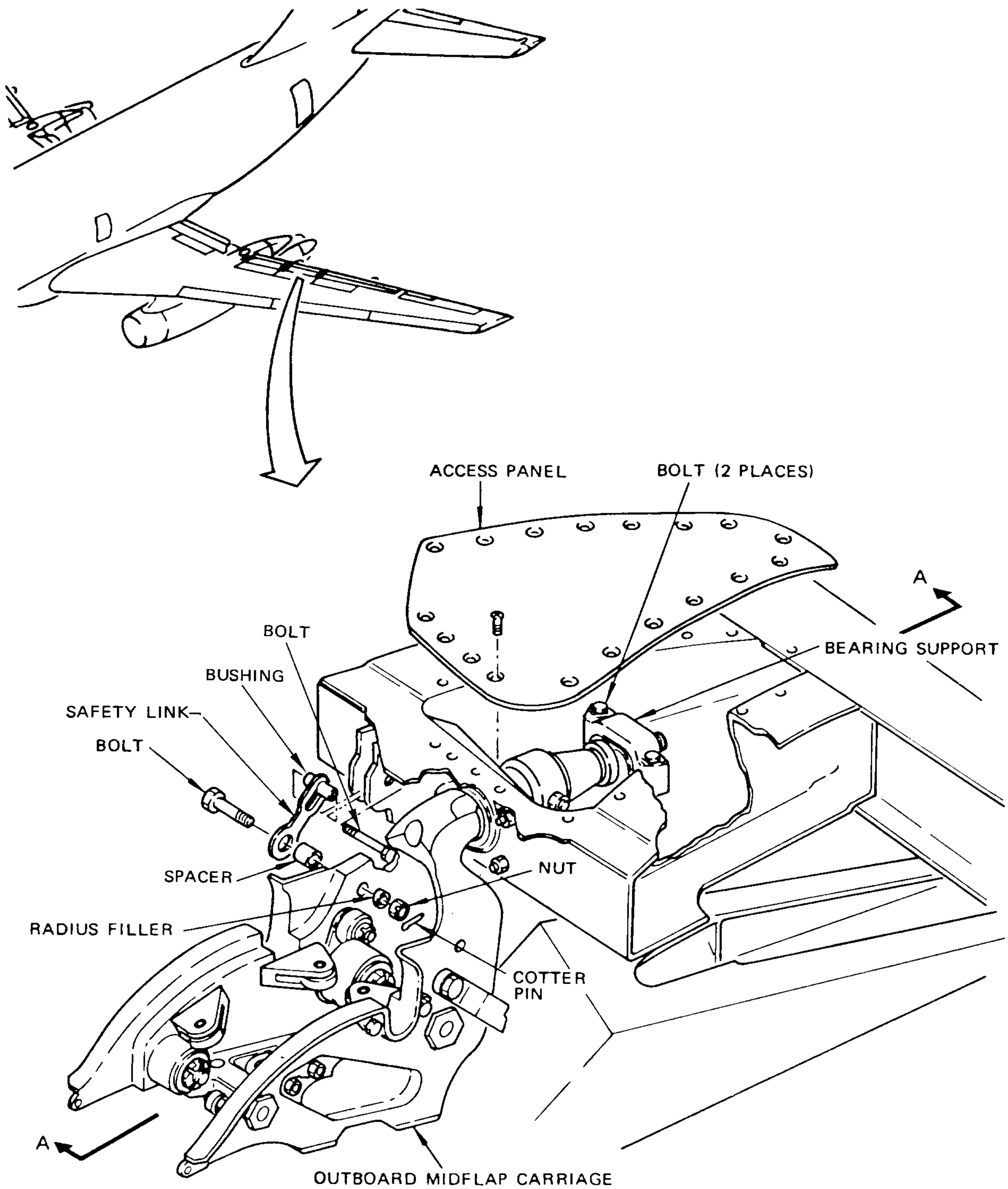
CAUTION: REMOVE UNWANTED MASTINOX FROM SURFACES WHICH WILL BE LUBRICATED AND FROM SURFACES THAT MOVE. YOU CAN CAUSE FAILURE OF MOVING PARTS IF YOU APPLY MASTINOX TO SURFACES THAT MOVE.

NOTE: Apply Mastinox at WBL 254 and WBL 355 on the outboard flap (Ref 27-51-44).

(f) Install bearing in midflap.

(g) If removed, apply a thin coat of sealant to seal and locate on midflap.

(h) Locate bearing retainer. Install four bolts with boltheads forward. Tighten nuts to 80-100 pound-inches.



Outboard Midflap Carriage Installation
Figure 401

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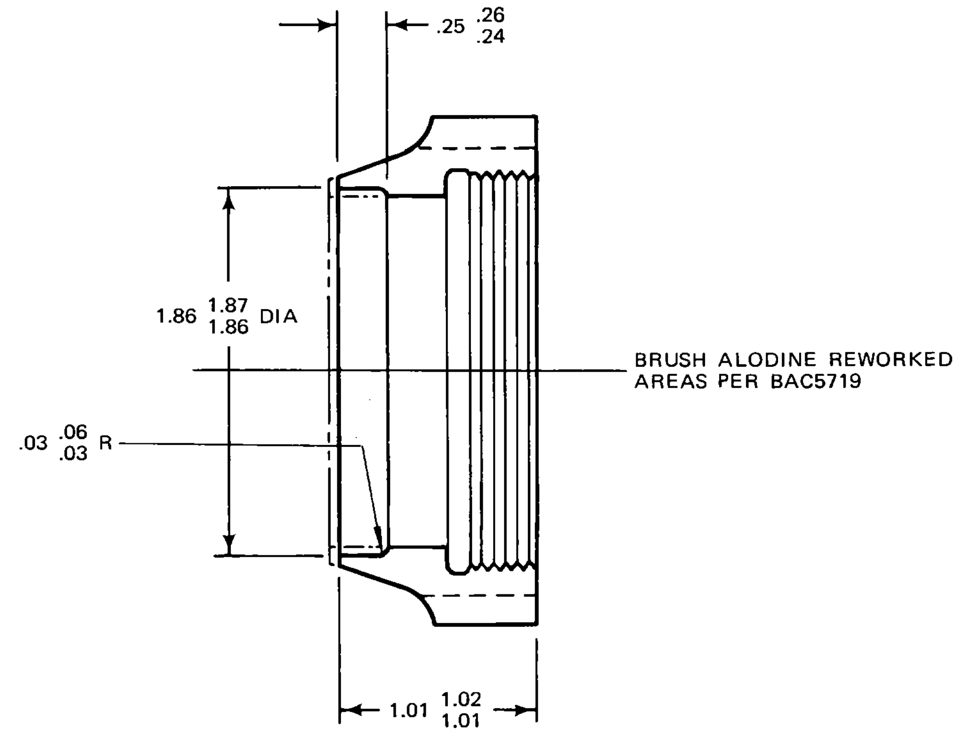
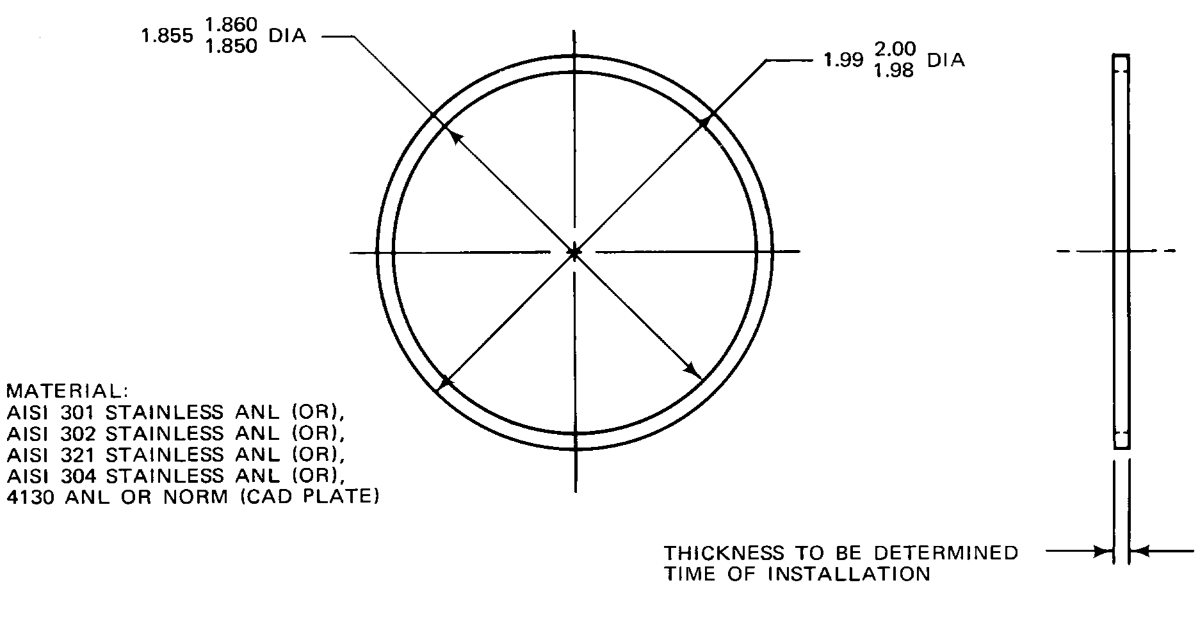
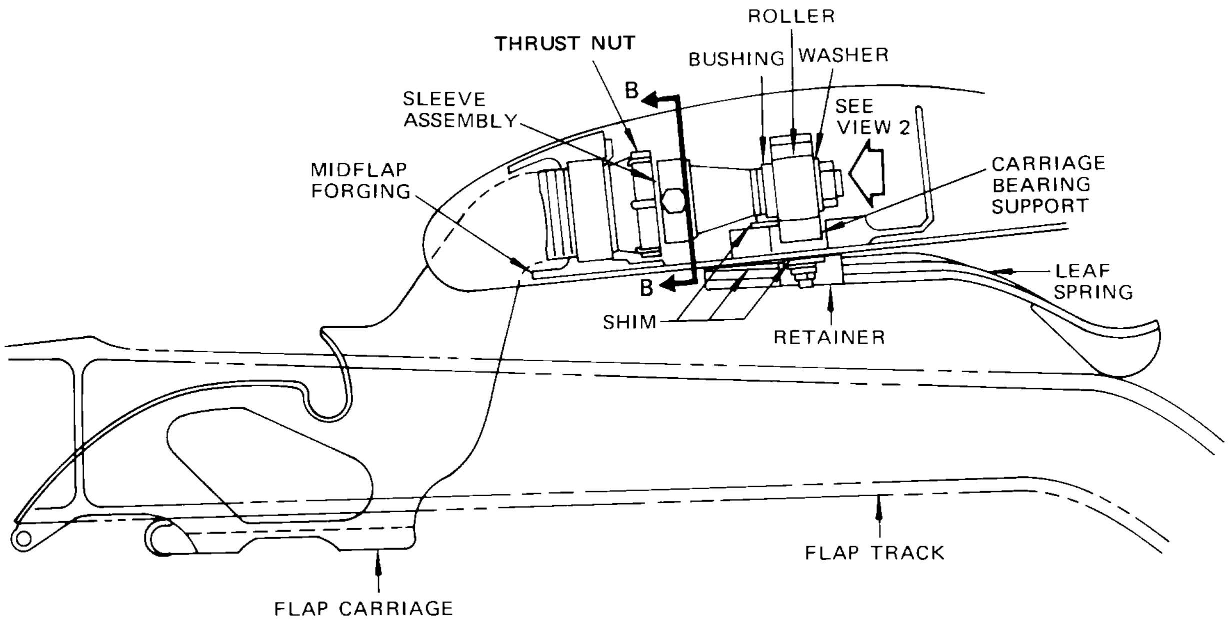


METHOD 1 (MACHINE THRUST - NUT)



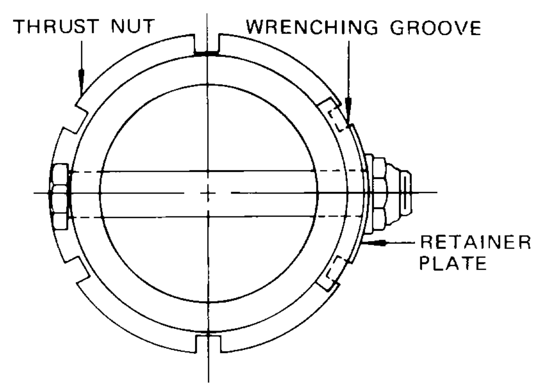
METHOD 2 (MAKE WASHER PER ABOVE)

Landing Light Adjustment
Figure 402



AIRPLANES WITH THRUST NUT

SECTION A-A



SECTION B-B

Outboard Midflap Carriage Installation
Figure 403 (Sheet 1)

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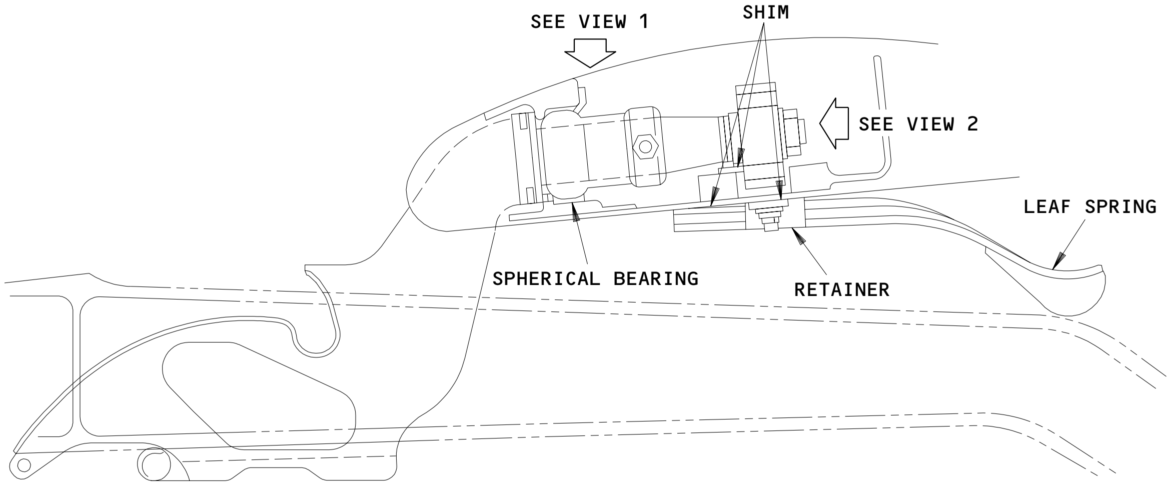
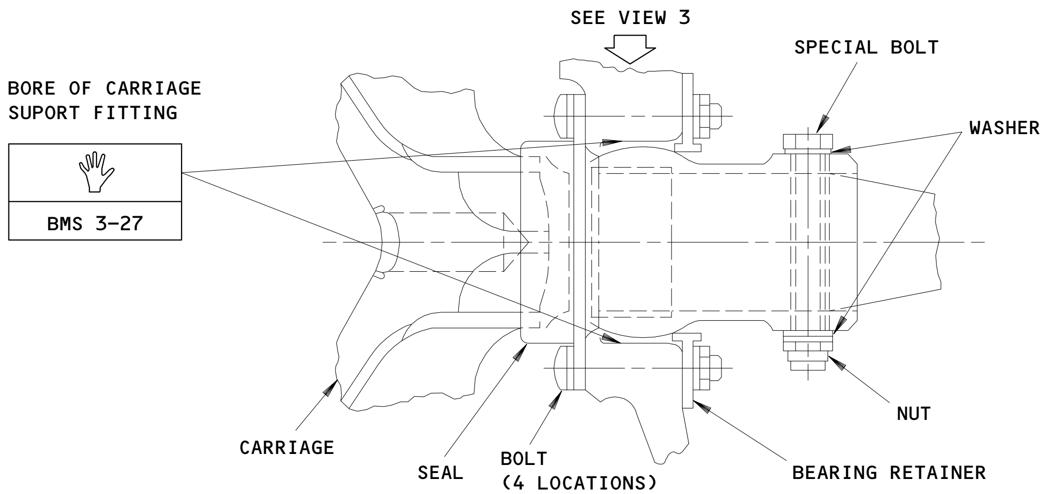
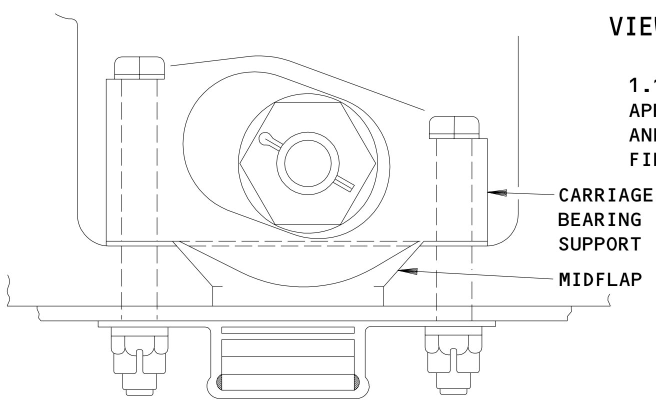


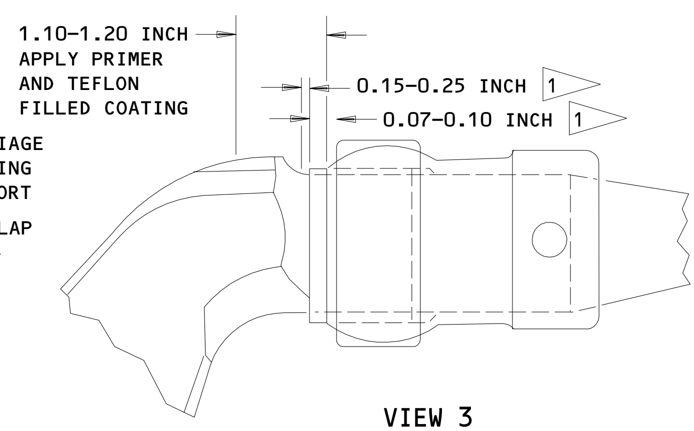
AIRPLANES WITH SPHERICAL BEARING
A-A



VIEW 1



VIEW 2



VIEW 3

1 APPLY BMS 5-95 SEALANT

Outboard Midflap Carriage Installation
Figure 403 (Sheet 2)

468590

(3) Completely coat flap carriage with corrosion preventive compound in area contacting thrust bearing, thrust nut and sleeve assembly (Fig. 401).
(4) Insert flap carriage aft through spherical bearing.
(5) Coat bolt with primer and install countersunk washer under bolthead.
(6) Install bolt with wet primer through flap carriage and spherical bearing with head on inboard side.
(7) Install washers and nut on bolt and tighten nut 60-85 pound-inches.
(8) Apply fillet of BMS 5-95 sealant around bolthead, countersunk washer, nut, washers, and spherical bearing.

D. On airplanes with thrust nut perform following:
(1) Apply a smooth coating of BMS 5-95 sealant over carriage fillet radius forward of bearing sleeve to a minimum thickness of bearing sleeve (0.03 inch).
(2) With sealant wet, install thrust washer spindle. Remove any sealant from bearing sleeve.
(3) Cure sealant until tack free.
(4) Apply enamel over sealant.
(5) Completely coat flap carriage with corrosion preventive compound in area contacting thrust bearing, thrust nut and sleeve assembly (Fig. 401).
(6) Insert flap carriage aft through thrust bearing.
(7) Slide thrust nut and sleeve assembly over carriage with thrust nut positioned against bearing retainer.
(8) Coat bolt with primer and install countersunk washer under bolthead.
(9) Install bolt with wet primer through flap carriage and sleeve assembly with head on inboard side.
(10) Install washers and nut on bolt and tighten nut 60-85 pound-inches.
(11) Apply fillet of BMS 5-95 sealant around bolthead, countersunk washer, nut, washers, and sleeve assembly.
(12) Tighten thrust nut to 1200-1400 pound-inches to clamp up bearing using spanner wrench. Wipe off excess corrosion preventive compound. Lockwire aircraft having provisions for lockwire. Aircraft having retainer plate safety, install with retainer plate lugs engaging wrenching grooves on thrust nut (Section B-B, Fig. 401).

NOTE: Examine thrust nut to bearing inner race relationship to ensure that thrust nut clamps bearing inner race to required torque, (it may be necessary to shake flap to determine if play exists.) If play exists (with thrust nut torqued correctly) method I or method II may be used as a corrective measure. Method I is the preferred repair (Fig. 401, Sheet 2).

(a) If method I is used rework thrust nut (Fig. 401, Sheet 2).

(b) If method II is used, fabricate a washer (Fig. 401, Sheet 2). Thickness should equal gap between thrust nut and bearing inner race plus 0.010 inch. (Ensure washer is installed against inner bearing race and over sleeve

E. Apply MIL-G-21164 grease liberally around slotted hole and on bearing periphery.

F. If removed, position carriage bearing support over end of flap carriage with shims installed between carriage bearing support and midflap forging. Install bolts and position shims, retainer, radius fillers, washers and nuts (Fig. 401). Tighten 3/8-inch nut within 160-190 pound-inches torque range and tighten 5/16-inch nut within 100 to 140 pound-inches torque range.

NOTE: Shim thickness should be identical with shim removed in step 2.F.

G. On airplanes with thrust nut, apply a fillet of BMS 5-95 sealant to aft end of thrust nut.

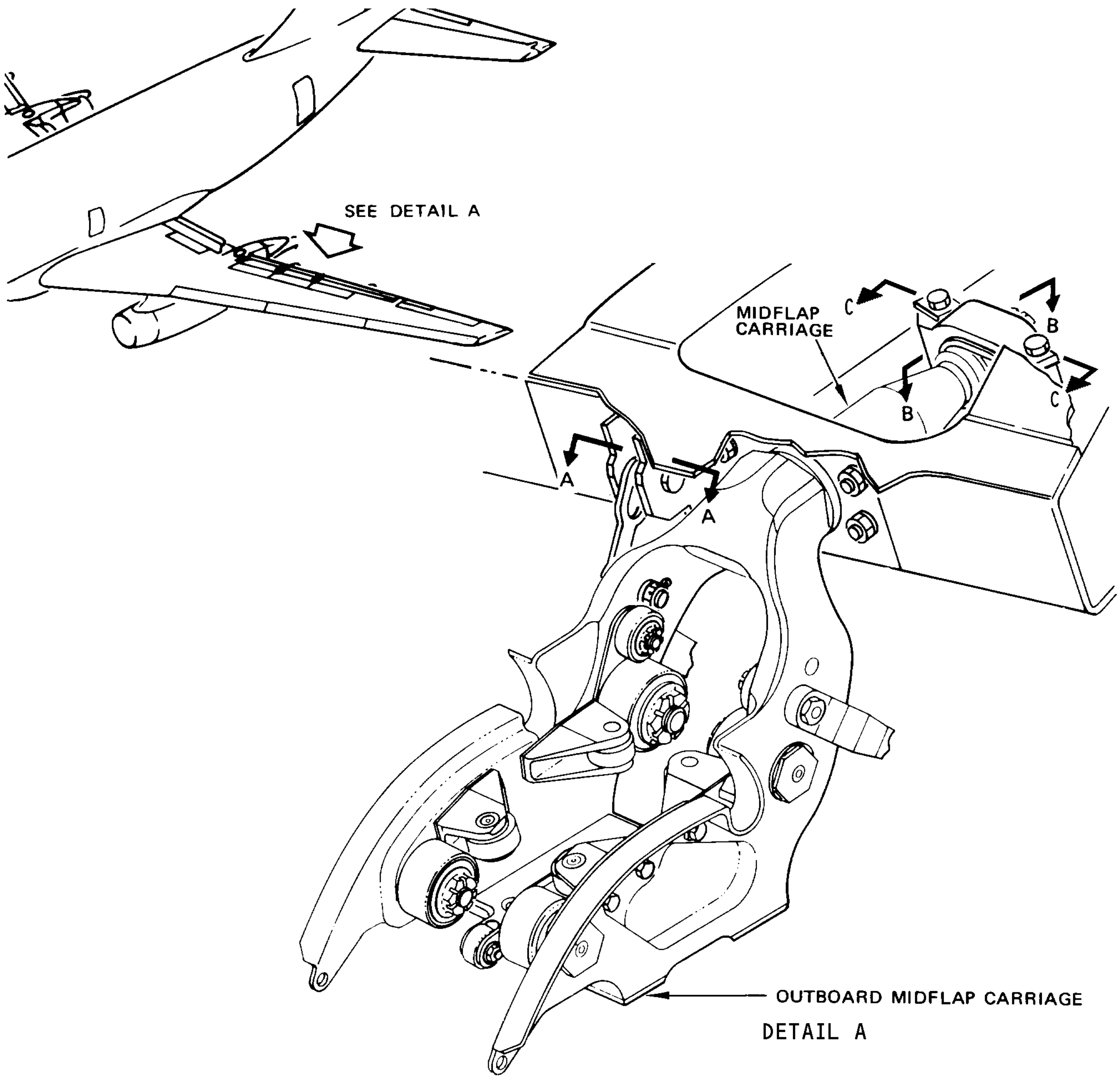
H. Install bolt through safety link, spacer and flap carriage. Secure with radius filler and nut. Install cotter pin.

I. Install outboard trailing edge flap (Ref 27-51-72 R/I).

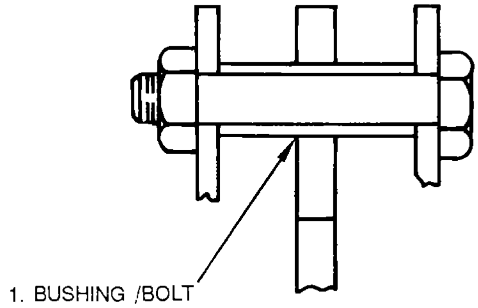
J. Apply BMS 5-79 sealant to carriage access panel and midflap faying surface and install panel.

OUTBOARD MIDFLAP CARRIAGE - INSPECTION/CHECK

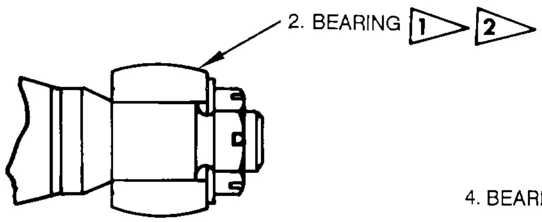
1. General
   A. This data consists of illustrations and a wear limits chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Outboard Midflap Carriage - Removal/Installation for this information.
2. Outboard Midflap Carriage Wear Limits (Fig. 601)



Outboard Midflap Carriage Wear Limits
Figure 601 (Sheet 1)

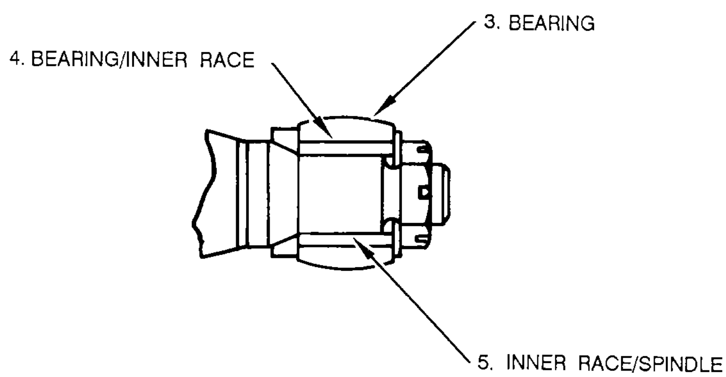


SECTION A-A



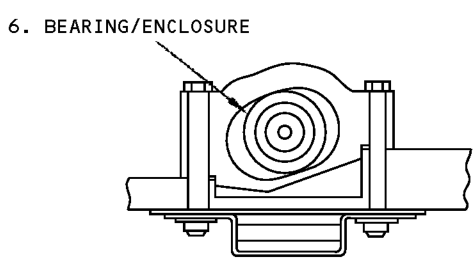
AIRPLANES WITH KEYED BEARING

SECTION B-B



AIRPLANES WITH BEARING AND INNER RACE

SECTION B-B



SECTION C-C

Outboard Midflap Carriage Wear Limits
Figure 601 (Sheet 2)

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INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
2	BEARING	OD	1.4945	1.4955	1.4645 [2]		[1]		
							X		
3	BEARING	OD	1.4945	1.4955	1.4645		X		
4	BEARING	ID	1.0510	1.0520	1.0560	0.0060	X		
	INNER RACE	OD	1.0490	1.0500	1.0450		X		
5 [3]	INNER RACE	ID	0.8740	0.8745	0.8770	0.0030	X		
	SPINDLE	OD	0.8742	0.8756	0.8726			X	
6	BEARING	OD	1.4945	1.4955		0.0250	X		
	ENCLOSURE	ID	1.5055	1.5105			X		

[1] ROTATE BEARING ON KEYWAY UNTIL ALL POSITIONS ARE WORN TO MINIMUM DIAMETER

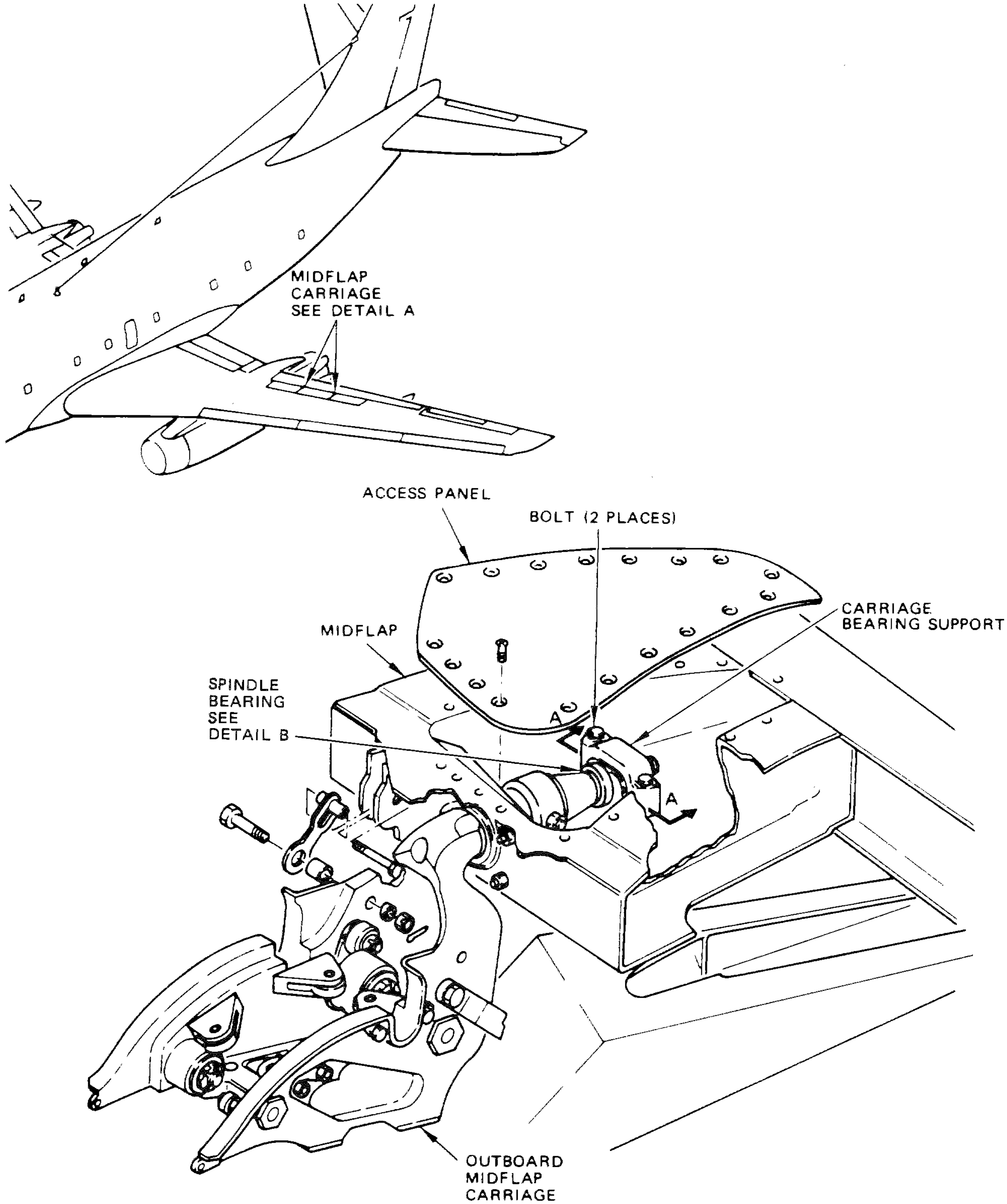
[2] MEASURE DIAMETER AT CONTACT WEAR POINT

[3] INTERFERENCE FIT - NEW PARTS

Outboard Midflap Carriage - Wear Limits
Figure 601 (Sheet 3)

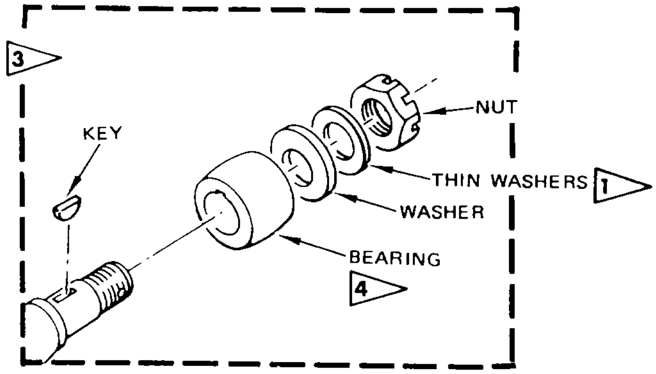
OUTBOARD MIDFLAP CARRIAGE - APPROVED REPAIR

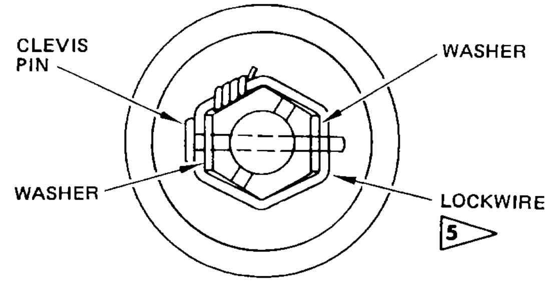
1. General
   A. The approved repair of the outboard midflap carriage consists of replacing the bearing or roller and bushing on aft end of the carriage spindle. The repair can be made with the flaps installed on the airplane; however, only one bearing or roller and bushing should be replaced at one time.
2. Equipment and Materials
   A. Grease - MIL-G-21164 (Alternate)
   B. Primer - BMS 10-11, Type I
   C. Sealant - BMS 5-95, Class B
   D. Corrosion Preventive Compound - MIL-C-11796, Class 3
3. Remove Outboard Midflap Carriage Spindle Bearing or Roller (Fig. 801)
   A. Provide system A hydraulic power (Ref 27-51-0, MP).
   B. Extend flaps as necessary for access to carriage spindle access panel (detail A).
   C. Remove system A hydraulic power (Ref 27-51-0, MP).
   D. Remove access panel from upper surface of flap.
   E. Provide suitable support at trailing edge of midflap to support flap when carriage bearing support is removed.
   F. Remove bolts which secure carriage bearing support to forging in midflap. Remove and record position and thickness of all shims which are freed when bolts are removed (Section A-A).
   G. Remove clevis pin, nut, washers, bearing and key if installed from spindle (detail B).
   H. Clean spindle and all removed parts of sealant, primer, corrosion preventive compound, grease and other soils.
4. Install Outboard Midflap Carriage Spindle Bearing or Roller (Fig. 801)
   A. On airplanes with keyed bearing, install bearing as follows:
      (1) Apply corrosion preventive compound to spindle and bore of bearing (Detail B). Install bearing and key on spindle.
      (2) Clean excess corrosion preventive compound from aft end of bearing and spindle.
      (3) Apply fillet of BMS 5-95 sealant between aft end of bearing and spindle before installing washer.
      (4) Install washer and nut and tighten as follows:
         (a) On airplanes with 1.30 inch long bearing, tighten nut 40 to 200 pound-inches.
         (b) On airplanes with 1.18 inch long bearing, tighten nut 40 to 200 pound-inches.



DETAIL A

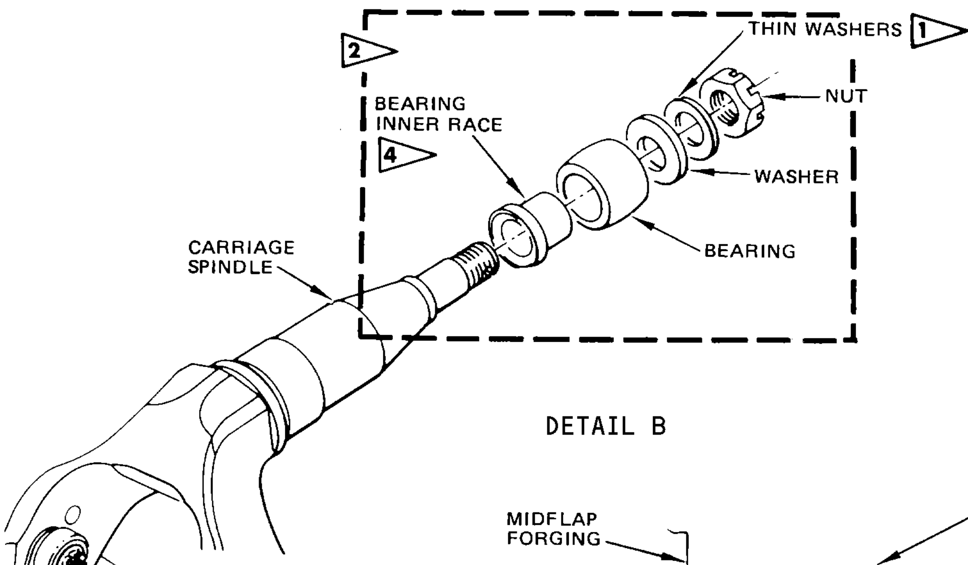
Outboard Midflap Carriage Spindle Bearing Installation
Figure 801 (Sheet 1)



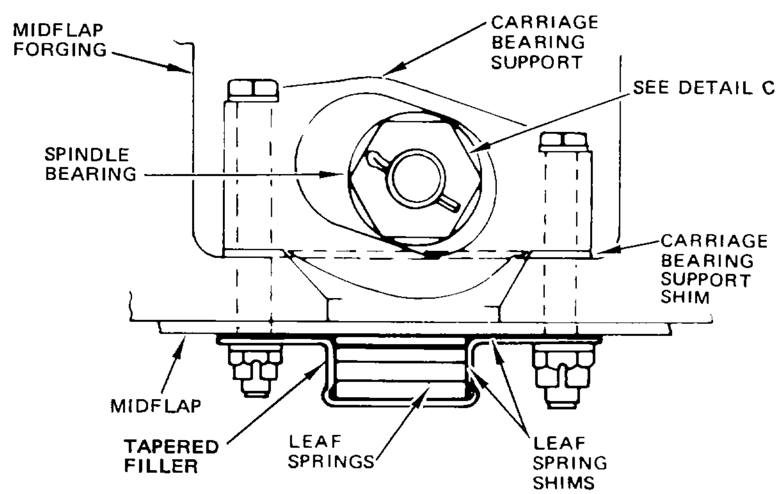


5 INSTALL LOCKWIRE THROUGH CLEVIS PIN. MAKE APPROXIMATELY ONE TWIST AND WRAP EACH END AROUND NUT, BRINGING ONE END AROUND CLEVIS PIN BETWEEN HEAD AND WASHER AND TWIST ENDS.

DETAIL C



DETAIL B



SECTION A-A

1 USE AS REQUIRED TO ALIGN LOCKING HOLES WITH NUT TIGHTENED TO REQUIRED TORQUE

2 AIRPLANES WITH BEARING AND BEARING INNER RACE

3 AIRPLANES WITH KEYED BEARING

4 APPLY FILLET OF BMS 5-95 SEALANT BETWEEN SPINDLE AND BEARING, OR BEARING INNER RACE. DO NOT GET SEALANT ON MOVEABLE BEARING

Outboard Midflap Carriage Spindle Bearing Installation
Figure 801 (Sheet 2)

(5) Apply fillet of BMS 5-95 sealant between bearing and spindle on forward end per Detail B.
(6) If locking holes in nut and spindle do not align with nut tightened as required, install thin washer under nut and retighten. Install clevis pin and lockwire.
(7) Clean excess corrosion preventive compound from forward end of bearing and spindle.
(8) Apply grease liberally around slotted hole in carriage bearing support and on bearing periphery.

B. On airplanes with bearing and bearing inner race, install bearing as follows:
(1) On airplanes with key slot in spindle, fill key slot with BMS 5-95 sealant.
(2) Apply primer to spindle and bore of bearing inner race (Detail B) and install bearing inner race on spindle with wet primer.
(3) Install bearing on inner race.
(4) Clean excess primer from aft end of inner race and spindle.
(5) Apply fillet of BMS 5-95 sealant between aft face of inner race and spindle before installing washer.
(6) Install washer and nut and tighten 150 to 300 pound-inches. Remove excess sealant from moveable bearing.
(7) If locking holes in nut and spindle do not align with nut tightened as required, install thin washer under nut and retighten. Install clevis pin and lockwire.
(8) Clean excess primer from forward end of bearing inner race and spindle.
(9) Apply fillet of BMS 5-95 sealant between forward face of inner race and spindle. Do not get sealant on moveable bearing.
(10) Apply grease liberally around slotted hole in carriage bearing support and on bearing periphery.

C. Install carriage bearing support, together with all shims which were tagged with correct thickness and location and when bearing was removed. Tighten 3/8-inch nut 160 to 190 pound-inches and 5/16-inch nut 100 to 140 pound-inches.

NOTE: If thickness and location of shims are unknown, refer to 27-51-72, A/T, to determine shim requirements. If carriage bearing support interferes with flap structure, install support fitting in unison with bearing or before installing bearing on aft end of carriage spindle.

D. Apply BMS 5-79 sealant to carriage access panel and midflap faying surface and install access panel above carriage spindle.

E. Provide system A hydraulic power (Ref 27-51-0, MP), retract flaps and remove system A hydraulic power (Ref 27-51-0, MP).

OUTBOARD AFTFLAP - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-41/201)
   B. Outboard Flap Rigging Tools:
      (1) Outboard Flap Rigging Beam - F80209-2 (Preferred)

         NOTE: F80209-2 is contained in the F80209-1 Beam Set.

      (2) Outboard Flap Rigging Tool - TE65-73720-1 and -2 (Optional)
   C. Sealant - BMS 5-79, Class C (Ref 20-30-11)
2. Prepare Outboard Aftflap for Removal
   A. Pressurize hydraulic system A (AMM 27-51-0/201).
   B. Position flap control lever to FLAP DOWN detent.
   C. Depressurize hydraulic system A (AMM 27-51-0/201).
   D. Remove four aftflap track access panels from midflap upper trailing edge.
3. Remove Outboard Aft flap
   A. Remove bolts connecting pushrods to aft flap (Fig. 401).
   B. Remove bolt attaching bottom flight rollers to roller support fitting.
   C. Roll flap aft, lift trailing edge and remove from flap tracks.
   D. Attach bottom flight rollers to roller support fitting.
4. Install Outboard Aft flap
   A. If existing bushings and bolts are to be used, check allowable wear (AMM 27-51-91/601).
   B. Remove bolt attaching bottom flight rollers to roller support fitting (Fig. 401).
   C. Lift flap onto tracks and install bolt attaching bottom flight rollers to roller support. Tighten the thinner nut 30 to 40 pound-inches (Ref .282 thickness).

      NOTE: Tighten the thicker nut to 60 to 85 pound-inches (Ref .329 thickness).

   D. Check that forward and aft deadweight rollers are contacting aftflap track flanges and that 0.000 to 0.025 inch gap exists between aftflap track and forward and aft flight rollers.
   E. If gap between aftflap track and aft flight rollers is incorrect, adjust aft deadweight rollers as follows (Detail A and B, Fig. 401):
      (1) Remove cotter pin, nut, and washer from aft deadweight roller bolt.
      (2) Partially extract eccentric bushing to disengage lock.
      (3) Rotate eccentric bushing to obtain adjustment and engage lock.

         NOTE: Eccentrics must be adjusted equally on both sides of track.

(4) Secure deadweight roller bolt with washer and nut. Tighten nut 12 to 15 pound-inches.

F. If gap between aftflap track and forward flight rollers is incorrect, adjust forward deadweight roller as follows (Detail A and B, Fig. 401):

(1) Remove cotter pin, nut, and washer from forward deadweight roller bolt.

(2) Partially extract eccentric bushing to disengage lock.

(3) Rotate eccentric bushing to obtain adjustment and engage lock.

NOTE: Eccentrics must be adjusted equally on both sides of track.

(4) Secure deadweight roller bolt with washer and nut. Tighten nut 12 to 15 pound-inches.

G. Apply 15 to 30 pounds downward force against a minimum 4.0 by 5.0 inches aluminum plate on aft edge of upper surface of aftflap at each track and check that forward and aft deadweight rollers are contacting aftflap track flanges and that forward and aft flight rollers clear track flanges.

H. Apply 15 to 30 pounds upward force against a minimum 4.0 by 5.0 inches aluminum plate on aft edge of lower surface of aftflap at each track and check that forward and aft flight rollers are contacting aftflap track flanges and that forward and aft deadweight rollers clear track flanges.

I. Check that 0.000 to 0.025 inch gap exists between aftflap track and forward and aft flight rollers.

J. If incorrect gap exists between aftflap track and forward and aft flight rollers, readjust forward and aft deadweight rollers per steps D. thru D6.

K. Move aftflap forward and aft for full length of travel and check for binding of rollers.

L. If rollers bind, readjust deadweight rollers while maintaining 0.000 to 0.025 inch gap between aftflap track and forward and aft flight rollers.

NOTE: Eccentrics must be adjusted equally on both sides of track.

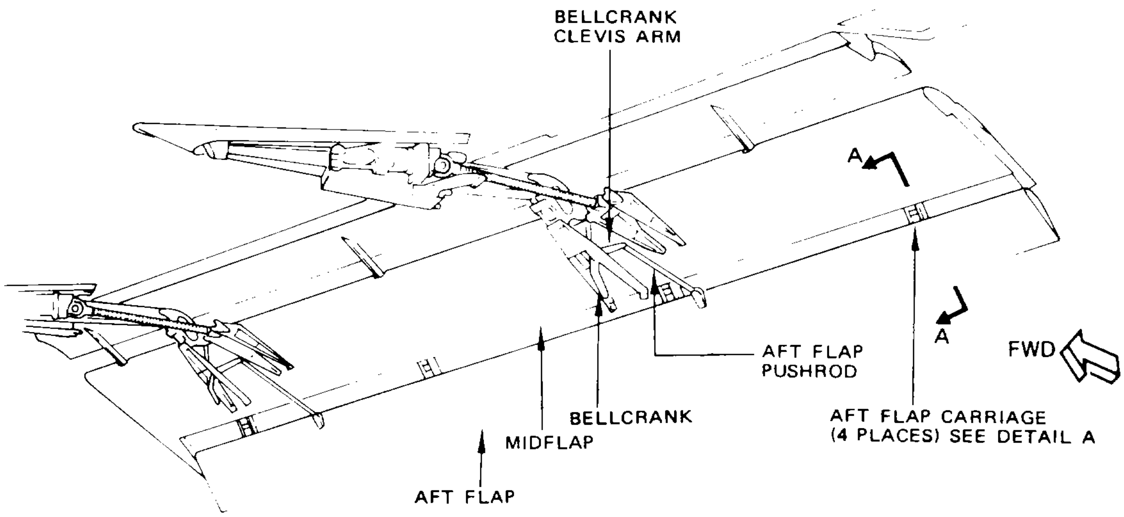
M. Connect pushrods to aftflap with boltheads up. Coat bolts with corrosion preventive compound before installing. Tighten nuts and install cotter pins.

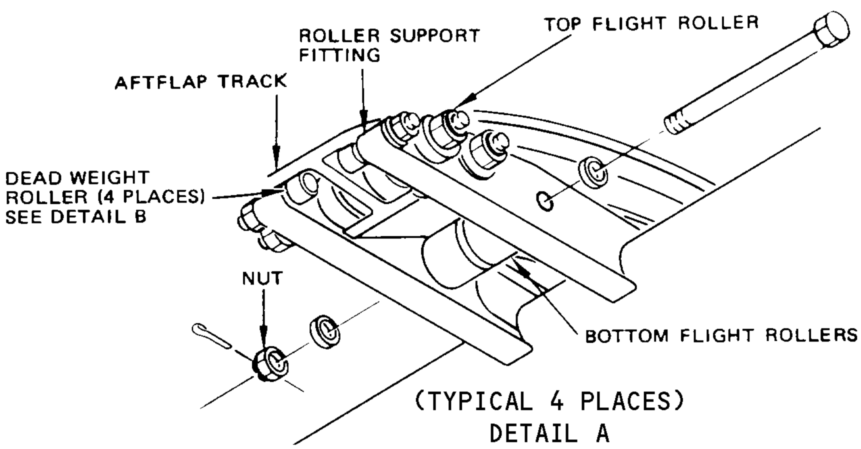
CAUTION: BOLTS MUST BE INSTALLED WITH HEADS UP TO PREVENT BOLTS FROM DAMAGING MIDFLAP AND/OR AFTFLAP PUSHRODS AND AFTFLAP. DO NOT INSTALL WASHERS ON BOLT HEAD. THE WASHER INSTALLATION CAN CAUSE DAMAGE TO THE MIDFLAP AND AFTFLAP.

N. Pressurize hydraulic system A (Ref 27-51-0).

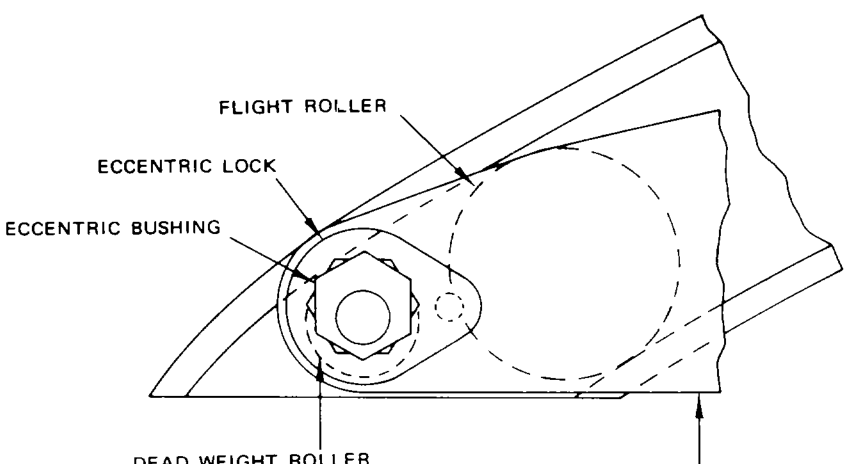
O. Adjust aftflap as follows (Section A-A, Fig. 401).

(1) Retract flaps.



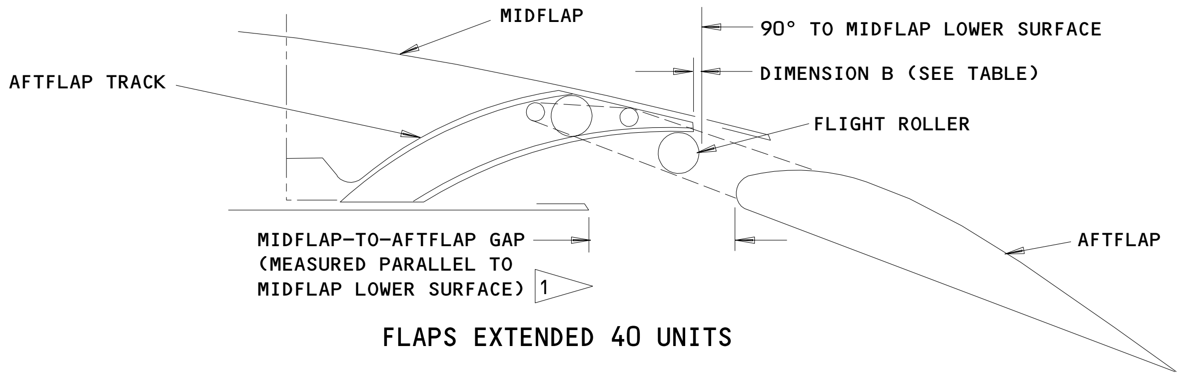


(TYPICAL 4 PLACES)
DETAIL A

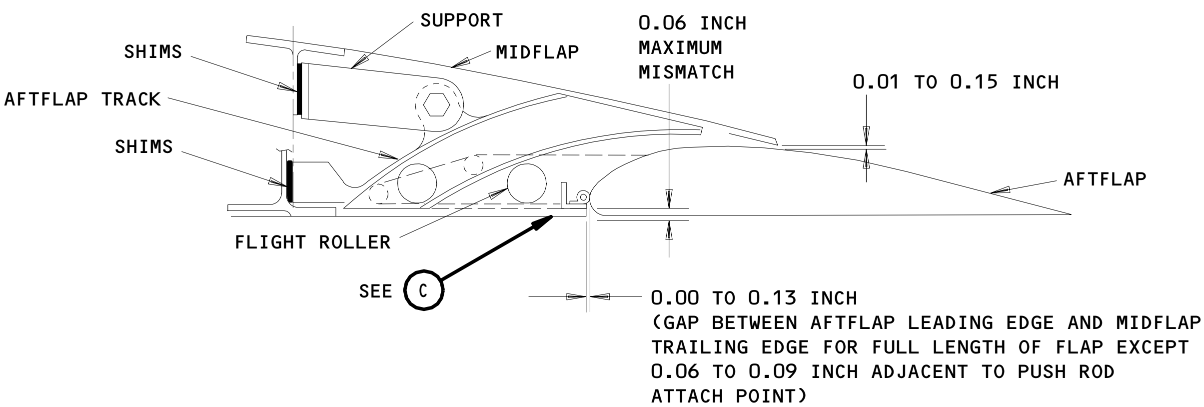


DETAIL B

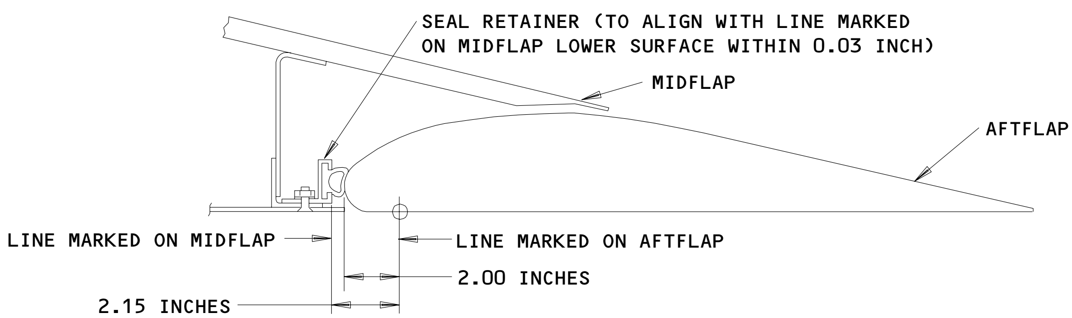
Outboard Flap Aft Flap Installation
Figure 401 (Sheet 1)



FLAPS EXTENDED 40 UNITS



FLAPS RETRACTED
A-A

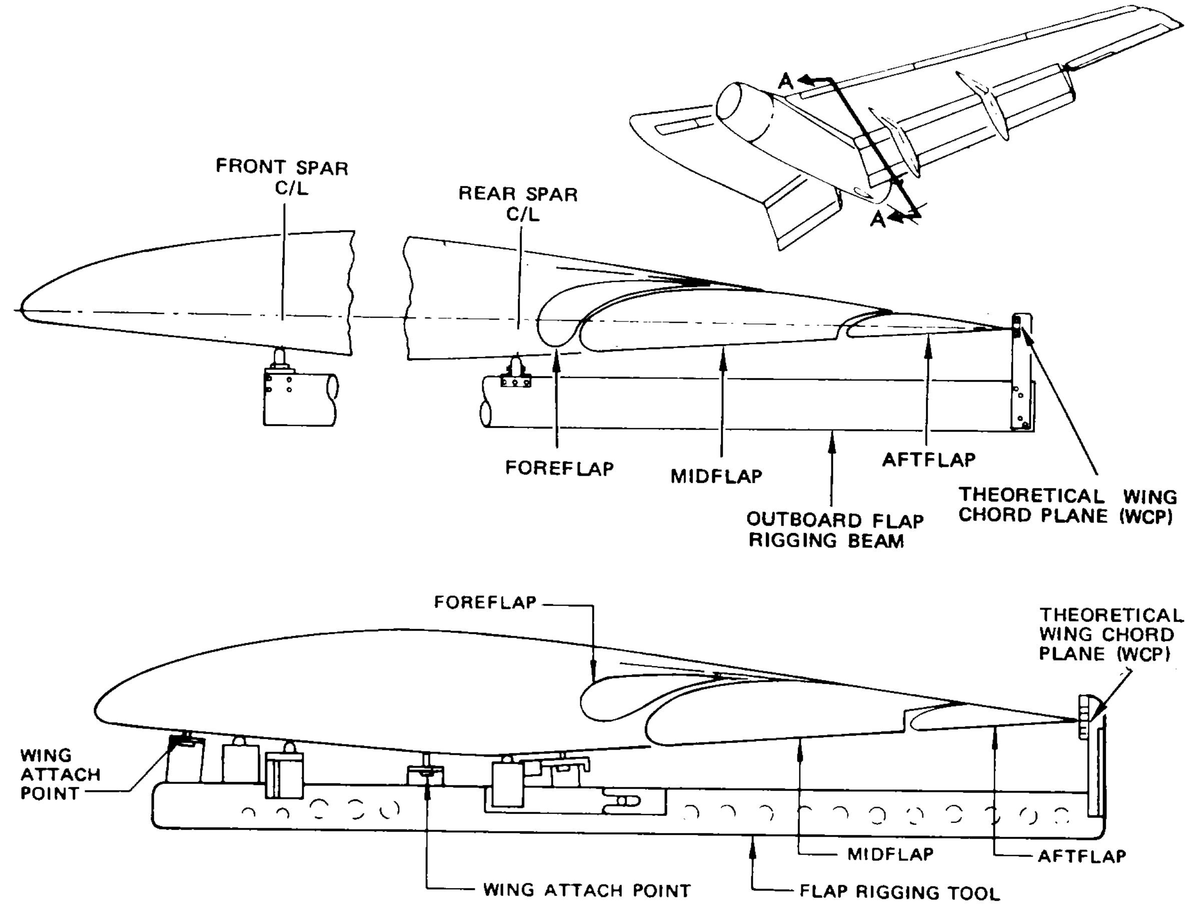


C

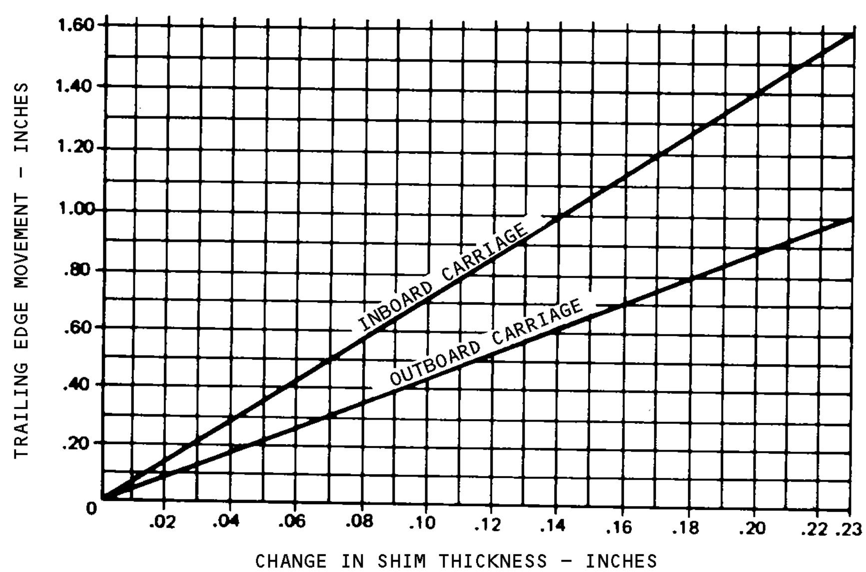
FLIGHT ROLLER LOCATION	DIMENSION B (INCHES)
OUTBD TRACKS (LEFT AND RIGHT WINGS)	0.18 TO 0.41
INBD TRACKS (LEFT AND RIGHT WINGS)	0.00 TO 0.41

1 GAPS AT INBD AND OUTBD ENDS OF LEFT WING AFTFLAPS TO BE EQUAL TO CORRESPONDING GAPS ON RIGHT WING AFTFLAPS WITHIN 0.05 INCH

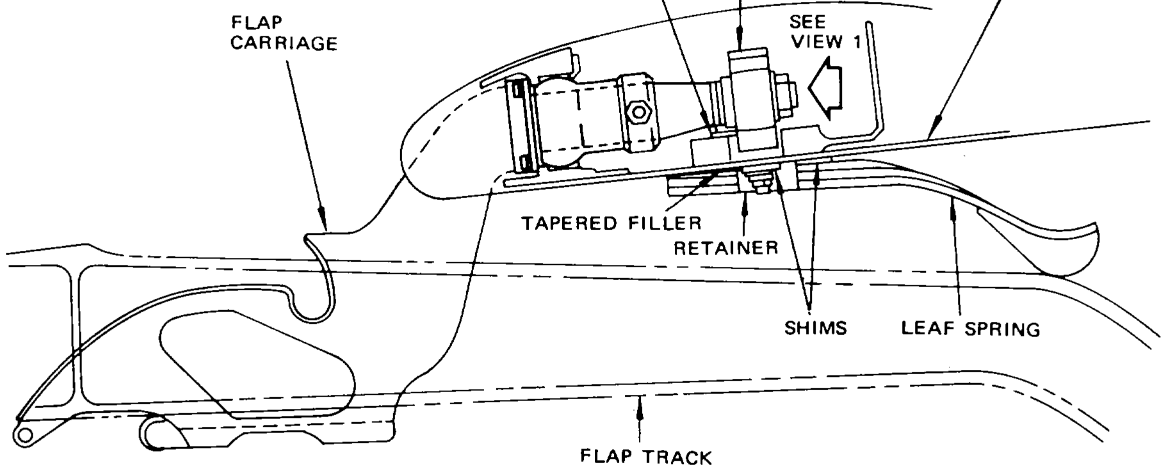
Outboard Flap Aft Flap Installation
Figure 401 (Sheet 2)

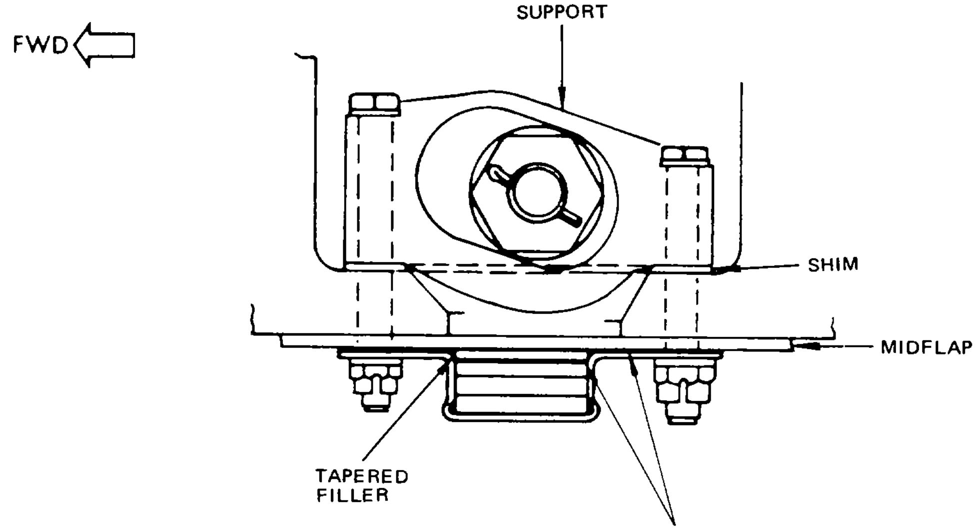


WING SECTION WBL 228.5
SECTION A-A



Outboard Flap Aft Flap Installation
Figure 401 (Sheet 3)





VIEW 1

Outboard Flap Aft Flap Installation
Figure 401 (Sheet 4)

(2) Check that aftflap leading edge-to-midflap trailing edge gap is as shown.
(3) Check that mismatch between lower surface of midflap and aftflap is as shown.
(4) Check that gap between midflap trailing edge and aftflap upper surface is as shown.
(5) Check that lower surface of midflap and aftflap are parallel.
(6) Shim aft track and or support and adjust aftflap pushrods to obtain specified dimensions.

P. Position flap control lever to FLAPS DOWN (40-unit) position.

Q. Remove system A hydraulic power and depressurize hydraulic system A (Ref 27-51-0).

R. Check that mid-to-aftflap gaps are per section A-A. Adjust gaps, if required, as follows:
(1) Adjust aftflap bellcrank clevis arm at both flap track fairings on one or both wings as necessary to obtain correct initial gap. Ensure that dimension B remains within limits (section A-A).
(2) Retract flaps by providing system A hydraulic power (Ref 27-51-0), retracting flaps to FLAPS UP position and removing system A hydraulic power (Ref 27-51-0).
(3) Check that aftflap leading edge to midflap trailing edge gap is per Section A-A. If necessary, adjust aftflap pushrods at both flap track fairings to obtain correct gap.
(4) Extend flaps to 40 units and ensure that mid-to-aftflap gaps and dimension B remain unchanged.

S. Retract flaps.

T. Adjust aftflap trailing edge as follows (Fig. 402):
(1) Retract flaps.
(2) Remove plug screws and attach outboard flap rigging tool at location marked by black arrows at WBL 228.5 or hand position outboard flap rigging beam to black stripes located at WBL 228.5 on front and rear spar.

NOTE: If black stripes are not on airplane, stencil 0.25 inch wide stripes per tool drawing F80209.

(3) Check that gap between aftflap trailing edge and fairing sidewall, on both sides of fairing is 0.10 inch. If not, adjust fairing supports.

NOTE: Excessive pressure from fairing will lift trailing edge of fairing.

(4) Apply 30-pound upward force against a minimum 4.0 by 6.0 inch aluminum plate at aft edge of aftflap near aftflap track rollers to hold aftflap in retracted position and measure flap position at flap rigging tool and fixed rib at outboard end of flap. Check that flap trailing edge is 0.00 to 0.25 inch below wing chord plane with aftflap airload rollers contacting flap track. Check that flap is symmetrical within 0.10 inch of opposite flap wing chord plane alignment.

NOTE: If this dimension cannot be achieved without exceeding the 0.23-inch maximum allowable shim thickness, use a 0.23-inch shim regardless of the flap position relative to the wing chord. If you have made trim corrections with the outboard TE flaps, the dimension can be more than the 0.00 to 0.25-inch limit. The aftflap is in the retracted position when the clearance between the lower trailing edge of the midflap and the leading edge of the aftflap is 0.00 to 0.13-inch for the full length of the aftflap.

(5) If flap trailing edge is not within limits, refer to chart and determine shim thickness required to position flap trailing edge 0.00 to 0.25 inch below wing chord plane. Inboard and outboard carriage shims should be equal within 0.12 inch.

NOTE: Inboard and outboard carriage shims may be changed to within 0.120 inch after first flight to achieve straight and level flight, however, thickness of shim cannot exceed 0.23 inch.

(6) Remove access panels from upper surface of midflap to gain access to each carriage bearing support.
(7) Remove bolts attaching carriage bearing support to midflap forging.
(8) Position carriage bearing support over end of flap carriage with correct shim thickness installed between carriage support and midflap forging, install bolt with washer and nut. Tighten 3/8-inch nut 160 to 190 pound-inches and tighten 5/16-inch nut 100 to 140 pound-inches.
(9) Remove outboard flap rigging tool and install plug screws if required.

U. Apply sealant to access panel and midflap faying surface and install access panels at midflap upper trailing edge.
V. Check for correct aftflap leading edge seal compression as follows (Detail C, Fig. 401):
(1) With flap extended, mark a line on lower surface of aftflap 2.00 inches aft of leading edge.
(2) Retract flap, then mark a line on lower surface of midflap 2.15 inches forward of line marked on aftflap.

(3) Extend flap and check that aft face of seal retainer aligns with line marked on midflap.
(4) If seal retainer does not align, loosen screws and position seal retainer to obtain correct position. Tighten screws.

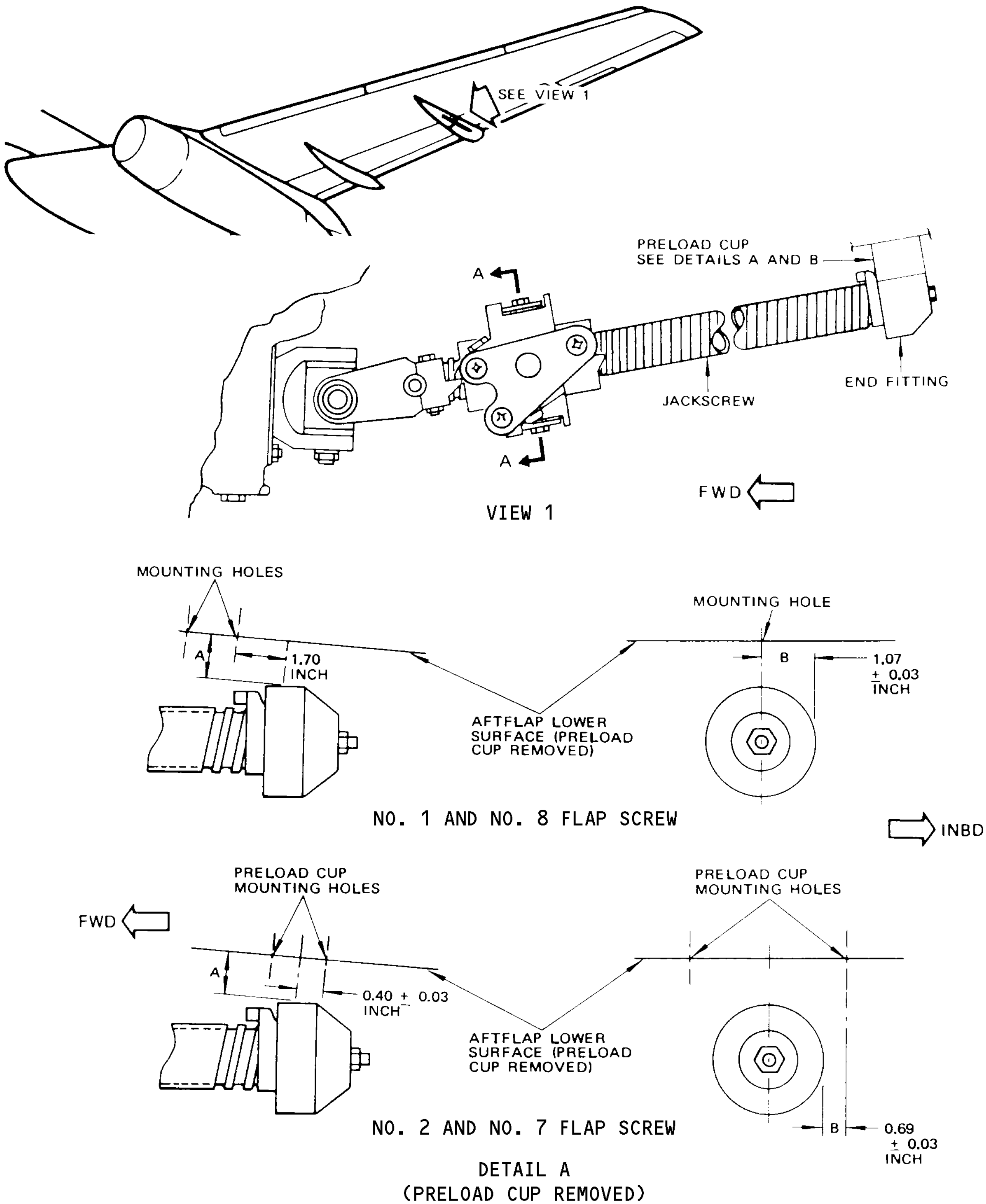
W. Adjust flap jackscrew preload pad (Fig. 403)
(1) If installed, remove aft fairing.
(2) Remove flap jackscrew preload pad from aftflap.
(3) With flaps retracted, measure dimension B. If dimension B is not within limits adjust shims in gimbal as follows:
(a) Position flap control lever to FLAP DOWN detent.
(b) Support flap so that weight of flap is off trunnions. Loosen gimbal bushing clamp-up bolts, remove gimbal bushing retaining bolts and slightly withdraw horizontal bushings to free shims. Adjust shim laminations to attain dimension B (Section A-A, Fig. 403).

NOTE: A 0.003-inch shim lamination will change dimension B 0.0167 inch. Transfer shim equally to maintain 0.006- to 0.010-inch clearance between bushings and gimbal. Also clearance between midflap gimbal attach fittings and gimbal shall be 0.01 inch minimum.

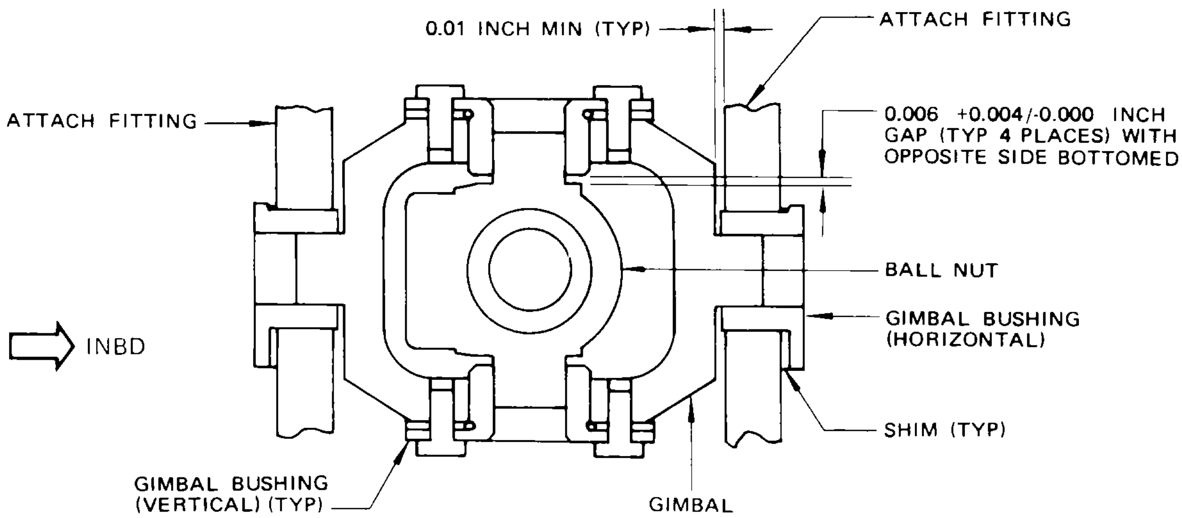
(c) Install gimbal bushing retaining bolts and tighten gimbal bushing clamp-up bolts 60 to 85 pound-inches.
(4) With flaps extended, check that jackscrew end fitting has 0.03 inch minimum vertical clearance with fitting on midflap. If clearance is not adequate, adjust ball nut shims as follows:
(a) Support flap so that weight of flap is not on trunnions. Remove ball nut bushing retaining bolts and slightly withdraw vertical bushings to free shims. Adjust shims laminations to attain clearance.

NOTE: Transfer shims equally to maintain 0.006 to 0.010 inch between bushings and ball nut.

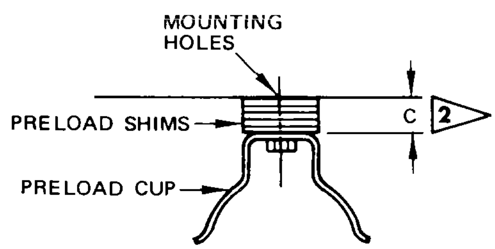
(b) Install ball nut bushing retainer bolts in gimbal.
(5) Position flap control lever to FLAP UP detent to retract flaps.
(6) During retraction check that flap jackscrew clears all linkage and structure.
(7) With flaps retracted place up load on aftflap and measure dimension A.
(8) Position flap control lever to 1-unit position to partially extend flaps.



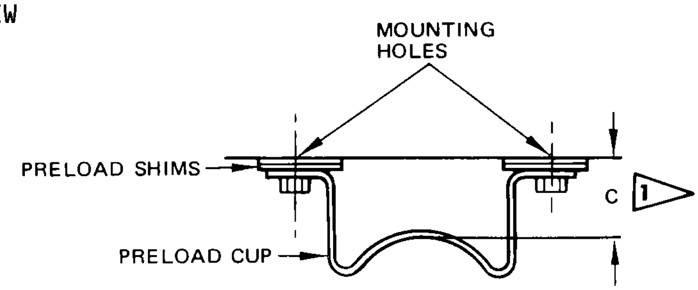
Flap Jackscrew Preload Pad Adjustment
Figure 402



SECTION A-A



NO. 1 AND NO. 8 FLAP SCREW PRELOAD CUP



NO. 2 AND NO. 7 FLAP SCREW PRELOAD CUP

1 DIMENSION C MUST EQUAL DIMENSION A PLUS 0.04 TO 0.08 INCH (SEE DETAIL A FOR MEASUREMENT OF DIMENSION A)

2 DIMENSION C MUST EQUAL DIMENSION A MINUS 0.52 TO 0.56 INCH

INBD

DETAIL B

Flap Jackscrew Preload Cup Adjustment
Figure 403

(9) Install flap jackscrew preload pad and shim so that dimension C is as specified (Fig. 403).

NOTE: If dimension C is greater than specified when no shims are installed, dimension A may be increased, as required, per step (4).

(10) Position flap control lever to FLAP UP detent.
(11) Check that flap jackscrew end fitting enters preload pad slightly before flap full up position and seats firmly against preload pad when flap is retracted.
(12) Position aft fairing on center fairing and install attaching screws.

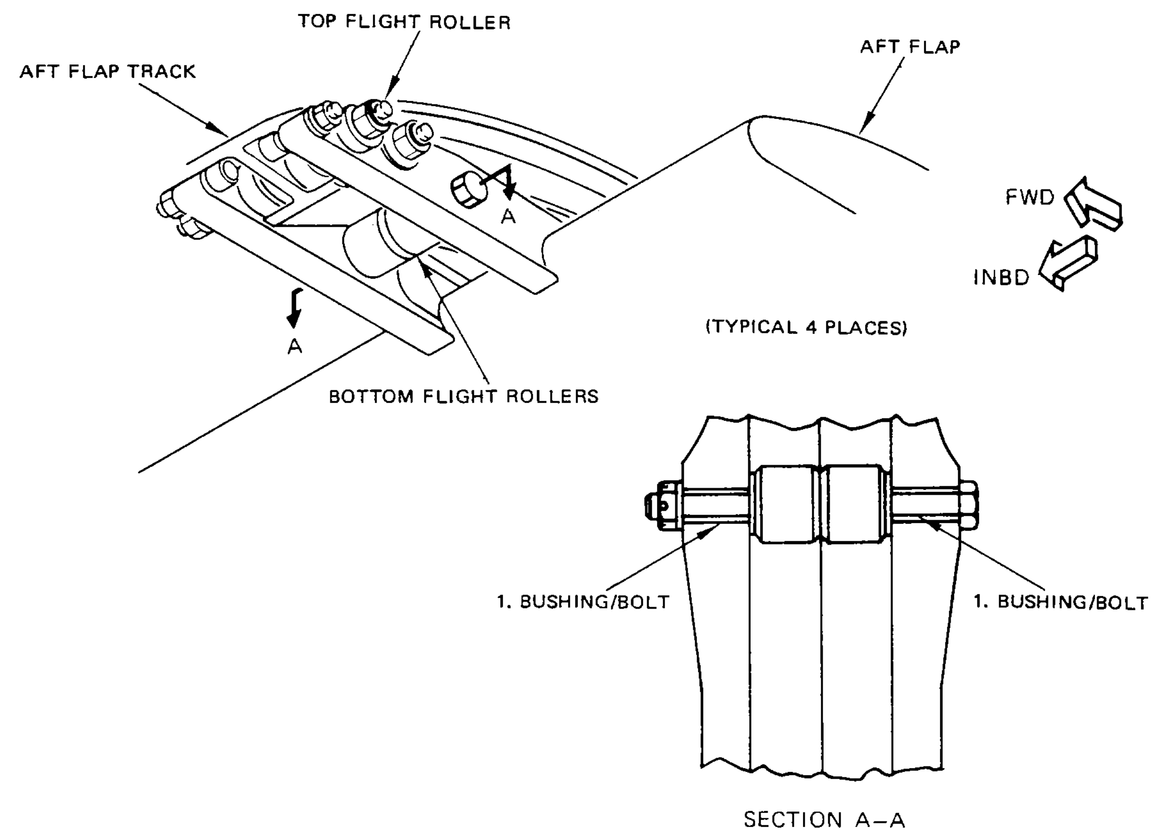
X. Check aftflap operates smoothly with no binding or structural interference.

5. Restore Airplane to Normal Configuration

A. Position flap control lever to FLAP UP detent.
B. Depressurize hydraulic system A (Ref 27-51-0, Maintenance Practices).

OUTBOARD TRAILING EDGE AFTFLAP - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There will be no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Outboard Trailing Edge Aftflap, Removal/Installation for this information.
2. Outboard Trailing Edge Aftflap Wear Limits (Fig. 601)



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.2490	0.2510	0.2545	0.0050	X		
	BOLT	OD	0.2485	0.2495	0.2440		X		

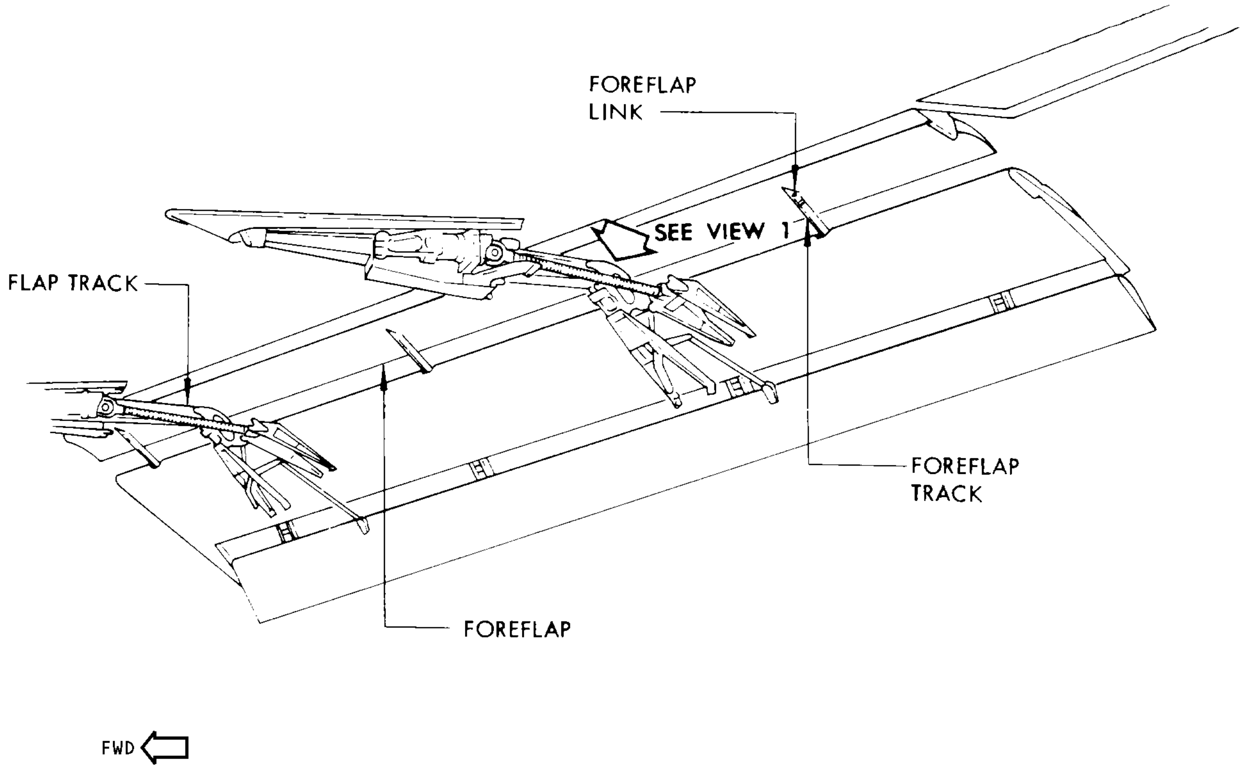
Outboard Trailing Edge Aft Wear Limits
Figure 601

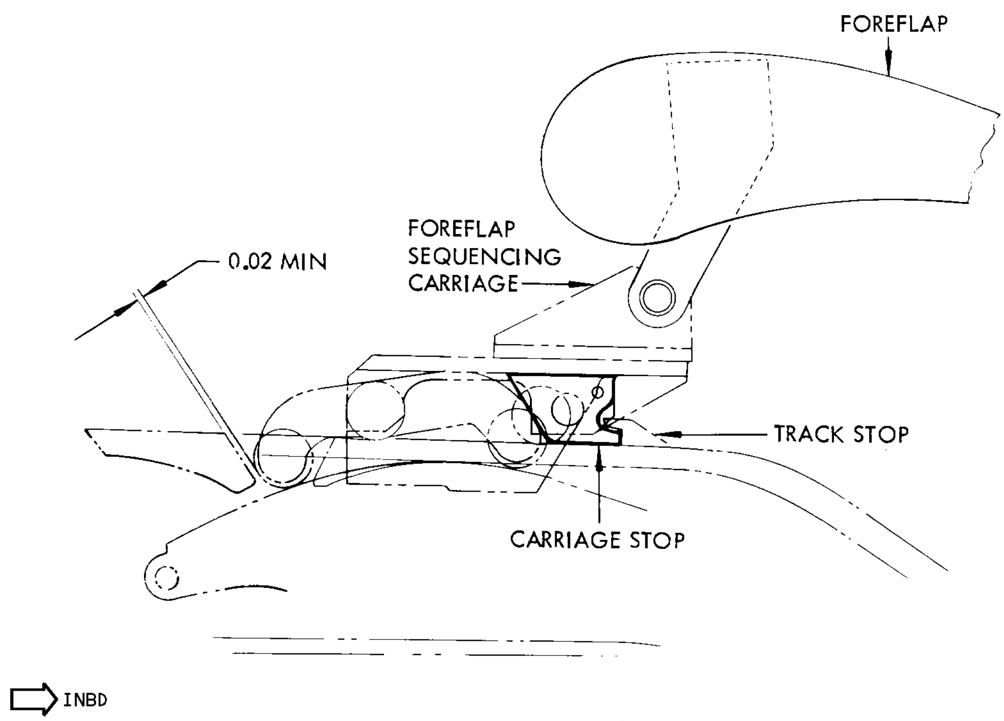
OUTBOARD FOREFLAP - REMOVAL/INSTALLATION

1. General
   A. The upper leading edge of the foreflap is finished with an abrasion resistant teflon coating. If repair of teflon coating is required, refer to Chapter 51, Abrasion Resistant Teflon Finish system.
2. Remove Outboard Foreflap
   A. Provide system A hydraulic power. Refer to 27-51-0, Trailing Edge Flaps - Maintenance Practices.
   B. Position flap control lever to FLAP DOWN (40-unit) detent, to extend flaps.
   C. Remove system A hydraulic power. Refer to 27-51-0.
   D. Remove bolts attaching foreflap to foreflap sequencing carriage at each flap track. (See figure 401.)
   E. Remove bolts attaching each foreflap link assembly to foreflap track and remove foreflap.

   NOTE: Foreflap weighs approximately 64 pounds.

3. Install Outboard Foreflap
   A. Align foreflap fitting with lugs on each sequencing carriage and install bolts. (See figure 401.) Secure bolt with washer and nut. Tighten nut to 60-85 pound-inches and install cotter pin.
   B. Install bolts connecting foreflap links to foreflap tracks.
   C. With sequencing carriage engaged to stop on track and dead weight rollers contacting upper surface of track, check that outside diameter of toggle roller shall clear the forward slope of slot by at least 0.020 inch.
   D. Provide system A hydraulic power. Refer to 27-51-0.
   E. Position flap control lever to FLAP UP detent.
   F. Check that foreflap retracts evenly with no binding.
   G. Remove system A hydraulic power. Refer to 27-51-0.
   H. Check gap between trailing edge of foreflap and top of midflap (flaps retracted). Gap is to be 0.03 inch minimum. If gap is not within limits, defective foreflap (or midflap) is indicated. Replace defective part.





VIEW 1

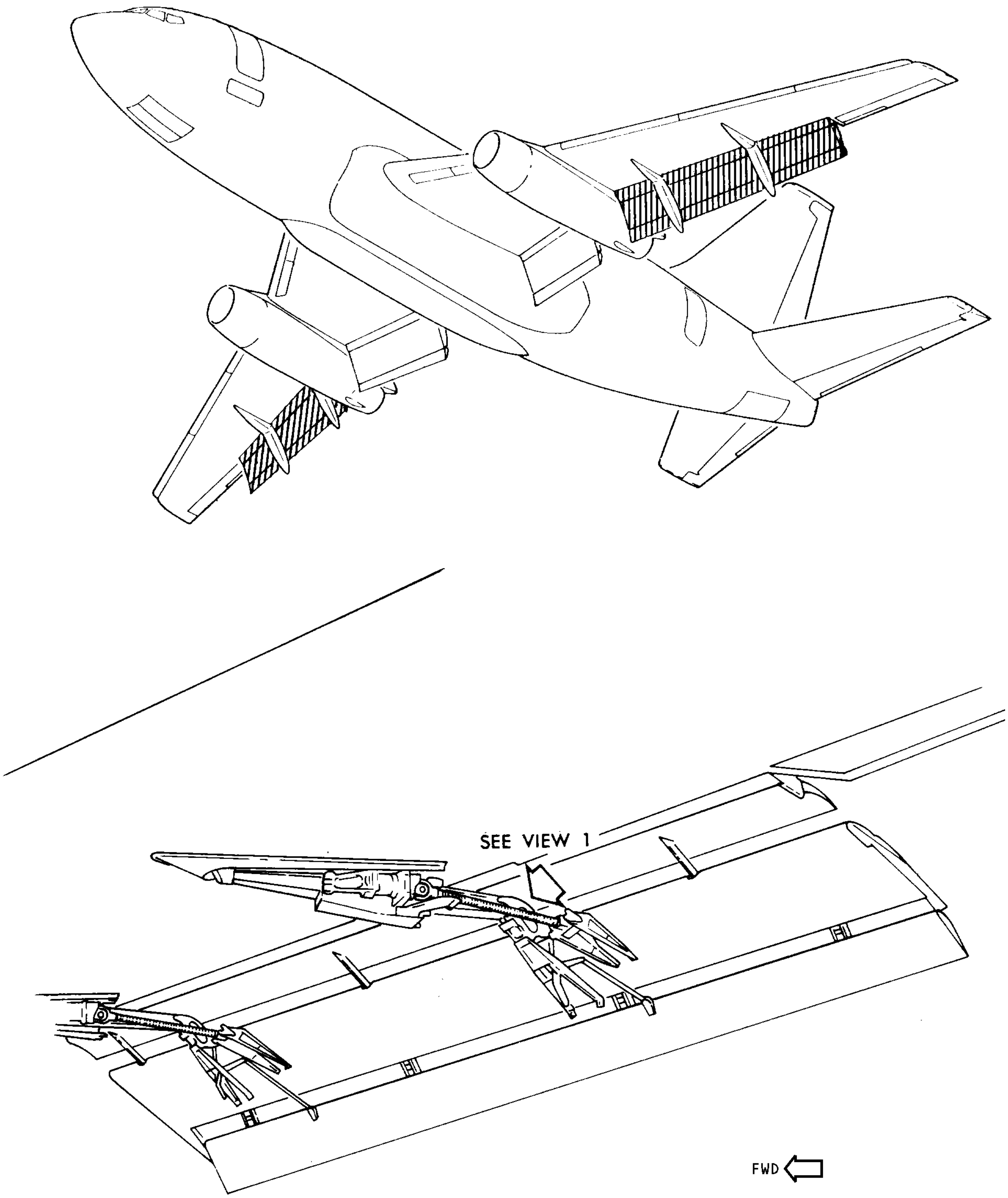
Outboard Foreflap Installation
Figure 401

OUTBOARD FOREFLAP SEQUENCING CARRIAGE - REMOVAL/INSTALLATION

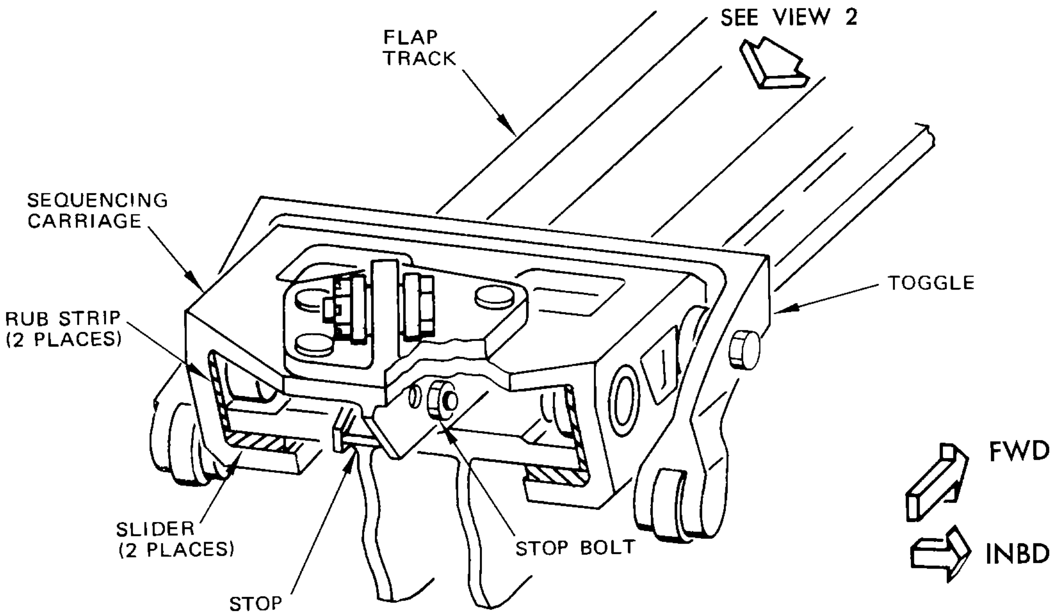
1. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Grease - MIL-G-21164 (Alternate)
2. Remove Outboard Foreflap Sequencing Carriage
   A. Remove outboard trailing edge flap (Ref 27-51-72).
   B. Remove bolt and pin attaching stop to sequencing carriage (Fig. 401).
   C. Remove bolts attaching toggle to sequencing carriage.
   D. Remove aft rollers from carriage.
   E. Move the sequencing carriage aft and down to remove it from the flap track.
3. Install Outboard Foreflap Sequencing Carriage
   A. If existing bushings, bolts, rubstrips or sliders are to be used, check allowable wear (Ref 27-51-111 I/C).
   B. Tighten the slider attachment fasteners 20 to 30 pound-inches.

      NOTE: Do not exceed 30 pound-inches to install the lockwire in the fastener heads. A 0.020 inch diameter lockwire is optional to the 0.032 inch diameter lockwire at the slider attachment fasteners. Use one washer if needed to achieve bolt torque requirements.

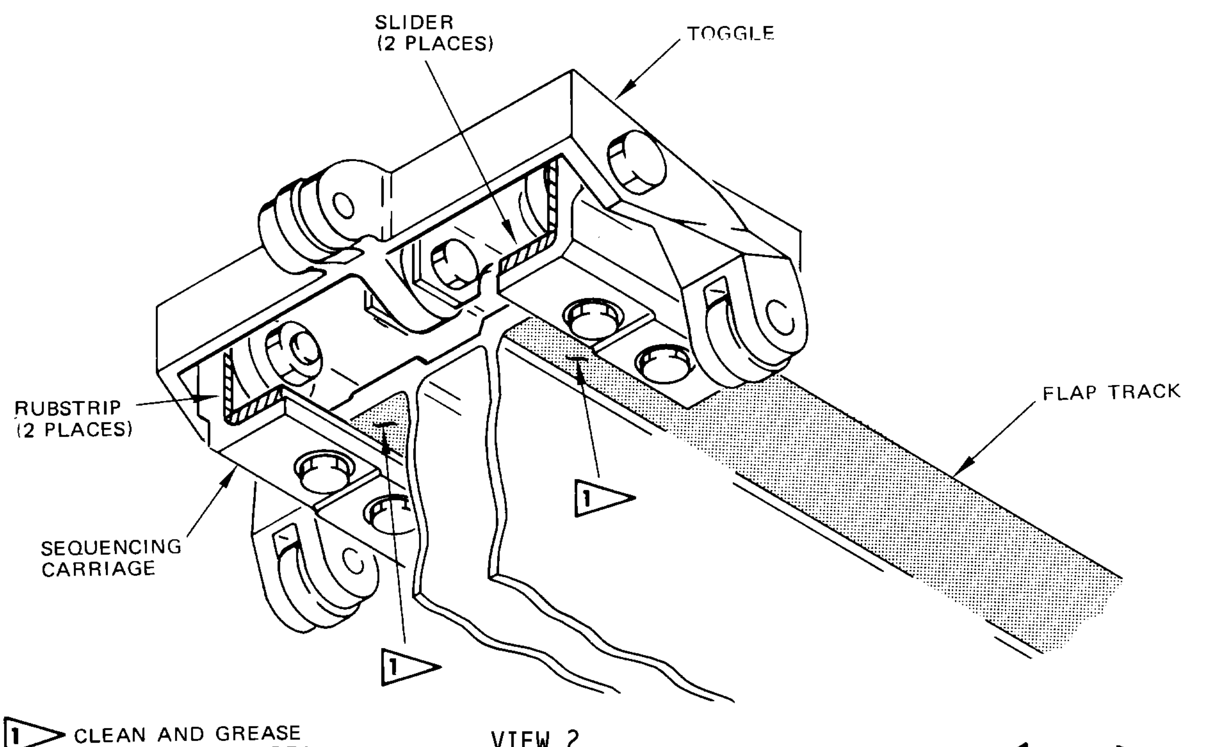
   C. Clean and grease the underside of the sequence carriage track for complete length of travel, making sure that any metal that may have transferred from the carriage rubstrip to the track is removed.
   D. Align sequencing carriage with upper flanges of track and roll forward past track stop.
   E. Install new or used rubstrips as necessary.
   F. Install stop on sequencing carriage. Secure with bolt and pin (Fig. 401).
   G. Install aft rollers on carriage.
   H. Install bolts attaching toggle to sequencing carriage.
   I. Install outboard trailing edge flap (Ref 27-51-72).



Outboard Foreflap Sequencing Carriage Installation
Figure 401 (Sheet 1)



VIEW 1



1 CLEAN AND GREASE TRACK IN THIS AREA

VIEW 2

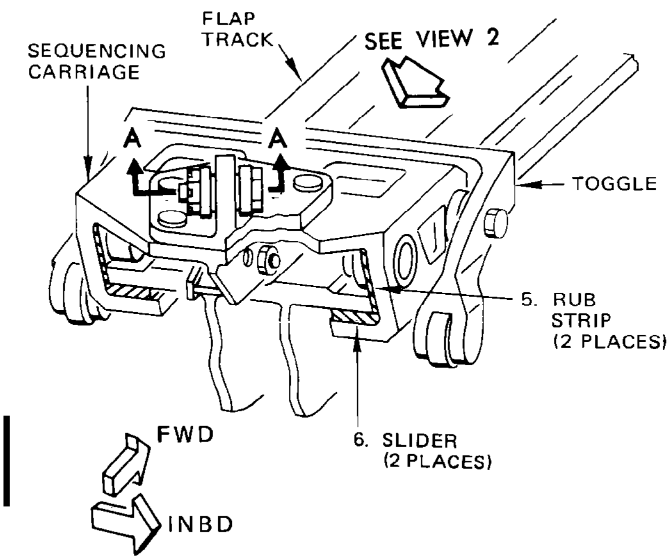
FWD INBD

Outboard Foreflap Sequencing Carriage Installation
Figure 401 (Sheet 2)

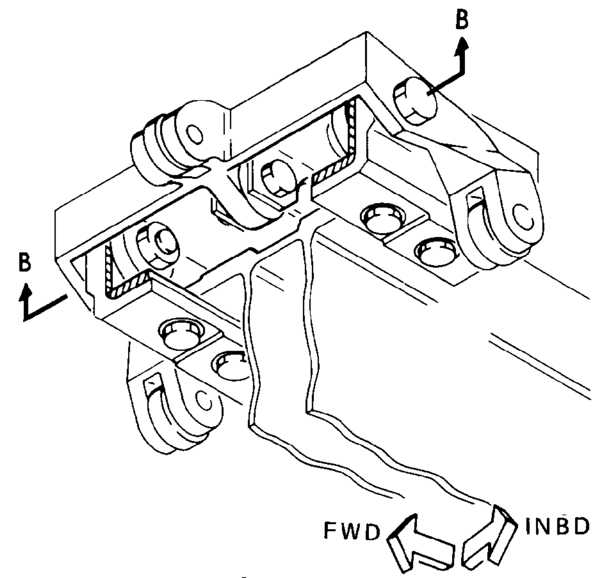
468626

OUTBOARD FOREFLAP SEQUENCING CARRIAGE - INSPECTION/CHECK

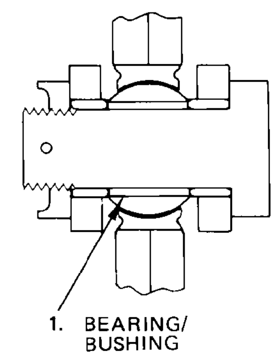
1. General
   A. This data consists of illustrations and a wear limit chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Outboard Foreflap Carriage - Removal/Installation.
2. Outboard Foreflap Sequencing Carriage Wear Limits (Fig. 601)



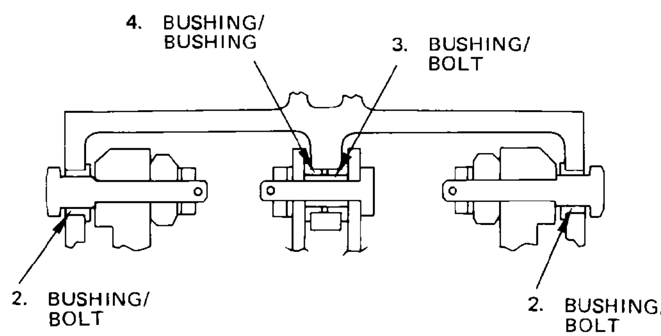
VIEW 1



VIEW 2



SECTION A-A



SECTION B-B

Outboard Foreflap Sequencing Carriage Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.4370	0.4375	0.4405	0.0040	X		
	BUSHING	OD	0.4355	0.4365	0.4330		X		
2	BUSHING	ID	0.3750	0.3765	0.3805	0.0060	X		
	BOLT	OD	0.3735	0.3745	0.3690		X		
3	BUSHING	ID	0.2500	0.2540	0.2605	0.0110	X		
	BOLT	OD	0.2485	0.2495	0.2390		X		
4	BUSHING	ID	0.3750	0.3765	0.3990	0.0230	X		
	BUSHING	OD	0.3650	0.3700	0.3520		X		
5	RUB STRIP	*[1]					X		
6	SLIDER	*[2]					X		

*[1] 0.040 MIN THICKNESS, 0.020 MAX WEAR

*[2]

SLIDER THICKNESS		VARIATION	ALLOWABLE WEAR DIMENSION	
MAX	MIN		FWD END	AFT END
0.145	0.135	0.010	0.120	0.03

Outboard Foreflap Sequencing Carriage Wear Limits
Figure 601 (Sheet 2)

OUTBOARD FLAP TRACK FAIRINGS - REMOVAL/INSTALLATION

1. Remove Flap Track Fairing
   A. Provide system A hydraulic power (AMM 27-51-0, Maintenance Practices).
   B. Position flap control lever to FLAP DOWN (40-unit) detent, and remove system A hydraulic power (AMM 27-51-0).
   C. For forward fairing removal:
      (1) Remove bolts attaching forward fairing to support installation.
      (2) Remove bolts attaching forward fairing to center fairing assembly.
      (3) Remove bolt from jumper cables.
      (4) Remove forward fairing.
   D. Remove access panel from center fairing assembly (Fig. 401).
   E. For outboard fairing:
      (1) Remove screws attaching aft fairing to center fairing assembly.
      (2) Remove landing light electrical connector at forward end of fairing.
      (3) Remove bolts from landing light cam track.
      (4) Remove bolt and cam follower from pushrod attached to cam arm.
   F. Remove bolts and bushings attaching center fairing assembly hinge fitting to fairing support on flap track (Fig. 401).

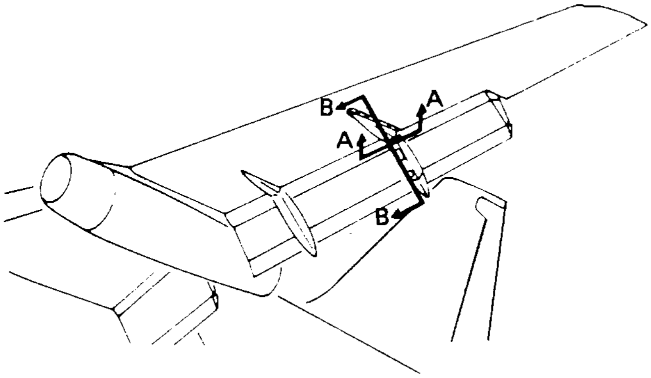
      NOTE: Bushings must be removed from side of clevis with larger hole.

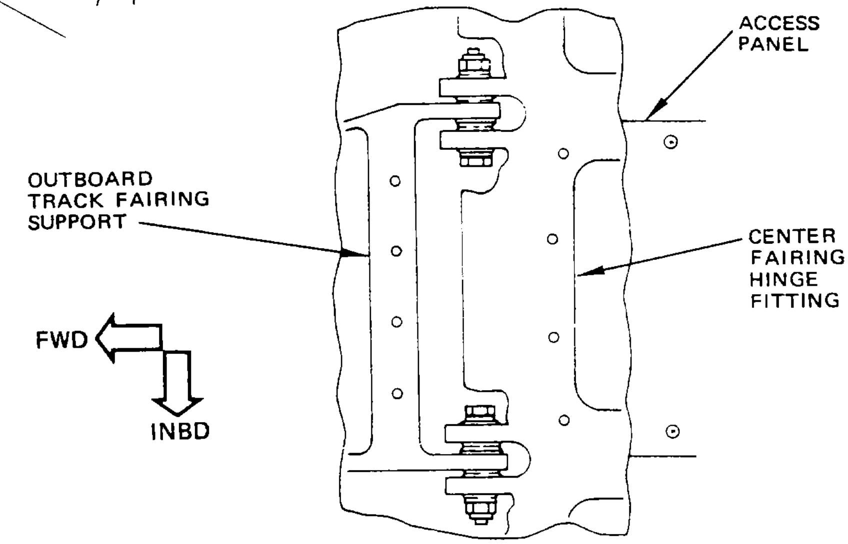
   G. Roll center fairing assembly aft to free fairing tracks from track rollers.
   H. If fairing is being replaced, remove cam track from fairing. Identify shim as to location and retain for installation in new fairing.
2. Install Flap Track Fairing
   A. If existing bushings, bearings and bolts are to be used, check allowable wear (AMM 27-51-121, Inspection/Check).
   B. If removed, install cam track in fairing as follows:
      (1) Provide system A hydraulic power (AMM 27-51-0, Maintenance Practices).
      (2) Retract flaps to full up position.
      (3) Measure and record distance between fairing pivot point and bellcrank pivot point and record as dimension Y (Fig. 401).

         NOTE: Flap track fairing center section must be removed from airplane and flaps fully retracted before dimension Y can be measured.

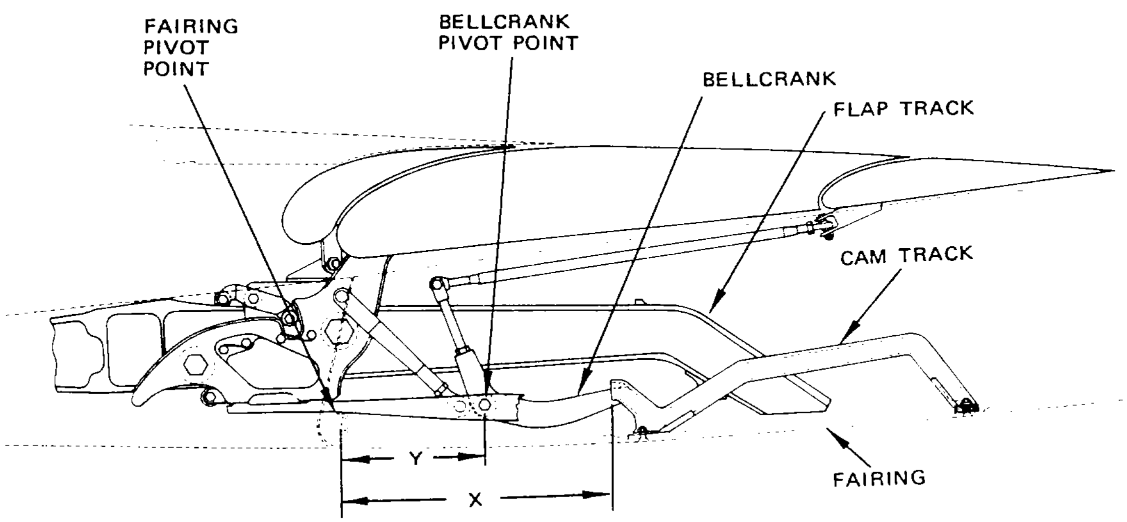
      (4) Extend flaps and remove hydraulic power (Ref 27-51-0).
      (5) Position cam track in fairing as follows:

         NOTE: For initial check, cam tracks should be positioned on serrated plates with bolts in center of slotted holes.



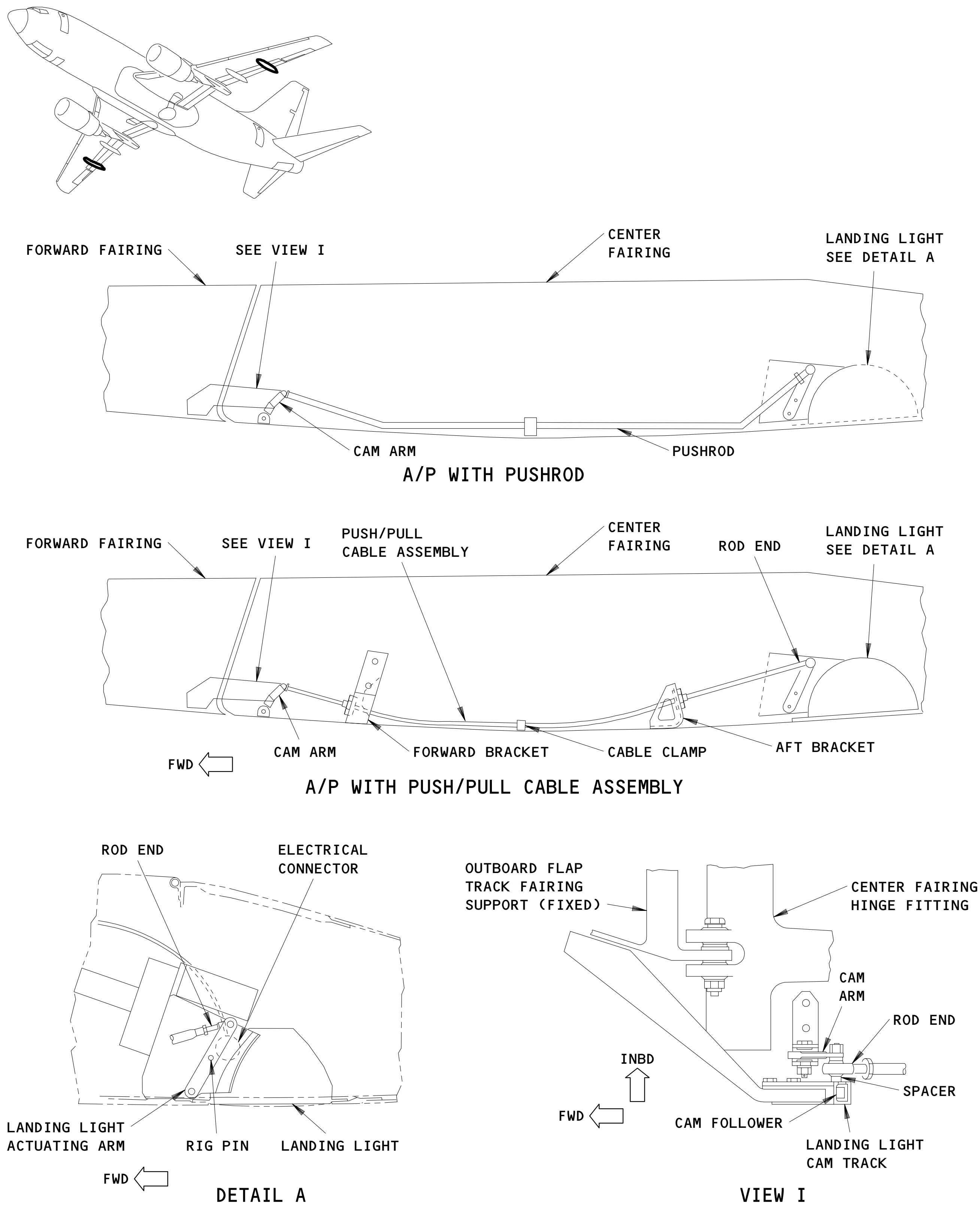


SECTION A-A



SECTION B-B

Outboard Flap Track Fairing Installation
Figure 401



Landing Light Adjustment
Figure 402

(a) Use straight edge and square across fairing tracks to locate cam track parallel to W.B.L.
(b) Install tapered shims and bolts to hold cam track in position.
(c) Check that fairing track is 5.92 to 5.94 inches from cam track on cam side and that parts are parallel. If not , add shims behind fairing track.
(d) Check that dimension between fairing tracks is 11.14 to 11.16 inches and that tracks are parallel. If not, add shims behind fairing track opposite cam side of cam track.

(6) Measure distance between forward end of cam track and fairing pivot point and record as dimension X (Fig. 401).
(7) Check that difference between dimensions X and Y is 5.78 to 6.07 inches for inboard fairing and 5.34 to 5.74 inches for outboard fairing. If not, adjust cam track forward or aft to obtain these dimensions.
(8) Tighten bolts.

C. Engage bellcrank roller with cam track and support arm rollers with fairing tracks.
D. Roll center fairing forward and align hinge fitting with suport fitting on flap track. Install bushings and bolts (Fig. 401).
E. For outboard fairing:
(1) Insert bolt through cam follower, spacer and pushrod and connect to cam arm (Fig. 402).
(2) Engage cam follower with cam landing light track and install bolts in cam track.
(3) Install landing light electrical connector at forward end of fairing.

F. If cam track has been replaced, check cam track roller alignment as follows:
(1) Remove tail cone from fairing.
(2) Provide system A hydraulic power (AMM 27-51-0).
(3) Slowly cycle flaps and check that bellcrank does not interfere with cam track during retraction and extension of flaps. If interference occurs, laminated shims at track attach bolts may be tapered as necessary to provide proper alignment.
(4) Install tail cone.

G. Adjust fairing (AMM 27-51-121 - Adjustment/Test).
H. For forward fairing:
(1) Install bolt for jumper cables
(2) Install bolts attaching forward fairing to support installation.
(3) Install bolts attaching forward fairing to support installation.

3. <u>Restore Airplane to Normal Configuration</u>
A. Position flap control lever to FLAP UP detent.
B. Depressurize hydraulic system A (AMM 27-51-0, Maintenance Practices).

OUTBOARD FLAP TRACK FAIRINGS - ADJUSTMENT/TEST

1. General
   A. This procedure covers both the inboard and outboard movable fairings of the outboard flaps.
2. Outboard Flap Track Fairings Adjustment
   A. Adjust Flap Track Fairing
      (1) Provide hydraulic system A power (Ref 27-51-0 MP).
      (2) Position flap control lever to FLAP UP detent to retract flaps.
      (3) Check that gap between aft flap trailing edge and flap track fairing is 0.10 inch maximum on each side of fairing, if not:
         (a) Position flap control lever to 40-unit detent to extend flaps.
         (b) Disconnect aftflap pushrods and move aftflap full forward.
         (c) Loosen jamnuts on support struts and turn coupling to reduce gap to less than 0.10 inch (Detail B, Fig. 501).

            CAUTION: TO REDUCE STRAIN ON FAIRING SUPPORT STRUTS, ADJUST BOTH STRUTS SIMULTANEOUSLY.

            NOTE: Support strut jamnuts may be left untorqued at this time.

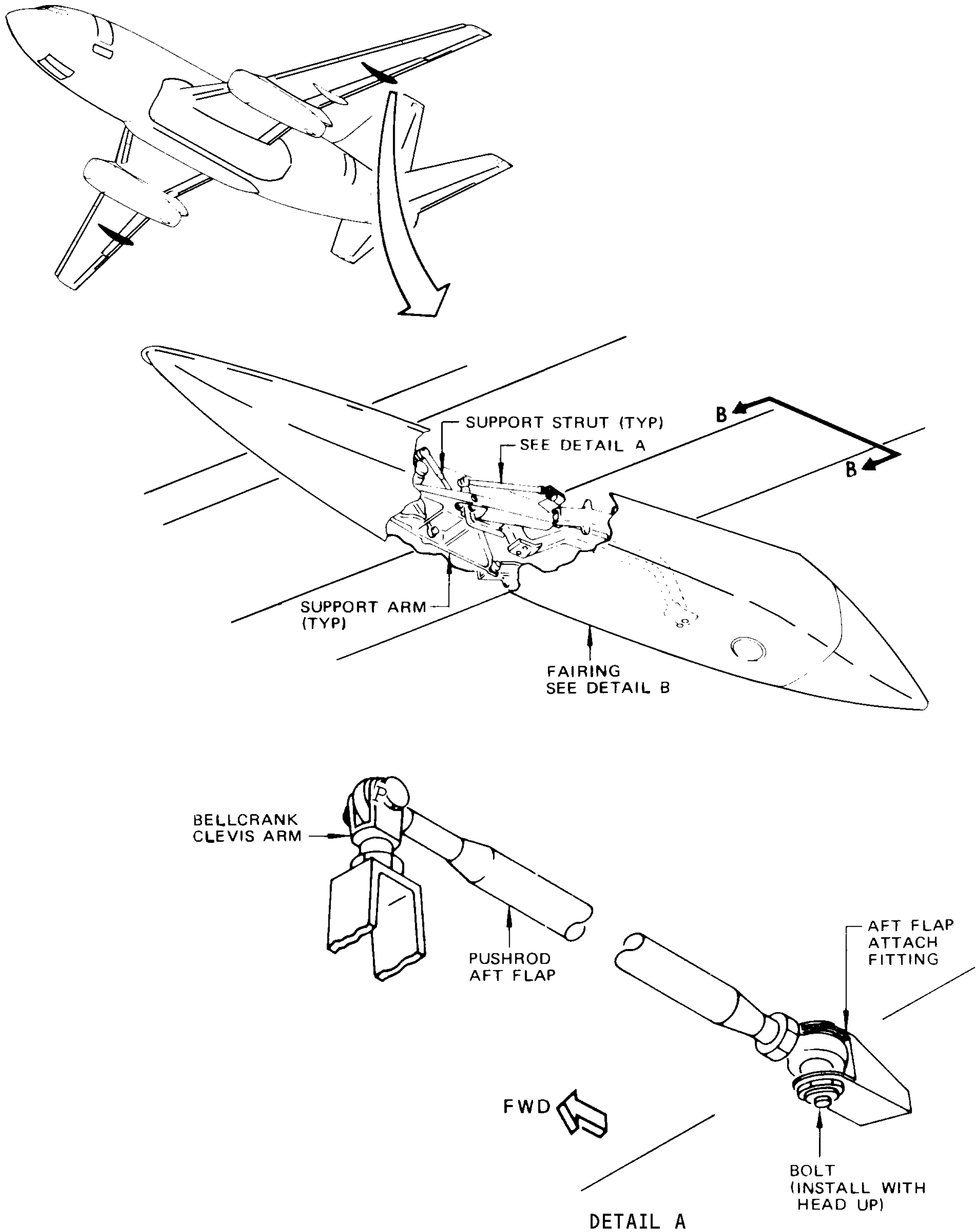
         (d) Connect aftflap pushrods with boltheads up. Tighten nuts and install cotter pins.

            CAUTION: BOLTS MUST BE INSTALLED WITH HEADS UP TO PREVENT BOLTS FROM DAMAGING MIDFLAP AND/OR AFTFLAP PUSHRODS AND AFTFLAP.

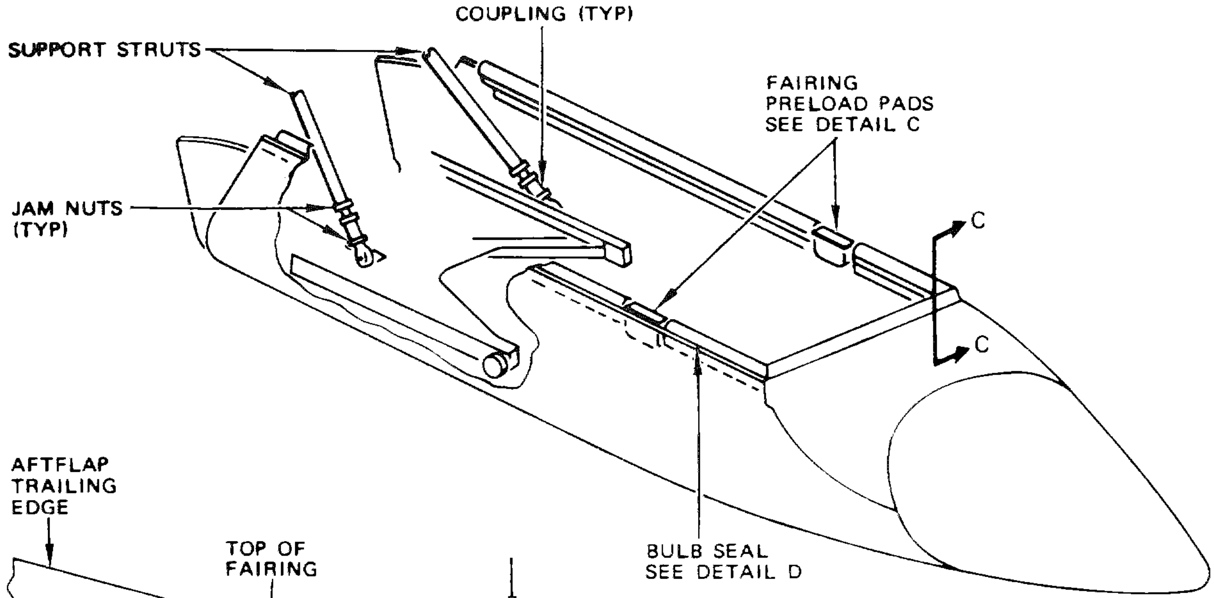
      (4) For No. 1 or 8 fairing, check that rigging pin can be inserted through landing light actuating arm and light body (Detail A, Fig. 502). If not, adjust pushrod to allow installation of rig pin.

         NOTE: If landing light is not installed, refer to Chapter 33, Outboard Landing Lights.

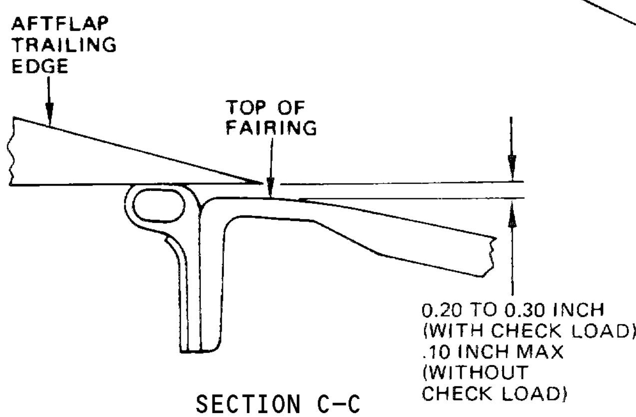
      (5) Extend flaps to 40-unit detent and check that mid-to-aftflap gap and dimension B are per section B-B. Adjust aftflap bellcrank clevis arm (detail A) at both flap tracks on one or both wings, if required to obtain correct gaps and dimensions.
      (6) Retract flaps and check that gap between aftflap leading edge and midflap trailing edge is per section B-B. Adjust aftflap pushrod (detail A), if required to obtain correct gap.



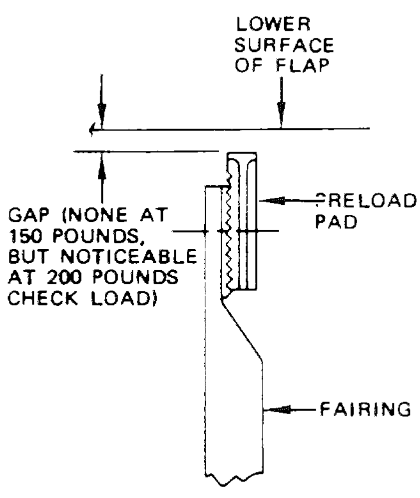
Outboard Flap Track Fairing Adjustment
Figure 501 (Sheet 1)



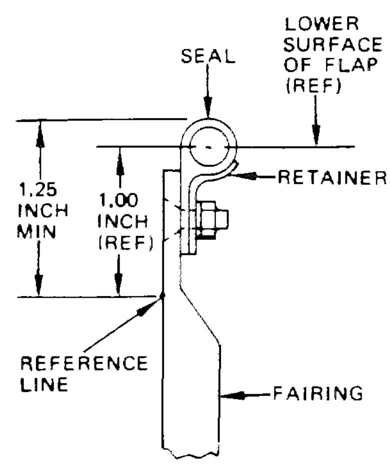
DETAIL B



SECTION C-C



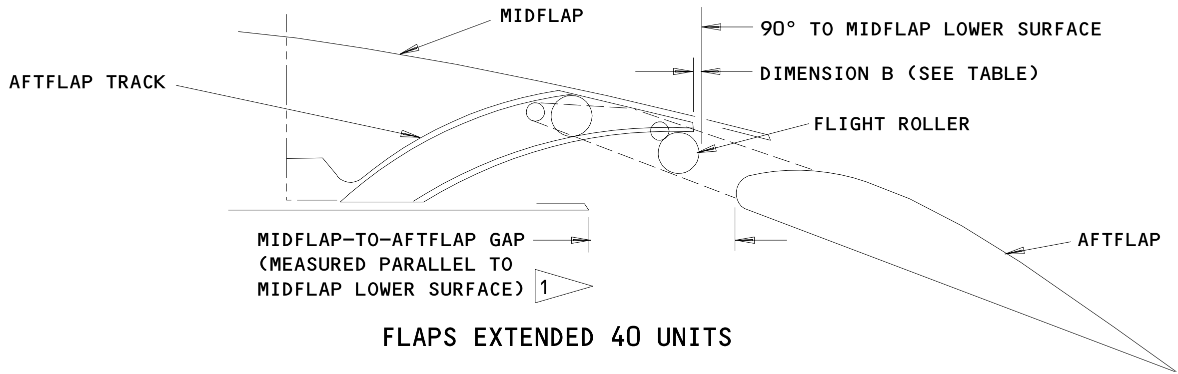
DETAIL C



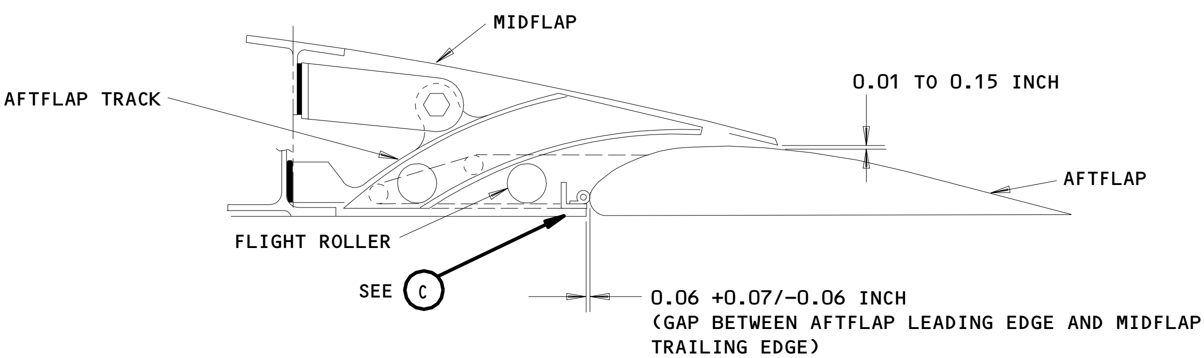
DETAIL D

SECTION A-A
(DELETED)

Outboard Flap Track Fairing Adjustment
Figure 501 (Sheet 2)



FLAPS EXTENDED 40 UNITS



FLAPS RETRACTED
B-B

FLIGHT ROLLER LOCATION	DIMENSION B (INCHES) 2
OUTBD TRACK (LEFT AND RIGHT WINGS)	0.33 +0.08/-0.15
INBD TRACK (LEFT AND RIGHT WINGS)	0.25 +0.16/-0.25

1 GAPS AT INBD AND OUTBD ENDS OF LEFT WING AFTFLAPS TO BE EQUAL TO CORRESPONDING GAPS ON RIGHT WING AFTFLAPS WITHIN 0.05 INCH

2 ONLY THE INBOARD AND OUTBOARD ENDS OF EACH AFTFLAP NEED TO HAVE THE "B" DIMENSION CHECKED.

Outboard Flap Aft Flap Installation
Figure 502

(7) Measure the clearance between the leading edge of the aftflap and the midflap.
   (a) Make sure the clearance is in the tolerance shown in Section C-C, Fig. 501.
   (b) If the clearance is not in the tolerance, adjust the aftflap pushrods.
(8) Measure the preload of the fairing against the bottom of the flap:
   (a) Put a strap across the top of the aft fairing along the line of screws attaching the tailcone.
   (b) Apply a 200-pound weight to the strap.
   (c) Measure the clearance on the two sides of the fairing between the trailing edge of the aftflap and the top of the fairing.

      NOTE: Measure the clearance to the top of the fairing, not the bulb seal.

      1) The clearance must be in the tolerance shown in Section B-B.
      2) If the clearance is not in the tolerance, adjust the fairing.
(9) Do a check of the adjustment of the preload pad:
   (a) Reduce the load on the fairings to 150 pounds.
   (b) Make sure there is not a clearance between the preload pad and the midflap.
   (c) If there is a clearance, adjust the preload pad.
   (d) Remove the load from the fairings.
(10) Make sure the clearance from the support arm to the flap track and the carriage is a minimum of 0.08 inch at all flap settings.
(11) Tighten adjustable fairing support strut jamnuts and lockwire. Tighten larger jamnut to 30-50 pound-inches, and smaller jamnut to 20-40 pound-inches.
(12) Recheck that gap between aftflap trailing edge and flap track fairing is 0.10 inch maximum. If not, readjust per step 2.A.(2) thru 2.A.(3)(d).
(13) Check for correct seal compression at leading edge of aftflap as follows:
   (a) With aftflap extended mark a line on lower surface of aftflap 2.00 inches aft of leading edge.
   (b) Retract aftflap then mark a line on lower surface of midflap 2.15 inches forward of line marked on aftflap.
   (c) Extend aftflap and check that aft face of seal retainer aligns with line marked on midflap.
   (d) If seal retainer does not align, loosen screws and adjust retainer to align. Tighten screws.

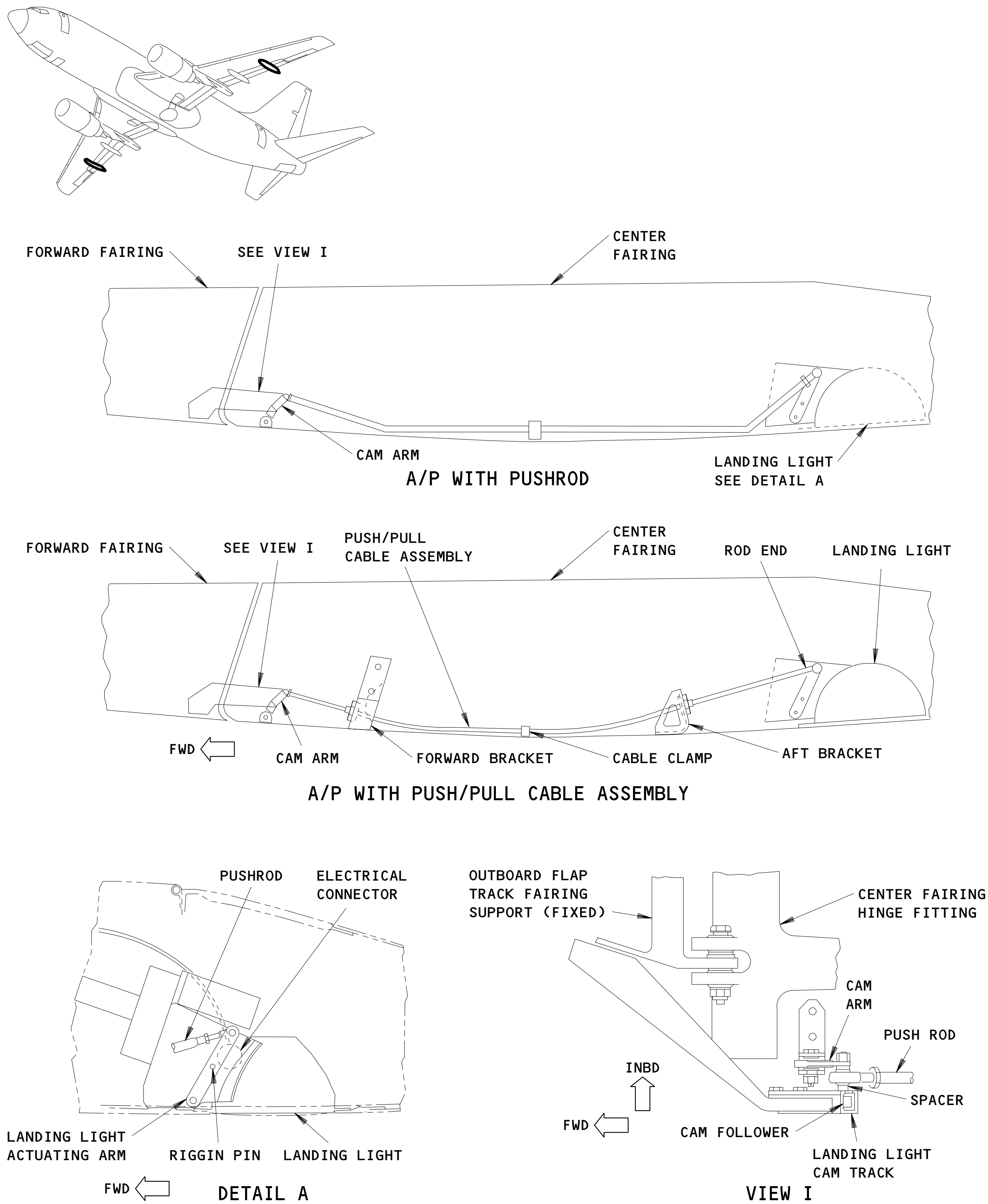
(14) Make sure the bulb seals on the two sides of the fairing compress 0.003 to 0.08 inch.
   (a) If the seal compression is not in the tolerance, adjust the seal retainer.

(15) For No. 1 or 8 fairing, check operation of landing light (Ref Chapter 33, Outboard Landing Lights).

3. Restore Airplane to Normal Configuration

A. Position flap control lever to FLAP UP detent.

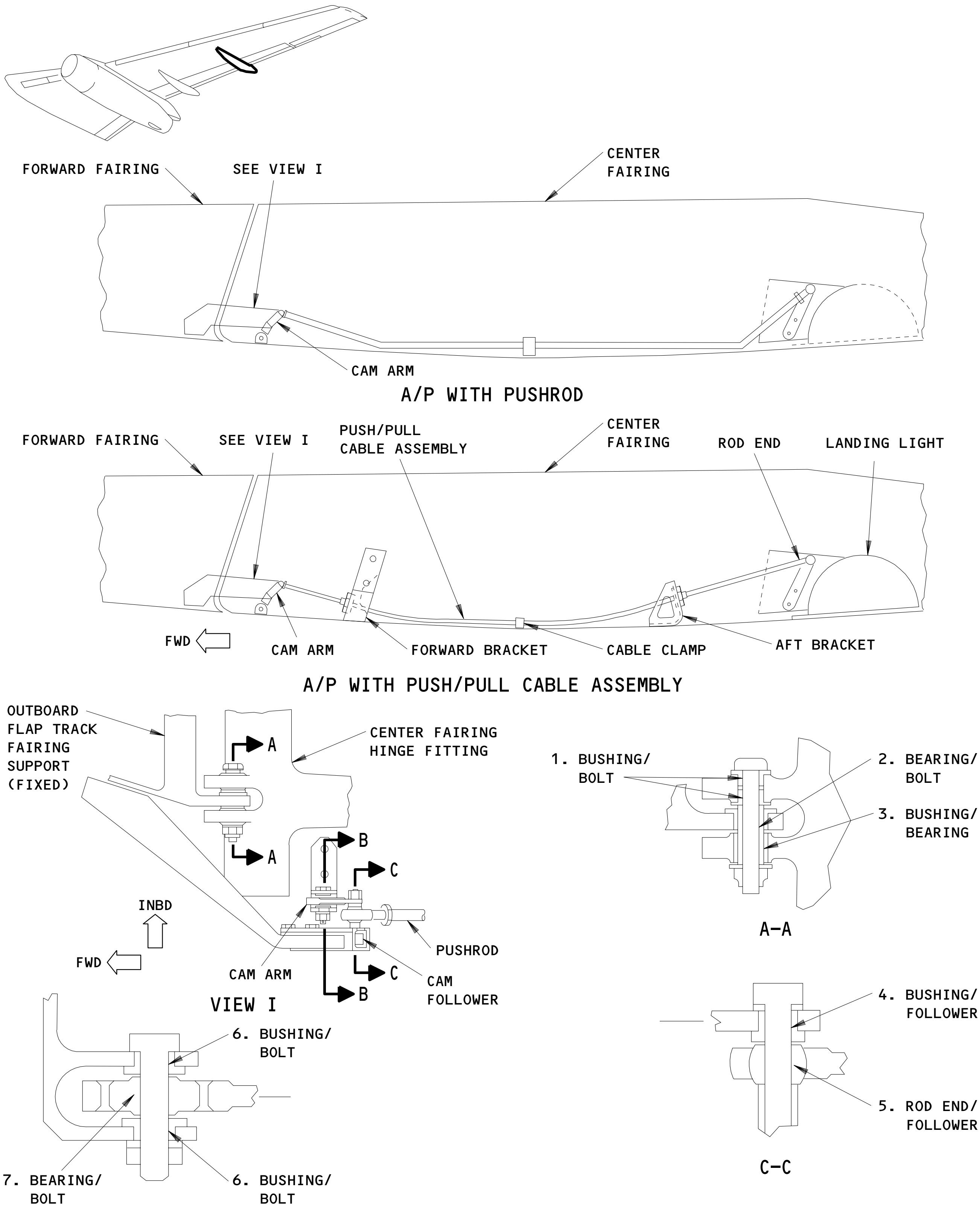
B. Depressurize hydraulic system A (Ref 27-51-0 MP).



Landing Light Adjustment
Figure 503

OUTBOARD FLAP TRACK FAIRINGS - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There will be no procedure given for gaining access to the component for removal or replacement after inspection for wear (Ref Outboard Flap Track Fairings Removal/Installation for this information).
2. Outboard Flap Track Fairings Wear Limits (Fig. 601)



Outboard Flap Track Fairing Wear Limits
Figure 601 (Sheet 1)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3120	0.3160	0.3210	0.0090	X		
	BOLT	OD	0.3115	0.3120	0.3030		X		
2	BEARING	ID	0.3150	0.3220	0.3320	0.020	X		
	BOLT	OD	0.3115	0.3120	0.2950		X		
3	BUSHING	ID	0.5000	0.5050	0.5190	0.020	X		
	BEARING	OD	0.4950	0.4990	0.4800		X		
4	BUSHING	ID	0.1900	0.1915	0.1950	0.0050	X		
	FOLLOWER	OD	0.1890	0.1900	0.1850		X		
5	ROD END	ID	0.1895	0.1900	0.1920	0.0020	X		
	FOLLOWER	OD	0.1890	0.1900	0.1875		X		
6	BUSHING	ID	0.1900	0.1940	0.1995	0.010	X		
	BOLT	OD	0.1885	0.1895	0.1800		X		
7	BEARING	ID	0.1895	0.1900	0.1905	0.010	X		
	BOLT	OD	0.1885	0.1895	0.1885		X		

Outboard Flap Track Fairing Wear Limits
Figure 601 (Sheet 2)

INBOARD FLAP TRACK FAIRING - REMOVAL/INSTALLATION

1. Remove Inboard Flap Track Fairing
   A. Remove access panels L3501/3601R.
   B. Remove cotter pin and nut (Fig. 401).
   C. Move fairing forward to disengage support pins. Lower fairing from airplane.
2. Install Inboard Flap Track Fairing
   A. Position fairing to align support pins with holes in attach plates (Fig. 401).
   B. Move fairing aft to engage pins with attach plates.
   C. Secure fairing with washer and nut. Install cotter pin.
   D. Check that gaps at inboard edge and at aft end of fairing are 0.10 +0.05 inch and that mismatch does not exceed 0.03 inch. If gaps and mismatch are not within limits, adjust fairing (Ref Inboard Flap Track Fairing - A/T).
   E. If new fairing is being fitted:
      (1) Jack airplane to retract landing gear (AMM 7-11-11/201).
      (2) Check that electrical power is available.
      (3) Connect external hydraulic test bench and apply pressure.
      (4) Remove gear ground lockpin from applicable main landing gear.
      (5) Place landing gear control lever in UP position.
      (6) Operate test bench to slowly retract gear to the up and locked position.
      (7) Remove hydraulic pressure.
      (8) Make sure that the gap between fairing and main gear shock strut door is 0.25 ±0.10 inch.
      (9) Adjust fairing fore and aft to obtain proper gap.

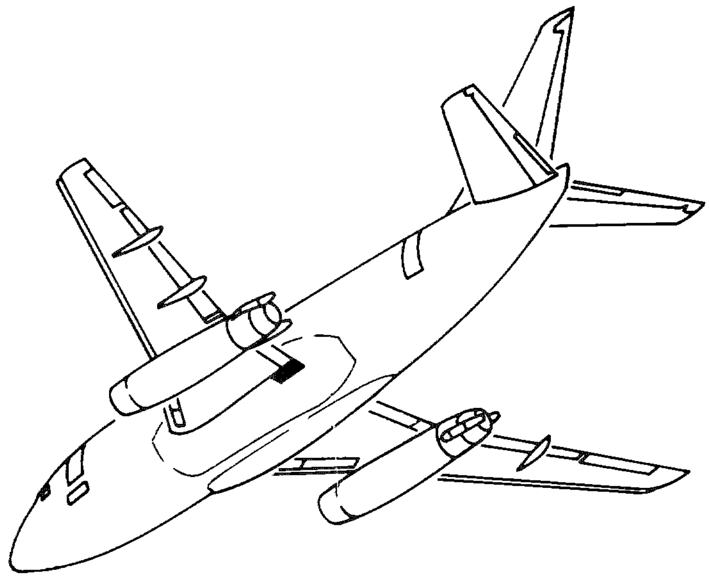
      NOTE: Gap limits at aft end of fairing must be maintained.

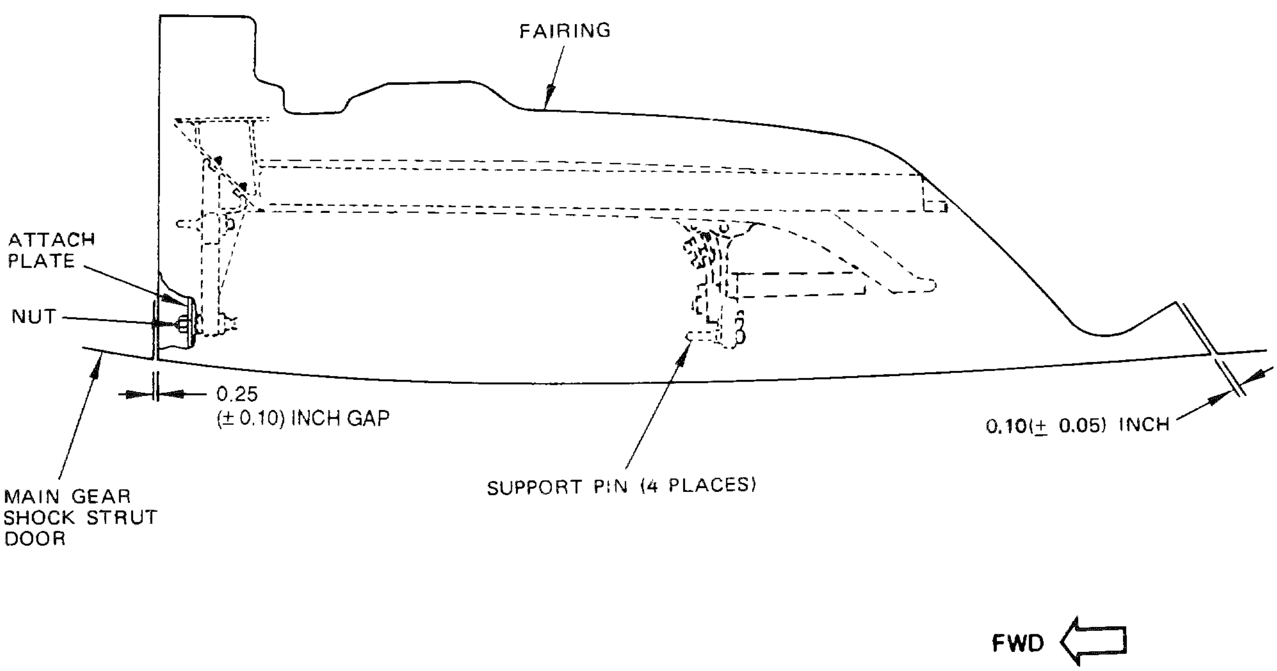
      (10) Apply hydraulic pressure with the hydraulic test bench.
      (11) Place landing gear control lever in DOWN position.
      (12) Remove hydraulic pressure and disconnect the extrnal hydraulic test bench.

(13) Install the gear ground lockpin into applicable main landing gear.
(14) Remove electrical power if it is no longer necessary (AMM 24-22-0/201).
(15) Lower the airplane and remove the jacks (AMM 7-11-11/201).

F. Check that seal at forward end of fairing contacts structure firmly.

G. Install access panels L3501/3601R.





Inboard Flap Track Fairing Installation
Figure 401

INBOARD FLAP TRACK FAIRINGS - ADJUSTMENT/TEST

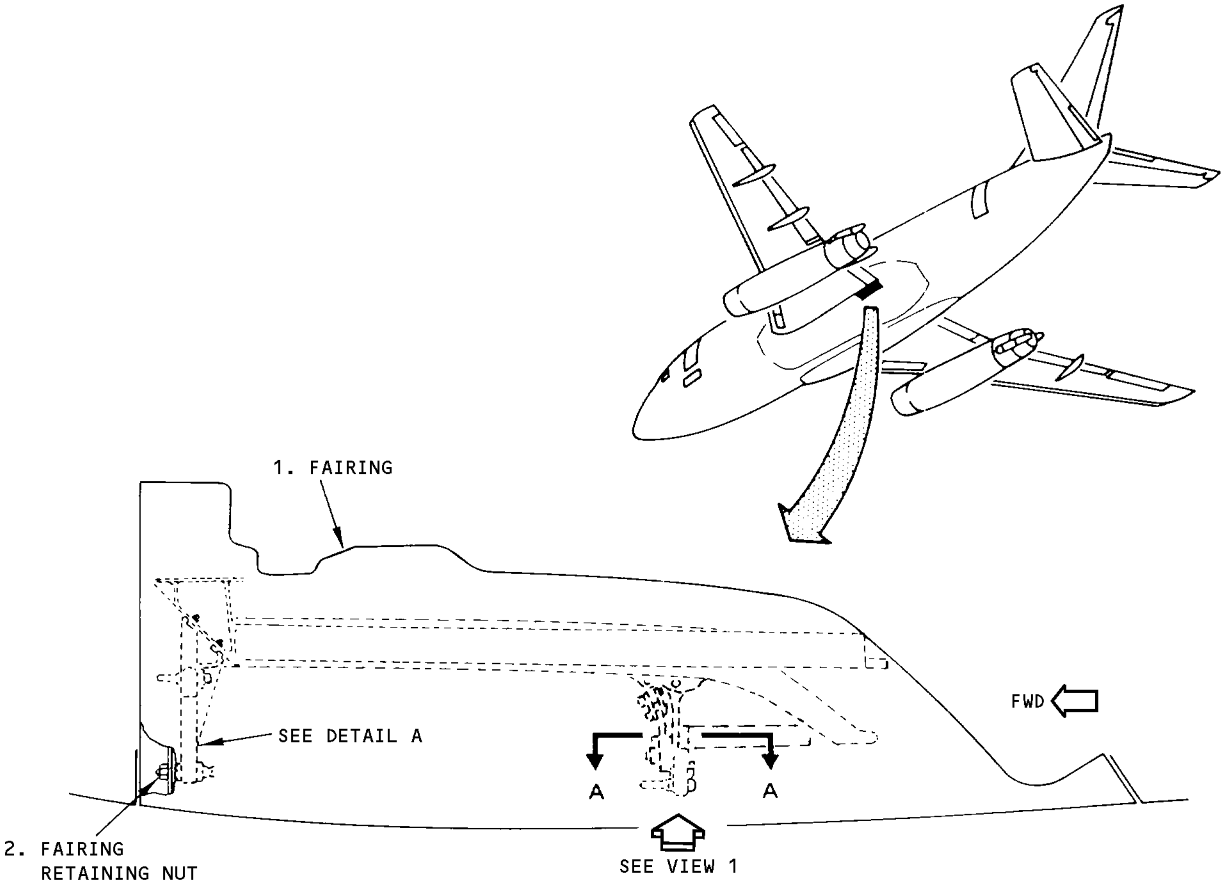
1. Inboard Flap Track Fairing Adjustment
   A. Adjust Flap Track Fairing
      (1) Check that gaps at inboard edge and at aft end of fairing are 0.10 (±0.05) inch and that mismatch does not exceed 0.03 inch.
      (2) If gaps and mismatch are not within limits determine amount of adjustment required, remove fairing and proceed as follows:

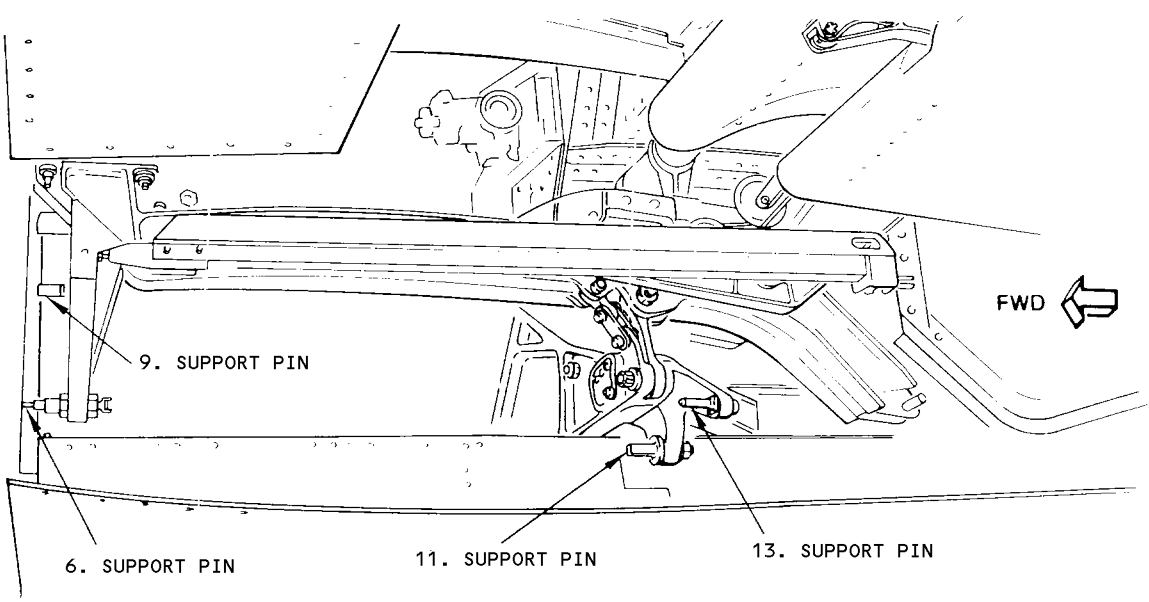
      NOTE: The following adjustments may be made individually or simultaneously, as necessary.

      (3) Adjust fairing laterally and vertically as follows:
         (a) Loosen clamping bolts (5) enough to allow movement of serrated plates (8). (See figure 501.)
         (b) Position fairing flush with adjacent surfaces.
         (c) Tighten bolts (5).
      (4) Adjust fairing fore and aft as follows:
         (a) Loosen nut (2) and checknuts (7). (See figure 501.)
         (b) Rotate pin (6) as necessary to shift fairing fore and aft to the required position.
         (c) Tighten nut (2) and checknuts (7). Install cotter pin.
      (5) Rotate fairing as follows:
         (a) Loosen seal assembly attaching screws in inboard side of forward end of fairing.

         NOTE: Seal plate attaching screw holes are elongated to provide for seal plate adjustment.

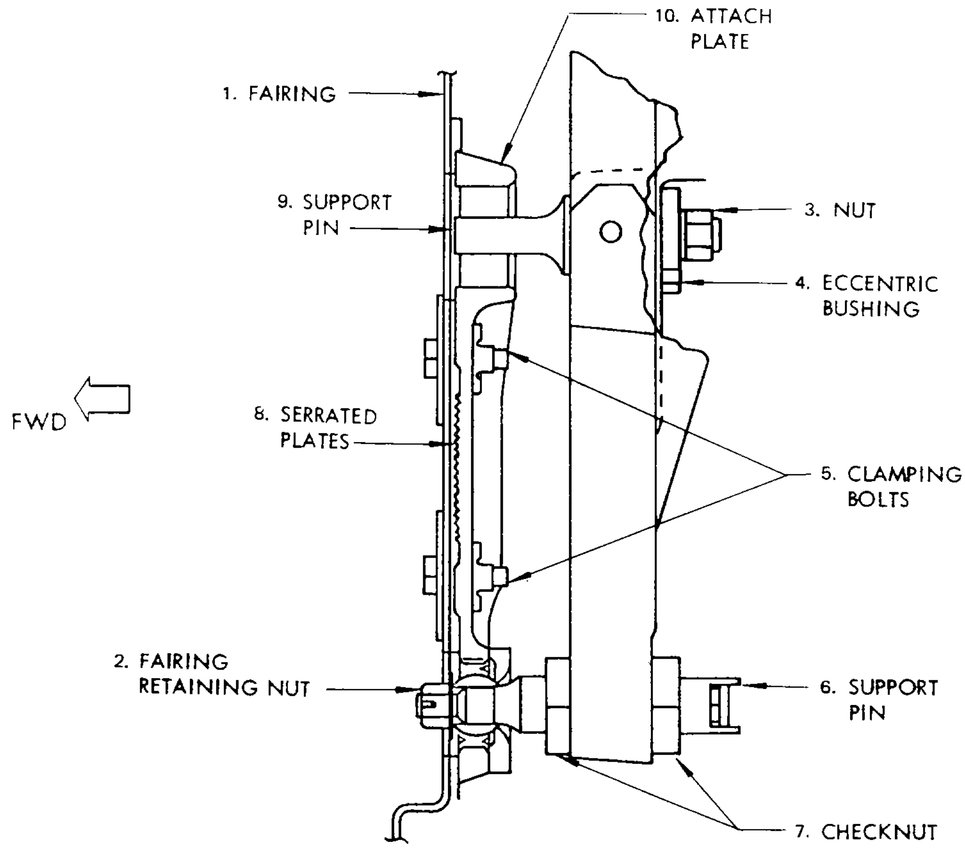
         (b) Loosen nuts (3, figure 501) enough to allow flanges on eccentric bushings (4) to clear stop pins.
         (c) Rotate eccentric bushings (4) as necessary to shift fairing to required position.
         (d) Engage flanges of eccentric bushings (4) with stop pins.
         (e) Tighten nuts (3).
         (f) Adjust seal assembly so that seal contacts fixed structure. Contact should be firm. Tighten retaining screws.
      (6) Install fairing and check that gaps and mismatch are within limits.
      (7) Adjust inboard midflap seal plate. Refer to 27-51-341, Inboard Midflap Seal Plate - Removal/Installation.



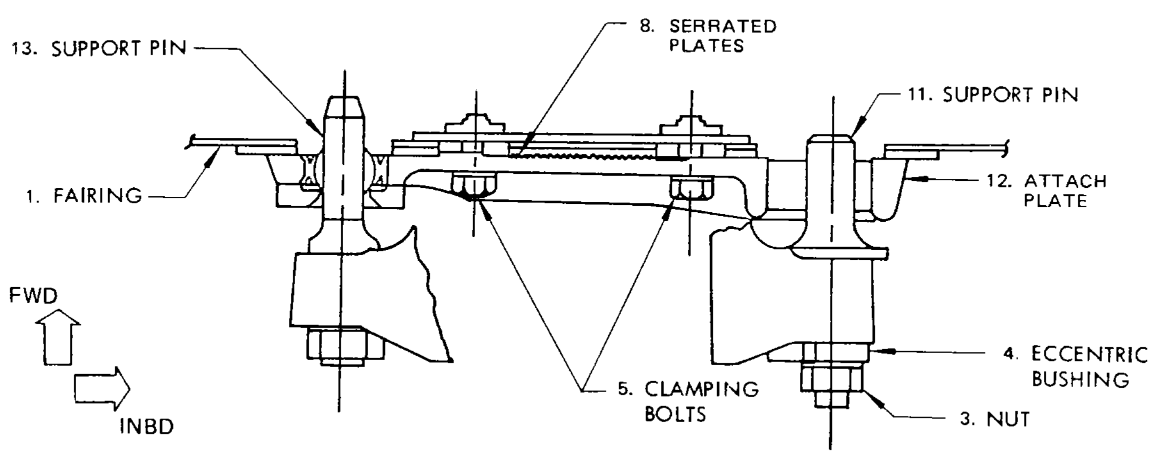


VIEW 1

Inboard Flap Track Fairing Adjustment
Figure 501 (Sheet 1)



DETAIL A



SECTION A-A

Inboard Flap Track Fairing Adjustment
Figure 501 (Sheet 2)

OUTBOARD FLAP TRACKS - REMOVAL/INSTALLATION

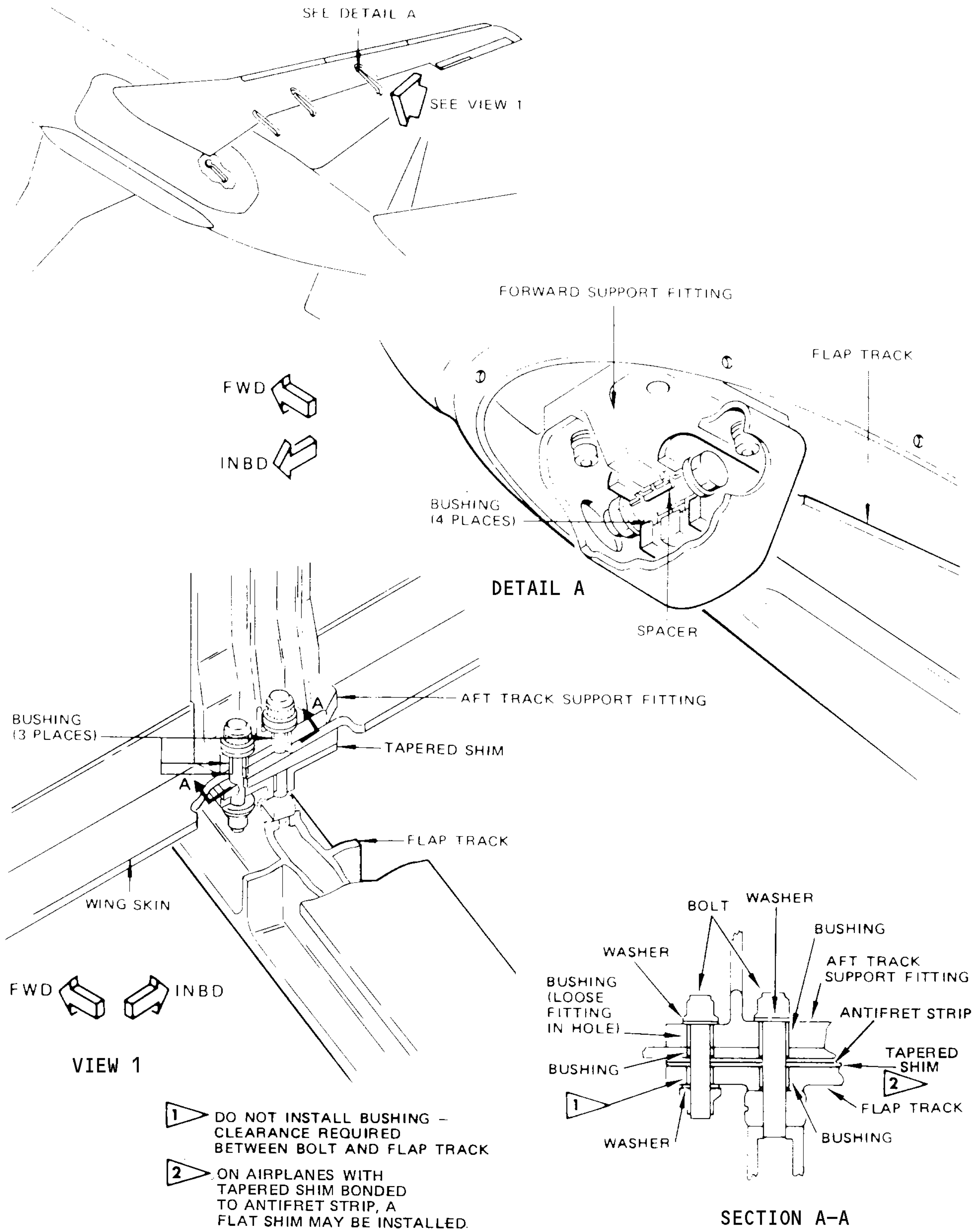
1. General
   A. The flap track installations require use of tapered aluminum shim stock at points where tracks attach to wing rear spar and landing gear trunnion support beam. Nominal design thickness of shim is 0.03 inch, however exact thickness is determined at jig assembly of wing and flap track during manufacture. If shim replacement is necessary the solid tapered shim with antifret strip is the preferred replacement.
   B. During track replacement it is extremely important to maintain thickness of shims as originally manufactured. Instructions are provided for replacing damaged or lost tapered shims and antifret strips. Failure to follow instructions will result in incorrect track alignment after installation. If a tapered solid shim is being fabricated to replace laminated shim, the shim thickness plus antifret strip should equal the thickness of original shim plus thickness of tapered filler.
2. Equipment and Materials
   A. Primer - BMS 10-11, type I (Ref 20-30-41)
   B. Corrosion Preventive Compound - MIL-C-11796, class 3 (Ref 20-30-21)
   C. Sealant - BMS 5-95 (Ref 20-30-11)
   D. Outboard Flap Rigging Tools:
      (1) Outboard Flap Rigging Beam - F80209-2 (Preferred) (Ref 27-09-700)

         NOTE: Rigging beam is a part of F80209-1.

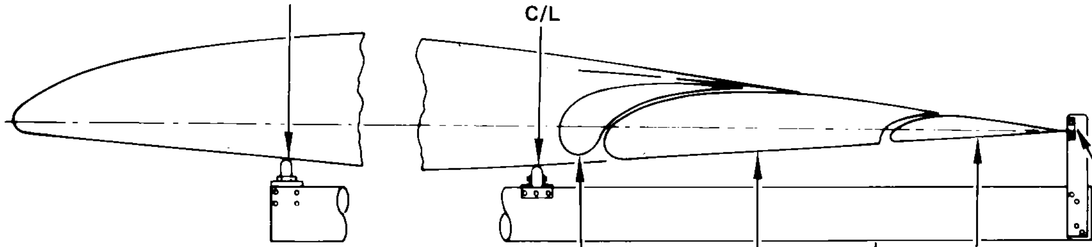
      (2) Outboard Flap Rigging Tool - TE65-73720-1 and -2 (Optional)
      (3) Alignment pin, 0.4990 inch (+0.0005/-0.0000) (12.67mm +0.0127/0.0000) diameter (local manufacture)
3. Prepare Flap Track for Removal
   A. Remove trailing edge flaps (Ref 27-51-72, R/I).
   B. Remove flap transmission (Ref 27-51-281 R/I).
   C. Disassemble foreflap sequencing carriage and remove from track (Ref 27-51-111, R/I).
4. Remove Flap Track
   A. Remove track aft attach bolts (Fig. 401).

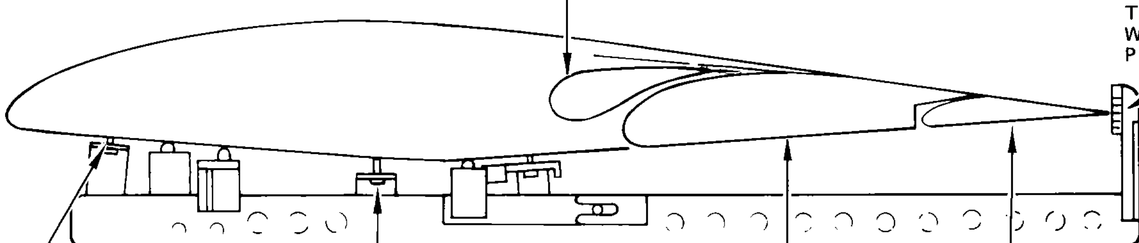
      NOTE: Be careful not to damage antifret strip or tapered shim when flap track is removed to simplify reinstallation.
      The antifret strip is bonded to wing lower surface. The tapered shim may be bonded to the flap track upper surface (preferred) or to the antifret strip (optional).

   B. On some airplanes, a flat shim is installed between tapered shim and flap track at aft track attach point. Measure and record exact thickness for track installation.



Outboard Flap Track Installation
Figure 401 (Sheet 1)





VIEW 2

Outboard Flap Track Installation
Figure 401 (Sheet 2)

C. Remove bolt attaching track to forward support fitting and remove track from airplane.

NOTE: Flap tracks weigh approximately 110 pounds.

5. Install Flap Track
   A. If antifret strip has been damaged, install new antifret strip as follows:
      (1) Remove damaged antifret strip and sealant from lower surface of wing.
      (2) Apply primer to damaged area and allow to cure.
      (3) Bond antifret strip to wing lower surface with sealant and apply 100 ±25 pounds per square inch pressure until sealant is cured.

      CAUTION: DO NOT INSTALL ATTACH BOLTS UNTIL SEALANT HAS CURED. SEALANT MAY EXTRUDE FROM FAYING SURFACE.

      (4) Apply fillet of sealant around periphery of antifret strip.
   B. Align track with forward support fitting and secure as follows:
      (1) Ensure that one bushing is in each forward lug of flap track and two bushings are in forward support fitting.
      (2) Position spacer in forward support fitting.
      (3) Coat bolt with corrosion preventive compound and install with countersunk washer under bolt head.
      (4) Install washer under nut. If forward attach bolt has a castle nut, tighten 350 to 600 pound-inches, and install cotter pin. If forward attach bolt is 7/16-inch diameter with self-locking nut, tighten 260 to 425 pound-inches. If forward attach bolt is 3/8-inch diameter with self-locking nut, tighten 300 to 500 pound-inches.
   C. Install a new tapered shim if it is necessary:

   NOTE: Use this procedure if you do not know the original shim thickness, or if you will replace the original flap track with a new or overhauled track of different aft attach pad thickness. If you will install the same track, with no machine work done to the aft attach pad, shim thickness must be same as shims that were removed. On airplanes with bonded decal on wing rear spar, adjacent to flap tracks, these decals show the necessary shim thickness exclusive of antifretting strip thickness.

      (1) Remove damaged tapered shim and sealant from upper surface of flap track.
      (2) Temporarily install flap track as follows:
         (a) Align track with forward support fitting and install bushings, spacers, bolt, washer and nut (View 2, Fig. 401).

         NOTE: Antifret strip must be installed on lower surface prior to fitting shim.

(b) Tighten nut 350 to 600 pound-inches.
(c) Position flap track and temporarily install bushings, bolts, washers and nut at aft attach point (Section A-A).

(3) Temporarily install trailing edge flap (Ref 27-51-72, R/I).

NOTE: It is not necessary to use corrosion preventive compound or wet primer when temporarily installing flap. Do not readjust aftflap.

(4) Determine flap track shim thickness as follows:
(a) Check that flaps are in fully retracted position.
(b) Remove plug screws and attach outboard flap rigging tool at location marked by black arrows at WBL 228.5 or hand position outboard flap rigging beam to black stripes located at WBL 228.5 on front and rear spar (View 2, Fig. 401).

NOTE: If black stripes are not on airplane, stencil 0.25 inch wide stripes per tool drawing F80209.

(c) Support flap track and remove bolts attaching track to wing at aft attach point.
(d) Raise or lower flap track to position trailing edge of aftflap 0.00 to 0.25 inch below theoretical wing chord plane (WCP). Measurement must be made with aftflap deadweight rollers contacting flap track while applying 30 pound upward force against minimum 4.0 x 6.0 inch aluminum plate at aft edge of aftflap near rigging tool.
(e) Position tapered shim between wing and flap track and rotate to fill gap.
(f) Mark periphery and bolt hole locations on tapered shim and remove shim.
(g) Temporarily install bolts attaching flap track to wing at aft attach point and remove track support.
(h) Trim tapered shim to size and drill bolt holes.

(5) Remove outboard flap rigging tool and install plug screws if required.
(6) Remove temporarily installed trailing edge flap (Ref 27-51-72, Removal/Installation).
(7) Remove nuts, bolts, bushings, and spacers and remove temporarily installed flap track.
(8) Bond Tapered shim to flap track upper surface with sealant and apply 100 ±25 pounds per square inch pressure until sealant is cured.

CAUTION: DO NOT INSTALL ATTACH BOLTS UNTIL SEALANT HAS CURED. SEALANT MAY EXTRUDE FROM FAYING SURFACE.

D. Ensure that three bushings are installed in track support fitting. If not, install bushings with wet primer.
   (1) Install a 0.4990 inch (+0.0005/-0.0000) (12.67 mm +0.0127/-0.0000) diameter alignment pin or equivalent in the inboard hole of the aft track attach fitting.
   (2) If the alignment pin will not fit through the hole, do the following:
      (a) Loosen the nut on the forward attach bolt.
      (b) Tighten the nut to 40-60 inch-pounds (4.519-6.779 Nm).
      (c) Lower the end of the flap track down to a temporary support.

      CAUTION: DO NOT INCREASE THE INNER DIAMETER OF THE STEEL BUSHING AT THE INBOARD ATTACH BOLT. AN INCREASED DIAMETER AT THIS LOCATION CAN RESULT IN A LOOSE TRACK. A LOOSE TRACK CAN MOVE IN FLIGHT AND DAMAGE THE TRACK, ATTACH BOLTS AND MATING STRUCTURE.

      (d) Increase the inner diameter of the aluminum bushing in the wing skin and aft track attach fitting to a maximum of 0.5015 inch (12.73 mm).
E. Raise track to align with holes in aft support fitting on rear spar. If installed, position shim between track and support fitting. Ensure that lower bushing on outboard bolt does not protrude above skin into track support fitting.

   NOTE: Thickness of shim shall equal that removed during disassembly.

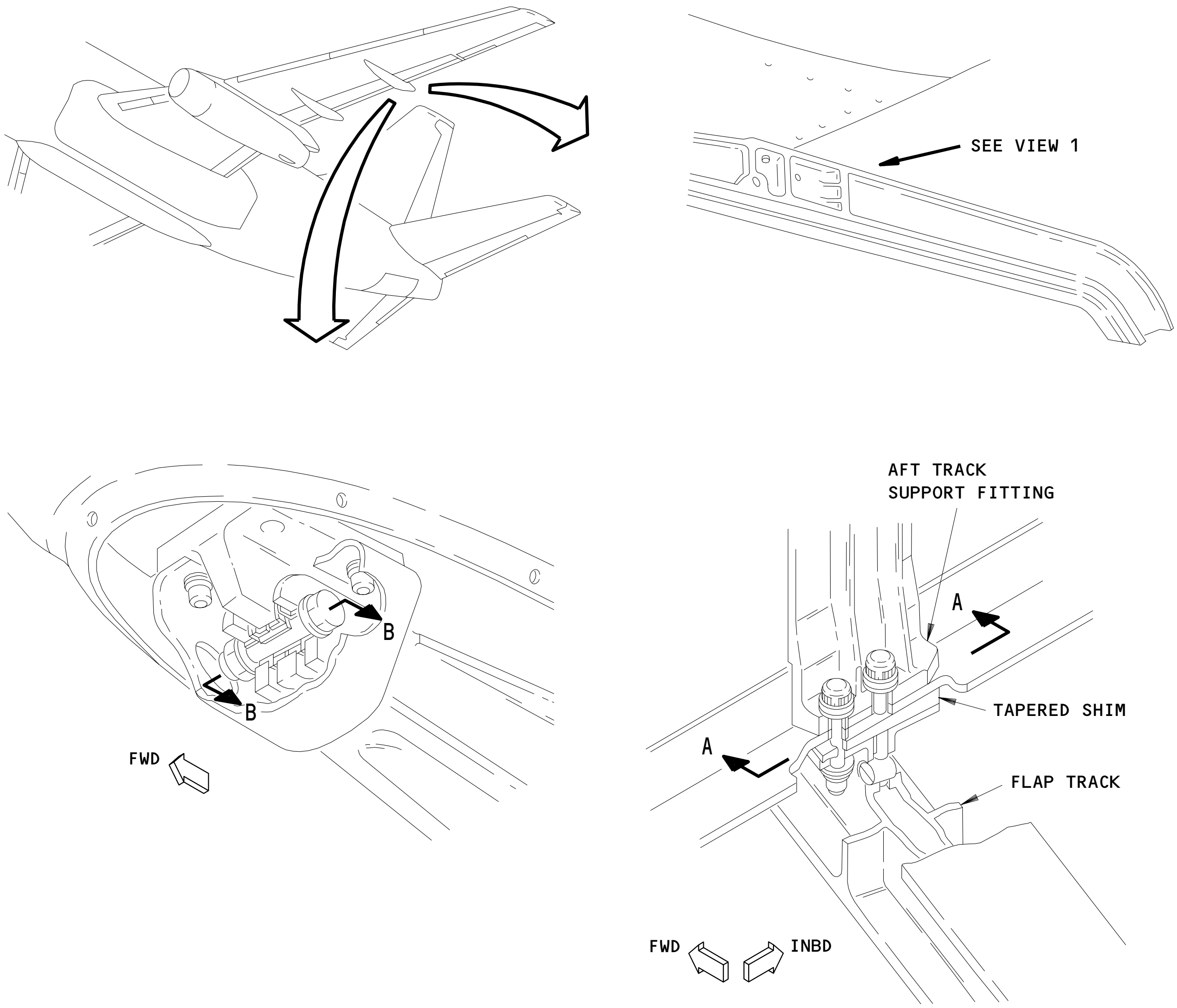
F. Use the alignment pin to position the flap track.
   (1) Apply a layer of the corrosion preventive compound on the bolts.
   (2) Install the outboard bolt with a countersunk washer.
      (a) Tighten the nut to 40-60 inch-pounds (4.519-6.779 Nm).
   (3) AIRPLANES POST-SB 57-1065;
      Tighten the nut on the forward attach bolt, on the outboard track, to 300-500 inch-pounds (33.89-56.49 Nm).
   (4) AIRPLANES POST-SB 57A1271;
      Tighten the nut on the forward attach bolt, on the inboard track, to 270-300 inch-pounds (30.50-33.89 Nm).
G. Install nut and washer on outboard bolt. Tighten nut to 360-420 inch-pounds (40.674-47.453Nm).
H. Remove the alignment pin.

I. Decrease the torque on the nut on the outboard attach bolt to 40-60 inch-pounds (4.519-6.779 Nm).
J. Decrease the torque on the nut on the forward attach bolt to 40-60 inch-pounds (4.519-6.779 Nm).
K. AIRPLANES POST-SB 57-1065 AND 57A1271;
Install the inboard bolt with the torque indicating washer. Tighten the bolt in the barrel nut to 40-60 inch-pounds (4.519-6.779 Nm).
   (1) AIRPLANES PRE-SB 57A1271;
   If forward attach bolt has a castle nut, tighten 350 to 600 pound-inches, and install cotter pin. If forward attach bolt is 7/16-inch diameter with self-locking nut, tighten 260 to 425 pound-inches. If forward attach bolt is 3/8-inch diameter with self-locking nut, tighten 300 to 500 pound-inches.
L. AIRPLANES POST-SB 57-1065 AND 57A1271;
Tighten the nut on the forward attach bolt to 270-300 inch-pounds (30.50-33.89 Nm). If there is a castellated nut on the forward attach bolt, install a cotter pin.
M. AIRPLANES POST-SB 57-1065 AND 57A1271;
Tighten outboard nut 360 to 420 pound-inches (40.67-47.45 Nm). Check that minimum of one thread extends through nut.
N. AIRPLANES POST-SB 57-1065;
Tighten inboard bolt on the outboard track until outer ring of torque indicating washer is no longer free to turn, 585-715 inch-pounds (66.09-80.78 Nm). Make sure that one full thread extends through the nut. If end of bolt bottoms out on barrel nut retainer, add washer under bolt head.
O. AIRPLANES POST-SB 57A1271;
Tighten inboard bolt on the inboard track until outer ring of torque indicating washer is no longer free to turn, (do not apply more than 1300 pound-inch (146.88 Nm). Make sure that one full thread extends through the nut. If end of bolt bottoms out on barrel nut retainer, add washer under bolt head.
P. Install nuts and washers. Tighten inboard bolt to 480 to 600 pound-inches. If end of bolt bottoms out on barrel nut retainer, add washer under bolt head.
Q. Install nut and washer on outboard bolt. Tighten nut to 220 to 360 pound-inches and lockwire bolt heads on inboard and outboard bolts. Check that minimum of one thread extends through nut.
R. Clean area around bolt heads.
S. Apply fillet of sealant around bolt heads.

6. Restore Airplane to Normal Configuration
A. Install outboard foreflap sequencing carriage (Ref 27-51-111, Removal/Installation).
B. Install flap transmission (Ref 27-51-281 Removal/Installation).
C. Install trailing edge flaps (Ref 27-51-72, Removal/Installation).

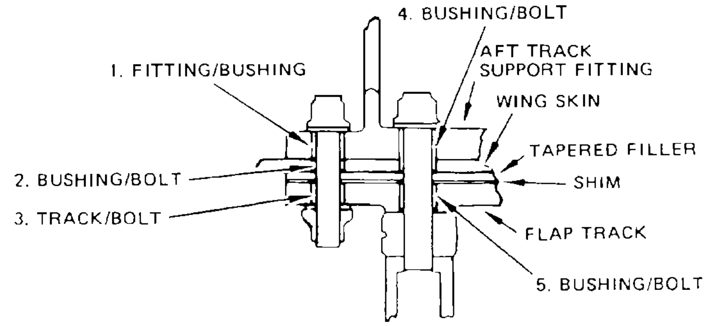
OUTBOARD FLAP TRACKS - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Outboard Midflap Carriage - Removal/Installation for this information.
2. Outboard Midflap Carriage Wear Limits (Fig. 601)

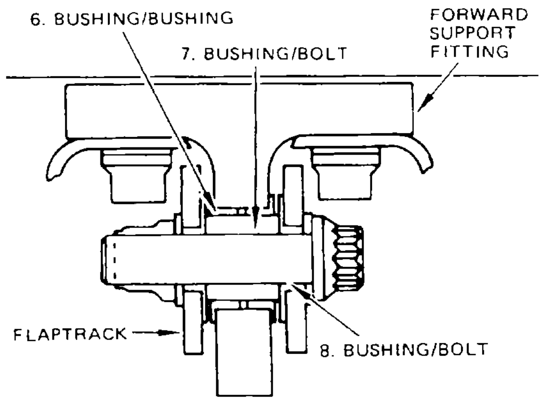


NOTE: OUTBOARD TRACK SHOWN - INBOARD TRACK SIMILAR

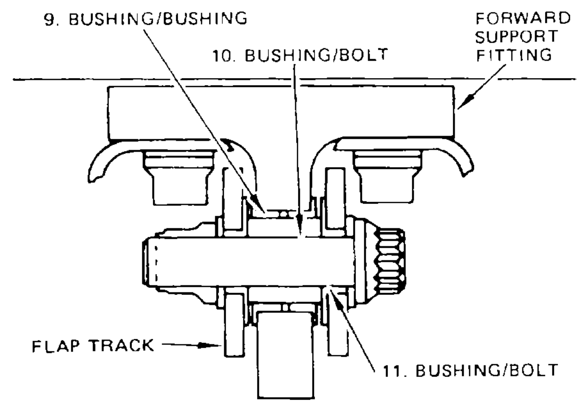
Outboard Flap Track Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION B-B
(INBOARD FLAP TRACK)



SECTION B-B
(OUTBOARD FLAP TRACK)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1 [2]	FITTING	ID	0.5613	0.5621		0.0100		X	
	BUSHING	OD					X		
2	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		

Outboard Flap Track Wear Limits
Figure 601 (Sheet 2)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
3 [3]	TRACK	ID	0.5000	0.5210		0.0100		X	
	BOLT	OD	0.4365	0.4370			X		
4	BUSHING	ID	0.4995	0.5005	0.5025	0.0030	X		
	BOLT	OD	0.4990	0.4995	0.4965		X		
5	BUSHING	ID	0.5010	0.5050	0.5070	0.0090	X		
	BOLT	OD	0.4990	0.4995	0.4965		X		
6	BUSHING	ID	0.7690	0.7710	0.7750	0.0290	X [4]		
	BUSHING	OD	0.7500	0.7510	0.7430		X		
7	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		
8	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		
9	BUSHING	ID	0.7690	0.7710	0.7750	0.0290	X [4]		
	BUSHING	OD	0.7500	0.7510	0.7430		X		
10	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		
11	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		

[2] LOOSE FIT BUSHING PROVIDES FOR 0.062 INCH NOMINAL CLEARANCE BETWEEN BUSHING AND FITTING.

[3] NO BUSHING BETWEEN BOLT AND TRACK PROVIDES FOR 0.074 INCH NOMINAL CLEARANCE BETWEEN BOLT AND TRACK.

[4] IF PRESS FIT BUSHINGS IN FORWARD SUPPORT FITTING HAVE BEEN REPLACED, REAM BUSHINGS TO DESIGN LIMITS.

Outboard Flap Track Wear Limits
Figure 601 (Sheet 3)

INBOARD FLAP TRACKS - REMOVAL/INSTALLATION

1. General
   A. The flap track installations require use of tapered aluminum shim at points where tracks attach to wing rear spar and landing gear trunnion support beam. Nominal design thickness of shim is determined at jig assembly of wing and flap track during manufacture.
   B. During track replacement it is extremely important to maintain thickness of shims as originally manufactured. Instructions are provided for replacing damaged or lost tapered shims. Failure to follow instructions will result in incorrect track alignment after installation.
2. Inboard Flap Outboard Track - Removal/Installation
   A. Equipment and Materials
      (1) Primer - BMS 10-11, Type I (Ref 20-30-41)
      (2) Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-21)
      (3) Grease - BMS 3-33 (Preferred)
      (4) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
      (5) Adhesive - BMS 5-126 (Ref 20-30-11)
      (6) Sealant - BMS 5-95 (Ref 20-30-11)
      (7) Inboard Flap Rigging Tools:
         (a) Inboard Flap Rigging Beam - F80209-3 (Preferred) (Ref 27-09-700)

            NOTE: Rigging Beam is a part of F80209-1.

         (b) Inboard Flap Rigging Tool - 2TE65-73720-1 and -2 (Optional)
   B. Prepare Inboard Flap Outboard Track for Removal
      (1) Remove trailing edge flaps (Ref 27-51-12, Removal/Installation).
      (2) Remove flap transmission (Ref 27-51-281, Removal/Installation).
      (3) Remove power plant (Ref Chapter 71, Power Plant).
      (4) Remove fixed fairing (Ref Chapter 71, Fixed Fairing).
      (5) Remove engine-to-wing mid fairing (Ref Chapter 54, Engine-to-Wing Mid Fairing).
      (6) Remove aft vibration isolator (Ref Chapter 71, Aft Vibration Isolator).
   C. Remove Inboard Flap Outboard Track
      (1) Remove track aft attach bolts (Fig. 401).

         NOTE: Be careful not to damage aluminum rub strip or tapered shim when flap track is removed to simplify reinstallation. Aluminum rub strip is bonded to wing lower surface. Tapered shim is bonded to the flap track upper surface.

      (2) Remove bolt(s) attaching track to forward support fitting and remove track from airplane.
      (3) If track forward support is being removed:
         (a) Remove access panel 7216 or 7416 on top of wing (Ref Chapter 12, Access Doors and Panels).

(b) Remove bolts attaching forward support to wing and remove track support from airplane.

D. Install Inboard Flap Outboard Track

(1) If track forward support is being installed (Fig. 401):

(a) Install inboard attach bolts.

1) Coat exterior of flanged spacers and thick washers with grease.
2) Coat exterior of bolts with primer.
3) Place countersunk washer and thick washer on bolt.
4) Install bolt with head down.
5) Install flanged bushing inside support fitting with flange up.
6) Locate phenolic antifret strip between support fitting and wing.

(b) Locate support fitting on wing lower surface and temporarily secure inboard bolts with washer and nut.

(c) Install outboard attach bolts:

CAUTION: ENSURE BOLTS WITH THE CORRECT GRIP LENGTH ARE USED TO SECURE THE FORWARD SUPPORT FITTING OR A FUEL LEAK MAY DEVELOP.

1) Coat exterior of bolts with primer.
2) Locate phenolic antifret strip between support fitting and wing.
3) Place countersunk washer on bolt and instal1 bolt with head up.
4) Secure bolt with washer and nut. Tighten nut to 220-360 pound-inches.

(d) Tighten nuts at inboard attach bolts within 180 to 250 pound-inches torque range.

(2) Attach flap track to forward support fitting.

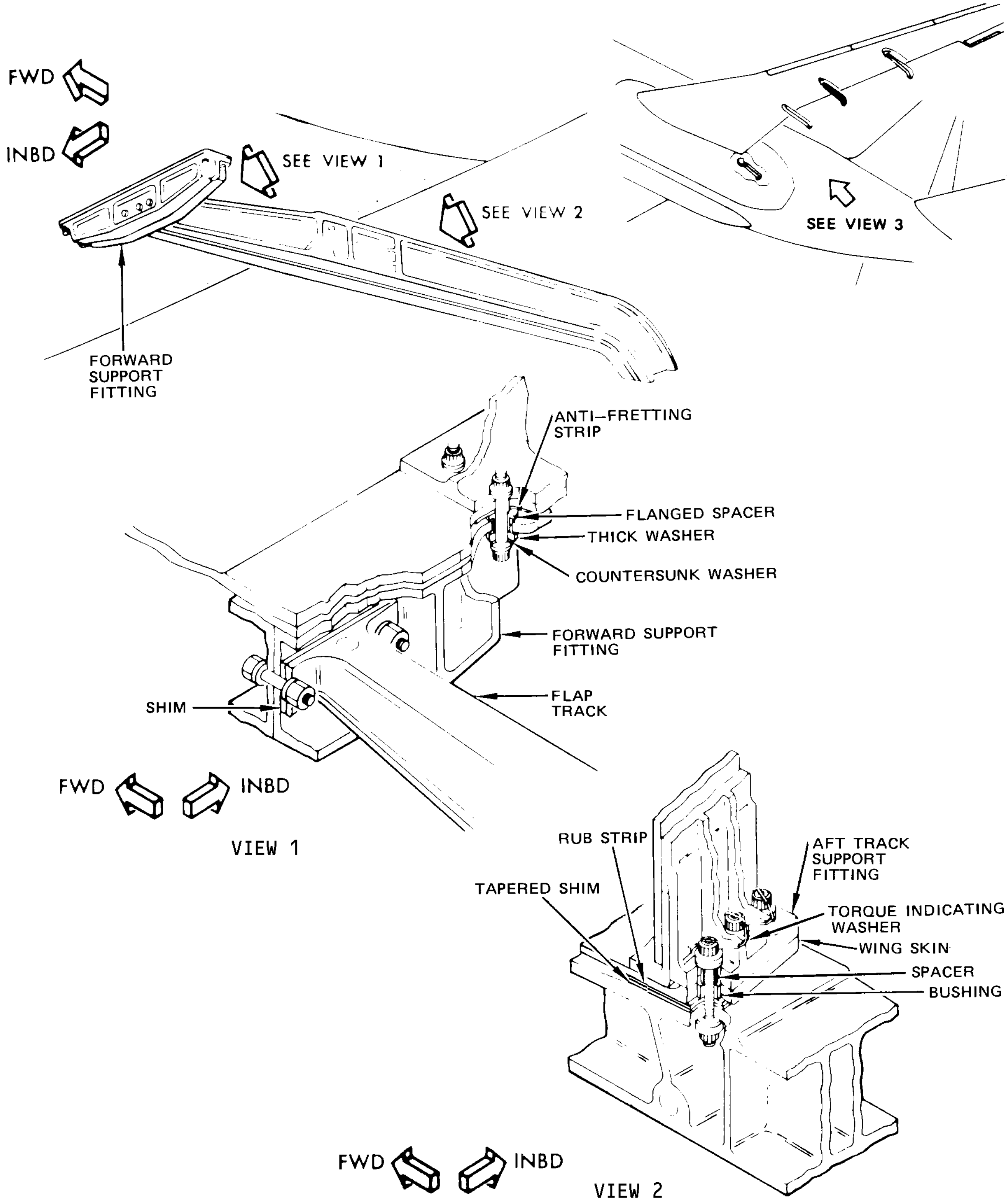
(a) Align track with forward support fitting. Ensure that shim is bonded to support fitting. Coat bolts with a thin film of grease and install with countersunk washer under head.

NOTE: Allowable shim thickness is 0.00 to 0.06 inch.

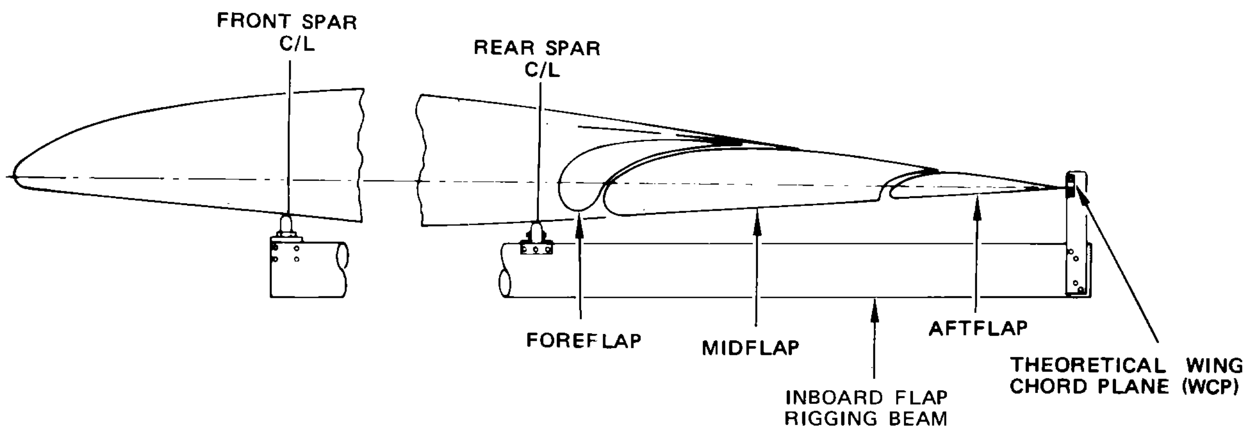
(b) Install center bolt and tighten within 910 to 1100 pound-inches torque range.

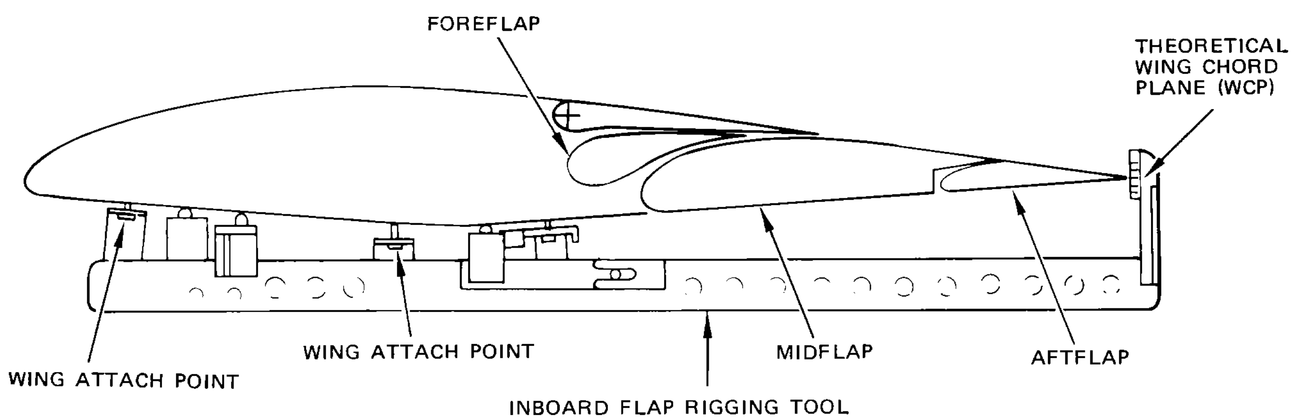
(c) Install washer and nut on inboard and outboard bolts. Tighten nuts within 810 to 1000 pound-inches torque range.

(d) Lockwire adjacent boltheads together.



Inboard Flap Outboard Track Installation
Figure 401 (Sheet 1)





VIEW 3

Inboard Flap Outboard Track Installation
Figure 401 (Sheet 2)

(3) If tapered shim has been damaged, install new tapered shims as follows:

NOTE: Shim thickness must be same as shims that were removed. On airplanes with bonded decal on wing rear spar, adjacent to flap tracks, these decals show the necessary shim thickness exclusive of anti-fretting strip thickness.

(a) Remove damaged tapered shim and sealant from upper surface of flap track.

(b) Temporarily install flap track as follows:

1) Position flap track and temporarily install spacers, bushings, bolts and nuts (View 1 and View 2, Fig. 401).

NOTE: Antifret strip must be installed on lower surface of wing prior to fitting tapered shim.

(c) Temporarily install trailing edge flap (Ref 27-51-12, Removal/Installation).

NOTE: It is not necessary to use corrosion preventive compound or wet primer when temporarily installing flap. Do not readjust aft flap.

(d) Determine flap track shim thickness as follows:

1) Check that flaps are in fully retracted position.

2) Remove plug screws and attach inboard flap rigging tool at location marked by black arrows at WBL 147.200 or hand position inboard flap rigging beam to black stripes located at WBL 147.200 on front and rear spar (View 3, Fig. 401).

NOTE: If black stripes are not on airplane, stencil 0.25 inch wide stripes per toll drawing F80209.

3) Support flap track and remove bolts attaching track to wing at aft attach point.

4) Raise or lower flap track to position trailing edge of aft flap within 0.25 inch of theoretical wing chord plane (WCP). Measurement must be made with aft flap deadweight rollers contacting flap track.

5) Position tapered shim between wing and flap track and rotate to fill gap.

6) Mark periphery and bolthole locations on tapered shim and remove shim.

7) Temporarily install bolts attaching flap track to wing at aft attach point and remove track support.

8) Trim tapered shim to size and drill boltholes.

(e) Remove inboard flap rigging tool and install plug screws if required.

(f) Remove temporarily installed trailing edge flap (Ref 27-51-12 R/I).

(g) Remove nuts, bolts, bushings, and spacers and remove temporarily installed flap track.

(h) Bond tapered shim to flap track upper surface with sealant and apply 100 ±25 pounds per square inch pressure until sealant is cured.

CAUTION: DO NOT INSTALL ATTACH BOLTS UNTIL SEALANT HAS CURED. SEALANT MAY EXTRUDE FROM FAYING SURFACE.

(4) Ensure that bushings are installed in skin at aft flap track support. If not install bushings with primer. Spacers will be located above inboard and outboard bushings.

(5) Align track with holes in track support fitting on rear spar.

(6) Clean all excess sealant from boltholes before installing bolts.

NOTE: Excess sealant may bind bolt during tightening and may result in loose bolts.

(7) Coat bolts with a thin film of grease and install with countersunk washer under head. Ensure that bushings at inboard and outboard bolt do not protrude above skin into track support fitting.

(8) Install washers and nuts finger-tight.

(9) Tighten inboard and outboard bolts to 360 to 420 pound-inches.

(10) Tighten center bolt until the outer ring of the torque indicating washer is no longer free to turn, maximum torque is 1300 pound-inches. Check that minimum of one thread extends through nut.

NOTE: Do not reuse torque indicating washer. Use new torque indicating washer before tightening bolt. If outer ring of torque indicating washer is still free to turn at 1300 pound-inches, the holes are not properly aligned.

(11) Lockwire adjacent boltheads together.

(12) Clean area around boltheads.

(13) Apply fillet of sealant around boltheads.

E. Restore Airplane to Normal Configuration

(1) Install aft vibration isolator (Ref Chapter 71, Aft Vibration Isolator).

(2) Install access panel on top of wing, if removed.

(3) Install engine-to-wing mid fairing (Ref Chapter 54, Engine-to-Wing Mid Fairing).

(4) Install fixed fairing (Ref Chapter 71, Fixed Fairing).
(5) Install power plant (Ref Chapter 71, Power Plant).
(6) Install flap transmission (Ref 27-51-281, Removal/Installation).
(7) Install trailing edge flaps (Ref 27-51-12, Removal/Installation).

3. Inboard Flap Inboard Track - Removal/Installation

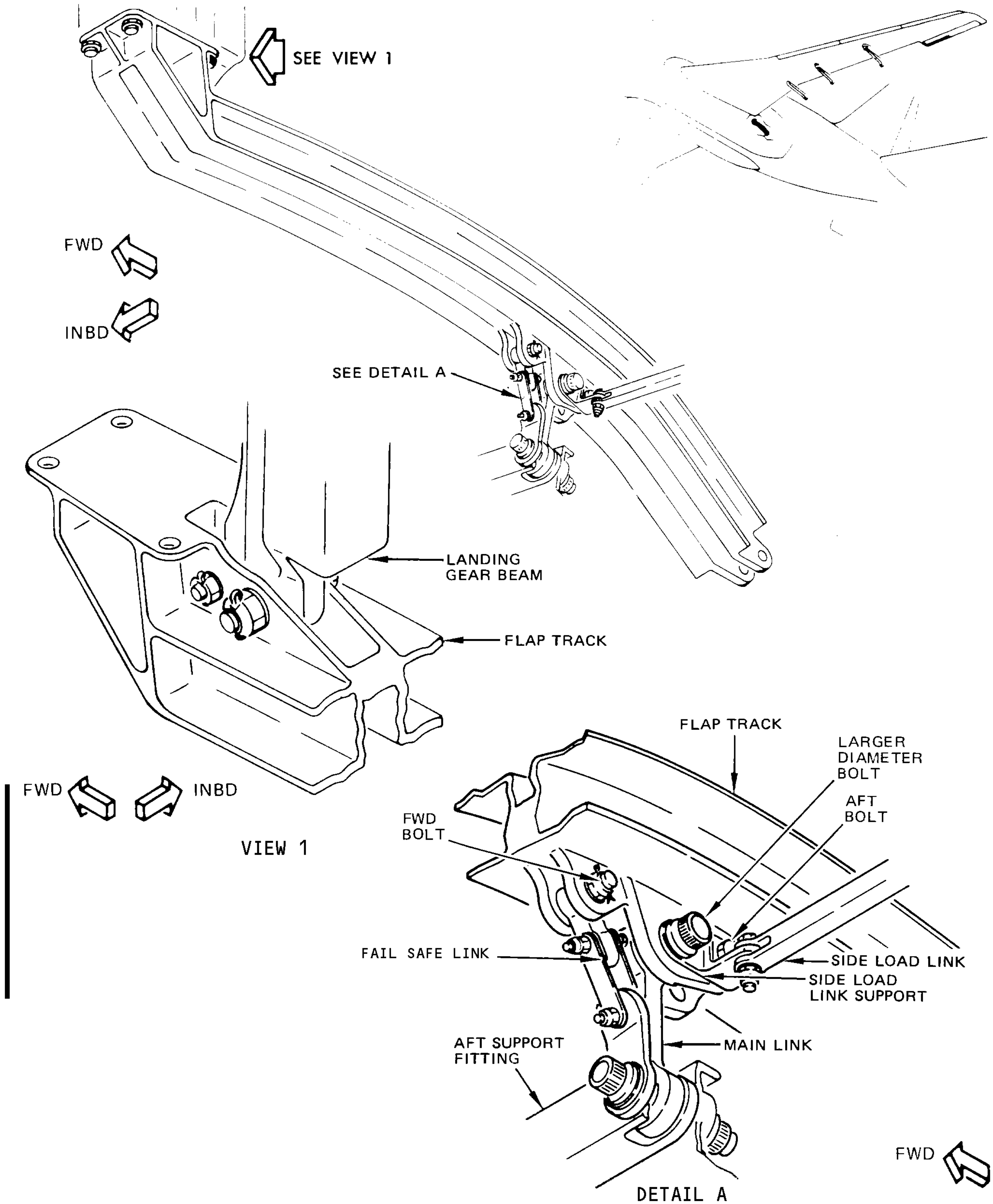
A. Equipment and Materials
(1) Primer - BMS 10-11, Type I (Ref 20-30-41)
(2) Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-41)

B. Prepare for Removal
(1) Remove trailing edge flap (Ref 27-51-12 R/I).
(2) Remove flap transmission (Ref 27-51-281 R/I).

C. Remove Inboard Flap Inboard Track
(1) Remove aft track attach bolts (Fig. 402).
(2) Remove bolts attaching track to forward track support fitting and remove track from airplane.

D. Install Inboard Flap Inboard Track
(1) If existing bearings, bushings and bolts are to be used, check allowable wear (Ref 27-51-161 I/C).
(2) Align track with main landing gear beam and install forward bolts (Fig. 402). Coat large diameter bolt with corrosion preventive compound before installation and dip small diameter bolt in primer and install while wet.
(3) Install washers and nuts. Tighten nut on large diameter bolt to 100 pound-inches and install cotter pin. Tighten nut on smal1 diameter bolt finger-tight and install cotter pin.
(4) Align track with aft track support fitting, with washer on each side of fail safe link. Coat large diameter bolt with corrosion preventive compound and insert through side load link support, track and main link. Dip small diameter bolts in primer and install forward bolt through track and fail safe link, install aft bolt through side load link support and track.
(5) Install washers and nuts. Tighten forward nut finger-tight and install cotter pin. Tighten large diameter nut 600-700 inch-pounds (67.79-79.09 Nm). Tighten aft nut 160-240 inch-pounds (18.08-27.12 Nm).

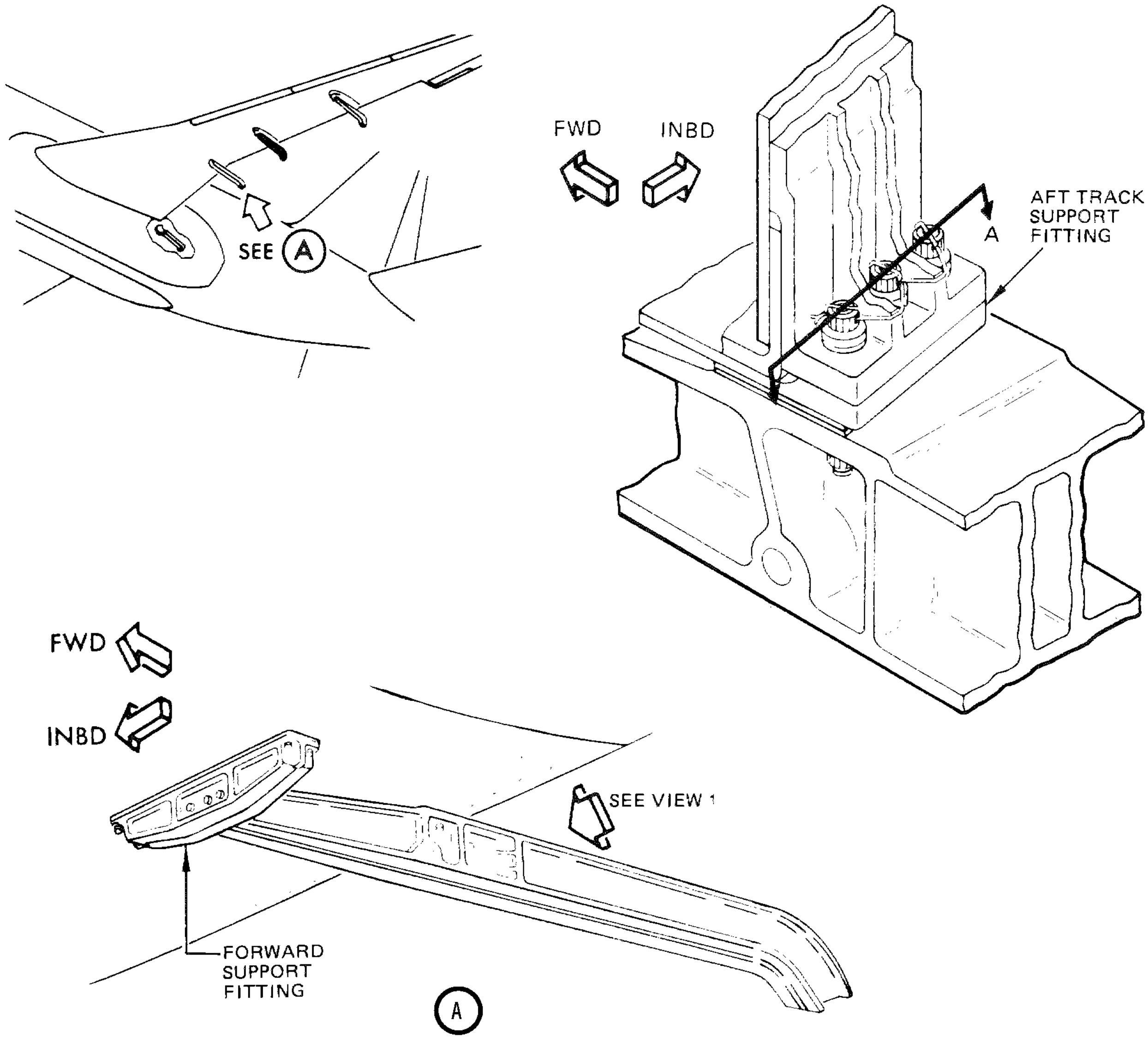
E. Restore Airplane to Normal
(1) Install flap transmission (Ref 27-51-281, Flap Transmission - Removal/Installation.
(2) Install trailing edge flap (Ref 27-51-12, Inboard Trailing Edge Flap - Removal/Installation.



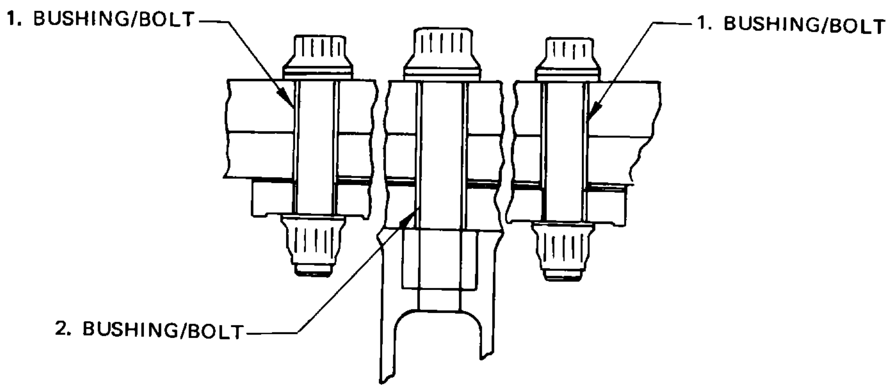
Inboard Flap Inboard Track Installation
Figure 402

INBOARD FLAP TRACKS - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Inboard Flap Tracks - Removal/Installation for this information.
2. Inboard Flap Tracks Wear Limits (Fig. 601, 602)



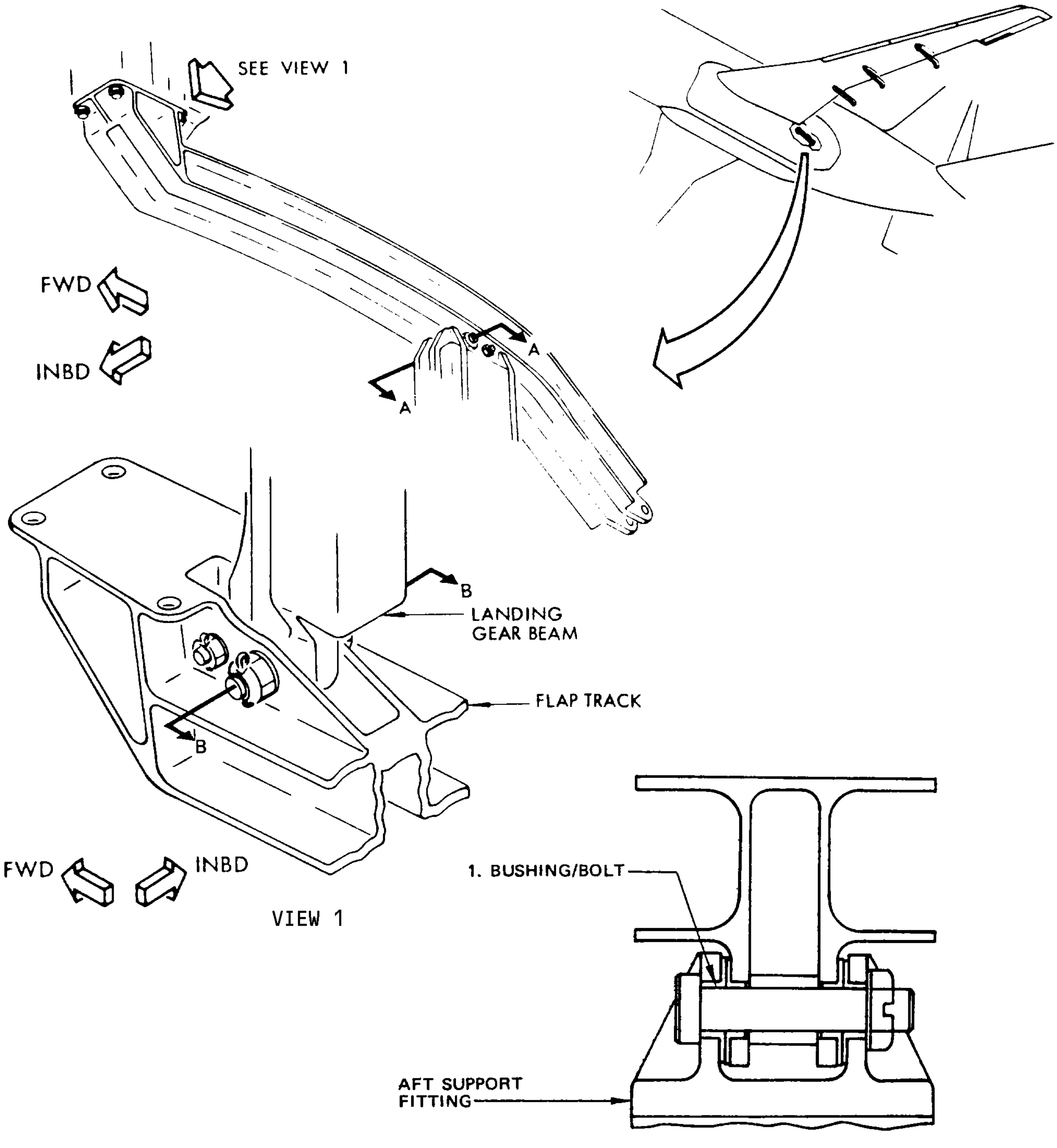
Inboard Flap Outboard Track Wear Limits
Figure 601 (Sheet 1)



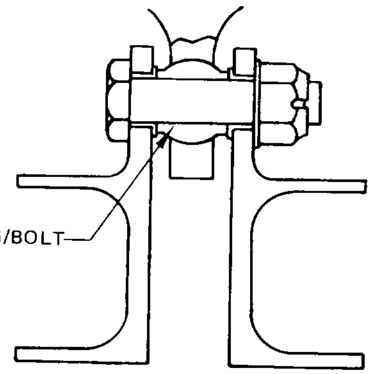
SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.4370	0.4420	0.4470	0.0100	X		
	BOLT	OD	0.4365	0.4370	0.4270		X		
2	BUSHING	ID	0.4995	0.5005	0.5025	0.0030	X		
	BOLT	OD	0.4990	0.4995	0.4965		X		

Inboard Flap Outboard Track Wear Limits
Figure 601 (Sheet 2)



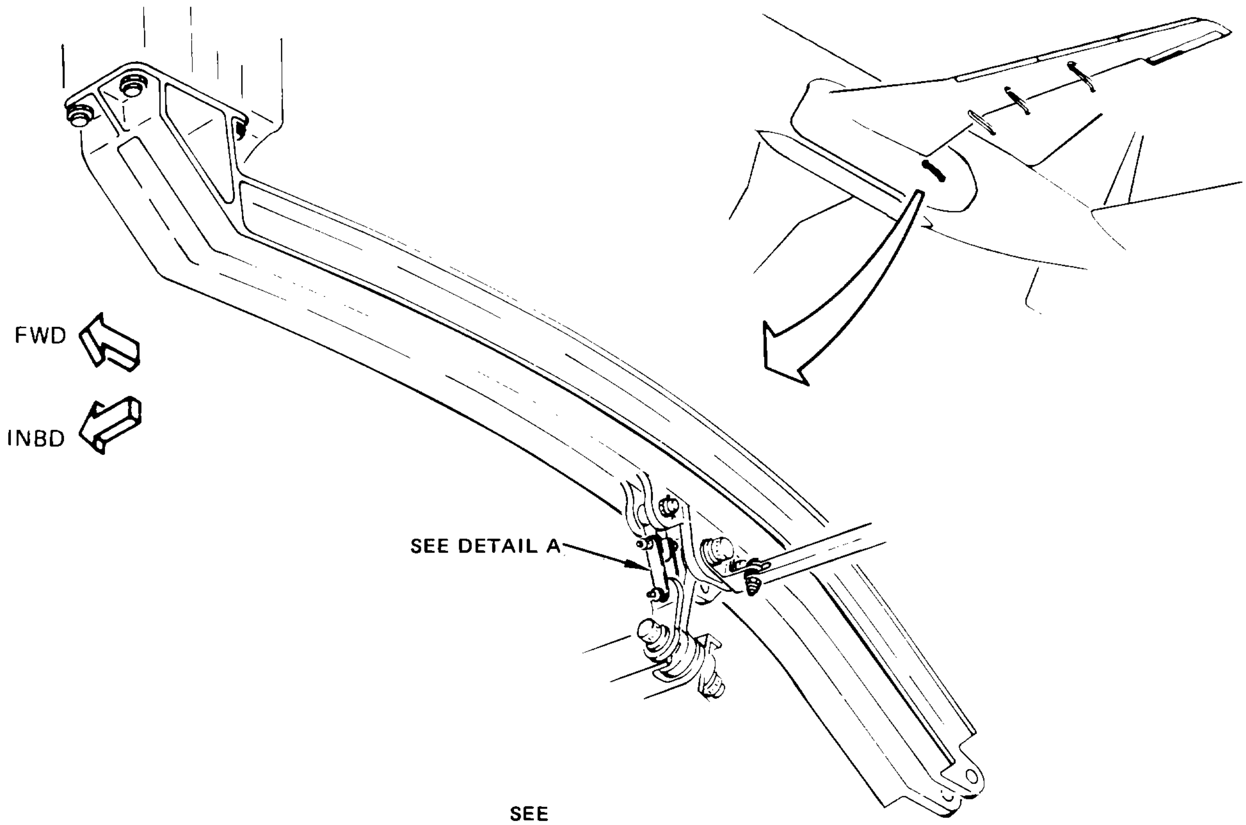
Inboard Flap Inboard Track Wear Limits
Figure 602 (Sheet 1)

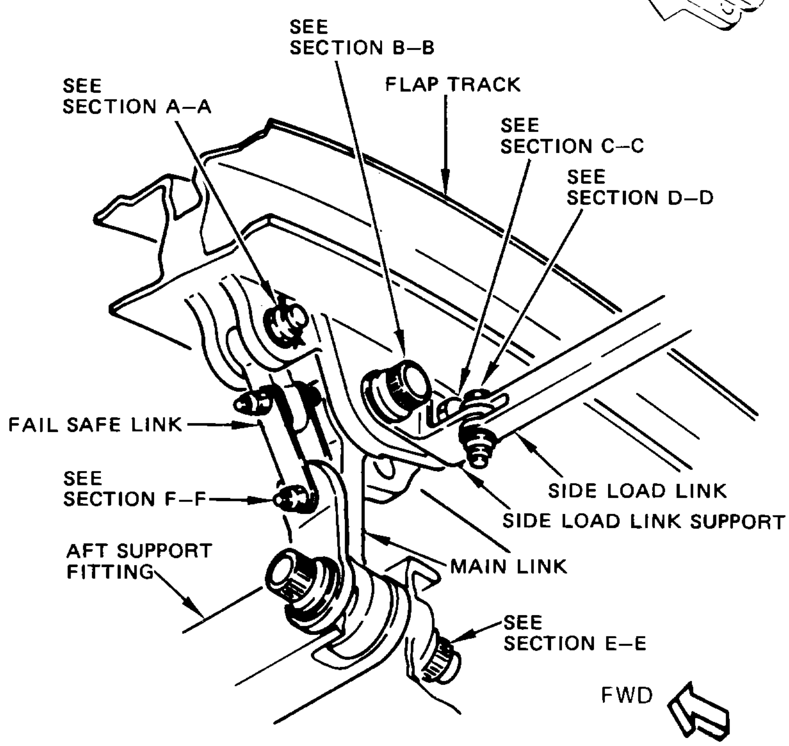


SECTION B-B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.6250	0.6265	0.6300	0.0060	X		
	BOLT	OD	0.6235	0.6240	0.6190		X		
2	BEARING	ID	0.5625	0.5630	0.5655	0.0040	X		
	BOLT	OD	0.5610	0.5615	0.5505		X		

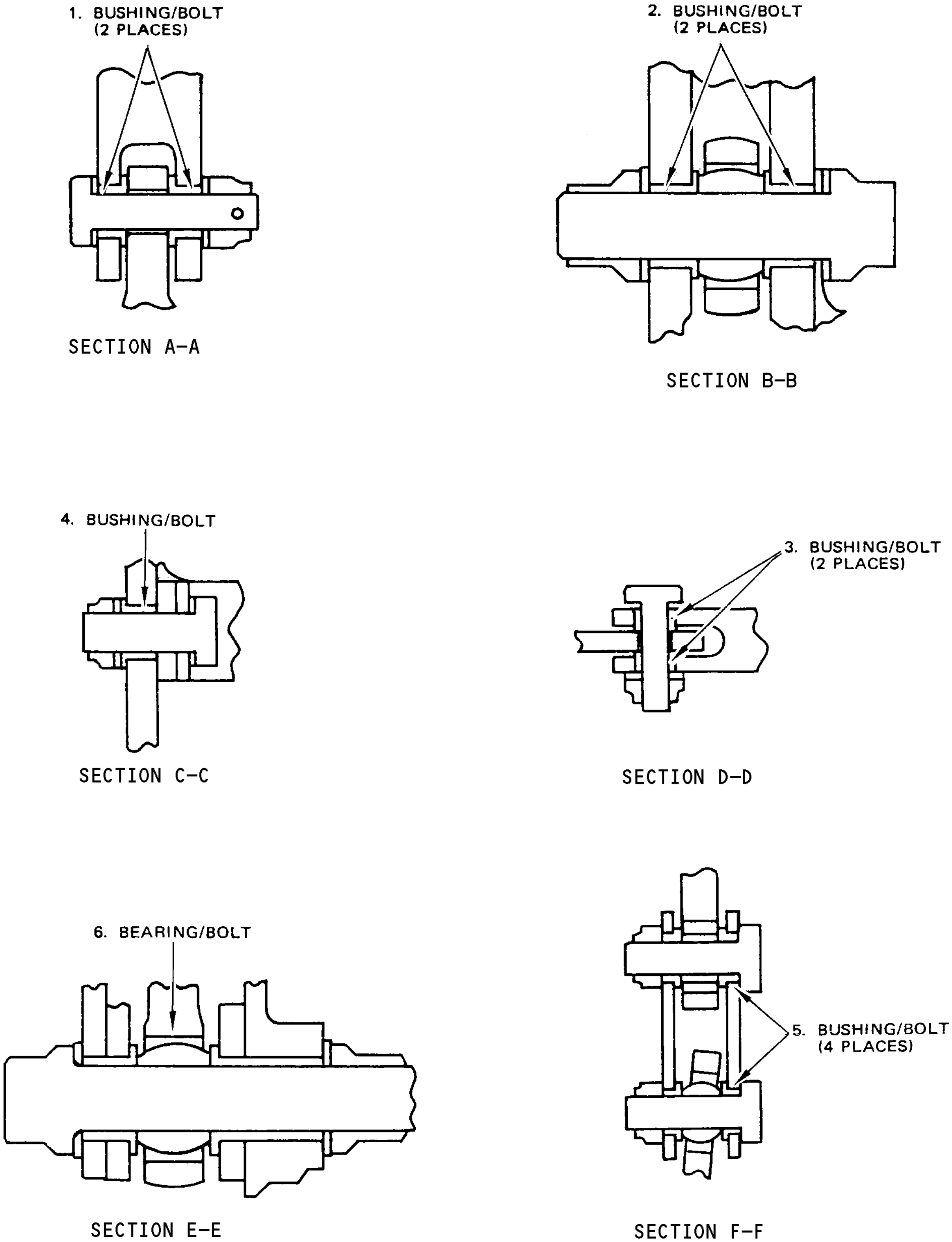
Inboard Flap Inboard Track Wear Limits
Figure 602 (Sheet 2)





DETAIL A

Inboard Flap Inboard Track Wear Limits
Figure 602 (Sheet 3)



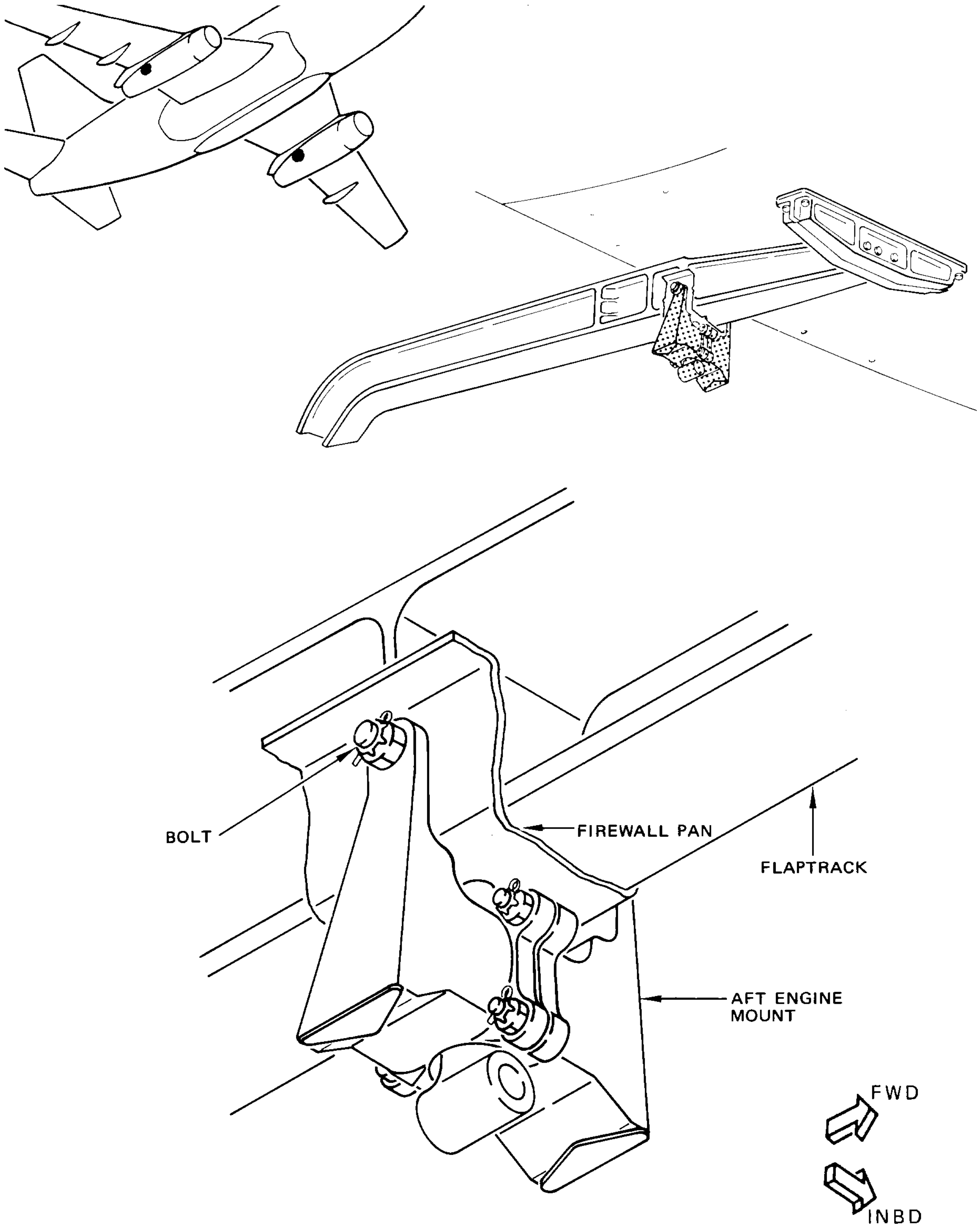
Inboard Flap Inboard Track Wear Limits
Figure 602 (Sheet 4)

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3750	0.3765	0.3795	0.0050	X		
	BOLT	OD	0.3740	0.3745	0.3700		X		
2	BUSHING	ID	0.6245	0.6255	0.6280	0.0040	X		
	BOLT	OD	0.6235	0.6240	0.6205		X		
3	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
4	BUSHING	ID	0.3750	0.3765	0.3190	0.0060	X		
	BOLT	OD	0.3735	0.3745	0.3180		X		
5	BUSHING	ID	0.3195	0.3140	0.3170	0.0050	X		
	BOLT	OD	0.3115	0.3120	0.3075		X		
6	BEARING	ID	0.6245	0.6250	0.6270	0.0030	X		
	BOLT	OD	0.6235	0.6240	0.6215		X		

Inboard Flap Inboard Track Wear Limits
Figure 602 (Sheet 5)

FLAP TRACK AFT ENGINE MOUNT ATTACH POINT - INSPECTION/CHECK

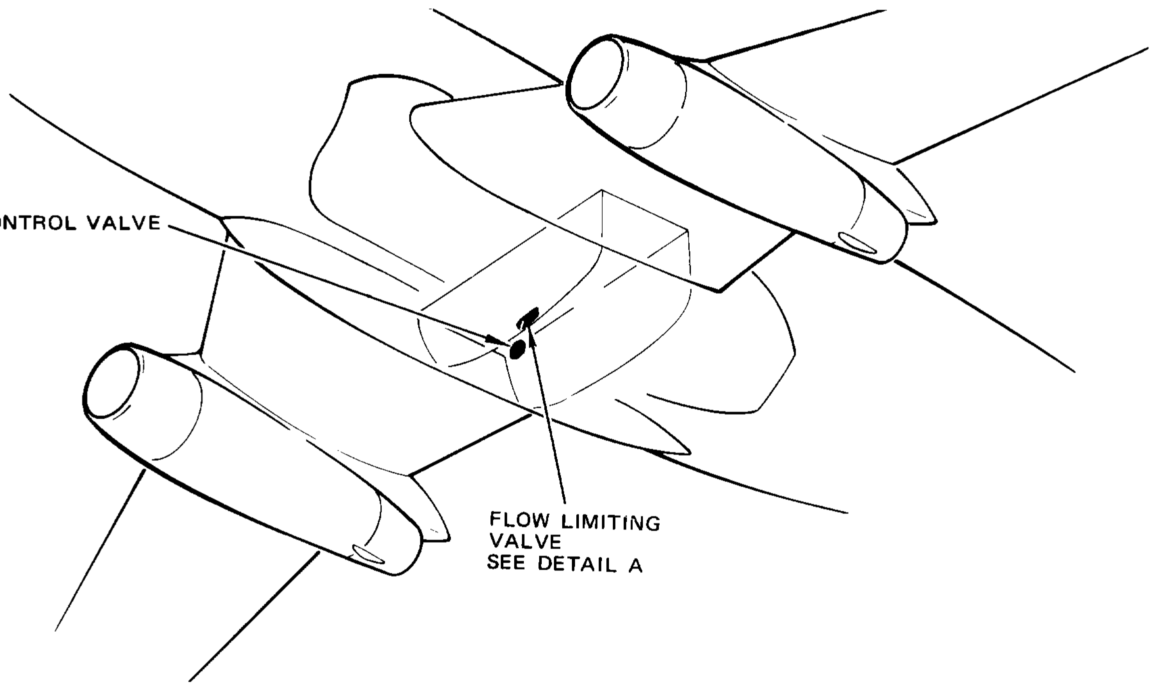
1. Flap Track Aft Engine Mount Attach Point Inspection
   A. General
      (1) This procedure applies to examination of the area of the flap track where the bolt supporting the aft engine mount is inserted.
   B. Prepare for Examination
      (1) Remove engine midfairing access panels 5119, 5219, 5126, and 5226.
      (2) Remove firewall pan sealant as necessary (Fig. 601).
      (3) Remove cover in firewall pan.
   C. Examine Flap Track at Aft Engine Mount Attach Point
      (1) Examine area around flap track attach point for cracks.
   D. Restore Airplane to Normal
      (1) Install cover in firewall pan.
      (2) Install sealant per Chapter 51, Seals and Sealing.
      (3) Install access panels.

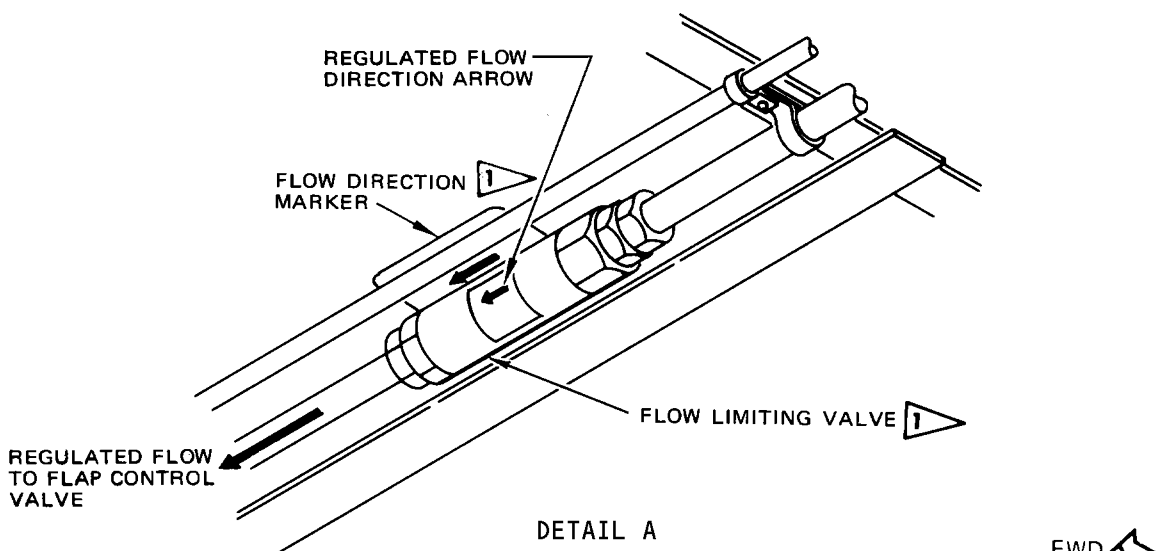


Flap Track Aft Engine Mount Attach Point Inspection
Figure 601

FLAP FLOW LIMITING VALVE - REMOVAL/INSTALLATION

1. General
   A. The flow limiting valve is installed on the ceiling of the right wheel well.
2. Equipment and Materials
   A. Fire Resistant Hydraulic Fluid - BMS 3-11 (Ref 20-30-21)
   B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
3. Remove Flow Limiting Valve (Fig. 401)
   A. Depressurize hydraulic system A (AMM 29-11-0/201).
   B. Disconnect hydraulic lines and remove flow limiting valve.
   C. Install plugs in hydraulic lines.
4. Install Flow Limiting Valve (Fig. 401)
   A. Remove reducer from each end of removed valve and install on replacement valve using new O-rings. Lubricate O-rings with hydraulic fluid or assembly lube prior to installation.
   B. Remove plugs from hydraulic lines and install flow limiting valve with regulated flow direction arrow on valve pointing toward flap control valve (flow direction arrows on valve in agreement with arrows on marker on ceiling of wheel well adjacent to valve). Tighten hydraulic fittings.
   C. Provide system A hydraulic power (AMM 29-11-0/201).
   D. Cycle flaps to bleed hydraulic system and check hydraulic fittings for leaks.
   E. Test flow limiting valve (Ref Adjustment/Test).
5. Restore Airplane to Normal
   A. Remove system A hydraulic power (AMM 29-11-0/201).
   B. Check hydraulic reservoirs and service if required (Ref Chapter 29).





DETAIL A

1 FLOW DIRECTION ARROWS ON VALVE TO AGREE WITH ARROWS ON MARKER

Flow Limiting Valve Installation
Figure 401

FLAP FLOW LIMITING VALVE - ADJUSTMENT/TEST

1. Flap Flow Limiting Valve Test
   A. Test Flow Limiting Valve
      (1) Provide system A hydraulic power (AMM 29-11-0/201).

         NOTE: Hydraulic service cart set at 20 gpm and 3000 psi or operation of at least one engine-driven pump is required to perform this portion of test.

      (2) Move flap control lever from FLAP UP detent to FLAP DOWN (40-unit) detent.
      (3) Check that flaps extend in 35 ±5 seconds.

         NOTE: Operating time should be measured from start of flap motion in up position until downstop on number 4 ball screw nut is 1.50 ±0.20 inches from downstop on jackscrew.

      (4) Position flap control lever in FLAP UP detent.
      (5) Check that flaps retract in 35 ±5 seconds.
      (6) Remove system A hydraulic power (AMM 29-11-0/201).

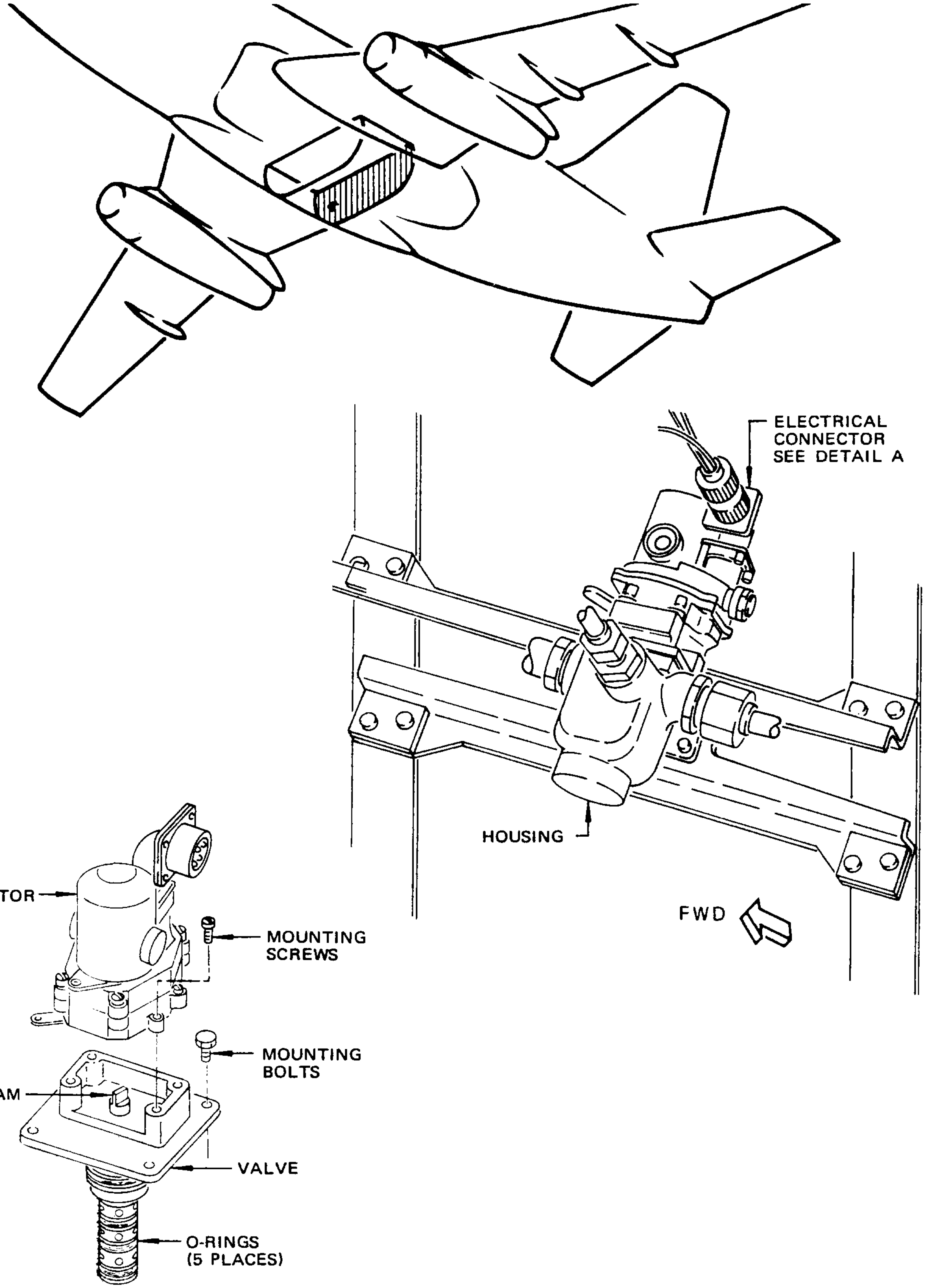
TRAILING EDGE FLAP BYPASS VALVE - REMOVAL/INSTALLATION

1. General
   A. The following procedures provide instructions for replacement of complete bypass valve including motor, valve and housing. Motor and valve may be replaced without removing housing or motor only may be replaced without removing valve or housing. The motor drive and valve cam are indexed to aid correct motor installation.
2. Removal/Installation Flap Bypass Valve Assembly

   NOTE: Use this procedure when replacing complete assembly (motor, valve and housing). When replacing motor and valve assembly use procedure in par. 3 or when replacing motor only use procedure in par. 4.
   1

   A. Equipment and Materials
      (1) Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   B. Remove Flap Bypass Valve Assembly
      (1) Depressurize hydraulic system A and depressurize hydraulic reservoirs (Ref 27-51-0, Trailing Edge Flaps - Maintenance Practices.
      (2) Disconnect hydraulic lines connected to bypass valve assembly (Fig. 401).
      (3) Install plugs in hydraulic lines and cap all ports.
      (4) Open FLAP VALVES circuit breaker and TE ALT FLAP DRIVE MOTOR circuit breaker on circuit breaker panel P6.
      (5) Disconnect electrical connector on bypass valve motor.
      (6) Remove bolts attaching bypass valve assembly to support bracket and remove bypass valve assembly.
   C. Install Flap Bypass Valve Assembly
      (1) Install union an O-ring in each port of valve assembly. Lightly lubricate O-ring with hydraulic fluid or assembly lube prior to installation.
      (2) Position valve assembly on support bracket and install mounting bolts (Fig. 401).
      (3) Remove caps from ports and plugs from hydraulic lines.
      (4) Connect hydraulic lines to valve assembly.
      (5) Install electrical connector on bypass valve motor.
      (6) Test bypass valve (Ref Trailing Edge Flap Bypass Valve - Adjustment/Test).
      (7) Check hydraulic reservoirs and service, if required.
3. Removal/Installation Flap Bypass Valve

   NOTE: Use this procedure when replacing assembly of motor and valve. When replacing the motor only use procedure in par. 4.



Trailing Edge Flap Bypass Valve Installation
Figure 401

A. Equipment and Materials
   (1) Fire Resistant Hydraulic Fluid - BMS 3-11
   (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)

B. Remove Flap Bypass Valve
   (1) Depressurize hydraulic system A and depressurize hydraulic reservoir (Ref 27-51-0).
   (2) Open FLAP VALVES circuit breaker and TE ALT FLAP DRIVE MOTOR circuit breaker on circuit breaker panel P6.
   (3) Disconnect electrical connector from valve motor.
   (4) Remove four valve mounting bolts attaching valve housing (Fig. 401).
   (5) Carefully remove valve from housing by turning slightly and lifting straight up.

       CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   (6) Take necessary precautions to prevent dirt entering shutoff valve cavity when valve is removed.

C. Install Flap Bypass Valve
   (1) Install five O-rings with backup rings on replacement valve (Fig. 401). Lightly lubricate O-rings and backup rings with hydraulic fluid or assembly lube at installation.
   (2) Carefully insert bypass valve into housing.
   (3) Install four mounting bolts. Tighten bolts to 30-40 pound-inches torque range.
   (4) Install lockwire on four mounting bolts.
   (5) Install electrical connector at valve motor.
   (6) Test bypass valve (Ref Trailing Edge Flap Bypass Valve - Adjustment/Test).
   (7) Check hydraulic reservoirs and service, if required.

4. Removal/Installation Flap Bypass Valve Motor

NOTE: Use this procedure when replacing the valve motor only. When replacing the motor and valve use the procedure in par. 3.

A. Remove Flap Bypass Valve Motor
   (1) Open FLAP VALVES circuit breaker and TE ALT FLAP DRIVE circuit breaker on circuit breaker panel P6.
   (2) Disconnect electrical connector from valve motor.
   (3) Move manual override lever to position 2.
   (4) Remove four mounting screws (Fig. 401) attaching valve motor to valve. Remove valve motor from valve.

B. Install Flap Bypass Valve Motor
   (1) On replacement of valve motor, move manual override lever to position No. 2.

(2) Position valve motor on valve and engage motor drive with valve cam (Fig. 401).
(3) Install the four mounting screws.
(4) Install lockwire on mounting screws.
(5) Install electrical connector on valve motor.
(6) Test bypass valve (Ref Trailing Edge Flap Bypass Valve - Adjustment/Test.

TRAILING EDGE FLAP BYPASS VALVE - ADJUSTMENT/TEST

1. Test Flap Bypass Valve
   A. Connect electrical power to airplane.
   B. Pressurize the hydraulic system A (AMM 27-51-0/201).
   C. Position the flap control lever to the FLAP UP detent to retract the flaps.
   D. Open TE ALT FLAP DRIVE MOTOR circuit breaker on circuit breaker panel P6.
   E. Close FLAP VALVES circuit breaker to energize alternate flap drive system.
   F. Position alternate flap master arming switch to ARM.
   G. Position flap control lever to FLAP DOWN (40-unit) detent and check that flaps do not extend.
   H. Position alternate flap master arming switch to OFF. Check that flaps extend.
   I. Position flap control lever to FLAP UP detent to retract flaps.
   J. Check bypass valve hydraulic fittings for leakage.
   K. Depressurize the hydraulic system A (AMM 27-51-0/201).
   L. Close TE ALT FLAP DRIVE MOTOR circuit breaker on circuit breaker panel P6.
   M. Determine whether there is any further need for electrical power on airplane. If not, disconnect electrical power.

FLAP CONTROL QUADRANT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Pressure Sealant - BMS 5-19, class A
   B. Ball and Roller Bearing Grease - MIL-G-25760
2. Prepare Flap Control Quadrant for Removal
   A. Gain access to flap control quadrant through passenger cabin floor or through aft cargo compartment.
      (1) To gain access through passenger cabin floor:
         (a) Remove necessary interior equipment, carpets and floor panel for access to flap control quadrant which is located outboard of seat tracks on right side of airplane, 20 inches aft of main gear downlock viewer window (Ref Chapter 25, Carpets, and Chapter 56, Main Gear Downlock Viewer Window).

            NOTE: Floor panel is 60 inches long and begins 14 inches forward of flap control quadrant.

      (2) To gain access through aft cargo compartment:
         (a) Remove forward right ceiling panel in aft cargo compartment. Refer to Chapter 25, Cargo Compartment Ceiling Lining.
   B. Provide system A hydraulic power. Refer to 27-51-0, Trailing Edge Flaps - Maintenance Practices.
   C. Position flap control lever to FLAP UP detent to retract flaps.
   D. Remove system A hydraulic power and depressurize hydraulic reservoirs. Refer to 27-51-0.
   E. Remove flap control unit. Refer to 27-51-201, Flap Control Unit - Removal/Installation.
   F. Open lower nose compartment access door. Refer to Chapter 12, Access Doors and Panels.
3. Remove Flap Control Quadrant
   A. Remove turnbuckle locking clips and disconnect WFA and WFB turnbuckles. Tag cables and clamp to minimize slack.
   B. Disconnect cables from flap control quadrant. Tag cables and flap control quadrant. Clamp cables to minimize slack (Fig. 401).
   C. If access is through aft cargo compartment:
      (1) Remove bolt securing quadrant segment to shaft and remove quadrant segment from airplane.
      (2) Slide shaft downward and remove from airplane.
   D. Remove eight screws and three bolts to disconnect quadrant support.
   E. Lift quadrant support away from pressure sealant on mounting surface and remove from airplane.
4. Prepare Flap Control Quadrant for Installation
   A. Remove pressure sealant from wheel well ceiling in area of flap control quadrant (AMM 51-31-0/201).

      CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

B. Apply a brush coat of pressure sealant in and around the upper surface of the 15 holes in wheel well ceiling.

C. If access is through aft cargo compartment, remove bolt which secures quadrant segment to shaft and remove shaft from quadrant support.

5. Install Flap Control Quadrant

A. Position quadrant support on wet pressure sealant with studs protruding through wheel well ceiling. Quadrant stop will be inboard of shaft (Fig. 401).

B. Install three bolts to secure support. Inboard bolt will have head up and outboard bolts will have heads down. Secure each bolt with washer and locknut.

C. Install eight screws with heads down. Secure each screw with washer and locknut.

D. If access is through aft cargo compartment:

(1) Slide shaft upward through quadrant support until shaft seats firmly in bearings.

(2) Position quadrant over stop with sloping face up and engage splines.

NOTE: Shaft has blind spline at both ends to ensure correct assembly.

(3) Secure quadrant segment to shaft using bolt, washer, and locknut. While tightening bolt 90 to 110 pound-inches, apply a 20- to 50-pound upwards load on shaft and downwards load on quadrant segment to seat shaft in bearings.

E. Connect WFA and WFB cables to quadrant. Secure cables with cotter pin. Remove tags and cable clamps.

F. Lubricate control cable with grease in area which contacts quadrant.

G. Ensure that quadrant stops are free of foreign particles.

H. Connect WFA and WFB cables at turnbuckles. Remove tags and cable clamps.

I. Lift flap control lever and clamp so that index dog is disengaged from detent plate.

J. Adjust WFA and WFB turnbuckles so that flap control lever springs back to rigging position shown in figure 402. Adjust so that cable tension is within (+ 10) pounds of that specified in temperature-tension chart when lever is in rigging position.

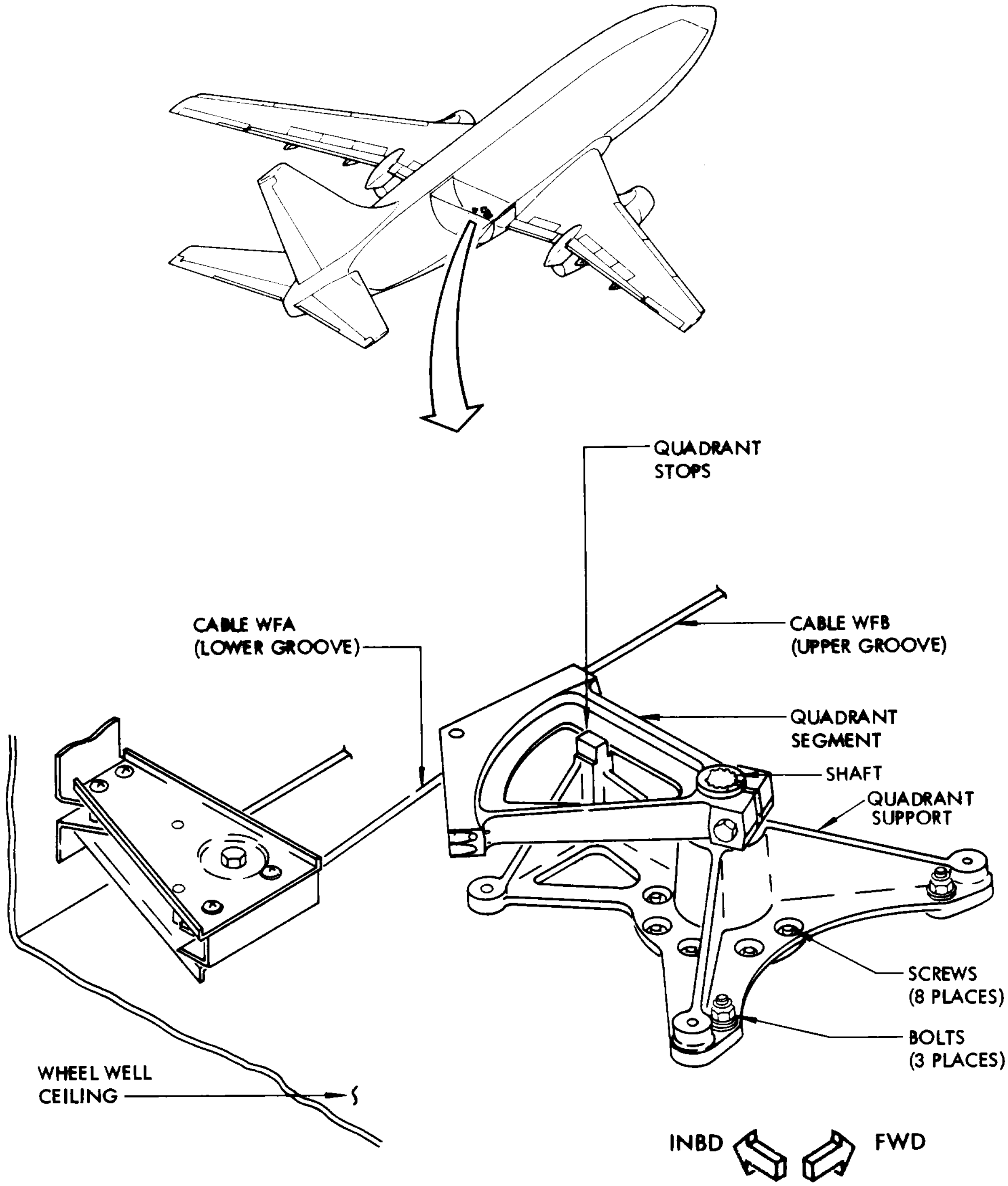
NOTE: Ensure that flap control quadrant stops contact when flap control lever is in rigging position.

K. Install turnbuckle locking clips.

L. Remove clamp from flap control lever.

M. Install flap control unit. See Flap Control Unit - Removal/Installation, 27-51-201.

N. Test flap control quadrant per flap control unit test. See Flap Control Unit - Adjustment/Test, 27-51-201.



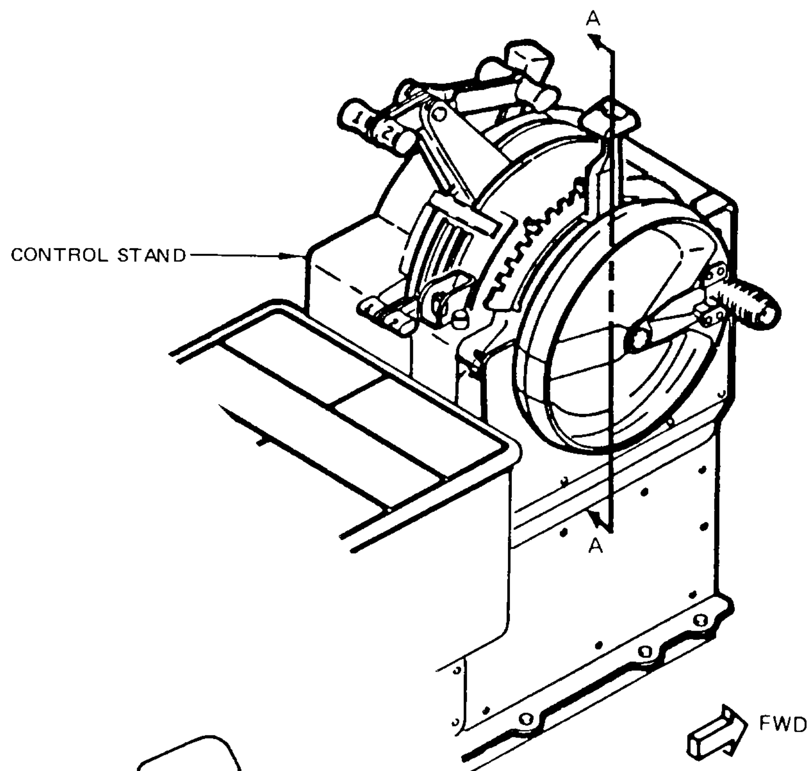
Flap Control Quadrant Installation
Figure 401

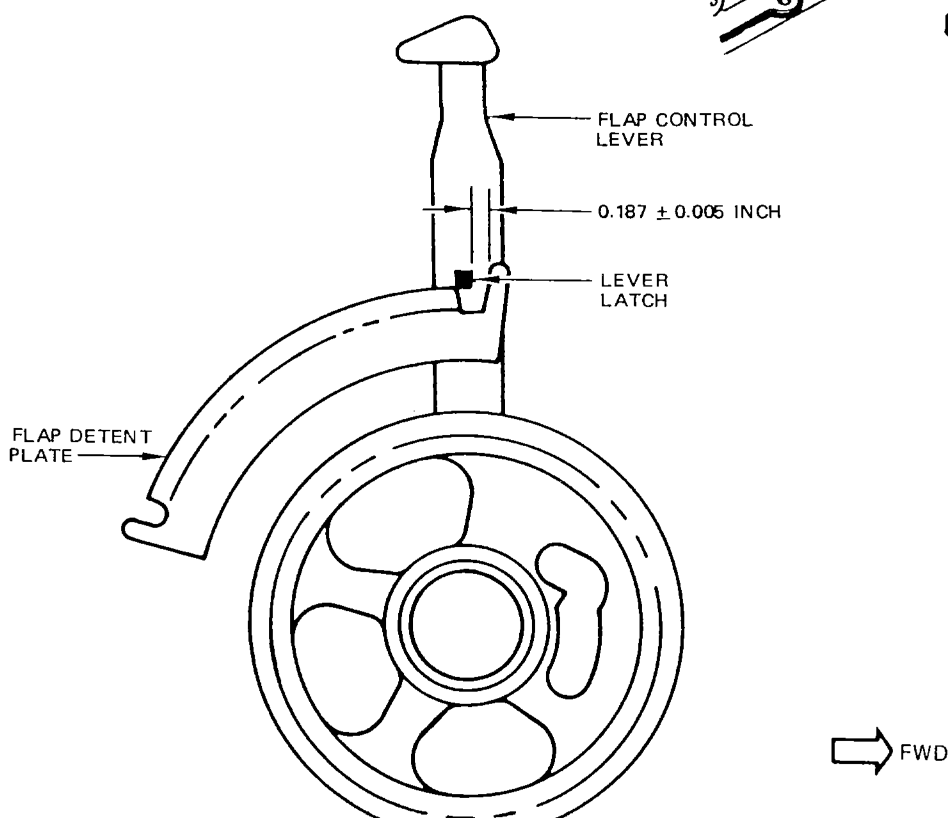
6. Restore Airplane to Normal Configuration
   A. If required, install and seal floor panel. See Passenger Cabin Floors, Chapter 53.
   B. If required, install carpets and interior equipment. See Carpets, Chapter 25.
   C. If required, install aft cargo compartment ceiling panel. See Cargo Compartment Ceiling Lining, Chapter 25.
   D. Close lower nose compartment access door.

TEMP °F [1]	RIGGING LOAD 3/32 AND 1/8 INCH DIA CABLES WFA AND WFB + 10/–0 POUNDS [2]
110	117
90	108
70	100
50	91
30	83
+10	74
–10	65
–30	57
–40	52

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (+ 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE

[2] CABLES FORWARD OF TURNBUCKLES ARE 3/32 INCH DIAMETER AND CABLES AFT OF TURNBUCKLES ARE 1/8 INCH DIAMETER





SECTION A-A

Flap Control Level Rigging Position
Figure 402

FLAP CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The flap control unit includes the leading edge flap control valve, the trailing edge flap control valve, control actuating linkage, follow-up linkage and flap limit switch actuating cams. The flap limit switches are mounted on the flap control unit and may be removed with the flap control unit, however they are not part of the replacement control unit assembly.
2. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, class 3 (AMM 20-30-21/201)
   B. Pressure Sealant - BMS 5-19, class A (AMM 20-30-11/201)
   C. Primer - BMS 10-11, Type 1 (AMM 20-30-41/201)
   D. Grease - BMS 3-33 (Preferred)
   E. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   F. Rigging Pin - F-1, 0.311 +0.000/-0.002 inch diameter, 2.35 ±0.06 inches long (MS20392-4)

      NOTE: Rigging pin is a part of kit F70207-3, -52, -61, or -84.

   G. Wrench Set - F80197-5 (Preferred) or -1 (Optional)
   H. Bonding Meter (Ref 20-22-01)
3. Prepare Flap Control Unit for Removal
   A. Provide system A hydraulic power (AMM 27-51-0/201).
   B. Position flap control lever in FLAP UP detent.
   C. Remove system A hydraulic power (AMM 27-51-0/201).
   D. Remove lower pan from flap control unit (Fig. 401).
   E. Remove switch cover from flap control unit.
4. Remove Flap Control Unit
   A. Use wrench set to remove limit switches (Fig. 401). Identify each switch so that it may be easily matched with proper mounting hole at installation. Retaining nuts and roller guides remain with each switch.
   B. Relieve tension in WFFA and WFFB cables, remove cable guard, and detach cables from follow-up drum.
   C. Disconnect hydraulic lines from leading edge flap and slat control valve and trailing edge flap control valve. Install caps on hydraulic ports and plugs in hydraulic lines.
   D. Loosen clamping bolt in flap control unit input crank.
   E. Remove locknut and washer from each of three control unit mounting studs. Lower control unit and remove from airplane.
   F. Reinstall cable guard, switch cover and lower pan on flap control unit.
5. Prepare Flap Control Unit for Installation
   A. Remove lower pan.
   B. Remove switch cover (Fig. 401).
   C. Remove cable guard.
   D. Coat exposed part of control unit input shaft and internal splines of input crank with corrosion preventive compound.

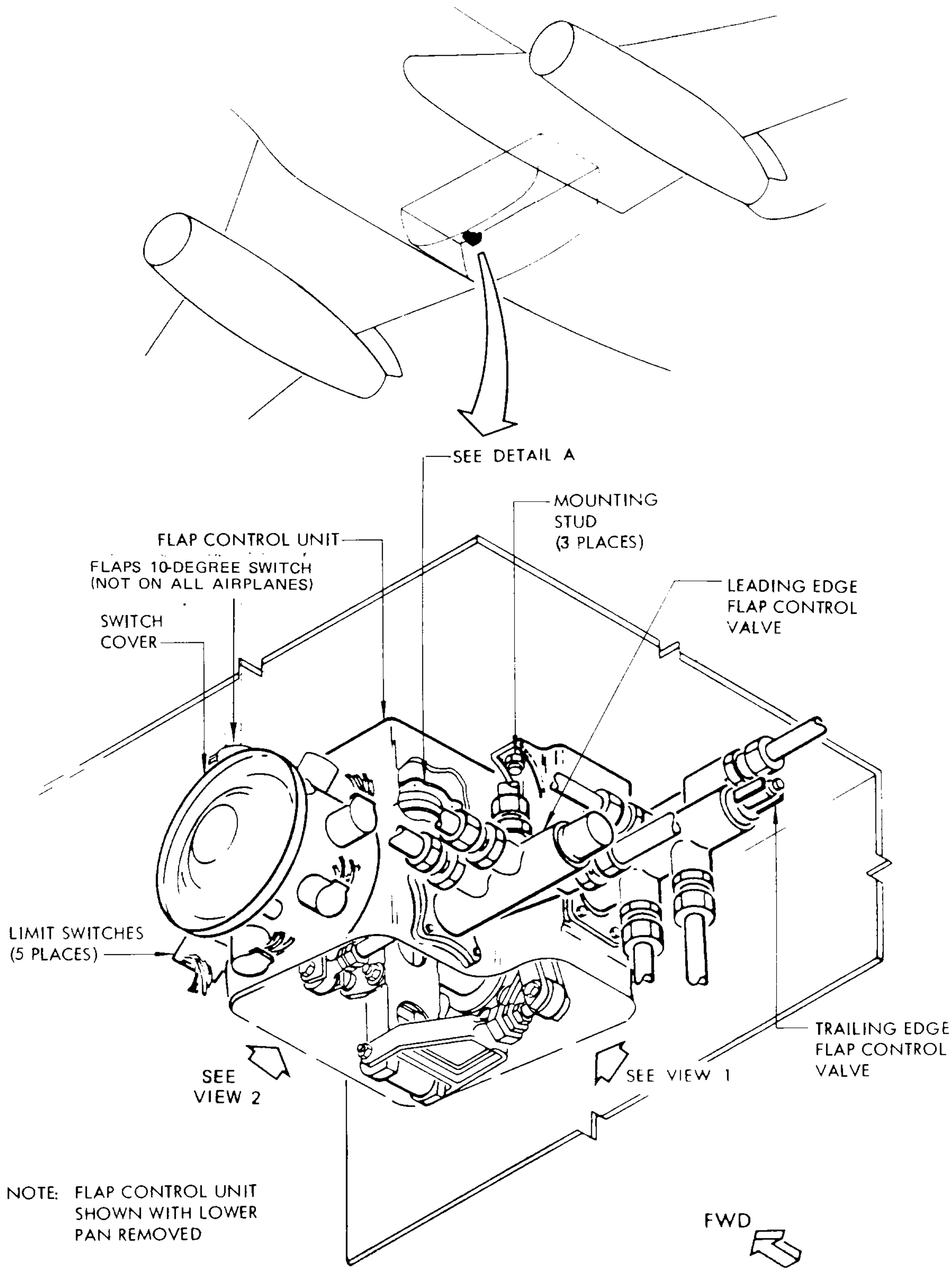
6. Install Flap Control Unit
   A. Apply a brush coat of pressure sealant to wheel well ceiling around each flap control unit mounting stud (Fig. 401).
   B. Install rigging pin F-1 in flap control unit.
   C. Align blind splines and position flap control unit on mounting studs with control quadrant shaft end engaging control unit input crank. Install locknut and washer on each outboard mounting stud.

      NOTE: Manually moving trailing edge flap control valve slide will aid aligning splines.

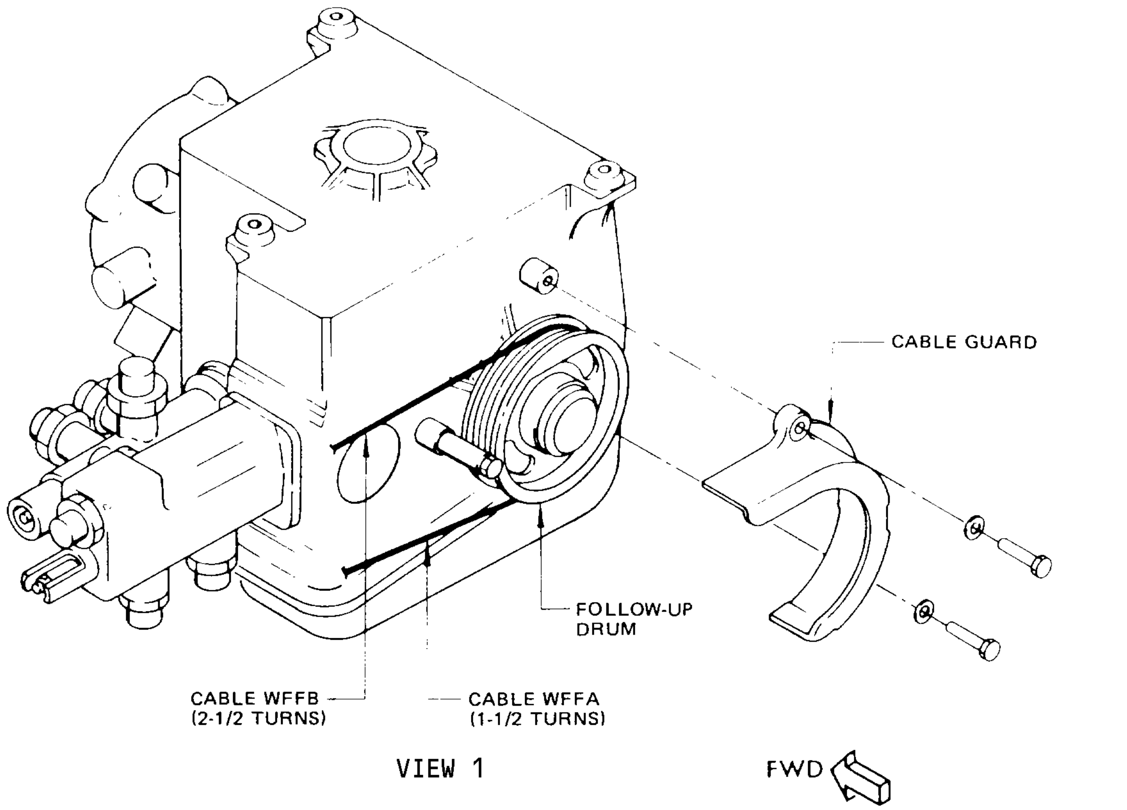
   D. Secure control unit at inboard mounting stud, as follows:
      (1) Remove finish on lower surface of mounting lug.
      (2) Position washer and bonding jumper on mounting stud, then secure with washer and locknut.
      (3) Check electrical bond between flap control unit and structure per 20-22-01. Maximum resistance should not exceed 0.0025 ohm.
      (4) Apply one coat of primer to exposed areas where finish was removed.
   E. Tighten clamping bolt in flap control unit input crank.
   F. Remove caps from control valves and plugs from hydraulic lines. Connect hydraulic lines to valve ports.
   G. Connect WFFA and WFFB cables to control unit follow-up drum. Wrap approximately 2-1/2 turns of WFFB cable on follow-up drum and approximately 1-1/2 turns of WFFA cable on follow-up drum. Tighten turnbuckles enough to remove cable slack.

      NOTE: At flap power unit, WFFA cable will have approximately 2-1/4 turns and WFFB cable will have approximately 1/3 turn on follow-up drum.

   H. Remove rigging pin F-1.
   I. Install cable guard.
   J. Use wrench set to install limit switches, as follows:
      (1) Remove finish at spot faced switch mounting areas on flap control unit.
      (2) Position one retaining nut on switch.
      (3) Install switch in flap control unit with retaining nut and roller guide. Install pin in roller guide and tighten retaining nut. Ensure that each switch is installed in proper position noted during control unit removal.
      (4) Check electrical bond between each switch and flap control unit per 20-22-01. Maximum resistance should not exceed 0.0025 ohm.
      (5) Apply one coat of primer to exposed area s where finish was removed.
      (6) Lockwire retaining nuts.
   K. Adjust and test flap control unit (Ref Flap Control Unit - A/T).
   L. Coat surface of gasket with light film of grease and install switch cover.



Flap Control Unit Installation
Figure 401 (Sheet 1)



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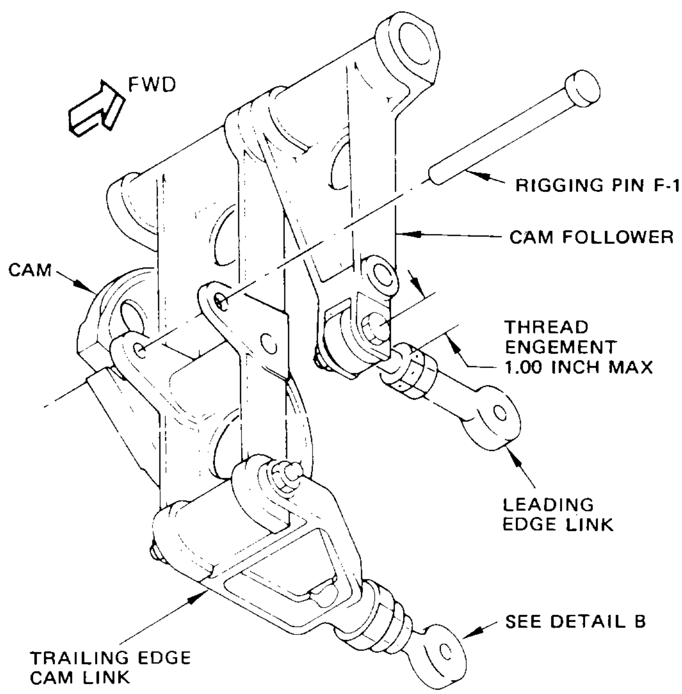

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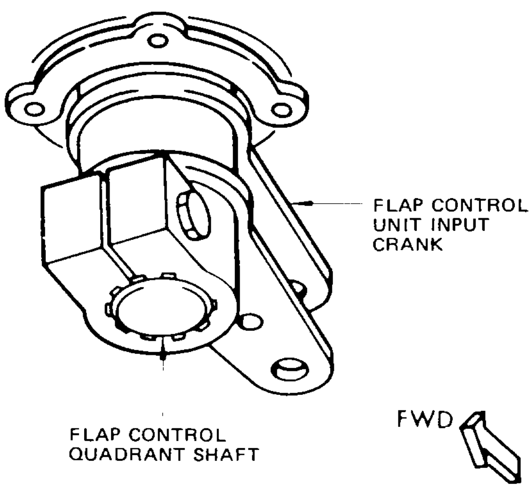


DETAIL A

Flap Control Unit Installation
Figure 401 (Sheet 2)

M. Coat surface of gasket with light film of grease and install lower pan.

FLAP CONTROL UNIT - ADJUSTMENT/TEST

1. Flap Control Unit Adjustment
    A. Equipment and Materials
        (1) Rigging Pin - F-1, 0.311 +0.000/-0.002 inch diameter, 2.35 ±0.06 inches long (MS20392-4)

            NOTE: Rigging pin is a part of kit F70207-3, -52, -61, or -84.

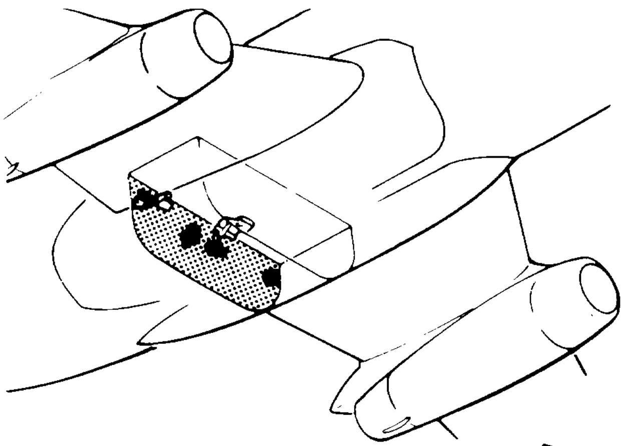
        (2) Tensiometer - 0 to 100-pound capacity
        (3) Flap Drive Adapter - F70300-1 (preferred) or ST2583-1 (optional)
        (4) Grease - BMS 3-33 (Preferred)
        (5) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
        (6) Wrench Set - F80197-5 (Preferred) or F80197-1 (Optional)
    B. Adjust Flap Control Unit
        (1) Adjust flap follow-up cables WFFA and WFFB.
            (a) Check that index mark on drum and matching mark on flap power unit housing align within ± 0.03 inch (Fig. 501). If index marks do not align, proceed as follows:
                1) Remove screws, attaching both torque tube coupling sleeves to splines on flap power unit and slide sleeves off splines to disconnect torque tubes.
                2) Use flap drive adapter to rotate flap power unit output shaft so that mark on drum and matching mark on housing align within ± 0.03 inch.

                    NOTE: Positioning flap bypass valve to BYPASS (Position 2) will allow rotation of flap power unit.

                3) Connect flap drive torque tube on each side of flap power unit. Install screws through sleeve and coupling. Lockwire heads of screws together.

                    NOTE: If flap transmission adjustment is to be checked, it is not necessary to connect torque tubes at this time. Torque tubes will be connected during check of transmission adjustment.

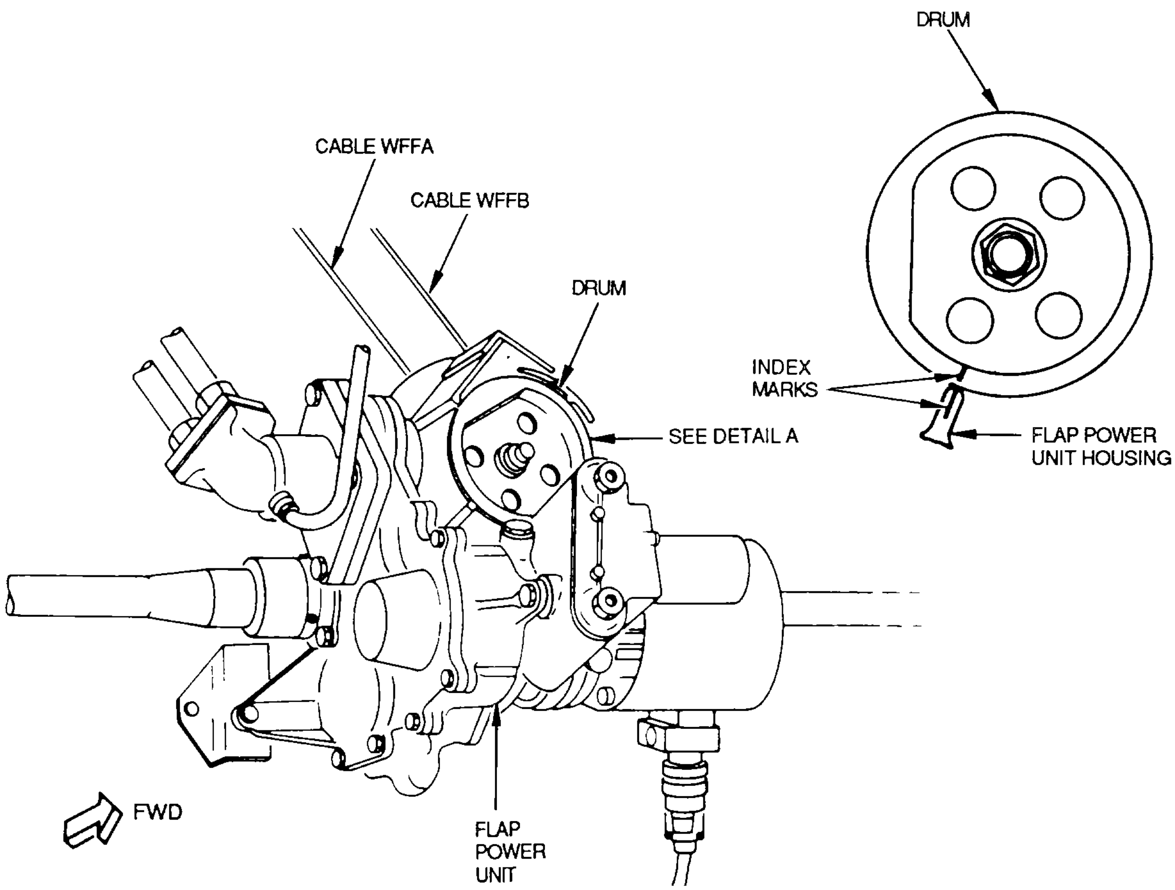
            (b) Check that rigging pin F-1 fits freely in flap control unit (Fig. 502).
            (c) Adjust follow-up cables WFFA and WFFB to tensionnon specified in temperature-tension chart in Fig. 501. Balance load on cables so that rig pin F-1 fits freely.
            (d) Install turnbuckle locking clips.
            (e) Remove rigging pin F-1.
        (2) Adjust flap control valves.
            (a) Ensure that flap control lever is in FLAP UP detent.



TEMP °F [1]	RIGGING LOAD [2] 3/32 INCH DIA CABLES WFFA AND WFFB (+20/-0 POUNDS)
110	71
90	65
70	60
50	55
30	49
+10	44
-10	38
-30	33
-40	30

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (±5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +2-/-20 POUNDS FROM TABLE VALUES.
FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE +20/-0 POUNDS FROM TABLE VALUES.
WHENEVER CABLES ARE READJUSTED, TABLE VALUES MUST BE MET.

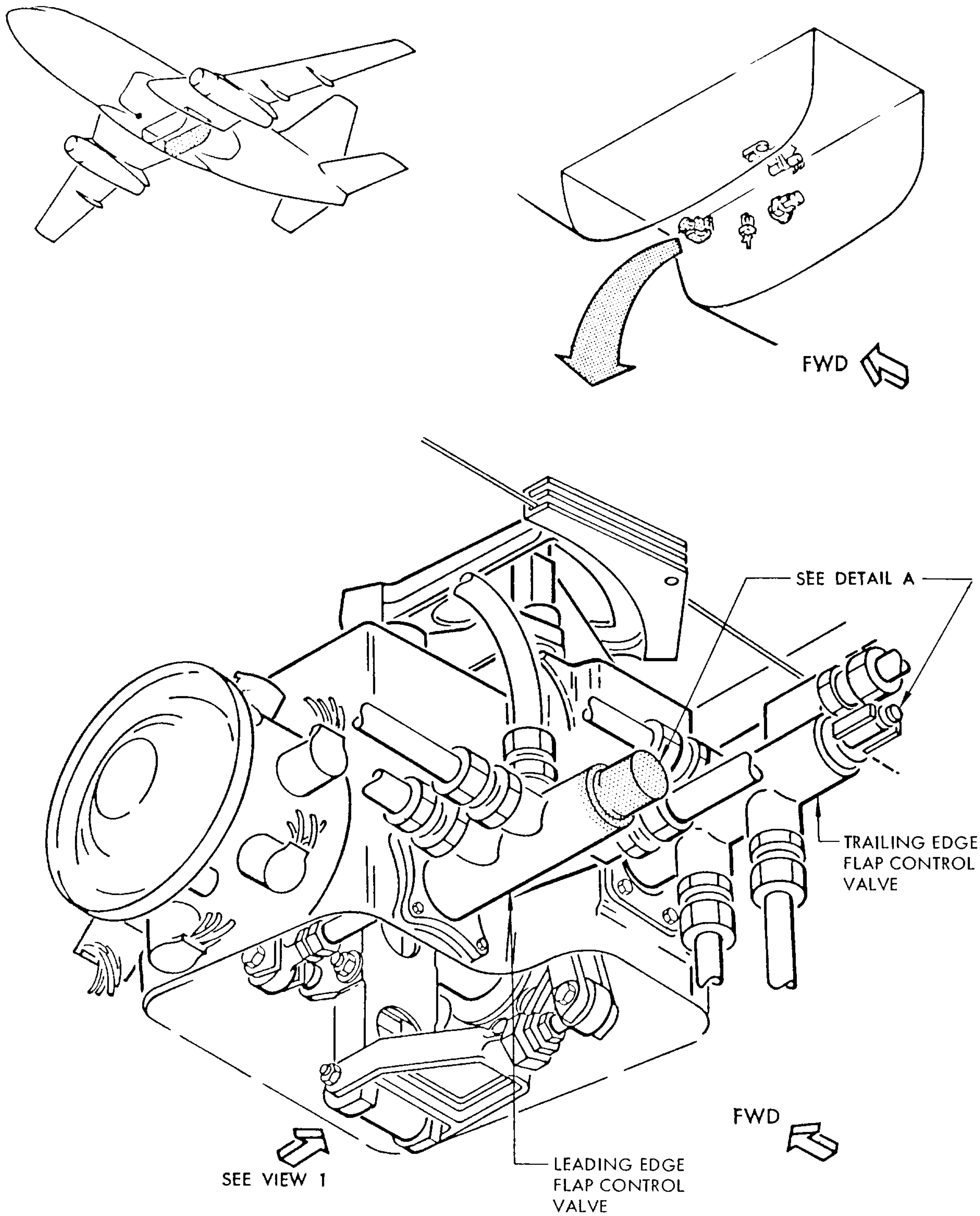


Flap Power Unit Adjustment
Figure 501

(b) Install rigging pin F-1 in flap control unit.
(c) Check that valve slide and indexing surface of trailing edge flap control valve align within ± 0.010 inch (Fig. 502). If not, adjust trailing edge cam link as follows:
  1) Remove lockwire and loosen two checknuts.
  2) Adjust sleeve to align valve slide and indexing surface within ± 0.010 inch.
  3) Tighten checknuts and install lockwire, two places.
  4) Ensure that thread engagement of rod end and vernier sleeve is within limits.
  5) If thread engagement is not within limits:
    a) Remove rod end bolt.
    b) Loosen checknut and turn rod end in one-half turn increments to obtain approximate adjustment.
    c) Install rod end bolt and secure with washer and locknut.
    d) Repeat steps 1) thru 4).
(d) Check that valve slide and indexing surface of leading edge flap control valve align within ± 0.010 inch. If not, adjust leading edge link as follows:
  1) Remove lockwire and loosen checknut.
  2) Remove rod end bolt at cam follower arm.
  3) Turn rod end in one-half turn increments to obtain adjustment.
  4) Install rod end bolt with washer and locknut.
  5) Secure rod end bolt with washer and locknut.
  6) Tighten checknut and install lockwire.
  7) Ensure that thread engagement of rod end is within limits.
(e) Remove rigging pin F-1.

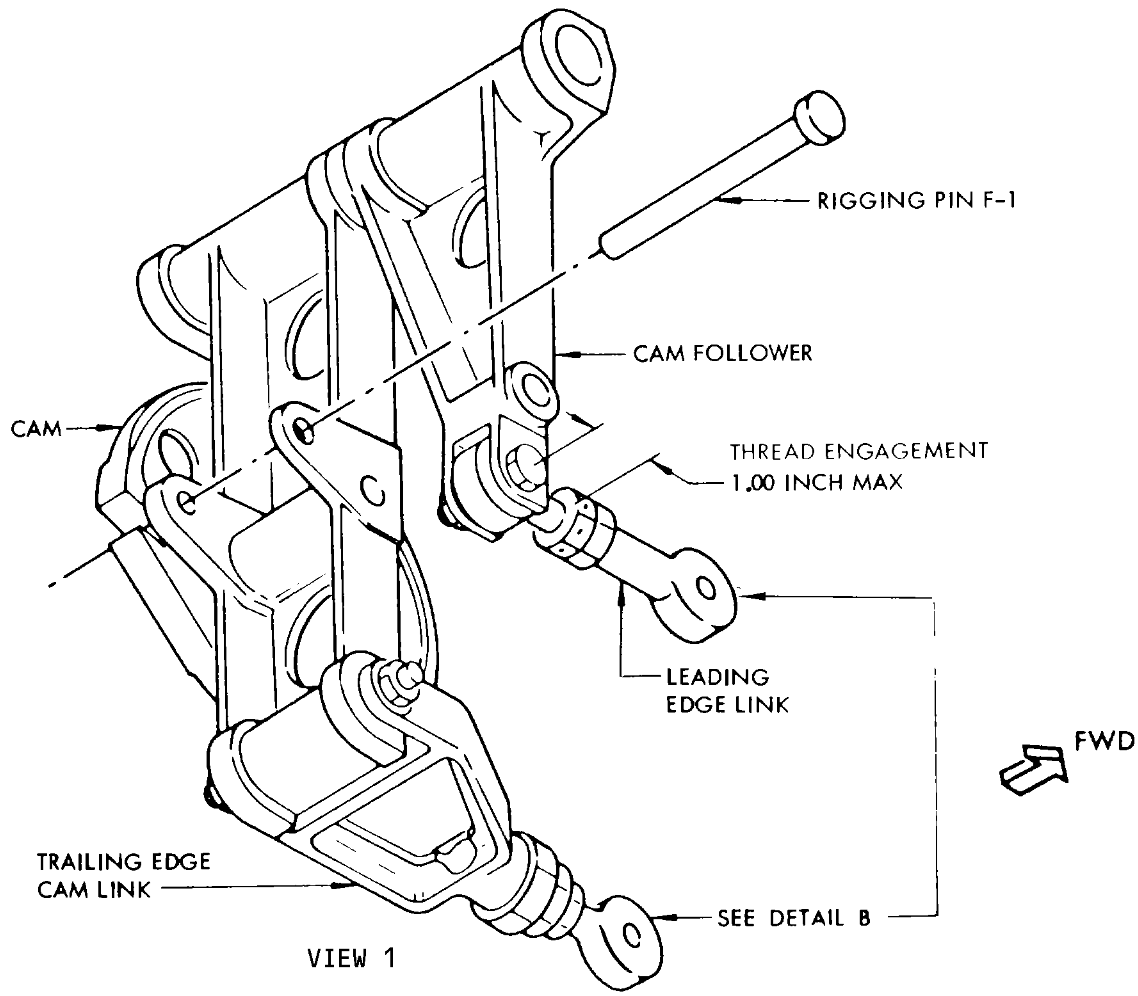
CAUTION: IF NOT REMOVED, RIGGING PIN F-1 MAY DAMAGE FLAP CONTROL UNIT WHEN HYDRAULIC POWER IS APPLIED.

(f) Pressurize system A hydraulic power (AMM 27-51-0/201, Trailing Edge Flaps).
(g) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.
(h) After 2-minute wait, depressurize system A hydraulic power (AMM 27-51-0).
(i) Check that rigging pin F-1 fits freely in flap control unit. If rigging pin does not fit freely, adjust trailing edge cam link as follows:
  1) Remove lockwire and loosen two checknuts.
  2) Remove rigging pin F-1.
  3) Provide system A hydraulic power (AMM 27-51-0).



NOTE: FLAP CONTROL UNIT
SHOWN WITH LOWER
PAN REMOVED

Flap Control Unit Adjustment
Figure 502 (Sheet 1)



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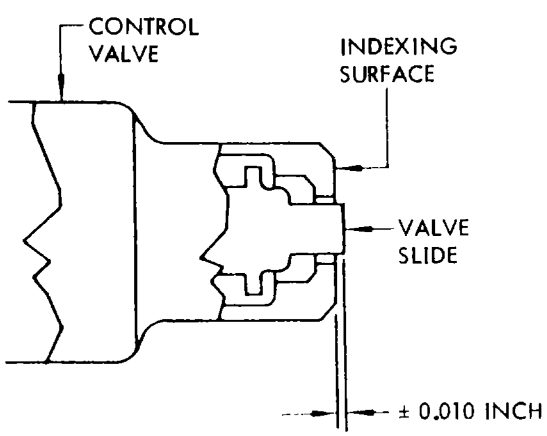
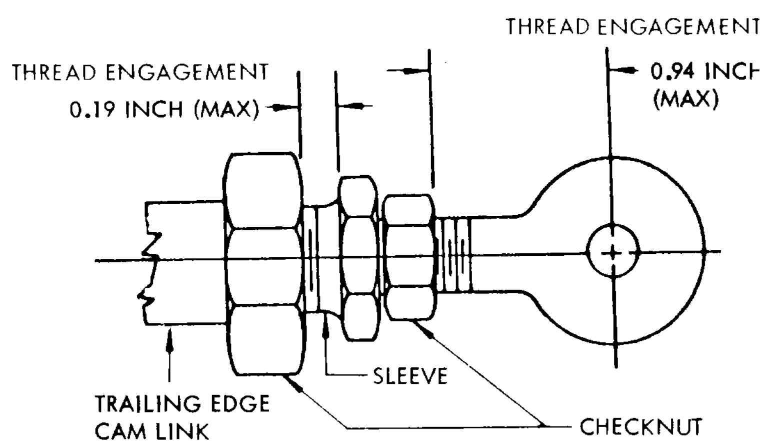


DETAIL B



DETAIL B

Flap Control Unit Adjustment
Figure 502 (Sheet 2)

4) Adjust sleeve to align rigging pin holes for rigging pin F-1.

CAUTION: DO NOT INSTALL RIGGING PIN F-1 WITH HYDRAULIC POWER ON.

NOTE: If rigging pin slot in follow-up cam must be rotated downward, cam link must be shortened. This is accomplished by rotating sleeve clockwise.

5) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.
6) After 2-minute wait, remove system A hydraulic power (AMM 27-51-0).
7) Check that rigging pin F-1 fits freely. If not, repeat step 2) thru 6).
8) Tighten checknuts and install lockwire, two places.
9) Ensure that thread engagement of rod end sleeve is within limits.

(j) Remove rigging pin F-1.
(k) Provide system A hydraulic power (AMM 27-51-0).
(l) Operate flap control system by moving flap control lever from FLAP UP and FLAP DOWN (40-unit) position and back to UP. Pause at UP and DOWN (40-unit) positions to allow flap drive unit to respond. Repeat for five cycles.
(m) Position flap control lever in FLAP UP detent. After waiting 2 minutes, remove system A hydraulic power (AMM 27-51-0).
(n) Check that rigging pin F-1 fits freely in flap control unit. If rigging pin does not fit freely, repeat steps (i) thru (n).
(o) Install lower pan on flap control unit.

(3) Use wrench set to adjust switches (AMM 27-51-291, Flap Limit Switches; AMM 31-26-23, Flap Takeoff Warning Switch; AMM 31-26-12, Flap Landing Warning Switch; AMM 22-21-31, Mach Trim Flap Switch; On airplanes with Flaps 10-Degree Switch, AMM 27-88-21).
(4) Coat surface of gasket with light film of grease and install limit switch cover. Test flap control unit.

2. Flap Control Unit Test

A. Test Flap Control Unit

(1) Test trailing edge flap indexing.

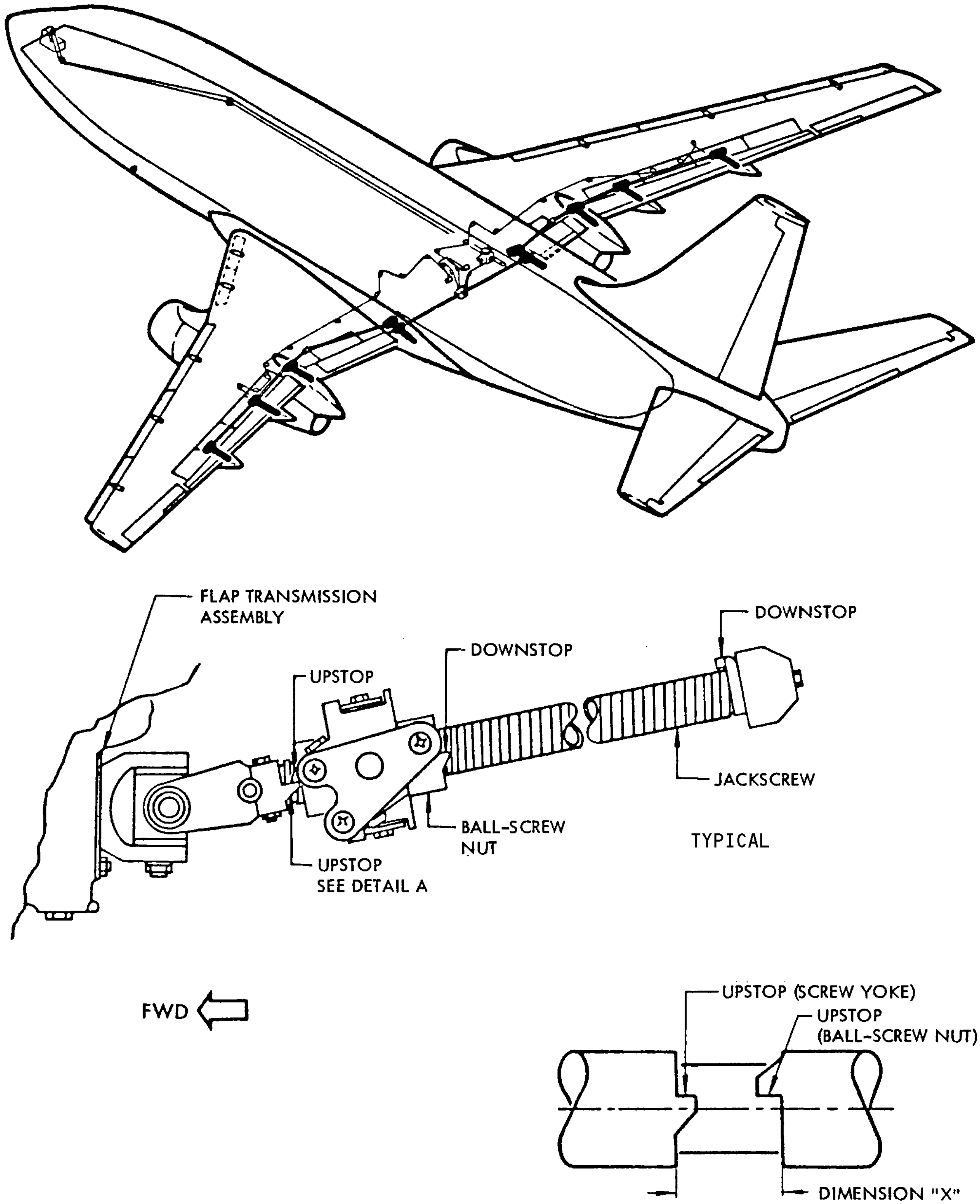
(a) Provide system A hydraulic power (AMM 27-51-0/201).
(b) Place flap control lever in FLAP UP detent and retract flaps.
(c) After waiting 5 minutes, remove system A hydraulic power (AMM 27-51-0).

(d) Check that angular clearance between upstop on ball screw nut and upstop on each jackscrew yoke is 170 to 190 degrees (1/2 turn ± 10 degrees) turn (1/4 to 5/6 (90-300 degrees) turn if lateral trim correction has been made) (Fig. 503).

<u>CAUTION</u>: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 (90-300 DEGREES) TURN. A VALUE FOR (X1) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

(e) At number 4 jackscrews, measure dimension X1 as shown. Record value.

(2) Test trailing edge flap positioning.
(a) Provide system A hydraulic power (AMM 27-51-0).
(b) Position flap control lever in 1-unit detent to extend trailing edge flaps.
(c) Wait 2 minutes, then measure X2 dimension at number 4 jackscrew. Record value in table below.



Flap Transmission Upstop Clearance
Figure 503

FLAP CONTROL LEVER POSITION -UNITS-	NO. 4 FLAP JACKSCREW POSITION -INCHES-				
	REQUIRED X2 - X1	ACTUAL X2 EXTEND	ACTUAL X2 - X1 EXTEND	ACTUAL X2 RETRACT	ACTUAL X2 - X1 RETRACT
1	3.90 to 5.00				
2 *[1]	13.45 to 14.80				
5	17.84 to 19.34				
10 *[1]	22.49 to 23.15				
15 *[1]	24.11 to 24.81				
15 *[2]	24.23 to 24.93				
25 *[1]	25.26 to 25.94				
25 *[2]	25.23 to 25.91				
30	27.12 to 27.78				
40	29.82 to 30.48				

*[1] AQ N20SW, N23SW, N24SW, N26SW and on
AR LV-JTD, LV-JTO, LV-LEB and on
PV CF-EPP, CF-EPU, C-GEPA and on
TM C9-BAC and on
TZ C-GTAQ and on
*[2] ALL EXCEPT *[1]

(d) Repeat step (c) with flap control lever in each position shown in preceding table until flaps are fully extended.
(e) Repeat step (c) with flap control lever in each position shown in preceding table until flaps are retracted.
(f) Using X1 dimension, from step (1)(e), perform necessary subtraction to obtain X2 - X1 dimensions. These dimensions must be within required tolerances for flaps extending and flaps retracting.

(3) Check normal trailing edge flap operating time.

NOTE: Hydraulic service cart set at 20 gpm and 3000 psi or operation of at least one engine-driven pump is required to perform this portion of test.

(a) Move flap control lever from FLAP UP detent to FLAP DOWN (40-unit) detent.
(b) Check that time for flaps to extend is 35 ±5 seconds.

NOTE: Operating time should be measured from start of flap motion in up position until downstop on number 4 bal1 screw nut is 1.50 ±0.20 inches from downstop on the jackscrew.

(c) Position flap control lever in FLAP UP detent.
(d) Check that time for flaps to retract is 35 ±5 seconds.

(4) Test trailing edge alternate flap drive operation.
(a) On circuit breaker panel (P6-2):
1) Check that TE ALT FLAP DRIVE MOTOR circuit breaker is closed.
2) Check that FLAP VALVES circuit breaker is closed.
(b) Position alternate flap switch at ARM.

NOTE: Actuation of alternate flap switch to ARM energizes standby hydraulic pump motor.

(c) Move flap control lever to FLAP DOWN detent.

NOTE: Flap control lever is moved to FLAP down position as a standard procedure to minimize load on flap hydraulic motor when system A hydraulic power is pressurized.

(d) Actuate alternate flap drive switch to DOWN position. Hold switch in this position until trailing edge flap motion stops.

CAUTION: LEADING EDGE CONTROL SURFACES WILL EXTEND. ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR.

NOTE: Extension of trailing edge flaps is controlled by limit switches.

(e) At number 4 jackscrew, check that clearance between downstop on ball screw nut and downstop lug on jackscrew is between 2 and 3 turns.

(f) Actuate alternate flap drive switch to UP position. Hold switch in this position until trailing edge flap motor stops.

NOTE: Retraction of trailing edge flaps is controlled by limit switches.

(g) At number 4 jackscrew, check that clearance between upstop on ball screw nut and upstop on jackscrew yoke is between 0.40 and 0.71 inch.

(5) Check flap control lever operating force.
(a) Check that tangential force required to move flap control lever between detents does not exceed 2.5 pounds, excluding cable cushion. Measure force at end of lever.
(6) Test operation of leading edge flaps and slats (AMM 27-81-0/501, Leading Edge Flaps and Slats).
(7) Test operation of flap takeoff warning switch (AMM 31-26-23, Flap Takeoff Warning Switch).
(8) Test operation of flap landing warning switch (AMM 31-26-12, Flap Landing Warning Switch).
(9) Test operation of Mach trim switch (AMM 22-21-31, Mach Trim Flap Switch).
(10) On airplanes with flaps 10-degree switch, test operation of switch (AMM 27-88-21, Flaps 10-Degree Switch).
(11) Restore airplane to normal configuration.
(a) Remove system A hydraulic power (AMM 27-51-0/201).
(b) Remove electrical power, if no longer required.

TRAILING EDGE FLAP CONTROL VALVE - REMOVAL/INSTALLATION

1. General
   A. The trailing edge control valve is mounted on the flap control unit aft of the leading edge flap and slat control valve. This procedure provides instructions for replacement of the trailing edge flap control valve.
   B. On airplanes with a flap load limiter system the trailing edge flap control valve has a solenoid valve attached. The procedure in par. 2 provides instructions for replacement of the control valve and solenoid valve as a unit. The procedure in par. 3 provides instructions for replacement of the solenoid valve only.
2. Removal/Installation Trailing Edge Flap Control Valve

   NOTE: On airplanes with flap load limiter, use this procedure when removing control valve and solenoid valve as a unit. Use procedure in par. 3 when replacing solenoid valve only.

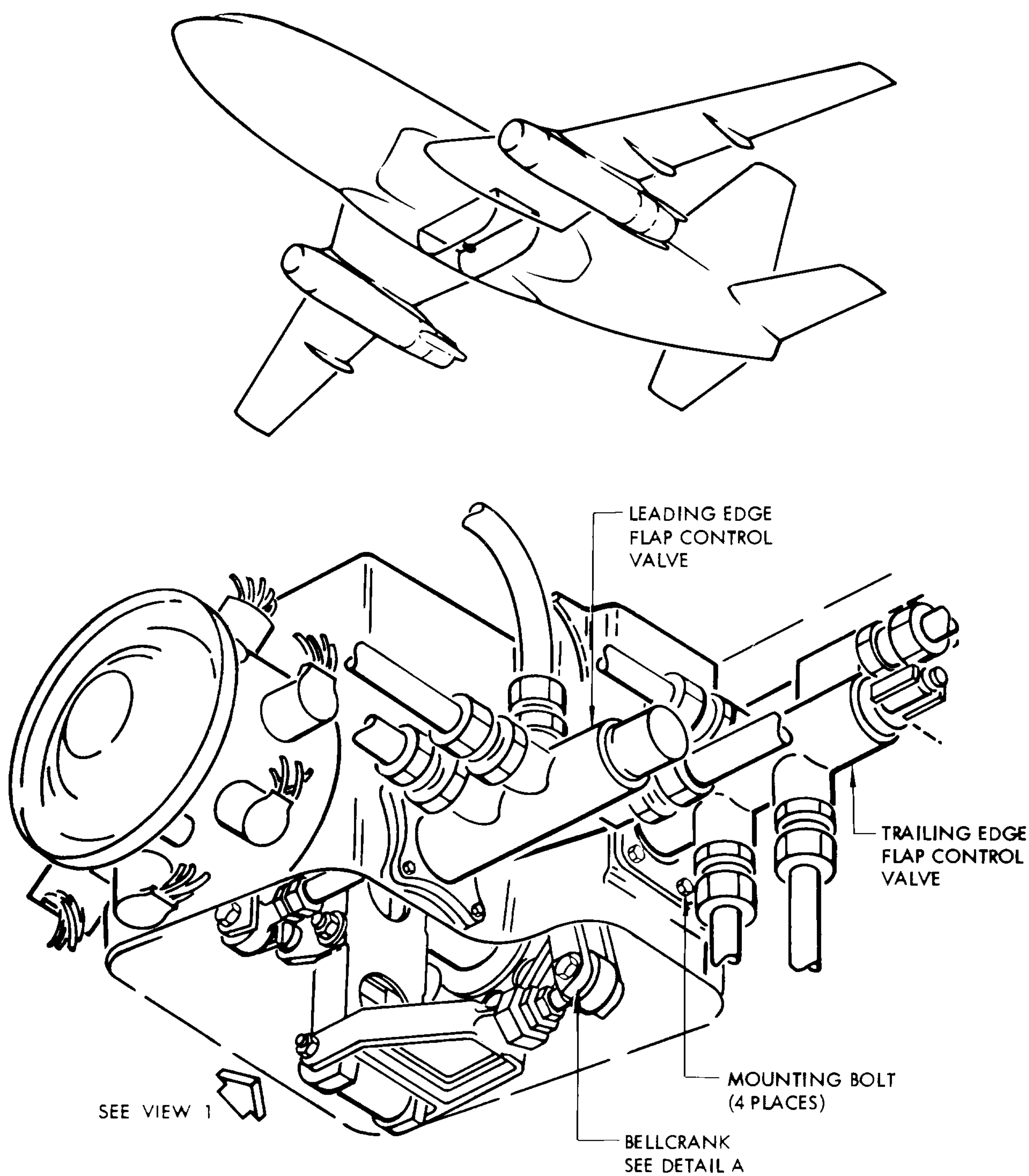
   A. Equipment and Materials
      (1) Hydraulic Fluid - BMS 3-11 (Ref 20-30-21)
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
      (3) Rigging Pin - F-1, 0.311 +0.000/0.002 inch diameter, 2.35 ±0.06 inches long

          NOTE: Rigging pin is a part of kit F70207-3, -52, -61, or -84.

      (4) Grease - BMS 3-33 (Preferred)
      (5) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
      (6) Sealant - BMS 5-95 (Supercedes BMS 5-79)
   B. Prepare Trailing Edge Flap Control Valve for Removal
      (1) Pressurize hydraulic system A (Ref 27-51-0 MP).
      (2) Position flap control lever to FLAPS UP detent.
      (3) Depressurize hydraulic system A and depressurize hydraulic reservoirs.
      (4) Remove lower pan from flap control unit (Fig. 401).
      (5) Install rigging pin F-1 through follower arm and valve cam.
   C. Remove Trailing Edge Flap Control Valve
      (1) Remove plug buttons from control unit housing (two places).
      (2) Remove bolt and spacers attaching valve slide to bellcrank (Fig. 401).
      (3) Disconnect hydraulic lines from control valve.

          CAUTION: BE PREPARED TO CATCH HYDRAULIC FLUID.

      (4) Install caps on all ports and plugs in hydraulic lines.
      (5) On airplanes with flap load limiter (Fig. 401), disconnect electrical connector from solenoid valve on trailing edge flap control valve.



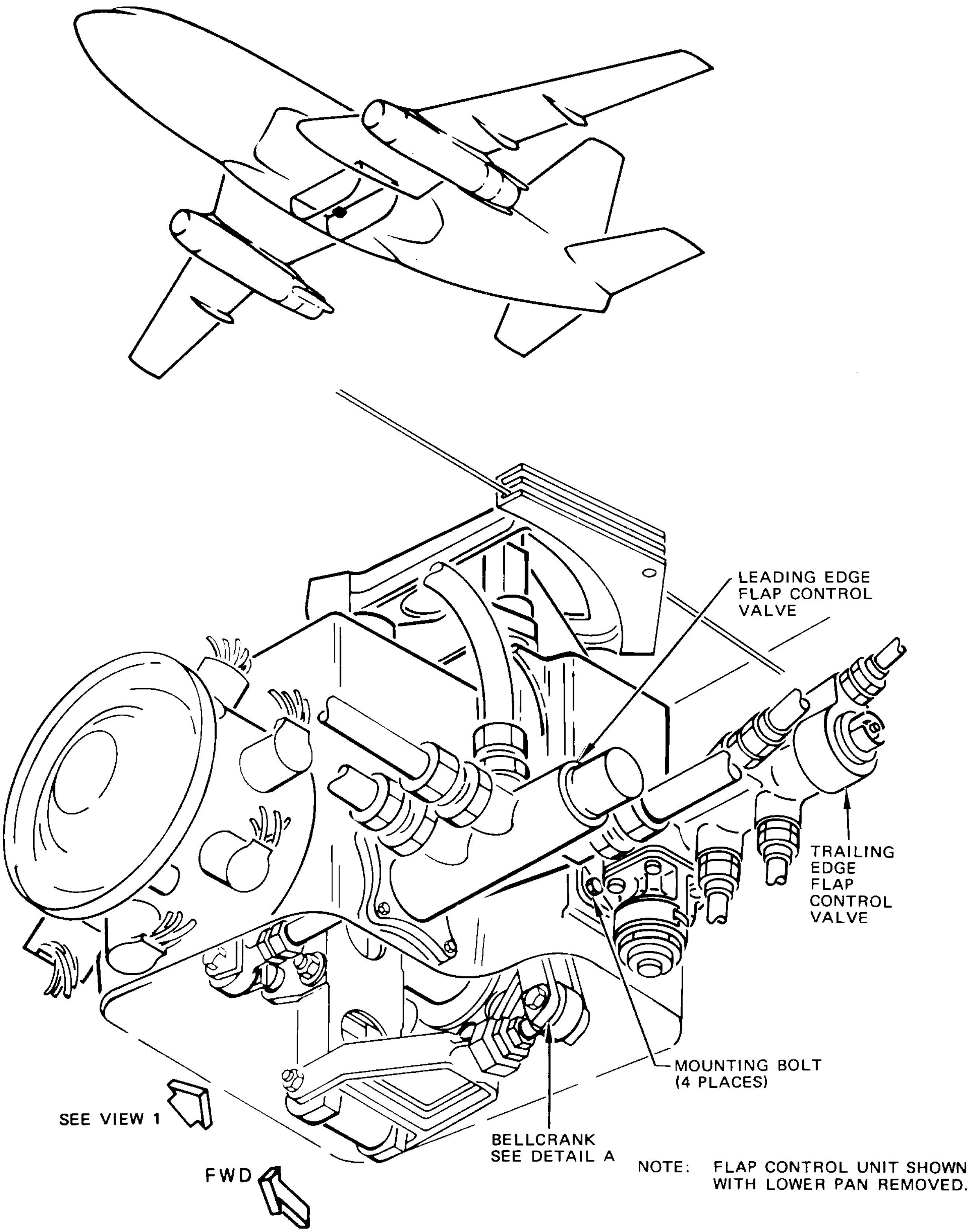
NOTE: FLAP CONTROL UNIT SHOWN WITH LOWER PAN REMOVED.

EFFECTIVITY

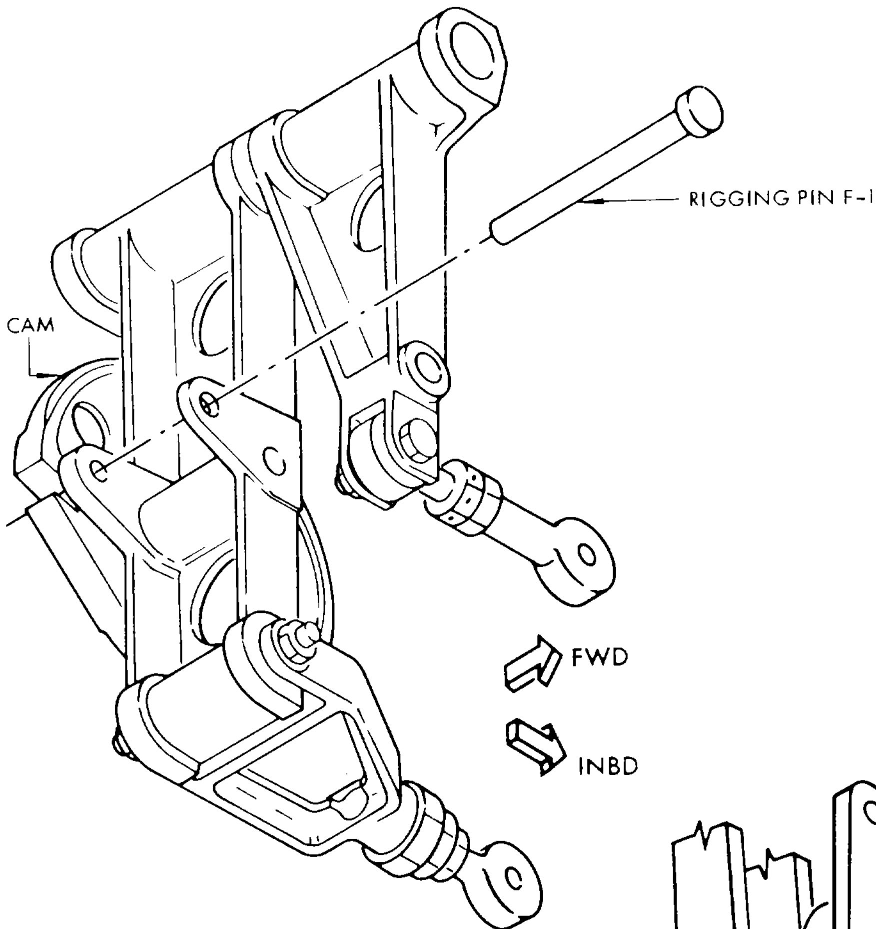
AIRPLANES WITHOUT FLAP LOAD LIMITER

FWD INBD

Trailing Edge Flap Control Valve Installation
Figure 401 (Sheet 1)



Trailing Edge Flap Control Valve Installation
Figure 401 (Sheet 2)



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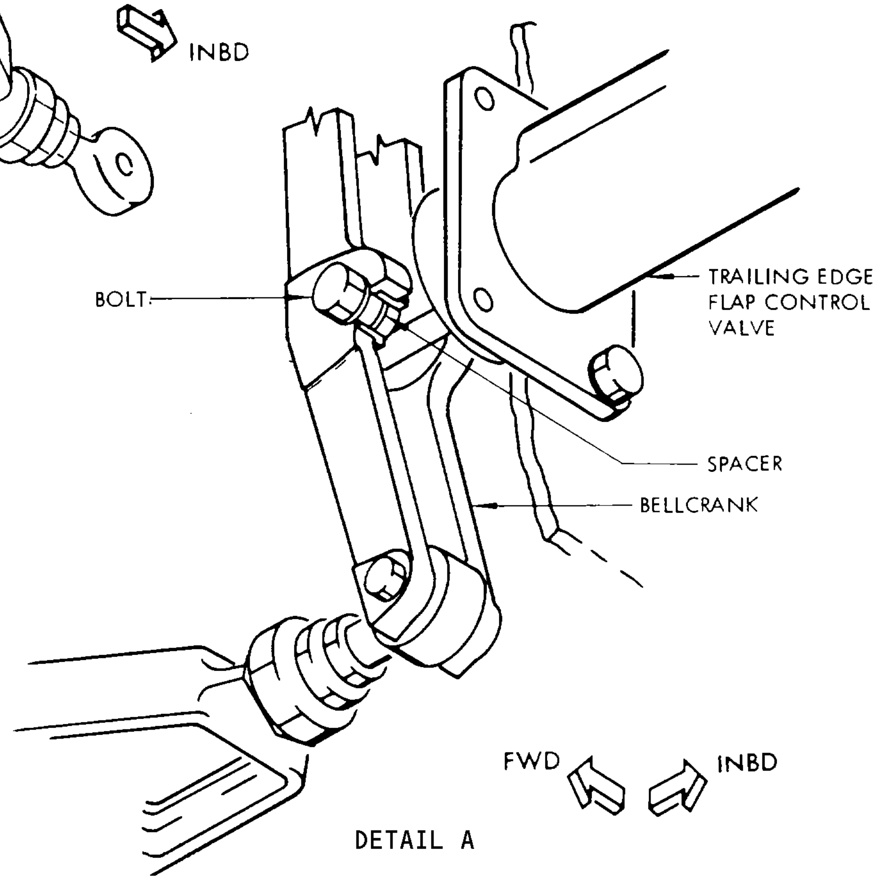


DETAIL A

Trailing Edge Flap Control Valve Installation
Figure 401 (Sheet 3)

(6) Remove four mounting bolts attaching control valve to control unit.
(7) Carefully remove control valve from control unit.

D. Install Trailing Edge Flap Control Valve
(1) Install union and O-ring in each port of valve. Lightly lubricate O-ring with Skydrol hydraulic fluid or Skydrol assembly lube MCS 352B prior to installation.
(2) Carefully insert control valve into control unit.
(3) Install four mounting bolts (Fig. 401). Tighten bolts and lockwire.
(4) Ensure that hydraulic system A is depressurized then remove caps from ports and plugs from hydraulic lines.
(5) Connect hydraulic lines to control valve.
(6) Connect valve slide to bellcrank.
(a) Pack lubrication grooves in spacers with grease.
(b) Place washer and spacer on bolt.
(c) Install bolt with head forward.
(d) Secure bolt with spacer, washer, and nut.
(e) Tighten nut and install cotter pin.
(7) Install plug buttons in control unit (2 places).
(a) Snap plug button in place.
(b) Apply sealant around edge of plug button.
(8) Remove rigging pin F-1.
(9) On airplanes with solenoid valve connect electrical connector to solenoid valve.
(10) Pressurize hydraulic system A (Ref 27-51-0).
(11) Position flap control lever to FLAP DOWN detent to extend flaps.
(12) Position flap control lever to FLAP UP detent to retract flaps.
(13) Check hydraulic connections at control valve for leakage.
(14) Adjust flap control valve (Ref 27-51-211, Adjustment/Test).

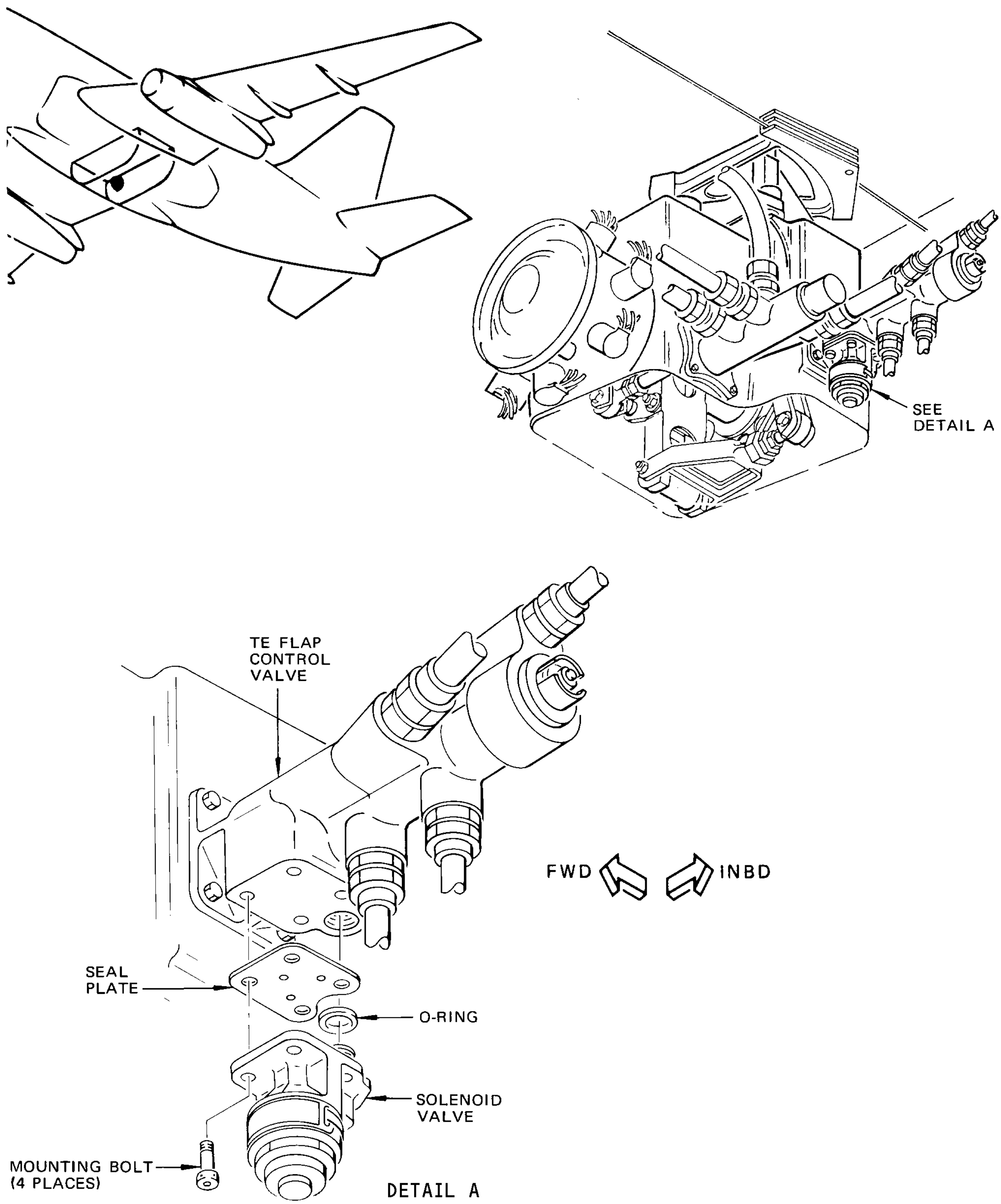
E. Restore Airplane to Normal Configuration
(1) Depressurize hydraulic system A (Ref 27-51-0).
(2) Check hydraulic reservoirs and service if required (Ref 12-12-0).
(3) Install lower pan on flap control unit.

3. <u>Remove Flap Load Limiter Solenoid Valve</u>

A. Prepare Solenoid Valve for Removal
(1) Depressurize hydraulic system A (Ref 27-51-0).

B. Remove Solenoid Valve
(1) Deleted.
(2) Install caps on all ports.
(3) Remove mounting bolts and lift valve and gasket from control valve.
(4) Disconnect electrical wires from solenoid valve.

C. Install Solenoid Valve
(1) Connect electrical wires to solenoid valve.
(2) Lubricate O-rings and hydraulic fittings with BMS 3-11 hydraulic fluid or Skydrol Assembly Lube.
(3) Position valve and gasket on control valve and install mounting bolts. Tighten bolts to 25-35 pound-inches torque.



Flap Load Limiter solenoid Valve Installation
Figure 402

(4) Lockwire boltheads.
(5) Deleted.
(6) Pressurize hydraulic system A and check for leakage (Ref 27-51-0).
(7) Test solenoid valve per Flap Load Limiter Solenoid Valve - Adjustment/Test.

D. Return Airplane to Normal
(1) Remove hydraulic system A power if no longer required (Ref 27-51-0).

TRAILING EDGE FLAP CONTROL VALVE - ADJUSTMENT/TEST

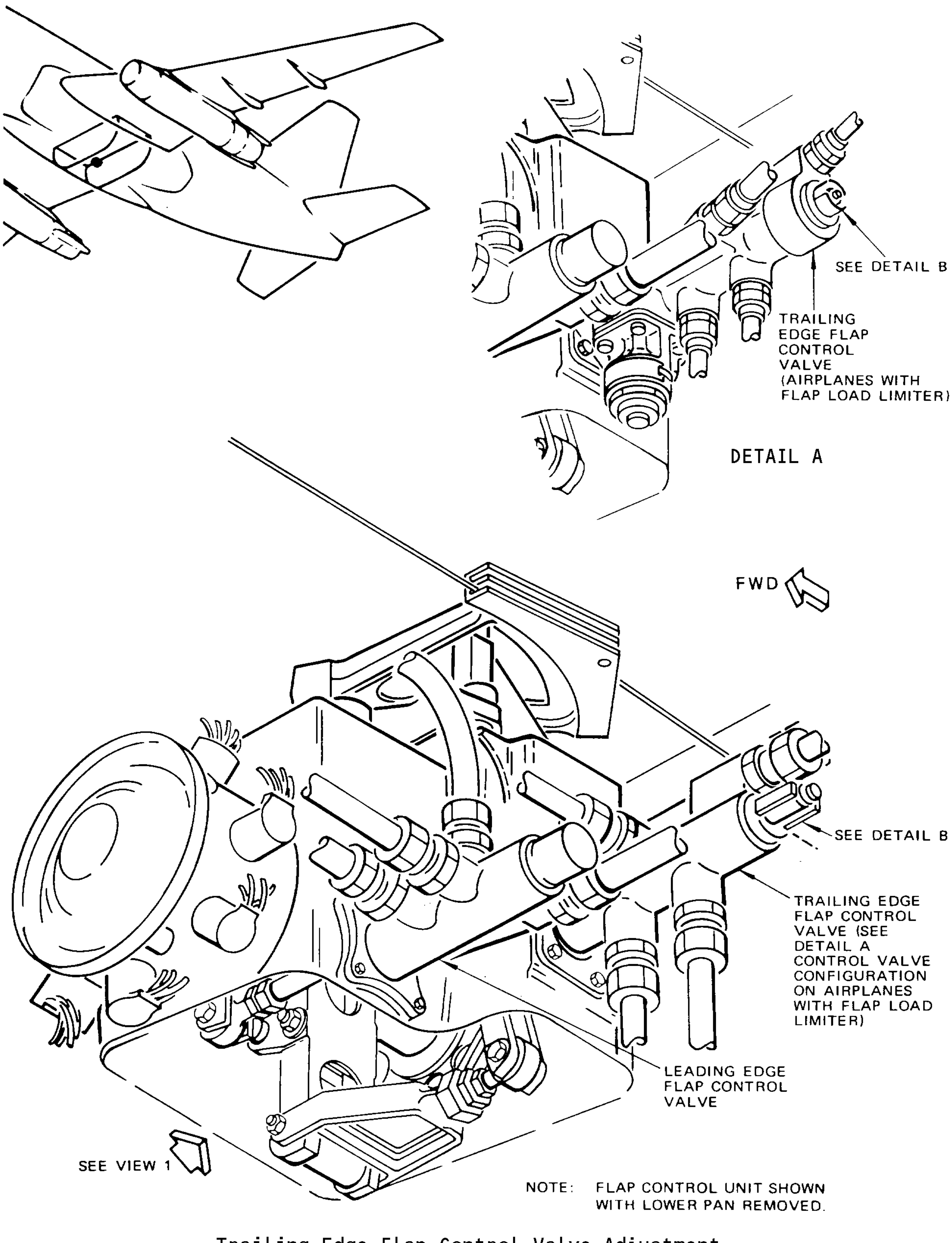
1. Trailing Edge Flap Control Valve Adjustment
   A. Equipment and Materials
      (1) Rigging Pin - F-1, 0.311 +0.000/-0.002 inch diameter, 2.35 ±0.06 inches long (MS20392-4)

      NOTE: Rigging pin is a part of Kit F70207-3, -52, -61, or -84.

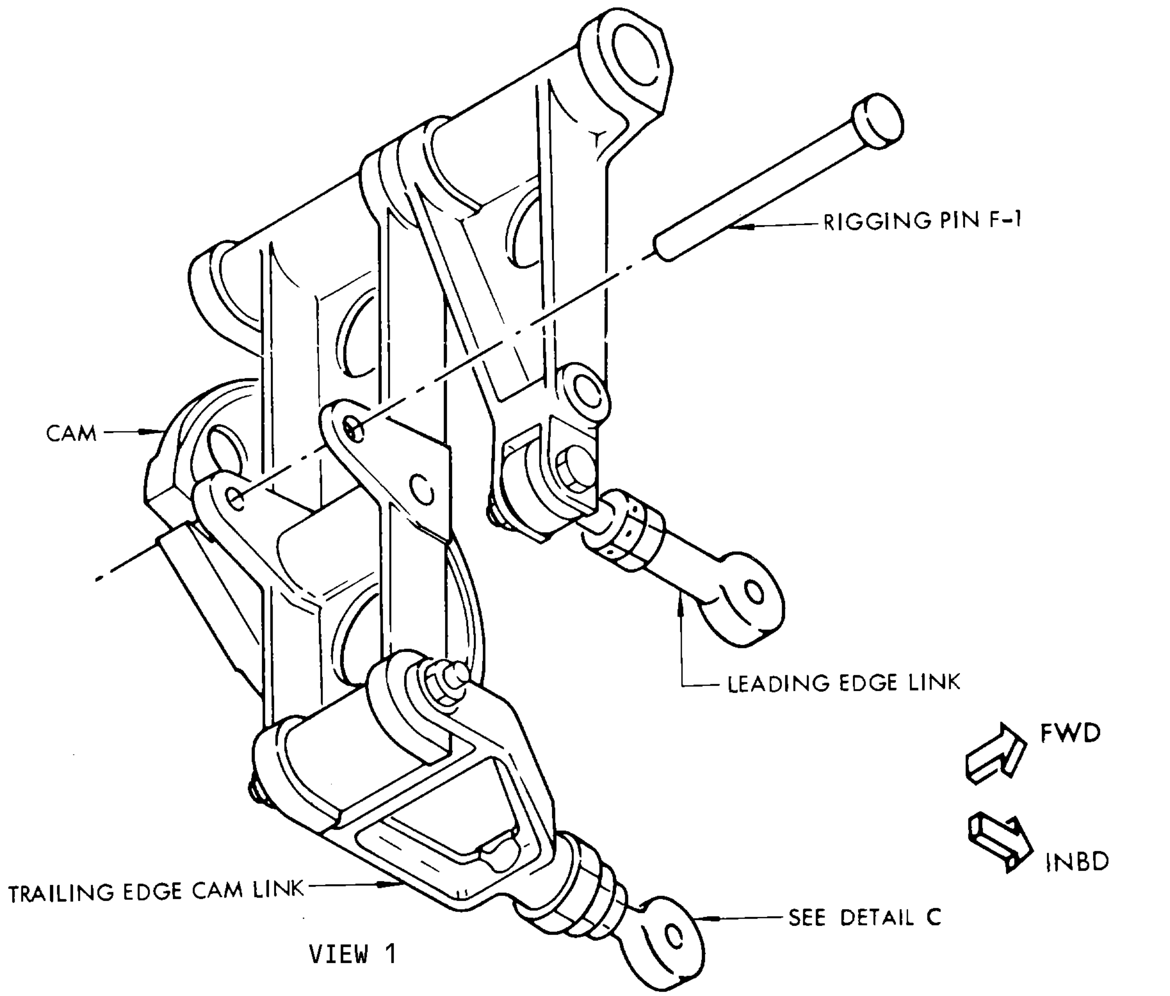
   B. Prepare Trailing Edge Flap Control Valve for Adjustment
      (1) Pressurize hydraulic system A (Ref 27-51-0 MP).
      (2) Position flap control lever to FLAP DOWN detent.
      (3) Position flap control lever to FLAP UP detent.
      (4) Wait 2 minutes then depressurize hydraulic system A (Ref 27-51-0 MP).
      (5) Remove lower pan from flap control unit (Fig. 501).
   C. Adjust Trailing Edge Flap Control Valve
      (1) Check that valve slide and indexing surface of trailing edge flap control valve align within ± 0.010 inch (Detail A, Fig. 501). If not, adjust trailing edge cam link as follows:
         (a) Remove lockwire and loosen two checknuts (detail B).
         (b) Adjust sleeve to align valve slide and indexing surface within ± 0.010 inch.
         (c) Tighten checknuts and install lockwire (2 places).
         (d) Ensure that thread engagement of rod end and vernier sleeve is within limits.
         (e) If thread engagement is not within limits:
            1) Remove rod end bolt.
            2) Loosen checknut and turn rod end in one-half turn increments to obtain approximate adjustment.
            3) Install rod end bolt and secure with washer and locknut.
            4) Repeat steps (a) thru (d).
      (2) Ensure that rigging pin F-1 is not installed.

      CAUTION: IF NOT REMOVED, RIGGING PIN F-l MAY DAMAGE FLAP CONTROL UNIT WHEN HYDRAULIC POWER IS APPLIED.

      (3) Pressurize hydraulic system A (Ref 27-51-0).
      (4) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.
      (5) After 2-minute wait, depressurize hydraulic system A (Ref 27-51-0).
      (6) Check that rigging pin F-1 fits freely in the flap control unit. If rigging pin does not fit freely, adjust trailing edge cam link as follows:
         (a) Remove lockwire and loosen two checknuts.
         (b) Remove rigging pin F-1.



Trailing Edge Flap Control Valve Adjustment
Figure 501 (Sheet 1)



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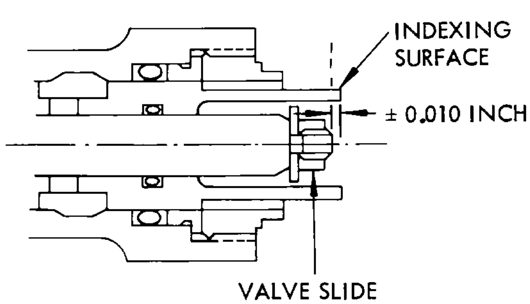
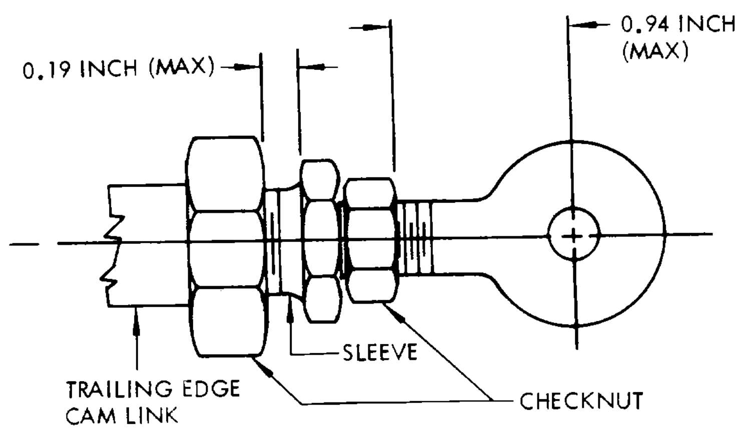




DETAIL B

DETAIL C

Trailing Edge Flap Control Valve Adjustment
Figure 501 (Sheet 2)

(c) Pressurize hydraulic system A (Ref 27-51-0).
(d) Adjust sleeve to align rigging pin holes for rigging pin F-1.

CAUTION: DO NOT INSTALL RIGGING PIN F-l WITH HYDRAULIC POWER ON.

NOTE: If rigging pin slot in follow-up cam must be rotated downward, cam link must be shortened. This is accomplished by rotating sleeve clockwise.

(e) Position flap control lever in 5-unit detent to extend flaps, then set lever in FLAP UP detent.
(f) After 2-minute wait, depressurize hydraulic system A (Ref 27-51-0).
(g) Check that rigging pin F-1 fits freely. If not, repeat steps (b) thru (f).
(h) Tighten checknuts and install lockwire, two places.
(i) Ensure that thread engagement of rod end and sleeve is within limits.

(7) Remove rigging pin F-1.
(8) Pressurize hydraulic system A (Ref 27-51-0).
(9) Position flap control lever to FLAP DOWN detent and then to FLAP UP detent. Pause at FLAP DOWN and FLAP UP detent to allow flap drive unit to respond. Repeat for five cycles.
(10) Position flap control lever to FLAP UP detent.
(11) After waiting 5 minutes, depressurize hydraulic system A (Ref 27-51-0).
(12) Check that rigging pin F-1 fits freely in flap control unit. If not, repeat steps (2) thru (11).
(13) Install lower pan on flap control unit.

NOTE: No additional testing of the control valve is required.

2. Flap Load Limiter Solenoid Valve Test

NOTE: Test flap load limiter solenoid valve as follows if solenoid valve was removed from trailing edge flap control valve.

A. Test Flap Load Limiter Solenoid Valve
(1) Connect electrical power to the airplane.
(2) Close the flap load limiter circuit breaker on the P6 panel.
(3) Pressurize hydraulic system A (Ref 27-51-0).

(4) Position flap control lever to the 40-unit detent.

<u>NOTE</u>: If airplane is on jacks, compress right-hand main gear strut approximately 5 inches to the ground position.

(5) Actuate the flap load limiter test switch on the equipment bay light panel in the electronics compartment to the SYSTEM TEST position, and check that the flaps retract to the approximate 30-unit position.
(6) Release test switch and check that flaps extend to the 40-unit position.
(7) Position flap control lever to the FLAPS UP detent to retract flaps.
(8) Turn off hydraulic system A power (Ref 27-51-0).
(9) Disconnect electrical power.

TRAILING EDGE FLAP CONTROL VALVE - APPROVED REPAIRS

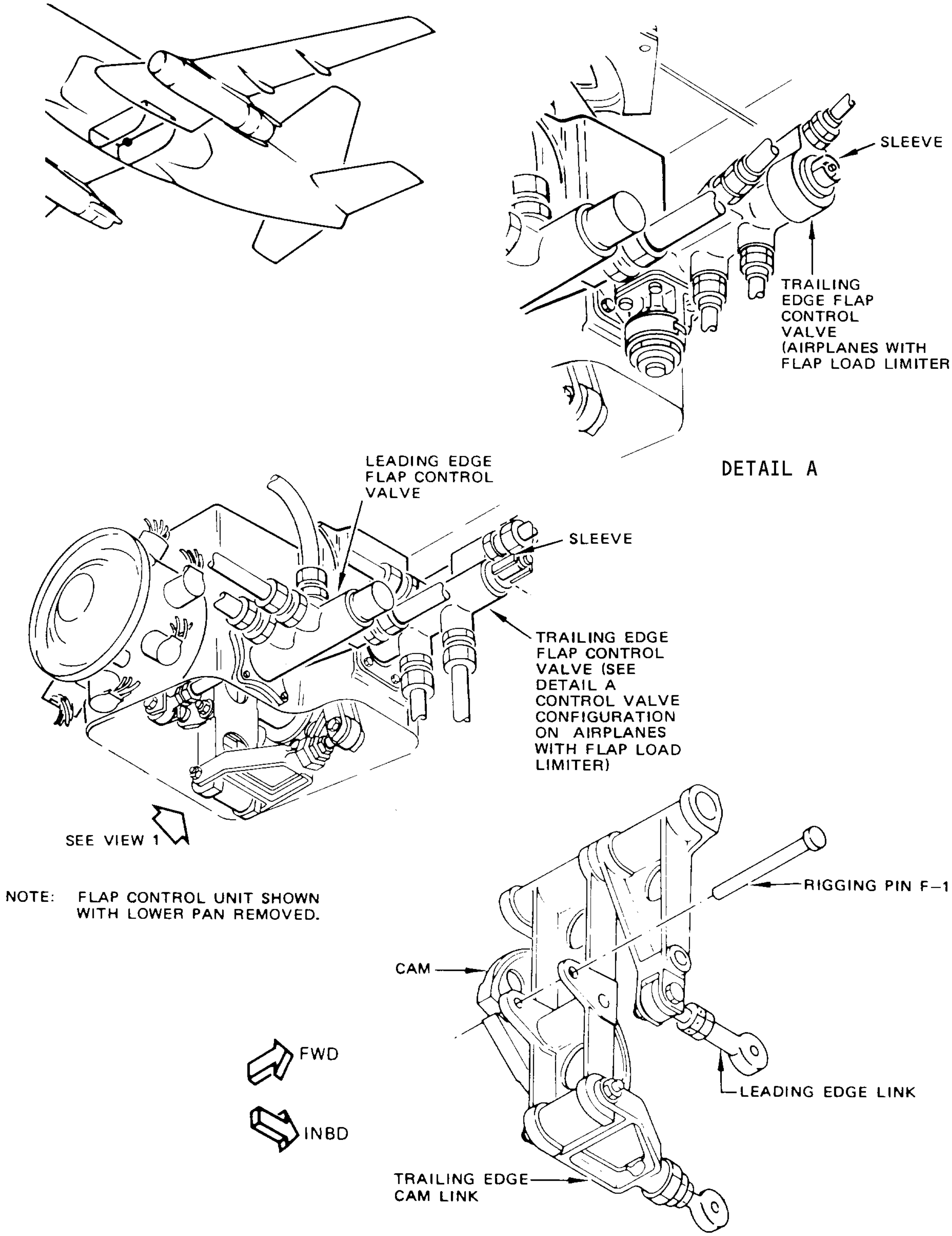
1. General
   A. If a trailing edge flap control valve is found to indicate excessive internal leakage, the following procedure may be implemented with the valve installed on the airplane, to reduce the leakage by approximately half.
2. Equipment and Materials
   A. Rigging Pin - F-1, 0.311 +0.000/-0.002 inch diameter, 2.35 ±0.06 inches long (MS20392-4)

      NOTE: Rigging pin is a part of kit F70207-3, -51, or -61

3. Trailing Edge Flap Control Valve Internal Leakage Repair
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Position flap control lever to 40-UNIT detent to extend trailing edge flaps.
   C. Remove system A hydraulic power (Ref 27-51-0).
   D. Position flap control lever to FLAPS UP detent.
   E. Rotate sleeve 90 degrees (Fig. 801).

      NOTE: This action repositions the eroded metering edges of the flap valve slide with respect to the rectangular slots in the sleeve.

   F. Position flap control lever to 40-UNIT detent.
   G. Provide system A hydraulic power (Ref 27-51-0).
   H. Position flap control lever to FLAPS UP detent to retract trailing edge flaps
   I. Test trailing edge flap control valve (Ref 27-51-211, page 505).
      (1) Position flap control lever to 40-UNIT detent and then to FLAP UP detent. Pause at 40 UNIT and FLAP UP detent to allow flap drive unit to respond. Repeat for five cycles.
      (2) Position flap control lever to FLAP UP detent.
      (3) After waiting 2 minutes, depressurize system A hydraulic power (Ref 27-51-0).
      (4) Remove lower pan from flap control unit.
      (5) Check that rigging pin F-1 fits freely in flap control unit. If not, adjust trailing edge flap control valve (Ref 27-51-211, Adjustment/Test).
      (6) Install lower pan on flap control unit.



Trailing Edge Flap Control Valve Repair
Figure 801

FLAP POWER UNIT - ADJUSTMENT/TEST

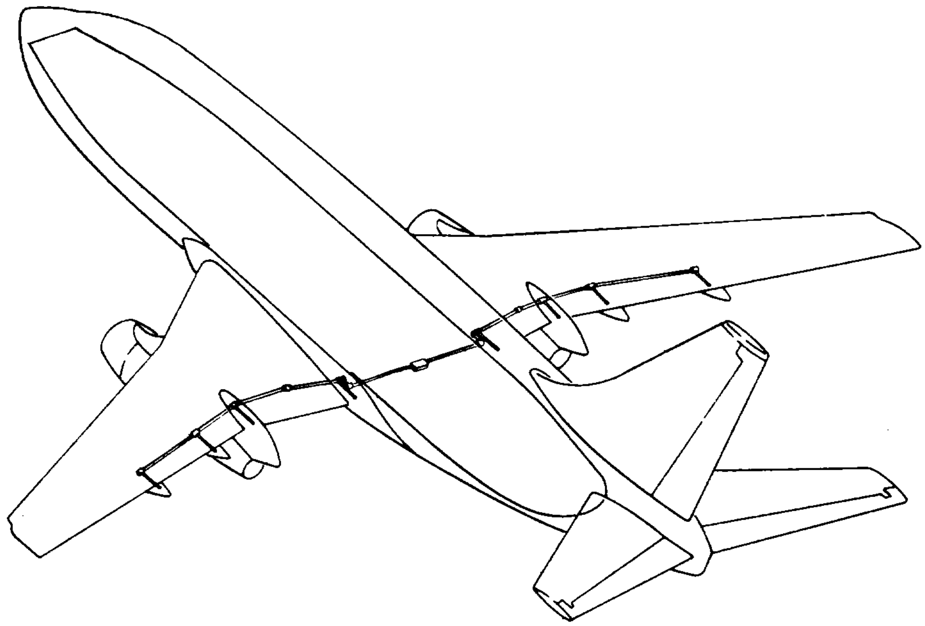
1. Flap Power Unit Test
   A. Prepare Flap Power Unit for Test
      (1) Connect electrical power to airplane.
      (2) Pressurize hydraulic system A (Ref 27-51-0, Maintenance Practices).
      (3) Remove inboard flap track fairings (Ref 27-51-141).
      (4) Check that the following circuit breakers on panel P6 are closed.
         (a) TE AL FLAP DRIVE MOTOR
         (b) FLAP VALVES
         (c) TE Flap Position INDICATION
   B. Test Flap Power Unit
      (1) Position flap control lever in 1-unit detent, allow flaps to respond, then return flap control lever to FLAP UP detent.
      (2) Check that both flap position indicator pointers point into the black UP area on the indicator dial. Also check that pointer tips are within 0.040 inch of each other.

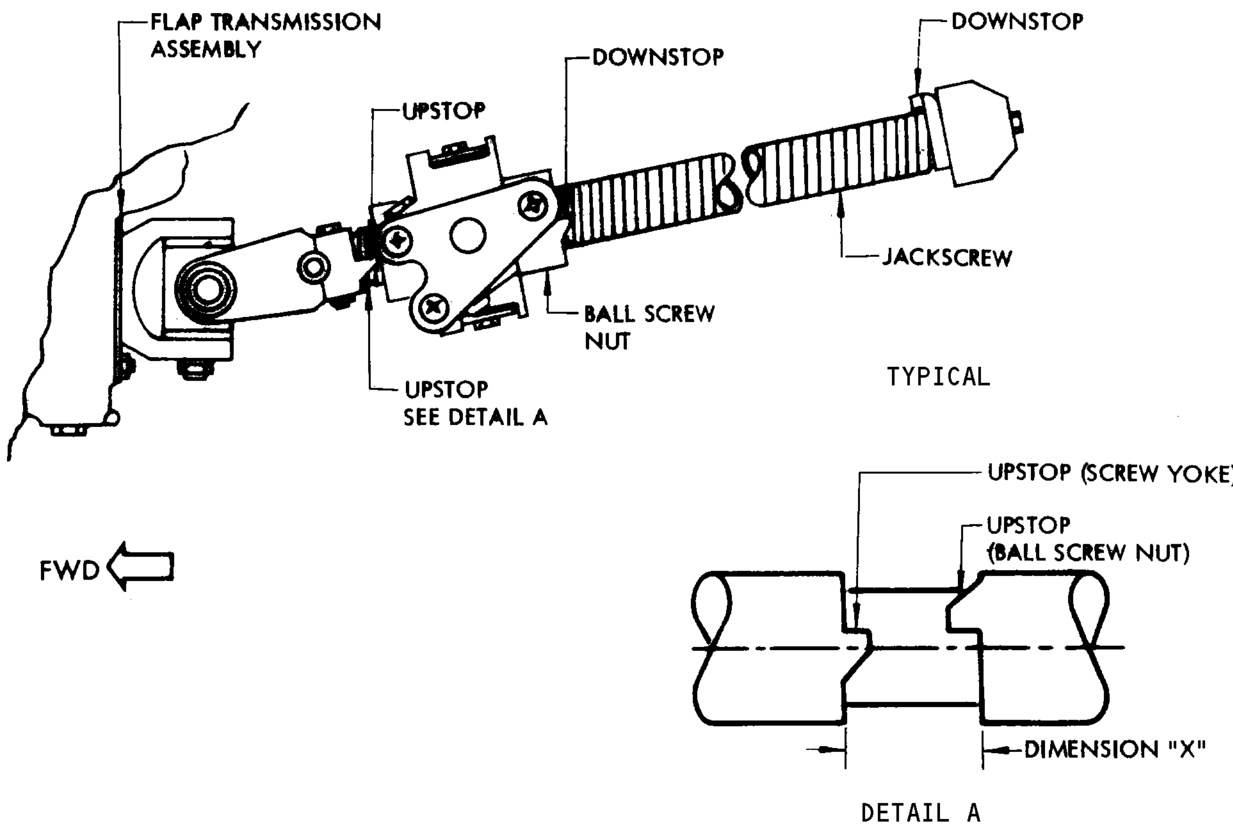
         NOTE: The indicator dial should be tapped with the fingers to remove friction error.

      (3) At number four and five jackscrews check that angular clearance between jackscrew upstops is 170 to 190 degrees (1/2 turn +10 degrees) turn (Fig. 501).

         CAUTION: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURN. A VALUE FOR (X1) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

      (4) At number four jackscrew measure dimension X1. Record value.
      (5) Position flap control lever in FLAP DOWN (40-unit) detent.
      (6) Check that both flap position indicator pointers point into the 40-unit black area on indicator dial.
      (7) At number four jackscrew measure dimension X2. Using dimension X1 from step (5) perform the necessary subtraction to determine that X2 - X1 dimension is between 29.82 inches and 30.48 inches.
      (8) Position flap control lever in FLAP UP detent to retract flaps.
      (9) Check alternate trailing edge flap operation.
         (a) Position alternate flap switch to ARM (to energize standby hydraulic pump motor).





Flap Transmission Upstop Clearance
Figure 501

(b) Position flap control lever in FLAP DOWN (40-unit) detent.

NOTE: Flap control lever is moved to FLAP DOWN to minimize load on flap hydraulic motor when hydraulic system A is pressurized.

(c) Position alternate flap drive switch to DOWN and check that trailing edge flaps move in extend direction.
(d) Position alternate flap drive switch to UP and check that flaps return to retracted position.
(e) Position alternate flap drive switch to OFF, flap control lever in FLAP UP detent, and alternate flap arming switch to OFF.

NOTE: With hydraulic system A pressurized, leading edge devices will retract.

C. Restore Airplane to Normal Configuration
(1) With flaps retracted, depressurize hydraulic system A (Ref 27-51-0).
(2) Install inboard flap track fairings (Ref 27-51-141).

FLAP POWER UNIT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Flap Drive Adapter - F70300-1 (preferred) or ST2583-1 (optional)
   B. Hydraulic Fluid - MIL-H-5606 (Ref 20-30-21)
   C. Rigging Pin F-1 - 0.311 +0.000/-0.002 inch diameter 2.35 ±0.06 inches long (MS20392-4)

      NOTE: Rigging pin is a part of kit F70207-3, -52, -61, or -84.

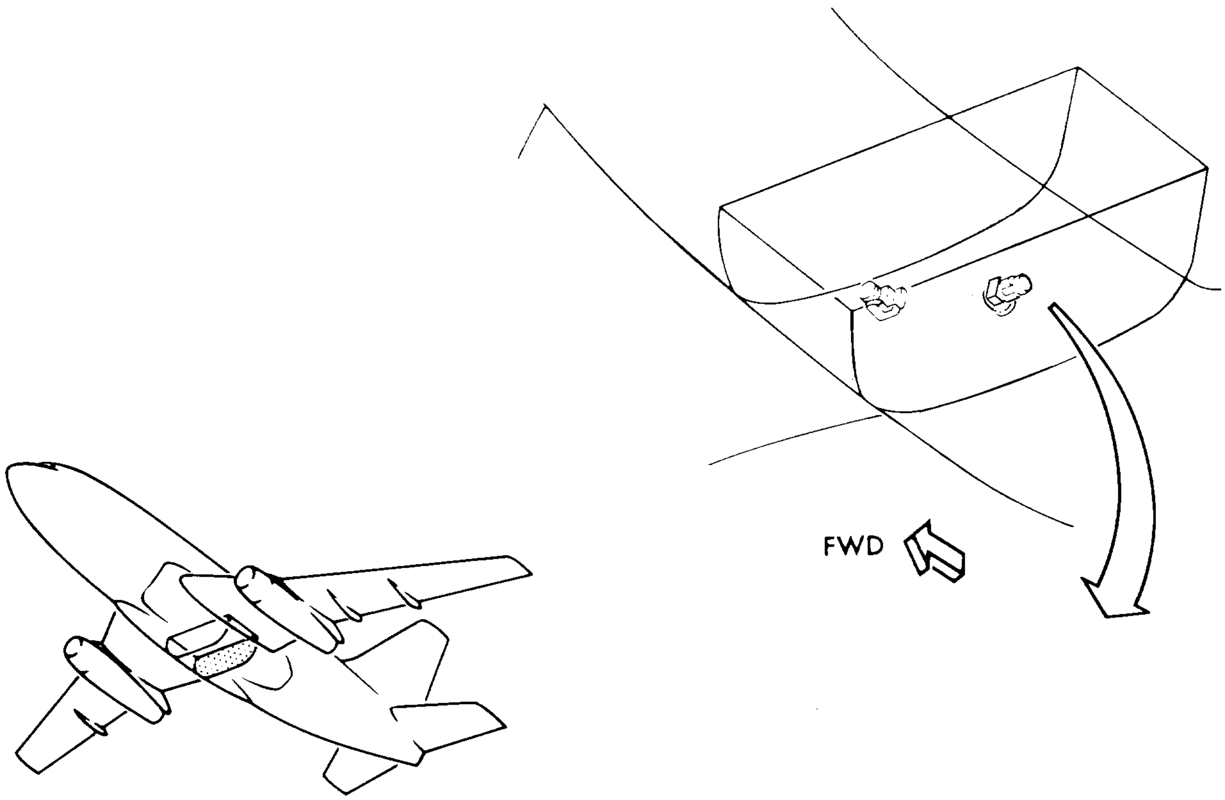
   D. Grease - BMS 3-33 (Preferred)
   E. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
2. Prepare Flap Power Unit for Removal
   A. Pressurize hydraulic system A (Ref 27-51-0 MP).
   B. Position flap control lever to FLAP UP detent to retract flaps.

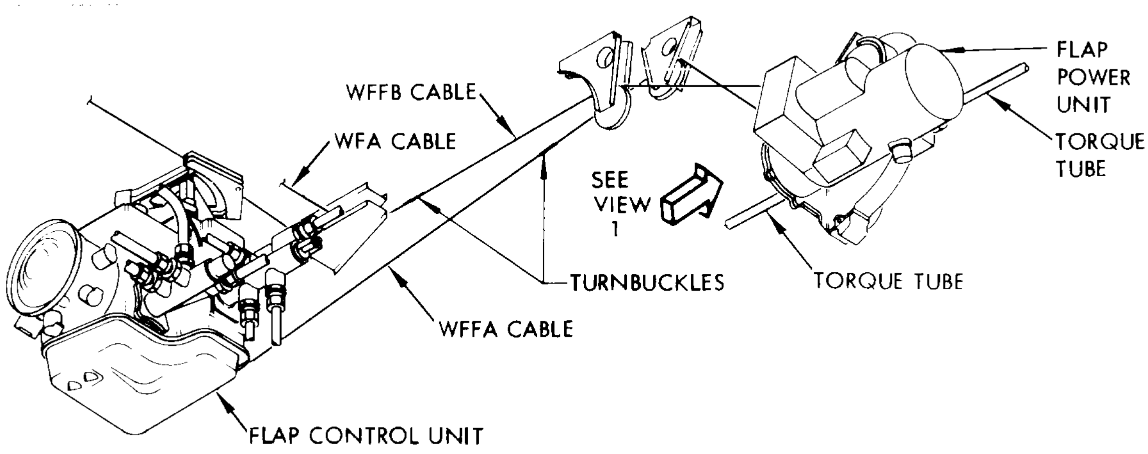
      NOTE: If flap power unit is jammed, it will be necessary to disconnect torque tubes from both sides of power unit and manually rotate torque tubes to retract flaps.

   C. Depressurize hydraulic system A and system A reservoir (Ref 27-51-0 MP).
   D. Open TE ALT FLAP DRIVE MOTOR circuit breaker on circuit breaker panel P6.
   E. Remove inboard flap track fairings (Ref 27-51-141 R/I).
3. Remove Flap Power Unit
   A. Disconnect electrical connector from flap alternate drive unit (Fig. 401).
   B. Remove lower pan on flap control unit (Fig. 402).
   C. Install rigging pin F-1 in flap control unit.
   D. Remove screws securing torque tube sleeves to power unit spline couplings and disconnect torque tubes (Fig. 401).
   E. Disconnect hydraulic lines from flap hydraulic motor.

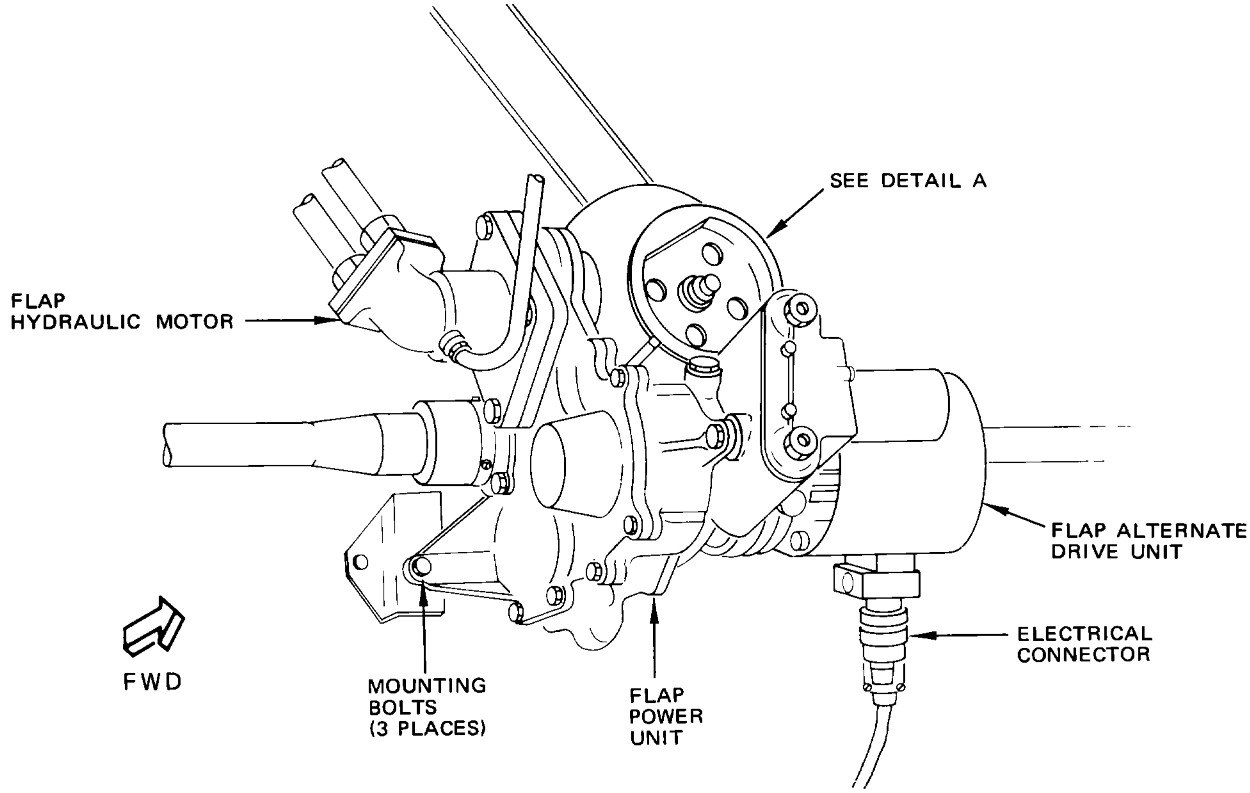
      CAUTION: BE PREPARED TO CATCH HYDRAULIC FLUID.

   F. Install plugs in hydraulic lines and cap all ports.
   G. Relieve tension in WFFA and WFFB cables and detach cables from power unit. Tag cables to aid in reinstallation.
   H. Disconnect bonding jumper from power unit mounting bracket.
   I. Remove power unit mounting bolts and remove power unit from airplane.
   J. Remove three mounting bolts and separate flap alternate drive unit from power unit.
   K. Remove four mounting bolts and separate hydraulic motor from power unit.
4. Prepare Flap Power Unit for Installation
   A. Apply light film of grease to full length of output splines on flap hydraulic motor and on flap alternate drive unit.
   B. Install flap hydraulic motor on power unit. Secure with four mounting bolts (Fig. 401).





Flap Power Unit Installation
Figure 401 (Sheet 1)



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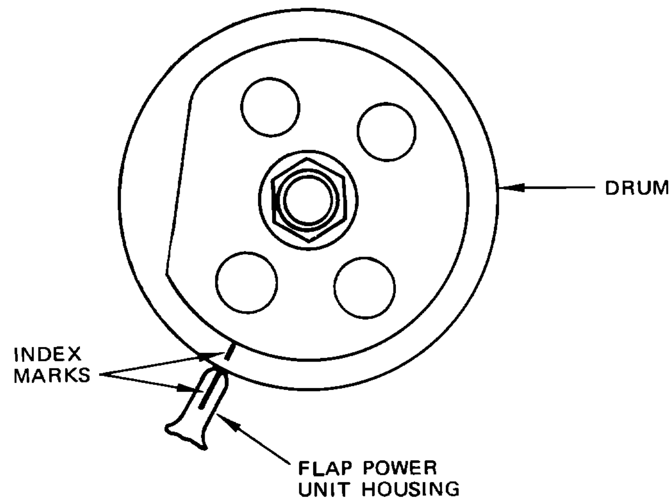
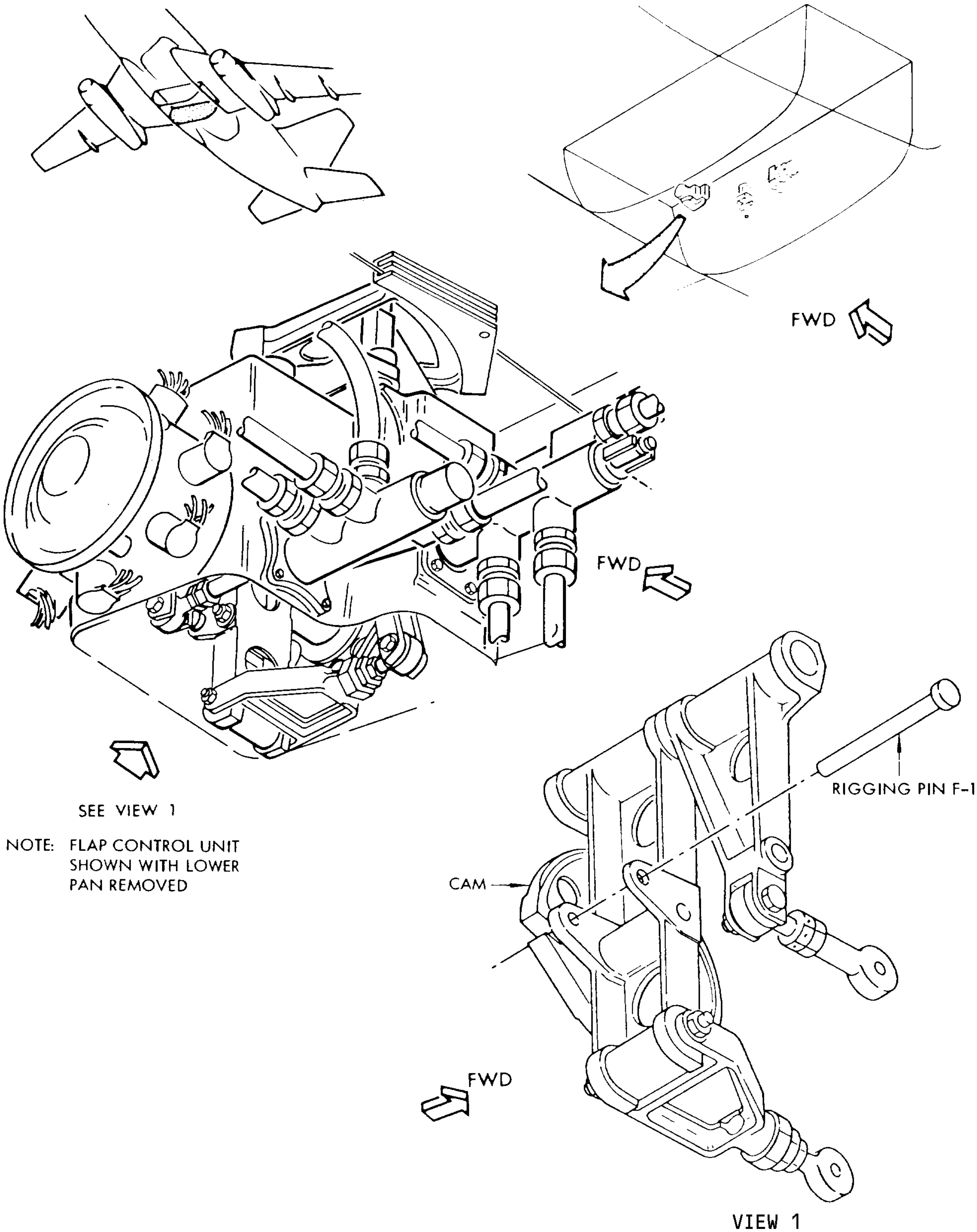


DETAIL A

Flap Power Unit Installation
Figure 401 (Sheet 2)



Flap Control Unit Adjustment
Figure 402

C. Install flap alternate drive unit on power unit. Secure with three mounting bolts.

5. Install Flap Power Unit

A. Position power unit on support bracket and install power unit mounting bolts (Fig. 401).

B. Install bonding jumper between flap alternate unit and mounting bracket.

C. Rotate power unit output shafts to align mark on drum within 0.03 inch with matching mark on power unit housing.

D. Remove plugs from hydraulic lines and caps from hydraulic motor ports.

E. Connect hydraulic lines to hydraulic motor.

F. Check that rigging pin F-1 is installed in flap control unit (Fig. 402).

G. Connect WFFA and WFFB cables to power unit follow-up drum on aft side of power unit. Pay particular attention to cable routing as shown in Fig. 401 to avoid incorrect routing. Wrap approximately 2-1/4 turns of WFFA cable on follow-up drum and approximately 1/3 turn of WFFB cable on follow-up drum.

NOTE: At flap control unit, WFFA cable will have approximately 1-1/2 turns and WFFB cable will have approximately 2-1/2 turns on follow-up drum.

H. Adjust turnbuckles to tension cables as shown in following table. When cables are tensioned, ensure that rigging pin fits freely in control unit. Install locking clips on turnbuckles.

TEMPERATURE (°F)	CABLE RIGGING LOAD (+20/-0 POUNDS) *[1]
110	71
90	65
70	60
50	55
30	49
10	44
-10	38
-30	33
-40	30

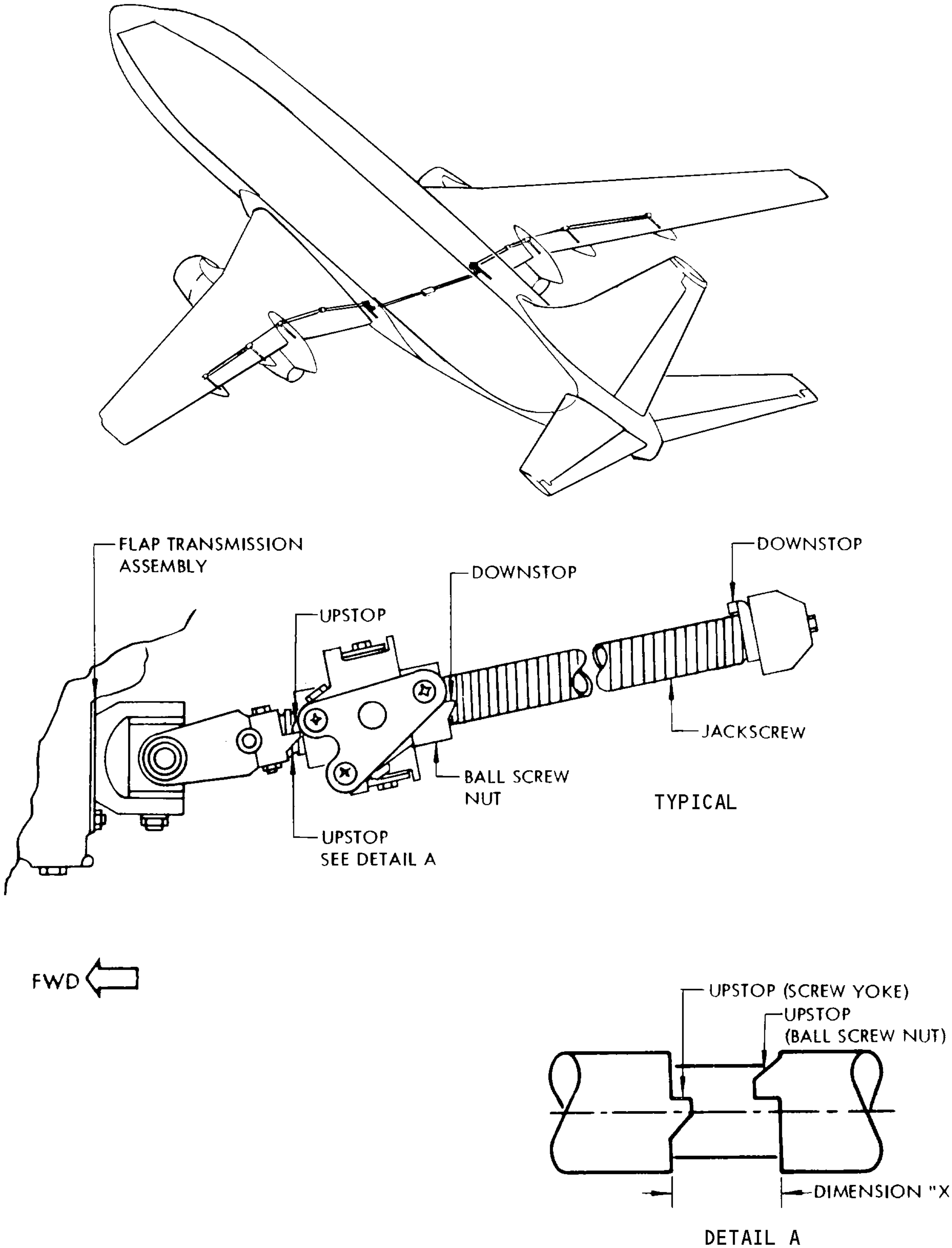
*[1] For required periodic checks without system discrepancy reports, the cable tensions may deviate +20/-20 pounds from Table values. For cable tension checks resulting from system discrepancy reports, the tensions may deviate +20/-0 pounds from Table values. Whenever cables are readjusted, Table values must be met.

NOTE: Allow a minimum of 1 hour at constant ambient temperature (± 5°F) for airframe temperature to stabilize.

I. Rotate torque tubes which connect to power unit until angular clearance between upstops on flap transmissions are 170 to 190 degrees (1/2 turn ±10 degrees) turn from contact (Fig. 403).

CAUTION: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURN. A VALUE FOR (XL) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

J. Lubricate torque tube sleeves with grease and connect to power unit spline couplings. Install retaining screws and lockwire.
K. Remove rigging pin F-1 from flap control unit (Fig. 402).
L. On circuit breaker panel P6, close TE ALT FLAP DRIVE MOTOR circuit breaker.
M. Test flap power unit (Ref 27-51-221, Adjustment/Test).
N. Check hydraulic reservoir and service if required (Ref Chapter 12, Hydraulic Servicing).
O. Install inboard flap track fairings (Ref 27-51-141, Inboard Flap Track Fairings).



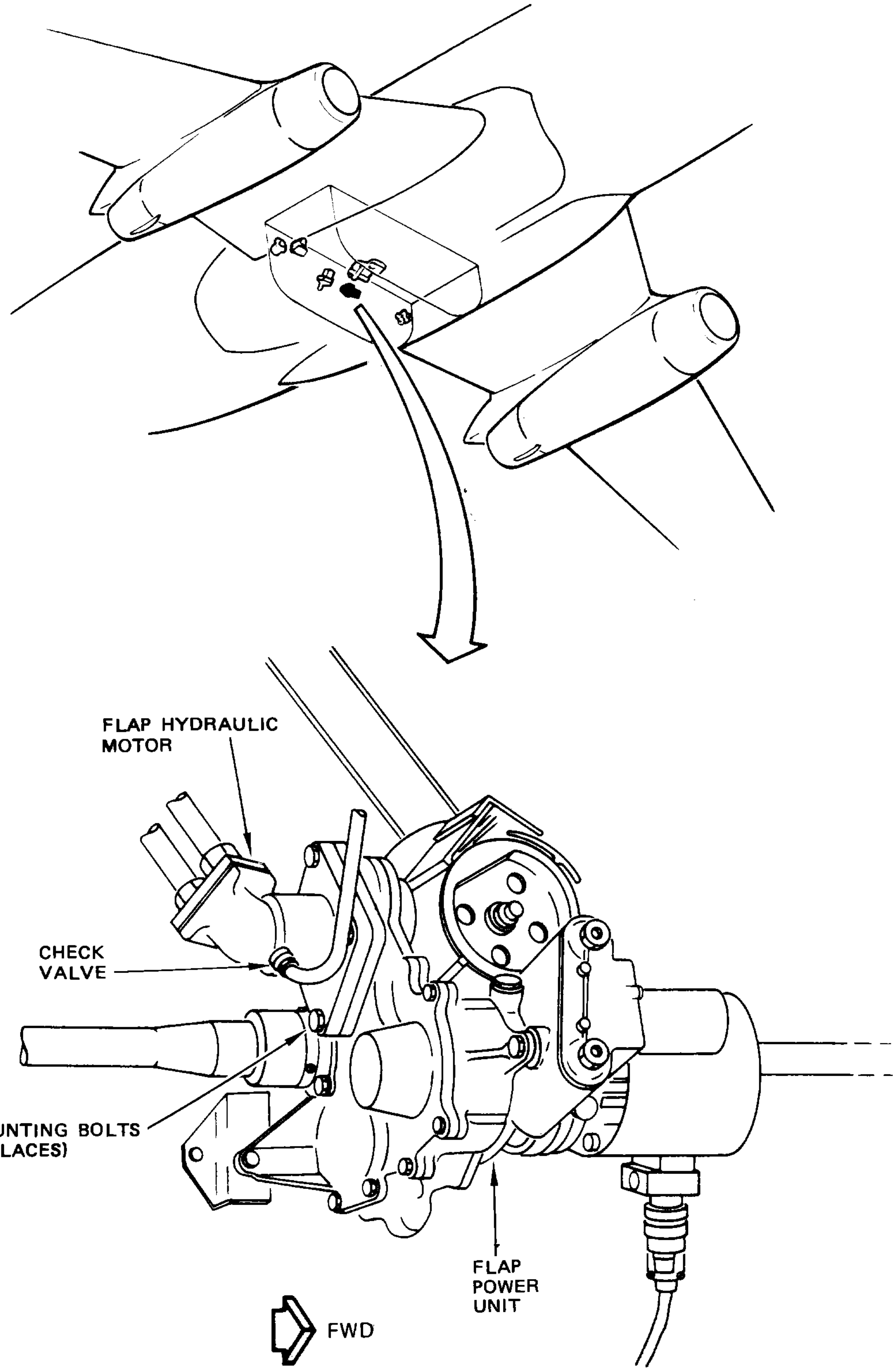
Flap Transmission Upstop Clearance
Figure 403

FLAP HYDRAULIC MOTOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   - A. Fire Resistant Hydraulic Fluid - BMS 3-11
   - B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   - C. Grease - BMS 3-33 (Preferred)
   - D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
2. Remove Flap Hydraulic Motor
   - A. Remove system A hydraulic power and depressurize hydraulic reservoir A. Refer to 27-51-0, Trailing Edge Flaps - Maintenance Practices.
   - B. Disconnect hydraulic lines from hydraulic motor. (See figure 401.)

     CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

   - C. Install plugs in hydraulic lines and cap all ports.
   - D. Remove mounting bolts attaching hydraulic motor to flap power unit and remove hydraulic motor.
   - E. Take necessary precautions to prevent dirt entering hydraulic motor cavity when motor is removed.
3. Install Flap Hydraulic Motor
   - A. Install O-ring and check valve in case drain port of motor. Lightly lubricate O-ring with hydraulic fluid or assembly lube at installation.
   - B. Install O-ring and reducer in remaining ports on hydraulic motor. Lubricate O-rings.
   - C. Grease hydraulic motor external spline lightly.
   - D. Carefully insert hydraulic motor into housing and install mounting bolts attaching motor to flap power unit. (See figure 401.)
   - E. Remove caps from ports and plugs from hydraulic lines.
   - F. Connect hydraulic lines to hydraulic motor.
   - G. Provide system A hydraulic power. Refer to 27-51-0.
   - H. Cycle flaps to bleed hydraulic system.
   - I. Examine hydraulic lines on motor for leakage.
   - J. Test flap hydraulic motor. Refer to Flap Hydraulic Motor - Adjustment/Test.
   - K. Remove system A hydraulic power. Refer to 27-51-0.
   - L. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.



Flap Hydraulic Motors Installation
Figure 401

FLAP HYDRAULIC MOTOR - ADJUSTMENT/TEST

1. Flap Hydraulic Motor Test
   A. Test Flap Hydraulic Motor
      (1) Provide system A hydraulic power. Refer to 27-51-0, Trailing Edge Flaps - Maintenance Practices.

      NOTE: Hydraulic service cart set at 20 gpm and 3000 psi or operation of at least one engine-driven pump is required to perform this portion of test.

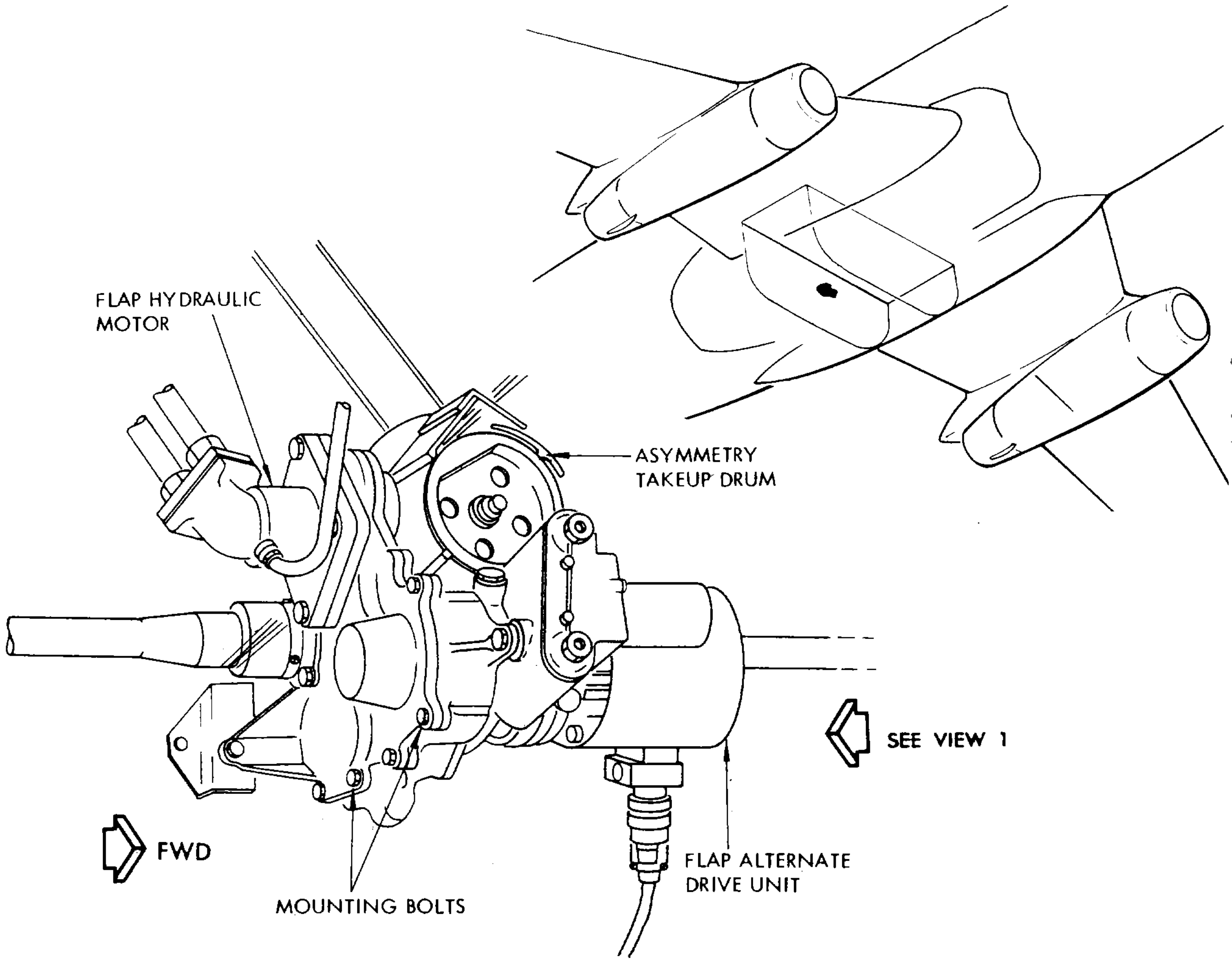
      (2) Move flap control lever from FLAP UP detent to FLAP DOWN (40-unit) detent.
      (3) Check that time for flaps to extend is 35 (±5) seconds.

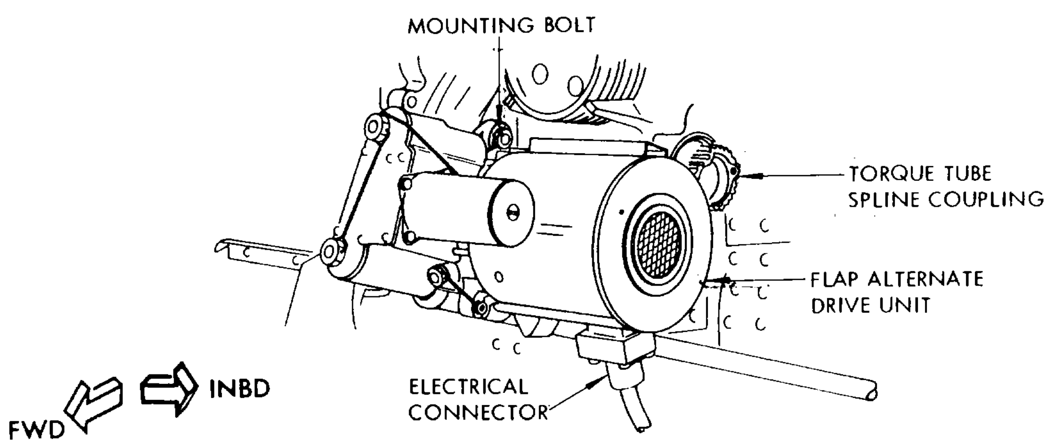
      NOTE: Operating time should be measured from start of flap motion in up position until downstop on number 4 ballscrew nut is 1.50 (±0.20) inches from downstop on jackscrew.

      (4) Position flap control lever in FLAP UP detent.
      (5) Check that time for flaps to retract is 35 (±5) seconds.
      (6) Remove system A hydraulic power. Refer to 27-51-0.

FLAP ALTERNATE DRIVE UNIT - REMOVAL/INSTALLATION

1. Equipment and Material
   A. Primer - BMS 10-11, Type I
   B. Grease - BMS 3-33 (Preferred)
   C. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   D. Hydraulic Fluid - MIL-PRF-5606 (Supercedes MIL-H-5606)
2. Prepare Flap Alternate Drive Unit for Removal
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Position flap control lever to FLAP UP detent.
   C. Remove system A hydraulic power and depressurize system A reservoir (Ref 27-51-0).
   D. On circuit breaker panel P6-2 open TE ALT FLAP DRIVE MOTOR circuit breaker.
3. Remove Flap Alternate Drive Unit
   A. Disconnect electrical connector from alternate drive unit (Fig. 401).
   B. Remove bonding jumper between alternate drive unit and mounting bracket.
   C. Remove bolts attaching alternate drive unit to flap power unit and remove unit.
4. Install Flap Alternate Drive Unit
   A. Fill drive unit with hydraulic fluid prior to installation (Ref Chapter 12, Trailing Edge Flap System Lubrication).
   B. Swab or brush primer in mounting bolt holes on flap power unit and on alternate drive unit (Fig. 401)
   C. Apply a light coat of grease to entire length of output spline of alternate drive unit and to input spline on flap power unit.
   D. Position alternate drive unit on flap power unit and install mounting bolts.
   E. Install bonding jumper between alternate drive unit and mounting bracket.
   F. Connect electrical connector to alternate drive unit.
   G. Test flap alternate drive unit (Ref Adjustment/Test).





VIEW 1

Flap Alternative Drive Unit Installation
Figure 401

FLAP ALTERNATE DRIVE UNIT - ADJUSTMENT/TEST

1. Flap Alternate Drive Unit Test
   A. Prepare Alternate Drive Unit for Test
      (1) Connect electrical power to airplane.
      (2) Check that the following circuit breakers on panel P6-2 are closed:
         (a) TE ALT FLAP DRIVE MOTOR
         (b) FLAP VALVES
   B. Test Alternate Drive Unit
      (1) Position alternate flap switch at ARM.

      NOTE: Actuation of alternate flap switch to ARM energizes standby hydraulic pump motor.

      (2) Move flap control lever to FLAP DOWN (40-unit) detent.

      CAUTION: DURING GROUND OPERATION, DO NOT OPERATE FLAP ALTERNATE DRIVE UNIT MORE THAN 4 MINUTES OPERATION AND 25 MINUTES OFF.

      NOTE: Flap control lever is moved to FLAP DOWN position as a standard procedure to minimize load on flap hydraulic motors when hydraulic system A is pressurized.

      (3) Actuate alternate flap drive switch to DOWN position. Hold switch in this position until trailing edge flap motion stops.

      CAUTION: LEADING EDGE DEVICES WILL EXTEND. ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR.

      NOTE: Extension of trailing edge flaps is controlled by limit switches.

      (4) Check that time for flaps to extend is 146 (+10/-20) seconds.
      (5) Actuate alternate flap drive switch to UP position. Hold switch in this position until trailing edge flap motion stops.
      (6) Check that time for flaps to retract is 146 (+10/-20) seconds.
   C. Restore Airplane to Normal Configuration
      (1) Position flap control lever in FLAP UP detent.
      (2) Position alternate flap switches to OFF.

(3) Pressurize hydraulic system A and allow leading edge devices to fully retract (AMM 29-11-0/201).

<u>WARNING</u>: APPLICATION OF HYDRAULIC SYSTEM A PRESSURE WILL CAUSE THE LEADING EDGE DEVICES TO RETRACT. ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR.

(4) Depressurize hydraulic system A (AMM 29-11-0/201).
(5) Determine whether there is any further need for electrical power, if not, disconnect power.

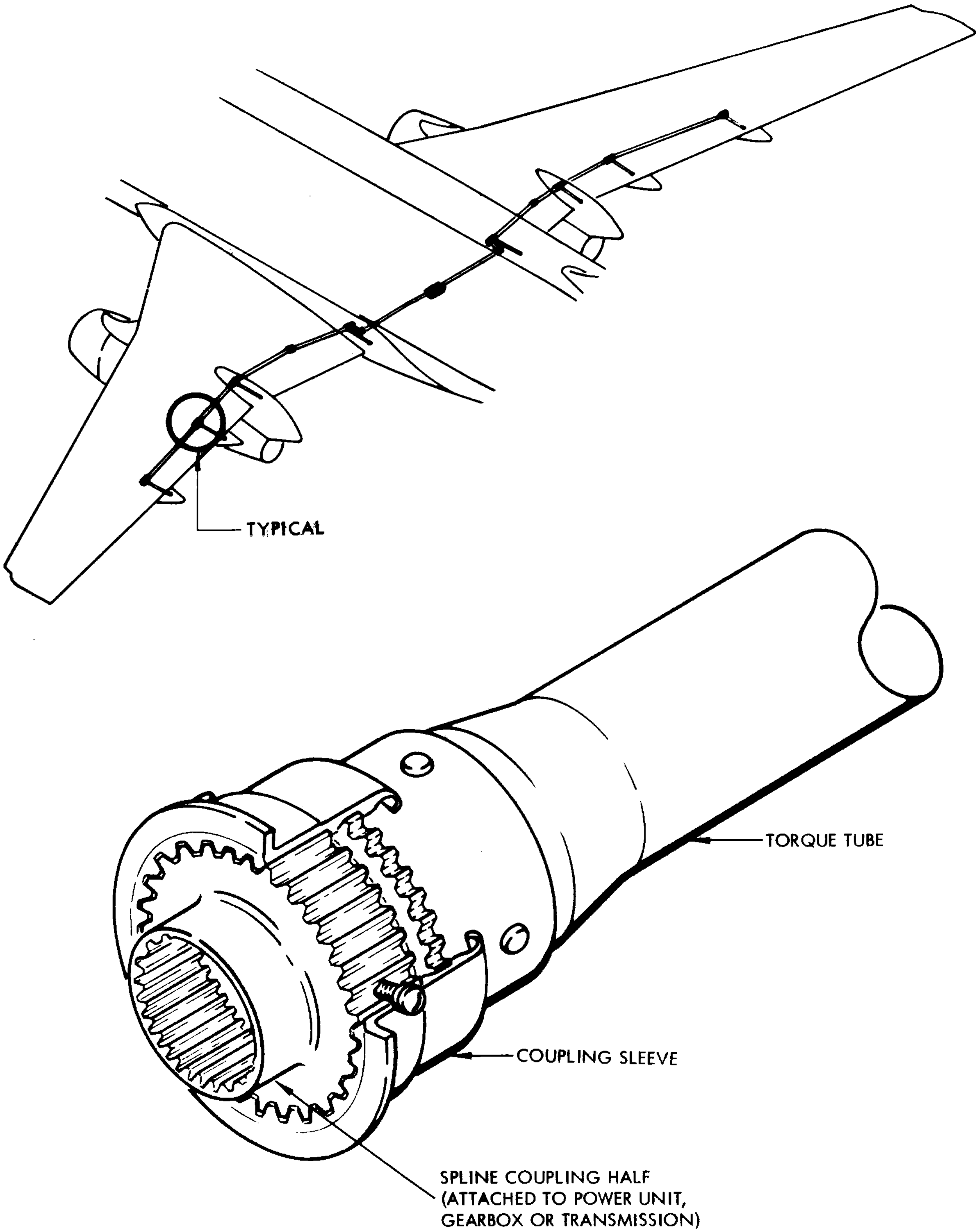
FLAP TORQUE TUBES - REMOVAL/INSTALLATION

1. General
   A. Flap torque tubes connect the components of the flap drive system with spline coupling sleeves at both ends of the torque tubes.
   B. The torque tube between the outboard flap transmissions has two segments with the flap position transmitter acting as a support bearing near its midpoint.
   C. The torque tube between the inboard flap outboard transmission and the flap angle gearbox has two segments with a three bolt flange connection.
2. Equipment and Materials
   A. Grease - BMS 3-33 (Perferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Flap Drive Adapter - F70300-1 (preferred) or ST2583-1 (optional)
   D. Sealant - BMS 5-95
3. Prepare Flap Torque Tubes for Removal
   A. Remove inboard flap track fairing, if required, to gain access to torque tube (Ref 27-51-141 R/I).
   B. Provide system A hydraulic power (Ref 27-51-0 MP).
   C. Position flap control lever to FLAP DOWN detent.
   D. Remove system A hydraulic power (Ref 27-51-0).
   E. Secure flaps to prevent motion when torque tubes are disconnected.
4. Remove Flap Torque Tubes
   A. If removing torque tube in wing, remove torque tube guard.
   B. Remove three screws attaching spline coupling sleeves to spline coupling. Slide coupling sleeves off splines to disconnect torque tubes (Fig. 401).
   C. If torque tube between inboard flap outboard transmission and angle gearbox is being removed, disconnect torque tube segments by removing three bolts at flange connection.
   D. Remove torque tube from airplane.
5. Install Flap Torque Tubes
   A. Position torque tube in airplane.

      CAUTION: IF INSTALLING FLAP TORQUE TUBE THROUGH ENGINE NACELLE OUTBOARD BULKHEAD ENSURE THAT ABRASION RESISTANT TEFLON COATING ON TORQUE TUBE IS LOCATED AT BULKHEAD SEAL.

   B. If torque tube between inboard flap outboard transmission and angle gearbox is being installed:
      (1) Locate torque tube segments so that flange connection is located 5 inches outboard of inboard ground spoiler outboard actuation fitting.
      (2) Apply a layer of sealant to the two flanges.
      (3) Install three bolts to connect flange connection.
      (4) Apply sealant to the bolts, washers and nuts.

C. At one end of torque tube, lubricate coupling splines with grease and engage spline coupling sleeve on splines. Secure spline coupling sleeve with three screws and lockwire screws (Fig. 401).
D. Position torque tube so that coupling halves at connected end contact.
E. Deleted.
F. Lubricate coupling splines with grease at remaining coupling and engage spline coupling sleeve with three screws and lockwire screws.
G. If installing torque tube in wings, install torque tube guard.
H. Remove restraint from flaps.
I. Test torque tubes (Ref Flap Torque Tubes - A/T).
J. If required, install inboard flap track fairing (Ref 27-51-141 R/I).



Typical Torque Tube Installation
Figure 401

FLAP TORQUE TUBES - ADJUSTMENT/TEST

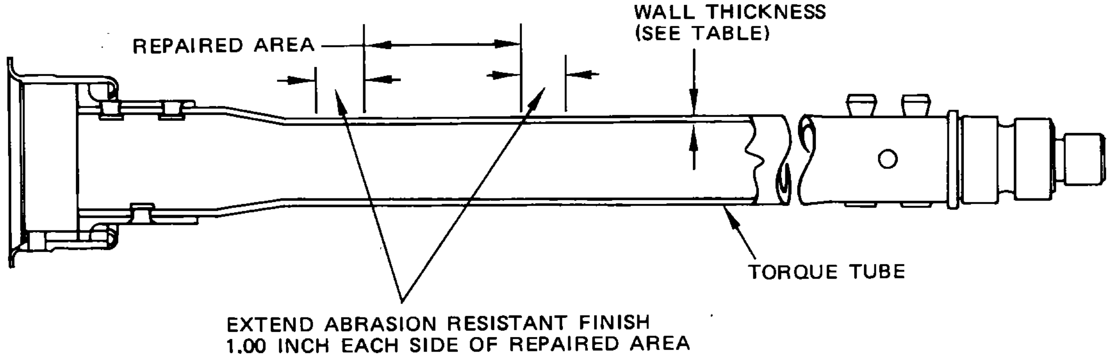
1. Flap Torque Tube Test
   A. Test Flap Torque Tubes
      (1) Provide system A hydraulic power (Ref 27-51-0 MP).
      (2) Position flap control lever to extend and retract flaps. Check that at least 0.25-inch clearance exists between rotating parts of flap torque tubes and all surrounding structure and equipment.
      (3) Position flap control lever to FLAP DOWN detent to extend flaps.
      (4) Remove system A hydraulic power (Ref 27-51-0 MP).
      (5) Check that where torque tubes pass through wing to nacelle bulkhead seals, the seals are free floating and can be moved without restriction within the seal retainer and that a minimum radial clearance of 0.05 inch between seal and torque tube can be obtained.

         NOTE: Inside diameter of seal is approximately 0.10 inch larger than outside diameter of torque tube.

      (6) Check torque tubes for straightness measured statically. Torque tubes must be straight within 0.01 inch total indicator reading per foot of torque tube length.
   B. Restore Airplane to Normal Configuration
      (1) Provide system A hydraulic power (Ref 27-51-0 MP).
      (2) Position flap control lever in FLAP UP detent to retract flaps.
      (3) Remove system A hydraulic power (Ref 27-51-0 MP).

FLAP TORQUE TUBE - APPROVED REPAIRS

1. Equipment and Materials
   A. Alodine 1200 (Ref 20-30-02)
2. Repair Torque Tube
   A. Remove torque tube from airplane (Ref 27-51-251, Removal/Installation).
   B. Clean torque tube and check for wear and tube wall reduction (Fig. 801).
   C. Repair defects using a minimum blend radius of 1.00 inch. Surface finish of repaired area must be 63 microinches or better. Reduction in wall thickness to be limited to dimensions shown in table.
   D. Apply colored alodized surface treatment to repaired area.
   E. Apply abrasion resistant finish to repaired area and to area each side of repaired area as shown per Fig. 801 (Ref 51-21-81, Abrasion Resistant Teflon Finish - Application).
   F. Install torque tube in airplane (Ref 27-51-251).



WALL THICKNESS (INCH)	
DESIGN	MINIMUM AFTER REWORK
0.083	0.075
0.100	0.090
0.120	0.108

Torque Tube Approved Repairs
Figure 801

FLAP RIGHT ANGLE GEARBOX - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. TE Wing Flap Drive Installation Alignment Checking Tool - F80186-10 (Preferred) F80186-1 (Optional)
   B. Grease - BMS 3-33 (Preferred)
   C. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
2. Prepare for Removal
   A. Remove inboard flap track fairing (Ref 27-51-141 R/I).
   B. Provide system A hydraulic power (Ref 27-51-0 MP).
   C. Position flap control lever to FLAPS UP detent.

      NOTE: Flaps must be fully retracted to align boltholes.

   D. Remove system A hydraulic power (Ref 27-51-0).
3. Remove Flap Right Angle Gearbox
   A. Remove screws attaching torque tube coupling sleeves to gearbox spline couplings. Slide sleeves off couplings to disconnect torque tubes (Fig. 401).

      NOTE: Restrain flaps to prevent motion when torque tubes are disconnected.

   B. Remove the three mounting bolts which attach the support bracket to the structure.
   C. Remove the three housing bolts which attach the gearbox to the support bracket.
4. Install the Flap Right Angle Gearbox
   A. Put the gearbox on the support bracket (Fig. 401).

      CAUTION: MAKE SURE THAT THE HEAD OF THE RIGHT HOUSING BOLT IS FORWARD. THE BOLT CAN CAUSE DAMAGE TO THE TORQUE TUBE COUPLING SLEEVE RETENTION SCREWS IF INSTALLED INCORRECTLY.

      (1) Install the three housing bolts, washers and nuts to attach the gearbox to the support bracket. Install the head of the right bolt forward. Install the heads of the countersunk bolts aft.
   B. Attach the support bracket, with the gearbox, to the structure with the three mounting bolts, washers and nuts.

      NOTE: Make sure the flaps are fully retracted.

C. With airplane resting on its landing gear check alignment of right angle gearbox output shaft centerline with input shaft of No. 4 or 5 transmission gearbox.

(1) If preferred alignment checking tool (Ref Equipment and Materials) is used, proceed as follows:

(a) Install alignment tool from output shaft of right angle gearbox to input shaft of transmission gearbox. Position alignment tool with end cap (end opposite spring) on transmission gearbox (Fig. 402).

(b) Check that cable is within tolerance zone in vertical and horizontal plane.

(c) Remove alignment tool between right angle gearbox and transmission gearbox.

(d) Install alignment tool between right angle gearbox and transmission gearbox. Position alignment tool with end cap (end opposite spring) on right angle gearbox.

(e) Check that cable is within tolerance zone in vertical and horizontal plane.

(f) If cable, with end cap positioned at transmission input shaft or at right angle gearbox output shaft, is not within tolerance zone in vertical and horizontal plane, install a maximum of 0.064-inch shims at each right angle gearbox bolt location to align gearbox.

NOTE: Do not relocate transmission gearbox to align right angle gearbox.

1) Typical vertical adjustment: Install a 0.032-inch washer under right angle gearbox mounting pad at bolt No. 1 or 3 and a 0.016-inch washer at bolt No. 2 to move cable toward tolerance zone.

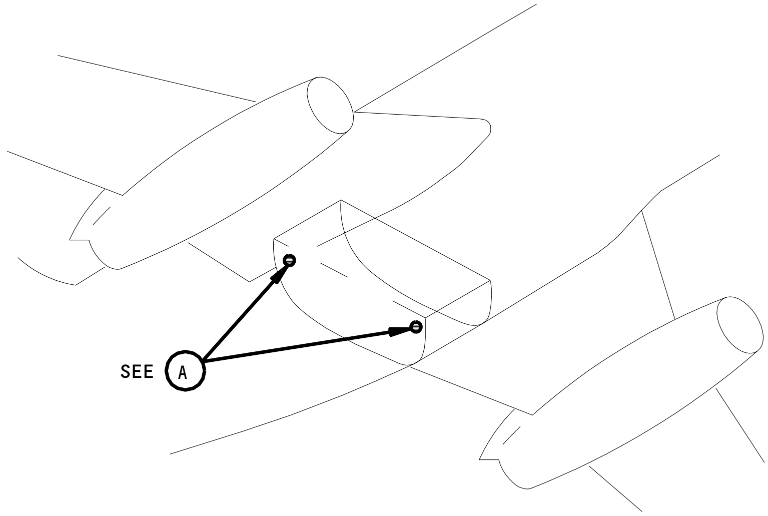
2) Typical horizontal adjustment: Install a 0.016-inch washer under right angle gearbox mounting pad at bolt No. 1 and 3, or bolt No. 2 to move cable toward tolerance zone.

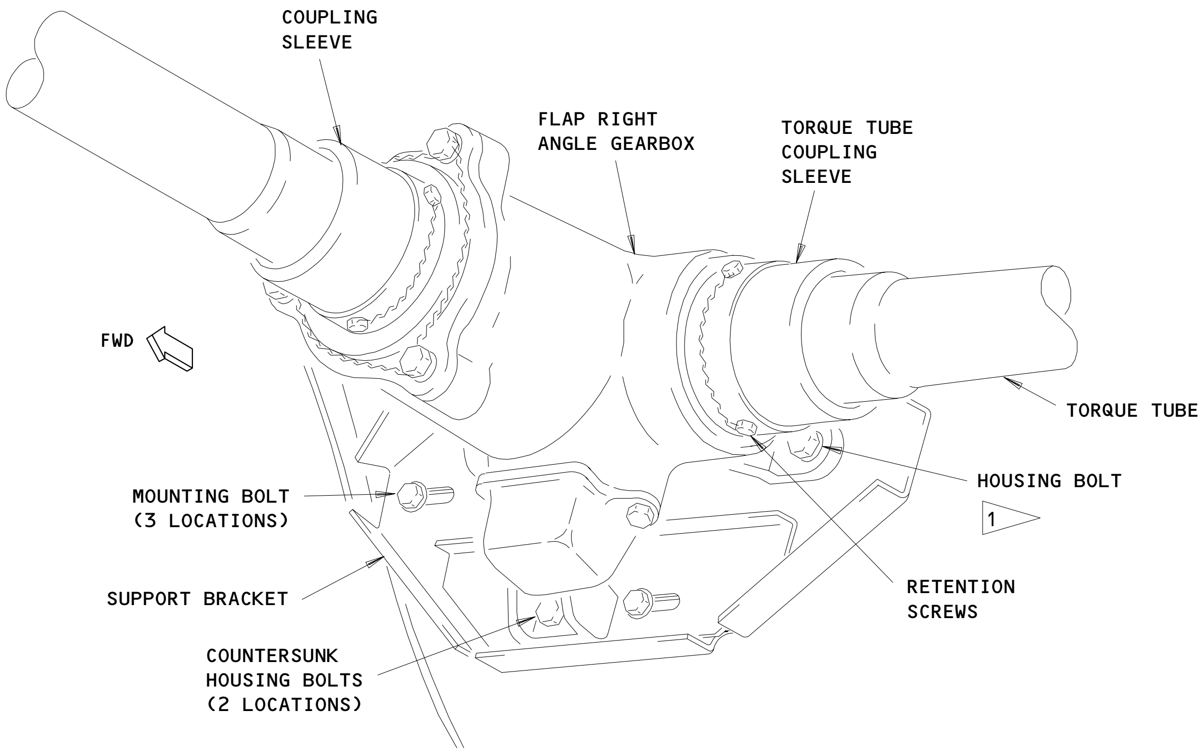
(2) If optional alignment checking tool (Ref Equipment and Materials) is used proceed as follows:

(a) Install alignment tool from output shaft of right angle gearbox to input shaft of transmission gearbox. Position alignment tool with pointer towards transmission gearbox (Fig. 402).

(b) Check that tool pointer is within ± 0.24 inch in vertical plane or ± 0.15 inch in horizontal plane of target center.

(c) Remove alignment tool between right angle gearbox and transmission gearbox.



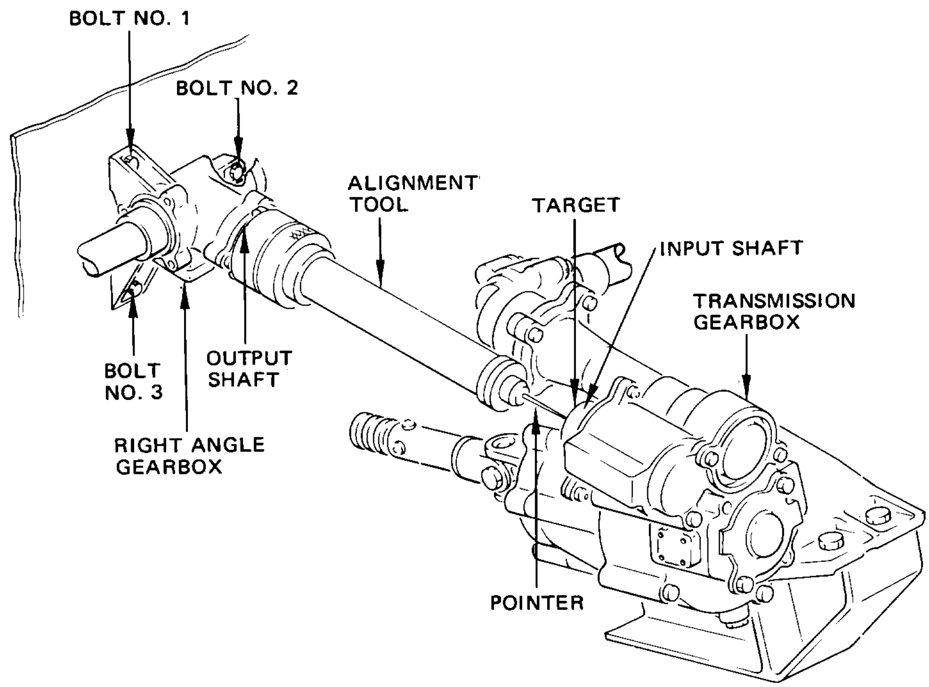


RIGHT GEARBOX SHOWN
(LEFT GEARBOX EQUIVALENT)

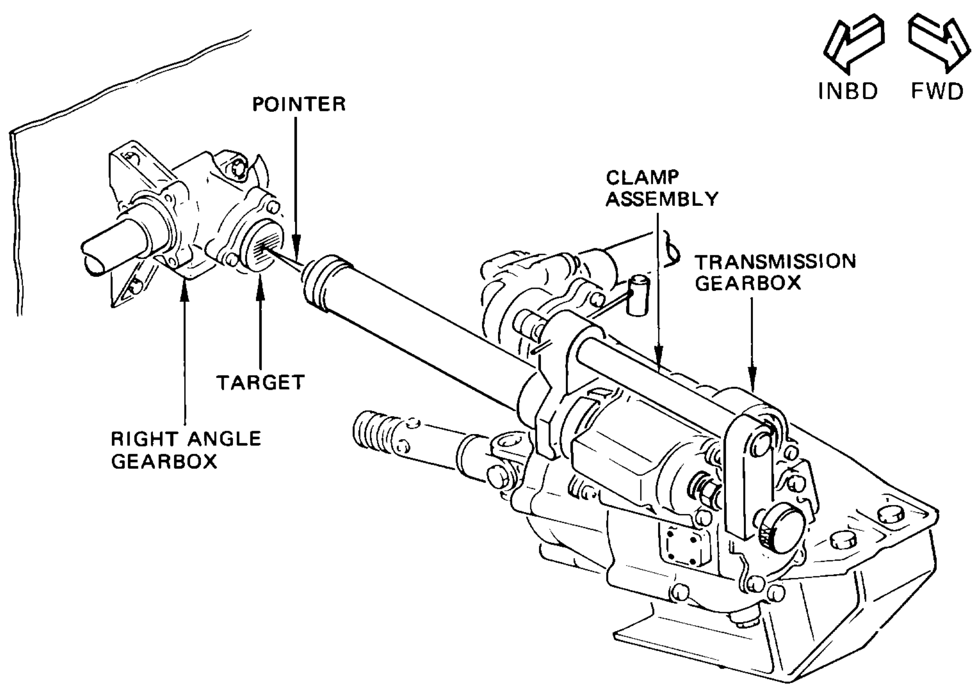
1 THE HEAD OF THE BOLT MUST POINT FORWARD.

A

Flap Right Angle Gearbox
Figure 401

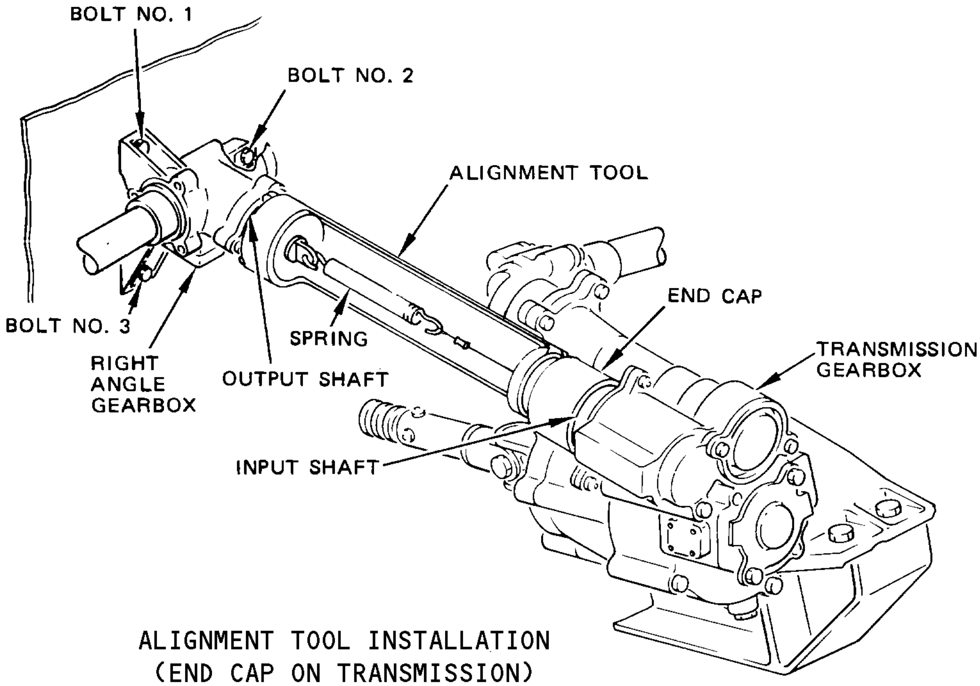


ALIGNMENT TOOL INSTALLATION
(POINTER TOWARD TRANSMISSION)

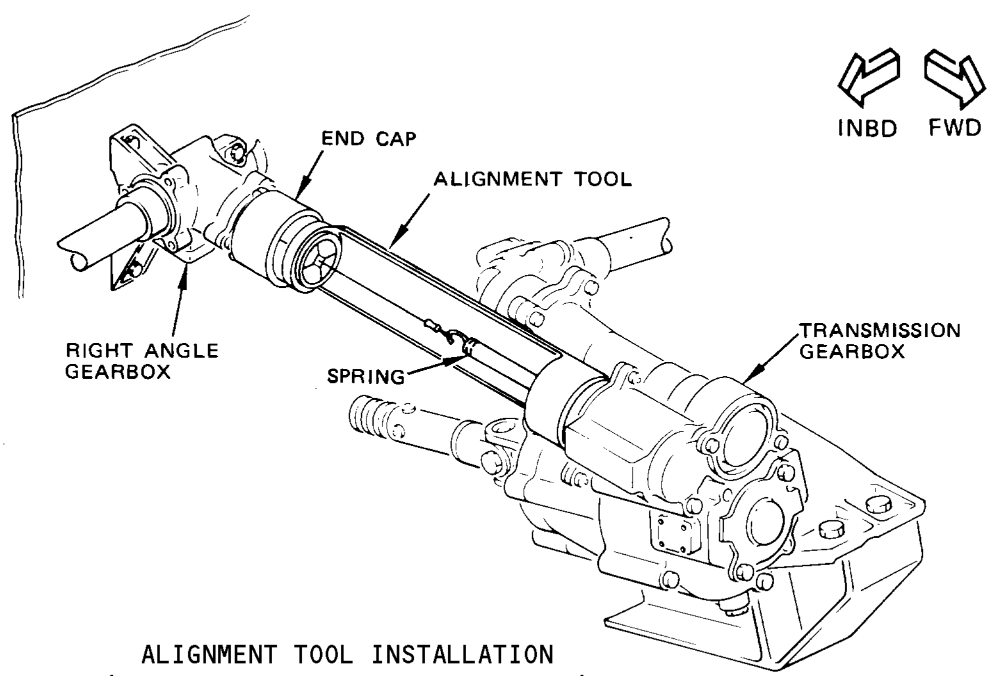


ALIGNMENT TOOL INSTALLATION
(POINTER TOWARD RIGHT ANGLE GEARBOX)

Flap Right Angle Gearbox Alignment
Figure 402 (Sheet 1)



ALIGNMENT TOOL INSTALLATION
(END CAP ON TRANSMISSION)



ALIGNMENT TOOL INSTALLATION
(END CAP ON RIGHT ANGLE GEARBOX)

Flap Right Angle Gearbox Alignment
Figure 402 (Sheet 2)

(d) Install alignment tool between right angle gearbox and transmission gearbox. Position alignment tool with pointer toward right angle gearbox. Use clamp assembly to stabilize pointer.
(e) Check that tool pointer is within ± 0.24 inch in vertical plane or ± 0.15 inch in horizontal plane of target center.
(f) If tool pointer, measured at transmission input shaft or at right angle gearbox output shaft, is more than ± 0.24 inch in vertical plane or ± 0.15 inch in horizontal plane from target center, install a maximum of 0.064-inch shims at each right angle gearbox bolt location to align gearbox.

NOTE: Do not relocate transmission gearbox to align right angle gearbox.

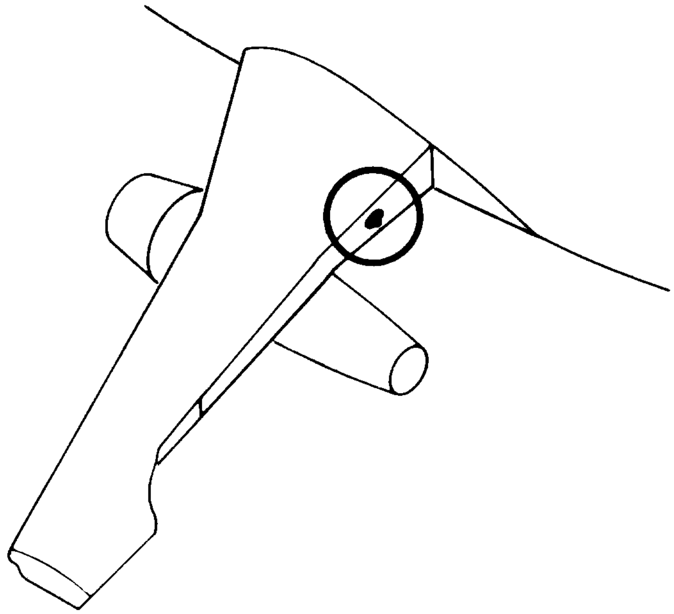
1) Typical vertical adjustment: Install a 0.032-inch washer under right angle gearbox mounting pad at bolt No. 1 or 3 and a 0.016-inch washer at bolt No. 2 to move forward end of alignment tool 0.175 inch.
2) Typical horizontal adjustment: Install a 0.016-inch washer under right angle gearbox mounting pad at bolts No. 1 and 3, or bolt No. 2 to move forward end of alignment tool 0.096 inch.

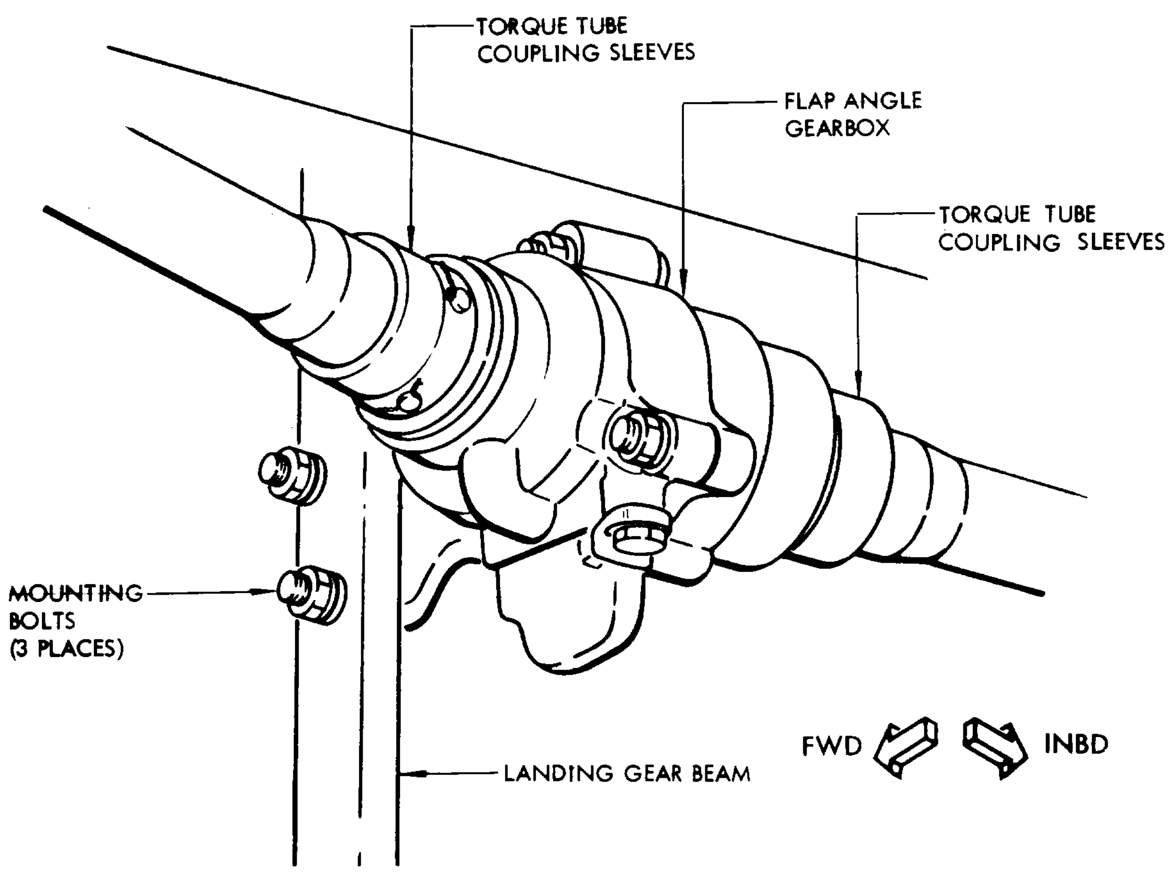
D. Remove alignment tool. Tighten bolts No. 1 and 3 on right angle gearbox within 50 to 70 pound-inches. Tighten bolt No. 2 within 63 to 77 pound-inches.
E. Lubricate spline couplings with grease, engage torque tube sleeves with spline couplings on gearbox and install retaining screws. Lockwire screw heads together.
F. Remove restraint from flaps.
G. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
H. Position flap control lever to exercise flaps and check operation of gearbox.

5. Restore Airplane to Normal
A. Position flap control lever to FLAP UP detent.
B. Remove system A hydraulic power (Ref 27-51-0).
C. Install inboard flap track fairing (Ref 27-51-141, Removal/Installation).

FLAP ANGLE GEARBOX - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
2. Prepare Flap Angle Gearbox for Removal
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Position flap control lever to FLAP DOWN detent.
   C. Remove system A hydraulic power (Ref 27-51-0).
   D. Restrain flaps to prevent motion when torque tubes are disconnected.
3. Remove Flap Angle Gearbox
   A. Remove screws attaching torque tube coupling sleeves to gearbox spline couplings. Slide sleeves off couplings to disconnect torque tube (Fig. 401).
   B. Remove three mounting bolts attaching gearbox to landing gear beam and remove gearbox.
4. Install Flap Angle Gearbox
   A. Align gearbox with landing gear beam and install mounting bolts (Fig. 401). Secure each bolt with two washers and locknut.
   B. Lubricate spline couplings with grease, engage torque tube sleeves with spline couplings on gearbox and install retaining screws. Lockwire screw heads together.
   C. Remove restraint from flaps.
   D. Provide system A hydraulic power (Ref 27-51-0).
   E. Position flap control lever to exercise flaps and check operation of gearbox.
5. Restore Airplane to Normal Configuration
   A. Position flap control lever to FLAP UP detent.
   B. Remove system A hydraulic power (Ref 27-51-0).





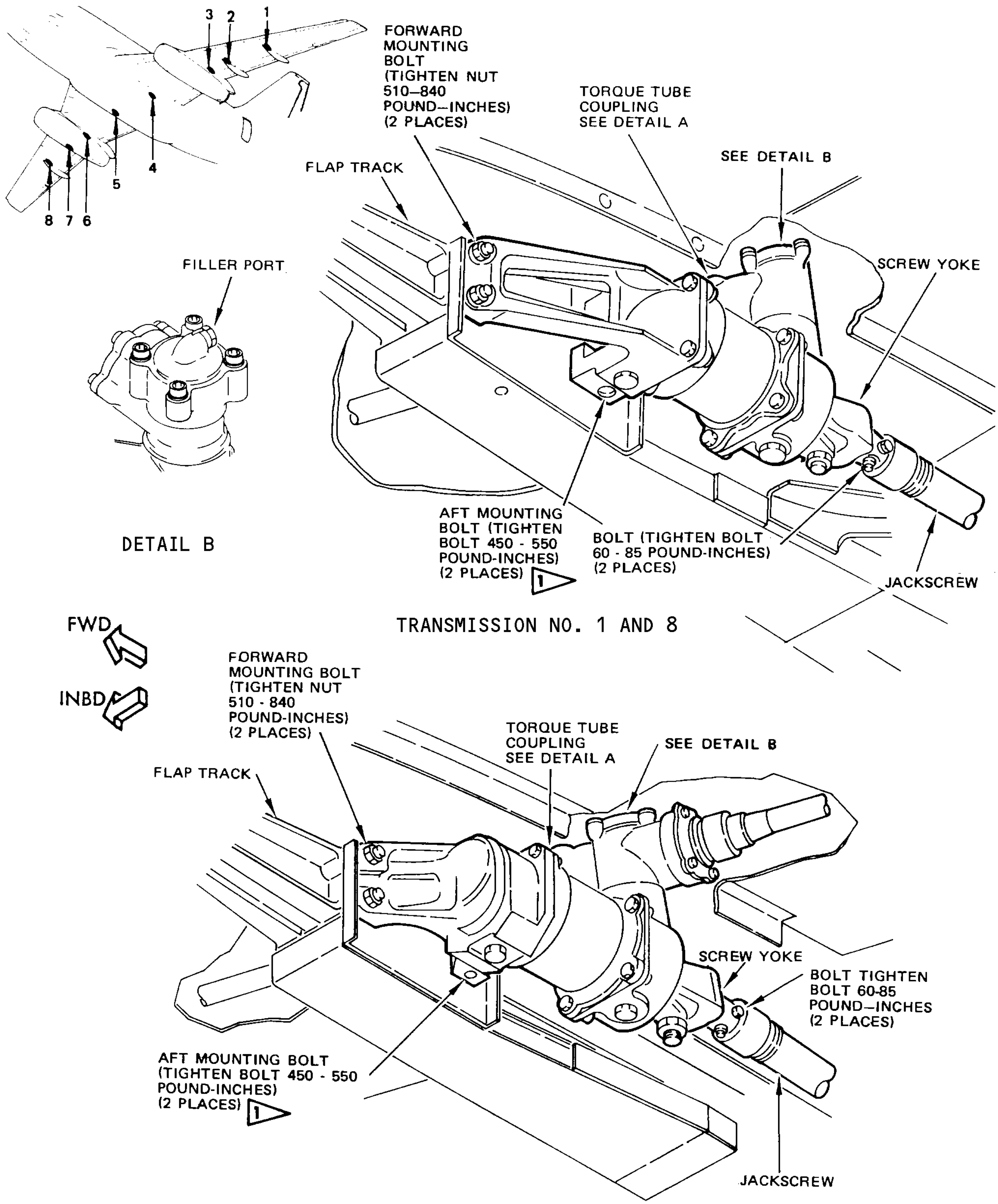
Flap Angle Gearbox Installation
Figure 401

FLAP TRANSMISSION - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Flap Drive Adapter - F70300-1 (preferred) or ST2583-1 (optional)
   B. Alemite Fitting - Z-737
   C. Lubricating Oil - general purpose (low temperature), MIL-L-7870
   D. Corrosion Preventive Compound - MIL-C-11796, Class 3
   E. Hydraulic Fluid - MIL-PRF-5056 (Supercedes MIL-H-5606)
   F. Grease - BMS 3-33 (Preferred)
   G. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   H. Sealant - BMS 5-95
2. Prepare Flap Transmission for Removal
   A. Provide system A hydraulic power (Ref 27-51-0 MP).
   B. Retract flaps. Remove system A hydraulic power (Ref 27-51-0 MP).
   C. Remove fairing to gain access to flap transmission.
      (1) For outboard flap transmission, remove forward fairing (Ref 27-51-121 R/I).
      (2) For inboard flap outboard transmission, remove engine-to-wing fairing tail cone, remove access panel from inboard side of fairing and access panel from aft of spring-loaded fairing door (Ref Chapter 54, Engine-to-Wing Fairing).
      (3) For inboard flap inboard transmission, remove fairing (Ref 27-51-141 R/I).
   D. With flaps in full up position, check angular clearance (X1) between upstop on jackscrew ball nut and upstop on screw yoke. If this value is between 170 to 190 degrees (1/2 turn ± 10 degrees) turn (1/4 to 5/6 turn if lateral trim correction has been made), record for use on installation.

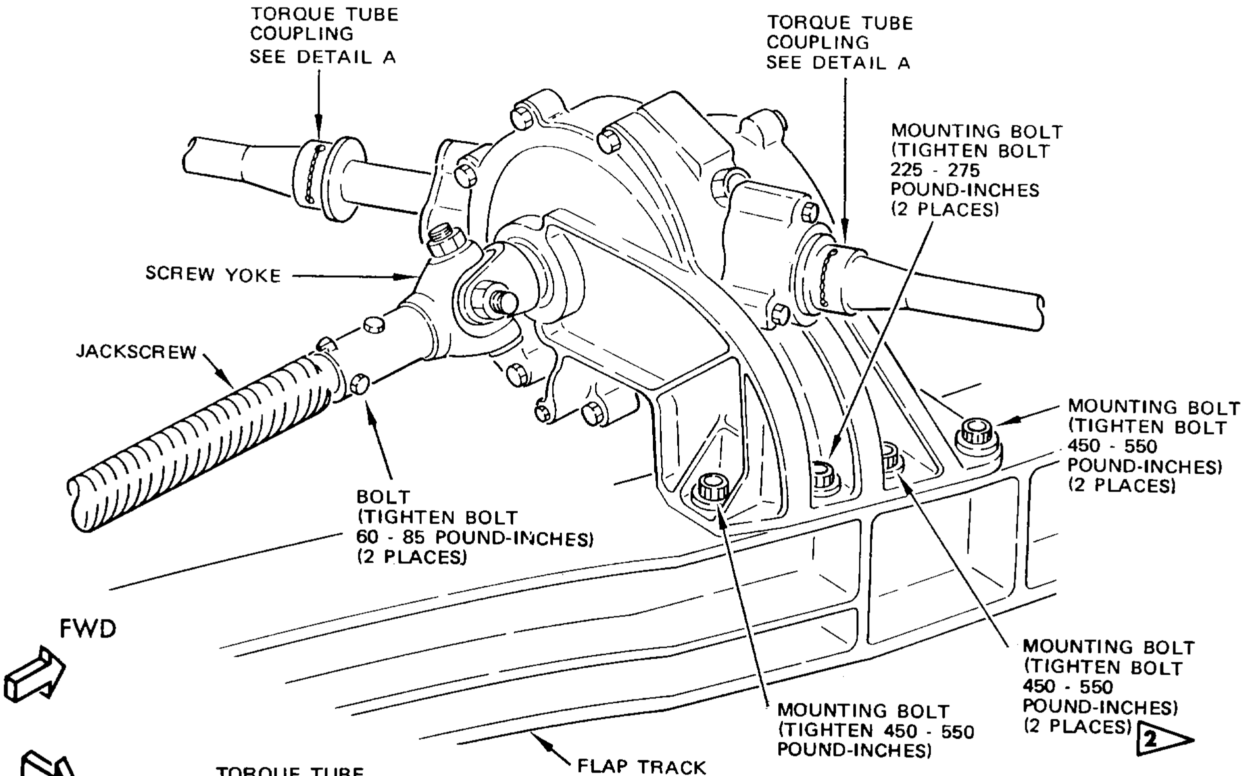
      CAUTION: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURNS. A VALUE FOR (X) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

   E. Provide system A hydraulic power (Ref 27-51-0 MP).
   F. Extend trailing edge flaps.
   G. Remove system A hydraulic power (Ref 27-51-0 MP).
   H. Restrain flaps to prevent motion when transmissions are disconnected.
3. Remove Flap Transmission
   A. Disconnect transmission jackscrew from gimbal by removing four bolts through gimbal and removing upper and lower bushings from ball nut trunnion (Fig. 402). At outboard flap transmissions, note location of shims to ensure proper replacement.
   B. Remove screws attaching torque tube coupling sleeves to splines to disconnect torque tubes (Fig. 401).



TRANSMISSION NO. 2 AND 7

Flap Transmission Installation
Figure 401 (Sheet 1)



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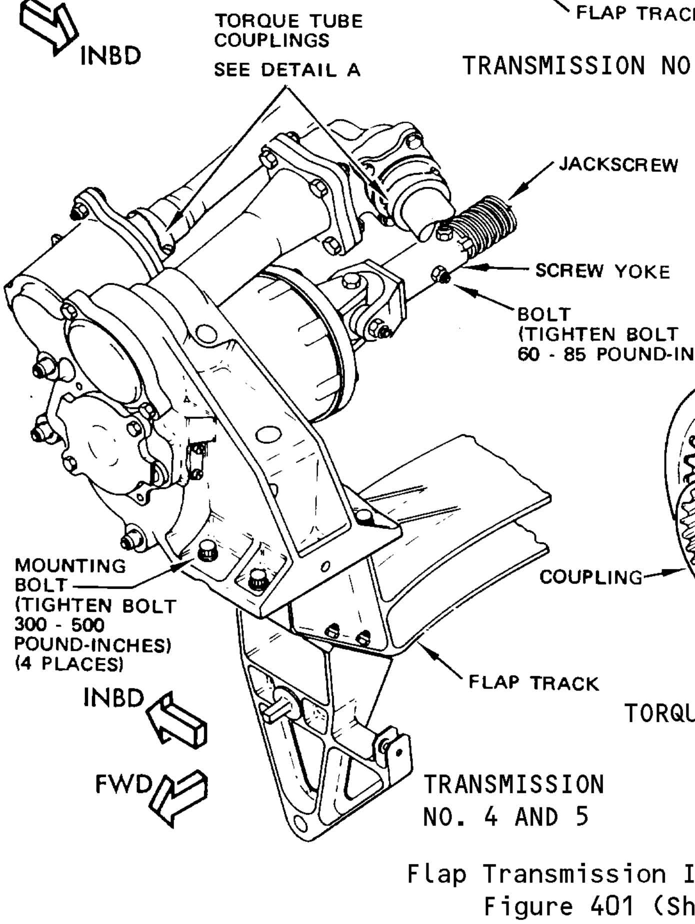
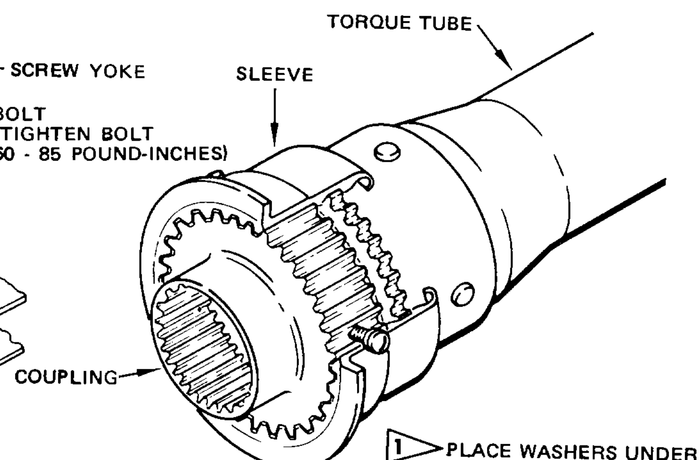


TRANSMISSION NO. 4 AND 5



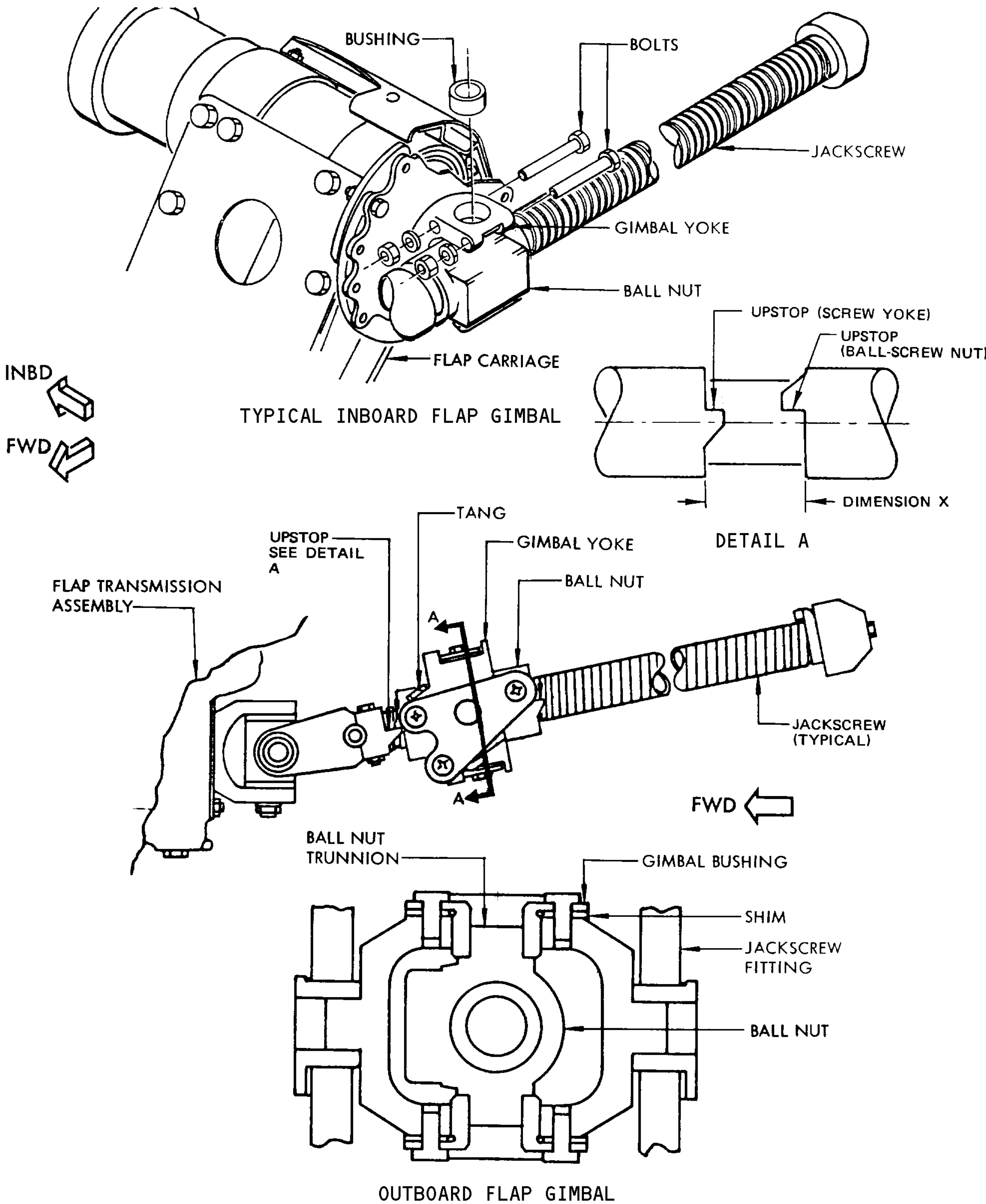
TORQUE TUBE COUPLING
DETAIL A

1 PLACE WASHERS UNDER HEAD OF BOLT SO THAT BOLT END PROTRUDES BEYOND BARREL NUT 0.08 TO 0.12 INCH AFTER TIGHTENING

2 NOT ON ALL AIRPLANES. PLUG OPEN HOLES WITH SEALANT

468809

Flap Transmission Installation
Figure 401 (Sheet 2)



Flap Jackscrew Installation
Figure 402

C. Remove bolts attaching transmission to flap track and remove transmission from airplane.

D. If required, disconnect ball nut and screw assembly from transmission by removing two bolts at universal joint yoke.

4. Prepare Flap Transmission for Installation

NOTE: Support flap when removing or installing bushings or shims to keep weight of flap off trunnion.

A. If ball nut and screw assembly is not installed on transmission gearbox, position screw in transmission universal joint. Coat both faying surfaces with BMS 5-95 sealant before assembly. Install bolts to connect screw to yoke and tighten bolts per Fig. 401. Apply sealant to the bolts, washers and nuts.

B. Position flap transmission in horizontal position and fill to level of filler port with hydraulic fluid. Rotate input drive by hand and add fluid as required. Continue until fluid level stabilizes and remains in filler port.

C. Rotate ball nut until upstop on ball nut contacts upstop on screw yoke. Check that a gap of 0.064 +0.035 inch exists between end of upstop on ball bearing nut and adjacent face of yoke (Fig. 401, 402 and 403).

5. Install Flap Transmission

A. Locate gearbox on flap track and install mounting bolts (Fig. 401).

(1) On inboard flap transmission assemblies, tighten bolts per Fig. 401.

(a) Apply the BMS 5-95 sealant to the heads of the bolts.

(2) On outboard flap transmission assemblies, apply MIL-C-11796 class 3 corrosion preventive compound to the bolts and to all areas of the hole. Tighten nuts and bolts per Fig. 401. If required, place washers under heads of aft mounting bolts to obtain bolt end protrusion per Fig. 401. Ensure that jackscrew is inserted in gimbal and that gimbal yoke is properly oriented with tang forward.

CAUTION: MAKE SURE THE ENDS OF THE BOLTS DO NOT TOUCH THE TRANSMISSION HOUSING. THE BOLTS CAN CAUSE DAMAGE TO THE TRANSMISSION.

NOTE: If transmission assembly does not clear bus cable pulleys because of heavier housing, clean and dress housing case 0.10 maximum to clear pulleys.

(a) Apply the BMS 5-95 sealant to the heads of the bolts.

B. Install alemite fitting on oil can and completely fill ball nut reservoir through lower fitting with lubricating oil. Simultaneously, depress upper fitting to vent pressure until lubricant flows out of upper fitting. When lubricant exits upper fitting, close fitting and continue to fill until lubricant exits from wiper seals or vent hole.

C. Rotate ball nut on jackscrew until trunnion on nut is aligned with gimbal (Fig. 402).

D. Position ball nut and screw in gimbal.
   (1) If installing inboard flap outboard transmission, position ball nut so that ball return tubes are on the outboard side of nut.
   (2) If installing inboard flap inboard transmission, position ball nut so that ball return tubes are on the inboard side of nut.

      NOTE: If installing outboard flap transmission, direction of ball return tubes is optional.

E. Install upper and lower bushings on ball nut trunnion. Coat outer surface of bushings with BMS 5-95 sealant before installation. If used bushings are being installed, check for allowable wear.
   (1) If installing outboard flap transmission, ensure that shims are installed in position noted during removal.

      NOTE: Support flap when removing or installing bushings or shims to keep weight of flap off trunnion.

F. Install four bolts to secure bushings in gimbal (AMM 27-51-73/401).
G. Temporarily install screws connecting torque tubes to transmission assembly (Fig. 401).
H. Remove restraint from flaps.
I. Provide system A hydraulic power (Ref 27-51-0).
J. Retract flaps.
K. Disconnect torque tubes from flap transmission.
L. Adjust transmission input shaft with flap drive adapter to obtain angular clearance obtained in step 2.D. above. Clearance must be 170 to 190 degrees (1/2 turn ±10 degrees) turn (1/4 to 5/6 turn if lateral trim correction has been made) between upstop on ball nut and upstop on screw yoke. Maintain contact of seal strip contacting nose of midflap.

   CAUTION: MAXIMUM ALLOWABLE ANGULAR CLEARANCE IS 1/4 TO 5/6 TURNS. A VALUE FOR (X) OUTSIDE THIS RANGE MAY CAUSE DAMAGE DURING FLAP OPERATION. PREVIOUS LATERAL TRIM CORRECTIONS SHOULD BE RETAINED.

M. Lubricate splines with grease and connect torque tubes to transmission. Install screws through sleeve and coupling. Lockwire heads of screws together.

   CAUTION: DO NOT APPLY END LOAD TO TRANSMISSION INPUT SHAFTS WHEN INSTALLING TORQUE TUBES.

N. Position flap control lever in 5-unit detent.

O. Coat nonworking groove portions of jackscrew with lubricating oil. These areas consist of first three turns of flap screw from upstop and first four turns from downstop.

P. Immediately exercise flaps through full travel to clean off excess lubricating oil with ball screw wipers.

Q. Check that flap transmission operates smoothly without binding.

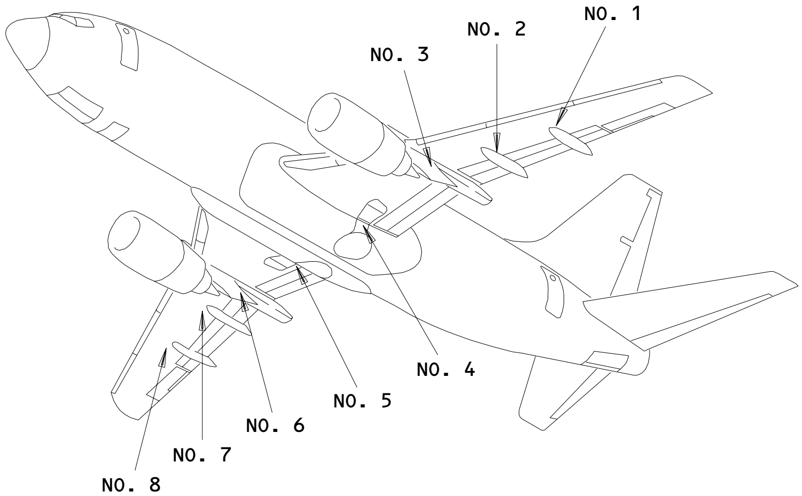
6. Restore Airplane to Normal

A. Extend flaps.

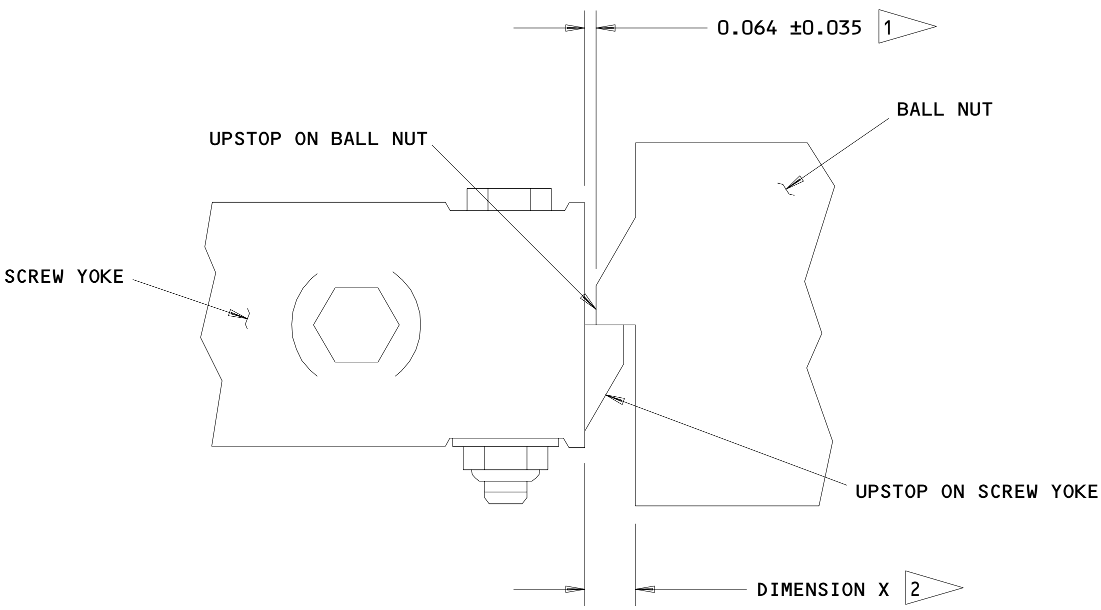
B. Install flap track fairing (Ref 27-51-121, Outboard Flap Track Fairings, 27-51-141, Inboard Flap Track Fairings, or Chapter 54, Engine-to-Wing Fairing).

C. Retract flaps.

D. Remove system A hydraulic power (Ref 27-51-0).



TRANSMISSION LOCATIONS



DEFINITION OF DIMENSION X

1 THIS DIMENSION IS BETWEEN THE FACE OF THE SCREW YOKE AND THE FORWARD END OF THE UPSTOP ON THE BALL NUT. THIS DIMENSION IS SEEN ONLY WHEN:
1. THE SCREW IS CORRECTLY ATTACHED TO THE SCREW YOKE
2. THE UPSTOPS ON THE BALL NUT AND SCREW YOKE ARE IN CONTACT

2 THIS DIMENSION IS BETWEEN THE FACE OF THE SCREW YOKE AND THE FACE OF THE BALL NUT, WITH THE BALL NUT AT ANY LOCATION ON THE SCREW

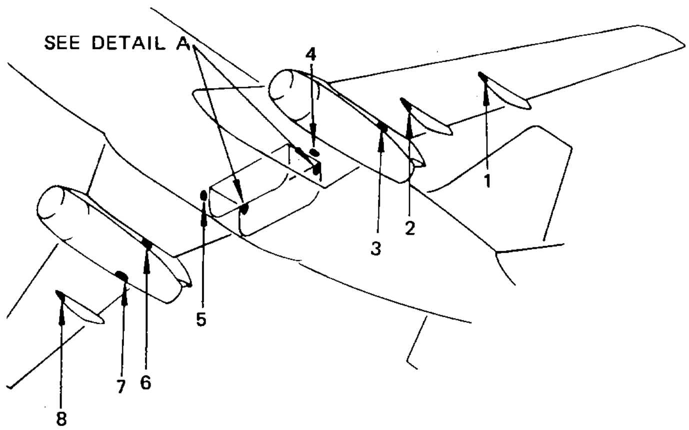
Transmission Location and Definition of Dimension X
Figure 403

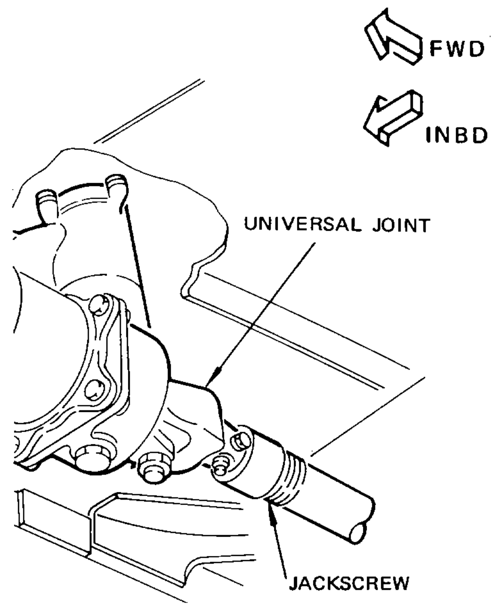
FLAP TRANSMISSION - INSPECTION/CHECK

1. Minimum Torque Brake Lockout - Check
   A. General
      (1) The following procedure provides instructions to aid in locating a transmission gearbox with a below minimum torque brake setting. While an exact check of the torque brakes can only be accomplished during overhaul, this airplane-check method will prevent the unnecessary removal of transmission gearboxes with acceptable torque brakes.
   B. Equipment and Materials
      (1) Universal Joint Torque Wrench Adapter
         (a) On transmissions with basic part numbers 65-5025X-X
            1) F80122-11, Transmissions 1, 2, 7 and 8
            2) F80122-13, Transmissions 3, 4, 5 and 6
         (b) On transmissions with basic part numbers 65-5030X-X or 65-5032X-X
            1) F80122-14, Transmissions 3, 4, 5 and 6
            2) F80122-15, Transmissions 1, 2, 7 and 8
      (2) Right Angle Gearbox Torque Wrench Spline Adapter - F80122-12
      (3) Torque Wrench - (250 to 800 lb-in. range)
      (4) Corrosion Preventive Compound - MIL-C-11796, Class 3
      (5) Grease - BMS 3-33 (Preferred)
      (6) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Prepare for Check
      (1) Disassemble universal joint on gearbox to be tested by removing bolt at universal joint (Fig. 601).

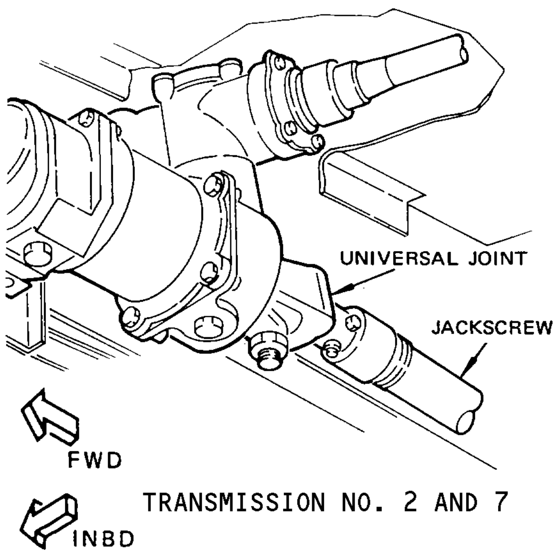
         NOTE: Examine output shaft at bearing/seal location for signs of corrosion. If present, bearing/seal should be replaced before continuing check.

         (a) Install universal joint torque wrench adapter in universal.
         (b) Connect torque wrench (250 to 800 pound-inch range) to adapter and block it against structure to prevent rotation.
      (2) Disconnect torque tube from inboard side of right angle gearbox on same side of airplane as gearbox to be tested.
         (a) Remove screws attaching torque tube coupling sleeves to gearbox spline couplings.
         (b) Slide sleeves off couplings to disconnect torque tubes.
   D. Check minimum lockout torque.
      (1) Attach right angle gearbox torque wrench adapter to the input coupling of the right angle gearbox.

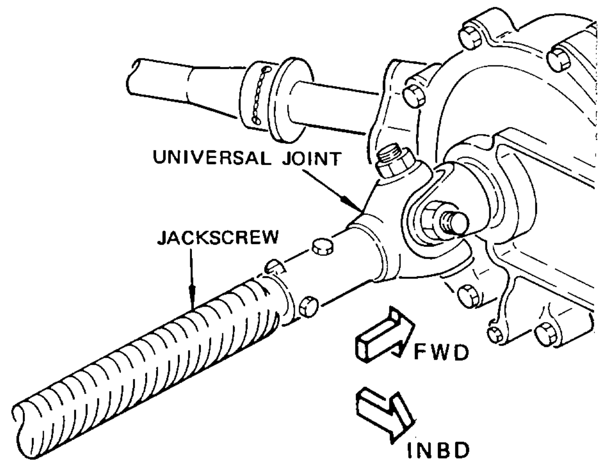




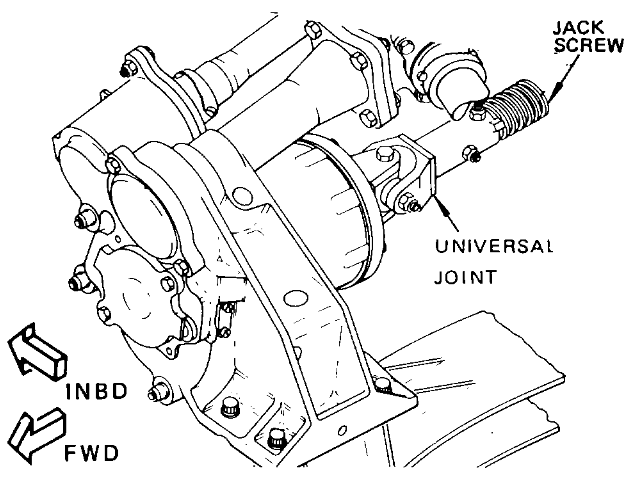
TRANSMISSION NO. 1 AND 8



TRANSMISSION NO. 2 AND 7

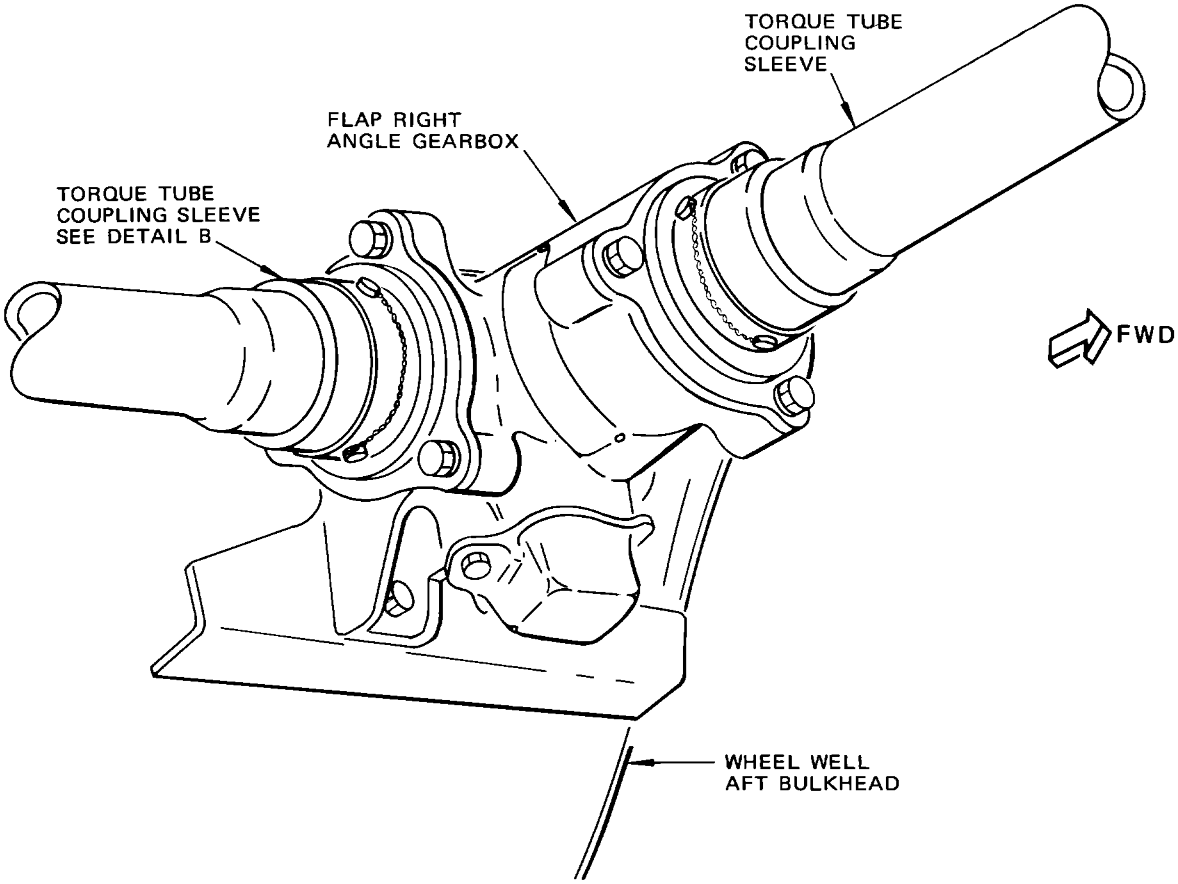


TRANSMISSION NO. 3 AND 6

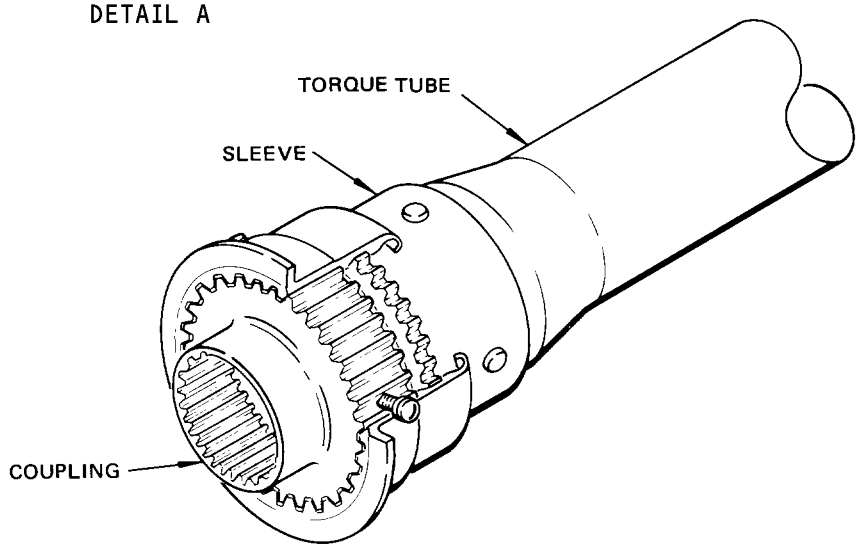


TRANSMISSION NO. 4 AND 5

Flap Transmission Installation
Figure 601 (Sheet 1)



FLAP RIGHT ANGLE GEARBOX
DETAIL A



TORQUE TUBE COUPLING SLEEVE
DETAIL B

Flap Transmission Installation
Figure 601 (Sheet 2)

(2) Attach torque wrench to adapter and apply a gradually increasing torque to the coupling until 180 pound-inches is reached.

NOTE: This may require up to 3/4 of a turn of the input coupling.

(3) Note torque reading on torque wrench attached to universal joint when 180 pound-inches is reached on torque wrench attached to right angle gearbox. This torque reading is the minimum lockout torque and must be equal to or greater than the values in Fig. 602.

NOTE: Torque brake check should be made in same direction as flaps were moving when lockout was reported.

(4) Repeat steps C and D for all transmissions to be checked.

E. Restore airplane to normal.

(1) Remove torque wrenches and adapters.

(2) Position jackscrew yoke in transmission universal joint. Instal1 bolt with corrosion preventive compound and tighten nut to 270-300 pound-inches.

(3) Lubricate splined couplings with grease, engage torque tube sleeves with spline couplings on right angle gearbox and installing retaining screws. Lockwire heads together.

2. Wear Limits

A. General

(1) This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component - Removal/Installation for this information.

B. Flap Transmission Wear Limits (Fig. 603)

TRANSMISSION GEARBOX	MINIMUM LOCKOUT TORQUE - LB -IN. 2		DIRECTION TO APPLY TORQUE TO RIGHT ANGLE GEARBOX 1			
			FLAPS EXTEND		FLAPS RETRACT	
	3	4	LEFT WING	RIGHT WING	LEFT WING	RIGHT WING
NO. 1 & NO. 8	582	690	CLOCKWISE	COUNTER-CLOCKWISE	COUNTER-CLOCKWISE	CLOCKWISE
NO. 2 & NO. 7	630	796	CLOCKWISE	COUNTER-CLOCKWISE	COUNTER-CLOCKWISE	CLOCKWISE
NO. 3 & NO. 6	324	392	CLOCKWISE	COUNTER-CLOCKWISE	COUNTER-CLOCKWISE	CLOCKWISE
NO. 4 & NO. 5	330	415	CLOCKWISE	COUNTER-CLOCKWISE	COUNTER-CLOCKWISE	CLOCKWISE

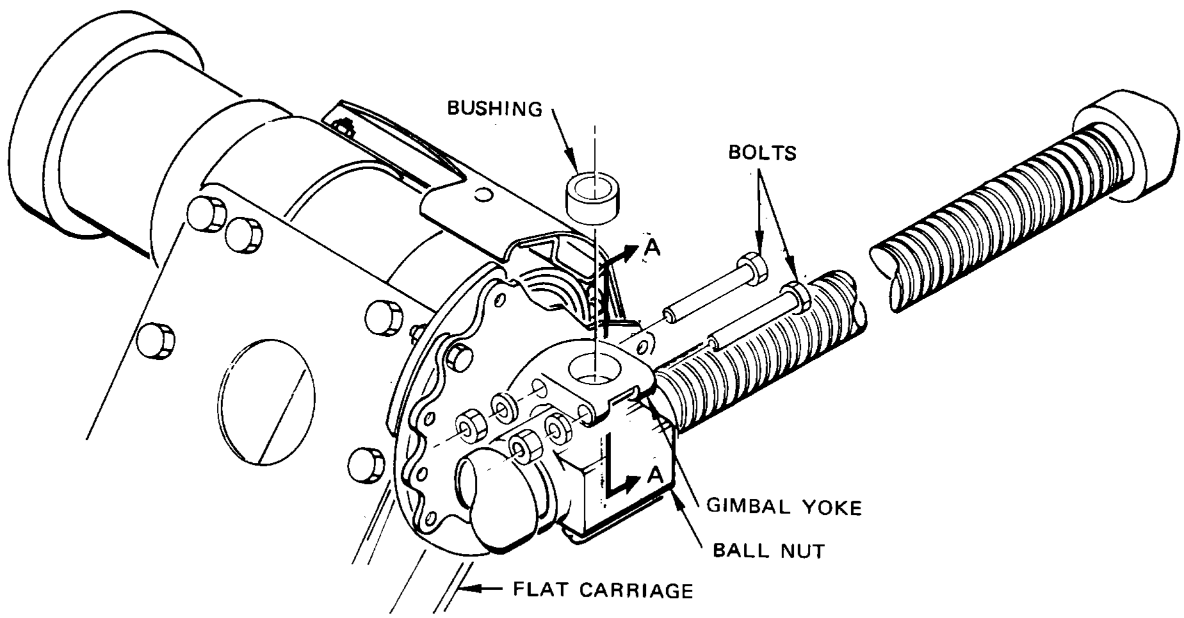
1 LOOKING OUTBOARD AT RIGHT ANGLE GEARBOX INPUT SHAFT.

2 THESE VALUES ARE SLIGHTLY LOWER THAN THE VALUES LISTED FOR THE OVERHAUL FUCTIONAL TEST WHEN USING THE FUNCTIONAL TEST RIG. THIS DIFFERENCE IS NECESSARY TO ACCOUNT FOR THE DIFFERENT METHOD OF TESTING.

3 TRANSMISSIONS WITH BASIC PART NUMBERS 65-5025X-X OR 65-5032X-X

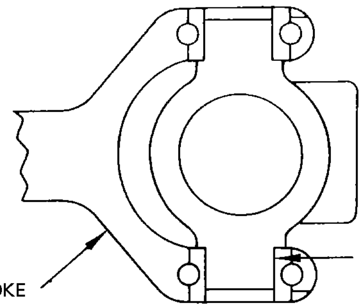
4 TRANSMISSIONS WITH BASIC PART NUMBERS 65-5030X-X

Torque Brake Minimum Lockout Torques
Figure 602



TYPICAL INBOARD FLAP GIMBAL

Flap Transmission Wear Limits
Figure 603 (Sheet 1)



SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.7490	0.7500	0.7570	0.0094	1		
	BALL NUT	OD	0.7476	0.7481	0.7476			X	2

1 REPPLACE BUSHING WHEN ID INCREASES BEYOND 0.7570 MEASURED ACROSS ANY DIAMETER.
2 VENDOR ITEM - REFER TO OVERHAUL MANUAL.

Flap Transmission Wear Limits
Figure 603 (Sheet 2)

FLAP LIMIT SWITCHES - REMOVAL/INSTALLATION

1. General
   A. Five switches are installed on the flap control unit. The flaps up switch and the flaps down switch are mounted on the forward portion of the unit housing (Fig. 401). The remaining three switches are covered as follows: (Ref 31-26-23, Flap Takeoff Warning Switch; 31-26-12, Flap Landing Warning Switch; 22-21-31, Mach Trim Flap Switch).
   B. On some airplanes a sixth switch is installed (Ref 27-88-21, Flaps 10-Degree Switch).

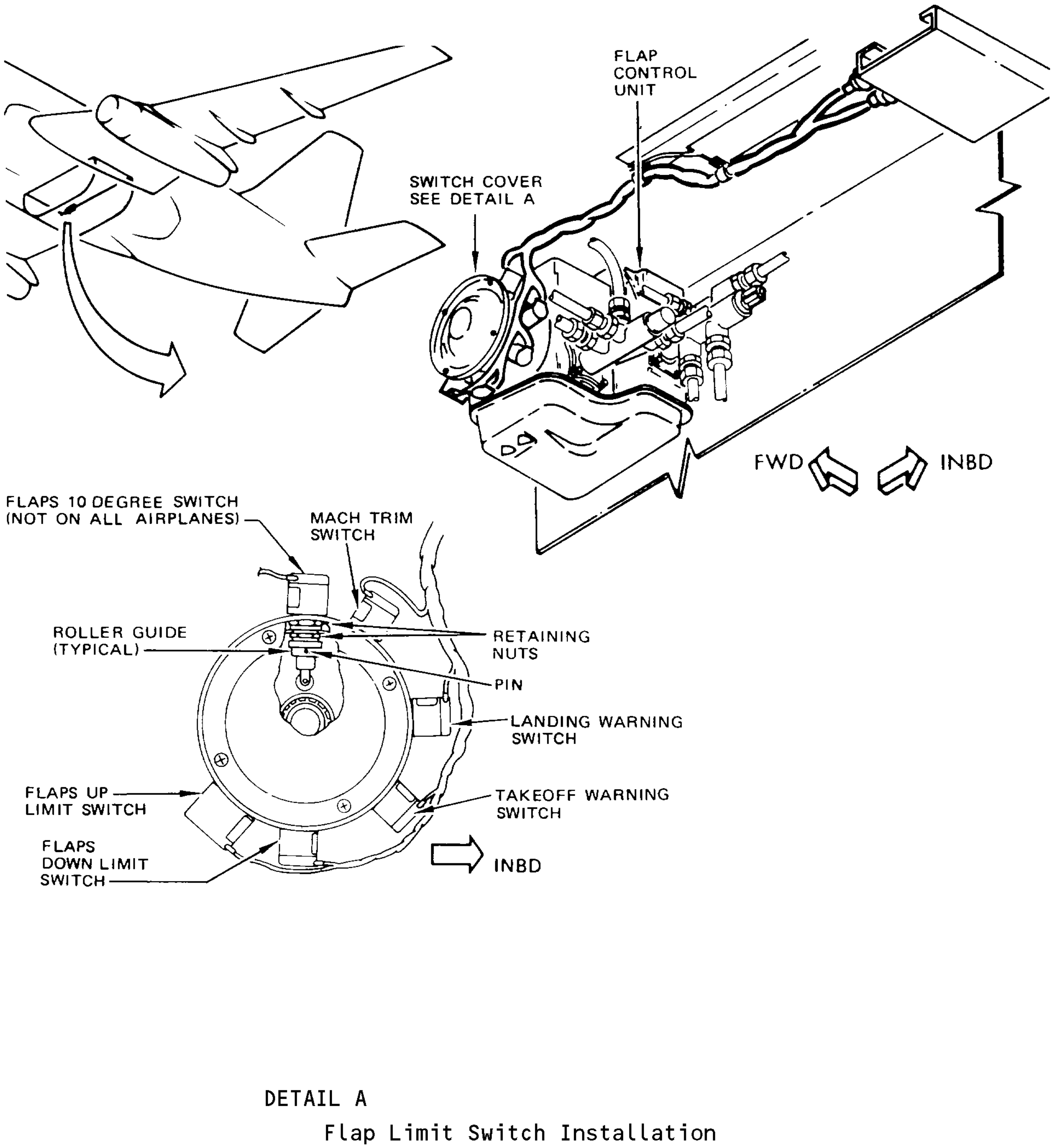
      NOTE: The switch leads for all but the Flaps 10-degree switch make a single wire bundle, and must be separated during switch removal and retied when a new switch is installed.

2. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827)
3. Remove Flap Limit Switch
   A. Remove number 4 and 5 inboard flap track fairings (Ref 27-51-141 R/I).

      NOTE: Fairing removal is required for access to measure ball screw nut location for switch adjustment.

   B. Remove switch cover from flap control unit (Fig. 401).
   C. Separate wire bundle connector from receptacle.
   D. Remove two wire bundle support clamps.
   E. Cut wire bundle ties and separate limit switch leads from remainder of bundle.
   F. Remove limit switch leads from connector.
   G. Extract pin to release roller guide.
   H. Remove retaining nut from limit switch and remove switch from control unit.
   I. Replace nut, roller guide, and pin on switch.
4. Install Flap Limit Switch
   A. Remove pin, roller guide, and one retaining nut from switch (Fig. 401).
   B. Position switch in flap control unit and install retaining nut and roller guide. Install pin to secure roller guide.
   C. Install switch leads in connector and connect to receptacle.
   D. Replace wire bundle ties.
   E. Install two wire bundle support clamps.
   F. Adjust limit switch (Ref Flap Limit Switches - Adjustment/Test).
   G. Ensure that switch retaining nuts are lockwired.
   H. Coat surface of gasket with light film of grease and install switch cover on flap control unit.
   I. Test flap takeoff warning switch (Ref 31-26-23, Flap Takeoff Warning Switch).

J. Test flap landing warning switch (Ref 31-26-12, Flap Landing Warning Switch).
K. Test Mach trim switch (Ref 22-21-31, Mach Trim Flap Switch).
L. On airplanes with flaps 10 degree switch, test switch (Ref 27-88-21, Flaps 10 Degree Switch).



DETAIL A

Flap Limit Switch Installation
Figure 401

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FLAP LIMIT SWITCHES - ADJUSTMENT/TEST

1. Flap Limit Switches Adjustment
   A. Prepare Flap Limit Switches for Adjustment
      (1) Connect electrical power to airplane.
      (2) Provide System A hydraulic power (Ref 27-51-0 MP).
      (3) Position flap control lever in 30-Unit detent to extend flaps, then to FLAP UP detent to retract flaps.
      (4) After flaps are fully retracted, wait 2 minutes then remove system A hydraulic power.
      (5) On circuit breaker panel P6-2:
         (a) Close TE ALT FLAP DRIVE MOTOR circuit breaker.
         (b) Close FLAP VALVES circuit breaker.
      (6) Remove inboard flap track fairings (Ref 27-51-141 R/I).
   B. Adjust Flap Limit Switches
      (1) Position flap control lever to FLAP DOWN detent.
         (a) Position alternate flap switch at ARM.
      (2) With flaps up measure dimension X (Fig. 501) at 4 and 5 jackscrews. Record value and label X1.
      (3) Actuate alternate flap drive switch to DOWN. Hold switch in this position until number 4 ball screw nut is an additional 29.95 to 30.11 inches from its up stop.

         CAUTION: LEADING EDGE CONTROL SURFACES WILL EXTEND.

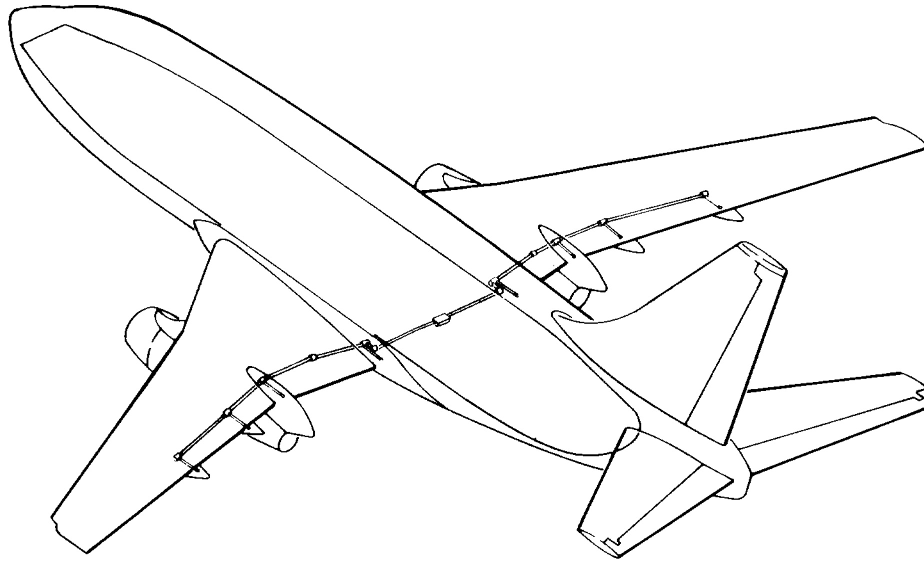
      (4) Remove switch cover from flap control unit (Fig. 502).
      (5) Adjust FLAP DOWN limit switch away from its actuating cam until switch actuates.

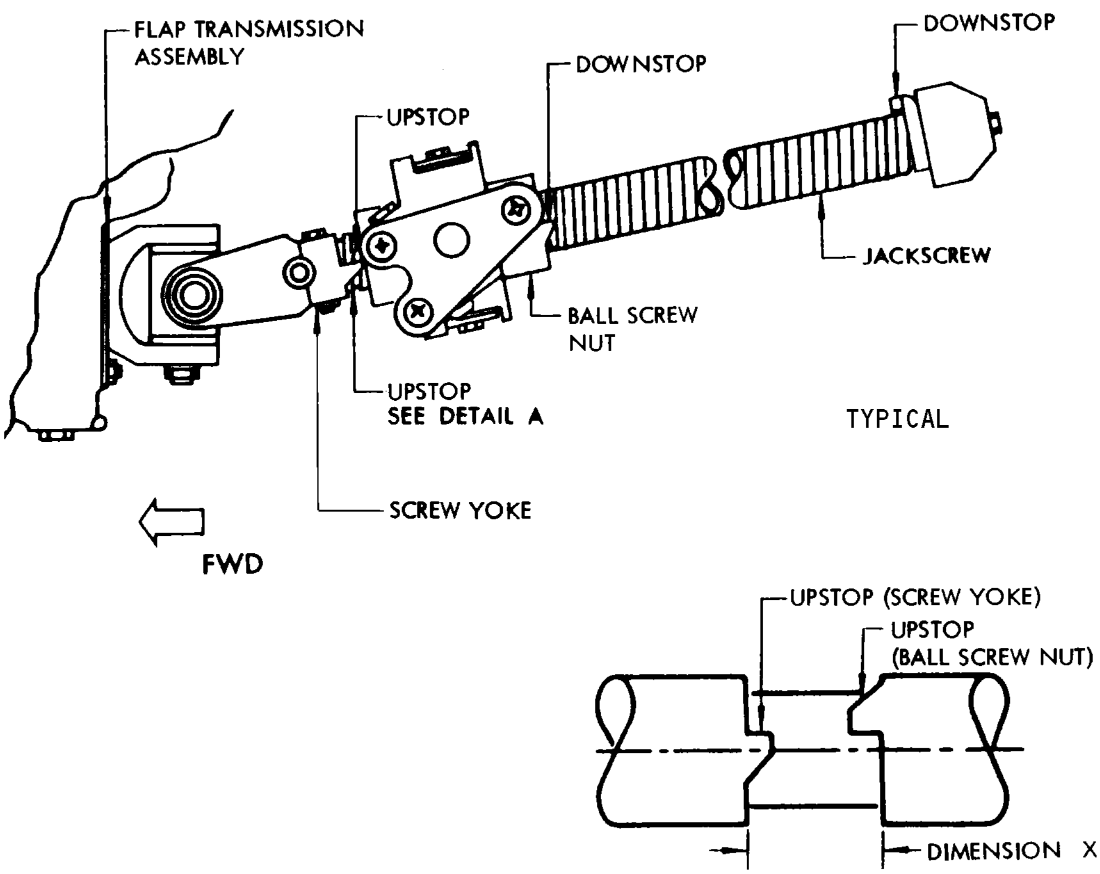
         NOTE: Care must be taken to pre-position switch so that actuation takes place with switch body being moved away from cam.

      (6) Lockwire switch retaining nuts.
      (7) Hold the ALTERNATE FLAPS position switch in the UP position to retract the trailing edge flaps. Retract the flaps until dimension X (Detail A, Fig. 501) is 0.87 to 1.03 inch. (This is approximately equal to 1-3/4 to 2-1/4 turns between the upstop on the screw yoke and the upstop on the ball nut.) Approach this position from a flaps down position.
      (8) Adjust FLAP UP limit switch away from actuating cam until switch actuates.

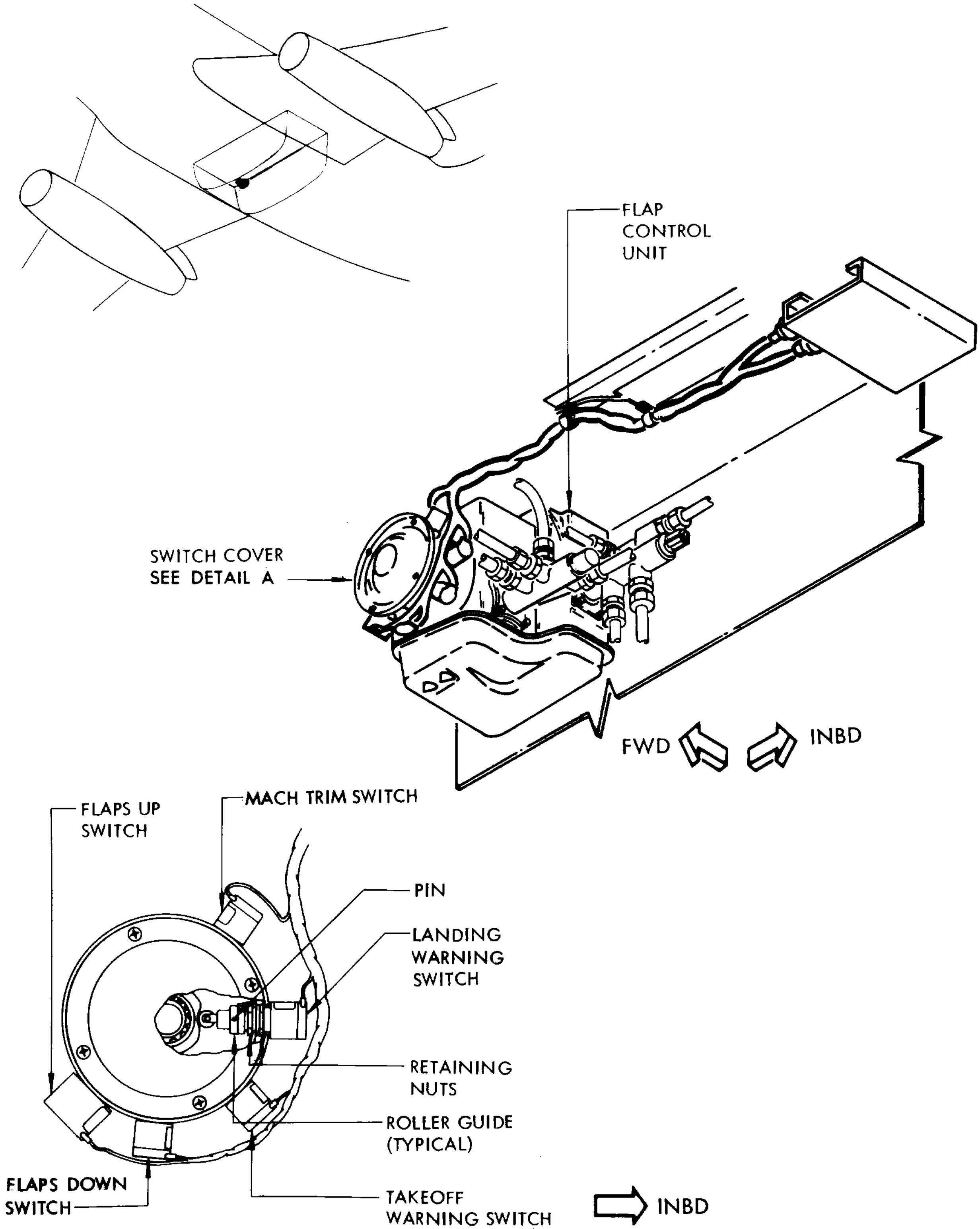
         NOTE: Care must be taken to pre-position switch so that actuation takes place with switch body being moved away from cam.

      (9) Lockwire switch retaining nuts.





Flap Jackscrew Stops
Figure 501



Flap Limit Switch Adjustment
Figure 502

(10) Test flap limit switch per par. 2.
(11) Test mach trim switch after adjustment of flaps up limit switch (Ref 22-21-31, Mach Trim Flap Switch).
(12) Test autopilot after adjustment of flaps up limit switch (Ref 22-11-81 A/T, and 22-11-131 A/T).

C. Restore Airplane to Normal Configuration
(1) Replace switch cover on flap control unit.
(2) Position alternate flap switch to OFF.
(3) Position flap control lever to FLAP UP detent.
(4) Pressurize hydraulic system A to retract leading edge devices (Ref 27-51-0 MP).
(5) Depressurize hydraulic system A (Ref 27-51-0 MP).
(6) Determine whether there is any further need for electrical power, if not, disconnect power.

2. Flap Limit Switches Test

A. Prepare Flap Limit Switches for Test
(1) Connect electrical power to airplane.
(2) Position flap control lever to FLAP DOWN detent.

NOTE: Flap control lever is moved to FLAP DOWN position as a standard procedure to minimize load on flap hydraulic motor when hydraulic system A is pressurized.

B. Test Flap Limit Switches
(1) Position alternate flap switch at ARM.
(2) Actuate alternate flap drive switch to DOWN. Hold switch in this position until FLAP DOWN limit switch actuates.

CAUTION: LEADING EDGE DEVICES WILL EXTEND.

(3) At number 4 and 5 jackscrews, check that dimension between the stop on the ball nut and the upstop on the jackscrew less X1 dimension previously recorded is between 29.65 and 30.18 inches (Fig. 501).
(4) Actuate alternate flap switch to UP. Hold switch in this position until FLAPS UP limit switch actuates.
(5) Check that dimension X (Detail A, Fig. 501) is 0.87 to 1.03 inch. (This is approximately equal to 1-3/4 to 2-1/4 turns between the upstop on the screw yoke and the upstop on the ball nut.) Approach this position from a flaps down position.

C. Restore Airplane to Normal Configuration
(1) Position alternate flap switch to OFF.
(2) Position flap control lever to FLAP UP detent.
(3) Install Inboard Flap Track Fairings (Ref 27-51-141 R/I).
(4) Pressurize hydraulic system A to retract leading edge devices (Ref 27-51-0).
(5) Depressurize hydraulic system A (Ref 27-51-0 MP).

(6) Determine whether there is any further need for electrical power, if not, disconnect power.

FLAP LOAD LIMITER AIRSPEED SWITCHES - REMOVAL/INSTALLATION

1. General
   A. Two flap load limiter airspeed switches are located in the lower compartment just below the flight compartment floor on the right-hand side forward of the station line common to the forward bulkhead of the nose wheel well. One switch is connected to auxiliary pitot static system No. 1 and one switch is connected to auxiliary pitot static system No. 2. The airspeed switches are preadjusted and require no further adjustment at time of installation. Either switch may be removed and installed by the following procedure.
2. Remove Flap Load Limiter Airspeed Switch
   A. Open the FLAP LOAD LIMITER circuit breaker on the P6 panel.
   B. Disconnect the pitot and static lines from airspeed switch.
   C. Disconnect electrical connector from airspeed switch.
   D. Remove mounting bolts from switch and remove switch.
3. Install Flap Load Limiter Airspeed Switch
   A. Position airspeed switch in mounting bracket and install mounting bolts.
   B. Connect electrical connector to switch.
   C. Connect pitot and static lines to airspeed switch.
   D. Close FLAP LOAD LIMITER circuit breaker on P6 panel.
   E. Test switch (Ref Load Limiter Airspeed Switches - Adjustment/Test).

FLAP LOAD LIMITER AIRSPEED SWITCHES - ADJUSTMENT/TEST

1. General
   A. The flap load limiter switches are located in the lower compartment just below the flight floor on the right hand side forward of the Station line common to the forward bulkhead of the nose wheel well. They do not require adjustment at installation. A test of switch actuation should be performed at installation to ensure system operation.
2. Flap Load Limiter Airspeed Switches Test
   A. Equipment and Materials
      (1) A vacuum source and barometer or equivalent, capable of measuring a differential pressure of up to 1.5 inches of mercury to an accuracy of ± 0.005 inch of mercury.
   B. Prepare to test airspeed switches.

      CAUTION: TO PREVENT DAMAGE TO EQUIPMENT AND INSTRUMENTS, CHECK THE FOLLOWING PRECAUTIONS BEFORE APPLYING PRESSURES TO THE PITOT STATIC SYSTEM.

      (1) Ensure that pitot static probe heaters remain off during testing.
      (2) Apply pitot line pressure with a suitable connection to the auxiliary pitot tubes.

         CAUTION: THE PITOT PRESSURE SHALL ALWAYS EQUAL OR EXCEED STATIC LINE PRESSURE AND THE DIFFERENCE (DIFFERENTIAL PRESSURE) SHALL NOT EXCEED 10.00 INCHES OF MERCURY.

      (3) Apply static absolute pressure to the auxiliary static system by connecting the vacuum source to the drain fittings located in the electronics bay or to the pitot static probe ports.

         CAUTION: INSTRUMENTS WILL BE DAMAGED IF STATIC PRESSURE EXCEEDS PITOT PRESSURE EVEN MOMENTARILY. STATIC PRESSURE SHALL NOT EXCEED 8000 FEET ABOVE ACTUAL AIRPORT ALTITUDE AND APPLICATION OR RELEASE OF VACUUM SHALL BE MADE AT A RATE OF CLIMB OR DESCENT OF APPROXIMATELY 3000 FEET PER MINUTE OR LESS.

      (4) Seal all unused auxiliary system static ports in such a way that removal of seal will be complete leaving no deposits or roughness in or about the static ports.
   C. Airplanes without SB 27-1123;
      Test the airspeed switches.
      (1) Remove the electrical connectors from the airspeed switches.

(2) Make sure there is continuity between pins C and D of the two airspeed switches.
(3) Pressurize the pitot static system until the differential pressure is between 1.166 inches Hg (155 knots) and 1.259 inches Hg (161 knots) to operate the airspeed switches.
   (a) Make sure there is continuity between pins D and E of the two airspeed switches.
   (b) Make sure there is no continuity between pins C and D.
(4) Decrease the pressure differential in the pitot static system until the differential pressure is between 1.076 inches Hg (149 knots) and 1.166 inches Hg (155 knots) to operate the airspeed switches.
   (a) Make sure there is continuity between pins C and D of the two airspeed switches.
(5) Connect the electrical connectors to the airspeed switches.

D. Airplanes with SB 27-1123;
Test the airspeed switches.
(1) Actuate and hold flap load limiter test switch on equipment bay light panel in electronics compartment to SWITCH TEST position. Check that green LOAD LIMITER TEST LIGHT comes on.

NOTE: Apply pitot pressure to one system at a time.

(2) Pressurize pitot static system until differential pressure is between 1.121 inches Hg (152 knots) and 1.274 inches Hg (162 knots). Check that green LOAD LIMITER TEST LIGHT goes off.
(3) Decrease differential pressure until pressure is between 1.046 inches Hg (147 knots) and 1.197 inches Hg (157 knots). Check that green LOAD LIMITER TEST LIGHT comes on. Release test switch.
(4) Test remaining airspeed switch per steps (1) thru (3).

E. Return airplane to normal.
(1) Depressurize pitot static system.
(2) Remove static port covers, checking that ports are free of foreign matter.

FLAP 40-UNIT SWITCHES - REMOVAL/INSTALLATION

1. General
   A. The flap 40-unit switches are installed within the control stand and are operated by a cam on the drum of the flap handle assembly. Access to the switches is gained by removing the right stabilizer trim wheel and door from the control stand (Fig. 401).
2. Prepare to Remove Switches
   A. Open FLAP LOAD LIMITER circuit breaker on circuit breaker panel P6.
   B. Remove retaining nut from center hub of right stabilizer trim wheel and remove wheel from control stand.

      NOTE: Do not remove splined shaft.

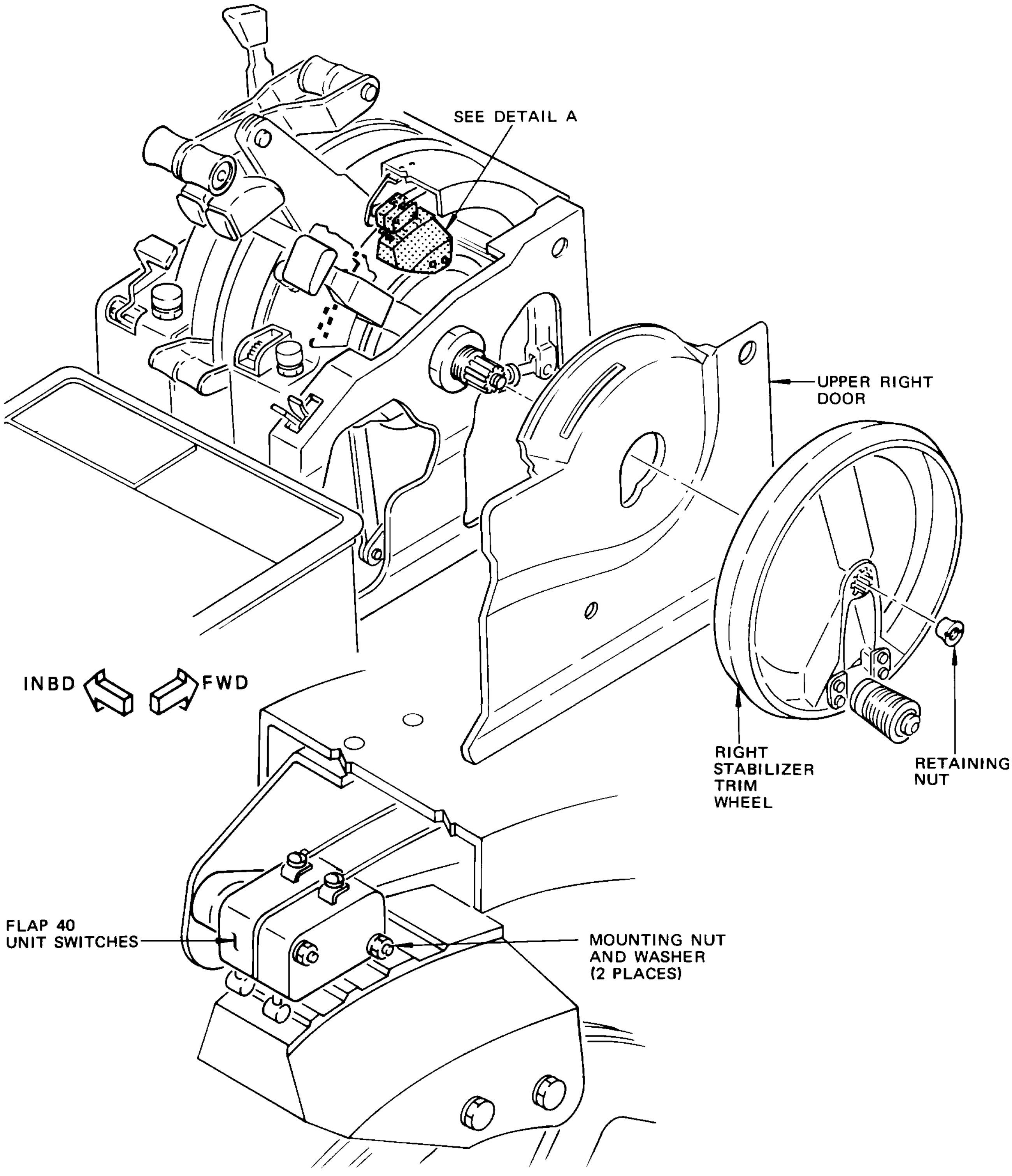
   C. Remove mounting screws from right door.
   D. Rotate door upwards to gain access to wires attached to lightplate and disconnect wires. Remove door.

      NOTE: Replace nuts and washers on lightplate studs.

3. Remove Flap 40-Unit Switches
   A. Remove mounting nuts and washers from switches.
   B. Pull switches from mounting screws and remove wires.
4. Install Flap 40-Unit Switches
   A. Connect wires to switches.
   B. Install switches on mounting screws.

      NOTE: Check that actuator is installed on switches.

   C. Install washers and nuts on mounting screws.
   D. Adjust and test switches. Refer to Flap 40-Unit Switches - Adjustment/Test.
5. Restore Airplane to Normal
   A. Install wires on lightplate studs.
   B. Install door on control stand with mounting screws.
   C. Position stabilizer trim wheel on shaft with handle 90 (±15) degrees from left trim wheel handle and install retaining nut.
   D. Close FLAP LOAD LIMITER circuit breaker on circuit breaker panel P6.



FLAP 40 UNIT SWITCHES
DETAIL A

Flap 40 Unit Switches Installation
Figure 401

FLAP 40-UNIT SWITCHES - ADJUSTMENT/TEST

1. Flap 40-Unit Switches Adjustment
   A. Equipment and Materials
      (1) Ohmmeter
   B. Prepare to adjust flap 40-unit switches (Fig. 501).
      (1) Remove retaining nut from center hub of right stabilizer trim wheel and remove wheel from control stand.

         NOTE: Do not remove splined shaft.

      (2) Remove mounting screws from right door.
      (3) Rotate door upwards to gain access to wires attached to lightplate and disconnect wires. Remove door.

         NOTE: Replace nuts and washers on lightplate studs.

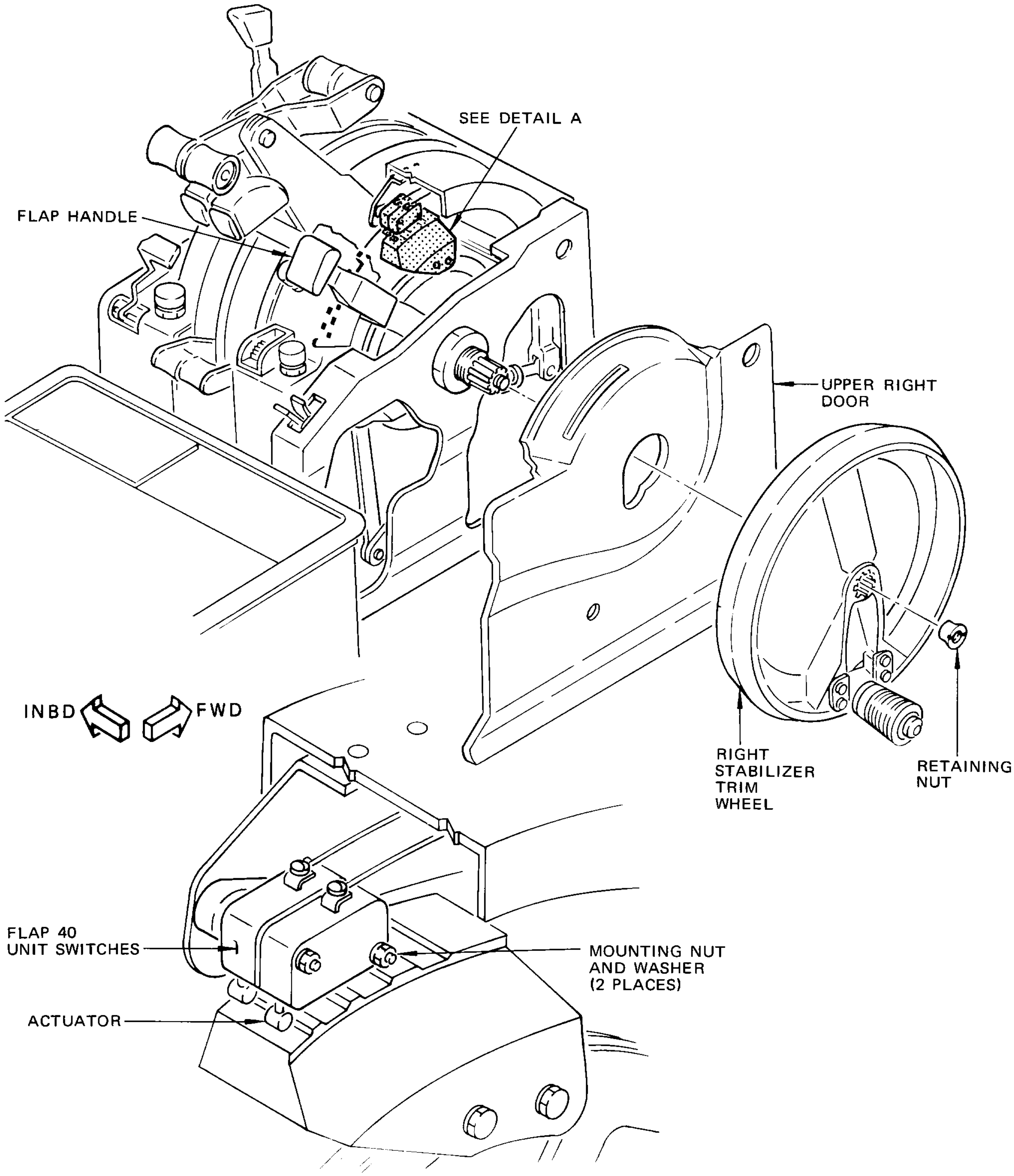
   C. Adjust flap 40-unit switches.
      (1) Position flap control lever to 30-unit detent, and check that switch is not actuated.
      (2) Position flap control lever 5 ±2 degrees aft of the 30-unit detent and check that switch is actuated.

         NOTE: Switch actuation can be ascertained by clicking sound or by checking continuity across switch terminals C and NO with an ohmmeter.

   D. If switch is not actuated, remove lockwire on cam, loosen bolts and adjust cam for actuation on aft surface of cam. Tighten bolts and lockwire.
   E. Replace access door on control stand.
   F. Position flap control lever to FLAPS UP detent.
   G. Perform test of switch operation per paragraph 2.
2. Flap 40-Unit Switches Test
   A. Prepare to test flap 40-unit switches.
      (1) Close FLAP LOAD LIMITER circuit breaker on circuit breaker panel P6.
      (2) Pressurize hydraulic system A.
      (3) Position flap control lever to 40-unit detent.

         NOTE: If airplane is on jacks, compress right-hand main gear strut approximately 5 inches to the ground position.

   B. Test flap 40-unit switches.
      (1) Actuate flap load limiter test switch on the equipment bay light panel in the electronics compartment to the SYSTEM TEST position. Observe that flaps retract to 30-unit position.



FLAP 40 UNIT SWITCHES
DETAIL A

Flap 40 Unit Switches Adjustment
Figure 501

(2) Release test switch and check that flaps extend to 40-unit position.
(3) Place flap control lever in 30-unit position and check that flaps retract to 30-unit position.
(4) Actuate flap load limiter test switch to SWITCH TEST position and observe that test lamp lights; and that light extinguishes upon release of switch.

C. Return airplane to normal.
(1) Raise flaps by positioning flap control lever to FLAPS UP detent.
(2) Turn off hydraulic system A power.
(3) Open FLAP LOAD LIMITER circuit breaker on circuit breaker panel P6.

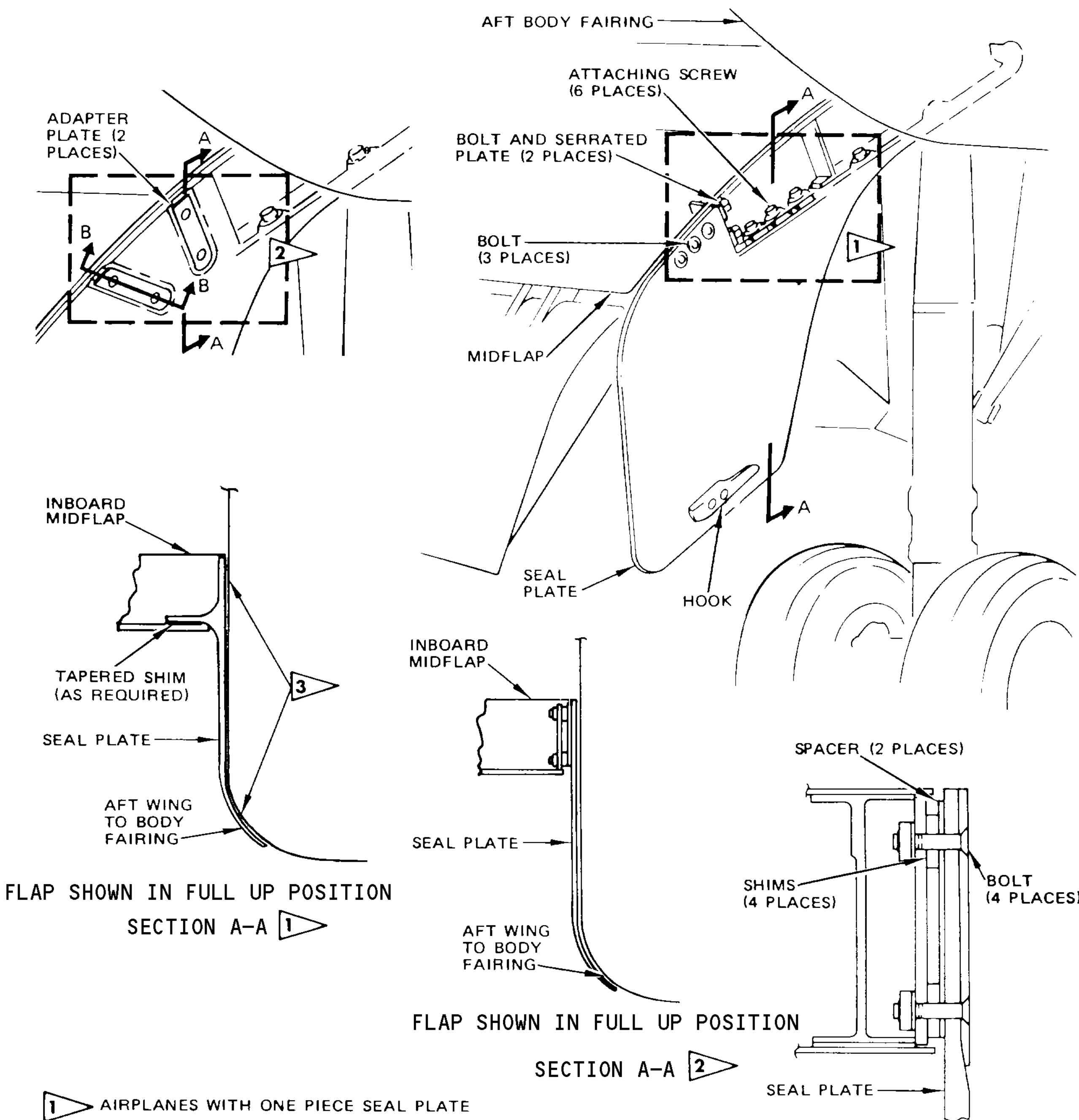
INBOARD MIDFLAP SEAL PLATE - REMOVAL/INSTALLATION

1. General
   A. The following procedure applies to both the left and right inboard midflap seal plates.
2. Equipment and Materials
   A. Primer - BMS 10-11, Type I (Ref 20-30-41)
   B. Sealant - BMS 5-79, Class C (Ref 20-30-11)
3. Remove Seal Plate (Fig. 401)
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Extend flaps to full down position.
   C. Remove system A hydraulic power (Ref 27-51-0).
   D. Remove seal plate mounting bolts and screw, and remove plate from midflap.

      NOTE: Retain all filler plates and shims for reinstallation of seal plate.

4. Install Seal Plate (Fig 401)
   A. Position seal plate on midflap and install all bolts and screws. Install fillers and shims removed with old seal plate. Apply primer to bare shims and install shims and fillers with faying surface sealant.
   B. Position seal plate at approximate center of slotted holes and tighten bolts and screws.
   C. Provide system A hydraulic power (Ref 27-51-0).
   D. Raise flaps to the full up position.
   E. Adjust gap between seal plate and wing to body fairing.
      (1) Check that gap at leading edge is 0.06 + 0.19/-0.06 inch. Average of readings taken at 6-8-inch intervals including maximum gap must not exceed 0.09 inch.
      (2) Check that gap at trailing edge is 0.06 + 0.19/-0.06 inch. Average of readings taken at 6-8-inch intervals including maximum gap must not exceed 0.15 inch.
      (3) If adjustment is required, adjust by increasing or decreasing thickness of shims or repositioning in slots as shown in Fig. 401.
      (4) If average readings cannot be obtained or seal plate deformation occurs during retraction due to contact at lower edge, adjust seal plate vertically to obtain gap less than stated in above steps.
   F. With flaps in full up position, check that lower curved end fits to give maximum contact with minimum pressure to fairing. If adjustment is required, adjust by increasing or decreasing thickness of shim as shown in Fig. 401. On airplanes with one piece seal plate, additional adjustment can be obtained by changing taper of tapered shim.

G. Extend flaps and check that at least 0.03 -inch clearance between seal plate and body fairing is maintained during flap transit. Check that seal plate does not bind against flap track fairing. Readjust if necessary by increasing or decreasing thickness of shim. On airplanes with one piece seal plate, additional adjustment can be obtained by changing taper of tapered shim.
H. On airplanes with two piece seal plate, check that forward segment of seal plate fairs with main seal plate within 0.00 to 0.03 inches and that forward segment clears body fairing 0.03 inch throughout ful1 cycle of flaps. If not, readjust as necessary. Apply primer to bare shims and install with faying surface sealant.
I. Raise flap to full up position and check that hook is fully engaged with flap track fairing.
J. Remove system A hydraulic power (Ref 27-51-0).



1 AIRPLANES WITH ONE PIECE SEAL PLATE

2 AIRPLANES WITH TWO PIECE SEAL PLATE

3 ADJUST INBD & UP TO GIVE MAXIMUM CONTACT WITH MINIMUM PRESSURE TO FAIRING

ADJUSTMENT 1

A. USE SHIMS (.12 NOMINAL) (VERTICAL)
B. USE TAPERED SHIMS (SPANWISE)
C. USE SLOTS IN SEAL PLATE (INBOARD–OUTBOARD)

ADJUSTMENT 2

A. USE SHIMS (SPANWISE AND INBOARD–OUTBOARD)
B. USE SLOTS IN ADAPTER PLATE (VERTICAL)

Inboard Midflap Seal Plate Installation
Figure 401

AFT FLAP ACTUATING MECHANISM BOOM CABLES - REMOVAL/INSTALLATION

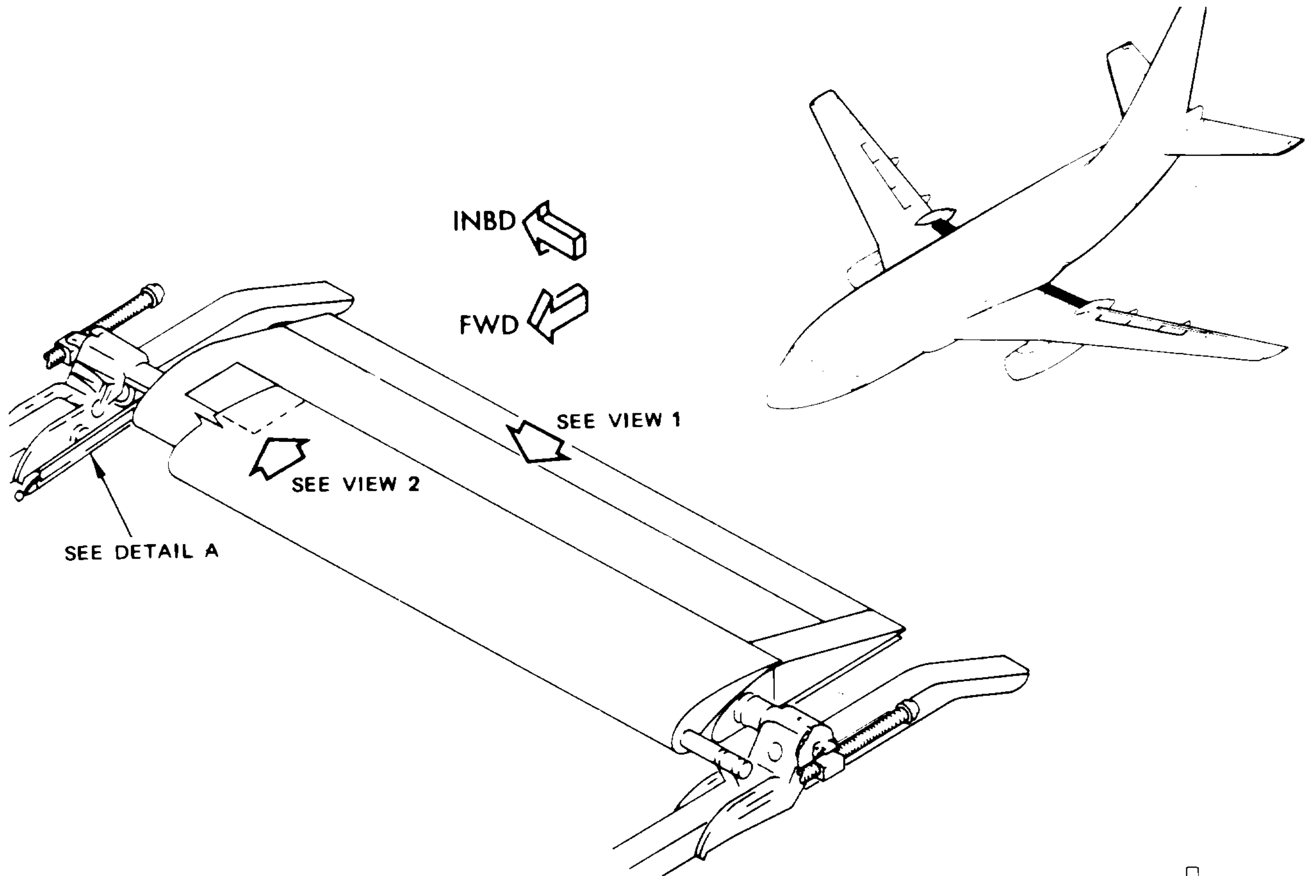
1. Equipment and Materials
   A. Rigging Pins - F-5 and F-6, 0.248 +0.000/-0.002-inch diameter, 3.7 ±0.25 inches long (MS20392-3)

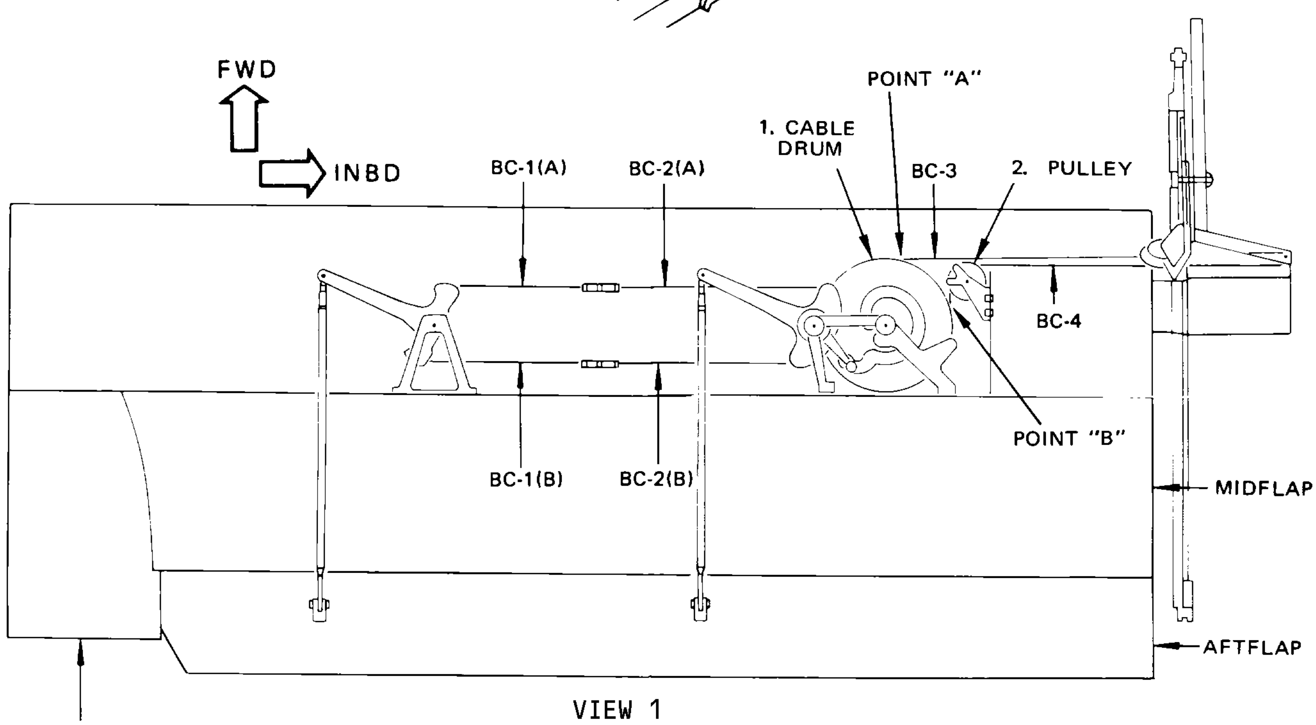
      NOTE: Rigging pins are a part of kit F70207-3, -52, -61, or -84.

2. Remove Aft Flap Actuating Mechanism Boom Cables (Fig.401)
   A. Remove inboard flap track fairing (Ref 27-51-141 R/I).
   B. Remove access panels L8476-8477/8576-8577R on underside of inboard midflap.
   C. Provide system A hydraulic power (Ref 27-51-0 MP).
   D. Position flap control lever to fully extend flaps.
   E. Remove system A hydraulic power (Ref 27-51-0 MP).
   F. Loosen cable adjusting nuts (7) and (10) (Detail A, Fig. 401) and disconnect cable ends from socket of end fittings.
   G. Remove cable guard (4).
   H. Remove screw holding cables BC-3 and BC-4 to cable drum (1).
   I. Remove cables BC-3 and BC-4.
3. Install Aft Flap Actuating Mechanism Boom Cables (Fig. 401)
   A. Feed cables from boom area into aft flap drive mechanism. With aft flap fully extended, attach cable BC-3 to mechanism with approximately 1/3 turn on drum. Cable must be in middle cable groove.
   B. Maintaining tension on cable BC-3, feed cable onto drum while slowly turning cable drum until aft flap is fully retracted. Install a cable clamp on cable BC-3 to block cable and prevent movement when aft flap is released.
   C. Check that cable BC-3 is wrapped approximately 1-1/3 turns on drum and is in middle and lower cable grooves.

      NOTE: The lower groove is closest to bottom of flap.

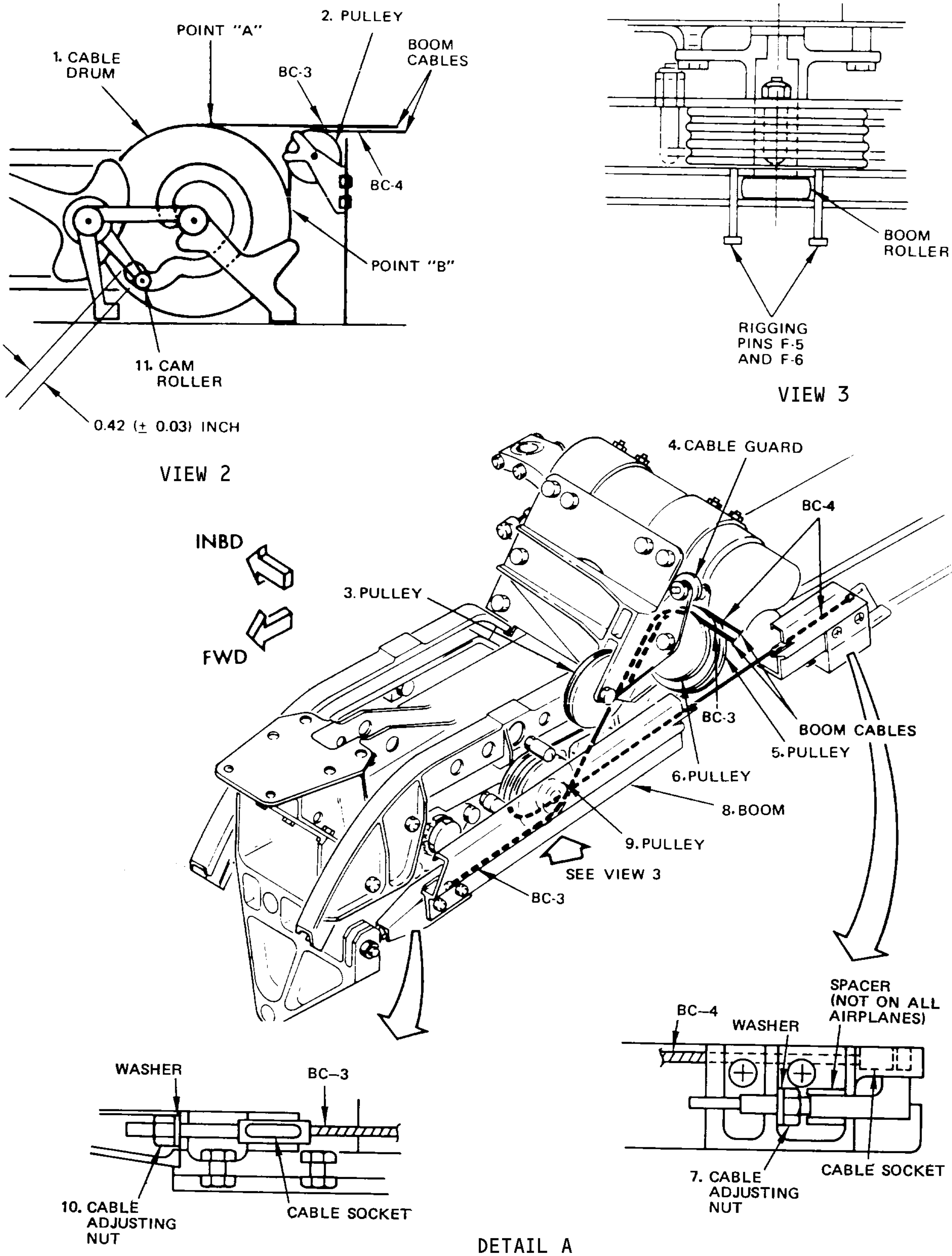
   D. Position and attach cable BC-4 to the drum.
      (1) Cable should have approximately 1/2 turn on cable drum and should be in middle groove.
   E. Install screw, washer and nut to lock ends of cables BC-3 and BC-4 in place on cable drum (1).
   F. Place cable BC-4 in groove of pulley (2) and pull cable end through cutout in flap rib.
   G. Thread cable BC-4 over pulley (5) under pulley (3) and around pulley (9) and hang a one or two pound weight on end of cable.
   H. Pull end of cable BC-3 through cutout in flap rib.
   I. Thread cable BC-3 over pulley (6) and under pulley (9) to forward end of boom (8).





VIEW 1

Aft Flap Actuating Mechanism Boom Cable Installation
Figure 401 (Sheet 1)



Aft Flap Actuating Mechanism Boom Cable Installation
Figure 401 (Sheet 2)

J. Place end fitting of cable BC-3 in socket of boom end fitting.
K. Remove cable clamp from BC-3 while manually holding tension on BC-3 and BC-4.
L. Manually operate aft flap from retract to full extend by pulling on BC-3 and holding tension on BC-4 while watching cables in drum grooves to see that they do not bind due to being crossed.
M. With aft flap full down BC-3 should be in center groove at point A and BC-4 should be in upper groove at point B (View 1 and 2).
N. Manually operate aft flap to full up while watching cables in drum grooves. With aft flap full up BC-3 should be in lower groove at point A and BC-4 should be in the center groove at point B.
O. Manually extend aft flap.
P. Place end fitting of cable BC-4 in socket of boom at end fitting at aft end of boom (8).
Q. Tighten cable adjusting nut (7) to take up slack in cable BC-4.
R. Tighten cable adjusting nut (10) to take up slack in cable.
S. Provide system A hydraulic power (Ref 27-51-0).
T. Retract trailing edge flaps.
U. Remove system A hydraulic power (Ref 27-51-0).
V. Install rigging pins F-5 and F6 through inboard side of boom so that boom roller is trapped between pins (View 3, Fig. 401).
W. Tighten cable adjusting nuts (7) and (10) to position cam roller 0.42 ±0.03 inch from forward of cam slot in cable drum (1) (View 2, Fig. 401).
   (1) If difficulty in obtaining 0.42-inch dimension is experienced, a rigging block of 0.25-inch thick plastic (or equivalent) shaped to curvature of cam slot and cut to required position dimension can be made.
   (2) Position rigging block in cam slot with cam roller against block, tape block to cam drum.
X. Tighten adjusting nuts as necessary to obtain cable tension of 100 ±10 pounds while maintaining 0.42-inch dimension obtained in step S.

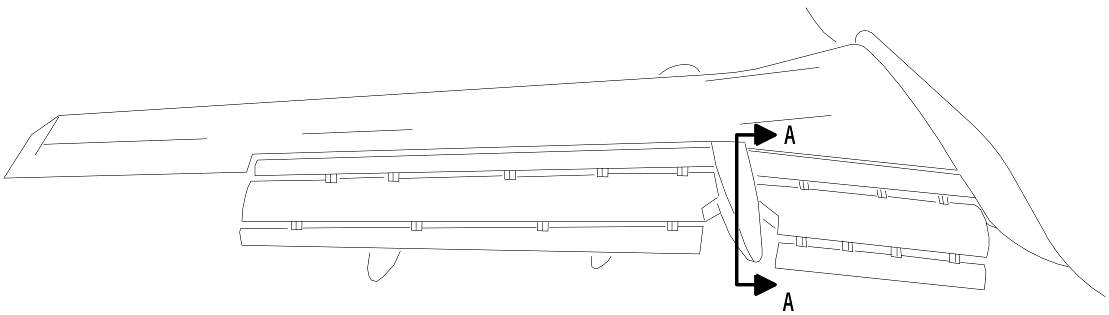
   NOTE: Cables should be adjusted to 100-pound tension at temperature of approximately 70°F. As temperature decreases, tension should be decreased and as temperature increases, tension should be increased. However, the 10-pound tolerance should not be exceeded. When adjusting tension of cables, place tensiometer on cable between rigging pins and aft cable adjusting point. Deflect cable away from boom to install tensiometer then release while making tension adjustments.

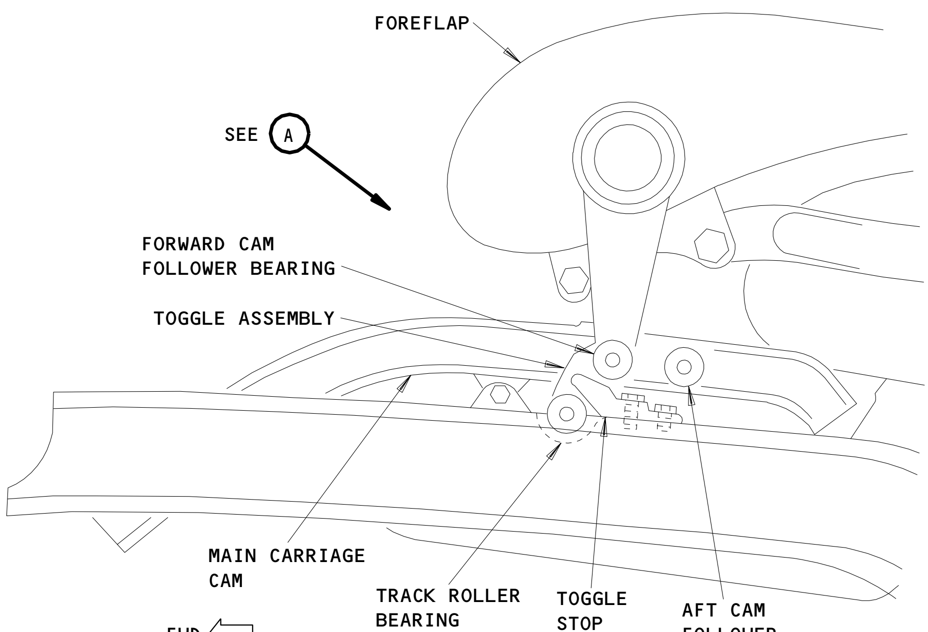
Y. Install cable guard (4).
Z. Remove rigging pins F-5 and F-6 from boom.
AA. Provide system A hydraulic power (Ref 27-51-0).
AB. Extend and retract flaps. Check for proper operation of aft flap drive mechanism.

AC. Remove system A hydraulic power (Ref 27-51-0).
AD. Install access panels L8476-8477/8576-8577R.
AE. Install inboard flap track fairing (Ref 27-51-141).

INBOARD FLAP TOGGLE ASSEMBLY - REMOVAL/INSTALLATION

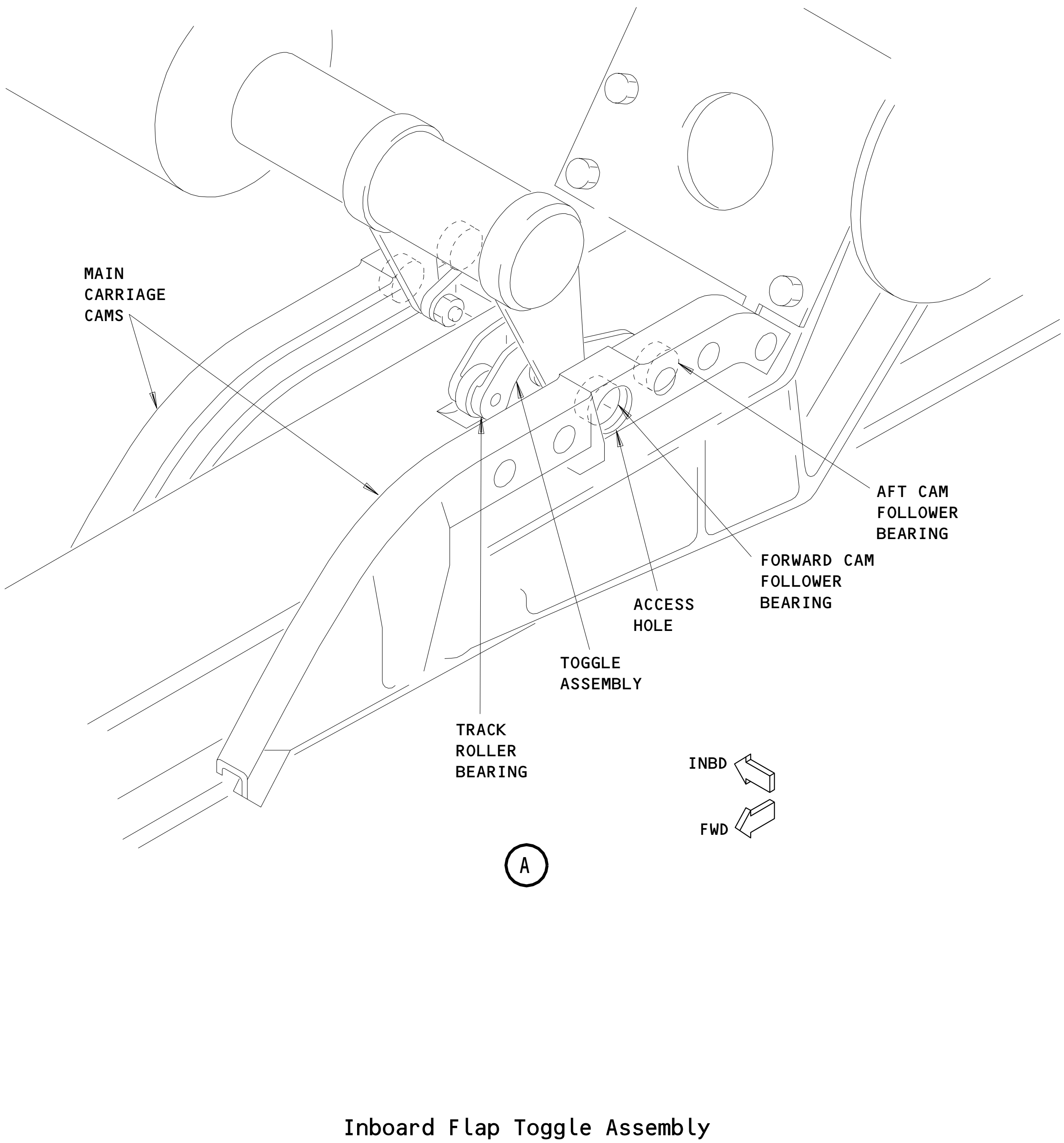
1. General
   A. The inboard flap toggle assemblies may be removed without removing the foreflap from the airplane.
   B. Removal of the inboard flap toggle assemblies is accomplished by removing the forward and aft cam follower bearings.
   C. Access holes in the main carriage cams, on top of the midflap carriage, are provided to allow removal of the cam follower bearings.
   D. Replace one toggle assembly at a time when both toggle assemblies of a flap are to be replaced.
2. Equipment and Materials
   A. Grease - BMS 3-33 (AMM 20-30-21/201)
3. Remove Inboard Flap Toggle Assembly (Fig. 401)
   A. Remove inboard flap track fairing (AMM 27-51-141/401.
   B. Provide system A hydraulic power (AMM 27-51-00/201).
   C. Position flap control lever to 15-unit detent.
   D. Remove system A hydraulic power (AMM 27-51-0/201).
   E. Check alignment of the forward cam follower bearings with access holes in sides of main carriage cams. If forward cam follower bearings and access holes are not aligned, proceed as follows:
      (1) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
         (a) ALT T.E. FLAP DRIVE-A.C.
         (b) FLAPS
      (2) Position the alternate flaps master switch to ARM.
      (3) Actuate the alternate flaps position switch to UP or DOWN as necessary to align forward cam follower bearings with access holes in the main carriage cams.
      (4) Depressurize hydraulic system A (AMM 27-51-00/201).
   F. Remove toggle assembly.
      (1) Remove the two forward cam follower bearings of the toggle assembly.
      (2) Roll the toggle assembly forward to align the aft cam follower bearings with the access holes in the main carriage cam.
      (3) Remove the two aft cam follower bearings of the toggle assembly.
      (4) Remove the toggle assembly from the main carriage.
4. Install Inboard Toggle Assembly (Fig. 401)
   A. If existing bushings and/or bearings are to be reused, check allowable wear (AMM 27-51-41/601).
   B. Position toggle assembly so that aft cam follower bearings can be installed.
      (1) Coat threads and shank of cam follower bearings with grease prior to installation.
      (2) Install bushings on shanks of the cam follower bearings.
      (3) Position cam follower bearings with bushings in installed position.





A-A

Inboard Flap Toggle Assembly
Figure 401 (Sheet 1)



Inboard Flap Toggle Assembly
Figure 401 (Sheet 2)

(4) Secure cam follower bearings to toggle assembly with washers and nuts. Tighten nuts to 95-110 pound-inches.
(5) Install cotter pins.

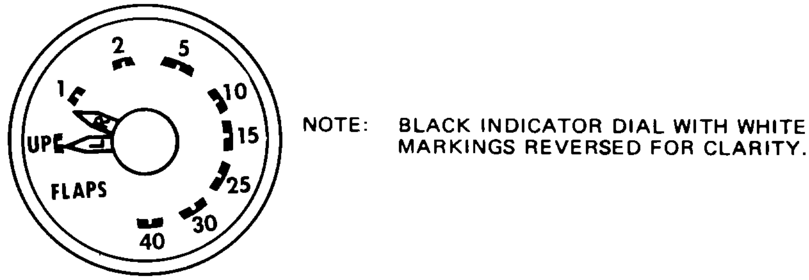
C. Position toggle assembly so that forward cam follower bearings can be installed.
(1) Coat threads and shank of cam follower bearings with grease prior to installation.
(2) Install bushings on shanks of the cam follower bearings.
(3) Position forward cam bearings with bushings in installed position.
(4) Secure forward cam bearings to toggle assembly with washers and nuts. Tighten nuts to 95-110 pound-inches.
(5) Install cotter pins.

D. Grease cam follower bearings and track roller bearing (AMM 12-22-51/401).

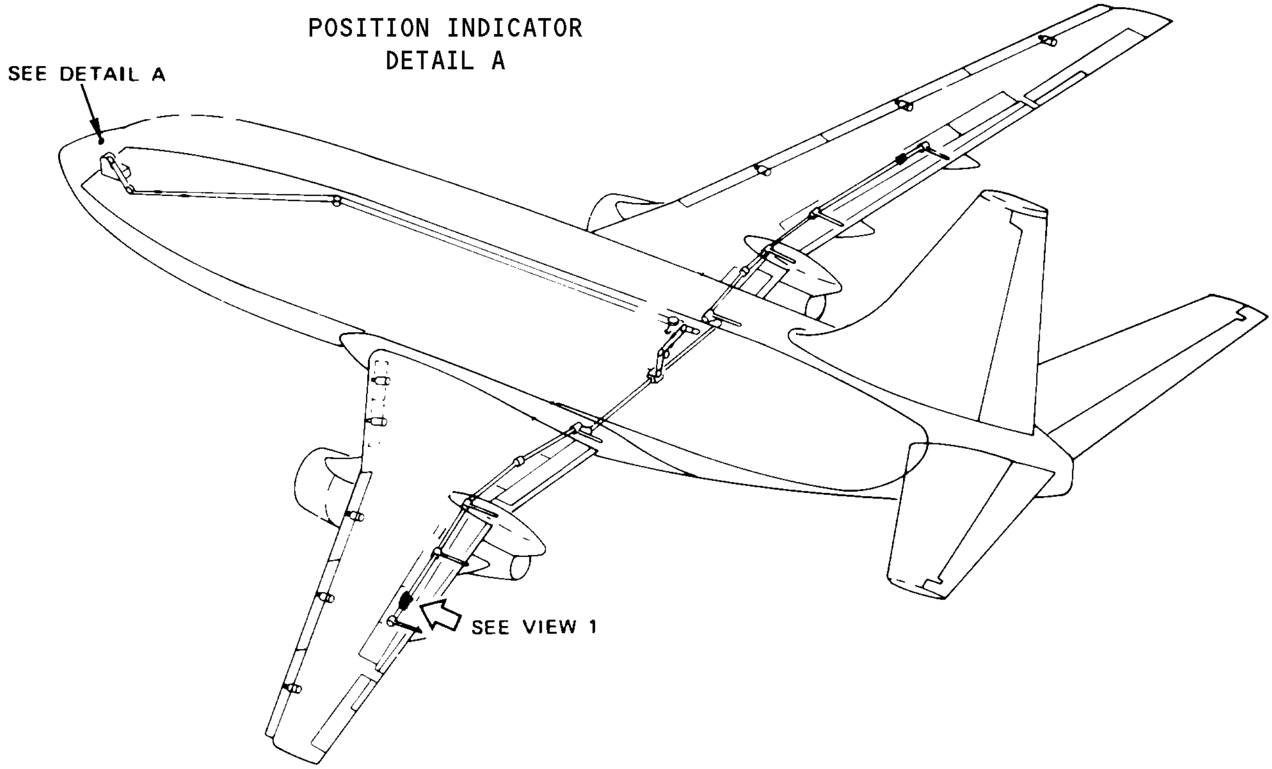
5. Restore Airplane to Normal
A. Provide system A hydraulic power (AMM 27-51-00/201).
B. Position flap control lever to FLAP UP detent.
C. Remove system A hydraulic power (AMM 27-51-00/201).
D. Install inboard flap track fairing (AMM 27-51-141/401).

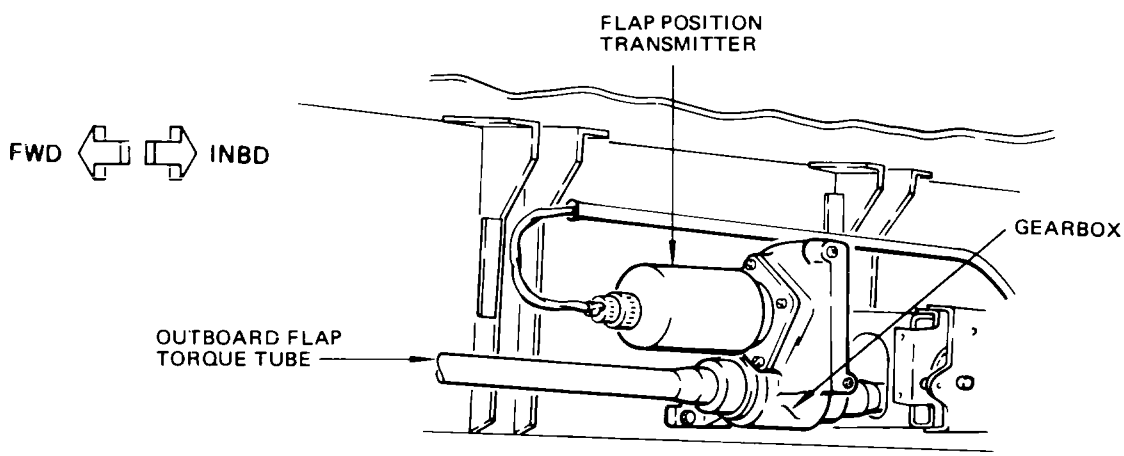
TRAILING EDGE FLAP POSITION INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The trailing edge flap position indicating system provides visible indication of the angular position of the trailing edge flaps. The synchro-type system consists of two position transmitter assemblies and one flap position indicator (Fig. 1). The flap position indicator shows angular position of the two outboard trailing edge flaps. Each position transmitter installation consists of a gearbox and a synchro-type transmitter. The gearbox is driven by the flap torque tubes, and in turn rotates the transmitter shaft. This varies the electric signal to the flap position indicator.
2. Flap Position Indicator
   A. A flap position indicator shows the position of the trailing edge flaps. It is a dual synchro-type indicator that registers flap position in units. The indicator receives 3-phase electric signals from the two flap position transmitters and moves two pointers to indicate flap position. The flap position indicator is mounted on the center instrument panel in the control cabin (Fig. 1).
3. Flap Position Transmitter Assembly
   A. A flap position transmitter assembly relays the angular position of each outboard trailing edge flap to a position indicator in the cabin. The position transmitter assembly consists of a synchro-type transmitter mounted on a gearbox (Fig. 1). The gearbox contains a pair of spur gears driven by the outboard flap torque tubes. The pinion gear has splines at each end, which are assembled with torque tube coupling halves. The output gear has an internal spline that drives the flap position transmitter that is mounted on the gearbox housing.
4. Operation
   A. During flap operation, the angular position of each trailing edge flap is indicated by a dual synchro-type indicator on the center instrument panel. A gear-driven position transmitter synchro relays flap position signals to the dual indicator synchros (Fig. 1). The position indicator needles move to reflect flap position. The position indicating system is driven by 28-volt ac power from the No. 2 transfer bus.



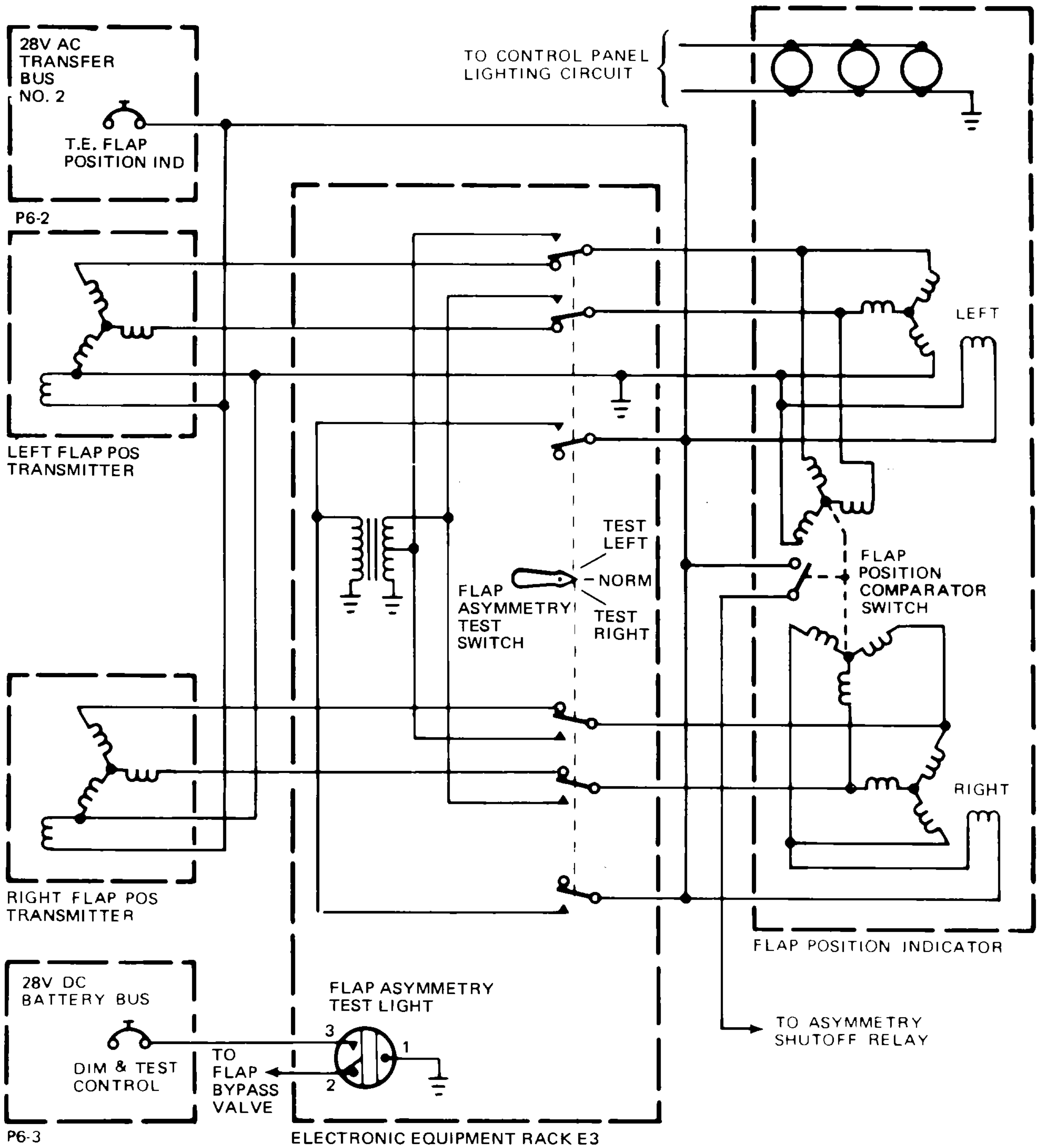
POSITION INDICATOR
DETAIL A





(LEFT WING SHOWN - RIGHT WING OPPOSITE)
VIEW 1

Trailing Edge Flap Position Indicating System Component Location
Figure 1



Trailing Edge Flap Position Indicating System Circuit
Figure 2

TRAILING EDGE FLAP POSITION INDICATING SYSTEM - TROUBLESHOOTING

1. General
   A. All troubleshooting procedures are based on the assumption that wiring is OK and that electrical power is available. If corrective action in the procedure does not correct the problem, check wiring using the wiring diagram.
   B. The trailing edge flap system must be properly adjusted prior to trouble shooting the trailing edge flap position indicating system.
2. Prepare for Troubleshooting
   A. Provide electrical power.
   B. Check that TRAILING EDGE FLAP POS IND circuit breaker is closed.
   C. Check that FLAP SHUT-OFF VALVE circuit breaker is closed.
   D. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
3. Trailing Edge Flap Position Indicating System Troubleshooting Chart

3. Trailing Edge Flap Position Indicating System Trouble Shooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Indicator pointer not within tolerance zone	Flaps are not extending properly	Visually inspect flap position	Adjust flap drive system
	Flap position transmitter out of adjustment	Retract flaps and check that pointer is within tolerance zone at flaps up	Adjust transmitter
Indicator pointer for one flap does not move when flaps move	Flap position transmitter defective	Check for 28V AC at transmitter plug pin 11 (left transmitter) or pin 11 (right transmitter)	Repair wiring or Replace transmitter
	Flap position indicator defective	Check for 28V AC at indicator plug pin 5 (left indicator) or pin 2 (right indicator)	Repair wiring or Replace indicator (Ref 27-58-41, R/I)
	Flap asymmetry test switch not functioning	Check switch for continuity between pin 3 and 8 and pin 2 and 7 (left flaps) or between pin 4 and 9 and pin 5 and 10 (right flaps)	Replace switch

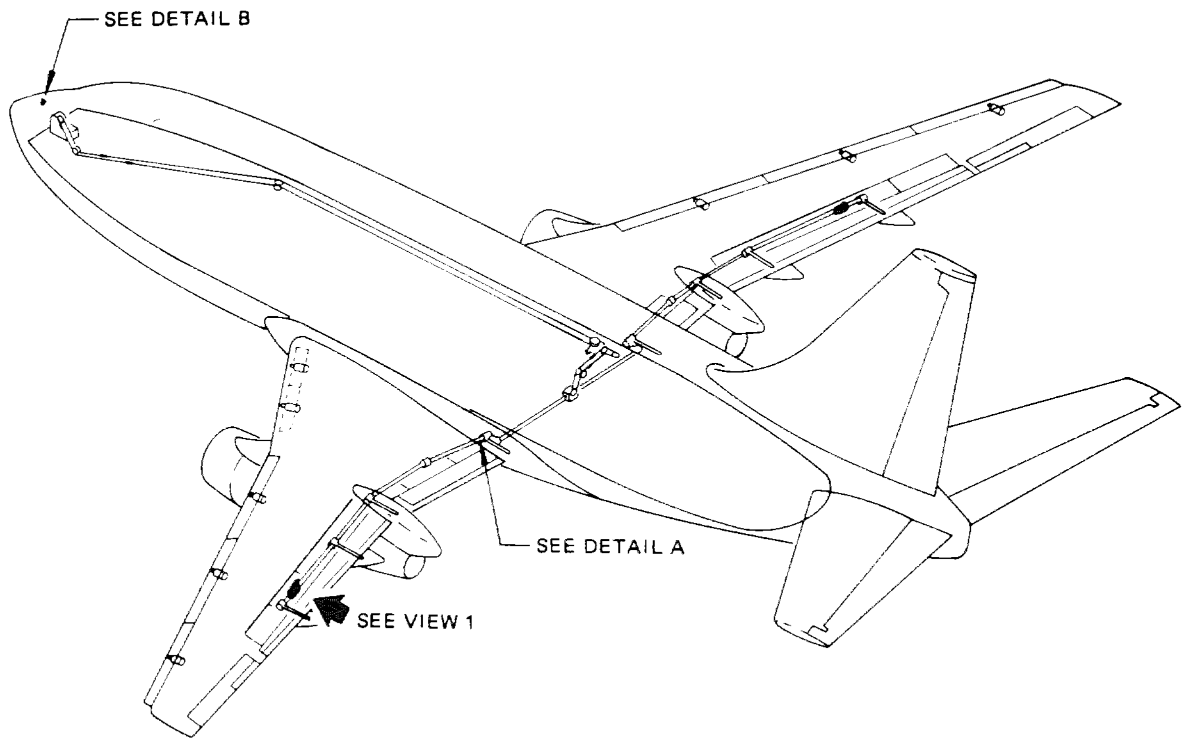
Trailing Edge Flap Position Indicating System Troubleshooting Chart
Figure 101

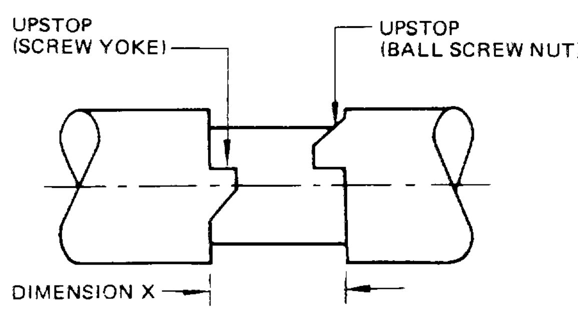
TRAILING EDGE FLAP POSITION INDICATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. The trailing edge flap system must be in adjustment before adjusting or testing the trailing edge flap position indicating system (Ref 27-51-0, Trailing Edge Flap System).
2. Trailing Edge Flap Position Indicating System Test
   A. Test Trailing Edge Flap Position Indicating System
      (1) Provide system A hydraulic power (Ref 27-51-0 MP).
      (2) With flap control lever in FLAP UP detent, check flap position indicators (Detail B, Fig. 501). Indicator pointer must both point into the white UP area on indicator dial and pointer tips shall be within 0.040 inch of each other.

         NOTE: The indicator should be tapped with the fingers to remove friction error.

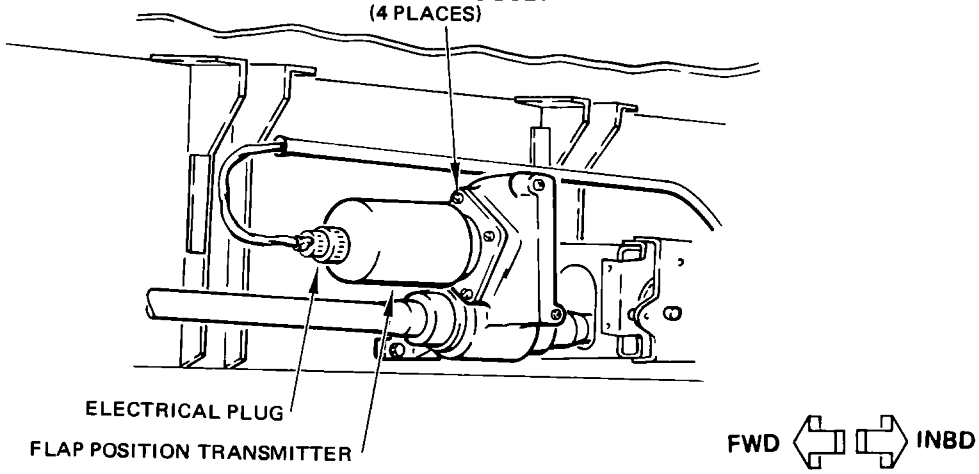
      (3) Do the left and right symmetry test (AMM 27-51-01/501), to examine a split left and right pointer condition.
      (4) Position flap control lever at each detent and check indicator operation as flaps extend. Approach each detent from both extend and retract directions. Allow enough time at each detent position for flaps to stop moving. Tap indicator to remove friction error. At each flap position, indicator pointers must point into respective white area on indicator dial.
      (5) If flap position indicator was replaced, test flap asymmetry checking circuit (Ref 27-32-0, Adjustment/Test).
      (6) If left or right flap position transmitter or gear box was replaced, test flap asymmetry checking circuit (Ref 27-51-01, Adjustment/Test [Test Flap Asymmetry Checking Circuit]).
      (7) If right position transmitter was replaced, test stall warning system (Ref 27-32-0, Adjustment/Test).
      (8) Remove system A hydraulic power (Ref 27-51-0). Disconnect electrical power if no longer required.



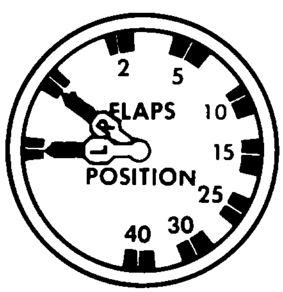


DETAIL A

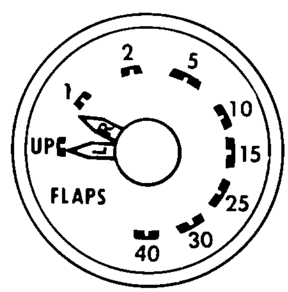
Trailing Edge Flap Position Indicating System Adjustment
Figure 501 (Sheet 1)



(LEFT WING SHOWN RIGHT WING OPPOSITE)
VIEW 1



(CONFIGURATION 1)



(CONFIGURATION 2)

POSITION INDICATOR
DETAIL B

NOTE: BLACK INDICATOR DIAL WITH WHITE MARKINGS REVERSED FOR CLARITY.

Trailing Edge Flap Position Indicating System Adjustment
Figure 501 (Sheet 2)

468875

FLAP POSITION TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. This procedure applies to both the left and right transmitters. The illustration shows left side installation. Right side illustration similar but opposite.
2. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Primer - BMS 10-11, Type 1
3. Remove Flap Position Transmitter
   A. Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
   B. Position flap control lever in FLAP DOWN detent to lower flaps.
   C. Remove system A hydraulic power (Ref 27-51-0).
   D. Remove electrical connector from position transmitter (Fig. 401).
   E. Remove four transmitter mounting bolts and remove transmitter.
4. Install Flap Position Transmitter
   A. Prepare for installation
      (1) Provide electric power.
      (2) Provide system A hydraulic power (Ref 27-51-0).
      (3) Set flap control lever in FLAP UP detent; allow 2 minutes for flaps to fully retract.
      (4) Remove system A hydraulic power (Ref 27-51-0).
      (5) Position flaps as follows:
         (a) At number 4 jackscrew, measure and record X dimension as shown in Detail A, Fig. 401.
         (b) On AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE MD 5R-MFA, reposition flaps so that X dimension measured in step (a) is and additional 24.50 to 24.66 inches.
         (c) On AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-IND and LV-INE MD ALL EXCEPT 5R-MFA, reposition flaps so that X dimension measured in (a) is an additional 24.38 to 24.53 inches.
   B. Install flap position transmitter.
      (1) Install electrical connector on transmitter receptacle.
      (2) Rotate each transmitter input shaft until corresponding flap position indicator needle point is centered within black index mark at 15-unit position.

      NOTE: Tap indicator to remove friction error before checking indicator reading.

      (3) Grease transmitter splines lightly and install transmitters onto gearboxes keeping indicator needles within black index mark. Install mounting screws and washers with wet primer. Do not lockwire.
      (4) Test position indicating system per 27-58-01, Adjustment/Test.

(5) Check electrical bond between transmitter and gearbox. Maximum resistance to be 0.0025 ohms.

(6) Lockwire transmitter mounting bolts.

C. If right flap position transmitter was replaced, test stall warning system (Ref 27-32-0, Adjustment/Test).

D. Install flap position transmitter.

(1) Install electrical connector on transmitter receptacle.

(2) Rotate each transmitter input shaft until corresponding flap position indicator needle point is centered within black index mark at 15-unit position.

NOTE: Rotating transmitter shaft clockwise should move position indicator needle toward UP position. If needle moves toward 40-unit position, rotate transmitter shaft clockwise until needle moves to 15-unit position toward UP position (approximately 14.5 turns clockwise). Tap indicator to remove friction error before checking indicator reading.

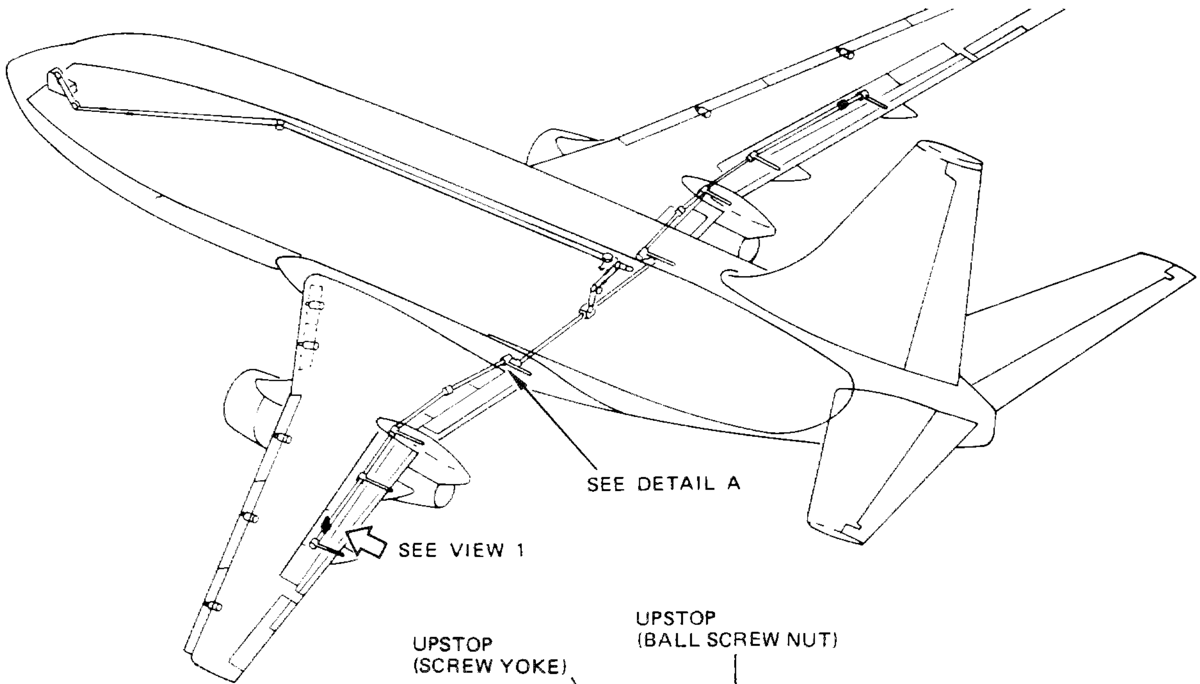
(3) Grease transmitter splines lightly and install transmitters onto gearboxes keeping indicator needles within black index mark. Install mounting screws and washers with wet primer. Do not lockwire.

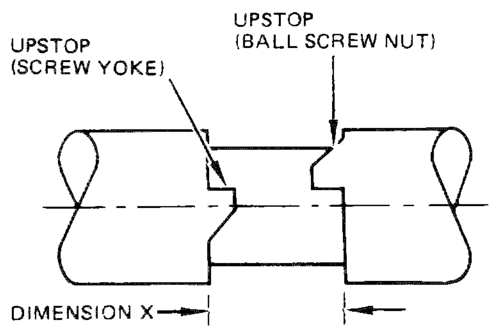
(4) Test position indicating system (Ref 27-58-01, A/T).

(5) Check electrical bond between transmitter and gearbox per 20-22-01. Maximum resistance should not exceed 0.0025 ohm.

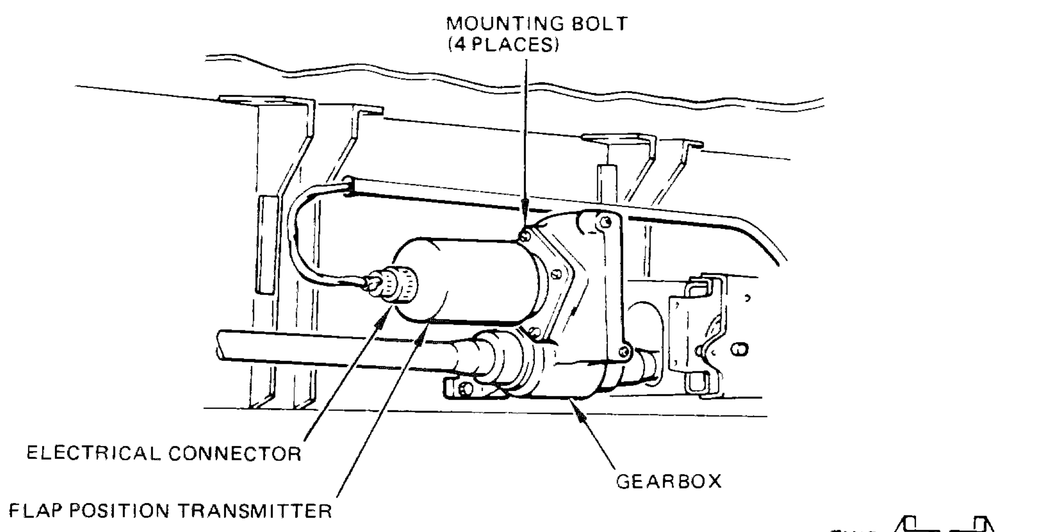
(6) Lockwire transmitter mounting bolts.

E. If left or right flap position transmitter was replaced, test stall warning system (Ref 27-32-0, A/T. Test system performance system 1, right transmitter, and test system performance system 2, left transmitter).





DETAIL A



VIEW 1

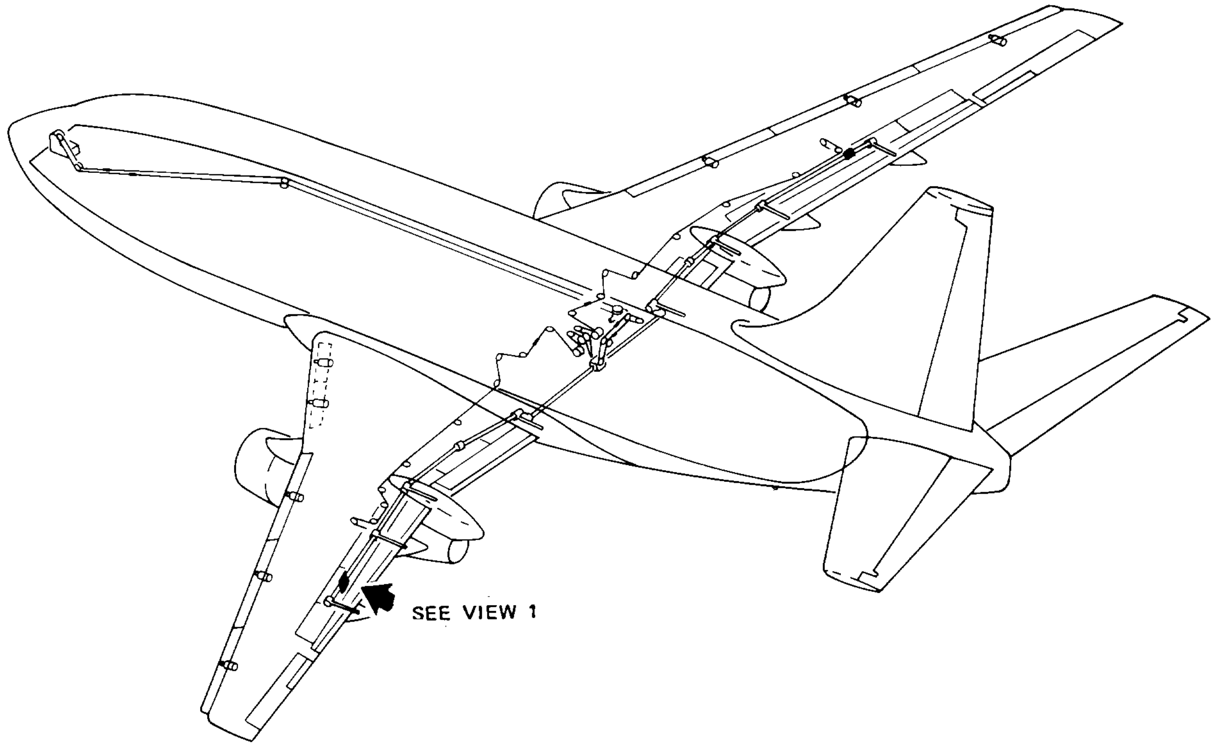
Flap Position Transmitter Installation
Figure 401

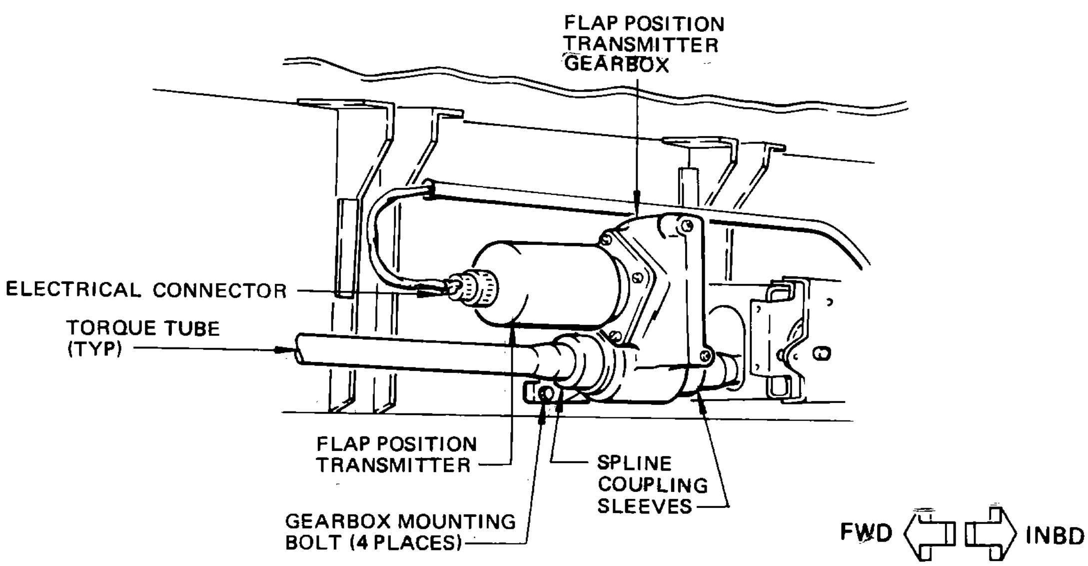
FLAP POSITION TRANSMITTER GEARBOX - REMOVAL/INSTALLATION

1. General
   A. This procedure covers both the left and right position transmitter gearboxes. The illustration shows left side installation. Right side installation is similar but opposite.
   B. The position transmitter may be left attached to the gearbox during removal by merely removing the electrical connector. Or the transmitter may be removed prior to removal of gearbox. Refer to 27-58-12, Flap Position Transmitter - Removal/Installation.
2. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Primer - BMS 10-11, Type I
3. Remove Flap Position Transmitter Gearbox
   A. Provide hydraulic system A hydraulic power. Refer to 27-51-0, Trailing Edge Flaps - Maintenance Practices.
   B. Position flap control lever in FLAP DOWN detent to lower flaps.
   C. Remove system A hydraulic power. Refer to 27-51-0.
   D. Remove electrical connector from position transmitter. (See figure 401.)
   E. Disconnect torque tube spline coupling sleeves.
      (1) Remove three screws from both spline coupling sleeves.
      (2) Slide coupling sleeves off gearbox splines to disconnect torque tubes.

      CAUTION: SUPPORT TORQUE TUBES BEFORE DISCONNECTING TO PREVENT POSSIBLE DAMAGE.

   F. Remove four gearbox mounting bolts and remove gearbox from airplane.
4. Install Flap Position Transmitter Gearbox
   A. Position gearbox against wing rear spar. Install four bolts and washers after wetting bolts with primer.
   B. Apply grease liberally to splines. Fill gearbox spline coupling voids with grease.
   C. Position torque tubes on each side of gearbox and slide coupling sleeve splines over gearbox splines.
   D. Secure each spline coupling sleeve with three screws and lockwire screws.
   E. Position torque tubes away from flap transmitter gearbox until couplings contact.
   F. Check that gap between each pair of gearbox coupling halves is 0.46 +0.06/-0.21 inch.
   G. Install flap position transmitter if transmitter was removed (Ref 27-58-12, Removal/Installation).
   H. Install electrical connector on flap position transmitter.
   I. Install transmitter installation (Ref 27-58-12, Removal/Installation).





VIEW 1

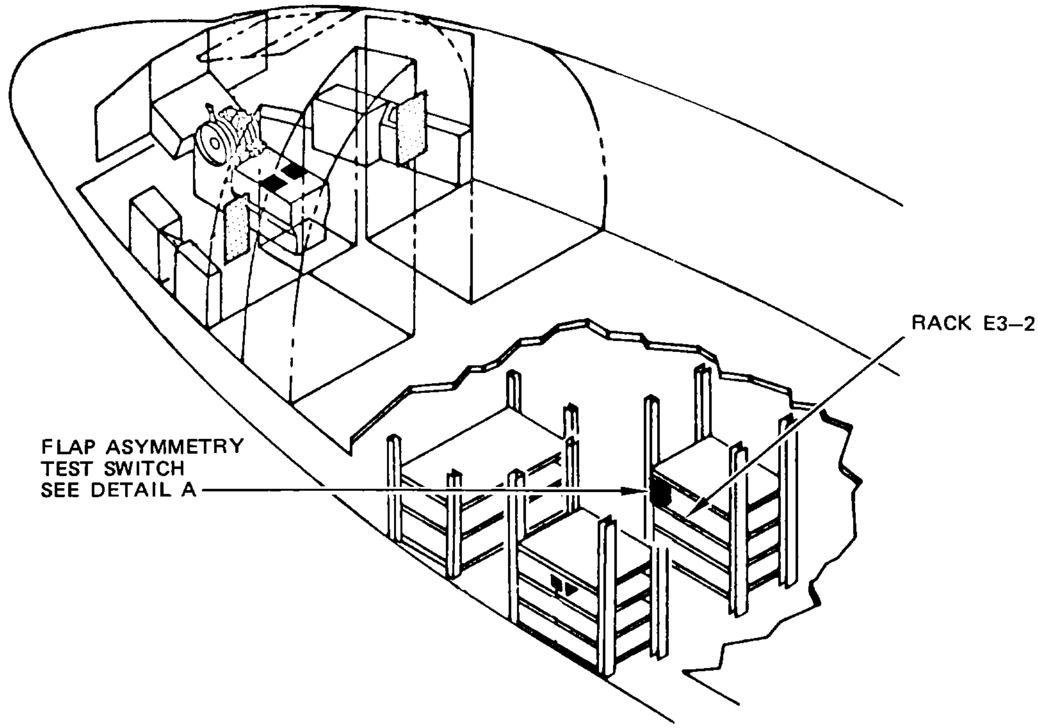
Flap Position Transmitter Gearbox
Figure 401

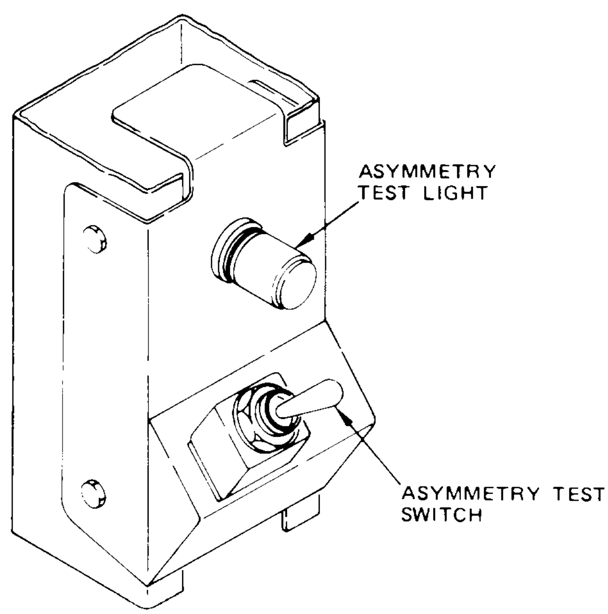
TRAILING EDGE FLAP POSITION INDICATOR - REMOVAL/INSTALLATION

1. General
   A. The trailing edge flap position indicator is located on the control cabin center instrument panel, P2.
2. Remove Indicator
   A. Open trailing edge flap position circuit breaker on P6 panel.
   B. Remove indicator from front of instrument panel and disconnect electrical connector.
3. Install Indicator
   A. Connect electrical connector on indicator and install in instrument panel.

      NOTE: Indicators for electrical asymmetry and mechanical asymmetry systems are physically interchangeable but not functionally interchangeable. If an indicator for a mechanical asymmetry system is installed in an electrical asymmetry system, the asymmetry system will not operate. The following procedure will verify a correct installation.

   B. Provide electrical power.
   C. Close trailing edge flap position circuit breaker on P6 panel.
   D. Position flap control lever in FLAP UP detent.
   E. Provide system A hydraulic power to retract flaps (Ref 27-51-0, Maintenance Practices). Hold for 2 minutes.
   F. Gain access to flap asymmetry test switch (Fig. 401).
   G. Position switch to test L position and check that test light illuminates.
   H. Release test switch and check that test light goes out.
   I. Position switch to test R position and check that test light illuminates.
   J. Release test switch and check that test light goes out.
   K. Cycle flaps through complete operating range and check that indicator pointers are compatible with flap positions.
   L. Remove system A hydraulic power.
   M. Remove electrical power if no longer required.



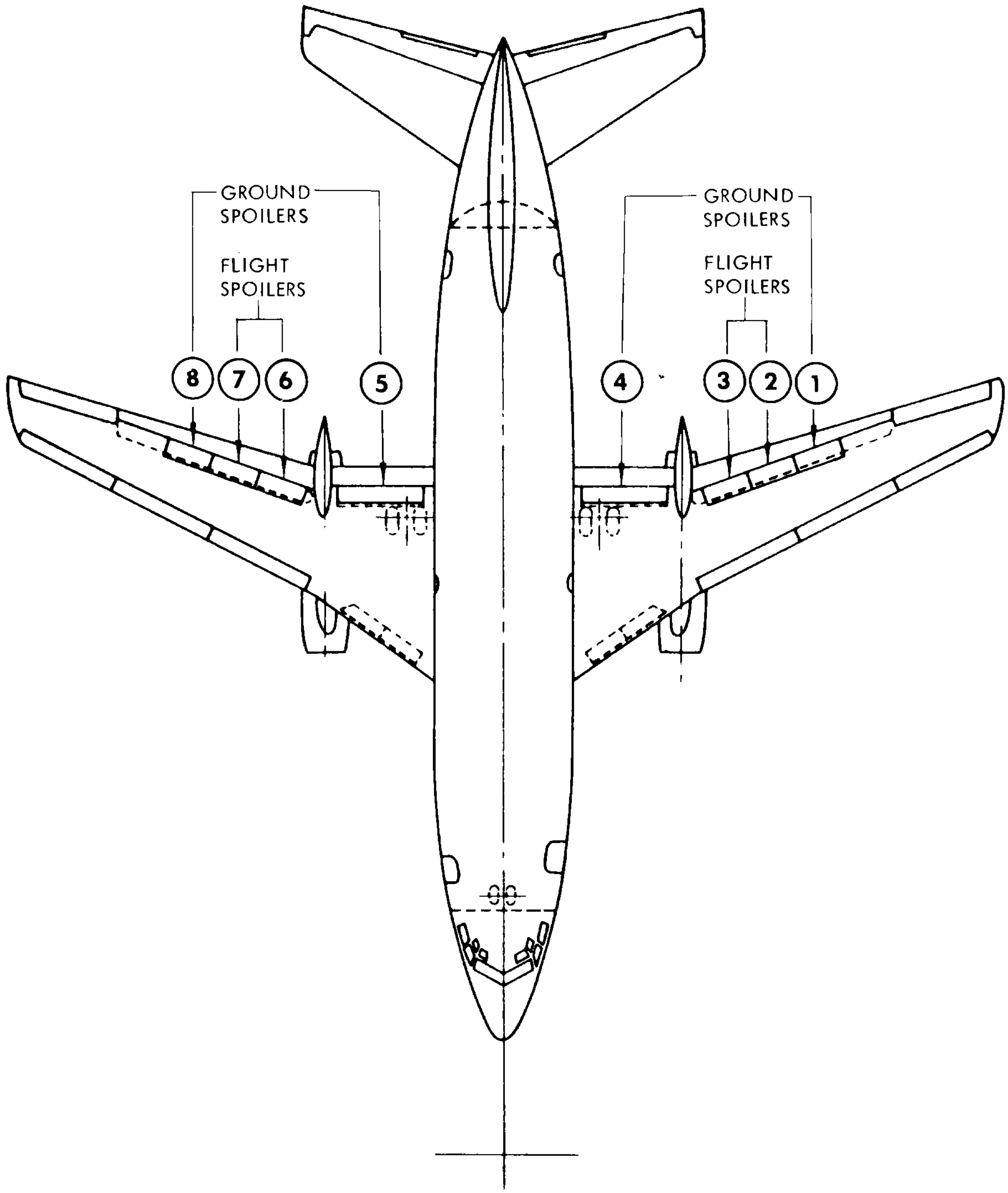


DETAIL A

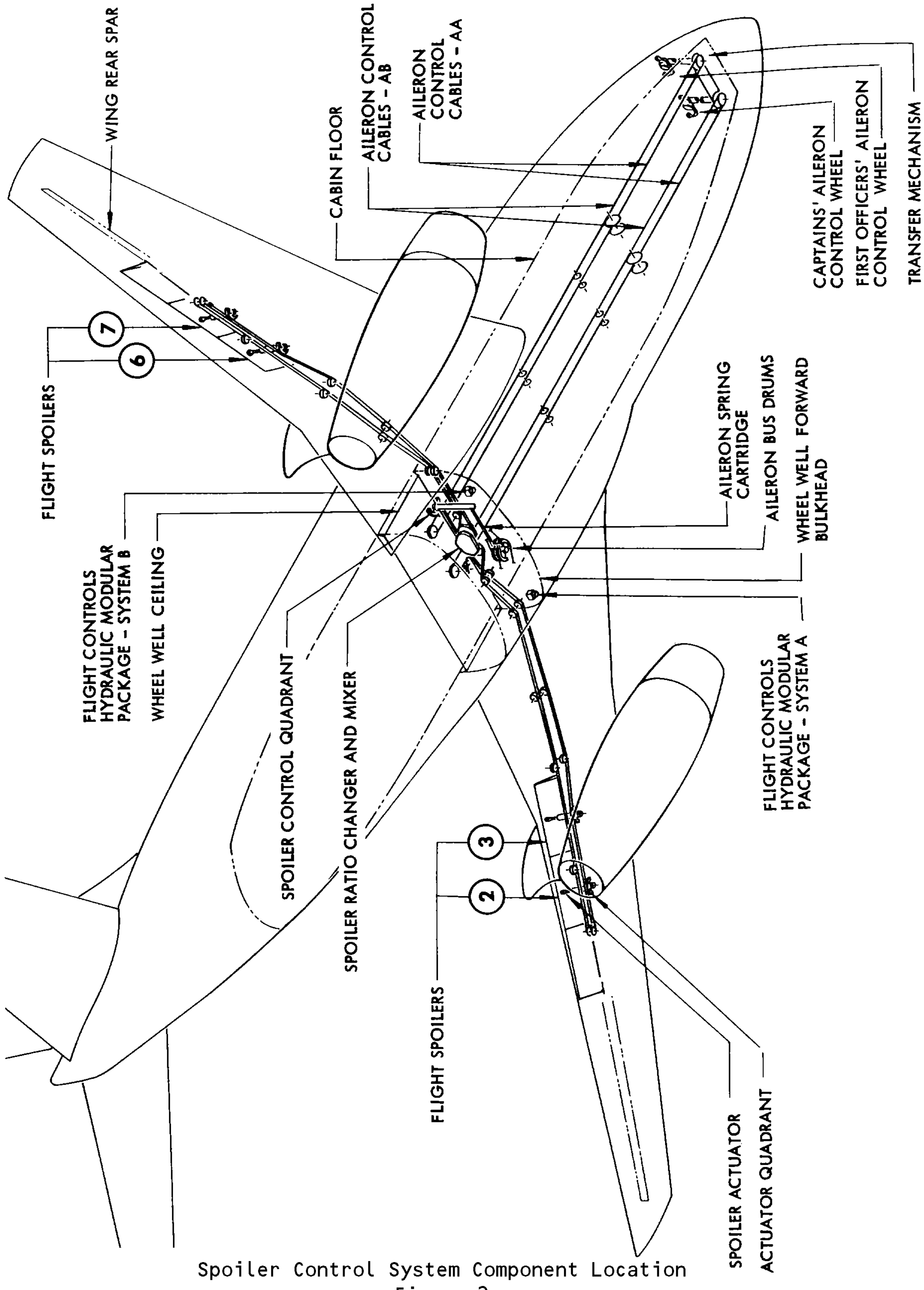
Flap Asymmetry Test Switch
Figure 401

FLIGHT SPOILER CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The flight spoiler control system supplements the ailerons in providing lateral control. The spoilers are numbered 1 through 8 from left to right. The flight spoilers, numbers 2, 3, 6, and 7 are located outboard of the engines. (See figure 1.) The ground spoilers 1 and 8 are located furthest outboard on the wings. The ground spoilers, numbers 4 and 5, are located inboard of the engines. (Refer to 27-62-0, Speed Brake Control System, for ground spoiler control.) The spoilers lie flush with the upper wing surface when not in use, and can be raised to various angles when in use. The flight spoilers may also act as speed brakes.
   B. When functioning as spoilers, the flight spoiler panels raise on the wing on which the aileron rotates up. The spoiler panels on the down aileron wing remain faired. When used as speed brakes, the spoiler panels on both wings rise. With speed brakes on, the spoiler panels on the up aileron wing will be raised more than those on the down aileron wing. This allows the flight spoilers to provide lateral control and speed brake operation simultaneously.
   C. Aileron control wheel rotation directs flight spoiler motion for lateral control. (See figure 2.) Input to the spoiler control system is normally through an aileron spring cartridge that connects the aileron bus drums to a spoiler ratio changer. The spoiler ratio changer reduces the magnitude of the lateral control input to the spoiler control system, when speed brakes are used. The amount of reduction depends on the speed brake lever position, with zero speed brakes giving maximum input. A spoiler mixer combines the lateral control inputs with speed brake inputs to move control cables, which are routed along the rear spars of the wings to spoiler actuator quadrants. The spoiler actuator quadrants position control valves in spoiler actuators and allow hydraulic pressure to position the spoilers. As the actuators move to position the spoilers, the valves are returned to the closed position. This provides a follow-up action such that the spoilers are hydraulically held in the desired position.
   D. An auxiliary set of control cables runs from a transfer mechanism at the base of the first officer's control column to a spoiler control quadrant, which also drives the spoiler ratio changer. If a malfunction occurs to restrict operation of the aileron control system, the first officer may transmit lateral control signals to the ratio changer through these cables. When spoiler control is obtained in this manner the first officer is required to override a spring in the transfer mechanism. If a malfunction occurs to restrict operation of the spoiler control system, the captain may override the spring in the transfer mechanism to provide aileron control. See 27-11-0, Aileron and Aileron Trim Control System, for a complete description of the transfer mechanism.



Spoiler Panel Identification
Figure 1



Spoiler Control System Component Location
Figure 2

E. Each spoiler is operated by its own actuator. Hydraulic power to operate the spoilers is obtained from hydraulic system B for the outboard flight spoiler on each wing, and from hydraulic system A for the inboard flight spoiler on each wing. Maximum hinge moment on the spoilers is limited by a check valve in each actuator, permitting the spoiler panels to blow down if limiting speed is exceeded with spoilers up.

F. Electric motor-driven shutoff valves, located in the flight controls hydraulic modular packages, allow the flight crew to shut off spoiler hydraulic power from system A, system B, or both systems. The system A flight controls hydraulic modular package is in the left wheel wel1 and the system B flight controls hydraulic modular package is in the right wheel well. Control switches for these two shutoff valves are on the pilots' overhead panel.

2. Flight Spoilers

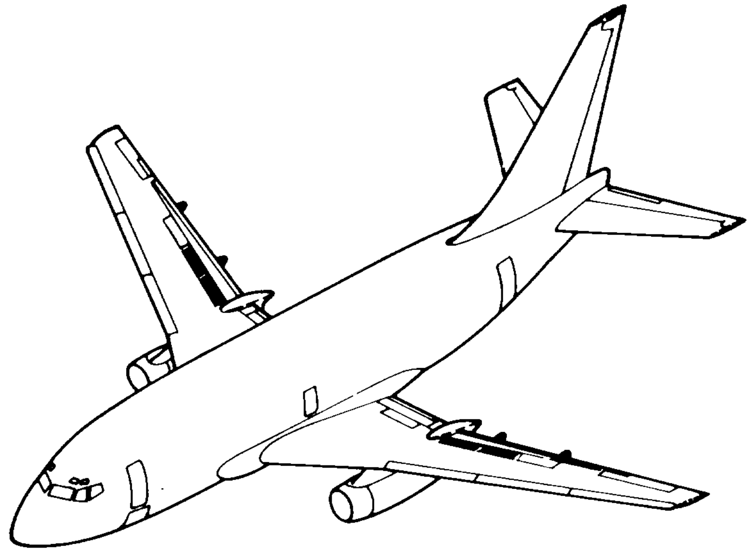
A. Spoilers raise to provide spoiler action. The spoilers are of bonded honeycomb construction with upper and lower skins of clad aluminum alloy and a nonperforated aluminum honeycomb core. On some airplanes, the spoilers are of graphite/epoxy construction with upper and lower skins of graphite laminate and graphite/epoxy nomex honeycomb core. A continuous phenolic rub strip is bonded to the lower surface at the trailing edge. Dacron covered silicone rubber seals are installed at each end and at the forward edge. The seals at each end are adjustable. The flight spoilers (number 2, 3, 6, and 7) and the outboard ground spoilers (number 1 and 8) are interchangeable among themselves.

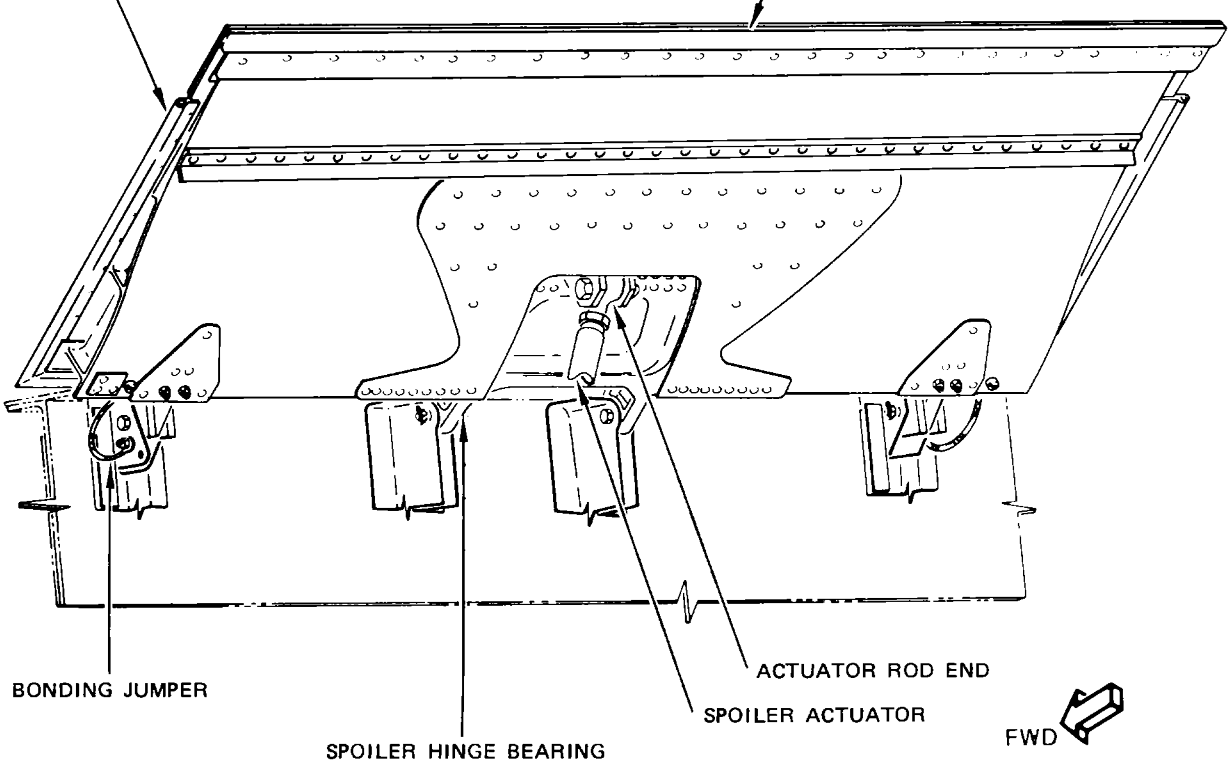
B. Spoilers are attached to the wing structure by four hinge fittings equipped with self-aligning bearings (Fig. 3). The flight spoilers are located forward of the outboard flaps and are attached to wing structure aft of the rear spar. The four flight spoiler actuators are attached between the spoilers and wing structure at the spanwise center of each spoiler. Bonding jumpers provide an electrical bond between spoilers and wing structure. On some airplanes, a blade seal along the bottom length of the spoiler acts as a dam to limit excessive air leakage through the flaps.

C. When the spoilers are down, the down limit is provided by bottoming the piston in the actuator. In this position a clearance is maintained between the spoilers and the outboard flap. In flight, the flap will move up due to airloads, and the phenolic rub strip may contact the abrasion resistant finish on the upper surface of the flap.

3. Spoiler Ratio Changer

A. The spoiler ratio changer is a mechanical device, which receives an input from the aileron control system and transfers it to the spoiler mixer to initiate spoiler action. For a given magnitude of input from the aileron system, the ratio changer varies the magnitude of the output to the spoiler mixer, depending on speed brake lever setting. The output decreases as speed brakes are raised.





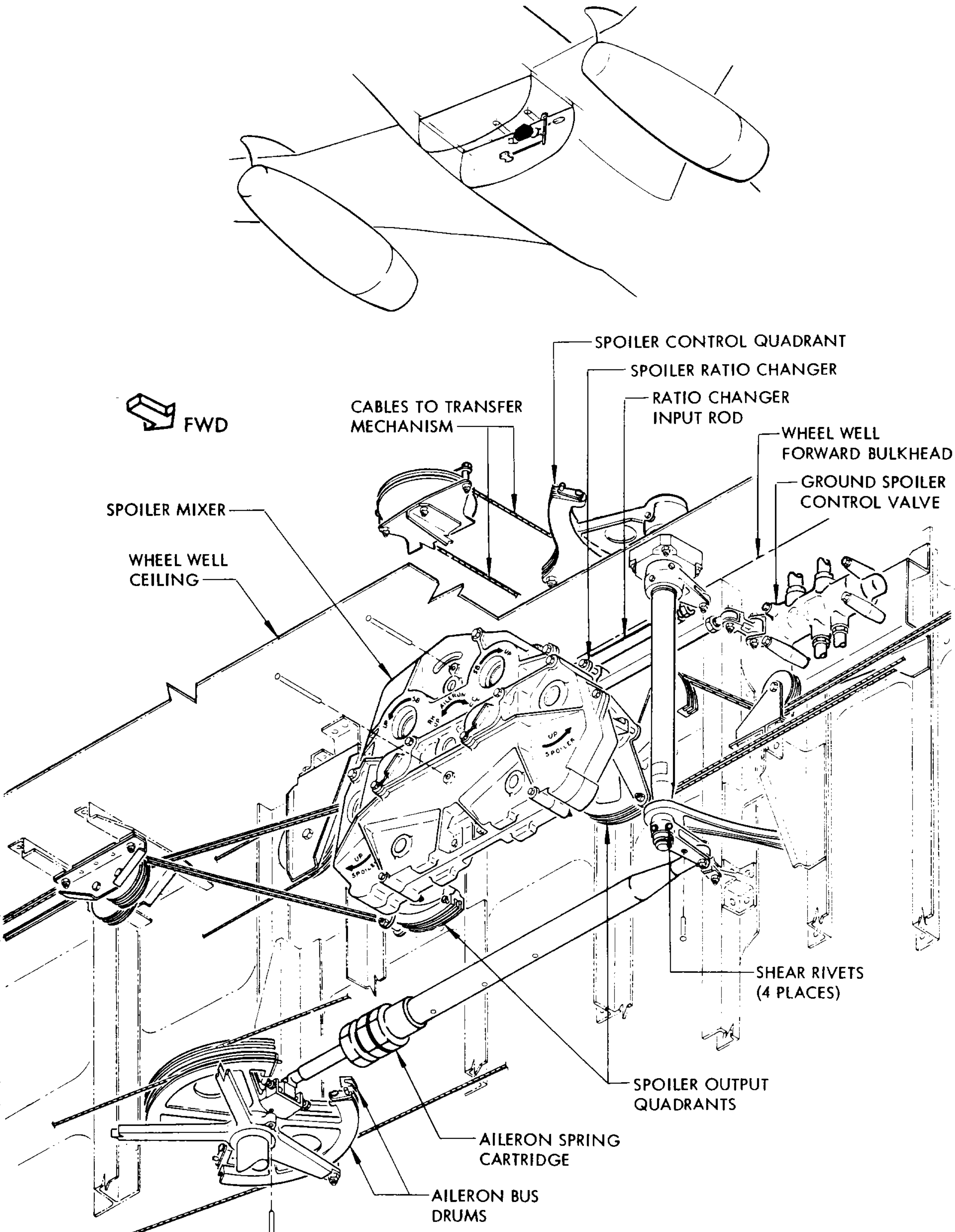
Flight Spoiler
Figure 3

B. The spoiler ratio changer is mounted on the forward bulkhead of the right wheel well. (See figure 4.) The ratio changer case supports spoiler output quadrants and a speed brake quadrant. A ratio changer input rod from the spoiler control quadrant, connects to a bell crank which is mounted on the ratio changer case. (See figure 5.) The bell crank is slotted to receive two rollers. These rollers engage the slots and are connected to a lever and a link. The lever is connected to a crank on the ratio changer output shaft. The link is attached to a fork lever assembly, which is connected to the speed brake quadrant by a two-part link. Action of the speed brake quadrant will cause motion of the rollers in the bell crank. Moving the speed brake quadrant to raise the spoilers will cause the rollers to move toward the bell crank pivot. This will cause a decrease in the magnitude of the ratio changer output for a given input. During normal operation, the two-part link attached to the speed brake quadrant is maintained at a fixed length by a bungee spring. In the event that the ratio changer should jamb, the bungee will allow the two-part link to become longer as the speed brake quadrant is rotated in the down direction. The speed brake quadrant has a fixed stop in the speed brake down position and an adjustable stop in the speed brake up direction.

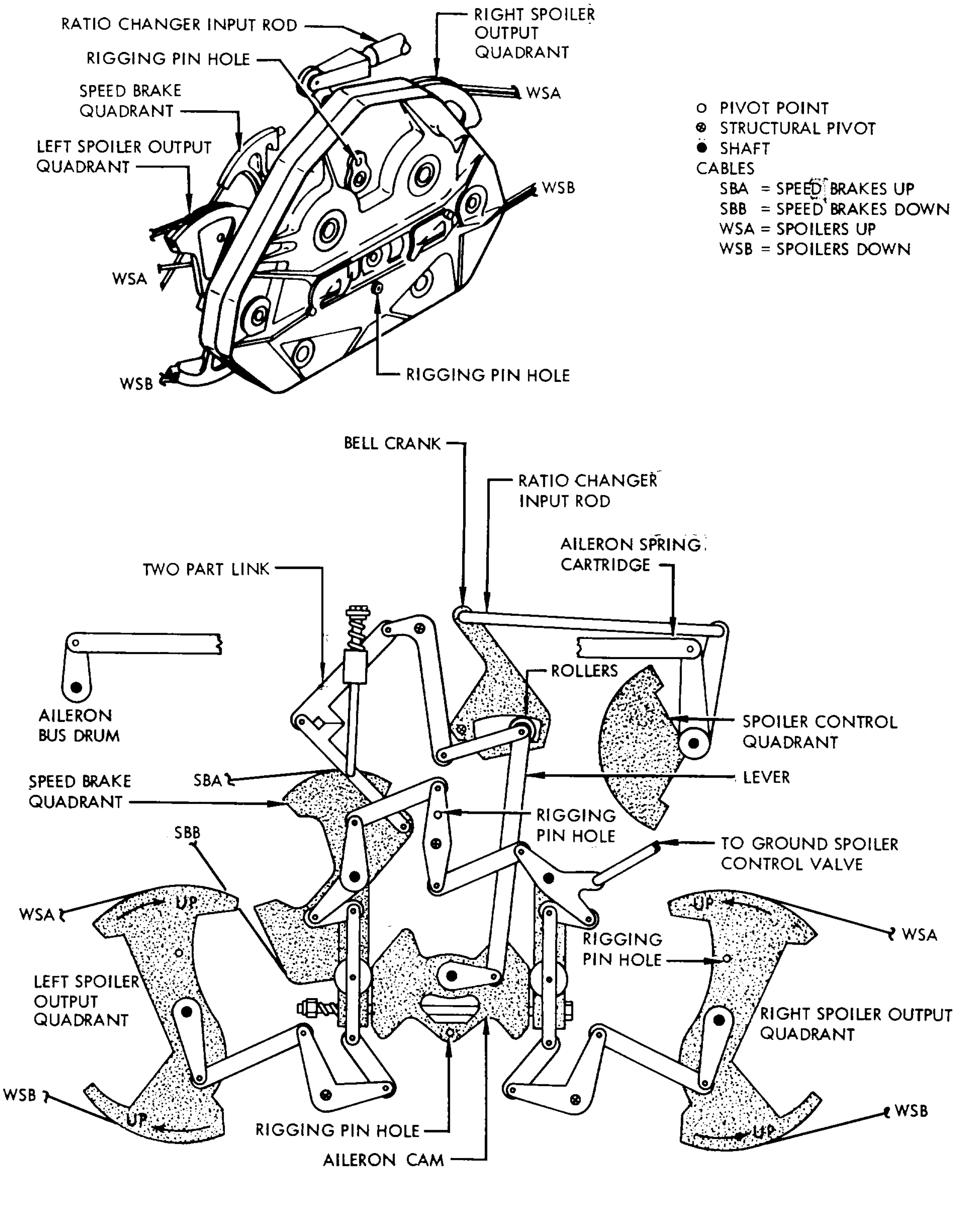
4. Spoiler Mixer

A. The spoiler mixer combines aileron input from the spoiler ratio changer with speed brake lever position. It allows the flight spoilers to augment lateral control of the airplane even when they are simultaneously being used as speedbrakes.

B. The spoiler mixer assembly is mounted on the spoiler ratio changer, which is located on the forward bulkhead of the right wheel well (Fig. 4). The housing is fastened to the ratio changer by four bolts and four splined shafts which mate with the ratio changer. These shafts are speed brake input, aileron input, left spoiler output and right spoiler output. An additional shaft on the mixer provides the speed brake signal to the ground spoiler control valve. The housing of the spoiler mixer contains an aileron cam and related levers and links (Fig. 5). Sealed bearings are used in all linkages, so the housing contains no oil. The spoiler mixer may be removed from the airplane without disturbing the rigging of the cables or linkage, which are mounted on the ratio changer.



Spoiler Ratio Changer and Mixer
Figure 4



Spoiler Ratio Changer and Mixer Schematic
Figure 5

C. Counterclockwise rotation of the speed brake quadrant repositions the linkage in the mixer and results in an "up" signal to both left and right output quadrants. Conversely, clockwise rotation results in a "down" signal at both output quadrants. Aileron signals received by the spoiler mixer, from the ratio changer rotate the cam inside the mixer. Clockwise rotation of the cam repositions the linkage in the mixer. This moves the left output quadrant to provide an "up" signal and the right output quadrant to provide a "down" signal. Conversely, counterclockwise rotation of this cam provides a "down" signal to the left output quadrant and an "up" signal to the right output quadrant. Simultaneous inputs from aileron and speedbrake systems will cause motion of these output quadrants in a combined manner, providing lateral control from flight spoilers with speedbrakes on.

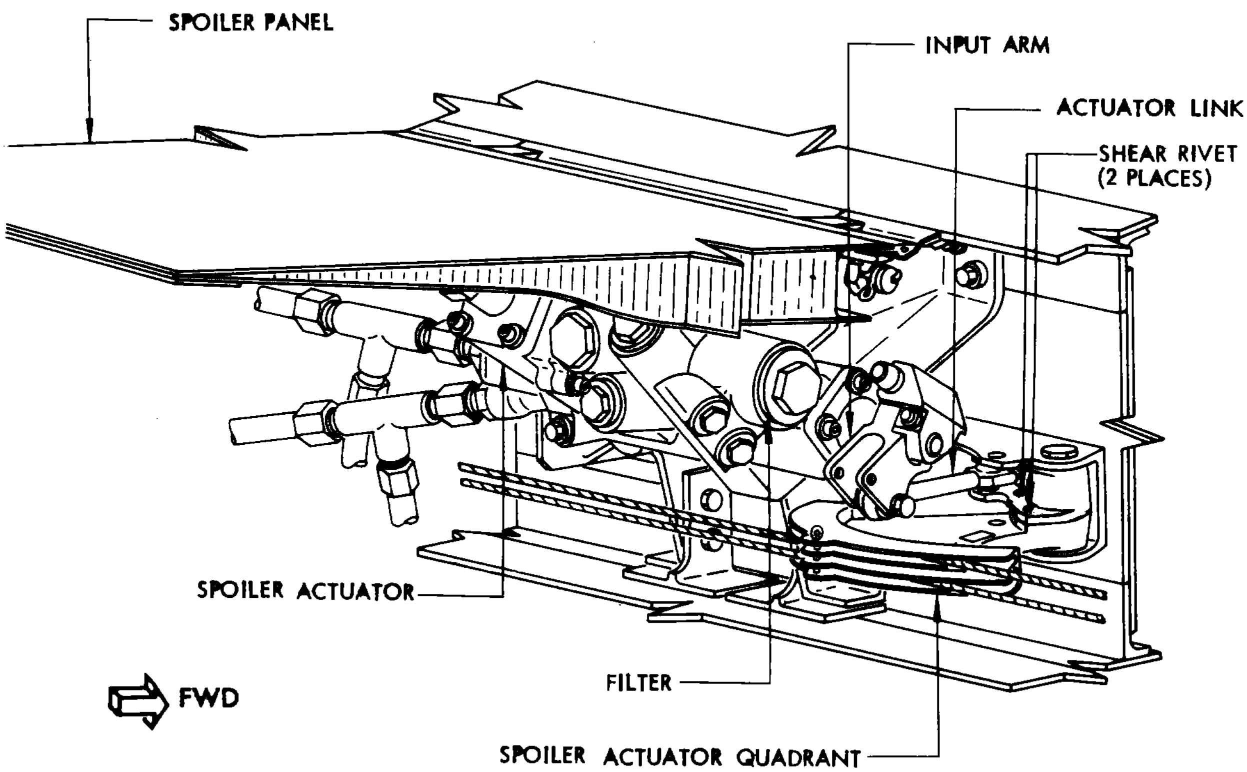
5. <u>Flight Spoiler Actuators</u>

A. A spoiler actuator is used to position each of the flight spoilers. (See figure 6.) Each of the identical actuators includes a cylinder, actuator rod and piston, control valve, filter, thermostat valve, relief check valve, blow-down check valve, extension check and thermal relief valve, snubber check valve, and over-travel pistons. Each actuator is trunnion mounted to a support fitting on the wing rear spar. An actuator link provides control inputs to the actuator from a spoiler control quadrant, which is also mounted on the support fitting. Hydraulic power is directed to the actuator through trunnion fittings. The piston rod end of the actuator is attached to the spoiler. Rotation of the spoiler control quadrant displaces an actuator input lever and the control valve, allowing hydraulic fluid at 3000 psi to be ported to one side of the piston and rod assembly. The input lever remains stationary after the initial displacement, but the actuator rotates on its trunnion as it positions the spoiler. Rotation of the actuator returns the control valve to the neutral position, stopping hydraulic fluid flow at the desired spoiler position.

B. Hydraulic power to the flight spoiler power control units is controlled by spoiler shutoff valves in the flight controls hydraulic modular packages. Switches for these electrically operated valves are located on the pilots' forward overhead panel. Hydraulic system A powers flight spoilers 3 and 6. Hydraulic system B powers flight spoilers 2 and 7.

C. Each flight spoiler actuator quadrant is bracket mounted on the actuator support fitting, and pivots on two sealed bearings. The quadrants have three cable grooves to receive wing spoiler cables. The quadrant crank is mounted on a boss around the quadrant hub and is secured in place by two shear rivets. A white painted scribe mark is provided to aid detection of shearout. Each actuator quadrant has a rigging pinhole.

D. The flight spoiler actuator is connected to the quadrant by an actuator link. The input arm on the actuator is adjustable to provide proper spoiler pickup. The input arm has two mounting locations for the actuator link. The forward position is used for the flight spoilers.



TYPICAL OF FLIGHT SPOILERS NO. 2,3,6 AND 7

Flight Spoiler Actuator
Figure 6

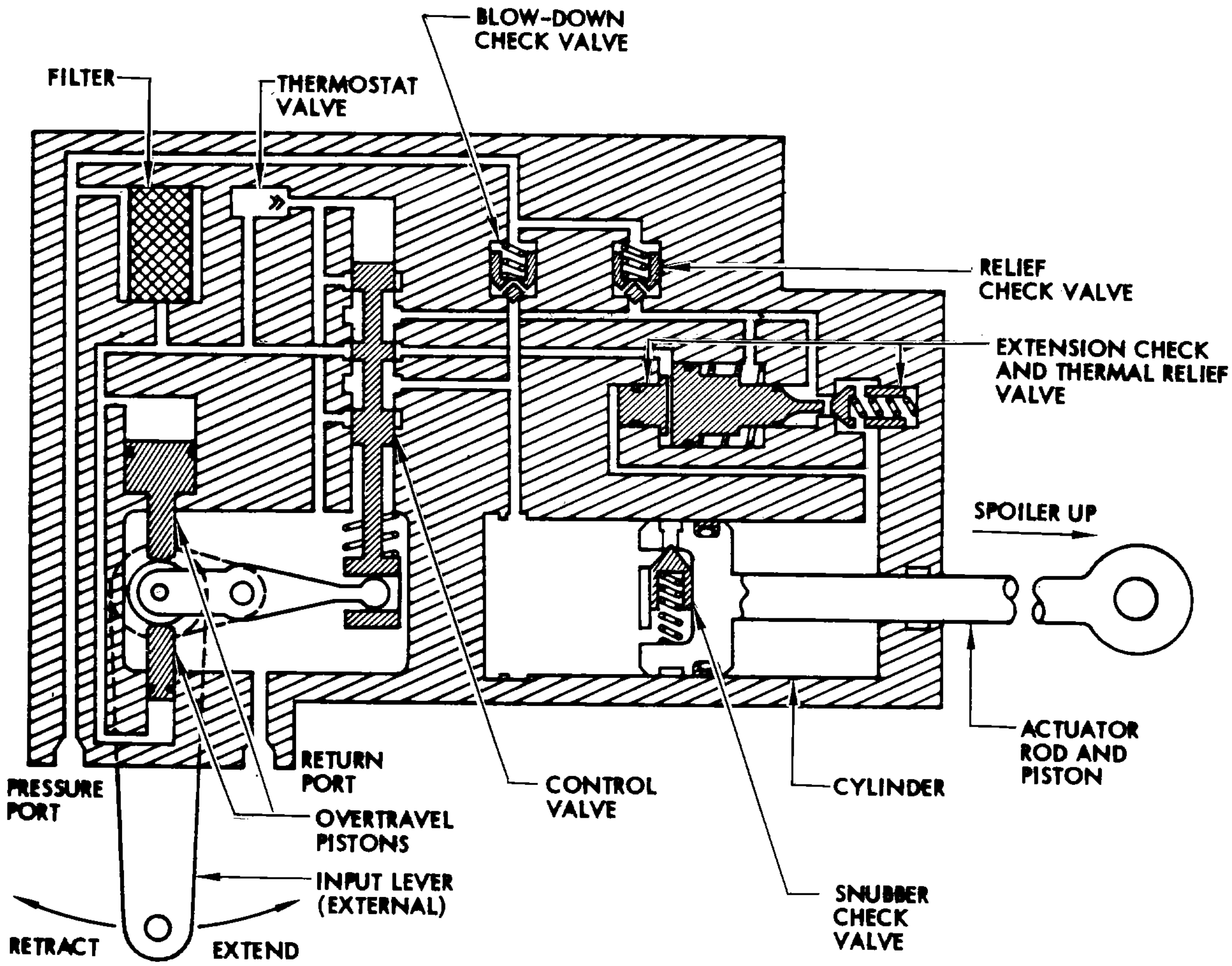
E. When the actuator is pressurized, the extension check valve is held open by pressure acting on a piston at the base of the valve. (See figure 7.) If hydraulic pressure is lost, springs reseat the extension check valve, to prevent spoiler float. A blow -down check valve located in the pressure line allows the spoilers to blow down at critical speed. Protection against actuator damage due to thermal expansion of entrapped hydraulic fluid or extreme "up " loads from the flaps is provided by a thermal relief valve and relief check valve. The thermal relief valve and the extension check valve are one unit; however the thermal relief valve is opened by actuator down pressure operating an additional piston. The thermal relief valve is set to open when a pressure of 3000 to 3600 psi is reached with hydraulic power off, and to reseat at a pressure no lower than 2500 psi. The relief check valve will also protect against damage from extreme flap up loads when hydraulic power is on. To prevent hydraulic lock when the spoilers are in the full down position, a snubber check valve is built into the piston. With the spoilers retracted and the piston in the full "down " position, an "up" signal to the control valve allows hydraulic fluid to flow to the base of the cylinder, around the piston, and through the snubber check valve to the face of the piston. The thermostat valve provides a hydraulic bleed at low temperatures to maintain warm hydraulic fluid in the actuator.

6. Spoiler Control Quadrant

A. A spoiler control quadrant located in the floor beam space above the main wheel well provides a control path from the first officer's control column to the ratio changer. (See figure 4.) The quadrant shaft projects through the wheel well ceiling to connect, by two cranks, to the aileron spring cartridge and the spoiler ratio changer input rod. The quadrant is connected by cables to the transfer mechanism at the base of the first officer's control column. The quadrant shaft rotates on two ball bearings. The upper bearing is enclosed in a ball fitting, which incorporates a rotary air pressure seal. The lower crank, to which the aileron spring cartridge connects, is secured to the quadrant shaft by four shear rivets.

7. Operation

A. Rotation of the aileron control wheels will transmit roll control signals to the aileron power control packages through the captain's control cables. (See figure 2.) Aileron power control package movement actuates the ailerons and simultaneously sends the roll control signal through the aileron spring cartridge and spoiler control quadrant to the ratio changer input rod. Motion of the input rod is transmitted by the ratio changer to the aileron cam inside the spoiler mixer. As the aileron cam rotates, it positions the linkage inside the spoiler mixer to rotate the output shafts and output quadrants. The rotation of the output quadrants is transmitted by cables and actuator quadrants to the spoiler actuator control valves. The resulting motion of the control valves directs hydraulic power to cause the flight spoilers to rise on the wing going down and remain faired on the wing going up. Vertical rotation of the extending actuators provides follow-up to null the control valves. This follow-up allows the flight spoilers to be positioned at any intermediate angle between faired and full up. In this manner the flight spoilers assist the ailerons in providing lateral control.

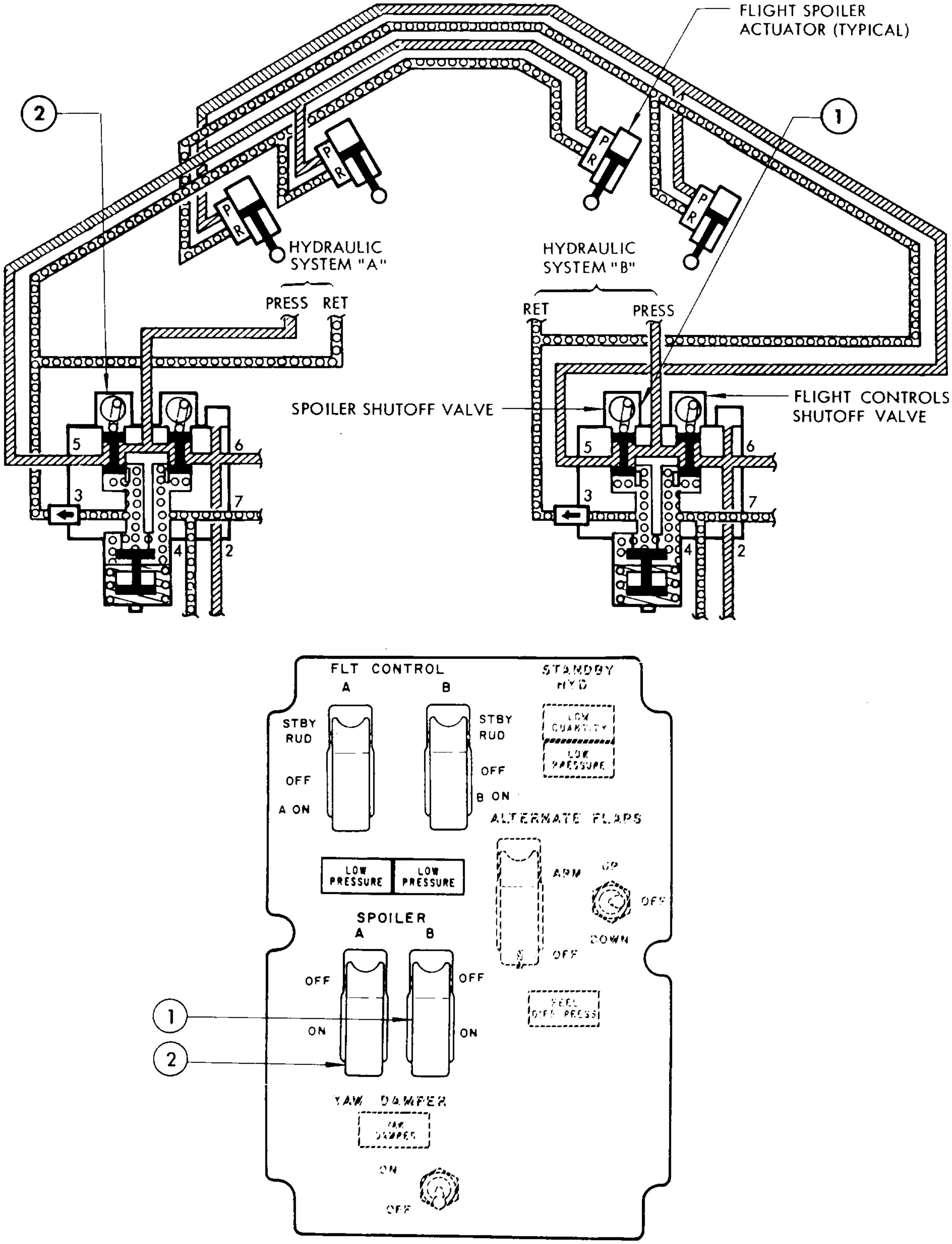


Flight Spoiler Actuator Schematic
Figure 7

B. The actuators for flight spoilers 3 and 6 are powered by hydraulic system A, and the actuators for flight spoilers 2 and 7 are powered by hydraulic system B (Fig. 8). Flight spoiler hydraulic power is controlled by electric motor -driven valves in the two flight controls modular packages. Two spoiler switches, system A and system B, are provided on the pilots' overhead panel to individually control the two valves.

C. The flight spoilers continue to provide lateral control when being used as speed brakes. When speed brakes are on, the ratio changer reduces the magnitude of the roll control signal to the spoiler mixer. This reduces the amount of angular movement of the spoiler panels for a given control wheel position. With the aileron control wheels in neutral, moving the speed brake control lever will cause the flight spoilers on both wings to rise symmetrically. If the aileron control wheels are now rotated, the ailerons will operate normally, and the spoiler panels on the wing going down can rise to their maximum position. The spoiler panels on the wing going up can fall to their minimum position (faired with the wing). The flight spoiler maximum position is 40 degrees up.

D. Normally the spoiler control signals are through the captain's control cables, the aileron power control package, and the spring cartridge to the ratio changer input rod. The first officer's control cables duplicate the motion of the captain's control cables. However, due to a lost motion device built into the transfer mechanism at the base of the first officer's control column, the first officer's control cables "float" and are actually driven by the powered aileron system through the spring cartridge. If aileron hydraulic power is off, approximately 12 degrees of control wheel travel either way from neutral will take up the lost motion and start to drive the first officer's cables. This, in turn, moves the spoiler control quadrant to initiate spoiler action. In the same manner, the spoilers may be operated by the first officer's control cables in case of a malfunction, which immobilizes the captain's cables or control column. In this case, only the first officer's control wheel transmits motion to actuate the spoilers. A wheel load of 80 to 120 pounds overcomes the spring preload in the transfer mechanism allowing the first officer's control wheel to move independently from the captain's control wheel. If a malfunction immobilizes the first officer's control cables, the captain's control wheel will operate the aileron control system after overcoming the transfer mechanism spring preload.



Flight Spoiler Hydraulic System Schematic
Figure 8

FLIGHT SPOILER CONTROL SYSTEM - TROUBLE SHOOTING

1. FLIGHT SPOILER CONTROL SYSTEM TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flight spoilers do not operate	Shear rivets on spoiler control quadrant shaft are sheared	Check witness hole on aileron input crank lever	Replace shear rivets (Ref 27-61-41, Approved Repair)
	No hydraulic pressure available	See Chapter 29, Hydraulic System - Trouble Shooting	
Spoilers do not start to rise within allowable control wheel rotation from neutral OR spoilers do not rise to full up position	Insufficient tension on cables to actuator quadrants	Check cable tension	Adjust tension per 27-61-0, Adjust Spoiler Control System Wing Cables and Actuators
	Spoiler-mixer cam follower out of adjustment	Open grease fitting access covers on aft surface of spoiler-mixer. Rotate captain's control wheel clockwise 87 degrees from neutral and then counterclockwise 87 degrees from neutral. Check that applicable cam follower is on maximum rise portion of cam at 87-degree position	Adjust spoiler mixer per 27-61-0, Adjustment/Test

Flight Spoiler Control System Troubleshooting Chart
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Inboard or out-board flight spoilers do not operate	Defective motor operated hydrau lic shutoff valve	Check that spoiler shutoff valve position indicator moves to position 1 when spoiler switches are turned on and returns to position 2 when spoiler switches are turned off. If not, spoiler shutoff valve actuator is defective	Replace spoiler shutoff valve per 27-09-221
Spoilers do not rise when con-trol wheel is rotated from neutral	Wing cables jam-med or broken	Check wing cable runs for broken or jammed cables	Correct as required
	Spoiler mixer defective	Check spoiler mixer output quadrants when control wheel is rotated. Spoiler mixer is defective if quadrant does not move correctly	Replace spoiler mixer
Travel of adja-- cent spoilers is restricted	Tension in cables to actuator quadrants is low	Check cable tension	Adjust cable ten-sion per 27-61-0, Adjust Spoiler Control System Wing Cables
Spoiler does not fair	Actuator quadrant and/or actuator piston rod end improperly adjusted	Check position of spoiler panel. If panel does not fair with control wheel in neutral position, quadrant and/or actuator piston rod end requires adjustment	Adjust actuator quadrant and/or actuator piston rod end per 27-61-0, Adjustment/ Test section
One flight spoiler does not operate	Rivet sheared connecting actuator quadrant to gooseneck lever	Check scribe marks on quadrant. If marks do not align rivet is sheared. Check quadrant and actuator for cause of sheared rivet	Replace shear rivet (Ref 27-61-61, Approved Repair
	Flight spoiler actuator in-operative	Check actuator quadrant movement when control wheel is rotated. Actuator is defective if quadrant moves correctly and spoiler does not	Replace spoiler actuator

Flight Spoiler Control System Troubleshooting Chart
Figure 101 (Sheet 2)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive external leakage in spoiler actuator			Replace spoiler actuator
Sluggish operation of one spoiler	Defective spoiler actuator	Operate spoilers and check actuator for evidence of overheating	Replace spoiler actuator
One spoiler does not raise to same angle during repeated tests	Spoiler hinges or rod end bearings worn	Check spoiler wear per inspection/check section	Repair or replace worn parts
Spoilers do not raise to same angle during repeated tests	Spoiler mixer or ratio changer worn	Check spoiler mixer and ratio changer for wear	Replace spoiler mixer or ratio changer

Flight Spoiler Control System Troubleshooting Chart
Figure 101 (Sheet 3)

FLIGHT SPOILER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General
   A. Hydraulic systems A and B must be depressurized prior to performing maintenance on flight spoiler control system components. This is to prevent injury to personnel, resulting from inadvertent operation of the control system while maintenance is being performed. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of control surface travel.

      WARNING: PRESSURIZING THE FLIGHT SPOILER SYSTEM ALSO ACTIVATES FLAPS, GROUND SPOILERS, AILERONS, RUDDER, AND ELEVATOR HYDRAULIC SYSTEMS. ISOLATE AND TAG ALL FLIGHT CONTROL SYSTEMS NOT BEING TESTED AND ENSURE THAT ALL CONTROL SURFACES ARE CLEAR OF OBSTRUCTIONS AND PERSONNEL BEFORE APPLYING POWER.

   B. When operating hydraulic system B pumps to pressurize hydraulic systems A and B, the following requirements must be observed:
      (1) At least 1675 pounds (761 kilograms) of fuel are required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days, or when fuel temperature is known to be above 90°F (32.2°C), monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5-minute period. Following the fifth start, run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. The following procedure covers pressurization of hydraulic systems B and A through operation of electrical-driven hydraulic system B pumps only. Pressurization of hydraulic systems A through operation of engine-driven hydraulic system A power is not covered.
2. Spoiler Hydraulic System A and B Pressurization
   A. Equipment and Materials
      (1) Lock Assembly - Ground, F72735
   B. Provide spoiler system A and B hydraulic pressure.
      (1) Connect electrical power to airplane.
      (2) Ensure that SPOILER SHUTOFF VALVES circuit breaker on P6 circuit breaker panel is closed.
      (3) Set parking brake and install ground lock assembly in nose gear.
      (4) Position GRD INTERCONNECT switch on forward overhead panel to OPEN.
      (5) Position No. 1 or No. 2 system B HYD PUMPS switches on forward overhead panel to ON.

(6) Position SPOILER A and B switches on forward overhead panel to ON.

NOTE: To pressurize system A or system B separately, select system by appropriate positioning of SPOILER A and B switches.

C. Restore Airplane to Normal

NOTE: Perform the following steps after completing flight spoiler system maintenance that required pressurization.

(1) Position No. 1 and 2 system B HYD PUMPS switches to OFF.
(2) Position GRD INTERCONNECT switch to CLOSE.
(3) Remove electrical power.
(4) Remove ground lock assembly.

3. Spoiler Hydraulic System A and B Depressurization

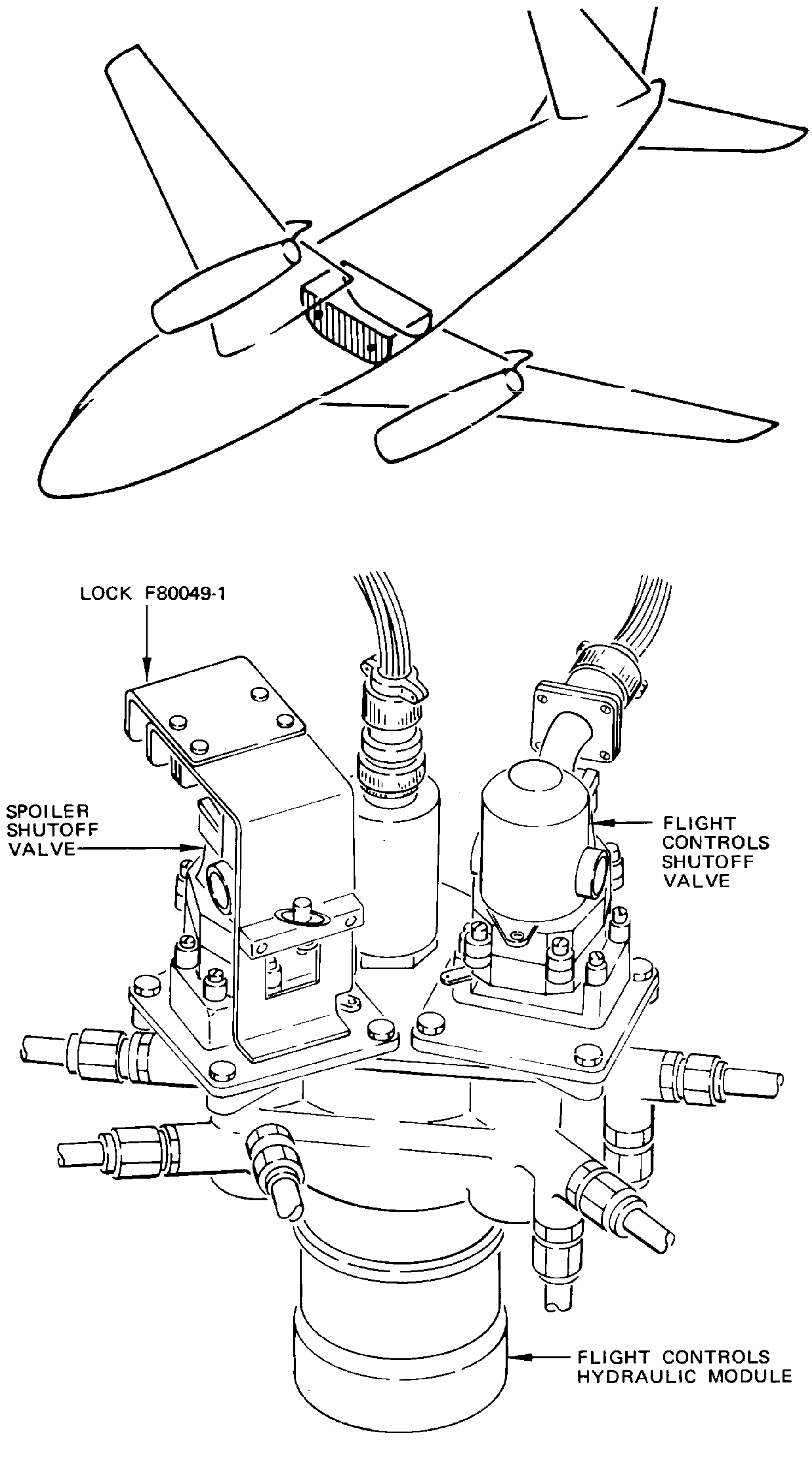
A. Equipment and Materials
(1) Lock Assembly - F80049-1 (2 required)

B. Depressurize spoiler hydraulic systems A and B.
(1) Position SPOILER A and B switches on the forward overhead panel to OFF.
(2) Open all flight control circuit breakers on P6 circuit breaker panel.
(3) Position No. 1 and 2 system B HYD PUMPS switches on forward overhead panel to OFF.
(4) Position GRD INTERCONNECT switch on forward overhead panel to CLOSE.
(5) To dissipate one remaining hydraulic power, cycle captain's control wheel.
(6) If any hydraulic connections are to be disturbed, depressurize hydraulic system A and system B reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
(7) Install hydraulic module locks. (See figure 201.)
(a) Disconnect electrical connector from spoiler shutoff valve at system A flight controls hydraulic module in left wheel well.
(b) Disconnect electrical connector from spoiler shutoff valve at system B flight controls hydraulic module in right wheel well.
(c) Manually place override lever at both spoiler shutoff valves in position 2.
(d) Install lock on each spoiler shutoff valve and insert attaching lockpins.

C. Restore Airplane to Normal

NOTE: Perform the following steps after completing spoiler system maintenance that required depressurization.

(1) Remove locks from system A and B flight control hydraulic module shutoff valves and reconnect electrical connectors.



Hydraulic Module Lock Installation
Figure 201

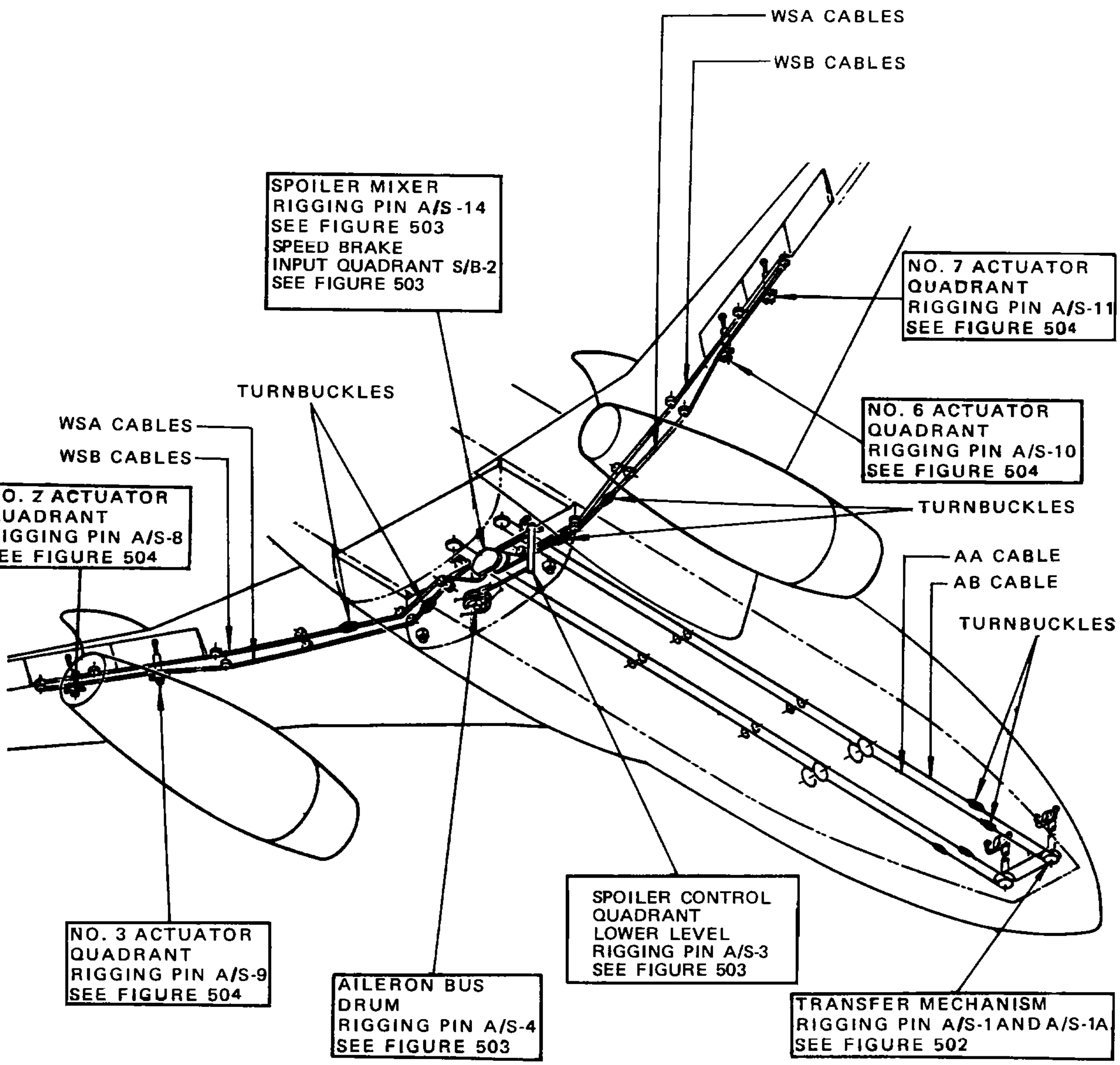
(2) Position SPOILER A and B switches on forward overhead panel to ON.
(3) Close all flight control circuit breakers on P6 circuit breaker panel.
(4) Pressurize hydraulic reservoirs as required. Refer to 29-09-300.

SPOILER CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. The spoiler control system provides lateral control and speed brake signals through the spoiler mixer to the flight spoiler actuators. The speed brake signals also control the ground spoilers (AMM 27-62-0, Speed Brake Control System).

      WARNING: ALL FLIGHT CONTROL SYSTEMS ARE FULLY POWERED. CHECK TO MAKE SURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON.

   B. Some airplanes have a metal-cal on the aileron control wheels, which is calibrated in degrees of control wheel rotation. These metal-cals are for flight crew use. Do not use these metal-cals when adjusting or testing the spoiler control system.
   C. The following conditions must be met before adjusting or testing the spoiler control system:
      (1) Aileron control system must be properly adjusted (AMM 27-11-0/501, Aileron and Aileron Trim Control System).
      (2) Wing trailing edge flaps must be properly adjusted (AMM 27-51-0/501, Trailing Edge Flap System).
      (3) Speed brake system must be properly adjusted. However, both systems must be in adjustment, prior to testing either system (AMM 27-62-0/501, Speed Brake Control System).
2. Spoiler Control System Adjustment
   A. General
      (1) The spoiler control system will be properly adjusted when the individual components are adjusted to meet the following conditions. See Fig. 501 for rigging pin locations and cable tension requirements.
         (a) Right Aileron Control Cables
            1) With rigging pins A/S-1 and A/S-14 installed, rigging pin A/S-3 fits freely and cable tension is within 15 pounds of required value. If not, these conditions may be met by adjusting turnbuckles in lower nose compartment,
         (b) Aileron Spring Cartridge
            1) With rigging pins A/S-3 and A/S-4 installed, the aileron spring cartridge is not deflected. This condition may be checked by removing rod end bolt and checking that it may be reinstalled freely. If not, this condition may be met by adjusting rod end.



Spoiler Control System - Rigging Pin Locations and Cable Tension
Figure 501 (Sheet 1)

TABLE 1

TEMP °F 1	AA & AB CABLE TENSION-POUNDS (+10/-0) 2	WSA & SWB CABLE TENSION-POUNDS (+10/-0) 3
110	133	81
90	124	75
70	115	70
50	107	66
30	99	61
10	90	56
-10	82	50
-30	74	45
-40	68	41

1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS. THE TENSIONS MAY DEVIATE (± 15) POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

3 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSION MAY DEVIATE +15/-20 POUNDS FROM TABLE 1 VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS. THE TENSIONS MAY DEVIATE (± 15) POUNDS FROM TABLE 1 VALUES. WHENEVER CABLES ARE READJUSTED, TABLE 1 VALUES MUST BE MET.

Spoiler Control System - Rigging Pin Locations and Cable Tension
Figure 501 (Sheet 2)

(c) Adjust Spoiler Wing Cables
1) With rigging pin A/S-14 installed rigging pins A/S-8, A/S-9, A/S-10, and A/S-11 fit freely and cable tension is within 15 pounds of required value. If not, these conditions may be met by adjusting turnbuckles in wheel well.

(d) Ratio Changer Input Rod
1) With rigging pin A/S-14 installed, rigging pin A/S-3 fits freely. If not, this condition may be met by adjusting ratio changer input rod.

(e) Spoiler to Flap Clearance (Hydraulic Power On)
1) With hydraulic power on, retract the flaps to the up position by placing the flap control lever in the FLAP UP detent. The flight spoiler to flap clearance is 0.03 +0.10/-0.00 inch measured at actuator centerline. If not, this condition may be met by adjusting actuator rod end.

(f) Spoiler Actuator Input Lever (Hydraulic Power On)
1) When rotating the captain's control wheel from 50 degrees counterclockwise toward neutral the No. 2 and 3 flight spoilers reach full down at the 4 ±2 degrees counterclockwise wheel position.
2) When rotating the captain's control wheel from 50 degrees clockwise toward neutral the No. 6 and 7 flight spoilers reach full down at the 4 ±2 degree clockwise wheel position.
3) Requirements 1) or 2) may be met by adjusting actuator input lever.

(g) Spoiler Mix (Hydraulic Power On) (Optional)

<u>NOTE</u>: This check is optional, and need be performed only if spoiler full up and down travel responses at zero speed brakes are not met.

1) With spoiler mixer grease fitting access covers removed and captain's control wheel rotated 87 degrees counterclockwise, the left cam follower is on the maximum rise portion of the spoiler mixer cam.
2) With spoiler mixer grease fitting access covers removed and captain's control wheel rotated 87 degrees clockwise, the right cam follower is on the maximum rise portion of the spoiler mixer cam.
3) Requirements of 1) or 2) may be met by adjusting speed brake cables SBA and SBB.

B. Equipment and Materials
(1) Cable Tensiometer - 0- to 150-pound range for 1/8-inch cable

(2) Rigging Pins Kit - F70207-3, -52, -61, or -84:

Ref No.	F70207-( )	Diameter (inches)	Length (inches)	Function
A/S-1	-13	0.309-0.311	2.35 ±0.06	Transfer mechanism
A/S-1A	-11	0.309-0.311	6.7 ±0.25	Transfer mechanism
A/S-3	-8	0.309-0.311	3.7 ±0.25	Spoiler control quadrant lower lever
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum
A/S-8	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-9	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-10	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-11	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-14	-11	0.309-0.311	6.7 ±0.25	Spoiler mixer
S/B-2	-13	0.309-0.311	2.35 ±0.06	Speed brake input quadrant

(3) Feeler Gage Set - capacity of at least 0.30 inch
(4) Corrosion Preventive Compound - MIL-C-11796, Class 3
(5) Control Surface Protractor - 4MIT65B80307-1 (preferred), F52485-500 (optional) (2 required)

NOTE: One protractor with stand (item (12) following) is for measuring angular position of spoiler panels. Protractor may be hand-held on spoiler instead of using stand. One protractor with mount (item (13) following) is for measuring angular position of control wheel.

(6) Control Surface Protractor Stand Assembly - F71292-17 (optional)
(7) Aileron Control Wheel Protractor Mount - F72790
(8) Control Wheel Straightedge - SE27-0001
(9) Sealant - BMS 5-95 (AMM 20-30-11)

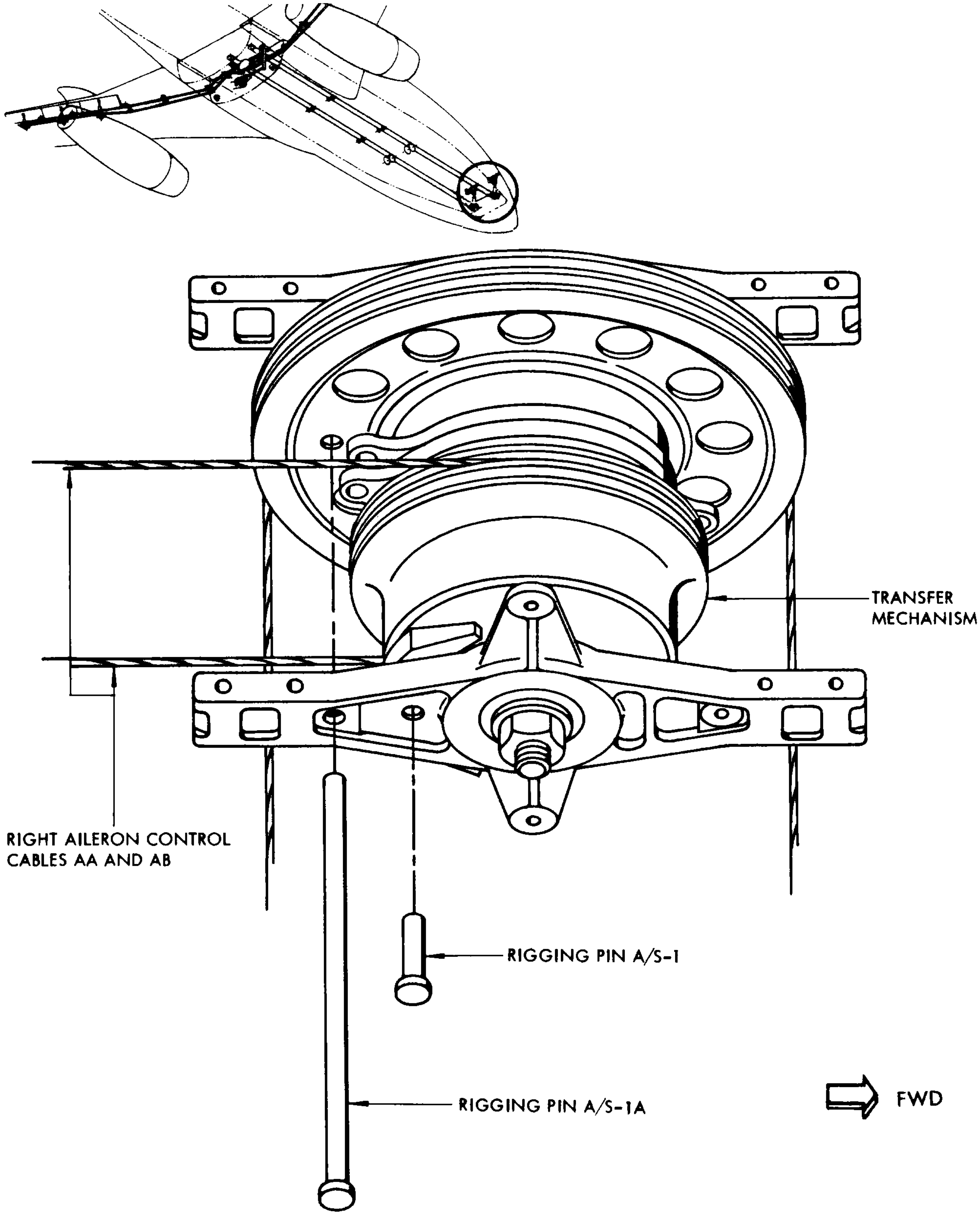
C. Adjust Spoiler Control System
   (1) Remove systems A and B hydraulic power (AMM 27-61-0/201).
   (2) Adjust Right Aileron Control Cables (AA and AB).
      (a) Open nose compartment access door.
      (b) Insert aileron rigging pin No. A/S-1 and A/S-1A in transfer mechanism at base of first officer's control column (Fig. 502).

      NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

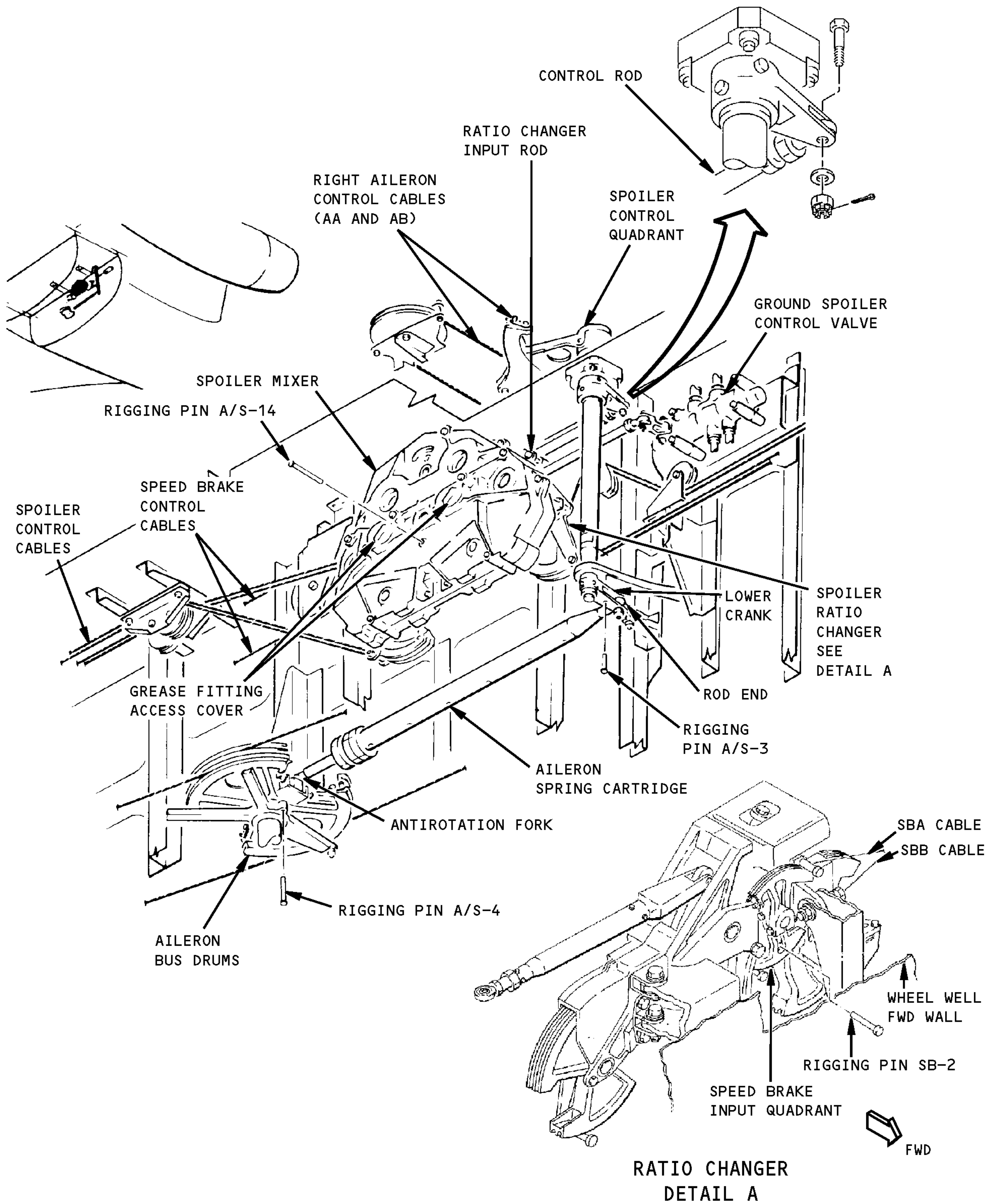
      (c) Check that rigging pin No. A/S-3 fits freely through rigging pin hole in lower lever at spoiler control quadrant (Fig. 503).
      (d) Check that tension in right aileron control cables AA and AB is within value required for ambient temperature. See temperature-tension chart in Fig. 501 for required cable tension. Check that tension in cables AA and AB is balanced.
      (e) If a new AA or AB cable is installed:
         1) Tension cables to twice the value required for ambient temperature. See temperature-tension chart in Fig. 501.

         NOTE: Turnbuckles are located in lower nose compartment.

         2) Remove rigging pins No. A/S-1, A/S-1A and A/S-3.
         3) Cycle aileron control system 20 times to maximum travel limits.
      (f) If checks in steps (c) and (d) are not met or if step (e) was accomplished, use turnbuckles to adjust cable tension as follows:
         1) Install rigging pins A/S-1 and A/S-1A in transfer mechanism (Fig. 502).
         2) Adjust cables AA and AB so that rigging pin A/S-3 can be freely inserted in rigging pin hole in lower crank at spoiler control quadrant (Fig. 503).



Transfer Mechanism Rigging Pin Location
Figure 502



Spoiler Mixer and Ratio Changer Linkage
Figure 503

3) Check that cable tension is balanced and is within values shown in Fig. 501.
4) Install turnbuckle-locking clips.
5) Remove rigging pins No. A/S-1, A/S-1A and A/S-3.

(3) Adjust Aileron Spring Cartridge
(a) Disconnect aileron spring cartridge at spoiler control quadrant lower crank (Fig. 503).
(b) Install rigging pin No. A/S-3 in spoiler control quadrant lower crank.
(c) Install rigging pin No. A/S-4 at aileron bus drum.
(d) Check that rod end bolt can be inserted freely without deflecting spring cartridge. If bolt does not fit freely:
1) Loosen rod end checknut.
2) Adjust rod end until bolt will fit.
3) Tighten rod end checknut within 10 to 20 pound-inch torque range.
(e) Connect aileron spring cartridge at spoiler control quadrant lower crank.
1) Ensure that spring cartridge is positioned with drain holes down and antirotation fork on lower side of lower crank clevis.
2) Install rod end bolt with head up. Secure with spacer, washer, nut and cotter pin.
(f) Remove rigging pins No. A/S-3 and A/S-4.

(4) Adjust Spoiler Wing Cables (WSA1, WSA2, WSB1 and WSB2)

NOTE: Cables WSA1 and WSB1 control flight spoilers No. 2 and 7. Cables WSA 2 and WSB2 control flight spoilers No. 3 and 6.

(a) Set speed brake control lever to DOWN detent and ensure that aileron control system is in neutral.
(b) Install rigging pin A/S-14 in spoiler mixer and SB-2 in ratio changer (Fig. 503).
(c) Check that rigging pins A/S-8 and A/S-9 can be freely inserted in spoiler actuator quadrants on left wing (Fig. 504).

(d) Check that rigging pins A/S-10 and A/S-11 can be freely inserted in spoiler actuator quadrants on right wing.

(e) With rigging pins installed per steps (b), (c) and (d) check that tension in spoiler wing cables WSA1, WSA2, WSB1 and WSB2 is within 15 pounds of required value for ambient temperature. See temperature - tension chart in Fig. 501 for required cable tension.

(f) If a new spoiler wing cable (WSA1, WSA2, WSB1, WSB2) is installed:

1) Tension cables to twice the value required for ambient temperature. See temperature-tension chart in Fig. 501.
2) Remove rigging pins A/S-14, SB-2 and A/S-8 thru A/S-11.
3) With speed brake control lever in DOWN position actuate aileron control wheel through 20 full travel cycles.

NOTE: Spoiler mixer must be installed to cycle spoiler wing cables.

4) With speed brake control lever in UP position actuate aileron control wheel through 20 full travel cycles.
5) Set speed brake control lever to DOWN position.
6) Reinstall rigging pins A/S-14, SB-2 and A/S-8 thru A/S-11.

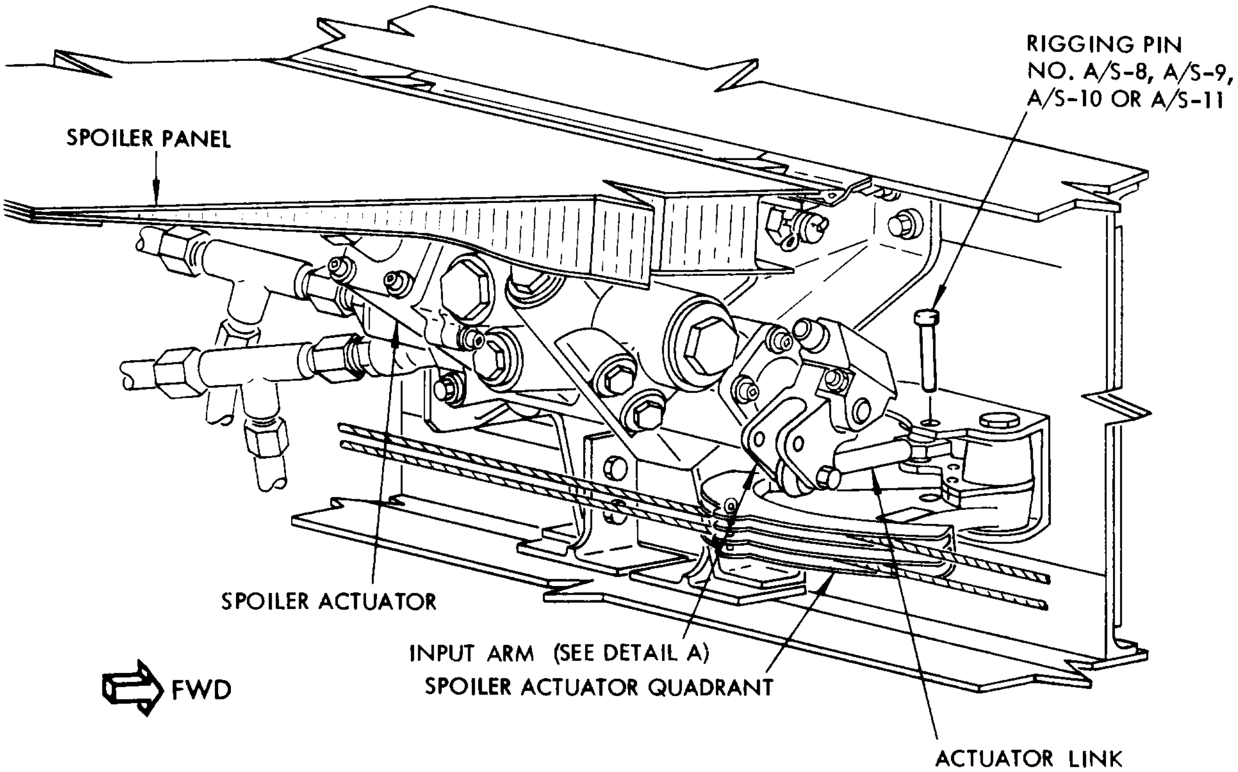
(g) If checks in steps (c), (d) or (e) are not met or if step (f) was accomplished, use turnbuckles to adjust cable tension within +10/-0 pounds of required values in temperature-tension chart in Fig. 501.

(h) Install turnbuckle locking clips and lockwire adjacent turnbuckles together (Fig. 505).

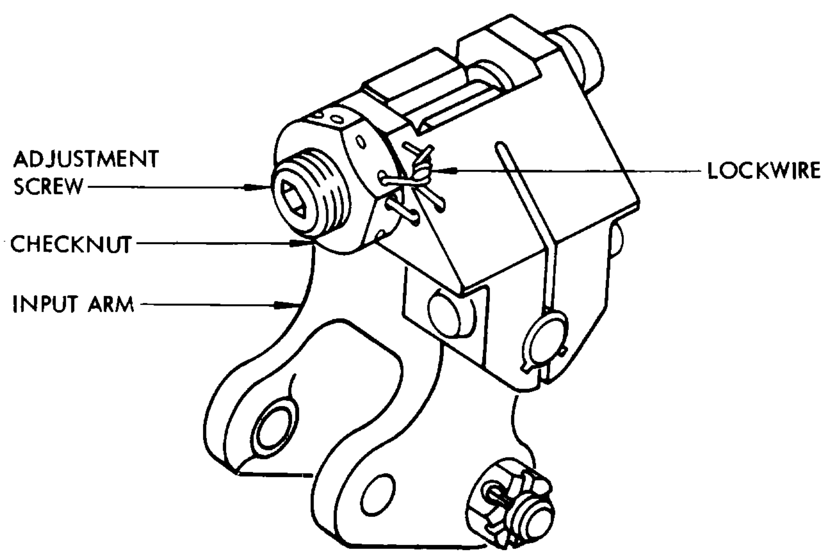
(i) Remove rigging pins A/S-14, SB-2 and A/S-8 thru A/S-11.

(5) Adjust Ratio Changer Input Rod

CAUTION: Step (5)(c)5) thru (c)7) is a critical installation step subject to mis-assembly that could result in the linkage disconnecting from the aft aileron control quadrant, affecting safe flight and landing.



TYPICAL OF FLIGHT SPOILER NO. 2,3,6 AND 7



DETAIL A

Flight Spoiler Actuator
Figure 504

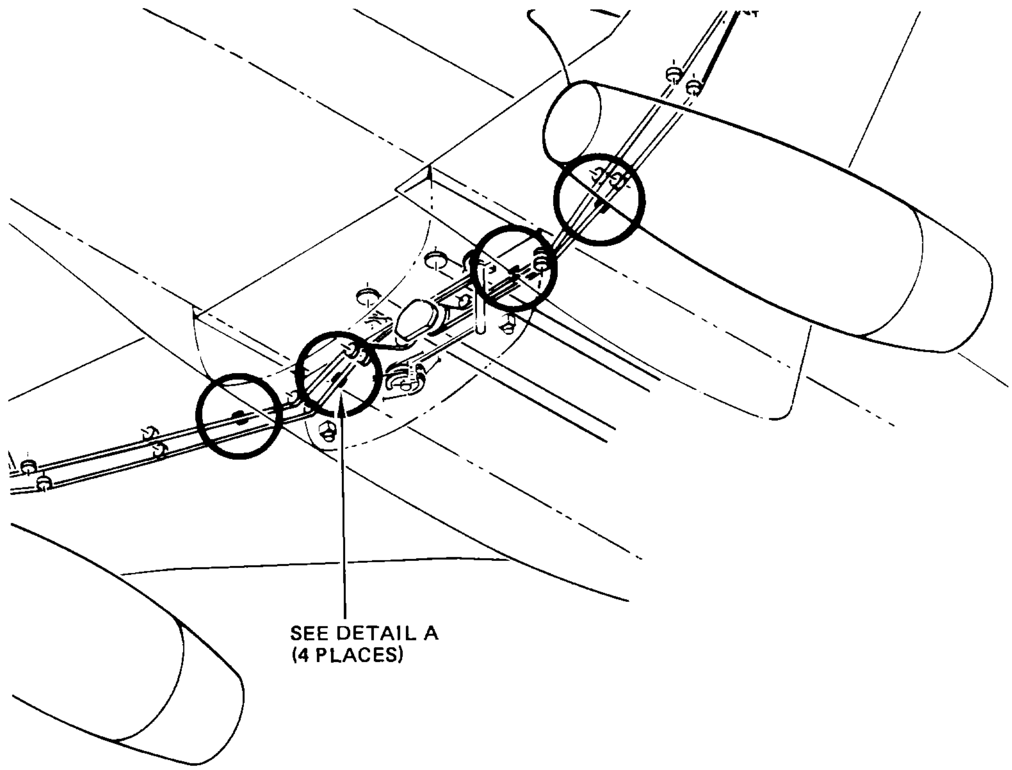
(a) Set speed brake control lever to DOWN position and make sure that aileron control system is in neutral.
(b) Insert rigging pins A/S-14 in spoiler mixer and SB-2 in ratio changer (Fig. 503).
(c) Check that rigging pin A/S-3 fits freely through rigging pin hole in lower crank at spoiler control quadrant. If rigging pin does not fit freely:
   1) Remove bolt to disconnect ratio changer input rod from upper crank at spoiler control quadrant.
   2) Install rigging pin A/S-3.
   3) Loosen the checknut on the input rod.
   4) Adjust the rod end until you can install the bolt to attach the input rod.
   5) Install the bolt with the head up.
   6) Install the washer, nut, and cotter pin on the bolt.
   7) Tighten the checknut on the input rod.
(d) Remove the rig pins A/S-3, A/S-14 and SB-2.

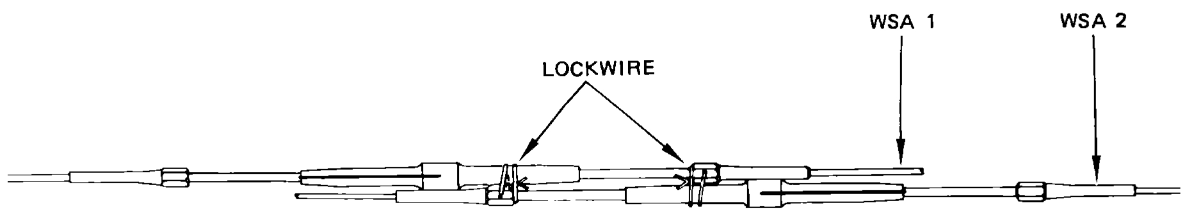
(6) Adjust Spoiler to Flap Clearance
(a) Provide electrical power to airplane.
(b) Provide systems A and B hydraulic power (AMM 27-61-0/201).
(c) Place speed brake control lever in FLIGHT DETENT position to raise all spoiler panels.

NOTE: Raising spoilers will make sure that trailing edge flaps do not strike spoilers during retraction.

(d) With hydraulic power on, retract the flaps to the up position by placing the flap control lever in the FLAP UP detent.
(e) Remove systems A and B hydraulic power (AMM 27-61-0/201).
(f) Place speed brake control lever in DOWN position.
(g) Using hand pressure on upper surface of spoiler panel, push down until actuator piston bottoms.
(h) Check that spoiler to flap clearance for flight spoilers No. 2, 3, 6, and 7 is 0.03 +0.10/-0.00 inch. Measure at point of minimum clearance (Fig. 506).

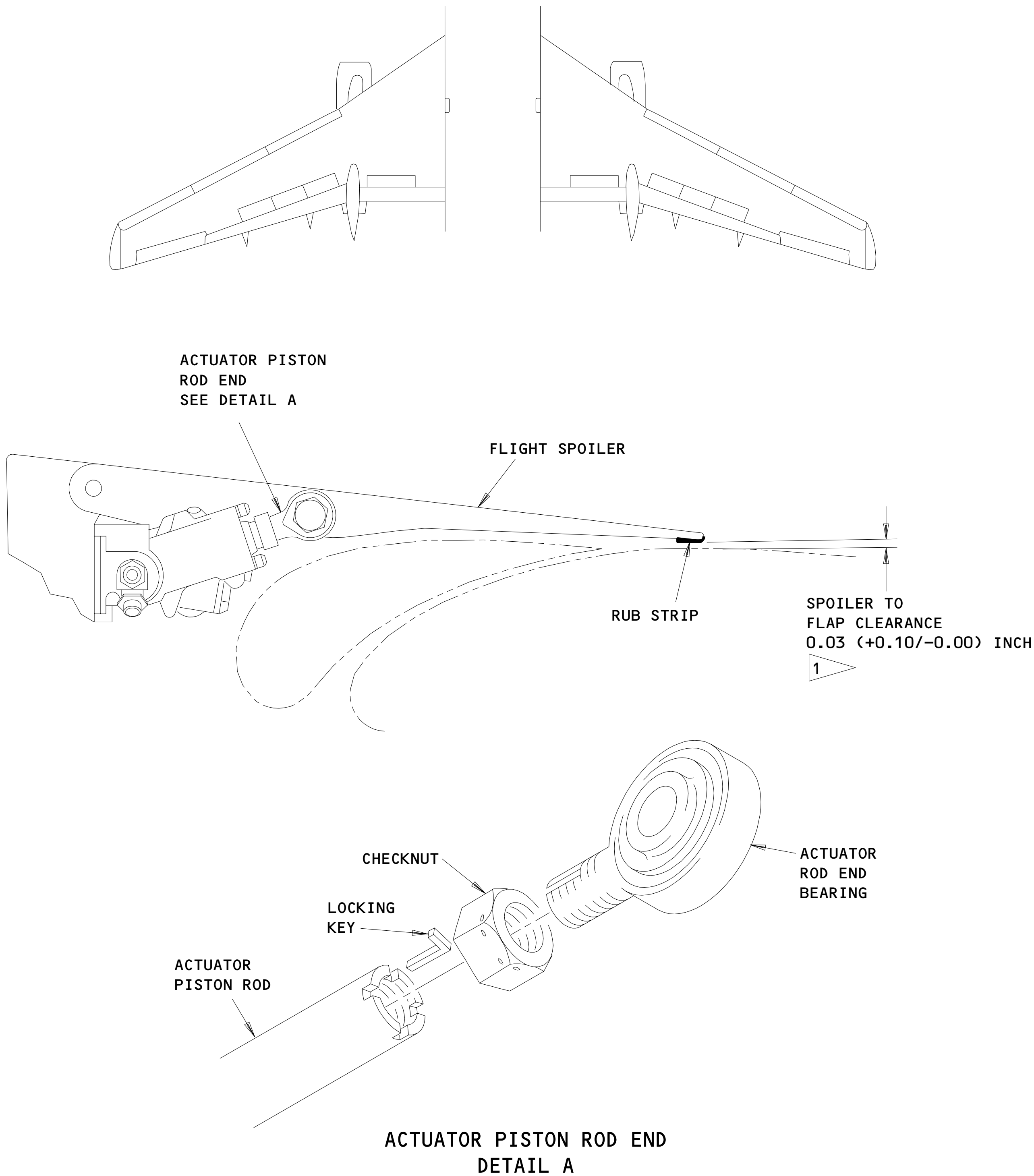
NOTE: Minimum spoiler panel gap measured along panel span at trailing edge need only be sufficient to make sure that panel has clearance with flap.





DETAIL A
(TYPICAL 4 PLACES)

Wing Spoiler Cable Turnbuckles
Figure 505



1 MEASURE AT POINT OF MINIMUM CLEARANCE

Flight Spoiler Panel Adjustment
Figure 506

(i) If spoiler to flap clearance is not within limits:
  1) Provide systems A and B hydraulic power (AMM 27-61-0/201).
  2) Provide access to spoiler actuator by either lowering flaps and opening applicable trailing edge panel or by placing speed brake control lever in UP position to raise spoilers. Depressurize systems A and B hydraulic power (AMM 27-61-0/201).

     WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

  3) Break lockwire and loosen checknut on actuator rod end.
  4) Disengage locking key from piston rod.
  5) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each quarter turn will change spoiler to flap clearance by approximately 0.10 inch.

     CAUTION: TURNING PISTON ROD WHEN ACTUATOR IS PRESSURED WILL DAMAGE ACTUATOR.

  6) Engage locking key with piston rod.
  7) Coat rod end threads with corrosion preventive compound.
  8) Tighten rod end checknut to 350-400 pound-inches.
  9) Lockwire checknut to locking key.
  10) Apply a bead of sealant to the rod end checknut.

(j) Provide systems A and B hydraulic power.
(k) Lower spoilers or raise flaps, as applicable.
(l) Rotate captain's control wheel clockwise to make sure that flight spoilers No. 2 and 3 are full down.
(m) Remove systems A and B hydraulic power (AMM 27-61-0).
(n) Check that spoiler to flap clearance for flight spoilers No. 2 and 3 is 0.03 +0.10/-0.00 inch.
(o) Rotate captain's control wheel counterclockwise to make sure that flight spoilers 6 and 7 are full down.
(p) Remove systems A and B hydraulic power (AMM 27-61-0).

(q) Check that spoiler to flap clearance for flight spoilers No. 6 and 7 is 0.03 +0.10/-0.00 inch.
(r) If spoiler to flap clearances are not within limits, repeat step (i).

(7) Adjust Spoiler Actuator Input Lever
(a) Provide systems A and B hydraulic power (AMM 27-61-0).
(b) Turn captain's control wheel clockwise from neutral to ensure that flight spoilers No. 2 and 3 are fully retracted.
(c) Install protractor mount and protractor on captain's aileron control wheel.
(d) Place straightedge across both aileron control wheels and set protractor on captain's control wheel to zero with control wheels in this position. Remove straightedge.
(e) Install control surface protractor stand and protractor on flight spoiler No. 2. Set protractor to zero.

NOTE: Protractor may be handheld on spoiler instead of using stand.

(f) Rotate captain's control wheel counterclockwise 50 ±5 degrees and return toward neutral.
(g) Check that spoiler is fully retracted when captain's control wheel is 4 ±2 degrees counterclockwise from neutral. Turn captain's control wheel clockwise 5 degrees from neutral to ensure that actuator pistons are bottomed. Check that spoilers do not move. Check that spoiler-to-flap clearance remains at 0.03 +0.10/-0.00 inch.
(h) Repeat steps (b) thru (g) for flight spoiler No. 3.
(i) If check in step (g) or (h) are not within limits:
1) Lower flaps by placing flap control lever in FLAP DOWN detent.
2) Hold captain's control wheel at 9 ±1 degrees counterclockwise from neutral.
3) Break lockwire on input arm adjusting screw and loosen checknut (Fig. 504).
4) Using adjusting screw, set No. 2 and 3 actuators so that spoiler panels begin to rise from zero (fully retracted) position.
5) Raise flaps by placing flap control lever in FLAP UP detent.
6) Release captain's control wheel and repeat steps (f) and (g).

7) Tighten checknut on input lever adjusting screw 30 to 40 pound-inches and install lockwire.

(j) Turn captain's control wheel counterclockwise from neutral to ensure that flight spoilers No. 6 and 7 are fully retracted.

(k) Install control surface protractor stand and protractor on flight spoiler No. 7. Set protractor to zero.

NOTE: Protractor may be handheld on spoiler instead of using stand.

(l) Rotate captain's control wheel clockwise 50 ±5 degrees and return toward neutral.

(m) Check that spoiler is fully retracted when captain's control wheel is 4 ±2 degrees clockwise from neutral. Turn captain's control wheel counterclockwise 5 degrees from neutral to ensure that actuator pistons are bottomed. Check that spoilers do not move. Check that spoiler-to-flap clearance remains at 0.03 +0.10/0.00 inch.

(n) Repeat steps (j) thru (m) for flight spoiler No. 6

(o) If check in step (m) or (n) are not within limits:

1) Lower flaps by placing flap control lever in FLAP DOWN detent.
2) Hold captain's control wheel at 9 ±1 degrees clockwise from neutral.
3) Break lockwire on input lever adjusting screw and loosen checknut.
4) Using adjusting screw, set No. 6 and 7 actuators so that spoiler panels begin to rise from zero (fully retracted) position.
5) Raise flaps by placing flap control lever in FLAP UP detent.
6) Release captain's control wheel and repeat steps (l) and (m).
7) Tighten checknut on input lever adjusting screw 30 to 40 pound-inches. Install lockwire.

(p) Move speed brake control lever until flight spoilers No. 2, 3, 6, and 7 rise 15 ±1 degrees measured by protractors positioned on spoilers. Any one spoiler panel shall not vary from position of the other three by more than 1/2 degree. If not within limits, repeat step (i).

(q) Remove protractors and protractor stands from spoilers.

(8) Adjust Spoiler Mixer (Optional)

NOTE: This check is optional, and need be performed only if spoiler full up and down travel responses at zero speed brakes are not met.

(a) Open grease fitting access covers on aft surface of spoiler mixer (Fig. 503).
(b) Set speed brake control lever in DOWN position.
(c) Rotate captain's control wheel counterclockwise 87 degrees from neutral.
(d) Check that left cam follower is on maximum rise portion of spoiler mixer cam (viewed through left grease fitting access hole).
(e) Return captain's control wheel to neutral.
(f) Rotate captain's control wheel clockwise 87 degrees from neutral.
(g) Check that right cam follower is on maximum rise portion of spoiler mixer cam (viewed through right grease fitting access hole).
(h) Return captain's control wheel to neutral.
(i) If checks in steps (d) and (g) are not met use turnbuckles to adjust SBA and SBB cables (Fig. 507).
1) Shorten SBB cable by one-half turn and lengthen SBA cable by one-half turn.

NOTE: SBB cable is the lower cable on speed brake quadrant on ratio changer. Speed brake quadrant rotates clockwise (looking forward) when tightening SBB cable.

2) Check that cable tension is within values shown in Fig. 507. Repeat steps (b) thru (g).

NOTE: After adjustment, rigging pin SB-2 need not fit in rigging pin hole.

3) Install turnbuckle locking clips.

(j) Install two grease fitting access covers.

(9) Test Spoiler Control System

D. Restore Airplane to Normal
(1) Remove systems A and B hydraulic power (AMM 27-61-0/201).
(2) Remove protractor and protractor mount from captain's control wheel.
(3) Remove electrical power if no longer required.

3. Spoiler Control System Test

A. General

(1) This test checks operation of flight spoilers (No. 2, 3, 6, and 7). Refer to AMM 27-62-0/501, Speed Brake Control System, for test of ground spoilers (No. 1, 4, 5, and 8), and speed brake operation of flight spoilers.

B. Equipment and Materials

(1) Control Surface Protractor - 4MIT65B80307-1 (preferred), F52485-500 (optional) (3 required)

NOTE: Two protractors with stands (item (2)) are for measuring angular position of spoiler panels. Protractor may be handheld on spoiler instead of using stand. One protractor with mount (item (3)) is for measuring angular position of control wheel.

(2) Control Surface Protractor Stand Assembly - F71292-17 (optional) (2 required)

(3) Aileron Control Wheel Protractor Mount - F72790

(4) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-14	-8	0.309-0.311	6.7 ±0.25	Aileron bus drum

C. Prepare for Test

(1) Install protractor mount and protractor on captain's control wheel. With control wheel in zero position, set protractor to zero.

(2) Install control surface protractor stand and protractor on flight spoiler No. 7. Set protractor to zero.

NOTE: Protractor may be handheld on spoiler instead of using stand.

(3) Provide systems A and B hydraulic power (AMM 27-61-0/201).

D. Test Spoiler Control System

(1) Test Spoiler Response at Zero Speed Brake

(a) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted. Remove rigging pin.

(b) Place speed brake control lever in DOWN position.

(c) Rotate captain's aileron control wheel clockwise. Check that spoiler No. 7 begins to rise at 9 ±1 degrees clockwise from zero.

(d) Rotate captain's aileron control wheel to 87 degrees clockwise. Check that spoiler No. 7 is 38 ±2 degrees up from zero position.

(e) From wheel position in previous step, return control wheel counterclockwise and check that spoiler No. 7 starts down when wheel is positioned at 70 degrees minimum clockwise from zero.

(f) From wheel position in previous step, rotate control wheel counterclockwise and check that all spoilers are full down when wheel is 4 ±2 degrees clockwise from zero.

(g) Install control surface protractor stand and protractor on flight spoiler No. 2. Set protractor to zero.

NOTE: Protractor may be handheld on spoiler instead of using stand.

(h) Rotate control wheel counterclockwise and check that spoiler No. 2 begins to rise at 9 ±1 degrees counterclockwise from zero.

(i) Rotate control wheel to 87 degrees counterclockwise. Check that spoiler No. 2 is 38 ±2 degrees up from zero position.

(j) From wheel position in previous step, return control wheel clockwise and check that spoiler No. 2 starts down when wheel is 70 degrees minimum counterclockwise from zero.

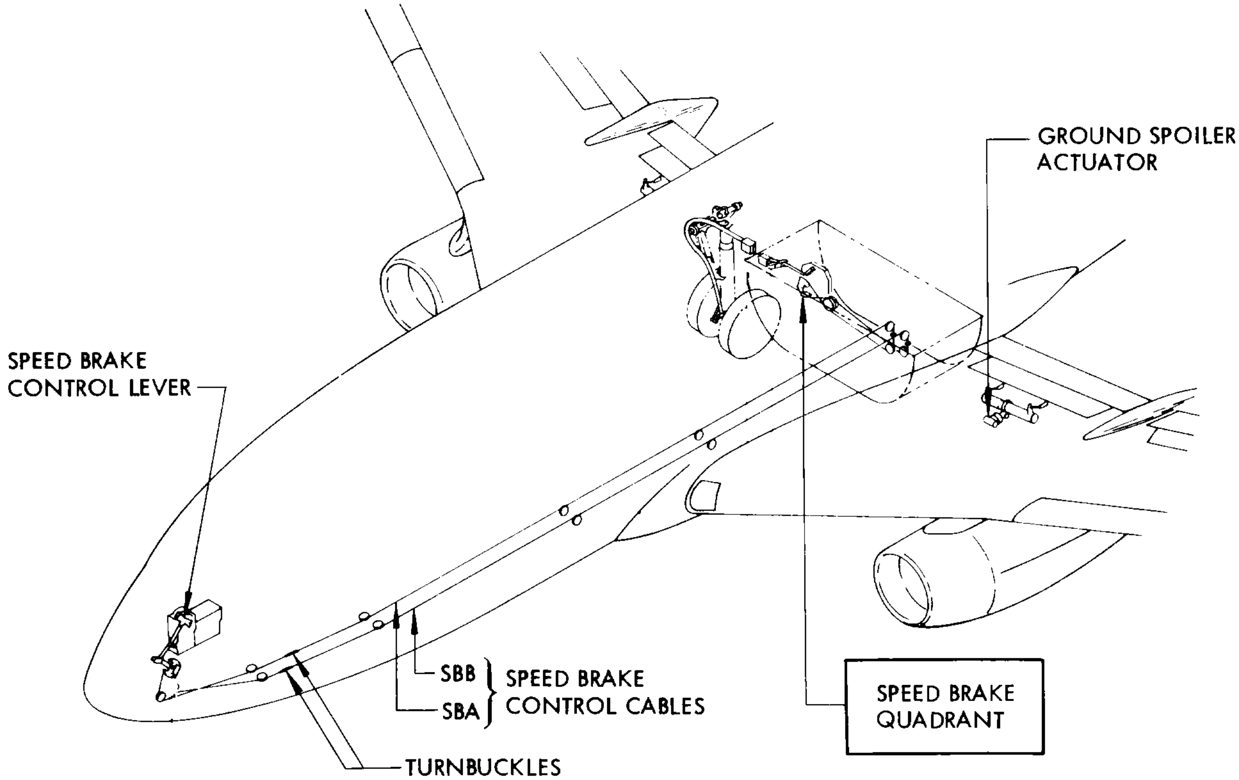
(k) From wheel position in previous step, rotate control wheel clockwise and check that all spoilers are full down when the wheel is 4 ±2 degrees counterclockwise from zero.

(2) Test Spoiler Equalization at Partial Speed Brake
 (a) Set speed brake control lever so that spoiler No. 2 is 15 ±1 degrees up from zero position. Check that spoilers No. 3, 6, and 7 are within ± 0.5 degree of spoiler No. 2.
(3) Test Spoiler Response at Flight Detent Position of Speed Brake
 (a) Set speed brake control lever in FLIGHT DETENT position and check that:
  1) Spoiler No. 2 is 26 ±2 degrees up from zero position. Record value.
  2) Spoiler No. 7 is within ± 1 degree of spoiler No. 2.
(4) Test Spoiler Response at Full Speed Brake
 (a) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted. Remove rigging pin.
 (b) Place speed brake control lever in UP position.
 (c) Set captain's control wheel at zero and check that:
  1) Spoiler No. 2 is 39 ±3 degrees up from zero. Record value.
  2) Spoiler No. 7 is within ± 2 degrees of spoiler No. 2 with a minimum of 36 degrees up from zero.
  3) Spoiler No. 3 fairs with spoiler No. 2 within ± 0.25 inch.
  4) Spoiler No. 6 fairs with spoiler No. 7 within ± 0.25 inch.
 (d) Set captain's control wheel 87 degrees counterclockwise from zero and check that:
  1) Spoiler No. 2 is 39 ±3 degrees up from zero. Record value.
  2) Spoiler No. 7 is partially raised.
 (e) Set captain's control wheel at 87 degrees clockwise from zero and check that:
  1) Spoiler No. 7 is 39 ±3 degrees up from zero. Record value.
  2) Spoiler No. 2 is partially raised.
(5) Test Spoiler Response Time
 (a) Rapidly move speed brake control lever from DOWN to UP and check that flight spoilers actuate from full down to full up in less than 1 second.
 (b) Rapidly move the speed brake control lever from UP to DOWN and check that flight spoilers actuate from full up to full down in less than 1 second.

(6) Test Autopilot Authority (AMM 27-11-0)

NOTE: The autopilot authority test for ailerons also tests autopilot authority for spoilers.

E. Restore Airplane to Normal
(1) Remove systems A and B hydraulic power (AMM 27-61-0).
(2) Remove protractor and protractor mount from captain's control wheel.
(3) Remove protractor and protractor stands from flight spoilers No. 2 and 7.
(4) Remove electrical power if no longer required.



[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

TABLE

TEMP °F [1]	CABLE TENSION - POUNDS (+10/-0)
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

Speed Brake Control Cable Locations and Cable Tension
Figure 507

FLIGHT SPOILERS - REMOVAL/INSTALLATION

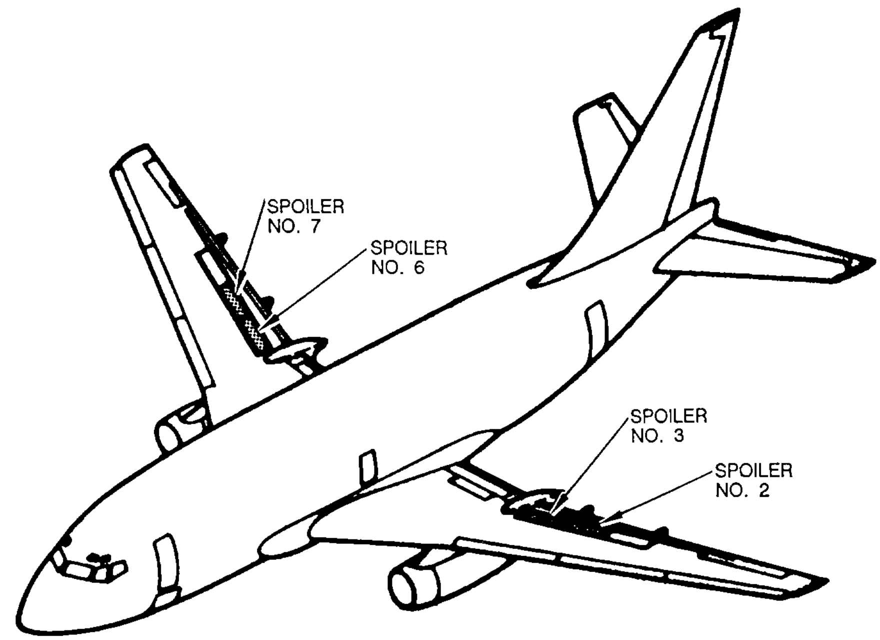
1. General
   A. For interchangeability of graphite/composite flight spoilers with aluminum/fiberglass flight spoilers, refer AMM 27-09-800/201.
2. Equipment and Materials
   A. Flight Spoiler Ground Lock Assy - F80017-33 (Preferred), F80017-23 (Optional) (Use on airplanes with chamfered clevis)
   B. Flight Spoiler Ground Lock Set - C27047-16 (Use on airplanes with rounded clevis)
   C. Corrosion Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-21/201)
3. Prepare for Removal
   A. Provide electrical power.
   B. Provide system A and B hydraulic power (AMM 27-61-0/201).
   C. Place FLT CONTROLS A and B switches on forward overhead panel to ON.
   D. Place flap control lever in FLAP DOWN position to extend trailing edge flaps.
   E. Place speed brake control lever in UP position to raise spoilers.
   F. Install spoiler ground lock on actuator for spoiler being removed.
   G. Remove system A and B hydraulic power (AMM 27-61-0/201).
4. Remove Flight Spoiler
   A. Remove bolt attaching spoiler actuator rod end to spoiler (Fig. 401).
   B. Disconnect bonding jumpers from spoiler. Jumpers are located adjacent to inboard and outboard hinge locations.
   C. Remove four hinge bolts.
   D. Remove spoiler from airplane.

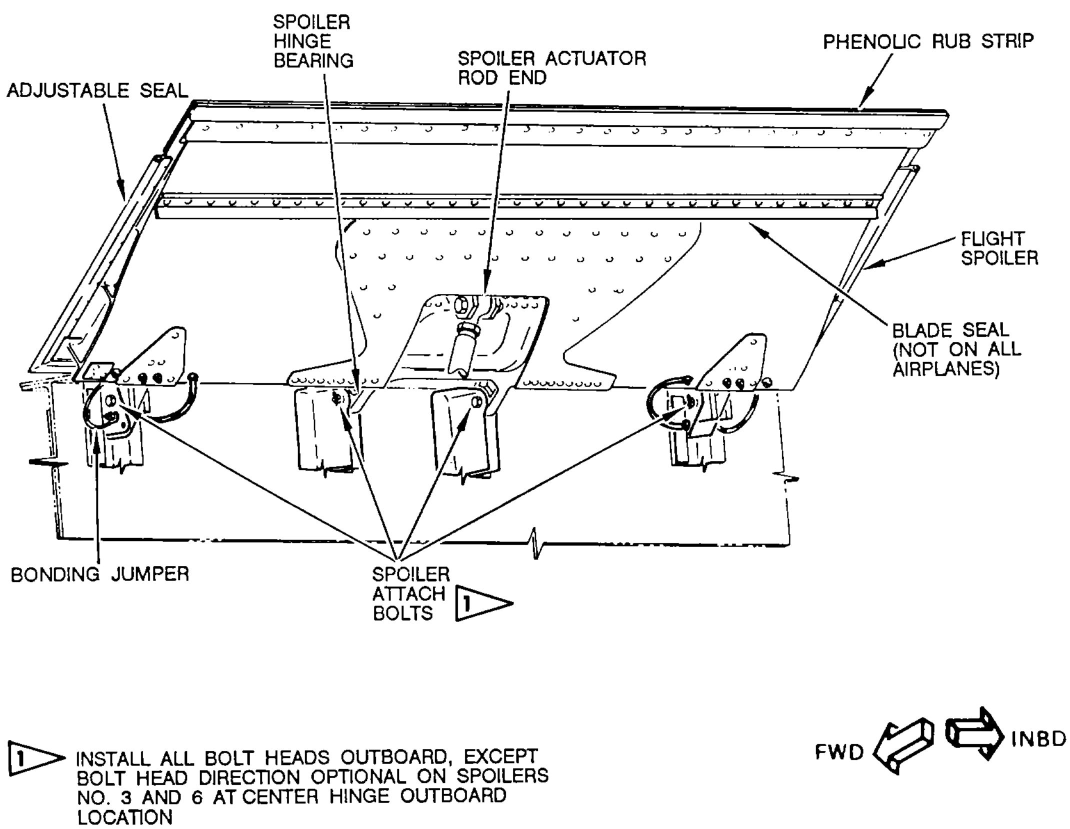
      NOTE: Flight spoiler weighs approximately 16 pounds.

   E. Remove bearings at inboard and outboard hinge locations.
5. Install Flight Spoiler

   NOTE: If a used bolt or bearing is being installed, check for allowable wear (Ref 27-61-51, I/C).

   A. Position bearings in spoiler at inboard and outboard hinge locations.
   B. Position spoiler on airplane.
   C. Install two center hinge bolts (Fig. 401).
      (1) Install bolts with heads as shown in Fig. 401.
      (2) Place washer and nut on bolt. Tighten nut 240 to 350 pound-inches.
      (3) Install cotter pin.





Flight Spoiler Installation
Figure 401

D. Install inboard and outboard hinge bolts.
   (1) Position spacer on both sides of bearing.

   NOTE: Ensure that flanged bushings are installed in structure.

   (2) Position bearing to align with clevis and install bolts with heads as shown in Fig. 401.
   (3) Place washer and nut on bolt. Tighten nut 100 to 140 pound-inches.
   (4) Install cotter pin.
E. Connect bonding jumpers to spoiler. Jumpers are attached at lower leg of leading channel adjacent to inboard and outboard hinges.
   (1) If hole is not provided for bonding jumper fastener, drill hole 3.5 inches in from end of panel and 0.5 inch aft of panel leading edge.
F. Rotate spoiler through full travel and check for binding or interference.
G. Install bolt attaching spoiler actuator rod end to spoiler.
   (1) Install bolt with head to the left.
   (2) Secure bolt with washer and nut.
   (3) Tighten nut to 240-350 pound-inches.
   (4) Install cotter pin.
H. Ensure that hydraulic systems A and B are not pressurized. Remove spoiler actuator lock.
I. Provide system A and B hydraulic power (Ref 27-61-0).
J. Place speed brake control lever in DOWN position to lower spoilers.
K. Remove system A and B hydraulic power (Ref 27-61-0).
L. Check that gap between spoiler and fixed wing structure is 0.40 +0.05 inch at end of spoiler panel. Gap is defined as metal-to-metal clearance.
M. Check that gap between adjacent spoilers is 0.70 ±0.10 inch.
N. Adjust seals on adjacent spoiler to 0.000 +0.020/-0.000-inch gap.
O. Ensure that seals between spoiler and fixed wing structure contact firmly.
P. Adjust and test flight spoiler (Ref 27-61-11, Flight Spoilers - Adjustment/Test).
Q. Remove electrical power if no longer required.

FLIGHT SPOILERS - ADJUSTMENT/TEST

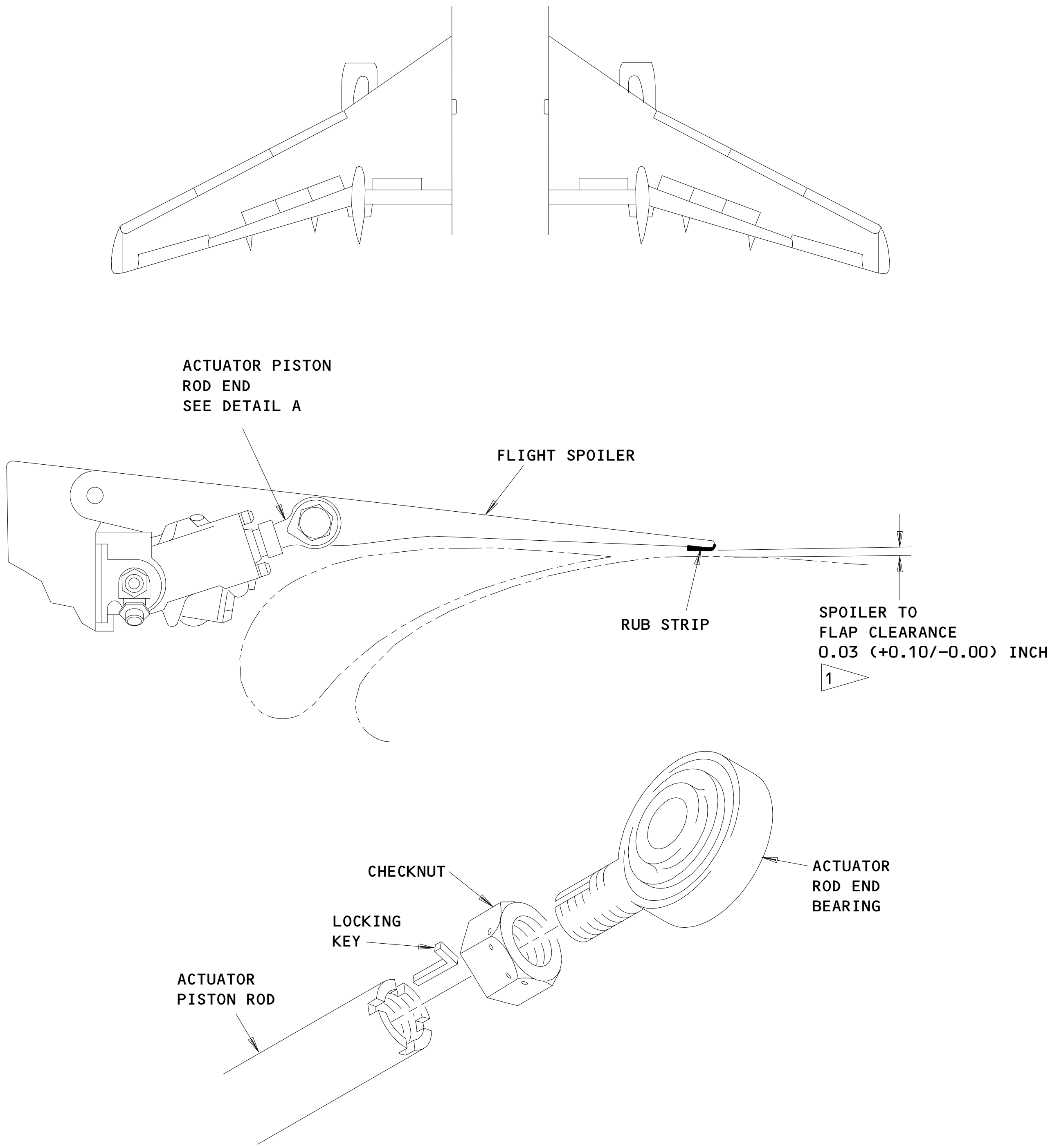
1. Flight Spoiler Adjustment
   A. Equipment and Materials
      (1) Corrosion Preventive Compound - MIL-C-11796, Class 3
      (2) Sealant - BMS 5-95 (Ref 20-30-11)
   B. Prepare for Adjustment
      (1) Provide electrical power.
      (2) Provide system A and B hydraulic power (Ref 27-61-0 MP).
      (3) Place speed brake control in UP position to raise spoilers.
      (4) Place FLT CONTROLS A switch on forward overhead panel to ON to pressurize trailing edge flaps.
      (5) Retract trailing edge flaps to full up position with jackscrew stops in contact.
         (a) Place flap control lever in FLAP UP detent.
         (b) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
      (6) Place speed brake control lever in DOWN position to lower spoilers.
   C. Adjust Flight Spoiler
      (1) Check that spoiler to flap clearance is 0.03 (+ 0.10/-0.00) inch measured at point of minimum clearance. Rotate captain's control wheel clockwise to ensure that flight spoilers No. 2 and 3 are full down, or counterclockwise to ensure that flight spoilers No. 6 and 7 are full down (Fig. 501).
      (2) If spoiler to flap clearance is not within limits:
         (a) Provide access to spoiler actuator by either lowering flaps or opening applicable hinged trailing edge panel or by placing speed brake control lever in UP position to raise spoilers. Depressurize hydraulic systems A and B (Ref 27-61-0 MP).

            WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

         (b) Break lockwire and loosen checknut on actuator rod end.
         (c) Disengage locking key from piston rod.
         (d) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each quarter turn will change spoiler to flap clearance by approximately 0.12 inch.

            CAUTION: TURNING PISTON ROD WHEN ACTUATOR IS PRESSURIZED WILL DAMAGE ACTUATOR.

         (e) Engage locking key with piston rod.
         (f) Coat rod end threads with corrosion preventive compound.
         (g) Tighten rod end checknut to 350-400 pound-inches.



ACTUATOR PISTON ROD END
DETAIL A

1 MEASURE AT POINT OF MINIMUM CLEARANCE

Flight Spoiler Panel Adjustment
Figure 501

(h) Lockwire checknut to locking key.
(i) Apply a bead of sealant to the rod end checknut.
(j) Provide system A and B hydraulic power.
(k) Lower spoilers or raise flaps, as applicable.
(l) Check spoiler to flap clearance per step (1).
(m) Test flight spoiler.

D. Restore Airplane to Normal
(1) Remove system A and B hydraulic power.
(2) Remove electrical power if no longer required.

2. Flight Spoiler Test

A. Equipment and Materials
(1) Control Surface Protractor - 4MIT65B80307-1 (preferred), F52485-500 (optional)
(2) Control Surface Protractor Stand Assembly - F71292-17

B. Prepare Flight Spoiler for Test
(1) Provide electrical power.
(2) Provide system A and B hydraulic power (Ref 27-61-0, Maintenance Practices).
(3) Install protractor and protractor mount on captain's control wheel. Set protractor to zero.

C. Test Flight Spoiler

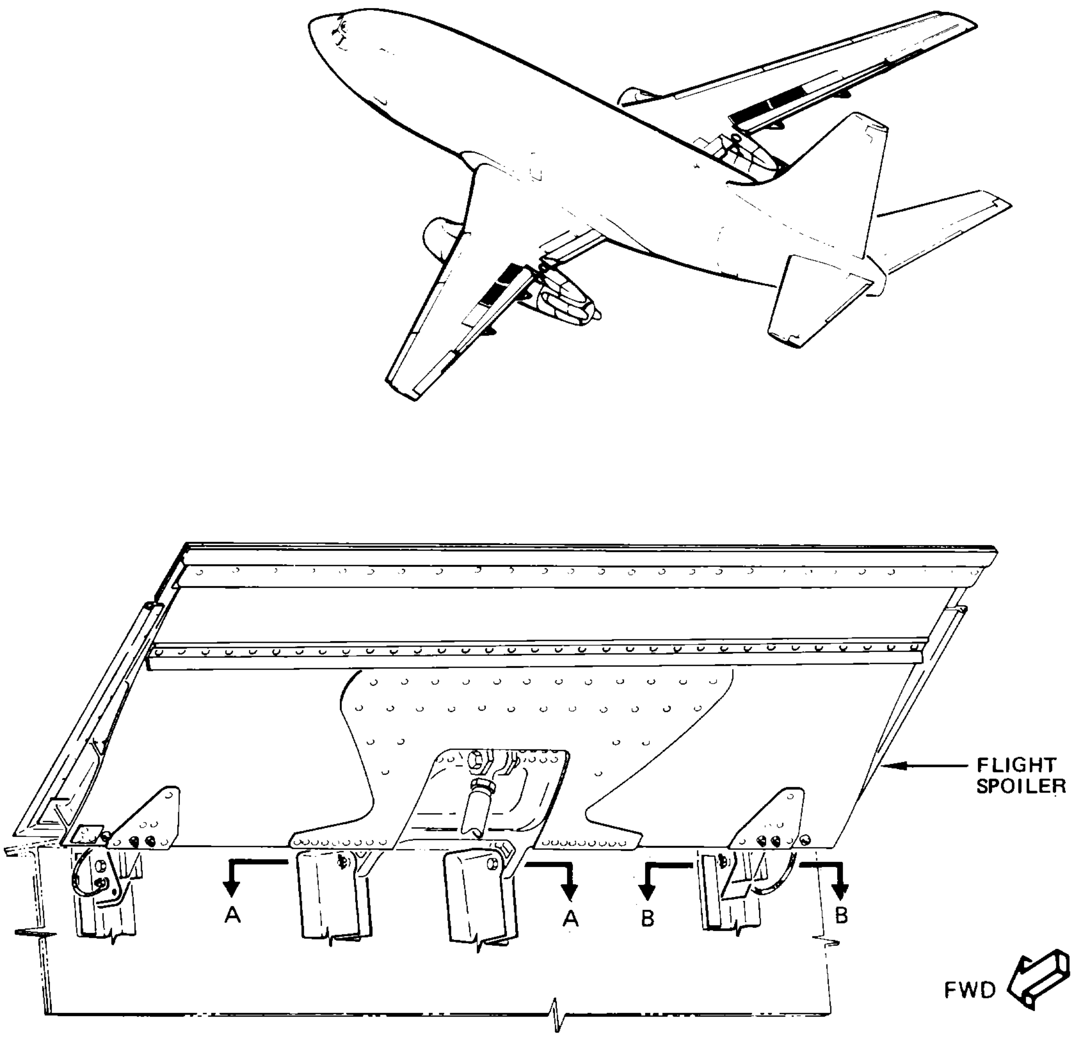
NOTE: This test presents check of full travel limits for all flight spoilers; however, only spoiler, which has been replaced, need be tested.

(1) Place speed brake control lever to UP position.
(2) Place captain's control wheel in neutral position and check that:
(a) Spoiler No. 2 is 39 (±3! degrees up from zero. Record value.
(b) Spoiler No. 3 fairs with spoiler No. 2 within ± 0.25 inch.
(c) Spoiler No. 6 is within ± 2 degrees of spoiler No. 2 in step (a) with a minimum of 36 degrees up from zero.
(d) Spoiler No. 7 fairs with spoiler No. 6 within ± 0.25 inch.
(3) Place speed brake control lever in DOWN position to lower spoilers.

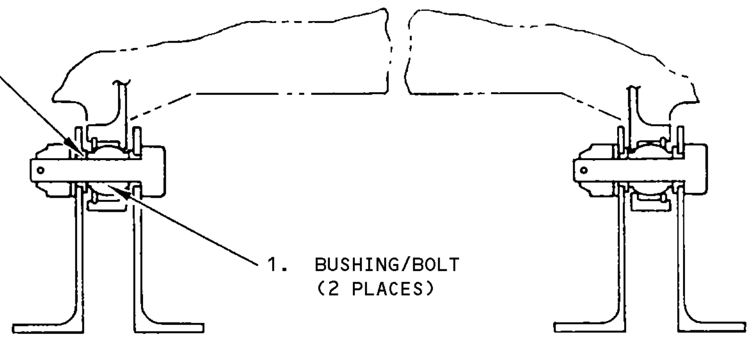
D. Restore Airplane to Normal
(1) Remove electrical power if not required.
(2) Remove system A and B hydraulic power. Refer to 27-61-0.
(3) Remove protractor and protractor mount from captain's control wheel.

FLIGHT SPOILER - INSPECTION/CHECK

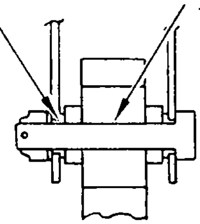
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component, Removal/Installation for this information.
2. Flight Spoiler Wear Limits



Flight Spoiler Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.4995	0.5000	0.5025	0.0030	X		
	BOLT	OD	0.4985	0.4995	0.4965		X		
2	BUSHING	ID	0.5000	0.5015	0.5045	0.0050	X		
	BOLT	OD	0.4985	0.4995	0.4950		X		
3	BEARING	ID	0.3120	0.3125	0.3150	0.0030	X		
	BOLT	OD	0.3110	0.3120	0.3090		X		
4	BUSHING	ID	0.3125	0.3140	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3090		X		

Flight Spoiler Wear Limits
Figure 601 (Sheet 2)

SPOILER MIXER - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Ground Spoiler Control Valve Rigging Tool - MIT65-45116
   B. Grease - BMS 3-33 (Preferred)
   C. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   D. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-3	-8	0.309-0.311	3.7 ±0.25	Spoiler control quadrant lower lever
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum
A/S-14	-11	0.309-0.311	6.7 ±0.25	Spoiler mixer
S/B-2	-11	0.309-0.311	2.35 ±0.06	Speed brake input quadrant

2. Remove Spoiler Mixer
   A. Place speed brake control lever in DOWN position.
   B. Remove systems A and B hydraulic power (Ref 27-61-0, MP).
   C. Install rigging pin A/S-3 in the spoiler quadrant lower lever (Fig. 401).
   D. Install rigging pin A/S-4 in aileron bus drum.
   E. Install rigging pin A/S-14 in spoiler mixer.

      CAUTION: TO PREVENT POSSIBLE DAMAGE TO SPOILER MIXER, RIGGING PIN A/S-14 SHOULD REMAIN INSTALLED IN MIXER DURING STORAGE.

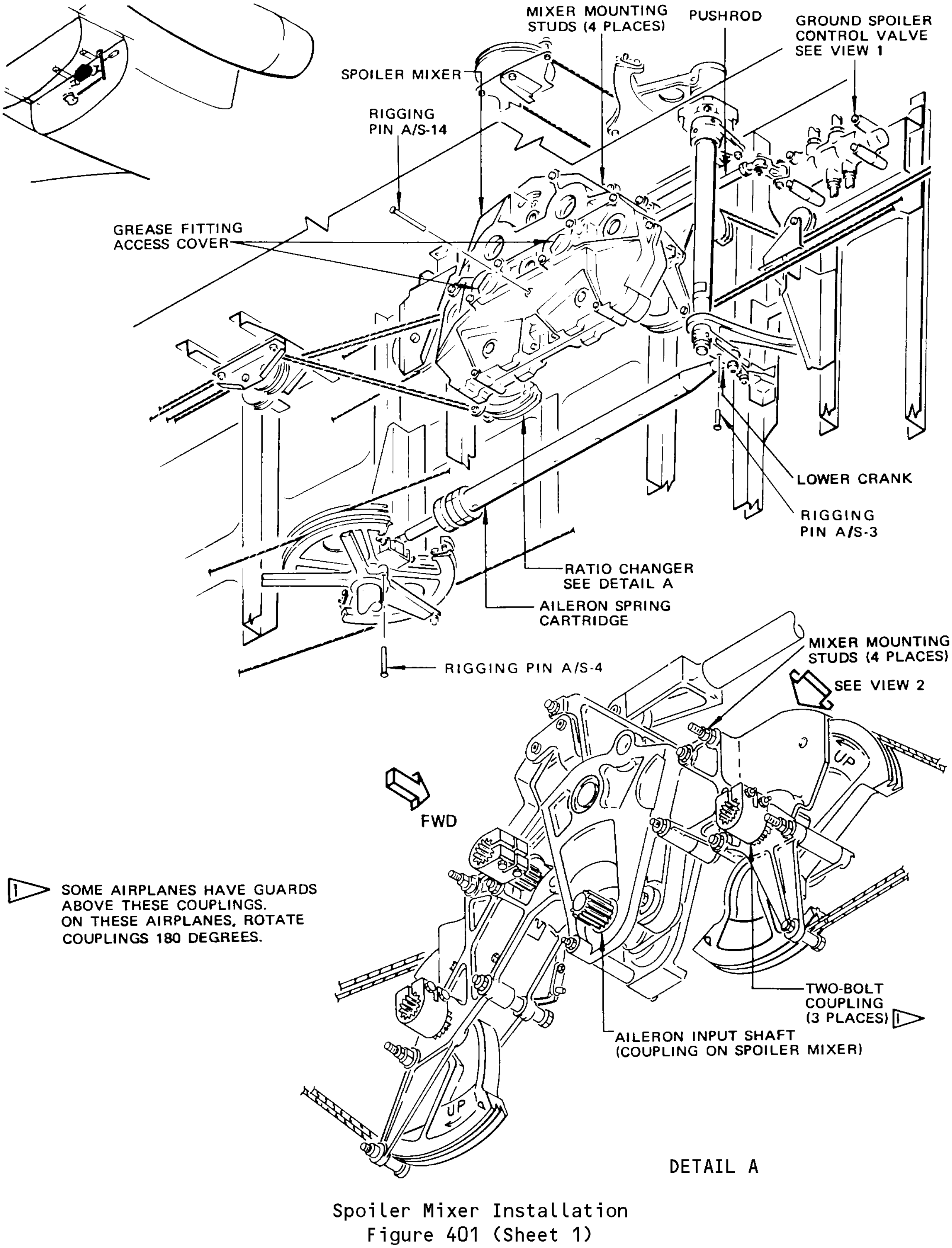
   F. Disconnect pushrod from ground spoiler control valve.
   G. Disconnect aileron spring cartridge from lower lever. Move aileron spring cartridge for additional access when loosening coupling bolts.

H. Loosen all bolts on the four couplings.
I. Remove four mixer mounting nuts.
J. Remove mixer from airplane.
K. Remove two bolt couplings from speed brake input shaft and two mixer output shafts. The remaining one bolt coupling shall remain with mixer.
L. Remove pushrod from spoiler mixer as follows:
   (1) Detach pushrod output lever from spoiler mixer.
   (2) Remove bolt-attaching pushrod to pushrod output lever.
   (3) Reattach pushrod output lever to spoiler mixer.
   (4) Temporarily attach pushrod to ground spoiler control valve.

3. Install Spoiler Mixer

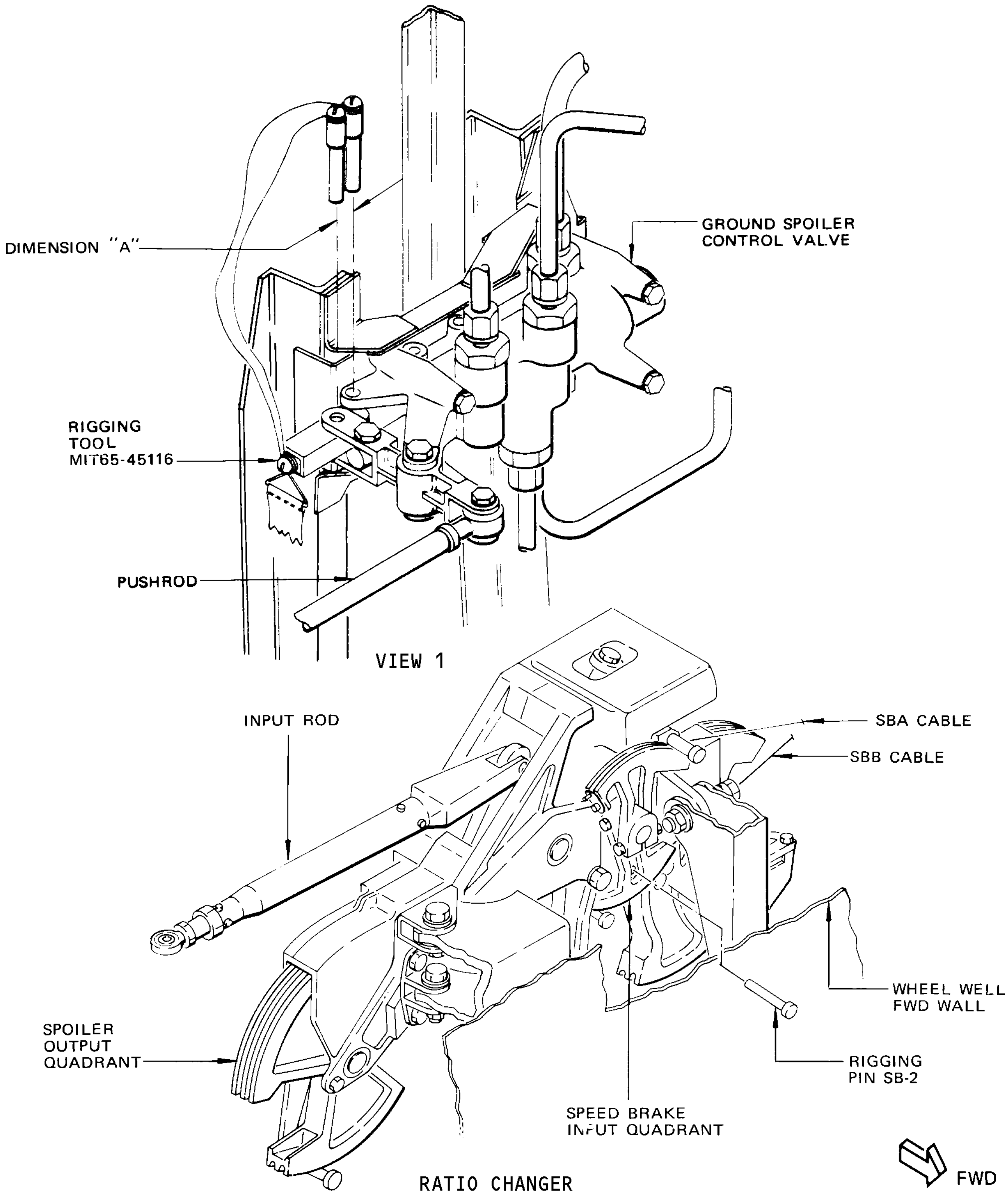
CAUTION: MAKE SURE YOU HAVE THE CORRECT PART NUMBER OF THE SPOILER MIXER. OTHER SPOILER MIXERS WILL INSTALL BUT WILL NOT OPERATE CORRECTLY. DAMAGE TO EQUIPMENT AND STRUCTURE MAY OCCUR.

A. Attach pushrod to spoiler mixer (Fig. 401).
   (1) Detach pushrod output lever from spoiler mixer.
   (2) Position pushrod so that fixed rod end will be connected to mixer.
   (3) Install rod end bolt with bolthead toward mixer.
   (4) Secure bolt with washer and locknut. Tighten locknut within 50 to 70 pound-inch torque range.
   (5) Reattach assembly of pushrod output lever and pushrod to spoiler mixer.
B. Check that speed brake control lever is in DOWN position. Check speed brake input quadrant position by inserting and removing rigging pin SB-2.
C. Position two bolt couplings on the ratio changer.
   (1) Couplings shall be positioned as shown in Fig. 401.
   (2) Secure bolts with washer and locknut but do not tighten locknuts.
D. Deleted.
E. Position one bolt coupling on the mixer.
   (1) End of coupling with clamp-up bolt goes on aileron input shaft of mixer.
   (2) Install bolt on outboard side of shaft with bolthead up.
   (3) Secure bolt with washer and locknut but do not tighten locknut.



1 SOME AIRPLANES HAVE GUARDS ABOVE THESE COUPLINGS. ON THESE AIRPLANES, ROTATE COUPLINGS 180 DEGREES.

Spoiler Mixer Installation
Figure 401 (Sheet 1)



Spoiler Mixer Installation
Figure 401 (Sheet 2)

F. Align mixer with ratio changer and engage couplings and mounting studs. Check that pushrod is aligned with ground spoiler control valve.
G. Secure mixer on four mounting studs.
   (1) Install washer and locknut.
   (2) Tighten locknut within 50 to 70 pound-inches torque range.
H. Tighten the seven nuts on the four couplings to 50 to 70 pound-inches torque.
I. Connect pushrod to ground spoiler control valve.
   (1) Using ground spoiler control valve rigging tool, position control valve lever so that dimension A is 0.70 ± 0.01 inch.
   (2) Loosen checknut and adjust rod end until rod end bolt fits freely. Lubricate rod end threads with grease.
   (3) Install rod end bolt and secure with washer, nut and cotter pin.
   (4) Tighten checknut and check for proper rod end thread engagement. Rod end threads shall be visible in inspection hole.
   (5) Remove rigging tool.
J. Install Aileron Spring Cartridge
   (1) Check that rigging pins A/S-3 and A/S-4 are installed.
   (2) Connect aileron spring cartridge to lower crank. Secure rod end bolt with spacer, washer, nut and cotter pin.
K. Remove all rigging pins.
L. Adjust spoiler mixer output cam.
   (1) Open grease fitting access covers on aft surface of spoiler mixer (Fig. 401).
   (2) Set speed brake control lever in DOWN detent.
   (3) Rotate captain's control wheel counterclockwise 87 degrees from neutral.
   (4) Check that left cam follower is on maximum rise portion of spoiler mixer cam when viewed through left grease fitting access hole.
   (5) Return captain's control wheel to neutral.
   (6) Rotate captain's control wheel clockwise 87 degrees from neutral.
   (7) Check that right cam follower is on maximum rise portion of spoiler mixer cam when viewed through right grease fitting access hole.
   (8) Return captain's control wheel to neutral.
   (9) If checks in steps (4) and (7) are not met use turnbuckles to adjust SBA and SBB cables: (See figure 402.)
      (a) Shorten SBB cable by one-half turn and lengthen SBA cable by one-half turn.

         NOTE: The SBB cable is the lower cable on speed brake quadrant on ratio changer. Speed brake quadrant should rotate clockwise when tightening SBB cable when looking forward.

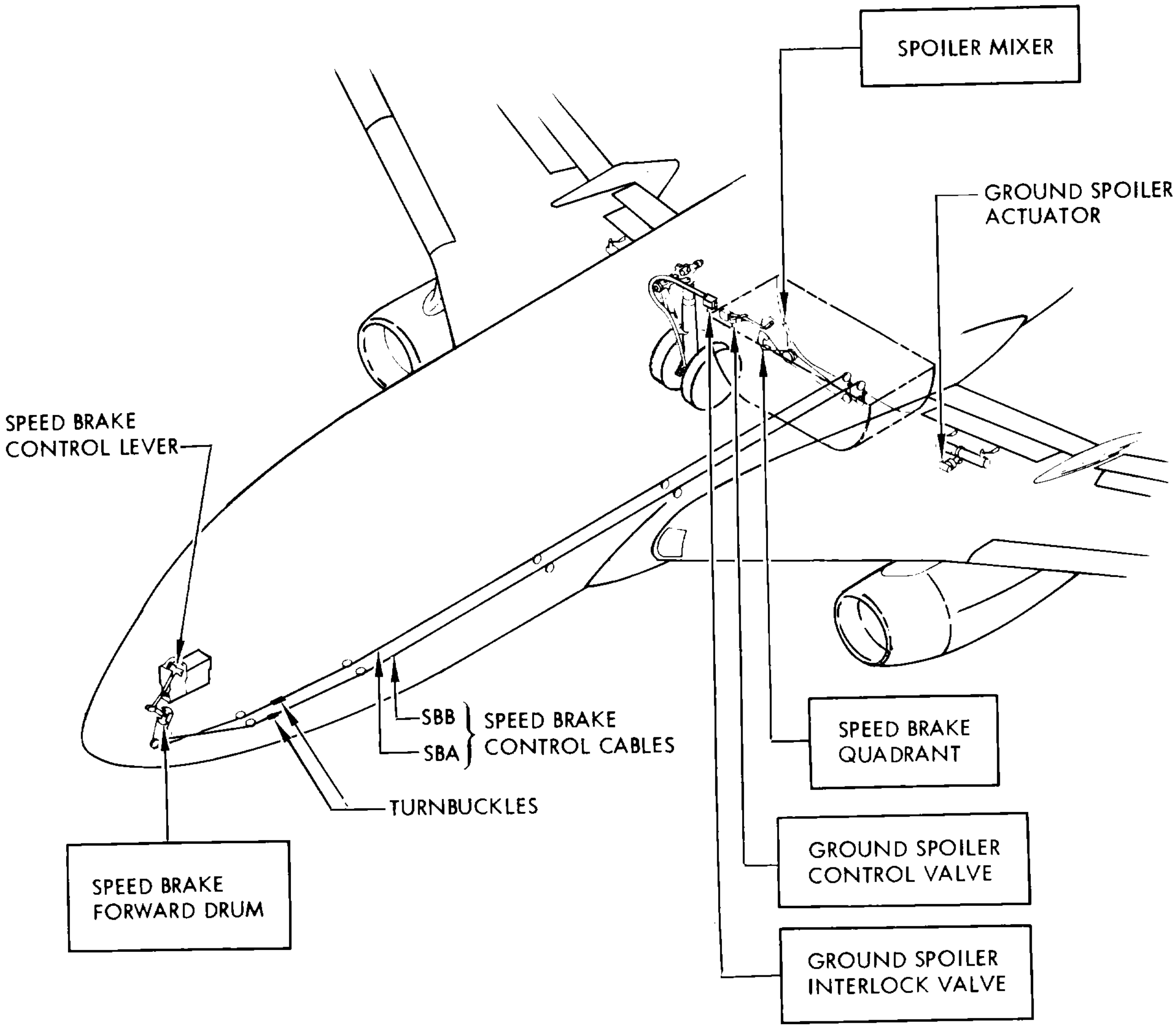
(b) Check that cable tension is within values in figure 402 and repeat steps (3) through (8).

<u>NOTE</u>: After adjustment rigging pin SB-2 need not fit in rigging pinhole.

(c) Install turnbuckle-locking clips.

(10) Install two grease fitting access covers.

M. Test spoiler mixer operation (AMM 27-61-21/501).



1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 SYSTEM MUST BE RERIGGED WHEN CABLE TENSION DEVIATES MORE THAN ±15 POUNDS FROM VALUES SHOWN IN TABLE.

TABLE

TEMP °F 1	CABLE TENSION - POUNDS (+10/-0) 2
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

Speed Brake Control System Turnbuckle Locations and Cable Tension
Figure 402

468923

SPOILER MIXER - ADJUSTMENT/TEST

1. Spoiler Mixer Test
   A. Equipment and Materials
      (1) Control Surface Protractors - 4MIT65B80307-1 (preferred) F52485-500 (optional) (3 required)
      (2) Control Surface Protractor Stand - F71292-17 (optional)
      (3) Aileron Control Wheel Protractor Mount - F72790 (2 required)
      (4) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum

B. Prepare for Test
   (1) Install aileron control wheel protractor mount and control surfaces protractor on captain's aileron control wheel.
   (2) Install control surface protractor stands and protractors on spoilers No. 2 and 7.

      NOTE: Protractors may be hand-held on spoilers instead of using stands.

   (3) Provide electrical power.
   (4) Provide systems A and B hydraulic power (AMM 27-61-0/201).
   (5) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed. Remove rigging pin.
   (6) Place speed brake control lever in DOWN position to lower spoilers.

C. Test Spoiler Mixer
   (1) Rotate captain's aileron control wheel 87 degrees counterclockwise.
   (2) Check that spoiler No. 2 is 38 ±2 degrees up from zero position.
   (3) From wheel position in previous step rotate control wheel clockwise and check that all spoilers are full down when wheel is positioned at 4 ±2 degrees counterclockwise from zero.
   (4) Continue clockwise rotation of control wheel to 87 degrees clockwise position.
   (5) Check that spoiler No. 7 is 38 ±2 degrees up from zero.
   (6) From wheel position in previous step rotate control wheel counterclockwise and check that all spoilers are full down when the wheel is positioned at 4 ±2 degrees clockwise from zero.
   (7) Set aileron control wheel at zero.
   (8) Set speed brake control lever so that spoiler No. 2 is 15 ±1 degrees up from zero. Check that spoilers No. 3, 6 and 7 are within ± 0.5 degree of spoiler No. 2 and each other.
   (9) Place speed brake control lever in UP position.
   (10) Check that spoiler No. 2 is 39 ±3 degrees up from zero.
   (11) Check that spoiler No. 7 is within ± 2 degrees of spoiler No. 2 with a minimum of 36 degrees up from zero.

D. Test Spoiler Mixer for correct part (IPC Chapter 27)

   NOTE: If the spoiler mixer does not pass this test, make sure the correct spoiler mixer part number is installed.

   (1) Move speed brake lever to flight detent.

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum

(2) Turn the control wheel to the fully counterclockwise position and hold.
(3) Make sure that the right flight spoilers 6 and 7 are 7.5 degrees or less from the fully down position.
(4) Turn the control wheel to the fully clockwise position and hold.
(5) Make sure that the left flight spoilers 2 and 3 are 7.5 degrees or less from the full down position.

E. Return Airplane to Normal
(1) Place speed brake control lever in DOWN position to lower spoiler.
(2) Remove systems A and B hydraulic power (AMM 27-61-0/201).
(3) Remove electrical power if no longer required.
(4) Remove protractors, mount, and stands from captain's control wheel and from spoilers No. 2 and 7.

SPOILER RATIO CHANGER - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Cable Tensiometer - 0 to 150-pound range, for 1/8 inch cable
   D. Rigging Pins Kit - F70207-3, -52, -61, or -84:

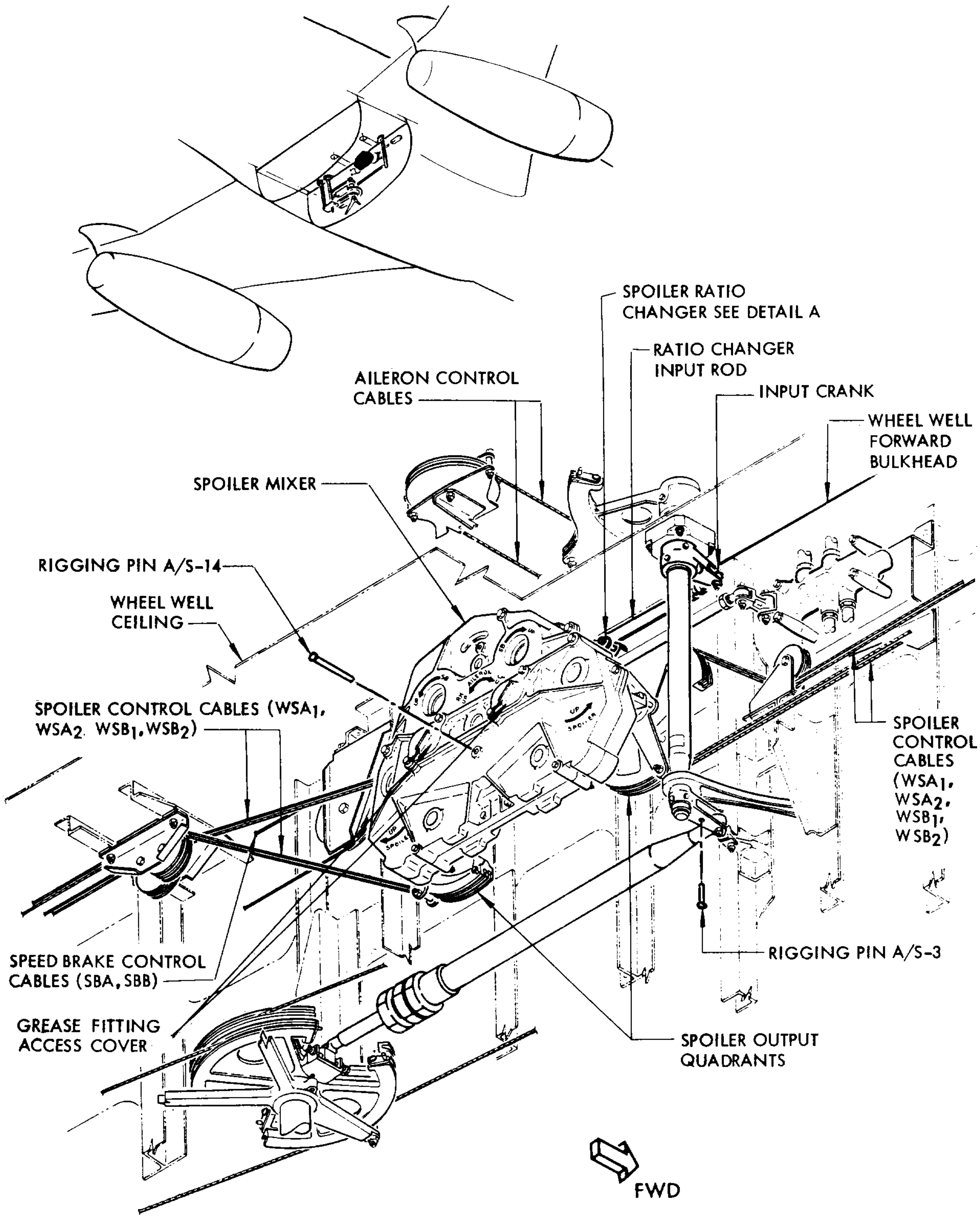
Ref No.	F70207-( )	Diameter (inches)	Length (inches)	Function
A/S-3	-8	0.309-0.311	3.7 ±0.25	Spoiler control quadrant lower lever
A/S-8	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-9	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-10	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-11	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-14	-11	0.309-0.311	6.7 ±0.25	Spoiler mixer
S/B-1	-11	0.309-0.311	6.7 ±0.25	Speed brake forward drum
S/B-2	-13	0.309-0.311	2.35 ±0.06	Speed brake input quadrant

2. Prepare Spoiler Ratio Changer for Removal
   A. Place speed brake control lever in DOWN position.
   B. Remove systems A and B hydraulic power (AMM 27-61-0/201).

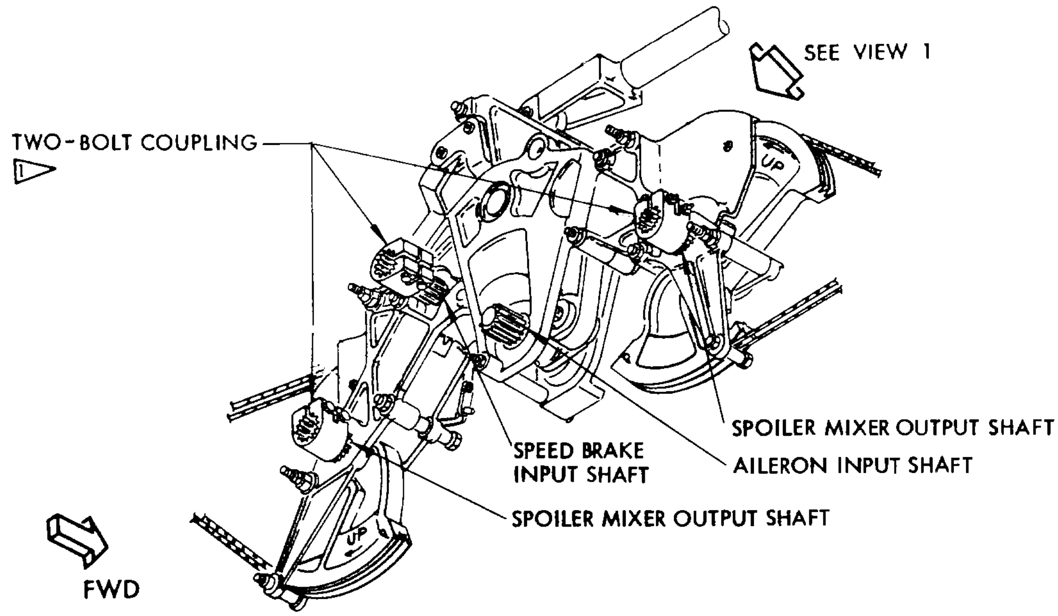
C. Open lower fuselage nose compartment access door.
D. Remove left forward, nose wheel access panel.
E. Remove spoiler mixer (AMM 27-61-21/401).

3. Remove Spoiler Ratio Changer (Fig. 401)
   A. If a new spoiler ratio changer is to be installed, remove two-bolt couplings from speed brake input shaft and two spoiler mixer output shafts.
   B. Disconnect spoiler cables from spoiler output quadrants (Fig. 402).
      (1) Attach cable retainers to maintain a slight cable tension.
      (2) Break lockwire, remove turnbuckle-locking clips and disconnect turnbuckles located in right and left wheel wells.
      (3) Identify cables for future installation.
      (4) Remove cables from quadrants.
   C. Disconnect speed brake control cables from speed brake input quadrant (Fig. 403).
      (1) Attach cable retainers to maintain cable tension.
      (2) Remove turnbuckle-locking clips and disconnect turnbuckles located in fuselage lower nose compartment.
      (3) Identify cables for future installation.
      (4) Remove cable SBB from quadrant.
   D. Disconnect ratio changer input rod from input crank.
      (1) Remove bolt attaching input rod to input crank.
      (2) If a new spoiler ratio changer is to be installed, remove rod end bolt from input rod.
   E. Loosen the rod guard to get access to the mounting bolts that attach the ratio changer.
      (1) Remove the four bolts that attach the rod guard.
      (2) Move the rod guard until you can get access to the mounting bolts.
   F. Remove three ratio changer mounting bolts.
   G. Remove three ratio changer mounting bushings.
   H. Remove spoiler ratio changer from airplane.
   I. Remove cable SBA from ratio changer.
   J. Remove the rod guard from the ratio changer input rod.

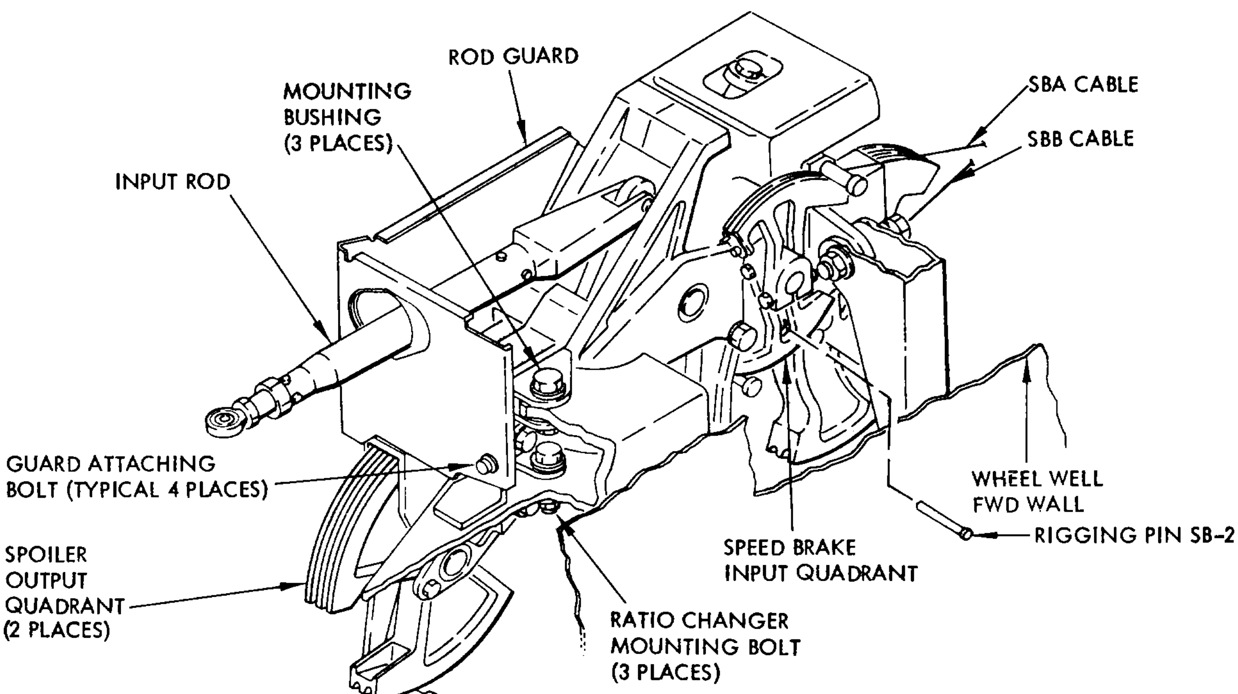
4. Install Spoiler Ratio Changer
   A. Check that ratio changer operates smoothly.



Spoiler Ratio Changer and Mixer
Figure 401 (Sheet 1)



SPOILER RATIO CHANGER
(MIXER REMOVED)
DETAIL A



RATIO CHANGER
VIEW 1

Spoiler Ratio Changer and Mixer
Figure 401 (Sheet 2)

B. Put the rod guard on the ratio changer input rod.
C. Position ratio changer in wheel well and attach cable SBA on speed brake input quadrant (Fig. 401).
D. Place ratio changer on mounting brackets. Install three mounting bushings.
   (1) Lubricate surface between mounting bushings and mounting bearings with a light coat of grease.
   (2) Install mounting bushings with shoulder either up or inboard.

   NOTE: Mounting bushings shall fit freely through all mounting bearings.

E. Secure ratio changer with three mounting bolts.
   (1) Install mounting bolts with head either up or inboard.
   (2) Install washer and locknut.
   (3) Tighten locknut within 50 to 70 pound-inch torque range.
F. Position rod guard on ratio changer. Secure guard with four bolts and washers.
G. Attach SBB cable onto speed brake input quadrant (Fig. 403).
H. Attach right and left wing cables WSA1, WSA2, WSB1 and WSB2, to spoiler output quadrant. Rotate quadrant to facilitate installation of cables and cable retainers (Fig. 401).
I. Install spoiler mixer (AMM 27-61-21/401).

   NOTE: Adjustment of spoiler mixer output cam is not required at this time.

J. Install speed brake control cables (Fig. 403).
   (1) Install rigging pins SB-1 and SB-2 (Fig. 401 and 404).
   (2) Install cable SBA and SBB turnbuckles in lower fuselage nose compartment.
   (3) Adjust cable tension per temperature-tension table (Fig. 403).
   (4) Check that pressure seals in left wheel well align properly with cables. If not, loosen seal retaining bolts and position seal properly. Tighten bolts.

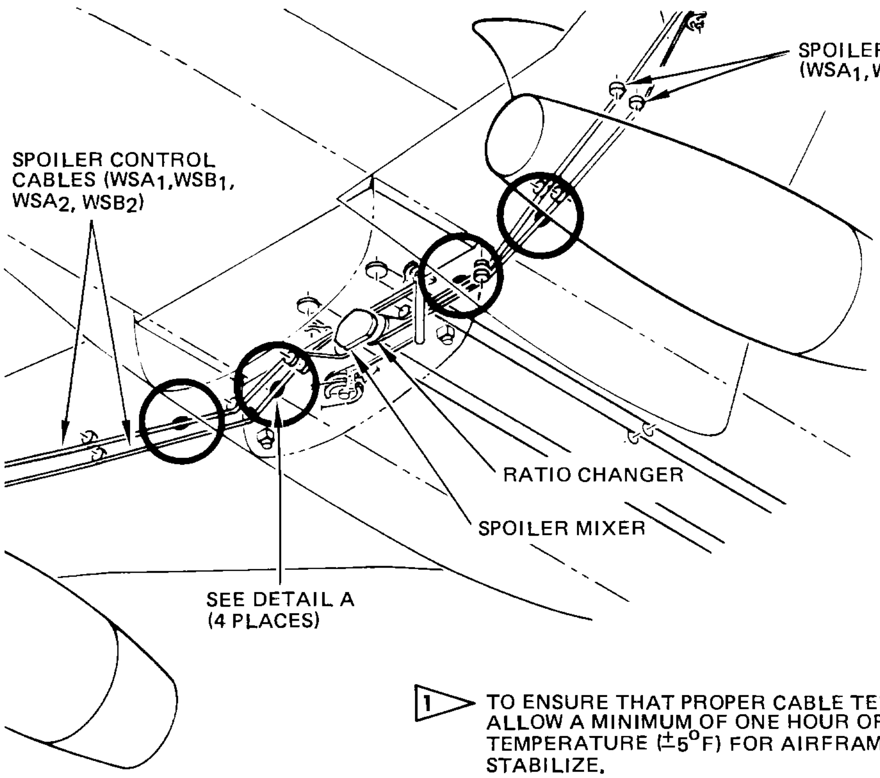
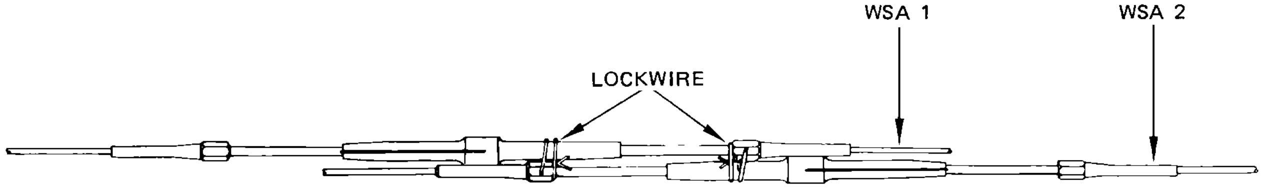


TABLE I	
TEMP °F [1]	WSA & WSB CABLE TENSION—POUNDS (+10/–0) [2]
110	81
90	75
70	70
50	66
30	61
10	56
–10	50
–30	45
–40	41

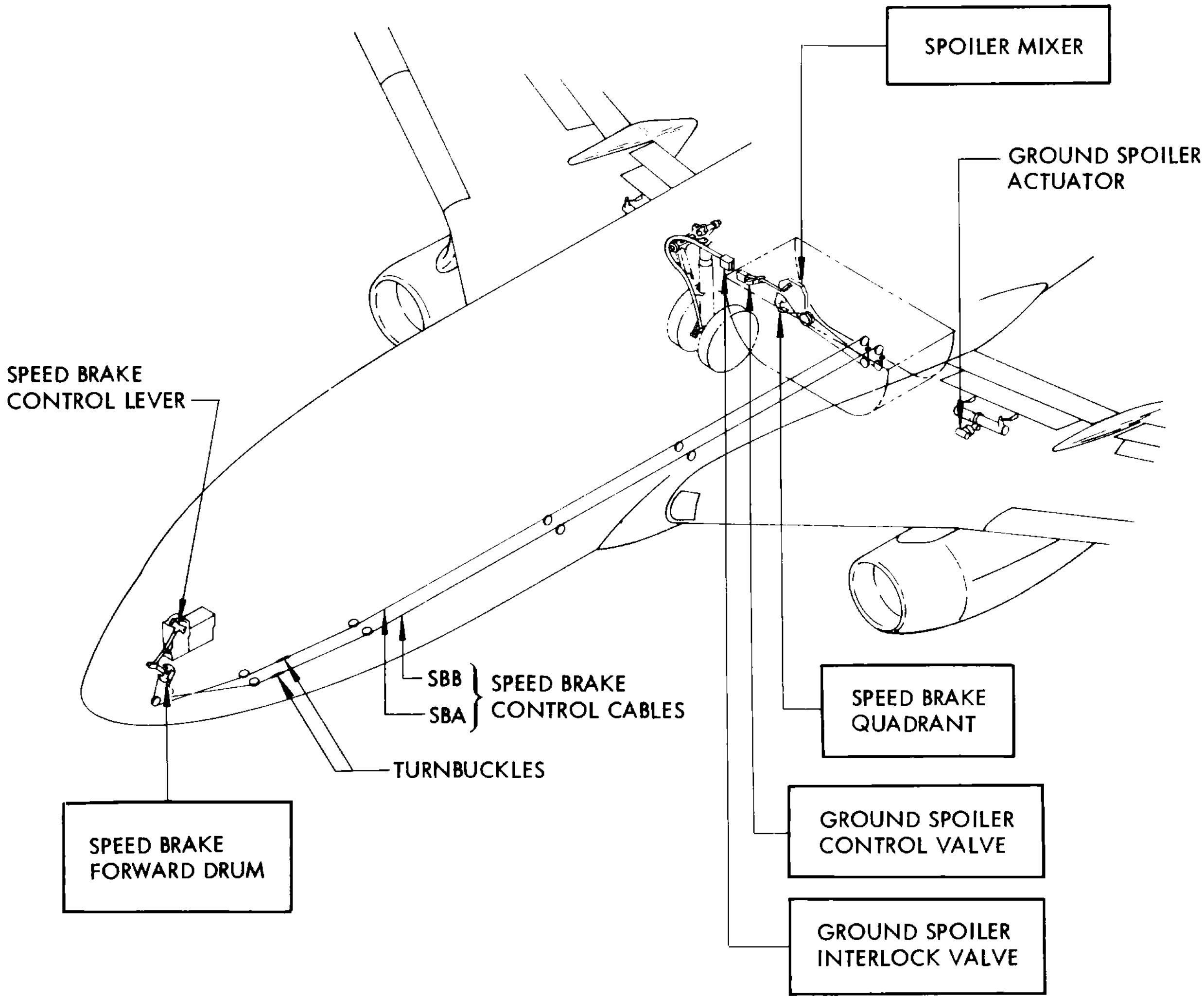
[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (±5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/–20 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±1.5 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.



DETAIL A
(TYPICAL 4 PLACES)

Spoiler Control Cable Turnbuckle Location and Cable Tension
Figure 402



[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

[2] SYSTEM MUST BE RERIGGED WHEN CABLE TENSION DEVIATES MORE THAN ± 15 POUNDS FROM VALUES SHOWN IN TABLE.

TABLE

TEMP °F [1]	CABLE TENSION - POUNDS (+10/-0) [2]
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

Speed Brake Control System Turnbuckle Locations and Cable Tension
Figure 403

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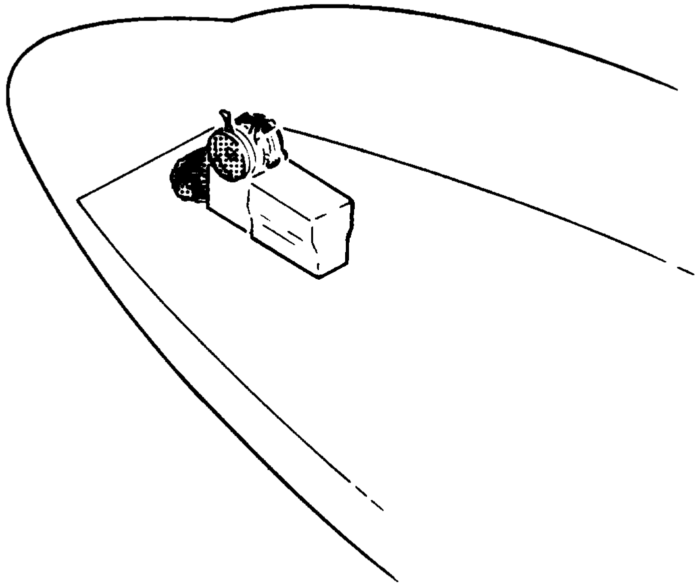
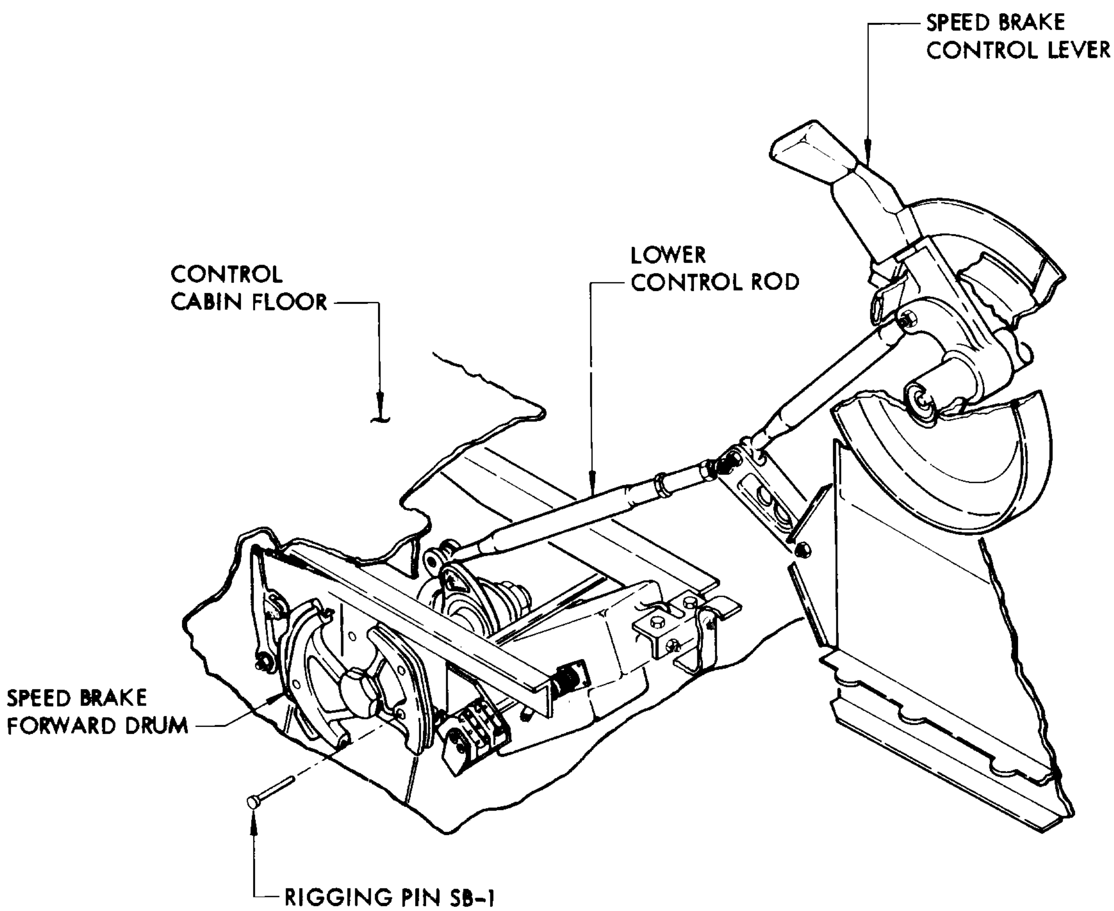




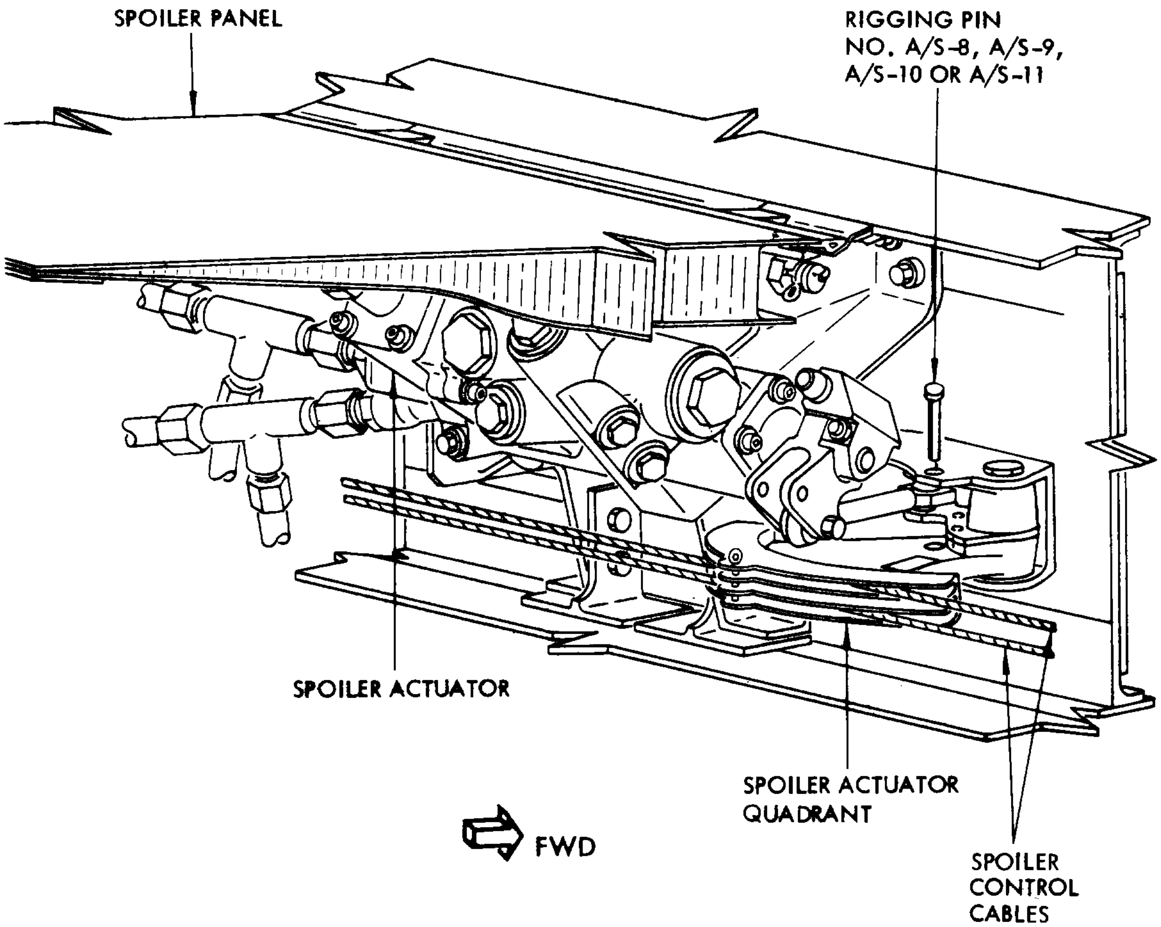
Speed Brake Forward Drum Rigging Pin Location
Figure 404

(5) Remove rigging pins SB-1 and SB-2.
(6) Check speed brake system for proper rigging as follows:
  (a) Move speed brake control lever through one complete cycle.
  (b) Insert rigging pins SB-1 and SB-2.
  (c) Check that cable tension is within required values on temperature-tension table. Cable tension should be balanced.
  (d) Remove rigging pins SB-1 and SB-2.
(7) Install turnbuckle-locking clips.

K. Install spoiler control cables (Fig. 402).
(1) Insert rigging pins A/S-8, A/S-9, A/S-10 and A/S-11 (Fig. 405).
(2) Insert rigging pins A/S-14 and SB-2 (Fig. 401).
(3) Install turnbuckles located in left and right wheel well.
(4) Adjust cable tension per temperature-tension table (Fig. 402).
(5) Remove rigging pins A/S-8, A/S-9, A/S-10, A/S-11, A/S-14, and SB-2.
(6) Cycle spoiler control cables by rotating aileron control wheels.
(7) Check that cable tension is within values in temperature-tension table.
(8) Check rigging by inserting rigging pins A/S-8 thru A/S-11, A/S-14 and SB-2.
(9) Remove all rigging pins.
(10) Install turnbuckle locking clips and lockwire adjacent cable turnbuckles together per Fig. 402.

L. Install ratio changer input rod.
(1) Insert rigging pin A/S-14 in the spoiler mixer.
(2) Insert rigging pin A/S-3.
(3) If a new spoiler ratio changer is being installed, attach rod end to input rod. Turn rod end until attaching bolt can be inserted.
(4) Ensure that rod end threads are visible in inspection hole of input rod.
(5) Tighten rod end locking nuts.
(6) Install attaching bolt with head up.
(7) Tighten nut and install cotter pin.
(8) Remove rigging pins A/S-3 and A/S-14.

M. Check adjustment of spoiler mixer output cam.
(1) Open grease fitting access covers on aft surface of spoiler mixer (Fig. 401).
(2) Set speed brake control lever in DOWN detent.



TYPICAL OF FLIGHT SPOILER NO 2,3, 6 AND 7

Flight Spoiler Rigging Pin Locations
Figure 405

(3) Rotate captain's control wheel counterclockwise 87 degrees from neutral.
(4) Check that left cam follower is on maximum rise portion of spoiler mixer cam, viewed through left grease fitting access hole.
(5) Return captain's control wheel to neutral.
(6) Rotate captain's control wheel clockwise 87 degrees from neutral.
(7) Check that right cam follower is on maximum rise portion of spoiler mixer cam viewed through right grease fitting access hole.
(8) Return captain's control wheel to neutral.
(9) If checks in steps (4) and (7) are not met use turnbuckles to adjust SBA and SBB cables (Fig. 403):
    (a) Shorten SBB cable by one-half turn and lengthen SBA cable by one-half turn.

        NOTE: The SBB cable is the lower cable on speed brake quadrant on ratio changer. Speed brake quadrant should rotate clockwise when tightening SBB cable when looking forward.

    (b) Check that cable tension is within values in Fig. 403 and repeat steps (3) thru (8).

        NOTE: After adjustment, rigging pin SB-2 need not fit in rigging pin hole.

    (c) Install turnbuckle-locking clips.
(10) Install two grease fitting access covers.

N. Test spoiler ratio changer. Refer to Spoiler Ratio Changer - Adjustment/Test.
O. Close lower nose compartment access door.
P. Replace left forward, nose wheel access panel.

SPOILER RATIO CHANGER - ADJUSTMENT/TES

1. Spoiler Ratio Changer Test
   A. Equipment and Materials
      (1) Control Surface Protractors - 4MIT65B80307-1 (preferred), F52485-500 (optional) (3 required)
      (2) Control Surface Protractor Stand Assembly - F71292-17 (optional) (2 required)
      (3) Aileron Control Wheel Protractor Mount - F72790
      (4) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum

   B. Prepare for Test
      (1) Provide electrical power.
      (2) Provide systems A and B hydraulic power (Ref 27-61-0 MP).
      (3) Install protractor mount and protractor on captain's control wheel.
      (4) Install control surface protractor stands and protractors on spoilers No. 2 and 7.

      NOTE: Protractors may be hand-held on spoilers instead of using stands.

      (5) Place both inboard and outboard antiskid switches to ON.
   C. Test Spoiler Ratio Changer
      (1) Test flight spoiler response at zero speed brake.
         (a) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed. Remove rigging pin.
         (b) Place speed brake control lever in DOWN position.
         (c) Rotate captain's control wheel clockwise and check that spoiler No. 7 begins to rise at 9 ±1 degrees clockwise from zero.

(d) Continue rotating captain's control wheel 87 degrees clockwise and check that:
   1) Spoiler No. 7 is 38 ±2 degrees up from zero.
   2) Spoilers No. 2 and 3 are full down.

(e) From wheel position in previous step, return control wheel counterclockwise and check that spoilers No. 7 starts down when wheel is positioned at 70 degrees minimum clockwise from zero.

(f) From wheel position in previous step, return control wheel counterclockwise and check that all spoilers are full down when wheel is positioned at 4 ±2 degrees clockwise from zero.

(g) Rotate control wheel counterclockwise and check that spoiler No. 2 begins to rise at 9 ±1 degrees counterclockwise from zero.

(h) Continue rotating control wheel to 87 degrees counterclockwise and check that:
   1) Spoiler No. 2 is 38 ±2 degrees up from zero.
   2) Spoilers No. 6 and 7 are full down.

(i) From wheel position in previous step, return control wheel clockwise and check that spoiler No. 2 starts down when wheel is positioned at 70 degrees minimum clockwise from zero.

(j) From wheel position in previous step, return control wheel clockwise and check that all spoilers are full down when wheel is positioned at 4 ±2 degrees clockwise from zero.

(2) Test spoiler response with speed brake control system.

(a) Set aileron trim in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed.

(b) Set speed brake control lever in DOWN detent.

(c) Check that all flight and ground spoilers are full down.

(d) Move speed brake control lever into ARMED detent.

(e) Check that all ground spoilers remain down, and flight spoilers do not extend beyond 1-1/2 degrees.

(f) Move speed brake control lever aft until ground spoilers extend.

(g) Check that speed brake control lever is either 31 ±3 degrees, or 2.96 ±0.28 inches measured along position indicating Metal-Cal surface, from DOWN position.

(h) Using control surface protractor, check that ground spoilers No. 4 and No. 5 are 60 ±2 degrees up from down position.

(i) Check that ground spoiler No. 4 is within 2 degrees of ground spoiler No. 5.

(j) Using control surface protractor, check that ground spoilers No. 1 and No. 8 are 40 ±2 degrees up.

(k) Check that ground spoiler No. 1 is within 2 degrees of ground spoiler No. 8.

(l) Return speed brake control lever toward DOWN position until ground spoilers retract.

(m) Check that speed brake control lever is either 22 ±3 degrees, or 2.10 ±0.28 inches measured along position indicating Metal-Cal surface, from DOWN position.

(n) Set speed brake control lever so that spoiler No. 3 is 15 (±1) degrees up from zero position. Check that spoilers No. 2, No. 6 and No. 7 are within ± 0.5 degree of spoiler No. 3 and each other.

(o) Set speed brake control lever in FLIGHT DETENT position and check that:
   1) Spoiler No. 2 is 26 ±2 degrees up from zero position. Record value.
   2) Spoiler No. 7 is within ± 1 degree of spoiler No. 2 in step 1).

(p) Place speed brake control lever in UP position.

(q) Using control surface protractors, check that:
   1) Spoiler No. 2 is 39 ±3 degrees up from zero. Record value.
   2) Spoiler No. 7 is within ± 2 degrees of spoiler No. 2 in step 1) with a minimum angle of 36 degrees up from zero.
   3) Spoiler No. 3 fairs with spoiler No. 2 within ± 0.25 inch.
   4) Spoiler No. 6 fairs with spoiler No. 7 within ± 0.25 inch.

(r) Set captain's control wheel 87 degrees counterclockwise from zero and check that:
   1) Spoiler No. 2 is 39 ±3 degrees up from zero. Record value.
   2) Spoiler No. 7 is partially raised.

(s) Set captain's control wheel 87 degrees clockwise from zero and check that:
   1) Spoiler No. 2 is partially raised.

2) Spoiler No. 7 is within ± 1 degree of spoiler No. 2 in step (r)1).

(t) Place speed brake control lever in DOWN position.

(3) Test speed brake lever friction.

(a) Using spring scale at the tip of the speed brake control lever, check that maximum lever loads are as follows:

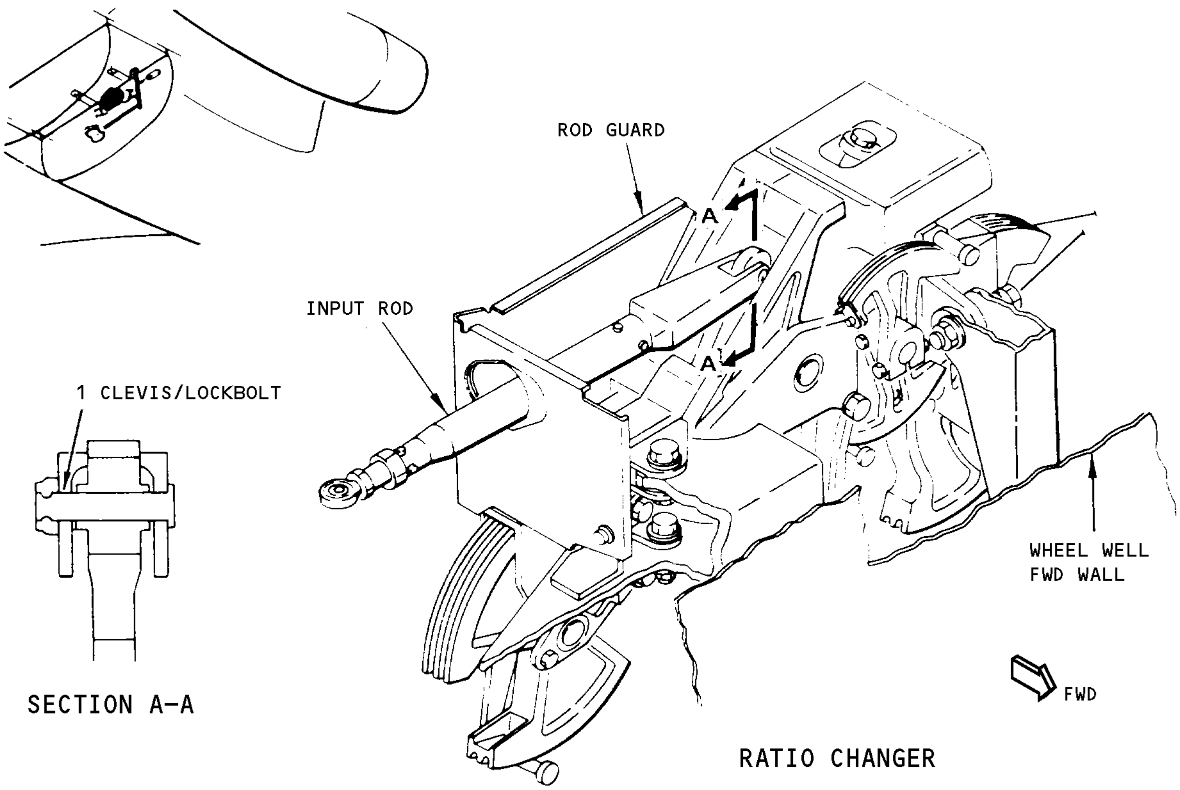
1) DOWN to FLIGHT DETENT - 20 pound maximum
2) FLIGHT DETENT to UP - 28 pounds maximum
3) UP to FLIGHT DETENT - 28 pounds maximum
4) FLIGHT DETENT to DOWN - 20 pounds maximum

D. Return Airplane to Normal

(1) Remove systems A and B hydraulic power (Ref 27-61-0).
(2) Remove protractor and protractor mount from captain's control wheel.
(3) Remove electrical power if no longer required.
(4) Remove protractors and protractor stands from spoiler panels.

SPOILER RATIO CHANGER - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. Refer to Component Removal/Installation for this information.
2. Spoiler Ratio Changer Input Rod Wear Limits



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS: DIAMETER MIN	DESIGN LIMITS: DIAMETER MAX	WEAR LIMITS: ALLOWED WEAR DIM.	WEAR LIMITS: MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	CLEVIS	ID	0.2495	0.2505	0.2515	0.0035	X		
	LOCKBOLT	OD	0.2480	0.2495	0.2480		X		

Spoiler Ratio Changer Input Rod Wear Limits
Figure 601

SPOILER CONTROL QUADRANT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Cable Tensiometer - 0- to 150-pound range for 1/8-inch cable
   B. Rigging Pins Kit - F70207-3, -52, -61, or -84:

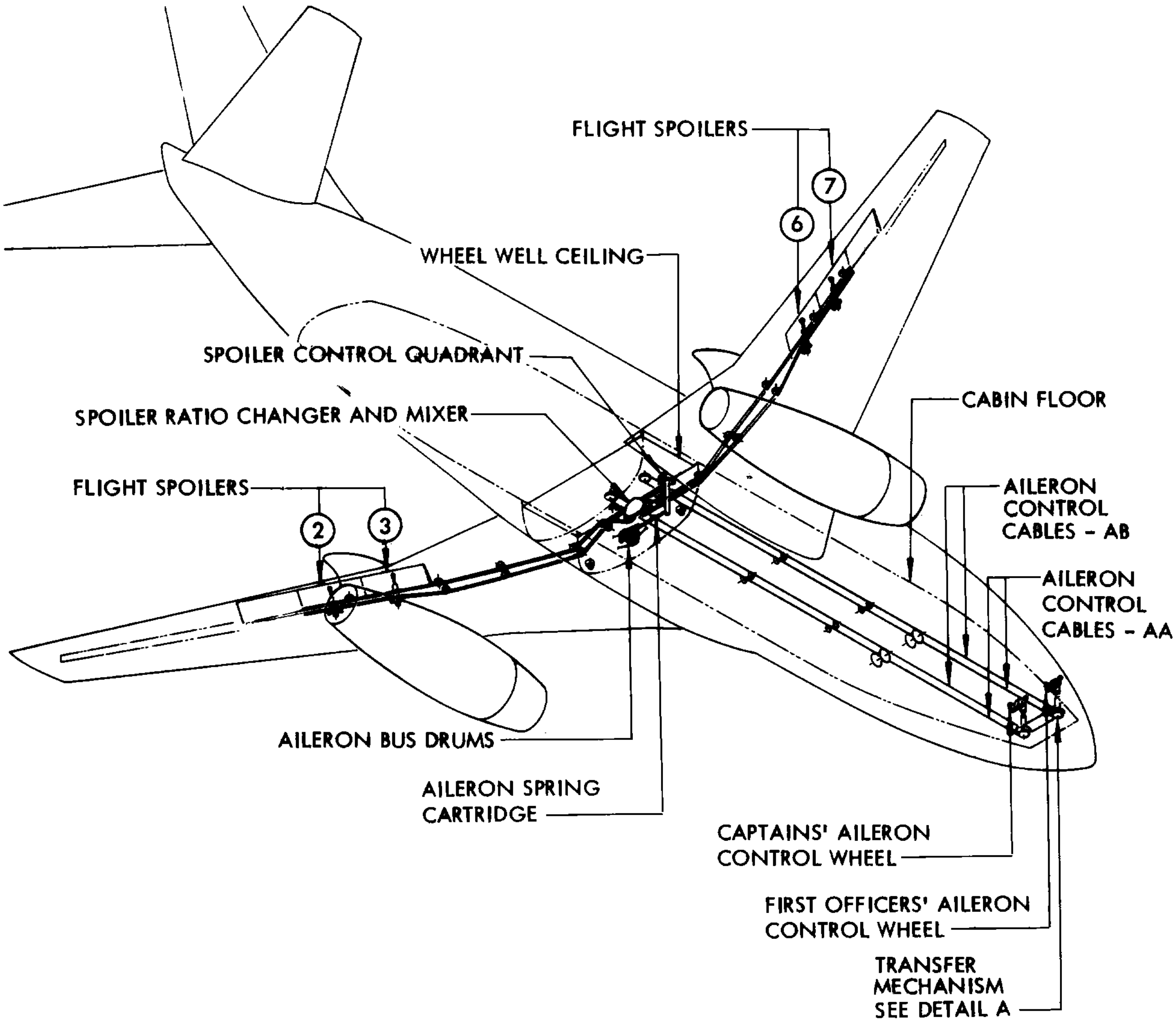
Ref No.	F70207-( )	Diameter (inches)	Length (inches)	Function
A/S-1	-13	0.309-0.311	2.35 ±0.06	Transfer mechanism
A/S-1A	-11	0.309-0.311	6.7 ±0.25	Transfer mechanism
A/S-3	-8	0.309-0.311	3.7 ±0.25	Spoiler control quadrant lower lever
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum
A/S-14	-11	0.309-0.311	6.7 ±0.25	Spoiler mixer

   C. Cement - BMS 5-14 (AMM 20-30-11)
   D. Control Wheel Straightedge - SE27-0001
2. Prepare Spoiler Control Quadrant for Removal
   A. Remove systems A and B hydraulic power (AMM 27-61-0/201).
   B. Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed.
   C. Open lower nose compartment access door.
   D. Insert rigging pins A/S-1 and A/S-1A in first officer's transfer mechanism (Fig. 401).

      NOTE: Rigging pin A/S-1 must be fully put into transfer mechanism and held to keep it from falling out.

   E. Remove seats and floor covering as required to expose right floor panel between seat tracks at second window aft of wing escape hatch. Remove floor panel to gain access to spoiler control quadrant (AMM Chapter 25, Equipment and Furnishings).

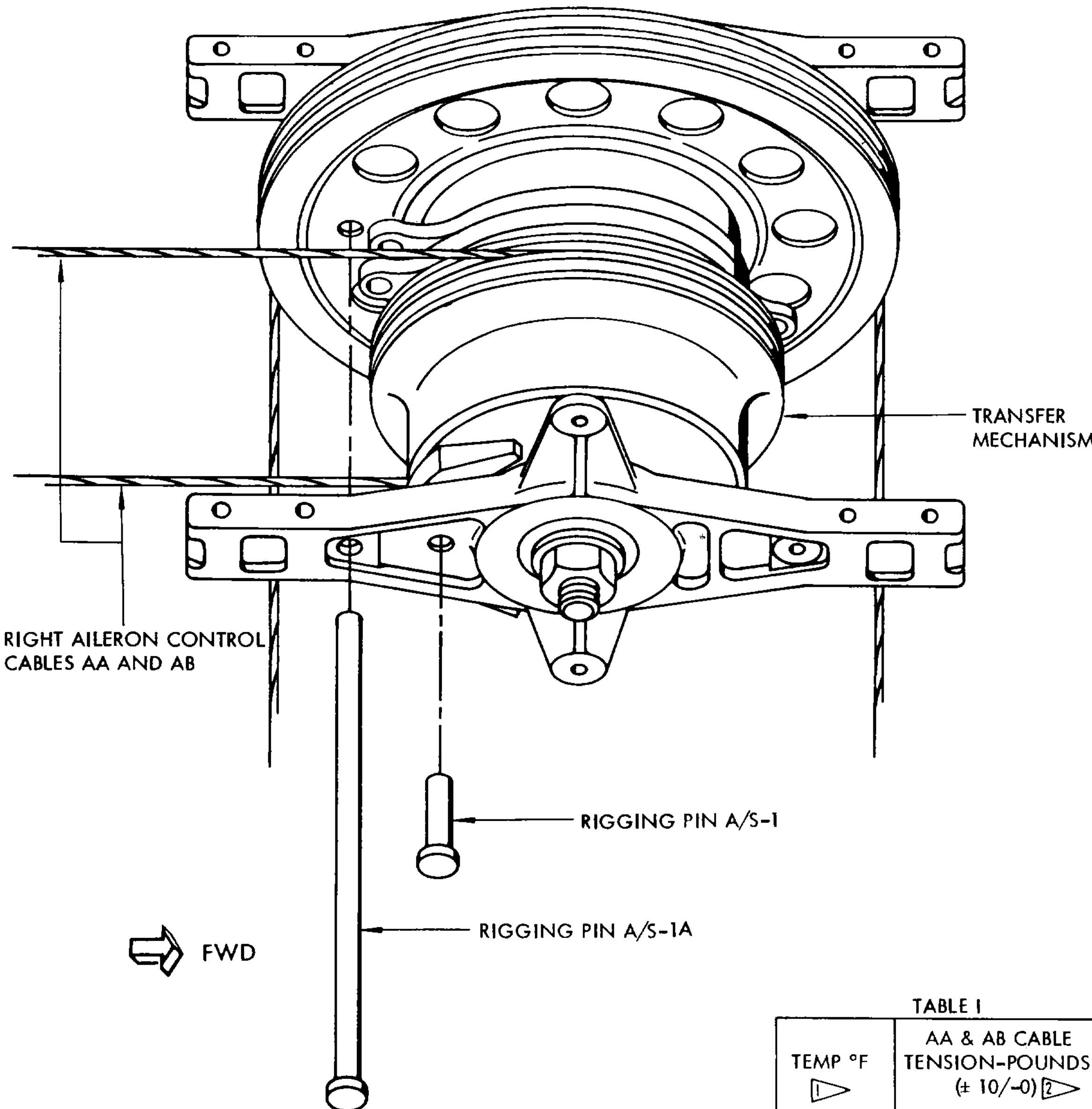
3. Remove Spoiler Control Quadrant
   A. Disconnect right-hand aileron control cables.
      (1) Secure cables to maintain a slight cable tension when turnbuckles are disengaged.
      (2) Disengage turnbuckles located in lower nose compartment.
      (3) Identify cables for subsequent installation.
      (4) Remove cables from spoiler control quadrant.
   B. Remove two bolts attaching spoiler control quadrant to quadrant shaft (Fig. 402).
   C. Disconnect bolt attaching ratio changer input rod to upper control crank.
   D. Disconnect bolt attaching aileron spring cartridge to aileron input crank.
   E. Remove two bolts attaching quadrant shaft support bracket to wheel wel1 forward wall.
   F. Break pressure seal and remove four bolts attaching quadrant shaft to wheel well ceiling.
   G. Disengage quadrant shaft from quadrant, lower shaft through wheel wel1 ceiling, and remove shaft from airplane.
   H. Remove spoiler control quadrant from airplane.
4. Install Spoiler Control Quadrant
   A. If a new spoiler control quadrant and quadrant shaft is to be installed, remove quadrant from shaft (Fig. 401).
   B. Check aileron input crank shear rivets (Fig. 402). If witness hole through aileron input crank and spoiler control quadrant does not align properly, replace shear rivets (AMM 27-61-41/801).
   C. Locate and slide quadrant shaft through wheel well ceiling, engaging spoiler control quadrant with shaft.
   D. Attach quadrant shaft to wheel well ceiling.
      (1) Pressure seal shaft and bearing housing by applying a fillet seal between bearing housing and pressure deck (AMM Chapter 51, Seals and Sealing).
      (2) Install four mounting bolts (heads up) through wheel well ceiling and bearing retainer.
      (3) Secure bolts with washer and locknut.
      (4) Tighten locknut within 20 to 25 pound-inch torque range.



1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (±5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/-30 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ± 15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.

Spoiler Control System Cable Location and Cable Tension
Figure 401 (Sheet 1)



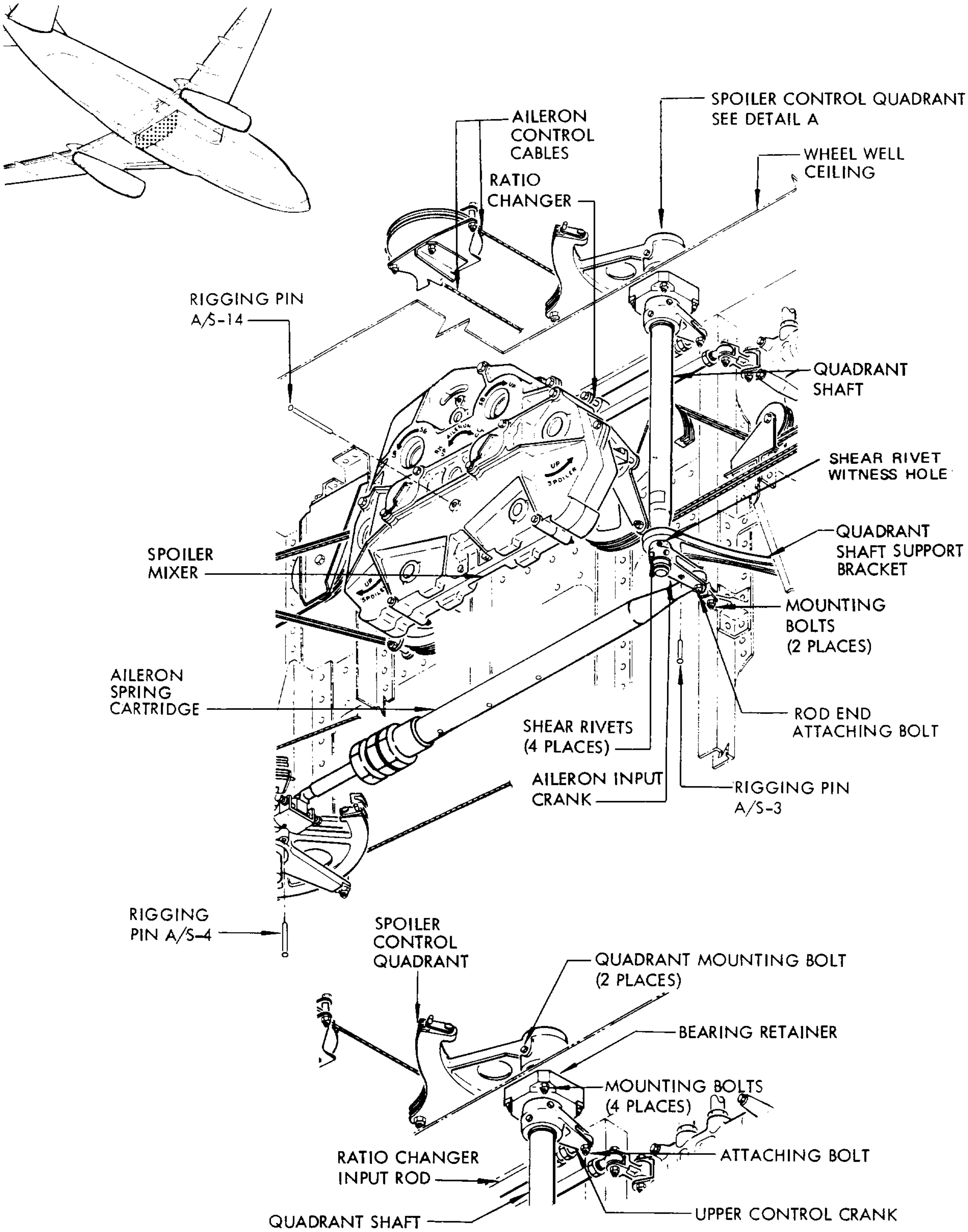
TRANSFER MECHANISM RIGGING PIN LOCATIONS

DETAIL A

TABLE I

TEMP °F 1	AA & AB CABLE TENSION-POUNDS (± 10/-0) 2
110	133
90	124
70	115
90	107
30	99
10	90
-10	82
-30	74
-10	68

Spoiler Control System Cable Location and Cable Tension
Figure 401 (Sheet 2)



Spoiler Control Quadrant Installation
Figure 402

E. Attach quadrant shaft support bracket to lugs on forward wall of wheel well with two bolts. Secure bolts with washer and locknut.

F. Install aileron spring cartridge.
   (1) Install rigging pins A/S-4 and A/S-3.
   (2) Provide systems A and B hydraulic power.
   (3) Check that rod end attaching bolt can be inserted freely without deflecting spring cartridge. If bolt does not fit freely:
      (a) Break lockwire and loosen rod end checknut.
      (b) Adjust rod end until attaching bolt will fit.
      (c) Tighten rod end checknut within 10 to 20 pound-inches torque range.
      (d) Lockwire rod end checknut.
   (4) Connect aileron spring cartridge at aileron input crank.
      (a) Make sure that spring cartridge is positioned with drain holes down and antirotation fork on lower side of lower crank clevis.
      (b) Install rod end attaching bolt with head up. Secure with spacer, washer, nut and cotter pin.
      (c) Turn off systems A and B hydraulic power.
   (5) Remove rigging pin A/S-4.

G. Attach ratio changer input rod to spoiler control quadrant upper control crank.
   (1) Install rigging pin A/S-14 in spoiler mixer.
   (2) Check that rod end attaching bolt can be inserted freely. If bolt does not fit freely:
      (a) Loosen rod end bolt.
      (b) Adjust rod end until attaching bolt will fit.
      (c) Tighten rod end locking nut.
   (3) Install attaching bolt. Secure with washer, nut and cotter pin.
   (4) Remove rigging pin A/S-14.

H. Attach aileron control quadrant to quadrant shaft.
   (1) Insert two attaching bolts through quadrant and shaft.
   (2) Secure bolts with washer and locknut.
   (3) Tighten bolts within 30 to 35 pound-inches torque range.

I. Check that sealant on quadrant shaft seal disk at shafts top is not damaged. If damage has occurred, apply fuel resistant cement to shaft shoulder and push seal disk down firmly onto shaft shoulder.

J. Install right-hand aileron control cables AA and AB as follows:
   (1) Attach cables to spoiler control quadrant using cable-retaining plates.
   (2) Connect turnbuckles located in lower nose compartment.
   (3) Remove rigging pins A/S-1, A/S-1A and A/S-3.
   (4) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed.
   (5) Position aileron control wheels in neutral by clamping straightedge across the upper ends of each control wheel. One end may be out of contact by 0.20 inch.
   (6) Adjust cable tension within required value range in temperature-tension table on Fig. 401.
   (7) Move captain's aileron control wheel through several complete cycles.
   (8) Check cable rigging by inserting and removing rigging pins A/S-1, A/S-1A, and A/S-3. All rigging pins must be inserted at the same time.
   (9) Check that cable tension is within required value range in temperature-tension chart.
   (10) Install turnbuckle-locking clips.
   (11) Remove rigging pins A/S-1, A/S-1A and A/S-3.
K. Test spoiler control quadrant (Ref Spoiler Control Quadrant - A/T).

5. <u>Return Airplane to Normal</u>
   A. Close lower nose compartment access door.
   B. Replace floor panel, floor covering and seats as required.

SPOILER CONTROL QUADRANT - ADJUSTMENT/TEST

1. Spoiler Control Quadrant Test
   A. Equipment and Materials
      (1) Control Surface Protractor -4MIT65B80307-1 (preferred), F52485-500 (optional) (3 required)
      (2) Control Surface Protractor Stand Assembly - F71292-17 (optional) (2 required)
      (3) Aileron Control Wheel Protractor Mount - F72790
      (4) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
A/S-4	-11	0.309-0.311	6.7 ±0.25	Spoiler mixer

   B. Prepare Spoiler Control Quadrant for Test
      (1) Install protractor mount and protractor on captain's control wheel.
      (2) Install protractor stand and protractor on spoilers No. 2 and 6.

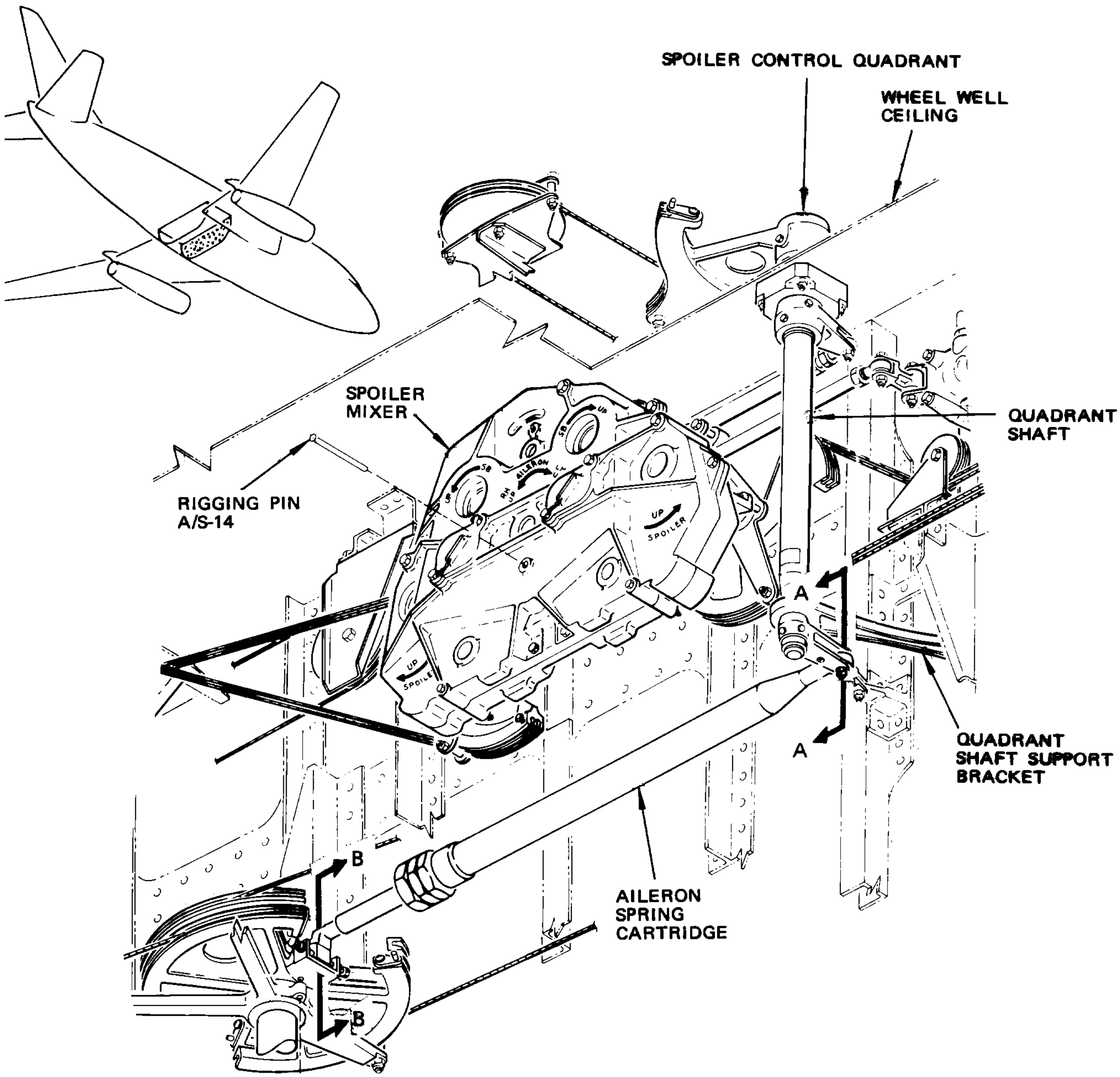
      NOTE: Protractors may be hand-held on spoilers instead of using stands.

      (3) Provide systems A and B hydraulic power (Ref 27-61-0 MP).
      (4) Place speed brake control lever in DOWN position.
      (5) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed. Remove rigging pin.
   C. Test Spoiler Control Quadrant
      (1) Rotate captain's aileron control wheel 87 degrees counterclockwise. Check that spoiler No. 2 is 38 ±2 degrees up from zero position.
      (2) Rotate captain's aileron control wheel 87 degrees clockwise. Check that spoiler No. 6 is 38 ±2 degrees up from zero position.
   D. Return Airplane to Normal
      (1) Remove systems A and B hydraulic power (Ref 27-61-0 MP).

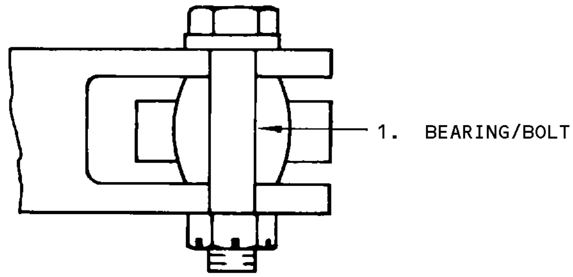
(2) Remove protractor and protractor mount from captain's control wheel.
(3) Remove protractors, and protractor stands from spoilers No. 2 and 6.
(4) Remove electrical power if no longer required.

SPOILER CONTROL QUADRANT - INSPECTION/CHECK

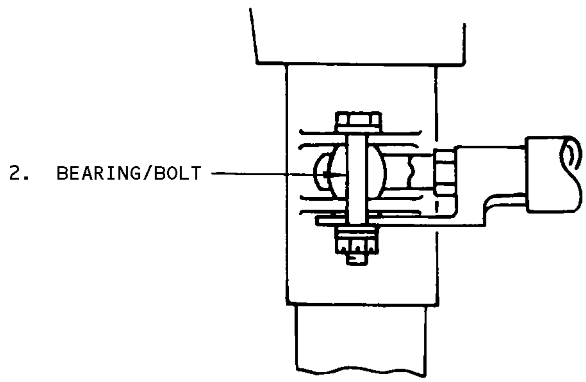
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Spoiler Control Quadrant - Removal/Installation for this information.
2. Spoiler Control Quadrant Wear Limits
   A. Aileron Spring Cartridge Wear Limits



Spoiler Control Quadrant Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION B-B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.2497	0.2500	0.2500 [1]	0.0019	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
2	BEARING	ID	0.2497	0.2500	0.2500 [1]	0.0019	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		

[1] MAXIMUM ALLOWABLE RADIAL PLAY OF BEARING 0.002 INCH.

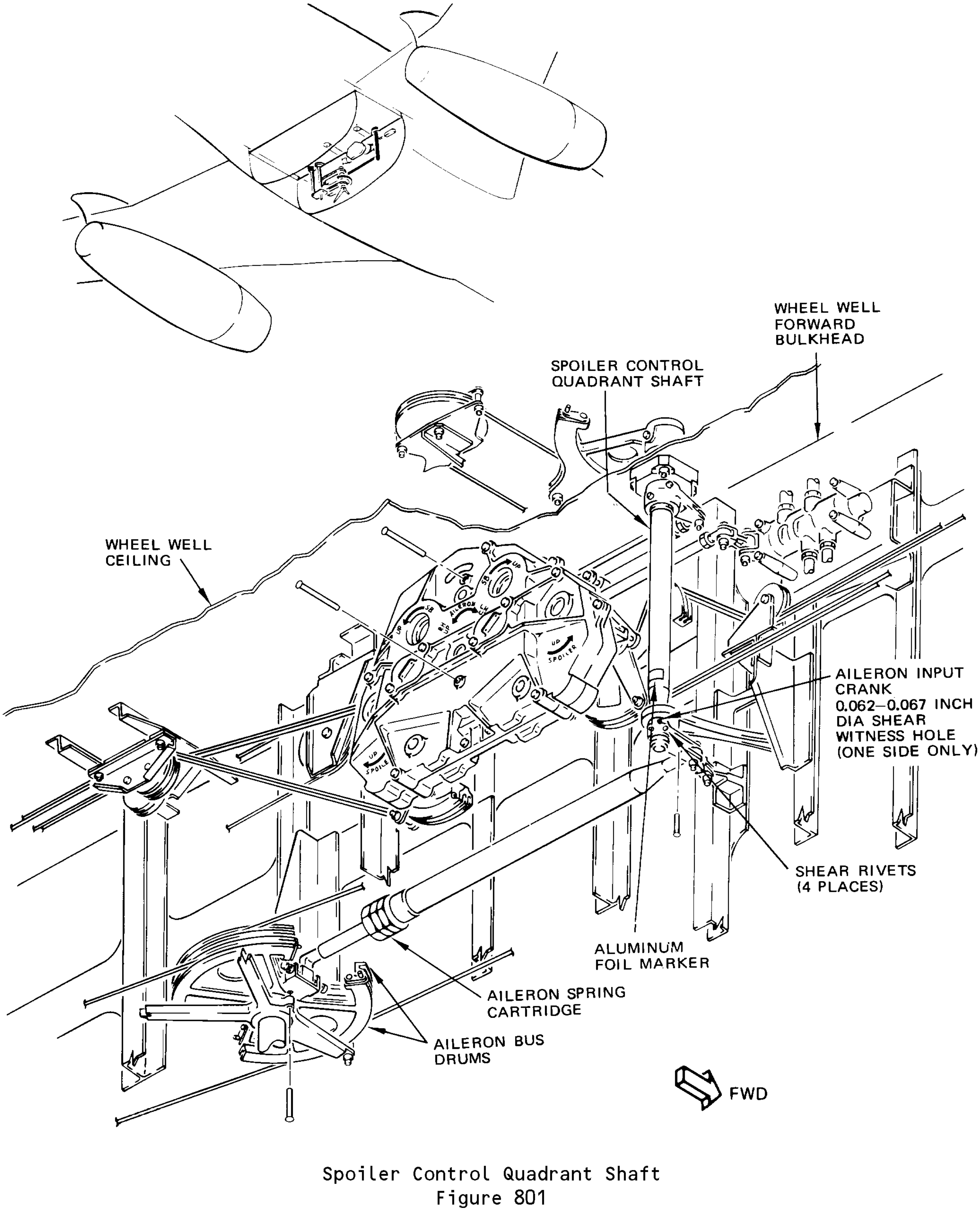
Spoiler Control Quadrant Wear Limits
Figure 601 (Sheet 2)

SPOILER CONTROL QUADRANT - APPROVED REPAIRS

1. General
   A. Shear rivets provide a means by which normal operation of essential flight systems can be maintained in the event of failure or jamming of related or interconnect secondary systems (Ref 27-09-500).
2. Equipment and Materials
   A. Shear Rivets - MS20470D
   B. Aluminum Foil Marker - BAC27DCT-13
3. Replace Sheared Rivets
   A. Remove spoiler control quadrant shaft (Ref 27-61-41, Removal/Installation).
   B. Remove sheared portions of rivet from holes (Fig. 801).

      WARNING: DO NOT ENLARGE RIVET HOLES.

   C. Install new rivets.
   D. Check aluminum foil marker and replace if damaged or missing.
   E. Install spoiler control quadrant shaft (Ref 27-61-41, Removal/Installation).



Spoiler Control Quadrant Shaft
Figure 801

FLIGHT SPOILER ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-21/201)
   B. Control Surface Protractor - 4MIT65B80307-1 (preferred), F52485-500 (optional) (2 required)
   C. Control Surface Protractor Stand Assembly - F71292-17 (optional)
   D. Aileron Control Wheel Protractor Mount - F72790
   E. Fire Resistant Hydraulic Fluid - BMS 3-11, or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   F. Control Wheel Straightedge - SE 27-0001
   G. Sealant - BMS 5-95, Type I, Class B-1/2 (Preferred) (AMM 20-30-11/201)
   H. Sealant - BMS 5-45, Class B-2 (Optional) (AMM 20-30-11/201)
   I. Solvent - Final Cleaning of Composites Prior to Painting (Series 87) (AMM/SOPM 20-30-87/201)
   J. Corrosion Preventive Compound - MIL-C-11796, Class 3 (AMM 20-30-41/201)
2. Remove Flight Spoiler Actuator
   A. Provide electrical power.
   B. Provide systems A and B hydraulic power (AMM 27-61-0/201).
   C. Place flap control lever in FLAP DOWN position to extend trailing edge flaps.
   D. Place the speedbrake handle in the UP position.
   E. Install a ground lock on the spoiler being replaced.
   F. Remove electrical power if no longer required.
   G. Depressurize hydraulic systems A and B (AMM 27-61-0/201).
   H. Disconnect actuator piston rod end from spoiler panel (Fig. 401).
   I. Disconnect hydraulic lines from actuator. Provide a container to catch any hydraulic fluid spilled.
   J. Remove bolt attaching actuator link to actuator input arm.
   K. Remove four actuator mounting bolts and remove actuator from airplane.
   L. Install protective plugs in hydraulic lines.
   M. Remove two hydraulic unions from actuator.
   N. Install protective caps in open ports.
3. Install Flight Spoiler Actuator
   A. Check flight spoiler actuator for wear (AMM 27-61-51/601).
   B. Lightly lubricate O-rings with fire resistant hydraulic fluid or Skydrol Assembly Lube. Install O-ring and hydraulic union at each hydraulic port.
   C. Remove protective caps from hydraulic lines. Place actuator in airplane and align hydraulic lines.

D. Install four actuator mounting bolts (Fig. 401).
   (1) Install bolts with washers on all bolts except shorter of two upper bolts. Do not install washer on short upper bolt.

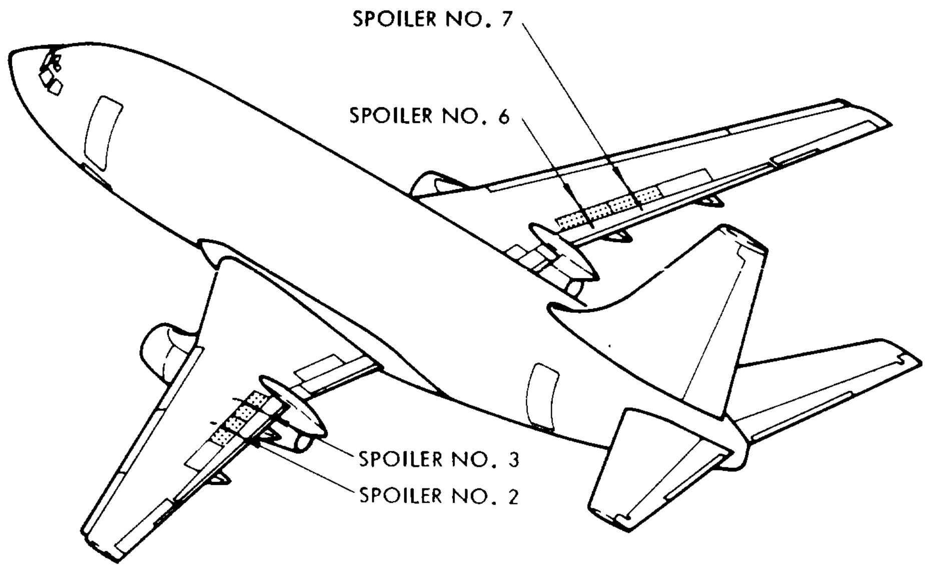
   CAUTION: IF WASHER IS USED ON SHORT UPPER BOLT, ACTUATOR MAY CONTACT BOLT DURING ACTUATION AND BECOME DAMAGED.

   NOTE: A spacer is part of the spoiler actuator assembly which is held in place by the upper shorter bolt. The spacer is installed in between the spoiler actuator and the spoiler actuator mount.

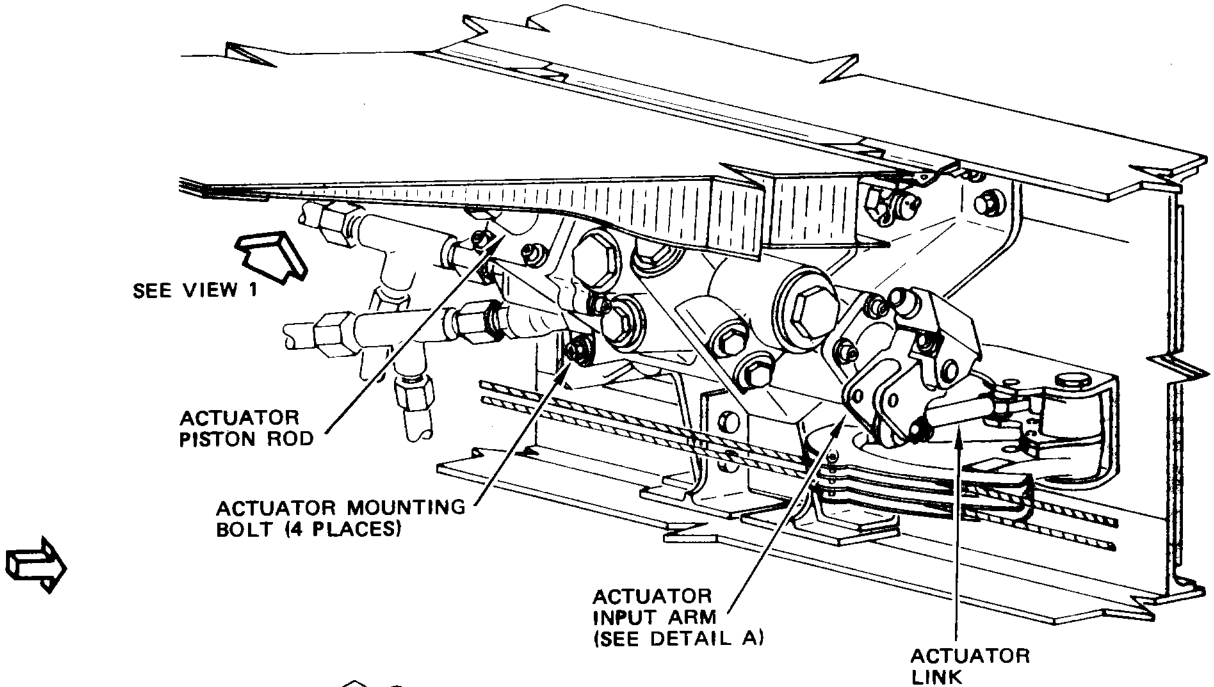
   (2) Tighten two upper bolts to 450-550 pound-inches.
   (3) Tighten two lower bolts to 225-275 pound-inches
E. Tighten hydraulic lines.
F. Connect actuator link at actuator input arm.
   (1) Install bolt at forward position in input arm with bolthead to left.
   (2) Secure bolt with washer, nut and cotter pin.
G. Connect actuator piston rod end to spoiler panel.
   (1) Position spacer bushing.
   (2) Clean areas around rod end checknut with solvent.
   (3) Coat piston rod end threads with corrosion preventive compound. Install rod end and tighten 350 to 400 pound-inches after adjustment. Install lockwire.
   (4) Install rod end attach bolt with bolthead to left.
   (5) Secure bolt with washer, nut and cotter pin.
   (6) Apply a bead of sealant to the rod end checknut.
H. Provide electrical power.
I. Provide systems A and B hydraulic power. Refer to 27-61-0.
J. Remove the ground lock from the spoiler.
K. Actuate speed brake control lever to bleed spoiler actuators.
L. Place speed brake control lever in UP position to raise all spoiler panels.

   NOTE: Raising the spoilers ensures that trailing edge flaps do not strike spoilers during retraction.

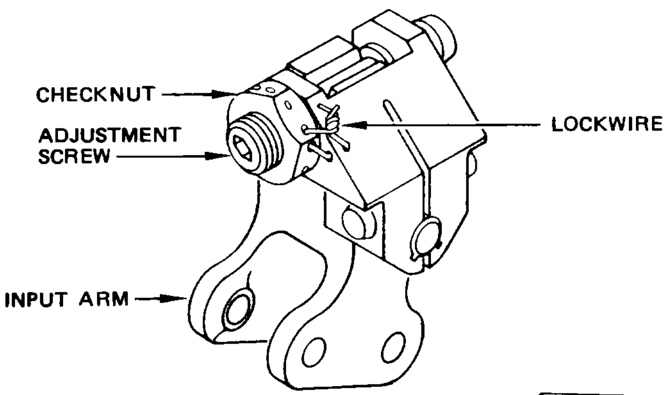
M. Check that there is no hydraulic leakage at actuator.
N. Raise trailing edge flaps to full up with jackscrew stops in contact.
   (1) Place flap control lever in FLAP UP detent to raise trailing edge flaps.
   (2) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
O. Remove systems A and B hydraulic power (Ref 27-61-0 MP).
P. Place speed brake control lever in DOWN position.



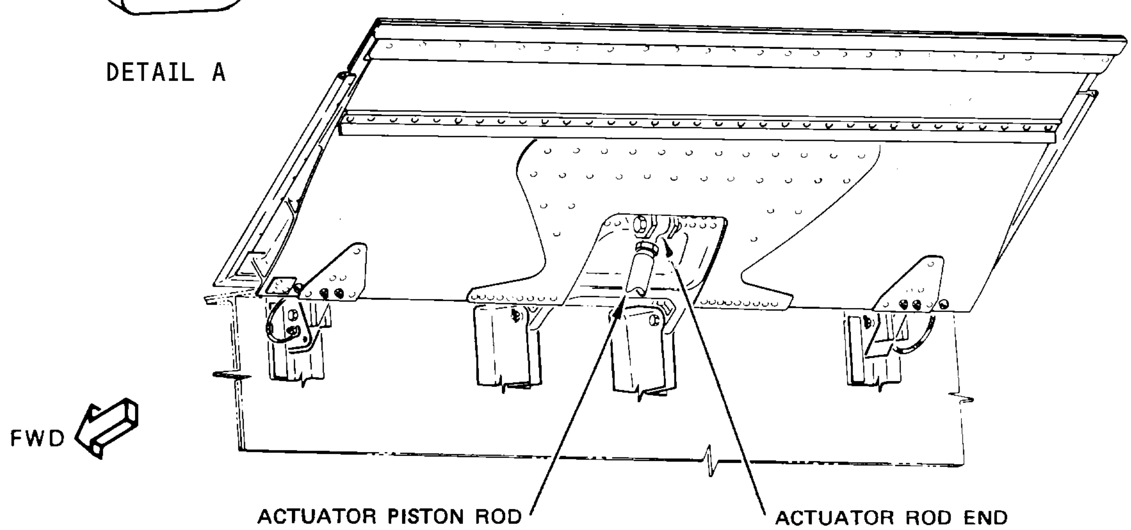
Flight Spoiler Actuator Installation
Figure 401 (Sheet 1)



FLIGHT SPOILER ACTUATOR NO. 2
(NOS. 3,6, AND 7 SIMILAR)



DETAIL A



Flight Spoiler Actuator Installation
Figure 401 (Sheet 2)

Q. Using hand pressure on upper surface of spoiler panel push down until actuator piston bottoms.

R. Check that spoiler to flap clearance for flight spoilers is 0.03 (+0.10/-0.00) inch. Measure at point of minimum clearance (Fig. 402).

S. If spoiler to flap clearance is not within limits:

(1) Provide systems A and B hydraulic power (Ref 27-61-0 MP).

(2) Provide access to spoiler actuator by either lowering flaps or opening applicable trailing edge panel or by placing speed brake control lever in UP position to raise spoilers. Depressurize hydraulic systems A and B (Ref 27-61-0 MP).

WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

(3) Break lockwire and loosen checknut on actuator rod end.

(4) Disengage locking key from piston rod.

(5) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each quarter turn will change spoiler to flap clearance by approximately 0.12 inch.

CAUTION: TURNING PISTON ROD WHEN ACTUATOR IS PRESSURIZED WILL DAMAGE ACTUATOR.

(6) Engage locking key with piston rod.

(7) Coat rod end threads with corrosion preventive compound.

(8) Tighten rod end checknut to 350-400 pound-inches.

(9) Lockwire checknut to locking key.

T. Check spoiler to flap clearance with hydraulic power on.

(1) Provide systems A and B hydraulic power (Ref 27-61-0 MP).

(2) Lower spoilers or raise flaps, if applicable.

(3) Rotate captain's control wheel clockwise to ensure that flight spoilers No. 2 and 3 are full down, or counterclockwise to ensure that flight spoilers No. 6 and 7 are full down.

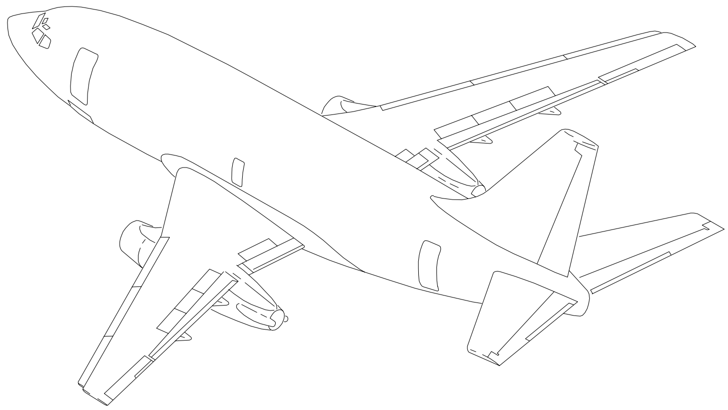
(4) Check that spoiler to flap clearance is 0.03 +0.10/-0.00 inch.

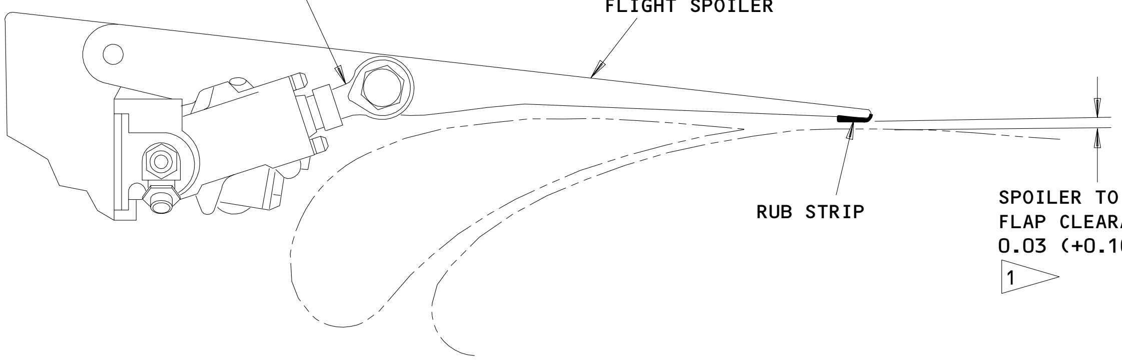
(5) If spoiler to flap clearance is not within limits, adjust per step R.

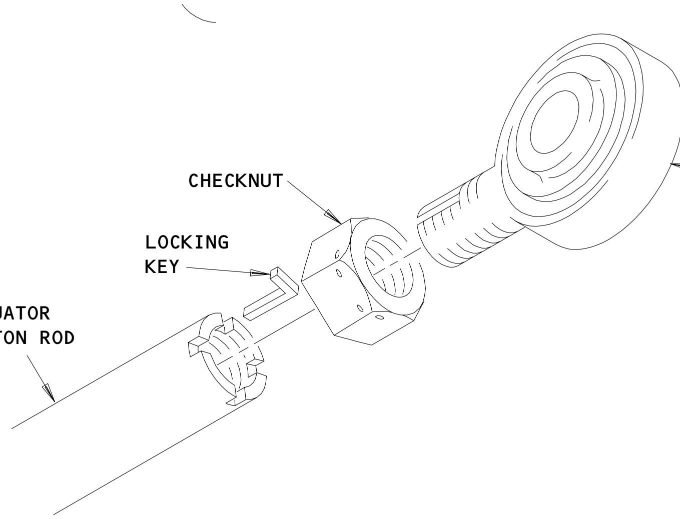
U. Adjust spoiler actuator input arm.

NOTE: Adjustment of all flight spoiler actuator input arms is presented in this procedure. However, only actuator which has been changed need be checked.

(1) Install protractor mount and bubble protractor on captain's aileron control wheel.







ACTUATOR PISTON ROD END
DETAIL A

1 MEASURE AT POINT OF MINIMUM CLEARANCE

Flight Spoiler Adjustment
Figure 402

(2) Place straightedge across both aileron control wheels and set bubble protractor to zero with control wheels in this position. Remove straightedge.
(3) Provide systems A and B hydraulic power (Ref 27-61-0).
(4) Set control surface protractor to zero as follows:
   (a) Turn captain's control wheel clockwise from neutral to ensure that flight spoilers No. 2 and 3 are fully retracted.
   (b) Position protractor and stand on flight spoiler and set protractor to zero.

   NOTE: Protractor may be hand-held on spoiler instead of using stand.

(5) Rotate captain's control wheel counterclockwise 50 ±5 degrees and return toward neutral.
(6) Check that flight spoilers No. 2 and 3 are fully retracted when the captain's control wheel is 4 ±2 degrees counterclockwise from neutral. Check that spoiler-to-flap clearance remains at 0.03 (+0.10/-0.00) inch.
(7) If check in step (6) is not within limits:
   (a) Lower trailing edge flaps by placing flap control lever in FLAP DOWN detent.
   (b) Hold captain's control wheel at 9 ±1 degrees counterclockwise from neutral.
   (c) Break lockwire on input lever adjusting screw and loosen checknut (Fig. 401).
   (d) Using adjusting screw set No. 2 and 3 actuators so that spoiler panels begin to rise from the zero (fully retracted) position.
   (e) Raise trailing edge flaps by placing flap control lever in FLAP UP detent.
   (f) Release captain's control wheel and perform steps (5) and (6). Spoilers must operate within these limits.
   (g) Tighten checknut on input lever adjusting screw within 30 to 40 pound-inch torque range and install lockwire.
(8) Set control surface protractor to zero by:
   (a) Turn captain's control wheel counterclockwise from neutral to ensure that flight spoilers No. 6 and 7 are fully retracted.
   (b) Position protractor and protractor stand on flight spoiler, and set protractor to zero.

   NOTE: Protractor may be hand-held on spoiler instead of using stand.

(9) Rotate captain's control wheel clockwise 50 ±5 degrees and return toward neutral.

(10) Check that flight spoilers No. 6 and 7 are fully retracted when the captain's control wheel is 4 ±2 degrees clockwise from neutral. Check that spoiler-to-flap clearance remains at 0.03 +0.10/-0.00 inch.

(11) If check in step (10) is not within limits:

(a) Lower trailing edge flaps by placing flap control lever in FLAP DOWN detent.

(b) Hold captain's control wheel at 9 ±1 degrees clockwise from neutral.

(c) Break lockwire on input lever adjusting screw and loosen checknut.

(d) Using adjusting screw set No. 6 and 7 actuators so that spoiler panels begin to rise from zero (fully retracted) position.

(e) Raise trailing edge flaps by placing flap control lever in FLAP UP detent.

(f) Release captain's control wheel and perform steps (9) and (10). Spoilers must operate within these limits.

(g) Tighten checknut on input lever adjusting screw to 30-40 pound-inches and install lockwire.

V. Check spoiler actuator at full travel.

(1) Place speed brake control lever in UP position.

(2) Set captain's aileron control wheel at zero and check that applicable spoiler is within following limits:

(a) Spoiler No. 2 is 39 ±3 degrees up from zero.

(b) Spoiler No. 6 is within ± 2 degrees of spoiler No. 2 in step (a), with a minimum of 36 degrees up from zero.

(c) Spoiler No. 3 fairs with spoiler No. 2 within ± 0.25 inch.

(d) Spoiler No. 7 fairs with spoiler No. 6 within ± 0.25 inch.

(3) Place speed brake control lever in DOWN position.

W. Check spoiler actuator pick-up position.

(1) Rotate captain's aileron control wheel counterclockwise and check that spoiler No. 2 begins to rise at 9 ±1 degrees counterclockwise from zero.

(2) Rotate captain's aileron control wheel clockwise and check that spoiler No. 6 begins to rise at 9 ±1 degrees clockwise from zero.

X. Return airplane to normal.

(1) Remove systems A and B hydraulic power. Refer to 27-61-0.

(2) Remove protractor and protractor mount from captain's control wheel.

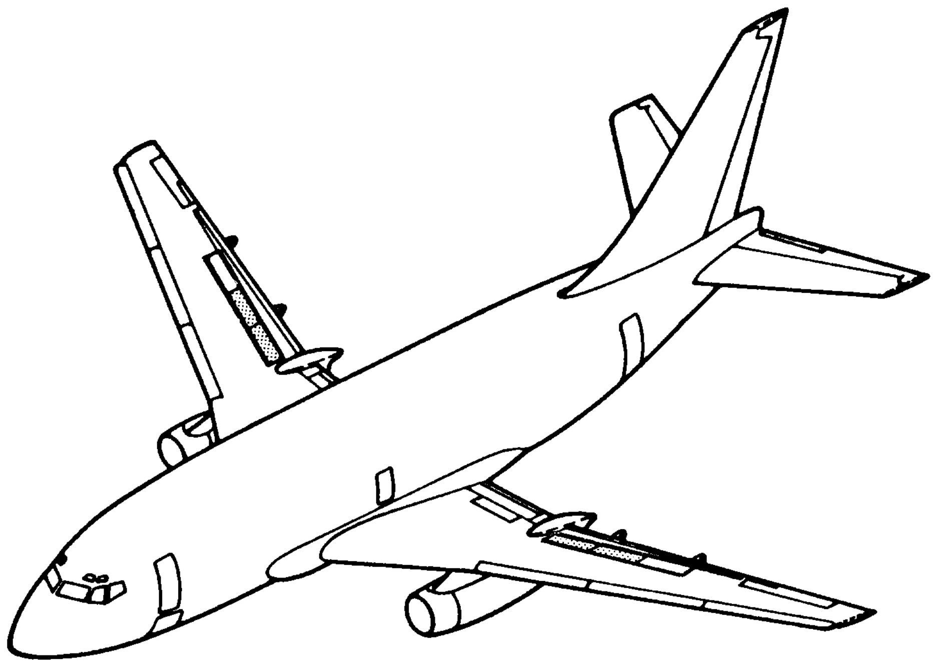
(3) Remove protractors and stands from spoilers.

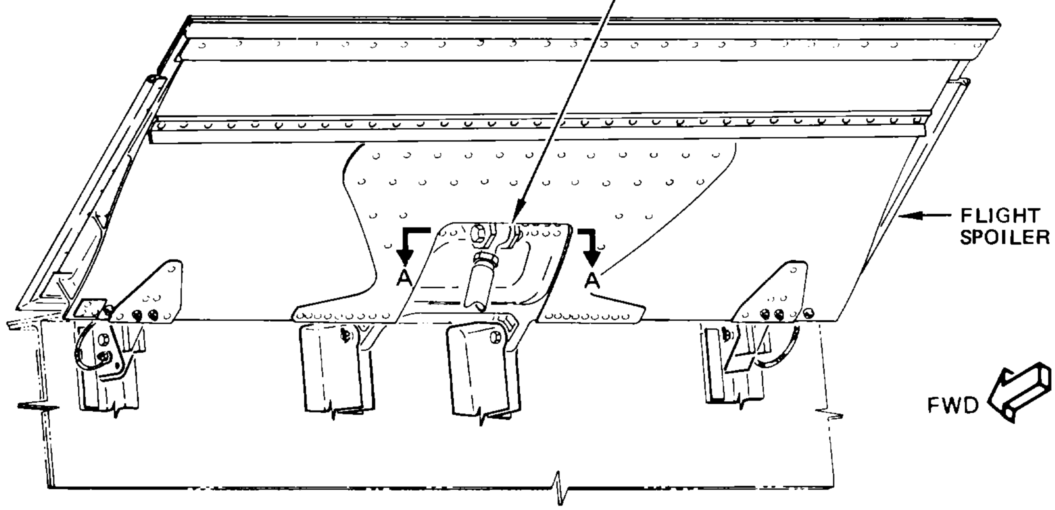
(4) Remove electrical power if no longer required.

(5) Check hydraulic reservoirs and service if required. Refer to Chapter 29, Hydraulic power.

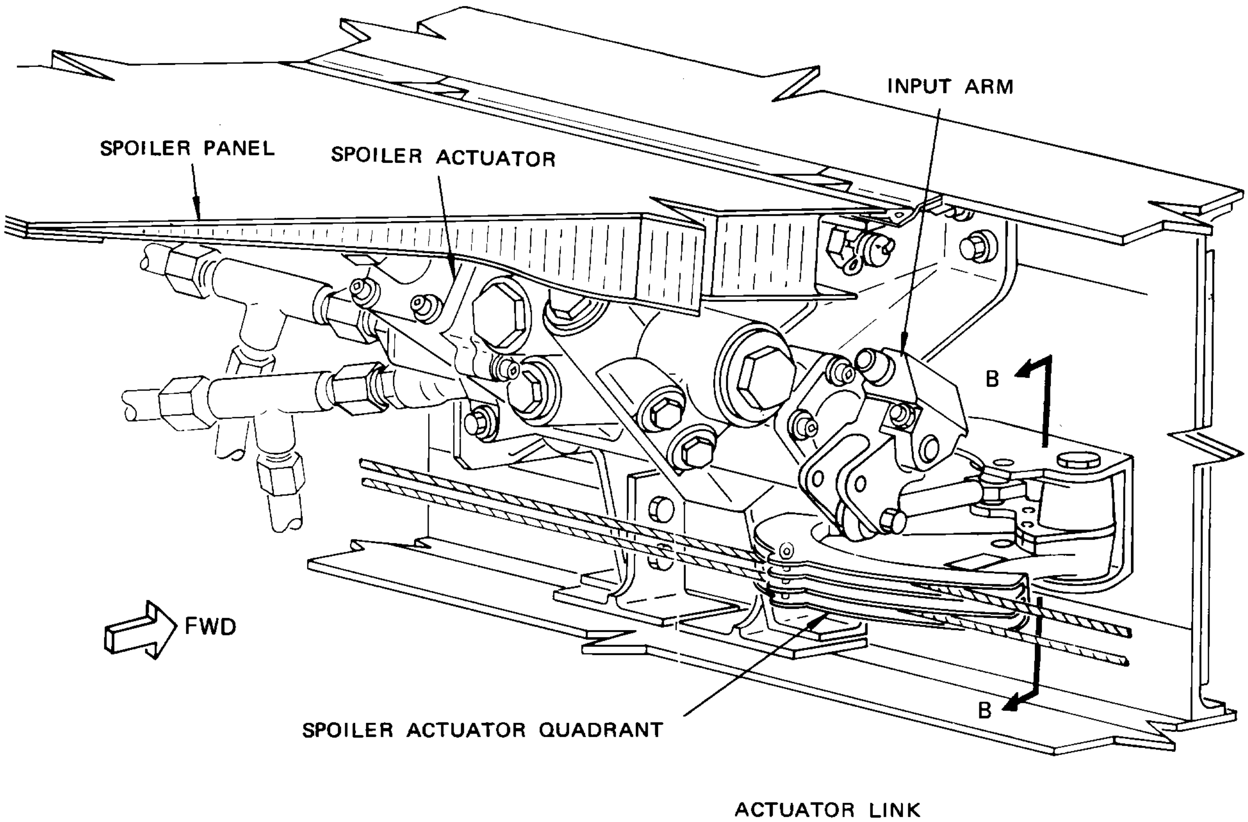
FLIGHT SPOILER ACTUATOR - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component, Removal/Installation for this information.
2. Flight Spoiler Actuator Wear Limits

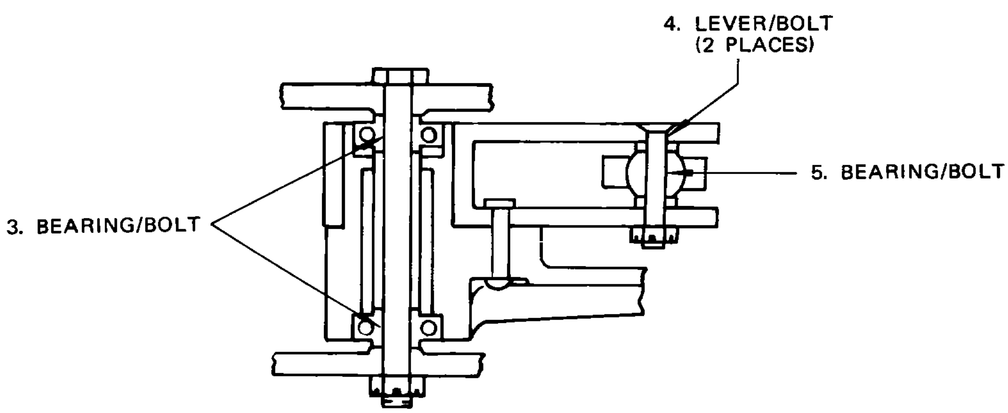




Flight Spoiler Actuator Wear Limits
Figure 601 (Sheet 1)

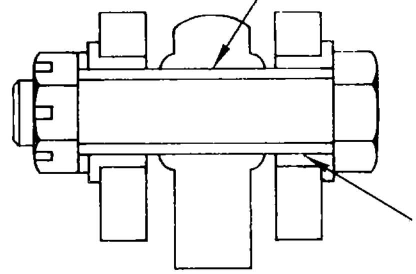


TYPICAL OF FLIGHT SPOILER NO. 2, 3, 6 AND 7



SECTION B-B

Flight Spoiler Actuator Wear Limits
Figure 601 (Sheet 2)



SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	ROD END	ID	0.7495	0.7500	0.753 [2]	0.004	X		
	BUSHING	OD	0.748	0.749	0.7455			X	[1]
2	BUSHING	ID	0.750	0.7515	0.754	0.005		X	[1]
	BUSHING	OD	0.748	0.7490	0.744		X		
3	BEARING	ID	0.2495	0.2500	0.2500 [3]	0.0019	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
4	LEVER	ID	0.2500	0.2510	0.2510	0.0029	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		
5	BEARING	ID	0.2495	0.2500	0.2500 [3]	0.0019	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		

[1] WORN PART IS REPAIRABLE. REFER TO OVERHAUL MANUAL FOR REPAIR INFORMATION.

[2] REPLACE BEARING WHEN RADIAL PLAY EXCEEDS 0.005 INCH DUE TO WEAR OF TEFLON FABRIC LINER.

[3] MAXIMUM ALLOWABLE RADIAL PLAY OF BEARING 0.002 INCH.

Flight Spoiler Actuator Wear Limits
Figure 601 (Sheet 3)

FLIGHT SPOILER ACTUATOR QUADRANT - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Cable tensiometer - 0- to 100-pound range for 3/32-inch cable
   B. Rigging Pins Kit - 70207-3, -52, -61, or -84:

Ref No.	F70207-( )	Diameter (inches)	Length (inches)	Function
A/S-8	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-9	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (left wing)
A/S-10	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-11	-23	0.246-0.248	3.7 ±0.25	Spoiler actuator quadrant (right wing)
A/S-14	-11	0.309-0.311	3.7 ±0.25	Spoiler mixer

2. Prepare for Removal
   A. Extend trailing edge flaps.
      (1) Provide electrical power.
      (2) Provide systems A and B hydraulic power (AMM 27-61-0/201).
      (3) Place flap control lever in FLAP DOWN position to extend trailing edge flaps.
      (4) Remove systems A and B hydraulic power (AMM 27-61-0/201).
   B. Place speed brake control lever in DOWN position.
   C. Set aileron trim to zero.
3. Remove Flight Spoiler Actuator Quadrant
   A. Remove flight spoiler cables to actuator quadrant being removed.
      (1) Install cable retainers to maintain a slight cable tension.

(2) Break lockwire and disconnect cables at turnbuckles located in wheel wells (Fig. 401).
(3) Identify cables for future installation.
(4) Remove cables from quadrant.

B. Remove bolt attaching forward end of actuator link to quadrant lever (Fig. 402).
C. Remove quadrant pivot bolt.
D. Remove quadrant from support.
E. Retain upper bearing and spacer in quadrant with a temporary bolt.

NOTE: Lower bearing is permanently installed in quadrant.

4. Install Flight Spoiler Actuator Quadrant

A. Remove bolt temporarily retaining upper bearing and spacer.
B. Position quadrant in support and install pivot bolt. Secure with washer, nut, and cotter pin (Fig. 402).
C. Position actuator link and install bolt attaching actuator link and quadrant lever. Secure with washer, nut, and cotter pin.
D. Attach spoiler control cables to quadrant.
(1) Insert rigging pins A/S-8 thru A/S-11 in spoiler actuator quadrants 2, 3, 6, and 7, and A/S-14 in spoiler mixer (Fig. 403).
(2) Remove cable retainers and identification and attach cables to quadrant.
(3) Install turnbuckles located in wheel wells.
(4) Adjust cable tension per temperature-tension table on Fig. 401.
(5) Check wing spoiler control cables for proper rigging as follows:
(a) Remove rigging pins A/S-8 thru A/S-11 and A/S-14.
(b) Rotate captain's aileron control wheel through one complete cycle.
(c) Insert rigging pin A/S-14 in spoiler mixer and rigging pins A/S-8, A/S-9, A/S-10, and A/S-11 in spoiler actuator quadrants 2, 3, 6, and 7.
(d) Check that tension in cables is per temperature-tension table.
(e) Check scribe marks for shear rivet integrity. If marks do not align replace rivets (AMM 27-61-61/801).

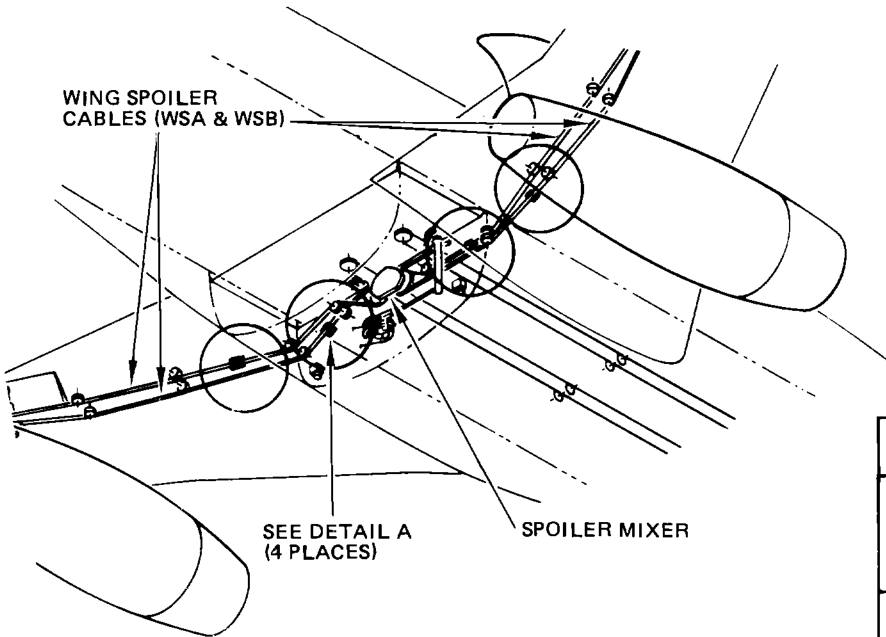
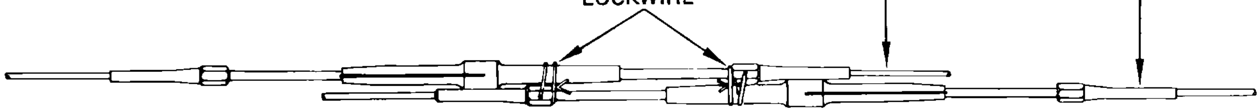


TABLE 1	
TEMP °F [1]	WSA & WSB CABLE TENSION—POUNDS (+10/—0) [2]
110	81
90	75
70	70
50	66
30	61
10	56
-10	50
-30	45
-40	41

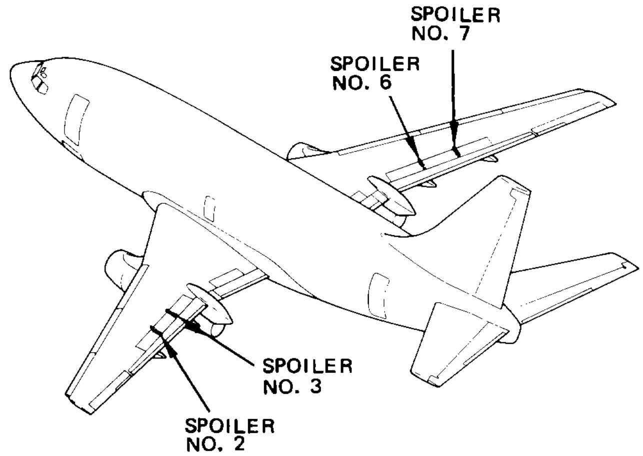
[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (±5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

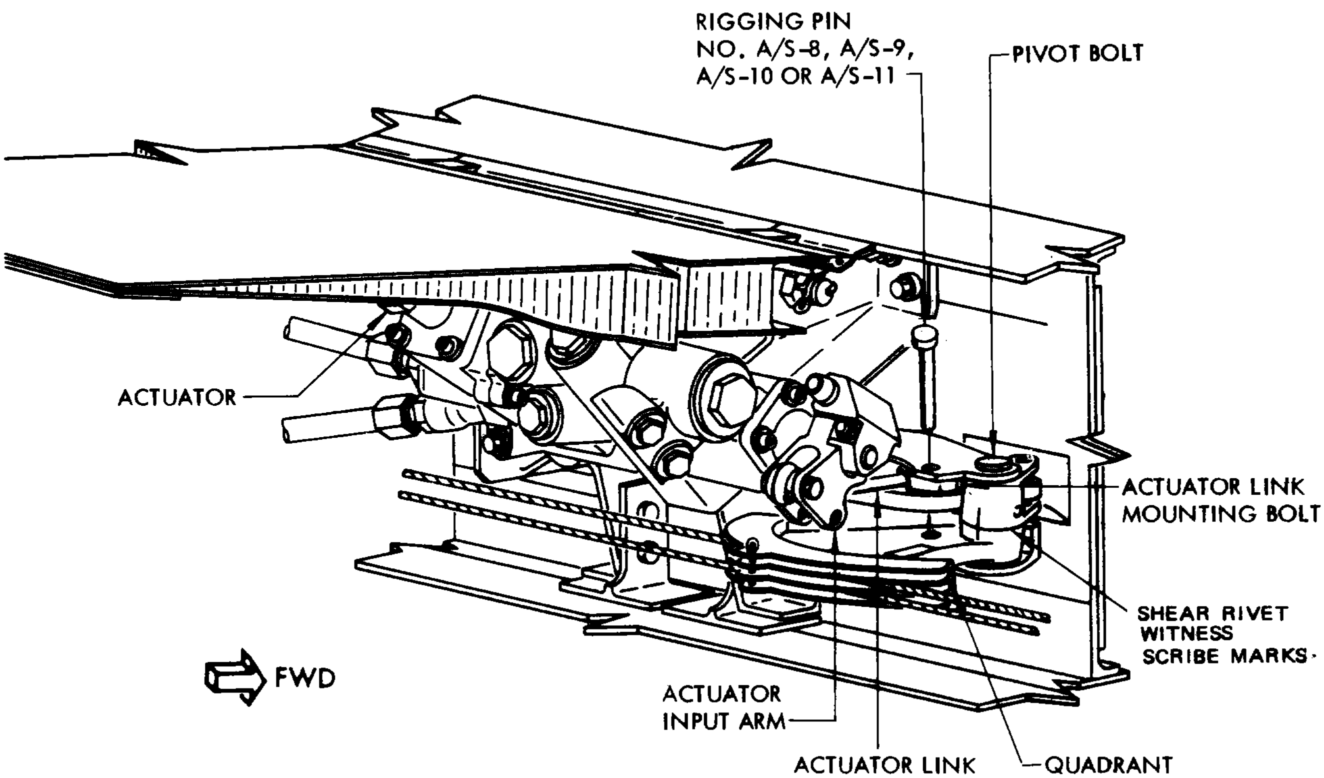
[2] FOR REQUIRED PERIODIC CHECKS WITHOUT SYSTEM DISCREPANCY REPORTS, THE CABLE TENSIONS MAY DEVIATE +15/—20 POUNDS FROM TABLE I VALUES. FOR CABLE TENSION CHECKS RESULTING FROM SYSTEM DISCREPANCY REPORTS, THE TENSIONS MAY DEVIATE ±15 POUNDS FROM TABLE I VALUES. WHENEVER CABLES ARE READJUSTED, TABLE I VALUES MUST BE MET.



DETAIL A
(TYPICAL 4 PLACES)

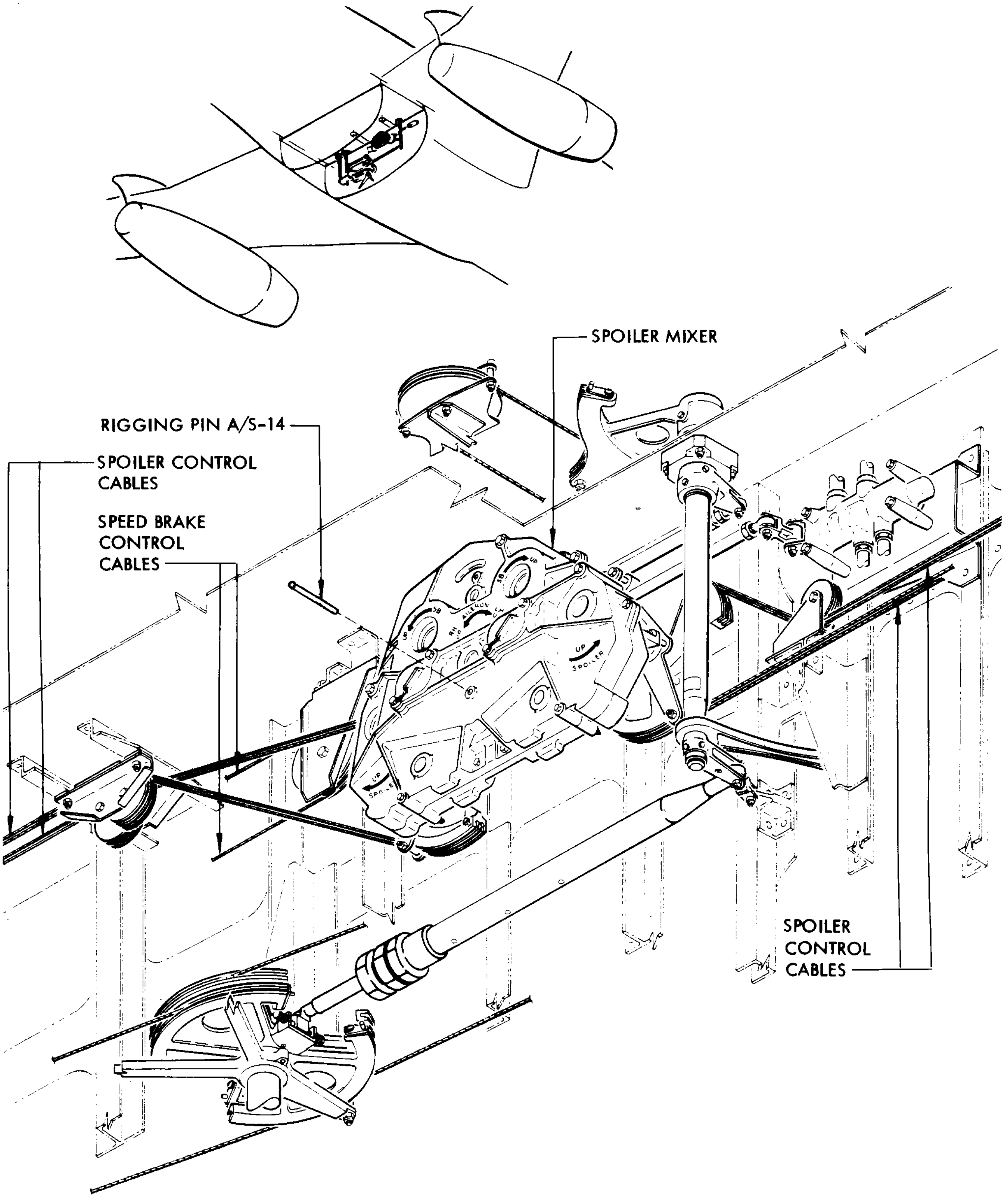
Wing Spoiler Cables and Turnbuckles
Figure 401





FLIGHT SPOILER ACTUATOR QUADRANT NO. 2
(NO.3, 6 AND 7 SIMILAR)

Flight Spoiler Actuator Quadrant Installation
Figure 402



Spoiler Mixer Rigging Pin Location
Figure 403

(f) Remove rigging pins.

(6) Install turnbuckle locking clips and lockwire adjacent cable turnbuckles together.

E. Adjust and test flight spoiler actuator quadrant (Ref Flight Spoiler Actuator Quadrant - Adjustment/Test).

5. <u>Return Airplane to Normal Configuration</u>

A. Raise trailing edge flaps.

(1) Provide systems A and B hydraulic power (AMM 27-61-0).

(2) Place flap control lever in FLAP UP position to raise trailing edge flaps.

(3) Remove systems A and B hydraulic power (AMM 27-61-0).

B. Remove electrical power if no longer required.

FLIGHT SPOILER ACTUATOR QUADRANT - ADJUSTMENT/TEST

1. General
   A. This test checks the operation of flight spoiler quadrants 2, 3, 6 and 7. However, only the quadrants actually changed require testing. When testing the spoilers on the right wing the full travel position of the applicable left wing spoiler must be determined. If any of the test checks in this section are not within limits, adjust the applicable flight spoiler (Ref 27-61-51 R/I).
2. Flight Spoiler Actuator Quadrant Test
   A. Equipment and Materials
      (1) Control Surface Protractor - 4MIT65B80307-1 (preferred) F52485-500 (optional) (2 required)
      (2) Control Surface Protractor Stand Assembly - F71292-17 (optional)
      (3) Aileron Control Wheel Protractor Mount - F72790
      (4) Rigging Pins Kit - F70207-3, -52, -61, or -84:

Ref No.	F70207-( )	Diameter (inches)	Length (inches)	Function
A/S-4	-11	0.309-0.311	6.7 ±0.25	Aileron bus drum

   B. Prepare for Test
      (1) Provide electrical power.
      (2) Provide systems A and B hydraulic power (Ref 27-61-0 MP).
      (3) Install protractor mount and protractor on captain's aileron control wheel.
      (4) Place speed brake control lever in DOWN position.
      (5) Set aileron in neutral. Aileron is in neutral when rigging pin A/S-4 can be freely inserted and removed. Remove rigging pin.
      (6) Install protractor stand and protractor on spoiler No. 6.

      NOTE: Protractor may be hand-held on spoiler instead of using stand.

(7) Set protractors to zero.

C. Test Spoiler Actuator Quadrant

(1) Rotate captain's aileron control wheel clockwise and check that spoiler No. 6 begins to rise at 9 ±1 degrees clockwise rotation from zero position.

(2) Rotate captain's aileron control wheel 87 degrees clockwise and check that:

(a) Spoiler No. 6 is 38 ±2 degrees up from zero position.

(b) Spoiler No. 2 is full down.

(3) From wheel position in previous step, return control wheel counterclockwise and check that spoiler No. 6 starts down when wheel is positioned at 70 degrees minimum clockwise from zero.

(4) From wheel position in previous step, rotate control wheel counterclockwise and check that all spoilers are full down when the wheel is positioned at 4 ±2 degrees clockwise from zero.

(5) Rotate control wheel counterclockwise and check that spoiler No. 2 begins to rise at 9 ±1 degrees counterclockwise from zero position.

(6) Continue rotating control wheel to 87 degrees counterclockwise and check that:

(a) Spoiler No. 2 is 38 ±2 degrees up from zero position.

(b) Spoiler No. 6 is full down.

(7) From wheel position in previous step, return control wheel clockwise and check that spoiler No. 2 starts down when wheel is positioned at 70 degrees minimum counterclockwise from zero.

(8) From wheel position in previous step, rotate control wheel clockwise and check that all spoilers are full down when the wheel is positioned at 4 ±2 degrees counterclockwise from zero.

D. Restore Airplane to Normal

(1) Remove systems A and B hydraulic power (Ref 27-61-0).

(2) Remove protractor and protractor mount from captain's control wheel.

(3) Remove protractor and protractor stand from spoiler.

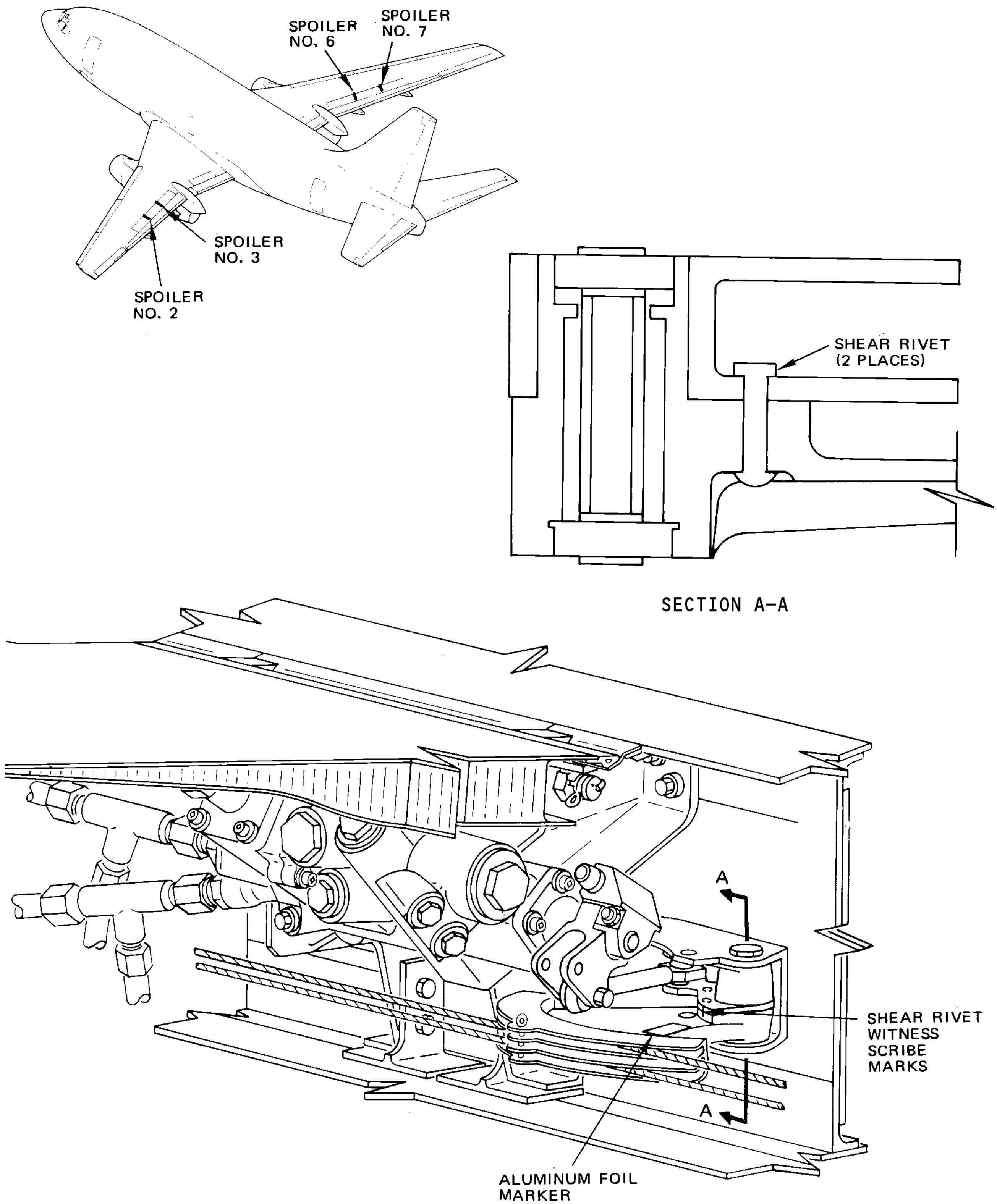
(4) Remove electrical power if no longer required.

FLIGHT SPOILER ACTUATOR QUADRANT - APPROVED REPAIRS

1. General
   A. Shear rivets provide a means by which normal operation of essential flight systems can be maintained in the event of failure or jamming of related or interconnect secondary systems (Ref 27-09-500).
2. Equipment and Materials
   A. Shear Rivet - BACR15BB-4AD
   B. Aluminum Foil Marker - BACM10L1EHR
3. Replace Sheared Rivets
   A. Remove actuator quadrant (Ref Removal/Installation).
   B. Remove sheared portions of rivet from holes (Fig. 801).

      WARNING: DO NOT ENLARGE RIVET HOLES.

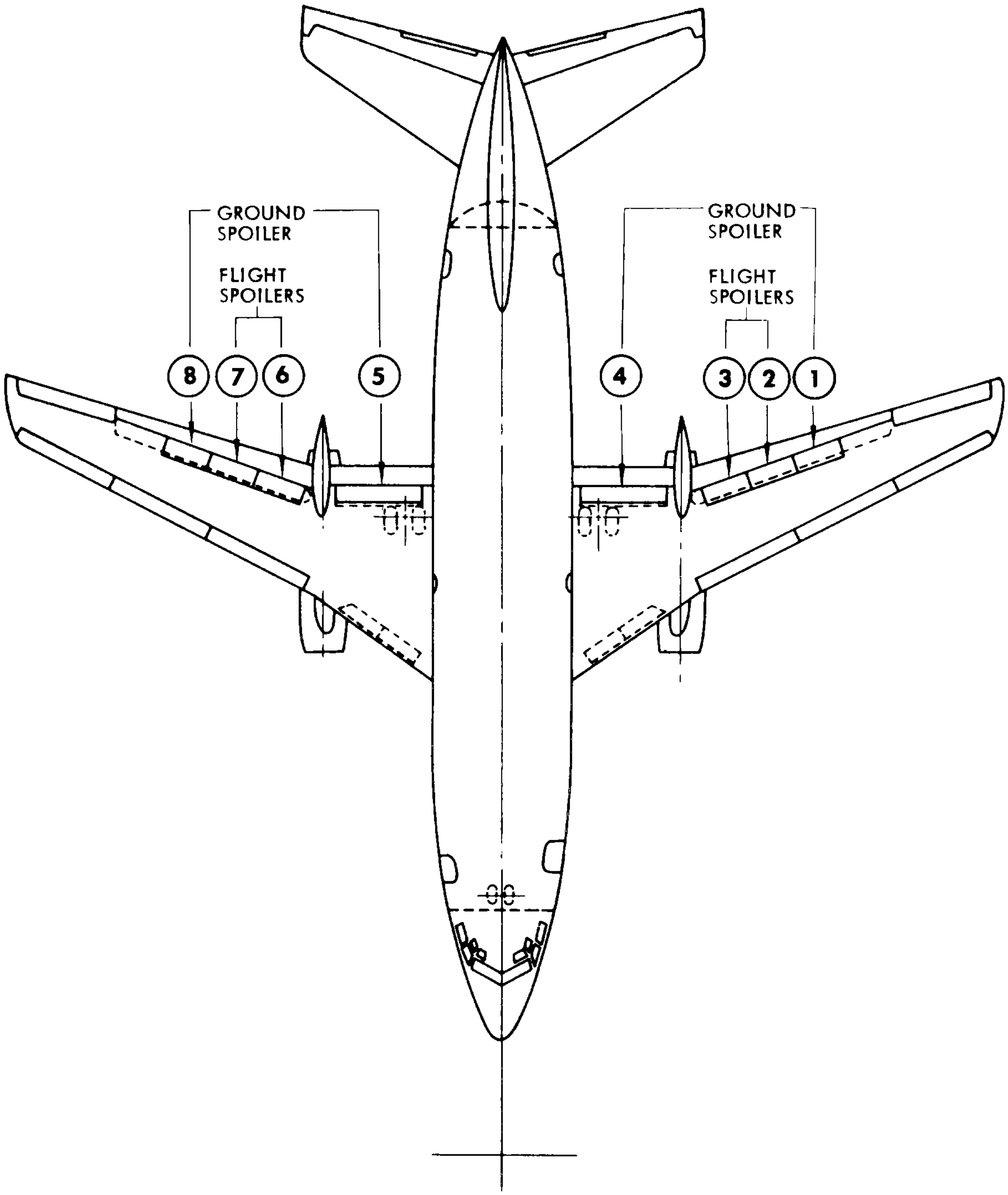
   C. Install new rivets.
   D. Check aluminum foil marker and replace if damaged or missing.
   E. Install actuator quadrant (Ref 27-61-61, Removal/Installation).



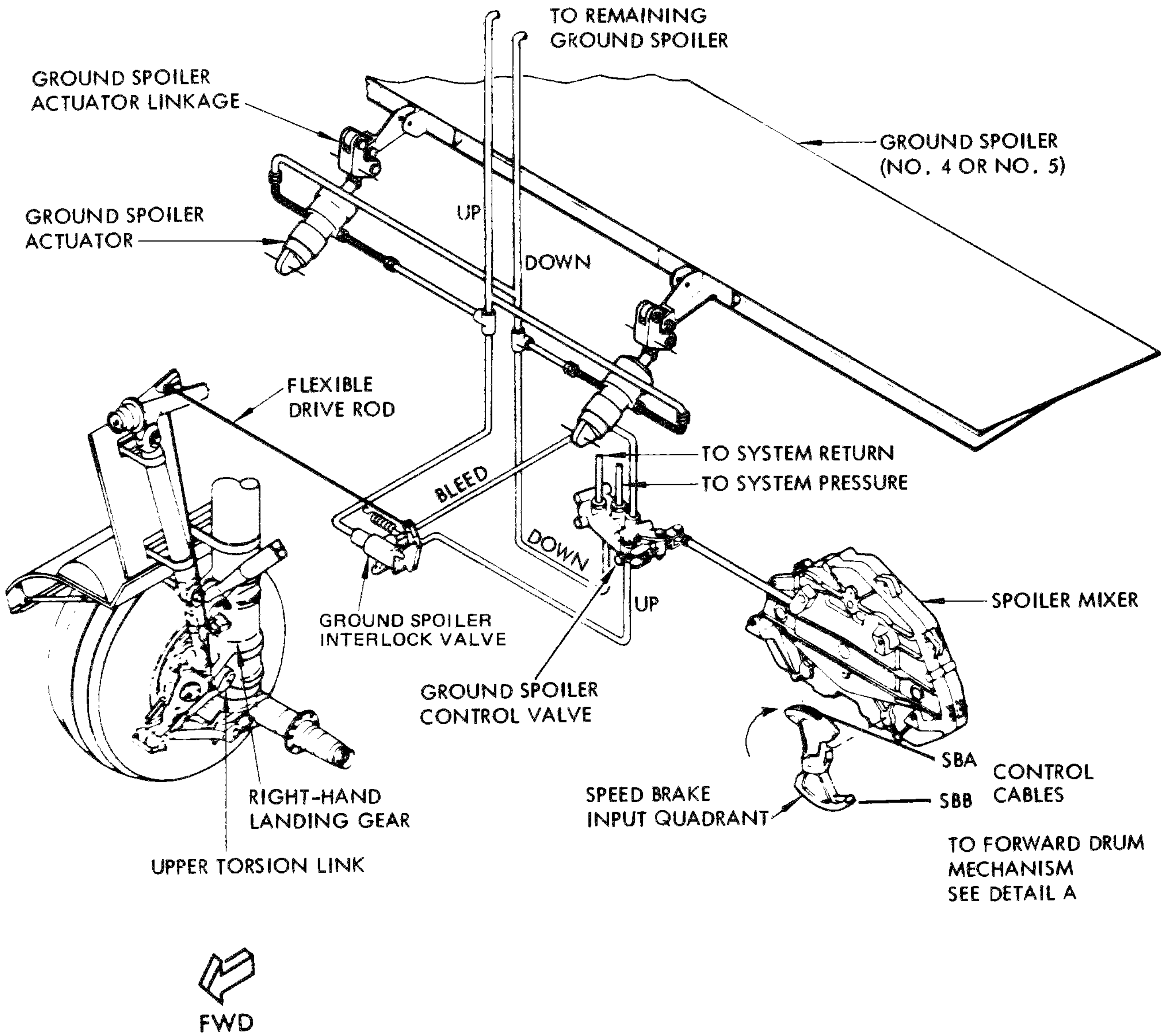
Flight Spoiler Actuator Quadrant
Figure 801

SPEED BRAKE CONTROL SYSTEM - DESCRIPTION AND OPERATION

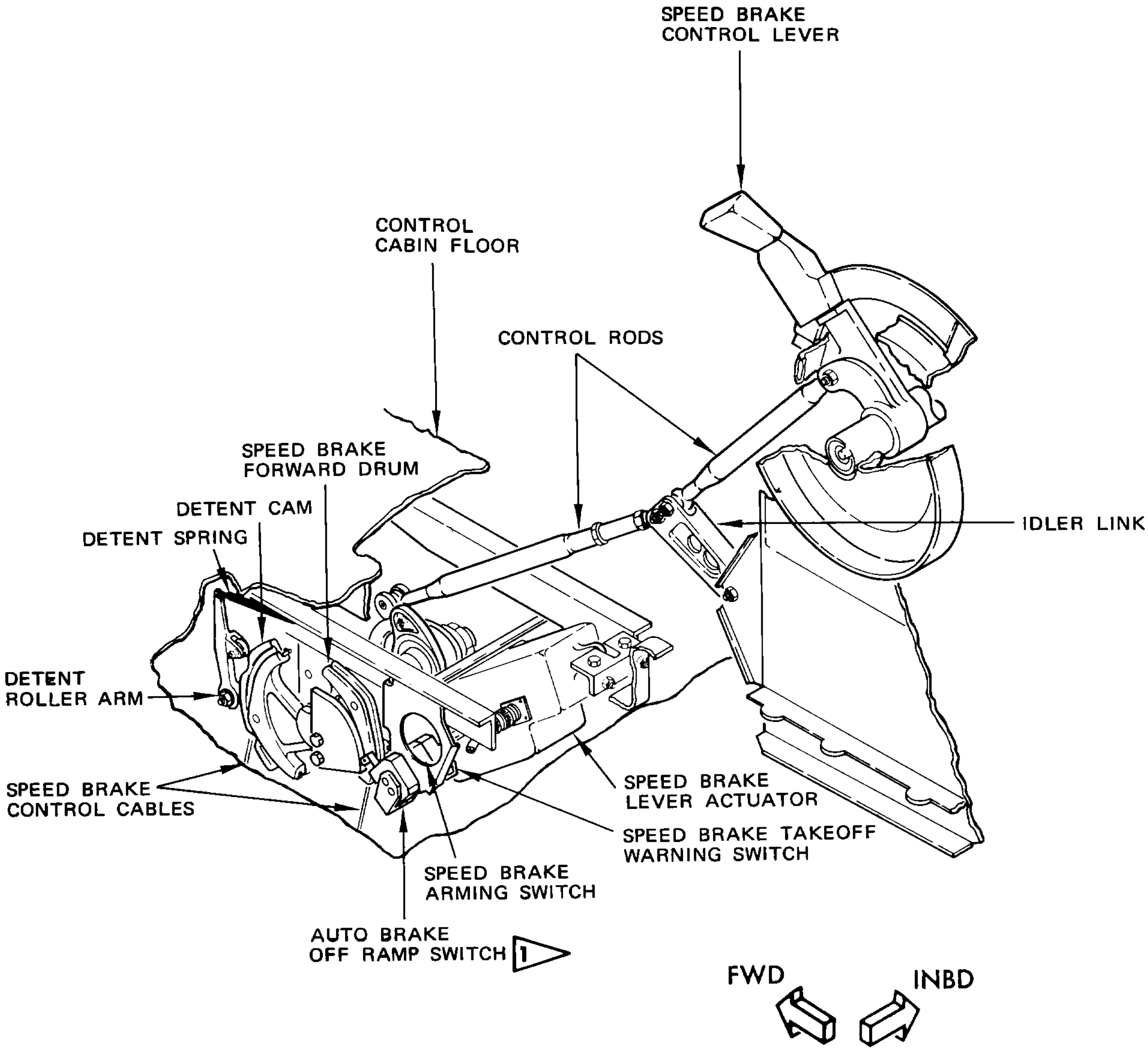
1. General
   A. The speed brake control system actuates the flight and ground spoilers on both wings to increase drag and reduce lift. The ground spoilers are used only on the ground to aid braking after touchdown. The flight spoilers are used for lateral control (Ref 27-61-0, Flight Spoiler Control System), reducing airspeed and to aid braking after touchdown. The spoiler panels are numbered 1 thru 8 from left to right. The flight spoilers, 2, 3, 6, and 7 are located outboard of the engines. Ground spoilers 1 and 8 are located outboard of the flight spoilers. Ground spoilers 4 and 5 are located inboard of the engines (Fig. 1). With lateral controls in neutral, application of speed brakes will cause the corresponding flight spoilers on both wings to rise equally. When speed brakes are applied on the ground, the ground spoilers will also rise.
   B. System control is applied to a speed brake control lever, which is located on the captain's side of the control stand (Fig. 2). Moving the speed brake control lever operates control rods that rotate a speed brake forward drum mechanism. The forward drum mechanism is connected by cables to a speed brake quadrant in the right wheel well. The speed brake quadrant operates a ratio changer and provides an input to a spoiler mixer. The spoiler mixer directs the speed brake signals to a ground spoiler control valve and to flight spoiler actuators. A ground spoiler interlock valve is installed in the hydraulic line between the "up" ports of the ground spoiler actuators and the ground spoiler control valve. The interlock valve is operated by a push-pull cable from the right main gear upper torsion link. With the airplane airborne, the shock strut is extended and the upper torsion link positions the push-pull cable to close the valve. When the airplane touches down, the shock strut is compressed and the push-pull cable opens the valve to actuate the ground spoilers.
   C. System control may also be applied by a speed brake lever actuator. This actuator electrically drives the speed brake control lever to cause the speed brakes to raise or lower. Placing the speed brake control lever in an ARMED detent will prepare the actuator for operation. When the main gear wheels begin rotation at touchdown, the actuator will move the speed brake control lever to full up position raising the ground and flight spoilers. Subsequently, if either engine thrust lever is positioned 25 degrees forward from engine idle position,
   D. Actuator will move the speed brake control lever into the DOWN detent, lowering the ground and flight spoilers. Indicator lights are provided on the center instrument panel to verify that the system is properly armed. Three pushbutton test switches are provided on the center instrument panel. Actuating these switches will test the indicator light control circuit and the actuator circuit.



Spoiler Panel Identification
Figure 1



Speed Brake Control System Component Location
Figure 2 (Sheet 1)



1	AR	ALL EXCEPT LV-JMW THRU LV-JMZ
	ML	ALL MODEL 737-212
	NH	ALL EXCEPT JA8401 THRU JA8403, JA8405 THRU JA8411
	TM	ALL EXCEPT CR-BAA AND CR-BAB
	IC	ALL EXCEPT VT-EAG THRU VT-EAL
	AQ	ALL EXCEPT N21SW THRU N23SW

DETAIL A

Speed Brake Control System Component Location
Figure 2 (Sheet 2)

E. The ground spoilers have two positions, fully retracted or fully raised. The fully raised position for ground spoilers 1 and 8 is 40 degrees. For ground spoilers 4 and 5, the fully raised position is 60 degrees. Ground spoilers 1 and 8 are each actuated directly by a single locking actuator. Ground spoilers 4 and 5 are each actuated by two locking actuators that drive individual linkages (Fig. 2). Hydraulic power for the ground spoilers is from hydraulic system A. This ground spoiler hydraulic pressure does not pass through the spoiler valves on the flight controls hydraulic modular package. Thus, the spoiler switches, which control these valves, have no effect on ground spoiler operation.

F. The flight spoilers will be positioned between 0 degrees and full up depending on speed brake lever position. The full up position for flight spoilers 2, 3, 6, and 7 is 40 degrees.

G. A speed brake warning system provides an aural warning to prevent takeoff with the speed brakes raised or speed brake control lever in ARMED position.

2. <u>Ground Spoiler Panel</u>

A. Ground spoilers 1 and 8 are located outboard of the flight spoilers. Ground spoilers 4 and 5 are located inboard of the engines (Fig. 1). The ground spoilers are of bonded honeycomb construction. They are constructed with upper and lower skins of clad aluminum alloy and a nonperforated aluminum alloy honeycomb core. On some airplanes, the ground spoilers are of graphite/epoxy construction with upper and lower skins of graphite laminate and graphite/epoxy nomex honeycomb core. A continuous phenolic rub strip is bonded to the lower surface at the trailing edge. Dacron covered silicon rubber seals are installed at each end and at the forward edge. The seals at each end are adjustable. Ground spoilers 4 and 5 are interchangeable between themselves. Ground spoilers 1 and 8 are interchangeable between themselves and with the flight spoilers.

B. The ground spoilers are attached to wing structure by four hinge fittings equipped with self-aligning bearings. Ground spoilers 1 and 8 are located forward of the outboard flaps and are attached to wing structure aft of the rear spar. Ground spoilers 4 and 5 are located forward of the inboard flaps and are attached to wing structure aft of the rear spar and landing gear support beam. the actuators for ground spoilers 1 and 8 are attached directly to the spoilers and wing structure at the center of each spoiler. The actuators for ground spoilers 4 and 5 are attached directly to wing structure and through an actuator linkage to the spoilers. Bonding jumpers provide an electrical bond between the ground spoilers and wing structure.

C. The ground spoilers are constructed with a straight trailing edge. When the spoilers are down, the down limit is provided by bottoming the piston in the actuator. In this position a clearance is maintained between the outboard flaps and ground spoilers 1 and 8. On ground spoilers 4 and 5 the actuator linkage is adjusted to maintain the clearance between the inboard flaps and the spoilers. In flight, the flap will move up due to airloads; and the phenolic strip may contact the abrasion resistant finish on the flap upper surface.

3. Speed Brake Control Lever

A. Manual control signals to the speed brake control system are applied at a speed brake control lever. (See figure 2.) The speed brake control lever is located on the left side of the control stand. The control lever handle extends above the control stand through a cutout in the cover. An indicator on the lever follows a plate on the stand. The plate is marked at the DOWN and UP positions with additional markings at the ARMED detent and FLIGHT DETENT.

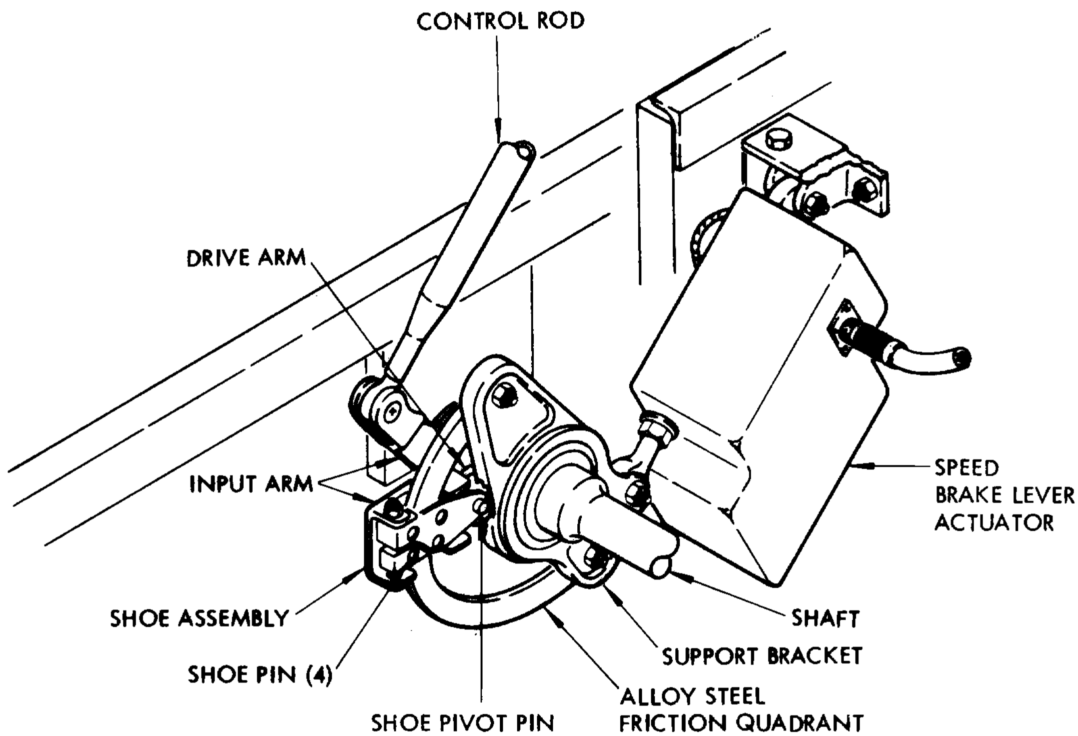
B. The speed brake control lever has a compression spring in the telescoping handle. Projecting inward from the control lever is a small latch lug. Lever movement aft of the DOWN position is prevented until the handle is lifted to raise the latch lug out of a detent.

4. Speed Brake Forward Drum Mechanism

A. A speed brake forward drum mechanism in the fuselage lower nose compartment transfers speed brake lever motion and speed brake lever actuator motion into cable motion. Speed brake lever input to the mechanism is through two control rods and an idler link. (See figure 2.) The mechanism also provides control lever braking, a speed brake armed detent and a speed brake inflight detent. It consists of a lever brake mechanism, a speed brake lever actuator, a speed brake forward drum, a detent roller arm, and switches.

B. The lever brake mechanism consists of an input arm, a shoe assembly, a drive arm, a brake quadrant, a shaft and a support bracket (Fig. 3). The lower control rod from the speed brake lever is attached to the input lever. The speed brake lever actuator is attached to the support bracket which is mounted on the shaft. The shaft is supported in the structure by two bearings. The outboard end of the shaft is splined for attachment of the speed brake forward drum. Shoe pins in the shoe assembly form a cluster about the brake quadrant in a rectangular layout. The shoe assembly is mounted on a pivot pin through a drive arm. The drive arm is fixed to the shaft and rotates with the shaft and drum. The brake quadrant and support bracket are held from rotating by the automatic speed brake lever actuator. A rotational force applied to the forward drum will be transmitted to the shoe assembly through the pivot froward drum will be transmitted to the shoe assembly through the pivot pin. This force on the shoe assembly applies a shearing action on the brake quadrant through two diagonally opposed shoe pins producing a locking action. Forces applied to the forward drum in the opposite direction will have a locking action on the other diagonally opposed shoe pins. Motion of the input arm, caused by the speed brake lever rotation, initially unlocks the shoe assembly and then rotates the shaft. The input arm drives the shaft through flanges that contact the drive arm. When lever rotation is stopped, a compression spring in the shoe assembly returns the shoe pins to the locked position. Motion of the automatic speed brake lever actuator causes the support bracket and brake quadrant to rotate. This rotation is transmitted through the shoe assembly to the drive arm causing the shaft to rotate. The drive arm also drives the speed brake lever through the input arm. A load at the speed brake lever will unlock the shoe assembly and override the motion of the speed brake lever actuator.

C. The speed brake lever actuator connects the lever brake mechanism support bracket to airplane structure. The actuator consists of a 28-volt dc electric motor, gearing, a displacement rod, non-jamming mechanical stops, and adjustable limit switches. The limit switches are bench adjusted to limit the stroke at the extended and retracted positions. The gearing prevents actuator motion due to external loads.



Lever Brake Mechanism
Figure 3

D. The speed brake forward drum is splined to the lever brake mechanism. The drum is grooved for 1/8-inch cables and has integral cable guards. A switch cam is provided on the aft side of the drum. A switch actuator contacts this cam when the speed brake handle is down and locked. Two switches ganged to this actuator control automatic speed brake arming and provide a speed brake input to the takeoff warning system (Ref 31-26-0, Aural Warning (Takeoff Warning) System). A detent cam is provided on the forward side of the drum to provide an armed detent and a maximum in-flight detent. A spring-loaded roller arm follows this cam and provides speed brake lever feel at these detents.

5. <u>Speed Brake Position Warning System</u>

A. An aural (takeoff) warning system is provided to warn against takeoff with the speed brakes on. An intermittent warning horn will sound if the thrust levers are advanced for takeoff and the speed brakes are raised or speed brake control lever is in the ARMED position. For complete description, Ref 31-26-0, Aural Warning (Takeoff Warning) System.

6. <u>Ground Spoiler Control Valve</u>

A. A ground spoiler control valve controls hydraulic pressure to ground spoiler actuators (Fig. 2). The valve is located in the right main wheel well and is bolted to a bracket on the outboard part of the wheel well forward bulkhead.

B. The valve consists of a piston and sleeve assembly enclosed in a valve body. Drilled passages in the sleeve are connected to five external ports on the valve body. A lever which pivots about a lug on the valve body is connected to the piston. The opposite end of the lever is connected by a pushrod to a speed brake crank on the spoiler mixer. Moving the speed brake control lever causes the speed brake crank on the spoiler mixer to transmit motion through the pushrod and lever, to position the valve piston.

C. When the speed brake control lever is in the DOWN position, the ground spoiler control valve directs hydraulic pressure directly to the down port of the ground spoiler actuator (Fig. 5). As the speed brake control lever is moved aft, the control valve moves through a neutral position where pressure is blocked and all other ports connected to return. As the speed brake lever is moved further aft, the control valve applies hydraulic pressure to the up ports of the ground spoiler actuators, through the ground spoiler interlock valve. The down port of the ground spoiler actuator is connected to return through the ground spoiler control valve.

7. <u>Ground Spoiler Interlock Valve</u>

A. A ground spoiler interlock valve limits use of the ground spoilers to ground operation. The valve is located above the right main gear trunnion and is secured to a bracket on the aft side of the wing rear spar (Fig. 2).

B. The valve consists of a three port housing, with passages for hydraulic fluid, and a valve slide. A bellcrank which pivots about a lug on the valve body is connected to the valve slide. The opposite end of the bellcrank connects to a ground spoiler interlock push-pull cable. The push-pull cable is routed along the right main gear drag strut and is connected to the upper torsion link.

C. With the landing gear in the retracted position the shock strut inner cylinder is fully extended. This positions the upper torsion link to cause the valve to block hydraulic pressure to the ground spoiler actuator up ports (Fig. 5).

D. With the landing gear in the extended position, the hydraulic pressure remains blocked until the airplane touches the ground and the right main landing gear shock strut is compressed. As the shock strut inner cylinder is compressed, the upper torsion link moves the push-pull cable to open the interlock valve. The interlock valve then connects hydraulic pressure from the ground spoiler control valve with the up ports of the ground spoiler actuators.

8. <u>Ground Spoiler Actuator</u>

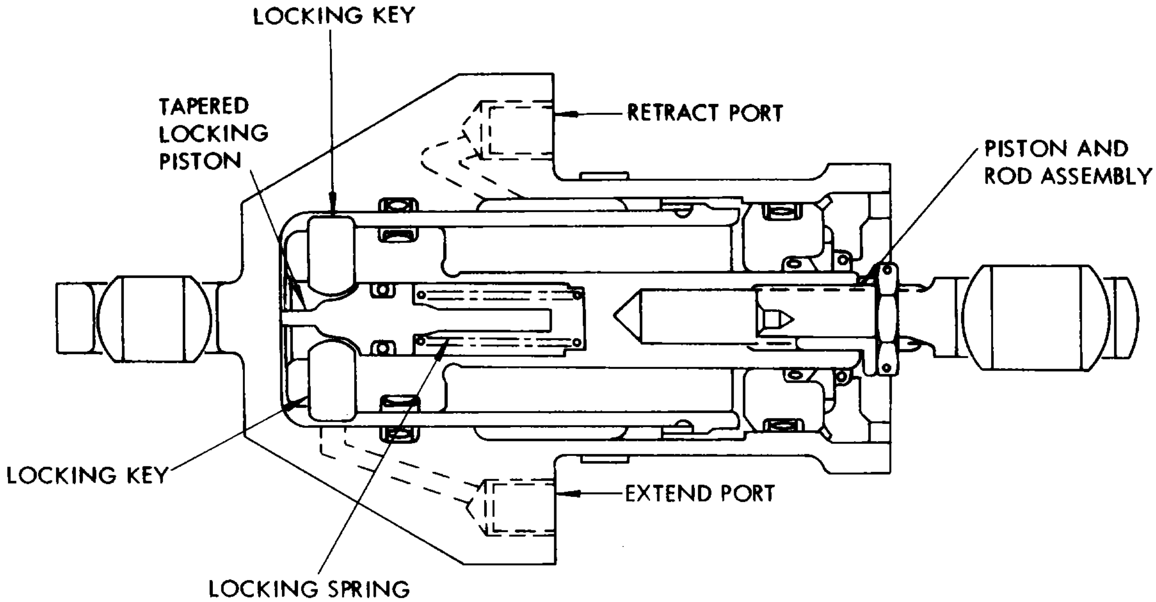
A. The ground spoilers are positioned by actuators powered by hydraulic system A. The actuators used on ground spoilers 1 and 8 are identical as are ground spoiler 4 and 5 actuators. However, the actuators used on ground spoilers 1 and 8 are not identical with the actuators used on ground spoilers 4 and 5.

B. No. 1 and No. 8 Ground Spoiler Actuators.

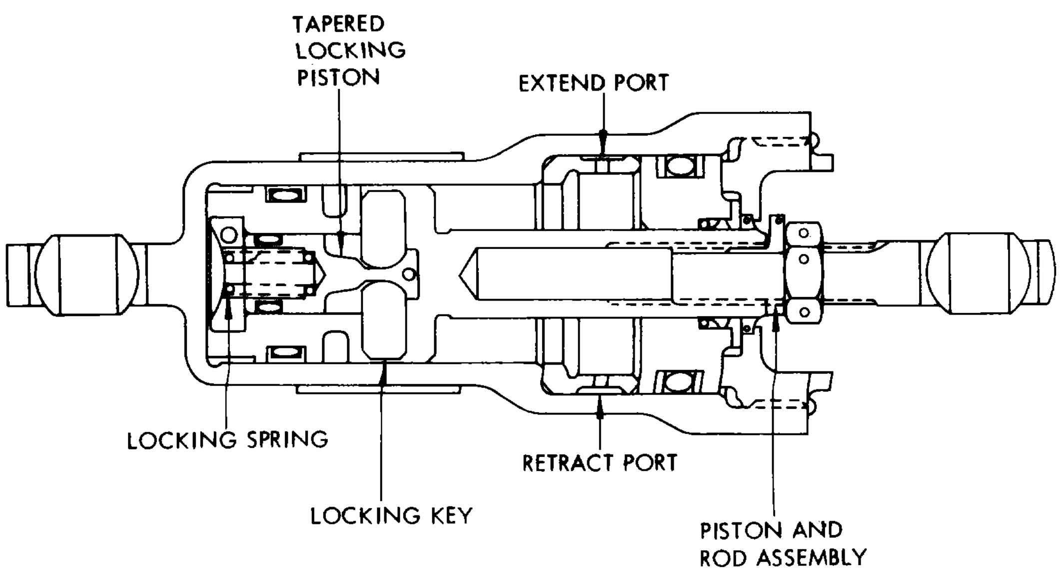
(1) The actuators are attached at the piston rod end to the spoiler and at the cylinder end to a support on the wing rear spar.

(2) The actuator contains a locking mechanism which locks the actuator in the retract position (Fig. 4). The locking mechanism consists of a spring-loaded tapered locking piston and two locking segments or keys. When the actuator reaches the retract position, the spring-loaded piston is forced downward by hydraulic pressure. This forces the locking segments in a radial direction into a cavity whose diameter is slightly larger than the cylinder inside diameter, thus locking the actuator. If hydraulic pressure is lost, the spring will hold the piston in the locked position. Directing hydraulic pressure to cause reverse actuation provides a force on the piston greater than the spring force thus moving the piston inward. This allows the locking segments to move inward unlocking the actuator.

(3) Swivel joints in the hydraulic lines allow the actuators to rotate as the spoilers raise.

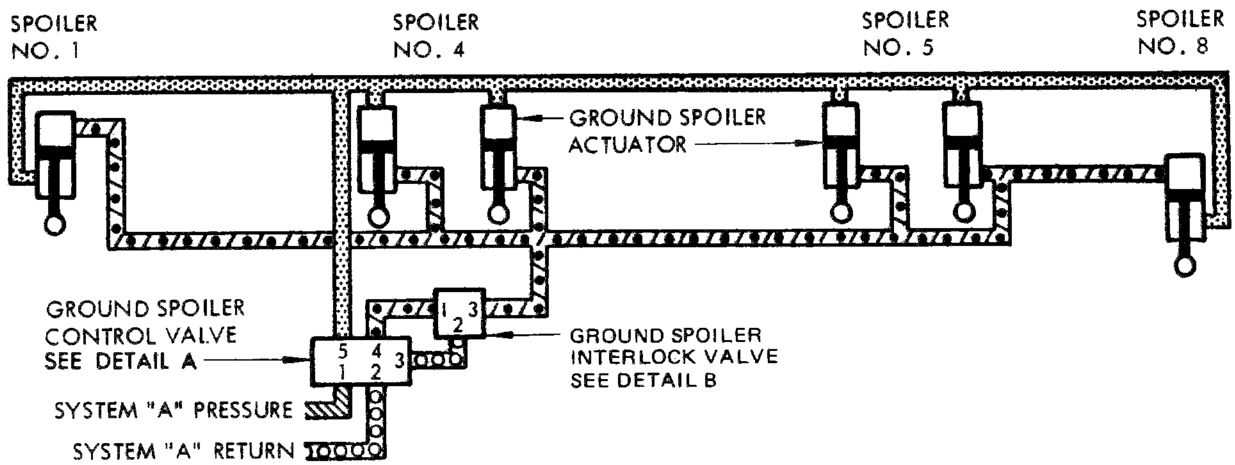


TYPICAL NO. 1 AND NO. 8 GROUND SPOILERS



TYPICAL NO. 4 AND NO. 5 GROUND SPOILERS

Ground Spoiler Actuator
Figure 4



SPOILERS DOWN

SPOILERS UP

GROUND SPOILER CONTROL VALVE
DETAIL A

OLEO COMPRESSED

OLEO EXTENDED

GROUND SPOILER INTERLOCK VALVE
DETAIL B

Speed Brake Hydraulic Schematic
Figure 5

C. No. 4 and No. 5 Ground Spoiler Actuator
   (1) Two identical actuators and actuator linkages used to position each ground spoiler. The actuators are attached at the cylinder end to a support on the wing rear spar. The actuator piston rod end is attached to the ground spoiler actuator linkage.
   (2) The actuators for ground spoilers 4 and 5 are similar to the actuators used on ground spoilers 1 and 8 except the locking mechanism locks the actuator in the extend position.

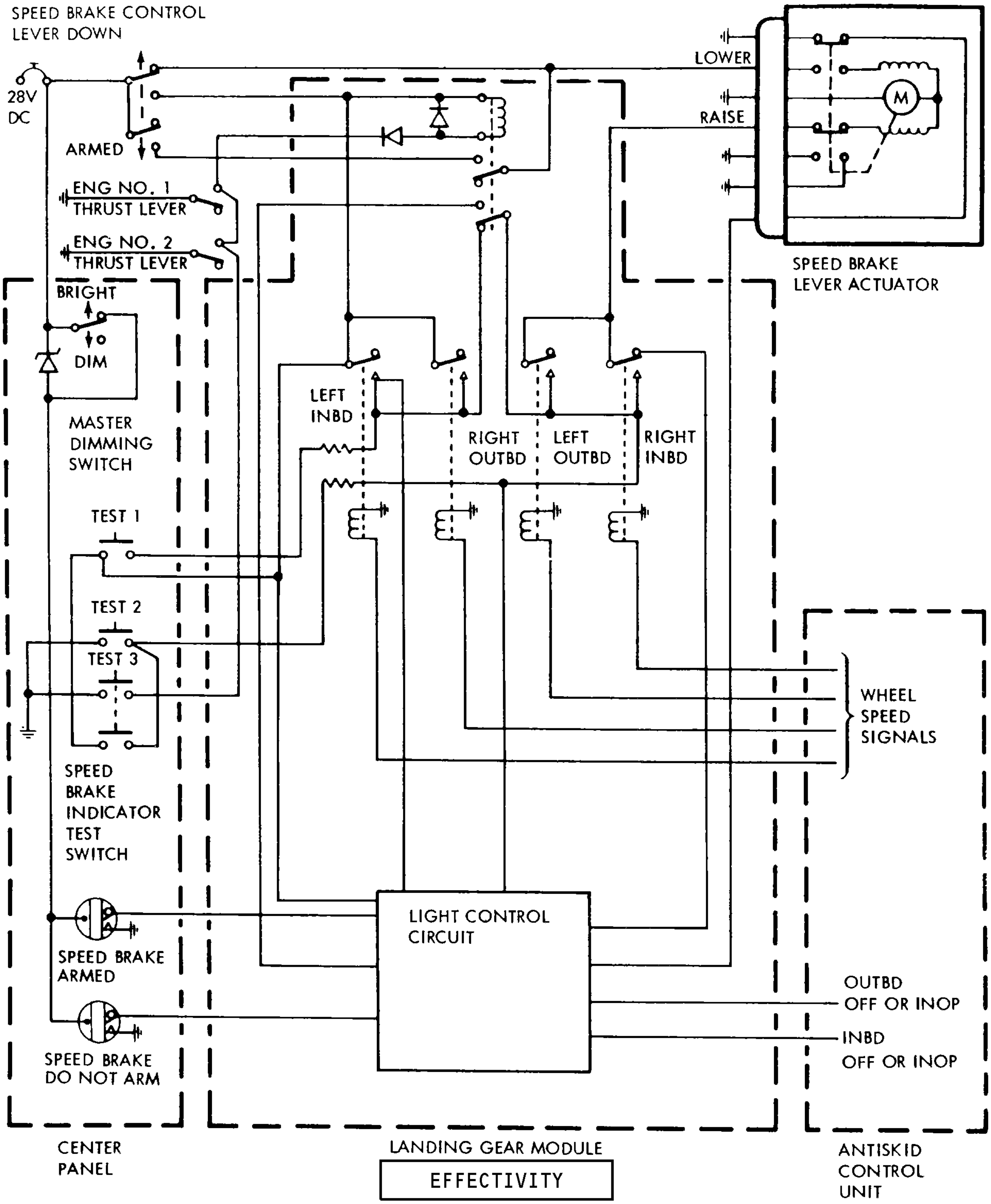
9. <u>No. 4 and No. 5 Ground Spoiler Actuator Linkage</u>
   A. A ground spoiler actuator linkage connects each ground spoiler actuator to the ground spoiler (Fig. 2). The actuator linkage consists of an idler crank and pushrod. The idler crank is pivoted in the actuator support. The actuator piston rod end is attached to one end of the idler crank and the pushrod to the other end. The ground spoiler is attached to the pushrod end.
   B. When the actuator is retracted, the idler crank pivots pushing the pushrod which moves the ground spoiler to the raised position.

10. <u>Operation</u>
   A. The speed brakes are activated by moving the speed brake control lever aft. This is done manually or by the speed brake lever actuator (Fig. 2). Initially the control lever must be raised to release the lever latch. As the lever is moved aft, lever motion is transferred through control rods to release the lever brake and rotate the speed brake forward drum. Cables from the forward drum, transfer speed brake signals to the speed brake quadrant at the spoiler ratio changer. Motion of the speed brake quadrant operates the ratio changer. Also, the speed brake quadrant transfers motion to the spoiler mixer, driving both mixer output drums in the spoiler "up" direction. This causes flight spoilers 2, 3, 6 and 7 to rise equally. The motion of the spoiler mixer also positions the ground spoiler control valve.
   B. When the airplane is airborne, the right main gear shock strut is extended and the push-pull cable closes the ground spoiler interlock valve. This valve blocks pressure from the ground spoiler control valve causing the ground spoilers to remain faired. The speed brake lever may be rotated aft to the FLIGHT DETENT. This is the maximum in-flight speed brake setting. A double acting lever brake, incorporated in the speed brake drum mechanism, retains the lever at the selected setting between DOWN and the FLIGHT DETENT. With the speed brakes in use, rotation of the aileron control wheels will cause further operation of the flight spoilers. Rotating the control wheels will lower the flight spoilers on the wing going up and raise the flight spoilers on the wing going down. As speed brakes are applied, the ratio changer reduces the amount of roll control input to the spoiler mixer for a given control wheel position. This reduces the angular change in spoiler position for a given roll control input.

C. When the airplane is on the ground, the right main gear shock strut is compressed and the push-pull cable opens the ground spoiler interlock valve. This valve then connects the ground spoiler control valve to the up side of the ground spoiler actuators. When the speed brake control lever is rotated approximately 29 degrees aft from the DOWN position the speed brake control valve directs hydraulic pressure through the interlock valve to cause ground spoilers 1 and 8 to extend 40 degrees and ground spoilers 4 and 5 to extend 60 degrees. On the ground, the speed brake lever may be rotated aft to the UP position. In this configuration ground spoilers 4 and 5 will be raised 60 degrees, and ground spoilers 1 and 8 and flight spoilers 2, 3, 6 and 7 will be raised 40 degrees.

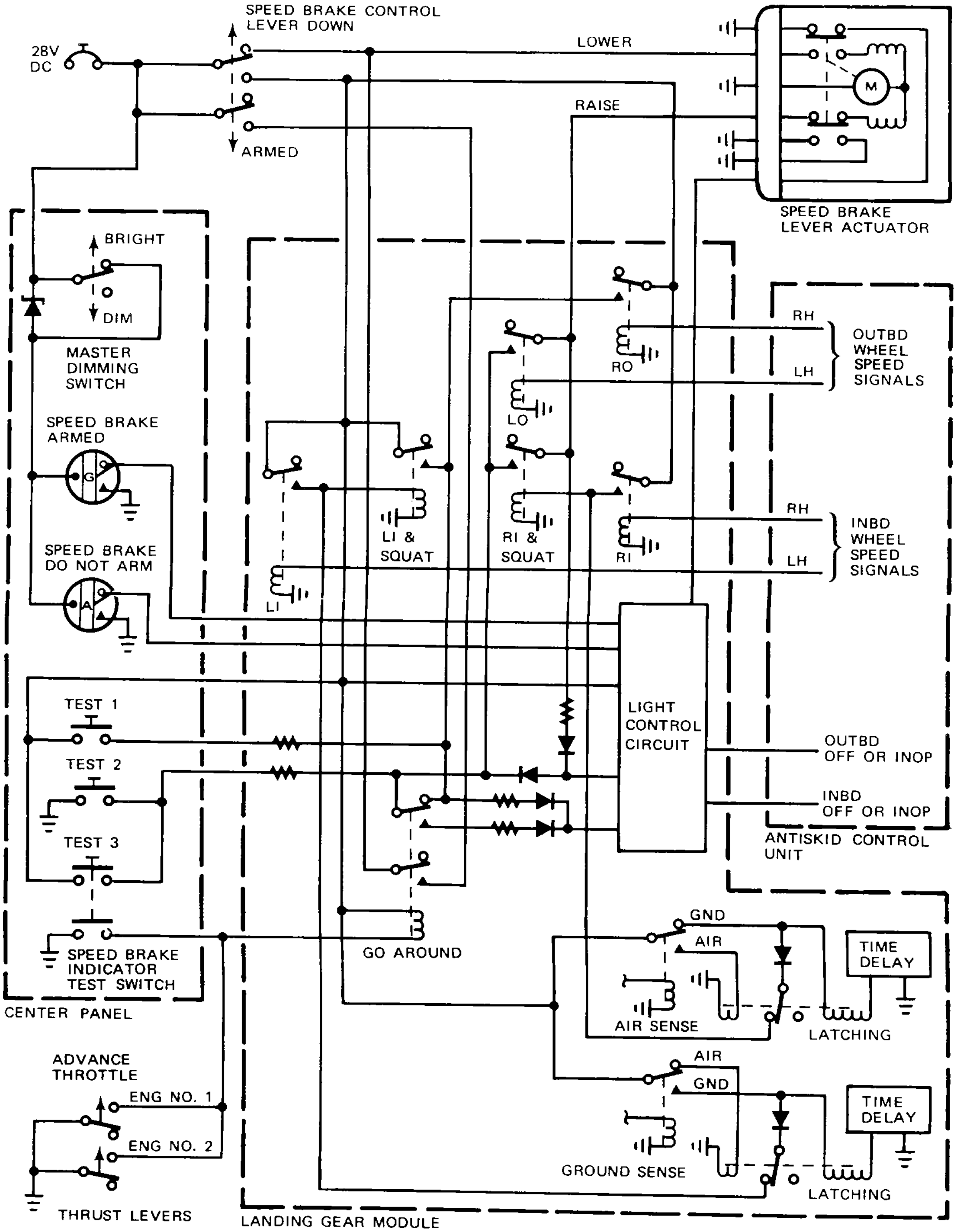
D. The speed brakes are activated automatically by the speed brake lever actuator to aid braking during landing roll. The system is armed prior to touchdown. Arming is accomplished by raising the speed brake control lever to release the lever latch and moving it aft into the ARMED detent. The speed brake lever actuator will drive the control lever full aft to the UP position when the correct combination of wheels rotate at a speed greater than 60 knots (Fig. 6). Rotation of at least the inboard wheels on both main gears, the outboard wheels on both main gears, or both wheels on either main gear will provide the wheel rotation signal. The electrical switching for the system is accomplished by an arming switch on the speed brake forward drum and relays in the landing gear accessory module. Activation of the four relays is accomplished by four solid state relay control circuits in the antiskid control unit. When the speed brake lever actuator drives the speed brake control lever, the flight and ground spoiler motion is the same as when the lever is manually moved to the ON position. On VP ALL EXCEPT PP-SMA thru PP-SMC, PP-SMQ thru PP-SMT; NH ALL EXCEPT JA8401 thru JA8411; SQ ALL EXCEPT 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE; TM ALL EXCEPT CR-BAA and CR-BAB; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; BU ALL EXCEPT LN-SUA, LN-SUG, LN-SUP, LN-SUS, plus LN-SUA, LN-SUG, LN-SUP, LN-SUS after incorporation of SB 27-1049, additional control inputs are provided to the automatic speed brake lever actuator by the main gear ground and air sensors. These inputs are separate and parallel to wheel speed control inputs, either of which can deploy the speed brakes. The ground and air sensor inputs act through air and ground sensing, latching and wheel speed and squat relays in the landing gear accessory module. Prior to touchdown, with the air and ground sensors on the right main gear strut in the air mode, the "air" coils of the associated latching relays are energized to arm the circuit for speed brake deployment. On touchdown, when the main gear shock strut is adequately compressed, the air and ground sensing relays move to the ground mode. This energizes the associated wheel speed and squat relays and applies power to the "ground" coil of the latching relay. If the air and ground sensing relays are both in ground mode, (right main gear struts compressed), the circuit is completed through the go-around relay to actuate the speed brake lever actuator. A time delay relay is incorporated in the "ground" coil of the air and ground sensing latching relays to delay pul1-in for approximately 4 seconds. If the air and ground sensors move to ground mode within 4 seconds of each other, the circuit will be completed to deploy the speed brakes. If not, the "ground" coil of first latching relay to sense ground mode will energize and open the circuit. The circuit cannot be reset except by go-around, since the air and ground sensors on the main gear must move to the air mode to reset the "air" coils of the air and ground sensing relays in the landing gear accessory module. However, if the landing were to be completed, the wheel speed relays would automatically deploy the speed brakes on wheel spin-up. On those airplanes with squat switch backup, the necessary sequence for proper automatic speed brake operation is as follows:

(1) Airplane in air.



EFFECTIVITY			
PW	CF-PWC THRU CF-PWE	TM	CR-BAA AND CR-BAB
NH	JA8401 THRU JA8411	FL	N7370F THRU 7381F
ML	9M-AOU THRU 9M-AOW, 9V-BBC AND 9V-BBE	AR	LV-JMW THRU LV-JMZ, LV-JND AND LV-JNE

Speed Brake Electrical Schematic
Figure 6 (Sheet 1)



EFFECTIVITY

NH ALL EXCEPT JA8401 THRU JA8411
ML ALL EXCEPT 9M-AOU THRU 9M-AOW, 9V-BBC AND 9V-BBE
SA AIRPLANES INCORPORATING SB 27-1049
TM ALL EXCEPT CR-BAA AND CR-BAB
AR ALL EXCEPT LV-JMW THRU LV-JMZ, LV-JND AND LV-JNE

Speed Brake Electrical Schematic
Figure 6 (Sheet 2)

(2) Speed brake control lever placed in ARMED position.
(3) Airplane landed with speed brake control lever in ARMED position. If, with the airplane in air, the speed brake control lever is placed in the ARMED position and then returned to the DOWN position, and the airplane is then landed in this condition (without speed brakes, such as the airplane being used for pilot training and doing touch and go landings), the spoilers will deploy upon the next arming on the ground.

NOTE: The spoilers would not deploy in the above example had the system not been previously armed in the air. In any event, no harm is done, this being merely an inherent characteristic of the automatic speed brake control system with squat switch (air and ground sensor) backup.

E. A green SPEED BRAKE ARMED light is provided on the center instrument panel. This light will be on when the control lever is in the ARMED detent and the following conditions are met: at least one of the two antiskid systems are operative, the speed brake lever actuator is in the lower position, the four wheel rotation relays are open and, on airplanes with ground and air sensing inputs, the ground and air sensors are in the air mode. If any of these conditions are not met the light control circuit will extinguish the SPEED BRAKE ARMED light and illuminate an amber SPEED BRAKE DO NOT ARM light. The SPEED BRAKE DO NOT ARM light is located on the center instrument panel. The speed brakes can be lowered either manually or automatically. Manual retraction will occur when the speed brake control lever is moved to the DOWN position. All the spoilers will lower and an electrical circuit to drive the speed brake lever actuator to the lower position will be completed. Also the SPEED BRAKE ARMED light or SPEED BRAKE DO NOT ARM light will be extinguished and the circuit will be reset for the next electrical speed brake application. Automatic retraction will occur if the speed brakes have been deployed automatically and engine No. 1 and 2 thrust lever is advanced far enough to actuate one of the thrust lever actuated switches. The speed brake lever actuator will drive the speed brake control lever to the DOWN position and all the spoilers will lower. The SPEED BRAKE ARMED light will be extinguished and the circuit will be reset for the next electrical speed brake application.
F. With the speed brake control lever in the ARMED detent, dual electrical failures in the automatic speed brake control system could raise the speed brakes. The speed brake indicating system monitors the automatic speed brake control system for electrical failures. When the first failure is sensed, the SPEED BRAKE DO NOT ARM light illuminates. This warns the flight crew that the speed brakes should only be operated manually.

G. The three speed brake test switches check the speed brake indicating circuit for continuity. The test switches simulate failures that the speed brake indicating system must annunciate. This proves the speed brake indicating system is operative, but does not verify if the speed brake system is operative. If continuity exists when any of the test switches are actuated, the SPEED BRAKE ARMED light extinguishes and the SPEED BRAKE DO NOT ARM light illuminates. Actuating test switch No. 1 simulates a short-to-power failure of a wheel speed relay. This applies a voltage at a point where a subsequent failure could raise the speed brakes. Actuating test switch No. 2 simulates a failed-closed (ground on the indicating system) position of a wheel speed relay. Actuation of test switch No. 3 simulates a failure with an engine thrust lever advanced far enough to actuate one of the thrust lever actuated switches. This applies a voltage at a point where a subsequent failure of a wheel speed relay would raise the speed brakes if the speed brake control lever is in the ARMED position, and cause the aural warning horn to sound if the airplane is on the ground and not in takeoff configuration.

H. If the speed brake control lever is manually placed in the up position when airplane speed is below 60 knots, the wheel rotation signal will not be sufficient to automatically extend the speed brake lever actuator and the speed brake lever actuator position limit switch will remain in speed brake down or lever down and locked position. If either engine No. l or 2 thrust lever is subsequently advanced far enough to actuate a thrust lever actuated switch, the electrical circuit to move the speed brake lever actuator automatically to the down position will not be completed, and the takeoff warning horn will sound. The speed brake lever must be moved manually to retract the speed brakes and silence the warning horn.

SPEED BRAKE CONTROL SYSTEM - TROUBLESHOOTING

1. General
   A. The following items should be noted before troubleshooting the speed brake system:
      (1) Spoiler switches on the overhead panel shut off hydraulic power to inboard and outboard flight spoilers. Ground spoilers are not affected by spoiler switches.
      (2) Spoiler shutoff valves are motor operated. Moving the switch will not move the valve unless electrical power is available at the valve.
      (3) Aileron trim control wheel should be set at zero during any check of spoiler/speed brake system.
      (4) Ground spoiler operation depends on the control valve, operated by the speed brake lever, and the interlock (shutoff) valve, operated by extension of the right main gear shock strut inner cylinder. Be sure these two valves are in the position required for the check being made.
2. Speed Brake Control System Troubleshooting Chart

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive force required to rotate speed brake control lever	Speed brake body cables binding or misaligned, fair-leads binding, brackets mis-aligned, or foreign object obstruction	Check cables for chafing or rubbing. Check for dirt or foreign objects	Repair or replace components as necessary
	Excessive cable tension	Check speed brake cable tension per 27-62-0, A/T	Adjust tension to specified values
	Speed brake lever brake mechanism defective or out of adjustment	Check that lever brake primary backlash gaps are approximately equal. Operate lever and check that brake releases	Adjust or replace mechanism as nec-essary (27-62-21)
	Interference be-tween speed brake lever and control stand, between lever and thrust lever, or between lever latch and	Disconnect speed brake lower control rod at idler link. Operate lever and check for friction, galling, burrs, or inter-ference	Replace or repair components as necessary

Speed Brake Control System - Troubleshooting
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Excessive force required to rotate speed brake control lever (Cont)	Abnormal friction in speed brake forward drum and lever brake bearings	Disconnect speed brake body cables from forward drum. Operate lever with and without a 50-100 pound force applied by hand on forward drum in direction of cable tension	Repair forward drum and lever brake mechanism (27-62-21 or 27-62-22, as applicable)
	Abnormal friction in spoiler mixer or spoiler ratio changer	Disconnect speed brake wheel well cables from speed brake input quadrant. Remove spoiler mixer (27-61-21). Rotate input quadrant and check for excessive friction in ratio changer	Replace spoiler mixer (27-61-21) or spoiler ratio changer (27-61-31)
	Abnormal friction in ground spoiler control valve	Disconnect spoiler mixer control rod at control valve input lever. Operate speed brake handle and check for excessive handle forces	Replace ground spoiler control valve (27-62-41)

Speed Brake Control System - Troubleshooting
Figure 101 (Sheet 2)

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TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Speed-brake lever-brake chatters when control lever is moved to UP or DOWN position	Speed-brake lever-brake mechanism not lubricated properly	Manually operate speed brake system. Check for chatter	Lubricate speed-brake lever-brake mechanism per 12-22-81. Repeat test; if chatter continues, re-place lever brake mechanism (27-62-21)
Speed brake lever moves when it is out of DOWN detent and ailerons are operated	Lever brake mechanism slipping	Place speed brake lever out of DOWN detent and move aileron control wheel	Adjust or replace mechanism as nec-essary (27-62-21)
Speed brakes do not retain set position	Lever brake mechanism slipping	Check locking action of lever brake mechanism by attempting to rotate for-ward drum by hand. Lever brake mechanism is de-fective if drum can be rotated	Adjust or replace mechanism as nec-essary (27-62-21)
	Insufficient speed brake body or wheel well cable tenssion	Check cable tension per 27-62-0, A/T	Adjust cables as necessary
No spoiler extension or motion in one direction only	Broken or disconnected cable	Check cable system	Rig speed brake cables (27-62-0, A/T)

Speed Brake Control System - Troubleshooting
Figure 101 (Sheet 3)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Flight spoilers do not operate as speed brakes	Ratio changer input rod disconnected	Move control wheel and check for ratio changer input rod movement	Repair or replace components as necessary
	Spoiler mixer defective		Replace spoiler mixer (27-61-31)
Ground spoilers do not operate	Ground spoiler interlock (shut-off) valve cable defective.	Check operation of inter-lock (shutoff) valve cable per 27-62-51.	Adjust or replace cable as neces-sary (27-62-51).
	Ground spoiler interlock (shut-off) valve defec-tive	Check operation of inter-lock (shutoff) valve per 27-62-61	Replace interlock (shutoff) valve and valve linkage as necessary (27-62-61)
	Ground spoiler control valve defective	Check for damaged or leak-ing control valve	Replace valve (27-62-41)
One ground spoiler does not operate correctly	Defective ground spoiler actuator	Operate ground spoiler and check for external leakage or for evidence of over-heating	Replace defective actuator (27-62-71, 27-62-72, or 27-62-101)
Ground spoiler float	Defective ground spoiler actuator or actuator linkage	Check actuator linkage for loose, broken, or worn parts	Replace actuator or actuator link-age as necessary (27-62-71, 27-62-72, 27-62-81, 27-62-82, or 27-62-101)

Speed Brake Control System - Troubleshooting
Figure 101 (Sheet 4)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
For automatic actuation, speed brake control lever and system do not actuate or do not actuate fully UP or DOWN (force required to rotate control lever not excessive)	Speed brake lever brake mechanism defective or out of adjustment	Operate automatic speed brake system (27-62-0 A/T). Check if electric actuator operates but lever brake slips	Adjust or replace mechanism as necessary (27-62-21)
	Speed brake arming switch defective or out of adjustment	Electric actuator does not operate	Adjust or replace arming switch (27-62-111, 31-26-25, or 31-26-26)
	Speed brake lever electric actuator defective		Replace actuator (27-62-31)
For automatic actuation, lever moves slow, but lever manual forces feel normal	Ground spoiler control valve high friction and/or no-back brake mechanism slipping	Check lever manual forces (27-62-0 A/T). If forces are within limits, disconnect the ground spoiler control valve input rod and measure lever forces again	If lever forces are less, replace control valve. If lever forces are unchanged, adjust no-back mechanism (27-62-21 A/T)
When automatically extended, with advance of thrust levers No. 1 or 2, speed brakes do not retract	Takeoff warning switch S283 (lever No. 1) or S133 (lever No. 2) defective or out of adjustment		Adjust or replace takeoff warning switch S283 or S133 (31-26-21)
AUTO SPEED BRAKE circuit breaker trips during automatic operation (force required to rotate control lever not excessive)	Speed brake lever electric actuator defective		Replace actuator (27-62-31)

Speed Brake Control System - Troubleshooting
Figure 101 (Sheet 5)

SPEED BRAKE CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General
   A. Hydraulic systems A and B must be depressurized prior to performing maintenance on speed brake control system components. This is to prevent injury to personnel, resulting from inadvertent operation of the control system while maintenance is being performed. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of control surface travel.

      WARNING: PRESSURIZING THE SPEED BRAKE SYSTEM ALSO ACTIVATES FLAPS, SPOILERS, AILERONS, RUDDER, AND ELEVATOR HYDRAULIC SYSTEMS. ISOLATE AND TAG ALL FLIGHT CONTROL SYSTEMS NOT BEING TESTED AND ENSURE THAT ALL CONTROL SURFACES ARE CLEAR OF OBSTRUCTIONS AND PERSONNEL BEFORE APPLYING POWER.

   B. When operating hydraulic system B pumps to pressurize hydraulic systems A and B, the following requirements must be observed:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days, or when fuel temperature is known to be above 90°F (32.2°C), monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5-minute period. Following the fifth start, run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   C. The following procedure covers pressurization of hydraulic systems B and A through operation of electrical-driven hydraulic system B pumps only. Pressurization of hydraulic system A through operation of engine-driven hydraulic system A pumps is not covered.
2. Speed Brake Hydraulic System A and B Pressurization
   A. Equipment and Materials
      (1) Lock Assembly - Ground, F72735
   B. Pressurize speed brake hydraulic system A and B.
      (1) Connect electrical power to airplane.
      (2) Ensure that SPOILER SHUTOFF VALVES circuit breaker on P6 circuit breaker panel is closed.
      (3) Set parking brake and install ground lock assembly in nose gear.
      (4) Position GRD INTERCONNECT switch on forward overhead panel to OPEN.
      (5) Position No. 1 or 2 system B HYD PUMPS switches on forward overhead panel to ON.

(6) Position SPOILER A and B switches on forward overhead panel to ON.

NOTE: To pressurize system A or system B separately, select system by appropriate positioning of SPOILER A and B switches.

C. Restore Airplane to Normal

NOTE: Perform the following steps after completing speed brake control system maintenance that required pressurization.

(1) Position No. 1 and No. 2 system B HYD PUMPS switches to OFF.
(2) Position GRD INTERCONNECT switch to CLOSE.
(3) Remove electrical power.
(4) Remove ground lock assembly.

3. Speed Brakes Hydraulic Systems A and B Depressurization

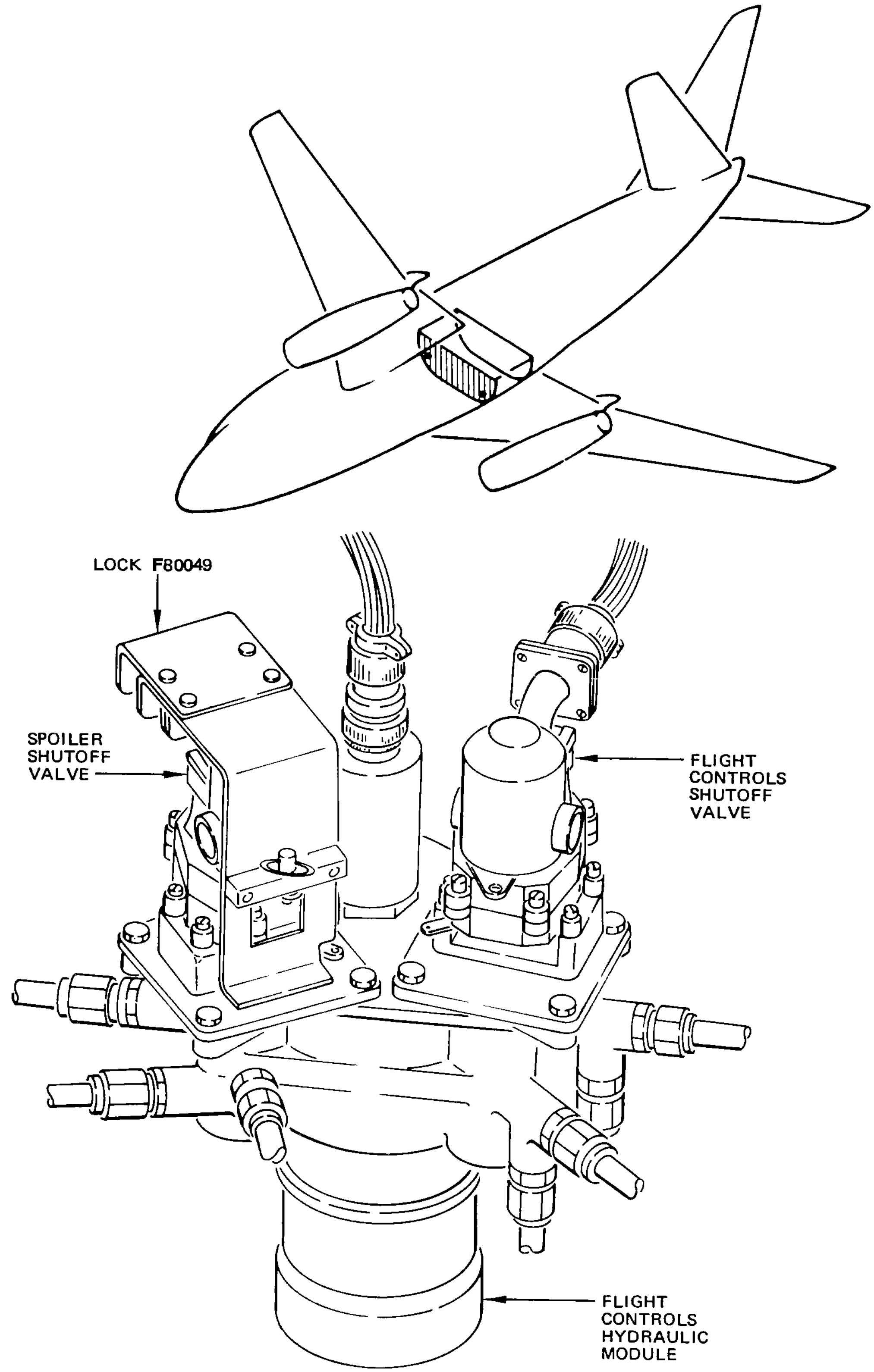
A. Equipment and Materials
(1) Lock Assembly - F80049-12 (Preferred), F80049-1 (Optional), (2 required)

B. Depressurize speed brakes hydraulic systems A and B.
(1) Position SPOILER A and B switches on forward overhead panel to OFF.
(2) Open all flight control circuit breakers on P6 circuit breaker panel.
(3) Position No. 1 and No. 2 system B HYD PUMPS switches on forward overhead panel to OFF.
(4) Position GRD INTERCONNECT switch on forward overhead panel to CLOSE.
(5) To dissipate remaining hydraulic power, cycle captain's control wheel.
(6) If any hydraulic connections are to be disturbed, depressurize hydraulic system A and system B reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
(7) Install hydraulic module. See figure 201.
(a) Disconnect electrical connector from spoiler shutoff valve at system A flight controls hydraulic module in left wheel well.
(b) Disconnect electrical connector from spoiler shutoff valve system B flight controls hydraulic module in right wheel well.
(c) Manually place override lever at both spoiler shutoff valves in position 2.
(d) Install lock on each spoiler shutoff valve and insert attaching lockpins.

C. Restore Airplane to Normal

NOTE: Perform the following steps after completing speed brake system maintenance.

(1) Remove locks from system s A and B flight controls hydraulic module shutoff valves and reconnect electrical connectors.



Hydraulic Module Lock Installation
Figure 201

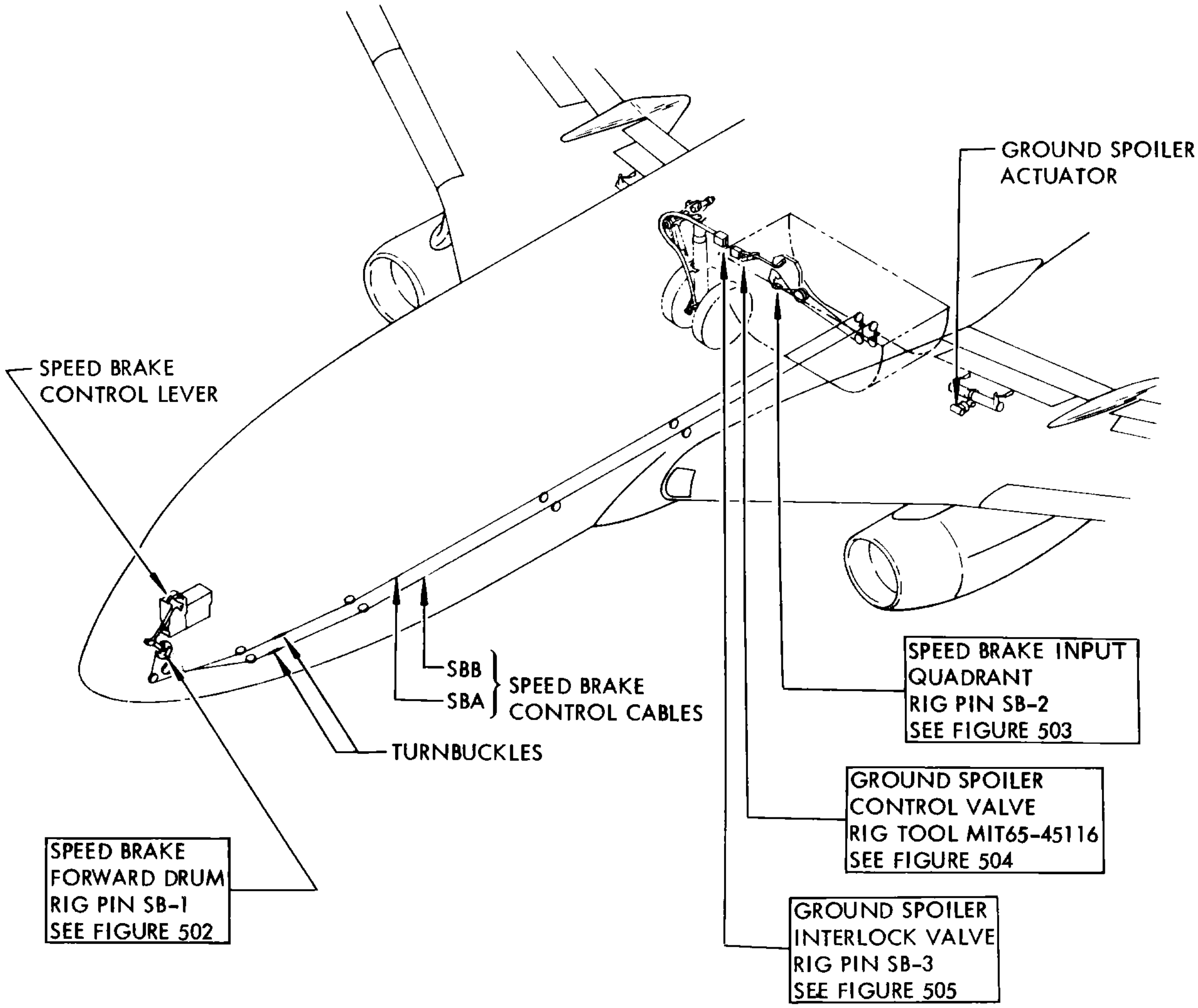
(2) Position spoiler A and B switches on forward overhead panel to ON.
(3) Close all flight control circuit breakers on P 6 circuit breaker panel.
(4) Pressurize hydraulic reservoirs as required. Refer to 29-09-300.

SPEED BRAKE CONTROL SYSTEM - ADJUSTMENT/TEST

1. General
   A. The speed brake control system provides a speed brake signal to the spoiler mixer and controls hydraulic system A pressure to the ground spoiler actuators. (See Spoiler Control System, 27-61-0.)

      WARNING: ALL FLIGHT CONTROL SYSTEMS ARE FULLY POWERED. CHECK TO ENSURE THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON.

   B. Both the spoiler and speed brake systems must be in adjustment prior to testing either system.
   C. The following conditions must be met before adjusting or testing the speed brake control system.
      (1) Aileron control system must be properly adjusted. Refer to 27-11-0, Aileron and Aileron Trim Control System - Adjustment/Test.
      (2) Wing trailing edge flaps must be properly adjusted. Refer to 27-51-0, Trailing Edge Flaps System - Adjustment/Test.
   D. Throughout the speed brake control system maintenance practices, it is assumed that the weight of the airplane is supported by the landing gear. In this configuration the ground spoiler interlock valve is open, allowing the ground spoiler actuators to operate the ground spoilers. Unless specifically noted otherwise, the weight of the airplane on the landing gear may be simulated by opening the ground spoiler interlock valve as follows:
      (1) Detach the ground spoiler interlock valve cable from the right landing gear torsion link. Refer to 27-62-51 Ground Spoiler Interlock Valve Cable - Removal/Installation.
      (2) Manually move the valve lever to dimension B in figure 505.
      (3) After completion of test, return airplane to normal configuration as follows:
         (a) Attach the ground spoiler interlock valve cable to the right landing gear torsion link.
         (b) Adjust and test ground spoiler interlock valve cable. Refer to 27-62-51, Ground Spoiler Interlock Valve Cable - Adjustment/Test.



1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 SYSTEM MUST BE RERIGGED WHEN CABLE TENSION DEVIATES MORE THAN ± 15 POUNDS FROM VALUES SHOWN IN TABLE.

TABLE I

TEMP °F 1	CABLE TENSION-POUNDS (+10/-0) 2
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

Speed Brake Control System-Rigging Pin
Figure 501

2. Speed Brake Control System Adjustment

A. General

(1) The speed brake control system will be properly adjusted when the individual components are adjusted to meet the following conditions. See figure 501 for rigging pin locations and cable tension requirements.

(a) Speed Brake Control Lever

1) With the speed brake control lever in the DOWN detent-rigging pin SB-1 fits freely. If not, this condition may be met by adjusting the lower control rod at the speed brake forward drum per paragraph 2.C.(1).

2) Pointer on aft face of control lever aligns with center of marks on control stand when control lever is placed in DOWN, ARMED and FLIGHT detents. Control lever travel between DOWN and UP detents is 48-1/2 (± 1/2) degrees. If not, these conditions may be met by adjusting control lever detents and control stand stop per paragraph 2.C.(1)(c).

(b) Speed Brake Control Cables - SBA and SBB

1) With rigging pin SB-1 installed, rigging pin SB-2 fits freely and cable tension is within 15 pounds of required value. If not, these conditions may be met by adjusting turnbuckles in fuselage lower nose compartment per paragraph 2.C.(2).

NOTE: If rigging pin SB-2 does not fit freely, check that spoiler mixer cam is adjusted per 27-61-0, Spoiler Control System - Adjustment/Test

(c) Ground Spoiler Control Valve

1) With rigging pin SB-1 installed, dimension A in figure 504 is within specified limits using rigging tool MIT65-45116. If not, this condition may be met by adjusting control rod per paragraph 2.C.(3).

(d) Ground Spoiler Interlock Valve

1) If airplane weight is on landing gear, dimension B in Fig. 505 is 1.62 inch minimum.

NOTE: Dimension B is to be used for system verification only. Do not use when rigging valve.

2) If airplane is jacked with right main gear oleo fully extended, rigging pin S/B-3 fits freely.

3) If not this condition may be met by adjusting push-pull cable per par. 2.C.(4).

(e) No. 1 and No. 8 Ground Spoilers
1) With ground spoilers hydraulically retracted and wing flaps full up, spoiler to flap clearance is within limits shown in Fig. 506. If not, this condition may be met by adjusting actuator rod end per par. 2.C.(5).

(f) No. 4 and No. 5 Ground Spoilers
1) With ground spoilers hydraulically retracted and wing flaps full up, ground spoiler to flap clearance is within limits shown in Fig. 506. If not, this condition may be met by adjusting actuator rod end per par. 2.C.(5).

B. Equipment and Materials
(1) Cable Tensiometer, 0 to 150 pound range for 1/8 inch cable
(2) Rigging Pins Kit - F70207-3, -52, -61 or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-1	-11	0.309-0.311	6.7 ±0.25	Speed Brake Forward Drum
S/B-2	-13	0.309-0.311	2.35 ±0.06	Speed Brake Input Quadrant
S/B-3	-11	0.309-0.311	6.7 ±0.25	Ground Spoiler Interlock Valve

(3) Ground Spoiler Control Valve Rigging Tool - MIT65-45116
(4) Grease - BMS 3-33 (Preferred)
(5) Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
(6) Corrosion Preventive Compound, MIL-C-11796, Class 3
(7) Sealant - BMS 5-95

C. Adjust Speed Brake Control System
(1) Adjust Speed Brake Control Lever
(a) Place speed brake control lever in DOWN detent. Ensure that lever latch is in detent on control stand.
(b) In fuselage lower nose compartment, check that rigging pin SB-1 can be freely installed through speed brake forward quadrant into structure. If rigging pin cannot be installed freely accomplish the following steps:
1) Disconnect upper end of lower control rod from idler link (Fig. 502).

2) Loosen checknut and adjust rod end until rod end bolt fits freely with rigging pin SB-1 installed.
3) Install rod end bolt with washer under bolt head. Secure bolt with washer and locknut.
4) Tighten checknut on rod end.
5) Ensure that rod end is visible in inspection hole of control rod.

(c) Adjust control lever detents.
1) Place speed brake control lever in DOWN detent. Ensure that lever latch is in detent on control stand.
2) Check that center of DOWN detent mark on control stand indicator plate aligns with indicator on aft face of control lever. If not within limits, loosen indicator plate attaching screws and move plate until it aligns with indicator on speed brake lever. Tighten attaching screws.
3) Disconnect detent spring from speed brake forward drum cam roller.
4) Install rig pin SB-1 in forward drum quadrant.
5) Loosen bolts in cam roller lever arm bracket and adjust to align roller contact surface with index mark on detent cam. Tighten bolts. (See section A-A, figure/502.)
6) Connect detent spring to cam roller lever arm. Remove rigging pin SB-1 from forward drum quadrant.
7) Move speed brake control lever aft until roller on cam roller lever arm is in ARMED detent on cam.
8) Check that indicator on aft face of control lever aligns with ARMED mark on control stand indicator plate. If not within limits, place speed brake control lever in DOWN position, then check roller for alignment with index mark on detent cam.
   a) If roller does not align, repeat steps 4) thru 7).
9) Move speed brake control lever aft until roller on cam roller lever arm is in FLIGHT detent on cam.
10) Check that indicator on aft face of speed brake control lever aligns within FLIGHT DETENT band on control stand indicator plate. If not within limits, repeat steps 1) thru 8).

11) Place speed brake control lever in DOWN position, then move lever to UP position. Check that control lever travel is 48 degrees minimum. If control lever is restrained from full travel, check adjustment of speed brake full travel stop on spoiler ratio changer. (See view II, figure 503.)

(2) Adjust Speed Brake Control Cables - SBA and SBB

(a) Move speed brake control lever through one full cycle, then place lever in DOWN and locked position.

(b) Install rigging pin SB-1 in speed brake forward drum. (See figure 502.)

(c) Check that rigging pin SB-2 fits freely through speed brake input quadrant. (See figure 503.)

(d) With rigging pins installed per steps (b) and (c), check that tension in cables SBA and SBB is within 15 pounds of required value for ambient temperature. See temperature- tension chart in figure 501 for required cable tension. Tension in cables SBA and SBB should be balanced.

(e) If a new SBA or SBB cable is installed:

1) Tension cables to twice value required for ambient temperature. See temperature-tension chart in figure/501.

<u>NOTE</u>: Turnbuckles are located in lower nose compartment.

2) Remove rigging pins SB-1 and SB-2.

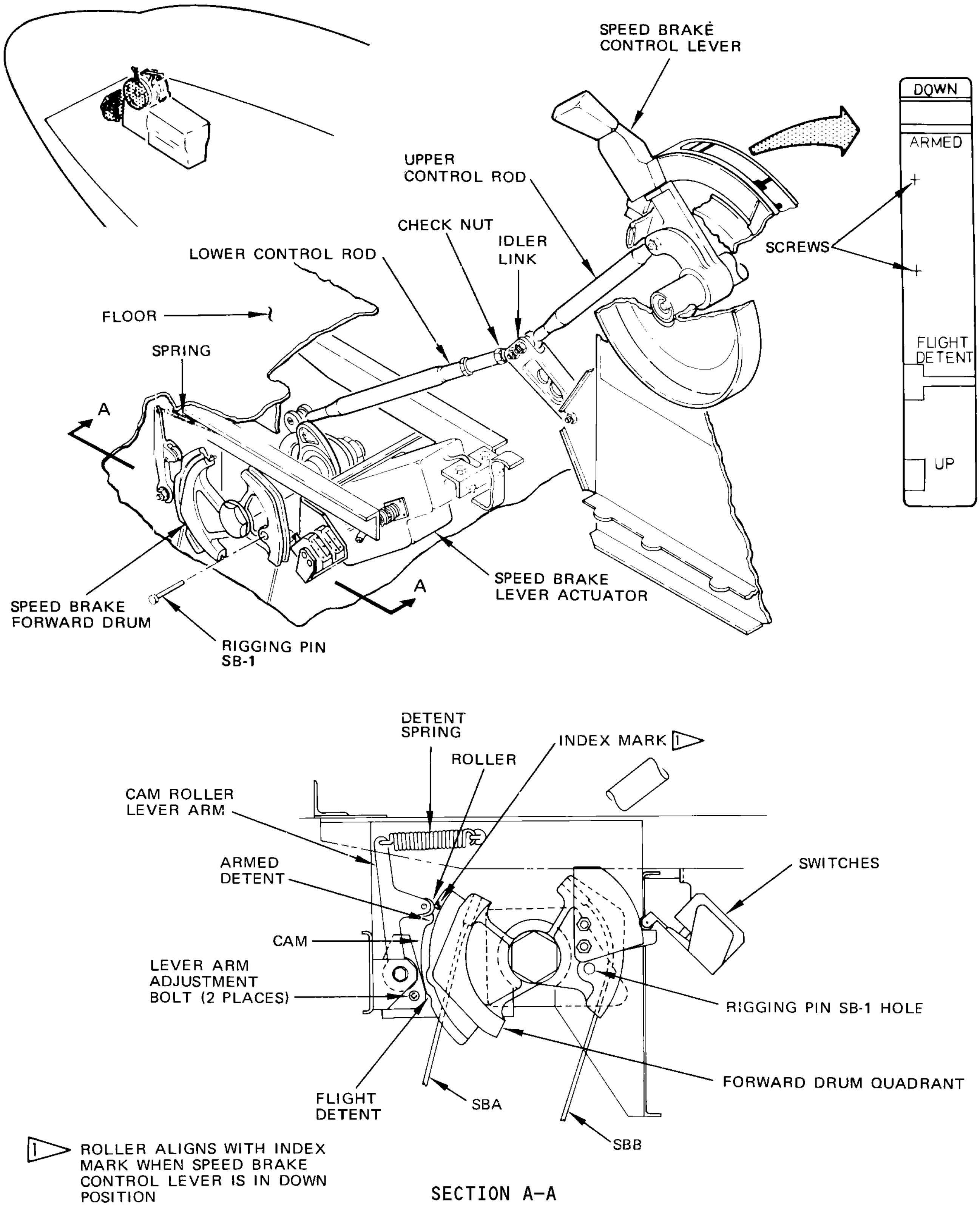
3) Cycle speed brake control lever 20 times to maximum travel limits.

4) Reinstall rigging pins SB-1 and SB-2.

(f) If checks in steps (c) and (d) are not met or if step (e) was accomplished, use turnbuckles to adjust cable tension within (+10/-0) pounds of required values in temperature tension chart in figure 501.

(g) Install turnbuckle-locking clips.

(h) Check that pressure seals in left wheel well ceiling align properly with cables SBA and SBB. If not, loosen seal retaining bolts and position seal properly. Tighten bolts.



Speed Brake Forward Drum and Linkage Adjustment
Figure 502

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(i) Remove rigging pins SB-1 and SB-2.

(3) Adjust Ground Spoiler Control Valve

(a) With speed brake control lever in DOWN position, install rigging-pin SB-1 in forward drum quadrant.

(b) Using rigging tool, check that ground spoiler control valve lever is positioned so that dimension A is 0.70 (± 0.01) inch. (See figure 504.) If lever does not meet check, adjust as follows:

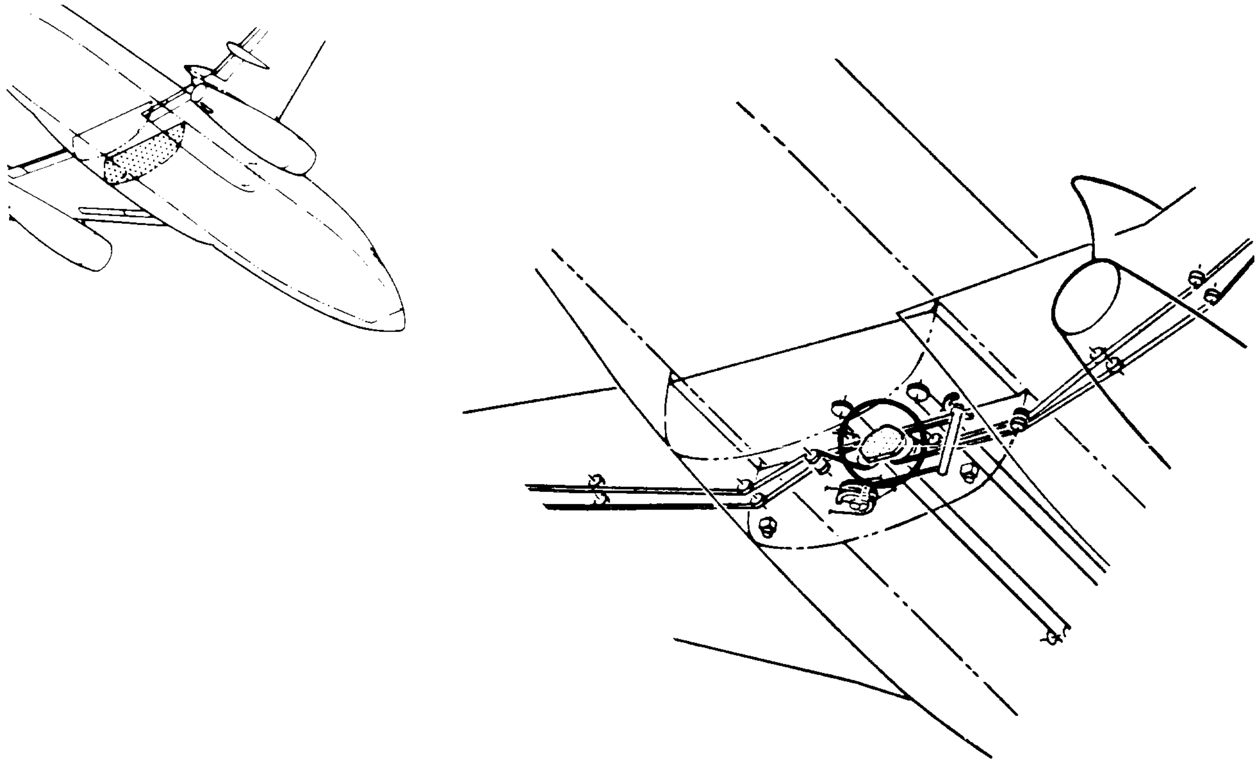
1) Remove rod end bolt attaching control rod to input lever.
2) Using rigging tool, block input lever so that dimension A is 0.70 (±0.01) inch.
3) Loosen checknut and adjust rod end until rod end bolt fits freely. Lubricate rod end threads with grease.
4) Install rod end bolt and secure with washer, nut and cotter pin.
5) Tighten checknut and check for proper rod end thread engagement. Rod end threads shall be visible in inspection hole.
6) Remove rigging tool from control valve lever. Remove rigging pin SB-1.

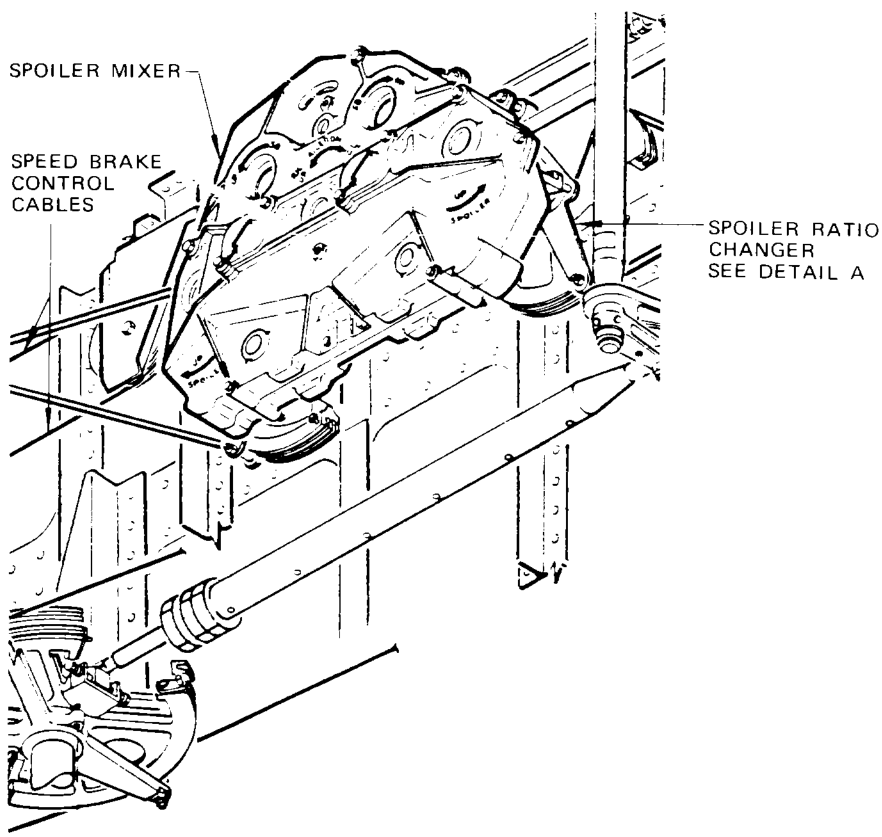
(4) Adjust Ground Spoiler Interlock Valve

(a) Place airplane on jacks so right main gear oleo is fully extended. Refer to Chapter 7, Jacking. Install rigging pin SB-3 in ground spoiler interlock valve. (See figure 505.)

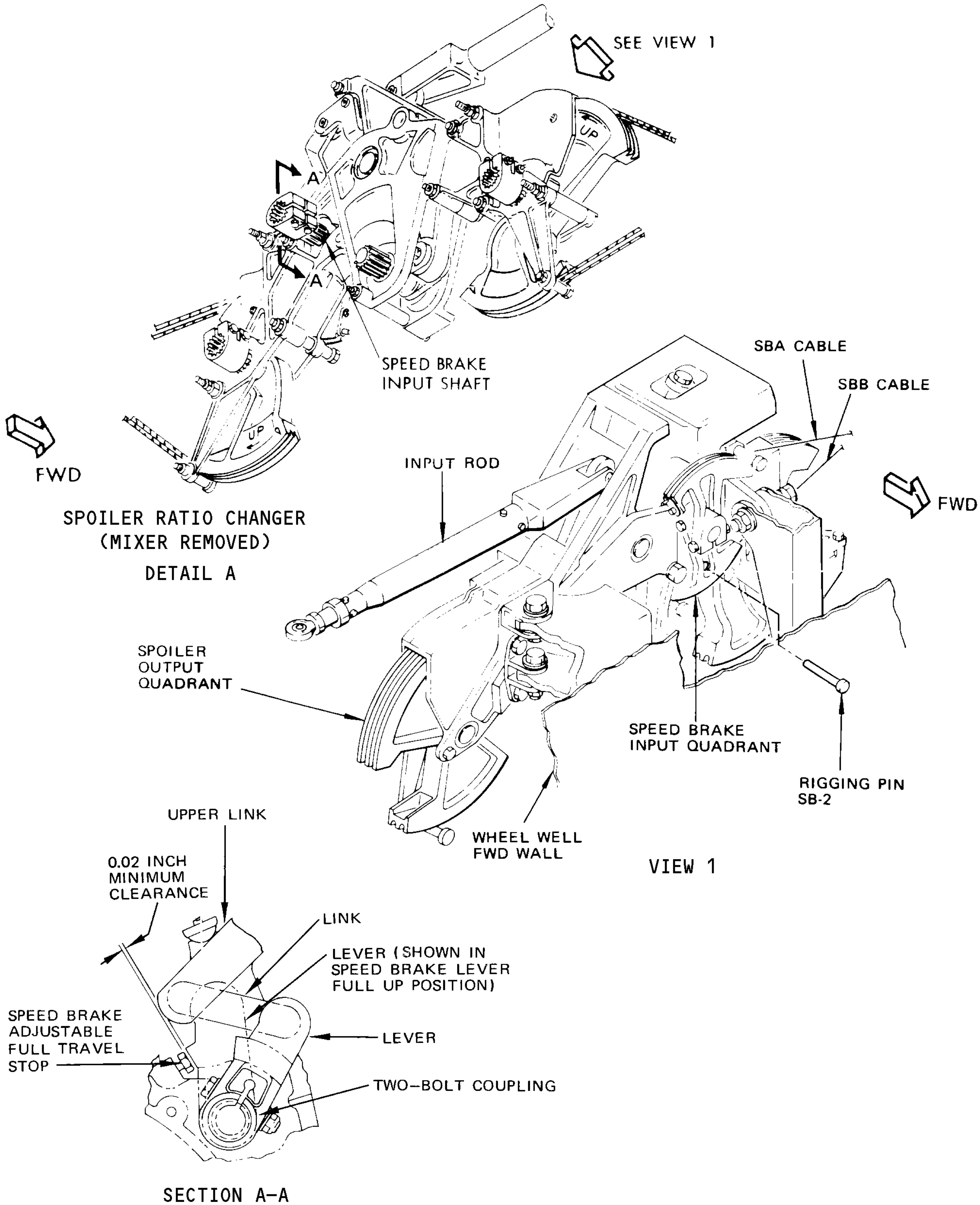
(b) If rigging pin SB-3 cannot be installed, proceed as follows:

1) Loosen protective boot and move until lower rod end of interlock valve control cable is exposed.
2) Remove bolt-attaching lower rod end to landing gear torsion link.
3) Install rigging pin SB-3.
4) Loosen checknut and adjust lower rod end so that attaching bolt will fit freely when installed.
5) Ensure that threads are visible in inspection hole of rod end.
6) Install bolt attaching rod end to landing gear torsion link. Secure bolt with washer, nut and cotter pin.
7) Ensure that both upper and lower rod ends properly align and tighten checknut on lower rod end.

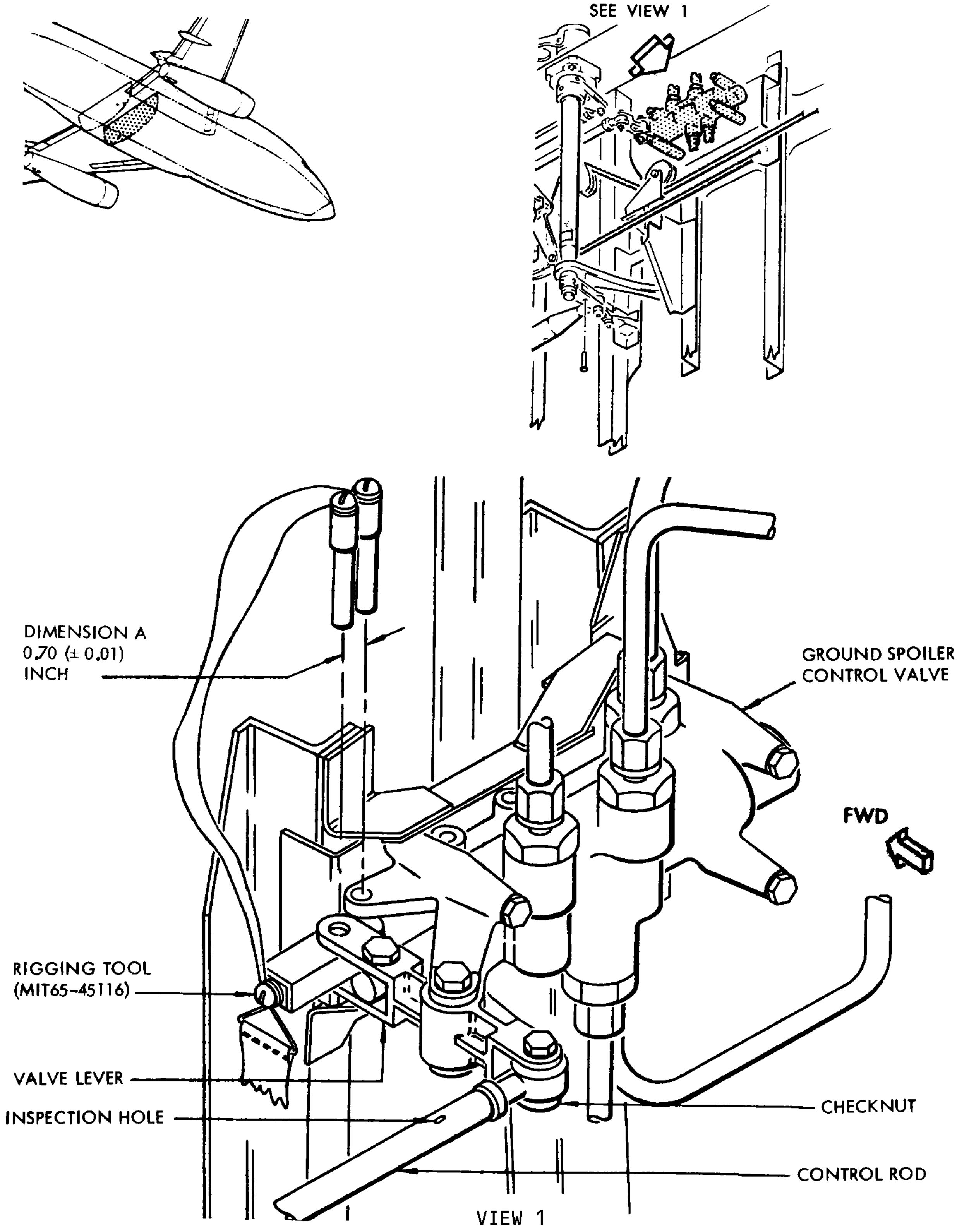




Spoiler Mixer and Ratio Change Linkage
Figure 503

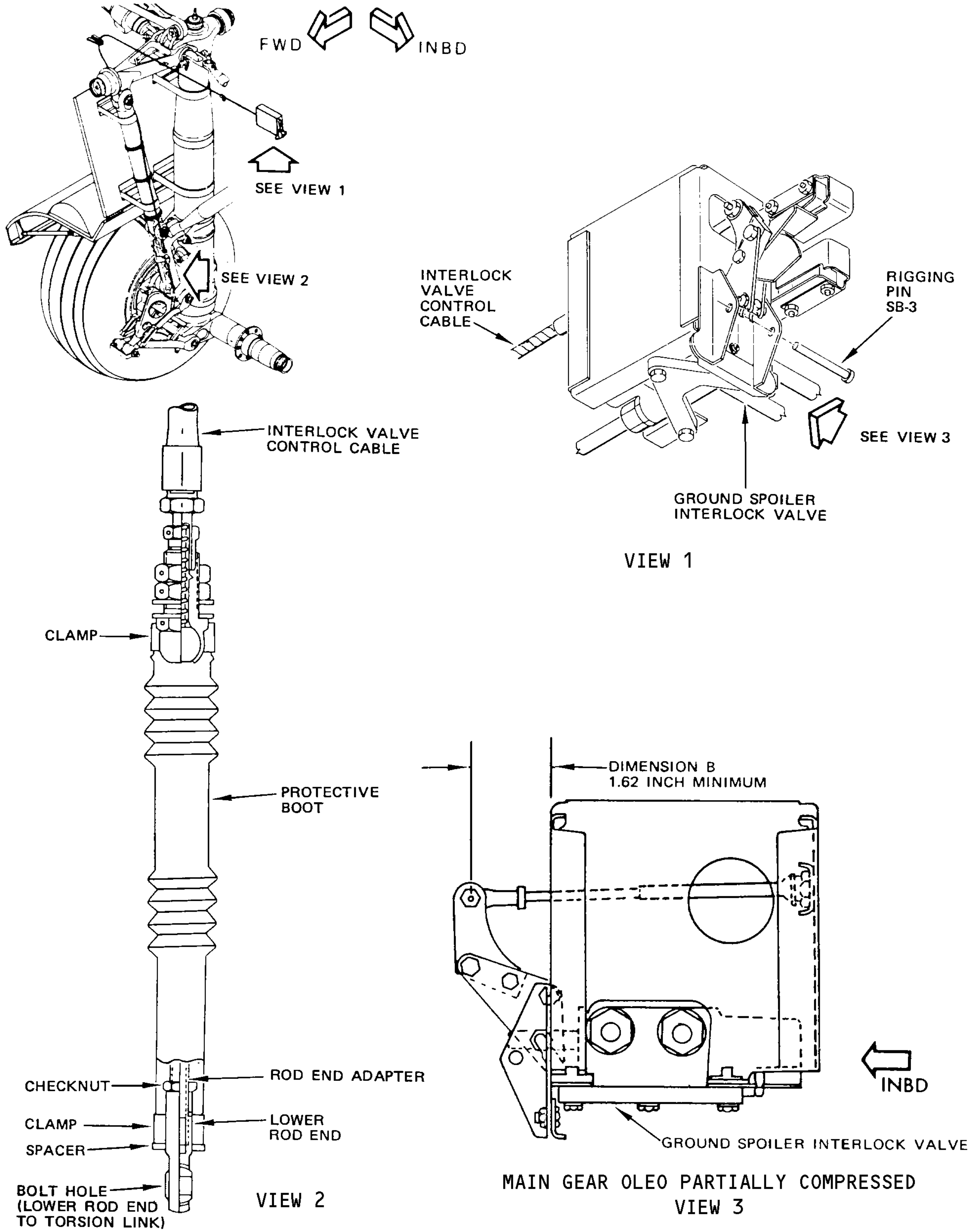


Spoiler Mixer and Ratio Changer Linkage
Figure 504



VIEW 1

Ground Spoiler Control Valve Adjustment
Figure 505



Ground spoiler Interlock Valve
Figure 506

8) Position protective boot over rod end and secure with clamp.
9) Remove rigging pin SB-3.
10) Remove jacks from airplane.

(5) Adjust Ground Spoiler Panel to Flap Clearance
(a) Connect external electrical power to airplane.
(b) Provide system A hydraulic power (Ref 27-62-0 MP).
(c) Place speed brake control lever in UP position to raise ground spoilers.
(d) With hydraulic power on, retract the flaps to the UP position by placing the flap control lever in the FLAP UP detent.
(e) Place speed brake control lever in DOWN position to lower ground spoilers.
(f) Check that No. 4 and 5 spoiler to flap clearance is within limits on Fig. 506.
(g) Check that No. 1 and 8 spoiler to flap clearance is 0.03 +0.10/-0.00 inch measured near actuator centerline.

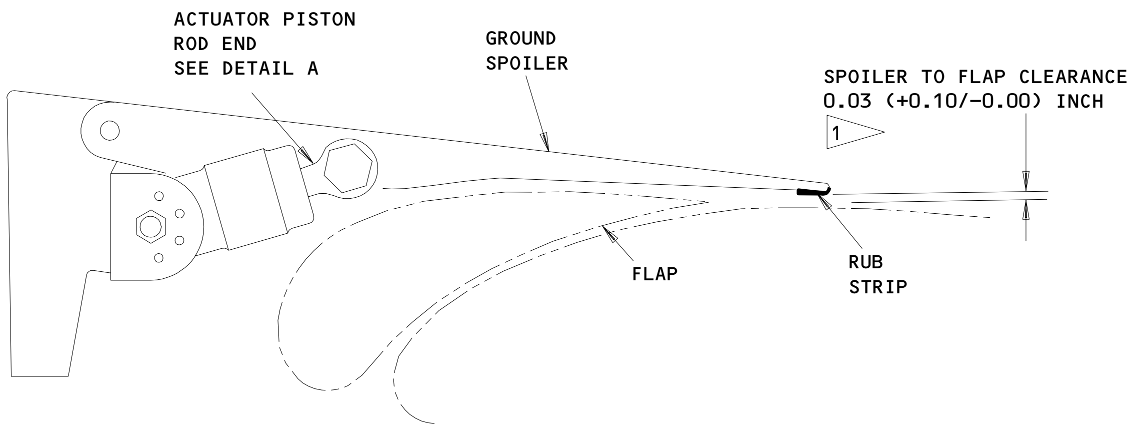
NOTE: Minimum spoiler panel gap measured along full panel span at trailing edge need only be sufficient to ensure that panel has clearance with flap.

(h) If spoiler to flap clearance in steps (f) or (g) is not within limits:
1) Record spoiler to flap clearance.
2) Provide access to spoiler actuator by either lowering flaps and opening applicable hinged trailing edge panel or by placing speed brake control lever in UP position. Remove systems A and B hydraulic power and depressurize hydraulic system A (Ref 27-62-0, Maintenance Practices).

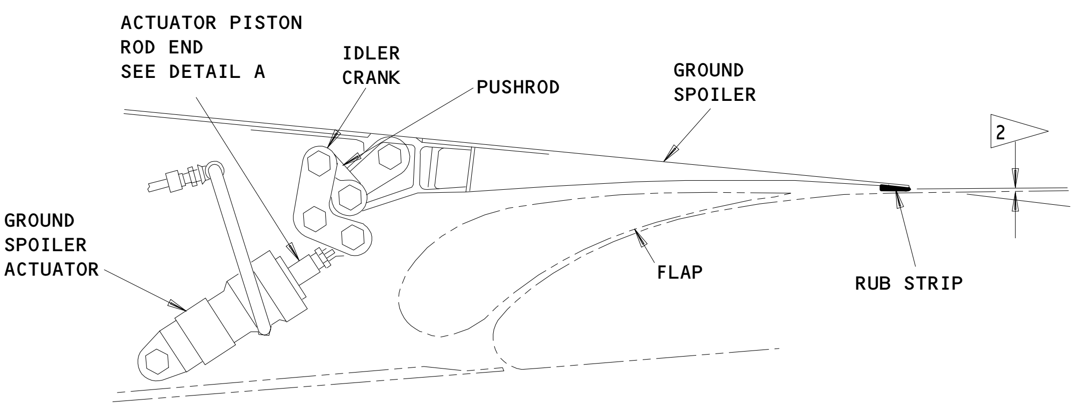
WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

3) Break lockwire, loosen checknut and disengage locking key on actuator piston rod end.
4) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each one-sixth turn of the actuator piston rod changes the gap at the trailing edge by 0.093 inch on ground spoilers No. 4 and No. 5 and by 0.05 inch on ground spoilers No. 1 and No. 8.

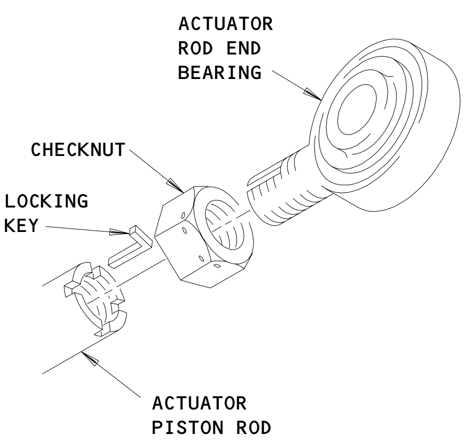
CAUTION: TURNING ACTUATOR PISTON ROD WHEN ACTUATOR IS PRESSURIZED WILL DAMAGE ACTUATOR.



TYPICAL OF GROUND SPOILERS NO. 1 AND NO. 8



TYPICAL OF GROUND SPOILERS NO. 4 AND NO. 5



ACTUATOR PISTON ROD END
DETAIL A

1 MEASURE BETWEEN THE RUB STRIP AND MIDFLAP AT CENTER OF SPOILER PANEL

2 SPOILERS NO. 4 AND NO. 5 SPOILER TO FLAP CLEARANCE

3 FUEL LOAD APPLIES TO THE WING AND BODY TANKS

4 FUEL LOAD APPLIES TO THE WING TANKS

AIRPLANE CONFIGURATION	CLEARANCE MEASURED AT OUTBOARD ACTUATOR ℄ (INCHES)	CLEARANCE MEASURED AT INBOARD ACTUATOR ℄ (INCHES)
ON JACKS NO FUEL 3	0.03 (+0.10/-0.00)	0.03 (+0.10/-0.00)
ON GEAR NO FUEL 4	0.03 (+0.10/-0.00)	0.08 (+0.10/-0.00)
ON GEAR FULL FUEL 4	0.03 (+0.10/-0.00)	0.13 (+0.10/-0.00)

Ground Spoiler Adjustment
Figure 507

5) Coat actuator piston rod end threads with corrosion preventive compound.
6) Engage locking key with actuator piston rod. Tighten checknut to 100 to 200 pound-inches.
7) Provide system A hydraulic power with system B pump (Ref 27-62-0, Maintenance Practices).
8) Lower spoilers, if applicable.
9) Check that spoiler to flap clearance is within limits.
10) Provide access to actuator.
11) Tighten checknut to 290 to 410 pound-inches and lockwire checknut to locking key.
12) Apply a bead of sealant to the rod end checknut.

(i) Remove system A and B hydraulic power (Ref 27-62-0, Maintenance Practices).

(j) Remove electrical power if no longer required.

(6) Test Speed Brake Control System

3. Speed Brake Control System Test

NOTE: This test checks operation of ground spoilers No. 1, 4, 5, and 8, and the automatic speed brake operation of flight spoilers No. 2, 3, 6, and 7. Refer to 27-61-0, Test Spoiler Control System, for other tests of flight spoilers No. 2, 3, 6, and 7.

A. Equipment and Materials
(1) Rigging Pins Kit - F70207-3, -52, -61, or -84:
(2) Control Surface Protractor - 4MIT65B80307-1 (preferred), F52485-500 (optional).
(3) Control Surface Protractor Stand Assembly - F71292-17
(4) Spring Scale capacity 0 to 50 pounds.
(5) Auto Speed Brake Test Box - F80208-1, or electrical power supply 9.0 ±1.0 volts dc (Refer to step C.(3) for airplane effectivity)
(6) Antiskid - Autobrake - Auto Speed Tester - F80129-100 (Refer to step C.(4) for airplane effectivity)

B. Prepare Speed Brake Control System for Test
(1) Connect electrical power to airplane and energize 28-volt dc bus No. 1, bus No. 2 and Battery Bus.
(2) Provide system A hydraulic power (Ref 27-62-0, MP).
(3) Place both inboard and outboard antiskid switches to ON. Switches are located on center instrument panel.
(4) Set aileron trim control knob in zero trim position.

C. Test Speed Brake Control System
(1) Test ground spoiler operation.
(a) Set speed brake control lever in DOWN position.
(b) Check that all spoilers are full down.
(c) Move speed brake control lever into ARMED detent.

(d) Check that all ground spoilers remain full down, and al1 flight spoilers do not extend beyond 1-1/2 degrees.
(e) Move speed brake control lever aft until ground spoilers extend.
(f) Check distance that speed brake control lever has moved from the DOWN position. Lever position is either 31 (± 3) degrees or 2.96 (± 0.28) inches measured along position indicating Metal-Cal surface.
(g) Using control surface protractor, check that ground spoilers No. 4 and 5 are 60 (± 2) degrees up from full down position.
(h) Check that ground spoiler No. 4 is within 2 degrees of ground spoiler No. 5.
(i) Using control surface protractor, check that ground spoilers No. 1 and No. 8 are 40 (± 2) degrees up from full down position.
(j) Check that ground spoiler No. 1 is within 2 degrees of ground spoiler No. 8.
(k) Return speed brake control lever toward DOWN position until ground spoilers retract.

REF NO.	F70207-()	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-3	-11	0.309-0.311	6.7 ± 0.25	Ground Spoiler Interlock Valve

Automatic Speed Brake Test Equipment
Figure 508 (Sheet 1)

(l) Check speed brake control lever distance from DOWN position. Lever position is either 22 (± 3) degrees, or 2.10 (± 0.28) inches measured along position indicating Metal-Cal surface.
(m) Place airplane on jacks so right main gear oleo is fully extended. Refer to Chapter 7, Jacking.
(n) Set speed brake control lever full aft in the UP position.
(o) Check that ground spoilers do not operate.
(p) Measure and record air pressure in right main gear shock strut. Release all air pressure after recording value.
(q) Place jack under jack pad on right main gear axle.

<u>CAUTION</u>: DO NOT JACK AT ANY POINT OTHER THAN JACK PAD. SEE JACKING, CHAPTER 7.

(r) Slowly raise axle jack to compress right main gear shock strut until ground spoiler interlock valve opens. The ground spoiler panels will move to full up.
(s) Measure the distance that the shock strut inner cylinder is compressed from the fully extended condition. It should be 1.5 (+1.5/-0.0) inches.
(t) Set speed brake control lever full forward in the DOWN detent. The ground spoiler panels will retract.
(u) Lower axle jack and allow right main gear shock strut to fully extend. Remove axle jack.
(v) Check that ground spoiler panels are full down.
(w) Service right main gear shock strut to air pressure recorded in step (p).
(x) Lower and remove jacks.
(y) Test spoiler response time.
    1) Rapidly move speed brake control lever from DOWN to UP and check that flight and ground spoilers actuate from full down to up in less than 1 second.
    2) Rapidly move speed brake control lever from UP to DOWN and check that flight and ground spoilers actuate from up to full down in less than 1 second.

(2) Test speed brake lever friction.
(a) Using spring scale at the tip of the speed brake control lever, check that maximum lever loads are as follows:
    1) DOWN to FLIGHT DETENT - 20 pounds maximum.
    2) FLIGHT DETENT to UP - 28 pounds maximum.
    3) UP to FLIGHT DETENT - 28 pounds maximum.
    4) FLIGHT DETENT to DOWN - 20 pounds maximum.

(3) On AG N21SW thru N23SW, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAL, ML 9M-AOU thru 9M-AOW, 9V-BBC, 9M-BBE, NH JA8401 thru JA8403, JA8405 thru JA8411, PW CF-PWC thru CF-PWE, CF-PWM, test speed brake lever actuator control and indicating circuits.

NOTE: Airplane weight must be on landing gear during this test.

(a) Ensure that following circuit breakers are closed: All INDICATOR LIGHTS, MASTER DIMMING BUS; DIM AND TEST; FLIGHT CONTROL VALVES; SPOILER SHUTOFF VALVES; AUTO SPEED BRAKE; and all ANTISKID.
(b) Move speed brake control lever from DOWN to ARMED detent.
(c) Check that ARMED light on center panel is illuminated.
(d) Deleted.
(e) Actuate speed brake indicator test by pushing test switch TEST 1 and check that:
    1) ARMED light is extinguished.
    2) DO NOT ARM light is illuminated.
(f) Repeat step (e) except actuate TEST 2 speed brake indicator test switch and then TEST 3 switch.

    NOTE: Takeoff warning horn may sound if throttles are advanced when TEST 3 switch is actuated.

(g) Position LIGHTS switch on P2-1 panel to DIM and check that ARMED light dims.
(h) Position LIGHTS switch to BRT and check that ARMED light returns to its original brightness.
(i) Remove protective cover at test connector J2 on antiskid control shield. Antiskid control shield is located on E3-2 shelf in electrical equipment area. Install auto speed brake test box (Fig. 507.)

    NOTE: Before installing, check that all switches on test box are off.

(j) Using auto speed brake test box, apply 9.0 +1.0 volts dc to pin 22 of test connector (pin 30 is gnd) and check that no spoiler response occurs. Also check that DO NOT ARM light on center instrument panel illuminates.
(k) Position LIGHTS switch on P2-1 panel to DIM and check that DO NOT ARM light dims.
(l) Position LIGHTS switch to BRT and check that DO NOT ARM light returns to its original brightness.
(m) Repeat checks in step (j) with voltage applied at:
    1) Pin 2.

2) Pin 12.
3) Pin 16.

(n) With aileron trim and aileron control wheels at neutral and engine thrust levers at idle position, apply 9.0 ±1.0 volts dc to pins 22 and 2 and check that:

WARNING: APPLY TEST VOLTAGE TO BOTH PINS SIMULTANEOUSLY TO PREVENT DAMAGE TO ANTISKID CONTROL SHIELD.

1) Flight and ground spoilers rotate to full UP in less than 1 second.
2) Speed brake control lever moves to UP position.
3) ARMED light is illuminated.

(o) Remove the 9.0 ±1.0 volts dc from pins 22 and 2.
(p) Check that:
1) ARMED light extinguishes.
2) DO NOT ARM light illuminates.

(q) Move speed brake control lever forward to DOWN position and check that DO NOT ARM light and ARMED light are both extinguished, and that flight and ground spoilers return to down position.

NOTE: The speed brake lever actuator resets for further operation of automatic speed brake system.

(r) Place speed brake control lever in ARMED detent and check that ARMED light illuminates and flight spoilers are within limits in step (1)(d).
(s) Repeat steps (n) thru (r) except apply 9.0 ±1.0 volts dc to the test connector as follows:
1) Pins 22 and 16.
2) Pins 12 and 16.
3) Pins 12 and 2.

(t) Apply 9.0 ±1.0 volts dc to pins 22 and 2. Flight and ground spoilers shall rotate to full up.
(u) Move engine No. 1 thrust lever 12.5 ±1 degrees forward from idle position and check that:
1) Flight and ground spoilers rotate to down position in less than 1 second.
2) Speed brake control lever returns to DOWN detent.
3) ARMED and DO NOT ARM lights are extinguished.

(v) Place speed brake control lever in ARMED detent and repeat steps (t) and (u) except move engine No. 2 thrust lever 12.5 ±1 degrees forward from idle position.
(w) Move engine No. 1 and engine No. 2 forward thrust levers to idle position.

(x) Position inboard and outboard antiskid switches to ON.
(y) Place speed brake control lever in ARMED detent. Check that armed light illuminates.
(z) Apply 9.0 ±1.0 volts dc to any of following combination of pins, 22 and 2, 22 and 16, 12 and 2, and 12 and 16. Check that speed brake control lever moves to full extend position.
(aa) Deleted.
(ab) Move engine No. 1 reverse thrust lever, then No. 2 reverse thrust lever to maximum reverse thrust position. Check that speed brake lever does not retract and warning horn does not sound.

WARNING: PERSONNEL MUST STAY CLEAR OF THRUST REVERSER WHEN ACTUATED TO PREVENT BEING CAUGHT BY ROTATING DEFLECTOR DOORS.

NOTE: Travel of reverse thrust levers to maximum position requires that thrust reversers hydraulically actuate or that thrust reverser follow-up cable be disconnected. Refer to Exhaust, Chapter 78.

(ac) Remove power from all pins.
(ad) Move both engine forward thrust levers to idle position.
(ae) Place speed brake control lever in DOWN detent.
(af) Position switch for inboard antiskid system to OFF.
(ag) Place speed brake control lever in ARMED position and check that ARMED light illuminates.
(ah) Apply 9.0 ±1.0 volts dc to pins 22 and 2 and check that:
1) DO NOT ARM light illuminates.
2) ARMED light extinguishes.
3) No spoiler response occurs.
(ai) Remove power from pins 22 and 2, and apply 9.0 (±1.0) volts dc to pins 12 and 2. Check that:
1) DO NOT ARM light extinguishes.
2) ARMED light illuminates.
3) No spoiler response occurs.
(aj) Remove power from pins 12 and 2, position inboard antiskid system switch to ON and outboard antiskid system switch to OFF.
(ak) Check that ARMED light is illuminated.
(al) Apply 9.0 (±1.0) volts dc to pins 12 and 16 and check that:
1) DO NOT ARM light illuminates.
2) ARMED light extinguishes.
3) No spoiler response occurs.

(am) Remove power from pins 12 and 16, and apply 9.0 (±1.0) volts dc to pins 22 and 16 and check that:
1) DO NOT ARM light extinguishes.
2) ARMED light illuminates.
3) No spoiler response occurs.

(an) Remove power from pins 22 and 16, and position both antiskid switches to OFF.

(ao) Ensure speed brake control lever is in ARMED detent.

(ap) Check that DO NOT ARM light illuminates and ARMED light is extinguished.

(aq) Apply 9.0 (±1.0) volts dc to pin pairs 22 and 2, 22 and 16, 12 and 16, and 12 and 2, respectively. Check that no spoiler response occurs during any of the four checks.

(4) On VP ALL EXCEPT PP-SMA thru PP-SME, PP-SMQ thru PP-SMT, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, SQ ALL EXCEPT 9V-BBC, 9V-BBE, NH ALL EXCEPT JA8403, JA8406 thru JA8411, BU ALL EXCEPT LN-SUA, LN-SUG, LN-SUP, LN-SUS, TZ ALL EXCEPT CF-TAO, test speed brake lever actuator control and indicating circuits.

NOTE: Airplane weight must be on landing gear during this test.

(a) Ensure that following circuit breakers are closed: All INDICATOR LIGHTS, MASTER DIMMING BUS; DIM AND TEST; FLIGHT CONTROL VALVES; SPOILER SHUTOFF VALVES; AUTO SPEED BRAKE; and all ANTISKID.

(b) Move speed brake control lever from DOWN to ARMED detent.

(c) Check that ARMED light on center panel is illuminated.

(d) Actuate speed brake indicator test by pushing test switch TEST 1 and check that:
1) ARMED light is extinguished.
2) DO NOT ARM light is illuminated.

(e) Repeat step (d) except actuate TEST 2 speed brake indicator test switch and then TEST 3 switch.

NOTE: Takeoff warning horn may sound if throttles are advanced when TEST 3 switch is actuated.

(f) Position LIGHTS switch on P2 panel to DIM and check that ARMED light dims.

(g) Position LIGHTS switch to BRT and check that ARMED light returns to its original brightness.

(h) Remove protective cover at test connector J2 on antiskid control shield. Antiskid control shield is located on E3-2 shelf in electrical equipment area. Install antiskid-auto brake-auto speed brake tester.

<u>NOTE</u>: Before installing, check that all switches on tester are off.

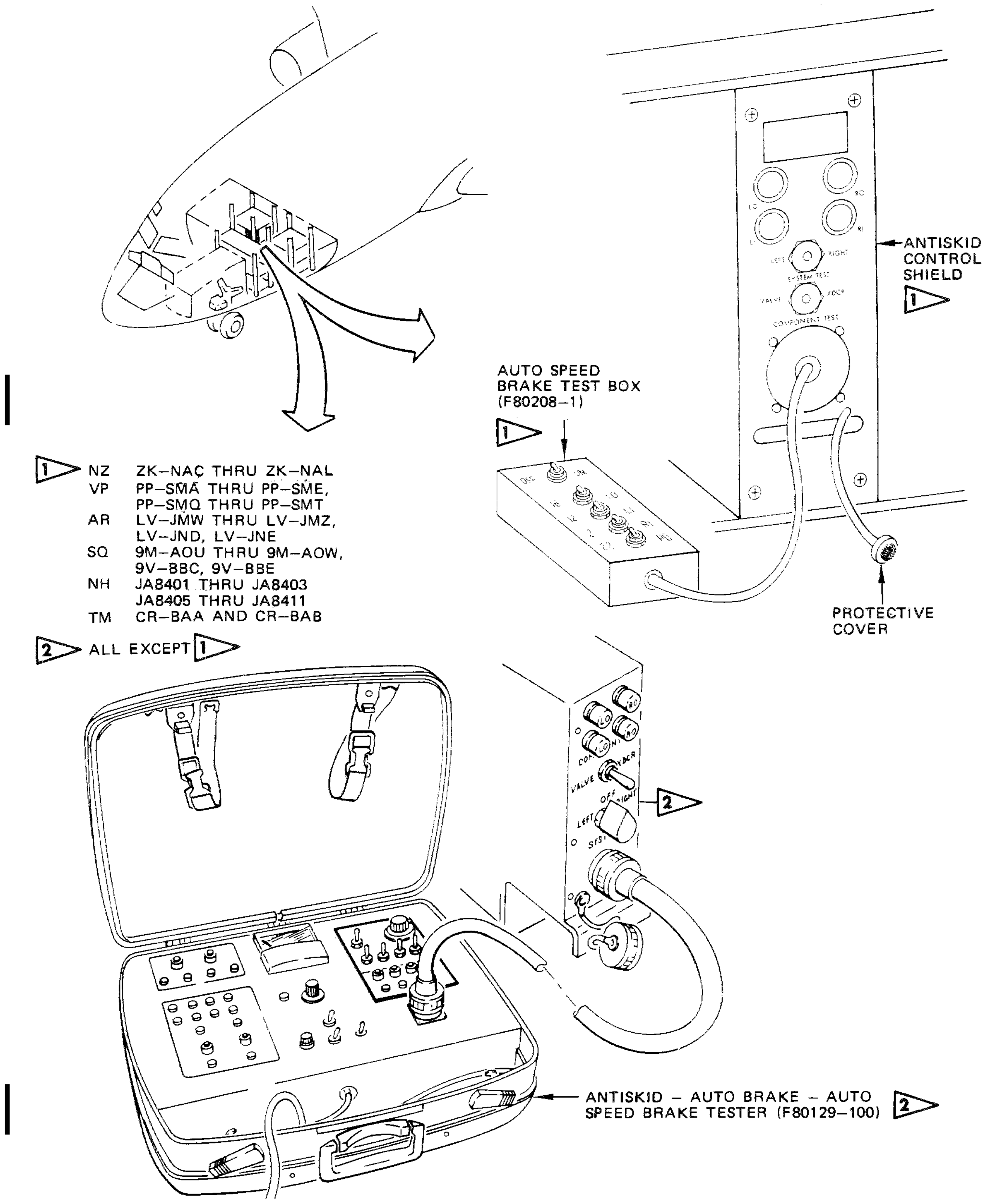
(i) Set up tester as follows:
1) Place master switch to ON position.
2) Place WHEEL SPEED LO, LI, RO and RI switches in OFF position.
3) Set rotary VELOCITY potentiometer to a position greater than 62 knots.
4) Place WHEEL SPEED velocity switch in VEL position.

<u>NOTE</u>: Throughout the test, LO, LI, RO and RI switches referred to are located in tester WHEEL SPEED section. Disregard all lamps on tester during test.

(j) Place speed brake lever in ARMED position. Check that ARMED light illuminates.
(k) Place LO switch in ON position. Check that DO NOT ARM light illuminates and spoilers do not actuate.
(l) Place LO switch in OFF position. Check that ARMED light illuminates.
(m) Repeat steps (k) and (1) for LI, RI and RO switches.
(n) With speed brake in ARMED position, place switches RO and RI in ON position. Check that speed brake lever automatically moves to UP position and all spoilers extend.
(o) Place switch RO and RI in OFF position.
(p) Place speed brake lever in DOWN and locked position, then to ARMED position. Check that all spoilers retract and ARMED light illuminates.

<u>NOTE</u>: DO NOT ARM light may momentarily come on if switches are not operated simultaneously.

(q) Repeat steps (n) thru (p) for the following pairs of switches:
1) RO and LO
2) LI and LO
3) LI and RI
(r) Place speed brake lever in ARMED position.
(s) Place RI and RO switches in ON position. Check that all spoilers extend.



Automatic Speed Brake Test Equipment
Figure 508 (Sheet 2)

(t) Move No. 1 thrust lever 12.5 ±1 degrees forward from idle position and check that:
   1) All spoilers return to full down position in less than 1 second.
   2) Speed brake control lever returns to DOWN detent.
   3) ARMED and DO NOT ARM lights are extinguished.

(u) Return thrust lever to idle position.

(v) Repeat steps (r) thru (u) except move No. 2 thrust lever 12.5 ±1 degrees forward from idle position instead of thrust lever No. 1.

(w) Repeat steps (r) thru (u) except actuate No. 3 speed brake test switch on center panel instead of thrust lever No. 1.

(x) Place inboard antiskid switch in OFF position and speed brake lever in ARMED position. Check that ARMED light illuminates.

(y) Simultaneously place RO and RI switches in ON position. Check that DO NOT ARM light illuminates and spoilers do not actuate.

(z) Place RO and RI switches in OFF position. Check that ARMED light illuminates and spoilers do not actuate.

(aa) Simultaneously place LI and RI in ON and then OFF position. Check that ARMED light remains on and spoilers do not actuate.

(ab) Place inboard antiskid switch in ON position and outboard antiskid switch in OFF position. Check that ARMED light illuminates and spoilers do not actuate.

(ac) Repeat steps (y) and (z) using LO and LI switches instead of RO and RI switches.

(ad) Repeat step (aa) using LO and RO switches instead of LI and RI switches.

(ae) Place both antiskid switch in OFF position and repeat steps (n) thru (p) except that actuation of switches should result in no spoiler actuation.

(af) Place both antiskid switches in ON position and place speed brake lever in ARMED position.

(ag) Ensure that both engine thrust levers are in idle position.

(ah) Simultaneously press both GRD SENSING TEST and AIR SENSING TEST switches on landing gear electrical module (located on E3 electrical/electronics shelf), then release both switches. Check that:
   1) Speed brake lever moves to full UP position.
   2) All spoilers extend to full up position.

   NOTE: DO NOT ARM light on center instrument panel may momentarily illuminate when GRD SENSING TEST and AIR SENSING TEST switches on landing gear module are pressed.

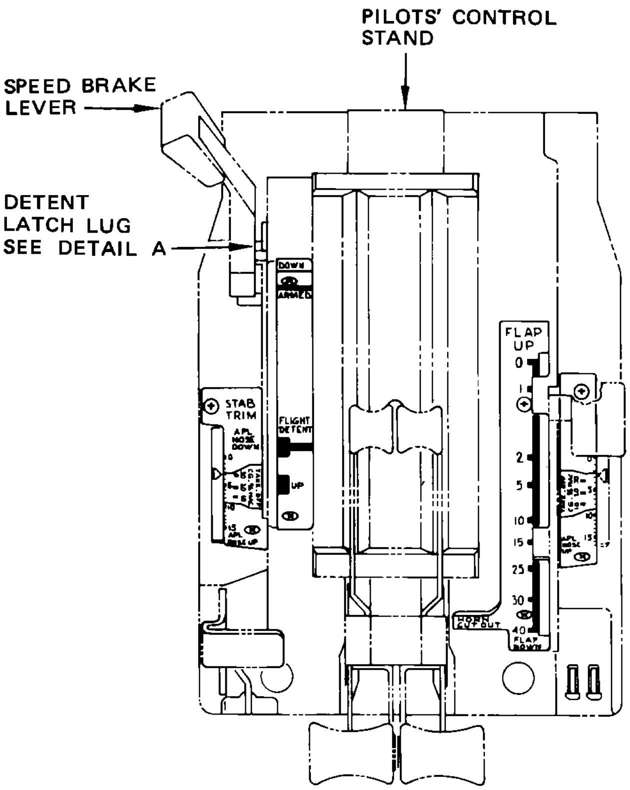
(ai) Place speed brake control lever in DOWN detent.

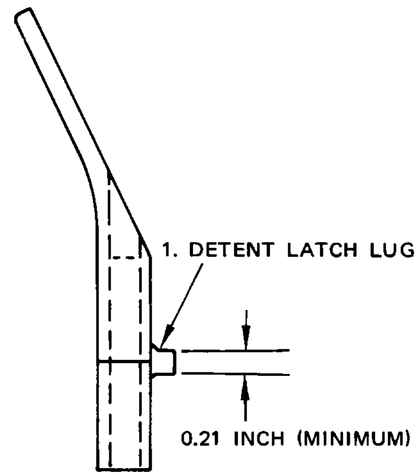
(aj) Check that all spoilers retract to full down position.
(ak) Place speed brake control lever in ARMED detent.
(al) Press GRD SENSING TEST switch on landing gear module, then release switch.
(am) Check that DO NOT ARM light on center instrument panel illuminates for 4.0 ±2.0 seconds after switch is released.
(an) Repeat steps (al) and (am) using AIR SENSING TEST switch.

D. Return Airplane to Normal
(1) Remove tester. Replace protective cover on test connector J2.
(2) Place speed brake control lever in DOWN position.
(3) Remove system A hydraulic power (Ref 27-62-0).
(4) Remove electrical power if no longer required.
(5) Remove control surface protractor and thrust lever adapter.

SPEED BRAKE CONTROL SYSTEM - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and a wear limit chart. There is no procedure given for gaining access to the component for removal or replacement after inspection for wear. For this information refer to OHM 27-09-46.
2. Speed Brake Control Lever Wear Limits (Fig. 601)





INDEX NO.	PART NAME	DIM	DESIGN LIMITS DIAMETER		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
			MIN	MAX	MAX WEAR DIM	MAX DIAM CLEARANCE			
1	DETENT LATCH LUG	X	X	X	X	X	1		

1 MAXIMUM ALLOWABLE WEAR IS 0.04 INCH.
REFER TO OVERHAUL MANUAL FOR REPAIR INFORMATION.

Speed Brake Lever Wear Limits
Figure 601

NO. 4 AND 5 GROUND SPOILERS - REMOVAL/INSTALLATION

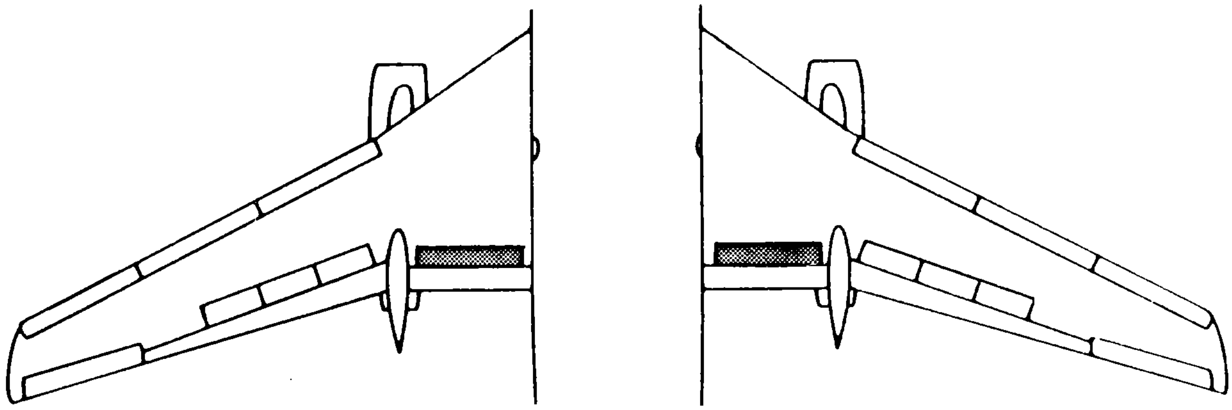
1. General
   A. For interchangeability of graphite/composite ground spoilers with aluminum/fiberglass ground spoilers, refer to 27-09-800.
2. Equipment and Materials
   A. Actuator Lock Ground Spoiler - F80040-2

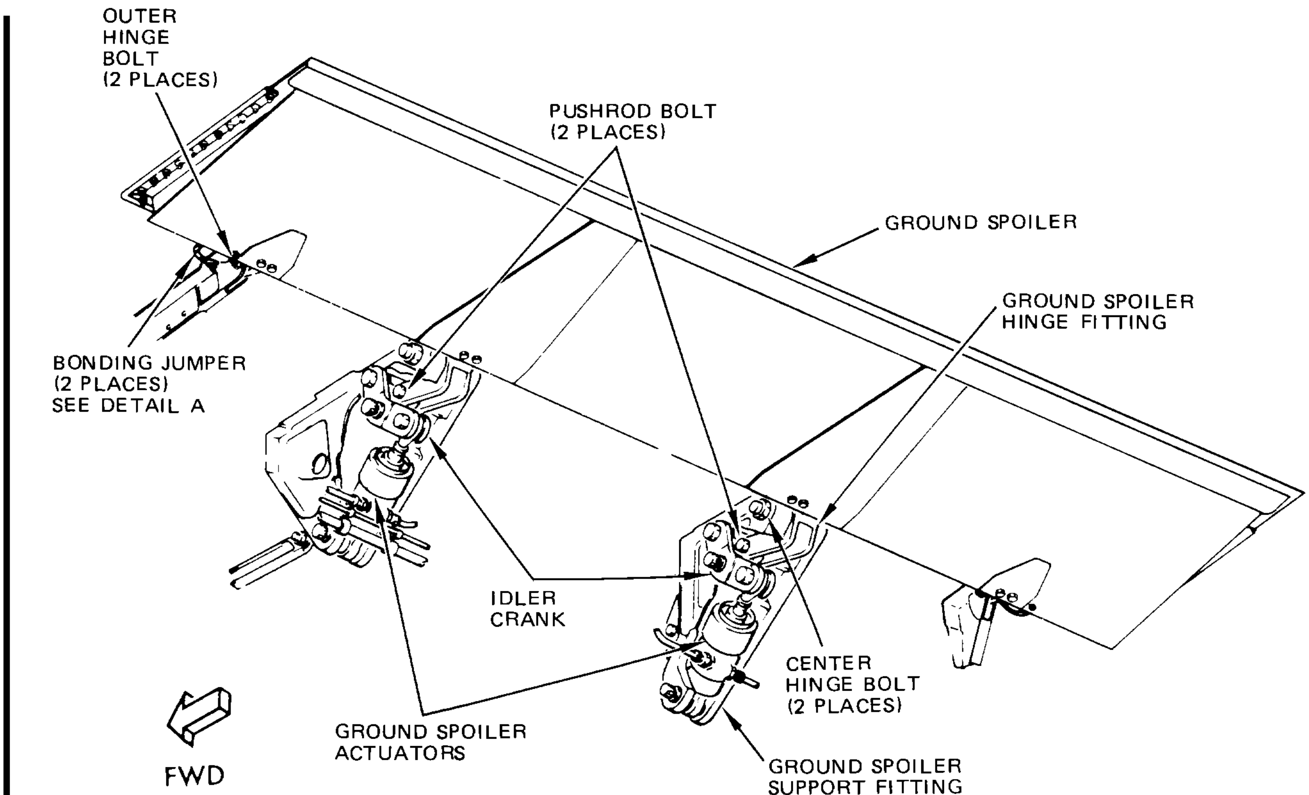
      NOTE: F80040-15 is used on airplanes having ground roll spoilers with single actuators. F80040-2 is used on airplanes having ground roll spoilers with double actuators.

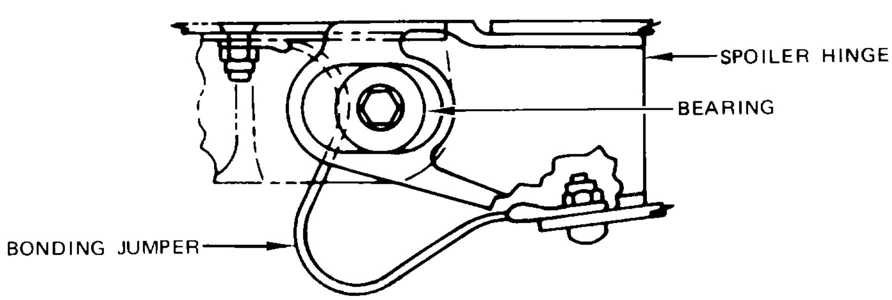
3. Prepare Ground Spoiler for Removal
   A. Connect electrical power to airplane.
   B. Pressurize hydraulic system A (Ref 27-62-0, MP).
   C. Position flap control lever to FLAP DOWN to extend trailing edge flaps.
   D. Position spoiler switches to OFF.
   E. Place speed brake control lever in UP position to raise ground spoilers.
   F. Install ground spoiler actuator locks.
   G. Turn off hydraulic system A (Ref 27-62-00, MP).
4. Remove Ground Spoiler Panel
   A. Remove two bolts attaching pushrods to ground spoiler (Fig. 401).
   B. Disconnect bonding jumpers from ground spoiler. Jumpers are located adjacent to inboard and outboard hinge locations.
   C. Remove four hinge bolts.
   D. Remove ground spoiler from airplane.

      NOTE: Ground spoiler weighs approximately 27 pounds.

   E. Remove bearings at inboard and outboard hinge locations.
5. Install Ground Spoiler
   A. Accomplish following:
      (1) Check attachment points for allowable wear (Ref 27-62-12 I/C).
      (2) Position bearings in ground spoiler at inboard and outboard hinge location (Fig. 401).
   B. Position ground spoiler on airplane.
   C. Insert four hinge bolts. Center hinge bolts with boltheads outboard. Inboard and outboard hinge bolts with boltheads inboard.
   D. Secure two outer hinge bolts.
      (1) Place washer and nut on bold. Tighten nut 50 to 70 pound-inches.
      (2) Install cotter pin.
   E. Secure two center hinge bolts.
      (1) Place washers and nut on bolt. Tighten nut 630 to 950 pound-inches.
      (2) Install cotter pin.
   F. Rotate ground spoiler through full travel and check for binding or interference.







DETAIL A

No. 4 and No. 5 Ground spoiler Installation
Figure 401

G. Connect two bonding jumpers to ground spoiler. Jumpers attach at lower leg of leading edge channel adjacent to inboard and outboard hinges.

NOTE: If hole is not provided for fastener, locate hole 9 inches in from end of panel and 0.5 inch aft of leading edge on lower leg.

H. Install the two bolts attaching pushrods to ground spoiler.
   (1) Install bolts with heads outboard.
   (2) Secure bolts with washers and locknuts. Tighten nuts 290 to 410 pound-inches.
I. Ensure hydraulic system A is depressurized and remove ground spoiler actuator lock.
J. Position ground spoiler down.
K. Check that gaps between ground spoiler and fixed wing structure are 0.40 ±0.05 inch at both ends of panel.
L. Check that end seals on the ground spoiler make firm contact with wing structure.
M. Check that short vertical bulb seal between spoiler and wing upper fixed panel is compressed 0.15 ±0.05 inch and at least 50 per cent covered by spoiler.
N. Adjust and test ground spoiler installation (Ref No. 4 and 5 Ground Spoiler - A/T).

6. Return Airplane to Normal Configuration
   A. If applicable, apply non-skid overwing escape route markings (Ref 51-21-151).
   B. Turn off hydraulic system B pumps No. 1 and 2 and CLOSE hydraulic interconnect valve.
   C. Position spoiler control switches to ON.
   D. Determine whether there is any further need for electrical power on the airplane; if not, remove power.

NO. 4 AND 5 GROUND SPOILERS - ADJUSTMENT/TEST

1. Ground Spoiler Adjustment
   A. Equipment and Materials
      (1) Corrosion Preventive Compound, MIL-C-11796, Class 3
   B. Prepare Ground Spoiler for Adjustment
      (1) Check that electrical power is connected to airplane and spoiler A and B switches are on.
      (2) Pressurize hydraulic system A (Ref 27-62-0, M/P).
      (3) Place speed brake control lever in UP position to raise all spoilers.
      (4) Retract trailing edge flaps to full up with jackscrew stops in contact.
         (a) Set flap control lever to FLAP UP position.
         (b) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
      (5) Place speed brake control lever in DOWN position to lower all spoilers.
      (6) Turn off spoiler A and B switches.
   C. Adjust Ground Spoiler
      (1) Check that spoiler to flap clearance is per Fig. 501.
      (2) If spoiler to flap clearance is not within limits:
         (a) Measure and record spoiler to flap clearance.
         (b) Provide access to spoiler actuators by either lowering flaps or by placing speed brake control lever in UP position. Depressurize hydraulic system A (Ref 27-62-0, M/P).

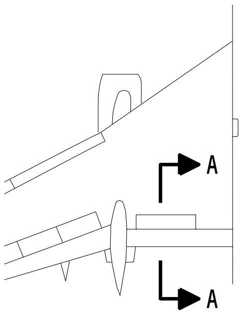
            WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

         (c) Break lockwire and loosen actuator rod end checknut and remove locking key.
         (d) Rotate the actuator piston rod in one-sixth turn increments to obtain the necessary ground spoiler to flap clearance. Use flats provided on piston rod to turn piston rod.

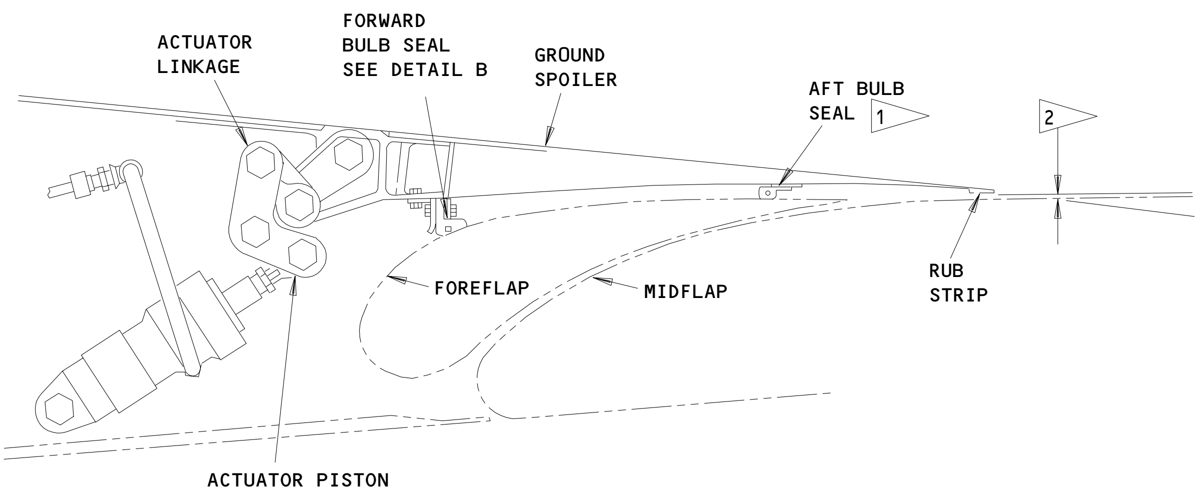
            CAUTION: DO NOT TURN PISTON ROD IF ACTUATOR IS PRESSURIZED.

            NOTE: One-sixth rotation of actuator piston rod changes the ground spoiler to flap clearance by 0.093 inch.

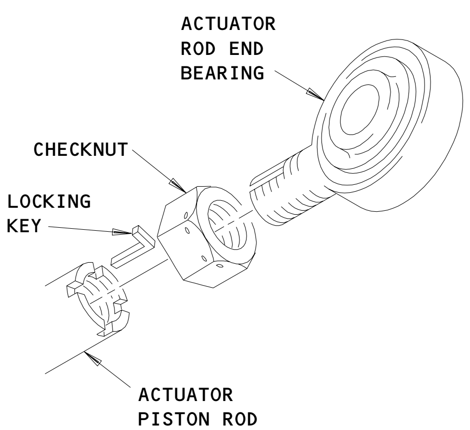
         (e) Insert locking keys and tighten actuator rod end checknut to 100-200 pound-inches.
         (f) Pressurize hydraulic system A.



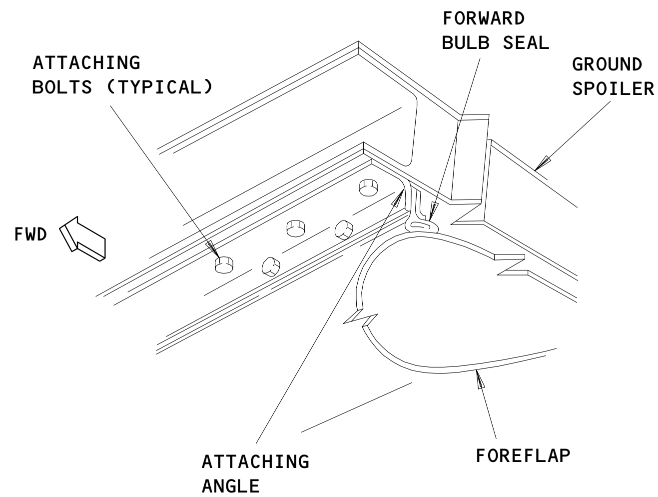
AIRPLANE CONFIGURATION	CLEARANCE MEASURED AT OUTBOARD ACTUATOR ℄ (INCHES)	CLEARANCE MEASURED AT INBOARD ACTUATOR ℄ (INCHES)
ON JACKS MINIMUM FUEL [3]	0.03 (+0.10/-0.00)	0.03 (+0.10/-0.00)
ON GEAR MINIMUM FUEL [4]	0.03 (+0.10/-0.00)	0.08 (+0.10/-0.00)
ON GEAR FULL FUEL [4]	0.03 (+0.10/-0.00)	0.13 (+0.10/-0.00)



SECTION A-A



ACTUATOR PISTON ROD END
DETAIL A



DETAIL B

1 NOT ON ALL AIRPLANES
2 SPOILER TO FLAP CLEARANCE
3 FUEL LOAD APPLIES TO WING AND BODY TANKS
4 FUEL LOAD APPLIES TO WING TANKS

Spoiler Adjustment
Figure 501

(g) Lower spoilers, if applicable.
(h) Check that spoiler to flap clearance is within limits.
(i) Provide access to actuators.
(j) Tighten actuator piston rod end checknut to 290 to 410 pound-inches.
(k) Coat actuator piston rod end threads with corrosion preventive compound.
(l) Lockwire actuator piston rod end checknut.

(3) Check forward bulb seal between spoiler and foreflap.
(a) Raise spoiler and remove hydraulic power.
(b) With flap up, check that both wing upper fixed panel bulb seals are compressed by foreflap 0.15 ±0.05 inch.
(c) Measure position of wing bulb seal in relation to wing upper surface.
(d) Check that spoiler forward bulb seal position in relation to spoiler upper surface aligns with wing bulb seal. Adjust spoiler forward bulb seal, if necessary, by loosening attaching bolts, repositioning seal, and retightening bolts.

(4) Check aft bulb seal, if installed, between spoiler and foreflap.
(a) Lower inboard flaps to one unit.
(b) With spoiler lowered, check that aft bulb seal contacts foreflap for at least 80 per cent of its length with no more than 0.02-inch gap for remainder.
(c) If necessary, adjust aft bulb seal by shimming.

(5) Test ground spoilers.

2. <u>Ground Spoiler Test</u>

A. Equipment and Materials

(1) Control Column Protractor Assembly - 4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
(a) Aileron Control Wheel Protractor Mount - F72790
(b) Forward Thrust Lever Protractor Adapter - F72952-2
(c) Control Surface Protractor Stand Assembly - F71292-17

B. Test Ground Spoiler

(1) Place flap control lever to FLAP UP position to raise trailing edge flaps.
(2) Place speed brake control lever in DOWN position.
(3) Check that ground spoilers are full down.
(4) Place speed brake control lever in UP position.
(5) Check that No. 4 and 5 ground spoilers are raised 60 ±2 degrees.
(6) Check that ground spoiler No. 4 is within 2 degrees of spoiler No. 5.

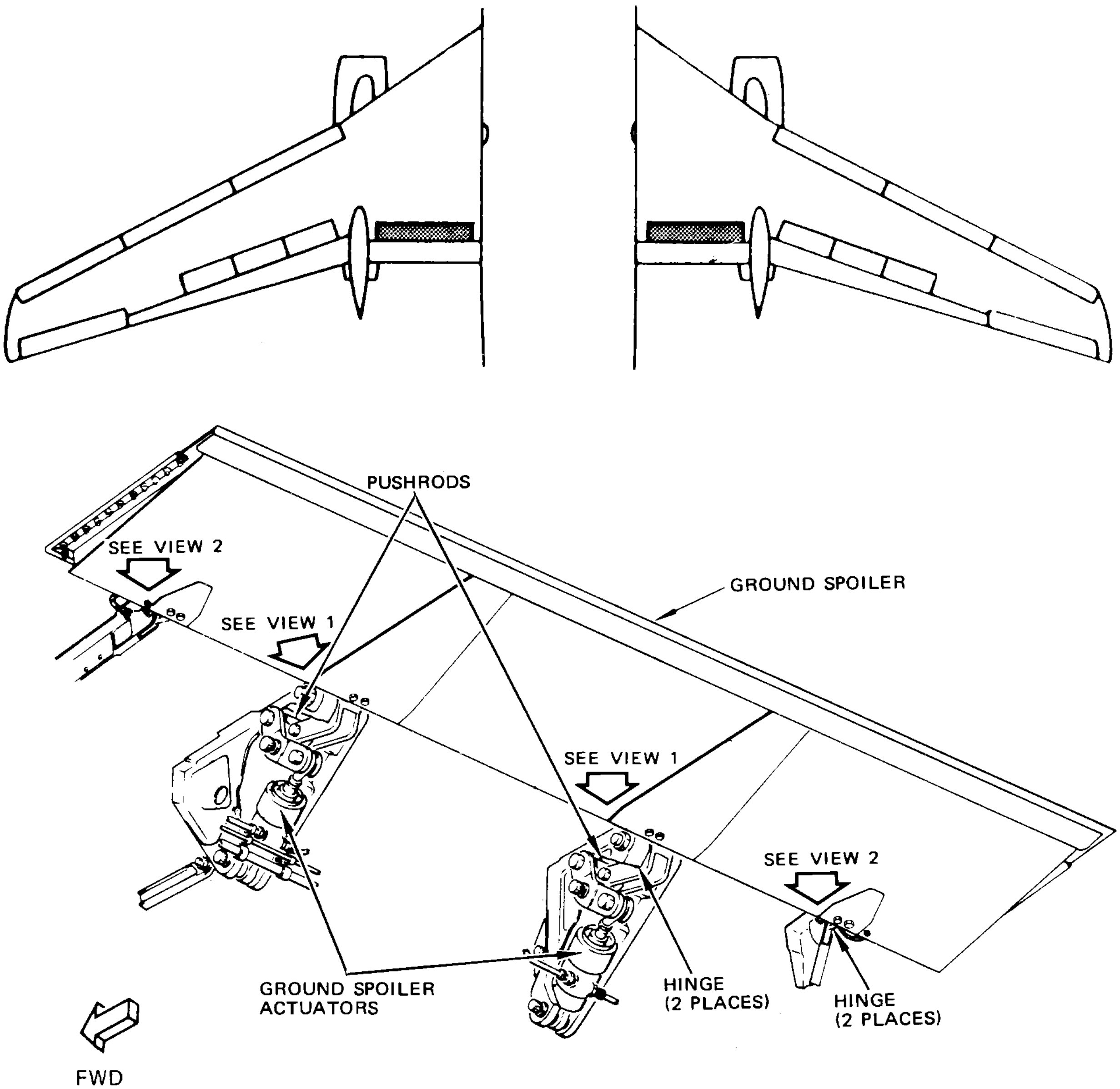
C. Restore Airplane to Normal Configuration

(1) Place speed brake control lever to DOWN position.
(2) Turn off hydraulic system B pumps No. 1 and 2 and CLOSE hydraulic interconnect valve.

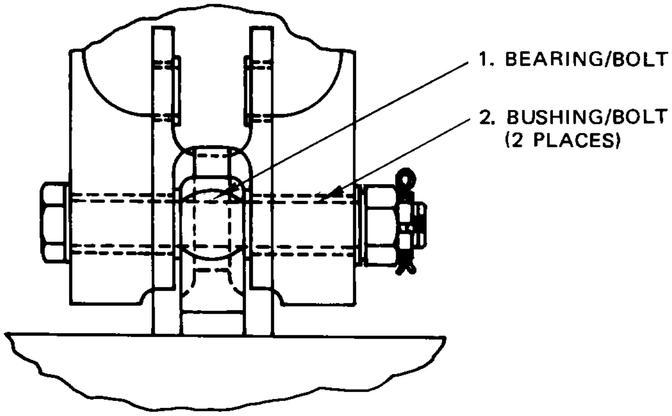
(3) Determine whether there is any further need for electrical power on the airplane; if not, remove power.

NO. 4 AND 5 GROUND SPOILERS - INSPECTION/CHECK

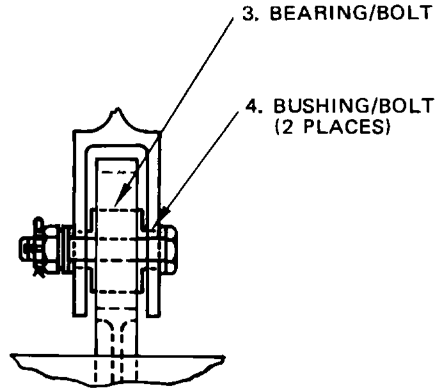
1. General
   A. This data consists of illustrations and wear limit charts. No procedure is given in this section for gaining access to permit inspection. For this information, refer to Removal/Installation.
2. No. 4 and 5 Ground Spoilers Wear Limits (Fig. 601)



No. 4 and 5 Ground Spoilers Wear Limits
Figure 601 (Sheet 1)



VIEW 1



VIEW 2

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.4995	0.5000	0.5025	0.003	X		
	BOLT	OD	0.4985	0.4995	0.4965		X		
2	BUSHING	ID	0.5000	0.5015	0.5045	0.005	X		
	BOLT	OD	0.4985	0.4995	0.4950		X		
3	BEARING	ID	0.2495	0.2500	0.2525	0.003	X		
	BOLT	OD	0.2485	0.2495	0.2465		X		
4	BUSHING	ID	0.2500	0.2515	0.2545	0.005	X		
	BOLT	OD	0.2485	0.2495	0.2450		X		

ALL DIMENSIONS ARE IN INCHES

No. 4 and 5 Ground Spoilers Wear Limits
Figure 601 (Sheet 2)

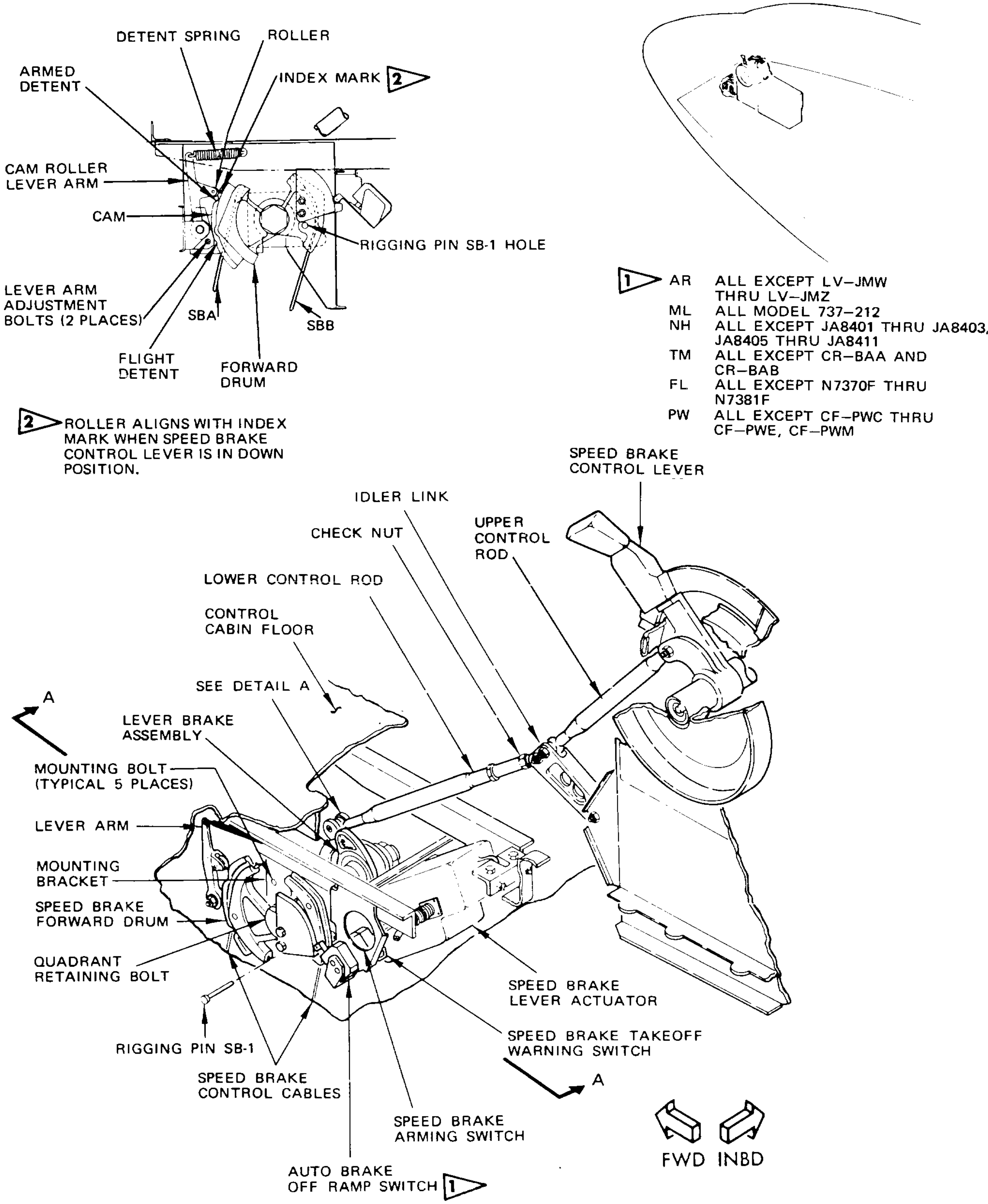
SPEED BRAKE FORWARD DRUM AND LEVER BRAKE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Primer - BMS 10-11, type I (AMM 20-30-41)
   B. Rigging Pins Kit - F70207-3, -52, -61, or -84:

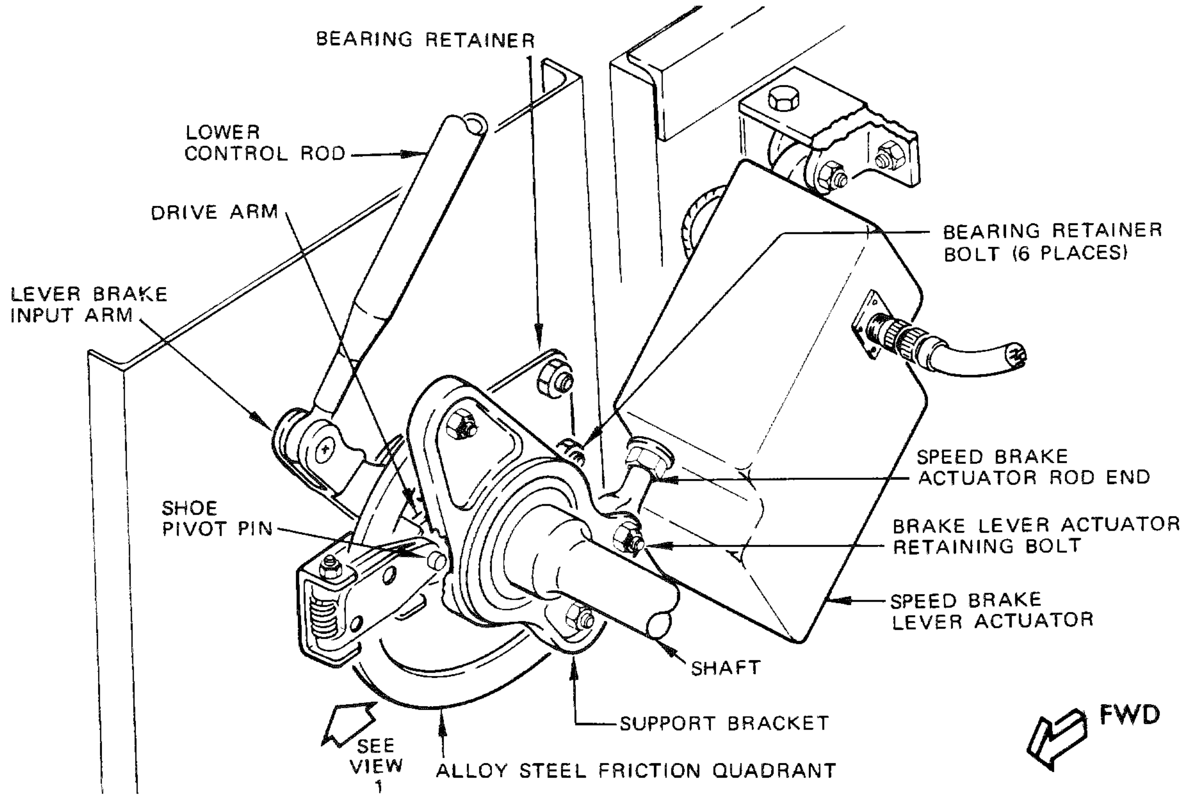
REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-1	-11	0.309-0.311	6.7 ±0.25	Speed Brake Forward Drum
S/B-2	-13	0.309-0.311	2.35 ±0.06	Speed Brake Input Quadrant

   C. Electrical Power Supply - 28 volts dc
   D. Grease - VV-P-236 (AMM 20-30-21)
2. Prepare Speed Brake Forward Drum and Lever Brake for Removal
   A. Depressurize systems A and B hydraulic power (AMM 27-62-0/201).
   B. Check that electrical power is off.
   C. Place speed brake control lever in DOWN position.
   D. Open lower fuselage nose compartment access door.
   E. Remove left forward, nose wheel well access panel.
3. Remove Speed Brake Forward Drum and Lever Brake
   A. Disconnect speed brake control cables.
      (1) Secure cables to maintain a slight cable tension when turnbuckles are disengaged.
      (2) Disengage turnbuckles located in aft portion of lower nose compartment.
      (3) Identify cables for subsequent installation.
      (4) Remove cable retainers and cables from speed brake forward drum.
   B. Remove speed brake forward drum (Fig. 401).
      (1) Break lockwire and remove from quadrant retaining bolt.
      (2) Remove quadrant retaining bolt and washer.
      (3) Remove speed brake forward drum from splined shaft.

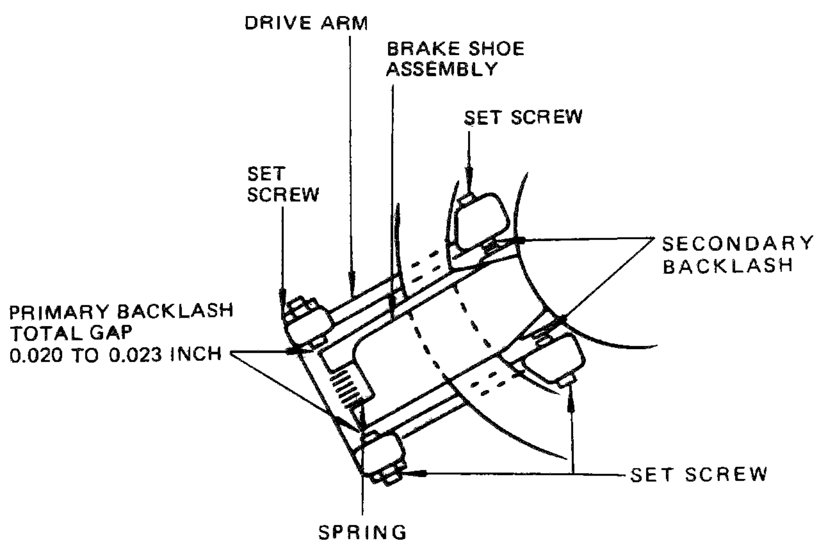
      NOTE: Hold spring-loaded lever away from forward drum to allow removal of forward drum.



Speed Brake Forward Drum and Lever Brake Installation
Figure 401 (Sheet 1)



LEVER BRAKE MECHANISM
DETAIL A



VIEW 1

Speed Brake Forward Drum and Lever Brake Installation
Figure 401 (Sheet 2)

C. Remove lever brake assembly.
   (1) Disconnect speed brake lever actuator rod end from lever brake.
   (2) Disconnect lower control rod from lever brake input arm.
   (3) Remove lever brake retaining locknut from shaft.
   (4) Remove bolts from bearing retainers at each end of lever brake shaft.
   (5) Remove lever brake from airplane.

   NOTE: Mounting brackets are slotted to allow shaft to be lowered for removal.

4. Install Speed Brake Forward Drum and Lever Brake (Fig. 401)
   A. Install lever brake.
      (1) Adjust lever brake backlash.
         (a) Check that primary backlash total gap is 0.020 to 0.023 inch equally distributed between each set screw and brake shoe assembly. If gap is within limits specified, proceed per step (3). If not, adjust per step (b).
         (b) Adjust lever brake backlash as follows:
            1) Measure total secondary backlash gap on brake shoe assembly (Fig. 401).
            2) Install two shims in gaps, each equal to one half total secondary backlash gaps, to centralize the drive arm and shoe pivot point.

            NOTE: Do not adjust secondary backlash setscrews.

            3) Adjust primary backlash set screws to provide a total gap of 0.020 to 0.023 inch equally distributed between each setscrew and brake shoe assembly.

            NOTE: When checking gaps, care must be taken to make sure that springs or brake shoes are not compressed.

            4) Remove two shims from lever brake assembly.

(2) Apply a thin film of lubricant to inner and outer edges of alloy steel friction quadrant.
(3) Install lever brake assembly.
   (a) Position bearings and bearing retainers on lever brake shaft ends and locate in airplane.
   (b) Install 11 bolts in two bearing retainers. Secure with washers and locknuts. Coat bolts with primer prior to installation.
   (c) Install lever brake retaining locknut onto shaft.
   (d) Attach lower end of lower control rod to lever brake input arm. Install bolt with head inboard. Secure bolt with washer and locknut.

B. Install speed brake forward drum.
(1) Install washer on splined shaft.
(2) Install forward drum quadrant on splined shaft.

NOTE: Shaft and quadrant splines are made with a missing tooth to ensure correct indexing.

(3) Install washer and quadrant retaining bolt. Tighten bolt within 40 to 50 pound-inch torque range.
(4) Lockwire quadrant retaining bolt to forward drum quadrant.

C. Adjust speed brake control lever.
(1) Place speed brake control lever in DOWN position. Make sure that lever latch is in detent on control stand.
(2) Check that rigging pin SB-1 can be freely installed through speed brake forward drum quadrant into structure. If rigging pin cannot be freely installed, accomplish the following steps:
   (a) Remove control stand access panel located on left side, forward and below the stabilizer trim wheel.
   (b) Disconnect upper end of lower control rod from idler link.
   (c) Loosen checknut and adjust rod end until rod end bolt fits freely with rigging pin SB-1 installed.
   (d) Install rod end bolt with washer under bolthead. Secure bolt with washers and locknut.
   (e) Ensure that rod end threads are visible in control rod inspection hole.

(f) Replace control stand access panel.

D. Attach speed brake lever actuator to speed brake lever brake.
  (1) Manually rotate lever brake forward until internal stop is contacted.
  (2) Fully extend lever actuator by applying 28 volts dc to pins 1 and 7 on actuator. Pins on actuator are numbered. Use pin 1 as ground.
  (3) Adjust lever actuator rod end fitting as follows:
    (a) Loosen lever actuator rod end checknut.
    (b) Adjust lever actuator rod end fitting until retaining bolt can be inserted through lever brake and lever actuator.

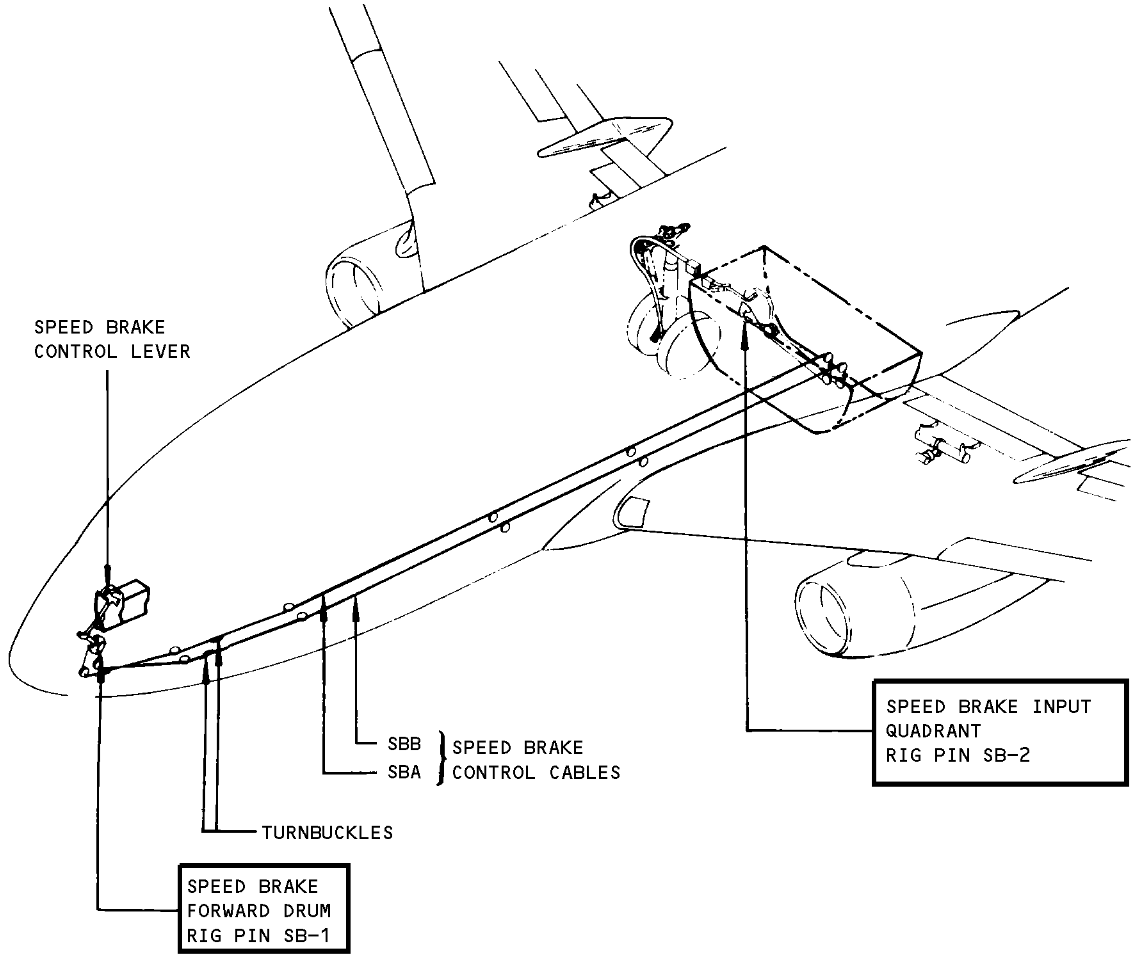
      NOTE: To facilitate alignment, lever brake assembly may be backed off from stop a distance equal to one-half turn of lever actuator rod end.

    (c) Insert retaining bolt.
    (d) Finger tighten lever actuator rod end checknut.
    (e) Remove retaining bolt and disconnect lever actuator from lever brake.
    (f) Loosen lever actuator rod end checknut and screw lever actuator rod end in one complete turn.
    (g) Tighten checknut and bend lockwasher tabs.
  (4) Manually rotate lever brake to align lever brake and lever actuator rod end. Install retaining bolt and secure with washer, nut, and cotter pin.
  (5) Remove rigging pin SB-1.
  (6) Retract actuator by applying 28 volts dc to pins 1 and 3 on actuator.
  (7) Manually operate speed brake control lever through full travel to check for binding or rough operation.

E. Connect speed brake control cables to speed brake forward drum (Fig. 402).
  (1) Install rigging pins SB-1 and SB-2 (Fig. 403).
  (2) Attach cables and cable retainers to quadrant.
  (3) Connect turnbuckles and tension cables to value shown in temperature-tension table on Fig. 402.

(4) Remove rigging pins SB-1 and SB-2.
(5) Operate speed brake control lever through one complete cycle.
(6) Check system for proper rigging by inserting rigging pins SB-1 and SB-2.
(7) Check that cable tension in cables is within values shown on temperature-tension table. Tension in cables should be balanced.
(8) Remove rigging pins SB-1 and SB-2.
(9) Install turnbuckle locking clips.

F. Adjust control lever detents.
(1) Place speed brake control lever in DOWN detent. Make sure that lever latch is in detent on control stand.
(2) Check that center of DOWN detent mark on control stand indicator plate aligns with indicator on aft face of control lever. If not within limits, loosen indicator plate attaching screws and move plate until it aligns with indicator on speed brake lever. Tighten attaching screws.
(3) Remove control stand access panel located on left side, forward and below stabilizer trim wheel.
(4) Disconnect detent spring from cam roller lever arm.
(5) Install rig pin SB-1 in forward drum quadrant.
(6) Loosen bolts in cam roller lever arm bracket and adjust to align roller contact surface with index mark on detent cam. Tighten bolts.
(7) Connect detent spring to cam roller lever arm and remove rigging pin SB-1 from forward drum quadrant.
(8) Move speed brake control lever aft until roller on cam roller lever arm is in ARMED detent.
(9) Check that indicator on aft face of control lever aligns with ARMED mark on control stand indicator plate. If not within limits, place speed brake control lever in DOWN position then check roller for alignment with index mark on detent cam.
(a) If roller does not align, repeat steps (4) thru (7).
(10) Move speed brake control lever aft until cam roller is in FLIGHT detent on cam.
(11) Check that indicator on aft face of speed brake control lever aligns within FLIGHT DETENT band on control stand indicator plate. If not within limits, repeat steps (1) thru (9).



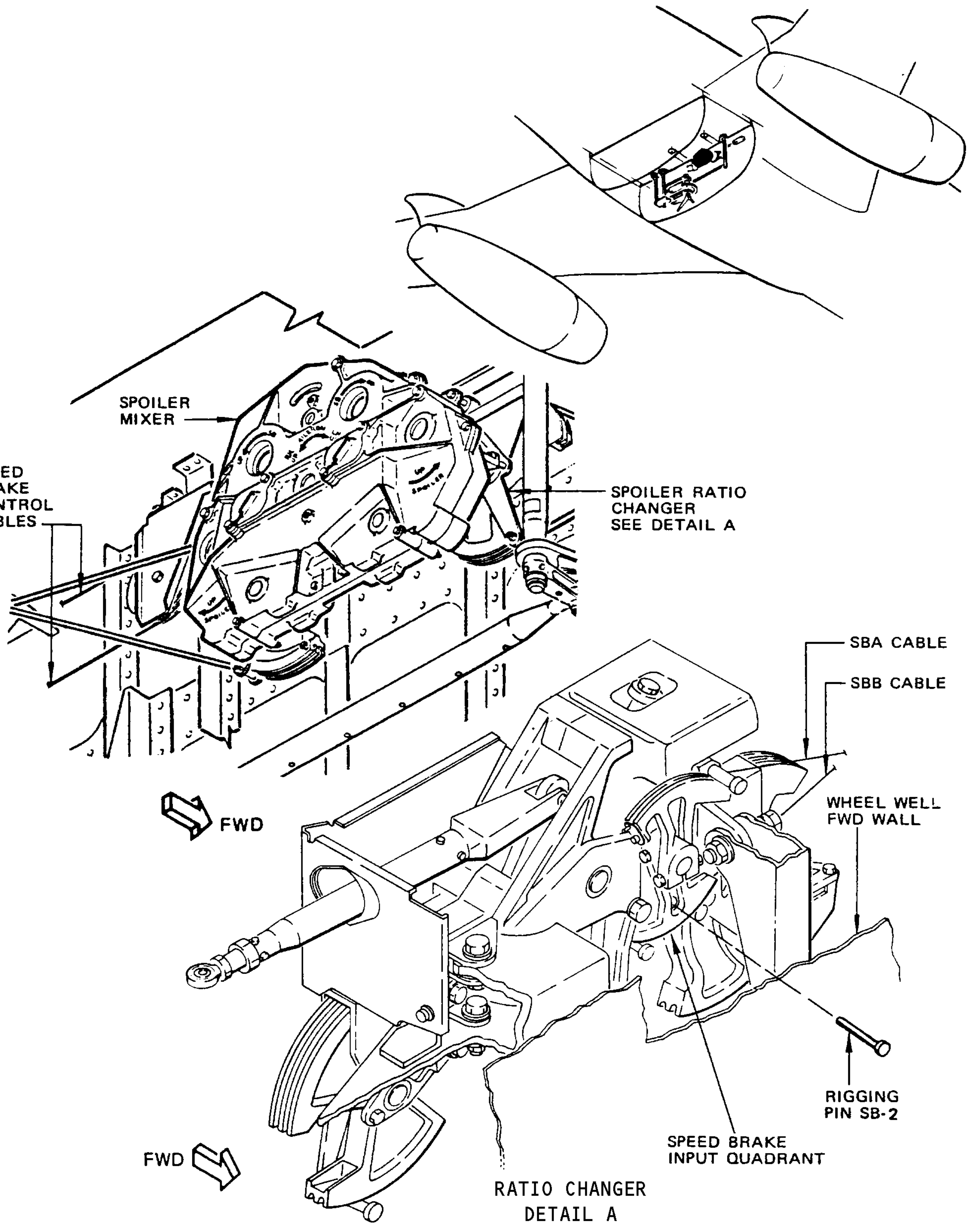
1 TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR OF CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE.

2 SYSTEM MUST BE RERIGGED WHEN CABLE TENSION DEVIATES MORE THAN ± 15 POUNDS FROM VALUES SHOWN IN TABLE.

TABLE I

TEMP °F 1	CABLE TENSION - POUNDS (+10/-0) 2
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

Speed Brake Control System Cable Locations and Cable Tension
Figure 402



Spoiler Mixer and Ratio Changer Rigging Pin Location
Figure 403

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(12) Place speed brake control lever in DOWN position, then move control lever to UP position. Check that control lever travel is 48 degrees minimum. If control lever is restored from full travel, check adjustment of speed brake full travel stop on spoiler ratio changes (AMM 27-62-0/501, Speed Brake Control System).
(13) Install control stand access panel.

G. Adjust speed brake takeoff warning and arming switches (AMM 31-26).
H. Test speed brake forward drum and lever brake. Refer to Speed Brake Forward Drum and Lever Brake - Adjustment/Test.
I. Close lower fuselage nose compartment access door.

SPEED BRAKE FORWARD DRUM AND LEVER BRAKE - ADJUSTMENT/TEST

1. Speed Brake Forward Drum and Lever Brake Test
   A. Equipment and Materials
      (1) Spring scale - capacity 0 to 50 pounds
      (2) Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
         (a) Aileron Control Wheel Protractor Mount-F72790
         (b) Forward Thrust Lever Protractor Adapter-F72952-2
      (3) Control Surface Protractor Stand Assembly - F71292-17
      (4) Auto Speed Brake Test Box - 2TE65-45113, or Electrical Power Supply 9.0 ±1.0 volts dc. (Refer to step C.(4) for airplane effectivity.)
      (5) Antiskid - Auto Brake - Auto Speed Brake Tester - F80129 (Refer to step C.(5) for airplane effectivity)
   B. Prepare Speed Brake Forward Drum and Lever Brake for Test
      (1) Provide electrical power.
      (2) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
      (3) Set aileron trim control knob in zero trim position.
   C. Test Speed Brake Forward Drum and Lever Brake
      (1) Test speed brake lever friction.
         (a) Position spoiler system A and B switches to OFF.
         (b) Move speed brake control lever from DOWN to UP for several cycles. Check system for binding or roughness in operation. Check that speed brake control lever does not rub on control stand.
         (c) Using spring scale at the tip of the speed brake control lever check that the maximum lever loads are as follows:
            1) DOWN to FLIGHT DETENT - 20 pounds maximum.
            2) FLIGHT DETENT to UP - 28 pounds maximum.
            3) UP to FLIGHT DETENT - 28 pounds maximum.
            4) FLIGHT DETENT to DOWN - 20 pounds maximum.
      (2) Check speed brake holding action.
         (a) Position speed brake lever at an intermediate position, not in a detent.
         (b) Rotate aileron control wheel for several cycles.
         (c) Check that speed brake lever has not been moved by system backlash.
      (3) Test for normal spoiler operation.
         (a) Position spoiler system A and B switches to ON.
         (b) Set speed brake control lever in DOWN position.
         (c) Check that all spoilers are full down.
         (d) Move speed brake control lever into ARMED detent.
         (e) Check that all ground spoilers remain full down and flight spoilers do not extend beyond 1-1/2 degrees.
         (f) Move speed brake control lever to UP position.

(g) Check that flight and ground spoilers are raised.
(h) Check spoiler rotation using control surface protractor.
1) Check that ground spoilers No. 4 and 5 are 60 ±2 degrees up from full down position.
2) Check that ground spoiler No. 5 is within 2 degrees of ground spoiler No. 4.
3) Check that flight spoiler No. 2 is 39 ±3 degrees up from full down position.
4) Check that flight spoiler No. 7 is within 3 degrees of flight spoiler No. 2.
(i) Return speed brake control lever to DOWN position.
(j) Check that flight and ground spoilers rotate to down position.

(4) On AQ N21SW thru N23SW;
IC VT-EAG thru VT-EAL;
AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
ML 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE;
NH JA8401 thru JA8403, JA8405 thru JA8411;
TZ CF-TAN, CF-TAO;
Test speed brake lever actuator operation.

NOTE: Airplane weight must be on landing gear during this test.

(a) Ensure that following circuit breakers are closed: ALL INDICATOR LIGHTS, FLIGHT CONTROL VALVES, SPOILER SHUTOFF VALVES, AUTOMATIC SPEED BRAKE, and ALL ANTISKID.
(b) Remove protective cover at test connector J2 on antiskid control shield. Antiskid control module is located on E3-2 shelf in electrical equipment area. Install auto speed brake test box.
(c) Move speed brake control lever from DOWN to ARMED detent.
(d) Using auto speed brake test box, apply 9.0 ±1.0 volts dc to pins 22 and 2 of test connector and check that:

WARNING: APPLY TEST VOLTAGE TO BOTH PINS SIMULTANEOUSLY TO PREVENT DAMAGE TO ANTISKID CONTROL SHIELD.

1) All flight and ground spoilers rotate to full up.
2) Speed brake control lever moves from ARMED detent to UP.
(e) Install control surface protractor and thrust lever adapter on thrust lever. Move either engine No. 1 or 2 thrust lever 12.5 ±1 degrees forward from engine idle position and check that:
1) All flight and ground spoilers rotate to full down position.
2) Speed brake control lever moves from UP to DOWN position.

(5) On IC ALL EXCEPT VT-EAG thru VT-EAL;
AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
SQ ALL EXCEPT 9V-BFD thru 9V-BFF, 9V-BBC, 9V-BBE;
NH ALL EXCEPT JA8401 thru JA8403, JA8405 thru JA8411;
TZ ALL EXCEPT CF-TAN, CF-TAO;
test speed brake lever actuator operation.

NOTE: Airplane weight must be on landing gear during this test.

(a) Ensure that following circuit breakers are closed: ALL INDICATOR LIGHTS, FLIGHT CONTROL VALVES, SPOILER SHUTOFF VALVES, AUTOMATIC SPEED BRAKE, and ALL ANTISKID.
(b) Remove protective cover at test connector J2 on antiskid control shield. Antiskid control module is located on E3-2 shelf in electrical equipment area. Install antiskid-auto brake-auto speed brake tester.

NOTE: Before installing, check that all switches on tester are off.

(c) Move speed brake control lever from DOWN to ARMED detent.
(d) Set up tester as follows:
1) Place master switch to ON position.
2) Place WHEEL SPEED LO, LI, RO and RI switches in OFF position.
3) Set rotary VELOCITY potentiometer to a position greater than 62 knots.
4) Place WHEEL SPEED velocity switch in VEL position.

NOTE: The RO and RI switches referred to are located in tester WHEEL SPEED section. Disregard all lamps on tester during test.

(e) Place RI and RO switches in ON position. Check that al1 spoilers extend.
(f) Move No. 1 thrust lever 12.5 +1 degrees forward from idle position and check that:
1) All spoilers return to full down position.
2) Speed brake control lever returns to DOWN detent.

(6) Test speed brake takeoff warning and arming switches and auto brake off ramp switch if installed (Ref 31-26).

D. Restore Airplane to Normal
(1) Remove systems A and B hydraulic power (Ref 27-62-0).
(2) Remove electrical power if no longer required.
(3) Remove tester. Replace protective cover on test connector J2.
(4) Close lower fuselage nose access door.
(5) Replace left forward nose wheel well access panel.

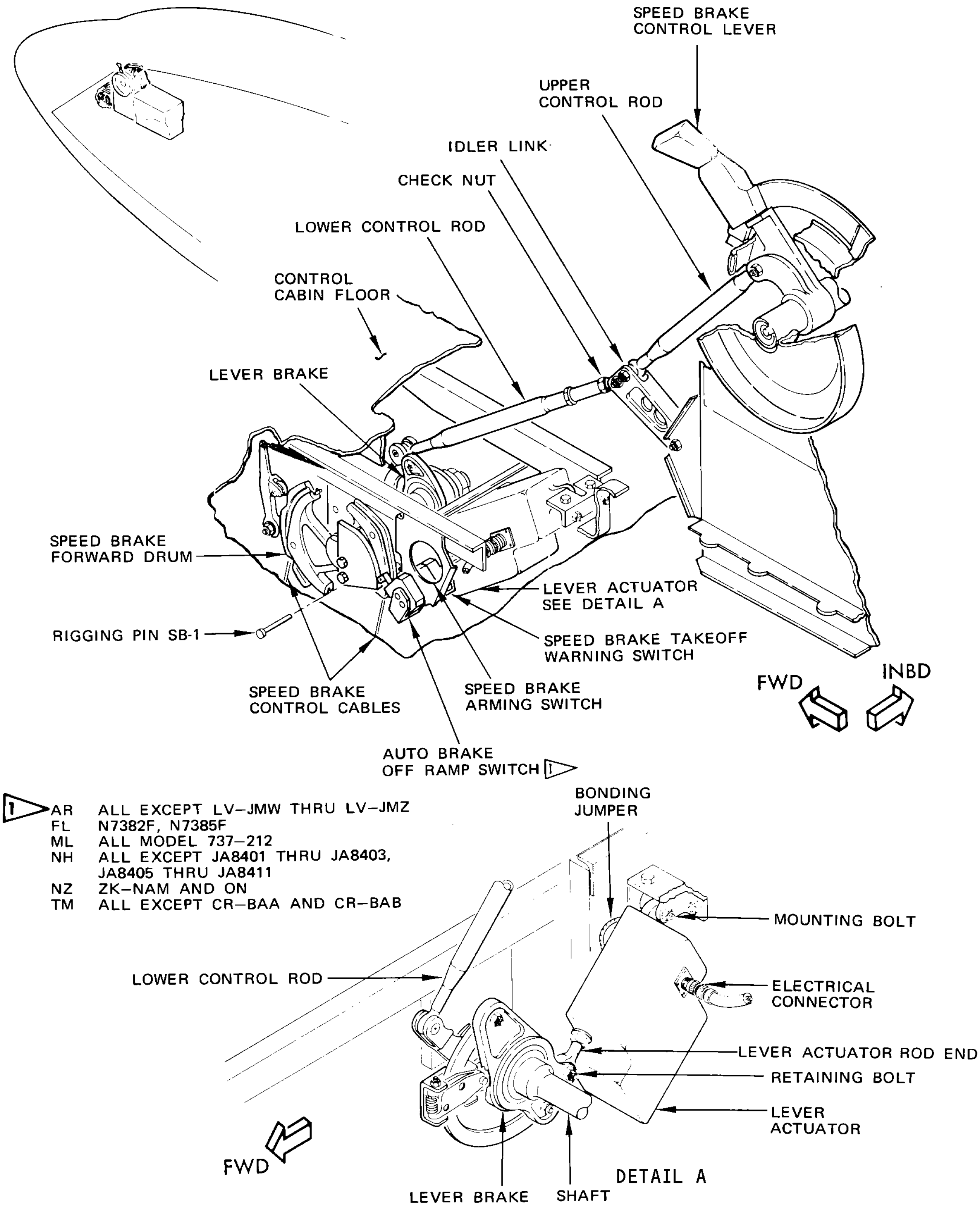
(6) Remove control surface protractor and thrust lever adapter.

SPEED BRAKE LEVER ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Ohmmeter - scale 0 to 5 milliohms
   B. Electrical power supply, 28 volts dc
   C. Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-1	-11	0.309-0.311	6.7 ±0.25	Speed Brake Forward Drum

2. Prepare Speed Brake Lever Actuator for Removal
   A. Depressurize hydraulic systems A and B (Ref 27-62-0 MP).
   B. Open AUTO SPEED BRAKE circuit breaker on circuit breaker panel P6.
   C. Place speed brake control lever in DOWN position.
   D. Open lower fuselage nose compartment door.
3. Remove Speed Brake Lever Actuator
   A. Disconnect electrical connector from lever actuator (Fig. 401).
   B. Remove bonding jumper.
   C. Remove bolt connecting lever actuator to lever brake.
   D. Remove bolt connecting lever actuator to structure support.
   E. Remove lever actuator from airplane.
4. Install Speed Brake Lever Actuator
   A. Clean area of lever actuator and airplane structure where bonding jumper attaches (Fig. 401).
   B. Insert rigging pin S/B-1. If rigging pin S/B-1 cannot be freely inserted, accomplish thee following steps:
      (1) Disconnect upper end of lower control rod from idler link.
      (2) Loosen checknut and adjust rod end until rod end bolt fits freely with rigging pin S/B-1 installed.
      (3) Install rod end bolt with washer under bolt head. Secure bolt with washer and locknut.
      (4) Tighten checknut on rod end.
      (5) Ensure that rod end is visible in inspection hole of control rod.



Speed Brake Lever Actuator Installation
Figure 401

C. Fully extend lever actuator by applying 28 volts dc to pins 1 and 7 on actuator. Pins on actuator are numbered. Use pin 1 as ground.
D. Position lever actuator in airplane and install mounting bolt attaching actuator to structural bracket.
E. Secure mounting bolt with washer, nut, and cotter pin.
F. Manually rotate lever brake forward until internal stop is contacted.
G. Adjust lever actuator rod end fitting by:
   (1) Loosen lever actuator rod end checknut.
   (2) Adjust lever actuator rod end fitting until retaining bolt can be inserted through lever brake and lever actuator.

   NOTE: To facilitate alignment, lever brake assembly may be backed off from stop a distance equal to one-half turn of lever actuator rod end.

   (3) Insert retaining bolt.
   (4) Finger tighten lever actuator rod end checknut.
   (5) Remove retaining bolt and disconnect lever actuator from lever brake.
   (6) Loosen lever actuator rod end checknut, and screw lever actuator rod end in one complete turn.
   (7) Tighten checknut and bend lock washer tabs.
H. Manually rotate lever brake to align lever brake and lever actuator rod end. Install retaining bolt and secure with washer, nut, and cotter pin.
I. Remove rigging pin SB-1.
J. Retract actuator by applying 28 volts dc to pins 1 and 3 on actuator.
K. Manually operate speed brake control lever through full travel to check for binding or rough operation.
L. Install bonding jumper.
   (1) Install attaching bolt. Secure with washers and locknut.
   (2) Check that maximum resistance of bonding jumper is 2.5 milliohms.
M. Install electrical connector.
N. Test lever actuator. Refer to Speed Brake Lever Actuator - Adjustment/Test.
O. Close lower fuselage nose compartment door.

SPEED BRAKE LEVER ACTUATOR - ADJUSTMENT/TEST

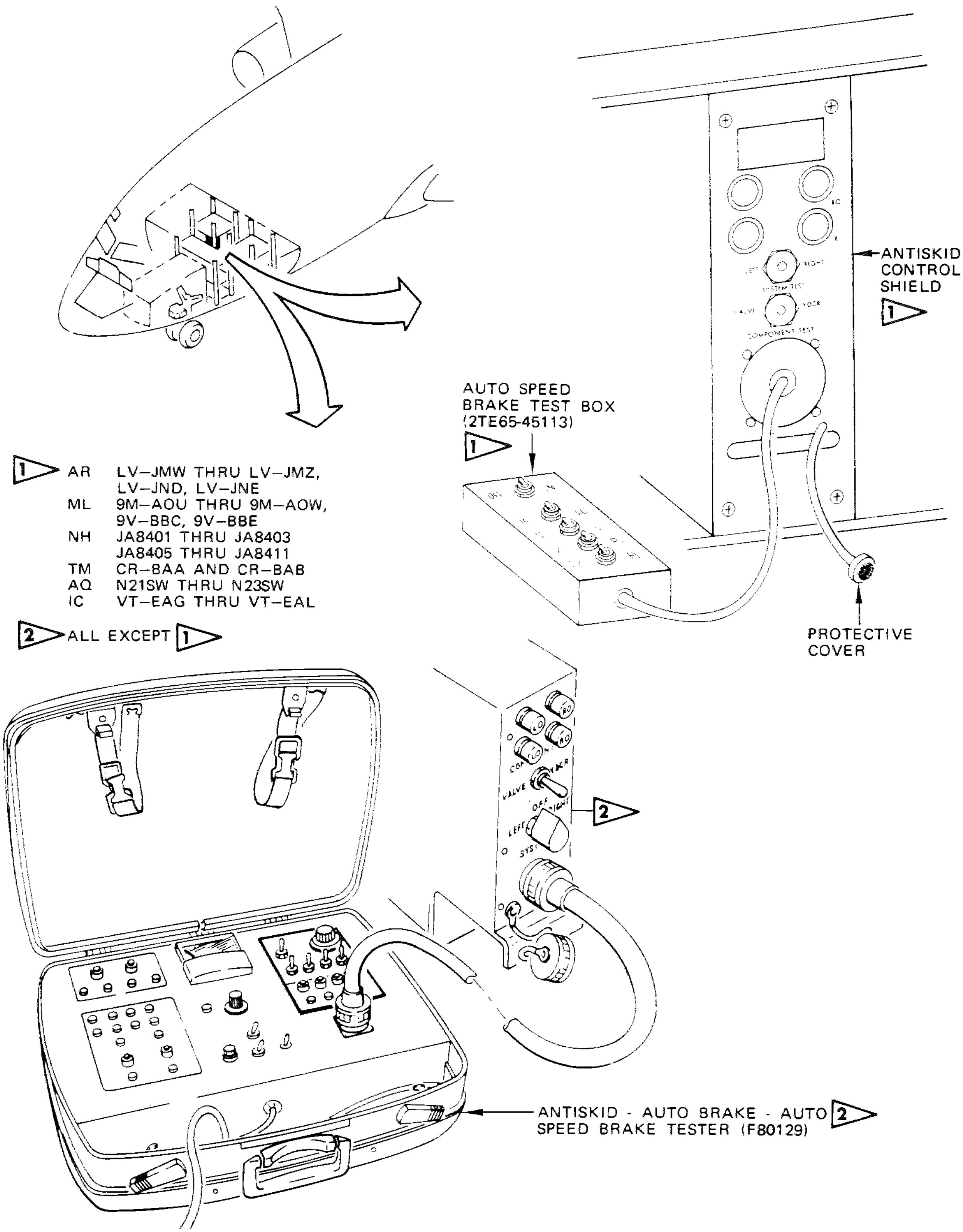
1. Speed Brake Lever Actuator Test
   A. Equipment and Materials
      (1) Auto Speed Brake Test Box - 2TE65-45113, or Electrical Power Supply 9.0 (±1.0) volts dc (Refer to step C for airplane effectivity)
      (2) Antiskid - Auto Brake - Auto Speed Brake Tester - F80129 or equivalent (Refer to step D for airplane effectivity)
   B. Prepare Speed Brake Lever Actuator for Test

      NOTE: Weight of airplane must be on landing gear for this test.

      (1) Connect electrical power to airplane.
      (2) Provide system A hydraulic power. Refer to 27-62-0, Speed Brake Control System - Maintenance Practices.
      (3) Place both inboard and outboard antiskid switches to ON. Switches are located on center instrument panel.
      (4) On circuit breaker panel P6 ensure that the following circuit breakers are closed:
         (a) INDICATOR LIGHTS
         (b) FLIGHT CONTROL VALVES
         (c) SPOILER SHUTOFF VALVES
         (d) AUTO SPEED BRAKE
         (e) ALL ANTISKID
      (5) Set aileron trim to neutral and center captain's aileron control wheel.
      (6) Set engine No. 1 and 2 thrust levers to idle position.
   C. On AQ N21SW thru N23SW, IC VT-EAG thru VT-EAL, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, ML 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE, NH JA8401 thru JA8403, JA8405 thru JA8411, TZ CF-TAN, CF-TAO, test speed brake lever actuator.
      (1) Move speed brake control lever from DOWN to ARMED detent.
      (2) Check that ARMED light on center panel is illuminated.
      (3) Check that no ground spoiler response occurs and flight spoilers do not raise beyond 1-1/2 degrees.
      (4) Remove protective cover at test receptacle on antiskid control shield. Antiskid control shield is located on E3-2 shelf in electrical equipment area. Install auto speed brake test box (Fig. 501).

         NOTE: Before installing, check that all switches on test box are off.

      (5) Using auto speed brake test box, apply 9.0 ±1.0 volts dc to pin 22 of test receptacle and check that no spoiler response occurs. Also, check that DO NOT ARM light on center instrument panel illuminates.



Automatic Speed Brake Test Equipment
Figure 501

(6) Apply 9.0 ±1.0 volts dc to pins 22 and 2 and check that:

WARNING: APPLY TEST VOLTAGE TO BOTH PINS SIMULTANEOUSLY TO PREVENT DAMAGE TO ANTISKID CONTROL SHIELD.

(a) Flight and ground spoilers rotate to full UP in less than 1 second.
(b) ARMED light is illuminated.
(c) Speed brake control lever moves to UP position.

(7) Remove the 9.0 ±1.0 volts dc from pins 22 and 2.
(8) Move speed brake control lever forward to ARMED detent and check that:
(a) Ground spoilers return to down position in less than 1 second.
(b) Flight spoilers are within limits in step (3).
(c) ARMED light is extinguished and DO NOT ARM light is illuminated.

(9) Move speed brake control lever forward to DOWN position and check that DO NOT ARM light and ARMED light are both extinguished.

D. On AQ ALL EXCEPT N21SW thru N23SW, IC ALL EXCEPT VT-EAG thru VT-EAL, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, ML ALL EXCEPT 9M-AOU thru 9M-AOW, 9U-BBC, 9V-BBE, NH ALL EXCEPT JA8401 thru JA8403, JA8405 thru JA8411, TZ ALL EXCEPT CF-TAN, CF-TAO, test speed brake lever actuator.
(1) Move speed brake control lever from DOWN to ARMED detent.
(2) Check that ARMED light on center panel is illuminated.
(3) Check that no ground spoiler response occurs and flight spoilers do not raise beyond 1-1/2 degrees.
(4) Remove protective cover at test receptacle on antiskid control shield. Antiskid control shield is located on E3-2 shelf in electrical equipment area. Install antiskid-auto brake-auto speed brake tester.

NOTE: Before installing, check that all switches on test box are off.

(5) Set up tester as follows:
(a) Place master switch to ON position.
(b) Place WHEEL SPEED LO, LI, RO and RI switches in OFF position.
(c) Set rotary VELOCITY potentiometer to a position greater than 62 knots.
(d) Place WHEEL SPEED velocity switch in VEL position.

NOTE: Throughout the test, LO, LI, RO and RI switches referred to are located in tester WHEEL SPEED section. Disregard all lamps on tester during test.

(6) Place speed brake lever in ARMED position. Check that ARMED light illuminates.
(7) Place LO switch in ON position. Check that DO NOT ARM light illuminates and spoilers do not actuate.
(8) Place LO switch in OFF position. Check that ARMED light illuminates.
(9) With speed brake lever in ARMED position, place switches RO and RI in ON position. Check that speed brake lever automatically moves to UP position and all spoilers extend in less than 1 second.
(10) Place RO and RI switch in OFF position.
(11) Place speed brake lever in DOWN and locked position, and check that all spoilers retract in less than 1 second.
(12) Press speed brake indicator test switch 3 to reset speed brake lever actuator to down position.
(13) Place speed brake lever in ARMED position and check that speed brake ARMED light illuminates.

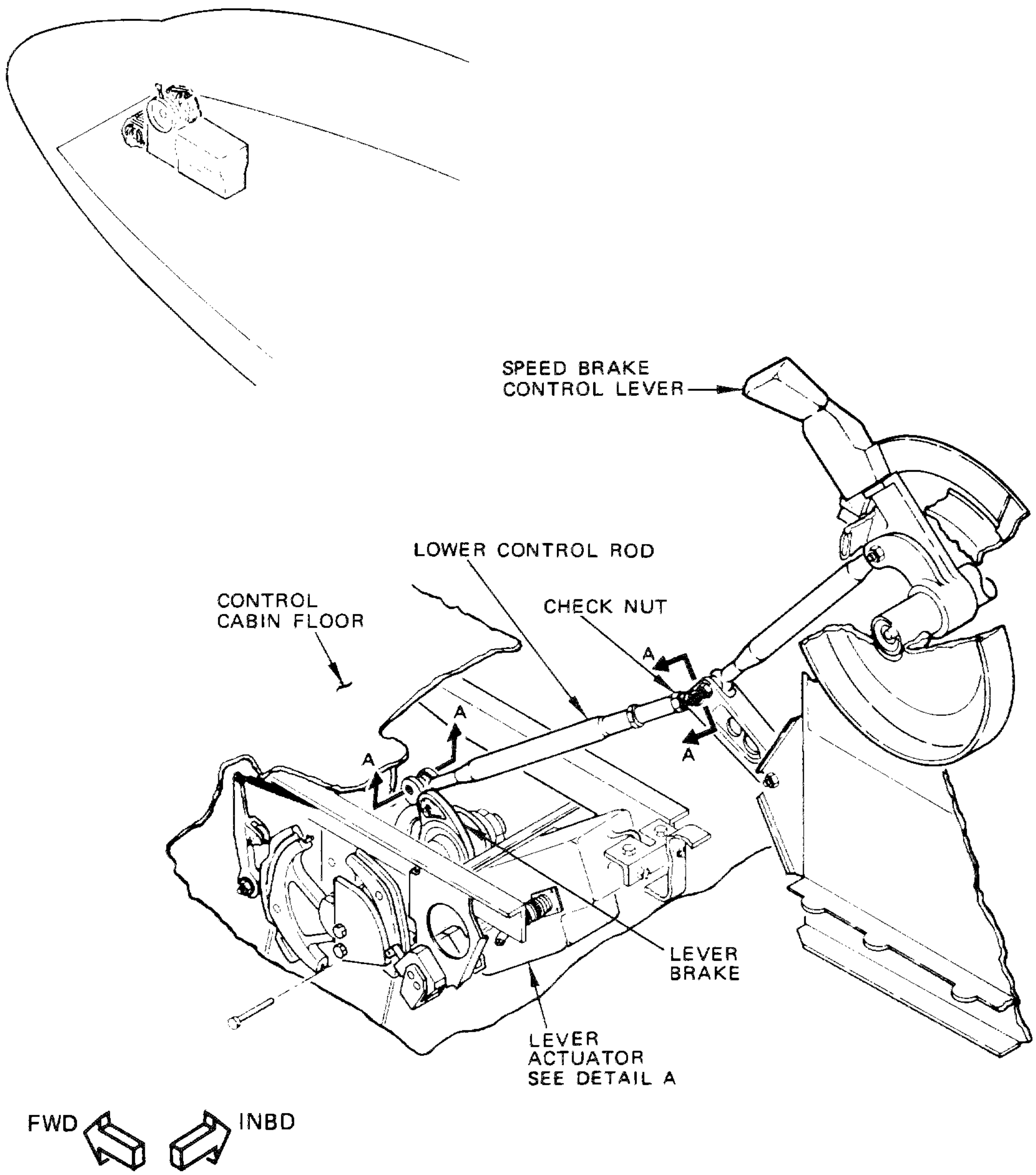
NOTE: DO NOT ARM light may momentarily come on if switches are not operated simultaneously.

(14) Place both antiskid switches in ON position.

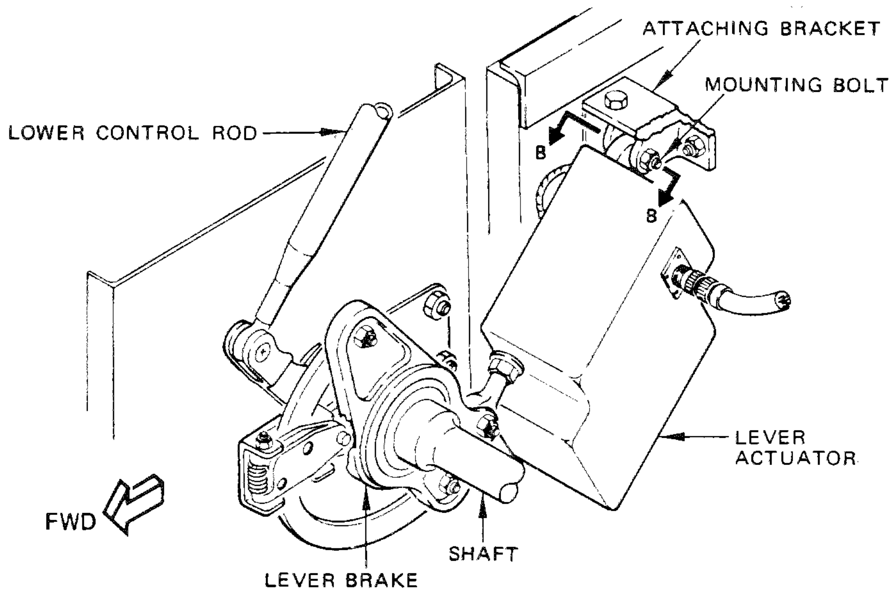
E. Return Airplane to Normal
(1) Remove tester. Replace protective cover on test connector J2.
(2) Return speed brake control lever to DOWN detent.
(3) Remove system A hydraulic power (Ref 27-62-0).
(4) Remove electrical power if no longer required.

SPEED BRAKE LEVER ACTUATOR - INSPECTION/CHECK

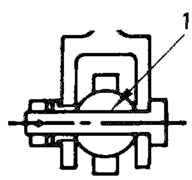
1. General
   A. This data consists of illustrations and wear limits charts. There will be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Inspection for this information.
2. Speed Brake Lever Actuator Wear Limits



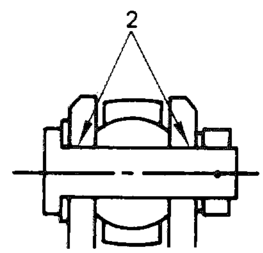
Speed Brake Lever Actuator Wear Limits
Figure 601 (Sheet 1)



DETAIL A



SECTION A-A



SECTION B-B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.1897	0.1900	0.1900	0.0019	X		
	BOLT	OD	0.1885	0.1895	0.1881		X		
2	BRACKET	ID	0.2500	0.2540	0.2540	0.0059	X		
	BOLT	OD	0.2485	0.2495	0.2481		X		

Speed Brake Lever Actuator Wear Limits
Figure 601 (Sheet 2)

GROUND SPOILER CONTROL VALVE - REMOVAL/INSTALLATION

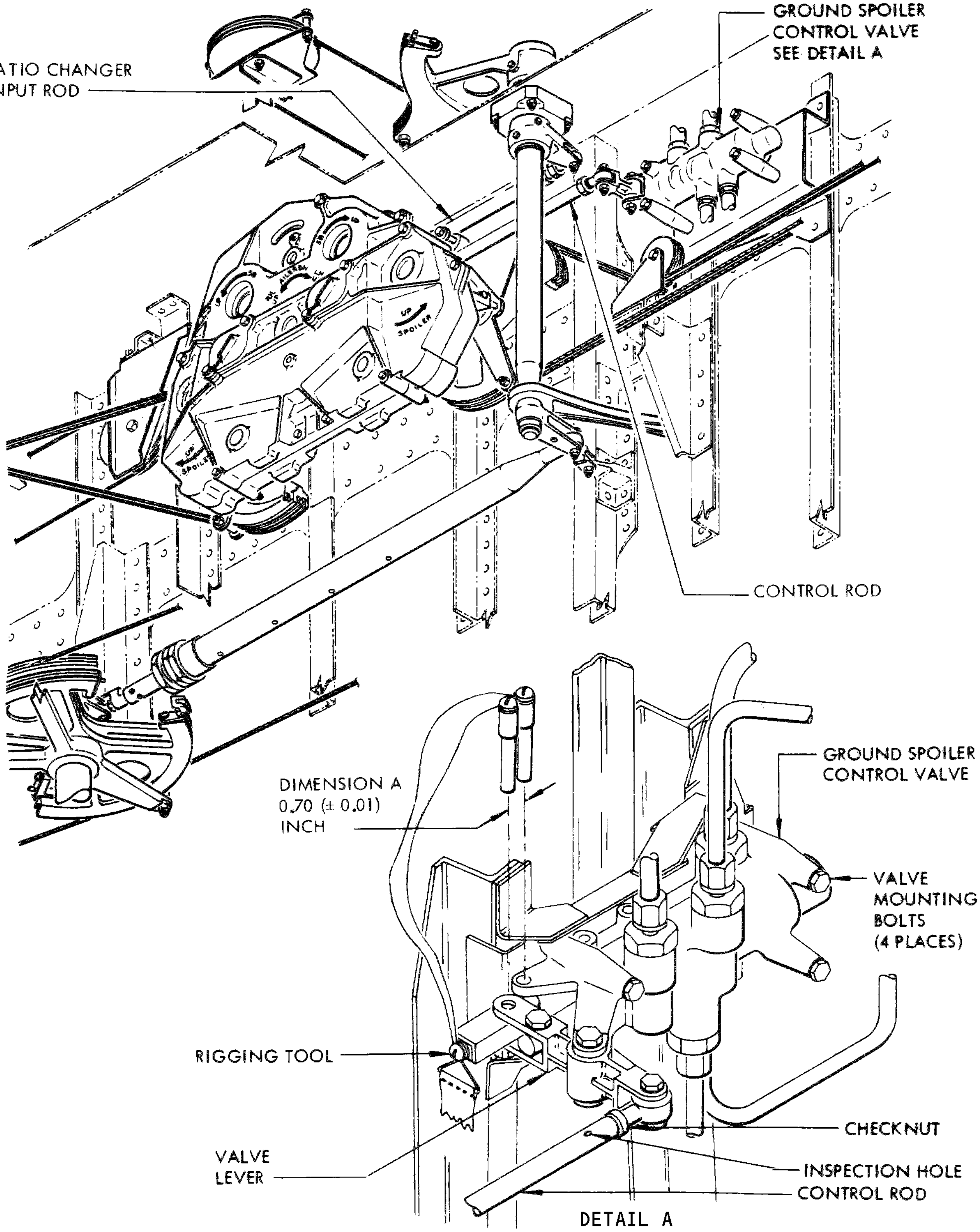
1. Equipment and Materials
   A. Speed Brake Rigging Tool - MIT65-45116
   B. Rigging Pins Kit - F70207-3, -52, 61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-1	-11	0.309-0.311	6.7 ±0.25	Speed Brake Forward Drum

   C. Grease - BMS 3-33 (Preferred)
   D. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   E. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11 (AMM 20-30-21/201)
2. Remove Ground Spoiler Control Valve
   A. Depressurize hydraulic system A (Ref 27-62-0 MP).
   B. Remove bolt attaching control rod to valve lever (Fig. 401).
   C. Remove five hydraulic tubing connections from valve.

      NOTE: Provide means to catch any hydraulic fluid leaking from the connections.

   D. Remove four valve mounting bolts attaching valve to mounting bracket and remove valve from airplane.
   E. Install protective caps on all hydraulic lines.
   F. Remove reducers and O-rings from the five valve ports.
   G. Install protective caps in open ports.
3. Install Ground Spoiler Control Valve
   A. Check that valve lever and valve slide on new valve operate smoothly through full range of travel.
   B. Remove protective caps from ports in valve.
   C. Install O-ring and reducer in each of the five valve ports. Lightly lubricate O-rings with hydraulic fluid or Skydrol Assembly Lube prior to installation.
   D. Ensure that hydraulic system A is depressurized and then remove protective caps from hydraulic lines.



Ground Spoiler Control Valve Installation
Figure 401

E. Position valve on mounting bracket and start five tubing connections. (Fig. 401).
F. Install four valve mounting bolts with washer under bolt head.
G. Check that the two bolts in the valve handle are installed with bolt heads up.
H. Tighten the five tubing connections.
I. Position speed brake control lever in DOWN detent.
J. Install rigging pin in speed brake forward drum.
K. Position rigging tool on ground spoiler control valve so that dimension A is 0.70 +0.01 inch.
L. Attach control rod to ground spoiler control valve. Install bolt with head up and secure with washer, nut and cotter pin. If bolt will not fit freely in rod end:
   (1) Loosen checknut and adjust rod end until bolt can be installed.
   (2) Lubricate rod end threads with grease.
   (3) Tighten checknut and check for proper rod end thread engagement. Rod end threads shall be visible in inspection hole.
M. Remove rigging tool from control valve lever and remove rigging pin.
N. Test control valve. Refer to Ground Spoiler Control Valve - A/T.

GROUND SPOILER CONTROL VALVE - ADJUSTMENT/TEST

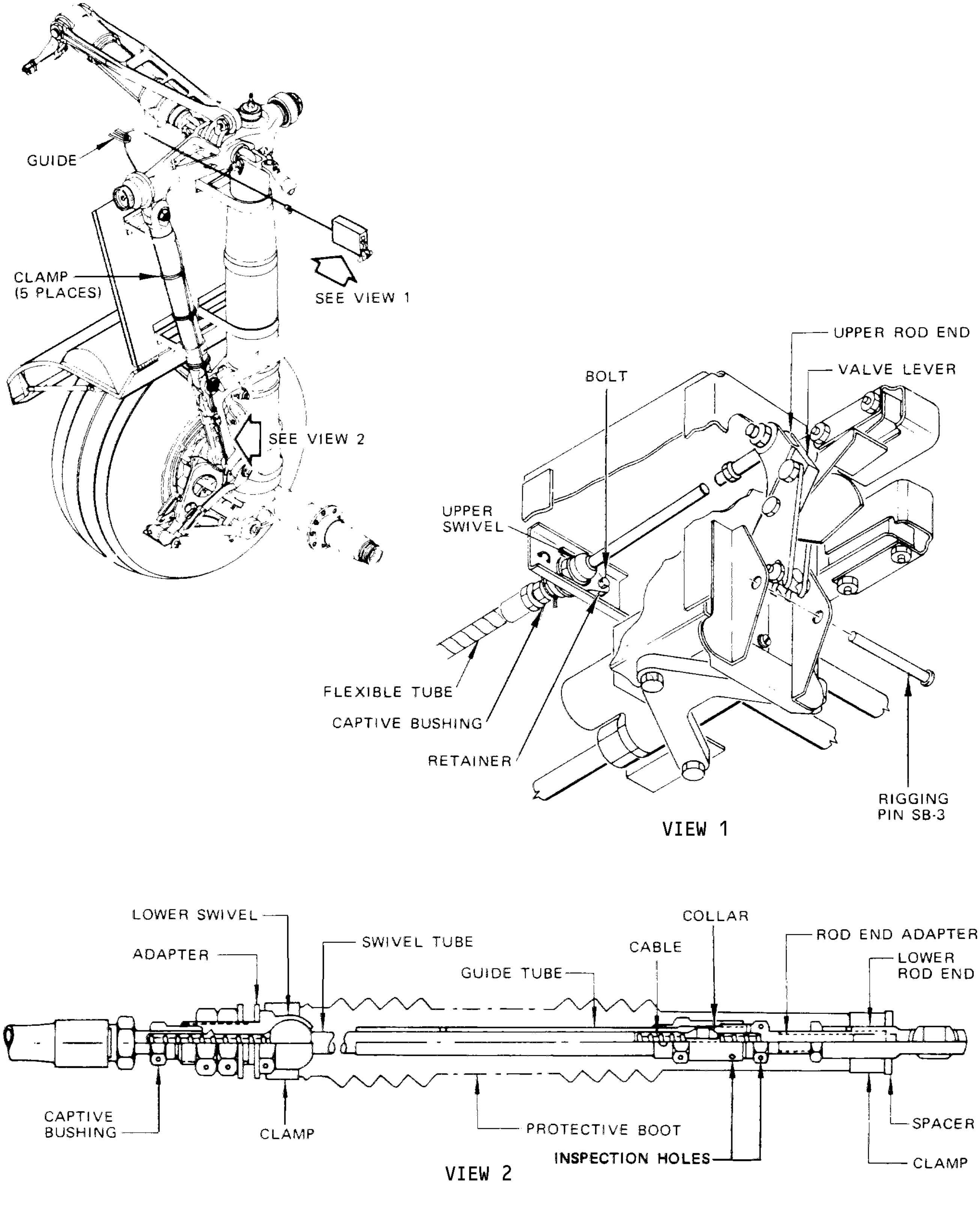
1. Ground Spoiler Control Valve Test
   A. Test Ground Spoiler Control Valve
      (1) Provide electrical power.
      (2) Provide system A hydraulic power. Refer to 27-62-0, Speed Brake Control System - MP.
      (3) Check valve and hydraulic connections for leakage.
      (4) Actuate speed brake control lever to ensure that hydraulic system is bled.
      (5) From DOWN position, move speed brake control lever toward UP position.
      (6) Check that ground spoiler panels move from down to full up when the speed brake control lever is either 31 +3 degrees or 2.96 +0.28) inches measured along position indicating marker surface from DOWN position.
      (7) From UP position, move speed brake control lever toward DOWN position.
      (8) Check that ground spoiler panels move from up to full down when the speed brake control lever is either 22 +3 degrees or 2.10 +0.28 inches measured along position indicating marker surface from the DOWN position.
      (9) Remove system A hydraulic power. Refer to 27-62-0.
      (10) Provide electrical power if not longer required.
      (11) Check hydraulic reservoir and service if required. Refer to Chapter 12, Hydraulic Servicing.

GROUND SPOILER INTERLOCK VALVE CABLE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Grease - BMS 3-33 (Preferred)
   B. Grease - MIL-PRF-23827 (Supercedes MIL-G-23827) (Alternate)
   C. Grease - Molykote 33 Grease (Dow Corning)
2. Remove Ground Spoiler Interlock Valve Cable
   A. Depressurize hydraulic systems A and B (Ref 27-62-0 Maintenance Practices).
   B. Remove flexible cable (Fig. 401).
      (1) Remove bolt attaching lower rod end to landing gear torsion link.
      (2) Remove lower clamp and spacer from protective boot. Slide boot until guide tube is exposed.
      (3) Break lockwire and turn guide tube to disconnect it from rod end adapter.
      (4) Remove rod end and rod end adapter.
      (5) Slide guide tube all the way onto swivel tube and remove collar from cable.
      (6) Remove guide tube.
      (7) Remove bolt attaching upper rod end to pivot on valve lever.
      (8) Remove cable from flexible tube by pulling at upper end.
   C. Remove flexible tube.
      (1) Disconnect flexible tube from swivel at both ends by turning captive bushings.
      (2) Remove guide adjacent to landing gear trunnion.
      (3) Remove two clamps on wing structure and three clamps on drag strut.
      (4) Remove flexible tube from airplane.
   D. Remove swivel assemblies.
      (1) Break lockwire and remove retaining nut from upper swivel.
      (2) Remove upper swivel and two washers.
      (3) Remove clamp and protective boot.
      (4) Break lockwire and remove two retaining nuts from lower swivel.
      (5) Remove lower swivel and two washers.
3. Install Ground Spoiler Interlock Valve Cable
   A. If replacement cable is completely assembled, it must be disassembled as called out in the removal instructions.
   B. Apply a generous film of grease to flexible cable, swivel tubes and guide tube.
   C. Install swivel assemblies (Fig. 401).
      (1) Secure with bolt, locknut and washer. (See Fig. 401 for effectivity.)
      (2) Place washer on lower swivel and insert swivel in mounting bracket with swivel tube downward.

      NOTE: Lower swivel has a greater threaded length than upper swivel.

      (3) Secure lower swivel with washer and two retaining nuts.



Ground Spoiler Interlock Valve Cable Installation
Figure 401

(4) If required for upper swivel, install retainer. Secure with bolt, locknut and washer.
(5) Place washer on upper swivel and insert swivel in valve mounting bracket with swivel tube inboard.
(6) Secure upper swivel with washer and retaining nut.

D. Install flexible tube.
(1) Route flexible tube through three clamps along drag strut, over landing gear trunnion, and through two clamps in wing structure.
(2) Install guide adjacent to landing gear trunnion.
(3) Connect flexible tube to swivels at each end by holding tube and tightening captive bushings to 25-40 pound-inches torque. Ensure there are no kinks in tube.
(4) On lower swivel, lockwire retaining nuts and captive bushing to each other.
(5) On upper swivel, lockwire retaining nut to valve mounting bracket and captive bushing.
(6) Tighten three clamps to secure flexible tube to drag strut. Pul1 upward on tube to remove any slack.
(7) Tighten the two clamps to secure flexible tube to wing structure. Pull outboard on tube to remove any slack.

E. Install flexible cable (Fig. 401).
(1) Insert cable at upper swivel.
(2) Install protective boot on adapter. Secure with clamp with worm screw aft and thumb flats outboard for maximum clearance.
(3) Slide guide tube all the way onto lower swivel tube.
(4) Install collar on cable so cable extends through collar approximately 0.4 inch.
(5) Engage threads of rod end adapter with guide tube. Hold guide tube stationary and tighten rod end adapter to 100-120 pound-inches torque to secure collar on cable.
(6) Check that cable end is located between the two inspection holes in the rod end adapter.
(7) Lockwire rod end adapter to guide tube.
(8) Connect upper end of cable to interlock valve.
(a) Ensure that cable end threads are visible in inspection hole in rod end.
(b) Position rod end in valve lever clevis.
(c) Install clevis bolt with head aft.
(d) Position spacer, washer, bushing, washer and nut on bolt forward of clevis.
(e) Tighten bolt and install cotter pin.
(9) Check that cable and valve operate freely.
(10) Install spacer on lower rod end.
(11) Connect lower rod end to landing gear torsion link. Secure bolt with washer, radius filler, nut and cotter pin.

(12) Adjust and test interlock valve cable.
(13) Check landing gear safety sensor adjustment (Ref 32-09-200).
(14) Position protective boot on spacer. Secure with clamp with worm screw forward and thumb flats inboard for maximum clearance.

GROUND SPOILER INTERLOCK VALVE CABLE - ADJUSTMENT/TEST

1. General
   A. Adjustment and test of the ground spoiler interlock valve cable must be accomplished with the airplane jacked so that the right main gear shock strut is fully extended.
2. Ground Spoiler Interlock Valve Cable Adjustment
   A. Equipment and Materials
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF. NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-3	-11	0.309-0.311	6.7 ±0.25	Ground Spoiler Interlock Valve

   B. Adjust Ground Spoiler Interlock Valve Cable
      (1) Place airplane on jacks so that right main gear oleo is fully extended (Ref. Chapter 7, Jacking).
      (2) Check that rigging pin S/B-3 can be freely installed through interlock valve lever, if not: (Fig. 501).
         (a) Remove bolt-attaching lower rod end to landing gear torsion link.
         (b) If installed, remove clamp from protective boot and slide boot clear of rod end.
         (c) Insert rigging pin S/B-3. Loosen checknut and adjust lower rod end so bolt fits freely.
         (d) Ensure that threads are visible in rod end inspection hole.
         (e) Install bolt attaching rod end to landing gear torsion link. Secure bolt with washer, radius filler, nut and cotter pin.
         (f) Ensure that both upper and lower rod ends properly align and tighten checknut on lower rod end.
         (g) Check that rigging pin S/B-3 still fits freely.
      (3) Remove rigging pin S/B-3.
      (4) Check that swivel tube is visible through inspection hole in guide tube.

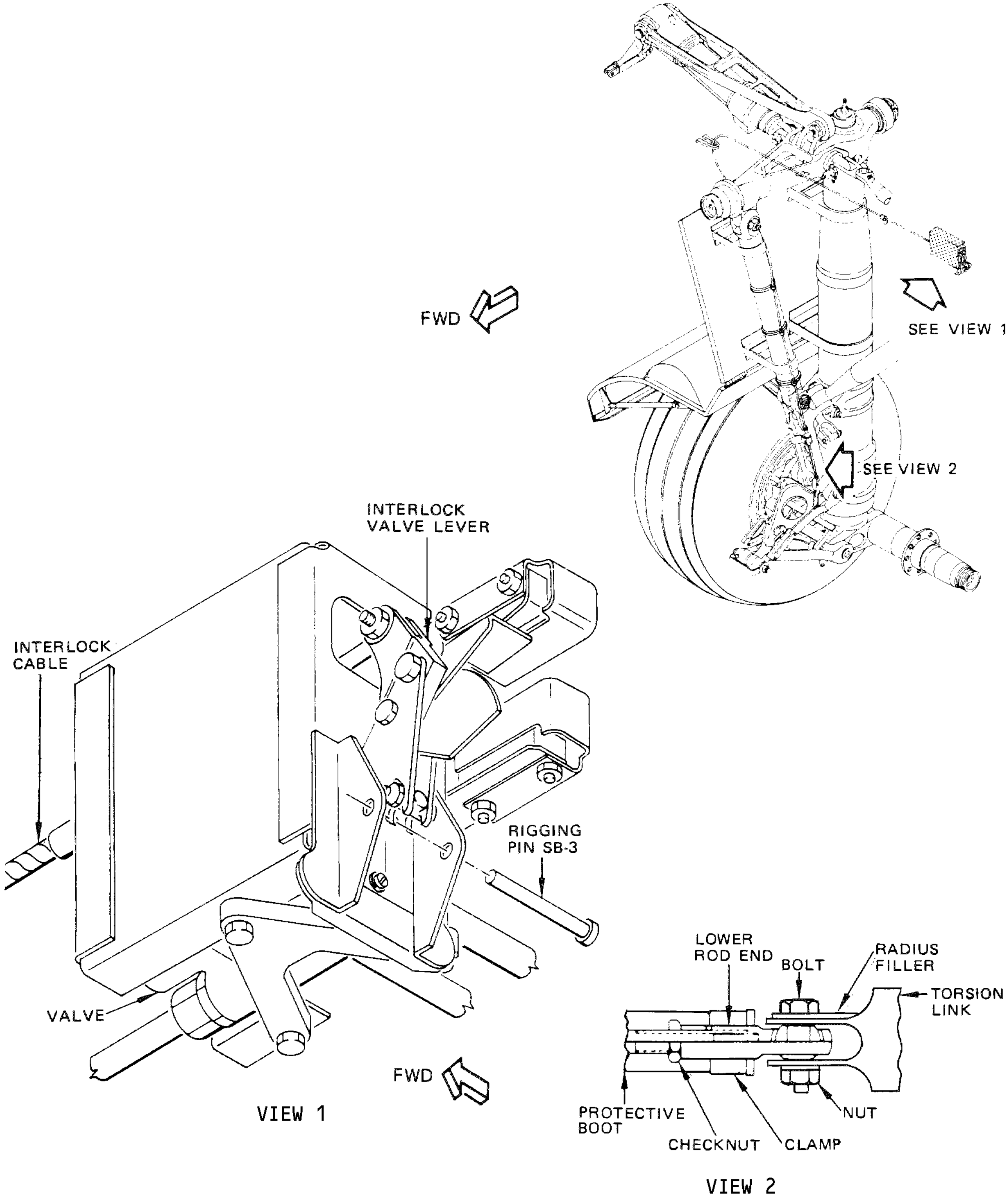
(5) If installed, position protective boot on spacer. Secure with clamp with worm screw forward and thumb flats inboard for maximum clearance.
(6) Test valve cable.
(7) Remove jacks from airplane (Ref. Chapter 7, Jacking).

3. Ground Spoiler Interlock Valve Cable Test
A. Prepare Ground Spoiler Interlock Valve Cable for Tests
(1) Place airplane on jacks so that main gear oleo is fully extended (Ref Chapter 7, Jacking).
(2) Provide electrical power.
(3) Provide system A hydraulic power (Ref 27-62-0).
B. Test Ground Spoiler Interconnect Valve Cable
(1) Move speed brake control lever to the UP position.
(2) Check that ground spoiler panels show no sign of movement.
(3) Release all air pressure in right main gear shock strut.
(4) Place jack under jack pad on right main gear axle (Ref Chapter 7, Jacking).

CAUTION: DO NOT JACK AT ANY POINT OTHER THAN JACK PAD.

(5) Slowly raise axle jack to compress right main gear shock strut until ground spoiler interlock valve opens. Check that fround spoiler panels move to full up.
(6) Check that distance shock strut inner cylinder is compressed from the fully extended condition is 1.5 +1.5/-0.0 inches.
(7) Place speed brake control lever in DOWN position. Check that ground spoiler panels retract.
(8) Lower axle jack and allow right main gear shock strut to fully extend. Remove axle jack.
(9) Check that ground spoiler panels are full down.
C. Restore Airplane to Normal Configuration
(1) Remove system A hydraulic power (Ref 27-62-0).
(2) Remove electrical power if no longer required.
(3) Service right main gear shock strut (Ref Chapter 12, Main Landing Gear Shock Strut - SRV).

(4) Lower and remove jacks (Ref Chapter 7, Jacking).



Ground Spoiler Interlock Valve Rigging Pin Location
Figure 501

GROUND SPOILER INTERLOCK VALVE - REMOVAL/INSTALLATION

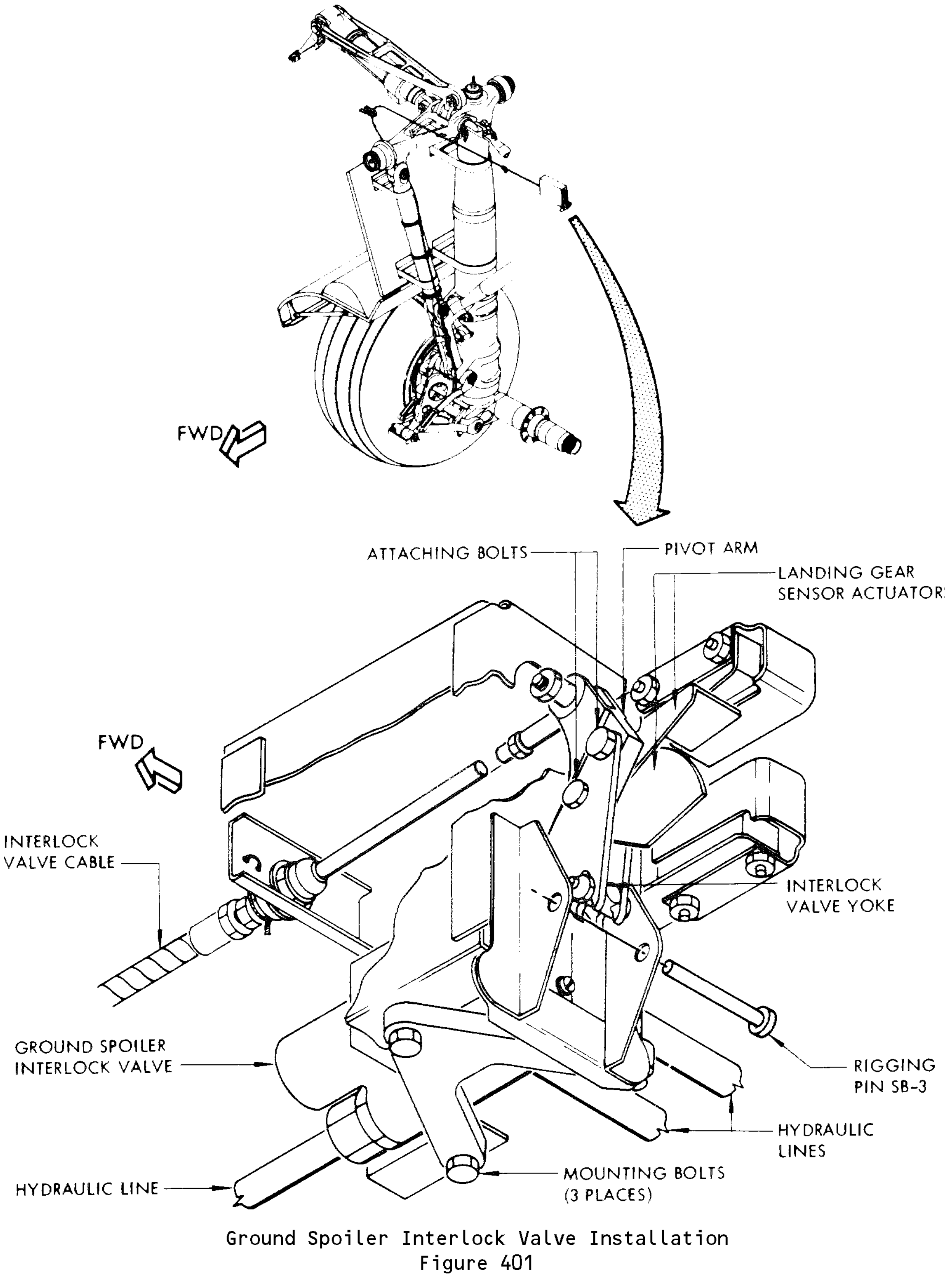
1. Equipment and Materials
   A. Fire resistant hydraulic fluid - BMS 3-11 or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
2. Remove Ground Spoiler Interlock Valve
   A. Depressurize hydraulic system A. Refer to 27-62-0, Speed Brake Control System - Maintenance Practices.
   B. Remove two bolts attaching interlock valve yoke to pivot arm.

      NOTE: Valve yoke is part of valve. Do not remove valve yoke from valve.

   C. Remove landing gear sensor actuators from airplane.
   D. Loosen tubing nuts on three hydraulic lines to valve.

      NOTE: Provide means to catch hydraulic fluid leaking from the loosened fittings.

   E. Install protective plugs in hydraulic lines.
   F. Remove three mounting bolts and remove ground spoiler interlock valve from airplane.
   G. Remove reducers and O-rings from three valve ports.
   H. Install protective covers in open ports.
3. Install Ground Spoiler Interlock Valve
   A. Check that valve operates smoothly through full travel range.
   B. Remove protective caps from three valve ports.
   C. Lightly lubricate O-rings with hydraulic fluid or assembly lube. Instal1 O-rings and hydraulic reducers in each valve port.
   D. Locate valve in airplane and align with hydraulic lines. Secure valve with three mounting bolts and washers. (See figure 401.)
   E. Remove protective plugs in hydraulic lines.
   F. Install hydraulic lines on valve.
   G. Install two attaching bolts through landing gear sensor actuators, pivot arm, and valve yoke. Secure bolts with washers and locknuts. Adjust landing gear sensors. Refer to Chapter 32, Landing Gear Safety Sensors.
   H. Provide electrical power.
   I. Provide system A hydraulic power. Refer to 27-62-0.
   J. Check valve and hydraulic connections for leakage.
   K. Move speed brake control lever through several cycles to ensure that hydraulic system is bled.
   L. Adjust and test valve. Refer to Ground Spoiler Interlock Valve - Adjustment/Test.
   M. Check adjustment of landing gear safety sensor. Refer to 32-09-200, Landing Gear Safety Sensor - Adjustment/Test.
4. Restore Airplane to Normal Configuration
   A. Remove system A hydraulic power. Refer to 27-62-0.



Ground Spoiler Interlock Valve Installation
Figure 401

B. Check hydraulic reservoir and service if required. Refer to Chapter 12, Hydraulic Servicing.
C. Remove electrical power if no longer required.

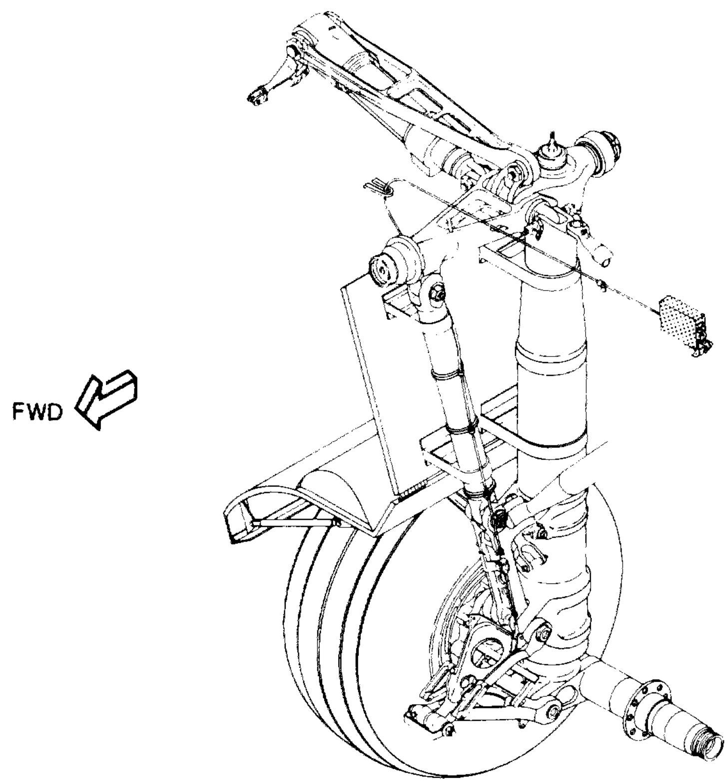
GROUND SPOILER INTERLOCK VALVE - ADJUSTMENT/TEST

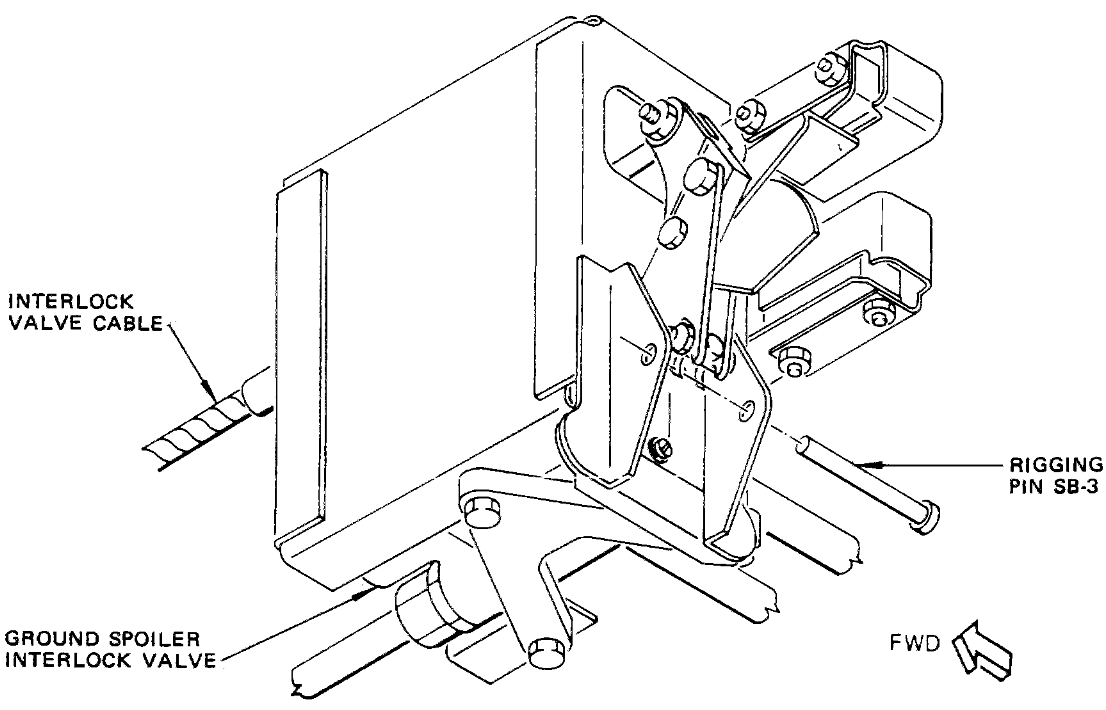
1. General
   A. Adjustment and test of the ground spoiler interlock valve must be accomplished with airplane jacked so that right main gear shock strut is fully extended.
2. Ground Spoiler Interlock Valve Adjustment
   A. Equipment and Materials
      (1) Rigging Pins Kit - F70207-3, -52, -61, or -84:

REF NO.	F70207-( )	DIAMETER (INCHES)	LENGTH (INCHES)	FUNCTION
S/B-3	-11	0.309-0.311	6.7 ±0.25	Ground Spoiler Interlock Valve

   B. Adjust Ground Spoiler Interlock Valve
      (1) Place airplane on jacks so that right main gear oleo is fully extended (Ref Chapter 7, Jacking).
      (2) Check that rigging pin S/B-3 can be freely installed through interlock valve yoke (Fig. 501). If required, adjust valve cable (Ref 27-62-51 A/T).
      (3) Remove rigging pin S/B-3.
      (4) Test ground spoiler interlock valve.
      (5) Lower and remove jacks from airplane.
3. Ground Spoiler Interlock Valve Test
   A. Prepare Ground Spoiler Interlock Valve for Test
      (1) Place airplane on jacks so that main gear oleo is fully extended (Ref Chapter 7, Jacking).
      (2) Provide electrical power.
      (3) Provide system A hydraulic power (Ref 27-62-0 MP).
   B. Test Ground Spoiler Interconnect Valve
      (1) Place speed brake control lever in UP position.
      (2) Check that ground spoiler panels show no sign of movement.
      (3) Place jack under jack pad on right main gear axle. Refer to Chapter 7, Jacking.

      CAUTION: DO NOT JACK AT ANY POINT OTHER THAN JACK PAD.





Ground Spoiler Interlock Valve Adjustment
Figure 501

(4) Slowly raise axle jack to compress right main gear shock strut until ground spoiler interlock valve opens. Check that ground spoiler panels snap to full up.
(5) Check that distance shock strut inner cylinder is compressed from fully extended condition is 1.5 (+1.5/-0.0) inches.
(6) Place speed brake control lever in DOWN position. Check that ground spoiler panels fully retract.
(7) Lower axle jack and allow right main gear shock strut to fully extended. Remove axle jack.
(8) Check that ground spoiler panels are full down.

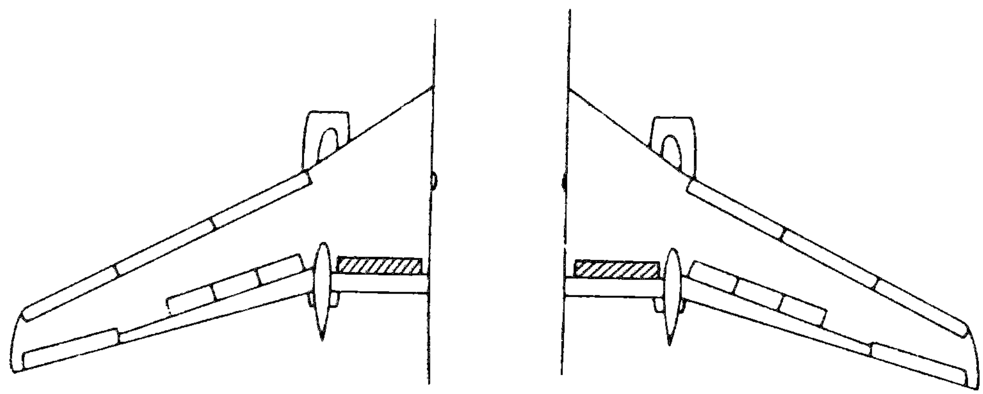
C. Restore Airplane to Normal
(1) Remove systems A and B hydraulic power. Refer to 27-62-0.
(2) Remove electrical power if no longer required.
(3) Service right main gear shock strut. Refer to Chapter 12, Main Landing Gear Shock Strut - Servicing.
(4) Lower and remove jacks.

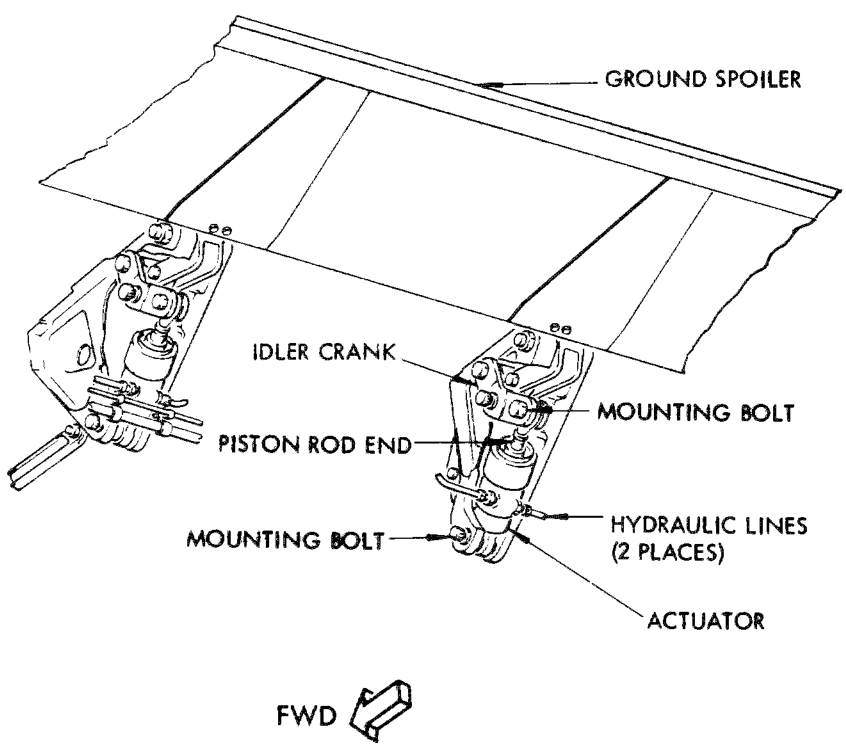
NO. 4 AND 5 GROUND SPOILER ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Fire Resistant Hydraulic Fluid - BMS 3-11 or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
2. Prepare for Removal
   A. Provide electrical power.
   B. Provide system A hydraulic power. Refer to 27-62-0, Speed Brake Control System - Maintenance Practices.
   C. Position flap control lever to FLAP DOWN position to lower the trailing edge flaps.
   D. Remove system A hydraulic power. Refer to 27-62-0.
   E. Depressurize hydraulic system A. Refer to 27-62-0.
3. Remove Ground Spoiler Actuator
   A. Disconnect two hydraulic lines on actuator. (See figure 401.)

      NOTE: Provide a container to catch the hydraulic fluid leaking from fittings.

   B. Install protective plugs in hydraulic lines.
   C. Loosen nut on mounting bolt attaching piston rod end to idler crank.
   D. Loosen nut on mounting bolt attaching actuator to structure.
   E. Remove mounting bolts and remove actuator from airplane.
   F. Remove two hydraulic unions from actuator and install protective caps.
4. Install Ground Spoiler Actuator
   A. Remove protective caps from actuator.
   B. Lightly lubricate O-rings with hydraulic fluid or assembly lube. Instal1 O-rings and hydraulic unions in actuator ports.
   C. Locate actuator in airplane and install two mounting bolts with heads outboard. (See figure 401.)
   D. Secure actuator piston rod end mounting bolt with nut and washer. Tighten nut 290-410 pound-inches.
   E. Secure remaining actuator mounting bolt with nut and washer. Tighten nut 630-950 pound-inches.
   F. Ensure that hydraulic system A is depressurized and then remove protective plugs from hydraulic lines.
   G. Align and tighten hydraulic lines.
   H. Pressurize hydraulic reservoirs. Refer to Chapter 29, Hydraulic Reservoir Pressurization.
   I. Place SPOILER A and B switches in OFF position.
   J. Remove systems A and B hydraulic power. Refer to 27-62-0.
   K. Actuate speed brake control lever to bleed spoiler actuators.
   L. Check that there is no hydraulic leakage at actuator.
   M. Adjust and test actuator installation. Refer to Ground Spoiler Actuator Adjustment/Test.





No. 4 and 5 Ground Spoiler Actuator Installation
Figure 401

5. Return Airplane to Normal
   A. Position flap control to FLAP UP position to raise trailing edge flaps.
   B. Remove systems A and B hydraulic power. Refer to 27-62-0.
   C. Remove electrical power if no longer required.
   D. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.

NO. 4 AND 5 GROUND SPOILER ACTUATOR - ADJUSTMENT/TEST

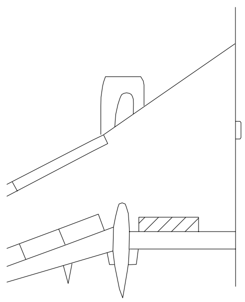
1. Ground Spoiler Actuator Adjustment
   A. Equipment and Materials
      (1) Corrosion Preventive Compound - MIL-C-11796, Class 3
      (2) Sealant - BMS 5-95, Type I, Class B-1/2 or BMS 5-95, Type II, Class B-2 (Preferred)
      (3) Sealant - BMS 5-45, Class B-2 (Optional)
   B. Prepare Ground Spoiler Actuator for Adjustment
      (1) Provide electrical power.
      (2) Provide systems A and B hydraulic power (Ref 27-62-0, M/P).
      (3) Place speed brake control lever in UP position. Check that all spoilers rise.
      (4) Retract trailing edge flaps to full up with jackscrews in contact.
         (a) Place flap control lever in FLAP UP detent.
         (b) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
      (5) Place speed brake control lever in DOWN position to lower all spoilers.
      (6) Place SPOILER A and B switches in OFF position.
      (7) Check ground spoiler actuator for hydraulic leaks.
   C. Adjust Ground Spoiler Actuator
      (1) Check that ground spoiler to flap clearance is per Fig. 501.
      (2) If spoiler to flap clearance is not within limits:
         (a) Record spoiler to flap clearance.
         (b) Provide access to spoiler actuators by either lowering flaps or by placing speed brake control lever in UP position. Depressurize system A hydraulic power (Ref 27-62-0, M/P).

            WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRALIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

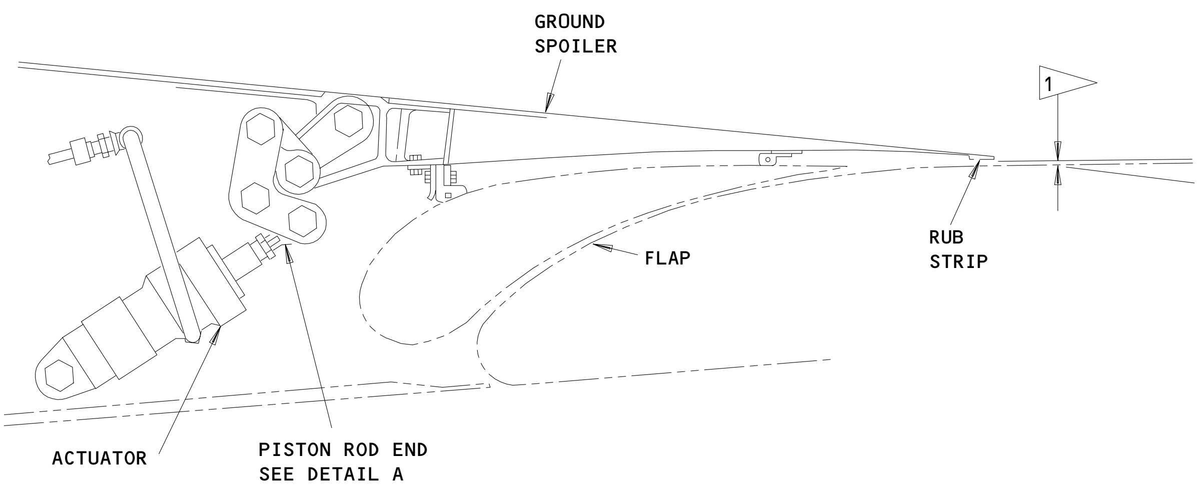
         (c) Break lockwire, loosen checknut and disengage locking key on actuator rod end.
         (d) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each one-sixth turn of the actuator piston rod changes the gap at the trailing edge by 0.093 inch.

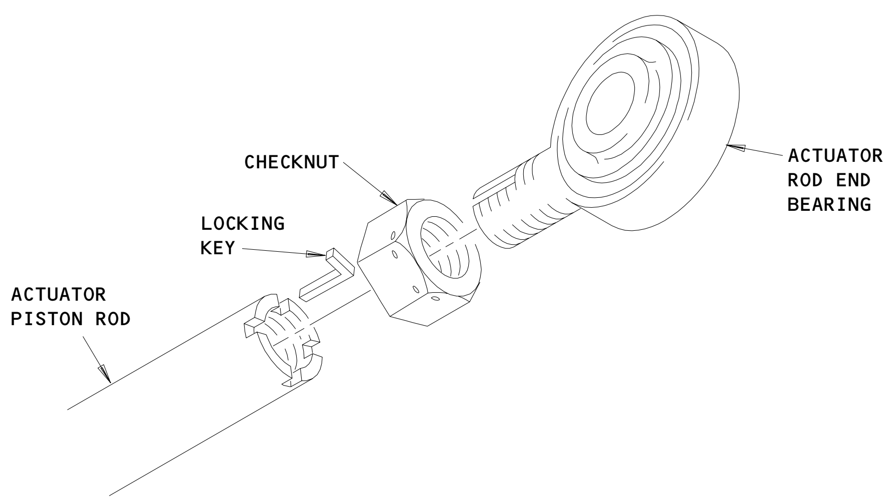
            CAUTION: DO NOT TURN ACTUATOR PISTON ROD WHEN ACTUATOR IS PRESSURIZED.

         (e) Coat piston rod end threads with corrosion preventive compound.
         (f) Engage locking key with actuator piston rod. Tighten checknut within 100 to 200 pound-inches torque range.
         (g) Provide system A hydraulic power.



AIRPLANE CONFIGURATION	CLEARANCE MEASURED AT OUTBOARD ACTUATOR ℄ (INCHES)	CLEARANCE MEASURED AT INBOARD ACTUATOR ℄ (INCHES)
ON JACKS MINIMUM FUEL [2]	0.03 (+0.10/-0.00)	0.03 (+0.10/-0.00)
ON GEAR MINIMUM FUEL [3]	0.03 (+0.10/-0.00)	0.08 (+0.10/-0.00)
ON GEAR FULL FUEL [3]	0.03 (+0.10/-0.00)	0.13 (+0.10/-0.00)





ACTUATOR PISTON ROD END
DETAIL A

[1] SPOILER TO FLAP CLEARANCE
[2] FUEL LOAD APPLIES TO WING AND BODY TANKS
[3] FUEL LOAD APPLIES TO WING TANKS

No. 4 and 5 Ground Spoiler Adjustment
Figure 501

(h) Lower spoilers, if applicable.
(i) Check that trailing edge gap is within limits.
(j) Provide access to actuators.
(k) Tighten actuator piston rod end checknut 290-410 pound-inches.
(l) Lockwire checknut and locking key.
(m) Apply a bead of sealant to the rod end checknut.
(3) Test ground spoiler actuator.

2. Ground Spoiler Actuator Test

A. Equipment and Materials
(1) Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
(a) Aileron Control Wheel Protractor Mount-F72790
(b) Forward Thrust Lever Protractor Adapter-F72952-2
(2) Control Surface Protractor Stand Assembly - F71292-17, or equivalent

B. Test Ground Spoiler Actuator
(1) Provide system A hydraulic power. Refer to 27-62-0.
(2) Place speed brake control lever in UP position to raise spoilers.
(3) Using control surface protractor check that ground spoilers No. 4 and 5 are 60 (±2) degrees up from the full down position.
(4) Check that ground spoiler No. 4 is within 2 degrees of ground spoiler No. 5.
(5) Place speed brake control lever in DOWN position.

C. Return airplane to normal
(1) Remove system A hydraulic power. Refer to 27-62-0.
(2) Remove electrical power if no longer required.
(3) Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.

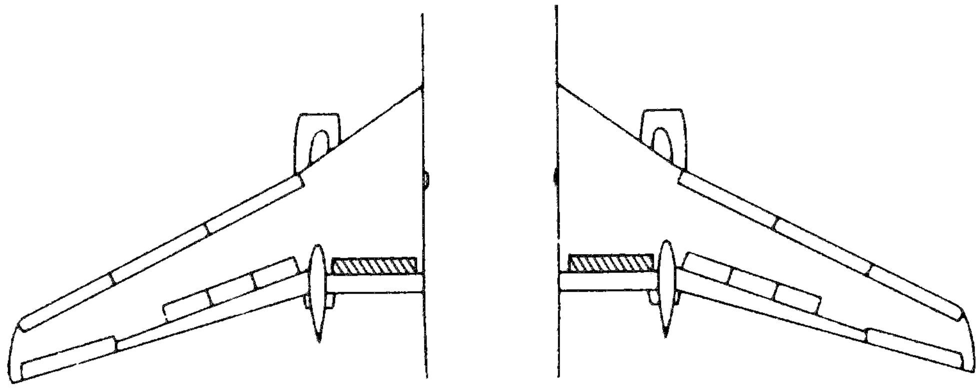
NO. 4 AND 5 GROUND SPOILER ACTUATOR LINKAGE - REMOVAL/INSTALLATION

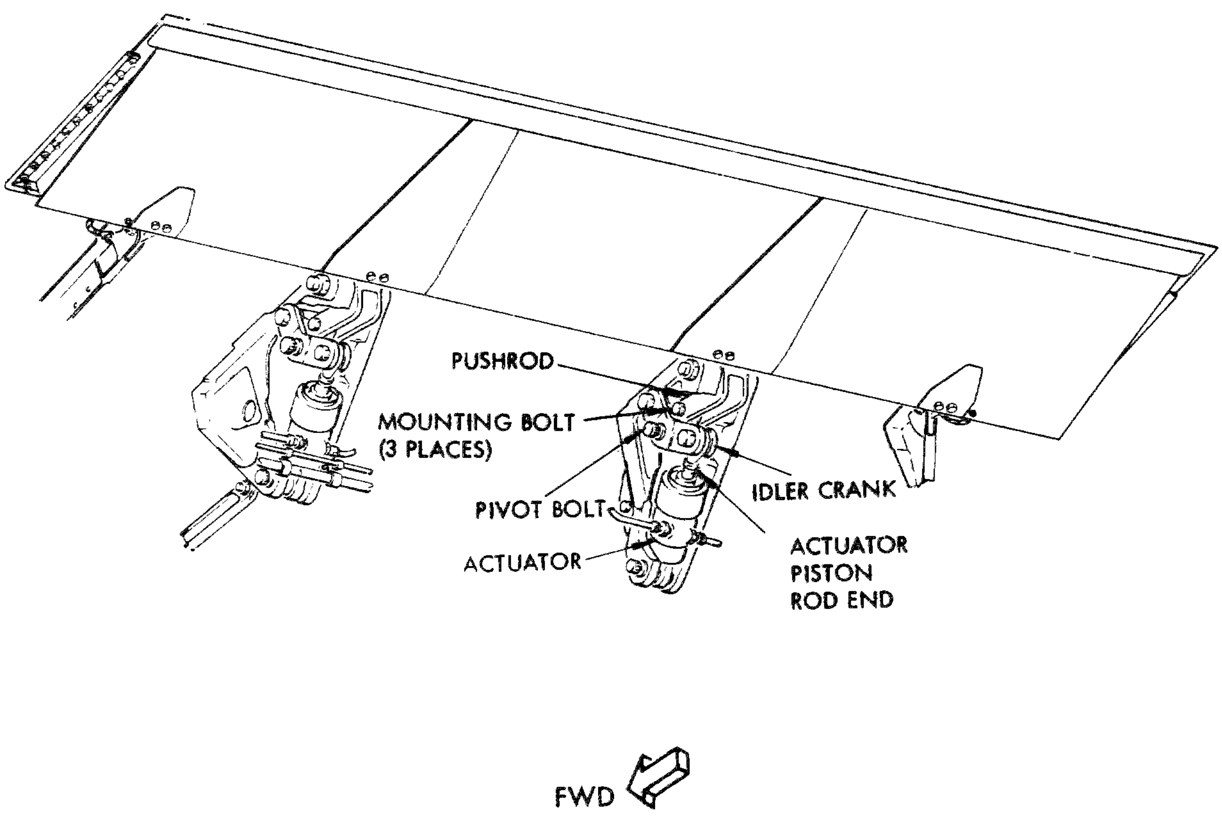
1. Equipment and Materials
   A. Ground Spoiler Ground Lock - F80040-( )

      NOTE: F80040-15 is used on airplanes having ground roll spoilers with single actuators. F80040-2 is used on airplanes having ground roll spoilers with double actuators.

   B. Grease - BMS 3-24 (AMM 20-30-21/201)
2. Prepare Ground Spoiler Actuator Linkage for Removal
   A. Provide electrical power.
   B. Provide system A hydraulic power (AMM 27-62-0/201).
   C. Place flap control lever in FLAP DOWN position to extend trailing edge flaps.
   D. Place speed brake control lever in UP position.
   E. Install ground spoiler ground lock on linkage not being removed.
   F. Remove system A hydraulic power (AMM 27-62-0/201).
3. Remove Ground Spoiler Actuator Linkage
   A. Mark idler crank to ensure correct reassembly (Fig. 401).
   B. Remove mounting bolt attaching actuator piston rod end to lower end of idler crank.
   C. Remove bolt attaching spoiler to pushrod.
   D. Remove idler crank pivot bolt and remove assembly of idler crank and pushrod from airplane.
   E. Remove bolt attaching pushrod to idler crank.
4. Install Ground Spoiler Actuator Linkage
   A. Check linkage for wear (AMM 27-62-82/601).
   B. Locate pushrod on idler crank. Ensure that pushrod is located on idler crank's longer arm. Apply grease to inside diameter of bushing housing and install bolt. Wipe off excess grease. Install washer and locknut. Tighten nut 290 to 410 pound-inches.
   C. Locate assembly of pushrod and idler crank in airplane. Install pivot bolt and secure with washer and locknut.
      (1) Install shims equally to both sides of the idler crank to maintain a 0.000-0.003-inch clearance.
   D. Apply grease to inside diameter of bushing housing and install bolt attaching pushrod to spoiler. Wipe off excess grease and secure bolt with washer and locknut.
   E. Apply grease to inside diameter of bushing housing and install bolt attaching idler crank to actuator piston rod end. Wipe off excess grease and secure bolt with washer and locknut.
   F. Tighten pivot bolt 350 to 390 pound-inches. Tighten all remaining bolts 290 to 410 pound-inches.
   G. Remove ground spoiler ground lock.
   H. Adjust and test ground spoiler actuator linkage (Ref 27-62-72 A/T).

5. Return Airplane to Normal Configuration
   A. Provide system A hydraulic power (Ref 27-62-0 MP).
   B. Place flap control lever in flap up position to retract trailing edge flaps.
   C. Place speed brake control lever in DOWN position to lower all spoilers.
   D. Remove system A hydraulic power (Ref 27-62-0 MP).
   E. Remove electrical power if no longer required.

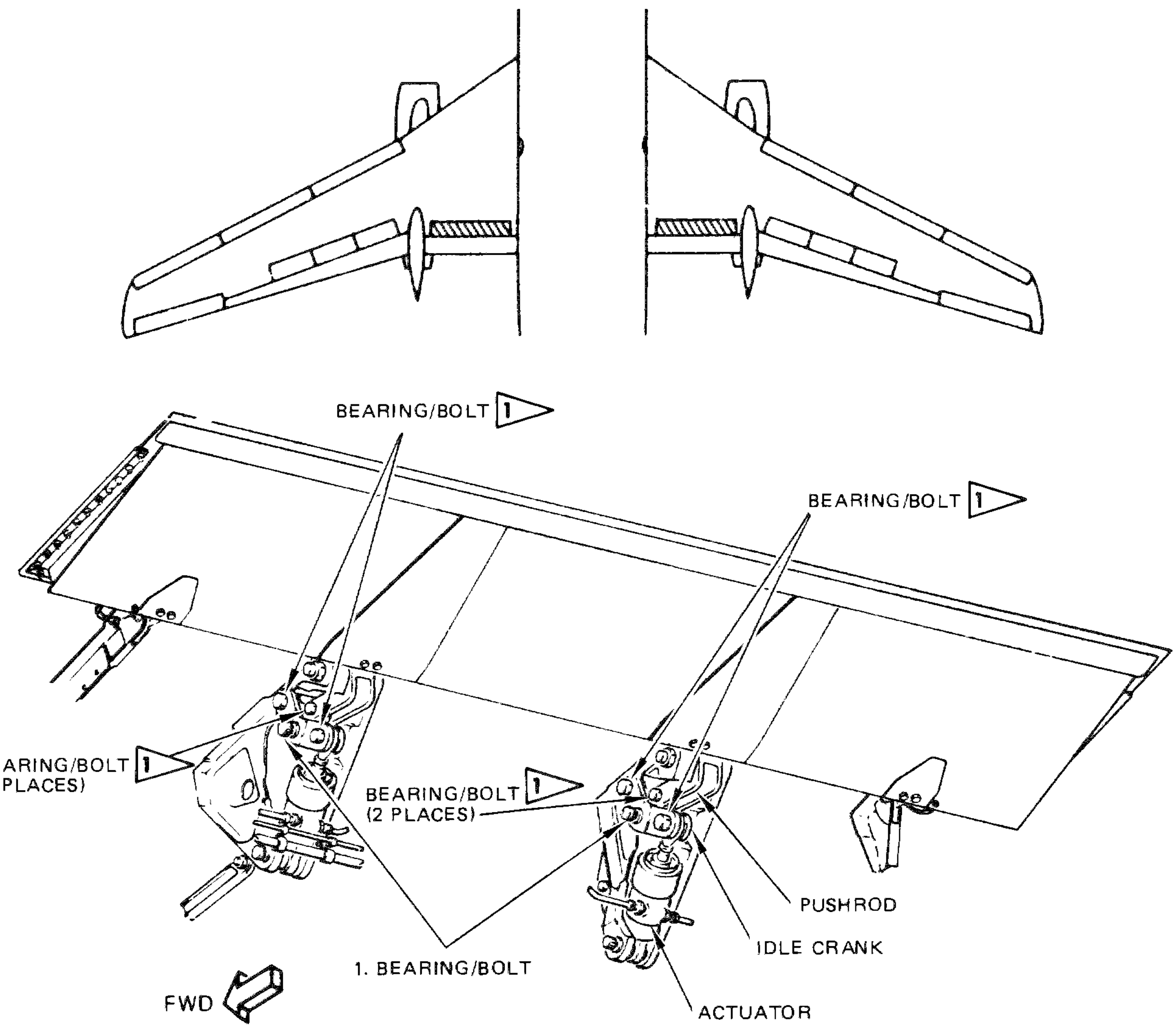




No. 4 and No. 5 Ground Spoiler Actuator Linkage
Figure 401

NO. 4 AND 5 GROUND SPOILER ACTUATOR LINKAGE - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limits charts. There wil1 be no procedure given in this section for gaining access to, or removing and replacing the component after inspection for wear. Refer to Component Removal/Installation for this information.
2. No. 4 and 5 Ground Spoiler Actuator Linkage Wear Limits



INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BEARING	ID	0.5000	0.5015	0.5045	0.0050	X		
	BOLT	OD	0.4985	0.4995	0.4950		X		

1 WEAR LIMITS SHOWN APPLY TO ALL BEARINGS AND BOLTS. ALL BEARINGS AND BOLTS ARE THE SAME RESPECTIVE DIAMETER WITH VARIOUS LENGTHS AS REQUIRED TO COMPLETE THE INSTALLATION.

No. 4 and No. 5 Ground Spoiler Actuator Linkage Wear Limits
Figure 601

NO. 1 AND 8 GROUND SPOILERS - REMOVAL/INSTALLATION

1. General
   A. For interchangeability of graphite/composite ground spoilers with aluminum/figerglass ground spoilers, refer AMM 27-09-800/201.
2. Equipment and Materials
   A. Ground Lock, Ground Spoiler - C27001-16 (Preferred), F80017-19 (Optional)
3. Prepare Ground Spoiler for Removal
   A. Provide electrical power.
   B. Provide system A hydraulic power (AMM 27-62-0/201).
   C. Position flap control lever in FLAP DOWN to extend trailing edge flaps.
   D. Position SPOILER switches to OFF.
   E. Place speed brake control lever in UP position to raise ground spoilers.
   F. Install ground spoiler ground lock.
   G. Remove system A hydraulic power (AMM 27-62-0/201).
4. Remove Ground Spoiler Panel
   A. Remove bolt attaching spoiler actuator rod end to ground spoiler (Fig. 401).
   B. Disconnect bonding jumpers from ground spoiler. Jumpers are located adjacent to inboard and outboard hinge locations.
   C. Remove four hinge bolts.
   D. Remove ground spoiler from airplane.

      NOTE: Ground spoiler weighs approximately 16 pounds.

   E. Remove bearings at inboard and outboard hinge locations.
5. Install Ground Spoiler

   NOTE: If a used bolt or bearing is being installed, check for allowable wear (AMM 27-61-11, 27-61-51/601).

   A. Position bearings in spoiler at inboard and outboard hinge locations.
   B. Position spoiler on airplane.
   C. Install two center hinge bolts (Fig. 401).
      (1) Install bolts with heads as shown in Fig. 401.
      (2) Place washer and nut on bolt. Tighten nut 240 to 350 pound-inches.
      (3) Install cotter pin.
   D. Install inboard and outboard hinge bolts.
      (1) Position spacer on both sides of bearing.

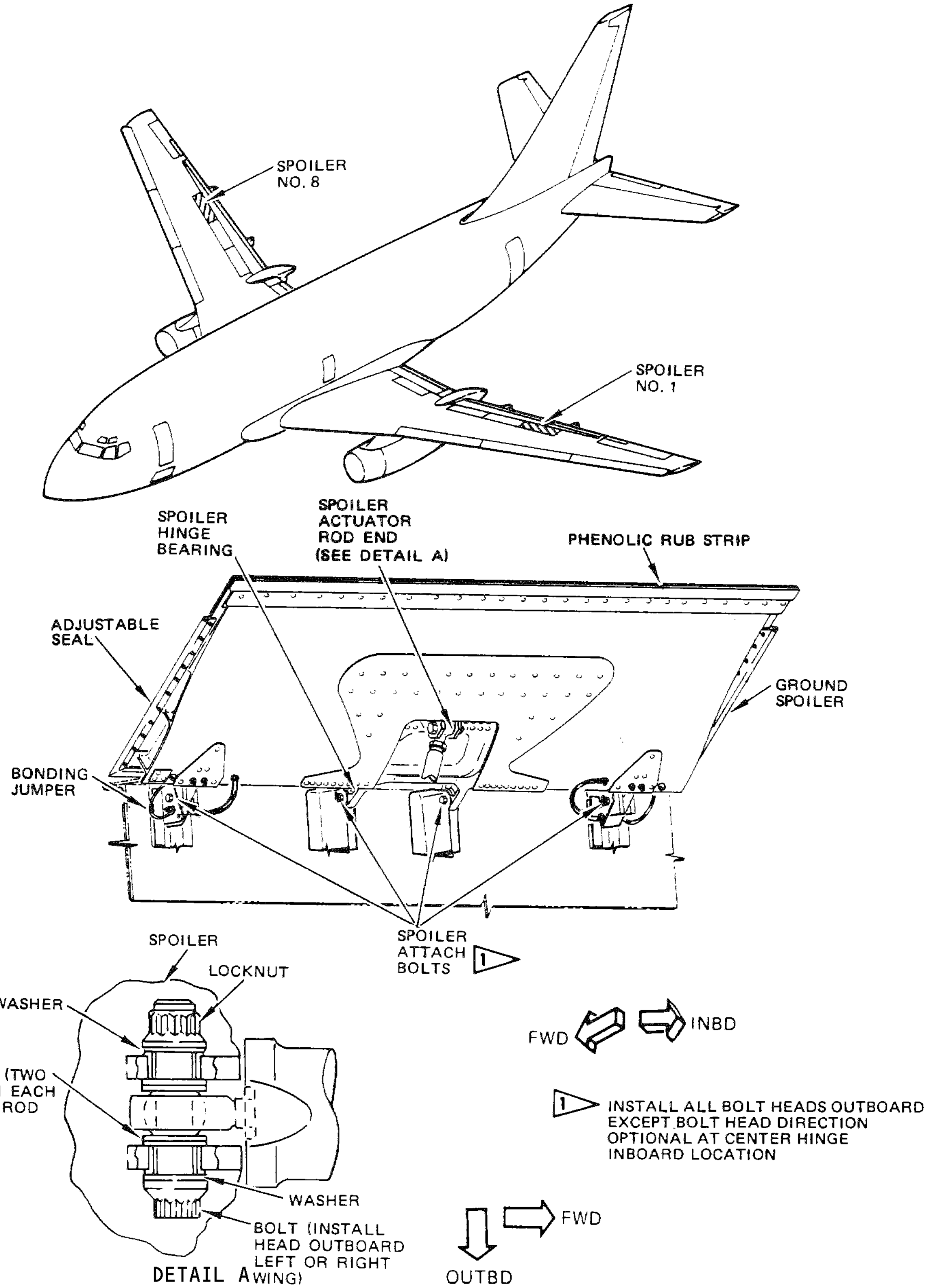
         NOTE: Ensure that flanged bushings are installed in structure.

      (2) Position bearing to align with clevis and install bolts with heads as shown in Figure 401.
      (3) Place washer and nut on bolt. Tighten nut 100 to 140 pound-inches.
      (4) Install cotter pin.

E. Connect two bonding jumpers to spoiler. Jumpers are attached at lower leg of leading channel adjacent to inboard and outboard hinges.

NOTE: If hole is not provided for fastener, locate hole 3.5 inches in from outboard end of panel and 0.5 inch aft of leading edge of lower leg. Inboard bonding jumper is fastened 8.5 inches outboard of inboard end of panel.

F. Rotate spoiler through full travel and check for binding or interference.
G. Install the bolt attaching the spoiler actuator rod end to spoiler per detail A. Tighten the nut to 660-780 pound-inches.
H. Ensure that hydraulic systems A and B are depressurized and remove spoiler ground lock.
I. Position spoiler down.
J. Check that gap between the spoiler and fixed wing structure is 0.40 ±0.05 inch at end of spoiler panel. Gap is defined as metal-to-metal clearance.
K. Check that gap between adjacent spoilers is 0.70 ±0.10 inch.
L. Adjust seals on adjacent spoiler to 0.000 ±0.020/-0.000 inch gap.
M. Ensure that seals between spoiler and fixed wing structure contact firmly.
N. Adjust and test ground spoiler (Ref No. 1 and 8 Ground Spoilers - Adjustment/Test).
O. Determine whether there is any further need for electrical power on the airplane, if not, remove power.



No. 1 and No. 8 Ground Spoiler Installation
Figure 401

NO. 1 AND 8 GROUND SPOILERS - ADJUSTMENT/TEST

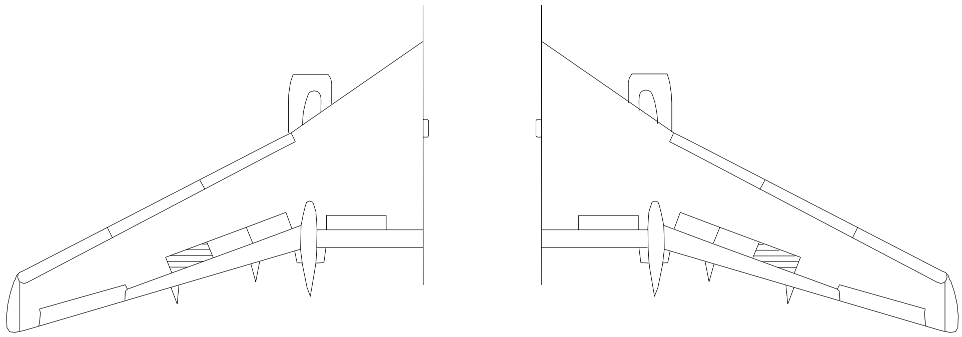
1. No. 1 and 8 Ground Spoiler Adjustment
   A. Equipment and Materials
      (1) Corrosion Preventive Compound - MIL-C-11796, Class 3 (Ref 20-30-41)
      (2) Sealant - BMS 5-95 (Ref 20-30-11)
   B. Prepare Ground Spoilers for Adjustment
      (1) Provide electrical power.
      (2) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
      (3) Ensure that spoiler switches are ON.
      (4) Place speed brake control lever in UP position. Check that ground and flight spoilers raise.
      (5) Fully retract trailing edge flaps with jackscrew stops in contact.
         (a) Set flap control lever in FLAP UP detent.
         (b) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
      (6) Place speed brake control lever in DOWN position to 1ower spoilers.
      (7) Position SPOILER A and B switches to OFF.
   C. Adjust Ground Spoiler
      (1) Check that spoiler to flap clearance is 0.03 (+0.10/-0.00) inch measured at centerline of spoiler actuator (Fig. 501).
      (2) If spoiler to flap clearance is not within limits:
         (a) Record spoiler to flap clearance.
         (b) Provide access to spoiler actuator by either lowering flaps and opening applicable hinged trailing edge panel or by placing speed brake control lever in UP position. Depressurize hydraulic system A (Ref 27-62-0, Maintenance Practices).

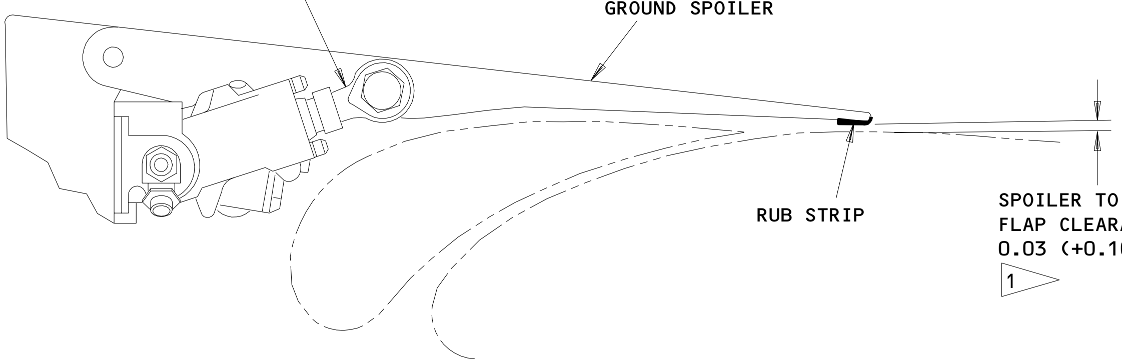
            WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

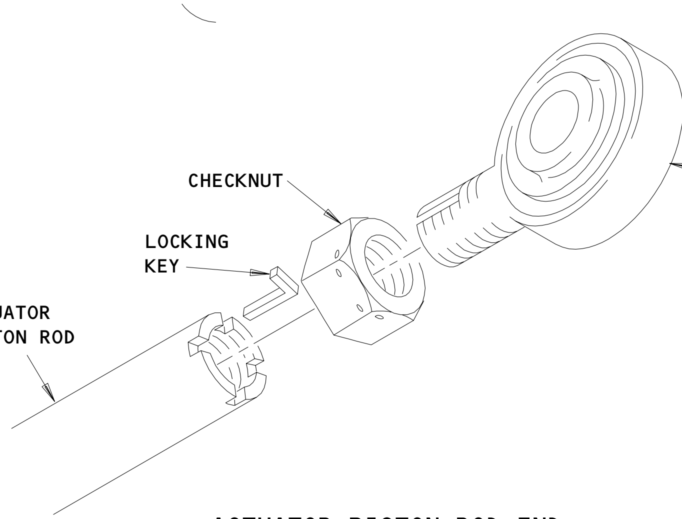
         (c) Break lockwire and loosen checknut on actuator rod end.
         (d) Disengage actuator key from piston rod.
         (e) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each one-sixth turn will change spoiler to flap clearance by approximately 0.045 inch.

            CAUTION: NEVER TURN PISTON ROD IF ACTUATOR IS PRESSURIZED.

         (f) Engage actuator key with piston rod.
         (g) Coat rod end threads with corrosion preventive compound.
         (h) Tighten rod end checknut 290 to 410 pound-inches.
         (i) Lockwire checknut to spoiler key.
         (j) Apply a bead of sealant to the rod end checknut.







ACTUATOR PISTON ROD END
DETAIL A

1 MEASURE BETWEEN RUB STRIP AND MIDFLAP AT CENTER OF SPOILER

No. 1 and No. 8 Ground Spoiler Adjustment
Figure 501

(k) Provide system A hydraulic power.
(l) Lower spoilers, if applicable.
(m) Check that spoiler to flap clearance is within limits.
(3) Test No. 1 and 8 ground spoiler.

2. Ground Spoiler Test
A. Equipment and Materials
(1) Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
(a) Aileron Control Wheel Protractor Mount-F72790
(b) Forward Thrust Lever Protractor Adapter-F72952-2
(2) Control Surface Protractor Stand Assembly - F71292-17
B. Test Ground Spoiler
(1) Set speed brake control lever to UP position.
(2) Check that ground spoilers are rotated 40 +2 degrees up from ful1 down position.
(3) Using control surface protractor, check that ground spoiler 1 is within 2 degrees of ground spoiler 8.
(4) Place speed brake control lever in DOWN position.
(5) Check that ground spoilers are full down.

3. Restore Airplane to Normal Configuration
A. Remove system A hydraulic power. Refer to 27-62-0.
B. Remove electrical power if no longer required.
C. Position the SPOILER A and B switches to ON.

NO. 1 AND 8 GROUND SPOILER ACTUATOR - REMOVAL/INSTALLATION

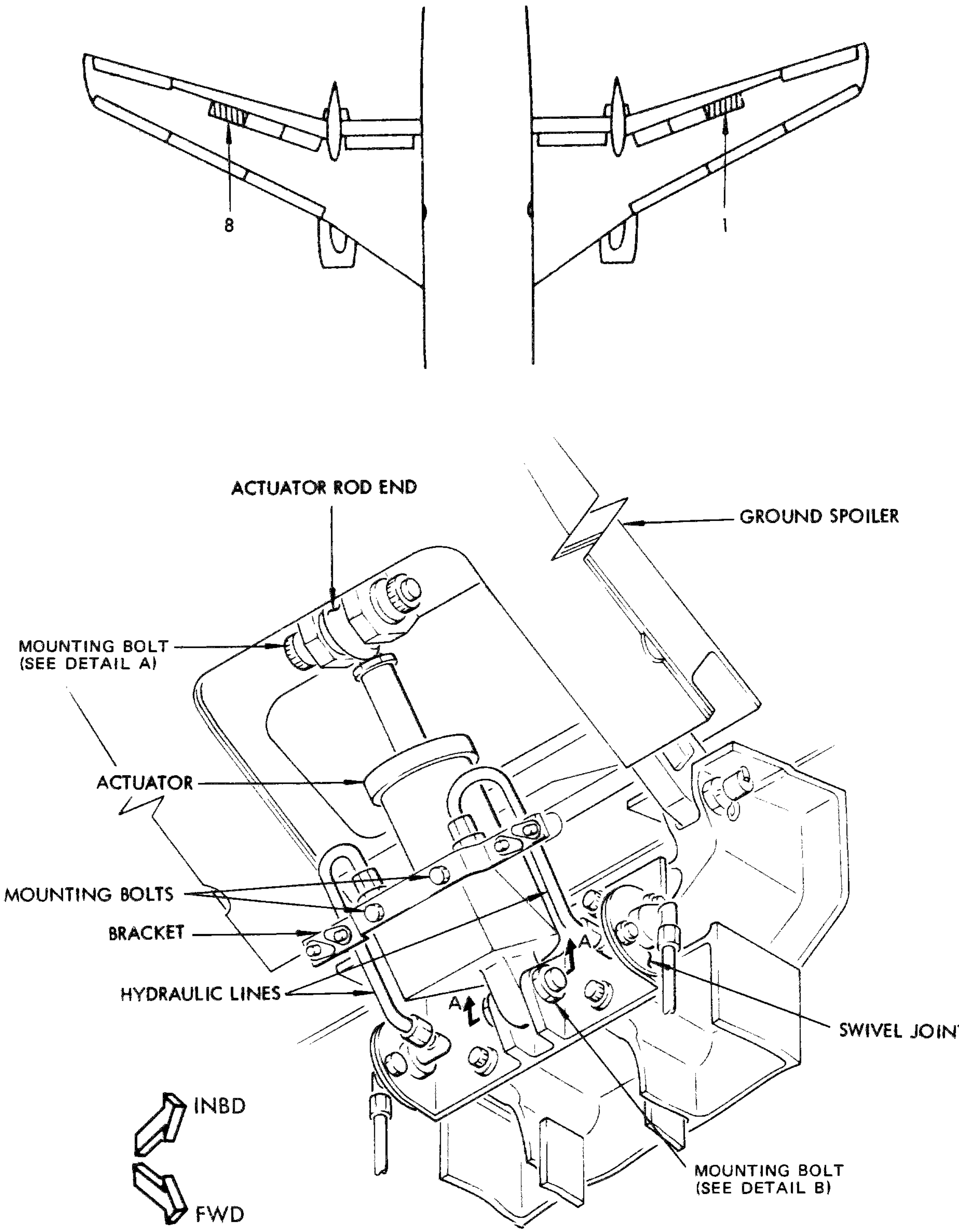
1. Equipment and Materials
   A. Fire resistant hydraulic fluid - BMS 3-11 or Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
2. Prepare Ground Spoiler Actuator for Removal
   A. Provide electrical power.
   B. Provide system A hydraulic power (Ref 27-62-0, - Maintenance Practices).
   C. Turn off SPOILER A and B switches to remove hydraulic power from flight spoilers. Provide access to spoiler actuator by either lowering flaps and opening applicable hinged trailing edge panel or by placing speed brake control lever in UP position to raise spoilers. Depressurize hydraulic system A (Ref 27-62-0, Maintenance Practices).

      WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

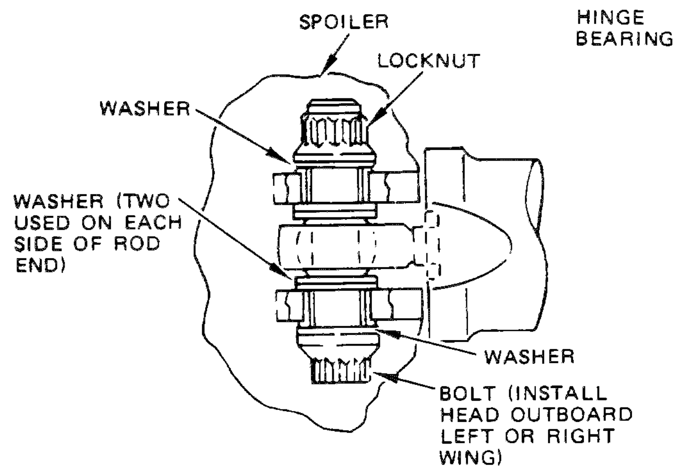
3. Remove Ground Spoiler Actuator
   A. Disconnect two bracket mounting bolts from actuator (Fig. 401).
   B. Disconnect actuator piston rod end from spoiler.
   C. Disconnect hydraulic lines from actuator. Provide a container to catch any hydraulic fluid spilled. Lower hydraulic lines and bracket by swivel joints.
   D. Install protective plugs in hydraulic lines.
   E. Remove mounting bolt attaching actuator to wing structure. Remove actuator.
   F. Remove hydraulic unions from actuator.
   G. Install protective caps in actuator ports.
4. Install Ground Spoiler Actuator

   NOTE: If a used bolt or bearing is being installed, check for allowable wear (Ref 27-61-51, Inspection/Check).

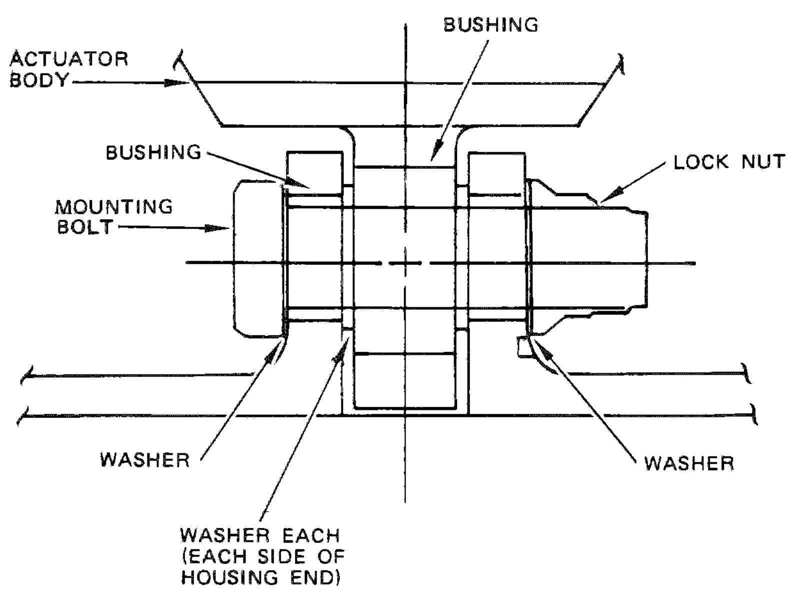
   A. Lubricate O-rings with hydraulic fluid or Assembly Lube. Remove protective CPS and install O-ring and hydraulic union at each actuator hydraulic port.
   B. Place actuator in airplane and check that hydraulic lines align (Fig. 401).
   C. Insert two actuator mounting bolts with heads outboard per detail A and section A-A.
   D. Secure actuator to wing mounting bolt with washer and locknut. Tighten locknut 290-410 pound-inches.
   E. Secure actuator piston rod end to spoiler mounting bolt with washer and locknut.
   F. Locate bracket and hydraulic lines. Install two mounting bolts and lockwire bolts together.



No. 1 and No. 8 Ground Spoiler Installation
Figure 401 (Sheet 1)



DETAIL A



SECTION A-A

No. 1 and No. 8 Ground Spoiler Installation
Figure 401 (Sheet 2)

G. Ensure that hydraulic system A is depressurized.
H. Remove protective plugs from hydraulic lines.
I. Connect hydraulic lines to actuator. Tighten hydraulic lines.
J. Pressurize hydraulic reservoirs (Ref Chapter 29, Hydraulic Reservoir Pressurization).
K. Place SPOILER A and B switches in OFF position.
L. Provide system A hydraulic power (Ref 27-62-0).
M. Actuate speed brake control lever to bleed spoiler actuators.
N. Check that there is no hydraulic leakage at actuator.
O. Adjust and test ground spoiler actuator. Refer to No. 1 and 8 Ground Spoiler Actuator - Adjustment/Test.

5. Return Airplane to Normal
A. Raise flaps, if applicable.
B. Lower spoilers, if applicable.
C. Remove system A hydraulic power (Ref 27-62-0, Maintenance Practices).
D. Position spoiler switches to ON.
E. Remove electrical power if no longer required.
F. Check hydraulic reservoirs and service if required (Ref Chapter 12, Hydraulic Servicing).

NO. 1 AND 8 GROUND SPOILER ACTUATOR - ADJUSTMENT/TEST

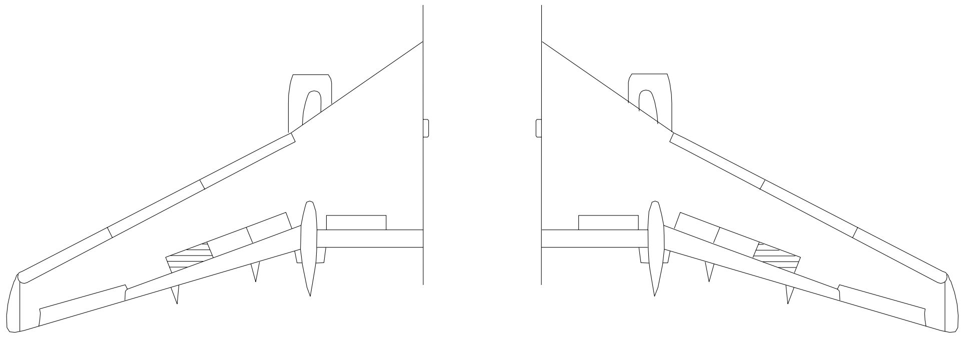
1. Ground Spoiler Adjustment
   A. Equipment and Materials
      (1) Corrosion Preventive Compound - MIL-C-11796, Class 3
      (2) Sealant - BMS 5-95, Type I, Class B-1/2 or BMS 5-95, Type II, Class B-2 (Preferred)
      (3) Sealant - BMS 5-45, Class B-2 (Optional)
   B. Prepare Ground Spoiler for Adjustment
      (1) Provide electrical power.
      (2) Provide systems A and B hydraulic power (AMM 27-62-0/201).
      (3) Place speed brake control lever in UP position to raise al1 spoilers.
      (4) Retract trailing edge flaps to full up.
         (a) Place flap control lever in FLAP UP position.
         (b) Pull inboard on WFFA cable in wheel well until jackscrew stops contact.
      (5) Place speed brake control lever in DOWN position to lower al1 spoilers.
      (6) Place SPOILER A and B switches in OFF position.
      (7) Check ground spoiler actuators for hydraulic leaks.
   C. Adjust Ground Spoiler Actuator
      (1) Check that ground spoiler to flap clearance is per Fig. 501. Clearance is to be measured near centerline of panel.
      (2) If spoiler to flap clearance is not within limits:
         (a) Record spoiler to flap clearance.
         (b) Provide access to spoiler actuator by either lowering flaps and opening applicable hinged trailing edge panel or by placing speed brake control lever in UP position to raise spoilers. Depressurize hydraulic system A (Ref 27-62-0 MP).

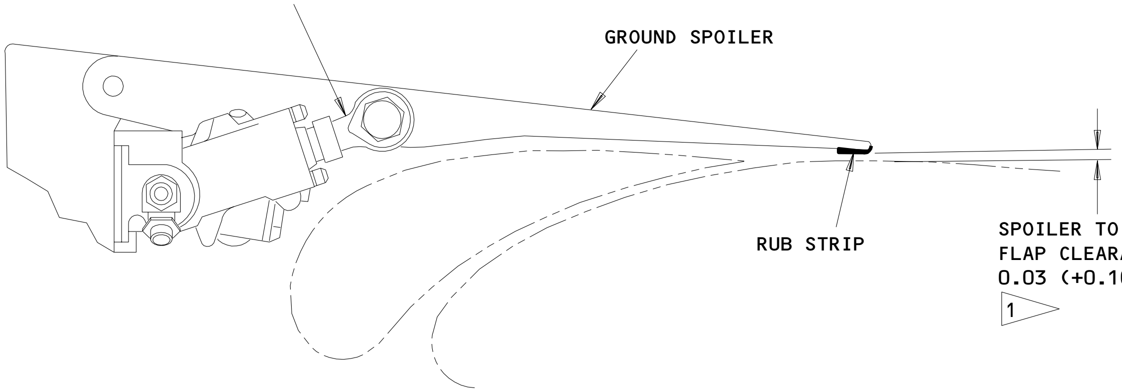
            WARNING: DO NOT PUT ANY PART OF BODY BETWEEN SPOILER AND WING UNLESS HYDRAULIC POWER IS REMOVED. SERIOUS INJURY CAN RESULT.

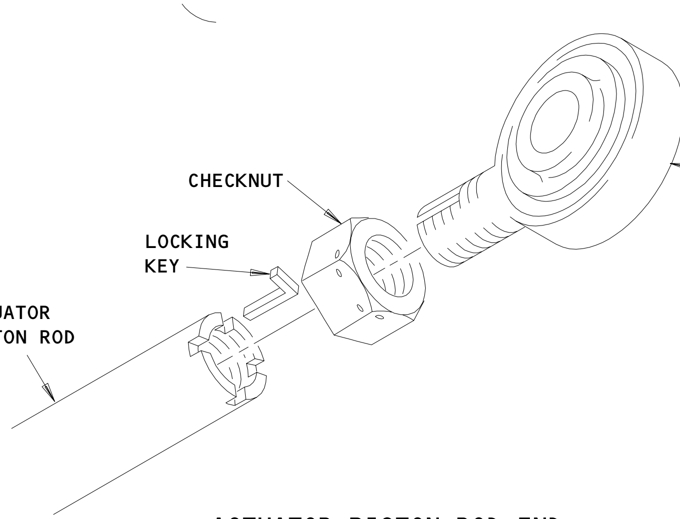
         (c) Break lockwire, loosen checknut and disengage locking key on actuator piston rod end.
         (d) Turn actuator piston rod to obtain proper spoiler to flap clearance. Each one-sixth turn of the actuator piston rod changes the gap at the trailing edge by 0.045 inch.

            CAUTION: NEVER TURN ACTUATOR PISTON ROD IF ACTUATOR IS PRESSURIZED.

         (e) Coat piston rod end threads with corrosion preventative compound.







ACTUATOR PISTON ROD END
DETAIL A

1 MEASURE BETWEEN RUB STRIP AND MIDFLAP AT CENTER OF SPOILER

No. 1 and No. 8 Ground Spoiler Adjustment
Figure 501

(f) Engage locking key with actuator piston rod.
(g) Tighten checknut 100-200 pound-inches.
(h) Provide system A hydraulic power (Ref 27-62-0 MP).
(i) Lower spoilers, if applicable.
(j) Check that spoiler to flap clearance is within limits.
(k) Provide access to actuator.
(l) Tighten checknut within 290 to 410 pound-inches torque range.
(m) Lockwire checknut and locking key.
(n) Apply a bead of sealant to the rod end checknut.

(3) Test ground spoiler actuator.

2. <u>Ground Spoiler Actuator Test</u>

A. Equipment and Materials

(1) Control Column Protractor Assembly-4MIT65B80307-1 (Preferred) or F52485-500 (Optional) which is used with the following adapters:
(a) Aileron Control Wheel Protractor Mount-F72790
(b) Forward Thrust Lever Protractor Adapter-F72952-2

(2) Control Surface Protractor Stand Assembly - F71292-17, or equivalent

B. Test Ground Spoiler

(1) Provide system A hydraulic power (Ref 27-62-0).
(2) Place speed brake control lever in UP position to raise spoilers.
(3) Using control surface protractor, check that ground spoilers No. 1 and 8 are 40 (±2) degrees up from full down position.
(4) Check that ground spoiler No. 1 is within 2 degrees of ground spoiler No. 8.
(5) Place speed brake control lever in DOWN position to lower spoilers.
(6) Check that spoilers are full down.

C. Return Airplane to Normal Configuration

(1) Remove system A hydraulic power (Ref 27-62-0, Maintenance Practices).
(2) Position spoiler switches to ON.
(3) Remove electrical power if no longer required.

LEADING EDGE FLAP AND SLAT CONTROL SYSTEM - DESCRIPTION AND OPERATION

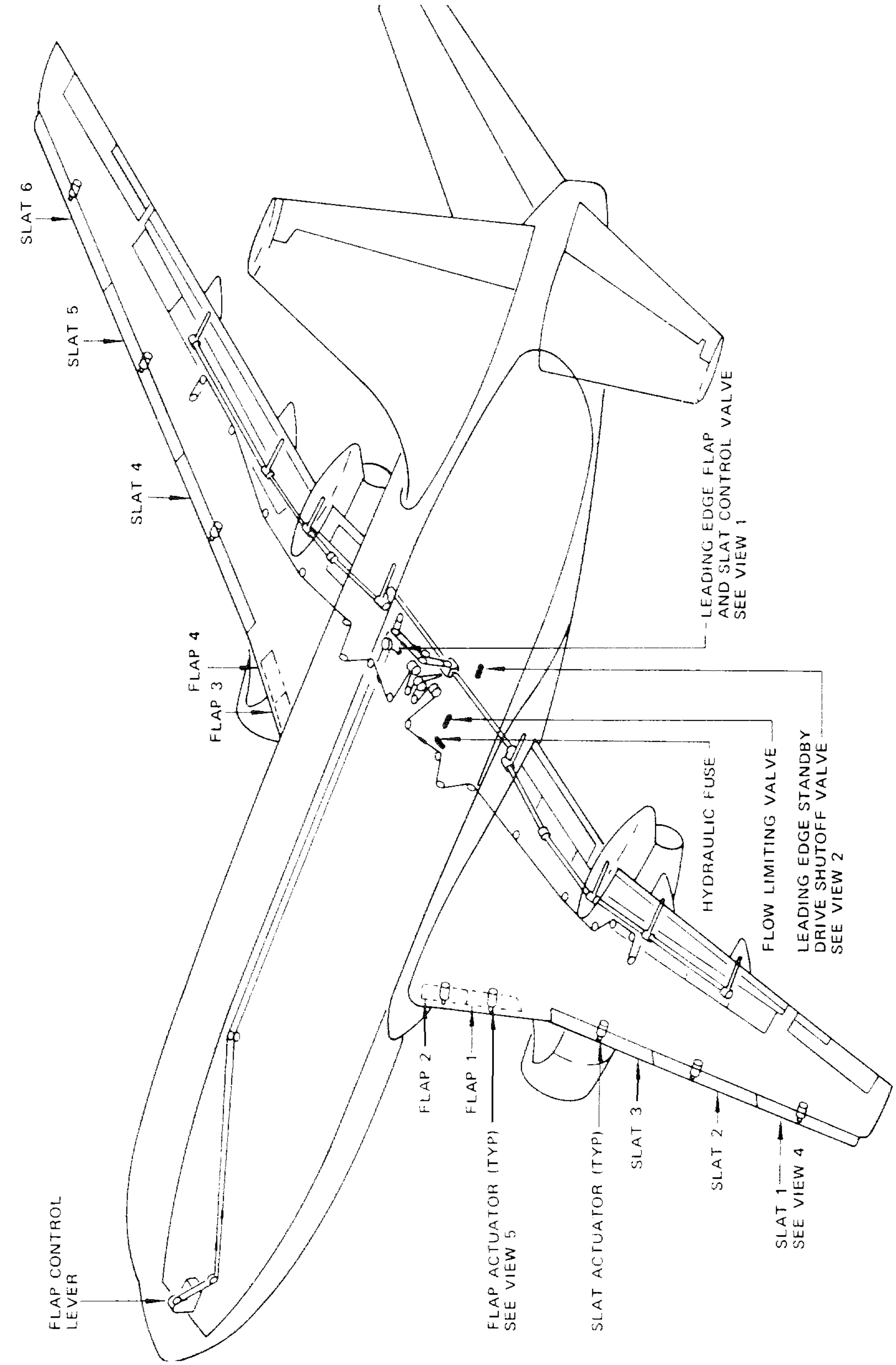
1. General
   A. High lift leading edge devices are used in combination with the trailing (-PROMPT-)s to allow airplane operation from short runways. The use of leading edge devices allows a change in wing camber which greatly increases lift. The leading edge lift devices consist of four Krueger flaps and six slats (Fig. 1).
   B. Three leading edge slats are installed outboard of the engine and two leading edge flaps are installed inboard of the engine on each wing. The slats and flaps are numbered from left to right as shown in Fig. 1. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT- EAG thru VT-EAM, AQ N21SW thru N23SW, 1eading edge slats 1 and 6 are actuated by a three-position hydraulic actuator and slats 2, 3, 4, and 5 by a two-position actuator. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, AQ ALL EXCEPT N21SW thru N23SW, all leading edge slats (1 thru 6) are actuated by a three-position actuator. If hydraulic pressure is low, a blocking valve will create a hydraulic lock that prevents actuator movement. This locking action will hold the slat in the position at which the loss of hydraulic pressure occurs. Each leading edge flap is actuated by a two-position hydraulic actuator. The flap actuator will also lock in position if hydraulic pressure is low. Locking the actuators prevents blowback of the flaps and slats if hydraulic pressure is lost during takeoff or landing. Restrictors installed in the flap and slat actuator hydraulic pressure lines limit the actuating speed of the leading edge devices.
   C. The leading edge flaps and slats are normally powered by hydraulic system A. A three-position, spool-type control valve is operated by the flap control unit. The control valve ports hydraulic fluid to the leading edge flap and slat actuators as follows:
      (1) On NH JA8401 thru JA 8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, AQ N21SW thru N23SW, when the trailing edge flaps are extended 1 to 25 units, the control valve ports pressure to fully extend the leading edge flaps and leading edge slats 2, 3, 4 and 5. Leading edge slats 1 and 6 extend to the intermediate position. Full extension of slats 2, 3, 4 and 5 corresponds to intermediate extension of slats 1 and 6. When the trailing edge flaps are extended to 30-40 units, the control valve ports pressure to fully extend leading edge slats 1 and 6.

(2) On NH ALL EXCEPT JA8401 thru JA 8411, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, AQ ALL EXCEPT N21SW thru N23SW, when the trailing edge flaps are extended between up and 10 units, the control valve ports pressure to fully extend the leading edge flaps and extend all leading edge slats to the intermediate position. When the trailing edge flaps are extended 10 units or more, all leading edge slats extend fully.

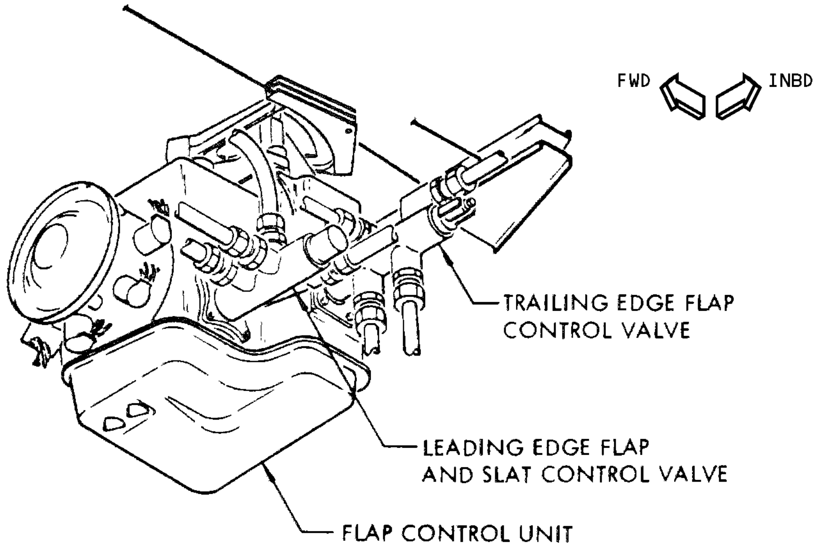
D. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru N23SW, when the trailing edge flaps are retracted, the leading edge slats 1 and 6 retract to the intermediate position as the trailing edge flaps reach the 25- to 5-unit range. Control lever movement toward the up detent is stopped momentarily at the l-unit position by a gate on the flap control quadrant. As the trailing edge flaps move from the 1 - to 0-unit range, all leading edge flaps and slats fully retract.

E. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, when the trailing edge flaps are retracted, all leading edge flaps and slats remain fully extended until the trailing edge flaps are retracted to less than 10 units extension. Between 10 units and up, all leading edge slats retract to their intermediate position and all leading edge flaps remain fully extended. When the trailing edge flaps reach the fully retracted position, all leading edge flaps and slats move to the fully retracted position. Control lever movement toward the up detent is stopped momentarily at the 1-unit position by a gate on the flap control quadrant.

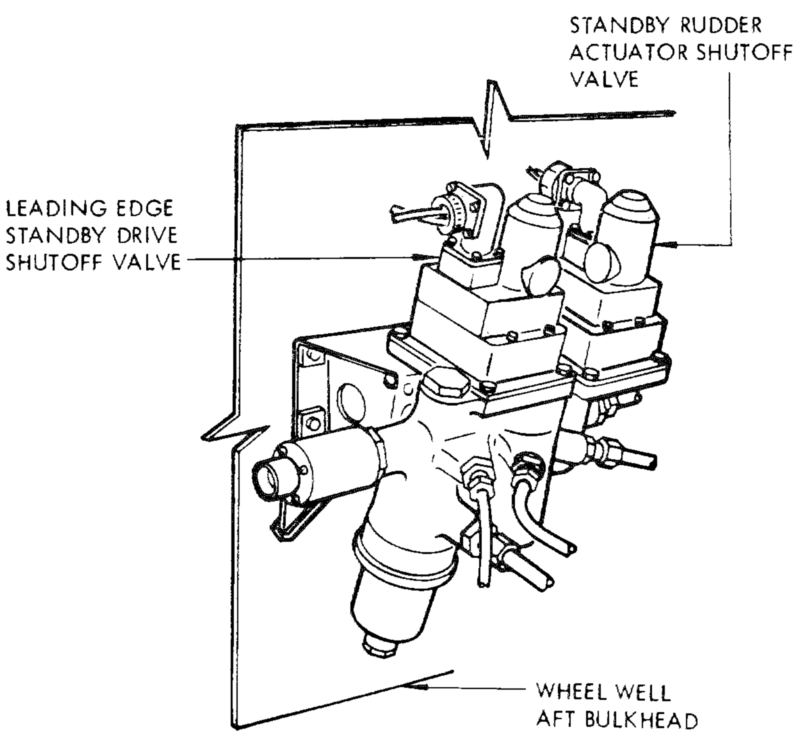
F. A standby hydraulic system is provided to extend the leading edge flaps and slats in the event hydraulic system A fails. The system is controlled by the alternate trailing edge flap switches on the overhead panel. Actuating the switches automatically pressurizes the standby hydraulic system. Pressurized fluid from the standby system is directed to the flap and slat actuators by a motor-operated shutoff valve in the standby system modular package. Fluid flow to the actuators is regulated by a flow limiting valve and a hydraulic fuse. The leading edge flap and slat control valve is bypassed during use of standby hydraulic power.



Leading Edge Flap and Slat Control System Component Location
Figure 1 (Sheet 1)

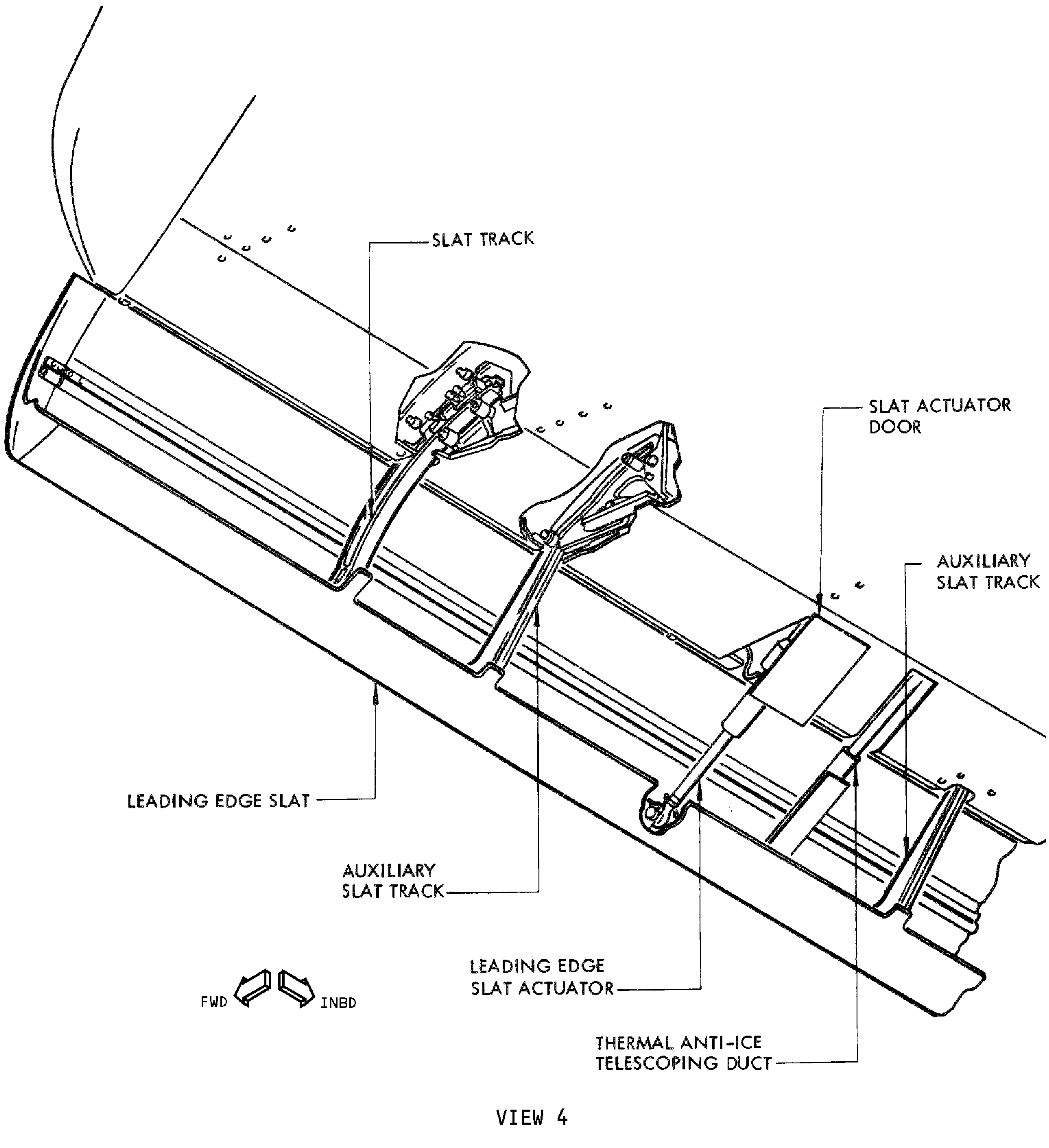


VIEW 1



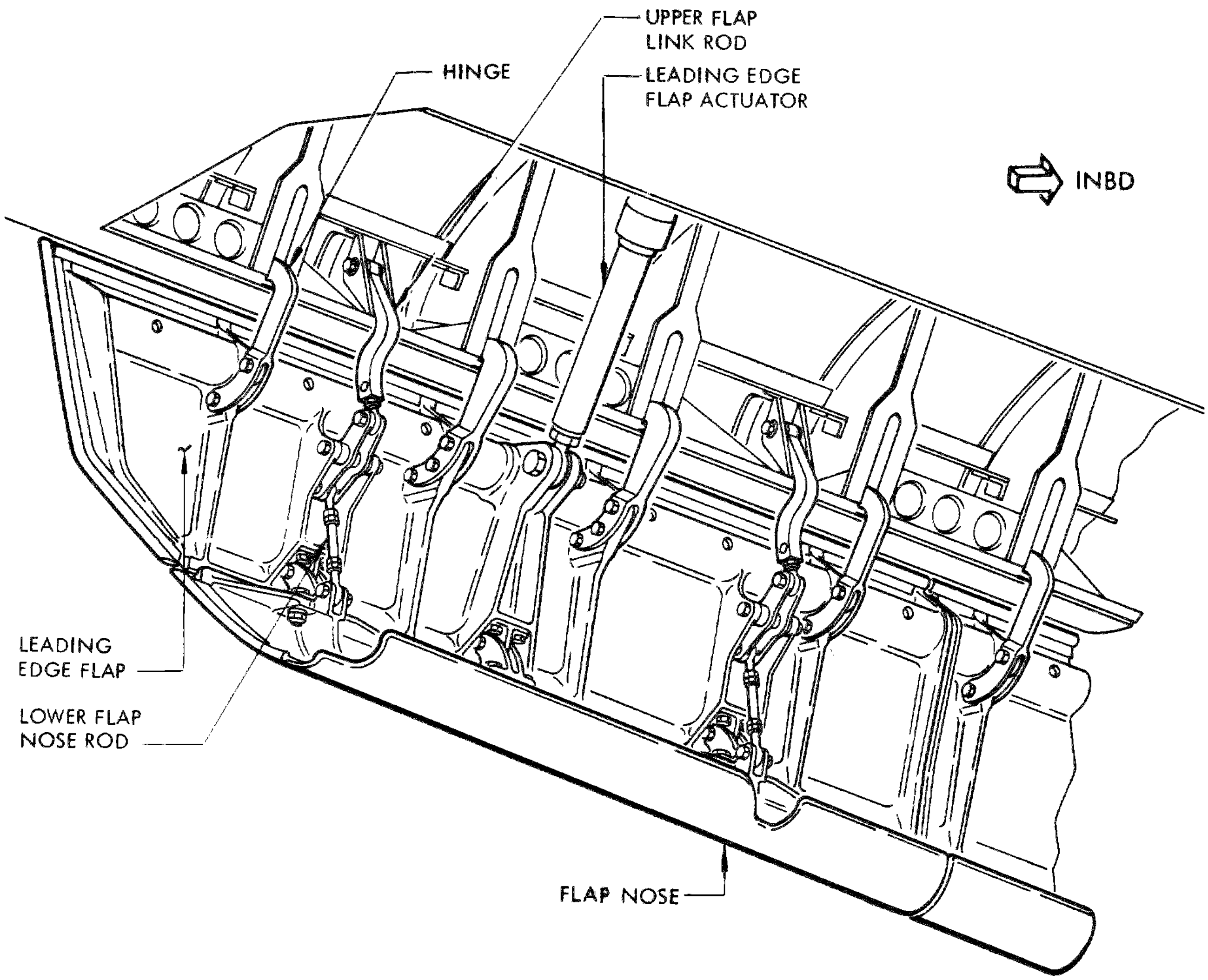
VIEW 2

Leading Edge Flap and Slat Control System Component Location
Figure 1 (Sheet 2)



VIEW 4

Leading Edge Flap and Slat Control System Component Location
Figure 1 (Sheet 3)



VIEW 5

Leading Edge Flap and Slat Control System Component Location
Figure 1 (Sheet 4)

2. Leading Edge Flaps

A. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT- EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru N23SW, two Krueger type leading edge flaps are installed on each wing. The flaps are numbered 1 thru 4 as shown on Fig. 1. Each flap is a machined aluminum casting containing integral ribs and stiffeners. Each flap has four gooseneck hinges which attach to fittings in the leading edge of the wing. A centrally located fitting is also provided on each flap for connecting the flap to a hydraulic actuator. A hinged fairing is installed on the trailing edge of each flap. Two linkages rotate the hinged fairing as the leading edge flap extends. Each linkage consists of two pushrods and a differential bar attached to a bracket on the flap casting. One pushrod extends from the fairing to the differential bar and the other pushrod connects the bar to the fixed leading edge of the wing. When the leading edge flap retracts, the linkage folds the fairing inward against the flap. When the leading edge flap extends, the fairing also extends, allowing air to flow smoothly over the surface of the flap.

B. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMV thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, two Krueger type leading edge flaps are installed on each wing. The flaps are numbered 1 thru 4 as shown on Fig. 1. Each flap is a machined aluminum casting containing integral ribs and stiffeners. Flaps 1 and 4 each have four gooseneck hinges and flaps 2 and 3 each have five gooseneck hinges which attach to fittings in the leading edge of the wing. A centrally located fitting is also provided on each flap for connecting the flap to a hydraulic actuator. A hinged fairing is installed on the trailing edge of flaps 1 and 4, and two fairings are installed on the trailing edge of flaps 2 and 3. Two linkages rotate the hinged fairing as the leading edge flap 1 or 4 extends. Three linkages rotate the two hinged fairings as the leading edge flap 2 or 3 extends. Each linkage consists of two pushrods and a differential bar attached to a bracket on the flap casting. One pushrod extends from the fairing to the differential bar and the other pushrod connects the bar to the fixed leading edge of the wing. When the leading edge flap retracts, the linkage folds the fairing inward against the flap. When the leading edge flap extends, the fairing also extends, allowing air to flow smoothly over the surface of the flap.

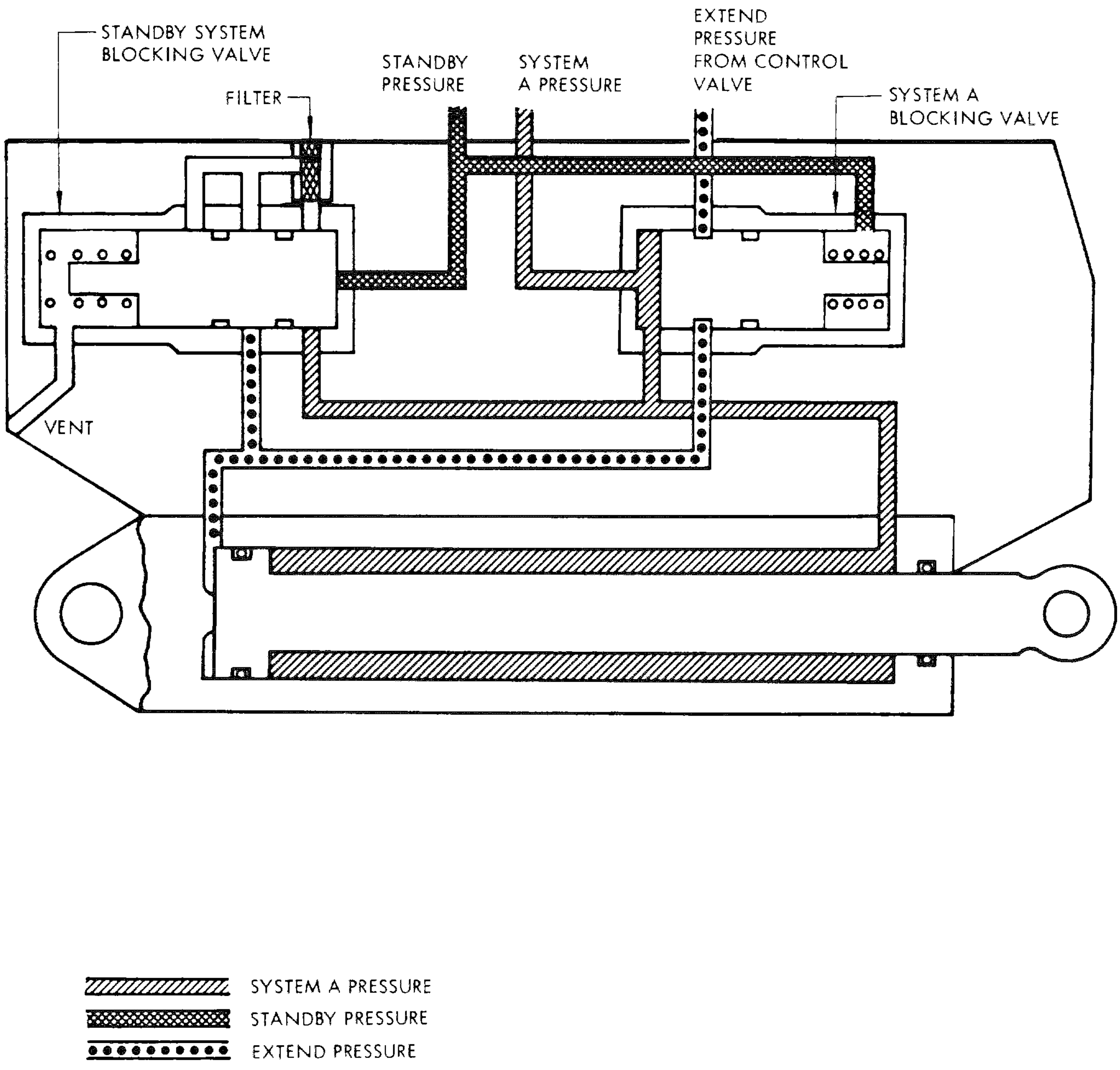
3. Leading Edge Slats
   A. Three leading edge slats are installed on each wing outboard of the engine. The slats are numbered 1 thru 6 as shown on Fig. 1. The slats consist of ribs attached to a beam, inner and outer clad aluminum skins, and a honeycomb trailing edge. A void between the inner and outer skins provides a path for thermal anti-icing. Anti-icing ducts installed in the slat leading edge connects with hot air supply lines through a telescoping tube. On NH JA8401 thru JA8411, AR LV-JMV thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru NL=#SW, a three-position hydraulic actuator is attached at the center of slats 1 and 6 and a two-position actuator is attached at the center of slats 2, 3, 4, and 5. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMV thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, a three-position hydraulic actuator is attached at the center of all leading edge slats (1 thru 6). Each slat has two main tracks and two auxiliary tracks which ride on rollers in the wing leading edge. A third auxiliary track is installed at the outboard end of slats No. 1 and 6. Structural stops are provided in both the extended and retracted slat positions. The downstops are attached to the slat tracks and contact with track guides in the extended position. The upstops consist of three adjustable plates which contact with the slat beam when the slats are retracted. On NH JA8401 thru JA8411, AR LV-JMV thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, slats 1 and 6 are stabilized at the intermediate position by a torsion tube and support arm assembly attached to the front spar between the auxiliary slat tracks. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMV thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, all slats (1 thru 6) are stabilized at the intermediate position by a torsion rod and support arm assembly attached to the front spar between the auxiliary slat tracks. In the fully extended position, the No. 1 and 6 slats do not extend as far as the other four slats.
4. Leading Edge Slat Aerodynamic Seal
   A. Wing leading edge aerodynamic seals are installed at cutouts in the wing fixed leading edge skin. The cutouts provide for attachment, actuation, and heating of leading edge slats. Seal curtains are located at slat main track and thermal anti-icing duct cutouts and seal doors are located at slat actuator and auxiliary track cutouts. When the leading edge slats extend, each seal rotates or slides downward sealing cutout and preventing airflow into fixed leading edge.

5. Leading Edge Flap and Slat Control Valve

A. A three-position control valve regulates operation of the leading edge flaps and slats (Fig. 1). The control valve is mounted on the trailing edge flap follow-up mechanism located in the right wheel well (Fig. 1). The valve consists of a sliding piston enclosed in a valve housing. Drilled passages are provided in the valve housing for a pressure port, a return port, and two cylinder ports. A pushrod connects the control valve to the trailing edge flap follow-up mechanism. With the trailing edge flaps retracted, the control valve slide blocks flow of pressurized fluid to the leading edge flap and slat actuator extend ports. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru N23SW, when the trailing edge flaps extend to the 0- to 1-unit position, pressurized fluid is ported through one of the cylinder ports to fully extend the leading edge flaps and slats 2, 3, 4, and 5. Slats 1 and 6 extend to the intermediate position. Moving the trailing edge flaps to the 30-unit position ports pressurized fluid through both cylinder ports. With the control valve in this position, leading edge slats 1 and 6 fully extend. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, when the trailing edge flaps extend to the 0- to 1-unit position, pressurized fluid is ported through one of the cylinder ports to fully extend the leading edge flaps and to extend the leading edge slats to the intermediate position. When the trailing edge flaps reach the 10-unit position, pressurized fluid is ported through both control valve cylinder ports to fully extend all leading edge slats.

6. Leading Edge Flap Actuator

A. A two-position hydraulic actuator mounted on the front spar of the wing is used to extend and retract each leading edge flap (Fig. 2). A self-aligning bearing at each end of the actuator allows the actuator to rotate about its mounting bolts. The actuator housing contains two identical blocking valves and a piston and rod assembly. The blocking valves will hydraulically lock the actuator pistons in position if hydraulic pressure drops below 2000 psi. If a loss of pressure occurs, a compression spring moves the blocking valve slide to prevent flow of hydraulic fluid through the valve. One blocking valve is used for hydraulic system A while the second blocking valve is used for the standby hydraulic system.



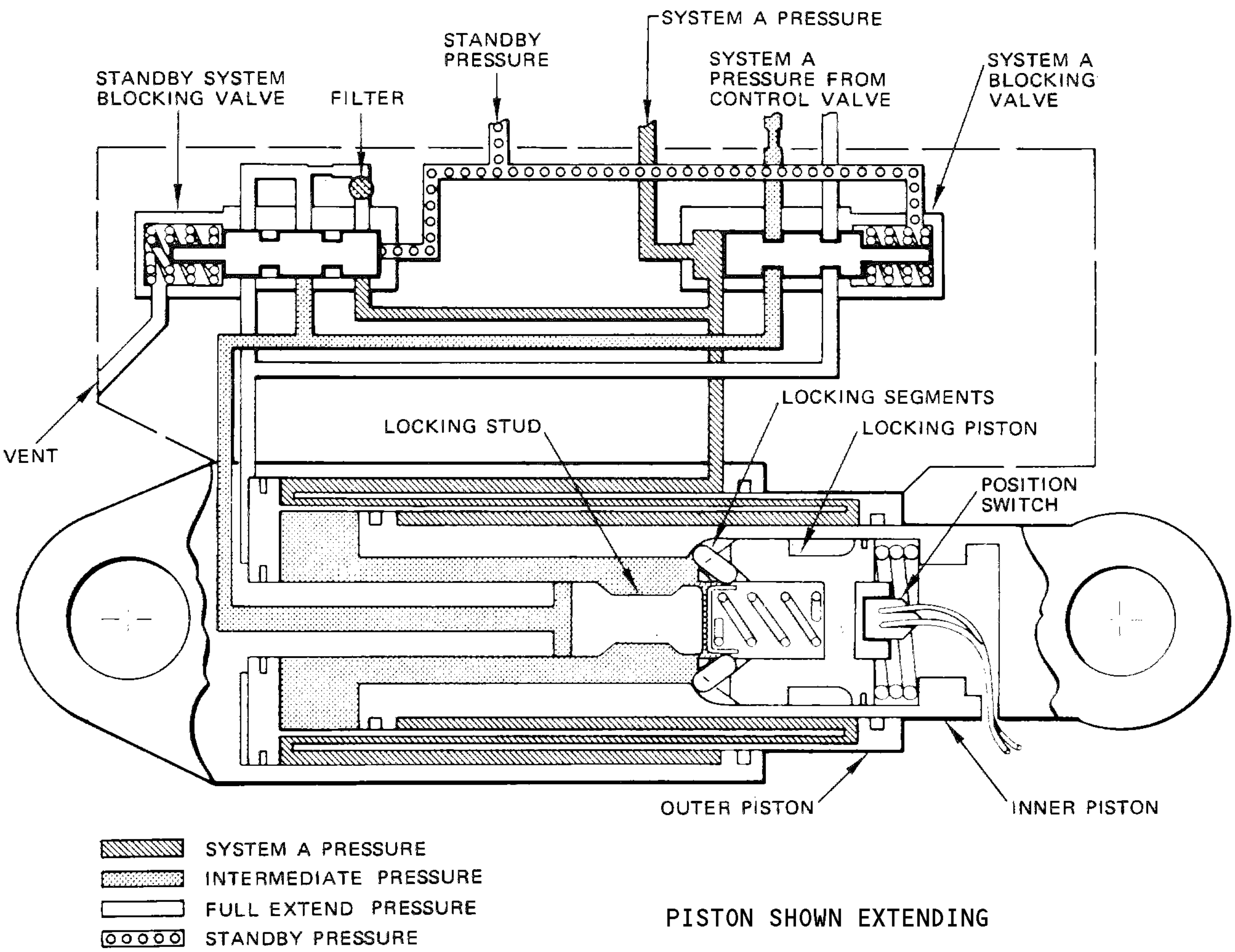
Leading Edge Flap Actuator
Figure 2

B. External ports in the actuator housing are provided for an actuator retract pressure line, an actuator extend pressure line and a standby system pressure line. The actuator retract pressure line provides system A pressurized fluid from the leading edge flap and slat control valve. With the hydraulic system pressurized, system A pressure is ported at al1 times to the retract side of the actuator piston. System A hydraulic pressure from the control valve extends the actuator by acting upon a larger piston area than the pressure attempting to retract it. When the control valve is closed, pressure from the extend side of the piston is ported to return. The flap will then retract due to hydraulic system A pressure on the retract side of the piston.

C. During standby hydraulic system operation, standby pressure is ported to both the extend and retract sides of the actuator piston. Since hydraulic pressure is acting on a larger piston area on the extend pressure side, the actuator extends. The actuator will remain in the extended position until system A hydraulic pressure is restored.

7. Leading Edge Slat Actuator (Fig. 3)

A. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru N23SW, a three-position hydraulic actuator mounted on the front spar of the wing is used to extend and retract leading edge slats 1 and 6. On NH ALL EXCEPT JA8401 thru JA8411, AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ ALL EXCEPT N21SW thru N23SW, a three-position hydraulic actuator is used to extend and retract leading edge slats 1 thru 6. The three actuator positions are retracted, intermediate and full extend. On NH JA8401 thru JA8411, AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, AQ N21SW thru N23SW, a two-position hydraulic actuator mounted on the front spar of the wing is used to extend and retract leading edge slats 2 thru 5. All actuators contain two identical blocking valves, an internal mechanical locking mechanism, an outer piston and an inner piston and rod assembly. A reed switch is installed in the actuator inner piston rod and is actuated by movement of the locking piston within the inner rod. The inner piston slides within the outer piston in all actuators. On three-position actuators only, the outer piston slides within the actuator housing. The internal mechanical locking mechanism consists of a spring-loaded piston and locking segments. It locks the actuator in the retracted position when pressure is removed. When extend pressure is applied, the locking piston moves against spring force to retract the locking segments and allow the actuator to extend. The blocking valves will hydraulically lock the actuator pistons in position if hydraulic pressure drops below 2000 psi. If a loss of pressure occurs, a compression spring moves the blocking valve slide to prevent flow of hydraulic fluid through the valve. One blocking valve is used for hydraulic system A while the second blocking valve is used for the standby hydraulic system.



Leading Edge Slat Actuator
Figure 3

B. External ports in the actuator housing are provided for an actuator retract pressure line, two actuator extend pressure lines and a standby system pressure line. The actuator retract pressure line provides pressurized fluid directly from hydraulic system A. The two actuator extend pressure lines provide system A pressurized fluid from the leading edge flap and slat control valve. With the hydraulic system pressurized, system A pressure is ported at all times to the retract side of both actuator pistons. System A hydraulic pressure from the control valve is directed to the slat actuator in two progressive steps. In the first step, as the control valve moves to its intermediate position, pressure is ported to extend the actuator inner piston and rod assembly. This allows the actuator to move to the intermediate position. In the second step, which produces a response only in three-position actuators, the control valve ports hydraulic pressure to extend the outer piston while pressure is still ported to the inner piston. This allows the actuator to move to the fully extended position. Actuator extension results from system A pressure acting upon a larger area on the extend pressure side of the pistons than on the retract pressure side. When the control valve is returned to the intermediate position, outer piston extend pressure, on three-position actuators, is ported to system A return. Hydraulic pressure on the retract side of the outer piston then causes the outer piston to retract. When the control valve closes, inner piston extend pressure is ported to system A return and hydraulic pressure on the retract side of the inner piston then causes the inner piston to retract.

C. During standby system operation, standby pressure is ported to the actuator retract line and to both actuator extend lines. Since the extend pressure acts on larger piston areas than the retract pressure, the actuator will move to the fully extended position. The actuator will remain in the extended position until system A hydraulic pressure is restored.

8. <u>Hydraulic Fuse</u>

A. A hydraulic fuse is installed in the leading edge flap and slat standby hydraulic system pressure line. (See figure 1.) The hydraulic fuse is located near the forward bulkhead in the left wheel well below hydraulic system B pump No. 1. If an actuator failure or a line rupture occurs, the fuse will close to prevent complete loss of standby system hydraulic fluid. The fuse will reset automatically when hydraulic pressure on both sides of the fuse is equalized within 5 psi.

9. Flow Limiting Valve
   A. A flow limiting valve is installed in the standby system hydraulic line downstream of the standby system modular package. (See figure 1.) It is located on the keel beam in the left wheel well just below the standby hydraulic system reservoir. The flow limiting valve controls the rate of standby system fluid flow to the leading edge flap and slat actuators. At normal temperatures with a hydraulic pressure of 200 to 3000 psi, fluid flow to the actuators is regulated at 1.35 to 1.58 gallons per minute.
10. Leading Edge Standby Drive Shutoff Valve
   A. Operation of the leading edge flap and slat alternate hydraulic system is controlled by the standby drive shutoff valve. The motor operated, two-position valve is contained in the standby modular package. It is located on the wheel well aft bulkhead above the keel beam. The standby drive shutoff valve connects the standby system pressure line to the leading edge flap and slat actuators. The shutoff valve is actuated by arming the alternate flap master switch and by moving the alternate flap drive control switch to DOWN. This positions the standby drive shutoff valve to allow standby pressure to extend the leading edge flaps and slats. Moving the alternate flap master switch to OFF closes the standby drive shutoff valve, thus connecting the leading edge flap and slat actuator standby pressure lines to standby return. However, the leading edge flap and slat actuators will remain extended until system A hydraulic pressure is restored.
11. Operation
   A. The leading edge flaps and slats are controlled by the trailing edge flap system. When the trailing edge flaps are retracted, the leading edge flap and slat control valve is closed. With the control valve in this position, the leading edge flap and slat actuators are held in the retracted position by hydraulic system A pressure. In addition, internal mechanical locks keep the leading edge slat actuators retracted in the absence of extend pressure (Fig. 4). When the trailing edge flaps are extended to the 0 - to 1-unit range, the control valve moves to its intermediate position.
      (1) On NH JA8401 thru JA8411; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC VT-EAG thru VT-EAM; FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F; AQ N21SW thru N23SW, when the control valve is in its intermediate position, leading edge flaps and slats 2, 3, 4 and 5 are fully extended. Leading edge slats 1 and 6 are in the intermediate position. Intermediate extension of slats 1 and 6 corresponds to full extension of slats 2, 3, 4 and 5. Extension of the trailing edge flaps to the 25- to 30-unit range fully opens the control valve to fully extend slats 1 and 6. Slats 2, 3, 4 and 5 and the leading edge flaps remain in their fully extended positions.

(2) On NH ALL EXCEPT JA8401 thru JA8411; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC ALL EXCEPT VT-EAG thru VT-EAM; FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F; AQ ALL EXCEPT N21SW thru N23SW, when the control valve is in the intermediate position, all leading edge flaps fully extend and all leading edge slats (1 thru 6) extend to the intermediate position. Extension of the trailing edge flaps to the 10-unit range and beyond fully opens the control valve. In this position, hydraulic fluid is ported to fully extend all leading edge slats (1 thru 6) while the leading edge flaps remain extended.

(3) If hydraulic system A pressure drops below 2000 psi, the flap and slat actuator blocking valves will hydraulically lock the actuator in the position at which the loss of pressure occurred. This locking action prevents aerodynamic blowback of the leading edge flaps and slats.

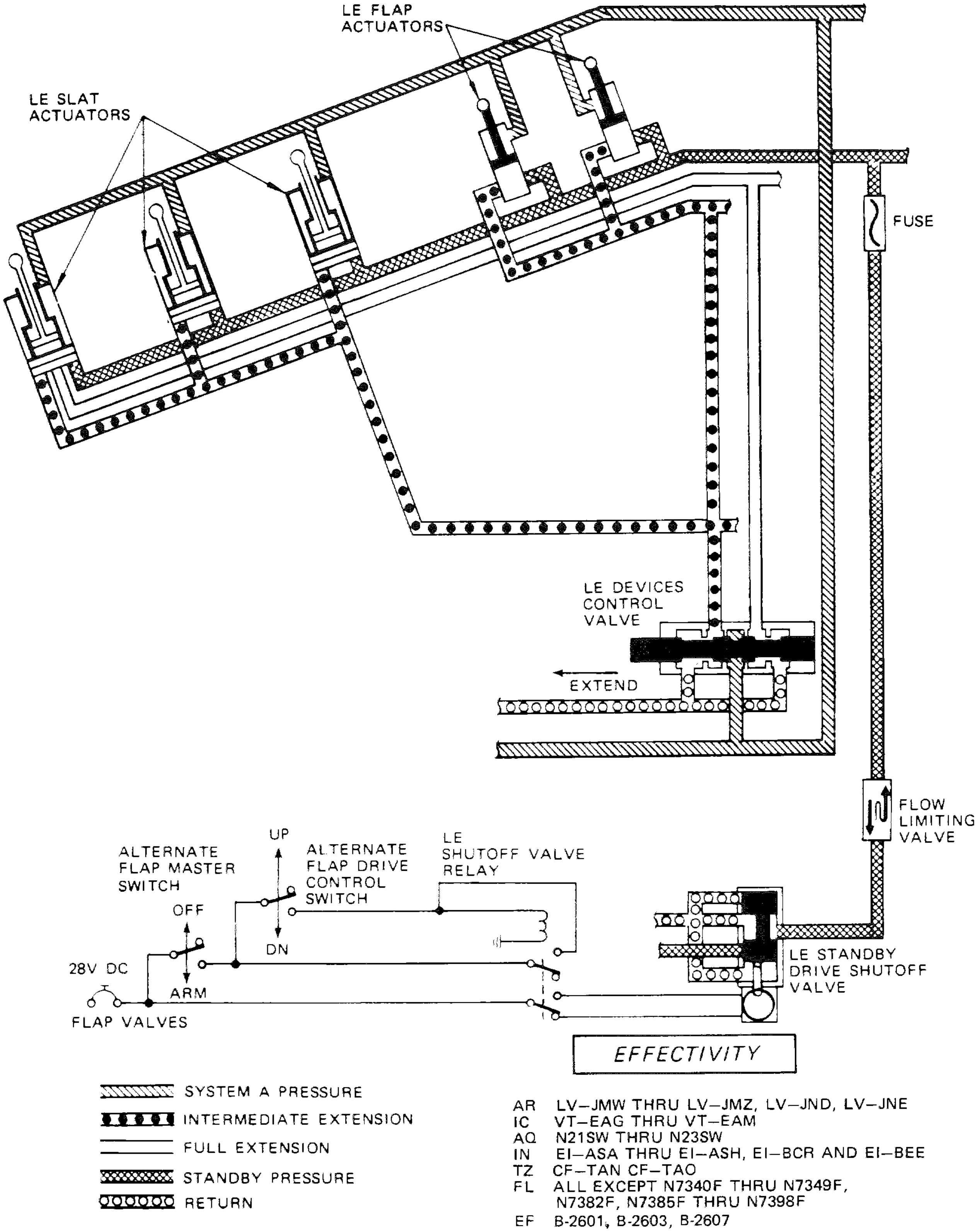
B. Retraction of the trailing edge flaps also retracts the leading edge flaps and slats.

(1) On NH JA8401 thru JA8411; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC VT-EAG thru VT-EAM; FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F; AQ N21SW thru N23SW, as the trailing edge flaps retract to the 25- to 30-unit range, the leading edge flap and slat control valve moves to its intermediate position. This retracts the leading edge slats 1 and 6 to the intermediate position, while leading edge flaps, and slats 2, 3, 4, and 5 remain fully extended.

(2) On NH ALL EXCEPT JA8401 thru JA8411; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC ALL EXCEPT VT-EAG thru VT-EAM; FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F; AQ ALL EXCEPT N21SW thru N23SW, as the trailing edge flaps retract to the 5- to 10-unit range, the leading edge flap and slat control valve moves to its intermediate position. This retracts all leading edge slats (1 thru 6) to the intermediate position while the leading edge flaps remain fully extended.

(3) Further retraction of the trailing edge flaps to the 0- to 1-unit range closes the leading edge flap and slat control valve, retracting all leading edge flaps and slats.

C. The standby hydraulic system will extend the leading edge flaps and slats if system A hydraulic pressure is lost. The standby system is activated by the alternate flap master switch on the overhead panel. Actuation of the master switch to ARM energizes the standby system. Moving the alternate flap drive control switch to DOWN completes a circuit which opens the leading edge flap standby drive shutoff valve. Standby system hydraulic pressure opens the standby system blocking valve in each leading edge flap and slat actuator and extends the leading edge devices simultaneously. The leading edge flaps and slats will remain extended until system A hydraulic pressure is restored.



Leading Edge Flap and Slat Control System Hydraulic Schematic
Figure 4 (Sheet 1)

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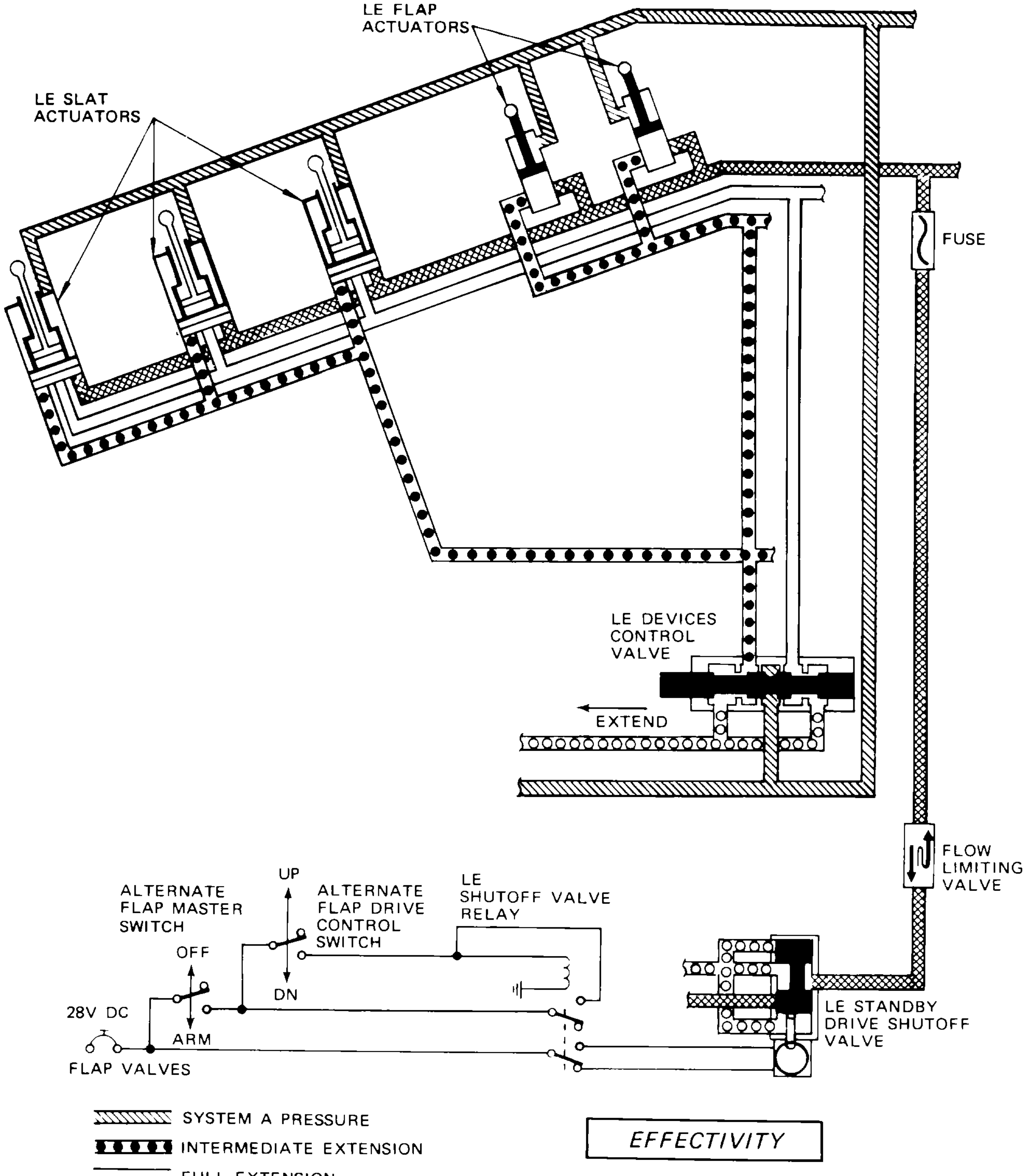


EFFECTIVITY

ML	ALL EXCEPT 9M–AOU THRU 9M–AOW, 9V–BBC, 9V–BBE
NH	ALL EXCEPT JA8401 THRU JA8411
AR	ALL EXCEPT LV–JMW THRU LV–JMZ, LV–JND, LV–JNE
IC	ALL EXCEPT VT–EAG THRU VT–EAM
AQ	ALL EXCEPT N21SW THRU N23SW
FL	N7340F THRU N7349F, N7382F, N7385F, N7391F THRU N7398F

Leading Edge Flap and Slat Control System Hydraulic Schematic
Figure 4 (Sheet 2)

LEADING EDGE FLAPS AND SLATS - TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Leading edge flaps and slats fail to extend during normal system operation	Defective leading edge flap and slat control valve	Remove lower pan from flap control unit and disconnect adjustment link from cam follower arm. Manually actuate valve and check leading edge flap operation. If flaps fail to extend -	Replace leading edge flap and slat control valve (AMM 27-81-81/401, Leading Edge Flap and Slat Control Valve)
Leading edge flaps and slats fail to extend during alternate system operation	No hydraulic pressure at leading edge standby shutoff valve	Check that standby hydraulic system low pressure warning light is extinguished. If light is illuminated, refer to AMM Chapter 29, Hydraulic System Troubleshooting	
	No dc power leading edge standby shutoff valve	Remove connector from leading edge standby shutoff valve and check for 28 volts dc. If power is not available, check wiring from valve to power source for open circuit	Repair wiring as required
	Leading edge standby shutoff still in normal (closed) position (Position 1)	Check that FLAP VALVES circuit breaker is closed and that alternate flap master switch is at ARM. Check for power at standby shutoff valve. If power is present, valve is defective	Replace standby shutoff valve (AMM 27-81-91/401, Leading Edge Standby Valve)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Leading edge flaps and slats do not extend or retract at specified trailing edge flap angle	Leading edge flap and slat control valve out of adjustment	Retract trailing edge flaps to FLAP UP position. Remove lower pan from flap control unit and install rigging pin	Adjust leading edge flap and slat control valve

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
One or more leading edge surfaces operate slowly	Defective leading edge flap or slat actuator	Check time required for flaps and slats to extend from faired position. Check time required for flaps and slats to retract from down to faired position (Ref Leading Edge Flap and Slat System - A/T)	Replace leading edge flap or slat actuator (Ref 27-81-31, R/I or 27-81-41, R/I)
Leading edge flap droops excessively with hydraulic pressure off	Defective leading edge flap actuator	With hydraulic system A depressurized, measure gap between lower surface of flap trailing edge and adjacent wing skin lower surface. If after one minute, gap exceeds 2.0 inches for new or overhauled actuators or 4.0 inches for inservice actuators, actuator is defective. Longer times with hydraulic pressure off may result in much bigger gaps.	Replace leading edge flap actuator (Ref 27-81-31, R/I)
Uncommanded leading edge device extension through standby system with hydraulic system A depressurized	Leading edge standby drive shutoff valve is open due to one of the following:	Keep leading edge extended by maintaining standby hydraulic pressure using standby rudder switch. Pressurize hydraulic system A and position flap control lever to FLAPS UP. Position alternate flap drive control switch and alternate flap master switch to OFF position. Open flap shutoff valve circuit breaker (P6-2 panel) and position flap shutoff valve position lever midway between position 1 (OPEN) and position 2 (CLOSED). Close flap shutoff valve circuit breaker and check for the following:	
	Continuity between pins B1 and B2 on leading edge standby drive shutoff valve relay K3	Flap shutoff valve position lever moves to position 1 (OPEN)	Replace leading edge standby drive shutoff valve relay K3

Leading Edge Flaps and Slats - Adjustment/Test
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Uncommanded leading edge device extension through standby system with hydraulic system A depressurized (Cont)	No continuity from P6-2 panel through pins B2 and B3 to ground	Flap shutoff valve position lever does not move to position 1 (open) or position 2 (CLOSED)	Replace leading edge standby drive shutoff valve relay K3. Complete systems test to check for continuity
	Separation between ball valve and valve motor	Flap shutoff valve position lever moves to position 2 (CLOSED) and leading edge do not retract	Replace leading edge drive shutoff valve (Ref 27-81-91, R/I)
	Wires crossed at flight control module of shutoff valve connector	On shutoff valve connector, check for 28V dc power at pin 2 and no power at pin 3. If otherwise -	Repair airplane wiring

Leading Edge Flaps and Slats - Adjustment/Test
Figure 101 (Sheet 2)

LEADING EDGE FLAPS AND SLATS - MAINTENANCE PRACTICES

1. General
   A. Hydraulic systems A and B and the standby hydraulic system must be depressurized prior to performing maintenance on leading edge flap and slat control system components. This is to prevent injury to personnel, resulting from inadvertent operation of the control system while maintenance is being performed. Care must be exercised to locate maintenance stands and items of ground equipment beyond the limits of travel of leading edge flaps and slats and trailing edge flaps.

      WARNING: PRESSURIZING HYDRAULIC SYSTEMS FOR OPERATION OF THE LEADING EDGE FLAPS AND SLATS ALSO PERMITS OPERATION OF THE TRAILING EDGE FLAPS AND GROUND SPOILERS SIMPLY BY MOVING THE RESPECTIVE CONTROLS. OTHER FLIGHT CONTROL SYSTEMS MAY BE ISOLATED BY SHUTOFF VALVES. ISOLATE OR TAG ALL FLIGHT CONTROL SYSTEMS NOT BEING TESTED AND ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF CONTROL SURFACES BEFORE APPLYING HYDRAULIC POWER.

   B. Hydraulic system B electric pumps are used to pressurize hydraulic systems A and B for operation of leading edge flaps and slats. This is to avoid the necessity of operating the engines to power the hydraulic system A engine-driven pumps.
   C. When operating hydraulic system B pumps to pressurize hydraulic systems A and B, the following requirements must be observed:
      (1) At least 1675 pounds (761 kilograms) of fuel is required in the No. 2 fuel tank to provide hydraulic fluid cooling. On hot days, or when fuel temperature is known to be above 90°F (32.2°C), monitor the system B overheat indicator and switch pumps off when overheat is indicated.
      (2) Intermittent system B pump operation is limited to five starts of any one pump in a 5-minute period. Following the fifth start, run pump for at least 5 minutes or turn pump off for a minimum of 30 minutes.
   D. The following procedures (par. 3 and 4) cover depressurization and pressurization of hydraulic systems A and B through operation of electrically driven hydraulic system B pumps only. Par. 5 provides instructions for the application of leading edge flap and slat locks to prevent extension and retraction of the leading edge flaps and slats.
2. Equipment and Materials
   A. Leading Edge Flap Actuator Locks - F80048-( )
   B. Leading Edge Slat Actuator Locks - F80048-( )
   C. Lock Assembly, Ground - F72735
   D. Lock Assembly - F80049-12 (Preferred) or F80049-1 (Optional)

3. Leading Edge Flaps and Slats Hydraulic Systems A and B Pressurization
   A. General
      (1) In the following procedure, hydraulic system B electric pumps are used to pressurize hydraulic systems A and B.
   B. Pressurize Leading Edge Flaps and Slats Hydraulic Systems A and B
      (1) Apply electrical power to airplane (AMM 24-22-0/201).
      (2) Set parking brake and install ground lock assembly in nose gear.
      (3) Position GRD INTERCONNECT switch on forward overhead panel to OPEN.
      (4) Position No. 1 or 2 system B HYD PUMPS switches on forward overhead panel to ON to pressurize hydraulic system A and B.
   C. Restore Airplane to Normal

      NOTE: Perform the following steps after completing the system maintenance that required pressurization.

      (1) Position No. 1 and 2 system B HYD PUMPS switches to OFF, to remove system A and B hydraulic power.
      (2) Position GRD INTERCONNECT switch to CLOSE.
      (3) Remove electrical power from airplane (AMM 24-22-0/201).
4. Leading Edge Flaps and Slats Hydraulic Systems A, B and Standby Depressurization
   A. General
      (1) Leading edge flaps and slats receive pressure through hydraulic systems A and B, and through the standby hydraulic system. All three hydraulic systems must be depressurized before maintenance is performed on leading edge components.
   B. Depressurize Leading Edge Flaps and Slats Hydraulic Systems A, B and Standby
      (1) Apply electrical power to airplane (AMM 24-22-0/201).
      (2) Open FLAP VALVES circuit breaker on P6 circuit breaker panel.
      (3) Ensure ALTERNATE FLAPS switch on forward overhead panel is OFF.
      (4) Ensure No. 1 and 2 system B HYD PUMPS switches on forward overhead panel are OFF.
      (5) Ensure GRD INTERCONNECT switch on forward overhead panel is positioned at CLOSE.
      (6) To dissipate remaining hydraulic power, cycle rudder pedals until rudder stops moving. Position FLT CONTROLS A switch to STBY RUD and cycle rudder again. Position FLT CONTROLS A and B switches to OFF.
      (7) If any hydraulic connections are to be disturbed, depressurize system A and standby hydraulic reservoirs (AMM 29-09-300/201).
      (8) Install lock on standby hydraulic module as follows (Fig. 201).
         (a) Disconnect electrical connector from leading edge devices shutoff valve at standby hydraulic module, located on aft bulkhead of main wheel well.

(b) Manually move override lever at leading edge devices shutoff valve to position 2.
(c) Install lock on shutoff valve and insert attaching lockpin.
(9) Remove electrical power to airplane (AMM 24-22-0/201).
C. Restore Airplane to Normal

NOTE: Perform the following steps after completing the system maintenance requiring depressurization.

(1) Apply electrical power to airplane (AMM 24-22-0/201).
(2) Remove lock from standby hydraulic module shutoff valve and reconnect electrical connector.
(3) Close FLAP VALVES circuit breaker.
(4) Return FLT CONTROLS A and B switches to ON.
(5) Safety wire FLT CONTROLS A and B switches in the ON position with annealed 0.020 inch diameter copper wire.
(6) Remove electrical power to airplane if no longer required (AMM 24-22-0/201).

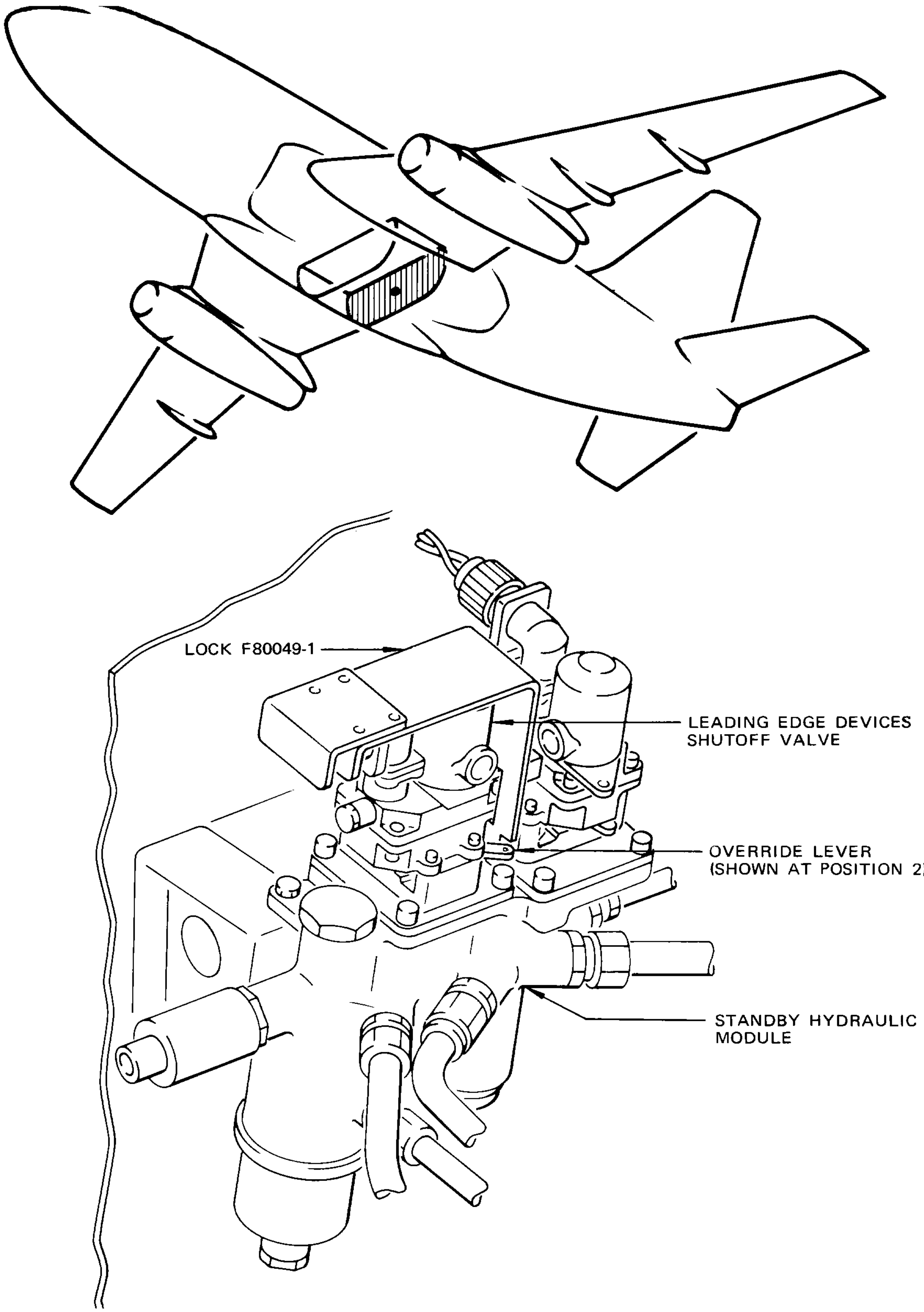
5. Leading Edge Flap And Slat Locks Application
A. Install leading edge flap and slat locks to prevent retraction of leading edge flaps and slats as follows:
(1) Provide system A hydraulic power (par. 3.B.).
(2) Position flap control lever to 40-degree detent to fully extend leading edge devices.
(3) Install leading edge flap and slat locks on extended leading edge flap and slat actuators.

WARNING: INSTALL LEADING EDGE FLAP AND SLAT LOCKS TO PREVENT INADVERTENT OPERATION OF LEADING EDGE FLAPS AND SLATS. FLAPS AND SLATS ARE FAST ACTING AND CAN CAUSE SERIOUS INJURY TO PERSONNEL.

(4) Remove system A hydraulic power (par. 3.C.).
B. Remove leading edge flap and slat locks as follows:
(1) Remove leading edge flap and slat locks from leading edge flap and slat actuators.

WARNING: LEADING EDGE FLAPS AND SLATS ARE FAST ACTING AND CAN CAUSE SERIOUS INJURY TO PERSONNEL.

(2) Provide system A hydraulic power (par. 3).
(3) Position flap control lever to FLAPS UP position to fully retract leading edge devices.
(4) Remove system A hydraulic power (par. 3.C.).



Hydraulic Module Lock Installation
Figure 201

C. Install lock assembly on standby hydraulic module to prevent extension of leading edge flaps and slats (Fig. 201).

NOTE: The leading edge control surfaces shutoff and bypass valve lock may be used to lock the leading edge devices in the retracted position. The lock is installed on the shutoff valve at the standby hydraulic module, located on the aft bulkhead of the main wheel well.

(1) Install lock on standby hydraulic module as follows:
 (a) Check that alternate flap master switch is in OFF position and tag switch DO NOT OPERATE.
 (b) Disconnect electrical connector from leading edge devices shutoff valve.
 (c) Manually move override lever at leading edge devices shutoff valve to position 2.
 (d) Install lock on standby hydraulic module and insert attaching lockpin.

WARNING: INSTALL LOCKS TO PREVENT INADVERTENT OPERATION OF LEADING EDGE FLAPS AND SLATS. FLAPS AND SLATS ARE FAST ACTING AND CAN CAUSE SERIOUS INJURY TO PERSONNEL.

D. Restore airplane to normal.
(1) Remove lock assembly from standby hydraulic module as follows (Fig. 201).
 (a) Remove attaching lockpin and remove lock from standby hydraulic module.
 (b) Manually move override lever at leading edge devices shutoff valve to position 1.
 (c) Connect electrical connector to leading edge devices shutoff valve.
 (d) Remove DO NOT OPERATE tag from alternate flap master switch.
 (e) Provide System A hydraulic power (par. 3.B.).
 (f) Position flap control lever to UP to retract flaps and slats.
 (g) Remove system A hydraulic power (par. 3.C.).

LEADING EDGE FLAPS AND SLATS - ADJUSTMENT/TEST

1. General
   A. The trailing edge flap system must be adjusted and tested per 27-51-0, A/T prior to adjusting and testing the leading edge flap and slat system. Rigging of the leading edge flap and slat system consists of adjusting the leading edge flap and slat control valve, adjustment of the nose fairing linkage on each leading edge flap and adjusting each leading edge slat to the faired position.
   B. The leading edge flaps and slats may be adjusted in any condition with airplane on or off jacks, with no fuel or any amount of fuel in tanks. However, gap and mismatch tolerance are to be met under the same conditions that flaps and slats were adjusted.
   C. During slat extension or retraction tests, chatter or vibration of the surfaces, especially at low hydraulic operating pressures, is normal.
2. Test For Uncommanded Leading Edge Extension With Standby Hydraulic Power
   A. Provide electrical power.
   B. Provide system B hydraulic power (Ref. 27-81-0 MP).
   C. Set parking brake.
   D. Verify ALTERNATE FLAP master arming switch on forward overhead panel (P5) is in OFF position and switch guard is closed.
   E. Verify flap control lever is in FLAP UP detent with leading edge flaps and slats and trailing edge flaps retracted.
   F. If not, open GRD INTERCONNECT switch (P5 panel) to pressurize system A hydraulic power. Place flap control lever to FLAP UP detent and verify leading edge flaps and slats and trailing edge flaps retract (Ref. 27-81-0 MP).
   G. Depressurize system A hydraulic power and system B hydraulic power (Ref. 27-81-0 MP).
   H. Close GRD INTERCONNECT switch (P5 panel) when residual pressure is less than 100 psi.
   I. Actuate A or B FLT CONTROL switch on forward overhead panel (P5) to STDBY RUD position.
      (1) Check that STANDBY HYD LOW PRESSURE light comes on.
      (2) Check that standby hydraulic pump starts and that STANDBY HYD LOW PRESSURE light goes off.
   J. Observe leading edge flaps and slats for 60 seconds. Verify that flaps and slats do not extend.
      Note: Leading edge flaps may slowly extend due to gravity.
   K. Return FLT CONTROL switch on pilot's forward overhead panel (P5) to ON position.
   L. Remove electrical power.

3. Leading Edge Flaps and Slats Adjustment

A. General

(1) Three rigging pins are used in the trailing edge flap system. One of these rigging pins is used when adjusting the leading edge flap and slat system.

(2) Leading edge flaps and slats will be properly adjusted when the following conditions are met.

(a) Leading Edge Flap Control Valve

1) With flaps hydraulically retracted, valve slide shall align with indexing surface within + 0.010 inch (Fig. 501). If not, this condition may be met by adjusting leading edge link in right wheel well per par. 2.(c)(2).

(b) Leading Edge Flaps (If conditions listed are not met see par. 2.(c)(3) for adjustment.)

1) With leading edge flaps extended, flap nose shall seat firmly on pads as shown in Fig. 502.

2) With leading edge flaps retracted hydraulically, the trailing edge of each flap shall fair with fixed wing structure within + 0.02 inch for 75% of flap span and within + 0.04 inch for remaining 25% of span.

3) With leading edge flaps retracted hydraulically, gaps between edge of flaps and wing structure shall be 0.06 to 0.12 inch.

4) Gap between adjacent flaps shall be 0.06 to 0.15 inch at all flap positions.

(c) Leading Edge Slats (If conditions listed are not met see par. 2.C.(4) for adjustment.)

1) With slat retracted, the following gaps and mismatches should be checked as shown in Fig. 504:

a) Slat trailing edge upper and lower gap

b) Slat trailing edge upper and lower surface mismatches

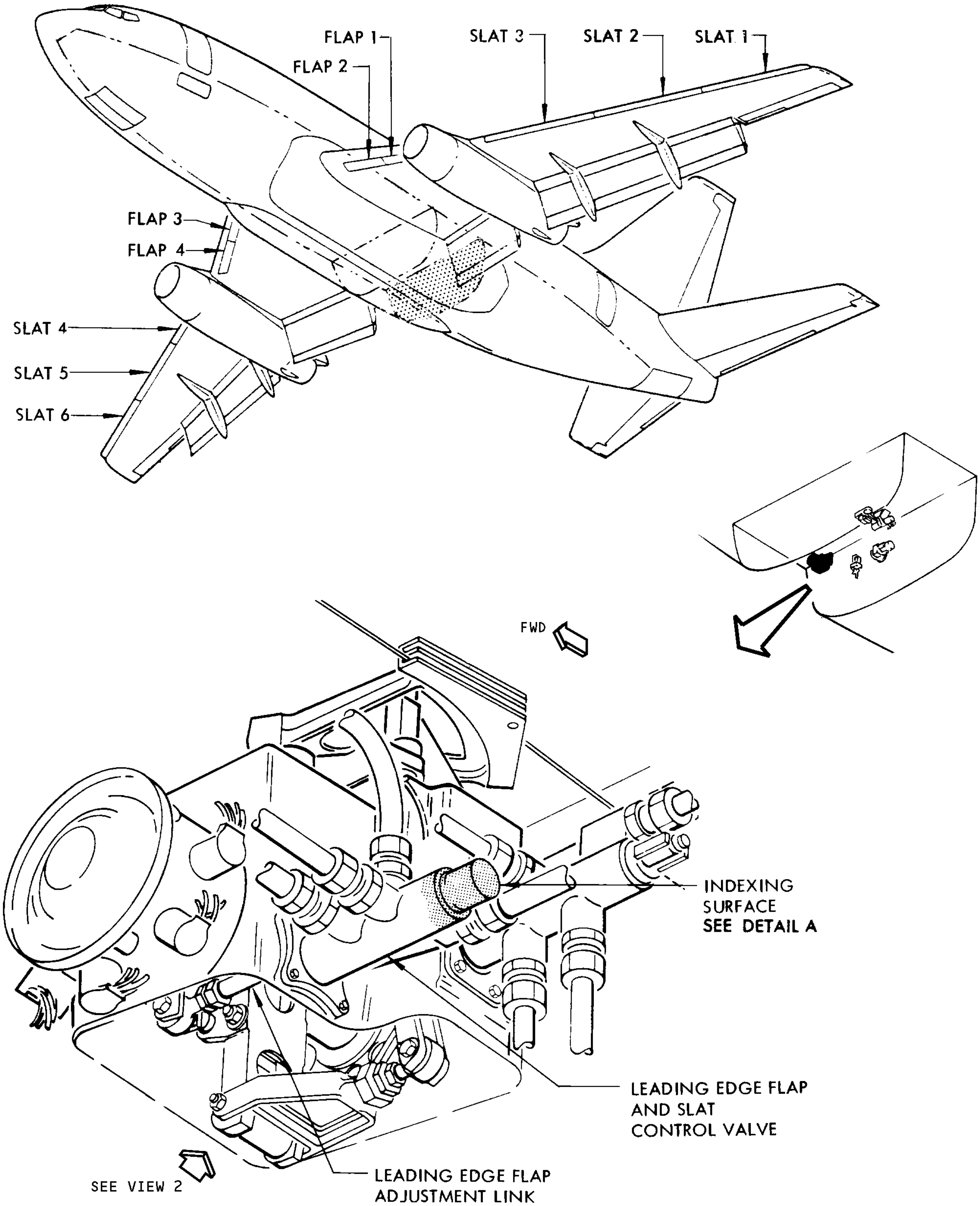
c) Slat leading edge mismatch between adjacent slats or slats and structure

2) With leading edge slats retracted, actuator door and thermal anti-icing tube door shall firmly contact structure on all edges.

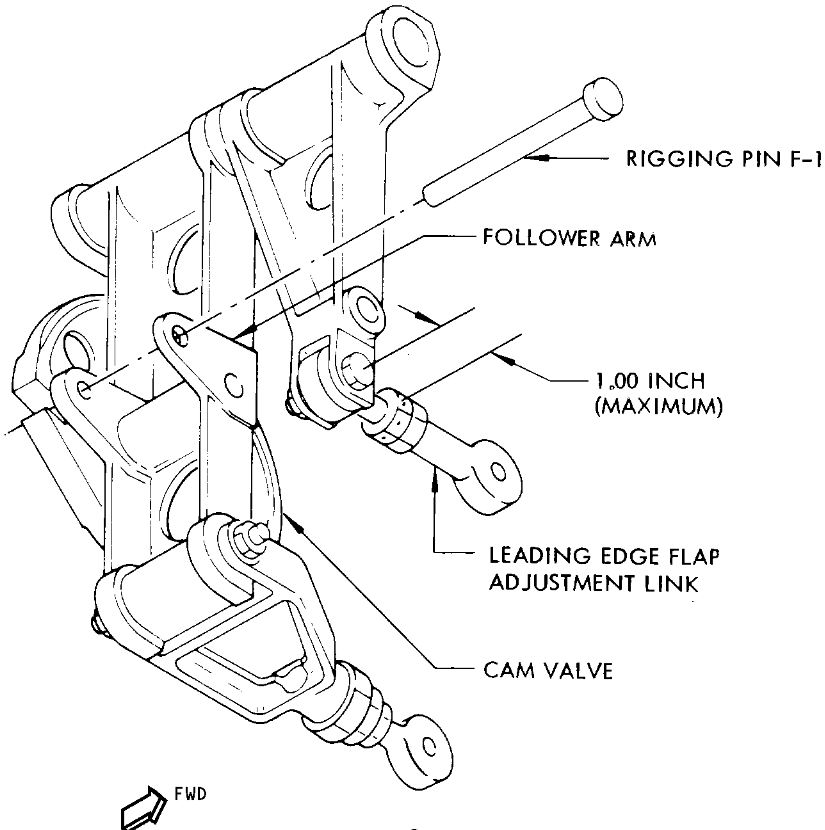
3) On AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, with slats extended to intermediate position, check that slat leading edge mismatch is as shown in Fig. 505.

NOTE: Extend slats forward to bring auxiliary track roller into contact with detent of detent arm before measuring leading edge mismatch.

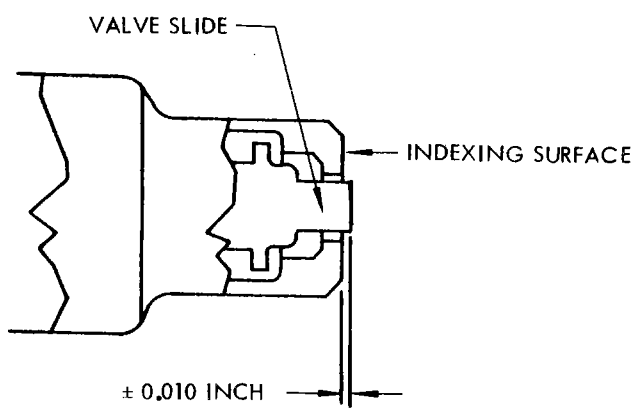
4) With slats in intermediate position, check that slat trailing edge gap is as shown in Fig. 505.



Leading Edge Flap and Slat Control Valve Adjustment
Figure 501 (Sheet 1)



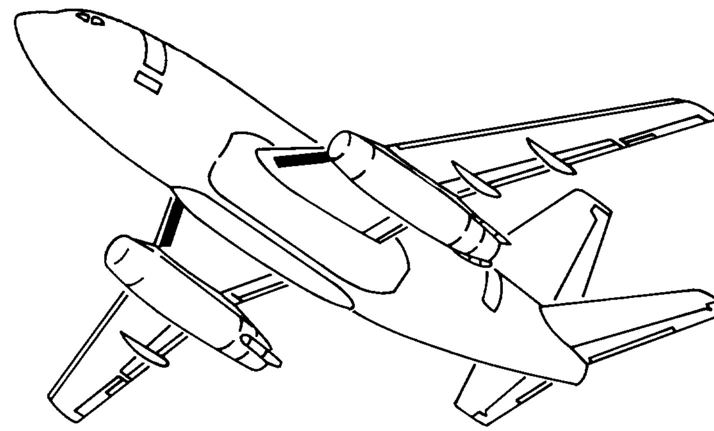
VIEW 2

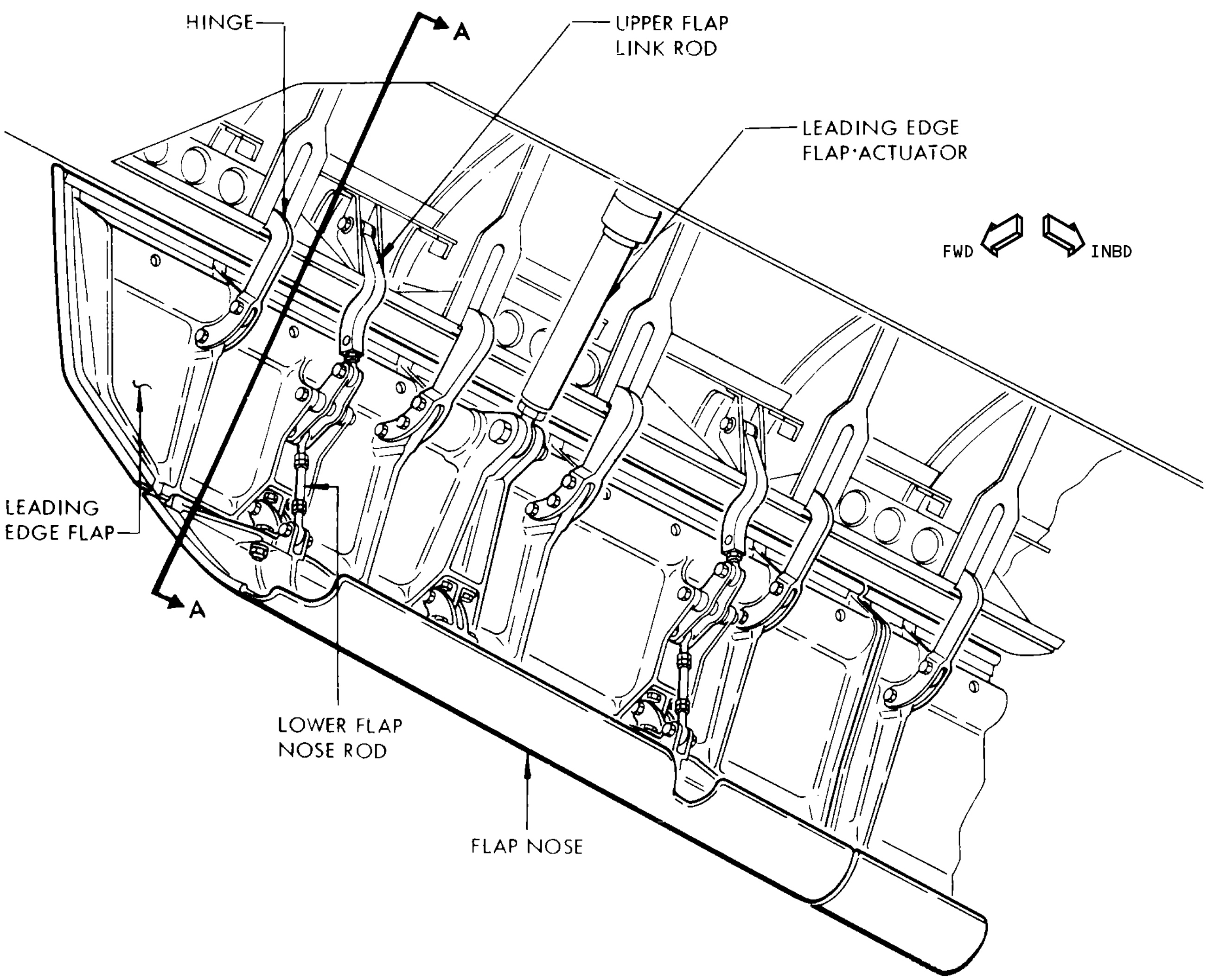


DETAIL A

Leading Edge Flap and Slat Control Valve Adjustment
Figure 501 (Sheet 2)

EFFECTIVITY	
AR	LV-JMW THRU LV-JMZ, LV-JND, LV-JNE
IC	VT-EAG THRU VT-EAM
AQ	N21SW THRU N23SW
IN	EI-ASA THRU EI-ASH
TZ	CF-TAN, CF-TAO
FL	ALL EXCEPT N7382F, N7385F





Leading Edge Flap Nose Linkage Adjustment
Figure 502 (Sheet 1)

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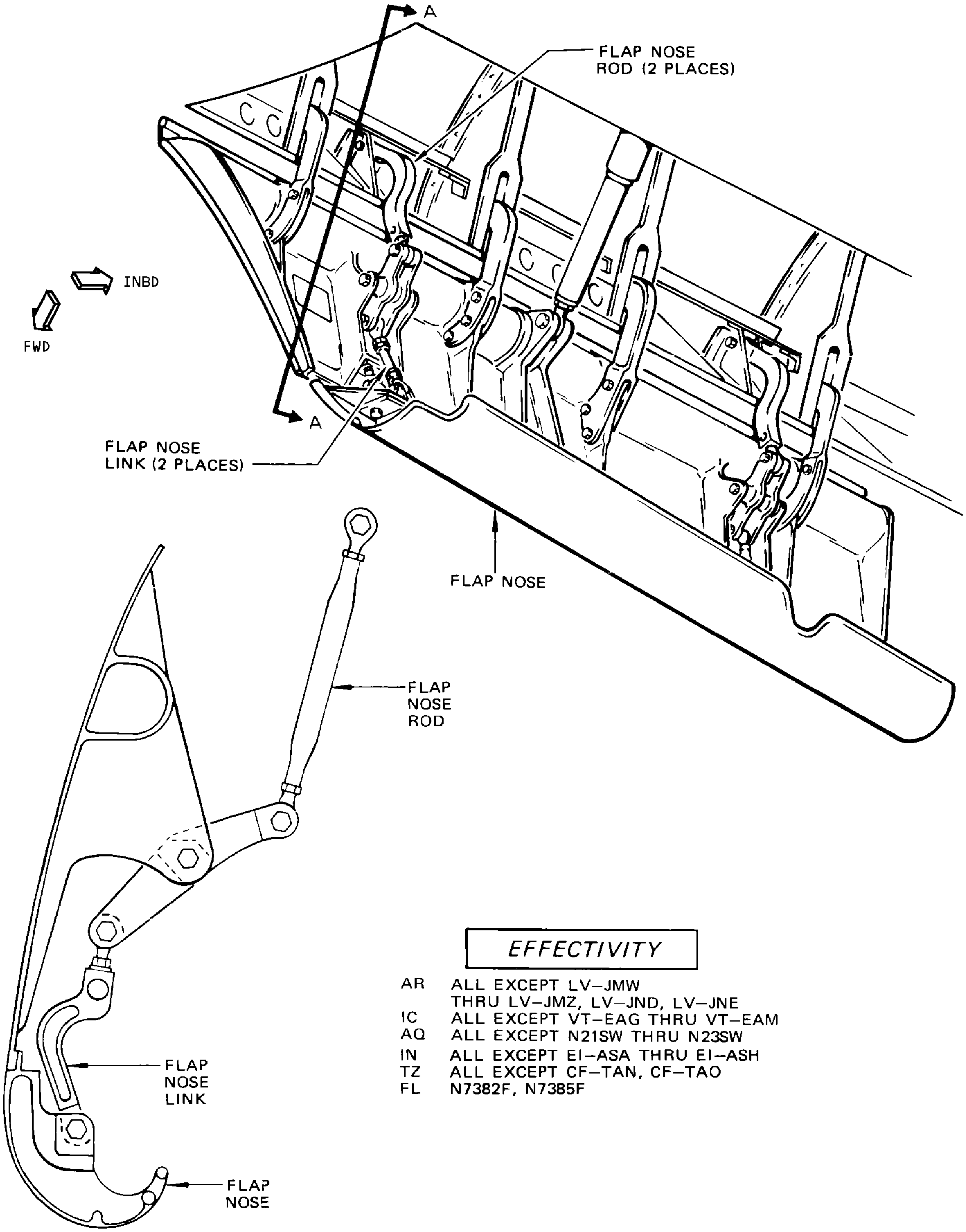
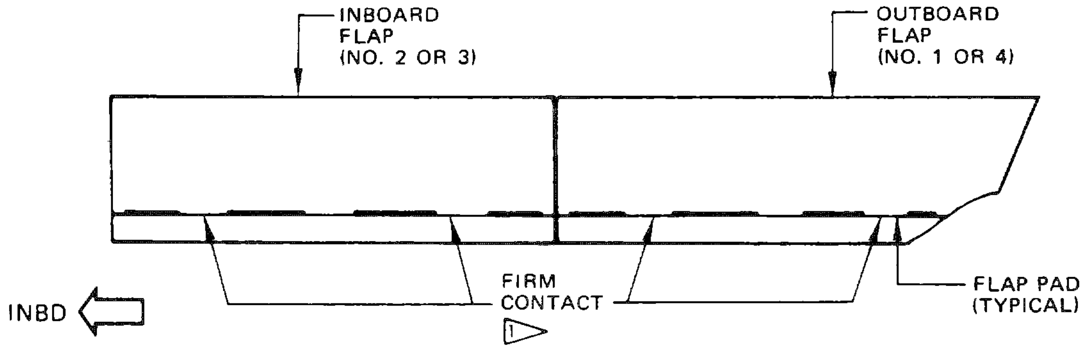


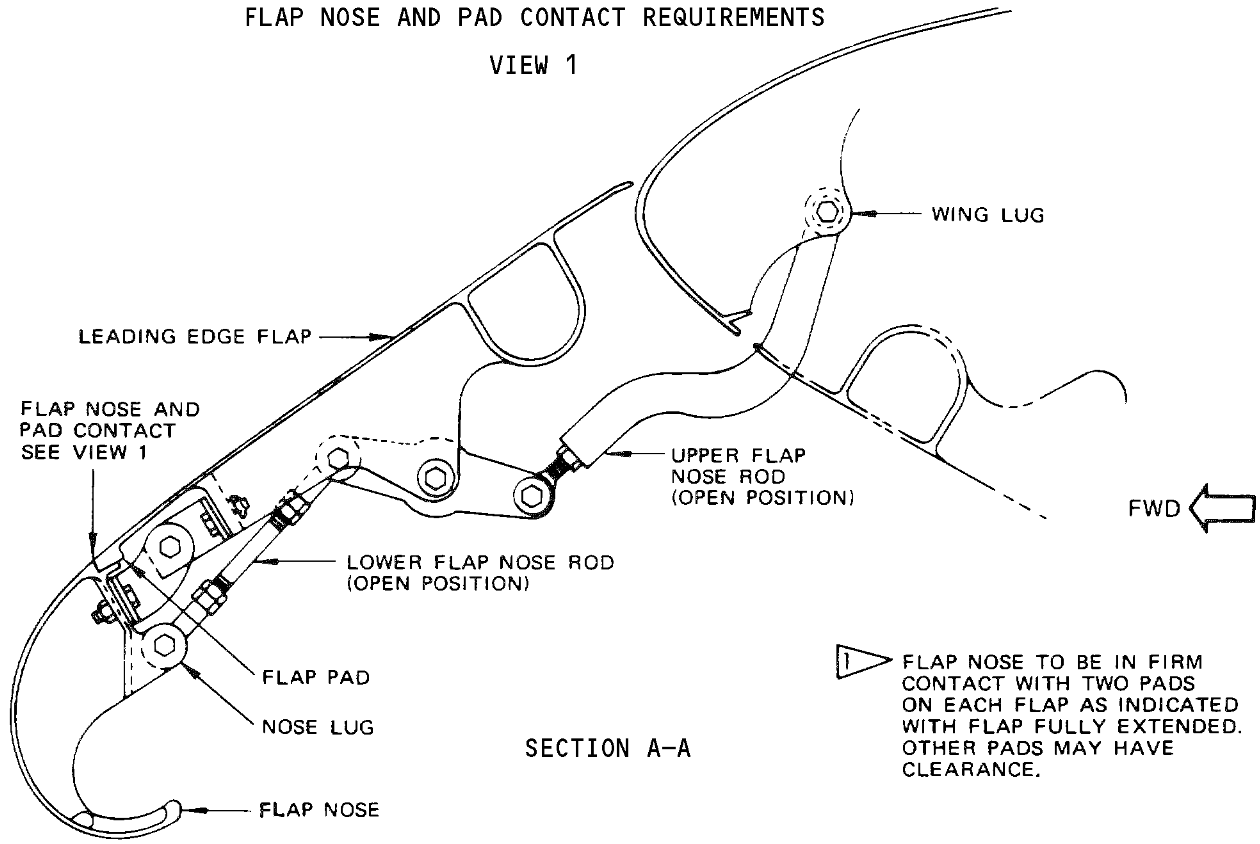
EFFECTIVITY	
AR	ALL EXCEPT LV-JMW THRU LV-JMZ, LV-JND, LV-JNE
IC	ALL EXCEPT VT-EAG THRU VT-EAM
AQ	ALL EXCEPT N21SW THRU N23SW
IN	ALL EXCEPT EI-ASA THRU EI-ASH
TZ	ALL EXCEPT CF-TAN, CF-TAO
FL	N7382F, N7385F

Leading Edge Flap Nose Linkage Adjustment
Figure 502 (Sheet 2)



FLAP NOSE AND PAD CONTACT REQUIREMENTS

VIEW 1



SECTION A-A

1 FLAP NOSE TO BE IN FIRM CONTACT WITH TWO PADS ON EACH FLAP AS INDICATED WITH FLAP FULLY EXTENDED. OTHER PADS MAY HAVE CLEARANCE.

TABLE 1

		INBOARD END OF FLAP	OUTBOARD END OF FLAP
LE FLAP NO. 1 OR 4	LENGTH OF LOWER NOSE ROD	5.24	5.24
LE FLAP NO. 2 OR 3	LENGTH OF LOWER NOSE ROD	4.92	4.51

EFFECTIVITY

AR LV-JMW THRU LV-JMZ, LV-JND, LV-JNE
ML 9M-AOU THRU 9M-AOW, 9V-BBC, 9V-BBE
NH JA8401 THRU JA8411
TM CR-BAA, CR-BAB
ND CF-NAB THRU CF-NAQ

Leading Edge Flap Nose Linkage Adjustment
Figure 502 (Sheet 3)

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5) With leading edge slats fully extended (slats 1 and 6 on AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, check that slat trailing edge gap is as shown in Fig. 506.

B. Equipment and Materials
  (1) Rigging Pin No. F-1 - 0.311 +0.000/-0.002-inch diameter x 1.65 ±0.06-inch length (MS20392-4)

  <u>NOTE</u>: Rigging pin is part of kit F70207-3, -52, -61, or -84.

  (2) Leading edge flap actuator locks
    (a) F80048-89, -90 (Preferred) or -84 (Optional), for use on leading edge flaps only
  (3) Leading edge slat actuator locks (AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE)
    (a) F80048-58, for use on No. 1 and 6 slats only
    (b) F80048-59, for use on No. 3 and 4 slats only
    (c) F80048-60, for use on No. 2 and 5 slats only
  (4) Leading edge slat actuator locks (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE)
    (a) F80048-79, for use on No. 1 and 6 slats only
    (b) F80048-57, for use on No. 2 thru 5 slats
  (5) Aerodynamic Smoother - BMS 5-79, Class B (AMM 20-30-11/201)

C. Adjust Leading Edge Flaps and Slats
  (1) Prepare System for Adjustment
    (a) Remove fixed leading edge access panels and slat track access panels.
    (b) Connect electrical power to airplane.
    (c) Provide system A hydraulic power. Refer to 27-81-0, Leading Edge Flaps and Slats - Maintenance Practices.
  (2) Adjust Leading Edge Flap Control Valve
    (a) Position flap control lever to FLAPS UP detent position.
    (b) After 5 minutes, depressurize hydraulic system A. Refer to 27-81-0.
    (c) Remove lower pan from flap control unit.
    (d) Check that rigging pin F-1 fits freely in the flap control unit. If rigging pin F-1 does not fit, the trailing edge flap system is not properly adjusted. Refer to 27-51-0, Trailing Edge Flap System - Adjustment/Test for adjustment procedure.
    (e) Check that valve slide and indexing surface of leading edge flap control valve align within ±0.010 inch (Fig. 501). If not, adjust leading edge link as follows:
      1) Remove lockwire and loosen checknut.
      2) Remove rod end bolt at cam follower arm.
      3) Turn rod end in 1/2-turn increments to obtain adjustment.

4) Install rod end bolt and check that valve slide and indexing surface align within ± 0.010 inch.
5) Secure rod end bolt with washer and locknut.
6) Tighten checknut and install lockwire.
7) Ensure that thread engagement of rod end is within limits.

(f) Remove rigging pin F-1, and install lower pan on flap control unit.

(3) Adjust Leading Edge Flaps

(a) Provide system A hydraulic power, and position flap control lever to 1 unit detent position. Refer to 27-81-0.

(b) Depressurize hydraulic system A. Refer to 27-81-0.

(c) Install leading edge flap actuator locks on all leading edge flaps except flap to be rigged.

NOTE: Each flap must be individually adjusted while the remaining flaps are held open.

(d) On AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; SQ 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE; NH JA8401 thru JA8411; TM CR-BAA, CR-BAB; FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F;
check that flap nose is in firm contact with two pads indicated in Fig. 502, view 1. If not, adjust as follows:
1) Disconnect lower flap nose rods from lugs on flap nose and adjust rod length per table I (Fig. 502).
2) Connect both rods to lugs on flap nose.
3) Disconnect upper flap link rods from lugs on fixed leading edge structure.
4) Adjust link rods at 8.93 inches nominal on flaps No. 2 and 3, and 8.08 inches nominal on flaps No. 1 and 4, so that flap nose is in firm contact with two pads indicated in view 1, Fig. 502. Connect to lugs on fixed wing structure. Ensure that bolt can be installed freely.
5) Disconnect one lower nose rod from lug on leading edge flap.
6) Provide system A hydraulic power and modulate hydraulic pressure and flow so that the leading edge flap can be operated slowly (Ref 27-81-0).
7) Position flap control lever to FLAP UP position to retract flap.

CAUTION: TO PRECLUDE STRUCTURAL DAMAGE, MONITOR FLAP NOSE CLEARANCE DURING RETRACTION.

8) Carefully check clearance between flap nose and fixed wing structure. If flap contacts structure, lower flap, depressurize hydraulic system and lengthen both upper and lower nose rods at each end of flap, upper rod first.
9) Repeat steps 6) thru 8) if adjustments are made.
10) If flap nose does not contact structure, reconnect lower nose rod to lug on flap nose with flap retracted. Rod end may have to be adjusted slightly to connect rod to lug.
11) Check that flap nose does not contact lower nose rod or flap structure in flap retracted position. If there is contact, extend flaps, depressurize hydraulic system A and shorten upper rod end as required.
12) If flap nose does not contact rods, extend flaps and check position of flap nose in open position. Adjust lower rods as necessary to seat flap nose on pads.

<u>NOTE</u>: Both upper and lower rods must be adjusted to correct for large discrepancies. To increase nose travel lengthen both rods, to decrease nose travel shorten both rods.

13) Repeat step 11) if flap nose is adjusted.
14) Cycle flaps open and closed to check structural clearance between flap nose and wing structure, leading edge flap actuator and nose linkage.

<u>CAUTION</u>: CLEARANCE MUST BE VERIFIED TO ENSURE PROPER FLAP OPERATION AND TO PREVENT ANY STRUCTURAL DAMAGE.

15) Extend flaps, depressurize hydraulic system, lockwire both flap nose rod and link rod (Ref 27-81-0).
16) Repeat procedure on all leading edge flaps.
17) Remove all leading edge flap actuator locks.
18) Check leading edge flap to wing mismatch and gaps as follows:
    a) Provide system A hydraulic power (Ref 27-81-0).
    b) With flaps extended and flap actuators pressurized, check that mismatch between adjacent flaps does not exceed 0.20 inch.
    c) Position flap control lever to FLAPS UP to retract flaps.
    d) Check that trailing edge of each leading edge flap fairs with wing structure within ± 0.02 inch for 75% of flap span and within ± 0.04 inch for 25% of span (Fig. 503). Actuators shall be pressurized while checking mismatch.

e) Check that leading edge of each flap fairs with wing structure within +0.00 to -0.10 inch.
f) Check gap between flap and fixed wing structure is 0.06 to 0.12 inch at ends and trailing edge of flap.
g) Check that gap between seal on leading edge of flap, and seal attached to wing structure, is within the limits specified in detail A, figure 503. If seal was adjusted to satisfy gap requirement fill void between seal and flap leading edge with aerodynamic smoother.
h) With flaps fully retracted, check that gap between adjacent flaps i s 0.06 to 0.15 inch except for aft 5 inches of flap which should be 0.06 to 0.25 inch. Ensure that gap remains in tolerance at all positions of flap travel. Gap is defined as metal to metal clearance.

(e) On airplanes ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD ALL EXCEPT 5R-MFA; NH ALL EXCEPT JA8401 thru JA8411; PV ALL EXCEPT CF-EPL, CF-EPO and CF-EPR; TM ALL EXCEPT CR-BAA and CR-BAB; VP ALL EXCEPT PP-SMA thru PP-SME, refer to 27-81-12, Leading Edge Flaps - Removal/Installation for flap adjustment.

(4) Adjust Leading Edge Slats
(a) Provide system A hydraulic power. Refer to 27-81-0.
(b) Position flap control lever to FLAP UP detent position to retract flaps and slats.
(c) Depressurize hydraulic system A. Refer to 27-81-0.

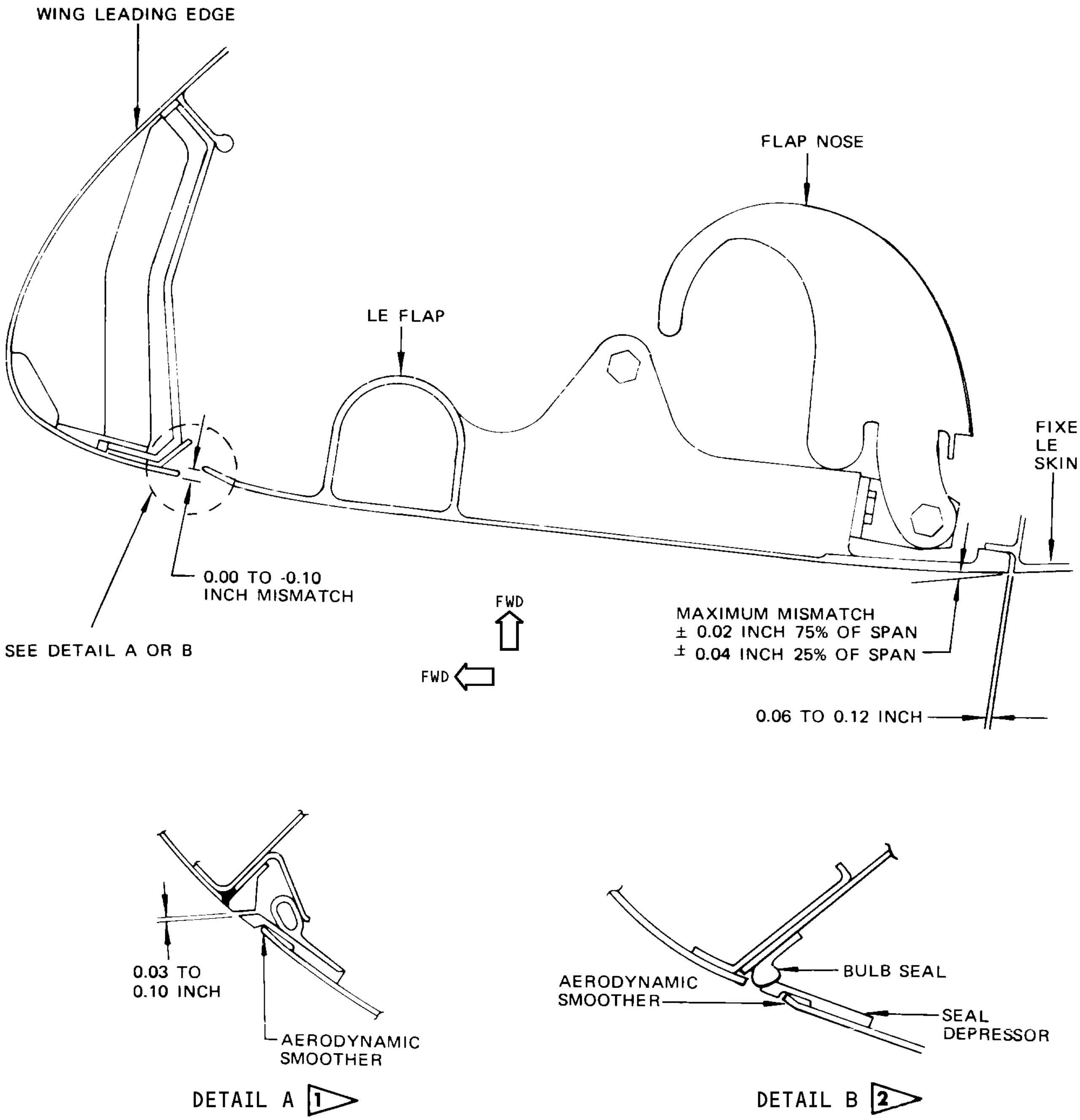
WARNING: ALL ADJUSTMENTS WILL BE ACCOMPLISHED WITH HYDRAULIC SYSTEM DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL OR COMPONENT DAMAGE.

(d) Deleted.
(e) Check that slat trailing edge upper and lower gaps are as shown in figure 504. If not, adjust upstops (figure 506) to obtain proper gap.

NOTE: After obtaining correct upper and lower gaps, the center upstop on the slat should be backed off one serration from contact with the slat fitting.

(f) Check that slat trailing edge lower surface mismatch is as shown in Fig. 504.

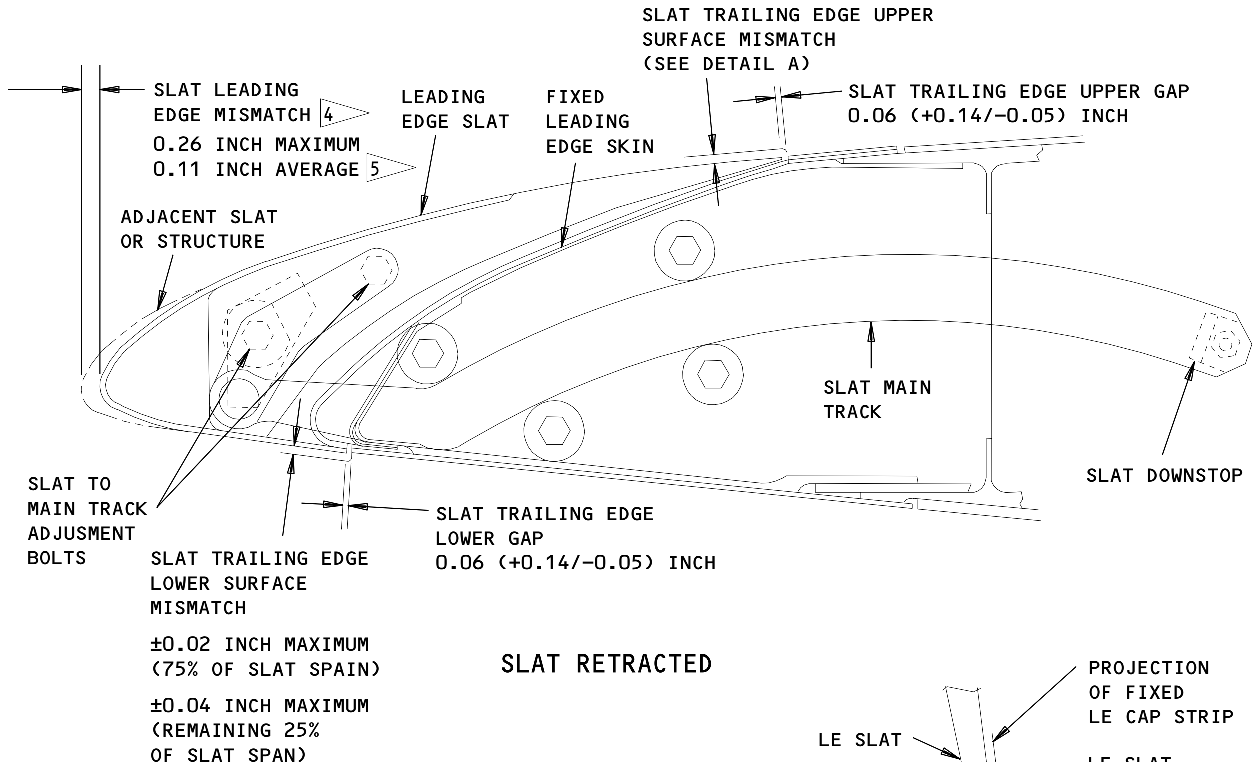
NOTE: Mismatch refers to a step in either direction.



1 PW 731 THRU 734, 762, 772
AR LV–JMW THRU LV–JMZ, LV–JND, LV–JNE
IC VT–EAG THRU VT–EAM
AQ N21SW THRU N23SW

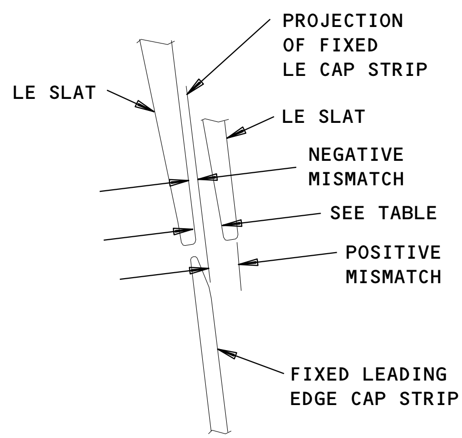
2 ALL EXCEPT 1

Leading Edge Flap Gap and Mismatch Requirements
Figure 503



SLAT RETRACTED

TRAILING EDGE UPPER SURFACE MISMATCH			
LOCATION ON SLAT SPAN	MAXIMUM MISMATCH (INCHES)		AVERAGE 3 MISMATCH (INCHES)
	AIRPLANES 1	AIRPLANES 2	AIRPLANES 1
WITHIN 30 INCHES OF SLAT END	0.19	0.16	0.05
ENTIRE SPAN EXCEPT 30 INCHES AT EACH END	0.07	0.05	0.05
AUXILIARY TRACKS	——	0.02	——



DETAIL A
(ROTATED 90 DEGREES)

1 AP N460AC
CI B-1870, B-1872, B-1874
BO N23SW
AR LV-LMW THRU LV-JMZ, LV-JND, LV-JNE
SQ 9V-BFD

2 ALL EXCEPT 1

3 OBTAIN AVERAGE MISMATCH BY RECORDING MISMATCH AT 6-INCH INTERVALS ALONG SLAT SPAN AND AVERAGING THE READINGS

4 MISMATCH IS MEASURED AT ENDS OF ADJACENT SLATS

5 OBTAIN AVERAGE MISMATCH BY RECORDING MISMATCH BETWEEN SLAT ENDS AND AVERAGING THE READINGS

Leading Edge Slat Gap and Mismatch Tolerances
Figure 504

(g) If mismatch exceeds limits specified, extend slat and adjust by loosening slat adjustment bolts at main tracks and reposition serrated washers. Make sure that serrations are properly aligned, then tighten bolts to 60-85 pound-inches. Install cotter pins if castellated nuts are used with drilled shank bolts.

WARNING: INSTALL LEADING EDGE SLAT ACTUATOR LOCKS AS REQUIRED WHEN ADJUSTING SLATS TO PREVENT INJURY TO PERSONNEL.

(h) Check that slat trailing edge upper surface mismatch is as shown in Fig. 504.

NOTE: Mismatch refers to a step in either direction.

(i) If mismatch exceeds limits specified, adjust aft end of auxiliary tracks by loosening aft adjustment bolts and positioning track vertically. Ensure that serrations are properly aligned, then tighten bolts to 45-65 pound-inches. Install cotter pin if castellated nut is used with drilled shank bolt.

(j) Bend tabs at main tracks (if required) to fair tabs with wing structure.

(k) Lower slats to intermediate position.

(l) Check that slat trailing edge gap is as shown in Fig. 505. If gap exceeds limits specified, adjust by loosening forward auxiliary track adjustment bolt and adjusting track as required. Ensure that serrations are properly aligned, then tighten bolt to 45-65 pound-inches. Install cotter pin if castellated nut is used.

NOTE: On slats with detent arm rollers maintain roller to detent arm clearance shown in figure 505 when measuring trailing edge gap.

(m) If track roller to detent arm clearance shown in Fig. 505 cannot be met while adjusting trailing edge gap, loosen both forward and aft adjustment bolts on track and position track as required. Ensure that serrations are properly aligned, then tighten bolts. Install cotter pins if castellated nuts are used.

(n) Provide system A hydraulic power (Ref 27-81-0).

(o) Position flap control lever in FLAP UP detent to retract flaps.

(p) Recheck slat trailing edge upper surface mismatch per Fig. 504 if adjustments were made to obtain required track roller to detent arm clearance. If mismatch exceeds limits specified, adjust aft end of auxiliary tracks by loosening aft adjustment bolt and positioning track vertically. Ensure that serrations are properly aligned, then tighten bolt 45 to 65 pound-inches. Install cotter pin if castellated nut is used.

(q) Position flap control lever to 30-unit position to fully extend slats.

(r) On 3-position slats, check that trailing edge gap is as shown in Fig. 506. If gaps are not within limits, adjust auxiliary slat tracks per steps (l) and (m) as required to satisfy gap requirement in intermediate and full extended positions.

NOTE: Slats 1 and 6 are 3-position slats on AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA. On all other airplanes, all slats are 3-position.

(s) On 3-position slats, check that distance from top of detent arm ramp to track lower surface is 0.72 +0.13/-0.08 inch. If not, reposition stop (Fig. 507). Ensure that bottom of detent is above lower surface of track after stop is repositioned.

(t) Deflect detent arm so that top of ramp is aligned with track lower surface within 0.03 inch. Load required to deflect detent arm shall be within 70 to 85 pounds. If not, adjust support arm. Difference in load measured between each detent arm at any slat shall not exceed 3 pounds.

(u) Check that all adjustment nuts are tight. Install cotter pins if castellated nuts are used.

(v) Position flap control lever to FLAP UP detent to retract slats.

(w) Remove system A hydraulic power (Ref 27-81-0).

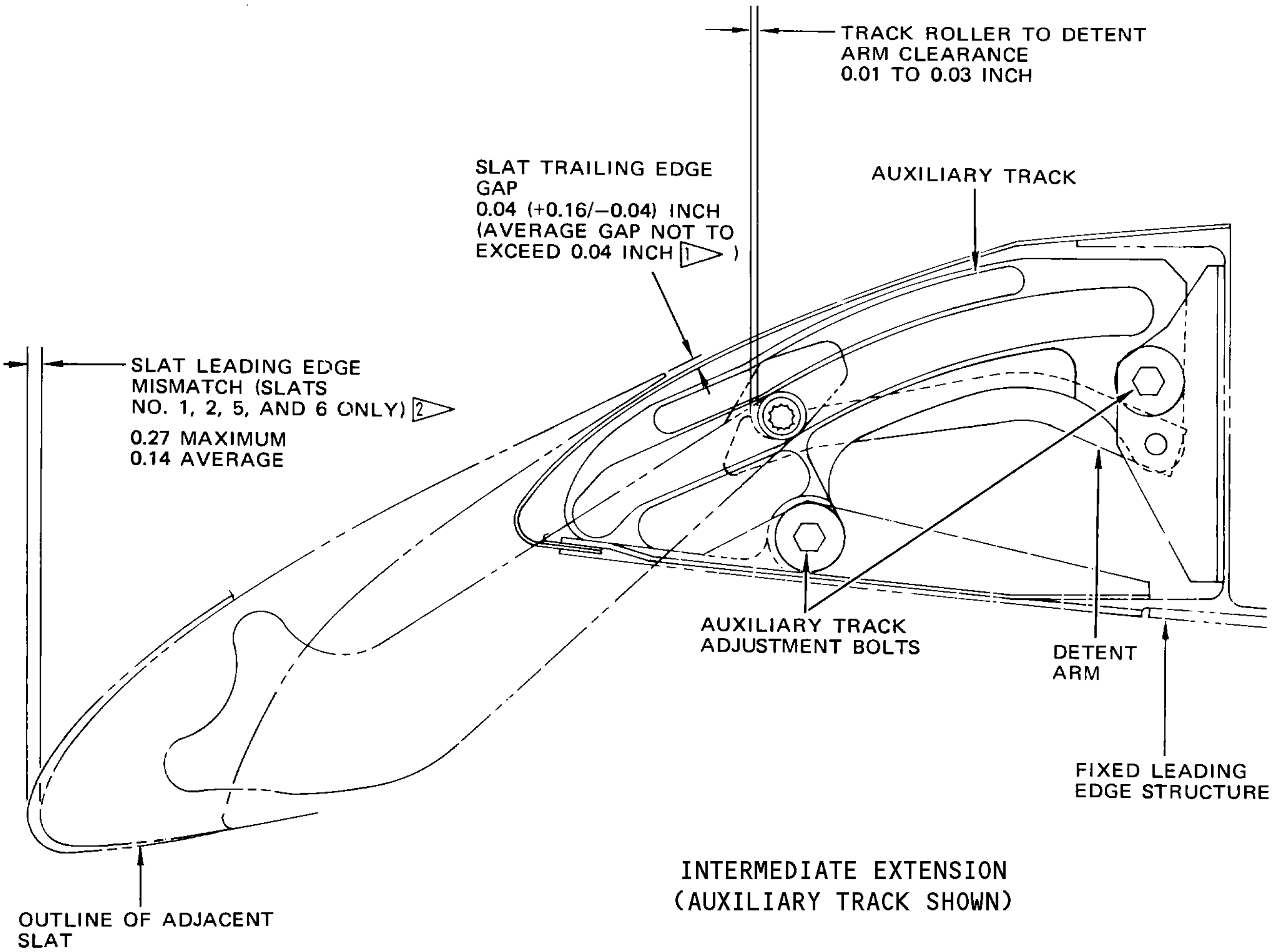
(x) Check that actuator door and thermal anti-icing duct door firmly contact structure on all edges. If not, adjust to obtain firm contact.

(y) With slats in retracted position, check that slat leading edge mismatch between adjacent slat ends or slat ends and adjacent structure is as shown in Fig. 504.

(z) Provide system A hydraulic power (AMM 27-81-0/201).

(aa) With leading edge slats in intermediate position, check that slat leading edge mismatch between adjacent slat ends or slat ends and adjacent structure is as shown in figure 505.

NOTE: Extend slats forward to bring auxiliary roller into contact with detent of detent arm before measuring leading edge mismatch.

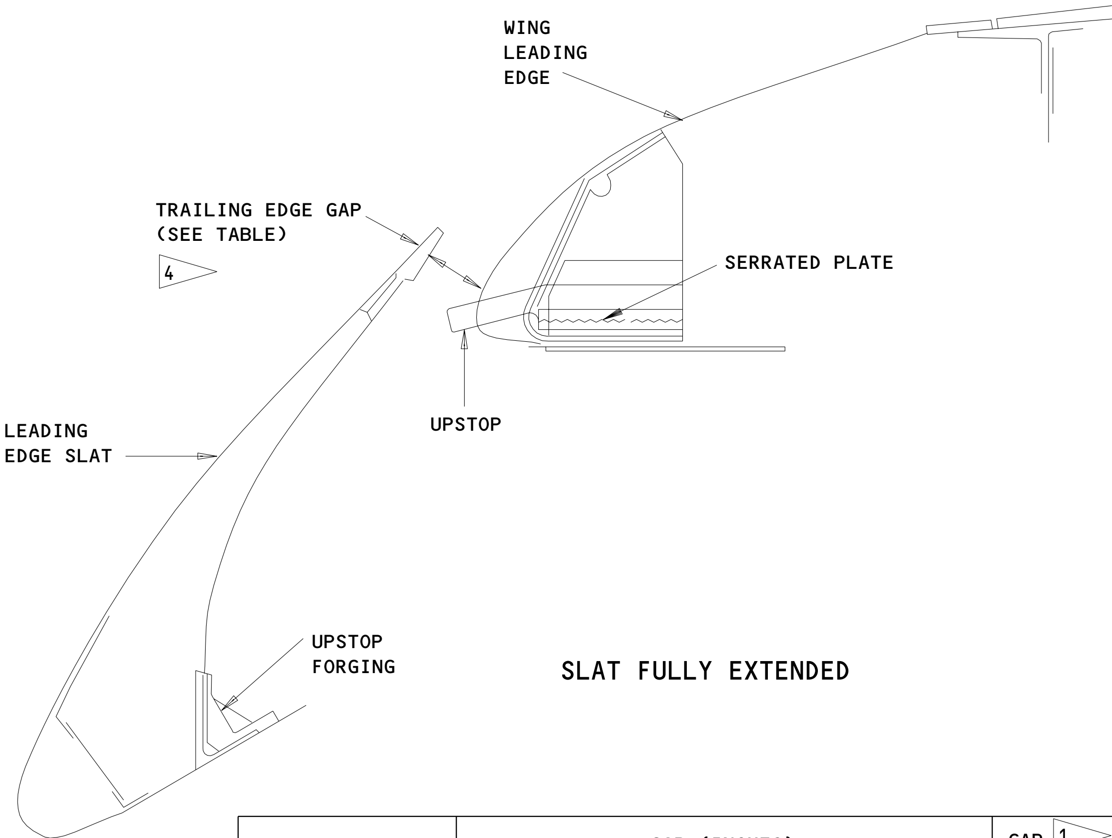


INTERMEDIATE EXTENSION
(AUXILIARY TRACK SHOWN)

1 AVERAGE GAP IS OBTAINED BY RECORDING GAP AT 6-INCH INTERVALS ALONG THE SLAT SPAN AND AVERAGING THE READINGS

2 MISMATCH IS MEASURED AT ENDS OF ADJACENT SLATS

Leading Edge Slat Adjustment
Figure 505



SLAT FULLY EXTENDED

SLAT NO.	GAP (INCHES)		GAP [1] ASYMMETRY (INCHES)
	INBD END	OUTBD END	
1 AND 6 [2]	0.96 (+0.25/-0.51)	0.60 (+0.25/-0.35)	0.25
1 AND 6 [3]	0.80 (±0.25)	0.60 (+0.25/-0.20)	0.25
2 AND 5 [3]	1.16 (+0.25/-0.30)	0.96 (+0.25/-0.20)	0.25
3 AND 4 [3]	1.28 (+0.25/-0.30)	1.16 (+0.25/-0.30)	0.25

[1] GAP ASYMMETRY IS MAXIMUM ALLOWABLE DIFFERENCE BETWEEN CORRESPONDING DIMENSIONS OF OPPOSITE SLATS. MORE THAN ONE TYPE OF SLAT STOP MAY BE USED TO GET THE SPECIFIED GAP.

[2] IC VT-EAG THRU VT-EAM
AQ N21SW THRU N23SW
NH JA8401 THRU JA8411
AR LV-JMW THRU LV-JMZ,LV-JND,LV-JNE
BU LN-SUA,LN-SUG,LV-SUP AND LN-SUS

[3] ALL EXCEPT [2]

[4] GAP MEASURED WITH SLAT EXTENDED HYDRAULICALLY

Leading Edge Slat Gap Adjustment
Figure 506

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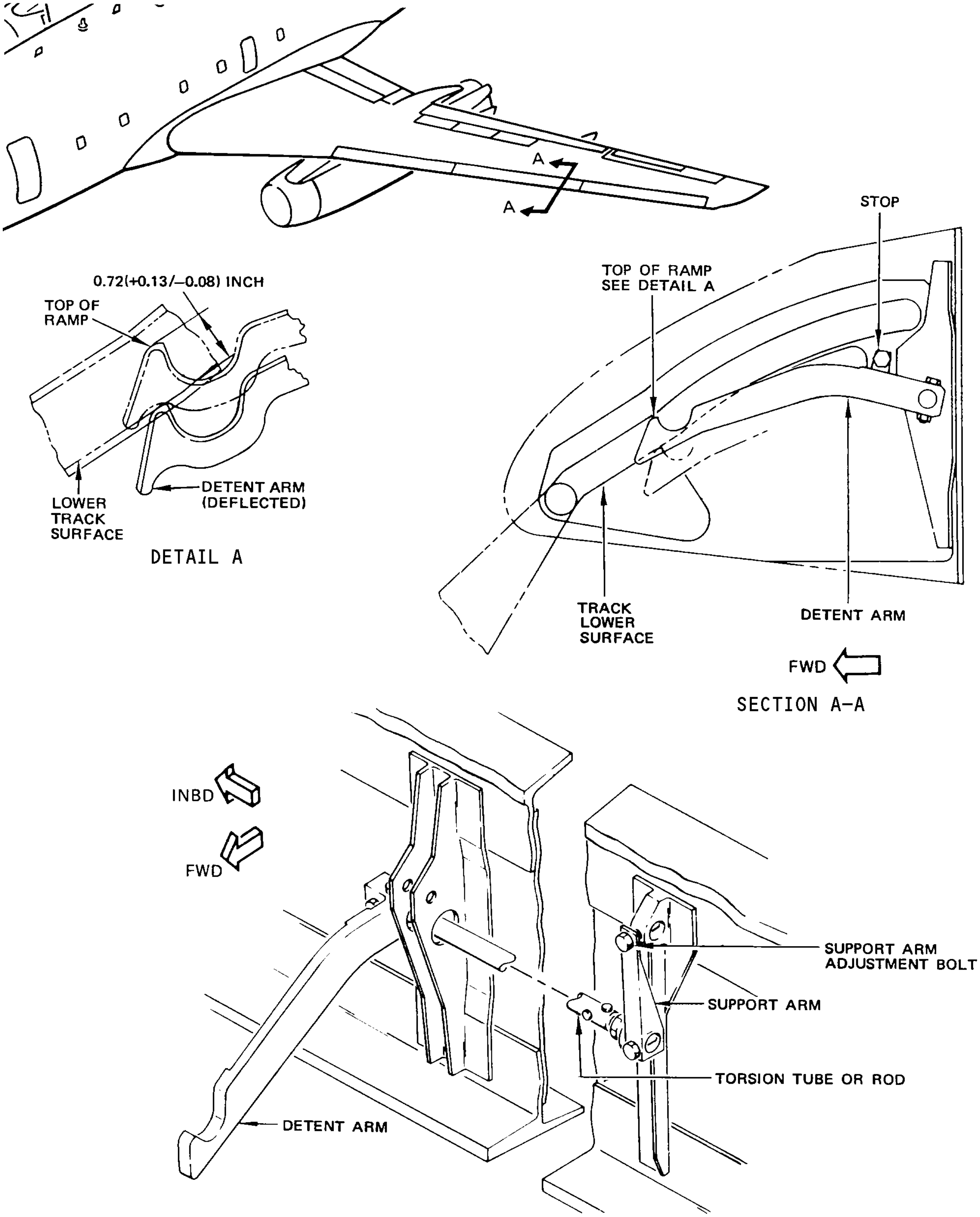


Slat Torsion Rod Adjustment
Figure 507

(ab) Remove leading edge slat actuator locks.
(ac) Make sure the clearances between the slat proximity sensor and the slat auxiliary track targets are correct and adjust any out of adjustment clearances if necessary (AMM 27-88-11/501).
(5) Test leading edge flaps and slats per paragraph 3.

4. Leading Edge Flaps and Slats Test

A. Prepare Leading Edge Flaps and Slats for Test
(1) Provide electrical power.
(2) Provide system A hydraulic power (AMM 27-81-0/201)
(3) Close the following circuit breakers on circuit breaker panel P6:
(a) BATT BUS and IND LTS
(b) SECTION 1
(c) LE FLAP POS IND AC
(d) LE FLAP POS IND DC
(e) FLAP SHUTOFF VALVE
(f) STBY RUD and STBY HYDR PUMP CONT
(g) NO. 1 GEN BUS IND
(h) STBY HYD PUMP (Normal)
(i) SECTION 4
(j) NO. 1 DC IND LTS
(k) LANDING GEAR IND LTS

B. Test Leading Edge Flaps and Slats
(1) Place flap control lever in FLAP UP detent position.
(a) Check that each flap and slat is in UP position and faired with wing structure.
(b) Check that all leading edge flap lights on center instrument panel and on aft overhead annunciator panel are extinguished.
(c) On aft overhead annunicator panel, press TEST switch and check that all green and amber lights illuminate.
(d) Release TEST switch, all lights shall extinguish.
(e) Press to test leading edge flap lights on center instrument panel. Check that each light illuminates when pressed and extinguishes when released.
(2) Modulate hydraulic flow using hydraulic ground interconnect valve so that all leading edge devices will operate slowly.

CAUTION: INTERCONNECT VALVE WILL OVERHEAT AND BE DAMAGED IF ALLOWED TO OPERATE IN THIS CONDITION FOR AN EXTENDED PERIOD OF TIME.

(3) Position flap control lever in 1-unit detent position.
(a) As each flap and slat unlocks and starts to extend, check that respective amber TRANSIT light on the annunciator panel illuminates.

(b) Check that amber LE FLAPS TRANSIT light on center instrument panel illuminates when first flap or slat unlocks and starts to extend.
(c) Check that respective amber lights extinguish and green EXT lights illuminate as flaps and slats reach end of travel.
(d) On center instrument panel, check that amber light extinguishes and green LE FLAPS EXT light illuminates as last flap or slat reaches position.

(4) On NH ALL EXCEPT JA8401 thru JA8411; ML ALL EXCEPT 9M-AOU thru 9M-AOW; 9V-BBC, 9V-BBE; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC ALL EXCEPT VT-EAG thru VT-EAM; AQ ALL EXCEPT N21SW thru N23SW;
(a) Position flap control lever in 5-unit detent.
1) Check that no change occurs in the position of any leading edge device or indicator illumination.
(b) Position flap control lever in 10-unit detent.
1) As all slats start to extend from intermediate position, check that respective amber TRANSIT light illuminates and respective EXT green light extinguishes.
2) Check that respective amber light extinguishes and FULL EXT green light illuminates as slats lock in fully extended position.
3) On center instrument panel, check that green EXT light illuminates as the last slat reaches position.
(c) Extend trailing edge flaps to 40-unit position and then retract flaps to 10-unit position.
1) Check that no change occurs in the position of any leading edge device or indicator illumination.
(d) Position flap control lever in 5-unit detent.
1) As all slats start to retract, check that respective amber TRANSIT light illuminates and FULL EXT light extinguishes. Check that respective EXT green light illuminates as slats reach intermediate position.
(e) Position flap control lever in 1-unit detent.
1) Check that no change occurs in the position of any leading edge device or indicator illumination.

(5) On NH JA8401 thru JA8411; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; BU LN-SUA, LN-SUG, LN-SUP and LN-SUS; IC VT-EAG thru VT-EAM; AQ N21SW thru N23SW:
(a) Position flap control lever in 25-unit detent.
1) No change shall occur in the position of any leading edge device or indicator illumination.
(b) Position flap control lever in 30-unit detent.
1) As slats 1 and 6 start to extend from intermediate position, check that respective amber TRANSIT light illuminates and respective EXT green light extinguishes.

2) Check that respective amber light extinguishes and FULL EXT green light illuminates as slats 1 and 6 lock in fully extended position.
3) On center instrument panel, check that green LE FLAPS FULL EXT light illuminates as the last slat reaches position.

(c) Position flap control lever in 25-unit detent.
1) As slats 1 and 6 start to retract, check that respective FULL EXT green light extinguishes and respective amber TRANSIT light illuminates.
2) Check that respective amber light extinguishes and EXT green light illuminates as slats 1 and 6 reach intermediate position.
3) On center instrument panel, check that LE FLAPS EXT green light illuminates as last slat locks in intermediate position.

(6) Position flap control lever in FLAP UP detent.
(a) Check that respective EXT green light extinguishes and respective amber TRANSIT light illuminates as each flap or slat unlocks and starts to retract.
(b) Check that when each flap and slat is in up and faired position the respective amber light extinguishes and no green lights will be illuminated.
(c) On center instrument panel, check that all lights extinguish as last flap or slat locks in up position.

NOTE: If lights function properly with hydraulic pressure applied, disregard amber light indications which may occur if hydraulic pressure is removed.

(7) Check normal leading edge flap and slat operating time.
(a) Close hydraulic ground interconnect valve and turn OFF hydraulic system B pumps No. 1 and 2.
(b) Provide system A hydraulic power using hydraulic service cart set at 20 gpm and 3000 psi or using at least one engine-driven pump. Refer to 29-11-0, Hydraulic System A - Maintenance Practices.
(c) If service cart is used for pressurizing, ensure parking brake is set, then open hydraulic ground interconnect valve.
(d) On airplanes AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA8401 thru JA8411; PV CF-EPL, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB; NZ ZK-NAC thru ZK-NAL, check operating times.
1) Position flap control lever in 1-unit detent position.
2) Check that all leading edge flaps are fully extended and locked, and all slats are in intermediate position and locked within 6 seconds after unlocking from up position.

3) Position flap control lever in 30-unit detent position.
4) Check that slats 1 and 6 are fully extended and locked within 1.6 seconds after unlocking from intermediate position.
5) Position flap control lever in 40-unit detent position, then return flap control lever to 30-unit detent. No change in leading edge flap or slat position or indicator light illumination shall occur.
6) Position flap control lever in 25-unit detent position.
7) Check that slats 1 and 6 are locked in intermediate position within 4 seconds after unlocking from down position.

(e) On airplanes NH ALL EXCEPT JA8401 thru JA8411; NZ ALL EXCEPT ZK-NAC thru ZK-NAL; ML 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; BU ALL EXCEPT LN-SUA, LN-SUG, LN-SUP and LN-SUS; SA ALL EXCEPT ZS-SBL thru ZS-SBR;
1) Position flap control lever in 1-unit detent position.
2) Check that leading edge flaps are fully extended and locked and slats are in intermediate position and locked within 6 seconds after unlocking from up position.
3) Position flap control lever in 10-unit detent.
4) Check that all slats are fully extended and locked with 1.6 seconds after unlocking from intermediate position.
5) Position flap control lever in 40-unit detent position, then return flap control lever to 10-unit detent. No change in leading edge flap or slat position or indicator light illumination shall occur.
6) Position flap control lever in 1-unit detent position.
7) Check that all slats are locked in intermediate position within 4 seconds after unlocking from down position.

(f) Position flap control lever in FLAP UP detent.
(g) Check that all leading edge flaps and slats retract within 9 seconds after unlocking from down and intermediate position.

(8) Check leading edge flap and slat alternate system operation.
(a) Ensure hydraulic system A is pressurized and flap control lever is in FLAP UP detent.
(b) Actuate alternate flap arming switch to ARM position.
1) Check that STANDBY HYD LOW PRESSURE light comes on.
2) Check that standby hydraulic pump starts and that STANDBY HYD LOW PRESSURE light is off.
3) Check that trailing edge flap bypass valve moves to position 2.

4) Check that leading edge flaps and slats do not extend.

NOTE: This verifies that leading edge standby drive shutoff valve is in correct position.

(c) Position flap control lever to 40-unit detent. Check that leading edge flaps and slats do not respond.

NOTE: Flap control lever is moved to 40-unit detent as a standard procedure to minimize load on flap hydraulic motor when hydraulic system A is pressurized.

(d) Actuate alternate flap drive control switch to DOWN position.

CAUTION: FOR GROUND OPERATION, ALTERNATE FLAP DRIVE UNIT IS LIMITED TO 4 MINUTES OPERATION AND 25 MINUTES OFF.

1) Check that leading edge flaps and slats are fully extended in 11 to 22 seconds from time flaps start to move.

(e) Position alternate flap drive control switch to OFF position.
1) Check that the leading edge flaps and slats do not move.
(f) Position flap control lever to FLAP UP detent. Check that leading edge flaps and slats do not respond.
(g) Position alternate flap arming switch to OFF position.
1) Check that standby hydraulic pump stops.
2) Check that trailing edge flap bypass valve moves to position 1.
3) Check that leading edge flaps and slats fully retract.

NOTE: Retraction is due to hydraulic system A being pressurized.

(h) Depressurize system A hydraulic system and system B hydraulic system (Ref 27-81-00 MP).
(i) Place alternate flaps arming switch to ARM position.
(j) Check that standby hydraulic system low pressure light is off.
(k) Observe leading edge flaps and slats for 60 seconds. Verify that flaps and slats do not extend.

NOTE: Leading edge flaps may slowly extend due to gravity.

(l) Place alternate flaps arming switch in OFF position.

(9) Check for leading edge flap droop.
(a) Pressurize hydraulic system A.
(b) Place flap control lever in FLAP UP position to fully retract leading edge devices.

(c) Depressurize hydraulic system A. Bleed off hydraulic pressure to zero psi.

(d) After a one-minute wait, measure gap between lower surface of flap trailing edge and adjacent wing skin lower surface at outboard end of inboard flap and inboard end of outboard flap.

(e) Check that gap does not exceed 2.0 inches for new or overhauled actuators or 4.0 inches for inservice units.

C. Restore Airplane to Normal Configuration

(1) Remove system A hydraulic power (Ref 29-11-0 MP).

(2) Close hydraulic ground interconnect valve.

(3) Lockwire alternate flap master arming switch.

(4) Determine if there is any further need for electrical power on airplane. If not, disconnect power.

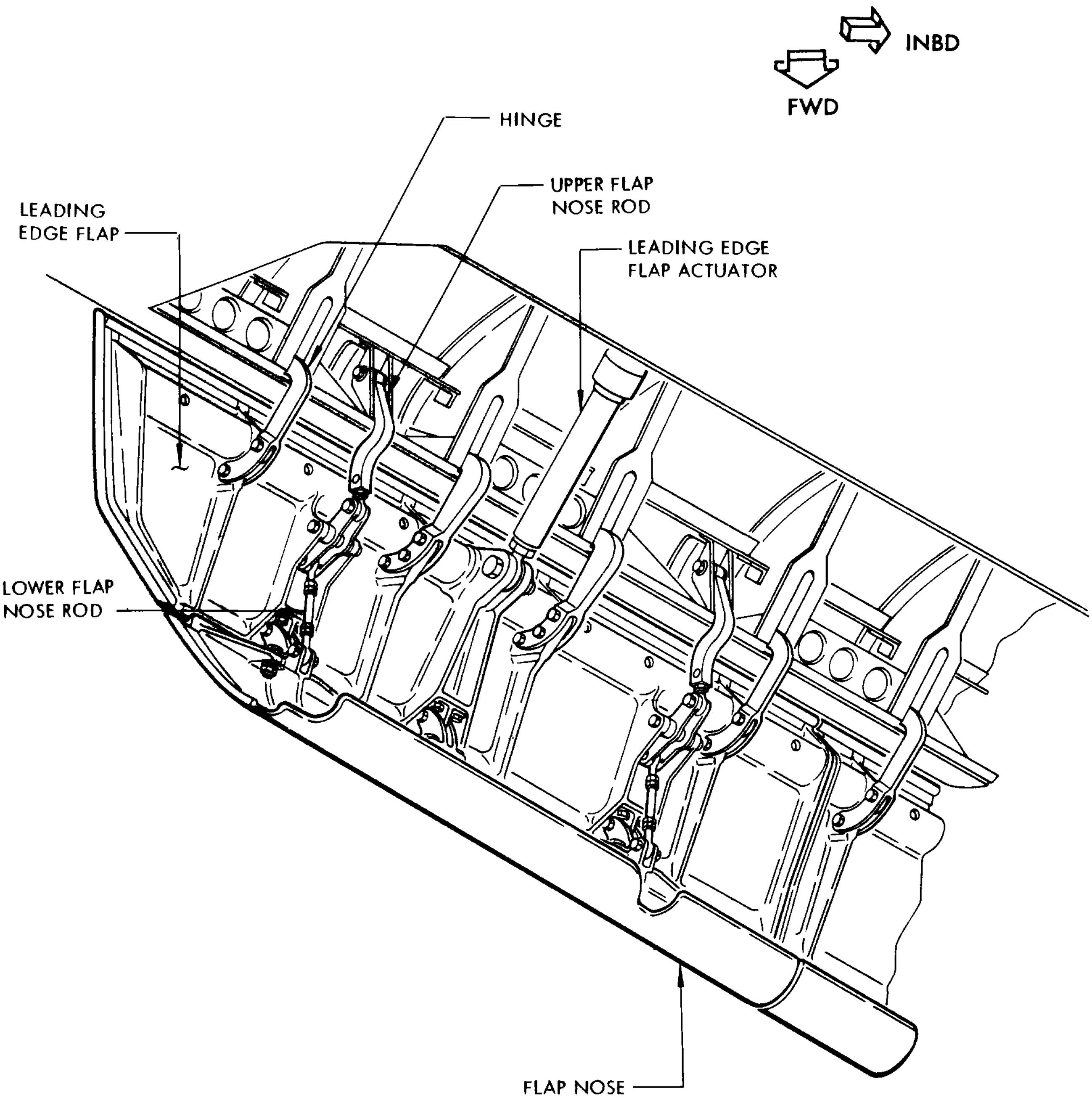
(5) Install all access panels.

LEADING EDGE FLAPS - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Leading Edge Flap Actuator Locks - F80048-84 (preferred), -36 (optional)
   B. Corrosion Preventive Compound - MIL-C-11736, Class 3 or MIL-C-16173, Grade 2 (Ref 20-30-21)
   C. Aerodynamic Smoother - BMS 5-79, Class B (Ref 20-30-11)
2. Remove Leading Edge Flap (Fig. 401)
   A. Provide system A hydraulic power (Ref 27-81-0, Maintenance Practices).
   B. Position flap control lever to 1-unit detent to extend leading edge flaps.
   C. Remove system A hydraulic power (Ref 27-81-0).
   D. Remove bolts attaching upper nose rods to wing lugs in fixed leading edge (Fig. 402).
   E. Remove bolt attaching leading edge flap actuator to clevis fitting on flap.
   F. Remove flap hinge bolts and remove leading edge flap.
3. Install Leading Edge Flap (Fig. 401)
   A. If used bolts or bushings are being installed, check for allowable wear (Ref 27-81-11, Inspection/Check).
   B. Attach flap to hinge fitting as follows:
      (1) Align flap hinges with hinge fittings in fixed leading edge and install end hinge bolts. Bonding jumper terminals must be installed over bolts on end hinges with a washer on each side of terminal. Tighten end hinge bolts to 30-40 pound-inches.
      (2) With end hinge bolts installed, check that misalignment of holes in flap hinge half and center hinge fitting does not exceed 0.03 inch. Align holes with a bullet nosed drift pin before installing bolts to reduce possibility of damage to fittings. Tighten bolts to 290-410 pound-inches.
   C. Align actuator rod end with leading edge flap and install bolt with a washer on each side. Install nut and tighten to 660-780 pound-inches. Install cotter pin.

      NOTE: Apply corrosion preventive compound to bolt before installing.

   D. Disconnect lower flap nose rods from lugs on leading edge flaps and adjust lower flap nose rods to nominal value shown on table (Fig. 402) and connect to lug on flap.
   E. Adjust upper flap nose rod at 8.93 inches nominal on flaps No. 2 and 3, and 8.08 inches nominal on flaps No. 1 and 4, to provide contact between flap nose and pads, then connect rod to lugs on fixed wing structure.
   F. Disconnect one lower nose rod from lug on leading edge flap.



Leading Edge Flap Installation
Figure 401

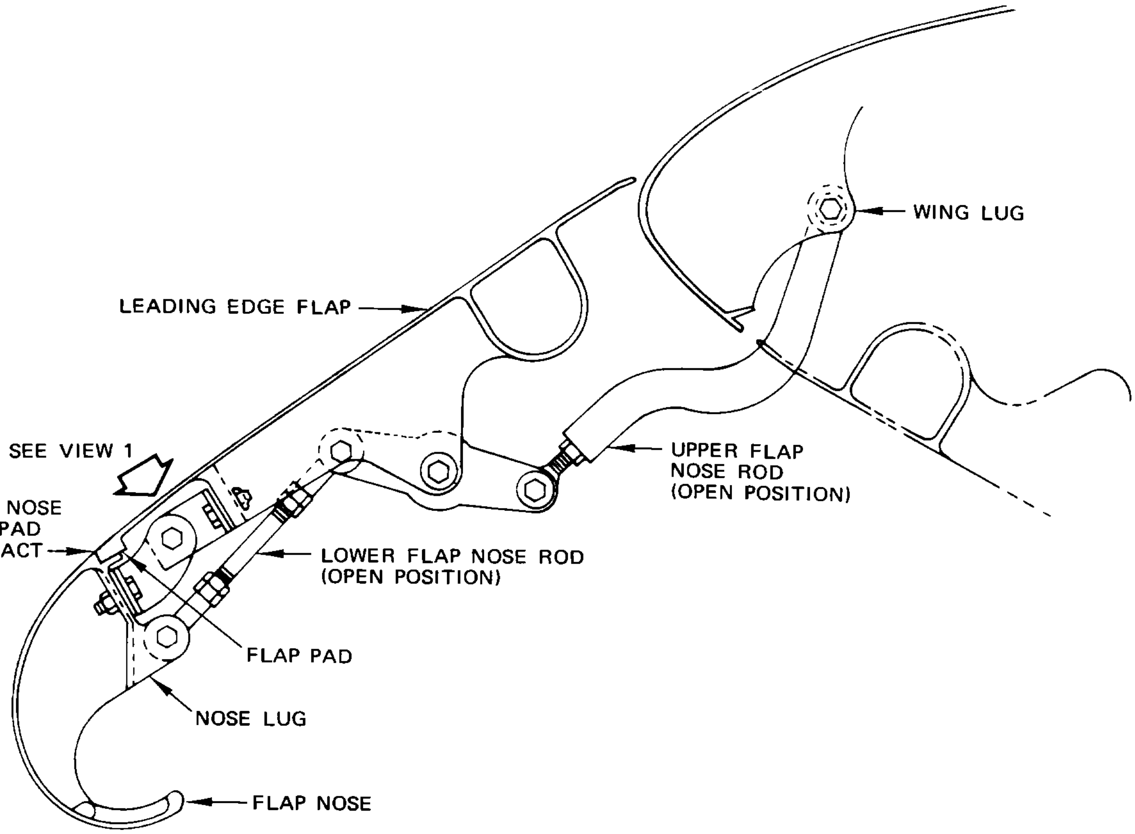
G. Install leading edge flap actuator lock on actuator of adjacent leading edge flap.
H. Provide system A hydraulic power and modulate hydraulic pressure and flow so that the leading edge flap can be operated slowly (Ref 27-81-0).
I. Position flap control lever to FLAP UP position to retract flap.

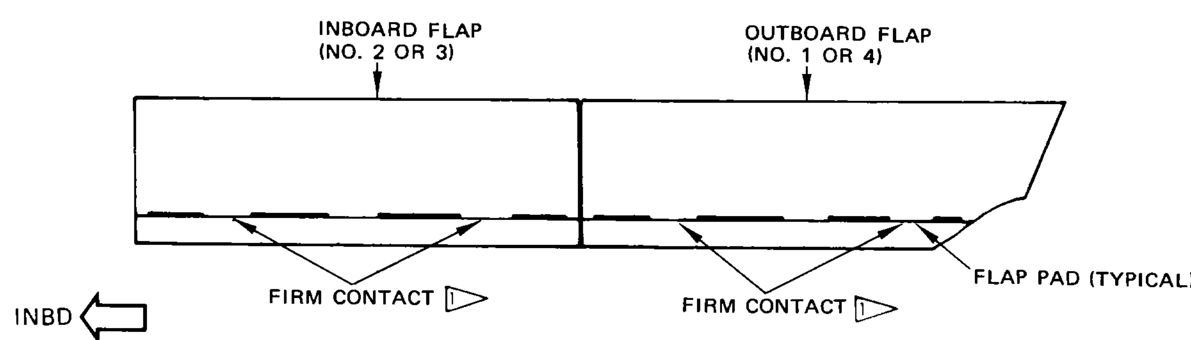
CAUTION: TO PRECLUDE STRUCTURAL DAMAGE, MONITOR FLAP NOSE CLEARANCE DURING RETRACTION.

J. Carefully check clearance between flap nose and fixed wing structure. If flap contacts structure, lower flap, depressurize hydraulic system and lengthen both upper and lower nose rods at each end of flap, upper rod first.
K. Repeat steps H. thru J. if adjustments are made.
L. If flap nose does not contact structure, reconnect lower nose rod to lug on flap nose with flap retracted. Rod end may have to be adjusted slightly to connect rod to lug.
M. Check that flap nose does not contact lower nose rod or flap structure in flap retracted position. If there is contact, extend flaps, depressurize hydraulic system A and shorten upper rod end as required.
N. If flap nose does not contact rods, extend flap and check flap nose in open position. If necessary, adjust lower nose rods until flap nose contacts pads. Flap nose must be in firm contact with two pads on each flap as indicated in view 1, Fig. 402. Remaining pads may have clearance.

NOTE: Both rods must be adjusted to correct for large discrepancies. To increase nose travel lengthen both rods, to decrease nose travel shorten both rods.

O. Repeat step M if flap nose is adjusted.
P. Cycle flap to check structural clearance between flap nose and wing structure, leading edge flap actuator and nose linkage. End cycling with flap extended.
Q. Remove system A hydraulic power (Ref 27-81-0).
R. Lockwire both flap nose rod and link rod.
S. Remove leading edge flap actuator lock.
T. Provide system A hydraulic power (Ref 27081-0).
U. With flaps extended and flap actuators pressurized, check that mismatch between adjacent flaps does not exceed 0.20 inch.
V. Retract flaps to faired position and check mismatch between aft end of leading edge flap and wing structure (Fig. 403). Mismatch at aftend shall be within + 0.02 inch for 75% of flap span and within + 0.04 inch for 25% of span. Actuators shall be pressurized while checking mismatch.
W. Check that leading edge of flap fairs with wing structure as shown in Fig. 403 (flush to 0.10 inch recessed from wing contour).
X. Check that gap between flap and fixed wing structure is 0.06 to 0.12 inch at ends and trailing edge of flap.





FLAP NOSE AND PAD CONTACT REQUIREMENTS
VIEW 1

TABLE I

		INBOARD END OF FLAP	OUTBOARD END OF FLAP
LE FLAP NO. 1 OR 4	LENGTH OF LOWER NOSE ROD	5.24	5.24
LE FLAP NO. 2 OR 3	LENGTH OF LOWER NOSE ROD	4.92	4.51

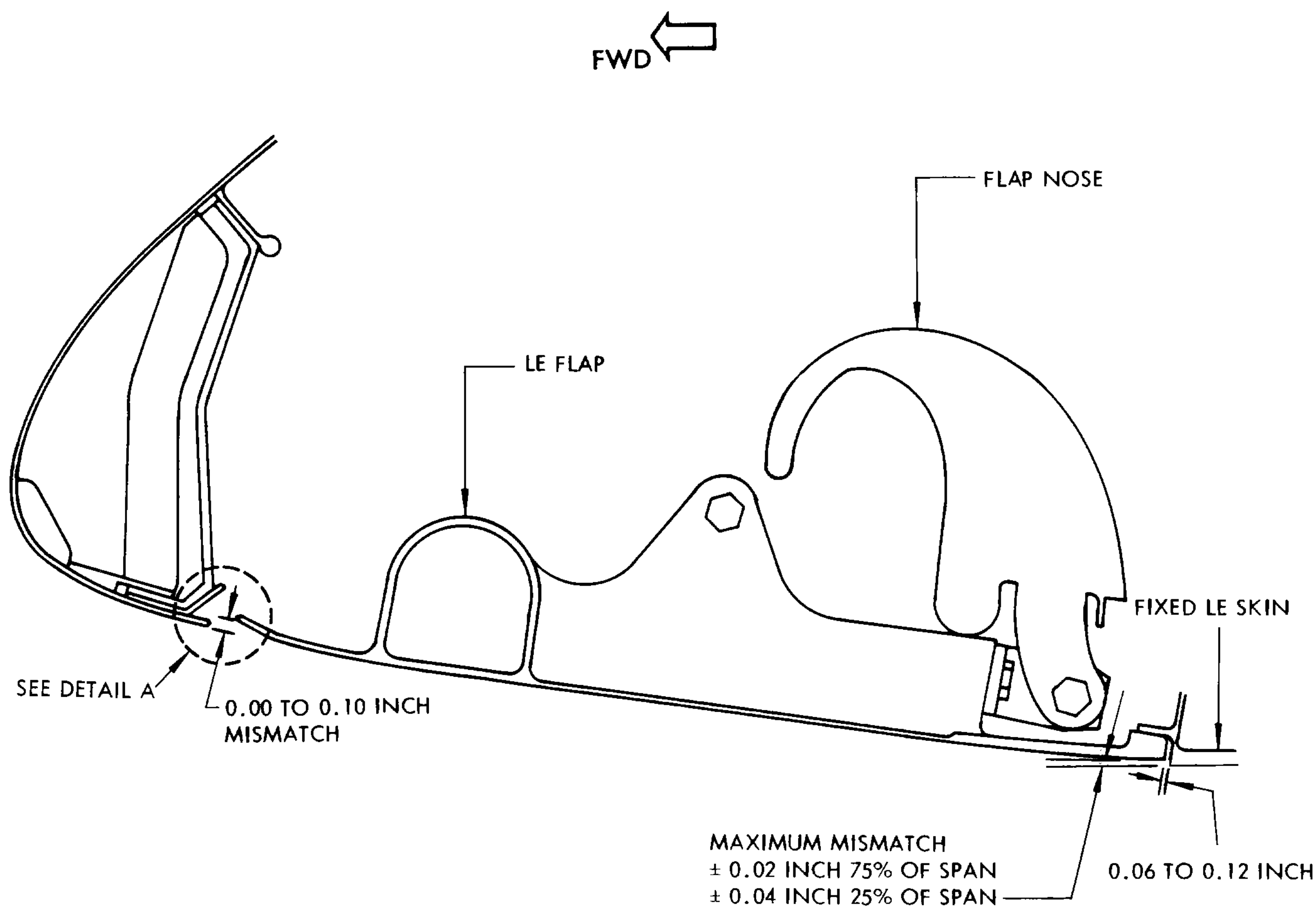
1 FLAP NOSE TO BE IN FIRM CONTACT WITH TWO PADS ON EACH FLAP AS INDICATED WITH FLAP FULLY EXTENDED. OTHER PADS MAY HAVE CLEARANCE.

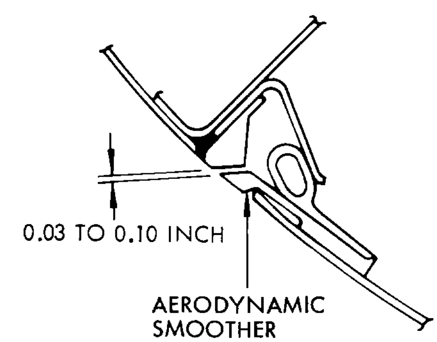
Leading Edge Flap Nose Linkage Adjustment
Figure 402

Y. Check that gap between seal on leading edge of flap and seal attached to wing structure is within the limits specified in detail A, Fig. 403. If seal was adjusted to satisfy gap requirement, fill void between seal and flap leading edge with aerodynamic smoother.

Z. With flaps fully retracted, check that gap between adjacent flaps is 0.06 to 0.15 inch, except for aft 5 inches of flap which should be 0.06 to 0.25 inch. Ensure that gap remains in tolerance at all positions of flap travel. Gap is defined as metal to metal clearance.

AA. Remove system A hydraulic power (Ref 27-81-11).



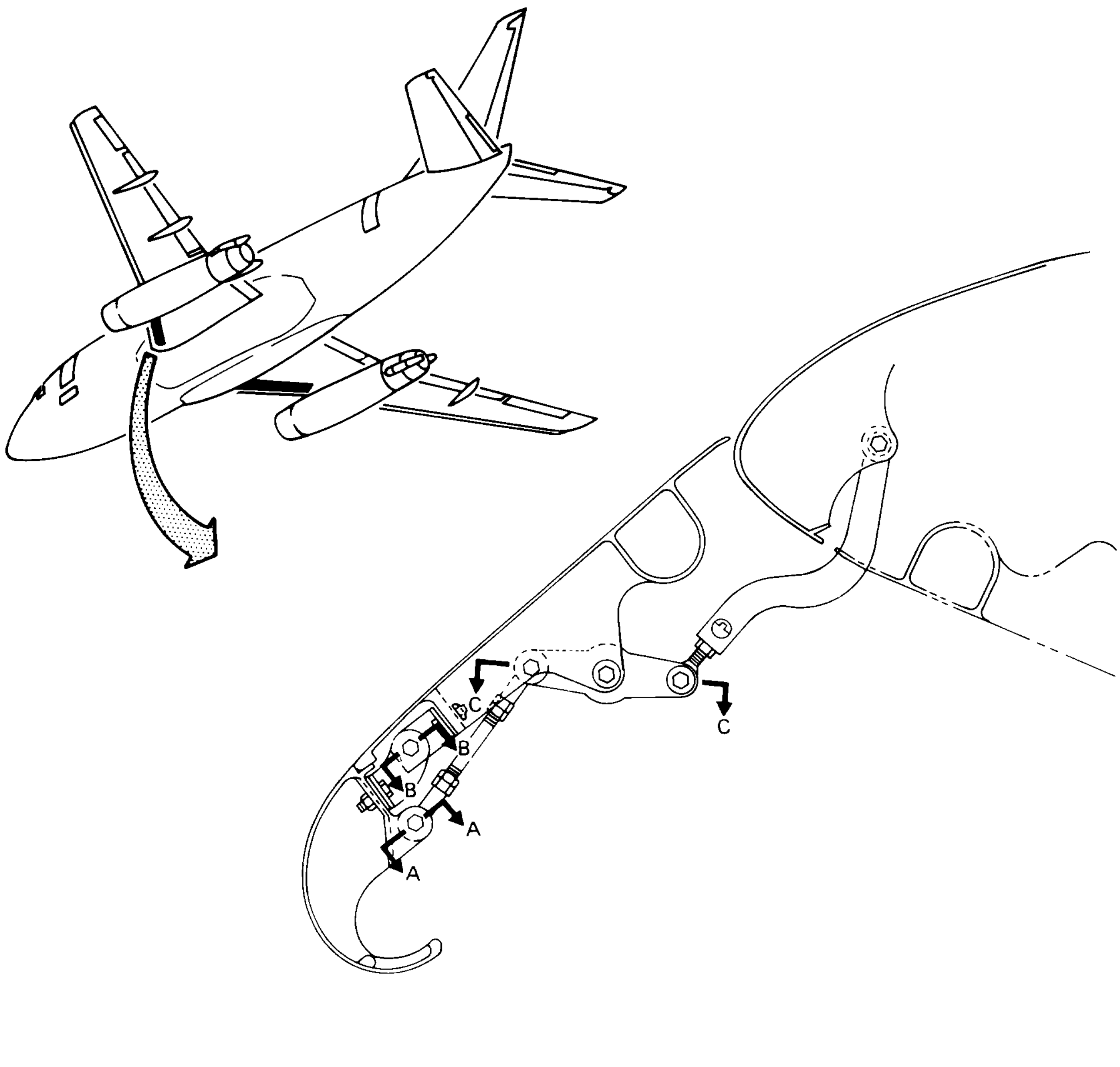


DETAIL A

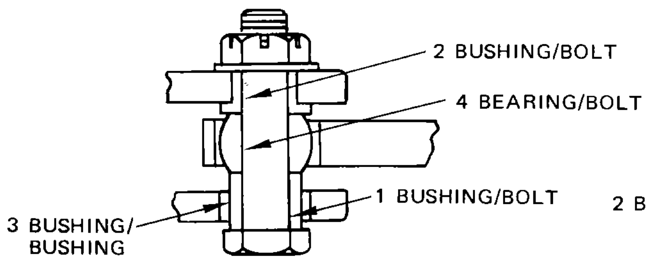
Leading Edge Flap Mismatch Requirements
Figure 403

LEADING EDGE FLAPS - INSPECTION/CHECK

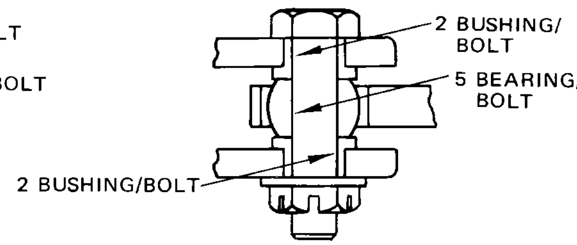
1. General
   A. This data consists of illustrations and wear limit charts. This section gives no procedures for gaining access to or removing the components, or for replacing them after inspection for wear. Refer to component removal/installation for this information.
2. Leading Edge Flaps Wear Limits



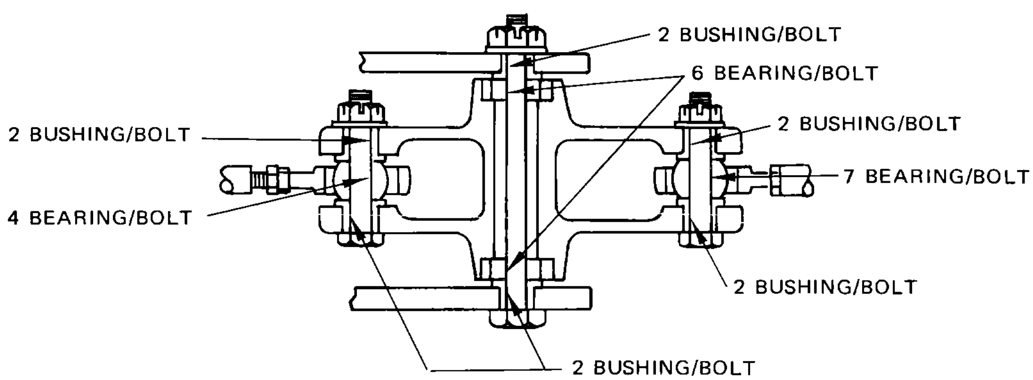
Leading Edge Flaps Nose Linkage Wear Limits
Figure 601 (Sheet 1)



SECTION A-A



SECTION B-B



SECTION C-C

Leading Edge Flaps Nose Linkage Wear Limits
Figure 601 (Sheet 2)

469378

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.2495	0.2510	0.2535	0.0040	X		
	BOLT	OD	0.2490	0.2495	0.2455		X		
2	BUSHING	ID	0.2500	0.2515	0.2545	0.0050	X		
	BOLT	OD	0.2490	0.2495	0.2450		X		
3	BUSHING	ID	0.4375	0.4390	0.4445	0.0090	X		
	BUSHING	OD	0.4335	0.4355	0.4285		X		
4	BEARING	ID	0.2495	0.2500	0.2515	0.0020	X		
	BOLT	OD	0.2490	0.2495	0.2475		X		
5	BEARING	ID	0.2495	0.2500	0.2515	0.0020	X		
	BOLT	OD	0.2490	0.2495	0.2475		X		
6	BEARING	ID	0.2495	0.2500	0.2515	0.0020	X		
	BOLT	OD	0.2490	0.2495	0.2475		X		
7	BEARING	ID	0.2495	0.2500	0.2515	0.0020	X		
	BOLT	OD	0.2490	0.2495	0.2475		X		

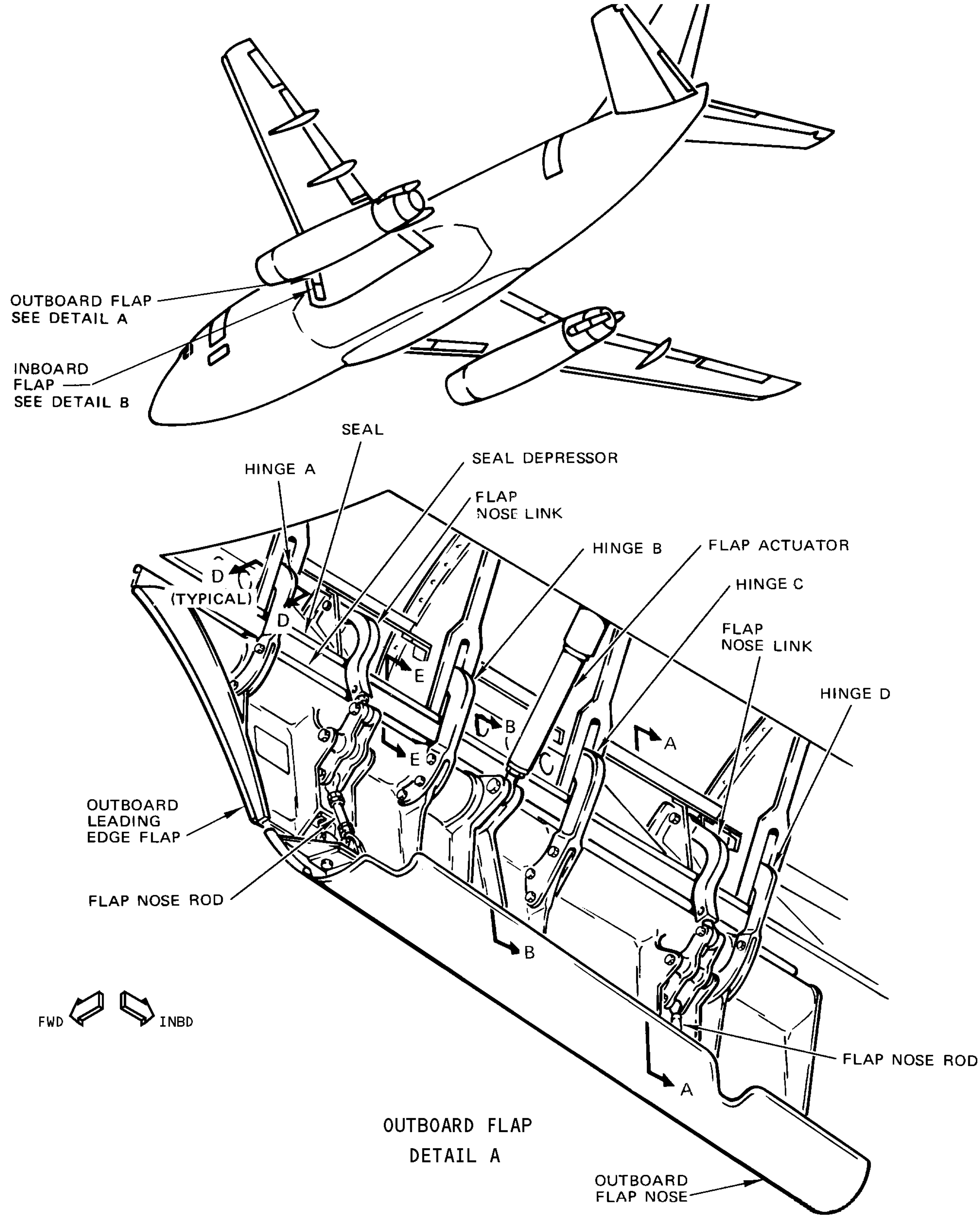
Leading Edge Flaps Nose Linkage Wear Limits
Figure 601 (Sheet 3)

LEADING EDGE FLAPS - REMOVAL/INSTALLATION

1. General
   A. The following procedure applies to the inboard and outboard leading edge flaps. If both flaps are being replaced, the inboard flap should be installed and adjusted first.
2. Equipment and Materials
   A. Leading Edge Flap Lock - F80048-84 (preferred), -36 (optional)
   B. Corrosion Preventive Compound - MIL-C-11796, Class 3 or MIL-C-16173, Grade 2 (Ref 20-30-21)
   C. Aerodynamic Smoother - BMS 5-79, Class B (Ref 20-30-11)
   D. Chemical and Solvent Resistant Finish - BMS 10-11, type 1 (Ref 20-30-41)
   E. Protractor Assembly - 4MIT65B80307-1 (preferred), F52485-500 (optional)
3. Remove Leading Edge Flap (Fig. 401)
   A. Provide system A hydraulic power (Ref 27-81-0 MP).
   B. Extend leading edge flaps.
   C. Remove system A hydraulic power (Ref 27-81-0 MP).
   D. Install leading edge flap actuator lock on actuator of flap adjacent to flap being removed.

      WARNING: INSTALL LEADING EDGE FLAP ACTUATOR LOCK WHEN FLAP IS IN EXTENDED POSITION. FLAPS ARE FAST ACTING AND CAN CAUSE SERIOUS INJURY TO PERSONNEL.

   E. At all flap nose operating linkages except inboard linkage of inboard flap, disconnect flap nose link from lugs in wing leading edge.
   F. At inboard linkage of inboard flap, if existing flap nose rod can be used, disconnect rod from operating crank on flap panel and leave installed in wing (Details A and B, Fig. 401). If existing flap nose rod cannot be used, remove landing light lens on wing leading edge for access and disconnect flap nose rod from lug in wing.
   G. Disconnect flap actuator from flap panel.
   H. Disconnect bonding jumpers.
   I. At inboard hinge of inboard flap, if existing hinge fitting can be used, disconnect hinge fitting from flap panel by removing two bolts and leave hinge fitting installed in wing. If existing hinge fitting cannot be used, remove landing light lens from wing leading edge and forward wing to body fairing for access and remove hinge bolt (Detail B).
   J. Support flap, remove all remaining flap hinge bolts and remove flap from wing (Details A and B).
4. Install Leading Edge Flap (Fig. 401)
   A. If used bushings or bolts are being installed, check for allowable wear (Ref 27-81-11, Inspection/Check).



OUTBOARD FLAP
DETAIL A

Leading Edge Flap Installation
Figure 401 (Sheet 1)

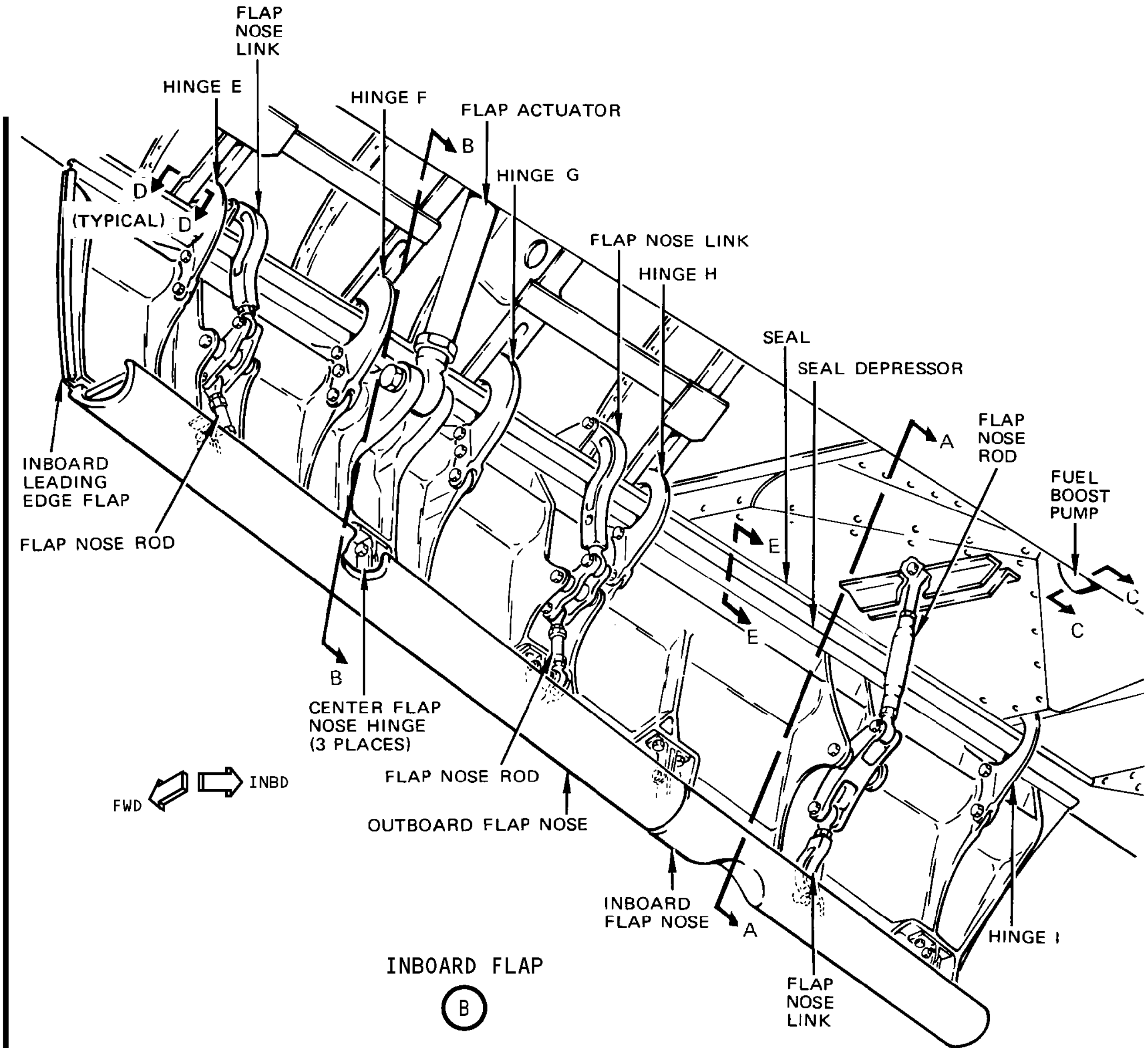
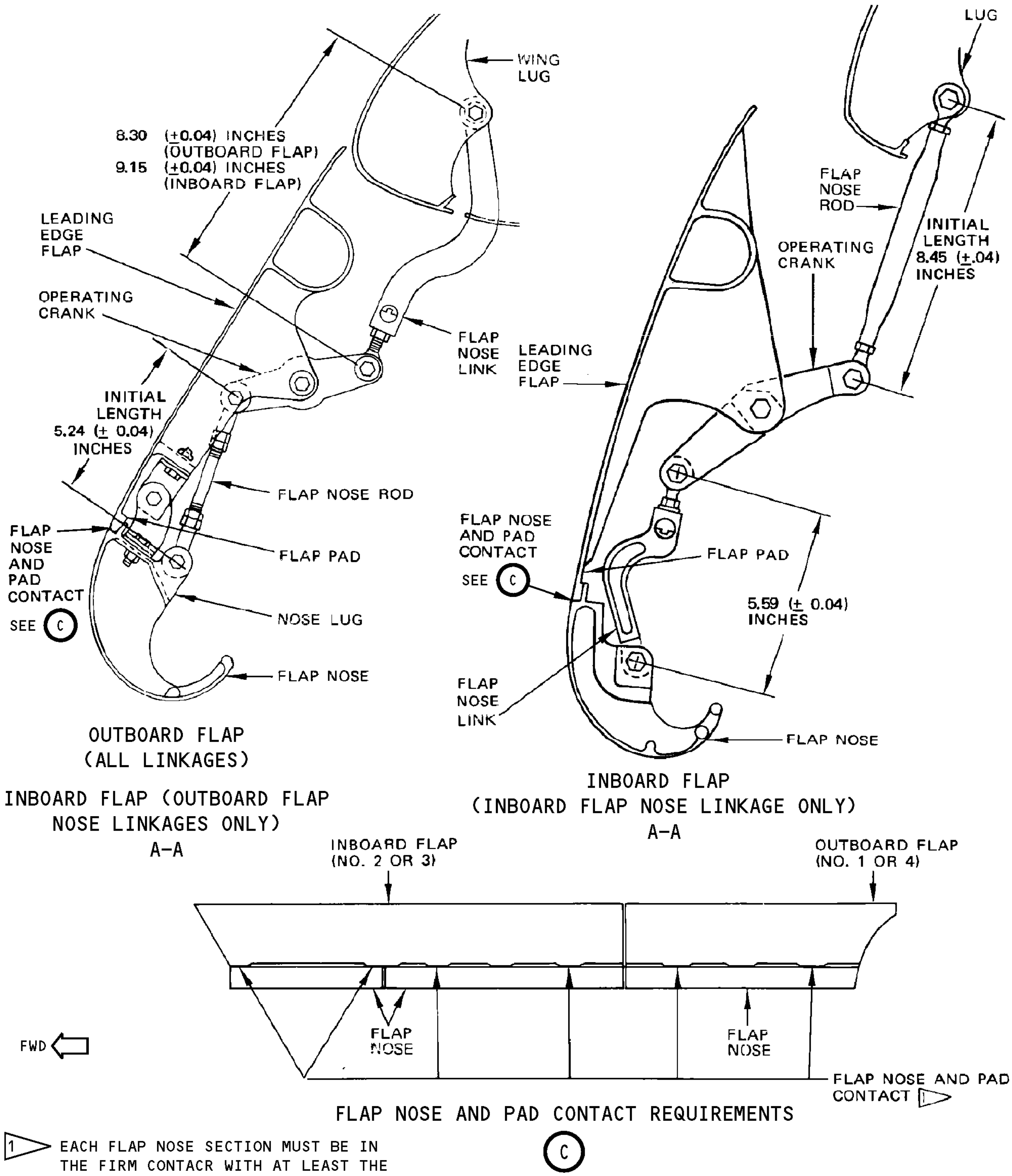


TABLE 1: HINGED BOLT TORQUE AND ORIENTATION

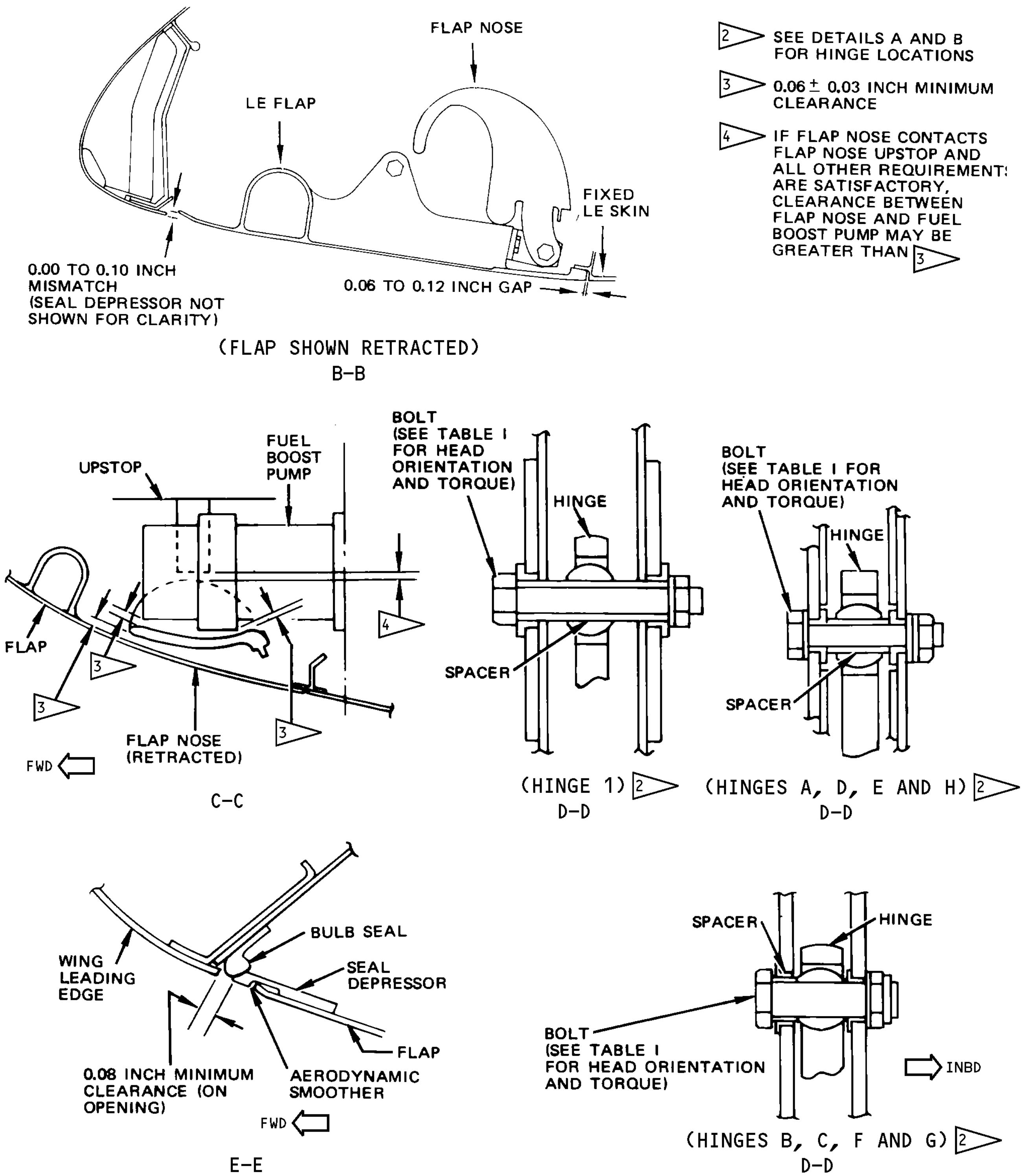
HINGE (SEE DETAILS A AND B FOR LOCATION)	BOLT HEAD DIRECTION	TORQUE (POUND-INCHES)
A,D,E,H,I	OPTIONAL	30-40
B,F	OUTBOARD	290-410
C,G	INBOARD	290-410

Leading Edge Flap Installation
Figure 401 (Sheet 2)



1 EACH FLAP NOSE SECTION MUST BE IN THE FIRM CONTACR WITH AT LEAST THE TWO PADS INDICATED IN VIEW C WITH FLAPS FULLY EXTENDED

Leading Edge Flap Installation
Figure 401 (Sheet 3)



Leading Edge Flap Installation
Figure 401 (Sheet 4)

B. On inboard flap, if old inboard hinge is to be used, remove inboard hinge fitting from replacement inboard flap (Detail B). If old nose flap rod at inboard flap nose operating linkage is to be used, remove inboard flap nose rod from operating crank on replacement flap panel.
C. On inboard flap, remove bulb seal installed between inboard and outboard flap noses. (Seal is installed with five screws and retainer plate.)
D. Adjust center-to-center length of flap nose links on replacement flap panel (section B-B). Lockwire adjustment nuts.
E. Lift flap panel to wing and install hinge bolts (Section D-D). Tighten bolts per Table I and install cotter pins.
F. On inboard flap, if old hinge fitting is to be used, connect fitting to flap panel (Detail B).
   (1) Align bolt holes in hinge fitting and flap.
   (2) Install shims between clevis of hinge fitting and lug on flap to eliminate all gaps over 0.004 inch. Maximum shim thickness on either side of lug is 0.070 inch. Install shims with wet primer.
   (3) Install bolts, washers and nuts with wet primer. Tighten nuts.
G. Install bonding jumpers at outboard hinge of each flap panel and also at inboard hinge on inboard flap panel.
H. Manually position flap to retracted position and check that no interference exists between flap nose and boost pump, upstop or inner surface of flap panel (Section C-C).
I. Connect flap actuator to lug on flap panel. Apply corrosion preventive compound to bolt before installing. Tighten nut 660 to 780 pound-inches and install cotter pin.
J. Provide system A hydraulic power (Ref 27-81-0 MP).
K. Retract leading edge flap using hydraulic pressure.
L. Attach adjustable angle protractor to flap and set to zero angle. Mark protractor location on flap for future use. On inboard flap, attach protractor to outboard end of flap. On outboard flap, attach protractor to inboard end of flap.
M. Extend leading edge flap with hydraulic pressure.
N. Attach protractor at same location as that for retracted position. Check that flap angle for extended position is 96 to 97 degrees. If not, disconnect actuator from flap panel. Adjust flap actuator rod end to attain required extend angle. Lockwire and seal. Connect actuator to flap panel, tighten nut 660 to 780 pound-inches and install cotter pin.

   NOTE: Maximum adjustment of rod end is limited to two full turns.

O. Remove system A hydraulic power (Ref 27-81-0 MP).
P. At all locations except inboard flap nose linkage of inboard flap, connect free ends of flap nose links to lugs in wing. Tighten nuts 30 to 40 pound-inches and install cotter pins.
Q. At inboard flap nose linkage of inboard flap, if old flap nose rod installed in wing is to be used, connect to operating crank on flap, tighten nut 5 to 10 pound-inches and install cotter pin. If new rod attached to flap is to be used, connect to lug in wing, tighten nut 30 to 40 pound-inches and install cotter pin.
R. Fully extend flap by hand until actuator is bottomed out.

S. Rotate flap nose to contact pads on flap panel and hold in position until flap nose rods are adjusted.

T. Adjust length of flap nose rods to connect to operating cranks on flap panels with flap nose in contact with flap pads as indicated in View 1. Tighten and lockwire adjustment nuts.

U. Connect flap nose rods to operating cranks and tighten nuts 5 to 10 pound-inches. Install cotter pins.

V. Check clearances with flap retracted manually.

(1) On inboard flap, disconnect flap nose rod from either outboard flap nose operating crank and leave disconnected until inboard flap nose clearances are checked. Restrain rod to prevent damage.

(2) On inboard flap, at inboard flap nose, apply modeling clay to flap nose as required to check clearances at boost pump, upstop and inner surface of flap panel (Section C-C).

(3) Retract flap to fully faired position by hand.

(4) On inboard flap, at inboard flap nose, extend flap and check modeling clay impressions to check boost pump, upstop and flap panel clearances. If clearances are not as specified in section C-C, adjust linkage as follows:

(a) Disconnect flap nose link and rod from operating crank.

(b) To increase clearance at boost pump and upstop, increase length of flap nose link. Shorten link to increase clearance at inner surface of flap panel.

NOTE: With flap nose rod disconnected and flap nose link connected and flap nose folded back, clearance between flap nose and operating crank should be 0.01 ±0.01 inch.

(c) Follow adjustment of link with flap nose rod adjustment to ensure that flap nose contacts pads on flap panel with flap fully extended (actuator bottomed out) and to ensure flap nose will clear fuel boost pump with flap fully retracted. Tighten and lockwire link and rod adjustment nuts.

NOTE: If adjustment of flap nose link and flap nose rod will not provide proper clearance between flap nose and fuel boost pump, replace or relocate the flap linkage attach fittings, and adjust the linkage.

(d) Connect link and rod to operating crank. Tighten nuts 5 to 10 pound-inches and install cotter pins.

(e) Recheck clearances and readjust as required.

(5) Remove restraint from disconnected outboard flap nose rod and connect to operating crank. Tighten nut 5 to 10 pound-inches and install cotter pin.

(6) On outboard flap and outboard flap nose of inboard flap, if flap nose did not clear structure and upstop beam at aft edge of flap cavity on retraction, adjust linkage as follows:

(a) Disconnect flap nose links and rods from both operating cranks.

(b) Shorten length of flap nose links if quicker retraction of flap nose is required. Lengthen links for slower retraction of flap nose.
(c) Follow adjustment of links with adjustment of flap nose rods to ensure that flap nose contacts pads on flap panel with flap fully extended (actuator bottomed out). Tighten and lockwire link and rod adjustment nuts.
(d) Connect links and rods to operating cranks. Tighten nuts 5 to 10 pound-inches and install cotter pins.
(e) Recheck clearances and readjust as required.

(7) Check that a minimum of 0.04 inch clearance exists between retracted flap and any adjacent airplane component in the leading edge flap cavity. This check applies to all flap locations.

W. Check flap nose clearances with flap retracted hydraulically.
(1) Provide system A hydraulic power (Ref 27-81-00 MP).
(2) Retract leading edge flap.
(3) Check that clearances specified in step V for manual retraction are maintained with flap retracted hydraulically.
(4) Remove system A hydraulic power (Ref 27-81-0 MP).
(5) If required, readjust flap nose linkages and recheck clearances with flap retracted hydraulically.

X. On inboard flap, install seal between inboard and outboard flap noses with five screws and retainer. (Seal was removed at beginning of installation.)

Y. Provide system A hydraulic power (Ref 27-81-0 MP).

Z. Check that seal depressor contacts entire length of bulb seal on wing structure with flap retracted and clears leading edge structure on flap extension (Section E-E). Adjust seal as required.

AA. Extend leading edge flap fully and remove system A hydraulic power (Ref 27-81-0 MP).

AB. Remove leading edge flap actuator lock.

AC. Provide system A hydraulic power and retract flaps (Ref 27-81-0 MP).

AD. Check flap panel gaps and mismatch as follows:
(1) Check gap at flap panel trailing edge and mismatch at leading edge (Section B-B).
(2) Check that gap between inboard and outboard flap panels is 0.06 to 0.15 inch except for aft 5 inches of flap which is to be 0.06 to 0.25 inch.
(3) If gaps and mismatch are not as required, check wing structure for damage and warpage.

<u>NOTE</u>: The above checks are made to ensure correct alignment of flap and wing structure. No adjustments can be made.

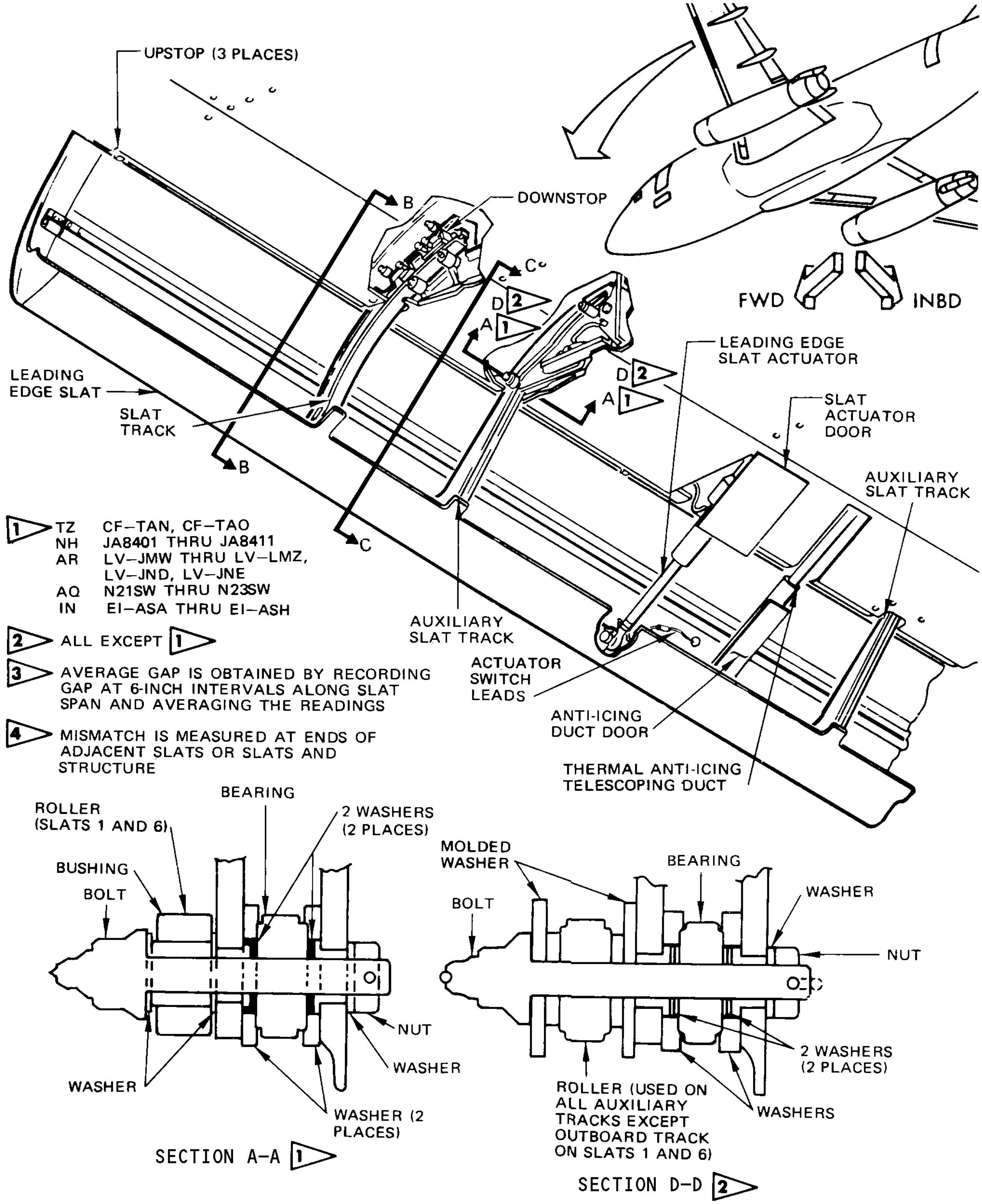
AE. Remove system A hydraulic power, if no longer required (Ref 27-81-0 MP).

AF. Reinstall landing light lens, if removed.

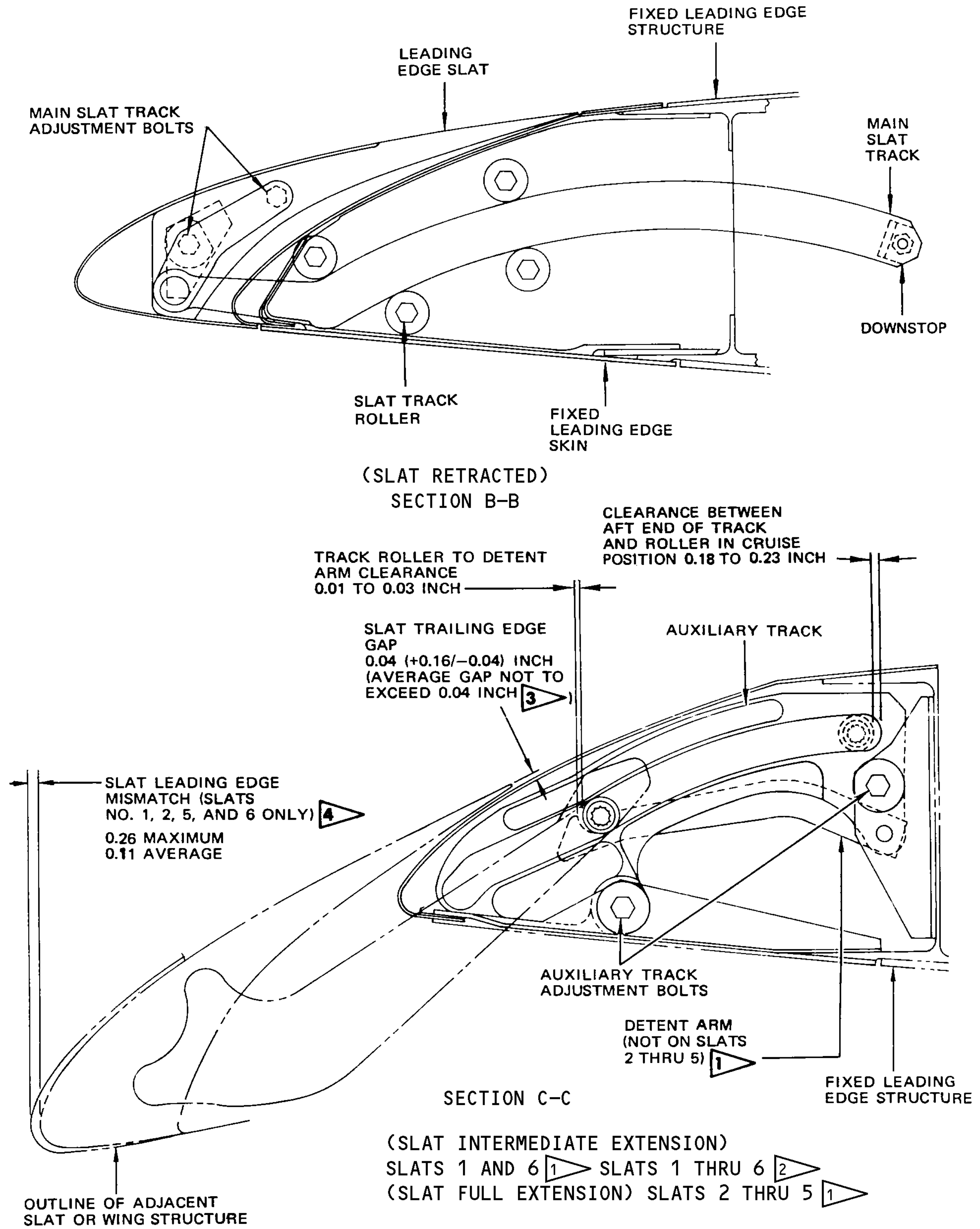
AG. Install forward wing to body fairing, if removed.

LEADING EDGE SLATS - REMOVAL/INSTALLATION

1. General
   A. The trailing edge of the inner skin on each leading edge slat is finished with an abrasion resistant teflon coating. The teflon coating is sprayed on the slat to protect aluminum skin surfaces. Refer to Chapter 51, Abrasion Resistant Teflon Finish System, if repair or rework of teflon coating is required.
   B. The leading edge slats may be rigged in any condition, with airplane on or off jacks, with no fuel or any amount of fuel in tanks. However, gap and mismatch tolerances are to be met under the same conditions that slats were rigged.
2. Equipment and Materials
   A. Corrosion Preventive Compound - MIL-C-11796, Class C (Ref 20-30-21)
   B. Locking Compound Sealer - MIL-S-46163, Type II
   C. Leading Edge Slat Actuator Locks - F80048-58, F80048-59, and F80048-60 (AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA8401 thru JA8411; PV CF-EPL, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB)
   D. Leading Edge Slat Actuator Locks - F80048-57, F80048-79 (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD ALL EXCEPT 5R-MFA; NH ALL EXCEPT JA8401 thru JA8411; PV ALL EXCEPT CF-EPL, CF-EPO and CF-EPR; TM ALL EXCEPT CR-BAA and CR-BAB)
   E. Slat Detent Arm Lever - F80192-1 (Preferred) or SE27-2005 (Optional)
   F. Tape - Scotch X-1155 or Scotch 61 3/4-inch wide (Ref 20-30-51)
   G. Spring Scale - 0- to 100-pound capacity
   H. Grease - BMS 3-33 (AMM 12-22-71/201, AMM 20-30-21/201)
3. Remove Leading Edge Slat
   A. Provide system A hydraulic power (Ref 27-81-0 MP).
   B. Position flap control lever in 1-unit detent.
   C. Remove system A hydraulic power (Ref 27-81-0).
   D. Remove fixed wing leading edge lower surface access panels.
   E. Remove seal and access door at leading edge slat actuator rod end.
   F. Remove bolt attaching rod end of leading edge slat actuator to leading edge slat (Fig. 401).
   G. Disconnect actuator switch leads at electrical connector and remove clamps securing leads to slat and anti-icing duct.
   H. Provide system A hydraulic power and modulate hydraulic pressure and flow so that leading edge devices will operate slowly (Ref 27-81-0).
   I. Position flap control lever to FLAP UP detent to retract slat actuator.
   J. Remove system A hydraulic power (Ref 27-81-0).
   K. Manually retract slat being removed to align downstops on slat tracks with holes in track ribs.
   L. Remove downstop from each slat track.
   M. Remove grease fitting bolt, bearing and roller (if installed) from each auxiliary track (Section A-A or D-D, Fig. 401).



Leading Edge Slat Installation
Figure 401 (Sheet 1)



(SLAT INTERMEDIATE EXTENSION)
SLATS 1 AND 6 1 SLATS 1 THRU 6 2
(SLAT FULL EXTENSION) SLATS 2 THRU 5 1

Leading Edge Slat Installation
Figure 401 (Sheet 2)

N. Roll slat forward and remove aerodynamic seal hook from stud at each auxiliary track.
O. Continue rolling slat forward to free tracks from slat rollers and remove slat from airplane. Telescoping, thermal, anti-icing duct will be freed as slat rolls forward.

4. Install Leading Edge Slat
   A. If used bolts or bushings are being installed, check for allowable wear (Ref 27-81-21 I/C).
   B. Check that thermal anti-icing spray tube and telescoping duct is installed in slat. If not, refer to Chapter 36, Pneumatic Ducts, and Chapter 30, Wing Anti-Icing Telescoping Duct. Check that track guide (Section B-B, Fig. 405) and track stop gap (Section A-A, Fig. 405) is 0.14 ±0.01 inch. If gap exceeds limits specified, shim as required.
   C. Insert male end of telescoping duct into female end attached to slat and install slat by sliding tracks between slat track rollers in wing leading edge (Fig. 401). Connect aerodynamic seal hooks to studs at each auxiliary track while installing slat and ensure tracks roll evenly between rollers without interference.
   D. Install grease fitting bolt, bearing, and bushing if used on CP CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; NH JA8401 thru JA8411; PI N734N thru N738N, N740N, N741N, N743N thru N747N; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; PW 731 thru 733, 762, 772, at each auxiliary track. Install roller at inboard and center tracks on slats 1 and 6. Also install roller at both tracks on slats 2, 3, 4 and 5 on CP ALL EXCEPT CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; NH ALL EXCEPT JA8401 thru JA8411; PI ALL EXCEPT N734N thru N738N, N740N, N741N, N743N thru N747N; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; PW ALL EXCEPT 731 thru 733, 762, 772 (Sections A-A and D-D, Fig. 401). Locate grease fitting end of bolt inboard at inboard auxiliary track and outboard at outboard auxiliary track except at center auxiliary track on slats 1 and 6, locate grease fitting end of bolt outboard. At outboard auxiliary track on slats 1 and 6, locate grease fitting end of bolt inboard. Tighten nuts to 30-40 pound-inches and install cotter pins.
   E. Install two downstops on each slat track. Slat should be almost in fully extended position to align each end of track with holes in track ribs. Tighten bolts finger-tight.
   F. Extend slat until downstops contact structural stops.

      NOTE: This step ensures that structural stops are properly aligned.

   G. Retract slats as required to align downstop bolts with access holes in aux tracks. Apply locking compound to bolt threads. Tighten stop bolts to 50-70 pound-inches.

H. Loosen auxiliary track adjustment bolts and on CP CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; NH JA8401 thru JA8411; PI N734N thru N738N, N740N, N741N, N743N thru N747N; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; PW 731 thru 733, 762, 772, loosen main track to slat adjustment bolts. On CP ALL EXCEPT CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; NH ALL EXCEPT JA8401 thru JA8411; PI ALL EXCEPT N734N thru N738N, N740N, N741N, N743N thru N747N; AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; PW ALL EXCEPT 731 thru 733, 762, 772 on slats 2, 3, 4 and 5 only, loosen main track to slat adjustment bolts; on slats 1 and 6 only, set main track to slat adjustment bolts at nominal and tighten.

I. On all slats except slats 2 thru 5 on airplanes CP CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; NH JA8401 thru JA8411; PI N734N thru N738N, N740N, N741N, N743N thru N747N; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; PW 731 thru 733, 762, 772, remove detent arm torque adjustment screw.

J. Manually retract slat to faired position.

K. Check that slat trailing edge upper gap is as shown in Fig. 402. If not, adjust upstops to obtain proper gap (Fig. 403).

L. Check that slat trailing edge lower surface mismatch is as shown in Fig. 402. If mismatch exceeds limits specified adjust main track by loosening slat adjustment bolts and repositioning serrated washers (Section B-B, Fig. 401). Ensure that serrations are properly aligned, then tighten bolts to 60-85 pound-inches. Install cotter pins if castellated nuts are used with drilled shank bolts.

M. Recheck slat trailing edge upper gap as shown in Fig. 402. Adjust upstops if required.

N. Adjust center stop near actuator by moving stop forward to contact slat. Back off one serration and tighten nuts.

O. Check gap between track bearing and aft end of auxiliary track is within limits (Section C-C, Fig. 401). If gap exceeds limits specified, adjust auxiliary track fore and aft. After adjustment, tighten bolts. Install cotter pins if castellated nuts are used with drilled shank bolts.

P. Check that slat trailing edge upper surface mismatch is as shown in Section A-A, Fig. 402. If mismatch exceeds limits specified, adjust aft end of auxiliary track by loosening aft adjustment bolt and adjusting track vertically. Ensure that serrations are properly aligned, then tighten bolt to 45-65 pound-inches. Install cotter pin if castellated nut is used with drilled shank bolt.

Q. Bend tabs at main tracks (if required) to fair tabs with wing structure.

R. Deleted.

S. Check that slat trailing edge lower surface mismatch is as shown in Section A-A. If mismatch exceeds limits specified, adjust auxiliary track by loosening forward adjustment bolt. Ensure that serrations are properly aligned, then tighten bolt to 45-65 pound-inches. Install cotter pin if castellated nut is used with drilled shank bolt.

T. Provide system A hydraulic power (Ref 27-81-0).

U. With slats in intermediate position, move flap control lever to 1-unit detent and align rod end of actuator with actuator support on slat.

V. Remove system A hydraulic power (Ref 27-81-0 MP).

WARNING: ALL ADJUSTMENTS WILL BE ACCOMPLISHED WITH HYDRAULIC SYSTEM DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL OR COMPONENT DAMAGE. INSTALL LEADING EDGE SLAT ACTUATOR LOCKS AS REQUIRED WHEN ADJUSTING SLATS WITH ACTUATOR CONNECTED.

W. Install bolt with washer on each side. Install locknut and tighten 220 to 360 pound-inches.

X. Install clamps securing actuator switch leads to slat and anti-icing duct and reconnect leads at electrical connector (Fig. 406). Two to four wraps of tape may be applied under clamp to prevent clamp from shifting.

CAUTION: TO PREVENT CHAFING, THE SLAT ACTUATOR DOWNLOCK HARNESS AND CLAMPS MUST BE POSITIONED AND INSTALLED TO AVOID INTERFERENCE WITH TELESCOPING DUCT.

Y. With slats in intermediate position, check that slat trailing edge gap is as shown in Fig. 401 on slats 1 and 6 (AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA8401 thru JA8411; PV CF-EPL, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB) or all slats (all other airplanes). Maintain specified gap between track roller and detent arm when measuring gap. If gaps exceed limits specified, adjust auxiliary track. Forward bolt adjusts for intermediate up and down trim. Loosen both bolts for fore and aft trim. Ensure that serrations are properly aligned, then tighten bolts 45 to 65 pound-inches. Install cotter pins if castellated nuts are used with drilled shank bolts.

Z. Provide system A hydraulic power (Ref 27-81-0 MP).

AA. Position flap control lever in FLAP UP detent to retract flaps and check that slat trailing edge upper surface mismatch is as shown in Fig. 402. If mismatch exceeds limits specified, adjust auxiliary track by loosening aft adjustment bolt. After adjustment, ensure that serrations are properly aligned, then tighten bolt 45 to 65 pound-inches. Install cotter pin if castellated nut is used with drilled shank bolt.

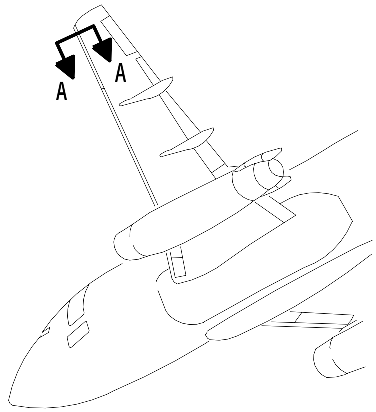
AB. Adjust aerodynamic seals on spoiler ends.

(1) Gap between blade type seal and adjacent structure is 0.00 to 0.03 inch.

(2) Bulb type seal (not on all airplanes) must be compressed 0.03 to 0.2 inch.

AC. Position flap control lever to 30-unit position.

AD. Install detent arm torque bolt.

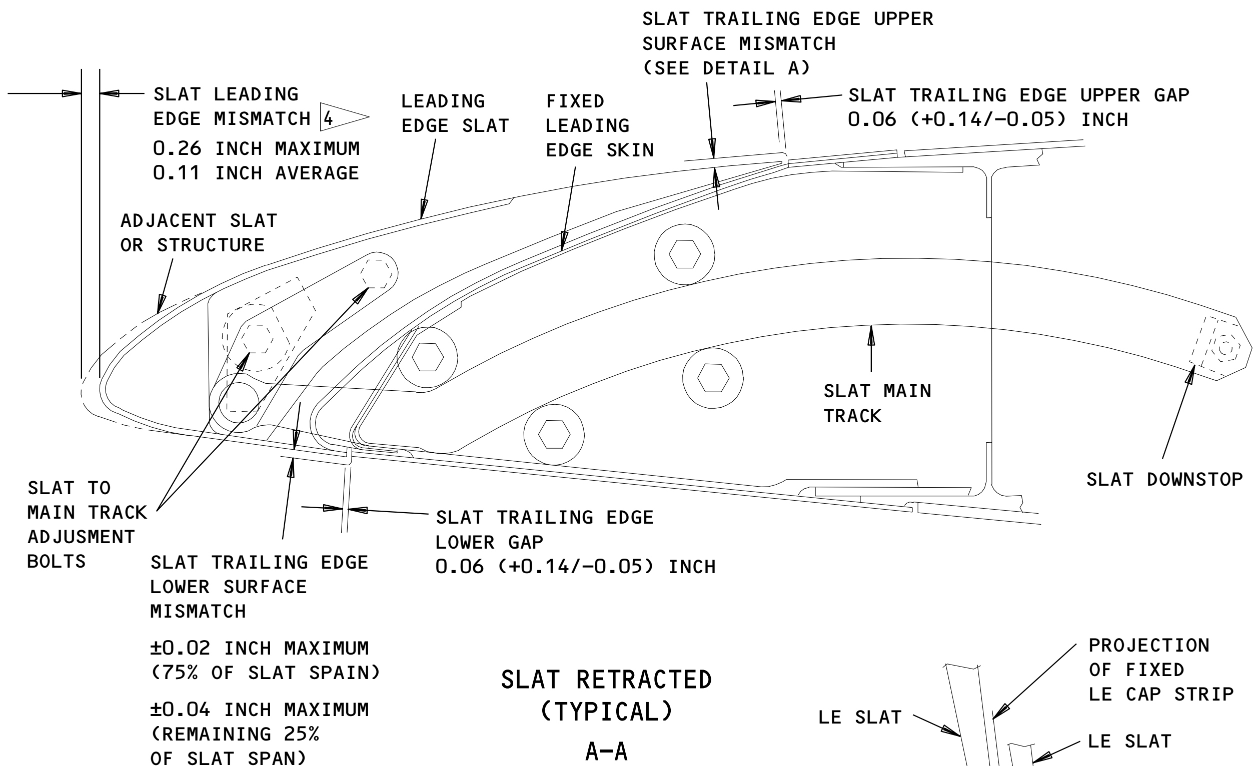


1 NH JA8401 THRU JA8411
ML 9M-AOU THRU 9M-AOW, 9V-BBC, 9V-BBE
AR LV-JMW THRU LV-JMZ, LV-JND, LV-JNE
NZ ZK-NAC THRU ZK-NAM

2 ALL EXCEPT 1

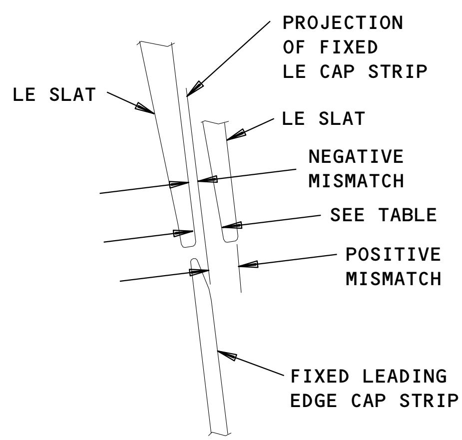
3 AVERAGE MISMATCH IS OBTAINED BY RECORDING MISMATCH AT 6-INCH INTERVALS ALONG SPAN AND AVERAGING THE READINGS

4 MISMATCH MEASURED AT ADJACENT SLAT ENDS



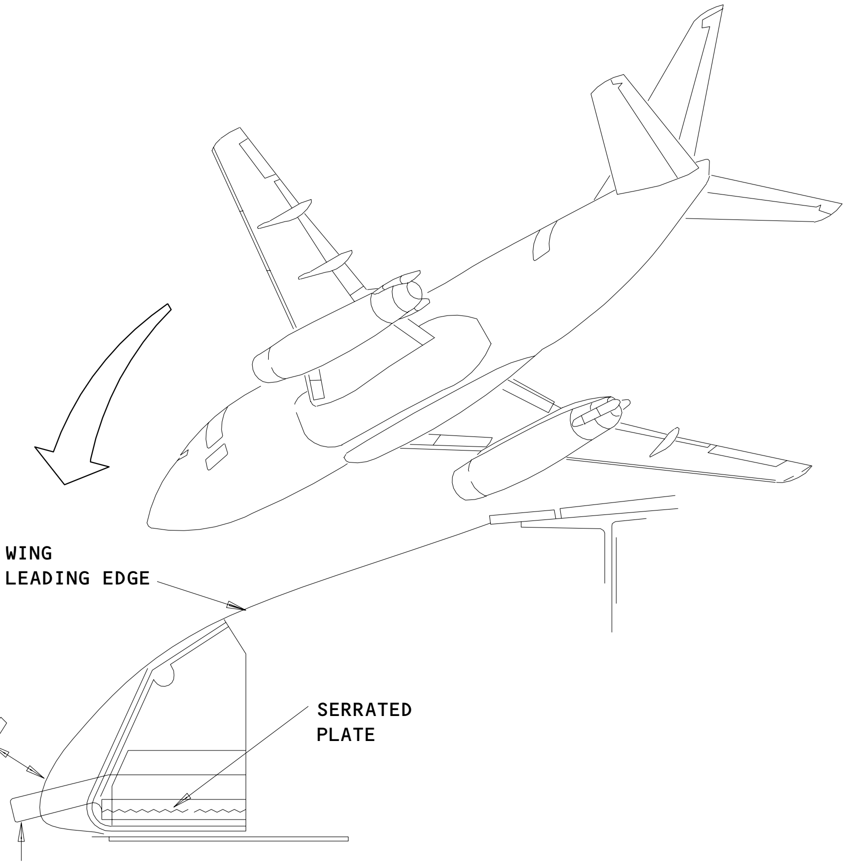
SLAT RETRACTED
(TYPICAL)
A-A

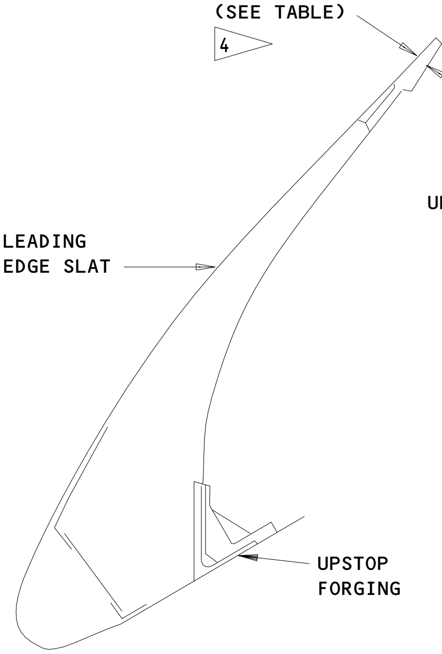
TRAILING EDGE UPPER SURFACE MISMATCH			
LOCATION ON SLAT SPAN	MAXIMUM MISMATCH (INCHES)		AVERAGE 3 MISMATCH (INCHES)
	AIRPLANES 1	AIRPLANES 2	AIRPLANES 1
WITHIN 30 INCHES OF SLAT END	0.19	0.16	0.05
ENTIRE SPAN EXCEPT 30 INCHES AT EACH END	0.07	0.05	0.05
AUXILIARY TRACKS	——	0.02	——



DETAIL A
(ROTATED 90 DEGREES)

Leading Edge Slat Mismatch Requirements
Figure 402





SLAT NO.	GAP (INCHES) (SLAT FULLY EXTENDED)		GAP [1] ASYMMETRY (SLAT FULLY EXTENDED) (INCHES)
	INBOARD END	OUTBOARD END	
1 AND 6 [2]	0.96 (+0.25/-0.51)	0.60 (+0.25/-0.35)	0.25
1 AND 6 [3]	0.80 (±0.25)	0.60 (+0.25/-0.20)	0.25
2 AND 5 [3]	1.16 (+0.25/-0.30)	0.96 (+0.25/-0.20)	0.25
3 AND 4 [3]	1.28 (+0.25/-0.30)	1.16 (+0.25/-0.30)	0.25

[1] GAP ASYMMETRY IS MAXIMUM ALLOWABLE DIFFERENCE BETWEEN CORRESPONDING DIMENSIONS OF OPPOSITE SLATS. MORE THAN ONE TYPE OF SLAT STOP MAY BE USED TO GET THE SPECIFIED GAP.

[2] NH JA8401 THRU JA8411
AR LV-JMW THRU LV-JMZ,LV-JND,LV-JNE
VP PP-SMA THRU PP-SME,PP-SMQ THRU PP-SMT
AQ N21SW,N22SW, AND N25SW
EF B-2601,B-2603,B-2607
QK 001,100,101

[3] NH,AR,VP,AQ,EF,QK ALL EXCEPT [2]

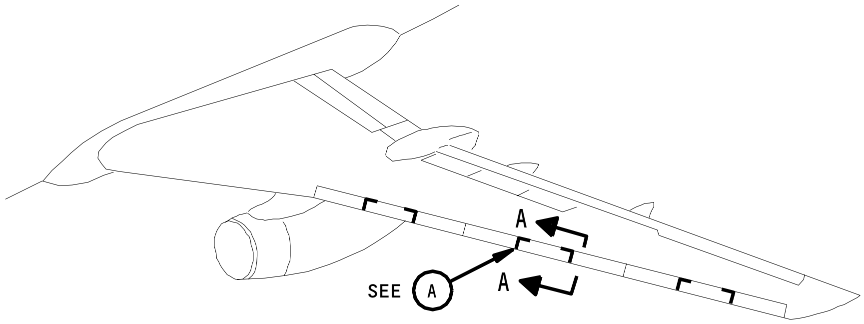
[4] GAP MEASURED WITH SLAT EXTENDED HYDRAULICALLY

Leading Edge Slat Gap Adjustment
Figure 403

AE. With slats fully extended, check that slat trailing edge gap is as shown in Fig. 403 on slats 1 and 6 (AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA8401 thru JA8411; PV CF-EP, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB) on all slats (all other airplanes). If gaps are not within limits, retract slats to intermediate position and adjust per step Y to obtain required gap in intermediate and full extend positions. After adjustment, tighten bolts to 45-65 pound-inches. Install cotter pins if castellated nuts are used with drilled shank bolts.
AF. With slats in step AE fully extended, check that distance from top of detent arm ramp to track lower surface is 0.72 +0.13/-0.08 inch. If not, reposition stop (Fig. 404). Ensure that bottom of detent is above lower surface of track after stop is repositioned.
AG. Deflect detent arm so that top of ramp is aligned with track lower surface within 0.03 inch. The load at this point shall be within 70 to 85 pounds, applied at the detent arm using slat detent arm lever. If not, adjust support arm. The difference in load measured between each detent arm at any slat shall not exceed 3 pounds.
AH. Remove system A hydraulic power (Ref 27-81-0).
AI. Check all adjustment nuts are tight. Install cotter pins if castellated nuts are used with drilled shank bolts.
AJ. Remove all leading edge slat actuator locks.
AK. Install access door and seal at leading edge slat actuator rod end.
AL. Lubricate tracks and bearings with grease (AMM 12-22-71/201, AMM 20-30-21/201).
AM. Install fixed wing leading edge lower surface access panels.
AN. Provide system A hydraulic power (Ref 27-81-0).
AO. Position flap control lever to FLAP UP detent.
AP. Check that actuator door and thermal anti-icing duct door firmly contact structure on all edges. If not, adjust to obtain firm contact.
AQ. With slats in retracted position, check that slat leading edge mismatch is as shown in Fig. 402.
AR. On NH ALL EXCEPT JA8401 thru JA8411; IN EI-ASA thru EI-ASH; VP PP-SMA thru PP-SME, PP-SMQ thru PP-SMT; AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; NZ ZK-NAC thru ZK-NAL; SA ZS-SBL thru ZS-SBR, with slats 1 thru 6 in intermediate position, check that slat leading edge mismatch is as shown in Fig. 401.

<u>NOTE</u>: Extend slats forward to bring auxiliary track roller into contact with detent of detent arm before measuring mismatch.

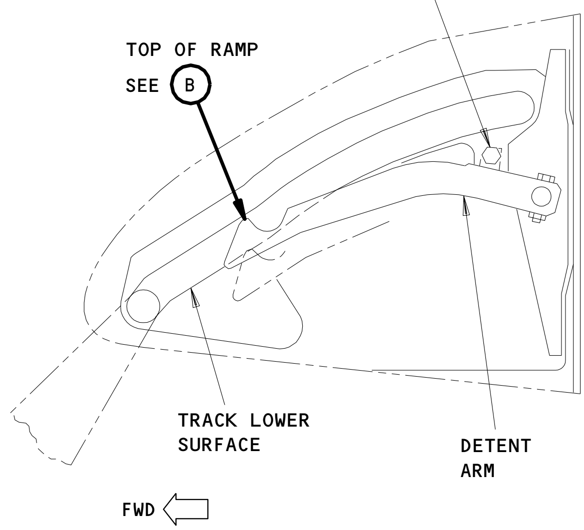
AS. Remove system A hydraulic power (Ref 27-81-0).



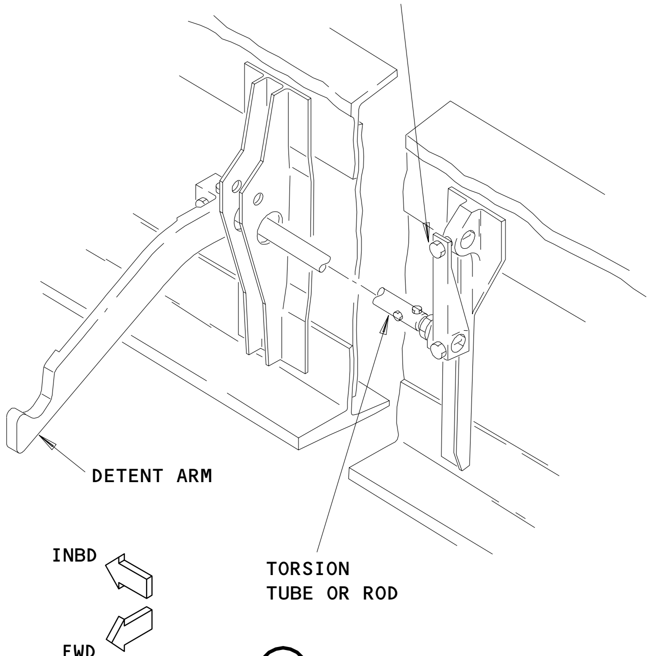
EFFECTIVITY

SLATS 1 AND 6 ONLY
AR LV-JMW THRU LV-JMZ,
LV-JND, LV-JNE

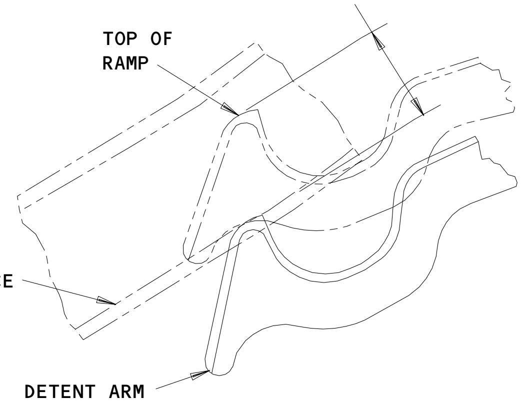
SLATS 1 THRU 6
AR ALL EXCEPT
LV-JMW THRU LV-JMZ
LV-JND, LV-JNE



A-A

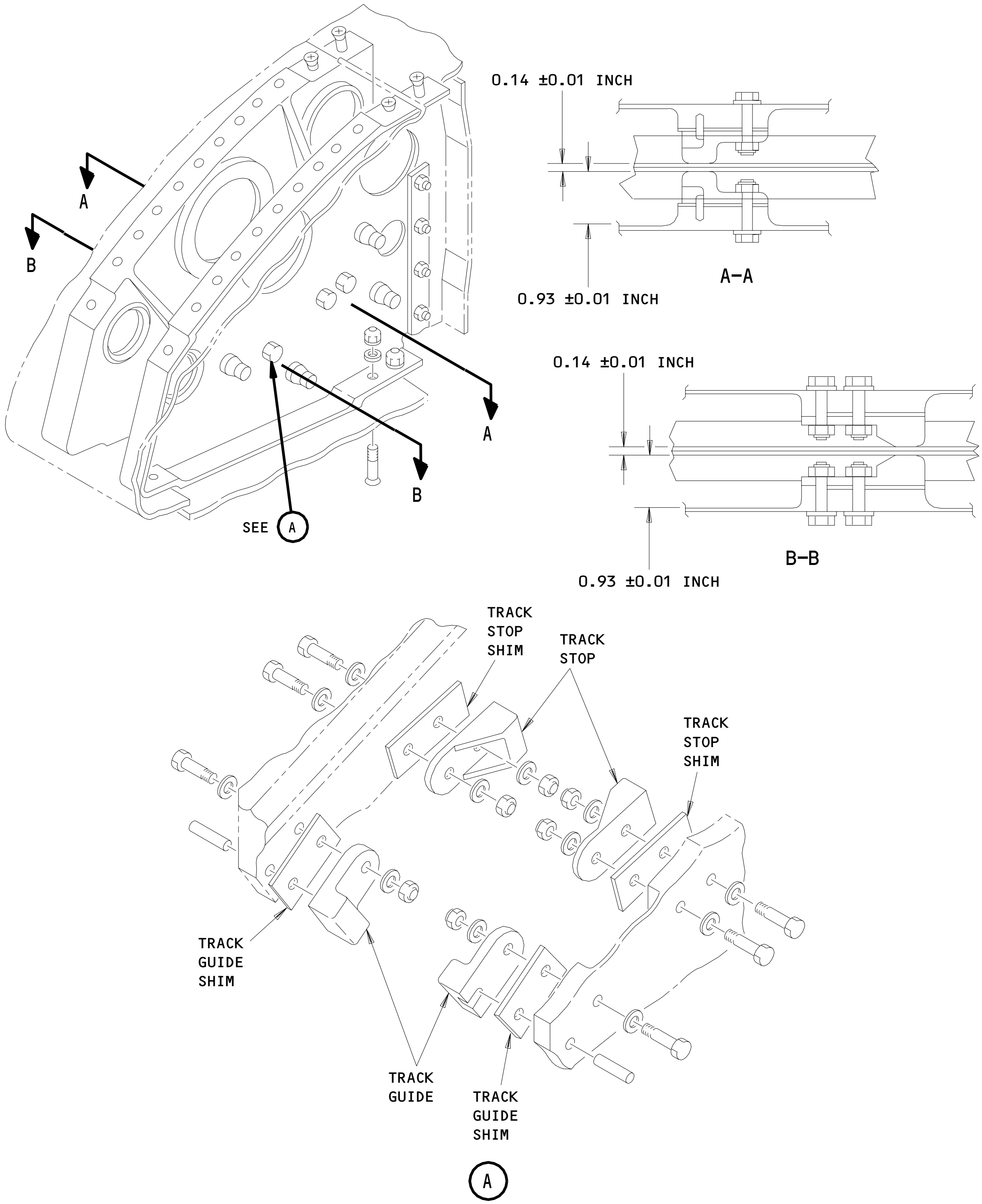


A

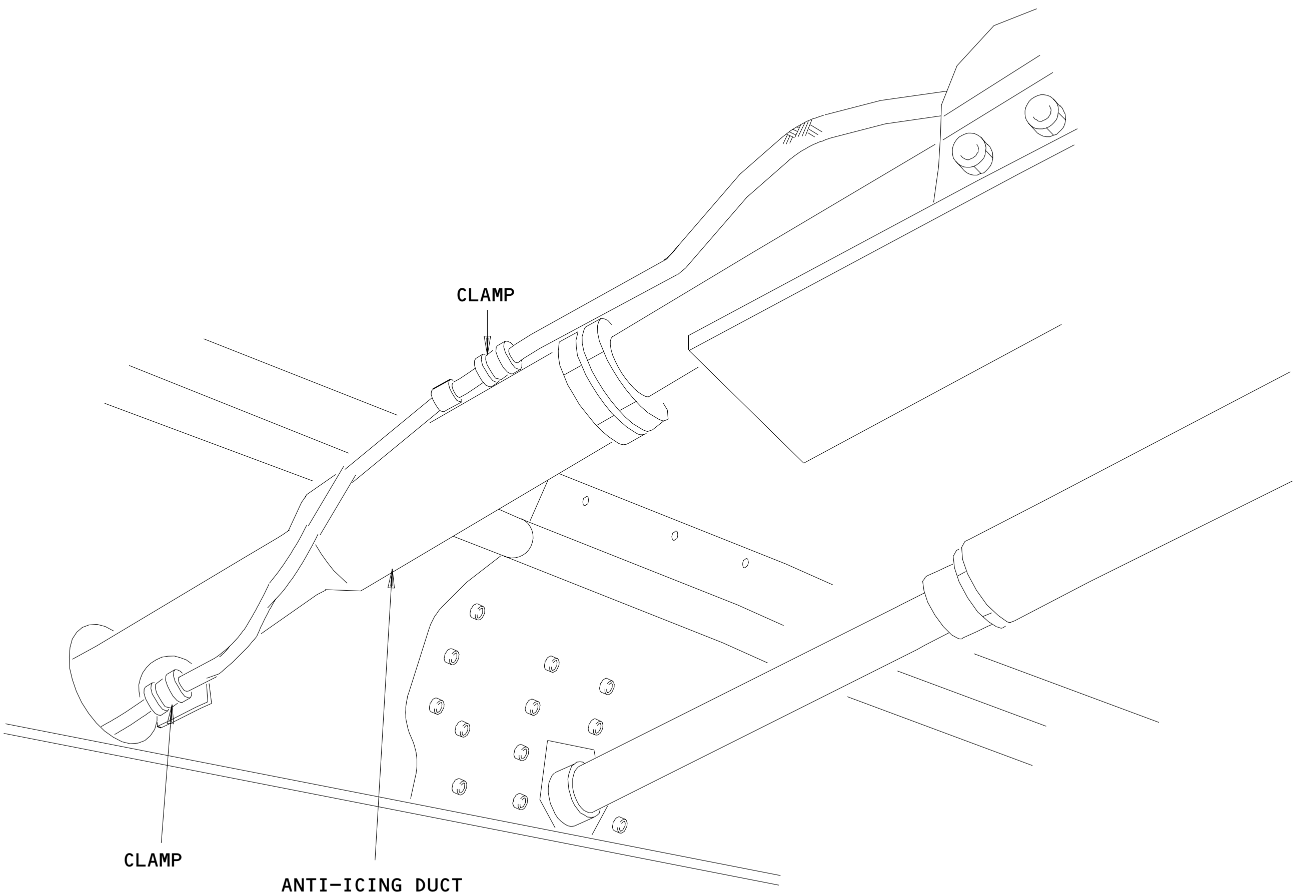


B

Slat Torsion Rod Adjustment
Figure 404



Leading Edge Slat Installation
Figure 405



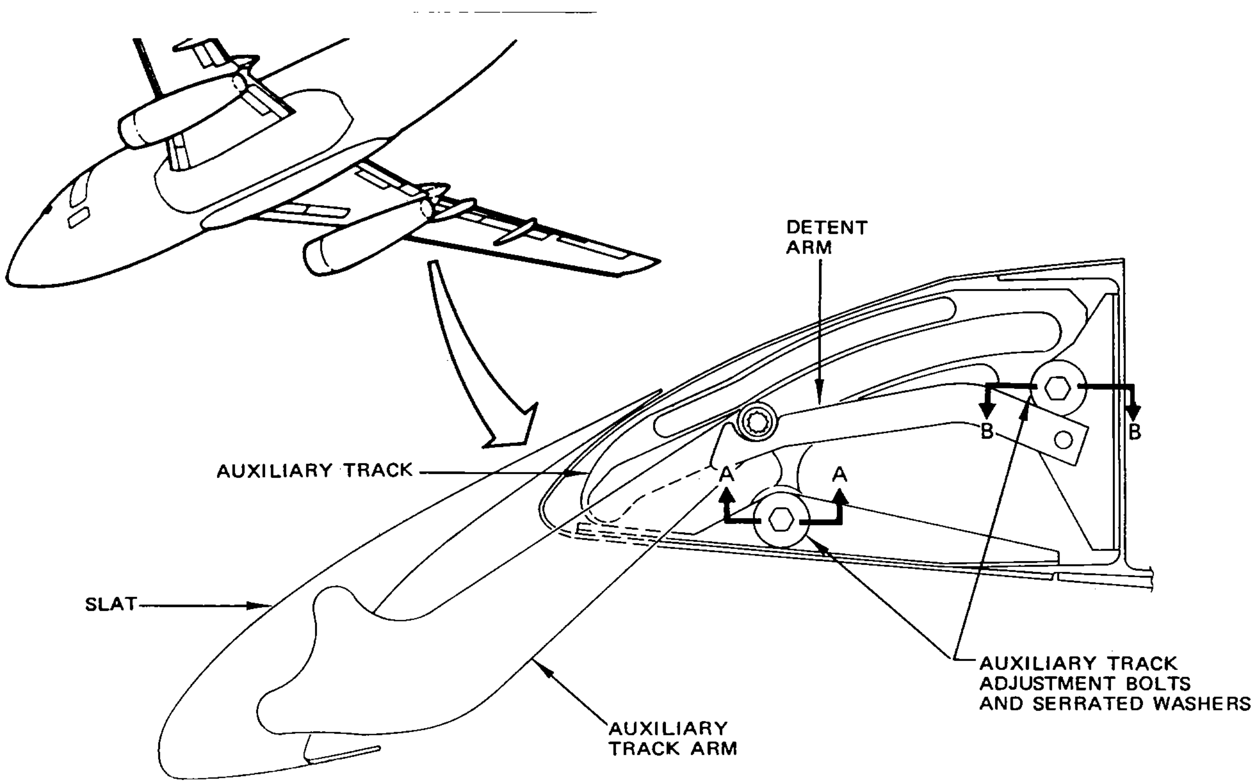
Actuator Switch Lead Clamp Installation
Figure 406

LEADING EDGE SLATS - INSPECTION/CHECK

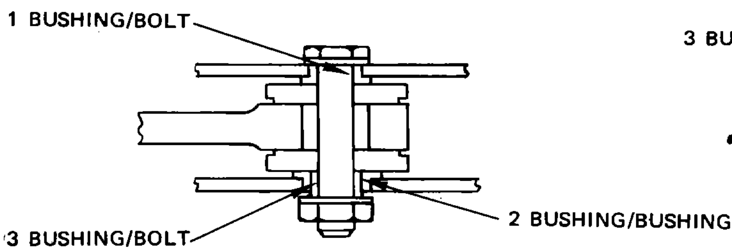
1. General
   A. This data consists of illustrations and wear limit charts. This section gives no procedures for gaining access to or removing the components, or for replacing them after inspection for wear . Refer to component removal/Installation for this information.
2. Leading Edge Slats - Surface Conditions
   A. Check that leading edge roughness is less than that of 240 grit sandpaper. Symmetry between left and right wing should be maintained. Refer to Structural Repair Manual 57-50-3 for leading edge erosion repair if roughness is exceeded.
   B. Check for dents in nonhoneycomb structure.

      NOTE: For allowable dents in the wing thermal anti-ice area refer to the Structural Repair Manual.

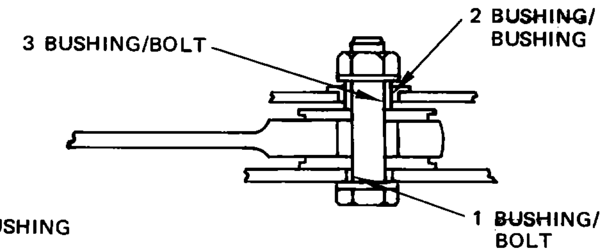
      (1) Maximum depth of dent damage (Y) must not exceed Y=0.10.
      (2) Maximum Y/A ratio (A=diameter of dent) must not exceed 0.03 inch per inch.
   C. Check for dents on honeycomb structure.
      (1) Maximum depth of dent damage must not exceed Y=0.10.
      (2) Maximum A/Y value must be greater than 10.
   D. Refer to Structural Repair Manual, 57-50-3 Wing Leading Edge Slat-Skin Repair for repair instructions for dents that fall within the allowable limits.
3. Leading Edge Slats - Wear Limits



Leading Edge Slat Auxiliary Track Wear Limits
Figure 601 (Sheet 1)



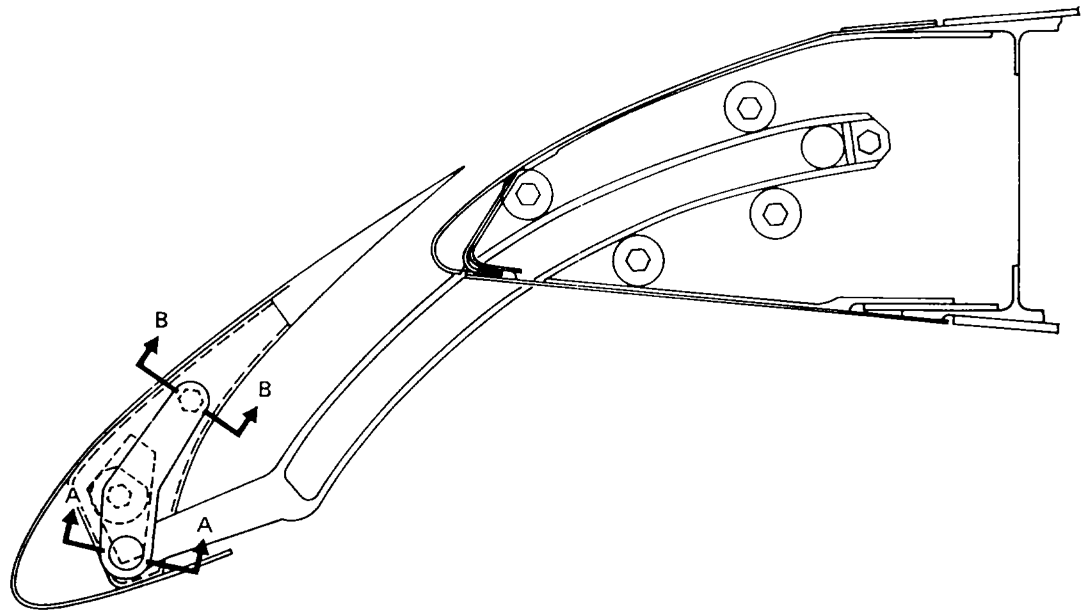
SECTION A-A

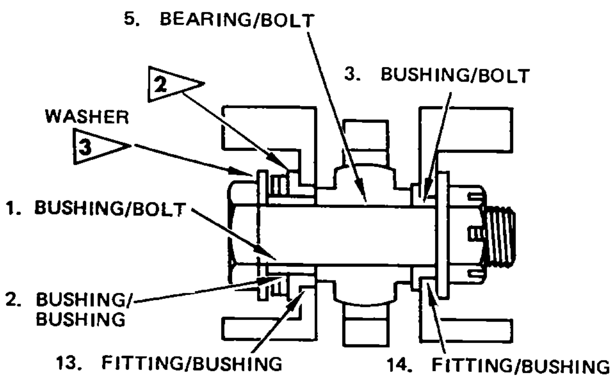


SECTION B-B

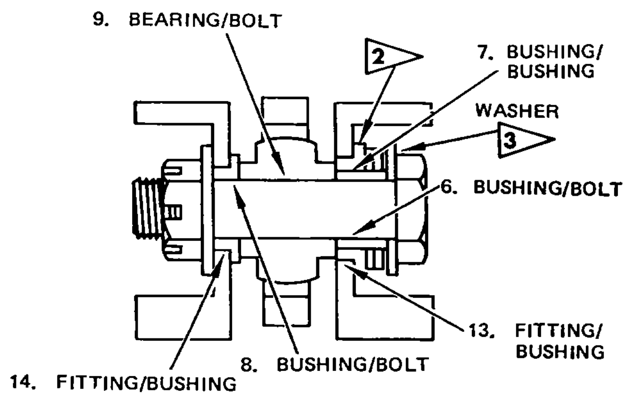
INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
2	BUSHING	ID	0.5000	0.5015	0.5070	0.0090	X		
	BUSHING	OD	0.4960	0.4980	0.4910		X		
3	BUSHING	ID	0.3120	0.3135	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		

Leading Edge Slats Auxiliary Track Wear Limits
Figure 601 (Sheet 2)

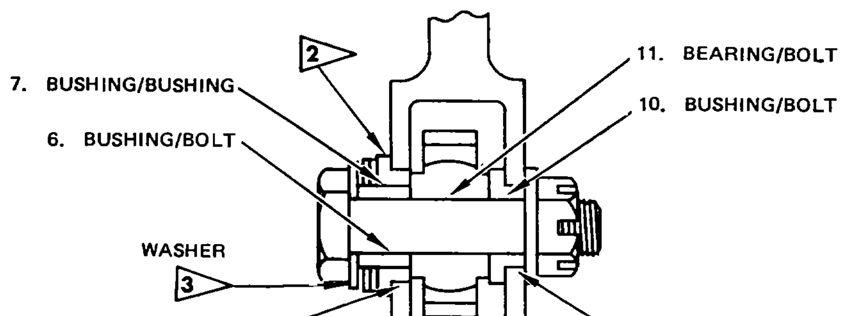




SLATS 1 AND 6 INBOARD AND
OUTBOARD MAIN TRACKS



SLATS 2 AND 5
OUTBOARD MAIN TRACKS



SLATS 2 AND 5 INBOARD MAIN TRACKS
SLATS 3 AND 4 INBOARD AND OUTBOARD MAIN TRACKS
SECTION A-A

Leading Edge Slats Main Track Wear Limits
Figure 602 (Sheet 1)

SLATS 1 AND 6 INBOARD AND OUTBOARD MAIN TRACKS

SLATS 2, 3, 4 AND 5 INBOARD AND OUTBOARD MAIN TRACKS

SECTION B-B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.3120	0.3135	0.3170	0.0050	X		
	BOLT	OD	0.3110	0.3120	0.3070		X		
2	BUSHING	ID	0.5000	0.5015	0.5070	0.0090	X		
	BUSHING	OD	0.4960	0.4980	0.4910		X		
3	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
4	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
5	BEARING	ID	0.3120	0.3125	0.3150	0.0030	X		
	BOLT	OD	0.3110	0.3120	0.3090		X		

Leading Edge Slats Main Tracks Wear Limits
Figure 602 (Sheet 2)

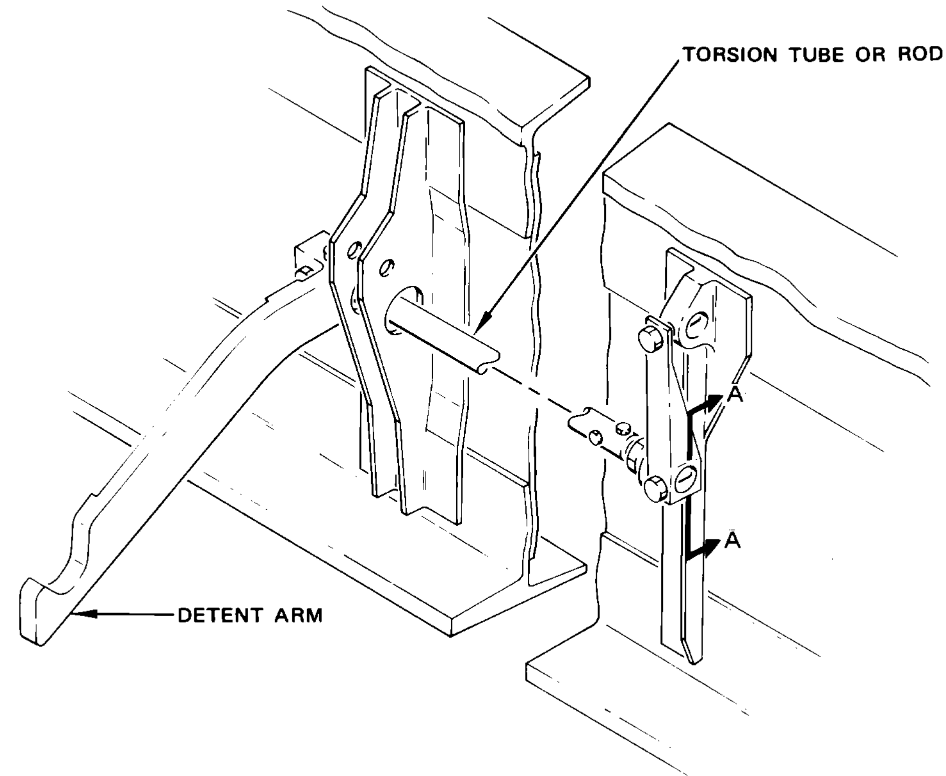
INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR- ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
6	BUSHING	ID	0.3120	0.3135	0.3160	0.0040	X		
	BOLT	OD	0.3115	0.3120	0.3080		X		
7	BUSHING	ID	0.5000	0.5015	0.5070	0.0090	X		
	BUSHING	OD	0.4960	0.4980	0.4910		X		
8	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
9	BEARING	ID	0.3120	0.3125	0.3150	0.0030	X		
	BOLT	OD	0.3170	0.3120	0.3090		X		
10	BUSHING	ID	0.3125	0.3140	0.3170	0.0050	X		
	BOLT	OD	0.3115	0.3120	0.3075		X		
11	BEARING	ID	0.3120	0.3125	0.3140	0.0060	X		
	BOLT	OD	0.3115	0.3120	0.3100		X		
12	BUSHING	ID	0.3125	0.3140	0.3180	0.0060	X		
	BOLT	OD	0.3110	0.3120	0.3065		X		
13	FITTING	ID	0.6247	0.6254	1				
	BUSHING	OD	0.6257	0.6265	1				
14	FITTING	ID	0.4373	0.4379	1				
	BUSHING	OD	0.4381	0.4386	1				

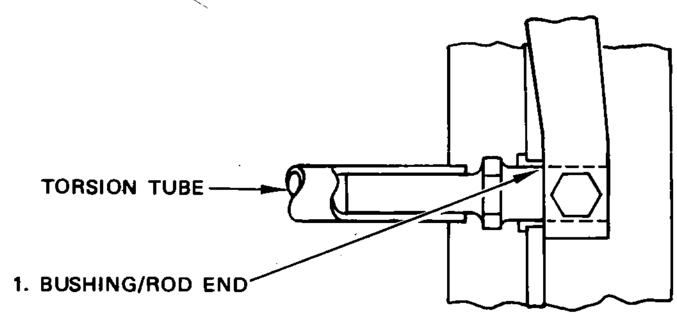
1 PARTS MAY NOT BE WORN BEYOND DESIGN LIMITS.

2 CHECK FLANGED BUSHINGS FOR MIGRATION. IF BUSHING SHOWS SIGNS OF MIGRATION, REMOVE BUSHING, CHECK FOR WEAR, AND REINSTALL WITH WET PRIMER.

3 CHECK THAT 0.02 ±0.01 INCH GAP EXISTS BETWEEN WASHER UNDER BOLT HEAD AND WASHER ON BUSHING ADJACENT TO FLANGED BUSHING. IF GAP IS INCORRECT, ADD OR REMOVE WASHERS ON BUSHING TO OBTAIN 0.02 ±0.01 INCH GAP.

Leading Edge Slats Main Tracks Wear Limits
Figure 602 (Sheet 3)





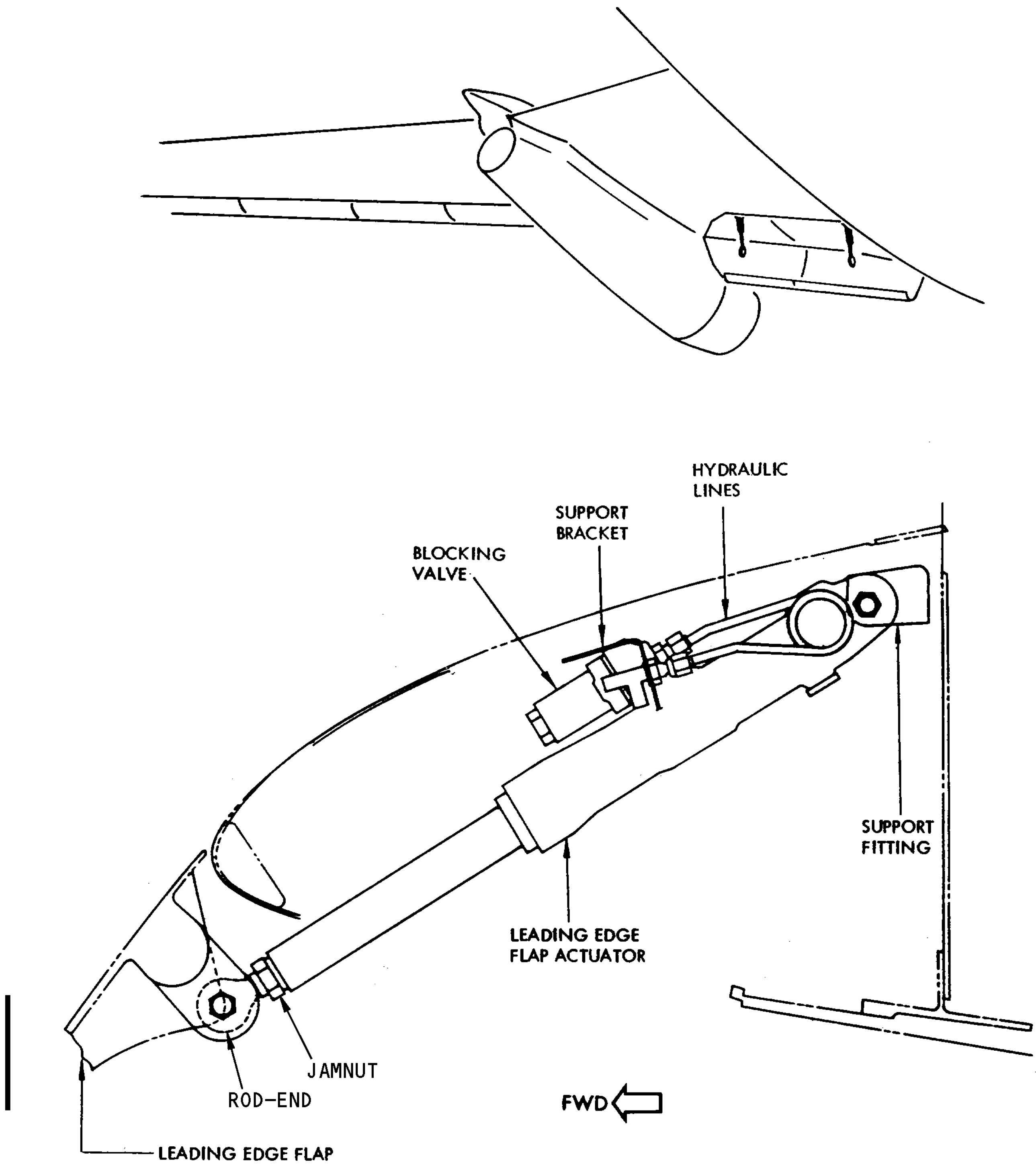
SECTION A-A

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS ALLOWED WEAR DIM.	WEAR LIMITS MAX DIAM CLEAR-ANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.5245	0.5255	0.5560	0.0510	X		
	ROD END	OD	0.5000	0.5050	0.4735		X		

Leading Edge Slat Torsion Tube Wear Limits
Figure 603

LEADING EDGE FLAP ACTUATORS - REMOVAL/INSTALLATION

1. General
   A. A container will be required to catch hydraulic fluid when disconnecting hydraulic lines from leading edge flap actuators.
2. Equipment and Materials
   A. Leading Edge Flap Actuator Locks - F80048-89, -90 (Preferred) or -84 (Optional)
   B. Corrosion Preventive Compound - MIL-C-11796 class 3 (AMM 20-30-21/201).
   C. Protractor Assembly - 4MIT65B80307-1 (preferred), F52485-500 (optional)
   D. Sealant - BMS 5-95 (AMM 20-30-11/201)
3. Remove Leading Edge Flap Actuator
   A. Provide system A hydraulic power (AMM 27-81-0/201).
   B. Position flap control lever to 1-unit detent to extend leading edge flaps.
   C. Depressurize hydraulic systems (AMM 27-81-0/201).
   D. Install lock on adjacent leading edge flap actuator.
   E. Remove bolt attaching leading edge flap actuator to leading edge flap (Fig. 401).
   F. Remove lockwire and disconnect hydraulic lines from support bracket. Install plugs in hydraulic lines and cap all ports.
   G. Remove bolt attaching actuator to support fitting and remove actuator.
4. Install Leading Edge Flap Actuator
   A. If existing bearings, bushings, or bolts are being installed, check for allowable wear (AMM 27-81-31/601).
   B. Align leading edge flap actuator with support fitting and install clamp-up bushing (if used) and bolt with washer on each side (Fig. 401). On airplanes without clamp-up bushing, install shim between actuator bearing and support fitting if gap exceeds 0.003 inch. Install locknut and tighten 300 to 450 inch-pounds. On airplanes without clamp-up bushing, check for cracks on support fitting (AMM 27-81-31/601).
   C. Ensure that hydraulic reservoirs are depressurized and remove plugs from hydraulic lines and caps from ports.
   D. Connect hydraulic lines to support bracket. Lockwire nuts.
   E. Apply a thin film of corrosion preventive compound to actuator rod-end attachment bolt and washers then align actuator rod-end with leading edge flap and install bolt with a washer under bolthead. Place washer under nut and tighten nut 660 to 780 inch-pounds, aligning cotter pin hole in bolt with slot in nut. Install cotter pin.
   F. Remove leading edge flap actuator lock (AMM 27-81-0/201).
   G. On AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE; NH ALL EXCEPT JA8401 thru JA8411; SQ ALL EXCEPT 9M-AOU thru 9M-AOW, 9V-BBC and 9V-BBE; TM ALL EXCEPT CR-BAA and CR-BAB:
      (1) Provide system A hydraulic power (AMM 27-81-0/201).
      (2) Retract leading edge flap using hydraulic pressure.



Leading Edge Flap Actuator Installation
Figure 401

CAUTION: TO PRECLUDE STRUCTURAL DAMAGE, MONITOR FLAP NOSE CLEARANCE DURING RETRACTION.

(3) Attach adjustable angle protractor to flap and set to zero angle. Mark protractor location on flap for future use. On inboard flap, attach protractor to outboard end of flap. On outboard flap, attach protractor to inboard end of flap.
(4) Extend leading edge flap with hydraulic pressure.
(5) Remove system A hydraulic power (AMM 27-81-0/201).
(6) Attach protractor at same location as that for retracted position. Measure flap angle at extended position.
  (a) If angle is 96 to 97 degrees, continue with paragraph 3.
  (b) If angle is not 96 to 97 degrees:
    1) Remove bolt attaching flap actuator to leading edge flap (Fig. 401).
    2) Loosen flap actuator rod-end jamnut.
    3) Adjust flap actuator rod-end to attain required flap extended position angle.

NOTE: Maximum adjustment of rod end is limited to two full turns.

    4) Tighten flap actuator rod-end jamnut, install lockwire and seal.
    5) Apply a thin film of corrosion preventative compound to actuator rod-end attachment bolt and washers. Align actuator rod-end with leading edge flap and install bolt with a washer under bolthead. Place washer under nut and tighten nut to 660 to 780 inch-pounds and install cotter pin.

H. Pressurize system A hydraulic power (AMM 27-81-0/201).
I. Cycle leading edge flaps and slats several times to bleed air from system.
J. Examine hydraulic fittings on actuator for leakage.
K. Test leading edge flap standby hydraulic system as follows:
  (1) Connect electrical power and check that power is available on No. 1 and 2 generator buses.
  (2) On the forward overhead panel, check that the following switches are in the OFF position:
    (a) FLT CONTROL A
    (b) FLT CONTROL B
  (3) Position ALT FLAP arming switch to ARM.

(4) Position alternate flaps position switch to down to extend leading edge flaps and slats.

<u>CAUTION</u>: ENSURE LEADING EDGE FLAPS AND SLATS ARE CLEAR OF OBSTRUCTIONS AND PERSONNEL. WITH SYSTEM A HYDRAULIC POWER APPLIED AND THE FLAP CONTROL HANDLE AT ZERO UNITS, THE LEADING EDGE FLAPS AND SLATS WILL SUDDENLY RETRACT WHEN POSITIONING THE ALTERNATE FLAP ARMING SWITCH TO OFF.

(5) Position alternate flaps arming switch to off.
(6) Repeat steps (3) thru (5) three times.

<u>CAUTION</u>: DO NOT OPERATE ALTERNATE FLAPS DRIVE MOTOR FOR MORE THAN 4 MINUTES IN A 25 MINUTE TIME SPAN. THE DRIVE MOTOR MAY OVERHEAT.

(7) Examine the hydraulic fittings on the flap actuator for leakage.

L. Perform leading edge flaps and slats test (AMM 27-81-0/501).

5. <u>Restore Airplane to Normal Configuration</u>

A. Retract flaps.

<u>CAUTION</u>: TO PRECLUDE STRUCTURAL DAMAGE, MONITOR FLAP NOSE CLEARANCE DURING RETRACTION.

B. On forward overhead panel, position the following switches to ON:
(1) FLT CONTROL A.
(2) FLT CONTROL B.

C. Remove system A hydraulic power (AMM 27-81-0/201).
D. Disconnect electrical power.
E. Check hydraulic reservoirs and service if required (AMM 12-12-0/201).

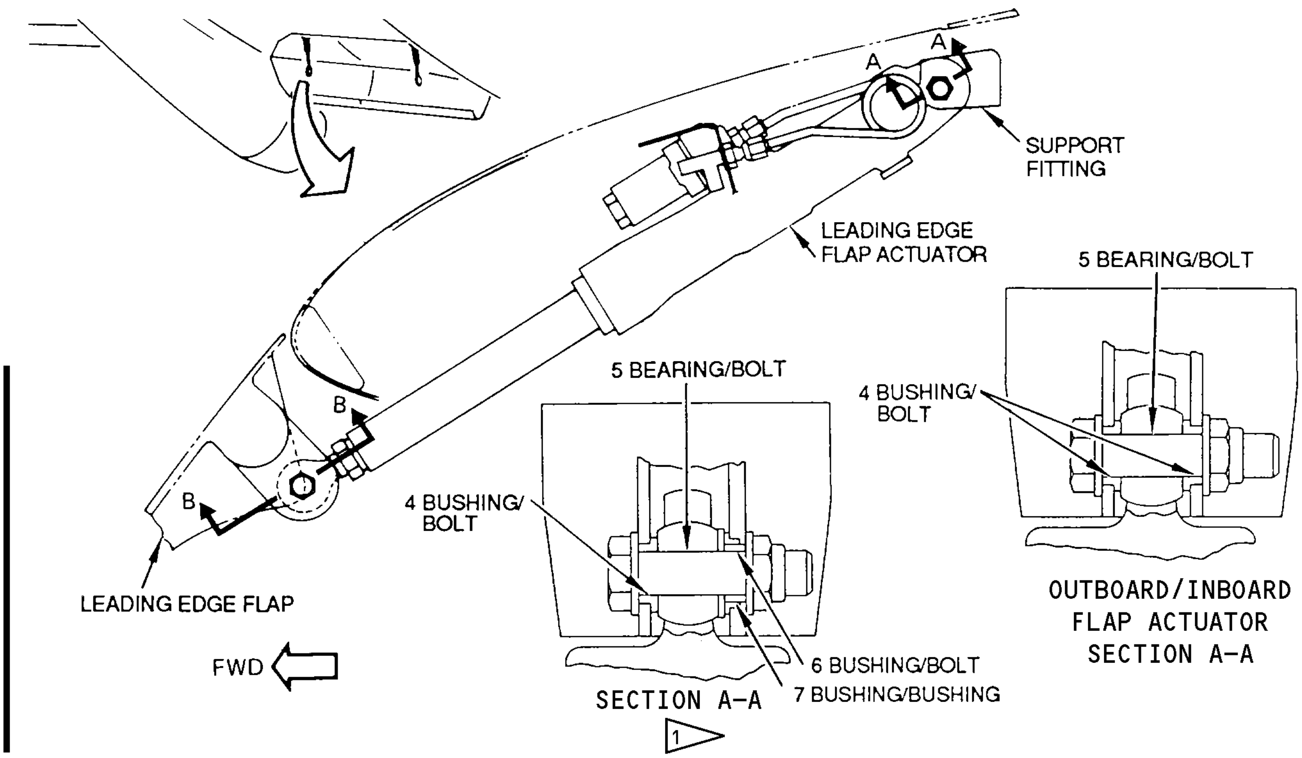
LEADING EDGE FLAP ACTUATORS - INSPECTION/CHECK

1. General
   A. This data consists of illustrations and wear limit charts. There will be no procedure given for gaining access to the component, for removing it, or for replacing it after inspection for wear.
2. Refer to Leading Edge Flap Actuators - Removal/Installation for this information.
3. Leading Edge Flap Actuators Support Fitting Inspection (Airplanes without clamp-up bushing)
   A. Extend Krueger flaps and depressurize all hydraulic systems (Ref 29-11-0, Hydraulic System A - D&O).
   B. AIRPLANES WITH ALUMINUM KRUEGER FLAP ACTUATOR SUPPORT FITTING;
      Back off the leading edge flap actuator aft attach bolts and nuts and do a high frequency eddy current (HFEC) inspection of the actuator support fitting.
   C. AIRPLANES WITH STEEL KRUEGER FLAP ACTUATOR SUPPORT FITTING;
      Back off leading edge flap actuator aft attach bolts and nuts and visually inspect actuator support fitting.
   D. If no cracks are found, apply BMS 3-23 corrosion inhibiting compound to accessible area of support fitting and return airplane to normal.
   E. AIRPLANES WITH ALUMINUM KRUEGER FLAP ACTUATOR SUPPORT FITTING;
      If crack are found, replace with a steel fitting per SB 57-1229 or contact Boeing for additional instructions.
   F. AIRPLANES WITH STEEL KRUEGER FLAP ACTUATOR SUPPORT FITTING;
      If crack are found, replace with a like fitting or contact Boeing for additional instructions.

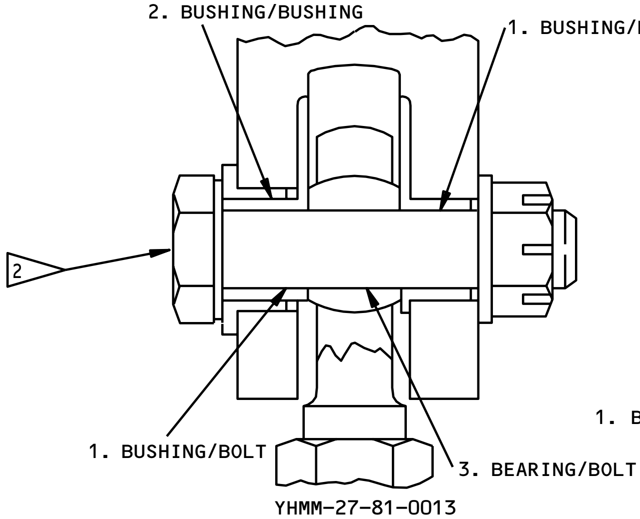
      NOTE: Fitting replacement will require tank entry.

      When replacing fitting, shim as required any gap between the actuator bearing and the attach lug bushing before clamp-up to hold total gap to 0.003 inch maximum. Use stainless steel shim material. Apply BMS 3-23 to accessible area of fitting.

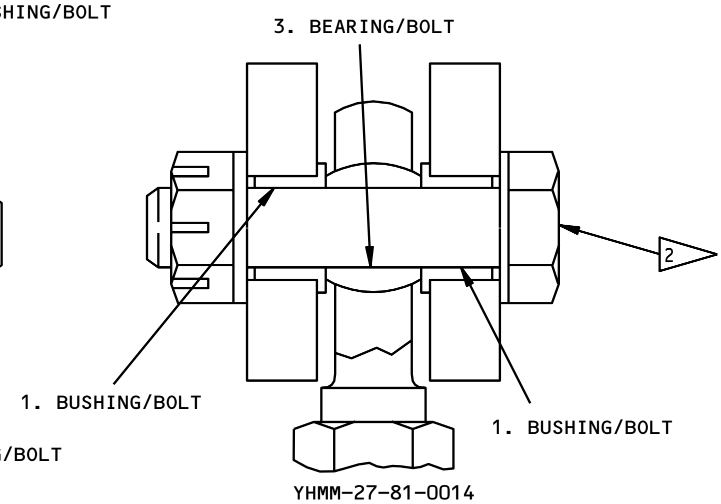
4. Leading Edge Flap Actuators Wear Limits (Fig. 601)



Leading Edge Flap Actuators Wear Limits
Figure 601 (Sheet 1)



OUTBOARD FLAP ACTUATOR



INBOARD FLAP ACTUATOR

B-B

2 INSTALL BOLT WITH HEAD INBOARD

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM CLEARANCE	REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
1	BUSHING	ID	0.6250	0.6265	0.6310	0.0070	X		
	BOLT	OD	0.6230	0.6240	0.6180		X		
2	BUSHING	ID	0.8750	0.8765	0.8800	0.0070	X		
	BUSHING	OD	0.8720	0.8730	0.8680		X		
3	BEARING	ID	0.6245	0.6250	0.6280	0.004	X		
	BOLT	OD	0.6230	0.6240	0.6205		X		
4	BUSHING	ID	0.5000	0.5015	0.5045	0.0050	X		
	BOLT	OD	0.4990	0.4995	0.4950		X		
5	BEARING	ID	0.4995	0.5000	0.5015	0.0020	X		
	BOLT	OD	0.4990	0.4995	0.4975		X		
6	BEARING	ID	0.5000	0.5005	0.5035	0.0050	X		
1	BOLT	OD	0.4990	0.4995	0.4950		X		
7	BEARING	ID	0.6250	0.6265	TBD	TBD	X		
1	BOLT	OD	0.6235	0.6240	TBD		X		

1 AIRPLANES WITH CLAMP-UP BUSHING

Leading Edge Flap Actuators Wear Limits
Figure 601 (Sheet 2)

LEADING EDGE SLAT ACTUATOR - REMOVAL/INSTALLATION

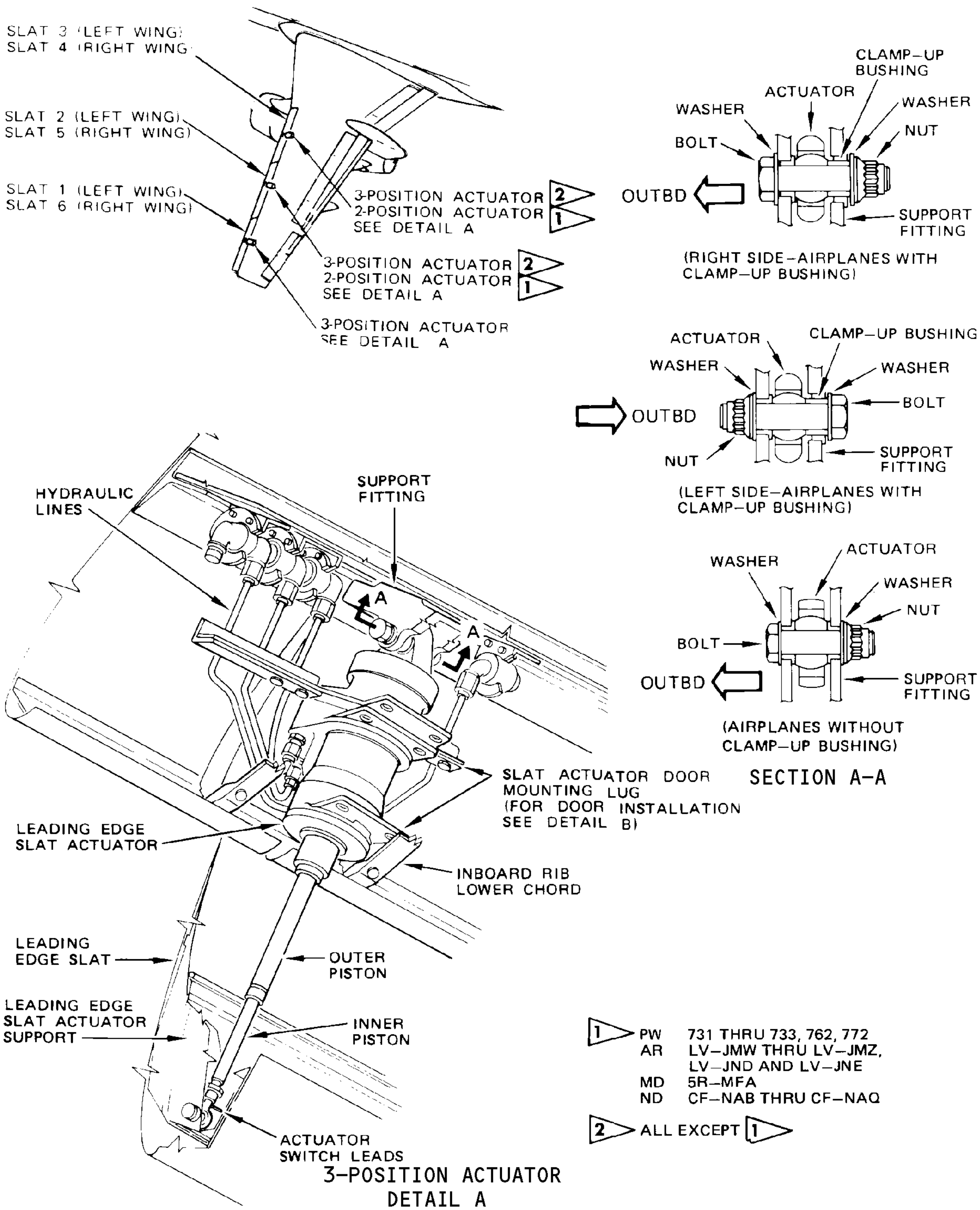
1. General
   A. The slat actuator being replaced may be a 2-position or 3-position actuator, depending on slat location and on the airplane. Some airplanes use both types. Care should be taken to ensure correct installation.
   B. The slat actuator contains blocking valves which hydraulically lock the actuator piston in position when hydraulic pressure is removed. The actuator must be retracted to remove it from the wing. This makes it necessary to have hydraulic pressure available to retract the actuator.
2. Equipment and Materials
   A. Leading Edge Slat Locks - F80048-58, F80048-59 and F80048-60 (AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA8401 thru JA8411; PV CF-EPL, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB; ND CF-NAB thru CF-NAQ)
   B. Leading Edge Slat Locks - F80048-57 and F80048-79 (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD ALL EXCEPT 5R-MFA; NH ALL EXCEPT JA8401 thru JA8411; PV ALL EXCEPT CF-EPL, CF-EPO and CF-EPR; TM ALL EXCEPT CR-BAA and CR-BAB; ND ALL EXCEPT CF-NAB thru CF-NAQ)
   C. Corrosion Preventive Compound - MIL-C-11796 class 3 (Ref 20-30-21)
3. Remove Leading Edge Slat Actuator
   A. Remove access panels adjacent to slat actuator and panel aft of actuator door.
   B. Provide system A hydraulic power (Ref 27-81-0 MP).
   C. Position flap control lever to 1-unit detent to extend slats.
   D. Depressurize hydraulic systems (Ref 27-81-0 MP).
   E. Install locks on adjacent leading edge slats.
   F. Remove slat actuator door and seal door strap angles from actuator (Detail B, Fig. 401).

      NOTE: Due to spring tension, release seal door straps slowly.

   G. Remove seal and access panel from slat at actuator rod end for access to electrical connector and rod end attach bolt.
   H. Disconnect slat actuator from slat (Detail A).
   I. Disconnect actuator switch leads at electrical connector.
   J. Pressurize hydraulic system A (Ref 27-81-0).
   K. Place flap lever in FLAP UP detent to retract actuator.
   L. Depressurize hydraulic systems (Ref 27-81-0).
   M. Disconnect wire bundle conduit clamps, as necessary.
   N. Remove bolts from inboard rib at actuator and remove rib lower chord.
   O. Remove clamps securing hydraulic lines to wing structure.

      NOTE: Tag all hydraulic lines and ports to ensure correct replacement.

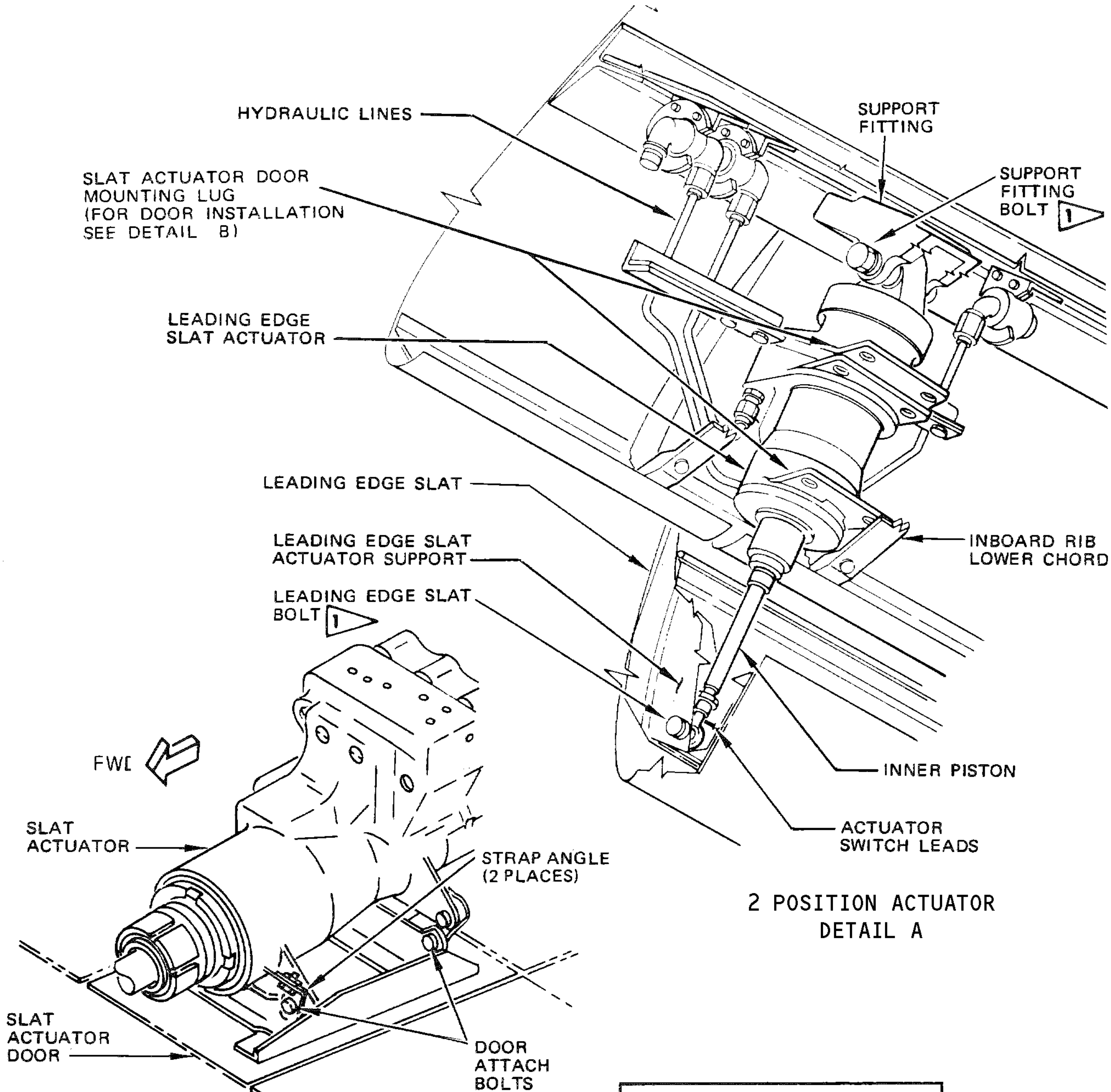
   P. Disconnect hydraulic lines from actuator and swivel joints. Install plugs in hydraulic lines and cap all ports.



1 PW 731 THRU 733, 762, 772
AR LV-JMW THRU LV-JMZ, LV-JND AND LV-JNE
MD 5R-MFA
ND CF-NAB THRU CF-NAQ

2 ALL EXCEPT 1

Leading Edge Slat Actuator Installation
Figure 401 (Sheet 1)



2 POSITION ACTUATOR
DETAIL A

SLAT ACTUATOR DOOR
DETAIL B

SLAT ACTUATOR EXTENSION	
ACTUATOR POSITION	SLATS 1 THRU 6
2–POSITION	18.7 (APPROX)
3–POSITION	21.8 (APPROX)

1 EXTENSION MEASUREMENT TAKEN FROM SUPPORT FITTING BOLT TO LEADING EDGE SLAT BOLT

Leading Edge Slat Actuator Installation
Figure 401 (Sheet 2)

Q. Disconnect actuator from support fitting in wing and remove actuator.

4. Install Leading Edge Slat Actuator

A. If existing bushings, bearings and balls are being installed, check for allowable wear (Ref 27-81-41).

B. Ensure that hydraulic systems are depressurized (Ref 27-81-0).

C. Connect actuator to support fitting in wing with bolt and washer on each side. Install locknut and tighten to 800-1000 pound-inches (Detail A, Fig. 401).

D. Connect hydraulic lines to actuator and swivel joints and install clamps securing lines to wing structure.

CAUTION: TO PREVENT POSSIBLE DAMAGE TO ACTUATOR, ENSURE LINES ARE MATED TO THEIR PROPER PORTS AND FITTINGS; THEN REMOVE IDENTIFYING TAGS.

E. Install inboard rib lower chord at actuator.

F. Connect wire bundle conduit clamps, as necessary.

G. Provide system A hydraulic power (Ref 27-81-00).

H. Extend actuator by placing flap lever in 1-unit detent.

I. Depressurize hydraulic systems (Ref 27-81-0).

J. Apply a thin film of corrosion preventive compound to actuator rod end attachment bolt and spacers and connect actuator to slat with bolt and washer on each side. Install locknut and tighten 220 to 360 pound-inches.

K. Reconnect actuator switch leads at electrical connector.

L. Remove all leading edge slat actuator locks.

M. Install access panel and seal on slat at actuator rod end.

N. Install leading edge slat actuator door and seal door strap angles on actuator.

(1) Align holes in leading edge slat actuator door, seal door strap angles, and actuator and loosely install bolts. Ensure that rod end seal is attached to clips under door.

(2) Pull door down as far as slotted and oversize holes will permit. Tighten bolts just tight enough to maintain position after being tapped into position.

O. Provide system A hydraulic power (AMM 27-81-0/201).

P. Retract slats and lightly tap slat actuator door up into faired position. Adjust door forward and aft to obtain a gap of 0.12 +0.03 inch at aft edge of door.

Q. Extend slats to 1-unit detent.

R. Depressurize hydraulic systems (AMM 27-81-0/201).

S. Check that each strap is properly positioned in adjustment slot of strap angle to ensure smooth operation and alignment of seal door.

T. Tighten slat actuator door attachment bolts.

U. Pressurize hydraulic system A (AMM 27-81-0/201).

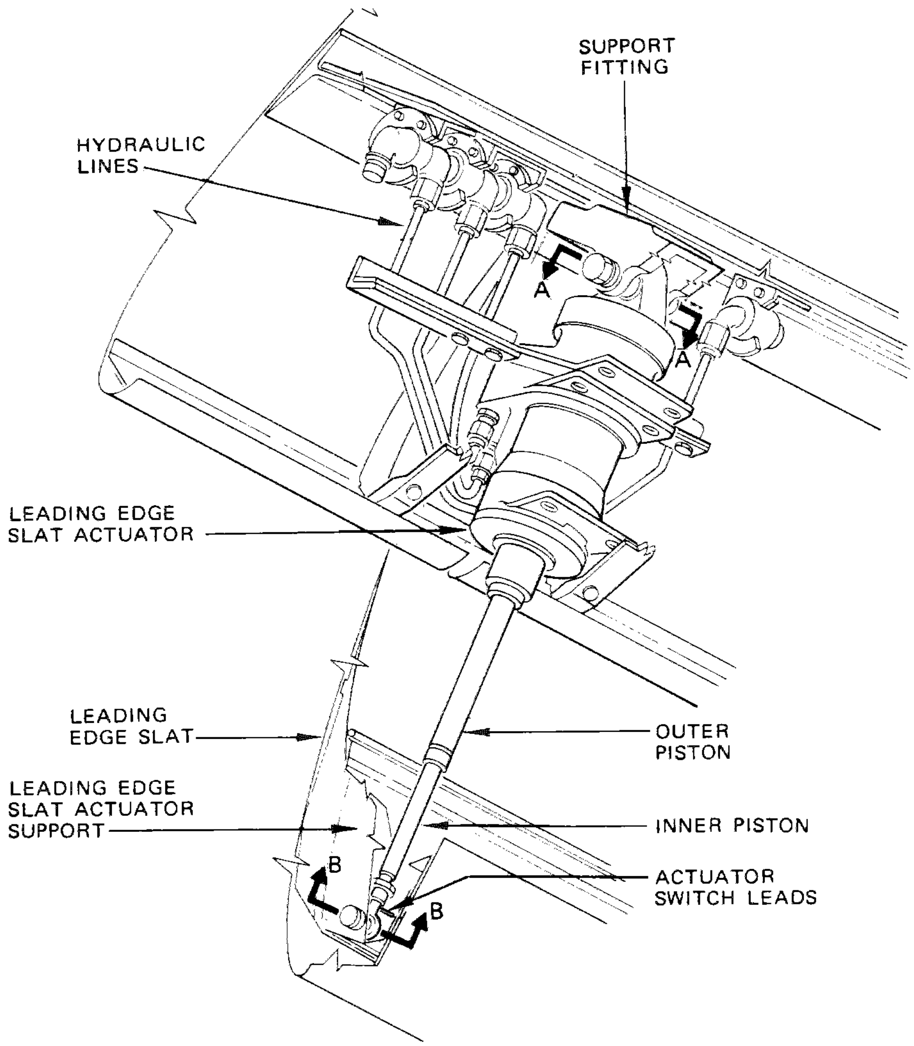
V. Cycle slats between 1-unit and UP positions of flap lever several times to bleed air from system. End cycling at 1-unit detent.
W. Position flap lever to fully extend slats. If the replacement actuator was installed at a slat requiring a 3-position actuator, ensure that slat extends from intermediate to full extend position. If a 2-position actuator was required, ensure that slat does not attempt to extend farther. (See Fig. 401 for slat actuator extension requirements.)
X. Examine hydraulic fittings on actuator for leakage.
Y. Repeat steps (V) through (X) with standby hydraulic system power.

NOTE: Retract slats with hydraulic system A power as necessary.

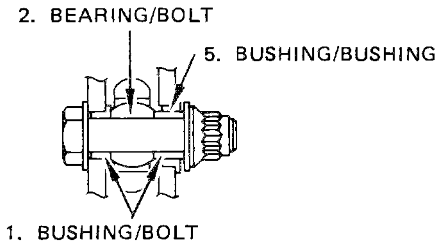
Z. Position flap control lever to FLAP UP detent to retract slats.
AA. Perform leading edge flaps and slats test (AMM 27-81-0/501).
AB. Remove hydraulic power if no longer required (AMM 27-81-0/201).
AC. Install access panels adjacent to actuator and panel aft of actuator door.
AD. Check hydraulic reservoirs and service if required (Ref Chapter 12, Hydraulic Servicing).

LEADING EDGE SLAT ACTUATOR - INSPECTION CHECK

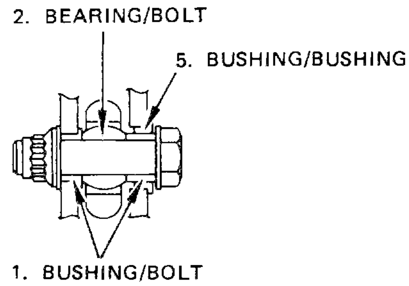
1. General
   A. This data consists of illustrations and wear limit charts. There will be no procedure given for gaining access to the component, for removing it, or for replacing it after inspection for wear.
2. Refer to Leading Edge Slat Actuator - Removal/Installation for this information.
3. Leading Edge Slat Actuator Wear Limits (Fig. 601)



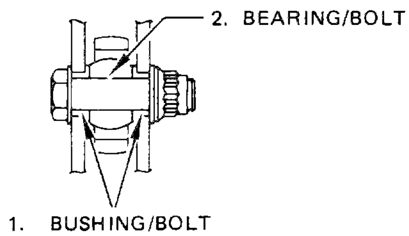
Leading Edge Slat Actuator Wear Limits
Figure 601 (Sheet 1)



(RIGHT SIDE-AIRPLANES WITH CLAMP-UP BUSHING)

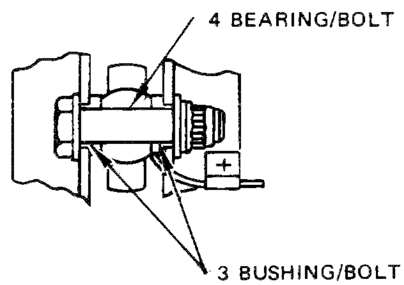


(LEFT SIDE-AIRPLANES WITH CLAMP-UP BUSHING)



(AIRPLANES WITHOUT CLAMP-UP BUSHING)

SECTION A-A



SECTION B-B

INDEX NO.	PART NAME	DIM.	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR.
			DIAMETER		MAX WEAR DIM.	MAX DIAM CLEAR-ANCE			
			MIN	MAX					
1	BUSHING	ID	0.5625	0.5640	0.5675	0.0060	X		
	BOLT	OD	0.5610	0.5615	0.5565		X		
2	BEARING	ID	0.5620	0.5625	0.5645	0.0030	X		
	BOLT	OD	0.5610	0.5615	0.5590		X		
3	BUSHING	ID	0.3750	0.3765	0.3795	0.0050	X		
	BOLT	OD	0.3740	0.3745	0.3700		X		
4	BEARING	ID	0.3745	0.3750	0.3765	0.0020	X		
	BOLT	OD	0.3740	0.3745	0.3725		X		
5	BUSHING	ID	TO BE FURNISHED WHEN AVAILABLE				X		
	BUSHING	OD					X		

Leading Edge Slat Actuator Wear Limits
Figure 601 (Sheet 2)

469519

LEADING EDGE SLAT AERODYNAMIC SEAL - REMOVAL/INSTALLATION

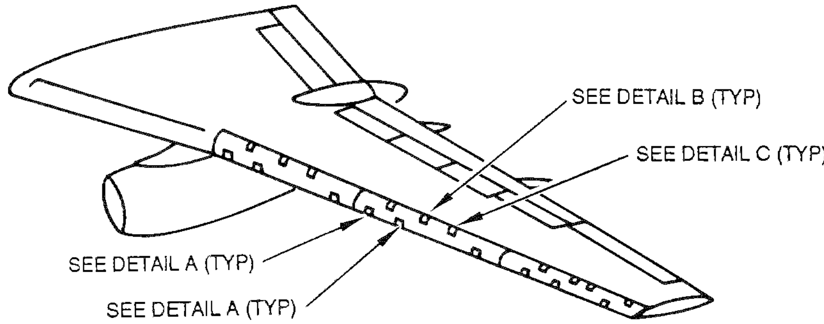
1. General
   A. The wing leading edge aerodynamic seal's function is to prevent airflow through cutouts provided in the wing fixed leading edge skin for attachment, actuation, and heating of leading edge slats.
2. Equipment and Materials
   A. Leading Edge Slat Actuator Locks - F80048-57, -58, -59 (737-100); -58, -59, -60 (737-200); -57, -79 (on advanced and aircraft with retrofit Hi-Lift system)
3. Remove Leading Edge Slat Aerodynamic Seal (Fig. 401)
   A. Provide system A hydraulic power (AMM 27-81-0/201).
   B. Position flap control lever to 40-unit detent to fully extend leading edge devices. Tag or placard flap control lever DO NOT OPERATE.
   C. Install leading edge slat locks on extended leading edge slat actuators (AMM 27-81-0/201).
   D. Depressurize hydraulic system A (AMM 27-81-0/201).
   E. Remove access panels and open access doors as required.
   F. Slat main track seal curtain assembly (Detail A).
      (1) Remove seal curtain assembly as follows:
         (a) Push spring arm into retracted position and remove screws joining seal curtain to wing fixed leading edge.

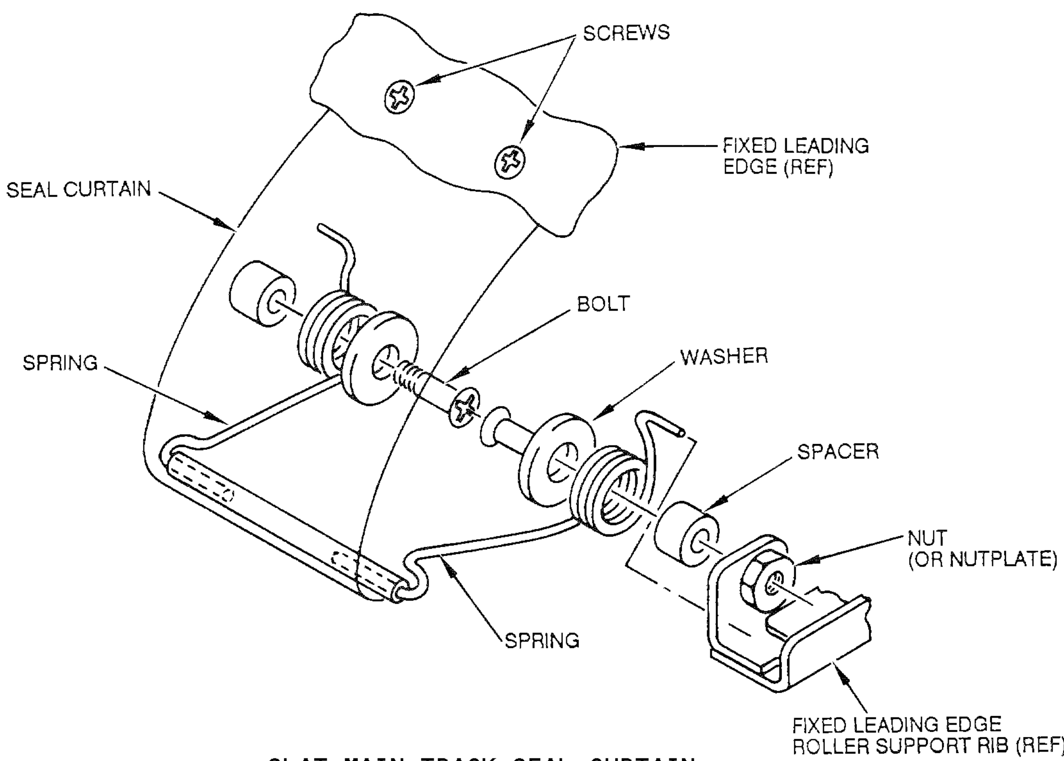
            CAUTION: DO NOT DEFLECT SPRING PAST EDGE OF SKIN CUTOUT (NORMAL TRAVEL RANGE). PERMANENT SET IN SPRINGS MAY OCCUR.

         (b) Release spring arm slowly.
         (c) Remove bolt, washer and spacer holding springs to fixed leading edge roller support rib. Save or replace as required.
         (d) Remove spring ends from seal curtain tube and replace springs and/or seal curtain as required.
      (2) Install seal curtain assembly as follows:
         (a) Insert spring ends into seal curtain tube.
         (b) Mount both springs to fixed leading edge roller support rib using bolt, washer and spacer as shown in Fig. 401, Detail A. Insert end of springs into roller support rib.
         (c) Push spring arm into retracted position and using screws fasten seal curtain to wing fixed leading edge.

            CAUTION: DO NOT DEFLECT SPRING PAST EDGE OF SKIN CUTOUT (NORMAL TRAVEL RANGE). PERMANENT SET IN SPRINGS MAY OCCUR.

         (d) Release spring arm.

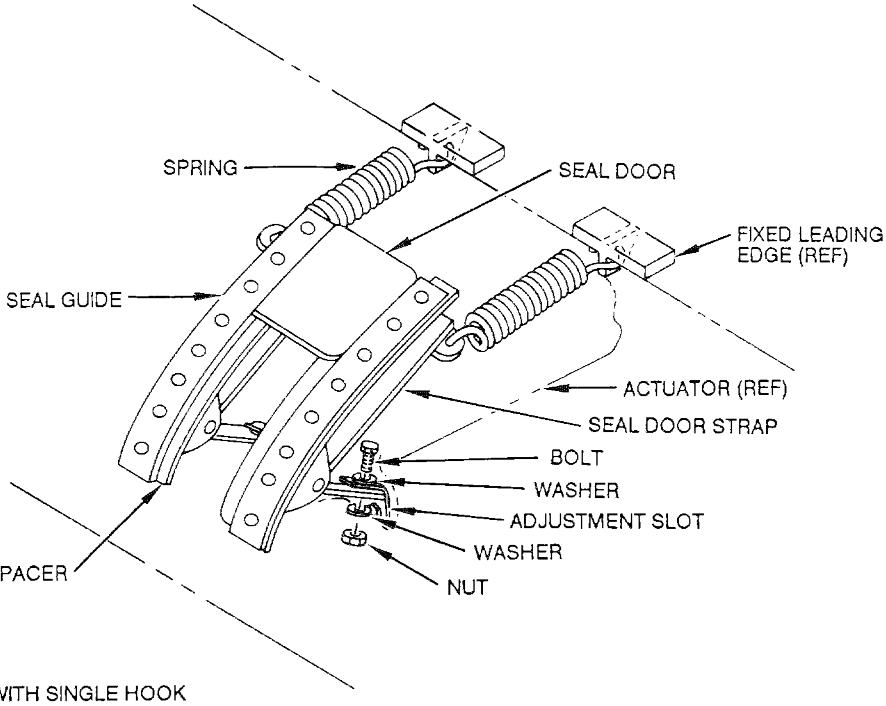




SLAT MAIN TRACK SEAL CURTAIN
THERMAL ANTI-ICING DUCT SEAL CURTAIN

DETAIL A

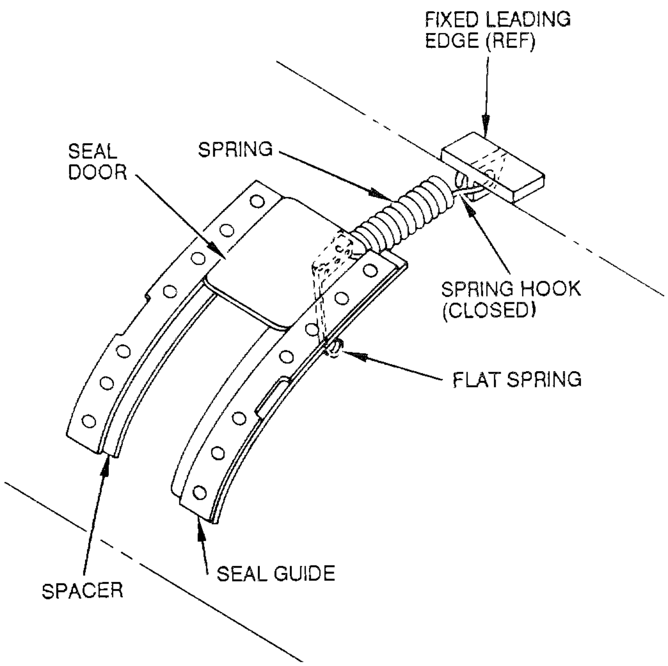
Leading Edge Slat Aerodynamic Seal Installation
Figure 401 (Sheet 1)



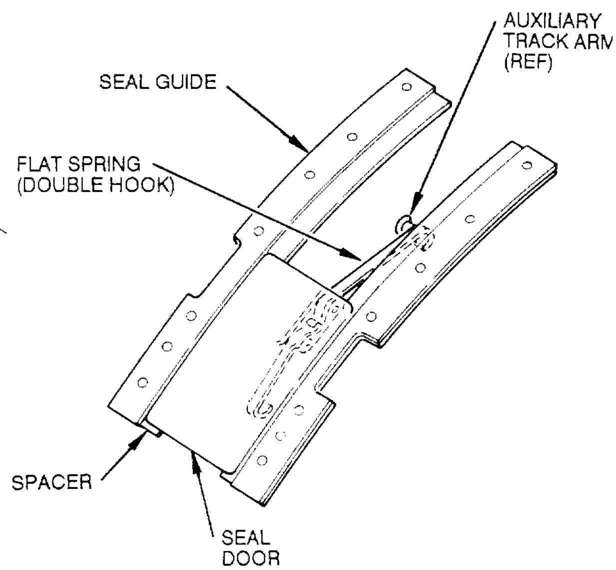
[1] ON AIRPLANES WITH SINGLE HOOK AND SPRING SEAL DOOR

[2] ON AIRPLANES WITH DOUBLE HOOK SEAL DOOR

SLAT ACTUATOR SEAL DOOR ASSEMBLY
DETAIL B



AUXILIARY TRACK SEAL DOOR ASSEMBLY
DETAIL C [1]



AUXILIARY TRACK SEAL DOOR ASSEMBLY
DETAIL C [2]

Leading Edge Slat Aerodynamic Seal Installation
Figure 401 (Sheet 2)

469523

G. Thermal anti-icing duct seal curtain assembly (Detail A).
   (1) Remove seal curtain assembly as follows:
      (a) Push spring arm into retracted position and remove screws joining seal curtain to wing fixed leading edge.

      CAUTION: DO NOT DEFLECT SPRING PAST EDGE OF SKIN CUTOUT (NORMAL TRAVEL RANGE). PERMANENT SET IN SPRINGS MAY OCCUR.

      (b) Release spring arm slowly.
      (c) Remove nut, bolt, washer and spacer holding springs to fixed leading edge. Save or replace as required.
      (d) Remove spring ends from seal curtain tube and replace springs and/or seal curtain as required.
   (2) Insert seal curtain as follows:
      (a) Insert spring ends into seal curtain tube.
      (b) Mount both springs to fixed leading edge using nut, bolt, washer and spacer as shown in Fig. 401, Detail B. Insert end of springs into fixed leading edge.
      (c) Push spring arm into retracted position and with screws fasten seal curtain to wing fixed leading edge.

      CAUTION: DO NOT DEFLECT SPRING PAST EDGE OF SKIN CUTOUT (NORMAL TRAVEL RANGE). PERMANENT SET IN SPRINGS MAY OCCUR.

      (d) Release spring arm.
H. Slat actuator seal door assembly (Detail B)
   (1) Remove seal door assembly as follows:
      (a) Hold seal door in position and remove nut, bolt and washers fastening seal door strap to adjustment slot on actuator. Repeat step for strap on opposite side of actuator.
      (b) Remove tension in springs by slowly sliding seal door aft along seal guide and spacer until clear.
      (c) Unhook springs and slide straps off seal door.
      (d) Replace seal door, springs and straps as required.
   (2) Install seal door assembly as follows:
      (a) Slide straps onto seal door.
      (b) Insert each spring through hole provided in seal door. Hook opposite end of spring to fixed leading edge.
      (c) Slide seal door inside seal guide and spacer.

(d) Thread each strap through channel and fasten to adjustment slot on actuator shown in Fig. 401, Detail C.

NOTE: Do not stretch spring past normal travel range. Permanent set in springs may occur.

(e) Position strap in adjustment slot to ensure smooth operation and alignment of seal door.

I. Auxiliary track seal door assembly (Detail C).
(1) Remove seal door assembly as follows:
(a) Slide seal door forward, press flat spring upward and slide seal door aft till flat spring clears auxiliary track structure.

CAUTION: DEFLECT SPRINGS ONLY AS FAR AS REQUIRED. PERMANENT SET IN SPRINGS MAY OCCUR.

(b) On airplanes with single hook and spring seal door, open and remove spring hook fastened to fixed leading edge structure.
(c) Slide seal door along seal guide and spacer until clear.
(d) Replace seal door assembly as necessary.
(2) Install seal door assembly as follows:
(a) Slide seal door inside seal guide and spacer.
(b) On airplanes with single hook and spring seal door, fasten spring hook to fixed leading edge structure and close.
(c) Press flat spring upward and slide seal door forward sufficient enough to hook flat spring to auxiliary track.

CAUTION: DEFLECT SPRINGS ONLY AS FAR AS REQUIRED. PERMANENT SET IN SPRINGS MAY OCCUR. ENSURE THAT FLAT SPRING HOOKS PROPERLY TO AUXILIARY TRACK DURING LEADING EDGE SLAT EXTENSION.

4. Restore Airplane to Normal Configuration
A. Close access doors and install access panels.
B. Provide system A hydraulic power (Ref 27-81-0 MP).
C. Remove leading edge slat locks from leading edge slat actuators (Ref 27-81-0 MP).
D. Remove tag or placard from flap control lever and position flap control lever to FLAP UP detent to retract leading edge devices.
E. Depressurize hydraulic system A (Ref 27-81-0 MP).

LEADING EDGE FLAP AND SLAT HYDRAULIC FUSE - REMOVAL/INSTALLATION

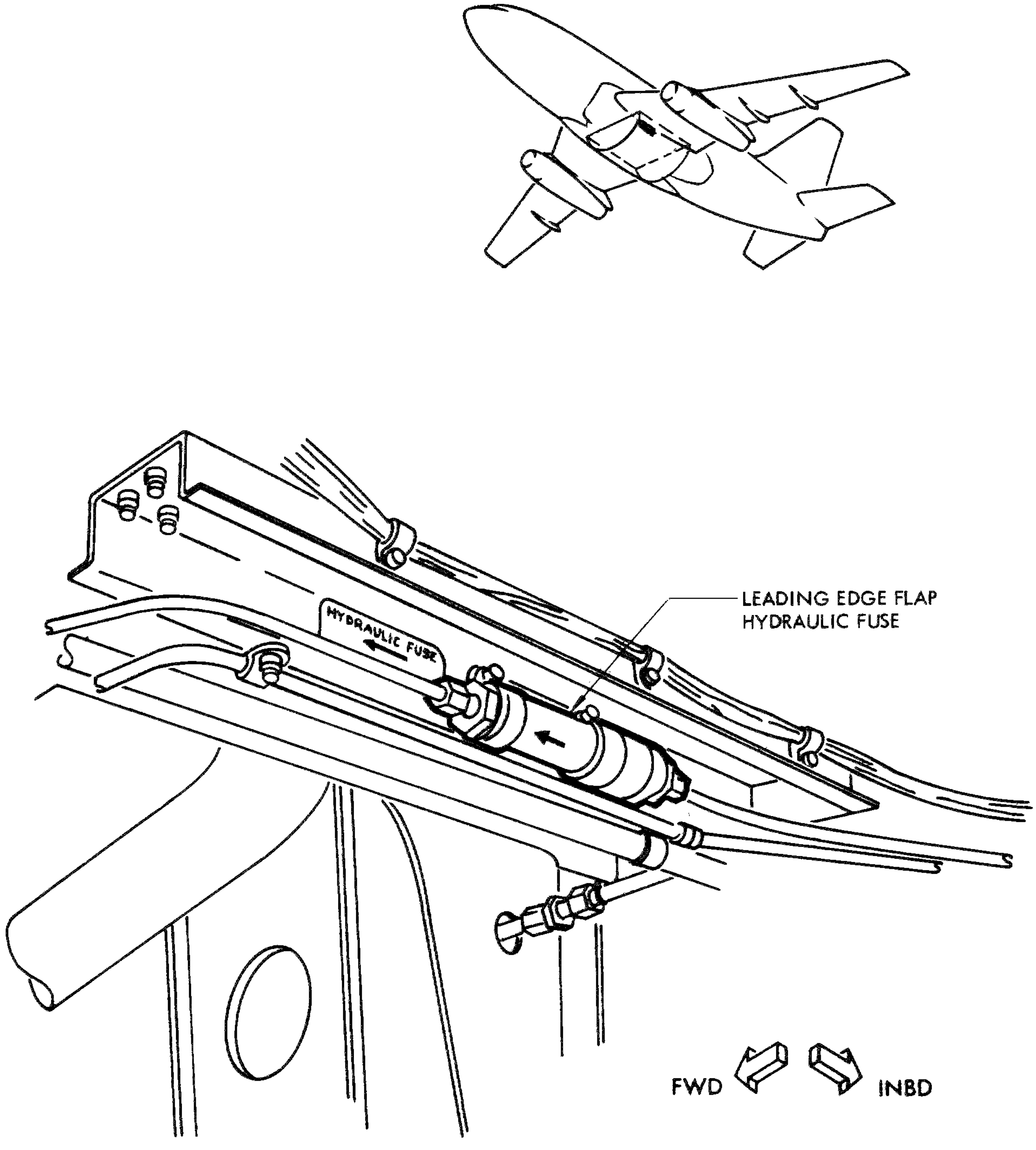
1. Equipment and Materials
   A. Hydraulic Fluid, Fire Resistant - BMS 3-11
   B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
2. Remove Hydraulic Fuse
   A. Depressurize hydraulic systems (Ref 27-81-0 MP).
   B. Disconnect inlet and outlet hydraulic lines and remove hydraulic fuse (Fig. 401).
3. Install Hydraulic Fuse

   CAUTION: MAKE SURE YOU USE THE 160 CUBIC INCH FUSE. MISPLACEMENT OF FUSES CAN CAUSE PARTIAL AND ASYMMETRICAL EXTENSION OF THE LEADING EDGE SURFACES.

   A. Remove reducer from each end of removed fuse and install on replacement fuse using new O-rings. Lubricate O-rings with hydraulic fluid or Skydrol Assembly Lube prior to installation.

      NOTE: Make sure you install the applicable hydraulic fuse (160 cubic inch) in the correct position for flow as shown in adjacent placards.

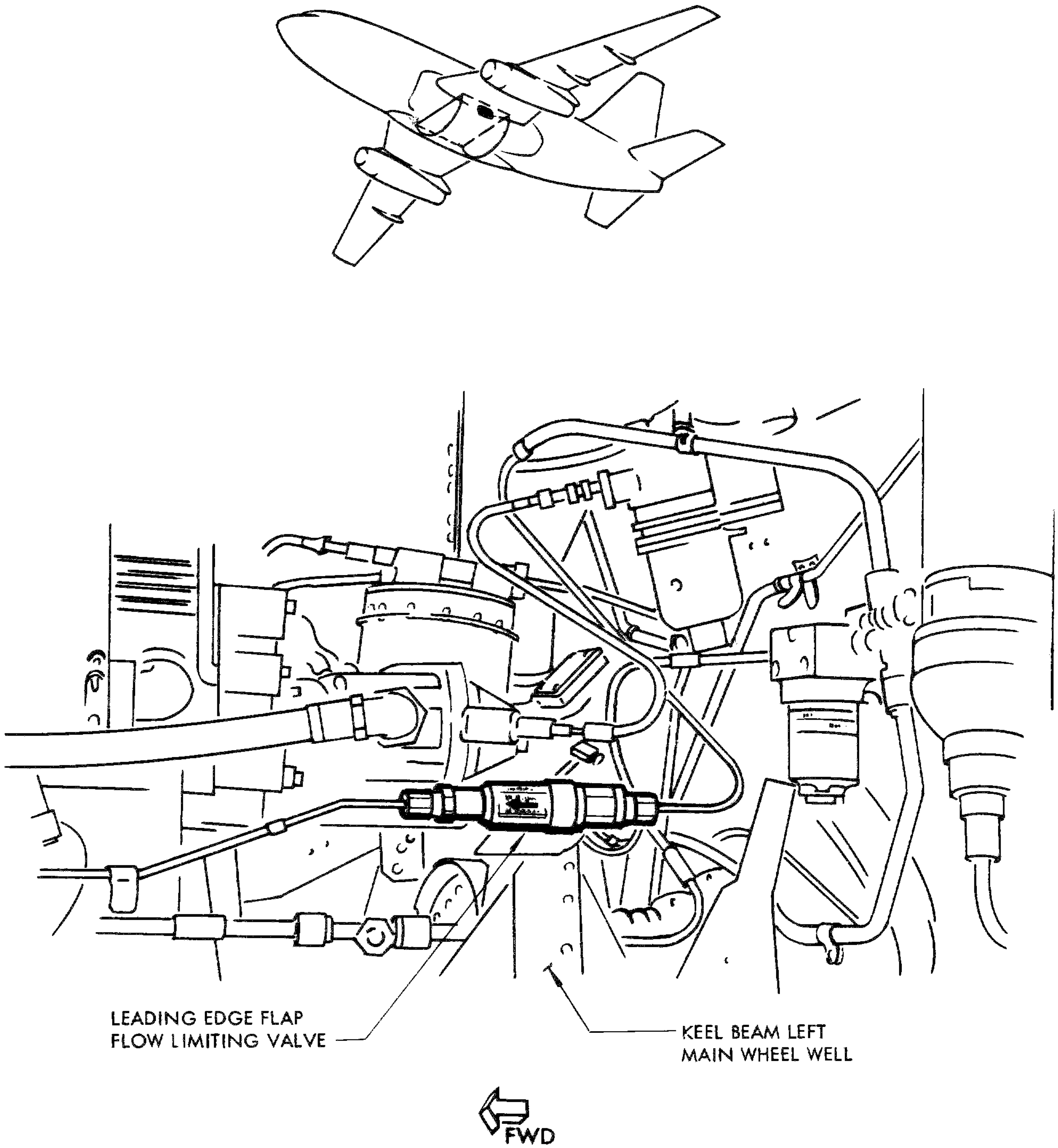
   B. Place fuse in position being sure flow direction arrow points outboard (Fig. 401).
   C. Tighten inlet and outlet line.
   D. Pressurize hydraulic systems (Ref 27-81-0 MP).
   E. Make sure there are no leaks.
   F. Depressurize hydraulic systems (Ref 27-81-0 MP).
   G. Check hydraulic reservoirs and service if required (Ref Chapter 12, Hydraulic Servicing).
   H. Do a check of the leading edge flap and slat alternate system operation (AMM 27-81-0/501).



Leading Edge Flap Hydraulic Fuse
Figure 401

LEADING EDGE FLAP FLOW LIMITING VALVE - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Hydraulic Fluid, Fire Resistant - BMS 3-11
   B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
2. Remove Flow Limiting Valve
   A. Depressurize hydraulic systems. Refer to 27-81-0, Leading Edge Flaps and Slats - Maintenance Practices.
   B. Disconnect inlet and outlet hydraulic lines and remove flow limiting valve (Fig. 401).
3. Install Flow Limiting Valve
   A. Remove reducer from each end of removed valve and install on replacement valve using new O-rings. Lubricate O-rings with hydraulic fluid or Skydrol Assembly Lube prior to installation.
   B. Place valve in position being sure the regulated flow direction arrow points forward (Fig. 401).
   C. Tighten inlet and outlet line.
   D. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.
   E. Test flap flow limiting valve. Refer to Leading Edge Flap Flow Limiting Valve - Adjustment/Test.



Leading Edge Flat Flow Limiting Valve
Figure 401

LEADING EDGE FLAP FLOW LIMITING VALVE - ADJUSTMENT/TEST

1. Test Flap Flow Limiting Valve
   - A. Connect electrical power to airplane.
   - B. Close FLAP VALVES circuit breaker on P6 panel.
   - C. Open TE ALT FLAP DRIVE MOTOR circuit breaker on P6 panel.
   - D. Pressurize hydraulic system A. Refer to 27-81-0, Leading Edge Flaps and Slats - Maintenance Practices.
   - E. Position flap control lever to FLAPS UP detent.
   - F. Position alternate flap master arming switch to ARM.
   - G. Position alternate flap drive control switch to DOWN.
   - H. Check that leading edge flaps and slats fully extend within 15 ±4 seconds.
   - I. Position alternate flap drive control switch and alternate flap arming switch to OFF.
   - J. Check that leading edge flaps and slats fully retract.

     NOTE: Retraction is due to hydraulic system A being pressurized.

   - K. Repeat steps F thru I to bleed standby hydraulic system by actuating leading edge devices.
   - L. Check flap flow limiting valve hydraulic fittings for leakage.
   - M. Close TE ALT FLAP DRIVE MOTOR circuit breaker.
   - N. Depressurize hydraulic system A. Refer to 27-81-0.
   - O. Lockwire alternate flap master arming switch.
   - P. Determine whether there is any further need for electrical power. If not, disconnect power.
   - Q. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.

LEADING EDGE FLAP AND SLAT CONTROL VALVE - REMOVAL/INSTALLATION

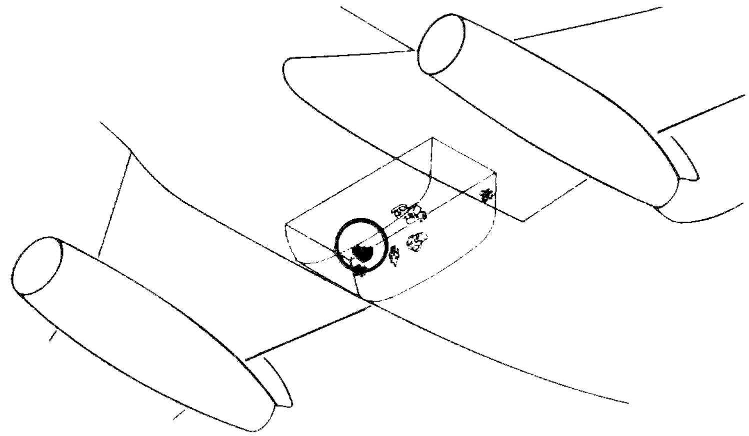
1. General
   A. The leading edge flap and slat control valve and the trailing edge flap control valve are similar units. The leading edge flap and slat control valve is mounted on the flap control unit forward of the trailing edge flap control valve. This procedure provides instructions for replacement of the leading edge flap and slat control valve.
2. Equipment and Materials
   A. Hydraulic Fluid, Fire Resistant - BMS 3-11 (Ref 20-30-21)
   B. Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   C. Rigging Pin, F-1 - 0.311 +0.000/-0.002-inch diameter x 2.35 ±0.06-inch length (MS20392-4)

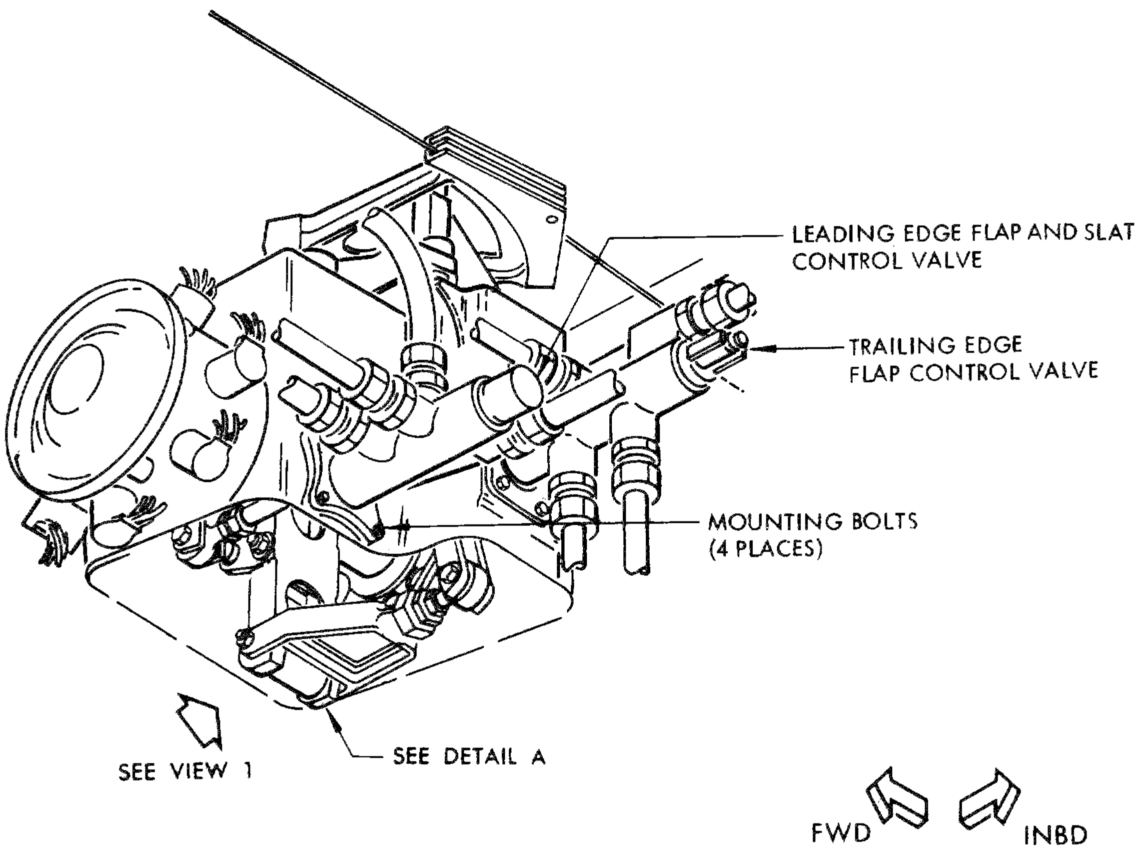
   NOTE: Rigging pin is part of kit F70207-3, -52, -61, or -84.

3. Prepare Leading Edge Flap and Slat Control Valve for Removal
   A. Pressurize hydraulic system A (Ref 27-81-0 MP).
   B. Position flap control lever to FLAP UP detent.
   C. Depressurize hydraulic systems (Ref 27-81-0 MP).
   D. Remove lower pan from flap control unit.
   E. Install rigging pin F-1 through follower arm and valve cam (Fig. 401).
4. Remove Leading Edge Flap and Slat Control Valve
   A. Disconnect control valve rod end from link assembly (Fig. 401).
   B. Disconnect hydraulic lines from control valve.

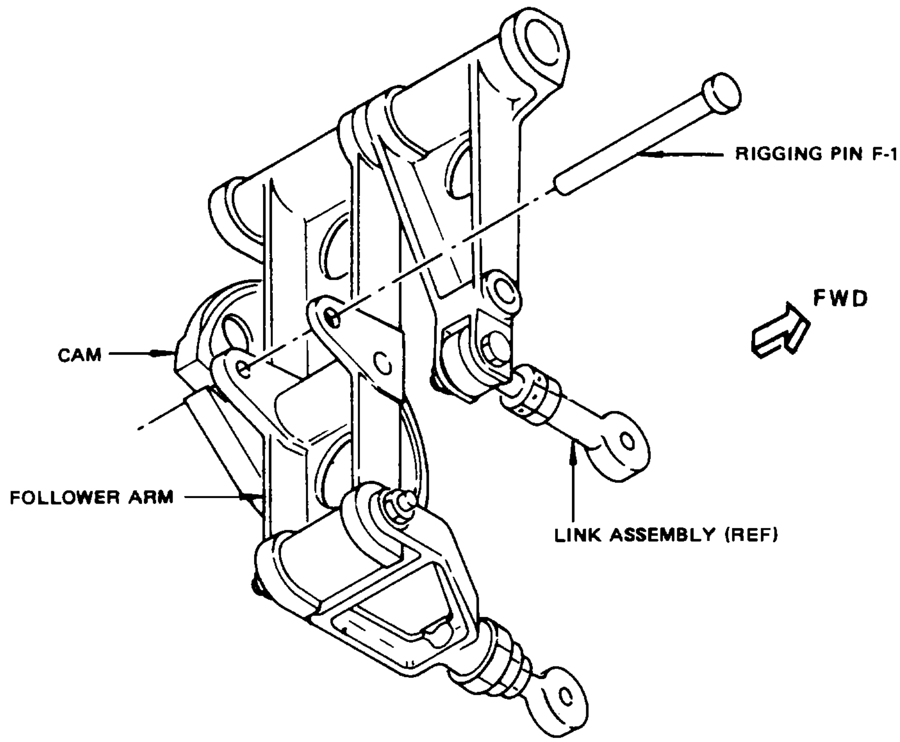
   CAUTION: BE PREPARED TO CATCH HYDRAULIC FLUID.

   C. Install caps on all ports and plugs in hydraulic lines.
   D. Remove four mounting volts attaching control valve to control unit.
   E. Carefully remove control valve from control unit.
5. Install Leading Edge Flap and Slat Control Valve (See figure 401.)
   A. Install union and O-ring in each port of valve. Lightly lubricate O-ring with hydraulic fluid or assembly lube prior to installation.
   B. Carefully insert control valve into control unit.
   C. Install four mounting bolts. Tighten bolts and lockwire.
   D. Remove caps from ports and plugs from hydraulic lines.
   E. Connect hydraulic lines to control valve.
   F. Connect control valve rod end to link assembly.
   G. Remove rigging pin F-1.
   H. Pressurize hydraulic system A. Refer to 27-81-0.
   I. Position flap control lever to fully extend flaps and slats.
   J. Position flap control lever to FLAP UP detent to retract flaps and slats.
   K. Examine hydraulic lines at control valve for leakage.
   L. Adjust and test control valve. Refer to Leading Edge Flap and Slat Control Valve - Adjustment/Test.
6. Restore Airplane to Normal Configuration
   A. Remove hydraulic power from system A. Refer to 27-81-0.

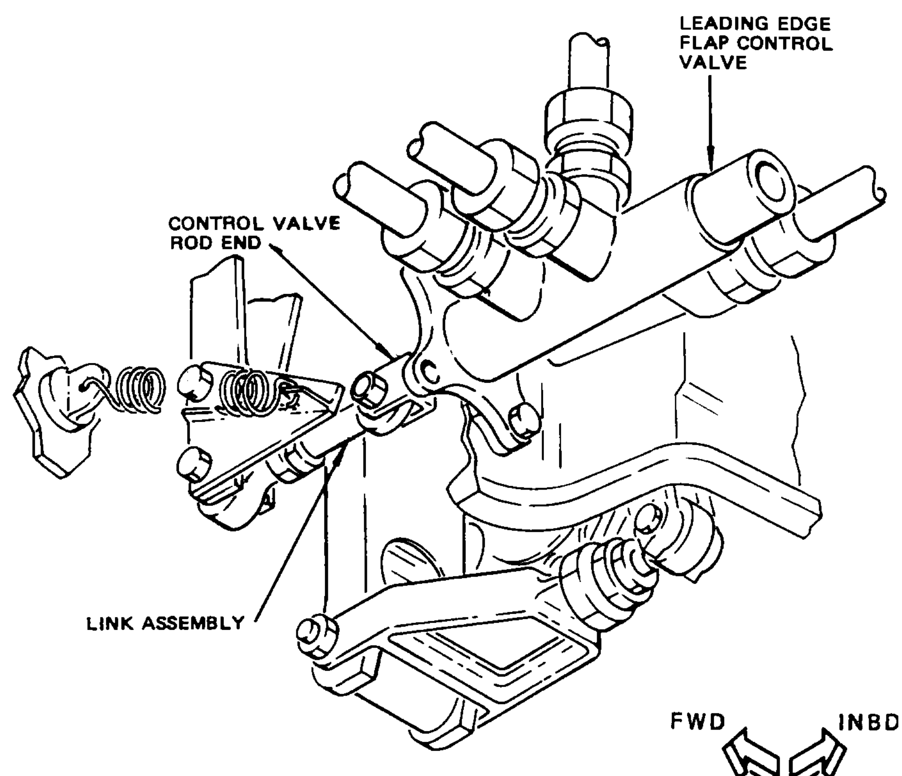




Leading Edge Flap and Slat Control Valve Installation
Figure 401 (Sheet 1)



VIEW 1



DETAIL B

Leading Edge Flap and Slat Control Valve Installation
Figure 401 (Sheet 2)

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B. Check hydraulic reservoirs and service if required. Refer to Chapter 12, Hydraulic Servicing.

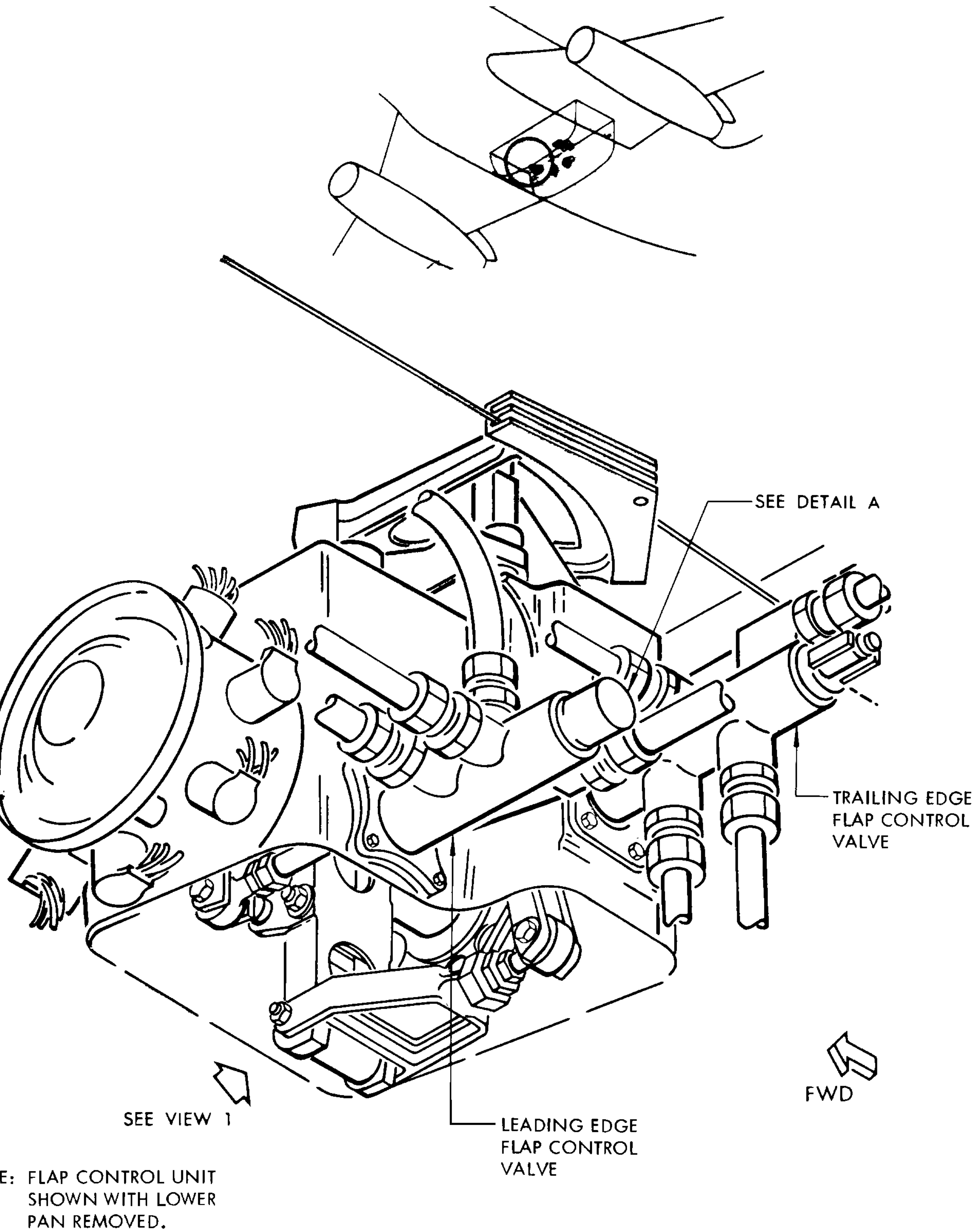
C. Install lower pan on flap control unit.

LEADING EDGE FLAP AND SLAT CONTROL VALVE - ADJUSTMENT/TEST

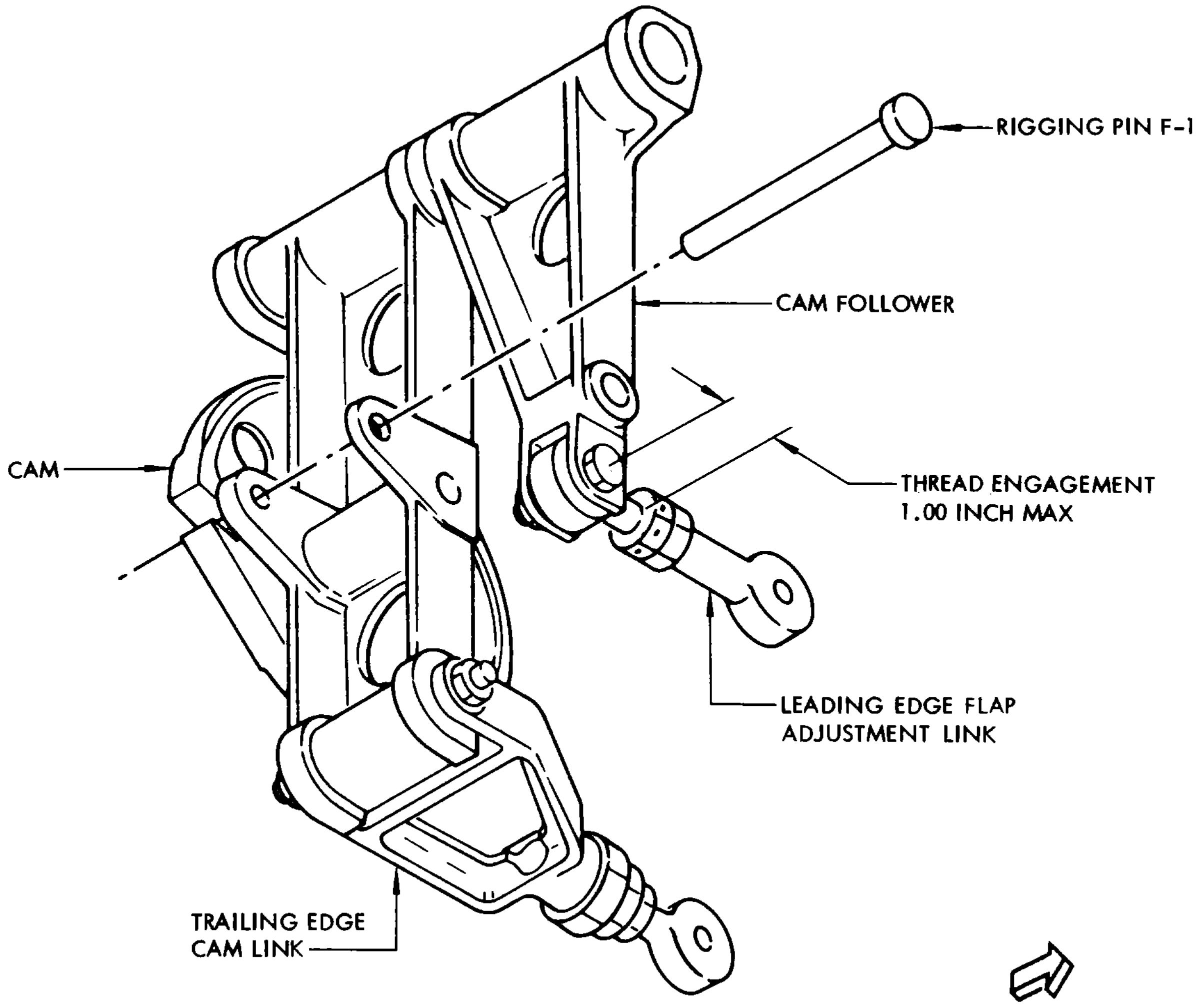
1. Leading Edge Flap and Slat Control Valve Adjustment
   A. Equipment and Materials
      (1) Rigging pin, F-1 - 0.311 +0.000/-0.002-inch diameter x 1.65 ±0.06-inch length (MS20392-4).

         NOTE: Rigging pin is part of kit F70207-3, -52, -61, or -84.

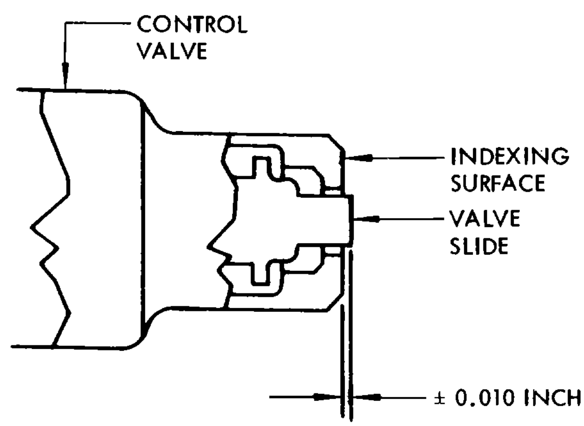
   B. Prepare Leading Edge Flap and Slat Control Valve for Adjustment
      (1) Pressurize hydraulic system A (Ref 27-81-0 MP).
      (2) Ensure that flap control lever is in FLAP UP detent.
      (3) Wait 5 minutes then depressurize hydraulic systems (Ref 27-81-0 MP).
      (4) Remove lower pan from flap control unit.
      (5) Install rigging pin F-1 in flap control unit (Fig. 501, view 1).
   C. Adjust Leading Edge Flap and Slat Control Valve
      (1) Check that valve slide and indexing surface of control valve align within ± 0.010 inch (Fig. 501, detail A). If not, adjust leading edge link as follows:
         (a) Break lockwire and loosen checknut.
         (b) Remove rod end bolt of cam follower arm.
         (c) Turn rod end in one-half turn increments to obtain adjustment.
         (d) Install rod end bolt and check that valve slide and indexing surface align within ± 0.010 inch.
         (e) Install rod end bolt with washer and locknut.
         (f) Tighten checknut and install lockwire.
         (g) Ensure that thread engagement of rod end is within limits. (See view 1.)
         (h) Remove rigging pin F-1.
         (i) Install lower pan on flap control unit.
         (j) Test control valve per par. 2.
2. Leading Edge Flap and Slat Control Valve Test
   A. Test Leading Edge Flap and Slat Control Valve
      (1) Pressurize hydraulic system A. Refer to 27-81-0.
      (2) Position flap control lever in FLAP UP detent.
      (3) Check that each flap and slat is in UP position and faired with wing structure.
      (4) On airplanes AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE, MD 5R-MFA, NH JA8401 thru JA8411, NZ ZK-NAC thru ZK-NAL, PV CF-EPL, CF-EPO and CF-EPR, TM CR-BBA and CR-BAB, check operation of flaps and slats.
         (a) Position flap control lever in 1-unit detent.
         (b) Check that leading edge flaps and slats 2, 3, 4, and 5 extend and that slats 1 and 6 move to intermediate position.
         (c) Position flap control lever in 25-unit detent.
         (d) Leading edge flaps and slats shall not move.
         (e) Position flap control lever in 30-unit detent.



Leading Edge Flap and Slat Control Valve Adjustment
Figure 501 (Sheet 1)



VIEW 1



DETAIL A

Leading Edge Flap and Slat Control Valve Adjustment
Figure 501 (Sheet 2)

(f) Slats 1 and 6 shall extend fully.
(g) Position flap control lever in 25-unit detent.
(h) Slats 1 and 6 shall retract to intermediate position.

(5) On airplanes AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE, MD ALL EXCEPT 5R-MFA, NH ALL EXCEPT JA 8401 thru JA8411, NZ ALL EXCEPT ZK-NAC thru ZK-NAL, PV ALL EXCEPT CF-EPL, CF-EPO and CF-EPR, TM ALL EXCEPT CR-BBA and CR-BAB, check operation of flaps and slats.
(a) Position flap control lever in 1-unit detent.
(b) Check that leading edge flaps extend and that slats 1 through 6 move to intermediate position.
(c) Position flap control lever in 5-unit detent.
(d) Leading edge flaps and slats shall not move.
(e) Position flap control lever in 10-unit detent.
(f) Slats 1 through 6 shall extend fully.
(g) Position flap control lever in 1-unit detent.
(h) Slats 1 through 6 shall retract to intermediate position.

(6) Position flap control lever in FLAP UP detent.
(7) All leading edge flaps and slats shall retract to UP position.
(8) Depressurize hydraulic systems. Refer to 27-81-0.

LEADING EDGE STANDBY DRIVE SHUTOFF VALVE - REMOVAL/INSTALLATION

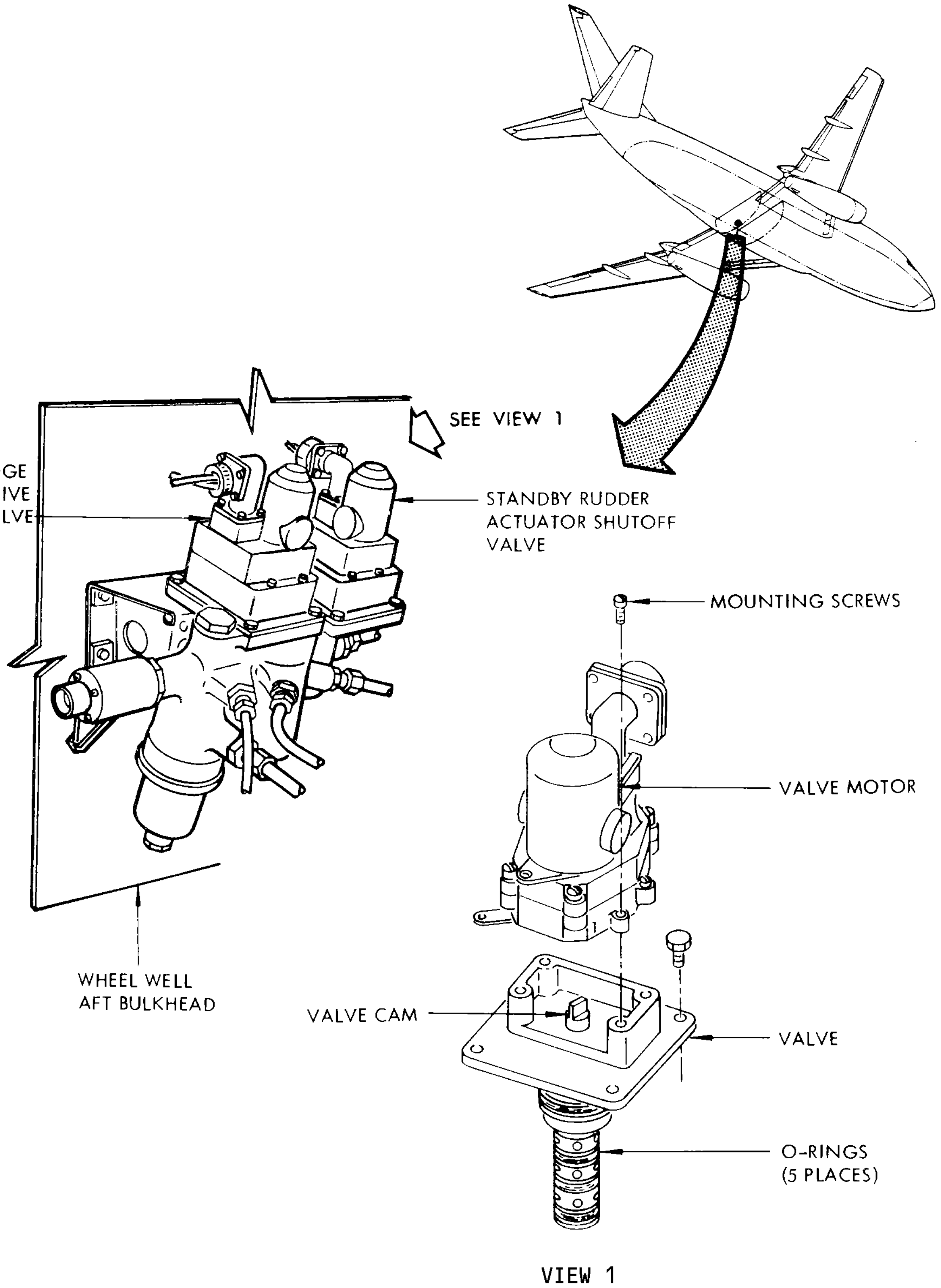
1. General
   A. The leading edge standby drive shutoff valve and standby rudder actuator shutoff valve are identical cartridge units. The leading edge standby drive shutoff valve is on the right portion of the modular package and the standby rudder actuator shutoff valve is on the left portion of the modular package. This procedure provides instructions for replacement of the leading edge standby drive shutoff valve. The complete cartridge unit, motor and valve, may be replaced or the motor only may be replaced without removing the valve body from the modular package. The motor drive and valve cam are indexed to aid in correct motor installation.
2. Removal/Installation Standby Drive Shutoff Valve

   NOTE: Use this procedure when replacing assembly of motor and valve. When replacing the motor only, refer to paragraph 3.

   A. Equipment and Materials
      (1) Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Skydrol Assembly Lube - MCS 352B (AMM 20-30-21/201)
   B. Remove Standby Drive Shutoff Valve
      (1) Depressurize hydraulic systems and hydraulic reservoirs. Refer to 27-81-0, Leading Edge Flaps and Slats - Maintenance Practices.
      (2) Open FLAP SHUTOFF VALVES circuit breaker on circuit breaker panel P6.
      (3) Disconnect electrical connector from valve motor.
      (4) Remove four valve mounting bolts attaching shutoff valve body to modular package housing.
      (5) Carefully remove shutoff valve from modular package housing by turning slightly and lifting straight up.

         CAUTION: BE PREPARED TO CATCH SPILLED HYDRAULIC FLUID.

      (6) Take necessary precautions to prevent dirt entering shutoff valve cavity when valve is removed.
   C. Install Standby Drive Shutoff Valve
      (1) Install five O-rings with backup rings on replacement valve. (See figure 401.) Lightly lubricate O-rings and backup rings with Skydrol 500 hydraulic fluid or Skydrol assembly lube MCS 352B at installation.
      (2) Carefully insert shutoff valve into modular package housing.
      (3) Install four mounting bolts. Tighten bolts within 30 to 40 pound-inch torque range.
      (4) Install lockwire on four mounting bolts.
      (5) Install electrical connector at valve motor.
      (6) Test shutoff valve. See Leading Edge Standby Drive Shutoff Valve -Adjustment/Test.
      (7) Check hydraulic reservoir and service, if required.



Standby Drive Shutoff Valve Installation
Figure 401

3. Removal/Installation Standby Drive Shutoff Valve Motor

NOTE: Use this procedure when replacing the valve motor only. When replacing the motor and valve use the procedure in paragraph 2.

A. Remove Standby Drive Shutoff Valve Motor
   (1) Open FLAP VALVES circuit breaker on circuit breaker panel P6-2.
   (2) Disconnect electrical connector from valve motor.
   (3) Move manual override lever to position 2.
   (4) Remove four mounting screws (figure 401) attaching valve motor to valve. Remove valve motor from valve. Remove valve motor from valve.

B. Install Standby Drive Shutoff Valve Motor
   (1) On replacement of valve motor, move manual override lever to position 2.
   (2) Position valve motor on valve and engage motor drive with valve cam. (See figure 401.)
   (3) Install the four mounting screws.
   (4) Install lockwire on mounting screws.
   (5) Install electrical connector on valve motor.
   (6) Test shutoff valve. See Leading Edge Standby Drive Shutoff Valve - Adjustment/Test.

LEADING EDGE STANDBY DRIVE SHUTOFF VALVE - ADJUSTMENT/TEST

1. Test Standby Drive Shutoff Valve
   A. Connect electrical power to airplane.
   B. Close FLAP SHUTOFF VALVES circuit breaker on P6 panel.
   C. Close STANDBY RUD and STANDBY HYD PUMP CONT circuit breaker on P6 panel.
   D. Open TE ALT FLAP DRIVE MOTOR circuit breaker on P6 panel.
   E. Check that manual override lever on valve is at position No. 1.
   F. Pressurize hydraulic system A (Ref 27-81-0, MP).
   G. Position flap control lever to FLAPS UP detent.
   H. Position alternate flap arming switch to ARM.
      (1) Check that STANDBY HYD LOW PRESSURE light comes on.
      (2) Check that standby hydraulic pump starts and that STANDBY HYD LOW PRESSURE light is off.
   I. Position flap control lever to 40-unit detent. Check that leading edge flaps and slats do not respond.

      NOTE: Flap control lever is moved to 40-unit detent as a standard procedure to minimize load on flap hydraulic motor when hydraulic system A is pressurized.

   J. Position alternate flap drive control switch to DOWN.

      CAUTION: FOR GROUND OPERATION, ALTERNATE FLAP DRIVE UNIT IS LIMITED TO 10 MINUTES OPERATION AND 25 MINUTES OFF.

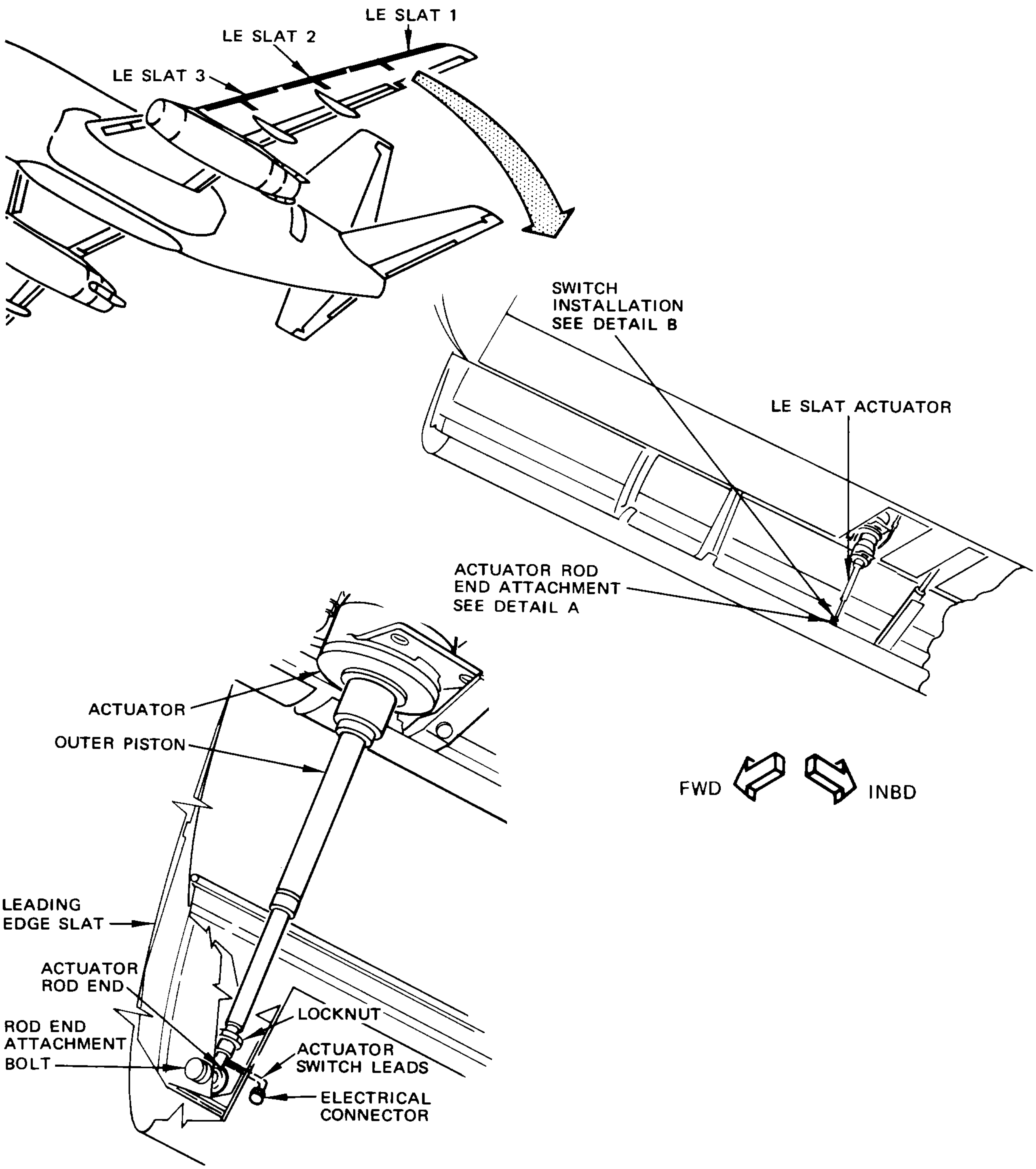
      (1) Check that manual override lever on valve is at position No. 2.
      (2) Check that leading edge flaps and slats fully extend.
   K. Position alternate flap drive control switch to OFF. Check that leading edge flaps and slats do not move.
   L. Position flap control lever to FLAP UP detent. Check that leading edge flaps and slats do not respond.
   M. Position alternate flap arming switch to OFF.
      (1) Check that manual override lever on valve moves to position No. 1.
      (2) Check that leading edge flaps and slats fully retract.

         NOTE: Retraction is due to hydraulic system A being pressurized.

   N. Repeat steps H, I, J, K, L and M to bleed standby hydraulic system by actuating leading edge devices.
   O. Check leading edge standby drive shutoff valve hydraulic fittings for leakage.
   P. Close TE ALT FLAP DRIVE MOTOR circuit breaker.
   Q. Depressurize hydraulic systems (Ref 27-81-0).
   R. Lockwire alternate flap master arming switch.
   S. Remove electrical power if no longer required.

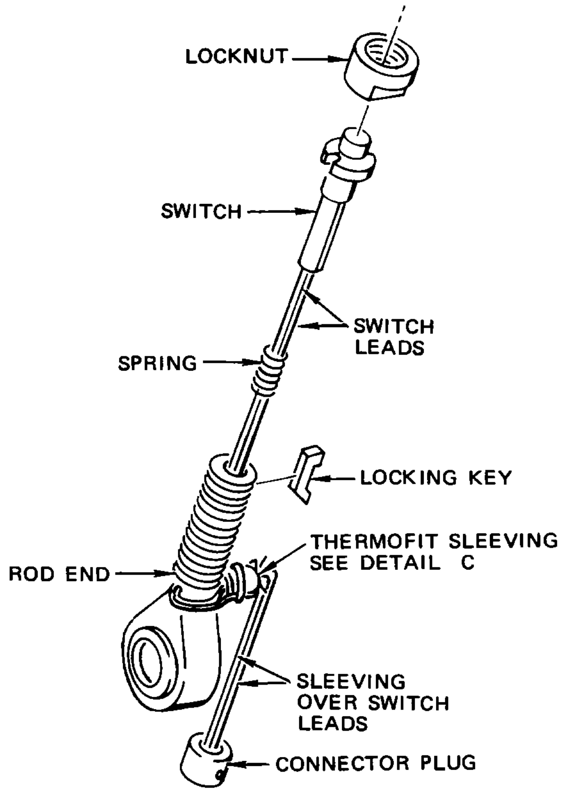
LEADING EDGE SLAT ACTUATOR SWITCH - REMOVAL/INSTALLATION

1. General
   A. The following procedure provides instructions for replacement of reed switch assembly on leading edge slat actuators without removing actuators from airplane.
2. Equipment and Materials
   A. Leading Edge Slat Locks - F80048-58, F80048-59, F80048-60 (AR LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD 5R-MFA; NH JA 8401 thru JA 8411; PV CF-EPL, CF-EPO and CF-EPR; TM CR-BAA and CR-BAB)
   B. Leading Edge Slat Locks - F80048-57, F80048-79 (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE; MD ALL EXCEPT 5R-MFA; NH ALL EXCEPT JA 8401 thru JA 8411; PV ALL EXCEPT CF-EPL, CF-EPO and CF-EPR; TM ALL EXCEPT CR-BAA and CR-BAB)
   C. Silicone Adhesive Sealant - RTV 174 (BAC5010 TYPE 60)(Ref 20-30-11)
   D. Heat-Shrinkable Sleeve - Thermofit RNF-100-1 (Rayclad Tubes, Inc.)
   E. Heat-Shrinkable Sleeve - Thermofit RNF-100-2 (Rayclad Tubes, Inc.)
   F. Tying Braid, Flat Woven Dacron - Airtex 417X, 0.012 X 0.090 inch (Eon Corp.)
   G. Connector Pin Insertion Tool - ST2220-2-4
   H. Connector Pin Removal Tool - ST2220-3-14
   I. Electrical Wire, Single Conductor, Insulated - BMS 13-16, Type I, Class I (22 gage)
   J. Sleeve, Braided Shield (Inner) - GS080 (Thomas and Betts)
   K. Sleeve, Braided Shield (Outer) - GS149 (Thomas and Betts)
   L. Wire Rope - MIL-W-83420, Type II, 3/64-Inch Diameter
   M. Heat Shrink Tubing - RT-876-1/8, 0.12 x 4.0 inch (Raychem Corp.)
   N. Heat Shrink Tubing - RT-876-3/16, 0.19 x 1.0 inch (Raychem Corp.)
3. Remove Leading Edge Slat Actuator Switch
   A. Remove access panels adjacent to slat actuator and panel aft of actuator door.
   B. Provide system A hydraulic power (Ref 27-81-0, Maintenance Practices).
   C. Position flap control lever to fully extend flaps and slats.
   D. Remove system A hydraulic power (Ref 27-81-0).
   E. Install locks on slat actuators adjacent to slat where switch is being replaced.
   F. Remove seal and access door from slat for access to electrical connector and rod end attach bolt.
   G. Remove slat rod end attach bolt (Detail A, Fig. 401).
   H. Disconnect electrical connector.
   I. Provide system A hydraulic power (Ref 27-81-0).
   J. Place flap control lever to FLAP UP detent to fully retract actuator.
   K. Remove system A hydraulic power (Ref 27-81-0).

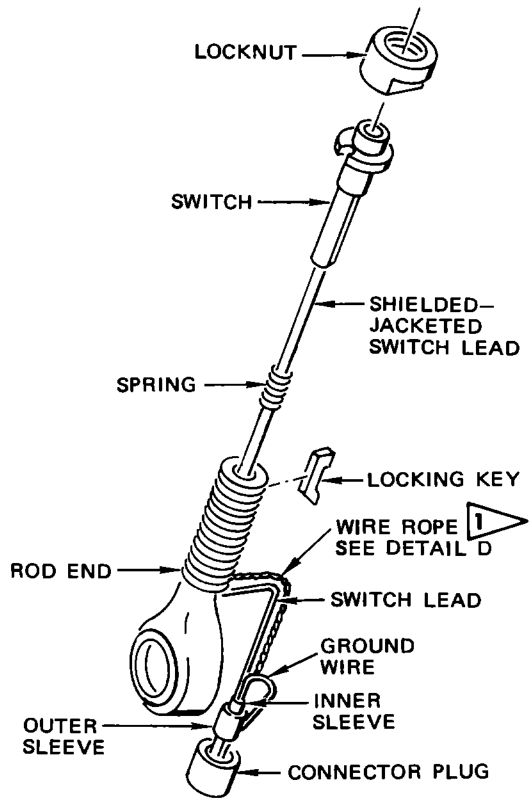


ACTUATOR ROD END ATTACHMENT
DETAIL A

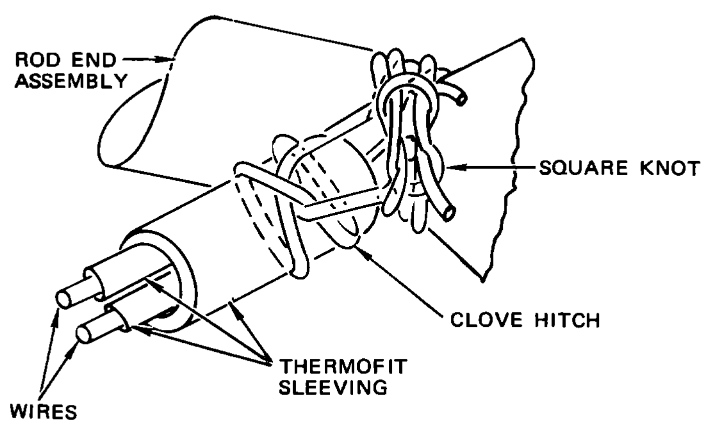
Leading Edge Slat Actuator Switch Installation
Figure 401 (Sheet 1)



SWITCH INSTALLATION
(PART NO. 65-44746)
DETAIL B

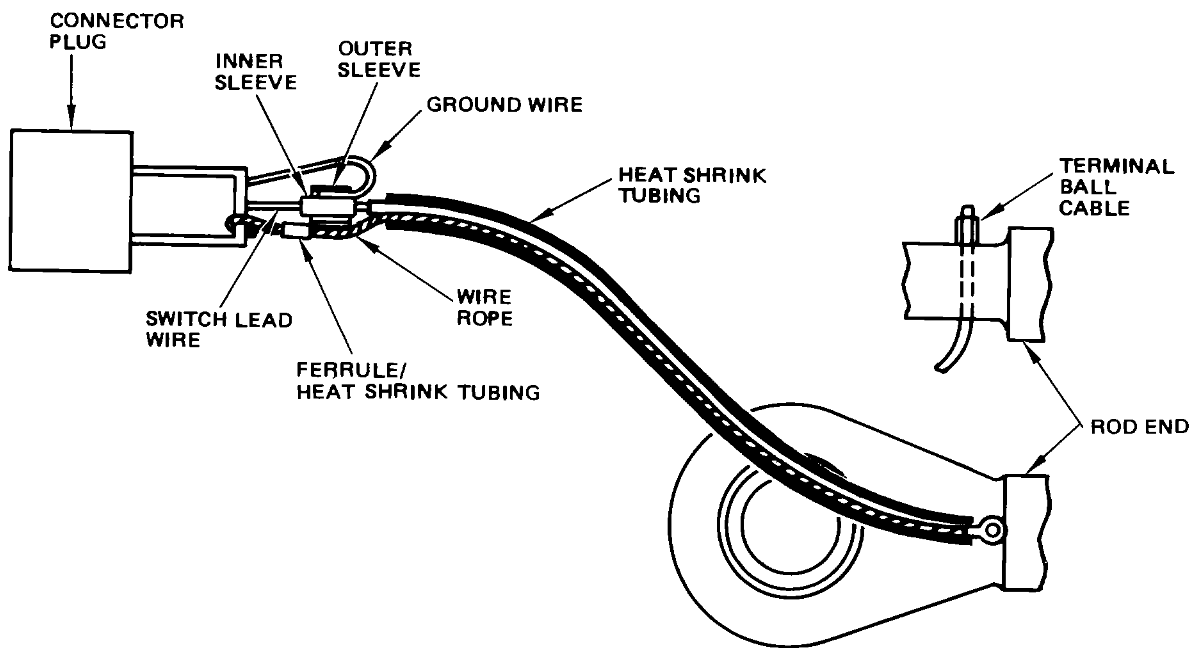


SWITCH INSTALLATION
(PART NO. 65-44873)
DETAIL B



THERMOFIT SLEEVING
DETAIL C

Leading Edge Slat Actuator Switch Installation
Figure 401 (Sheet 2)



WIRE ROPE
DETAIL D

1 ON ROD END ASSEMBLIES WITH WIRE ROPE HOLE ONLY.

Leading Edge Slat Actuator Switch Installation
Figure 401 (Sheet 3)

L. Mark a point on actuator housing close to outer piston, but not on piston. Measure as accurately as possible, the distance from this point to centerline of rod end bolt. Record measurement and retain for use in reinstallation of rod end.

NOTE: This dimension will be used to set rod end length on installation if inside calipers are not available or clearance prevents their use.

M. Cut switch leads between rod end and connector plug. On rod end assemblies with wire rope hole, cut wire rope joining rod end and connector plug (Detail D, Fig. 401).
N. Remove sealant from rod end and locknut. Remove lockwire from nut and locking key.
O. Back off locknut and remove rod end assembly.
P. Cut tying braids, if present, securing switch leads to rod end.
Q. Withdraw switch from rod end. Remove and save spring (Detail B).

NOTE: Step Q. does not apply, if replacement switch and rod end come pre-assembled.

R. Disconnect connector plug from mounting bracket and using connector pin removal tool, remove pins from connector plug. Save connector plug for use with replacement switch.
S. If locknut and locking key are removed for any purpose, save locknut and locking key.

4. Install Leading Edge Slat Actuator Switch
   A. If removed from rod end, place locking key in locknut (with tabs outward) and run locknut onto rod end (Detail B, Fig. 401).
   B. If replacement switch and rod end come pre-assembled:
      (1) Screw rod end into piston until distance between centerlines of actuator support fitting bolt and rod end bolt is 12.69 to 12.71 inches. Use inside calipers to measure distance. Ensure that switch assembly turns with rod end and seats correctly in piston.
      (2) If inside calipers are not available, or clearance prevents their use, screw rod end into piston until distance between centerline of rod end bolt and point marked on actuator housing during rod end removal is exactly as that recorded in step 3.L. Ensure that switch assembly turns with rod end and seats correctly in piston.
      (3) Tighten locknut 220 to 300 pound-inches. Lockwire nut and locking key.

C. Install switch by installing spring, threading switch leads through holes inside of rod end and sliding switch into position in rod end.

NOTE: Ensure that flats on switch align with flats in rod end. This step does not apply if replacement switch and rod end come preassembled.

D. If using switch, part No. 65-44746, install switch as follows:
(1) Compress switch and hold switch leads firmly against rod end.
(2) Screw rod end into piston until distance between centerlines of actuator support fitting bolt and rod end bolt is 12.69 to 12.71 inches. Use inside calipers to measure distance. Ensure that switch assembly turns with rod end and seats correctly in piston.
(3) If inside calipers are not available, or clearance prevents their use, screw rod end into piston until distance between centerline of rod end bolt and point marked on actuator housing during rod end removal is exactly as that recorded in step 3.L. Ensure that switch assembly turns with rod end and seats correctly in piston.
(4) Tighten locknut 220 to 300 pound-inches. Lockwire nut and locking key.
(5) Connect switch leads to connector plug as follows (Detail B):
(a) Place a yellow RNF-100-1, heat-shrinkable sleeve (1/16-inch diameter) over each lead. Extend sleeving tightly into holes in rod end and shrink sleeving.
(b) Bring both wires together as shown and cover with a clear RNF-100-2, heat-
shrinkable sleeve (5/32- or 3/16-inch diameter). Position sleeve so it is tight against rod end assembly as shown and shrink sleeve (Detail C).
(c) Using tying braid, place a clove hitch tightly over the sleeving and wires near the rod end as shown.

NOTE: Do not exert enough pressure to cause deformation of the wires.

(d) With the ends of the clove hitch make two tight wraps around rod end and tie securely with a square knot as shown.
(e) Cover knots and wraps of tying material and sleeving with silicone sealant.

NOTE: Do not seal the wire holes in rod end assembly.

(f) Cut switch leads as required to provide overall length of 7.00 to 8.00 inches from rod end to outer end of connector plug, when connected.

(g) Using connector pin insertion tool, connect switch leads to pins 1 and 2 on connector plug.

E. On actuators using switch, part No. 65-44873, connect switch lead to connector plug as follows: (Detail B).

(1) On rod end assemblies with wire rope hole, position wire rope alongside switch lead wire and slide on heat shrink tubing, RT-876-1/8. Do not shrink.

(2) Connect ground wire to switch lead.

(a) Strip outer jacket from switch lead to within 4.5 inches of rod end. Cut shielding at sufficient distance from end of jacket to allow folding the shielding over sleeve.

(b) Slide inner sleeve over shielding and fold shielding back over inner sleeve.

(c) Strip insulation from end of ground wire to expose 1/2 inch of conductor. Double conductor back on itself making an exposed end of 0.25-inch long.

(d) Lay exposed conductor of ground wire on exposed shielding of switch lead. Ground wire is to point toward connector plug.

(e) Position outer sleeve over ground wire connection and center over inner sleeve. Hexagonal swage outer sleeve to make a secure connection.

(3) On rod end assemblies without wire rope hole, connect switch leads to connector plug and install rod end (Detail B).

(a) Cut switch lead and ground wire as required to provide overall length of 7.00 to 8.00 inches from rod end to outer end of connector plug, when connected.

(b) Using connector pin insertion tool, connect switch lead to pin 2 of connector plug and ground wire to pin 1.

(c) Compress switch and hold switch leads firmly against rod end.

(d) Screw rod end into piston until distance between centerlines of actuator support fitting bolt and rod end bolt is 12.69 to 12.71 inches. Use inside calipers to measure distance. Ensure that switch assembly turns with rod end and seats correctly in piston.

(e) If inside calipers are not available, or clearance prevents their use, screw rod end into piston until distance between centerline of rod end bolt and point marked on actuator housing during rod end removal is exactly as that recorded in step 3.L. Ensure that switch assembly turns with rod end and seats correctly in piston.

(f) Tighten locknut 220 to 300 pound-inches. Lockwire nut and locking key.

(g) Release switch lead wire.

(h) Using tying braid, secure switch lead to rod end. Apply a clove hitch firmly around rod end at lead wire hole. Tie a square knot firmly over the clove hitch and cut off free ends to a length of 0.25 to 0.50 inch.

<u>NOTE</u>: Do not exert enough pressure to cause deformation of the wire insulation.

(4) On rod end assemblies with wire rope hole, connect switch leads to connector plug and install rod end (Detail D).
(a) Compress spring in rod end with switch and hold. Cut switch lead wire and ground wire as required to provide overall distance of 7.5 to 8.0 inches from rod end to outer end of connector plug, when connected.
(b) Cut wire rope 0.30 inches shorter than switch wire length from rod end and trim 1/8-
inch tubing at least 0.75 inches away from rod end.

<u>NOTE</u>: Wire rope length is such that after installation, load between connector plug and rod end will be carried by wire rope and not switch wire.

(c) Release hold on spring.
(d) Using connector pin insertion tool, connect switch lead wire to pin 2 of connector plug and ground wire to pin 1.
(e) Slide heat shrink tubing, RT-876-3/16, over wire rope (near connector end). Loop end of wire rope through hole in connector and ferrule. Swage ferrule. Position tubing over swage. Do not shrink.
(f) With switch compressing spring in rod end, hold switch wire and wire rope firmly against rod end and screw rod end into piston until distance between centerlines of actuator support fitting bolt and rod end bolt is 12.69 to 12.71 inches. Use inside calipers to measure distance. Ensure that switch assembly turns with rod end and seats correctly in piston.
(g) If inside calipers are not available, or clearance prevents their use, screw rod end into piston until distance between centerline of rod end bolt and point marked on actuator housing during rod end removal is exactly as that recorded in step 3.L. Ensure that switch assembly turns with rod end and seats correctly in piston.
(h) Tighten locknut 220 to 300 pound-inches. Lockwire nut and locking key.
(i) Release switch wire and wire rope and insert end of wire rope through hole in rod end. Swage terminal ball cable on end of wire rope that projects through.

(5) Check that 3/16-inch tubing is covering ferrule and that 1/8-inch tubing allows space for free switch wire movement near rod end. Shrink tubing.

F. Attach connector plug to mounting bracket.

G. Apply silicone sealant around rod end assembly and lockout. Ensure that sealant is applied to tying braid and wire rope, if present, and point where switch lead wire enters rod end.

CAUTION: SEAL OFF ALL ACCESS AREA TO ROD END THREADS AND GLAND NUTS. SWITCH WIRE IS HELD PERPENDICULAR TO ROD END DURING APPLICATION AND CURING OF SEALANT.

H. Remove all leading edge slat actuator locks.

I. Provide system A hydraulic power (Ref 27-81-0).

J. Extend actuator by placing flap lever in 1-unit detent.

K. Remove system A hydraulic power (Ref 27-81-0).

L. Connect actuator to slat with rod end bolt. Install washer on each side of rod end. Install locknut and tighten 220 to 360 pound-inches.

M. Connect electrical connector.

N. Install access door and seal.

O. Provide system A hydraulic power (Ref 27-81-0).

P. Retract leading edge flaps and slats by placing flap lever in FLAP UP detent.

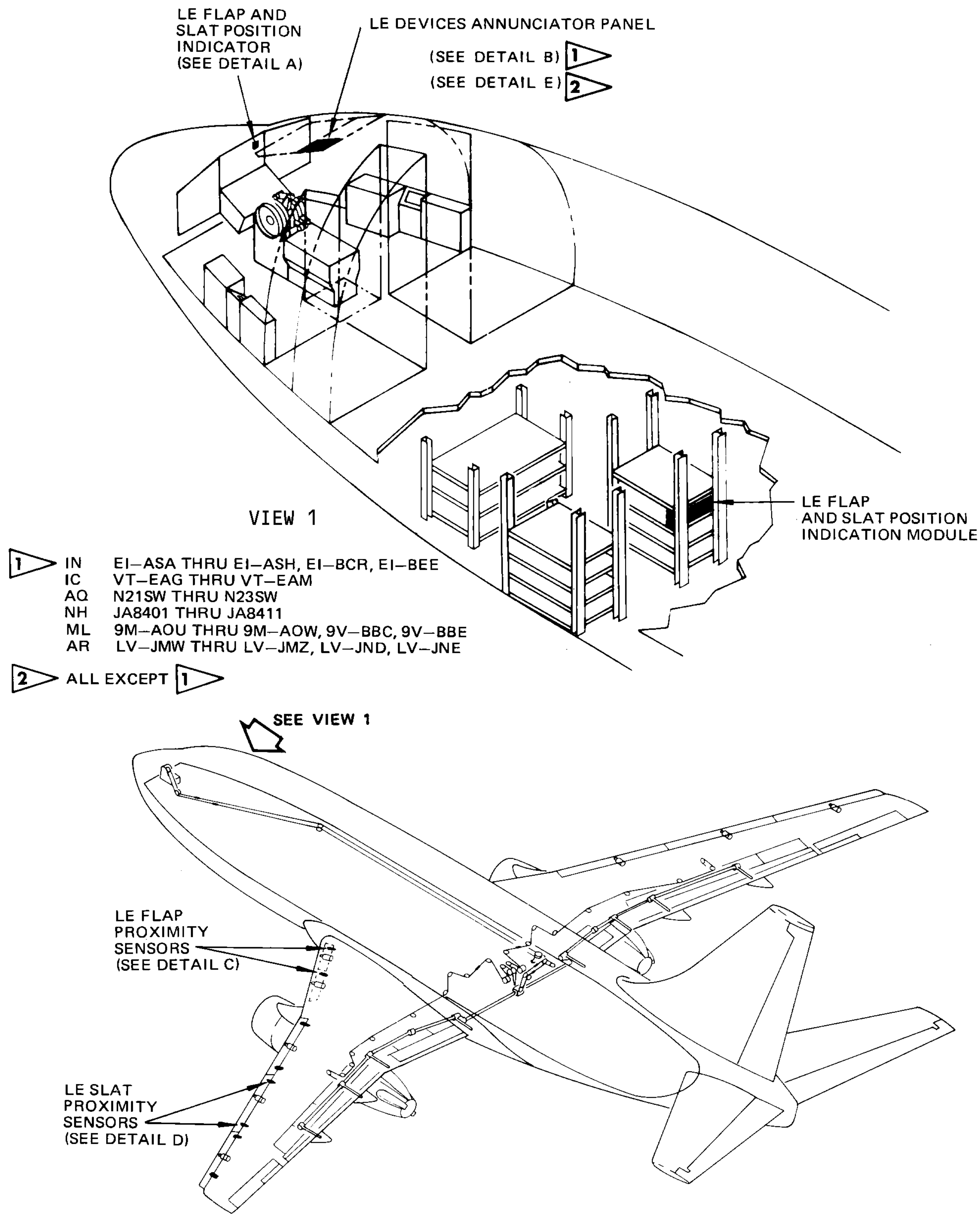
Q. Place flap control lever in 1-unit detent. Check that amber TRANSIT lights on leading edge annunciator panel on the aft overhead panel come on as slats extend and go off when extended. Check that green EXT lights come on when slats are extended.

R. Place flap control lever in FLAP UP detent. Check that TRANSIT annunciator lights come on as slats retract. Check that all lights on annunciator panel go off when slats are fully retracted.

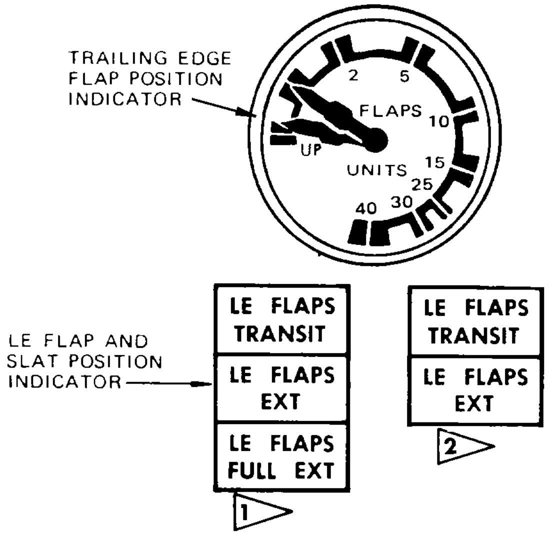
S. Remove system A hydraulic power (Ref 27-81-0).

LEADING EDGE FLAP AND SLAT POSITION INDICATING SYSTEM - DESCRIPTION AND OPERATION

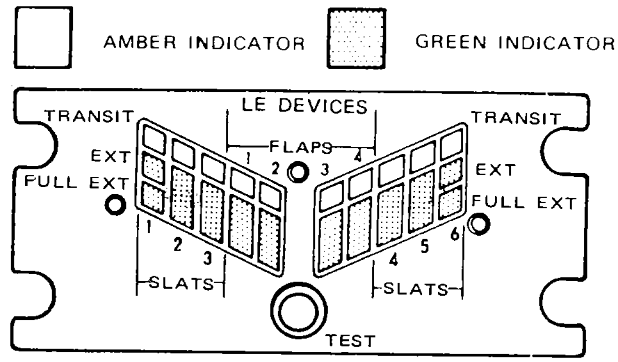
1. General
   A. A position indicating system provides visible indication of the position of the leading edge flaps and slats (Fig. 1). The system includes system indicator lights on the center instrument panel an individual flap and slat indicator lights on an annunciator panel in the aft overhead panel. This provides indication of normal operation on the center panel and enables the pilots to easily determine which flap or slat is not in the proper position when normal indications do not appear. The indicating system consists of reed switches in the slat actuator, proximity sensors, a leading edge flap and slat position indication module, the pilots' indicator light panel, and the annunciator panel.
2. Proximity Sensors
   A. Proximity sensors indicate the position of each leading edge flap and slat (Fig. 1). Each proximity sensor consists of an induction coil and an actuating bar. Each sensor coil is connected electrically to a transistorized switch card (switch) in the leading edge flap and slat position indication module (module). Each sensor coil is mounted on fixed leading edge structure and each actuating bar moves with a flap or slat. When the system is on, a constant current flow exists through each coil to ground. When an actuating bar is brought into position adjacent to the coil, the current flow is increased and a switch in the module is triggered. Two sensor coils are mounted adjacent to the inboard hinges of the leading edge flaps. The actuation bars are mounted on the inboard hinges. One sensor coil is installed adjacent to the inboard auxiliary track on each leading edge slat. An actuation bar is mounted on each inboard auxiliary track arm. A sensor coil is also installed adjacent to the middle auxiliary track on slats 1 and 6. On AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, AQ N21SW thru N23SW, IN EI-ASA thru EI-ASH, TZ CF-TAN, CF-TAO, FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F, PW 731 thru 733, 762, 772, a sensor coil is installed adjacent to the outboard auxiliary track on slats 2 thru 5.
3. Leading Edge Flap and Slat Position Indication Module
   A. A leading edge flap and slat position indication module controls the operation of the position indicating system (Fig. 2). The module consists primarily of plug-in switch and logic cards in the LE DEVICES annunciator panel light circuits, additional transistor circuits that work with the plug-in cards to control the pilots' indicating lights, and interconnecting circuitry. The module receives 28-volt ac power from the 28-volt ac transfer bus and 28-volt dc power from the No. 1 dc bus; it provides a reduced dc voltage to the proximity sensor coils. The module is located on equipment rack shelf E3-2.



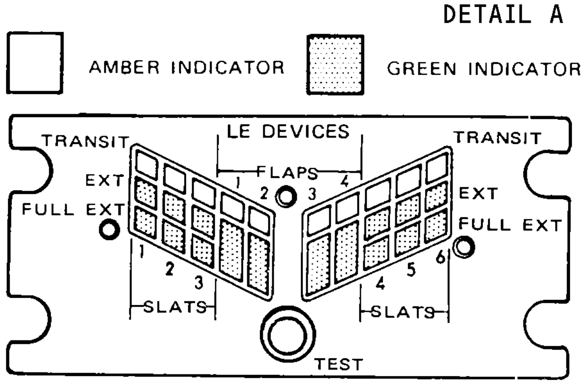
Leading Edge Flap and Slat Position Indicating
Figure 1



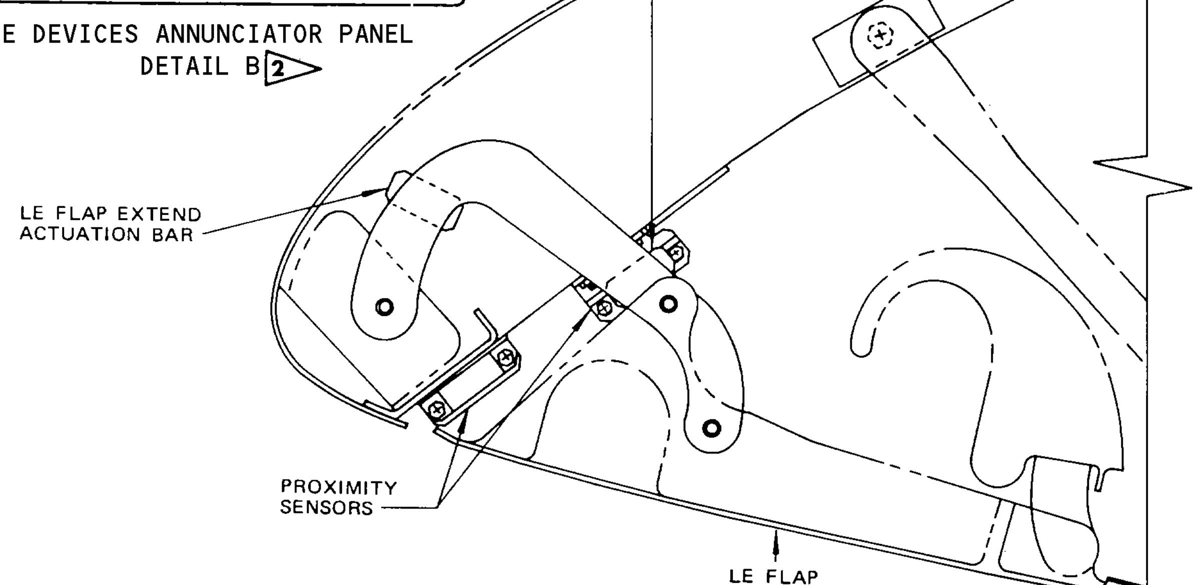
LEADING EDGE FLAP AND SLAT
POSITION INDICATOR
DETAIL A



LE DEVICES ANNUNCIATOR PANEL
DETAIL B 1

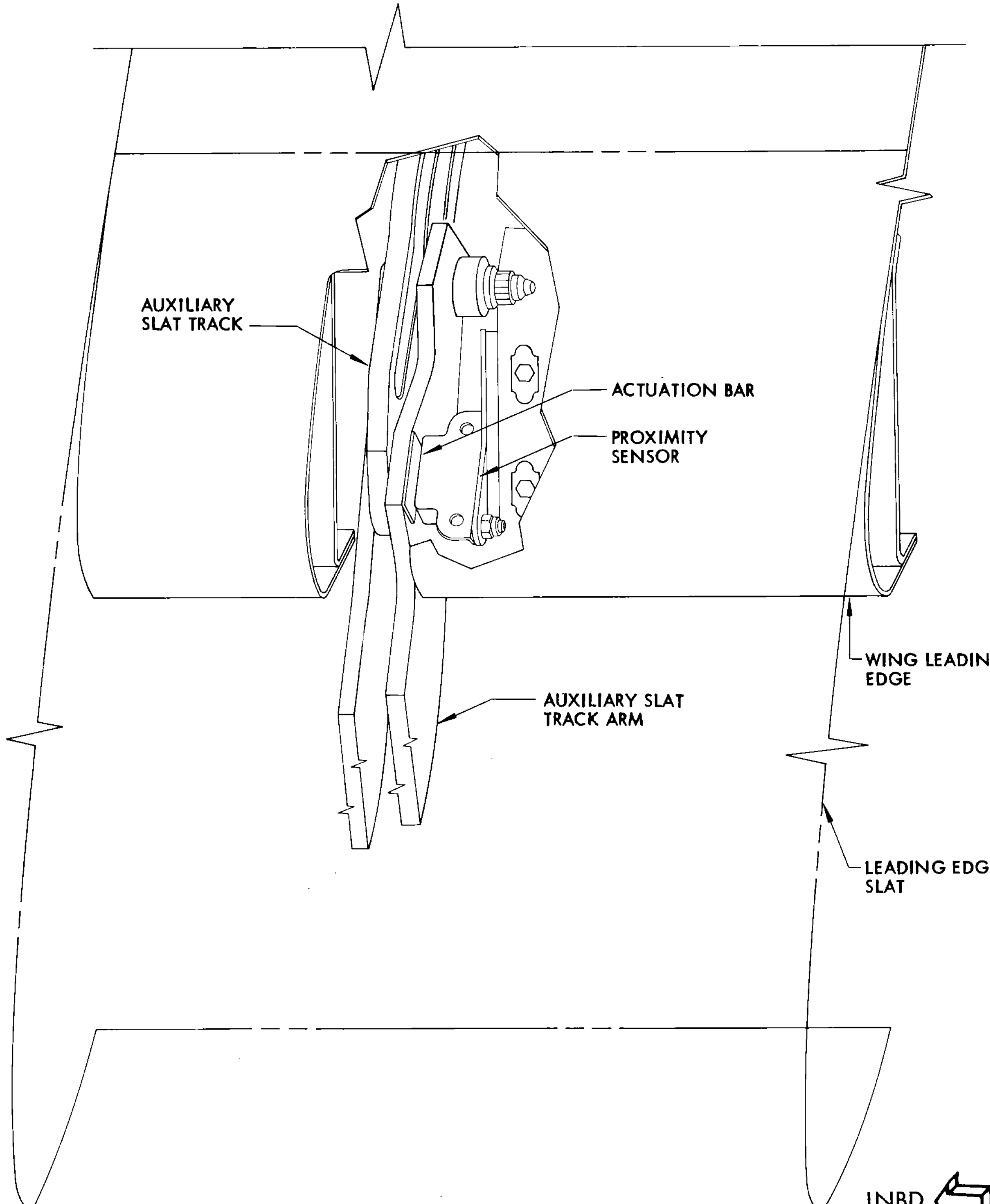


LE DEVICES ANNUNCIATOR PANEL
DETAIL B 2



DETAIL C

Leading Edge Flap and Slat Position Indicating System Component Location
Figure 2 (Sheet 1)



DETAIL D

Leading Edge Flap and Slat Position Indicating System Component Location
Figure 2 (Sheet 2)

B. AIRPLANES WITH POSITION INDICATION MODULE THAT HAS THE BUILT-IN-TEST EQUIPMENT (BITE); The BITE is provided to aid in fault isolation, to test the proximity sensors, and to test the system configuration (Fig. 3).

4. <u>Leading Edge Flap and Slat Position Indicator</u>

A. The leading edge flap and slat position indicator provides an indication of normal flap and slat operation (Fig. 1). It is located on the pilots' center instrument panel. On AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC VT-EAG thru VT-EAM, the position indicator consists of one amber LE FLAPS TRANSIT light, a green LE FLAPS EXT light, and a green LE FLAPS FULL EXT light. On AR ALL EXCEPT JV-JMW thru LV-JMZ, LV-JND, LV-JNE, IC ALL EXCEPT VT-EAG thru VT-EAM, the position indicator consists of an amber LE FLAPS TRANSIT light and a green LE FLAPS EXT light. Each light includes a fuse and a press-to-test switch. The indicators receive 28-volt dc power from the airplane lighting system. Individual lamp circuits are completed in the transistorized control circuitry in the module.

5. <u>Leading Edge Devices Annunciator Panel</u>

A. The leading edge devices annunciator panel indicates the position of each leading edge flap and slat by means of transit and position indicator lights (Fig. 1). The annunciator panel is mounted in the aft overhead panel and includes a test switch. The annunciator panel also contains a transformer and a full-wave rectifier. The transformer primary receives power from the 28-volt ac transfer bus. Transformer output is delivered to the indicator lamps. The individual lamp circuits from any set of indicators are completed in the applicable logic card in the module.

6. <u>Operation</u> (AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC VT-EAG thru VT-EAM)

A. The position of the leading edge flaps and slats is displayed on two indicator light panels (Fig. 1). Indication of flap and slat system operation is shown by indicator lights on the center instrument panel. If these lights do not indicate the anticipated condition, an annunciator on the aft overhead panel will indicate the discrepant flap or slat. When the leading edge devices are retracted, none of the indicator lights on either panel are illuminated.

B. When the trailing edge flaps are extended to 1 unit, the leading edge flaps and leading edge slats 2, 3, 4, and 5 are fully extended and leading edge slats 1 and 6 are in the intermediate position. As each flap leaves the retracted position, an actuation bar mounted on the flap hinge moves away from the retract proximity sensor coil (sensor). As each slat leaves the retracted position, the reed switch in the actuator closes. The resultant changes in current flow are sensed by transistorized switch cards in the position indication module. The switches then operate to complete logic card circuits which control annunciator panel indicators and flap and slat position indicators on the center instrument panel (Fig. 2). This illuminates the LE FLAPS TRANSIT indicator on the center panel and the ten FLAPS and SLATS TRANSIT indicators on the annunciator panel. When the flaps and slats 2, 3, 4, and 5 reach the extended position and the slats 1 and 6 reach the intermediate position, actuation bars are adjacent to the flap extend sensors and the inboard sensor on each slat. This extinguishes all transit indicator lights and illuminates the LE FLAPS EXT indicator on the center instrument panel and the FLAPS and slats 2, 3, 4, and 5 FULL EXT and SLATS 1 and 6 EXT indicators on the annunciator panel. If any flap or slat does not reach the selected position, the LE FLAPS EXT indicator on the center panel will not illuminate and the LE FLAP TRANSIT indicator will remain lighted. On the annunciator panel, the transit indicator will remain illuminated for the flap or slat not reaching the selected position. The extend or full extend indicator will illuminate for the flaps and slats reaching the selected position.

C. When trailing edge flaps are extended to 30-units, leading edge slats 1 and 6 are fully extended. As the slats move from the intermediate position, actuation bars are moved away from the inboard sensors on each slat. This extinguishes the LE FLAPS EXT indicator and illuminates the LE FLAPS TRANSIT indicator on the center instrument panel. At the same time, the SLATS EXT indicators on the annunciator panel are extinguished and the SLATS TRANSIT indicators for slats 1 and 6 are illuminated. The FLAPS and slats 2, 3, 4, and 5 FULL EXT indicators on the annunciator panel remain illuminated. When slats 1 and 6 are fully extended, actuation bars are adjacent to the outboard slat position sensors on each slat. In this slat position, the LE FLAPS TRANSIT indicator on the center panel is extinguished and the LE FLAPS FULL EXT indicators are illuminated. Simultaneously, the SLATS TRANSIT indicators on the annunciator panel are extinguished and the SLATS FULL EXT indicators are illuminated. If any slat does not reach the fully extended position, the indicator on the center panel will continue to show the in-transit condition and the malfunctioning slat will be located on the annunciator panel.

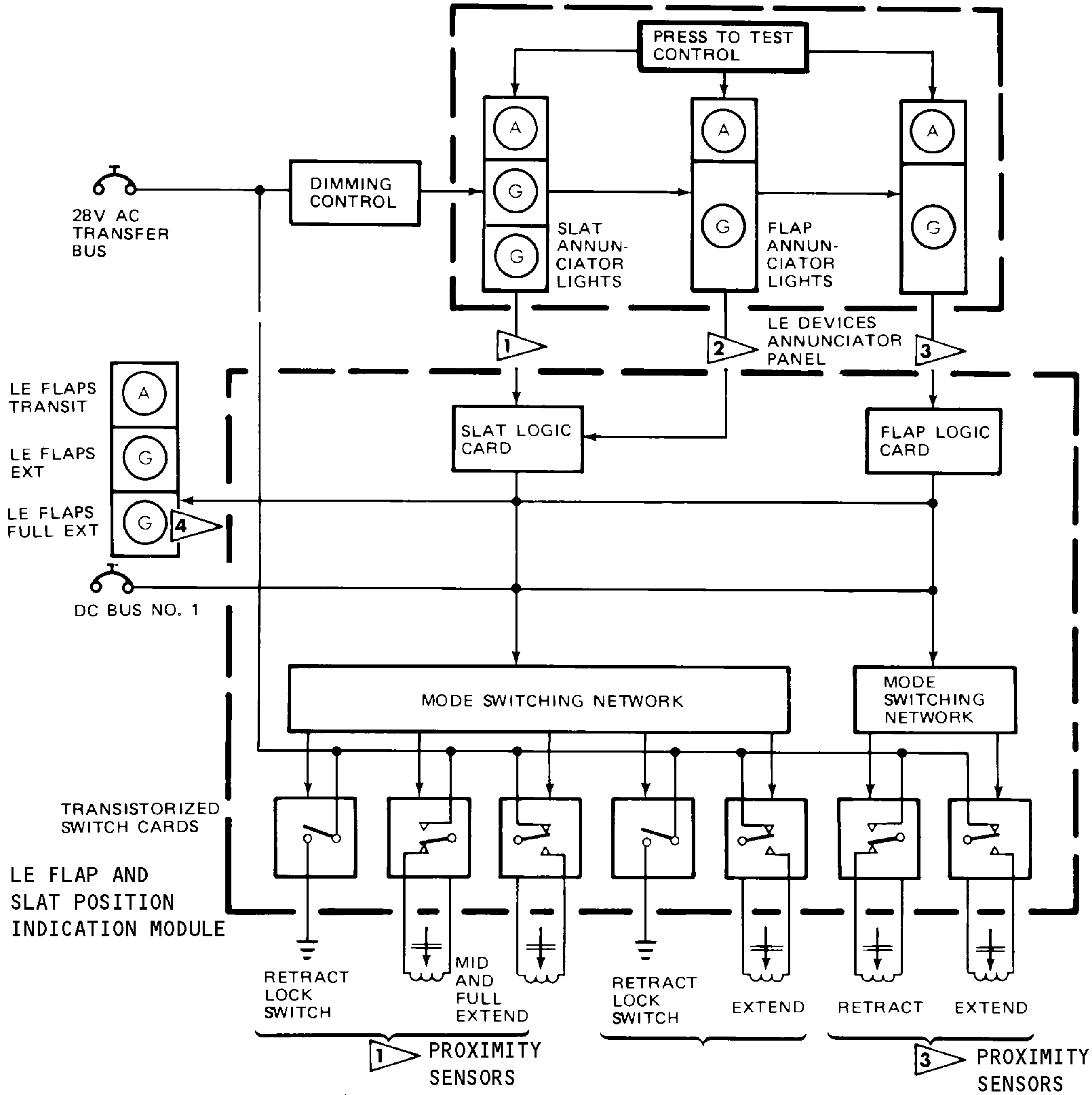
D. When the trailing edge flaps are retracted to the 25 unit range, slats 1 and 6 will be retracted to the intermediate position. As the slats retract, the center instrument panel and annunciator panel extend indicators will be extinguished and the transit indicators will be illuminated. When slats 1 and 6 reach the intermediate position, the transit indicators on both panels will be extinguished and the LE FLAPS EXT indicator on the center panel and LE SLATS EXT indicators on the annunciator panel will be illuminated.

E. When the trailing edge flaps are retracted to the UP position, the leading edge flaps and slats are fully retracted. As the slats and flaps retract, the extend indicators will be extinguished and the transit indicators on the center instrument panel and annunciator panel will be illuminated. When the flaps and slats reach the retracted position, all indicator lights are extinguished.

7. Operation (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC ALL EXCEPT VT-EAG thru VT- EAM; IN ALL EXCEPT EI-ASA thru EI-ASH; TZ ALL EXCEPT CF-TAN, CF-TAO; FL N7370F thru N7381F, N7383F, N7384F, N7386F thru N7390F; AQ ALL EXCEPT N21SW thru N23SW; PW ALL EXCEPT 731 thru 733, 762, 772)

A. The position of the leading edge flaps and slats is displayed on two indicator light panels (Fig. 1). Indication of flap and slat system operation is shown by indicator light s on the center instrument panel. If these lights do not indicate the anticipated condition, an annunciator on the aft overhead panel will indicate the discrepant flap or slat. When the leading edge devices are retracted, none of the indicator lights on either panel are illuminated.

B. When the trailing edge flaps are extended to 1-unit, the leading edge flaps are fully extended, and leading edge slats 1 thru 6 are in the intermediate position. As each flap leaves the retracted position, an actuation bar mounted on the flap hinge moves away from the retract proximity sensor coil (sensor). As each slat leaves the retracted position, the reed switch in the actuator closes. The resultant changes in current flow are sensed by transistorized switch cards in the position indication module. The switches then operate to complete logic card circuits which control annunciator panel indicators and flap and slat position indicators on the center instrument panel (Fig. 2). This illuminates the LE FLAPS TRANSIT indicator on the center panel and the 10 FLAPS and SLATS TRANSIT indicators on the annunciator panel. When the flaps reach the extended position, and slats 1 thru 6 reach the intermediate position, actuation bars are adjacent to the flap extend sensors and the inboard sensor on each slat. This extinguishes al1 transit indicator lights and illuminates the LE FLAPS EXT indicator on the center instrument panel, and the FLAPS FULL EXT, and SLATS 1 thru 6 EXT indicators on the annunciator panel. If any flap or slat does not reach the selected position, the LE FLAPS EXT indicator on the center panel will not illuminate and the LE FLAP TRANSIT indicator will remain lighted. On the annunciator panel, the transit indicator will remain illuminated for the flap or slat not reaching the selected position. The full extend indicator will illuminate for the flaps reaching the selected position. The extend indicator will illuminate for the slats reaching the selected position.



1 TYPICAL FOR SLATS 1 AND 6 4
TYPICAL FOR SLATS 1 THRU 6 5

2 TYPICAL FOR SLATS 2, 3, 4 AND 5 4

3 TYPICAL FOR FLAPS 1, 2, 3, 4

4 PI N734N THRU N738N, N740N, N741N, N743N THRU N747N
FL ALL EXCEPT N7340F THRU N7346F, N7382F, N7385F, N7391F THRU N7398F
IC VT–EAG THRU VT–EAM
NH JA8401 THRU JA8411;
AR LV–JMW THRU LV–JMZ, LV–JND, LV–JNE
NZ ZK–NAC THRU ZK–NAL

5 PI, IC, NH, AR, NZ ALL EXCEPT 4
FL N7340F THRU N7346F, N7382F, N7385F, N7391F THRU N7398F

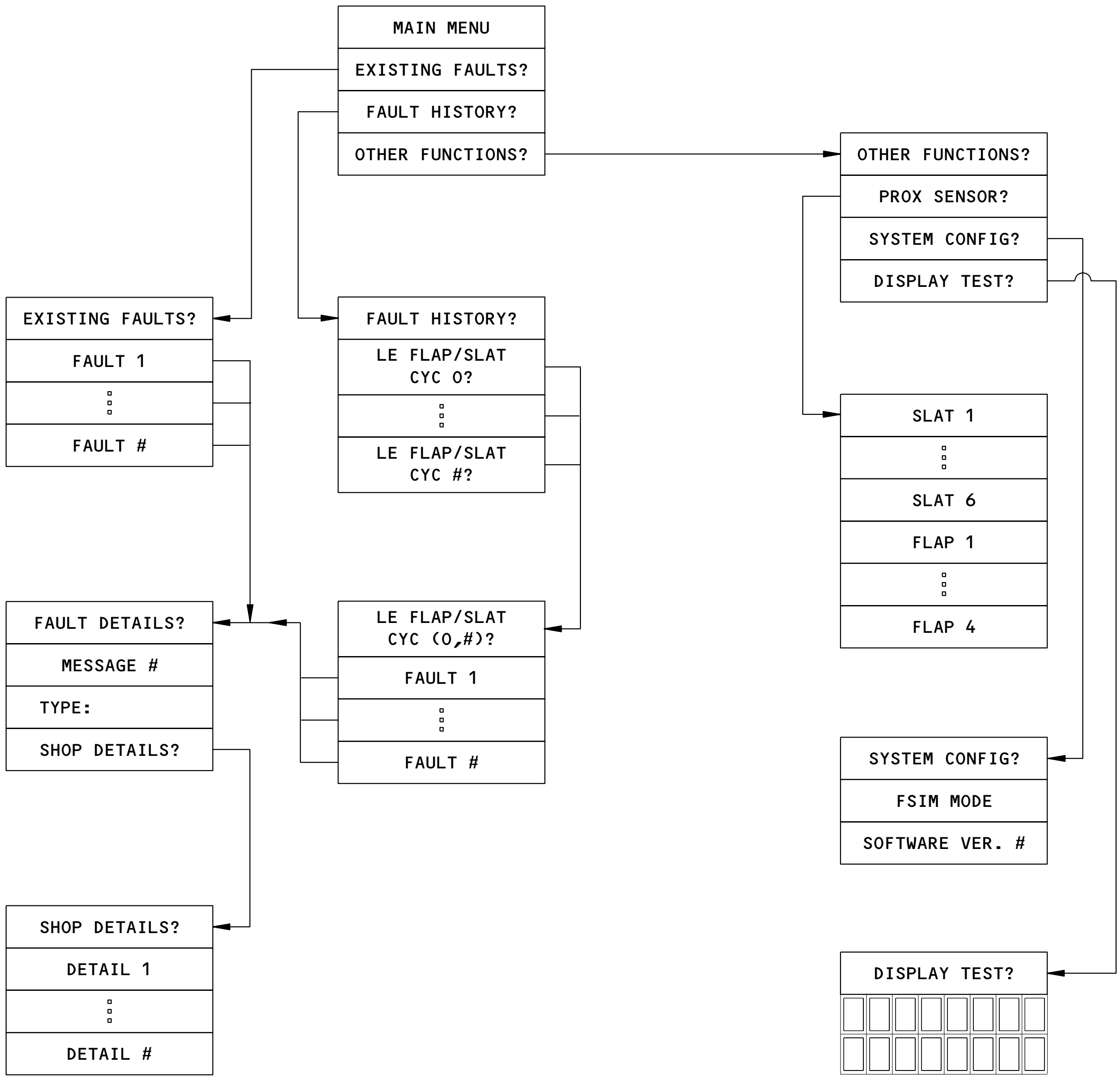
Leading Edge Flap and Slat Position Indicating Circuit
Figure 3

C. When trailing edge flaps are extended to 10 units, all leading edge slats fully extend. As the slats move from the intermediate position, actuation bars move away from the intermediate position sensors on each slat. This extinguishes the LE FLAPS EXT indicator and illuminates the LE FLAPS TRANSIT indicator on the center instrument panel. At the same time, the SLATS EXT indicators on the annunciator panel extinguish and the SLATS TRANSIT indicators illuminate. The FLAPS FULL EXT indicators on the annunciator panel remain illuminated. When the slats are fully extended, actuation bars are adjacent to the full extend position sensors on each slat. In this slat position, the LE FLAPS TRANSIT indicator on the center panel is extinguished and the LE FLAPS EXT indicator is illuminated. Simultaneously, the SLATS TRANSIT indicators on the annunciator panel are extinguished and the SLATS FULL EXT indicators are illuminated. If either slat does not reach the fully extended position, the indicator on the center panel will continue to show the in-transit condition and the malfunctioning slat will be located on the annunciator panel.

D. When the trailing edge flaps are extended 10 units or more, the leading edge flaps and slats remain fully extended.

E. When the trailing edge flaps are retracted to between 10 and 1 units, all slats will be retracted to the intermediate position. As the slats retract, the center instrument panel and annunciator panel full extend indicators will be extinguished and the transit indicators will be illuminated. When the slats reach the intermediate position, the transit indicator on the center panel and SLATS EXT indicators on the annunciator panel will be illuminated.

F. When the trailing edge flaps are retracted to the UP position, the leading edge flaps and slats are fully retracted. As the slats and flaps retract, the extend indicators will be extinguished and the transit indicators on the center instrument panel and annunciator panel will be illuminated. When the flaps and slats reach the retracted position, all indicator lights are extinguished.



Flap/Slat Indication Module (FSIM) Menu Hierarchy
Figure 4

LEADING EDGE FLAP AND SLAT POSITION INDICATING SYSTEM - TROUBLESHOOTING

1. General
   A. Green and amber LE position indicating lights are provided on the center instrument panel and LE flap and slat position annunciator panel to indicate position of the leading edge devices. One amber and two green indicator lights on the center instrument panel indicate collective position of all leading edge flaps and slats. The position annunciator panel has one amber and one or two green annunciator lights for each flap and slat.
   B. Green and amber LE position indicating lights are provided on the center instrument panel and LE flap and slat position annunciator panel to indicate position of the leading edge devices. One amber and two green indicator lights on the center instrument panel indicate collective position of all leading edge flaps and slats. The position annunciator panel has one amber and one or two green annunciator lights for each flap and slat.
   C. The amber indicator and annunciator lights indicate that the applicable flap or slat is in transit. The green lights indicate that the flap or slat is extended. No light illuminated indicates that the flap or slat is retracted.
   D. The green EXT annunciator light indicates that the applicable flap or two-position slat (slat with only one green extend light on annunciator panel) is fully extended. The green EXT light indicates that the applicable three-position slat (two green lights on annunciator panel) is in intermediate (mid) extend position. The green FULL EXT light applies only to three-position slats and indicates that the three-position slat is in full extend position.
      (1) LE flaps and two-position slats extend fully when trailing edge flaps are extended one unit or more.
      (2) AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
          BU LN-SUA, LN-SUG, LN-SUP and LN-SUS;
          EF B-2601, B-2603, B-2607;
          FL ALL EXCEPT N7340F thru N7349F, N7382F, N7385F,
             N7391F thru N7398F;
          ML SM-AOU thru 9M-AOW, 9V-BBC, 9V-BBE;
          NH JA8401 thru JA8411;
          Three-position slats extend to intermediate position when trailing edge flaps are extended 1 to 25 units, and fully extend when trailing edge flaps are extended more than 25 units.
      (3) AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
          BU ALL EXCEPT LN-SUA, LN-SUG, LN-SUP and LN-SUS;
          EF ALL EXCEPT B-2601, B-2603, B-2607;
          FL N7340F thru N7349F, N7382F, N7385F, N7391F thru N7398F;
          ML ALL EXCEPT 9M-AOU thru 9M-AOW, 9V-BBC, 9V-BBE;
          NH ALL EXCEPT JA8401 thru JA8411;
          Three-position slats extend to intermediate position when trailing edge flaps are extended 1 to 10 units, and fully extend when trailing edge flaps are extended more than 10 units.

E. This troubleshooting procedure assumes that electrical wiring, indicator lights on center instrument panel and annunciator lights on position annunciator panel are good. Placing the master dim and test switch in TEST position will confirm the indicator lights. Pressing the TEST switch on the position indication module will confirm the annunciator lights. If the troubleshooting procedures does not isolate the trouble, a further check of the wiring will be required.

2. Trouble Shooting (AR LV-JMW thru LV-JMZ,LV-JND,LV-JNE; CP CF-CPV,CF-CPZ; EF B-2601,B-2603,B-2607; FL N7363F,N7370F thru N7381F,N7383F,N7384F,N7386F thru N7390F; IC VT-EAG thru VT-EAM)

NOTE: Refer to par. 3 for trouble shooting for all airplanes not listed in par. 2.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows all surfaces retracted	Failure in M229 module, leading edge flap and slat position indicator accessory unit		Replace M229 module. Suspect "extend" proximity switch circuit cards; logic and annunciation circuit cards
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	Repair or replace wiring as necessary
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows one or more surfaces in transit	Failure in M229 module		Replace M229 module. Suspect circuit cards for leading edge surface indicated on overhead annunciator
	LE flap retract proximity sensor or wiring	Note indication on overhead panel position annunciator. For each LE flap TRANSIT light, check associated retract proximity sensor per 27-88-11	Adjust or replace sensor as necessary
		Check wiring between proximity sensor and M229 module for open or short circuit	Repair or replace wiring as necessary

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 1)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows one or more surfaces in transit (Cont)	Short circuit to ground in LE slat actuator switch or associated wiring	With leading edges retracted. note indication on overhead panel position annunciator. For each LE slat TRANSIT light, check associated lock position sensing circuit as follows: Remove M229 module. Set ohmmeter on Rx1K scale and check continuity from M229 ship mating connector D728B pin associated with slat lock switch to ground (Ref Wiring Diagram 27-81-11, 27-81-12) <u>CAUTION</u>: DO NOT USE LOWER RESISTANCE SCALE OR DAMAGE TO SWITCH MAY RESULT.	
		If continuity exists, extend slats then disconnect slat actuator switch electrical connector. If continuity still exists from M229 module pin to ground, check wiring and connectors between switch and M229 module for a short circuit to ground	Repair or replace wiring as necessary
		If no continuity from M229 module to ground exists with slat extended and lock switch connector unplugged, switch is defective	Replace actuator switch per 27-81-111

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 2)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows one or more surfaces extended	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
LE FLAPS TRANSIT center panel light on while leading edge surfaces are intransit; overhead annunciator panel shows one or more surfaces extended with no associated TRANSIT lights	LE flap or slat extend or full-extend proximity sensor or wiring		Replace proximity sensor per 27-88-11, R/I or check sensor wiring for open or short circuit and repair as necessary
LE FLAPS TRANSIT center panel light on when leading edge surfaces are extended; overhead annunciator shows correct indication	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect logic and annunciation circuit card
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	Repair or replace wiring as necessary

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 3)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light remains on when leading edges are extended; overhead annunciator shows one or more surfaces retracted	Open circuit in LE slat actuator switch or associated wiring	Note indication on overhead panel position annunciator. For any LE slat which is indicated retracted (no light on), check associated actuator lock switch and wiring as follows: with slat extended position, remove electrical connector from switch. Set multimeter on Rx1K scale and check continuity of switch CAUTION: DO NOT USE LOWER RESISTANCE SCALE OR DAMAGE TO SWITCH MAY RESULT.	
		If no continuity exists -	Replace actuator switch per 27-81-111
		If continuity exists, check wiring and connectors between switch and M229 module for an open circuit	Repair or replace wiring as necessary
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
LE FLAPS TRANSIT center panel light on when leading edges are extended; overhead annunciator shows one or more sur-	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 4)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edges are extended; overhead annunciator shows one or more surfaces in transit (Cont)	LE flap or slat extend proximity sensor or wiring	Note indication on overhead panel position annunciator. For each LE flap or slat indicated in transit, check "extend" proximity sensor by placing 6-inch steel ruler (or equivalent) against sensor	Adjust sensor per 27-88-11
		If transit lights go off,	Adjust sensor per 27-88-11
		If transit lights remain on	Replace proximity sensor or check sensor wiring for open or short circuit and repair as necessary
LE FLAPS EXTEND or LE FLAPS FULL EXTEND center panel light does not come on when leading edge surfaces are extended; overhead annunciator shows correct indication; LE FLAPS transit center panel light not on	Burned out lamps or failed light assembly	Press light assembly. If light does not come on	Replace lamps
		If light still does not come on	Replace light assembly
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect master annunciator circuit card
	Open circuit in wiring or connector between light and M229 module		Repair or replace wiring as necessary

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 5)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS EXTEND or LE FLAPS FULL EXTEND center panel light on when leading edge surfaces are not extended	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect master annunciation circuit card
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel. If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	Repair or replace wiring as necessary
LE FLAPS TRANSIT center panel light does not come on when leading edge surfaces are in transit	Burned out lamps or failed light assembly	Press light assembly. If light does not come on	Replace lamps
		If light still does not come on	Replace light assembly
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect master annunciation circuit card
	Open circuit in wiring or connector between light and M229 module		Check wiring and connectors between light and M229 module for open circuit and repair as necessary

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 6)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Center panel indication normal; overhead panel indication abnormal at any leading edge position	Open circuit in overhead annunciator or wiring.	Press TEST button on overhead annunciator panel. If any light does not come on,	Replace lamp or panel as required
		If light still does not come on, check for open circuit between overhead annunciator and M229 module	Repair or replace wiring as necessary
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
	Short circuit in overhead annunciator or wiring	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel. If any overhead annunciator light remains on,	Replace annunciator panel
		If any overhead light still remains on,	Check for a short circuit to ground between annunciator and M229 module and repair

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 7)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Center panel indication normal; overhead panel indication abnormal at any leading edge position (Cont)	Failure in leading edge flap position takeoff warning circuit (if installed)	If overhead annnunciator indication for flaps 1 and/or 4 is abnormal,	Check leading edge position takeoff warning per 31-26-0

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 8)

3. Trouble Shooting (AR ALL EXCEPT LV-JMW thru LV-JMZ,LV-JND,LV-JNE; BU ALL EXCEPT LN-SUA,LN-SUG,LN-SUP,LN-SUS; CP ALL EXCEPT CF-CPV,CF-CPZ; EF ALL EXCEPT B-2601, B-2603,B-2607; FL ALL EXCEPT N7363F,N7370F thru N7381F,N7383F,N7384F,N7386F thru N7390F; IC ALL EXCEPT VT-EAG thru VT-EAM)

NOTE: Refer to par. 2 for trouble shooting for all airplanes not listed in par. 3.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; over-head annunciator shows all surfaces retracted	Open circuit in trailing edge flaps up switch (S245) or associated wiring	Check continuity from M229 ship mating connector D728B, pin 50 to ground if no continuity exists.	Adjust or replace S245 per 27-51-291
		If LE FLAPS TRANSIT light still remains on, check wiring and connectors between D728B, pin 50 and S245 for an open circuit	Repair or replace wiring as neces-sary
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit card A22, Flap and Slat Comparator Logic
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel. If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	Repair or replace wiring as neces-sary
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; over-head annunciator shows one or more surfaces in transit	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indi-cated on overhead annunciator

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 9)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows one or more surfaces in transit (Cont)	LE flap retract proximity sensor or wiring	Note indication on overhead panel position annunciator. For each LE flap TRANSIT light, check associated retract proximity sensor per 27-88-11	Adjust or replace sensor as necessary
		Check wiring between proximity sensor and M229 module for open or short circuit	Repair or replace wiring as necessary
	Short circuit to ground in LE slat actuator switch or associated wiring	With leading edges retracted, note indication on overhead panel position annunciator. For each LE SLAT TRANSIT light, check associated lock position sensing circuit as follows: Remove M229 module. Set ohmmeter on Rx1K scale and check continuity from M229 ship mating connector D728B pin associated with slat lock switch, to ground (Ref Wiring Diagram 27-81-11, -12). <u>CAUTION</u>: DO NOT USE LOWER RESISTANCE SCALE OR DAMAGE TO SWITCH MAY RESULT.	
		If continuity exists, extend slats then disconnect slat actuator switch electrical connector. If continuity still exists from M229 module pin to ground, check wiring and connectors between switch and M229 module for a short circuit to ground	Repair or replace wiring as necessary
		If no continuity from M229 module to ground exists with slat extended and lock switch connector unplugged,	Replace actuator switch per 27-81-111

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 10)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edge surfaces are retracted; overhead annunciator shows one or more surfaces extended	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-41 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
LE FLAPS TRANSIT center panel light on while leading edge surfaces are intransit; overhead annunciator panel shows one or more surfaces extended with no associated TRANSIT lights	LE flap or slat extend or full-extend proximity sensor or wiring		Replace proximity sensor per 27-88-11, R/I or check sensor wiring for open or short circuit and repair as necessary
LE FLAPS TRANSIT center panel light on when leading edges are at intermediate extend (TE flaps 1,2, or 5); overhead annunciator shows correct indication	Open circuit in LE slat actuator switch or associated wiring	Retract flaps and slats by moving flap selector handle to UP position. As leading edge slats are retracting, observe overhead panel position annunciator. For any LE slat which is not indicated TRANSIT while slats are in transit, check associated actuator switch and wiring as follows: with slats in intermediate extend position, remove electrical connector from switch. Set multimeter on Rx1K scale and check continuity of switch <u>CAUTION</u>: DO NOT USE LOWER RESISTANCE SCALE OR DAMAGE TO SWITCH MAY RESULT.	
		If no continuity exists	Replace actuator switch per 27-81-111
		If continuity exists, check wiring and connectors between switch and M229 module for an open circuit	Repair or replace wiring as neces-

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 11)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edges are at intermediate extend (TE flaps 1,2, or 5); overhead annunciator shows correct indication (Cont)	Open circuit in trailing edge flaps 10° switch (S584) or associated wiring	Check continuity from M229 ship mating connector D728B, pin 54 to ground if no continuity exists	Adjust or replace S584 per 27-88-21
		If LE FLAPS TRANSIT light still remains on,	Check wiring and connectors between D728B pin 54 and S584 for an open circuit and repair as necessary
	Short circuit in trailing edge flaps up switch (S245) or associated wiring	Check continuity from M229 ship mating connector D728B, pin 50 to ground if continuity exists,	Replace or adjust S245 per 27-51-291
		If LE FLAPS TRANSIT light still remains on, check wiring and connectors between D728B, pin 50 and S245 for a short circuit to ground	Repair or replace wiring as necessary
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit card A22

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 12)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edges are at intermediate extend (TE flaps 1,2, or 5); overhead annunciator shows correct indication (Cont)	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel. If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	Repair or replace wiring as necessary
LE FLAPS TRANSIT light on when leading edges are at intermediate or full extend; overhead annunciator shows one or more surfaces in transit	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
	LE flap or slat extend or full-extend proximity sensor or wiring	Note indication on overhead panel position annunciator. For each LE flap or slat indicated in transit, check applicable "extend" or "full extend" proximity sensor by placing 6" steel ruler (or equivalent) against sensor if transit lights go out	Adjust sensor per 27-88-11
		If transit lights remain on	Replace proximity sensor or check sensor wiring for open or short circuit. Repair as necessary

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 13)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edges are fully extended; (TE flaps 10-40); overhead annunciator shows correct indication	Open circuit in LE slat actuator switch or associated wiing	Retract flaps and slats by moving flap selector handle to UP position. As leading edge slats are retracting, observe overhead panel position annunciator. For any LE slat which is not indicated TRANSIT while the slats are in transit, check associated actuator switch and wiring as follows: with slats in intermediate extend position, remove electrical connector from switch. Set multimeter on Rx1K scale and check continuity of switch. CAUTION: DO NOT USE LOWER RESISTANCE SCALE OR DAMAGE TO SWITCH MAY RESULT.	
		If no continuity EXISTS.	Replace actuator switch per 27-81-111
		If continuity exists, check wiring and connectors between switch and M229 module for an open circuit	Repair or replace wiring as necessary
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit card A22

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 14)

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TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light on when leading edges are fully extended; (TE flaps 10-40); overhead annunciator shows correct indication (Cont)	Short circuit in trailing edge flaps 10° switch (S584) or associated wiring	Check continuity from M229 ship mating connector D728B, pin 54 to ground if continuity exists	Adjust or replace S584 per 27-88-21
		If LE FLAPS TRANSIT light still remains on, check wiring and connectors between d728B pin 54 and S584 for a short circuit to ground	Repair or replace wiring as necessary
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel.	Repair or replace wiring as necessary
		If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 15)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS EXTEND center panel light does not come on when leading edge surfaces are extended; overhead annunciator shows correct indication. LE FLAPS TRANSIT center panel light not on	Burned out lamps or failed light assembly	Press light assembly. If light assembly does not come on	Replace lamps
		If light still does not come on	Replace light assembly
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit card A22
	Open circuit in wiring or connector between light and M229 module		Check wiring and connectors between light and M229 module for open circuit
LE FLAPS EXTEND center panel light on when leading edge surfaces are not extended	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit card A22
	Short circuit to ground between lamp and M229 module	Open LE FLAP POSN IND-DC circuit breaker (C22) on P6-2 panel.	Repair or replace wiring as necessary
		If light remains on, check wiring and connectors between light and M229 module for short circuit to ground	

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 16)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
LE FLAPS TRANSIT center panel light does not come on when leading edge surfaces are in transit	Burned out lamps or failed light assembly	Press light assembly. If light does not come on	Replace lamps
		If light still does not come on,	Replace light assembly
	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit card A22
	Open circuit in wiring or connector between light and M229 module		Check wiring and connectors between light and M229 module for open circuit and repair as necessary
Center panel indication normal; overhead panel indication abnormal at any leading edge position	Open circuit in overhead annunciator or wiring		Press TEST button on overhead annunciator panel. If any light does not come on, replace lamp or panel as required. If light still does not come on, check for open circuit between overhead annunciator and M229 module

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 17)

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Center panel indication normal; overhead panel indication abnormal at any leading edge position (Cont)	Failure in M229 module		Replace M229 module. Refer to OHM 27-56-40 for test and repair. Suspect circuit cards for leading edge surface indicated on overhead annunciator
	Short circuit in overhead annunciator or wiring	Open LE FLAP POSN IND-DC circuit breaker (C211) on P6-2 panel. If any overhead annunciator light remains on,	Replace annunciator panel
		If any overhead light still remains on	Check for a short circuit to ground between annunciator and M229 module and repair as necessary
	Failure in leading edge flap position takeoff warning circuit (if installed)	If overhead annunciator indication for flaps 1 and/or 4 is abnormal,	Check leading edge position takeoff warning per 31-26-0

Leading Edge Flap And Slat Position Indicating System - Troubleshooting
Figure 101 (Sheet 18)

LEADING EDGE FLAP AND SLAT PROXIMITY SENSORS - REMOVAL/INSTALLATION

1. Prepare Proximity Sensors for Removal
   A. Pressurize hydraulic system A. Refer to 27-81-0, Leading Edge Flaps and Slats - Maintenance Practices.
   B. Position flap control lever to 1-unit detent.
   C. Tag flap control lever to prevent unexpected movement of the leading edge devices.
   D. Depressurize hydraulic systems. Refer to 27-81-0.
   E. Remove access panels to gain access to slat proximity sensors.
2. Remove Proximity Sensors
   A. Remove screws attaching bracket to leading edge structure. (See figures 401 and 402.)
   B. Disconnect wiring at splice. (Splice is located within 4 feet of sensor.)
   C. Remove bolts attaching proximity sensor to bracket and separate sensor from bracket.
3. Install Proximity Sensors
   A. Secure proximity sensor to mounting bracket.
   B. With leading edge devices at intermediate extend position, loosely install proximity sensors at locations shown in figures 401 and 402 and adjust sensors as follows:
      (1) On leading edge slats, adjust sensor to maintain gap of 0.08 (±0.02) inch between sensor and adjacent actuation bar.
      (2) On Krueger flaps, adjust gap between sensor and adjacent actuation bar as follows:
         (a) Pressurize hydraulic system A. Refer to 27-81-0.
         (b) Cycle flaps several times to allow upper flap nose rod (figure 402) to center on its self-aligning bearings
         (c) Depressurize hydraulic systems. Refer to 27-81-0
         (d) Without disturbing the upper flap nose rod, maintain gap of 0.16 (±0.01) inch between flap extend sensor and actuation bar.
         (e) At flap retract sensor (Fig. 402), maintain gap of 0.08 (±0.02) inch between sensor and actuation bar.

            NOTE: To obtain the preceding gap it may be necessary to apply putty to the flap retract sensor, pressurize hydraulic system A and then slowly retract the flaps. After extending the flaps again, depressurize hydraulic system A and check the gap by measuring the thickness of putty remaining on the flap retract sensor.

      (3) Pressurize hydraulic system A. Refer to 27-81-0.
      (4) Position flap control lever to FLAP DOWN detent.
      (5) Depressurize hydraulic systems. Refer to 27-81-0.

(6) Tag flap control lever to prevent unexpected movement of the leading edge devices.

C. Match color coded wires and splice. Retie wire bundles and ensure wires are properly routed through clamps.

D. Test proximity sensors. Refer to Leading Edge Flap and Slat Proximity Sensors - Adjustment/Test.

4. Restore Airplane to Normal Configuration

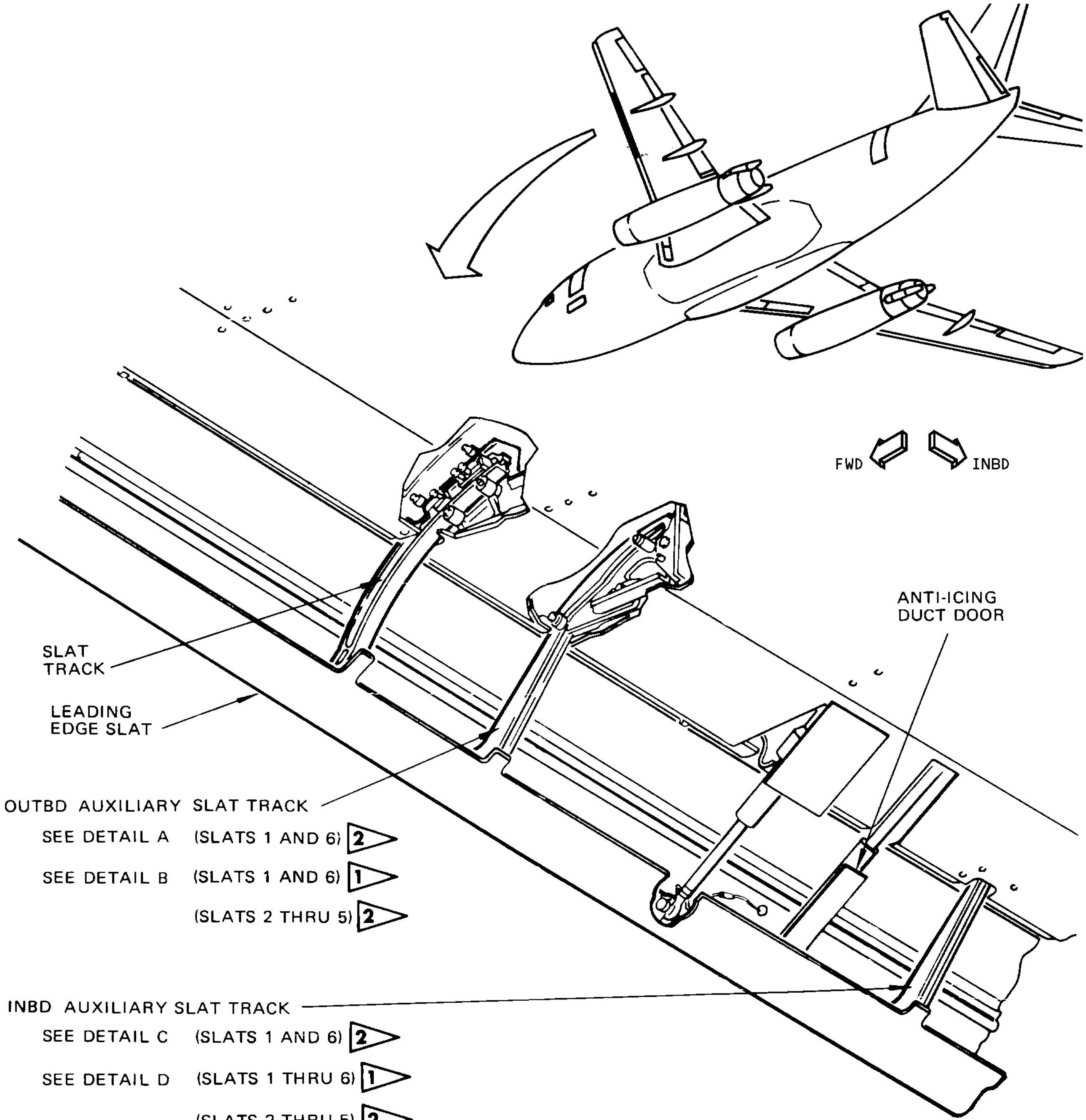
A. Pressurize hydraulic system A. Refer to 27-81-0.

B. Position flap control lever to FLAP UP to retract flaps.

C. Depressurize hydraulic systems. Refer to 27-81-0.

D. Remove tag from flap control lever.

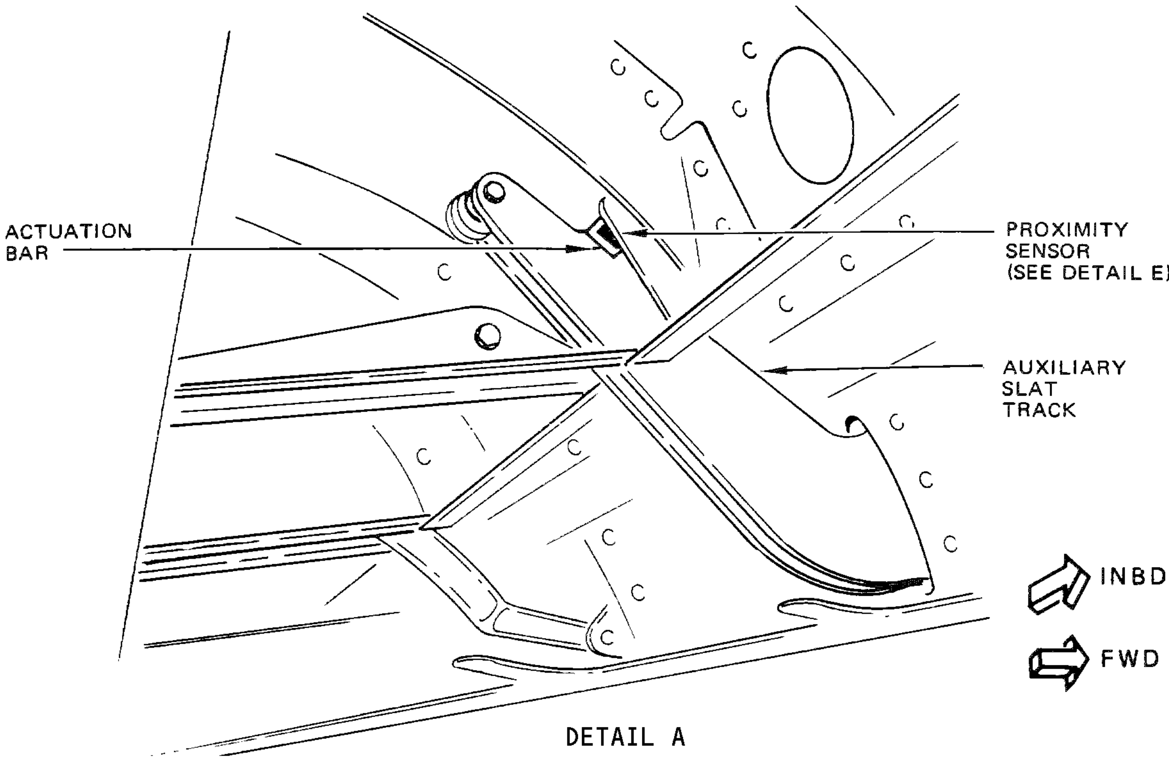
E. Install access panels.



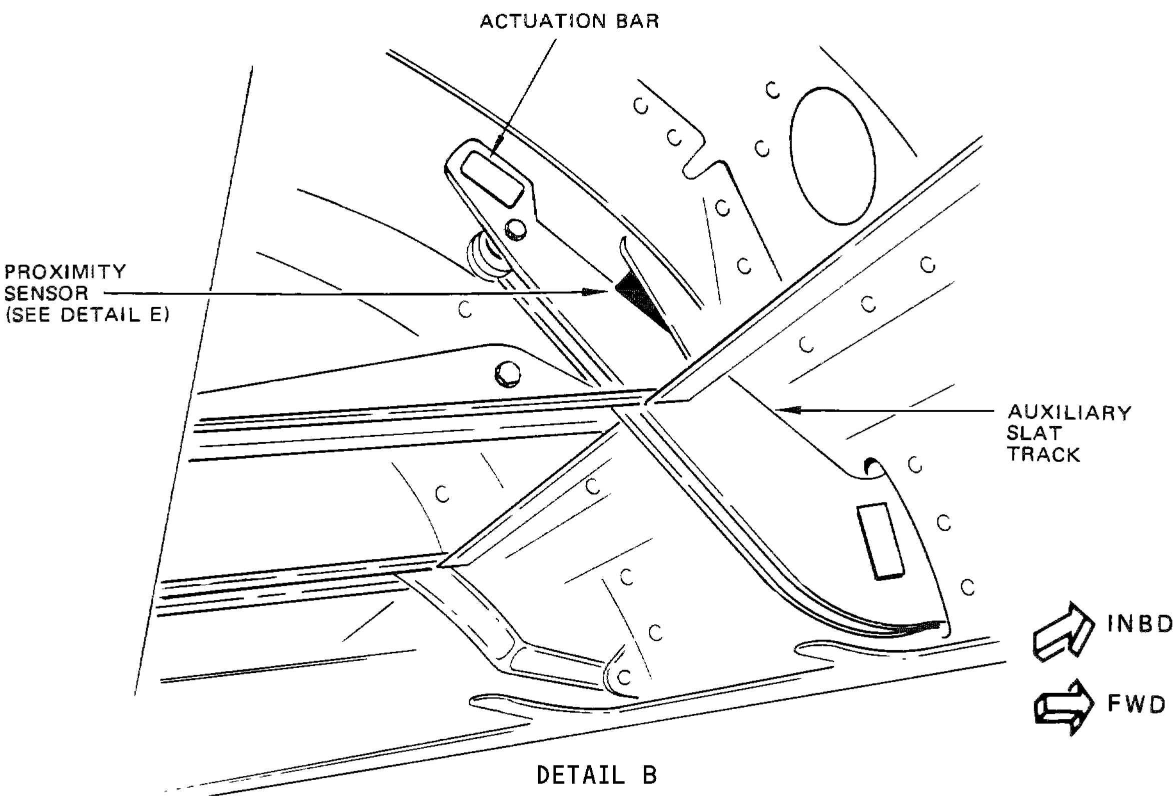
1 IC VT-EAG THRU VT-EAM
AQ N21SW THRU N23SW
NH JA8401 THRU JA8411
AR LV-JMW THRU LV-JMZ, LV-JND, LV-JNE
SA ZS-SBL THRU ZS-SBR

2 ALL EXCEPT 1

Leading Edge Slat Proximity Sensor Installation
Figure 401 (Sheet 1)

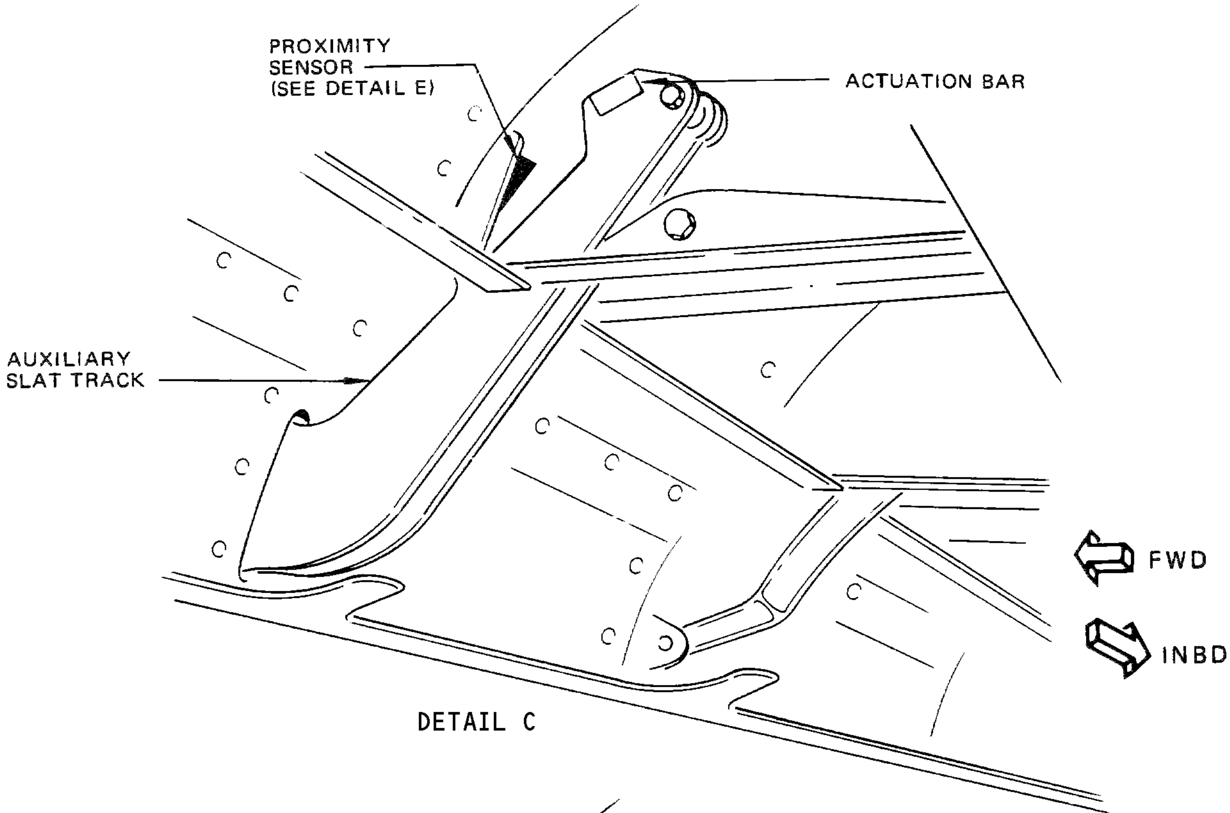


DETAIL A

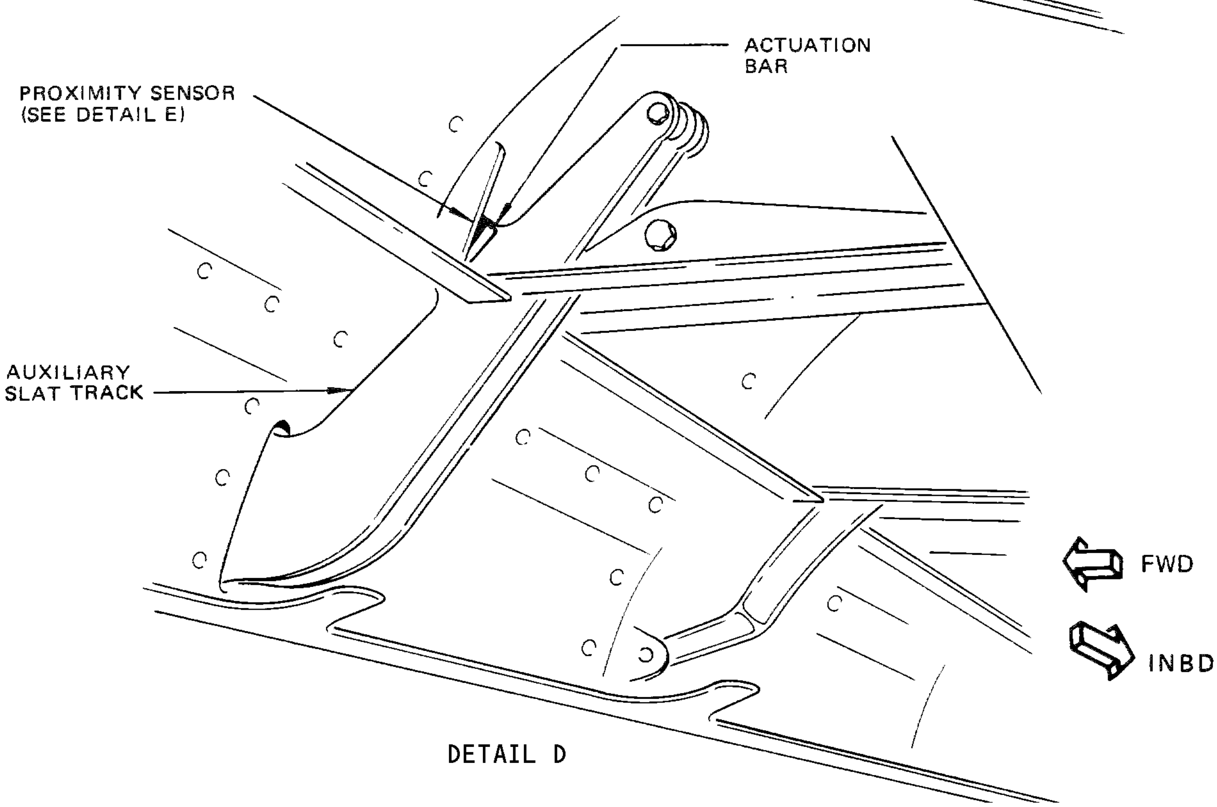


DETAIL B

Leading Edge Slat Proximity Sensor Installation
Figure 401 (Sheet 2)

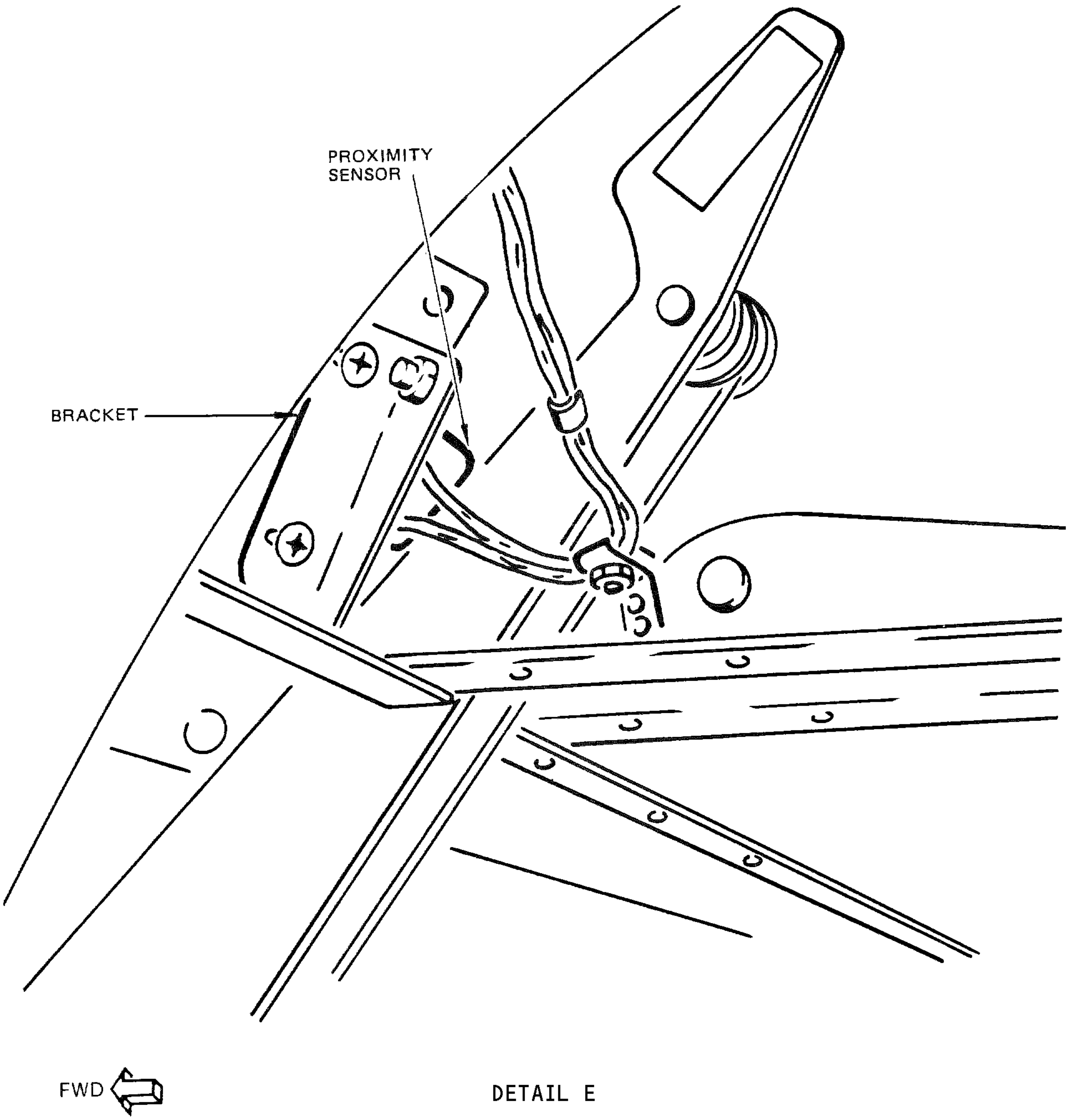


DETAIL C



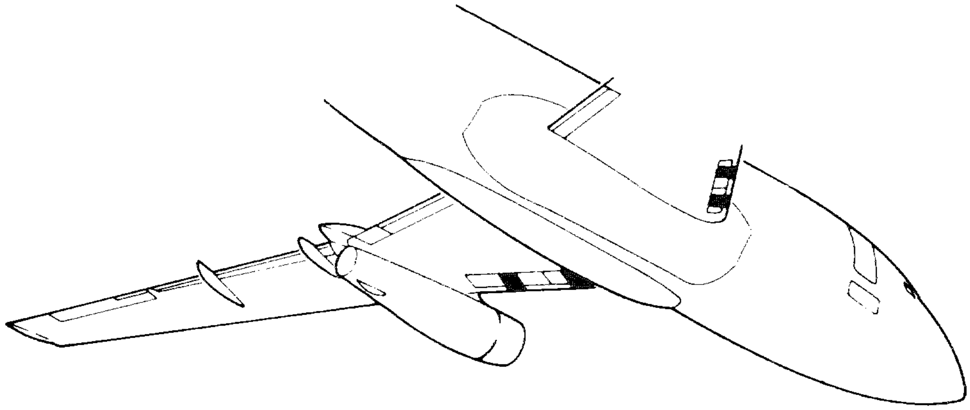
DETAIL D

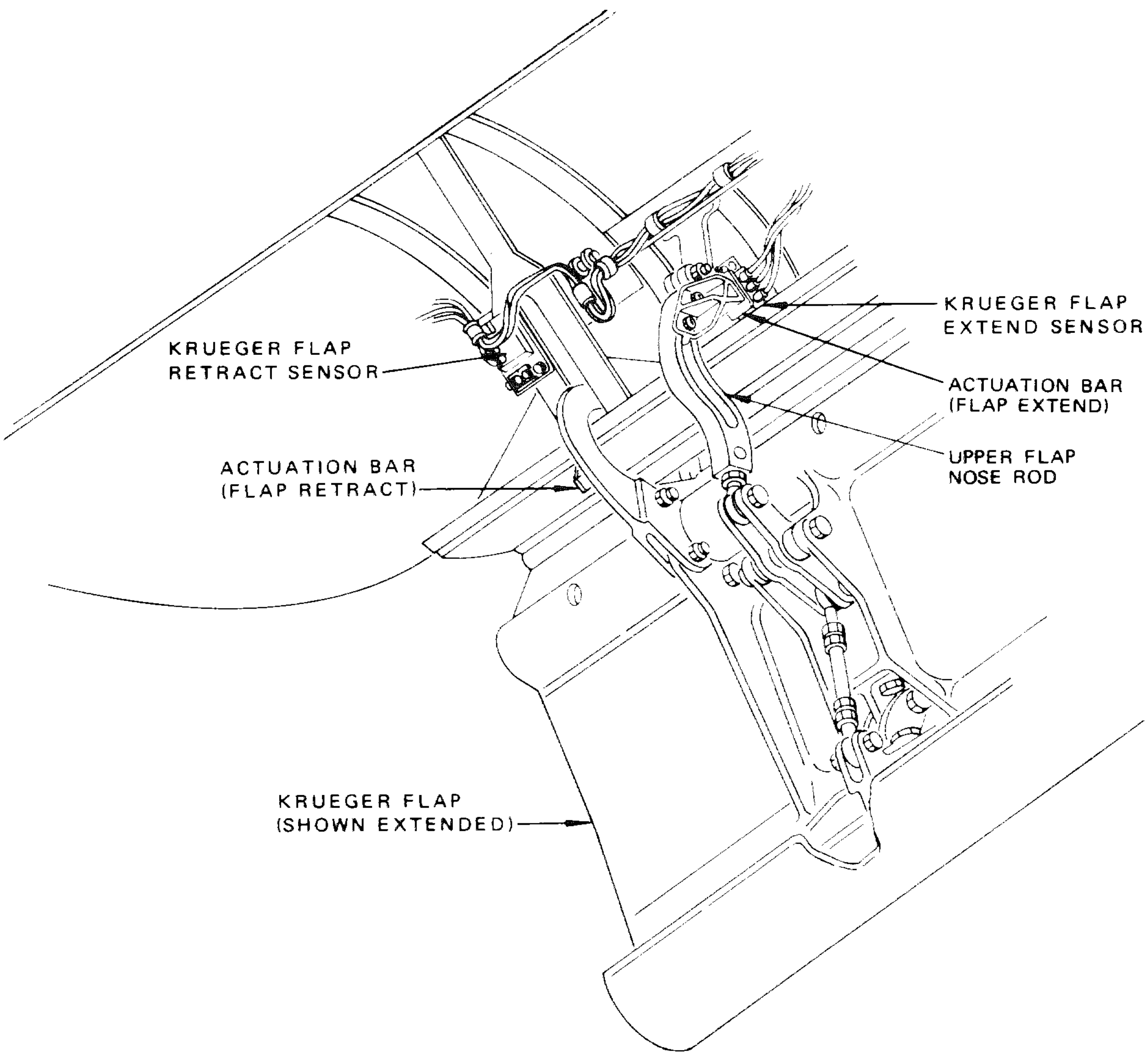
Leading Edge Slat Proximity Sensor Installation
Figure 401 (Sheet 3)



DETAIL E

Leading Edge Slat Proximity Sensor Installation
Figure 401 (Sheet 4)





Leading Edge Flap Proximity Sensor Installation
Figure 402

LEADING EDGE FLAP AND SLAT PROXIMITY SENSORS - ADJUSTMENT/TEST

1. Leading Edge Flap and Slat Proximity Sensors Test
   A. Prepare Leading Edge Flap and Slat Proximity Sensors for Test
      (1) Connect electrical power to airplane.
      (2) Pressurize hydraulic system A (Ref 27-81-0).
      (3) Close the following circuit breakers on circuit breaker panel P6:
         (a) BATT BUS and IND LTS
         (b) SECTION 1
         (c) LE FLAP POS IND AC
         (d) LE FLAP POS IND DC
         (e) FLAP SHUTOFF VALVES
         (f) STBY RUD and STBY HYDR PUMP CONT
         (g) NO. 1 GEN BUS IND
         (h) STBY HYD PUMP (Normal)
         (i) SECTION 4
         (j) NO. 1 DC IND LTS
         (k) LANDING GEAR IND LTS
   B. Test Leading Edge Flap and Slat Proximity Sensors (ND CF-NAB thru CF-NAQ; TS N73711 thru N73713, N73715, N73717; WE N2711R, N4902W, N4906 and N4907; EF B-2601, B-2603, B-2607; CP CF-CPB thru CF-CPE, CF-CPU, CF-CPV, CF-CPZ; WA N4502W thru N4530W).
      (1) Position flap control lever in FLAP UP detent position.
         (a) Check that each flap and slat is in up position and faired with wing structure.
         (b) Check that all leading edge flap lights on center instrument panel and on aft overhead annunciator panel are extinguished.
         (c) On aft overhead annunciator panel, press TEST switch and check that all green and amber lights come on.
         (d) Release TEST switch, check that all lights go off.
         (e) Press to test leading edge flap lights on center instrument panel. Check that each light comes on when pressed and goes off when released.
      (2) Modulate hydraulic flow using hydraulic ground interconnect valve so that all leading edge devices will operate slowly.

      CAUTION: INTERCONNECT VALVE WILL OVERHEAT AND BE DAMAGED IF ALLOWED TO OPERATE IN THIS CONDITION FOR AN EXTENDED PERIOD OF TIME.

      (3) Position flap control lever in 1-unit detent position.
         (a) As each flap and slat unlocks and starts to extend, check that respective amber TRANSIT light on the annunciator panel comes on.

(b) Check that amber LE FLAPS TRANSIT light on center instrument panel comes on when first flap or slat unlocks and starts to extend.

(c) Check that respective amber light goes off and respective green EXT light comes on as each flap, and slats 3 and 4 lock in full extended position; and slats 1, 2, 5, and 6 lock in intermediate position.

(d) On center instrument panel, check that amber light goes off and green LE FLAPS EXT light comes on as last flap or slat reaches position.

(e) To verify that each proximity sensor is properly connected, place a piece of copper sheet of convenient size between sensor face and actuating bar of extend sensors for each flap and slat. Check that associated green lights go off and amber light comes on with copper shield in place. Check that lights return to EXT configuration when copper is removed.

(4) Position flap control lever in 25-unit detent.

(a) No change shall occur in the position of any leading edge device or indicator illumination.

(5) Position flap control lever in 30-unit detent.

(a) As slats 1, 2, 5, and 6 start to extend from intermediate position, check that respective amber TRANSIT light comes on and respective EXT green light goes off.

(b) Check that respective amber light extinguishes and FULL EXT green light illuminates as slats 1 and 6 lock in fully extended position.

(c) On center instrument panel, check that green LE FLAPS FULL EXT light illuminates as the last slat reaches position.

(6) Position flap control lever in 25-unit detent.

(a) As slats 1 and 6 start to retract, check that respective FULL EXT green light extinguishes and respective amber TRANSIT light illuminates.

(b) Check that respective amber light extinguishes and EXT green light illuminates as slats 1 and 6 reach intermediate position.

(c) On center instrument panel, check that LE FLAPS EXT green light illuminates as last slat locks in intermediate position.

(7) Position flap control lever in FLAP UP detent.

(a) Check that respective EXT green light extinguishes and respective amber TRANSIT light illuminates as each flap or slat unlocks and starts to retract.

(b) Check that when each flap and slat is in up and faired position the respective amber light extinguishes and no green lights will be illuminated.

(c) On center instrument panel, check that all lights extinguish as last flap or slat locks in up position.

NOTE: If lights function properly with hydraulic pressure applied, disregard amber light indications which may occur if hydraulic pressure is removed.

C. Test Leading Edge Flap and Slat Proximity Sensors (AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC ALL EXCEPT VT-EAG thru VT-EAM; IN ALL EXCEPT EI-ASA thru EI-ASH; TZ ALL EXCEPT CF-TAN, CF-TAO; AQ ALL EXCEPT N21SW thru N23SW)

(1) Position flap control lever in FLAP UP detent position.

(a) Check that each flap and slat is in up position and faired with wing structure.

(b) Check that all leading edge flap lights on center instrument panel and on aft overhead annunciator panel are extinguished.

(c) Press test switch below leading edge devices annunciator on aft overhead panel. Check that all lights illuminate (10 amber and 16 green lights).

(d) Release test switch for leading edge devices annunciator. Check that all lights extinguish.

(2) Place flap handle in 1-unit detent.

(a) As trailing edge flaps begin to extend, check that amber LE Flap Transit light on forward panel illuminates.

(b) As each flap and slat starts to extend, check that respective amber lights on overhead annunciator illuminate (10 amber).

(c) As leading edge slats lock in intermediate EXTEND position, check that annunciator transit lights extinguish and that associated slat EXT green lights illuminate (6 green).

(d) As leading edge flaps lock in their extended position, check that annunciator transit lights extinguish and that associated flap green lights illuminate.

(e) When flap and slat green lights are all illuminated, check that forward panel LE Flap Transit light extinguishes and that LE Flaps Extend light illuminates.

(f) To verify that each proximity sensor is properly connected, place a piece of copper sheet of convenient size between sensor face and actuating bar of extend sensors for each flap and slat. Check that associated green lights go out and amber light illuminates with copper shield in place. Check that lights return to EXT configuration when copper is removed.

(3) Place flap handle in 5-unit detent.

(a) Check that no change occurs in position of any of leading edge devices or in indicator illumination.

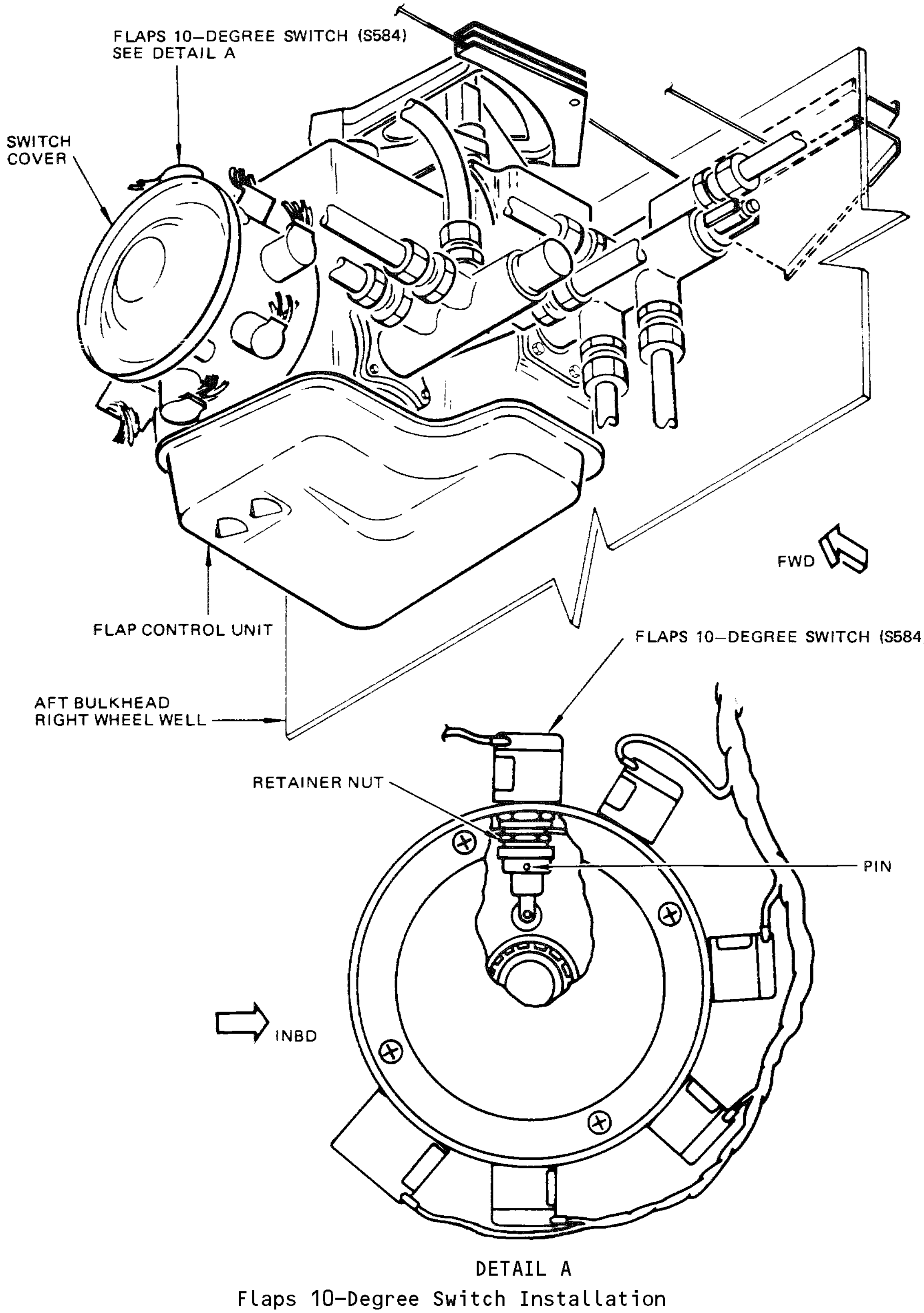
(4) Place flap handle in 10-unit detent.
 (a) As trailing edge flaps travel toward 10 units, check that forward panel LE Flap Extend light extinguishes and that LE Flap Transit light illuminates.
 (b) As slats 1 through 6 start to extend, check that respective slat extend green lights on overhead annunciator extinguish and that associated amber transit lights illuminate.
 (c) As slats lock in full extend position, check that respective annunciator transit lights extinguish and that associated slat extend green lights illuminate.
 (d) When annunciator green lights are all illuminated , check that forward panel LE Flap Transit light extinguishes and that LE Flap Exit light illuminates.
(5) Extend trailing edge flaps to 40-unit position and then back to 10 unit position. Check that no change occurs in position of any of leading edge devices or in indicator light illuminations.
(6) Place flap handle in 5-unit detent.
 (a) As slats retract to intermediate position, check that respective green extend lights illuminate.
(7) Place flap handle in 1-unit detent.
 (a) Check that no change occurs in positions of any of leading edge devices or in indicator light illuminations.
(8) Place flap handle in full up detent.
 (a) When each leading edge device is in up and locked position, check that respective amber lights extinguish and that no green lights illuminate.

 NOTE: Amber indicator lights may illuminate if slats are extended and hydraulic pressure is removed. Lights must operate as outlined any time hydraulic pressure is applied to A hydraulic system.

D. Restore Airplane to Normal
(1) Turn off system A hydraulic power. Refer to 27-81-0.
(2) If no longer required, remove electrical power from airplane.

FLAPS 10-DEGREE SWITCH - REMOVAL/INSTALLATION

1. General
2. Remove Flaps 10-Degree Switch (S584)
   A. Open FLAP SHUTOFF VALVES circuit breaker on panel P6.
   B. Remove switch cover from flap control unit (Fig 401).
   C. Remove switch leads from connector.
   D. Extract pin to release roller guide.
   E. Remove retainer nut from switch and remove switch from control unit.
   F. Replace nut, roller guide and pin on switch.
3. Install Flaps 10-Degree Switch (S584)
   A. Remove pin, roller guide and one retainer nut from replacement switch.
   B. Position switch in flap control unit and install retainer nut and roller guide. Install pin to secure roller guide.
   C. Install switch leads in connector and connect to receptacle.
   D. Replace switch cover and close FLAP SHUTOFF VALVES circuit breaker on panel P6.
   E. Adjust and test switch (Ref Flaps 10-Degree Switch - Adjustment/Test.



DETAIL A

Flaps 10-Degree Switch Installation
Figure 401

FLAPS 10-DEGREE SWITCH - ADJUSTMENT/TEST

1. General
2. Flaps 10-Degree Switch Adjustment (S584)
   A. Prepare for Adjustment
      (1) Provide hydraulic power to system A (Ref 27-81-0 MP).
      (2) Connect electrical power to airplane.
      (3) Check that FLAP SHUTOFF VALVES circuit breaker on panel P6 is closed.
   B. Adjust Flaps 10-Degree Switch (S584)

      WARNING: WING CONTROL SURFACES ARE FAST ACTING AND CAN CAUSE INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT. ENSURE PERSONNEL AND EQUIPMENT ARE CLEAR DURING OPERATION.

      (1) Retract trailing edge flaps hydraulically with flap control lever to normal retracted position (zero unit detent) and hold for 5 minutes.
      (2) Remove No. 4 jackscrew fairing and record dimension X (Fig. 501) between No. 4 ball screw nut and upstop.
      (3) Position alternate flaps arm switch to ARM.

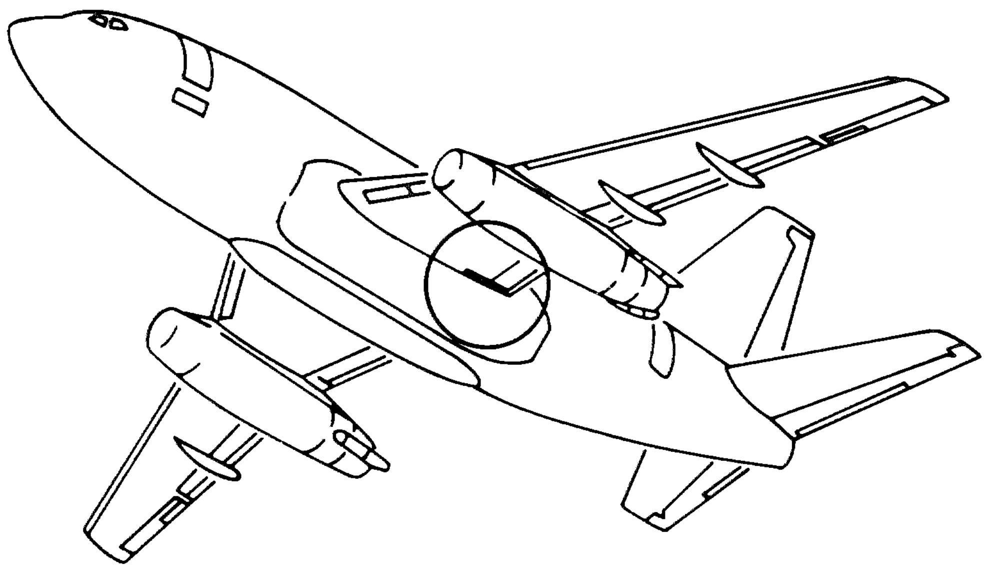
      CAUTION: FOR GROUND OPERATION, ALTERNATE FLAP DRIVE UNIT IS LIMITED TO 10 MINUTES OPERATION AND 25 MINUTES OFF.

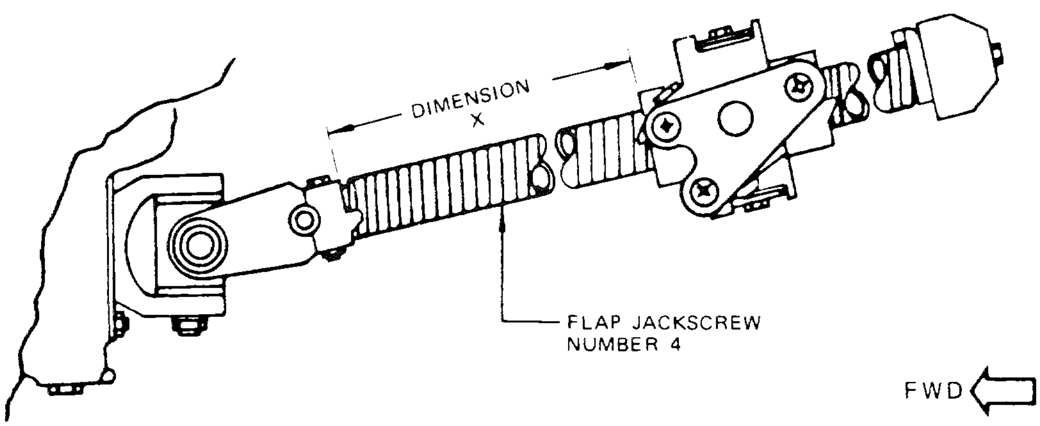
      NOTE: Actuation of alternate flaps arm switch to ARM energizes standby hydraulic pump motor.

      (4) Position flap control lever to 10-unit detent. Check that trailing edge and leading edge flaps do not respond.

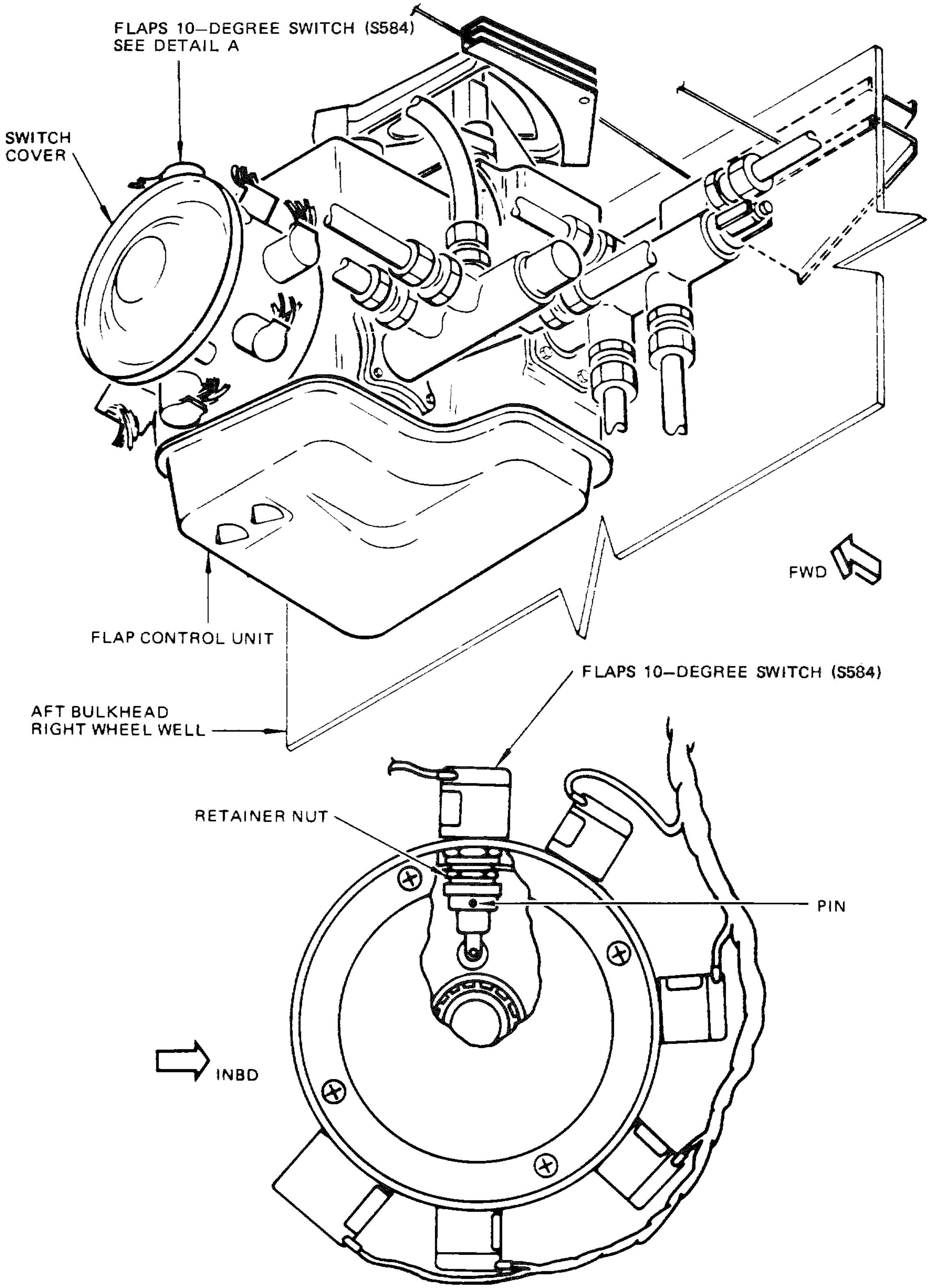
      NOTE: Flap control lever is moved to 10-unit detent as a standard procedure to minimize load on flap hydraulic motor when hydraulic system A is pressurized.

      (5) Actuate alternate flaps control switch to DOWN position. Hold switch in this position, extending trailing edge flaps as required until dimension X is 20.25 to 20.40 inches greater than that recorded in step (2) (Ref 27-51-0 A/T).
      (6) Actuate alternate flaps control switch to OFF.
      (7) Remove switch cover from flap control unit located in ceiling area of right wheel well (Fig. 502).





Flap Jackscrew
Figure 501



DETAIL A

Flaps 10-Degree Switch
Figure 502

(8) Adjust flaps 10-degree switch away from actuating cam until switch actuates.

NOTE: Care must be taken to pre-position switch so that actuation takes place with switch body being moved away from cam.

(9) Lockwire switch retainer nuts.
(10) Install switch cover on flap control unit.
(11) Position alternate flap arm switch to OFF.

CAUTION: LEADING EDGE AND TRAILING EDGE WILL AUTOMATICALLY MOVE TO FLAP CONTROL LEVER POSITION. ENSURE PERSONNEL AND EQUIPMENT ARE CLEAR.

(12) Replace jackscrew fairing.
(13) Position flap control levers to FLAP UP detent, to hydraulically retract control surfaces.
(14) Test switch per par. 2.

3. Flaps 10-Degree Switch Test (S584)

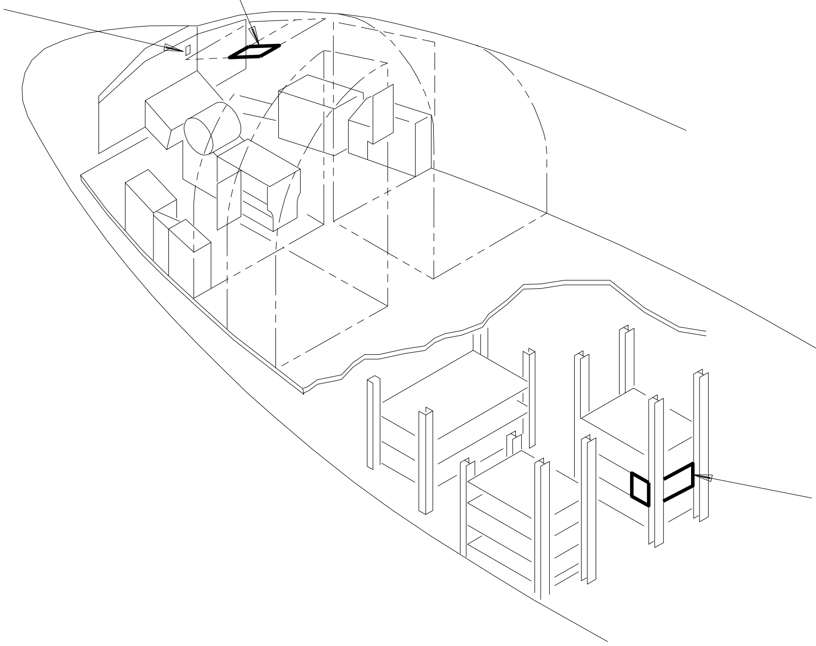
A. Provide system A hydraulic power (Ref 27-81-0).
B. Connect electrical power to the airplane.
C. Check that the following circuit breakers on P6 panel are closed:
(1) LE FLAPS POS IND DC
(2) LE FLAPS POS IND AC
D. Place flap control lever in 10-unit detent.

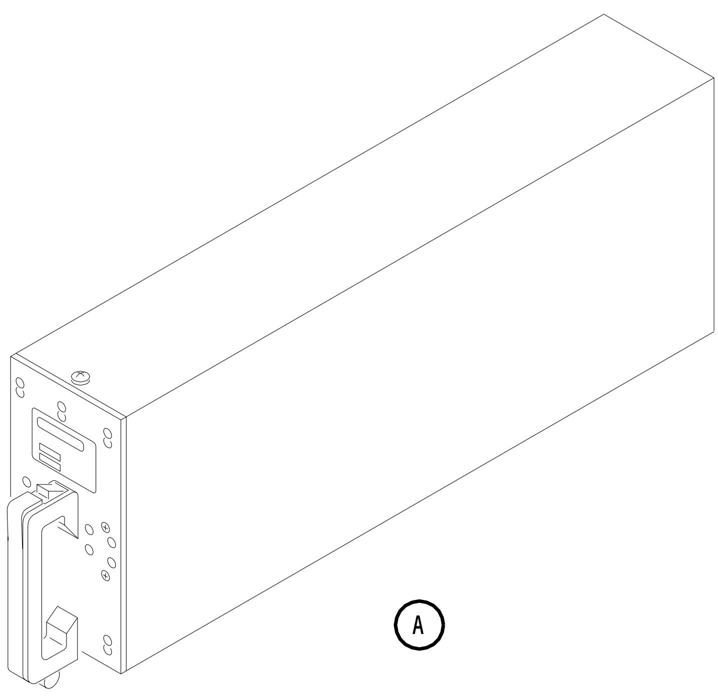
CAUTION: CLEAR AREA FOR FLAP OPERATION.

E. Check that amber LE FLAPS TRANSIT light on P2 panel illuminates as leading edge devices extend.
F. Check that green LE FLAPS EXT light on P2 panel illuminates when all slats are fully extended.
G. Remove electrical and hydraulic power if no longer required.

LEADING EDGE FLAP AND SLAT POSITION INDICATION MODULE - MAINTENANCE PRACTICES

1. General
   A. The leading edge flaps and slats position indication module, M229, provides circuits for indicator lamps denoting leading edge flap and slat position. The indication module, M229, is found in the electrical/electronic compartment on equipment rack E3-2.
2. Remove the Leading Edge Flaps and Slats Position Indication Module (Fig. 201)
   A. Open these circuit breakers and attach DO-NOT-CLOSE tags:
      (1) P6-2 Panel
         (a) LE FLAP POS IND DC
         (b) LE FLAP POS IND AC
   B. Remove the indication module from the shelf.
3. Install the Leading Edge Flaps and Slats Position Indication Module (Fig. 201)
   A. Carefully install the indication module on the equipment rack.
   B. Remove the DO-NOT-CLOSE tags and close these circuit breakers:
      (1) P6-2 Panel
         (a) LE FLAP POS IND DC
         (b) LE FLAP POS IND AC
   C. Do the leading edge flap and slat proximity sensors test (Ref 27-88-11).
4. Restore Airplane to Normal
   A. If it is no longer required, remove hydraulic power (Ref 27-81-0).
   B. If it is no longer required, remove electrical power.





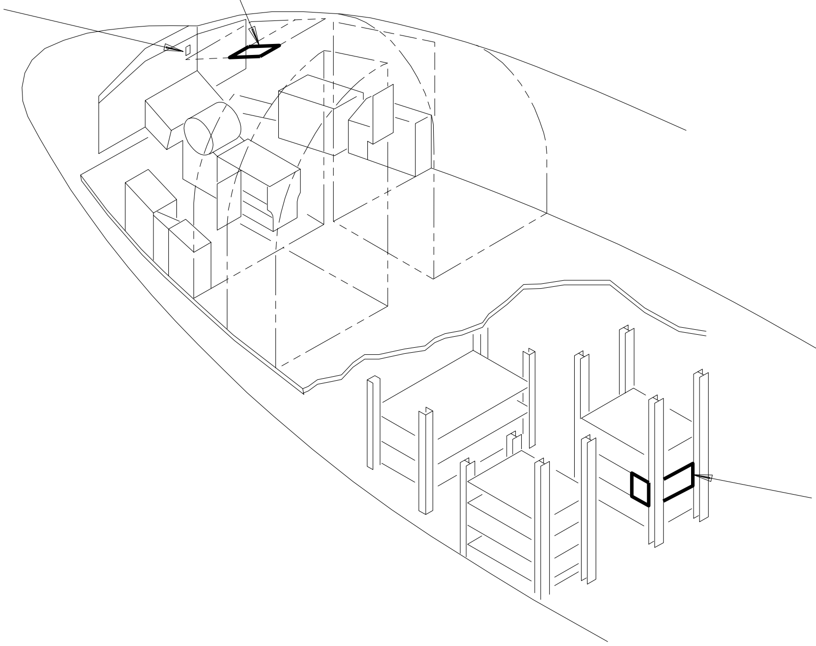
Leading Edge Flap and Slat Position Indication Module Installation
Figure 201

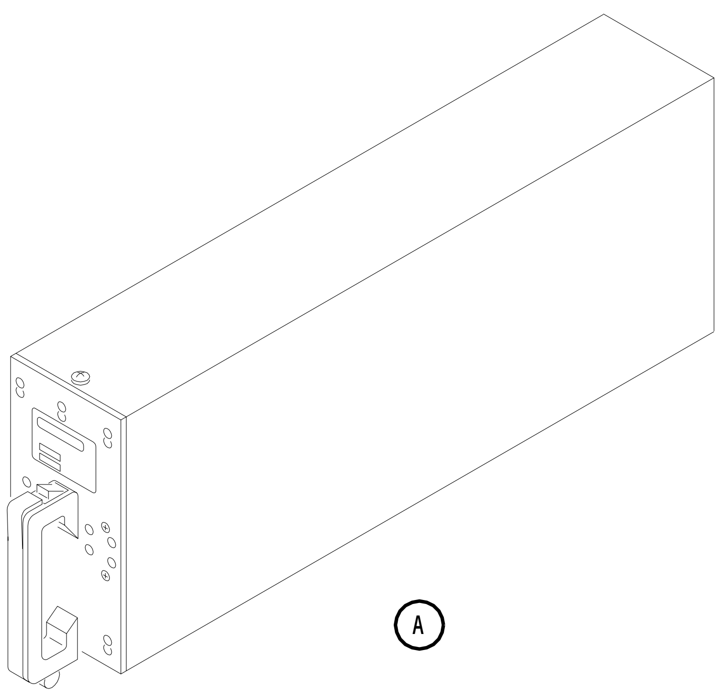
LEADING EDGE FLAP AND SLAT POSITION INDICATION MODULE - MAINTENANCE PRACTICES

1. General
   A. The leading edge flaps and slats position indication module, M229, provides circuits for indicator lamps denoting leading edge flap and slat position. The indication module, M229, is found in the electrical/electronic compartment on the equipment rack E3-2.
2. Remove the Leading Edge Flaps and Slats Position Indication Module (Fig. 201)
   A. Open these circuit breakers and attach DO-NOT-CLOSE tags:
      (1) P6-2 Panel
         (a) LE FLAP POS IND DC
         (b) LE FLAP POS IND AC
   B. Remove the indication module from the shelf.
3. Install the Leading Edge Flaps and Slats Position Indication Module (Fig. 201)
   A. Carefully install the indication module on the equipment rack.
   B. Remove the DO-NOT-CLOSE tags and close these circuit breakers:
      (1) P6-2 Panel
         (a) LE FLAP POS IND DC
         (b) LE FLAP POS IND AC
   C. Do the test of the leading edge flap and slat position indication module.
      (1) Push the ON/OFF key on the FSIM to start the BITE display.
      (2) Wait for one minute or less for the self-test of the indication module.
      (3) Do these steps to make sure the display on the indication module shows the correct mode select type:
         (a) Push the down arrow key until you find OTHER FUNCTNS?
         (b) Push the YES button adjacent to the arrow key to enter menu selection.
         (c) Push the down arrow key until you find SYSTEM CONFIG?.
         (d) Push the YES button adjacent to the arrow key to enter menu selection.
         (e) Make sure 737-200 NON-ADV or 737-200 ADV shows on the display.
      (4) Push the ON/OFF key to stop the test.
   D. Do the leading edge flap and slat proximity sensors test (Ref 27-88-11).

      NOTE: Do not remove hydraulic and electrical power after the test.

   E. Do the built-in-test-equipment (BITE) test of the leading edge flap and slat proximity sensor circuits.
   F. Do the BITE test of the leading edge flap and slat position indication module for fault history.
      (1) Put the flap control lever back to the UP position.
         (a) Make sure the leading edge indication shows the flaps and slats are up.





Leading Edge Flap and Slat Position Indication Module Installation
Figure 201

(2) Push the MENU key until you find EXISTING FAULTS?.
(3) Push the down arrow key until you find FAULT HISTORY?.
(4) Push the YES button to enter menu selection.
(5) Push the YES button when you see LE FL/SL CYC 0?.
(6) Make sure the display shows NO FAULTS.
(a) If a fault is found, correct the problem then cycle the flaps and slats two times to clear the fault history.
(7) Push the ON/OFF key to stop the BITE test.

4. Restore Airplane to Normal

A. If it is no longer required, remove hydraulic power (Ref 27-81-0).
B. If it is no longer required, remove electrical power.

5. 737-200 NON-ADVANCED AIRPLANES;
Built-In-Test-Equipment (BITE) Test for the Leading Edge Flap and Slat Proximity Sensor

NOTE: The 737-200 non-advanced airplanes used in this procedure are airplanes that have 3-position actuators on slats 1 and 6, and 2-position actuators on slats 2, 3, 4 and 5.

A. Make sure the flap control lever is in the full UP detent position.
B. Do these steps on the leading edge flap and slap position indication module (FSIM):
(1) Push the ON/OFF key on the FSIM to start the BITE display.
(2) Push the down arrow key until you find OTHER FUNCTNS?.
(3) Push the YES button adjacent to the arrow key to enter menu selection.
(4) Push the YES button when you see PROX SENSOR? on the display.
(5) Make sure the display shows the correct gap indication for each sensor;

NOTE: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP FAR
(b) S1 F EXT GAP FAR
(c) S2 M EXT GAP FAR
(d) S3 M EXT GAP FAR
(e) S4 M EXT GAP FAR
(f) S5 M EXT GAP FAR
(g) S6 M EXT GAP FAR
(h) S6 F EXT GAP FAR
(i) F1 RET GAP NEAR
(j) F1 EXT GAP FAR
(k) F2 RET GAP NEAR
(l) F2 EXT GAP FAR
(m) F3 RET GAP NEAR

(n) F3 EXT GAP FAR
(o) F4 RET GAP NEAR
(p) F4 EXT GAP FAR

C. Push the MENU key until you find EXISTING FAULTS?.

D. Put the flap control lever to the 1-unit detent position.
   (1) Make sure the green lights for the intermediate extension (EXT) on the leading edge devices annunciator panel comes on for slats 1 and 6.
   (2) Make sure the green lights for the full extend (FULL EXT) comes on for slats 2, 3, 4 and 5, and for all the flaps.

E. Do these steps on the leading edge flap and slat position indication module (FSIM):
   (1) Push the down arrow key until you find OTHER FUNCTNS?.
   (2) Push the YES button adjacent to the arrow key to enter menu selection.
   (3) Push the YES button when you see PROX SENSOR? on the display.
   (4) Make sure the display shows the correct gap indication for each sensor;

NOTE: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP NEAR
(b) S1 F EXT GAP FAR
(c) S2 M EXT GAP NEAR
(d) S3 M EXT GAP NEAR
(e) S4 M EXT GAP NEAR
(f) S5 M EXT GAP NEAR
(g) S6 M EXT GAP NEAR
(h) S6 F EXT GAP FAR
(i) F1 RET GAP FAR
(j) F1 EXT GAP NEAR
(k) F2 RET GAP FAR
(l) F2 EXT GAP NEAR
(m) F3 RET GAP FAR
(n) F3 EXT GAP NEAR
(o) F4 RET GAP FAR
(p) F4 EXT GAP NEAR

F. Push the MENU key until you find EXISTING FAULTS?.

G. Put the flap control lever to the 30-unit detent position.
   (1) Make sure the green lights for the full extend (FULL EXT) on the leading edge devices annunciator panel comes on for slats 1 and 6.
   (2) Make sure slats 2, 3, 4 and 5, and all the flaps continue to show full extension.

H. Do these steps on the leading edge flap and slat position indication module (FSIM):
   (1) Push the down arrow key until you find OTHER FUNCTNS?.
   (2) Push the YES button adjacent to the arrow key to enter menu selection.
   (3) Push the YES button when you see PROX SENSOR? on the display.
   (4) Make sure the display shows the correct gap indication for each sensor:

      NOTE: Push the down arrow key after each slat and flap sensor display.

      (a) S1 M EXT GAP FAR
      (b) S1 F EXT GAP NEAR
      (c) S2 M EXT GAP NEAR
      (d) S3 M EXT GAP NEAR
      (e) S4 M EXT GAP NEAR
      (f) S5 M EXT GAP NEAR
      (g) S6 M EXT GAP FAR
      (h) S6 F EXT GAP NEAR
      (i) F1 RET GAP FAR
      (j) F1 EXT GAP NEAR
      (k) F2 RET GAP FAR
      (l) F2 EXT GAP NEAR
      (m) F3 RET GAP FAR
      (n) F3 EXT GAP NEAR
      (o) F4 RET GAP FAR
      (p) F4 EXT GAP NEAR

I. Push the MENU key until you find EXISTING FAULTS?.

J. Put the flap control lever to the 25-unit detent.
   (1) Make sure the green lights for the intermediate extention (EXT) on the leading edge devices annunciator panel comes on for slats 1 and 6.
   (2) Make sure slats 2, 3, 4 and 5, and all the flaps continue to show full extension.

K. Do these steps on the leading edge flap and slat position indication module (FSIM):
   (1) Push the down arrow key until you find OTHER FUNCTNS?.
   (2) Push the YES button adjacent to the arrow key to enter menu selection.
   (3) Push the YES button when you see PROX SENSOR? on the display.

(4) Make sure the display shows the correct gap indication for each sensor;

NOTE: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP NEAR
(b) S1 F EXT GAP FAR
(c) S2 M EXT GAP NEAR
(d) S3 M EXT GAP NEAR
(e) S4 M EXT GAP NEAR
(f) S5 M EXT GAP NEAR
(g) S6 M EXT GAP NEAR
(h) S6 F EXT GAP FAR
(i) F1 RET GAP FAR
(j) F1 EXT GAP NEAR
(k) F2 RET GAP FAR
(l) F2 EXT GAP NEAR
(m) F3 RET GAP FAR
(n) F3 EXT GAP NEAR
(o) F4 RET GAP FAR
(p) F4 EXT GAP NEAR

6. 737-200 ADVANCED AIRPLANES;
Built-In-Test-Equipment (BITE) Test for the Leading Edge Flap and Slat Proximity Sensor

NOTE: The 737-200 advanced airplanes used in this procedure are airplanes that have 3-position actuators on all slats.

A. Make sure the flap control lever is in the full UP detent position.
B. Do these steps on the leading edge flap and slap position indication module (FSIM):
(1) Push the ON/OFF key on the FSIM to start the BITE display.
(2) Push the down arrow key until you find OTHER FUNCTNS?.
(3) Push the YES button adjacent to the arrow key to enter menu selection.
(4) Push the YES button when you see PROX SENSOR? on the display.
(5) Make sure the display shows the correct gap indication for each sensor;

NOTE: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP FAR
(b) S1 F EXT GAP FAR
(c) S2 M EXT GAP FAR

(d) S2 F EXT GAP FAR
(e) S3 M EXT GAP FAR
(f) S3 F EXT GAP FAR
(g) S4 M EXT GAP FAR
(h) S4 F EXT GAP FAR
(i) S5 M EXT GAP FAR
(j) S5 F EXT GAP FAR
(k) S6 M EXT GAP FAR
(l) S6 F EXT GAP FAR
(m) F1 RET GAP NEAR
(n) F1 EXT GAP FAR
(o) F2 RET GAP NEAR
(p) F2 EXT GAP FAR
(q) F3 RET GAP NEAR
(r) F3 EXT GAP FAR
(s) F4 RET GAP NEAR
(t) F4 EXT GAP FAR

C. Push the MENU key until you find EXISTING FAULTS?.

D. Put the flap control lever to the 1-unit detent position.

(1) Make sure the green lights for the intermediate extension (EXT) on the leading edge devices annunciator panel comes on for slats 1 thru 6.

(2) Make sure the green lights for the full extend (FULL EXT) comes on for all the flaps.

E. Do these steps on the leading edge flap and slat position indication module (FSIM):

(1) Push the down arrow key until you find OTHER FUNCTNS?.

(2) Push the YES button adjacent to the arrow key to enter menu selection.

(3) Push the YES button when you see PROX SENSOR? on the display.

(4) Make sure the display shows the correct gap indication for each sensor:

<u>NOTE</u>: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP NEAR
(b) S1 F EXT GAP FAR
(c) S2 M EXT GAP NEAR
(d) S2 F EXT GAP FAR
(e) S3 M EXT GAP NEAR
(f) S3 F EXT GAP FAR
(g) S4 M EXT GAP NEAR
(h) S4 F EXT GAP FAR
(i) S5 M EXT GAP NEAR
(j) S5 F EXT GAP FAR

(k) S6 M EXT GAP NEAR
(l) S6 F EXT GAP FAR
(m) F1 RET GAP FAR
(n) F1 EXT GAP NEAR
(o) F2 RET GAP FAR
(p) F2 EXT GAP NEAR
(q) F3 RET GAP FAR
(r) F3 EXT GAP NEAR
(s) F4 RET GAP FAR
(t) F4 EXT GAP NEAR

F. Push the MENU key until you find EXISTING FAULTS?.

G. Put the flap control lever to the 10-unit detent position.
(1) Make sure the green lights for the full extend (FULL EXT) on the leading edge devices annunciator panel comes for all slats.
(2) Make sure all the flaps continue to show full extension.

H. Do these steps on the leading edge flap and slat position indication module (FSIM):
(1) Push the down arrow key until you find OTHER FUNCTNS?.
(2) Push the YES button adjacent to the arrow key to enter menu selection.
(3) Push the YES button when you see PROX SENSOR? on the display.
(4) Make sure the display shows the correct gap indication for each sensor:

<u>NOTE</u>: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP FAR
(b) S1 F EXT GAP NEAR
(c) S2 M EXT GAP FAR
(d) S2 F EXT GAP NEAR
(e) S3 M EXT GAP FAR
(f) S3 F EXT GAP NEAR
(g) S4 M EXT GAP FAR
(h) S4 F EXT GAP NEAR
(i) S5 M EXT GAP FAR
(j) S5 F EXT GAP NEAR
(k) S6 M EXT FAP FAR
(l) S6 F EXT GAP NEAR
(m) F1 RET GAP FAR
(n) F1 EXT GAP NEAR
(o) F2 RET GAP FAR
(p) F2 EXT GAP NEAR
(q) F3 RET GAP FAR
(r) F3 EXT GAP NEAR
(s) F4 RET GAP FAR

(t) F4 EXT GAP NEAR

I. Push the MENU key until you find EXISTING FAULTS?.

J. Put the flap control lever to more than 10-unit detent position.

(1) Make sure the green lights for the (FULL EXT) on the leading edge devices annunciator panel comes on for all slats.

(2) Make sure all the flaps continue to show full extension.

K. Do these steps on the leading edge flap and slat position indication module (FSIM):

(1) Push the down arrow key until you find OTHER FUNCTNS?.

(2) Push the YES button adjacent to the arrow key to enter menu selection.

(3) Push the YES button when you see PROX SENSOR? on the display.

(4) Make sure the display shows the correct gap indication for each sensor;

NOTE: Push the down arrow key after each slat and flap sensor display.

(a) S1 M EXT GAP FAR
(b) S1 F EXT GAP NEAR
(c) S2 M EXT GAP FAR
(d) S2 F EXT GAP NEAR
(e) S3 M EXT GAP FAR
(f) S3 F EXT GAP NEAR
(g) S4 M EXT GAP FAR
(h) S4 F EXT GAP NEAR
(i) S5 M EXT GAP FAR
(j) S5 F EXT GAP NEAR
(k) S6 M EXT GAP FAR
(l) S6 F EXT GAP NEAR
(m) F1 RET GAP FAR
(n) F1 EXT GAP NEAR
(o) F2 RET GAP FAR
(p) F2 EXT GAP NEAR
(q) F3 RET GAP FAR
(r) F3 EXT GAP NEAR
(s) F4 RET GAP FAR
(t) F4 EXT GAP NEAR

L. Put the flap control lever to the 10-unit or less detent position.

(1) Make sure the green lights for the intermediate extension (EXT) on the leading edge devices annunciator panel comes on for slats 1 thru 6.

(2) Make sure the green lights for the full extend (FULL EXT) comes on for all the flaps.

M. Do these steps on the leading edge flap and slap position indication module (FSIM).
   (1) Push the down arrow key until you find OTHER FUNCTNS?.
   (2) Push the YES button adjacent to the arrow key to enter menu selection.
   (3) Push the YES button when you see PROX SENSOR? on the display.
   (4) Make sure the display shows the correct gap indication for each sensor:

       NOTE: Push the down arrow key after each slat and flap sensor display.

       (a) S1 M EXT GAP NEAR
       (b) S1 F EXT GAP FAR
       (c) S2 M EXT GAP NEAR
       (d) S2 F EXT GAP FAR
       (e) S3 M EXT GAP NEAR
       (f) S3 F EXT GAP FAR
       (g) S4 M EXT GAP NEAR
       (h) S4 F EXT GAP FAR
       (i) S5 M EXT GAP NEAR
       (j) S5 F EXT GAP FAR
       (k) S6 M EXT GAP NEAR
       (l) S6 F EXT GAP FAR
       (m) F1 RET GAP FAR
       (n) F1 EXT GAP NEAR
       (o) F2 RET GAP FAR
       (p) F2 EXT GAP NEAR
       (q) F3 RET GAP FAR
       (r) F3 EXT GAP NEAR
       (s) F4 RET GAP FAR
       (t) F4 EXT GAP NEAR