TO: ALL HOLDERS OF RUDDER CONTROL TORQUE TUBE ASSEMBLY OVERHAUL MANUAL, 27-27-04

REVISION NO. 7, DATED JUL 1/03

HIGHLIGHTS

DESCRIPTION OF CHANGE	TOPICS AFFECTED												
	D & O	D / Assy	Cleaning	Insp/Chk	Repair	Assy	F/C	Test	T/Shooting	S/Tools	Storage	IPL	L/Overhaul
Added torque tube assembly 65-45142-13 with spring-loaded cranks and new tube and bellcrank for the Enhanced Rudder Control System (RSEP) per PRR 35436-R and SB 27-1252, SB 27-1255	X	X		X	X	X	X					X	
Added clarifications and updated callouts	X	X	X	X	X	X	X				X	X	

RUDDER CONTROL TORQUE TUBE ASSEMBLY

27-27-04

BOEING P/N 65-45142-3, -4, -6, -8, -9, -11, -12, -13

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT
		PRR 30623	Feb 15/69
		PRR 31506	Dec 10/70
		PRR 31506-3	Dec 10/70
		PRR 31628	Dec 10/70
		PRR 31726	Dec 10/70
		PRR 32900-1	Jul 5/79
		PRR 32912-1	Jul 5/79
27-1252		PRR 35436-R	Jul 1/03
27-1255		PRR 35436-R	Jul 1/03

LIST OF EFFECTIVE PAGES

* Indicates pages revised, added or deleted in latest revision
F Indicates foldout pages - print one side only

PAGE	DATE	PAGE	DATE	PAGE	DATE
27-27-04					
* T-1	Jul 1/03				
T-2	BLANK				
* LEP-1	Jul 1/03				
LEP-2	BLANK				
* T/C-1	Jul 1/03				
T/C-2	BLANK				
* 1	Jul 1/03				
* 2	Jul 1/03				
* 3	Jul 1/03				
* 4	Jul 1/03				
* 5	Jul 1/03				
* 6	Jul 1/03				
* 7	Jul 1/03				
* 8	Jul 1/03				
* 9	Jul 1/03				
* 10	Jul 1/03				
* 11	BLANK				
* 12	Jul 1/03				
* 13	Jul 1/03				
* 14	Jul 1/03				
* 15	Jul 1/03				
* 16	Jul 1/03				
* 17	Jul 1/03				
* 18	Jul 1/03				

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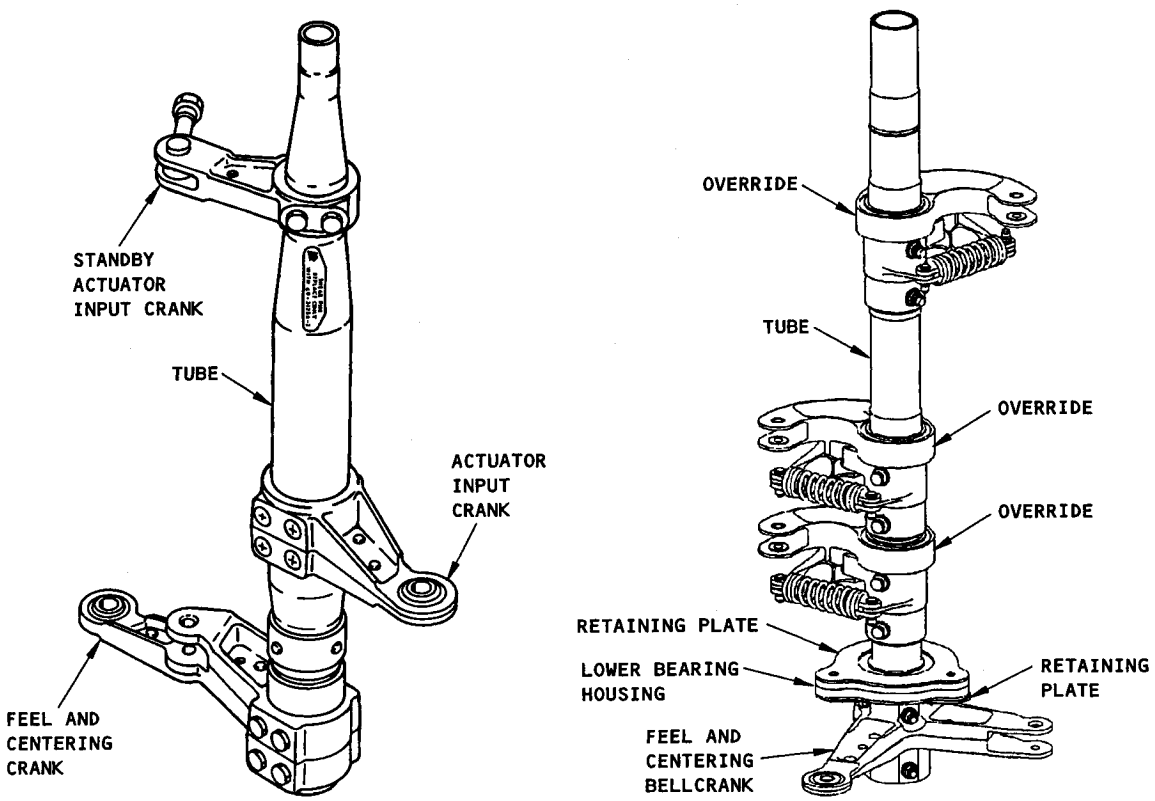
*[1] Special instructions are not necessary. Use standard industry practices.

*[2] Also use the instructions in SOPM 20-30-01 and 20-30-03.

*[3] Also use the instructions in SOPM 20-44-02 and 20-70-01.

RUDDER CONTROL TORQUE TUBE ASSEMBLY



Rudder Control Torque Tube Assembly
Figure 1

1. DESCRIPTION AND OPERATION

A. The torque tube assembly includes a bonded inner and outer swaged tube, riveted sleeve, spacer sleeve, and three actuator crank assemblies, bolted to the torque tubes. The latest unit has springs in the cranks and a different crank for the feel and centering unit. The torque tube acts as a dual load path.

B. Rudder pedal or rudder trim movements are transferred from the aft rudder control quadrant to the actuator cranks on the rudder control torque tube, to turn the torque tube. As the torque tube turns, it operates the feel and centering unit, main rudder power control unit, and the standby power control unit linkage. The spring-loaded cranks on the latest unit help the system sense trouble in the main rudder power control unit.

C. Leading Particulars (Approximate):

Height -- 23 inches
Width -- 6 inches
Weight -- 4 pounds

2. DISASSEMBLY

A. Disassemble the unit only as necessary for cleaning, inspection, repair and replacement of components. Do not remove or separate the following parts unless necessary for repair or replacement:

(1) Fig. 3

(a) Pin (5), bearing (6)

(b) Bearings and sleeves (12, 13) (22, 23), (32)

(c) Rivets (14, 31)

(d) Cranks (16, 17) (26, 27)

(e) Label (29)

(2) Fig. 4

(a) Spring assembly (60)

(b) Carrier arm assembly (75, 75A)

(c) Base fitting assembly (120, 120A)

(d) Crank arm assembly (135, 135A)

(e) Bellcrank assembly (175)

(f) Housing assembly (210)

(g) Tube assembly (270)

B. Assemblies 65-45142-3, -4, -6, -8, -9, -11, -12 (Fig. 3)

(1) Remove nuts (1), washers (2), bolts (3) and crank (4 or 7).

(2) Remove nuts (8), washers (9), bolts (10 or 10A), bracket arm (10B) if applicable, and crank (11).

(3) Remove nuts (18), washers (19), bolts (20) and crank (21).

(4) Remove sleeve (28).

C. Assembly 65-45142-13 (Fig. 4)

(1) Remove nuts (25), washers (15, 20), bolts (5, 10)

(2) Remove override assemblies (30, 30A)

(3) Remove nuts (170), washers (160, 165), bolts (155)

(4) Remove bellcrank assembly (175)

3. INSPECTION/CHECK

A. Examine all parts for defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits.

B. Magnetic particle examine (SOPM 20-20-01) -- Fittings (62, 110, 130), arm (150), tube (270), (Fig. 4).

C. Penetrant check (SOPM 20-20-02)

(1) Fig. 3: Cranks (4, 7, 15, 25) and tube assembly (30).

(2) Fig. 4: Crank (195), tube assembly (270).

4. REPAIR

A. Repair small defects by standard industry practices. Refer to Fits and Clearances for design dimensions and wear limits.

B. Refinish

NOTE: Refer to SOPM 20-30-02 for stripping of protective finishes. Refer to SOPM 20-41-01 for explanation of F and SRF finish codes.

(1) Fig. 3

(a) Crank (4, 7) -- Chemical treat or chromic acid anodize and apply, BMS 10-11, Type 1 primer (SRF-2.30) all over but no primer on surface of 1.600- and 0.250-inch diameter holes. Material: Al alloy.

(b) Crank (15) (65-45143-2) -- Chemical treat (F-17.10) and apply BMS 10-11, Type 1 primer (F-20.02) but no primer on surface of 2.001-inch diameter bore and bearing hole. Material: Al alloy.

(c) Crank (15) (65-45143-4, -6, -8) -- Phosphoric acid anodize (F-20.31) and apply BMS 5-89 corrosion resistant primer (F-20.26) but no primer on surface of from 2.001-inch diameter bore and bearing hole. Material: Al alloy.

(d) Crank (25) -- Chemical treat or chromic acid anodize and apply BMS 10-11, Type 1 primer (SRF-2.30), but no primer on 1.812-inch diameter bore, bolt hole, or bearing hole. Material: Al alloy.

(e) Sleeve (28) -- Chemical treat or anodize and apply BMS 10-11, Type 1 primer (SRF-2.71 and SRF-12.205) all over. Material: Al alloy.

(f) Tube assembly (30) -- Chemical treat or chromic acid anodize and apply BMS 10-11, Type 1 primer (SRF-2.30) on inner surface only. Chromic acid anodize (F-2.20) and apply MIL-P-8585 primer (SRF-12.205) on outer surface but only chemical treat (F-2.940) the machined surfaces. Material: Al alloy.

(g) Shear pin (5) -- Chromic acid anodize and dye color red. Material: Al alloy.

(h) Bracket arm (10B) -- Chromic acid anodize and apply BMS 10-11, Type 1 primer (F-18.06) all over. Material: Al alloy.

(2) Fig. 4

(a) Spring assembly (60) -- Apply Type 49 coating (F-21.14) to coils only.

(b) Fitting (62) -- Passivate (F-17.25). Material: 15-5PH CRES, 125-145 ksi.

(c) Fittings (110, 130), arm (150) -- Passivate (F-17.25). Material: 15-5 PH CRES, 150-170 ksi.

(d) Bellcrank (195) -- Chemical treat (F-17.10) Apply BMS 10-11, Type 1 primer (F-20.02). Material: Al alloy.

(e) Plates (200, 220, 235), retainer (205), housings (225, 230) -- Boric acid-sulfuric acid anodize (F-17.31). Apply BMS 10-11, Type 1 primer (F-20.02). Material: Al alloy.

(f) Tube assembly (270) -- Passivate (F-17.25). Material: 17-7 PH CRES, 150-170 ksi.

C. Replacement

(1) Replace all parts found unserviceable that cannot be repaired.

(2) Fig. 3 Parts

(a) Bearings (12, 22), sleeves (13, 23) -- Install replacements and roller swage them (SOPM 20-50-03).

(b) Pin (5), bearing (6) -- Grind off the end of shear pin (5) and tap it out. Install a replacement bearing with a new shear pin. Squeeze the pin in position until it is 0.043 inch out from the side of the clevis fork. Make sure the bearing turns freely.

(c) Label (29) -- Replace per SOPM 20-50-05.

(3) Fig. 4 Parts

(a) Bearing (80) -- Press out the old bearing. Install a replacement by the press fit method (SOPM 20-50-03). Use something to hold the bearing in position until the unit is installed in the airplane.

(b) Bushing (125) -- Remove the old bushings. Install a replacement by the shrink fit method (SOPM 20-50-03) with BMS 3-33 or BMS 3-24 grease on mating surfaces. Machine the bushing ID to 0.1895-0.1910 inch.

(c) Bushings (140) -- Remove the old bushings. Install replacements by the shrink fit method (SOPM 20-50-03) with BMS 3-33 or BMS 3-24 grease on mating surfaces. Machine the bushing ID to 0.2495-0.2505 inch.

(d) Bearings (145) -- Press in replacements (SOPM 20-50-03).

5. ASSEMBLY

A. Assemblies 65-45142-3, -4, -6, -8, -9, -11, -12 (Fig. 3)

(1) Materials

(a) Corrosion preventive compound -- MIL-C-11796 class 3 (SOPM 20-60-02)

(2) General

(a) Make sure you install the crank assemblies in the positions shown.

(b) If you replaced cranks, drill 0.250-0.254 inch diameter holes in them with the holes in torque tube (30) as a guide. Countersink the holes in crank (11), 100 degrees by 0.515-0.525 inch diameter.

(c) Install bolts (3, 10, 10A, 20) with corrosion preventive compound.

(3) Install sleeve (28) on the large end of tube assembly (30).

(4) Install crank (21) on large end of tube (30) with clevis side next to sleeve (28). Attach with bolts (20), washers (19) and nuts (18). Tighten nuts (18) to 25-35 lb-in.

(5) Install crank (11) over small end of tube (30). On assembly 65-45142-8, install bracket arm (10B) on crank assembly (11). Attach with bolts (10 or 10A), as applicable, washers (9) and nuts (8). Make sure the bearing side of crank (11) is towards crank (21). Tighten the nuts to 25-35 lb-in.

(6) Install crank (4) over the small end of tube (30) with bolts (3), washers (2), nuts (1). Make sure the crank (4) arm angle relationship to crank (11) is as shown. Tighten the nuts to 25-35 lb-in.

B. Assembly 65-45142-13 (Fig. 4)

(1) Materials

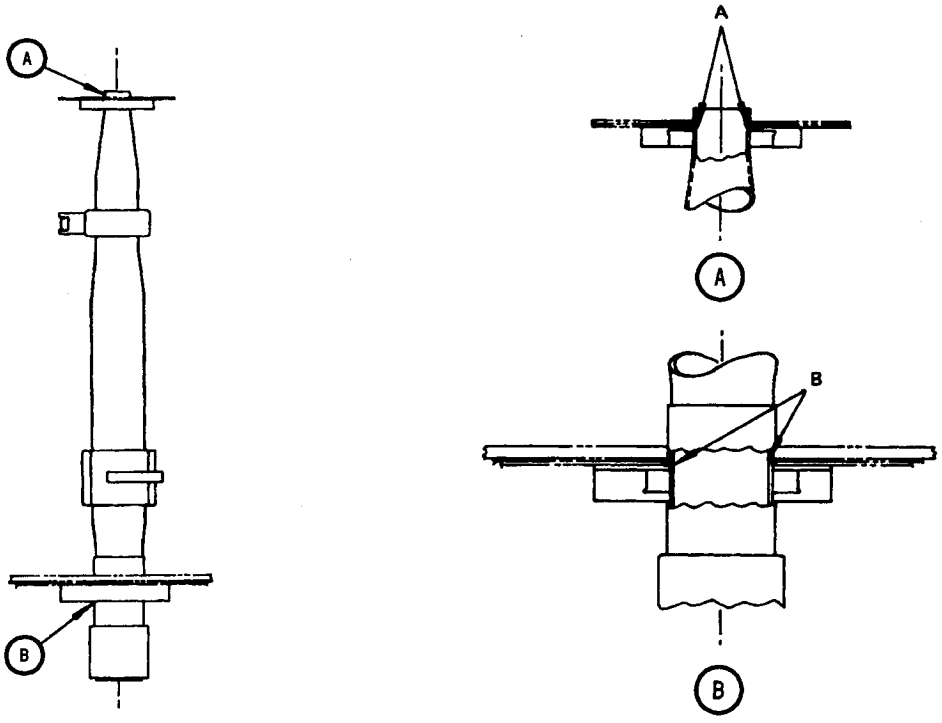
(a) Sealant -- BMS 5-95 (SOPM 20-60-04)

(2) Use standard industry practices and these steps.

(3) Make sure you install the override assemblies (30, 30A) in the correct positions. Note that override (30A) is opposite compared to override (30).

(4) Install fasteners with sealant. Hand tighten only, because the overrides and fasteners will be removed when the torque tube assembly is installed in the airplane. Refer to SB 27-1252 or 27-1255 for details.

6. FITS AND CLEARANCES



Fits and Clearances
Figure 2

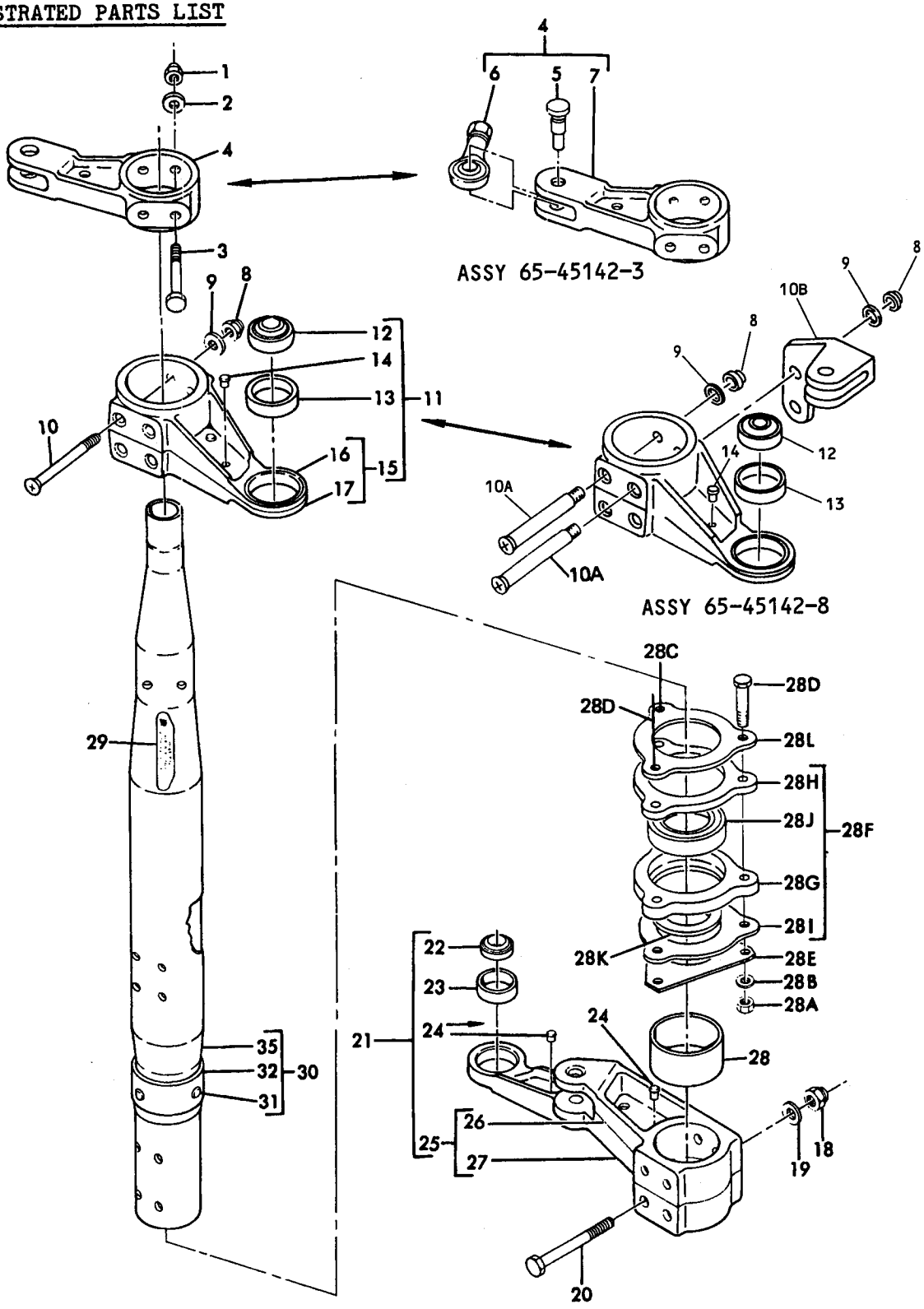
Ref Letter Fig. 2	Mating Item No. Fig. 3	Design Dimensions				Service Wear Limits		
		Dimensions (inches)		Assembly Clearance (inch) *[3]		Dimension Limits (inch)		Maximum Allowable Clearance (inch)
		Min	Max	Min	Max	Min	Max	
A	ID *[1]	0.9990	1.000		0.0015		1.0030	0.0035
	OD 30	0.9985	0.9995	-0.0005		0.9955		
B	ID *[2]	1.812	1.813		0.002		1.816	0.0040
	OD 30	1.811	1.812	0.000		1.808		

*[1] BACB10A827

*[2] BACB10A831

*[3] Negative values are an interference fit

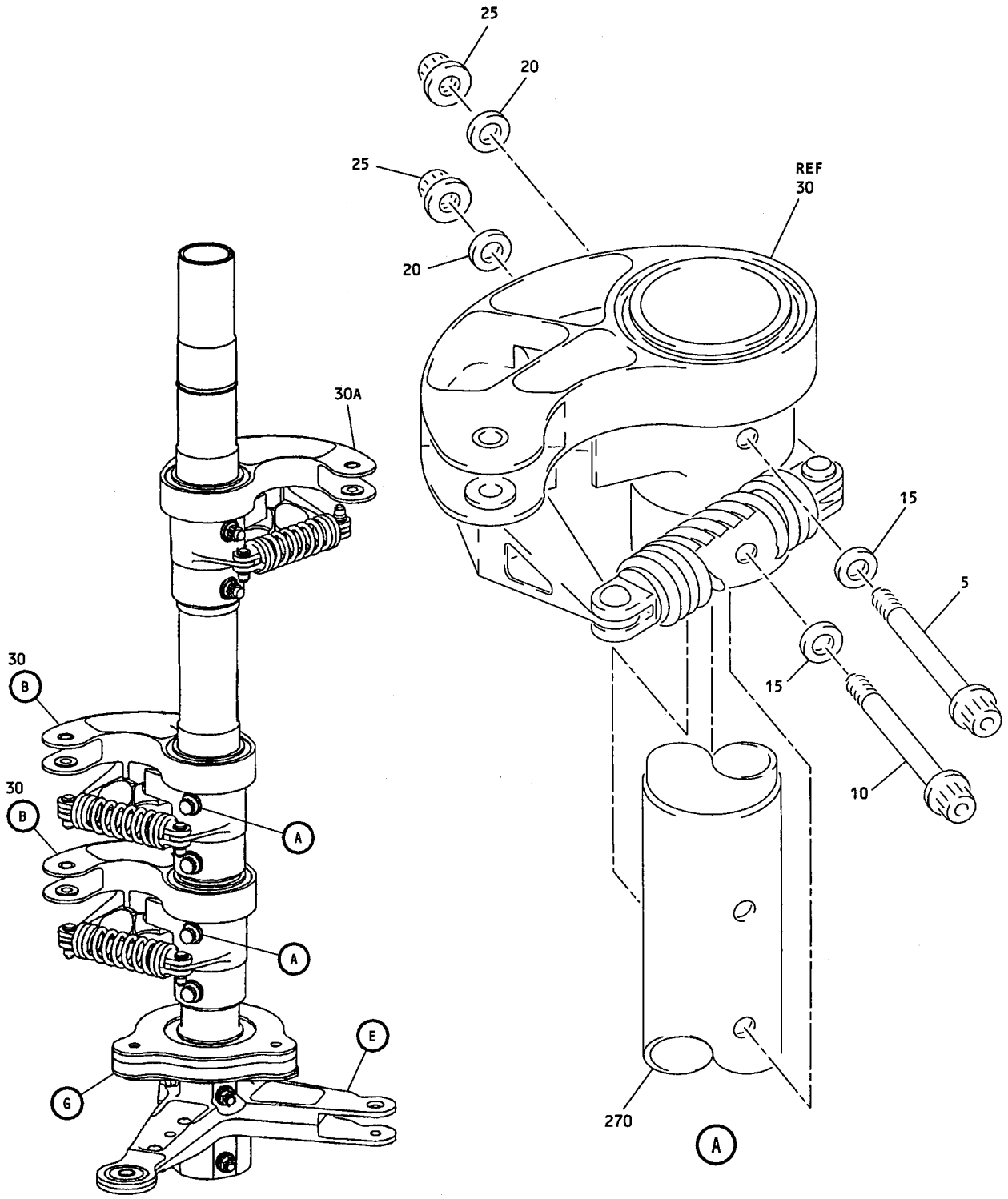
7. ILLUSTRATED PARTS LIST



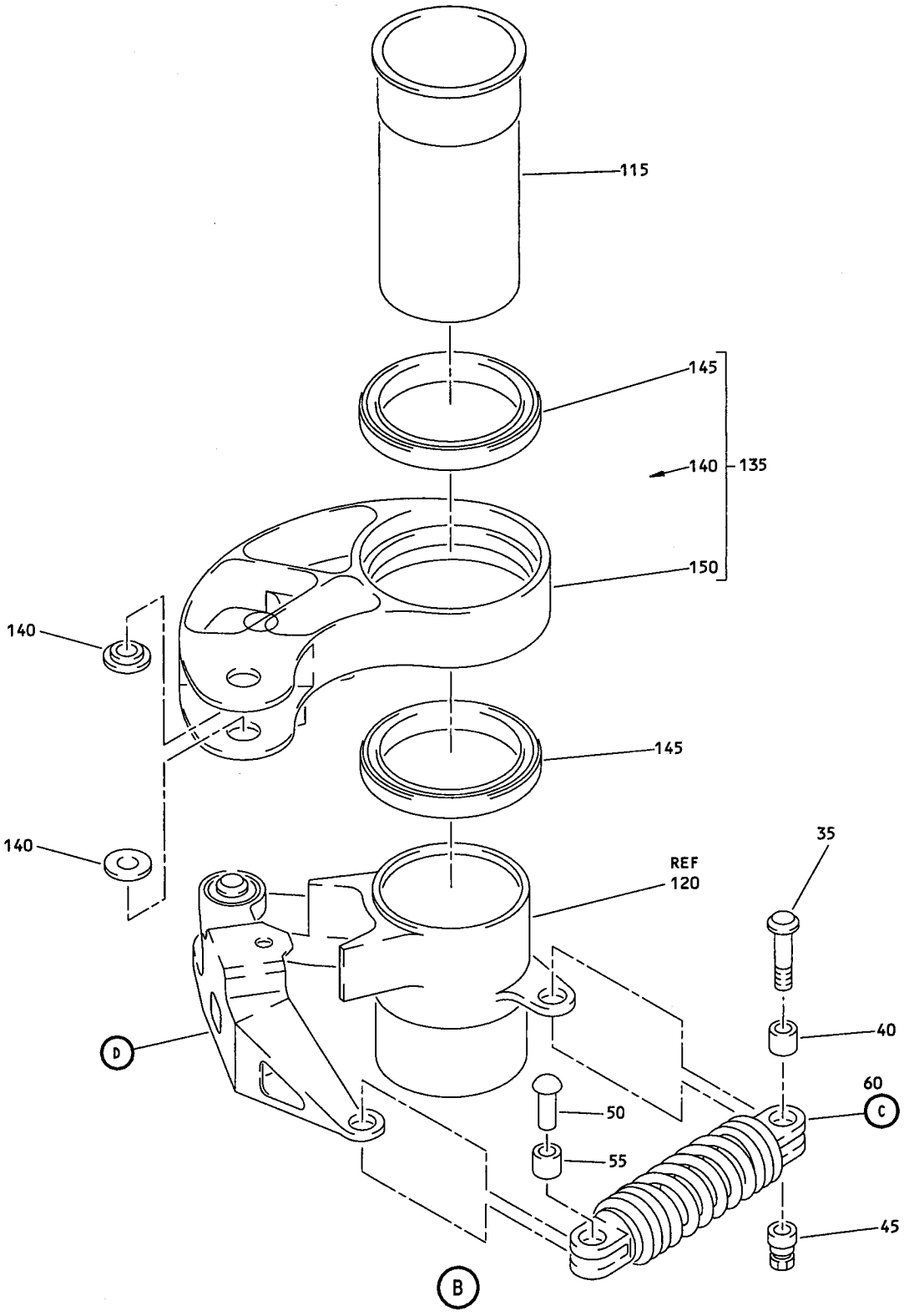
Rudder Control Torque Tube Assembly
Figure 3

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
3-					
	65-45142-3		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252)	A	RF
	65-45142-4		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252)	B	RF
	65-45142-6		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252, 27-1255)	C	RF
	65-45142-8		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252)	D	RF
	65-45142-9		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1255)	E	RF
	65-45142-11		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252, 27-1255)	F	RF
	65-45142-12		TUBE ASSY, RUDDER CONTROL TORQUE (PRE SB 27-1252, 27-1255)	G	RF
	65-45142-13		TUBE ASSY, RUDDER CONTROL TORQUE (POST SB 27-1252, 27-1255) (FOR DETAILS SEE FIG. 4)	H	RF
1	BACN10JC4		. NUT		2
2	AN960PD416L		. WASHER (REPLD BY NAS1149D0416J)		2
3	BACB30NF4-31		. BOLT		2
4	65-45145-4		. CRANK (SB 27-1013)	B-F	1
4	65-45145-1		. CRANK ASSY (SB 27-1013)	A	1
4	65-45145-8		. CRANK	G	1
5	69-31256-2		. . SHEAR PIN		1
6	GRR4M6-7E9171		. . BEARING, (V21335)		1
6	BACB10C241H		. . BEARING (OPT)		1
7	65-45145-2		. . CRANK		1
8	BACN10JC4		. NUT		4
9	AN960PD416L		. WASHER (REPLD BY NAS1149D0416J)		4
10	NAS584-38		. BOLT	CEFG	4
10	NAS584-40		. BOLT	AB	4
10	BACB30LP4-38		. BOLT	D	2
10A	BACB30LP4-40		. BOLT	D	2
10B	69-71021-2		. BRACKET ARM	D	1
11	65-45143-1		. CRANK ASSY	AB	1
11	65-45143-3		. CRANK ASSY	CD	1
11	65-45143-5		. CRANK ASSY	E	1
11	65-45143-7		. CRANK ASSY	FG	1
12	BACB10AC5		. . BEARING		1
13	69-38919-1		. . SLEEVE		1
14	BACR15BB5D		. . RIVET		1
15	65-45143-2		. . CRANK, BONDED ASSY (USED ON 65-45143-1)		1

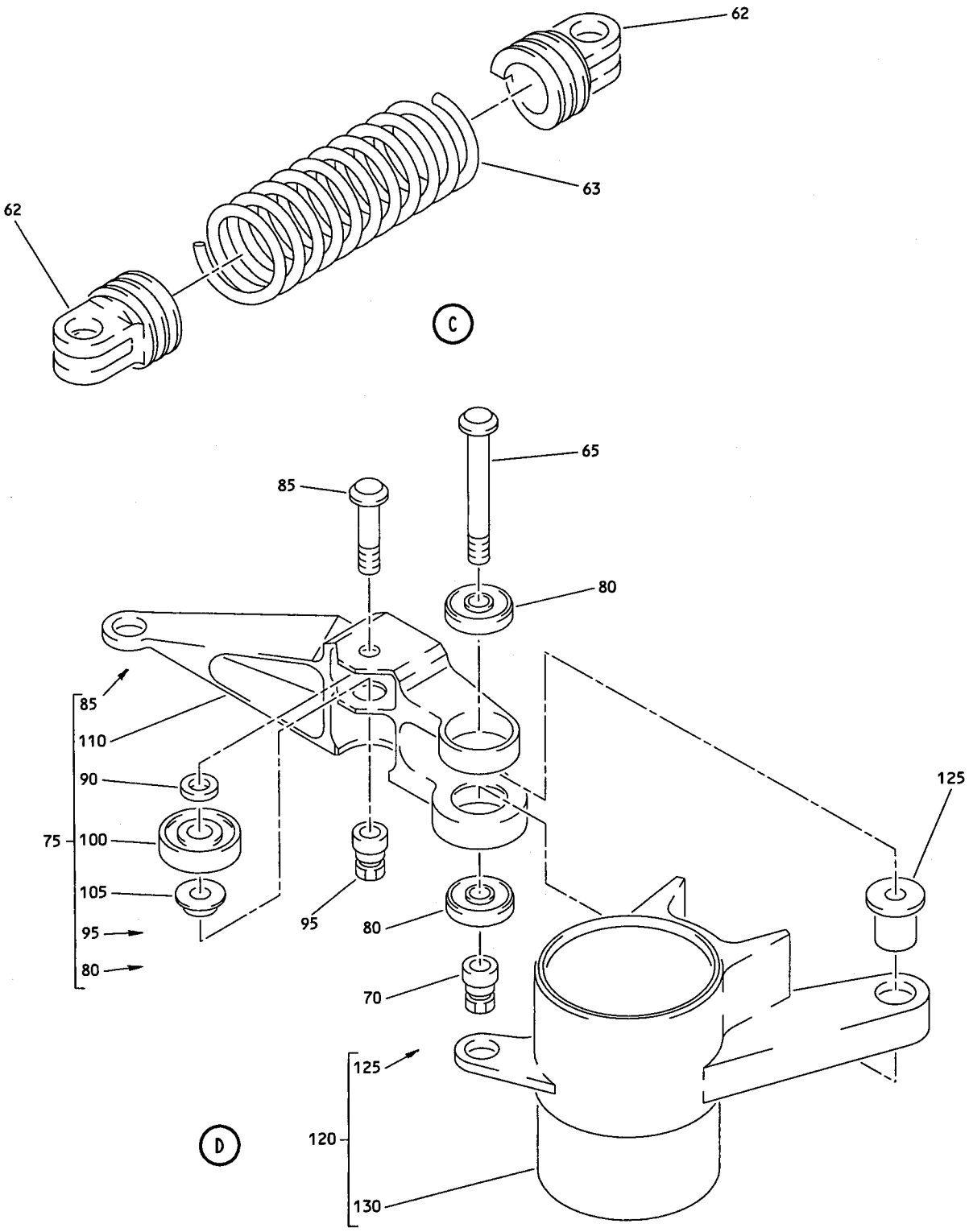
FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
3-					
15	65-45143-4		. . CRANK, BONDED ASSY (USED ON 65-45143-3)		1
15	65-45143-6		. . CRANK, BONDED ASSY (USED ON 65-45143-5)		1
15	65-45143-8		. . CRANK, BONDED ASSY (USED ON 65-45143-7)		1
16	65-45144-1		. . . CRANK (USED ON 65-45143-2,-4)		1
16	65-45144-5		. . . CRANK (USED ON 65-45143-6)		1
16	65-45144-13		. . . CRANK (USED ON 65-45143-8)		1
17	65-45144-2		. . . CRANK (USED ON 65-45143-2,-4)		1
17	65-45144-6		. . . CRANK (USED ON 65-45143-6)		1
17	65-45144-14		. . . CRANK (USED ON 65-45143-8)		1
18	BACN10JC4		DELETED		
18	NAS679A4W		. NUT	AB	4
19	AN960PD416L		. WASHER (REPLD BY NAS1149D0416J)	AB	4
20	BACB30NE4-36		DELETED		
20	NAS1104-36		. BOLT	AB	4
21	65-45146-1		. CRANK ASSY	AB	1
22	BACB10AC5A		. . BEARING		1
23	69-38919-17		. . SLEEVE		1
24	BACR15BB5D		. . RIVET		2
25	65-45146-2		. . CRANK, BONDED ASSY		1
26	65-45147-3		. . . CRANK		1
27	65-45148-1		. . . CRANK		1
28	65-45149-4		. SLEEVE	AB	1
28A	BACN10JC4		. NUT	C-F	3
28B	AN960PD416L		. WASHER (REPLD BY NAS1149D0416J)	C-F	3
28C	BACB10NF4-16		DELETED		
28C	BACB30NF4-18		. BOLT	C-F	1
28D	BACB30NF4-13		. BOLT	C-F	2
28E	69-37286-2		. PLATE	C-G	1
28F	69-37288-1		. HOUSING ASSY	C-G	1
28G	69-37288-2		. . HOUSING		1
28H	69-37288-3		. . HOUSING		1
28I	69-37286-1		. . PLATE		1
28J	BACB10A831		. . BEARING		1
28K	69-60773-1		. RETAINER	C-G	1
28L	69-37286-1		. PLATE	C-G	1
29	BACM10P8CL		. LABEL (SB 27-1013)	A	1
30	65-45149-1		. TUBE ASSY		1
31	BACR15BB5D		. . RIVET (REPLS MS20470D5)		4
32	65-45149-4		. . SLEEVE		1
33	65-45149-3		DELETED		
34	65-45149-2		DELETED		
35	TUBE		. . BONDED TUBE ASSY		1



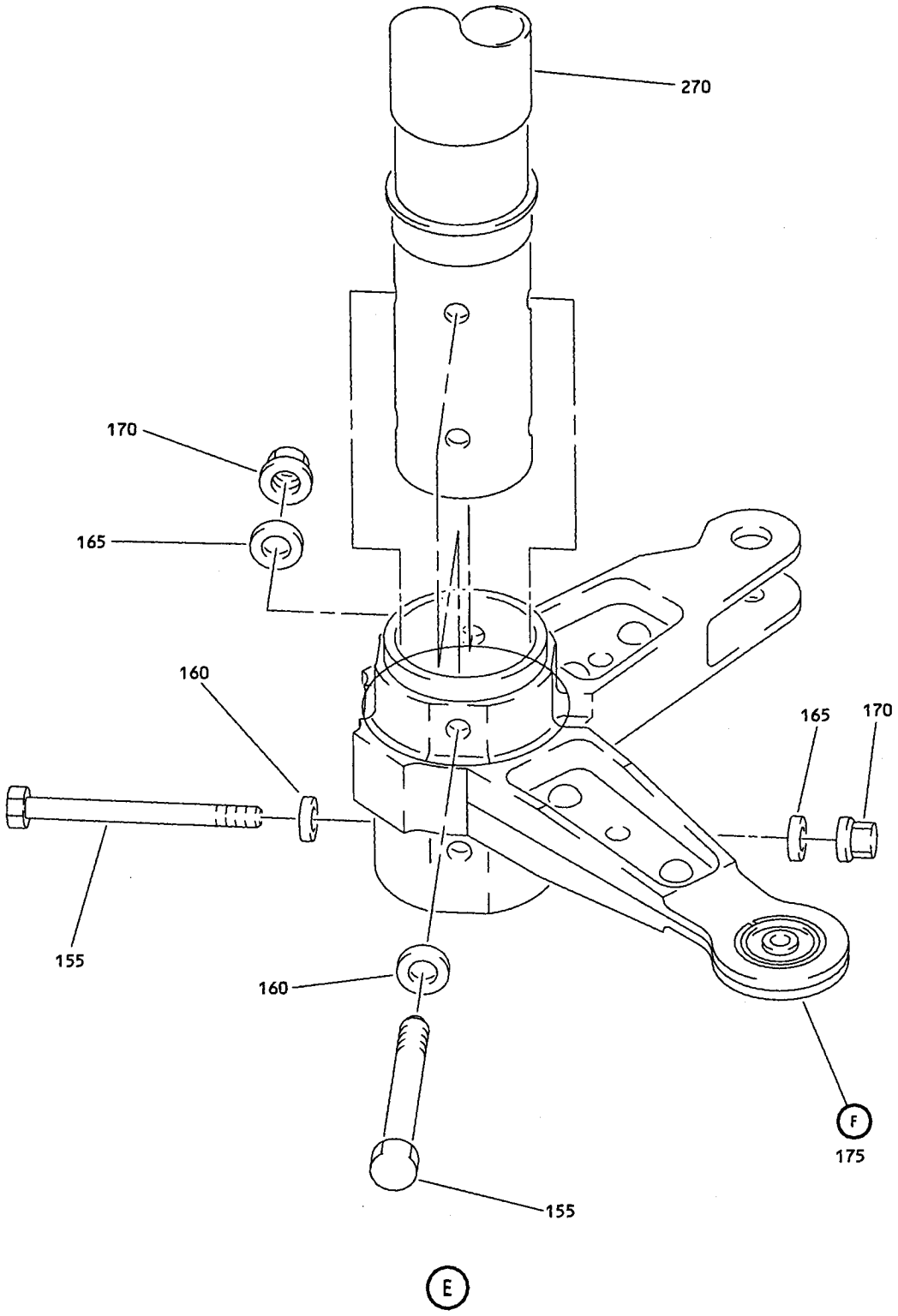
Rudder Control Torque Tube Assembly
Figure 4 (Sheet 1)



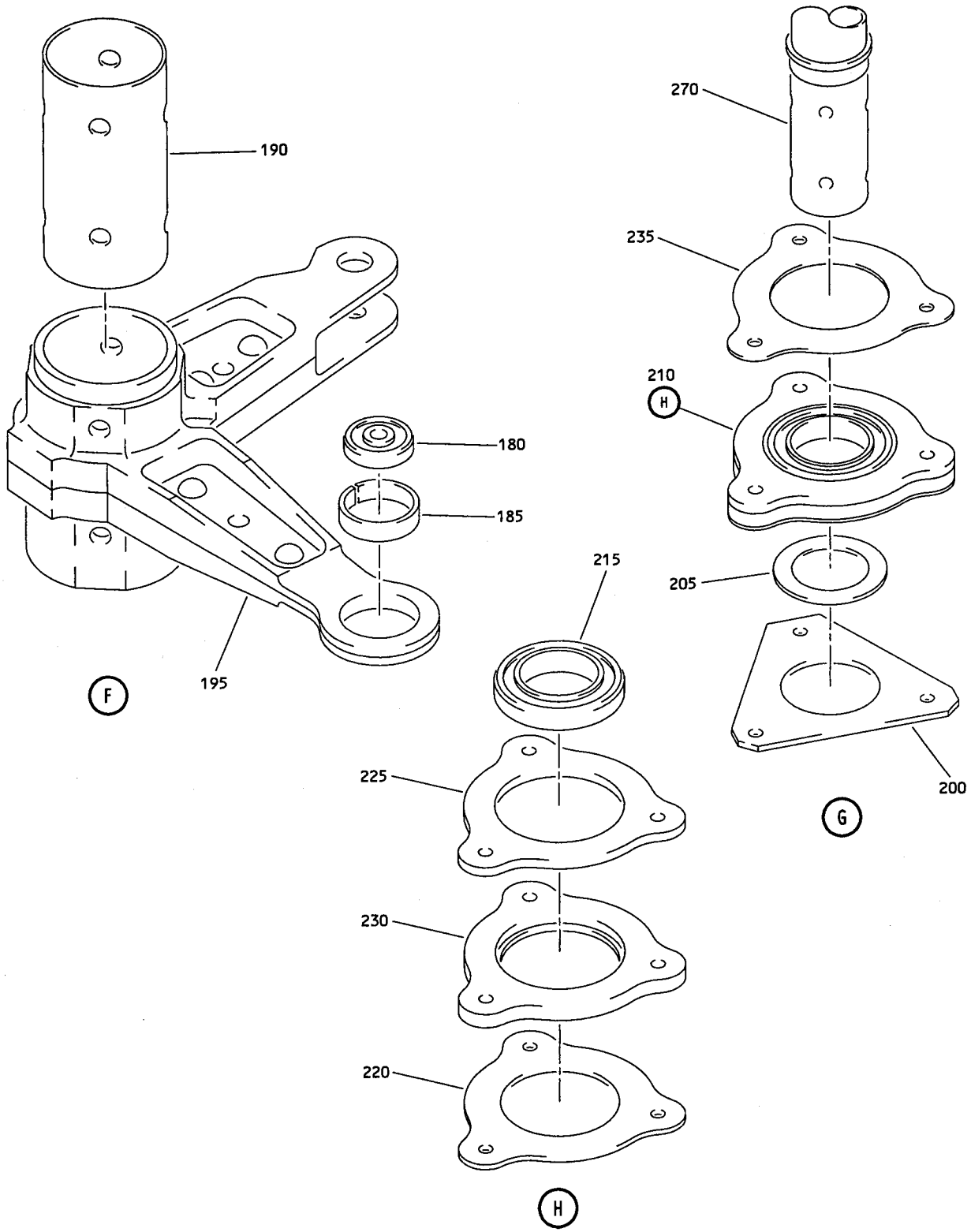
Rudder Control Torque Tube Assembly
Figure 4 (Sheet 2)



Rudder Control Torque Tube Assembly
Figure 4 (Sheet 3)



Rudder Control Torque Tube Assembly
Figure 4 (Sheet 4)



Rudder Control Torque Tube Assembly
Figure 4 (Sheet 5)

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
4-					
-1	65-45142-13		TUBE ASSY-TORQUE RUDDER CONTROL (POST SB 27-1252, 27-1255)	H	RF
5	BACB30MR4S28		. BOLT	H	3
5	BACB30MR4K28		. BOLT (OPT)	H	3
10	BACB30MR4S27		. BOLT (OPT)	H	3
10	BACB30MR4K27		. BOLT	H	3
15	BACW10BP4ACU		. WASHER	H	6
20	BACW10BP4APU		. WASHER	H	6
25	NAS1805-4		. NUT	H	6
30	65-45156-1		. OVERRIDE ASSY (MIDDLE AND LOWER POSITIONS)	H	2
30A	65-45156-2		. OVERRIDE ASSY (UPPER POSITION)	H	1
35	BACB30VT6K7		. . BOLT		1
40	BACB28AK03-029		. . BUSHING		1
45	BACC30BS6S		. . COLLAR		1
50	MS20615-6M		. . RIVET		1
55	BACB28AK03-029		. . BUSHING		1
60	251A3452-1		. . SPRING ASSY		1
62	251A3454-1		. . . FITTING-END		2
63	251A3452-2		. . . SPRING		1
65	BACB30VT6K17		. . BOLT		1
70	BACC30BS6S		. . COLLAR		1
75	65-45158-1		. . ARM ASSY-CARRIER (USED ON 65-45156-1)		1
75A	65-45158-2		. . ARM ASSY-CARRIER (USED ON 65-45156-2)		1
80	BACB10FS03RJP		. . . BEARING		2
-80	BACB10FS03RJ		. . . BEARING (OPT)		2
85	BACB30VT6K9		. . . BOLT		1
90	NAS1149E0332R		. . . WASHER		1
95	BACC30BS6S		. . . COLLAR		1
100	BACB10HH03		. . . BEARING		1
105	251T3742-41		. . . BUSHING		1
110	65-45158-3		. . . FITTING-CARRIER ARM (USED ON 65-45158-1)		1
110A	65-45158-4		. . . FITTING-CARRIER ARM (USED ON 65-45158-2)		1
115	251A3492-1		. . FITTING-SLEEVE		1
120	65-45157-1		. . FITTING ASSY-BASE (USED ON 65-45156-1)		1
120A	65-45157-2		. . FITTING ASSY-BASE (USED ON 65-45156-2)		1
125	251T3742-42		. . . BUSHING		1
130	65-45157-3		. . . FITTING (USED ON 65-45157-1)		1
130A	65-45157-4		. . . FITTING (USED ON 65-45157-2)		1

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
4-135	65-45143-10		. . ARM ASSY-CRANK (USED ON 65-45156-1)		1
135A	65-45145-5		. . ARM ASSY-CRANK (USED ON 65-45156-2)		1
140	BACB28AP04-007		. . . BUSHING		2
145	BACB10FU25JP		. . . BEARING		2
145	BACB10FU25J		. . . BEARING (OPT)		2
150	65-45144-15		. . . CRANK ARM (USED ON 65-45143-10)		1
150A	65-45145-6		. . . CRANK ARM (USED ON 65-45145-5)		1
155	BACB30NR4K30		. BOLT	H	4
160	BACW10BP4CD		. WASHER	H	4
165	BACW10BP4DP		. WASHER	H	4
170	BACN10YR4CD		. NUT	H	4
175	251A3456-1		. BELLCRANK ASSY	H	1
180	BACB10FP05AJ		. . BEARING		1
185	69-38919-31		. . SLEEVE		1
190	251A3401-1		. . SLEEVE		1
195	251A3456-2		. . BELLCRANK		1
200	251A3457-2		. PLATE-RETAINING	H	1
205	251A3458-1		. RETAINER	H	1
210	251A3455-1		. HOUSING ASSY-LWR BRG	H	1
215	BACB10FV23J		. . BEARING		1
220	251A3457-1		. . PLATE-RETAINING		1
225	251A3455-3		. . HOUSING		1
230	251A3455-2		. . HOUSING		1
235	251A3457-1		. PLATE	H	1
270	251A3444-7		. TUBE ASSY	H	1

VENDORS

V21335 TORRINGTON CO., FAFNIR BEARING DIV., 59 FIELD ST., TORRINGTON, CONNECTICUT 06790-4942