TO: ALL HOLDERS OF GROUND SPOILER ACTUATOR ASSEMBLY OVERHAUL MANUAL, 27-60-31

REVISION NO. 8, DATED MAR 1/99

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 note for equivalent substitute tooling Edited title page										X			

GROUND SPOILER ACTUATOR ASSEMBLY

27-60-31

BOEING P/N 65-44951-1, -2, -5 thru -8

AIRLINE P/N

THE FOLLOWING DIRECTIVES APPLY TO THIS SUBJECT:

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVES	DATE DIRECTIVE INCORPORATED INTO TEXT

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
27-60-31						
*	T-1	Mar 1/99				
	T-2	BLANK				
*	LEP-1	Mar 1/99				
	LEP-2	BLANK				
	T/C-1	May 15/68				
	T/C-2	BLANK				
	1	Jan 5/80				
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	101	May 15/68				
	102	BLANK				
	201	May 15/68				
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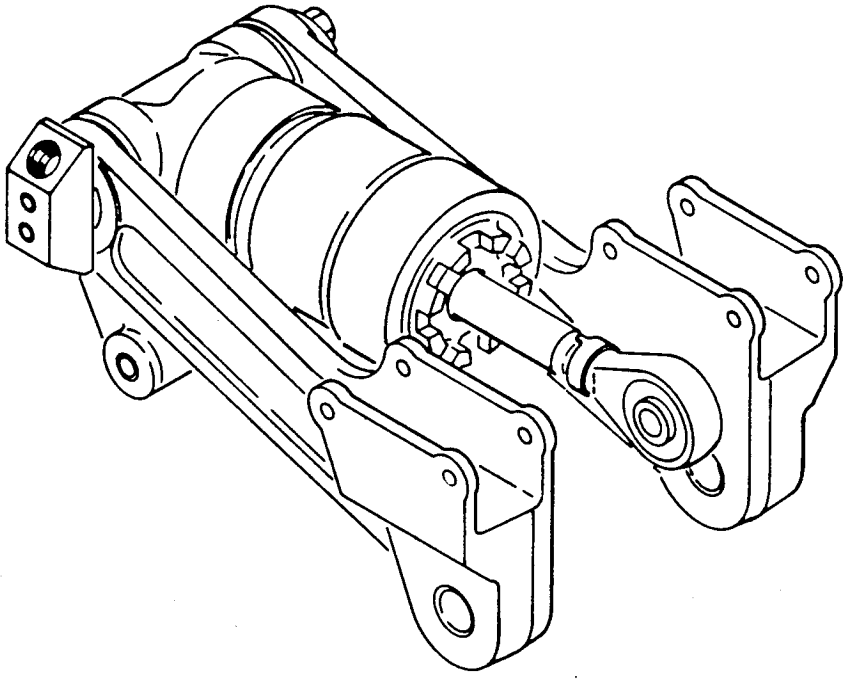


Ground Spoiler Actuator Assembly
Figure 1

DESCRIPTION AND OPERATION

1. Description

   A. The ground spoiler actuator consists of a piston and rod operating in a sleeve insert in a cylinder housing.

2. Operation

A. The ground spoiler actuator is used to position each ground spoiler panel. The actuator is trunnion-mounted in a reaction link which connects to a linkage support and to structure. The trunnion is threaded and connected to hydraulic lines. The piston rod end is connected to a ground spoiler actuator linkage lever.

3. Leading Particulars

Length -- 7.66 inches (retracted length, between bearings centerlines)
Width -- 7.60 inches
Height -- 4.80 inches
Weight -- 9.5 pounds

DISASSEMBLY

1. Disassembly (See figure 1101.)

   A. Remove all lockwiring.

   B. Remove bolts (1 and 3), washers (2 and 4), and plate retainer (5).

   C. Remove trunnion assembly (6) and support assemblies (12 and 13).

   D. Remove cap rings (10) and packings (11) from trunnion (7).

      NOTE: Do not remove plugs (8) or pins (9) from trunnion (7) or bushings (16, 17 and 18) from support assemblies (12 and 13) unless inspection or replacement make it necessary.

   E. Hold cylinder assembly (37) in vise or fixture that will not damage it. Unscrew nut (19) and remove assembled items (20 through 33) from cylinder (38).

      NOTE: Do not remove plugs (39), pins (40 and 41), bushings (42), or nameplate (43) from cylinder (38) unless replacement is necessary.

   F. Hold piston (33) by the wrench flats in vise or fixture that will not damage it. Bend back tangs of lockwasher (20) and, using wrench F-71313-8 remove rod end assembly (21) and lockwasher (20) from piston (33).

   G. Remove items (24 through 30) from piston (33), and disassemble.

   H. Remove items (31 and 32) from piston (33) head.

   J. Remove sleeve (34) from cylinder (38).

CLEANING

1. General

   A. Wash all metal parts, except bearing (23), with dry cleaning solvent, Specification P-D-680 or equivalent. Use a stiff bristle brush to remove stubborn accumulations of foreign matter.

   B. Drain and dry thoroughly all metal parts with a clean, lint-free cloth or with clean, moisture-free compressed air.

2. Bearing (23, figure 1101)

   A. Clean bearing per Subject 20-30-01, "Cleaning and Relubricating of Antifriction Bearings."

INSPECTION/CHECK

1. Check all metal parts under strong light and 10-power magnification for cracks, burrs, and corrosion.

2. Check all threads for cross-threading, stripping and dirt accumulation.

3. Check all packing grooves for obstructions or defects that might damage O-rings and backup rings.

4. Check all plated or painted surfaces for blistering, flaking, and continuity of plating.

5. Perform a fluorescent dye penetrant examination on supports (14 and 15), gland (25), bushing (26), and cylinder (38). (See figure 1101.)

6. Perform a magnetic particle examination on trunnion (7), nut (19), rod end (22), piston (33), and sleeve (34).

REPAIR

1. Repair (See figure 1101.)

   A. Remove minor scratches, nicks, and corrosion by polishing with abrasive cloth, 220 grit or finer. Maintain limits specified on figure 601.

   B. Chase or file minor thread damage.

   C. Repair of Trunnion (7) -- Grind, per Subject 20-10-01, 1.050 inch diameter to a minimum of 1.043 inch and 8 microinch finish. Build up with hard chrome plate, per Subject 20-42-03. Grind per Subject 20-10-04, to restore original design dimension shown on figure 601, and 8 microinch finish.

   D. Repair of Piston (33)

      (1) Repair of 1.8665 inch diameter -- Machine to clean up. Minimum allowable rework diameter is 1.8475 inches. Build up with hard chrome plate per Subject 20-42-03. Grind per Subject 20-10-04, to restore original design dimension shown on figure 601, and 16 microinch finish. Maintain concentricity within 0.002 inch TIR to piston rod OD.

      (2) Repair of 0.747 inch diameter -- Machine to clean up. Minimum allowable rework diameter is 0.728 inch. Build up with hard chrome plate per Subject 20-42-03. Grind per Subject 20-10-04, to restore original design dimension shown on figure 601, and 8 microinch finish. Maintain concentricity within 0.002 inch TIR to piston head OD.

2. Refinish

   NOTE: Refer to Subject 20-30-02 for stripping of protective finishes and to Subject 20-41-01 for decoding of F and SRF finish symbols and their BAC equivalents.

   A. If plated or painted surfaces are worn or chipped, refinish listed items as indicated below.

      (1) Retainer Plate (5) -- Apply F-1.1923 all over

      (2) Trunnion (7) -- Apply F-1.1923 except F-1.842 on 1.050 inch OD and no finish on hydraulic passage grooves

      (3) Supports (14 and 15) -- Apply SRF-2.30 except no primer on holes for bushings

(4) Nut (19) -- Apply F-1.1913 all over

(5) Rod End (22) -- Apply F-1.1923, 0.0003-0.0005 inch single plate thickness, except no plating on hole for bearing (23)

(6) Gland (25) -- Apply F-4.201, 0.0003-0.0005 inch single plate thickness, except no plating on ID

(7) Bushing (26) and Piston (33) -- Refinish as shown on Fig. 401.

(8) Cylinder (38) -- Apply F-2.20 plus SRF-12.206 on exterior surfaces only. Alodine (F-2.940) any aluminum surface from which anodizing was removed during assembly.

3. Replacement

A. Replace all parts found unserviceable or damaged beyond repair.

B. Replace all O-ring packings (11, 28, 30, 32, and 36), cap rings (10 and 31), scraper (24), foot seal (27), backup rings (29 and 35), and channel seal (31) at each overhaul.

C. If bushings need replacement proceed as indicated:

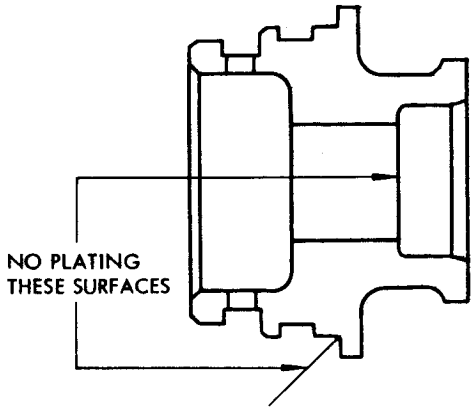
(1) Bushings (17) -- Press new bushing with 0.0005-0.0025 inch interference fit and machine ID to 1.053-1.055 inch diameter. Maintain perpendicular to support (14 or 15) face within 0.001 inch. Refer to Fig. 402.

(2) Bushings (42) -- Press new bushings with 0.0000-0.0020 inch interference fit. Using old pin holes as pilots, drill 0.1250-0.1255 inch diameter pin holes through bushings (42) and cylinder (38) and press new pins (41) flush with bushings (42). Machine ID in line, to 1.053-1.055 inch diameter.

(3) Bushings (16) -- Press new bushing with 0.0002-0.0019 inch interference fit. Machine ID to 0.6245-0.6255 inch diameter so that the two bushings (16) are in line within 0.001 inch FIM after assembly. Refer to Fig. 402. Maintain perpendicular to support (14 or 15) face within 0.001 inch.

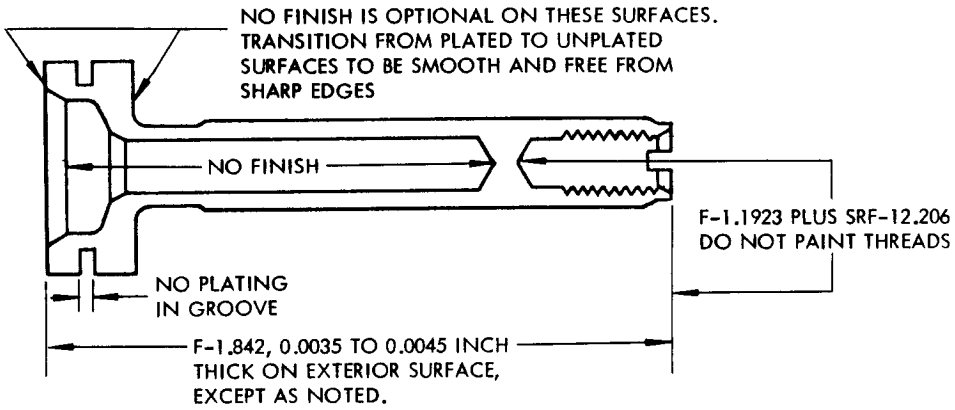
D. Replace lockwasher (20) at each overhaul.

E. If bearing (23) needs replacement, install new bearing per 20-50-03 using roller staking method.



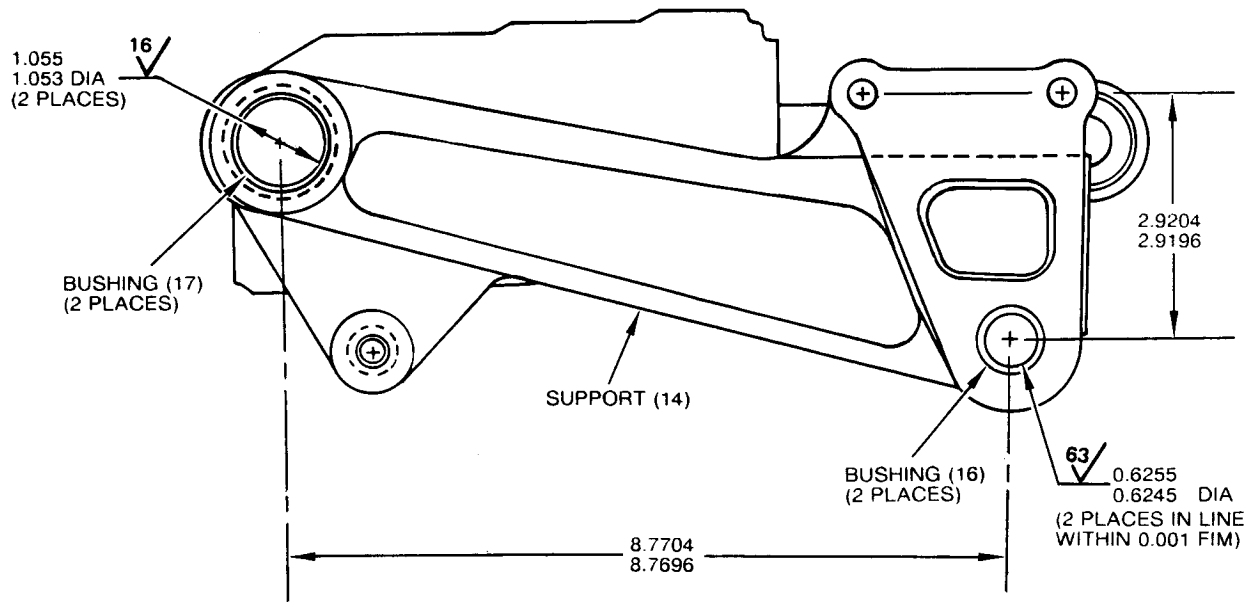
F-4.201, 0.0003 TO 0.0005
INCH THICK, EXCEPT AS NOTED

BUSHING (26)



PISTON (33)

Refinish Diagram
Figure 401



Bushing Replacement
Figure 402

ASSEMBLY

1. Assembly (Fig. 1101)

   A. Hold piston (33) by the wrench flats in vise or fixture that will not damage it.

   B. Lightly lubricate cap ring or channel seal (31) and O-ring packing (32) with BMS 3-11 hydraulic fluid and install on piston (33) head.

   C. Lightly lubricate backup rings (29) and O-ring packing (30) with BMS 3-11 hydraulic fluid and install on bushing (26). Slip bushing (26) onto piston (33) rod.

   D. Install foot seal (27), and O-ring packing (28) and gland (25) into bushing (26). Slip scraper (24) and nut (19) over piston (33) rod.

      NOTE: Optional procedure to prevent corrosion to piston rod (33) and rod end (22), consists of completely filling piston rod (33) cavity with grease before inserting rod end (22) into piston rod (33).

   E. Thread rod end (22) with lockwasher (20) onto piston (33) rod to obtain an engagement of approximately 2 threads. Apply a light coating of grease to exposed male threads of rod end (22). Tighten to a torque range of 350 to 400 pound-inches, using wrench F-71313-8. Wipe excess grease from rod end (22), lockwasher (20) and piston (33), using clean cloth. Clean contact areas between rod end (22) and lockwasher (20) and between lockwasher (20) and piston (33), where sealant will be applied, using clean cloth wetted with solvent. Apply a bead of sealant to contact areas and allow sealant to cure. Check that sealant has bonded to surfaces.

      NOTE: Tang of lockwasher fits into slot on piston rod. Break flange of lockwasher with an 0.14 inch square punch to fit into slot on rod end farthest from slot on piston.

   F. Hold cylinder assembly (37) in vise or fixture that will not damage it. Thoroughly lubricate cylinder bore with hydraulic fluid BMS 3-11. Insert backup rings (35) and O-ring packing (36) into cylinder (38).

G. Install sleeve (34) and preassembled items (19 thru 33) into cylinder (38) to obtain an engagement of approximately 2 threads. Apply a light coating of grease to exposed male threads of nut (19). Tighten nut (19) to a torque range of 150 to 200 pound-inches. Wipe excess grease from nut (19) and cylinder (38) using clean cloth. Clean contact area between nut (19) and cylinder (38), where sealant will be applied, using clean cloth wetted with solvent. Apply a bead of sealant to contact area and allow sealant to cure. Check that sealant has bonded to surfaces. Lockwire nut (19) to cylinder (38) using double twist method.

H. Lightly coat cap rings (10) and O-rings (11) with hydraulic fluid BMS 3-11 and install on trunnion (7) per 20-50-06.

J. Install support assemblies (12 and 13), trunnion assembly (6), plate, retainer (5), bolts (1 and 3) and washers (2 and 4) on cylinder assembly (37).

2. Materials

A. Hydraulic Fluid -- BMS 3-11 (Ref 20-60-03)

B. Lubricating Grease -- Batco 8401 No. 1 (No. 2 optional) (Ref 20-60-03)

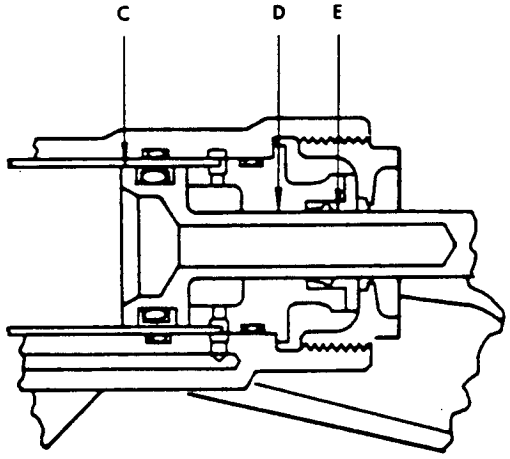
C. Sealant -- BMS 5-26 Type II, Class B-1/2 (Class B-2 optional) (Ref 20-60-04)

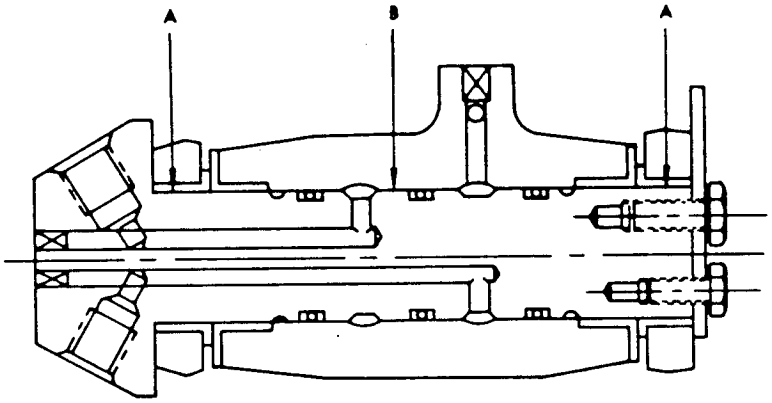
D. Solvent -- Methyl ethyl ketone (TT-M-261) or equivalent (Ref 20-60-01)

FITS AND CLEARANCES

1. Figure 601 lists original design dimensions and service wear limits for certain close tolerance parts of the assembly. The original design dimensions are to be used as a guide for rework of parts which fail to meet the wear tolerance requirements. Unless otherwise specified in the rework procedure, a part should be returned to the design dimensions whenever rework is accomplished.

2. Clearances are given to aid assembly of the component. The value given in the "Maximum Allowable Clearance" column is the maximum permitted to ensure proper functioning until the next overhaul cycle of the component. If assembled parts fail to meet these requirements, one or more of the parts must be rejected. Parts that are rejected should be reworked if within the rework limits given in the repair procedure; if not within rework limits, the parts should be scrapped. It is recommended that whenever newly reworked parts are assembled, the design clearances should be used as the guiding assembly criteria.





Ref. Letter Fig.601	Mating Index No. Fig.1101		Original Design Limits: Dimension (inch) Min.	Original Design Limits: Dimension (inch) Max.	Original Design Limits: Assembly Clearance (inch) Min.	Original Design Limits: Assembly Clearance (inch) Max.	Service Wear Limits: Dimension Limits (inch) Min.	Service Wear Limits: Dimension Limits (inch) Max.	Service Wear Limits: Maximum Allowable Clearance (inch)
A	ID	(12)(13)	1.053	1.055	0.002	0.006		1.061	0.010
	OD	(7)	1.049	1.051			1.043		
B	ID	(37)	1.053	1.055	0.002	0.006		1.061	0.010
	OD	(7)	1.049	1.051			1.043		
C	ID	(34)	1.8700	1.8720	0.0025	0.0065		1.8750	0.0085
	OD	(33)	1.8655	1.8675			1.8640		
D	ID	(26)	0.750	0.752	0.002	0.006		0.755	0.009
	OD	(33)	0.746	0.748			0.745		
E	ID	(25)	0.750	0.752	0.002	0.006		0.755	0.007
	OD	(33)	0.746	0.748			0.745		

TESTING

1. Test Equipment

   A. Hydraulic test stand capable of supplying graduated pressure up to 4500 psi.

   B. 0-100cc graduated cylinder.

2. Preparation for Test

   A. Conduct test at room temperature.

   B. Thread sizes of extend and retract ports are 7/16-20 UNF-3B.

   C. Fill the actuator with hydraulic fluid BMS 3-11 and bleed off all air. Use of Skydrol 7000 is optional.

      CAUTION: DO NOT APPLY COMPRESSED AIR TO PORTS AT ANY TIME. DO NOT CYCLE UNIT AT PROOF PRESSURE.

3. Testing

   A. With the piston fully extended, apply a proof pressure of 4500 psi at the extend port for a period of 2 minutes. There shall be no external leakage and no evidence of damage.

   B. Cycle unit at 3000 psi through 25 cycles. Leakage at the piston seal shall not exceed one drop. The unit shall operate smoothly with no tendency to stick or lag.

   C. Repeat 3.A. with 5 psi pressure. There shall be no leakage or permanent set.

   D. With the piston fully extended, apply 3000 psi pressure at the extend port for 2 minutes. Leakage from the retract port shall not exceed 10cc per minute.

   E. Repeat 3.A., 3.C. and 3.D. with piston fully retracted and pressure applied at the retract port.

      CAUTION: TESTS MUST BE CONDUCTED IN SEQUENCE SHOWN.

Test Phase	Limit
1) Piston fully extended, apply 4500 psi to extend port for 2 minutes	1) No leakage or evidence of damage
2) Cycle unit at 3000 psi through 25 cycles	2) Leakage at piston seal shall not exceed one drop. Smooth operation, no sticking or lagging
3) Repeat 1) with 5 psi pressure	3) No leakage or permanent set
4) Piston fully extended, apply 3000 psi to extend port for 2 minutes	4) Leakage from retract port shall not exceed 10cc per minute
5) Repeat 1) with piston fully retracted and pressure applied to retract port	5) No leakage or evidence of damage
6) Repeat 3), piston fully retracted and pressure at retract port	6) No leakage or permanent set
7) Repeat 4), piston fully retracted and pressure applied to retract port	7) Leakage from extend port shall not exceed 10cc per minute

TROUBLE SHOOTING

1. Trouble during test after overhaul. (See figure 1101.)

	Trouble	Possible Cause	Correction
A.	Leakage at piston (33) rod seal exceeds one drop	Defective O-ring packings (28 and 30), backup rings (29) or foot seal (27)	Replace O-ring packings backup rings and foot seal
B.	Movement of piston (33) is erratic or it sticks	Presence of foreign matter, or defective cap ring (31), channel seal (31) or O-ring packing (32)	Replace cap ring or channel seal and O-ring packing
C.	Excessive leakage from one port, while pressure is applied to other port	Defective cap ring (31) or channel seal (31), O-ring packings (32 and 36), or backup rings (35)	Replace cap ring or channel seal, O-ring packings and backup rings

STORAGE INSTRUCTIONS

1. After testing, partially fill actuator with hydraulic fluid BMS 3-11 and cap or plug ports with hydraulic fluid resistant plugs to prevent leakage during storage. If Skydrol 7000 was used during testing, unit must be thoroughly drained before filling with BMS 3-11 hydraulic fluid.

2. Wrap the assembly in vapor barrier paper. Tag actuator with date and cure date for packings. Tag should carry the following information: "This unit contains BMS 3-11 hydraulic fluid."

3. For further information, refer to "Temporary Protective Coatings," Subject 20-44-02.

SPECIAL TOOLS, FIXTURES AND EQUIPMENT

NOTE: Equivalent substitutes may be used.

1. Rod End Wrench -- F-71313-8

ILLUSTRATED PARTS LIST

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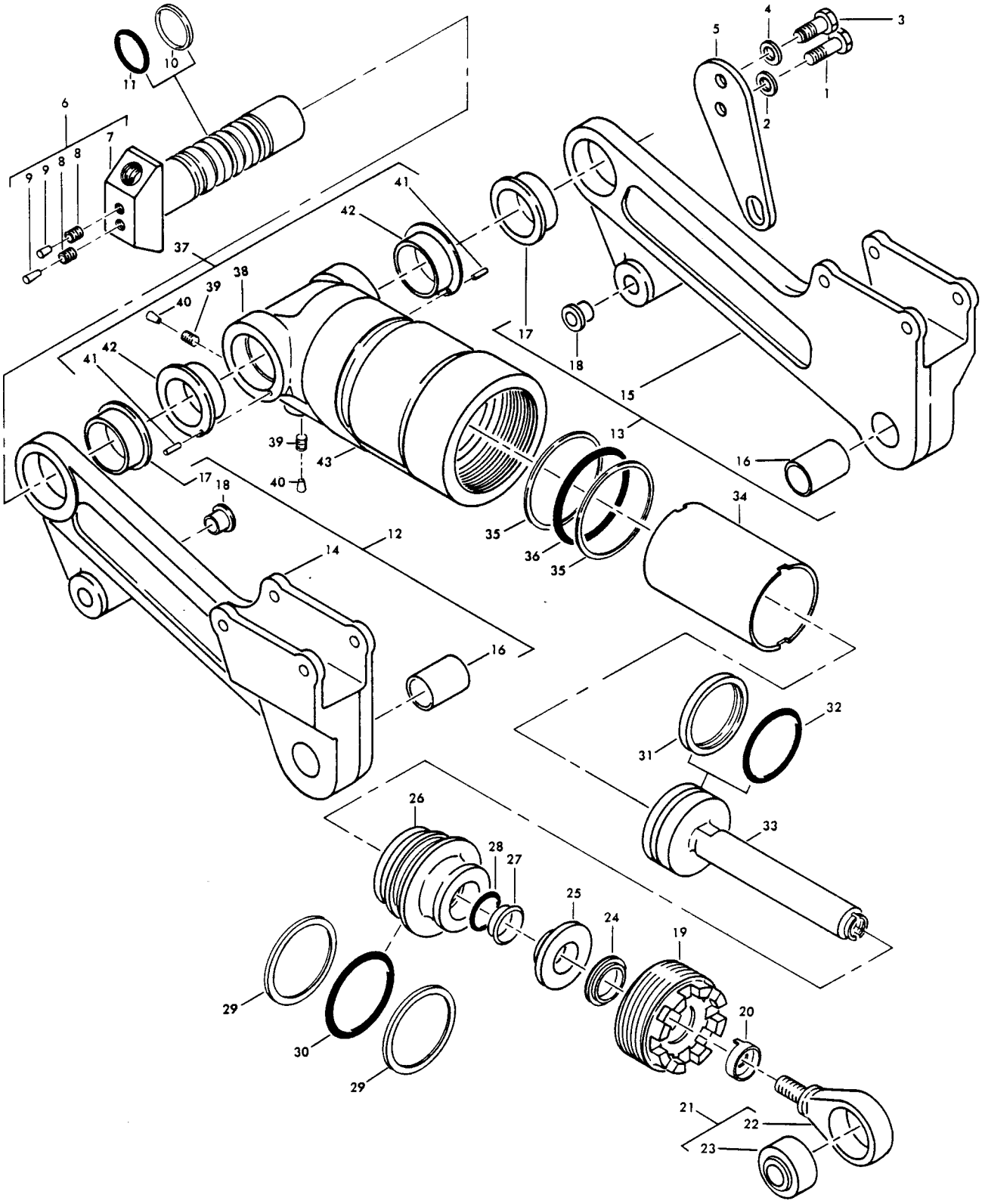

Ground Spoiler Actuator Assembly
Figure 1101

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101					
	65-44951-1		GROUND SPOILER ACTUATOR ASSY	A	RF
	65-44951-2		GROUND SPOILER ACTUATOR ASSY	B	RF
	65-44951-5		GROUND SPOILER ACTUATOR ASSY	C	RF
	65-44951-6		GROUND SPOILER ACTUATOR ASSY	D	RF
	65-44951-7		GROUND SPOILER ACTUATOR ASSY	E	RF
	65-44951-8		GROUND SPOILER ACTUATOR ASSY	F	RF
1	BACB30NE4H2		. BOLT (REPLS NAS1304-2H)		1
2	AN960-416L		. WASHER		1
3	BACB30NF3H2		. BOLT (REPLS NAS1303-2H)		1
4	AN960-10L		. WASHER		1
5	69-35831-1		. RETAINER		1
6	65-44958-1		. TRUNNION ASSEMBLY		1
7	65-44958-2		. . TRUNNION		1
8	BACP20AX12		. . PLUG		2
9	BACP20AX12P		. . PIN		2
10	BACR12BE211AN		. RING, PACKING CAP		3
11	NAS1611-211		. PACKING, O-RING		3
12	65-44954-1		. SUPPORT ASSEMBLY		1
13	65-44954-2		. SUPPORT ASSEMBLY		1
14	65-44954-3		. . SUPPORT (USED ON 65-44954-1)		1
15	65-44954-4		. . SUPPORT (USED ON 65-44954-2)		1
16	BACB28U10B112		. . BUSHING (USED ON 65-44954-1 AND -2)		1
17	BACB28W16B43		. . BUSHING (USED ON 65-44954-1 AND -2)		1
18	BACB28X5B28		. . BUSHING (USED ON 65-44954-1 AND -2)		1
19	69-30124-1		. NUT		1
20	66-12156-1		. LOCKWASHER		1
21	69-35678-1		. ROD END ASSEMBLY		1
22	69-35678-2		. . ROD END		1
23	BLFN10-021		. . BEARING, V81376 (BOEING, 10-60545-117S)		1
23	KSBG10N5		. . BEARING, V97613 (BOEING 10-60545-117S)		1
23	SBS20ATC38		. . BEARING, V21335 (BOEING 10-60545-117S)		1
23	TFA10A		. . BEARING, V77896 (BOEING 10-60545-117S)		1
23	03-728-0625		. . BEARING, V09455 (BOEING 10-60545-117S)		1
24	BACS34A5		. SCRAPER		1
25	66-20911-1		. GLAND		1
26	66-20908-1		. BUSHING		1

FIG. & ITEM NO.	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USE CODE	QTY PER ASSY
1101					
27	BACS11AA116		. SEAL, FOOT		1
28	NAS1611-116		. PACKING, O-RING		1
29	MS28774-134		. RING, BACKUP		2
30	NAS1611-134		. PACKING, O-RING		1
31	BACR12BH325		. SEAL, CHANNEL	AB	1
31	69-54540-325		. RING, CAP	C-F	1
32	NAS1611-325		. PACKING, O-RING		1
33	69-30120-2		. PISTON		1
34	69-30125-1		. SLEEVE		1
35	MS28774-137		. RING, BACKUP		2
36	NAS1611-137		. PACKING, O-RING		1
37	65-37565-1		. CYLINDER ASSEMBLY	A-D	1
37	65-37565-5		. CYLINDER ASSEMBLY	EF	1
38	65-37565-2		. . CYLINDER (USED ON 65-37565-1)		1
38	65-37565-6		. . CYLINDER (USED ON 65-37565-5)		1
39	BACP20AX18D		. . PLUG		2
40	BACP20AX18DP		. . PIN		2
41	NAS607-2-3P		. . PIN		2
42	66-13322-1		. . BUSHING		2
43	BACN12S6J		. NAMEPLATE		1

VENDORS

V09455 LEAR STEGLER INC., TRANSPORT DYNAMICS DIV., P.O. BOX 1953, 3131 WEST SEGERSTROM AVE., SANTA ANA, CALIFORNIA 92702

V21335 FAFNIR BEARING CO., DIVISION OF TEXTRON INC., 37 BOOTH STREET, NEW BRITAIN, CONNECTICUT 06050

V77896 REXNORD INC., BEARING DIV., 2400 CURTIS ST., DOWNERS GROVE, ILLINOIS 60515

V81376 SOUTHWEST PRODUCTS CO., 1705 SOUTH MOUNTAIN AVE., MONROVIA, CALIFORNIA 91016

V97613 SARGENT INDUSTRIES, KAHR BEARING DIV., 3010 N. SAN FERNANDO RD., BURBANK, CALIFORNIA 91503