TO: ALL HOLDERS OF RUDDER CONTROL COMPONENTS COMPONENT MAINTENANCE MANUAL 27-21-60

REVISION NO. 3 DATED OCT 01/90

HIGHLIGHTS

Pages which have been added or revised are outlined below together with the highlights of the revision. Remove and insert the affected pages as listed and enter Revision No. and date on the Record of Revision Sheet.

CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
REPAIR 3-1 602	Changed dimension lines.

RUDDER CONTROL COMPONENTS

PART NUMBER: SEE CONTENTS, PAGE 1

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

REVISION RECORD

- Retain this record in front of manual. On receipt of revision, insert revised pages in the manual, and enter revision number, date inserted and initial.

REVISION NUMBER	REVISION DATE	DATE FILED	BY	REVISION NUMBER	REVISION DATE	DATE FILED	BY

TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR B11233	APR 10/85

PAGE	DATE	CODE
27-21-60		
TITLE PAGE		
1	OCT 10/84	01
2	BLANK	
REVISION RECORD		
1	OCT 10/84	01
2	BLANK	
TR & SB RECORD		
1	APR 10/85	01.1
2	BLANK	
LIST OF EFFECTIVE PAGES		
*1	OCT 01/90	01
THRU LAST PAGE		
CONTENTS		
1	OCT 10/84	01
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INTRODUCTION		
1	OCT 10/84	01
2	BLANK	
REPAIR-GENERAL		
601	OCT 10/84	01
602	OCT 10/84	01
REPAIR 1-1		
601	OCT 10/84	01
602	OCT 10/84	01
REPAIR 2-1		
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*602	OCT 01/90	01.1
REPAIR 4-1		
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602	OCT 10/84	01
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601	APR 10/85	01.1
602	APR 10/85	01.1
REPAIR 6-1		
601	APR 01/89	01.1
602	APR 01/89	01.1
ILLUSTRATED PARTS LIST		
1001	OCT 10/84	01
1002	OCT 10/84	01
1003	BLANK	
1004	OCT 10/84	01
1005	APR 10/85	01.1
1006	OCT 10/84	01
1007	OCT 10/84	01
1008	OCT 10/84	01
1009	OCT 10/84	01
1010	BLANK	

* = REVISED, ADDED OR DELETED

TABLE OF CONTENTS

NOTE: This manual contains overhaul data for various components of the Rudder Control System. Functions which cannot be performed by the use of standard industry practices are included in repair instructions for each component.

RUDDER CONTROL COMPONENTS

INTRODUCTION

The instructions in this manual provide the information necessary to perform maintenance functions ranging from simple checks and replacement to complete shop-type repair.

This manual is divided into separate sections:

1. Title Page
2. Record of Revisions
3. Temporary Revision & Service Bulletin Record
4. List of Effective Pages
5. Table of Contents
6. Introduction
7. Procedures & IPL Sections

Refer to the Table of Contents for the page location of applicable sections. An asterisked flagnote *[ ] in place of the page number indicates that no special instructions are provided since the function can be performed using standard industry practices.

The beginning of the REPAIR section includes a list of the separate repairs, a list of applicable standard Boeing practices, and an explanation of the True Position Dimensioning symbols used.

An explanation of the use of the Illustrated Parts List is provided in the Introduction to that section.

All weights and measurements used in the manual are in English units, unless otherwise stated. When metric equivalents are given they will be in parentheses following the English units.

Design changes, optional parts, configuration differences and Service Bulletin modifications create alternate part numbers. These are identified in the Illustrated Parts List (IPL) by adding an alphabetical character to the basic item number. The resulting item number is called an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless otherwise indicated.

REPAIR - GENERAL

1. Content

   A. Each separate repair includes, as applicable, check, repair and refinish instructions.

2. Standard Practices

   A. Refer to the following standard practices as applicable, for details of procedures in individual repairs.

      20-10-04 Grinding of Chrome Plated Parts
      20-20-02 Penetrant Methods of Inspection
      20-30-02 Stripping of Protective Finishes
      20-41-01 Decoding Table for Boeing Finish Codes
      20-42-03 Hard Chrome Plating
      20-43-01 Chromic Acid Anodizing
      20-50-03 Bearing Installation and Retention

3. Materials

   NOTE: Equivalent substitutes may be used.

   A. Primer -- BMS 10-11, type 1 (Ref 20-60-02)

   B. Adhesive -- Type 70 (Ref 20-50-12)

   C. Enamel -- BMS 10-11, type 2, color BAC702 white (Ref 20-60-02)

4. Dimensioning Symbols

A. Standard True Position Dimensioning Symbols used in applicable repair procedures are shown in Fig. 601.

—	STRAIGHTNESS
▱	FLATNESS
⊥	PERPENDICULARITY (OR SQUARENESS)
//	PARALLELISM
○	ROUNDNESS
⌭	CYLINDRICITY
⌒	PROFILE OF A LINE
⌓	PROFILE OF A SURFACE
◎	CONCENTRICITY
⌯	SYMMETRY
∠	ANGULARITY
↗	RUNOUT
⌖	THEORETICAL EXACT POSITION OF A FEATURE (TRUE POSITION)
∅	DIAMETER
BASIC (BSC) OR [DIM]	A THEORETICALLY EXACT DIMENSION USED TO DESCRIBE SIZE, SHAPE OR LOCATION OF A FEATURE FROM WHICH PERMISSIBLE VARIATIONS ARE ESTABLISHED BY TOLERANCES ON OTHER DIMENSIONS OR NOTES.
[-A-]	DATUM
Ⓜ	MAXIMUM MATERIAL CONDITION (MMC)
Ⓢ	REGARDLESS OF FEATURE SIZE (RFS)
Ⓟ	PROJECTED TOLERANCE ZONE

EXAMPLES

— 0.002	STRAIGHT WITHIN 0.002
⊥ B 0.002	PERPENDICULAR TO B WITHIN 0.002
// A 0.002	PARALLEL TO A WITHIN 0.002
○ 0.002	ROUND WITHIN 0.002
⌭ 0.010	CYLINDRICAL SURFACE MUST LIE BETWEEN TWO CONCENTRIC CYLINDERS, ONE OF WHICH HAS A RADIUS 0.010 INCH GREATER THAN THE OTHER
⌒ A 0.006	EACH LINE ELEMENT OF THE SURFACE AT ANY CROSS SECTION MUST LIE BETWEEN TWO PROFILE BOUNDARIES 0.006 INCH APART IN RELATION TO DATUM PLANE A
⌓ A 0.020	SURFACES MUST LIE WITHIN PARALLEL BOUNDARIES 0.02 INCH APART AND EQUALLY DISPOSED ABOUT TRUE PROFILE
◎ C ∅ 0.0005	CONCENTRIC TO C WITHIN 0.0005 DIAMETER (FULL INDICATOR MOVEMENT)
⌯ A 0.010	SYMMETRICAL WITH A WITHIN 0.010
∠ A 0.005	ANGULAR TOLERANCE 0.005 WITH A
⌖ B ∅ 0.002 Ⓢ	LOCATED AT TRUE POSITION WITHIN 0.002 DIA IN RELATION TO DATUM B, REGARDLESS OF FEATURE SIZE
⊥ A ∅ 0.010 Ⓜ 0.510 Ⓟ	AXIS IS TOTALLY WITHIN A CYLINDER OF 0.010-INCH DIAMETER, PERPENDICULAR TO, AND EXTENDING 0.510-INCH ABOVE, DATUM A, MAXIMUM MATERIAL CONDITION
[2.000] OR 2.000 BSC	EXACT DIMENSION IS 2.000

True Position Dimensioning Symbols
Figure 601

143993

BEARING HOUSING - REPAIR 1-1

69B81070-1

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction.

1. Penetrant check housing per 20-20-02.

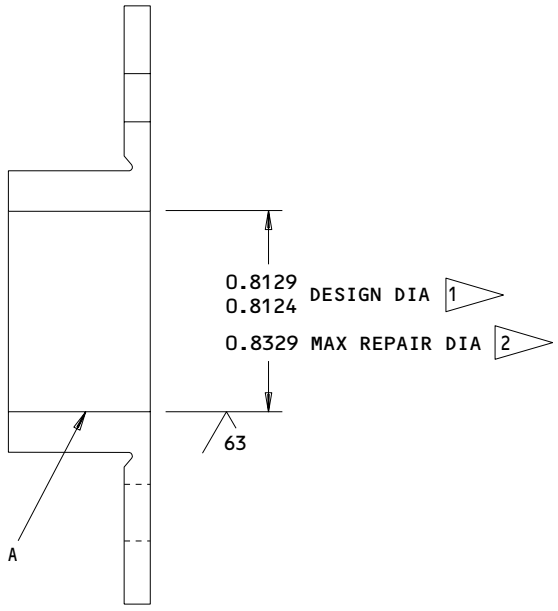
2. Repair

   A. Bearing seat repair (Fig. 601).

      (1) Machine bearing seat as required, within repair limit, shown to remove defects.

      (2) Build up repair surface with chrome plate and grind to design dimension and finish shown.

   B. Housing refinish -- Fig. 601



REFINISH

CHEMICAL TREAT (F-17.01) AND APPLY 1 COAT OF PRIMER (F-20.02) EXCEPT AS NOTED IN 1

1 OMIT PRIMER THIS SURFACE

2 BUILD UP WITH CHROME PLATE (F-15.03) AND GRIND TO DESIGN DIM AND FINISH SHOWN

REPAIR

REF 2

125 ALL MACHINED SURFACES EXCEPT AS NOTED

BREAK ALL SHARP EDGES 0.008R

MATERIAL: AL ALLOY

Ref Letter Fig.601	Mating Item No. IPL Fig.1	Design Dimension				Service Wear Limit		
		Dimension		Assembly Clearance *[1]		Dimension		Maximum Clearance
		Min	Max	Min	Max	Min	Max	
A	ID 5	0.8124	0.8129	-0.0001	0.0009		0.8150	0.0040
	OD *[2]	0.8120	0.8125			0.8110		

*[1] NEGATIVE VALUES DENOTE INTERFERENCE FIT
*[2] INSTALLATION PART BBACB10AC5A
ALL DIMENSIONS ARE IN INCHES

69B81070-1
Housing Repair
Figure 601

144045

BEARING HOUSING ASSY - REPAIR 2-1

69B81071-1

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction, Fig. 601. Item numbers refer to IPL Fig. 1.

1. Penetrant check housing (30) per 20-20-02.

2. Repair

   A. Bearing (25) replacement.

      (1) Remove bearing.

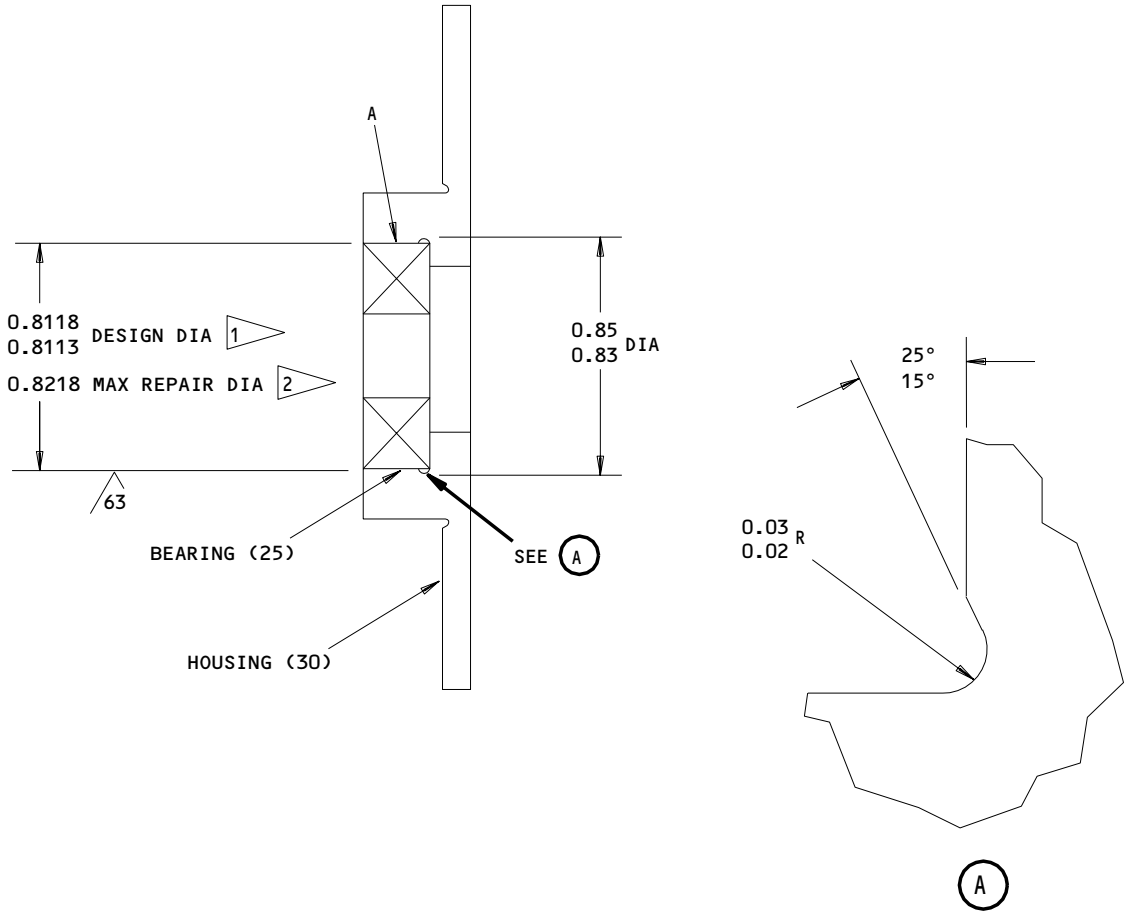
      (2) Install replacement bearing and roller swage type 1 per 20-50-03 except install bearing with primer instead of grease.

   B. Bearing seat repair (Fig. 601).

      (1) Machine bearing seat as required, within repair limit shown to remove defects.

      (2) Build up repair surface with chrome plate and grind to design dimension and finish shown.

   C. Housing refinish -- Fig. 601



REFINISH

CHEMICAL TREAT (F-17.01) AND APPLY 1 COAT OF PRIMER (F-20.02) EXCEPT AS NOTED IN 1

1 OMIT PRIMER THIS SURFACE

2 BUILD UP WITH CHROME PLATE (F-15.03) AND GRIND TO DESIGN DIM AND FINISH SHOWN

REPAIR

REF 2

125 ALL MACHINED SURFACES EXCEPT AS NOTED

BREAK ALL SHARP EDGES 0.008 R

MATERIAL: AL ALLOY

Ref Letter Fig.601	Mating Item No. IPL Fig.1	Design Dimension				Service Wear Limit		
		Dimension		Assembly Clearance		Dimension		Maximum Clearance
		Min	Max	Min	Max	Min	Max	
A	ID 30	0.8113	0.8118	-0.0012	0.0002		0.8120	0.0000
	OD 25	0.8120	0.8125			0.8120		

ALL DIMENSIONS ARE IN INCHES

69B81071-1
Housing Repair
Figure 601

144047

SUPPORT ASSY - REPAIR 3-1

253T3119-1, -2

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction, Fig. 601. Item numbers refer to IPL Fig. 2.

1. Penetrant check support (10) per 20-20-02.

2. Repair

   A. Bearing replacement.

      (1) Remove bearing.

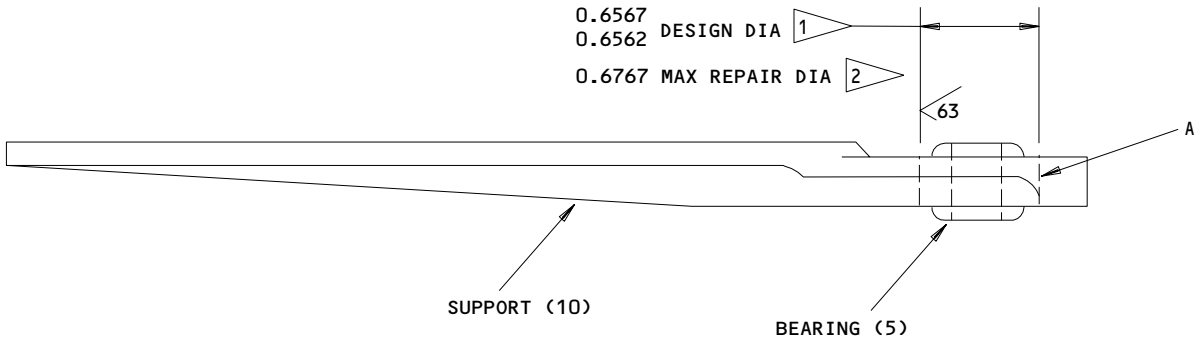
      (2) Install replacement bearing and double swage per 20-50-03.

   B. Bearing bore repair.

      (1) Machine bearing bore as required, within repair limit shown to remove defects.

      (2) Build up repair surface with chrome plate and grind to design dimension and finish shown.

   C. Support (10) refinish -- Fig. 601.



REFINISH

CHROMIC ACID ANODIZE AND
APPLY 1 COAT OF PRIMER (F-18.13)
APPLY 1 COAT OF ENAMEL (F-21.03)
EXCEPT AS NOTED

1 OMIT PRIMER AND ENAMEL THIS SURFACE

2 BUILD UP WITH CHROME PLATE (F-15.03) AND GRIND TO DESIGN DIM AND FINISH SHOWN

REPAIR

REF 2

125 ALL MACHINED SURFACES EXCEPT AS NOTED

BREAK ALL SHARP EDGES 0.008 R

MATERIAL: AL ALLOY

Ref Letter Fig.601	Mating Item No. IPL Fig.2	Design Dimension				Service Wear Limit		
		Dimension		Assembly Clearance		Dimension		Maximum Clearance
		Min	Max	Min	Max	Min	Max	
A	ID 10 OD 5	0.6562 0.6557	0.6567 0.6562	0.0000	0.0010	0.6537	0.6587	0.005

ALL DIMENSIONS ARE IN INCHES

253T3119-1,-2
Support Repair
Figure 601

144050

SUPPORT ASSY - REPAIR 4-1

253T3119-5

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction, Fig. 601. Item numbers refer to IPL Fig. 3.

1. Penetrant check support (10) per 20-20-02.

2. Repair

   A. Bearing replacement.

      (1) Remove bearing.

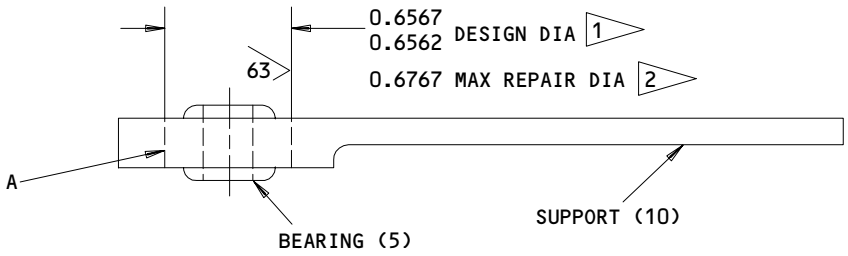
      (2) Install replacement bearing and double swage per 20-50-03.

   B. Bearing bore repair.

      (1) Machine bearing bore as required, within repair limit shown to remove defects.

      (2) Build up repair surface with chrome plate and grind to design dimension and finish shown.

   C. Support (10) refinish -- Fig. 601.



REFINISH

CHROMIC ACID ANODIZE AND
APPLY 1 COAT OF PRIMER (F-18.13) THEN
APPLY ENAMEL (F-21.03) EXCEPT AS NOTED

1 OMIT PRIMER AND ENAMEL THIS SURFACE

2 BUILD UP WITH CHROME PLATE (F-15.03) AND
GRIND TO DESIGN DIM AND FINISH SHOWN

REPAIR

REF 2

125 ALL MACHINED SURFACES EXCEPT AS NOTED

BREAK ALL SHARP EDGES 0.008R

MATERIAL: AL ALLOY

Ref Letter Fig.601	Mating Item No. IPL Fig.3	Design Dimension				Service Wear Limit		
		Dimension		Assembly Clearance		Dimension		Maximum Clearance
		Min	Max	Min	Max	Min	Max	
A	ID 10	0.6562	0.6567	0.0000	0.0010		0.6587	0.005
	OD 5	0.6557	0.6562			0.6537		

ALL DIMENSIONS ARE IN INCHES

253T3119-5
Support Repair
Figure 601

SHAFT ASSY - REPAIR 5-1

253T3616-2, -3

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction. Item numbers refer to IPL Fig. 1.

1. Penetrant check lever (45, 50), shaft (65) per 20-20-02.

2. Magnetic particle check stud (60) per 20-20-01.

3. Parts Replacement (Fig. 601)

   A. Remove rivets (40, 55) as required and remove damaged parts.

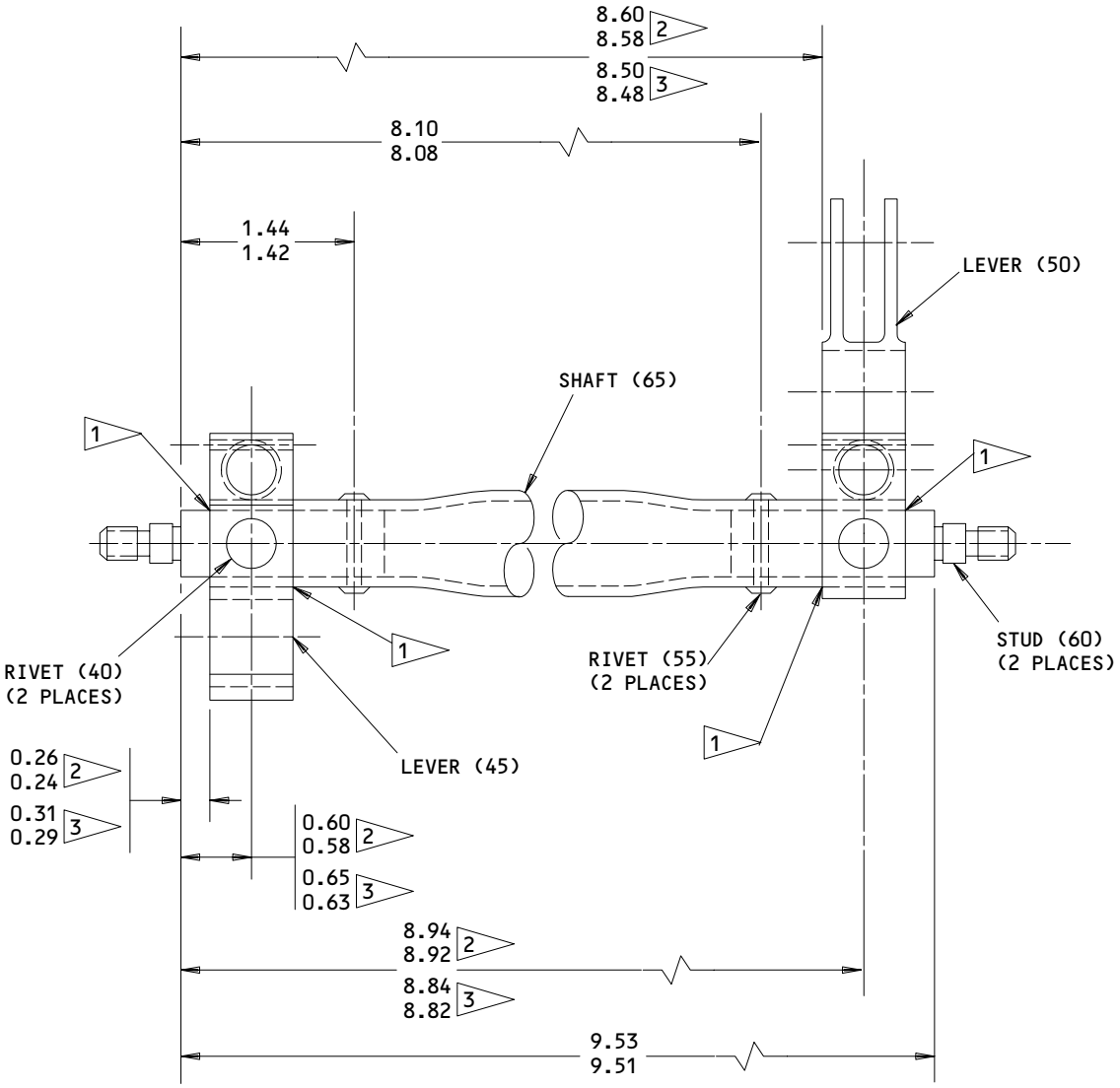
   B. Install replacement parts at position shown and bond per 20-50-12 type 70. Secure parts with rivets (40, 55) as required.

4. Refinish

   A. Lever (45, 50) -- Chemical treat (F-17.01) all over and apply 1 coat of primer (F-20.02). Omit primer in all holes except 0.687-0.708 inch diameter hole. Material: Al alloy.

   B. Stud (60) -- See REPAIR 6-1.

   C. Shaft (65) -- Chemical treat and apply 1 coat of primer (F-18.07) all over. Material: Al alloy.



1 BOND PER 20-50-12, TYPE 70
2 253T3616-2
3 253T3616-3

253T3616-2,-3

ALL DIMENSIONS ARE IN INCHES

Parts Replacement
Figure 601

STUD - REPAIR 6-1

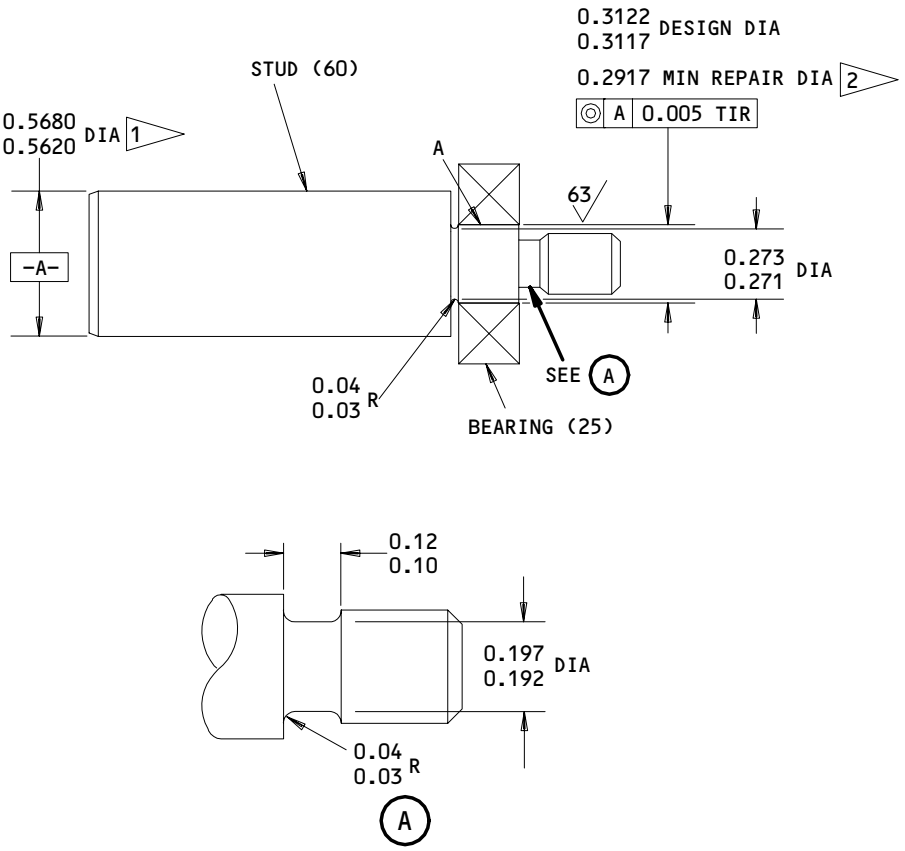
69B81074-1

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may only required stripping and restoration of original finish, refer to REFINISH instruction, Fig. 601. Item numbers refer to IPL Fig. 1.

1. Bearing Seat Repair (Fig. 601)

   A. Machine bearing seat as required, within repair limit shown to remove defects.

   B. Build up repair surface with chrome plate and grind to design dimension and finish shown.



REFINISH

PASSIVATE (F-17.09) ALL OVER AND CADMIUM PLATE AS NOTED BY 1

1 CADMIUM PLATE (F-15.02) THIS SURFACE

2 BUILD UP WITH CHROME PLATE (F-15.03) AND GRIND TO DESIGN DIMENSION AND FINISH SHOWN. OBSERVE CHROME PLATE RUNOUT PER 20-42-03

REPAIR

REF 2

125 ALL MACHINED SURFACES EXCEPT AS NOTED

BREAK ALL SHARP EDGES 0.008 R

MATERIAL: 17-4PH CRES, 180-200 KSI

ALL DIMENSIONS ARE IN INCHES

Ref Letter Fig.601	Mating Item No. IPL Fig.1	Design Dimension				Service Wear Limit		
		Dimension		Assembly Clearance		Dimension		Maximum Clearance
		Min	Max	Min	Max	Min	Max	
A	ID 25 OD 60	0.3120 0.3117	0.3125 0.3122	-0.0002	0.0008	0.3100	0.3145	0.0045

69B81074-1
Stud Repair
Figure 601

144057

ILLUSTRATED PARTS LIST

1. This section lists and illustrates replaceable or repairable component parts. The Illustrated Parts Catalog contains a complete explanation of the Boeing part numbering system.

2. Indentures show parts relationships as follows:

    Assembly
      Detail Parts for Assembly
      Subassembly
      Attaching Parts for Subassembly
        Detail Parts for Subassembly

    Detail Installation Parts (Included only if installation parts may be returned to shop as part of assembly)

3. One use code letter (A, B, C, etc.) is assigned in the EFF CODE column for each variation of top assembly. All listed parts are used on all top assemblies except when limitations are shown by use code letter opposite individual part entries.

4. Letter suffixes (alpha-variants) are added to item numbers for optional parts, Service Bulletin modification parts, configuration differences (Except left- and right-hand parts), product improvement parts, and parts added between two sequential item numbers. The alpha-variant is not shown on illustrations when appearance and location of all variants of the part is the same.

5. Service Bulletin modifications are shown by the notations PRE SB XXXX and POST SB XXXX.

    A. When a new top assembly part number is assigned by Service Bulletin, the notations appear at the top assembly level only. The configuration differences at detail part level are then shown by use code letter.

    B. When the top assembly part number is not changed by the Service Bulletin, the notations appear at the detail part level.

6. Parts Interchangeability

Optional (OPT)	The parts are optional to and interchangeable with other parts having the same item number.
Supersedes, Superseded By (SUPSDS, SUPSD BY)	The part supersedes and is not interchangeable with the original part.
Replaces, Replaced By (REPLS, REPLD BY)	The part replaces and is interchangeable with, or is an alternate to, the original part.

VENDORS

02758 NETWORKS ELECTRONIC CORP U S BEARING DIV
9750 DESOTO AVENUE
CHATSWORTH, CALIFORNIA 91311

09455 LEAR SIEGLER INC TRANSPORT DYNAMICS DIV
PO BOX 1953 3131 WEST SEGERSTROM STREET
SANTA ANA, CALIFORNIA 92702

15860 NEW HAMPSHIRE BALL BEARINGS, INCORPORATED ASTRO DIVISION
155 LEXINGTON AVENUE
LACONIA, NEW HAMPSHIRE 03246

21335 TEXTRON INC FAFNIR BEARING DIVISION
37 BOOTH STREET
NEW BRITAIN, CONNECTICUT 06050

30163 DAYRON CORP
333 MAGUIRE BLVD PO BOX 20394
ORLANDO, FLORIDA 32814

38443 TRW INC BEARING DIV
402 CHANDLER STREET
JAMESTOWN, NEW YORK 14701

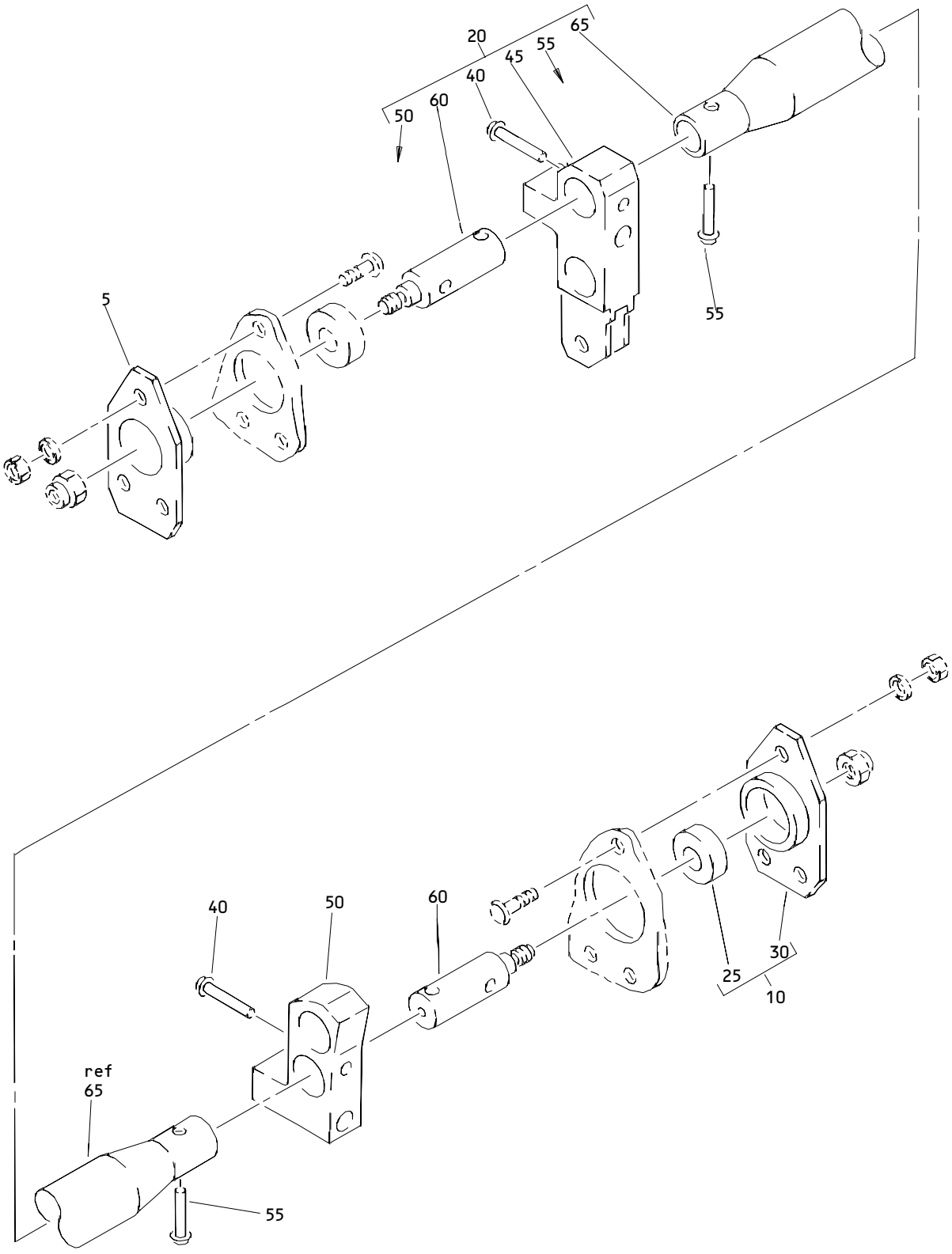
43991 FAG BEARING INCORPORATED
HAMILTON AVENUE
STAMFORD, CONNECTICUT 06904

50294 NMB INC
9730 INDEPENDENCE AVENUE
CHATSWORTH, CALIFORNIA 91311

73134 HEIM DIV INCOM INTERNATIONAL INC
60 ROUND HILL ROAD
FAIRFIELD, CONNECTICUT 06430

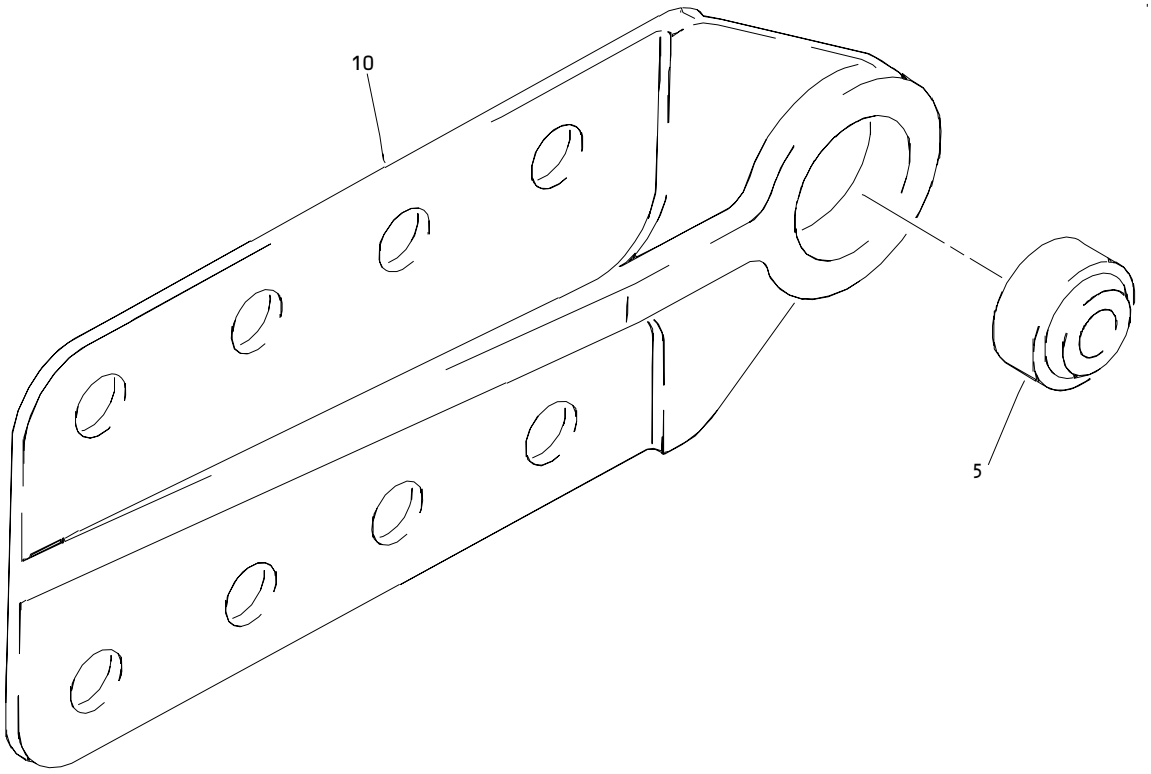
81376 SOUTHWEST PRODUCTS COMPANY
2240 BUENA VISTA ST PO BOX 2046
IRVINDALE, CALIFORNIA 91706

97613 SARGENT INDUSTRIES KAHR BEARING DIVISION
3010 NORTH SAN FERNANDO ROAD
BURBANK, CALIFORNIA 91503



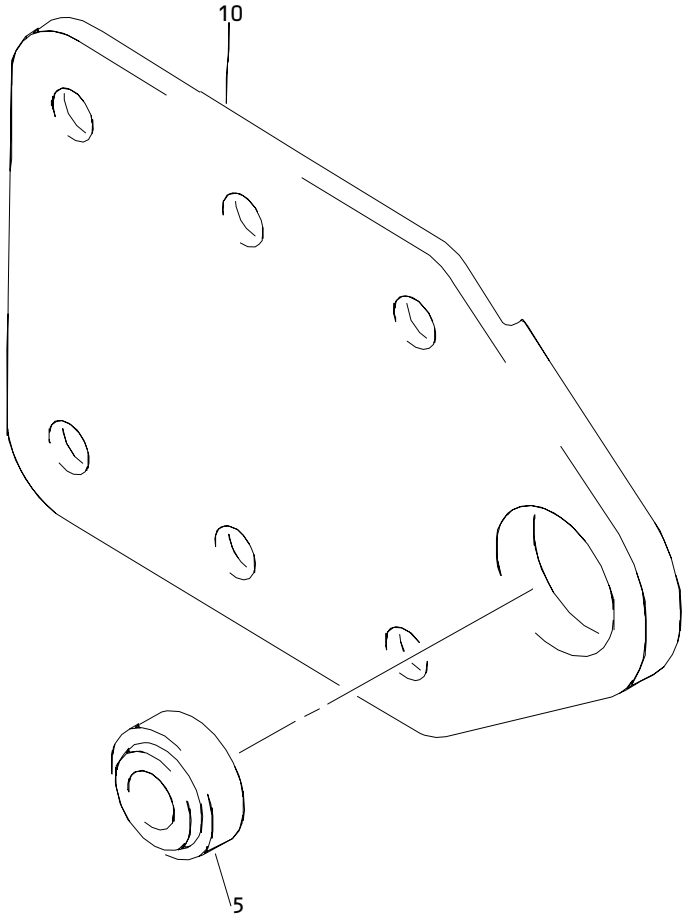
Rudder Control Components
Figure 1

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-			COMPONENTS-RUDDER CONTROL		
5	69B81070-1		HOUSING-PARKING BRAKE BRG	A	RF
10	69B81071-1		HOUSING ASSY-PARKING BRAKE BRG	B	RF
-15	253T3119-1		SUPPORT ASSY-RUD PEDAL PIVOT LINK (FOR DETAILS SEE FIG. 2)	C	RF
-15A	253T3119-2		SUPPORT ASSY-RUD PEDAL PIVOT LINK (FOR DETAILS SEE FIG. 2)	D	RF
-15B	253T3119-5		SUPPORT ASSY-RUD PEDAL PIVOT LINK (FOR DETAILS SEE FIG. 3)	E	RF
20	253T3616-2		SHAFT ASSY-PARKING BRAKE	F	RF
-20A	253T3616-3		SHAFT ASSY-PARKING BRAKE	G	RF
25	KSP5A		.BEARING- (V38443) (SPEC BACB10AC5A) (OPT HHKSP5A (V38443)) (OPT KSP5AE944OA (V21335)) (OPT KSP5AFS428 (V21335)) (OPT KSP5A2TS (V43991)) (OPT KSP5AG27 (V30163))	B	1
30	69B81071-2		.HOUSING	B	1
40	BACR15BB6D		.RIVET	FG	2
45	69B81842-1		.LEVER	FG	1
50	69B81843-2		.LEVER	FG	1
55	BACR15BB4D		.RIVET	FG	2
60	69B81074-1		.STUD	FG	2
65	253T3617-2		.SHAFT	FG	1



Rudder Pedal Pivot Link Support Assembly
Figure 2

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
02-					
-1	253T3119-1		SUPPORT ASSY-RUD PEDAL PIVOT LINK	A	RF
-1A	253T3119-2		SUPPORT ASSY-RUD PEDAL PIVOT LINK	B	RF
5	AG4-25		.BEARING- (V15860) (SPEC BACB10CL4) (OPT BLN4-2220 (V81376)) (OPT HG4-141 (V02758)) (OPT KSBG4-56 (V97613)) (OPT NB4A (V73134)) (OPT 55766-04 (V09455)) (OPT ABG4-4 (V50294))		1
10	253T3119-3		.SUPPORT	A	1
-10A	253T3119-4		.SUPPORT	B	1



Rudder Pedal Pivot Link Support Assembly
Figure 3

T93261

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
03-					
-1	253T3119-5		SUPPORT ASSY-RUD PEDAL PIVOT LINK		RF
5	AG4-25		.BEARING- (V15860) (SPEC BACB10CL4) (OPT BLN4-2220 (V81376)) (OPT HG4-141 (V02758)) (OPT KSBG4-56 (V97613)) (OPT NB4A (V73134)) (OPT 55766-04 (V09455)) (OPT ABG4-4 (V50294))		1
10	253T3119-6		.SUPPORT		1