Beech Duke 60 Series

Component Maintenance Manual

Volume 1 of 1

INSTALL & USE INSTRUCTIONS

Electronic Directory of Catalogs and Services

Windows 95 Users

1. Open Windows Explorer.
2. Double click on d:\pplcat.pfd (where d is the CD-ROM drive). *If the CD does not run, see note below.*

Windows 3.1 Users

1. Open File Manager
2. Double click on d:\CD600001-27A1.pdf (where d is the CD-ROM drive). *If the CD does not run, see note below.*

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1. Click on the arrows (facing right) on the left-hand side of the page to show the subheadings. They will then become arrows facing downward. All headings are linked to their applicable pages in the catalog. *Note: You can scroll the entire CD page by page by utilizing the arrows in the center of tool bar and the far right scroll down arrow. Also, the Book covers on Welcome screen are hyperlinked to the specific sections of this CD.*

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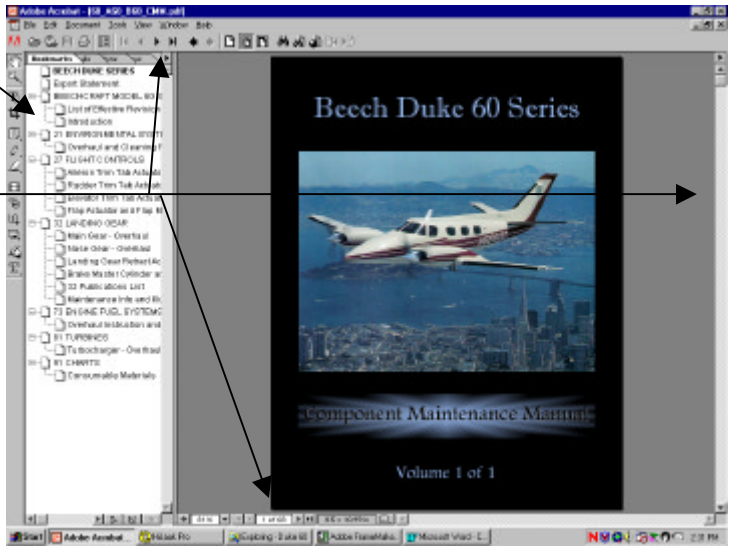

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Install Adobe Acrobat Reader 4.0 for Windows 95/98/NT

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2. Double click on d:\New Reader 4.0\ar40eng(1).exe. This is a self extracting, Installation file.

3. Follow the on-screen instructions

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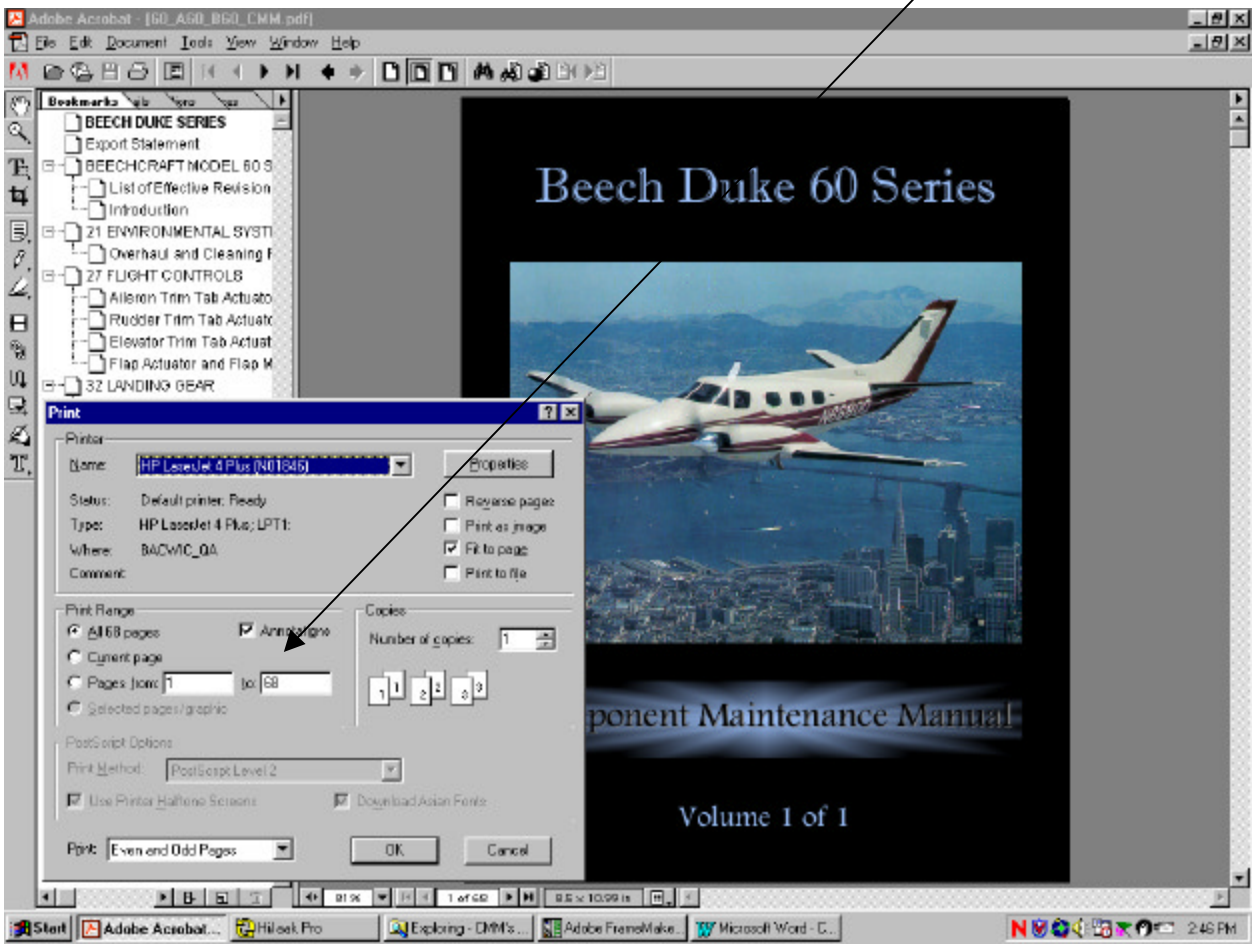
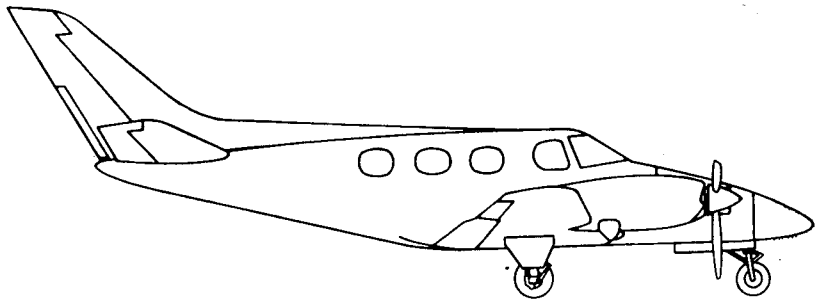


Beechcraft® DUKE

MODEL 60 (P-4 thru P-126 except P-123)
MODEL A60 (P-123, P-127 thru P-246)
MODEL B60 (P-247 and after)

BEECH MANUFACTURED COMPONENTS MAINTENANCE MANUAL



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NOTE
Where Beech Aircraft Corporation or Beechcraft is referred to in this publication, it will be taken to read Raytheon Aircraft Company.

LIST OF EFFECTIVE REVISIONS

Always destroy superseded pages when you insert revised pages.

LOG OF REVISIONS

Part Number	Date	Chapters Affected
60-590001-27	May 3, 1974	Original
60-590001-27A1	November 26, 1985	32

NOTE: A list of the effective pages will be found in the front of each chapter.

A1

98 36416C

Basic publications are assigned a part number which appears on the title page with the date of the issue. Subsequent revisions are identified by the addition of a revision code after the part number. A1 after a part number denotes the first revision to the basic publication, A2 the second, etc. Occasionally, it is necessary to completely reissue and reprint a publication for the purpose of obsoleting a previous issue and outstanding revisions thereto. As these replacement reissues are made, the code will also change to the next successive letter of the alphabet at each issue. For example, B for the first reissue, C for the second reissue, etc.

When ordering a handbook, give the basic number, and the reissue code when applicable, if a complete up-to-date publication is desired. Should only revision pages be required, give the basic number and revision code for the particular set of revision pages you desire.

INTRODUCTION

The BEECHCRAFT Duke 60 Component Maintenance Manual, P/N 60-590001-27, is prepared in accordance with the ATA (Air Transport Association) Specification No. 100 format and is supplemented by the Duke 60 Parts Catalog, P/N 60-590001-35.

ASSIGNMENT OF SUBJECT MATERIAL

The content of this publication is organized at four levels: Group, System/Chapter, Sub-System/Section, and Unit/Subject.

Group - Identified by different colored divider tabs. These are primary divisions of the manual that enable broad separation of content. Typical of this division is the separation between Airframe Systems and the Power Plant.

System/Chapter - The various groups are broken down into major systems such as Air Conditioning, Electrical Power, Landing Gear, etc. The systems are arranged more or less alphabetically rather than by precedence or importance. They are assigned a number, which becomes the first element of a standardized numbering system. Thus, the element "32" of the number 32-00-00 refers to the chapter "Landing Gear". Everything related to overhauling the landing gear will be covered in this chapter.

Sub-System/Section - The major systems of an aircraft are broken down into sub-systems. These sub-systems are identified by the second element of a standard numbering system. The number "30" of the number 32-30-00 is for the extension and retraction portion of the landing system.

Unit/Subject - The individual units within a sub-system may be identified by the third element of the standard numbering system, such as 32-30-01. This number is assigned by the manufacturer and may, or may not, be used and will vary in usage.

APPLICATION

Any publication conforming to the ATA format will use the same basic numbering system. Thus, whether the manual be a BEECHCRAFT King Air 90 Component Maintenance Manual, a BEECHCRAFT-HAWKER BH-125 Maintenance Manual, or a Wiring Diagram Manual for a Beech King Air 90, the person wishing information concerning the extension and retraction portion of the landing gear system would refer to the Tab System/Chapter 32, Landing Gear. The table of contents in the front of this chapter will provide a list of sub-systems covered in the chapter.

For example:

00	General
10	Main Gear and Doors
20	Nose Gear and Doors
30	Extension and Retraction
40	Wheels and Brakes
50	Steering
60	Position and Warning
70	Supplementary Gear

The table of contents in front of each chapter will list the items covered and the numbers assigned.

All publications will use the standard numbering system, even though all chapters may not be applicable to the aircraft or to the publication.

LIST OF EFFECTIVE REVISIONS

The Log of Effective Revisions following the title page of the manual lists the revisions currently effective for the manual.

ATA 100 PAGE BLOCK GUIDE

The pages within each chapter or section in this manual are numbered "1" through "100." The overhaul procedures that utilize this simple method of page enumeration include the disassembly; cleaning, inspection and parts replacement; assembly; wear tolerances; and parts breakdown of each unit contained in the particular chapter. The word "END" at the bottom of a page indicates the last page pertaining to a particular subject.

LIST OF EFFECTIVE PAGES

The List of Effective Pages and the Table of Contents in the front of each chapter will each start with page 1 and be numbered consecutively, thereafter, as necessary.

ATA 100 SYSTEM - CHAPTER INDEX GUIDE

The following is an ATA-100 Chapter Index Guide for use with Maintenance Manuals, Parts Catalogs, Wiring Diagram Manuals and Component Maintenance Manuals as required.

ATA-100 SYSTEM - CHAPTER INDEX GUIDE

NOTE: The chapters that are indicated as "Not Applicable" are not covered within the Component Maintenance Manual.

System Chapter	Sub-System Section	Title
INTRODUCTION		
AIRCRAFT GENERAL		
5		Time Limits/Maintenance Checks (Not Applicable)
6		Dimensions and Areas (Not Applicable)
7		Lifting and Shoring (Not Applicable)
8		Leveling and Weighing (Not Applicable)
9		Towing and Taxiing (Not Applicable)
10		Parking and Mooring (Not Applicable)
11		Placards & Markings (Not Applicable)
12		Servicing (Not Applicable)
AIRFRAME SYSTEMS		
20		Standard Practices - Airframe (Not Applicable)
21		Air Conditioning
	00	General
	10	Compression
	20	Distribution
	30	Pressurization Control
	40	Heating
	50	Cooling
	60	Temperature Control
	70	Moisture/Air Contaminant Control
22		Auto Flight (Not Applicable)
23		Communications (Not Applicable)
24		Electrical Power (Not Applicable)
25		Equipment/Furnishings (Not Applicable)
26		Fire Protection (Not Applicable)
27		Flight Controls
	00	General
	10	Aileron and Tab
	20	Rudder and Tab
	30	Elevator and Tab
	40	Horizontal Stabilizers
	50	Flaps
	60	Spoiler, Drag Devices and Variable Aerodynamic Fairings
	70	Gust Lock and Dampener
	80	Lift Augmenting
28		Fuel (Not Applicable)
29		Hydraulic Power (Not Applicable)
30		Ice and Rain Protection (Not Applicable)
31		Indicating/Recording Systems (Not Applicable)
32		Landing Gear
	00	General
	10	Main Gear and Doors
	20	Nose Gear and Doors
	30	Extension and Retraction
	40	Wheels and Brakes
	50	Steering
	60	Position and Warning
	70	Supplementary Gear
33		Lights (Not Applicable)
34		Navigation (Not Applicable)
35		Oxygen (Not Applicable)
36		Pneumatic (Not Applicable)
37		Vacuum (Not Applicable)
38		Water/Waste (Not Applicable)
39		Electrical/Electronic & Multipurpose Components (Not Applicable)
49		Airborne Auxiliary Power (Not Applicable)

ATA-100 SYSTEM - CHAPTER INDEX GUIDE

System Chapter	Sub-System Section	Title
STRUCTURE		
51		Structures (Not Applicable)
52		Doors (Not Applicable)
53		Fuselage (Not Applicable)
54		Nacelles/Pylons (Not Applicable)
55		Stabilizers (Not Applicable)
56		Windows (Not Applicable)
57		Wings (Not Applicable)
PROPELLER		
60		Standard Practices - Propeller (Not Applicable)
61		Propellers (Not Applicable)
POWER PLANT		
70		Standard Practices - Engine (Not Applicable)
71		Power Plant (Not Applicable)
72		Engine Reciprocating (Not Applicable)
73		Engine Fuel and Control
	00	General
	10	Distribution
	20	Controlling
	30	Indicating
74		Ignition (Not Applicable)
75		Air (Not Applicable)
76		Engine Controls (Not Applicable)
77		Engine Indicating (Not Applicable)
78		Exhaust (Not Applicable)
79		Oil (Not Applicable)
80		Starting (Not Applicable)
81		Turbines
	00	General
	10	Power Recovery
	20	Turbo-Supercharger
83		Accessory Gearboxes (Not Applicable)
91		Charts
INSPECTION (Not Applicable)		

"END"

LIST OF PUBLICATIONS IN CHAPTER 21

TITLE	*PUBLICATION NUMBER*	*DATE*
Overhaul and Cleaning Procedure for Pressurization Controllers, Outflow and Safety Valves	98-36374	Dec/72

"END"

OVERHAUL AND CLEANING PROCEDURE FOR PRESSURIZATION CONTROLLERS, OUTFLOW AND SAFETY VALVES

for the

Beechcraft®

DUKE 60

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OVERHAUL AND CLEANING PROCEDURE FOR PRESSURIZATION CONTROLLERS, OUTFLOW AND SAFETY VALVES

1.0 This manual provides overhaul and cleaning instructions for the Cabin Pressurization System manufactured by Dukes Astronautics Company, Canoga Park, California. Except for the following tools, no special equipment or tools are necessary to perform the specific procedures.

TOOL NUMBER	*DESCRIPTION*
Dukes T-1036	Spanner Wrench (to remove the cap from the housing)
Dukes T-1038	Differential Spring Adjustment Tool

2.0 *PART NUMBER 4344-00 CONTROLLER*

DISASSEMBLY, CLEANING AND REASSEMBLY

NOTE

Disassemble only to the extent necessary to perform overhaul and cleaning. Identify wire leads to facilitate reassembly. Refer to Figure 2-1 for item numbers.

2.1 Unscrew the housing (1) from the body (2).

2.2 Remove the screws (3). With a pair of needle nose pliers, carefully remove the pilot seat assembly (4) with a twisting motion.

2.3 Remove the "O" rings (5) from the pilot seat assembly (4).

2.4 Remove the spring guide (6) from the pilot seat housing (7) as follows: Hold the pilot seat housing (7) in a vise and insert a sharp knife between the spring guide (6) and the pilot seat housing (7); tap lightly with a small hammer for initial separation, then remove from the vise and pry evenly around the gap to fully disassemble.

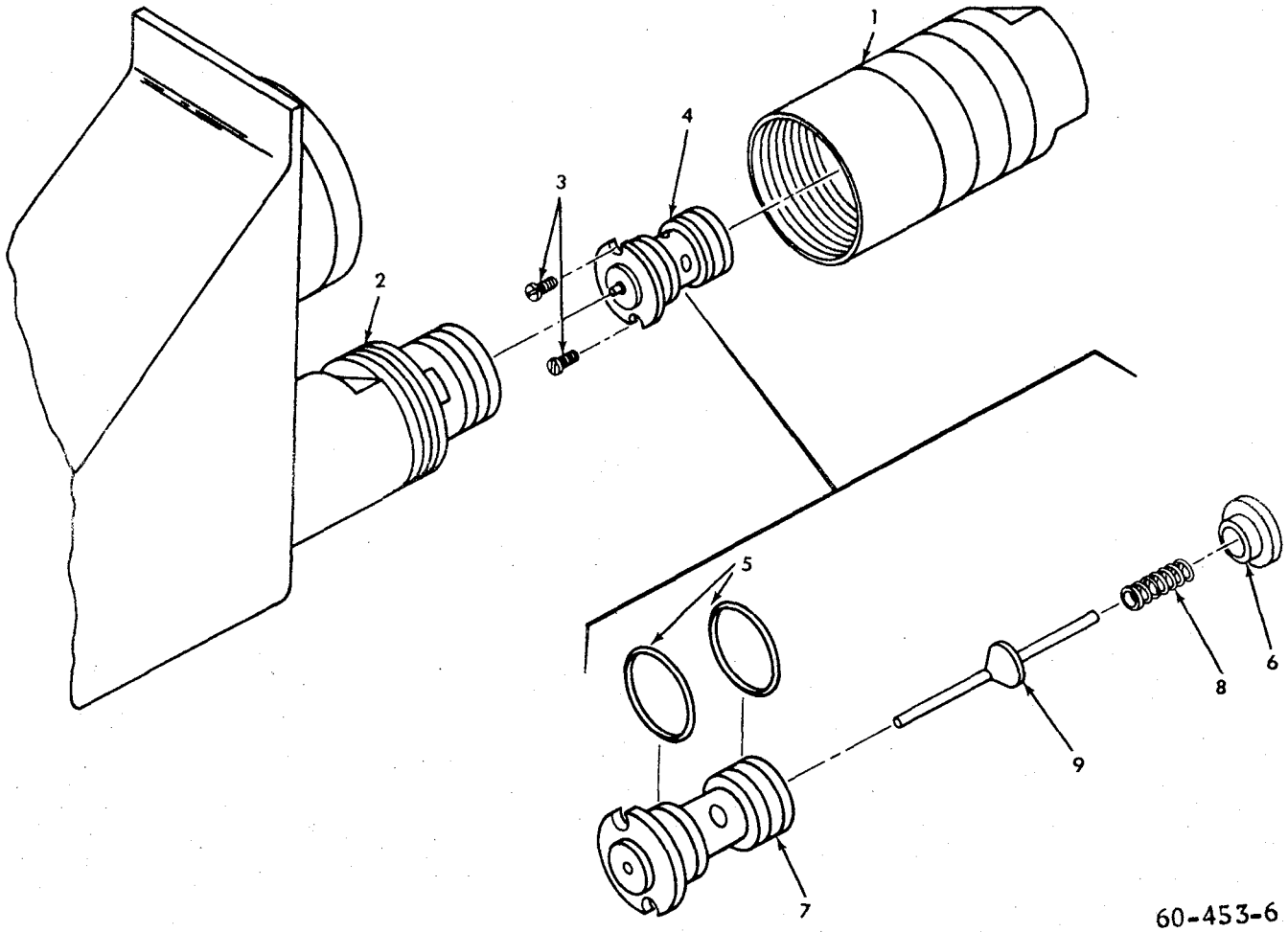
2.5 Remove the spring (8) and poppet (9).

2.6 Clean the poppet (9) with a lint-free cloth moistened with alcohol until all tobacco tar is removed.

2.7 Remove all tobacco tar from the interior of the pilot seat housing (7) with a lint-free cloth moistened with alcohol.

CAUTION

Do not damage the seat face.



1. Housing
2. Body
3. Screws
4. Pilot Seat Assembly
5. "O" Rings
6. Spring Guide
7. Pilot Seat Housing
8. Spring
9. Poppet

Figure 2-1. 4344-00 Controller

2.8 Reassemble in the reverse order and note that the spring guide (6) must fully seat against the pilot seat housing (7). Also, note that spring (8) must be correctly centered in the spring guide (6).

2.9 Check for proper operation of the pilot seat assembly (4) by carefully depressing the poppet (9). The poppet (9) shall not stick to the seat and shall move freely against spring force.

2.10 Lubricate (2 each) new "O" rings, Dukes P/N 2180-11 (5), sparingly with Dow Corning #4 Compound, product of Dow Chemical Corp., Midland, Michigan 48641 and install on the pilot seat housing (7).

2.11 Apply a small amount of Dow Corning #4 Compound to I.D. of the housing (1) and carefully insert the pilot seat assembly (4) into the housing (1).

2.12 Attach (2 each) screws (3) and install the housing (1) to the body (2).

2.13 Leak test the unit by pulling approximately 3 inches Hg. vacuum on the control port. Vacuum decay must not exceed .3 inches Hg. for one minute.

3.0 *PART NUMBER 3275-00 CONTROLLER*

DISASSEMBLY, CLEANING AND REASSEMBLY

NOTE

Disassemble only to the extent necessary to perform overhaul and cleaning. Refer to Figure 3-1 for item numbers.

3.1 Remove the screws (1) and separate the front plate assembly (2) from the body (3). Mark the front plate assembly (2) and body (3) for alignment purposes.

CAUTION

Do not disassemble the knob assembly.

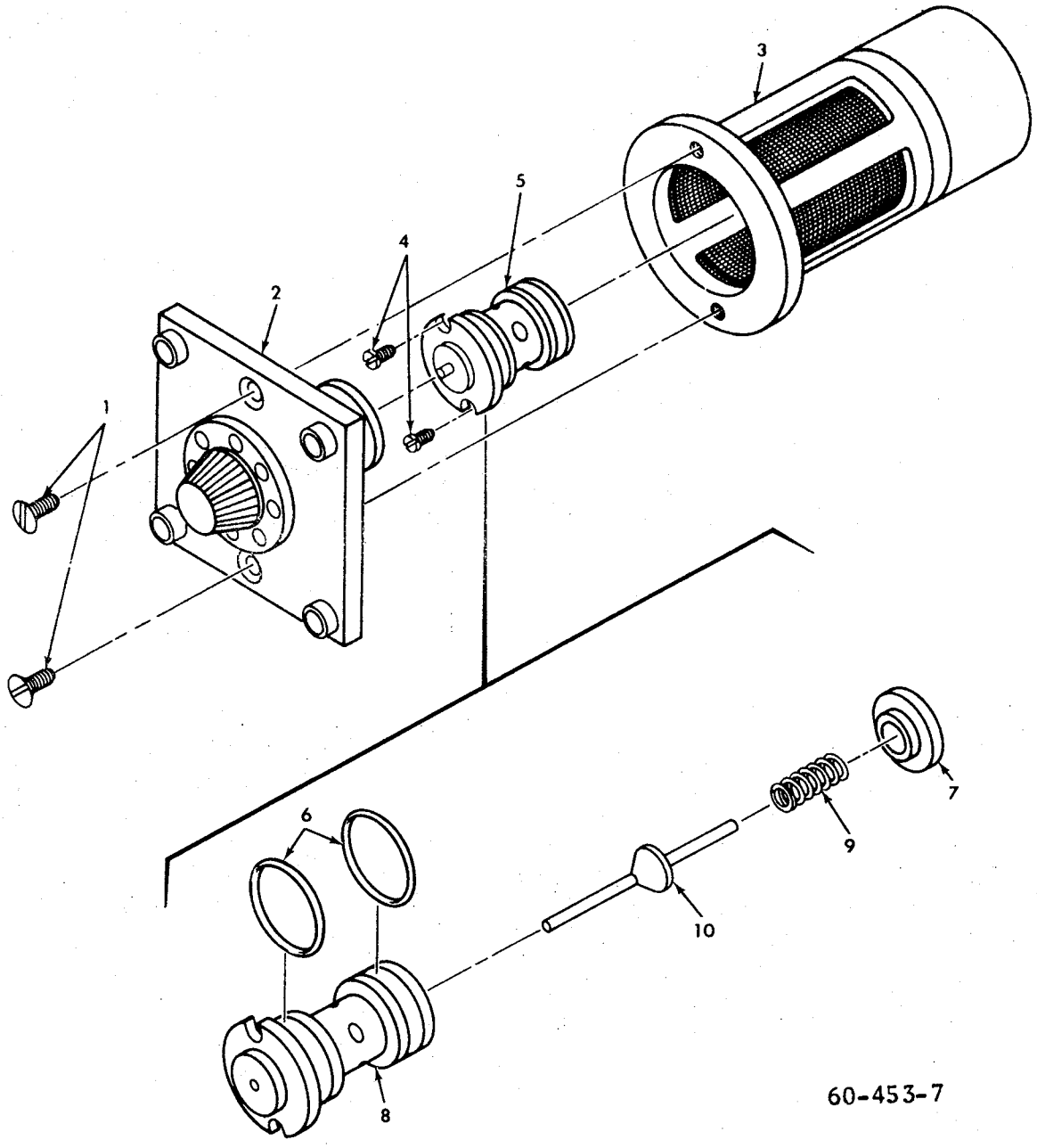
3.2 Remove the screws (4). Carefully remove the pilot seat assembly (5) with a twisting motion. Use a pair of needle nose pliers to hold the pilot seat assembly (5).

3.3 Remove the "O" rings (6) from the pilot seat assembly (5).

3.4 Remove the spring guide (7) from the pilot seat housing (8) as follows: Hold the pilot seat housing (8) in a vise and insert a sharp knife between the spring guide (7) and the pilot seat housing (8), tap lightly with a small hammer for initial separations, then remove from the vise and pry evenly around the gap to fully disassemble.

3.5 Remove the spring (9) and poppet (10).

3.6 Clean the poppet (10) with a lint-free cloth moistened with alcohol until all tobacco tar is removed.



1. Screws
2. Front Plate Assembly
3. Body
4. Screws
5. Pilot Seat Assembly
6. "O" Rings
7. Spring Guide
8. Pilot Seat Housing
9. Spring
10. Poppet

Figure 3-1. 3275-00 Controller

3.7 Remove all tobacco tar from the interior of the pilot seat housing (8) with a lint-free cloth moistened with alcohol.

CAUTION

Do not damage the seat face.

3.8 Reassemble in the reverse order and note that the spring guide (7) must fully seat against the pilot seat housing (8) and that the spring (9) must be correctly centered in the spring guide (7).

3.9 Check for proper operation of the pilot seat assembly (5) by carefully depressing the poppet (10). The poppet (10) shall not stick to the seat and shall move freely against the spring force.

3.10 Lubricate (2 each) new "O" rings, Dukes P/N 2180-11 (6), sparingly with Dow Corning #4 Compound, product of Dow Chemical Corp., Midland, Michigan 48641 and install in the pilot seat housing (8).

3.11 Lubricate the I.D. of the body (3) sparingly with small amount of Dow Corning #4 Compound and carefully insert pilot seat assembly (5) into the body (3).

3.12 Attach (2 each) screws (4). Attach the front plate assembly (2) to body (3) with (2 each) screws (1).

3.13 Leak test the unit by pulling approximately 3 inches of Hg. vacuum on the control port. Decay must not exceed .3 inch of Hg. for one minute.

4.0 *PART NUMBER 4180-00-33, -60 and -72 OUTFLOW VALVE*
PART NUMBER 396-00-29, -60 and -72 SAFETY VALVE

DISASSEMBLY, CLEANING AND REASSEMBLY

NOTE

Disassemble only to the extent necessary to perform overhaul and cleaning. Identify wire leads to facilitate reassembly. Refer to Figure 4-1 for item numbers.

4.1 Push the diaphragm (1) away from the seat (2) and with a lint-free cloth moistened with alcohol, wipe the seat (2) until all tobacco tar is removed. Blow dry with air.

4.2 Loosen the screw (3) and with spanner wrench (Dukes T-1036) remove the cap (4) from the valve.

CAUTION

Cap is spring loaded.

NOTE

Keep cap (4) and spring guide (5) as an assembly.

1. Diaphragm
2. Seat
3. Screw
4. Cap
5. Spring Guide
6. Spring
7. Guide
8. Poppet Assembly
9. Seat
10. Diaphragm
11. Piston
12. Gasket

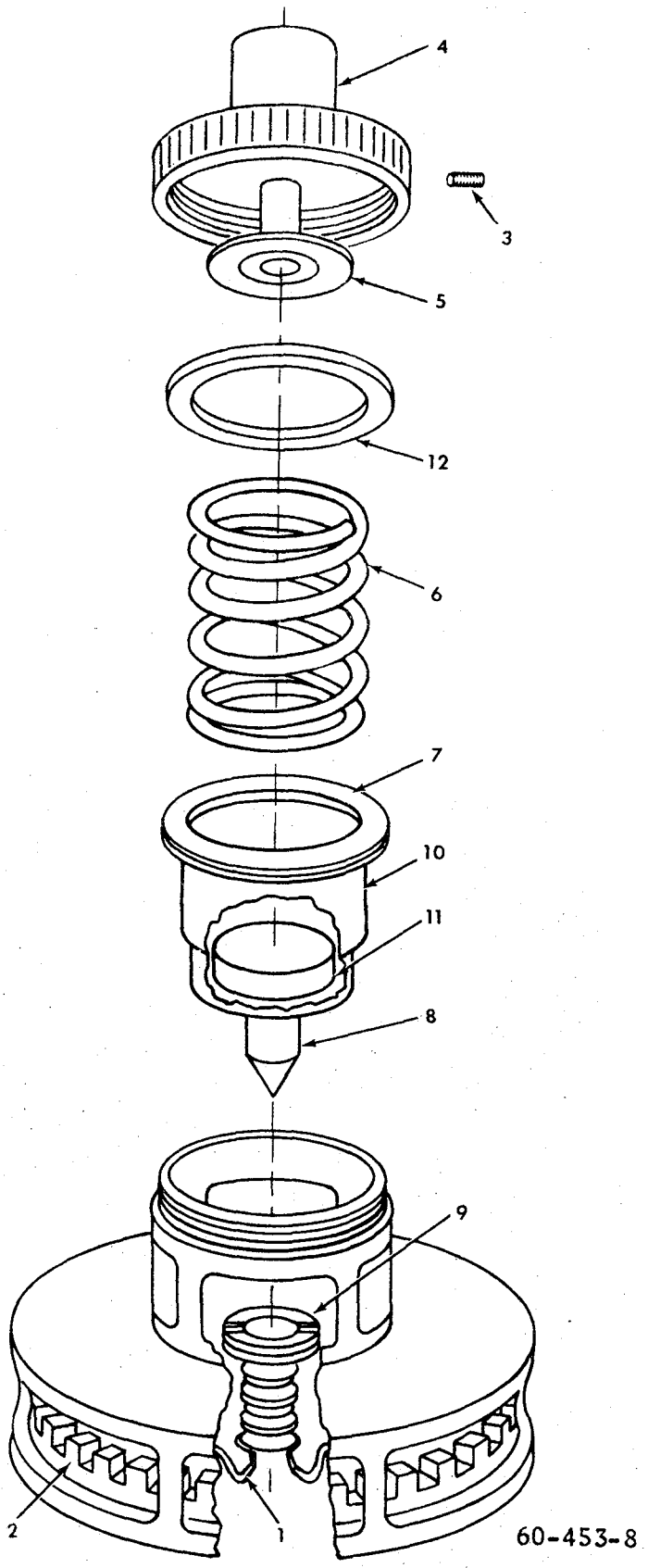


Figure 4-1. 4180-00-33, -60 and -72 Outflow Valve and 396-00-29, -60 and -72 Safety Valve

4.3 Identify top-end of the spring (6) and remove from the valve.

NOTE

Spring must be reassembled in same position.

4.4 Remove the guide (7) and poppet assembly (8) and clean the poppet seat face with a lint-free cloth moistened with alcohol.

CAUTION

Do not damage the poppet seat face.

4.5 Clean the seat (9) carefully with a soft lint-free cloth moistened with alcohol, taking care not to damage the seat face. Blow dry with air.

4.6 Reassemble in the reverse order and observe that the diaphragm (10) is fully seated against the guide (7).

4.7 Install the spring (6) and note that it must fully seat in the piston (11).

4.8 Note the correct position of the gasket (12). Install the cap (4) and torque to 100 ± 2 In. Lbs. Tighten screw (3).

4.9 Leak test the unit by pulling vacuum on the ambient discharge hole.

5.0 *CABIN SAFETY VALVE AND OUTFLOW VALVE DIFFERENTIAL ADJUSTMENT PROCEDURE:*

Conducted with valves installed in the airplane.

5.1 Disconnect the ambient sensing line from the outflow valve and cap the line, leaving the safety valve connected.

5.2 Pressurize the aircraft on the ground and note the cabin pressure at which the safety valve opens.

NOTE

To pressurize the aircraft, pull the pressurization circuit breaker, disconnecting the 1/4 inch diameter polyflo sense line at the outflow valve. Close the bleed control valve, start both engines and advance the throttles slowly until the safety valve opens.

5.3 If this pressure is between 4.8 and 4.9 PSI, continue with Paragraph 5.9, otherwise, continue with Paragraph 5.4.

NOTE

When adjusting the safety and outflow valves, the adjustments may be accomplished without completely depressurizing the cabin.

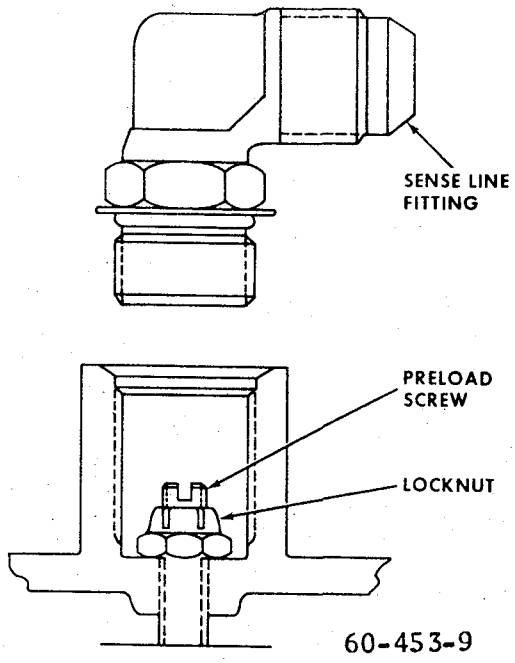


Figure 5-1. Cabin Safety Valve and Differential Outflow Valve

5.4 Adjust the safety valve as follows:

5.5 Remove the ambient sense line and fitting from the safety valve.

5.6 With adjustment tool (Dukes T-1038) loosen the locknut and readjust the preload screw as required. See Figure 5-1.

NOTE

One turn (360°) clockwise will result in an approximately 0.1 PSI increase in cabin safety pressure.

5.7 Lock the preload screw with the locknut and attach the fitting and ambient sense line.

5.8 Check that the safety valve opens at 4.8 to 4.9 PSI. If the safety valve does not function properly, repeat steps 5.4 thru 5.8 until it performs satisfactorily.

5.9 Connect the ambient sensing line to the outflow valve and disconnect the line from the safety valve and cap the line.

5.10 Pressurize the aircraft on the ground and note the cabin pressure at which the outflow valve opens. The outflow valve should open between 4.6 and 4.7 PSI.

NOTE

To pressurize the aircraft, pull the pressurization circuit breaker, disconnecting the 1/4 inch polyflo sense line at the outflow valve. Close the bleed control valve, start both engines and advance the throttles slowly until the safety valve opens.

5.11 If required, adjust the outflow valve differential as follows:

5.12 Remove the ambient sense line and fitting from the outflow valve.

5.13 With adjustment tool (Dukes T-1038) loosen the locknut and readjust the preload screw as required.

NOTE

One turn (360°) clockwise will result in an approximately 0.1 PSI increase in differential pressure.

5.14 Lock the preload screw with the lock nut and attach the fitting and sense line.

5.15 Repeat above until the outflow valve differential opens between 4.6 and 4.7 PSI.

5.16 Connect the 1/4 inch diameter polyflo sense line at the outflow valve, push the circuit breaker in, then open the bleed control valve 1-1/8 to 1-1/4 turns.

CHAPTER 27

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CHAPTER 27-FLIGHT CONTROLS

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Cleaning Flap Motor Gearbox		3
Flap Motor Gearbox Assembly		3

"END"

AILERON TRIM TAB ACTUATOR - OVERHAUL

AILERON TRIM TAB ACTUATOR DISASSEMBLY (Figure 1)

a. Remove the snap ring (5) from the actuator housing and pull the actuator screw (4) and nut assembly (8) out of the housing.

b. Remove the actuator screw (4) from the nut assembly (8).

c. Remove the spacer (2) and actuator rod end (1) from the actuator screw. The bearing (6) and bushing (3) can now be removed from the actuator screw.

d. Remove the check nut (11) and screw out the adjusting bushing (10) with a spanner wrench.

e. Remove the bearing (9) from the actuator housing.

CLEANING AILERON TRIM TAB ACTUATOR (Figure 1)

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00) and inspect for cracks, corrosion and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate the actuator screw threads (4) and bearings (6 and 9) with grease (2, Chart 1, 91-00-00) prior to assembly.

AILERON TRIM TAB ACTUATOR ASSEMBLY (Figure 1)

a. Install the bearing (9) in the actuator housing (7).

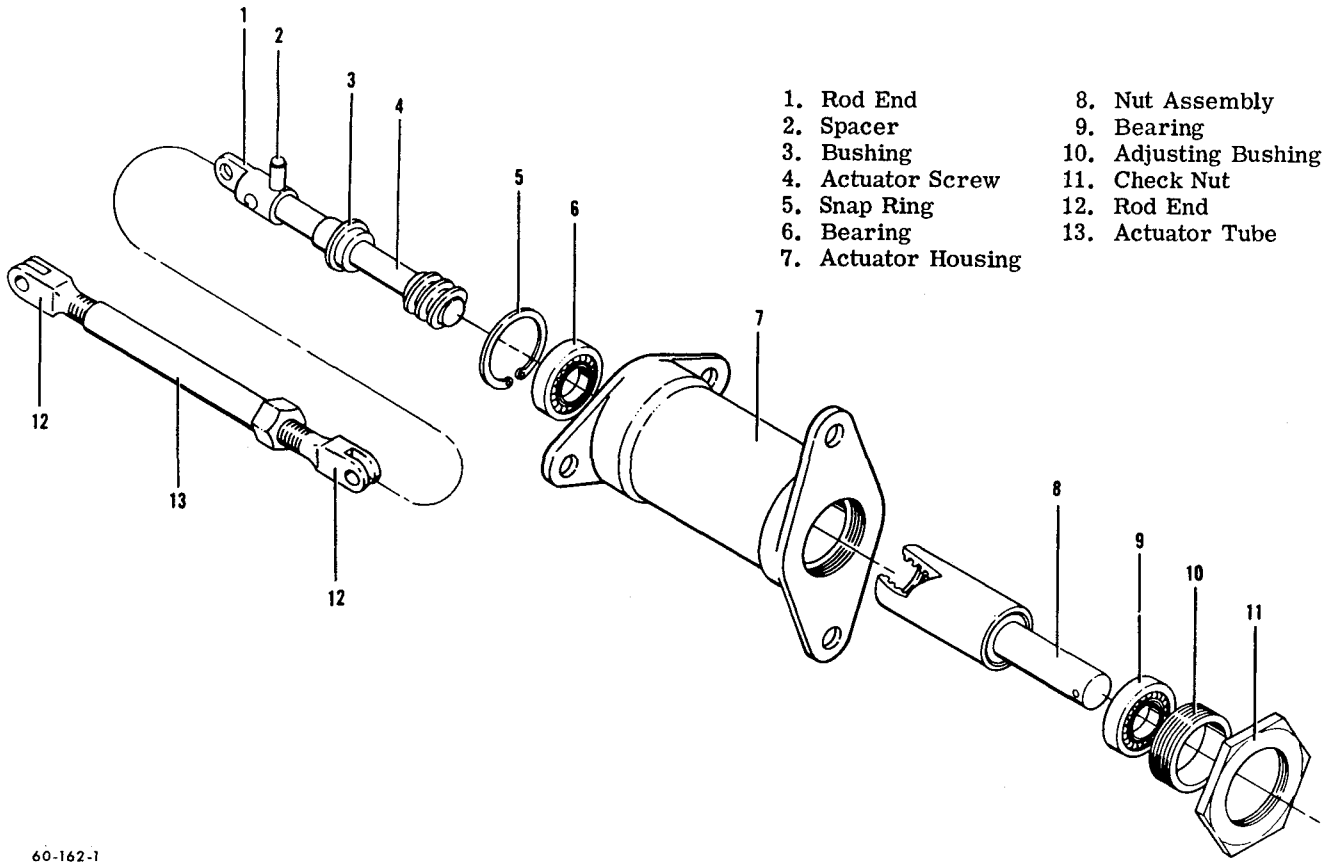
b. Install the bearing (6) and bushing (3) on the actuator screw (4).

c. Install the actuator rod end (1) and spacer (2) on the actuator screw.

d. Install the actuator screw in the nut assembly (8).

e. Position the actuator screw and nut assembly in the housing and secure with the snap ring (5).

f. Using a spanner wrench, screw the adjusting bushing (10) into the actuator housing until end play in the nut assembly (8) is less than .003 inch. After tightening the bushing (10), the nut assembly must be free to rotate and the complete assembly must be sufficiently free of binding to allow smooth operation. Secure with the check nut (11).



Aileron Trim Tab Actuator
Figure 1

"END"

RUDDER TRIM TAB ACTUATOR - OVERHAUL

RUDDER TRIM TAB ACTUATOR DISASSEMBLY (Figure 1)

a. Cut and remove all safety wire.

b. Loosen the check nut (16) and remove the actuator rod end (15) and check nut from the actuator screw (14).

c. Unscrew the collar (13) and remove the actuator screw (14) from the drive barrel (10).

d. Remove the retaining screws (9) from the bearing housing (1 and 8) and pull the back of the housing (1) off the sprocket shaft (6).

e. Remove the bearing (4) and laminated shim (5) from the sprocket shaft.

f. Remove the roll pin (11), the sprocket shaft (6) and bushing (12) from the drive barrel (10).

g. Remove the bearing (3) and bushing (2) from the bearing housing (1).

CLEANING RUDDER TRIM TAB ACTUATOR (Figure 1)

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00) and inspect for cracks, corrosion, distortion and excessive wear. Replace bushings and any parts showing evidence of deterioration. Lubricate the actuator screw threads (14) and bearings (4 and 7) with MIL-G-23827 grease (2, Chart 1, 91-00-00) prior to assembly.

RUDDER TRIM TAB ACTUATOR ASSEMBLY (Figure 1)

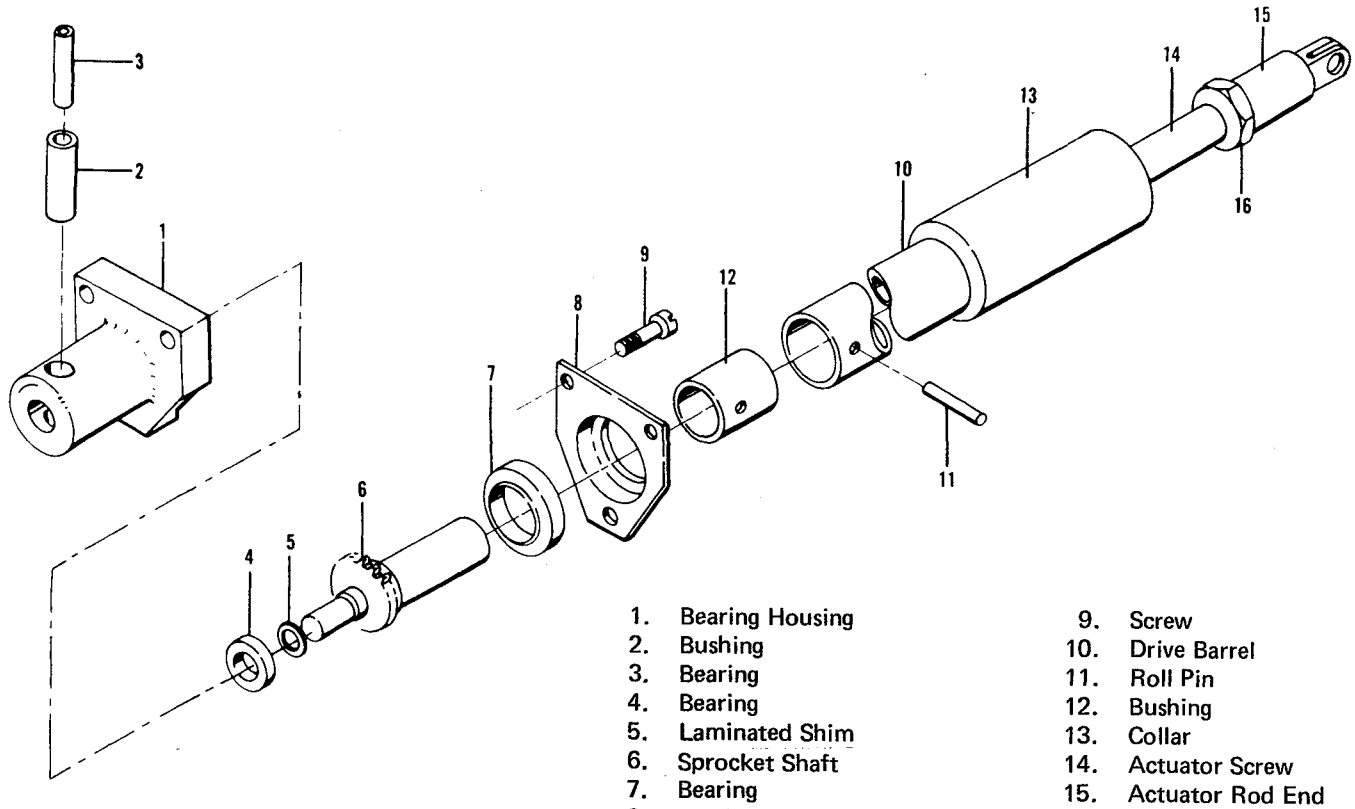
a. Install the bearing (3) and bushing (2) in the bearing housing (1).

b. Position the sprocket shaft (6) and the bushing (12) in the drive barrel and secure with the roll pin (11).

c. Install the bearing (4) on the sprocket shaft (6). Laminated shim stock (5) may be used, as required, to eliminate sprocket end play.

d. Position the bearing housing sections (1 and 8) and secure with the attaching screws (9). Install the actuator screw (14) to the drive barrel (10) and screw on the collar (13).

e. Install the check nut (16) and the actuator rod end (15). Tighten the check nut and safety wire.



1. Bearing Housing
2. Bushing
3. Bearing
4. Bearing
5. Laminated Shim
6. Sprocket Shaft
7. Bearing
8. Bearing Housing
9. Screw
10. Drive Barrel
11. Roll Pin
12. Bushing
13. Collar
14. Actuator Screw
15. Actuator Rod End
16. Check Nut

Rudder Trim Tab Actuator
Figure 1

"END"

ELEVATOR TRIM TAB ACTUATOR - OVERHAUL

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY (Figure 1)

a. Cut and remove all safety wire.

b. Loosen the check nut (14) and remove the actuator rod end (15) and check nut from the actuator screw (13).

c. Unscrew the collar (12) and remove the actuator screw (13) from the drive barrel (11).

d. Remove the retaining screws (8) from the bearing housing (2 and 7) and pull the back of the housing (2) off the sprocket shaft (4).

e. Remove the bearing (3) from the sprocket shaft.

f. Remove the roll pins (10), the sprocket shaft (4), and bushing (9) from the drive barrel (11).

g. Remove the bearing (6) and bushing (1).

CLEANING ELEVATOR TRIM TAB ACTUATOR (Figure 1)

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00) and inspect for cracks, corrosion, distortion and excessive wear. Replace bushings and any parts showing evidence of deterioration. Lubricate the actuator screw threads (13) and bearings (3 and 6) with MIL-G-23827 grease (2, Chart 1, 91-00-00) prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY (Figure 1)

a. Install the bushing (1) in the bearing housing (2).

b. Install the bearing (6) on the sprocket shaft (4) using laminated shim stock (5), as required, to eliminate sprocket shaft end play.

c. Position the sprocket shaft (4) through the bearing housing (7). Install the bushing (9) on the sprocket shaft and in the drive barrel (11). Secure with the two roll pins (10).

NOTE

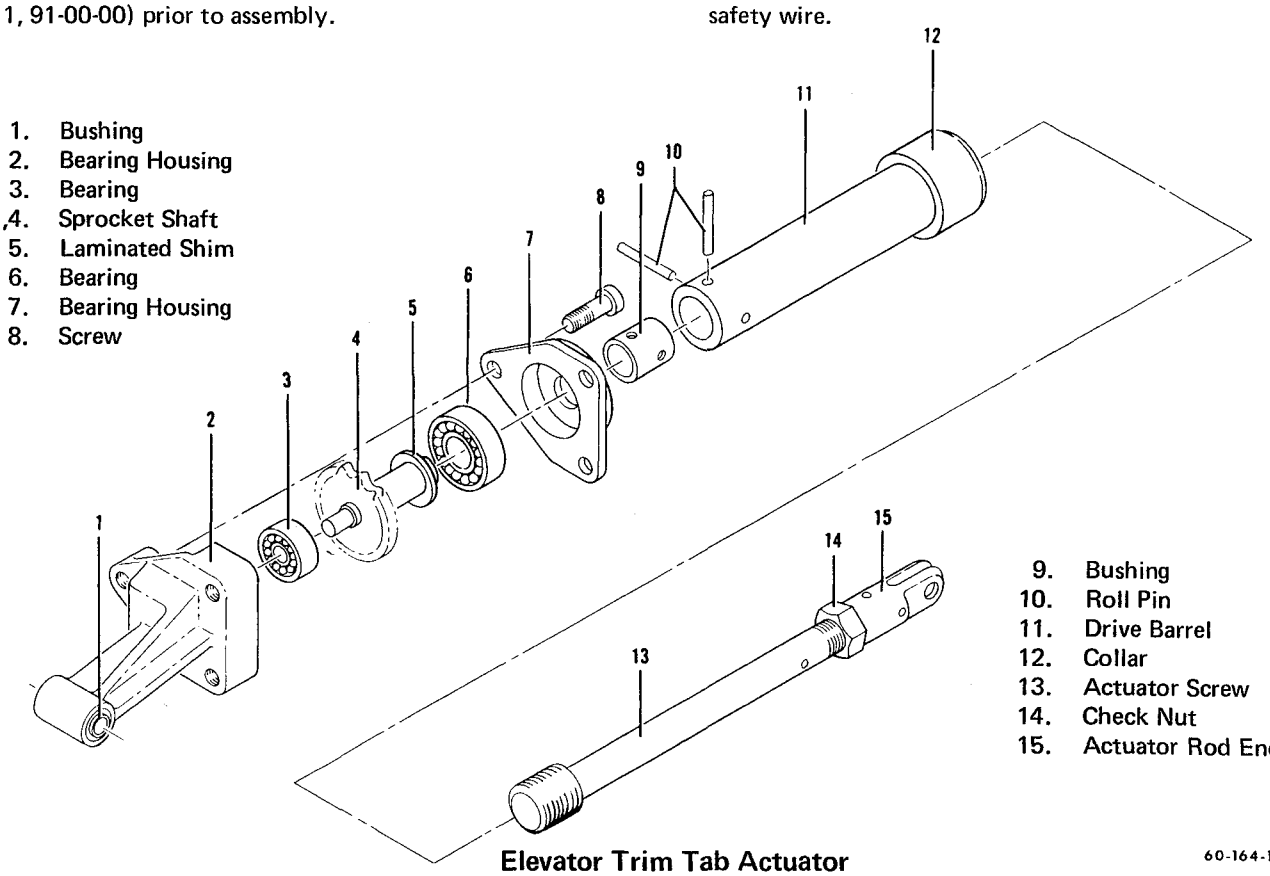
Check for a .09 inch clearance between the shoulders of the bearing housing and the drive barrel.

d. Install the bearing (3) to the support shaft.

e. Position the bearing housing sections (2 and 7) and secure with the attaching screws (8). AN960PD10L washers may be used, as required, (maximum of two on any one screw) between the bearing housing sections to prevent the assembly from binding.

f. Install the actuator screw (13) into the drive barrel (11) and install the collar (12).

g. Install the check nut (14) and the actuator rod end (15) on the actuator screw (13). Tighten the check nut and safety wire.



1. Bushing
2. Bearing Housing
3. Bearing
4. Sprocket Shaft
5. Laminated Shim
6. Bearing
7. Bearing Housing
8. Screw
9. Bushing
10. Roll Pin
11. Drive Barrel
12. Collar
13. Actuator Screw
14. Check Nut
15. Actuator Rod End

60-164-1

Elevator Trim Tab Actuator
Figure 1

"END"

FLAP ACTUATOR - OVERHAUL

FLAP ACTUATOR DISASSEMBLY (Figure 1)

a. Loosen the clamp nut and remove the drive assembly (1) from adapter (3).

b. Remove the retaining ring (2), then remove adapter (3) from the housing (8).

c. Extend the piston (9) to relieve spring tension and remove the two retaining nuts (14) and spring (6).

d. Drive the pin (4) out, then remove the plug (5) from piston (9).

e. Press (using an arbor press, if necessary) the assembled screw (13), piston (9), bearings (12), seal (11), and spacers (10) out of housing (8).

f. Remove the packing (7) from the housing.

g. Thread the piston (9) from the end of screw (13), then remove the spacer (10), seal (11) and bearings (12) from the screw.

CLEANING FLAP ACTUATOR

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00) and inspect for cracks, corrosion, distortion and excessive wear. Inspect the piston and screw for damaged or worn threads.

FLAP ACTUATOR ASSEMBLY (Figure 1)

a. Prior to reassembly, lubricate all internal parts with a coating of MIL-L-6086 lubricating oil (3, Chart 1, 91-00-00); and pack the bearings with MIL-G-23827 grease (2, Chart 1, 91-00-00).

b. Insert the plug (5) into piston (9). Align the pin hole in both parts; then install a new pin (4). Peen the pin and file the pin ends flush with the piston diameter.

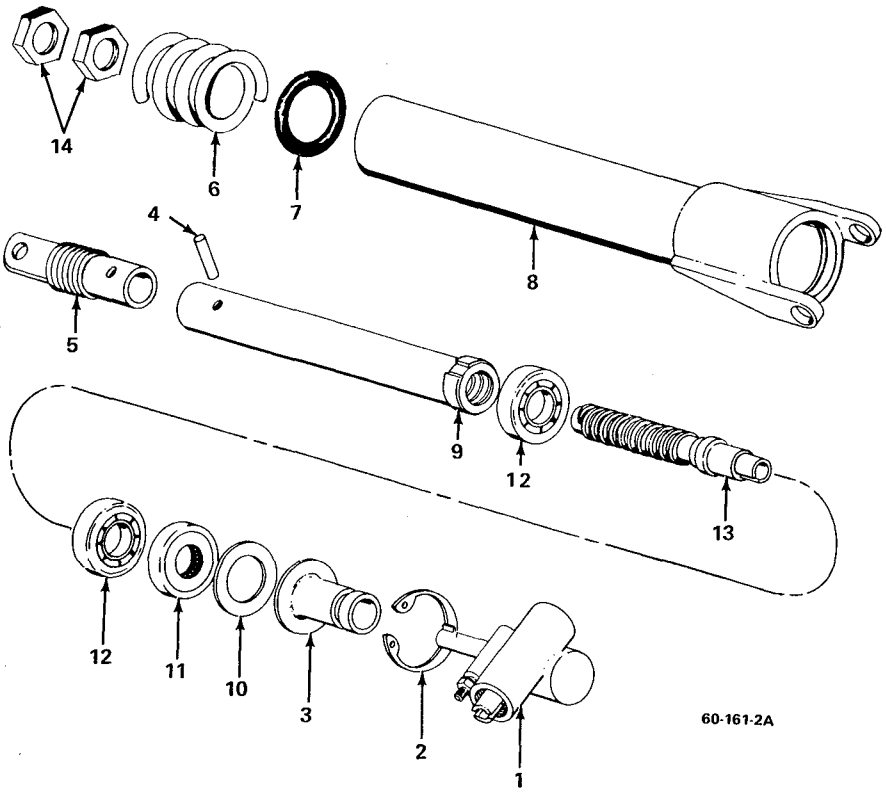
c. Install the packing (7) in the recess provided in the lower end of the housing (8).

d. Pour 2/3 ounce of MIL-L-6086 lubricating oil (3, Chart 1, 91-00-00) into the threaded end of piston (9).

e. Install one of the bearings (12) over the threaded end of screw (13). Start the screw into the piston; then insert the piston into the housing.

f. Install the remaining bearing and seal (11). Apply approximately 1000 pounds pressure to seat the parts.

g. Install spacers (10), adapter (3) and retaining ring (2). Apply approximately 1000 pounds reverse pressure to seat the parts against the retaining ring.



1. Drive Assembly
2. Retaining Ring
3. Adapter
4. Pin
5. Plug
6. Spring
7. Packing
8. Housing
9. Piston
10. Spacer
11. Seal
12. Bearing
13. Screw
14. Retaining Nut

Flap Actuator
Figure 1

"END"

NOTE

A maximum of seven spacers may be used between the outermost bearing and the adapter.

h. Check for .005 to .020 inch end play between the piston (9) and housing (8).

i. Install the drive portion of drive assembly (1) on the same side of the actuator as the vent hole, then tighten the clamp nut.

j. With the piston extended, install spring (6) and nuts (14).

BREAK-IN AND INSPECTION OF FLAP ACTUATOR

To insure proper operation and break-in of the actuator, the following break-in procedure must be complied with prior to installation of a newly overhauled actuator in the aircraft.

Run the actuator 10 cycles with no load applied, then 10 cycles with a load of 45 to 55 lbs. and 10 cycles with a load of 95 to 105 lbs. applied to the actuator. During the cycling of the actuator, it shall not bind or bottom out in any of the above conditions. After the break-in period the actuator should not squeal during operation (loaded or unloaded).

NOTE

Excess lubricating oil will be forced out the vent hole the first time the actuator is run all the way in.

"END"

FLAP MOTOR GEARBOX - OVERHAUL

FLAP MOTOR GEARBOX DISASSEMBLY (Figure 2)

a. Cut and remove all safety wire.

b. Remove the two long screws from the motor brush housing to separate the motor and gearbox.

c. Remove the screws which secure the cover (8) and gasket (7) to the gear housing.

d. Set screw (11) must be removed to allow the counter shaft (10) to be drawn out of the gearbox.

e. Remove the worm and gear (14), washers (12 and 15), bearing (16) and bearing cup (17).

f. Remove the retaining pin (24) from the control shaft (20) and slip the spacer (21), washer (22) and shim washer (23) down enough to remove the shaft.

CLEANING FLAP MOTOR GEARBOX (Figure 2)

Clean all parts in PD680 solvent (1, Chart 1, 91-00-00) and inspect for worn, cracked or corroded components. Pay particular attention to the worm (14) and worm wheel gear (19) and the bearings (9) in the side of the gearbox. Inspect the brushes of the flap motor for wear. The original length of the brushes is 1/2 inch; if the length is less than 5/16 inch they should be replaced. Refer to Duke Parts Catalog P/N 60-590001-35 for replacement brushes. Fill the gearbox with MIL-G-23827 grease (1, Chart 1, 91-00-00).

FLAP MOTOR GEARBOX ASSEMBLY (Figure 2)

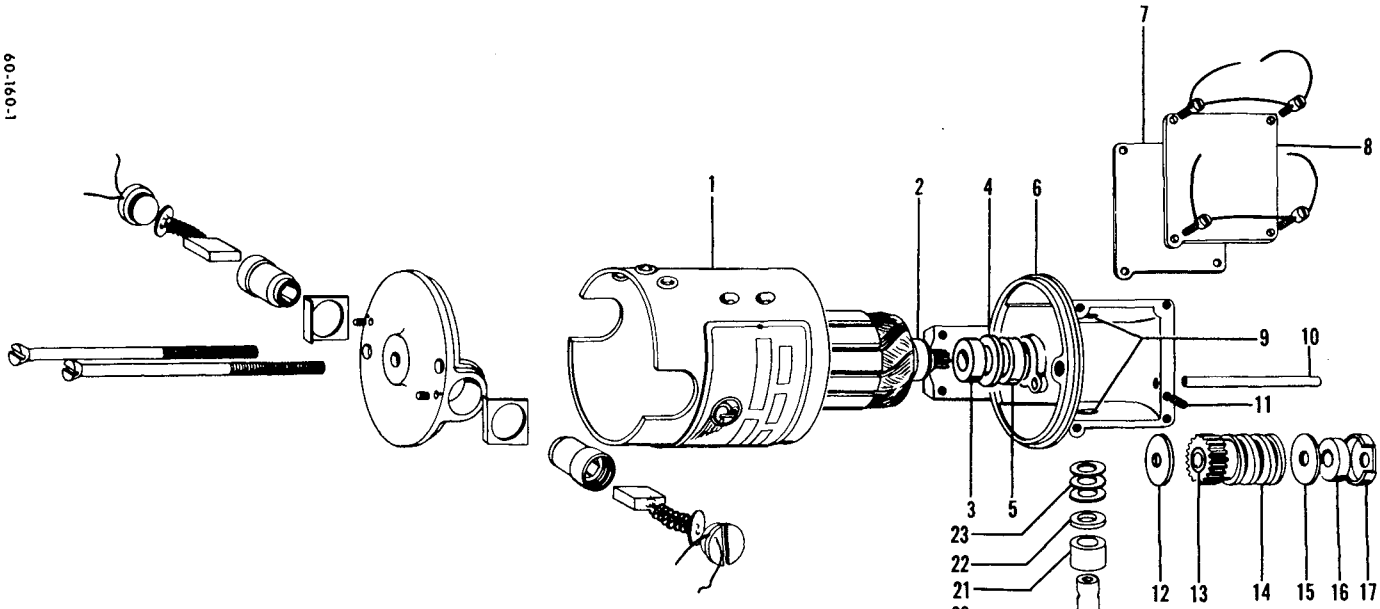
a. Install the control shaft in the gearbox, position the spacer (21), washer (22) and shim washer (23) and install the retaining pin.

b. Install the worm and gear (14), washers (12 and 15), bearing (16) and bearing cup (17).

c. Install the counter shaft (10) and secure with the set screw (11).

d. Position the gasket (7) and the cover (8) to the gear housing and secure with the attaching screws.

e. Position the motor brush housing and secure with the two attaching screws and safety wire all applicable areas.



1. Flap Motor Housing
2. Armature Bearing
3. Oil Seal Collar
4. Oil Seal Washer
5. Armature Shaft Washer
6. Motor Housing End Plate
7. Gear Housing Gasket
8. Cover Plate
9. Sleeve Bearing
10. Counter Shaft
11. Set Screw
12. Washer
13. Counter Shaft Bearing, Needle
14. Worm and Gear
15. Thrust Washer
16. Counter Shaft Bearing
17. Bearing Cup
18. Thrust Washer
19. Worm Wheel Gear
20. Flap Control Shaft
21. Spacer
22. Washer
23. Shim Washer
24. Retaining Pin

Flap Motor Gearbox
Figure 2

"END"

CHAPTER 32

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CHAPTER 32-LANDING GEAR

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"END"

MAIN GEAR - OVERHAUL

MAIN GEAR DISASSEMBLY (Figure 1)

a. Place the strut in a vertical position to prevent the hydraulic fluid from spilling when air valve assembly (1) is removed.

WARNING

Do not remove the air valve assembly until all air pressure has been released. It may be blown out with considerable force and cause personal injury or property damage.

b. Release the air pressure in the strut, cut the safety wire and remove air valve assembly (1).

c. Invert the strut and drain out the hydraulic fluid.

d. (Left gear only). Remove the landing gear safety switch (4) from strut housing (5) and the upper torque knee (8), if installed.

e. Remove the brake line and miscellaneous clamps and brackets, if installed.

f. Remove cotter pin, nut, washers, bolt, and bushings (11 and 28) connecting the upper torque knee (8) to the lower torque knee (15).

g. Cut the safety wire and thread the strut retainer and scraper ring (17) from the strut housing (5), using a spanner wrench.

h. Slide the shock strut piston and axle assembly (16) out of the strut housing (5).

i. Remove items (17) through (25) from the shock strut piston and axle assembly (16).

j. Remove cotter pins, pins, roll pins (9 and 13) and washers attaching the upper and lower torque knee (8 and 15) to the strut housing (5) and the shock strut piston and axle assembly (16).

k. Remove the nut, seal and washer (30) and the orifice rod assembly (6) from the strut housing (5).

l. Remove the orifice, O-ring, piston seal ring and nut (7) from the orifice rod assembly (6).

m. Remove the bolts, washers and nuts (26) attaching the forward and aft braces (31 and 32) to the strut housing (5).

MAIN GEAR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Check castings for cracks and pitting; and finished surfaces for scoring, pitting, nicks, cracks, distortion and wear. Chart 1 lists manufacturing tolerances to aid in determining the extent of wear. Replace all defective and excessively worn parts. Replace all seals, backup rings, and O-rings.

CHART 1
MANUFACTURING TOLERANCES

a.	Outer hinge bearing (2) (maximum)	O.D. .7192 in.
b.	Inner hinge bearing (3)	I.D. .5000 ±0005 in. O.D. .6235 + .0000 in. − .0015 in.
c.	Upper torque knee roll Pin (9) (maximum)	I.D. .7200 in.
d.	Torque knee bushings (11) (maximum)	O.D. .5325 in.
e.	Lower torque knee roll Pin (13) (maximum)	I.D. .7200 in.
f.	Shock strut piston (16) (minimum)	O.D. 1.999 in.
g.	Lower strut bearing (18) (O.D. maximum) (I.D. minimum)	O.D. 2.490 in. I.D. 2.004 in.
h.	Rebound tube (22) (minimum)	Length 4.540 in.
i.	Upper strut bearing (24) (maximum)	I.D. 1.968 in. O.D. 2.156 in.

MAIN GEAR ASSEMBLY (Figure 1)

a. Install the forward and aft braces (31 and 32) on the strut housing (5) with bolts, washers and nuts (26). Torque to 290 to 410 inch-pounds.

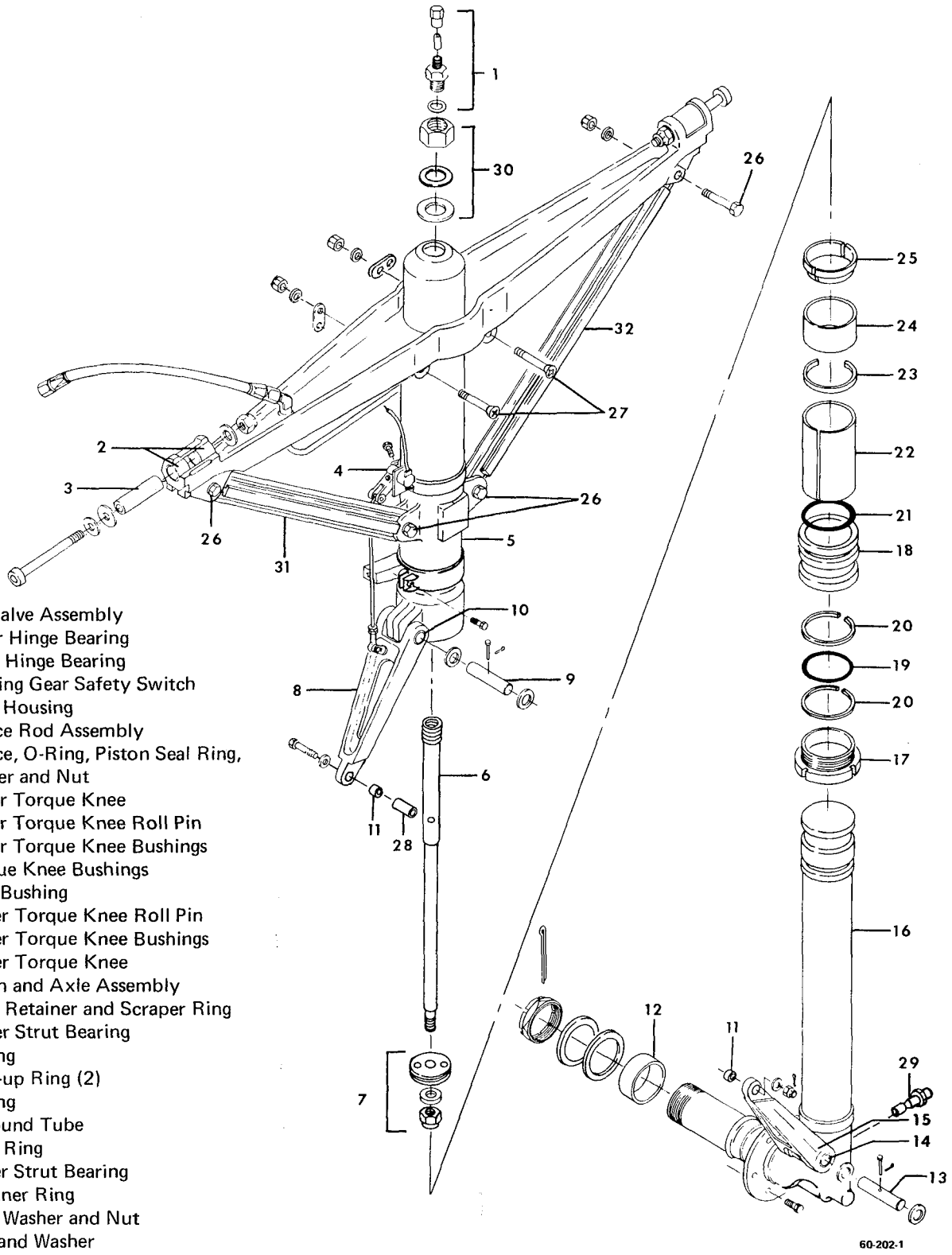
NOTE

Install bolts (26) with heads facing outboard as shown in Figure 1.

b. Lubricate the bore of strut housing (5); orifice rod assembly (6); orifice, O-ring and piston seal ring (7); outer diameter of piston (16); and items (17) through (25) with a light coating of clean MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00).

NOTE

Those Duke 60 and A60 serials which have not complied with Service Instruction No. 0536-202, Rev. II, should incorporate the change at this time.



1. Air Valve Assembly
2. Outer Hinge Bearing
3. Inner Hinge Bearing
4. Landing Gear Safety Switch
5. Strut Housing
6. Orifice Rod Assembly
7. Orifice, O-Ring, Piston Seal Ring, Washer and Nut
8. Upper Torque Knee
9. Upper Torque Knee Roll Pin
10. Upper Torque Knee Bushings
11. Torque Knee Bushings
12. Axle Bushing
13. Lower Torque Knee Roll Pin
14. Lower Torque Knee Bushings
15. Lower Torque Knee
16. Piston and Axle Assembly
17. Strut Retainer and Scraper Ring
18. Lower Strut Bearing
19. O-Ring
20. Back-up Ring (2)
21. O-Ring
22. Rebound Tube
23. Snap Ring
24. Upper Strut Bearing
25. Retainer Ring
26. Bolt, Washer and Nut
27. Bolt and Washer
28. Bushing
29. Blind Fastener (Jo-Bolt)
30. Nut, Seal and Washer
31. Forward Brace
32. Aft Brace

Main Landing Gear Assembly
Figure 1

c. Install O-ring and piston seal ring in the orifice groove; then install the orifice, washer and nut (7) on the orifice rod assembly (6).

d. Install the orifice rod assembly (6) in the bore of strut housing (5) with washer, seal and nut (30).

e. Install the upper and lower torque knees (8 and 15) on the strut housing (5) and the piston and axle assembly (16) with washers, roll pins (9 and 13), pins, and new cotter pins.

NOTE

The washers are installed between the working surfaces of the torque knees and the attachment lugs of the strut housing (5), and the piston and axle assembly (16).

f. Assemble items (17) through (25) on the piston and axle assembly (16); then slide the entire assembly into the strut housing (5). Tighten the strut retainer and scraper ring (17) using a spanner wrench, and safety wire.

g. Connect the upper and lower torque knees with bolt, washers, bushings (11 and 28), nut, and a new cotter pin.

h. Install the brake line, and miscellaneous clamps and brackets removed during disassembly. Torque nuts on bolts (26) to 25 to 40 inch-pounds.

i. (Left gear only). Install the landing gear safety switch (4) removed during disassembly.

j. Place the strut in a vertical position and fill through the air valve assembly hole with approximately 1 pint of MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00) with the strut completely compressed. When the fluid overflows, cycle the strut (full extension to compressed) and refill. Repeat until fluid cannot be added with the strut in the compressed position.

k. Install the air valve assembly (1).

l. To leak test the assembly, inflate the strut to 410 psi and coat the air valve assembly and other surfaces with soapsuds.

WARNING

As with all operations involving equipment under high pressure, exercise caution when performing the leak test; avoid the areas directly above and below the strut.

m. Release the air pressure; clean the soapsuds off the strut with fresh water and wipe dry.

n. Safety wire the air valve assembly (1) and install the cap.

"END"

NOSE GEAR - OVERHAUL

NOSE GEAR DISASSEMBLY (Figure 1)

a. Place the strut in a near vertical position to prevent the hydraulic fluid from spilling when the air valve assembly (18) is removed.

WARNING

Do not remove the air valve assembly until all air pressure has been released. It may be blown out with considerable force and cause personal injury or property damage.

b. Release the air pressure in the strut, cut the safety wire and remove the air valve assembly (18).

c. Invert the strut and drain out the hydraulic fluid.

d. Cut the safety wire and remove the bolts attaching the upper strut housing retainer (2) to the gear brace (6). Remove retainer (2), laminated shims (3) and spacer (4).

e. Slide the strut housing (19) out of the gear brace (6).

f. Remove the cotter pin, nut, washers, pin, bushing and the lower drag leg braces (35) from the gear brace (6), if installed.

g. Remove the landing light (7), the wheel and tire assembly from the strut housing (19), if installed.

h. Remove the cotter pin, nut, washers, bolt, and bushing (16) connecting the upper and lower torque knees (10 and 13) together.

i. Cut the safety wire and thread the lower strut retainer (31) from the strut housing (19), using a spanner wrench.

j. Slide the shock strut piston and axle assembly (32) out of the strut housing (19).

k. Remove items (20), (24) through (31) from the piston and axle assembly (32).

l. Remove the nut and seal (33), and the orifice rod assembly (22).

m. Remove the nut and washer (34), and the O-ring and orifice (23) from the orifice rod assembly (22).

n. Remove cotter pin, nut, washers, indicator, bolt, roll pin (11), washers, and bushings (12) attaching the upper torque knee (10) to the strut housing (19).

o. Remove cotter pin, washers, pin, tow pin (14), washers, and bushings (15) attaching the lower torque knee (13) to the piston and axle assembly (32).

p. Remove nut, washers, bolt, and steering roller (1) from the upper strut housing retainer (2).

NOTE

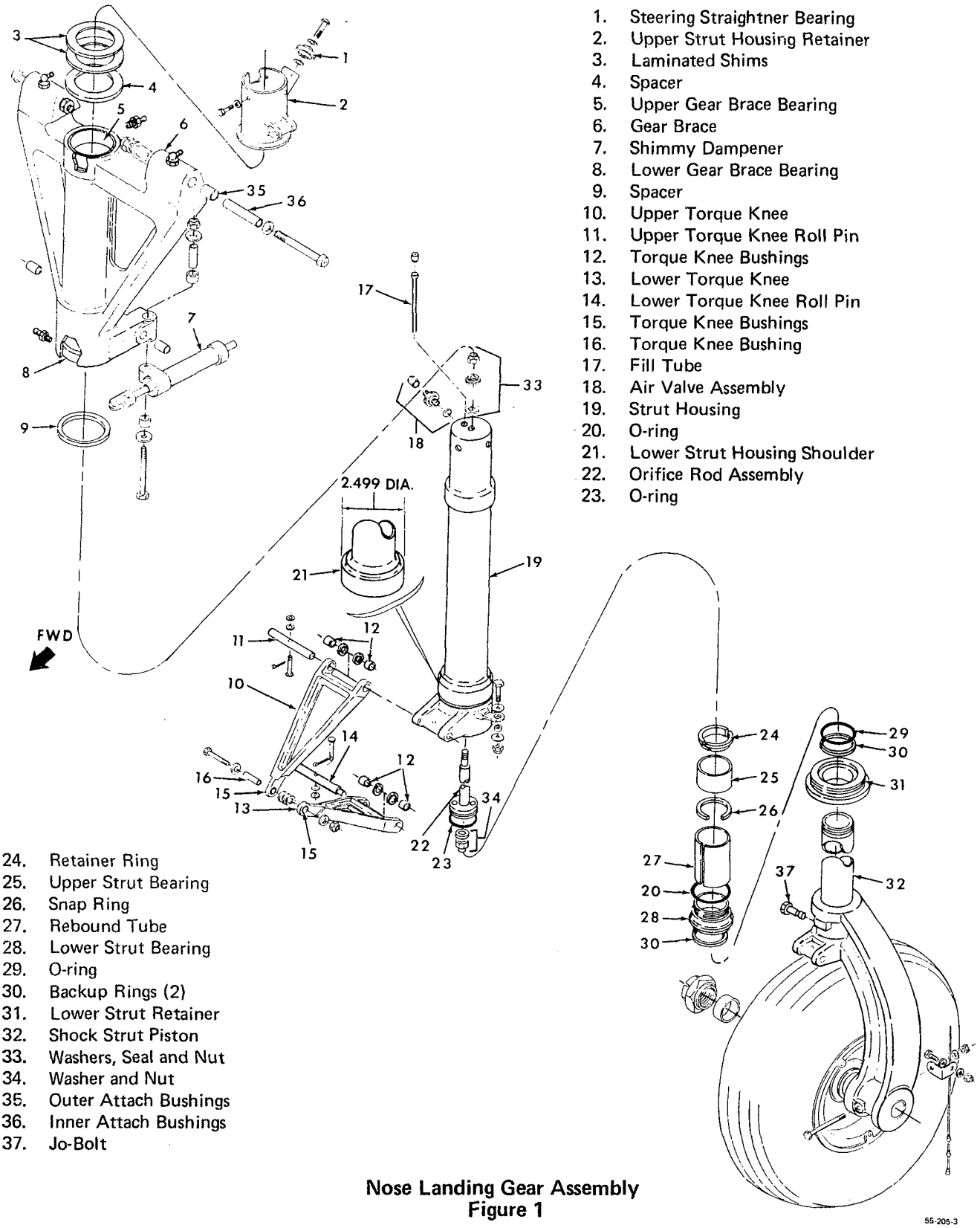
Do not remove fill tube (17) unless replacement is necessary.

NOSE GEAR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Check castings for cracks and pitting, and finished surfaces for scoring, pitting, nicks, cracks, distortion and wear. Chart 1 lists manufacturing tolerances to aid in determining the extent of wear. Replace all defective and worn parts. Replace all seals, backup rings and O-rings.

CHART 1
MANUFACTURING TOLERANCES

Chrome plated portion of absorber assembly piston (32) O.D. (minimum)	1.750 in.
Upper bearing (25) in the barrel assembly I.D. (maximum)	1.748 in.
Lower bearing (28) in the barrel assembly I.D. (maximum)	1.755 in.
Bushing (16) I.D. (maximum)	.257 in.
Bushing (16) O.D. (minimum)	.310 in.
Roll Pin (11) O.D. (minimum)	.373 in.
Tow Pin (14) O.D. (minimum)	.373 in.
Bushing (12) in line and I.D. (maximum)	.3740 in.
Distance between bushing (12) faces when in knee (maximum)	2.136 in.
Bearings (5) and (8) I.D. (maximum)	2.5035 in.
Bearings (5) and (8) O.D. (minimum)	2.6880 in.
Bushings (15) in line and I.D. (maximum)	.3740 in.
Distance between bushing (15) faces when in knee (maximum)	1.580 in.
Lower strut housing shoulder (21) (minimum)	2.499 in.
Rebound tube (27) (length)	3.380 in.



1. Steering Straightner Bearing
2. Upper Strut Housing Retainer
3. Laminated Shims
4. Spacer
5. Upper Gear Brace Bearing
6. Gear Brace
7. Shimmy Dampener
8. Lower Gear Brace Bearing
9. Spacer
10. Upper Torque Knee
11. Upper Torque Knee Roll Pin
12. Torque Knee Bushings
13. Lower Torque Knee
14. Lower Torque Knee Roll Pin
15. Torque Knee Bushings
16. Torque Knee Bushing
17. Fill Tube
18. Air Valve Assembly
19. Strut Housing
20. O-ring
21. Lower Strut Housing Shoulder
22. Orifice Rod Assembly
23. O-ring
24. Retainer Ring
25. Upper Strut Bearing
26. Snap Ring
27. Rebound Tube
28. Lower Strut Bearing
29. O-ring
30. Backup Rings (2)
31. Lower Strut Retainer
32. Shock Strut Piston
33. Washers, Seal and Nut
34. Washer and Nut
35. Outer Attach Bushings
36. Inner Attach Bushings
37. Jo-Bolt

Nose Landing Gear Assembly
Figure 1

55-205-3

NOSE GEAR ASSEMBLY
(Figure 1)

a. Install the steering roller (1) on the upper strut housing retainer (2) with bolt, washers and nut.

b. Attach the lower torque knee (13) to the piston and axle assembly (32) with tow pin (14), washers, bushings (15), pin, washers, and a new cotter pin.

c. Attach the upper torque knee (10) to the strut housing (19) with roll pin (11), washers, bushings (12), bolt, indicator, washers, nut, and a new cotter pin.

d. Lubricate the bore of the strut housing (19), orifice rod assembly (22), orifice and O-ring (23), the outer diameter of piston (32), O-ring (20), and items (24) through (31) with a light coating of clean MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00).

e. Install the O-ring and orifice (23) on the orifice rod assembly (22) with washer and nut (34).

f. Install the orifice rod assembly (22) in the bore of the strut housing (19) with seal and nut (33).

NOTE

Use AN960PD616L or AN960PD616 washers between the upper shoulder of the orifice rod assembly (22) and the upper inside surface of the strut housing (19) to obtain between .025 and .062 inch thread protrusion beyond the attaching nut.

g. Install O-ring (20) inside the strut housing (19). Assemble items (31) through (24) on the piston end of the piston and axle assembly (32); then slide the entire assembly into the strut housing (19). Tighten the lower strut retainer (31) using a spanner wrench, and safety wire.

h. Connect the upper and lower torque knees with bolt, washers, bushing (16), nut and a new cotter pin.

i. Slide the strut housing (19) into the gear brace (6).

j. Place the gear assembly in a vertical position. Assemble the laminated shims (3) and spacer (4) in the upper strut housing retainer. Loosely install the retainer over the top of the strut housing (19) and measure the distance between the gear brace (6) and the strut housing.

NOTE

Add or remove shim lamination, as necessary, to obtain an end play of .005 to .015 inch between the strut and the brace.

k. Install the bolts attaching the upper strut housing retainer (2) and safety wire.

l. Install the landing light (7), the wheel and tire assembly, if removed during disassembly.

m. Install the lower drag leg braces with bushing, pin, washers, nut and a new cotter pin if removed during disassembly.

n. With the strut in a vertical position and completely compressed, fill through the air valve assembly hole with approximately 1 pint of MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00). When the fluid overflows, cycle the strut (full extension to compressed) and refill. Repeat until the fluid cannot be added with the strut in the compressed position.

o. Install the air valve assembly (18).

p. To leak test the assembly, inflate to 300 psi and coat the air valve, retainer cap and other surfaces with soap suds.

WARNING

As with all operations involving equipment under high pressure, exercise caution when performing the leak test; avoid the areas directly above and below the strut.

q. Release the air pressure, clean the soap suds off the strut with fresh water and wip dry.

r. Safety wire the air valve assembly (18) and install the cap.

"END"

LANDING GEAR RETRACT ACTUATOR - OVERHAUL

RETRACT ACTUATOR DISASSEMBLY (Figure 1)

a. Cut the safety wire and remove the bolts (33) and washers attaching the retract motor (1) to the upper actuator housing (35). Remove the spur and pinion gear (2) from the motor.

b. Remove the snap ring (3) and the worm drive gear (4) from the worm gear drive shaft (19).

c. Remove the cotter pin, nut, washers, plate, snap ring (5), and the actuator retract arm (6) from the actuator drive shaft (7). Push the shaft out of the actuator assembly in the direction of the arrows.

d. Remove the snap ring (27) and the actuator retract arm (28) from the drive shaft (7).

e. Remove the cotter pin, nut, washers, and bolt (9). Cut the safety wire and remove the screws (8) and washers attaching the lower actuator housing (34) to the upper actuator housing (35).

f. Index mark both housings. Carefully separate both housings and remove the actuator worm sector gear (10), the sector gear stop assembly (32) and the spacer (43).

g. Cut the safety wire and remove the bolts (15) and washers attaching the hand crank housing to the upper actuator housing (35).

h. Using a spanner wrench, remove the retainer nut (17) and tap the worm gear shaft (19) in the direction of the arrows.

i. Remove the cotter pin and back off on lock nut (21). Slide the bearing (20) down the worm gear shaft (19) and remove the split bushing (18). Remove the key (44) from the shaft keyway.

j. Remove the seal (22) and the bearings (23 and 24) from the upper housing (35).

k. Remove the bearing (29) and the grease fill plug (30), with the ball check (31), from the upper housing.

l. Remove the seals (25) and the bearings (26) from the upper and lower housing (34 and 35).

m. Remove the screw (11) attaching the actuator hand crank (12) to the drive gear assembly (37). Remove the washer (42).

n. Remove the screws attaching the cover (13) to the crank shaft housing (16).

o. Remove the cover (13), the drive gear assembly (38), and the bushings (39 and 40).

p. Cut the safety wire and remove the pin, washers, and spring (41), the drive gear assembly (37), and the bushings (39 and 40) from the housing (16).

RETRACT ACTUATOR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Check all bushings and bearings for cracks and excessive wear. Check all gears for cracks, chipping, missing teeth, nicks and wear. Check the housings for cracks, wear and obvious damage. Replace all defective and excessively worn parts and seals during assembly.

RETRACT ACTUATOR ASSEMBLY (Figure 1)

a. Lubricate the inside diameter of the seal (14) with a light coating of MIL-G-81322 grease (7, Chart 1, 91-00-00) and install in the crank shaft housing (16).

b. Install the bushings (39 and 40) in both the cover (13) and the housing (16).

c. Lubricate the teeth of the drive gear assemblies (37 and 38) with a light coating of MIL-G-81322 grease (7, Chart 1, 91-00-00) and install in housing (16).

d. Install the washers, spring, and pin (41) on the drive gear assembly (37). Safety wire the pin.

e. Apply a coating of permatex (8, Chart 1, 91-00-00) to the mating surfaces of the cover (13) and the housing (16).

f. Align the holes in the cover (13) with the aligning pins in the housing (16) and install the screws (36).

g. Slip washer (42) over the end of the drive gear assembly (37) and install hand crank (12) with screw (11), washers and nuts.

h. Install the bearings (26) and the seals (25) in the upper and lower actuator housings (34 and 35).

NOTE

Coat the outside diameters of seals (25) with sealing compound (15, Chart 1, 91-00-00).

i. Install the key (44) in the keyway of the worm gear shaft (19).

j. Fully thread the nut (21) on the worm gear shaft (19) and slip the bearing (20) on the shaft. Install the split bushing (18) on the shaft and tighten the nut (21) against the bearing (20) and install a new cotter pin.

NOTE

Cut the ends of the cotter pin so that .12 to .19-inch will protrude beyond the nut (21). Bend the cotter pin ends tightly across the nut.

k. Install the bearings (23 and 24), and the seal (22) into the upper housing (35).

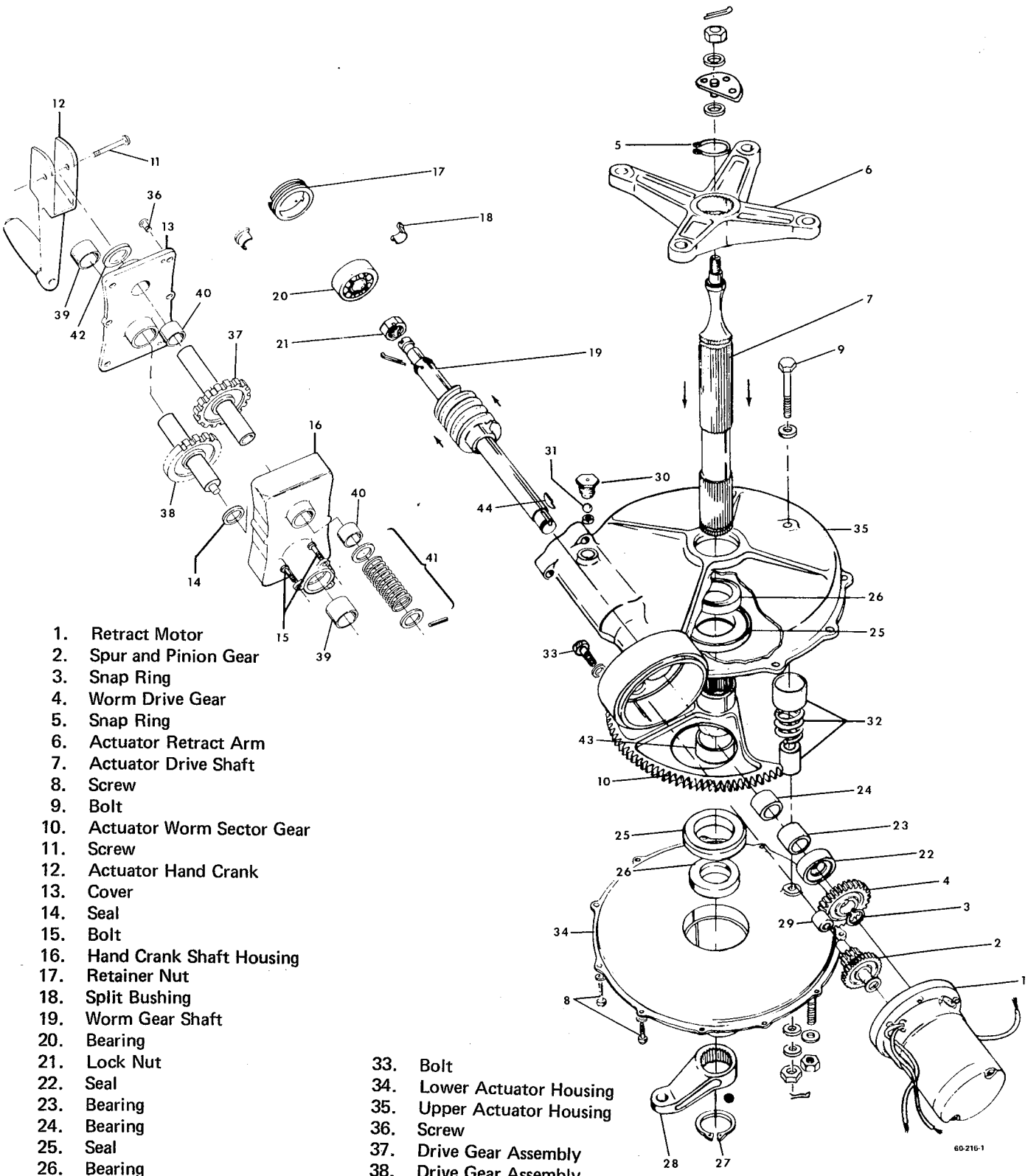
l. Slide the worm gear shaft (19) into the upper housing (35) in the opposite direction of the arrows.

m. Lubricate the threads of the retainer nut (17) with a light coating of thread lub (9, Chart 1, 91-00-00) and install in the upper housing (35) with a spanner wrench. Stake the nut (3 places).

n. Align index mark of the actuator retract arm (28) with the index mark on the actuator drive shaft (7). Install the arm on the shaft with the snap ring (27).

o. Slide the actuator drive shaft (7) into the lower housing (34) in the opposite direction of the arrows. Install the spacer (43).

"END"



1. Retract Motor
2. Spur and Pinion Gear
3. Snap Ring
4. Worm Drive Gear
5. Snap Ring
6. Actuator Retract Arm
7. Actuator Drive Shaft
8. Screw
9. Bolt
10. Actuator Worm Sector Gear
11. Screw
12. Actuator Hand Crank
13. Cover
14. Seal
15. Bolt
16. Hand Crank Shaft Housing
17. Retainer Nut
18. Split Bushing
19. Worm Gear Shaft
20. Bearing
21. Lock Nut
22. Seal
23. Bearing
24. Bearing
25. Seal
26. Bearing
27. Snap Ring
28. Actuator Retract Arm
29. Bearing
30. Grease Fill Plug
31. Ball Check
32. Sector Gear Stop Assembly
33. Bolt
34. Lower Actuator Housing
35. Upper Actuator Housing
36. Screw
37. Drive Gear Assembly
38. Drive Gear Assembly
39. Bushings
40. Bushing
41. Pin, Washer and Spring
42. Washer
43. Spacer
44. Key

Landing Gear Retract Actuator
Figure 1

p. Align the center splined tooth of the actuator drive shaft (7) with the index mark on sector gear (10). Install the sector gear on the shaft.

q. Coat the mating surfaces, and the machined surfaces where bolt (9) is installed, on the upper and lower housings (34 and 35) with silastic compound (10, Chart 1, 91-00-00).

r. Temporarily insert bolt (9) through the lower housing (34) and position the sector gear stop assembly (32) over the bolt.

s. Align the index marks, made during disassembly, and position the upper housing (35) over the lower housing (34). Install screws (8) and washers, and safety wire.

t. Carefully remove bolt (9) and install as shown in Figure 1, with washers, nut and a new cotter pin.

u. Align the center splined tooth of the actuator drive shaft (7) with the index mark on the actuator retract arm (6). Install the arm on the shaft with snap ring (5). Install washers, plate, nut, and a new cotter pin.

v. Install the worm drive gear (4) on the worm gear shaft (19) with the snap ring (3). Install the spur and pinion gear (2) in the upper housing (35), making sure the teeth engage those of the worm drive gear (4).

w. Lubricate that portion of the upper housing (35), containing the spur and pinion gear (2) and the worm drive gear (4), with approximately one ounce of MIL-G-81322 grease (7, Chart 1, 91-00-00). Fill within -.000 to +.100-inch of the housing center line.

x. Install the retract motor to the upper actuator housing (35) with bolts (33) and washers, and safety wire.

y. Lubricate the actuator assembly, through the grease fill port, with one-half pint of grease (6, Chart 1, 91-00-00).

z. Install the ball check (31), and the grease fill plug (30) in the upper housing (35).

RETRACT ACTUATOR FUNCTIONAL TEST

a. Hand crank the actuator and check for binding.

b. Using test fixture 35-810080, tool code 807-1 or equivalent, with the actuator loaded to simulate approximate normal usage, operate the actuator through six full cycles.

c. The actuator shall not bind or produce excessive noise or vibration.

d. No grease leakage is permitted.

"END"

BRAKE MASTER CYLINDER - OVERHAUL

BRAKE MASTER CYLINDER DISASSEMBLY (Figure 1)

a. Remove the snap ring (1) and pull the assembled piston out of the brake cylinder (2).

b. Remove the clevis (3) from the piston (14), also the check nut (4); this will free the washer (5), piston guide bushing (6), retainer O-ring (7) and the rear seat washer (8) from the piston (14).

c. Remove the cotter pin (9) from the collar (10) and pull the collar from the piston.

d. Remove the cotter pin (11) from the plunger end of the piston and allow the flow lock piston (12) to come free.

e. The return spring (13) will fall free of the cylinder with the piston removed.

CLEANING BRAKE MASTER CYLINDER

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Check all parts for cracks, corrosion, distortion and wear. Replace flow lock piston (12), valve spring (16), all washers and seals at reassembly. Lubricate all parts with clean MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00) prior to assembly.

BRAKE MASTER CYLINDER ASSEMBLY (Figure 1)

a. Position the return spring (13) in the cylinder (2).

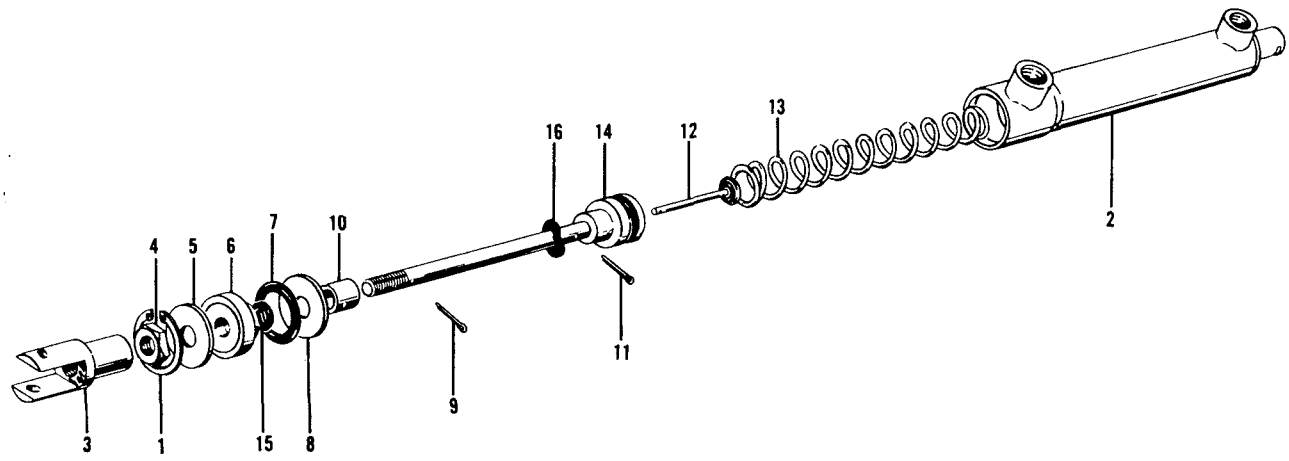
b. Position the flow lock piston (12) in the plunger end of the piston (14) and secure with the cotter pin (11).

c. Install the collar (10) on the piston and secure with the cotter pin (9).

d. Install the rear seat washer (8), retainer O-ring (7), piston guide bushing (6) and washer (5) on the piston.

e. Install the clevis (3) and secure with the check nut (4).

f. Position the assembled piston in the cylinder (2) and install the snap ring (1).



60-220-1

1. Snap Ring
2. Cylinder
3. Clevis
4. Check Nut
5. Washer
6. Piston Guide Bushing
7. Retainer "O" Ring
8. Rear Seat Washer
9. Cotter Pin
10. Collar
11. Cotter Pin
12. Flow Lock Piston
13. Return Spring
14. Piston
15. "O" Ring
16. Valve Spring

Brake Master Cylinder
Figure 1

PARKING BRAKE VALVE - OVERHAUL

PARKING BRAKE VALVE DISASSEMBLY (P-4 through P-45) (Figure 2)

a. Remove the valve seat (1) from the valve body.

b. Remove the elbow (2) from the valve seat; then remove the spring (3), washer (4) and the ball (5).

c. Remove the nozzle (7) from the valve body.

d. Remove the rivets and washers (8) attaching the brake valve arm to the valve body and to the valve stem assembly (6).

e. Remove the spacer (9) and the valve stem assembly from the valve body.

f. Remove the pin (12) and separate the valve head (13) and spring (14) from the stem (15).

g. Remove the O-rings (10 and 11).

PARKING BRAKE VALVE CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Inspect the valve housing for cracks, thread damage and obvious damage. Inspect parts for cracks and wear. Replace all O-rings and defective parts at assembly.

PARKING BRAKE VALVE ASSEMBLY (P-4 through P-45) (Figure 2)

a. Lubricate the new O-rings and internal parts with a light coating of MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00).

b. Assemble the spring (14), and the valve head (13) on the stem (15) and install the spring pin (12).

c. Install the O-ring (10) in the valve body and install the valve stem assembly (6).

d. Install the spacer (9) and attach the brake valve arm to the valve body and the stem (15) with the rivets and washers (8).

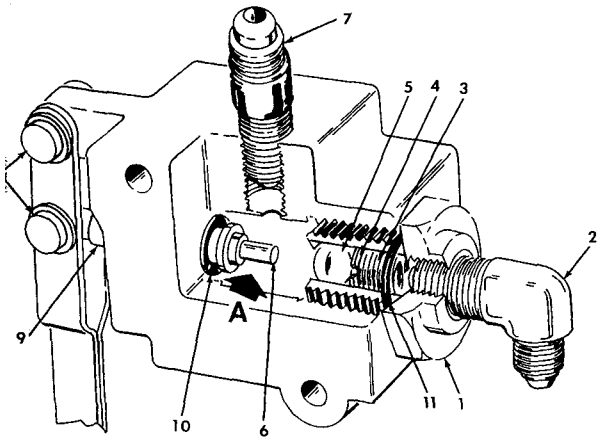
e. Position the ball (5), washer (4) and the spring (3) in the valve seat (1) and install the elbow (2).

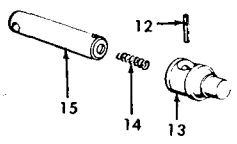
f. Install the O-ring (11) in the valve housing and install the valve seat (1).

g. Install the nozzle (7) in the valve body.

TESTING PARKING BRAKE VALVE (P-4 through P-45)

Check the parking brake valve for leaks by applying 1500 lbs. pressure in the valve through the elbow (2). Release the pressure; then apply it through the nozzle (7).

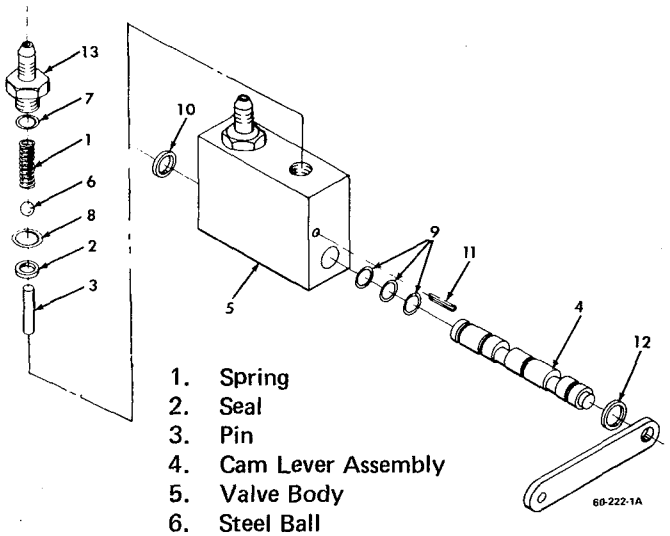




DETAIL A

P-4 thru P-45

1. Valve Seat
2. Elbow
3. Spring
4. Washer
5. Ball
6. Valve Stem Assembly
7. Nozzle
8. Rivets and Washers
9. Spacer
10. O-Ring
11. O-Ring
12. Spring Pin
13. Valve Head
14. Spring
15. Stem



P-46 and after

1. Spring
2. Seal
3. Pin
4. Cam Lever Assembly
5. Valve Body
6. Steel Ball
7. "O" Ring
8. "O" Ring
9. "O" Ring
10. Retaining Ring
11. Roll Pin
12. Washer
13. Fitting

Parking Brake Valve
Figure 2

PARKING BRAKE VALVE DISASSEMBLY (P-46 and after) (Figure 2)

a. Remove the fittings (13), O-rings (7), springs (1), balls (6), O-rings (8), seals (2) pins (3) from the valve body.

b. Remove the retaining ring (10) from the cam lever assembly (4).

c. Remove the cam lever assembly (4) by grasping the lever and rotating the cam lever assembly counterclockwise while pulling outward to prevent scoring of the cam lever assembly surface.

d. Remove the O-rings (9) and washer (12).

PARKING BRAKE VALVE CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (1, Chart 1, 91-00-00). Inspect the valve housing for cracks and thread damage. Inspect the cam lever assembly for wear, scoring and scratches. Inspect other parts for damage and condition. Replace all O-rings, seals and defective parts at assembly.

PARKING BRAKE VALVE ASSEMBLY (P-46 and after) (Figure 2)

a. Lubricate the new O-rings, seals and internal parts with a light coating of MIL-H-5606 hydraulic fluid (5, Chart 1, 91-00-00).

b. Install the washer (12), and the O-rings (9) in the grooves provided on the cam lever assembly (4).

c. Carefully insert the cam lever assembly (4) into the valve body (5) and install the retaining ring (10).

d. Install the seals (2) and O-rings (8) in the valve housing. Insert the pins (3), balls (6) and the springs (1) in the valve body.

e. Install the O-rings (7) on the fittings (13) and install in the valve housing.

TESTING PARKING BRAKE VALVE (P-46 and after)

The valve should open with the application of 2 pounds of pressure or less, if not, the valve is unserviceable.

"END"

BEECHCRAFT
DUKE 60 SERIES
BEECH MANUFACTURED
COMPONENTS MAINTENANCE MANUAL

LIST OF PUBLICATIONS IN CHAPTER 32

TITLE	*PUBLICATION NUMBER*	*DATE*
Maintenance Information and Illustrated Parts Breakdown for Landing Gear Motor	98-35798B	November 15, 1985

"END"

MAINTENANANCE INFORMATION AND ILLUSTRATED PARTS BREAKDOWN for

LANDING GEAR MOTOR

Part Number 96-380022 (Lamb Electric Co. P/N 14818) used on

BEECHCRAFT

BARON 55, 56TC, 58 and 58P

DUKE 60

TRAVEL AIR 95

PUBLISHED BY

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General Aviation
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MAINTENANCE INFORMATION AND ILLUSTRATED PARTS BREAKDOWN

for

LANDING GEAR MOTOR P/N 96-380022

Disassembly (See illustration for index numbers)

1. Remove the 2 nuts (2) which are located on the end bracket (12). This will permit removal of the two end brackets and the armature assembly (16) from the field assembly (15). Do not disconnect wiring between commutator end bracket (13) and field assembly (15) unless necessary for future checking and/or repairs.

2. Loosen the 2 set screws (5) in the commutator end bracket (13) and remove brush and spring assembly (17).

3. Remove bearings (3) and (4) from armature shaft.

Cleaning

1. Clean all parts, except sealed bearings, with PD680 solvent or equivalent.

2. Do not leave armature or coil of motor in solvent (permissible to immerse and remove immediately).

3. Dry all parts prior to reassembly.

Inspection

Inspect all parts and scrap those that are nonrepairable.

Rejection

The specific conditions listed below are cause for rejection.

1. Wear which is greater than the allowable wear tolerances given.

2. Damage which cannot be corrected by one or more of the authorized repairs listed in this manual.

3. Armature assemblies that have shafts that are heavily scored, or that are worn to the extent that bearings are loose on the shaft, or that have loose commutator segments.

4. Armature assemblies and field coils which have cracked, burned, or excessively worn insulation.

5. All screw that are severely damaged or have stripped, excessively worn or scored threads.

6. All gears on which teeth are severely worn.

7. Parts that are cracked, chipped, or broken.

8. Parts that have corrosion or other defects that cannot be repaired within the requirements of this manual.

Repair and Reconditioning

Recondition and make necessary repairs as follows:

Retape or replace wiring that extends outside of the motor case if dirty or discolored. Do not disassemble more than necessary for complete check and reconditioning as follows:

1.	13981A Armature	Visually inspect for excessive wear or damage. If noticeable step is worn on involute surface of gear end of shaft, replace armature. Check armature with "growler" for short circuit. If there is a short or open circuit, replace with new or rebuilt armature. If armature tests satisfactorily, recut surface of commutator (if burned, pitted, or uneven) until it is smooth, then regroove. Minimum acceptable diameter of commutator shall be .968 (31/32). The teeth of the armature gear shall not show severe wear or damage.
2A	30-7623 and 20-7609 Open Bearings (may be relubricated)	With bearing clean and dry, rotate race by hand and feel for roughness, side-play and end-play; if noticeably greater than that of a new bearing, scrap and replace. Perform a magnetic particle inspection per MIL-I-6868.
2B	30-7625 and 20-7639 Sealed Bearings	Install new bearings because the condition of sealed bearings cannot be determined.
3.	14818F Field Coil Assembly	Visually inspect coils, poles, and housing for severe wear or damage. Replace any part as necessary. Using a "Hi-Pot" tester, check for high potential shorts by applying 500 volts of single phase, 60 cycle alternating current between the field coil wiring and housing for 5 to 15 seconds duration. No breakdown is permissible. Perform tests for continuity. Do not disassemble further unless damaged, or a short or open circuit is indicated, then disassemble only as necessary to repair.
4.	33107-A Brush Holder Assembly	Visually inspect brush plugs, insulator and brush holder for severe wear or damage.
5.	0-6864 End Bracket *0-6865	Visually inspect end bracket for severe wear or damage. *NOTE: Do not disassemble from field coil assembly (4) unless necessary for further testing, rework, or replacement.

6. Visually inspect the following parts. Reuse all that show no severe wear or damage.

7978 10-7822	Set Screw
10-7888	Stud
7469	Nut
0-3518	Load Spring
8058	Drive Pin
0-3883 0-3896	Cord Bushing
39109-A	Lead and Clip Assembly
P-O-750	Tape
YX10-1	Connector
106242-3-00014	Insulator

MS20659-5	Terminal
0-2497	Washer
10-4431	Disc
5705	Screw
8047	Name Plate

New Parts Required

Parts Not To Be Reused - To Be Supplied New

(2)	35175-A	Brush Assem.
(2)	MS24665-138	Cotter Pin

Authorized Repairs. These are in addition to the specific repairs noted in Repair and Reconditiong.

1. Slight scoring of shafts may be corrected by lapping carefully with a flat oil stone.

2. Smooth minor nicks, burrs and scratches.

3. Strip and replate, with same type plating as removed, those parts that are scratched or worn through the plating.

4. Chase the threads to clean or smooth minor thread damage.

5. Remove all corrosion.

6. Replace severely damaged or unserviceable parts with new or serviceable parts.

7. Revarnish all wiring as needed.

8. Bushings that check within dimensional range of a new part may be reused.

Reassembly (See illustration for index numbers)

Replace all scrapped parts with new or serviceable parts.

1. Repack all bearings* with MIL-G-23827 grease. Install needle bearings (7) in end bracket (13). Place bearings on armature shaft. NOTE: The bearing opposite the gear end shall be placed on the shaft in such a way that the shield faces inside of the motor. The needle bearing is to be installed with open end facing the outside of the motor.

2. Place new brush assembly and brush holder in the commutator end bracket. Paint around the brush holders and adjacent parts of the casting with P-2163 a corrosion preventive (product of General Electric). Before installing the 2 set screws on the outer side of commutator end bracket, place 2 or 3 drops of red Glyptal P-2081 in each set screw hole to cement them in place.

3. Place commutator end bracket, field coil assembly, armature, and end bracket in place and secure with 2 nuts.

4. Stake all flat-head screws at slots. Install cotter pin at brush caps.

Functional Test

1. Connect the motor to 24 volts. Run-in to assure full seating of brushes.

*30-7625 and 20-7639 are sealed bearings that cannot be lubricated.

2. Using a "Hi-Pot" tester, check for high potential shorts by applying 500 volts of single phase, 60 cycle alternating current between motor wiring and motor frame for a maximum duration of 15 seconds. No breakdown is permissible.

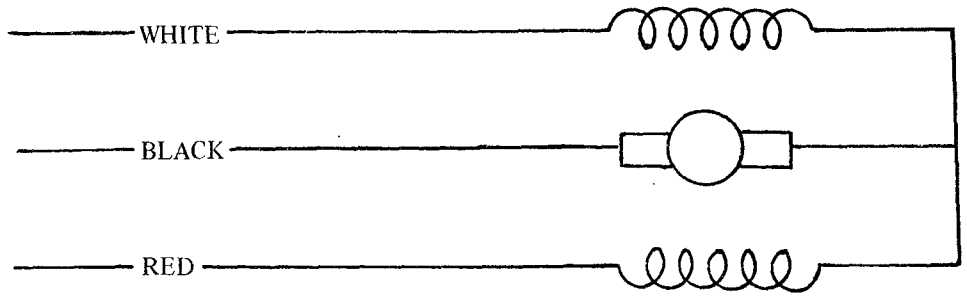
3. Check motor operation at no-load, with both clockwise and counterclockwise rotation. Noise and vibration shall not greatly exceed that of the average motor.

4. With motor running at no-load, current drain shall not exceed 6 1/2 amperes.

MOTOR DATA

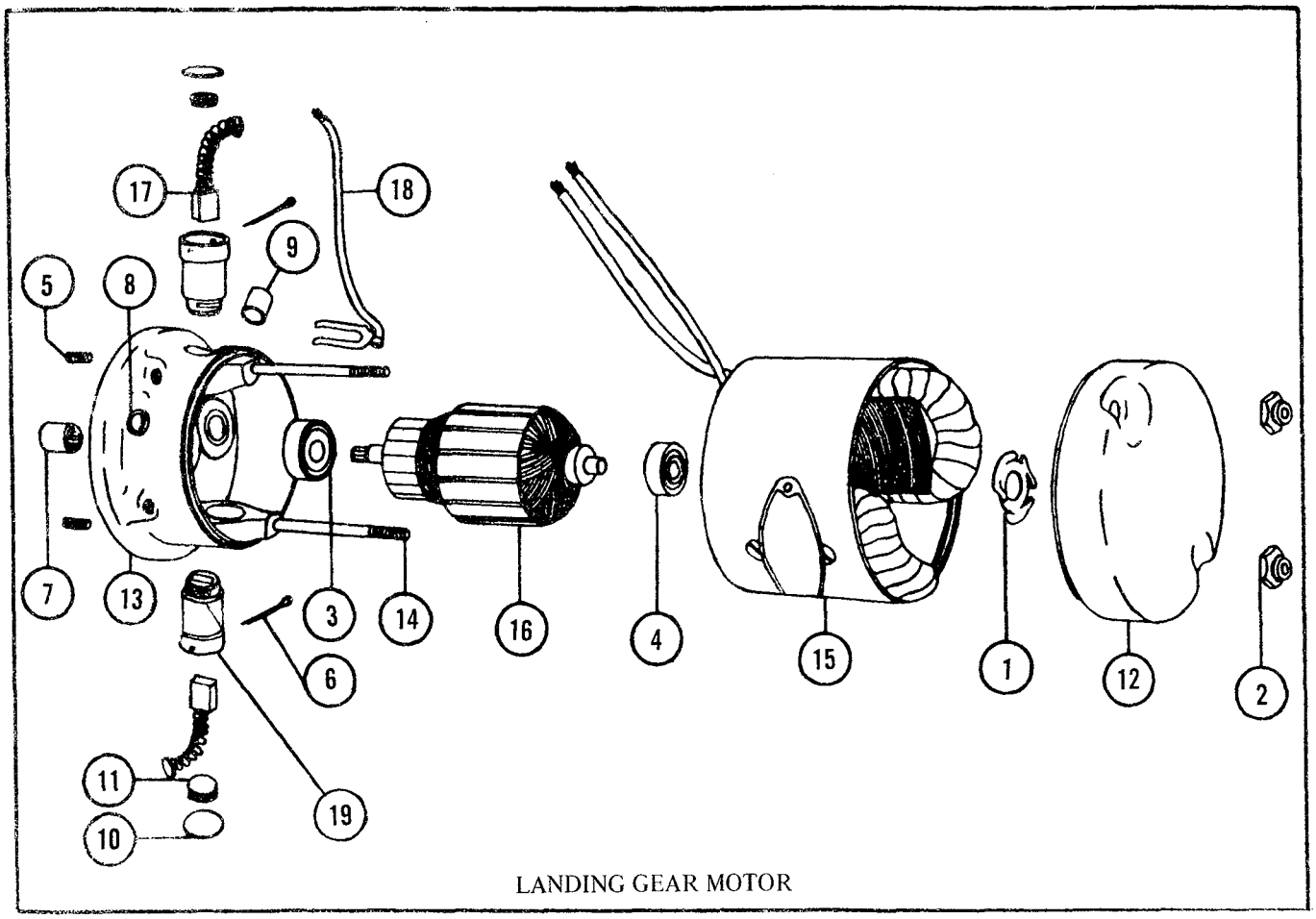
Rated voltage - 24 volts DC
Horsepower - 1/4 to 1/5
Weight - 2 lbs. 12 oz.
Duty Cycle - Intermittent
Type - Series
Brush Replacement - New brush length is 17/32 inch.
Minimum brush length is 7/32 inch.

Commutator - Clean commutator every second brush change with a light cut. Replace armature when the commutator reaches a minimum diameter of (.986) 31/32 inch.



Electrical Wiring Schematic

The split field in the series-wound motor allows the motor to drive in either direction. The electric connections for shaft rotation (facing the pinion gear) are: for counterclockwise rotation connect the black and red leads to the line, to reverse connect black and white leads to the line.



LANDING GEAR MOTOR

Index	Part Number	Description	Quantity Required
	IS14818	Landing Gear Retract Motor	1
1	0-3518	Load Spring	2
2	7469	Nut	2
3	30-7623	Ball Bearing	1
4	20-7609	Ball Bearing	1
5	7978	Set Screw	2
6	MS24665-138	Cotter Pin	2
7	20-7642	Bearing (Needle)	1
8	0-3883	Cord Bushing	1
9	0-3896	Cord Bushing	1
10	10-4431	Fibre Disc	2
11	5705	Brush Holder Screw	2
12	0-6864	End Bracket	1
13	0-6865	Comm. End Bracket	1
14	10-7888	Stud	2
15	14818-F	Field	1
16	13981-A	Armature	1
17	35107-A	Brush & Spring Assem.	2
18	39109-A	Lead and Clip Assem.	1
19	33107A	Brush Holder Assem.	2
	8047	Name Plate	1
	0-2497	Fibre Washer	2
	20-3841	Sleeve	3
	0-5113	Clip	1
	0-5114	Clasp	2
	10-7822	Set Screw	2
	8058	Drive Pin	2

LIST OF PUBLICATIONS IN CHAPTER 73

TITLE	*PUBLICATION NUMBER*	*DATE*
Overhaul Instruction and Illustrated Parts Breakdown-Engine Driven Fuel Pump	98-33702	May 26, 1967

"END"

OVERHAUL INSTRUCTIONS
AND
ILLUSTRATED PARTS BREAKDOWN
FOR
Beechcraft

Engine Driven Fuel Pump
Part Number 50—921560

Published By
Parts and Service Operations
Beech Aircraft Corporation
Wichita 1, Kansas

98-33702
(Supersedes 92-483)
May 26, 1967

NOTE

The -5, -7 and -11 pumps that have been modified by the 4107-70 kit which prevents the vane spacer pin from wearing the cover plate will be identified with an M stamped after the part number.

ENGINE DRIVEN FUEL PUMP

NOTE

The 50-921560-5, -7 and -11 pumps have been discontinued. The -33 pump supersedes these pumps and should be ordered when the entire pump is to be replaced. For individual parts replacement, refer to the parts list. The part numbers for the following pumps have been changed:

50-921560-1 becomes 50-921560-21
50-921560-3 becomes 50-921560-23
50-921560-9 becomes 50-921560-29
50-921560-13 becomes 50-921560-33
50-921560-15 becomes 50-921560-35

DISASSEMBLY (See Figure 4)

a. Cut and remove all safety wire from pump.

b. Remove the pressure adjusting lock nut (1) and permit the pressure adjusting screw (2), gasket (3), spring follower nut (4), and relief valve spring (5) to drop out of the relief valve cover (6).

c. Remove the 4 screws (7) and detach the relief valve assembly (9) from the main housing (10).

NOTE

Do not remove the guide pin from the relief valve housing casting.

d. Disassemble the relief valve cover (6), diaphragm (11), relief valve (12), and gasket (13) from the relief valve housing (14).

NOTE

If the diaphragm (11) sticks to the relief valve housing (14), it can be removed by inserting a blunt instrument, such as a small screwdriver, in the underside of the valve housing and then applying a steady pressure against the relief valve (12). Do not push against the diaphragm (11).

e. Hold the relief valve housing (14) very lightly in a vise and unscrew the by-pass valve cover (15).

f. Remove the gasket (16) from the by-pass valve cover (15).

g. Remove the spring (17) and by-pass valve (18) from the relief valve housing (14).

h. Disengage the snap ring (19).

i. Remove the auxiliary seal (20) from the rear plate (21) by inserting a thin flat tool, such as a dull knife blade, under the outer edge of the seal and working the seal out of the recess in the rear plate. Then stretch the seal and pull it off the drive shaft (22).

j. Remove the 4 screws (23) and disassemble the rear plate (21), drive shaft (22), rear plate disc (24), universal washer (25), seal (26), and spring (27) from the main housing (10).

k. Remove the 4 screws (28) that hold the front cover (30) on the main housing (10) and detach the front cover, auxiliary cover plate (39) or (42) and gasket (31).

NOTE

The vane spacer pin (32) in the center of the rotor (33) will now fall out if the pump is held with the mounting flange up. With the spacer pin removed, it is possible for the vanes to fall into the center bore of the rotor, from where they can fall unexpectedly to the floor and be damaged. To prevent this from occuring it is a good practice to hold the spacer pin in place with the fingers while the front bearing (35) is being removed.

l. Press the front bearing (35) out of the main housing (10) by pressing on the drive end of the rotor (33) using one of the tools shown in figure 1. With the bearing removed, the rotor (33) and the vanes (34) will drop out of the liner (36).

m. Remove the set screw (38).

n. Heat the main housing (10), with the liner (36) and rear bearing (37) in place, to about 121 degrees C (250 degrees F) in an oven or oil bath. The bearing and liner can then be easily removed by hand.

o. Wash all parts in solvent, specification P-S-661.

REPAIR

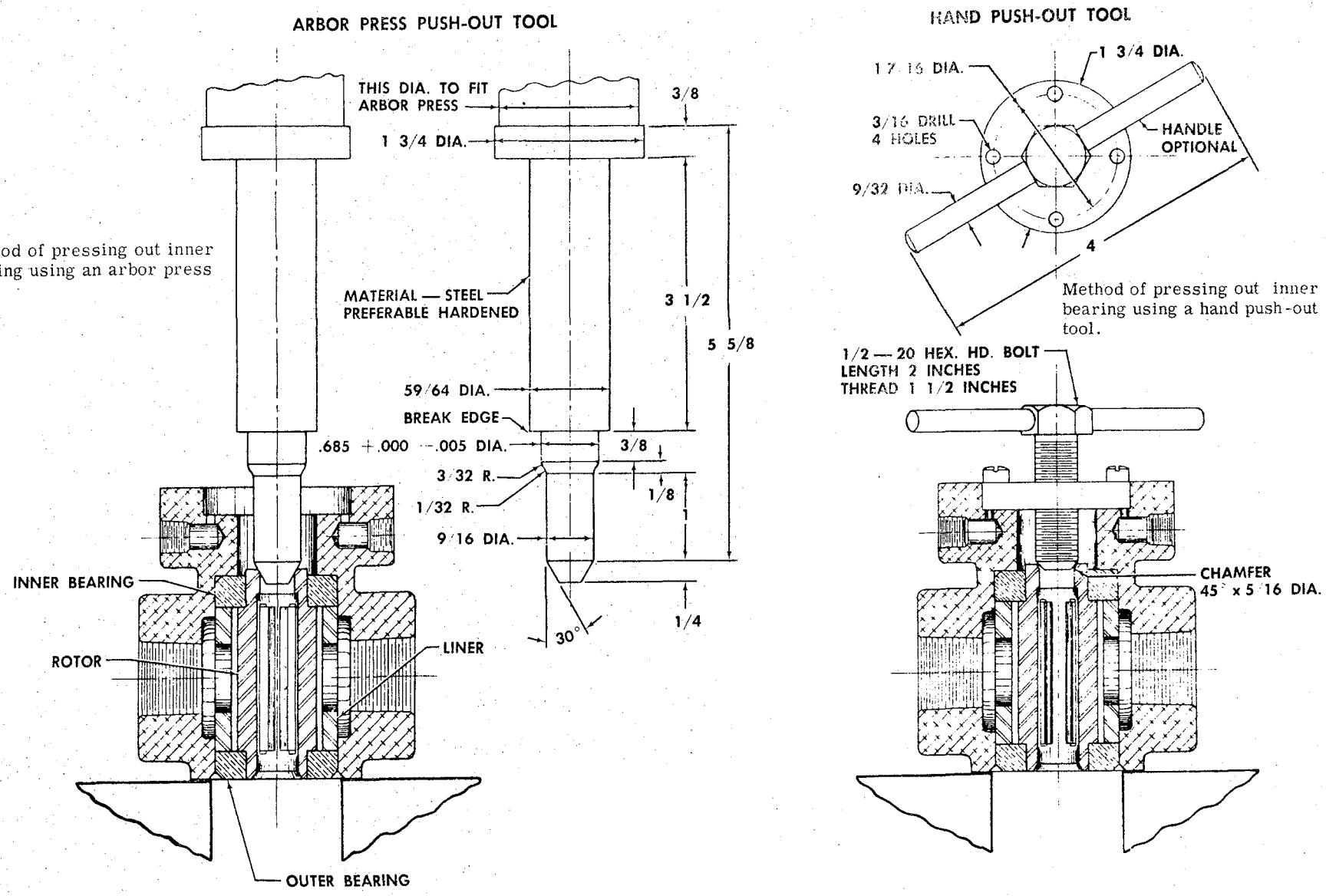
Replace all worn, damaged or otherwise defective parts. See table of fits and clearances for dimensions of the mating parts when new, the desired clearance, and the maximum clearance or wear at which replacement of parts is recommended. Useage of parts beyond the maximum clearances will reduce the capacity and impair the efficiency of the pump.

ASSEMBLY

NOTE

Replace all gaskets and seals with new ones and apply anti-seize compound, specification MIL-T-5544, to all threads.

a. Heat the main housing (10) to about 121 degrees C (250 degrees F) and then insert the rear bearing (37) into the main housing bore and quickly press it into place before it expands from the heat of the housing. The flat side of the bearing should be toward the liner.



Method of pressing out inner bearing using an arbor press tool.

Method of pressing out inner bearing using a hand push-out tool.

Figure 1. Fuel Pump Bearing Removal Tools

b. Insert the liner (36) in the housing and align the slot in the liner with the set screw hole using a one-eighth inch pin.

NOTE

Be sure that the rear bearing (37) is tight against the housing bore and that the liner (36) is tight against the bearing.

c. When the housing has cooled, install the set screw (38).

CAUTION

Do not tighten the set screw down against the bottom of the liner slot, as it might distort the liner. Install the screw only far enough to engage the slot in the liner.

d. Place the vane spacer pin (32) inside the bore of the rotor (33).

e. Insert a vane (34) in each of the slots in the rotor (33) and see that they work freely in the slots.

f. Position the vane and rotor assembly inside the liner (36) with the drive end of the rotor hub inserted in the rear bearing (37).

g. Hold the vane spacer pin (32) in place with a finger and insert the drive shaft (22) in the drive end of the rotor (33). Then rotate the rotor with the drive shaft to make sure the vanes and rotor turn freely.

h. Press the front bearing (35) into place in the main housing (10).

NOTE

The bearing must be pressed into position perfectly square with the axis of the rotor. An arbor press with the ram flat and parallel to its bed is recommended. If such a press is not available, the rotor may be pushed forward until the hub of the rotor is out of the rear bearing (37). This will allow the front hub of the rotor to extend out beyond the main housing. Then place the front bearing on the front rotor hub and press the bearing into place allowing the rotor to go down with it. The rotor hub in the bearing will hold it square.

i. Check the rotor (33) for free rotation.

j. Check the end play of the rotor. Only a barely perceptible movement should be felt. If too much is present, and pressing down the front bearing does not correct it, it may be due to foreign matter between either end of the liner (36) and the bearings (35 and 37).

NOTE

Be careful that the vane spacer pin (37) does not fall out while the cover plate (30) is still removed.

k. Place the gasket (31) in the groove between the front bearing (35) and main housing (10).

l. Position the auxiliary cover plate (39) or (42) and front cover (30) into place on the main housing (10) and secure them with the 4 screws (28) and 4 washers (29).

m. Place the spring (27) over the square end of the drive shaft (22) and insert the shaft in the square hole in the rotor hub.

n. Place the seal (26), universal washer (25), rear plate disc (24), and rear plate (21) over the splined end of the drive shaft (22).

o. Press down on the splined end of the drive shaft (22) to compress the spring. As the rear plate (21) enters its recess in the main body (10), align the screw holes in the rear plate (21) and seal (26) and install the 4 screws (23).

p. Slip the auxiliary seal (20) over the drive shaft splines and into position in the recess in the rear plate.

q. Install the snap ring (19) in the recess in the rear plate over the auxiliary seal.

r. Determine the discharge port from the direction of rotation, then position the relief valve housing (14) and gasket (13) on the main housing (10) with the by-pass valve end of the housing on the discharge side of the pump.

s. Place the relief valve (12) on the guide pin in the relief valve housing and see that it moves freely.

t. Position the diaphragm (11) and relief valve cover (6) on the upper side of the relief valve housing with the supercharger port facing the front cover side of the pump.

u. Align the screw holes in the diaphragm (11) and relief valve cover (6), and install the 4 screws (7) and 4 washers (8) in the relief valve assembly.

v. Place the spring (5) in the axial bore of the relief valve cover (6).

NOTE

Make sure the spring is not cocked and rests properly on the diaphragm.

w. Place gasket (3) on the pressure adjusting screw (2) and then install the spring follower nut (4) on the screw.

x. Insert the screw and follower nut in the bore of the relief valve cover, making sure the follower nut enters the square recess in the valve cover.

y. Install the pressure adjusting lock nut (1) while holding the spring in a compressed position. Tighten the pressure adjusting lock nut enough to lock the adjusting screw and then loosen it one-half turn.

z. Place the pump loosely in a vise with the by-pass valve opening up.

aa. Place gasket (16) on the by-pass valve cover (15).

bb. Place the by-pass valve (18) on the by-pass cover guide pin with the spring (17) installed between the valve cover and valve.

NOTE

Make sure that the valve slides freely on the guide pin and that the axial bore of the valve is completely free of dirt. Any dirt in the bottom of the hole may later work up on the guide pin causing the valve to bind.

cc. Insert the assembled valve in the relief valve housing (14) and tighten the by-pass valve cover (15).

dd. After completion of tests and adjustment safety wire by-pass valve cover (15) and all screws.

TESTING

After the pump has been reassembled, it should be thoroughly tested and adjusted as follows:

NOTE

In no instance should fluid other than calibrating fluid, Specification MIL-F-7024, be used for testing and adjusting the pump. The test area must be well ventilated to prevent the accumulation of calibrating fluid vapors.

a. Plug the pump outlet port and simultaneously apply a pressure of 30 PSI to the inlet port and supercharger connection. While the pump is pressurized, submerge it in calibrating fluid and check it for leaks by noting the formation of air bubbles on the pump. Leakage is not permissible at any place but the shaft seal. If leakage is observed at any other point, tighten screws.

NOTE

The 50-921560-17 must be pressurized and tested for leaks at a pressure of 45 PSI.

b. The pump should be subjected to a 1 hour break-in run at 1750 RPM with a total pressure head of 5 PSI. Replace any seals that leak during the break-in run.

c. Immediately following break-in run, disconnect fluid supply from pump and run pump at not less than 1700 RPM, with air circulating through the pump, for a period of 3 minutes.

d. At the end of 3 minutes dry run, connect a mercury manometer to pump inlet port and operate at the speeds listed below. The pressure relief valve must be blocked shut.

RPM	Inlet Depression ins. Hg.
250	0.80 minimum
1,000	4.50 minimum
2,000	9.25 minimum

Do not run pump for more than a total of 5 minutes while taking inlet suction readings.

e. If the pump fails to meet the test, determine if the loss is in the relief valve assembly or pumping mechanism.

f. Remove relief valve housing assembly (9) as a unit from the pump. Close valve outlets in the main housing by holding the palm of the hand over them and again perform test. If pump passes test with relief valve removed, it indicates a leak in the relief valve assembly or by-pass valve.

g. If pump fails to pass test after removing relief valve assembly, it indicates a leak in the pumping mechanism, or binding of parts during assembly.

h. Reconnect fluid supply. Run pump at 2500 RPM with a pressure head of about 20 PSI, achieved by turning the pressure adjusting screw (2, figure 4) clockwise. The fuel flow must not be less than 200 GPH.

i. Run the 50-921560-21 and -23 pump at 2000 RPM, 25 GPH flow, and 15 PSI discharge pressure. A variation of negative inlet pressure from 0 to 8 inches Hg. shall not cause the discharge pressure to vary from the range of 14.5 PSI to 16 PSI.

j. Run the 50-921560-5, -7, -11, -29, -33, and -35 pump at 2300 RPM, 53 GPH flow, 22 PSI discharge pressure and a 4 in. Hg. inlet suction. Increase the inlet pressure to 18 PSI. The discharge pressure shall not exceed 25 PSI.

k. Run the 50-921560-5, -7, -11, -29, -33 and -35 pump at 1700 RPM, 0 to 2 in. Hg. inlet suction and 30 PSI discharge pressure for 3 minutes. No leakage at the shaft seal is permissible.

l. Run the 50-921560-17 pump at 3200 RPM, 78 GPH flow, 40 PSI discharge pressure, and a 4 in. Hg. inlet suction. Increase the inlet pressure to 40 PSI. The discharge pressure shall not exceed 45 PSI.

m. Run the 50-921560-17 pump at 2300 RPM, 0 to 2 in. Hg. inlet suction and 40 PSI discharge pressure for 3 minutes. No leakage at the shaft seal is permissible.

n. Set the 50-921560-5, -7, -11, -21 and -23 pump at 15 PSI discharge pressure at 2500 RPM and 25 GPH flow. Tighten the pressure adjusting lock nut (1, figure 4) and safety wire.

o. Set the 50-921560-29, -33, and -35 pump at 22 PSI discharge pressure at 2300 RPM and 53 GPH flow. Tighten the pressure adjusting lock nut (1, figure 4) and safety wire.

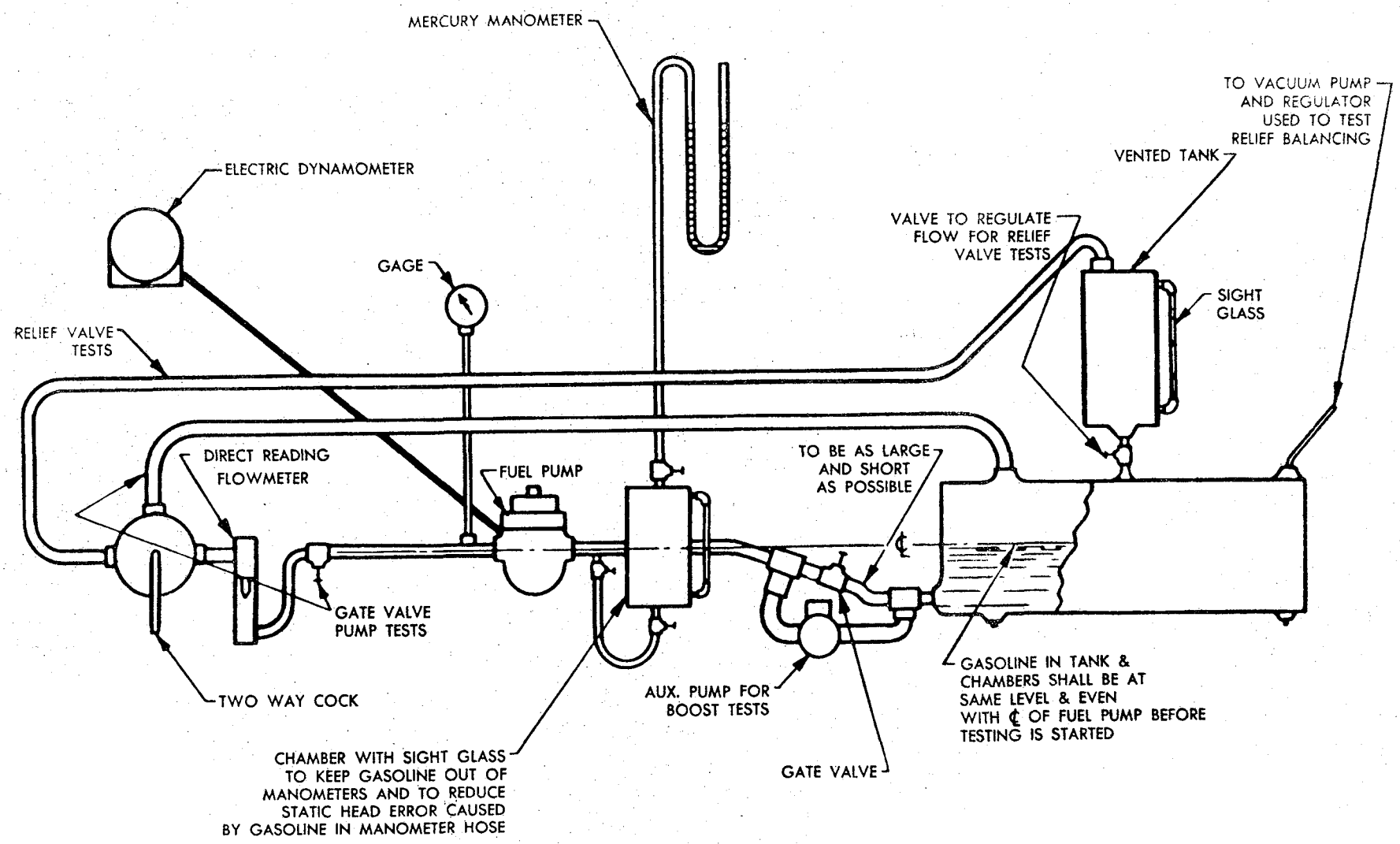


Figure 2. Pump Test Equipment Set-up

p. Set the 50-921560-17 pump at 35 PSI discharge pressure at 2750 RPM and 78 GPH flow. Tighten the pressure adjusting lock nut (1, figure 4) and safety wire.

TABLE OF FITS AND CLEARANCES

	When New	Limit	Ref.
PUMP WITH CARBON VANE			
Outside diameter of vane spacing pin	0.2517 to 0.2521	0.2512	N
Width of carbon vane	0.3999 to 0.4005	0.3985	J
Inside diameter of liner	1.0535 to 1.0545	1.0555	G
Clearance between pin, carbon vane and liner	0.0004 to 0.0020	0.0078	N-G-J
PUMP WITH STEEL VANE			
Outside diameter of vane spacing pin	0.2517 to 0.2521	0.2512	N
Width of steel vane	0.3995 to 0.4000	0.3985	J
Inside diameter of liner	1.0535 to 1.0545	1.0555	G
Clearance between pin, steel vane and liner	0.0004 to 0.0030	0.0078	N-G-J
PUMP ROTOR			
Width of slot in pump rotor	0.1252 to 0.1270	0.1285	I
Thickness of vane	0.1245 to 0.1250	0.1235	M
Clearance of vane in slot	0.0002 to 0.0025	0.0050	I-M
PUMP LINER			
Length of liner	1.2505 to 1.2510	1.2503	F
Length of rotor along slots	1.2495 to 1.2500	1.2465	H
End play of rotor in liner	0.0005 to 0.0015	0.0038	F-H
Length of vane	1.2490 to 1.2496	1.2485	K
End play of vanes in liner	0.0009 to 0.0020	0.0028	F-K
ROTOR AND CARBON BEARING			
Inside diameter of carbon bearing	0.6876 to 0.6884	0.6894	E
Outside diameter of hubs on rotor	0.6859 to 0.6864	0.6854	L
Fit of hubs in bearing	0.0012 to 0.0025	0.0040	E-L
Outside diameter of carbon bearing	1.4380 to 1.4385	1.4380	D
Inside diameter of bore in main housing	1.4365 to 1.4380	1.4380	C
Fit of bearings in bore	0.0000 to +0.0020	0.0000	C-D
ROTOR AND BRONZE BEARING			
Inside diameter of bronze bearing	0.6871 to 0.6879	0.6889	E
Outside diameter of hubs on rotor	0.6859 to 0.6864	0.6854	L
Fit of hubs in bearing	0.0012 to 0.0020	0.0040	E-L
Outside diameter of bronze bearing	1.4380 to 1.4385	1.4380	D
Inside diameter of bore in main housing	1.4365 to 1.4380	1.4380	C
Fit of bearings in bore	0.0000 to +0.0020	0.0000	C-D
RELIEF VALVE ASSEMBLY			
Inside diameter of relief valve assembly	0.3642 to 0.3657	0.3662	B
Outside diameter of guide pin in relief valve housing	0.3622 to 0.3627	0.3615	A
Fit of valve on pin	0.0015 to 0.0035	0.0047	A-B

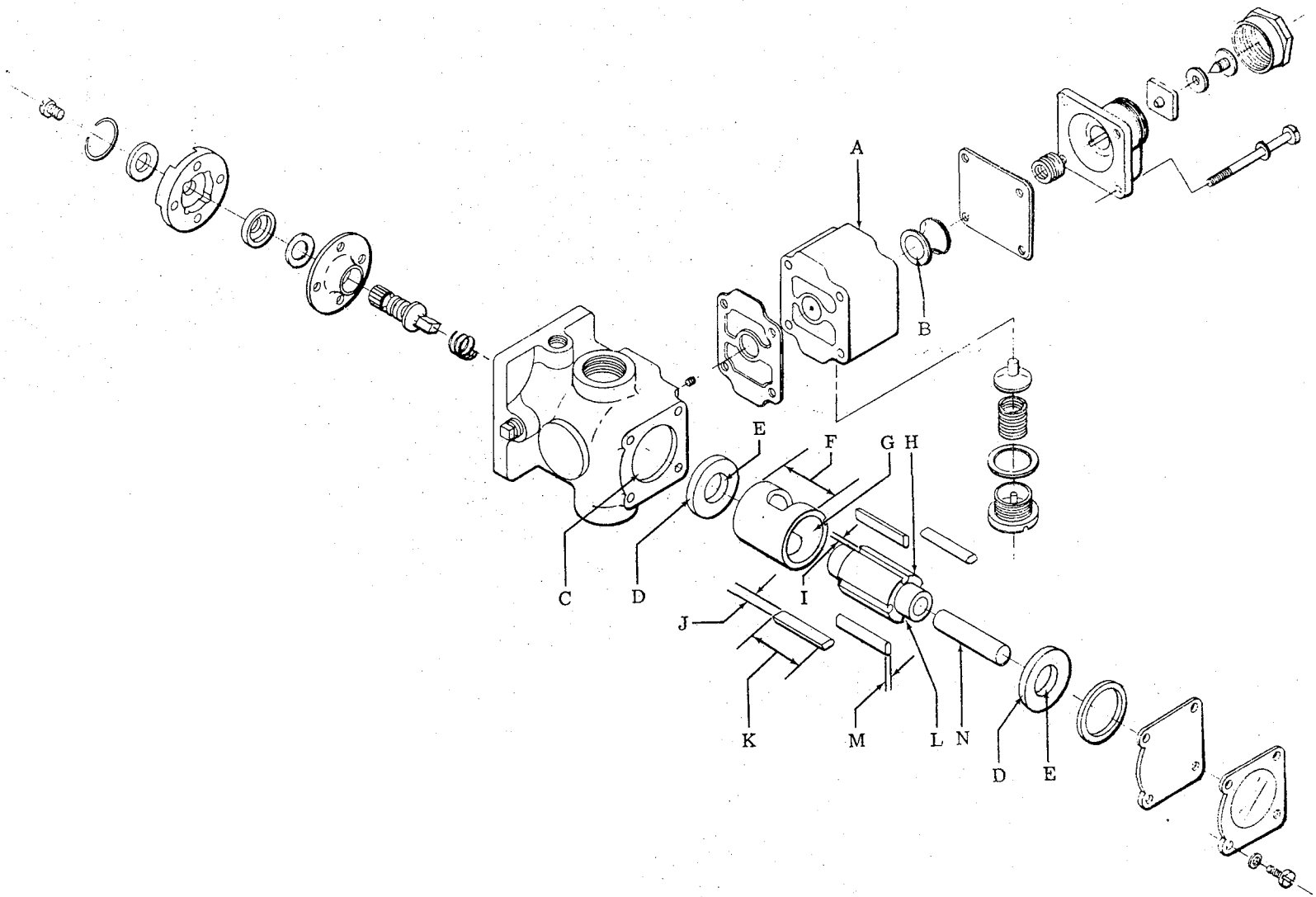


Figure 3. Pump Fits and Clearances

MINOR SERVICE TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP FAILS TO PUMP.	Foreign matter holding the relief or bypass valve open.	Remove valve housing and see that valve seats are clean and that the valve works freely.
	Drive shaft safety section twisted off.	Remove pump and free the rotating parts so that rotor turns easily. Replace broken drive shaft.
	Possible leak in intake lines.	Examine intake line for leaks.
	Relief valve diaphragm may be ruptured.	Remove valve and examine diaphragm. Replace if necessary.
PRESSURE FLUCTUATES.	Relief valve sticking on guide pin.	Remove valve housing and clean pin and valve bore until valve is free.
	Obstruction in intake line.	Examine lines to see that they are open. Clean strainers.
	Supercharger vent plugged.	Remove vent plug and clean out vent hole in plug.
PRESSURE CANNOT BE ADJUSTED PROPERLY.	Spring follower nut jammed on pressure adjusting screw.	Remove pressure adjusting screw lock nut and see that spring follower nut is free on screw. Replace if necessary.
LEAKING GASKETS.	Loose screws.	Tighten screws.
	Damaged gasket.	Replace gasket.
	Damaged gasket surfaces.	Remove gasket and examine metal surfaces. Metal surfaces must be remachined if they are not smooth and flat.
LEAKING SHAFT SEAL.	Warped metal seal parts.	Remove and lap sealing surfaces flat or replace.
	Deteriorated synthetic rubber parts.	Replace.
	Obstruction in engine driver pushes pump drive shaft in so that sealing parts do not seat.	Examine engine driver for obstruction in bottom. Badly worn condition of engine driver can also cause this failure.
GASOLINE LEAKS FROM SUPERCHARGER VENT PLUG.	Relief valve diaphragm damaged.	Replace relief valve diaphragm.

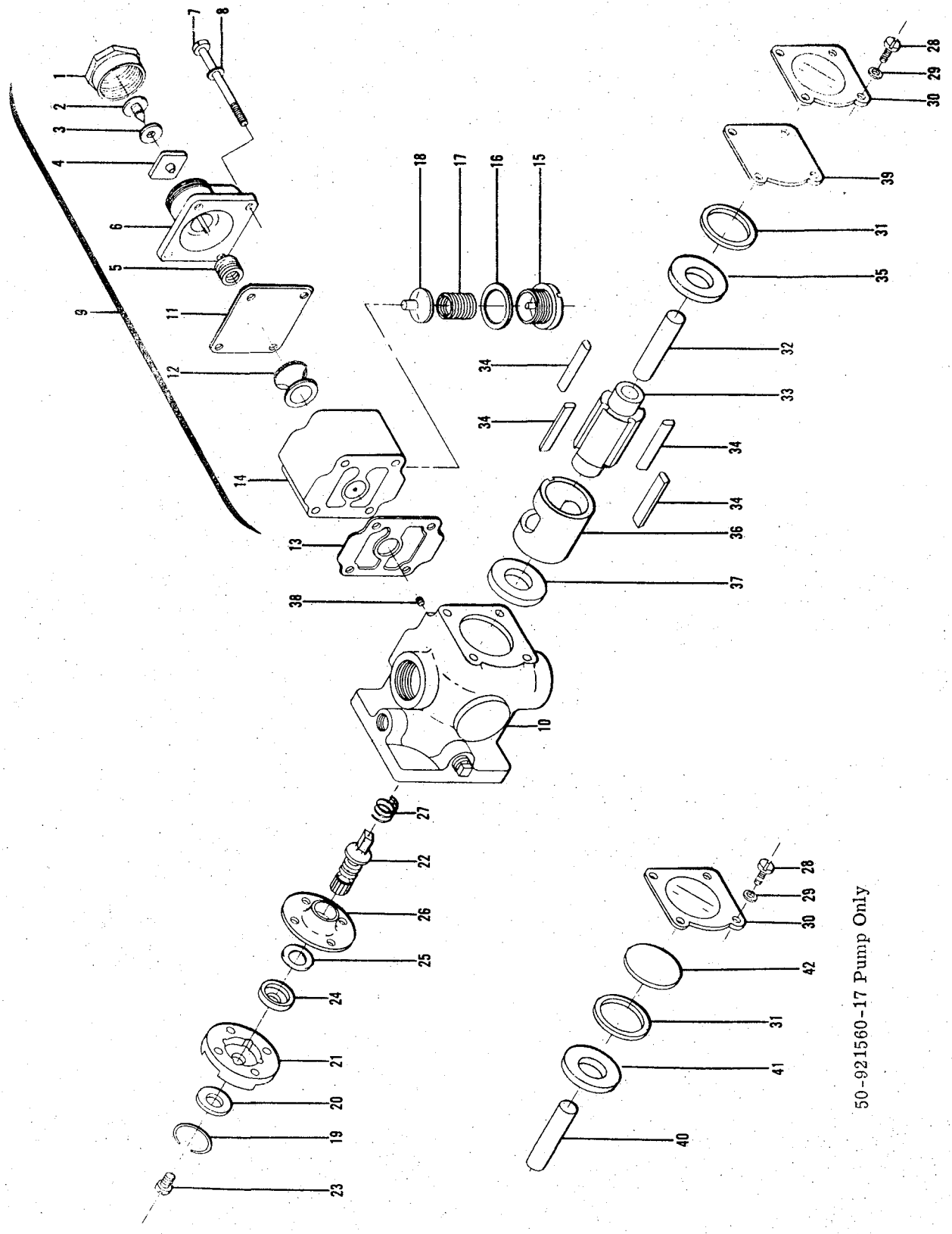


Figure 4. Fuel Pump Assembly

INDEX NO.	PART NUMBER		UNITS PER ASSEMBLY	
1	50-300001-3	Nut, Pressure Adjusting Lock	1	
2	50-300001-1	Screw, Pressure Adjusting	1	
3	50-300001-29	Gasket, Pressure Adjusting Screw	1	
4	50-300001-5	Nut, Spring Follower	1	
5	50-300001-7	Spring, Relief Valve	1	B, C
	50-300001-67	Spring, Relief Valve	1	D, E, F, G, H, I
	50-300001-85	Spring, Relief Valve	1	A
6	50-300001-31	Cover, Relief Valve	1	
7	50-300001-33	Screw	4	
8	AN960-10	Washer	4	
9	No Number	Valve Assembly, Relief	NP	
10	50-300001-21	Housing, Main	1	B, C, D, G
	50-300001-69	Housing, Main	1	A, E, F, H, I
11	50-300001-35	Diaphragm	1	
12	50-300001-39	Valve, Relief	1	
13	50-300001-17	Gasket, Relief Valve Housing	1	
14	50-300001-37	Housing, Relief Valve	1	
15	50-300001-15	Cover, By-Pass Valve	1	
16	50-300001-9	Gasket, By-Pass Valve Cover	1	
17	50-300001-11	Spring, By-Pass Valve	1	
18	50-300001-13	Valve, By-Pass	1	
19	50-300001-57	Ring, Auxiliary Seal Snap	1	
20	50-300001-63	Seal, Auxiliary	1	
21	50-300001-51	Plate, Rear	1	
22	50-300001-61	Shaft, Drive	1	B, C, D, G, H
	50-300001-71	Shaft, Drive	1	A, E, F, I
23	AN503-8-10	Screw	4	
	AN936-B8	Lockwasher	4	
24	50-300001-53	Disc, Rear Plate	1	
25	50-300001-59	Washer, Universal	1	
26	50-300001-55	Seal Assembly	1	
27	50-300001-49	Spring, Shaft Seal	1	
28	AN503-10-8	Screw	4	
29	AN936-B10	Lockwasher	4	
30	50-300001-45	Cover, Nameplate	1	
31	50-300001-47	Gasket, Cover	1	
32	50-300001-25	Pin, Vane Spacer	1	B, C, D, E, F, G, H, I
33	50-300001-23	Rotor	1	
34	50-300001-27	Vane (Carbon)	4	B, C, D, G, H, I
	50-300001-73	Vane (Steel)	4	A, E, F
35	50-300001-43	Bearing (Carbon)	1	B, C, D, G, H, I
	50-300001-75	Bearing (Bronze)	1	E, F
36	50-300001-19	Liner	1	
37	50-300001-43	Bearing (Carbon)	1	B, C, D, G, H, I
	50-300001-75	Bearing (Bronze)	1	A, E, F
38	AN566C10-6	Screw, Headless Set	1	
	AN4059-1	Gasket	1	
	AN913-1	Gasket	1	
39	50-300001-77	Plate, Auxiliary Cover	1	B, C, D, E, F, G, H, I
40	50-300001-79	Pin, Vane Spacer	1	A
41	50-300001-81	Bearing (Bronze)	1	A
42	50-300001-83	Plate, Auxiliary Cover	1	A
	50-921550-17	Placard, Nameplate	1	A
	50-921550-21	Placard, Nameplate	1	B
	50-921550-23	Placard, Nameplate	1	C
	50-921550-29	Placard, Nameplate	1	D
	50-921550-33	Placard, Nameplate	1	E
	50-921550-35	Placard, Nameplate	1	F
	50-921550-5	Placard, Nameplate	1	G
	50-921550-7	Placard, Nameplate	1	H
	50-921550-11	Placard, Nameplate	1	I

		USABLE ON CODE
50-921560-17	Pump Assy., Engine Driven Fuel	A
50-921560-21	Pump Assy., Engine Driven Fuel	B
50-921560-23	Pump Assy., Engine Driven Fuel	C
50-921560-29	Pump Assy., Engine Driven Fuel	D
50-921560-33	Pump Assy., Engine Driven Fuel	E
50-921560-35	Pump Assy., Engine Driven Fuel	F
50-921560-5	Pump Assy., Engine Driven Fuel	G
50-921560-7	Pump Assy., Engine Driven Fuel	H
50-921560-11	Pump Assy., Engine Driven Fuel	I

CHAPTER 81

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TURBOCHARGER - OVERHAUL

APPROVED TURBOCHARGER REPAIR AND OVERHAUL FACILITIES

The following facilities are approved for providing complete service for the exhaust turbocharger and controls manufactured by the AiResearch Industrial Division, Garrett Corporation, Los Angeles, California and used on the Avco Lycoming aircraft engines. The services of these organizations include parts replacement and rebalancing the rotating assembly.

APPROVED OVERHAUL FACILITIES

Aero Engine Service, Ltd.
Hamilton, New Zealand

Aerotransportes Wollkupt
Libertad 1388
Buenos Aires, Argentina

Alvis Limited
Coventry, England

Garrett Manufacturing Ltd.
International Airport
Rexdale, Ontario, Canada

Hagelin Aircraft Motors, Inc.
4320 Donald Douglas Drive
Long Beach, California 90808

Hawker DeHavilland
Australia, Pty., Ltd.
P. O. Box 78
Lidcombe, NSW, Australia

Industrie Aoronautiche e Meccaniche
Rinaldo Piaggio
Stabilimento di Finale Ligure
17024 Finale Ligure
Savona, Italy

Lacom Componentes Automotivos, S.A.
Rua Ferreira Viano 688
C. Postal 5380
Sao Paulo, Brazil

Motortec Industria E. Comercio, S.A.
Arenida Franklin Roosevelt 137-11 Andar
Rio de Janeiro, Brazil

Motoren-Und Turbinen-Union Munchen GMBH
Dachauer Strasse 665
8 Munchen-Allach
West Germany

Sacramento Sky-Ranch Inc.
Sacramento Municipal Airport
Sacramento, California 95822

Schneck Aviation, Inc.
P. O. Box 1089
Rockford, Illinois 61109

Shimadzu Siesakusho, Ltd.
Kyoto, Japan

Standard Aero Engine Ltd.
Hangar #6
Winnipeg International Airport
Winnipeg, Canada

"END"

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CHART 1

CONSUMABLE MATERIALS

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
1.	Solvent	PD680		
2.	Lubricating Grease (Aircraft and Instrument, High and Low Temperatures)	MIL-G-23827	Supermil Grease No. A72832	American Oil Co. 910 South Michigan Ave. Chicago, Illinois 60680
			Royco 27A	Royal Lubricants Co. P.O. Box 95 River Road Hanover, New Jersey 07936
			Shell 6249 Grease	Shell Oil Co. 50 West 50th Street New York, New York 10020
3.	Lubricating Oil (Gear)	MIL-L-6086	Trojan Gear Oil No. 6086M	Cities Service Oil Co. 60 Wall Tower New York, New York
			Aeroshell Fluid 5M	Shell Oil Co. 50 West 50th Street New York, New York 10020
4.	Compound, Sealing		Dow Corning No. 4	Dow Corning S. Saginaw Road Midland, Michigan 48641
5.	Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Co. 3344 Medford Street Los Angeles, Calif. 90063
			PED 3565	Standard Oil Co. of Calif. 225 Bush Street San Francisco, California 94120
6.	Lubricating Grease (Gear)		Mobile Compound G.G.	
7.	Grease, Aircraft, General Purpose, Wide Temperature Range	MIL-G-81322	Mobilgrease 28	Mobile Oil Corporation Shoreham Building Washington, D. C. 20005

CHART 1 (Cont'd)

CONSUMABLE MATERIALS

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
7.	Grease, Aircraft, General Purpose Wide Temperature Range (Cont'd)	MIL-G-81322	Aeroshell Grease 22	Shell Oil Co. 50 West 50th Street New York, New York 10020
			Royco 22S	Royal Lubricants Co. P. O. Box 95 River Road Hanover, New Jersey 07936
8.	Gasket Cement		Permatex No. 2	Permatex Co. Inc. Kansas City, Kansas
9.	Thread Lube		Threadlube	Parker Appliance Co. Cleveland, Ohio
10.	Compound, Sealing		Silastic No. 140	Dow Corning S. Saginaw Road Midland, Michigan 48641
11.	Thread Compound, Anti-Seize, Graphite Petro-latum	MIL-T-5544	Armite Product	Esso Standard Eastern Inc. 15 West 51st Street New York, New York 10019
12.	Calibration Fluid	MIL-F-7024		
13.	Isopropyl Alcohol	TT-I-735		
14.	Zinc Chromate Primer	MIL-P-8585		
15.	Sealing Compound		R-134-B Perfect Seal	Ford Motor Co. Dearborn, Michigan

"END"