# CESSNA

This Service Manual contains factory recommended procedures and instructions for ground handling, servicing and maintaining the Cessna 340 aircraft. This manual also describes the Cessna 340 II aircraft which is the same as the Cessna 340 with some optional equipment installed as standard. Where there are specific differences, reference will be made to the individual aircraft. Besides serving as a reference for the experienced mechanic, this Service Manual also covers step-by-step procedures for the less experienced mechanic. This Service Manual should be kept in a handy place for ready reference. If properly used, it will better enable the mechanic to maintain the aircraft and, thereby, establish a reputation for reliable service.

The information in this Service Manual is based on data available at the time of publication, and is supplemented and kept current by Service Letters and Service News Letters published by Cessna Aircraft Company. These are sent to all Cessna Dealers so that they have the latest authoritative recommendations for servicing Cessna aircraft. Therefore, it is recommended that Cessna owners utilize the knowledge and experience of the factory-trained Dealer Service Organization.

In addition to the information in this Service Manual, a group of vendor publications are available from the Cessna Customer Service Department which describe complete disassembly, overhaul and parts breakdown of some of the various vendor equipment items. A listing of the available publications is issued periodically in Service Letters.

CHANGE NOTICE

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NOTE: This reprint of basic Service Manual D930-13 dated December 1971 incorporates Change 1 dated June 1972, Change 2 dated October 1972, Change 3 dated January 1973, Change 4 dated September 1973, Change 5 dated December 1973, Change 6 dated May 1974, Change 7 dated October 1974 and Change 8 dated February 1975.

# SERVICE MANUAL

**DECEMBER 1971**

**CHANGED FEBRUARY 1975**

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# LIST OF EFFECTIVE PAGES

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## SERVICE LETTERS AND SERVICE KITS

Service Letters and Service Kits (SK's) provide instructions for making modification changes to the aircraft in service.

When a Service Letter or Service Kit is initially incorporated into this Service Manual, information applicable to the change is referenced in the text or illustrations, and the Service Letter and/or Service Kit is listed below. At the first revision of the Service Manual, after the information is incorporated, the Reference Data will be eliminated from the Data Record below.

| REFERENCE DATA | ISSUE DATE | TITLE | INCORPORATION DATE |
|---|---|---|---|
| Cessna Avionics Service Letter AV74-14 | 8-30-74 | ELT System Improvements | Feb 1975 |
| Cessna Avionics Service Letter AV74-16 | 9-13-74 | ELT Modification | Feb 1975 |
| Cessna Service Letter ME74-13 | 8-9-74 | Voltage Regulator Modification | Feb 1975 |
| Cessna Service Letter ME74-21 | 12-18-74 | Exhaust System Inspection | Feb 1975 |

## CHANGE SYMBOLS

Changes to text and tables in the manual are indicated by a vertical black line in the margin which extends along the entire length of the area affected. Changes to Illustrations, Charts and Tables are indicated by miniature pointing hands. Change Symbols are not shown for:

1. Introductory material, indexes and tabular data.
2. Blank spaces which are the result of text, illustration or table deletion.
3. Correction of minor inaccuracies, such as punctuation, relocation of material, etc., unless such a correction changes the meaning of instructive information and procedures.

SECTION 1

# GENERAL INFORMATION

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| General Description | 1-1 |
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MODEL NUMBER AND SERIAL

| MODEL | YEAR | BEGINNING | ENDING |
|---|---|---|---|
| 340 | 1972 | 340-0001 | 340-0115 |
| 340 | 1973 | 340-0151 | 340-0260 |
| 340 | 1974 | 340-0301 | 340-0370 |
| 340 | 1975 | 340-0501 | |

## GENERAL DESCRIPTION

The Model 340 is a six place, all-metal, low-wing, pressurized executive aircraft built by Cessna Aircraft Company, Wichita, Kansas. The pressurized cabin permits flights to 20,000 feet without the use of oxygen. The aircraft is powered by two Continental Turbocharged TSIO-520-K, six cylinder, fuel injected 285 horsepower engines. Each engine drives a constant-speed, full-feathering McCauley propeller. The landing gear on the Model 340 is tricycle-type fully retractable and electrically operated. Trim tabs located on the right elevator, left aileron, and the rudder are provided to aid in flight adjustment; also provided are split-type electrically-operated wing flaps to aid in landing.

## PRINCIPAL DIMENSIONS:

GROSS WEIGHT

| | |
|---|---|
| 340 | 5975 Pounds |

LANDING WEIGHT

| | |
|---|---|
| 340 | 5975 Pounds |

ENGINES: Continental TSIO-520-K, 6-Cylinder Opposed
Fuel Injected, Turbocharged, Wet Sump

| | |
|---|---|
| Spark Plugs (Champion) | RHB-32E |
| (AC) | AC273 |
| Magnetos (Bendix) | S6RN-1201 |
| (Bendix) | S6RN-1205 |

(See Section 9 for Engine Specifications)

| PROPELLERS: | (2 Blade) | (3 Blade) |
|---|---|---|
| McCauley | D2AF34C71/84JF-3 | 3AF32C87/82NC-4 |
| Propeller Governor (McCauley) | DSFS290D11T3 | DSFS290D11T3 |
| Diameter | 81.00 Inches | 78.00 Inches |

FUEL CAPACITY:

| | |
|---|---|
| Main Tanks (each wing) | 51.00 U.S. Gallons |
| Usable (each wing) | 50.00 U.S. Gallons |
| Auxiliary Tanks (each wing) | 20.50 U.S. Gallons |
| Usable (each wing) | 20.00 U.S. Gallons |
| Optional Wing Tanks (each wing) | 11.50 U.S. Gallons |
| Usable (each wing) | 11.50 U.S. Gallons |
| Wing Locker Tanks (each wing) | 20.50 U.S. Gallons |
| Usable (each wing) | 20.00 U.S. Gallons |

CONTROL SURFACE TRAVEL:

| | |
|---|---|
| Flap | |
| Down | 45° +1° -0° |
| Aileron | |
| Up | 20° +1° -0° |
| Down | 20° +1° -0° |
| Aileron Trim Tab | |
| Up | 20° +1° -0° |
| Down | 20° +1° -0° |
| Rudder (Measured Perpendicular to Hinge Line) | |
| Left | 32° +1° -0° |
| Right | 32° +1° -0° |
| Rudder Trim Tab (Measured Perpendicular to Hinge Line) | |
| Left | 24° +1° -0° |
| Right | 19° +1° -0° |
| Elevator | |
| Up | 20° +1/2° -0° |
| Down | 15° +1° -0° |
| Elevator Trim Tab | |
| Up | 10° +1° -0° |
| Down | 16° +1° -0° |

LANDING GEAR:

| | |
|---|---|
| Main Wheels and Brakes (Triple-Piston, Disc-Type) | |
| Tire Size | 6.50 x 10 - 8 Ply Rating |
| Tire Pressure | 60 psi |
| Main Strut Pressure (Without Load) | 300 psi |
| Nose Wheel | |
| Tire Size | 6.00 x 6 - 6 Ply Rating |
| Tire Pressure | 40 psi |
| Nose Strut Pressure (without load) | 165 psi |
| WING DIHEDRAL | 5.0° |

ACCESS AND INSPECTION PROVISIONS.

Access for periodic adjustment, lubrication, or inspection of certain parts of the aircraft is gained by removing access hole covers adjacent to the items affected. Figure 1-3 shows the access hole locations on the aircraft. Access to the interior of aft fuselage is gained through the rear cabin access door.

CAUTION

Before entering the aft fuselage, be sure rear section of fuselage is supported. Failure to support aft fuselage may result in the aircraft tipping backward causing damage to the aircraft.

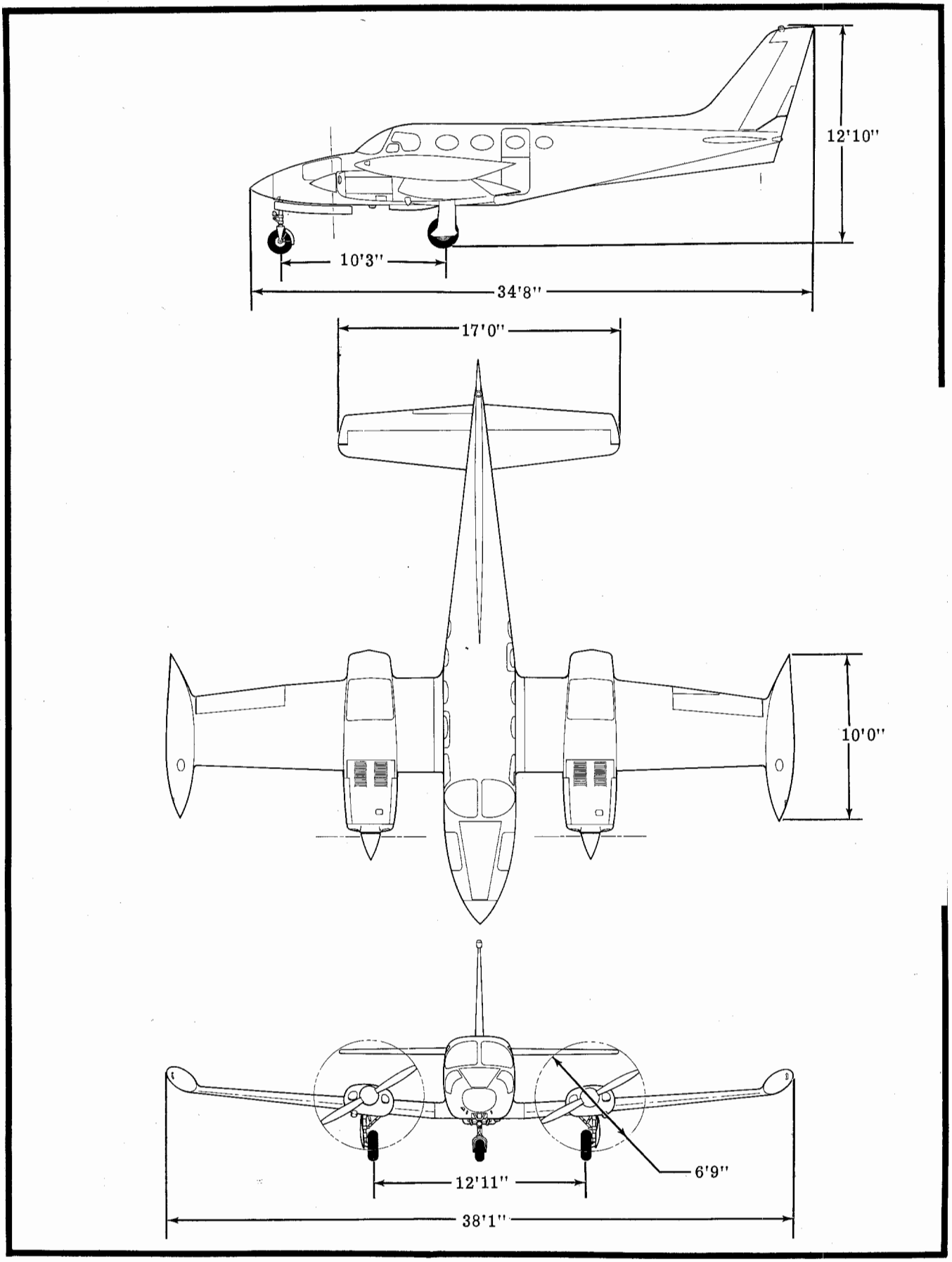



Figure 1-1. General Dimensions

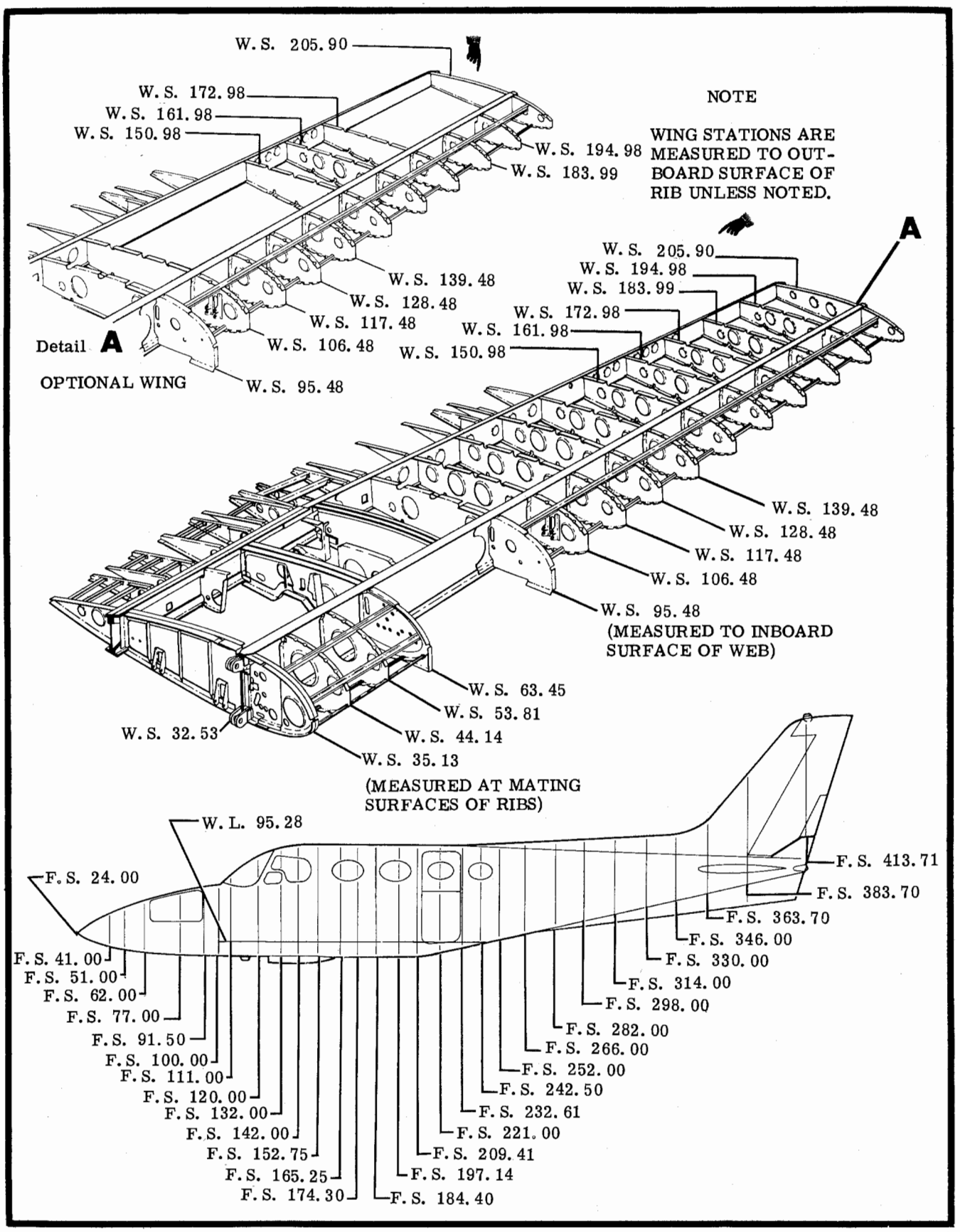



Figure 1-2. Station Diagrams (Sheet 1)

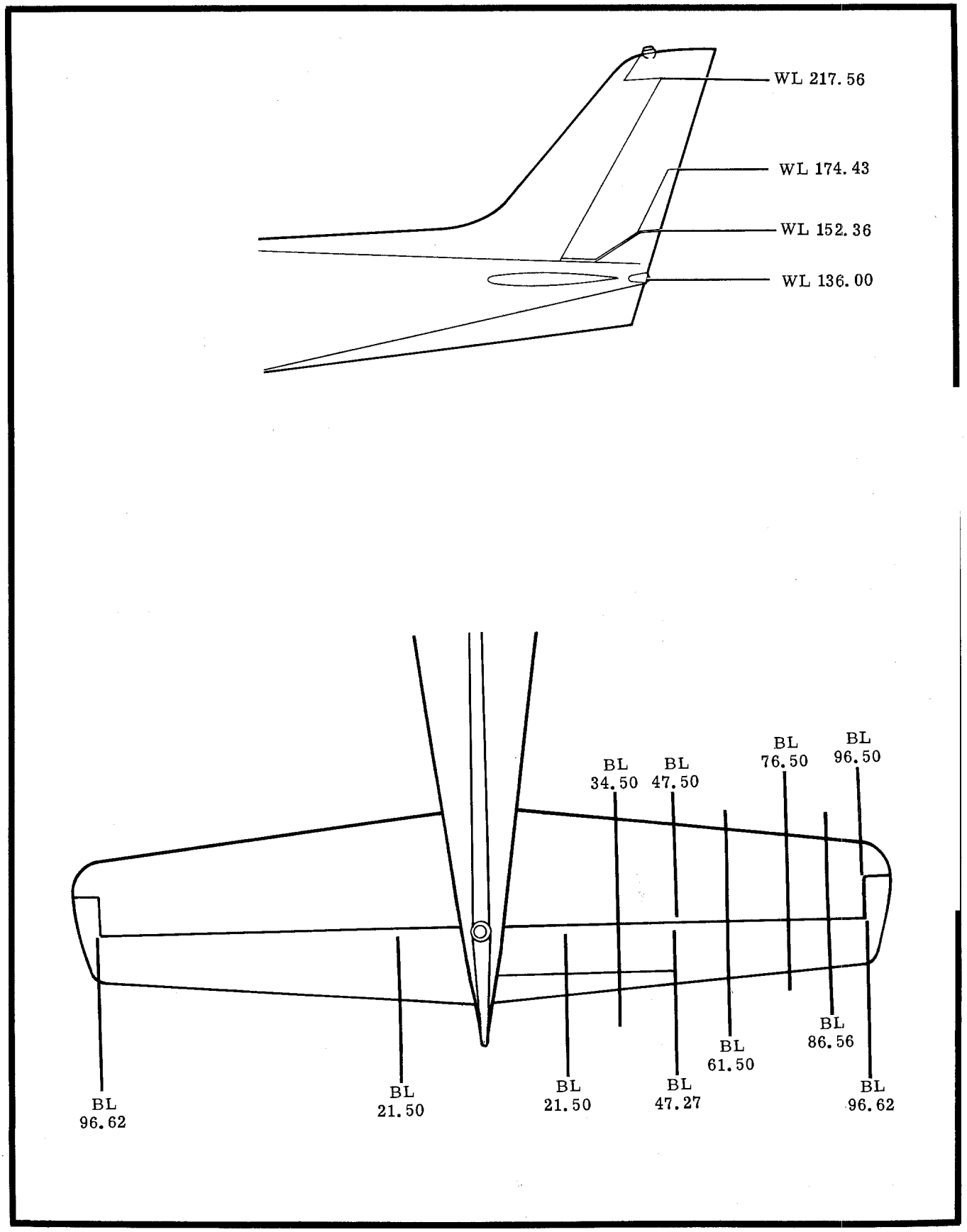



Figure 1-2. Station Diagrams (Sheet 2)

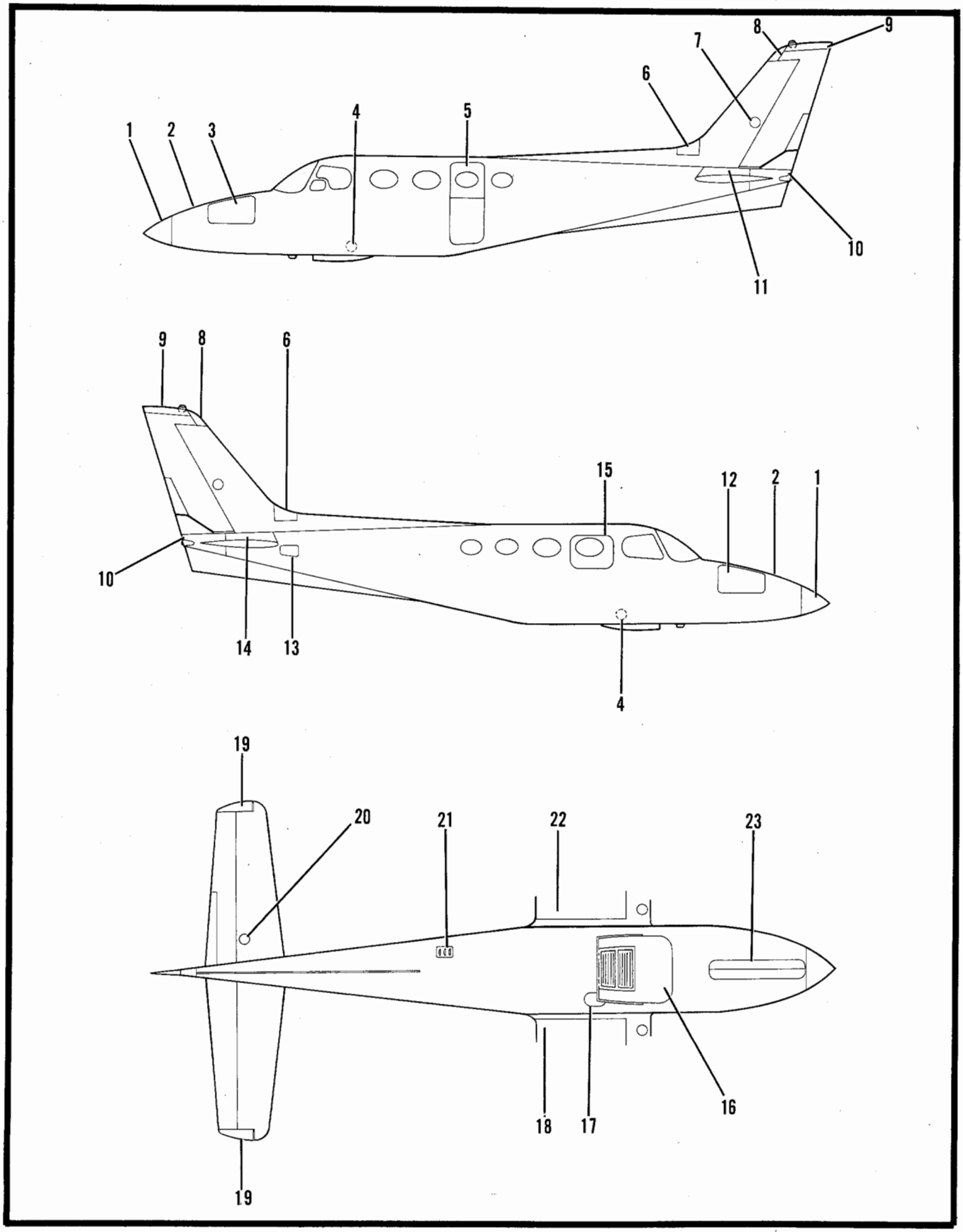



Figure 1-3. Inspection Plates and Access Panels (Sheet 1)

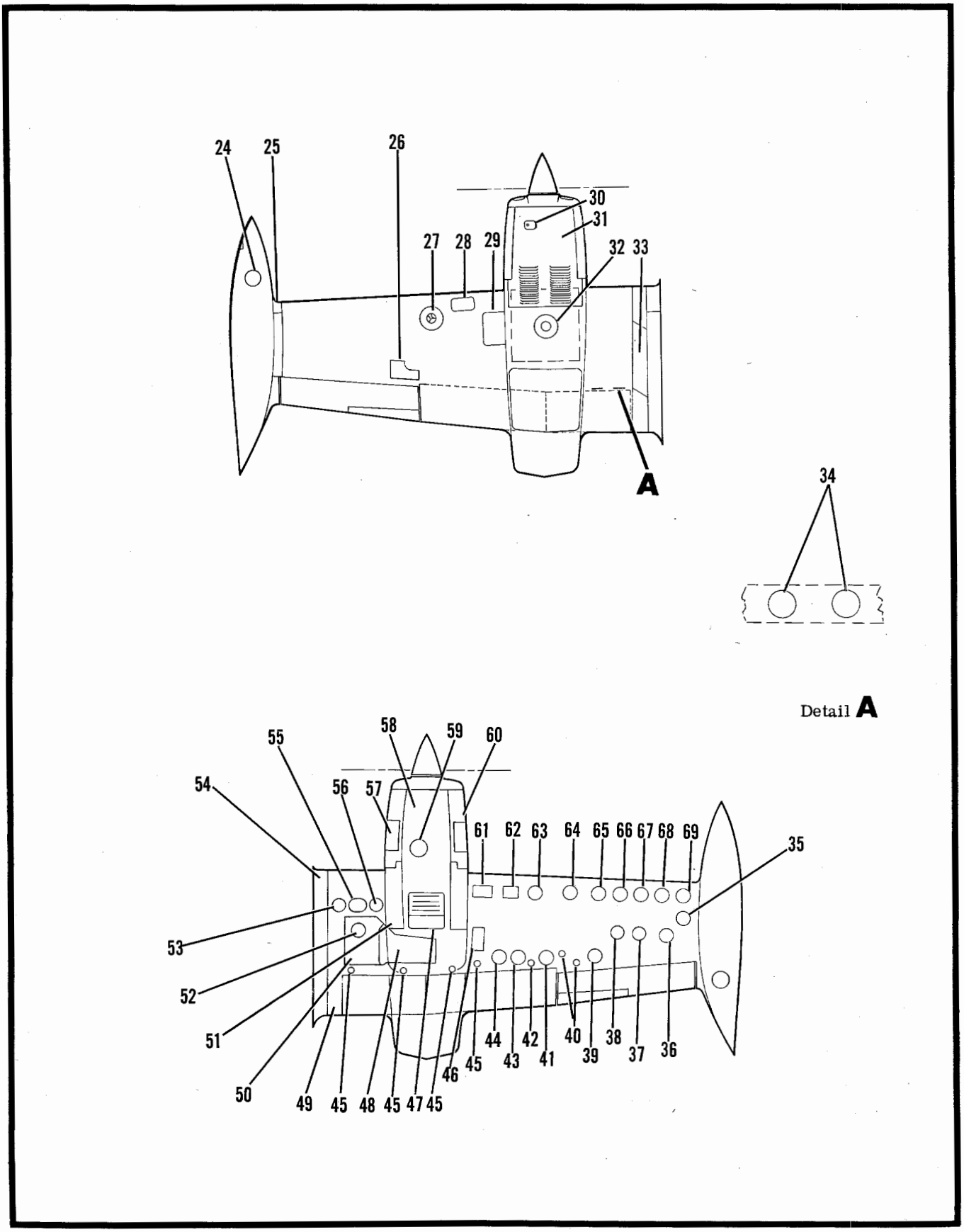



Figure 1-3. Inspection Plates and Access Panels (Sheet 2)

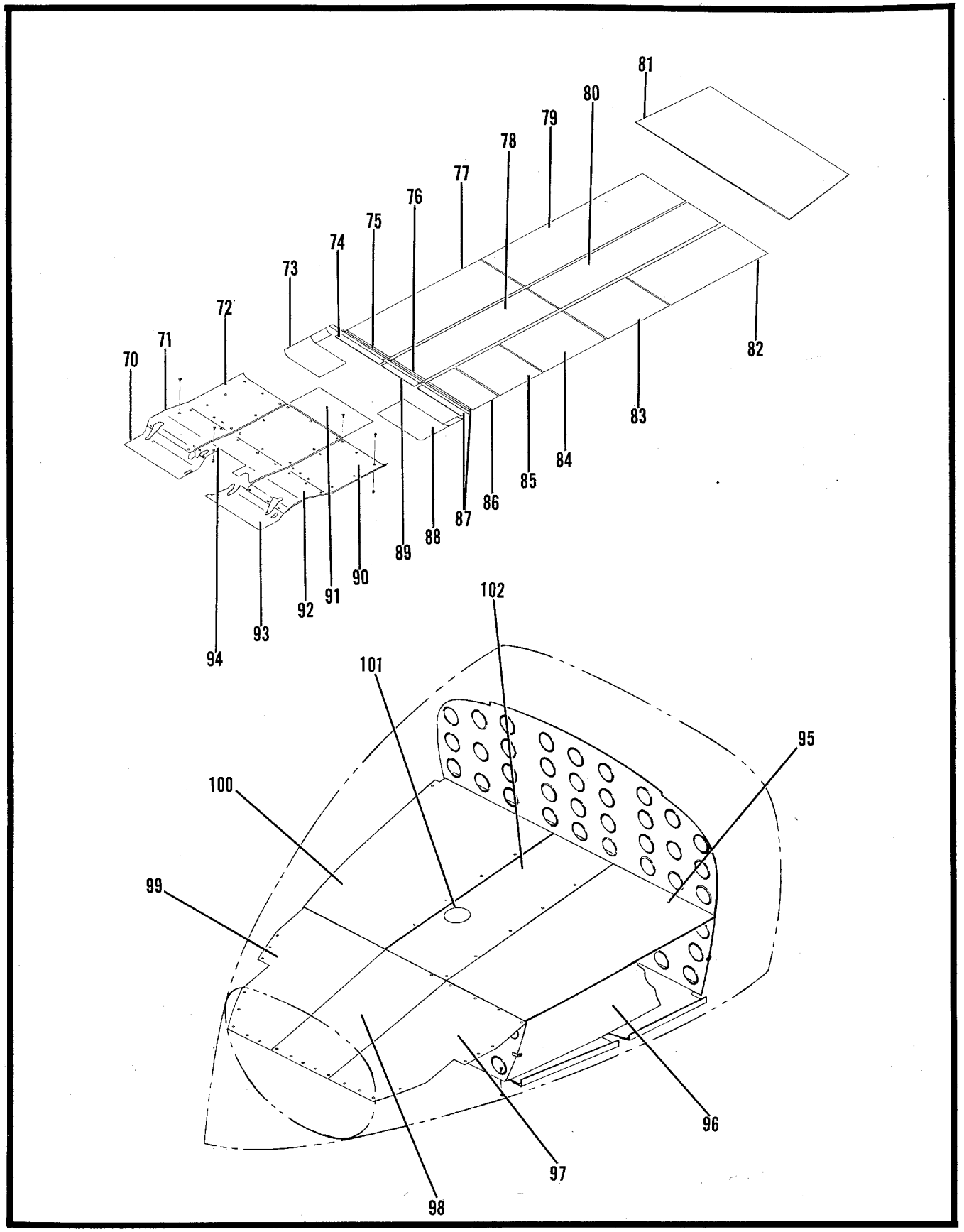



Figure 1-3. Inspection Plates and Access Panels (Sheet 3)

1. Radome
2. Nose Section Access
3. Left Baggage Door
4. Landing Gear Boot Access
5. Cabin Door
6. Emergency Locator Transmitter Access
7. Rudder Trim Access
8. Fin Tip
9. Rudder Tip
10. Stinger
11. Left Stabilizer Fairing
12. Right Baggage Door
13. Elevator Bellcrank Access
14. Right Stabilizer Fairing
15. Emergency Exit Door
16. Heat Exchange Access
17. Landing Gear Actuator Access
18. Left Wing Root Access
19. Elevator Tip
20. Elevator Trim Access
21. Tailcone Vent
22. Right Wing Root Access
23. Nose Gear Doors
24. Main Tank Filler
25. Main Tank Gap Fairing
26. Aileron Bellcrank Access
27. Auxiliary Fuel Filler
28. Fuel Selector Valve Access
29. Battery Access
30. Oil Filler Access
31. Upper Engine Cowl
32. Wing Locker Fuel Filler
33. Center Wing Gap Fairing
34. Flap Cable Access
35. Outboard Wing Access
36. Fuel Vent Line Access
37. Rear Spar Access
38. Inboard Wing Access
39. Aileron Trim Access
40. Aileron Quadrant Bolt Plug Button
41. Aileron Trim Pulley Access
42. Plug Button Outboard Cap
43. Outboard Flap Access
44. Aileron Cable Stop Access
45. Flap Bellcrank Bolt Access
46. Signal Conditioner Access
47. Nacelle Vent
48. Landing Gear Door (Outboard)
49. Aft Wing Gap Fairing
50. Inboard Main Gear Door
51. Aft Nacelle Access
52. Main Landing Gear Door Bellcrank Access
53. Fuel Line Access
54. Forward Wing Gap Fairing
55. Engine Control Cable Access
56. Vacuum Line Access
57. Cowl Flap
58. Lower Nacelle Access
59. Oil Drain Plug Access
60. Outboard Engine Access Door
61. Fuel Selector Access
62. Fuel Selector Access
63. Fuel Line Access
64. Fuel Line Clamp Access (Inboard)
65. Fuel Line Clamp Access
66. Tie-Down Ring
67. Leading Edge Access
68. Fuel Line Access
69. Main Fuel Tank Access
70. RH Forward Floorboard
71. RH Forward Scuff Plate
72. Copilot Floorboard
73. Copilot Floor Access
74. RH Front Spar Access
75. RH Front Spar Access
76. Center Front Spar Access
77. Right Aft Floorboard
78. Center Aft Floorboard
79. RH Aft Floorboard
80. Center Aft Floorboard
81. Baggage Floorboard
82. Left Aft Floorboard
83. Left Middle Floorboard
84. Left Middle Floorboard
85. Left Middle Floorboard
86. Landing Gear Actuator Access
87. Spar Access LH
88. Pilot Floor Access
89. Spar Access Center
90. Pilot Floorboard
91. Forward Center Floorboard
92. Left Scuff Plate
93. Left Forward Floorboard
94. Forward Center Floorboard
95. Left Aft Nose Gaggage Shelf
96. Lower Left Radio Shelf
97. Forward Left Baggage Shelf
98. Forward Wheel Well Web
99. Right Forward Nose Baggage Shelf
100. Right Aft Baggage Shelf
101. Nose Gear Uplock Inspection Access
102. Nose Wheel Well Web

Figure 1-3. Inspection Plates and Access Panels (Sheet 4)

## RECOMMENDED NUT TORQUES

THE TORQUE VALUES STATED ARE POUND-INCHES, RELATED ONLY TO STEEL NUTS ON OIL-FREE CADMIUM PLATED THREADS.

FINE THREAD SERIES

| TAP SIZE | TENSION NUTS TORQUE | | SHEAR NUTS TORQUE | |
|---|---|---|---|---|
| | STD (NOTE 1) | ALT (NOTE 2) | STD (NOTE 3) | ALT (NOTE 2) |
| 8-36 | 12-15 | | 7-9 | |
| 10-32 | 20-25 | 20-28 | 12-15 | 12-19 |
| 1/4-28 | 50-70 | 50-75 | 30-40 | 30-48 |
| 5/16-24 | 100-140 | 100-150 | 60-85 | 60-106 |
| 3/8-24 | 160-190 | 160-260 | 95-110 | 95-170 |
| 7/16-20 | 450-500 | 450-560 | 270-300 | 270-390 |
| 1/2-20 | 480-690 | 480-730 | 290-410 | 290-500 |
| 9/16-18 | 800-1000 | 800-1070 | 480-600 | 480-750 |
| 5/8-18 | 1100-1300 | 1100-1600 | 660-780 | 660-1060 |
| 3/4-16 | 2300-2500 | 2300-3350 | 1300-1500 | 1300-2200 |
| 7/8-14 | 2500-3000 | 2500-4650 | 1500-1800 | 1500-2900 |
| 1-14 | 3700-5500 | 3700-6650 | 2200-3300 | 2200-4400 |
| 1-1/8-12 | 5000-7000 | 5000-10000 | 3000-4200 | 3000-6300 |
| 1-1/4-12 | 9000-11000 | 9000-16700 | 5400-6600 | 5400-10000 |

COARSE THREAD SERIES

| | (NOTE 4) | | (NOTE 5) | |
|---|---|---|---|---|
| 8-32 | 12-15 | | 7-9 | |
| 10-24 | 20-25 | | 12-15 | |
| 1/4-20 | 40-50 | | 25-30 | |
| 5/16-18 | 80-90 | | 48-55 | |
| 3/8-16 | 160-185 | | 95-100 | |
| 7/16-14 | 235-255 | | 140-155 | |
| 1/2-13 | 400-480 | | 240-290 | |
| 9/16-12 | 500-700 | | 300-420 | |
| 5/8-11 | 700-900 | | 420-540 | |
| 3/4-10 | 1150-1600 | | 700-950 | |
| 7/8-9 | 2200-3000 | | 1300-1800 | |
| 1-8 | 3700-5000 | | 2200-3000 | |
| 1-1/8-8 | 5500-6500 | | 3300-4000 | |
| 1-1/4-8 | 6500-8000 | | 4000-5000 | |

NOTES

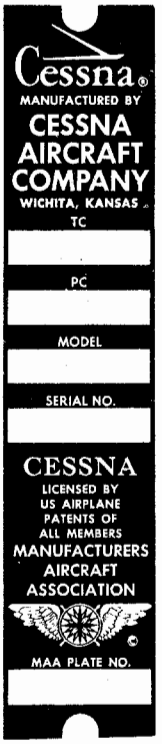
1. Covers AN310, AN315, AN345, AN362, AN363, AN366, MS17825, MS20365, MS21044, MS21043, MS21044, MS21045, MS21046, MS21047, MS21048, MS21078 and other fine thread tension nuts.
2. When using AN310, AN320, MS17825 or MS17826 castellated nuts where alignment between the bolt and cotter pin hole is not reached using normal torque values, use alternate torque values or replace the nut.
3. Covers AN316, AN320, AN7502, MS17826, MS20364, MS21043, MS21083, MS21245 and other fine thread shear nuts.
4. Covers MS20341, MS20365, MS21042, MS21043, MS21044, MS21045, MS21046 and other coarse thread tension nuts.
5. Covers AN340, MS20364, MS21083 and other coarse thread shear nuts.

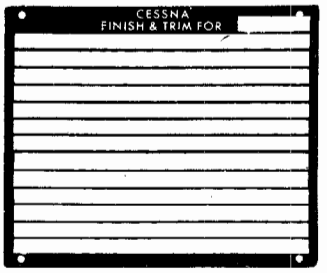
CAUTION

During removal and replacement of component parts, all self-locking nuts and castellated self-locking nuts must be replaced with new nuts.

These torque values are recommended for all procedures contained in this manual except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

Figure 1-4. Torque Values



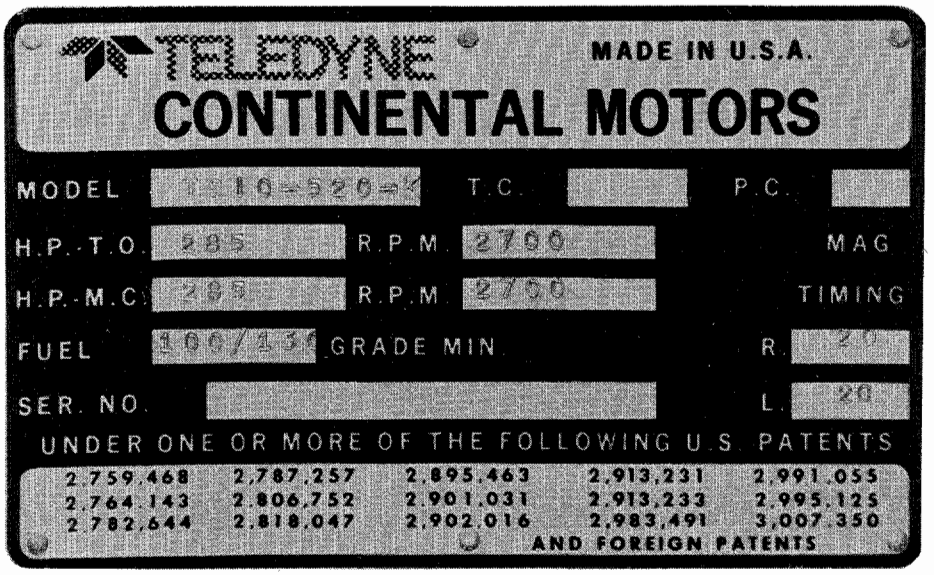




Figure 1-5. Serial Numbers and Identification Plates

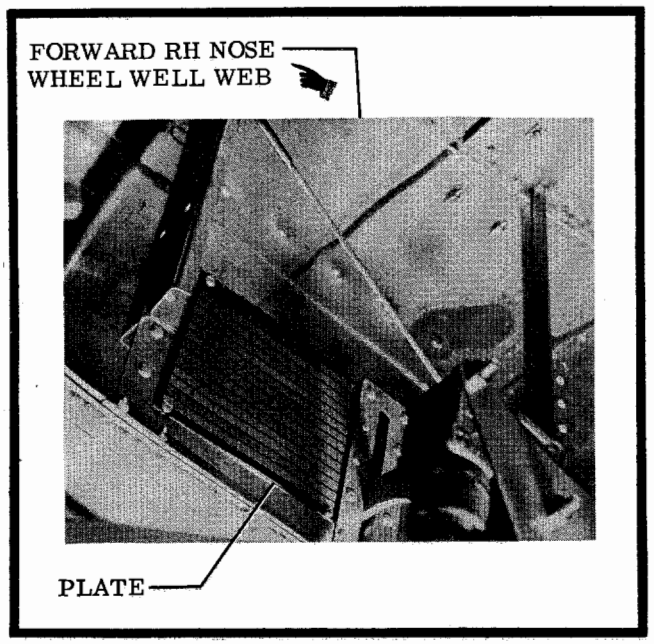



Figure 1-6. Finish and Trim Plate Location

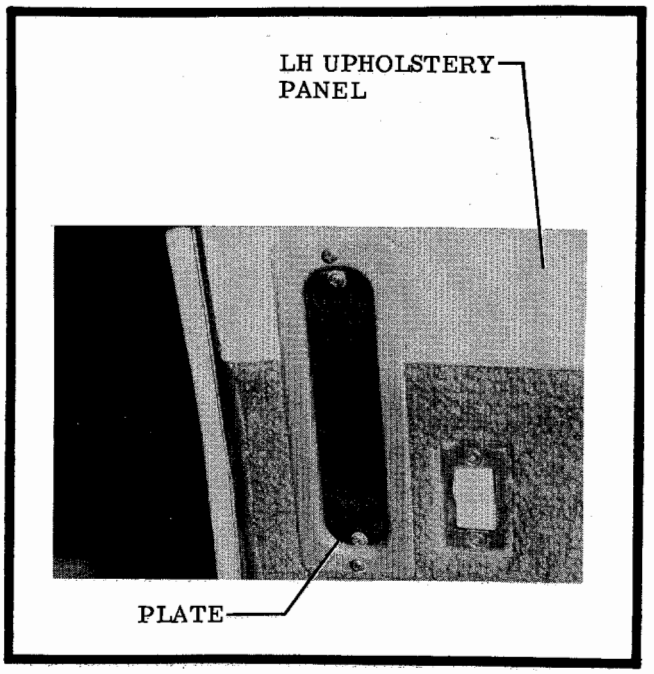



Figure 1-7. MAA Plate Location

SECTION 2

# GROUND HANDLING, SERVICING AND INSPECTION

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## GENERAL DESCRIPTION.

This section contains routine servicing and maintenance procedures that are most frequently encountered. Frequent reference to this section will aid maintenance personnel by providing information on ground handling and emergency procedures, daily and periodic servicing procedures and airframe maintenance and lubrication. When any system or unit requires service or maintenance, other than the routine procedures as outlined in this section, refer to the section applicable to that system or unit.

## GROUND HANDLING.

The following precautionary measures should be taken when handling the aircraft on the ground:

a. Control surfaces shall not be locked while towing or taxiing the aircraft.

b. Do not set parking brake if brakes are overheated. When operating the engines, observe the following:

1. Remove all towing equipment.
2. Head aircraft into wind and chock wheels.
3. Remove all control locks.

4. All personnel, work stands, and equipment shall be clear of danger areas.
5. Parking brake set.
6. Position nose wheel exactly fore and aft when running engine at high RPM.

Towing.

A steering bar, located in the left nacelle baggage compartment, is provided to aid in ground movement of the aircraft. The steering bar engages spacers on the nose gear lower torque link and is used to guide the aircraft manually. The nose gear will caster a maximum of 55 degrees to either side of center.

CAUTION

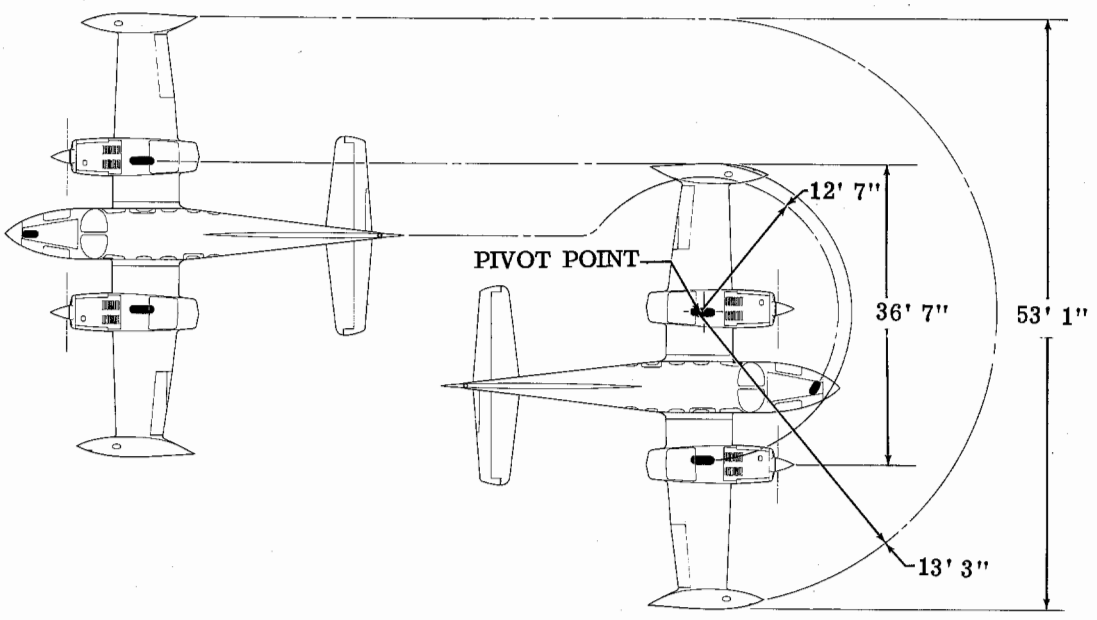
When towing the aircraft, the 55 degree limit shall be strictly observed, as the nose gear and/or steering mechanism will be damaged if turned beyond the 55 degree stops.

CAUTION

Be sure parking brake is released and the external and internal rudder gust lock is removed before towing. Structural damage will occur.

Never push, pull or lift aircraft by the ailerons, elevators, flaps, nacelles or unsupported skin between wing ribs.

Power towing is not recommended. However, aircraft can be power towed to move aircraft over soft or muddy ground or in emergencies by attaching a rope harness to the main landing gear. When power towing, station a crew member in the aircraft to apply brakes in case of emergency. Use extreme caution to avoid jerky motions, as serious structural dan age can result.




PROPELLER GROUND CLEARANCE: 7. 20 INCHES

Figure 2-1. Minimum Turning Radius

CAUTION

Do not power tow aircraft with towing vehicle attached to nose gear or tail skid.

Taxiing.

Before attempting to taxi the aircraft, ground personnel should be checked out by qualified pilots or other responsible personnel. When it is determined that the propeller blast area is clear, apply power and start taxi roll and perform the following checks:

a. Taxi forward a few feet and apply brakes to determine their effectiveness.
b. While taxiing, make slight turns to determine effectiveness of nose gear steering.
c. Check operation of turn and bank indicator and directional gyro.
d. Check for sluggish instruments during taxiing. In cold weather, make sure all instruments have warmed sufficiently for normal operation.
e. Minimum turning distance must be strictly observed when taxiing the aircraft close to buildings or other stationary objects.
f. Do not operate the engine at high RPM when taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

Minimum Turn Radius.

See figure 2-1 for minimum turning radius.

Parking.

a. When parking the aircraft, head into the wind and set parking brake.

CAUTION

Do not set parking brakes when the brakes are overheated, or during cold weather when accumulated moisture may freeze the brakes.

b. Close engine cowl flaps and install internal control lock. Install pitot tube cover and place chocks under all wheels. In parking the aircraft, it is also important to turn the nose gear to its full limit, either right or left, if external rudder lock is not available. This will place the rudder bellcrank against the stop and hold it there with spring tension from the nose gear steering mechanism.

Rudder Pedals Gust Lock (Optional). (See figure 2-2.)

An optional rudder pedal gust lock is available on the 340 aircraft. This lock is installed on the left-hand floorboard with a clamp which permits the lock to pivot forward to engage the rudder pedals when in use, and back to the floorboard for stowage when not in use. The lock is secured to the floorboard by two clips when stowed. The lock is adjustable for rigging purposes.

NOTE

Rig gust control lock so that both rudder pedals must be pushed forward a minimum of 0.10 to engage lock.

Tie-Down.

Tying-down the aircraft should be accomplished in anticipation of light winds, or anytime the aircraft is to be left outside for lengthy periods, such as overnight. Tie-down as follows:

a. Head aircraft into the wind, if possible, and close engine cowl flaps.
b. Set parking brake and install control lock.

CAUTION

Do not set parking brake when the brakes are overheated or during cold weather when accumulated moisture may freeze the brakes.

c. Set trim tabs to neutral, so tabs will be streamlined with control surfaces.
d. Install external gust locks on rudder, elevator and aileron (one each wing) as shown in figure 2-2.

NOTE

If external rudder gust lock is not available, turn nose wheel to extreme right or left position.

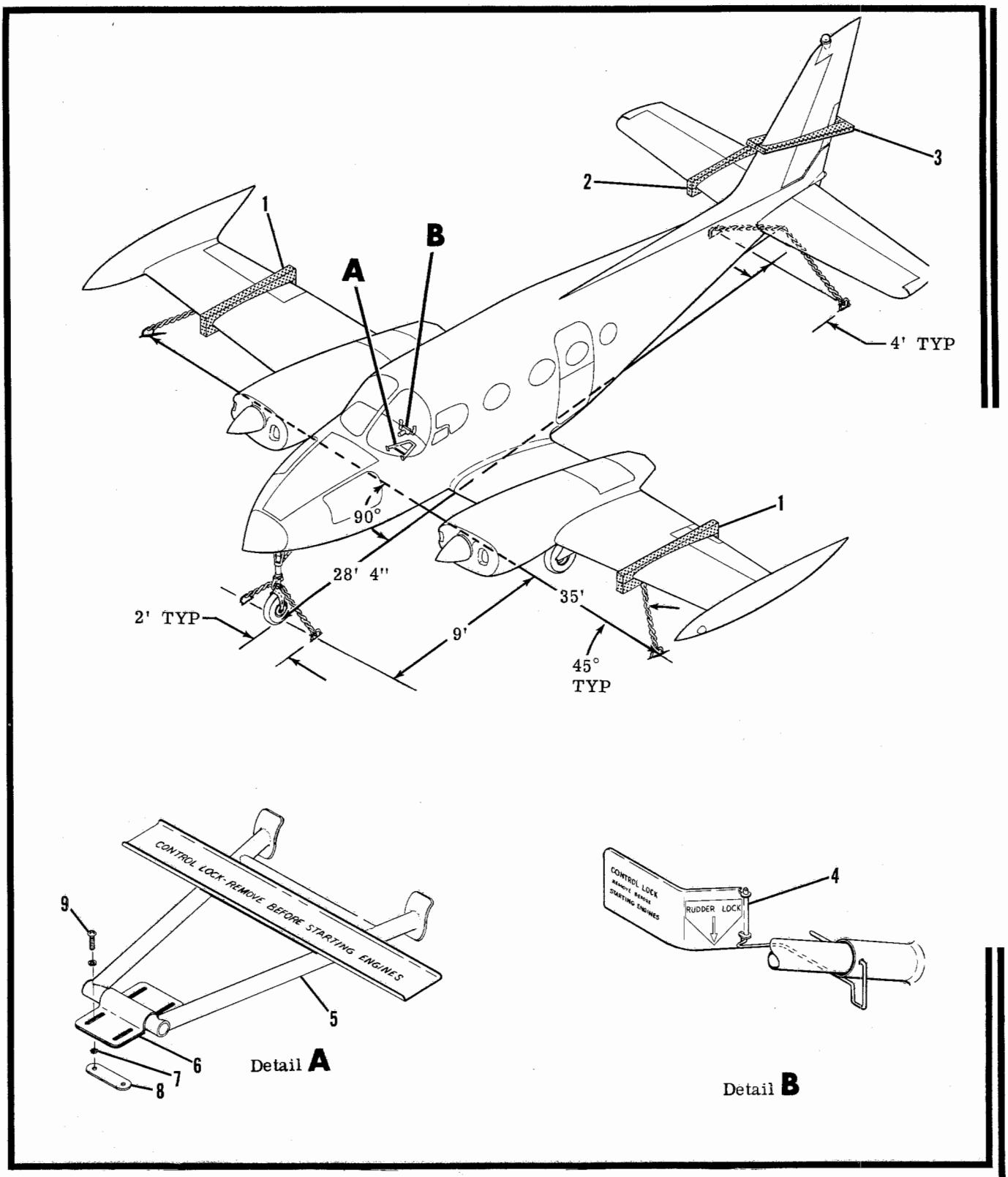
e. (See figure 2-2.) Drive the ground anchor stakes as shown, provide a rope angle of 45° to the ground. Secure chains or manila rope of 700 pounds or more tensile strength to the tie-down fittings under the wings and secure opposite end to the ground anchor stakes.
f. Tie a manila rope around the nose gear, above torque link, and secure the outer end to a ground anchor.
g. Tie a manila rope or chain to tailcone bumper and secure other end to a ground anchor.
h. Install pitot tube cover.

Jacking.

Three jack points are on the underside of the aircraft, one just aft of the nose wheel well, and one on the lower surface of each wing, just aft of the main gear attach points. See figure 2-3 for jacking procedures.

NOTE

To prevent the flight hour recorder from recording while the aircraft is on jacks and battery switch is in the ON position, remove fuse located in the left console.

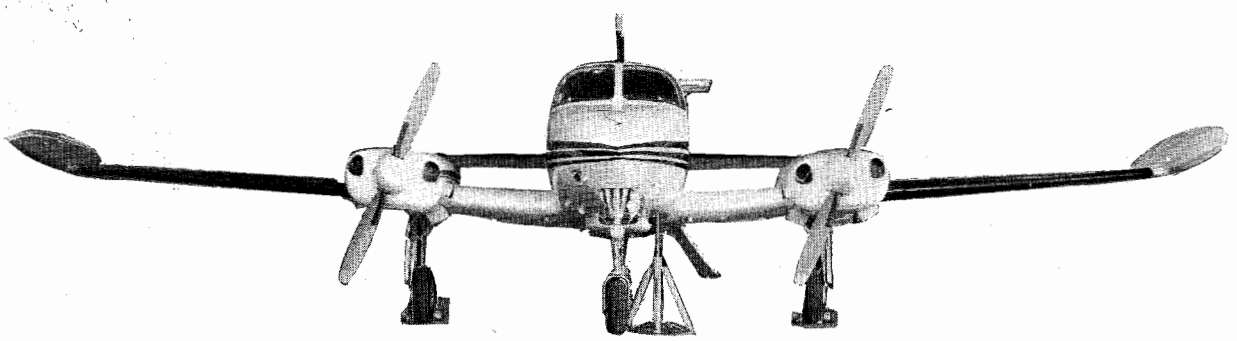



1. Aileron Gust Lock
2. Elevator Gust Lock
3. Rudder Gust Lock
4. Control Lock
5. Rudder Control Lock
6. Clamp
7. Lockwasher
8. Plate
9. Screw

Figure 2-2. Tie-Down and Control Lock

NOTE

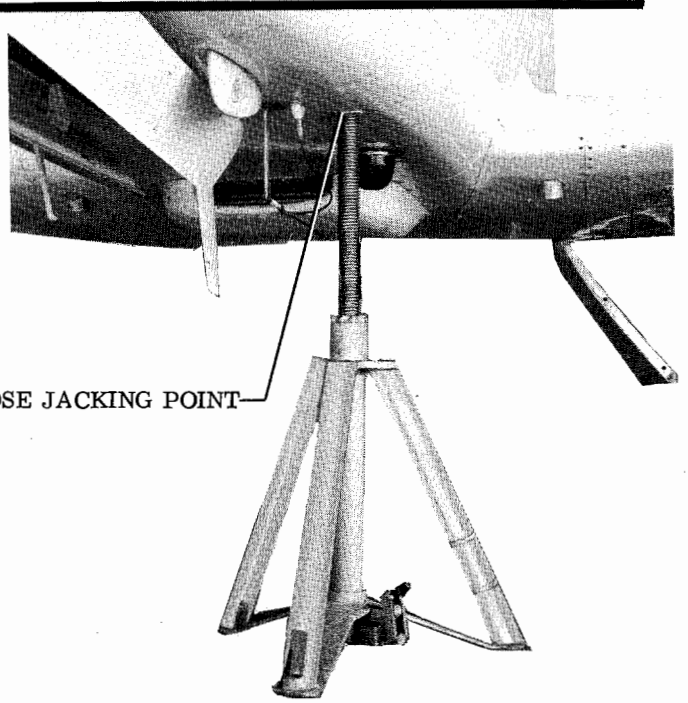
FOR LANDING GEAR REMOVAL AND MAINTENANCE, USE THREE JACKING POINTS.
FOR REMOVAL OF MAIN WHEELS, WHEEL JACKING LUGS MAY BE USED.
FOR REMOVAL OF NOSE WHEEL, THE NOSE JACKING POINT MAY BE USED.



CAUTION

PLACE WEIGHTS IN NOSE SECTION OF FUSELAGE TO PREVENT AIRCRAFT FROM TIPPING BACKWARD WHEN NOSE IS RAISED.

| JACK REQUIREMENTS | | | |
|---|---|---|---|
| | HEIGHT CLOSED | HEIGHT EXTENDED | CAPACITY |
| NOSE | 26.5 | 44.5 | 2 TONS |
| WING | 26.5 | 44.5 | 2 TONS |
| WHEEL LUG | 11 | 18 | 2 TONS |



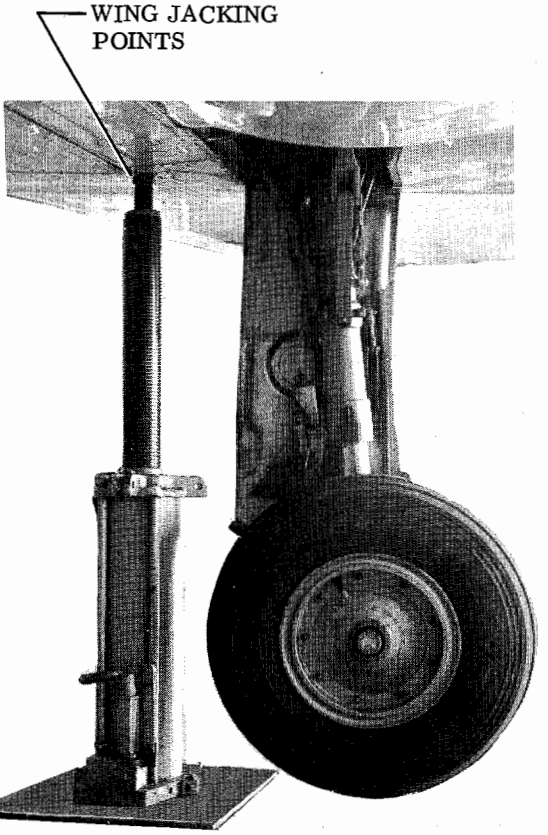




Figure 2-3. Jacking

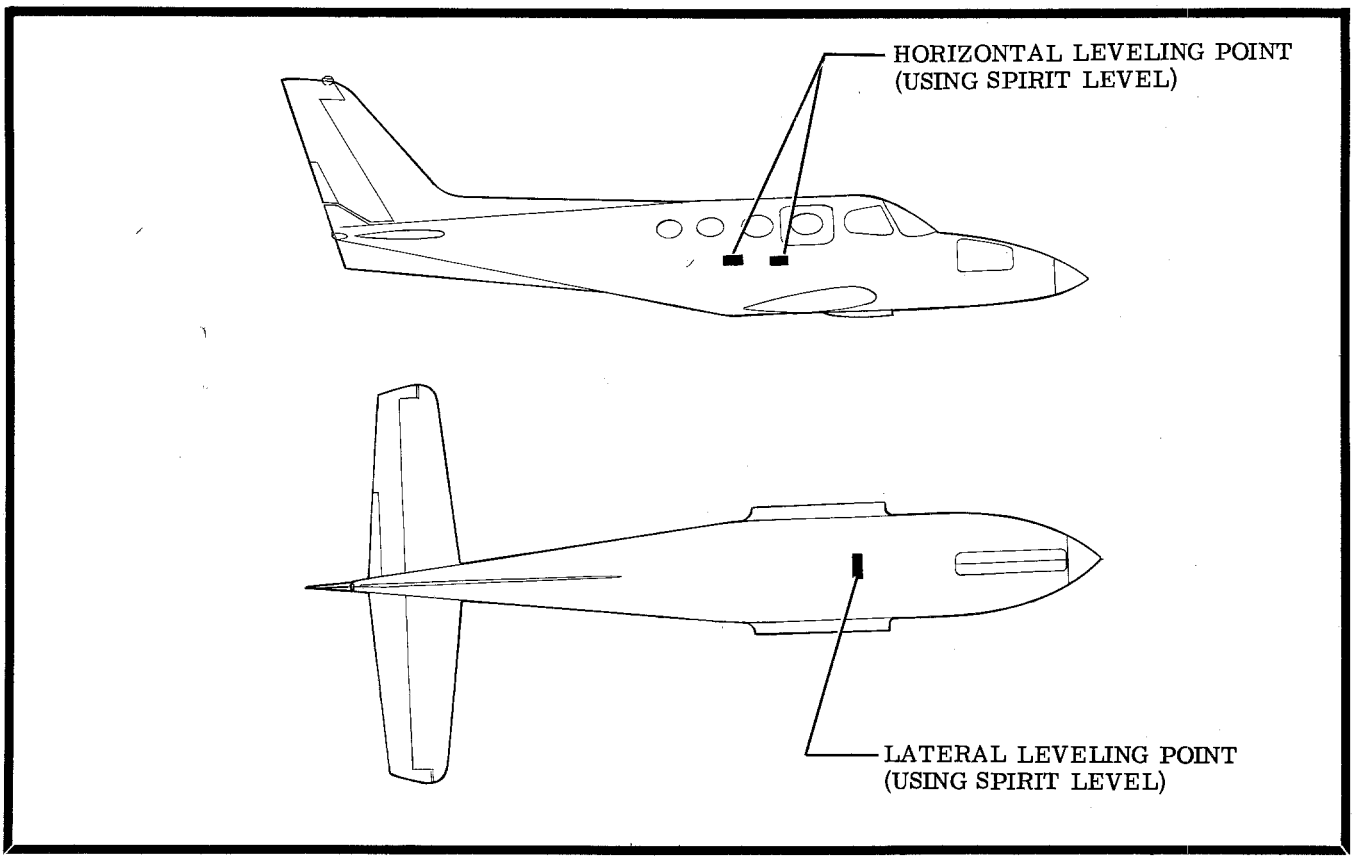



Figure 2-4. Leveling

NOTE

Special two-ton jacks, ideally suited, can be supplied by the Cessna Aircraft Company. Three jacks are required to lift the aircraft.

Leveling.

To level the aircraft longitudinally and laterally, use the three jacking points provided on the aircraft. Level longitudinally by the two screws at "Level Point" on the right hand outside fuselage (opposite cabin door at Stations 185.50 and 209.41 and place a spirit level on these screws, then level longitudinally. To level laterally, place a spirit level between the black marks at Station 153.75 (aft of front spar) on the underside of fuselage.

Weighing and Measuring.

For weighing and measuring the aircraft refer to figure 2-5.

STORAGE OF AIRCRAFT.

There are three recommended categories of storage of the aircraft:

a. Flyable Storage - Aircraft which will not be flown for an indefinite period of time but which are to be kept ready to fly with the least possible preparation.
b. Temporary Storage - Aircraft which will be stored for a period of time up to 90 days.
c. Indefinite Storage - Aircraft which will be stored for an indefinite period of time.

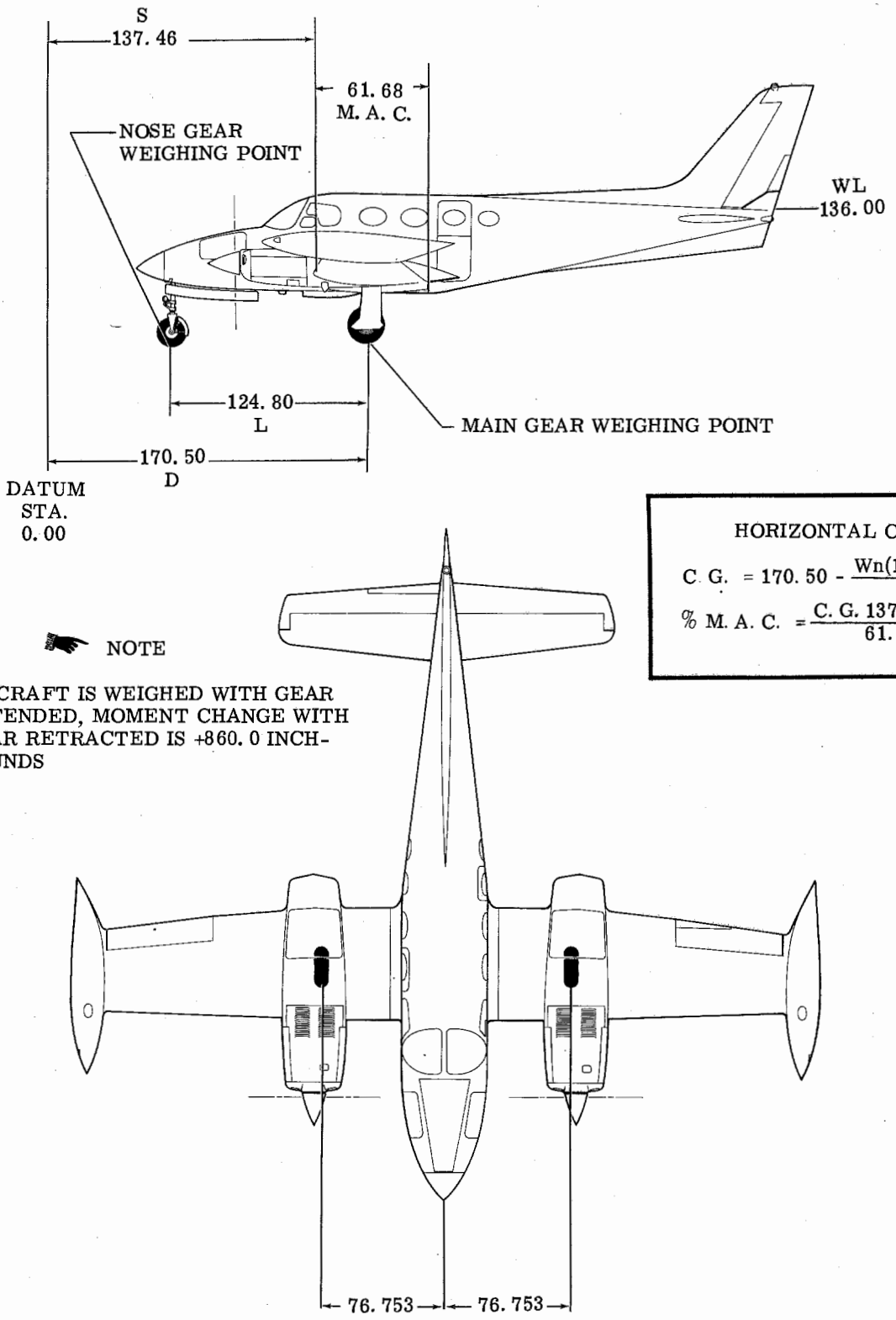
If the aircraft is to be stored outside, the following normal precautions should be taken:

a. Tie-down the aircraft in accordance with tie-down procedures.
b. If local conditions (dust or snow) exist take normal aircraft precautions, such as install plugs on air vents, exhaust outlets and any other vents.
c. Install pitot tube cover.
d. Install control surface locks, on ailerons, rudder and elevator, if available.
e. If surface locks are not available install control locks on pilots control column if available, if control lock is not available tie pilots control wheel back with front seat belt.

Flyable Storage.

Aircraft which are not in daily flight should have the engine rotated by hand-turning the propeller five (5) revolutions at least once each week. In damp climate

WEIGHING ON GEAR




HORIZONTAL C. G.

$$C.G. = 170.50 - \frac{Wn(124.80)}{W}$$

$$\%\ M.A.C. = \frac{C.G.\ 137.46(100)}{61.68}$$

NOTE

AIRCRAFT IS WEIGHED WITH GEAR EXTENDED, MOMENT CHANGE WITH GEAR RETRACTED IS +860. 0 INCH-POUNDS

Figure 2-5. Weighing and Measuring (Sheet 1)

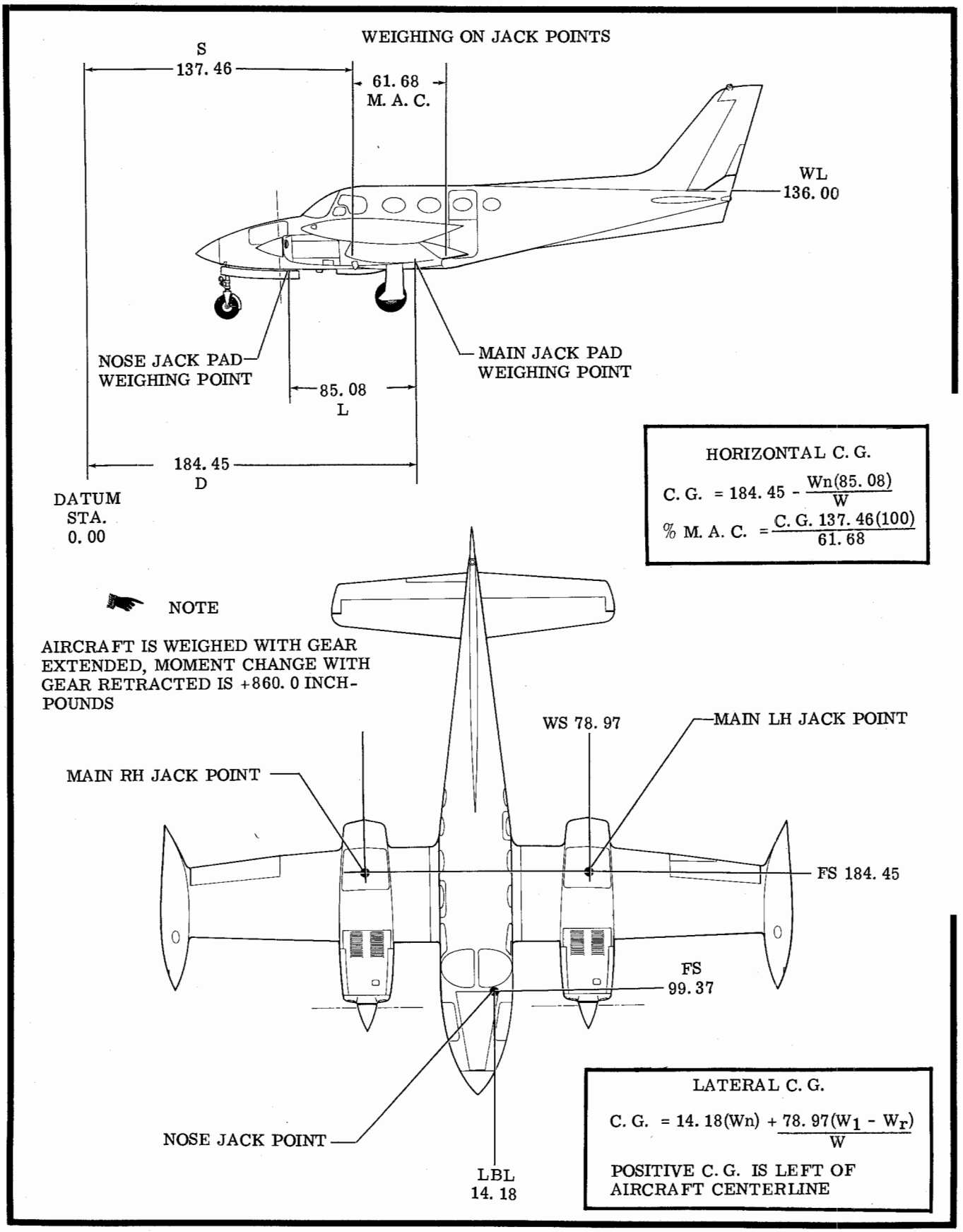



Figure 2-5. Weighing and Measuring (Sheet 2)

LEGEND

| | | | |
|---|---|---|---|
| W | The weight of the aircraft. ($W_n + W_l + W_r$) | C. G. | The distance from the datum to the center of gravity of the aircraft. |
| D | The horizontal distance from the datum to the main weighing points. | $W_n$ | The weight at the nose weighing point. |
| L | The horizontal distance from the main weighing points to the nose weighing point. | $W_l$ | The weight at the left main weighing point. |
| S | The horizontal distance from the datum to the leading edge of the M. A. C. | $W_r$ | The weight at the right main weighing point. |
| | | M. A. C. | Mean Aerodynamic Chord. |

$$\text{Formula: C. G.} = D - \frac{(W_n(L))}{W}$$

$$\%\ \text{M. A. C.} = \frac{\text{C. G.} - S(100)}{\text{M. A. C.}}$$

| WEIGHING POINT | SCALE READING (LBS) | TARE (LBS) | NET WEIGHT (LBS) |
|---|---|---|---|
| $W_l$ | | | |
| $W_r$ | | | |
| $W_n$ | | | |
| W (EMPTY WEIGHT) | | | |

Table 1.

Preparation for Weighing.

a. Remove excessive dirt, grease, moisture, etc., from the aircraft before weighing.
b. Weigh the aircraft inside a closed building to prevent error in scale reading due to wind.
c. To determine the center of gravity, place the aircraft in a level attitude.
d. Have all items of equipment included in the certificated empty weight installed in the aircraft when weighing. These items of equipment are listed on the equipment list.
e. Defuel the aircraft in accordance with defueling procedure and drain the sump. Fuel remaining aboard after draining is residual fuel and is included in the empty weight.
f. Drain all oil from engines by opening drain cocks. The oil remaining after draining is residual oil and is included in empty weight.

NOTE

When weighed with full oil, actual empty weight equals the actual recorded weight less the weight of the oil in the engines (oil weight = oil capacity in gallons x 07. 5 pounds).

g. Properly calibrate, zero and use scales in accordance with the scale manufacturer's instructions.
h. Place the scales and suitable supports (jacks) under the aircraft jack pads or wheels and record the scale readings. (See Table 1. )
i. Do not set brakes while taking scale readings.
j. Note tare when the aircraft is removed from the scales.

NOTE

TARE is the weight of the chocks, blocks, stands, etc., used when weighing the aircraft, and is included in the scale readings. Tare is deducted from the scale readings at each respective weighing point where tare is involved to obtain the aircraft weight.

Figure 2-5. Weighing and Measuring (Sheet 3)

and in storage areas where the daily temperature variation can cause condensation, the turning operation should be accomplished more frequently. Rotating the engine an odd number of turns redistributes residual oil on cylinder walls, shaft and gear surfaces and repositions the pistons in the cylinder thus preventing corrosion accumulation.

CAUTION

For maximum safety, accomplish engine rotation as follows: assure magneto switches are OFF, throttle position CLOSED, mixture control IDLE CUT-OFF and do not stand within the arc of the propeller blades while turning the propeller.

a. Fill fuel tanks full to minimize condensation in the fuel tanks. Keep battery fully charged to prevent the electrolyte from freezing in cold weather. If the aircraft is stored outside, tie-down should be accomplished in anticipation of high winds.
b. Tie ropes or chains to the wing tie-down fittings located on the underside of each wing. Secure the opposite ends of the ropes or chains to ground anchors.
c. Secure a rope (no chains or cables) to the upper trunnion of the nose gear and secure opposite end of rope to a ground anchor.
d. Secure the middle of a rope to tail tie-down ring. Pull each end of rope away at 45-degree angle and secure to ground anchors at each side of tail.
e. Install surface control locks (aileron, rudder and elevator) if available.
f. Install control lock on pilot control column if available; if control lock is not available, tie pilot control wheel back with front seat belt.
g. After thirty (30) days, aircraft should be flown for thirty (30) minutes or ground run-up until oil has reached operating temperature.

Temporary Storage.

a. Remove top and bottom spark plugs and atomize spray preservative oil, (Lubrication Oil - Contact and Volatile, Corrosion Inhibited, MIL-L-46002, Grade 1) (221° - 250°) through upper spark plug hole of each cylinder with the piston in the down position. Rotate crankshaft as each pair of cylinders is sprayed. Stop crankshaft with no piston at top position. If the aircraft is to be stored outside, 2-bladed propeller position should be as nearly horizontal as possible to provide maximum clearance with passing aircraft.

NOTE

Listed below are approved preservative oils recommended for use in Continental engines.

Continental: Nucle Oil 105, Petrotect VA, Ferro-Gard 1009-G or equivalent.

b. Respray each cylinder without rotating crank. To thoroughly cover all surfaces of the cylinder interior, move the nozzle or the spray gun from the top to the bottom of the cylinder.
c. Reinstall spark plugs.
d. Apply preservative to engine interior by spraying the above specified oil (approximately 2 ounces) through the oil filler tube.
e. Seal all engine openings exposed to the atmosphere using suitable plugs, or non-hygroscopic tape, and attach red streamers at each point.
f. Install pitot tube cover, seal static source, install ground locks on retractable gear aircraft and attach red streamers at each location. Close all vents and plug cowl openings to prevent bird nests in the engine compartment.
g. Engines, with propellers installed, that are preserved for storage in accordance with this section should have a tag affixed to the propeller in a conspicuous place with the following notation on the tag: 'DO NOT TURN PROPELLER - ENGINE PRESERVED."
h. Disconnect or remove the battery from the aircraft. If the battery is disconnected and left in the aircraft, regular servicing will be required to prevent freezing or discharge. Batteries which are removed from the aircraft and stored should be checked regularly for state of charge. Recent production aircraft have the battery serial recorded in the aircraft equipment list. To assure accurate warranty records, batteries should be reinstalled in the same aircraft from which they were removed.
i. If the aircraft is stored outdoors, place control locks on all movable control surfaces and tie the aircraft down snugly, not tightly, with enough clearance so wind gusts will not shift aircraft into another. Leave no long chains dangling. Release the parking brake to prevent seizing and chock the wheels.

Indefinite Storage.

a. Drain the engine oil and service with corrosion preventive mixture.

NOTE

Corrosion preventive mixture consists of one part compound MIL-C-6529, Type I, (Esso Rust-Ban 628, Cosmoline No. 1223 or equivalent) mixed with three parts new lubricating oil of the grade recommended for service. This mixture should be thoroughly mixed and maintained at a temperature of at least 221° F. at the time it is added to the engine. Immediately after servicing with the corrosion preventive mixture, fly the aircraft for a period of time not to exceed a maximum of 30 minutes.

b. Remove the top spark plug from each cylinder and spray with corrosion preventive mixture (221° to 250° F). To thoroughly cover all surfaces of the

cylinder interior, move the nozzle of the spray gun from the top to the bottom of the cylinder. If by accident the propeller is rotated following this spraying, respray the cylinders to insure an unbroken coverage of corrosion preventive mixture on all surfaces.

c. Install protex plugs in each of the top spark plug holes, making sure that each plug is blue in color when installed. Protect and support the spark plug leads with AN-4060-1 protectors.

d. Place a bag of desiccant in the exhaust pipes and seal the openings with moisture resistant tape.

e. Seal the cold air inlets with moisture resistant tape to exclude moisture and foreign objects.

f. Seal the engine breather by inserting a protex plug in the breather hose and clamping in place.

g. Attach a red streamer to each place on the engine where bags of desiccant are placed. Either attach red streamers outside of the sealed area with tape or to the inside of the sealed area with safety wire to prevent wicking of moisture into the sealed area.

h. Engines, with propellers installed, that are preserved for storage in accordance with this section should have each propeller tagged in a conspicuous place with the following notation on the tag: "DO NOT TURN PROPELLER - ENGINE PRESERVED."

i. After the engine has been prepared for storage, remove the battery from the aircraft, store in a cool dry place and check regularly for state or charge. Note serial number on battery and reinstall in the same aircraft.

j. If the aircraft is stored outdoors, place control locks on all movable control surfaces and tie the aircraft down snugly, not tightly, with enough clearance so wind gusts will not shift aircraft into another. Leave no long chains dangling. Release the parking brake to prevent seizing and chock the wheels.

k. Cover the aircraft with moisture resistant paper and tape as necessary.

NOTE

The necessity of this requirement can be determined by the condition at the storage area.

l. Install pitot tube cover, seal static source, install ground locks on retractable gear and attach red streamers at each location. Close all vents and plug cowl openings to prevent bird nests in the engine compartment.

As an alternate method of indefinite storage, the aircraft may be serviced in accordance with the procedures under Temporary Storage providing the aircraft is run-up at maximum intervals of ninety (90) days and then reserviced per the temporary storage requirements.

m. Aircraft stored in accordance with the Indefinite Storage Procedures should be inspected per the following instructions:

1. Aircraft prepared for indefinite storage shall have the cylinder protex plugs inspected weekly. The plugs should be changed as soon as their color indicates unsafe conditions of storage. If the dehydrator plugs have changed color in one half or more of the cylinders, all desiccant material on the engine should be replaced.

2. The cylinder bores of all engines prepared for indefinite storage should be resprayed with corrosion preventive mixture every 6 months. Before spraying, the engines shall be inspected for corrosion as follows: Inspect the interior of at least one cylinder on each engine through the spark plug hole. Remove at least one rocker box cover from each engine and inspect the valve mechanism.

Restoring Aircraft to Service.

If the proper procedures were followed for extended storage, the aircraft should require the following service:

a. Airframe.

1. Remove all covers from vents and air inlets.
2. Clean aircraft if required.
3. Lubricate the aircraft.
4. Check the brake cylinders, struts and shimmy dampener.
5. Drain a small amount of fuel from all fuel drains and check for water and sediment.
6. Check fuel selector valve for evidence of leakage.

b. Battery.

1. Charge and check battery.
2. Install battery.

c. Engines.

1. Remove all vent and opening covers installed.
2. Remove oil sump drain plugs.
3. Remove plugs from spark plug holes in all cylinders. Rotate engines, by hand, to remove corrosion preventive oil from cylinders.

WARNING

Magneto switches must be in the off position when rotating propellers by hand.

4. Install recommended spark plugs which have been properly cleaned and gapped.
5. Remove, clean and reinstall the oil filter screens.
6. Install the oil sump drain plugs and fill oil sump with recommended oil.
7. Lubricate propellers and check for free operation.
8. Start engine and give aircraft complete ground run-up check.
9. Perform flight test.

PAINTING.

Preparation of Surface.

Thoroughly clean all surfaces, beyond area to be painted with Turco 800 or Enmar 3094 thinner. Extreme care should be taken to remove all letters, grease, bugs, etc. Mask off stripe areas to be painted carefully; see that all tapes are firmly adhered to metal to prevent ragged edges. Class "A" wrapping paper and thinner proof masking tape should

be used to cover the plexiglas area. This will prevent damage from solvent and thinner vapors. (Newspaper will not provide adequate protection.) Extreme care should be taken to assure that no oil seepage occurs from seams, splices, or rivet heads.

CAUTION

- Metallic paper, metal, metal foil or metal of any kind should never be used as a paint spray mask on heated windshields.
- During aircraft painting operations, extreme care must be taken to insure that stripping fluids do not come in contact with fuel cells. Paint stripping fluids can inflict severe damage to cells which is not readily apparent or easily detected. For this reason, the cells should be disconnected from their upper skin covers and hangers and protected with a plastic sheet during stripping operations.

Paint Stripping.

a. Paint stripping is required to reach paint covered corrosion, repaint an area with paint that is incompatible to paint currently on the part etc.
b. Before applying paint stripper, windows, areas not being painted, openings, rubber and other nonmetallic parts must be masked off. If paint stripper should accidently get on material, such as plexiglas, flush parts with water immediately.

CAUTION

During paint stripping operations, extreme care must be taken to insure that stripping fluids do not come in contact with fuel cells. Paint stripping fluids can inflict severe damage to cells which is not readily apparent or easily detected. For this reason, the cells should be disconnected from their upper skin covers and hangers and protected with a plastic sheet during stripping operations.

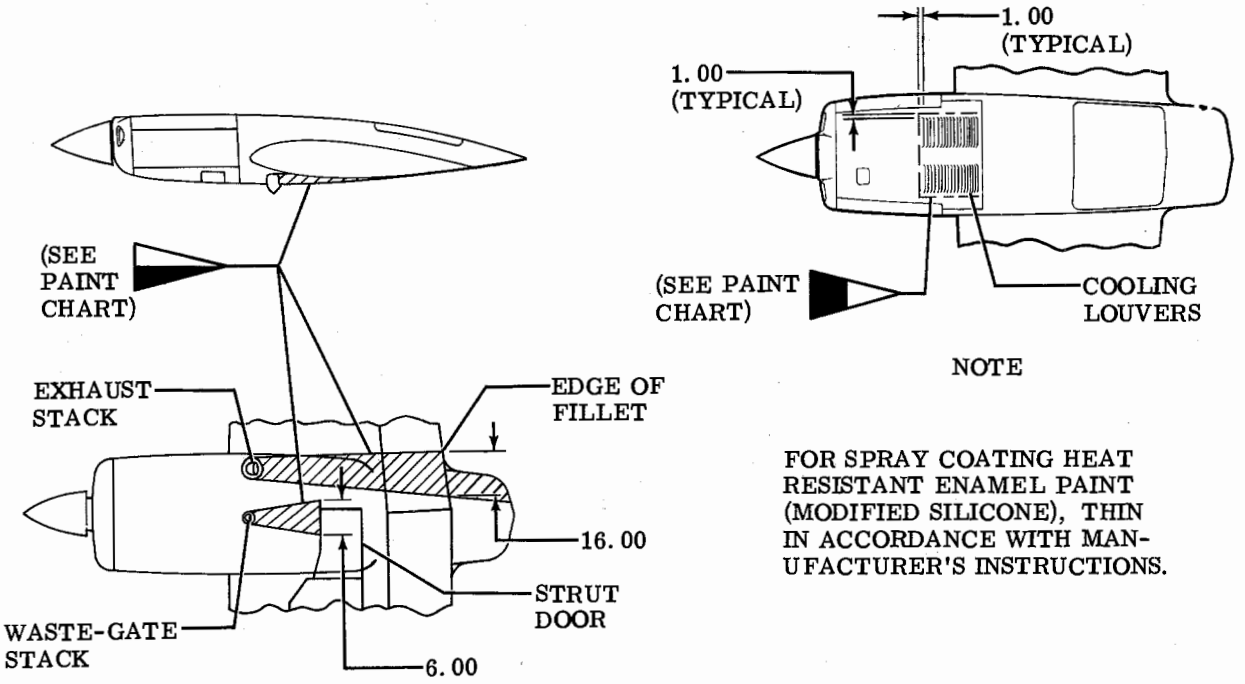
c. During paint stripping, the following safety precautions should be observed.
1. Have fire extinguisher available.
2. Provide adequate ventilation in working area.
3. Wear goggles, rubber gloves, apron, face shield and head coverings.
d. Apply paint stripper as follows:
1. Starting at the top and working down, brush or spray paint stripper on painted surface. Follow paint stripper manufacturer's recommendations regarding use of the stripper.
2. Rinse area thoroughly and allow to dry.

Corrosion Treatment.

a. If corrosion occurs, complete removal of corrosion deposits is required to prevent recurrence. Partial removal and covering with paint will not halt continued attack because a small amount of moisture penetrates the surface of all paint and allows corrosion to continue.
b. If an area of corrosion exists, the area shall be cleaned and the paint stripped. If the area is confined and the use of paint stripper is impractical because of rinsing difficulties paint may be removed with solvent material Federal Specification TT-E-751 or TT-T-266. Apply solvent with a soft bristle brush, allow solvent to remain until paint film is loosened, then wipe clean with a clean damp cloth.
c. Heavy aluminum parts are suspectible to intergranular corrosion attack. Mechanical corrosion removal may be used in pitted areas or in conjunction with chemical corrosion removal in lightly corroded areas. Use #400 aluminum grit abrasive paper or abrasive mat for mechanical corrosion removal.
d. Chemical corrosion removal must be used on clad aluminum parts; such as skin. It is also suitable for other areas of light corrosion removal. The surrounding parts and materials shall be protected from damage of the corrosion remover by proper masking or other appropriate methods. Specific CAUTION should be exercised in areas where the corrosion remover could become entrapped or attack an uncorroded area.
e. For light corrosion and discoloration proceed as follows:
1. Apply Delchem810 with brush or cloth.
2. Agitate with short fiber brush or abrasive mat until all corrosion is removed. Do not leave conditioner in contact with the surface longer than 20 minutes.
3. Rinse off the corrosion remover with a damp cloth. Rinse the cloth frequently in water.
4. Repeat cycle as required.
5. After all corrosion is removed, thoroughly rinse treated area with clean water.
6. Apply pretreatment (Iridite 14-2) to aluminum where corrosion was removed in accordance with manufacturer's instructions.
f. For moderate corrosion proceed as follows:
1. Dilute Pennsalt 715 with an equal volume of water in a plastic lined container.
2. Apply diluted Pennsalt 715 with a brush or cloth wetting the entire corroded surface thoroughly.
3. Allow the solution to stand as long as necessary to remove corrosion but no longer than 20 minutes.
4. Scruff with a short fiber brush just before rinsing with water and damp cloth.
5. Repeat cycle as necessary.
6. After all corrosion is removed, rinse the treated area thoroughly with water and dry.
7. Apply pretreatment (Iridite 14-2) to aluminum where corrosion was removed in accordance with manufacturer's instructions.

Recommended Materials and Equipment.

| NAME | NUMBER | MANUFACTURER | USE |
|---|---|---|---|
| | | GENERAL CLEANING INCLUDING EXHAUST DEPOSITS | |
| Delchem Jet Wash | 2271 | Pennsalt Chemical Corp.<br>2700 South Eastern Ave.<br>Los Angeles, Calif. | To wash exterior surface of the aircraft. |
| Aerowash | | Wyandotte Chemicals Corp.<br>8921 Dick Road<br>Los Nietos, Calif. | To wash exterior surface of the aircraft. |
| | | PAINT REMOVER | |
| Delchem E-Z Strip | 19B | Pennsalt Chemical Corp.<br>2700 South Eastern Ave.<br>Los Angeles, Calif. | To strip polyurethane paint. |
| Paint Remover | Turco 5556A | Turco Products Inc.<br>Box 1055<br>Wilmington, Calif. | To strip polyurethane paint. |
| Paint Remover | Turco 5556AF | Turco Products Inc.<br>Box 1055<br>Wilmington, Calif. | To strip polyurethane paint. |
| | | CORROSION REMOVAL | |
| Delchem | 810 | Pennsalt Chemical Corp.<br>2700 South Eastern Ave.<br>Los Angeles, Calif. | To remove light corrosion or discoloration. |
| Pennsalt | 715 | Pennsalt Chemical Corp.<br>2700 South Eastern Ave.<br>Los Angeles, Calif. | To remove moderate corrosion. |
| | | DEICING EXTERIOR SURFACES | |
| Deicing Fluid | WD-20 | Jefferson Chemical Corp.<br>Houston, Texas | To remove ice and frost from control surfaces. |
| | | PRETREATMENT | |
| Iridite | 14-2 | Allied Research Inc. | To prevent aluminum against corrosion. |




HEAT RESISTANT - PAINT CHART

| LOCATION | CESSNA PART NO. | VENDOR PART NO. | TYPE | COLOR |
|---|---|---|---|---|
| ▶ | CES2800-2112 | KANSAS PAINT | HEAT RESISTANT ENAMEL MODIFIED SILICONE | VESTAL WHITE |
| ▶ | CES1054-142 | ENMAR 22-11980 | ENAMEL | GRAY |

Figure 2-6. Heat Resistant Paint Chart

Primer - Mixture and Application.

NOTE

Mix EX2016G primer only in quantities required for use within six hours, and then only in stainless steel bucket provided.

a. Mix equal parts of EX2016G primer and T6070 diluent and stir thoroughly.
b. Apply EX2016G primer in a well-broken up, wet, even coat. If primer has to be sanded, sand and reprime. Sanding breaks film, resulting in poor adhesion.

NOTE

On all leading edge surfaces, apply cross coat, wet and even, of EX2016G primer.

c. Clean equipment immediately after use and under no consideration use EX2016G primer that has been mixed longer than six hours.

Polycarbonate Primer - Mixture and Application.

a. Surfaces to receive primer shall be solvent washed with isopropyl alcohol.
b. Primer shall be Lacco 600 SL9953, white - Red Spot Paint and Varnish Company or RV3649, white - Duralac Chemical Corporation. This primer shall be reduced to spray viscosity by thinning with Red Spot SL8381 or Duralac T901 respectively. Use approximately one volume of thinner for one volume of primer.
c. The first coat of reduced primer shall be dry sprayed to an approximate cured film thickness of 0.0003 to 0.0004 inch.
d. The sprayed coating shall be allowed to dry a minimum of one hour prior to overcoating.

Epoxy Primer.

Fiberglass parts that have been stripped of their primer should be primed with P-900 Sky Spar Surfaces, consisting of the following:

| | |
|---|---|
| P-900 Sky Spar Surfaces | Base Component |
| C-918 Catalyst Concentrate | Component I |
| C-916 Catalyst Thinner | Component II |
| T-262 Thinner | Component III |

a. Surfaces to receive Epoxy primer should be sanded lightly so the outer laminated layer is not exposed.
b. Remove residue by wiping with a cloth dampened with Isopropyl Alcohol.

NOTE

Do not use wood filler, lacquer, putty or aerodynamic smoothers, such as White Streak or Bondtite on fiberglass.

c. Allow all materials when first mixed with a catalyst, to stand in a closed container for approximately one hour before use.

NOTE

Mixed material has a usable pot life of 8 hours. When the material becomes thick and starts to gel, it must be discarded.

Materials, Description and Mixing Instructions.

P-900 Surfaces is an epoxy resin and constitutes the base component of the system. By mixing with the C-918 Catalyst Concentrate and/or the C-916 Catalyst Thinner in varying proportions and thinning with T-262 Thinner, any desired consistency can be obtained, from heavy putty to a spraying viscosity.

a. Mix 12 parts of the base component with one part of Component I (Catalyst Concentrate). Mix thoroughly then cover the container and allow to stand 1 hour.
b. The mixture should be thick, smooth putty and may be applied with a spatula or heavy bristled brush.
c. The material may be overcoated immediately with P-900 either by brushing or spraying. The material will be dry for sanding when it does not gum up in the sandpaper and sands off in a dry powder. This will occur after air drying for a period of not less than 2 hours or is forced dried at 170° F for 30 minutes.
d. If the material is to be brushed on, take a portion of the putty material that has been allowed to set for one hour and thin it to a suitable brushing viscosity with Component II (Catalyst Thinner). This material is ready to brush on after thinning.
e. The mixture should be brushed on the part, working material well into surface and filling all holes.
f. Allow part to air dry for a period of not less than two hours or force dry at 170° F for 20 minutes before sanding.
g. If the material is to be sprayed, take a portion of the mixed material, thin it further using Component III (T-262 Thinner), until a suitable spray viscosity is obtained. This material is ready for use after thinning.
h. Spray the mixture with the necessary number of coats to cover any brush marks or imperfections in the surface.

NOTE

When applying heavy spray coats, solvent entrapment may occur causing pin holes. To eliminate this, let the part stand for 5 to 10 minutes after it has been sprayed to allow solvent flash off. After 10 minutes, spray one final finish coat and dry.

The part may be force dried at 170° F for a period of 20 to 30 minutes.

Surface Preparation.

a. Clean part well by wiping with Isopropyl Alcohol.
b. Fill all large holes with putty.
c. Using a thinned putty mixture brush material well into surface of material. Do not work back over the surface once it has been completed. Material dries quickly and brush strokes are difficult to sand out.
d. Allow to air dry for a period of 2 hours or force dry at 170° F for 30 minutes.
e. Sand surface smooth.
f. Spray final finish using a thinned mixture and allow to dry same as step d.
g. Repeat procedure as necessary to achieve desired results.
h. Paint in accordance with painting procedures.

Epoxy Enamel.

When touch up or refinish of parts becomes necessary, the edge of the finish adjacent to the defect shall be feathered by sanding with #320 followed by #400 sandpaper. Avoid sanding through the primer if possible. If the primer is penetrated over an area of 1/2 inch square or larger, the surface must be reprimed.

Epoxy Primer. (Type I-M)

a. Mix thoroughly by volume one part epoxy primer to one part catalyst. Thin this mixture with T-6487 Thinner to a spray viscosity of 17-19 seconds in a number 2 Zahn cup.
b. Allow mixture to set for one hour before using.

NOTE

The work life of the primer is six hours after mixing.

c. Material should be applied in a wet coat application to a dry film thickness of . 0004 to . 0007 inch.
d. Allow 20 to 30 minutes drying time between applications of primer coats. Primed surface should be allowed to air dry 30 minutes, then final dry 4 hours at 135° F.

Epoxy Enamel Application.

a. Mix epoxy enamel by adding 1 part by volume of thinner (Enmar 5400) to 1 part by volume of enamel. No additional thinning is necessary.
b. Allow mixture to set for 1 hour before using.

NOTE

Work life of epoxy enamel is 8 hours.

c. Spray coats shall be applied to a dry film thickness of . 0008 to . 0012 inch.
d. Allow finish to cure for a period of 8 hours at room temperature. As an alternate finish may be force dried by air for 30 minutes followed by a 30 minute bake at 250° F or 2 hours at 130° F.

Preparation of 82B Series Vinyl Enamel Colors.

Thoroughly mix and stir in original container and make sure all pigments are in solution. Thin required amount of vinyl color with T1866B vinyl thinner in a 1:1 ratio. Mix thoroughly and strain into either a cup or pressure pot.

Application of 82B Series Vinyl Colors.

NOTE

If vinyl is to be applied from pressure pot, do so under the following conditions: pressure of 10 pounds on the pot. Regulate gun pressure at gun with test gage to 25 pounds, using gun with FX needle and fluid tip, with fan set wide open and yield two turns open. If cups are used, set gun at 30 pounds with EX needle and fluid tip, fan set one turn open and yield wide open.

a. Apply first coat even and wet; second and third coats in the same manner.
b. Check carefully before second and third coats for defects and correct before final coats.
c. On second and third colors, mask off and lightly sand with 400 grit sandpaper the painted surfaces of previous color that is in area to be painted.

NOTE

On all leading edges apply a fourth coat. After finishing each color coat, burn down with T1411 burn down thinner. Remove all masking from painted surfaces after each color application. If you have a Heat Room, turn up the heat and dry paint at temperatures of 125° to 145° F, for at least three hours. Heat will give a very good reflow on vinyl paint.

VHT Finish (Very High Temperature).

The cowl flaps, upper engine nacelle area above the turbocharger and the area aft of the exhaust outlet are painted with VHT paint. The following instructions apply only to the areas where high temperature paint is applied.

Priming is not necessary. Area to be refinished must be dry; clean and free of dirt and oil and sanded using a 220 grit or finer abrasive paper.

VHT coating should be thinned for spraying by adding an equal volume of volvene.

Thinned material should be sprayed on surface to be painted to yield a cured film thickness of 0. 001 inch.

VHT paint shall be allowed to air dry for 30 minutes followed by a 15 minute force dry at 250° F. Final cure involves 30 minutes at a temperature of 600° - 650° F.

Heat Resistant Paint. (See figure 2-6. )

The cooling louvers are painted with heat resistant paint (modified silicone). The area aft of the exhaust stack and waste-gate stack on underside of the wing has been painted with heat resistant enamel.

a. When it is necessary to repaint the areas painted with heat resistant enamel the area should be masked off and the area stripped using Delchem E-Z Strip 19B or equivalent, then rinsed clean with a water spray.
b. Scuff sand and tack rag area to be sprayed.
c. Spray coat Red Iron Oxide Primer (Type 1-8) to insure a cure film thickness of 0. 0002 to 0. 0005 inches to the area receiving heat resistant enamel.

NOTE

Thin Red Iron Oxide Primer to a one to one ratio with Toluene for spray.

d. Spray coat areas receiving heat resistant with wash primer EX2016G Enmar, or 818-012 Dupont wash primer to insure a cured film thickness of 0. 0002 to 0. 0003 inch.

NOTE

Wash primer should be thinned with a one to one ratio with T670 Enmar or Dupont equivalent. The mixed primer must be used within a six hour period after thinning or discarded.

e. Allow primed surface to air dry approximately one hour.
f. Sand primed surface irregularities and reprime.
g. On surfaces to receive heat resistant enamel, spray coat enamel to insure a film thickness of 0. 001 to 0. 0015 inch.

NOTE

Heat resistant enamel should be thinned in a one to one ratio with 1 part Xylene or Toluene to four parts enamel and allowed to air dry for a period of 24 hours.

Touch Up Vinyl.

When it is necessary to touch up or refinish an area the edge of the finish adjacent to the defect shall be feathered by sanding with #320 followed by #400 sandpaper. Avoid, if possible, sanding through the primer. If the primer is penetrated over an area of 1/2 inch square or larger, the surface must be reprimed.

NOTE

Avoid spraying metal primer on the adjacent paint.

a. When touching up vinyl, use EX2016G primer mixed one part primer to one part EX2016A activator. Stir and allow 30 minutes before spraying.
b. When priming with EX2016G, use a light coat of MIL-P-8585 zinc chromate primer thinned four parts toluol to one part primer applied over the EX2016G.
c. Fill the feathered areas by spraying on several light coats of Acme 538 dark grey surfaces and allowing 5 to 8 minutes drying time for each coat.
d. Sand the entire area with #400 sandpaper and apply the top coat.

NOTE

Remove dry overspray by burndown (T-1411) or by compounding with Dupont 808 Rubbing Compound.

Polyurethane Finish (Optional).

a. The surfaces to receive polyurethane paint shall be sanded smooth and solvent cleaned with isopropyl alcohol.
b. Mix wash primer EX2616G Enmar in a 1:1 ratio by volume so that the viscosity is 17 seconds in #2 Zahn cup. No induction time is necessary and the pot life is 8 hours.
c. Apply a light spray coat with a dry film thickness of 0.0005 to 0.0007 inches and allow to air dry for a period of 30 minutes.
d. Mix an intermediate primer by mixing two parts AA-92 to one part Y-53 urethane zinc chromate primer, and then combine three parts of this mixture with two parts T-888 thinner. This mixture will have a viscosity of 17 seconds in a #2 Zahn cup, and also an induction time of one hour and a pot life of 8 hours.
e. Apply a spray coat of the intermediate primer over the washed prime surface. Spray the AA-92, Y-53 film to a dry thickness of 0.0007 to 0.001 and allow to dry one hour at 80° F before overcoating.
f. Mix AA-92 urethane enamel in a 1:1 ratio.

NOTE

For a minimum of orange peel, the material should be thinned to a viscosity of 18 seconds in a #2 Zahn cup. Induction time is 30 minutes and pot life is 8 hours. Induction time is the time required for mixture to set after mixing and before application. Pot life is the work life after mixing.

g. Apply urethane enamel to primed surface in two passes such that the dry film thickness is 0.0013 to 0.0017 inches.
h. Force dry at 140° F for a period of 4 hours before masking for additional painting.

NOTE

Applying a heavy film will cause solvent popping and should be avoided. If anti-cratering solution is used, #92C24 should be added at the rate of not more than 2 ounces per catalyzed gallon.

i. Apply W102 white for the topcoat if white is specified.

Touch Up of Polyurethane Finish.

a. Urethane touch up and design should be accomplished within 24 hours after the application of the topcoat. The topcoat must be wiped down with MEK before touch up or painting stripes.
b. If the touch up or striping is accomplished after the 24 hour limitation the area should be scuff sanded.
c. Apply touch up in accordance with Polyurethane Finish, steps f thru h.

NOTE

All equipment should be cleaned immediately after use. T-732A, Methyl-Ethyl-Ketone, or Cellosolve Acetate should be used for cleaning equipment.

Touch Up Landing Gear Finish.

a. The area of the landing gear to receive touch up paint should be masked off, sanded, cleaned and primed in accordance with Priming Procedures, using Red Oxide Primer P/N BM 111-35.
b. Apply enamel touch up paint Gull Gray P/N 52-9375 in accordance with Touch Up Vinyl Enamel Procedures and allow to air dry. On aircraft 340-0301 and On, apply Epoxy White P/N 54E-511 in accordance with Epoxy enamel.

RAIN EROSION COATING APPLICATION (RADOME).

Refer to Section 16 for preparation and application of rain erosion coating.

## I INSPECTION REQUIREMENTS

As required by Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a complete inspection (ANNUAL) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must also have a complete inspection every 100 hours of operation.

In lieu of the above requirements, an aircraft may be inspected in accordance with progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the COMPLETE AIRCRAFT INSPECTION (refer to paragraph II, c., for definition) requirements of both the 100 HOUR and ANNUAL inspection as applicable to Cessna Aircraft.

## II INSPECTION CHARTS

The following Inspection Charts show the recommended intervals at which items are to be inspected.

As shown in the charts, there are items to be checked each 50 hours, each 100 hours, each 200 hours, and also Special Inspection Items which require servicing or inspection at intervals other than 50, 100 or 200 hours.

a. When conducting an inspection at 50 hours, all items marked under EACH 50 HOURS would be inspected, serviced or otherwise accomplished as necessary to insure continuous airworthiness.

b. At each 100 hours, the 50 hour items would be accomplished in addition to the items marked under EACH 100 HOURS as necessary to insure continuous airworthiness.

c. At each 200 hours, the 50 hour items and 100 hour items would be accomplished in addition to the items marked under EACH 200 HOURS as necessary to insure continuous airworthiness.

d. The numbers appearing in the SPECIAL INSPECTION ITEMS column refer to data listed at the end of the inspection charts. These items should be checked at each inspection interval to insure that applicable servicing and inspection requirements are accomplished at the specified intervals.

e. A COMPLETE AIRCRAFT INSPECTION includes all 50, 100 and 200 hour items plus those Special Inspection Items which are due at the time of the inspection.

## III INSPECTION PROGRAM SELECTION

AS A GUIDE FOR SELECTING THE INSPECTION PROGRAM THAT BEST SUITS THE OPERATION OF THE AIRCRAFT, THE FOLLOWING IS PROVIDED.

1. IF THE AIRCRAFT IS FLOWN LESS THAN 200 HOURS ANNUALLY
   a. IF FLOWN FOR HIRE
      An aircraft operation in this category must have a COMPLETE AIRCRAFT INSPECTION each 100 hours of operation and each 12 calendar months of operation (ANNUAL). A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above.

   b. IF NOT FLOWN FOR HIRE
      An aircraft operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 12 calendar months of operation (ANNUAL). A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above. In addition, it is recommended that between annual inspections, all items be inspected at the intervals specified in the inspection charts.

2. IF THE AIRCRAFT IS FLOWN MORE THAN 200 HOURS ANNUALLY
   Whether flown for hire or not, it is recommended that aircraft operating in this category be placed on the CESSNA PROGRESSIVE CARE PROGRAM. However, if not placed on Progressive Care, the inspection requirements for aircraft in this category are the same as those defined under paragraph III, 1., a. and b.

   Cessna Progressive Care may be utilized as a total concept program which insures that the inspection intervals in the inspection charts are not exceeded. Manuals and forms which are required for conducting Progressive Care inspections are available from the Cessna Service Parts Center.

IV INSPECTION GUIDE LINES

a. MOVABLE PARTS for: lubrication, servicing, security of attachment, binding, excessive wear, safetying, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing and tension.

b. FLUID LINES AND HOSES for: leaks, cracks, dents, kinks, chafing, proper radius, security, corrosion, deterioration, obstruction and foreign matter.

c. METAL PARTS for: security of attachment, cracks, metal distortion, broken spotwelds, corrosion, condition of paint and any other apparent damage.

d. WIRING for: security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration and corroded terminals.

e. BOLTS IN CRITICAL AREAS for: correct torque in accordance with torque values given in the chart in Section 1, when installed or when visual inspection indicates the need for a torque check.

NOTE

Torque values listed in Section 1 are derived from oil-free cadmium-plated threads, and are recommended for all installation procedures contained in this book except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

f. FILTERS, SCREENS & FLUIDS for: cleanliness, contamination and/or replacement at specified intervals.

g. AIRCRAFT FILE.

Miscellaneous data, information and licenses are a part of the aircraft file. Check that the following documents are up-to-date and in accordance with current Federal Aviation Regulations. Most of the items listed are required by the United States Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of exported aircraft should check with their own aviation officials to determine their individual requirements.

To be displayed in the aircraft at all times:

1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
2. Aircraft Registration Certificate (FAA Form 8050-3).
3. Aircraft Radio Station License, if transmitter is installed (FCC Form 556).

To be carried in the aircraft at all times:

1. Weight and Balance, and associated papers (Latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
2. Aircraft Equipment List.

To be made available upon request:

1. Aircraft Log Book and Engine Log Book.

h. ENGINE RUN-UP.

Before beginning the step-by-step inspection, start, run-up and shut down the engine in accordance with instructions in the Owner's Manual. During the run-up, observe the following, making note of any discrepancies or abnormalities:

1. Engine temperatures and pressures.
2. Static rpm.
3. Magneto drop (refer to Owner's Manual).
4. Engine response to changes in power.
5. Any unusual engine noises.
6. Fuel selector and/or shutoff valve; operate engine(s) on each tank (or cell) position and OFF position long enough to ensure shutoff and/or selector valve functions properly.
7. Idling speed and mixture; proper idle cut-off.
8. Alternator and ammeter.
9. Suction gage.
10. Fuel flow indicator.

After the inspection has been completed, an engine run-up should again be performed to determine that any discrepancies or abnormalities have been corrected.

INSPECTION FREQUENCY

1 - As required or 500 hours
2 - See Table I
3 - Check torque first 100 hours then every 100 hours thereafter check for security, looseness and working. DO NOT TORQUE
4 - Every 1400 hours
5 - First 100 hours and 200 hours thereafter
6 - Every 50 hours or sooner when dust conditions exist
7 - Daily
8 - Every 3 years
9 - Every 5 years
10 - Every 2 years
11 - Every 50 hours and at tire replacement
12 - 400 Hours

| IMPORTANT | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| Read all Inspection Requirements and Paragraphs prior to using this Chart. | | | | |
| NOTE | | | | |
| This Inspection Chart is to be used in conjunction with the Cleaning Inspection, Repair and Servicing paragraph immediately following the Overhaul and Replacement Chart. | | | | |
| AIRFRAME | | | | |
| 1. Fuselage - Check exterior and interior surfaces for damaged paint and skin | | | ★ | |
| 2. Cabin Pressurization - Check | | | | 1 |
| 3. Pressure Cabin (Type A Inspection) | | | | 2 |
| 4. Pressure Cabin (Type B Inspection) | | | | 2 |
| 5. Pressure Cabin (Type C Inspection) | | | | 2 |
| 6. Windshield and Windows - Check for condition | | ★ | | |
| 7. Cabin Door - Check for condition and operation | | ★ | | |
| 8. Cabin Door Seal - Check for cuts, abrasions and excessive wear | | ★ | | |
| 9. Door Latch Pin (Upper and Lower) - Check for damage, cracks, wear and rigging | | ★ | | |
| 10. Door Latch Pin Guides - Check for damage, cracks and wear | | ★ | | |
| 11. Door Latch Pin Receptacles - Check for damage, cracks and wear | | ★ | | |
| 12. Nose Baggage Doors - Check for condition and operation | | ★ | | |
| 13. Wing Locker Door - Check condition and security | | | ★ | |
| 14. Nose Ram Air - Check clamps and hoses to heating and ventilating system for condition and security | | | ★ | |
| 15. Heater - Check | | | ★ | |
| 16. Seats, Seat Belts and Shoulder Harness - Check condition and security | | | ★ | |
| 17. Upholstery and Carpet - Clean | | | ★ | |
| 18. Instruments - Check condition and marking | | ★ | | |
| 19. Control Quadrant - Check for condition and security | | | ★ | |
| 20. Placards and Decals - Check for presence and legibility | | | ★ | |
| 21. Empennage - Check exterior surface for damaged paint and skin | | | ★ | |
| 22. Vertical and Horizontal Stabilizers - Check bolts for security | | | ★ | |
| 23. Wing - Check for loose rivets, cracks, loose mounting bolts and security - Check for loose rivets, refer to ME73-22 | ★ | | ★ | |
| 24. Wing Wheel Well - Check for damage and sealing | | ★ | | |
| 25. Wing Spar Fittings - Check bolts for torque and security (Refer to Section 3) | | | | 3 |
| 26. Tip Tank Fittings - Check bolts for security | | | ★ | |
| 27. Wing and Stub Wing (Type A Inspection) | | ★ | | |
| 28. Wing and Stub Wing (Type B Inspection) | | | | 4 |
| 29. Emergency Exit Door - Check for condition and security | | ★ | | |
| 30. Nacelle Firewall Structure - Check condition and security (Refer to expanded paragraph) | | | ★ | |

Figure 2-7. Inspection Chart (Sheet 1 of 6)

| | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| **LANDING GEAR** | | | | |
| 1. Main Landing Gear Actuator - Check for condition, security and Specification compliance | ★ | | | |
| 2. Emergency Manual Extension System - Check for condition, operation and Specification compliance | | | ★ | |
| 3. Main and Nose Landing Gear Assemblies - Check for condition | ★ | | | |
| 4. Rigging - Perform Landing Gear Rigging Inspection in accordance with Figure 2-31 | | | ★ | |
| 5. Torque Links - Check wear and condition | | | ★ | |
| 6. Main and Nose Gear Retracting Linkage - Check for condition | | | ★ | |
| 7. Drive Tube Seals - Check for security, position and wear | | | ★ | |
| 8. Shock Strut Servicing - Check for proper servicing | | | ★ | |
| 9. Nose Gear Shimmy Dampener - Check fluid and condition | ★ | | | |
| 10. Nose Wheel Steering System - Check cable tension, travel and gimbal for condition and security | | | ★ | |
| 11. Main and Nose Wheel Tires - Check wear, pressure and condition | | | | 11 |
| 12. Wheel Bearings - Check and repack | | | | 5 |
| 13. Brake System Plumbing - Check for leaks, hoses for bulges and deterioration, parking brake for operation | | | ★ | |
| 14. Brake Assemblies - Check wear of lining and disc warpage | | | ★ | |
| 15. Master Cylinders - Check fluid level | | | ★ | |
| **FLIGHT CONTROLS** | | | | |
| 1. Control Column - Check for security, looseness, wear and proper rig | | | ★ | |
| 2. Aileron - Check hinge, bellcrank, stop bolt for looseness and/or jamb nut for being tight, linkage and bolt for condition, operation and security, and travel | | | ★ | |
| 3. Aileron Trim Tab - Check hinge for cracks, wear; bolts for proper safety and tab travel | | | ★ | |
| 4. Aileron Trim Tab Actuator - Check travel linkage for condition and security | | | ★ | |
| 5. Aileron and Aileron Trim Cables - Check for tension, fraying and turnbuckles for safety - Check pulleys for condition and security | | | ★ | |
| 6. Elevator - Check hinges and hinge bolts, bellcranks and push rod connecting bolt and stop bolts for security and condition | | | ★ | |
| 7. Elevator Trim Tab - Check hinge for cracks, wear, bolt for proper safety and tab travel | | | ★ | |
| 8. Elevator Trim Tab Actuator - Check travel, condition and security | | | ★ | |
| 9. Elevator and Elevator Trim Tab Cables - Check tension, fraying and turnbuckles for safety - Check pulleys for condition and security | | | ★ | |
| 10. Electric Elevator Trim - Check for security, condition and travel | | | ★ | |
| 11. Rudder - Check hinge, bellcrank, stop bolts and jamb nut for looseness, torque tube and connector links for security and safety; check travel | | | ★ | |
| 12. Rudder Trim Tab - Check security and condition, linkage and travel | | | ★ | |
| 13. Rudder Trim Tab Actuator - Check travel, mountings for security | | | ★ | |
| 14. Rudder and Rudder Trim Tab Cables - Check tension, fraying and turnbuckles for safety - Check pulleys for condition and security | | | ★ | |
| 15. Flaps - Check linkage, bellcranks, pulleys and cables for condition, tension and security - Check hinges for cracks | | | ★ | |
| 16. Flap Motor and Position Indicator - Check for travel, condition and security | | | ★ | |
| 17. Flap Actuator Assembly - Check for condition, security and Specification compliance | | | ★ | |
| 18. Cable Seals - Check for tears and security | | | ★ | |
| 19. Autopilot (Optional Equipment) - Check cables, attachments, pulleys and turnbuckles for tension, condition, operation and security | | | ★ | |

Figure 2-7. Inspection Chart (Sheet 2)

| | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| **ENGINE GROUP** | | | | |
| CAUTION<br>Ground magneto primary circuit before working on the engine. | | | | |
| 1. Engine - Wash, check for security of accessories | | ★ | | |
| 2. Cowling - Wash, check for cracks, evidence of abrasion and wear | | | ★ | |
| 3. Induction Air Filter - Clean | | | | 6 |
| 4. Induction Manifold - Check connections for condition | | ★ | | |
| 5. Engine Oil Pressure System - Check for leaks, bends, cracks and security | | ★ | | |
| 6. Engine Oil - Change | | ★ | | |
| 7. Oil Filter - Replace and inspect adapters (Refer to expanded paragraph) | ★ | | | |
| 8. Engine Oil Breather Separator - Inspect and clean element (P/N 0850694-5) | | | | 6 |
| 9. Engine Compartment - Visually check for condition, oil leaks, fuel leaks, etc. | | ★ | | |
| 10. Engine Controls - Check travel and security | | ★ | | |
| 11. Engine Wire Bundle - Check for condition and security | | ★ | | |
| 12. Engine Mounts - Check for condition and security | | ★ | | |
| 13. Engine Compartment Hoses - Fuel (check fuel lines under pressure Oil Vacuum, etc. - Check deterioration, leaks, discoloration, bleaching and rubber hoses for stiffness | ★ | | | |
| 14. Cylinder Compression - Refer to Manufacturer's Service Bulletin M73-19 | | ★ | | |
| 15. Engine Cylinders, Rocker Box Covers and Push-Rod Housings - Check for fin damage, cracks, oil leakage, security of attachment and general condition | | ★ | | |
| 16. Crankcase, Oil Sump and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary | | ★ | | |
| 17. Plugs - Clean and rotate (top right to bottom left, top left to bottom right) | | ★ | | |
| 18. Ignition Cables - Check condition and security | | ★ | | |
| 19. Magneto - Check timing, breaker gap and security | | ★ | | |
| 20. Alternator - Check brushes, leads, bearings, slip rings and mountings | | | | 1 |
| 21. Starter - Check brushes, commutator and electrical connections | | ★ | | |
| 22. Propeller Governor - Check for oil leaks, condition and security | | | ★ | |
| 23. Pumps - Fuel, Vacuum and Autopilot - Check for leaks, condition and security | | ★ | | |
| 24. Turbocharger - Check for condition, bulges, warps and security | | ★ | | |
| 25. Engine Exhaust System - Check for security, cracks, slip joint, spring tension - Visually inspect slip joint seals | ★ | | | |
| 26. Waste-Gate Valve, Pressure Ratio and Absolute Pressure Controller - Check for condition and security. Visually check springs and linkage | | | ★ | |
| 27. Manifold Pressure Relief Valve - Visually check for obstructions, condition, security and operation | | | ★ | |
| 28. Engine Compartment Fire Extinguisher - Check system pressure, condition and security | | ★ | | |
| **PROPELLER** | | | | |
| 1. Blades - Check for nicks, cracks, scratches and blade angles | | ★ | | |
| 2. Propeller Cylinder - Check for leaks, and bolt for security | | ★ | | |
| 3. Bulkhead - Check for cracks and security on crankshaft | | | ★ | |
| 4. Deice System Electrical Leads - Check for condition and security | | ★ | | |

Figure 2-7. Inspection Chart (Sheet 3)

| | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| **PROPELLER (CONT.)** | | | | |
| 5. Deice System Brushes - Check for wear and seating (refer to Section 13) | | ★ | | |
| 6. Propeller Spinners - Wash, check for cracks and fractures | | ★ | | |
| 7. Propeller Mounting - Check nuts for security | | ★ | | |
| 8. Propeller Unfeathering System - Check for condition and security | | ★ | | |
| 9. Propeller Synchronizer - Check for condition and security | | ★ | | |
| 10. Deice Slip Rings - Check security and warpage | | ★ | | |
| **FUEL SYSTEM** | | | | |
| 1. Metering Unit Filter Screen | | ★ | | |
| 2. Fuel Manifold - Inspect for leaking | | ★ | | |
| 3. Fuel Discharge Nozzles - Inspect orifices and clean | | ★ | | |
| 4. Fuel Selector Valve - Perform operational check, feel for detents through 270°; check linkage, bearings, pins for condition and security | | ★ | | |
| 5. Selector Valve - Perform an operational check in accordance with Section 11 | | | | 1 |
| 6. Sediment Bowl - Drain | | | | 7 |
| 7. Fuel Strainer - Clean | | ★ | | |
| 8. Fuel System Main - Inspect for leaks, and operation | | | | 7 |
| 9. Fuel System Main - Inspect plumbing and component mountings for condition, security, system for leaks | | ★ | | |
| 10. Tip Tanks - Inspect mounting bolts for security, tip tank for leaks, cracks, and dents, cracks at welds | | ★ | | |
| 11. Boost Pumps (Auxiliary) - Inspect for leaks, operation, vent and overboard drain for obstruction | | | ★ | |
| 12. Tip Tank Vents and Nose Cap Drain- Inspect for obstruction | | | | 7 |
| 13. Auxiliary Tanks - Inspect system for security and operation | | | ★ | |
| 14. Heater Fuel Filter - Clean | | | ★ | |
| 15. Main Tank Fuel Transfer Pump - Check security and mounting | | | ★ | |
| 16. Main Tank Fuel Transfer Pump Filter - Clean | | | ★ | |
| 17. Wing Locker Transfer Pump - Check for leaks and security of mounting | | | ★ | |
| **OXYGEN SYSTEM** | | | | |
| 1. Oxygen System - Check installation, mountings and pressure | | | ★ | |
| 2. Oxygen Masks and Hoses - Check condition and clean | | | ★ | |
| 3. Oxygen Cylinder - ICC-3HT/DOT-3HT - Inspect condition and Hydrostatic Test Date | | | | 8 |
| 4. Oxygen Cylinder - ICC-3AA/DOT-3AA - Inspect condition and Hydrostatic Test Date | | | | 9 |
| 5. Oxygen Regulator - Check pressure and rate of flow | | | ★ | |
| **VACUUM SYSTEM** | | | | |
| 1. Filter - Clean | | | ★ | |
| 2. Relief Valve - Check security and filter for obstruction | | | ★ | |
| 3. Hoses - Inspect for hardness, deterioration, looseness and bulging | | | ★ | |

Figure 2-7. Inspection Chart (Sheet 4)

| | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| **SURFACE DEICE SYSTEM** | | | | |
| 1. Deice System - Check for leaks, condition and operation of controls, lines and clamps for security | | | ★ | |
| 2. Deice Boots - Check for abrasions, cuts, nicks and security of mounting | | | ★ | |
| 3. Deice Filter - Clean | | | ★ | |
| **PITOT STATIC SYSTEM** | | | | |
| 1. Sump - Check for cracks, dents, leaks and presence of water | | | ★ | |
| 2. System - Leak check | | | ★ | |
| 3. Altimeter - Inspect as required by FAR Part 91, paragraph 91.170 in accordance with FAR Part 43, Appendix E, by authorized repair station | | | | 10 |
| **AIR CONDITIONING SYSTEM (BELT DRIVEN)** | | | | |
| 1. Compressor Drive Belt Tension - Check | | ★ | | |
| 2. Compressor Drive Belt - Check condition and security | ★ | | | |
| 3. Compressor Lines - Check suction, injection and discharge lines for leaks cracks, sharp bends and condition | | ★ | | |
| 4. Condenser Fan - Check blade for nicks, looseness and security | ★ | | | |
| 5. Evaporator Fans - Check blades for nicks, looseness and security | | ★ | | |
| 6. Component Mounting - Check condition and security | | ★ | | |
| 7. Condenser - Check inlet and outlets for obstructions, check coils for debris, etc. | ★ | | | |
| 8. Sight Glass - Check proper charge with engine operating | | ★ | | |
| 9. Condenser Fan Motor Brushes - Visually check | | ★ | | |
| **AIR CONDITIONING SYSTEM (HYDRAULIC DRIVEN)** | | | | |
| 1. Compressor Lines - Check suction, injection and discharge lines for leaks, cracks, sharp bends and condition | | ★ | | |
| 2. Compressor and Motor - Check condition and security | | ★ | | |
| 3. Condensers - Check inlets and outlets for obstruction, check coils for debris, etc. | ★ | | | |
| 4. Sight Glass - Check proper charge with engine operating and air conditioner on | | ★ | | |
| 5. Hydraulic Lines - Check for leaks, security and condition | | ★ | | |
| 6. Condenser Fan - Check blades for nicks, looseness and security | | ★ | | |
| 7. Condenser Fan Motor Brushes - Visually check | | ★ | | |
| 8. Evaporator Fan - Check blades for nicks, looseness and security | | ★ | | |
| 9. Hydraulic Fluid and Filter - Change fluid and element (P/N 6655567) (Refer to expanded paragraph) | | ★ | | |
| **PRESSURIZATION SYSTEM COMPONENTS** | | | | |
| 1. Safety Valve - Visually check for contamination, nicotine tars and for security and operation | | | ★ | |
| 2. Outflow Valve - Visually check for contamination, for nicotine tars and for security and operation | | | ★ | |

Figure 2-7. Inspection Chart (Sheet 5)

| | 50 | 100 | 200 | Spl Insp |
|---|---|---|---|---|
| **PRESSURIZATION SYSTEM COMPONENTS (CONT.)** | | | | |
| 3. Outflow Valve Screen - Check for obstruction | | | | 1 |
| 4. Safety Valve Screen - Check for obstruction | | | | 1 |
| 5. Variable Pressure Controller Screen (Optional System) - Clean | | | | 1 |
| 6. Heat Exchanger - Check for security and air passage obstruction | | | ★ | |
| 7. Dump Valves - Check for security and proper operation | | | ★ | |
| 8. Door Seals - Check for proper installation, cuts, wear and abrasion | | | ★ | |
| 9. Perform Cabin Pressurization Check (Refer to Section 13) | | | | 1 |
| **ALCOHOL WINDSHIELD ANTI-ICE SYSTEM** | | | | |
| 1. Check reservoir for proper service | | | ★ | |
| 2. Check nozzles for security and obstructions | | | ★ | |
| 3. Anti-ice System - Check for leaks, condition and operation of controls | | | ★ | |
| 4. Pump - Check for condition and security | | | ★ | |
| **ELECTRICAL SYSTEM** | | | | |
| 1. Junction Box and Circuit Breaker Panel - Check wiring and terminals for condition and security | | ★ | | |
| 2. Pedestal and Instrument Panel - Check wiring and terminals for condition and security | | | ★ | |
| 3. Regulators - Check wiring and terminals for condition and security | | | ★ | |
| 4. Switches - Check for security and interference | | ★ | | |
| 5. Landing Gear Relay and Limit Switch - Check wiring and terminals for condition and security | | | ★ | |
| 6. Flap Limit Switch and Motor - Check wiring and terminals for condition and security | | | ★ | |
| 7. Wing and Fuselage - Check wiring bundle for condition and security | | | ★ | |
| 8. Battery - Check electrolyte and general condition and security | ★ | | | |
| 9. Battery Cables - Check for corrosion, condition and security | | ★ | | |
| 10. Instrument and Interior Lights - Check lights for operation | | ★ | | |
| 11. Radio and Navigation System - Check for condition and security | | | ★ | |
| 12. Check bonding between stationary panel and instrument panel for proper ground - resistance must be 0.010 ohms or less | | | ★ | |
| 13. Emergency Locator Transmitter - Check for condition and security, operation, and battery pack for proper charge | | ★ | | |
| 14. Warning Lamps - Check condition | | ★ | | |
| 15. Battery Box - Check for corrosion, condition and security, clean vent tube | ★ | | | |
| 16. Starter Relay -Check Contact Area | | | | 12 |
| **POST INSPECTION** | | | | |
| 1. Correct all discrepancies, replace all fairings, doors and access hole covers | | | | |
| 2. Ground check engine, check ignition drop, alternator charging rate, oil pressure and general operation of components | | | | |
| **SERVICE LETTERS** | | | | |
| 1. Check that all applicable Cessna Service Letters and Service Bulletins are complied with. | | | | |
| 2. Check that all applicable current airworthiness regulations are complied with. | | | | |

Figure 2-7. Inspection Chart (Sheet 6)

## OVERHAUL AND REPLACEMENT CHART

A - Every 500 hours
B - Every 1400 hours
C - Every 1500 hours
D - On Condition
E - Every 15 years or 4380 cycles whichever occurs first
F - Every 3 years or 3000 hours
G - Every 9000 hours
H - Every 500 hours of heater operation
J - Every 12 months
K - Every 2500 hours
L - Every 2800 hours
M - Every 5 years

| | Overhaul | Replace |
|---|---|---|
| **AIRFRAME** | | |
| 1. Oxygen Bottle ICC or DOT-3HT 1800 (See Section 13) | | E |
| 2. Oxygen Regulator | F | |
| 3. Oxygen Pressure Gage | | F |
| 4. Filler Valve | F | |
| 5. Oxygen Outlets | F | |
| 6. Heater (See Heater and Components Overhaul/Parts Manual) | H | |
| 7. Control Cable Seals | | B |
| 8. Safety Valve (See Manufacturers Overhaul Manual) | D | |
| 9. Outflow Valve (See Manufacturers Overhaul Manual) | D | |
| 10. Control Head, Cabin Pressure (Optional) (See Manufacturers Overhaul Manual) | D | |
| 11. Pressurization Dump Valve | D | |
| 12. Ram Air Valve | D | |
| 13. Vacuum System Filter Element | | A |
| 14. Windshield | | G |
| **LANDING GEAR** | | |
| 1. Landing Gear Actuator (See Cessna Landing Gear and Flap System Components Overhaul/Parts Manual) | D | |
| 2. Actuator Motor (See Cessna Landing Gear and Flap System Components Overhaul/Parts Manual) | D | |
| 3. Actuator Reduction Unit | D | |
| 4. Drive Tube Seals | | B |
| 5. Shimmy Dampener (See Section 4) | D | |
| **FLIGHT CONTROLS** | | |
| 1. Flap Actuator Gearbox (See Cessna Landing Gear and Flap System Components Overhaul/Parts Manual) | D | |
| 2. Flap Actuator Motor (See Cessna Landing Gear and Flap System Components Overhaul/Parts Manual) | D | |
| 3. Rudder Trim Tab Actuator (See Section 7) | B | |
| 4. Aileron Trim Tab Actuator (See Section 5) | B | |
| 5. Elevator Trim Tab Actuator (See Section 5) | B | |
| **ENGINE GROUP** | | |
| 1. Engine (See Continental Motors Engine Overhaul Manual) | B | |
| 2. Magneto (See Bendix Magneto Overhaul Manual) | B | |
| 3. Alternator - 50 AMP (See Prestolite Alternator Service/Parts Manual) | B | |

Figure 2-8. Overhaul and Replacement Chart (Sheet 1)

| | | Overhaul | Replace |
|---|---|---|---|
| 4. | Alternator - 100 AMP (See Prestolite Service Manual) | B | |
| 5. | Turbocharger (See Cessna Turbocharger and Controls Overhaul/Parts Manual) | B | |
| 6. | Controller (See Cessna Turbocharger and Controls Overhaul/Parts Manual) | B | |
| 7. | Actuator Bypass Valve (See Cessna Turbocharger and Controls Overhaul/Parts Manual) | B | |
| 8. | Waste Gate (See Cessna Turbocharger and Controls Overhaul/Parts Manual) | B | |
| 9. | Vacuum Pump (Wet) (See Authorized Repair Station) | B | |
| 10. | Vacuum Pump (Dry) (See Authorized Repair Station) | B | |
| 11. | Vacuum System Hoses | | B |
| 12. | Fuel Pump (Refer to Manufacturers Overhaul Manual) | B | |
| 13. | Tach Generator (Refer to Manufacturers Overhaul Manual) | B | |
| 14. | Starter (Refer to Manufacturers Overhaul Manual) | B | |
| 15. | Engine Compartment Hoses e. g. Fuel, Oil, Deice etc. (Rubber) | | B |
| 16. | Engine Compartment Fuel and Oil Hoses (Teflon) | | L |
| 17. | Induction Air Filter (P/N 9913001) | | B |
| 18. | Engine Compartment Fire Extinguisher Container | | M |
| 19. | Engine Compartment Fire Extinguisher Cartridge | | M |
| 20. | Engine Mounts | | B |
| 21. | Vacuum Pressure Relief Valve | | B |
| 22. | Manifold Pressure Relief Valve (See Cessna Turbocharger and Controls Overhaul/Parts Manual) | B | |
| PROPELLER | | | |
| 1. | Propeller (See McCauley Maintenance and Overhaul Manual) | B | |
| 2. | Accumulator, Unfeathering (See Manufacturer's Overhaul Manual) | B | |
| 3. | Governor (See Manufacturer's Overhaul Manual) | B | |

Figure 2-8. Overhaul and Replacement Chart (Sheet 2)

CLEANING, INSPECTION, REPAIR AND SERVICING.

The cleaning, inspection, repair and servicing items listed in this section appear in the same sequence as the Inspection Chart, Figure 2-7. These procedures are more detailed and provide expansion of the inspection items requiring additional attention.

AIRFRAME.

Fuselage.

a. Cleaning.

1. Clean the fuselage with mild soap and water. Use Stoddard Solvent to remove grease and tar then wash with soap and water and allow to dry.

2. The fuselage may be cleaned with any good aircraft cleaner and wax.

b. Inspection.

1. Inspect exterior surface for damage and cracks, loose rivets and nuts.

2. Inspect attaching screws, access plates, exterior paint, nose gear door hinge points, for damage and excess wear.

3. Inspect stiffeners, stringers, doublers, bulkheads and stinger for loose screws, rivets, cracks or damage.

4. Inspect nose ram air hoses and clamps to heat and vent system for wear and security and leaks.

5. Inspect heater installation for evidence of fuel leaks, exhaust leaks, combustion air leaks, loose wiring and security to structure.

6. Inspect instruments for proper marking, broken glass, loose fittings and electrical wiring, and for proper calibration.

7. Check all placards and decals for security and legibility.

8. Inspect all fluid lines and hoses for leaks, cracks, dents, kinks, chafing, bleaching or discoloration, proper radius, security, corrosion, deterioration, obstructions and foreign matter.

c. Repair and servicing.

1. If cracks are found in stinger, or fuselage area, refer to Section 16 and repair.

2. Loose or working rivets must be replaced. Refer to Section 16.

Pressure Cabin.

a. Cleaning.

1. Refer to Owner's Manual Section 5 for cleaning pressure cabin windows and painted surfaces.

b. Inspection.

1. Any leak at windows or doors, noted during the flight check, should be corrected. If pressurization air dump valve malfunction was detected, the unit should be repaired or replaced.

2. Check cabin pressurization ducting fittings in the engine compartment for security, cracks, leaks, loose clamps and deterioration.

3. Check ram air valve in the nose for operation and possible leakage or blockage due to foreign material.

4. Check electrical operation of the safety valve.

5. Check main and nose gear actuating pushrod boots for loose clamps, cracks or deterioration.

6. Check access doors to the cabin for possible seal leaks, check test fittings in forward pressure bulkhead in nose wheel well area.

7. Check the sealing of any repairs or field electronics installation affecting the cabin pressurized area and the control cable seals for cracks, deterioration, excessive wear and proper installation. Leaks in the cabin structure may be sealed in accordance with Sealing Instructions given in Section 16.

8. Check heater ducting, mounting and sealing forward of pressure bulkhead.

9. On completion of repairs to the cabin pressurization area, a flight or ground check should be performed in accordance with Section 13.

10. To assure a successful fail-safe structure for the pressure cabin, periodic inspection are required. Three types of inspection are outlined for the pressure cabin structure, Types A, B, and C. The aircraft hour intervals and type of inspection to be performed are listed in Table I.

11. Type "A" inspection.

Type "A" inspection consists of a limited inspection of the cabin structure requiring a very minimum of equipment and upholstery removal for access. The shaded areas to each figure are the critical areas to be inspected. Use the following procedures:

TABLE I.

| INSPECTION SCHEDULE FOR CABIN STRUCTURE | |
|---|---|
| Type of Inspection | Hours at which Inspections are Required |
| A | Every 1400 hours. |
| B | First time at 6000 hours and repeat every 3000 hours thereafter. |
| C | First time at 9000 hours and repeat every 4200 hours thereafter. |

(a) Inspect all external pressure cabin structure for cracks and damage.

(b) Inspect pressure cabin structure for loose or failed fasteners.

(c) Inspect pressure cabin skin and skin splices for cracks, loose rivets or failed fasteners.

(d) Inspect windshield, cockpit side windows and cabin windows for looseness, cracks, nicks, deep gouges and scratches.

(e) Inspect the cabin door and cabin doorframe for cracks, loose rivets or fasteners.

(f) See figure 2-9. Inspect forward cabin pressure bulkhead at Fuselage Station 100. 00.

(g) See figure 2-19. Inspect aft cabin pressure bulkhead at Fuselage Station 252. 00.

(h) See figure 2-10. Inspect stationary instrument panel for cracks at Fuselage Station 120. 00.

12. Type "B" inspection.

Type "B" is a visual inspection of the most critical areas of the cabin structure. To conduct this inspection, only partial upholstery and floorboards necessary for these areas must be removed. Inspect all cabin structure for fatigue cracks and damaged areas for loose and failed rivets or structural fasteners. Shaded areas in each figure are the critical areas to be inspected. Use the following procedures:

(a) See figure 2-13. Inspect front spar bulkhead at Fuselage Station 152. 75 both left hand and right hand, especially around the lightening holes.

(b) See figure 2-14. Inspect front spar carry-thru noting especially the critical points.

(c) See figure 2-15. Inspect rear spar bulkhead at Fuselage Station 184. 40.

(d) See figure 2-16. Inspect rear spar carry-thru at Fuselage Station 184. 40.

(e) See figure 2-19. Inspect aft pressure bulkhead at Fuselage Station 252. 00

13. Type "C" inspection.

Type "C" is a complete visual inspection of the cabin structure. Should a crack be detected, the structure must be repaired using the standard structural repair as defined in Section 16 of the Service Manual, with the following exceptions, the windshield, cockpit side windows, cabin windows, door latch pin receptacles, door latch pin guides and lower cabin door pins. Any cracks found in any of these components must be replaced. To conduct this inspection, the floorboards and upholstery must be removed. Shaded areas in each figure are the critical areas to be inspected, using the following procedures:

(a) See figure 2-9. Inspect forward pressure bulkhead at especially noted areas at Fuselage Station 100. 00.

(b) Inspect windshield, cockpit side windows and cabin windows especially in attaching areas for cracks, nicks, dents, deep gouges, loose rivets or structural fasteners.

CAUTION

When inspecting the critical (shaded) areas, it may be necessary to remove primer and dye check. Removal of sealing is not recommended unless repair is being made.

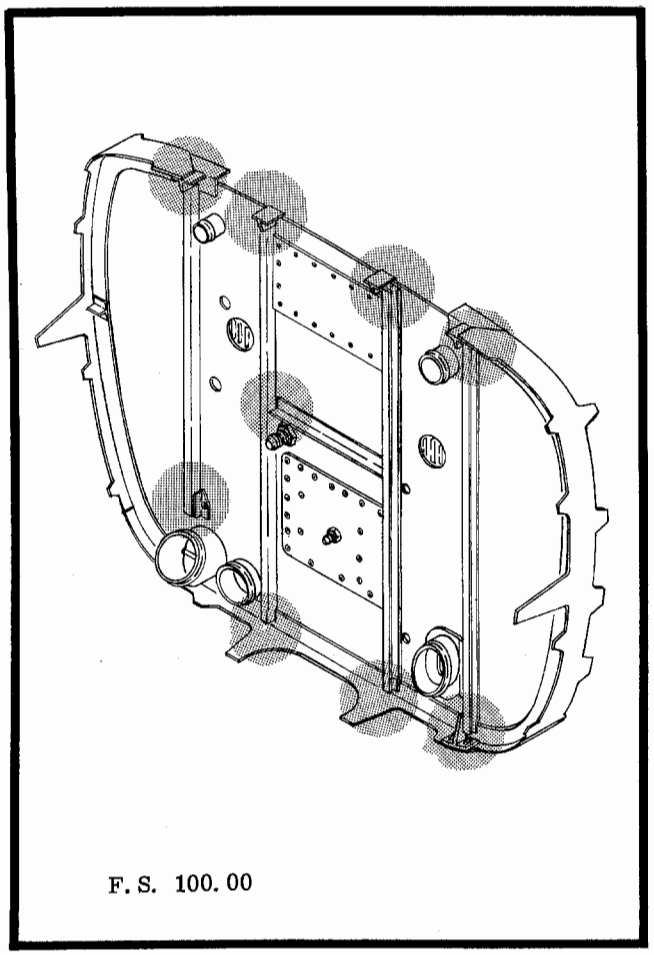



Figure 2-9. Forward Pressure Bulkhead

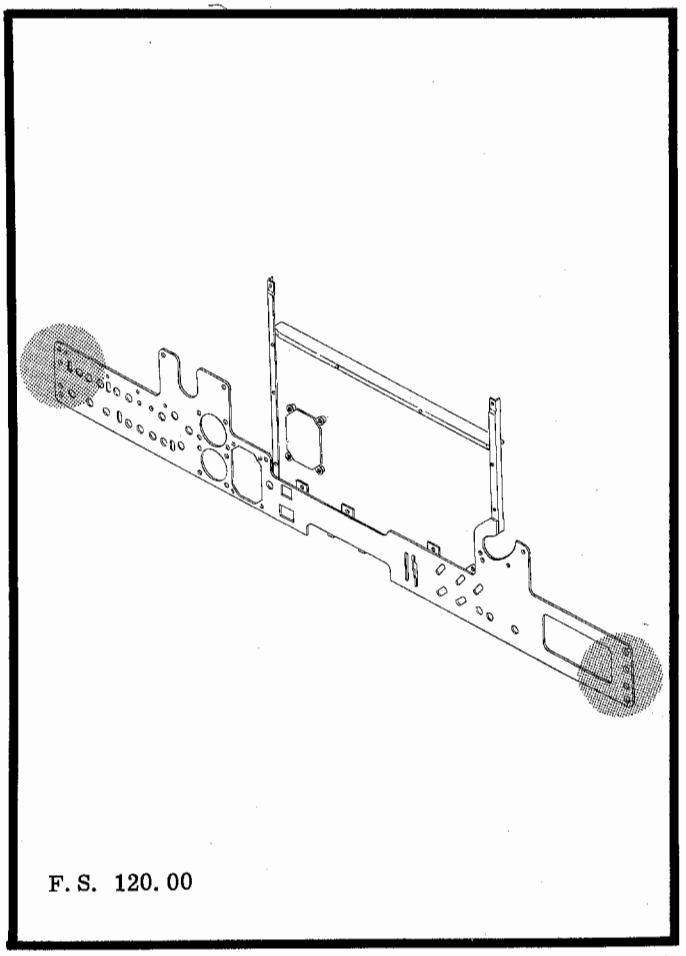



Figure 2-10. Stationary Instrument Panel

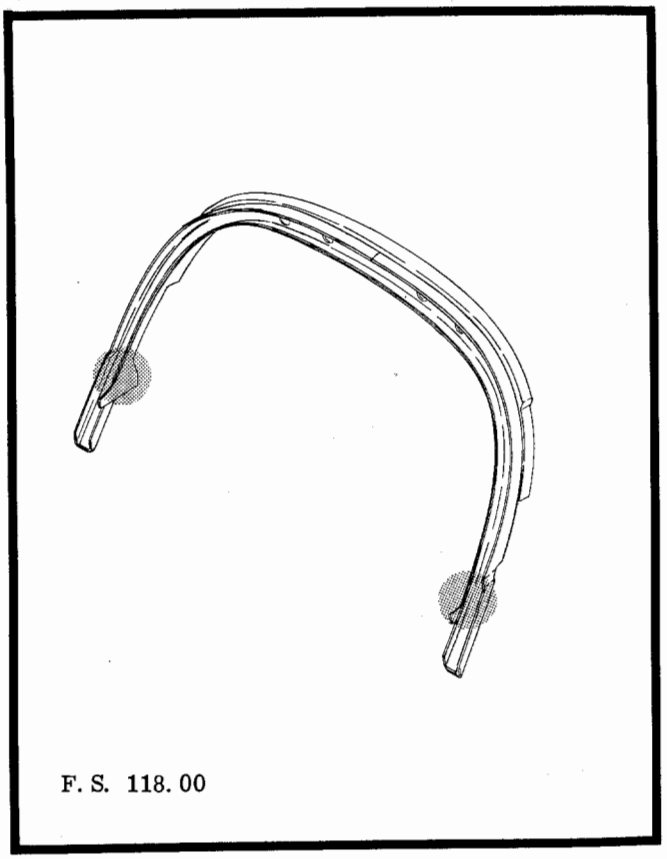



Figure 2-11. Canted Windshield Bulkhead

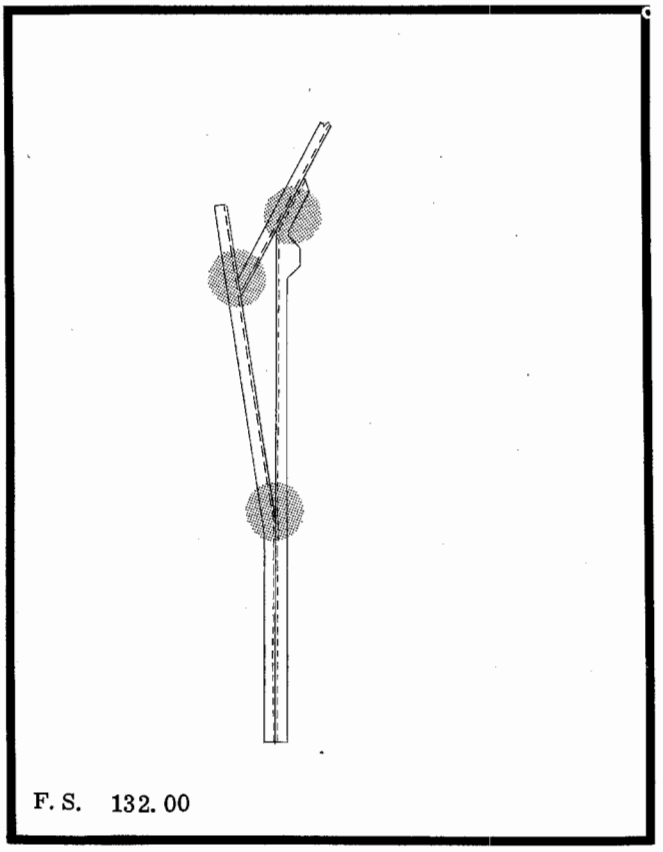



Figure 2-12. Left-Hand Bulkhead

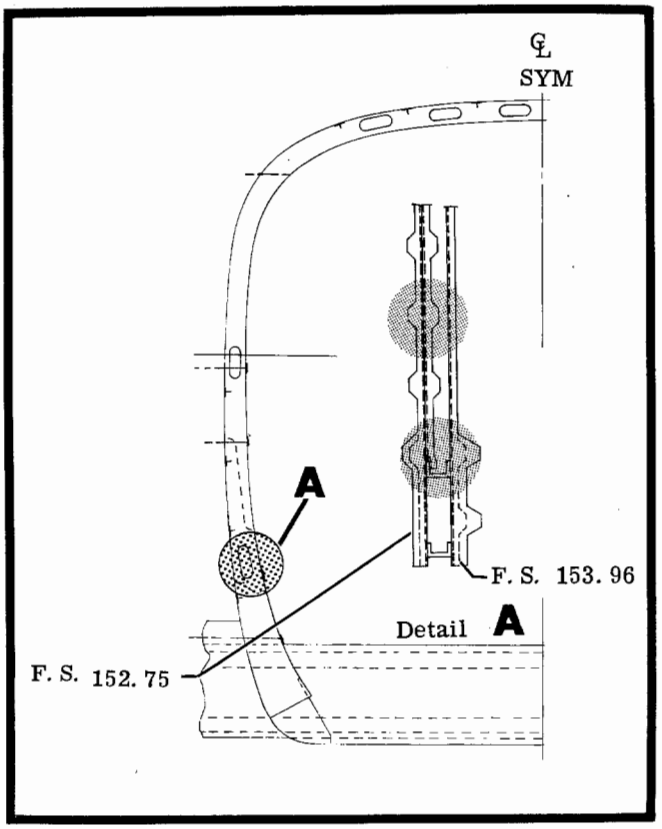



Figure 2-13. Front Spar Bulkhead (Left-Hand)

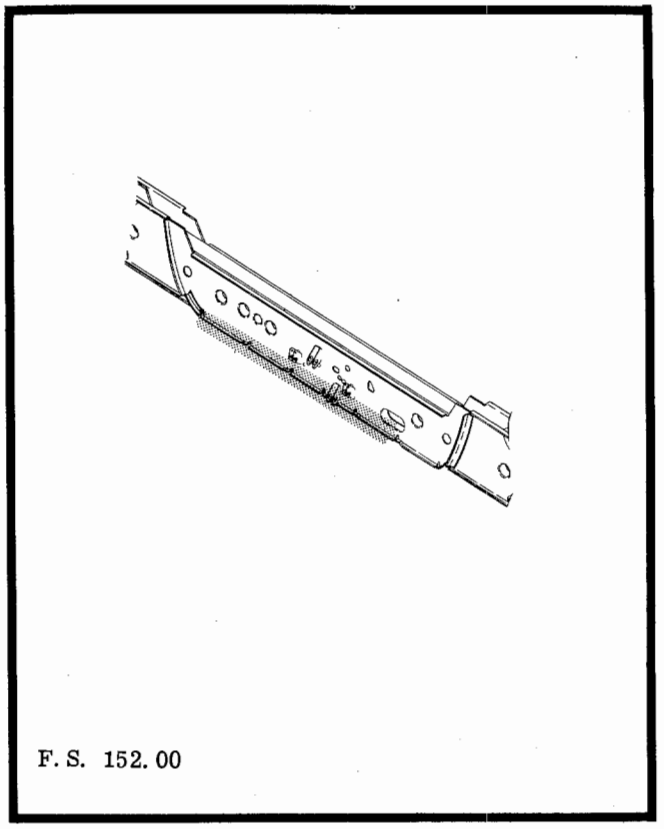



Figure 2-14. Fuselage Front Spar

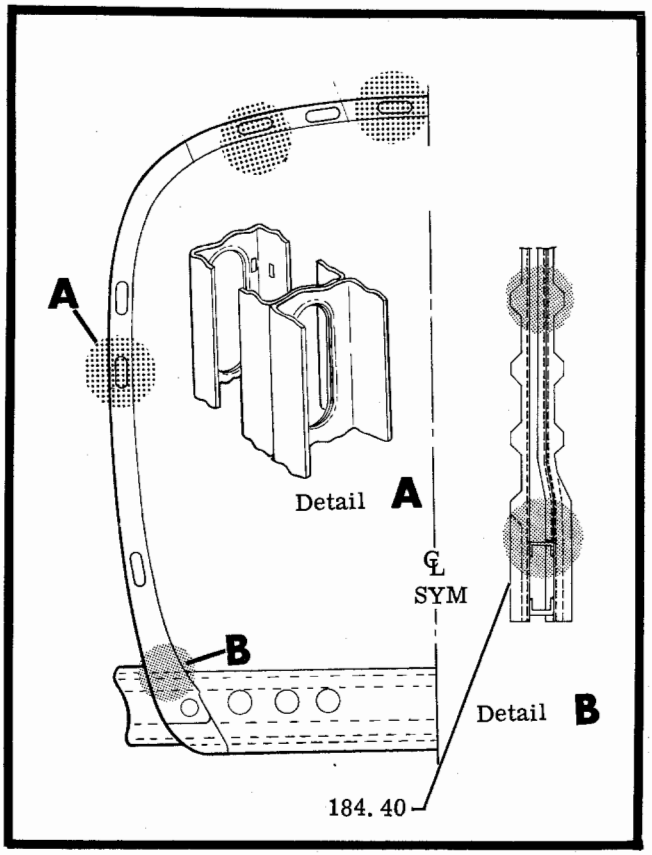



Figure 2-15. Rear Spar Bulkhead

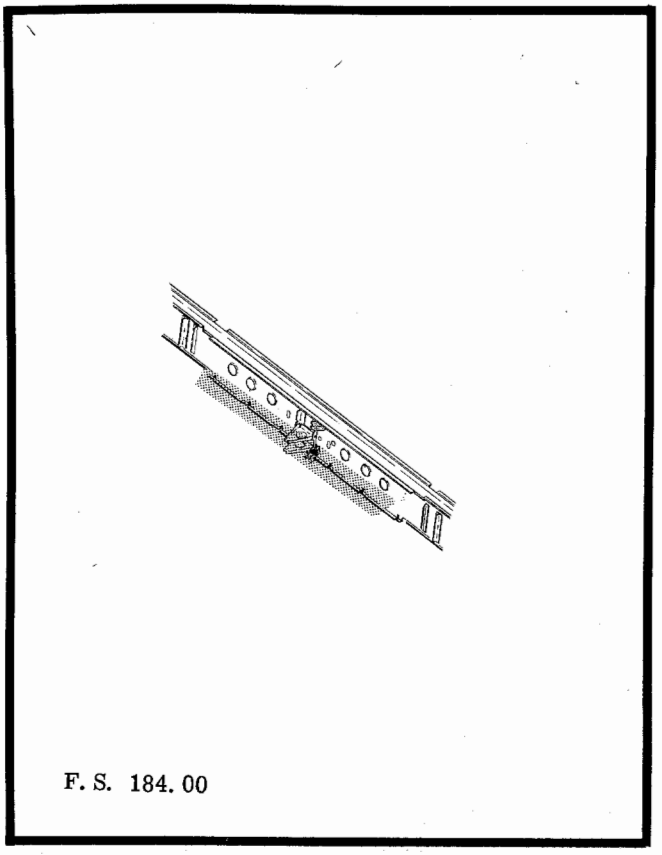



Figure 2-16. Rear Spar Carry-Thru

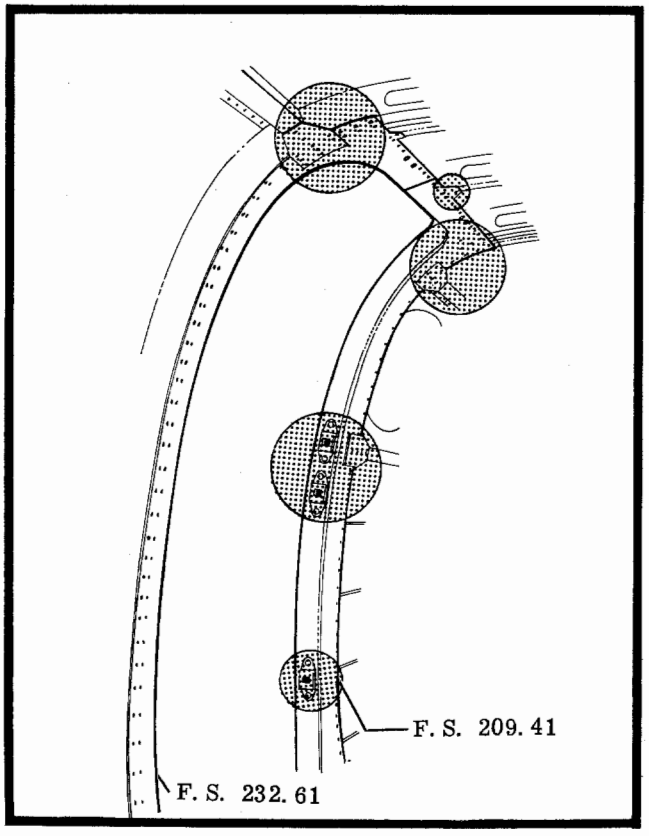



Figure 2-17. Cabin Doorframe

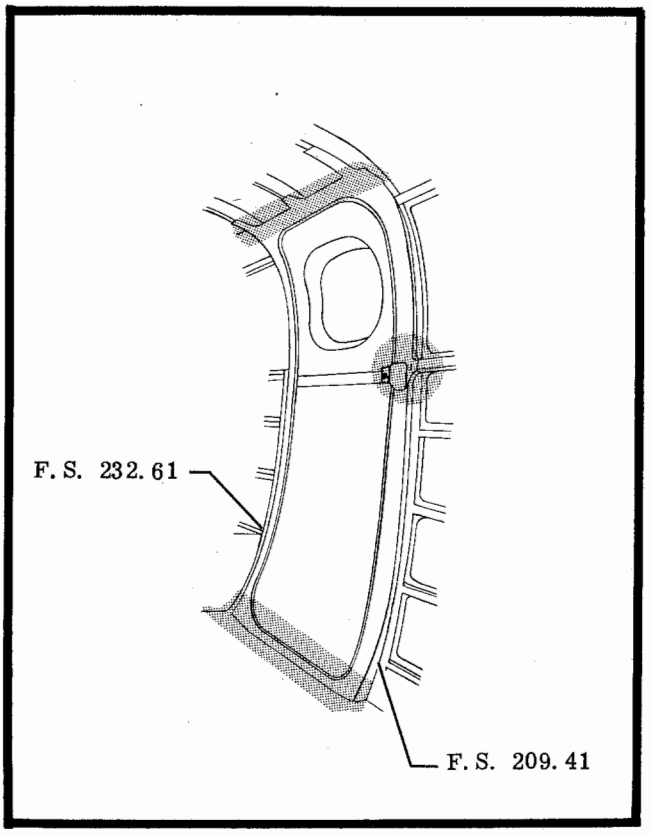



Figure 2-18. Cabin Door Hinge Structure

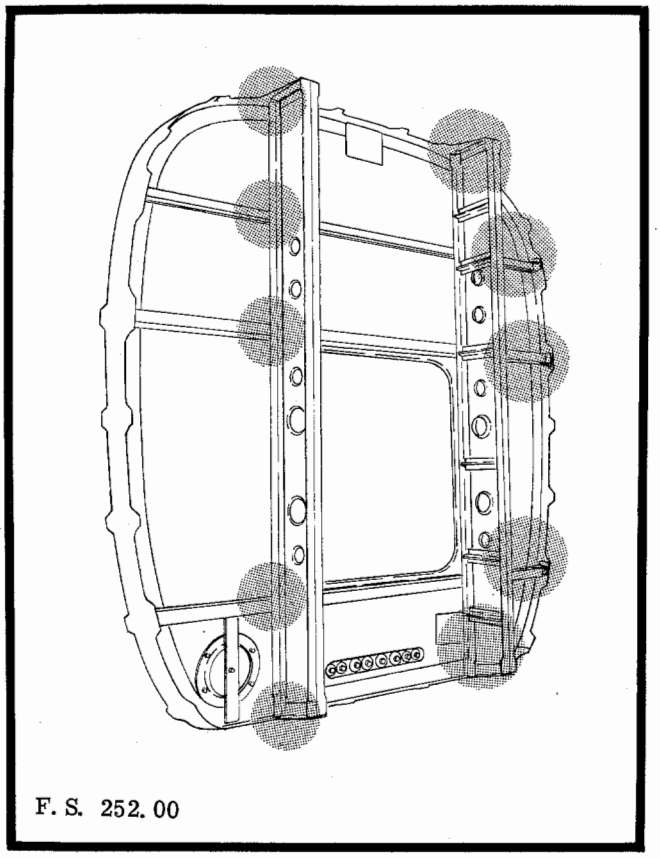



Figure 2-19. Aft Pressure Bulkhead

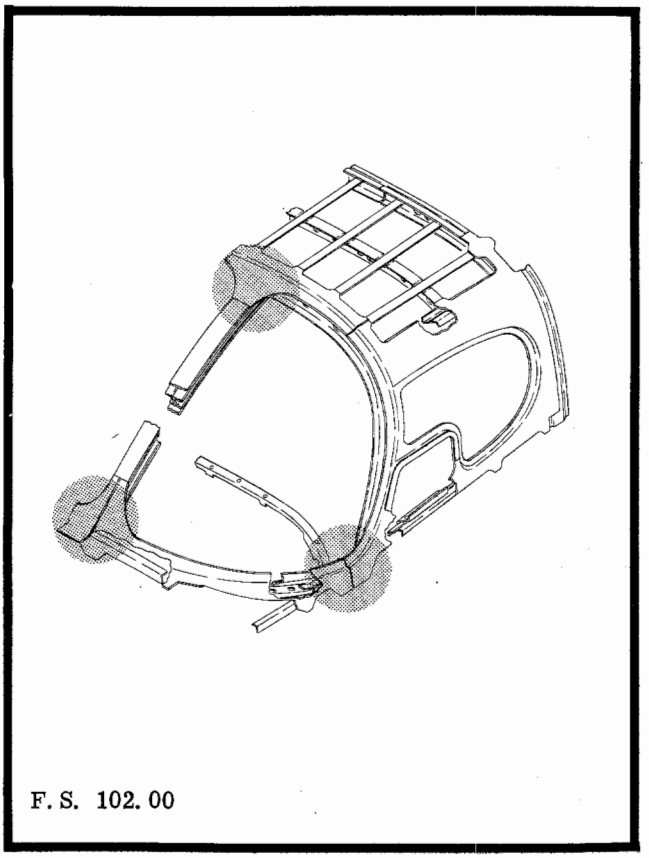



Figure 2-20. Bottom Inner Cap of Windshield

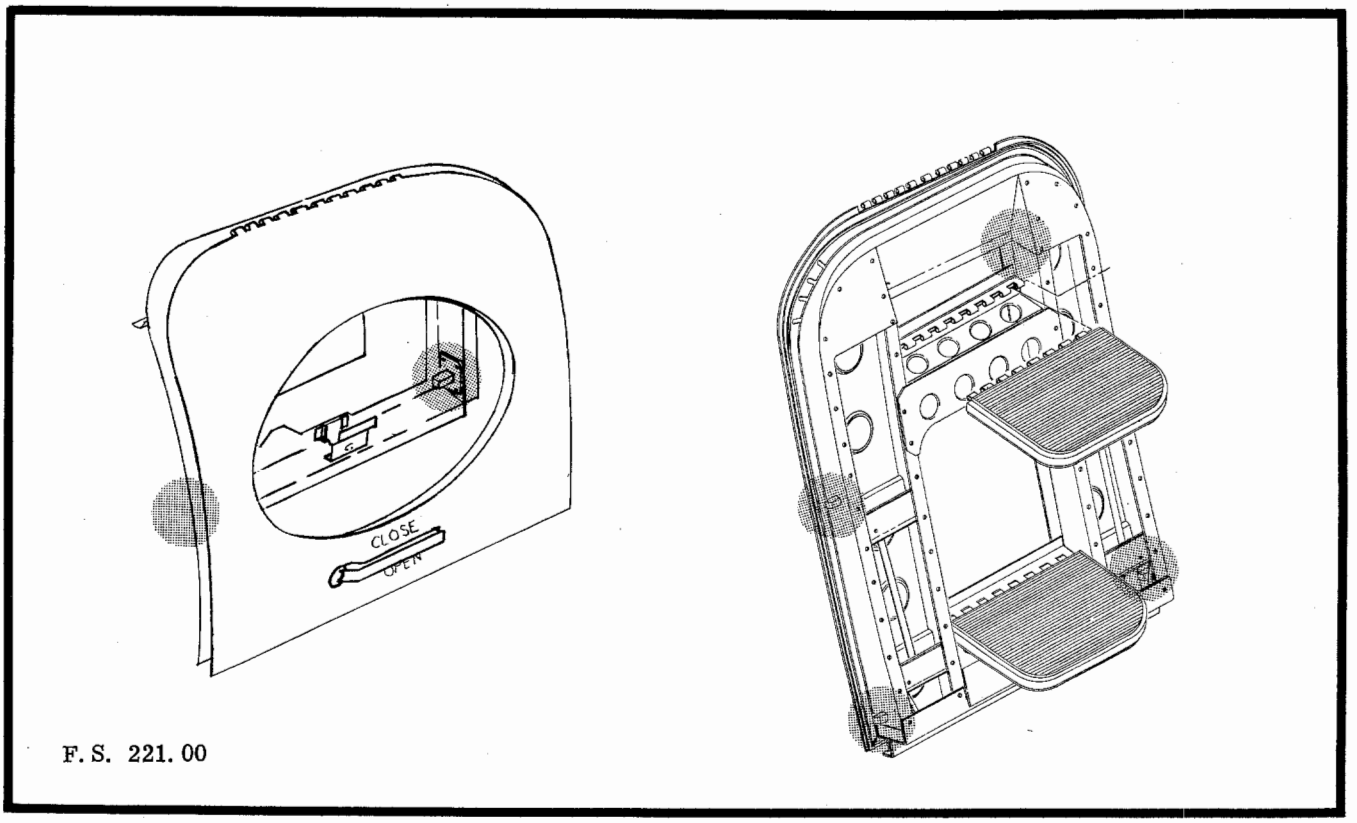



Figure 2-21. Cabin Door Latch and Pins

(c) See figure 2-10. Inspect instrument panel structural fastenings at Fuselage Station 120. 00.

(d) See figure 2-11. Inspect canted windshield bulkhead structure mountings and skin fasteners at Fuselage Station 118. 00

(e) See figure 2-12. Inspect bulkhead for structural mounting left hand and right hand at Fuselage Station 132. 00.

(f) Open escape hatch and inspect frame.

(g) See figure 2-17. Inspect cabin doorframe at Fuselage Station 209. 41.

(h) See figures 2-17 and 2-18. Inspect cabin doorframe at Fuselage Station 221. 00. Note critical areas.

(i) See figure 2-18. Inspect cabin doorframes, hinges, hinge pins, hinge support castings, and suppost castings attachments.

(j) See figure 2-21. Remove cabin door latch pin receptacles and guides from cabin door and cabin doorframe and inspect for wear, cracks, dents, bends and reinstall.

NOTE

If latch pin receptacles or cabin door latch pins are damaged or worn, don't hesitate to reject and install new parts.

(k) See figure 2-19. Inspect bulkhead at Fuselage Station 252. 00 left hand and right hand mountings as shown.

(l) Inspect skins, skin attaching rivets and skin splices in pressure cabin area.

(m) Inspect all stringers behind upholstery and under the floorboards.

Windshield and Windows.

a. Cleaning.

1. Remove dust and dirt from the panels by washing with a solution of mild soap and warm water.

2. Dissolve grease and oil deposits with either kerosene or Aliphatic Naphtha, Specification TT-N-95 (Type II only). Apply this solvent with either a soft, grit-free cloth, chamois, sponge or with bare hands. Bare hands are the most satisfactory applicators, as they are least likely to produce scratches.

CAUTION

Do not use any solvent except those specified in step 2, above, as many chemical solvents will soften or craze the surface of the plastic. Cleaning sprays and other cleaning solutions prepared for use on cellulose-nitrate and cellulose-acetate base plastics often contain ingredients harmful to acrylic plastic, which is the material used in this aircraft. Even a light coat of salt spray or dust should not be wiped off when dry, as small hairline scratches will result when gritty paritcles are rubbed over the surface. Always flush the surface first with clean water or soap solution. Finally, rinse generously with clean water.

b. Inspection.

1. Refer to Section 3 and inspect all windows and windshield in accordance with Plastic Windows Inspection Criteria.

c. Repair and servicing.

1. After cleaning plastic window surfaces, allow to dry, then wax to give surface a maximum transparency.

2. Minute hairline scratches can often be removed by rubbing with commercial automobile body cleaner. Apply the cleaner with a soft, dry, clean cloth or imitation chamois of flannel.

3. If repair to plastic window surfaces becomes necessary, refer to Section 16 and repair them in accordance with Repair of Plastic Window Surfaces.

Cabin Door.

a. Cleaning.

1. Clean the cabin door and latching mechanisms by wiping with a suitable cloth.

2. Remove accumulations of grease from cabin door parts by using a suitable solvent and wipe clean with a cloth.

b. Inspection.

1. Make a visual inspection of component parts for excessive wear, metal breaks and improper threads.

2. Operate door and observe for proper function of component parts.

c. Repair and servicing.

1. Refer to Section 3, and replace components which show evidence of excessive wear.

2. Refer to Lubrication Diagram, this section, and service components as shown.

3. Lubricate the cabin door seal with Sil-Glide, or equivalent, to aid sealing.

Cabin Door Seal.

a. Cleaning.

1. Remove accumulation of dirt and grease from cabin door seal by using a suitable solvent and wipe clean with a clean cloth.

b. Inspection.

1. Inspect door seal for cuts, abrasions, and excessive wear.

c. Repair and servicing.

1. Refer to Section 3 for replacement of door seal if evidence of excessive wear exists.

2. Refer to Lubrication Diagram, this section, and service door seal with proper lubricant.

3. If repair to seals is required, refer to Section 16 for repair procedures.

Door Latch Pins (Upper and Lower).

a. Cleaning.

1. Clean the door latch pins with Trichloroethelene or suitable solvent.

b. Inspection.

1. Inspect door latch pins for damage, cracks, and wear.

2. Check for proper rigging in accordance with

rigging procedures (see Section 3).
3. Check door latch pin guides for cracks and wear.
4. Check door latch pin receptacles for wear, cracks and visible damage.
c. Repair and servicing.
1. Refer to Lubrication Diagram, this section, for lubrication of door latch pins.

Nose Baggage and Wing Locker Doors.

a. Cleaning.
1. Clean upholstery panel with a suitable commercial upholstery cleaner.
2. Clean latch assembly, cylinder assembly and door assembly with suitable solvent and wipe dry with cloth.
b. Inspection.
1. Make a visual inspection of latch and cylinder assemblies for excessive wear or binding.
c. Repair and servicing.
1. Refer to Section 3, replace components which show evidence of excessive wear.
2. Refer to Lubrication Diagram, this section, and service component parts as shown.

Heater.

Refer to Cessna Heater and Components Overhaul/ Parts Manual for cleaning, inspection, servicing and repair of heater.

Seats.

a. Cleaning.

NOTE

Cleaning fluids used on fabrics having a naphtha base are recommended for use in cleaning fabric covered seats.

CAUTION

Never use anything except a mild soap solution on leather and vinyl covered seats. Solvents and cleaners will damage, discolor and shorten the life of the seats.

1. Clean fabric covered seats as follows:
(a) Carefully brush off and vacuum all loose particles of dirt.
(b) Wet a small, clean cloth with cleaning solution and wring out thoroughly. Then open the cloth and allow a small part of the fluid to evaporate.
(c) Pat the spot lightly with the cloth, but do not rub it. Repeat this procedure several times, using a clean part of the cloth each time.

NOTE

Patting the spot lightly will prevent its spreading and is less likely to leave a ring.

(d) Moisten another piece of cloth and allow to evaporate until barely damp. Now pat the spot lightly, working from the outside in toward the center.

CAUTION

Do not use too much fluid. Seat cushions are padded with foam rubber, and since volatile cleaners attack rubber, these pads may be damaged if the material gets soaked with the cleaner.

(e) Brush again to remove any more paritcles which have become loosened.
2. Clean vinyl or leather seats as follows:
(a) On vinyl or leather seats, use a mild soap solution and sponge to remove dirt from seats; wipe dry with a clean damp cloth.
b. Inspection.
1. Inspect the front seats for binding on seat rails.
2. Inspect for proper functioning of adjusting handles and tilting mechanism.
3. Seat belts for proper security.
4. If electrically operated seats are installed (optional equipment), actuate switches and observe for smooth operation.
c. Repair and servicing.
1. Refer to Section 3, replace components which show evidence of excessive wear or binding.
2. Lubricate seat base rollers with oil as required.
3. Wax seat rails with automotive wax to reduce friction between seat rollers and seat rails.

Seat Belts and Shoulder Harness.

a. Cleaning.

NOTE

Seat belts and shoulder harness should be removed from the aircraft to clean.

1. Clean seat belts and shoulder harness using a suitable solvent or mild soap solution.

CAUTION

Never use thinner or strong solutions on seat belts or shoulder harness. See inspection procedures before reinstalling seat belts and shoulder harness in aircraft.

b. Inspection.
1. Inspect webbing material for fraying.
2. Inspect seat belt and shoulder harness installation for security.

Upholstery.

a. Cleaning.
1. The upholstery can be cleaned with a nonflammable solvent while installed in the aircraft. Spots or stains can be removed by following the procedure

for cleaning the seats (fabric), as outlined in this section.

b. Inspection.

1. Inspect upholstery for general condition and wear. Observe areas where chafing from other equipment might occur thus damaging the upholstery panels.

Carpets.

a. Cleaning.

1. Use a small whisk broom to loosen dirt; then vacuum the carpet. The more difficult spots or stains can be removed by using a nonflammable dry-cleaning fluid. General care of the carpet is the same as the care of the carpets in your home.

b. Inspection.

1. Inspect carpet for excessive wear and security to the floorboard.

Control Quadrant.

a. Cleaning.

1. Clean all metal parts in a suitable solvent and allow to air dry.

b. Inspection.

1. Inspect all parts for evidence of cracking and excessive wear.

2. Inspect the racks and ratchet stops on the mixture levers for broken teeth and excessive wear.

c. Repair and servicing.

1. Replace racks, ratchet stops, and ratchet stop springs if worn or too weak to insure positive locking.

2. Lubrication of control quadrant is not recommended; however, the control quadrant pedestal does require lubrication. (Refer to Lubrication Diagram, this section).

Empennage.

a. Cleaning.

1. Clean the empennage with mild soap and water, Stoddard Solvent may be used to remove grease and tar then washed with soap and water and allowed to dry.

2. The empennage may be cleaned with any good aircraft cleaner and wax.

b. Inspection.

1. Inspect rxterior surfaces for damage and cracks, loose rivets and loose nuts.

2. Inspect attaching bolts and hinge attaching points for security.

Wing.

a. Cleaning.

1. Clean the wing as follows:

(a) Use a suitable solvent to remove all grease and dirt from nacelle area and landing gear area.

CAUTION

Never use gasoline, paint thinners, or Ketone to remove grease. These are highly inflammable and fire could result.

(b) After washing area with suitable solvent, wash the remaining solvent off with soap and water and allow to air dry.

(c) The wing can be cleaned with any good aircraft cleaner and wax.

b. Inspection.

1. Inspect wing skins, wing attach fittings, tip tank fittings, flap and aileron attach fittings for cracks and visible damage.

2. Inspect wheel well, fluid lines and hoses for leaks, cracks, dents, kinks, chafing, bleaching or discoloration, proper radius, security, corrosion, deterioration and foreign matter.

3. Inspect wing spar bolts for security and insure they are not working. Torque front spar bolts 60 ±5 foot-pounds and rear spar bolts 175 ±15 inch-pounds.

NOTE

When checking torque on spar bolts, always loosen nut first then check torque while tightening nut. Spar bolts are installed in shear position. DO NOT OVERTORQUE. It is possible wing spar bolts will turn if a slight torque is applied to bolt head.

c. Wing and stub wing area.

1. Two types of inspections are required for the wing and stub wing area. These inspections, Type A and Type B, are outlined in the following paragraphs. The aircraft hour intervals and type of inspection to be performed are shown in Figure 2-7.

2. Type "A" inspection.

Type "A" inspection is a limited visual inspection of the wing and stub wing structure. Use the following procedures:

(a) Inspect all external wing structure for cracks and damaged areas.

(b) Inspect for loose and failed structural fasteners.

(c) Inspect wing skin and splices for cracks, wrinkles, abnormal stresses, dents, etc.

(d) Inspect rivets, especially those common to front spar and skin, for loose or working rivets, stretched rivets, and cracks around dimples.

(e) Inspect gear attach fittings and supporting structure for loose bolts, elongated bolt holes, and structural member damage resulting in secondary damage such as high shear or stretched rivets.

3. Type "B" inspection.

Type "B" inspection is a complete visual inspection of the wing and stub wing using all available access holes, lightning holes, etc. To conduct this inspection, engine cowls, tip tank fairing, wing stub gap cover, battery box assembly, prop unfeathering accumulator and all access doors and panels are to be removed. Flaps should be fully extended and ailerons free to move for ease in inspection. Shaded

areas in each figure are the critical areas to be inspected.

Should a crack be detected, the structure must be repaired using the standard structural repair as defined in Section 16, with the following exceptions: the wing-stub wing spar fittings, tip tank fittings, landing gear and attachment fittings, push-pull tubes, bellcranks, hinges, bolts, rivets, pins, bushings and bearings. Any cracks in or failure of these items will require replacement.

CAUTION

When inspecting the critical (shaded) areas it may be necessary to remove primer and dye check.

(a) Inspect all wing and stub wing structure for cracks and damaged areas.
(b) Inspect for loose and failed structural fasteners.
(c) See figure 2-23. Inspect wing skin and splices.
(d) Inspect rivets, especially those common to front spar and skin.
(e) See figure 2-24. Inspect front spar and leading edge assembly.
(f) See figure 2-26. Inspect front spar carry-thru structure. (For carry-thru structure inside the fuselage, refer to "Pressure Cabin Inspection Requirements. ")
(g) See figure 2-25. Inspect rear spar and trailing edge assembly.
(h) See figure 2-27. Inspect rear spar carry-thru structure. (For carry-thru structure inside the fuselage, refer to "Pressure Cabin Inspection Requirements. ")
(i) Inspect wheel well, especially gear fittings, ribs and spars.
(j) See figure 2-22. Inspect engine nacelle, especially engine mounts, prop unfeathering accumulator mounting holes and areas shaded.
(k) See figure 2-28. Inspect stub wing.
(l) Inspect flaps, especially the hinge, scissors, their attachments, and push-pull rod connecting the scissor assembly to the bellcrank.
(m) See figure 2-29. Inspect ailerons.

d. Repair and servicing.

1. Refer to Lubrication Diagram, this section, for servicing requirements.

LANDING GEAR.

Landing Gear Actuator.

a. Cleaning.

1. Clean external parts of landing gear actuator assembly and reduction gear by wiping with a clean cloth.
2. Dampen cloth with a suitable cleaning solvent to remove oil or grease accumulations.

b. Inspection.

1. Inspect assemblies externally for visible damage such as cracks, nicks, dents and scratches. Check upper and lower bellcranks and splines on the protruding portions of sector shaft for visible damage.
2. Check landing gear actuator for proper operating times as follows:

(a) Flight check for excessive noise and for free, proper operation.

NOTE

Use maximum airspeeds placarded in aircraft for extension and retraction tests.

(b) Flight check time for full retraction "UP, " amber light on 10 to 14 seconds. Time for full extension "DOWN, " green lights on 8 to 11 seconds.
(c) If during flight check, the landing gear will not retract and extend within the time limit described in step (b), remove the landing gear motor and perform the following no load test:

(1) Mount motor securely in a horizontal position.
(2) Connect motor as shown in Figure 2-30 to a variable 30 volt, DC power supply.
(3) Connect switch S3 for either direction.
(4) Open switch S2 to read ammeter.
(5) Close switch S1 to start motor.
(6) Gradually increase voltage from zero until the brake releases.

NOTE

The brake releasing may be indicated either by sound or by the armature starting to turn.

(7) Read voltmeter when brake releases. Brake must release at or less than 18 volts.
(8) Stop motor, close switch S3 for opposite rotation and repeat steps (3) thru (7).
(9) Voltage must be within the same limits as previous rotation.
(10) If the voltage is not within the limits as described in step (7), refer to Troubleshooting the Landing Gear Actuator Motor, Section 4.
(11) Run motor in each direction as shown connected in Figure 2-30 with 24 volts DC applied.
(12) Open switch S2 and read ammeter current. The ammeter should read approximately 7. 5 amperes under no load, when the RPM is approximately 4000 RPM.
(13) Stop motor, close switch S3 for opposite rotation and repeat step (12).
(14) Motor should operate within limits as described in step (12).
(15) If the motor does not operate within the limits as described in step (12), refer to Troubleshooting the Landing Gear Actuator Motor, Section 4.

(d) If the motor will not meet operating requirements, after performing no load check, replace motor and repeat step (b).
(e) If the gear still will not meet flight check requirements, check all linkage and hinge points for

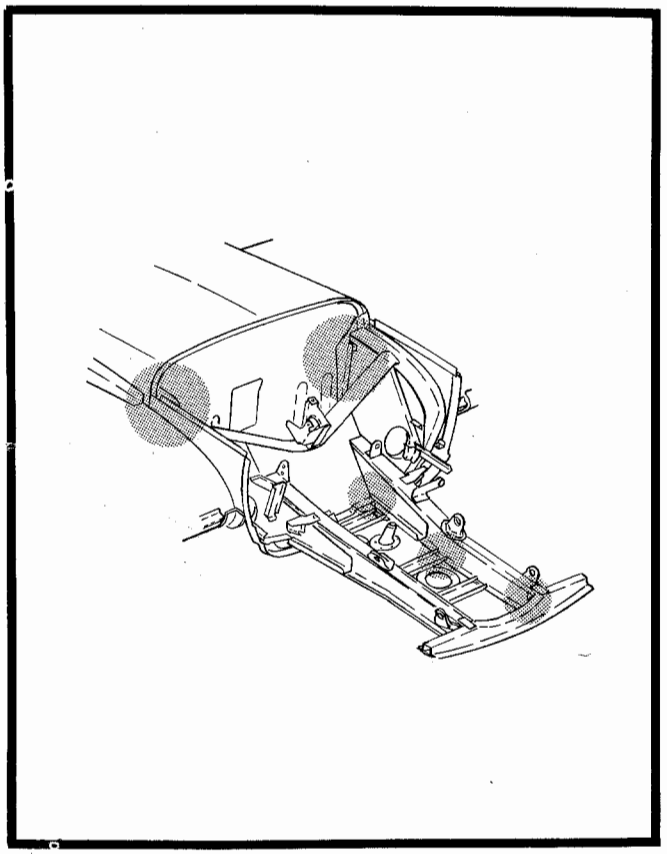


Figure 2-22. Engine Nacelle

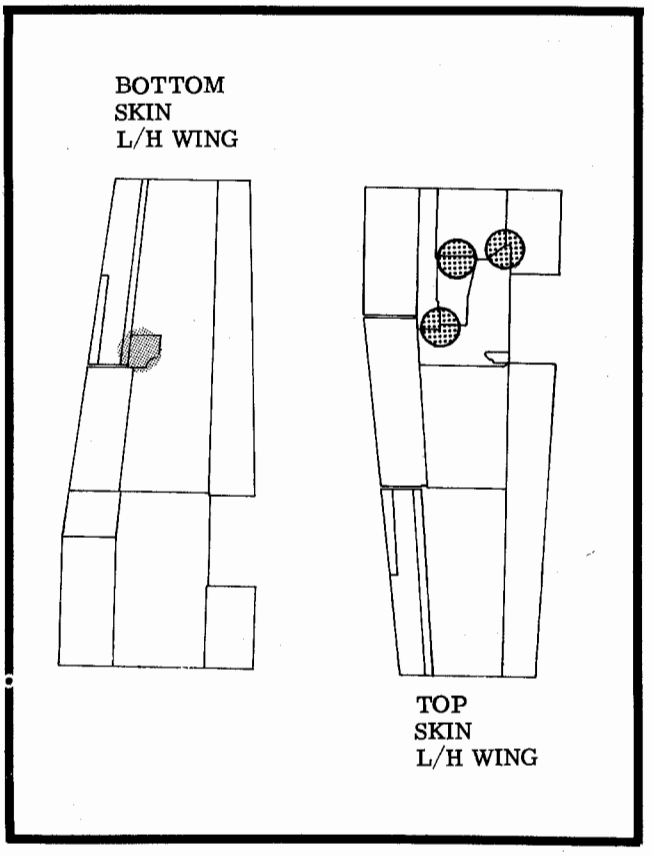



Figure 2-23. Wing Skin and Splices

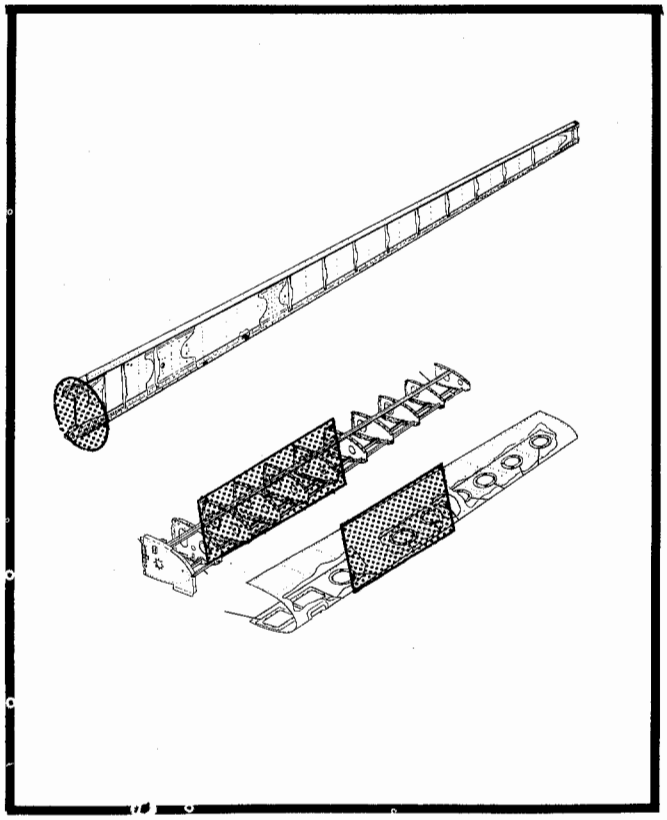


Figure 2-24. Front Spar and Leading Edge Assembly

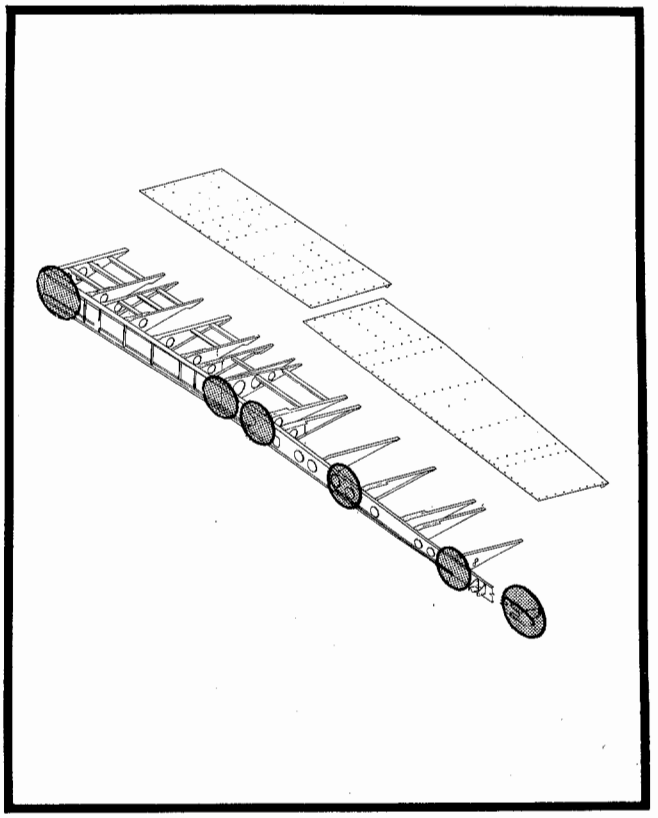


Figure 2-25. Rear Spar

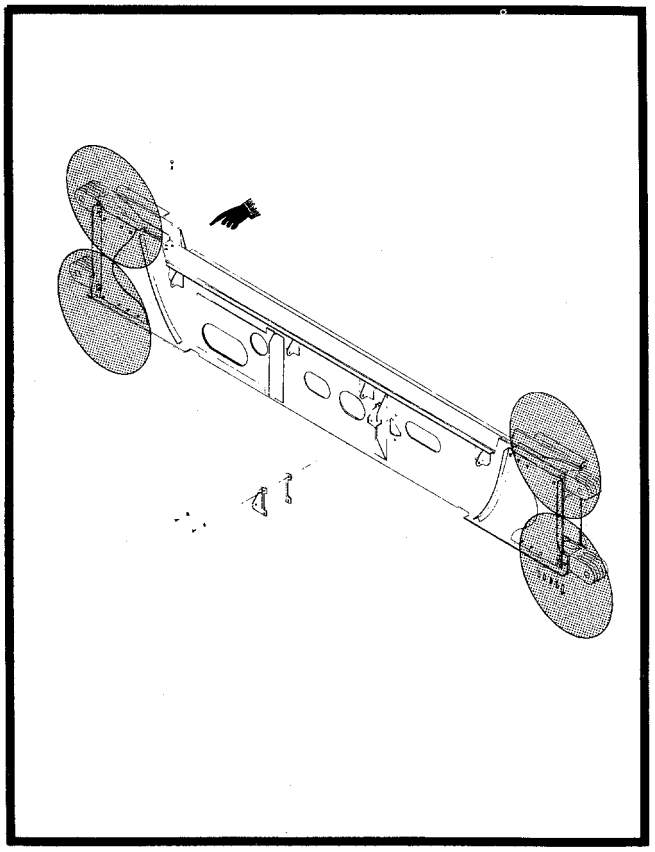


Figure 2-26. Front Spar Carry-Thru Structure

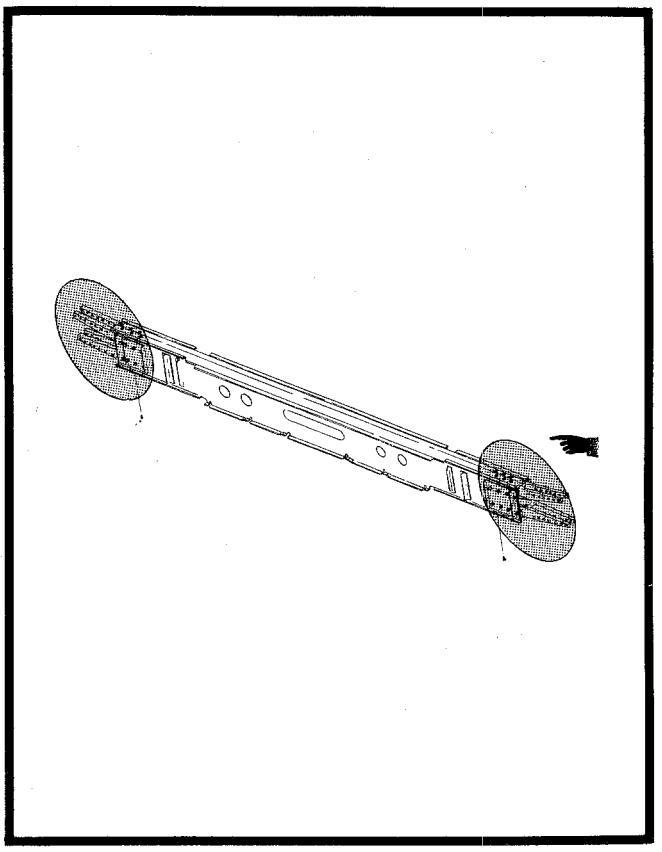


Figure 2-27. Rear Spar Carry-Thru Structure

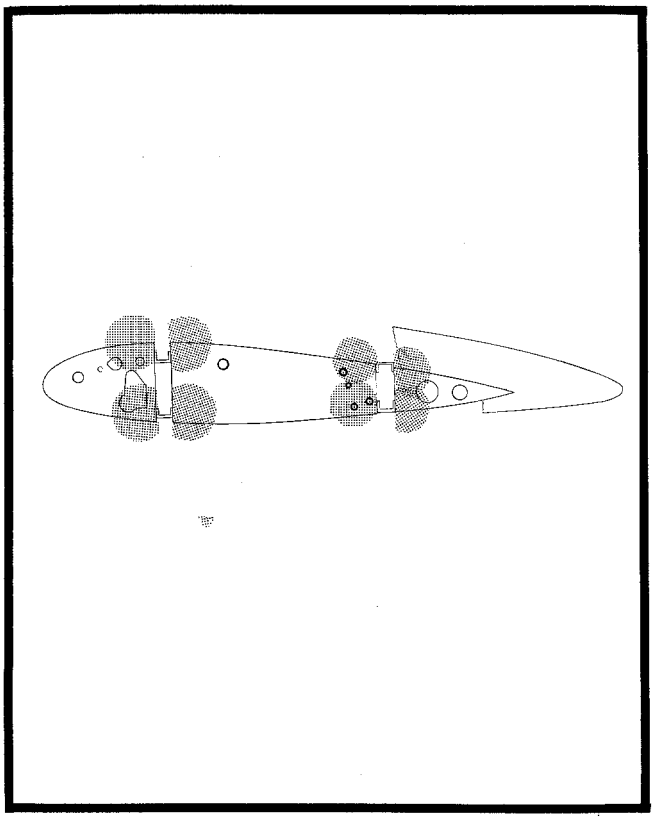


Figure 2-28. Stub Wing

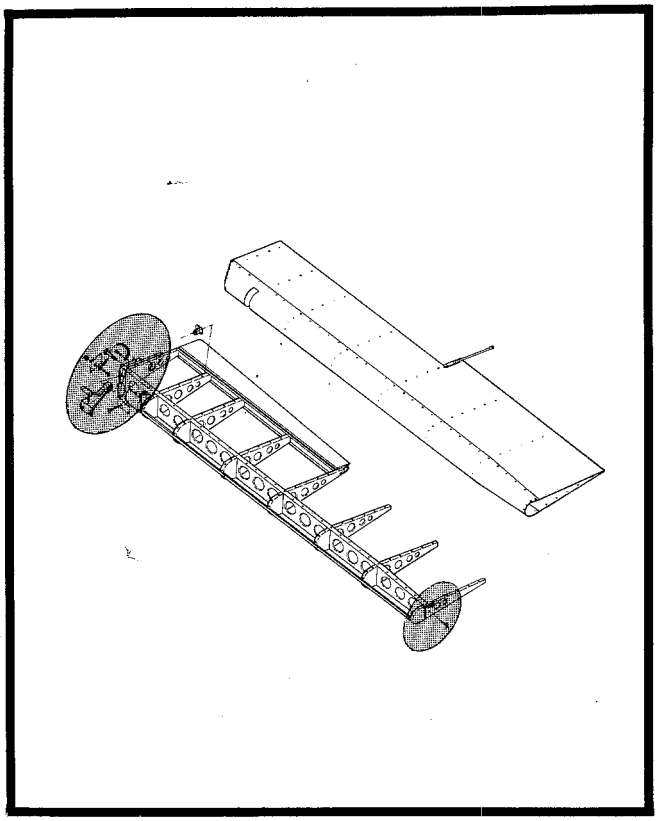


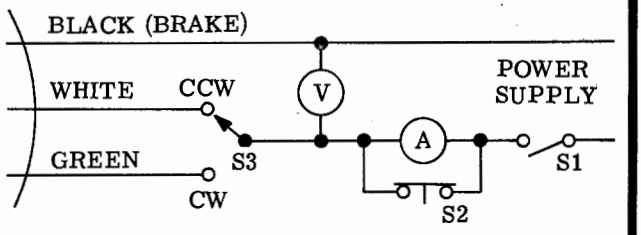
Figure 2-29. Ailerons

binding or interference.

(f) If no evidence of binding or interference is found, landing gear actuator must be replaced or overhauled in accordance with Cessna Landing Gear and Flap System Components Overhaul/Parts Manual.

c. Servicing.

1. Refer to Lubrication Diagram, this section, and service components as shown.




V = VOLTMETER, DC, 7.5/30/75, TYPE DP-11, NO. 50-202011 RCPF
A = AMMETER, DC, 5/20/50, TYPE DP-11, NO. 50-202111 RXPS
S1 = SWITCH, SPST 30 AMPERE CAPACITY, NO. 707
S2 = SWITCH - PUSH BUTTON NO. CR2940-UA202B
S3 = SWITCH, DPDT NO. 2565K5

Figure 2-30. Schematic Test Connection Diagram

Emergency Manual Extension System.

a. Cleaning.

1. Clean all components with suitable solvent.

b. Inspection.

1. Inspect miter gears and sprocket for visible damage such as chipped or broken teeth, nicks, dents, cracks or deep scratches.
2. Inspect all bolt and pin holes for elongation.
3. Inspect around all welds for cracks.
4. Check emergency manual extension system for specification compliance as follows:

NOTE

This check must be accomplished during flight.

(a) Place the landing gear actuator switch in the "OFF" position.

(b) Manually extend the landing gear, counting the number of turns required to illuminate the green lights. Fifty-two to fifty-six turns are required to illuminate the lights.

c. Repair and servicing.

1. Refer to Lubrication Diagram, this section, and service components as shown.

Main and Nose Landing Gear Assemblies.

a. Cleaning.

1. Clean all metal parts with suitable solvent.

CAUTION

If metal parts are not to be assembled immediately, coat with system hydraulic fluid to prevent rusting. Before assembly it will be necessary to again clean with solvent.

2. Clean all O-rings and seals with system hydraulic fluid.

b. Inspection.

1. Inspect all components for excessive wear, cracks, dents, nicks and scratches.
2. Inspect outer barrel of the lower strut assembly for any defects that may damage seals.
3. Refer to Inspection Chart for additional periodical inspection requirements.

c. Repair and servicing.

1. Repair of main landing gear is limited to replacement of parts, smoothing out of minor scratches, nicks and dents and repainting of areas where paint has chipped or peeled.
2. Refer to Lubrication Diagram, this section, and service components as shown.

Torque Links.

a. Cleaning.

1. Clean torque link assemblies with a suitable solvent and wipe clean with a clean cloth.

b. Inspection.

1. Refer to Inspection Chart for periodical requirements.

c. Repair and servicing.

1. Repair of torque link assemblies is limited to replacement of parts, smoothing out of minor scratches, nicks, and dents and repainting of areas where paint has chipped or peeled.
2. Refer to Lubrication Diagram, this section, and service components as shown.

Main and Nose Gear Retracting Linkage.

a. Cleaning.

1. Clean linkage components with cloth saturated with suitable cleaning solvent.

CAUTION

Do not clean sealed bearings or needle bearings which do not have provisions for lubrication.

b. Inspection.

1. Refer to Inspection Chart for periodical inspection requirements.

c. Repair and servicing.

1. Repair of main landing gear retracting linkage is limited to replacement of parts, smoothing out of minor nicks, dents, and scratches and repainting of

areas where paint has chipped or peeled.
2. Refer to Lubrication Diagram, this section, and service components as shown.

Shock Strut Servicing.

a. To fill the main landing gear shock struts, use the following procedures:
1. Jack aircraft in accordance with Jacking Procedures.
2. Deflate strut by loosening valve body 2-1/2 turns (maximum).
3. With strut fully compressed, remove valve and fill with hydraulic fluid. (MIL-H-5606)
4. Stroke strut slowly 3 times (minimum).
5. Top off fluid with strut compressed.
6. Replace valve and inflate strut to 300 PSI with tire clear of ground.
7. When aircraft is on the ground, service strut to approximately 4. 55 inches extension until it can be serviced per step 6.
b. To fill nose landing gear shock strut, use the following procedures:
1. To fill the nose gear shock strut follow procedure given above, inflating nose strut to 165 PSI with tire clear of ground.
2. When aircraft is on the ground, service strut to approximately 2. 60 inches extension until it can be serviced per step 1.

Nose Gear Shimmy Damper.

a. Cleaning.
1. Clean all metal parts with suitable solvent.
2. Clean all O-rings and seals with clean system hydraulic fluid.

CAUTION

If metal parts are not to be assembled immediately, coat with system hydraulic fluid to prevent rusting. Before assembly, it will be necessary to again clean with suitable solvent.

b. Inspection.
1. Refer to Inspection Chart for periodical inspection requirements.
c. Repair and servicing.
1. Repair of shimmy damper is limited to replacement of parts, smoothing out of minor nicks, scratches, and dents, and repainting areas where paint has chipped or peeled.
2. Refer to Lubrication Diagram, this section, and follow this procedure to fill the shimmy damper.
(a) Using the tow bar, turn the nose wheel strut to the extreme left position against the 55-degree stop. This will place the shimmy damper piston to the rear of the cylinder and eliminate the possibility of entrapped air in the cylinder.
(b) Remove the filler plug and fill with hydraulic fluid.
(c) Replace filler plug and turn nose wheel strut through its entire travel several times.
(d) Return strut to the extreme left position against the 55-degree stop.
(e) Remove filler plug and add whatever fluid is needed to fill the cylinder.
(f) Replace and safety filler plug.

Nose Wheel Steering System.

a. Cleaning.
1. Clean metal parts with suitable solvent.
2. Wipe cables and pulleys with a clean dry cloth.
b Inspection
1. Refer to Inspection Chart for periodical inspection requirements.
2. Check gimbal mounting bolts for torque (50 to 70 inch-pounds.
c. Repair and servicing.
1. Repair of components in the nose gear steering system is limited to replacement of parts.
2. Refer to Lubrication Diagram, this section, and service system components as shown.

Main and Nose Wheels and Tires.

a. Cleaning.
1. Clean all metal parts with suitable solvent.
2. Clean felt seals and bearing cones by washing in suitable solvent and dry thoroughly.
b. Inspection.
1. Inspect wheel castings for cracks, nicks, dents, scratches and corrosion.

NOTE

Replace castings which show evidence of cracks or heavy corrosion. See Section 4 for servicing castings which show evidence of light corrosion.

2. Inspect disc drive clips for damage, looseness, and excessive wear.
3. Inspect bearing cups for visible damage and wear.

NOTE

Do not remove bearing cups unless replacement is required.

4. Inspect bearing cones for visible damage and wear.

NOTE

If more than the usual number of takeoffs and landings are made or the aircraft is operated in dusty areas, it is recommended that cleaning and lubrication of wheel bearings be accomplished at each 100-hour inspection.

5. Inspect retainers and snap rings for damage and distortion. Straighten or replace as necessary.
6. Inspect the tire for breaks, cuts, foreign objects embedded in tread and flat spots and/or exposed cords.

CAUTION

Breaks, flat spots, exposed cords and cuts that damage cords are cause for immediate rejection of tire. Should there be any doubt about a tire's reliability, don't hesitate to reject it.

7. Refer to Inspection Chart for periodical inspection requirements.
c. Repair and servicing.
1. Slightly corroded areas on wheel castings can be repaired as follows:
(a) Clean affected area thoroughly.
(b) Repaint with two coats of zinc chromate primer on area which has had the protective coating removed.
(c) Finish coat casting with two coats of aluminum lacquer.
2. Replace bearing cones with applicable grease as shown in Lubrication Diagram.
3. Replace damaged clips.
4. Lubricate felt seal with light oil.

NOTE

The tires should be maintained at 62 PSI for the main wheel tires and 40 PSI for the nose wheel tire. Check and examine tires for wear, cuts and bruises when checking tire pressures.

Brake System Plumbing.

a. Cleaning.
1. Clean hydraulic components with clean system hydraulic fluid or denatured alcohol.
b. Inspection.
1. Inspect fittings for damaged threads and deformed flares on ends of tubing; lines for cracks, dents, deep scratches, flattened bends and signs of chafing at points of wear; hose for swelling, cracking, abrasions through protective plies and leaks.
2. Refer to Inspection Chart for periodical inspection requirements.
c. Repair and servicing.
1. Repairs to brake system plumbing should be made in accordance with best shop practice, using standard parts and procedures, and be conducted in compliance with applicable regulations.
2. Service system in accordance with Service Chart, Figure 2-37.

Brake Assemblies.

a. Cleaning.
1. Wash metal parts in suitable solvent.
2. Wash O-rings with clean system hydraulic fluid or denatured alcohol.
3. If required, clean brake linings with MEK.
b. Inspection.
1. Inspect metal parts for wear and thread damage.
2. See Inspection and Replacement of Brake Linings, Section 4, for wear tolerances.
3. Inspect cylinder walls for corrosion, pitting and scoring.
4. Refer to Inspection Chart for periodical inspection requirements.
c. Repair and servicing.

CAUTION

Always release parking brake before servicing cylinders.

1. Replace worn or damaged parts.
2. Polish out minor nicks using 400 grit wet-or-dry sandpaper with system hydraulic fluids.
3. Replace brake discs at each engine overhaul or when wear approaches limits described in Section 4, Replacement of Brake Linings.

Master Cylinders.

a. Cleaning.
1. Clean all metal parts in suitable solvent.
2. Clean O-ring seals with clean system hydraulic fluid or denatured alcohol.
b. Inspection.
1. Inspect metal parts for wear and thread damage.
2. Inspect cylinder walls for corrosion, pitting and scores.
3. Inspect O-ring seal and O-ring portion of lock-o-seal for swelling, chipping or other evidence of damage.
4. Refer to Inspection Chart for periodical inspection requirements.
c. Repair and servicing.
1. Replace master body when damage to cylinder wall is found.
2. Repairs to master cylinder components are not recommended, only replacement of defective parts.
3. Refer to Lubrication Diagram, this section, and service as shown.

FLIGHT CONTROLS.

Control Column.

a. Cleaning.
1. The control column tube assemblies are chemically treated with a dry lubricant and should be cleaned only with a clean, dry cloth.
2. Clean roller chains and cables with a clean, dry cloth.
b. Inspection.
1. Check all bolt holes for elongation.
2. Check bearings for excessive wear, binding and looseness.
3. Check tube assemblies for cracks and loose rivets.
4. Check for loose or missing bolts, pins, nuts and rivets on control wheel, aileron sprocket, bearing blocks and tube assemblies.
5. Check control wheel, control locks for condition and operation.
c. Repair and servicing.
1. Repair is limited to replacement of parts and smoothing minor dents or scratches.

Aileron and Aileron Trim System.

a. Cleaning.
1. Clean ailerons, hinges, pulleys, bellcranks, trim tab actuator and trim tab mechanism with suitable solvent.
2. Remove dirt and grease from cables with suitable solvent.
b. Inspection.
1. Inspect aileron and trim system for visible damage such as cracks, dents, nicks, deep gouges and loose balancing weights.
2. Inspect aileron and trim system hinges for freedom of movement, wear and fatigue cracks and attach bolts for security.
3. Inspect aileron and trim control system cables for fraying, proper tension and safeties; fairleads, pulleys and chains for wear and attachment; all gears and sprockets for wear, missing or broken teeth, damage, security of attachment, binding and excessive wear; controls for proper operation, adjustment, travel and security of attach bolts.
4. Inspect linkage, bellcrank and bolt for security, stop bolts for looseness and security.
5. Check travel on aileron up $20^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$ and down $20^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
6. Check travel on aileron trim tab up $20^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$ and down $20^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
7. Check aileron cable tension 25 ±5 pounds.
8. Check aileron trim tab cable tension 10 ±3 pounds.
9. Refer to Lubrication Diagram, this section, for lubrication of aileron and trim system.

Elevator and Elevator Trim Tab Control System.

a. Cleaning.
1. Use a soap solution and a clear water rinse to remove dirt and grease from the exterior surfaces of the elevator and elevator trim tab. Wipe the hinges and actuator clean using a cloth dampened with suitable solvent.
2. Clean grease from elevator trim tab actuator with Stoddard Solvent and air dry.
b. Inspection.
1. Inspect the elevator and trim tab hinges and attach points for wear, cracked fittings, defective bearings, corrosion, deformation of parts, excessive looseness and attach bolts for security.
2. Inspect the skin for loose rivets, push rods for wear, binds, cracks and condition.
3. Inspect linkage, bellcranks, and bolts for looseness and security.
4. Inspect elevator trim tab, hinge and push rod for security and condition.
5. Inspect elevator trim tab actuator for wear and condition.
6. Inspect elevator and elevator trim tab cables for fraying, proper tension and safeties; fairleads, pulleys and chains for wear and attachment; all gears and sprockets for wear, missing or broken teeth, damage, security of attachment, binding, and excessive wear; controls for proper operation, adjustment, travel and security of attach bolts.
7. Check travel on elevator up $20^{\circ}\ ^{+1/2^{\circ}}_{-0^{\circ}}$ and down $15^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
8. Check travel on elevator trim tab up $10^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$ and down $16^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
9. Check elevator cable tension 32 ±3 pounds.
10. Check elevator trim tab cable tension 10 ± 3 pounds (electric trim cable tension 18 ±3).
11. Inspect ends of elevator torque tubes.
c. Repair and servicing.
1. Refer to Section 16 for repair, and Lubrication Diagram, this section, for lubrication of elevator and trim system.

Rudder and Rudder Trim Tab System.

a. Cleaning.
1. Use a soap solution and clear water rinse to remove dirt and grease from the exterior surfaces of the rudder and rudder trim tab. Wipe the hinges and actuator clean using a cloth dampened with a suitable solvent.
2. Clean grease from the rudder trim tab actuator with Stoddard Solvent and air dry.
b. Inspection.
1. Inspect the rudder hinge and attaching points for wear, cracks and excessive looseness.
2. Inspect skin for loose rivets, push rods for wear, bends, cracks and condition.
3. Inspect linkage, bellcranks and bolts for looseness and security.
4. Inspect rudder trim tab hinge and push rod for condition and security.
5. Inspect rudder trim tab actuator for wear and condition.
6. Inspect the rudder and rudder trim cables for proper tension and safeties; fairleads, and pulleys for proper alignment, wear and attachment.
7. Check travel on rudder, left $32^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$ and right $32^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
8. Check travel on rudder trim tab left $24^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$ and right $19^{\circ}\ ^{+1^{\circ}}_{-0^{\circ}}$.
9. Check cable tension on rudder cables 25 ±5 pounds. (Refer to Rigging of Rudder, Section 7.)
10. Check cable tension on rudder trim tab cables 10 ±3 pounds.
c. Repair and servicing.
1. Refer to Section 16 for repair and Lubrication Diagram, this section, for lubrication of rudder.

Rudder Pedal Assembly.

a. Cleaning.
1. Clean component parts with suitable solvent.
b. Inspection.
1. Inspect all components for visible damage such as dents, cracks and broken welds.
2. Inspect all bearings for scoring, binding and excessive wear.
3. Inspect all pin and bolt holes for elongation.
c. Repair and servicing.
1. Repair rudder pedal assembly by replacing de-

fective parts only.
2. Refer to Lubrication Diagram, this section, and service as shown.

Flap System.

a. Cleaning.
1. Use Stoddard Solvent to remove dirt and grease in the flap scissor area. After solvent is used the entire area should be washed with a mild soap and water solution and rinsed with clear water and allowed to air dry.
b. Inspection.
1. Inspect the external surface of flaps for dents, nicks, cracks and proper flush fit in the up position.
2. Inspect the flap scissors and attaching bolts for wear and security. Check flap hinge segments for cracks.
3. Inspect bellcranks and push-pull rods for security.
4. Inspect flap cables for fraying, proper tension and safeties; fairleads and pulleys for proper alignment, wear and attachment.
5. Check rigging and travel down at the 15° stop 15° +0°, -2°, and 45° +1°, -0° at the 45° stop.
6. Check cable tension direct cable with flaps down 85 ±10 pounds. Return cables, flaps up 225 ±25 pounds.
7. Check flap operation for specification compliance as follows:
(a) Flight check to verify that flaps fully extend in 9 - 13 seconds, and retract in 7 - 10 seconds. Check extension and retraction times at 160 MPH IAS. Check actuation to 15° at 180 MPH IAS.
(b) If during flight check the flaps will not extend and retract within the time limits described in step (a), the flap motor must be replaced.
c. Repair and Servicing.
1. Refer to Section 16 for repair of flap.
2. Lubricate flap hinge as necessary with oil (MIL-L-7870).

Control Cable Seals.

a. Cleaning.
1. The control cable seals are packed with a lubricant; therefore, care must be exercised when cleaning to prevent dissolving grease within the seal.
2. Clean control cables using a dry cloth.
b. Inspection.
1. Check seals for cuts or excessive wear.
2. Clean control cables using a dry cloth.
b. Inspection.
1. Check seals for cuts or excessive wear.
2. Check cables and seals for proper lubrication.
c. Repair and servicing.
1. Replace worn or damaged seals as required.
2. Lubricate cables for full length of travel within the seal with MIL-G-81322A lubricant.
3. Pack seal with MIL-G-81322A lubricant.
4. Place the seal on the cable on the non pressurized side of bulkhead with the small end of seal toward bulkhead.
5. Insert seal in the bulkhead hole so that bulkhead metal is seated within the retaining groove of seal and so that the small end of seal is in the pressurized section.
6. Install proper retaining rings in the grooves on the seal (two on small end and one on large end).

ENGINE GROUP.

Engine.

a. Cleaning.
1. Wash down the engine with Stoddard Solvent and dry with a jet of low pressure air.
b. Inspection.

NOTE

Instructions concerning inspection of particular engine components, refer to applicable paragraph in "Engine Maintenance and Overhaul Manual," Continental Motors Corporation.

1. Inspect all hoses for evidence of internal swelling, chafing, cuts or breaks.
2. Inspect all fittings for thread damage, damage to chamfered seats and replace fittings as necessary.
3. Inspect oil separators for evidence of restrictions and clean as necessary.
4. Visually inspect the engine cylinders for cracks, loose nuts and studs; baffles for cracks and security, push rod housings and rocker box covers for leaks, cracks and security, crankcase, oil sump and oil cooler for loose bolts, cracks and oil leakage. Make necessary corrections and repairs in accordance with best shop practices and in compliance with applicable FAA regulations.
5. Perform a cylinder compression check in accordance with engine manufacturer's operator's Manual.
c. Repair and servicing.
1. Refer to Engine Overhaul Manual and Section 9 for repair and servicing.

Engine Cowling.

a. Cleaning.
1. Wash cowling with Stoddard Solvent and wipe dry with a clean cloth.

CAUTION

Never use thinners or MEK to clean cowling.

b. Inspection.
1. Inspect cowling for cracks, elongated holes, abrasions and wear due to rubbing.
c. Repair and servicing.
1. Refer to Section 16 for repair of engine cowling.

Induction Air Filter.

The induction air filters should be cleaned every 50 hours or more often under dusty conditions and replaced every engine overhaul. Under extremely dusty conditions, daily maintenance of the filter is recommended. One method is to use dry compressed air at not over 100 PSI and blow through the filter. Blow from the inside to outside to remove dirt and dust. At 50 hour intervals clean the filter as follows:

a. Cleaning.
1. Remove the filter from the canister.
2. Slightly rap the filter to remove heavy dirt accumulations.
3. Wash thoroughly, using a mild detergent, non-sudsing soap and water solution.
4. Rinse filter with a stream of water until water is clear.
5. Dry thoroughly using dry compressed air. Air pressure should not exceed 100 PSI.
b. Inspection.
1. Check filter for holes, cracks, deterioration and pleats for proper bonding.
2. Install the filter in the canister and safety.
3. Refer to Overhaul and Replacement Chart for inspection and replacement intervals.

Induction Manifold.

a. Cleaning.
1. Clean the induction manifold when washing down engine using the same solvent.
b. Inspection.
1. Inspect the induction manifold for security, loose connections, air leaks and condition.
c. Repair of induction manifold is limited to replacement of components.

Engine Oil Pressure System.

Each engine's oil system has a capacity of 13 U. S. quarts, which includes 1 quart for oil filter. Do not operate on less than 9 U. S. quarts of oil. The filler cap is located on the upper part of the engine or between the first and second left cylinders. The oil dipstick is located outboard of the filler cap and is used to check the quantity of oil. The gear type engine oil pump is located on the lower aft end of the engine and circulates the oil through the oil system.

a. Cleaning.
1. Clean line assemblies and fittings with suitable solvent.
b. Inspection.
1. Start and run engine for a few moments observing oil pressure gage for fluctuations.
2. Shutdown engine and inspect oil pressure lines and fittings for leaks.
c. Repair and servicing.
1. Service oil pressure system as follows:
(a) With all connections tightened, start engine and allow time for the engine pumps to fill the oil pressure lines.
(b) After a positive indication of oil pressure has been noted, loosen the hose fittings on the rear of the engine gage units and allow a few drops of oil to leak from the fittings. This will bleed the trapped air from the lines and provide an accurate oil pressure indication.

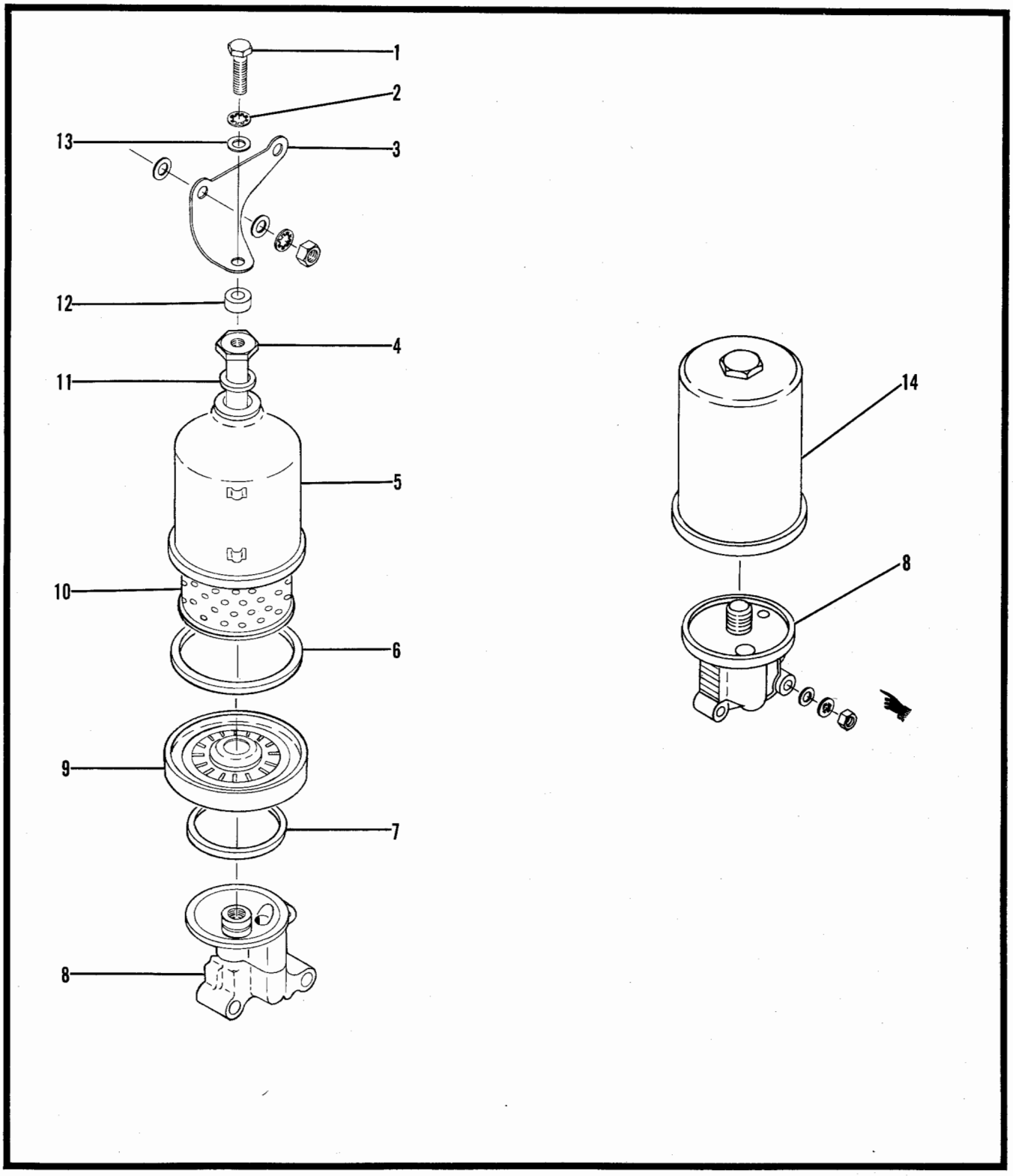
Engine Oil and Filter Service. (See figure 2-32.)

a. Installation and Inspection.
1. Inspect bottom surface of filter case (5) by placing a straight edge on the washer seat surface. If any distortion or out-of-flat condition greater than .010 inch is observed, replace filter case (5).
2. Lubricate the gasket (6) furnished with filter element kit with a light coat of engine oil or general purpose grease which allows the gasket to move freely and seat properly.
3. Assemble bolt (4), washer (11), through case (5) and filter element (10). Position case (5) so that element (10) is facing upwards, assemble gasket (6) and cover (9) onto bolt (4).
4. Assemble new gasket (7) on cover (9), turn cover (9) so that it is facing downwards. If gasket (7) falls off, replace the gasket and repeat test. Should this gasket fall from cover (9), replace the cover.
5. Inspect the adapter gasket seat for possible gouges, excessive scratches, wrench marks or other types of mutilation. If defects are found, replace the adapter.
6. Inspect threaded hole in the center of the adapter gasket seat. If the hole is off center more than .030 inch, replace the adapter.
7. Install the cover assembly (9) on the adapter (8) but DO NOT allow the gasket (7) to make contact with the gasket seat. Hold the case assembly to prevent it from turning, torque the filter bolt (4) 15 to 18 foot-pounds (180 to 216 inch pounds).

NOTE

If torque wrench is not available, tighten bolt 1-3/4 turns after gasket (7) snugs against the gasket seat.

8. Secure filter assembly to support bracket (3) with spacer (12), washer (13), lockwasher (2) and bolt (1).
9. Refill engine with proper grade and quantity of oil. Start engine and check for leaks after the engine has warmed properly, cycle through at least one high power setting.
10. If gasket (7) protrudes more than twice as much on one side as on the other, the gasket has become unseated during assembly. This condition indicates that either the cover or adapter are faulty and should be replaced.
11. Recheck filter bolt torque and safety wire the filter assembly.
12. Aircraft equipped with oil filter P/N 637584; install and torque per instructions on filter. Safety wire.




1. Bolt
2. Lockwasher
3. Bracket
4. Bolt
5. Case
6. Gasket
7. Gasket (Cover)
8. Adapter Assembly
9. Cover
10. Element
11. Washer
12. Spacer
13. Washer
14. Filter

Figure 2-32. Oil Filter Assembly

Oil Breather-Separator. (See figure 2-33.)

a. Cleaning.
1. Wash metal parts and element in suitable solvent and allow to dry.
b. Inspection.
1. Inspect metal parts for cracks in body and around the welded tubes.
2. Inspect filter element for clogging and general deterioration.

NOTE

If inspection of filter reveals damage or deterioration, replace element with P/N 0850694-5.

Engine Compartment.

a. Cleaning.
1. Spray engine compartment with a suitable solvent and allow to drain and air dry.
b. Inspection.
1. Visually inspect the engine compartment for evidence of chafing lines and wires, evidence of fuel leaks, oil leaks, burned spots, parts for excessive wear, loose connections, loose bolts and entire area for cracks, nicks and bends.
c. Repair and servicing.
1. Refer to Lubrication Diagram, this section, and service components as shown.

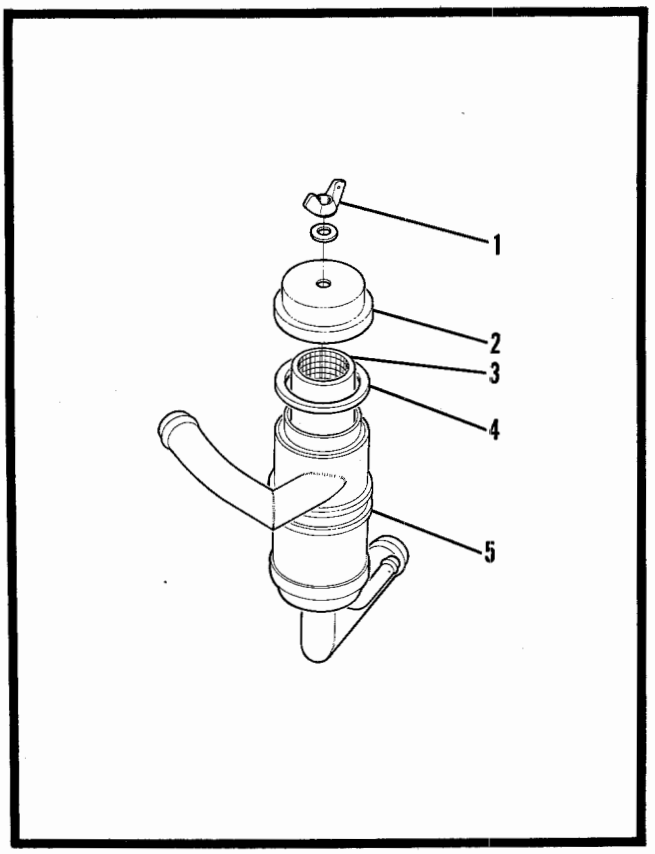
Engine Compartment Fire Extinguisher.

a. Cleaning.
1. Wipe with a clean dry cloth.
b. Inspection.
1. Inspect the fire extinguisher bottles for proper operating pressure. Replace bottle if pressure is not satisfactory.

NOTE

The pressure-temperature correction table indicates upper and lower pressure limits at a specified ambient temperature.

2. Inspect the extinguisher bottles for security, electrical connections and replacement schedule.
3. Inspect the deployment tubes for security and outlet obstruction.
c. Repair and Servicing.
1. Repair of components is limited to replacement of parts.
2. Refer to Section 13 for servicing the fire extinguisher.




1. Wing Nut
2. Top
3. Element
4. Gasket
5. Body

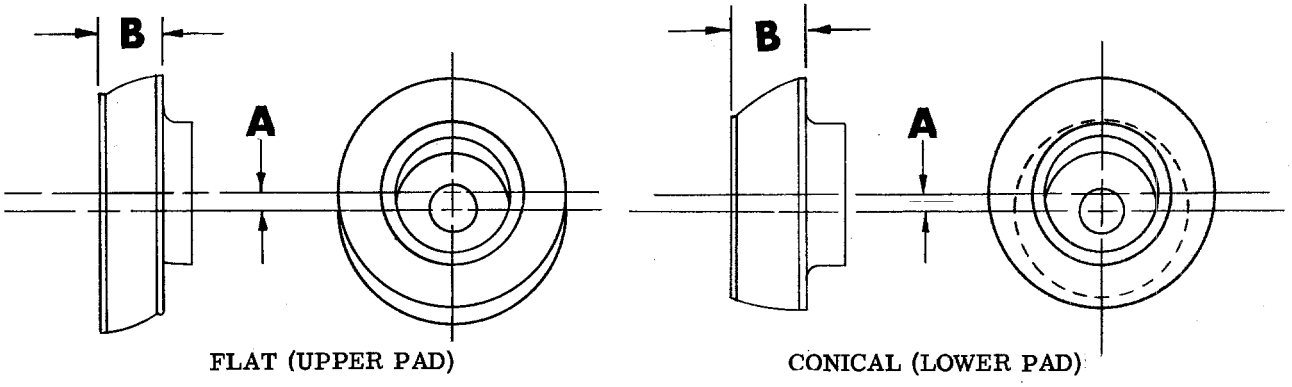
Figure 2-33. Oil Breather-Separator

Engine Controls.

a. Cleaning.
1. The controls should be cleaned when the engine compartment is cleaned or washed down.
b. Inspection.
1. Inspect the engine controls for security of mounting, sharp bends, kinks and damage which might affect operation of the control.
c. Repair and servicing.
1. Repair of engine controls is limited to replacement of parts.

Engine Wire Bundles.

a. Cleaning.
1. The wire bundles should be wiped clean with a dry cloth. DO NOT use solvents.
b. Inspection.




| Model | Engine | Mount Assembly | Mount Component | Max. "A" Eccentricity | Min. "B" Thickness |
|---|---|---|---|---|---|
| 340 | TSIO520K | J-9613-58 | J-9612-32<br>J-9612-33 | 0.12<br>0.12 | 1.20<br>1.20 |

Figure 2-34. Engine Mount Inspection Limits

1. Inspect the wire bundles for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration and corroded terminals.
2. Inspect wire bundles in high heat areas, such as close proximity of exhaust stacks or turbocharger for heat damage.

c. Repair and servicing.

1. If wire bundles are damaged they should be replaced.
2. Wire bundles should be clamped out of high heat areas.

Engine Mounts.

a. Cleaning.

1. Clean engine mounts with a suitable solvent.

CAUTION

Never use a wire brush or sandpaper to clean engine mounts.

b. Inspection.

1. Refer to the Inspection Chart for interval.
2. Inspect engine mounts for security, safetying, looseness, deterioration, cracked fitting, localized burning, blistering, sagging and end separation.
3. Check engine mount for sag.

NOTE

If the area between the exhaust riser of number six cylinder and the lower cowl panel does not have a minimum of 0.40 inch clearance, refer to Section 9 and install engine mount shims.

4. See figure 2-34 for inspection requirements.

NOTE

At each engine overhaul period it is recommended that engine mounts be replaced. Engine mounts which have been replaced prior to the normal engine overhaul may be reused providing dimensions are within inspection requirements.

Engine Compartment Hoses.

a. Cleaning.

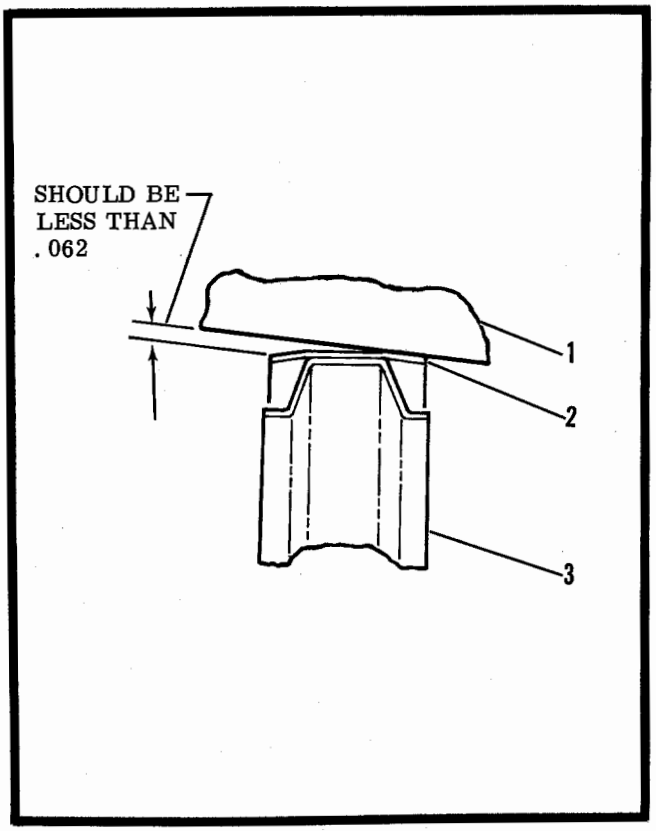
1. Clean engine compartment hoses by washing engine compartment down with mineral spirits or a suitable solvent.

CAUTION

Never use inflammable or combustible solvents.

b. Inspection.

1. Inspect all engine compartment hoses for excessive wear, cracks, nicks, bulges, deterioration, discoloration, bleaching and rubber hoses for hardening.




1. Straight Edge 2. Outer Band (Normally Flat) 3. Coupling

Figure 2-35. Exhaust Coupling Deformation Limits

NOTE

Teflon hose assemblies exhibit considerable stiffness throughout their useful life. Reasonable stiffness is normal and does not indicate that the line should be replaced.

2. Inspect engine compartment fuel hoses under pressure for deformation and leaks as follows:
(a) Make sure throttles are in idle position and mixture controls are in idle cutoff.
(b) Turn prime switch on and assure boost pumps are operating in HI position.
(c) Check hoses for leaks, bulges, deterioration, and deformation.
3. Inspect hoses in the high heat areas such as close proximity of exhaust stacks or turbocharger area for heat deterioration and hardening or cracking due to age.
c. Repair and servicing.
1. Refer to Overhaul and Replacement Chart for replacement intervals of engine compartment hoses.

Spark Plugs.

a. Cleaning.
1. Clean the spark plugs with an abrasive type cleaner.
b. Inspection.
1. Inspect spark plugs for proper gap 0.016 to 0.018 inches.
2. Inspect porcelain for cracks and evidence of arcing.
c. Repair and servicing.
1. Rotate spark plugs top right to bottom left, and top left to bottom right.

Ignition Cables.

a. Cleaning.
1. The ignition cables should be wiped clean using a clean cloth and DC4 Silicone grease.
b. Inspection.
1. Inspect the ignition cable for damaged insulation and the end fitting for evidence of cracks and damage.
c. Repair and servicing.
1. Refer to Section 9 for maintenance and care of the ignition cables.

Magneto.

a. Cleaning.
1. Clean the magnetos with a suitable solvent such as Stoddard solvent and dry with dry compressed air.
b. Inspection.
1. Inspect the magneto for proper breaker point gap (refer to Section 9), and evidence of moisture and arcing.
c. Repair and servicing.
1. Refer to Section 9 for proper maintenance and care of the magneto.

Alternator.

a. Cleaning.
1. The alternator should be washed down at the time the engine is cleaned using the same cleaning procedure.
b. Inspection.
1. Check wiring for breaks and evidence of wear.
2. Check mounting and alternator for security.
3. At 500 hours check brushes, slip rings and bearings (refer to Manufacturers Overhaul/Parts Manual.

NOTE

For electrical output and operational check, refer to Section 14.

c. Repair and servicing.
1. Refer to Section 14 and Overhaul and Replacement Chart (figure 2-8).

Pumps.

a. Cleaning.
1. The fuel and vacuum pumps should be washed down at the same time as the engine, using the same solvent.

b. Inspection.
1. Inspect the pumps for evidence of leaking, condition and security.
c. Repair and servicing.
1. Repair of the engine driven pumps is limited to replacement. Refer to Overhaul and Replacement Chart (figure 2-8).

Turbocharger.

a. Cleaning.
1. Clean outer surface of turbocharger with a suitable solvent.
b. Inspection.
1. Remove turbocharger heat shield from turbine and inspect housing for cracks or bulges.
2. Remove the tail pipe from the turbine and visually inspect the impellers and visible portions of turbine for coking, carbonization, oil deposits, nicks or dents.
c. Repair and servicing.
1. If cracks or bulges do appear on the turbine housing, replace housing in accordance with the Turbocharger and Controls Overhaul/Parts Manual.
2. For removing coke and carbonized oil deposits, refer to the Turbocharger and Controls Overhaul/ Parts Manual.

Manifold Pressure Relief Valve.

a. Cleaning.
1. Clean dirt and debris from valve with a suitable cloth.
b. Inspection.
1. Inspect relief valve vents for obstructions or foreign material.
2. Check for proper operation as follows:
(a) After adequate engine warm up with oil temperature at the lower third of green arc, accelerate the engine rapidly from idle to maximum RPM.

CAUTION

Discontinue acceleration if manifold pressure exceeds 34. 5 in. Hg.

(b) If maximum manifold pressure exceeds 34. 5 in. Hg., immediately reduce power and shut down engine. Manifold pressure relief valve is faulty and must be replaced.

Engine Exhaust System.

a. Cleaning.

NOTE

In order to properly inspect the exhaust system, components must be clean and free of oil, grease, etc. If required, clean as follows:

1. Spray engine exhaust system components with a suitable solvent (such as Stoddard Solvent), allow to drain and then wipe dry with a clean cloth.

WARNING

Never use highly flammable solvents on engine exhaust systems.

Never use a wire brush or abrasives to clean exhaust systems or mark on the system with lead pencils.

b. Inspection.

NOTE

This inspection should be conducted when the engine is cool.

1. Remove the heat shields on the turbocharger in accordance with heat shield removal procedures in the service manual.
2. Remove shields around the exhaust bellows or slip joints, multi-segment V-band clamps at joints, and other items which might hinder inspection of the system.

NOTE

Do not remove clamps.

3. Inspect exhaust stacks for burned areas, cracks and looseness. Insure that attach bolts are properly torqued in accordance with the aircraft service manual.
4. Inspect exhaust clamps for cracks, looseness and proper torque. Refer to figure 9-19.

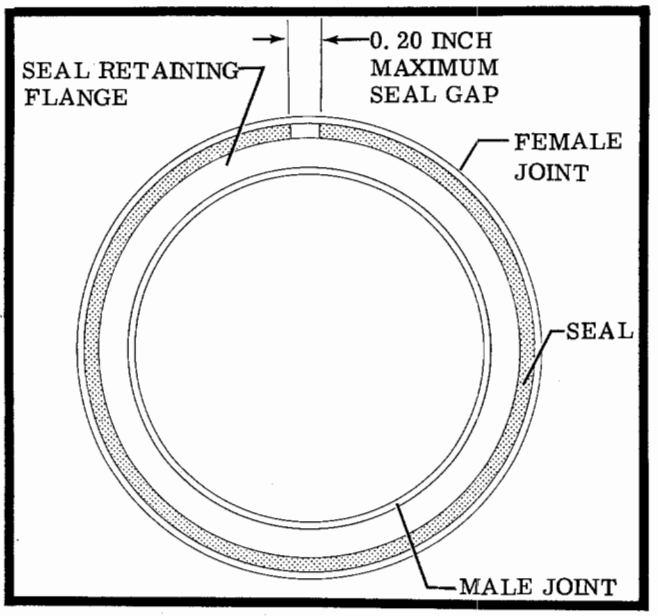



Figure 2-35A. Exhaust Slip Joint Inspection Limit

NOTE

During inspection, particular attention should be given to condition of the clamp flanges, bellows or slip joints and welded areas along seams and around the bellows or slip joints.

5. Inspect exhaust joint springs for correct compression only if the joint is disturbed (see figure 9-27).

(a) Before removal of exhaust joint springs, measure installed length of each spring. Those compressed to less than 0.45 inch must be replaced.

(b) Remove all springs and measure free length. Springs having a free length of less than 0.57 inch must be replaced.

NOTE

Add AN960-10 washers under head of joint bolts as required to obtain correct dimension.

During installation, joint bolts should be tightened gradually and spring length checked frequently to prevent over compression of springs.

(c) Reinstall springs and measure installed length. Length must be 0.51 +.00, -.03 inch.

6. Inspect multi-segment V-band clamp for deformation, looseness and leakage (see figure 2-35).

(a) Inspect installed clamps for deformation by checking the flatness of the outer back-up band, especially within 2 inches of the spot welded tabs which retain the T-bolt fastener. This can be done by placing a straight edge across the flat part of the outer band as shown, then check the gap between the straight edge and band. This gap should be less than 0.062 inch.

(b) If deformation gap exceeds the 0.062 inch limit the clamp must be replaced with a new part. When replacement is required, install the new clamp over the exhaust flange and torque to the correct value. As the band is tightened, lightly tap it circumferentially in a radial direction with a rawhide or soft plastic mallet.

(c) Clamps found in acceptable condition should then be checked for looseness and leakage. Only clamps which are obviously loose or leaking should be retorqued. If retorquing is required, refer to figure 9-19.

(d) Any leakage (minor or major) in all other areas of the exhaust system must be corrected.

NOTE

If not previously accomplished, the overboard exhaust stack to turbocharger clamps (multi-segment V-band type) must be replaced with a new one-piece V-clamp.

The remainder of the multi-segment V-band clamp(s) down stream of the aft engine cylinders are "Life Limited" to 400 hours. These clamps must be replaced on or before 400 hours of service and every 400 hours thereafter.

## PROPELLERS.

### Propeller Systems.

a. Cleaning.

1. Clean all metal parts in a mixture consisting of 1/3 lubricating oil, Specification MIL-L-6082, Grade 1030, and 2/3 solvent, Federal Specification P-S-661. Clean small, highly finished parts separately, exercising care not to cause damage, particularly to working surfaces.

NOTE

Inside diameter of counterweight halves and ferrule groove in which they mount, must be free of all oil. Use solvent only - not the mixture - to clean these surfaces. Should cleaning mixture or any other lubricant accidentally come into contact with these surfaces, clean thoroughly prior to reassembly.

2. Clean non-metallic parts (except gaskets, packings and seals) by wiping with a soft, lint-free cloth dampened with cleaning mixture.

3. Heavy and tightly adhering deposits may be removed with a soft brush.

CAUTION

Under no circumstances are any parts to be cleaned with a steel, other metal, or hard bristle brush or tool of any type.

4. After cleaning, allow parts to air dry, or remove excess mixture with a gentle stream of clean, dry compressed air. Keep nozzle well away from parts.
5. Protect parts from collecting dust and dirt during storage and handling for overhaul. It is recommended that small parts be kept in transparent plastic bags.
6. Parts which are to be coated with dry film lubricant are to be cleaned with ethyl acetate immediately prior to application of lubricant.

WARNING

Under no circumstances should engine operation be continued when the presence of a crack in the propeller is suspected.

b. Inspection.
1. Refer to the Inspection Chart, figure 2-7, and McCauley Industrial Corporation's Service Manual.
2. Refer to the Inspection Chart, figure 2-7, for interval, and visually examine the condition of the epoxy sealant by looking through the hole in the spinner. The outboard end of the retention nut to hub connection will appear as a wide, circumferential flat with a narrow, light brown colored groove in the center. The light brown material is epoxy sealant and should be in place without evidence of missing portions. A normal appearance may include several areas with air bubbles on the surface. If in doubt, rock the blades and check for noticeable movement between the nut and hub.

CAUTION

If one propeller is found with missing portions of epoxy sealant and/or loose retention nut, remove and repair both propellers even though the mating propeller appears to be in satisfactory condition.

3. Anytime the propeller attachment has been subjected to excessive engine roughness, the propeller should be removed and dowel pin inspected, for looseness, cracks and visual damage.
4. Check propeller attachment nuts for 80 - 85 foot-pounds torque. If torque is less than 80 foot-pounds, replace nuts with new elastic element lock nuts.
c. Repair and servicing.
1. Any repairs should be made in accordance with best shop practices as outlined in McCauley Industrial Corporation's Service Manual and FAA regulations.
2. Refer to McCauley Industrial Corporation's Service Manual and lubricate only on reassembly.

Propeller Deice System.

a. Cleaning.
1. Clean brushes and slip ring with a suitable non-corrosive solvent.
b. Inspection.
1. Inspect electrical leads for security, chafing and proper length of cable, refer to Section 13.
2. Inspect propeller deice brushes for correct length and alignment in accordance with Section 13.

Propeller Unfeathering System.

a. Cleaning.
1. Clean accumulator with suitable solvent.
2. Wipe hoses and accumulator with a clean cloth.
b. Inspection.
1. Inspect hose assemblies for chafing and fittings for tightness.
2. Inspect accumulator for security to mounting brackets.
3. After charging, always inspect filler valve for leaks.
c. Repair and servicing.
1. Repairs to propeller unfeathering system are limited to replacement of components.

CAUTION

Always release system pressure by placing propeller control in unfeathered position and release accumulator pressure through filler valve, before disconnecting hose between accumulator and governor or removing accumulator.

2. Service accumulator as follows:
(a) Place propeller control in the unfeathered position before charging the accumulator to prevent the possibility of oil under pressure being trapped in the accumulator.
(b) Although the accumulator will function properly when charged with air, dry nitrogen gas is recommended to minimize corrosion.
(c) Either too much pressure or not enough pressure in the accumulator will reduce efficiency of the unfeathering system. With a normal amount of friction within the propeller, a range of 100 to 110 psi is acceptable.
(d) Always check and make sure the filler valve does not leak after charging the accumulator.

FUEL SYSTEM.

Fuel-Air Control.

a. Cleaning.
1. Remove the fuel strainer and clean the screen in fresh cleaning solvent. Reinstall and safety.

b. Inspection.
1. Check control connections, levers, and linkage for security of attaching parts, for safetying and lost motion due to wear.
2. Check the air control body for cracks and the fuel-air control unit for overall condition.

Fuel Manifold.

a. Cleaning.
1. Disconnect the overboard vent line from the manifold top cover.
2. Hold the top cover down against internal spring until all four attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below.
3. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

If the valve attached to the diaphragm is stuck in the bore of the body, grasp the center nut and rotate and lift at the same time to work gently out of the body.

WARNING

Do not attempt to remove needle or spring from inside valve. Removal of these items from the valve will disturb the 4 PSI factory calibration.

4. Remove the flushing plug located opposite the inlet fitting.

CAUTION

The filter screen is a tight fit and may be damaged if removal is attempted. It should be removed only if a new screen is to be installed.

5. Using clean gasoline, flush out the chamber below the screen.
6. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.
7. Replace flushing plug.
8. Clean the diaphragm valve, top cover and springs in the same manner.
9. Carefully replace diaphragm and valve in manifold body. Check that valve works freely.
10. Place upper spring in position.
11. Align mounting holes in body, diaphragm and top cover locating the vent fitting hole in the cover to the side. Hold the cover down against the spring while installing and tightening all four attaching screws. Safety the screws.
12. Connect overboard vent line.

Fuel Discharge Nozzles.

a. Cleaning.
1. To clean fuel discharge nozzles, immerse in fresh cleaning solvent.

CAUTION

Do not use a wire brush or other sharp metal objects to clean orifices. This will damage orifice.

b. Inspection.
1. Inspect the fuel discharge nozzle for damaged orifice, dirt and foreign objects.

Fuel Selector Valve and Strainer.

a. Cleaning.
1. Fuel selector valve handles - OFF.
2. Drain excess fuel from sediment bowl with quick-drain.
3. Remove the lower access cover plate.
4. Remove the eight screws securing sediment bowl to bottom of selector valve and remove bowl and filter assembly.
5. Clean filter in fresh solvent and air dry.
b. Inspection.
1. Inspect quick-drain valve, gasket, filter and fuel selector for nicks, dents, scratches, dirt accumulation and other foreign matter.
2. Refer to Inspection Chart for interval of inspection.

Fuel Selector Valve Control System.

a. Cleaning.
1. Clean the fuel selector valve with a suitable solvent, wipe clean with a dry cloth.
b. Inspection.
1. Inspect fuel selector valve control system for binding of control, travel, proper operation, excessive wear, safetying and detent position.

CAUTION

The fuel selector valve should always stop in a detent position, never intermediate. If the fuel selector stops in an intermediate position, the controls are improperly rigged, and should be rigged in accordance with Section 11.

Fuel System - Main.

a. Visually inspect filler cap gasket. If crushed or damaged, replace filler gasket.
b. Remove main tank nose cap (Section 11); visually inspect area for evidence of fuel leakage.
1. If fuel leakage is evident, defuel the main tank and replace the stat-o-seals and/or panel gaskets as required.

NOTE

When installing new stat-o-seals and gaskets, apply a small amount of rubber lubricant or petroleum jelly to the new stat-o-seals or gaskets. This will prevent damage to the seals when screws are tightened and will allow the seals to seat evenly.

c. Purge in accordance with Section 2.
d. Refer to Section 11 for cleaning and inspection of disassembled main fuel system.

Fuel System - Auxiliary.

Refer to Inspection Chart and Section 11 for cleaning and inspecting of auxiliary fuel system.

Main Fuel Tank and Transfer Pump.

a. Cleaning.
1. Refer to Section 11, Main Tank Fuel Transfer Pump for cleaning and inspection of main tank transfer pump.

OXYGEN SYSTEM.

Filler Valve.

a. Cleaning.
1. The filler valve should be cleaned with trichlorethylene MIL-T-7003.
2. Clean Freon MIL-C-8638 or Alcohol may be used as an alternate.
b. Inspection.
1. Inspect the filler valve for nicks, cracks and deep gouges.
c. Repair and servicing.
1. Repair is limited to the replacement of parts. Refer to Section 13 for servicing oxygen system.

Oxygen Regulator and Cylinder.

a. Cleaning.
1. Clean regulator and cylinder with a clean cloth.
b. Inspection.
1. Refer to Section 13 for inspection requirements and criteria.
2. Refer to Section 13 for Hydrostatic Test Date on oxygen cylinder.
c. Repair and servicing.
1. Refer to Section 13 for repair and servicing oxygen cylinders and regulators.

Oxygen Masks and Hoses.

a. Cleaning.
1. Clean the mask and hoses with a mild solution of soap and water. Rinse thoroughly with clean water and allow to dry.

NOTE

Make sure all soap is removed by rinsing. Disinfect masks with Zep Aero SBT-12 or equivalent hospital antiseptic spray.

CAUTION

Remove microphone from pilot's mask before cleaning.

b. Inspection.
1. Inspect mask and hoses for leaks, cracks, and deterioration. Check mask stowage compartment for cleanliness and general condition. Check flow indicator for freedom of movement.
2. Inspect couplings and adapters for proper insertion.
c. Repair and servicing.
1. Refer to Section 13 for repair and servicing.

VACUUM SYSTEM.

Vacuum System Components.

a. Cleaning.
1. The vacuum system components may be cleaned by immersing lines and hoses in dry cleaning solvent, and dried with filtered dry compressed air.
2. Wipe exterior of lines and hoses with a clean, dry cloth.
3. Clean vacuum system filter with a jet of clean, dry air and tapping lightly while blowing air over the filter.
4. Remove the relief valve screen and submerge in suitable solvent. Allow to soak or wash until all foreign particles are dislodged.
5. Clean relief valve if required by washing in suitable solvent and drying with filtered dry compressed air.
b. Inspection.
1. Inspect the vacuum system for scratches, chips, nicks, dents, deformed tubes, sharp bends, dirt, proper operation and correct vacuum indication.

SURFACE DEICE SYSTEM.

Surface Deice System Components.

a. Cleaning.
1. The deice system components can be washed down with the engine using Stoddard Solvent.
2. The deice boots can be cleaned using soap and water.

NOTE

Never use thinners, Ketone or harsh solvents on deice boots.

b. Inspection.
1. Inspect the deice system for leaks, remove filter and clean with Naphtha and dry with a jet of dry compressed air.

c. Repair and servicing.

1. Repair of the deice system components is limited to the replacement of parts.

2. For repair of the deice system boots, refer to Section 13.

3. For replacement of the filter P/N H95888-36, refer to Overhaul and Replacement Chart, figure 2-8.

PITOT STATIC SYSTEM.

Pitot Static System Components.

a. Cleaning.

1. Immerse lines in dry cleaning solvent.

NOTE

All pitot static components must be disconnected from instruments and removed from the aircraft when cleaning.

2. Dry lines with filtered compressed air.
3. Wipe exterior of lines with a clean, dry cloth.

b. Inspection.

1. Inspect lines for cracks, chafing and abrasions.
2. Refer to Section 12 for testing.

NOTE

Make sure alternate static source valve is closed before returning aircraft to service.

AIR CONDITIONING SYSTEM. (Belt Driven)

a. Cleaning.

1. The air conditioning components should be wiped clean with a cloth and a stream of low pressure dry air.
2. Remove lint, grease or other debris from evaporator module coils.
3. Clean and flush condensate valve with water.

b. Inspection.

1. Refer to Air Conditioning Systems Service/Parts Manual for checking compressor oil.
2. Check lines and fittings for evidence of oil seepage around compressor.

CAUTION

If evidence of oil seepage is noted around the compressor shaft or at the system fittings, the compressor seal should be replaced, the fittings tightened, the oil checked for proper servicing and the refrigerant system checked for proper charge.

3. Check compressor drive belt for fraying, looseness, evidence of cuts, nicks, heat deterioration hardness, and alignment of pulleys. Refer to Section 13 for drive belt tension.

NOTE

If the drive belt is out of alignment it will necessitate adding shims to the compressor mounting to properly align belt.

4. Check compressor discharge and suction lines for cracking, fraying or evidence of high temperatures.
5. Check compressor support bracket bushings for deterioration or wear.
6. Check condenser fan blade, evaporator motor shaft, condensers, receiver-dryer, condenser fan motor and evaporator modules for looseness and security of mounting.
7. Check condenser coil inlets and evaporator coil inlets for paper, lint, grease or other debris.
8. Check freon sight glass for bubbles with air conditioning system in operation, add more freon until bubbles are not indicated in accordance with the Charging Procedures in Air Conditioning Systems Service/Parts Manual.
9. Check brushes on condenser fan motor for proper length. If brush length is 1/4" or less new brushes are required. Refer to Replacement of Condenser Blower Motor Brushes in Air Conditioning Systems Service/Parts Manual.
10. Check condenser fan blade for excessive nicks, cracks or hub looseness.

c. Repair and servicing.

1. Repair of the air conditioning system is limited to component replacement. Refer to Section 13 for the removal, replacement and installation of various air conditioning components.

AIR CONDITIONING SYSTEM. (Hydraulic Driven)

a. Cleaning.

1. The air conditioning components should be wiped clean with a cloth and a stream of low pressure dry air.
2. Remove lint, grease or other debris from evaporator module coils.
3. Clean and flush condensate (drain) valve with water.

b. Inspection.

1. Refer to Air Conditioning System Service/Parts Manual for checking compressor oil level.
2. Check refrigerant lines and fittings for evidence of oil seepage around compressor.

CAUTION

If evidence of oil seepage is noted around the compressor shaft or at the system fittings, the compressor seal should be replaced, the fittings tightened, the oil level checked for proper level and the refrigerant system checked for proper charge.

3. Check hydraulic lines and fittings for evidence of hydraulic fluid seepage around pump, motor, manifold and valve assembly and reservoir.

NOTE

If evidence of hydraulic fluid seepage is noted, tighten the fittings and check the hydraulic fluid reservoir for proper level.

4. Check compressor discharge, suction and liquid injection lines and hydraulic fluid lines for cracking or evidence of high temperatures.
5. Check condenser blower fan blade, evaporator motor shaft, condensers, receiver-dryer, condenser fan motor and evaporator modules for looseness and security of mounting.
6. Check condenser coil inlets and evaporator coil inlets for paper, lint, grease or other debris.
7. Check freon sight glass for bubbles with air conditioning system in operation, add more freon until bubbles are not indicated in accordance with the charging procedures in Air Conditioning Systems Service/Parts Manual.
8. Check brushes on condenser fan motor for proper length. If brush length is 1/4 or less new brushes are required. Refer to Replacement of Condenser Blower Motor Brushes in Air Conditioning Systems Service/Parts Manual.
9. Check condenser fan blade for excessive nicks, cracks or hub looseness.

c. Repair and servicing.
1. Repair of the air conditioning system is limited to component replacement. Refer to Section 13 for removal, replacement and installation of various air conditioning components.
2. Service hydraulic fluid filter element (see figure 13-28B) as follows:
   (a) Remove RH nacelle air conditioning access cover.
   (b) Place container under reservoir drain.
   (c) Cut safety wire; open drain valve and drain fluid from reservoir.
   (d) Remove filter element from manifold valve assembly by loosening filter case.
   (e) Assemble new O-ring (P/N MS28775-226), filter element (P/N 6655567) and filter case into the manifold valve assembly.
   (f) Torque filter case to 10-15 foot-pounds.
   (g) Close drain valve and safety wire.
   (h) Fill hydraulic fluid reservoir.
   (i) Operate system and check filter for leakage.
   (j) Install air conditioning access cover.

PRESSURIZATION SYSTEM COMPONENTS.

Safety Valve and Outflow Valve.

a. Cleaning.
1. Clean the safety valve and outflow valve with a clean cloth saturated with a suitable solvent such as an 8 to 1 solution of Burline 815MX, or a sponge soaked as required in a diluted solution of NRG+No. 678 (National Collaid Corporation, P. O. Box 293, Garden Grove, California 92642). This will remove tars and nicotine deposits from valves.

CAUTION

Extreme care must be taken to prevent the solution from entering the valve's internal cavities. During cleaning of the assembled valves, all sense ports must be protected to prevent solution from entering the internal parts of the valve.

b. Inspection.
1. Inspect the safety valve and outflow valve for freedom of movement.
2. Inspect the fittings and lines for security and condition.
3. Inspect landing gear safety switch to assure actuation of safety valve as described in Adjustment of Landing Gear Safety Switch procedures, Section 4.

c. Repair and servicing.
1. Repair of the safety valve and outflow valve is limited to the replacement of the valves.

Dump Valves.

a. Cleaning.
1. Cleaning the dump valves requires the removal of the valves and cleaning in a suitable solvent.

b. Inspection.
1. Inspect dump valves for proper operation, security, condition and wear.

c. Repair and servicing.
1. Repair of dump valve is limited to replacement of O-ring and valve. Refer to Section 13 for removal and replacement of dump valve.

Door Seals.

a. Cleaning.
1. Clean door seals with a mild detergent solution and dry with a clean cloth.

b. Inspection.
1. Inspect door seals for cuts, breaks, tears and abrasions.

c. Repair and servicing.
1. Refer to Section 16 for repair of the door seals.
2. Refer to Lubrication Diagram, this section, for lubrication of door seals.

ALCOHOL WINDSHIELD ANTI-ICE SYSTEM.

Alcohol Windshield Anti-ice System Components.

a. Cleaning.
1. Immerse lines in a dry cleaning solvent.

NOTE

Lines not readily removable from aircraft may be flushed with cleaning solvent. Take necessary precautions to protect windshield.

2. Dry lines with filtered compressed air.
3. Clean pump filter screen in accordance with Cleaning and Inspection of Main Tank Fuel Transfer Pump Parts (Section 11).

b. Inspection.
1. Inspect lines for cracks, chafing and abrasions.
2. Inspect lines and adjacent areas for evidence of leakage.
3. Inspect pump for security and operation.

ELECTRICAL SYSTEM.

Inspection.

a. Inspect the electrical system and components for the following:
1. All aircraft and systems wiring for chafing, terminals for security, and general condition.
2. Circuit breakers for mounting and condition.
3. Regulators for mounting, terminals for loose wires.
4. Switches for loose wiring, proper mounting.
5. Relays for wiring and mounting.
6. Motors for proper mounting and wires for clamping.
7. Battery cables for corrosion and looseness.
8. Battery for electrolyte level and specific gravity.
9. Instruments and interior lights for operation and broken glass.
10. Communications and navigation system for proper installation, security in mounts and proper operation, antenna for damage.
11. Instrument panel and control pedestal for loose wiring, clamps and terminals for security.
12. Wing and fuselage wiring for proper wire routing, clamped properly and loose terminals.
13. External power receptacle for proper door closing, terminals for corrosion and looseness.
14. Engine compartment wire bundles for proper clamping, evidence of burning, heat hardness, security and chafing.
15. Stall warning vane and heater for proper operation and security.

Battery.

NOTE

If excessive corrosion is detected around upper portion of battery box, remove the battery and inspect battery box and surrounding area of wing for corrosion.

a. Cleaning.
1. Clean batteries with a mild solution of bicarbonate of soda (baking soda) and water to remove acid corrosion.

NOTE

Remove batteries from aircraft before cleaning.

2. Rinse with clear water and sponge off excess water and allow batteries to dry.

CAUTION

- Take special precautions to insure that battery cell filler caps are tight before cleaning the battery. Entrance of soda water into battery cells will neutralize the cell electrolyte.

- Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

3. Clean battery terminals as needed with a wire brush to brighten the terminals for good electrical contact. Coat with Petrolatum to prevent corrosion.

b. Inspection.
1. Check battery case for possible cracks and deterioration.
2. Check electrolyte for specific gravity as follows:
(a) Using a hydrometer, check specific gravity for a reading of 1.250 to 1.280, corrected to temperature.
(b) Check that specific gravity of the electrolyte does not vary more than 0.025 between cells.
(c) Should a greater variation exist, battery should be slow charged and retested.

CAUTION

Remove batteries from aircraft when charging the batteries. Do not use external power generators for charging purposes.

Battery Box.

NOTE

At 50 hours, battery removal is not required if corrosion is not evident around upper portion of box, at 200 hours, the battery must be removed and the battery box thoroughly cleaned and repainted as necessary.

a. Cleaning.
1. Battery lead should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water.
2. Clean hard deposits of spilled acid and corrosion products using a wire brush.
3. When all foreign materials have been removed from the box, flush it thoroughly with clean water.
4. After cleaning battery box, flush surrounding skin with clean water to ensure that all corrosive material has been removed.

CAUTION

Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

b. Inspection.

1. Inspect the cleaned battery box for physical damage and for areas lacking proper acid proofing. Badly damaged or corroded boxes should be replaced.
2. Inspect surrounding areas of wing adjacent to battery box for damage and corrosion.

c. Repair.

1. Boxes requiring acid proofing should be painted inside and out with TT-L-54 Enmar Acid Proof Black lacquer.

NOTE

It is recommended that the bottom of the battery box compartment cover and the battery box supports be painted with acid proof lacquer.

Starter Relay. (See figure 2-35B.)

a. Inspection.

1. Remove starter relay.
2. Remove contact cover.
3. Inspect contact area for burned and pitted area - if 25% of area is burned and pitted, replace relay.

Emergency Locator Transmitter

a. Cleaning.

1. Clean emergency locator transmitter with a clean dry cloth.

b. Inspection.

1. Perform the following periodic inspections at the prescribed intervals.
2. Monthly
   (a) Turn aircraft master switch ON.
   (b) Turn aircraft transceiver ON and set frequency on local tower frequency.
   (c) Contact local tower personnel and alert them of the proposed test.
   (d) Place the ELT function selector switch in the ON position until the emergency tone is heard on the aircraft radio (not over 10 seconds). Immediately place the function selector switch in the ARM position. (Ensure that the transmitter has been deactivated.)
3. 100 Hours.
   (a) Check ELT operation in accordance with procedure outlined under "Periodic".

NOTE

After accumulated test or operation time equals 1 hour, battery pack replacement is required.

NOTE

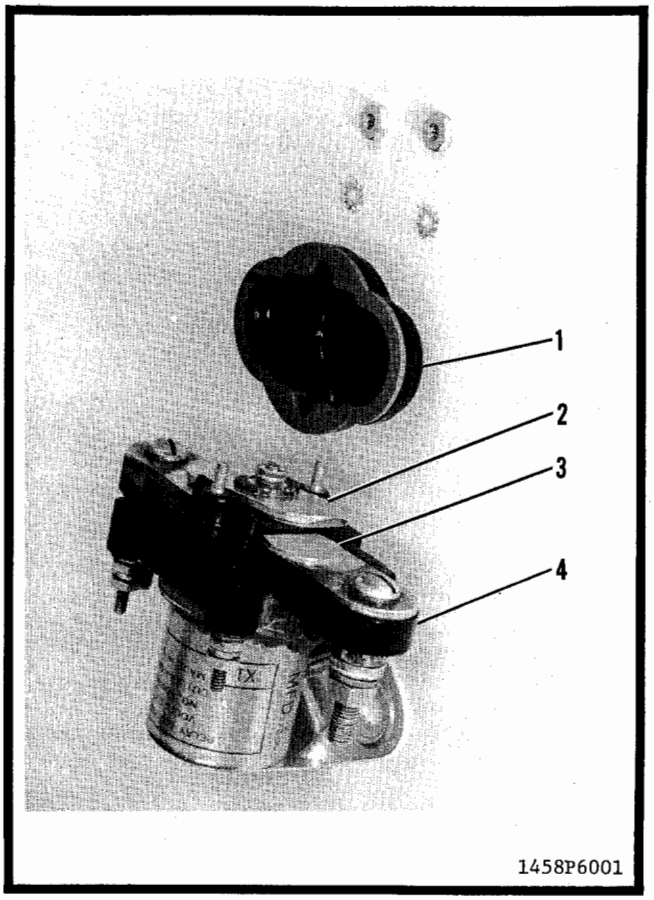
Check calendar date for replacement of battery pack. This date is supplied on a sticker attached to the outside of the ELT case and to each battery.

b. Verify compliance with Cessna Avionics Service Letter AV74-10 and AV74-14.

4. 12 Months.

Have your dealer check your ELT for the following:

(a) Power output (refer to Section 13).
(b) Carrier frequency.
(c) Modulation.
(d) Sweep.
(e) Sweep rate.
(f) Operation of "g" switch.
(g) Replacement of battery pack.
(h) Mounting security.




1. Cover
2. Contactor
3. Contact Area
4. Relay

Figure 2-35B. Starter Relay Inspection

FREQUENCY (HOURS)

- 50 HOURS
- 100 HOURS
- 200 HOURS
- 500 HOURS
- 1400 HOURS
- AS REQUIRED

METHOD

- HAND
- SQUIRT CAN
- FILLER CAN
- GREASE GUN

NOTE

Specified lubricants will meet requirements for extreme hot or extreme cold temperature operations. Use of substitutes or other lubricants may cause malfunction when operating in extreme temperature conditions, or may cause excessive wear due to improper lubrication.

TYPE OF LUBRICANT

| | |
|---|---|
| GL . . . . . | Grease, Low Temperature (MIL-G-21164) |
| OG . . . . . | Oil, General Purpose (MIL-L-7870) |
| FG . . . . . | Graphite, Lubricating (SS-G-659) |
| P . . . . . | Petrolatum or Terminal Grease (VV-P-236) |
| OI . . . . . | Oil, Lubricating, Aircraft Instrument (MIL-O-6085) |
| OH . . . . . | Hydraulic Fluid (MIL-H-5606) |
| GW . . . . . | Grease, Wide Temperature Range (MIL-G-81322) |
| GS . . . . . | Grease, Medium Consistency (MIL-G-23827) |
| DS . . . . . | Dry Spray, Lubricant Camie No. 1000 Watson Industrial Park, St. Louis, Mo., or Dupont Slip Spray Dry Film Lubricant |
| GSL . . . . | Grease, Light Consistency Silicone #33, Dow Corning, Midland, Michigan |

Do not lubricate roller chains or cables except under seacoast conditions. Wipe with a clean, dry cloth.

Lubricate unsealed pulley bearings, rod ends, oilite bearings, pivot end hinge points, and any other friction point obviously needing lubrication, with general purpose oil every 500 hours or more often, if required.

Lubricate control surface hinges with general purpose oil (MIL-L-7870) as required.

Lubricate door latches with automotive type door latch lubricant, and the latching mechanism with general purpose oil every 1400 hours, or more often if binding occurs. Lubricate door stop with Sil-Glyde or (MIL-S-8660) or equivalent.

Figure 2-36. Lubrication Diagram (Sheet 1)

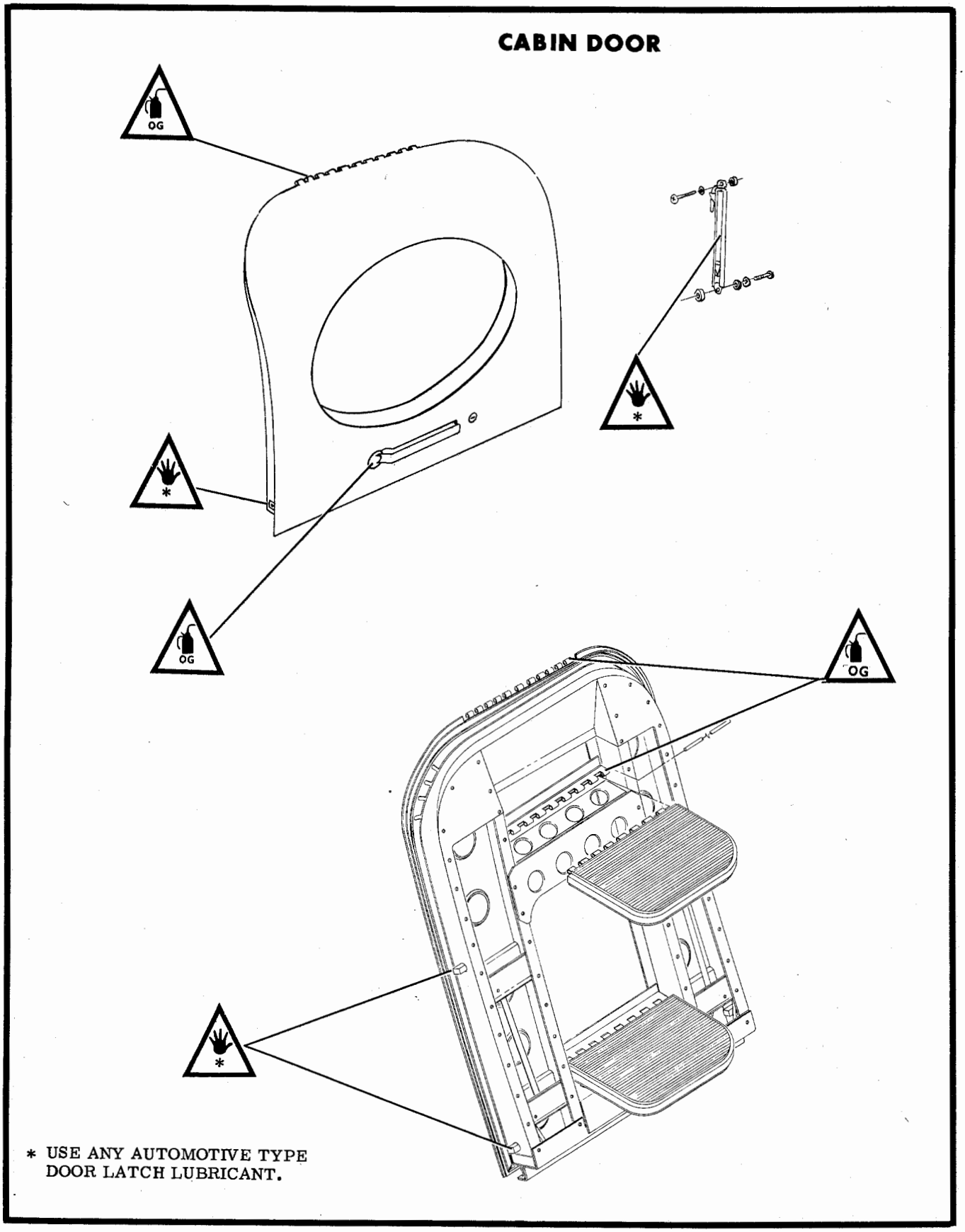
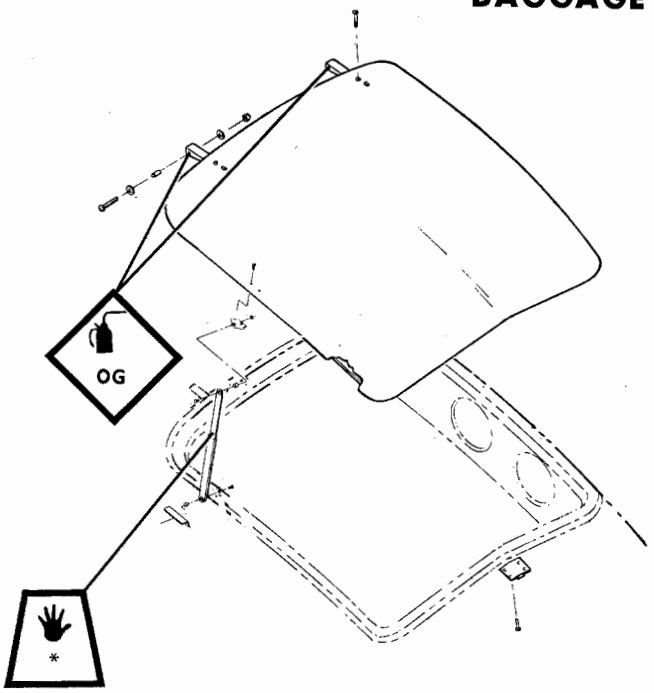



Figure 2-36. Lubrication Diagram (Sheet 2)

## BAGGAGE DOORS




* USE ANY AUTOMOTIVE TYPE DOOR LATCH LUBRICANT.

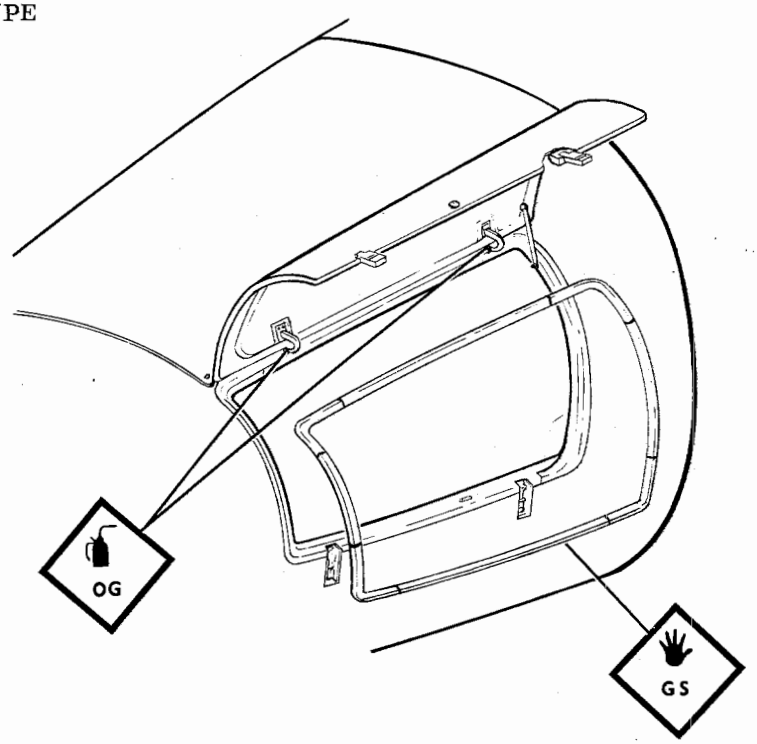



Figure 2-36. Lubrication Diagram (Sheet 3)

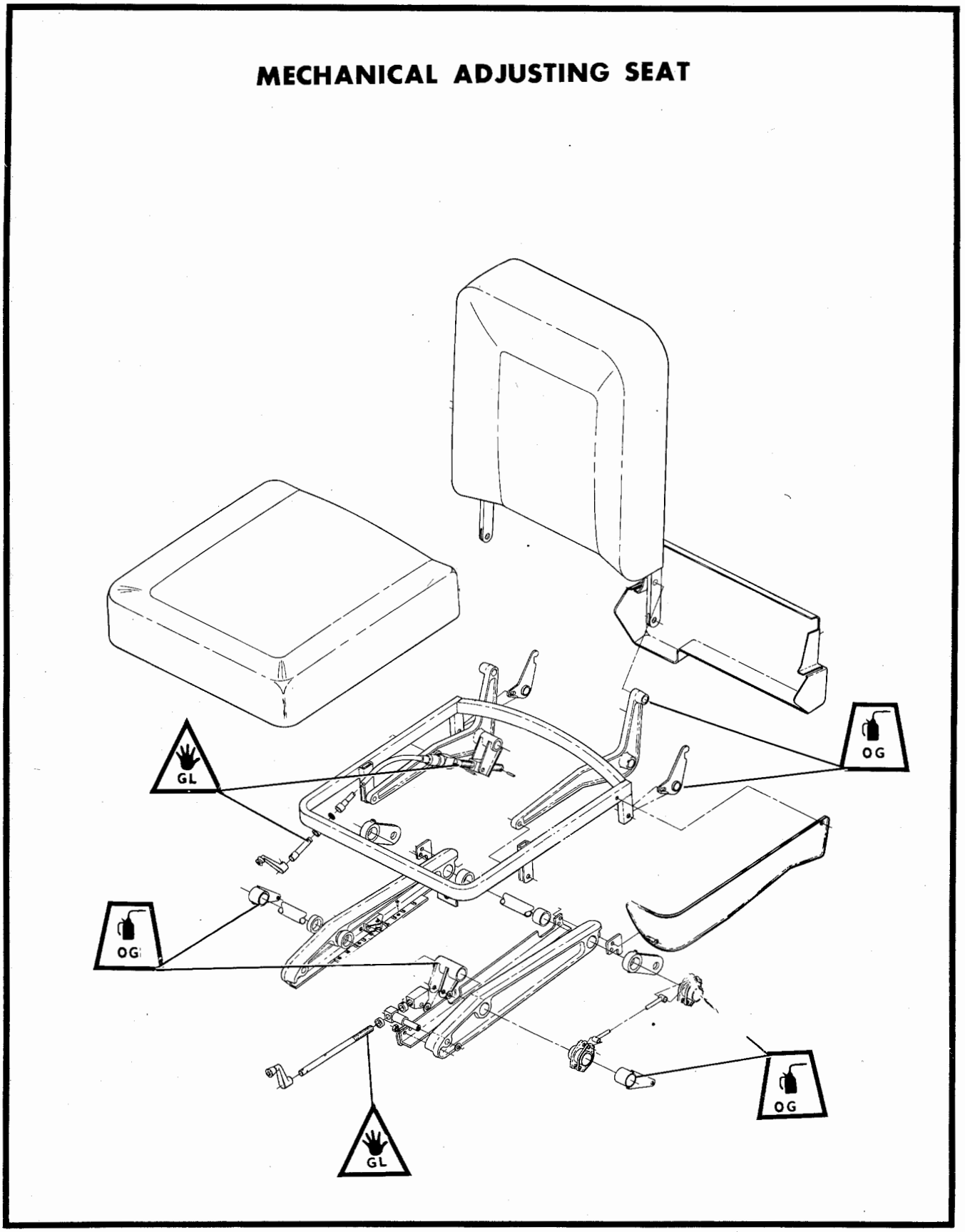



Figure 2-36. Lubrication Diagram (Sheet 4)

## ELECTRICAL ADJUSTING SEAT

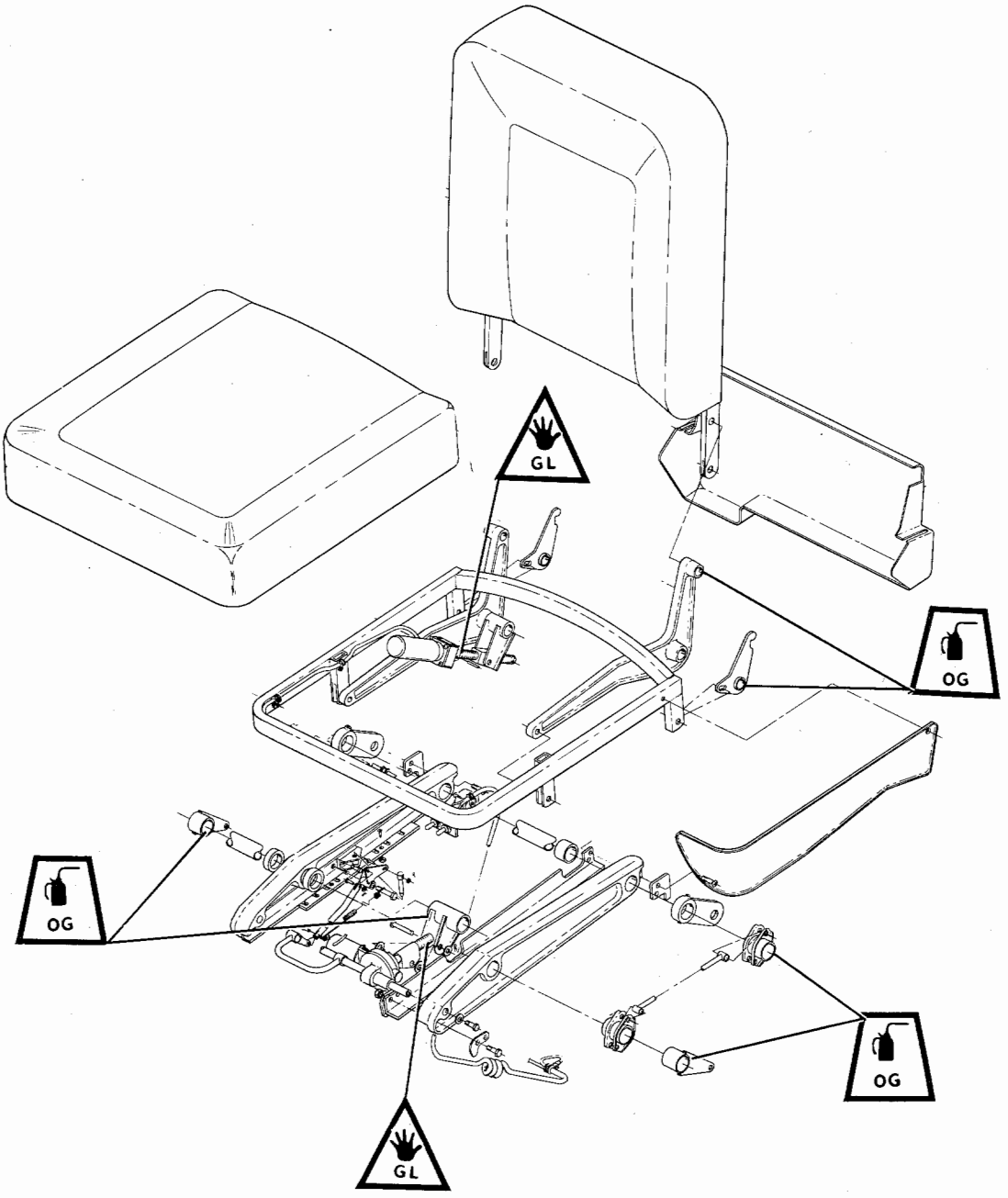
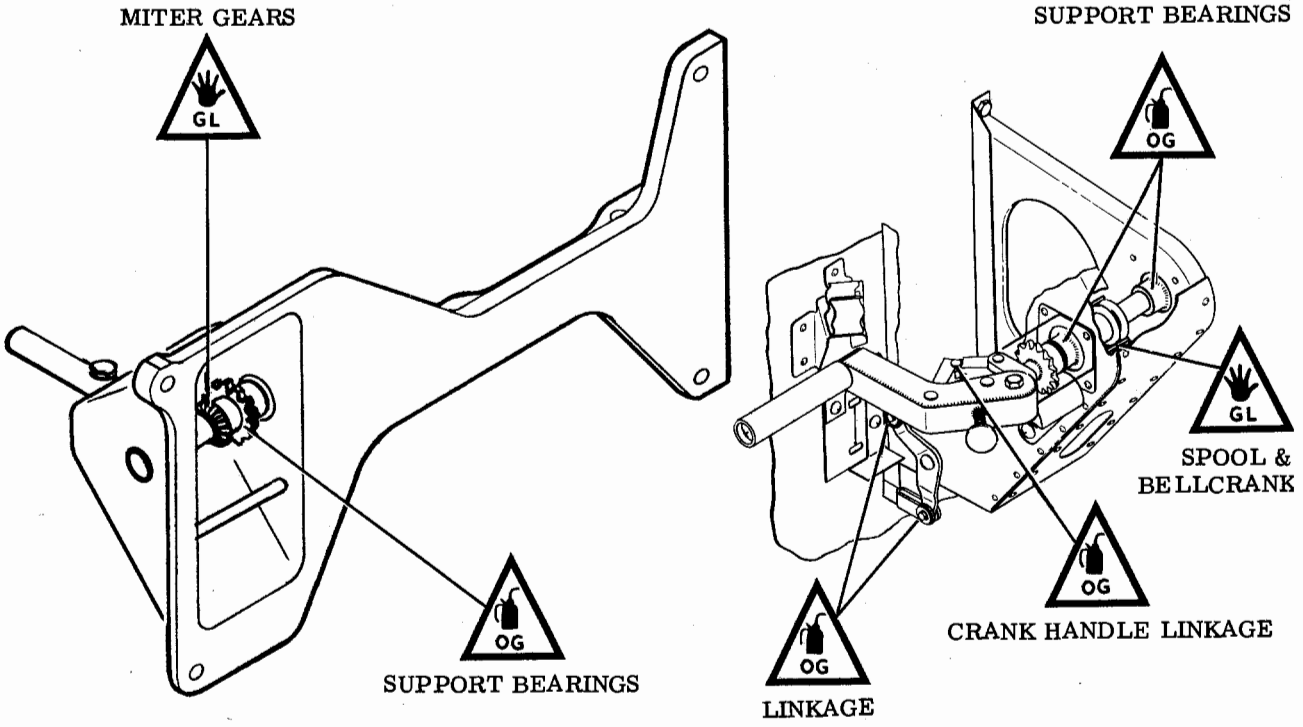



Figure 2-36. Lubrication Diagram (Sheet 5)

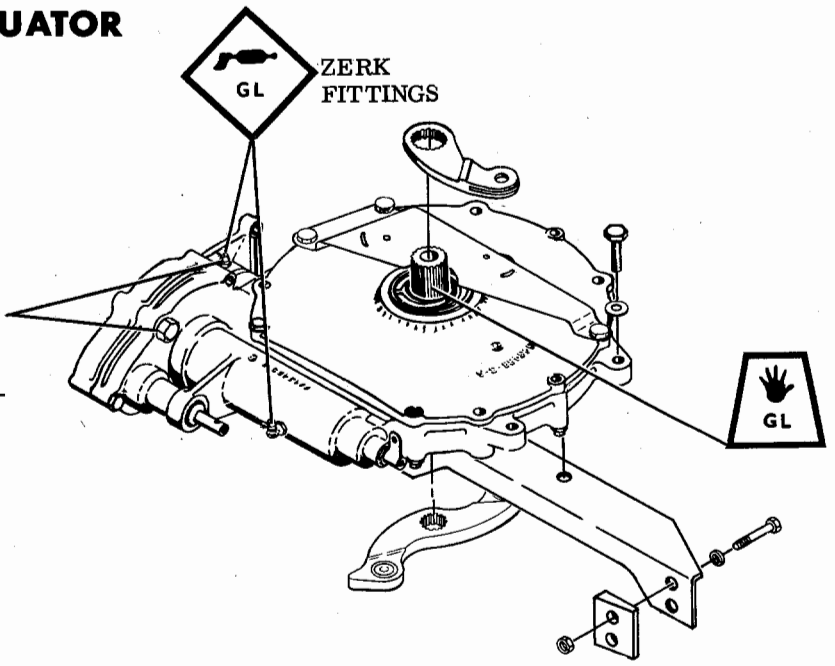
## LANDING GEAR MANUAL EXTENSION MECHANISM

NOTES:
1. AFTER LUBRICATING, WIPE OFF EXCESS LUBRICANT ADJACENT TO CRANKING HANDLE.

2. DO NOT OIL THE CHAIN; AN OILED CHAIN MAY COLLECT DIRT AND GRIT. WIPE CHAIN WITH A CLEAN DRY CLOTH.




## LANDING GEAR ACTUATOR GEAR BOX




NOTE

WHEN GREASING THIS FITTING REMOVE THIS BOLT TO PREVENT BREAKING SEAL, REINSTALL WHEN FINISHED GREASING.

NOTE

APPROXIMATELY 3 PUMPS ON A HAND GREASE GUN WILL GIVE ADEQUATE LUBRICATION.

Figure 2-36. Lubrication Diagram (Sheet 6)

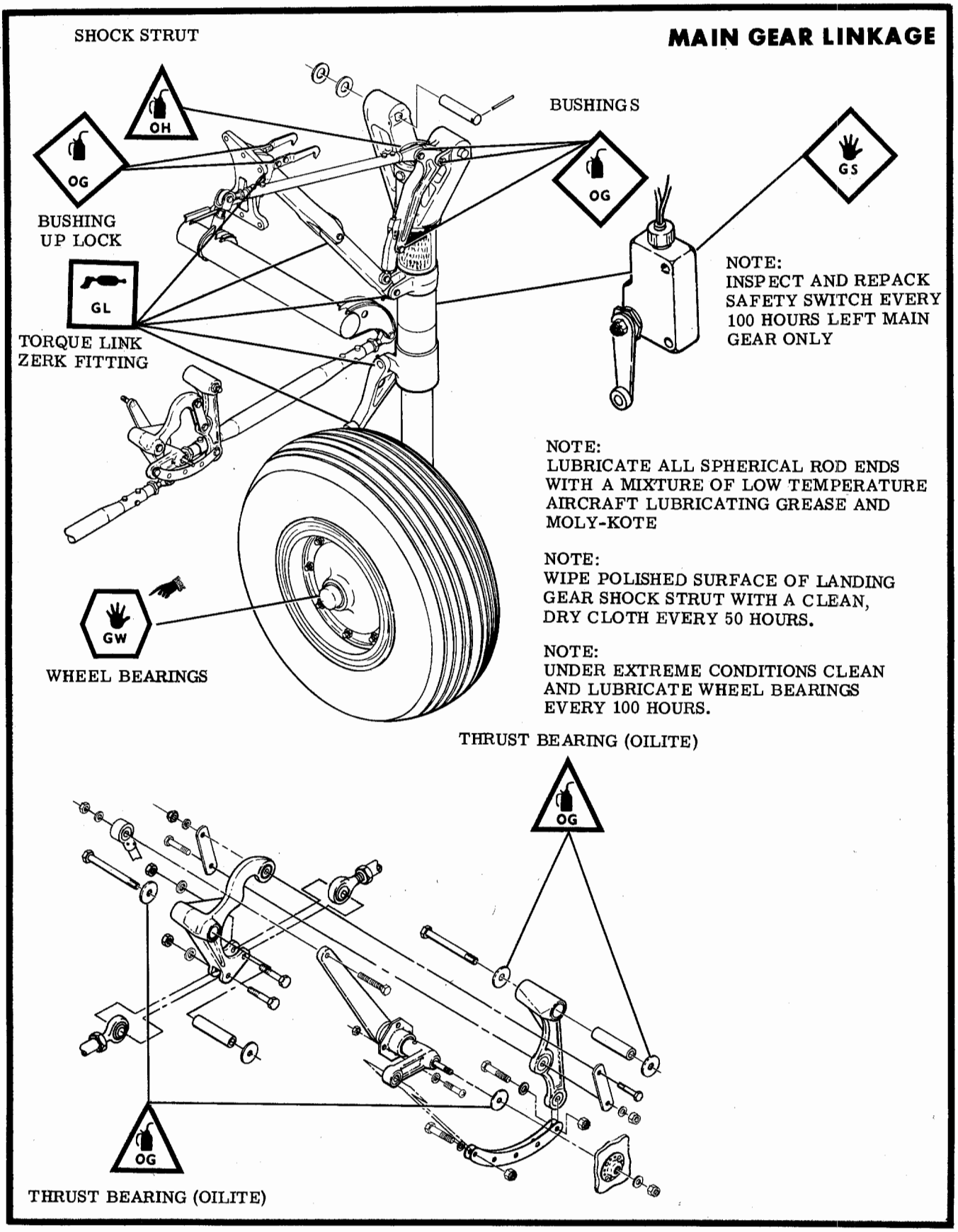



Figure 2-36. Lubrication Diagram (Sheet 7)

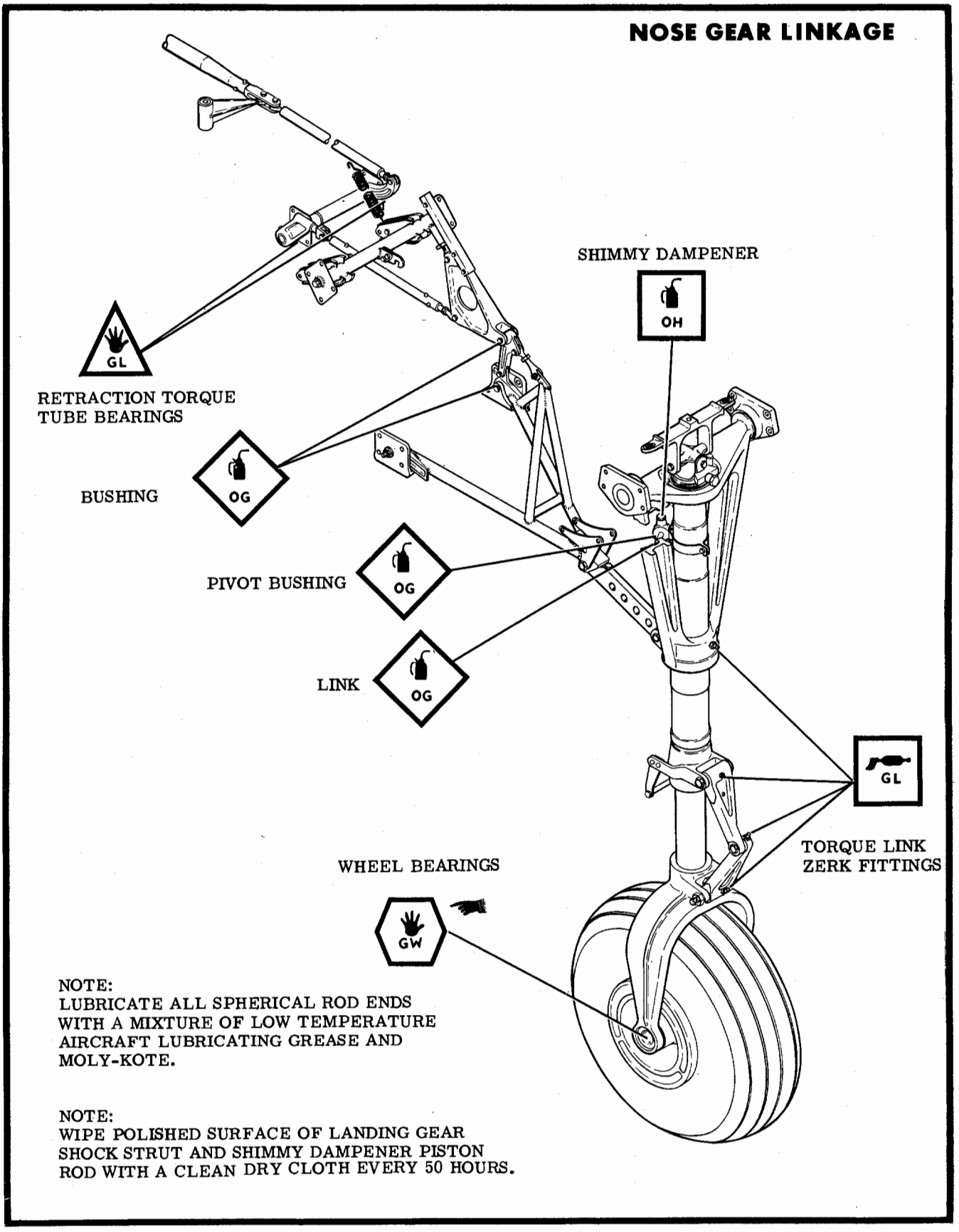



Figure 2-36. Lubrication Diagram (Sheet 8)

## RUDDER PEDAL MECHANISM

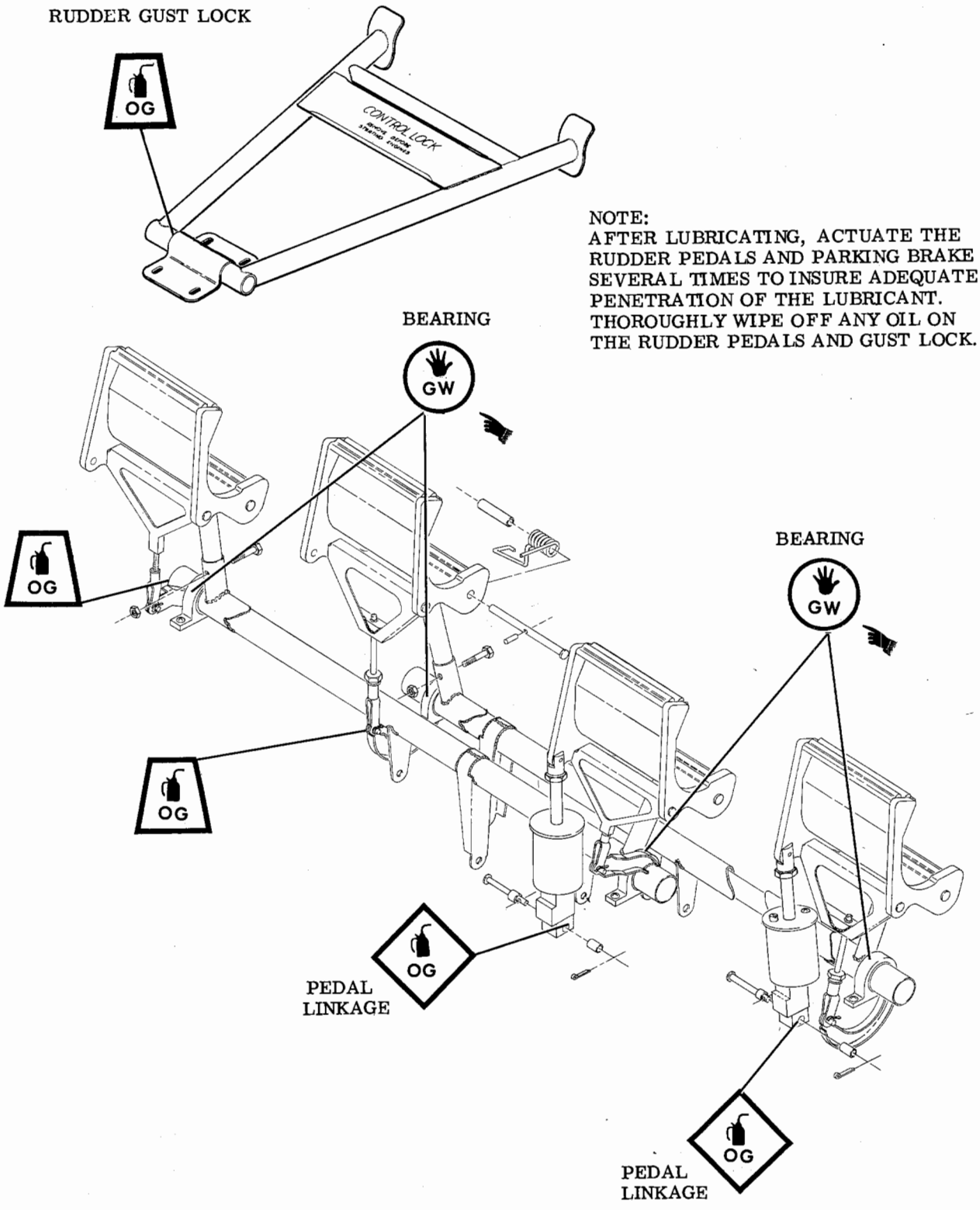
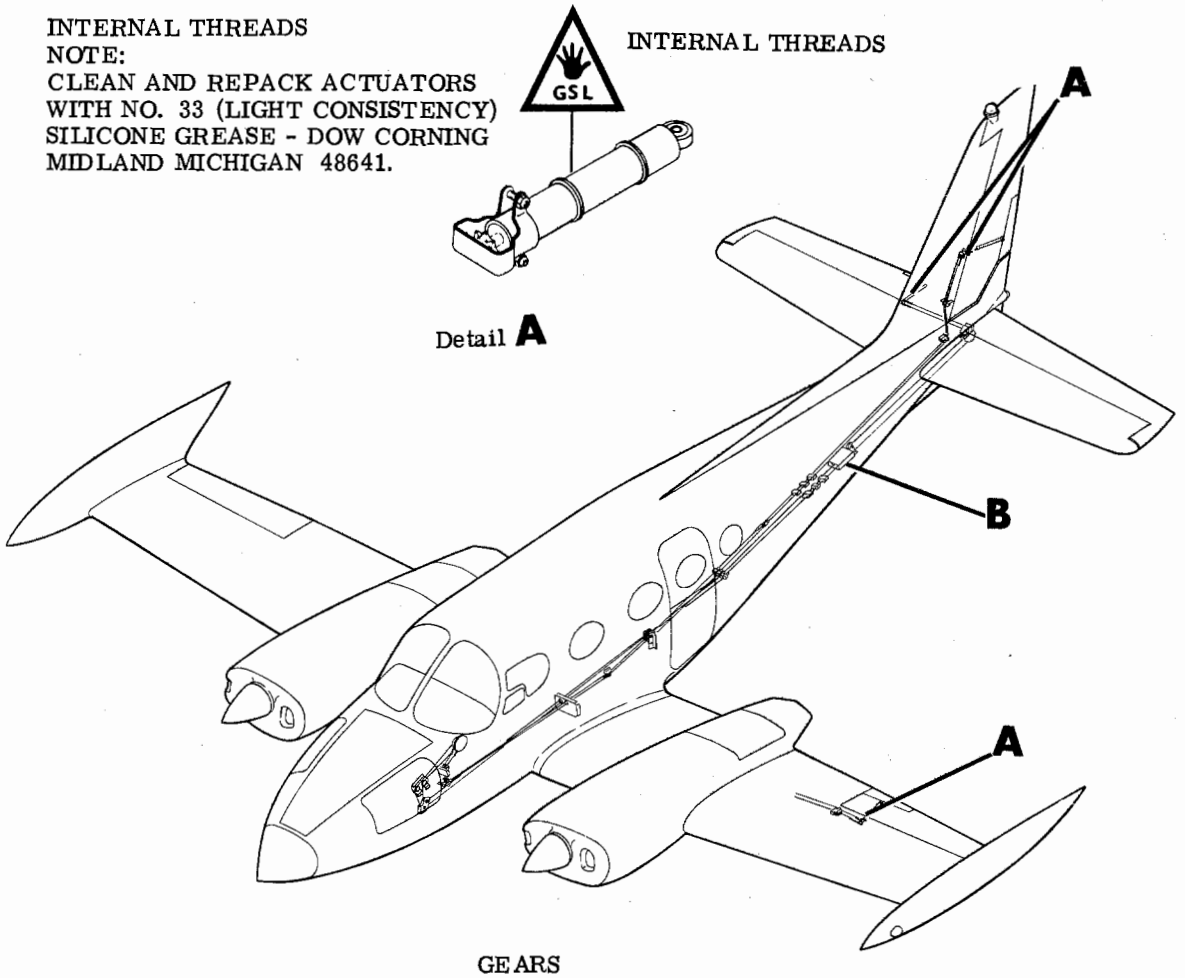



Figure 2-36. Lubrication Diagram (Sheet 9)

## TRIM TAB ACTUATORS

INTERNAL THREADS
NOTE:
CLEAN AND REPACK ACTUATORS WITH NO. 33 (LIGHT CONSISTENCY) SILICONE GREASE - DOW CORNING MIDLAND MICHIGAN 48641.




## ELECTRIC ELEVATOR TRIM TAB ACTUATOR

NOTE

ELECTRIC TRIM TAB ACTUATOR DRUM AND CABLE MUST BE FREE OF GREASE AND OIL.

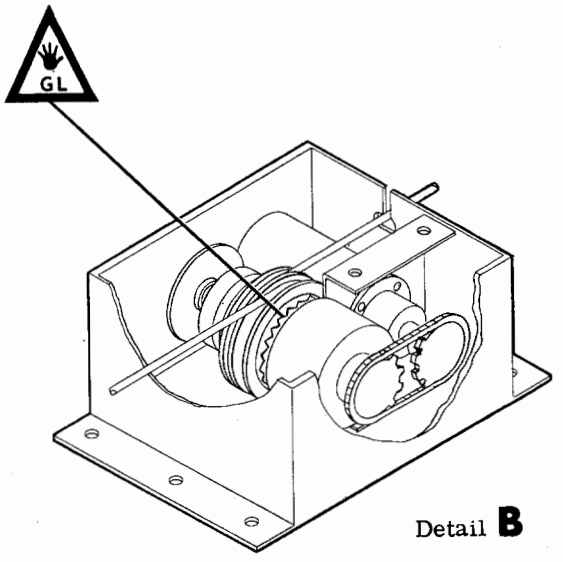



Figure 2-36. Lubrication Diagram (Sheet 10)

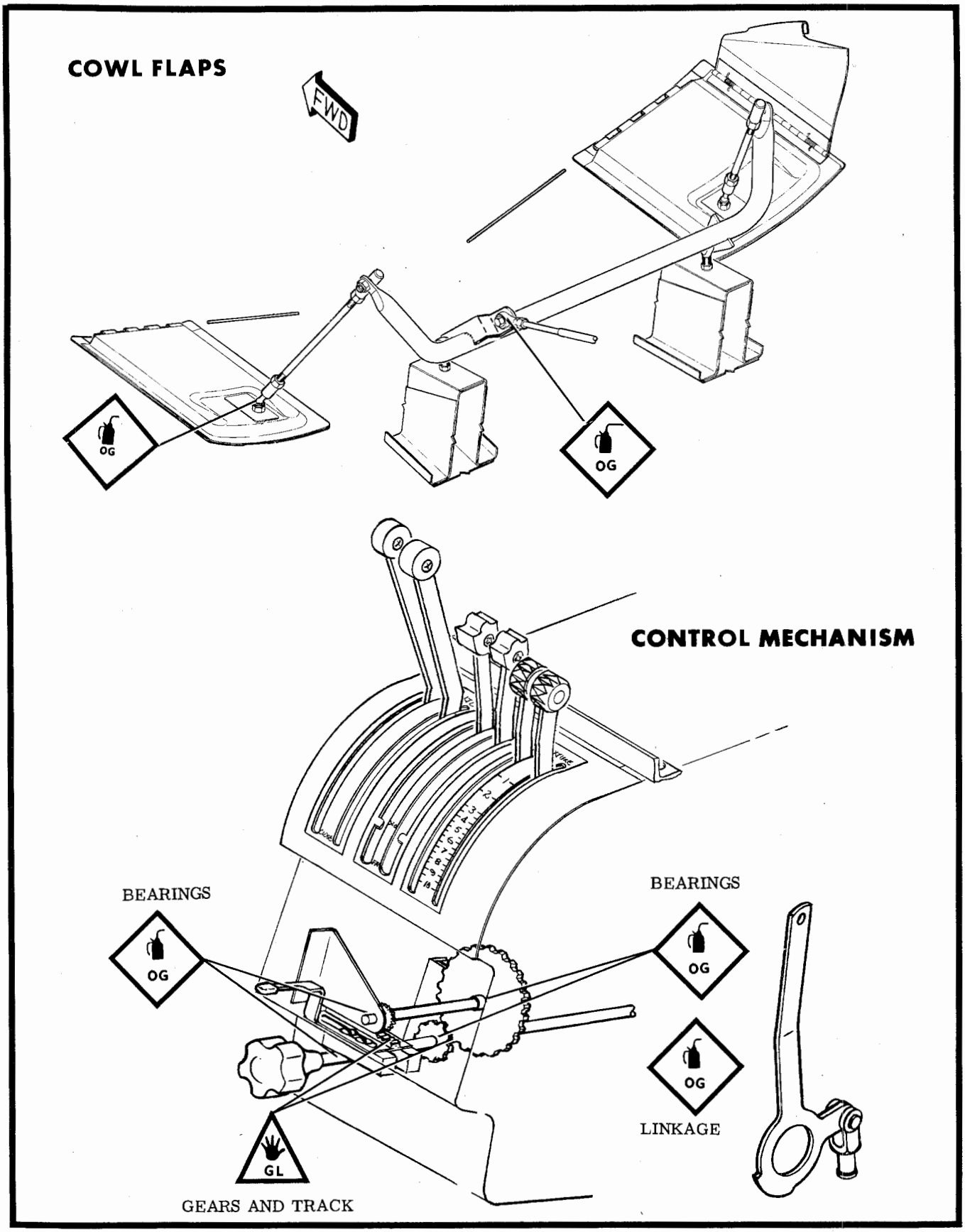
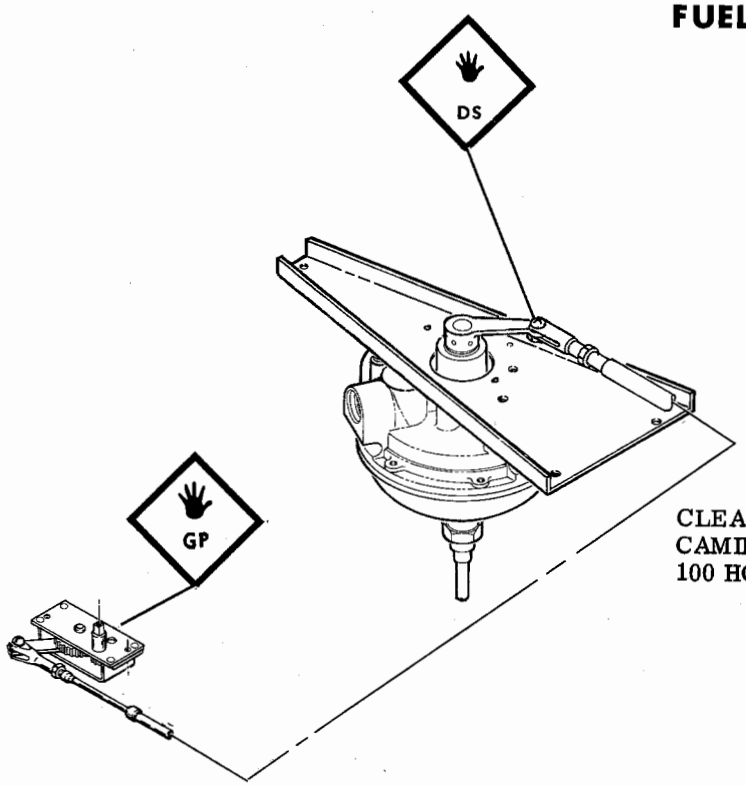



Figure 2-36. Lubrication Diagram (Sheet 11)

## FUEL SELECTOR




NOTE

CLEAN AND LUBRICATE CONTROL WITH CAMIE DRY SPRAY LUBRICANT EVERY 100 HOURS.

## LANDING LIGHT

NOTES
1. THE LIGHT MUST BE EXTENDED TO LUBRICATE THE LARGE SECTOR GEAR. WIPE OFF EXCESS GREASE FROM GEAR SECTOR BEFORE RETRACTING THE LIGHT.
2. THE OPTIONAL RIGHT WING LANDING LIGHT, IF INSTALLED, MAY BE LUBRICATED IN THE SAME MANNER.

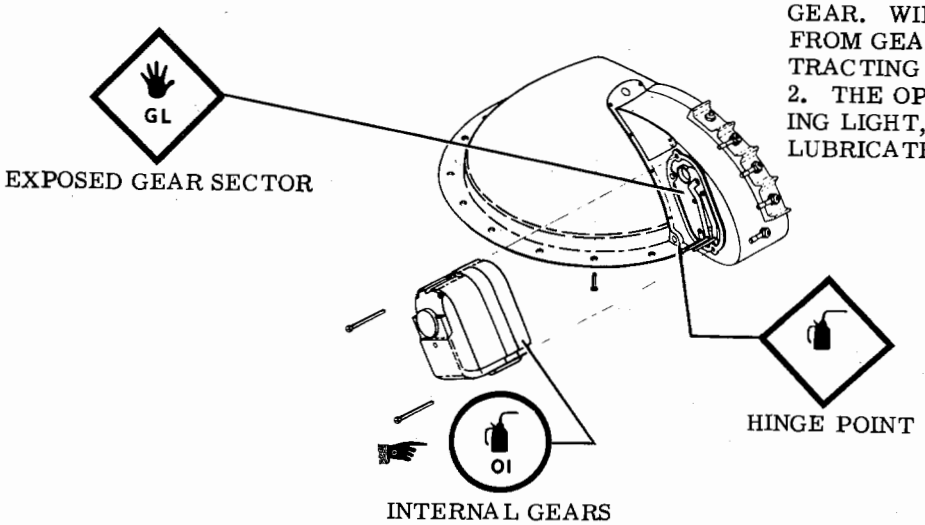
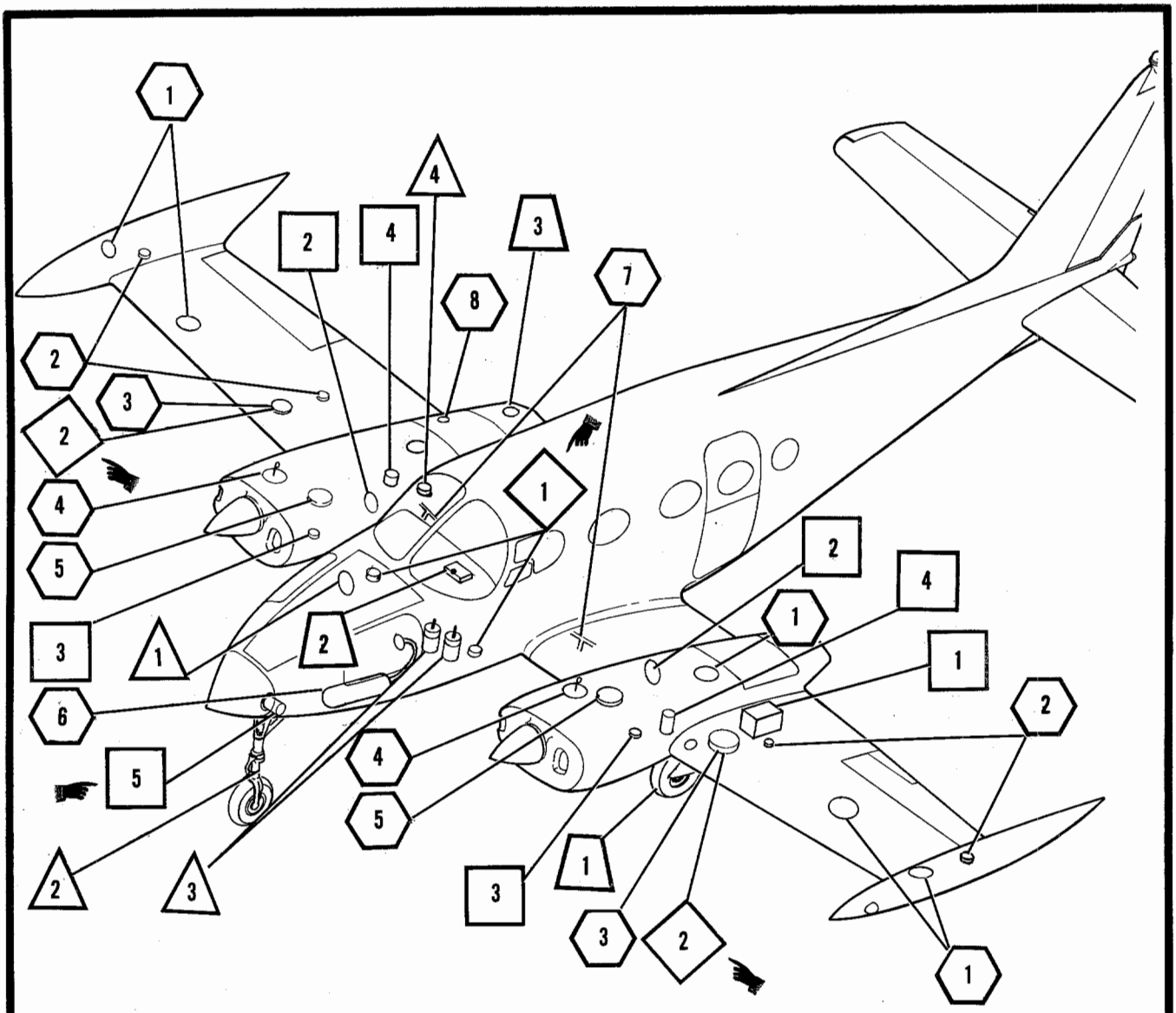



Figure 2-36. Lubrication Diagram (Sheet 12)



SERVICING PROCEDURES

For convenience, the items listed below are segregated into servicing intervals; that is, all items which must be checked or serviced daily are listed, then items requiring 50-hour service are listed, etc. The numbered symbol at each item refers to the item as shown in the Servicing Diagram.

SERVICING CHART

Symbol denotes servicing interval. Number within symbol refers to component to be serviced.

| CHECK OR SERVICE DAILY | SERVICE AT 50 HOURS | SERVICE AT 100 HOURS | SERVICE AT 200 HOURS | SERVICE AS REQD. |
|---|---|---|---|---|

Figure 2-37. Service Chart (Sheet 1)

DAILY

1 FUEL TANK FILLERS:
Service after each flight. Keep full to retard condensation in tanks. Service with 100/130 or alternate 115/145 aviation gasoline. Capacity each tip tank: 51 U. S. Gals., 42. 5 Imp. Gals., or 193 Liters. Capacity each auxiliary (optional) tank: 20 U. S. Gals., 17. 1 Imp. Gals., or 77. 5 Liters and/or 11. 5 U. S. Gals., 9. 6 Imp. Gals. or 43. 5 Liters. Capacity each wing locker (optional) tank: 20. 3 U. S. Gals., 16. 8 Imp. Gals., or 76. 8 Liters.

2 FUEL TANK DRAINS:
On the first flight of each day and after each refueling, drain a small amount of fuel from the fuel selector drain valve.

3 FUEL SELECTORS:
On the first flight of each day and after each refueling, drain a small amount of fuel from the fuel selector drain valve.

4 OIL DIPSTICKS:
Check oil level before each flight. Capacity for each engine oil sump is 13 U. S. quarts, including 1 quart for oil filter (do not operate on less than 9 quarts).

5 OIL FILLER CAPS:
Check oil level before each flight. Capacity for each engine oil sump is 13 U. S. Qts. which includes one Qt. for oil filter. (Do not take off on less than 9 Qts. ) When pre-flight shows less than 9 Qts., service with aviation grade engine oil, SAE 30 below 40°F, SAE 50 above 40°F. The aircraft is delivered from the factory with straight mineral oil, therefore, it will be necessary during the break-in period or first 20 to 30 hours of operation to add straight mineral oil Military Specification (MIL-L-6082). Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting and turbocharger controller operation in cold weather. Ashless dispersant oil, conforming to Continental Motor Specification MHS-24A, must be used after the first 20 to 30 hours of new or overhauled engine operation.

6 OXYGEN CYLINDER (OPTIONAL):
Check oxygen pressure gage for anticipated requirements before first flight. Whenever pressure drops below 300 PSI, refill with aviator's breathing oxygen, Military Specification MIL-O-27210. See Section 13 for allowable filling pressure.

7 FUEL LINE CROSSOVER DRAINS:
On the first flight of each day, drain two ounces of fuel from each valve.

8 AIR CONDITIONING RESERVIOR:
Check hydraulic fluid level before flight - service with Military Specification MIL-H-5606 (RED)

50 HOURS

1 BATTERY:
Check level of electrolyte every 50 hours or at least every 30 days; more often in hot weather. Maintain level of electrolyte in the filler hose even with the bottom of the vent well by adding distilled water.

2 INDUCTION AIR FILTERS:
Service every 50 hours or more often when operating in dusty conditions. Under extremely dusty conditions, daily maintenance of the filter is recommended. Follow instructions stamped on filter frame.

Figure 2-37. Service Chart (Sheet 2)

50 HOURS (CONTINUED)

3 OIL SUMP DRAINS AND OIL FILTERS:
Change oil, remove and replace filters. After break-in oil (mineral oil) is removed, change engine oil filter element every 50 hours and oil every 100 hours. Change engine oil at least every six months, even though less than 100 hours have accumulated. Reduce periods for prolonged operation in dusty areas, cold climates, or where short flights and long idle periods are encountered which cause sludging conditions. Always change oil and replace filter element whenever oil on dipstick appears dirty. Use caution when installing filter element so as not to overtorque.

4 OIL SEPARATORS:
Remove oil separator element and clean with Stoddard Solvent, dry with compressed air.

5 SHIMMY DAMPER:
Check fluid level and fill as required with hydraulic fluid, Military Specification MIL-H-5606A (Red).

100 HOURS

1 SUCTION RELIEF VALVE:
Check suction relief valve screen for dirt or obstructions if suction gage reading reading appears high. Remove screen and clean with compressed air or wash with Stoddard Solvent.

2 FUEL SELECTOR VALVE CONTROL:
Clean and lubricate with Camie 1000, Dry Spray Lubricant.

200 HOURS

1 VACUUM SYSTEM FILTER:
Clean at 200 hours, replace with new filter (standard) P/N C294501-0101 or (optional) P/N C294501-0201.

2 SHOCK STRUTS:
Check and fill to level of filler plug with hydraulic fluid, Military Specification MIL-H-5606A (Red).

3 BRAKE MASTER CYLINDERS:
Check fluid level in reservoirs and fill as needed through plug on cylinder heads. Fill with hydraulic fluid, Military Spccification MIL-H-5606A (Red).

4 HEATER FUEL FILTER:
Remove filter and wash thoroughly with unleaded gasoline.

AS REQUIRED

1 TIRES:
Nosewheel tire maintain 40 PSI. Main wheel tire maintain 60 PSI.

2 FUEL SELECTOR VALVE GEARBOX:
Clean thoroughly with a suitable solvent. Allow to air dry and lubricate by hand with general purpose grease.

3 WINDSHIELD ANTI-ICE RESERVIOR:
Check fluid level and fill as required with isopropyl alcohol MIL-F-5566.

Figure 2-37. Service Chart (Sheet 3)

EXTREME WEATHER MAINTENANCE.

Cold Weather.

After the last flight of the day, drain engine oil into clean containers so it can be preheated. Cover the engines, including the rear air scoop opening, to prevent ice or snow from collecting inside the cowling. When preparing an engine for operation after using this procedure, preheat the oil. After preheating the oil, gasoline may be mixed with the oil in a ratio of one part gasoline to 12 parts oil before pouring the oil in the engines. If free air temperature is below -29°C (-20°F), the engine compartments should also be preheated with a ground heater. Check all engine compartment drain and vent lines for presence of ice. Remove protective covers placed on engines and rear cowl opening. Pull propellers through several revolutions by hand before starting the engines.

WARNING

Preheat oil before diluting with gasoline, and do not heat above 121°C (250°F), to prevent the possibility of a flash fire. Before pulling propellers through by hand, insure the magneto switches are OFF.

CAUTION

Due to the desludging effect of the diluted oil, engine operation should be observed closely during initial warmup of the engines. Engines that have a considerable amount of operational hours accumulated since their last dilution period may be seriously affected by the dilution process. This will be caused by the diluted oil dislodging sludge and carbon deposits within the engines. This residue will collect in the oil sumps and possibly clog the screened inlet to the oil pumps. Small deposits may actually enter the oil pumps and be trapped by the main oil filter screens. Partial, or in some cases, complete loss of engine lubrication may result from either condition. If these conditions are anticipated after oil dilution, the engines should be run for several minutes at normal operating temperatures and then stopped and inspected for evidence of sludge and carbon deposit in the oil sumps, oil coolers, and oil filter screens. Future occurrence of this condition can be prevented by diluting the oil prior to each oil change. This will prevent accumulations of sludge and carbon deposits within the engines.

Hot Weather.

In hot weather, with hot engine, fuel may vaporize at certain points in the fuel system. Vaporized fuel may be purged by setting the mixture control in IDLE CUT-OFF and operating the auxiliary fuel pump on "HI."

Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhaust are caused by over-priming or flooding. This situation is more apt to develop in hot weather, or when the engine is hot. If it occurs, repeat the starting routine with the throttle approximately one-half OPEN, the mixture control in IDLE CUT-OFF, and the auxiliary fuel pump switch OFF. As the engine fires, move the mixture control to full RICH and decrease the throttle to desired idling speed.

Engine mis-starts characterized by sufficient power to disengage the starter but dying after 3 to 5 revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting routine but allow additional priming time with the auxiliary fuel pump switch to "LO" before cranking is started, or place the auxiliary fuel pump switch on "HI" immediately for a richer mixture while cranking.

If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the starter.

Dusty Conditions.

Dust inducted into intake systems is probably the greatest single cause of early engine wear. Under high dust conditions, the induction air filters should be serviced daily.

Seacoast and Humid Areas.

In salt water areas, special care should be taken to keep engines and engine accessories clean to prevent oxidation. Fuel and oil should be checked frequently and drained of condensed moisture in humid areas.

MISCELLANEOUS SERVICE ITEMS.

Cold Weather Servicing.

If the aircraft is to be frequently used in extremely cold weather, the oil should be drained while the engine is hot and stored in a dry warm place until needed for next flight. If desired, the oil may be heated before it is poured into the engine for the next flight.

a. Drain oil system as follows:
1. Start engine and run until oil temperature is within normal operating limits.
2. Stop engine and open oil drain access.
3. Remove drain plug and allow sump to completely drain.
4. Install drain plug and close oil drain access.

WARNING

When preheating the oil, do not allow the temperature of the heated oil to rise above 121°C (250° F). Heating the oil above this temperature may cause a flash fire. Just before shutting down the engine in cold weather a quart of gasoline may be added to the oil in the sump to dilute the oil for the next start.

Fuel System Servicing

The standard fuel system is comprised of two main tip tanks. Each main tank has a capacity of 51. 0 U. S. gallons of which 50. 0 U. S. gallons are usable. Optional fuel systems include two auxiliary fuel tanks with a capacity of 20. 5 U. S. gallons each tank of which 20. 0 U. S. gallons are usable (340-0001 to 340-0151). On aircraft 340-0151 and ON two optional fuel tanks are available with a capacity of 11. 5 U. S. gallons each tank of which 11. 5 U. S. gallons are usable. The optional wing locker fuel tanks in each wing have a capacity of 20. 5 U. S. gallons each tank of which 20. 0 U. S. gallons are usable. This provides a total usable fuel capacity of 203. 0 U. S. gallons in both wings.

NOTE

Fuel servicing rates on some ground servicing equipment may tend to exceed the aircraft's fuel system intake rate, thus creating several false "Full" indications. A slower fueling rate is therefore recommended.

Fuel System Drains.

The fuel system has incorporated two drain valves which must be drained before the first flight each day to check for water or sediment. Two fuel selector valves and two crossover drain valves are drained by pushing up on the valve stem. The fuel selector valves are located outboard of the nacelles in the leading edge, while the crossover drain valves are located in the wing gap area inboard of the nacelles in the leading edge. The auxiliary and optional tank drain valves are located outboard of the nacelle and forward of the rear spar. These drain valves are drained by pushing up on the center plunger.

Defueling.

The defueling procedures given pertain to either wing. A standard defueling truck or defueling pump is necessary to defuel the aircraft.

CAUTION

During all defueling, tank purging and tank repairing operation, the aircraft must be located a safe distance from other aircraft and buildings. Fire fighting equipment must be available. The use of two ground wires from different points on the aircraft to separate approved grounding stakes shall be used to prevent ungrounding of the aircraft due to accidental disconnecting of one ground wire.

a. Turn off all electrical power.
b. Turn fuel selector valve handles off.
c. Remove filler cap and insert defueling tube. Remove as much fuel as possible through the filler.
d. Cut safety wire and remove drain valves from the bottom side of the wing and drain remaining fuel in a clean open container. Use defueling pump to remove fuel from container.
e. Drain the crossover lines at the wing gap drain valve.

WARNING

Residual fuel accumulation in the wing is a fire hazard. Use care to prevent the accumulation of such fuel.

Purging Main Fuel Tanks and Auxiliary Fuel Cells.

To reduce the possibility of an explosion during repair, purge fuel tanks and fuel cells with an inert gas such as Argon. Since Argon is heavier than air, it will remain in the fuel tank or cell during the repair. Repairs shall be made using non-sparking tools (air motors, plastic scrapers, etc.). The use of a portable vapor detector (Mine Safety Appliances Explosimeter, Model 5 Indicator) to detect the presence of explosive gases is also recommended.

a. Defuel the aircraft in accordance with defueling procedure.
b. Insert hose through filler opening into fuel tank or cell.
c. Attach hose to inert gas container and allow inert gas to flow into the fuel tank or cell until all explosible gas vapors are dissipated.

NOTE

The length of time required to fill the fuel tank or cell with inert gas is dependent upon rate of flow and tank capacity.

SPECIAL TOOLS AND EQUIPMENT.

The relative simplicity of easy accessibility of 340 components eliminates the use of many special tools.

In most cases, the well equipped shop will find it necessary to employ only the following special tools which are available through the Cessna Dealers' Organization.

| Part No. | Nomenclature |
|---|---|
| C173001-0101 | Towing Bar - Light Duty |
| 2-170 | Jack |
| SK320-2 | Fuel Pressure Test Kit |
| SE608 | Motor Mount Wrench (for use with 0851559 lockwasher) |
| SE716 | Inclinometer |
| 5090006-9 | Propeller Torque Wrench Adapter |
| SK421-1 | Pressurization System Leakage Test Kit |
| SK310-32 | Oxygen Refill Kit |
| 0880002-3 | Hook |
| 0880001-1 | Actuator Arm Tension Measuring Tool |
| FT251 | Reamer Tool |
| SK182-43 | Cylinder Head Calibration Unit |
| 0880004-1 | Ring Pack Support Tool |
| 0880004-2 | Ring Pack Support Tool |
| SK421-40 | Exhaust System Seal Replacement Tool Kit |
| SK150-20 | Wheel Balancer Kit |
| 5090005-1 | Alternator Hub Wrench |
| 5090002-1 | Tool, Pressure Ratio Controller |
| CM3 | Screwdriver/Sampler Cup |

MISCELLANEOUS INSPECTION.

To avoid repetition throughout the inspection, general points to be checked are given below. In the inspection, only the items to be checked are listed and details as to how to check or what to check for, are excluded. Refer to Inspection Chart for interval.

Check as Applicable:

Movable Parts.

Inspect for lubrication, servicing, security of attachment, binding, excessive wear, safetying, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing, and tensions.

Engine Compartment Hoses.

Inspect for leaks, cracks, chafing, kinks, deterioration, security, heat hardness, obstructions and foreign matter. The hoses and wire bundles in the heat areas close to the exhaust and turbocharger should be inspected for heat hardness, cracking, flexibility and security during regular engine inspection. (See figure 2-7 for interval.)

Fluid Lines and Hoses.

Inspect for leaks, cracks, dents, kinks, chafing, proper radius, security, corrosion, deterioration, obstructions and foreign matter.

Metal Parts.

Inspect for security of attachment, cracks, metal distortion, broken spot-welds, corrosion, condition of paint and any other apparent damage.

Wiring.

Inspect for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration and corroded terminals. Inspect wire bundles in high heat areas such as close proximity of exhaust stacks or turbocharger for heat damage.

Bolts in Critical Area.

Inspect for correct torque in accordance with torque values given in the chart in Section 1, when installed or when visual inspection indicates the need for a torque check.

Filters, Screens and Fluids.

Inspect for cleanliness, contamination, and/or replacement at specified intervals.

Post Inspection.

Post inspections should be made after the last flight of the day. All pilot and operating discrepancies relating to the flight and safety of flight must be corrected before the next flight.

a. Remove necessary access plates, doors and fairings to gain access to flight controls, engines and electronics equipment only to correct discrepancies.

b. Make sure all systems are operating properly.

c. Ground check engine, check ignition drop, alternator charging rate, oil pressure and general operation of components, when post inspection reveals it necessary.

Aircraft File.

Inspect for miscellaneous data, information and licenses that are a part of the aircraft file. (See Inspection Chart, Figure 2-7.)

| COMPONENT | LOCATION |
|---|---|
| Air Conditioning System (Belt Driven) | |
| Blower Relay | Under RH floorboard Station 197.00 |
| Charging Ports | Under rear baggage shelf |
| Condensate Tank | Under floorboard right side F.S. 209.41 |
| Expansion Valve | On each evaporator |
| High Pressure Switch | In liquid injection line leading to manifold |
| Pressure Switch | Right wing locker |
| Sight Gage | Right evaporator |
| Solenoid Shutoff Valve | Under floorboard F.S. 197.14 in manifold |
| Temperature Relay | Under floorboard on RH evaporator bracket |
| Resistor | (Aircraft with 12 V clutch) Under floorboard at RH evaporator |
| Air Conditioning System (Hydraulic Driven) | |
| Hydraulic Pump | RH engine compartment |
| Compressor Drive Assembly | RH wing locker compartment |
| Reservoir (Hydraulic Fluid) | RH wing locker compartment |
| Manifold and Valve Assembly | RH wing locker compartment |
| Condenser Blower Motor | RH wing locker compartment |
| Condensers | RH wing locker compartment |
| Drain Valve (Hydraulic Fluid) | RH wing locker compartment |
| Low Pressure Switch | RH wing locker compartment |
| High Temperature Switch | RH wing locker compartment |
| Receiver-Dryer | RH wing locker compartment |
| Expansion Valve | On each evaporator |
| Sight Gage | RH evaporator |
| Charging Ports | Under rear baggage shelf |
| Evaporators | Under rear baggage shelf |
| Blower Relay | RH evaporator |
| Alternate Static Source Valve | Left side panel forward of circuit breakers |
| Alternate System | |
| Emergency Field Fuse | Mounted on wing rib wing Station 95.47 |
| Fail Light Diode | Mounted on alternator |
| Fail Light | Annunciator panel |
| Fail Module | Mounted on alternator |
| Filter Capacitor | Mounted under voltage regulator left of pilot seat |
| Ammeter | Left side panel |
| Shunts | Behind left circuit breaker panel |
| Battery Solenoid | Support, aft of battery box in LH wing |
| Cigar Lighter Resistor | Pilots seat base (340-0301 to 340-0501) |
| Deice System (Wing) | |
| Timer | Left side panel |
| Control Switch | Left side panel |
| Pressure Switch | Under floorboards RH side aft of front spar |
| Deice System (Propeller) | |
| Timer | Right aft side 100.00 pressure bulkhead |
| Engine | |
| Cylinder Head Temperature Bulb | Lower side of number 3 cylinder |
| EGT Probe | In exhaust tube aft of #2 cylinder |
| Oil Temperature Bulb | Aft side of engine under oil cooler |
| Tachometer Generator | Accessory drive aft side of engine |
| External Power Relay | LH wing rib Station 89.20 |
| External Power Receptacle | Under fuselage wing root fairing |
| Elevator Trim Actuator | In tailcone aft of F.S. 282.00 |

Figure 2-38. Components Location Chart (Sheet 1 of 3)

| COMPONENT | LOCATION |
|---|---|
| Flap System | |
| Position Indicator | Part of preselect system |
| Limit Switches | Mounted on actuator mounting bracket |
| Actuator | Located aft of rear spar under floorboards |
| 400A Autopilot Resistor | Located on flap actuator mounting bracket |
| Flight Hour Recorder | Forward RH upholstery side panel |
| Actuator Switch | LH main landing gear safety switch |
| Fuse | Forward edge of terminal block behind circuit breaker panel |
| Finish and Trim Plate | Forward left side on nose wheel web |
| Fuel System | |
| Drain Valves | Wing gap area and under each fuel tank |
| Selector and Strainer | Outboard of nacelles in leading edge |
| Boost Pump Relays | Forward of instrument panel on support |
| Transfer Pump (Main Tank) | Aft side of main tank bulkhead |
| Pressure Switch | Engine nacelle aft of engine |
| Signal Conditioner | Located outboard of each nacelle on wing rib |
| Tank Vent Heaters | End of vent lines below fuel tanks |
| Wing Locker Transfer Pump | Outboard of wing locker in wing |
| Fuel Pump Resistors | Mounted on forward pilot seat support |
| Heater | |
| Filter and Solenoid | Right wing leading edge W. S. 44. 14 |
| Ignitor Plug | Located on heater |
| Shutoff Valve (Manual) | RH wing leading edge W. S. 44. 14 |
| Thermostat | Inside RH nose ducting F. S. 100. 00 |
| Fuel Pump | Located on combustion blower motor |
| Junction Box (Avionics) | Forward left side of 100. 00 bulkhead |
| Landing Gear | |
| Actuator and Motor | Aft of front spar under floorboards |
| Limit Switches | Mounted on top of landing gear actuator |
| Safety Switch | Left main gear torque link |
| Light Dimming Diode Assembly | Aft side of stationary instrument left of centerline slightly |
| Up Indicator Switches | Mounted on retraction linkage in each wheel well |
| Down Indicator Switches | Mounted on landing gear braces in each wheel well |
| Resistor | Under floorboard on outboard seat rail F. S. 165. 25 |
| Gear Relay | Under floorboard on outboard seat rail F. S. 165. 25 |
| Lighting | |
| Landing | Tip tank tailcone |
| Cabin Entrance | In upper cabin door |
| Wing Locker Baggage | Wing locker sidewall |
| Wing Locker Baggage Switch | Wing locker sidewall |
| Strobe Light Flasher Unit | Mounted in tailcone left side skin |
| Strobe Light Power Supply | Mounted in tailcone left side skin |
| Wing Deice | Outboard side of each engine nacelle |
| Locator Beacon | In dorsal fin |
| Batteries | In base of locator beacon |
| MAA Plate | Left upholstery panel forward of cabin door |
| Outside Air Temperature Bulb | Located in heat exchanger air inlet on belly of aircraft |
| Overhead Flood Light | |
| Dimming Regulator Transistor | Aft part of console under headliner |
| Oxygen Regulator | Top of oxygen cylinder |
| Oxygen Warning Barometric Pressure Switch | Forward of instrument panel on quadrant support |
| Pitot Static System Sump | Aft side of aft pressure bulkhead |
| Pressurization System | |
| Safety Valve | Aft pressure bulkhead |
| Outflow Valve | Aft pressure bulkhead |
| Dump Valve | Wing root area |
| Venturi | Inboard side of each nacelle |

Figure 2-38. Components Location Chart (Sheet 2)

| COMPONENT | LOCATION |
|---|---|
| Propeller | |
| Synchronizer | Control box under glove box |
| Synchronizer Actuator | In engine compartment aft of engine |
| Unfeathering Accumulator | Outboard side of engine mount beam |
| Starter | |
| Solenoid | Left wing root rib |
| Vibrator | Forward of instrument panel on 100.00 bulkhead |
| Stereo Tape Player | |
| Regulator | Mounted on bracket on aft side of stereo player |
| Terminal Blocks | |
| TB1 | Below circuit breaker panel left side |
| TB2 | Forward of instrument panel on elevator control LH support |
| TB5 | Forward LH side of pedestal |
| TB6 | Forward LH side of pedestal |
| TB8 | Right wing root |
| TB9 | Left wing root |
| TB10 | Right wing root |
| TB11 | Left wing root |
| TB13 | Right side of overhead console |
| Tow Bar | Stowed in LH wing locker |
| Vacuum System | |
| Filter | Forward side of 100.00 bulkhead |
| Regulator | Aft engine nacelle |
| Variable Pressure Controller | Stationary instrument panel |
| Voltage Regulators | Left side of pilot seat structure |
| Overvoltage Relays | Left side of pilot seat structure |
| Warning Horn | Forward of instrument panel on 100.00 bulkhead |
| Warning Horn Flasher | Forward of instrument panel on 100.00 bulkhead |
| Windshield Deice Tank | Aft section of RH wing locker |
| Windshield Deice Pump | Aft section of RH wing locker |
| Wemac Blower | Under floorboard left side forward of cabin door |

Figure 2-38. Components Location Chart (Sheet 3)

SECTION 3

# AIRFRAME

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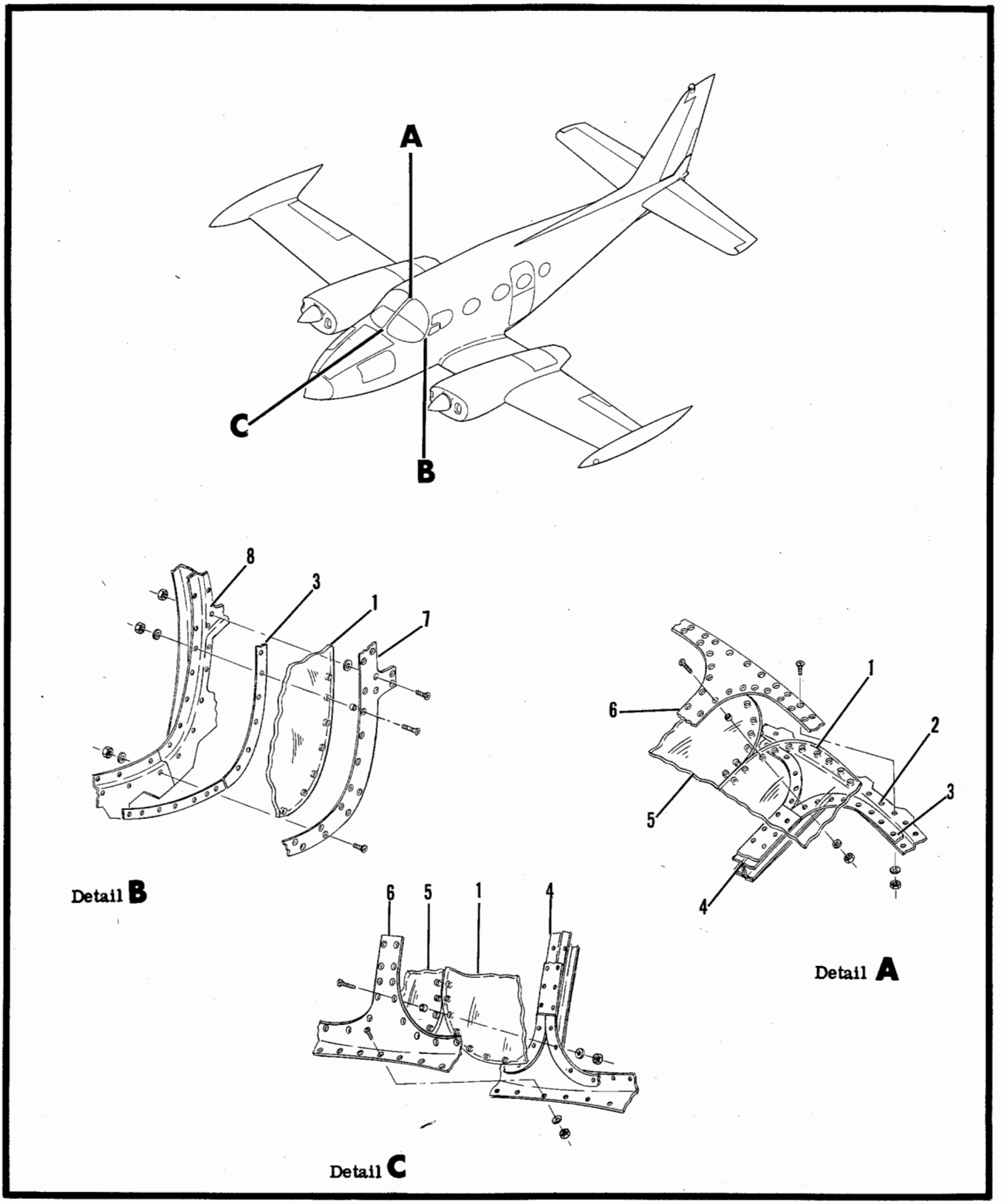
## FUSELAGE.

The fuselage is of semimonocoque construction, pressurized to the skin between pressure bulkheads at stations 100. 00 and 252. 0. All skin, bulkhead and structure joints, plumbing, controls, and wiring connections passing through a pressure wall, access doors, windows, control cables, and torque shafts are sealed to minimize air leakage. Acrylic plastic windows and a two-piece windshield are provided in the fuselage. A pilot's foul weather window, is provided for the pilot. On aircraft 340-0211 and On and aircraft incorporating SK340-7, a foul weather window is provided for the copilot. An emergency exit is provided on the right side of the fuselage at the second window. The cabin entrance door swings down to provide a convenient stairway for boarding the plane. Individual adjusting passenger seats are installed on seat rails secured to floorboard structure. Baggage space and electronics areas are provided in the forward nose section.




1. Left Windshield
2. Lower Retainer
3. Filler
4. Center Strip
5. Right Windshield
6. Upper Retainer
7. Lower Side Retainer
8. Lower Side Retainer

Figure 3-1. Windshield Installation

Windshield. (See figure 3-1.)

The windshield is a two-piece stretched acrylic plastic section. It is secured to the fuselage by screw fastened retainers. The retainers and screws are sealed upon installation to adequately maintain pressurization capabilities of the cabin section.

Removal of Windshield. (See figure 3-1.)

a. Disconnect electrical wiring to magnetic compass, remove screw, nut and compass, remove windshield trim.

NOTE

The following instructions are given for the removal of the LH windshield only. The RH windshield is removed in the same manner.

b. Remove screws and nuts attaching the lower retainer (2) and remove retainer.
c. Remove upper retainer (6) by removing screws and nuts.
d. Remove windshield from aircraft.

Installation of Windshield. (See figure 3-1.)

a. Install sleeve in each attachment hole of windshield.
b. Position windshield half in place and temporarily hold in place with a screw at top and one at bottom of glass until installation of retainers.
c. Fill the void around the edges of glass as described in Section 16.
d. Fay seal between retainers, windshield and skin with sealant using non-crazing accelerator, in accordance with Section 16. Seal all screws by dabbing countersunk or dimpled area with sealant.
e. Align holes in windshield half (1) with holes in frame and secure upper retainer (6) to frame with attaching screws.
f. Install lower retainer (2) with attaching screws.
g. Install trim strip and magnetic compass with attaching screws and nuts.

Removal and Replacement of Foul Weather Window. (See figure 3-2.)

a. Aircraft 340-0001 to 340-0301, remove and replace pilot's weather window as follows:
1. The foul weather window assembly is removed by removing hinge pin securing hinge to the frame at the aft side.
2. Install window assembly by installing the hinge pin securing the hinge to the frame.

b. Aircraft 340-0301 and On, remove and replace pilot's foul weather window as follows:
1. The foul weather window assembly is removed by removing the nuts, washers and screws at the upper and lower hinge brackets and hinge clips.
2. Install window assembly by installing the screws, washers and nuts in upper and lower hinge clips and hinge brackets.

NOTE

Apply Loctite sealant to nuts.

c. Aircraft 340-0211 and On and aircraft incorporating SK340-7, remove and replace copilot's foul weather window assembly as follows:
1. The foul weather window is removed by removing the nuts, washers and screws at the upper and lower hinge brackets and clips.
2. Install window assembly by installing the screws, washers and nuts in upper and lower hinge clips and hinge brackets.

NOTE

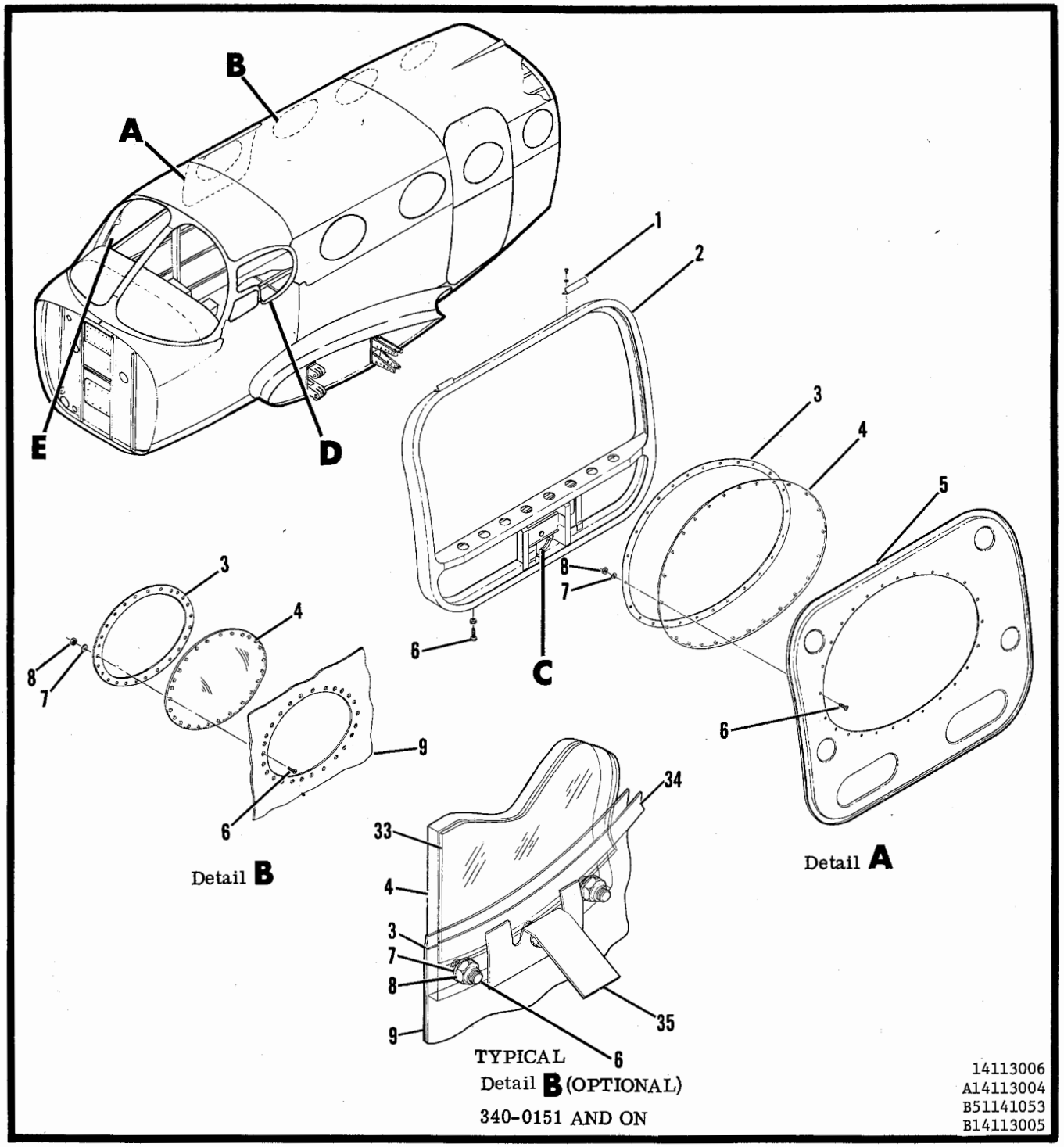
Apply Loctite sealant to nuts.

Cabin Windows. (See figure 3-2.)

The cabin windows are made of one-piece stretched acrylic plastic. The pilot and copilot windows are secured to the structure by screw-fastened retainers. The retainers and screws are sealed upon installation to provide adequate pressurization capabilities of the cabin section. The aft cabin windows are secured to the structure by screws; sealing between the window and structure to provide a cabin pressure seal.

Removal and Replacement of Side Window. (See figure 3-2.)

Remove side window as follows:
a. Remove side window trim.
b. Remove the screws, nuts and washers attaching upper forward retainer to glass.
c. Remove screws (6), nuts (8) and washers (7) attaching window retainer (3) to glass.
d. Remove the screws attaching retainer (3) to frame.
e. Remove retainer (3) and remove window (4).
f. To install window, place glass in position in frame.
g. Fay seal between window and retainer and between skin and retainer in accordance with Section 16. Install retainer (3).
h. Dab sealer in screw holes and attach retainer (3) to frame with screws and attach retainer to glass with screws, nuts and washers.
i. Install window upholstery trim.




1. Clip
2. Escape Door
3. Retainer
4. Window
5. Door Panel
6. Screw
7. Washer
8. Nut
9. Skin
10. Cover
11. Roll Pin
12. Handle
13. Pan
14. Spring
15. Support
16. Handle Support
17. Striker Plate
18. Guide
19. Latch
20. Pin
21. Bearing Plate
22. Cam
23. Hinge Pin
24. Hinge
25. Spacer
26. Foul Weather Window
27. Retainer
28. Frame
29. Doubler
30. Grommet
31. Striker
32. Lock
33. Inner Window
34. Seal Strip
35. Clip

Figure 3-2. Side Window and Escape Hatch Installation (Sheet 1)

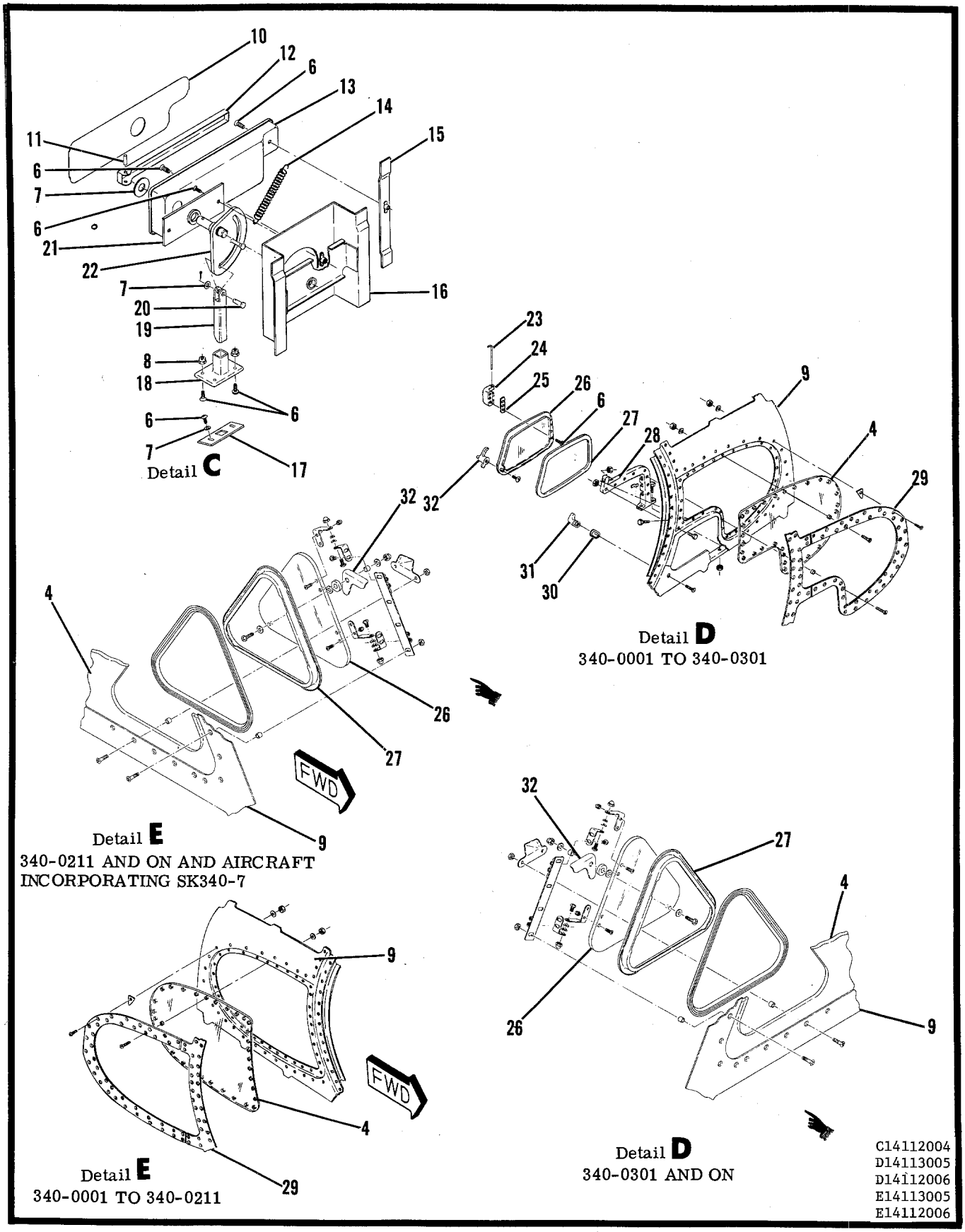



Figure 3-2. Side Window and Escape Hatch Installation (Sheet 2)

Removal and Installation of Escape Hatch. (See figure 3-2.)

a. Remove plexiglass cover (10) from release pan (13) and turn the handle counterclockwise as far as it will turn, (approximately 1/4 turn).
b. Remove hatch by pulling inboard on the handle.

NOTE

Check seal for cuts or deterioration before installation of hatch. Replace seal if questionable.

c. To install hatch, position hatch in place and turn handle to locked position.
d. Install cover (10).

Removal and Installation of Escape Hatch Window. (See figure 3-2.)

a. Remove window trim.
b. Remove screws, nuts and washers securing glass to escape hatch frame and remove glass.
c. Fay seal between glass and skin when placing the glass in position. Refer to Section 16 for sealing procedures.
d. Dab sealant in screw holes and secure glass panel with screws, nuts and washers.
e. Install window trim.

Removal and Installation of Escape Hatch Release Mechanism. (See figure 3-2.)

a. Remove plexiglass cover (10) from pan (13) and turn handle counterclockwise.
b. Remove pan (13) by removing roll pin (11) from handle (12) and removing screws (6).
c. Remove upholstery panel.
d. Remove clevis pin (20) from latch (19) by removing cotter pin and washer.
e. Disconnect spring (14) and remove bearing plate (21) by removing two screws.
f. Remove guide (18) by removing nuts (8) and screws (6).
g. Lubricate moving parts in accordance with Section 2 before installation.
h. The installation of the release mechanism is the reversal of the removal procedure.
i. With handle turned counterclockwise until it is against the stop, make sure latch is fully engaged and will unlatch using handle with no binding.

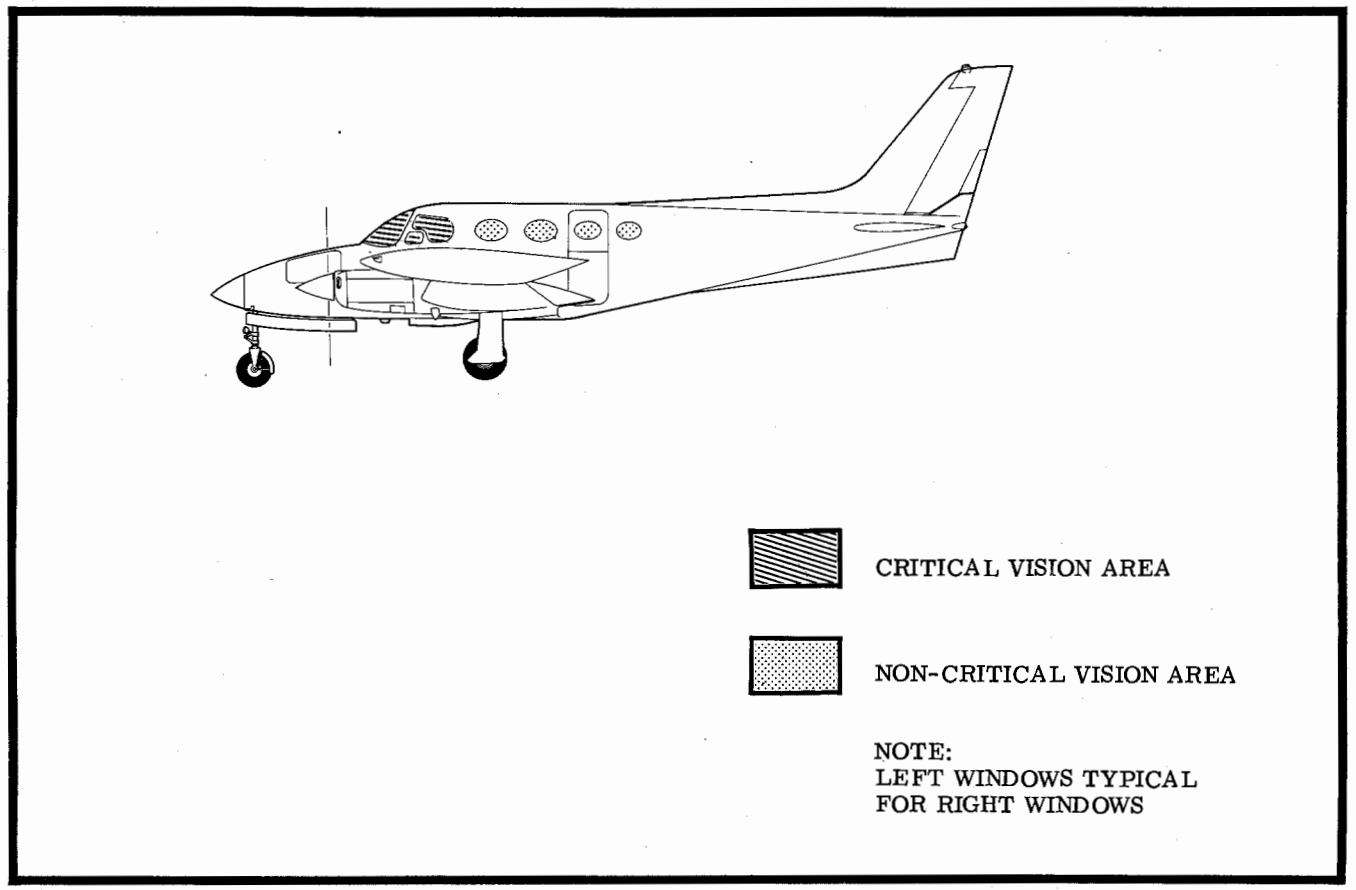



Figure 3-3. Critical Vision Diagram

Removal and Replacement of Cabin Windows. (See figure 3-2.)

a. Remove window trim by removing attaching screws.
b. Remove nuts securing clips (35). Remove clips and inner window (33).
c. Remove nuts, washers and screws securing window and retainer to structure.
d. To install window panel, place window in position. Fay seal between window and structure using a sealant with noncrazing accelerator. Refer to Section 16 for detailed instructions
e. Secure window and retainer in place with screws, washers and nuts.
f. If optional inner windows are installed, cement new seal strip (34) in position using EC2141 adhesive. Cut seal strip to provide a .40 inch gap at lower side.
g. Position inner window against seal strip and secure in place with four clips (35) and nuts over existing nuts, one each at top, bottom, front and aft sides.
h. Install window trim.

Inspection of Plastic Windshield and Windows.

See Plastic Window Inspection Criteria Chart for allowable defects. Repairable defects after repair are considered permanent repairs. "Not repairable" defects may be repaired and/or used only as a temporary repair.

Plastic Windows Inspection Criteria.

| DEFECTS | CRITICAL VISION AREA | | NON-CRITICAL VISION AREA | |
|---|---|---|---|---|
| | MAXIMUM REPAIRABLE | MAXIMUM PERMISSIBLE WITHOUT REPAIRING | MAXIMUM REPAIRABLE | MAXIMUM PERMISSIBLE WITHOUT REPAIRING |
| NICKS AND DENTS | | | | |
| Maximum Diameter. | Not repairable. | 0.025 inch. | 0.250 inch. | 0.125 inch. |
| Depth. | Not repairable. | 0.016 inch. | 0.060 inch. | 0.032 inch. |
| Frequency. | None. | 2 per sq. ft. | 2 per sq. ft. | 1 per sq. ft. |
| SCRATCHES | | | | |
| Length. | 12 inches total per area. | 12 inches total per area. | 24 inches total per area. | 24 inches total per area. |
| Width. | 0.020 inch. | 0.020 inch. | 0.050 inch. | 0.020 inch. |
| Depth. | 0.016 inch. | 0.008 inch. | 0.008 inch. | 0.008 inch. |
| Frequency. | 12 inches total per area. | 12 inches total per area. | 20% of total area. | Total length of scratches equals 3 times longest dimension of area. |
| CRACKS | | | | |
| Length. | Not repairable. | None. | Not repairable. | None. |
| Frequency. | Not repairable. | None. | Not repairable. | None. |
| CRAZING | | | | |
| Slight. | Not repairable. | Crazing adjacent to the edges of the glass must not extend more than 1 inch into the C.V. area. | Not repairable. | Shall be contained in a 9.00 inch circle. |
| Severe. | Not repairable. | Crazing adjacent to the edge of the glass must not extend more than 1 inch into C.V. area. | Not repairable. | Shall be contained in a 6.00 inch circle. |

Plastic Windows Inspection Criteria. (Continued)

| DEFECTS | CRITICAL VISION AREA | | NON-CRITICAL VISION AREA | |
|---|---|---|---|---|
| | MAXIMUM REPAIRABLE | MAXIMUM PERMISSIBLE WITHOUT REPAIRING | MAXIMUM REPAIRABLE | MAXIMUM PERMISSIBLE WITHOUT REPAIRING |
| DISCOLORATION | Not repairable. | None. | Not repairable. | May extend 1 inch from all edges of non-critical areas. |

CAUTION

If temporary repairs are made, aircraft must be operated in unpressurized mode until replacement of window can be made.

Repair of Plastic Windshield and Windows.

See Section 16 for repair of windshield and windows.

Doors.

Removal and Installation of Upper Cabin Door. (See figure 3-4.)

a. Open cabin doors.
b. Remove door stop assembly.
c. With upper door open and supported, remove hinge pin.
d. Remove upper door from aircraft.
e. Install upper door by reversing removal procedures.

Removal and Installation of Lower Cabin Door. (See figure 3-5.)

a. With cabin door open and supported, remove nut and screw attaching cable to door.
b. Remove lower door hinge pin.
c. Remove lower door from aircraft.
d. Install lower door by reversing removal procedures.
e. Adjust door latch receptacles as follows:
1. Remove upholstery side panels.
2. Loosen nut (10) securing receptacle (24) to lock plate (25).
3. Adjust receptacles (24), two in forward door jamb and two in aft door jamb so that when the latch pins (2) are engaged in the receptacles, the door will produce a good fit.
4. Secure nuts on receptacles.
5. Install upholstery panels.

Removal and Installation of Cabin Door Seal. (See figures 3-4 and 3-5.)

The removal procedures apply to both upper and lower door.

a. Remove cabin door seal from retainer pulling gently. It may be necessary to use a phenolic wedge or plastic tool to free the cabin door seal should it be stuck.
b. If seal is damaged or worn refer to Section 16 for repair.

NOTE

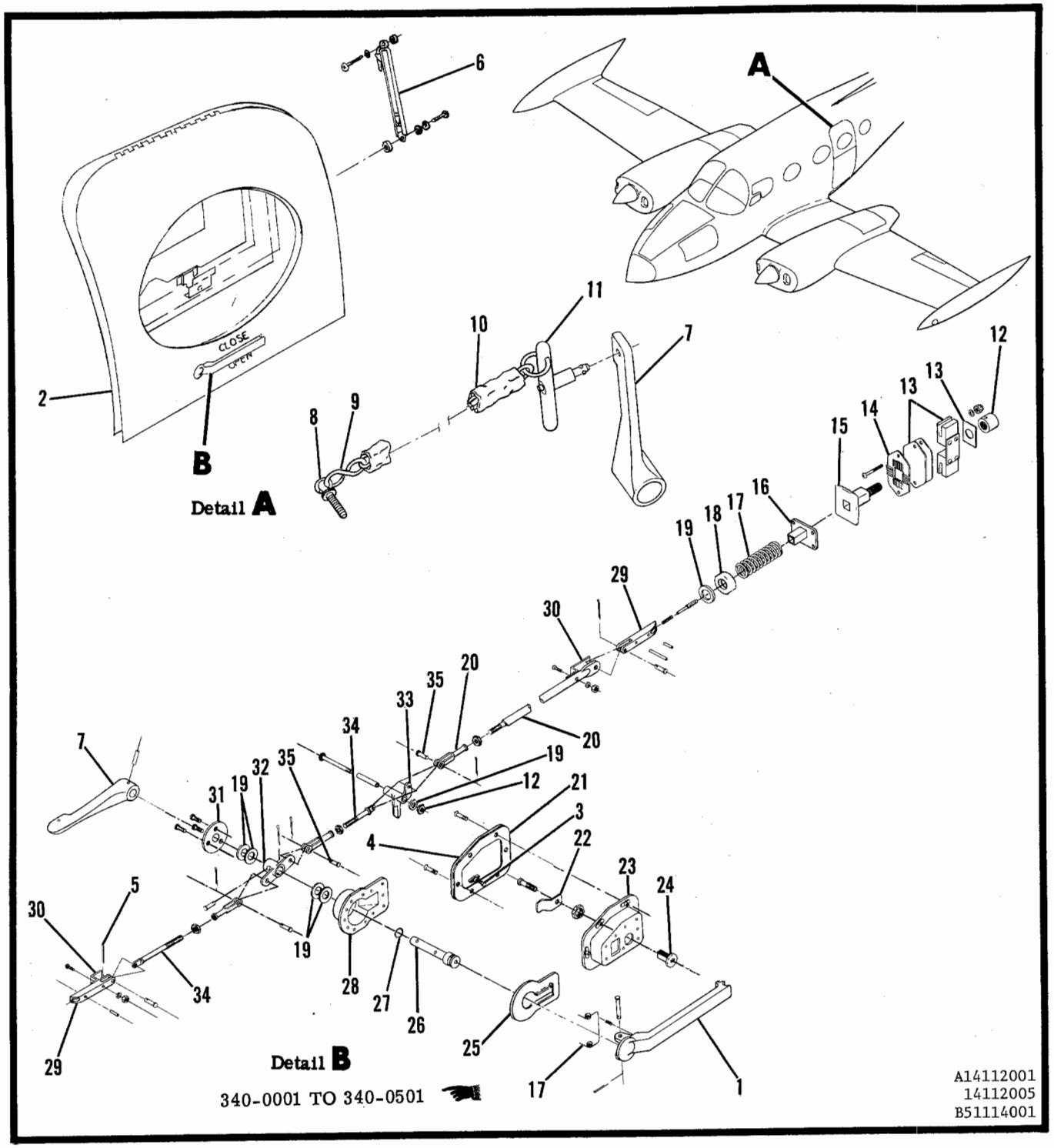
Install door frame seal with the holes (in the side of seal) towards the door opening and the lower door seal (21) (figure 3-5) with the holes (in side of seal) towards the top of door. Pressurized air from inside the cabin enters the holes, inflating the seal to form a pressurized seal.

Removal and Installation of Step Mechanism. (See figure 3-5.)

a. Remove upholstery panel from aft side of the step well.
b. Using Detail A, figure 3-5, disassemble repair and reassemble as necessary.
c. Reinstall upholstery panel.

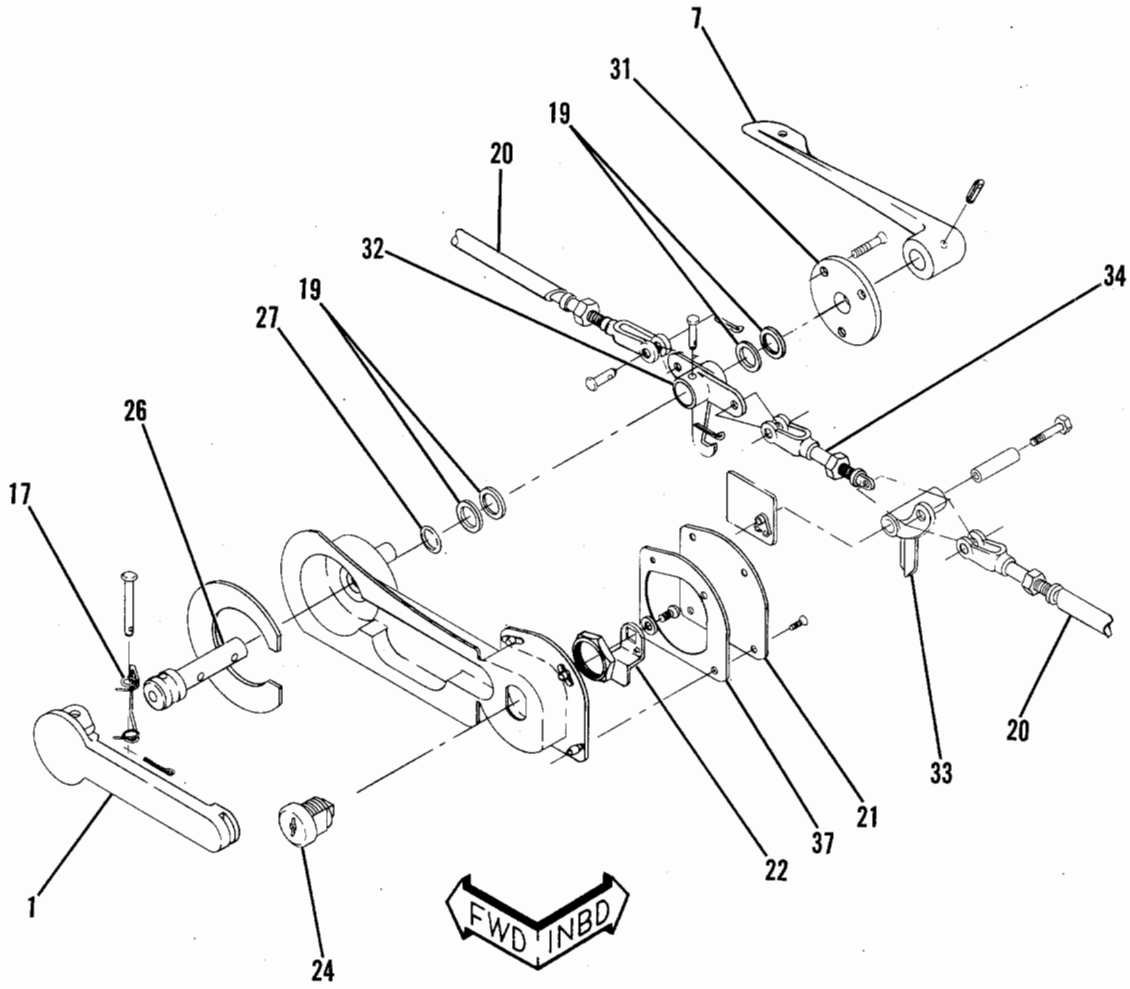
Removal, Installation and Adjustment of Lower Cabin Door Latch. (See figure 3-5.)

a. Open lower cabin door and remove necessary upholstery panels to gain access to latch mechanism.
b. Using Detail B, figure 3-5, disassemble, repair and reassemble door latch as necessary.
c. Adjust lower receptacles to outboard position.
d. Adjust upper receptacles to inboard position to insure that the lower door in the closed position will produce a good fit.
e. With the handle in the locked position, adjust the tube assemblies (11) to a length whereby the pins (8) can be installed with no binding.
f. Install cotter pins (7) on clevis (9).
g. Position handle (12) in the open position.




1. Handle
2. Door Frame
3. Stop Bolt
4. Gasket
5. Cotter Pin
6. Stop Assembly
7. Handle
8. Eye Bolt
9. Chain
10. Cover
11. Lock Pin
12. Nut
13. Spacer
14. Lock Plate
15. Receptacle
16. Guide
17. Spring
18. Cup
19. Washer
20. Tube Assembly
21. Cover
22. Lock Cam
23. Pan
24. Lock
25. Doubler
26. Spindle
27. O-Ring
28. Housing
29. Latch Pin
30. Indicator
31. Base
32. Bellcrank
33. Lock Assembly
34. Link Assembly
35. Pin

Figure 3-4. Upper Cabin Door Installation (Sheet 1 of 2)




Detail B

340-0501 AND ON

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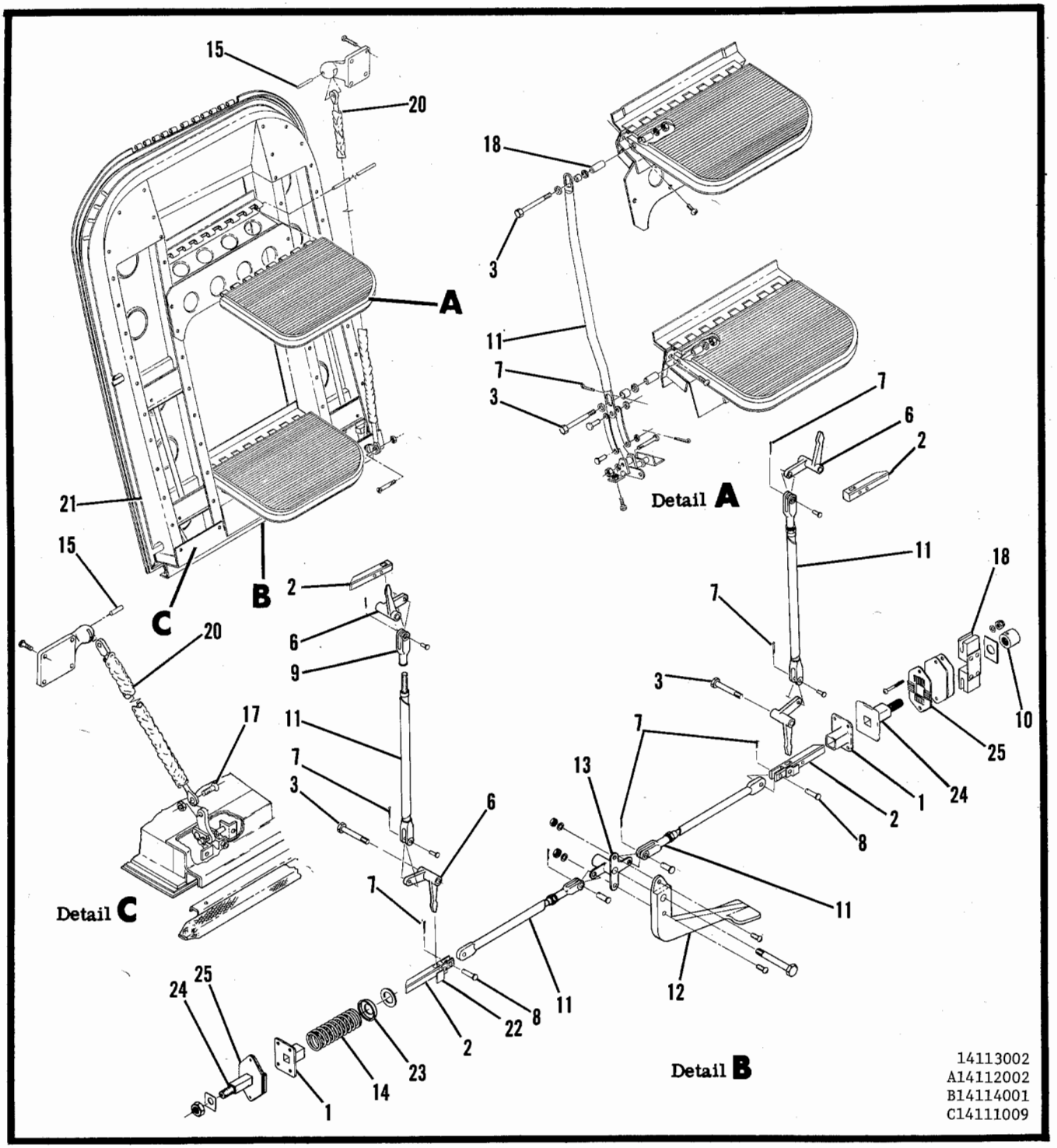
Figure 3-4. Upper Cabin Door Installation (Sheet 2)




1. Guide
2. Latch Pin
3. Bolt
4. Washer
5. Bearing
6. Bellcrank
7. Cotter Pin
8. Pin
9. Clevis
10. Nut
11. Tube Assembly
12. Handle
13. Bellcrank
14. Spring
15. Roll Pin
16. Stop Assembly
17. Screw
18. Spacer
19. Cap Nut
20. Cable Assembly
21. Seal
22. Indicator Flag
23. Cup
24. Receptacle
25. Lock Plate

Figure 3-5. Lower Cabin Door Installation

h. Loosen jamb nuts (10) on tube assemblies (11) and remove pins (8).
i. Screw tube assemblies (11) clockwise or counterclockwise to decrease or increase the length of them.
j. (Refer to figure 3-6.) Adjust the upper pins to a minimum of 0.77 inch engagement with the receptacles (3) in the door locked position and a minimum of 0.05 clearance in the unlocked position and a maximum of 0.21 clearance.

NOTE

If required, one spacer (5 and 6) may be added between the lock plate (4) and the doorframe at each required latch pin (2) location.

k. Adjust the lower latch pins for the same engagement and clearance requirements as specified for upper latch pins.
l. Secure jamb nuts (10) and install cotter pins (7) on tube assemblies (11).
m. Adjust lower receptacles inboard as far as possible to allow free latch pin movement within the receptacles.
n. Recheck all latch pins for engagement and clearance.
o. Adjust lower door handle stops in the locked and unlocked position to correspond with engagement and clearance requirements.
p. Close doors and check for proper operation, positive locking and observe the door locked indicators (22), which should show a locked condition.
q. Install upholstery panels.

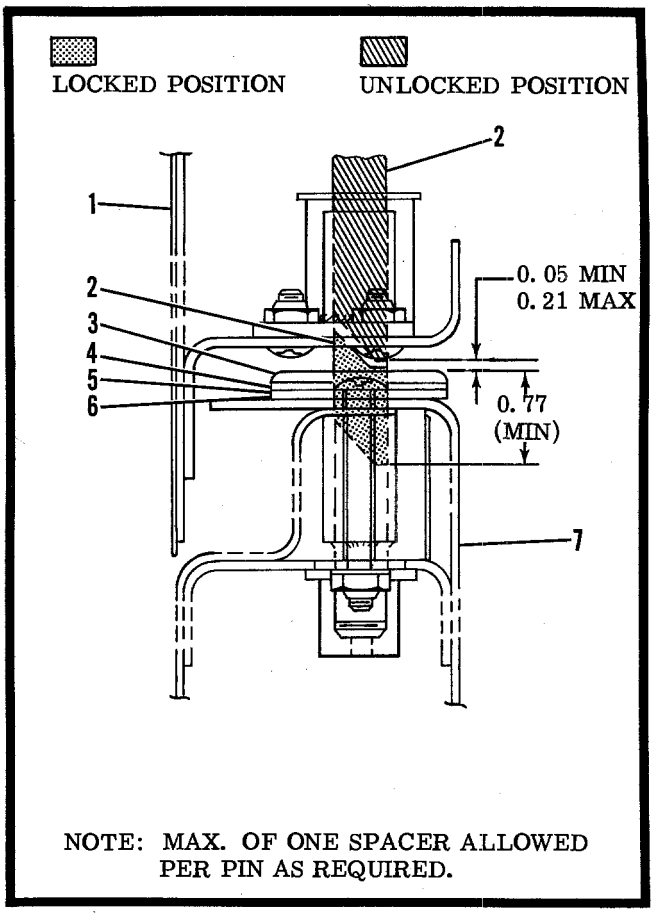
Removal, Installation and Adjustment of Upper Cabin Door Latch. (See figure 3-4.)

a. Open cabin door and remove handle (1), base (31) and window trim panel by removing screws and pin.
b. Using Detail B, figure 3-4, disassemble, repair and reassemble door latch as necessary.
c. With the inside handle turned as far as it will go in a clockwise rotation, adjust link (34) to give a positive locking condition of the lock assembly (33).
d. Adjust links (34) and tube assembly (20) until the pins (35) can be installed with no binding.
e. Install cotter pins except on pins holding latch pins (29) to link (34) and tube assembly (20).
f. Secure jamb nut on link (34) holding lock assembly (33).
g. Position handle (1) so that bellcrank (32) is against the housing stop in the open position.
h. Loosen jamb nuts on tube assembly (20) and link (34) holding latch pins (29), and remove pins (35).
i. Screw tube assembly (20) and link (34) holding latch pins (29) clockwise or counterclockwise to decrease or increase length of them.
j. (Refer to figure 3-6.) Adjust pins to a minimum of 0.77 inch engagement with the receptacles (3) in the locked position and a minimum of 0.05 clearance in the unlocked position and a maximum of 0.21 clearance.

NOTE

If required, one spacer (5 or 6) may be added between the lock plate (4) and the doorframe at each required pin location.

k. Secure jamb nuts and install cotter pins on tube assembly (20) and link (34) holding latch pins (29).
1. Remove window trim.
2. Loosen nut securing receptacle (15) to lock plate (14).
3. Adjust receptacle (15) in forward door jamb and aft door jamb so that when the latch pins (29) are engaged in the receptacles, the door will produce a tight fit.




1. Door
2. Latch Pin
3. Receptacle
4. Lock Plate
5. Spacer P/N 5111565-1
6. Spacer P/N 5111565-2
7. Door Jamb

Figure 3-6. Cabin Door Latch Pin Requirements

4. Secure nuts on receptacle.

m. Close and fully lock cabin doors. The indicators (30) should indicate a locked condition.

n. Close and fully lock cabin doors observing the cabin door not-locked light on the stationary instrument panel for a light-out condition. If the light remains illuminated, adjust switch located just forward of doorframe near guide receptacle (15) using the following steps:

1. Remove window trim just forward of entrance door.
2. Loosen screws securing warning switch to bracket and adjust switch until positive contact with the shaft assembly is made and light on instrument panel is extinguished.
3. Secure switch in this position by tightening screws.
4. Reinstall window trim.

Adjustment of Upper Cabin Door and Baggage Door Stop Tension. (See figure 3-7.)

Adjustment of the upper cabin door and baggage compartment door stop tension is accomplished by adding spring washers (4) to spacer (2) as shown.

NOTE

A maximum of two spring washers is allowable to increase tension. If tension remains insufficient after adding two spring washers, spacer (2) must be replaced.

Seats.

Removal of Pilot's and Copilot's Seats. (See figure 3-9.)

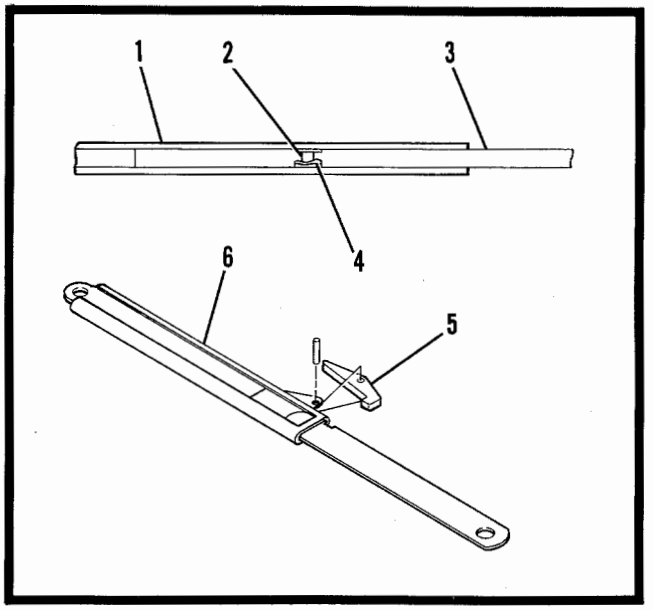
a. Pull up on right-hand adjusting handle and tilt the seat back as far as possible.
b. Remove screws securing front seat stops (23) on left seat rail to pan assembly (28).
c. Pull up on left-hand adjusting handle and slide seat aft to remove.
d. Disassemble and assemble front seats in accordance with figure 3-9.

Installation of Pilot's and Copilot's Seats. (See figure 3-9.)

a. Install pilot's and copilot's seats by reversing removal procedure.

Removal and Installation of Seat Belts. (See figure 3-9.)

a. Remove nut and bolt from seat belt anchor.
b. Remove seat belt.
c. Install seat belt by reversing removal procedures.




1. Channel
2. Spacer
3. Strap
4. Spring Washer (P/N 3518-18-14)
5. Latch Lever
6. Door Stop

Figure 3-7. Upper Cabin Door and Baggage Door Stop

NOTE

Make sure seat belts are installed properly with respect to seat belt buckle.

Removal and Installation of Shoulder Harness. (See figure 3-9.)

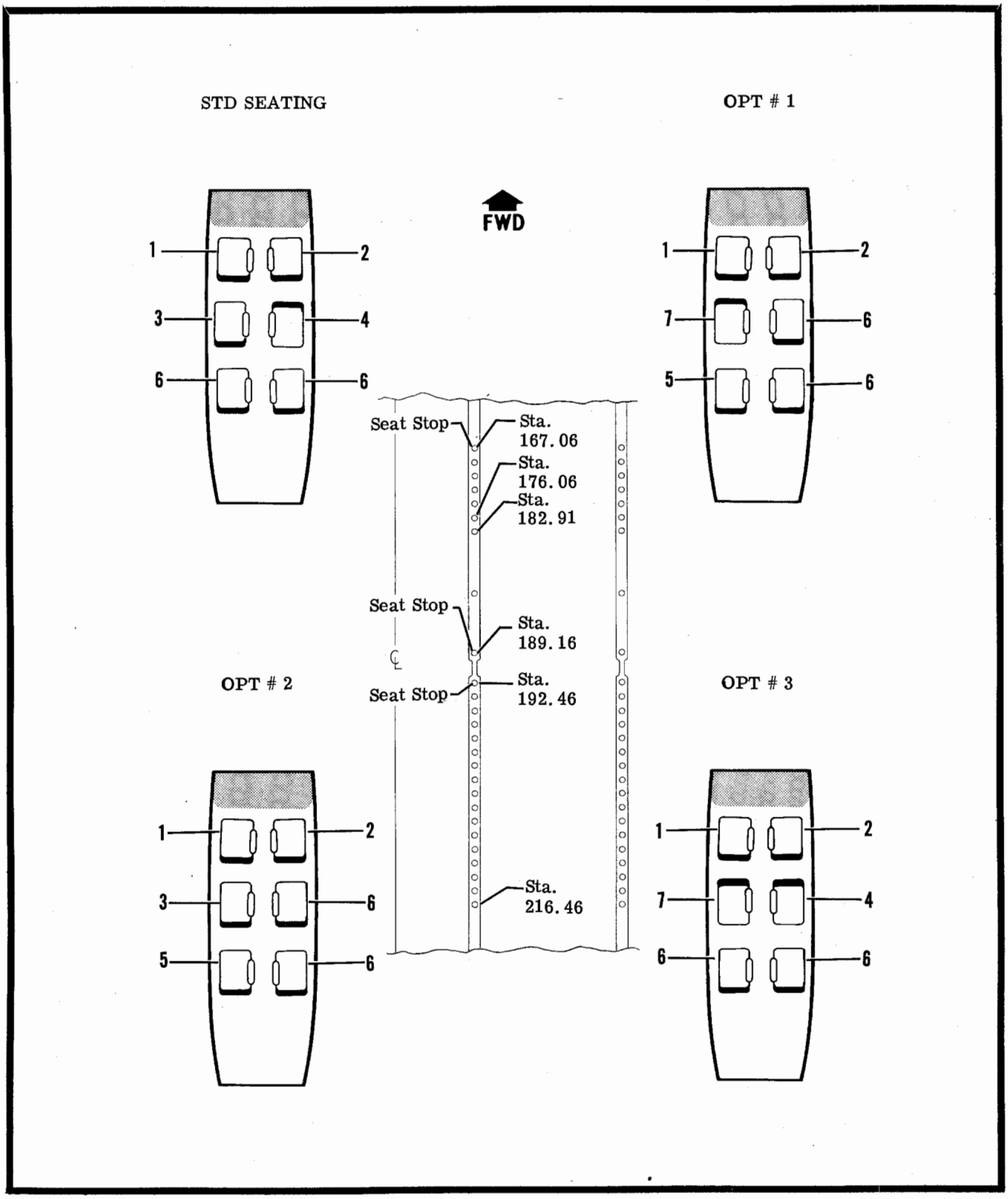
a. Remove bracket cover from shoulder harness (53).
b. Remove nut and bolt securing shoulder harness to bulkhead.
c. Remove opposite end of shoulder harness by removing seat belt and shoulder harness from seat belt anchor.
d. Install shoulder harness by reversing the removal procedures.

NOTE

Make sure the shoulder harness buckle is installed on the lower seat belt anchor position.

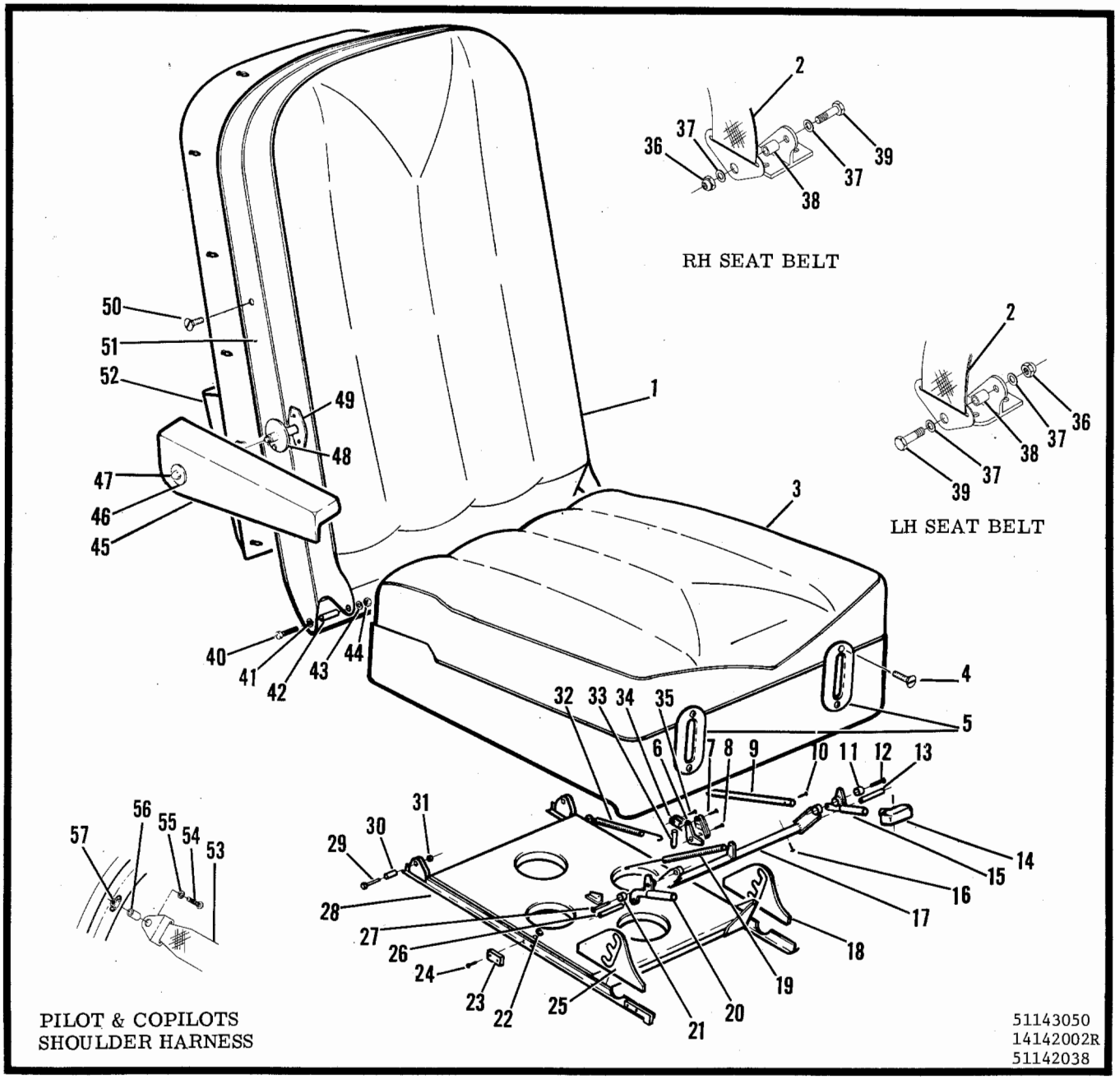
WARNING

After pilot's and copilot's seats are installed, ensure that stops (23) are installed and seat adjustment mechanisms are functioning properly.



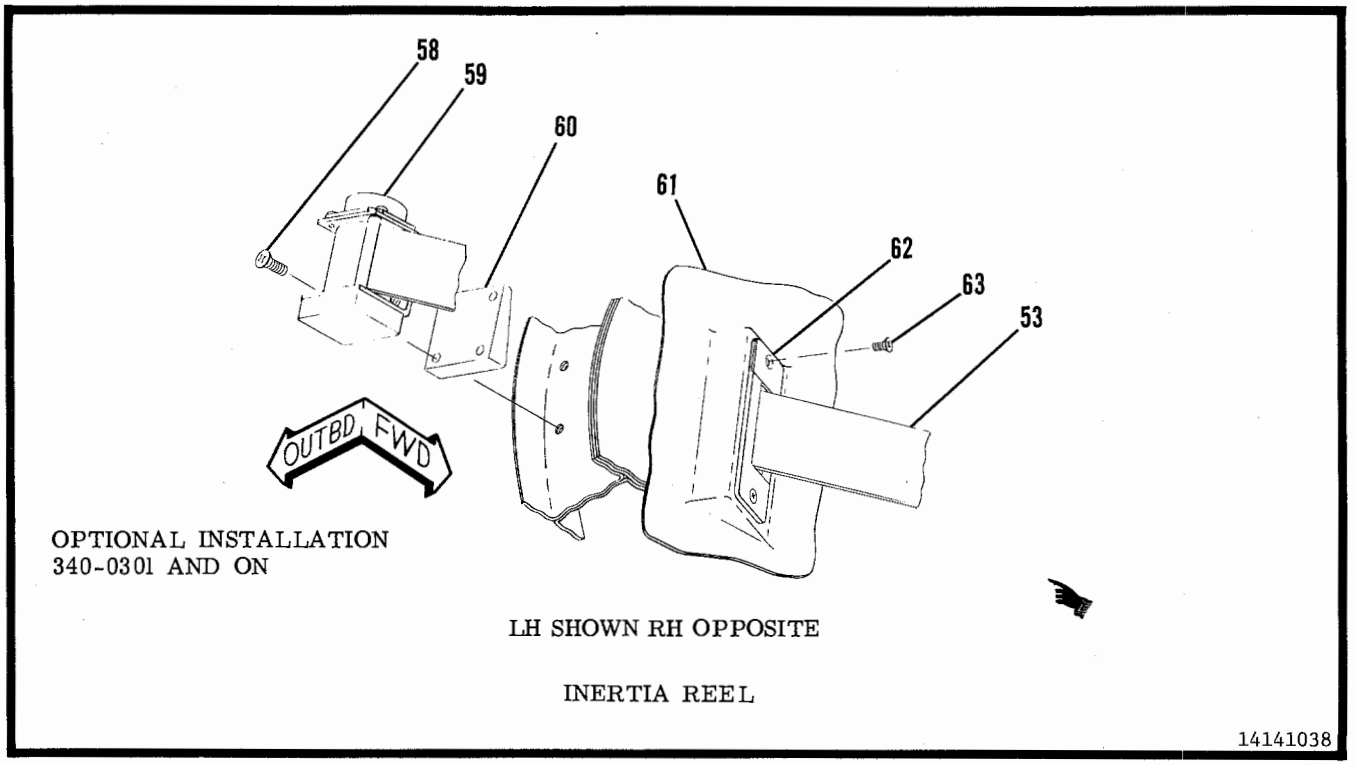

1. Pilot's Seat
2. Copilot's Seat
3. Forward Facing Center Passenger Seat LH
4. Aft Facing Center Passenger Seat RH
5. Forward Facing Rear Passenger Seat LH
6. Forward Facing Rear Passenger Seat RH
7. Aft Facing Center Passenger Seat LH

Figure 3-8. Seating and Seat Stop Arrangement Schematic




1. Cover Assembly
2. Seat Belt
3. Cover Assembly
4. Screw
5. Escutcheon Plate
6. Stop Pin
7. Pin
8. Pin
9. Tube
10. Pin
11. Spacer
12. Pin
13. Pin
14. Handle
15. Arm Assembly
16. Pin
17. Actuator Assembly
18. Bracket
19. Spring
20. Arm Assembly
21. Spacer
22. Nut
23. Stop
24. Screw
25. Bracket
26. Pin
27. Pin
28. Pan Assembly
29. Bolt
30. Spacer
31. Nut
32. Spring
33. Pin
34. Pivot
35. Pin
36. Nut
37. Washer
38. Spacer
39. Bolt
40. Screw
41. Washer
42. Spacer
43. Washer
44. Nut
45. Cover
46. Washer
47. Nut
48. Stop Assembly
49. Escutcheon Plate
50. Screw
51. Cover
52. Pocket
53. Shoulder Harness
54. Screw
55. Washer
56. Spacer
57. Nutplate

Figure 3-9. Pilot's and Copilot's Seat (Sheet 1)

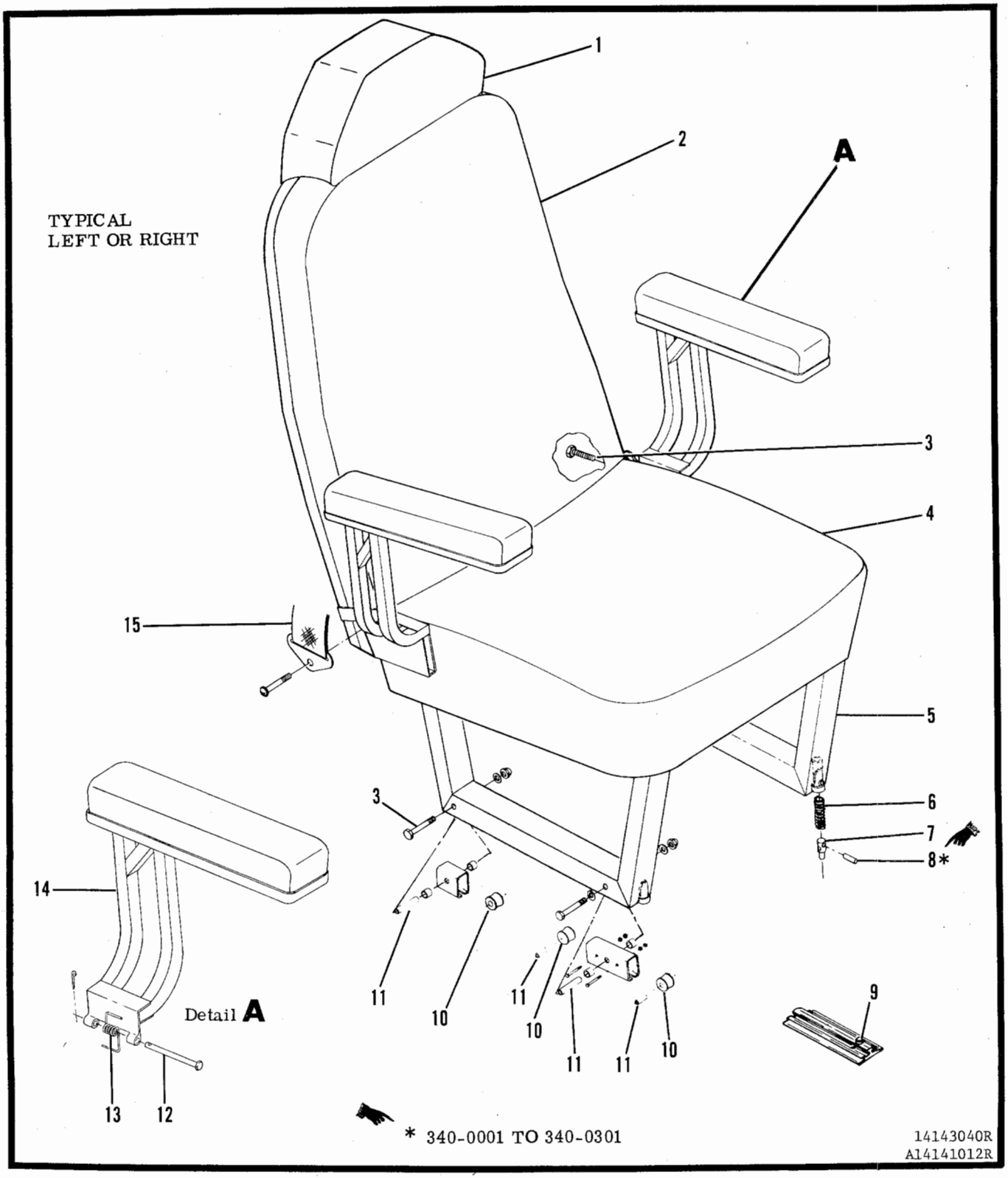



58. Screw
59. Inertia Reel
60. Spacer
61. Window Trim
62. Guide Segments
63. Screw

Figure 3-9. Pilot's and Copilot's Seat (Sheet 2)

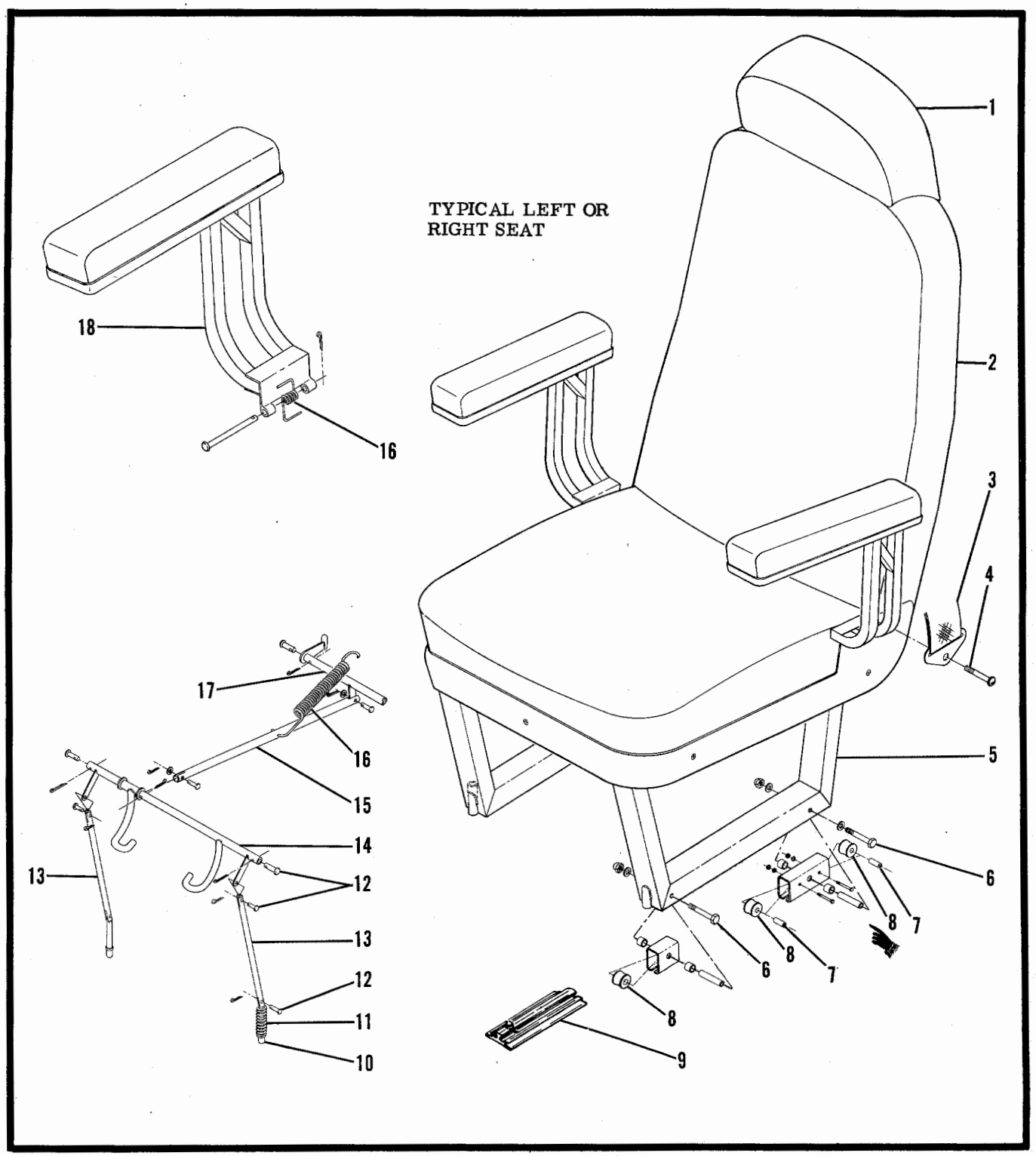
Removal and Installation of Inertia Reel. (See figure 3-9.) (340-0301 and On.)

a. Remove screws, securing guide segments and remove guide segments.
b. Remove window trim.
c. Pull out on shoulder harness to gain access to screws, securing inertia reel; remove inertia reel and spacer.
d. Install inertia reel by reversing removal procedures.




1. Headrest
2. Seat Back
3. Bolt
4. Seat Bottom
5. Seat Base
6. Spring
7. Seat Stop
8. Pin
9. Seat Rail
10. Roller
11. Bushing
12. Pin
13. Spring
14. Armrest
15. Seat Belt

Figure 3-10. Rear Facing Passenger Seat Installation




1. Headrest
2. Seat Back
3. Seat Belt
4. Bolt
5. Seat Base
6. Bolt
7. Bushing
8. Roller
9. Seat Rail
10. Seat Stop
11. Spring
12. Pin
13. Rod
14. Release
15. Linkage
16. Spring
17. Torque Tube
18. Armrest

Figure 3-11. Forward Facing Passenger Seat

Removal of Passenger Seats. (See figures 3-10 and 3-11.)

a. Remove rail stops by removing cotter pin.
b. Pull up on the adjusting handle and slide the seat over the cutout in rail.
c. Disengage seat rollers from rail assemblies.
d. Remove seat from aircraft and disassemble and assemble passenger seat in accordance with figures 3-10 and 3-11.

Installation of Passenger Seats. (See figure 3-10 and 3-11.)

a. Engage seat rollers with seat rail along cutouts in tracks.
b. Install rail stops on seat rail and secure in place with cotter pin.

WARNING

Forward facing seats should never be installed or used as aft facing seats. When installing seats make certain dual roller guide assembly is installed in the aft side of forward facing seats and in the forward side of seat on aft facing seats.

Troubleshooting Individual Seat Assemblies.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LOCKING MECHANISM FAILS TO ENGAGE IN SEAT SUPPORT | Broken, disconnected or missing spring. | Replace spring. |
| | Distorted parts. | Repair or replace parts. |
| SEAT ADJUSTMENT MECHANISM FAILS TO OPERATE | Broken, disconnected or missing spring. | Replace spring. |
| | Distorted parts. | Repair or replace parts. |
| SEAT ASSEMBLY FAILS TO SLIDE FREELY ON SEAT SUPPORT | Improper lubrication. | Apply paraffin wax to the seat rails on the pan assembly. |
| | Parts bent or broken. | Repair or replace parts. |

Removal and Installation of Upholstery and Upholstery Trim. (See figure 3-12.)

a. Remove front and passenger seats in accordance with seat removal procedures.
b. Remove headliner as follows:
1. Remove sunvisor by removing clamp screws securing clamps to support. Remove supports by screwing counterclockwise out of retainer.
2. Remove cover plate on individual combination light assemblies by removing oxygen outlet port cover, retaining nut and attaching screws.
3. Remove upper windshield trim (22).
4. Remove side window trim.
5. Remove upholstery channels from headliner using a blunt plastic tool and prying down at each attaching point.
6. Starting at the windshield, remove headliner (1) from upholstery retainer.
7. Remove headliner from side window retainer.
8. Remove headliner from curtain track (27 and 28) by unsnapping retainer (27 and 28) from curtain track working from front to rear.
9. Carefully remove headliner from pronged retainer above cabin entrance door and at aft cabin bulkhead.
10. Remove headliner by carefully working from left to right and front to rear.
c. Remove aft cabin bulkhead upholstery by removing tailcone access door and peeling upholstery from aft cabin bulkhead.
d. Remove set screw at the end of curtain track and slide curtain from curtain track.
e. Remove upholstery side panels by removing attaching screws, ash receivers and retainers and pulling panels out at the bottom and removing.
f. Install upholstery panels by reversing removal procedures and bonding affected panels with cement (EC880 Minnesota Mining and Manufacturing Co., or equivalent).
g. Install headliner by reversing removal procedures and bonding affected areas with cement (EC880 Minnesota Mining and Manufacturing Co., or equivalent).

Removal and Installation of Carpet. (See figure 3-13.)

a. Remove pilot's, copilot's and passenger seats in accordance with removal procedures.
b. Remove scuff plates by removing attaching screws.
c. Remove the screws securing the carpet to the floorboards and remove carpet from aircraft.
d. Remove forward bulkhead carpet by carefully peeling the bonded carpet from the metal.
e. Install carpets by reversing the removal proce-

dures and bonding carpet to metal surface using Cement (EC880 Minnesota Mining and Manufacturing Co., or equivalent).

Removal and Installation of Control Pedestal. (See figure 3-14.)

NOTE

The control pedestal is riveted to the forward cabin bulkhead and should not be removed unless damaged.

a. Remove front seats, front carpet and kick plates.
b. Remove cover (8), right and left side filler and cover.
c. Remove control quadrant in accordance with Section 9.
d. Remove elevator trim control in accordance with Section 6.
e. Remove rudder trim control in accordance with Section 7.
f. Disconnect aileron trim cable in accordance with Section 5.
g. Route elevator, rudder and trim cables from pedestal.
h. Remove throttle mixture, and propeller controls in accordance with Section 9.
i. Remove cover (8) and controls from bracket as follows:

1. Remove nut securing controls to bracket.
2. Pull control aft until cable will slip out of slots in bracket.

j. Remove bearing pads (4) by removing screws securing pads to pedestal.
k. Tag and remove wiring from terminal blocks (7).
l. Remove two screws (3) securing pedestal to instrument panel.
m. Remove pedestal side panels by drilling out rivets at floor and forward cabin bulkhead. Drill out rivets securing side panels to bulkhead and pulley brackets.
n. Replace damaged parts and reassemble by reversing the removal procedures.

NOTE

When assembling parts to forward cabin pressure bulkhead, be sure that parts are sealed in accordance with Section 16.

WING.

Removal of Wing. (See figure 3-15.)

a. Disconnect and remove batteries in accordance with Section 14.
b. Refer to Section 2 and defuel aircraft in accordance with defueling procedures.

NOTE

Wings can be removed with all fuel tanks and fuel cells installed. If fuel tanks and fuel cells are to be removed, refer to Section 11, for removal.

c. Remove engine in accordance with removal procedures, Section 9.

CAUTION

If one or both engines are removed, the aircraft may become tail heavy. Therefore, to balance the aircraft, place equivalent weight (shot bags or sand bags) in the engine nacelles and support the tailcone with padded support.

d. Jack aircraft in accordance with jacking procedures in Section 2.
e. Place suitable padded supports beneath cabin section and wings; then remove jacks.

NOTE

To prevent damage to skin, place padded supports beneath front and rear spars in fuselage and beneath wing ribs. If both engines were removed and weight was placed in the nacelles, remove weight after removing jacks.

CAUTION

If only one wing is being removed and the engine on the opposite wing remains installed, relieve the engine weight on opposite wing by using engine hoist before removing wing or serious damage may occur due to an overbalance tipping condition.

f. Remove wing root fillets by removing attaching screws.
g. Disconnect or remove landing gear drive tube in accordance with removal procedures in Section 4.

NOTE

Wings can be removed with main landing gear installed. If gear removal is desired, remove in accordance with removal procedures in Section 4.

h. Remove flap cables from wing in accordance with removal procedures in Section 8.
i. Remove aileron cables from wing in accordance with removal procedures in Section 5.
j. On left wing only, remove aileron trim cables in accordance with removal procedures in Section 5.
k. Disconnect engine control in engine nacelle in accordance with Section 9.
l. (See figure 3-16.) Disconnect, tag or route the

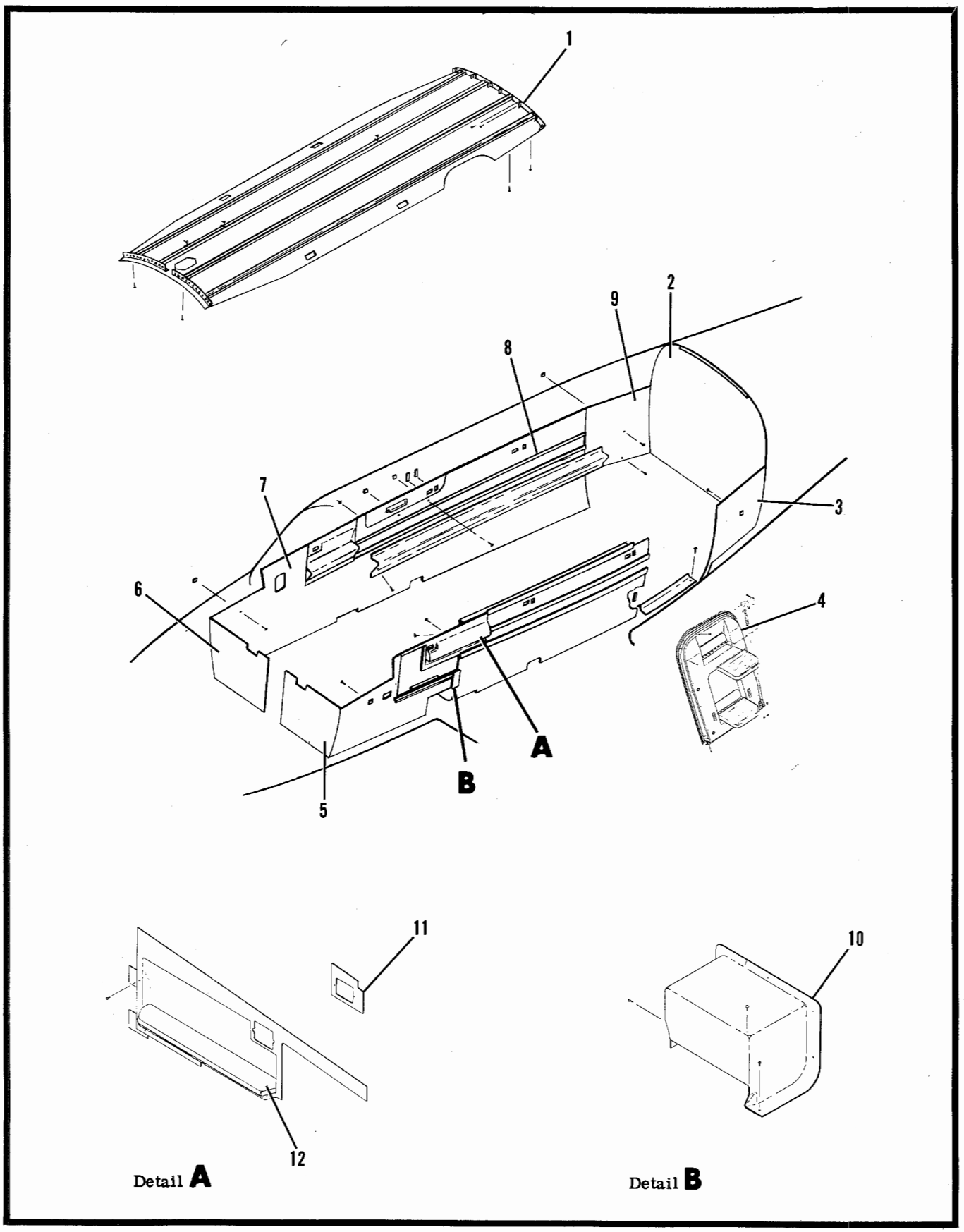
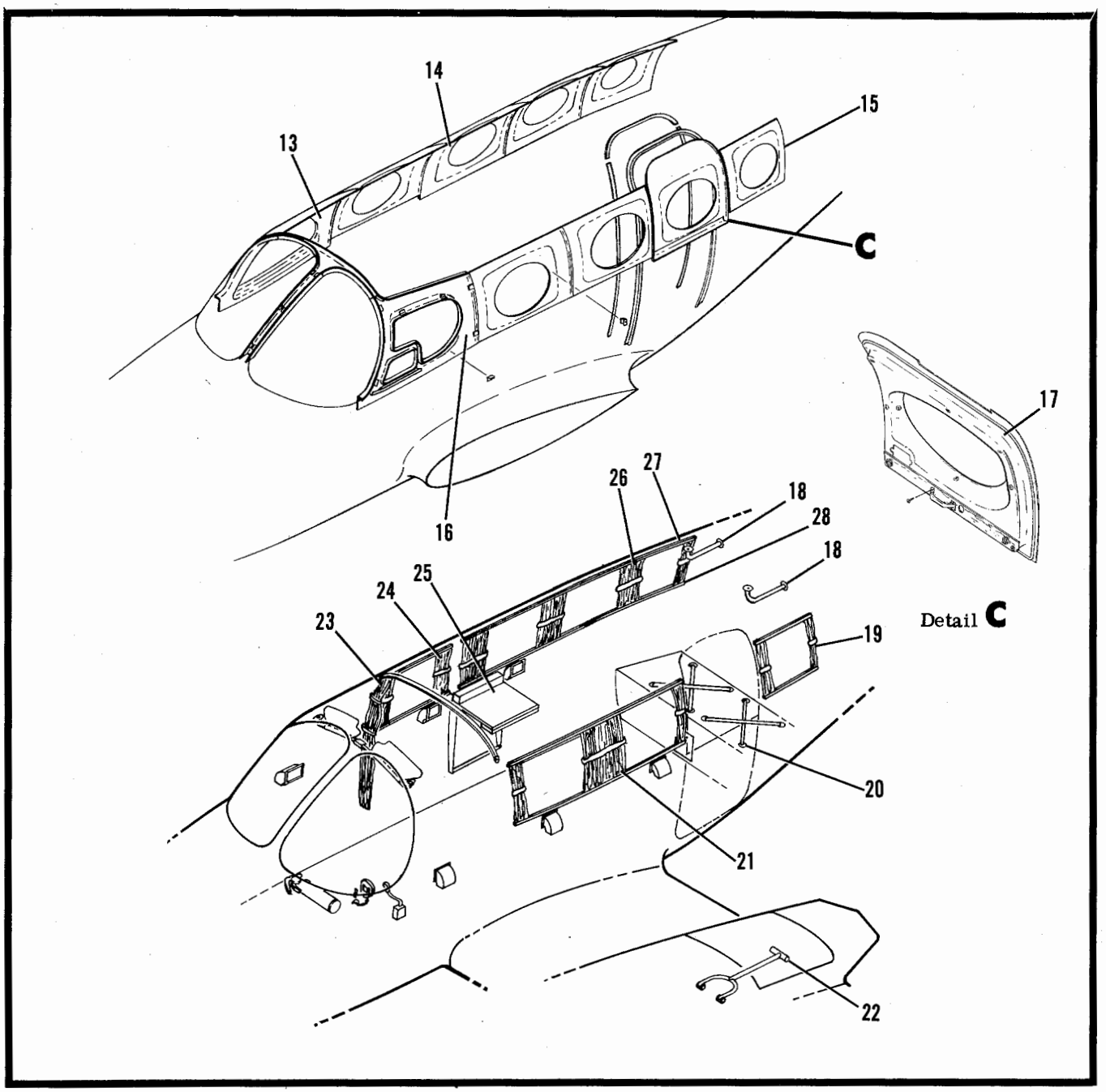
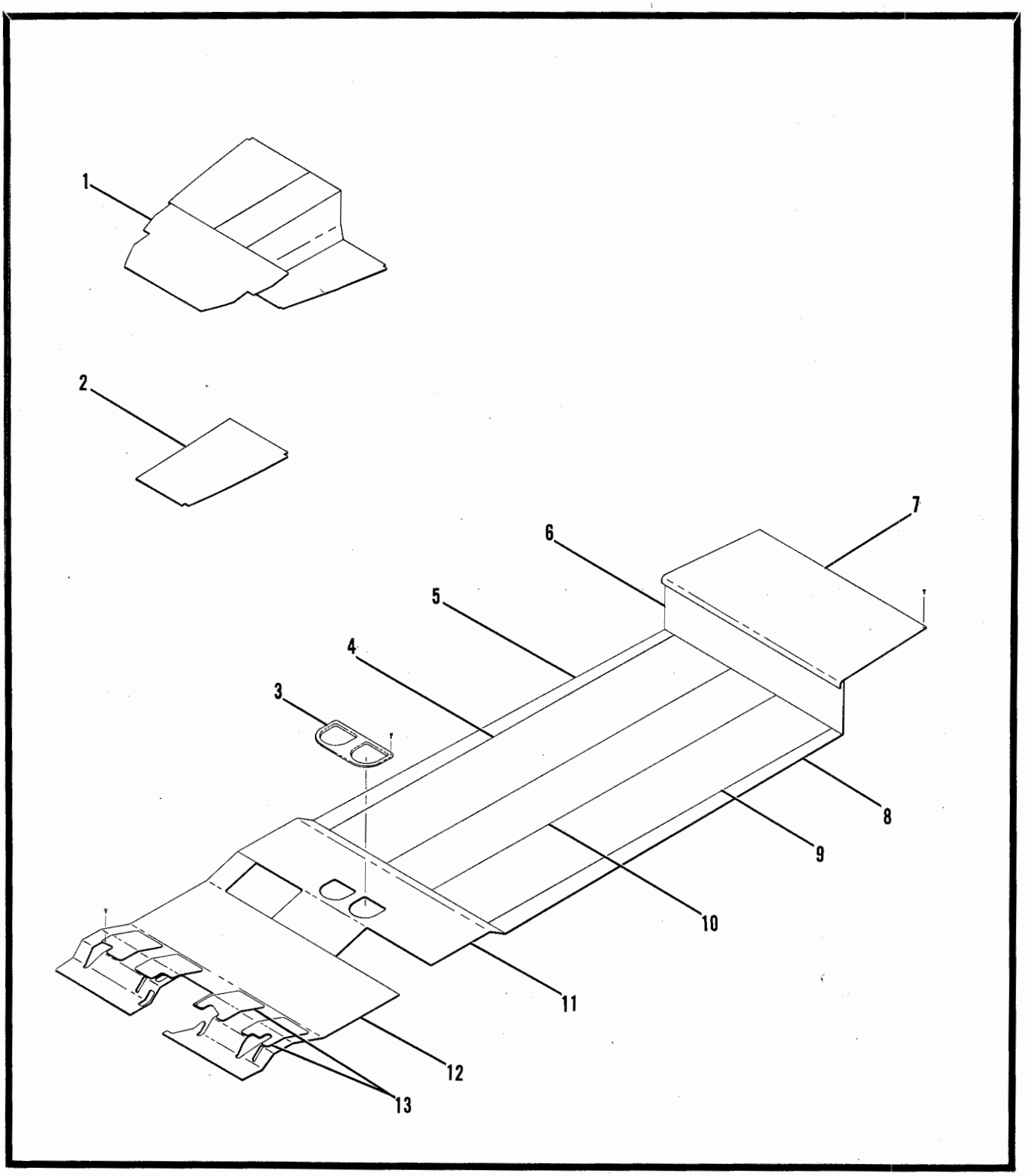



Figure 3-12. Upholstery and Upholstery Trim (Sheet 1)



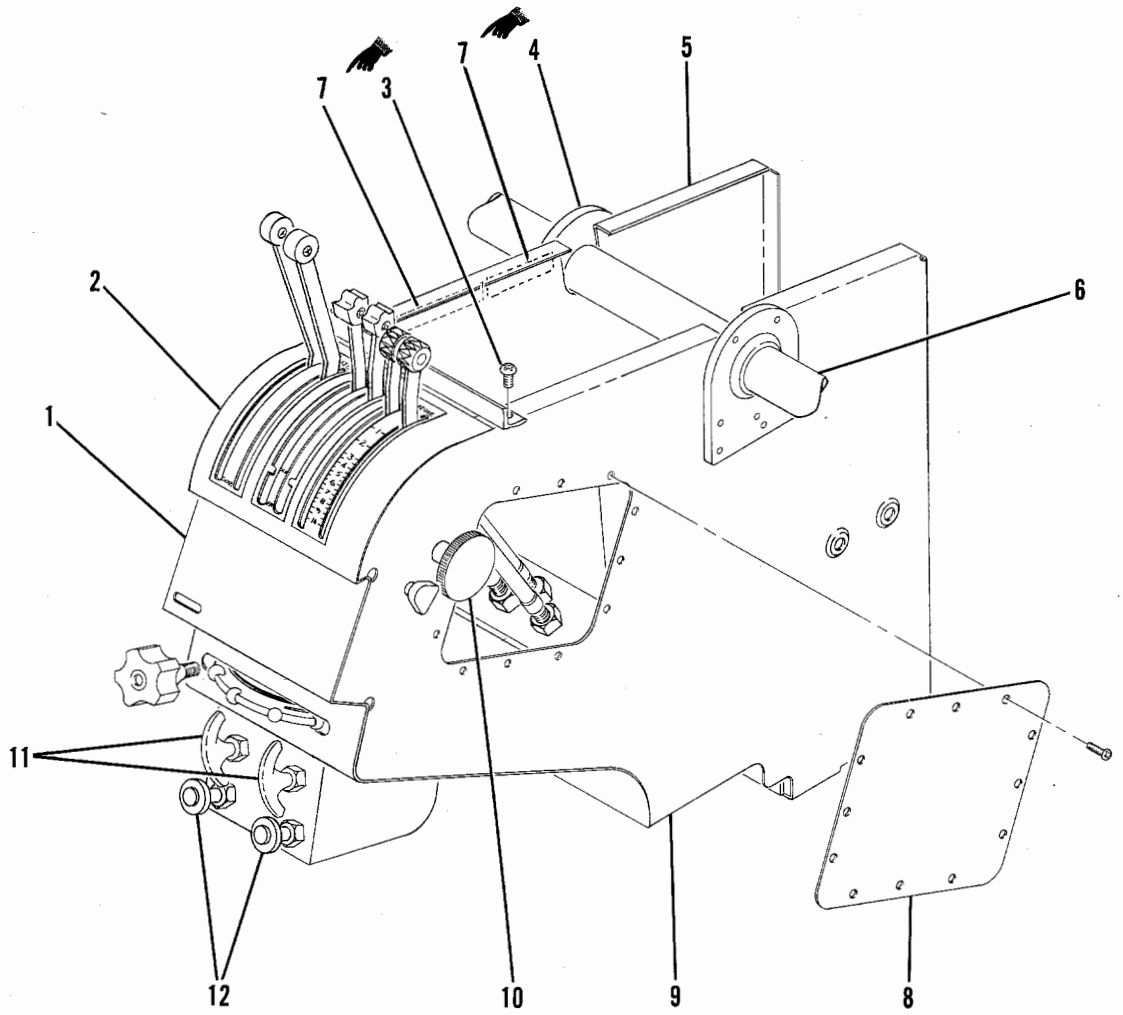

1. Headliner
2. Aft Pressure Bulkhead Upholstery
3. Left Baggage Side Panel
4. Lower Cabin Door Trim
5. Left Forward Pressure Bulkhead Carpet
6. Right Forward Pressure Bulkhead Carpet
7. Right Forward Side Panel
8. Right Cabin Side Panel
9. Right Baggage Side Panel
10. Voltage Regulator Cover
11. Ash Receptacle Trim
12. Right Forward Side Panel
13. Copilots Window Trim
14. Emergency Exit Window Trim
15. Cabin Window Trim
16. Pilots Window Trim
17. Upper Cabin Door Trim
18. Coat Racks
19. Aft Cabin Window Curtain
20. Baggage Tie Down Straps
21. LH Cabin Window Curtains
22. Tow Bar
23. Cockpit Divider Curtain
24. Right Forward Cabin Curtain
25. Writing Desk
26. Right Cabin Curtains
27. Upper Curtain Track
28. Lower Curtain Track

Figure 3-12. Upholstery and Upholstery Trim (Sheet 2)



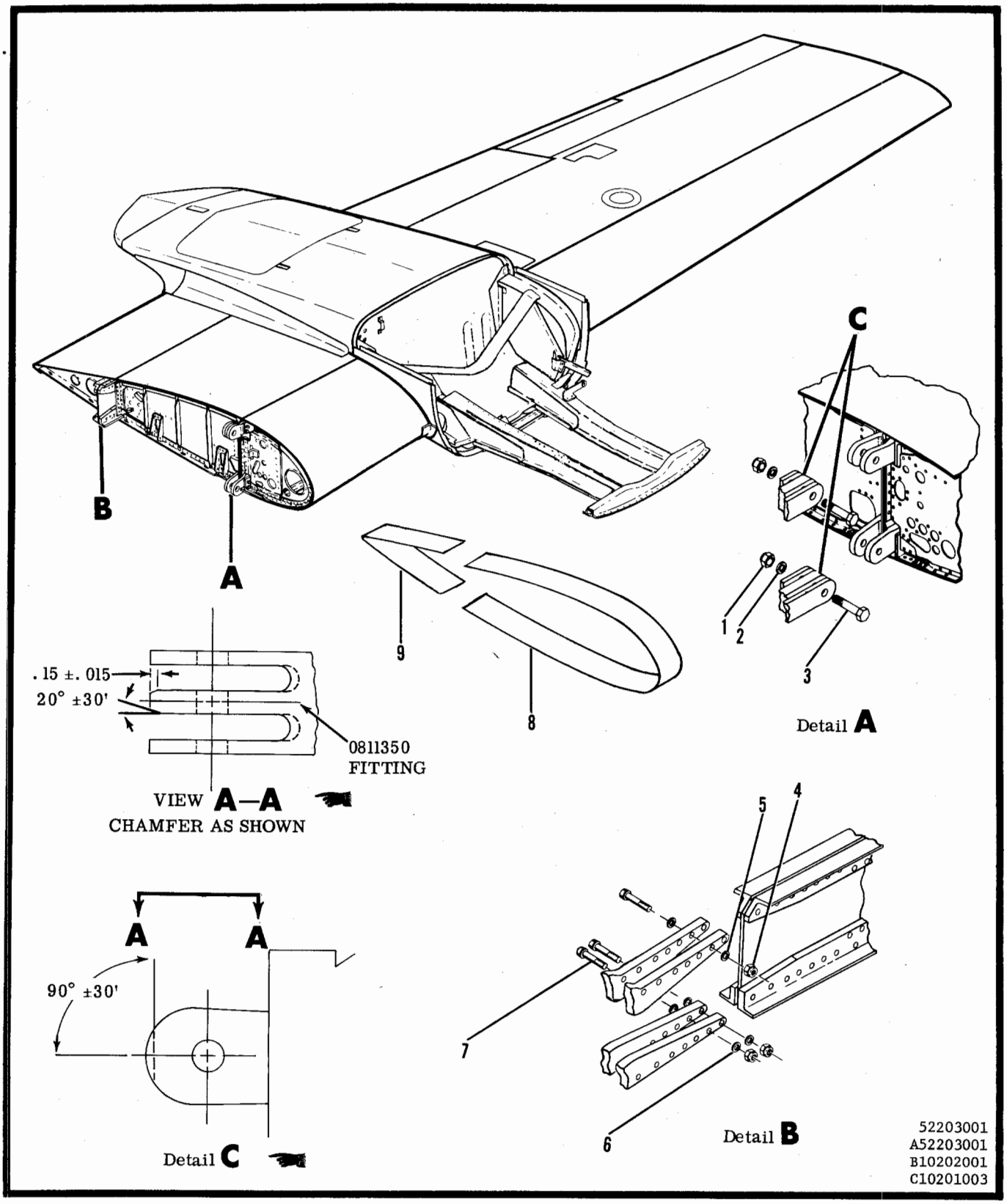

1. Forward Carpet
2. Cover Plate
3. Fuel Selector Trim
4. RH Inboard Carpet
5. RH Outboard Carpet
6. Aft Step Carpet
7. Aft Carpet
8. LH Outboard Carpet
9. LH Inboard Carpet
10. Center Carpet
11. Cabin Carpet
12. Forward Cabin Carpet
13. Scuff Plate

Figure 3-13. Carpet Installation




1. Face Plate
2. Quadrant
3. Screw
4. Bearing Pad
5. Pedestal Bulkhead
6. Rudder Torque Tube
7. Terminal Block
8. Cover
9. Engine Controls
10. Function Knob
11. Cowl Flap Controls
12. Alternate Air Controls

Figure 3-14. Control Pedestal Installation




1. Nut
2. Washer
3. Bolt
4. Nut
5. Washer
6. Countersunk Washer
7. Bolt
8. Forward Fillet
9. Lower Fillet

Figure 3-15. Wing Installation

following items in the wing root area:
1. Route engine flex cables (15, 16, 17 and 18) to fuselage.
2. Disconnect electrical wire bundles (4 and 10).
3. Disconnect fuel lines (5 and 14).
4. Disconnect manifold pressure line at fitting (7).
5. Disconnect fuel pressure line at fitting (8).
6. Disconnect vacuum hose at fitting (1).
7. Disconnect brake line at fitting (2).
8. If installed, disconnect deice line at fitting.
9. If installed, disconnect auxiliary fuel tank plug, at electrical connector.
10. Route wing wiring bundle from fuselage.
11. Disconnect heater fuel line (12) at fitting.
12. Disconnect oil pressure line and supercharger pressure line at fittings (3 and 6).
13. Disconnect fuel selector control (9) at fuel selector.
14. Disconnect cabin pressure line at duct (11).

m. Remove nuts (1 and 4), washers (2, 5 and 6) and bolts (3 and 7) from wing attachment fittings.

n. Move wing and padded wing supports outboard until wing attachment fittings have disengaged.

NOTE

If difficulty is encountered in driving out wing bolts or disengaging fittings, it may be necessary to rock wing slightly.

Installation of Wing. (See figure 3-16.)

NOTE

If a new wing(s), wing front spar(s), or front spar fitting(s) is being installed on the aircraft, the fuselage front spar fittings may have to be modified in accordance with figure 3-15. After performing this modification, all bare surfaces must be color chemical filmed (Irridite 14-2, Allied Research Product) per manufacturer's instructions, then primed with zinc chromate primer.

a. Position wing approximately one foot from fuselage.

b. (Refer to Section 2.) Clean and/or lubricate engine flex cables fittings, electrical wiring and all other items relating to the wing needing servicing.

c. Route flex cables (15, 16, 17 and 18) through root rib towards engine nacelle. Do not secure cables to structure at this time.

d. Move the wing toward fuselage until wing attachment fittings begin to engage, guide landing gear drive tube through opening in root rib.

e. Guide fuel selector valve flex cable through root rib toward engine nacelle.

f. (See figure 3-15.) Align bolt holes in wing attachment fittings and install bolt (3), washer (2) and nut (1) on front attach fitting; install bolt (7), washer (6), washer (5) and nut (4) on rear attach fitting.

NOTE

(See figure 3-15.) Install front spar bolts with heads facing forward and rear spar bolts with heads facing aft. On rear spar bolts, place countersunk washers (6) under heads of bolts (7). Torque front spar nuts (1) to 60 ±5 foot-pounds, and rear spar nuts (4) to 175 ±5 inch-pounds.

Spar bolts are installed in shear position. DO NOT OVERTORQUE. It is possible wing spar bolts will turn if a slight torque is applied to bolt head.

g. Connect any of the following items of optional equipment which were disconnected during wing removal:
1. Connect deice line to fitting.
2. Connect auxiliary fuel tank electrical plug to electrical connector.

NOTE

Lubricate all fittings used on fuel, oil and air lines with suitable thread lubricant. Apply lubricant to the male fittings only, omitting the first two threads. Lubricate straight threads of hydraulic fittings with system fluid.

h. Connect the following items at the wing root area and remove tags:
1. Connect heater fuel line to fitting (12).
2. Connect brake line to fitting (2).
3. Connect vacuum hose to fitting (1).
4. Connect fuel pressure line to fitting (8).
5. Connect oil pressure line to fitting (3).
6. Connect manifold pressure line to fitting (7).
7. Connect fuel lines (5 and 14).
8. Connect electrical wire bundles (4 and 10).
9. Connect supercharger pressure line at fitting (6).
10. Connect cabin pressure line at duct (11).
11. Connect fuel selector control (9).

i. Refer to Section 8, install flap cables in wing and rig in accordance with rigging procedures.

j. Refer to Section 5, install aileron cables in wing and rig in accordance with rigging procedures.

k. If left wing was removed, install and rig aileron trim cables.

l. If wing tip fuel tank was removed, install in accordance with Section 11. Do not install lower fairing at this time.

m. Refer to Section 2, jack aircraft in accordance with jacking procedures.

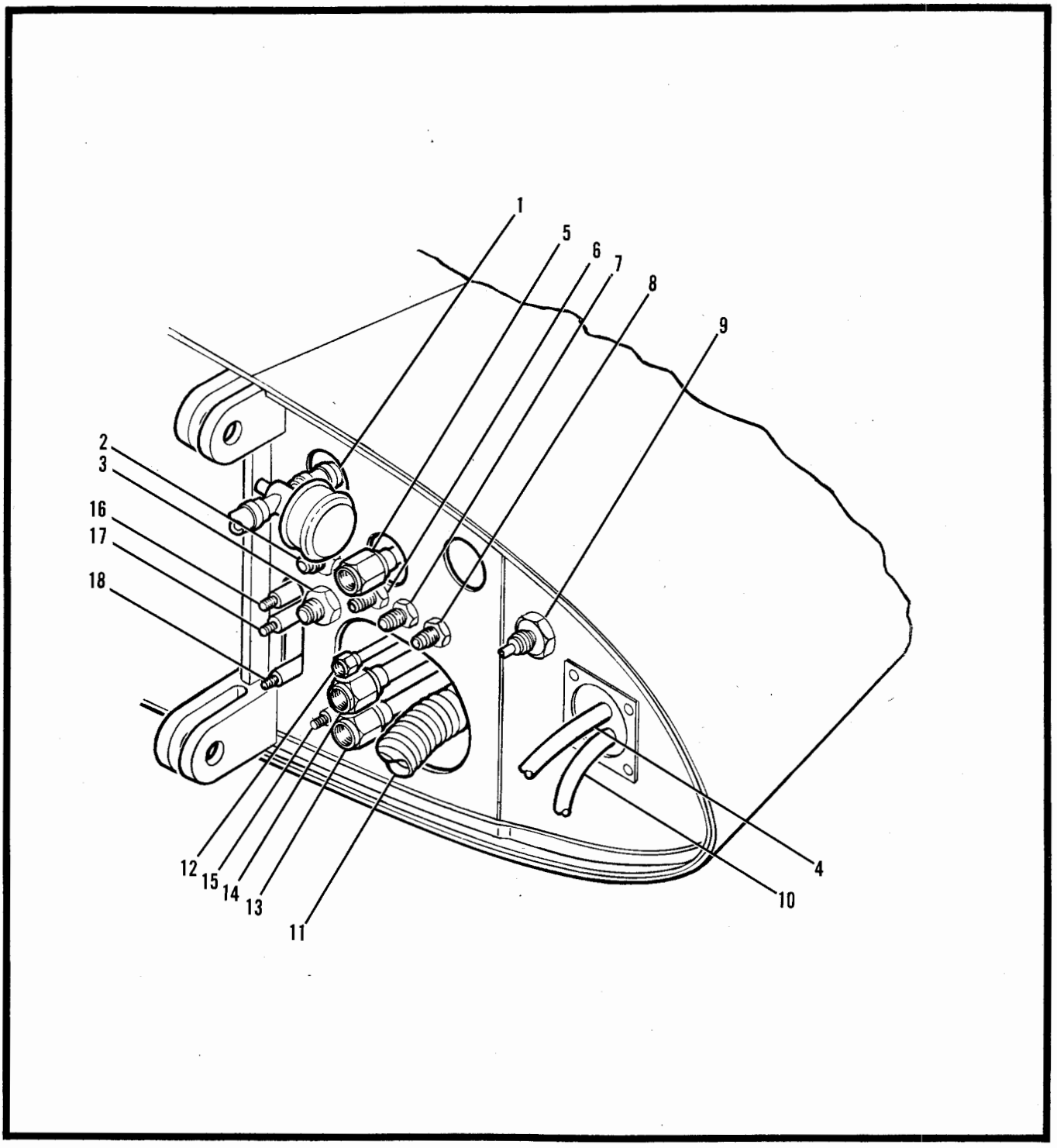
CAUTION

If both engines were removed, the aircraft is tail heavy. To balance the aircraft, place weight (such as shot bags or sand bags) in engine nacelles prior to jacking.

n. Remove padded supports from beneath cabin section, tail section and wings.

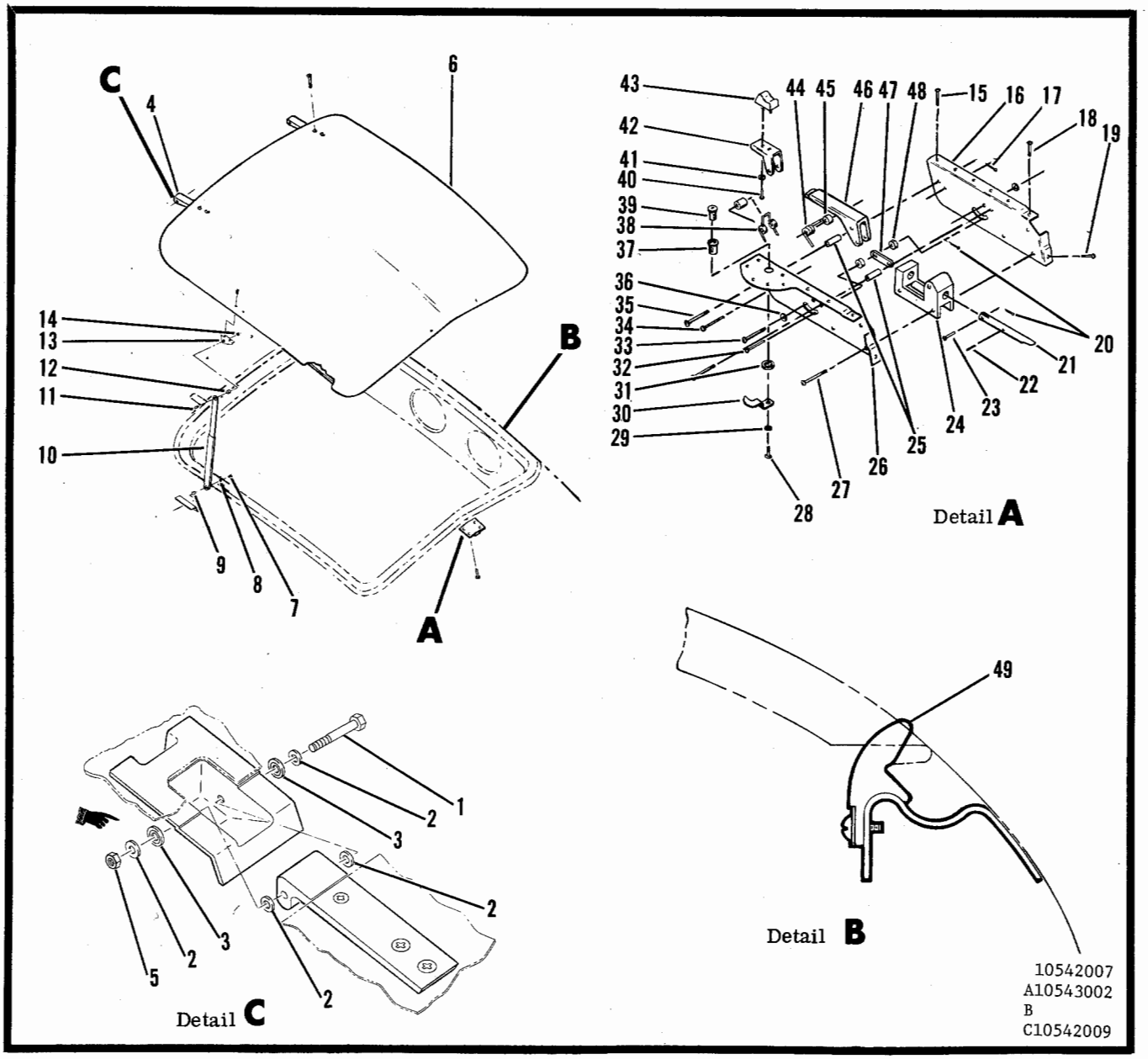
o. Place tailcone support beneath tailcone bumper.

p. If landing gear was removed, refer to Section 4 for installation and rigging of landing gear.




1. Vacuum Line
2. Brake Line
3. Oil Pressure Line
4. Electrical Wire Bundle
5. Fuel Line
6. Supercharger Pressure Line
7. Manifold Pressure Line
8. Fuel Pressure Line
9. Fuel Selector Control
10. Electrical Wire Bundle
11. Cabin Pressure Duct
12. Heater Fuel Line (RH Wing Only)
13. Autopilot Supply Line
14. Fuel Line
15. Throttle Control
16. Alternate Air Control
17. Propeller Control
18. Mixture Control

Figure 3-16. Wing Root Connections




1. Bolt
2. Washer
3. Stat-o-seal
4. Hinge Strap
5. Nut
6. Door Assembly
7. Screw
8. Washer
9. Spacer
10. Stop Assembly
11. Screw
12. Spacer
13. Bracket
14. Nut
15. Screw
16. Support
17. Cotter Pin
18. Screw
19. Screw
20. Cotter Pin
21. Bolt Latch
22. Pin
23. Pin
24. Block Guide
25. Spacer
26. Support
27. Screw
28. Screw
29. Lockwasher
30. Lock Arm
31. Nut
32. Pin
33. Screw
34. Pin
35. Screw
36. Washer
37. Shell
38. Spring
39. Cylinder Assembly
40. Screw
41. Lockwasher
42. Latch Handle Retainer
43. Button
44. Spring
45. Spacer
46. Latch Handle
47. Link
48. Spacer
49. Seal

Figure 3-17. Wing Locker Door Installation

NOTE

To facilitate rigging of landing gear, use external power source.

q. Refer to Section 9, install engine in accordance with installation procedures and connect flex cables (15, 16, 17 and 18) to engine.

NOTE

To prevent serious binding, check flex cables for proper security during rigging of cables.

r. Remove support from beneath tailcone bumper.
s. Remove aircraft jacks.
t. Refer to Section 14, install batteries in accordance with installation procedures.
u. Check control cables for proper operation and correct directional travel.
v. Service aircraft and check for fuel leaks, especially at the fuel tank and wing connections.
w. Install wing root and fuel tank fairings.
x. Refer to Section 9, perform an engine operation check and observe engine controls and electrical equipment for proper operation.

Removal of Wing Locker Door. (See figure 3-17.)

a. Open wing locker door.
b. Remove screw (7), washer (8) and spacer (9) from lower end of stop assembly (10).
c. Remove nuts (5), washers (2), stat-o-seals (3) and bolts (1) from door hinge (4) and remove door from nacelle.

Installation of Wing Locker Door. (See figure 3-17.)

Install wing locker door by reversing removal procedures.

Removal and Installation of Wing Locker Door Latch.

Removal and installation of wing locker door latch is not recommended unless replacement or repair is necessary. Use figure 3-17 as a guide for removal and installation.

STABILIZERS.

Removal of Vertical Stabilizer. (See figure 3-18.)

a. Place a suitable support under tailcone.
b. Remove horizontal stabilizer fairings.
c. If omni-antenna (optional) is installed, disconnect the coaxial cable in the aft fuselage.

NOTE

If the coaxial cable is disconnected at the vertical stabilizer tip, a guide wire should be attached and pulled into place to facilitate installation.

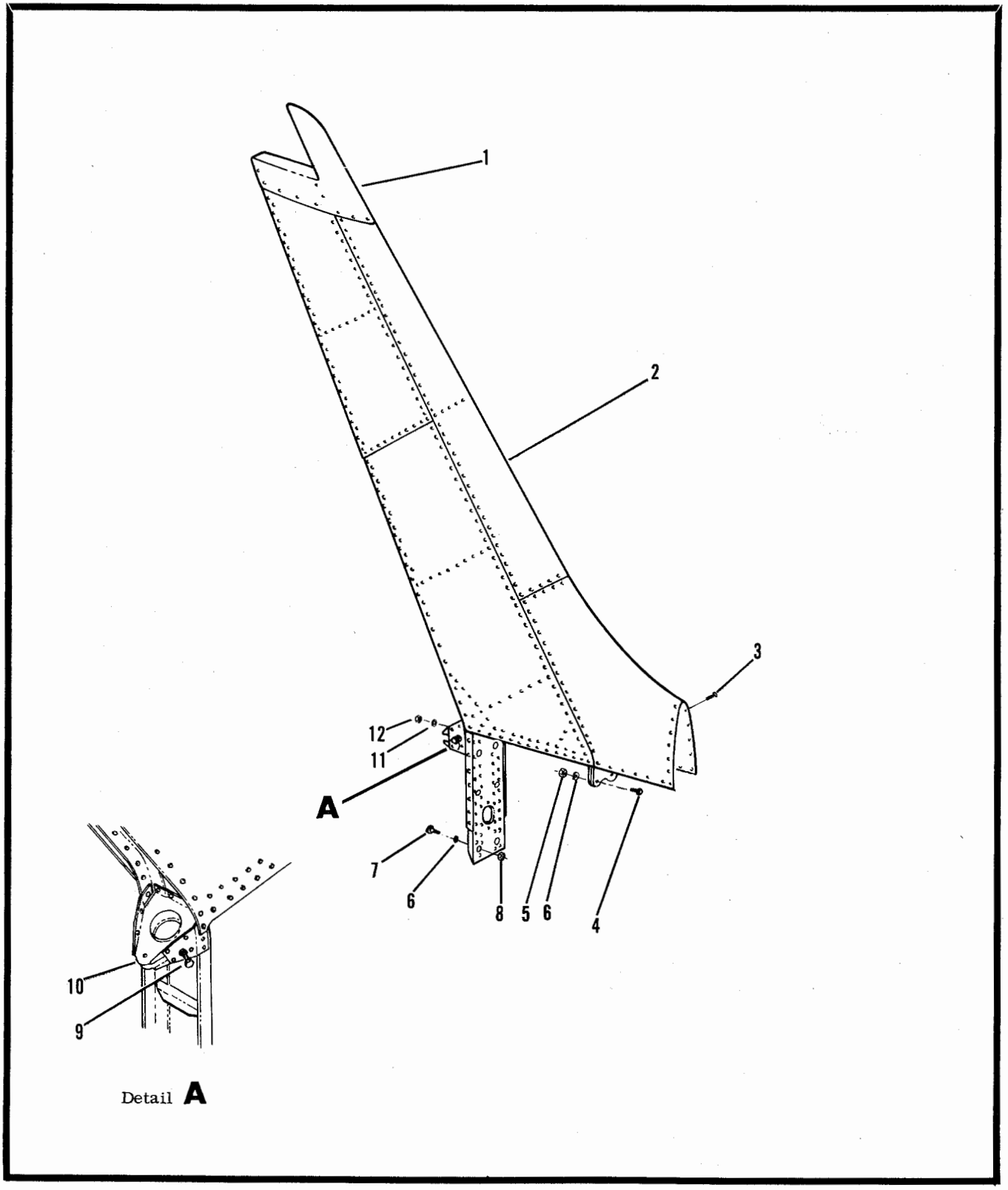
d. Disconnect the two quick-disconnect terminals and the ground wire at the aft fuselage bulkhead.
e. Refer to Section 7, remove rudder in accordance with removal procedures.
f. Refer to Section 7, remove rudder trim cables in accordance with removal procedures.
g. Remove four screws (3) attaching forward dorsal skin to fuselage.
h. Remove two nuts (5) and bolts (4) from front spar to fuselage.
i. Remove four bolts (7) and washers (6) attaching rear spar to fuselage.
j. Lift stabilizer vertically until front spar has cleared fuselage and remove stabilizer from fuselage.

Installation of Vertical Stabilizer. (See figure 3-18.)

a. Place vertical stabilizer in position on fuselage and align mounting holes.
b. Attach vertical stabilizer rear spar to tailcone bulkhead with four bolts (7) and washers (6). Torque attaching bolts to 175 ±15 pound-inches.
c. Attach vertical stabilizer front spar to fuselage with two bolts and nuts. Torque attaching bolts to 175 ±15 pound-inches.
d. Attach forward dorsal skin to fuselage with four screws.
e. Refer to Section 7 and install rudder and rudder trim controls in accordance with installation procedures.
f. Refer to Section 7, rigging procedures and rig rudder and rudder trim system.
g. If omni-antenna (optional) is installed, connect the coaxial cable in the aft fuselage.
h. Connect rotating beacon wire terminals and attach the ground wire to the bulkhead in the aft fuselage.
i. Install fairings and remove tailcone support.

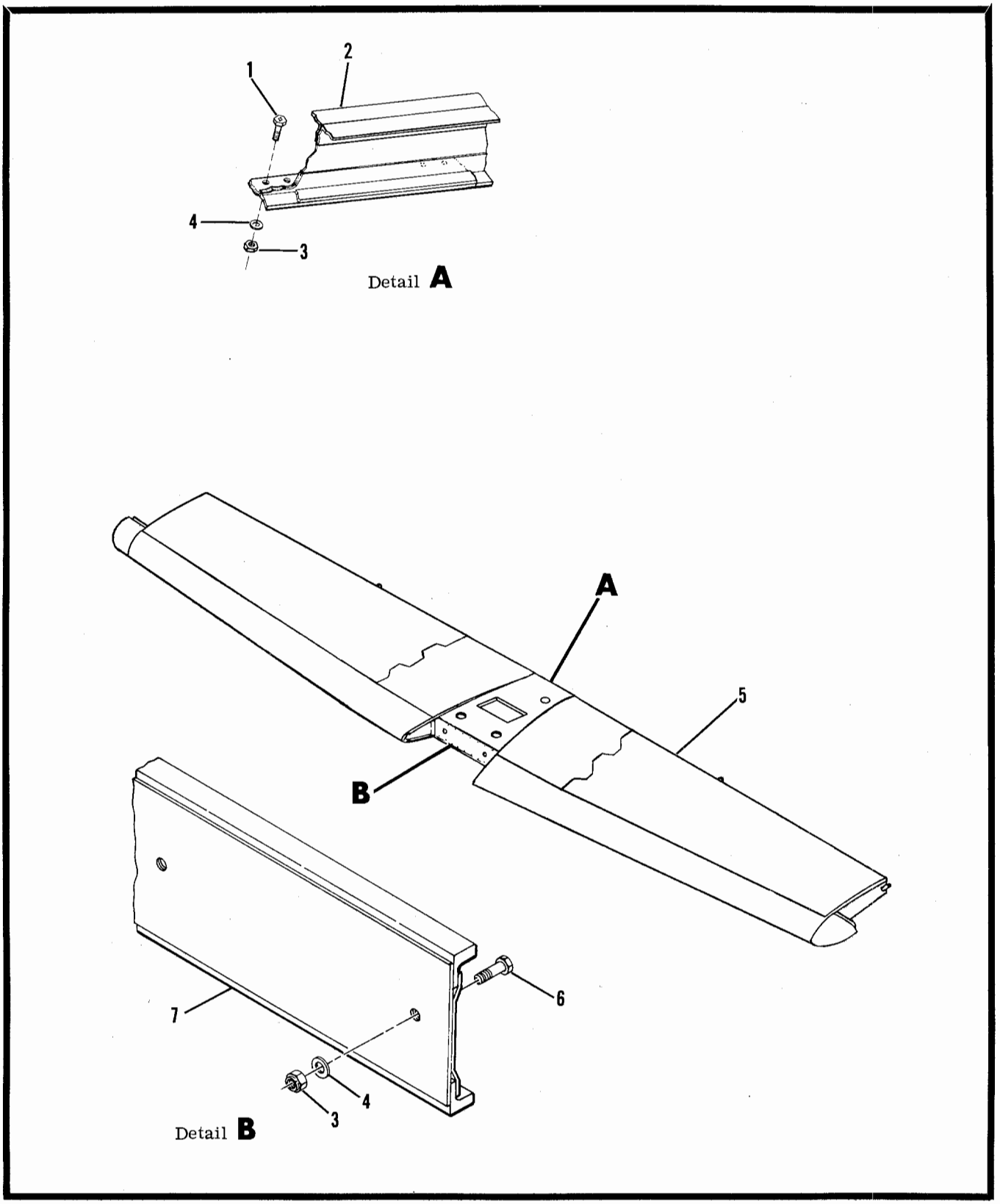
Removal of Horizontal Stabilizer. (See figure 3-19.)

a. Place a suitable support under tailcone.
b. Remove fuselage stinger in accordance with removal procedures.
c. Refer to Section 6, remove elevators in accordance with removal procedures.
d. Refer to Section 7, remove rudder in accordance with removal procedures.
e. Refer to Section 6, remove elevator trim cables in accordance with removal procedures.
f. Refer to Section 7, remove rudder trim cables in accordance with removal procedures.
g. Remove tail navigation light wires by removing screws from attaching clamps and wire terminal.
h. If deice system (optional equipment) is installed, disconnect and tag hoses at tee located on support bracket just forward of center bulkhead in tailcone.
i. See Figure 3-18 and remove vertical stabilizer in accordance with removal procedures.
j. See Figure 3-19 and remove four nuts (3), washers (4) and bolts (1) attaching rear spar to tailcone bulkhead.
k. Remove two nuts (3), washers (4) and bolts (6) attaching front spar (7) to fuselage bulkhead.




1. Fiberglass Tip
2. Vertical Fin
3. Screw
4. Bolt
5. Nut
6. Washer
7. Bolt
8. Nut
9. Rudder Bellcrank Stop Bolt
10. Lower Hinge Assembly
11. Washer
12. Nut

Figure 3-18. Vertical Stabilizer Installation




1. Bolt
2. Stabilizer Rear Spar
3. Nut
4. Washer
5. Horizontal Stabilizer
6. Bolt
7. Stabilizer Front Spar

Figure 3-19. Horizontal Stabilizer Installation

l. Lift the rear spar until horizontal stabilizer is at an angle of approximately 45 degrees, then lift straight up vertically and remove from fuselage.

Installation of Horizontal Stabilizer. (See figure 3-19.)

a. Position horizontal stabilizer on tailcone and align mounting holes.
b. Attach stabilizer front spar (7) to fuselage bulkhead with bolts (6), washers (4) and nuts (3). Torque bolts to 175 ±15 pound-inches.
c. Attach stabilizer rear spar (2) to tailcone bulkhead with bolts (1), washers (4) and nuts (3). Torque bolts to 120 ±20 pound-inches.
d. Install vertical stabilizer in accordance with installation procedures.
e. If deice system (optional) is installed, connect hoses to tee located on support bracket forward of center bulkhead in tailcone.
f. Connect tail navigation light wire and install screws in attaching clamps and wire terminals.
g. Refer to Section 7 and install rudder trim cables in accordance with installation procedures.
h. Refer to Section 6 and install elevator trim cables and elevators in accordance with installation procedures.
i. Refer to Section 7 and rig rudder trim and rudder control systems.
j. Refer to Section 6 and rig elevator trim and elevator control systems.
k. Install fuselage stinger in accordance with installation procedures.

FUSELAGE STINGER.

Removal of Fuselage Stinger. (See figure 3-20.)

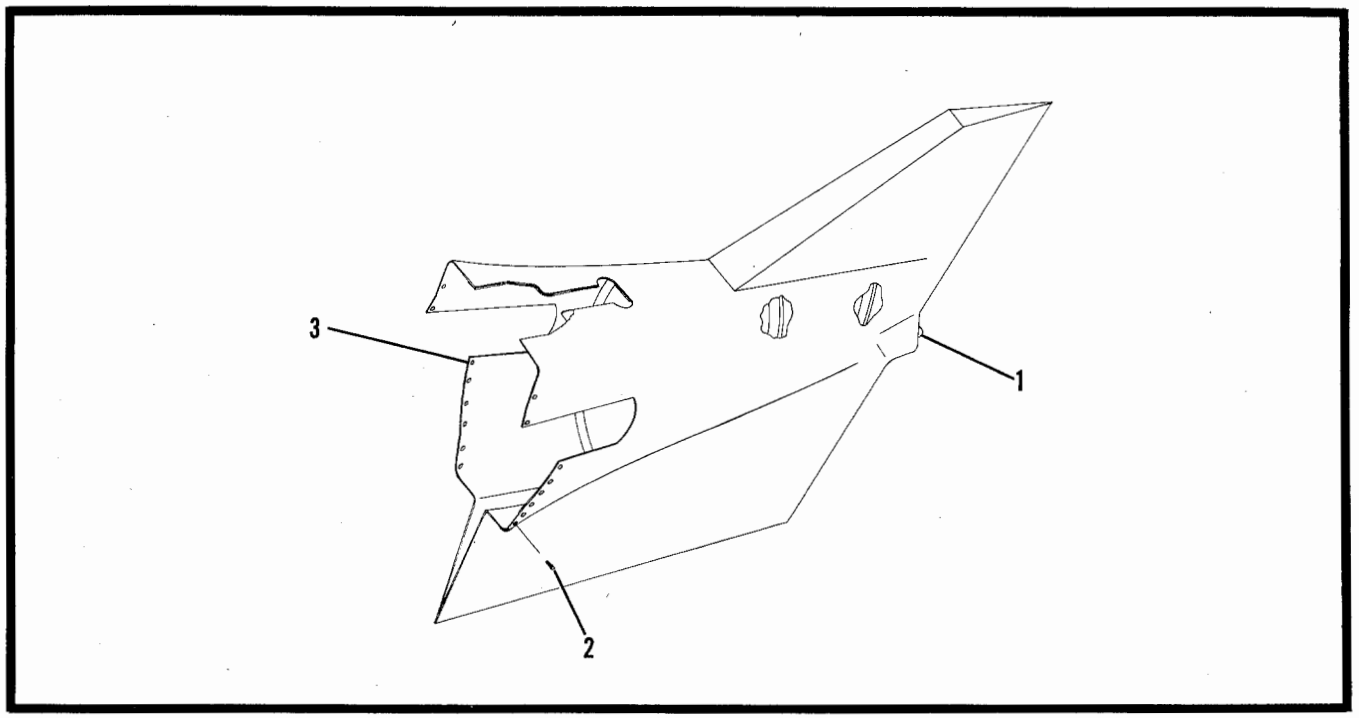
a. Remove attaching screws and move stinger assembly aft slightly.
b. Disconnect electrical wires to the navigation light.
c. If a reel antenna (optional) has been installed, disconnect the reel antenna lead wires.
d. Remove stinger assembly (3) from tailcone.

Installation of Fuselage Stinger. (See figure 3-20.)

a. If removed, install tail navigation light with attaching screws, washers and nuts.
b. Place stinger assembly (3) near tailcone.
c. If antenna reel (optional) is installed, connect reel and lead wires.
d. Connect electrical wire.
e. Secure stinger assembly (3) to tailcone with screws.

Radome.

The radome is a covering designed to protect the radar antenna from the elements. It is part of the nose section and has certain physical and electrical properties. Physically, the radome must withstand airloads subjected to it and also minimize drag. Electrically, the radome must permit passage of the radar transmitted signals and return echoes with min-




1. Tail Light Assembly 2. Screw 3. Fuselage Stinger

Figure 3-20. Fuselage Stinger

imum distortion and absorption. In order to do this, it must have a certain electrical thickness and this is related to the physical thickness, operating frequency and type of material and construction. This relationship is defined by a number of complex mathematical equations. These equations show that for given physical properties a radome will have certain electrical thickness for a narrow range of operating frequencies. This is why C-band radomes will not give optimum performance with X-band radar and vice-versa. Also, a very small variation in physical thickness will cause a sizeable variation in electrical thickness. This can mean the difference between an efficient radome and an inefficient radome that can reduce radar range, distort displays and cause inaccurate directions and false targets.

Removal and Installation of Radome. (See figure 3-21.)

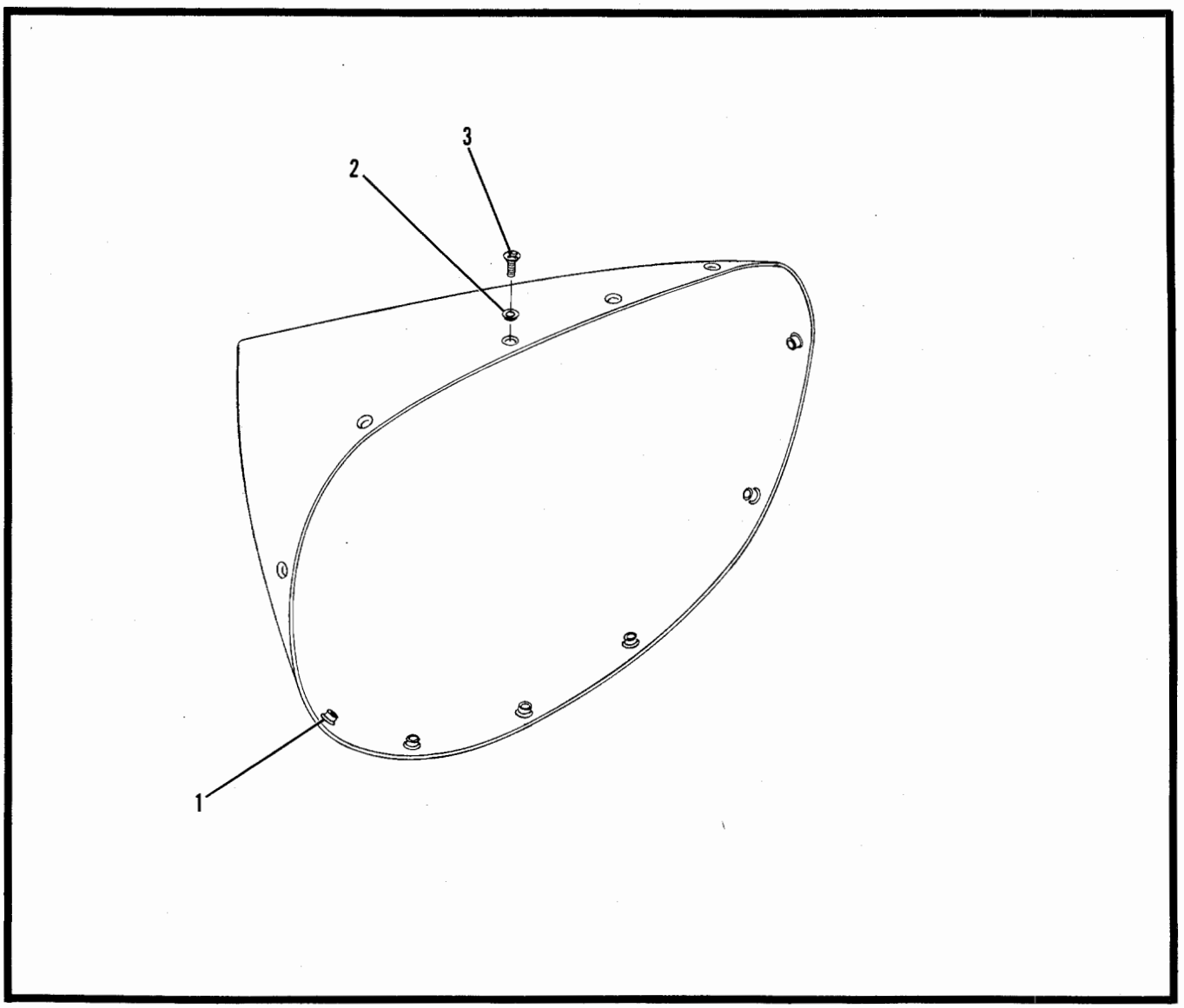
NOTE

Removal and installation is the same for the standard nose cap or for the radome.

a. Remove screws around the periphery of the radome.
b. Slide the radome forward sufficiently to disconnect the glide slope antenna lead.
c. Installation of the radome is the reversal of the removal procedures.

Repair of Radome.

Refer to Section 16 for repairing the radome.




1. Screw 2. Washer 3. Screw

Figure 3-21. Radome Installation

SECTION 4

# LANDING GEAR AND BRAKE SYSTEM

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LANDING GEAR.

The landing gear is a fully-retractable tricycle landing gear consisting of a main gear located aft of each engine nacelle, and a nose gear located in the nose section of the fuselage. Each landing gear is connected mechanically to a single gearbox driven by an electric motor. In the event of landing gear electrical system failure, the landing gear can be extended by operating the manual extension hand crank located at the right side of the pilot's seat. Limit switches control the UP and DOWN limits and prevent overtravel by opening the electrical circuits to the motor when the correct amount of travel has been attained. There is a position indicator switch located on each gear to indicate when the landing gear is down and locked. A safety switch prevents accidental retraction on the ground by opening the landing gear electrical circuit while the weight of the aircraft is on the landing gear.

Troubleshooting the Landing Gear System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LANDING GEAR FAILS TO RETRACT - GEAR MOTOR OPERATES | Manual extension crank improperly stowed. | Stow crank properly. |
| | Defective landing gear actuator. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual. |
| | Defective reduction unit. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual. |
| | Pin sheared on gear motor shaft. | Replace pin. |
| | Broken bolts or retracting linkage, or disconnected retracting linkage. | Replace broken parts. Connect linkage if disconnected. |
| LANDING GEAR FAILS TO RETRACT - GEAR MOTOR DOES NOT OPERATE | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| | Insufficient electrical power. | Recharge batteries. Check voltage regulators. |
| | Defective UP limit switch. | Replace switch. Adjust in accordance with rigging procedure. |
| | Defective landing gear safety switch. | Replace switch. |
| | Incorrectly adjusted landing gear safety switch. | Adjust safety switch. |
| | Defective landing gear relay. | Replace relay. |
| | Defective landing gear switch. | Replace switch. |
| | Defective landing gear motor. | Replace motor. |
| | Defective UP electrical circuit. | Repair circuit. |
| LANDING GEAR FAILS TO RETRACT COMPLETELY | Landing gear incorrectly rigged for retracted position. | Rig in accordance with rigging procedure. |
| | Circuit breaker out, due to overload caused by incorrect landing gear rigging. | Reset circuit breaker and rig in accordance with rigging procedure. |
| | Circuit breaker out, due to overload caused by defective retracting linkage. | Reset circuit breaker, replace defective linkage, rig in accordance with rigging procedure. |

Troubleshooting the Landing Gear System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LANDING GEAR FAILS TO RETRACT COMPLETELY (CONT.) | UP limit switch incorrectly adjusted. | Adjust in accordance with rigging procedure. |
| ONE LANDING GEAR FAILS TO RETRACT | Retracting linkage to affected gear broken or disconnected. | Replace broken parts. Connect linkage if disconnected. Rig in accordance with rigging procedure. |
| | Affected landing gear incorrectly rigged for retracted position. | Rig in accordance with rigging procedure. |
| | Defective retracting linkage to affected landing gear. | Replace defective linkage and rig in accordance with rigging procedure. |
| LANDING GEAR FAILS TO EXTEND - GEAR MOTOR OPERATES | Manual extension crank improperly stowed. | Stow crank properly. |
| | Defective landing gear actuator. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual. |
| | Defective reduction unit. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual. |
| | Pin sheared on gear motor shaft. | Replace pin. |
| | Broken bolts or retracting linkage, or disconnected retracting linkage. | Replace broken parts. Connect linkage if disconnected. |
| LANDING GEAR FAILS TO EXTEND - GEAR MOTOR DOES NOT OPERATE | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| | Insufficient electrical power. | Recharge batteries. Check voltage regulators. |
| | Defective DOWN limit switch. | Replace switch. Adjust in accordance with rigging procedure. |
| | Defective landing gear switch. | Replace switch. |
| | Defective landing gear motor. | Replace motor. |
| | Defective DOWN electrical circuit. | Repair circuit. |
| LANDING GEAR FAILS TO EXTEND COMPLETELY | DOWN limit switch incorrectly adjusted. | Adjust in accordance with rigging procedure. |
| | Landing gear incorrectly rigged for the DOWN position. | Rig in accordance with rigging procedure. |
| | Circuit breaker out, due to overload caused by incorrect rigging. | Reset circuit breaker and rig in accordance with rigging procedure. |
| | Circuit breaker out, due to overload caused by defective retracting linkage. | Reset circuit breaker, replace defective linkage, and rig in accordance with rigging procedure. |

Troubleshooting the Landing Gear System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ONE LANDING GEAR FAILS TO EXTEND | Retracting linkage to affected gear broken or disconnected. | Replace broken parts. Connect linkage if disconnected. Rig in accordance with rigging procedure. |
| ONE LANDING GEAR FAILS TO EXTEND COMPLETELY | Affected landing gear incorrectly rigged for the DOWN position. | Rig in accordance with rigging procedure. |
| | Defective retracting linkage to affected gear. | Replace defective linkage and rig in accordance with rigging procedure. |
| MANUAL EXTENSION SYSTEM FAILS TO EXTEND LANDING GEAR | Manual extension crank not fully engaged. | Engage crank fully. |
| | Incorrect adjustment of manual extension linkage. | Adjust linkage in accordance with rigging procedure. |
| | Defective manual extension linkage. | Replace defective linkage. |
| | Defective landing gear retracting linkage or actuator. | Replace defective linkage or actuator. |
| | Landing gear improperly rigged. | Rig landing gear in accordance with rigging procedure. |
| RED LIGHT FAILS TO LIGHT WHEN GEAR RETRACTS | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| | Lamp burned out. | Replace lamp. |
| | Lamp loose. | Repair or replace receptacle. |
| | Defective electrical circuit. | Repair circuit. |
| | Defective indicator module. | Replace module. |
| | Landing gear not fully retracted. | Retract fully. |
| | Defective or incorrectly adjusted UP limit switch. | Replace and/or adjust switch in accordance with rigging procedure. |
| RED LIGHT REMAINS ON WHEN GEAR IS DOWN AND LOCKED | Defective UP limit switch. | Replace switch and adjust in accordance with rigging procedure. |
| | Circuit shorted to another system. | Locate and repair. |
| LEFT GEAR DOWN (GREEN)<br>RIGHT GEAR DOWN (GREEN)<br>NOSE GEAR DOWN (GREEN)<br>LIGHTS FAIL TO LIGHT | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker or electrical circuit. | Replace circuit breaker. Replace defective electrical circuit. |
| | Lamps burned out. | Replace lamps. |
| | Lamps loose. | Repair or replace receptacle. |
| | Landing gear not fully extended. | Extend fully. |
| | One or more DOWN indicator switches defective or incorrectly adjusted. | Replace defective switches and/or adjust in accordance with rigging procedure. |
| | Defective indicator module. | Replace module. |

Troubleshooting the Landing Gear System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LEFT GEAR DOWN (GREEN)<br>RIGHT GEAR DOWN (GREEN)<br>NOSE GEAR DOWN (GREEN)<br>LIGHT REMAINS ON WHEN GEAR IS UP | Circuit shorted to another system. | Locate and repair. |
| | Defective switch. | Locate and repair or replace. |
| LEFT GEAR DOWN (GREEN)<br>RIGHT GEAR DOWN (GREEN)<br>NOSE GEAR DOWN (GREEN)<br>LIGHT FLICKERS WHEN GEAR IS DOWN | One or more DOWN indicator switches defective or incorrectly adjusted. | Replace defective switches and/or adjust in accordance with rigging procedure. |
| | Loose lamp. | Repair or replace receptacle. |
| | Defective indicator module. | Replace module. |
| GEAR WARNING HORN SOUNDS IN FLIGHT WHEN LANDING GEAR IS DOWN AND THROTTLES ARE RETARDED | Defective gear DOWN indicator switch. | Replace defective switch and adjust in accordance with rigging procedure. |
| GEAR WARNING HORN SOUNDS IN FLIGHT WHEN LANDING GEAR IS UP AND THROTTLES ARE NOT RETARDED | Defective throttle microswitch. | Replace switch and adjust in accordance with rigging procedure. |
| | Incorrectly adjusted throttle microswitch or landing gear warning switch on flap preselect arm. | Refer to Section 4 and Section 8 and adjust in accordance with rigging procedures. |
| GEAR WARNING HORN SOUNDS ON THE GROUND WHILE LANDING GEAR SWITCH IS DOWN | Incorrectly adjusted gear DOWN indicator switches. | Replace switch and adjust in accordance with rigging procedure. |
| | Defective gear DOWN indicator switches. | Replace switch and adjust in accordance with rigging procedure. |
| GEAR WARNING HORN SOUNDS WHEN BATTERY SWITCH IS TURNED ON, OR SOUNDS WHEN AN UNRELATED SYSTEM IS TURNED ON | Circuit shorted to another system. | Locate and repair. |
| | Incorrectly adjusted gear DOWN indicator switches. | Adjust switch in accordance with rigging procedure. |
| | Defective gear DOWN indicator switches. | Replace switch and adjust in accordance with rigging procedure. |
| GEAR WARNING HORN FAILS TO SOUND WHEN LANDING GEAR SWITCH IS PLACED UP WHILE ON THE GROUND | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| | Landing gear safety switch incorrectly adjusted. | Adjust in accordance with rigging procedure. |
| | Defective landing gear safety switch. | Replace switch and adjust in accordance with rigging procedure. |
| | Defective electrical circuit. | Repair circuit. |
| | Defective warning horn or flasher unit. | Replace horn or flasher unit. |

Troubleshooting the Landing Gear System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| GEAR WARNING HORN FAILS TO SOUND IN FLIGHT WHEN LANDING GEAR IS UP AND THROTTLES ARE RETARDED | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| | Defective gear DOWN indicator switches. | Replace switch and adjust in accordance with rigging procedure. |
| | Defective electrical circuit. | Repair circuit. |
| | Defective warning horn. | Replace horn. |
| | Throttle microswitch incorrectly adjusted. | Adjust in accordance with rigging procedure. |
| | Defective throttle microswitch. | Replace switch and adjust in accordance with rigging procedure. |
| | Flap warning switch incorrectly adjusted. | Refer to Section 8 and adjust switch in accordance with rigging procedures. |
| LANDING GEAR DOORS FAIL TO OPERATE PROPERLY | Doors incorrectly rigged. | Rig doors in accordance with rigging procedure. |
| | Defective door operating linkage. | Replace defective linkage. |
| LANDING GEAR SHIMMIES DURING FAST TAXI, TAKEOFF OR LANDING | Insufficient fluid in shimmy dampener. | Service shimmy dampener in accordance with Section 2. |
| | Internal leakage in shimmy dampener. | Replace defective seals and/or piston. |
| | Roll pin attaching piston to piston rod sheared. | Replace roll pin. |
| | Shimmy dampener loose at mounting. | Replace worn housing and/or attaching bolt. |
| | Tires out of balance. | Replace tires when tread is worn unevenly or has flat spots. |
| | Worn or loose wheel bearings. | Replace and/or adjust bearings. |
| | Excessive clearance between upper and lower torque links. | Adjust clearance in accordance with alignment procedure. |
| | Worn torque link bushings. | Replace bushings. |
| EXCESSIVE OR UNEVEN WEAR ON TIRES | Incorrect operating pressure. | Inflate to correct pressure. |
| | Incorrect wheel alignment. | Align in accordance with alignment procedure. |
| | Wear resulting from shimmy. | See the preceding corrections for shimmy. |
| NOSE GEAR FAILS TO STEER PROPERLY | Incorrect rigging of nose gear steering system. | Rig in accordance with nose gear steering procedure. |
| | One brake dragging. | Determine cause and correct. |
| | Defective nose gear steering springs. | Replace springs. |

Troubleshooting the Landing Gear System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NOSE GEAR FAILS TO STRAIGHTEN WHEN LANDING GEAR EXTENDS | Gimbal broken or damaged at the top of the nose strut. | Replace defective gimbal. |
| | Incorrect rigging of nose gear steering system. | Rig in accordance with nose gear steering procedure. |
| NOSE GEAR FAILS TO STRAIGHTEN WHEN LANDING GEAR RETRACTS | Gimbal broken or damaged on top of the nose strut. | Replace defective gimbal. |
| ATTITUDE OF AIRCRAFT ON GROUND IS INCORRECT | Landing gear struts incorrectly inflated. | Inflate struts correctly. |
| STRUT BOTTOMS ON NORMAL LANDING OR TAXIING ON ROUGH GROUND | Insufficient air and/or fluid in strut. | Service strut with proper amount of fluid and air. |
| | Defective internal parts in strut. | Replace defective parts. |
| STRUT DEFLATED WITH EVIDENCE OF FLUID LEAKAGE | Defective O-rings. | Determine which O-rings are defective and replace. |

Landing Gear Actuator.

The landing gear actuator consists of an electric motor, a reduction unit, and a worm-and-sector assembly. The actuator is normally operated by the electric motor; however, linkage is provided to disengage the motor-driven reduction unit and engage the manual extension system, which is linked directly to the actuator worm gear. The bellcrank that operates the main landing gear drive tubes is attached to the lower end of the sector shaft, which extends vertically through the actuator assembly, and the bellcrank that operates the nose gear drive tube is attached to the upper end of the sector shaft. Adjustable limit switches are provided so that correct landing gear travel can be obtained.

Troubleshooting the Landing Gear Actuator Motor.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| BRAKE DOES NOT RESPOND AS REQUIRED | Loosen or open connections or circuits. Improper assembly. | Check test connections; if all right, test motor circuits for proper resistance, check for proper brake air gap. Adjust or replace defective parts. |
| SPEED IS TOO LOW OR CURRENT IS TOO HIGH | Incorrect end play, shorted armature circuit, excessive bearing friction. | Check motor for correct end play. If all right, test motor circuits for shorts. Replace defective parts. |
| MOTOR WILL NOT RUN | Circuit breaker out. | Reset breaker. If breaker will not remain set, check for shorted wiring in field circuit. If field circuit is shorted, refer to Landing Gear and Flap System Components Overhaul/ Parts Manual and repair or replace motor. |
| MOTOR NOISY | Faulty bearings or armature dragging. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual and repair or replace motor. |

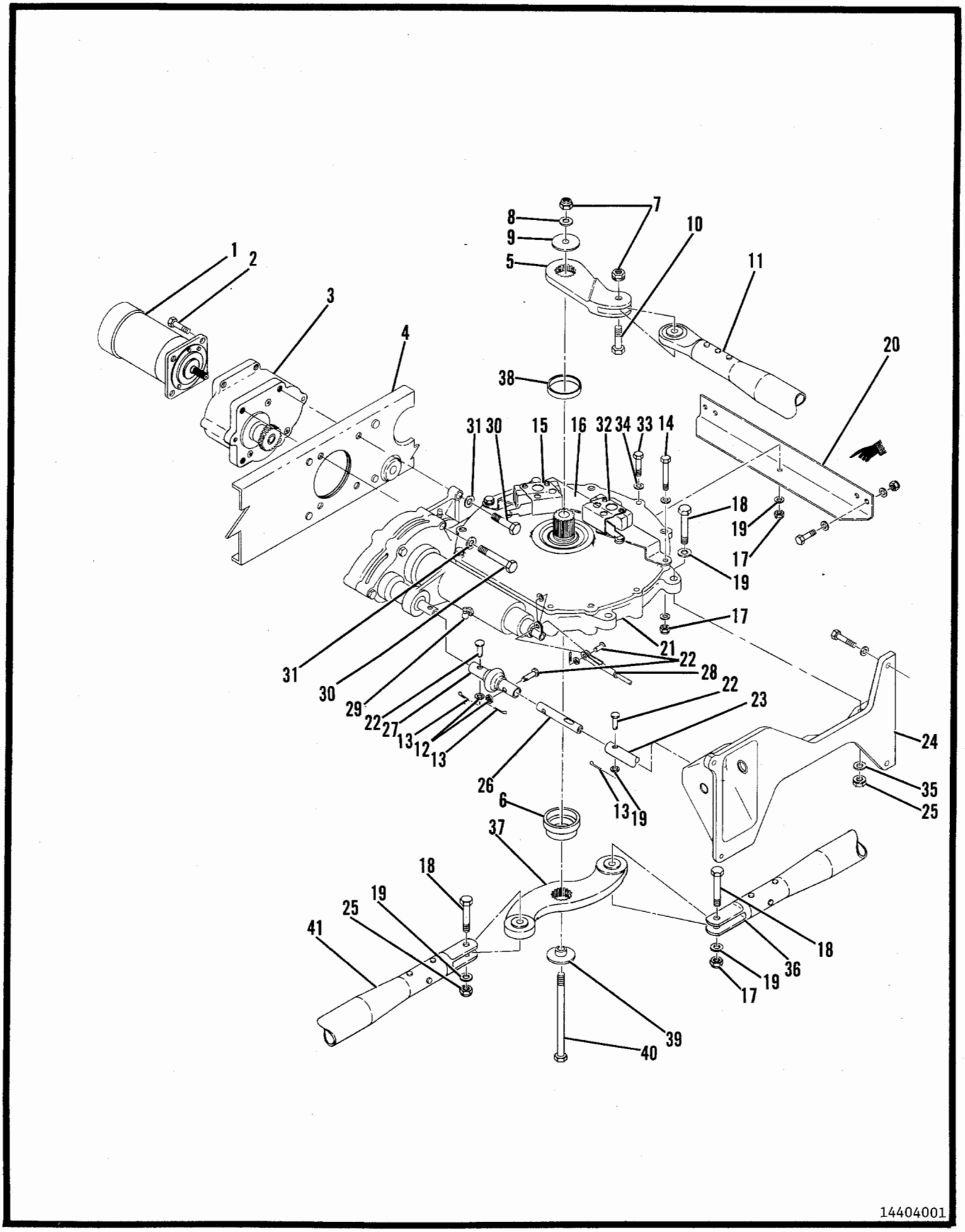



Figure 4-1. Landing Gear Actuator Installation

Figure 4-1. Landing Gear Actuator Installation Callouts

1. Landing Gear Motor
2. Bolt
3. Reduction Unit
4. Bulkhead
5. Upper Bellcrank
6. Spacer
7. Nut
8. Washer
9. Cap
10. Bolt
11. Nose Gear Drive Tube
12. Washer
13. Cotter Pin
14. Bolt
15. Up Limit Switch
16. Bracket
17. Nut
18. Bolt
19. Washer
20. Support
21. Actuator Assembly
22. Pin
23. Gear Shaft
24. Mounting Bracket
25. Nut
26. Torque Shaft
27. U-Joint
28. Manual Extension Disengage Rod
29. Grease Fitting
30. Bolt
31. Washer
32. Down Limit Switch
33. Bolt
34. Washer
35. Washer
36. Main Landing Gear Drive Tube
37. Lower Bellcrank
38. Spacer
39. Bolt
40. Cap
41. Bolt
42. Main Gear Drive Tube

Removal of Landing Gear Actuator. (See figure 4-1.)

a. Jack the aircraft in accordance with Section 2.
b. Remove the rear seats and carpet.
c. Remove cabin floorboards above landing gear actuator and access hole cover from underside of fuselage beneath landing gear actuator.
d. Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
e. Disconnect nose gear forward push-pull tube from fork bolt.
f. Disconnect both main landing gear drive tubes from idler bellcranks.
g. Remove the nose gear drive tube attached to upper bellcrank.
h. Remove nut, washer, caps, and bolt attaching upper and lower bellcranks to the sector shaft.
i. Lower bellcrank enough to allow main gear drive tubes to be disconnected. Remove nuts, washers and bolts attaching main gear drive tubes to lower bellcrank and slide both tubes outboard so they will not interfere with removal.
j. Disconnect manual extension disengage rod by removing cotter pin and clevis pin.
k. Disconnect the manual extension drive tubes by removing the three clevis pins, washers and cotter pins; then slide torque shaft and universal joint forward to disconnect.
l. Remove safetywire from bolts to be removed; then remove the four bolts and washers attaching reduction unit and actuator assembly to the aft bulkhead.

NOTE

When removing the motor, disconnect and tag all electrical wires at the quick-disconnects provided.

m. Remove switch brackets from actuator assembly. Do not disturb switch adjustments except to replace switches or brackets.

NOTE

If switches are to be replaced, tag wires before disconnecting.

n. Remove the two bolts, washers, and nuts attaching actuator assembly for forward bracket and bolt, washers and nut attaching actuator to side support.
o. Lift actuator assembly vertically and remove from aircraft.
p. Remove the lower bellcrank and spacer from end of sector shaft.

Cleaning, Inspection, and Lubrication of Landing Gear Actuator. (See Section 2.)

Installation of Landing Gear Actuator. (See figure 4-1.)

a. Install lower bellcrank on lower end of sector shaft.

NOTE

When installing lower bellcrank, align the index punch mark on the bellcrank with the chamfered spline on the sector shaft.

b. Position actuator assembly in position, aligning manual extension outer and inner shaft so they will mate.

NOTE

To facilitate installation, install all actuator attaching bolts before any bolts are tightened.

c. Install the two bolts attaching the actuator to the forward mounting bracket and bolt, washers and nut securing actuator to side support.
d. Install the four bolts and washers attaching actuator assembly and reduction unit to bulkhead.
e. If motor was removed, connect the electrical wires at the quick-disconnect provided.
f. Install switch brackets with bolts, washers and nuts.

CAUTION

Check switches thoroughly for proper operation. A faulty switch may cause damage to the landing gear actuator.

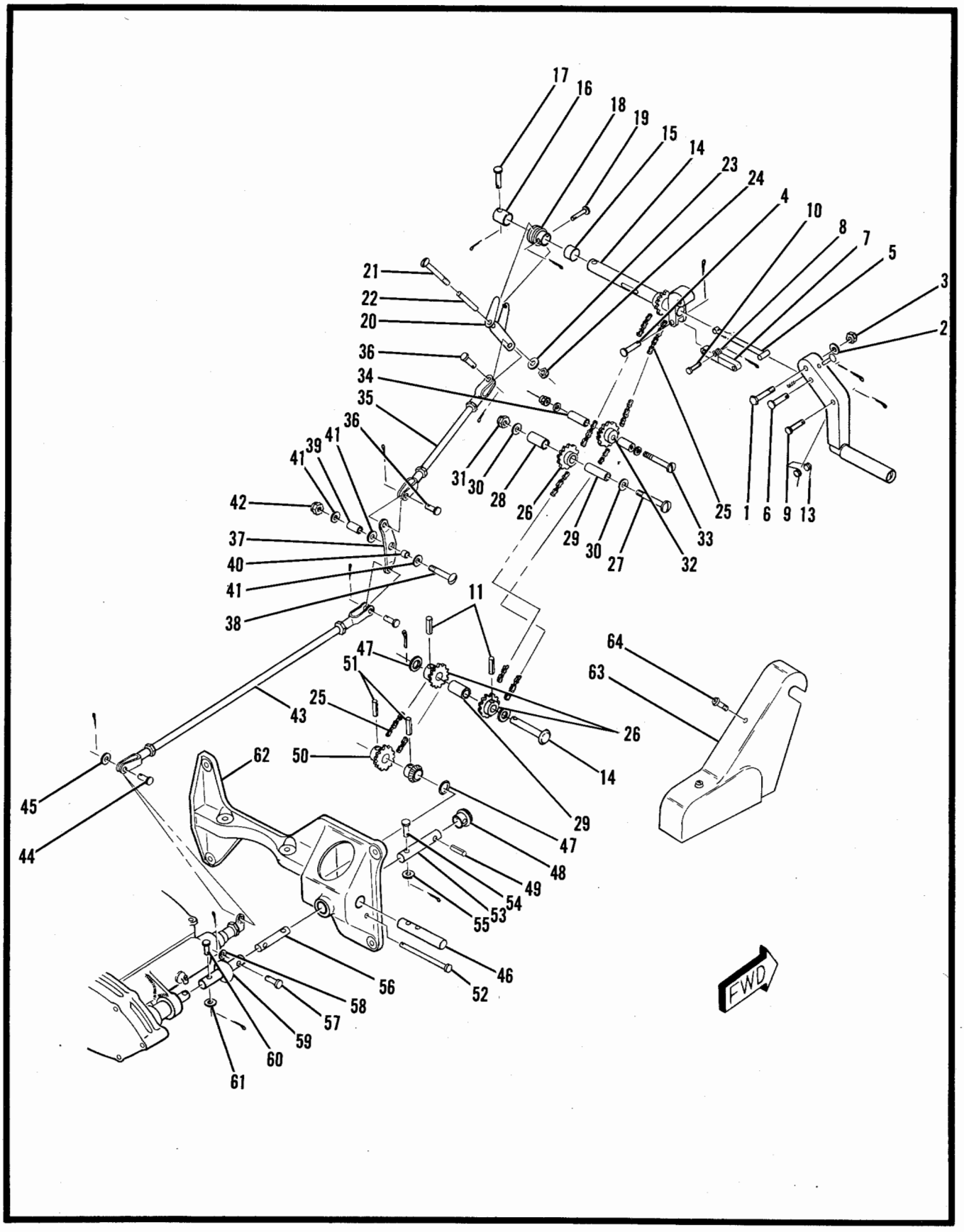



Figure 4-2. Manual Extension System Installation

Figure 4-2. Manual Extension System Installation Callouts

1. Bolt
2. Washer
3. Nut
4. Nut
5. Spool Link
6. Pin
7. Link
8. Spring
9. Pin
10. Pin
11. Pin
12. Sprocket
13. Spring
14. Shaft
15. Spacer
16. Spacer
17. Pin
18. Spool
19. Pin
20. Bellcrank
21. Screw
22. Bushing
23. Washer
24. Nut
25. Chain
26. Sprocket
27. Bolt
28. Spacer
29. Spacer
30. Washer
31. Nut
32. Sprocket
33. Bolt
34. Spacer
35. Link
36. Pin
37. Bellcrank
38. Bolt
39. Spacer
40. Spacer
41. Washer
42. Nut
43. Rod
44. Pin
45. Washer
46. Spacer
47. Washer
48. Miter Gear
49. Pin
50. Sprocket
51. Pin
52. Pin
53. Shaft
54. Pin
55. Washer
56. Shaft
57. Pin
58. Washer
59. U-Joint
60. Pin
61. Washer
62. Mounting Bracket
63. Chain Guard
64. Screw

g. Tighten all nuts and bolts which were installed but not tightened.
h. Safetywire bolts attaching actuator to the bulkhead.
i. Connect torque shaft and universal joint with clevis pins and washers, and safety with cotter pins.
j. Connect the manual extension disengage rod with clevis pin and safety with cotter pin.
k. Position lower bellcrank below actuator assembly, slide main gear drive tubes inboard and attach to bellcrank with bolts, washers and nuts. Install bolts with their threaded ends DOWN.

NOTE

Main gear drive tubes must be installed with half-round side of end fitting upwards.

l. Place spacer and lower bellcrank on sector shaft.

NOTE

When installing lower bellcrank, align the index punch mark on the bellcrank with the chamfered spline on the sector shaft.

m. Insure that upper bellcrank and spacers are correctly ;in position and install bolt, caps, washer and nut.
n. Attach nose gear drive tube to upper bellcrank with bolt, washer and nut.
o. Connect main landing gear drive tubes to idler bellcranks with bolts, spacers and nuts.
p. Connect forward push-pull tube to fork bolt with bolt and nut.
q. Perform an operational check of landing gear, checking especially that limit switches are correctly adjusted and landing gear is correctly rigged.
r. Install cabin floor panel and access hole cover on underside of fuselage beneath landing gear actuator
s. Install rear carpet and seats removed for removal of actuator.
t. After making sure landing gear is DOWN and locked, remove aircraft from jacks.

Manual Extension System.

The manual extension system consists of a hand crank, which is connected to the landing gear actuator by an arrangement of chain and sprockets, bellcranks, miter gears, and push-pull rods. The hand crank, located at the right of the pilot's seat, is provided with a spring-loaded release button which unlocks the hand crank so that it can be folded into the stowed position. When the hand crank is folded, it disengages the manual extension system; when unfolded, into its operating position, the hand crank disengages the normal landing gear operating system.

Removal of Manual Extension System. (See figure 4-2.)

a. Remove pilot's seat.
b. Remove left rear seats and carpet to gain access to cover over extension system.
c. Remove cabin floorboards above the landing gear actuator.
d. Remove chain guards by removing the three attaching screws.
e. Remove upper and lower chains by disconnecting at the master links.
f. Remove crank handle and shaft assembly as follows:

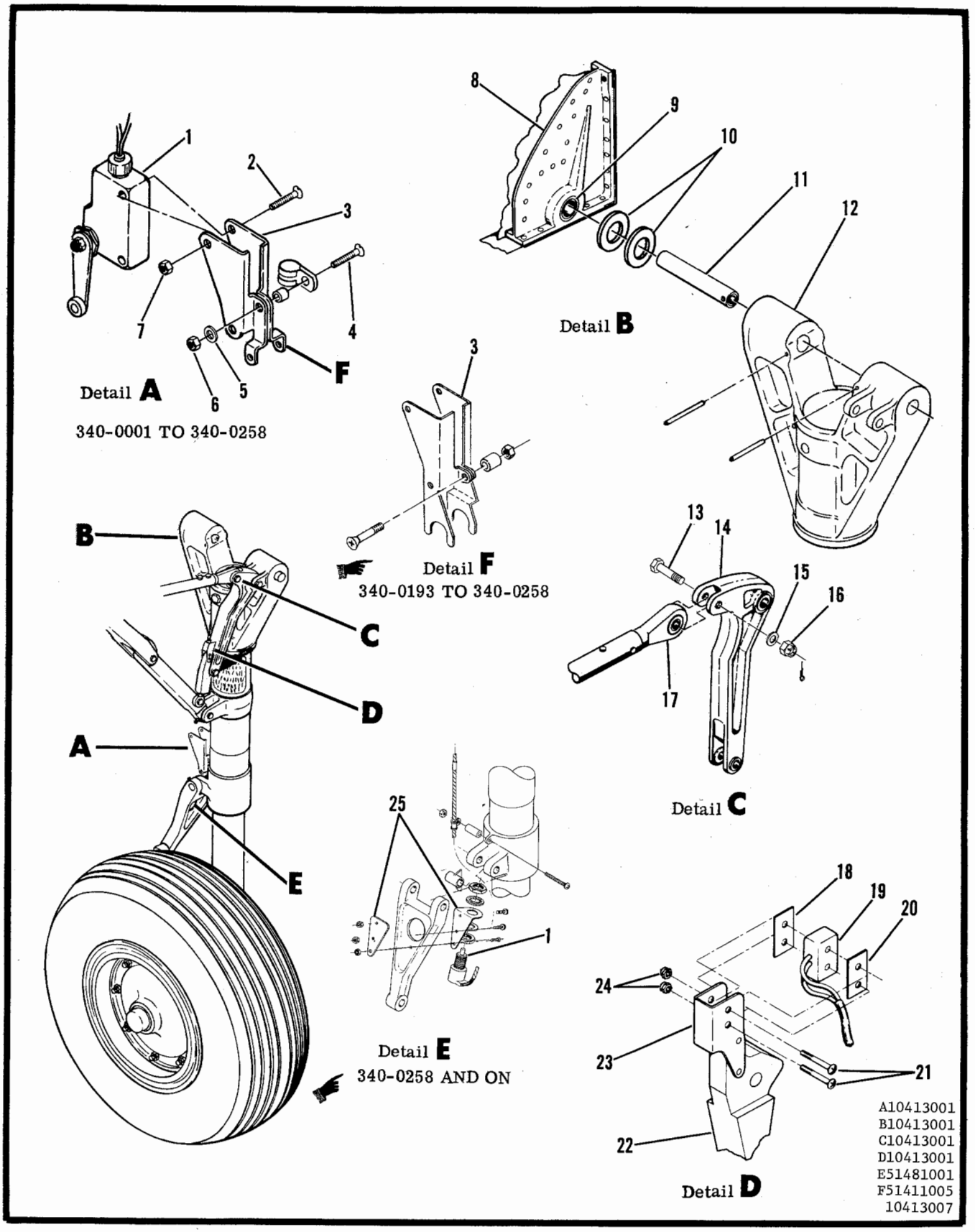



Figure 4-3. Main Landing Gear Installation

Figure 4-3. Main Landing Gear Installation Callouts

1. Landing Gear Safety Switch
2. Screw
3. Bracket
4. Screw
5. Washer
6. Nut
7. Nut
8. Landing Gear Support
9. Bearing
10. Washer
11. Attaching Shaft
12. Truss Assembly
13. Bolt
14. Bellcrank
15. Washer
16. Nut
17. Outboard Push-Pull Tube
18. Spacer
19. Down Indicator Switch
20. Spacer
21. Screw
22. Side Lock Link
23. Bracket
24. Nut
25. Plates

1. Remove roll pin and washer from shaft.
2. Remove cotter pin and clevis pin from spool.
3. Pull crank handle and shaft from supports, removing spool as shaft is pulled through it.

g. Remove upper rod assembly by removing cotter pins, washers, and clevis pins attaching rod assembly to the bellcranks.

h. Remove upper bellcrank by removing nut, washer, and bolt; then remove bushing from bellcrank.

i. Remove lower rod assembly by removing cotter pins, washer and clevis pins attaching rod assembly to lower bellcrank and landing gear actuator.

j. Remove lower bellcrank by removing nut, washer, spacer and bolt.

k. Remove chain tighteners by removing attaching screws and washers, then remove the adjusting screw, washers, and nut.

l. Remove center sprockets by removing roll pins, washers and pin from bracket.

m. If support bracket is to be disassembled further, proceed as follows:

1. Remove roll pins from sprocket and miter gear and slide shaft out of bracket and remove sprocket and miter gear.
2. Disconnect universal joint from actuator by removing cotter pin, washer and clevis pin.
3. Slide shaft with other miter gear aft and remove roll pin; then remove the other miter gear.

NOTE

If bushings in the support bracket are to be replaced, the landing gear actuator must be removed; then the support bracket removed from front spar. The oilite bearings in which the gear shafts rotate are a press fit, and should be removed only for replacement.

Cleaning, Inspection, and Lubrication of Manual Extension System. (See Section 2.)

Installation of Manual Extension System. (See figure 4-2.)

a. If the support bracket has been disassembled without removing the landing gear actuator, assemble as follows:

1. Insert actuator drive tube through the aft bushing; then install miter gear on shaft and insert roll pin.
2. Holding sprocket and other miter gear in position, slide the shaft through the gear and sprocket, then insert the two roll pins.

b. Connect universal joint and torque shaft from landing gear actuator.

NOTE

AN3-6A bolt and MS21042-3 nut with AN960-10 washers may be installed in lieu of clevis pin (54), washer (55) and cotter pin on universal joint if clevis pins are excessively loose.

c. Install chain tighteners with attaching screws and washers; then install adjusting screw, washers, and nut, but do not tighten at this time.

d. Install center sprockets by inserting in position and installing pin, washers and roll pins.

e. Install lower bellcrank with bolt, spacer, washer and nut.

f. Insert bushing into upper bellcrank then install bellcrank with bolts, washers and nuts.

g. If disassembled, reassemble crank handle and shaft with pins, cotter pins, nut and bolt.

h. Install crank handle and shaft assembly as follows:

1. Insert crank handle and shaft through inboard support, spool, and the outboard support.
2. Engage upper bellcrank with spool, align spool attaching holes, and install pin and cotter pin.
3. Place washer and collar on the shaft and install roll pin and safety. This washer is to remove end play.

i. Install chain on sprockets and connect with master link. Adjust chain tighteners and tighten adjusting screw and nut.

j. Attach the lower rod assembly to the lower bellcrank and landing gear actuator with pins and washers and safety with cotter pins.

k. Attach upper rod assembly to bellcranks with pins, washers and cotter pins.

l. If the length of the upper or lower rod has been changed, adjust as follows:

1. Place crank in operating position.
2. Adjust lower rod assembly to a length of approximately 18. 10 inches, measured between the rod end bolt holes, and install bolt.
3. Pull lower rod assembly forward until internal gear, in landing gear actuator, reaches the end of its travel; adjust upper rod assembly so that rod end bolt holes align with holes in upper and lower bellcranks.

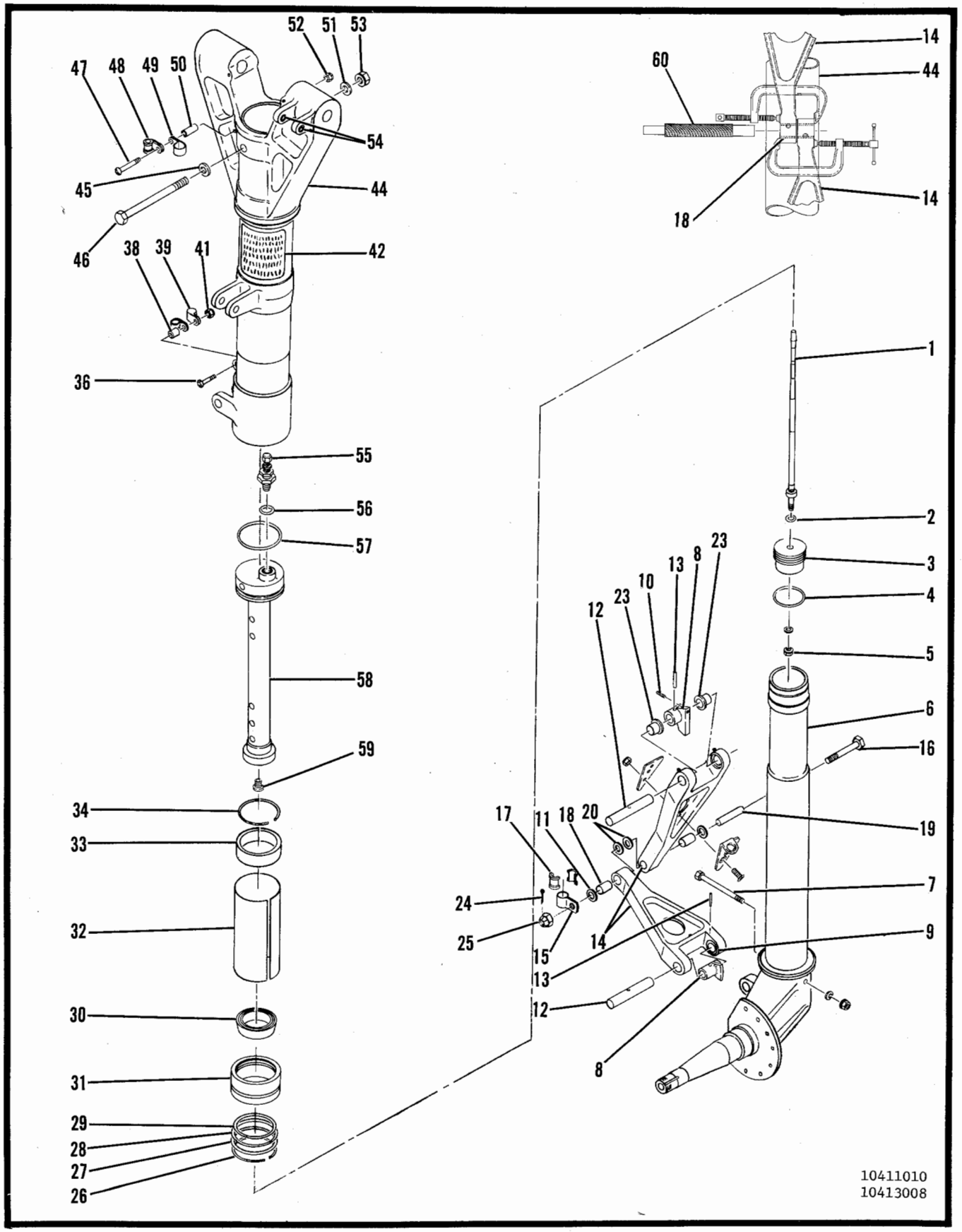



Figure 4-4. Main Landing Gear Strut

Figure 4-4. Main Landing Gear Strut Callouts

1. Metering Pin
2. O-Ring
3. Seal Support
4. O-Ring
5. Nut
6. Barrel Piston
7. Bolt
8. Spacer
9. Bushing
10. Setscrew
11. Washer
12. Shaft
13. Roll Pin
14. Torque Links
15. Clamp
16. Bolt
17. Bushing
18. Bushing
19. Spacer
20. Washer
21. Deleted
22. Deleted
23. Bushing
24. Cotter Pin
25. Nut
26. Lock Ring
27. Scraper Ring
28. Internal Lock Ring
29. O-Ring
30. Polypak Seal
31. Ring Pack Support
32. Spacer
33. Inner Bearing
34. External Lock Ring
35. Deleted
35. Screw
37. Deleted
38. Spscer
39. Clamp
40. Deleted
41. Nut
42. Placard
43. Deleted
44. Trunnion
45. Washer
46. Bolt
47. Screw
48. Clamp
49. Clamp
50. Spacer
51. Washer
52. Nut
53. Nut
54. Bushing
55. Valve Body
56. Packing
57. O-Ring
58. Metering Tube
59. Orifice
60. Reamer

4. Lengthen upper rod assembly one-half turn and install.

NOTE

If the upper rod assembly adjustment cannot be obtained because an excessive amount of threads would be exposed, readjust the lower rod assembly to obtain the desired result, and repeat steps "3" and "4."

m. Perform an operational check to see that manual extension functions properly.

CAUTION

Do not use the manual extension system to fully retract the landing gear, except when manually pushing upward on all landing gears to relieve strain on manual extension system.

n. Install chain guards with attaching screws.
o. Install access hole cover on cabin floor above the landing gear actuator.
p. Install rear carpet and seats.

Main Landing Gear.

Each main landing gear consists of a wheel and tire assembly, brake assembly, lower piston assembly, cantilever axle, upper cylinder assembly, and torque links. The Air-oleo shock strut contains an orifice and tapered metering pin which vary the resistance to shock according to its severity. During extension and retraction, the landing gear pivots on heavy-duty needle bearings by means of trunnion shafts attached to the upper cylinder assembly.

Removal of Main Landing Gear. (See figure 4-3.)

a. Jack the aircraft in accordance with Section 2.
b. Drain brake system by loosening bleeder plug.
c. Disconnect brake hose at forward wheel well bulkhead union. Plug hose and cap fittings to prevent entry of foreign matter.
d. Remove safety switch and down indicator switch by removing attaching screws and nuts.
e. Remove wire clamps and tie switches where they will not interfere with gear removal.
f. Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
g. Disconnect the main landing gear doors.
h. Disconnect retracting linkage as follows:
1. Disconnect outboard push-pull tube from bellcrank by removing nuts, washers, and bolts.
2. Disconnect upper side link from lower side link by removing nuts, washers, and bolts.
i. Remove roll pins from attaching shafts, and insert AN6 bolt or puller tool.
j. Support gear and pull attaching shafts.

NOTE

Needle bearings, in which the attaching shafts pivot, are a press fit and should be removed only for replacement. Bearings must be removed by driving them toward the wheel well.

CAUTION

NOTE the amount of thickness of washers removed. These washers should be installed exactly as they were located before removal to insure proper alignment of side link assembly.

Disassembly of Main Landing Gear. (See figure 4-4.)

a. Completely deflate strut, and after all the air has been expelled, remove the valve body and drain fluid.
b. Remove lower strut assembly from upper truss assembly as follows:
1. Disconnect brake hose from brake at elbow and remove hose.
2. Remove wheel and tire assembly and brake assembly from axle fitting.
3. Disconnect torque links (14) by removing cotter pin, nut (25), washer (11), spacer (19), clamp and bolt (16).
4. Remove lock ring (26), scraper ring (27), and internal lock ring (28).
5. Pull piston assembly (8) from trunnion (44).

CAUTION

Removal and handling of the lower strut should be done with care to prevent the possibility of damage to exposed parts.

c. Disassemble trunnion as follows:
1. Remove bolt (46), washers (45) and nut (53) from trunnion (44).
2. Remove metering tube (58) from trunnion (44) by pulling straight out.

CAUTION

If the metering pin and seal support are to be reinstalled, use extreme caution during removal.

NOTE

Lower piston barrel and axle fittings are press fit and drilled on assembly. Disassembly is not recommended.

3. See Section 2 for cleaning and inspection of main landing gear.

Assembly of Main Landing Gear. (See figure 4-4.)

NOTE

Before each component of the main landing gear shock strut is assembled, assure that it is thoroughly clean, then lubricate with system hydraulic fluid.

a. Assemble landing gear as follows:
1. Carefully work O-ring (2) over threads of metering pin (1) and install in seal support (3) with nut (5).
2. Install O-ring (4) in groove on outside of seal support (3).
3. Insert seal support (3), with metering pin assembled, into lower piston barrel (6).
4. Slide lock ring (26), scraper ring (27), and internal lock ring (28) on piston barrel (6).
5. Install polypak seal (30) inside ring pack support (31), then work O-ring (29) on the outside into groove on ring pack support (31) and slide onto piston barrel (6).

CAUTION

Install polypak seal with wide lip up toward pressure area.

6. Install spacer (32) on piston barrel (6).
7. Install inner bearing (33) on piston barrel (6) and secure with external lock ring (34).

NOTE

Install inner bearing with chamfered end up in order to seat against external lock ring.

8. Carefully work piston barrel into trunnion assembly (44) and slide ring pack support (31), internal lock ring (28), scraper ring (27), and lock ring (26) into barrel assembly (35) and secure.

NOTE

To prevent damage to piston barrel and ring pack support during installation, a ring pack support tool P/N 0880004-1, see figure 4-5, available from your Cessna Dealers Organization should be used.

9. Carefully work O-ring (57) into groove in metering tube (58) and insert into barrel assembly (35) taking care to align holes.
10. Install bolt (46), washers (45) and nut (53).
b. Assemble torque links (14), if removed, to strut assembly in accordance with installation of main gear torque links procedures.
c. Install brake assembly, wheel and tire assembly; then connect hoses and clamp.
d. Service strut with hydraulic fluid in accordance with Section 2. Do not fill with air at this time.
e. Install new O-ring (56) on valve body (55) and install in top of metering tube (58).
f. Install side braces removed with bolts, washers, and nuts.

Installation of Main Landing Gear.

a. If needle bearings were removed, install as follows:
1. Press needle bearings into landing gear supports. Bearings must seat against shoulders provided in supports.
b. Position gear in place; then install washers between supports and align holes.
c. Install attaching shafts into gear trunnion and align gear trunnion, washer, and bearing in the land-

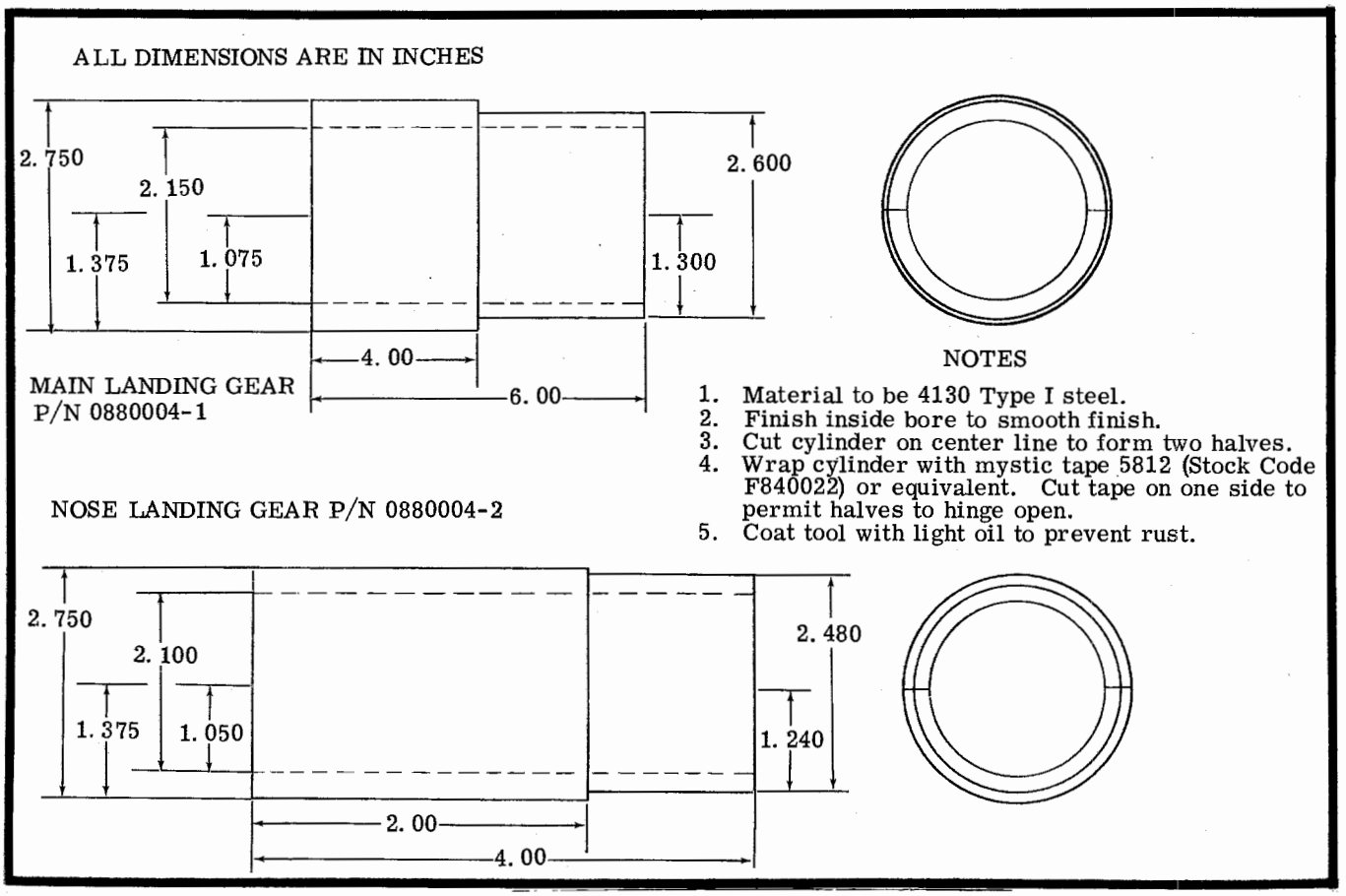



Figure 4-5. Landing Gear Ring Pack Support Tool

ing gear supports, then work the shafts into position, using care to align holes in shaft and trunnion for the installation of roll pin.

NOTE

The attaching shafts are a slip fit and should be lubricated with light oil to aid in the installation of the shafts.

d. Remove AN6 bolt used in removal and installation of attaching shafts and install roll pin.
e. Connect side brace and push-pull tubes and gear door using bolts, washers, nuts and cotter pins.
f. Install safety switch and down indicator switch with screws and nuts and adjust in accordance with Rigging of Main Landing Gear.

NOTE

Make sure landing gear limit switches have been packed with DC-4 Silicone Compound and all holes in the housing plugged to prevent moisture entering limit switches.

g. Remove plug and caps and connect brake hose to union at bulkhead at forward wheel well. Use suitable lubricant on threads.
h. Install clamps securing switch wire bundle and brake hose.
i. Service and bleed brake system in accordance with Servicing Instructions, Section 4.
j. Perform operational check on landing gear.
k. Service strut in accordance with Servicing Instructions in Section 2, then remove jacks.
l. Check landing gear alignment in accordance with Main Wheel Alignment and Figure 4-6.

Main Wheel Alignment. (See figure 4-6.)

Correct alignment of the main landing wheels is necessary to minimize tire wear. If the tires are wearing excessively or unevenly, the wheel alignment should be checked and corrected in accordance with the following procedure:
a. Position the aircraft with the main wheels resting on grease plates.

NOTE

For each set of grease plates, use two aluminum sheets approximately 18 inches square with sufficient grease spread between them to permit the top plates to slide freely on the bottom plates.

b. Set a straightedge in place against the main wheel tires at axle height as illustrated.
c. Place one leg of a carpenter's framing square

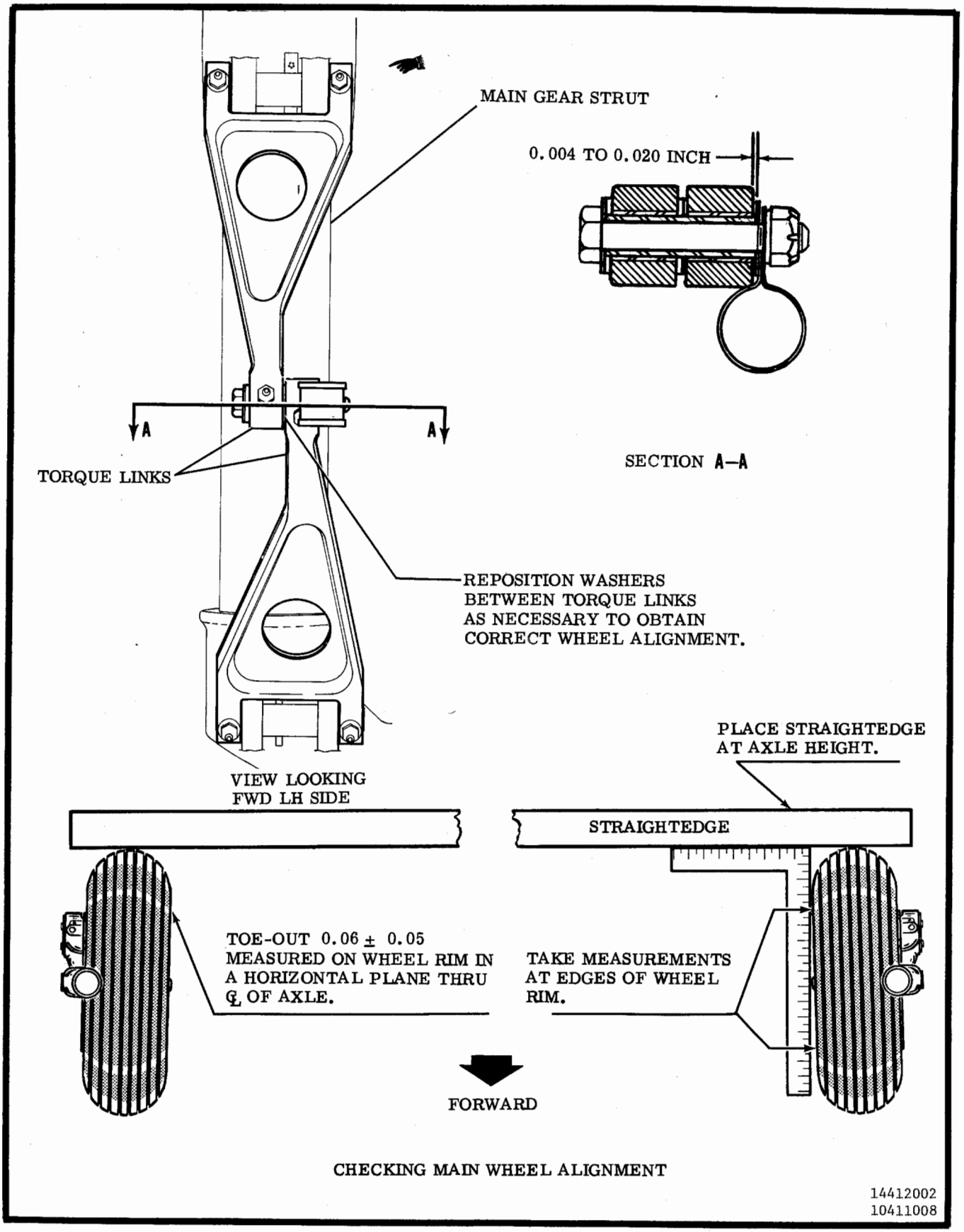



Figure 4-6. Main Wheel Alignment

against the straightedge, with the other leg against the inboard side of the wheel being checked. Measure the distance from framing square leg adjacent to wheel, to wheel rim, at extreme aft circumference of wheel rim. The difference between the two measurements will be the toe-in or toe-out for that wheel. Maximum permissible toe-out for either wheel is 0.06 ±0.05 inch.

NOTE

Remove weight from gear by jacking aircraft before attempting to add or remove washers to torque links.

d. Add washers between torque links to correct for excessive toe-in. Wheel alignment after adjustment must be within limits prescribed in step "c."

NOTE

AN960-716 and AN960-716L washers are used as shims between the upper and lower torque links. Combinations of thick and thin washers can be used between the torque links to obtain the correct wheel alignment. Washers that are added or removed between the torque links must also be removed or added to the outside end of the spacer to maintain an 0.004 to 0.020 side play of the torque links. Be sure the spacer washers are centered on the spacer as the nut is being torqued up to proper value (refer to figure 1-7).

Removal of Main Gear Torque Links. (See figure 4-4.)

The removal procedures are the same for either left or right main landing gear torque links.

a. Check alignment of main landing gear wheels in accordance with alignment procedures.
b. With main landing gear wheels aligned and jacks removed, mark the relative position of each main landing gear piston and axle assembly, and trunnion assembly to facilitate alignment of parts for installation.

NOTE

Use a grease pencil for marking.

c. Mark extension of landing gear strut.
d. Jack the aircraft in accordance with Section 2.

NOTE

Make sure jack is positioned to allow removal of wheel and brake assembly.

e. Remove brake, wheel and tire assembly in accordance with Section 4.
f. Deflate strut in accordance with Section 2.
g. Disconnect landing gear door and tie out of way.
h. Disconnect torque link braces by removing cotter pins (24), nut (25), bolt (16), washers (20) and spacer (19).

NOTE

Washers located between torque link braces control toe-out and must be retained and replaced in removal order for proper wheel and torque link brace alignment.

i. Remove roll pin (13) using a suitable drift punch.
j. Remove shaft (12) using a suitable drift punch.
k. Remove torque links (14).

Disassembly of Main Gear Torque Links. (See figure 4-4.)

Bushings (18 and 23) are a press fit and should be removed only for replacement. When replacement becomes necessary proceed as follows:

a. Remove grease fittings.
b. Using a bench vise, wood blocks and proper size shaft or punch press out bushings (18 and 23).

CAUTION

Take precaution when removing bushings to prevent damage to torque link.

Assembly of Main Gear Torque Links. (See figure 4-4.)

a. Press in bushings (18 and 23) using bench vise, with necessary wood block and proper size punch.

NOTE

Bushings (18 and 23) must be pressed in wet using MIL-P-8585 zinc chromate primer or equivalent, and lube fitting holes of bushings aligned with torque brace lube fitting holes.

b. Mill and finish installed bushings (18 and 23) flush with outside edge of torque link brace (14), break sharp edges 0.005 radius minimum. Bushings must not extend past edge of torque link brace.

NOTE

Mill an equal amount on each bushing (23) using a flat mill file to provide a slip fit between the lugs on the torque link and the lugs on the trunnion and/or the lugs on the axle.

c. Insure lube fitting holes on clean and installed lube fittings.

Installation of Main Gear Torque Links. (See figure 4-4.)

a. Install upper torque link (14) on barrel assembly (35) with shaft (12), spacer (8) and the necessary shims to align pin hole in shaft with pin hole in spacer.

CAUTION

Do not force shaft (12); remove shaft's finish as required. If stop welds on inside of spacer interfere, smooth welds with file.

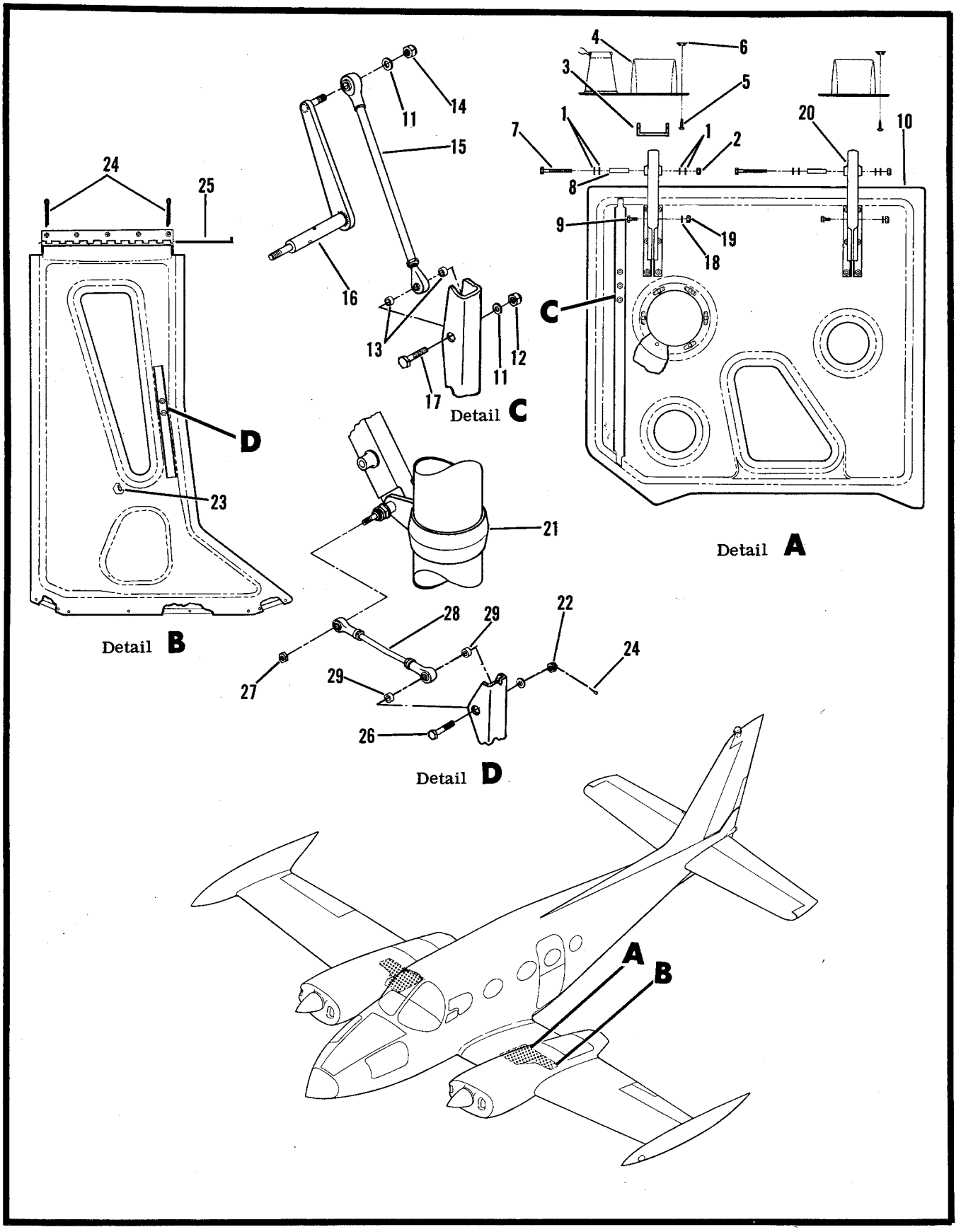



Figure 4-7. Main Landing Gear Door Installation

Figure 4-7. Main Landing Gear Door Installation Callouts

1. Washer
2. Nut
3. Bracket
4. Hinge Cover
5. Screw
6. Nut
7. Bolt
8. Spacer
9. Bolt
10. Main Wheel Well Door
11. Washer
12. Nut
13. Spacer
14. Nut
15. Door Link Tube
16. Door Actuator Arm
17. Bolt
18. Washer
19. Nut
20. Hinge
21. Main Landing Gear
22. Nut
23. Snubber
24. Cotter Pin
25. Hinge Pin
26. Bolt
27. Nut
28. Door Link Rod
29. Spacer

NOTE

Adjust set screw (10) against strut to prevent spacer from pivoting then stake setscrew.

b. Install pin (13) and safety wire in place by routing wire through roll pin and around the bushing.
c. Install lower torque link (14) on barrel assembly (35) using same procedures as the upper torque link.
d. Align main landing gear barrel piston (6) and axle assembly in position as previously marked.
e. Block landing gear strut up using wood block to previously marked extension to facilitate aligning torque link braces.
f. Align upper and lower torque link (14) using same number of retained washers positioned between braces in the same order they were removed.
g. Use a 0.4300 diameter pilot (bolt or rod) to align torque link braces and washers.
h. Clamp torque link braces in position using two small "C" clamps (see sheet 2).
i. Using a standard 29/64 (0.4531) reamer, having a 0.75 length, 0.4300 diameter pilot or Cessna Special Tool FT251 reamer, ream bushings to insure a straight through hole in both parts.

CAUTION

Turn reamer by hand, using a T-handle. Do not use power tools.

j. Remove clamps and clean torque link braces with suitable solvent.
k. Install retained lube fitting in torque link braces and flush grease to insure bushings are free of dirt and remove grease.
l. Position brake hose and clamp on bolt (16) and connect upper and lower torque links at hinge point, using bolt (16), bushing (18), washers (20) and nut (25).

NOTE

Make sure all new and existing washers at torque link hinge point are in place and free in movement, tighten bolt and nut to insure a side play of 0.004 to 0.020 is maintained between torque link braces. It may be necessary to position the washers in a different locations to maintain alignment and side play simultaneous.

m. Insure brake line is clear of all structure and secure.
n. Safety bolt (16) and nut (25) with cotter pin (24).
o. Install wheel and brake assembly in accordance with installation procedures.
p. Torque all nuts properly and safety.
q. Lubricate upper and lower torque link fittings.
r. Inflate landing gear strut in accordance with Section 2.
s. Connect landing gear door and cycle landing gear to make sure door fits properly and all lines are clear.
t. Remove aircraft from jacks.

Main Landing Gear Doors.

The main landing gear is equipped with wheel well doors and strut doors. Each strut door, pivoting on a continuous hinge located at its outboard end, is operated by a push-pull rod attached to the main landing gear strut. Each wheel well door, pivoting on forged aluminum hinges located at its inboard end, is operated by a bellcrank and push-pull tube, which is connected to the landing gear retracting linkage. The operating mechanism is so arranged that the wheel well door is closed when the main gear is either fully retracted or fully extended.

Removal of Main Landing Gear Doors. (See figure 4-7.)

a. Remove strut door as follows:
1. Disconnect door link rod from strut by removing nut and bolt.
2. Remove cotter pins in the ends of hinge pin; then remove the hinge pin and outboard door.
b. Remove wheel well door as follows:
1. Jack aircraft and engage manual extension, and release tension on gear retraction system.
2. Remove access hole covers from wheel well door.
3. Disconnect the door link tube from actuator arm.
4. Remove wheel well door by removing nuts, washers, and bolts attaching hinge arms to door.
d. If desired, remove hinge arms as follows:
1. Remove lower wing root fillet and hinge covers

by removing attaching screws.
2. Remove hinge arms from brackets by removing nuts, washers, spacers, and bolts.

Installation of Main Landing Gear Door. (See figure 4-7.)

a. If hinge arms were removed, attach to brackets with bolts, spacers, washers, and nuts. Install hinge covers and lower wing root fillet with attaching screws.
b. Install wheel well door as follows:
1. Jack aircraft and engage manual extension to release tension on gear retraction system.
2. Place wheel well door in position, align mounting holes, and attach to hinge arms with bolts, washers, and nuts.
3. Attach door link tube to actuator arm with bolt and nut.

NOTE

If length of door link tube has been changed, or new door components are being installed, rig in accordance with Rigging Procedures of Main Landing Gear Doors.

4. Install access hole cover on wheel well door.
c. Install strut door as follows:
1. Place strut door in position and install hinge pin. Install cotter pins in each end of hinge pin to safety.
2. Attach door link rod to strut with bolt and nut.

NOTE

If length of door link rod has been changed or new door components are being installed, rig in accordance with Rigging Procedures of Main Landing Gear Doors.

Rigging Main Landing Gear Door. (See figure 4-7.)

a. Jack aircraft in accordance with Section 2.
b. Disconnect wheel well door by removing nut (14), attaching door link tube (15) to actuator arm (16).
c. Disconnect strut door by removing nut (27) attaching door link rod (28) to strut.
d. Using the normal landing gear retraction system, operate gear to the UP position.

NOTE

The use of an external power source is recommended for operation of electrical units while engines are not being operated. Low voltage could cause low downlock tension readings.

e. Close strut door and adjust door link rod (28) so that door fits flush.
f. Adjust snubber (23) so there is 0 to 0.06 inches clearance between door and main gear torque link.
g. Operate gear to the DOWN position.
h. Close wheel well door and adjust door link tube (15) so that door just fits flush.
1. Adjust rod end on door link tube one-half turn shorter and connect.

NOTE

Make sure door link tube adjustment does not cause deformation of door.

i. Operate gear to the UP position.

CAUTION

When retracting gear while rigging door, be prepared to stop before damage can occur.

j. If necessary, readjust door link tube (15) so that door fits flush.
k. Repeat steps "d" thru "j" as necessary to obtain proper fits of doors, checking that wheel well door clears tire and wheel.
l. The door push-pull tube is to be 5 degrees overcenter with the door actuator arm against its stop, as shown in figure 4-8, in both gear UP and gear DOWN positions.

CAUTION

If the door actuator arm stop is moved, rerigging of the main landing gear system will be necessary.

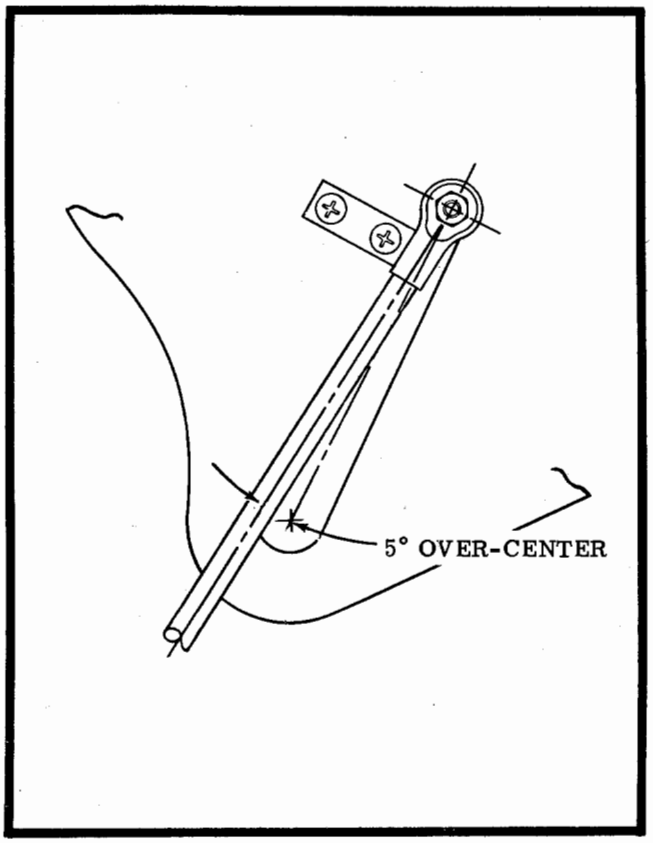



Figure 4-8. Door Actuator Arm Overcenter Adjustment

m. Install access hole cover on wheel well door.
n. Insure that the landing gear is DOWN and locked, remove jacks.

Main Landing Gear Retracting Linkage.

The main landing gear retracting linkage consists of push-pull tubes, bellcranks, torque tubes, braces, and links interconnected between the landing gear actuator and the main landing gear. A positive downlock is obtained by rigging the main side links to an overcenter position. The link assemblies which hold the main side links in an overcenter position are also rigged overcenter. Downlock springs, which apply spring tension to the overcenter position of the link assemblies, are provided as an added safety feature. Hook-type mechanical locks are provided to lock the landing gear in its retracted position. The main landing gear retracting linkage also operates the main landing gear door operating mechanism.

Removal of Main Landing Gear Retracting Linkage. (See figure 4-9.)

a. Jack the aircraft in accordance with Section 2.
b. Disconnect main landing gear doors.
c. Release tension on retracting linkage by engaging hand crank and operating a few turns toward the UP position.
d. Remove rear seats, carpet and floorboards to gain access to the landing gear actuator.
e. (See figure 1-3.) Remove access covers.
f. Remove inboard drive tube (35) as follows: (See figure 4-9.)
1. Disconnect drive tube from landing gear actuator bellcrank.
2. Disconnect drive tube from idler bellcrank (7) by removing nut (36), washer (34) and bolt (32).
3. Remove clamp (48) securing seal boot (49) to drive tube; then remove drive tube by pulling tube into cabin area.
g. Remove seal boot as follows: (See figure 4-9.)
1. The following procedures are given for the left side. The procedures are the same for the right side.
2. Remove the landing gear drive tube in accordance with the preceding instructions.
3. (See figure 1-3.) Remove cover access (18 and 4).
4. Remove clamps (48) and remove boot.
5. Installation of seal boot is the reversal of the removal procedures.

NOTE

Clamp seal boot to drive tube with gear down and with boot extended approximately 11". Install clamps with the clamp body aft to clear the rib when gear retracts. Install boot so that the majority of folds in the boot, when compressed, are in the aft position. Check neoprene gasket for cuts or tears before reinstalling cover access (4, figure 1-3).

g. Remove idler bellcrank (7) and door operating linkage as follows:
1. Remove nut (25) and bolt (22) and four screws attaching bearing housing to web.
2. Remove nut (18) and thrust bearing washer (21) then pull door actuator arm (10) through web.

NOTE

Door actuator arm assembly (10) is a matched set. Disassembly is not recommended.

3. Remove bolt (39) and thrust bearing washers (30), attaching idler bellcrank (7) to front spar and support web.
4. Remove bolt (11) and thrust bearing washers (12) attaching bellcrank rocker arm (13) to front spar and support web.
5. Pull bellcranks and attached linkage from between front spar and support web.
6. Remove the spacers (14 and 31) from the idler bellcrank (7) and bellcrank rocker arm (13).
7. Remove upper connecting links (6) by removing nuts (4), washers (2), and bolts (16).
8. Remove rocker arm lower link (23) by removing nuts (20 and 25), washers (19 and 24), and bolts (22 and 16).

NOTE

See figure 4-10 for the following steps.

h. Remove LH push-pull tube (1) as follows:
1. Disconnect the push-pull tube from the bellcrank (35) by removing cotter pin, nut (31), washer (32) and bolt (34).
2. Disconnect push-pull tube from torque tube (3) by removing cotter pin, nut (5) and bolt (4).
i. Remove bellcrank (35) and side brace lock link (42) as follows:
1. Disconnect DOWN indicator switch (37) by removing nuts (39) and screws (40).
2. Remove downlock spring.
3. Disconnect side brace lock link from lower side link (57) by removing nut (55), washer (60), and bolt (45).
4. Disconnect bellcrank (35) from the upper barrel by removing cotter pin, nut (29), spacer (30), and bolt (33).
5. Remove the side brace lock link (42) from the bellcrank (35) by removing setscrew (41) and pin (36).
j. Remove uplock assembly as follows:
1. Disconnect uplock push-pull tube (10) from uplock assembly by removing cotter pin, nut (22), washer (23), and bolt (24).
2. Remove screw (25) attaching uplock assembly to side link (18).
k. Remove side links (18 and 57) as follows:
1. Disconnect lower side link (57) from upper barrel by removing nut (49), door link rod (50), nut (51), washers (52), spacers (53) and bolt (54).
2. Disconnect lower side link (57) from upper side link (18) by removing cotter pin, bolt (56), washer, and nut.
3. Disconnect upper side link (18) from support (15) by removing cotter pin, bolt (17), washer and nut.
l. Remove torque tube (3) as follows:
1. Disconnect uplock push-pull tube (10) from torque tube by removing cotter pin, nut (6), washer (7), and bolt (8).
2. Remove nut (9), washer (11) and bolt (2) attaching torque tube to rib mounting bracket.

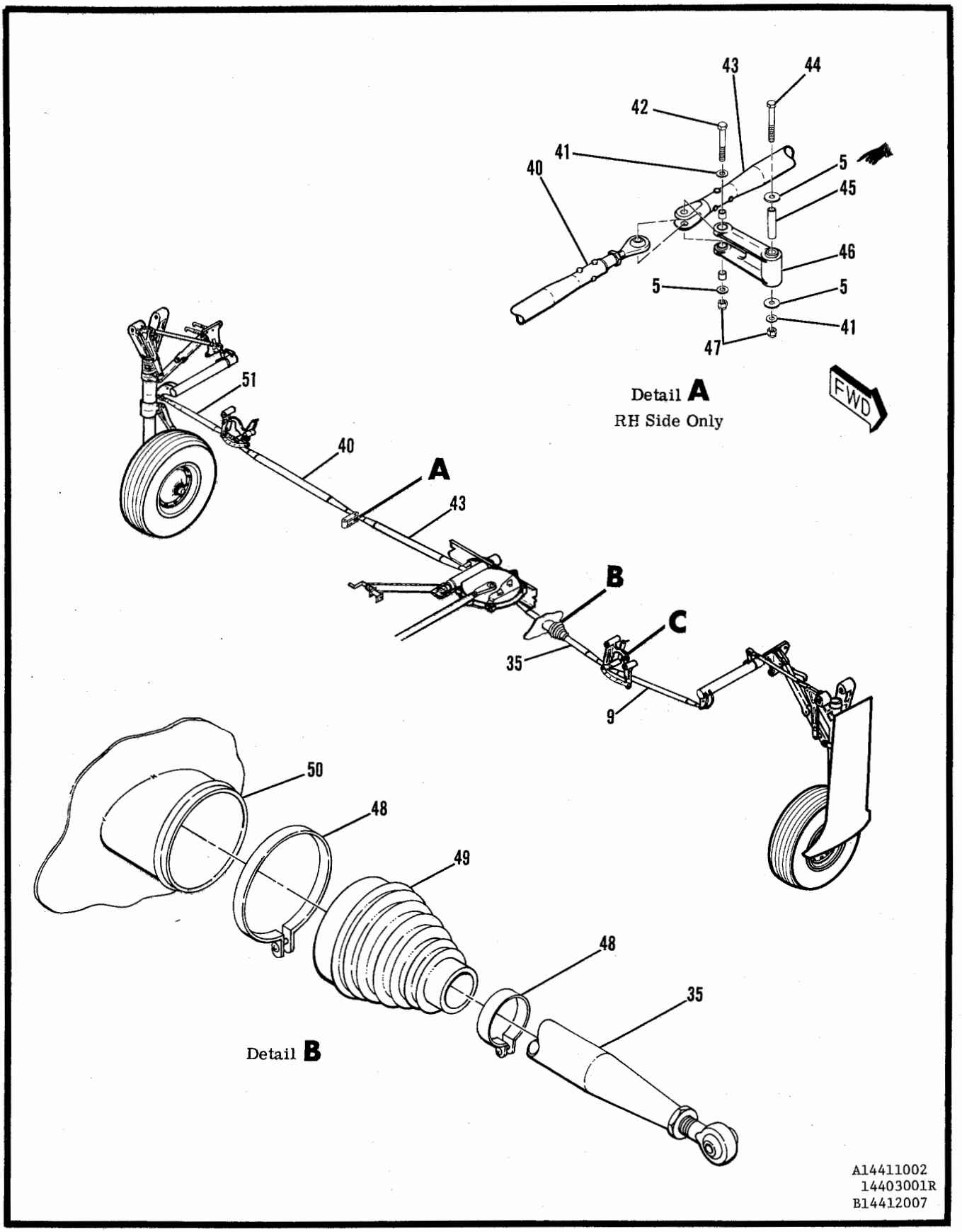
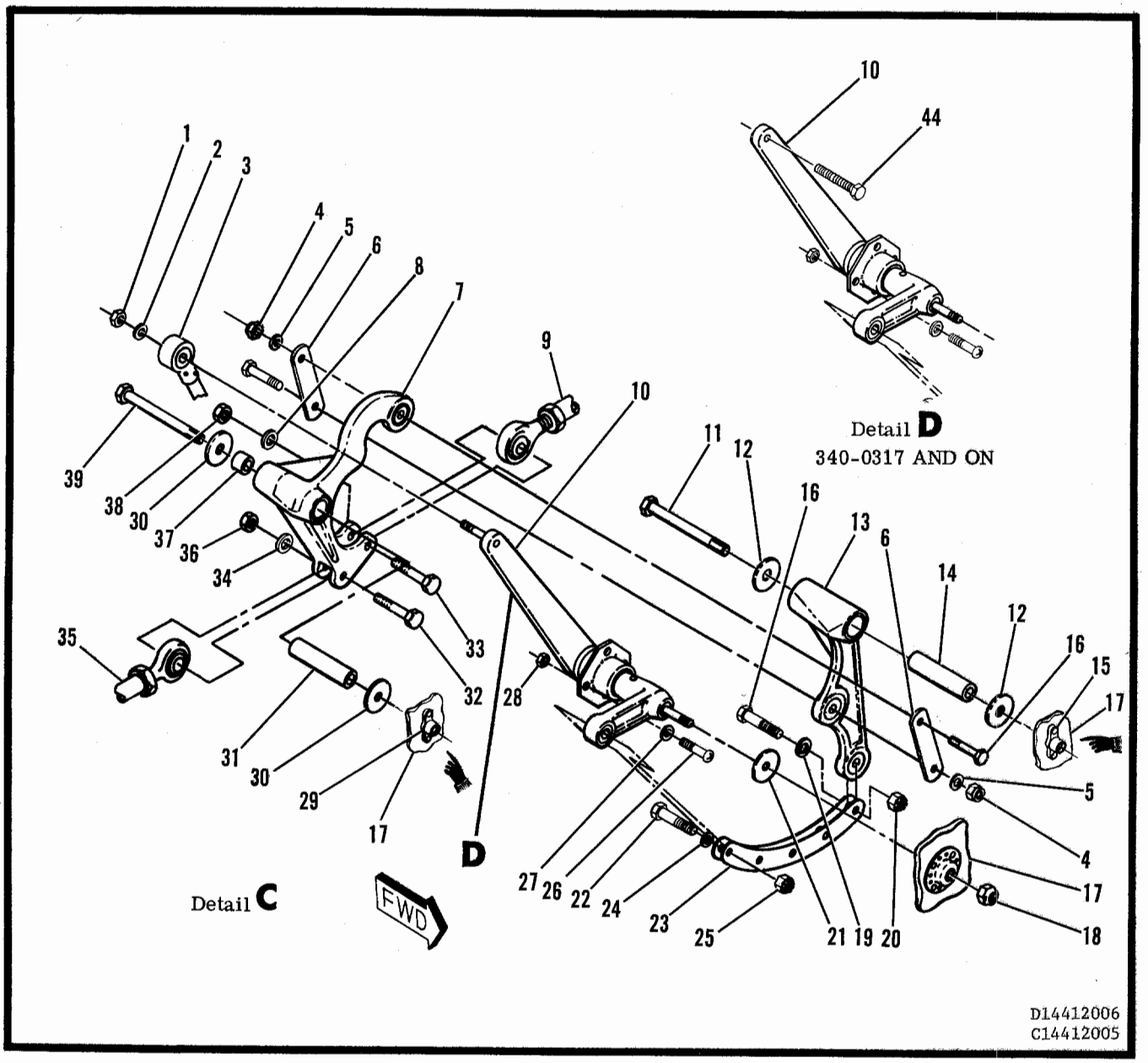



Figure 4-9. Main Landing Gear Linkage and Inboard Components (Sheet 1 of 2)




1. Nut
2. Washer
3. Door Link Tube
4. Nut
5. Washer
6. Upper Connecting Link
7. Idler Bellcrank
8. Washer
9. LH Outboard Drive Tube
10. Door Actuator Arm Assembly
11. Bolt
12. Thrust Bearing Washer
13. Bellcrank Rocker Arm
14. Spacer
15. Nutplate
16. Bolt
17. Spar
18. Nut
19. Washer
20. Nut
21. Thrust Bearing Washer
22. Bolt
23. Rocker Arm Lower Link
24. Washer
25. Nut
26. Screw
27. Washer
28. Nut
29. Nutplate
30. Thrust Bearing Washer
31. Spacer
32. Bolt
33. Bolt
34. Washer
35. LH Inboard Drive Tube
36. Nut
37. Bearing
38. Nut
39. Bolt
40. Intermediate Drive Tube
41. Washer
42. Bolt
43. RH Inboard Drive Tube
44. Bolt
45. Bushing
46. Idler Bellcrank
47. Nut
48. Clamp
49. Seal Boot
50. Adapter
51. RH Outboard Drive Tube

Figure 4-9. Main Landing Gear Linkage and Inboard Components (Sheet 2)

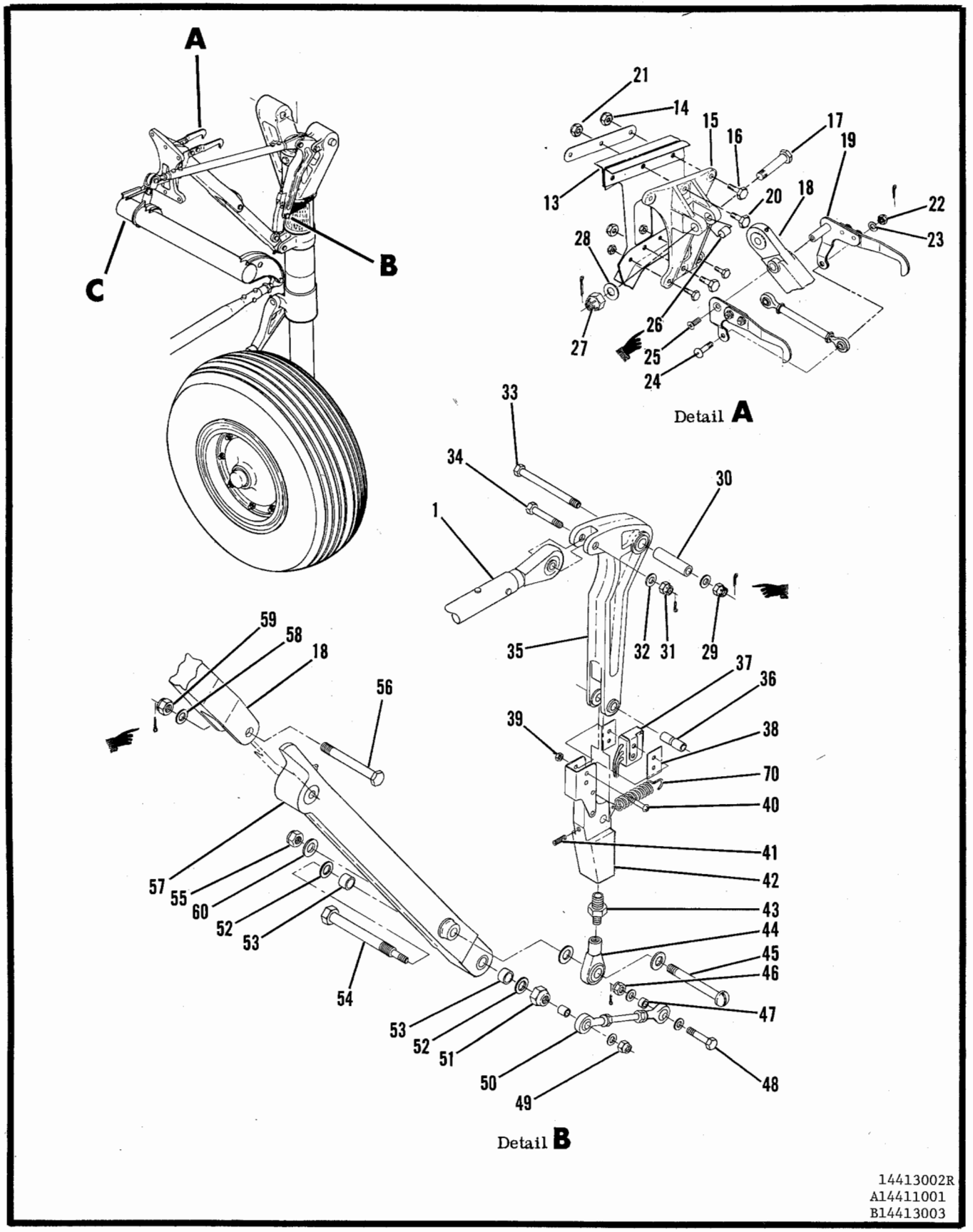
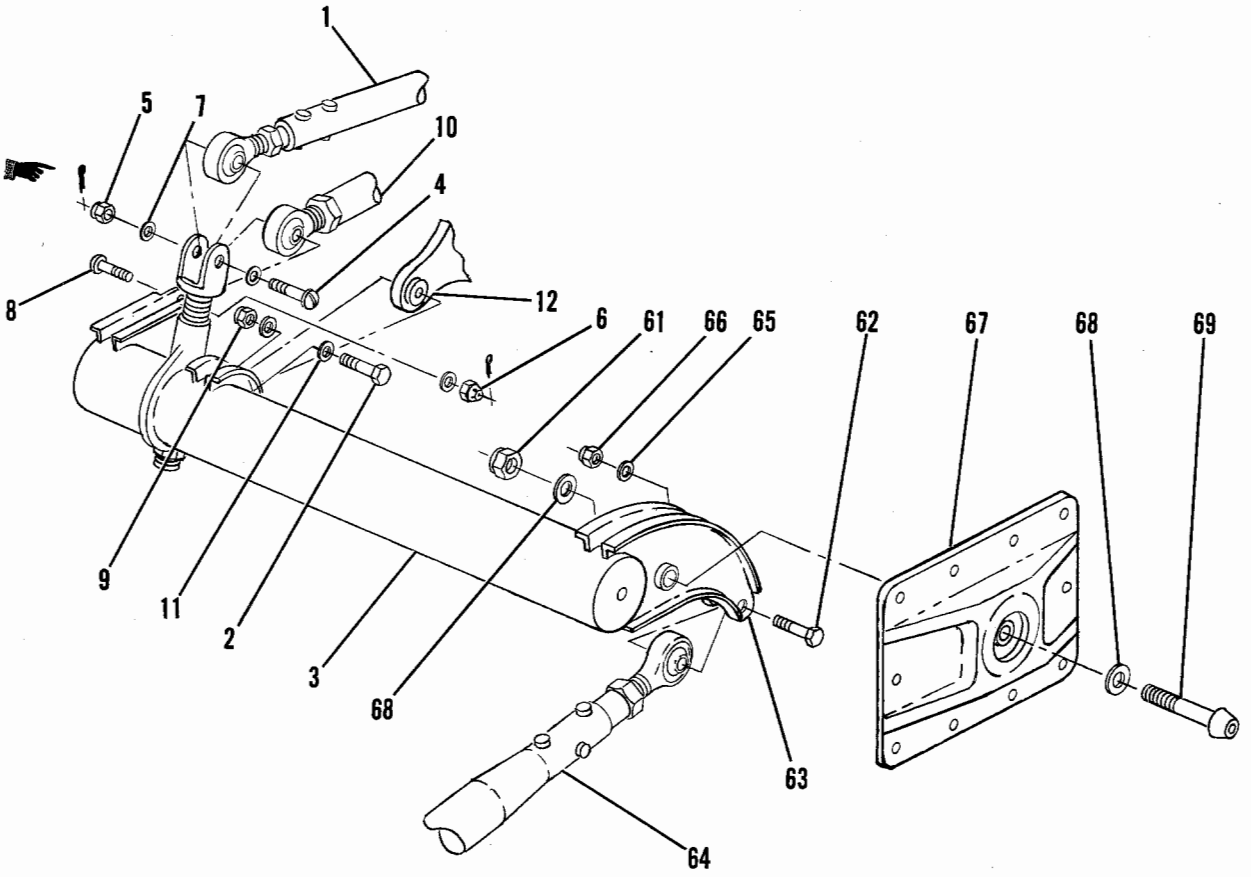



Figure 4-10. Main Gear Retracting Linkage - Outboard Components (Sheet 1)




1. LH Push-Pull Tube
2. Bolt
3. Torque Tube
4. Bolt
5. Nut
6. Nut
7. Washer
8. Bolt
9. Nut
10. Uplock Push-Pull Tube
11. Washer
12. Mounting Bracket
13. Rib Assembly
14. Nut
15. Support
16. Bolt
17. Bolt
18. Upper Side Link
19. Uplock Assembly
20. Bolt
21. Nut
22. Nut
23. Washer
24. Bolt
25. Screw
26. Spacer
27. Nut
28. Washer
29. Nut
30. Spacer
31. Nut
32. Washer
33. Bolt
34. Bolt
35. Bellcrank
36. Pin
37. Down Indicator Switch
38. Spacer
39. Nut
40. Screw
41. Setscrew
42. Side Brace Lock Link
43. Adjusting Screw
44. End Fitting
45. Bolt
46. Nut
47. Spacer
48. Bolt
49. Nut
50. Door Link Rod
51. Nut
52. Washer
53. Spacer
54. Bolt
55. Nut
56. Bolt
57. Lower Side Link
58. Washer
59. Nut
60. Washer
61. Nut
62. Bolt
63. Torque Tube
64. LH Outboard Drive Tube
65. Washer
66. Nut
67. Torque Tube Support
68. Washer
69. Bolt
70. Spring

Figure 4-10. Main Gear Retracting Linkage - Outboard Components (Sheet 2)

3. Remove nut (61), washer (68) and bolt (69) attaching torque tube to torque tube support (67).

Installation of Main Landing Gear Retracting Linkage. (See figure 4-10.)

a. Install torque tube as follows:
1. Attach torque tube (3) to torque tube support (67) with bolt (69), washer (68) and nut (61).
2. Attach torque tube (3) to rib mounting bracket
3. Connect uplock push-pull tube (10) to torque tube (3) with bolt (8), washer (7), nut (6), and cotter pin.

b. Attach upper side link (18) to lower side link (57) with bolt (56), washer (58), and nut (59). Torque nut to 110 ±5 inch-pounds. Install cotter pin.

c. Attach upper side link (18) to support with bolt (17), washer (28), and nut (27). Torque nut (27) to 200 ±25 inch-pounds. Install cotter pins.

d. Attach lower side link (57) to upper barrel with bolts (54), washers (52), spacers (53), and nut (51). Torque nut (51) to 110 ±5 inch-pounds. Install door link rod (50) on bolt (54) with nut (49).

e. Install uplock assembly as follows:
1. Insert uplock hook (19) into upper side link (18) and secure uplock assembly with screw (25).
2. Attach uplock push-pull tube (10) to uplock assembly with bolt (24), washer (23), nut (22) and cotter pin.

f. Install bellcrank (35) and side brace lock link (42) as follows:
1. Attach side brace lock link (42) to bellcrank (35) with pin (36). Secure set screw (41) and stake. Do not stake over existing stakes.

NOTE

Ensure arrow (indicating flat surface) located on end of pin (36) is aligned towards set screw (41).

2. Attach bellcrank (35) to upper barrel with bolt (33), spacer (30), nut (29) and cotter pin.
3. Attach side brace lock link (42) to lower side link (57) with bolt (45), washer (60), and nut (55).
4. Install downlock spring (70).
5. Install DOWN indicator switch (37) with attaching screws and nuts.

g. Install LH push-pull tube (1) as follows:
1. Attach push-pull tube to bellcrank (35) with bolt (34), washer (32), nut (31), and cotter pin.
2. Attach push-pull tube to torque tube (3) with bolt (4), nut (5) and cotter pin.
3. Insert push-pull tube and verify that the heads of the three in-line rivets are facing down.

NOTE

See figure 4-9 for the following steps.

h. Install idler bellcrank (7) and door operating linkage as follows:
1. Attach rocker arm lower link (23) to bellcrank rocker arm (13) and door actuator assembly (10) with bolts (16 and 22), washers (19 and 24), and nuts (20 and 25).
2. Attach upper connecting links (6) to bellcrank rocker arm (13) and idler bellcrank (7) with bolts (16), washers (2) and nuts (4).
3. Install spacers (14 and 31) in idler bellcrank (7) and bellcrank rocker arm (13).
4. Place bellcranks and attached linkage in position between front spar and support web.
5. Install bellcrank rocker arm (13) with bolt (11), and thrust bearing washers (12).
6. Install idler bellcrank (7) with bolt (39), and thrust bearing washers (30).
7. Insert door actuating arm assembly (10) through web; then install thrust bearing washer (21) and nut (18).
8. Install four screws attaching bearing housing to web and bolt (22) and nut (25). Safety with locktite sealant.

i. Install inboard gear drive tube (35) as follows:
1. Insert drive tube into position from the cabin area and attach to idler bellcrank (7) and bolt (32), washer (34), and nut (36).
2. Attach drive tube to landing gear actuator bellcrank.

j. (See figure 4-10.) Install outboard drive tube (64) as follows:
1. Attach drive tube to torque tube (63) with bolt (62), washer (65), and nut (66).
2. (See figure 4-9.) Attach drive tube to idler bellcrank (7) with bolt (33), washer (8), and nut (38).

k. Rig main landing gear in accordance with rigging procedure.

l. Install access hole covers on underside of wing forward of wheel well.

m. Install floorboard and rear carpet.

n. Connect landing gear doors and rig per Main Landing Gear Door Rigging Procedure.

o. Insure that landing gear is DOWN and locked, then remove aircraft from jacks.

p. Install rear seats.

Rigging of Main Landing and Nose Gear. (See figure 4-11.)

The following landing gear rigging procedure is designed specifically for the Model 340. A faithful

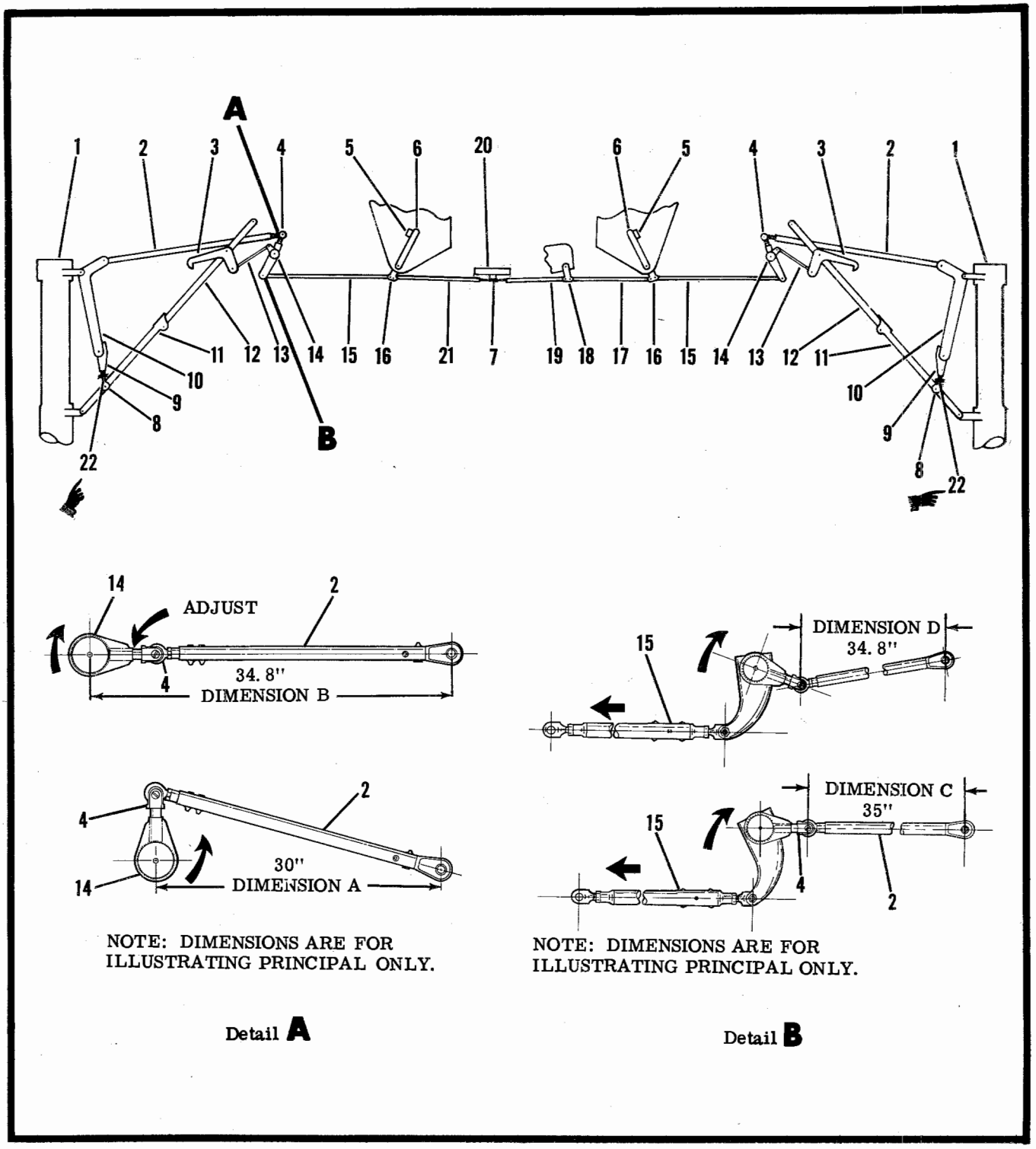
following of this procedure will result in a proper rigged and efficient operating system. Before starting the rigging the "toe-out" should be checked in accordance with main wheel alignment procedures, the tires inflated to proper pressures and main gear door link tube should be checked for proper overcenter adjustment, in accordance with main landing gear door rigging procedures.

a. Jack aircraft using the three provided jack points. One point is located on the underside of the fuselage, just aft of the nose wheel well, and one point is located on the lower surface of each wing on the rear spar, just aft of the main gear attach points. Position jacks to clear movement of main gear strut door.

b. Remove carpet and floorboards covering and necessary access plates to gain access to the gear box and idler in the fuselage.

CAUTION

Anytime the floorboards are removed a temporary protective cover should always be used to prevent damage and improper settings of the landing gear actuator limit switches.




1. Main Landing Gear Strut
2. Push-Pull Tube
3. Uplock
4. Fork Bolt
5. Door Actuator Arm Stop
6. Door Actuator Arm
7. Bellcrank
8. Lock Link End Fitting
9. Side Brace Lock Link
10. Bellcrank
11. Lower Side Link
12. Upper Side Link
13. Uplock Push-Pull Tube
14. Torque Tube
15. Outboard Drive Tube
16. Door Actuator Bellcrank
17. RH Inboard Drive Tube
18. Bellcrank
19. Intermediate Drive Tube
20. Landing Gear Actuator
21. LH Inboard Drive Tube
22. Adjusting Screw

Figure 4-11. Schematic of Main Gear Retracting Linkage

c. Release compression on retracting linkage by engaging manual extension crank and operating a sufficient number of turns toward the up position to open the nboard main gear door 20° - 30°.

NOTE

Prior to any operation of the landing gear by the manual extension crank, assure the landing gear switch is in the neutral position and circuit breaker is pulled.

d. (See figure 4-7.) Remove main wheel well door link tube (15) by removing nut (14) and washer (11) from the door actuators. (See figure 4-18.) Remove door link tubes (3 and 15) by removing nuts and bolts.

NOTE

Always remove nose gear door link tubes to prevent the possibility of structural damage.

e. (See figure 4-12.) Disconnect nose gear retracting linkage in the nose gear wheel well by removing nuts and bolts attaching nose push-pull tube (7) to fork bolt (8) and connector link (3) and removing push-pull tube (7).

f. Disconnect the inboard end of both outboard drive tubes (15) by removing nuts, spacers and bolt.

g. Disconnect LH inboard drive tube (21) and RH inboard drive tube (17) at door actuator bellcranks (16).

CAUTION

During operation of landing gear actuator be prepared to stop to prevent any possible damage.

CAUTION

It is recommended that the inboard drive tubes be held during actuation to prevent damage to the structure. It may be necessary to install a length of safetywire in the drive tube ends to help hold tubes in position during operation.

h. (See figure 4-1.) Adjust the UP and DOWN limit switches (15 and 32) on the landing gear actuator as follows:

1. Adjust both limit switches to the end of their adjusting slots in a direction which will permit maximum bellcrank travel.

NOTE

When adjusting either limit switch, align switch so that roller is contacted squarely by the bellcrank or drive tube.

2. Engage manual extension crank and operate toward the up position until the internal stop in the actuator is reached. To prevent possible damage to the actuator, do not force against the internal stop.

3. (See figure 4-1. Note the angular position of the crank when internal stop is reached, back crank off toward the down position 2 turns on the hand crank, then advance crank 1/2 turn toward the up position. Adjust the up limit switch (15) so that it is actuated at this point.

4. Engage manual extension crank and operate toward the down position until the internal stop in the actuator is reached. Do not force against the internal stop.

5. (See figure 4-1.) Note the angular position of the crank when internal stop is reached, back crank off toward the up position 2 turns of the hand crank, adjust the down limit switch (32) so that it is actuated at this point.

6. After these preliminary adjustments to the limit switches have been made, stow the manual extension crank and operate the actuator electrically to the up position until the up limit switch is actuated.

CAUTION

Caution must be observed during actuation to insure that no damage is incurred by the disconnected ends of the main drive tubes.

NOTE

To facilitate rigging of the landing gear, a two-position momentary ON switch with suitable lengths of electrical wires can be connected to the landing gear electrical circuit in such a manner that the landing gear can be observed while being operated during rigging. The use of an external power source is also recommended.

7. Engage the manual extension crank and note the angular position of the crank. Operate crank toward the up position noting the number of turns required to reach the internal stop in the actuator. The minimum number of turns required in the up position is three-fourths of one turn. The desired is 1-1/2 turns. If necessary, adjust the up limit switch to obtain this requirement.

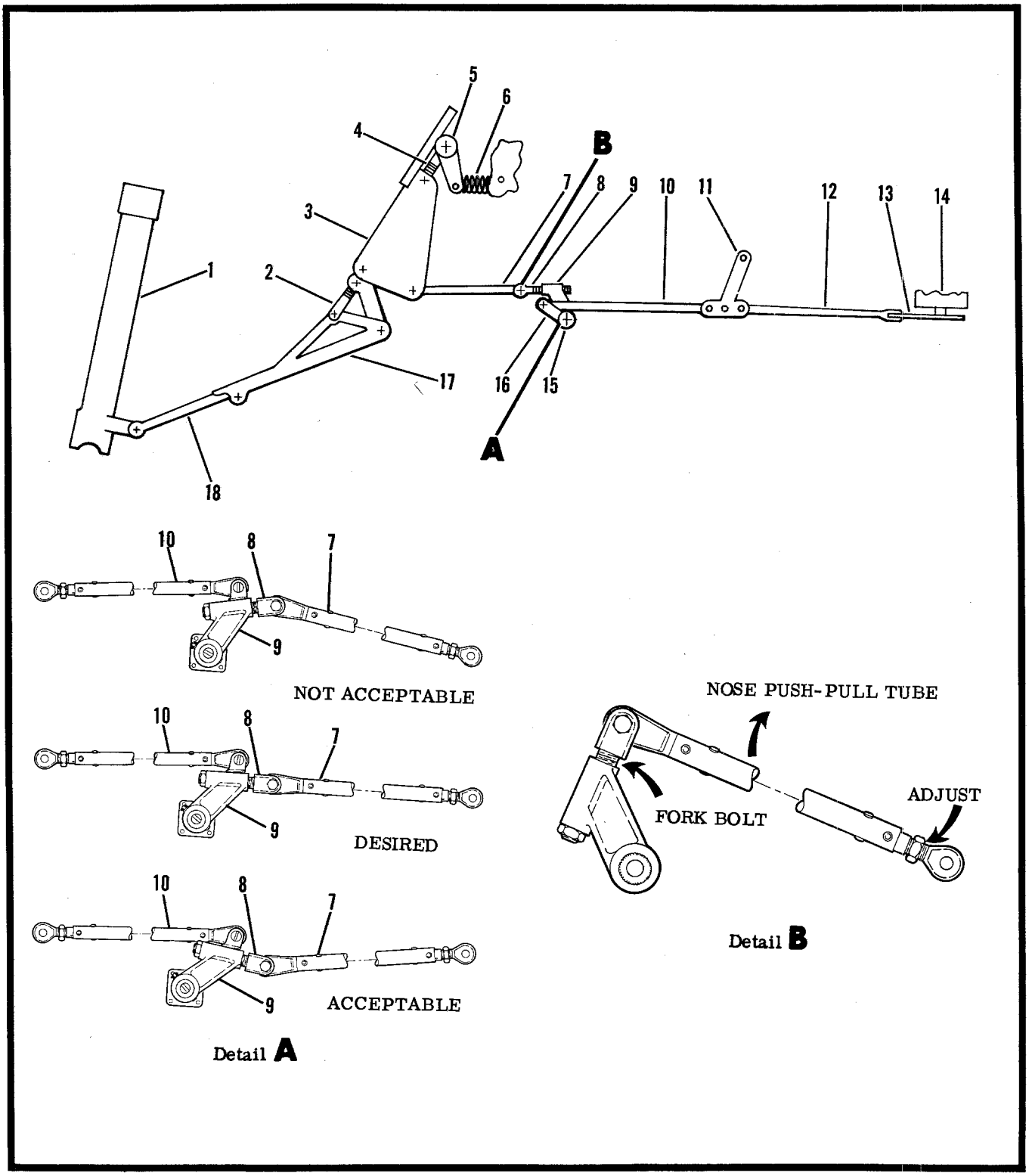
8. Stow the manual extension crank and operate the actuator electrically to the down position until the down limit switch is actuated.

9. Engage the manual extension crank and note the position of the crank. Operate crank toward the down position and note the number of turns required to reach the internal stop in the actuator. The minimum number of turns required in the down position is one and the maximum (and desired) number of turns is two turns. If necessary, adjust the down limit switch to meet this requirement.

10. Actuate gear electrically to the down position. Manually place the door actuator arm (6) against its stop. Adjust RH and LH inboard drive tubes (17 and 21) to align with hole in door actuator bellcrank (16); then lengthen the rod ends on the drive tubes (17 and 21) two turns. Actuate gear electrically toward the up position as required to install bolts, washers and nuts.

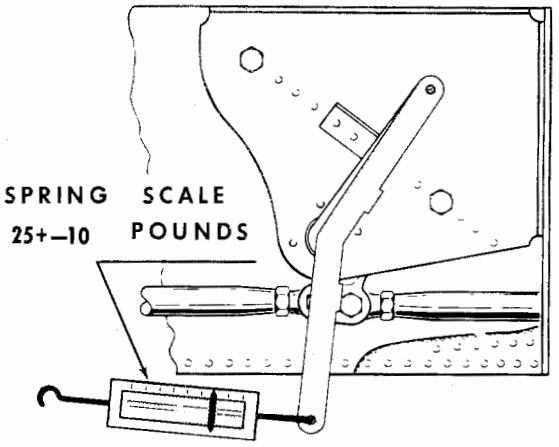
CAUTION

Bolt (32, figure 4-9) must be installed with head of bolt forward.




1. Nose Gear Strut
2. Adjusting Fork
3. Connector Link
4. Adjusting Rod End
5. Uplock Torque Tube
6. Spring
7. Nose Push-Pull Tube
8. Fork Bolt
9. Adjusting Bellcrank
10. Forward Drive Tube
11. Idler Bellcrank
12. Aft Drive Tube
13. Actuator Bellcrank
14. Landing Gear Actuator
15. Torque Tube Assembly
16. Outboard Bellcrank
17. Truss Assembly
18. Drag Brace

Figure 4-12. Schematic of Nose Gear Retracting Linkage



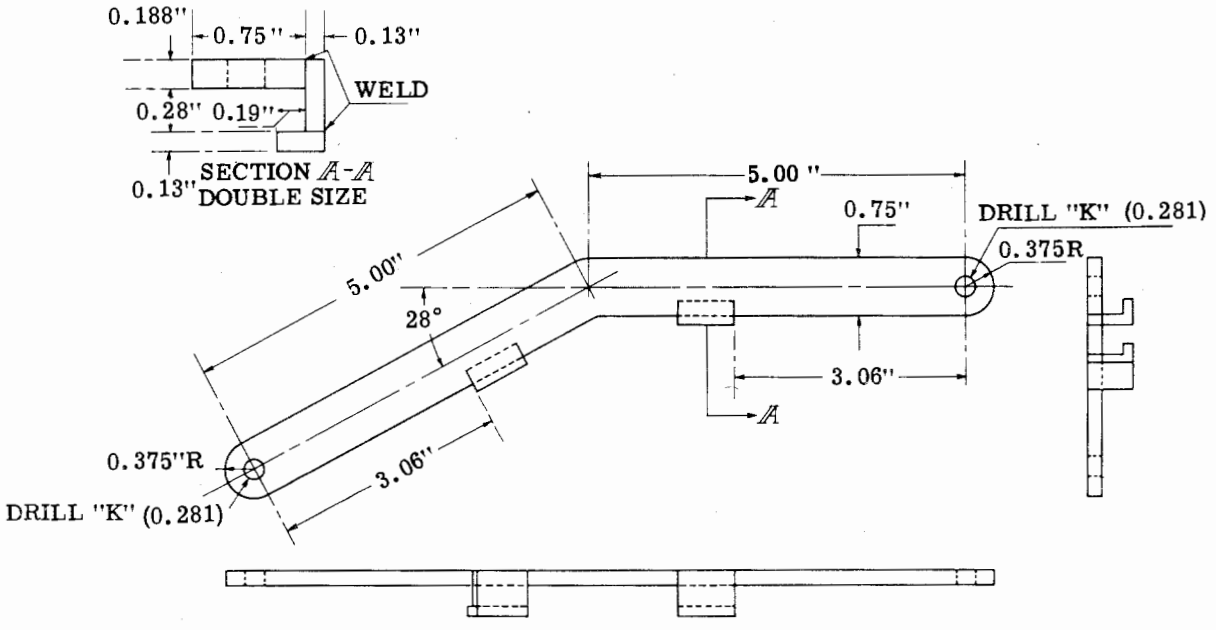




Figure 4-13. Fabrication and Usage of Tool for Measuring Door Actuator Arm Tension

11. (See figure 4-13.) Actuate gear electrically to the DOWN position and check the pull force required to move the door actuator arms from their stops as illustrated.

NOTE

The pull required to move door actuator arm from stop must be measured at a right angle to the arm. The tool illustrated in figure 4-13 can be made to facilitate this measurement.

12. Adjust the length of both inboard drive tubes (17 and 21) as necessary to obtain a force of 25 ±10 pounds required to move door actuator arms (6) from stops (5) in the down position.
13. Actuate gear electrically to the UP position and adjust the up limit switch as necessary to obtain a force of 25 ±10 pounds and a maximum difference of 10 pounds from the down position required to move the door actuator arms (6) from stop (5) in the up position.

NOTE

If the up limit switch is readjusted recheck the minimum turn requirement in step 7.

i. Adjust side brace lock links (9) as follows:
1. With landing gear in the down position, adjust end fitting (8) so that lower side link (11) and upper side link (12) are held firmly in overcenter position when side brace lock link (9) is firmly overcenter.
2. During retraction check for clearance between bellcrank (10) and push-pull tube (2). It may be necessary to add or subtract washers to provide clearance.
3. Manually "break" the lock link from its overcenter position and move the landing gear to a position five to six inches inboard from the down and locked position, then release. The landing gear must free fall and lock when released from this position.

NOTE

Lengthen side brace lock link end fitting (8) in 1/2 turn increments until the gear will not free fall down and locked.

4. Shorten adjusting screw (22) in small increments until the gear will free fall down and locked. Double Safety wire screw in adjusted position.
5. Adjust both main landing gear side brace lock links in this manner.

NOTE

After the preceding steps have been completed the main landing gear retracting system is rigged from the limit switches through the door actuator bellcranks, and both side brace lock links are adjusted at the landing gear. The following procedure is to rig the retraction system from the door actuator bellcranks to the side brace lock links.

j. Make the following preliminary preparations:
1. Remove uplocks (3) and uplock push-pull tubes (13) by removing attaching bolts.
2. Adjust the length of outboard drive tubes (15) to 1/4 inch from as short as possible and install.

NOTE

Bolt (33, figure 4-9) must be installed with head of bolt forward.

3. Disconnect push-pull tube (2) from fork bolt (4).
4. Screw fork bolts (4) into torque tubes (14) as far as possible.
5. Operate landing gear actuator to DOWN position.
6. With landing gear DOWN, adjust length of push-pull tubes (2) so that rod end holes align with the holes in fork bolts (4), then shorten one turn. Operate landing gear actuator toward the UP position far enough to permit installation and install push-pull tubes (2). INSTALL WITH THE COLLAR-END OF THE HI-SHEAR RIVETS POINTING UPWARD FOR CLEARANCE.

CAUTION

The bolt installing push-pull tube (2) to the fork bolt (4) must be installed with the bolt head forward.

NOTE

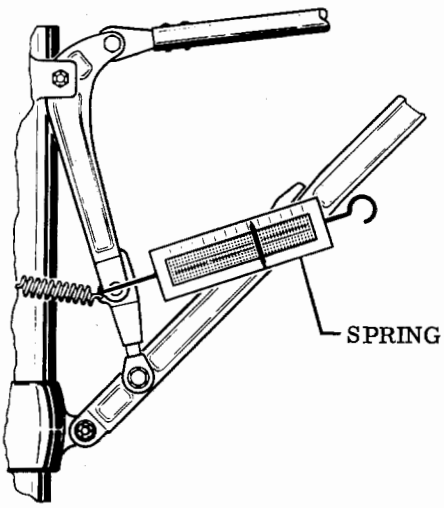
The preceding preparations will result in incomplete retraction, thus eliminating the possibility of damage to the wing structure caused by retracting too far.

k. Operate landing gear to the UP position and observe the highest position reached by the gear during retraction and the amount of drop-off.
l. Adjust the highest position reached by the gear during retraction as follows:
1. Lengthen fork bolt (4) in half-turns to increase the highest position during retraction.

NOTE

Detail A illustrates this adjustment. Lengthening the fork bolt increases dimension "B," the longer dimension "B" is, the higher the gear will retract.

2. The axle dust cover should make light contact with the corrugated reinforcement at the top of wheel well, then drop down a specified distance (drop-off). Refer to step m.
m. Adjust the amount of drop-off as follows:
1. Determine whether drop-off is too little or too much. The minimum and desired amount of drop-off, measured at the center of the wheel, is 1/8 inch.
2. If drop-off is too much, lengthen outboard drive tube (15) in half-turn increments until drop-off is correct.
3. If drop-off is too little, shorten outboard drive tube (15) in half-turn increments until drop-off is correct.




SPRING SCALE
MODEL 140 HEAVY DUTY
0-200 IBS.
JOHN H. CHATILLON AND SON
83-28 KEW GARDENS
KEW GARDENS, NEW YORK

40-50 LBS. DURING RIGGING
40-60 LBS. FOR ROUTINE IN-SERVICE INSPECTION

Figure 4-14. Main Landing Gear Downlock Requirements

4. Adjust the amount of drop-off for both main landing gears in this manner.

NOTE

Detail B illustrates the principle used to obtain drop-off. Notice that dimension "C" is 35 inches. If we continue to rotate the torque tube fork bolt past its parallel position with the push-pull tube, dimension "C" will decrease as illustrated by dimension "D." Dimension "C" represents the highest position reached by the main landing gear during retraction. If the fork bolt is rotated past its parallel position, we actually cause the main gear to start extending. This slight past center extension is defined as drop-off.

n. Adjust the downlock tension as follows:

1. (See figure 4-14.) Operate the landing gear to the DOWN position. The main landing gear downlock tension should be 40 to 50 pounds.

NOTE

When checking downlock tension always place finger on the downlock switch and pull scales at a right angle to the lock link and read scale at the point when a definite switch actuation is felt.

2. If downlock tension is too high, lengthen push-pull tube (2) until the correct downlock tension is obtained.

3. If downlock tension is too low shorten push-pull tube (2) until the correct downlock tension is obtained.

NOTE

Since the highest position during retraction is controlled by the combined length of the push-pull tube (2) and the fork bolt (4), this combined length must remain unchanged to maintain the correct highest position. When adjusting the push-pull tube to obtain the specified downlock tension, the fork bolt must be readjusted a corresponding amount in the direction of the push-pull tube and fork bolt.

4. Adjust the downlock tension for both main landing gear in this manner.

o. Install and adjust uplocks as follows:

1. Connect uplock push-pull tubes (13) to uplock assemblies with bolts, washers and nuts.

2. (See figure 4-10.) Position uplock assemblies in place and attach to upper side links with screws (25). Do not tighten attachment.

3. Adjust uplock push-pull tubes (13) to a preliminary length of 5.15 inches and attach to torque tube (14) with bolts, washers and nuts.

4. Operate landing gear to the UP position.

CAUTION

Use caution when landing gear nears the UP position before adjustment of uplock push-pull tubes has been completed. If necessary, readjust the push-pull tube and/or uplock hooks to prevent damage.

5. Adjust uplock push-pull tubes so that uplock assemblies fully engage the spacers provided on the landing gear and tighten nuts.

NOTE

Elongated slots are provided in the uplock hooks so that each uplock hook can be adjusted vertically to contact the spacers.

6. Operate the landing gear several times, observing uplock assemblies. Uplock hooks must engage fully with the spacers provided on the gear, and must engage and disengage freely and smoothly with no indication of binding.
7. VISUALLY CHECK THE ALIGNMENT OF ALL ROD ENDS TO INSURE THAT THEY ALIGN WITH THEIR ATTACH FITTINGS.
p. Refer to figure 4-12 for the following steps q. through z. for rigging the nose gear.
q. Disconnect downlock assist spring (6) in nose gear wheel well.

NOTE

Because the aft drive tube (12) is a fixed length, the idler bellcrank (11) is correctly positioned to the actuator bellcrank (13).

r. Operate the actuator to the DOWN position, then adjust the length of the forward drive tube (10) as follows:
1. Disconnect forward drive tube (10) from outboard bellcrank (16).
2. Adjust the length of forward drive tube (10) so that fork bolt (8) is parallel with the upper flange of the wheel well former adjacent to the fork bolt. The forward end of the fork bolt will point downward any amount caused by less than one turn of the threaded end of the forward drive tube (10). Detail "A" illustrates three possible conditions. The straight configuration is most desired. The fork bolt must never point up.

NOTE

The collar-end of the forward horizontal hi-shear rivet must point inboard for clearance.

s. Make the following preliminary adjustments:
1. Screw fork bolt (8) into adjusting bellcrank (9) as far as possible.
2. Screw adjusting rod end (4) into uplock torque tube (5) as far as possible.
3. Shorten adjusting fork (2) as much as possible.
4. (See figure 4-19.) Adjust uplock hook (52) to the end of its adjusting slots in the direction that will prevent hook from fully engaging.
t. Adjust connector link (3) as follows:
1. With nose gear DOWN, check the overcenter position of connector link (3).

NOTE

A slight force should be required to snap connector link into its overcenter position.

2. Lengthen adjusting rod end (4) in half-turn increments to increase the force required to snap connector link overcenter; shorten to decrease.
3. Manually place nose gear UP, push upward on door actuator arm to lock connector link overcenter, and check the retracted position.

NOTE

The nose gear should retract to a position that will align the center of the uplock hook with the spacer provided on the gear for hook engagement.

4. If the retracted position is too low, lengthen adjusting rod end (4) and shorten adjusting fork (2) in half-turn increments.
5. If the retracted position is too high, shorten adjusting rod end (4) and lengthen adjusting fork (2) in half-turn increments.

NOTE

Since the combined length of adjusting rod end (4) and adjusting fork (2) determines the force required to snap link overcenter in the DOWN position, this combined length must remain unchanged. When changing the length of adjusting rod end (4) to obtain the correct retracted position, change the length of adjusting fork (2) a corresponding amount in the direction that will not change their combined length.

u. Adjust uplock and downlock tensions as follows:
1. Lengthen nose push-pull tube (7) as much as possible. Insure rod end is visible through the inspection hole for thread engagement.
2. Temporarily install nose push-pull tube (7).
3. Retract landing gear electrically.

NOTE

If the auxiliary switch described in paragraph h., step 6., of Rigging of Main Landing Gear, is not being used to rig the landing gear, use the normal retraction system. The use of an external power source is recommended for operation of electrical units while engines are not being operated.

4. Check the uplock tension at the nose gear door actuator arm, as illustrated in figure 4-14. The force required to move the connector link from its position against uplock torque tube must be 75 +10, -15 pounds.
5. Shorten nose push-pull tube (7) in half-turn in-

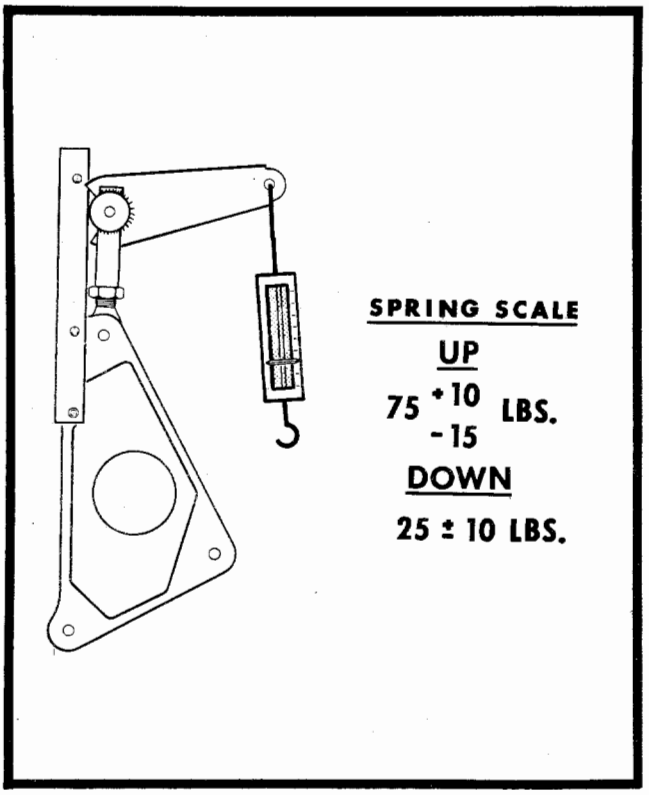



Figure 4-15. Nose Gear Tension Requirements

crements to increase uplock tension; lengthen to decrease.

6. Operate landing gear to the DOWN position and check the downlock tension in the same manner. The force required to move the connector link from its position against the uplock torque tube must be 25 ±10 pounds.

NOTE

Place finger against lock link, pull scales at right angle to lock link and read scales when lock breaks overcenter.

7. Lengthen fork bolt (8) in half-turn increments to increase downlock tension; shorten to decrease. DO NOT adjust nose push-pull tube (7).

NOTE

Detail B illustrates the principle for adjusting the uplock and downlock tension. Adjust length of nose push-pull tube for uplock tension and the length of the fork bolt for downlock tension.

8. Operate landing gear to the UP position and recheck the uplock tension. If necessary, readjust nose push-pull tube (7) in accordance with step 5.

NOTE

Since the combined length of fork bolt (8) and nose push-pull tube (7) determines the downlock tension, this combined length must remain unchanged. When changing the length of the nose push-pull tube to obtain the correct uplock tension, change the length of the fork bolt to a corresponding amount in the direction that will not change their combined length.

v. Adjust the uplock hook as follows:

1. With landing gear in the UP position, check the clearance between uplock hook and the spacer on the strut with which the hook engages.

NOTE

An access cover is provided in the top of the nose gear wheel well to check uplock hooks in the gear UP position with door closed.

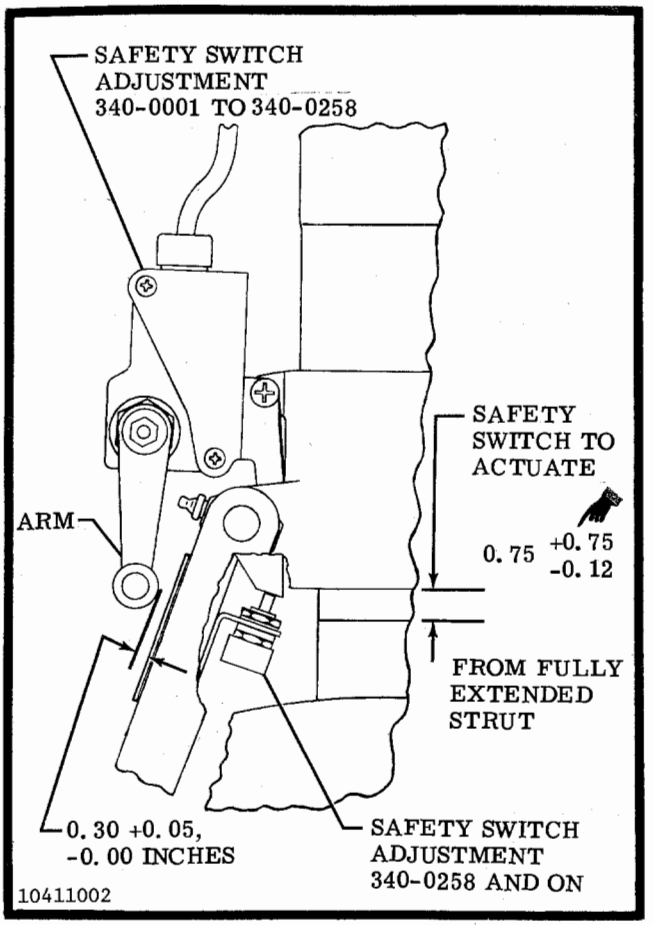



Figure 4-15A. Adjustment of Landing Gear Safety Switch

2. Adjust uplock hook to obtain a minimum clearance of 0. 003 to 0. 060 inch and a maximum clearance of 0. 06 inch at the closest point, which should be at the underside of the spacer, near the fully engage position of the hook.

NOTE

For adjustment of uplock hook, elongated holes are provided in the supports to which the hook is attached.

12

3. Operate landing gear several times to observe the uplock hook. The hook must engage and disengage freely, with no indication of binding between the hook and the spacer.

w. Connect downlock assist spring and cycle landing gear. The spring must cause no interference with gear operation.

x. (See figure 4-18. ) Connect door link tubes (3 and 15) with bolts and nuts and rig nose gear doors in accordance with Nose Gear Door Rigging Procedures.

y. (See figure 4-7. ) Connect main wheel well door link tubes (15) with washer (11) and nut (14). Rig doors in accordance with Main Gear Landing Doors Rigging Procedures.

z. Reinstall floorboards, seats, carpet and access covers. Insure that landing gear is DOWN and locked, then remove jacks.

Adjustment of Landing Gear Safety Switch. (See figure 4-15A. )

The landing gear safety switch is located on the aft side of the left main landing gear and is actuated by the upper torque link.

a. Jack aircraft in accordance with Section 2.

b. Place landing gear switch in the DOWN position.

c. Insure that battery switch is OFF.

d. (Aircraft 340-0001 to 340-0258. ) Adjust safety switch as follows:

1. With left main landing gear strut fully extended, adjust arm of landing gear safety switch so that switch is actuated when the arm is raised to a position of 0. 30 +. 05, -. 00 inches. Assure pressurization portion of the landing gear safety switch provides and opens circuit to pressurization safety valve. Movement of the landing gear safety switch arm should provide an audible actuation of the safety valve solenoid. If either the landing gear safety switch portion or pressurization safety valve portion does not operate within the prescribed limits, the switch must be replaced.

NOTE

The arm is adjusted by removing the cotter pin and nut which attach the arm to the switch, repositioning the arm, and reinstalling the nut and cotter pin.

e. (Aircraft 340-0001 to 340-0258. ) Check the adjustment of the landing gear safety switch as follows:

WARNING

Since landing gear may retract if adjustment of safety switch is incorrect, insure that all wheel well areas are clear while performing the following checks.

1. If available, connect an external power source, if not available, turn battery switch ON.

2. Raise the switch arm to the position adjusted in step d. While holding the switch arm in this position, have an assistant place the landing gear switch in the UP position. Landing gear should NOT retract.

3. Continue to raise the switch arm upward to the end of its travel. Landing gear should NOT retract.

4. Release the switch arm. Landing gear SHOULD retract.

5. Operate landing gear through several cycles; checking landing gear for proper operation.

f. (Aircraft 340-0258 and On. ) Adjust safety switch as follows:

1. Adjust the landing gear safety switch to operate on the center line of the stop plate.

2. Remove bottom left-hand wing gap fairing.

3. Place jack under axle and raise strut to 0. 75 +0. 75, -0. 12 from full extended position. Cut safety wire and adjust the switch to actuate at this position.

NOTE

To ensure switch is actuating at position described above, refer to Section 14 and make a continuity check of safety switch.

4. Tighten jam nuts at safety switch and safety wire nuts.
5. Remove jack from under axle.
6. If available connect external power source, if not available, turn battery switch ON.

WARNING

Since landing gear may retract if adjustment of safety switch is incorrect, insure that all wheel well areas are clear while performing operational check.

7. Place the landing gear switch in the UP position. Landing gear should retract.
8. Operate landing gear through several cycles, check landing gear for proper operation.
9. Reinstall bottom left-hand wing gap fairing.

g. Insure that landing gear switch and landing gear are DOWN and battery switch is OFF, then remove jacks.

n. If used, disconnect the external power source.

Adjustment of Landing Gear Warning System.

a. Adjust the throttle microswitch as follows:

NOTE

To properly adjust the throttle microswitch, it is necessary to fly the aircraft. As a preliminary adjustment before flight, adjust microswitch to actuate when the aft edges of the throttle levers are approximately 3/4 inch from the fully closed position.

1. Obtain a pressure altitude of 2500 feet.
2. Adjust propeller pitch levers to obtain 2300 rpm on both engines.
3. Place mixture levers in FULL RICH.
4. Retard throttle levers to obtain 12 to 14 inches of manifold pressure.

NOTE

If throttle levers are retarded below the specified manifold pressure, advance them and repeat the retarding procedure.

5. Using a pencil, tape, or other suitable means of marking, index the position of the throttle levers in the control quadrant.

NOTE

The remainder of the adjusting procedure must be accomplished with the aircraft on the ground.

6. With engines not being operated, place mixture levers in FULL RICH.

WARNING

Insure that fuel selector valve handles and fuel boost pump switches are in the OFF position.

7. Jack aircraft in accordance with Section 2.
8. Fully advance throttle levers, then retard to the position marked on the control quadrant during flight.
9. Adjust the throttle microswitch to actuate at this position. Turn battery switch ON and check that warning horn sounds as throttle levers are retarded to this position, then turn battery switch OFF.

NOTE

Elongated slots are provided for vertical adjustment and an adjusting screw positions the microswitch horizontally.

10. Fully advance throttle levers.
11. Position flap preselect lever at 15° detent.
12. Turn off electrical power.
13. (See figure 8-3.) Loosen screws (24) and adjust switch (19) to actuate with flap lever .04 to .08 below 15° detent.
14. (See figure 8-3.) Tighten screws (24) and turn electrical power ON.
15. Operate the landing gear to the full up position.
16. Operate the flaps to the full down position and note flap travel when warning horn sounds.

NOTE

Anytime the flap preselect lever is placed below the 15° detent, the landing gear warning horn should sound.

17. It may be necessary to repeat steps 13 through 16 several times to properly adjust landing gear warning system.
18. After microswitch adjustment is completed, place throttle levers in the CLOSED position and the mixture levers in IDLE CUT-OFF.

b. Adjust DOWN indicator switches as follows:

1. (See figure 4-7.) Disconnect main wheel door link tubes (15) from main wheel well door (10).
2. (See figure 4-18.) Disconnect nose gear door link tube (15) from nose gear door hinge (21).
3. Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
4. (See figure 4-19.) Disconnect nose gear nose push-pull tube (37) from fork bolt (39) by removing nut and bolt.
5. (See figure 4-9.) Disconnect main gear LH outboard drive tube (9) from idler bellcrank (7) by removing nut, spacers and bolt.

6. Adjust all three DOWN indicator switches so that they are not actuated until landing gear is DOWN and locked by the overcenter linkage. Adjust the main landing gear switches by repositioning. Adjust the nose gear switch by adjusting the switch actuating bolt.
7. Attach the push-pull tubes disconnected in steps 4 and 5.
8. Using the normal landing gear retraction system, operate landing gear to the UP position.
9. Place landing gear switch in a neutral position, engage the manual extension crank, and lower the landing gear. Stop cranking immediately when the green light illuminates, and note the exact angular position of the crank.
10. Check that both main gear and nose gear are DOWN and locked in the overcenter position.
11. Resume cranking toward the DOWN position noting the number of turns required, until the internal stop in the landing gear actuator is reached. The number of turns required should not be less than four, nor more than eight for the main landing gears. The number of turns should not be less than eight nor more than fourteen for the nose gear.
12. If necessary, readjust DOWN indicator switches as required to meet the conditions of steps 6 and 11.
13. Connect nose push-pull tube (7) to fork bolt (8).
14. (See figure 4-9.) Connect main gear LH outboard drive tube (9) to idler bellcrank (7).
15. Insure that landing gear is DOWN, then remove jacks.

NOSE GEAR.

The nose gear consists of a wheel and tire assembly yoke, axle, lower strut, upper strut, trunnion assembly, torque links, and shimmy damper. The Air-oleo shock strut contains an orifice and tapered metering pin which vary the resistance to shock according to its severity. During extension and retraction, the nose gear pivots on heavy-duty needle bearings by means of sleeved lugs on the trunnion assembly. A wheel straightener and steering mechanism are provided so that the nose wheel turns while taxiing, but is straightened during retraction.

Removal of Nose Gear. (See figure 4-16.)

a. Jack aircraft in accordance with Section 2.
b. Remove taxi light (if installed, optional).
c. Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
d. Disconnect nose gear doors.
e. Disconnect retracting linkage as follows:
1. Remove nut (20), washer (19), and bolt (22) attaching drag brace (23) to strut.

NOTE

To facilitate installation, note the number and position of attaching clamps and the routing of electrical wires.

2. Remove bolts (25 and 29), washers (26 and 30), and spacers (27 and 28).
3. Remove four nuts (17), washers (16), and bolts (14) on both left and right side of wheel well; then turn nose gear and slide retainer and gear aft to remove gear.

NOTE

To facilitate removal, wax or paraffin was applied to retainer (13) upon installation.

Disassembly of Nose Gear. (See figure 4-17.)

WARNING

Deflate the nose gear strut before removing or disconnecting nose gear torque links.

a. Remove fender (if installed, optional).
b. Remove wheel and tire assembly.
c. Remove retainers from trunnion assembly.

NOTE

Needle bearings are a press fit and should be removed only for replacement.

d. Remove shimmy damper by removing nuts, washers, and bolts.
e. Completely deflate strut and after all air has been expelled remove valve assembly and drain fluid.
f. Remove snap ring (26) and stop (32) then pull trunnion (28) from upper barrel (57).
g. Remove ball bearing (31) and packing (30) from trunnion (28).
h. Remove cotter pin (33), washer (34), and pin (58) from upper barrel (57).

Figure 4-16. Nose Gear Installation Callouts

1. Connector Link
2. Washer
3. Retracting Arm
4. Bolt
5. Nut
6. Truss Assembly
7. Washer
8. Bolt
9. Retainer
10. Nut
11. Trunnion
12. Bearing
13. Retainer
14. Bolt
15. Shim
16. Washer
17. Nut
18. Web
19. Washer
20. Nut
21. Trunnion
22. Bolt
23. Drag Brace
24. Nose Gear Down Indicator Switch
25. Bolt
26. Washer
27. Spacer
28. Spacer
29. Bolt
30. Washer
31. Nose Gear Steering Assembly

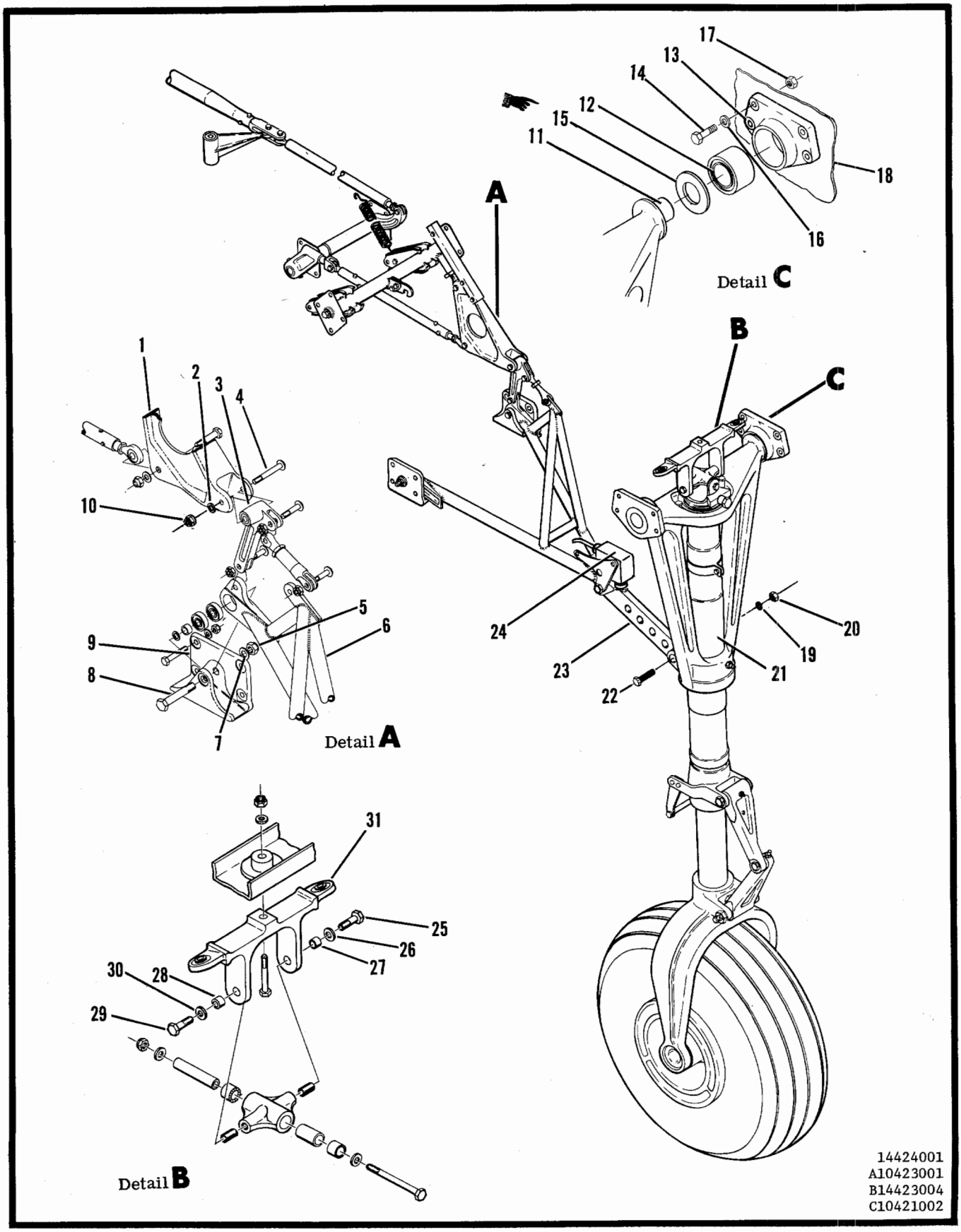



Figure 4-16. Nose Gear Installation

i. Remove cotter pin (40), nut (41), washer (42 and 48), and bolt (47). Then disconnect torque links (44 and 49).
j. Pull inner tube and fork assembly (1) and upper barrel (57) far enough apart to remove lock ring (25); then remove lock ring (25) and separate upper barrel (57) and inner tube (1)
k. Pull orifice tube (14) from inner tube and fork (1), then unscrew orifice (15) from orifice tube (14).
l. Remove lock ring (16) from inner tube and fork (1) and remove bearing (17).
m. Slide spacer (18), shim (19), ring pack support (21), scraper ring (23), and ring pack retainer (24) up and off of inner tube and fork (1).
n. Remove metering pin as follows:
1. Remove nut (12) and bolt (9) from wheel fork.
2. Pull metering pin from inner tube and wheel fork.
3. Remove nut and disassemble metering pin as shown.
o. Remove polypak seal (22) from ring pack support (21).

NOTE

Inner tube and fork are a press fit and drilled on assembly. Disassembly is not recommended.

Assembly of Nose Gear. (See figure 4-17.)

Before each component of the nose gear shock strut is assembled, assure that it is thoroughly clean, then lubricate with system hydraulic fluid.

a. If metering pin was disassembled, assemble as follows:
1. Install O-rings (3) as shown and install pin (2) in pin plug base (4) and install nut (5).
2. Install metering pin in inner tube and fork (1). Align holes and install bolt (9), washer and nut (12).
b. Slide lock ring (25), ring pack retainer (24), and scraper ring (23) on inner tube and fork (1).
c. Install inside ring pack support (21); and O-ring (20) in the groove on the outside of ring pack support (21).

NOTE

To prevent damage to piston barrel and ring pack support during installation, a ring pack support tool P/N 0880004-2 (see figure 4-5), available from your Cessna Dealers' Organization should be used.

d. Slide ring pack support on inner tube and fork (1) then install shim (19) and spacer (18).
e. Install bearing (17) on inner tube and fork (1) and install lock ring (16).

NOTE

Install bearing with chamfered end up in order to seat against external lock ring.

f. Screw orifice (15) in bottom of orifice tube (14) and install O-ring (13) in groove in orifice tube (14).
g. Insert assembled orifice tube (14) into upper barrel (57); align holes and install pin (58), washer (34) and safety with cotter pin (33).

NOTE

Lubricate O-ring (13) or tape sharp edges of lower strut to prevent O-ring damage.

h. Install assembled inner tube and fork (1) into upper barrel (57). Carefully work scraper ring (23) and retainer ring (24) into place and install lock ring (25).

NOTE

Lubricate O-ring (20) or tape sharp edges of lower strut to prevent O-ring damage.

i. Connect torque links (44 and 49) together with bolt (47), washer (48), bushing (50), washer (51), spacer (52), washer (51), bushing (53), washers (42), nut (41), and cotter pin (40).
j. Install packing (30) and ball bearing (31) into trunnion (28) and lubricate.

CAUTION

Do not use high pressure grease gun on fitting (29). Damage may result to trunnion (28).

k. Install ball bearing (27) in top of trunnion (28) and fit trunnion on upper barrel.
l. Install stop (32) and snap ring (26).
m. Press needle bearings into place on trunnion (28).
n. Install shimmy damper in accordance with installation procedure.
o. Install fender (if required, optional).
p. Install wheel and tire assembly.
q. With strut completely deflated, fill with hydraulic fluid as specified in Section 2 and install valve body. Do not inflate strut at this time.

Installation of Nose Gear. (See figure 4-16.)

a. Make sure bearings (12) are in place, then install retainers (13) and shims (15) on trunnion (11).

NOTE

Shim as required to center nose gear and to limit side play to not exceed 0.020.

b. Place nose gear in wheel well and turn into position for installation. Force nose gear forward and align mounting holes.

NOTE

To facilitate installation, rub wax or paraffin on the wheel well bulkheads against which the retainers must slide; and move forward evenly.

c. Install eight bolts (14), washers (16), and nuts (17) attaching retainers to airframe. Torque heads of bolts to 85 ±15 inch-pounds.
d. Align Gimbal fitting on nose gear steering unit and install spacers (27 and 28), washers (26 and 30), and bolts (25 and 29), torque 50 to 70 inch-pounds.

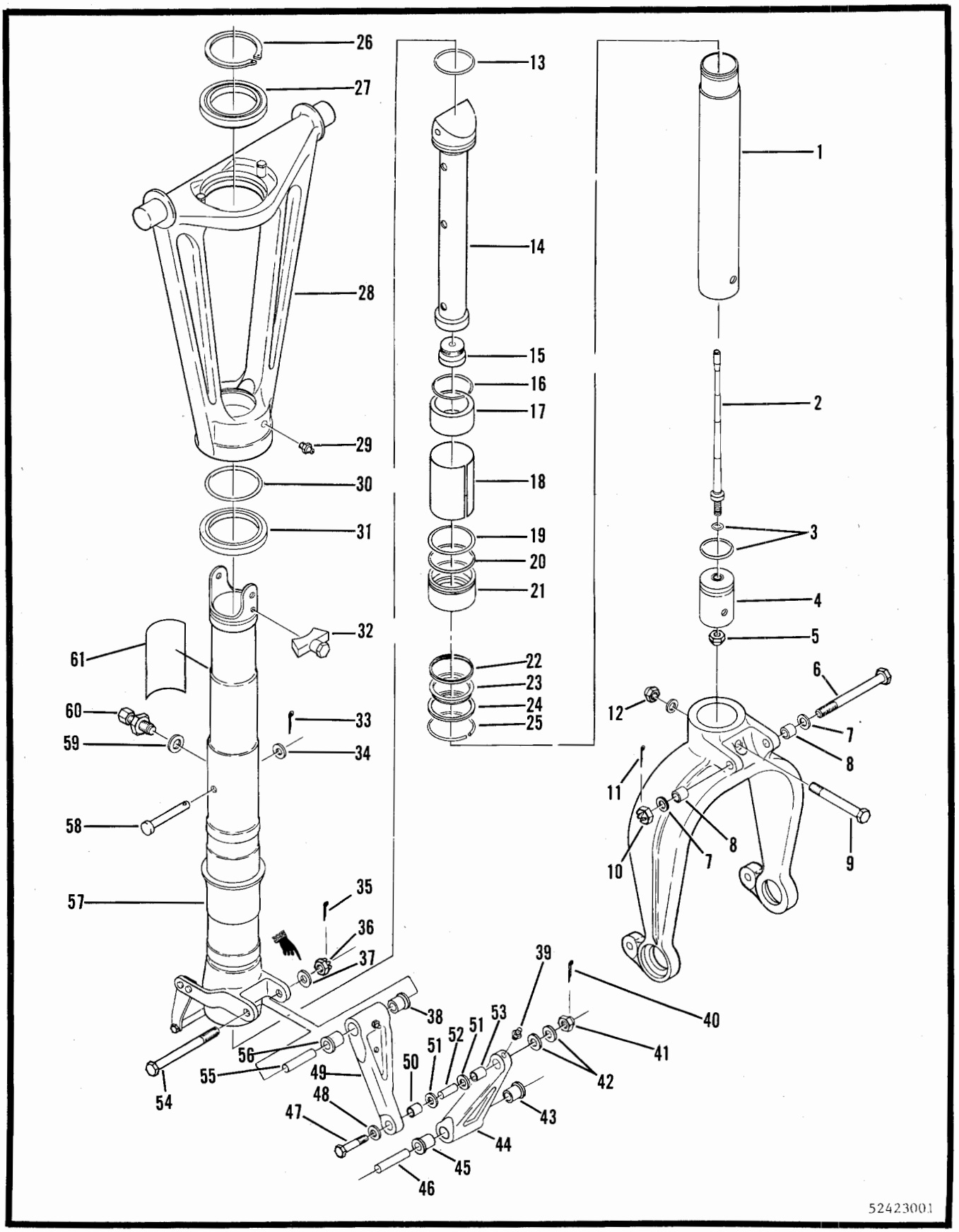



Figure 4-17. Nose Gear Strut

Figure 4-17. Nose Gear Strut Callouts

1. Inner Tube and Fork
2. Metering Pin
3. O-Ring
4. Plug Pin Base
5. Nut
6. Bolt
7. Washer
8. Spacer
9. Bolt
10. Nut
11. Cotter Pin
12. Nut
13. O-Ring
14. Orifice Tube Assembly
15. Orifice
16. Lock Ring
17. Bearing
18. Spacer
19. Shim
20. O-Ring
21. Ring Pack Support
22. Polypak Seal
23. Scraper Ring
24. Ring Pack Retainer
25. Lock Ring
26. Snap Ring
27. Bearing Ball
28. Trunnion
29. Lube Fitting
30. Packing
31. Bearing Ball
32. Stop Assembly
33. Cotter Pin
34. Washer
35. Cotter Pin
36. Nut
37. Washer
38. Bushing
39. Grease Fitting
40. Cotter Pin
41. Nut
42. Washer
43. Bushing
44. Torque Link
45. Bushing
46. Spacer
47. Bolt
48. Washer
49. Torque Link
50. Bushing
51. Washer
52. Spacer
53. Bushing
54. Bolt
55. Spacer
56. Bushing
57. Upper Barrel Assembly
58. Pin
59. Gasket
60. Valve Assembly
61. Placard

Removal and Disassembly of Nose Gear Torque Link Assemblies. (See figure 4-17.)

WARNING

If the aircraft is on jacks, it is advisable to deflate struts before removing torque links to avoid possible damage.

a. Remove cotter pins (11, 35 and 40).
b. Remove nuts (10, 36 and 41).
c. Remove washers (7, 37 and 42).
d. Remove spacers (8, 46 and 55).
e. Remove bolts (6, 47 and 54) attaching links to strut and attaching the upper torque links to the lower torque links.

NOTE

Observe the number of washers (51) installed to facilitate reinstallation.

f. Remove nose gear torque links by pulling forward.

NOTE

The bushings and spacers in the torque links are a press fit and should be removed only for replacement.

g. Remove grease fittings from torque links.

Assembly and Installation of Nose Gear Torque Link Assemblies. (See figure 4-17.)

a. Install grease fitting in torque link.
b. If removed, install bushings (38, 43, 45, 50, 53 and 56).
c. Install spacers (8, 46 and 55).

NOTE

- Mill an equal amount on each busing (38, 43, 45 and 56) using a flat mill file to provide a slip fit between the lugs on the torque link and the trunnion and/or lugs on the axle.
- Make sure holes in spacers are aligned with grease fittings.

d. Insert nose gear torque links (49 and 44) into position and install washers (7 and 37) and bolts (6 and 54).
e. Install nuts (10 and 36) and safety with cotter pins (11 and 35).
f. Install correct number of washers (51) previously removed.
g. Install bolt (47), washers (42), nut (41), and safety with cotter pin (40).

NOTE

Washers should be installed in the same position from which they were removed. If new components are being installed, align landing gear in accordance with Main Wheel Alignment Procedures.

h. If aircraft was placed on jacks, insure the gear is DOWN and locked and remove aircraft from jacks.
i. Inflate struts in accordance with Section 2.
j. Lubricate torque links in accordance with Lubrication Chart.

Nose Gear Doors.

Right and left main doors are used to enclose the nose gear in its retracted position. The doors are connected to the nose gear retracting linkage and hinged at their outboard ends, pivoting downward during nose gear extension and remaining down

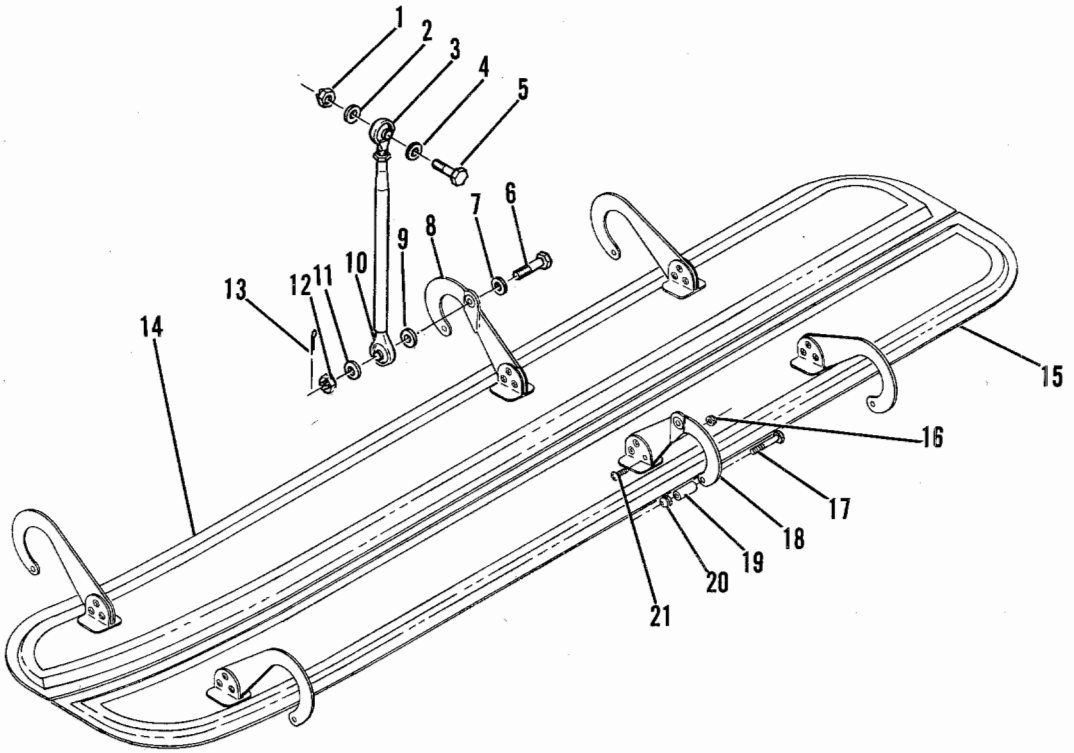
while the nose gear is down.

Removal of Nose Gear Doors. (See figure 4-18.)

a. Remove nut, washers, and bolt from door link tubes (3 and 15).
b. Remove the three nuts and bolts from three hinge brackets and doors; then remove doors.
c. Remove nose gear door hinges as follows:
1. Remove necessary radio equipment and shelves to gain access to hinge bolts.
2. Remove nuts, spacers, washers, and bolts from hinge brackets and remove hinges.

Installation of Nose Gear Doors.

a. If nose gear door hinges were removed, install as follows:
1. Install hinges in brackets using bolts, washers, spacers, and nuts.
2. Replace radio shelves and equipment removed previously.
b. Install nose gear doors at the three hinges with the three bolts and nuts.
c. Connect door link tubes with bolt, washers and nut.
d. Rig nose gear doors in accordance with rigging procedure.




1. Nut
2. Washer
3. Door Link Tube
4. Washer
5. Bolt
6. Bolt
7. Washer
8. Hinge
9. Washer
10. Washer
11. Nut
12. Cotter Pin
13. Cotter Pin
14. RH Nose Gear Door
15. LH Nose Gear Door
16. Nut
17. Bolt
18. Hinge
19. Spacer
20. Nut
21. Screw

Figure 4-18. Nose Gear Doors Installation

Rigging Nose Gear Door. (See figure 4-18.)

a. Jack aircraft in accordance with Section 2.
b. Disconnect main door link tubes (3 and 15) from center hinges (8 and 21) by removing cotter pins, nuts, washers and bolts.
c. Using the normal landing gear retraction system, operate gear to the UP position.

NOTE

The use of an external power source is recommended for operation of electrical units while engines are not being operated.

CAUTION

When operating gear before door rigging is completed, be prepared to stop before damage can occur. On new doors, operation by hand is necessary to make sure of clearance between fuselage skin and door.

d. Connect and adjust main door link tubes (3 and 15) until main doors close snugly when gear is in the UP position.
e. Extend and retract gear, check for clearance between nose tire and doors, and readjust door link tubes (3 and 15) as necessary to obtain clearance.
f. Insure that landing gear is DOWN and locked, then remove jacks.

Nose Gear Retracting Linkage.

The nose gear retracting linkage consists of a drag brace, truss assembly, bellcranks, torque tubes, push-pull tubes and drive tubes interconnected between the landing gear actuator and the nose gear. A positive down lock is obtained by rigging the drag brace to an overcenter position. The connector link assembly which holds the drag brace in an overcenter position is also rigged overcenter. A hook-type mechanical lock is provided to lock the nose gear in its retracted position. The nose gear retracting linkage also operates the main nose gear doors.

Removal of Nose Gear Retracting Linkage. (See figure 4-19.)

a. Jack the aircraft in accordance with Section 2.
b. Remove pilot's seat and front carpet.
c. Remove covers from access holes from underside of fuselage and left front cabin floor.
d. Disconnect main nose gear doors.
e. Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
f. Remove nose push-pull tube (37) as follows:
1. Remove nut and bolt attaching nose push-pull tube to fork bolt.
2. Remove nut, washer, and bolt attaching nose push-pull tube to connector link.

NOTE

During removal of nose gear linkage, manually move gear as required for access to attaching bolts and nuts.

NOTE

The use of an external power source is recommended for operation of electrical units.

g. Remove aft drive tube (1) as follows:
1. Remove nut (14) and bolt (15) from actuator bellcrank, and nuts (9), washers (10 and 11) and bolts (2 and 7) from idler bellcrank (13) and remove aft drive tube (1).

2. Move aft drive tube (1) forward as far as possible to gain access to idler bellcrank attachment point, and remove nut, washer, spacers, and bolt.
h. Remove forward drive tube (8) as follows:
1. Remove nut, washer, spacers, and bolt attaching forward drive to idler bellcrank.
2. Remove nut and bolt attaching forward drive tube to outboard bellcrank.
i. Remove idler bellcrank by removing bolt and washers. Then remove spacer from idler bellcrank.

NOTE

Access to bolt (3) is provided by a hole in the cabin floor above the bolt head.

j. Remove torque tube (25) as follows:
1. Remove adjusting bellcrank (18) by removing cotter pin (40) and pin (16). If desired, the fork bolt (39) can be removed from adjusting bellcrank.
2. Remove inboard support bearing (20) by removing four nuts (21) and bolts (19). Then remove washer (22).
3. Pull torque tube (25) inboard until it clears outboard support bearing (30), then tilt the outboard end upward and remove from nose section. Then remove washer (33).
4. If desired, outboard support bearing (30) can be removed by removing attaching nuts (31) and bolts (32).
5. Remove collar (24) from torque tube by removing cotter pin (35) and pin (23).

NOTE

Removal of collar (26) and outboard bellcrank (28) from torque tube (25) is not recommended. These are matched parts and collar (26) is a press fit.

k. Remove connector link assembly (48) as follows:
1. Remove nut (79) and bolt (65) attaching connector link assembly to retracting arm (78).
2. Remove nut (50), washer (49), and bolt (47) attaching connector link assembly to adjusting rod end (51).

NOTE

Access to bolt (47) is provided by a hole in the adjacent structure. Rotate connector link assembly to align hole.

1. Remove drag brace (61) as follows:
1. Remove nut (58), washer (59), and bolt (62) attaching drag brace to truss assembly (55).
2. Remove nut and bolt attaching drag brace to strut.

m. Remove uplock torque tube (41) as follows:
1. Remove nut (44) and washer (45) from each end of assembly, then unhook spring (82).

NOTE

Uplock torque tube (41) must be removed with bearing assemblies in place.

2. Remove the bearing assemblies (46) by removing attaching nuts (43) and bolts (42).

NOTE

Bearings are a press fit, and should be removed from supports only for replacement.

3. If desired, uplock hook (52) and adjusting rod end (51) can be removed from uplock torque tube.

n. Remove truss assembly (55), retracting arm (78), and adjusting fork (68) as an assembly as follows:
1. Remove nut (63) and bolt (56) attaching switch bracket (57) to truss assembly.
2. Remove clamps attaching switch wires to retracting linkage and tilt switch where it will not interfere with linkage removal.
3. Remove nuts (70), washers (71), and bolts (73) attaching truss assembly to retainers (72).
4. Pull truss assembly forward and remove from aircraft.
5. If desired, retracting arm (78) and adjusting fork (68) can be removed from truss assembly by removing attaching nuts and bolts.
6. If desired, retainers (72) can be removed from aircraft by removing nuts (76), washers (75), and bolts (74).

Installation of Nose Gear Retracting Linkage. (See figure 4-19.)

a. Install truss assembly (55) as follows:
1. If removed, install retracting arm (78) and adjusting fork (68) on truss assembly.

NOTE

Lower retracting arm bolt (67) is inaccessible after truss assembly is installed.

2. If removed, install retainers (72) with bolts (74), washers (75) and nuts (76).
3. Place truss assembly in position and attach to retainers with bolts (73), washers (71) and nuts (70).
4. Install clamps attaching switch wires to retracting linkage and attach switch bracket (57) to truss assembly with bolt (56) and nut (63).

b. Install uplock torque tube assembly (41) as follows:
1. If removed, attach uplock hook (52) and adjusting rod end (51) to uplock torque tube.
2. Install bearing assemblies (46) with bolts (42) and nuts (43).
3. Install washer (45) and nut (44) on each end of uplock torque tube assembly.

c. Install drag brace (61) as follows:
1. Attach drag brace to truss assembly (55) with bolt (62), washer (59), and nut (58).

NOTE

When installing bolt (62), insure that down indicator switch bracket (57) is properly in place.

2. Connect drag brace to strut with attaching bolt and nuts.

d. Install connector link assembly (48) as follows:
1. Attach connector link assembly to retracting arm (78) with bolt (65) and nut (79).
2. Attach connector link assembly to adjusting rod end (51) with bolt (47), washer (49), and nut (50).

NOTE

Access to bolt (47) is provided by a hole in the adjacent structure. Rotate connector link assembly to align hole.

e. Install torque tube (25) as follows:
1. Install stop collar (24) on torque tube with pin (23) and safety with cotter pin (35).
2. If removed, install outboard support bearing (30) with bolts (32) and nuts (31).

NOTE

Torque the nuts attaching inboard and outboard support bearings to 13.5 ±1.5 inch-pounds.

3. Install outboard washer (33) on torque tube and place in position.

NOTE

Insert inboard end of torque tube through the inboard mounting hole from the left, pull into wheel well area until outboard end of torque tube can be inserted into outboard support bearing.

4. Place inboard washer (22), then inboard support bearing (20), on inboard end of torque tube. Install support bearing with bolts (19) and nuts (21).
5. If removed, install fork bolt (39) in adjusting bellcrank (18).
6. Install adjusting bellcrank (18) on torque tube with pin (16) and safety with cotter pin (40).

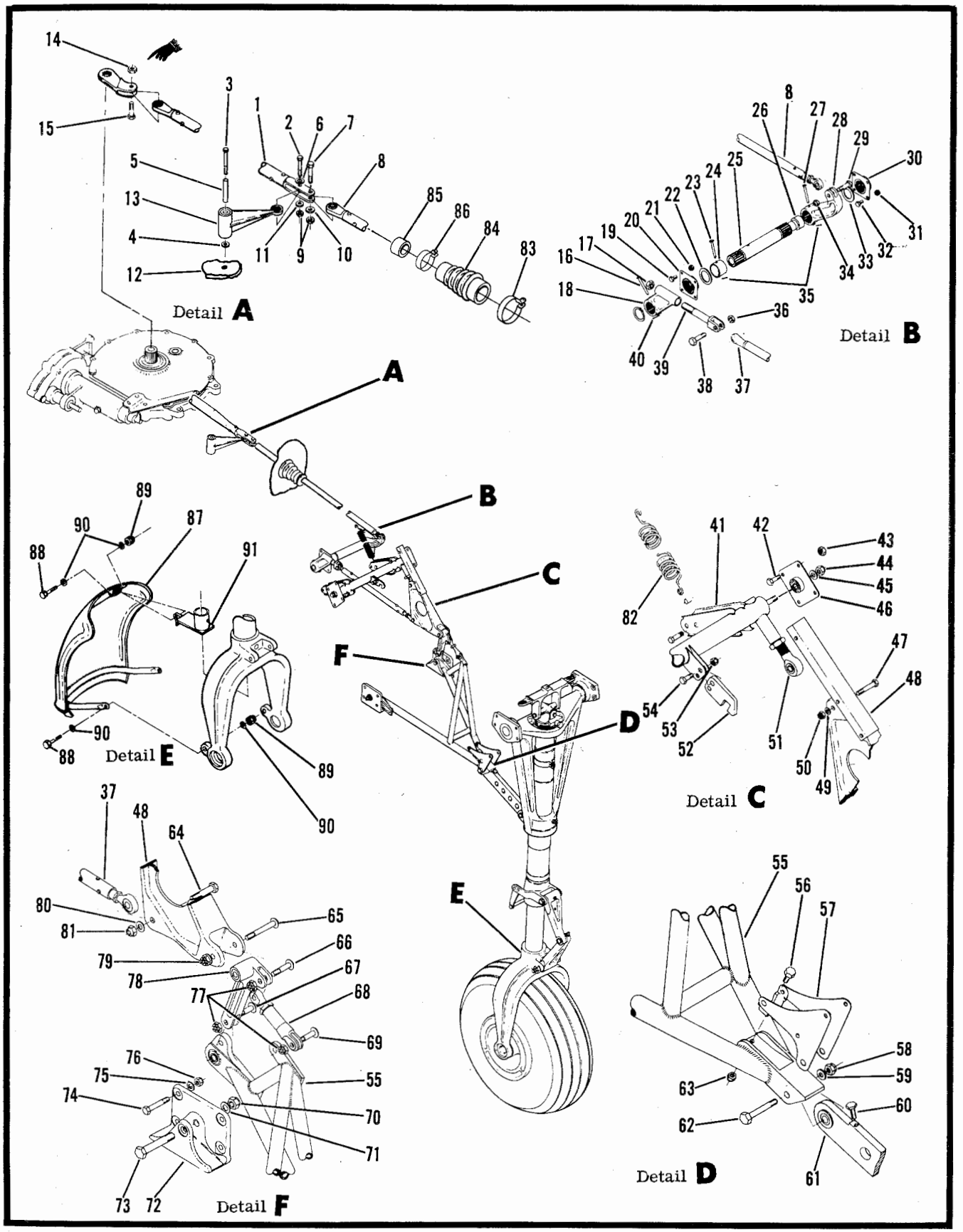



Figure 4-19. Nose Gear Retracting Linkage

Figure 4-19. Nose Gear Retracting Linkage Callouts

1. Aft Drive Tube
2. Bolt
3. Bolt
4. Washer
5. Spacer
6. Washer
7. Bolt
8. Forward Drive Tube
9. Nut
10. Washer
11. Washer
12. Bracket
13. Idler Bellcrank
14. Nut
15. Bolt
16. Pin
17. Nut
18. Adjusting Bellcrank
19. Bolt
20. Inboard Support Bearing
21. Nut
22. Washer
23. Pin
24. Collar
25. Torque Tube
26. Collar
27. Pin
28. Outboard Bellcrank
29. Bolt
30. Outboard Support Bearing
31. Nut
32. Bolt
33. Washer
34. Nut
35. Cotter Pin
36. Nut
37. Nose Push-Pull Tube
38. Bolt
39. Fork Bolt
40. Cotter Pin
41. Uplock Torque Tube
42. Bolt
43. Nut
44. Nut
45. Washer
46. Bearing Assembly
47. Bolt
48. Connector Link Assembly
49. Washer
50. Nut
51. Adjusting Rod End
52. Uplock Hook
53. Nut
54. Bolt
55. Truss Assembly
56. Bolt
57. Switch Bracket
58. Nut
59. Washer
60. Adjusting Bolt
61. Drag Brace
62. Bolt
63. Nut
64. Bolt
65. Bolt
66. Bolt
67. Bolt
68. Adjusting Fork
69. Bolt
70. Nut
71. Washer
72. Retainer
73. Bolt
74. Bolt
75. Washer
76. Nut
77. Nut
78. Retracting Arm
79. Nut
80. Washer
81. Nut
82. Spring
83. Clamp
84. Seal Boot
85. Spacer
86. Clamp
87. Fender
88. Bolt
89. Nut
90. Washer
91. Bracket Assembly

NOTE

Splines must align so that pin (16) can be installed and bellcranks (18 and 28) both extend forward from torque tube.

f. Insert spacer (5) into idler bellcrank (13), place bellcrank in position and install with bolt (3) and washers (4 and 6).

g. Install forward drive tube (8) as follows:

1. Attach forward drive tube (8) to outboard bellcrank (28) with bolt (29) and nut (34).
2. Attach forward drive tube (8) to idler bellcrank (13) with bolt (7), washer (10) and nut (9).

NOTE

To gain access to idler bellcrank attachment points, rotate bellcrank forward as far as possible.

h. Install aft drive tube (1) as follows:

1. If seal boot (84) was removed; install boot but do not clamp to forward drive tube (8) at this time.

NOTE

After gear is rigged, cement rubber spacer (85) to forward drive tube (8) and clamp boot to spacer at a position approximately 5 inches from the station 100.00 bulkhead while gear is in the down position.

2. Attach aft drive tube (1) to idler bellcrank (13) with bolt (2), washer (6), washers (11) and nut (9).
3. Attach aft drive tube (1) to landing gear actuator upper bellcrank with bolt, washer and nut, then safety with cotter pin.

NOTE

Access to lower bellcrank is gained through an access hole on underside of fuselage.

i. Install nose push-pull tube (37) as follows:

1. Using the manual extension system, operate the landing gear to the DOWN position, then crank a few turns toward the UP position.
2. Attach nose push-pull tube (37) to connector link assembly (48) with bolts, washers and nuts.
3. Attach nose push-pull tube (37) to fork bolt (39) with bolt and nut.

j. Rig nose gear retracting linkage in accordance with rigging procedure.

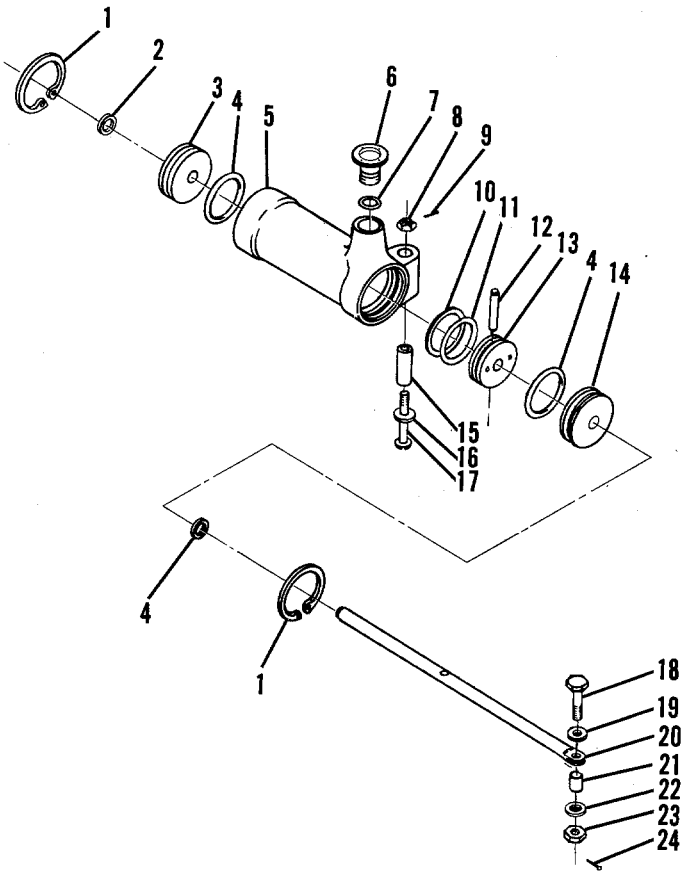
k. Connect nose gear doors and rig nose gear doors in accordance with rigging procedure.

l. Install access hole covers and carpet.

m. Install pilot's seat, insure that landing gear is DOWN and locked; then remove aircraft from jacks.

Nose Gear Shimmy Damper.

The shimmy damper provided for the nose gear offers resistance to shimmy by forcing hydraulic




1. Lock Ring
2. Backup Ring
3. Bearing Head
4. O-Ring
5. Barrel
6. Filler Plug
7. O-Ring
8. Nut
9. Cotter Pin
10. Backup Ring
11. Retainer
12. Roll Pin
13. Piston
14. Bearing Head
15. Bushing
16. Washer
17. Bolt
18. Bolt
19. Washer
20. Piston Rod
21. Spacer
22. Washer
23. Nut
24. Cotter Pin

Figure 4-20. Shimmy Damper

fluid through small orifices in the piston. The outer housing is attached to the upper nose strut and moves as the strut turns, while the piston and piston rod are attached to the trunnion assembly which does not turn, thus causing motion between the housing and the piston.

Removal of Nose Gear Shimmy Damper. (See figure 4-20.)

a. Disconnect piston rod (20) from trunnion assembly by removing nut (23), washer (22), spacer (21), washer (19), bolt (18) and cotter pin (24).
b. Remove shimmy damper by removing nut (8), bushing (15), washer (16) and bolt (17).

Disassembly of Nose Gear Shimmy Damper. (See figure 4-20.)

a. Push piston rod (20) into shimmy damper, remove filler plug (6) and O-ring (7), and drain fluid.
b. Remove lock ring (1) from forward end of shimmy damper and pull piston and rod assembly from barrel (5).

CAUTION

Remove bearing heads and piston assemblies with care to prevent damage to O-rings.

c. Remove O-rings, backup ring and retainer from piston (13).
d. Remove roll pin (12) and remove piston (13) from piston rod (20).
e. Remove bearing head (14) from piston rod (20).
f. Remove lock ring (1) from aft end of shimmy damper and pull bearing head (3) from barrel (5).
g. Remove outer O-rings (4) from bearing heads (3 and 14).
h. Remove internal retaining rings, wiper rings, backup rings and O-rings from bearing heads (3 and 14).

Assembly of Nose Gear Shimmy Damper. (See figure 4-20.)

Before each component of the shimmy damper is assembled, assure that it is thoroughly clean, then lubricate with system hydraulic fluid.

a. Install internal retaining rings, wiper rings, backup rings and O-rings inside bearing heads (3 and 14).
b. Install outer O-rings (4) on bearing heads (3 and 14).
c. Install bearing head (3) in barrel (5) and secure with aft lock ring (1).
d. Position bearing head (14) on piston rod (20), then assemble piston (13) to piston rod (20) with roll pin (12).
e. Install O-rings, backup ring and retainer on piston (13).
f. Insert piston and piston rod assembly into barrel (5), slide bearing head (14) into position, and secure with forward lock ring (1).

CAUTION

Insert piston and bearing heads with care to prevent damage to O-rings.

g. Completely fill shimmy damper with hydraulic fluid, as specified in Section 2, and install filler plug (6) and O-ring (7).

NOTE

For proper operation, shimmy damper must be completely full of hydraulic fluid, with no trapped air present. Push piston rod into the shimmy damper to the limit of its travel, then fill with hydraulic fluid. If desired, shimmy damper can be serviced after installation in accordance with Section 2.

Installation of Nose Gear Shimmy Damper. (See figure 4-20.)

a. Place bushing (15) in barrel (5), align mounting holes and install bolt (17), washer (16) and nut (8).

NOTE

Lubricate bushing (15) with light oil during installation.

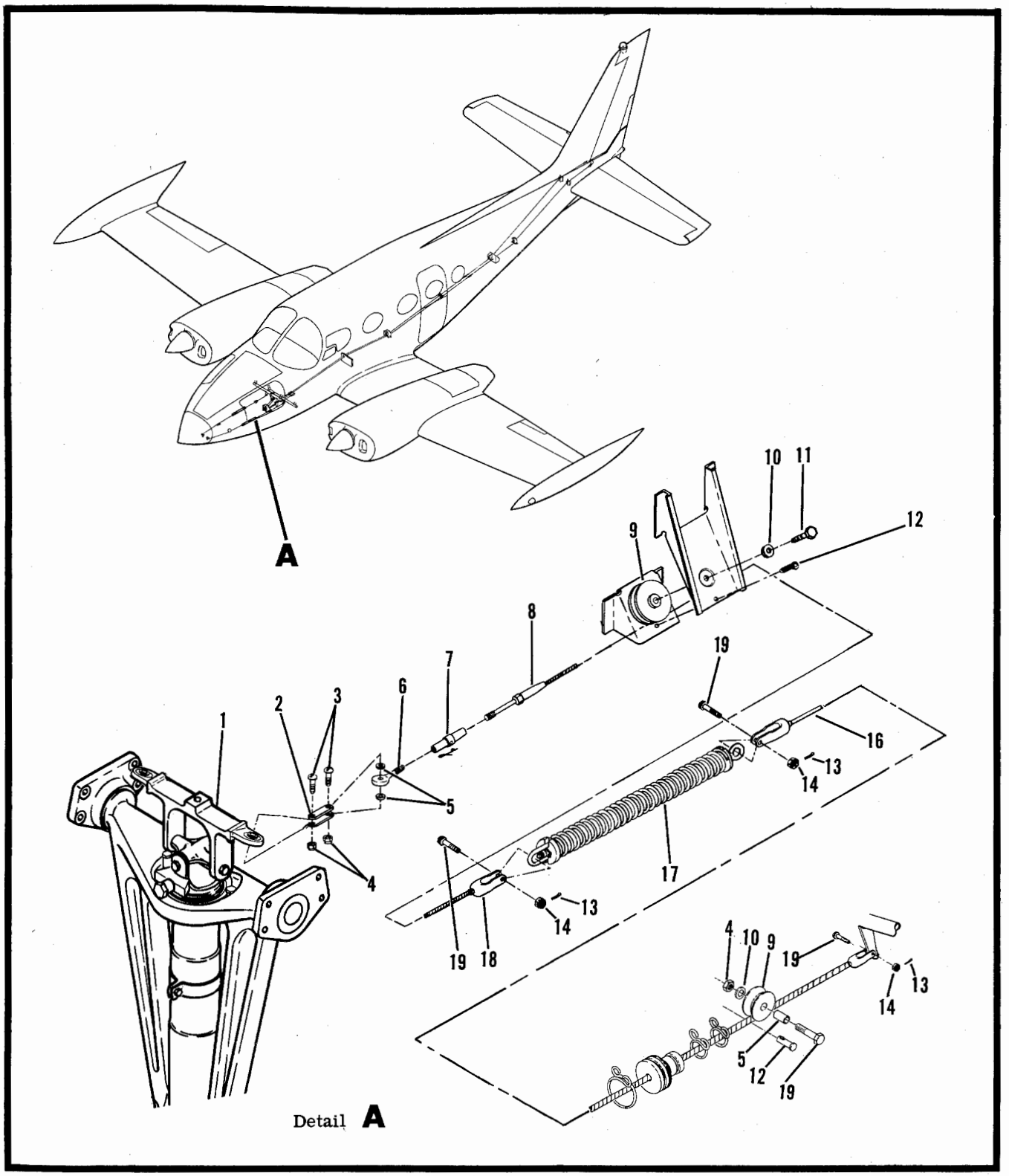
b. Connect the piston rod (20) to the trunnion assembly with bolt (18), washer (19), spacer (21), washer (22), nut (23), and cotter pin (24).
c. If not filled with hydraulic fluid during assembly, service shimmy damper in accordance with Section 2.

Nose Gear Steering System.

The nose gear steering system permits nose gear steering with the rudder pedals, for angles up to 18 degrees, either right or left of center. Spring-loaded nose gear steering cables permit continued resisted turning action of the nose gear for steering angles greater than 18 degrees, up to a maximum of 55 degrees. Steering arms, welded to the rudder torque tubes, are connected by the steering cables, to a steering gimbal, which pivots in a support mounted directly above the nose gear trunnion assembly. The gimbal allows nose gear steering when the gear is down. When gear is retracted, the gimbal serves as an idler, permitting free wheeling of the nose gear steering.

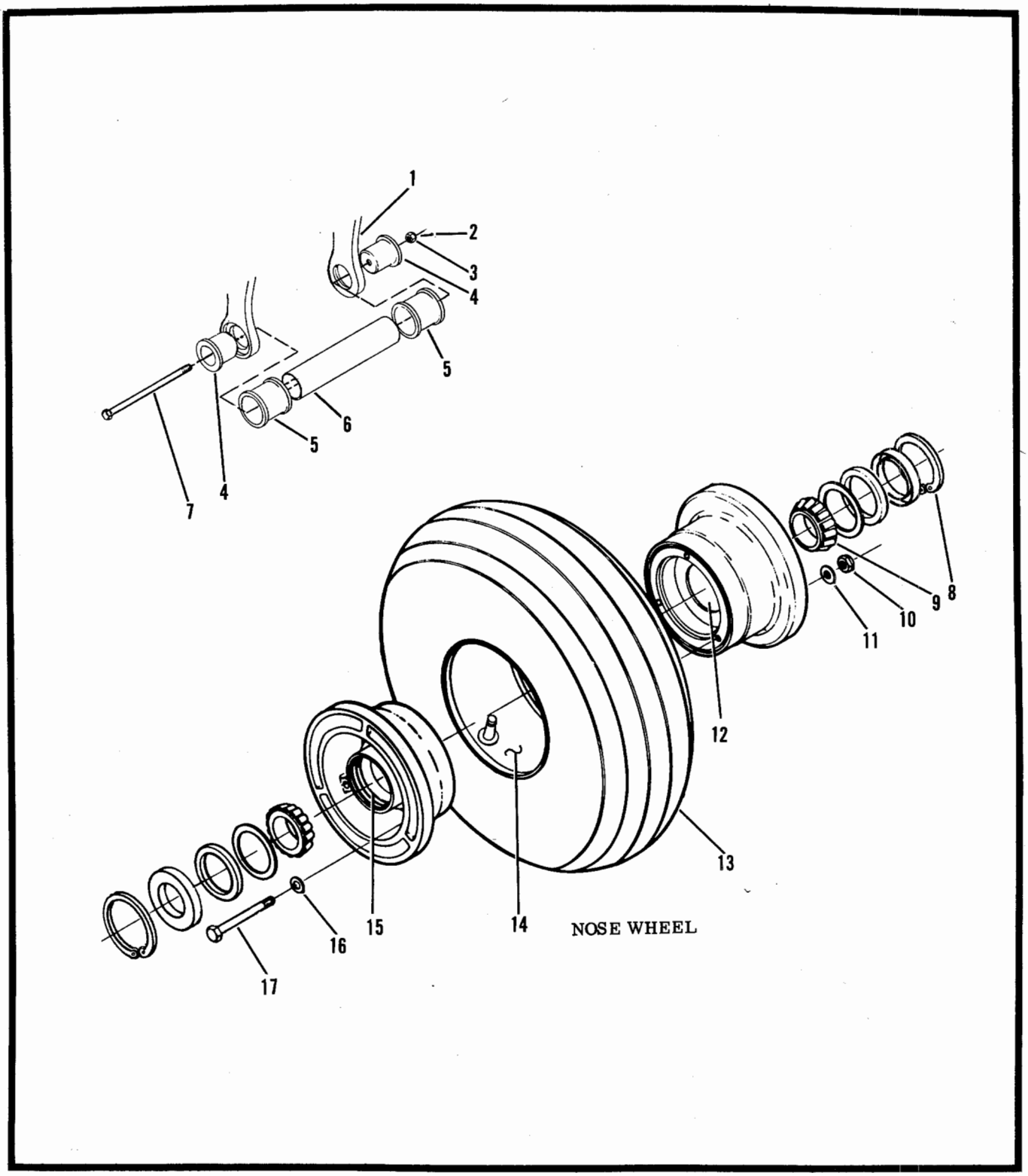
Removal of Nose Gear Steering System. (See figure 4-21.)

a. Remove pilot's and copilot's seats.
b. Remove carpets and floorboards.




1. Nose Gear Steering Bellcrank
2. Link
3. Screw
4. Nut
5. Spacer
6. Eye
7. Turnbuckle Assembly
8. Cable Assembly
9. Pulley
10. Washer
11. Bolt
12. Cable Pin
13. Cotter Pin
14. Nut
15. Seal Assembly
16. Cable Assembly
17. Spring
18. Cable Assembly
19. Bolt

Figure 4-21. Nose Gear Steering System




1. Nose Wheel Fork
2. Cotter Pin
3. Nut
4. Axle Bolt Bucket
5. Spacer
6. Axle Tube
7. Bolt
8. Retainer
9. Bearing Cone
10. Nut
11. Washer
12. Inner Wheel Half
13. Tire
14. Tube
15. Outer Wheel Half
16. Washer
17. Bolt

Figure 4-22. Nose Wheel and Tire Assembly

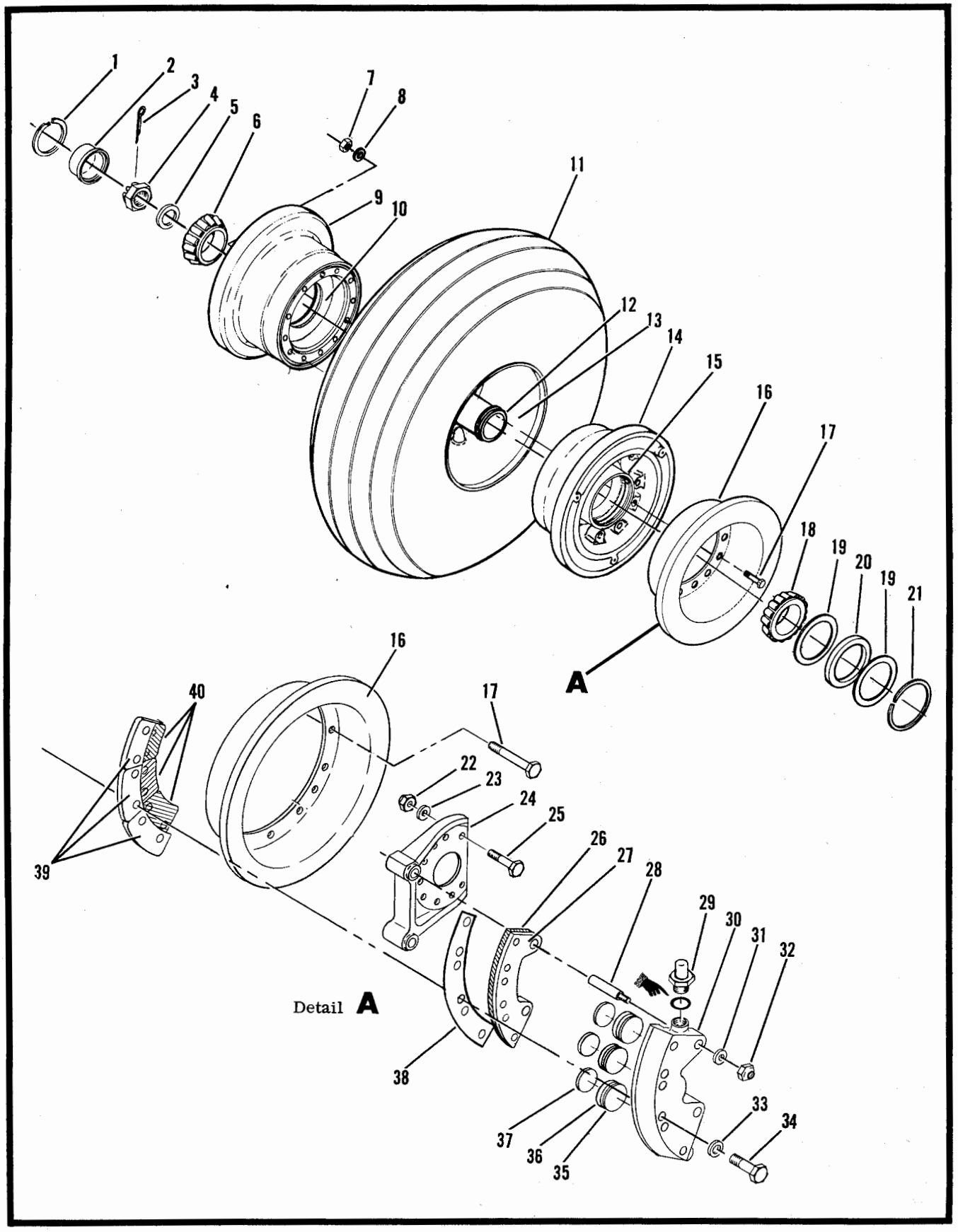



Figure 4-23. Main Wheel, Tire and Brake Assembly

Figure 4-23. Main Wheel, Tire and Brake Assembly Callouts

1. Snap Ring
2. Cap
3. Cotter Pin
4. Nut
5. Washer
6. Bearing Cone
7. Nut
8. Washer
9. Wheel Half
10. Bearing Cup
11. Tire
12. Spacer
13. Tube
14. Wheel Half
15. Bearing Cup
16. Brake Disc
17. Bolt
18. Bearing Cone
19. Grease Seal Ring
20. Grease Seal Felt
21. Snap Ring
22. Nut
23. Washer
24. Plate
25. Bolt
26. Lining
27. Plate
28. Anchor Bolt
29. Bleeder Valve
30. Brake Cylinder
31. Washer
32. Nut
33. Washer
34. Bolt
35. Piston
36. O-Ring
37. Insulator
38. Insulator Shim
39. Backup Plate
40. Lining

c. Disconnect the nose gear steering cables at the forward bellcrank in the nose wheel well by loosening the turnbuckles.

CAUTION

Do not remove clevis pin from nose gear steering bellcrank without first releasing tension on the nose gear steering cables.

d. Remove necessary radio shelving to gain access to nose gear steering cable pulleys and remove cable guard pins.
e. Disconnect nose gear steering cable from rudder torque tube by removing cotter pin, nut, and bolt.
f. Remove seals (15) from forward cabin pressure bulkhead.
g. Pull forward cable through wheel well web into nose section then pull cable forward and remove from aircraft.
h. Disassemble cables from spring by removing cotter pins, nuts and bolts.
i. If desired, remove nose gear steering bellcrank as follows:
1. Remove the two bolts in the gimbal.
2. Remove the nut, washer and bolt in bellcrank and remove bellcrank.

Installation of Nose Gear Steering System. (See figure 9-21.)

a. If removed, install nose gear steering bellcrank as follows:
1. Position bellcrank in place and install the two washers and bolts in the gimbal.
2. Align upper hole in bellcrank with hole in structure and install bolt, washer and nut.
b. Attach forward end of turnbuckles to bellcrank with screws, washers and nuts.
c. Assemble forward and aft cables to spring with bolts, nuts and safety with cotter pins.
d. Route the aft cable through the spring housing to the rudder torque tube and connect with bolt and nut and safety with cotter pin.
e. Route the forward cable through nose wheel well web.
f. Install cable seals (15) as follows:
1. Insure that the cables are lubricated for the full length of its travel within the seals.
2. Pack the seals with MIL-G-21164C lubricant.
3. Place seals on cable on the non-pressurized side of bulkhead with small end of seal toward bulkhead.
4. Insert seal in bulkhead hole so that bulkhead metal is seated within the retaining groove of seals and so that the small end of the seal is on the pressurized side of the bulkhead.
5. Install proper retaining rings in the grooves on the seals (two on small end and one on large end).
g. Install cable guard pins and replace radio equipment shelves removed during removal.
h. Connect nose steering cables to turnbuckles and tighten. Rig cable tension in accordance with Rigging of Rudder Control System (Section 7). Resafety turnbuckles.
i. Install carpet, floorboards, pilot and copilot seats.

NOTE

Nose steering springs are preset at the factory to 85 pounds.

Rigging the Nose Gear Steering System.

Rig nose gear steering system in accordance with Section 7.

Nose Wheel and Tire Assembly.

The nose wheel is a two-piece, magnesium alloy casting. Two halves of the wheel, which are bolted together, can be separated to install the tire. Each wheel half contains a tapered roller bearing, which seats in hardened steel cups. The nose wheel rotates around a tubular axle attached to the nose strut fork.

Removal of Nose Wheel and Tire Assembly. See figure 4-22.)

a. Jack aircraft in accordance with Section 2.

b. Remove cotter pin (2), nut (3) and bolt (7).
c. Remove axle bolt buckets (4). After removal of buckets, the wheel and tire assembly can be removed from fork (1).
d. Remove spacers (5) and axle tube (6) from wheel.

Disassembly and Assembly of Nose Wheel and Tire Assembly.

Instructions for the disassembly and reassembly of the main wheel and tire assembly also applies to the nose wheel and tire assembly.

Installation of Nose Wheel and Tire Assembly. (See figure 4-22.)

a. Insert axle tube (6) in wheel and place spacers (5) on ends of axle tube.
b. Place wheel and tire assembly in position, align with mounting holes in fork (1), and install axle bolt buckets (4).
c. Install bolt (7) and nut (3).

NOTE

Tighten nut (3) until a slight bearing drag is felt as wheel is rotated. Loosen nut to the nearest slot that will align cotter pin hole.

d. Install cotter pin (2).
e. Insure gear is DOWN and locked, then remove aircraft from jacks.

Main Wheel and Tire Assembly.

The main wheel is a two-piece, magnesium alloy casting, equipped with a single-disc type brake. The two halves of the wheel, which are bolted together, can be separated to install the tube and tire. Tapered roller bearings, seated in hardened steel cups, are provided in each wheel half. The brake side of the main wheel is equipped with a hardened-steel brake disc, bolted to the wheel half. The brake disc is a single unit.

Removal of Main Wheel and Tire Assembly. (See figure 4-23.)

a. Jack the aircraft in accordance with Section 2.
b. Remove snap ring (1), bearing cap (2), cotter pin (3), nut (4) and washer (5) from axle.
c. Remove brake unit from plate by removing six washers and bolts and secure in a position not to interfere with removal of wheel.
d. Remove wheel and tire assembly from axle using caution to prevent damage to axle threads and to keep bearings clean.
e. Remove outer bearing cone (6) from wheel to prevent it from dropping out of wheel after wheel removal.

Disassembly of Main Wheel and Tire Assembly. (See figure 4-23.)

a. Remove tire (11) as follows:
1. Deflate tire by removing valve core from tube.

WARNING

Always deflate tire before separating wheel halves.

2. Remove nuts (7), washers (8) and bolts (17) and separate wheel halves (9 and 14).

NOTE

Remove O-ring, if installed, between wheel halves and discard, they are not necessary.

3. Separate brake disc (16) from wheel half (14).
4. Remove each wheel half from tire and remove tire and tube.

CAUTION

During disassembly be careful not to gouge, nick or scratch the rim in the tire bead seat area, this could cause wheel rim to crack.

b. Remove snap ring (21), grease seal rings (19), felt seal (20), and bearing cone (18) from wheel half (14).
c. Bearing cups (10 and 15) are a shrink fit, and should be removed only for replacement.

NOTE

If removal is necessary, place wheel half in boiling water for at least 30 minutes, then remove the bearing cup by tapping cup evenly from the inner side.

Cleaning and Inspection of Main Wheel Assembly.

a. Remove dirt and grease as specified in the following procedures:

WARNING

Dry-cleaning solutions are toxic and volatile. Use in a well-ventilated area. Avoid contact with skin or clothing. Do not inhale vapors.

1. Clean all metal parts with dry-cleaning solution, Federal Specification P-D-680. A soft bristle brush may be used to remove hardened grease, dust, or dirt.

CAUTION

Clean bearing cones in a separate container of clean solvent.

2. Dry bearing cones thoroughly, using filtered and dried compressed air.

CAUTION

Do not spin bearings with compressed air.

3. Inspect and repack bearing cones and coat bearing cups with clean bearing grease, Specification MIL-G-81322.
4. Wash inboard bearing seal in denatured alcohol and dry with a clean, soft cloth.

b. Make the following inspection as specified in the following procedures:

1. Inspect all parts of wheel for cracks, nicks, corrosion, or other damage. Replace all cracked or severely damaged parts.
2. Inspect inboard bearing seal for wear or damage to sealing lip or to metal reinforcing ring. Replace if damaged or deformed.
3. Visually inspect bearing cones for nicks, scratches, water staining, spalling, heat discoloration, roller wear, cage damage, cracks, or distortion. Replace if defective or worn.
4. Inspect wheel halves for cracks, corrosion, and other damage. Areas having suspected cracks should be inspected by Zyglo or other dye-penetrant method. Cracked or badly corroded castings should be replaced. Small nicks, scratches, or pits in the castings should be blended out with fine (400 grit) wet-or-dry sandpaper.
5. Inspect bearing cups for looseness, scratches, pitting, corrosion, or evidence of overheating. If evidence of any defect exists, replace cup.
6. Inspect valve hole of outboard wheel half for cracks or corrosion. Replace cracked wheels. Pits or nicks may be polished out with fine (400 grit) wet-or-dry sandpaper.
7. Inspect wheel bolts. Carefully check for cracks in radius under bolt head and in the threads adjacent to the bolt shank. Replace cracked bolts.

NOTE

No reworking of bolts is permissible.

8. Inspect self-locking nuts for self-locking feature. Replace if nut can be turned onto bolt with the fingers past the nut's locking section.

Retreating and Repainting of Main Wheel Repaired Surfaces.

a. Thoroughly clean repaired surfaces and areas of the wheel from which paint has been removed.
b. Treat cleaned surfaces with Dow No. 1 solution, Specification MIL-M-3171, and paint with two coats of zinc chromate primer, Specification MIL-P-8585A, and two coats of aluminum lacquer, Specification TT-L-32.

CAUTION

Never paint working surfaces of bearing cups. Wheel register surfaces and bolt bosses should receive one mist coat of zinc chromate primer.

NOTE

Wheel halves between bead flanges should be kept painted with zinc chromate primer and aluminum lacquer. This will help to prevent corrosion.

Assembly of Main Wheel and Tire Assembly. (See figure 4-23.)

a. If removed, replace bearing cups (10 and 15).

NOTE

Bearings are a shrink fit in the wheel. To install, place wheel in boiling water for at least 30 minutes, chill bearing cups with dry ice, and tap lightly into position to insure proper seating.

b. Install tube in tire and leave deflated.
c. Place wheel halves (9 and 14) and brake disc (16) in position on tire.
d. Install bolts (17), washers (8) and nut (7). Torque nut (7) to value marked on wheel half.

CAUTION

Tighten nuts evenly and torque correctly to lessen the possibility of bolt failure. Make sure at least one full thread is through nut.

e. Inflate tire enough to seat the beads of the tire against the wheels; deflate completely, then reinflate to approximately one-half operating pressure.
f. Install bearing cone (18), felt seal (20), grease seal rings (19) and snap ring (21).

CAUTION

Insure that bearing cones (6 and 18) are properly greased before installing.

g. Check wheel balance using Service Kit SK150-20.

Installation of Main Wheel and Tire Assembly. (See figure 4-23.)

a. Place the wheel and tire assembly in position on the axle, aligning brake disc with brake unit.
b. Install outer bearing cone (6), washer (5) and nut (4).

NOTE

Tighten wheel bearing nut (4) to 40 pound-inches while rotating wheel, back off nut and retighten to 20 pound-inches while rotating wheel, continue to first locking position and install cotter pin.

c. Install cotter pin (3), bearing cap (2), and snap ring (1).
d. Install brake in position on disc and strut with six self-locking bolts and washers.
e. Check that wheel rotates freely, then remove jack, and inflate tire to correct operating pressure.

BRAKE SYSTEM - MAIN AND PARKING.

The aircraft has a hydraulically actuated braking system. A hydraulic master cylinder is attached to each pilot's rudder pedal, and hydraulic lines and hoses are routed from these cylinders through the cabin, through the wings, and to the brake assemblies on each main landing gear. The brakes are single-disc, non-adjustable type, with three actuating cylinders in each brake assembly. No manual adjustment is necessary on these brakes. The brakes can be operated from either pilot's or copilot's pedals. The parking brake system consists of a manually operated handle assembly connected to the parking brake valves located in each main brake line. When pressure is applied to the brake system and the parking brake handle is pulled, the valve holds pressure on the brake assemblies until released. To release parking brakes, push parking brake handle in.

NOTE

Do not depress rudder pedals when releasing parking brakes.

Troubleshooting the Brake System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| BRAKE PEDAL BOTTOMS | Insufficient brake fluid in system. | Bleed and fill system in accordance with Section 2. |
| | Brake disc warped, causing excessive clearance. | Replace disc. |
| | Loose bleeder screw, faulty bleeder screw, washer or adapter not tight. | Tighten bleeder screw. Replace washer. Tighten adapter. |
| | Leaking connections or broken lines or hoses. | Tighten connections. Replace or repair lines or hoses. |
| | Rudder pedals not connected to master cylinders. | Connect pilot's rudder pedals to master cylinders. |
| | Damaged O-ring seal in master cylinder or in brake actuating cylinder. | Replace O-ring seal. |
| | Damaged Lock-o-seal in master cylinder. | Replace Lock-o-seal. |
| "SPONGY" BRAKES | Air trapped in system. | Bleed system. |
| | Swollen hose. | Replace hose. |
| BRAKES DRAG | Binding brake pedal linkage. | Free linkage to prevent binding. |
| | Brake disc badly dished or warped. | Replace brake disc. |
| | Internally swollen hoses and/or swollen O-ring seals due to improper hydraulic fluid in system. | Replace hoses and/or O-ring seals. Flush system with denatured alcohol. Bleed and fill system in accordance with Section 2. |

Troubleshooting the Brake System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| BRAKES FAIL TO HOLD | Brake linings worn out. | Replace linings in accordance with Section 4. |
| | New linings just installed. | Taxi aircraft and apply brakes several times to condition linings. |
| | Air in system. | Bleed and fill system in accordance with Section 4. |
| | Oil, grease, or other foreign material on disc or brake linings. | Clean and flush with Trichlorethylene, then taxi the aircraft slowly, apply the brakes several times to condition the linings. |
| | Rudder pedals positioned so that brakes cannot be fully applied. | Reposition pedals. |
| | Brakes too hot from extensive use. | Allow time for brakes to cool. |

Removal of Brake System. (See figure 4-24.)

a. Drain fluid from system by removing bleeder valve.
b. Remove pilot's and copilot's seats in accordance with Section 3.
c. Remove front carpets and floorboards.
d. Disconnect master cylinders (29) from rudder pedals and rudder torque tube by removing cotter pins and clevis pins.
e. Remove hoses (1 and 2) from master cylinders and parking brake valve.
f. Remove parking brake as follows:
1. On aircraft 340-0001 to 340-0113, disconnect link (11), cable (31), stop (10), and lines (12 and 13) from parking brake valves (5) and remove valves by removing nuts, spacers and screws attaching valves to bulkhead.
2. On aircraft 340-0113 and On, disconnect cable (31) and lines (12 and 13) from parking brake valve and remove valve by removing screws securing valve to bulkhead.
g. Remove clamps from lines (12 and 13), disconnect lines from elbow (14) and union (15) and remove line.

NOTE

Removal of brake lines is not recommended except for replacement.

h. Remove access panels on lower side of inboard leading edge and wing gap covers on left and right wings.
i. Remove clamps from lines (16 and 17) then disconnect at wing gap from unions (15) and pull line.
j. Remove clamps from lines (18 and 19) then disconnect union (15) and elbow (20) and remove lines through access holes in wing.
k. Remove clamps from lines (21 and 22) then disconnect at elbows (25) and remove into wheel well area.
l. Remove clamps from line (24) on right wing and disconnect at elbow (25).
m. Remove elbow (25) from structure of wing by removing the nut and washer and disconnecting hoses (26).
n. Remove clamps (27) from main gear strut and disconnect hose at brake unit, then remove hose.
o. Remove brake units by removing the six bolts securing unit to strut and remove elbow (28).
p. If removal of parking brake control is desired, remove as follows:
1. Remove clamps (6) by removing nuts (9), spacer (7), and screw (8).
2. Remove stop (10) from cable.
3. Remove nut securing cable (31) in panel bracket and pull cable (31) aft out into cabin area.

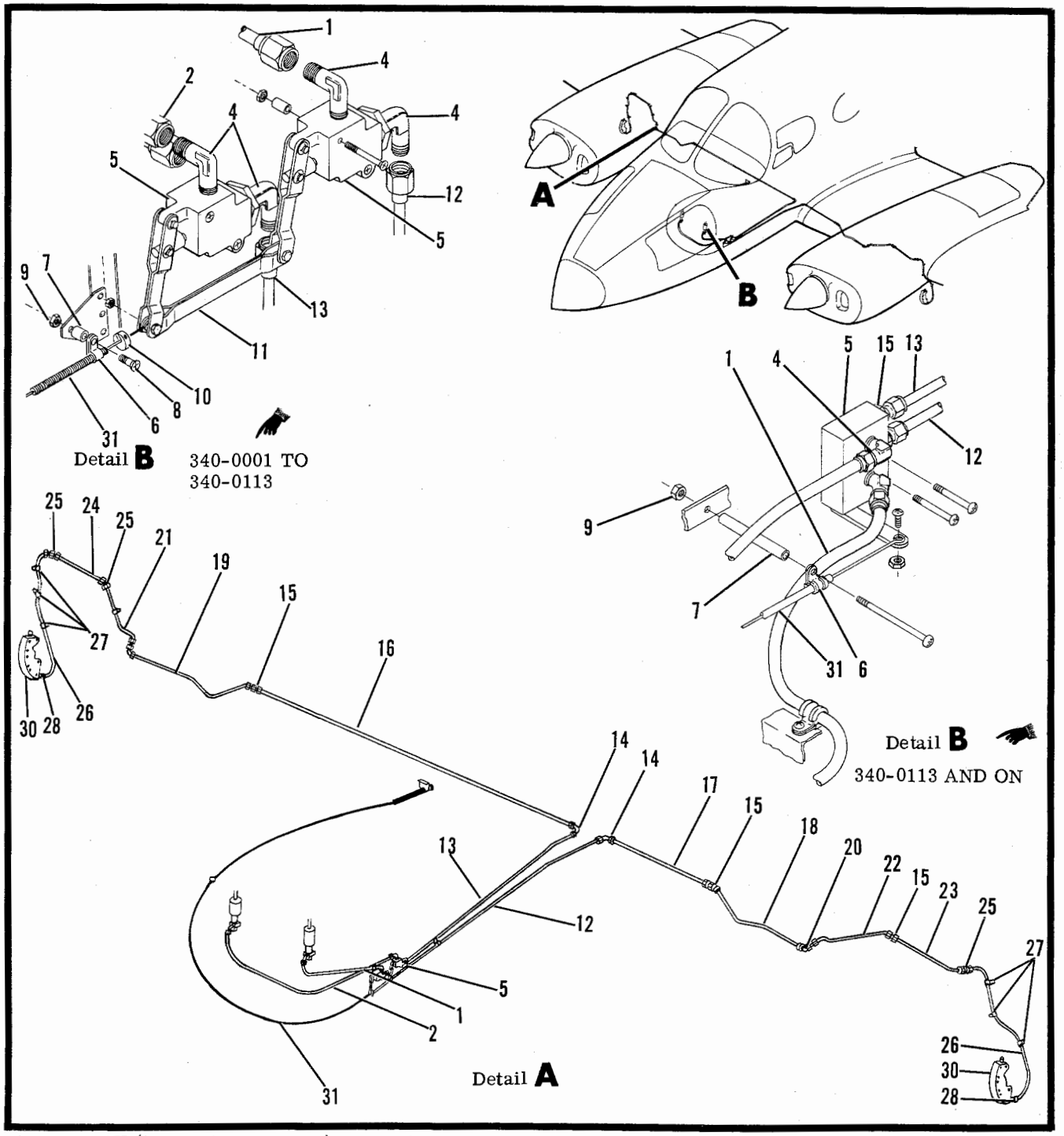
Installation of Brake System. (See figure 4-23.)

a. If removed, install parking brake control as follows:
1. Route cable (31) through panel bracket, forward through grommet, and around down and aft into parking brake valve area. Then clamp to brackets with clamps (6), spacers (7), screw (8), and nut (9).

CAUTION

Do not bend cable in too sharp a radius to prevent binding in cable action.

2. Install stop (10) with screw and nut, and tighten only snug at this time.
b. Install brake units on main strut with six bolts and nuts and install elbow (28) in brake unit.
c. Install hose (26) and clamp to strut with clamps (27).
d. Install elbow (25) in bulkhead with washer and nut.
e. Connect hose (26) to brake unit and elbow (25).
f. Route lines (23 and 24) in position. Connect to elbow (25) and clamp.
g. Install elbow (20) on lines (21 and 22). Route in place and connect to lines (23 and 24) and clamp in




1. Hose LH (To Master Cylinder)
2. Hose RH (To Master Cylinder)
3. Elbow
4. Elbow
5. Valve Parking Brake
6. Clamp
7. Spacer
8. Screw
9. Nut
10. Stop
11. Link
12. Line LH
13. Line RH
14. Elbow
15. Union
16. Line Assy. RH Brake
17. Line Assy. LH Brake
18. Line Assy. LH Brake
19. Line Assy. RH Brake
20. Elbow
21. Line Assy. LH Brake
22. Line Assy. RH Brake
23. Line Assy. LH Brake
24. Line Assy. RH Brake
25. Elbow
26. Hose
27. Clamp
28. Elbow
29. Master Cylinder
30. Brake Assembly Main Wheel
31. Cable

Figure 4-24. Brake System Plumbing Installation

place.

h. Install unions (15) on lines (18 and 19) then route in wing and clamp in place.

i. Install unions (15) on lines (16 and 17) and route in wing position and connect to elbow (14) and clamp as required.

j. Install lines (12 and 13) to elbow (14) and connect to line (16 and 17) then clamp.

NOTE

When installing lines, it may be necessary to bend lines to work into position. However, excessive bending should be avoided.

k. On aircraft 340-0001 to 340-0031, install parking brake valves (5) as follows:

1. Install fittings (4) and valve link (11).
2. Install valves (5) in place with screws, spacers and nuts.
3. Connect valve link (11) with bolt, and connect cable (31) to link bolt at time of installation.
4. Rig stop (10) so the valve link (11) movement is stopped, in forward direction, approximately 1/16 inch before it reaches the full forward direction of the valve arms. Loosen stop to set, then tighten stop screw.

l. On aircraft 340-0113 and On, install parking brake valve as follows:

1. Install fittings (4) and secure valve to bracket with screws.
2. Connect parking brake control to valve with screw and nut.

m. Connect lines (12 and 13) and hoses (1 and 2) to parking brake valve.

n. Bleed brake system and conduct operational check of brakes and parking braking brake control.

Main Wheel Brake Disassembly. (See figure 4-23.)

a. Remove the six washers and bolts in the brake units, then remove brake unit from disc.

b. Disconnect hydraulic hose from brake unit.

c. Disassemble brake unit as follows:

1. Remove brake linings by sliding a thin screwdriver or knife behind the lining and prying out.

d. If brake cylinders are to be disassembled, proceed as follows:

1. Use air pressure or other suitable pressure remove pistons.
2. Remove O-rings.

Main Wheel Brake Lining Replacement. (See figure 4-25.)

If the linings are worn between 0.125 and 0.100 inch, they should be replaced. If the linings on the pressure plate or the back plate are worn between 0.125 and 0.100 inch they should be replaced. The brake disc should be replaced when worn to a thickness of 0.334 minimum or when dished to 0.015 maximum.

Cleaning of Brake Assembly Parts.

a. Clean all metal parts of brake assembly, except rotating discs, in dry-cleaning solution. Federal Specification P-D-680, and dry with filtered compressed air. A soft bristle brush may be used where necessary.

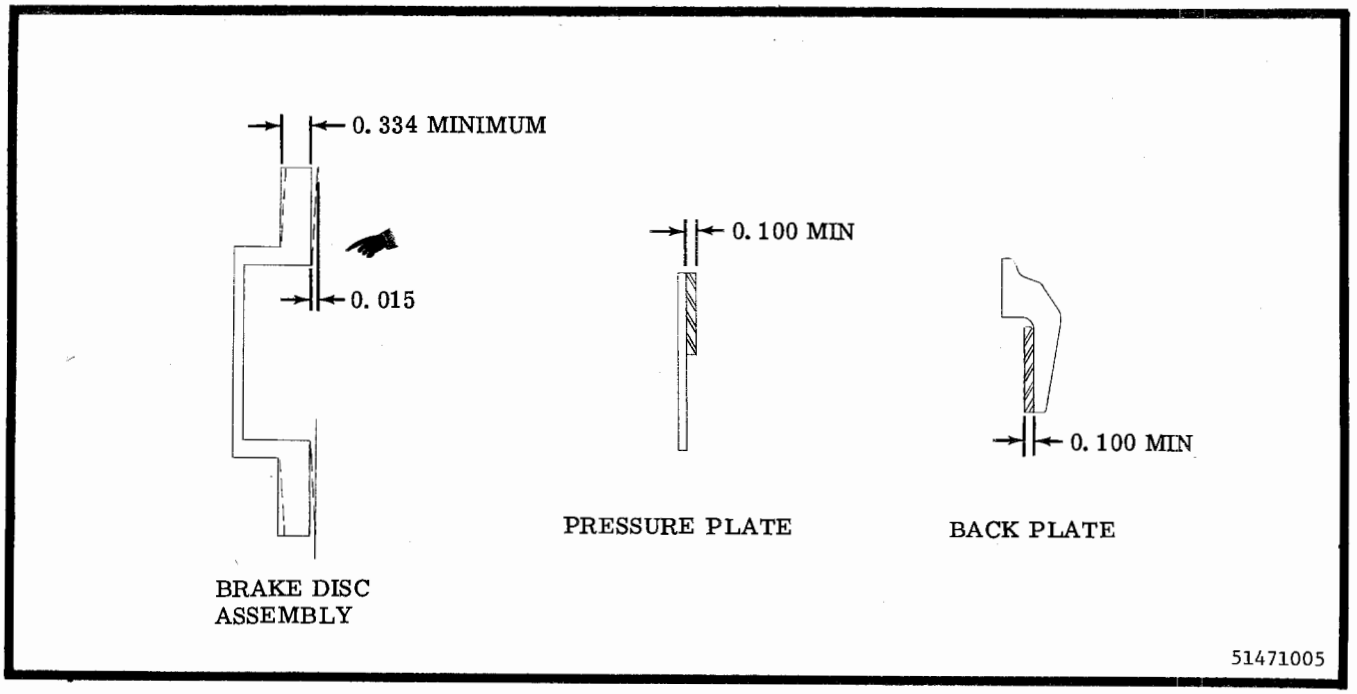
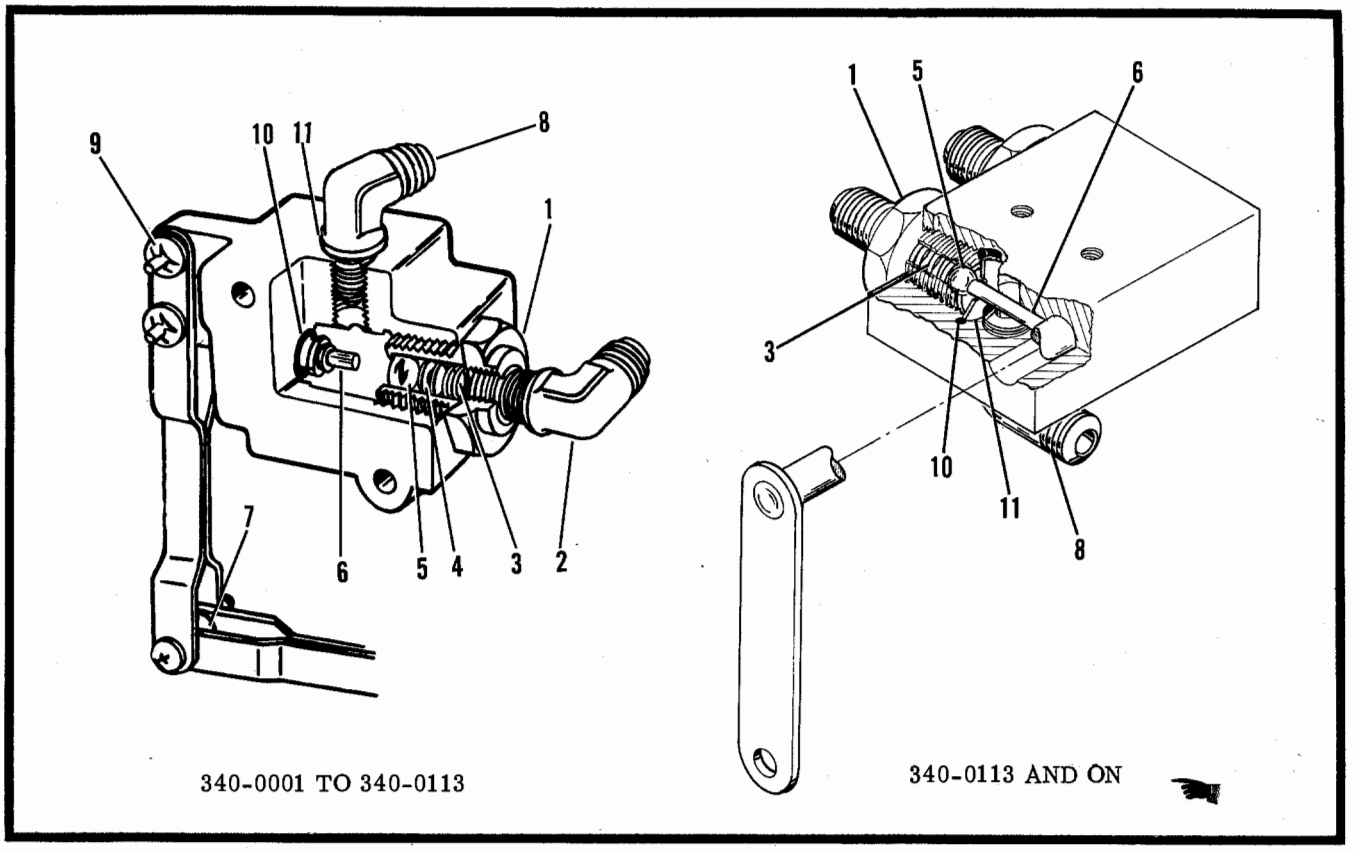



Figure 4-25. Recommended Brake Wear Limits




1. Valve Seat
2. Elbow
3. Spring
4. Washer
5. Ball
6. Plunger
7. Spacer
8. Elbow
9. Lockwasher
10. O-Ring
11. Seal

Figure 4-26. Parking Brake Valve

WARNING

Dry-cleaning solvents are toxic and volatile. Use in a well-ventilated area. Do not inhale solvent vapors or allow solvent to contact skin or clothing.

b. Clean rotating discs with compressed air and a soft wire or stiff bristle brush.
c. Clean piston insulators with denatured alcohol. Dry with compressed air or a clean cloth.

NOTE

It is recommended that new O-ring packings be installed at each overhaul. If packings must be reused, they should be cleaned with denatured alcohol and dried with a clean, soft cloth. Reinstall packings in same location from which they were removed.

Retreating and Repainting Brake Housing.

a. Rinse reworked areas with hot water and dry thoroughly with filtered, dried compressed air.
b. Retreat reworked areas with Dow No. 1 Solution, MIL-M-3171, Type I.
c. Repaint reworked areas with two coats of zinc chromate primer, Specification MIL-P-8585, and two coats of aluminum lacquer, Specification TT-L-32.

Assembly of Main Wheel Brake. (See figure 4-23.)

a. If removed, install O-rings in brake cylinders.
b. Install pistons in each cylinder.

NOTE

With a clean cloth, wipe all parts clean and lubricate O-rings and pistons with clean hydraulic oil before installation.

c. Install brake linings in place. Insure they snap into position.

Installation of Main Wheel Brake. (See figure 4-23.)

a. Install the brake units on main wheel assembly brake disc with six bolts and washers and safety with safetywire.
b. Install hydraulic hose fitting in brake unit, if removed, and connect the hydraulic hose. Then bleed brakes in accordance with Bleeding Procedures.

Bleeding the Brake System. (See figure 4-23.)

In order to assure proper brake action, it is necessary to have positive transfer of hydraulic pressure through the system. Any air trapped in the system must be removed. This is accomplished by bleeding, which can be done in any one of several different ways. The following procedure is bleeding pressure with a bleeder pump:

a. Fill reservoir of bleeder pump with clean system hydraulic fluid. (See Section 2 for hydraulic fluid specifications.)
b. Remove filler plug from master cylinder.

NOTE

When bleeding the brake system, it is advisable to wrap the master cylinder with rags to prevent fluid from spilling or leaking on the carpet.

c. Remove bleeder screw and open bleeder plug and allow hydraulic fluid to drain from the system into a suitable container.
d. Connect the hose to the bleeder pump to the bleeder valve on top of brake unit.
e. Pump slowly until fluid in master cylinder reservoir is within 1/2 inch of the top.
f. Close bleeder plug (30) and detach bleeder pump hose connection.
g. Check brake operation.

NOTE

If brakes are "spongy" and do not have a solid feel in the pedals, repeat the above procedure.

h. Install bleeder screw in brake unit and replace filler plug in master cylinder.

Parking Brake Valves. (See figure 4-26.)

The removal and installation of the parking brake valves is included in the Removal and Installation of the Brake System.

Master Cylinder. (See figure 4-27.)

Each vertical mounting type master cylinder used on the aircraft incorporates a fluid reservoir of cylinder within the same body (11). A plastic filler plug (3) is used to close the filler opening in the cover (5), which is threaded into the body. The filler plug is vented, as sufficient ventilation is not provided by clearance between the piston rod (6) and piston rod passage through the cover (5). With the exception of the piston return spring (12), all internal operating parts are assembled onto the piston rod; piston (17), piston spring (15), lock-o-seal (18), and compensating sleeve (19). A seal between the piston (17) and the cylinder walls is provided by a packing O-ring (16) installed in a groove around the piston. As pressure is applied to advance the piston rod into the cylinder, the piston remains stationary until the lock-o-seal is seated on the piston (0.030 to 0.40 inch movement). Proper operation of the master cylinder depends upon this seating action. When the lock-o-seal is seated, fluid cannot get past the piston and with continued movement of the piston rod forcing the piston farther into the cylinder, pressure in the cylinder is increased. At any time during the stroke that pressure on the piston is eased, the piston spring will tend to keep the piston seated against the lock-o-seal, maintaining pressure in advance of the piston. As the pressure if further eased, allowing the piston return spring to force the piston to retreat, the upper end of the compensating sleeve will contact the cover boss, forcing the piston to unseat itself from the lock-o-seal. This will allow additional fluid from the reservoir to enter the cylinder. This positive unseating also allows unrestricted passage of fluid from cylinder to reservoir while the piston is in the static position. This is to compensate for any excess fluid which may be present in the system due to pumping or from thermal expansion. The effective stroke of the piston is 1.437 inches with maximum displacement of 0.5327 cubic inch. Reservoir capacity is approximately 3.391 cubic inches.

Removal of Master Cylinder. (See figure 4-27.)

Removal of either master cylinder can be accomplished as follows:

a. Remove pilot's seat in accordance with Section 2.
b. Remove carpet and floorboards.
c. Drain hydraulic fluid from master cylinder by removing the line at the main wheel, then connect the line after draining fluid to prevent entry of foreign material into brake.

NOTE

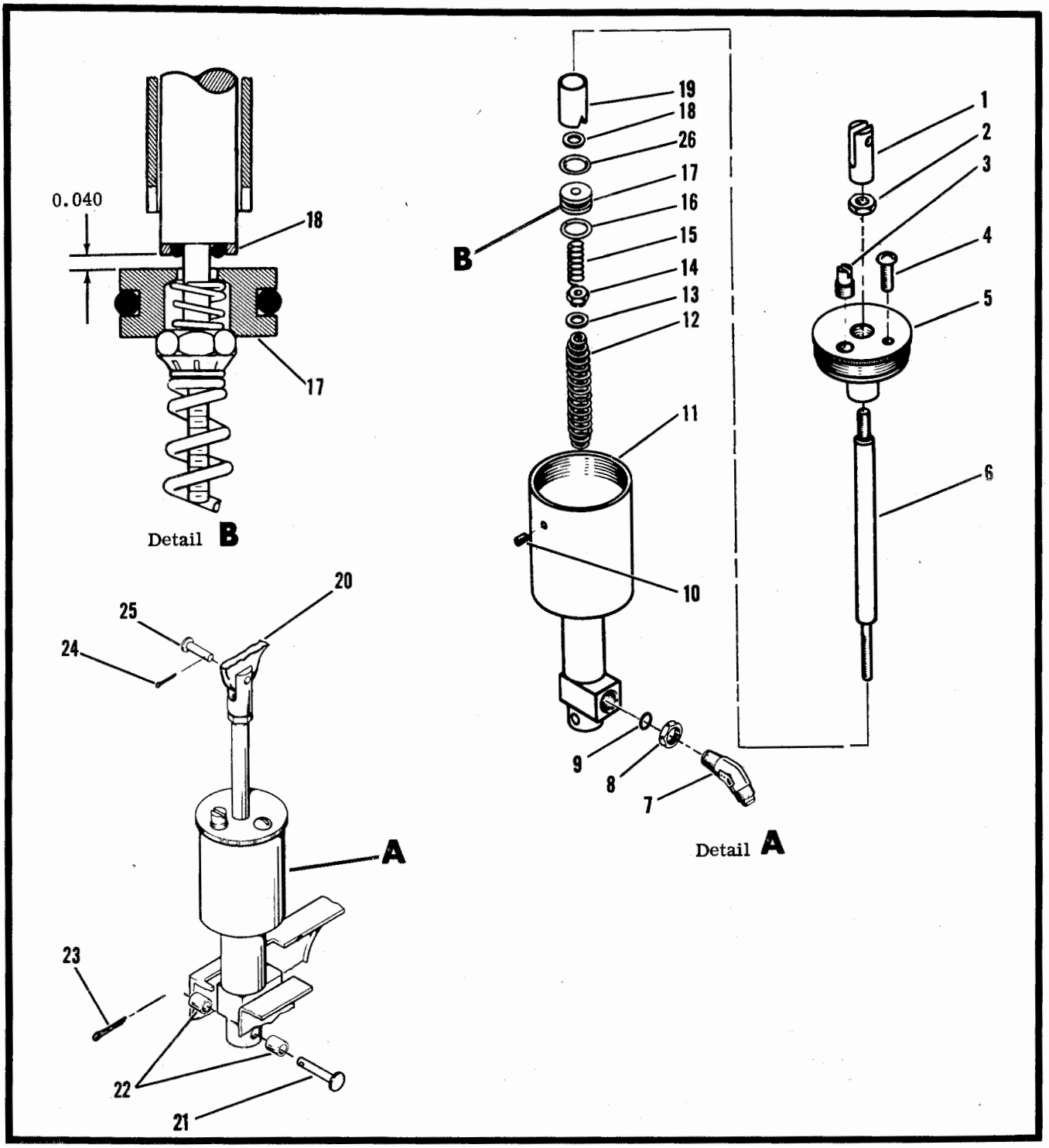
When making connections on hydraulic lines, use only system fluid as a lubricant.

d. Disconnect clevis (1) from rudder pedal (20) by removing cotter pin (24) and pin (25).
e. Disconnect lower end of master cylinder by removing cotter pin (23), pin (21), and spacers (22).
f. Disconnect hose from fitting (7) in base of master cylinder body (11) by lifting master cylinder enough to allow removal of hose.
g. Remove master cylinder and cap hose to prevent entry of foreign material into system.

Disassembly of Master Cylinder. (See figure 4-27.)

Disassembly of either master cylinder can be accomplished as follows:

a. Remove filler plug (3) and drain residual hydraulic fluid from reservoir portion of master cylinder. Screw (4) serves no purpose in this assembly except as a plug for the threaded hole in the cover, and need not be removed.




1. Clevis
2. Jamb Nut
3. Filler Plug
4. Screw
5. Cover
6. Piston Rod
7. Elbow
8. Nut
9. O-Ring
10. Setscrew
11. Body
12. Piston Return Spring
13. Washer
14. Nut
15. Piston Spring
16. O-Ring
17. Piston
18. Lock-O-Seal
19. Compensating Sleeve
20. Pilot's Rudder Pedal
21. Pin
22. Spacer
23. Cotter Pin
24. Cotter Pin
25. Pin
26. O-Ring

Figure 4-27. Brake Master Cylinder Installation

b. Remove setscrew (10) and unscrew cover (5) to remove cover and piston rod (6) along with the other illustrated parts which are attached to the piston rod. The piston return spring (12) will remain inside the body (11); to remove, lift from position.
c. Remove nut (14) from piston rod (6), to remove piston spring (15), piston (17), lock-o-seal (18) and compensating sleeve (19).
d. Back off jamb nut (2) from its locking position against base of clevis (1) and remove both parts from piston rod (6).
e. Remove O-ring (16) from piston (17).
f. Remove elbow (7) from body (11), if required.

NOTE

Clean all metal parts with suitable solvent. O-ring seals should be washed in clean system hydraulic fluid or denatured alcohol. Inspect metal parts for wear and thread damage. Inspect cylinder walls for corrosion, pitting and scores. Damaged cylinder walls require replacement of the body (11). Inspect O-ring seal (16) and O-ring portion of lock-o-seal (18) for swelling, chipping, or other evidence of damage. Replace as necessary. Repairs to master cylinder components are not recommended. Damage or defective parts should be replaced.

Assembly of Master Cylinder. (See figure 4-27.)

Assemble either master cylinder as follows:

a. Install lock-o-seal (18) on shank of piston rod (6).

CAUTION

Lubricate O-ring portion of lock-o-seal with system hydraulic fluid and install carefully to prevent damage from the threaded portion of the piston rod shank.

b. Slip O-ring (16) into groove in piston (17) as illustrated, using clean system hydraulic fluid as a lubricant.

CAUTION

Install O-ring carefully to prevent chipping on sharp corner of piston.

c. Install piston (17), piston spring (15), and nut (14) on piston rod (6) as illustrated. Tighten nut (14) and with piston spring (15) compressed to seat piston (17) against nut, adjust clearance between piston and lock-o-seal (18) to 0.040 inch as illustrated, using feeler gage or 0.040 wire to check measurement.

CAUTION

Be careful, when inserting feeler gage or wire not to damage lock-o-seal.

NOTE

The 0.030 to 0.040 inch dimension between the lock-o-seal and the piston determines the relationship between piston rod travel and seating of the lock-o-seal to the piston. Proper master cylinder operation depends upon this dimension being set correctly.

d. Place piston return spring (12) into cylinder section of body (11).
e. Lubricate cylinder walls and piston (17) with clean system hydraulic fluid and insert nut (14) against piston return spring.
f. Place compensating sleeve (19) notched end toward piston, over piston rod (6). Slide cover (5) over piston rod, and tighten into body. Install setscrew (10) and tighten to prevent movement of cover (5).
g. Screw jamb nut (2) and clevis (1) onto piston rod end.
h. Install filler plug (3), and elbow (7), if removed during disassembly.

NOTE

If elbow is being installed, use a suitable lubricant on O-ring (9) and threads before screwing into master cylinder.

Installation of Master Cylinder. (See figure 4-27.)

Install either master cylinder as follows:

a. Lift hose end and connect to lower elbow (7).

NOTE

Use only system hydraulic fluid for lubricant when making this connection.

b. Insert pin (21) through master cylinder mounting brackets and hole in body of master cylinder (11) with spacers (22) in place as illustrated. Secure pin (21) with cotter pin (23).
c. Connect clevis (1) to rudder pedal (20) with pin (25). Adjust clevis (1) to align tips of rudder pedals (20) with rudder pedals in a neutral position. Secure pin (25) with cotter pin (24), and secure clevis with jamb nut (2).
d. Install access hole cover, carpet and scuff plates.
e. Fill master cylinder and bleed brakes in accordance with bleeding procedure in Section 4.
f. Install pilot's seat.

SECTION 5

# CONTROL COLUMN, AILERON AND TRIM CONTROL SYSTEM

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CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

## CONTROL COLUMN.

The control column assembly consists of two telescopic tube assemblies which rotate within each other. The control column incorporates the use of roller-bearings for the purpose of easing the forward and aft motions of the tube assemblies. Each control column is attached to the forward cabin bulkhead and is supported by a bearing block. A roller-bearing block assembly supports the control column at the stationary instrument panel. The control column assemblies are physically coupled by an interconnect assembly located at the forward cabin bulkhead.

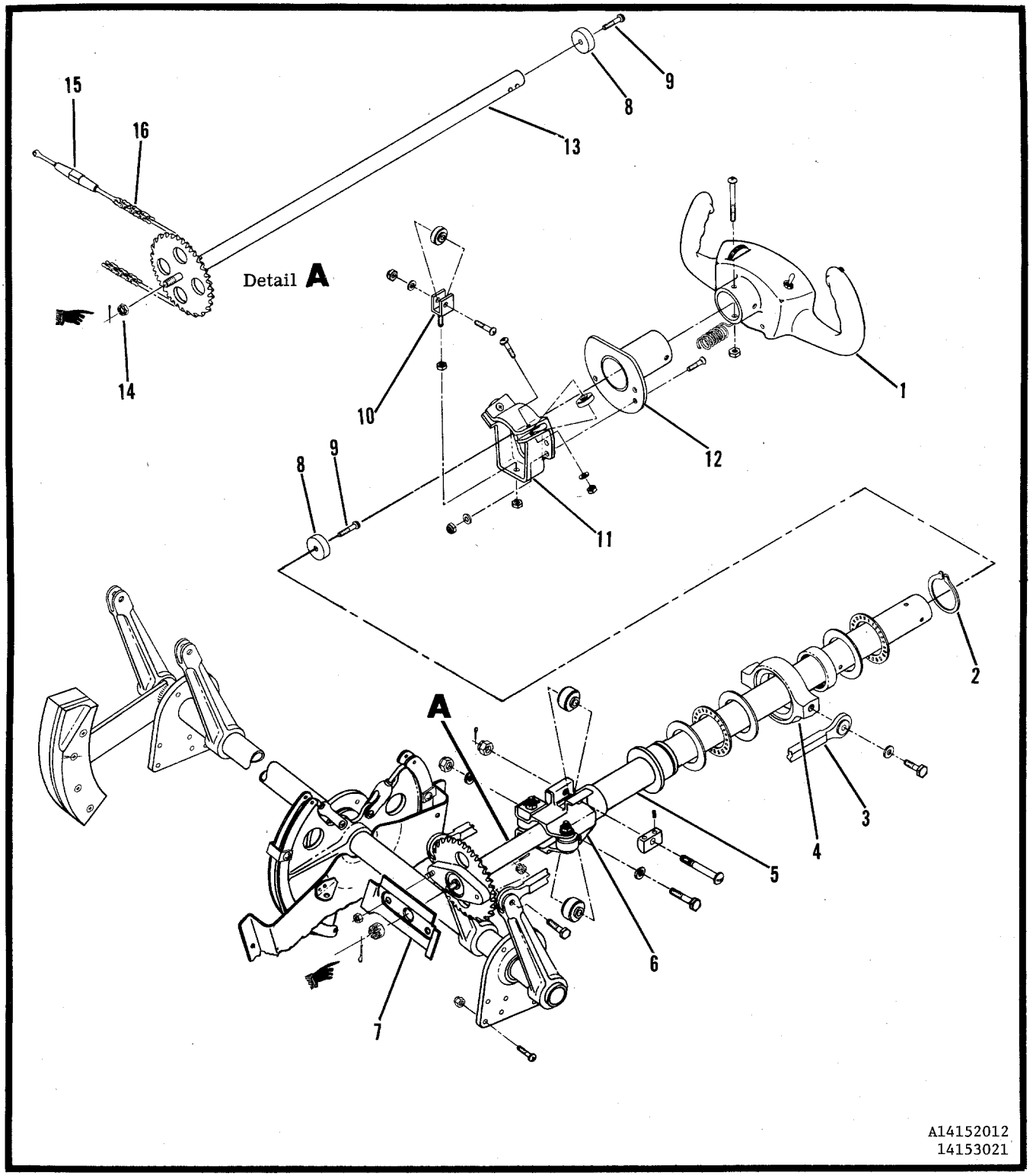
### Removal of Control Column. (See figure 5-1.)

a. Remove instrument panel in accordance with Section 12.
b. Position front seats to the most aft position.
c. Disconnect electrical wiring to control wheels and remove control wheel (1) from tube assembly (5) by removing nuts and bolts.
d. Remove nut (14) from control column sprocket shaft.
e. Remove safety and loosen turnbuckle (15) to relieve tension on rigging chain (16) and disengage chain from sprocket.
f. Disconnect push rods (3) from bearing sleeve (4) by removing bolt and washer.
g. Remove screws, washers and nuts retaining the control column support block (11) and cover (12) to instrument panel.
h. Tilt control column up and remove by lifting upwards and to the rear until the stationary instrument panel is cleared.

### Disassembly of Control Column. (See figure 5-1.)

NOTE

Disassembly and repair of control column is limited to the replacement of worn or defective shafts, bearings, bushings, rollers or other replaceable components.




1. Control Wheel
2. External Retainer
3. Push Rod
4. Bearing Sleeve
5. Tube Assembly
6. Roller Support
7. Bulkhead
8. Slide
9. Screw
10. Clevis Assembly
11. Support Block
12. Cover
13. Tube Assembly
14. Nut
15. Turnbuckle
16. Chain

Figure 5-1. Control Column

a. Loosen clevis assembly (10) on control support block (11) and remove column support block from tube assembly (5).
b. Compress tube assemblies (5 and 13) together and remove screw (9) and slide (8).
c. Remove tube assembly (13) from inside tube assembly (5) by pulling apart.
d. Expand external retainer (2) and remove bearing sleeve (4) and retainer from tube assembly (5).
e. Remove roller support (6) by drilling out the four rivets attaching roller support to the sleeve on tube assembly (5).

NOTE

Do not remove roller support (6) from tube assembly (5) except when replacement of roller support is required.

Assembly of Control Column. (See Figure 5-1.)

a. Assemble component parts of the control column by reversing disassembly procedures.

NOTE

When assembling the control support block (11) to the control tube assembly (5), set the adjustable lower bearing to provide 0.008 inch clearance with the two upper bearings in direct contact with tube assembly.

Installation of Control Column. (See figure 5-1.)

a. Compress control column together and insert into slot provided in the stationary instrument panel.
b. Align holes in cover (12) and support block (11) with stationary instrument panel and attach with screws, washers and nuts.
c. Extend control column, align aileron sprocket with bearing block attached to bulkhead and secure with nut (14) and cotter pin.
d. Connect push rods (3) to bearing sleeve (4) with bolts and washers.
e. Place chain (16) on sprocket and rig interconnect assembly in accordance with rigging procedure.
f. Secure turnbuckle (15) by safetying.
g. Install control wheel (1) to tube assembly (5) with nuts and bolts.
h. Connect electrical wiring and check rigging.

Rigging Control Column. (See figure 5-4.)

a. (See figure 5-2.) Align interconnect assembly (3) as shown.

NOTE

Check and/or adjust length of interconnect assembly to provide 16.10 inches span, measuring from center to center of clevis holes. If adjustment is made to interconnect assembly, recheck aileron cable tensions.

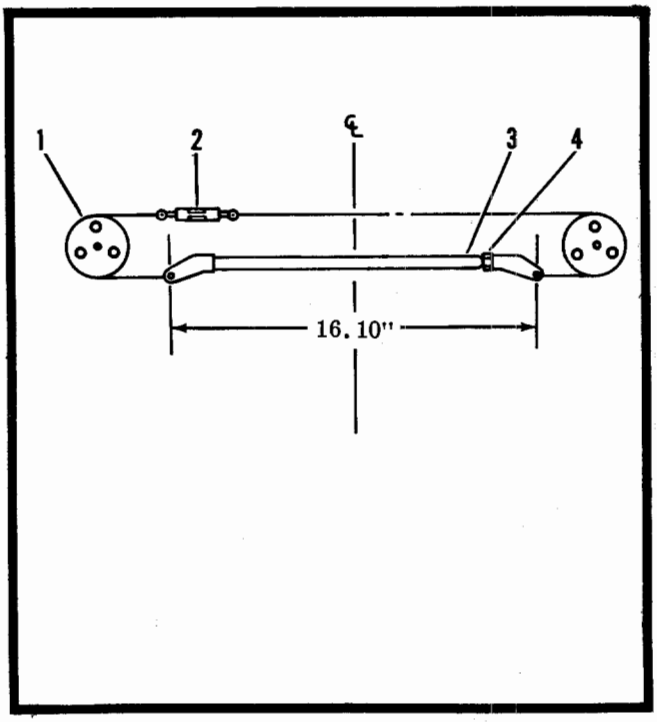
b. With interconnect assembly centered, check pilot's and copilot's control wheels for the neutral position. If control wheels do not assume the neutral position, or are not aligned together, proceed with the following steps.
1. Loosen turnbuckle (28) on chain (31) and remove chain from control column sprockets.
2. Rotate pilot's control wheel to the neutral position and install control column lock.
3. Visually align copilot's control wheel with pilot's control wheel.
4. Align interconnect assembly with sprockets as shown in figure 5-2, and engage chain on sprockets.
5. Tighten turnbuckle and install safety wire.

NOTE

When tightening turnbuckles, chain tension should not exceed the minimum necessary to remove excess slack.

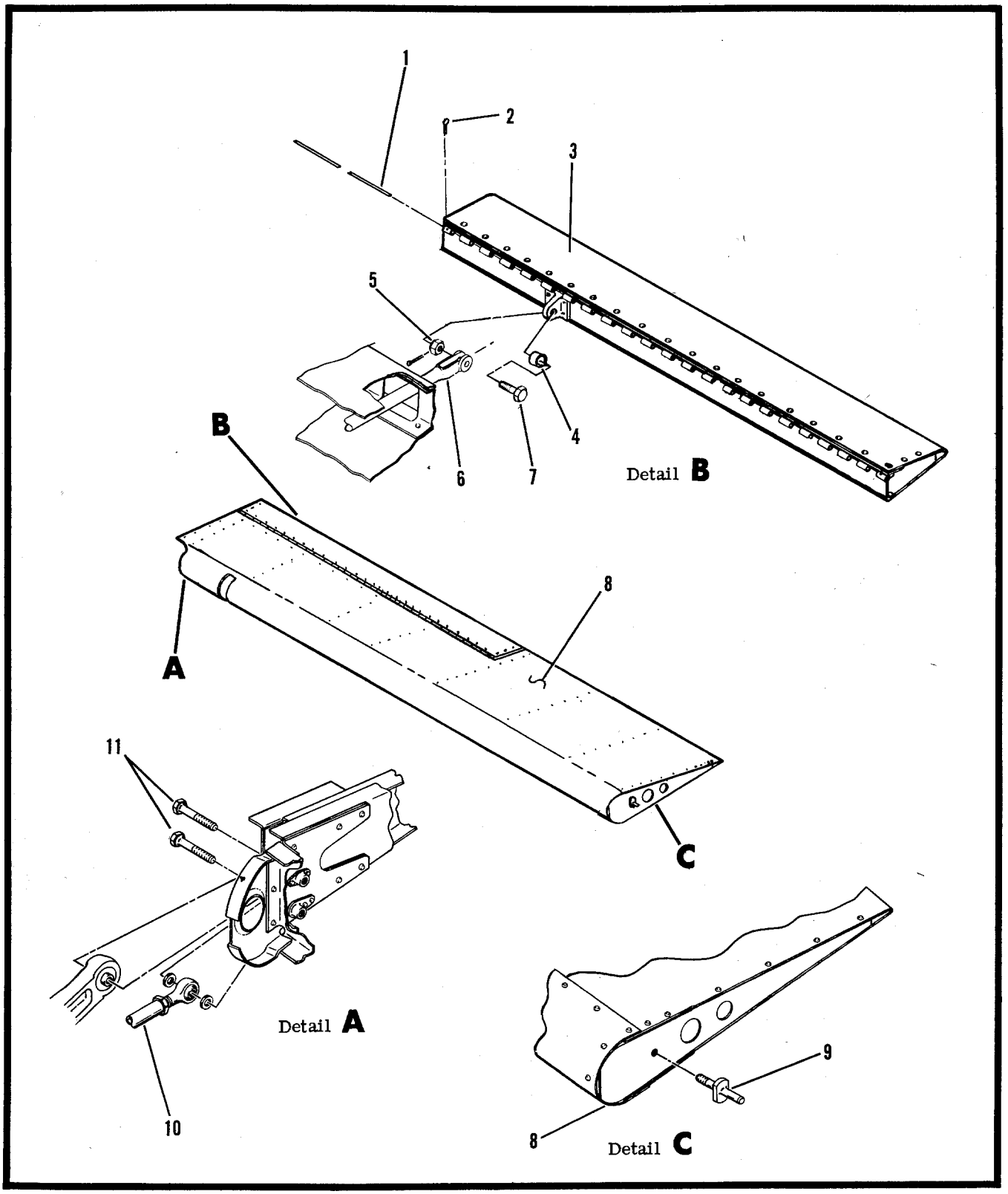
AILERONS.

The all metal ailerons attach to the rear spar of each wing at two hinge points, each hinge point is bolted to the rear spar and incorporates a sealed bearing. The aileron trim tab actuator fastens to the left aileron by a full length hinge and operates from a push-pull tube. The ailerons are 100% static balanced at the time of installation.




1. Sprocket
2. Turnbuckle
3. Interconnect Assembly
4. Lock Nut

Figure 5-2. Interconnect Assembly Adjustment




1. Hinge Pin
2. Cotter Pin
3. Aileron Trim Tab
4. Spacer
5. Nut
6. Aileron Trim Tab Push-pull Tube
7. Bolt
8. Aileron
9. Hinge Pin
10. Aileron Push-pull Tube
11. Bolt

Figure 5-3. Aileron and Aileron Trim Tab Installation

Removal of Aileron (See figure 5-3.)

a. When the left aileron assembly is being removed, move aileron trim tab to the extreme UP position and remove cotter pin, nut, bolt and spacer from aileron trim tab push-pull tube (6).
b. Lower flaps and disconnect aileron push-pull rod assembly (10) by removing bolt and washer.
c. Disconnect bonding strap from aileron by removing attaching screw.
d. Remove bolt attaching aileron to hinge assembly.
e. To remove aileron, move aileron to the rear, clearing hinge assembly, and slightly inboard until outboard hinge pin (9) is free of bearing.

Installation of Aileron.

NOTE

If rigging was correct prior to aileron removal and aileron push-pull rod end adjustment was not disturbed, it should not be necessary to rerig the aileron control system. If the push-pull rod end adjustment was disturbed, adjust rod ends to provide 9.65 inches span measuring from center to center of rod end attach holes.

a. Installation of ailerons is the reversal of the removal procedures.

NOTE

After installation of ailerons, check the travel and alignment and rerig if necessary in accordance with rigging procedures.

AILERON TRIM TAB.

The all metal aileron trim tab is attached to the left aileron by a single hinge extending the entire length of the trim tab and is operated by a push-pull tube. The aileron trim tab must be installed when static balancing the left aileron.

Removal of Aileron Trim Tab. (See figure 5-3.)

a. Position aileron trim tab to full DOWN and disconnect bonding strap by removing screw.
b. Remove cotter pin, nut and bolt attaching aileron trim tab push-pull tube (6) to aileron trim tab.
c. Remove cotter pins in hinge half and remove hinge pin.
d. Remove aileron trim tab from aileron.

Installation of Aileron Trim Tab. (See figure 5-3.)

a. Install aileron trim tab by reversing removal procedures.

NOTE

Check aileron trim tab travel, alignment and rerig, if necessary, in accordance with rigging procedure.

AILERON CONTROL SYSTEM

The ailerons are actuated by the rotational movement of either control wheel. The actuation of ailerons is accomplished by cable assemblies which are attached to the control column interconnect assembly and routed through the fuselage to the fuselage bellcrank located just forward of the rear spar. From the fuselage bellcrank, cable assemblies are then routed through each wing to a wing bellcrank assembly where a push-pull tube is connected to the aileron. An aileron trim system is provided and is routed directly through the fuselage and left-hand wing to the aileron trim tab actuator. An aileron trim control knob is provided on the control pedestal.

Troubleshooting Aileron Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LOST MOTION BETWEEN CONTROL WHEEL AND AILERON | Cable tension too low. | Adjust cable tension in accordance with rigging procedures. |
| | Broken pulley. | Replace pulley. |
| | Cables not in place on pulleys or wing bellcranks. | Install cables correctly. Check cable guards. |
| RESISTANCE TO CONTROL WHEEL ROTATION | Cable tension too high. | Adjust cable tension in accordance with rigging procedures. |
| | Wing bellcrank bolts overtorqued. | Loosen bolts. |

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| RESISTANCE TO CONTROL WHEEL ROTATION (CONT.) | Pulleys binding or rubbing. | Replace binding pulleys, provide clearance if rubbing pulley brackets or cable guards. |
| | Clevis assembly in control column support block adjusted too close to control tube assembly. | Provide proper clearance between bearing and control tube assembly. |
| RESISTANCE TO CONTROL WHEEL | Control column crossover chains too tight. | Adjust in accordance with control control rigging procedures. |
| | Cables not in place on pulleys or wing bellcrank. | Install cables correctly. |
| | Bent aileron. | Repair or replace aileron. |
| CONTROL WHEELS NOT SYNCHRONIZED | Incorrect control column rigging. | Rig in accordance with control column rigging procedures. |
| | Aileron system tension greater than control column crossover tension. | Adjust tensions in accordance with rigging procedures. |
| CONTROL WHEELS NOT HORIZONTAL WHEN AILERONS ARE NEUTRAL | Incorrect aileron system rigging. | Rig in accordance with rigging procedures. |
| INCORRECT AILERON TRAVEL | Aileron quadrant stops incorrectly adjusted. | Adjust in accordance with rigging procedures. |
| CORRECT AILERON TRAVEL CANNOT BE OBTAINED BY ADJUSTING WING BELLCRANK STOPS | Incorrect rigging of quadrant cables, compensated for by incorrect adjustment of push-pull rods. | Rig in accordance with rigging procedures. |
| | Incorrect rigging of aileron bellcrank. | Rig in accordance with rigging procedures. |

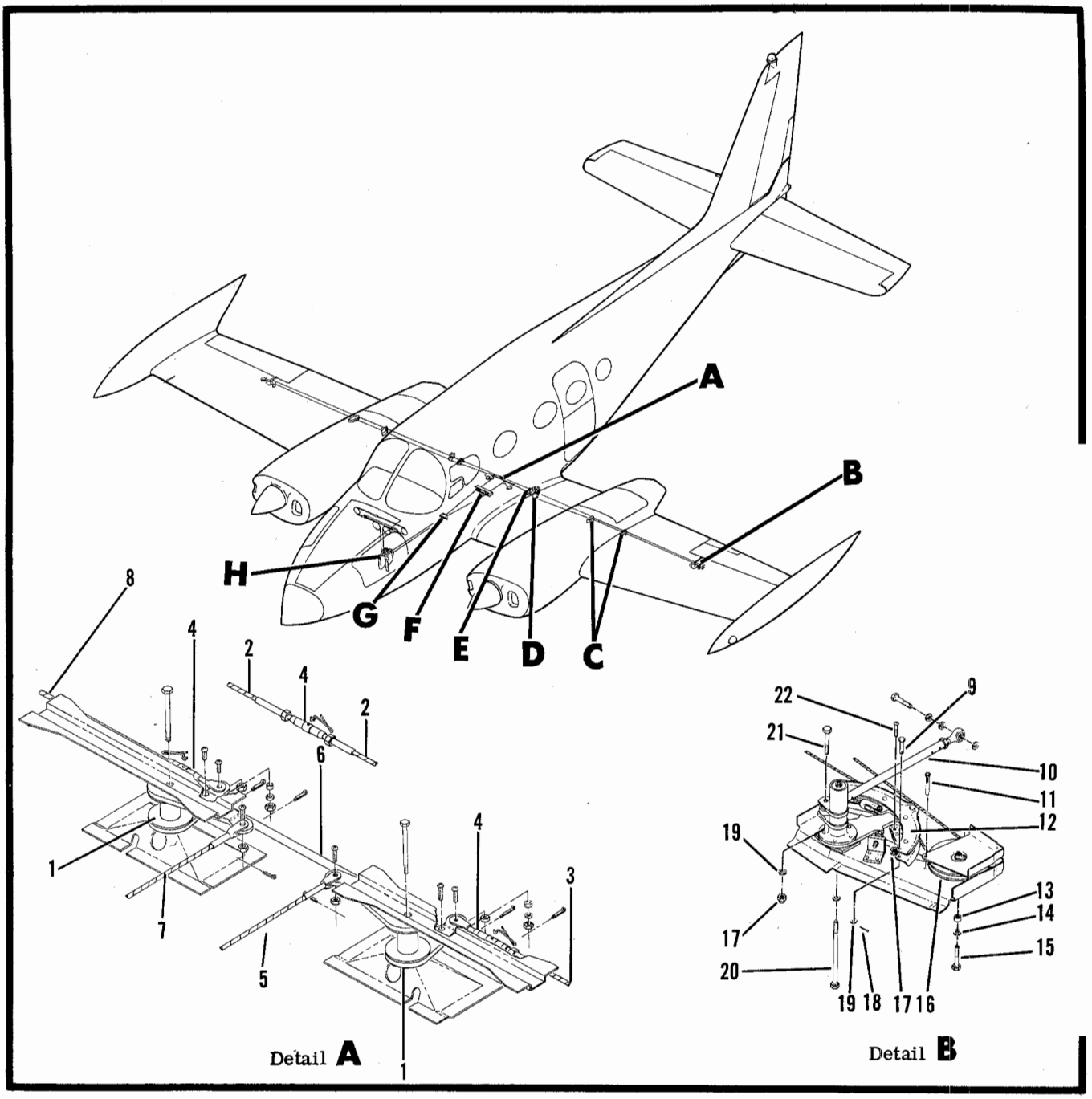
Removal of Aileron Control Cables. (See figure 5-4.)

The following procedures are for removing the aileron control cables from the control wheel to the aileron. Steps "b" through "f" apply to the aileron cables from the control wheel to the aileron bellcrank inside the fuselage. Steps "g" through "n" apply to the aileron cables from the aileron bellcrank inside the fuselage to the wing bellcrank.

a. (See figure 1-3.) Remove seats, floorboards (75, 76, 82, 88 and 89), wing root access (18 and 22), and wing access panels (38, 41, 43 and 44).
b. Remove cable guard pins from aileron pulley brackets in fuselage.
c. Remove safety and loosen turnbuckle and disconnect cables (7 and 5) and (34 and 36) at F.S. 120.00.
d. Remove instrument panel.
e. Remove cotter pin (33), nut (32) and bolt (30) from chain (31). Tie guide wire on cable (36) and pull cable out from forward of the instrument panel.
f. If chain (31) is to be removed, refer to Removal of Control Column Procedures for removal.
g. Loosen turnbuckles (4) and disconnect left aileron cable (3), right aileron cable (8) and follow through cable (2).
h. Tie guide wire to turnbuckle ends.
i. Remove necessary pulley guard pins through wing access panels.
j. Remove seals (27) by removing retaining rings (26).
k. Disconnect left aileron cable (3) and right aileron cable (8) at wing bellcrank (12) by removing cotter pin, nut and bolt.
l. Pull from the wing bellcrank access, left aileron cable (3) and right aileron cable (8), routing in a guide wire to serve as a guide for cable installation.
m. Disconnect follow through cable (2) from wing bellcrank (12) by removing cotter pin, nut and bolt.
n. Pull follow through cable (2) out through the wing bellcrank access while guiding in guide wire to serve as a guide for installation.

Installation of Aileron Control Cables. (See figure 5-4.)

a. Attach guide wires to follow through cable (2), left aileron cable (3) and right aileron cable (8)




1. Aileron Bellcrank
2. Follow Through Cable
3. Left Aileron Cable
4. Turnbuckle
5. Left Aileron Control to Bellcrank Cable
6. Bellcrank Interconnect Tube
7. Right Aileron Control to Bellcrank Cable
8. Right Aileron Cable
9. Pin
10. Aileron Push-Pull Tube
11. Cable Guard Pin
12. Wing Bellcrank (Aileron)
13. Spacer
14. Washer
15. Bolt
16. Pulley
17. Nut
18. Cotter Pin
19. Washer
20. Pivot Bolt
21. Bolt
22. Screw
23. Bolt
24. Nut
25. Pulley
26. Retainer Ring
27. Seal
28. Turnbuckle
29. Guard Pin
30. Bolt
31. Chain
32. Nut
33. Cotter Pin
34. Left Forward Aileron Cable
35. Pulley
36. Right Forward Aileron Cable
37. Washer
38. Interconnect

Figure 5-4. Aileron Control System (Sheet 1)

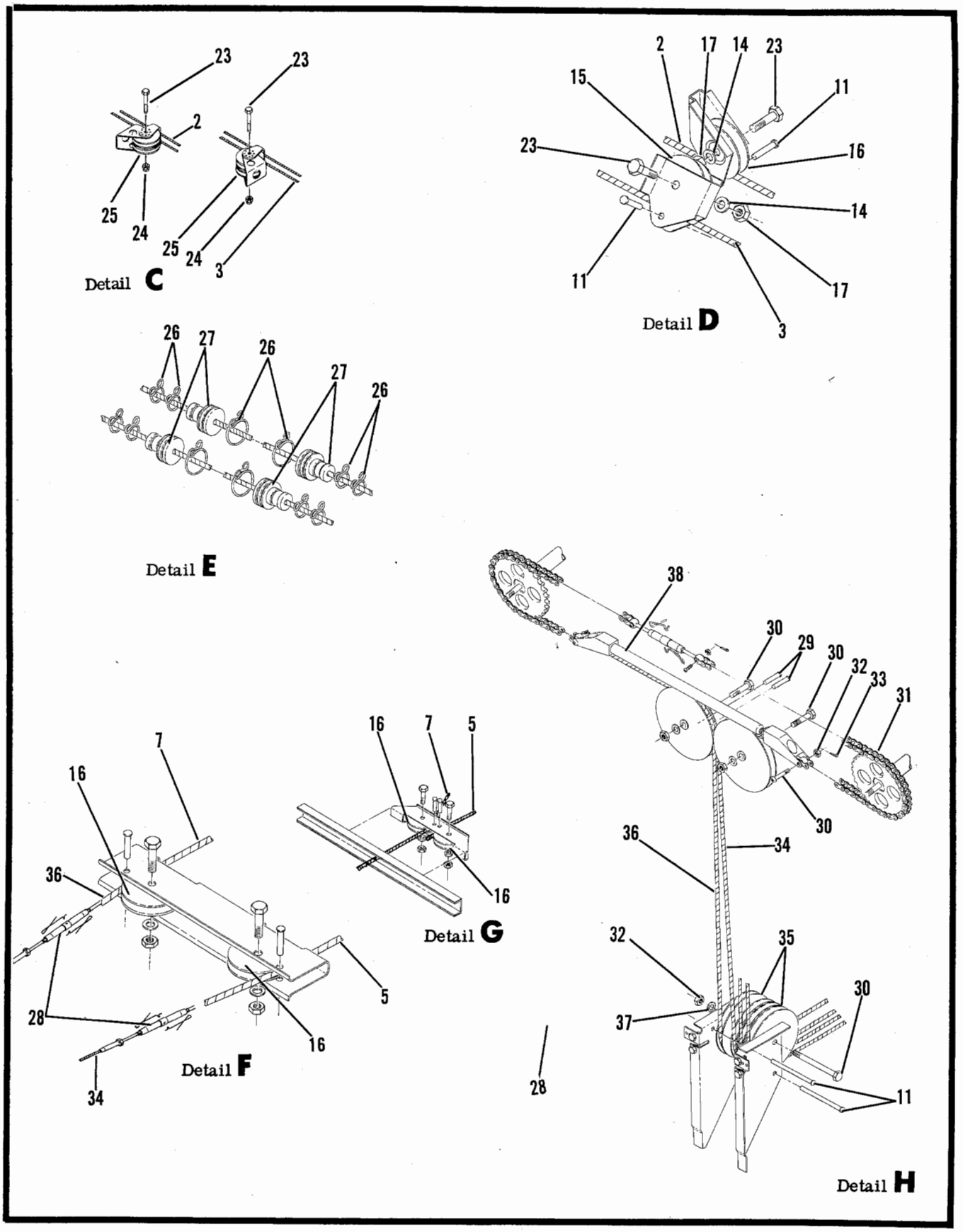



Figure 5-4. Aileron Control System (Sheet 2)

routing through wing into fuselage.
b. Connect follow through cable (2) to wing bellcrank (12) with bolt, nut and cotter pin.
c. Connect follow through cables (2) in fuselage with turnbuckle (4). Do not tighten turnbuckle at this time.
d. Connect left aileron cables (3) and right aileron cable (8) at aileron bellcrank (1) with turnbuckle (4). Do not tighten turnbuckle at this time.
e. Install pulley guard pins in wing and fuselage.
f. Install cable seals (27) as follows:
1. Insure cables are lubricated for the full length of its travel within the seals.
2. Pack seals with MIL-G-81322A lubricant.
3. Place seal on the cable on the non pressurized side of bulkhead with small end of seal toward bulkhead.
4. Insert seal in the bulkhead hole so that bulkhead metal is seated within the retaining groove of seal and so that the small end of seal is in the pressurized section.
5. Install proper retaining rings in the grooves on the seal (two on small end and one on large end).

NOTE

Assure the aileron cables are lubricated with MIL-G-81322A Grease the full length of cable travel within the seal.

g. Connect left forward aileron cable (34) and right forward aileron cable (36) to guide wire and pull into position through pulleys.
h. Connect left forward aileron cable (34) to chain (31) with bolt (30), nuts (32) and cotter pin (33).
i. Connect left aileron control to bellcrank cable (5) and right aileron control to bellcrank cable (7) to bellcrank (1) with bolts, nuts and cotter pin and route forward into position by using guide wire for routing.
j. Connect left forward aileron cable (34) and left aileron control to bellcrank cable (5) with turnbuckle (28). Do not tighten at this time.
k. Connect right forward aileron cable (36) and right aileron control to bellcrank cable (7) with turnbuckle (28). Do not tighten at this time.
l. Install pulley guard pins.
m. If chain (31) was removed, refer to Installation of Control Column procedures and install chain.
n. Refer to Rigging of Aileron Control System and rig ailerons.
o. Refer to Section 12 and install instrument panel.
p. Safety all turnbuckles, install wing access panels, wing root access, floorboards, and seats.

WARNING

Assure ailerons move in proper direction when operated by the control wheel.

Removal and Installation of Fuselage Bellcrank. (See figure 5-4.)

The removal and installation procedures given are applicable to either left or right fuselage bellcrank.

a. (See figure 1-3.) Remove seats, floorboards and carpets.
b. Remove safety, loosen turnbuckles (4 and 28) and disconnect cables attached to fuselage bellcrank.
c. Remove bolt securing fuselage bellcrank and slide bellcrank out of mounting and remove from aircraft.
d. Reverse the removal procedures for installing the fuselage bellcrank.
e. Refer to Rigging Procedures and rig aileron.
f. (See figure 1-3.) Install floorboards, carpets and seats.

WARNING

Make sure ailerons move in proper direction when the control wheel is moved.

Removal of Aileron Wing Bellcrank. (See figure 5-4.)

NOTE

See figure 1-3 and remove floorboard access panels (75, 76, 82 and 81), wing plug buttons (40) and wing access panel (26).

a. Relieve tension on aileron control system by loosening the aileron control cable turnbuckles at the fuselage bellcrank assembly (1).
b. Disconnect wing aileron cables from aileron wing bellcrank assembly (12) by removing the cable guard pins, washers and cotter pins and attaching screws and nuts.
c. Disconnect aileron push-pull tube (10) from aileron wing bellcrank assembly (12) by removing attaching nut, washer and bolt.
d. Remove pivot bolt (20) from aileron wing bellcrank assembly (12) and work bellcrank through wing access hole.

NOTE

Repair of aileron wing bellcrank is limited to replacement of defective bearings and spacers.

Installation of Aileron Wing Bellcrank. (See figure 5-4.)

a. Installation of aileron wing bellcrank is the reversal of the removal procedures.

CAUTION

Do not overtorque pivot bolt (20), or serious binding may result.

b. Rig aileron control system in accordance with rigging procedures.
c. Safety turnbuckles by installing clips.
d. Install floorboards (75, 76, 82 and 81) and wing access panels (38, 39 and 40).

WARNING

Make sure ailerons move in correct direction when operated by the control wheel.

Rigging Aileron Control System. (See figure 5-4.)

NOTE

See figure 1-3 and remove floorboards (75, 76, 82 and 81) and wing access panel (26).

a. Place pilot's control wheel in neutral position and install control column gust lock.

NOTE

The next steps may be omitted if copilot's wheel is aligned in neutral with pilot's control wheel.

1. Loosen turnbuckle on crossover chain and adjust copilot's control column sprocket to provide the neutral position. Chain tension should be the minimum necessary to remove slack from chain.
5. Align interconnect assembly as shown in figure 5-2.
b. Loosen fuselage and wing aileron cable turnbuckles to provide free swivel of fuselage bellcranks (1).
c. Adjust fuselage aileron cables as necessary to bring fuselage bellcranks (1) to neutral position.
d. Rig fuselage aileron cables to provide 25 ±5 pounds tension.
e. Retain control column gust lock in place; streamline trailing edge of aileron with edge of flap and secure aileron in place with a temporary locking device.

NOTE

Rig each wing aileron separately.

f. Remove excess slack in wing aileron cables by tightening turnbuckles.
g. Rig wing aileron cables to 25 ±5 pounds tension.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

h. Remove control column gust lock and temporary aileron locking device and check aileron for the neutral position.
i. Adjust wing aileron bellcrank stop bolts to provide 20° up and down travel with a plus one and minus zero tolerance.

CAUTION

Do not overtorque pivot bolt (20) or serious binding may result. Safety bolt to pulley bracket.

j. Tighten jam nuts on stop blocks, safety turnbuckles and bellcrank stop bolts and check for obstructed travel.
k. Check all pulleys for cable guard pins in place.

WARNING

Insure that ailerons move in the proper direction when operated by the control wheel.

l. Install access panels in aircraft.

NOTE

An Inclinometer for measuring control surface travel is available from Cessna Dealers' Organization.

AILERON TRIM CONTROL SYSTEM.

The aileron trim control system is interconnected by chains, cables, sprockets, turnbuckles, miter gears, an actuator, and a push-pull tube. The aileron trim control wheel, mounted on the aft side of the control pedestal, incorporates a track in which the indicator rides.

Troubleshooting Aileron Trim Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE | Cable tension too high. | Adjust tension in accordance with rigging procedure. |
| | Pulleys binding or rubbing. | Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. |

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE (CONT.) | Trim tab hinge binding. | Lubricate hinge. If necessary, replace. |
| | Cables not in place on pulleys during installation. | Install cables on pulleys correctly. |
| LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB | Cable tension too low. | Adjust tension in accordance with rigging procedure. |
| | Broken pulley. | Replace pulley. |
| | Cables not in place on pulleys. | Install cable on pulleys correctly and check cable guards. |
| | Worn trim tab actuator. | Repair or replace actuator. |
| TRIM INDICATOR FAILS TO INDICATE CORRECT TRIM POSITION | Indicator incorrectly engaged with wheel track. | Engage indicator on track. |
| INCORRECT TRIM TAB TRAVEL | Travel stop blocks loose or incorrectly adjusted. | Adjust stop blocks in accordance with rigging procedures. |
| CORRECT TRAVEL CANNOT BE OBTAINED BY ADJUSTING STOP BLOCKS | Actuator screw incorrectly adjusted. | Adjust in accordance with rigging procedures. |

Removal of Aileron Trim Control Cables and Chains. (See figure 5-5.)

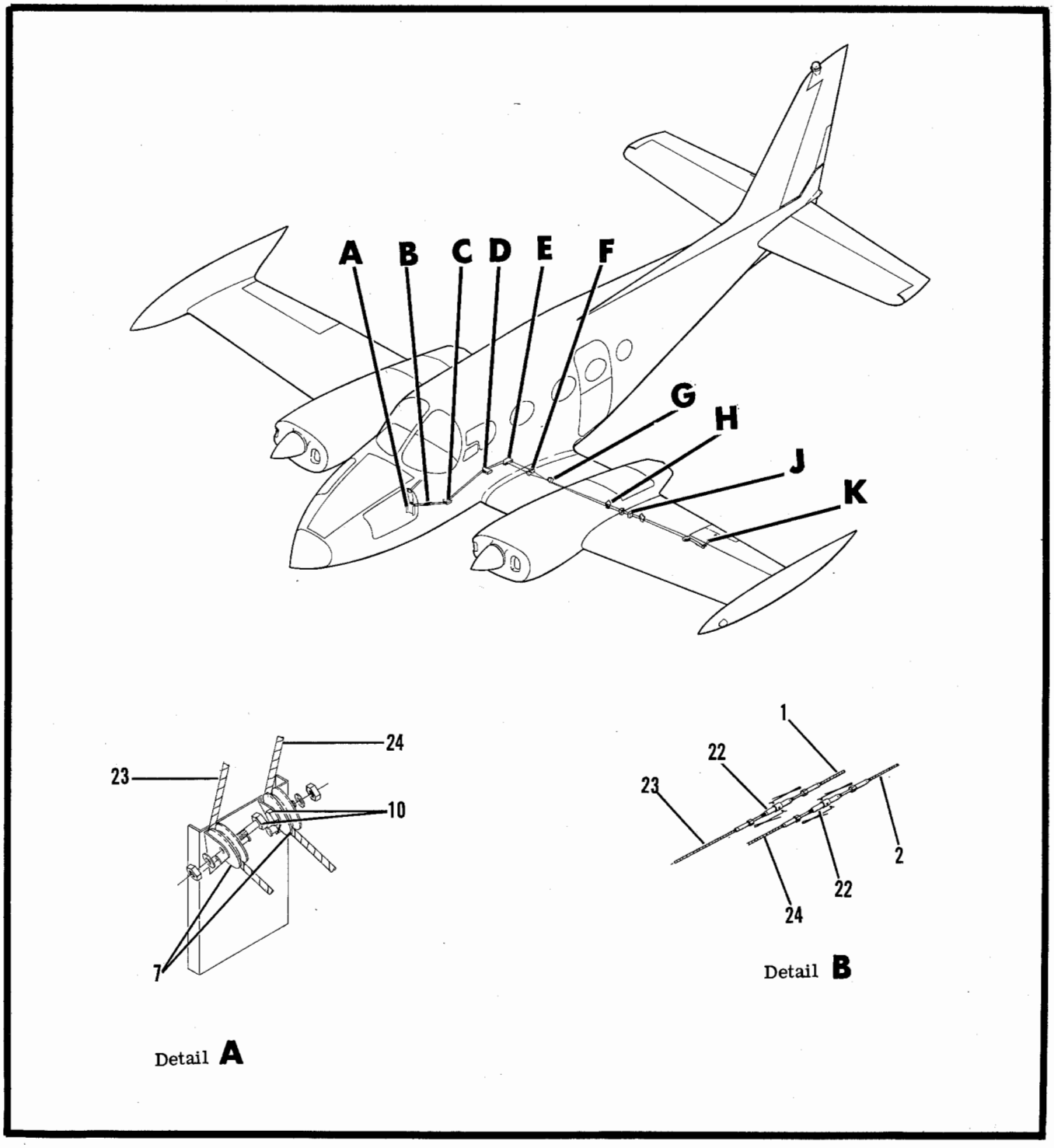
a. Remove seats, carpets and necessary upholstery.
b. (See figure 1-3.) Remove floorboards (81, 82, 87, 88 and 89), pedestal side panels and necessary wing access panels.
c. Remove safety and loosen turnbuckles (22) and disconnect cable (1) from cable (23) and cable (2) from cable (24).
d. Tie guide wire to ends of cables (1 and 23) and (2 and 24).
e. Remove the necessary pulleys (7), pulley guard pins (5), pulleys (7) and seals (4).
f. Remove chain (21) from sprocket (25) and pull out cables (23 and 24) while guiding in wire to aid installation.
g. Remove stop blocks (12) and bushings (14).
h. Remove chain guard (20) from trim tab actuator (19).
i. Remove chain (21) from sprocket and pull out cables (1 and 2) while guiding in wire to aid installation.

Installation of Aileron Trim Control Cables and Chains. (See figure 5-5.)

a. Install aileron trim control cables and chains by reversing the removal procedure.
b. Rig aileron trim tab in accordance with rigging procedures.
c. Install seals (4) in accordance with aileron cable seal installation procedures.
d. Install floorboards, pedestal side panels and wing access plates which were removed.

Removal of Aileron Trim Tab Actuator. (See figure 5-5.)

a. Remove LH aileron in accordance with aileron removal procedure.
b. Disconnect turnbuckles on aileron trim cables.
c. Relieve tension on aileron trim control system by disconnecting turnbuckles in forward cabin section.
d. At the aileron trim tab actuator assembly, remove chain guard (20) and disengage chain (21) from sprocket.
e. Remove cotter pin, nut, washer and bolt attaching push-pull tube (18) to aileron trim actuator (19).
f. On forward side of rear spar, remove nuts, bolts, and clamps (15).
g. On aft side of rear spar, remove nut, bolt and clamp (15).
h. (See figure 5-6.) Remove forward retaining ring (7) from housing (6).
i. Remove aileron trim tab actuator (19) from aircraft through rear spar.




1. Left Aileron Trim Cable (Aft)
2. Right Aileron Trim Cable (Aft)
3. Retaining Ring
4. Seal
5. Pulley Guard Pin
6. Bolt
7. Pulley
8. Washer
9. Nut
10. Screw
11. Cotter Pin
12. Stop Blocks
13. Screw
14. Bushing
15. Clamp
16. Trim Tab
17. Bolt
18. Push-Rod
19. Trim Tab Actuator
20. Chain Guard
21. Chain
22. Turnbuckle
23. Left Aileron Trim Cable (Fwd)
24. Right Aileron Trim Cable (Fwd)
25. Sprocket

Figure 5-5. Aileron Trim Control System (Sheet 1)

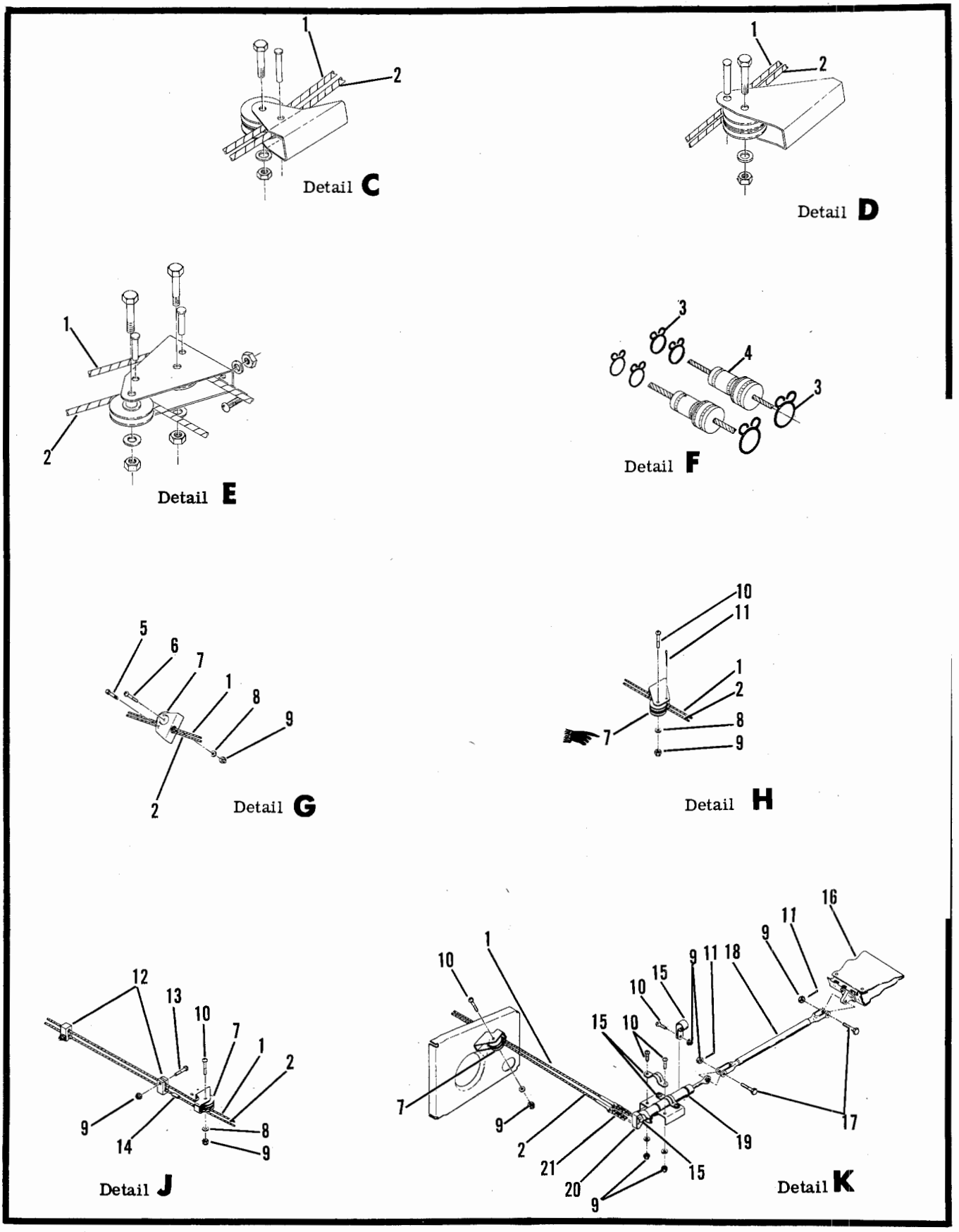



Figure 5-5. Aileron Trim Control System (Sheet 2)

Disassembly, Overhaul and Assembly of Trim Tab Actuators. (See figure 5-6.)

a. Disassemble aileron trim tab actuator assembly in accordance with exploded view, figure 5-6. This view clearly illustrates the proper relationship of all component parts.
b. Do not remove bearing (1) from screw (2) unless replacement of parts is required.
c. Clean all component parts, except bearing (1), by washing in suitable solvent. Do not clean sealed bearing (1).
d. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.
e. Check bearings (3 and 12) and screws (2 and 9) for excessive wear and scoring. Dimensions of parts shall be as follows:

| | | |
|---|---|---|
| Front bearing (12) ID | 0.373 in. | min. |
| | 0.370 in. | max. |
| Rear bearing (3): | | |
| Small hole ID | 0.248 in. | min. |
| | 0.253 in. | max. |
| Large hole ID | 0.373 in. | min. |
| | 0.380 in. | max. |
| Screw (2) OD (Shank) | 0.242 in. | min. |
| | 0.246 in. | max. |
| Screw (9) OD | 0.367 in. | min. |
| | 0.370 in. | max. |

NOTE

Relative linear movement between internal threaded screw (9) and bearing (3) should be 0.008 to 0.012 inch on rudder trim tab actuator when set at room temperature.

NOTE

Relative linear movement between internal threaded screw (9) and bearing (3) should be 0.004 to 0.010 on aileron and elevator trim tab actuator when set at room temperature.

f. Examine screws (2 and 9) for damaged threads or dirt particles that may impair smooth operation.
g. Check sprocket (13) for broken, chipped and/or worn teeth.
h. Check bearing (1) for smoothness of operation.
i. Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.
j. Always discard the following items and install new parts during reassembly: nuts (16), groov-pins (8 and 11) and O-ring packing (4).
k. During reassembly, lubricate collars (5) and screw (9) with general purpose lubricating grease.
l. Reassemble actuator in accordance with the following:
m. Slip bearing (12) and collar (5) on screw (9).
n. Press sprocket (13) into hollow end of screw (9), making sure pin holes are aligned. Press two new groov pins (11) into pin holes.
o. Insert screw (9), with assembled parts, into housing (6).

NOTE

Locate sprocket (13) at the end of housing (6) which is farthest from the groove for retaining ring (7).

p. Align pin holes in bearing (12) and housing (6) Press new groov-pin (8) into pin holes.
q. Insert collar (5), new O-ring packing (4) and bearing (3) into end of housing (6). Align pin holes in bearing and housing and install new groov-pin (8).
r. If new parts are required, press bearing (1) into boss at end of screw (2). Be sure force bears against outer race of bearing. Install screw (2) in housing (6) and screw (9).
s. Install retaining rings (7) in grooves provided on outside of housing (6).
t. Test actuator assembly by rotating sprocket (13) with fingers while holding bearing end of screw (2). Screw (2) should travel in and out of housing (6) smoothly, with no indication of binding.

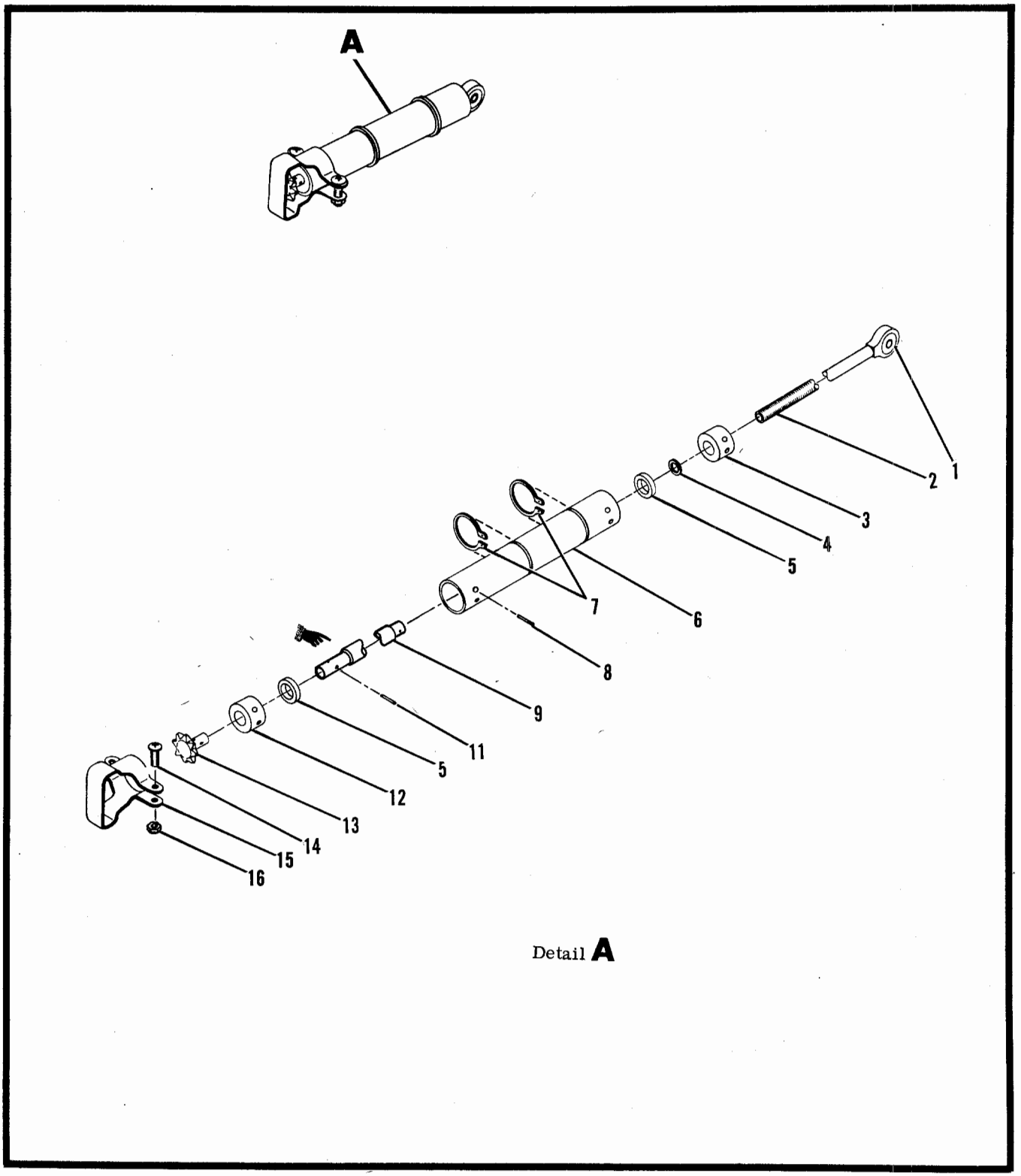
Installation of Aileron Trim Tab Actuator. (See figure 5-5.)

a. Secure aileron trim tab actuator (16) in position with clamps (15).
b. Engage chain (21) on sprocket and install chain guard (20) with screws and nuts.
c. Connect forward and main aileron trim cables with turnbuckles (22) and tighten cables to 10 ±3 pound tension and safety turnbuckle.

NOTE

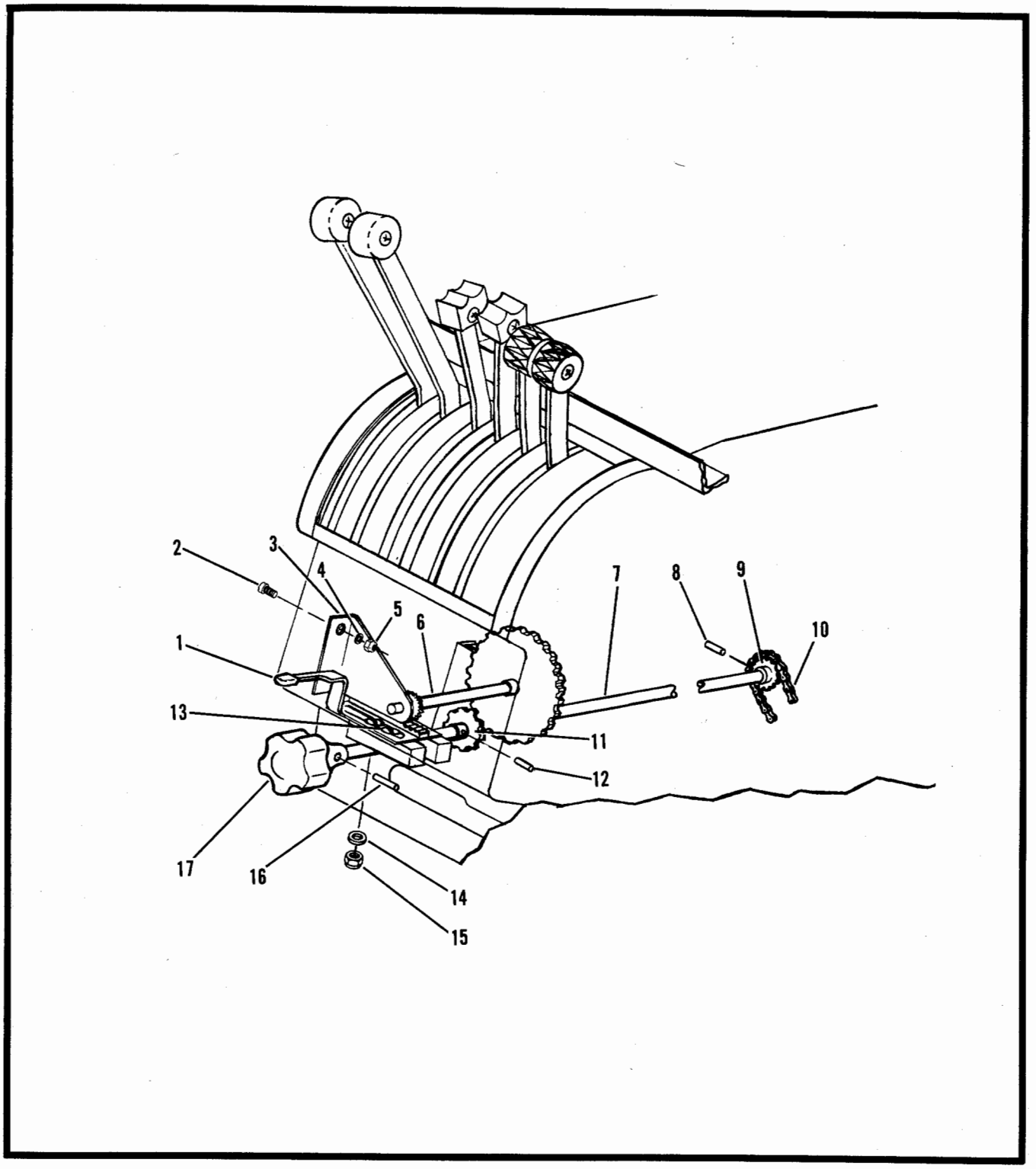
Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

d. Connect aileron trim tab push-pull tube (18) to actuator (19) with bolt, washer, nut and cotter pin.
e. Install left aileron in accordance with installation and rigging procedures.
f. Rotate aileron trim control knob to the neutral position and align aileron with the trailing edge of wing.
g. Position the trailing edge of trim tab with aileron trailing edge.
h. Align push-pull tube (18) with trim tab horn and secure with bolt and nut.
i. Check aileron trim tab for proper operation, correct travel and rigging.
j. Install access covers.




1. Bearing
2. Screw
3. Bearing
4. O-Ring Packing
5. Collar
6. Housing
7. Retaining Ring
8. Groov-Pin
9. Screw
10. Deleted
11. Groov-Pin
12. Bearing
13. Sprocket
14. Screw
15. Chain Guard
16. Nut

Figure 5-6. Trim Tab Actuators




1. Pointer
2. Screw
3. Bracket
4. Washer
5. Nut
6. Gear Assembly
7. Shaft
8. Roll Pin
9. Sprocket
10. Chain
11. Gear
12. Roll Pin
13. Screw
14. Washer
15. Nut
16. Roll Pin
17. Knob

Figure 5-7. Aileron Trim Control Knob and Pointer Assembly

Removal of Aileron Trim Control Knob and Pointer Assembly. (See figure 5-7.)

a. Remove pedestal access covers.
b. Remove gear assembly (6) and bracket (3) from pedestal assembly.
c. Remove pointer assembly (1) by removing four attaching screws (13).
d. Relieve tension on aileron trim control system by loosening turnbuckles.
e. Disengage roller chain (10) from sprocket (9) and slide sprocket from shaft (7).
f. Remove roll pin (12) from gear (11) and slide shaft (7) from pedestal assembly.

Installation of Aileron Trim Control Knob and Pointer Assembly. (See figure 5-7.)

a. Installation of trim control knob and pointer is the reversal of the removal procedure.
b. Check rigging and rig, if necessary, in accordance with Rigging of Aileron Trim Control System.

Rigging of Aileron Trim Control System. (See figure 5-5.)

NOTE

See figure 1-3 and remove necessary floorboards and wing access panels.

a. Remove safety from turnbuckles (22) and adjust cable tension to 10 ±3 pounds.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

b. Move aileron trim control system to neutral by rotating control knob.
c. Check to make sure ends of chain (21) are equal in length from sprocket on actuator (19) and ends of chain (21) are equal in length from sprocket (25).
d. (See figure 5-7.) Adjust aileron trim indicator to neutral by removing screw and raising bracket to allow pointer (1) to move to the center.
e. Remove cotter pin (11), nut (9) and bolt (17) attaching push-pull tube (18) to aileron trim tab.
f. Align aileron with trailing edge of wing and place trim tab in neutral.
g. Adjust screw of trim tab actuator (19) so that hole in push-pull tube (18) is in line with hole in trim tab horn.
h. Install bolt (17), nut (9) and cotter pin (11).
i. Loosen stop blocks (12), move trim tab to 20 plus one, minus zero degrees DOWN, slide outboard stop block against outboard rib assembly at station 129. 24 and tighten stop block.

NOTE

Stop blocks (12) should be installed so that bottom cable passes through bushing and top cable is clamped by stop blocks.

j. Move trim tab to 20 plus one, minus zero degrees UP, slide inboard stop block against inboard rib assembly at station 118. 24 and tighten stop block.

WARNING

Insure that aileron moves in the proper direction when operated by trim knob.

k. Install all access panels.

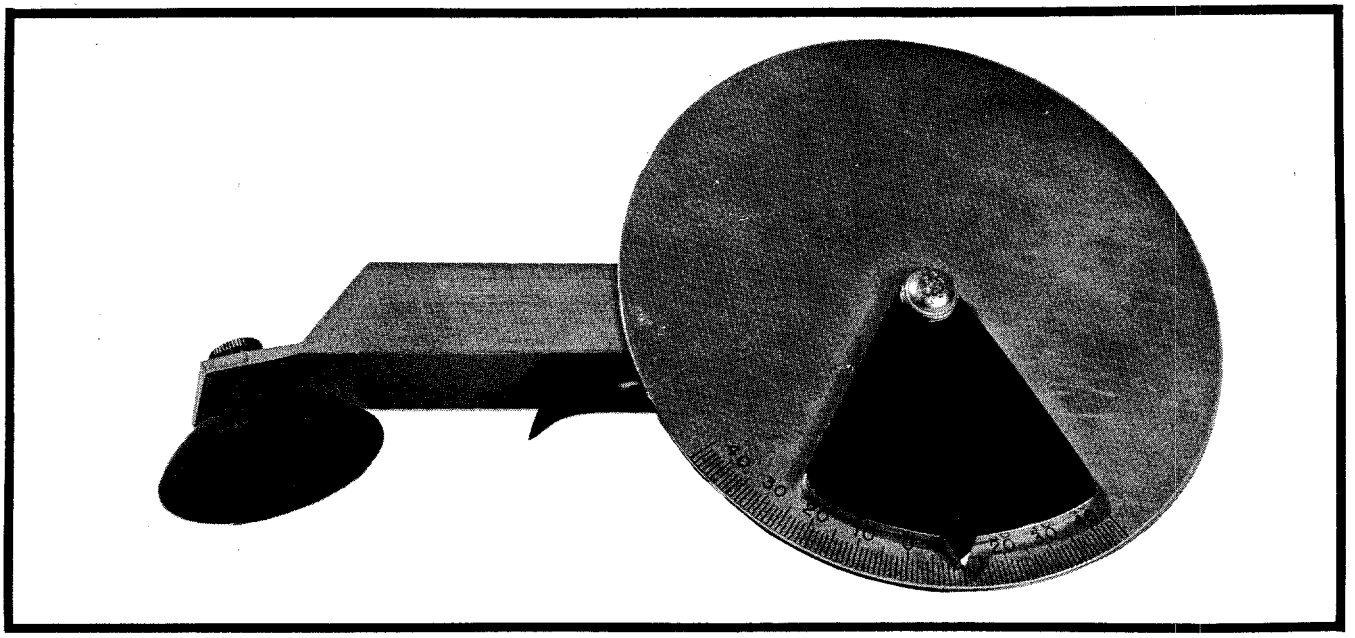


Figure 5-8. Inclinometer SE716 for Measuring Control Surface Travel

SECTION 6

# ELEVATOR AND TRIM CONTROL SYSTEM

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CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

## ELEVATORS.

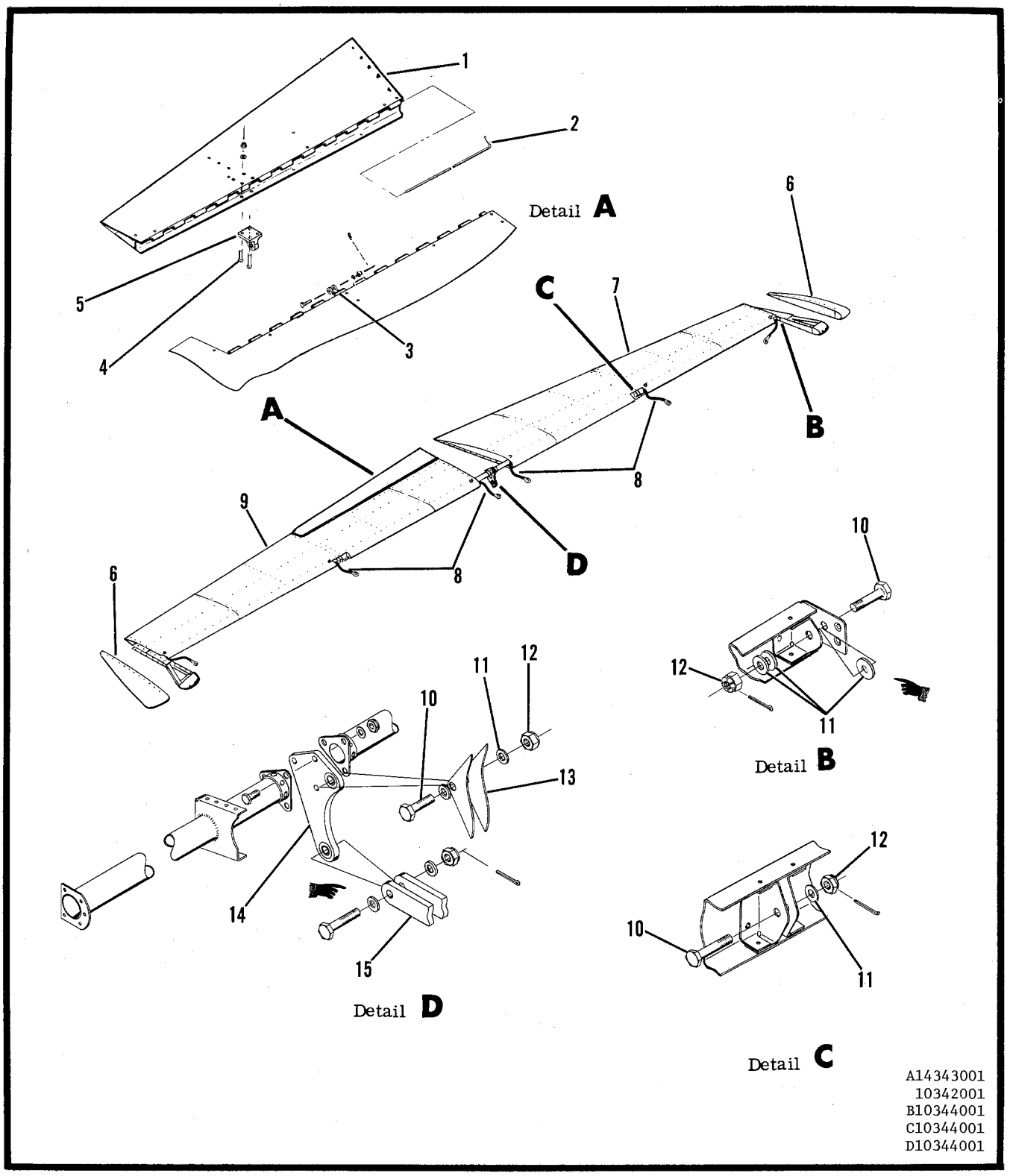
The elevator control surfaces consist of two elevator assemblies connected by a torque tube, and an elevator trim tab located at the trailing edge of the right elevator. Each elevator is attached to the rear spar of the horizontal stabilizer with two hinges. The elevators are operated by a pylon to which the elevator torque tubes are bolted. Each elevator is 100% static balanced with the elevator trim tab and elevator arm attached, at the time of installation.

### Removal of Elevators. (See figure 6-1.)

a. Refer to Section 3 and remove stinger in accordance with removal procedures.
b. Disconnect elevator trim tab push-pull tube (3) by removing cotter pin, nut, washer and bolt.
c. Disconnect elevator torque tubes from the elevator pylon (14) by removing nuts and bolts.
d. Disconnect bonding straps (8) by removing attaching screws.
e. Remove fiberglass tips (6) by removing attaching screws.
f. Remove each elevator by removing nuts (12), washers (11), and bolts (10).
g. When removing right elevator, guide elevator trim tab push-pull tube (3) out through elevator.

### Installation of Elevators. (See figure 6-1.)

a. Place elevators in position, guiding elevator trim tab push-pull tube (3) through opening in right elevator, and align mounting holes.
b. Attach each elevator to horizontal stabilizer with bolts (10), washers (11) and nuts (12).
c. Attach elevator torque tubes to elevator pylon (14) by installing bolts, washers and nuts.
d. Attach bonding straps (8) with attaching screws.
e. Install fiberglass tips (6) with attaching screw.




1. Elevator Trim Tab
2. Hinge Pin
3. Push-Pull Tube
4. Bolt
5. Elevator Trim Tab Horn
6. Fiberglass Tip
7. Left Elevator
8. Bonding Strap
9. Right Elevator
10. Bolt
11. Washer
12. Nut
13. Hinge Bracket
14. Elevator Pylon
15. Elevator Push-Pull Tube

Figure 6-1. Elevator and Trim Tab Installation

f. Attach elevator trim tab push-pull tube (3) to trim tab with bolt, washer, nut and cotter pin.
g. Refer to rigging procedures and check elevators and elevator trim tab for proper operation and travel.
b. Refer to Section 3 and install stinger in accordance with installation procedures.

ELEVATOR TRIM TAB.

Removal of Elevator Trim Tab. (See figure 6-1.)

a. Disconnect elevator trim tab push-pull tube (3) by removing nut, washer and bolt.
b. Remove cotter pins from hinge pin (2), and detach trim tab from elevator by removing hinge pin.

Disassembly and Assembly of Elevator Trim Tab. (See figure 6-1.)

a. Remove elevator trim tab horn (5) and bolt (4) by removing nuts, washers and screws.
b. To assemble, reverse the above procedure.

Installation of Elevator Trim Tab. (See figure 6-1.)

a. Attach trim tab to elevator with hinge pin (2) and safety in place with cotter pins.
b. Connect elevator trim tab push-pull tube (3) to trim tab horn (5) with bolt, washer, nut and cotter pin.
c. Refer to elevator trim control system rigging procedures, checking elevator trim tab for proper operation and correct travel.

ELEVATOR CONTROL SYSTEM.

The elevators are operated by the fore and aft movement of the control column. The quadrant assembly is attached to the control column by links attached to a swivel bearing on the control column. The elevator cable assemblies are attached to the quadrant and routed down under the floorboards through the fuselage by pulleys to the elevator bellcrank in the tailcone. The push-pull tube connects the bellcrank to the elevator pylon which is connected to the elevator torque tubes. The adjustable elevator travel stops, are located between the elevator bellcrank mounting brackets secured by bolts extending through both brackets. The elevator bob weight attached to the elevator quadrant torque tube is provided to stabilize the aircraft during flight.

Troubleshooting the Elevator Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LOST MOTION BETWEEN CONTROL WHEEL AND ELEVATORS | Cable tension too low. | Adjust cable tension in accordance with elevator rigging procedures. |
| | Broken pulley. | Replace pulley. |
| | Cables not in place on pulleys. | Install cables correctly. Check cable guards. |
| RESISTANCE TO ELEVATOR CONTROL MOVEMENT | Cable tension too high. | Adjust cable tension in accordance with elevator rigging procedures. |
| | Pulleys binding or rubbing. | Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. |
| | Cable not in place on pulleys during installation. | Install pulleys correctly. |
| | Control column needs lubricating. | Lubricate in accordance with Section 2. |
| | Bent elevator or hinge. | Repair or replace elevator hinge. |
| INCORRECT ELEVATOR TRAVEL | Elevator bellcrank stops incorrectly adjusted. | Adjust in accordance with elevator rigging procedures. |
| CORRECT ELEVATOR TRAVEL CANNOT BE OBTAINED BY ADJUSTING BELLCRANK STOPS (Continued) | Elevator cables incorrectly rigged. | Rig cables in accordance with elevator rigging procedures. |
| | Control column contacting fuselage bulkhead or instrument panel. | Adjust length of forward elevator push-pull tubes in accordance with elevator rigging procedures. |

Troubleshooting the Elevator Control System. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| CORRECT ELEVATOR TRAVEL CANNOT BE OBTAINED BY ADJUSTING BELLCRANK STOPS | Incorrect positioning of forward elevator bellcrank. | Rig elevator cables in accordance with elevator rigging procedures. |

Removal of Elevator Control Cables. (See figure 6-2.)

a. Remove necessary seats, carpets and upholstery to gain access to elevator control cables in accordance with Section 3.
b. (See figure 1-3.) Remove floorboards (88, 89, 75, 77 and 79) and tail access panel.
c. Place suitable support under tailcone at fuselage station (FS) 282.00.
d. Disconnect left elevator cables (10 and 15) and right elevator cables (14 and 17) at turnbuckles in tailcone.
e. Remove cotter pins, nuts (4), screw (9) and spacer (30) from bellcrank (12) and remove left elevator cable (10).
f. Remove cotter pins, nuts (4), screw (9) and spacer (30) from bellcrank (12) and remove right elevator cable (14).
g. Tie a guide wire to turnbuckle end of each elevator cable (15 and 17).
h. Remove seals (20) from adapter plate (19) by removing retaining rings.
j. Remove cotter pin (23), nut (4), washer (5) and screw (9) from quadrant (28) on both forward elevator cables (15 and 17).
k. Pull elevator cables (15 and 17) out from the quadrant end while routing in guide wire. Disconnect guide wire.

NOTE

It may be necessary to remove cable guard pins and pulleys from pulley brackets to remove cables at FS 100.00.

Installation of Elevator Control Cables. (See figure 6-2.)

a. Tie elevator cable turnbuckles ends to guide wires at the quadrant.
b. Pull elevator cables (15 and 17) aft through the fuselage into the tailcone.
c. If cable pulleys and cable guard pins were removed to assist in removal of cables, install pulleys and cable guard pins in respective pulley brackets.
d. Connect elevator cables (15 and 17) to quadrant (28) with screws (9), washers (5), nuts (4) and cotter pins (23).
e. Install seals (20) as follows:
1. Insure that the cables are lubricated for the full length of its travel within the seals.
2. Pack the seal with MIL-G-81322A lubricant.
3. Place the seal on the cable on the non pressurized side of the bulkhead with the small end of the seal toward bulkhead.
4. Insert seal in the bulkhead hole so that bulkhead metal is seated within the retaining groove of seal and so that the small end of seal is in the pressurized section.
5. Install proper retaining rings in the grooves on the seal (two on small end and one on large end).
e. Install seal (20) in adapter plate (19) with retaining rings.
f. Connect elevator cables (10 and 14) to bellcrank (12) with screws (9), spacers (30), washers (5) and nuts (4).
g. Connect aft elevator cables (10 and 14) to forward elevator cables (15 and 17) with turnbuckles.
h. Refer to rigging procedures and rig elevator control system.
i. Install floorboards, tailcone access door, carpets, upholstery and seats.

Removal of Elevator Control Quadrant. (See figure 6-2.)

a. Remove pilot and copilot seats in accordance with Section 3.
b. Remove elevator cable cover on each side of pedestal.
c. Remove tailcone access panel.
d. Disconnect elevator cables (15 and 17) at turnbuckle in tailcone.
e. Disconnect cables (15 and 17) from quadrant by removing nut (4), washer (5), screw (9) and cotter pin (23). Remove cable guard (30).
f. Disconnect push-rods (24) from each control column assembly.
g. Disconnect left, right and center bearing pads (25) from support (26).
h. Tilt the right side of quadrant (28) up and work quadrant out the left side of the aircraft.

CAUTION

Use care when removing quadrant assembly, bob weight could cause damage.

Installation of Elevator Control Quadrant. (See figure 6-2.)

a. Installation of the elevator control quadrant is the reversal of the removal procedures.
b. Refer to rigging procedures and rig elevator control system.

Removal of Elevator Bellcrank. (See figure 6-2.)

a. Remove tailcone access panel.

b. Place a suitable support under tailcone at FS 282.00.
c. Disconnect elevator cables (10 and 14) from elevator cables (15 and 17) by removing turnbuckle.
d. Remove cables (10 and 14) from elevator bellcrank (12) by removing cotter pin, nut (4) and screw (9).
e. Remove cotter pin, nut (4), washer (5) and bolt (3) from push-pull tube (6).
f. Remove nut (4), washer (5), spacer (8) and bolt (3) from bellcrank (12) and remove bellcrank through bottom of hinge bracket (7).

Installation of Elevator Bellcrank. (See figure 6-2.)

a. Installation of elevator bellcrank is the reversal of the removal procedures.
b. Refer to rigging procedures and rig elevator control system.
c. Install tailcone access panel.

Removal and Installation of Elevator Push-Pull Tube.

a. Place a suitable support under tailcone FS 282.00.
b. Remove tailcone access panel.
c. Refer to figure 1-3 and remove stinger (10).
d. Remove cotter pin, nut (4), washer (5), bolt (3)

and push-pull tube (6) from elevator pylon (2).
e. Remove cotter pin, nut (4), washer (5), bolt (3) and push-pull tube (6) from bellcrank (12) and remove push-pull tube (6) from tailcone.
f. To install push-pull tube, reverse the above procedure.
g. Refer to rigging procedures and check rigging.
h. Install tailcone access door and stinger.

Removal and Installation of Elevator Pylon. (See figure 6-2.)

a. (See figure 1-3.) Remove stinger (10).
b. Disconnect push-pull tube (6) by removing cotter pin, nut (4), washer (5) and bolt (9).
c. Remove nuts, washers and bolts (3) from elevator pylon (2).
d. Remove nut, washer and bolt (3) from hinge bracket (7) and remove elevator pylon.
e. To install the elevator pylon, reverse the removal procedures.
f. Refer to rigging procedures and check rigging.
g. Install stinger.

Rigging Elevator Control System. (See figure 6-2.)

a. Remove tailcone access panel, center pedestal covers, necessary seats and upholstery.
b. (Refer to figure 1-3.) Remove stinger (11) and elevator bellcrank access (13).
c. Place a suitable support under tailcone FS 282.00.
d. Disconnect push-pull tube (6) from elevator pylon (2) by removing cotter pin, nut (4), washer (5) and bolt (3).
e. Install rigging pins in hole (13) in bellcrank (12).

NOTE

When rigging pin is installed, the elevators should be streamlined (neutral) and the control wheel lock pin holes should be 1.75 inches apart.

f. Adjust turnbuckles connecting elevator cables (10) to (15) and (14 to 17) until control wheel lock pin holes are 1.75 inches apart and cable tension is 32 ±3 pounds.

NOTE

Tension should be measured at F.S. 266.00 in tailcone. Cable tension should be adjusted when ambient temperature is 60°F. Allow aircraft temperature to stabilize for a period of four hours.

g. Safety turnbuckles.
h. Install an external control lock between the right-hand elevator horn and right stabilizer. To align the centerlines of the elevator horn and stabilizer.
i. Check elevator horn alignment of left-hand elevator. The centerline of the elevator counterweight attachment to the elevator must not exceed .10 inch above or below the centerline of the left-hand stabilizer. If alignment exceeds .10 inch proceed as follows:
1. Remove the three AN3-7A bolts that attach the elevators to the elevator pylon.
2. Install an external control lock between the left-hand elevator horn and stabilizer to hold the elevator in neutral position.
3. Enlarge the bolt holes in the elevators and pylon (2) to (.257) diameter and replace existing AN3-7A bolts with AN4-7A bolts and MS21045-4 nuts.
j. Adjust rod end on push-pull tube (6) to align with hole in elevator pylon (2) and install bolt (3) washer (5) nut (4) and cotter pin.
k. Remove rigging pin from elevator bellcrank (12).

CAUTION

Do not operate elevator from the tips, damage could result.

l. Adjust elevator bellcrank up stop to provide an up travel of 20° +1°, -0°.
m. Adjust elevator bellcrank down stop to provide a down travel of 15° +1°, -0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Dealer's Organization. (See figure 5-8.)

n. If the correct up or down travel cannot be obtained at the elevator bellcrank stops, it will be necessary to adjust push-pull tube (6) and repeat steps "l and m."

NOTE

Adjusting push-pull tube (6) will alter the up and down travel. Therefore, it is necessary to recheck up and down travel.

o. Install access covers on pedestal, stinger, tailcone access door and elevator bellcrank access plate.

WARNING

Insure that elevator controls have freedom of movement and elevator moves in proper direction when operated by the control wheel.

ELEVATOR TRIM TAB CONTROL SYSTEM.

The elevator trim tab is operated by a control wheel mounted on the left side of the pedestal. The control wheel is attached to a sprocket which drives a chain and cables. The chain and cables are routed to pulleys, forward and down through the pedestal under the floor and aft to the tailcone of the aircraft. In the tailcone, the cables are routed aft to pulleys just forward of the horizontal stabilizer rear spar, then up and through the right horizontal stabilizer to a chain which operates the trim tab actuator. The trim

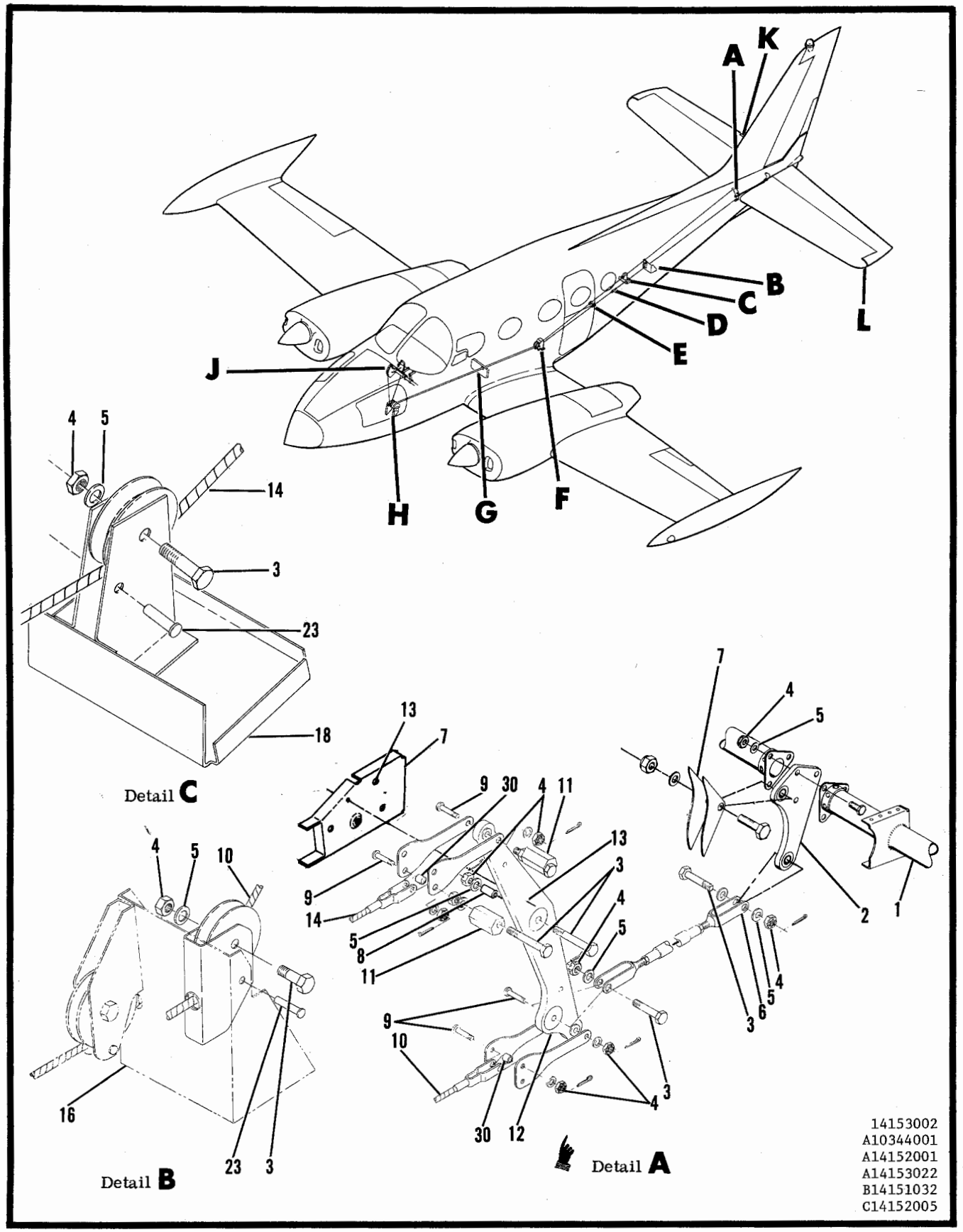



Figure 6-2. Elevator Control System (Sheet 1 of 3)

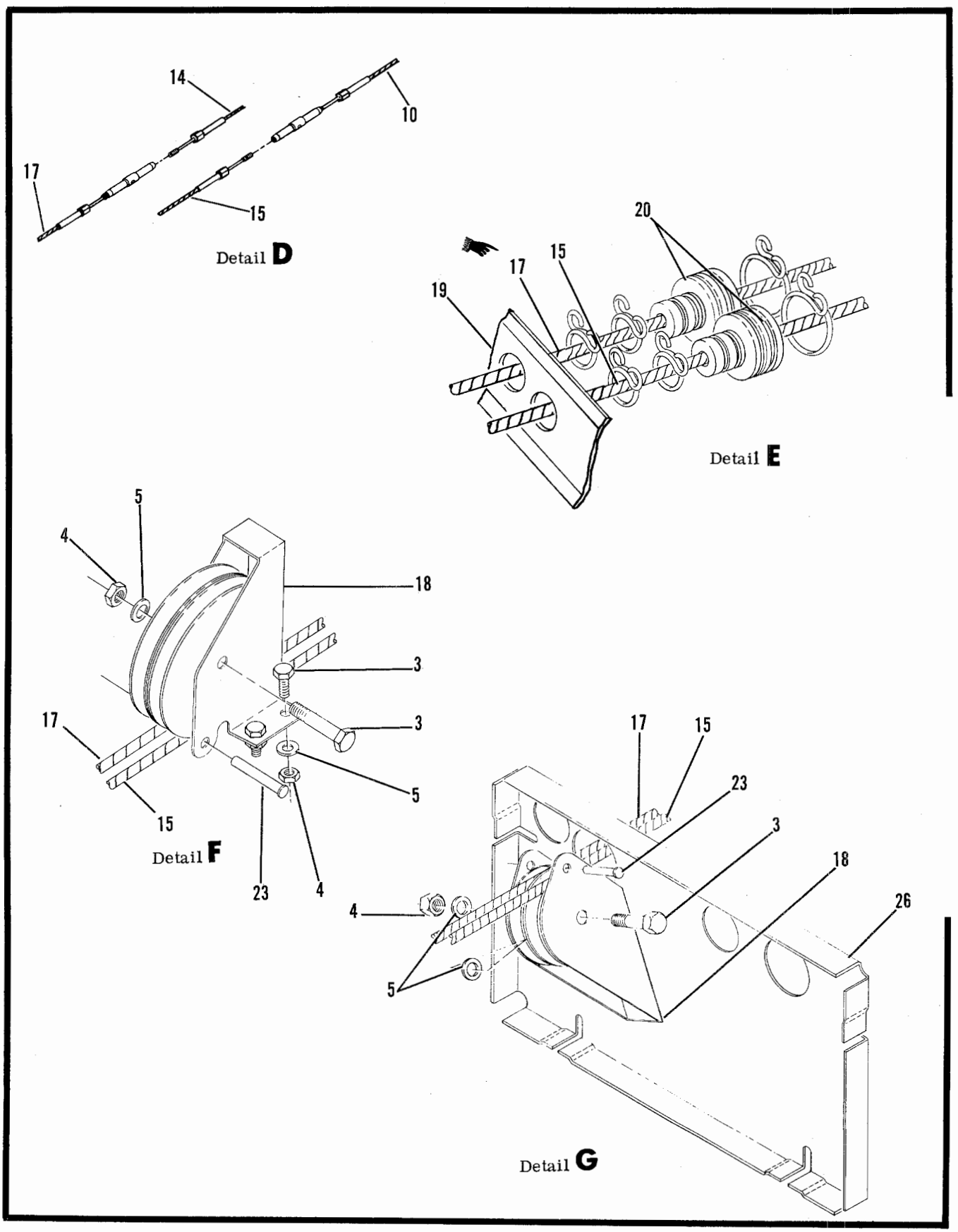
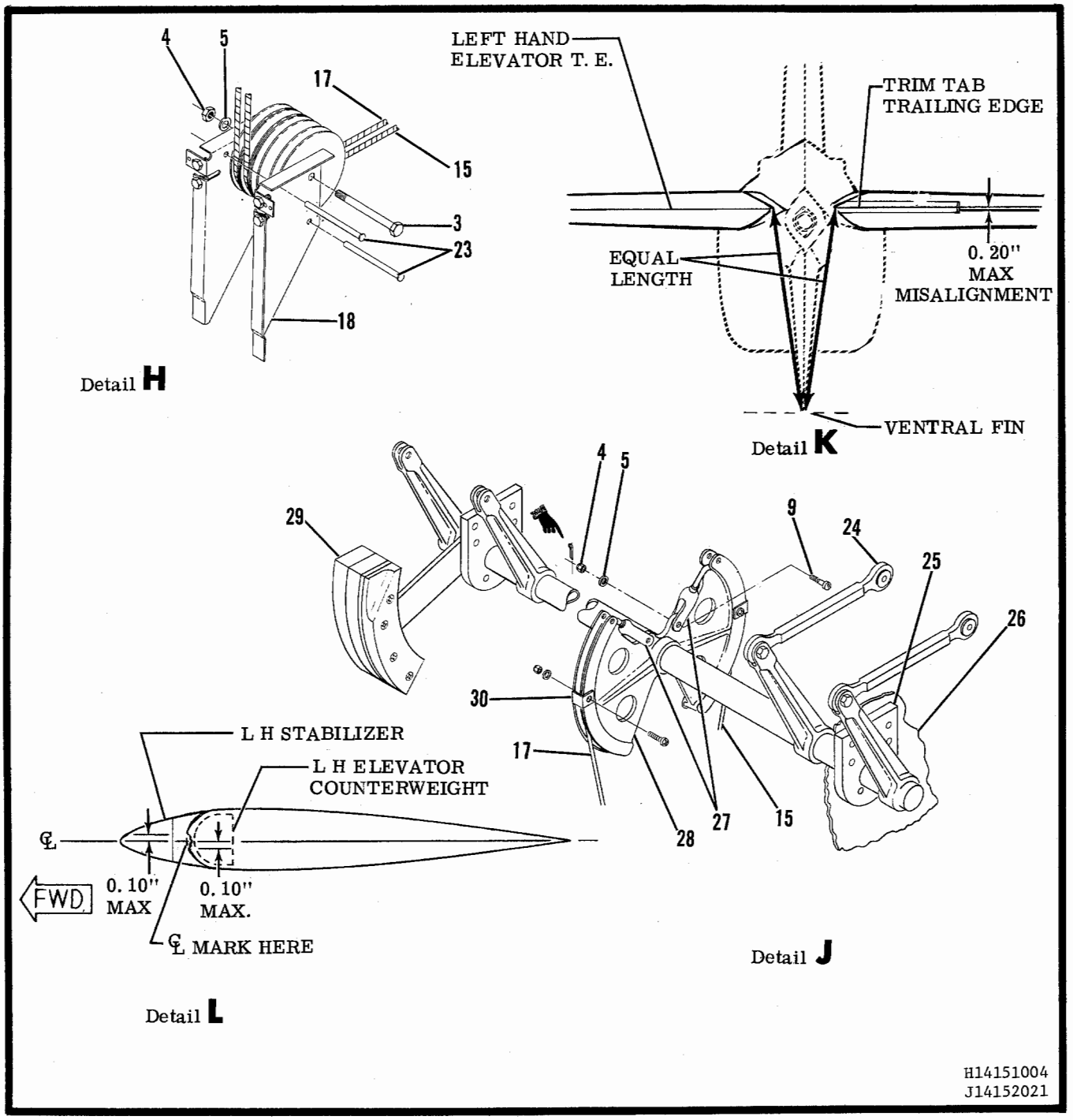



Figure 6-2. Elevator Control System (Sheet 2)




1. Elevator Torque Tube
2. Elevator Pylon
3. Bolt
4. Nut
5. Washer
6. Push-Pull Tube
7. Hinge Bracket
8. Spacer
9. Screw
10. Left Elevator Cable (Aft)
11. Elevator Stop
12. Bellcrank
13. Rigging Pin Hole
14. Right Elevator Cable (Aft)
15. Left Elevator Cable (Forward)
16. Bracket
17. Right Elevator Cable (Forward)
18. Bracket
19. Adapter Plate
20. Seal
21. Bracket
22. Bracket
23. Guard Pin
24. Push-Rod
25. Bearing Pad
26. Support
27. Clevis
28. Quadrant
29. Bob Weight

Figure 6-2. Elevator Control System (Sheet 3)

tab push-rod connects the trim tab actuator to the elevator trim tab which is mounted to the right elevator by a continuous hinge. The adjustable turnbuckles and stop blocks are located in the tailcone for the cable tension and elevator trim tab travel adjustment.

Troubleshooting Elevator Trim Tab Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB | Cable tension too low. | Adjust cables in accordance with elevator trim control rigging instructions. |
| | Broken pulley. | Replace pulley. |
| | Cables not in place on pulley. | Install cables correctly. Check cable guards. |
| | Worn trim tab actuator. | Repair or replace actuator. |
| RESISTANCE TO CONTROL WHEEL MOVEMENT | Cable tension too high. | Adjust cable in accordance with elevator trim control rigging instructions. |
| | Pulleys binding or rubbing. | Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. |
| | Cable not in place on pulleys. | Install cable correctly. |
| | Trim tab actuator defective. | Repair or replace actuator. |
| INCORRECT ELEVATOR TRIM TAB TRAVEL | Stop block loose or incorrectly adjusted or control wheel not indexed properly on chain. | Adjust stop block or chain in accordance with elevator trim control rigging instructions. |
| CORRECT ELEVATOR TRIM TAB TRAVEL CANNOT BE OBTAINED BY ADJUSTING STOP BLOCK | Actuator screw incorrectly adjusted. | Adjust in accordance with elevator trim control rigging instructions. |
| INDICATOR DOES NOT INDICATE THE CORRECT TRIM POSITION | Indicator incorrectly engaged with wheel track. | Adjust in accordance with elevator trim control rigging instructions. |

Removal of Elevator Trim Control Cables and Chains. (See figure 6-3. )

a. Remove seats, carpet, tailcone access panel and necessary upholstery.
b. (See figure 1-3. ) Remove floorboards (87, 88, 89, 75, 77 and 79), elevator trim access (20), elevator bellcrank access (14), stabilizer fairings (11 and 15) and stinger (10).
c. Place a suitable support under tailcone at FS 282. 00.
d. Disconnect cables (7 and 25) and (10 and 19) by removing turnbuckles (18).
e. Remove aft pulleys (9) by removing nut, washer and bolt (5).
f. Loosen screws and remove chain guard (12).
g. Remove chain (6) from sprocket (13), tie a guide wire on chain and pull cables (7 and 10) out into the tailcone of the aircraft.
h. Tie a guide wire on cables (19 and 25). Remove the necessary cable guard pins and pulleys as illustrated.
i. Remove seals (26) from adapter plate by removing retaining rings.
j. Remove elevator trim control wheel (27) by removing four screws and washers.
k. Remove pedestal side panels.
l. Remove chain (6) from sprocket (29), pull chain (6) and cables (19 and 25) out into the forward cabin area, routing in guide wire to facilitate installation.

Installation of Elevator Trim Control Cables and Chains. (See figure 6-3. )

a. Tie guide wires at pedestal to turnbuckle ends of cables (19 and 25), pull into position through fuselage into tailcone and remove guide wire.

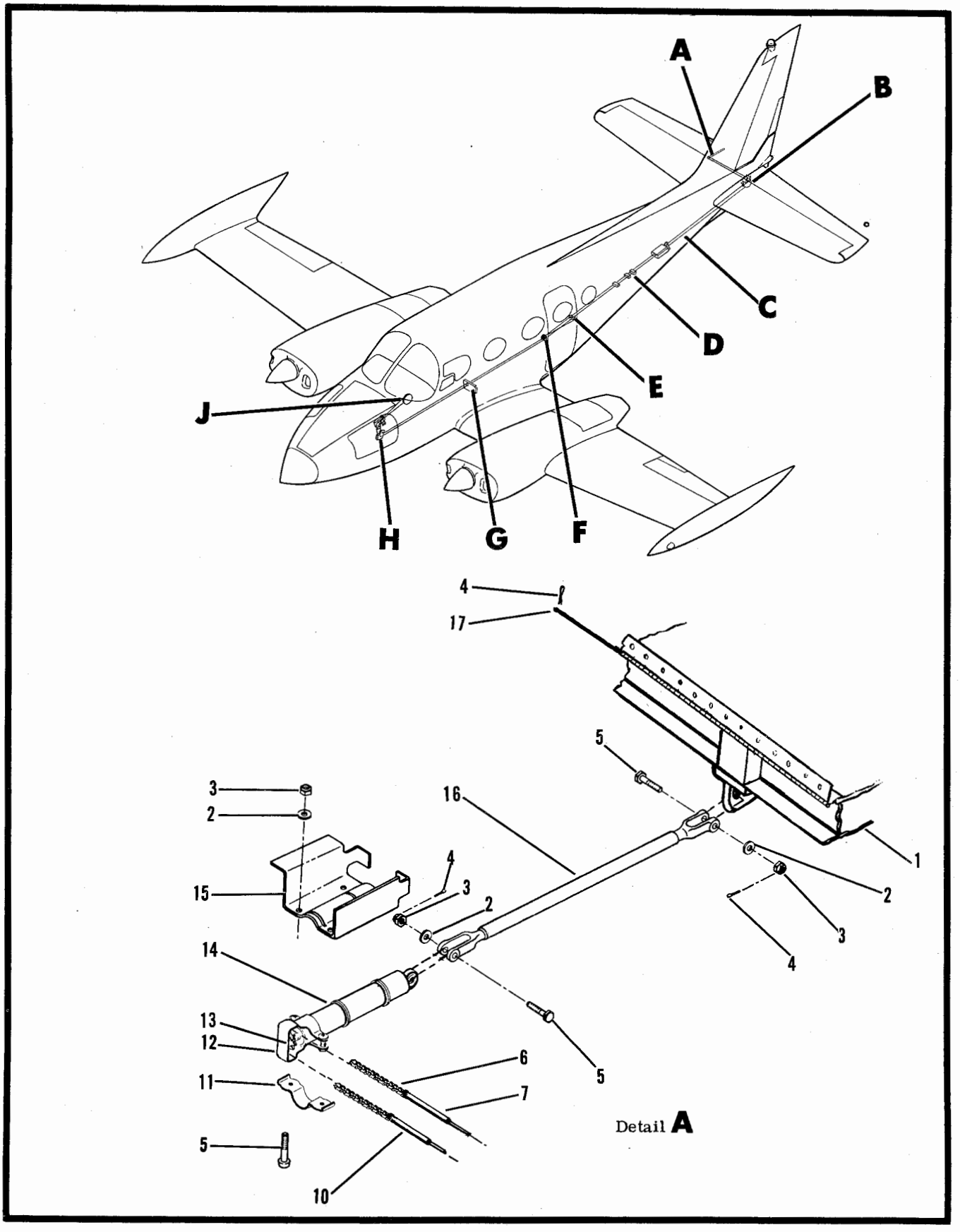



Figure 6-3. Elevator Trim Control System (Sheet 1)

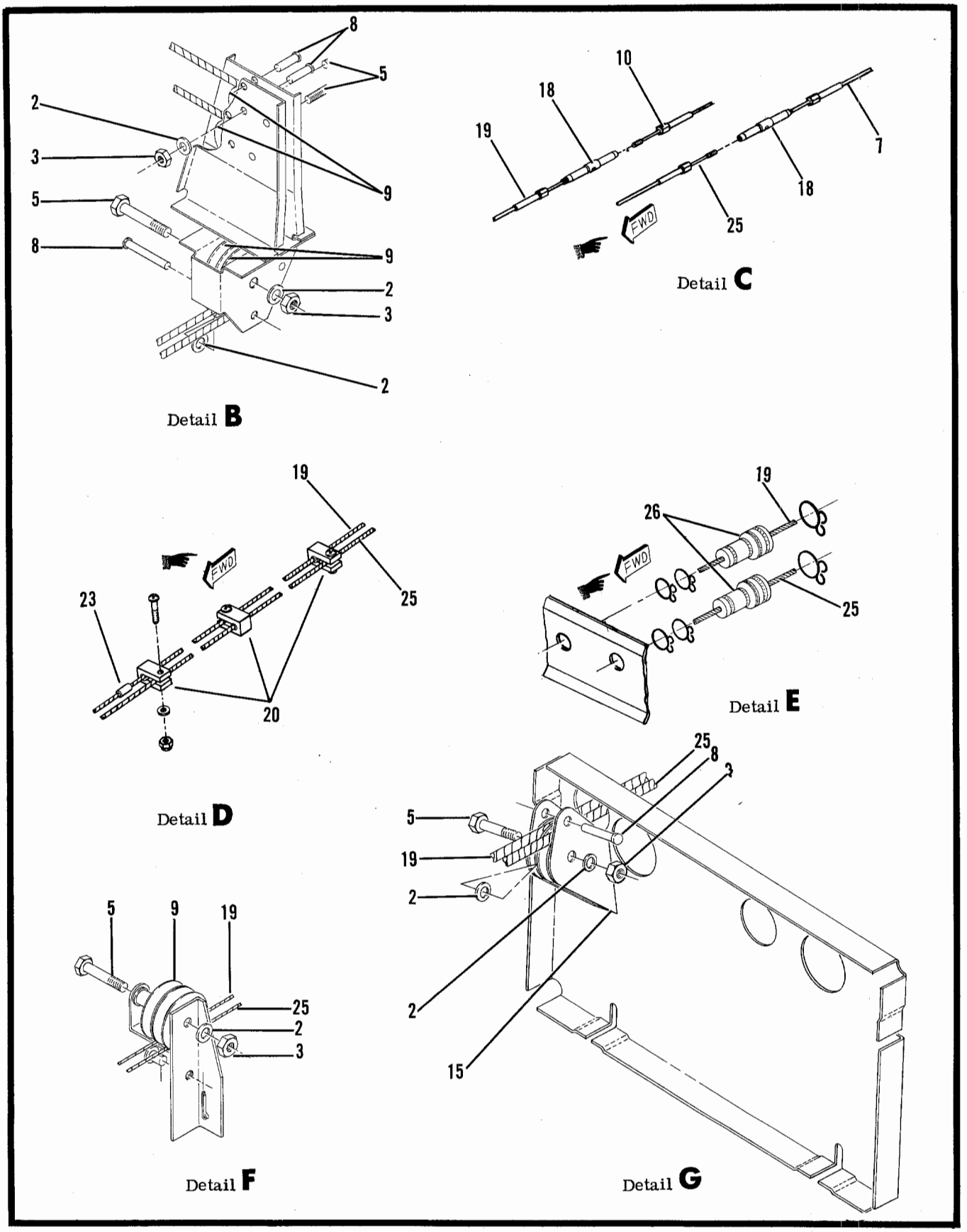
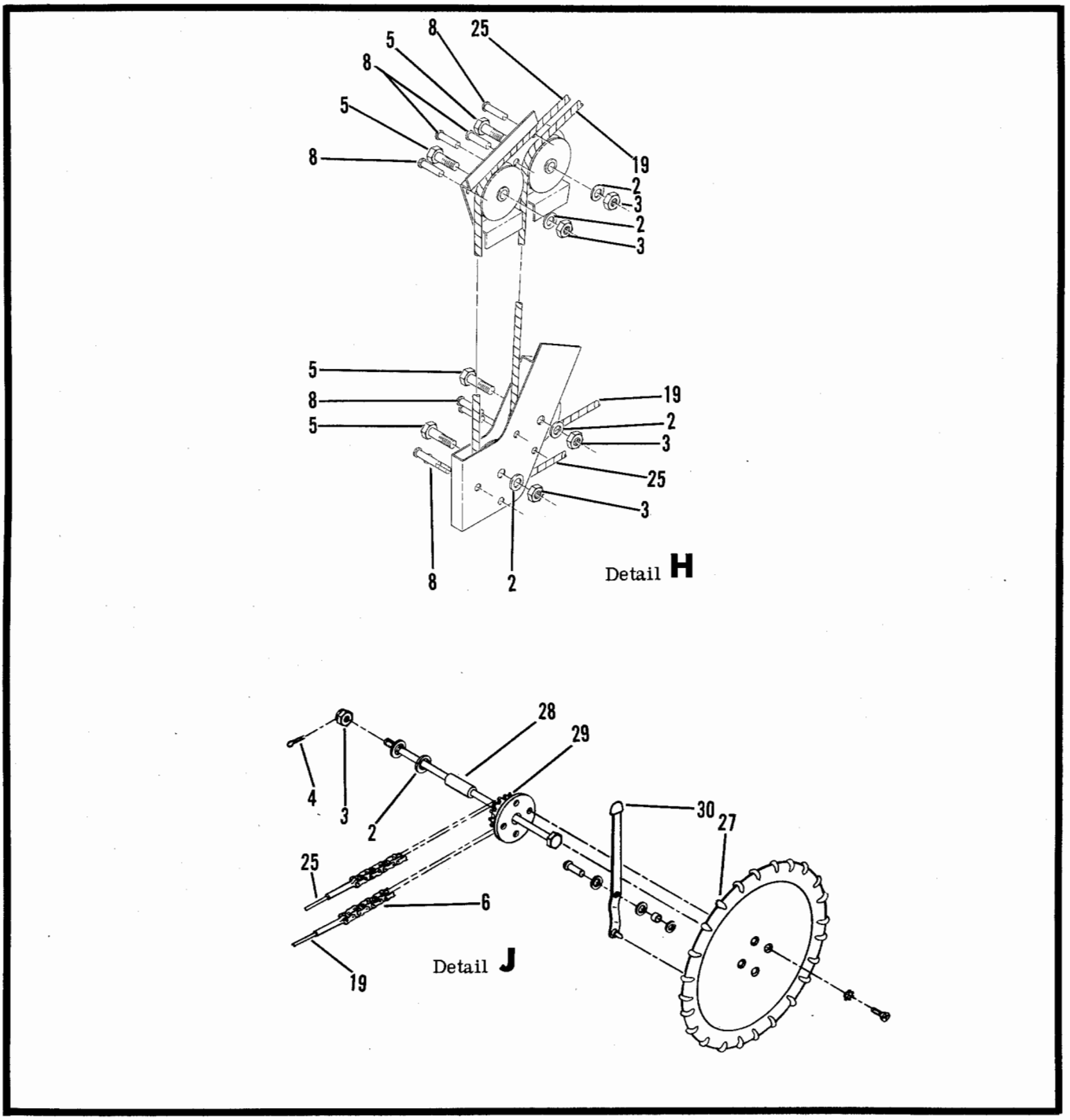



Figure 6-3. Elevator Trim Control System (Sheet 2)




1. Trim Tab
2. Washer
3. Nut
4. Cotter Pin
5. Bolt
6. Chain
7. Left Aft Cable
8. Pulley Guard Pin
9. Pulley
10. Right Aft Cable
11. Clamp
12. Chain Guard
13. Sprocket
14. Actuator
15. Bracket
16. Push-Pull Tube
17. Hinge Pin
18. Turnbuckle
19. Right Forward Cable
20. Stop Block
21. Washer
22. Nut
23. Bushing
24. Screw
25. Left Forward Cable
26. Seal
27. Control Wheel
28. Bearing
29. Sprocket
30. Pointer

Figure 6-3. Elevator Trim Control System (Sheet 3)

b. Install chain (6) over sprocket (29), install pulleys and guard pins.
c. Tie guide wire to chain (6), pull into position in stabilizer, install chain (6) over sprocket (13) and install pulleys and guard pins.
d. Connect cables (7 and 10) and cables (19 and 25) with turnbuckle (18).
e. Install seals (26) in accordance with the elevator control cable seal installation procedures
f. Install stop blocks (20) and bushings (23) on cables (19 and 25). Do not tighten at this time.
g. Rig elevator trim control in accordance with rigging of elevator trim control system.
h. Install stabilizer fairings, stinger, access palte and floorboards.
i. Install tailcone access panel, carpets and seats. Check for proper operation of trim tab.

Removal of Elevator Trim Tab Actuator. (See figure 6-3.)

a. Remove tailcone access panel.
b. (See figure 1-3.) Remove stinger (10) and elevator trim access (20).
c. Unsafety and loosen turnbuckles (18) to release tension on elevator trim cables.
d. Remove right elevator in accordance with elevator removal procedures.
e. Disconnect push-pull tube (16) from trim tab actuator screw end by removing cotter pin, nut, washer and bolt (5).
f. Remove chain guard (12) from elevator trim tab actuator (14) by removing nuts and screws, and disengage chain from sprocket (13).
g. Remove elevator trim tab actuator by removing nuts, screws and clamps securing actuator and remove out through access opening.

Disassembly of Elevator Trim Tab Actuator. (See figure 5-5.)

The instructions for disassembly, overhaul and assembly of aileron trim tab actuator given in Section 5 are the same procedures for the disassembly, overhaul and assembly of elevator trim tab actuator.

Installation of Elevator Trim Tab Actuator. (See figure 6-3.)

a. Insert elevator trim tab actuator (14) through access hole into position and install clamps and screws to secure.
b. Install push-pull tube (16) to trim tab actuator screw end with bolt (5), washers, nut and cotter pin.
c. Install right elevator in accordance with installation procedures.
d. Engage chain (6) with sprocket (13) and install chain guard (12) using screws and nuts.
e. Rig elevator trim control in accordance with rigging procedures.
f. Install tailcone access panel elevator trim access and stinger, and check for proper operation of trim tab.

Removal of Elevator Trim Control Wheel, Sprocket and Indicator Assembly. (See figure 6-3.)

a. Remove tailcone access panel.
b. Unsafety and loosen turnbuckles (18) to release tension on elevator trim control system.
c. Remove four screws and washers from control wheel (27).
d. Remove left and right side panels from pedestal.

NOTE

To remove the elevator trim indicator assembly, the rivet around which the indicator pivots must be removed.

e. Disengage chain (6) from sprocket (29).
f. Remove sprocket (29) from pedestal by removing cotter pins, nut, washer, bearing (28) and bolt.

Installation of Elevator Trim Control Wheel, Sprock- and Indicator Assembly. (See figure 6-3.)

a. Install sprocket (29) with bolt, bearing (28), washer, nuts and cotter pin.
b. Engage chain (6) with sprocket (29) and install right and left pedestal side panels.
c. Install trim indicator with rivet.
d. Install control wheel (27) with washers and screws.
e. Rig the elevator control system in accordance with rigging procedures.
f. Install tailcone access panel.

Rigging of Elevator Trim Control System. (See figure 6-3.)

a. Remove tailcone access panel.
b. Loosen stop blocks (20) by loosening nuts.
c. Unsafety turnbuckle (18) and adjust tension on the elevator trim control cables to 16 ±3 pounds, and safety turnbuckle (18).

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

NOTE

If an autopilot is installed, adjust tension on elevator trim control cables to 22 ±2 pounds.

NOTE

If an electric elevator trim control is installed in addition to the autopilot, adjust tension on elevator trim control cables to 22 ±2 pounds.

d. (See figure 6-1.) Disconnect elevator trim tab push-pull tube (3) from elevator trim tab horn (5) by removing attaching nut, washer and bolt.
e. Rotate elevator trim control wheel (27) forward (nose down) until aft chain and forward chain have approximately two links clearing the sprockets.

NOTE

If the elevator trim indicator reaches its extreme travel during rigging, it can be relocated by removing elevator trim control wheel, moving the indicator and reinstalling control wheel.

f. With the chains in the above position and the elevators held in neutral position (elevator horns aligned with stabilizer) with external control locks, establish neutral position of trim tab by measuring the distance from the inboard trailing edge of the left elevator to the lower edge of the ventral fin and then position trim tab inboard trailing edge to the same dimension. Set inclinometer to 0 degrees.

NOTE

If trim tab and right-hand elevator do not align within .20 inch (see figure 6-2), the right-hand elevator and trim tab assembly must be replaced.

g. Position elevator trim tab 11 degrees up and adjust actuator screw by rotating push-pull tube so that the aft bolt hole in the push-pull tube aligns with the bolt hole in the trim tab.
h. (See figure 6-1.) Connect push-pull tube (3) to elevator trim tab horn (5) with attaching bolt, washer and nut.
i. Rotate elevator trim control wheel (27) so that elevator trim tab is 10° +1°, -0° up, locate aft stop block (20) adjacent to cable terminal, and tighten. Slide the center stop block against aft stop block and tighten.

NOTE

If an automatic pilot (optional equipment) is installed, refer to Section 13 for rigging of stop blocks.

j. Rotate elevator trim control wheel (27) so that the elevator trim tab is 16° +1°, -0° down. Slide forward stop block against the center stop block and tighten.
k. When the elevator trim control system is in either extreme position, the elevator trim indicator should be in the same relative position to the NOSE UP and NOSE DOWN positions on the decal. To adjust the indicator, use the following procedure:
1. Rotate elevator trim control wheel (27) so that elevator trim control system is in the extreme NOSE DOWN position.
2. Remove elevator trim control wheel (27) by removing four screws and washers, and place the elevator trim indicator at the NOSE DOWN position on the decal.
3. While the elevator trim indicator is in this position, install the elevator trim control wheel (27) with four washers and screws.

NOTE

The elevator trim control wheel (27) can be installed in any one of four positions. Select the position which causes the least indicator movement as it engages with the wheel track.

WARNING

Insure that elevator trim tab moves in the proper direction when operated by the trim control wheel.

l. Install tailcone access panel.

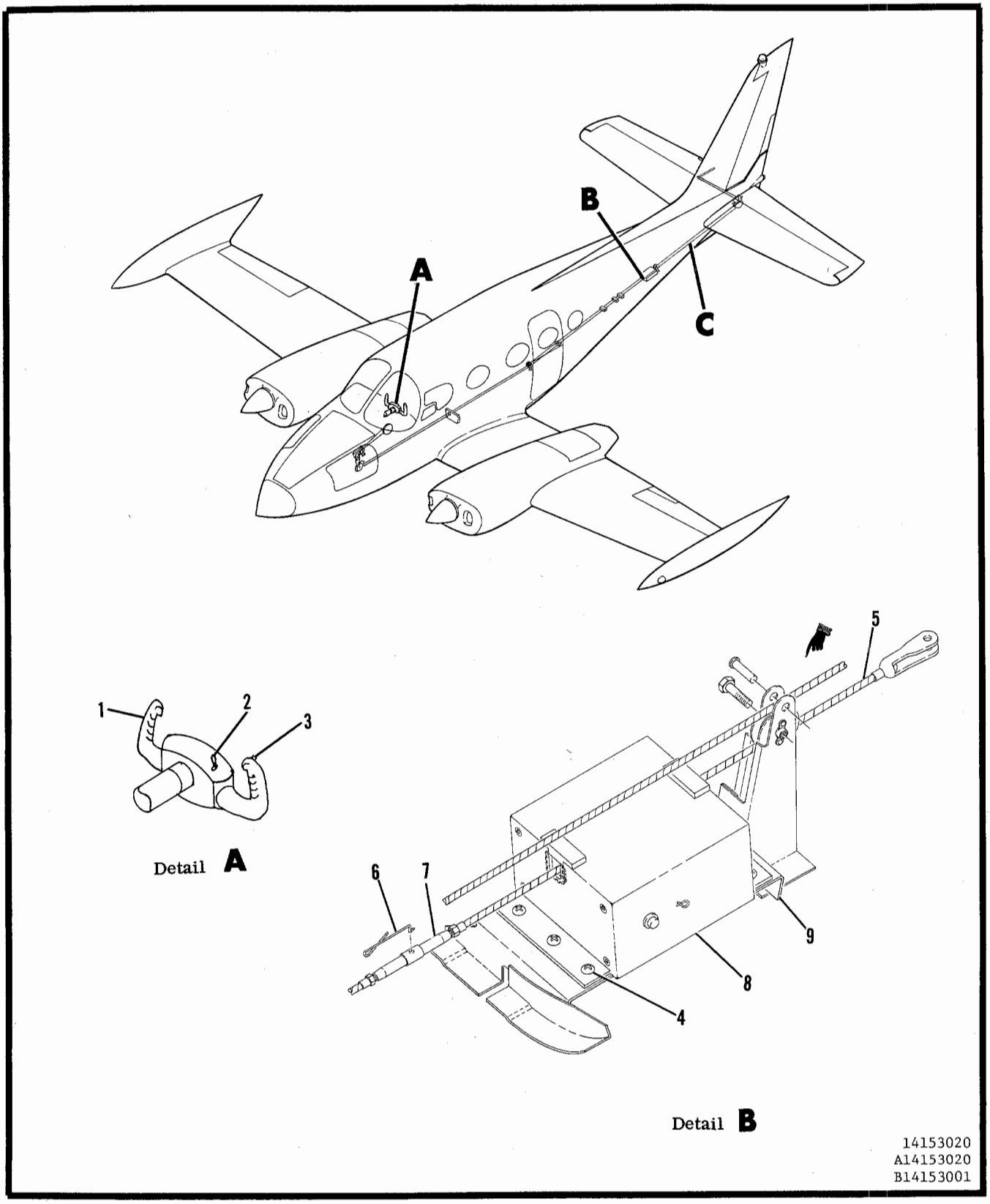
ELECTRIC ELEVATOR TRIM CONTROL SYSTEM (OPTIONAL).

The electric elevator trim control system is comprised of a single pole single throw switch, slider switch and actuator assembly. The switches are mounted in the pilot's control wheel; the actuator assembly is mounted in the tailcone at FS 330.00. The elevator trim control cable is attached to the actuator cable which is routed around the cable drum on the actuator clutch. The electric elevator trim control system is energized when the single pole single throw switch is engaged and the slider switch is moved to the forward (DOWN) or aft (UP) position. The actuator motor drives the clutch, which moves the elevator trim control cable and places the trim tab in the corresponding UP or DOWN position. Manual override is accomplished by operating the elevator trim control wheel mounted on the left side of the pedestal.

Removal of Electric Elevator Trim Actuator Assembly. (See figure 6-4.)

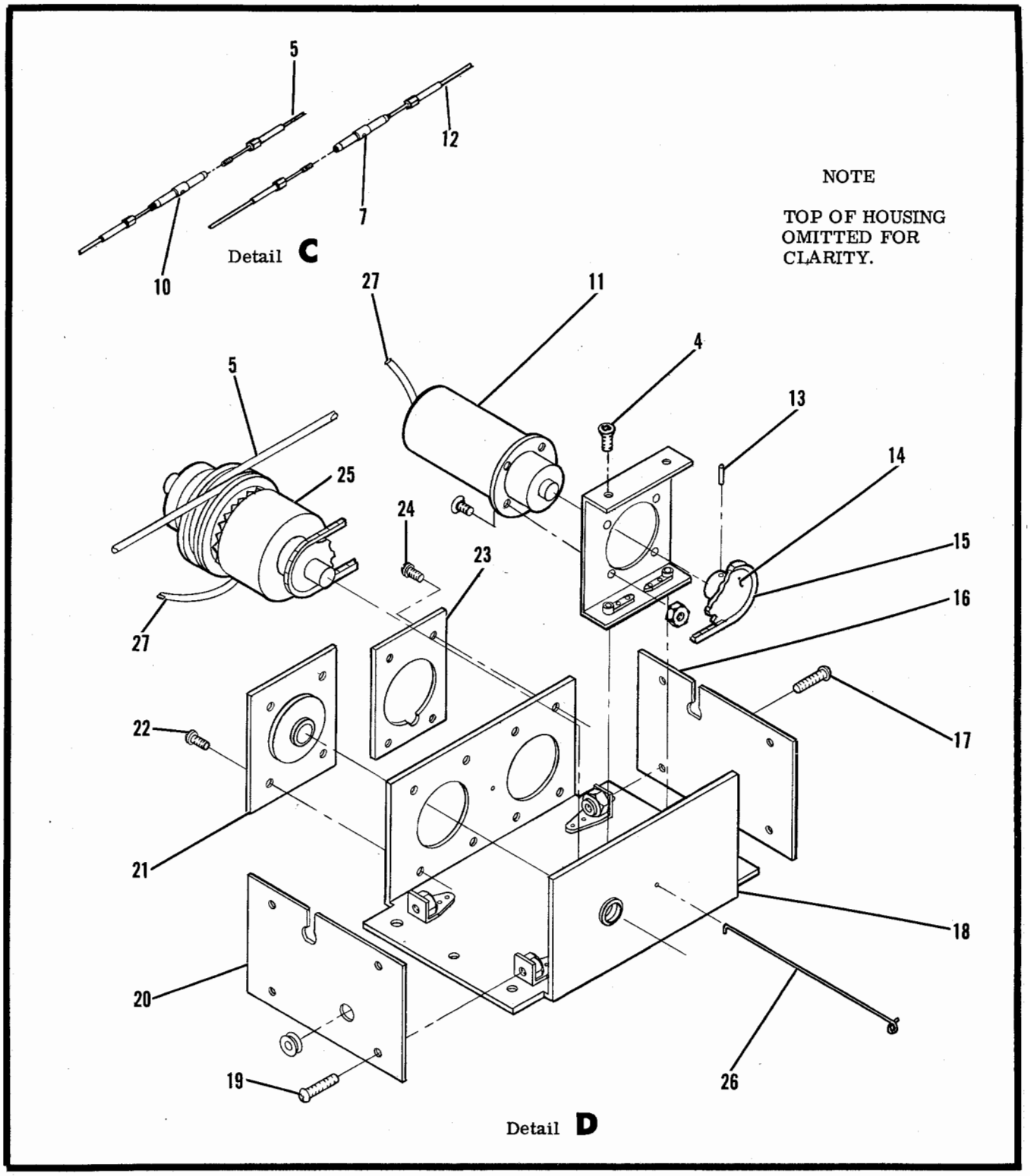
a. Remove tailcone access panel.
b. Remove locking clips from turnbuckles.
c. Disconnect turnbuckles (7 and 10) from the control cable and remove cable from drum.
d. Remove screws (4) attaching actuator assembly (8) to support (9) disconnect electrical wiring (27) and remove actuator assembly.

6




1. Control Wheel
2. Switch
3. Switch
4. Screw
5. Control Cable
6. Locking Clip
7. Turnbuckle
8. Actuator Assembly
9. Support

Figure 6-4. Electric Elevator Trim Control System (Sheet 1)




10. Turnbuckle
11. Motor Assembly
12. Trim Followup Cable
13. Pin
14. Sprocket
15. Chain Assembly
16. Cover
17. Screw
18. Housing
19. Screw
20. Cover
21. Cover Assembly
22. Screw
23. Support Assembly
24. Screw
25. Clutch Assembly
26. Cable Guard
27. Electrical Wire

Figure 6-4. Electric Elevator Trim Control System (Sheet 2)

Disassembly and Assembly of Electric Elevator Trim Actuator Assembly. (See figure 6-4.)

a. Loosen screws ( 4, 17 and 19) and remove top and side covers (16 and 20).
b. Loosen screws (22 and 24) and remove cover assembly (21), support assembly (23) and cable guard (26).
c. Slide clutch assembly (25) from housing (18) and remove chain assembly (15) from clutch assembly (25) and sprocket (14).
d. Remove control cable (5) from clutch assembly (25).
e. Remove motor assembly (11) from housing (18).
f. Clean component parts by wiping with a clean cloth saturated with a suitable solvent.
g. Check clutch assembly sprocket and sprocket (14) for broken, chipped and worn teeth.
h. Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all defective parts and install new parts during reassembly.
i. Adjust clutch assembly (25) to slip at 25 ±3 inch-pounds.
j. During assembly, lubricate clutch assembly (25) in accordance with Lubricating Chart.
k. Install motor assembly (11) in housing (18).
l. Install control cable (5) on clutch assembly (25).

NOTE

Clutch assembly cable drum and control cable must be free of grease and oil and control cable must make two full wraps around the cable drum.

m. Install chain assembly (15) on sprocket (14) and clutch assembly sprocket and slide clutch assembly into housing (18).
n. Install support assembly (23), cover assembly (21) and secure with screws (22 and 25).
o. Install cable guard (26) in housing (18).
p. Install top and side covers (16 and 20) and secure with screws ( 4, 17 and 19).

Installation of Electric Elevator Trim Actuator Assembly. (See figure 6-4.)

a. Install actuator assembly (8) on support (9) and secure with screws (4).
b. Connect electrical wiring (27).
c. Connect turnbuckles (7 and 10) to elevator trim control cable.
d. Install locking clips (6) in turnbuckles.
e. Rig elevator trim control system in accordance with the rigging procedures, except cable tension should be 18 ±3 pounds.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

f. Install rear upholstery panel to tailcone.

SECTION 7

# RUDDER AND TRIM CONTROL SYSTEM

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CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

## RUDDER.

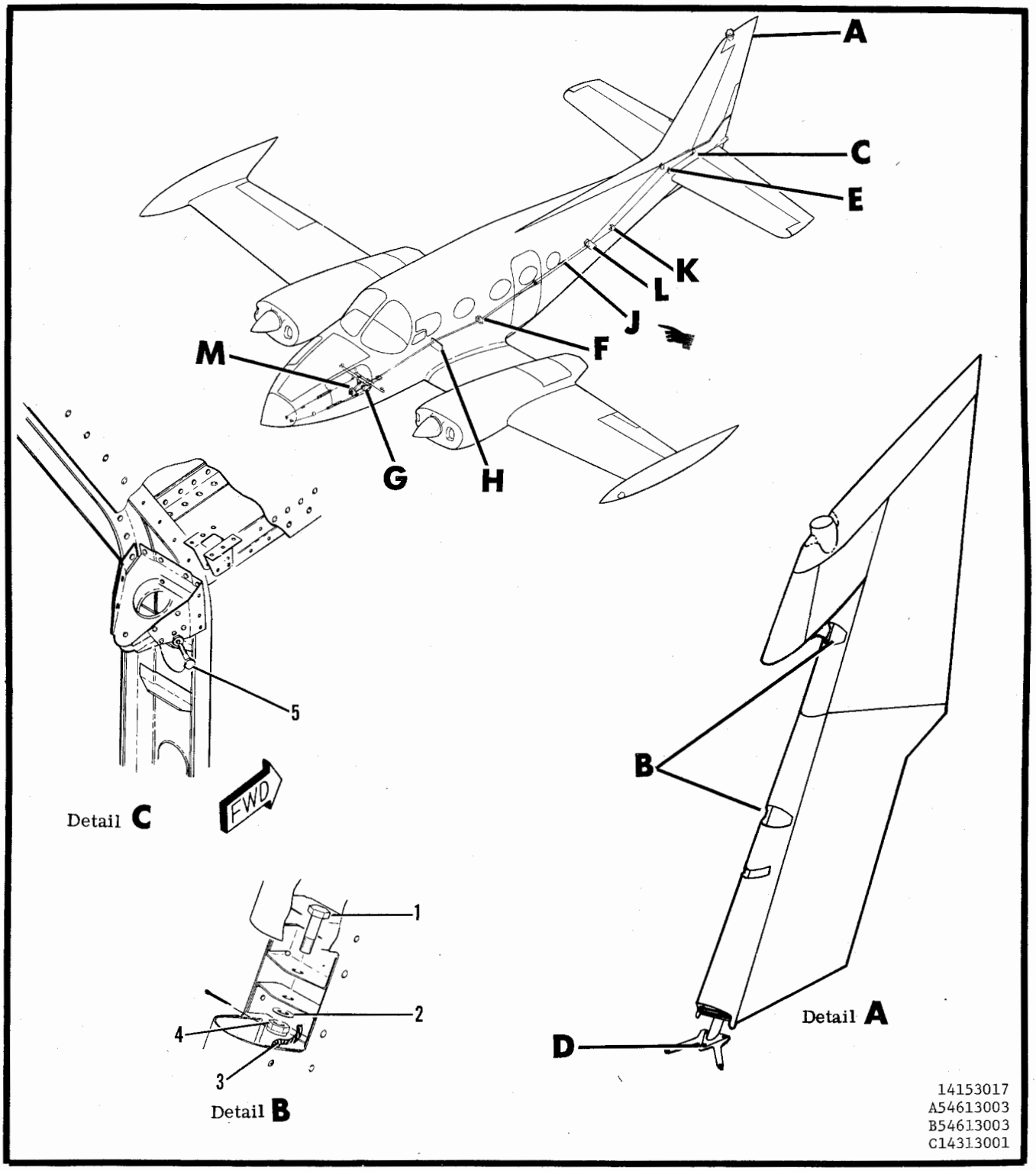
The all-metal rudder has a fiberglass tip which encloses a lead weight used for static balance. The rotating beacon is installed in the fiberglass tip. The rudder trim tab, located at the trailing edge of the rudder, is actuated by a push-pull tube which is routed through the rudder to an actuator in the vertical fin. The rudder attached to the vertical fin with three hinges, is operated by cables attached to a bellcrank to the lower hinge. The rudder is 100% static balanced by means of a lead weight enclosed in the leading edge.

### Removal of Rudder. (See figure 7-1.)

a. Place a suitable support beneath the tailcone at station 282.00.
b. Refer to Section 3 and remove stinger in accordance with removal procedures.
c. Remove cotter pin, nut, washer and bolt from rudder trim tab push-pull tube (4, figure 7-2).
d. Remove three cotter pins, nuts, washers and bolts attaching rudder torque tube (11) to bellcrank (10).
e. Disconnect bonding straps (3) from vertical stabilizer.
f. Support rudder and remove nuts (4) washers (2) and bolts (1) from hinges.
g. Remove rudder from vertical stabilizer by pulling aft and guiding rudder trim tab push-pull tube (4, figure 7-2) through rudder.

### Installation of Rudder. (See figure 7-1.)

a. Place rudder into position, guide rudder trim tab push-pull tube through rudder and align mounting holes on upper and center hinges with vertical stabilizer.
b. Attach rudder to vertical stabilizer at the upper and center hinges with bolts (1), washers (2) and nuts (4).
c. Attach rudder torque tube (11) to bellcrank (10) with three bolts, washers, nuts and cotter pins.
d. (See figure 7-2.) Connect rudder trim tab push-pull tube (4) to trim tab horn (6) with bolt, washer, nut and cotter pin.
e. Remove support from beneath tailcone and check rudder and rudder trim tab for proper operation and correct travel. If rigging is necessary, rig in accordance with rigging procedures.
f. Refer to Section 3 and install stinger in accordance with installation procedures.




1. Bolt
2. Washer
3. Bond Strap
4. Nut
5. Rudder Stop Bolt
6. Link
7. Left Aft Rudder Cable
8. Turnbuckle
9. Terminal
10. Rudder Bellcrank
11. Rudder Torque Tube
12. Right Aft Rudder Cable
13. Seal
14. Right Forward Rudder Cable
15. Left Forward Rudder Cable
16. Bracket
17. Bracket
18. Position Cable
19. Seal
20. Left Forward Nose Gear Steering Cable
21. Spring
22. Left Aft Nose Gear Steering Cable
23. Left Rudder Torque Tube
24. Right Rudder Torque Tube

Figure 7-1. Rudder and Rudder Control System (Sheet 1)

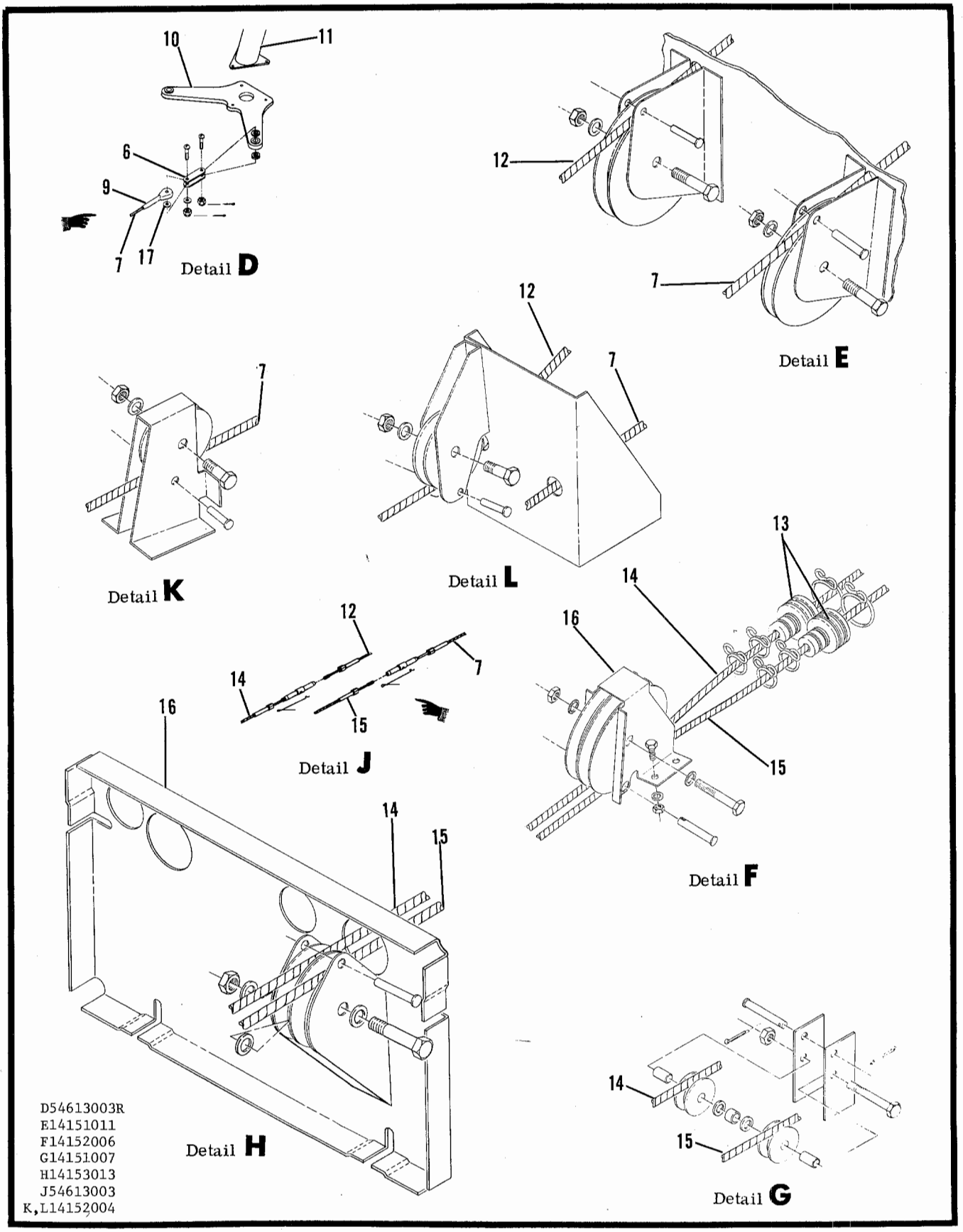



Figure 7-1. Rudder and Rudder Control System (Sheet 2)

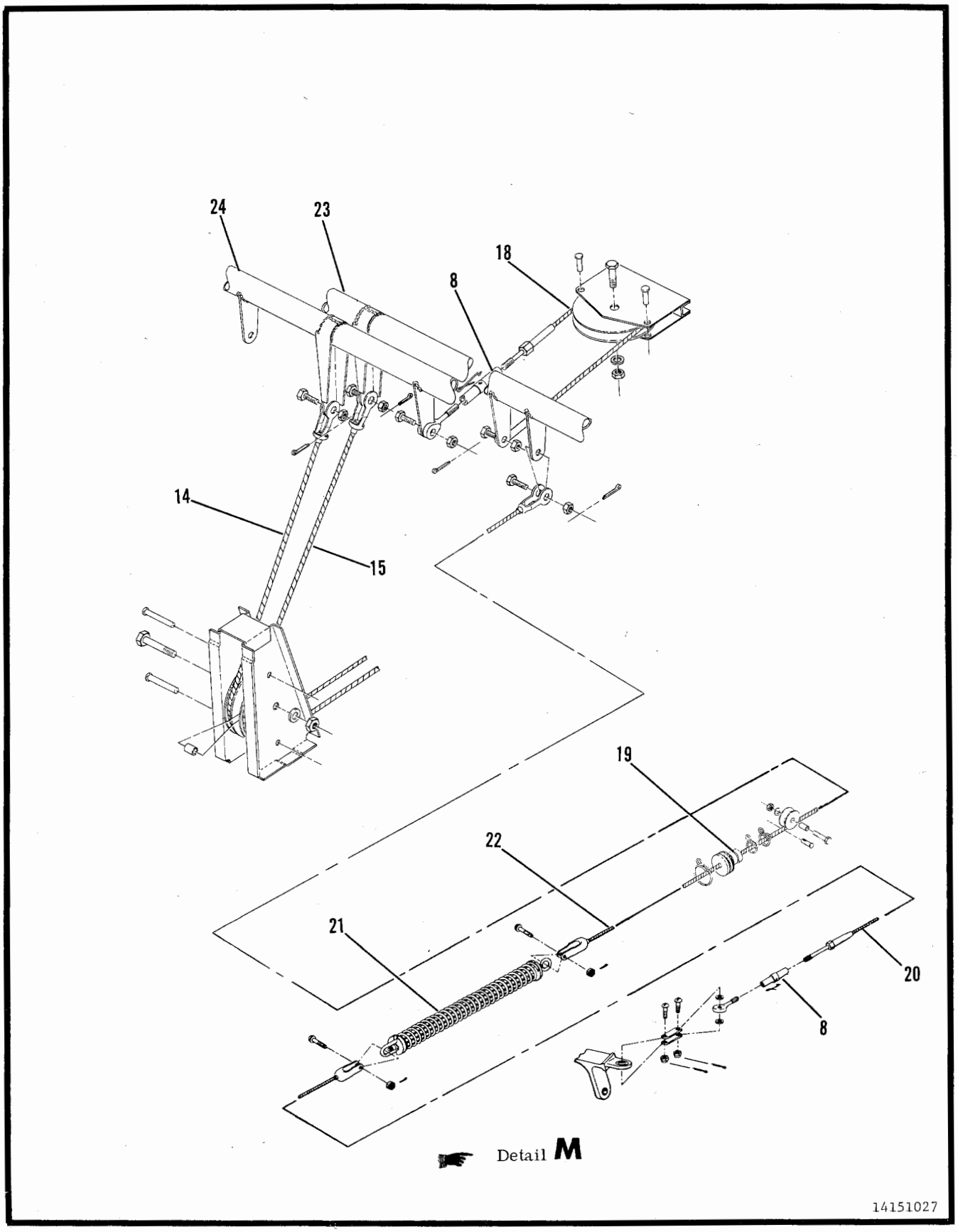
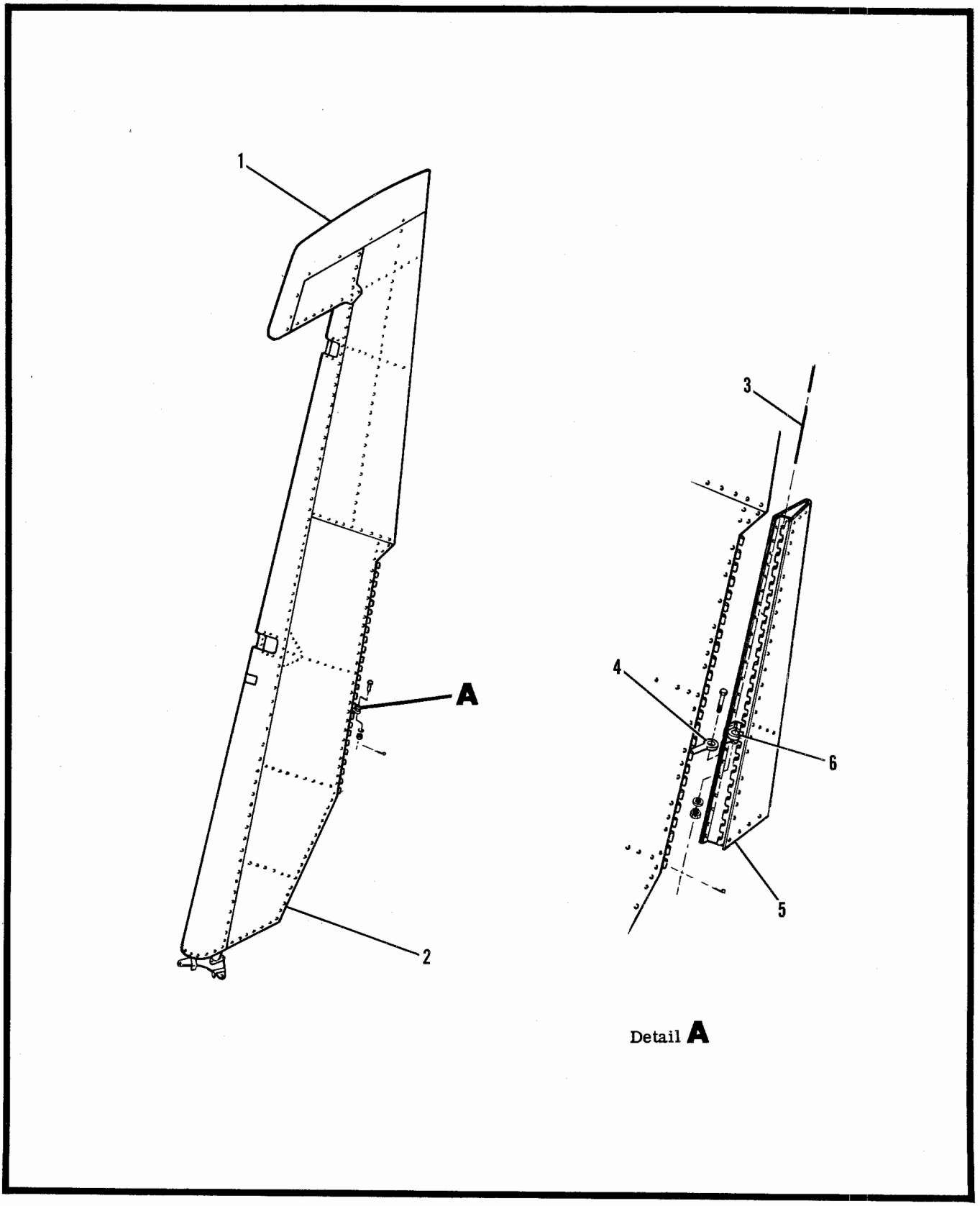



Figure 7-1. Rudder and Rudder Control System (Sheet 3)




1. Fiberglass Tip
2. Rudder
3. Hinge Pin
4. Push-Pull Tube
5. Trim Tab
6. Trim Tab Horn

Figure 7-2. Rudder and Rudder Trim Tab

RUDDER TRIM TAB.

The all-metal rudder trim tab is operated by a push-pull tube extending through the rudder and attached to an actuator in the vertical fin. The tab is attached to the lower trailing edge of the rudder by a continuous hinge and is adjustable in flight.

Removal of Rudder Trim Tab. (See figure 7-2.)

a. Turn rudder trim control wheel on pedestal until indicator is pointing to full right position.
b. Disconnect rudder trim tab push-pull tube (4) by removing cotter pin, nut, washer and bolt.
c. Remove trim tab from rudder by removing cotter pins and hinge pin (3).

NOTE

Any further disassembly or assembly of the rudder trim tab is not advisable.

Installation of Rudder Trim Tab. (See figure 7-2.)

a. Attach rudder trim tab to rudder with hinge pin (3) and cotter pins.
b. Connect rudder trim tab push-pull tube (4) to trim tab horn (6) with bolt, washer and nut.
c. Check rudder trim tab for proper operation and correct travel. Rig in accordance with rigging procedures.

RUDDER CONTROL SYSTEM.

The rudder is operated by the movement of the pilot's rudder pedals (copilot's optional equipment). The pedals are connected to torque tubes which have link arms for the attachment of the rudder cables. The rudder cables are attached to the torque link arms and routed forward over a pulley and then aft under the floorboards and through the tailcone by pulleys to the adjustable turnbuckles which are attached to the rudder bellcrank. The bellcrank is attached directly to the rudder torque tube and also provides the lower hinge for the rudder. The rudder travel stops, consisting of bolts mounted in brackets attached to the lower hinge bracket, are provided for the recommended travel adjustment. The position cable is attached to the left rudder torque tube and is routed aft around a pulley and then forward to right rudder torque tube to complete the rudder control cable system. The nose gear steering cables are attached to the right and left rudder torque tubes; routed forward to springs and then to the nose gear steering bellcrank.

Troubleshooting Rudder Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER | Cable tension too low. | Adjust in accordance with rigging procedures. |
| | Broken pulley. | Replace pulley. |
| | Bolts attaching rudder to bellcrank are loose. | Tighten bellcrank bolts. |
| EXCESSIVE RESISTANCE TO RUDDER PEDAL MOVEMENT | Cable tension too high. | Adjust in accordance with rigging procedures. |
| | Pulleys binding or rubbing. | Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. |
| | Rudder binding because of faulty bearings or bent hinges. | Replace bearings and/or hinges. |
| | Rudder pedal torque tube bearings misaligned or need lubrication. | Loosen bearing halves, lubricate and retighten. Refer to Section 2 for lubrication requirements. |
| | Cables not in place on pulleys during installation. | Install cables correctly. |
| | Bent rudder. | Repair or replace rudder. |
| RUDDER PEDALS NOT NEUTRAL WHEN RUDDER IS STREAMLINED | Aft rudder cables incorrectly rigged. | Rig in accordance with rigging procedures. |

Troubleshooting Rudder Control System. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| INCORRECT RUDDER TRAVEL | Rudder bellcrank stop incorrectly adjusted. | Adjust in accordance with rigging procedures. |
| CORRECT RUDDER TRAVEL CANNOT BE OBTAINED | Rudder pedals contacting fuselage bulkhead. | Rig position cable, nose wheel, steering cables, and rudder cables in accordance with rigging procedures. |

Removal of Rudder Control Cables. (See figure 7-1.)

a. Refer to Section 3 and remove necessary seats, carpets and upholstery.
b. Refer to figure 1-2 and remove the necessary access plates, fairings and cabin floorboards (88) to gain access to rudder cables.

NOTE

If optional autopilot is installed, disconnect autopilot cables from rudder bellcrank when removing aft rudder cables (7 and 12).

c. Remove safety clip and loosen turnbuckle (8).
d. Remove aft rudder cables (7 and 12) from rudder bellcrank (10) by removing cotter pins, nuts, washers, bolts and links (6).
e. Remove cable guards and pulleys from pulley fuselage stations (FS) 363.70, 314.00 and 296.80 and remove aft rudder cables (7 and 12).
f. Disconnect left and right forward rudder cables (14 and 15) from left and right rudder torque tubes (23 and 24) by removing cotter pins, nuts and bolts.
g. Remove seals (13) at FS 252.00 by removing retaining rings and pressure seal out of plate aft.
h. Remove cable guards and pulleys from FS 208.16, 171.00 and 111.00.
i. Tie guide wires to forward ends of forward rudder cables (14 and 15) and pull aft into tailcone, routing guide wire through pulley brackets.

CAUTION

Tension on nose wheel steering system must be released before removing position cable (18).

j. Remove position cable (18) by removing cotter pins, nuts and bolts.
k. Refer toSection 4 for removal of nose gear steering system.

Installation of Rudder Control Cables. (See figure 7-1.)

a. Installation of rudder control cables is the reversal of the removal procedures.
b. Install seals (13) on rudder cables (14 and 15) and seal (19) on nose gear steering system cable as follows:
1. Insure that cables are lubricated for the full length of its travel within the seals.
2. Pack the seals with MIL-G-81322A Lubricant.
3. Place seals on cable on non-pressurized side of bulkhead with small end toward bulkhead.
4. Insert seal in the bulkhead hole so that bulkhead metal is seated within the retaining groove of seals and the small end of seal is in the pressurized section.
5. Install proper retaining rings in the grooves of the seal (two on small end and one on large end).
c. Rig rudder control system in accordance with rigging of the rudder control system.

Removal of Rudder Bellcrank. (See figure 7-1.)

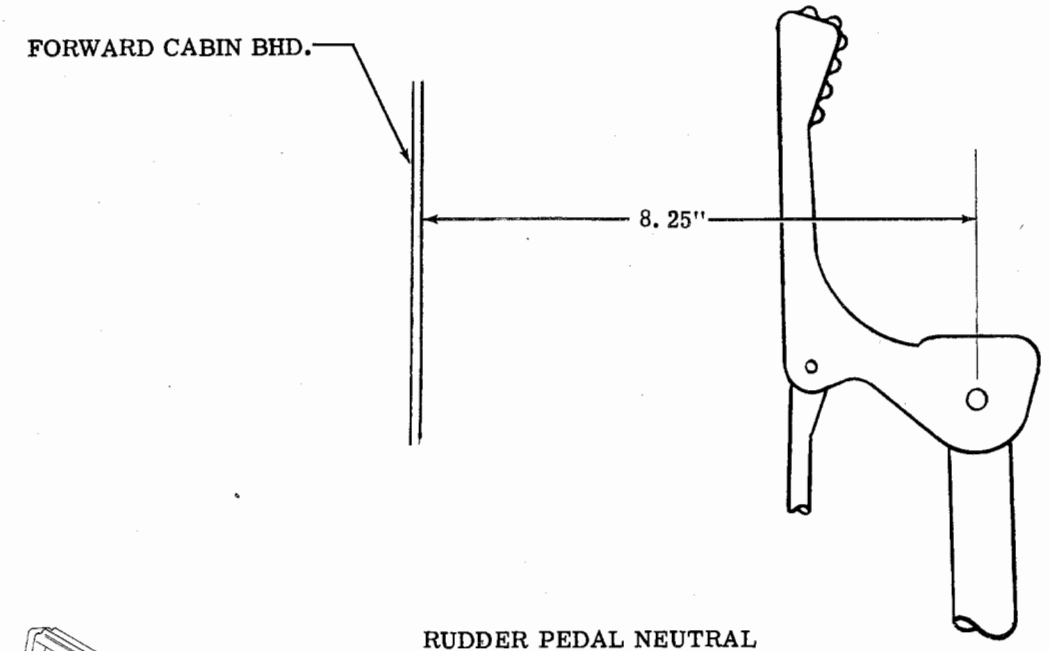
a. (See figure 1-3.) Remove stabilizer fairings.
b. Remove turnbuckle clips and loosen either turnbuckle (8) (to release tension on rudder cables).
c. Disconnect rudder cables (7 and 12) from rudder bellcrank (10) by removing cotter pins, nuts, washers and bolts.
d. Remove nut, washer and bolt from rudder bellcrank hinge.
e. Remove rudder bellcrank (10) from the rudder torque tube by removing nut, washer and bolt.

Installation of Rudder Bellcrank. (See figure 7-1.)

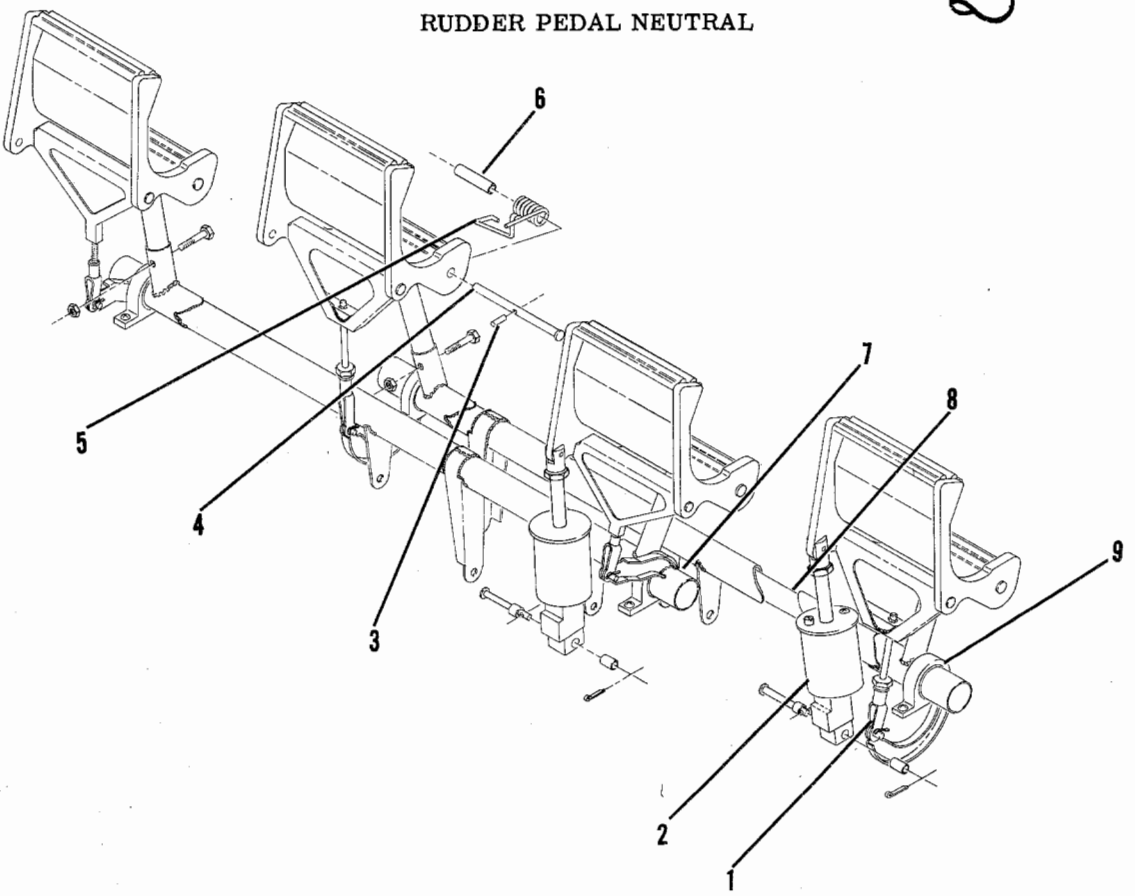
a. Reverse the rudder bellcrank removal procedures except the installation of the stabilizer fairings.
b. Rig rudder control system in accordance with rigging of rudder control system.

Removal of Rudder Pedal Assembly. (See figure 7-3.)

a. Remove pilot's seat and copilot's seat, and carpet in accordance with Section 3.
b. (See figure 1-3.) Remove pilot's floorboard, copilot's floorboard and center floorboard.
c. Release tension on nose wheel steering cables, rudder cables and rudder position cable.
d. Remove five cables from rudder torque tubes (8) by removing cotter pins, nuts, washers and bolts.
e. Disconnect brake master cylinders (2) from the pilot's rudder pedals by removing cotter pins and pins.
f. Remove four brake links (1) from rudder pedal torque tubes by removing cotter pins, spacers and pins.
g. Remove rudder pedal assemblies by removing




RUDDER PEDAL NEUTRAL




1. Brake Link
2. Brake Master Cylinder
3. Roll Pins
4. Pin
5. Spring
6. Spacer
7. Brake Torque Tube
8. Rudder Torque Tube
9. Bearing

Figure 7-3. Rudder Pedal Assembly

eight screws from rudder pedal bearing housings.

NOTE

The rudder pedal bearing housings are pressed on the rudder torque tube and should be removed only for replacement.

Disassembly of Rudder Pedal Assembly. (See figure 7-3.)

a. Remove brake links (1) by removing cotter pins and pins.
b. Remove pilot's and copilot's rudder pedals by driving out roll pins (3) and removing pins (4), springs (5) and spacers (6).

NOTE

Copilot's rudder pedals do not have springs (5) and spacers (6) installed.

c. Remove brake torque tubes (7) from rudder pedal torque tubes (8) by removing cotter pins, pins and couplers.
d. Bearing (9) in rudder pedal torque tube and torque arm are press fit and should be removed only, if during an inspection, it is determined that the bearings need to be replaced.

Assembly of Rudder Pedal Assembly. (See figure 7-3.)

a. Insert brake torque tubes (7) into rudder pedal torque tubes (8) and install couplings using pins and cotter pins.
b. Install rudder pedals on rudder pedal torque tube arms using spacers (6), springs (5), pins (4), and roll pins (3).

NOTE

Copilot's rudder pedals do not have springs (5) and spacers (6) installed.

c. Install brake links (1) using pins and cotter pins.

Installation of Rudder Pedal Assembly. (See figure 7-3.)

a. Install the rudder pedal assembly by placing the bearing housings over attached nutplates and install the eight screws.

NOTE

During the installation of rudder pedal assemblies, lubricate in accordance with Section 2. Rudder pedal torque tubes must rotate freely in bearings.

b. Connect brake links (1) to rudder pedal torque tubes (8) with pins, spacers and cotter pins.
c. Connect brake master cylinders (2) to pilot's rudder pedals with pins and cotter pins.
d. Attach rudder cables, nose wheel steering cable and position cable to rudder pedal torque tube with bolts, washers, nuts and cotter pins.
e. Rig rudder control system in accordance with rigging of the rudder control system.
f. Install pilot's floorboard, copilot's floorboard and brake cylinder access.
g. Install center floorboard, carpet, and pilot's and copilot's seats.

Rigging of Rudder Control System. (See figure 7-1.)

a. Remove seats, cover plates and carpet in accordance with Section 3.
b. (See figure 1-3.) Remove floorboards, necessary access covers and stabilizer fairings.
c. Remove turnbuckle clips from the rudder system turnbuckles (8).
d. Adjust the position cable (18), which is a "balance" cable, used to close the rudder system. The position cable turnbuckle (8) should be adjusted so that the pivot point of the rudder pedals are 8.12 to 8.38 inches from the forward cabin bulkhead. (See figure 7-3.)
e. With the nose wheel and rudder pedals in neutral position, adjust the nose wheel steering cables tension to 20 ±5 pounds.

NOTE

Figure 7-5 illustrates one method of determining center and correct travel measurements.

f. With the nose wheel and rudder pedals in neutral, adjust the rudder bellcrank turnbuckles so that the cable tension is 25 ±5 pounds while the rudder is in neutral position.

NOTE

The tension on the nose wheel steering cables and the aft rudder cables operate in the same direction. If either cable is adjusted, it will be necessary to recheck the tension on the opposite cable which was not adjusted.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperatue to stabilize for a period of 4 hours.

g. Adjust the rudder bellcrank stop bolts (5) so that the rudder travel is 32° +1°, -0° left and 32° +1°, -0° right (measured perpendicular to the rudder hinge line).
h. Resafety stop bolts (5) and install turnbuckle clip on all turnbuckles.
i. (See figure 7-3.) Check the tips of the pilot's rudder pedals for alignment and if needed, adjust

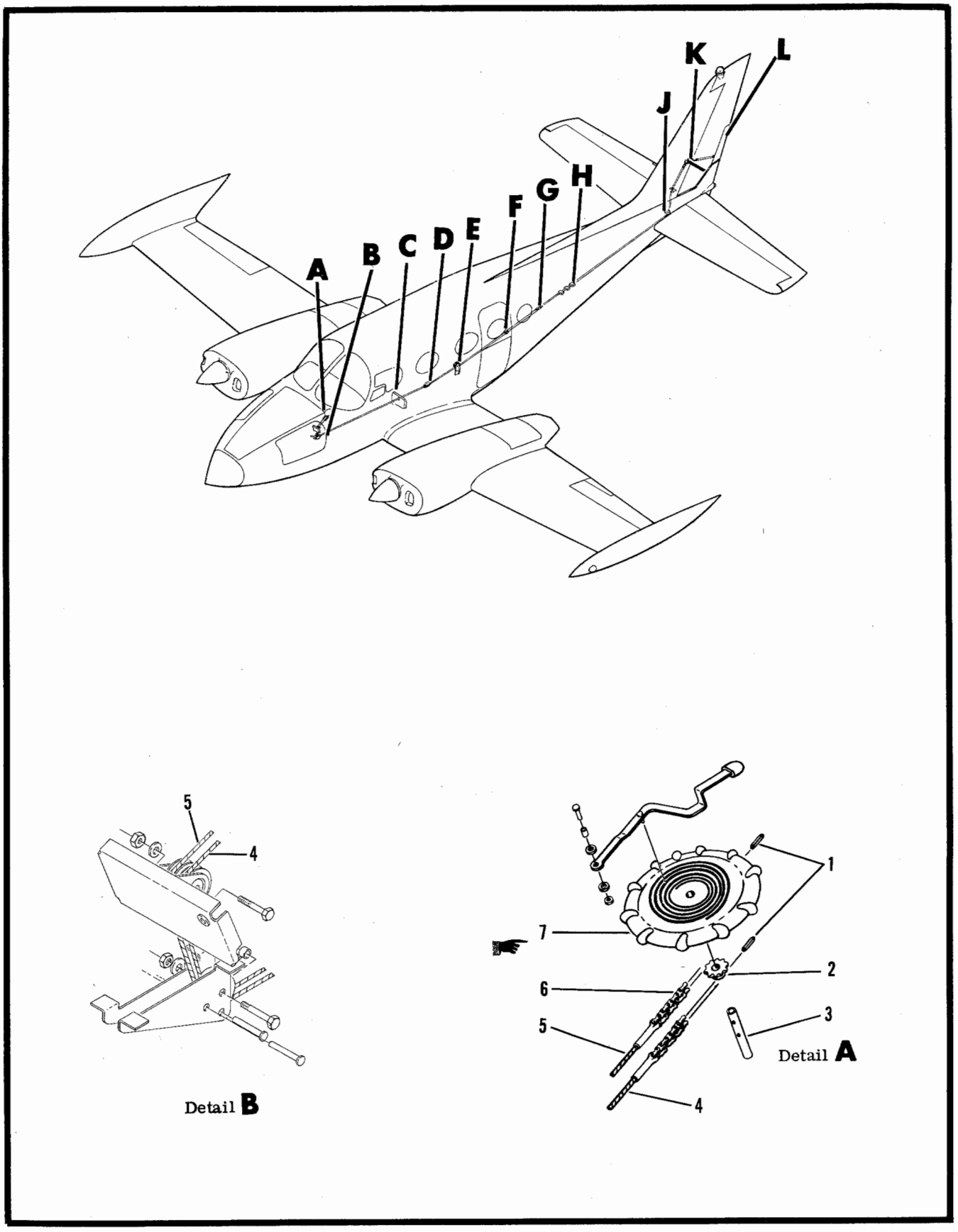



Figure 7-4. Rudder Trim Control System (Sheet 1)

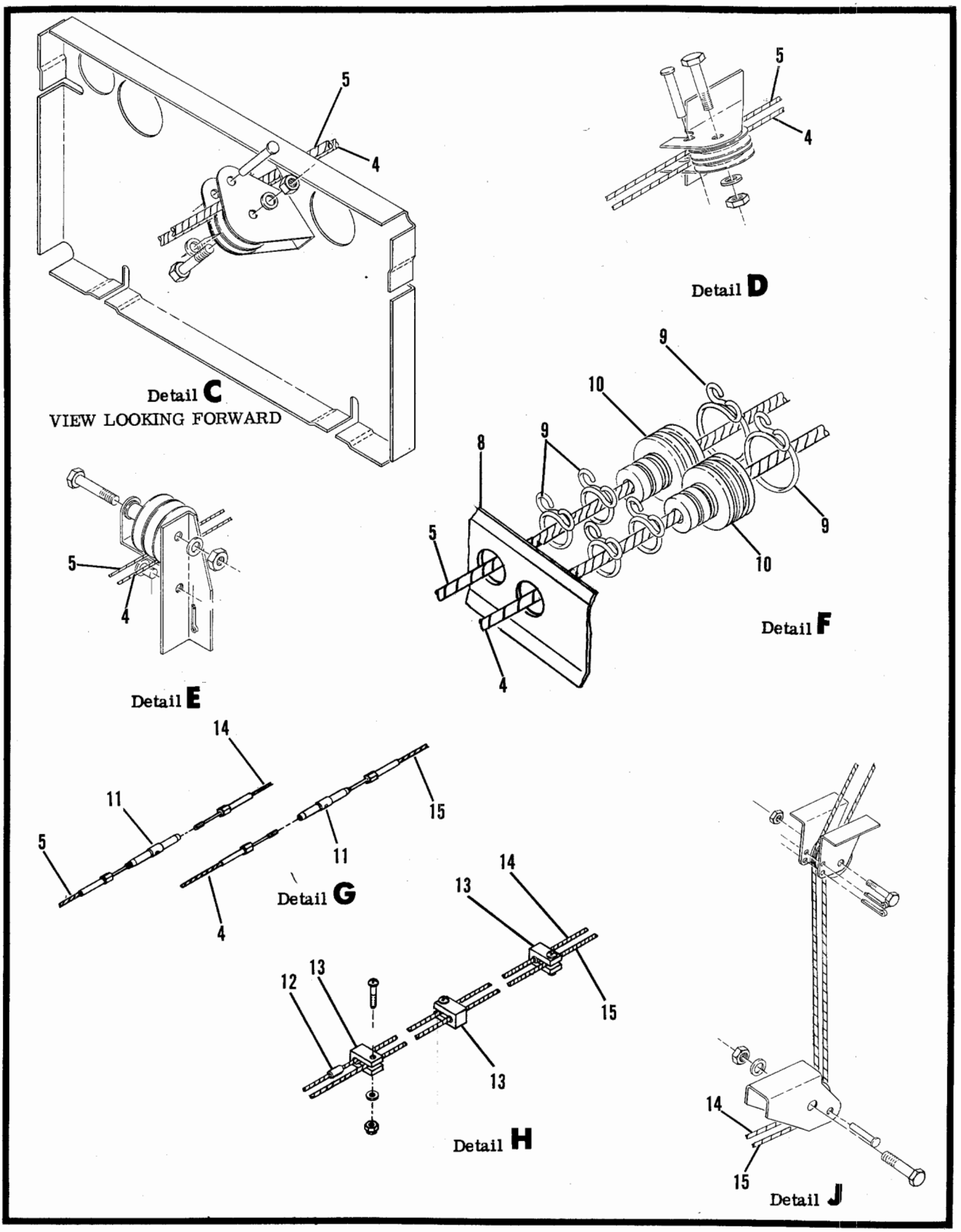
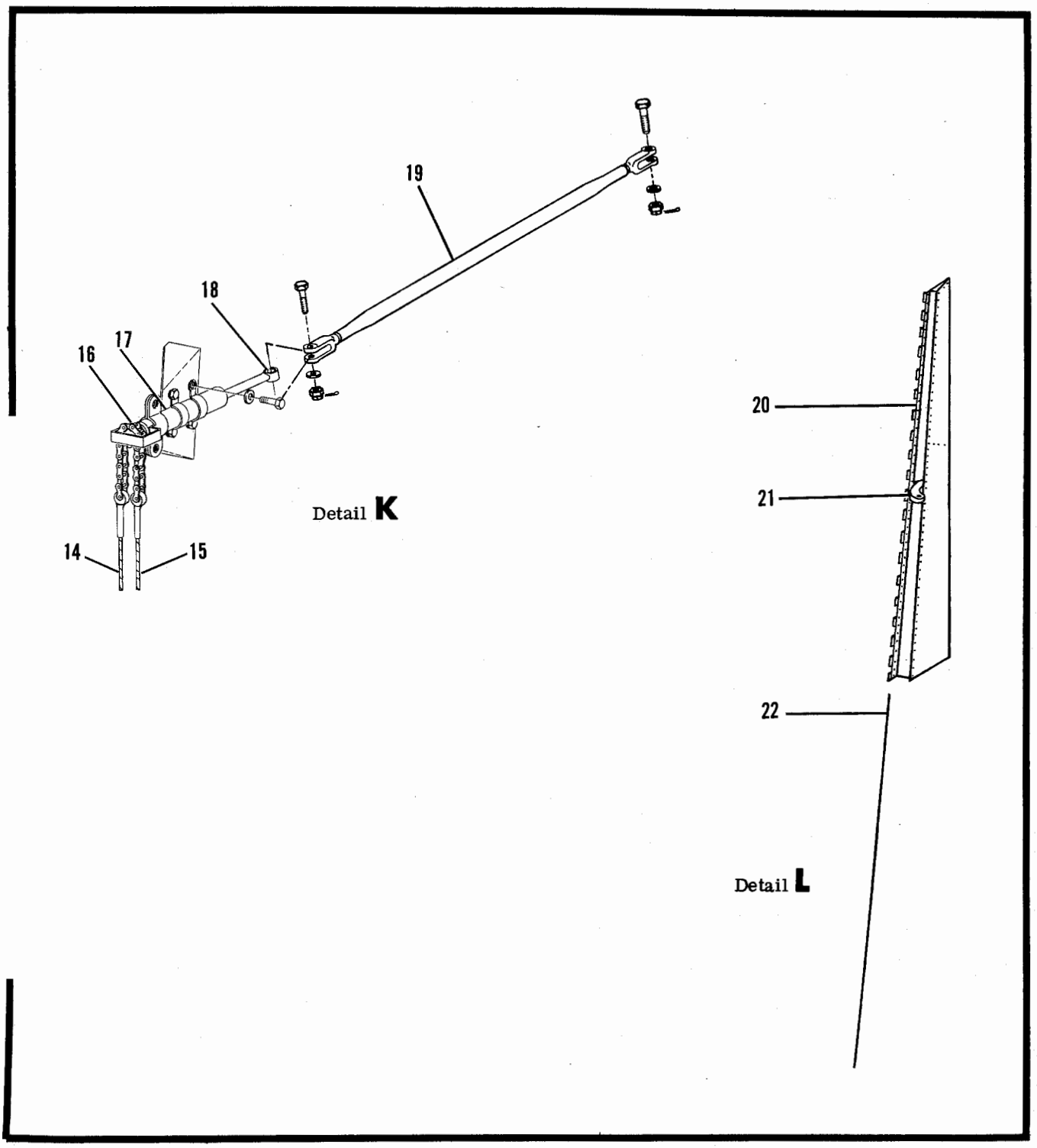



Figure 7-4. Rudder Trim Control System (Sheet 2)




1. Pin
2. Sprocket
3. Shaft
4. Left Forward Cable
5. Right Forward Cable
6. Forward Chain
7. Control Wheel
8. Plate
9. Retainer Rings
10. Seal
11. Turnbuckle
12. Bushing
13. Stop Block
14. Right Aft Cable
15. Left Aft Cable
16. Aft Chain
17. Actuator
18. Actuator Screw
19. Push Rod
20. Trim Tab
21. Trim Tab Horn
22. Hinge Pin

Figure 7-4. Rudder Trim Control System (Sheet 3)

clevis rod ends on brakes master cylinders. Check and adjust the copilot's rudder pedals for alignment.

WARNING

Insure that rudder moves the proper direction when operated by the rudder pedals.

j. Install access covers, stabilizer fairings and tailcone access.
k. Install floorboards, carpets and seats.

RUDDER TRIM CONTROL SYSTEM.

The rudder trim tab is operated by a control wheel mounted on the aft side of the pedestal. The control wheel is attached to a sprocket which drives a chain and cables. The chain and cables are routed by pulleys, forward and down through the pedestal under the floor and aft to the tailcone of the aircraft. In the tailcone, the cables are routed aft to pulleys mounted on the aft side of the vertical stabilizer rear spar, then up and through the vertical stabilizer, to a chain which operates the trim tab actuator. The trim tab push rod connects the trim actuator to the rudder trim tab which is mounted to the rudder by a continuous hinge. The adjustable turnbuckles, for cable tension adjustment, are located under the floorboard aft of the pedestal. The stop blocks are located in the tailcone for adjustment of the rudder trim tab travel.

7

Troubleshooting Rudder Trim Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| RESISTANCE TO CONTROL WHEEL MOVEMENT | Cable tension too high. | Adjust cables in accordance with rudder trim control rigging instructions. |
| | Pulleys binding or rubbing. | Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. |
| | Cable not in place on pulleys. | Install cable correctly. |
| | Trim tab actuator defective. | Repair or replace actuator. |
| | Trim tab hinge binding. | Lubricate hinge. If necessary, replace. |
| LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB | Cable tension too low. | Adjust cables in accordance with rudder trim control rigging instructions. |
| | Broken pulley. | Replace pulley. |
| | Worn trim tab actuator. | Repair or replace actuator. |
| INCORRECT TRIM TAB TRAVEL | Stop block loose or incorrectly adjusted. | Adjust stop block in accordance with rudder trim control rigging instructions. |
| CORRECT RUDDER TRIM TAB TRAVEL CANNOT BE OBTAINED BY ADJUSTING STOP BLOCK | Actuator screw incorrectly adjusted. | Adjust in accordance with rudder trim control rigging instructions. |
| | Indicator incorrectly engaged with control wheel. | Adjust in accordance with rudder trim control rigging instructions. |

Removal of Rudder Trim Control Cables and Chains. (See figure 7-4.)

a. Remove seats, carpet, pedestal cover and tailcone access door in accordance with Section 3.
b. (See figure 1-3.) Remove center floorboards, center and aft to gain access to cables, pulleys and attachment points.
c. (See figure 1-3.) Remove stabilizer fairing, vertical stabilizer access and tailcone access.
d. Remove rudder trim stop blocks (13) and bushings by removing nut, washer and screw.
e. Unsafety turnbuckles (11) and disconnect cables by removing turnbuckles.
f. Remove chain guard from rudder trim actuator (17) by removing nuts, washers and screws.
g. Remove the necessary pulleys by removing cable guard pins, nuts, washers and bolts.
h. Disengage aft chain (16) from actuator sprocket, attach a guide wire to the chain and remove cables and chain from vertical stabilizer by pulling out through opening in tailcone.

i. Remove seals (10) by removing retaining rings (9).
j. Remove necessary pulleys from under cabin floorboards and control pedestal by removing cable guard pins, nuts, washers and bolts.
k. Remove chain from sprocket (2), tie a guide wire to the chain, and pull the cables down out through the forward center floorboard access.
l. Tie guide wires to cables (4 and 5) in tailcone and pull cables forward and out through the forward center floorboard access.

Installation of Rudder Trim Control Cables and Chains. (See figure 7-4.)

a. Tie guide wires at forward center floorboard access to turnbuckles end of cables (4 and 5); pull into position in tailcone.
b. Tie guide wires from pedestal to control chain, pull chain and cable into pedestal, remove guide wire, and install chain (6) over sprocket (2).
c. Install pulleys, guard pins, bolts, washers and nuts removed to assist in removing the cables.
d. Tie guide wire from vertical stabilizer to aft cable and chain (14 and 15), pull into position through tailcone into vertical stabilizer, remove guide wire and install chain (16) over sprocket.
e. Connect left forward cable (4) with aft cable (15) using turnbuckle (11).
f. Connect right forward cable (5) with aft cable (14) using turnbuckle (11).
g. Install stop blocks (13) and bushings (12) with screws, nuts and washers. Do not tighten at this time.
h. Install seals (10) in accordance with rudder cable seal installation procedures.
i. Rig rudder trim control in accordance with rigging of the rudder trim control system.
j. Safety turnbuckles, install stabilizer fairing and rudder actuator access panel.
k. Install pedestal access panels, floorboard panels and fuel selector gearbox access panel.
l. Install tailcone access, seats, carpets and upholstery removed.

Removal of Rudder Trim Tab Actuator. (See figure 7-4.)

a. (See figure 1-3.) Remove forward center floorboards (89) and rudder trim access (7).
b. Unsafety and loosen turnbuckles (11) to release tension on rudder trim control cables.
c. Disconnect the rudder trim tab push rod (19) by removing the cotter pin, nut, washer and bolt.
d. Remove cable guard from rudder trim tab actuator (17) by removing nuts, washers and screws, and disengage chain from sprocket. Tie chain to hole in vertical stabilizer.
e. Remove actuator clamps by removing bolts and washers and removing the trim tab actuator (17).

Disassembly, Overhaul and Assembly of Rudder Trim Tab Actuator.

The instructions for disassembly, overhaul and assembly of the aileron trim tab actuator, given in Section 5, also applies to the rudder trim tab actuator.

Installation of Rudder Trim Tab Actuator. (See figure 7-4.)

a. Reverse the rudder trim tab actuator removal procedure.
b. Rig the rudder control system in accordance with rigging of rudder trim control system.

Removal of Rudder Trim Control Wheel, Sprocket, and Indicator Assembly. (See figure 7-4.)

a. Remove from the pedestal lower access cover, right access cover, and autopilot cover to autopilot panel (optional).
b. Remove center floorboard (89) and loosen turnbuckles (11) to release tension on rudder trim control system.
c. Disengage chain and drive out pins (1) from control wheel (7) and sprocket (2).
d. Remove the control wheel and sprocket by removing shaft (3).

NOTE

To remove the rudder trim indicator assembly, the rivet, around which the indicator pivots, must be removed.

Installation of Rudder Trim Control Wheel, Sprocket, and Indicator Assembly. (See figure 7-4.)

a. Reverse the rudder trim control wheel, sprocket and indicator assembly removal procedure except the installation of the access cover and panels.
b. Rig rudder trim control system in accordance with rigging of the rudder trim control system.

Rigging of Rudder Trim Control System. (See figure 7-4.)

a. (See figure 1-3.) Remove tailcone access door, center floorboard (89) and rudder trim access (7).
b. Loosen stop block (13) by loosening attaching nuts and screws.
c. Check and adjust the cable tension on the rudder trim control cables to 10 ±3 pounds.

NOTE

Cable tension should be adjusted when ambient temperature is 60° F to 90° F. Allow aircraft temperature to stabilize for a period of 4 hours.

d. Move rudder trim control system to neutral by rotating trim control wheel so that the ends of the chains are equal length from actuator and control wheel sprocket.

e. Check the rudder trim indicator to indicate neutral position and if requiring adjustment, insert a screwdriver beneath the indicator and prying out of track in the trim control wheel, moving the indicator to neutral, and re-engaging with the track.

f. Disconnect rudder trim tab push rod (19) from rudder trim tab (20) by removing attaching cotter pin, nut, washer and bolt.

g. With the control wheel (7), rudder and rudder trim tab (20) in neutral, adjust the trim actuator (17) so that the hole in the push rod (19) is aligned with the hole in the trim tab horn (21); attach with bolt, washer, nut and cotter pin.

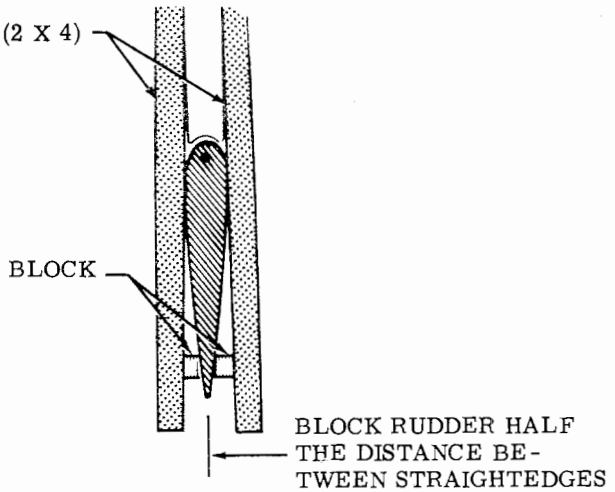
h. Rotate rudder trim control wheel (7) so rudder trim tab (20) is 19° +1°, -0° right (measured perpendicular to rudder hinge line). Locate center stop block (13) 13 inches aft of the aft cabin bulkhead and tighten. Slide the aft stop block (13) against center stop block (13) and tighten.

i. Rotate rudder trim control wheel (7), so rudder trim tab (14) is 24° +1°, -0° left (measured perpendicular to rudder hinge line). Slide forward stop block (13) against center stop block (13) and tighten.

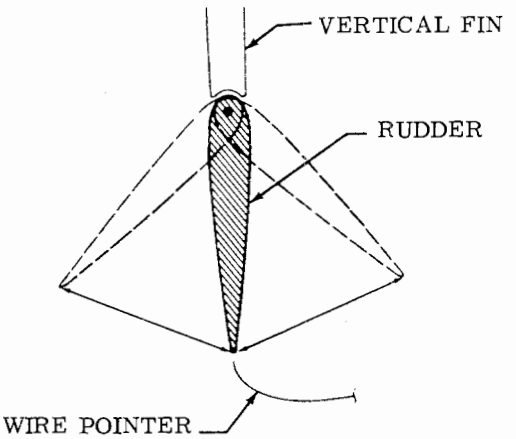
WARNING

Insure that rudder trim tab moves in the proper direction when operated by the trim control wheel.

j. Install the tailcone access door, center floorboard (89), pedestal access and rudder trim access.




ESTABLISHING NEUTRAL POSITION OF RUDDER




MEASURING RUDDER TRAVEL

1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 x 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
3. Using a soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges and blocks.
5. Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 13.50 and 14.00 inches.

Figure 7-5. Checking Rudder Travel

SECTION 8

# FLAP CONTROL SYSTEM

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CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

## FLAP CONTROL SYSTEM.

The flap control system is operated by an electric motor which drives a gear reduction unit. Two sprockets, connected in tandem to the reduction unit output shaft by special rivets, drive four chain-connected cables which actuate the flap bellcranks. The four bellcranks in each wing are interconnected by push-pull tubes. A cam, driven by a gear attached to the aft output shaft of the reduction unit, operates two limit switches. The flap control system is controlled from the stationary instrument panel by a flap preselect system, comprised of a preselect lever assembly, mounted on the instrument panel; a flap preselect control cable, attached to the preselect lever assembly and routed aft under the cabin floorboard and attached to the flap control cable, and associated electrical wiring. When the preselect lever assembly is placed in the 0° (UP) or 15°, 30° or 45° (DOWN) position, the preselect lever assembly microswitches are energized and actuate the flap motor, which drives the flaps until the corresponding flap position is reached. As the flaps reach the preselected position, the preselect lever assembly microswitches are de-energized. The landing gear aural warning system is actuated by a limit switch mounted on the flap preselect system. When the flaps are lowered beyond 15°, the landing gear warning horn will sound if the landing gear is not in the down and locked position.

Troubleshooting Flap Control System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| FLAP FAILS TO EXTEND OR RETRACT | Battery switch OFF. | Turn switch ON. |
| | Circuit breaker out. | Reset circuit breaker. |
| | Defective flap limit switches. | Replace flap limit switches. |
| | Defective flap motor. | Replace flap motor. |

Troubleshooting Flap Control System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| FLAP FAILS TO EXTEND OR RETRACT (CONT.) | Stripped or broken drive gear on flap motor. | Replace flap motor. |
| | Stripped or broken gears in reduction unit. | Replace reduction unit. |
| | Drive sprockets not secured to reduction unit output shaft. | Replace special rivets and/or sprockets. |
| FLAPS FAIL TO RETRACT | Up limit switch incorrectly adjusted. | Adjust in accordance with rigging procedures. |
| | Incorrect rigging of flap cables, compensated for by incorrect adjustment of push-pull rods. | Rig in accordance with rigging procedures. |
| FLAPS FAIL TO EXTEND COMPLETELY | DOWN limit switch incorrectly adjusted. | Adjust in accordance with rigging procedures. |
| | Incorrect rigging of flap cables, compensated for by correct adjustment. | Rig in accordance with rigging procedures. |
| | Incorrect adjustment of push-pull rod. | Rig in accordance with rigging procedure. |
| FLAPS NOT SYNCHRONIZED OR FAIL TO FIT EVENLY WHEN RETRACTED | Incorrect adjustment of push-pull rods. | Adjust in accordance with rigging procedure. |
| | Bent push-pull rods. | Straighten or replace. |
| | Incorrect adjustment of bellcrank interconnecting push-pull tubes. | Adjust in accordance with rigging procedure. |
| | Incorrect rigging of cables and chains. | Rig in accordance with rigging procedures. |
| | Bent flap. | Repair or replace flap. |
| FLAPS ON ONE SIDE FAIL TO OPERATE | Drive sprocket for inoperative side not secured to reduction unit output shaft. | Replace special rivets and/or sprocket. |
| | Broken chain, cable of attaching pin. | Replace broken parts. |

Removal of Flaps. (See figure 8-1.)

The following is a removal procedure for the left inboard flap. Remove the other flaps in a similar manner.

a. Extend flaps.
b. (See figure 1-3.) Remove wing gap fairings.
c. Disconnect lower scissors link assemblies (1) from flap structure by removing nuts (8), washers (9), spacers (11) and bolts (12).
d. Remove safety wire from bent end of hinge pin (2), and detach flap by removing hinge pin.

NOTE

If difficulty is encountered in removing outboard flap hinge pin, it may be necessary to remove aileron to gain better access to hinge pin.

Installation of Flaps. (See figure 8-1.)

a. Attach flap to wing with hinge pin (2). Safety wire bent end of hinge pin.

NOTE

To facilitate hinge pin installation, check hinges and pin for distortion, lubricate hinge pin, and taper end of hinge pin.

b. Connect lower scissors link assemblies (1) to flap structure by installing bolts (12), spacers (11) washers (9) and nuts (8).
c. (See figure 1-3.) Replace wing gap fairings.
d. Check flap for proper operation and correct travel. If adjustment is necessary, refer to rigging procedure.

Removal of Flap Control Cables and Chains. (See figure 8-1.)

a. Remove cabin seats and carpet on LH and RH sides of aircraft in accordance with Section 3.
b. (See figure 1-3.) Remove floorboard access panels (75, 76 and 82).
c. (See figure 1-3.) Remove wing gap fairings and access plates (41, 43 and 44).

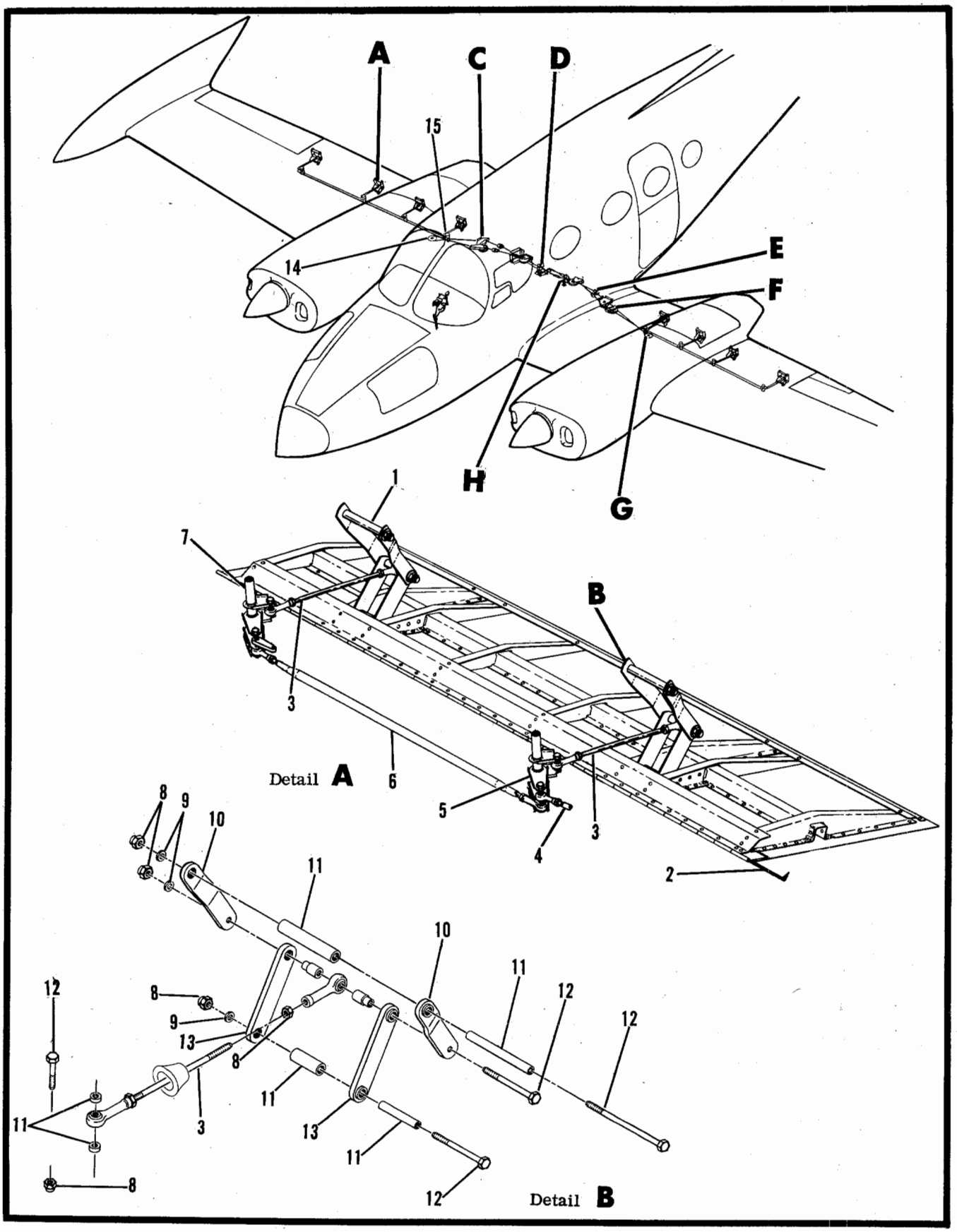



Figure 8-1. Flap Control System (Sheet 1)

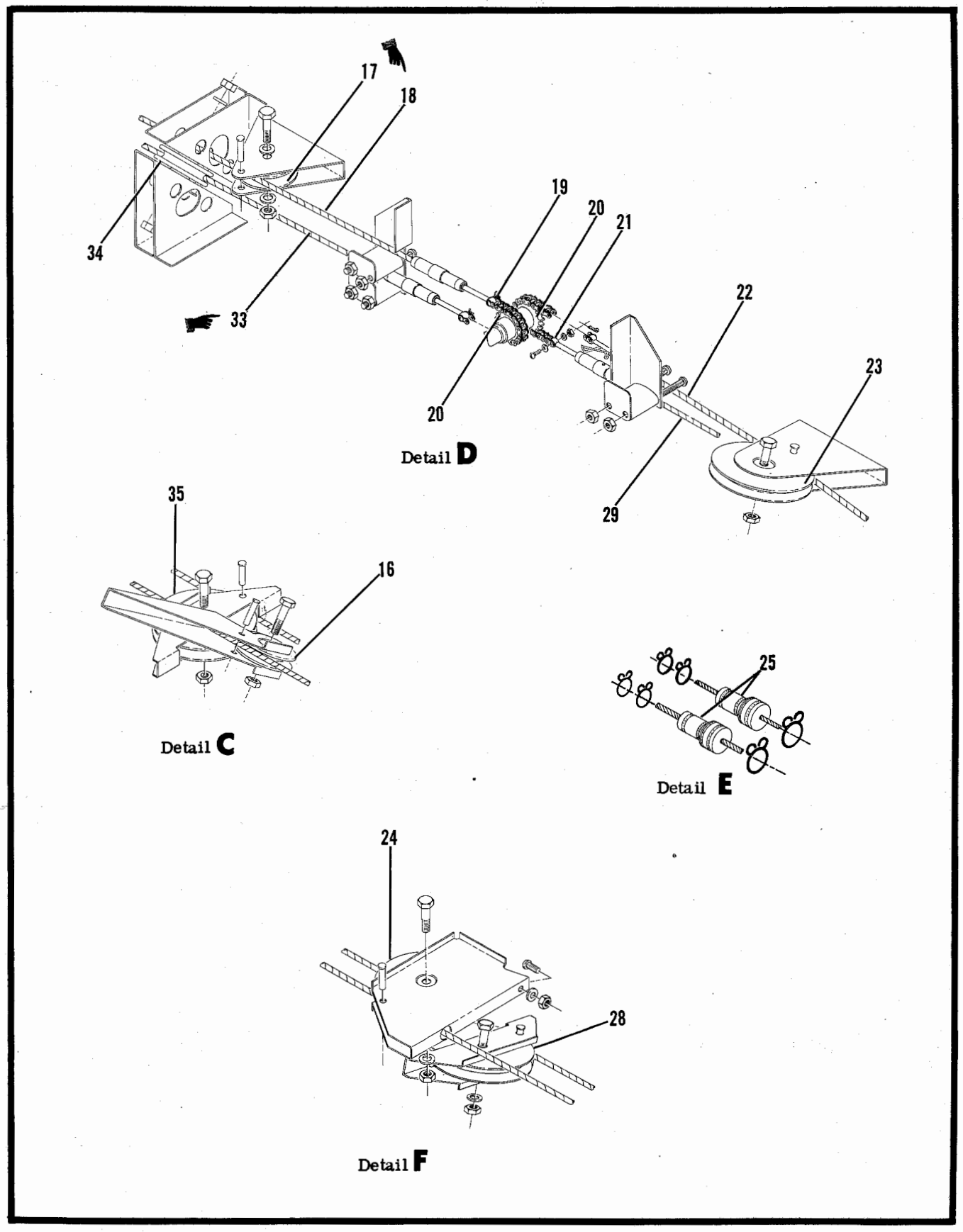
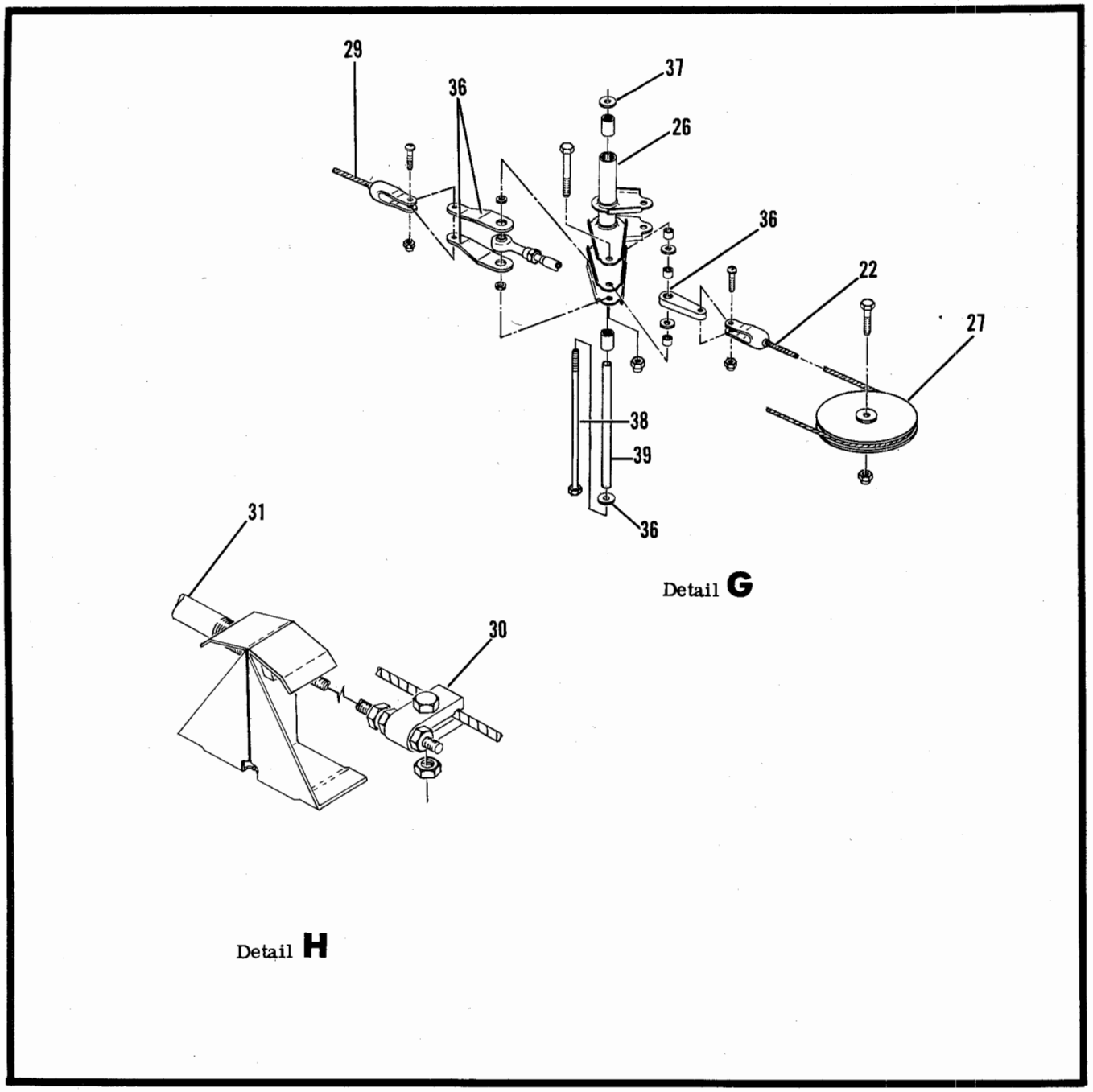



Figure 8-1. Flap Control System (Sheet 2)




1. Scissors Assembly
2. Hinge Pin
3. Push-Pull Rod
4. Center Interconnecting Push-Pull Tube
5. Outboard Bellcrank
6. Inboard Interconnecting Push-Pull Tube
7. Bellcrank
8. Nut
9. Washer
10. Upper Link Assembly
11. Spacer
12. Bolt
13. Lower Link Assembly
14. Right Outboard Pulley
15. RH Bellcrank
16. Right Upper Center Pulley
17. Right Upper Inboard Pulley
18. Right Extend Cable
19. Right Flap Chain
20. Sprockets
21. Left Flap Chain
22. Left Return Cable
23. Left Inboard Upper Pulley
24. Left Upper Center Pulley
25. Seal Assembly
26. Bellcrank LH
27. Left Outboard Pulley
28. Left Lower Center Pulley
29. Left Extend Cable
30. Clamp
31. Control Cable
32. Flap Actuator
33. Right Return Cable
34. Left Lower Inboard Pulley
35. Right Lower Center Pulley
36. Cable Attach Links
37. Washer
38. Bolt
39. Bushing

Figure 8-1. Flap Control System (Sheet 3)

d. Remove four inspection plates on forward side of rear spars adjacent to wheel well.
e. Lower flaps several degrees to decrease tension on cables, remove safety and disconnect the turnbuckles.
f. Disengage chains from sprockets.
g. Disconnect flap extend cable (29) and return cable (22) from cable attach links (36) by removing cotter pins, screws and nuts.
h. Remove outboard pulley (27) by removing nut and bolt.

NOTE

Outboard pulley cable guard cotter pins are quite difficult to remove and install and should be removed only for replacement.

i. Remove pulleys (24 and 28) located on wing stub by removing nuts and bolts.
j. Remove pulley (23) located under floorboard access panel by removing bolts.
k. (See figure 1-3.) Remove left and right wing root access (18 and 22) and remove seal assemblies.
l. Disconnect Chain (21) from extend cable (29) and return cable (22) by removing cotter pins, nuts, washers and bolts.
m. Tie guide wires to flap cables and pull out through fuselage.
n. Untie guide wires and remove cables from aircraft.
o. Remove right-hand cables and chain in a similar manner.

Installation of Flap Control Cables and Chains. (See figure 8-1.)

Installation procedures are for LH wing only. Install RH cables and chain in a similar manner.

a. Tie cables (22 and 29) to guide wire and route into position through the fuselage and wing.
b. Attach flap extend cable (29) and return cable (22) to cable attach links (35) on bellcrank (7) with screws, washers, nuts and cotter pins.
c. Place return cables (22) in position on pulleys (23, 24 and 27) and install pulleys with bolts and nuts.
d. Place extend cables (29) in position on pulley (28) and install pulley with bolts and nuts.
e. With turnbuckle ends attached to extend cable (29) and return cable (22), secure cables to chain (21) with screws, washers, nuts and cotter pins.
f. Engage chains (21) on reduction unit sprocket and rig cables in accordance with flap rigging procedures.
g. Install seal assemblies (25) as follows:
1. Insure that cables are lubricated for the full length of its travel within the seals.
2. Pack the seals with MIL-G-81323A lubricant.
3. Place seals on cable on non-pressurized side of bulkhead with small end toward bulkhead.
4. Insert seal in tee bulkhead hole so that bulkhead metal is seated within the retaining groove with the small end of seal in the pressurized section.
5. Install proper retaining rings in the grooves of the seal (two on small end and one on large end).
h. Install inspection plates, wing access panels, wing gap skin, floorboard access panels, carpet and seats.

Removal of Flap Bellcrank. (See figure 8-1.)

NOTE

Eight bellcranks are used to operate the flaps. The following procedure is used for removing the inboard bellcrank on the inboard flaps. Removal of the remaining bellcranks may be accomplished in a similar manner.

a. Remove cabin seats and carpet in accordance with Section 2.
b. (See figure 1-3.) Remove floorboard access panels (75, 76 and 82).
c. (See figure 1-3.) Remove plug button and rear spar access cover adjacent to bellcrank.
d. Lower flaps several degrees to decrease tension on return cable (22), remove safety and loosen turnbuckles to release tension on cables.
e. Disconnect extend cable (29) and return cable (22) from cable attach links (36) by removing screw and nut.

NOTE

The above steps apply only to removal of the inboard bellcrank for the inboard flaps. To remove other bellcranks, remove access hole covers from rear spar adjacent to affected bellcrank.

f. Disconnect push-pull rod (3) from bellcrank (7) by removing cotter pin, nut, spacers and bolt.
g. Disconnect interconnecting push-pull tube (6) from bellcrank (7) by removing cotter pin, nut, spacers and bolt.
h. Unsafety bolt (38) retaining bellcrank (7) and remove bolt by gaining access through plug button from the underside of wing beneath bolt.
i. Remove bellcrank through rear spar access panels taking care that bushing (39) does not fall from bellcrank during removal.

Installation of Flap Bellcrank. (See figure 8-1.)

a. Insert bellcrank through access hole and install with washers (37) and bolt (38). Safety bolt and install plug button on underside of wing beneath bolt.

NOTE

Washers (37) and bushing (39) must be in place before installing bolt (38).

b. Attach interconnecting push-pull tube (6) to bellcrank with attaching bolt, spacers, nut and cotter pin.
c. Connect push-pull tube to bellcrank (7) with

attaching bolt, spacers, nut and cotter pin.
d. On bellcrank (7) connect flap extend cable (29) and return cable (22) to cable attach links (36) by installing screws, nuts and cotter pins.
e. Rig flaps in accordance with rigging procedure.
f. Reinstall access hole covers, carpets and seats as necessary.

Removal and Installation of Flap Scissors Assembly. (See figure 8-1.)

a. Removal of flap scissors is as follows:
1. Extend flaps.
2. Disconnect upper and lower scissors links (10 and 13) by removing cotter pins, nuts, washers, spacers and bolts.
3. Remove scissors by removing cotter pin, nut, washers, spacers and bolts which attach scissor to push-pull rod.
b. Install flap scissors as follows:
1. Attach scissor links (10 and 13) to push-pull rod using bolt, spacers, washer, nut and cotter pin.
2. Connect upper and lower scissor links (10 and 13) using bolts, spacers, washers, nuts and cotter pins.
3. Check flaps for proper operation and correct travel. See Rigging of Flap Control System for limits and tolerances.

Troubleshooting the Flap Actuator Motor.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| BRAKE DOES NOT RESPOND AS REQUIRED | Loosen or open connections or circuits. Improper assembly. | Check test connections; if all right, test motor circuits for proper resistance, check for proper brake air gap. Adjust or replace defective parts. |
| SPEED IS TOO LOW OR CURRENT IS TOO HIGH | Incorrect end play, shorted armature circuit, excessive bearing friction. | Check motor for correct end play. If all right, test motor circuits for shorts. Replace defective parts. |
| MOTOR WILL NOT RUN | Circuit breaker out. | Reset breaker, if breaker will not remain set, check for shorted wiring in field circuit. If field circuit is shorted, refer to Landing Gear and Flap System Components Overhaul/Parts Manual and repair or replace motor. |
| MOTOR NOISY | Faulty bearings or armature dragging. | Refer to Landing Gear and Flap System Components Overhaul/Parts Manual and repair or replace motor. |

Removal of Flap Actuator Assembly. (See figure 8-2.)

a. Flap motor can be removed without removing reduction unit; however, due to limited working space, it is desirable to remove reduction unit and flap motor as an assembly.
b. (See Section 3.) Remove cabin seats and carpet.
c. (See figure 1-3.) Remove floorboard access panels (75, 76 and 82).
d. Lower flaps several degrees to release tension on return cables, remove safety from turnbuckles and loosen turnbuckles enough to disengage chains from sprockets.
e. Turn battery switch OFF.
f. Remove screws attaching actuator to channel.
g. Move complete actuator assembly forward until it clears the channel, tilt assembly slightly and remove.

NOTE

Care should be exercised when working flap actuator assembly through control cables.

h. Disconnect and tag wires leading from wire bundle to limit switches (5 and 7).

NOTE

If optional 400A Nav-O-Matic autopilot flap actuator is installed, tag and disconnect wires from resistor (28).

Removal of Limit Switch Bracket. (See figure 8-2.)

a. Disconnect and tag electrical wires and route from bracket.
b. Remove safety wire from bolts (1).
c. Remove screw (30), lockwasher (31) and bolt (1). The RH bolt only needs to be loosened. Bracket hole is slotted for removal.
d. Remove bracket (3) and switch assembly.

Installation of Limit Switch Bracket. (See figure 8-2.)

a. Position bracket (3) and switch assembly to motor (2) and secure with bolts (1), screw (30) and lockwasher (31). Safety wire bolts (1).

b. Route electrical wires to clear cables and secure in place. Connect wires and remove tags.

c. Check that the reduction unit output shaft (26) does not turn when 800 pound-inches torque is applied.

d. Adjust setscrew (23) to provide 0.005 maximum transfer shaft movement and secure with locknuts (24).

NOTE

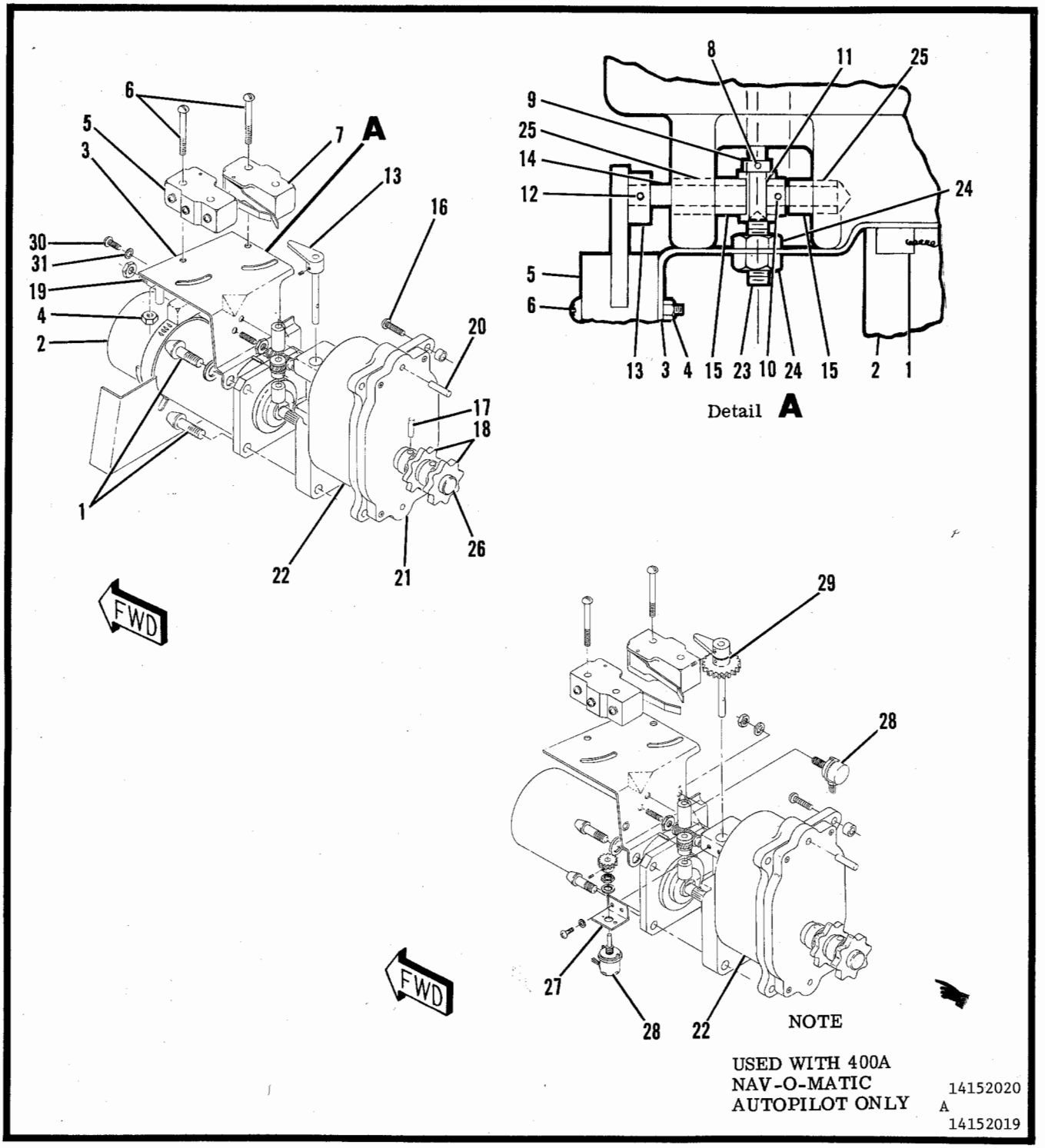
Shaft movement measurement should be measured between miter gear (11) and miter gear (9).

Installation of Flap Actuator Assembly. (See figure 8-2.)

a. Place flap actuator assembly near floorboard access and attach wires from wire bundle to respective limit switch and remove tags.

NOTE

Insure that terminals of the limit switches are covered with insulated sleeving and wiring is secure and clear of all control cables and moving parts.




1. Bolt
2. Flap Motor
3. Bracket
4. Nut
5. Limit Switch (UP)
6. Screw
7. Limit Switch (DOWN)
8. Roll Pin
9. Miter Gear
10. Roll Pin
11. Miter Gear
12. Setscrew
13. Cam
14. Shaft
15. Spacer
16. Screw
17. Roll Pin
18. Sprocket
19. Electrical Wire Bundle
20. Dowel Pin
21. Reduction Unit Cover Plate
22. Reduction Unit
23. Setscrew
24. Locknut
25. Spacer Bushing
26. Output Shaft
27. Resistor Bracket
28. Resistor
29. Gear
30. Lockwasher
31. Screw

Figure 8-2. Flap Actuator Assembly

b. Insert actuator assembly in position and install screws.
c. Engage chains with sprockets (18) and rig flap control system in accordance with rigging procedure.
d. Install floorboard access panels.
e. Install carpets and cabin seats in accordance with Section 3.

Rigging of Flap Control System. (See figure 8-1.)

The flap control system should be rigged using a 24 volt external power source, with a two-position momentary switch, attached to the flap motor wires so the flaps may be observed while being operated during rigging.

CAUTION

When connecting the momentary switch, make sure the limit switches are not bypassed to avoid damage to flap system.

a. Remove seats and carpet in accordance with Section 3.
b. (See figure 1-3.) Remove floorboard access panels (75, 76 and 82).
c. Remove four inspection plates on the forward side of rear spar adjacent to wheel well.
d. Check length of inboard push-pull rod (3) on each inboard flap and adjust to 10.45 inches.

NOTE

Measure the length of push-pull rods between the centerlines of rod end bolt holes.

e. Check length of interconnecting push-pull tubes and adjust, if necessary to the following dimensions:

| | |
|---|---|
| Outboard interconnecting push-pull tubes . . . . . | 33.35 inches |
| Center interconnecting push-pull tubes . . . . . | 23.80 inches |
| Inboard interconnecting push-pull tubes . . . . . | 23.80 inches |

f. Adjust remaining push-pull rods from bellcranks to scissors so flaps fit evenly when in the UP position.
g. (See figure 8-2.) Adjust limit switches as follows:
1. Loosen limit switches (5 and 7) and position them where they will be activated by the cam (13).
2. With the flaps in the UP position loosen setscrew (12), rotate cam (13) to a point where it actuates the UP limit switch (5), and then tighten setscrew (12).
h. (See figure 8-1.) With flaps in the UP position, check for correct positioning of the flap chains on sprockets and, if necessary, adjust as follows:
1. Engage right chain (19) with forward sprocket so that approximately 2-1/2 links extend around bottom side of sprocket.
2. Engage left chain with aft sprocket so that 3 links extend around the top side of sprocket.
3. Connect RH extend cable (18) to the long end of chain (top side of forward sprocket) and route over pulleys (16 and 17) to bellcrank (15).
4. Connect RH return cable (33) to the short end of chain (bottom side of fwd sprocket) and route over pulley (34) around outboard pulley (14) and back to bellcrank (15).
5. Connect LH extend cable (29) to the long end of chain (bottom side of aft sprocket) and route over pulley (28) to LH bellcrank (26).
6. Connect return cable (22) to the short end of chain (top side of aft sprocket) and route over pulleys (23 and 24) around inboard pulley (17) and back to LH bellcrank (26).
7. With flaps secured in UP position tighten turnbuckles until all slack is out of cables. Temporarily rig both return cables (22 and 33) with 185 lbs. tension. Final tension on return cables should be 200 to 250 lbs. with flaps in the UP position. The differential tension between left and right should not exceed 25 lbs.

NOTE

At this point, recheck flap position as to being in proper position with respect to wing trailing edge. Should further adjustment of push rods be necessary, this must be accomplished before final setting of cable tension.

8. Remove tape or other means of securing flaps in the UP position and lower flaps a few degrees at a time, observing for any unusual tension build-up in the cables or binding of the push-pull tubes and push rods, until flaps reach their bottom position as measured with a protractor. Tolerance for flap travel is plus one degree, minus zero degrees.
9. Rig both extend cables (18 and 29) with 85 lbs. of tension. (Final tension on extend cables, with flaps down should be 75 to 95 lbs., with the differential tension between left and right not exceeding 25 lbs.)
10. Raise flaps and make final tension check of return cables (22 and 33) when stopped by the limit switch (200 to 250 lbs.)

NOTE

If the return cable tension is readjusted at this time, it will be necessary to recheck the extend cable tension with the flaps in the down position and adjust as required. It will always be necessary to make the last tension adjustment on the extend cables with flaps down.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

11. (See figure 8-2.) Lower flaps to 45 degrees and adjust down limit switch (7) to actuate and stop flap travel at this point. Safety turnbuckles.
i. If used, disconnect the switch and outside power source which were wired into the flap circuit.
j. Replace access hole covers.
k. Install rear carpet in accordance with Section 3.
l. Install rear seats in accordance with Section 3.

Operational Flight Check.

The operational flight check of the flaps consists of flying the aircraft at 165 MPH CAS and operating the flaps down, noting the extension time. The flaps should extend in 10 to 14 seconds. Operate the flaps up and note the retraction time. The flaps should retract in 6 to 10 seconds.

NOTE

If the flaps will not extend or retract within the correct time, it will be necessary to replace the flap motor.

Removal of Flap Preselect Lever Assembly. (See figure 8-3.)

a. Loosen setscrew (10) and remove knob (11) from lever assembly (9).
b. Loosen nut (26) and remove screw (24) from rod end (25).
c. Remove bolt (23) from nutplate (17).
d. Remove flap preselect lever assembly from bracket assembly (33).

NOTE

When removing flap preselect lever assembly from bracket assembly, make sure spring washers do not fall into center console.

Disassembly and Assembly of Flap Preselect Lever Assembly. (See figure 8-3.)

a. Remove friction washers (20).
b. Remove arm assembly (21) and lever assembly (9) from spacer (32).
c. Remove friction washer (20) from spacer (32).
d. Loosen nuts and remove washers, screws and switches (27) from arm assembly (21).
e. Remove nut and screw and separate cam (31) from pivot bellcrank (30) and cam (28) from preselect lever (9).

NOTE

To facilitate reassembly, mark position of preselect lever (9) to cams (28 and 31) before disassembly.

f. Assemble flap preselect lever assembly by reversing disassembly procedure.

Installation of Flap Preselect Lever Assembly. (See figure 8-3.)

a. Place flap preselect lever assembly into position in bracket assembly (33).
b. Install bolt (23) to nutplate (17).
c. Align holes in rod end (25) and arm assembly (21), install screw (24) and secure with nut (26).
d. Install knob (11) on lever assembly (9) and secure with setscrew (10).

NOTE

Install knob with a minimum clearance of 0.12 from instrument panel structure.

e. Rig flap preselect system in accordance with rigging procedure.

Removal of Flap Preselect Control Cable. (See figure 8-3.)

a. Remove pilot's, copilot's and forward passenger seats in accordance with Section 3.
b. Remove center carpets and floorboard in accordance with Section 3 to gain access to flap preselect control cable.
c. Loosen nut (26) and remove screw (24).
d. Loosen nut (7) and remove bolt (5) and clamp (3) from flap cable (2) and control cable (1).
e. Remove clamps securing control cable (1) to bulkheads.
f. Remove control cable (1) from aircraft.

Installation of Flap Preselect Control Cable. (See figure 8-3.)

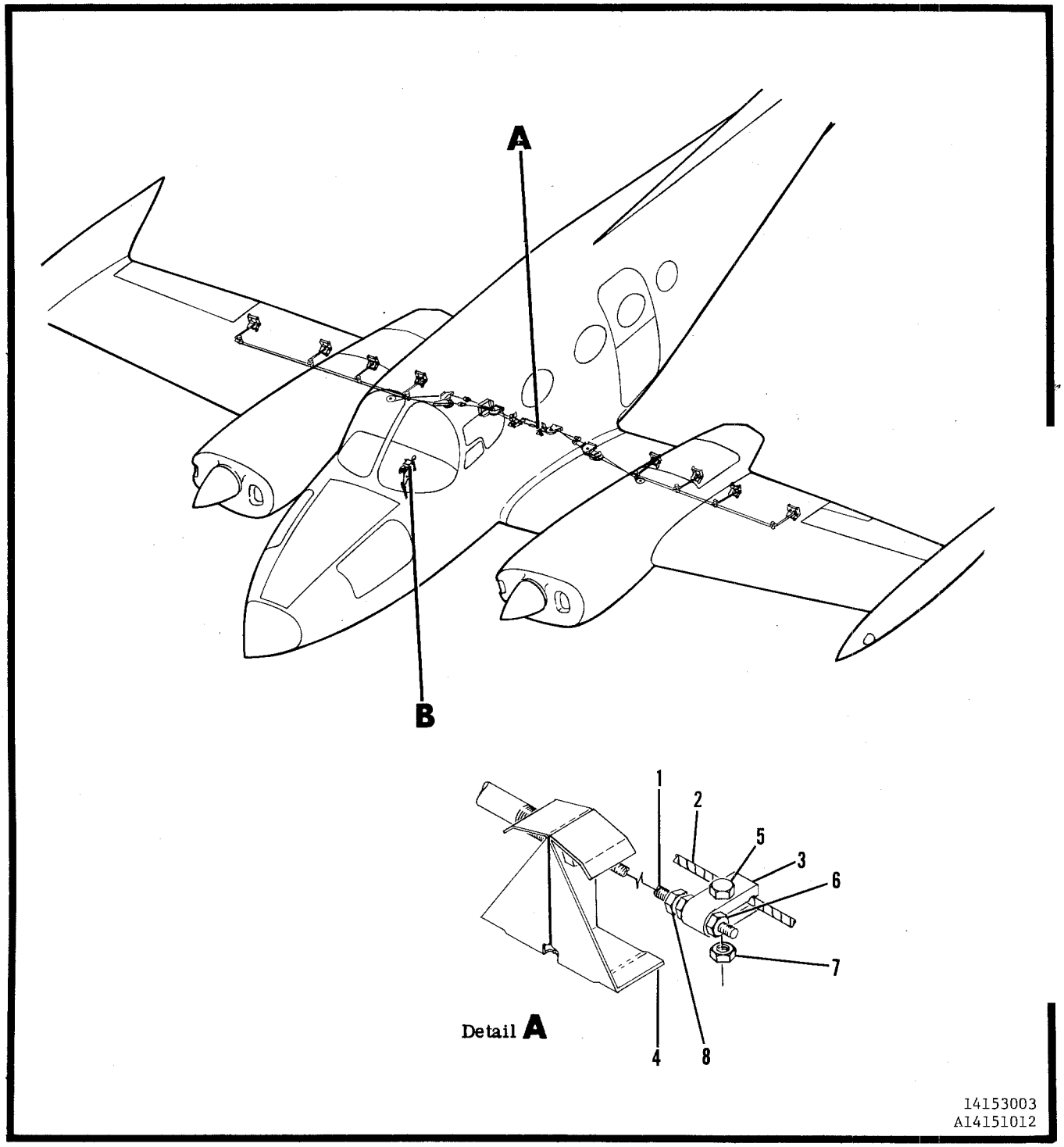
a. Install flap preselect control cable by reversing removal procedure and rig in accordance with rigging procedure.

Rigging Flap Preselect System. (See figure 8-3.)

a. Remove passenger seats and center carpets in accordance with Section 3 to gain access to the right-hand forward floorboard.
b. Remove right-hand floorboard.
c. Loosen nut (7) and remove bolt (5) from clamp (3).
d. Remove clamp (3) from flap cable (2) and control cable (1).
e. Connect a 24 volt external power source.

NOTE

To facilitate rigging of the flap preselect system, a two position momentary switch with suitable lengths of electrical wires can be connected to the flap actuator limit switches in such a manner that the flaps can be observed while being operated during rigging.




1. Control
2. Flap Cable
3. Clamp
4. Bracket
5. Bolt
6. Nut
7. Nut
8. Nut
9. Flap Preselect Lever
10. Setscrew
11. Knob
12. Guard Block
13. Pointer
14. Indicator Block
15. Instrument Panel
16. Stop Bolt
17. Nutplate
18. Spacer
19. Warning Switch
20. Friction Washer
21. Arm Assembly
22. Flat Washer
23. Bolt
24. Screw
25. Rod End
26. Nut
27. Limit Switch
28. Cam
29. Spacer
30. Pivot Bellcrank
31. Cam
32. Spacer
33. Bracket Assembly

Figure 8-3. Flap Preselect Installation (Sheet 1)

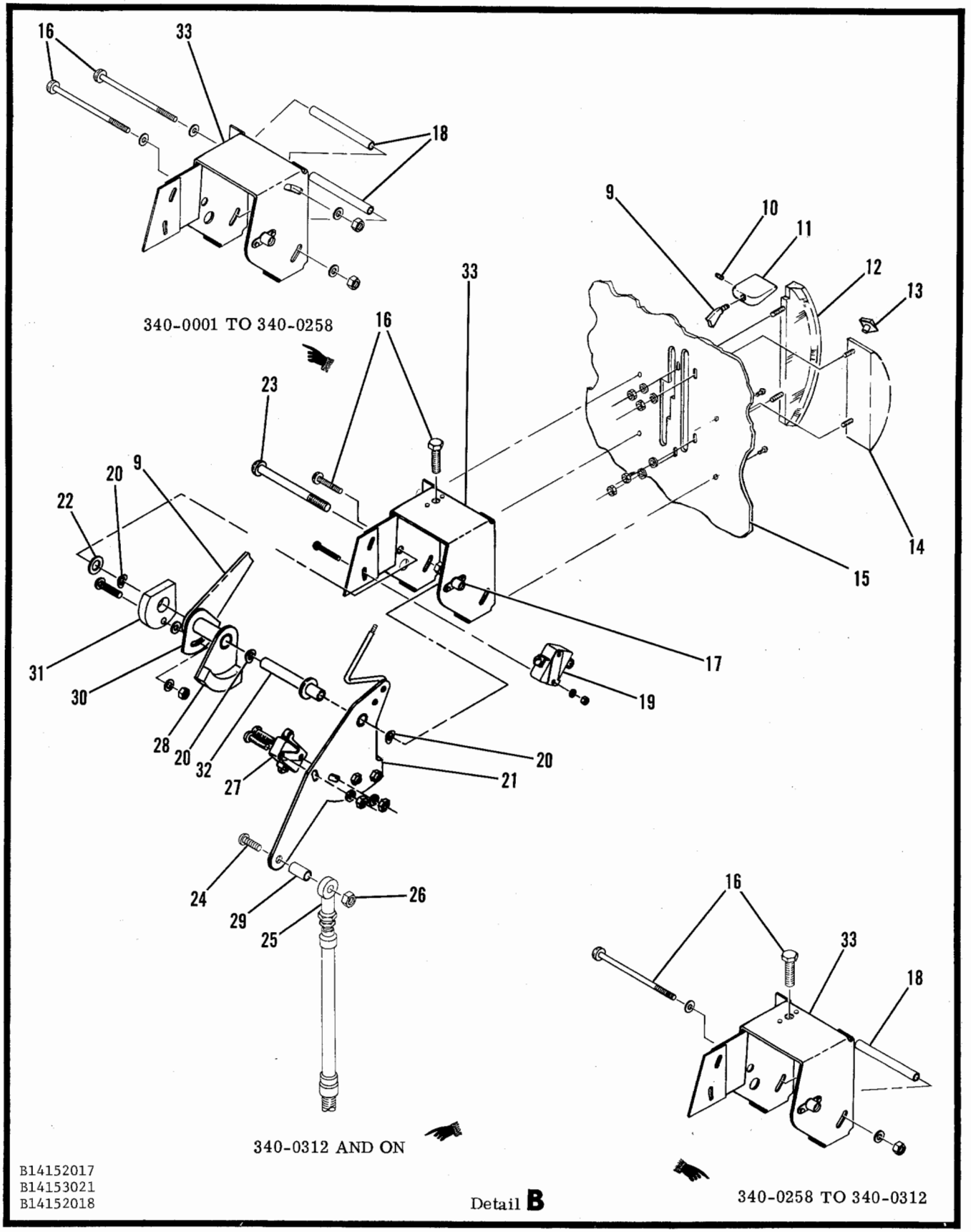



Figure 8-3. Flap Preselect Installation (Sheet 2)

f. On aircraft 340-0001 to 340-0258, rig flap preselect system as follows:

1. Adjust flap motor limit switches to provide 0° (UP) position and 45° +1, -0° position flap travel in accordance with the adjusting procedures.
2. Operate flaps full down and retract control cable (1) to full in position at aft end.
3. Move control cable (1) out 0.12 inch and install clamp (3) to flap cable (2) with bolt (5) and secure with nut (7). Operate flaps to full up position.
4. Adjust limit switch (27) rollers snug against cam (28) at the flap preselect control.
5. Adjust tension on control cable (1) to prevent flap preselect lever (9) from moving when limit switch roller falls off cam (28).
6. Attach rod end (25) to preselect arm (21) and adjust rod end (25) and/or cable housing to locate preselect arm (21) to the dimension shown in figure 8-4.
7. Move flap preselect lever (9) to 15° position detent. Loosen adjustment screw (24) between the flap preselect lever (9) and pivot bellcrank (30). Measure flap control surface and move cam (28) as required to provide a flap surface position of 15° ±0°. Tighten adjustment screw (24) at flap preselect lever (9) and pivot bellcrank (30).

NOTE

When the preselect lever assembly is placed in the 15° (DOWN) position, the flap angular travel must be 15° +0°, -2°.

8. Adjust pointer (13) to center on 15° mark on indicator block (14) by bending wire.
9. Place preselect lever assembly (9) in the 30° (DOWN) position.
10. Operate flap motor until flaps are in the 30° ±0° (DOWN) position.
11. Check preselect limit switches (27) for proper adjustment, to ensure limit switches are de-energized when the flaps reach the 30° (DOWN) position.
12. Match pointer arc with indicator block (14) and guard block (12) by adjusting blocks vertically. (Slotted holes provided.)
13. Adjust flap handle (9) to cam (28) so that switch rollers are still on cam when 0° and 45° flap. motor limit switches are actuated. This will take 0.12 inch to 0.16 inch handle travel measured at the intersection of the panel slot.
14. Check flap surface travel tolerances at the following locations: 15° ±0° DOWN; 30° ±2° DOWN; 45° +1°, -0° DOWN; 15° +0°, -2° from DOWN to UP.

g. On aircraft 340-0258 and On, rig flap preselect system as follows:

1. Adjust flap motor limit switches to provide 0° (UP) position and 46° +1°, -0° position flap travel. Adjust return cable tension to 280 lbs. ±20 lbs. with flaps retracted and extend cable tension to 85 lbs. ±10 lbs. with flaps extended.
2. Operate flaps full down and retract control cable (1) to full in position at aft end.
3. Move control cable (1) out 0.10 inch and install clamp (3) to flap cable (2) with bolt (5) and secure with nut (7). Operate flaps to full up position.
4. Adjust limit switch (27) rollers snug against cam (28) at the flap preselect control.
5. Tighten bolt (23) to obtain a 2 lb. ±.5 lb. friction load measured at aft end of preselect lever with lever between 0° and 15° setting.
6. Run flaps full up and adjust rod end (25) and/or cable housing to locate preselect arm (21) to the dimension shown in figure 8-5.
7. Move flap preselect lever (9) to 15° position detent. Loosen adjustment screw (24) between the flap preselect lever (9) and pivot bellcrank (30). Measure flap control surface deflection and move cam (28) as required to obtain a flap surface position of 15° ±0°. Tighten adjustment screw (24) at flap preselect lever (9) and pivot bellcrank (30).

NOTE

When the preselect lever assembly is placed in the 15° (DOWN) position, the flap angular travel must be 15° +0°, -2°.

8. Match pointer arc with indicator block (14) and guard block (12) by adjusting blocks vertically. (Slotted holes provided.)
9. Adjust pointer (13) to center on 15° mark on indicator block (14) by bending wire.
10. Adjust flap preselect lever spacer (18) to limit 0° flap setting with 225 lbs. ±25 lbs. return cable tension.
11. Adjust flap preselect lever spacer (18) to limit flap travel to 45° +1°, -0° travel.
12. Adjust flap/landing gear warning switch. Refer to Adjustment of Landing Gear Warning System.
13. Check flap surface travel tolerances at the following locations: 15° ±0° DOWN; 30° ±2° DOWN; 45° +10°, -0° DOWN; 15° +0°, -2° from DOWN to UP.

h. Disconnect the 24 volt external power source from flap motor wiring.

i. Perform operational checkout of flap and preselect system, using the aircrafts power system, to ensure that proper operation of limit switches, preselect switches and flap angular movements are within specified tolerances.

j. Install right-hand floorboard.

k. Install center carpets and center seats in accordance with Section 3.

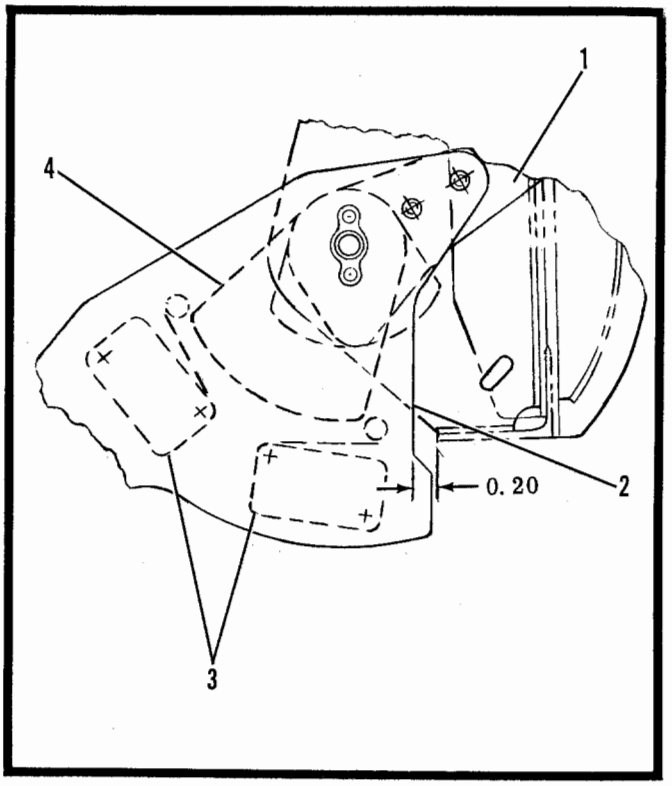
Adjustment of Landing Gear Warning System. (See figure 8-3.)

a. Jack the aircraft in accordance with Section 2.
b. Connect an external power supply.
c. Position flap preselect lever 16° +2°, -0°.
d. Turn off electrical power.
e. Loosen screws (24) and adjust switch (19) to actuate at this position. A definite click should be felt when switch actuates.
f. Tighten screws (24) and turn on power.
g. Operate landing gear to the up position.
h. Place throttles full forward and operate the flaps to full down position.

NOTE

When flap preselect lever is placed below the 15° detent the warning horn should sound when flaps reach 16° +2°, -0°.

i. It may be necessary to repeat steps "e" through "h" until warning horn is properly adjusted.
j. Operate the gear to the down and locked position.
k. Turn off power and remove aircraft from jacks.




1. Flap Preselect Lever
2. Arm Assembly
3. Limit Switches
4. Cam

Figure 8-4. Flap Preselect Dimension Requirement

SECTION 9

# ENGINE

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GENERAL INFORMATION.

Two Continental TSIO-520-K engines are mounted on the aircraft. The engines are turbocharged, six-cylinder, fuel injected, horizontally opposed and develop 285 horsepower at 2700 RPM. Installed on each engine are two magnetos, twelve spark plugs, ignition harness and wiring, primer distribution lines and fittings, engine-driven fuel pump, continuous flow fuel injection system, pressure type intake manifold piping, integral oil pump and externally mounted oil cooler, starter and various adapters, clamps and brackets for mounting these items on the engine. Each engine drives an all-metal, two bladed, constant-speed, full feathering propeller. In addition to the propeller and the above mentioned engine accessories, the complete engine assembly consists of the following Cessna installed items: Propeller governor, engine baffles; induction air filter, vacuum pump, exhaust stack assemblies, cylinder head temperature bulb, oil temperature bulb cowl flap assembly, crankcase breather line and various other lines, hoses, fittings and brackets necessary for the proper assembly and operation of each engine.

Detail Engine Specifications.

| | |
|---|---|
| Model | TSIO-520-K |
| Propeller Drive Ratio | Direct |
| Propeller Shaft Rotation (Looking Forward) | Clockwise |
| Bore, Inches | 5.25 |
| Stroke, Inches | 4.00 |
| Displacement, Cubic Inches | 520 |
| Compression Ratio | 7.5:1 |
| Oil SAE Number Above 40°F | SAE #50 |
| Below 40°F | SAE 10W/30 Multiviscosity or SAE #30 |
| Oil Sump Capacity (Without Filter) | 12 Qts. |
| Fuel, Aviation Grade, Octane (Minimum) (Low Lead Fuels are Approved) | 100/130 |
| Fuel System | Continental Fuel Injection |
| Fuel Injector | Continental Fuel Injection |
| Magneto Drive, Ratio to Crankshaft | 1.5:1 |
| Magneto (See Section 1) | Counterclockwise* |
| Tachometer Drive, Ratio to Crankshaft | 0.5:1 |
| Rotation | Counterclockwise* |
| Starter Drive, Ratio to Crankshaft | 48:1 |
| Rotation | Counterclockwise* |
| Alternator Drive, Ratio to Crankshaft | 3:1 |
| Rotation | Clockwise* |
| Vacuum Pump Drive, Ratio to Crankshaft | 1.5:1 |
| Rotation | Clockwise* |
| Propeller Governor Drive, Ratio to Crankshaft | 1:1 |
| Rotation | Clockwise* |
| Spark Plug Type | See Section 1 |
| Breaker Point Setting | (20°) BTC |
| Spark Plug Gap | 0.016-0.018 |
| Firing Order | 1-6-3-2-5-4 |

*Direction of rotation facing engine drive pad.

Detail Engine Specifications (Continued).

| | |
|---|---|
| Oil Pressure (Lbs. Per Sq. Inch) | |
| Normal | 30 to 60 |
| Maximum | 100 |
| Idling (Minimum) | 10 |
| Oil Temperature (°F) | |
| Normal | 170° |
| Maximum | 240° |
| Cylinder Head Temperature (°F) | |
| Maximum | 460° |
| Cruise (Recommended) | 380° |
| Minimum (Takeoff) | 200° |
| Standard Engine Dry Weight (Lbs.) (With Turbocharger Accessories) | 462.66 |

Troubleshooting the Engine.

| TROUBLE | PORBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE WILL NOT START | Fuel tank empty. | Fill with correct grade of fuel. |
| | Improper starting procedure. | Refer to Pilot's Checklist for starting procedures and check for performance of each item. |
| | Cylinder overprimed. | With auxiliary fuel pump switch OFF, allow manifold to drain at least 5 minutes or until fuel ceases to flow out of the drain under the nacelle. If circumstances do not allow natural draining periods recommended above, with the auxiliary pump switch OFF, magneto switch OFF, mixture idle cut-off and throttle full open, turn engine with starter and/or by unfeathering for a minimum of 15 revolutions. |
| CAUTION<br>If the primer switch is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or aircraft due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary pump switch in the ON position. | | |
| | Induction system leak. | Tighten or replace loose or damaged hose connections. |
| | Excessive start slippage. | Replace starter adapter. |
| | Fuel system malfunction. | Isolate cause and correct. (See Troubleshooting the Fuel Injection System and refer to Section 11 for Troubleshooting the Fuel System.) |
| | Ignition system malfunction. | Isolate cause and correct. (See Troubleshooting the Ignition System.) |
| ENGINE WILL NOT RUN AT IDLING SPEED | Propeller levers set in high pitch (DECREASE RPM). | Use low pitch (INCREASE RPM) position for all ground operations. |
| | Fuel injection system improperly adjusted. | See Troubleshooting the Fuel Injection System. |

Troubleshooting the Engine (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE WILL NOT RUN AT IDLING SPEED (CONTINUED) | Air leak in intake manifold. | Tighten loose connection or replace damaged part. |
| | Spark plugs fouled by oil escaping past piston rings. | Top overhaul. |
| ROUGH IDLING | Fuel injection system improperly adjusted. | See Troubleshooting the Fuel Injection System. |
| | Mixture levers set for lean mixture. | Use FULL RICH position for all ground operation. |
| | Fouled spark plugs. | Remove and clean. Adjust gaps. |
| | Discharge nozzle air vent manifold restricted or defective. | Set the fuel control on FULL RICH position, turn auxiliary pump ON, check to be sure feed lines and filters are not restricted. Clean or replace defective components. |
| | Hydraulic lifters fouled. | Remove and clean lifters. Inspect and clean oil filter at more frequent intervals. |
| | Burned or warped exhaust valves, worn seats, scored valve guides. | Top overhaul. |
| ENGINE RUNS TOO LEAN AT CRUISING POWER | Improper manual leaning procedure. | Operate in FULL RICH position below 5000 feet. Above 5000 feet, retard mixture levers until a slight drop in rpm is noted, then advance levers approximately one inch toward FULL RICH position. |
| | Fuel flow reading too low. | Check fuel strainer for clogging. Clean screen. (Refer to Section 11.) |
| | Fuel injection malfunction. | See Troubleshooting the Fuel Injection System. |
| ENGINE RUNS TOO RICH AT CRUISING POWER | Restrictions in air intake passages. | Check passages and remove restrictions. |
| ENGINE RUNS TOO LEAN OR TOO RICH AT THROTTLE SETTINGS OTHER THAN CRUISE | Fuel injection malfunction. | See Troubleshooting the Fuel Injection System. |
| CONTINUOUS FOULING OF SPARK PLUGS | Piston rings excessively worn or broken. | Replace rings. Replace cylinder if damaged. |
| | Oil leakage from turbocharger into intake system. | Check turbocharger oil drain lines, separator and scavenger oil pump. |
| | Piston rings inverted or not seated. | Install with side marked "TOP" toward piston head. Allow approximately 25 hours for new rings to "wear in." |
| ENGINE RUNS ROUGH AT HIGH SPEED | Loose mounting bolts or damaged mount pads. | Tighten mounting bolts. Replace mounting pads. |
| | Plugged nozzle. | Clean. |

Troubleshooting the Engine (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE RUNS ROUGH AT HIGH SPEED (CONTINUED) | Propeller out of balance. | Remove and repair. |
| | Ignition system malfunction. | See Troubleshooting the Ignition System. |
| REGULAR MISSING AT HIGH SPEED | Broken valve spring. | Replace. |
| | Plugged nozzle. | Clean. |
| | Burned or warped valve. | Top overhaul. |
| | Hydraulic tappet dirty or worn. | Remove and clean or replace. |
| SLUGGISH OPERATION AND LOW POWER | Throttle not opening wide. | Check and adjust linkage. (See Rigging of Mixture and Throttle Controls.) |
| | Exhaust system leakage. | Locate and correct. |
| | Restrictions in air intake passages. | Check passages and remove restrictions. |
| | Turbocharger wheels rubbing. | Replace turbocharger. |
| | Ignition system malfunction. | See Troubleshooting the Ignition System. |
| | Fuel injection malfunction. | See Troubleshooting the Fuel Injection System. |
| | Valve seats worn and leaking. Piston rings worn or stuck in grooves. | Top overhaul. |
| HIGH CYLINDER HEAD TEMPERATURE | Low octane fuel. | Drain tanks and replace with correct grade of fuel. (Refer to Section 2.) |
| | Lean fuel/air mixture due to improper manual leaning procedure. | See "CORRECTION" under "Engine Runs Too Lean At Cruising Power." |
| | Cylinder baffles loose or bent. | Check and correct. |
| | Dirt between cylinder fins. | Clean thoroughly. |
| | Excessive carbon deposits in cylinder head and on pistons. | Top overhaul. |
| | Exhaust system gas leakage. | Locate and correct. |
| | Exhaust valves leaking. | Top overhaul. |
| OIL LEAKS | At front of engine; damaged crankshaft oil seal. | Replace seal. |
| | Around push rod housings; damaged push rod housing packing. | Replace seal. |
| | Around propeller mounting flange; damaged hub O-ring seal. | Replace seal. (Refer to Section 10.) |

Troubleshooting the Engine (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| OIL LEAKS (CONTINUED) | Around plugs, fittings and gaskets due to looseness or damage. | Tighten or replace. |
| LOW COMPRESSION | Piston rings excessively worn. | Top overhaul. |
| | Valve faces and seats worn. | Top overhaul. |
| | Excessively worn cylinder walls. | Replace cylinders and piston rings. |
| ENGINE WILL NOT ACCELERATE PROPERLY | Unmetered fuel pressure too high. | Refer to "Unmetered Fuel Pressure and Mixture Checkout and Adjustment." |
| | Waste-gate does not close properly. | See Turbocharger and Controls Overhaul/ Parts Manual for the Waste-Gate Check and Adjustment. |
| | Manifold pressure relief valve sluggish or stuck open. | Replace manifold pressure relief valve. |
| | Leak in turbocharger discharge pressure system. (See Note.) | Refer to "Inspection of Engine and Turbocharger Installation." |
| | NOTE<br>Leak in turbocharger discharge system is characterized by the engine leaning out at idle, but when acceleration is attempted, it will not accelerate because of an over-rich mixture. However, when the mixture control is leaned, the maximum RPM will be low and the engine will be very rough. | |
| SLOW ENGINE ACCELERATION ON A HOT DAY | Mixture too rich. | Momentarily pull mixture control back until engine acceleration picks up, then move mixture control to full forward again. |
| ROUGH IDLE AT AIRFIELDS WITH GROUND ELEVATION OF 3500 FEET OR HIGHER | Mixture too rich. | Pull mixture control back to where the engine operates the smoothest at IDLE RPM. |
| SLOW ENGINE ACCELERATION AT AIRFIELDS WITH A GROUND ELEVATION OF 3500 FEET OR HIGHER | Mixture too rich. | Pull mixture control back to where engine operates at IDLE RPM. Engine should accelerate normally. |
| MANIFOLD PRESSURE OVERSHOOT ON ENGINE ACCELERATION | Engine acceleration too rapid from idle to full power. | Open throttles about half-way. Let engines accelerate to 29 inches Hg. and peak. Move throttles to full open position. |
| | Manifold pressure relief valve stuck closed. | Replace manifold pressure relief valve. |
| ENGINE WILL NOT STOP AT IDLE CUT-OFF | Fuel manifold valve not seating tightly. | Repair or replace manifold valve. |
| ENGINE WILL NOT START | Fuel manifold valve sticking closed. | Repair or replace manifold valve. |

Troubleshooting the Engine (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| HIGH ENGINE IDLE PRESSURE IMPOSSIBLE TO OBTAIN | Fuel manifold valve sticking closed. | Repair or replace manifold valve. |
| ERRATIC ENGINE OPERATION | Fuel manifold valve sticking part-way or not free. | Repair or replace manifold valve. |
| CLIMBING TO ALTITUDES ABOVE 12,000 FEET, ENGINE QUITS WHEN POWER REDUCED | Fuel vaporization. | Turn boost pumps ON when climbing 12,000 feet, when climb completed, continue with boost pumps ON until vaporization possibility is eliminated. Lean mixture during climb for proper fuel flow for power being used.<br><br>Engines may quit when throttles are brought back for power adjustment after leveling off. If this occurs, lean mixture and engines will pick up again. |
| MANIFOLD PRESSURE BETWEEN ENGINES VARIES WITH ALTITUDE | 1000 feet critical altitude tolerance between engines. | Advance one throttle in front of the other to keep manifold pressure the same. |
| MANIFOLD PRESSURE VARIES WITH AIRSPEED INCREASE WHEN AIRSPEED INCREASED, DECREASE WHEN AIRSPEED DECREASED | Waste-gate stuck or closed. | Adjust throttles after airspeed has increased from climb speed. |
| NOTE<br><br>The left engine manifold pressure will not normally increase or decrease more than right engine because of location of left engine air intake duct. | | |
| MANIFOLD PRESSURE VARIES WITH ENGINE RPM | Waste-gate OPEN, RPM increase manifold pressure slight decrease. RPM decrease manifold pressure slight increase. | Normal turbocharged engines characteristic. |
| MANIFOLD PRESSURE VARIES WITH INCREASING OR DECREASING FUEL FLOW | Waste-gates CLOSED. | Fuel flow increase the mass flow of exhaust increased, turbine turns faster more induction air furnished engine resulting in manifold pressure increase. |

ENGINE COWLS.

Removal and Installation of Engine Cowls. (See figure 9-1.)

NOTE

The removal procedures given pertain to the left engine cowling, repeat procedures for removal of right cowling.

a. Release fasteners retaining cowl doors (2 and 6) to upper cowl assembly (1).
b. Release fasteners retaining upper cowl assembly (1) to nacelle structure and remove upper cowl assembly (1) from aircraft.
c. Remove screws attaching lower portion of cowls (2 and 6) to engine beam assembly.
d. Remove screws retaining nose cap assemblies (4 and 5) to forward engine beam assembly.
e. Remove screws securing nose cap assemblies (4 and 5) together and remove nose cap assemblies.
f. Install engine cowling by reversing removal

procedures.

COWL FLAPS.

Removal and Installation of Cowl Flaps. (See figure 9-2.)

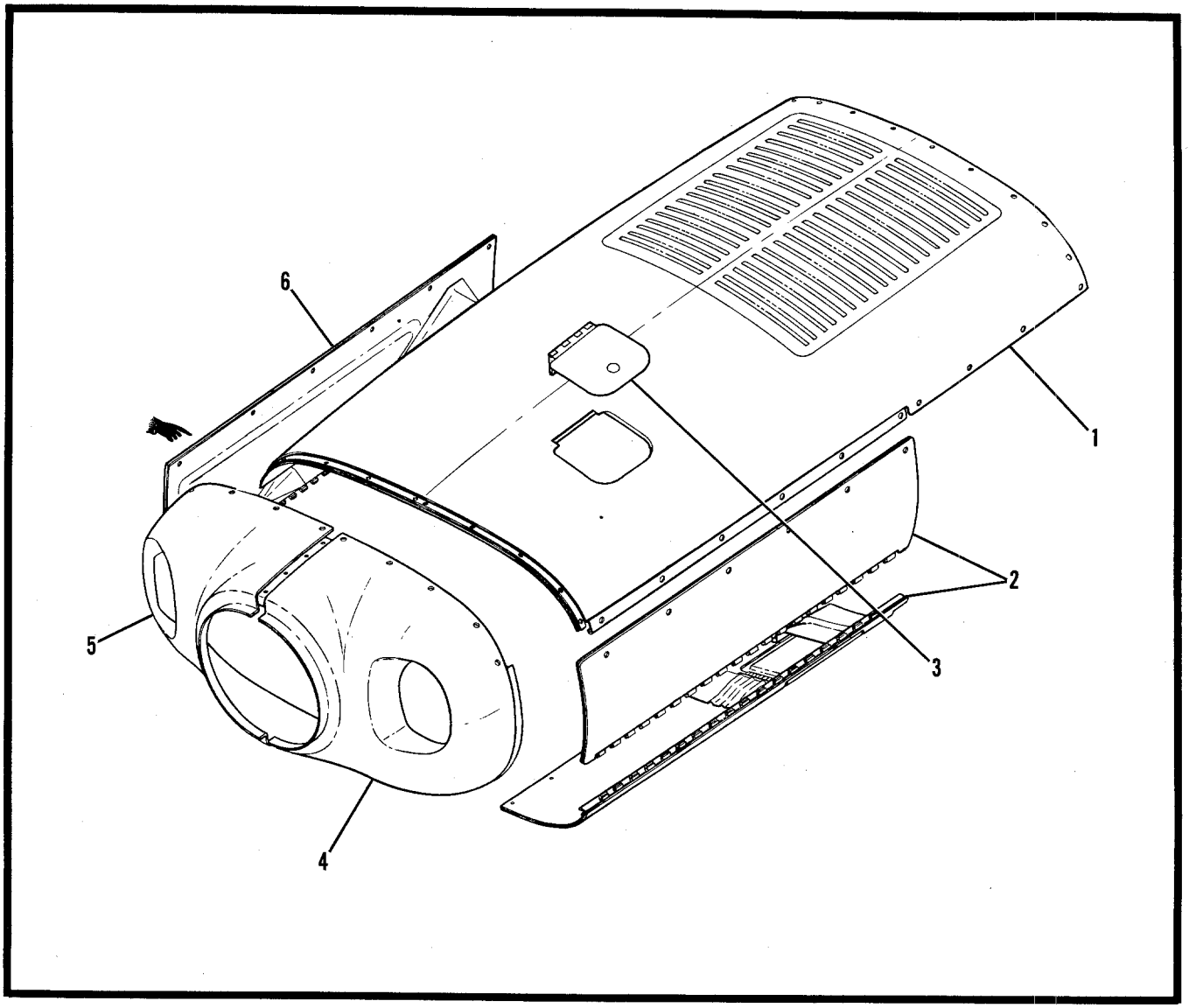
a. Position cowl flaps to OPEN.
b. Disconnect rod assembly (8) by removing nut and bolt attaching rod assembly to upper ball joint (9).
c. Remove rod assembly (8) from door assembly (4) by screwing from nutplate.
d. Remove hinge pin (7) from hinge halves and remove door assembly (4) from engine nacelle.
e. Install door assembly (4) by reversing removal procedures.

NOTE

Secure hinge pin (7) with cotter pins upon installation.

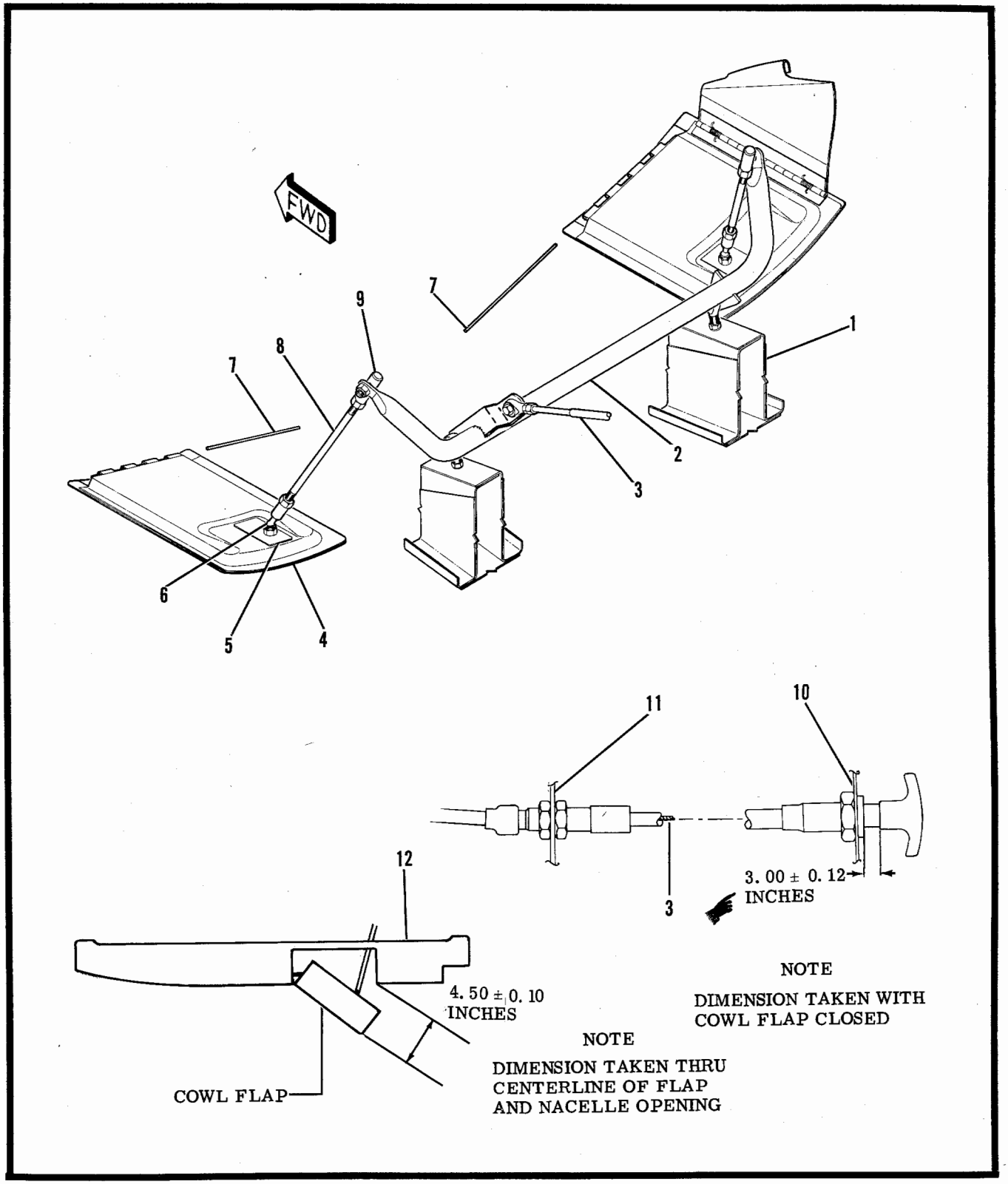
Removal and Installation of Cowl Flap Torque Tube Assembly. (See figure 9-2.)

a. Position cowl flap to OPEN.
b. Disconnect rod assembly (8) by removing nut and bolt attaching rod assembly to upper ball joint (9).
c. Disconnect control cable (3) from torque tube assembly (2) by removing nut and bolt.
d. Remove nuts and bolts attaching torque tube assembly (2) to support (1).




1. Upper Cowl Assembly
2. Door Assembly (LH, Outboard)
3. Door Assembly (Oil Filler)
4. Nose Cap Assembly (Cowl LH)
5. Nose Cap Assembly (Cowl RH)
6. Door Assembly (LH, Inboard)

Figure 9-1. Engine Cowls




1. Support
2. Torque Tube Assembly
3. Control Cable
4. Door Assembly
5. Spacer
6. Lower Ball Joint
7. Hinge Pin
8. Rod Assembly
9. Upper Ball Joint
10. Control Pedestal
11. Engine Nacelle Bracket
12. Lower Nacelle

Figure 9-2. Cowl Flap Installation

e. Route torque tube assembly (2) from engine nacelle through the inboard cowl flap opening.
f. Install torque tube assembly (2) by reversing removal procedures.
g. Check rigging in accordance with rigging procedures.

Removal and Installation of Cowl Flap Control Cable. (See figure 9-2.)

a. Remove engine cowling.
b. Position cowl flaps to OPEN.
c. Disconnect clevis end of control cable (3) from torque tube assembly (2) by removing nut and bolt.
d. Remove nuts retaining control cable (3) to nacelle bracket.
e. Loosen nut retaining control cable (3) to control pedestal.
f. Tie guide wire to control cable (3) and route from wing to control pedestal.
g. Install control cable (3) by reversing removal procedures and rig in accordance with rigging procedures.

Rigging of Cowl Flaps. (See figure 9-2.)

a. Position cowl flaps to OPEN.
b. Locate the centerline of cowl flap door (4) and nacelle opening. Measure the distance of travel from 4.50 ±0.10 inches.
c. Adjust travel of flap doors by increasing or decreasing the length of clevis and on control cable (3).
d. Position cowl flaps to CLOSE.
e. Check the extension of control handle for not more than 3.00 ± 0.12 inches of travel from control pedestal.

ENGINE.

Engine Removal Procedures. (See figure 9-3.)

The removal procedure is the same for either engine. Although the routing of wire bundles, cables, lines, hoses and conduit varies between engines, the following description will be typical for either engine. Identify each item as it is disconnected to aid in reinstallation. Cover the open ends of all lines and hoses to prevent entry of foreign materials.

NOTE

If engine is being removed to be placed in storage, proper preparatory steps as outlined in Section 2, "Indefinite Storage," must be observed. In addition to the above mentioned procedures, cover all engine and accessory vents and other openings, including the crankcase breather, with other vaporproof material.

a. Turn all cockpit switches and fuel selector valves OFF.
b. Open the battery circuit by disconnecting the battery ground cable.
c. Remove engine cowling in accordance with removal procedures.
d. Disconnect starter cable (14) from starter (13).
e. Tag and disconnect the engine wiring bundle (17) from the following components:
1. Magnetos (7).
2. Alternator (26).
3. Propeller deice brush holder assembly (9) (optional equipment).
4. Tach generator.
5. Oil temperature bulb (located on lower portion of oil cooler).
6. Cylinder head temperature bulb (located on cylinder head No. 3 on LH and RH engine).
f. Remove all clamps attaching engine wire bundle (18) to engine components and route clear of engine assembly.
g. Remove engine ground strap (11) from engine beam assembly by removing bolt.
h. Drain engine oil in accordance with Section 2. Replace drain plug and tighten.
i. (Refer to Section 13.) If installed, remove propeller unfeathering system hose at the governors.

WARNING

The propeller unfeathering accumulator is normally pressurized; therefore, release accumulator pressure by referring to Section 13 before attempting to disconnect hose from governor.

j. Remove propeller in accordance with Section 10.
k. Disconnect propeller control rod end (35) at the governor (34) by removing nuts, spacer and bolt.
l. (See figure 9-6.) Disconnect propeller control support bracket (15) from engine intake manifold by removing clamps (14).
m. If installed, remove air conditioner drive belt.
n. Disconnect hose to engine intake manifold.
o. Disconnect hoses and clamps from vacuum pump.
p. Disconnect turbocharger air pressure hose from manifold fitting.
q. Disconnect aft air intake manifold drain hose from manifold fitting.
r. (See figure 9-8.) Disconnect the following lines and hoses from engine assembly.
1. Line and hose assemblies (10, 11, 12, 14 and 16) from fuel pump (9).
2. Metered fuel hose (6) from baffle fitting.
3. Hose assembly (15) from throttle body (19).
4. Hose assembly (13) from baffle fitting.
s. (See figure 9-13.) Disconnect the following lines and hoses from engine assembly.
1. Oil cooler hoses (9 and 10) from oil cooler (8).
2. Oil return hose (14) at the engine oil return port (13).
3. Turbocharger oil return hose (22) from scavenger pump (24).
4. Disconnect oil separator drain line (7) from oil

separator (5).
5. If installed, disconnect fire extinguisher lines.
t. Disconnect drain line from intake manifold crossover (10).
u. (See figure 9-27.) Disconnect exhaust system at the bellows (3) by removing attaching nuts, washers, bolts and springs.
v. Attach engine hoist to the engine hoisting lug (21) and lift the engine just enough to relieve weight from the engine mounts.

CAUTION

Place a suitable stand under the aircraft tailcone bumper before removing engine. The loss of engine weight may cause the tail to drop.

w. (See figure 9-4.) Remove the engine mounts and engine as follows:
1. Remove bolt (7), lockwasher (6), retainer (5), boots (8), lower mount (4), bonded spacer (9) and upper mount (2) from engine mount (1).
2. Hoist engine out of nacelle and clear of aircraft.

NOTE

Hoist engine slowly and make certain that all wires, lines and hoses have been disconnected.

Disassembly and Assembly of Engine.

NOTE

The disassembly procedure is the same for either engine and is intended to cover only those items which could normally be expected to require removal or are not noted by Continental Motors Corporation "Engine Maintenance and Overhaul" manual for engine specified.

a. Hoist engine assembly to a convenient working height.
b. Refer to Section 2 and Continental Motors Corporation's maintenance and overhaul manual for cleaning engine.

CAUTION

Particular care should be given to electrical components and bearings before cleaning. Solvents should not be allowed to enter magnetos, starters, alternators, compressor idler pulley bearings, and any lubricated control. These items must be protected with cover before saturating the engine with solvent. Any oil, fuel, and air openings on the engine accessories should be covered before washing down the engine with solvent. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

NOTE

As each of the following items is removed from the engine, place a temporary cover over the hole left by the removal of the item. This procedure should prevent the accidental entry of foreign material which could cause engine damage or lead to a serious engine malfunction.

c. Refer to Section 12, remove vacuum pump in accordance with removal procedures.
d. Remove engine baffles in accordance with removal procedures.
e. Remove the tachometer generator by removing four nuts and lifting tachometer generator free of drive adapter.
f. Refer to Section 10, remove propeller governor in accordance with removal procedures.
g. Remove all other fittings, hoses, lines and attaching parts necessary to facilitate maintenance of engine.
h. To assemble the engine, reverse the engine disassembly procedures.

Inspection of Engine Assembly. (Refer to Section 2.)

NOTE

Instructions concerning inspection of particular engine components, refer to applicable paragraph in "Engine Maintenance and Overhaul" manual, Continental Motors Corporation.

a. Inspect all hoses for evidence of internal swelling, chafing, cuts, breaks and heat hardness.
b. Inspect all fittings for thread damage, damage to chamfered seats and replace fittings as necessary.
c. Inspect oil separators for evidence of restrictions and clean as necessary.
d. Visually inspect the engine for loose nuts, bolts, cracks and fin damage. Make necessary corrections and repairs in accordance with best shop practices and in compliance with applicable FAA regulations.

Engine Installation Procedures. (See figure 9-3.)

NOTE

The installation procedure is the same for either engine. Although there is some difference in the routing of wire bundles, lines, hoses and conduit, the following procedure is typical for installation of either engine.

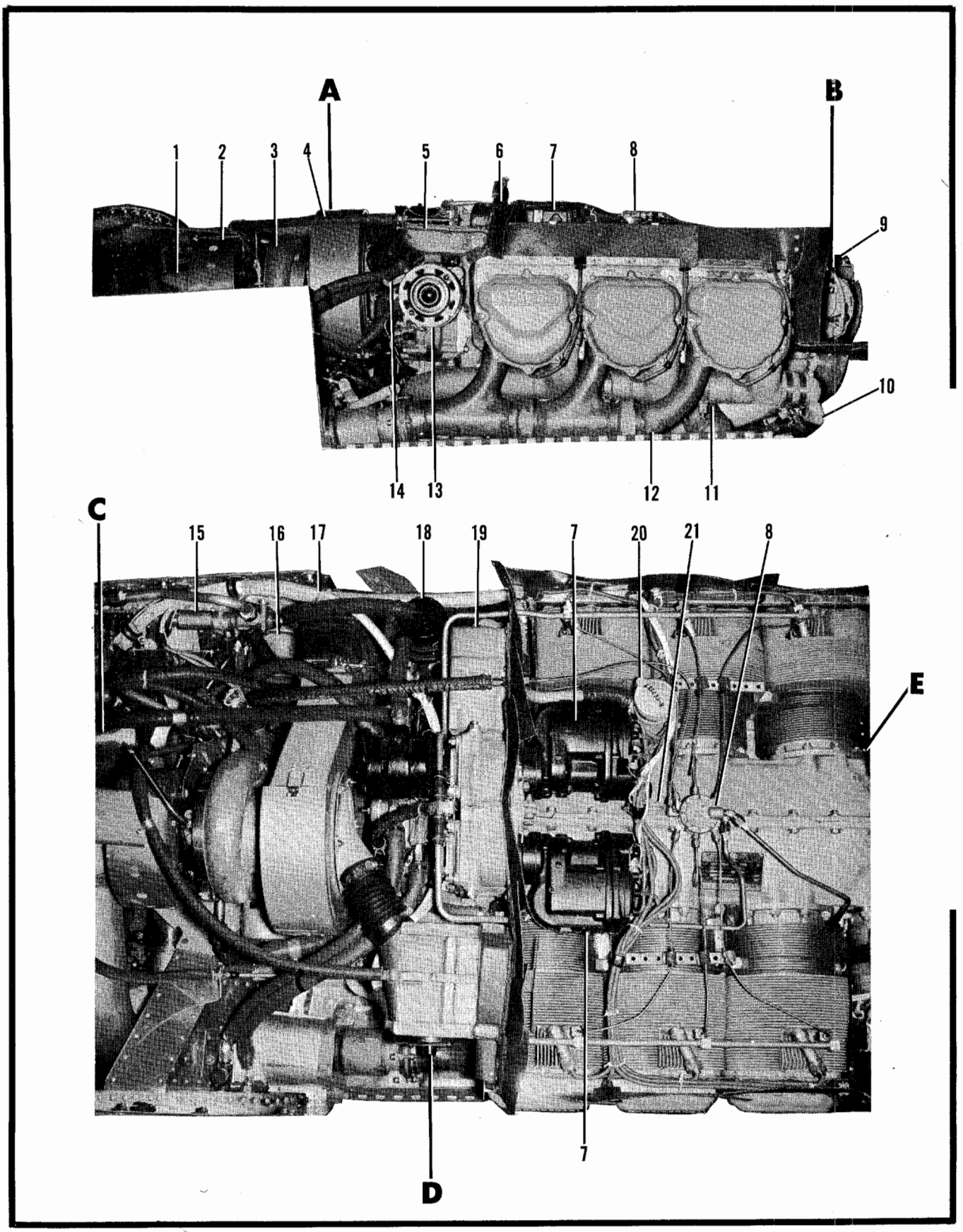
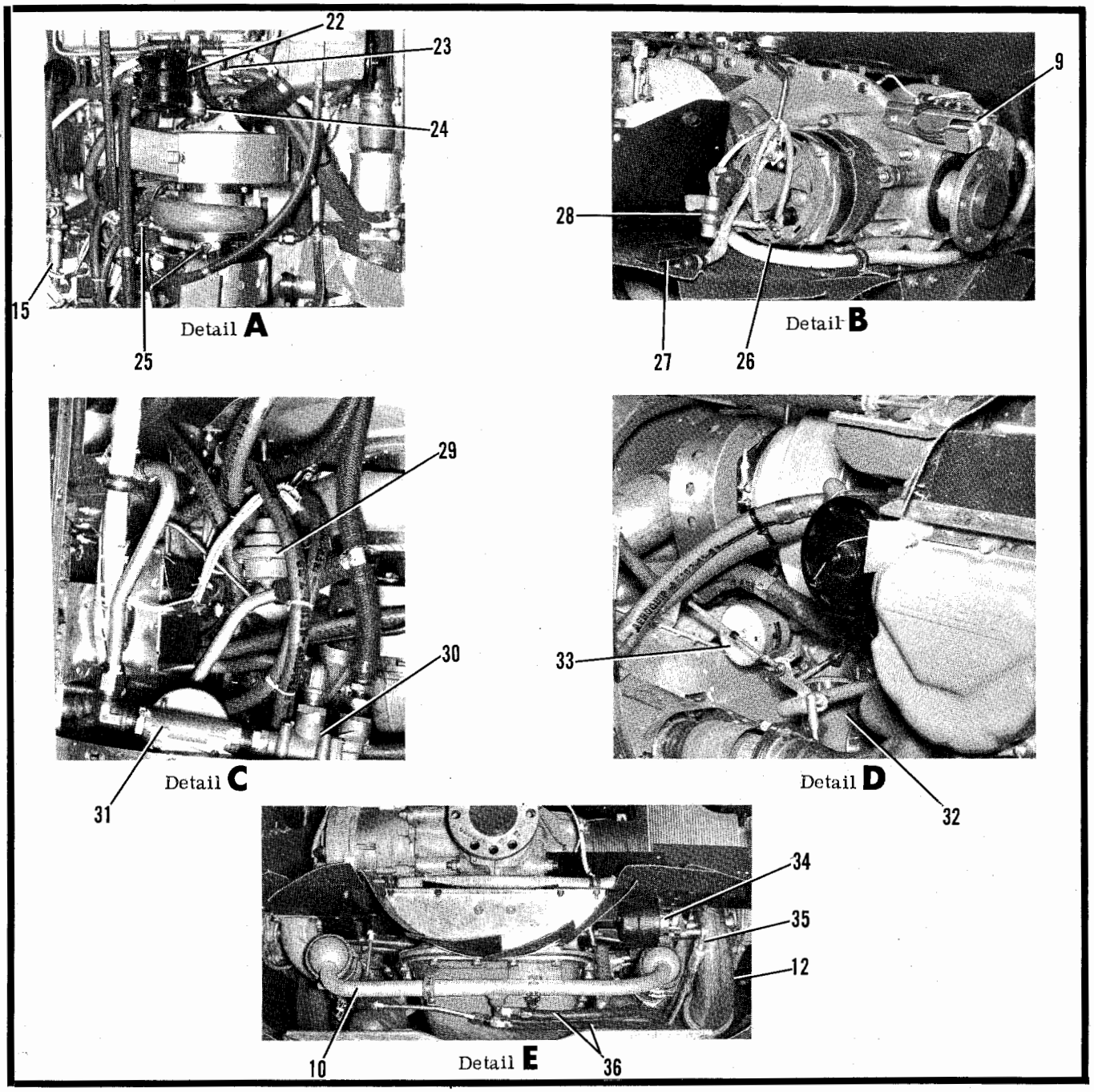



Figure 9-3. Engine Installation (Sheet 1)




1. Overboard Exhaust Tube
2. Turbocharger Turbine
3. Turbocharger Compressor
4. Air Induction Canister
5. Alternate Air Box
6. Rear Engine Baffle
7. Magneto
8. Fuel Nozzle Manifold
9. Brush Holder (Deice)
10. Induction Air Crossover
11. Ground Strap
12. Exhaust Stack
13. Starter
14. Starter Cable
15. Deice Control
16. Venturi
17. Wire Bundle Engine
18. Oil Separator
19. Oil Cooler
20. Oil Filler
21. Hoisting Lug
22. Deice Vacuum Pump
23. Scavenge Pump
24. Fuel Pump
25. Absolute Pressure and Pressure Ratio Controller
26. Alternator
27. Alternator Fail Sensor
28. Alternator Diode Module
29. Fuel Pressure Limiter
30. Deice Shuttle Valve
31. Deice Filter
32. Throttle Body
33. Manifold Pressure Relief Valve
34. Propeller Governor
35. Propeller Control Rod End
36. Intake Air Drain Hoses

Figure 9-3. Engine Installation (Sheet 2)

a. Hoist engine to a point just above the nacelle.
b. (See Figure 9-4.) Install engine mounts and engine as follows:
1. Position upper mount (2) on fitting assembly (3). Index upper mount (2) with roll pin on back side of fitting assembly (3).
2. Using a shop punch or like instrument as an aligning tool, guide engine on upper mount (2) and fitting assembly (3).

NOTE

Align exhaust stack assemblies with engine studs as engine is being lowered on mounts.

3. Assemble lockwasher (5), bonded spacer (7), and lower mount (4) with bolt (6). Position these items on the fitting assembly (3) and index lower mount (4) with roll pin (8). Align lockwasher (5) with hole provided in lower mount (4).
4. Torque bolt (6) to 300 +50, -0 inch-pounds.
5. Safety bolt (6) by crimping the ears on lockwasher over the flat surfaces of the bolt head.
c. (See figure 9-27.) Connect exhaust system to bellows (3) with attaching washers, nuts, bolts and springs. Refer to installation of exhaust system for spring length requirements.
d. Connect drain line to intake manifold crossover (14).

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed.

e. (See figure 9-13.) Connect the following lines and hoses to the engine assembly.
1. Oil separator drain line (7) to oil separator (5).
2. Turbocharger oil return hose (22) to scavenger pump (24).
3. Oil return hose (14) to engine oil return port (13).
4. Oil cooler hoses (9 and 10) to oil cooler (8).
f. (See figure 9-8.) Connect the following lines and hoses to the engine assembly.
1. Hose assembly (13) to baffle fitting.
2. Hose assembly (15) to throttle body (19).
3. Metered fuel hose (6) to baffle fitting.
4. Line and hose assemblies (10, 11, 12, 14 and 16) to fuel pump (9).
g. Connect aft air intake manifold drain line to manifold fitting.
h. Connect turbocharger air pressure hose from manifold fitting.
i. Connect hoses with clamps to vacuum pump.
j. Connect engine air intake hose and exhaust stack with attaching hoses and clamps.
k. (See figure 9-6.) Position and secure propeller control mounting bracket (15) to engine intake manifold with clamps (14).
l. Connect propeller control rod end (35) to the governor (34) with attaching bolt, spacer and nuts.
m. Install propeller in accordance with Section 10.

NOTE

Use a multimeter to assure proper bond between engine and aircraft structure. Resistance should be 0.00 ohms.

n. Connect engine ground strap (13) to engine beam assembly with existing bolt.
o. Connect engine wire bundle (18) to the following components and remove tags.
1. Connect cylinder head temperature bulb (located on cylinder head No. 3 on LH and RH engine. Make sure ground wire is properly bonded.
2. Oil temperature bulb (located on lower oil cooler).
3. Tach generator (24).
4. Propeller deice brush holder assembly (9) (optional equipment).
5. Alternator (26).
6. Magnetos (7).
p. Connect starter cable (14) to starter (13).
q. Inspect engine installation in accordance with installation inspection procedures.
r. Rig engine controls in accordance with rigging procedures.
s. Make a magneto switch ground-out and continuity check. Connect magneto ground wires to the magnetos.
t. Service the engine with oil in accordance with Section 2.
u. Close battery circuit by connecting the battery ground cable.
v. Install engine cowling in accordance with installation procedures.
w. Perform an engine operational check.

Inspection of Engine Installation. (See figure 9-3.)

The following check may be used as a guide for inspecting the installation of either engine.

a. Propeller mounting nuts - torque.
b. Engine mounts secure.
c. Oil temperature bulb electrical connector secure and safetied, ground wire connection tight.
d. Oil pressure relief valve plug safetied.
e. Tachometer generator electrical connector secure and safetied.
f. Starter cable connection secure and insulating boot in place.
g. Cylinder head temperature bulbs installed and ground wire connections properly bonded.
h. Alternator cable connections secure.
i. All wiring securely clamped in place.
j. Feul pump connections tight.
k. Manifold pressure hose connections tight.
l. Oil pressure connections clamped and tight.
m. Fuel injection nozzles tight.
n. Fuel pressurization line tight.
o. Fuel injection lines clamped and tight.
p. Fuel manifold secure.
q. Turbocharger oil supply line tight.
r. Oil filter lines tight.
s. Controller lines secure and tight.
t. All flexible tubing in place and clamped.
u. Crankcase breather line connections secure.
v. Air-oil separator exhaust and return hoses secure.
w. Turbocharger assembly secure.

x. Vacuum line and vacuum pump outlet hose and connection secure.
y. Engine controls properly rigged.
z. Oil drain plugs tight and safetied.
aa. Oil quantity check (refer to Section 2).
ab. Hose and lines secured at firewall.
ac. Throttle body and metering control unit secure.
ad. Shrouds installed on engine-driven fuel pump, and fuel-air control unit. Ram air tube installed and clamped.
ae. Air leak check should be made on induction system to insure optimum performance from the turbocharger. The following procedure is recommended:
1. Remove alternate air chamber in accordance with removal procedures.
2. With an adapter plug at hose, attach the pressure side of an industrial vacuum cleaner to the compressor inlet.

NOTE

The inside of the vacuum cleaner should be free of any contamination that might be blown into the engine induction system.

3. With the vacuum cleaner on, all joints may be check for leaks by using a soap solution and watching for bubbles. All joints should be free of air leaks with the exception that some small bubbles will appear at the gasket joint of the waste-gate controller cover and body.

NOTE

The manifold pressure indicator should indicate two to three inches of pressure above atmospheric pressure, when the vacuum cleaner is on.

4. Install alternate air chamber in accordance with installation procedures.
af. Exhaust system secure.
ag. Spark plugs tight. Ignition harness connections tight and harness properly clamped.
ah. Magneto ground wires connected.
ai. Engine nacelle for loose objects (tools, nuts, rag, etc.).
aj. Cowl flaps free.
ak. Cowling and access doors for security.

Engine Operational Check.

CAUTION

Ground operation time should be held to a minimum to prevent overheating the engine. At no time should the engine temperatures be allowed to exceed their maximum limits. Do not operate the engine with cowling removed.

a. Park aircraft with nose headed into prevailing wind and clear an area directly in front and to the rear of all objects that may be affected by the propeller and propeller slipstream.

CAUTION

Avoid engine runup with aircraft parked in a loose gravel area. The propeller will pick up small stones which can damage propeller blades.

b. Install wheel chocks and position a fire extinguisher for easy access in the event of engine fire.
c. Release parking brake, if previously set, and test-operate brakes. Take note of any sponginess or excessive pedal travel. Reset parking brake after completion of test.

CAUTION

If parking brake action is not normal, do not perform engine runup until corrective action is accomplished on the brake system.

d. Refer to Owner's Manual and perform "Before Starting Engines" and "Starting Engines" procedures.
e. Warm-up engine as follows:
Throttles - 750 to 900 RPM.
1. Leave cowl flap in FULL OPEN position.
2. Perform magneto ground-out check as follows:
(a) Throttle engine back to idle RPM.
(b) Momentarily switch both magnetos OFF.
RESULT: The tachometer will indicate a sudden RPM drop when magnetos cease firing.

CAUTION

If the magneto switches are left OFF for a prolonged period, after-firing may occur when they are switched back on. If the engine continues to run with switches OFF, stop engine by placing mixture control in IDLE CUT-OFF and check magneto ground.

3. Advance throttle to 1700 RPM and perform a magneto check as follows:
(a) Place right magneto switch to OFF position and note RPM drop. Return switch to ON position. Repeat check with left magneto switch.
RESULT: Engine speed drop of 150 RPM is considered maximum. The difference in the drops in RPM between the left and right magneto should not exceed 50 RPM.
4. With engine at 1700 RPM, exercise the propeller:
(a) Retard the propeller pitch lever to obtain a 1200 RPM tachometer indication.
RESULT: Exercise propeller and watch for any indication of sluggish or erratic operation.
5. Make a mixture control check by slowly moving the mixture lever toward IDLE CUT-OFF.
RESULT: When a slight drop in RPM is noted, immediately return mixture lever to FULL RICH position.

6. Stop engine by placing the mixture lever in IDLE CUT-OFF. As soon as propeller has stopped turning, place ignition switches OFF. Turn all switches OFF.

CAUTION

After extended periods of ground engine operation above 1600 RPM or when the cylinder head temperature indicator shows values within the upper half of the green operating arc, reduce power to speeds between 600 and 800 RPM for a period not less than 2 to 3 minutes prior to engine shutdown. This expedient is intended to reduce internal turbocharger temperatures and preclude the possibility of premature accumulation of carbon on the turbine shaft seals.

ENGINE MOUNTS.

The engine is mounted to the nacelle structure by four engine mounts. Each mount incorporates two rubber pads capable of sustaining operational loads and provide absorption for engine vibrations.

Removal of Engine Mount. (See figure 9-4.)

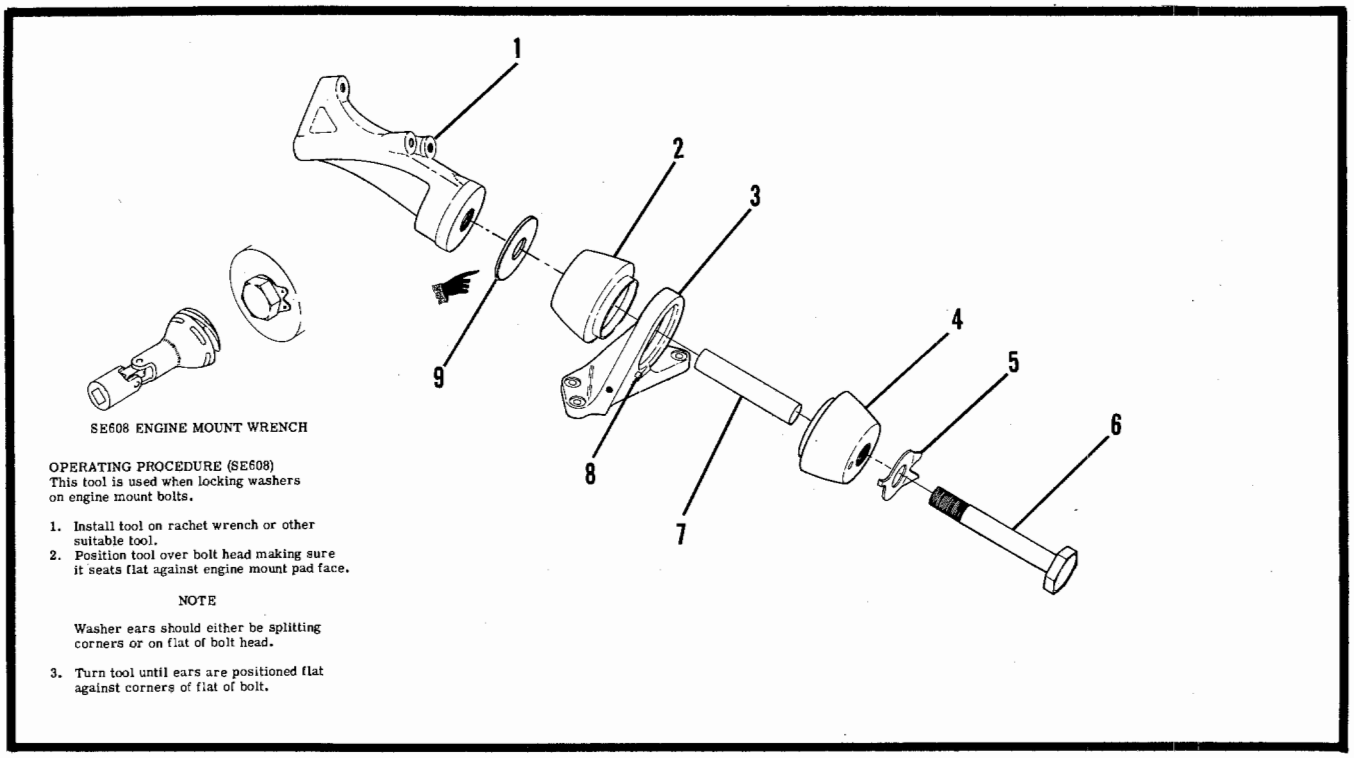
NOTE

The engine must be supported with an engine hoist before attempting removal of mount. If engine is going to be removed from aircraft, refer to "Removal of Engine" for the attaching parts to be disconnected.

a. Remove necessary engine cowling in accordance with removal procedures.
b. Place suitable support beneath tailcone.
c. Remove bolt (6) and lockwasher (5) from engine mount (1).
d. Disconnect the following components on the engine:
1. Hose from elbow to engine air intake manifold.
2. (See figure 9-13.) Oil separator drain hose (7) from overboard drain tube.
3. Air intake manifold drain line from intake crossover pipe.
e. Hoist engine slowly to a height of 2 to 3 inches above normal mounting position.

NOTE

Care should be taken not to introduce adverse stresses on other items attached to engine while hoisting engine.




1. Engine Mount
2. Upper Mount
3. Fitting Assembly
4. Lower Mount
5. Lockwasher
6. Bolt
7. Bonded Spacer
8. Roll Pin
9. Spacer

Figure 9-4. Typical Engine Mount Installation

f. Remove upper mount (2), spacer (7) and lower mount (4) from fitting assembly (3).

Shimming the Engine Mount. (See figure 9-4.)

Although engine mount sag is normal and occurs over period of time in-service, it can be corrected by shimming the mount back to its original position with special spacers. Engine mount sag which has resulted in a loss of clearance between the engine mount and/or cowling components should be corrected by shimming. If the area between the exhaust riser of number six cylinder and the lower cowl panel does not have sufficient clearance, 0.40 inch minimum, install shims to obtain proper clearance.

a. Hoist engine and support as required to insert spacers (9).

NOTE

Spacers may be obtained from the Cessna Dealers' Organization. Refer to Table I for part number and thickness desired. If the total thickness of spacers installed on any mount exceeds 0.312 inch, the mount must be removed and inspected in accordance with Section 2.

TABLE I.

| Part Number | Description | Thickness |
|---|---|---|
| 5056010-1 | Spacer | 0.125 Inch |
| 5056010-2 | Spacer | 0.188 Inch |
| 5056010-3 | Spacer | 0.250 Inch |

b. Insert spacers between the engine fitting assembly (3) and upper mount (2) as required to obtain 0.40 inch minimum clearance.

NOTE

Align propeller spinner with cowling nose cap contours, to assist in determining correct engine mount position.

CAUTION

For each 0.125 inch of spacer thickness added, it will be necessary to add the next length longer bolt in engine mount.

c. Secure engine mount in place and safety in accordance with engine mount installation procedures.
d. Recheck all clearances, especially in the exhaust stack.

Installation of Engine Mount. (See figure 9-4.)

a. Install engine mounts by reversing removal procedures.
b. Torque bolt (6) to 300 +50, -0 inch-pounds.

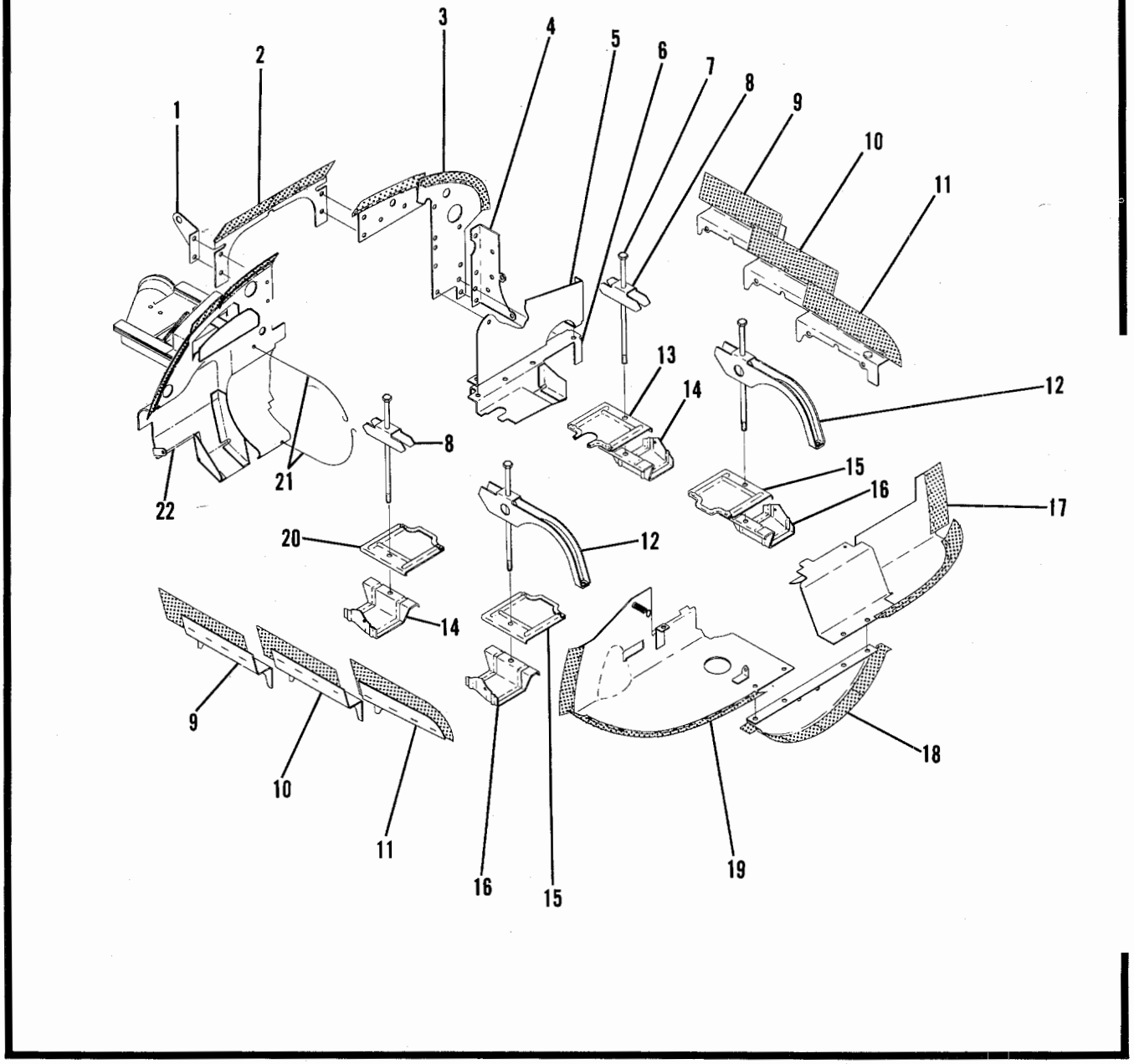
NOTE

Lock washers (5) with a break tool. This break tool is available from Cessna Dealers' Organization (Tool No. SE608).

ENGINE BAFFLES

Removal of Engine Baffles. (See figure 9-5.)

a. Remove engine cowling in accordance with removal procedures.
b. Remove screws attaching baffle (2) to support (1). Remove baffle (2) from engine nacelle.
c. Disconnect and remove the following items from baffle (3):
1. Disconnect oil filler breather hose from oil separator by loosening attaching clamps.
2. (See figure 9-3.) Remove oil separator (18) from baffle by removing two clamps and attaching screws.
3. Disconnect LH nozzle pressurization line from fuel injection nozzles and route line through baffle (3) by removing grommet.
4. Remove the remaining screws attaching baffle (3) to oil cooler and bracket (4).
5. Remove baffle (3) from engine nacelle.
d. On both LH and RH sides of engine, remove baffles (9, 10 and 11) by removing existing screws in rocker covers and screws attaching baffles (11) to baffles (17 and 19). Remove baffles from engine nacelle.
e. Remove baffle (5) by removing four screws attaching baffle (5) to channel (6). Remove baffle (5) from engine nacelle.
f. Remove channel (6) by removing screws attaching channel (6) to rocker cover. Remove baffle from engine nacelle.
g. Remove supports (8 and 12) from between engine cylinders by removing bolts (7). Remove supports from engine nacelle.
h. Remove baffles (13, 14, 15, 16 and 20) from engine as follows:
1. (See figure 9-3.) Disconnect hose from elbow to intake manifold by loosening clamp.
2. Remove attaching nuts and washers and lower air intake manifold until it comes to rest upon the engine support mounts.
3. Route baffles (13, 14, 15, 16 and 20) from beneath engine cylinder heads.
4. Remove baffles from engine nacelle.
i. Remove baffle (17) from engine as follows:
1. (Refer to Section 13.) If propeller synchronizer is installed, disconnect electrical impulse pick-up from governor and route through baffle.




1. Support Assembly (Aft, baffle)
2. Baffle Assembly (Aft, center)
3. Baffle Assembly (Aft, LH)
4. Bracket Assembly (Aft, baffle)
5. Baffle Assembly (Aft, baffle)
6. Channel Assembly (Aft, baffle)
7. Bolt
8. Support (Intercylinder baffles, aft)
9. Baffle Assembly (Aft, side)
10. Baffle Assembly (Center, side)
11. Baffle Assembly (Forward, side)
12. Support (Intercylinder baffles, fwd)
13. Baffle Assembly (Intercylinder inboard aft, LH)
14. Baffle Assembly (Intercylinder outboard aft)
15. Baffle Assembly (Intercylinder inboard fwd)
16. Baffle Assembly (Intercylinder outboard fwd)
17. Baffle Assembly (Fwd, LH)
18. Baffle Assembly (Fwd, center)
19. Baffle Assembly (Fwd, RH)
20. Baffle Assembly (Intercylinder inboard aft, RH)
21. Fastener (Baffle aft, RH)
22. Baffle Assembly (Aft, RH)

Figure 9-5. Engine Baffle Installation

2. Remove two screws attaching baffle (17) to baffle (18).
3. Remove baffle from engine nacelle.

j. Remove baffle (19) from the engine as follows:
1. Remove radio noise filter from baffle (19) by removing attaching screws.
2. Remove lower forward bolt which attaches alternator and baffle (19) to crankcase.
3. Remove two screws attaching baffle (19) to baffle (18).
4. Release spring and remove baffle (19) from engine nacelle.

k. Remove baffle (18) as follows:
1. (Refer to Section 10.) Remove propeller spinner in accordance with removal procedures.
2. Remove two nuts and four washers attaching baffle (18) to engine crankcase.
3. Remove baffle from engine nacelle.

l. Remove baffle (22) as follows:
1. (See figure 9-3.) Disconnect from baffle the following items:
(a) alternate air hose from alternate air box (5).
(b) (See figure 9-8.) Metering fuel line (5).
(c) Disconnect and route wire bundle (17) through baffle.
(d) If autopilot is installed, disconnect ram air tube from baffle.
2. Disconnect spring (21) and remaining attaching screws and route baffle (22) from engine nacelle.

Installation of Engine Baffles. (See figure 9-5.)

a. Install engine baffles by reversing removal procedures.

NOTE

If induction air intake manifold was lowered to remove baffles (13, 14, 15, 16 and 20), replace gaskets upon installation.

ENGINE CONTROL CABLES.

Troubleshooting Engine Control Cables

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NOTE<br>Control actions must be corrected in the order presented in Rigging Chart. Start at the top of the chart and work toward the bottom. | | |
| MIXTURE CONTROL LEVER REACHES QUADRANT BEFORE COVERING FULL TRAVEL | Insufficient control travel. | (See figure 9-6.) Shorten travel of serrated lever (11) by resetting lever higher on serrated spacer (10). |
| MIXTURE CONTROL LEVER STOPS SHORT AT BOTH ENDS OF QUADRANT | Excessive control travel. | (See figure 9-6.) Lengthen travel of serrated lever (11) by resetting lever lower on serrated spacer (10). |
| MIXTURE CONTROL LEVER STOPS SHORT AT ONE END OF TRAVEL AND STRIKES QUADRANT STOP AT OTHER END | Uneven control travel adjustment. | (See figure 9-6.) Disconnect rod end (8) from lever (11) and turn rod end until desired adjustment is achieved. Connect rod end to lever. |
| UNEVEN MIXTURE RESPONSE BETWEEN ENGINES (MORE THAN HALF KNOB DIFFERENCE AT BALANCED FLOW METER READINGS, RPM AND MANIFOLD PRESSURE | Different mixture control sensitivities. | Refer to Rigging Mixture and Throttle Controls. |
| THROTTLE CONTROL LEVER REACHES QUADRANT STOPS BEFORE COVERING FULL TRAVEL | Insufficient control travel. | (See figure 9-6.) Shorten travel of pinned lever (6) by moving bolt (5) away from throttle body on slotted hole. |

Troubleshooting Engine Control Cables (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| THROTTLE CONTROL LEVER STOPS SHORT AT BOTH ENDS OF QUADRANT | Excessive control travel. | (See figure 9-6.) Lengthen travel of pinned lever (6) by moving bolt (5) towards throttle body on slotted hole. |
| THROTTLE CONTROL LEVER STOPS SHORT AT ONE END OF TRAVEL AND STRIKES QUADRANT STOP AT OTHER END | Uneven control travel adjustment. | (See figure 9-6.) Disconnecr rod end (8) from lever (11) and turn rod end until desired adjustment is achieved. Connect rod end to lever. |
| UNEVEN THROTTLE SETTING RESPONSE BETWEEN ENGINES. MORE THAN 1/8 INCH DIFFERENCE BETWEEN KNOBS (AT SAME FLOW METER MANIFOLD PRESSURE AND RPM READINGS) | Different throttle control sensitivities. | Refer to Rigging Mixture and Throttle Controls. |
| NOTE<br>If described corrective measures do not provide adequate throttle control operation, check throttle body, control valve operation and air intake system for leaks. | | |

Removal of Engine Control Cables. (See figure 9-6.)

a. (Refer to Control Pedestal Installation in Section 3.) Remove elevator trim control wheel, alternate air controls and cabin pressurization controls, cover plate, friction knob and RH side panel.
b. Disconnect throttle, propeller and mixture control cables (4, 12 and 1) from quadrant control levers by removing attaching clevis pins.
c. Unthread locknuts from control cables (4, 12 and 1) at bracket (15) in control pedestal and throttle body bracket in nacelle.
d. Unthread and remove locknuts (9) from propeller control cable (12) at support bracket (15) and disconnect rod end (8) from governor (13) by removing nut, washer, spacer and bolt. Remove rod end (8) from propeller control cable (12).
e. Disconnect swivel ball joint (3) on mixture control cable (1), by removing attaching nut and washer.
f. Disconnect rod end (8) on throttle cable (4) from pinned lever (6) by removing attaching nut and washer from bolt (5).
g. Remove rod end (8) from throttle cable (4) by loosening locknut (9) and unthreading rod end.
h. Remove swivel ball joint (3) from mixture control cable (1) by removing nut (2).
i. Remove cable clamp (17) securing control cables to floorboards.
j. Attach guide wires to control cables (1, 4 and 12) and route control cables through wing to control pedestal, and remove from fuselage.

NOTE

To facilitate installation, leave guide wires in aircraft.

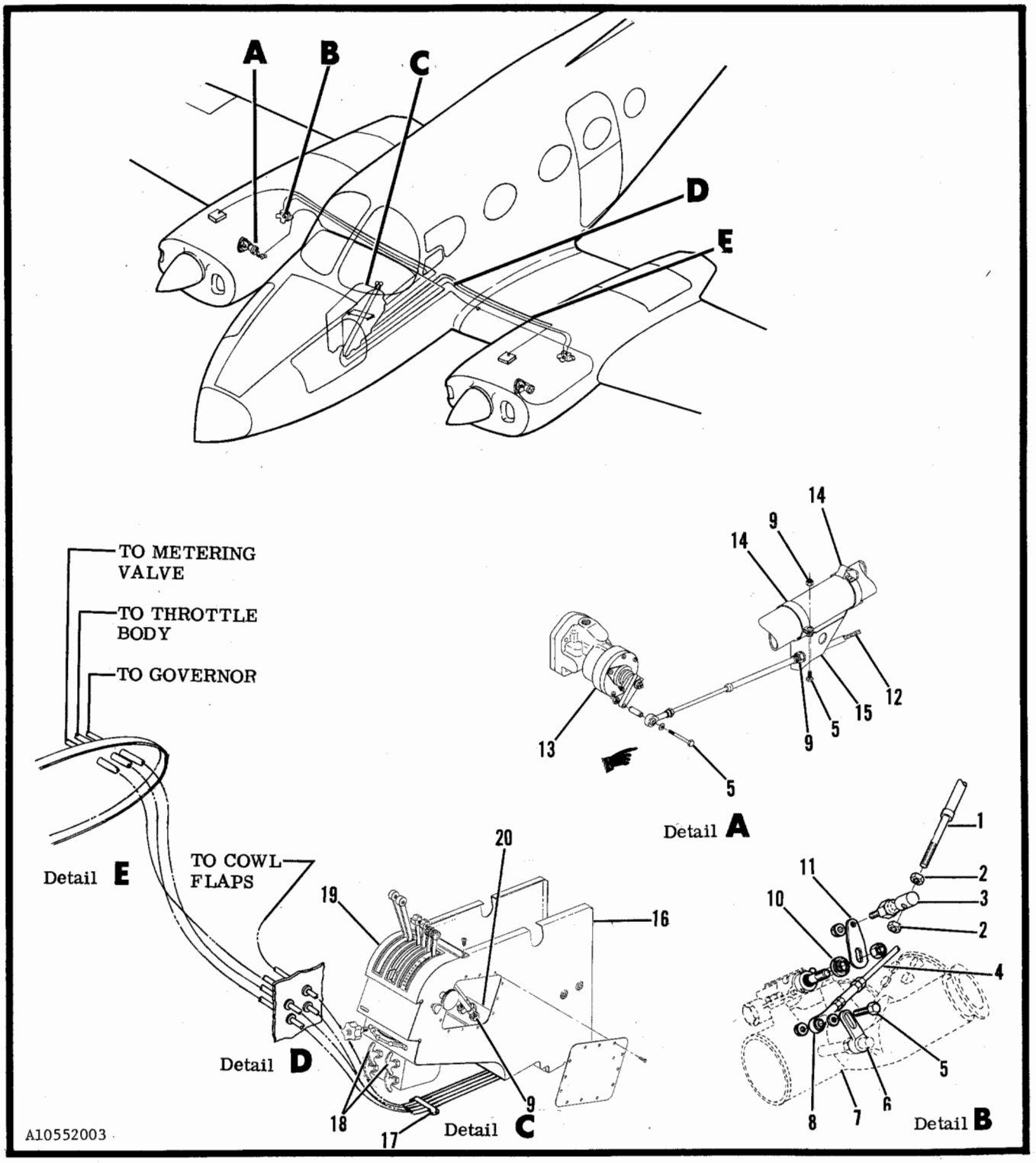
Installation of Engine Control Cables. (See figure 9-6.)

a. Attach guide wires to the ends of control cables (1, 4 and 12).
b. Route control cables (1, 4 and 12) to bracket (17) in control pedestal (16) to engine nacelle and remove guide wires.
c. Install rod end (8) on throttle cable (4).

NOTE

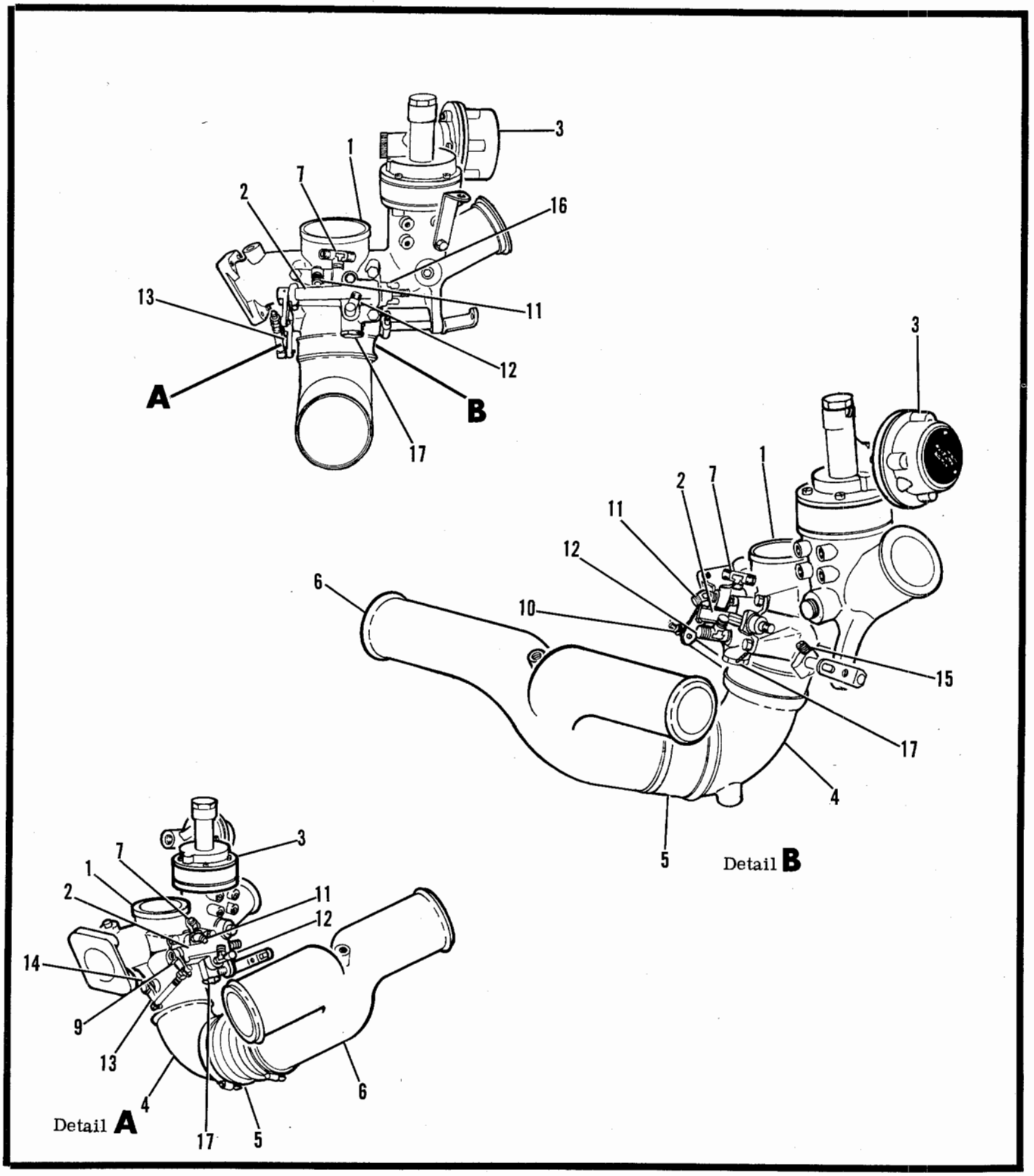
Do not connect rod ends to pinned lever (6) or serrated lever (11) at this time.

d. Secure control cables (1, 4 and 12) to bracket (20) in control pedestal and throttle body bracket in nacelle.
e. Connect control cables (1, 4 and 12) clevis ends to quadrant control levers with attaching clevis pins and safety in place with cotter pins.
f. Route propeller cable (12) through bracket (15) and secure with locknuts.
g. Secure rod end to propeller cable (12) and connect rod end to propeller governor (13) with bolt, spacer, washer and nut.
h. (Refer to Section 10.) Rig propeller control in accordance with rigging procedures.
i. Connect rod end (8) on throttle cable (4) to pinned lever (6) with bolts (5), washer and nut.
j. Connect mixture control cable (1) to ball joint (3) with nuts (2).
k. Install ball joint (3) to serrated lever (11) with washer and nut.
l. Refer to rigging procedures and rig throttle and




1. Mixture Control Cable
2. Nut
3. Ball Joint
4. Throttle Cable
5. Bolt
6. Pinned Lever
7. Throttle Body
8. Rod End
9. Locknut
10. Serrated Spacer
11. Serrated Lever
12. Propeller Control Cable
13. Governor
14. Clamp
15. Support Bracket
16. Control Pedestal
17. Cable Clamp
18. Cowl Flap Controls
19. Control Quadrant
20. Bracket

Figure 9-6. Engine Controls Installation




1. Throttle Body
2. Metering Unit
3. Absolute Pressure Controller
4. Elbow
5. Connecting Hose
6. Wye
7. Fuel Return Line to Pump
8. Metering Unit Shaft
9. Metering Unit Lever
10. Idle Mixture Adjustment Lever
11. Metered Fuel Line to Manifold Valve
12. Fuel Supply Line From Pump
13. Fuel Supply Line From Pump
14. Throttle Shaft
15. Idle Speed
16. Pin Stop
17. Metering Unit Filter Screen

Figure 9-7. Fuel-Air Control Unit

mixture controls.

Rigging Mixture and Throttle Controls. (See figure 9-6.)

a. Rig control cables on throttle valve and metering unit as follows:

1. Find the neutral position of the throttle shaft by rotating the throttle shaft clockwise and then counterclockwise until the shaft comes to rest on the internal stops. Scribe an index mark on shaft and throttle body at these positions. Rotate throttle shaft to the midpoint between the marks and scribe a neutral position mark. The neutral position on the metering unit can be determined by visually positioning the pin on the metering unit shaft at the midpoint between the two stop pins. Position both the throttle and metering unit shafts to neutral.

2. Align serrated spacer (10) on throttle shaft so that serration line on the face of spacer is perpendicular to the neutral position of the shaft.

CAUTION

Care should be exercised in order to maintain original factory setting of serrated spacer on shaft.

3. Install lever (11) on spacer (10) aligning the serration end secure to shaft with washer and nut.

4. On the control quadrant (19), place the throttle and mixture control levers at the midpoint between stops.

5. With the throttle and metering shaft in the NEUTRAL position and the throttle and mixture control levers set at the midpoint, adjust control cable rod ends (8) and slotted pin lever (6) attached with swivel and ball joint to form a 90 degree angle between centerline of lever (6) and control cables (1 and 4).

NOTE

If throttle and mixture controls on the quadrant were not set at a true midpoint as described in step 5 above, the 1/4 inch tolerance as noted in following steps b and d, will not be available. Readjustment for 1/4 inch travel (cushion) will be necessary and should be made as specified in Rigging Procedures Chart.

b. (See figure 9-7.) Adjustment of the idle mixture is accomplished by the use of locknut which is attached to metering unit lever on the metering unit. Tightening locknut to shorten the interconnecting linkage provides a richer mixture. Adjust to obtain a slight and momentary gain in idle speed as the mixture control is moved toward IDLE CUT-OFF (if set too lean, idle speed will drop under the same condition). Mixture control levers in the cabin should end their travels approximately 1/4 of an inch before reaching the quadrant stops. At the same time, the metering unit levers on the engines should rest against the corresponding stops.

c. Metering unit levers should be uniform within 1/2 a knob through the cruising range. This can be checked by adjusting both flow meter readings to an identical value at uniform RPM and manifold pressure on both engines.

d. Adjust the throttle control levers in the cabin so that their travel stops 1/4 of an inch before reaching the quadrant stops. At the same time the throttle levers on the engines should rest against the corresponding stops.

e. Throttle control levers should be uniform within 1/8 of an inch of the knobs through the entire travel. The rigging procedures chart provides corrective instructions in order to meet the above control requirements.

ENGINE CONTROL QUADRANT.

The engine control quadrant, mounted in the control pedestal, contains the throttle levers, propeller pitch levers, and mixture levers. The control quadrant components are fastened together in a manner which allows a friction control knob at the right side of the control quadrant to vary the amount of friction on the various control levers. This provides a means of locking the control levers in the desired position.

Removal of Engine Control Quadrant. (See figure 9-6.)

a. (Refer to Section 3, Control Pedestal Installation.) Remove elevator trim control wheel, cover plate, friction knob, upper panel and side panel.

b. Remove cover box or autopilot control unit (optional equipment) from upper face of control pedestal (16) by removing screw from support angles.

c. Disconnect control cables (1, 4 and 12) from quadrant control levers by removing the clevis pins. The clevis pins are safetied with cotter pins.

d. Remove control quadrant (19) from control pedestal (16) by removing attaching screws.

Disassembly of Control Quadrant. (See figure 9-9.)

a. Remove the three screws (18) attaching right mounting plate (31) to guide rods (24).

b. Remove cotter pins (49), washers (48) and pins (56) from terminal (47).

c. Remove nut (58), spacers (55), lugs (53) and bolt (57) from right and left mounting plates (21 and 31).

d. Remove washer (34) and spring (35) from end of center stud (33).

e. Remove spacer (22), rack (23) and spacers (59) from guide rods, then remove spacer (36), friction disc (37) and mixture lever (38) from hub (43). Follow this sequence and remove the remaining parts assembled on the guide rods and hub.

NOTE

The spacers are of different thickness.

f. Remove three screws (18) attaching guide rods to left mounting plate (21) and remove guide rods.

CAUTION

Hold the ratchet stop (27) on the mixture levers (38) down when removing the racks to prevent them from springing out of their housings.

g. Remove lockscrew (19) from left mounting plate (21) and remove hub (43) from mounting plate.
h. Unscrew retainer (20) from hub (43) and center stud (33) from retainer, to complete disassembly.
i. To remove gear warning switches (52) from spacer (51), remove nut (58), spacer (51) and screws (50).

Assembly of Control Quadrant. (See figure 9-9.)

a. Install gear warning switch using bolts, spacers and nuts as illustrated.
b. Screw center stud (33) into retainer (20).
c. Screw retainer (20) into hub (43) and install hub in left mounting plate with lockscrew (19).

NOTE

Stake punch edge of lockscrew after installing to prevent it from becoming loose and dropping out.

d. Install three guide rods (24) on left mounting plate (21) with three attaching screws (18).
e. Assemble control levers, spacers, guides, etc., on hub and guide rods as illustrated.

NOTE

Do not lubricate the parts to be assembled on the hub. These parts must remain dry for proper operation of the control friction lock.

f. Install right mounting plate (31) with three screws (18), attaching mounting plate to guide rods (24).
g. Install the two lugs (53) with the spacers (55), bolts (57) and nuts (58).
h. Install screws (54) in lugs (53) and terminals (47) on screws (54), then with terminals (47) located on spacer lugs, install pins (56), washers (48) and cotter pins (49).
i. Adjust forward screw (50) on the gear warning switches (52) so that when the throttle levers (41) are CLOSED, the switches (52) are closed.

Installation of Control Quadrant. (See figure 9-6.)

Reverse the removal of control quadrant procedure.

FUEL INJECTION SYSTEM.

The fuel injection is a simple, low pressure system of injecting fuel into the intake valve port in cylinder head. It is a multi-nozzle, continuous flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a flow gage, indicating metered fuel pressure, are provided for precise leaning at any combination of altitude and power setting. The continuous flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine-driven fuel injection pump.

Troubleshooting the Fuel Injection System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE WILL NOT START AND NO FUEL FLOW GAGE INDICATION | No fuel to engine. | Check tank fuel level. |
| | Mixture control improperly rigged. | Check mixture control for proper rigging. |
| | Engine not primed. | Auxiliary pump switch in PRIME position. |
| | Selector valve in wrong position. | Position selector valve to MAIN TANK position. |
| ENGINE WILL NOT START WITH FUEL FLOW GAGE INDICATION | Engine flooded. | Reset throttle, clear engine of excess fuel, try another start. |

Troubleshooting the Fuel Injection System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE WILL NOT START WITH FUEL FLOW GAGE INDICATION (CONTINUED) | No fuel to engine. | Loosen one line at nozzle. If no fuel shows, with fuel flow on gage, replace fuel manifold valve. |
| ROUGH IDLE | Nozzle restricted. | Remove nozzles and clean. |
| | Improper idle mixture. | Adjust fuel-air control unit in accordance with adjustment procedures. |
| POOR ACCELERATION | Idle mixture incorrect. | Adjust fuel-air control unit in accordance with adjustment procedures. |
| | Unmetered fuel pressure too high. | Lower unmetered fuel pressure. |
| | Worn linkage. | Replace worn elements of linkage. |
| ENGINE RUNS ROUGH | Restricted nozzle. | Remove and clean all nozzles. |
| | Improper mixture. | Improper pump pressure, replace. |
| LOW FUEL FLOW GAGE INDICATION | Restricted flow to metering valve. | Check mixture control for full travel. Check for clogged fuel filters. |
| | Inadequate flow from fuel pump. | Adjust engine-driven fuel pump. |
| | Defective fuel regulator or fuel regulator diaphragm. | Repair or replace fuel regulator or fuel regulator diaphragm. |
| HIGH FUEL FLOW GAGE INDICATION | Restricted flow beyond metering valve. | Check for restricted nozzles or fuel manifold valve. Clean or replace as required. |
| | Fuel regulator improperly adjusted. | Adjust fuel regulator in accordance with Unmetered Fuel Check and Adjustment Procedures. |
| | Restricted recirculation passage in fuel pump. | Replace engine-driven fuel pump. |
| FLUCTUATING OR ERRONEOUS FUEL FLOW INDICATIONS | Vapor in system, excess fuel temperature. | If not cleared with auxiliary pump, check for clogged ejector jet in vapor separator cover. Clean only with solvent, no wires. |
| | Air in fuel flow gage line. Leak at gage connection. | Repair leak and purge line. |
| POOR IDLE CUT-OFF | Engine getting fuel. | Check mixture control is in full idle cut-off. Check auxiliary pump is OFF. If neither, replace manifold valve. |
| ERRATIC IDLE FUEL PRESSURE | Dirty relief valve. | Clean relief valve. Refer to Continental Service Bulletin M73-22. |
| UNMETERED FUEL PRESSURE RISE | Internal orifices plugged. | Clean internal orifices in injector pump. |
| UNMETERED FUEL PRESSURE DROP | Relief valve stuck open. | Repair or replace injector pump. |

Troubleshooting the Fuel Injection System. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| VERY HIGH IDLE AND FULL THROTTLE FUEL PRESSURE | Relief valve stuck closed. | Repair or replace injector pump. |
| FUEL DISCHARGED INTO ENGINE COMPARTMENT AND RELIEF VALVE WILL NOT OPEN | Leaking diaphragm. | Repair or replace injector pump. |
| LOW FUEL PRESSURE AT HIGH POWER | No turbocharger discharge pressure. | Check turbocharger lines and fittings. |
| NO FUEL PRESSURE | Check valve stuck open. | Repair or replace ejector pump. |

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Removal and Installation of Fuel Pressure Lines and Hoses. (See figure 9-8.)

NOTE

Cap all openings and lines on removal.

a. Disconnect and remove line assembly (1) from tee and elbow.
b. Disconnect and remove line assembly (2) from elbow and nozzle manifold (3).
c. Disconnect and remove line assembly (4) from nozzle manifold (3) and union.
d. Disconnect and remove line assembly (5) from nozzle manifold (3) and union.
e. Disconnect and remove hose assembly (6) from union and fuel pressure gage.
f. Disconnect and remove line assembly (8) from fuel pump (9) and hose assembly (16).
g. Disconnect and remove hose assembly (16) from line assembly (8) and drain assembly (17).
h. Disconnect and remove hose assembly (10) from fuel pump (9) and supply.
i. Disconnect and remove hose assembly (11) from fuel pump (9) and fuel inlet supply.
j. Disconnect and remove hose assembly (12) from fuel pump (9) and metering unit (18).
k. Disconnect and remove hose assembly (13) from union and metering unit (18).
l. Disconnect and remove hose assembly (14) from fuel pump (9) and metering unit (18).
m. Disconnect and remove hose assembly (15) from fuel manifold (7) and throttle body (19).
n. Install fuel pressure lines by reversing removal procedures.

FUEL-AIR CONTROL.

This unit occupies the position ordinarily used for a carburetor at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control elements in this unit, one for air and two for fuel, one of which is for fuel mixture and the other for fuel metering. Main fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls the fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions air-flow to fuel-flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. A fuel pressure switch, connected in the line to the fuel metering unit, actuates to cause the auxiliary fuel pump to operate at a high speed if the engine-driven fuel pump pressure drops below 4 to 5 PSI. The auxiliary fuel pump switch must be ON for the fuel pressure switch to operate. A fuel regulator, connected in the line to the fuel metering unit, allows the fuel pressure to reach maximum allowable.

Removal of Fuel-Air Control. (See figure 9-7.)

a. Remove engine cowling.
b. Place fuel selector valve handles OFF.
c. Remove the induction air canister assembly in accordance with removal procedures.
d. Remove the turbocharger in accordance with the removal procedures.
e. Remove the five fuel lines from the metering unit.

NOTE

Plug or cap all open lines, hoses and fittings.

f. On LH engine throttle body, disconnect line from cross that routes from fuel regulator to cross and from cross to turbocharger discharge pressure.
g. On RH engine throttle body, disconnect turbocharger discharge pressure line from tee.
h. Remove V-clamp securing throttle body (RH

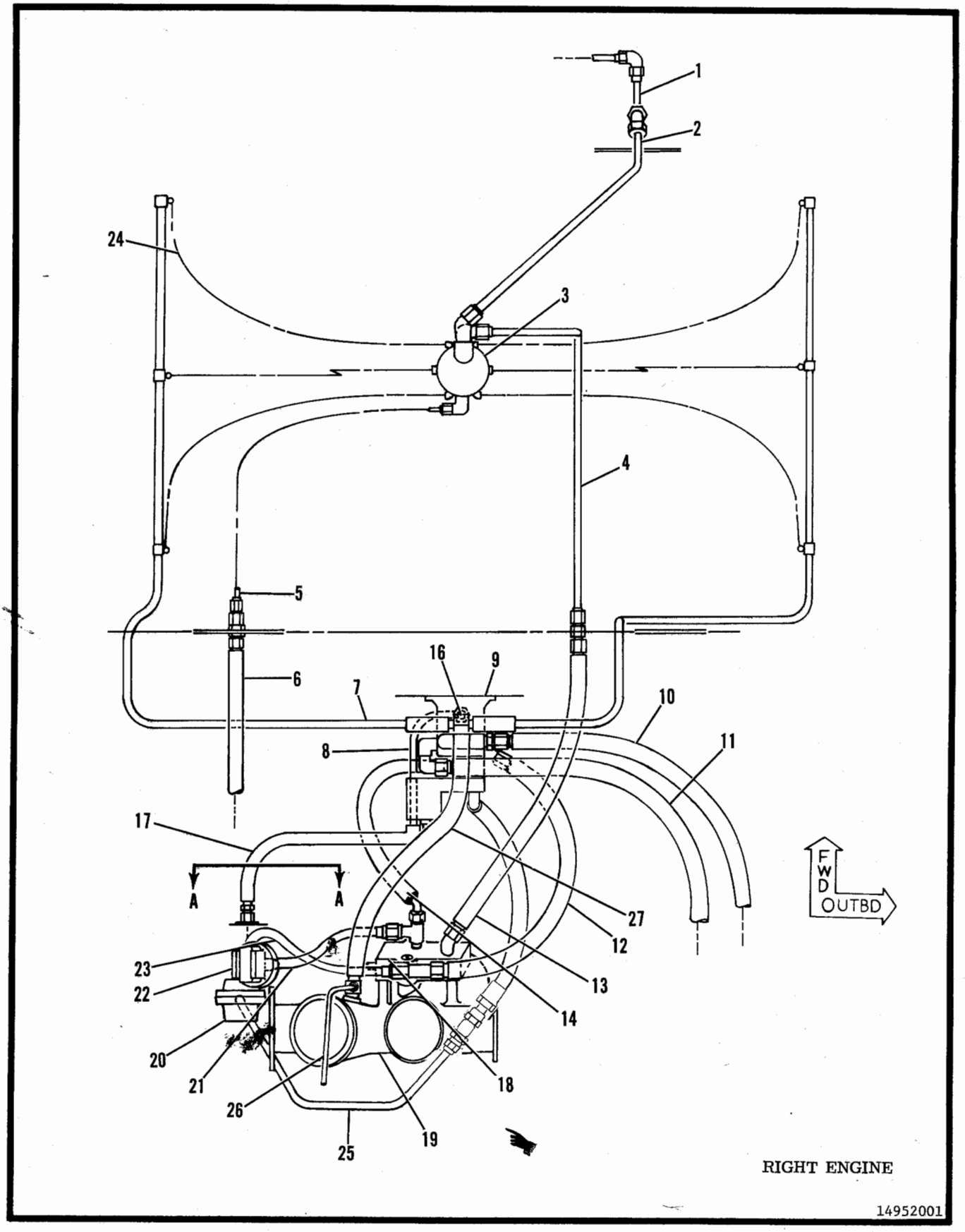
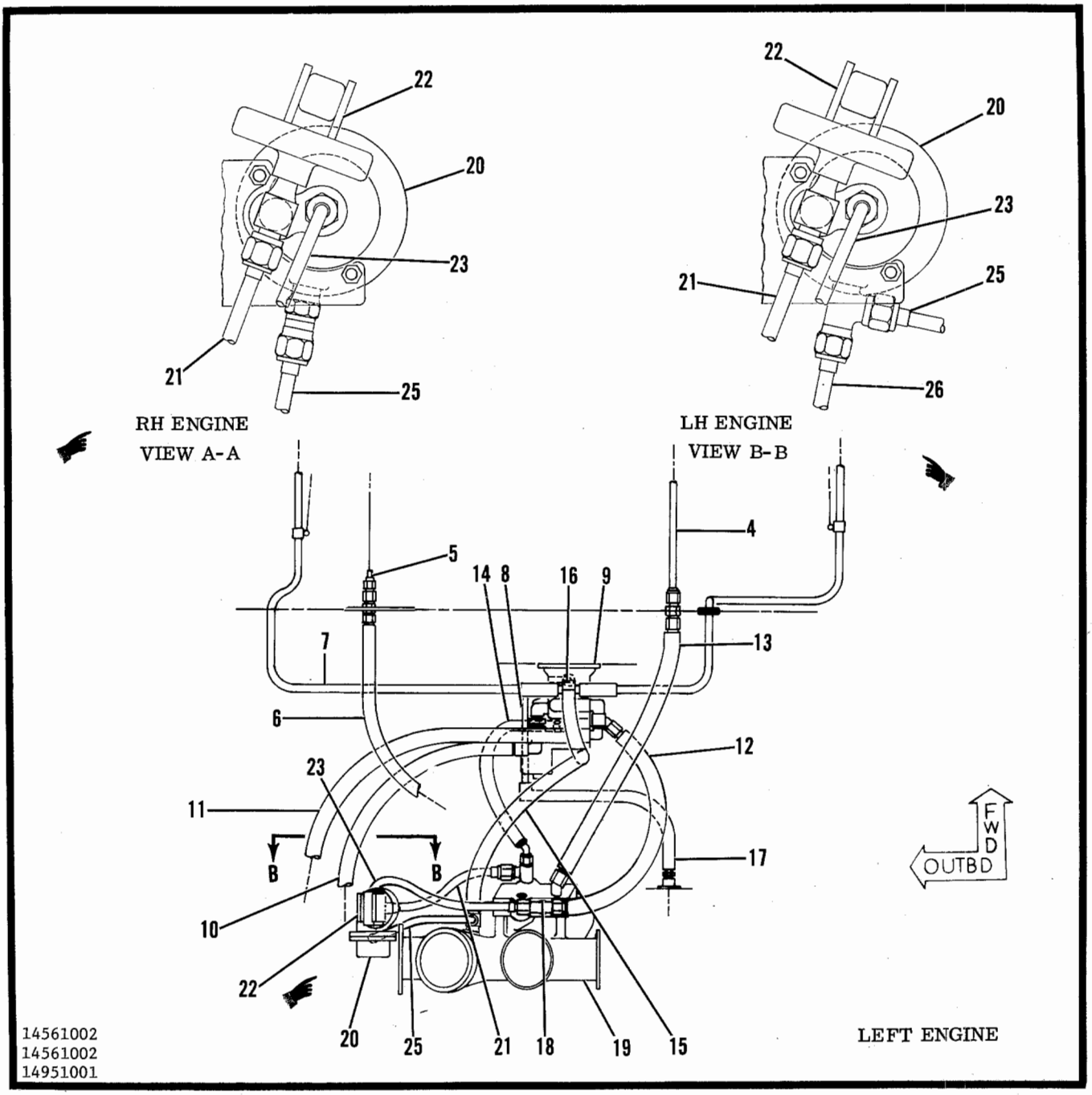



Figure 9-8. Engine Fuel System Lines and Components Installation (Sheet 1)




1. Line (Tee to Elbow)
2. Line (Elbow to Nozzle Manifold)
3. Fuel Manifold
4. Line (Nozzle Manifold to Union)
5. Line (Nozzle Manifold to Union)
6. Hose (Line Union to Fuel Pressure Gage)
7. Fuel Manifold
8. Line (Fuel Drain)
9. Fuel Pump
10. Hose (Fuel Vapor Return to Supply)
11. Hose (Fuel Supply to Pump)
12. Hose (Mixture Return Metering to Pump)
13. Hose (Metering Unit to Nozzle Manifold)
14. Hose (Fuel Pump to Metering Unit)
15. Hose (Throttle Body to Fuel Pump)
16. Hose (Fuel Pump to Fuel Manifold)
17. Hose (Line to Drain Assembly)
18. Metering Unit
19. Throttle Body
20. Fuel Pressure Regulator
21. Line (Fuel Pressure Regulator to Metering Unit)
22. Fuel Pressure Switch
23. Line (Fuel Pressure Regulator)
24. Nozzle Pressurization Line
25. Line (Fuel Pressure Regulator to Throttle Body)
26. Compressor Discharge Line

Figure 9-8. Engine Fuel System Lines and Components Installation (Sheet 2)

engine) or throttle body adapter assembly (LH engine) to sonic venturi.
i. Disconnect throttle control lever and mixture control lever.
j. Disconnect line from absolute pressure controller.
k. Remove throttle control and mixture bracket from absolute pressure controller.
l. Remove throttle body with metering unit, absolute pressure controller, and manifold pressure relief valve from elbow.
m. Remove metering unit from throttle body.

NOTE

The throttle body may be further disassembled by removing the absolute pressure controller, manifold pressure relief valve, and the adapter assembly on LH engine.

Installation of Fuel-Air Control. (See figure 9-7.)

a. Install metering unit to throttle body.

NOTE

Throttle body components consisting of the absolute pressure controller, manifold pressure relief valve, and the adapter assembly on LH engine should be installed at this time if they have been removed.

b. Place throttle body and metering unit in position on elbow.

CAUTION

Examine O-ring on throttle body for nicks, cuts, or deterioration. Be sure that O-ring remains in groove when installing to elbow.

c. Install throttle control and mixture control bracket to absolute pressure controller.
d. Connect line to absolute pressure controller.
e. Connect throttle control lever and mixture control lever.
f. Install V-clamp securing throttle body (RH engine) or throttle body adapter assembly (LH engine) to sonic venturi.
g. On RH engine throttle body connect turbocharger discharge pressure line to tee.
h. On LH engine throttle body connect turbocharger discharge pressure line and fuel regulator line to cross.
i. Connect the five fuel lines to metering unit.

NOTE

When installing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

j. Install turbocharger in accordance with the installation procedures.
k. Install induction air canister assembly in accordance with the installation procedures.
l. Inspect completed installation.
m. Rig the engine controls in accordance with the rigging procedures.
n. Install engine cowling.

Fuel-Air Control Unit Adjustments. (See figure 9-6.)

The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. Adjust idle speed adjustment screw to obtain 575 to 625 RPM. Turn adjustment screw CW to increase RPM, CCW to decrease RPM. The idle mixutre adjustment is accomplished by the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. With engine running at 1000 RPM and auxiliary pumps set to the LOW position, adjust idle mixture as rich as possible without obtaining an increase in engine RPM when mixture control is slowly moved toward IDLE CUT-OFF. Check idle mixture with auxiliary pumps off to assure that idle mixture has not changed.

FUEL MANIFOLD.

From the fuel control unit, fuel is delivered to the fuel manifold which provides a central point for dividing fuel to the individual cylinders. In the fuel manifold, a diaphragm and plunger valve raises or lowers, by fuel pressure, to open or close the individual cylinder fuel supply port simultaneously. A fine mesh screen is included in the fuel manifold as additional protection of the injection nozzles against dirt or foreign matter. The fuel manifold is calibrated to operate at 4 PSI.

Removal of Fuel Manifold. (See figure 9-8.)

NOTE

Plug or cap all disconnected lines, hoses and fittings.

a. Disconnect fuel line (5) at the fuel manifold (3).
b. Disconnect the six fuel injection lines at the fuel manifold.
c. Disconnect fuel lines (2 and 4).
d. Remove the fuel manifold (3) by removing the crankcase thru-bolt securing it to engine.

Installation of Fuel Manifold. (See figure 9-8.)

NOTE

When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

a. Install the fuel manifold (3).
b. Connect fuel lines (2 and 4).
c. Connect fuel line (5) at the fuel manifold (3).
d. Connect the six fuel injection lines at the fuel manifold.
e. Inspect the completed installation.

FUEL DISCHARGE NOZZLES.

From the fuel manifold, individual fuel lines carry the metered fuel to the fuel discharge nozzles, one for each cylinder. These nozzles are installed in the cylinder heads outside each intake valve. An air bleed and nozzle pressurization arrangement is incorporated in each nozzle. The nozzle pressurization arrangements supplies pressurized air to the nozzle. The air bleed arrangement aids in vaporization of fuel and, by breaking the high vacuum at idle, maintains the fuel lines solidly filled and ready for instant acceleration of the engine. Nozzles are stamped with a letter on the hex of the nozzles body. Each engine has matched (same letter) nozzles. Replacement nozzles must match but a matched set of another letter may be used.

Removal of Fuel Discharge Nozzles. (See figure 9-8.)

a. Disconnect the fuel injection lines at the fuel discharge nozzles.

NOTE

Plug or cap all disconnected lines and fittings.

b. Disconnect nozzle pressurization lines (24).
c. Remove fuel discharge nozzles from cylinders.

Installation of Fuel Discharge Nozzles. (See figure 9-8.)

NOTE

When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

a. Install the fuel discharge nozzles in the cylinders.
b. Connect fuel injection lines at the fuel discharge nozzles.
c. Connect nozzle pressurization lines (24) at the fuel discharge nozzle.
d. Check installation for crimped lines and loose fittings.

FUEL INJECTION PUMP.

Fuel pump is a positive-displacement type. It has a splined shaft for connection to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line and routed to the fuel tank. Since the pump is engine-driven, changes in engine speed affect total pump flow proportionally. The pump supplies more fuel than is required by the engine; therefore, a recirculation path within the pump must be provided. By arranging a calibrated variable orifice (aneroid valve) and relief valve in the recirculation path, the pump delivery pressure is maintained in relation to altitude. A check valve is provided so that auxiliary pump pressure can bypass the engine-driven pump for starting. In case of engine-driven fuel pump failure, the auxiliary fuel pump will operate automatically when the auxiliary fuel pump switch is ON.

Removal of Fuel Injection Pump. (See figure 9-8.)

a. Place fuel selector valve handles OFF.
b. Remove the engine cowling.
c. Tag and disconnect all lines and fittings attached to the fuel pump (9).

NOTE

Plug or cap all disconnected lines, hoses and fittings.

d. Remove two nuts and washers attaching the fuel pump to the engine.
e. Remove the fuel pump and gasket.

WARNING

Residual fuel draining from lines and hoses is a fire hazard. Use care to prevent the accumulation of such fuel when lines or hoses are disconnected.

f. If a replacement pump is not being installed immediately, a temporary cover should be installed on the fuel pump mount pad.

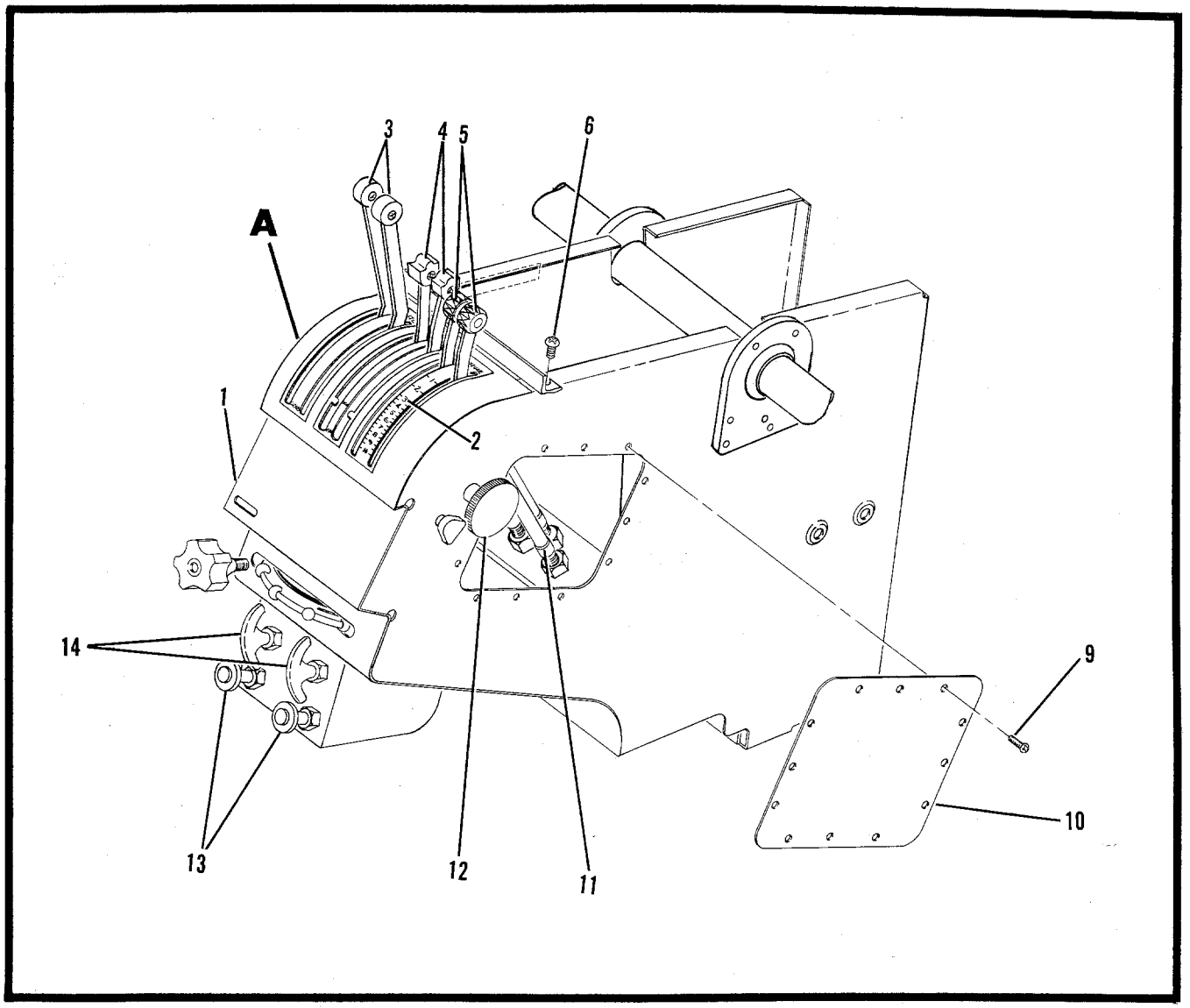
Installation of Fuel Injection Pump. (See figure 9-8.)

a. Position a new gasket and fuel pump (9) on two mounting studs with the fuel pump inlet to the left.
b. Secure fuel pump to engine with washers and nuts.

NOTE

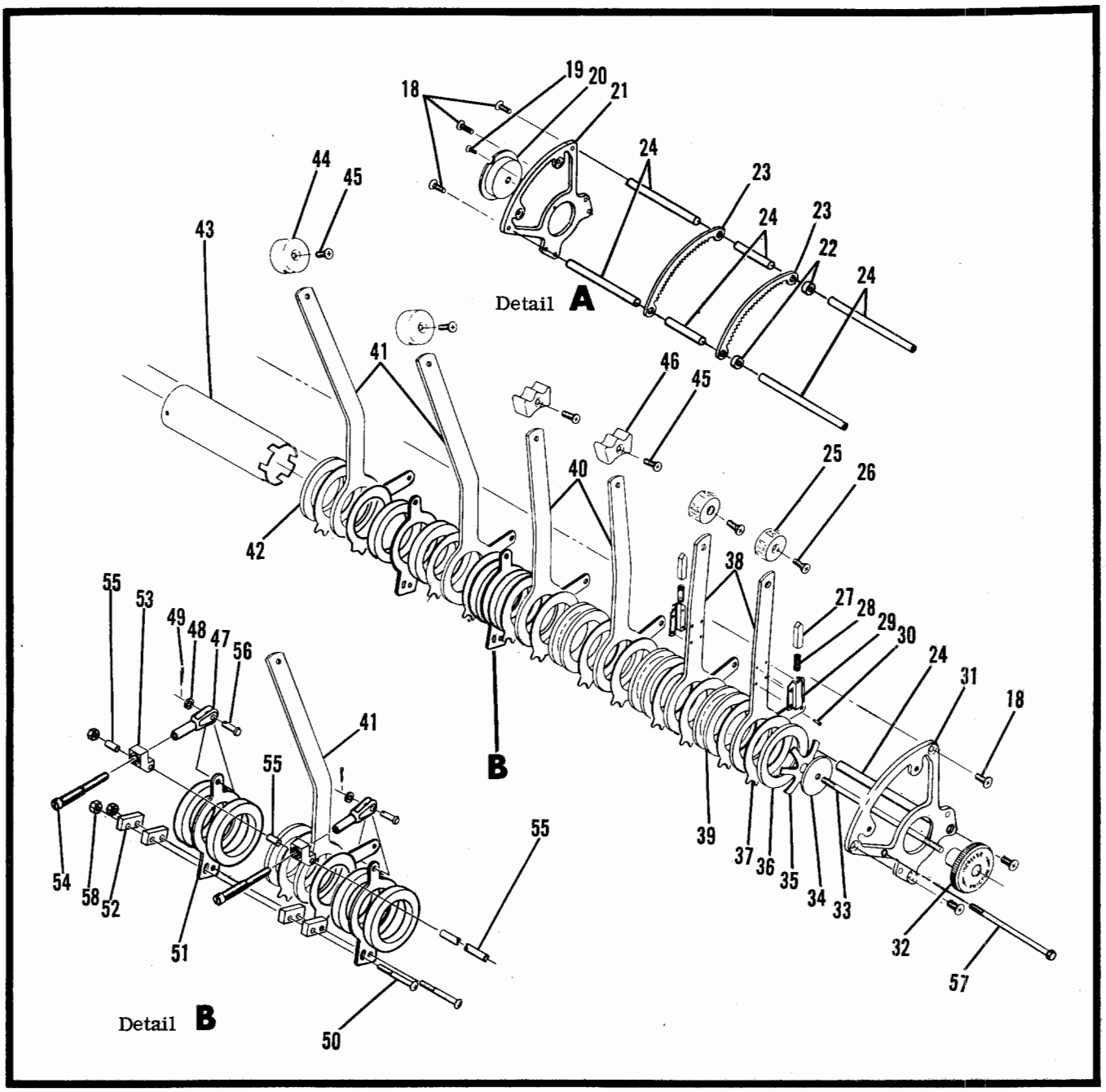
When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

c. Install all fittings and connect all lines as tagged at removal.
d. Check unmetered fuel pressures in accordance with Unmetered Fuel Test Hookup, Check and Adjustment.




1. Control Pedestal
2. Metalcal
3. Throttle Levers
4. Propeller Levers
5. Mixture Levers
6. Screw
7. Deleted
8. Deleted
9. Screw
10. Cover Plate
11. Control Cable Assembly
12. Friction Knob
13. Alternate Air Controls
14. Cowl Flap Controls
15. Deleted
16. Deleted
17. Deleted

Figure 9-9. Control Quadrant (Sheet 1)




18. Screw
19. Lockscrew
20. Retainer
21. Left Mounting Plate
22. Spacer
23. Rack
24. Guide Rod
25. Mixture Lever Knob
26. Screw
27. Ratchet Stop
28. Spring
29. Housing
30. Screw
31. Right Mounting Plate
32. Friction Knob
33. Center Stud
34. Washer
35. Spring
36. Spacer
37. Friction Disc
38. Mixture Lever
39. Spacer
40. Propeller Pitch Lever
41. Throttle Lever
42. Spacer
43. Hub
44. Throttle Lever Knob
45. Screw
46. Pitch Lever Knob
47. Terminal
48. Washer
49. Cotter Pin
50. Screw
51. Spacer
52. Switch
53. Lug
54. Screw
55. Spacer
56. Pin
57. Bolt
58. Nut
59. Spacer

Figure 9-9. Control Quadrant (Sheet 2)

Fuel Mixture Check.

a. Perform a fuel mixture check as follows:
1. Warm-up engine, move throttle back to idle position (600 RPM).
2. Place mixture control to full rich and propeller control full forward.
3. With engine running at 1000 RPM and auxiliary pumps set to the LOW position, adjust idle mixture as rich as possible without obtaining an increase in engine RPM when mixture control is slowly moved toward IDLE CUT-OFF.
4. To insure that the mixture is rich enough, repeat above procedure with throttle set at 1300 RPM and reduce mixture control slowly. If mixture control and fuel injection pumps are set properly, RPM should increase 10 RPM when the mixture control is gradually moved towards IDLE CUT-OFF.

NOTE

If RPM increases more than 10 RPM when mixture is reduced, the fuel mixture is too rich; conversely, if RPM decreases rapidly when mixture is reduced, fuel mixture is too lean.

5. Check idle mixture with auxiliary pumps off to assure that idle mixture has not changed.
b. If fuel mixture check indicates a too rich or too lean idle condition, refer to Fuel-Air Control Adjustments paragraph and adjust as necessary.

Unmetered Fuel Injection Pump Test Hookup, Check and Adjustment. (See figure 9-11.)

a. Connect test gage to fuel pump as follows:
1. Install fittings in gage and attach hose (5) to aft side of gage (4).
2. Install nipples (6, 8 and 10) in tee (7) and connect hose (5) to nipple (10).
3. Connect hose (9) to nipple (8).
4. Disconnect hose (1) (hose from engine-driven fuel pump to metering unit) from fuel pump elbow (2) and connect hose (9) to elbow (2).
5. Connect hose (1) to nipple (6).
b. Adjust pressure relief valve to obtain the following low unmetered fuel pressure setting:

NOTE

The test gage should be placed as near the same level as the fuel pump as possible or erroneous readings will result.

1. Low unmetered pressure adjustment: Allow engine to warm-up, then idle engine at 600 RPM. Pressure should indicate 5.5 to 6.5 PSI on test hookup pressure gage. If the indicated pressure is not within prescribed tolerances, turn adjusting screw on pressure relief valve (turn IN to increase fuel pressure or turn OUT to decrease fuel pressure) until proper fuel pressure is obtained. Position auxiliary pump to LOW, observe that unmetered fuel pressure does not exceed 6.2 PSI.

2. Maximum fuel flow adjustment (see figure 9-8).
(a) Disconnect hose (21) from center port of pressure regulator (20) and plug the end of detached hose and center port of pressure regulator.
(b) Allow engine oil to reach a temperature indication in the upper 1/3 of green arc on temperature indicator.

CAUTION

Do not disconnect or plug line connected to side port of pressure regulator. Complete failure of pressure regulator could occur.

(c) Run engine with throttle full open, mixture full rich, boost pump on low, and propeller control retarded to maintain 2500 RPM.
(d) Adjust fuel flow at the engine-driven fuel pump to 165 PPH reading from the aircraft instrument panel gage.

NOTE

The above adjustments are accomplished by loosening locknut and turning adjustment screw on altitude compensator (turn out to increase or turn in to decrease).

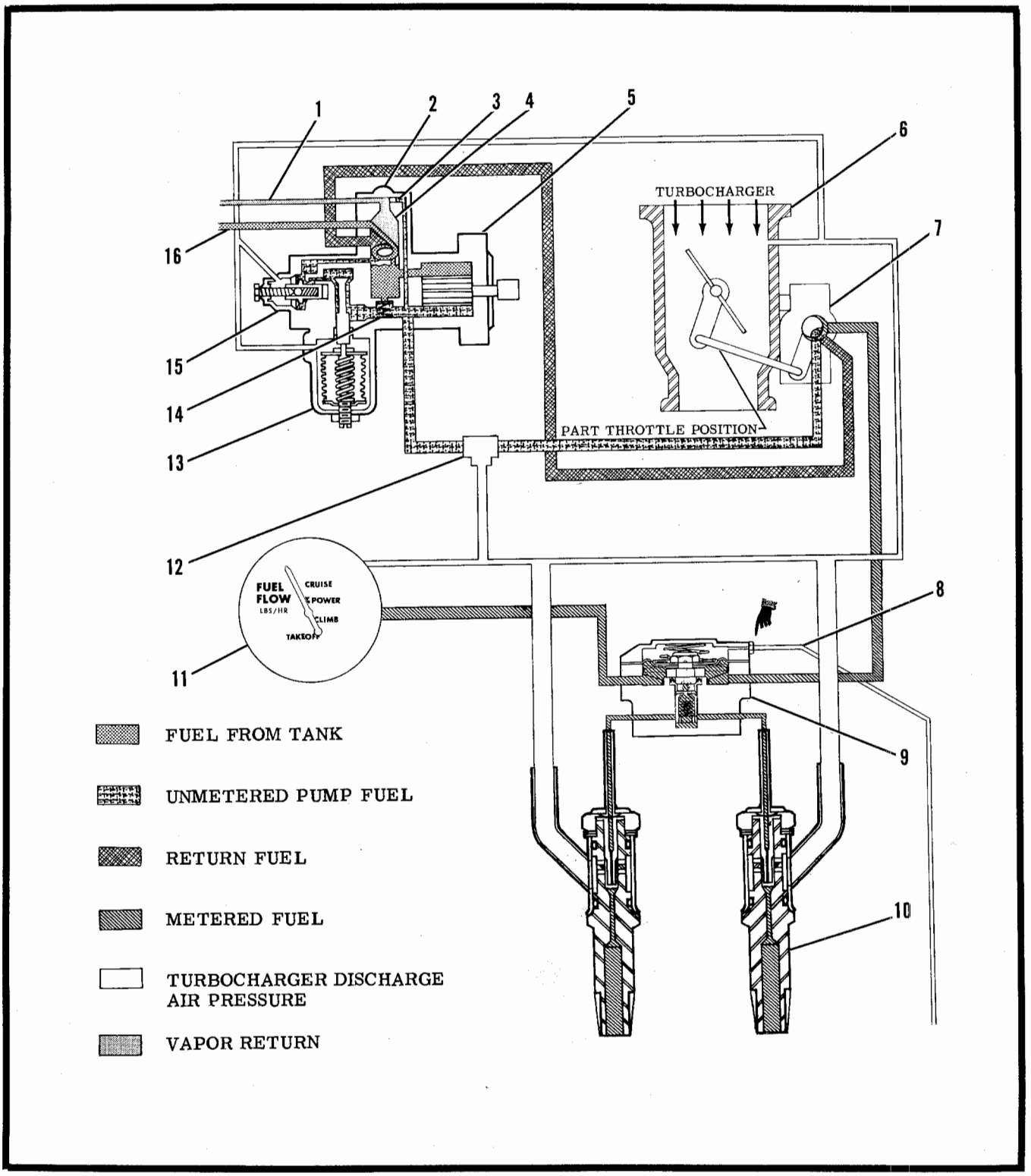
(e) With engines set at 28.0" Hg of manifold pressure and 2450 RPM verify that both engines indicate a fuel flow of not less than 115 PPH and a difference not to exceed four pounds per hour under full rich mixture conditions. If fuel flows are not within tolerance adjust throttle valve to metering unit linkage as required to eliminate discrepancies. Check again low unmetered and high pressure pump settings.
(f) Shutdown engine, remove plug and connect hose (21) to center port of pressure regulator (20).
(g) Start engine and run to full power manifold and static RPM.
(h) Adjust top screw on pressure regulator (20) to obtain a flow of 165 to 177 pounds per hour with throttle full open, mixture full rich, boost pump on "Low" and maximum RPM static.

NOTE

This setting will override the setting made at the engine-driven fuel pump. Therefore, it is important to follow these procedures correctly to assure proper fuel flow.

NOTE

If fuel fluctuations are experienced under full rich conditions in the above procedures or if substantial fuel flow differences cannot be corrected in the high setting within four PPH between engines, the metering unit is defec-




1. Vapor Return Line
2. Vapor Separator
3. Vapor Ejector
4. Swirl Well
5. Pump
6. Throttle Body
7. Fuel-Air Control Unit
8. Overboard Vent Drain
9. Fuel Manifold Valve
10. Injector
11. Fuel Flow Gage
12. Fuel Regulator
13. Aneroid Valve
14. Check Valve
15. Pressure Relief Valve
16. Fuel Inlet

Figure 9-10. Fuel Injection System Schematic

tive and must be replaced. Normally the engine with the low flow will require metering unit replacement. If manifold pressure fluctuations are experienced during the above adjustments, replacement of the metering unit should correct manifold pressure fluctuation.

(i) Turn the auxiliary boost pump ON and check that fuel flow does not exceed 170 to 177 PPH on instrument panel gage. If fuel flow exceeds 170 to 177 PPH with auxiliary boost pumps ON, the fuel pressure relief valve is malfunctioning or the auxiliary boost pump pressure is set too high. (Refer to Section 11 for Auxiliary Boost Pump Adjustment.)

NOTE

Adjustments made to either the pressure relief valve or the altitude compensator will affect the pressure setting of the other valve. Therefore, recheck low and high RPM indications and readjust each pressure valve until the proper balance and pressure settings are achieved.

3. After adjusting the low unmetered fuel pressure and the maximum fuel flow, check idle RPM and idle mixture in accordance with the FUEL MIXTURE CHECK.

4. Remove test hook-up.

5. After completion of unmetered fuel adjustments with test equipment removed and fuel lines connected in normal position, it may be necessary to purge air from the fuel lines to prevent indicator needle fluctuations or erroneous readings.

Purging Fuel Pressure Lines. (See figure 9-11A.)

WARNING

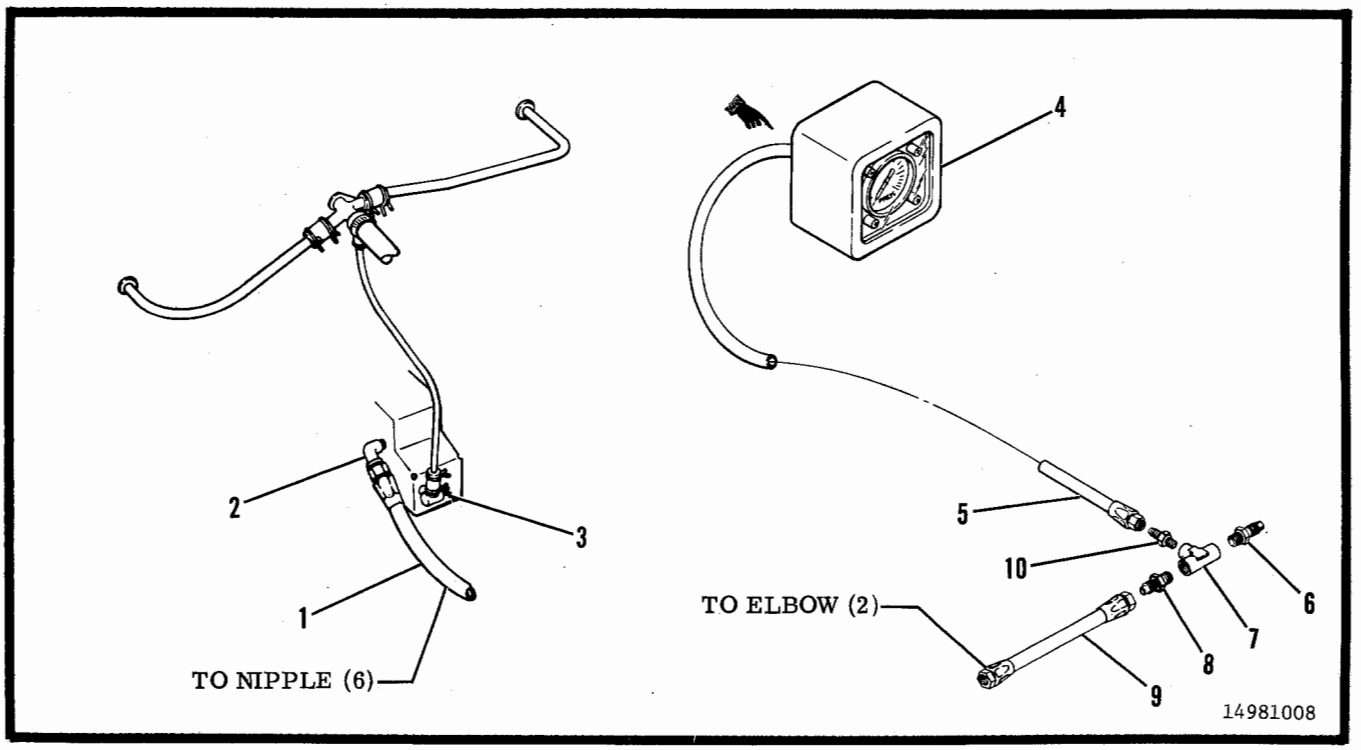
Considerable fuel will run from the intake drain under each nacelle during purging procedures. An appropriate receptacle should be provided to prevent a pool of raw fuel from accumulating under each nacelle.

a. Place throttle in full open position and mixture to full rich.

b. Remove caps (6) from fuel pressure lines and operate auxiliary fuel pump until at least one pint of fuel has discharged from each pressure line.

c. Reinstall caps (6), tightening finger tight then backing off one-half turn.

d. Operate auxiliary pump until solid fuel is discharged from the cap connection. Tighten cap with pump still operating then turn pump off.




1. Hose (Fuel pump to metering unit)
2. Elbow
3. Adjusting Screw
4. Gage
5. Hose
6. Nipple
7. Tee
8. Nipple
9. Hose
10. Nipple

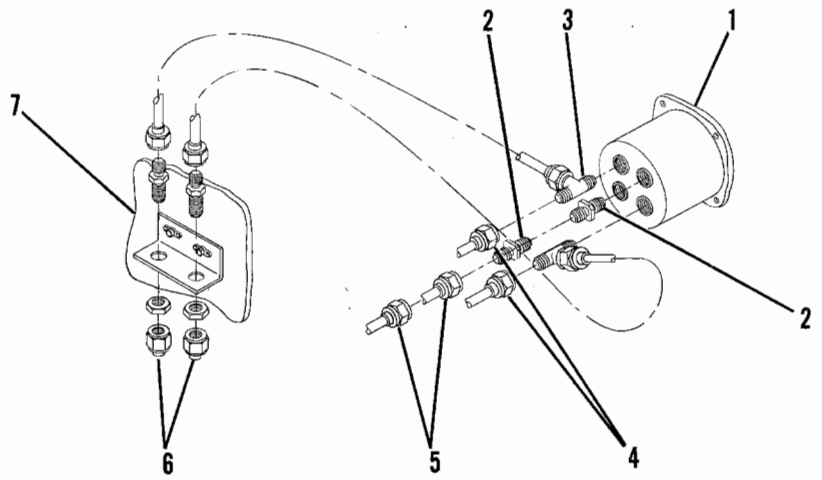
Figure 9-11. Fuel Injection Pump Adjustment

NOTE

Verify that snubbers (2) and snubber tees (3) are properly installed if excessive fuel flow fluctuations are encountered.

ENGINE OIL SYSTEM.

The Continental engines installed in the aircraft have a wet pump type, pressure lubricating system. Oil temperature in each engine is controlled by a thermally operated valve which either routes oil through the externally mounted cooler or bypass the oil around the cooler. Oil is routed through internal passages to all moving engine parts which require lubrication. Oil needed for propeller operation is routed through internal passages to the propeller governor. Engine oil is also routed externally for use in actuating the turbocharger waste-gate and turbocharger lubrication. Engine oil is first filtered through an internally mounted outlet filter screen in the oil pump and filtered again in the externally mounted oil filter. Should the externally mounted oil filter become clogged, an oil filter bypass valve will port oil around the filter. Oil pressure is maintained during engine operation by a spring-loaded relief valve. Oil temperature is sensed through a heat variable resistor type temperature bulb which is located directly below the cooling fins of the oil cooler. Changes in oil temperatures are transmitted from the oil temperature bulb to the oil temperature gage through a single electrical wire.

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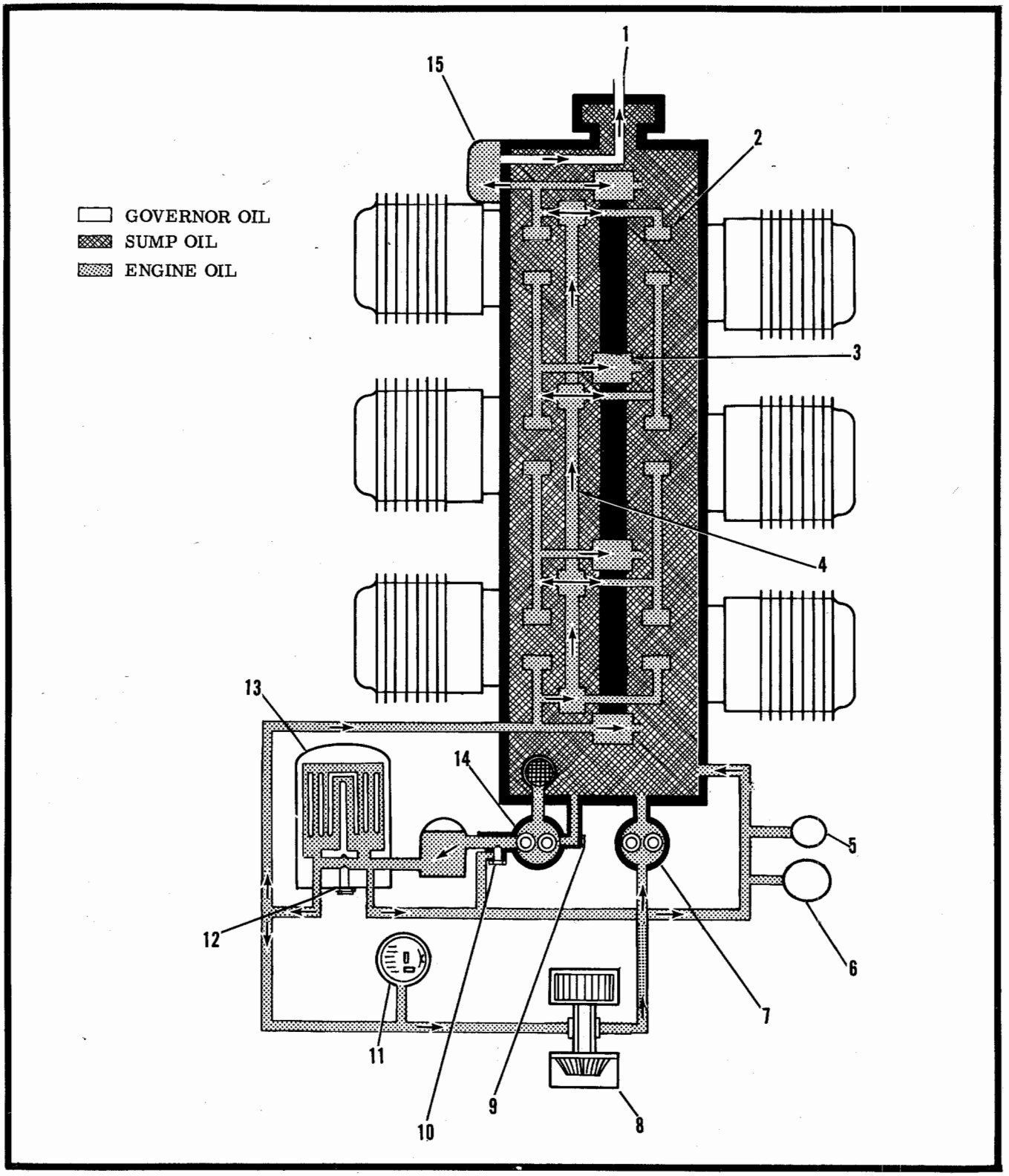
1. Fuel Flow Gage
2. Snubber
3. Snubber Tee
4. Fuel Pressure Line
5. Turbocharger Discharge Line
6. Cap
7. Instrument Panel

Figure 9-11A. Purging Fuel Pressure Lines




1. To Propeller
2. Tappets (Typical)
3. Crankshaft Bearings
4. Camshaft
5. Absolute Controller
6. Waste-gate Actuator
7. Scavenger Pump
8. Turbocharger
9. Pressure Relief Valve
10. Bypass Valve
11. Engine Gage
12. Vernatherm
13. Oil Cooler (Vernatherm Open)
14. Oil Pump
15. Propeller Governor

Figure 9-12. Engine Oil System Schematic

Troubleshooting Engine Oil System.

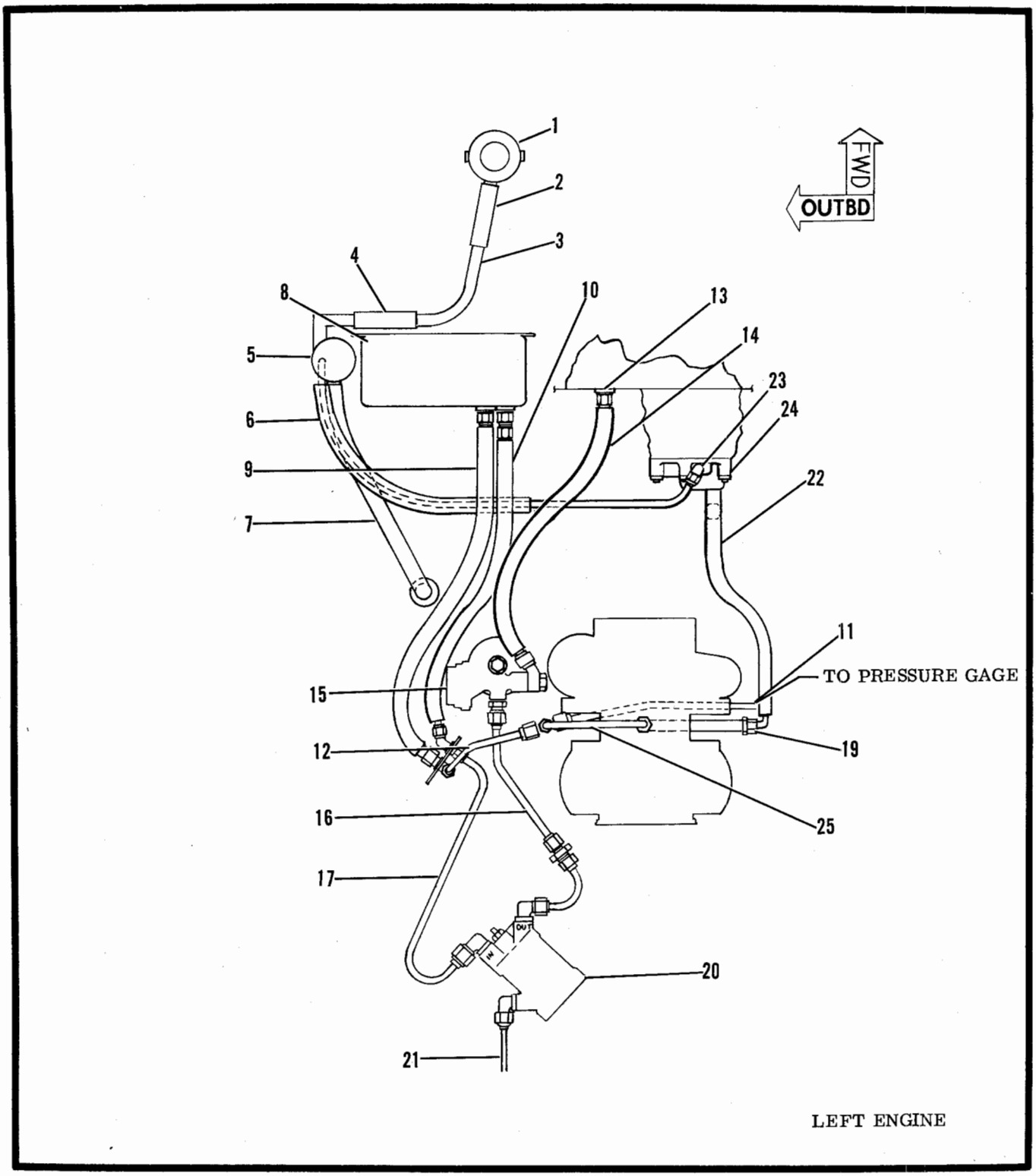
| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| HIGH OIL TEMPERATURE INDICATION | Low oil supply. | Replenish. |
| | Cooler air passages clogged. | Clean thoroughly. |
| | Cooler core plugged. | Remove cooler and flush thoroughly. |
| | Vernatherm damaged or held open by solid matter. | Remove, clean valve and seat. If still inoperative, replace. |
| | Oil viscosity too high. | Drain and refill with correct seasonal weight. (Refer to Section 2.) |
| | Prolonged ground operation. | Limit ground operation to a minimum. |
| | Malfunctioning gage or bulb unit. | Check wiring. Check bulb unit. Check gage. Replace defective parts. |
| LOW OIL PRESSURE INDICATION | Low oil supply. | Replenish. |
| | Oil viscosity too low. | Drain and refill with correct seasonal weight. (Refer to Section 2.) |
| | Foam in oil due to presence of alkaline solids in system. | Drain and refill with fresh oil. It may be necessary to flush cooler core if presence of alkaline solids is due to a previous cleaning with alkaline materials. |
| | Defective pressure pump. | Replace pump. |
| | Malfunctioning pressure gage. | Check gage. Clean plumbing. Replace if required. |
| | Weak or broken oil pressure relief valve spring. | Replace spring. Adjust pressure to 30-60 PSI by adjusting screw. |
| | Clogged oil filter. | Replace oil filter. |

Removal and Installation of Oil Pressure Lines and Hoses. (See figure 9-13.)

NOTE

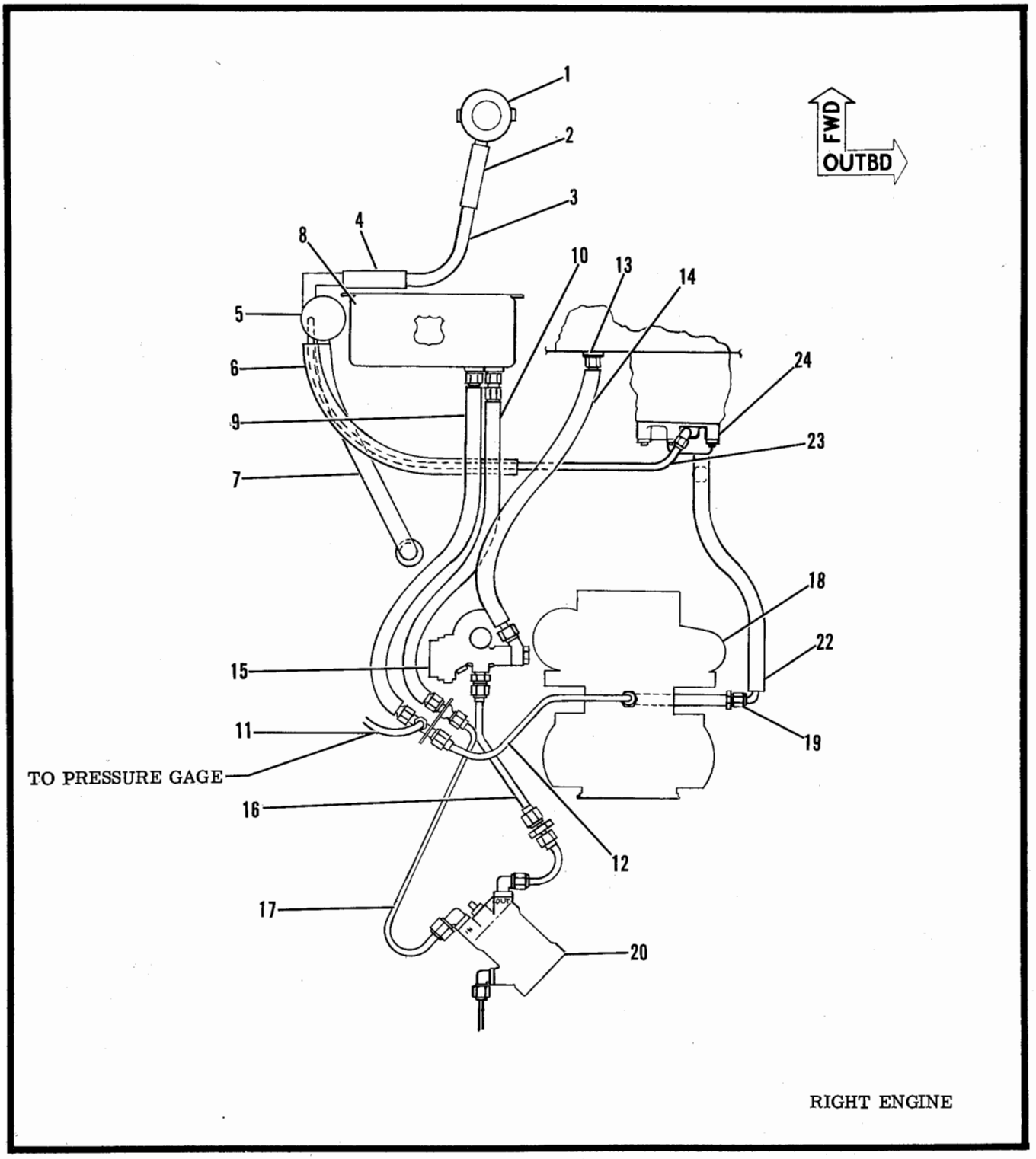
Cap all openings and lines on removal.

a. Loosen clamps and remove hose (2) from breather line (3) and engine oil filler cap (1).
b. Remove breather line (3) from hose (4) by loosening clamp.
c. Disconnect and remove hose (4) from oil separator line.
d. Loosen clamps and remove flexible hose (6).
e. Disconnect and remove line (23) from scavenger pump (24).
f. Loosen clamps and remove hose (7).
g. Disconnect and remove hose assemblies (19 and 10) from oil cooler (8), tee, and elbow.
h. Disconnect and remove pressure gage line (11) from union and pressure gage.
i. On right-hand installation, disconnect and remove line (12) from tee and turbocharger (18). On left-hand installation, disconnect and remove line (12) from elbow and tee, and disconnect and remove line (25) from tee and turbocharger (18).
j. Disconnect and remove line (16) from absolute pressure controller (15) and waste-gate actuator (20).
k. Disconnect and remove line (17) from elbow and waste-gate actuator (20).
l. Disconnect and remove line (14) from engine oil return port (13) and controller (15).
m. Disconnect and remove turbo oil return hose assembly (22) from turbo oil drain (19) and scavenge pump (24).
n. Install oil pressure lines by reversing the removal procedures.



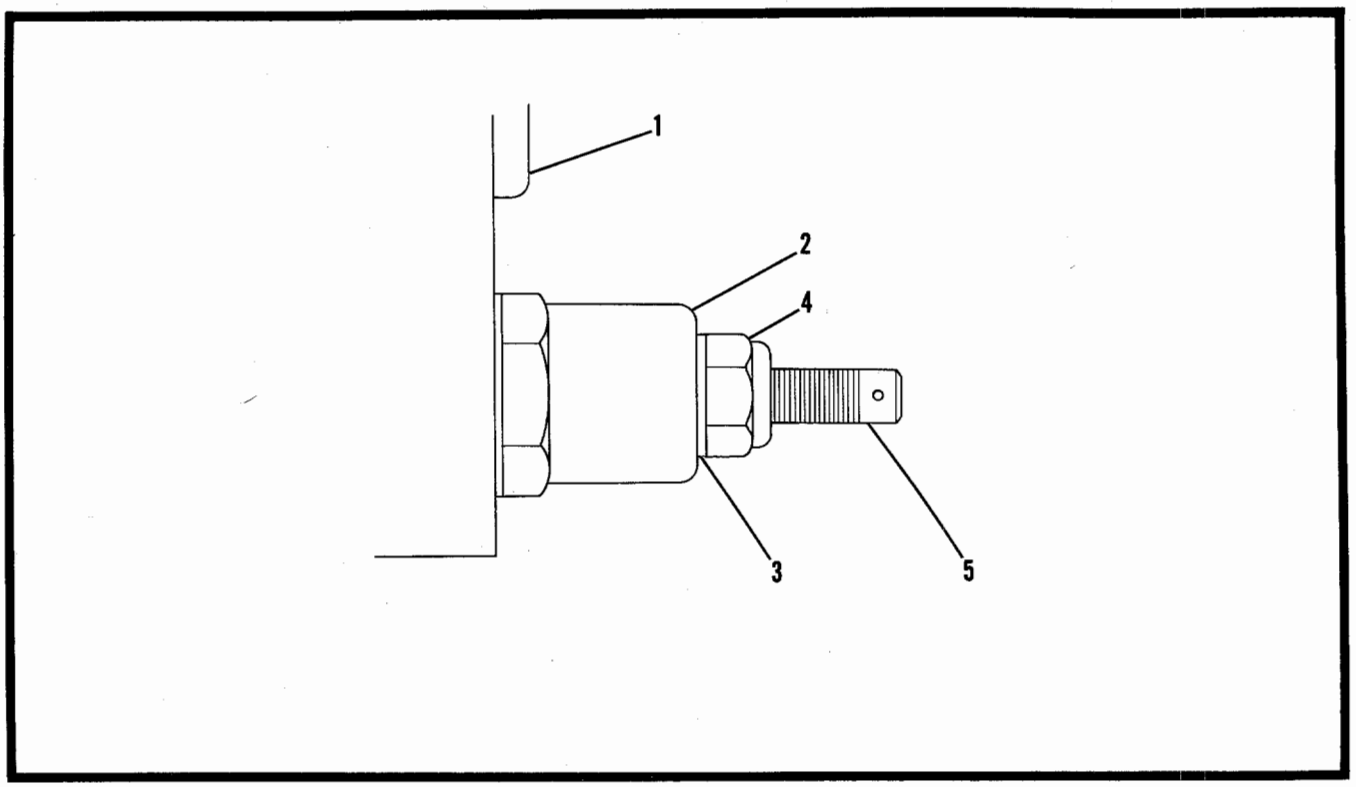

1. Engine Oil Filler Cap
2. Hose (Oil Filler Cap to Breather Line)
3. Breather Line
4. Hose (Breather Line to Oil Separator)
5. Oil Separator
6. Flexible Hose (Oil Separator to Scavenge Pump Line)
7. Oil Separator Drain Line
8. Oil Cooler
9. Hose (Oil Cooler to Tee)
10. Hose (Oil Cooler to Elbow)
11. Pressure Gage Line
12. Line (Tee to Turbocharger)

Figure 9-13. Oil System Lines and Components Installation (Sheet 1)




13. Engine Oil Return Port
14. Line (Engine Oil Return Port to Absolute Pressure Controller)
15. Absolute Pressure Controller
16. Line (Absolute Pressure Controller to Waste-gate Actuator)
17. Line (Elbow to Waste-gate Actuator)
18. Turbocharger
19. Turbo Oil Drain
20. Waste-gate Actuator
21. Waste-gate Actuator Oil Drain
22. Line (Turbocharger Oil Drain to Scavenge Pump)
23. Line (Flexible Hose to Scavenge Pump)
24. Scavenge Pump
25. Line (Turbocharger to Tee)

Figure 9-13. Oil System Lines and Components Installation (Sheet 2)

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1. Oil Pump
2. Housing
3. Washer (Copper)
4. Locknut
5. Adjusting Screw

Figure 9-13A. Oil Pressure Adjustment

Removal and Installation of Waste-Gate Actuator Oil Control System Lines and Hoses. (See figure 9-13.)

a. Disconnect and remove line (16) from controller (15) and waste-gate actuator (20).
b. Disconnect and remove line (17) from elbow and waste-gate actuator (20).
c. Disconnect and remove drain line (21) from waste-gate actuator (20).
d. Disconnect and remove hose (14) from controller (15) and engine oil return port (13).
e. Disconnect and remove line (14) from controller (8) and elbow.
f. Install waste-gate actuator oil system line and hoses by reversing removal procedures.

Removal and Installation of Turbocharger Return Oil Lines and Hoses. (See figure 9-13.)

a. Disconnect and remove turbocharger oil return hose (22) from turbocharger oil drain (19) and scavenge pump (24).
b. Disconnect and remove line (25) from turbocharger (18) and tee on LH engine. Disconnect and remove line (12) from turbocharger (18) and tee on RH engine.
c. Install turbocharger oil lines and hoses by reversing the removal procedures.

NOTE

(See figure 9-15.) Replace gaskets (2) when installing turbocharger inlet and outlet lines (18 and 6) to turbocharger.

OIL PRESSURE ADJUSTMENT

The oil pressure relief valve, located on the oil pump is adjustable to increase or decrease oil pressure. Refer to figure 9-13A and adjust oil pressure to 30 to 60 psi.

AIR INDUCTION SYSTEM.

The air induction system consists of a ram air intake scoop, located in the inboard nacelle door, a manually controlled alternate air door, located inboard and forward of the air canister and the separately mounted exhaust-driven turbocharger. Ram air is routed through the filter to the turbocharger where it is compressed and routed to the induction system. In the event filters become clogged or the ram air inlet obstructed, heated air may be supplied to the turbocharger through the alternate air door which is controlled from the cockpit pedestal. The turbocharger is automatically controlled by the waste-gate and the absolute pressure controller to maintain a manifold pressure of 36.0 inches Hg. from sea level to 20,000 feet. See figure 9-14 for Air Induction System Schematic.

Removal and Installation of Induction and Alternate Air System. (See figure 9-17.)

a. Remove upper engine cowl in accordance with the removal procedure.
b. Remove clamp (6) attaching air canister assembly to turbocharger.
c. Remove clamp (10) attaching alternate air intake hose (11) to adapter assembly (9).
d. Remove clamp (3) attaching air canister (5) to ram air inlet scoop (4).
e. Remove canister assembly from engine nacelle. Any further disassembly can be done in accordance with figure 9-17.
f. Install air canister assembly by reversing the removal procedures.

INDUCTION AIR FILTER.

The air canister filter removes dust particles from the ram air by collecting them in the filtering units. Air induction filter maintenance and service, particularly in areas where dust is prevalent, is very important to the life of the turbocharger and engine.

Removal and Installation of Induction Air Filter. (See figure 9-17.)

a. Remove engine cowling.
b. Loosen fasteners securing clamp assembly (8) to canister (5).
c. Remove filter (7) from canister.

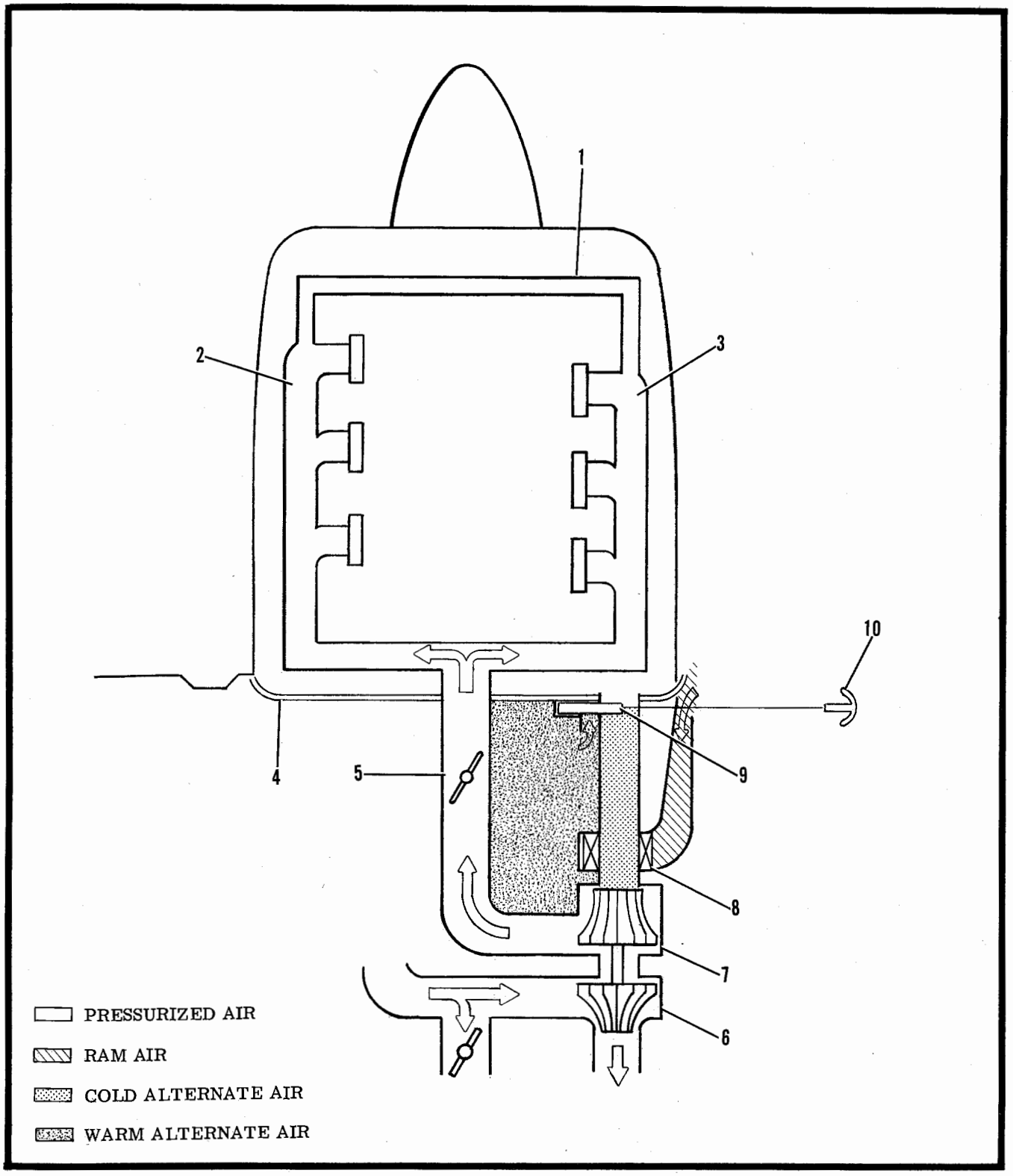
NOTE

Exercise care when removing filter from canister to prevent damage to flexible lines and engine controls.

d. Install induction air filter by reversing the removal procedures.

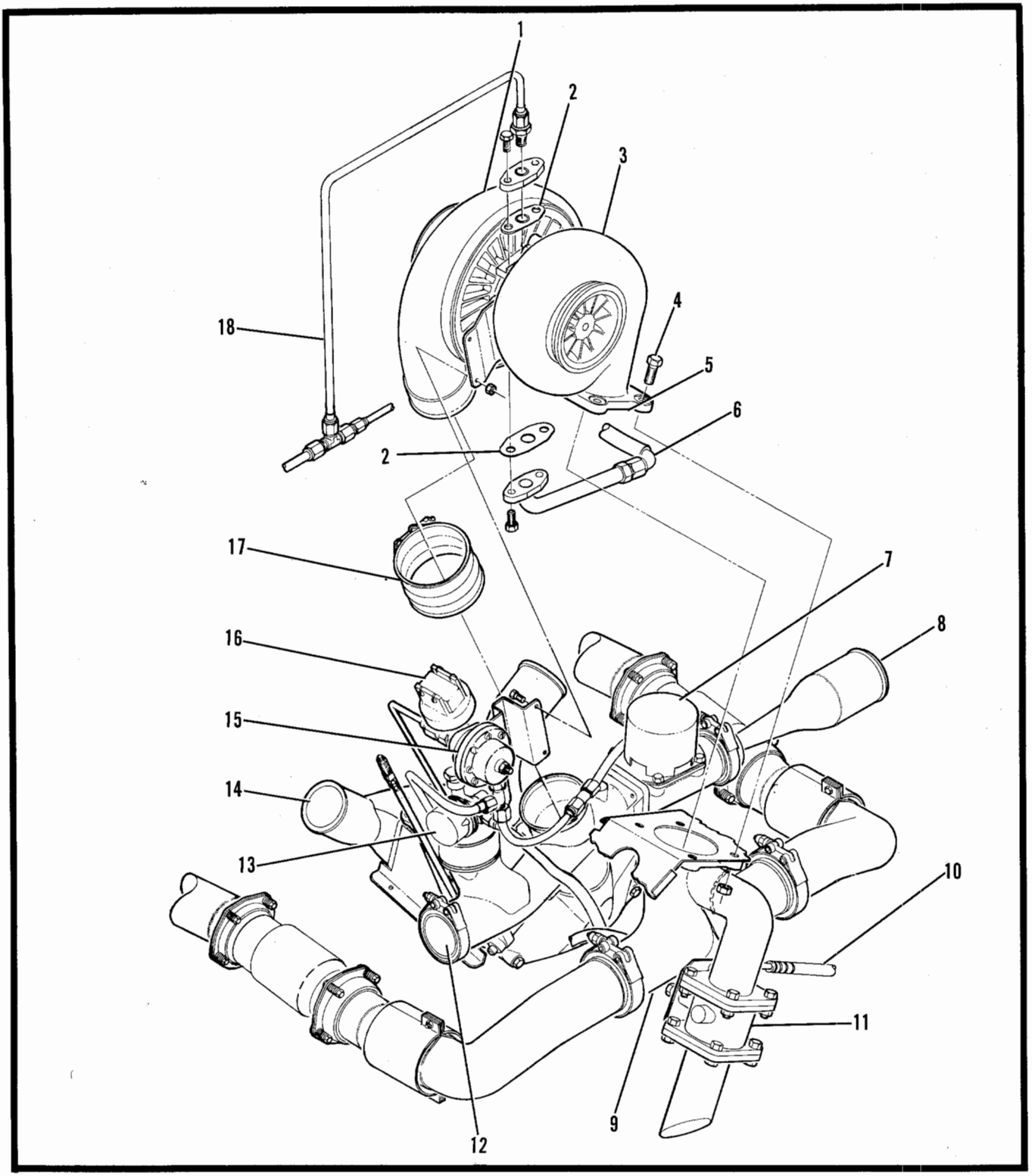
Removal and Installation of Alternate Air Control. (See figure 9-17.)

a. Remove upper engine cowl in accordance with the removal procedure.
b. Disconnect control at baffle (12).
c. (See figure 9-9.) Remove cover plate (10), alternate air control handles (13), and remove clamps attaching cable to side of pedestal.
d. (See figure 1-2.) Remove all access plates, carpets, and floorboards necessary to route alternate air control cable from the aircraft.
e. Route control cable from aircraft, removing all clamps necessary to free cable.




1. Induction System Balance Tube
2. Induction Manifold Left-Hand Bank
3. Induction Manifold Right-Hand Bank
4. Baffle
5. Throttle Body
6. Turbocharger Compressor
7. Turbocharger Turbine
8. Filter
9. Manually Controlled Alternate Air Door
10. Control Lever on Control Pedestal

Figure 9-14. Air Induction Schematic




1. Turbocharger Compressor
2. Gasket
3. Turbocharger Turbine
4. Bolt
5. Turbine Inlet
6. Center Housing Oil Line (Outlet)
7. Manifold Pressure Relief Valve
8. Venturi
9. Exhaust Wye
10. EGT Probe
11. Waste-Gate Valve
12. Adapter Cap
13. Pressure Ratio Controller
14. Induction Air Wye
15. Fuel Pressure Regulator
16. Fuel Pressure Switch
17. Compressed Air Coupling
18. Center Housing Oil Line (Inlet)

Figure 9-15. Turbocharger Installation

f. Install alternate air control cable by reversing the removal procedures.

NOTE

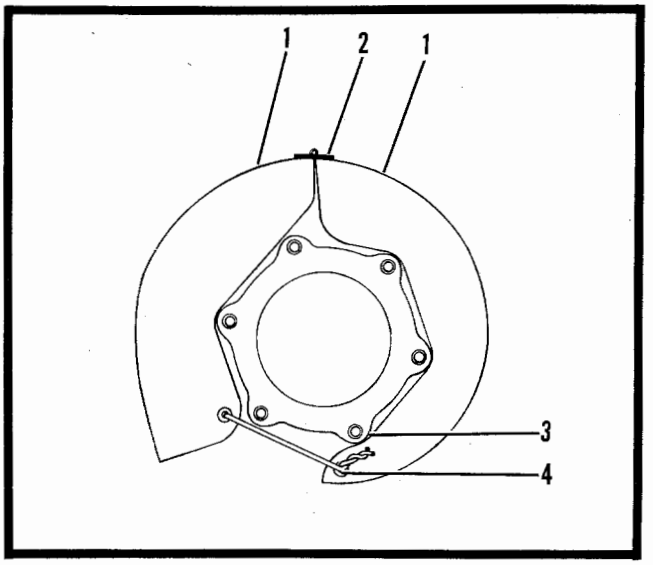
When installing alternate air control cable, deform spring as required, to provide an intermediate alternate air control detent pull force of 20 to 27 pounds.

Rigging of Alternate Air Control Door. (See figure 9-17.)

a. Position door to CLOSE.
b. Adjust travel of alternate air control door by loosening nut (14) to increase or decrease length of travel.
c. Position door to OPEN.
d. Check the extension of control handle for not more than 3.00 inches of travel from control pedestal.

WASTE-GATE ACTUATOR, CONTROLLER AND TURBOCHARGER.

a. Functions. The waste-gate actuator and controllers use engine oil for power supply. The turbocharger is controlled by the waste-gate and waste-gate actuator, absolute pressure and above critical altitudes by the pressure ratio controller. The waste-gate bypasses the engine exhaust gases around the turbocharger turbine inlet. The waste-gate actuator, which is physically connected to the waste-gate by mechanical linkage, controls the position of the waste-gate butterfly valve. The manifold pressure relief valve will open and prevent engine overboost should the engine manifold pressure exceed 34.5 inches of mercury. The absolute pressure controller controls the maximum turbocharger compressor discharge pressure (33.0 ±0.5 in. Hg. to critical altitude, approximately 16,000 feet). The pressure ratio controller begins to function at approximately critical altitude and controls the maximum turbocharger compressor discharge pressure at a ratio of 2.2 times nacelle ambient pressure.
b. Operation. The waste-gate actuator is spring-loaded to position the waste-gate to the normally open position when there is not adequate oil pressure in the waste-gate actuator power cylinder during engine shutdown. When the engine is started, oil pressure is fed into the waste-gate actuator power cylinder through the capillary tube. This automatically fills the waste-gate actuator power cylinder and lines leading to the controllers, blocking the flow of oil by normally closed metering and/or poppet valves. As the oil pressure builds up in the waste-gate actuator power cylinder, it overcomes the force of the waste-gate open spring, closing the waste-gate. When the waste-gate begins to close, the exhaust gases are routed through the turbocharger turbine. As the engine increases its power and speed, the increase of temperature and pressure of the exhaust gases causes the turbocharger to rotate faster, raising the turbocharger compressor outlet pressure. As the compressor outlet pressure rises,



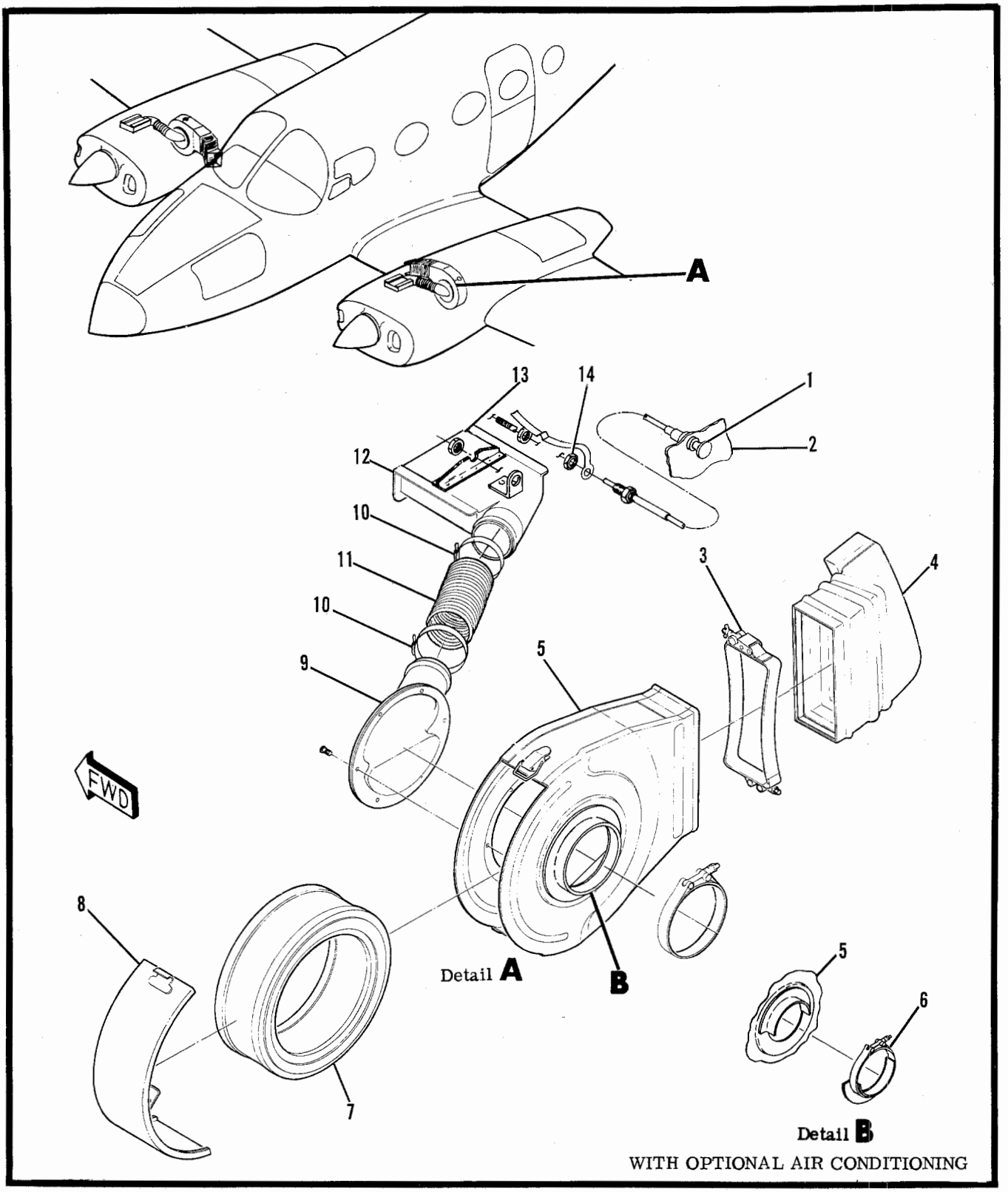

1. Shield
2. Hinge
3. Turbocharger
4. Safety Wire

Figure 9-16. Turbocharger Heat Shields

the aneroid bellows in the absolute pressure controller sense the increase in pressure. When at high engine speed and load and the proper absolute pressure is reached, the force on the aneroid bellows opens the normally closed metering valve. When the oil pressure in the waste-gate actuator power cylinder is lowered sufficiently, the waste-gate actuator open spring forces the mechanical linkage to open the waste-gate. A portion of the exhaust gases then bypasses the turbocharger turbine, thus preventing further increase of turbocharger speed and holding the compressor discharge absolute pressure to the desired value. Conversely at engine idle, the turbocharger runs slowly with low compressor pressure output; therefore, low pressure applied to aneroid bellow is not sufficient to affect the unseating of the normally closed metering valve. Consequently, engine oil pressure keeps the waste-gate closed. After critical altitude is reached (approximately 16,000 feet), the absolute pressure controller is unable to maintain 33 ±0.5 inches of manifold pressure. The pressure ratio controller, which senses both nacelle ambient pressure and discharge pressure, begins the function of controlling turbocharger discharge pressure at a ratio of 2.2 times nacelle ambient pressure. When the proper discharge pressure is reached inside the pressure ratio controller, the force on the aneroid bellows opens the poppet valve and lowers the oil pressure in the waste-gate actuator power cylinder.

CAUTION

The absolute pressure controller and the pressure ratio controller are adjusted at the factory. The controller adjustments should not be tampered with except for the prescribed minor adjustments to obtain the rated manifold pressure.




1. Alternate Air Control
2. Control Pedestal Bracket
3. Clamp
4. Ram Air Inlet Scoop
5. Cannister
6. Clamp
7. Filter
8. Clamp Assembly
9. Adapter Assembly
10. Clamp
11. Alternate Air Intake Hose
12. Baffle
13. Alternate Air Door
14. Nut

Figure 9-17. Induction and Alternate Air Installation

Troubleshooting Waste-Gate Actuator Controllers and Turbocharger.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| UNABLE TO GET RATED POWER BECAUSE MANIFOLD PRESSURE IS LOW | Controller not getting enough oil pressure to close the waste-gate. | Check pump outlet pressure, oil filter and external lines for obstructions. |
| | Chips under metering and/or poppet valves in controllers holding them open. | Flush chips out of controller. Replace controller if necessary. |
| | Capillary tube in actuator plugged. | Remove actuator and clean capillary. |
| | Actuator piston seal failed and leaking oil excessively. | Replace actuator. |
| | Pressure ratio controller set too low and cutting in at altitude below 16,000 feet. | Adjust pressure ratio controller. |
| | Leak in exhaust system. | Replace defective exhaust components. |
| | Leak in induction air system. | Replace or repair in accordance with Induction Air Leak Check Procedures. |
| LOW POWER OR INSUFFICIENT MANIFOLD PRESSURE | Improper alignment of air inlet ducts, canister and filter elements. | Align ducts, clean or replace filter. |
| | Hot nacelle air leaking into induction system. Improperly rigged alternate air door. | Rig alternate induction air door. |
| | Obstructions in air inlet system or filter. | Clean or replace filter, remove obstruction. |
| | Waste-gate not closing properly. | Refer to Turbocharger and Controls Overhaul/Parts Manual and check rigging of waste-gate actuator. |
| | Wrong manifold pressure relief valve installed. | Replace with proper manifold pressure relief valve. |
| | Waste-gate actuator leaking oil. | Replace waste-gate and actuator. |
| | Low engine oil pressure in flight. | Verify that engine oil pressure remains in the upper half of green arc during cruise. |

NOTE

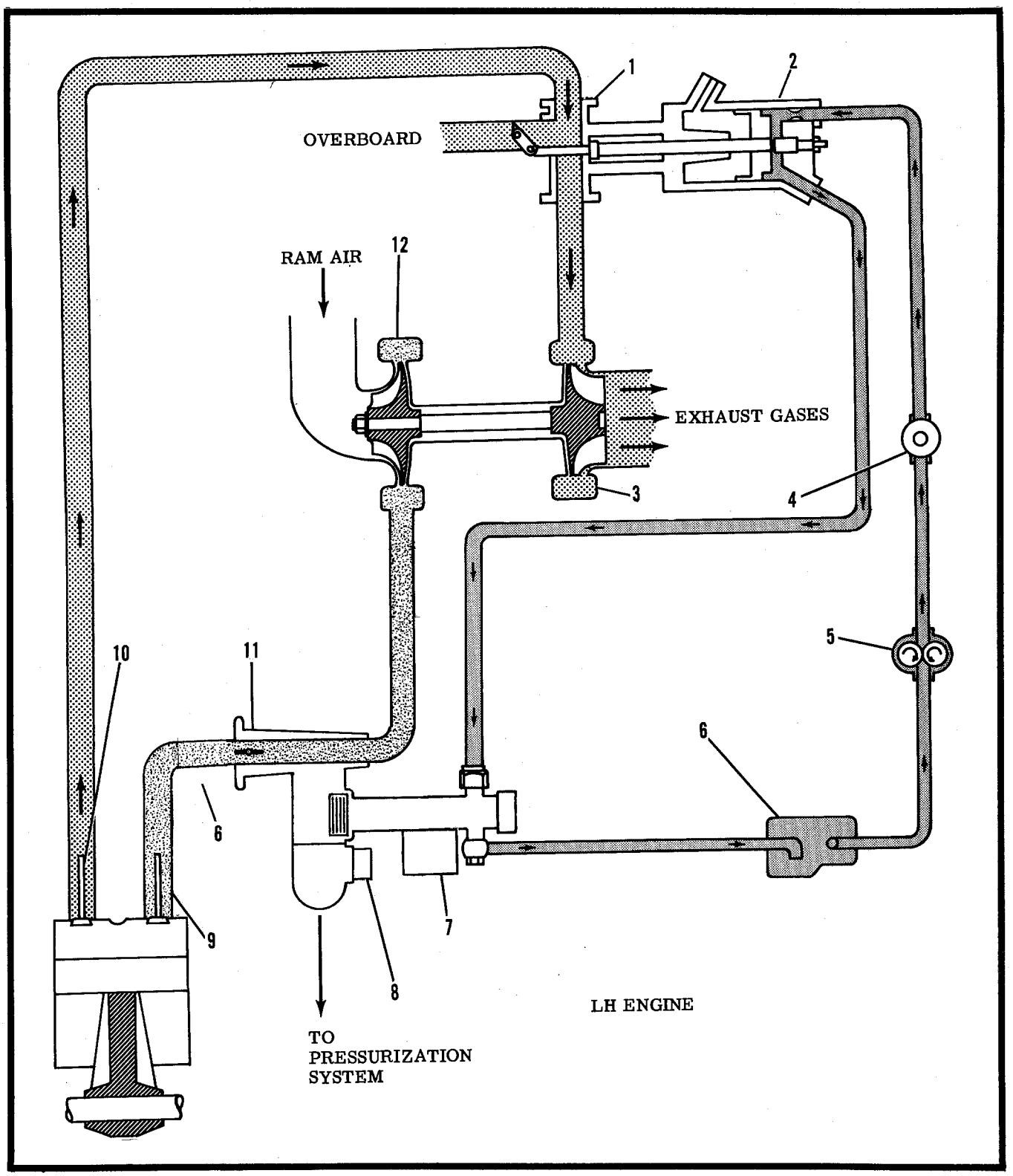
This verification can be made on the ground but must be reasserted in flight with oil temperatures in the normal limits. Adjust pressure relief valve if necessary to obtain proper oil pressure.

CAUTION

If low oil pressure is encountered during flight check, reduce power to minimum cruise and allow oil to cool to the lower sector of the green arc. Open cowl flaps to aid in cooling the oil temperatures. Upon attainment of the cooler oil temperature, apply power and recheck the bootstrapping power level. If a marked improvement is attained, correct oil pressure or isolate the overheating cause.

Troubleshooting Waste-Gate Actuator Controllers and Turbocharger (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE SURGES OR SMOKES | Metering valve stem seal broken in the absolute controller, leaking oil into manifold. | Replace or repair absolute controller in accordance with Turbocharger and Controls Overhaul/ Parts Manual. |
| | Actuator bypass valve linkage binding. | Correct cause of binding. |
| TURBOCHARGER NOISY, PLENTY OF POWER | Turbocharger overspeeding, controllers not opening, aneroid bellows leaking or not properly adjusted. | Adjust or replace controller assemblies and turbocharger. |
| | Waste-gate sticking closed. | Replace waste-gate, waste-gate actuator, or correct binding linkage. |
| | Controller drain line obstructed. | Clean or replace line. |
| ENGINE POWER INCREASES SLOWLY, OR SEVERE FLUCTUATIONS OF MANIFOLD PRESSURE ON RAPID THROTTLE ADVANCE | Controller drain line obstructed. | Clean or replace line. |
| | Waste-gate operation is sluggish. | Replace waste-gate, waste-gate actuator or correct binding linkage. |
| | Manifold pressure relief valve is popping open too soon. | Check or replace valve. |
| ENGINE POWER INCREASES RAPIDLY AND MANIFOLD PRESSURE OVERBOOSTS ON RAPID THROTTLE ADVANCE | Absolute pressure controller out of calibration. | Calibrate or replace absolute pressure controller. |
| | Waste-gate operation is sluggish. | Replace waste-gate, waste-gate actuator or correct binding linkage. |
| | Manifold pressure relief valve failed. | Check or replace valve. |
| MANIFOLD PRESSURE OVERBOOSTS DURING FLIGHT | Manifold pressure relive valve closed. | Repair or replace manifold pressure relief valve. |
| | Waste-gate actuator sluggish. | Repair or replace waste-gate. |
| | Waste-gate butterfly valve clearances improperly set. | Refer to Turbocharger and Controls Overhaul/Parts Manual and adjust butterfly valve clearances. |
| CAUTION<br>The manifold pressure relief valve is preset at the factory and should not be tempered with except for prescribed minor adjustments to obtain rated manifold pressure. | | |
| SLUGGISH OR LOW POWER ENGINE OPERATION | Check turbine shaft drag and seal ring for rust deposit. | Soak or spray area behind turbine wheel with KANO penetrating oil. KANO LAB., 1000 S. Thompson Lane, Nashville, Tennessee 37211. |




1. Waste-Gate
2. Waste-Gate Actuator
3. Turbine
4. Oil Filter
5. Oil Pump
6. Oil Sump
7. Absolute and Pressure Ratio Controllers
8. Relief Valve
9. Intake Valve
10. Exhaust Valve
11. Throttle Body
12. Compressor

Figure 9-18. Turbocharger, Controllers, and Waste-Gate Actuator System Schematic (Sheet 1)

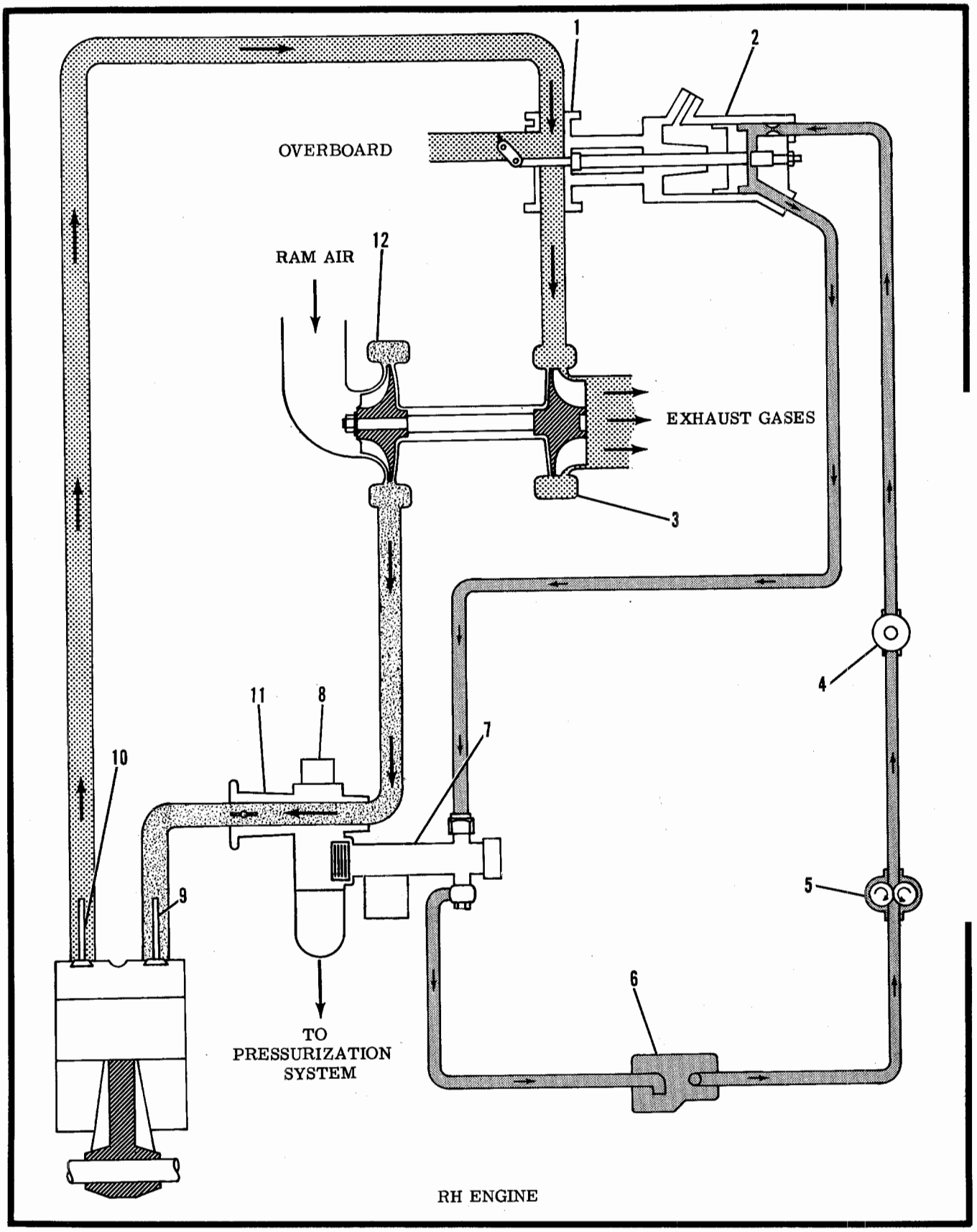



Figure 9-18. Turbocharger, Controllers, and Waste-Gate Actuator System Schematic (Sheet 2)

Turbocharger Heat Shields.

The turbocharger heat shield installation consists of two formed heat shields pinned at the hinge and held in place with monel wire. Each shield is formed around the turbocharger with a spacer to hold the shield the same distance from the turbine housing. Holes are provided in the shield to allow dissapation of heat.

Removal and Installation of Turbocharger Heat Shields. (See figure 9-16.)

a. Cut safety wire holding heat shields in place.
b. Remove hinge pin.
c. Carefully remove the two heat shields from the turbocharger turbine.
d. Install heat shields by placing the large heat shield on the turbocharger first. Install small heat shield in place and install hinge pin.
e. Secure heat shields together with 0.032 Monel Wire.

Checking Turbine Shaft Drag.

Excessive turbine shaft drag can be verified by manually rotating the compressor wheel through the air filter opening. This shaft drag is caused by the formation of rust deposits in the area of the turbine shaft piston ring area as a result of water vapor accumulation. Though not detrimental to the integrity of the turbocharger, these deposits may momentarily restrict or impede rotation of the turbine assembly, resulting in sluggish or low-power engine operation. Where this condition exists, the turbine shaft can be freed by the method described below.

a. Remove the overboard exhaust stack and liberally spray the area behind the turbine wheel with the following approved or equivalent penetrating oil: Kano Aerokroi (Kano Laboratories, 1000 South Thompson Lane, Nashville, Tennessee 37211).
b. After a soaking period of not less than 10 minutes, turn the turbine by hand. Lightly tapping the shaft end with a soft mallet may be required to free the shaft in the most severe cases.
c. Once the shaft is free, reinstall the overboard exhaust stack and conduct an engine power check to confirm proper turbocharger output.

NOTE

The above turbine shaft drag problem concerns only formation of rust deposits in new or low-time turbochargers, those in which combustion product have not yet formed a protective coating on seal surfaces. This problem should not be confused with turbine shaft binding caused by excessive internal coking, which can occur on high-time turbochargers. Units which are binding after a long time in-service must be removed for cleaning or replacement. Turbocharger coke removal procedures are given in the Cessna Turbocharger and Controls Overhaul/Parts Manual.

Removal of Turbocharger. (See figure 9-15.)

a. Remove upper engine cowl in accordance with removal procedures.
b. (See figure 9-17.) Disconnect and remove induction air canister (5), ram air duct (4), and alternate air duct (11).
c. Remove coupling (17) attaching turbocharger compressor (1) to throttle body.
d. Loosen clamp securing overboard exhaust pipe and remove overboard exhaust.
e. Disconnect oil pressure lines (18) and oil return line (6).
f. Remove safety and bolts (4) securing turbocharger to support bracket and exhaust wye (9).
g. Remove turbocharger from nacelle.

NOTE

Cap or plug all oil lines and seal turbine-compressor air openings to prevent the entry of foreign material.

Installation of Turbocharger. (See figure 9-15.)

a. Remove covers or seals from turbine and induction air openings.
b. Position turbocharger in place and install bolts (3). Refer to figure 9-19 for torque value of bolts and clamps.

NOTE

Apply Fel-Pro C-5 or equivalent (Felt Products Manufacturing Company, Chicago, Illinois) high temperature anti-seize compound to attaching nuts and bolts when installing turbocharger to exhaust wye.

c. Connect oil pressure line and oil return line to turbocharger.
d. Install exhaust pipe to turbine outlet with coupling.
e. Connect support bracket with two bolts and safety them.
f. Attach turbocharger compressor to throttle body with coupling.

Removal and Installation of Absolute Pressure, and Pressure Ratio Controllers. (See figure 9-15.)

a. Remove engine cowling.
b. Disconnect and cap lines to fuel pressure regulator.
c. Disconnect and cap lines to absolute pressure and pressure ratio controllers.
d. Disconnect throttle and mixture control cables

| ENGINE TORQUE VALUES IN POUND-INCHES | |
|---|---|
| Engine Mount Bolts | 300-350 |
| Turbine Flange Bolts | 150-160 |
| Compressor Housing Coupling Bolt | 40-60 |
| Turbine to Center Housing Bolts | 160-190 |
| Compressor Discharge to Throttle Body Coupling Bolts | 70-75 |
| Turbine Exhaust to Overboard Exhaust Tube Clamp | 40 |
| Exhaust Tube Assemblies to Exhaust Wye Clamps | 45 |
| Venturi Inlet to Throttle Body Coupling Bolt | 45-50 |
| Intercooler Outlet to Riser Coupling Bolt | 45-50 |
| Air Filter to Compressor Inlet Clamp | 70-75 |
| Exhaust Elbow to Waste-Gate Assembly Bolts | 70-90 |
| Exhaust Riser to Cylinder Studs | 100-110 |

Figure 9-19. Engine Torque Values

and stow out of the way.
e. Cut safety wire and remove screws securing controllers to throttle body and carefully work the controllers out of the nacelle.
f. Install absolute pressure and pressure ratio controller by reversing the removal procedures.

NOTE

If absolute pressure and pressure ratio controller are being replaced, use existing fittings with new packing.

g. Perform operational check in accordance with Operational Check Procedures.

Absolute Pressure Controller Adjustment. (See figure 9-20.)

a. Remove engine cowling in accordance with removal procedures.
b. Remove adjustment plug from absolute pressure controller.
c. Using a flat bladed screwdriver, rotate metering valve seat (1/16th of one full turn changes manifold pressure 1 inch Hg.), clockwise to increase or counterclockwise to decrease.
d. Install absolute pressure controller adjustment plug.
e. Install engine cowling in accordance with installation procedures.
f. Start engine, allow engine oil to reach operating temperature (upper 1/3 of green arc), ground check manifold pressure for 33.0 ±0.5 in. Hg. and 2700 RPM.

NOTE

Several adjustments and checks may be necessary to achieve correct manifold pressure.

Pressure Ratio Controller Adjustment. (See figure 9-20.)

a. Remove engine cowling in accordance with removal procedures.
b. Remove ambient air plug from low pressure port.
c. Remove line and fitting from oil outlet port and cap.
d. Restrain internal cap by inserting screwdriver through access port.
e. Insert tool 509002-1 into drain port. Rotate poppet assembly until screwdriver blade engages slot provided in bellow assembly boot.
f. Holding bellows assembly boot, rotate poppet assembly (1/16th of one full turn changes manifold pressure 1 inch Hg.), clockwise to increase and counterclockwise to decrease.

NOTE

Facing drain port, turn poppet clockwise to increase and counterclockwise to decrease.

g. Install line and fitting from oil outlet port.
h. Install engine cowling in accordance with installation procedures.
i. Refer to Turbocharger Operation Flight Check procedures and check operation of pressure ratio controller.

Removal of Waste-gate Actuator. (See figure 9-15.)

NOTE

The waste-gate and actuator are considered a matched set and must be removed and replaced as sets.

a. Remove upper cowl in accordance with removal procedures.

b. (See figure 9-27.) Loosen clamp and remove overboard exhaust tube (9).
c. (See figure 9-13.) Disconnect drain line (21) and oil lines (16 and 17).
d. Remove the four upper mounting bolts from waste-gate valve to exhaust wye (9) and remove waste-gate and actuator as an assembly.
e. Disassemble waste-gate valve from tailpipe by removing the four lower mounting bolts.

Installation of Waste-gate Actuator. (See figure 9-15.)

a. Before installation of waste-gate and actuator, check adjustments in accordance with adjustment procedures in Turbocharger and Controls Overhaul/Parts Manual, Section 3.
b. Attach waste-gate to tailpipe using four bolts and nuts.

NOTE

Apply Fel-Pro C-5, or equivalent, on all bolts in extreme high heat area.

c. Install tailpipe, waste-gate and actuator as an assembly and secure with four bolts to exhaust wye.

NOTE

See figure 9-19 for torque value of clamps.

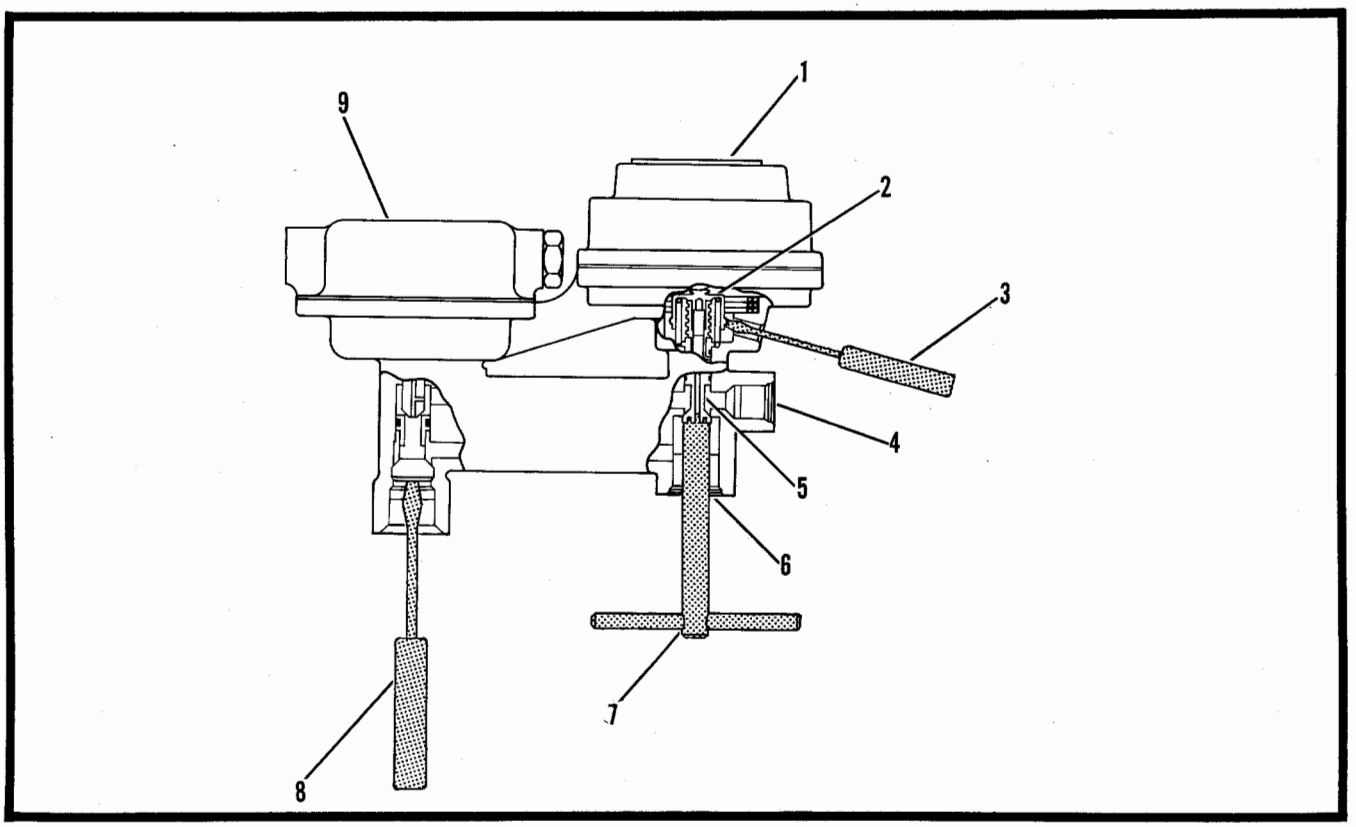
d. Connect oil lines (6 and 18) and drain line.
e. Connect overboard exhaust pipe to turbocharger.
f. Refer to Section 2, and perform inspection in accordance with inspection procedures engine exhaust system.

Adjustment of Waste-gate and Actuator.

a. See Turbocharger and Controls Overhaul/Parts Manual.

Turbocharger Operational Flight Check Procedure.

The flight check procedure, details the method of checking the turbocharger and absolute pressure controller. This procedure is to be used for aircraft suspected of improper turbocharger operation in order for the discrepancy to be correctly diagnosed. To aid in recording the necessary flight readings, a sample form, as shown in figure 9-22, is provided. This sample form, or one with similar content, should be used in conjunction with the flight check procedure. To determine at which conditions




1. Pressure Ratio Controller
2. Bellows Assembly Boot
3. Small Flat Blade Screwdriver
4. Inlet Port
5. Poppet Port
6. Drain Port
7. 5090002-1 Tool
8. Flat Blade Screwdriver
9. Absolute Pressure Controller

Figure 9-20. Controller Adjustments

bootstrapping is most likely to occur, refer to the Bootstrapping Tolerance Chart in figure 9-21.

NOTE

Bootstrapping check must be accomplished at 20, 000 ft., and manifold pressure of 28. 0 inch Hg.

1. TAKEOFF - ABSOLUTE CONTROLLER.
   a. Cowl flaps - open
   b. Airspeed - 103 MPH IAS
   c Oil temperature - upper 1/3 of green arc.
   d. RPM 2700 ±25 RPM
   e. Fuel flow - 165 to 177 PPH
   f. Full throttle M. P. - 33. 0 ±5 inch Hg.
2. CLIMB - ABSOLUTE CONTROLLER.
   a. Cowl flaps - open
   b. Airspeed - 126 MPH IAS
   c. Pressure altitude - 20, 000 ft.
   d. RPM 2700 ±25 RPM
   e. Fuel flow - 165 to 177. 0 PPH
   f. Maximum M. P. - 28. 0 ±5 inch Hg.
3. CRUISE - MANIFOLD PRESSURE RELIEF VALVE.
   a. Cowl flaps - closed.
   b. Airspeed - level flight.
   c. Pressure altitude - 16, 000 ft.
   d. RPM - 2700 ±25 RPM
   e. Fuel flow - full rich
   f. Throttle (one engine at a time)
      (1) Idle until M. P. stabilizes
      (2) Rapidly advance to full throttle
      (3) Engine should not overboost by more than 4. 0 inch Hg.
4. CRUISE - BOOTSTRAPPING DETERMINATION
   a. Cwol flaps - closed
   b. Airspeed - level flight
   c. Pressure altitude - 16, 000 ft.
   d. RPM - 2700 RPM
   e. Fuel flow - full rich
   f. Throttle - 28. 0 inch Hg.
   g. Prop control (one engine at a time)
      (1) Slowly decrease RPM until M. P. drop indicates waste-gate is closed.
      (2) The M. P., RPM, OAT, and $H_p$ at the instant of waste-gate closing.should be recorded.
      (3) The actual power being developed is shown in figure 9-21.
   h. RPM - Increase 50 RPM
   i. Mixture - recommended lean
   j. Engine should not boot-strap
5. CLIMB-PRESSURE RATIO CONTROLLER
   a. Cowl flaps - open
   b. Airspeed - 120 MPH
   c. Pressure altitude - 16, 000 to 20, 000 ft.
   d. Engine speed - 2700 ±25 RPM
   e. Fuel flow - full rich
   f. Full throttle M. P. - as shown.

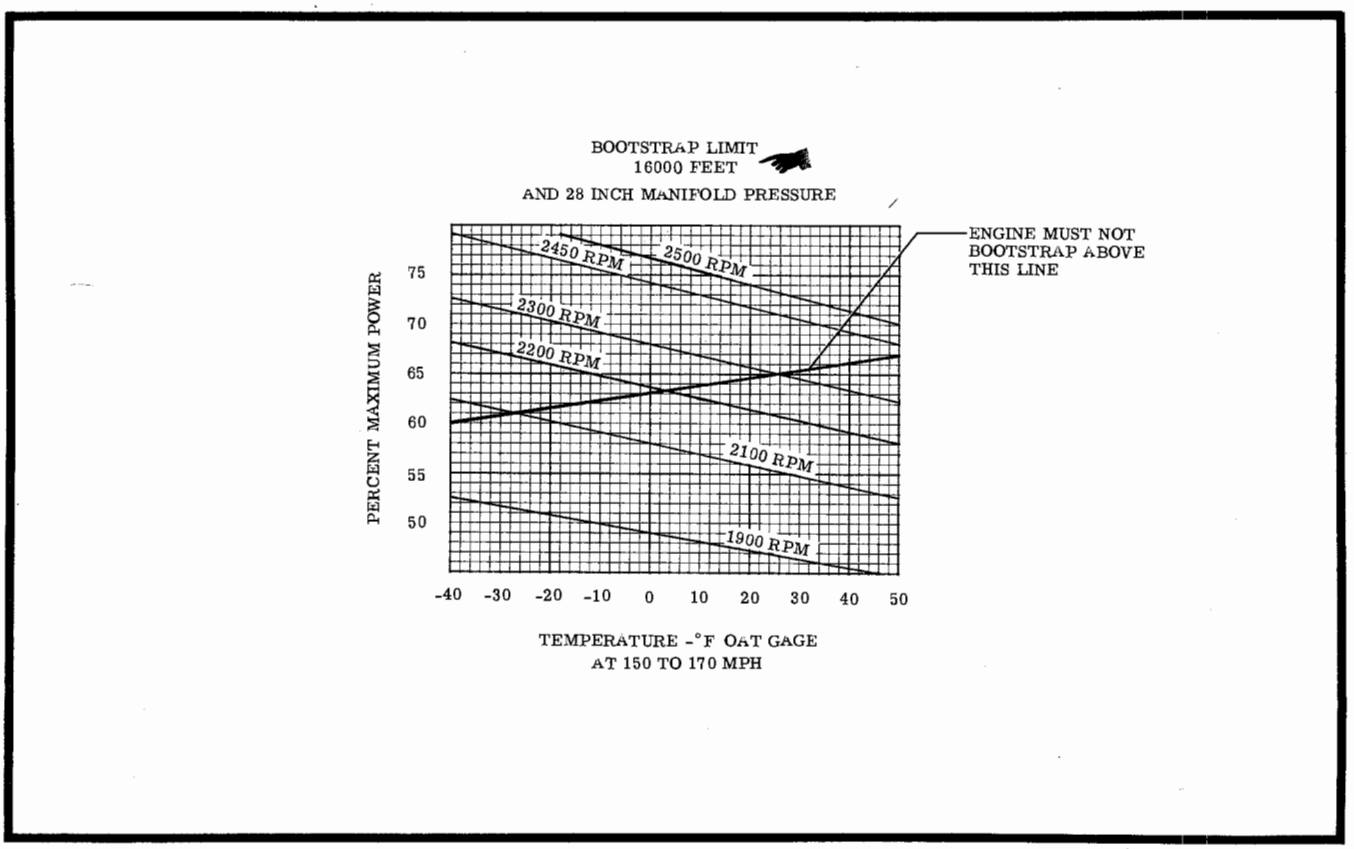



Figure 9-21. Bootstrapping Tolerance Chart

**6 LEVEL OFF 20,000 FT**

COWL FLAPS - CLOSED

1. Perform Controller Operation Flight Check Procedure step 6.

**5 CLIMB 20,000 FT**

FULL THROTTLE
FULL RPM
MIXTURE - LEAN
COWL FLAPS - OPEN
CLIMB SPEED - 120 MPH IAS

1. Observe manifold pressure at 20,000 ft. If 28.0 ± 0.5 in. Hg. is available, pressure ratio controller is functioning properly.
2. If 28.0 ± 0.5 in. Hg. is not available, perform Controller Operation Flight Check, step 5.

READINGS AT 20,000 FT. OAT _____

M.P. Number 1 _____ In. RPM Number 1 _____ Fuel Flow _____ PPH
M.P. Number 2 _____ In. RPM Number 2 _____ Fuel Flow _____ PPH

**4 CLIMB 16,000 FT**

M.P. 33.0 ± 0.5 IN. HG.
FULL 2700 RPM
MIXTURE - RICH
COWL FLAPS - OPEN
CLIMB SPEED - 120 MPH IAS

1. Observe manifold pressure at 16,000 ft. If 33.0 ± 0.5 in. Hg. is available, absolute pressure controller is functioning properly.
2. If 33.0 ± 0.5 in. Hg. is not available, perform Controller Operation, Flight Check, step 3.
3. Observe manifold pressure at 16,000 ft. If 33.0 ± 0.5 in. Hg. is available, absolute pressure controller is functioning properly.
4. If 33.0 ± 0.5 in. Hg. is not available, the manifold pressure relief valve is popping open too soon.

READINGS AT 16,000 FT. OAT _____

M.P. Number 1 _____ In. RPM Number 1 _____ Fuel Flow ____ PPH
M.P. Number 2 _____ In. RPM Number 2 _____ Fuel Flow ____ PPH

**3 CLIMB 14,000 FT.**

M.P. 28.0 ± 0.5 IN. HG.
RPM 2450
MIXTURE - RICH
COWL FLAPS - OPEN
CLIMB SPEED - 120 MPH IAS

READINGS AT 14,000 FT. OAT _____

M.P. Number 1 _____ In. RPM Number 1 _____ Fuel Flow _____ PPH
M.P. Number 2 _____ In. RPM Number 2 _____ Fuel Flow _____ PPH

**2 TAKEOFF**

M.P. 33.0 ± 0.5 IN. HG.
FULL RPM
MIXTURE - RICH
OIL TEMPERATURE - UPPER 1/3 GREEN ARC

1. Observe and record altitude where manifold pressure (M.P.) falls off. If altitude is unusually low (below 6,000 or 7,000 ft. on a hot day) suspect exhaust system leak.

ALTITUDE READINGS AT M.P. FALL OFF

Altutide Number 1 _____ Ft
Altitude Number 2 _____ Ft

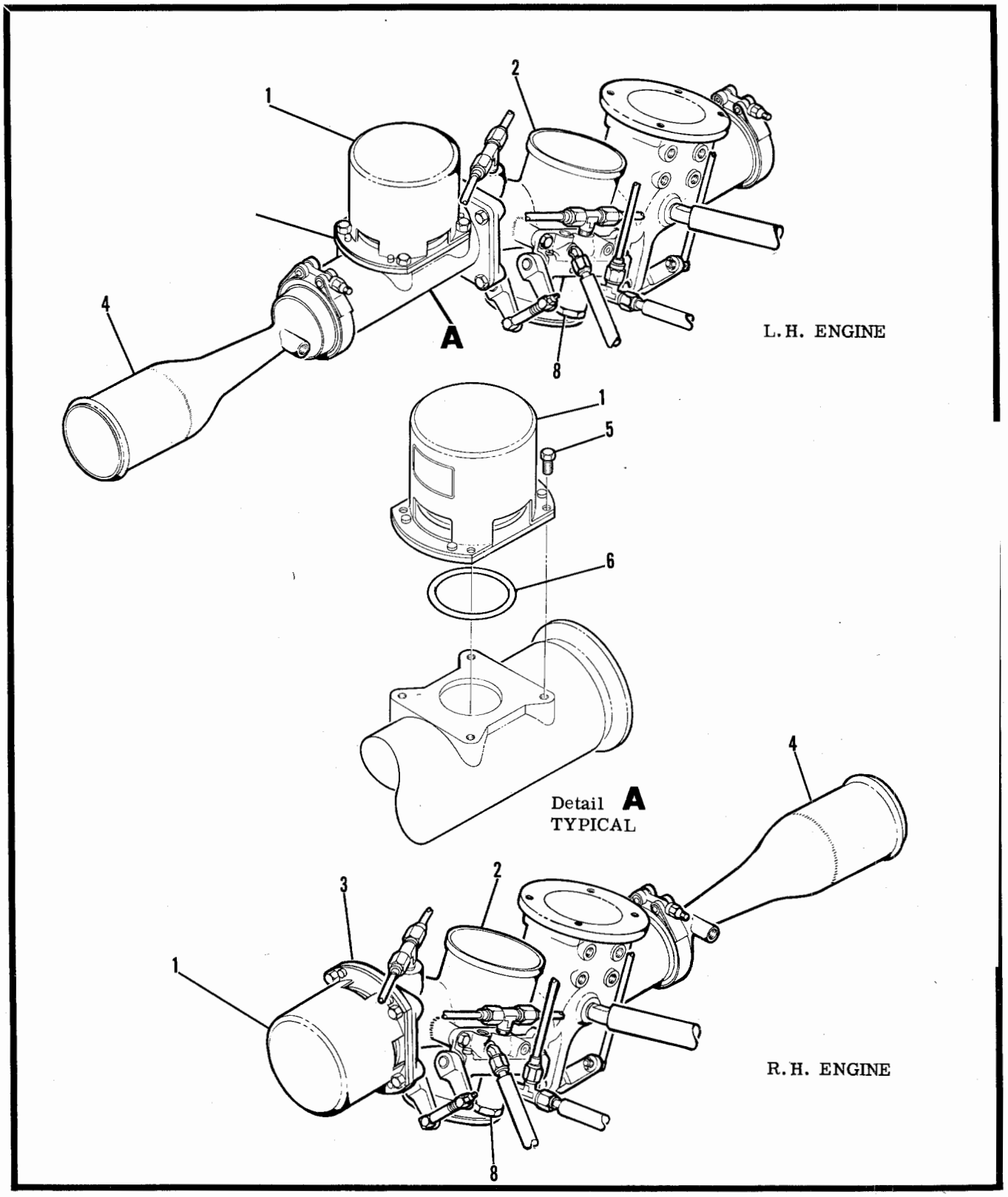
READINGS AT TAKEOFF OAT _____

M.P. Number 1 _____ In. RPM Number 1 _____ Fuel Flow _____ PPH
M.P. Number 2 _____ In. RPM Number 2 _____ Fuel Flow _____ PPH

**1 SET ALTIMETER**

29.92

Figure 9-22. Turbocharger System Operational Check Chart




22

1. Manifold Pressure Relief Valve
2. Throttle Body
3. Throttle Body Adapter Pad
4. Sonic Venturi
5. Bolt
6. O-Ring
7. Throttle Body Extension Adapter Pad
8. Metering Unit Filter Screen

Figure 9-23. Manifold Pressure Relief Valve

6. CRUISE - PRESSURE RATIO CONTROLLER STABILITY.
   a. Cowl flaps - closed
   b. Airspeed - level flight
   c. Pressure altitude - 20, 000 ft.
   d. Engine speed - 2700 RPM
   e. Fuel flow - full rich
   f. Throttle - full throttle
   g. Stability check
      (1) Release prop control to 2450 RPM, manifold pressure should remain at 28. 0 ±0. 5 in. Hg.
      (2) Reduce manifold pressure to 25. 0 in. Hg. Fluctuation should be not more than ±0. 50 in. Hg. in manifold pressure and should dampen in less than 5 seconds.

MANIFOLD PRESSURE RELIEF VALVE.

A manifold pressure relief valve is provided to prevent engine damage from excessive intake manifold pressure. On the left-hand engine, it is mounted in a vertical position to the throttle body extension. On the right-hand engine, it is mounted horizontal to the end of the throttle body. The non-adjustable manifold pressure relief valve will be actuated if the compressor discharge pressure exceeds 39. 5 in. Hg.

Removal of the Manifold Pressure Relief Valve. (See figure 9-23.)

a. (See figure 9-1.) Remove engine cowl in accordance with the removal procedure.
b. Remove bolts (5) attaching manifold pressure relief valve (1) to throttle body adapter pad (3) or throttle body extension adapter pad (7), and remove manifold pressure relief valve (1) with O-ring (6).

Adjustment of Manifold Pressure Relief Valve.

For adjustment of the manifold pressure relief valve, refer to the Cessna Turbocharger and Controls Overhaul/Parts Manual.

Installation of Manifold Pressure Relief Valve.

a. Install the manifold pressure relief valve by reversing the removal procedure.

CAUTION

Be sure that O-ring remains in groove on relief valve when installing to adapter pad.

IGNITION SYSTEM

Troubleshooting the Ignition System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE FAILS TO START DUE TO IGNITION TROUBLE | Ignition switch OFF or grounded switch wires. | Flip switch ON. Check for grounded wires. |
| | Spark plugs fouled, improperly gapped, or loose. | Remove and clean. Adjust to proper gap. Tighten to specified torque. |
| | Magnetos improperly timed to engine. | Refer to Installation of Magnetos and Ignition Timing for timing procedures. |
| | Shorted condenser. | Replace condenser. |
| | Magneto internal timing incorrect or timed for opposite rotation. | Install correctly timed magneto. |
| ROUGH IDLING | Spark plugs fouled or improperly gapped. | Clean spark plugs. Adjust spark plug gap. |
| | Weak condenser. | Replace condenser. |
| ROUGH AT SPEEDS ABOVE IDLE | Loose or improperly gapped spark plugs. | Tighten to specified torque. Adjust to proper gap. |
| | High tension leak in ignition harness. | Check for faulty insulation. |
| | Weak or burned out condenser as evidenced by burned or pitted breaker points. | Replace points and condenser. |

Troubleshooting the Ignition System (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| SLUGGISH OPERATION AND/OR EXCESSIVE RPM DROP | Fouled or dead spark plugs. | Clean spark plugs. Replace dead spark plugs. |
| | Improperly gapped spark plugs. | Adjust to proper gap. |
| | Magnetos out of time with engine. | Refer to Installation of Magnetos and Ignition Timing for proper timing procedures. |
| | Damaged magneto breaker points or condenser. | Replace points and condenser |

Removal of Magnetos. (See figure 9-3.)

The magneto removal procedure is identical for removing either magneto from either engine.

a. Remove the engine cowling in accordance with removal of engine cowl procedure.
b. Detach the magneto ground wires from both magnetos and tag for identification when reinstalling.

CAUTION

Magnetos are not grounded when ground wires have been removed.

c. Detach the high tension outlet plate from the magneto to be removed.
d. Rotate the propeller by hand in the normal direction of rotation until the No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate installation of a replacement magneto, it is good practice to position the crankshaft at the advance firing angle for No. 1 cylinder during this step. Any standard timing device or method can be used, or if the magneto being removed is correctly rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

e. Remove the two magneto flange clamp nuts, washers and clamps. Pull the magneto forward from the crankcase mounting pad.

NOTE

As the magneto flange clears the crankshaft hole, watch the rubber drive bushings and steel retainer in the gear hub to make sure they will not drop out.

Inspection of Magnetos.

a. Inspect the rubber drive bushings in the drive gear hub for deformation. Replace with new parts if they will not fit the magneto coupling lugs closely.
b. Remove the magneto breaker cover plate and inspect the points. They should have a gray, frosty appearance. If burning or pitting is apparent, determine the cause and correct it before replacing the points. If the breaker points are oily, they can be cleaned with clear, unleaded gasoline. Avoid getting any gasoline on the breaker felt as this will wash away the lubricant. Breaker point gap is .018 ±.006.

Internal Timing. (See figure 9-24.)

a. On each side of the breaker compartment there are five timing marks. The marks on the left-hand side, viewed from the breaker compartment, are for clockwise rotation viewed from the drive end. The marks on the right-hand side are for counterclockwise rotation. The timing marks indicate "O" position, "E" gap, and various degrees of magneto retard. (See figure 9-25.) The point in the center of the "E" gap boss indicates the exact "E" gap position. The width of the boss on either side of the point is the allowable tolerance of ±4°. In addition to these marks, the cam has an indented line across its end for locating neutral position. The number of degrees retard for a particular magneto is stamped at the bottom of the breaker compartment.

NOTE

When 25° retard is required, advance pointer until it is over the 20° mark. Then turn rotor until pointer is over the 45° mark. This will give a total of 25° retard.

b. Turn rotor in direction of rotation until painted chamfered tooth of distributor gear is just becoming visible in timing window. Continue turning rotor of magneto until line on end of cam is aligned with neutral mark in housing.

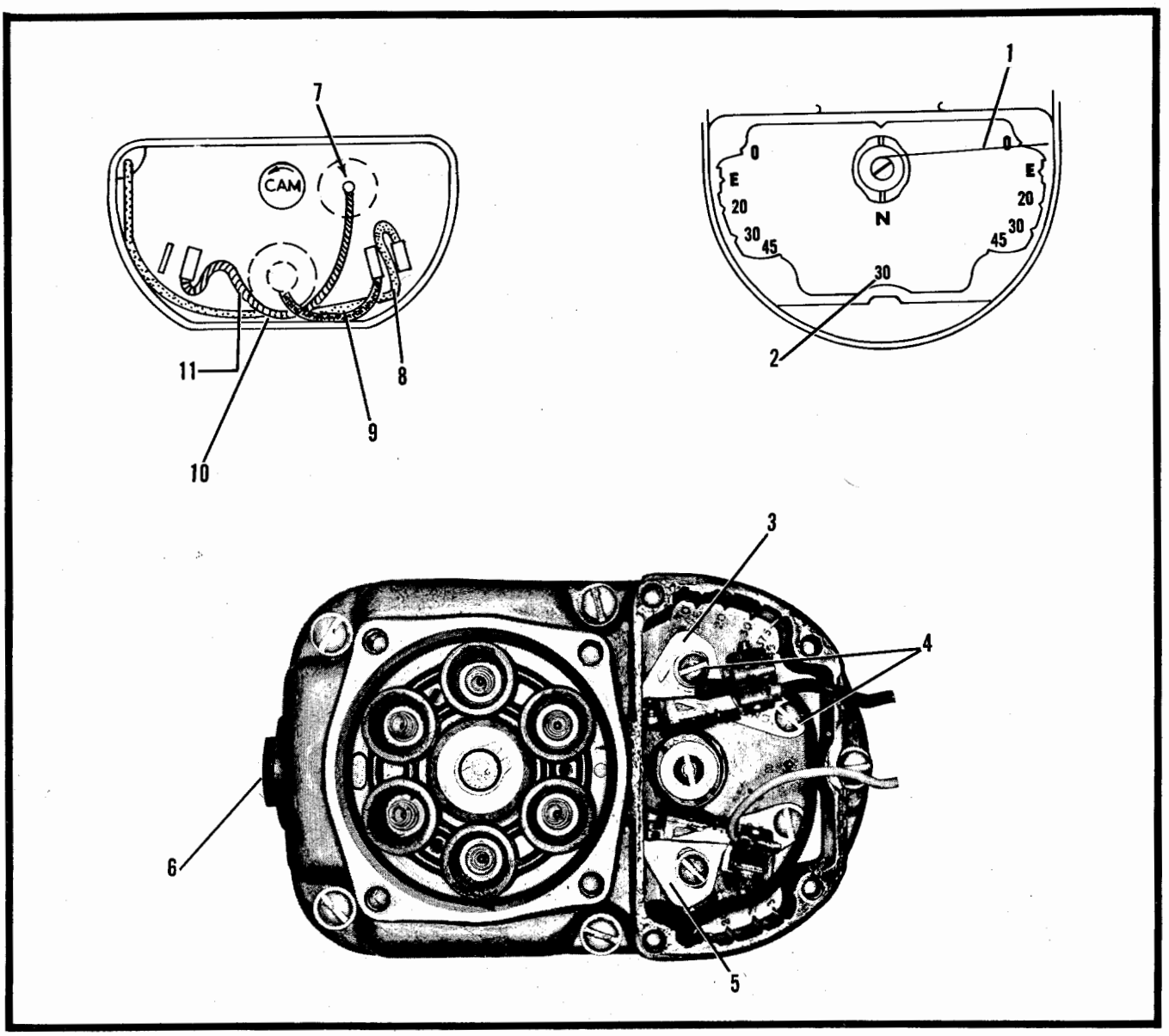
c. Fabricate a timing pointer from a piece of wire (approximately 2-1/2 inches) as follows:

1. Remove the cam screw and flat washer from cam.
2. Bend one end of the wire around the threads of the screw, loose enough to allow wire to be rotated.
3. At the outside diameter of the large washer, bend wire straight up parallel to the screw.
4. Install assembly on cam shaft and tighten screw just enough to hold wire in position and yet allowing it to be rotated.
5. At a height sufficient to clear breaker housing, make a right-angle bend in the wire.

NOTE

Pointer should be over timing marks, but not touching the housing.

d. On retard breaker magnetos, it is necessary to set the retard breaker to open a predetermined number of degrees after the main breaker opens within +2°, -0°. The number of degrees retard for a particular magneto is stamped at the bottom of the breaker compartment. After main breaker has been set to open a "E" gap (10° ±4°) move pointer back until it is over the zero mark without moving rotor from its




1. Fabricated Timing Pointer
2. Number Degrees Retard
3. Retard Contact Breaker Point Assy
4. Adjusting Screw
5. Main Breaker Contact Point Assy
6. Timing Inspection Plug
7. Retard Terminal
8. Primary Lead
9. Capacitor Lead
10. Wedge Between Capacitor and Housing
11. Retard Lead

Figure 9-24. Magneto Timing Adjustment

position where main breaker just opened. Turn rotor until pointer is over correct retard mark. Using a timing light, adjust retard breaker contacts to open at this point. A tolerance of 1/16 inch past the point can be used to get proper contact clearance. Continue rotating rotor until cam follower is on the high point of the lobe. Measure contact clearance. It should be 0.018 ±0.006. If not, readjust breaker and recheck to be sure that contacts will open within retard degree tolerance. Replace breaker assembly if retard degree tolerance and contact clearance cannot be obtained.

NOTE

Extreme care must be taken not to move the rotor from the main breaker opening position when returning the pointer back to the zero mark.

Installation of Magnetos and Ignition Timing.

a. (See figure 9-25.) Remove the magneto timing inspection hole plug. Rotate the magneto shaft until the timing pointer inside the magneto case is aligned with marked gear tooth.
b. Remove either the upper or lower spark plug from No. 1 cylinder.
c. (See figure 9-25.) Remove timing inspection plug located on the side of the crankcase and forward of No. 6 cylinder.
d. Rotate propeller to locate timing mark scribed on ring gear through timing inspection hole, when No. 1 cylinder is on the compression stroke.

NOTE

The No. 1 cylinder firing position is 20° BTC. This can be accomplished by rotating the propeller shaft and centering the timing mark on ring gear with the centerline of the crankcase timing inspection hole (see figure 9-25).

e. Check magneto to see that it is internally timed for right-hand drive rotation.

NOTE

The magneto installation procedure is identical for installing either magneto on either engine.

f. Set the magneto in place on the crancase accessory mounting pad.
g. Attach a timing light to the magneto in accordance with the timing light manufacturer's instructions.
h. If timing light is extinguished, rotate magneto housing in direction of its magneto rotation a few degrees beyond point where light illuminates. Slowly rotate magneto in opposite direction until light is extinguished.
i. Tighten magneto clamp nuts to prevent any further movement of the magneto.

CAUTION

Do not adjust breaker points to compensate for ignition timing. Breaker point adjustment is for internal magneto timing only. The adjustment of magneto breaker points, to compensate for ignition timing, will ultimately produce a weak ignition spark and reduce engine performance.

j. Rotate propeller in opposite direction of normal rotation for a few degrees after light illuminates.
k. Rotate propeller in direction of normal rotation until light extinguishes. If timing mark is visible, through the crankcase timing inspection hole, when light extinguishes, the magneto is correctly timed to the engine.
l. Repeat timing procedure for other magneto, if applicable.
m. When ignition timing has been checked (breaker points open on both magnetos at 20° BTC) retighten magneto clamp nuts to prevent movement of the magnetos.
n. Remove timing light from the magneto and engine.
o. Replace magneto timing inspection hole plug and attach high tension outlet plate to magneto.
p. Attach the magneto ground wire to magneto.
q. Replace the removed spark plug.
r. Install the engine cowling.

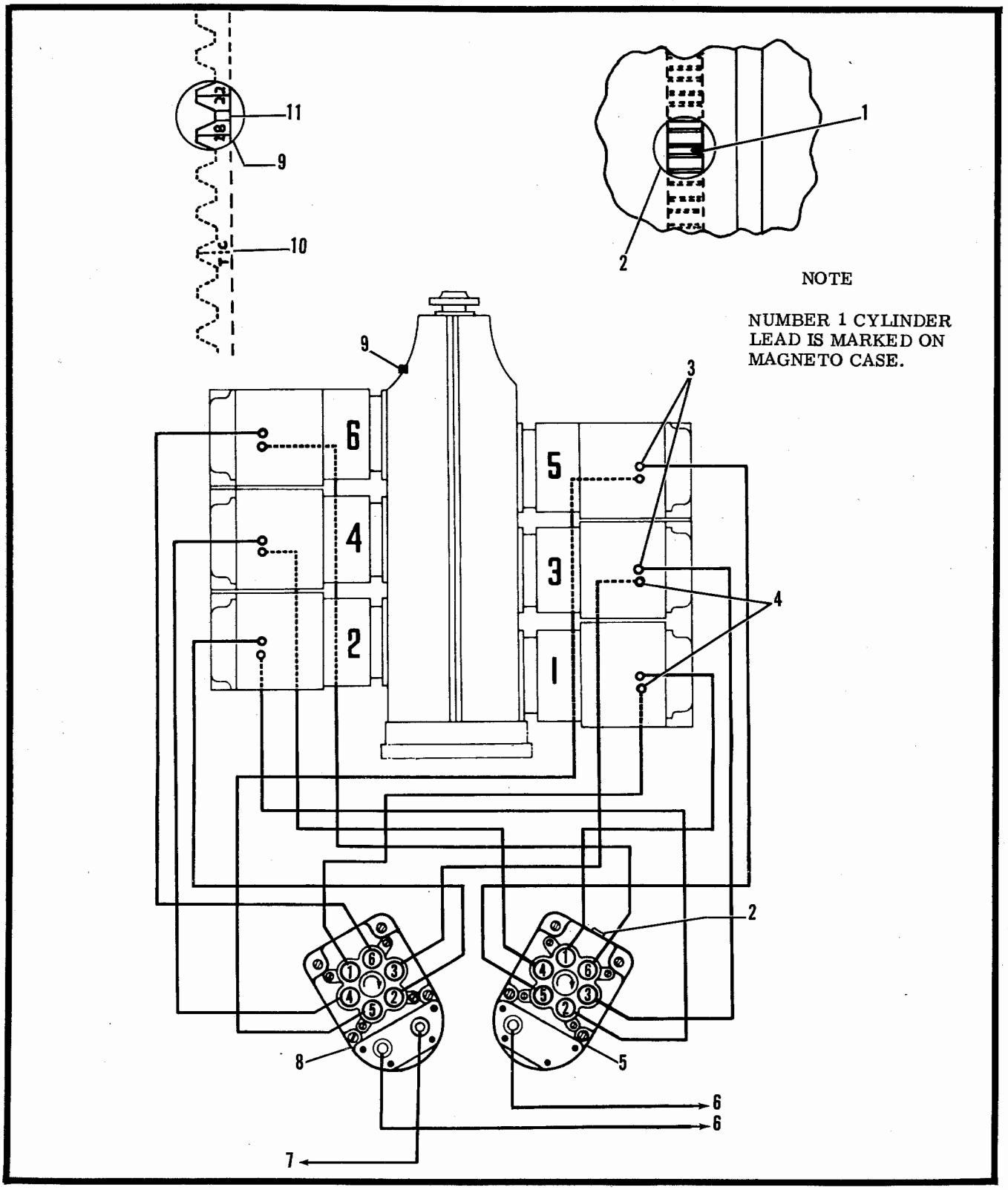
IGNITION CABLES.

Removal of Ignition Cables.

a. Remove engine cowling in accordance with removal procedure.
b. To remove any ignition cable:
1. Remove the cable from the spark plug and withdraw the contactor from the spark plug barrel.
2. Loosen attaching clamps.
3. Remove screws which secure high-tension plate to magnetos.
4. Remove the slotted-head screw and brass washer from plate grommet base which is in line with cable to be detached.
5. Withdraw cable.

Installation of Ignition Cable.

a. All cables can be installed in the same manner. If a new cable is being installed, check it for correct length by comparing it with the cable which is being replaced.
b. By using good ignition maintenance practices in addition to the Do's and Dont's listed herein, the normal life expectancy of the harness can be reached. Avoid sloppy installation and maintenance to gain full harness service life. Don't let poor practices reduce reliability.




1. Painted Chamfered Tooth
2. Magneto Timing Inspection Hole
3. Upper Spark Plugs
4. Lower Spark Plugs
5. Right Magneto
6. Magneto Switch Leads
7. Starting Vibrator Lead
8. Left Magneto
9. Engine Timing Inspection Hole
10. Top Center Timing Mark
11. 20 Degree Mark

Figure 9-25. Magneto Timing and Ignition Cable Numbering

Do - Use the Bendix 11-8950 High-Tension Lead Tester to avoid unnecessary handling and replacement of leads.

Do - Route leads to avoid all contact with engine, engine components, oil lines, airframes, etc.

Don't - Allow leads to chafe on engine, engine components, oil lines, airframes, etc.

Do - Make necessary bends as gradual as possible. Keep leads straight wherever possible. Use an elbow clamp P/N 10-320283, screw P/N 10-35936-6 and nut P/N 10-09494-4 where a bend at the spark plug is required.

Don't - Make sharp bends or stretch leads.

Do - Torque spark plug coupling nuts accurately: 90-95 inch-pounds for 5/8"-24 nut and 110-120 inch-pounds for the 3/4"-20 coupling nut.

CAUTION

Don't overtorque or undertorque spark plug coupling nuts. Always use a torque wrench.

Do - Hold the hex-shaped crimped portion of the spark plug terminal ferrule with a crescent wrench. This will prevent the ferrule from turning and twisting the lead while tightening or loosening the coupling nut. A four-inch crescent-type wrench is about the right size.

Don't - Allow the leads to twist while coupling. Twisting leads may rupture the insulating material.

Do - Use as many clamps and wire bundle ties as necessary. When in doubt, use another clamp or tie.

Do - Redress harnesses when engines are mounted in their nacelles to prevent chafing against airframe components, etc. Change nylon ties or clamps if they will hold better in a new position. Check harnesses, ties and clamps when other checks are being made on the engine.

Don't - Allow leads and wire bundles to hang loosely from their clamps. Don't allow leads to come near the exhaust manifold - keep them as far away as possible. Retighten or reposition clamps or ties if they are loosened for any reason.

Do - Check lead terminals, especially bottom cylinder plug terminals (which seem to run the hottest). The heat may cause the insulating sleeve of the plug terminal to stick in the barrel of the spark plug. If stuck, the insulating sleeve should be removed from the spark plug in such a manner as to protect the silicone insulation on the lead as much as possible. The insulating sleeve, which is readily replaceable, will receive most of any damage incurred during removal.

Don't - Bend and twist the spark plug lead until the insulation is damaged or cut by the edge of the terminal ferrule. Do not damage the 5mm high-tension wire by allowing a screwdriver blade or other sharp tool to pierce it.

Do - Remember to clean the spark plug well ceramic and terminal insulating sleeve. Clean with a cloth dampened in alcohol.

Don't - Touch the terminal insulating sleeve after washing.

Do - Use a high-temperature mold (MS-122 Fluorocarbon Spray, Miller-Stepenson Chemical Co., Inc., 16 Sugar Hollow Rd., Danbury, Connecticut), release on terminal sleeves and on grommets at the magneto cable outlet plates. This will help prevent the hotter running plug insulating sleeves from sticking.

Don't - Apply mold release to dirty plugs or insulating sleeves.

c. During maintenance check, carefully inspect the silicone lead insulation between the braided conduit and insulating sleeve. Remove the elbow clamp, if installed, to facilitate this inspection. Any lead that is torn or cut must be replaced. A longitudinal or cross-shaped tear may be caused by spark plug leakage. This leakage usually causes a gray or black discoloration of the lead at the torn area.

CAUTION

Avoid bending the lead over the edge of the harness ferrule; this may result in cutting the lead.

d. Whenever a 3/4-20 spark plug is used, insure that the compression spring is fully seated in the ferrule counterbore. If this precaution is not observed, a "Z" or "S" shaped bend can occur in the lead when assembled to the plug and the conductor may eventually puncture the silicone lead insulation. As shown in figure 9-26, the braided conduit should always be pushed along the lead to its original position before assembling the lead to the spark plug.

e. Connect cable to high-tension outlet.

1. Insert cable end with ferrule and coupling nut in place, through high-tension cable outlet plate and into proper hole in outlet plate grommet.
2. Fasten cable in place with cable piercing screw and brass washer.

CAUTION

Do not overtighten screws.

3. Attach high-tension outlet plate, with cables in place, to the magneto with four attachment screws.
4. Replace cable on proper spark plug.
5. Replace cowling.

SPARK PLUGS.

a. There are two 18mm short-reach type spark plugs for each cylinder. The spark plugs are screwed into a heli-coil insert in each cylinder. The spark plugs have an internal resistor to provide longer gap life and are shielded to prevent radio interference. An average life of 200 hours can be expected; however, this time will vary with operating conditions. The spark plugs are installed in the engine at a torque of 330±30 inch-pounds. The correct gap setting is 0.016 to 0.018 inch.

ENGINE EXHAUST SYSTEM.

Removal of Engine Exhaust System. (See figure 9-27.)

NOTE

Removal of LH exhaust system is given. Repeat procedure for removal of RH exhaust system.

a. Remove engine cowling in accordance with removal procedures.
b. If economy mixture indicator system (optional equipment) is installed, disconnect probes.
c. Disconnect exhaust assembly (1) as a unit by removing four nuts and washers from each of the three exhaust risers and at slip joint (3). Do not attempt to separate exhaust assembly to remove.
d. Remove shields (2 and 15) from above slip joint (3) by removing attaching screws.
e. Disconnect slip joint (3) from tube assemblies (6 and 11) by removing cotter pins, nuts, bolts and spring. Route slip joint (3) from engine nacelle.
f. Disconnect tube assemblies (11) from exhaust wye (10) by loosening clamp. Route tube assembly (11) through canted bulkhead and from engine nacelle.
g. (See figure 9-17.) Remove air canister assembly in accordance with the removal procedures.
h. Remove shield (7) from tube assembly (6) by loosening two clamps.
i. Disconnect tube assembly (6) from exhaust wye (10) by loosening clamp. Route tube assembly (6) through canted bulkhead from engine nacelle.
j. Remove overboard exhaust tube (9) by removing v-band coupling and clamps (19). Route overboard exhaust tube (9) from engine nacelle.
k. Remove exhaust wye (10) as follows:
1. (See figure 9-13.) Disconnect line assemblies (16, 17 and 21) from actuator (20).
2. (See figure 9-15.) Remove turbocharger in accordance with removal procedures.
3. Remove turbocharger support brace by removing attaching bolts.
4. Remove exhaust wye from engine nacelle.

Removal and Installation of Exhaust Slip Joint Seals and Expansion Ring. (See figure 9-27.)

a. Remove exhaust system in accordance with removal procedures.
b. Remove seal and expansion rings.
c. Install new expansion ring and seal in accordance with SK421-40.

Installation of Engine Exhaust System. (See figure 9-27.)

a. Install exhaust system by reversing removal procedures.

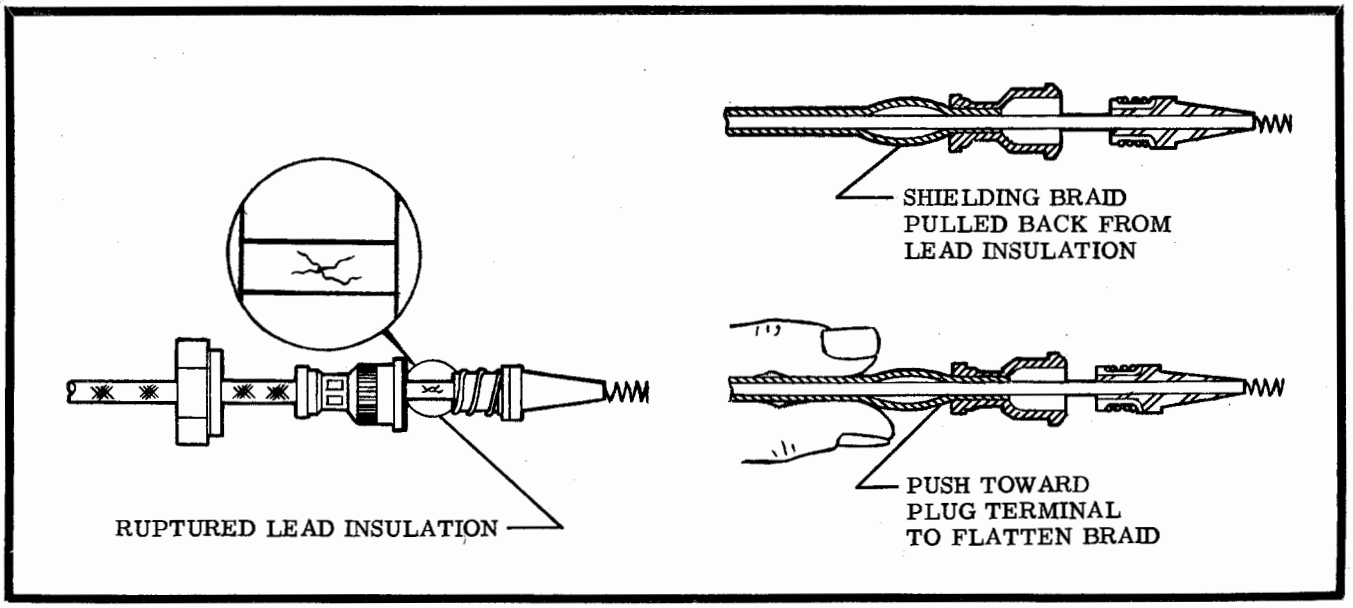



Figure 9-26. Ignition Harness

CAUTION

Make sure "V" clamps and seal rings are centered and fully seated prior to tightening. Misaligned seal rings will cause exhaust flanges to warp. As the ban is tightened, lightly rap with a soft hammer in a radial direction.

NOTE

Apply Fel-Pro C-5, or equivalent, (Felt Products Manufacturing Company, Chicago, Illinois) high temperature anti-seize compound to attaching bolts and nuts when installing turbocharger, exhaust system bolts and clamps.

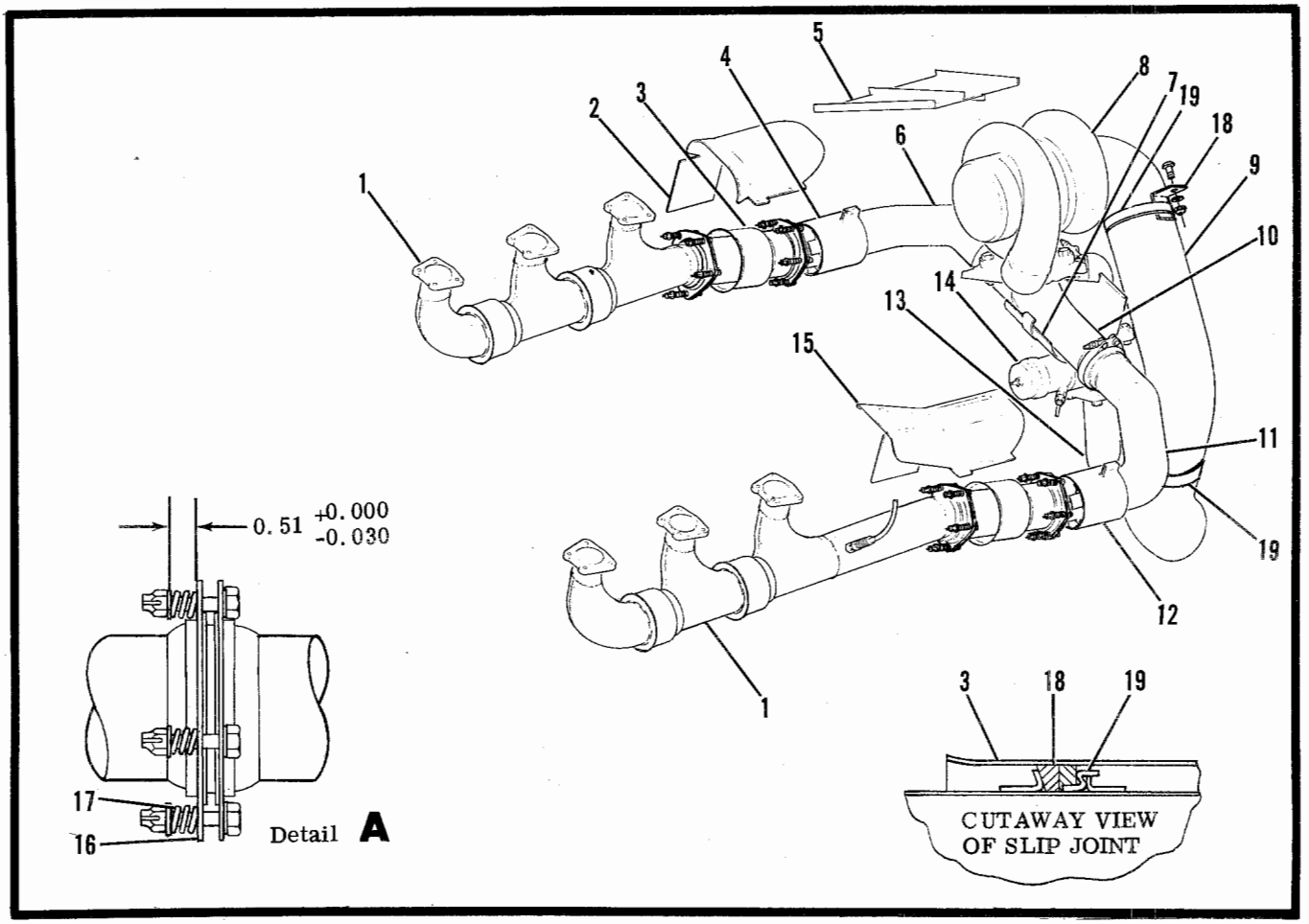
b. Torque four nuts on each exhaust riser to 100 to 110 inch-pounds.

c. Torque clamp between tube assemblies (11) and exhaust wye (10) to 45 inch-pounds.

NOTE

Progressive retorquing of "V" band couplings between heat cycles absorbs the resiliency of the channel segment sections of the coupling until they bottom out on the flanges. Repeated torquing following the heat cycle deforms the outer band. Couplings which have been overstressed can be identified by outer band deformation. Refer to Section 2, figure 2- for inspection of exhaust clamp deformation.

d. Refer to Section 2 and perform Exhaust System Inspection.




1. Exhaust Assembly
2. Shield (Inboard)
3. Slip Joint
4. Shroud (Inboard)
5. Manifold Shield
6. Tube Assembly (Inboard)
7. Shield Assembly
8. Turbine
9. Overboard Exhaust Tube
10. Exhaust Wye
11. Tube Assembly (Outboard)
12. Shroud (Outboard)
13. Waste-gate Overboard Tube
14. Waste-gate and Actuator
15. Shield (Outboard)
16. Coupling
17. Spring
18. Retention Bracket
19. Clamp

Figure 9-27. Exhaust Manifold System Installation

SECTION 10

# PROPELLER SYSTEM

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## PROPELLER.

The Model 340 is equipped with all metal, two bladed (standard equipment) or three bladed (optional equipment), constant-speed, full-feathering, single-acting, and governor regulated propellers. Each propeller utilizes hydraulic pressure which opposes the forces of springs and counterweights to obtain the correct pitch for engine load. Hydraulic pressure from the engine-mounted governor urges blades toward low pitch (increasing rpm) while the springs and counterweights urge blades toward high pitch (decreasing rpm). The source of hydraulic pressure for propeller operation is furnished by the engine oil system boosted in pressure by the governor gear pump, and supplied to the propeller hub through engine shaft flange. When the engine is not in operation, the high pitch latch mechanism prevents the propeller blades from moving into the feathered position. To feather the propeller blades, the propeller control levers on the control pedestal must be placed in the feathered position. Unfeathering the propeller is accomplished by positioning the propeller control levers to increase rpm position and rotating the blades to the low pitch position, or by starting the engine. If installed, the optional unfeathering system uses accumulator air and oil to force the propeller to the low pitch condition.

Troubleshooting the Propellers.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| PROPELLER DOES NOT RESPOND TO MOVEMENT OF PROPELLER PITCH LEVER OR FAILS TO CHANGE PITCH | Control linkage disconnected. | Check visually, connect or replace control linkage. |
| | Governor not correct for propeller. | Check that correct governor is installed. |
| | Governor speeder spring broken. | Overhaul or replace governor. |
| | Screen in governor mounting gasket clogged. | Remove governor and replace gasket. |
| | Governor drive shaft sheared. | Overhaul or replace governor. |
| | Defective pitch changing mechanism, or excessive blade friction. | Check propeller manually, repair or replace parts as required. |
| FAILURE TO CHANGE PITCH FULLY | Improper rigging of governor control. | Check that arm on governor has full travel and rig correctly. |
| | Defective governor. | Overhaul or replace governor. |
| SLUGGISH PROPELLER MOVEMENT TO EITHER HIGH OR LOW PITCH | Excessive propeller blade friction. | Overhaul propeller. |

Troubleshooting the Propellers (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ENGINE SPEED WILL NOT STABILIZE | Governor relief valve sticking. | Overhaul or replace governor. |
| | Excessive clearance in pilot valve. | Overhaul or replace governor. |
| | Air trapped in propeller actuating cylinder. | Trapped air should be purged by exercising the propeller several times prior to takeoff, after the propeller has been reinstalled or has been idle for an extended period. |
| | Excessive friction in pitch changing mechanism or excessive blade friction. | Check propeller manually, repair or replace parts as required. |
| | Excessive governor oil pump clearance. | Overhaul or replace governor. |
| EXCESSIVE RPM CHANGES WITH AIRSPEED OR POWER CHANGES | Sludge in governor. | Remove and clean governor. Drain engine oil, clean oil filter, service engine with new oil. |
| FAILURE OF PROPELLER TO GO TO FULL LOW PITCH (HIGH RPM) | Improper rigging or governor control system. | Refer to Rigging Procedures |
| | Governor arm reaches stop before maximum rpm is obtained. | Adjust in accordance with Adjustment Procedures. |
| | Defective governor. | Overhaul or replace governor. |
| STATIC RPM TOO HIGH | Incorrect propeller or incorrect low pitch blade angle. | Install correct propeller, with correct blade angle. |
| | High governor maximum rpm settings. | Adjust in accordance with Adjustment Procedures. |
| | Internal binding of governor components. | Replace governor. |
| STATIC RPM TOO LOW | Governor high rpm stop set too low. | See Note 1 at the end of this chart and rig. |
| | Defective governor. | See Note 2 at the end of this chart. |
| | Incorrect propeller or incorrect low pitch blade angle. | Install correct propeller, with correct blade angle. |
| MINIMUM RPM TOO HIGH | Control cable rod end bolt installed in wrong control arm hole. | Install in accordance with Rigging Procedures. |
| | Control lever engaging feather gate stop too soon. | Rerig controls. |
| MINIMUM RPM TOO LOW | Control cable rod end bolt installed in wrong control arm hole. | Install in accordance with Rigging Procedures. |
| | Inadequate top end control system cushion. | Rerig controls. |

Troubleshooting the Propellers (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| PROPELLER FEATHERING PERIODS IN EXCESS OF 9 SECONDS | Feather rpm settings too high. | Adjust in accordance with Adjustment Procedures. |
| PROPELLER FEATHERS TOO SOON | Improper control cable rigging. | Rerig controls. |
| | Improper feather rpm settings. | Adjust in accordance with Adjustment Procedures. |
| PROPELLER FAILS TO UNFEATHER | Improper feather rpm settings. | Adjust in accordance with Adjustment Procedures. |
| PROPELLER FEATHERS DURING ENGINE SHUT-DOWN | Latching mechanism does not engage. | Due to unusual circumstances, a propeller may occasionally feather during engine shutdown. If this occurs repeatedly, the latching mechanism is defective. Propeller repair or replacement is required. |
| FAILURE TO FEATHER | Defective governor. | See Note 2 at the end of this chart. |
| | Defective pitch changing mechanism or excessive blade friction. | Check propeller manually, repair or replace parts as required. |
| | Incorrect rigging of governor control. | Check that arm on governor has full travel and rig. |
| | Defective latching mechanism inside propeller. | Propeller repair or replacement is required. |
| | Attempting to feather from too low an engine rpm. | Increase rpm and attempt to feather again. (See Feathering Procedures.) |
| OIL LEAKAGE AT MOUNTING FLANGE | Feathering spring weak or broken. | Overhaul propeller. |
| | Damaged O-ring seal between engine and propeller. | Check visually for oil leakage and replace O-ring seal. |
| OIL OR GREASE LEAKAGE | Foreign material between engine and propeller mating surfaces or nuts not tight. | Check visually for oil leakage and clean propeller and engine mating and tighten nuts properly. |
| | Defective seals, gaskets, etc., or incorrect assembly. | Check vusually for oil or grease leakage, repair or replace propeller as required. |

NOTE 1. It is possible for either the propeller low pitch (high rpm) stop or the governor high rpm stop to be the high rpm limiting factor. It is desirable for the governor stop to limit the high rpm at the maximum rated rpm. Due to climatic conditions, field elevation, low pitch blade angle, and other considerations, an engine may not reach rated rpm on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated rpm when airborne.

NOTE 2. When troubleshooting a propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault. Removal and replacement, high-speed stop adjustment, desludging, and replacement of the mounting gasket are not major repairs and may be accomplished in the field. Repairs to governors are classed as propeller major repairs in Federal Aviation Regulations, which also defines who may accomplish such repairs.

Removal of Propellers. (See figure 10-1.)

The removal procedure is the same for either propeller. Before removing the propeller it should be placed in the FEATHERED position. This will allow the oil in the blade actuating cylinder to drain back into the engine and will protect the blade actuating cylinder wall from damage during the removal procedure.

a. Feather the propeller by either the normal or the optional procedure.

Normal Feathering Procedure:

1. Start engine in accordance with "Pilot's Checklist."
2. Operate engine at normal idle (700 rpm).
3. Place the propeller pitch lever in the FEATHER position and at the same time place the mixture lever in the IDLE CUT-OFF position.

CAUTION

Do not feather from a high rpm as this will cause excessive manifold pressure and possible damage to the engine. If the propeller fails to feather at idling (700 rpm), increase the rpm slightly and attempt to feather again.

Feathering Procedures with Optional Unfeathering System Installed:

1. After the propeller has been feathered and the engine shutdown, move propeller control out of the FEATHER position until blades start to unfeather, then quickly pull the control back into FEATHER.
2. Continue to "milk" pressure out of the system with the propeller control until the propeller blades will no longer move. This may require from 15 to 20 movements of the propeller control.

NOTE

Do not allow propeller blades to rotate far enough to let high pitch latches engage, or engine will have to be restarted, propeller feathered again, and the procedure repeated.

b. Remove cowling in accordance with Section 9.
c. Remove screws attaching spinner (1) to spinner bulkhead (8). Retain all spacers (3) from behind support (2).

NOTE

The propeller spinner and propeller bulkhead are indexed to each other by having one attaching bolt larger than the others.

d. Remove six attaching nuts securing the propeller hub to engine crankshaft.

CAUTION

Support the propeller before removing the last nut, to prevent the possibility of dropping propeller.

e. Remove propeller from engine crankshaft.

NOTE

If the aircraft is equipped with a propeller deice system, loosen the deice wires from terminal strip.

f. Remove spinner bulkhead (8) from propeller hub.

NOTE

Refer to McCauley Service/Parts Manual for maintenance, overhaul and repair of propellers.

Installation of Propellers. (See figure 10-1.)

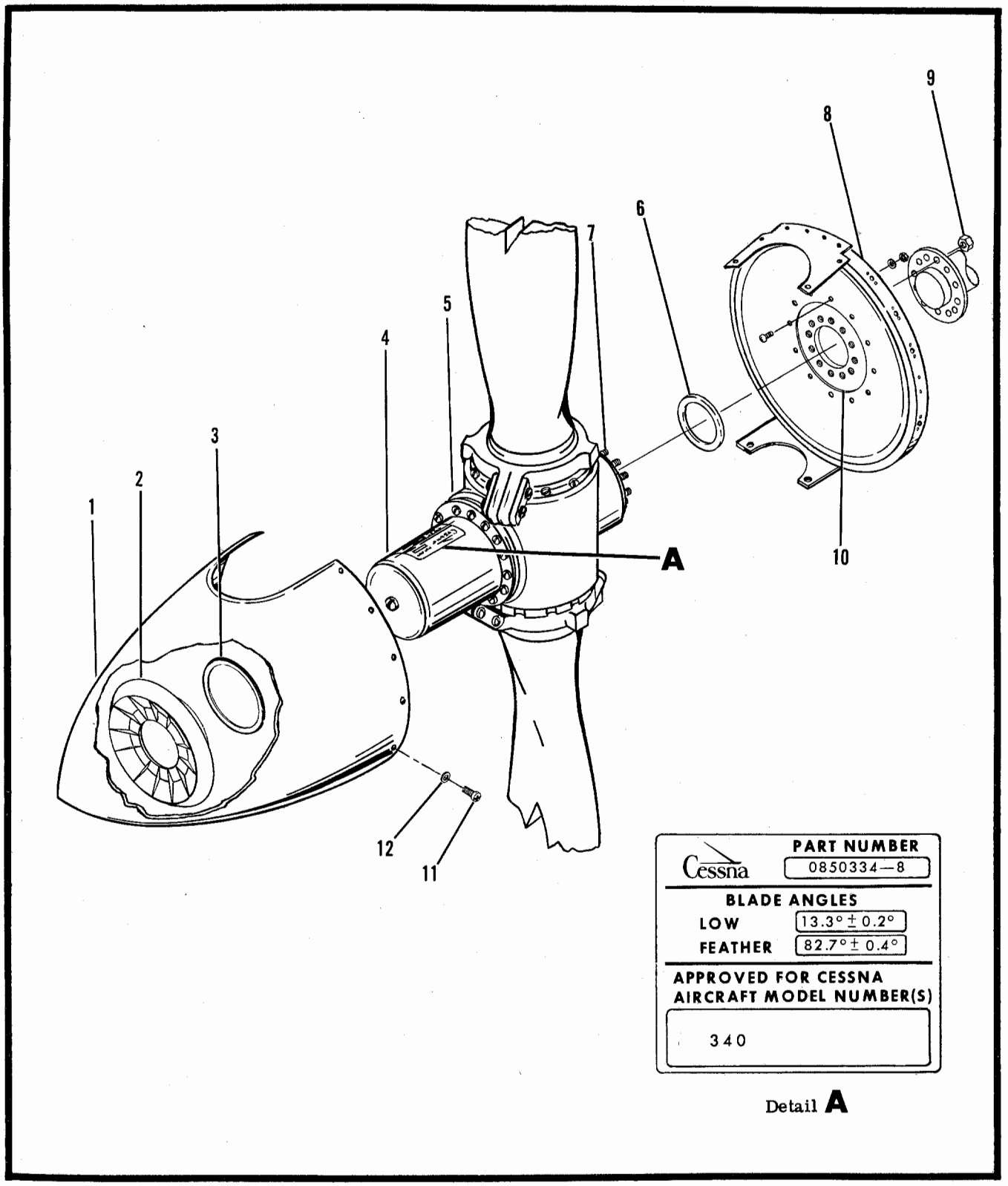
The installation procedure is the same for either propeller.

a. Position spinner bulkhead over propeller hub attach studs.
b. Wipe all dust and foreign particles from the propeller hub flange, the propeller hub oil passage, the crankshaft flange and the crankshaft oil passage with a clean cloth.
c. Install or check O-ring seal in the propeller hub and lubricate lightly with engine oil.
d. Position propeller and spinner bulkhead on the crankshaft.
e. Secure propeller to crankshaft with six nuts.

WARNING

Do not use all steel locknuts, use only new elastic element locknuts when installing propeller.

f. Torque nuts to 80 to 85 foot-pounds.
g. Install spinner. (See figure 10-1.)
1. Install spacer (3) and support (2).
2. Lightly press spinner (1) to hold snug against support and check alignment of spinner holes with bulkhead (8).
3. Alignment lack of 3/64 is approximate fit: add or remove shims to produce this condition.
4. Pushing hard on the shell, install screws (11) and washers (12). Remove shims, if necessary, until just possible to install screws.
h. Replace nose cap cowling and check propeller for operation in accordance with the Operational Check procedure.
i. If optional propeller unfeathering system is installed, charge accumulator in accordance with Section 2.




1. Spinner
2. Support
3. Spacer
4. Propeller Cylinder
5. Propeller Hub
6. O-Ring Seal
7. Stud
8. Spinner Bulkhead
9. Nut
10. Adapter
11. Screw
12. Washer

Figure 10-1. Propeller Installation (Sheet 1)

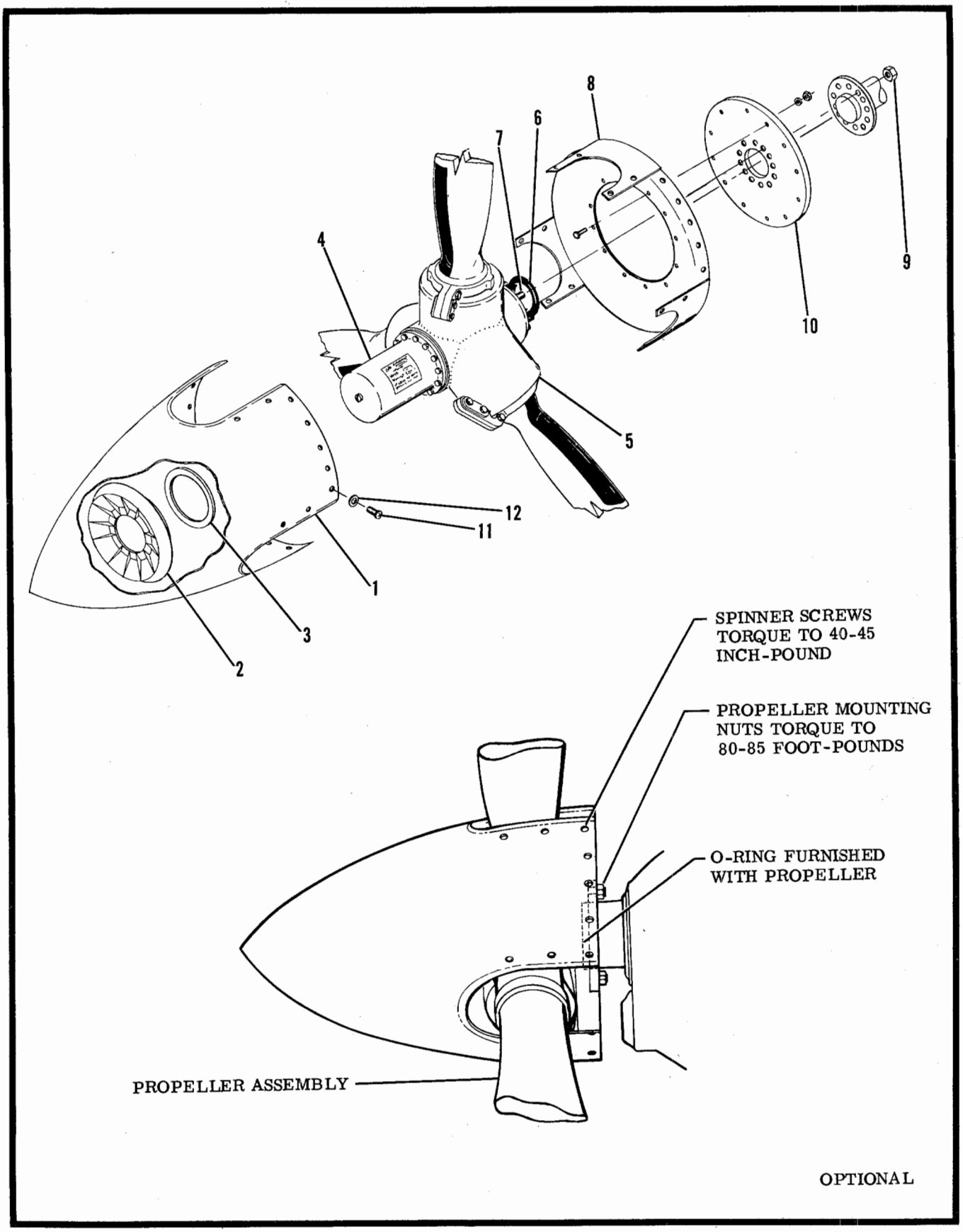



Figure 10-1. Propeller Installation (Sheet 2)

Operational Check of Propellers. (See figure 10-5.)

Anytime the propellers or propeller governor have been removed, the following check should be performed after reinstallation. This will insure that the engine-propeller-governor combination is in good operating condition and properly adjusted to give maximum performance.

a. Face aircraft into the wind. Start engines and allow to warm up with the oil temperature operating in the upper two thirds of the operating range, on the oil temperature indicator.

NOTE

Avoid running up engines where loose stones or cinders can be picked up by an inflow of air and damage the propeller blades.

b. Maximum rpm check. If local wind and ambient temperature condition allows ground attainment of maximum rpm, verify and/or adjust control system as follows:

1. Check maximum rpm (2700 ±25 rpm).

2. Check top end of control lever for a minimum of 0. 20 inches cushion. If necessary adjust control lever to obtain proper cushion.
3. Check minimum control rpm in accordance with step "c. 1. "
4. Check control levers synchronization in accordance with step "c. 2. "
5. Check override of control cable travel limits. Control cable should not reach internal stops before contact is established at governor or control quadrant stops.
6. If local wind and ambient temperature conditions do not allow ground attainment of maximum rpm, the aircraft may be flown for flight testing only, providing the engine speed is not lower than 50 rpm from maximum rpm as indicated in step "c, " and the difference between both engines does not exceed 25 rpm.

CAUTION

If adjustments performed on the maximum rpm setting screw on the governor fail to provide increments of ground maximum static rpm's (as an indication of inability to attain maximum governing speeds), the governor setting screw must be returned to the original adjustment. This is required to prevent the possibility of an overspeed condition during flight.

c. Minimum control check.
1. With manifold pressure maintained at 24" Hg., gradually retard the propeller control levers and verify that with levers firmly against the feather gate stops, assure the indicated engine speed drop is within the 1800-2000 rpm range. If required adjust control system as required.
2. Gradually advance the propeller control levers and verify that identical engine speeds are available within a half knob differential between control levers.
d. Check control lever cushion as follows:
1. With engine control quadrant friction lock completely relaxed, verify that a minimum top end cushion of 0. 20 inches is maintained. Any control cable system adjustments performed to correct inadequate cushion conditions requires a new verification of maximum rpm (step b) and minimum rpm (step c).
e. Check operation of feathering as follows:
1. With propeller control full forward and mixture control in full rich position, reduce throttle to attain 1050-1000 rpm.
2. After engine speed stabilizes between 1050-1000 rpm, place the propeller control lever behind the feather gate stop on the control pedestal. This motion must be carried at a rapid rate and feathering periods must be timed from the instant the propeller control lever reaches the feather cushion position.
3. Immediately following step "e. 2. " retard the mixture control lever to the idle cut-off position.
4. Feathering periods terminate when the propeller blades cease to rotate about their axis, and must not exceed 9. 0 seconds.

NOTE

Changes to the governor head or control arm orientations are not authorized on governor. Lead seals and safety wires installed at the cover retainer and control arms must not be disturbed.

PROPELLER GOVERNORS.

A lever head, base-mounted, constant-speed, single-acting governor is installed on each engine to control the propeller pitch. The governors are engine-driven and mounted on the left side of the crankcase just below the forward cylinder. A gear type pump and relief valve is incorporated in each governor to boost engine oil pressure which, regulates aircraft engine speed by varying the pitch of the propeller to match load torque to engine torque in response to changing conditions of flight. Internal flyweights are attached to a pilot valve that directs high pressure oil to the propeller piston or allows oil to drain from the piston.

Removal of Propeller Governors. (See figure 10-2. )

NOTE

The removal procedure is the same for either propeller governor.

a. Refer to Section 9, remove engine cowling and baffles as necessary to gain access to propeller governor.
b. Disconnect propeller control from governor control arm.
c. Disconnect propeller sync magnetic pickup wires.

CAUTION

If aircraft is equipped with optional unfeathering system, release accumulator pressure prior to removal of governor.

d. Remove governor and mounting gasket by removing the four nuts, lockwashers, plain washers, and the forward left engine baffle support tab.

Installation of Propeller Governors. (See figure 10-2, )

a. Place the mounting gasket over the governor mount studs with the raised surface of gasket screen facing away from the engine.
b. Align the splines on the governor shaft with the engine drive, and slide the governor into position.
c. Secure the governor in place with the four plain washers, lockwashers and nuts on the governor mount studs. The forward left engine baffle support tab should be fastened to the lower forward governor mount stud.
d. Connect propeller control to governor control arm.
e. Connect propeller sync magnetic pickup wires.
f. If optional unfeathering system is installed, connect hoses and charge accumulator in accordance with Section 2.
g. Rig propeller control in accordance with rigging procedures.

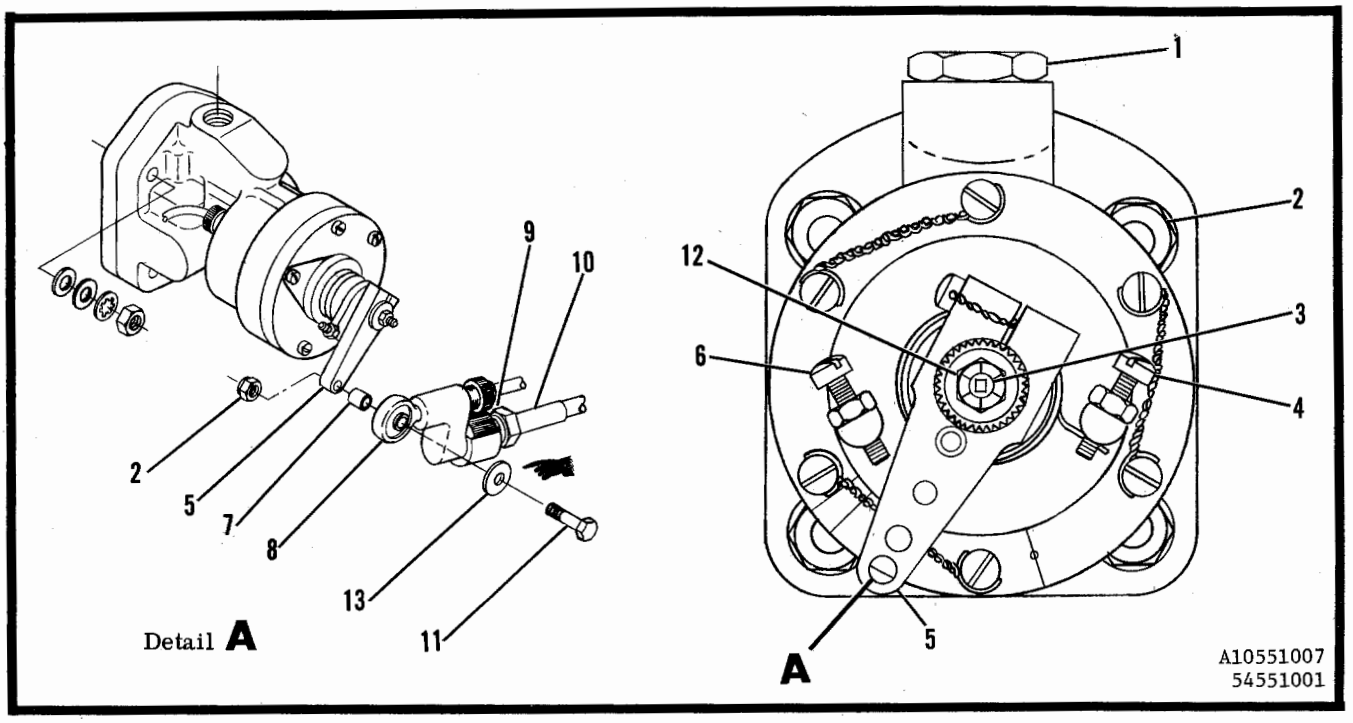
h. Refer to Section 9, install engine baffles and cowling.
i. Perform operational check of propellers.

Rigging Propeller Governor Controls. (See figure 10-2.)

a. Disconnect the propeller control at the governor arm.
b. Move propeller control lever from maximum to minimum rpm position (against feather gate stop).
c. Adjust control system cable rod ends, cable housing and support bracket as required to align rod end hole with rigging pin (No. 8 drill shank or equivalent) installed and positioned over the 2000 rpm index mark.
d. Remove rigging pin and connect propeller control to outboard arm hole.
e. Cycle propeller control lever to insure a minimum top end cushion of 0.20 inch. Make minor adjustments as required to attain minimum cushion at top end and minimum control rpm of 1800 to 2000 rpm at the lower end of lever travel.

Adjustment of Governor. (See figure 10-2.)

If maximum rpm, low minimum rpm or propeller feathering periods are incorrect adjust as required.
a. If static rpm is too high, reduce by adjusting governor stop screw (6). Turn clockwise one revolution for each 17 rpm decrease. This reduction prevents possible overspeeding at takeoff.
b. If static rpm is too low, it is possible that either the governor stop screw (6) or the propeller low pitch stop is the limiting factor. Move the propeller control lever toward decrease rpm and then to increase rpm position; if the maximum attainable rpm is reached at the same time as the governor stop the governor is the limiting factor. Correct by adjusting the governor stop screw. Turn counterclockwise one revolution for each 17 rpm increase. If the maximum obtainable is reached before governor stop is reached, the propeller low pitch stop may be the limiting factor. This would require an adjustment of the propeller blades to decrease the low pitch angle.
c. If feathering time period is in excess of 9 seconds, adjust by loosening locking nut (12) and turn adjustment screw (3) counterclockwise. Hole screw position while securing locknut.
d. If propeller feathers before control lever reaches a point 0.20 inch aft of the feather gate stop position, ascertain that propeller control is properly rigged and that minimum rpm is on the high end of the 1800-2000 rpm range. If control rigging is correct, turn feather adjustment screw (3) clockwise to lower the feather position.
e. If propeller fails to unfeather when propeller control lever is advanced forward of the feather gate stop, turn adjustment screw clockwise.
f. For minimum rpm adjustments, adjust controls in accordance with rigging procedures.




1. Plug
2. Nut
3. Screw Adjustment
4. Feather Stop
5. Control Arm
6. High RPM Stop
7. Spacer
8. Rod End
9. Locknut
10. Control Cable
11. Bolt
12. Locknut
13. Washer

Figure 10-2. Propeller Governor

PROPELLER SYNCHRONIZER SYSTEM.

The component parts of the propeller synchronizer system are two electrical pulse pickups, trimmer assembly, actuator motor assembly, switch, interconnecting electrical cable assemblies, and an indicator light. The control box assembly, located under the glove compartment box, contains an all transistorized circuitry. The actuator motor is a stepping type that operates on command from the control box and is located in the right engine nacelle. The flexible rotary shaft is connected to the actuator motor and trimmer assembly to trim the right engine speed setting. Magnetic pickups are mounted in each propeller governor to provide engine speed indications to the control box assembly. The function of the propeller synchronizer system is to automatically match the RPM between the two engines; therefore, the left engine is designated as the "master" engine while the right engine is termed the "slave" engine. The electrical pulses from both magnetic pickups are fed into the control box from the governors. Any difference in these pulse rates will cause the control box assembly to run the actuator motor and through the flexible shaft, trim the "slave" engine governor speed setting to exactly match the "master" engine RPM. Normal governor operations and functions are unchanged, but the synchronizer system will continuously monitor engine RPM and reset the "slave" engine governor as required. The limited range feature prevents the "slave" engine from losing more than a fixed amount of RPM in case the "master" engine is feathered with the synchronizer on.

Troubleshooting the Propeller Synchronizer System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| PROPELLER SYNCHRONIZER SYSTEM WILL NOT OPERATE | Circuit Breaker Out. | Reset circuit breaker. |
| | Actuator Motor Defective. | Reset circuit breaker. |
| | Magnetic Pickup Out. | Replace. Refer to Testing Procedures. |
| | Defective Governor. | Repair or replace governor. |
| | Wiring Defective. | Perform Continuity Check in accordance with Synchronizer Wiring Test Procedures. |

Operation of Propeller Synchronizer System.

Electrical pulses from the magnetic pickup in each governor are fed into the control box (figure 10-6). As any difference in the number of pulses is detected, a signal is sent from the control box to the actuator, which trims the slave governor speed to match that of the master engine exactly. Normal governor operation is unaffected. The synchronizer will continuously monitor the engine speeds and reset the slave engine speed setting as required. Operating range of the actuator is approximately ±50 RPM.

CAUTION

Disconnect the propeller synchronizer control box before doing any work on the governor pickup leads. Turning the propeller synchronizer switch to the OFF position WILL NOT give this protection. Battery master switch must be OFF.

Removal of Propeller Synchronizer Components. (See figure 10-3.)

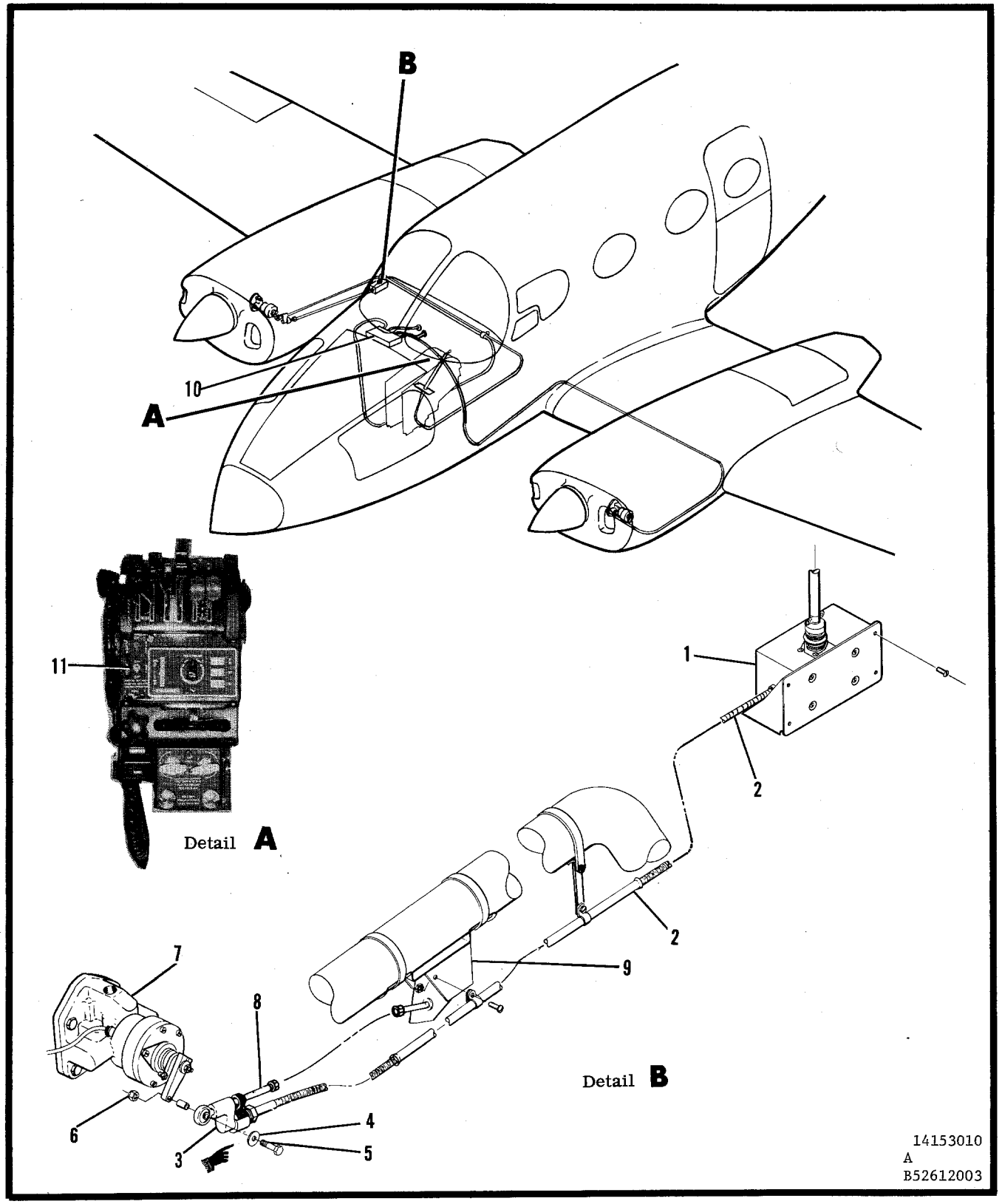
a. Remove engine cowling.
b. Disconnect electrical plug and flexible shaft (2) from actuator (1).
c. Remove nuts and screws securing actuator to bracket and remove actuator from engine nacelle.
d. Disconnect flexible shaft (2) and control (8) from trimmer assembly (3).
e. Loosen nuts securing control (8) to bracket (9), remove forward nut and route control aft through the bracket (9).
f. Remove nuts (6), washers (4) and bolts (5) from governor (7), and remove trimmer assembly (3).
g. If the switch or light is to be removed, the panel (11) can be removed by removing autopilot controller, if installed, and removing the screws fastening the panel to the pedestal.

Installation of Propeller Synchronizer Components. (See figure 10-3.)

a. Install components by reversing removal procedures.
b. Adjust in accordance with adjusting procedures.

Adjustment of the Propeller Synchronizer System. (See figure 10-3.)

a. Start rigging procedures by disconnecting flexible shaft (2) from actuator motor (1).




1. Actuator
2. Flexible Shaft
3. Trimmer Assembly
4. Washer
5. Bolt
6. Nut
7. Governor
8. Control
9. Bracket
10. Control Box
11. Prop Synchronizer and Light Panel

Figure 10-3. Propeller Synchronizer System Installation

b. Rotate free end of flexible shaft (2), counting total turns available on the "slave" governor trimmer assembly (3).
c. Return trimmer assembly (3) to its center range.
d. When trimmer assembly (3) is centered, rig governor (7) and control cable (8) in accordance with Rigging Propeller Controls.
e. Manually rotate trimmer assembly (3) to either end of its travel.
f. Move propeller pitch levers on the pedestal through its entire range, observing the governor speed adjusting lever to be certain it travels to the maximum and minimum RPM limits.
g. Manually rotate the trimmer assembly (3) to opposite end of its travel.
h. Perform step f. again.
i. Recenter the trimmer assembly (3).
j. Insert a squared shaft into drive of actuator motor (1) and count total turns available.
k. Place actuator motor (1) in its center range.
l. With both actuator motor (1) and trimmer assembly (3) centered, connect the flexible shaft (2) to actuator motor.
m. Check flexible shaft (2) for binding and clearance in the full RPM position.
n. Perform functional test.

Functional Test of Synchronizer System.

To test the operation of the synchronizer in flight, first synchronize propellers manually and turn the synchronizer switch ON. Then slowly adjust the master engine propeller governor control lever, in small increments, to increase or decrease RPM. The RPM range over which the slave engine will remain synchronized with the master engine is the limited range mentioned above. With the synchronizer ON, move the master engine propeller governor control lever to a point which is close to the end of this limited travel. Turn the synchronizer OFF. An unsynchronized condition will develop as the actuator moves to its mid-position. When the synchronizer is turned ON again, synchronization will result. If the units do not become synchronized, the actuator has reached the end of its travel and must be recentered in this manner.

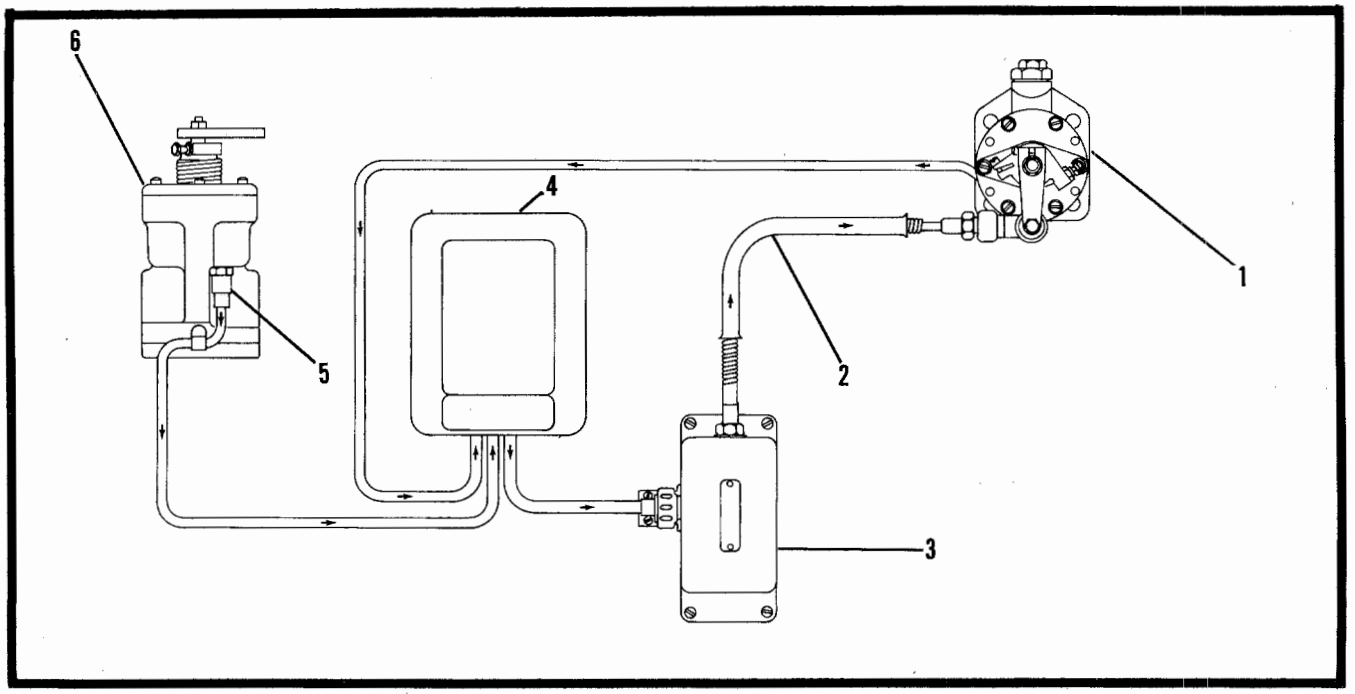
a. Turn the switch OFF.
b. Synchronize the engines manually.
c. Turn the switch ON.

Synchronizer Wiring Test.

CAUTION

Do not plug in control box until this test has been satisfactorily completed. Even with switch OFF, the box could be seriously damaged.

a. Before starting this test, be sure the control box is unplugged, the master switch is off, and the synchronizer circuit breaker is pulled. On a new installation, connect the actuator assembly and the magnetic pickups to the cables. Either pickup wire may be connected to pin receptacle No. 8 of the Jones cinch socket. Connect the other wire to pin




1. Slave Governor
2. Flex Shaft
3. Actuator
4. Control Box
5. Magnetic Pickup
6. Master Governor

Figure 10-4. Schematic Diagram of Synchronizer Operation

receptacle No. 6 for slave engine, and No. 7 for the master engine. Before tying down pickup wires, complete continuity check given in chart below between pins 8 and 6 and between pins 8 and 7.

NOTE

If another accessory uses the same circuit breaker, turn this accessory off before starting tests. The control box must be unplugged for these tests.

b. Make the following tests, using an Ohmmeter to the pin receptacles in the Jones cinch socket number 233032: zero the Ohmmeter and read on the X1 or X10 scale.

CAUTION

Do not use a probe that exceeds 0.045 inch in thickness. Insert and remove probe carefully. Failure to do this will result in loose pin connectors and faulty synchronizer operation.

Propeller Synchronizer Wiring Continuity Check.

| Test between receptacle numbers: | With Actuator Centered | OBTAIN With Actuator Uncentered 180° Turn Clockwise (Facing Drive End) To Uncenter | OBTAIN With Actuator Uncentered 180° Counterclockwise (Facing Drive End) To Uncenter | ACTION (If out of limits) |
|---|---|---|---|---|
| 5 & 1 | open circuit (high resistance) | 6.5 to 8.5 OHM | 6.5 to 8.5 OHM | Bench check the actuator in accordance with Woodward Synchronizer Manual, Bulletin 33049. |
| 5 & 3 | open circuit (high resistance) | closed circuit (0 to 1.0 OHM) | 13 - 17 OHM | |
| 5 & 4 | open circuit (high resistance) | 13 - 17 OHM | closed circuit (0 to 1.0 OHM) | |
| 4 & 1 | 6.5 to 8.5 OHM | 6.5 to 8.5 OHM | 6.5 to 8.5 OHM | |
| 4 & 3 | 13 - 17 OHM | 13 - 17 OHM | 13 - 17 OHM | |
| 3 & 1 | 6.5 to 8.5 OHM | 6.5 to 8.5 OHM | 6.5 to 8.5 OHM | |

| Test between receptacle numbers: | OBTAIN | ACTION (if out of limits) |
|---|---|---|
| 7 & 8 (with 6 disconnected at pickup) | 52 - 68 OHM | Repair wiring if at fault; Replace governor if pickup is at fault; Replace pickup (Approved Governor Shop). |
| 8 & 6 (with 7 disconnected at pickup) | 52 - 68 OHM | |
| 8 & aircraft ground | open circuit (very high resistance) | |
| 1 & aircraft ground | short circuit zero OHMS | Trace wiring to determine poor ground |
| 2 & aircraft ground* | open circuit (very high resistance) | Trace wiring to remove fault. |

*2 & aircraft ground will read some low OHM value if you cannot open the circuit breaker. If the synchronizer shares a circuit breaker with another circuit, you may read an OHM value of the other circuit.

c. When the system meets all of the above test values, turn the master switch on and reset the synchronizer circuit breaker (CONTROL BOX must still be unplugged) and make the following voltage check.

Propeller Synchronizer Voltage Check.

| TEST BETWEEN RECEPTACLE | METER READING | ACTION (If out of limits) |
|---|---|---|
| 2 & 1 | Same as supply voltage and polarity of pin No. 2 must be positive and pin No. 1 must be negative. | Trace wiring to determine fault or reversed polarity. |

d. Check magnetic pickup output with engine running at any cruise RPM. Check potential between pin receptacles 6 and 8. Also check potential between pin receptacles 7 and 8. Voltage must be a minimum of 1/2 volt at minimum cruise RPM, and a maximum of 3 volts at maximum cruise RPM. Voltages and RMS voltages are read on 6000 OHM/volt AC voltmeter. If you do not obtain this voltage, replace governor or have approved governor repair shop adjust or repair the pickup.

e. When the system complies with the specifications above, the control box may be connected.

f. If the synchronizer malfunctions now, the cause of the malfunction can probably be traced to the control box, to the mechanical function of the flexible shaft or governor speed trimming device. Check for high friction level in the trimming mechansim. Be sure to center the actuator and trimming device before mating cable.

NOTE

To check magnetic picup resistance at the governor, disconnect both connectors and measure resistance with an ohmmeter. Use X1 or X10 scale. Replace pickup if reading is other than 52-68 OHMS.

Removal and Installation of Magnetic Pickup in Propeller Governor.

a. Remove propeller governor in accordance with removal procedure.

b. Tag and disconnect wiring to pickup.

c. Unscrew magnetic pickup from propeller governor.

d. Install magnetic pickup as follows:

1. Set governor for maximum RPM, slowly rotate the governor drive shaft.
2. Screw in pickup, tighten with fingers until pickup makes contact internally with the rotating flyweight head.

CAUTION

Do not use wrench or pliers to tighten magnetic pickup.

NOTE

When installing new pickup, always install new O-ring.

3. Tighten the pickup 1/8 turn counterclockwise and lightly tighten locknut.
4. Connect a 5000 OHM/Voltmeter across the pickup leads.
5. Drive the propeller governor at minimum cruise RPM and adjust pickup output to obtain 1.0 ±0.2 volt. Screw pickup in to increase voltage, and screw pickup out to decrease voltage.
6. Tighten pickup locknut and safety with lockwire.

CAUTION

Do not torque locknut over 25 inch-pounds.

e. Install propeller governor in accordance with installation procedure.

f. Connect wires and remove tags.

SECTION 11

# FUEL SYSTEM

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## FUEL SYSTEM.

The aircraft standard fuel system consists of an integrally sealed (wet) tank mounted to each wing tip. The auxiliary fuel system (optional equipment) for aircraft 340-0001 to 340-0151 is comprised of one synthetic rubber cell in each wing, plus necessary plumbing. For aircraft 340-0151 and On, there are two synthetic rubber cells in each wing plus necessary plumbing. Wing locker fuel tanks installed in the forward section of each nacelle are also provided for additional fuel capacity. Fuel capacities for each system are given in Section I. Two electrically operated fuel pumps are mounted in each main tank, the auxiliary fuel pump and the fuel transfer pump. The auxiliary fuel pump, mounted in the bottom of the main tank, provides fuel pressure for priming during engine starting and supplies fuel to the engine in an emergency. The fuel-transfer pump is mounted on aft side of the main tank rear bulkhead and transfers fuel from the nose section of the main tank to the center baffle area, where it is picked up and routed to the engine by either the engine-driven or the auxiliary fuel pump. The fuel transfer pump prevents the possibility of fuel starvation to the engine during steep angles of descent and a low quantity of fuel. The fuel boost pump feeds fuel to the selector valve, located outboard of each engine nacelle and in turn routes fuel to the engine-driven fuel pumps on each engine. A vapor return line is installed from the engine-driven fuel pump to the main tank to return unused fuel. A line is installed from each auxiliary fuel cell to respective fuel selector. When fuel is used from the main tanks, the fuel vapor from the fuel pump is returned to the main tank. The wing locker fuel system is equipped with a transfer pump mounted outboard of the wing locker on the rib. These pumps transfer fuel from the wing locker to the main tanks. A pressure switch is installed in the fuel line to operate a pilot indicator light mounted in

the left side of the annunciator panel. Fuel is routed from the wing locker tank to each respective main tank through lines routed in the leading edge of the wing. There are no return lines in the wing locker fuel systems, therefore, it is necessary the aircraft be flown with the fuel selector on MAIN for at least sixty minutes or until thirty gallons of fuel remain in the main tanks before transferring fuel from the wing locker tanks. Quick drain valves are provided in the bottom of each main, auxiliary and wing locker tanks, in addition to a drain valve located in the crossover drain line and fuel selector sediment bowl to drain trapped moisture and sediment. The fuel system is vented to a common vent located on the underside of each tip tank and incorporates a heater to prevent icing. A sniffle valve located aft of the filler cap, provides a secondary vent for the main tank.

Troubleshooting the Fuel System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NO FUEL QUANTITY INDICATION | Fuel tank empty. | Fill tank with correct grade of fuel. |
| | Fuel quantity indicator circuit breaker open. | Reset circuit breaker. |
| | Loose connections or open circuit. | Tighten connections and check wiring. |
| | Defective signal conditioner. | Replace signal conditioner. |
| | Defective fuel quantity indicator. | Replace fuel quantity indicator. |
| | Defective fuel tank unit. | Verify tank unit is defective using Field Calibration Unit Test Box. |
| | Broken or loose wiring. | Check circuit with multimeter. |
| INDICATOR READS LOW | System out of adjustment. | Substitute capacitance with Field Calibration Unit Test Box. |
| | Tank unit has low capacitance. | Replace tank unit. |
| INDICATOR READS HIGH | System out of adjustment. | Calibrate system. |
| | Tank unit has high capacitance. | Replace tank unit. |
| | Additional capacitance in Hi-2 input circuit due to moisture in connector. | Check connector, remove moisture or replace connector. |
| INDICATOR OPERATION SLUGGISH | Low insulation resistance of the circuit. | Isolate insulation resistance using Field Calibration Unit Test Box. |
| FUEL DRIPS FROM NACELLE | Mixture lever not in IDLE CUT-OFF. | Place mixture lever in IDLE CUT-OFF. |
| | Mixture lever not in IDLE CUT-OFF due to improper rigging. | Rig mixture control in accordance with Section 9, Rigging Mixture and Throttle Controls. |
| | Broken fuel line or loose fitting. | Check fuel lines and fittings. |
| AUXILIARY FUEL PUMP INOPERATIVE | Master switch OFF. | Turn master switch ON. |
| | Circuit breaker open. | Reset circuit breaker. |
| | Open circuit or loose connections. | Check circuit and repair. |
| | Defective fuel pump. | Replace fuel pump. |

Troubleshooting the Fuel System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| AUXILIARY FUEL PUMP RUNS AT HIGH SPEED WHEN SWITCH IS MOVED TO "ON" POSITION WITH ENGINES RUNNING | Defective fuel pressure switch. | Replace fuel pressure switch. |
| AUXILIARY FUEL PUMP RUNS AT SLOW SPEED WITH MASTER SWITCH "ON, " AUXILIARY FUEL PUMP SWITCH "ON" AND ENGINES NOT RUNNING | Defective fuel pressure switch. | Replace fuel pressure switch. |
| ENGINE WILL NOT START OR CONTINUE TO RUN AFTER STARTING | Fuel tank empty | Fill tank with correct grade of fuel. |
| | Fuel selector valve in OFF position. | Move fuel selector valve to main tank desired. |
| | Mixture in IDLE CUT-OFF. | Set mixture to FULL RICH. |
| | Engine overprimed. | Place mixture control in IDLE CUT-OFF, turn engine over several revolutions with throttle WIDE OPEN. |
| | Fuel strainer in fuel control unit dirty. | Clean fuel control unit strainer. |
| | Auxiliary fuel pump switch not in PRIME position. | Place auxiliary fuel pump switch in PRIME position. |
| | Plugged fuel cap vent. | Clean vent. |
| | Bypass valve in engine-driven fuel pump stuck. | Replace engine-driven fuel pump. |
| VERY HIGH FUEL FLOW INDICATION AT FULL THROTTLE AFTER RAPID ENGINE ACCEL-ERATION ON GROUND | Gage vent line restricted, plugged or leaking. | Clean, tighten or replace vent line. |
| LOW FUEL FLOW | Fuel control lever does not contact | Rig mixture control in accordance with Section 9, Rigging Mixture and Throttle Controls. |
| | No turbocharge discharge pressure. | Check turbocharger and fuel pump aneroid. |
| ROUGH AND ERRATIC ENGINE SHUTDOWN | Fuel control lever does not contact idle cut-off stops firmly. | Rig mixture control in accordance with Section 9, Rigging Mixture and Throttle Controls. |
| FUEL SHUTOFF INCOMPLETE | Misaligned linkage or fuel control levers hitting stops too hard. | Align linkage or rig mixture in accordance with Section 9, Rigging Mixture and Throttle Controls. |

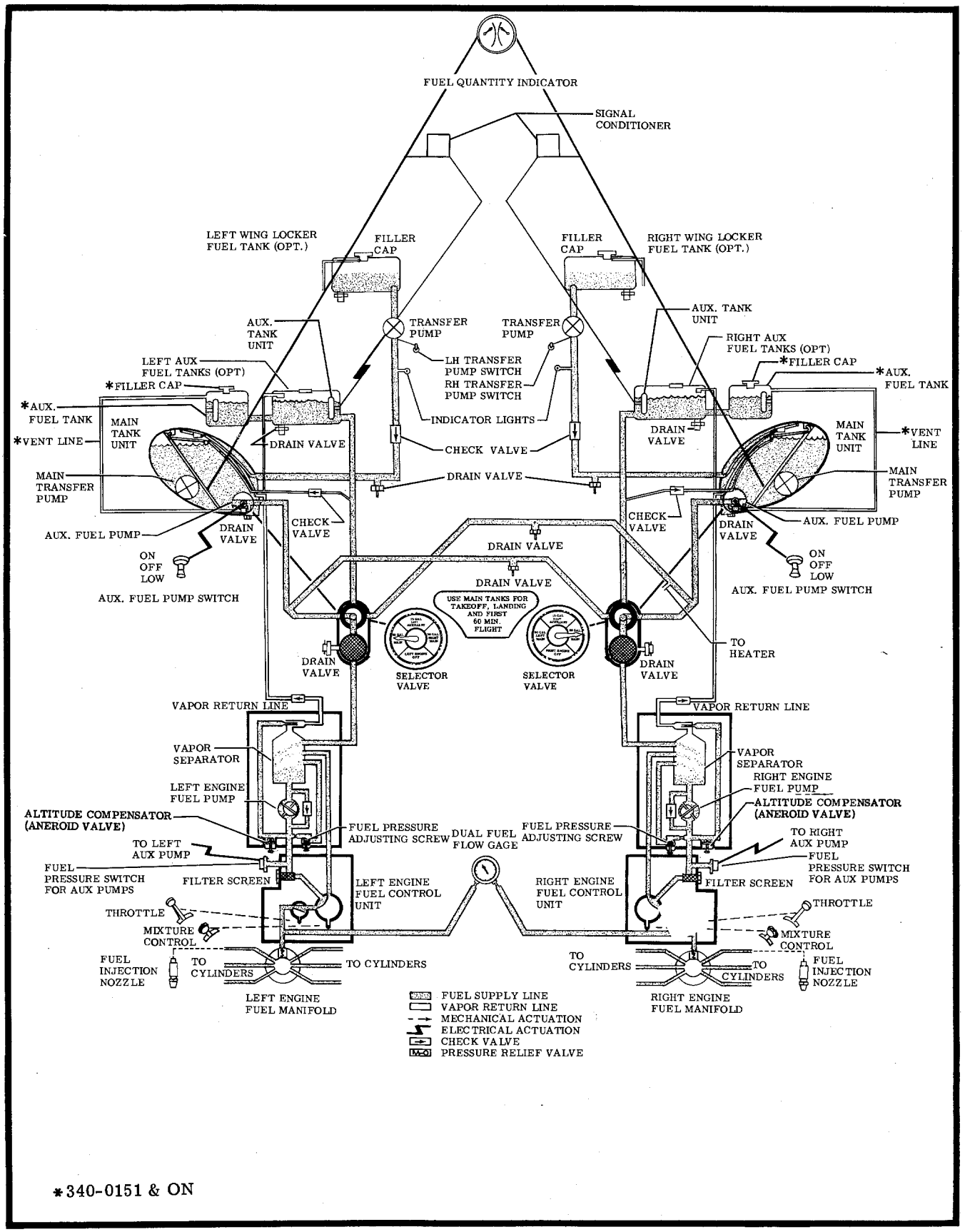



Figure 11-1. Fuel System Schematic

Troubleshooting the Fuel System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| FUEL FLOW INCREASES ENGINE DIES | Pressure switch set too high. | Reset fuel pressure switch to actuate between 4 to 5 PSI. |
| | Pressure switch stuck. | Replace pressure switch. |
| AUXILIARY PUMP WILL NOT SWITCH TO HIGH SPEED | Pressure switch stuck. | Replace pressure switch. |
| AUXILIARY WING LOCKER TRANSFER PUMP INOPERATIVE | Circuit breaker open. | Reset circuit breaker. |
| | Open circuit or loose connections. | Check circuit and repair. |
| | Defective fuel pump. | Replace pump. |
| AUXILIARY WING LOCKER FUEL TRANSFER LIGHTS INOPERATIVE | Open circuit or loose connection. | Check circuit and repair. |
| | Defective pressure switch. | Replace pressure switch. |

MAIN FUEL TANKS.

Each main tank is attached to the outboard end of both spars and is streamlined to the wing by fairing strips. A flush-type filler cap is incorporated for servicing. The tanks are integrally sealed (wet) tanks and have two electrically operated fuel pumps mounted in each main tank, the auxiliary fuel pump and the fuel transfer pump. A fuel capacitance tank unit is mounted in the upright position to provide fuel quantity measurements. Access to the auxiliary fuel pump is gained by removing upper and lower fairing strips. Access to the fuel transfer pump is made by removing tail cap assemblies from wing main fuel tanks. Access to the fuel capacitance tank unit is gained by removing main tank filler cap. A quick-drain valve is incorporated in the bottom of each fuel tank for draining moisture and sediment.

Removal of Main Fuel Tank.

(See figure 11-2.) The removal procedure is the same for either main tank.

a. Turn selector valve handles OFF. Make sure handle is in detent in the OFF position to prevent fuel leakage.
b. Defuel main tank to be removed, in accordance with Section 2.

CAUTION

During all defueling, tank purging and tank repairing operations, two ground wires, from different points on the aircraft to separate approved grounding stakes, shall be used to prevent ungrounding of the aircraft due to accidental disconnection of one ground wire.

c. Remove wing fairings and tail cap.
d. Disconnect electrical wiring.
e. Disconnect fuel lines, fittings, and vent lines.
f. Remove mounting nuts, washers, and bolts.
g. Remove main tank.

Disassembly of Main Fuel Tank.

a. Disassemble main fuel tank in accordance with figure 11-2 and figure 11-3.

Inspection and Repair of Main Fuel Tanks.

a. Inspect filler cap gasket. If crushed or damaged, replace filler gasket. On integrally sealed (wet) tanks, inspect sealing gaskets, loose rivets, cracks or dents for leaks and attaching mounts.
b. Purge in accordance with Section 2.
c. Repair in accordance with Section 16.

Assembly of Main Fuel Tanks.

a. Assemble main fuel tanks in accordance with figure 11-2 and figure 11-3.

NOTE

Lubricate all lines and fittings with gasoline and oil resistant grease. Apply lubricant to male threads only, omitting first two threads.

b. All access openings must be sealed and checked on assembly. Seal and check as follows:
1. Clean all surfaces to be sealed with low moisture solvent, using a lintless cloth for solvent application.

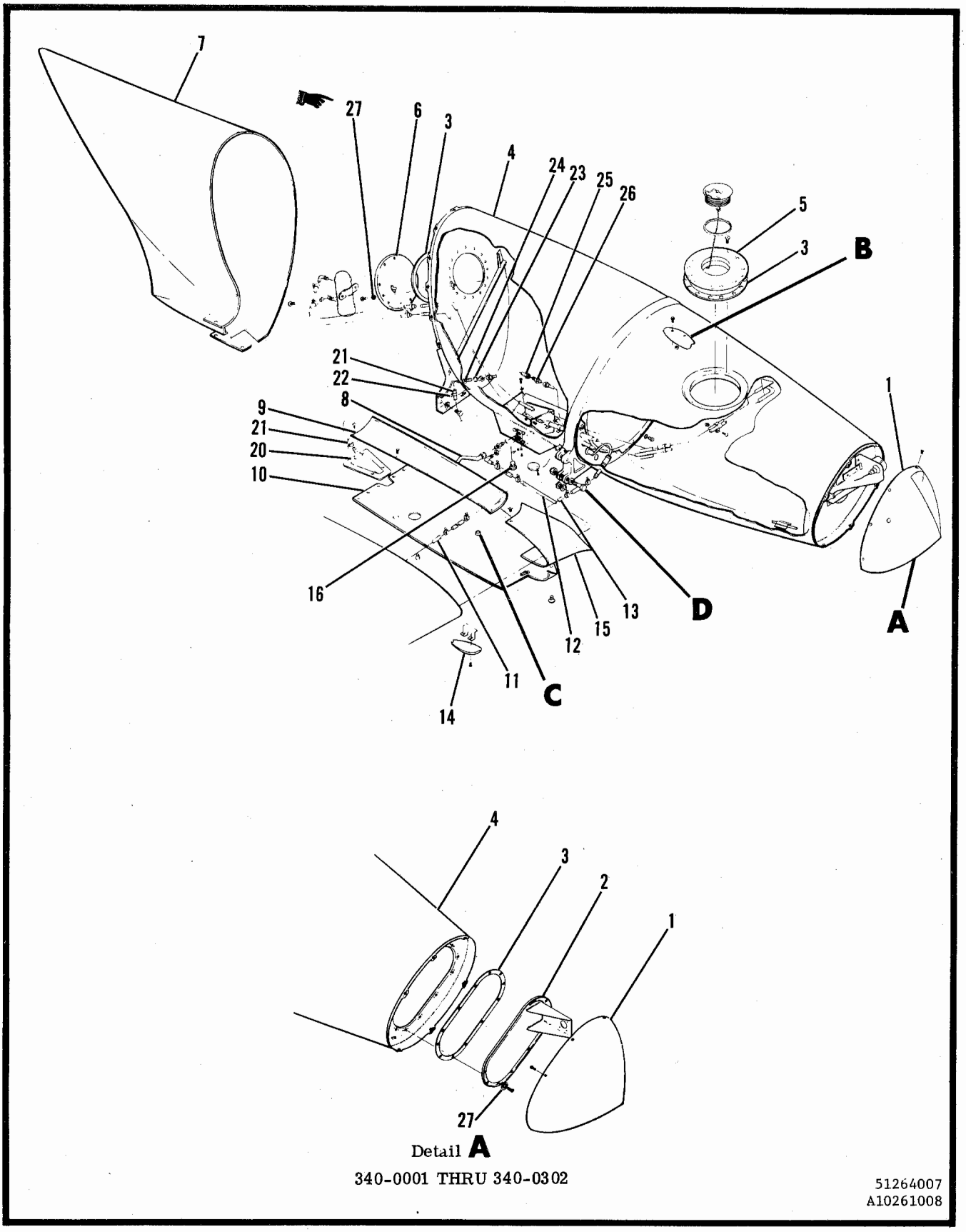
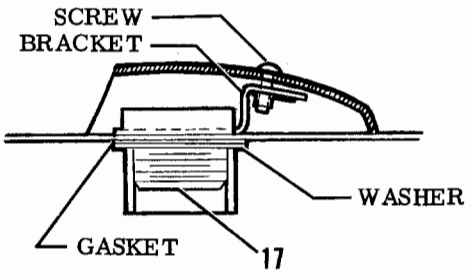
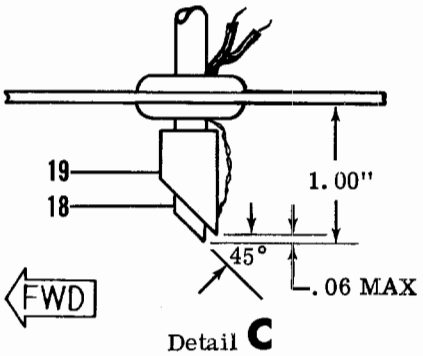



Figure 11-2. Main Fuel Tank Installation (Sheet 1 of 2)

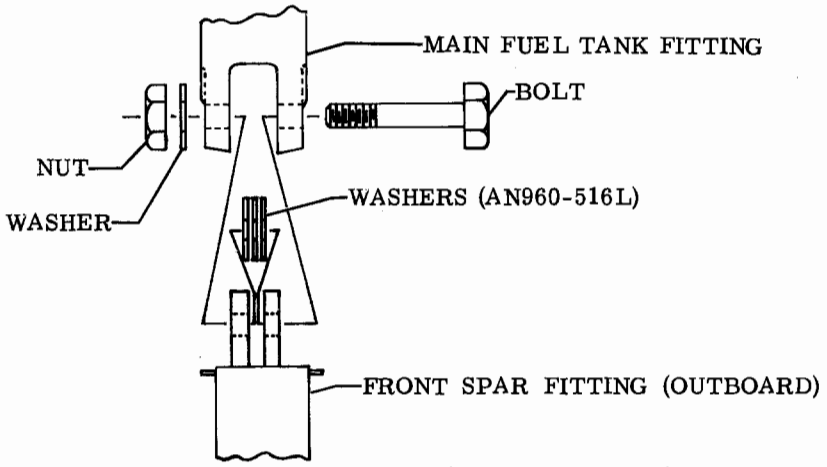



Detail **B**




Detail **C**

340-0507 AND ON




TYPICAL FOR UPPER AND
LOWER FRONT SPAR FITTINGS

Detail **D**

10261016

1. Nose Cap
2. Forward Access Plate
3. Gasket
4. Fuel Tank
5. Filler Cap
6. Aft Access Plate
7. Tail Cap
8. Fuel Pump Drain
9. Upper Fairing
10. Lower Fairing
11. Auxiliary Fuel Cell Vent Line
12. Fuel Line
13. Fuel Vapor Line
14. Vent Shield
15. Front Fairing
16. Tank Drain Plug
17. Sniffle Valve
18. Vent Tube
19. Vent Heater
20. Vent Scoop
21. Hose
22. Clamp
23. O-ring
24. Fitting
25. Line
26. Union
27. Stat-o-seal

Figure 11-2. Main Tank Installation (Sheet 2)

NOTE

Do not allow cleaning solvent to evaporate; wipe dry.

2. Mix sealant MIL-S-8802 per manufacturer's instructions and apply with a spatula over all seams, rivets, fittings and possible leak areas.
3. Inspect tank as follows:
   (a) Seal off all access holes in tanks. Close vent hole by covering inside with tape.
   (b) Saturate a clean rag with 25 cubic centimeters of household ammonia. Insert rag in fuel tank and close filler cap.
   (c) Pressurize fuel tank to a maximum of 2 PSI.
   (d) Saturate a large clean cloth with indicator solution (1/2 gallon distilled water, 1/2 gallon denatured alcohol, and 1/2 ounce of phenolphthalein crystals or powder) and spread smoothly on surface of tank.
   (e) A leak will appear as a pink spot on the cloth Repair all leaks and repeat testing until entire tank surface has been tested.

WARNING

Remove tape from filler cap, rag from inside fuel tank, and allow fuel tank to air out before using.

Installation of Main Fuel Tank.

(See figure 11-2.) The installation procedure is the same for either main fuel tank. For installation of main fuel tanks, reverse removal procedure.

NOTE

Torque main tank mounting bolts to 50 ±10 inch-pounds.

CAUTION

If vent scoop is installed; lower fairing, tail cap and drip fence must be sealed with Pro-Seal 890 to prevent entry of fuel to wing structure.

SNIFFLE VALVE.

The sniffle valve is located in the top of each main tank, aft of the filler cap. This valve will vent the tank in the event the overboard vent becomes clogged or obstructed.

Removal of Sniffle Valve. (See figure 11-2.)

The removal procedure is the same for either tank.

CAUTION

Care should be taken to prevent entry of foreign matter into the fuel tank.

a. Defuel main tank in accordance with Section 2.
b. Remove screw securing cover.
c. Remove main tank filler cap in accordance with removal procedures.
d. Holding top half of valve, remove bottom of valve washer and gasket.
e. Remove sniffle valve.

Installation of Sniffle Valve. (See figure 11-2.)

a. Install sniffle valve by reversing removal procedure.

MAIN TANK FUEL TRANSFER PUMP.

One main tank fuel transfer pump is mounted on the aft side of the main tank rear bulkhead. The function of these pumps are to transfer fuel from the forward end of the main tanks to the center baffle area, where it is picked up and routed to the engine by either the engine-driven pump or the auxiliary fuel pump.

Removal of the Main Tank Fuel Transfer Pump. (See figure 11-3.)

The removal procedure is the same for either main tank fuel transfer pump.

a. Make sure fuel selector handles are OFF.
b. Defuel main tank in accordance with Section 2.
c. Remove tail cap assemblies from wing main fuel tanks by removing attaching screws.
d. Disconnect electrical wiring.
e. Disconnect fuel lines from pump.
f. Remove two nuts attaching pump to bulkhead and remove pump from aft end of main tank.

Disassembly of Main Tank Fuel Transfer Pump. (See figure 11-4.)

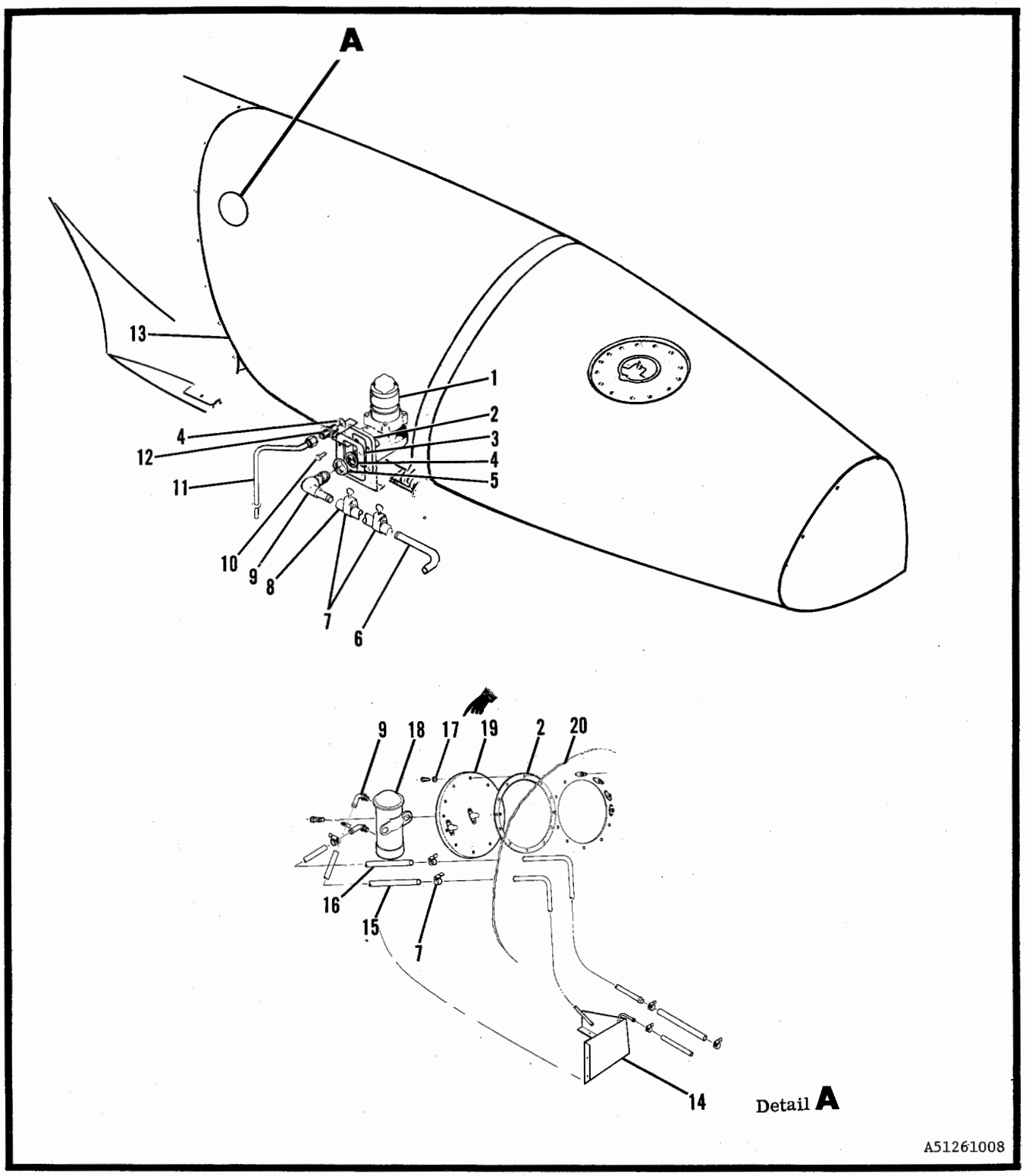
NOTE

The interrupter end of the transfer pump is sealed with air removed and an atmosphere of a special dry gas injected. Should any of the electrical components become inoperative, the fuel pump must be replaced. The gas seal is located in the center of the mounting bracket and no attempt should be made to break this seal, as it would render the pump useless.

a. Hold the pump body securely in one hand and release the bottom cover from the bayonet fittings by rotating it counterclockwise with a 5/8 inch wrench.
b. Remove the gasket from the cover.
c. Carefully remove the filter screen.
d. Remove the three screws that hold the plunger spring cup to the pump body.
e. Remove the gasket and plunger spring.
f. Carefully withdraw the plunger from the pump body. Do not drop or mutilate the plunger.

Cleaning and Inspection of Main Tank Fuel Transfer Pump. (See figure 11-4.)

a. Wash the plunger assembly in Stoddard solvent




1. Auxiliary Fuel Pump
2. Gasket
3. Doubler
4. O-ring
5. Nut
6. Fuel Supply Line
7. Clamp
8. Hose
9. Elbow
10. Bolt
11. Fuel Pump Drain Line
12. Nipple
13. Fuel Tank
14. Baffle
15. Fuel Line (Transfer Outlet)
16. Fuel Line (Transfer Inlet)
17. Stat-O-Seal
18. Main Fuel Transfer Pump
19. Access Plate
20. Aft Bulkhead

Figure 11-3. Auxiliary Fuel and Transfer Pumps Installation

or gasoline. If it fails to become thoroughly clean or if any rough spots are present, dress the surface carefully with crocus cloth. Rinse thoroughly to remove all foreign material.

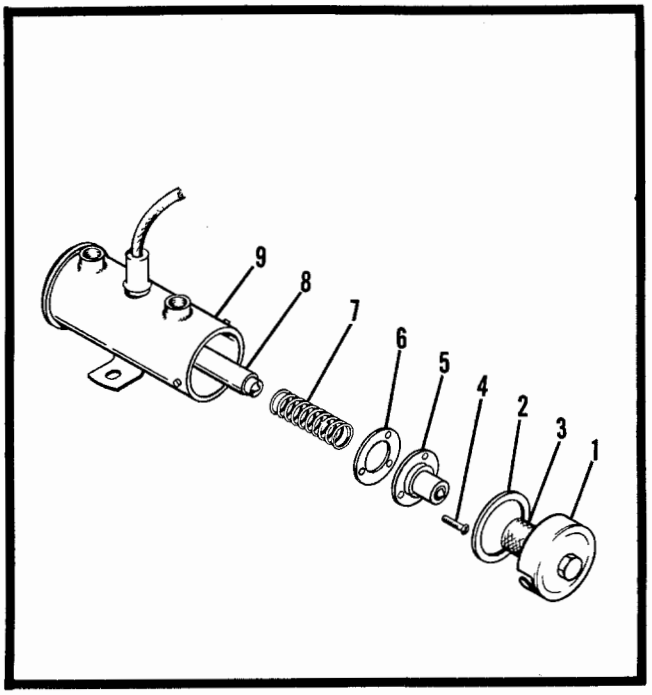
b. Dip the pump body in clean solvent, shake it lightly, then remove it and dry with compressed air.

c. Blow out the plunger tube with compressed air and check for any rough spots, deposits or foreign material. If not smooth, wrap a piece of cloth around a wood dowel, dip the cloth in Stoddard solvent (Federal Specification P-D-680), and swab the plunger tube until clean.

d. Rinse remaining parts in the solvent and dry with compressed air. Exercise care when drying the screen to prevent damage.

e. Inspect all parts visually for damage.

f. Inspect the fuel pump electrical resistance by connecting an ohmmeter between the connector terminal and ground on the pump housing. Resistance should be between 19.0 and 19.5 ohms. If the resistance is not within limits, replace the pump assembly.




1. Bottom Cover
2. Cover Gasket
3. Filter Screen
4. Screw
5. Plunger Spring Cup
6. Gasket
7. Plunger Spring
8. Plunger
9. Pump Body

Figure 11-4. Main Tank Fuel Transfer Pump

Assembly of Main Tank Fuel Transfer Pump. (See figure 11-4.)

a. Insert the plunger assembly (8) in the tube with the buffer-spring end first. Check for proper fit by slowly raising and lowering the plunger in the tube; it should move freely without any tendency of sticking. A click should be heard each time the plunger approaches the top of the tube. If this click cannot be heard, the interrupter assembly in the sealed portion of the pump is not functioning properly, and the pump assembly must be replaced.

b. Install the plunger spring (7).

c. Place the spring-cup gasket (6) in position on the plunger spring cup (5) and carefully attach this assembly to the pump body (9), with the three screws (4). Tighten screws securely.

d. Carefully install the screen (3), place cover gasket (2) in position in cover (1) and attach the cover to the pump body (9).

e. Hold the pump body securely with one hand and tighten the cover (1) into place on the pump body bayonets with a 5/8 inch open-end wrench or box socket.

Installation of Main Tank Fuel Transfer Pump. (See figure 11-3.)

The installation procedure is the same for either main tank fuel transfer pump.

a. Install pump to bulkhead.
b. Connect fuel lines to pump.

CAUTION

Observe "IN" and "OUT" markings on pump relative to lines being connected for correct installation. Outlet port must be up. The transfer pump must be pumping from forward section of main tank to the center baffle area.

c. Connect electrical wiring.
d. Perform the following operational check of transfer pump:
1. Pour approximately 5 gallons of fuel into main tank.
2. Turn master switch ON.
3. Observe that pump is functioning properly.
e. Install tail cap assemblies to main fuel tank.
f. Refuel aircraft.

## AUXILIARY FUEL PUMP.

One auxiliary fuel pump is installed in the bottom of each main tank. These pumps are submerged, electrically controlled by three switches. The prime switch is a momentary on, center off switch. When the prime switch is placed in the left position, the left auxiliary pump provides priming for the left engine. When the prime switch is placed in the right position, the right auxiliary pump provides priming for the right engine. During the priming operation, the auxiliary pumps operate at high speed. The auxiliary pump switches are a two-position center off switch. When placed in the LOW position, the auxiliary pump provides pressure for purging. When the auxiliary pump switch is placed in the ON position, the auxiliary pump operates at low speed. In case of an engine-driven fuel pump failure, the auxiliary pump will automatically operate at high speed. During takeoff and landing, the auxiliary pump is

placed in the ON position.

Removal of Auxiliary Fuel Pump. (See figure 11-3.)

The removal procedure is the same for either auxiliary fuel pump.

a. Make sure fuel selector handles are OFF.
b. Defuel main fuel tank affected in accordance with Section 2.
c. Remove wing fairings.
d. Disconnect electrical wiring.
e. Remove fittings, lines, and hoses required.
f. Remove tail cap, rear access plate, and gasket.
g. Remove the four auxiliary pump mounting bolts, and remove pump from inside the fuel tank.

Installation of Auxiliary Fuel Pump.

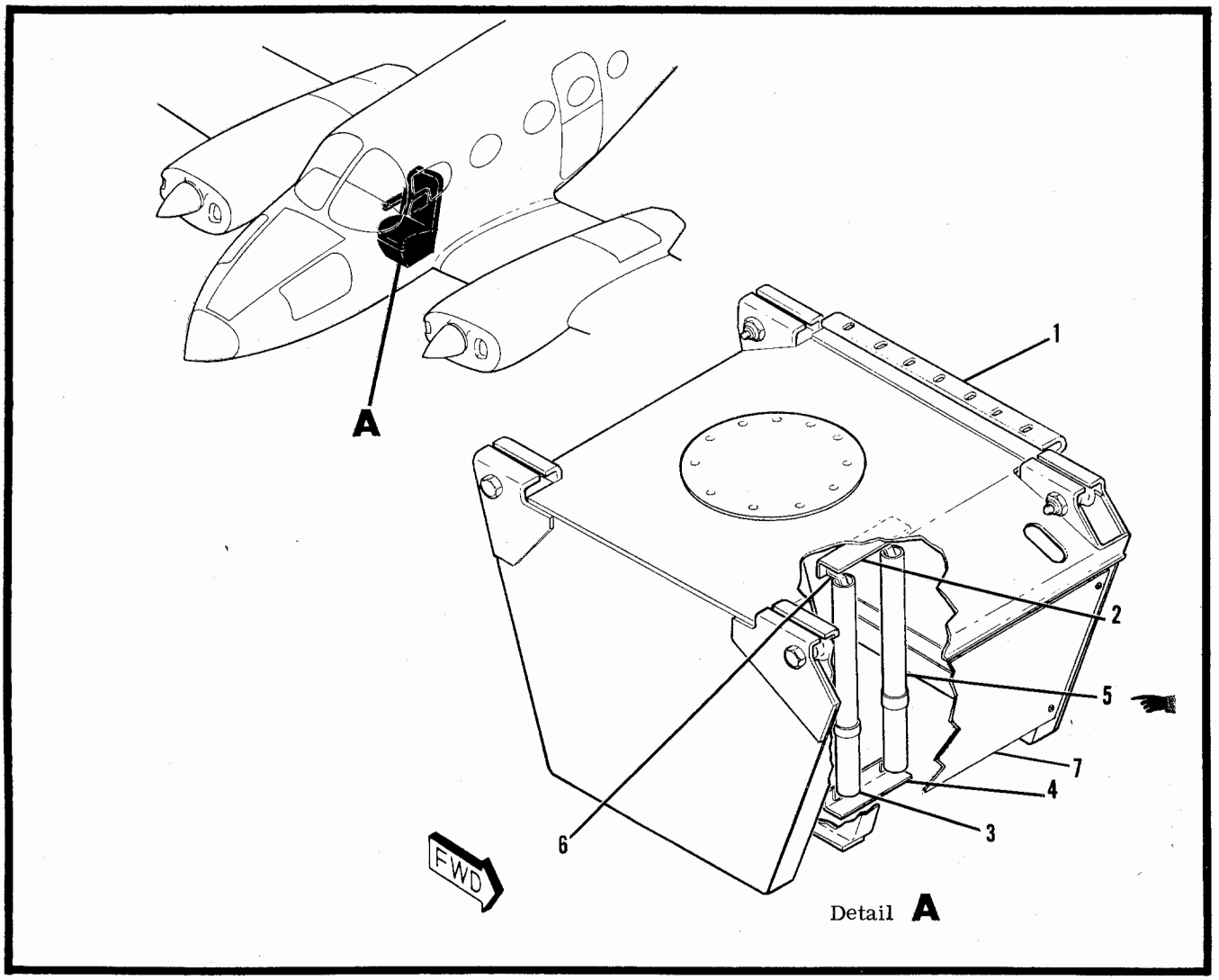
The installation procedure is the same for either auxiliary fuel pump. For installation of auxiliary fuel pump, reverse removal procedures as outlined in preceding paragraph.

NOTE

Anytime the auxiliary fuel pump has been replaced or altered, the auxiliary fuel pump low adjustment must be performed.

Auxiliary Fuel Pump Low Adjustment.

a. Fill main tanks with proper grade of fuel (refer to Section 2).
b. Place fuel selector valve handle to desired tank.
c. Place mixture lever to IDLE CUT-OFF.




1. Seat Support
2. Clip Assembly
3. Resistor (RH)
4. Clip Assembly
5. Resistor (LH)
6. Mounting Bracket
7. Cover Plate

Figure 11-5. Auxiliary Fuel Pump Resistors

d. Connect a test pressure gage at engine-driven pump inlet line.
e. Connect a 28 volt dc auxiliary power unit to aircraft or run opposite engine at sufficient speed to indicate a charge on ammeter.
f. Position auxiliary fuel pump to LOW position for engine being checked and check test pressure gage connected to engine-driven inlet line for 5.5 ±0.25 PSI of fuel pressure.
g. If auxiliary fuel pump pressure is not 5.5 ±0.25 PSI, adjust as follows. (See figure 11-5.)
1. Remove pilot's seat.
2. Remove cover plate (7).
3. Adjust resistor until required auxiliary fuel pump pressure is obtained.

NOTE

The left resistor is for the left auxiliary fuel pump and the right resistor is for the right auxiliary fuel pump.

4. Turn all switches OFF, place fuel selector valve handle to OFF position.
5. Replace cover plate (7) and install pilot's seat.
h. Remove test pressure gage.

AUXILIARY FUEL CELLS.

Removal of Auxiliary Fuel Cells. (See figure 11-6.)

NOTE

The removal procedures are the same for LH or RH wing auxiliary fuel cells.

a. Remove the fuel cap adapter assembly (5) and gasket (6) by removing twenty-four attaching screws (7).
b. (340-0151 and On) Remove cover (8) and gasket (6) by removing twenty-four attaching screws (7).
c. Remove the auxiliary fuel quantity sending units (15) in accordance with removal procedures.
d. (340-0001 to 340-0151) Loosen clamp and disconnect fuel supply line (16) from fuel cell (1).
e. (340-0151 and On) Loosen clamps and disconnect fuel supply lines (16 and 17) from fuel cell (1).
f. (340-0001 to 340-0151) Loosen clamps and disconnect vent line (18) from fuel cell.
g. (340-0151 and On) Loosen clamps and disconnect vent lines (18) from fuel cells.
h. Remove the two screws securing the quick-drain adapter assembly to the lower skin.
i. (340-0001 to 340-0151) Disconnect the seven fuel cell fasteners.
j. (340-0151 and On) Disconnect the fuel cell fasteners, seven for the inboard cell and four for the outboard cell.
k. Remove fuel cell through the upper wing opening vacated by the adapter assembly (5) and cover (10).

NOTE

Retain sending unit gaskets for replacement if they are not damaged.

Inspection and Repair of Auxiliary Wing Fuel Cells.

a. Inspect filler cap gasket. If crushed or damaged, replace filler gasket. Inspect fuel cell for cuts, tears, abrasions and deterioration.
b. Purge in accordance with Section 2.
c. Repair in accordance with Section 16.

Installation of Auxiliary Fuel Cells. (See figure 11-6.)

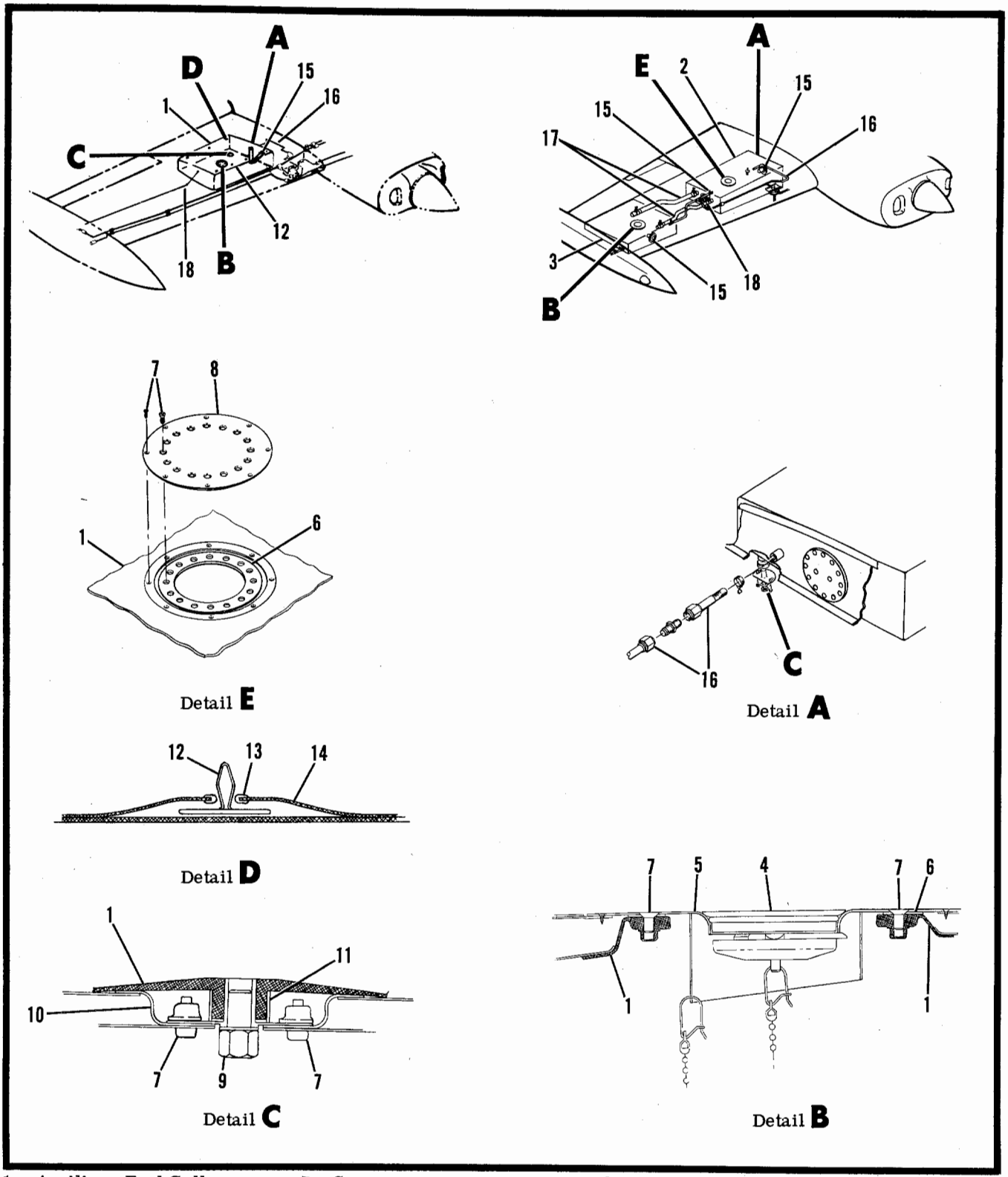
NOTE

The installation procedures are the same for LH or RH wing auxiliary fuel cells.

a. Insert fuel cell through wing opening and arrange the cell in the correct position.
b. (340-0001 to 340-0151) Secure the cell in place with seven fasteners.
c. (340-0151 and On) Secure the cells with fasteners, seven for the inboard cell and four for the outboard.
d. Attach quick-drain adapter assembly to the lower wing skin with attaching screws.
e. (340-0001 to 340-0151) Install vent line (18), secure with clamps.
f. (340-0151 and On) Install vent lines (18), secure with clamps.
g. (340-0001 to 340-0151) Install fuel line (16), secure with clamp.
h. (340-0151 and On Install fuel lines (16 and 17), secure with clamps.
i. Install auxiliary fuel quantity sending units (15) in accordance with installation procedures.
j. Install fuel cap adapter assembly (5) and gasket (6) with twenty-four attaching screws.
k. (340-0151 and On) Install cover (8) and gasket (6) with twenty-four attaching screws.
l. Service system and leak check.
m. Install access covers.

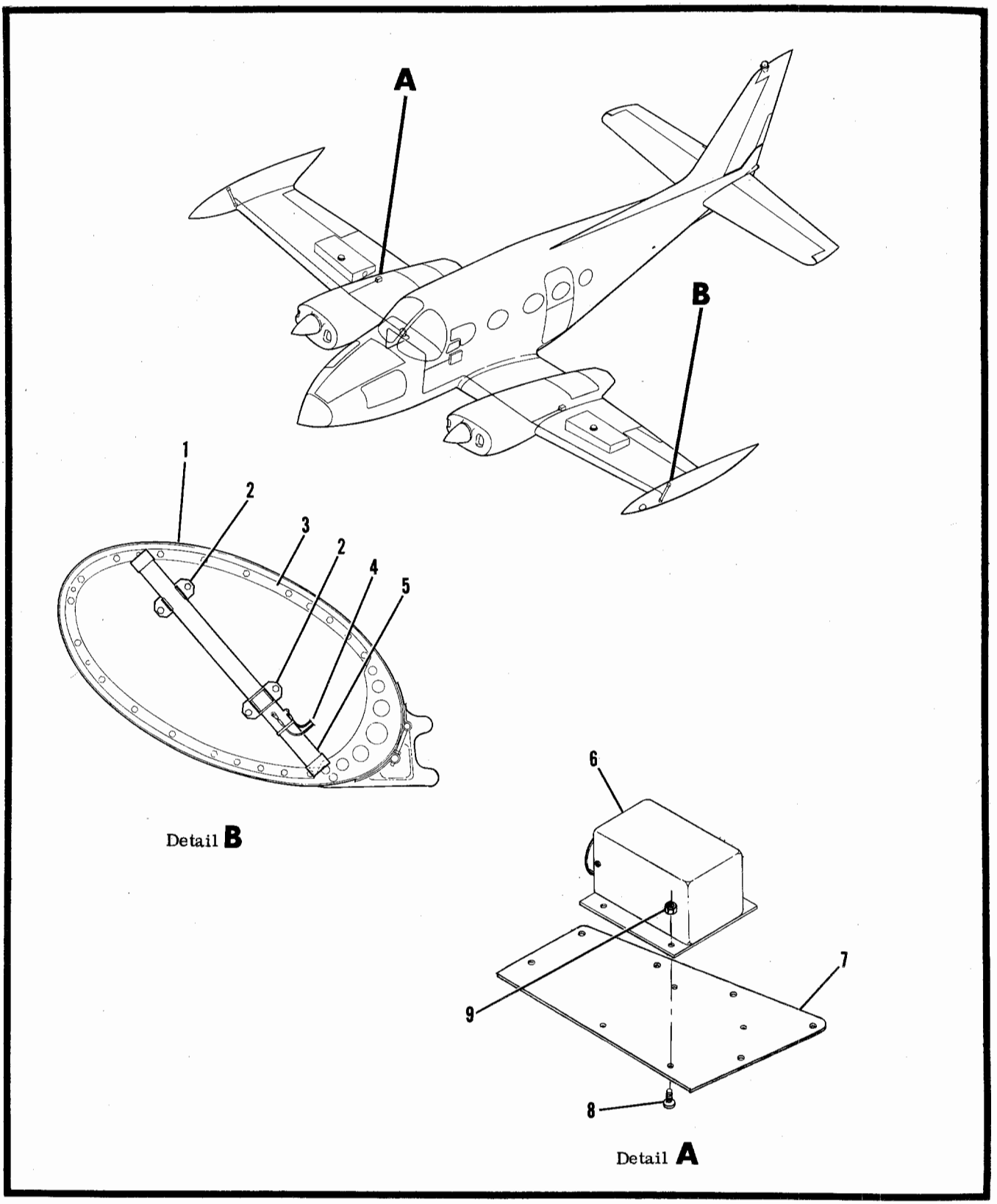
FUEL QUANTITY INDICATING SYSTEM.

A capacitance-type fuel quantity indicating system, compensated for specific gravity and reads in pounds and gallons, is installed in the aircraft. The system components include an indicator, a fuel indicator selector switch mounted on the instrument panel, a signal conditioner mounted on the rib just outboard of each engine nacelle and one tank unit mounted in each main tank and each auxiliary fuel cell. Each tank unit consists of two concentric electrodes. The inner electrode consists of a main body of insulating material with two conducting surfaces, separately insulated around the outside face of the tank unit. One conducting surface is grounded and the other surface is connected to the signal conditioner input bridge circuit. The outer electrode is an aluminum tube coated with insulating material on the outside.




1. Auxiliary Fuel Cell
2. Inboard Fuel Cell
3. Outboard Fuel Cell
4. Fuel Filler Cap
5. Adapter Assembly
6. Gasket
7. Screw
8. Cover
9. Drain
10. Adapter Assembly
11. Clamp
12. Fastener
13. Grommet
14. Fuel Cell Web
15. Fuel Quantity Tank Unit
16. Line - Fuel Supply
17. Line - Auxiliary Tank to Auxiliary Tank
18. Line - Vent

Figure 11-6. Auxiliary Fuel Cell Installation




1. Fuel Tank
2. Bracket (Tank Unit)
3. Access Plate
4. Electrical Bundle
5. Tank Unit
6. Signal Conditioner
7. Cover Plate
8. Screw
9. Nut

Figure 11-7. Main Fuel Tank Unit

Openings in the unit allow fuel to flow between electrodes to the same level as that in the tank. Fuel between the electrodes is the variable dielectric factor of the capacitor. Capacitance of the tank units, which are part of the system bridge circuit provide a continuous signal to the signal conditioner and is amplified to the indicator.

Troubleshooting the Fuel Quantity Indicator System.

The indicator is a dual indicator providing a left and right-hand indication for the main fuel tanks as well as left- and right-hand indication for the auxiliary fuel cells. When the fuel selector handle is placed in the main position, the fuel quantity indicator will indicate fuel in the main tanks. When the fuel selector handle is placed in the auxiliary position, an indicator light located under the indicator will be turned on indicating the selector valve is in the auxiliary position and the fuel quantity indicator will indicate auxiliary fuel. An override switch is pro-

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NO INDICATION ON GAGE AND TANK IS FULL | Circuit breaker out. | Reset circuit breaker. |
| | Defective circuit breaker. | Replace circuit breaker. |
| POWER SWITCH ON POINTER BELOW 0 | No power. | Use a voltmeter to check that power is being applied to the system. |
| | Defective indicator. | Substitute a known good indicator. If proper indication is obtained, original indicator is defective. |
| | Open wiring in harness or probe. | Use an ohmmeter to check continuity. |
| | Defective probe. | Verify probe is defective using Field Calibration Test Box. |
| | Open HiZ line to probe. | Use an ohmmeter to check for open. |
| POWER SWITCH ON POINTER ABOVE 310 LBS. (INTO STOP) | Open HiZ to compensator. | Use an ohmmeter to check for open. |
| | Defective tank unit. | Check for defective probe. |
| | Defective indication. | Check for defective indicator. |
| | Defective tank fuel valve switch and/or selector switch relays. | Check switch and relays with ohmmeter. |
| INACCURATE FUEL | Defective indicator. | Check for defective indicator. |
| | Contaminated probe. | Check for defective probe. |
| | Capacitance leakage in wiring. | Refer to wiring manual. |
| POWER ON AND BOTH POINTERS AT MID-SCALE REGARDLESS OF FUEL LEVEL | LoZ to ground short. | Use ohmmeter to check for short on LoZ leads. |
| | Defective indicator. | Check for defective indicator. |
| POWER ON AND POINTER READS APPROXIMATELY 80 TO 100 LBS. HIGH | Defective selector switch relay. | Use ohmmeter to check relay. |
| POWER ON AND POINTERS CHANGE READINGS WHEN OTHER AVIONICS ARE OPERATED | HiZ shield shorted to ground. | Use ohmmeter to check for short between HiZ and shield (with indicator disconnected). |
| | Defective indicator. | Check for defective indicator. |

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| POWER ON AND POINTER POSITION SENSITIVE TO BATTERY VOLTAGE | Defective indicator. | Check for defective indicator. |
| | Battery voltage too low. | Check battery voltage. |
| ERRATIC INDICATOR READINGS | Defective indicator. | Check for defective indicator. |
| | Defective harness. | Check all grounds. |
| | Defective probe. | Verify probe is defective using the Field Calibration Test Box. |
| STICKY POINTER | Defective tank selector. | Check switch with ohmmeter. |
| | Defective indicator. | Replace indicator. |

vided for monitoring the fuel quantity in the opposite system. When the fuel selector handles are placed in the main position and the override switch is pressed, the indicator light will light and the indicator will read auxiliary fuel quantity. When the fuel selector handles are placed in the auxiliary position, the indicator lights will light. If the override switch is pressed the indicator will read main fuel quantity.

NOTE

Fuel quantity system is solid state. There are no moving parts.

Removal of Main Fuel Tank Unit. (See figure 11-7.)

The removal procedure is the same for either main fuel quantity sending unit.

a. Defuel aircraft in accordance with Section 2.

CAUTION

During all defueling, tank purging and tank repairing operations, two ground wires from different points on the aircraft to separate approved grounding stakes shall be used to prevent ungrounding of the aircraft due to accidental disconnection of one ground wire.

b. (See figure 11-2.) Remove filler cap (5) and gasket (3) from main fuel tank.
c. Tag and disconnect electrical bundle (4) from tank unit (5).
d. Remove four bolts attaching brackets (2) to bulkhead.
e. Working through filler cap access opening, carefully remove tank unit (5) from main fuel tank (1).

Installation of Main Fuel Tank Unit. (See figure 11-7.)

The installation procedure is the same for either main tank.

a. Install fuel tank unit (5) in position and secure with brackets (2) and bracket bolts.
b. Connect electrical bundle (4) to tank unit.
c. (See figure 11-2.) Install filler cap (5) and gasket (3) to main fuel tank.
d. Refuel main tanks.
e. Check for leaks.
f. Check operation of fuel quantity indicating system.
g. Check calibration in accordance with calibration procedures.

Removal and Installation of Signal Conditioner. (See figure 11-7.)

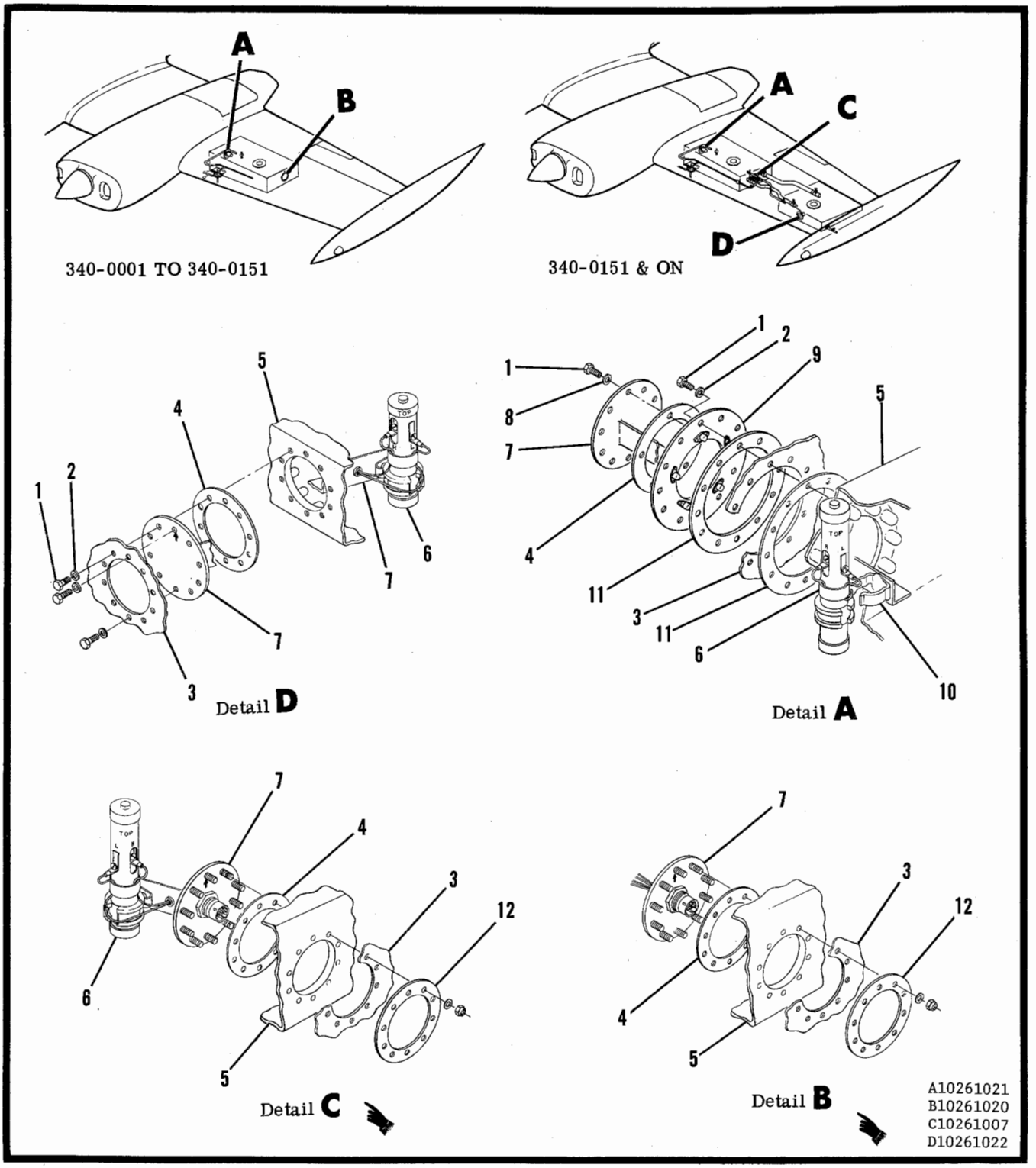
a. Remove access plate (46, figure 1-3) to remove signal conditioner (6).
b. Remove four screws and washers attaching the signal conditioner to bracket (2).
c. Remove signal conditioner through access hole (46, figure 1-3).
d. Install the signal conditioner by reversing the removal procedures.

Removal of Auxiliary Fuel Quantity Tank Units. (See figure 11-8.)

a. (340-0001 to 340-0151) Remove access door located just outboard of the engine nacelle on the upper surface of the wing.
b. (340-0151 and On) Remove access door located just outboard of the engine nacelle on upper surface of wing, cover forward of inboard end of aileron, and cover in leading edge forward of fuel filler cap.
c. Defuel aircraft in accordance with Section 2.

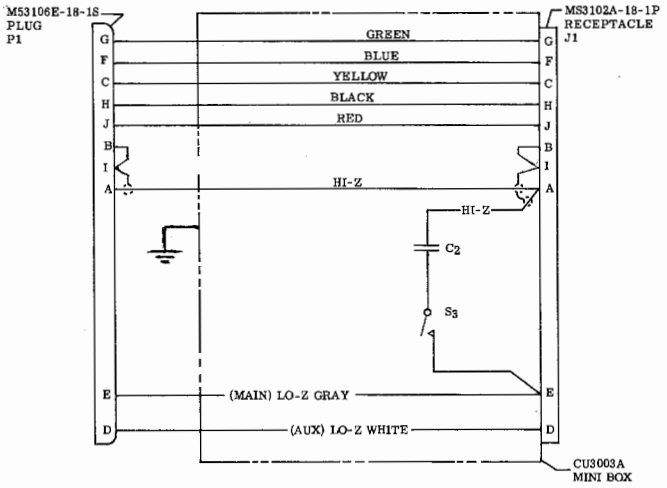
CAUTION

During all defueling, tank purging and tank repairing operations, two ground wires from




1. Bolt
2. Washer
3. Rib
4. Gasket
5. Fuel Cell
6. Tank Unit
7. Bracket Assembly
8. Stat-O-Seal
9. Adapter
10. Clip
11. Gasket
12. Doubler

Figure 11-8. Auxiliary Fuel Cell Tank Units




| Part Number | Description | Quantity |
|---|---|---|
| MS3106E-18-1S ($P_1$) | Plug | 1 |
| CU3003A | Mini Box | 1 |
| MS3102A-18-1P ($J_1$) | Receptacle | 1 |
| VY13C31R6F ($C_2$) | 31.6 PF Capacitor | 1 |
| D15 (Alternate $C_2$) | 31.6 PF Capacitor | 1 |
| MST-105D ($S_3$) | Switch | 1 |
| MS35489-5 | Grommet | 1 |

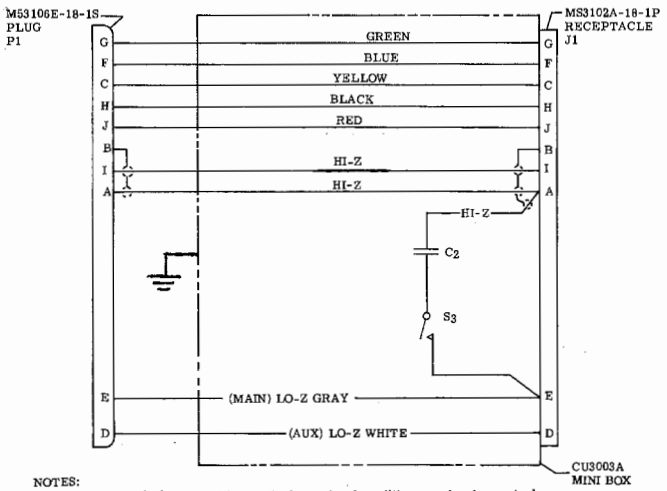
($S_3$) SWITCH POSITIONS

1. Off
2. Main Full

NOTES:

1. Plug ($P_1$) mates with receptacle on signal conditioner and and receptacle ($J_1$) mates with signal conditioner. Refer to capacitance fuel system wiring diagram in Section 14.
2. All wire except for HI-Z wire to be 22 gage per MIL-W-16878D/4 Type "E" or equivalent. HI-Z wires to be per MIL-W-16878D Type "E" 20 gage shielded with Teflon insulation over shield.

## 340-0001 TO 340-0151




| Part Number | Description | Quantity |
|---|---|---|
| MS3106E-18-1S ($P_1$) | Plug | 1 |
| CU3003A | Mini Box | 1 |
| MS3102A-18-1P ($J_1$) | Receptacle | 1 |
| VY13C32R6F ($C_2$) | 32.6 PF Capacitor | 1 |
| D15 (Alternate $C_2$) | 32.6 PF Capacitor | 1 |
| MST-105D ($S_3$) | Switch | 1 |
| MS35489-5 | Grommet | 1 |

($S_3$) SWITCH POSITIONS

1. Off
2. Main Full

NOTES:

1. Plug ($P_1$) mates with receptacle on signal conditioner and and receptacle ($J_1$) mates with signal conditioner. Refer to capacitance fuel system wiring diagram in Section 14.
2. All wire except for HI-Z wire to be 22 gage per MIL-W-16878D/4 Type "E" or equivalent. HI-Z wires to be per MIL-W-16878D Type "E" 20 gage shielded with Teflon insulation over shield.

## 340-0151 AND ON

Figure 11-9. Fabrication of Fuel Quantity Calibration Test Box

different points on the aircraft to separate approved grounding stakes shall be used to prevent ungrounding of the aircraft due to accidental disconnecting of one ground wire.

d. Tag and disconnect electrical wires.
e. Remove bolts (9) securing the auxiliary fuel quantity sending units, carefully remove sending unit from aircraft.

WARNING

Residual fuel accumulation in the wing is a fire hazard. Use care to prevent the accumulation of such fuel.

Installation of Auxiliary Fuel Quantity Tank Unit. (See figure 11-8.)

The installation procedure for the auxiliary fuel sending units are the same for left or right wing auxiliary fuel cells.

a. Carefully position auxiliary fuel tank unit into cell and secure into place with bolts. Torque bolts to 50 ±5 inch-pounds.
b. Connect electrical wires.
c. Service fuel cell in accordance with fueling procedures and check for leaks.
d. Replace cover plates and perform operational and calibration check.

Fuel Quantity System Calibration

Two methods of calibrating the fuel quantity system are given: Dry Calibration and Alternate Calibration.

Dry Calibration is the preferred method, being the most accurate. Dry Calibration uses the actual tank units for Zero Calibration, this compensates for the tank unit and wiring harness tolerances. A fixed capacitance is added in parallel with the actual dry tank unit to represent the fuel in the tank to provide for calibration in the full condition.

To calibrate the fuel system with the Dry method, it will be necessary to fabricate a capacitance test box in accordance with Figure 11-9 or use the Field Calibration Unit Test Box. The parts for fabricating the capacitance test box may be purchased locally or through your Cessna Dealers' Organization. The Field Calibration Unit Test Box is designed for complete maintenance, troubleshooting and calibration, enabling the technician to measure capacitance of system, individual components, harness insulation breakdown, resistance of system components and substitute capacitance to simulate the tank sensors or actual fuel in the tank.

The Alternate method of calibrating the fuel quantity system may be accomplished without the capacitance test box. This method checks fuel temperature and quantity versus total capacitance of fuel. The Alternate method of calibration has a greater chance for error than the Dry Fuel System Calibration.

Dry Calibration

a. Defuel aircraft in accordance with Defueling Procedures in Section 2.

CAUTION

During all defueling and tank calibration, the aircraft must be located a safe distance from other aircraft and buildings. Fire fighting equipment must be available. Two ground wires from different points on the aircraft to separate approved grounding stakes shall be used to prevent accidental disconnecting of one ground wire.

b. Apply electrical power - If battery is used, be sure voltage is not less than 22 volts.
c. Place fuel selector handle to MAIN position.
d. Adjust the MAIN EMPTY potentiometer on signal conditioner to read exact zero pounds indication on fuel quantity indicator.

NOTE

Tap the indicator slightly when reading indicator, this will help overcome friction of the needle when the indicator is in a static condition.

e. Interconnect capacitance test box in accordance with figure 11-9.

NOTE

Fabricate test box in accordance with figure 11-9.

f. Position selector switch on capacitance test box to MAIN FULL.
g. Adjust the MAIN FULL potentiometer on the signal conditioner to read 310 pounds (full scale indication).
h. Position selector switch on the capacitance test box to OFF and recheck zero indication.

NOTE

If the zero indication has changed, readjust zero and full indications until no change is evident by the adjustment setting of the other.

i. Turn off power and return aircraft to original configuration and remove capacitance test box.
j. Turn power on and recheck main zero indication.

NOTE

This will assure that calibration of the main tank was good and not affected by a defective test box.

k. Place fuel selector valve to AUX position.
l. Adjust the EMPTY AUXILIARY potentiometer on the signal conditioner to read exact zero on the indicator.
m. With power on the aircraft, place fuel selector handles to MAIN position and check MAIN EMPTY potentiometer setting.

NOTE

It may be necessary to readjust main and auxiliary empty potentiometers by switching back and forth the main and auxiliary positions respectively until NO deviation reading is evident.

n. Turn power OFF.
o. Interconnect capacitance test box in accordance with figure 11-9, and recheck MAIN FULL indication.
p. If calibration has changed, repeat steps c. through l., until a full indication without change in both main and auxiliary zero indication is obtained.
q. After both LH and RH systems have been restored to their original configurations, read indication on auxiliary tank by actuating the override switch located below the fuel quantity indicator and verify that auxiliary zero corresponds to that of main.
r. Turn off electrical power and service fuel systems in accordance with Section 2.

Alternate Method

The Alternate method of calibrating the fuel system should be used only as a temporary calibration until the preferred method of calibration can be accomplished. The alternate method of calibration will require a thermometer with a scale reading of -30°F to 150°F.

a. Defuel aircraft in accordance with Defueling Procedures in Section 2.

CAUTION

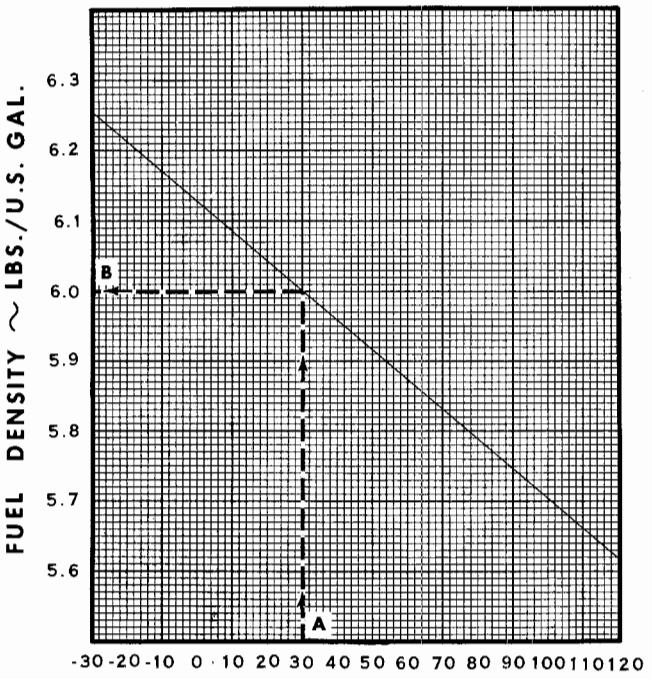
During all defueling and tank calibration, the aircraft must be located a safe distance from other aircraft and buildings. Fire fighting equipment must be available. Two ground wires from different points on the aircraft to separate approved grounding stakes shall be used to prevent accidental disconnecting of one ground wire.

b. Turn on electrical power.
c. Place fuel selector control valve to MAIN position.
d. Adjust the MAIN EMPTY potentiometer on the signal conditioner to exact zero on the fuel quantity indicator.

NOTE

Tap the indicator lightly when reading indicator. This will overcome friction of the needle when the indicator is in a static condition.

e. Position fuel selector valve handles to AUXILIARY and adjust the AUXILIARY EMPTY potentiometer exact zero on the fuel indicator.
f. Using a thermometer, measure the temperature of the fuel and determine density of the fuel from figure 11-10, Temperature Conversion Chart.
g. Fuel the system or tank being calibrated in accordance with Fueling Procedures, Section 2.
h. Record the total number of gallons in the tank.




EXAMPLE: A - Temperature, 30°
B - Density, 6.0 Pounds Per Gallon

| | |
|---|---|
| TOTAL FUEL IN TANK | 51.00 gal |
| FUEL DENSITY | 6.00 lbs/gal |
| TOTAL POUNDS IN TANK | 306.00 lbs |
| MINUS UNMEASURED FUEL | 6.00 lbs = 1 gal ±0.5 gal |
| APPROXIMATE GAGED FUEL | 300.00 lbs |

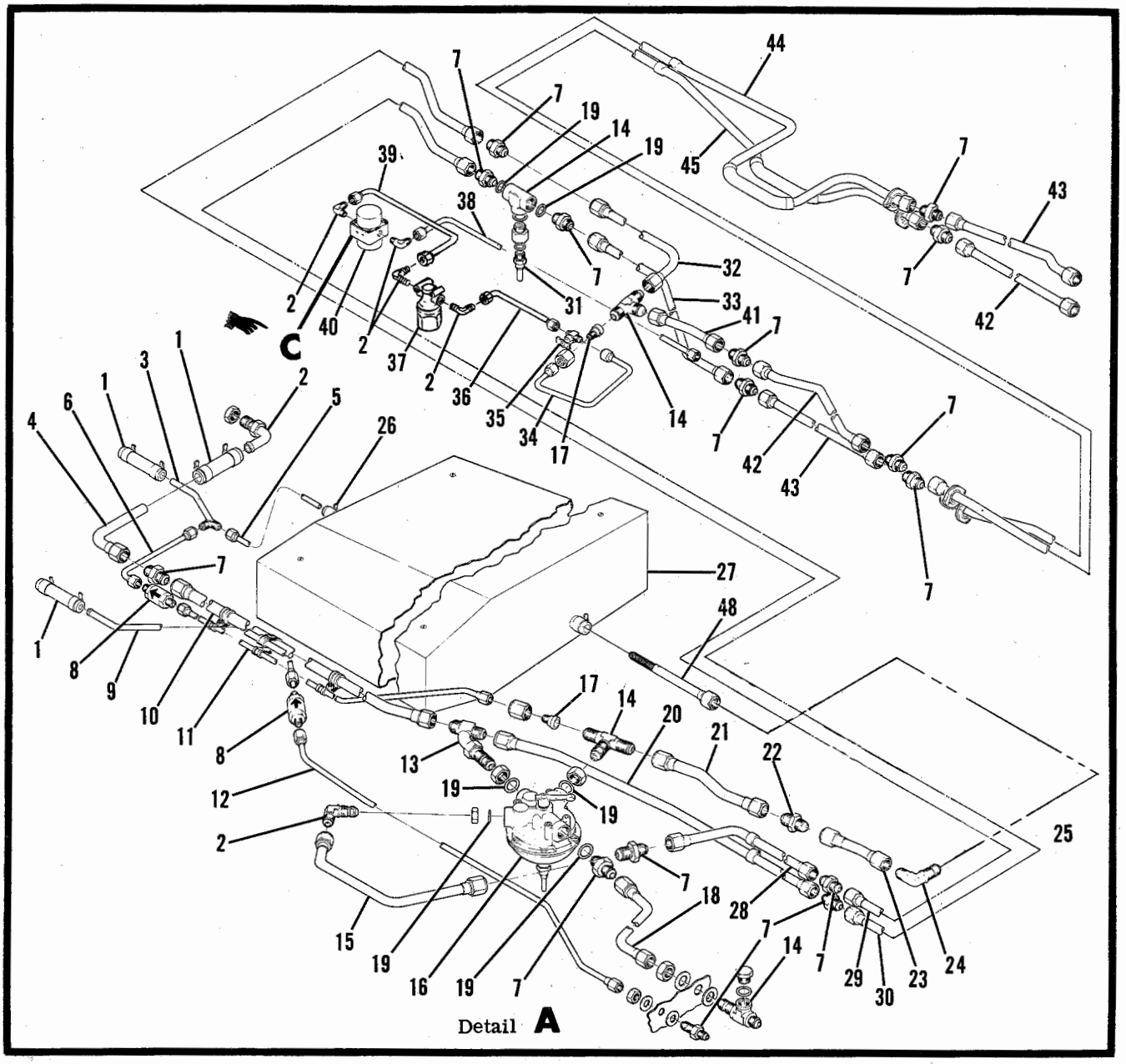
Figure 11-10. Temperature Conversion Chart

i. Multiply the density of the fuel as determined in step f. by the total number of gallons of fuel in the tank to obtain total pounds of fuel.

NOTE

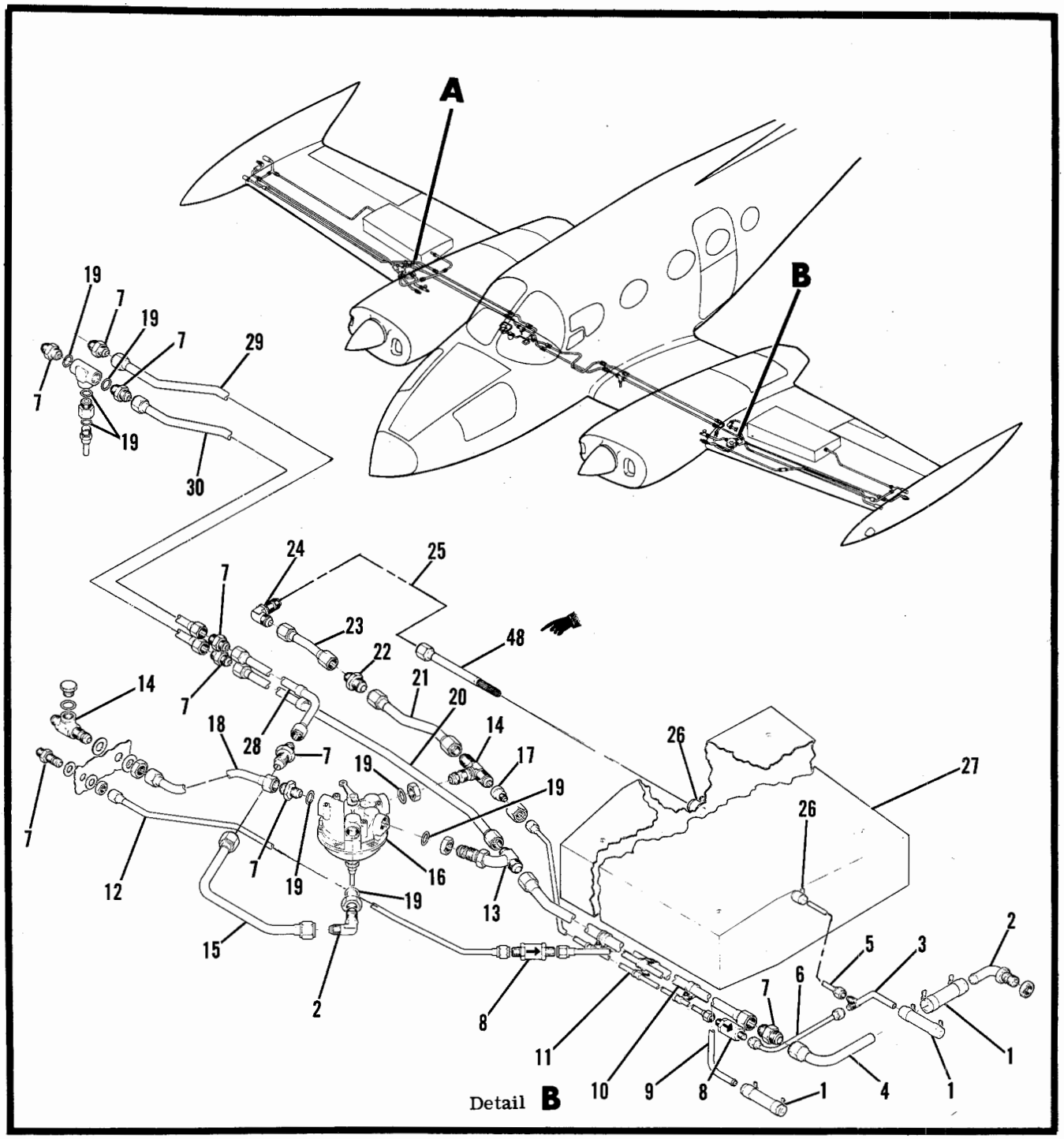
This should be the exact number of pounds of fuel as indicated on the fuel quantity indicator.

j. If the total pounds of fuel as indicated on the fuel quantity indicator is other than the total number pounds of fuel as determined in step h., adjust the MAIN FULL potentiometer on the signal conditioner to the correct number of pounds.
k. Place fuel selector valve to AUXILIARY position and check fuel quantity gage.
l. Determine total pounds of fuel from figure 11-10, using the same procedure as for the main tank.



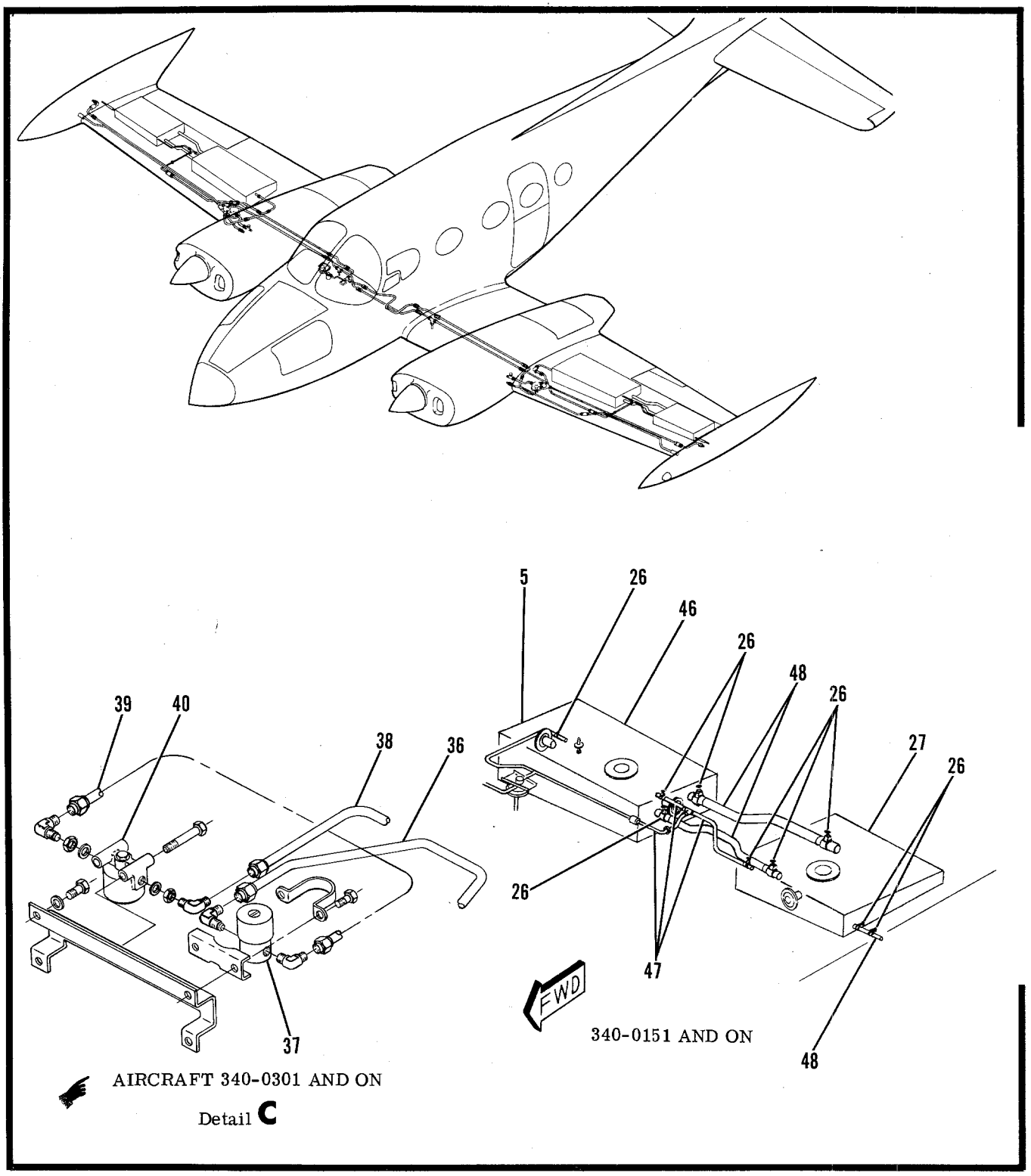

1. Hose
2. Elbow
3. Adapter Fitting
4. Line Assy (Main fuel, main tank)
5. Line Assy (Auxiliary fuel vent, tank to adapter fitting)
6. Line Assy (Tank vent, adapter fitting to check valve)
7. Union
8. Check Valve
9. Line Assy (Main tank to check valve)
10. Line Assy (Main fuel, outboard)
11. Line Assy (Tank vent, check valve to tee)
12. Line Assy (Vapor return, check valve to nacelle)
13. Valve Fitting
14. Tee
15. Line Assy (Crossover, elbow to union)
16. Fuel Selector Valve
17. Restrictor
18. Line Assy (Fuel selector to nacelle tee)
19. O-Ring
20. Line Assy (Crossover, valve fitting to union)
21. Line Assy (Auxiliary, selector tee to union)
22. Union
23. Line Assy (Auxiliary, union to bulkhead elbow)
24. Elbow
25. Line Assy (Auxiliary, fuel cell to elbow)
26. Clamp
27. Auxiliary Fuel Cell
28. Line Assy (Crossover, union to union)
29. Line Assy (Crossover, union to union)
30. Line Assy (Crossover, union to drain line)

Figure 11-11. Fuel System Plumbing (Sheet 1 of 3)




31. Fuel Drain Line
32. Line Assy (Crossover, union to heater system tee)
33. Line Assy (Crossover, drain tee to union)
34. Line Assy (Heater fuel, tee to shutoff - off valve)
35. Shutoff - Off Valve (Heater)
36. Line Assy (Heater fuel, shutoff - off valve to heater fuel pump)
37. Heater Fuel Filter
38. Line Assy (Solenoid valve to heater)
39. Line Assy (Heater fuel line, fuel pump to solenoid valve)
40. Solenoid Valve
41. Line Assy (Crossover, heater tee to union)
42. Line Assy (Crossover, union to union)
43. Line Assy (Crossover, union to union)
44. Line Assy (Crossover, fuselage)
45. Line Assy (Crossover, fuselage)

Figure 11-11. Fuel System Plumbing (Sheet 2)




46. Outboard Auxiliary Fuel Cell
47. Line Assembly (Fuel Vent)
48. Line (Fuel)

Figure 11-11. Fuel System Plumbing (Sheet 3)

FUEL AND VENT LINES.

Removal of Fuel and Vent Lines. (See figure 11-11.)

Removal procedure is the same for either wing except for the heater fuel lines which are installed in the right wing only.

a. (See figure 1-3. Removal all necessary access panels from wing, and wing gap covers and main tank fairings.

NOTE

It may be necessary to drill off the access hole doublers to gain access to the fuel lines.

b. Defuel main tank in accordance with Section 2.

CAUTION

During all defueling, tank purging and tank repairing operations, two ground wires from different points on the aircraft, to separate approved grounding stakes, shall be used to prevent ungrounding of the aircraft due to accidental disconnection of one ground wire.

WARNING

Residual fuel draining from lines is a fire hazard. Use care to prevent accumulation of such fuel when lines and hoses are being disconnected.

c. Remove main fuel tank in accordance with removal procedures.
d. Remove clamps securing lines.
e. Remove vapor return line by disconnecting line (11) from union and check valve (8), hose (1) and route from wing.
f. Remove vapor return line (12) and check valve (8) from nacelle rib fitting.
g. Remove main fuel line (10) at union and valve fitting (13).
h. Route lines (10 and 12) from wing by pulling outboard.

NOTE

Crossover lines (41, 42, 43, 44 and 45) should not be removed. If removal is necessary, perform steps j. through l.

i. Remove wing in accordance with Section 3.
j. Disconnect lines (42 and 43) from lines (33 and 41) at unions and from lines (44 and 45) at unions and route from stub-wing.
k. Disconnect lines (44 and 45) from unions and route from fuselage.
l. Disconnect line (38) from heater and solenoid valve elbow.
m. To remove wing crossover lines, disconnect lines (15, 20, 28, 29, 30, 32 and 33) from unions, tees, elbows and valve fitting. Route lines from wing.
n. (340-0001 to 340-0151) To remove auxiliary fuel lines, disconnect lines (21, 23 and 25) from tee, unions, elbows, and route from wings.
o. (340-0151 and On) To remove auxiliary fuel lines, disconnect lines (21, 23 and 25) from tee, disconnect lines (47 and 48), elbows and unions, route from wings.
p. Disconnect line (18) fuel selector valve, union and tee, and remove line.
q. Disconnect line (9) from hose and check valve, and route from wing.
r. Disconnect lines (5 and 6) from adapter fitting (3), auxiliary fuel cell (27) (340-0001 to 340-0151) auxiliary fuel cell (46) (340-0151 and On), check valve (8) and remove from wing.

Installation of Fuel and Vent Lines. (See figure 11-11.)

To install fuel lines, reverse the removal procedures.

NOTE

Use a fuel soluble thread lubricant on male threads of all fittings. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

SELECTOR VALVES

One fuel selector valve is located in each wing just forward of the main spar on the outboard side of the nacelle. Each valve is cam operated from the cabin through flex cables. Each valve has four positions which allows fuel to flow to the respective engine from the left tank, the right tank, the auxiliary tank, or stops all fuel flow through the valve. Each fuel selector valve has a fuel strainer located at the bottom of the valve and a quick-drain is provided to remove moisture and sediment.

Removal of Fuel Selector Valves.

The removal of the fuel selector valves is essentially the same for either valve; however, there are right and left brackets which mount the valve into position.

a. Defuel in accordance with Section 2.
b. Remove upper and lower access cover plates.
c. Tag and disconnect electrical wires.
d. Disconnect lines and fittings.

CAUTION

Plug or cap all open lines or fittings.

e. Disconnect selector linkage at valve arm.
f. Remove the three bolts securing valve and remove the valve from wing.

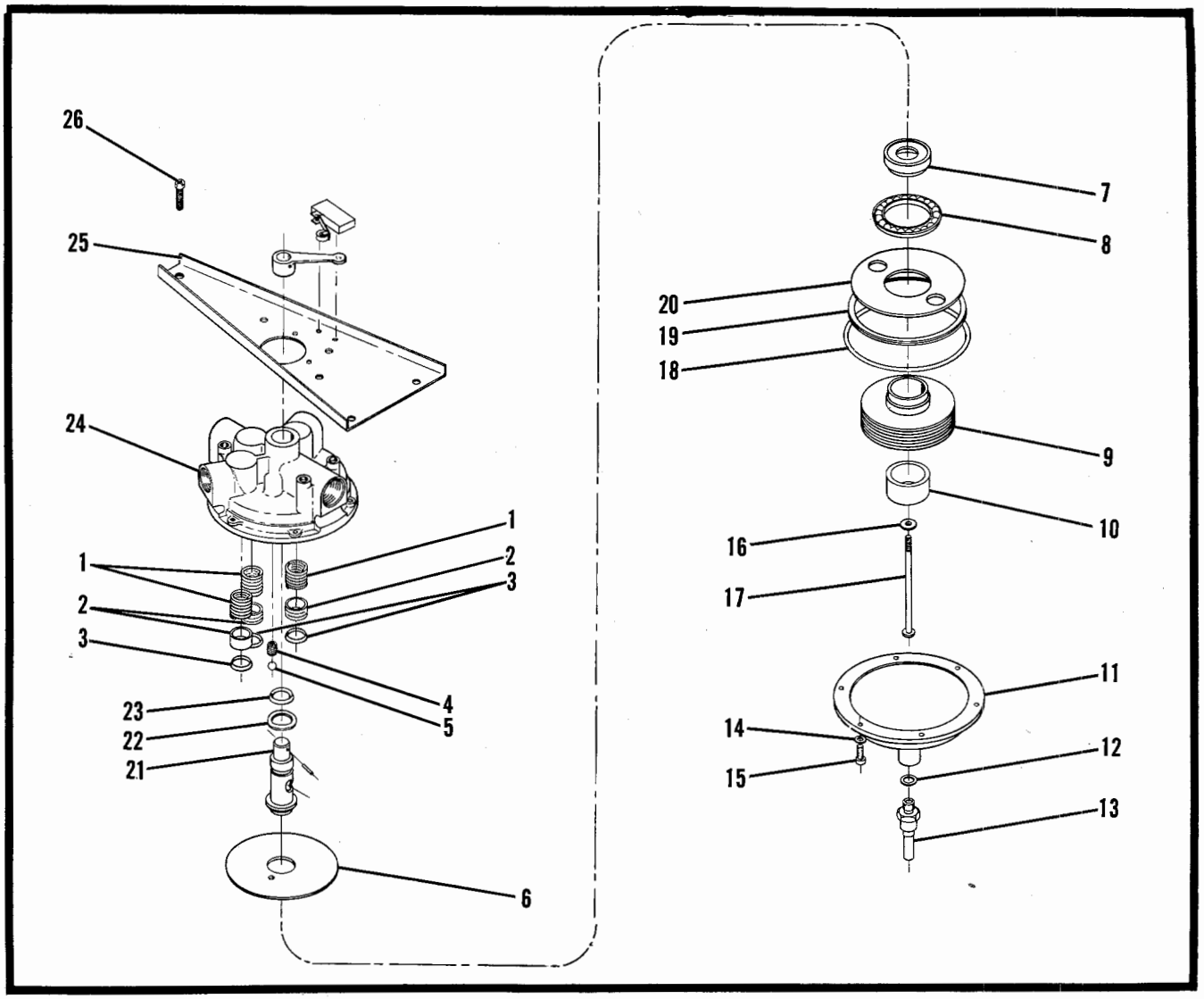
WARNING

Residual fuel draining from the lines and hoses is a fire hazard. Care should be exercised in disposal of such fuel when lines or hoses are disconnected to prevent its accumulation in the wing.

Disassembly and Assembly of Fuel Selector Valve. (See figure 11-12.)

The disassembly and assembly procedures given pertain to either left or right-hand fuel selector valves. Disassembly and assembly should be accomplished on a clean, well-lighted work table.

a. Remove the six screws (14) securing bowl and remove bowl.
b. Loosen screw (16) and remove filter (9) and gasket.
c. Remove snap ring, disc (20), bearing (8), filter seat (7) and plate (6).
d. Remove pin from arm (26) and disassemble shaft (21), spring washer (22), O-ring (23), packings (3), screws (2) and springs (1) from housing (24).
e. The assembly procedures are the reversal of the disassembly procedures.




1. Spring
2. Screw
3. Packing
4. Spring
5. Ball
6. Plate
7. Filter Seat
8. Bearing
9. Filter
10. Spacer
11. Bowl
12. Packing
13. Drain Valve
14. Screw
15. Washer
16. Screw
17. Stat-O-Seal
18. Packing
19. Snap Ring
20. Disc
21. Shaft
22. Spring Washer
23. O-Ring
24. Housing
25. Bracket
26. Arm

Figure 11-12. Fuel Selector Valve and Strainer

NOTE

Make sure selector valve arm rotates free and does not bind. Make sure a positive detent is felt when valve is in selected position.

## FUEL SELECTOR CONTROL SYSTEM

The fuel selector valve controls are located between the front seats on the cabin floor. The valve control on the right controls fuel flow to the right engine and the valve control on the left controls the fuel flow to the left engine. The handles are of rotary-type and are operated mechanically with a flex cable to the fuel selector valve assemblies mounted outboard of the nacelles in the leading edge of the wing. The four valve position are marked: LEFT MAIN, RIGHT MAIN, LEFT AUXILIARY, and OFF; RIGHT MAIN, LEFT MAIN, RIGHT AUXILIARY, and OFF. The fuel selector valve handles indicate the position of the fuel selector valves.

Removal of Fuel Selector Control System. (See figure 11-14.)

Removal of fuel selector control system is the same for either selector.

a. Fuel selector valve handles - OFF.
b. Remove fuel selector handle.
c. Remove carpet and floorboard aft of control pedestal to gain access to gearbox.
d. Disconnect linkage and remove gearbox.
e. Remove cable fittings and clamps securing cable to stringers.
f. Remove cable from aircraft.

Installation of Fuel Selector Valves

The installation of the fuel selector valves is essentially the same for either valve; however, there are left and right brackets which mount the valve into position.

a. Install fittings in valve and clock to correct position.

NOTE

Use Hercules Chemical Co., Teflon Tape to improve sealing of threads common to fittings and valve. Wrap tape tightly around all but first 1-1/2 male threads of fitting, overlapping ends 3/8 inch. Assemble joint as usual.

b. Install valve, securing in position with three bolts, then connect lines.
c. Connect selector linkage and safety.
d. Connect electrical wires and remove tags.
e. Check operations of selector valve.

NOTE

If selector valve handle is in the selected position and does not have a positive feel, (in detent) refer to rigging procedures and check rigging.

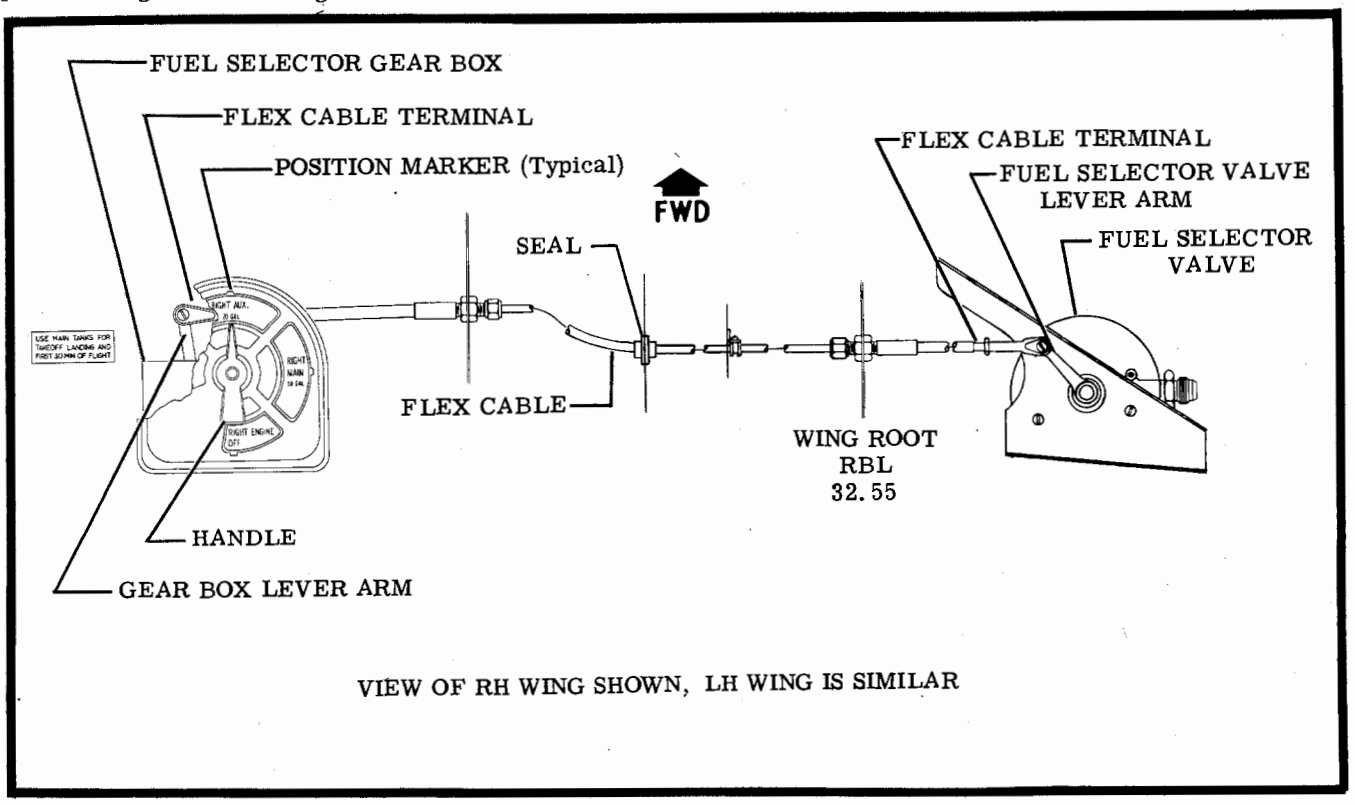
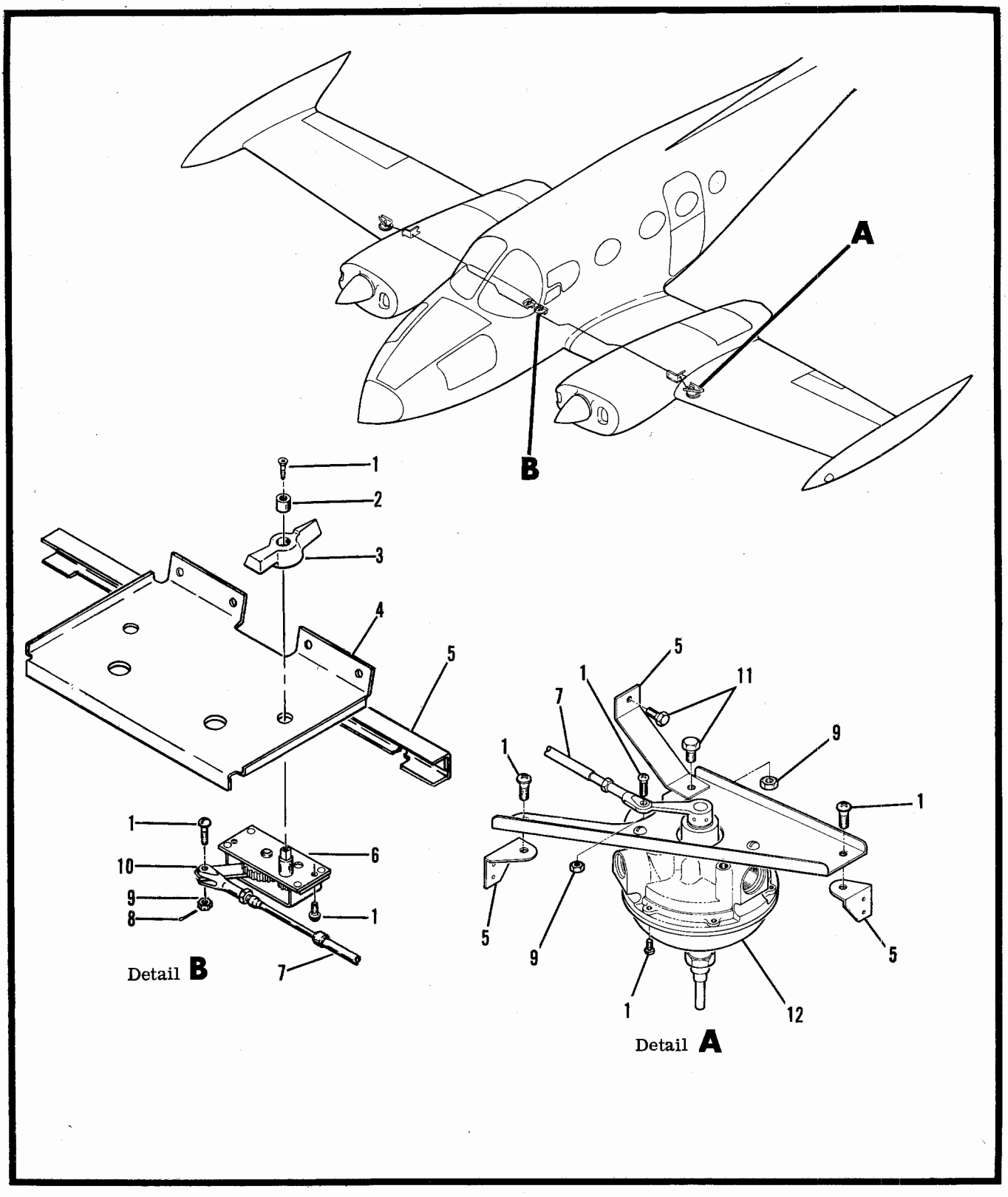



Figure 11-13. Fuel Selector Rigging Schematic




1. Screw
2. Spacer
3. Handle
4. Pan
5. Support
6. Gearbox
7. Cable
8. Cotter Pin
9. Nut
10. Terminal
11. Bolt
12. Fuel Selector Valve

Figure 11-14. Fuel Selector Control

Installation of Fuel Selector Control System. (See figure 11-14.)

a. Route cable through stringers and clamp.
b. Connect cable ends to selector valve and gearbox and safety.
c. Install gearbox to bracket.
d. Install selector valve handle.
e. Check operation for binding and smooth actuation.

NOTE

Support and security of the fuel selector flex cables is most essential to provide the optimum fuel selector valve operation. Inspect the fuel selector cable support points, as shown in figure 11-13, for adequate tightness and security.

Rigging the Fuel Selector Control System. (See figure 11-13.)

a. (Refer to Section 3.) Remove carpet retainer and fold back carpet just enough to remove floorboards.
b. (See figure 1-3.) Remove necessary access plates.
c. Position lever arm on fuel selector valve in wing to the outboard detent and resting against the stop pin.

NOTE

Observe that the attachment hole in lever arm is pointing inboard.

d. Connect terminal on flex cable to the fuel selector valve lever arm with attaching bolt, nut and cotter pin.
e. On the cabin floorboard, rotate (counterclockwise for LH and clockwise for RH) the handle on gearbox until lever arm comes to rest against gearbox bracket.
f. Rotate handle (clockwise for LH and counterclockwise for RH) approximately 5° until pointer on handle is aligned with the OFF position marker.

CAUTION

Observe that the handle is parallel with the centerline of aircraft and pointer on handle is indexed to the OFF position (aft).

g. With the handles in the position described in step f., above, adjust terminal and flex cable until attach holes on gearbox lever arm and terminal are aligned.
h. Connect terminal to gearbox lever arm with attaching screw, nut and cotter pin.
i. Start from the OFF position and rotate (clockwise for LH and counterclockwise for RH) the handles to the LEFT MAIN and RIGHT MAIN positions respectively.
j. Observe that the pointer end of handle nearly aligns with marker on placard after traveling approximately 90° from the OFF position and the fuel selector valve lever arm seats in the respective main tank detent on the fuel selector valve.
k. If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 90° from the OFF position, lengthen or shorten terminals and/or flex cable as necessary to achieve proper rigging.
l. Continue from the LEFT MAIN and RIGHT MAIN position, rotate handles to the LEFT AUXILIARY and RIGHT AUXILIARY positions respectively.
m. Observe that the pointer end of handle nearly aligns with marker on placard after traveling approximately 180° from the OFF position and the fuel selector valve lever arm seats in the respective auxiliary tank detent on the fuel selector valve.
n. If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 180° from the OFF position, lengthen or shorten terminals and/or flex cable as necessary to achieve proper rigging.
o. Continue from the LEFT AUXILIARY and RIGHT AUXILIARY position, rotate LH handle to the RIGHT MAIN (crossover) and RH handle to the LEFT MAIN (crossover).
p. Observe that the pointer end of handle nearly aligns with marker on placard after traveling approximately 270° from the OFF position and the fuel selector valve lever arm seats in the respective inboard crossover tank detent on the fuel selector valve and against pin stop.
q. If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 270° from the OFF position, lengthen or shorten terminals and/or flex cable as necessary to achieve proper rigging.

NOTE

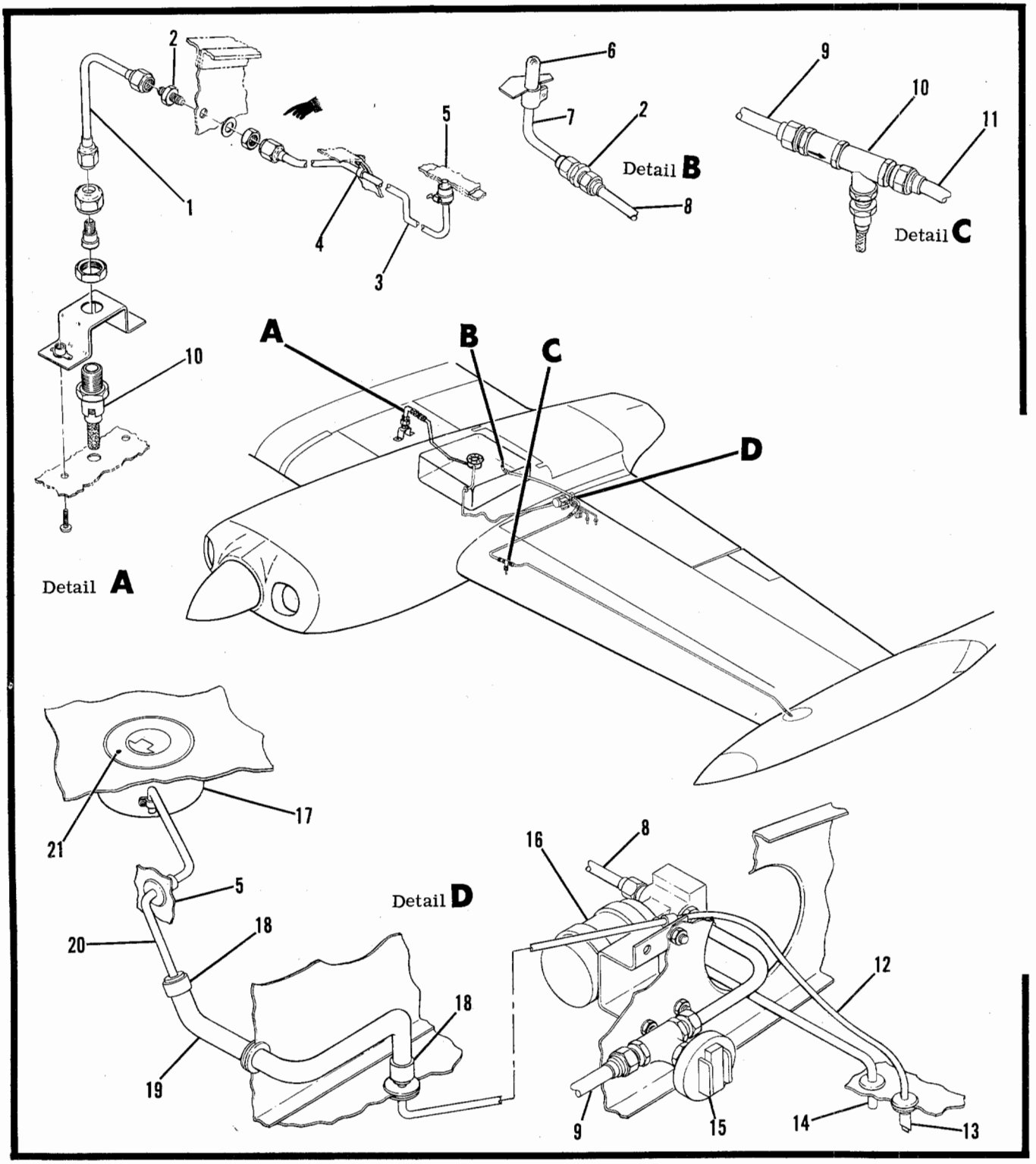
If terminal and/or flex cable adjustments have been made at any one of the fuel selector positions, repeat steps i, j, l, m, o, and p to verify correct rigging and make further adjustments as necessary.

WING LOCKER FUEL TANKS (OPTIONAL).

The optional wing locker fuel tanks are mounted in the forward wing locker baggage area of each wing. The tank is a synthetic rubber cell held in place by button fasteners. Each tank has vent and drain tubes. A fuel transfer pump mounted on the rib outboard of the wing locker transfers fuel from the wing locker tank to the respective main wing tank. Each tank has a total capacity of 20.5 U.S. Gallons.

Removal of Wing Locker Fuel Tanks (Optional). (See figure 11-15.)

The removal procedure is the same for either left-hand or right-hand wing locker tank.




1. Drain Line (Union to Drain Valve)
2. Union
3. Drain Line (Fuel Cell to Union)
4. Clamp
5. Wing Locker Fuel Cell
6. Fuel Strainer
7. Fuel Line (Tank to Union
8. Fuel Line (Union to Transfer Pump)
9. Fuel Line (Transfer Pump to Drain Valve)
10. Fuel Drain Valve
11. Fuel Line (Drain Valve to Main Fuel Tank)
12. Vent Line
13. Vent Heater
14. Transfer Pump Drain
15. Transfer Light Pressure Switch
16. Transfer Pump
17. Fuel Filler Cap
18. Clamp
19. Vent Hose
20. Vent Line
21. Vent Hole

Figure 11-15. Wing Locker Fuel System

a. Defuel wing locker tank to be removed by transferring fuel to main fuel tank and opening drain valve to drain remaining fuel.
b. Turn power OFF.

CAUTION

During all defueling, tank purging and tank repair operations, two ground wires from different points on the aircraft to separate approved grounding stakes shall be used to prevent ungrounding of the aircraft due to accidental disconnecting of one ground wire.

c. (See figure 1-3.) Remove the necessary access panels and wing locker fuel tank filler cap.
d. Loosen clamp and remove strainer (6) from bottom of wing locker fuel cell.
e. Loosen clamp inside cell and disconnect drain line (3).
f. Pull fasteners down; carefully fold the cell and remove cell through the filler cap opening.

WARNING

Residual fuel draining from lines and hoses is a fire hazard. Use care to prevent accumulation of the fuel in the bottom of the nacelle and wing area when lines and fuel cell are removed.

Installation of Wing Locker Fuel Tanks (Optional). (See figure 11-15.)

a. Make sure fuel cell area is clean, free from dirt and foreign material.
b. Carefully insert fuel cell through the filler opening and arrange the cell in the correct position by fastening the fasteners in place.
c. Install strainer (6) into fuel cell and clamp.
d. Install drain line (3) and install clamp inside the fuel cell.

NOTE

When installing clamps, be careful not to overtorque.

e. Install filler cap and adapter (17).
f. Fuel aircraft and check for leaks.

WING LOCKER FUEL PLUMBING.

Removal of Wing Locker Fuel Plumbing System (Optional). (See figure 11-15.)

The removal procedures are the same for either side of the wing locker fuel system plumbing.

a. Defuel wing locker fuel tank by transferring fuel to main fuel tank and opening drain valve and crossover drain valves to drain remaining fuel.
b. (See figure 1-3.) Remove the necessary access panels and tip tank fairings.
c. Remove wing locker fuel tank in accordance with removal procedures.
d. Disconnect drain line (1) from drain valve and remove.
e. Remove two screws securing drain valve and bracket assembly and remove drain valve through wheel well access.
f. Disconnect fuel line (8), fuel line (9) and drain line (14) from transfer pump (16).
g. Tag and remove wires from fuel pump and remove from bolts securing pump to structure and remove the pump.
h. Disconnect fuel line (9) from tee. Tag and remove electrical wires from pressure switch (15) and remove line (9) and pressure switch (15) as an assembly.
i. Disconnect fuel line (9) from check valve (10) and remove through wing leading edge access opening.
j. Remove clamps from fuel line (11) in wing leading edge. Disconnect line (11) from main fuel tank. Remove line (11) through outboard wing leading edge rib.

Installation of Wing Locker Fuel Plumbing System (Optional). (See figure 11-15.)

a. Installation of the wing locker fuel plumbing is the reversal of the removal procedures.
b. Fuel aircraft and check for leaks.
c. Check operation of fuel system.

FUEL VENT HEATERS.

Vent heaters installed on each vent tube prevent the vent from freezing of vapors. During removal and installation, care must be used to prevent damage to the wiring and heaters.

a. Removal of the vent heater is not recommended; if heater is removed, replace as follows:
1. Clean vent tube surface in the area where heater is to be installed with 280 grit sandpaper and Ketone (MEK).
2. (See figure 11-15.) Bond vent heater to vent tube using epoxy cement Epon 834 with curing agent TTA in accordance with the manufacturer's instructions.
3. Pot heater wires with EC2273 or Hysol EA9309 to prevent from damage. Mix in accordance with manufacturer's instructions.

SECTION 12

# INSTRUMENT AND RELATED SYSTEMS

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## GENERAL.

The stationary instrument panel is a part of the fuselage cabin structure and is ordinarily considered not removable. The pilot's and copilot's instrument panels are removable panels and contain the flight instruments. The instrument panels are directly attached to the stationary panel. The radio panel located between the pilot and copilot's instrument panel contain the optional installed radio equipment. All panels are removable and will depend on the individual or group of instruments and radio equipment to be removed.

INSTRUMENTS.

Troubleshooting the Instruments.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | VACUUM SYSTEM INSTRUMENTS | |
| BOTH VACUUM INSTRUMENTS MALFUNCTIONING | Dirty filter element. Restricted airflow or improper adjustment. | Clean and replace filter. Adjust vacuum relief valve. |
| ONE VACUUM INSTRUMENT MALFUNCTIONING, OTHER VACUUM INSTRUMENT OPERATING NORMAL | Defective instrument. | Replace instrument. |
| DIRECTIONAL GYRO PRECESSES AND/OR SPINS | Insufficient suction. | Repair or replace vacuum pump and/or check system. |
| | Filter element dirty. | Replace filter element. |
| | Excessive vibration of instrument panel. | Replace instrument panel shock mounts. |
| | Operation limits exceeded. | Replace or overhaul directional gyro. |
| GYRO HORIZON WILL NOT ERECT, TUMBLES, AND IS SLUGGISH IN OPERATION | Insufficient suction. | Repair or replace vacuum pump and/or check system. |
| | Filter element dirty. | Replace filter element. |
| | Excessive vibration of instrument panel. | Replace instrument panel shock mounts. |
| | Operational limits exceeded. | Replace or overhaul gyro horizon. |
| | SENSITIVE ALTIMETER | |
| INDICATING POINTERS FAIL TO RESPOND | Static line obstructed. | Disconnect static line from all instruments and altitude hold on autopilot computer, and blow out line with dry compressed air. |
| EXCESSIVE POINTER VIBRATION | Excessive vibration of static line or hose. | Secure to aircraft structure or components. |
| ERRONEOUS INDICATIONS | Water or foreign matter in static line. | Disconnect static line from all instruments and altitude hold on autopilot computer, and blow out line with dry low pressure air. |
| | Loose static line connection. | Test and repair in accordance with testing static pressure system. |
| | Defective instrument. | Replace instrument. |

Troubleshooting the Instruments. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | AIRSPEED INDICATOR | |
| POINTER FAILS TO RESPOND | Clogged pitot line. | Disconnect pitot line and altitude hold on autopilot computer from instrument and blow out line with dry compressed air. |
| ERRONEOUS INDICATIONS | Water or restriction in pitot and/or static line. | Disconnect tube from all pitot static system instruments and altitude hold on autopilot computer and blow out lines with dry compressed air. |
| | Leak in pitot and/or static line. | Test and repair in accordance with testing of pitot pressure system. |
| | Pitot and/or static line improperly connected. | Connect lines as illustrated in figure 12-9. |
| | VERTICAL SPEED INDICATOR | |
| POINTER FAILS TO RESPOND | Water or restriction in static line. | Disconnect static line from all pitot static system instruments and altitude hold on autopilot computer and blow out with dry compressed air. |
| | Defective instrument. | Replace instrument. |
| | TURN-AND-BANK INDICATOR | |
| | NOTE<br>To operate any of the electrical instruments, the battery switch must be in the ON position. | |
| BALL OFF CENTER | Incorrectly mounted. | Mount correctly. |
| | Defective instrument. | Replace instrument. |
| TURN INDICATED | Open circuit. | Reset circuit breaker. Check and repair circuit. |
| | Defective instrument. | Replace instrument. |
| | DUAL TACHOMETER | |
| ERRONEOUS INDICATION OR INDICATOR INOPERATIVE | Defective circuit. | Check and repair circuit. |
| | Defective instrument. | Replace instrument. |
| | Defective tachometer generator. | Replace tachometer generator. |
| | DUAL FUEL QUANTITY INDICATOR | |
| NO INDICATION | Defective tank unit. | Repair or replace tank unit. |
| | Open circuit. | Reset circuit breaker. Check and repair circuit. |

Troubleshooting the Instruments. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | DUAL FUEL QUANTITY INDICATOR (Continued) | |
| NO INDICATION (Continued) | Defective fuel quantity signal conditioner. | Replace fuel quantity signal conditioner. |
| | Defective indicator. | Replace indicator. |
| ERRONEOUS INDICATION | Defective fuel tank unit. | Repair or replace tank unit. |
| | Defective circuit. | Check and repair circuit. |
| | Malfunctioning fuel quantity signal conditioner. | Check in accordance with Section 11. Replace if necessary. |
| | Defective indicator. | Replace indicator. |
| | Improper calibration. | Calibrate in accordance with calibration procedures. |
| | OUTSIDE AIR TEMPERATURE INDICATOR | |
| POINTER FAILS TO RESPOND | Open circuit. | Reset circuit breaker. Check and repair circuit. |
| ERRONEOUS INDICATION | Defective circuit. | Check and repair circuit. |
| | Defective air temperature bulb. | Replace air temperature bulb. |
| | Defective indicator. | Replace indicator. |
| | STALL WARNING INDICATOR | |
| HORN FAILS TO OPERATE | Open circuit. | Reset circuit breaker. Check and repair circuit. |
| | Defective transmitter. | Replace transmitter. |
| | Defective horn. | Replace horn. |
| | COMBINATION GAGES | |
| NO INDICATION ON OIL TEMPERATURE GAGE | Open circuit. | Reset circuit breaker. Check and repair circuit. |
| | Defective oil temperature bulb. | Replace oil temperature bulb. |
| | Defective instrument. | Replace instrument. |
| ERRONEOUS INDICATION OF CYLINDER | Defective circuit. | Check and repair circuit. |
| | Defective cylinder head temperature bulb. | Replace cylinder head temperature bulb. |
| | Defective instrument. | Replace instrument. |

Troubleshooting the Instruments. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | COMBINATION GAGES (Continued) | |
| HIGH CYLINDER HEAD TEMPERATURE INDICATION | Improper ground. | Remove ground wire and clean bonding area, replace ground wire. |
| ERRONEOUS OIL PRESSURE INDICATION | Defective instrument. | Replace instrument. |
| | Broken or restricted oil pressure line. | Repair or replace oil pressure line. |
| | Defective oil pressure relief valve. | Repair or replace relief valve. |
| | MANIFOLD PRESSURE GAGE | |
| SLUGGISH POINTER OPERATION | Damaged or restricted lines. | Remove line and blow out restriction. Replace line or hoses as necessary. |
| | Defective instrument. | Replace instrument. |
| | MAGNETIC COMPASS | |
| EXCESSIVE COMPASS ERROR | Improper compensation. | Compensate the compass. |
| | External magnetic interference. | Locate the interference and eliminate if possible. |
| FAILURE TO RESPOND TO COMPENSATION | Compensating magnets demagnetized. | Replace instrument. |
| | FUEL FLOW GAGE | |
| ERRONEOUS FUEL PRESSURE INDICATION | Clogged or restricted fuel lines. | Clean fuel lines and fuel strainer. |
| | Broken or restricted fuel flow lines. | Replace fuel flow lines. |
| | Defective fuel pump. | Replace fuel pump. |
| | Defective instrument. | Replace instrument. |
| | VOLTAMMETER | |
| NO INDICATION ON VOLTAMMETER | Defective voltammeter. | Check/replace voltammeter. |
| | Defective voltammeter leads. | Check/repair or replace. |
| | CABIN DIFFERENTIAL PRESSURE GAGE | |
| ERRONEOUS INDICATIONS | Static line obstructed. | Disconnect static line from all instrument and altitude hold on autopilot computer, and blow out line with dry compressed air. |
| | Defective instrument. | Replace instrument. |

Troubleshooting the Instruments. (Continued)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | CABIN RATE OF CHANGE INDICATOR | |
| POINTER FAILS TO RESPOND | Static ports obstructed. | Remove obstructions. |
| | Defective instrument. | Replace instrument. |

Vacuum System Instruments.

a. The Directional Gyro is a flight instrument incorporating an air-driven gyro stabilized in the vertical plane. The gyro is rotated at high speed by lowering the pressure in the airtight case with the engine-driven vacuum pumps and simultaneously allowing air at atmospheric pressure to enter against the gyro buckets. Due to gyroscopic inertia, the spin axis continues to point in the same direction, even though the aircraft yaws to the left or right. This relative motion between the gyro and the instrument case is shown on the instrument dial which is similar to a compass card. The dial, when set to agree with the aircraft's magnetic compass, provides a "dead beat" azimuth indicator that is free from "swing."

b. The Slaved Directional Gyro includes a single, synchro-driven pointer and in some gyros, a dual pointer for use with ADF/VOR inputs to provide continuous indication of the bearing to specific ground stations. The slaved directional gyro operates with a slaving meter and a flux detector, to produce input to the electronic compass circuit in the gyro. The flux detector is remotely located in the tailcone of the aircraft. Refer to Compass Alignment procedures for compensating the slaved directional gyro.

c. The Horizontal Gyro is essentially an air-driven gyroscope rotating in a horizontal plane, operated by the same supply of vacuum as the directional gyro. Due to gyroscopic inertia, the spin axis continues to point in the vertical direction providing a constant visual reference to the attitude of the aircraft relative to its pitch and roll axis. A bar across the face of the indicator represents the horizon and a miniature adjustable aircraft is mounted to the case. Aligning the miniature aircraft to the horizon bar simulates the alignment of the aircraft to the actual horizon and any deviation simulates the deviation of the aircraft from the true horizon. The indicator is marked from zero to 90 degrees.

d. Directional and Attitude Gyro Precession. Acceptable limits for gyro drift is 4° in either direction from a heading during a ten minute period. Excessive gyro precession can be caused by low vacuum system pressure; therefore, the following items should specifically be checked prior to gyro removal and/or replacement:

1. Vacuum system lines for kinks or leaks.
2. Central air filter or instrument filter for dirt. The filter should be cleaned and/or replaced.
3. Suction gage for proper operation.
4. Vacuum relief valve for proper adjustment. Adjustment instructions are outlined in "Adjustment of Vacuum Relief Valve."

NOTE

A gage reading of 5.0 inches of mercury is desirable for gyro instruments; however, a range of 4.75 to 5.25 inches of mercury is acceptable.

e. The Suction Gage is calibrated in inches of mercury and indicates the amount of vacuum created by the engine-driven vacuum pumps. The suction gage has four connecting lines. The upper outboard line is routed directly to the directional gyro to monitor vacuum. The lower lines are attached to the vacuum system manifold for the purpose of monitoring vacuum pump function. The upper inboard line is routed to static air.

Pitot-Static Instruments.

a. The Sensitive Altimeter is a pressure instrument that measures the change in static pressure and by means of an indicator, translates this change into altitude above sea level. A barometric scale is incorporated in the instrument. The barometric pressure scale is calibrated in inches of mercury and is set manually by a knob on the lower left-hand corner of the altimeter case. Three pointers on the dial of the instrument indicate altitude in units of 100 feet, 1,000 feet and 10,000 feet.

b. The Airspeed Indicator measures the differential between ram, or impact air pressure taken at the pitot tube, and static air pressure. The instrument dial is calibrated in both knots and miles per hour. Should airspeed indicator require maintenance and recalibration, recalibrate in accordance with FAA TSO-2C.

c. The Vertical Velocity Indicator measures the rate of change in static pressure when the aircraft is climbing or descending. By means of a pointer and dial it indicates the rate of ascent and descent of the aircraft in feet per minute.

d. The Cabin Altitude and Differential Pressure instrument is a dual purpose instrument which indicates cabin altitude in feet. It also indicates differential pressure between cabin pressure and atmospheric pressure. This function is given in PSI.

e. The Cabin Altitude Rate of Change indicates the rate in feet per minute at which the cabin pressure is changing. The instrument dial is calibrated in 100 feet increments. The cabin altitude rate of

change is similar in function to the vertical velocity indicator except the cabin altitude rate of change indicator is referenced to cabin pressure instead of static air pressure.

Engine Instruments.

a. A Dual Fuel Quantity Indicator is located in the upper center portion of the instrument panel. The indicator has two pointers, left and right, and indicates in pounds and/or gallons the amount of re-

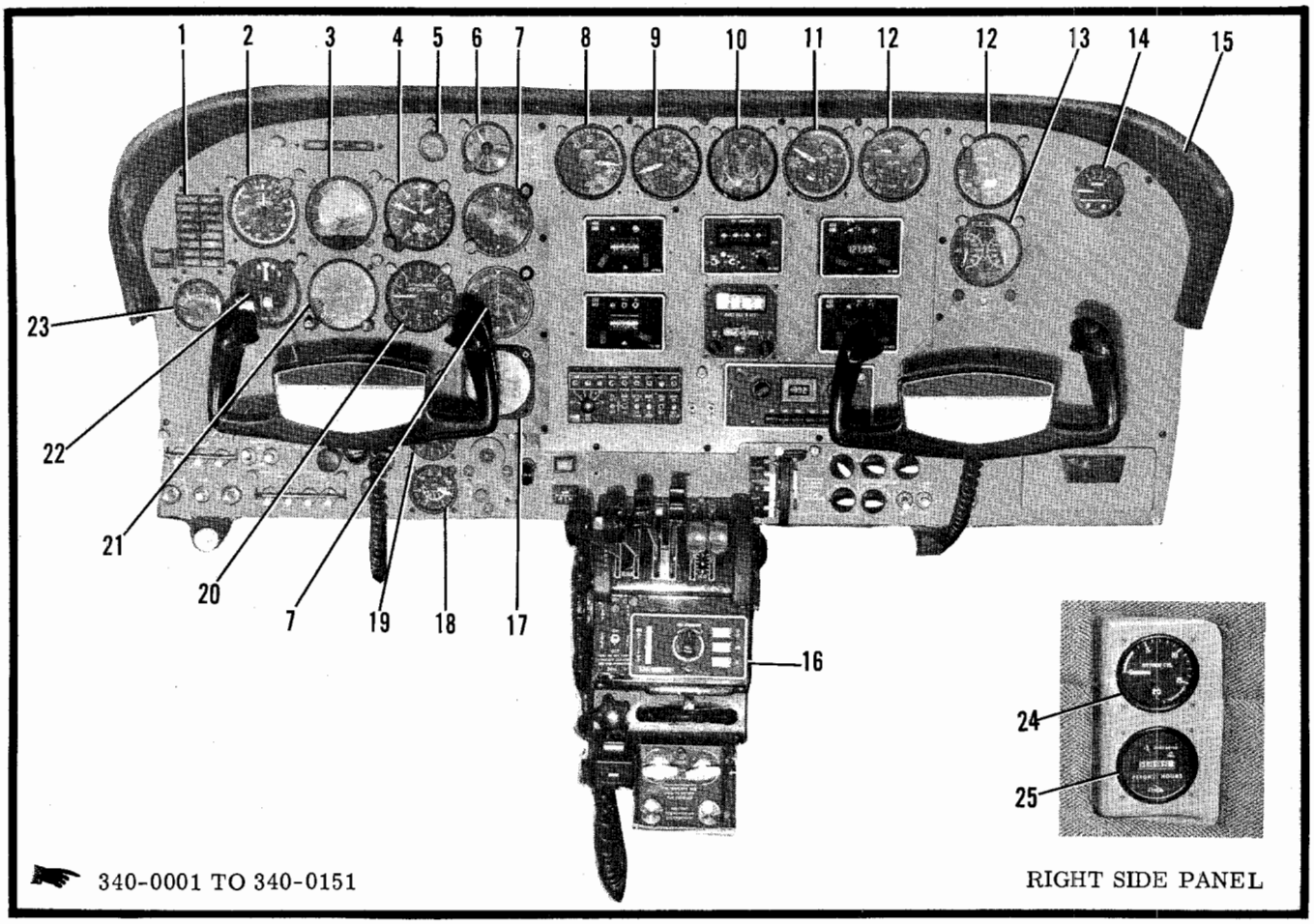
remaining usable fuel in either the main tank or auxiliary cell.

b. The Dual Fuel Flow Gage senses the pressure at which fuel is delivered to the fuel injection nozzles. The gage is a direct reading pressure gage and is calibrated in pounds per hour. The blue scale on the indicator is calibrated in gallons per hour for a comparison between pounds per hour and gallons per hour.

c. The Manifold Pressure Gage is a direct reading gage used to indicate the pressure of the induction air in the engine intake system. Two pointers indicate the manifold pressure in inches of mercury absolute.

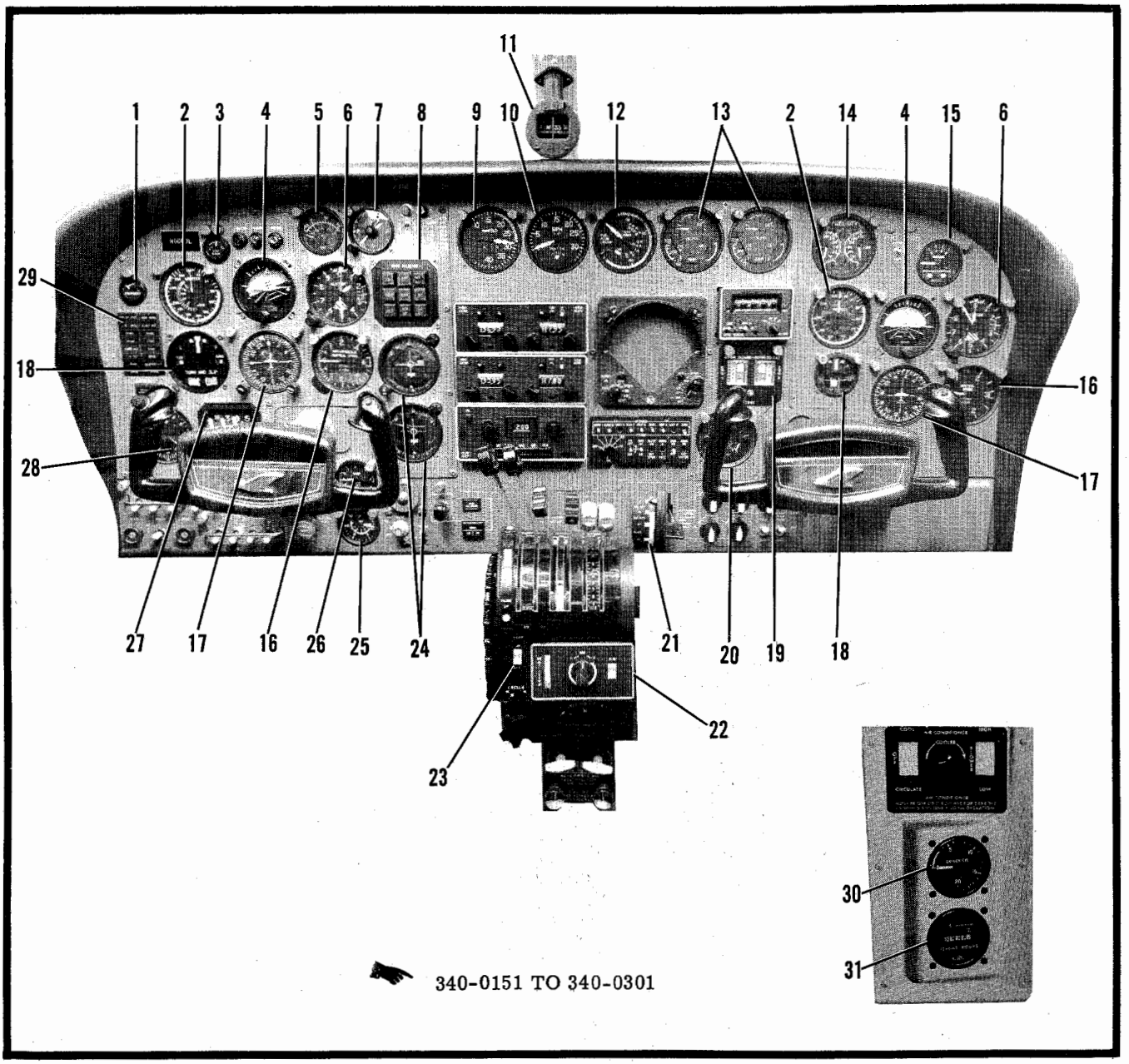
d. The Engine Combination Gages (Cylinder Head Temperature, Oil Temperature and Oil Pressure), one for each engine, are remote electrical indicators. Each gage is connected electrically to a cylinder head temperature bulb located underneath the number three cylinder on the LH engine and the RH engine. As the temperature of the bulb changes, the combination gage measures the change and the pointer indicates the temperature in degrees Fahrenheit. The oil temperature is electrically received from the oil temperature bulb, located in the engine oil passage and calibrated in degrees Fahrenheit. Oil pressure is taken directly from the pressurized engine oil passage. It is routed through small lines and hoses to the combination gage which calibrates the pressure to pounds per square inch.

e. The Dual Tachometer is a remote electrical instrument that is connected by electrical leads to a tachometer generator on each engine. The tachometer calibrates electrical current from the tachometer generator to revolutions per minute. The pointers, one marked for each engine, are concentrically mounted so that the engines may be synchronized visually by over-lapping the pointers.



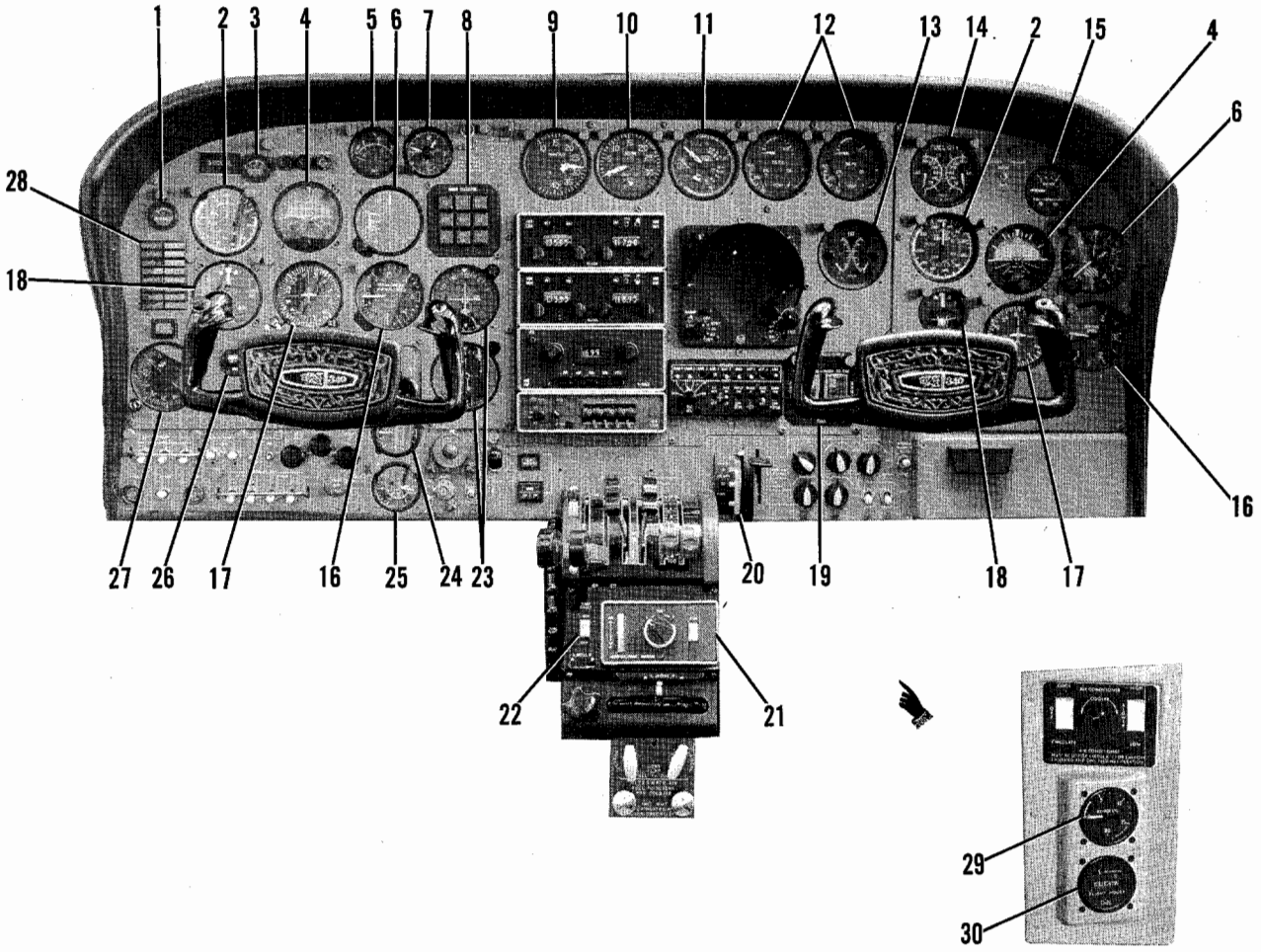

1. Annunciator Panel
2. Airspeed
3. Gyro Horizon
4. Altimeter
5. Propeller Deice Ammeter
6. Clock
7. VOR Indicator
8. Manifold Pressure
9. Tachometer
10. Economy Mixture
11. Fuel Flow
12. Engine Combination Gage
13. Fuel Quantity Gage
14. Suction Gage
15. Padded Glare Shield
16. Autopilot Flight Controller
17. ADF Indicator
18. Differential Pressure
19. Cabin Rate of Change
20. Vertical Speed
21. Directional Gyro
22. Turn and Bank
23. Outside Air Temperature
24. Oxygen Indicator
25. Flight Hour Recorder

Figure 12-1. Instrument Panel




1. Propeller Deice Ammeter
2. Airspeed
3. Slaving Meter
4. (ADI) Attitude Director Indicator
5. Outside Air Temperature Indicator
6. Altimeter
7. Clock
8. Mode Selector
9. Manifold Pressure Indicator
10. Tachometer
11. Compass
12. Fuel Flow Indicator
13. Engine Combination Gage
14. Fuel Quantity Indicator
15. Suction Gage
16. Vertical Speed
17. Directional Gyro
18. Turn and Bank Indicator
19. Fire Extinguisher Control
20. EGT Indicator
21. Flap Position Indicator
22. A/P Control Unit
23. Yaw Damper Switch
24. OBS Indicator
25. Differential Pressure Indicator
26. Cabin Rate of Change Indicator
27. DME Indicator
28. ADF Indicator
29. Annunciator Panel
30. Oxygen Pressure Indicator
31. Flight Hour Recorder

Figure 12-1A. Instrument Panel

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1. Propeller Deice Ammeter
2. Air Speed
3. Slaving Meter
4. (ADI) Attitude Director Indicator
5. Outside Air Temperature Indicator
6. Altimeter
7. Clock
8. Mode Selector
9. Manifold Pressure Indicator
10. Tachometer
11. Fuel Flow Indicator
12. Engine Combination Gage
13. EGT Indicator
14. Fuel Quantity Indicator
15. Suction Gage
16. Vertical Speed
17. Directional Gyro
18. Turn and Bank Indicator
19. Fire Extinguisher Control
20. Flaps Position Indicator
21. A/P Control Unit
22. Yaw Damper Switch
23. OBS Indicator
24. Cabin Rate of Change Indicator
25. Differential Pressure Indicator
26. DME Indicator
27. ADF Indicator
28. Annunciator Panel
29. Oxygen Pressure Indicator
30. Flight Hour Recorder

Figure 12-1B. Instrument Panel

Miscellaneous Instruments.

a. The Turn-and-Bank Indicator is a combination instrument. The turn indicator is an electrically-driven gyro mounted in a horizontal gimbal that is attached to a pointer which indicates the rate of turn. The slip indicator consists of a curved, liquid-filled glass tube in which an inclinometer ball, moving with dampened motion, changes positions according to the gravitational and centrifugal force acting upon the aircraft.

b. The Voltammeter, located on the left switch panel measures the current received from each alternator, individually or simultaneous, the battery drain or the battery bus voltage, whichever is desired, using the Voltammeter Selector Switch.

c. The Magnetic Compass is located on the windshield centerstrip. It consists of a pair of parallel magnetic bars surrounded by a circular calibrated compass card visible through a window in the compass case. The compass case is a metal bowl filled with liquid to dampen dial oscillation. Lighting is integral and controlled by a rheostat on the switch panel. The compass has two adjusting set screws, one for N-S headings and one for E-W headings. These set screws are located on lower face of compass behind the metal disc.

d. The Outside Air Temperature Gage is calibrated in degrees Fahrenheit and operated electrically from a free air temperature bulb located in the front of the heat exchanger air duct.

e. The Clock is a standard eight-day aircraft clock with a sweep second hand. A winding stem is provided in the lower left-hand portion of the case.

Typical Instrument Removal. (See figure 12-2.)

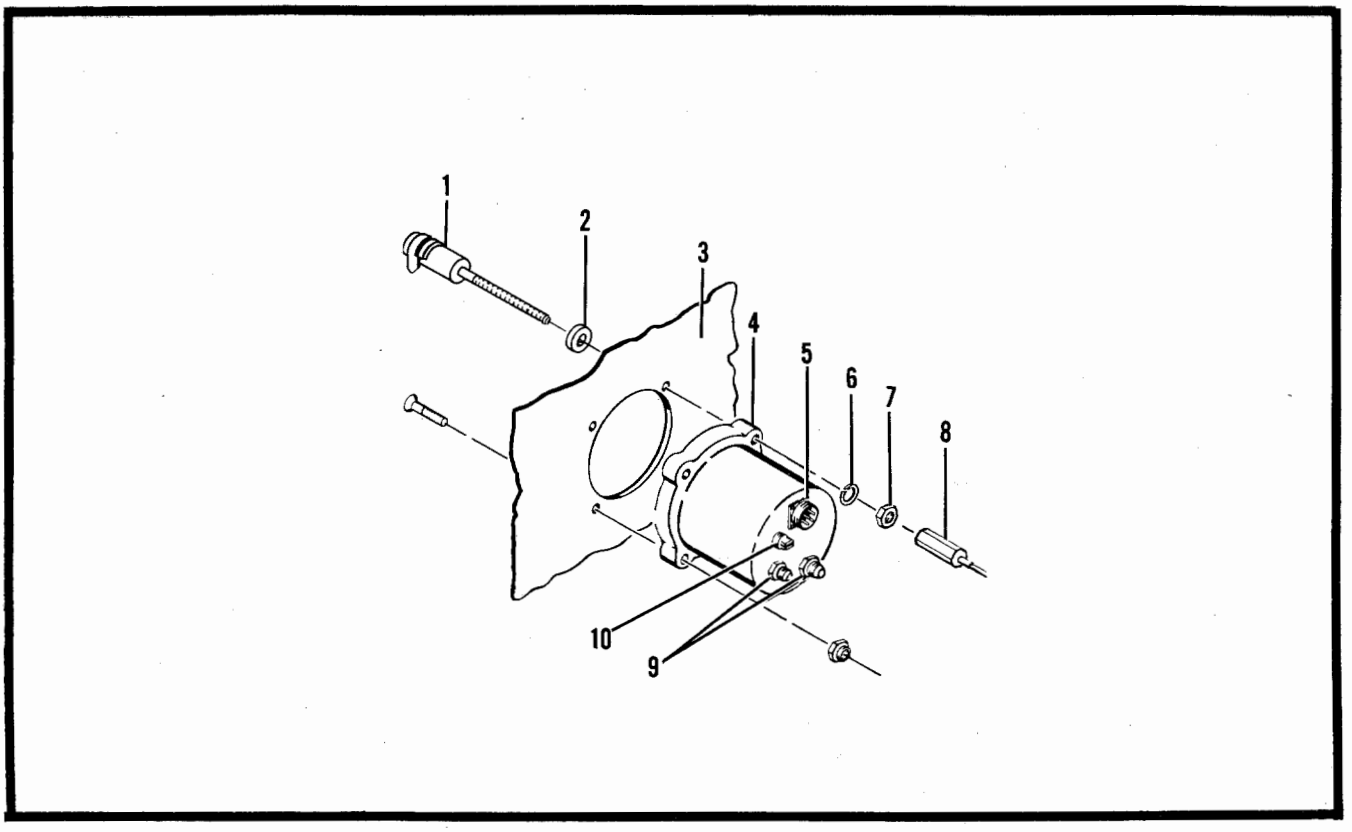
a. If instrument is not accessible, remove instrument panel in accordance with removal of instrument panel.

b. Disconnect and tag electrical wires and hoses from back of instrument being removed.

c. Plug all hoses and cap fittings to prevent the entry of foreign matter.

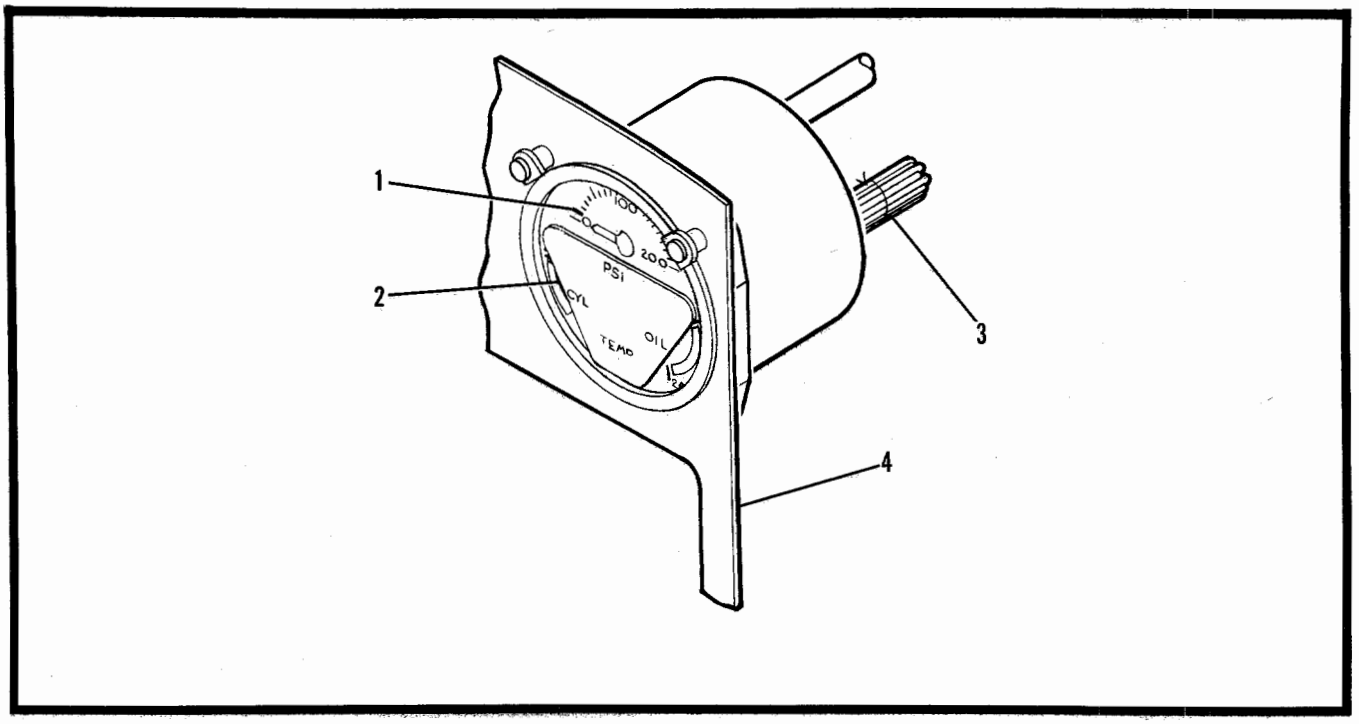
d. Remove the connector (8), nut (7), lockwasher (6), and spacer (2) from the lighting fixture (1) if installed on instrument.

e. Remove instrument (4) from panel (3) by removing nuts and screws.




1. Lighting Fixture
2. Spacer
3. Instrument Panel
4. Instrument
5. Electrical Connector
6. Lockwasher
7. Nut
8. Connector
9. Hose Fittings
10. Vent Plug

Figure 12-2. Typical Instrument Installation




1. Oil Pressure Line
2. Oil Temperature
3. Cylinder Head Wiring Bundle
4. Instrument Panel

Figure 12-3. Engine Combination Gage

NOTE

If the instrument is to be replaced, remove the hose fittings and install the replacement unit.

Typical Instrument Installation. (See figure 12-2.)

NOTE

Lubricate straight threads with specification petrolatum; tapered threads with specification anti-seize compound. Apply lubricant to male threads only, omitting the first two threads.

a. Position instrument (4) on back of instrument panel (3) and secure with attaching screws and nuts.

NOTE

Steps "b" and "c" should be omitted if no lighting fixtures are used to attach instrument.

b. Install lighting fixtures using spacers (2), lockwashers (6) and nuts (7).
c. Attach connectors (8) to lighting fixtures (1).
d. Connect hoses, tubing and electrical wires as tagged at removal.
e. Reinstall panel if removed.

Removal of Magnetic Compass. (See figure 12-4.)

a. Remove compass light wire.
b. Remove two mounting screws (4) securing compass to mounting bracket (3).

Installation of Magnetic Compass. (See figure 12-4.)

a. Position compass (5) on windshield centerstrip (2) and secure with two screws (4).
b. Connect compass light wire.

Compass Alignment Procedure.

The following procedures pertain to alignment of the magnetic (standby) compass and the flux detector on the slaved directional gyro. A calibrated compass rose must be used to accomplish the alignment procedures.

a. Insure compensator adjustments are set to a neutral position. The compensators are located on flux detector or gyro, depending on system.
b. Using a hand held magnetic compass, check all ferrous material parts for magnetism near the magnetic compass and flux detector.
c. Degauss any parts within two feet which cause greater than 10° deflection of the magnetic compass, and any part within four feet which cause greater than 90° deflection of the magnetic compass.

d. Insure that each of the applicable systems are controlled from the proper circuit breakers, and the corresponding "HDG" flag appears when the circuit breaker is disengaged.
e. Insure slave meter is operative.
f. Insure the systems fast slaving circuitry is operational.
g. Insure all electrical instruments for the aircraft are installed and operative.
h. Insure other aircraft and vehicles are a safe out of the way distance.
i. Position aircraft on the 270° heading of the compass rose.
j. With both engines running 1000 RPM, turn on the following:
1. All circuit breakers.
2. Inverters.
3. All lights except landing lights and reading lights.
4. All avionics systems.
5. All electrical systems except pitot heat, stall and static heaters.
6. Allow slaved gyro system to stabilize (stabilization speed may be increased by using fast slave).
7. Record the slaved gyro system error in degrees and direction with the slave meter nulled.
8. Record the standby compass error in degrees and direction.

NOTE

High readings are positive errors, low readings are negative errors.

9. Position aircraft on the 360° heading of the compass rose and repeat steps 1 thru 8.
10. Position aircraft on the 90° heading of the compass rose and repeat steps 1 thru 8.
11. Position aircraft on the 180° heading of the compass rose and repeat steps 1 thru 8.

Index Error Alignment.

This alignment should insure that the compass systems flux detector is positioned for a minimum index error.
a. Algebraically sum the four cardinal heading errors obtained in preceeding paragraph, steps j, 1 thru 8.
b. Divide the sum obtained by four. This result is the index error correction and direction of rotation of the flux detector.
c. Rotate flux detector the direction and amount as calculated in steps a and b. CCW rotation of the flux detector is required to correct a positive error.

NOTE

Approximately five degrees rotation equals approximately 1/8 inch distance measured on the outer circumference of the flux detector.

d. Repeat compass alignment procedure step j, 1 thru 8.
e. The remaining error at the cardinal headings as received in step d should equal the difference between the initial cardinal heading errors obtained originally in compass alignment procedures, step j, 1 thru 8.
f. Recalculate error and assure the remaining error is 0 ±0.5 degrees.

Compensation Adjustments.

a. If the corrected error as calculated in index error alignment paragraph step a is greater than ±2° the compensators must be adjusted. The index corrected errors are used to calculate the required amount of degrees of compensation required for the remote compass. The errors obtained in the compass alignment procedure step j, 1 thru 8 for the standby compass will be used to determine the required amount and degree of compensation for the standby compass.

Compensation Calculations.

a. Using cardinal heading errors calculated in index error alignment step e for remote compass system and compass alignment procedure for the standby compass, algebraically sum the north and south errors, divide this sum by two and change the sign of the result. The resulting number is the amount and direction of north/south compensator adjustment.
b. Repeat step a for east/west errors.

Compass Compensation.

a. At one cardinal heading, adjust the appropriate compensator the amount calculated in the compensation calculations paragraph step a.
b. Rotate the aircraft 90° and adjust the appropriate compensator the amount calculated.
c. Rotate the aircraft to the next two cardinal headings and insure that no errors greater than two degrees for slaved gyro systems or five degrees for the standby compass are present.
d. With normal aircraft power, all electrical systems on rotate the aircraft to 30° headings (including cardinals). Stop on each heading long enough to allow the gyros to stabilize and the slave meter to null.
e. Observe and record the headings indicated by the slaved gyro system.
f. Record the headings indicated by the standby compass at the 30° positions.
g. No error greater than ±5° shall be indicated by the standby compass.

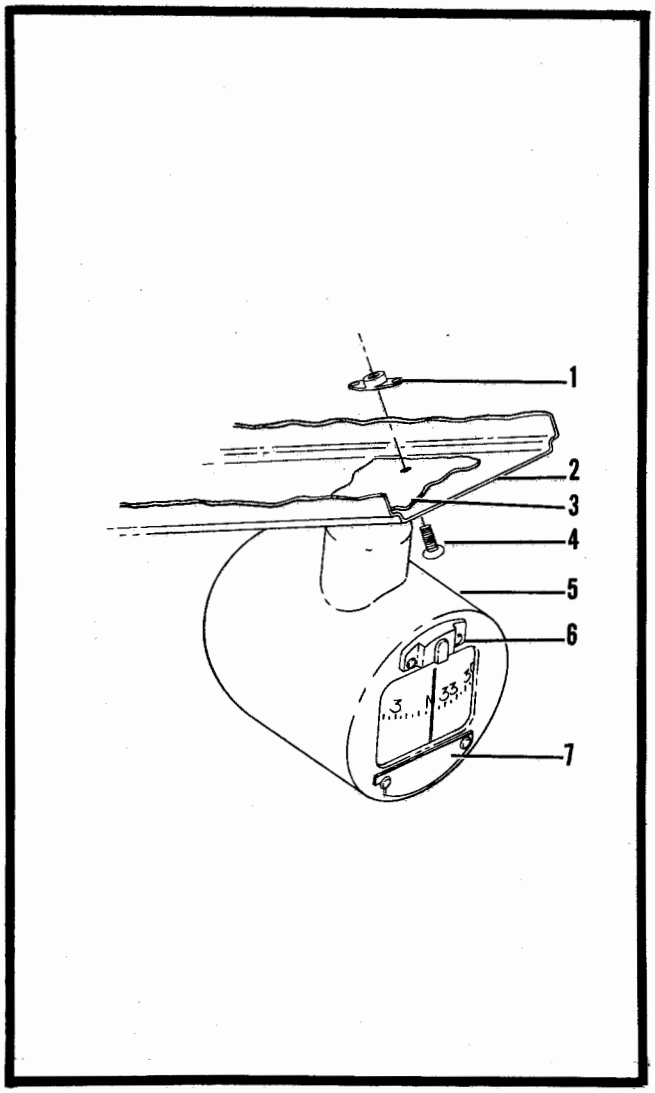
NOTE

The errors determined in step f shall be recorded on the compass correction card.

h. Turn off all electronic systems and shut down engines.

Typical Bulb Removal and Installation. (See figure 12-5.)

a. Tag and disconnect electrical connector (1).




1. Nutplate
2. Windshield Centerstrip
3. Mounting Bracket
4. Screw
5. Compass
6. Compass Light
7. Compensating Screws

Figure 12-4. Magnetic Compass

b. Remove bulb (2).
c. Install bulb by reversing removal procedures.

INSTRUMENT PANELS.

Removal of Instrument Panels. (See figure 12-1.)

a. Install the instrument panels as follows:
1. Disconnect tubing lines to instruments and tag.
2. Remove screws, washers, and spacers necessary to remove panel and pull aft enough to disconnect instrument hoses and electrical leads. Tag all hoses and electrical leads.

NOTE

Plug all lines and cap fittings to prevent entry of foreign objects.

b. Remove the avionics instrument panel as follows:
1. Remove screws and spacers from avionics panel and pull aft enough to disconnect instruments electrical leads.
2. Tag and remove electrical leads and remove panel.

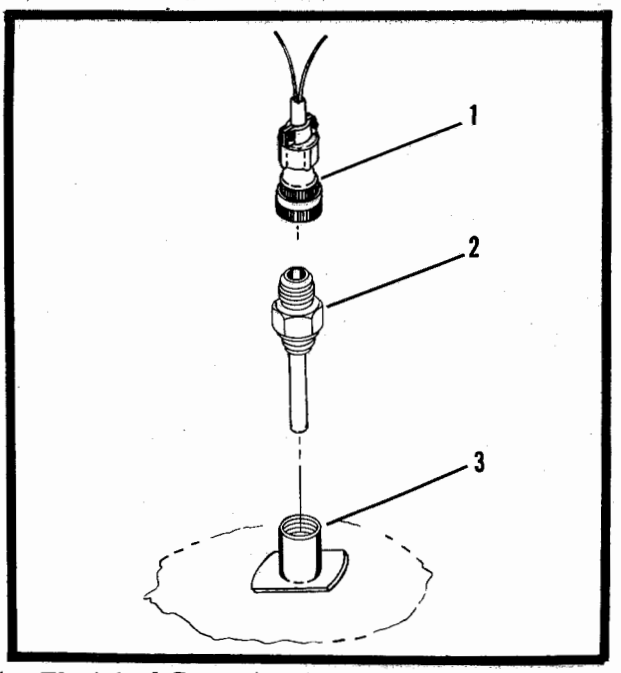
Installation of Instrument Panels. (See figure 12-1.)

a. Install the instrument panels as follows:
1. Position instrument panel to attach hoses and electrical leads as tagged at removal.

NOTE

Lubricate straight threads with specification petrolatum; tapered threads with specification anti-seize compound. Apply lubricant to male threads only, omitting the first two threads.

2. Install the instrument panel with screws, washers, and spacers.
3. Connect tubing lines to instrument.
b. Install the avionics instrument panel as follows:
1. Position the instrument panel, to attach electrical leads as tagged at removal.
2. Locate instrument panel and install with screws and washers to anchor nuts.




1. Electrical Connector 2. Bulb 3. Flange

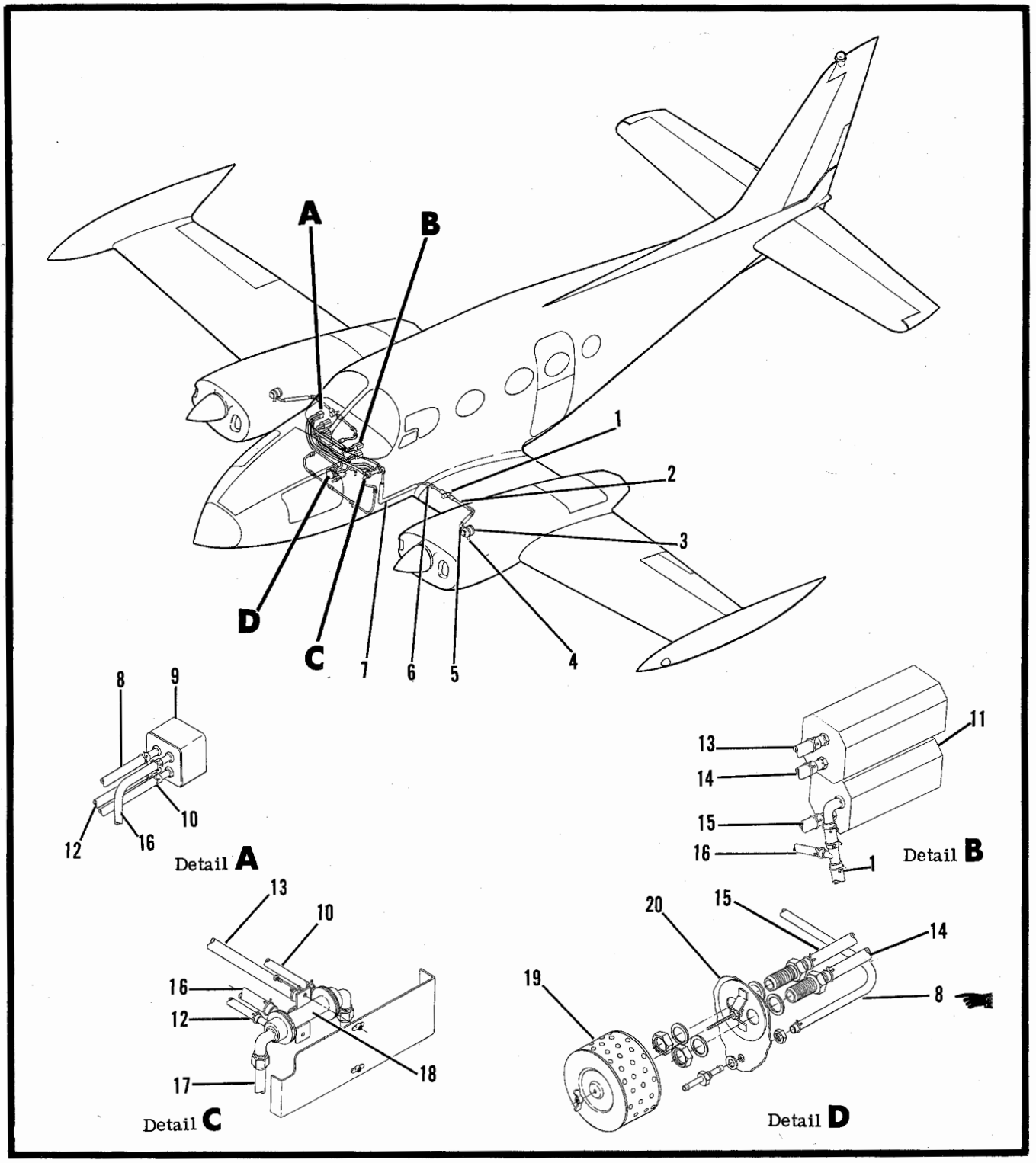
Figure 12-5. Indicator Bulb

VACUUM SYSTEM.

A dry vacuum pump. which requires no lubrication of any kind, is located on the aft right accessory mount pad of each engine. The pump outlets are exhausted into the engine nacelle. The vacuum line plumbing is routed from the vacuum pumps through the nacelles to the relief valves mounted in the wing root area. From the relief valves, the lines are routed through the cabin to the vacuum manifold located on the left side of the forward cabin bulkhead. The manifold has check valves included to prevent reverse flow, in the event of failure of either vacuum pump. Hoses are routed from the manifold to the directional gyro, horizontal gyros, and suction gage. Other hoses connect the gyros to a vacuum air filter located on the forward side of the forward cabin pressure bulkhead and to the suction gage. The suction gage is vented to ambient air through a fitting mounted in the forward cabin bulkhead. The suction gage indicates amount of vacuum present in the system; also provided are operational indicator buttons for each pump. The vacuum air filter is provided to remove dust particles and vapor from the air, providing dry, clean air for the instruments.

Troubleshooting the Vacuum System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NO SUCTION INDICATED AT ONE SOURCE | Defective vacuum pump. | Check suction at pump. Replace pump. |
| | Disconnected, broken or plugged lines or hoses. | Check suction through lines and hoses. Clean or replace lines and hoses. |
| | Defective relief valve. | Check suction to and from relief valve. Replace relief valve. |
| | Defective suction gage. | Check suction at applicable line to test indicator buttons. Replace suction gage. |
| NO SUCTION INDICATED, BUT GYROS OPERATE NORMALLY | Defective suction gage. | Check suction to gage. Replace gage. |
| LOW SUCTION | Defective vacuum pump. | Check suction at pump. Replace pump. |
| | Leaking or restricted lines or hoses. | Clean or replace lines and hoses. Check suction through lines and hoses. |
| | Defective or improperly adjust relief valves. | Check suction to relief valves. Adjust relief valve in accordance with adjusting procedures. Replace if defective. |
| | Defective check valves. | Check operation of check valves. Replace manifold assembly. |
| HIGH SUCTION | Relief valve air filters dirty. | Check operation with filters removed. Clean or replace filters. |
| | Defective or improperly adjusted relief valve. | Check suction to relief valves. Adjust relief valves in accordance with adjusting procedures. Replace if defective. |
| SUCTION GAGE FLUCTUATES | Excessive vibration. | Visually check for panel, gage or plumbing vibration. Determine cause of vibration and correct. |
| | Defective suction gage. | Check for fluctuating suction to gage. Replace gage. |




1. Relief Valve
2. Wing Line
3. Vacuum Pump
4. Outlet Hose
5. Inlet Hose
6. Aft Line Fuselage
7. Intermediate Hose
8. Static Hose
9. Suction Gage
10. Left Indicator Hose
11. Directional Gyro
12. Right Indicator Hose
13. Horizontal Gyro Hose
14. Left Filter Hose
15. Right Filter Hose
16. Directional Gyro Hose
17. Vacuum Source
18. Vacuum Manifold
19. Vacuum Air Filter
20. Forward Pressure Bulkhead

Figure 12-6. Vacuum System

NOTE

All flexible and fixed line fittings, clamps, relief valves, and filters must be cleaned and suitably protected by caps or bags until installed in aircraft. The vacuum system shall not be open while awaiting the remaining parts to be installed. Prior to running of the vacuum pumps, the lines shall be flushed with air to approximately seven (7) cubic feet per minute while alternately closing off the ends of the lines. This will create pressure pulses to dislodge and eject foreign particles.

Removal of Vacuum Pumps. (See figure 12-6.)

a. Remove upper nacelle cowl.
b. Loosen the two hose clamps securing hoses (5 and 4) to the vacuum pump (3).
c. Remove vacuum pump (3) by removing four attaching nuts and washers.

NOTE

Do not clean vacuum pump (3) in solvent. Clean by wiping with a clean cloth.

Installation of Vacuum Pumps. (See figure 12-6.)

NOTE

If a new vacuum pump is being installed, remove the serviceable fittings from the old pump and install the fittings on the new pump. Use no oil of any sort, no thread lubricant of any description on any fitting used on the inlet side of the vacuum pumps. Make sure inlet fitting on the dry vacuum pump has an inlet screen.

a. Align splines on the vacuum drive (3) with splines on the engine drive and slide vacuum pump into position so the ports are facing to the right.
b. Secure vacuum pump (3) to the engine with four washers and nusts.
c. Slide vacuum line hose (4) and clamp onto the IN port of the vacuum pump and secure clamp.
d. Slide vacuum pump outlet hose (5) and clamp on to the OUT port of the vacuum pump and secure clamp.
e. Install upper nacelle cowl.

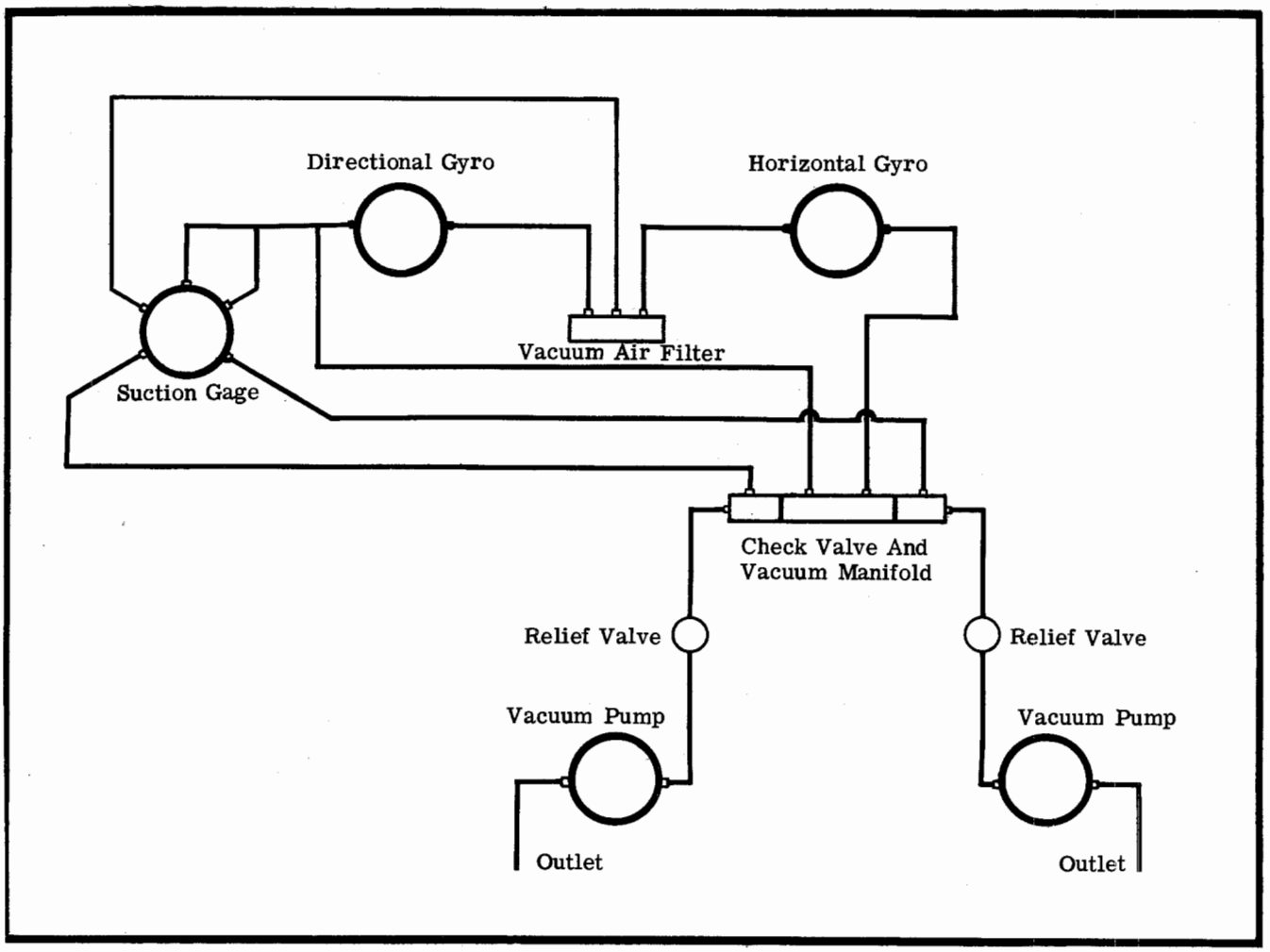



Figure 12-7. Vacuum System Schematic

Removal of Vacuum Air Filter. (See figure 12-6.)

a. Disconnect filter hoses (8, 14 and 15) from filter fittings.
b. Remove vacuum air filter (19) from forward side of the left-hand bulkhead by removing wing nut.

Replacement of Vacuum Air Filter Element.

NOTE

Removal of the air filter is not required to replace the vacuum air filter element.

a. Remove safety wire and wing nut from the vacuum air filter (18).
b. Remove vacuum air filter element.
c. Install new vacuum air filter element.
d. Fasten element in place using wing nut.
e. Safety wire wing nut.

Installation of Vacuum Air Filter. (See figure 12-6.)

Installation of the vacuum air filter is the reversal of the vacuum air filter removal procedures.

Removal of Vacuum Relief Valve. (See figure 12-6.)

a. (See figure 1-3.) Remove wing gap skin.
b. Remove relief valve (1) by loosening hose clamps, then slide hoses off of valve.
c. Remove valve (1).

Installation of Vacuum Relief Valve. (See figure 12-6.)

Installation of the vacuum relief valve is the reversal of the vacuum relief valve removal procedures.

Adjustment of Vacuum Relief Valve.

Since a relief valve is used for each vacuum source, each relief valve must be adjusted separately.
a. (See figure 1-3.) Remove wing gap skin.
b. Remove safety wire from adjusting screw locknut.
c. Start the engines and idle the right engine.
d. With the left engine operating and tachometer reading 1700 RPM, the suction gage should read 5.00 inches of mercury.
e. Adjust the left relief valve by loosening the knurled screw locknut and adjusting to obtain the desired vacuum reading, clockwise rotation of the adjusting screw increases the vacuum.
f. Idle the left engine and operate the right engine so tachometer reads 1700 RPM.
g. Adjust the right relief valve by loosening the knurled screw locknut and adjusting to obtain the desired vacuum reading. Clockwise rotation of the adjusting screw increases the vacuum.
h. With both engines operating at tachometer RPM of 1700, the suction gage should read 5.00 ±0.25 inches of mercury. If the gage reading is not within these limits, the relief valves should be readjusted to these limits.
i. Shutdown both engines and check that the locknuts on the knurled adjusting screw are tight.

Removal of Vacuum System Plumbing. (See figure 12-6.)

NOTE

Removal procedure will be given for left engine installation only. Removal of right engine installation is basically the same.

a. Remove engine cowling in accordance with removal procedures.
b. Remove hose (5) by loosening clamp and removing.
c. Remove hose (4) by loosening clamp at vacuum pump and detaching from union at wing rib.
d. Removal of line (2) is not recommended except as required for replacement. The replacement of the line with a hose to facilitate installation is permissible.
e. Remove pilot's seat, copilot's seat, floorboards and carpet in accordance with Section 3.
f. Remove aft cabin vacuum line (6) by disconnecting at fuselage skin union and intermediate line union.
g. Remove intermediate hose (7) by disconnecting at aft line union and forward line union.
h. Remove left upholstery side panel in accordance with Section 3.
i. Remove manifold line by disconnecting from union at support bracket and from union at manifold (18).
j. Remove manifold (18) by disconnecting all hoses from manifold and removing two screws.
k. Remove hose from manifold (18) to instrument and instrument to filter by removing clamps at manifold and disconnecting hoses at instrument.

Installation of Vacuum System Plumbing. (See figure 12-6.)

NOTE

Slight bending of the vacuum line may be required to facilitate installation, however, excessive bending should be avoided. Use no oil of any sort, no thread lubricant of any description on any fitting used on the inlet side of the vacuum pumps.

a. Reverse the vacuum system plumbing removal procedure except installation of the upholstery panel, wing panels, access panels, carpet, floorboards, pilot's seat and copilot's seat.
b. Check vacuum system and adjust the relief

valves if system vacuum gage indication is not within the specified limits.

c. Install the upholstery panel, wing panels, access panels, carpet, pilot's seat, copilot's seat and nacelle cowls.

PITOT STATIC SYSTEM.

The pitot tube is mounted in the nose of the fuselage left of center. The optional dual pitot tube is mounted right of center. Both tubes are connected with plastic tubing to the airspeed indicator providing it with ram air pressure. An electrical heating element is installed within the pitot tube to prevent ice from obstructing the pitot tube opening during severe weather conditions. The static pressure is provided by two holes mounted on opposite sides of the fuselage, aft of the cabin compartment. These are connected with metal lines and routed forward through the right side of the fuselage to a tee. The static drain valve is forward of the tee and is accessible through the copilot's side pocket. The static pressure line is routed from the tee up the right side and across to the altimeter, vertical speed indicator and airspeed indicator. The left static drain valve and the alternate static source valve which substitutes an alternate ambient air pressure for atmospheric air pressure in emergencies is located forward of the left-hand switch and circuit breaker panel. The valve is attached to the airspeed indicator by a hose.

Removal of Pitot and Static Lines. (See figure 12-9.)

The location of all pitot and static lines are shown in figure 12-9. All lines are standard aluminum tubing and fittings. (All of the lines are equipped with the conventional fittings and may be removed when necessary.) Lines and fittings may be cleaned by immersing in denatured alcohol or tri-ethyl alcohol and dried with filtered compressed air.

Installation of Pitot and Static Lines. (See figure 12-9.)

a. Install lines as illustrated in figure 12-9.

NOTE

Apply a small amount of suitable thread lubricant to male threads of all metal fittings before installation.

Testing Static Pressure System. (See figure 12-9.)

When testing the static pressure system, it will be necessary to evacuate the system using a vacuum source capable of 9 inches Hg. to provide an instrument altitude indication of 9550 feet. See figure 12-11 for test equipment and connection schematic.

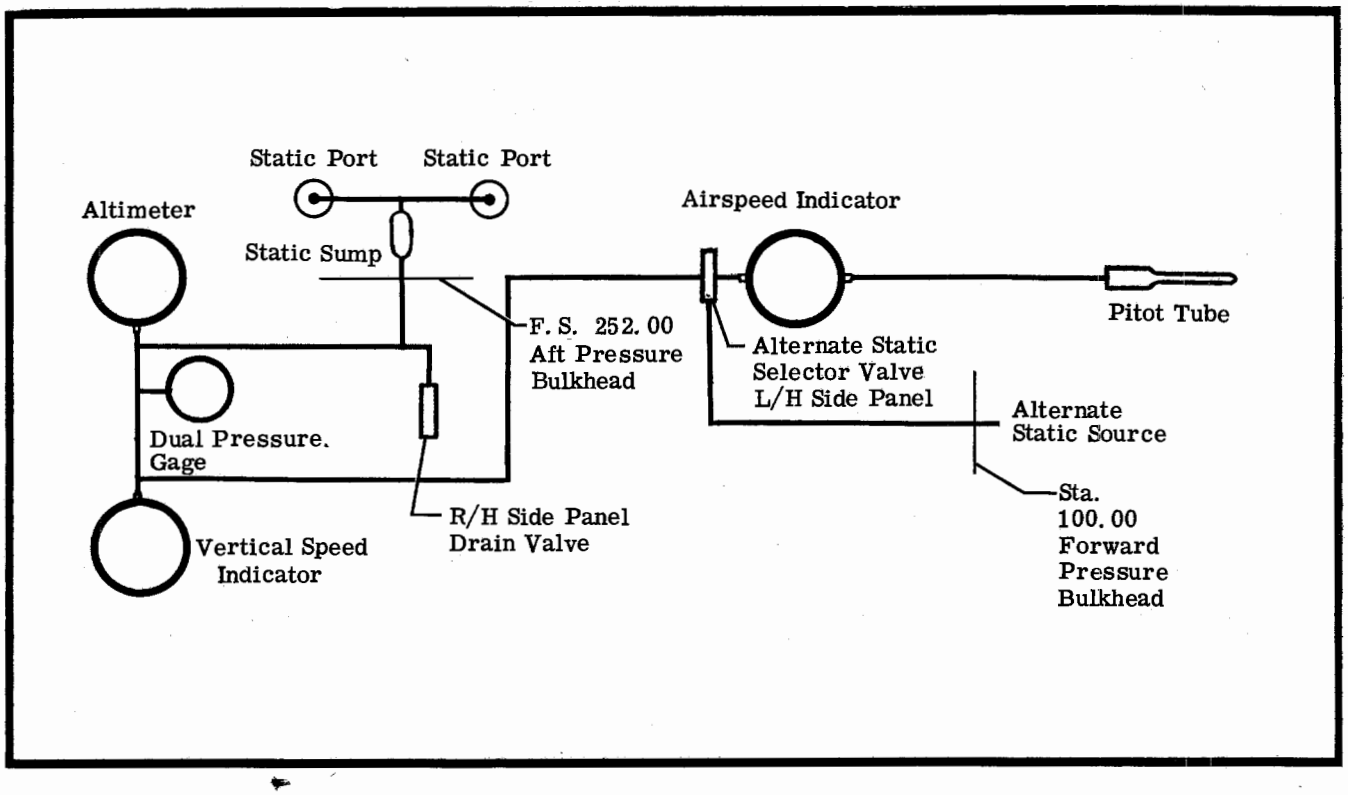
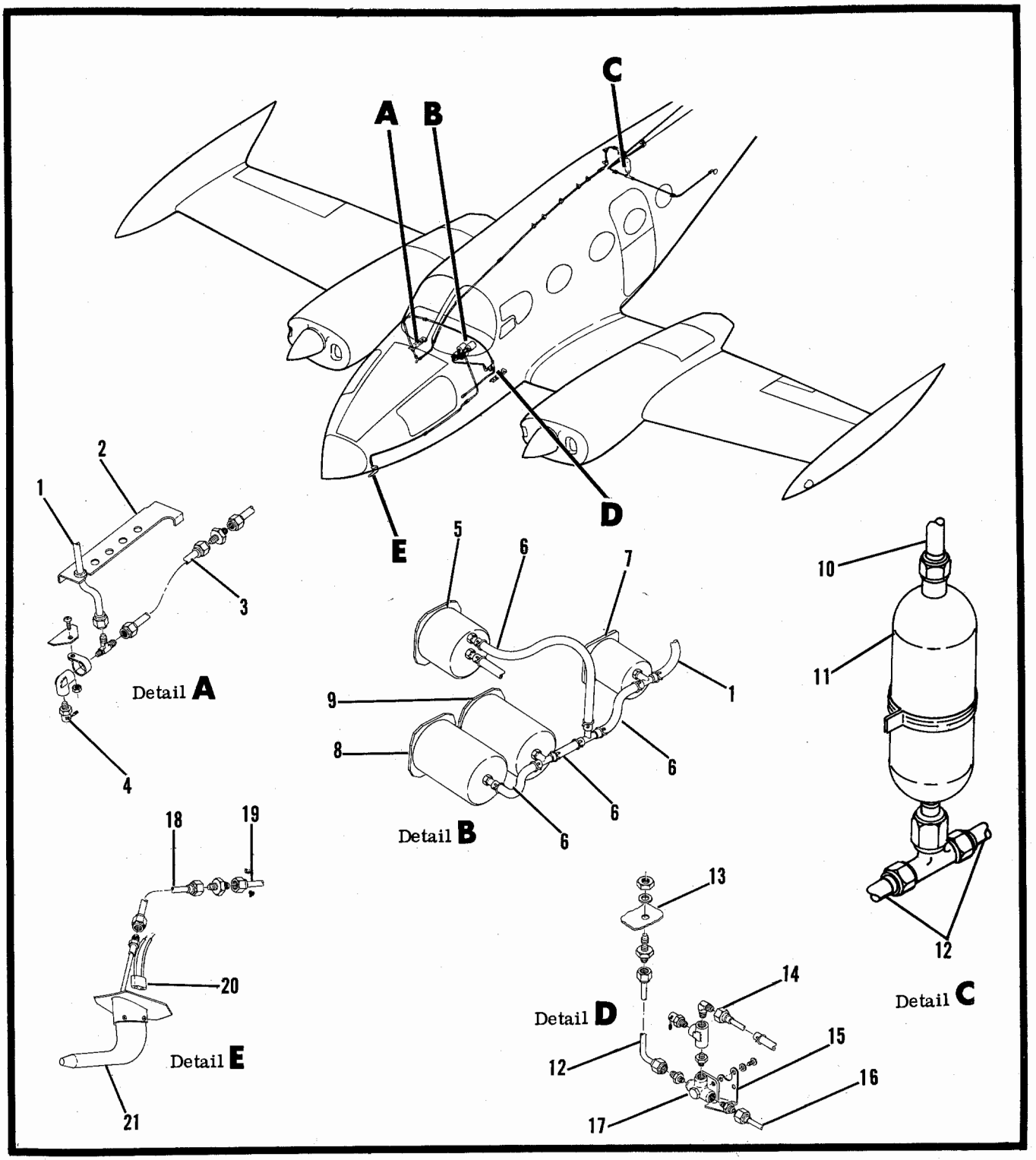



Figure 12-8. Pitot Static System Schematic




1. Forward Static Line
2. Bracket
3. Fuselage Station Line
4. Drain Valve
5. Airspeed Indicator
6. Static Line to Instrument
7. Dual Pressure Gage
8. Vertical Speed Indicator
9. Altimeter
10. Aft Static Line
11. Sump
12. Static Crossover Line
13. Support Bracket
14. Static Line
15. Valve Bracket
16. Alternate Static Line
17. Alternate Valve
18. Pitot Line
19. Pitot Line to Instrument
20. Electrical Bundle
21. Pitot Tube

Figure 12-9. Pitot Static System

NOTE

If autopilot is installed turn off all electrical power.

a. Set all altimeters to zero.
b. Close static drain valve (4).
c. Alternate static system valve (17) must be closed.
d. Carefully seal static ports in tailcone with masking tape.
e. Connect vacuum source to the alternate static system bulkhead fitting at station 100.00 lower left side of nose compartment.
f. Disconnect pitot line at aft cabin airspeed indicator.
g. Attach vacuum line to airspeed pitot tube. This is to equalize pressure within the cockpit airspeed instruments to prevent damage when vacuum is applied to the static system.

NOTE

Do not use positive pressure in the static system with the instruments connected. When applying or releasing vacuum from the static system, care should be taken not to exceed the range of the rate of climb indicator as instrument damage could result.

h. Close pitot control valve to protect airspeed indicators during the test in step (i). 27
i. With the alternate static valve (17) closed apply vacuum to the line between the vacuum source attachment and the alternate static valve (17) until 9550 feet is indicated on the altimeter. Lock pressure in the line by closing the vacuum control valve and immediately check leak down rate for one minute. The indicated altitude loss should not exceed 190 feet per minute. Tap indicator lightly during leak down check.
j. Release vacuum slowly and change alternate static valve (17) to the open position.
k. Apply vacuum to the static system until altimeters indicate approximately 3500. Slowly open pitot control valve to apply enough vacuum to equalize pressure and stabilize the airspeed indicators.

NOTE

Care must be taken during evacuation of the static system above 3500 feet indicated altitude to prevent damaging airspeed indicators. This can be done by metering vacuum to the pitot system through the pitot control valve, to keep from exceeding instrument range.

l. Continue to evacuate the static system until 9550 feet is indicated on the altimeters. Lock pressure in the static and pitot systems by closing both test control valves and immediately check leak down rate for one minute, tap altimeter lightly during leak down check.
m. A leak down rate of 190 feet per minute or less indicates the static system is within the allowable tolerance and has satisfactorily completed the test.
n. Slowly release the vacuum from the pitot and static systems, remove the test equipment, close the alternate static valve (17) and remove tape from static ports in tailcone. Reconnect aft cabin airspeed indicator if installed to return aircraft to service.

Isolation of Excessive Static System Leakage.

If the system leak down rate exceeds 190 feet per minute, the leakage must be located and corrected. Possible sources are the static port assemblies, system connections and fittings, selector and drain valves and instrument case leakage. When checking for excessive leakage proceed as follows:

a. Remove the static line from one of the tailcone static ports and plug the line. Apply vacuum to the system and leak check for one minute as described above. Check the leakage rate. Repeat the above test with the other static port disconnected from the system. If system leak down rate is improved with static ports out of the system, either or both ports are leaking and should be resealed or replaced as follows:
1. Remove static port by drilling out four rivets. Install a tube in the static port, seal the vent hole securely, apply positive pressure while static port is immersed in water to detect leakage. If the static port is leaking replace it.
2. If the static port assembly does not leak it should be reinstalled and sealed using PR1422 (MIL-S-8802).

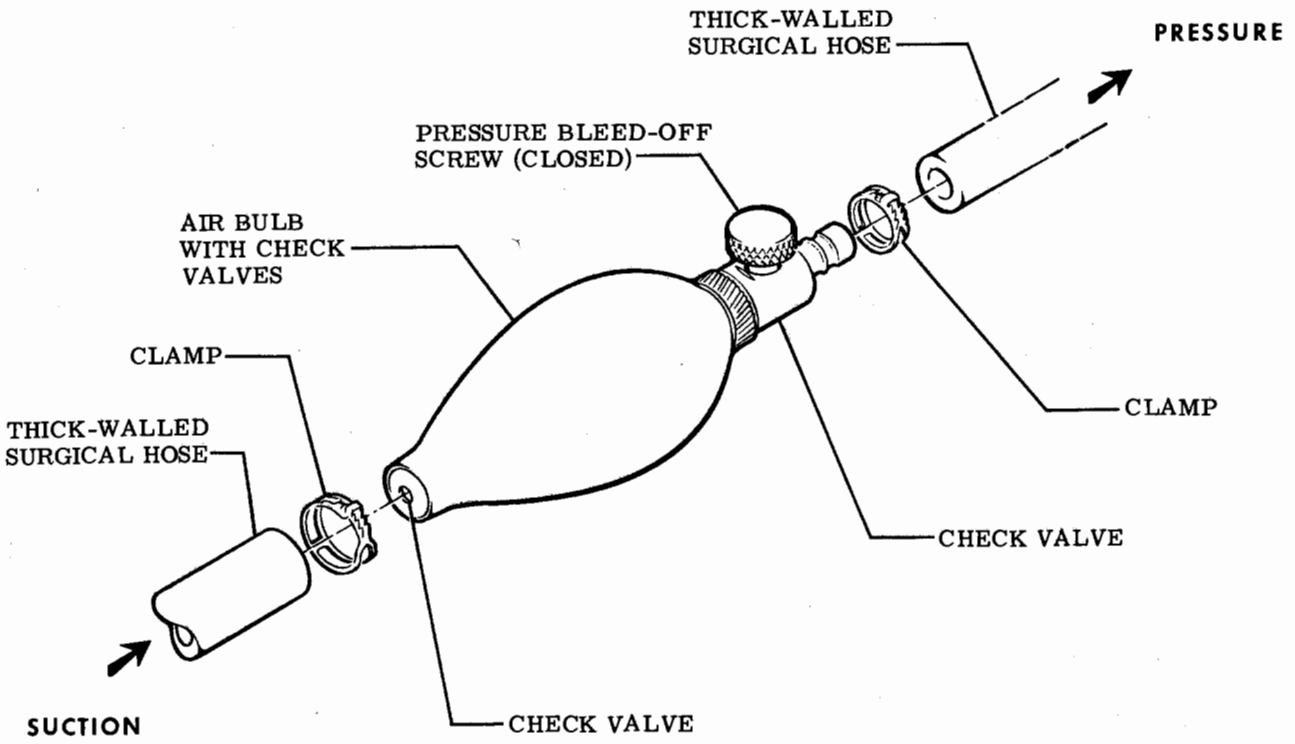
NOTE

Insert a wire through the vent hole to prevent sealant from plugging hole. Do not apply vacuum to port, for a period of 4 hours after resealing to allow sealant to set. Remove wire after sealant has set.

b. Connect static port lines together and apply vacuum to 9550 feet altitude and check leak down rate for one minute.
c. If static system leak down rate is still in excess of 190 feet per minute, slowly remove the vacuum source, disconnect and plug cockpit instrument static line at the instrument side of the drain valve (located at the copilot's side pocket). This isolates the cockpit instruments from the remainder of the system.
d. Slowly apply vacuum to the static and pitot systems of the cockpit instruments as described previously (monitor pitot vacuum above 3500 feet) until 9550 feet altitude is indicated. Lock pressure in the system and conduct leak check for one minute.
e. A leak rate of less than 190 feet per minute indicates cockpit instrument system is satisfactory and excessive system leakage is isolated to the remainder of the system in the fuselage.
1. Remove line fittings at static system drain valve, aft cabin bulkhead and tailcone sump and make sure fittings are not cracked. Reinstall fittings using a light coating of Parker thread lube or equivalent for sealant.
2. Reconnect the cockpit instrument system and

NOTE

Air bulb with check valves may be obtained locally from a surgical supply company. This is the type used in measuring blood pressure.




TO TEST PITOT PRESSURE SYSTEM

1. Connect pressure hose to pitot tube.
2. Slowly squeeze air bulb to apply desired pressure to pitot system. Desired pressure may be maintained by repeatedly squeezing bulb to replace any air escaping through leaks.
3. Release pressure by slowly opening pressure bleed-off screw, then remove test equipment.

Figure 12-10. Pitot System Test Equipment

the fuselage system at the static drain valve. Apply vacuum to the test altitude to check leak down rate. If leakage is less than 190 feet per minute the system is satisfactory.

f. A leak down rate in excess of 190 feet per minute while testing cockpit instruments, as described in item (d) above, requires that the leakage be isolated and corrected.

1. Release vacuum from the cockpit instrument system and remove the glove box for easier access to lines behind the instrument panel.
2. Disconnect and plug pitot and static lines between pilot and copilot instrument group (copilot optional instruments) behind the copilot's instrument panel.
3. With pilot's instruments isolated, apply vacuum to the pitot and static systems (monitor airspeed pitot vacuum above 3500 feet) until 9550 feet altitude is reached and conduct leak check for one minute.
4. If leak rate for the pilot's instrument group is less than 190 feet per minute, release vacuum slowly from the system, reconnect pilot and static lines between pilot and copilot instrument groups coupling the cockpit instruments together again.
5. The above test indicated excess leakage in the copilot instrument group. Check for leak as follows:
   (a) Isolate copilot instruments in the following order, one at a time - airspeed rate of climb indicator and altimeter. Disconnect and plug the static line at the instrument (both pitot and static lines for airspeed) and apply vacuum to the remainder of the system, until a 9550 foot altitude is reached and conduct leak down check for one minute.
   (b) After each instrument is tested by removing it from the system, lines should be reconnected to each acceptable instrument before proceeding. The results of these tests will show the source of leakage.
   (c) Instruments found to be leaking excessively should be replaced.
6. If the test of the pilot's instruments (f. 4. above) indicates a leak rate over 190 feet per minute, the following isolation procedure is required:
   (a) Release vacuum from the system and isolate instruments in the following order, one at a time - airspeed, rate of climb, cabin differential pressure gage and altimeter. Disconnect and plug the static line at the instrument (both pitot and static lines for airspeed). Apply vacuum to the remainder of the system until the test altitude is reached and check leak down rate for one minute.
   (b) Reconnect each acceptable instrument to the static system before proceeding. If instruments leak replace instruments.

NOTE

If leakage is indicated at a point other than the pilot's instruments, be sure to test the static line to the autopilot computer.

7. With leakage isolated and corrected in the cockpit instrument system and in the fuselage system, reconnect lines to the tailcone static ports. Check security of connections of static lines at the drain valve.
8. Apply vacuum to the complete system (monitor airspeed pitot vacuum above 3500 feet) until 9550 feet is indicated on the altimeters. Lock pressure in the static and pitot systems and check leak down rate for one minute. The altitude loss should not exceed 190 feet per minute.
9. Replace glove box, remove test equipment, connect pitot line at the aft cabin airspeed, close alternate static valve and replace access openings to return the aircraft to service.

CAUTION

If static drain valve is left open during flight, damage to instruments can occur.

Testing Pitot Pressure Lines. (See figure 12-9.)

a. Connect a pressure source to opening in pitot tube assembly (21).
b. Apply pressure slowly until airspeed indicator reads 150 MPH; shutoff pressure, seal opening and wait one minute.

CAUTION

The amount of pressure required for a 150 MPH indication is less than 1/2 PSI. Avoid high pressures as instrument damage will result.

c. If airspeed indicator (5) drops more than 10 MPH in one minute, disconnect hose from airspeed indicator (4).
d. Plug hose and apply pressure.
e. Coat lines and connections with a solution of soap and water to locate leak.
f. Tighten or repair faulty connections or replace lines. Connect hose to instrument and repeat step (b) to be certain connections and lines do not leak.

CAUTION

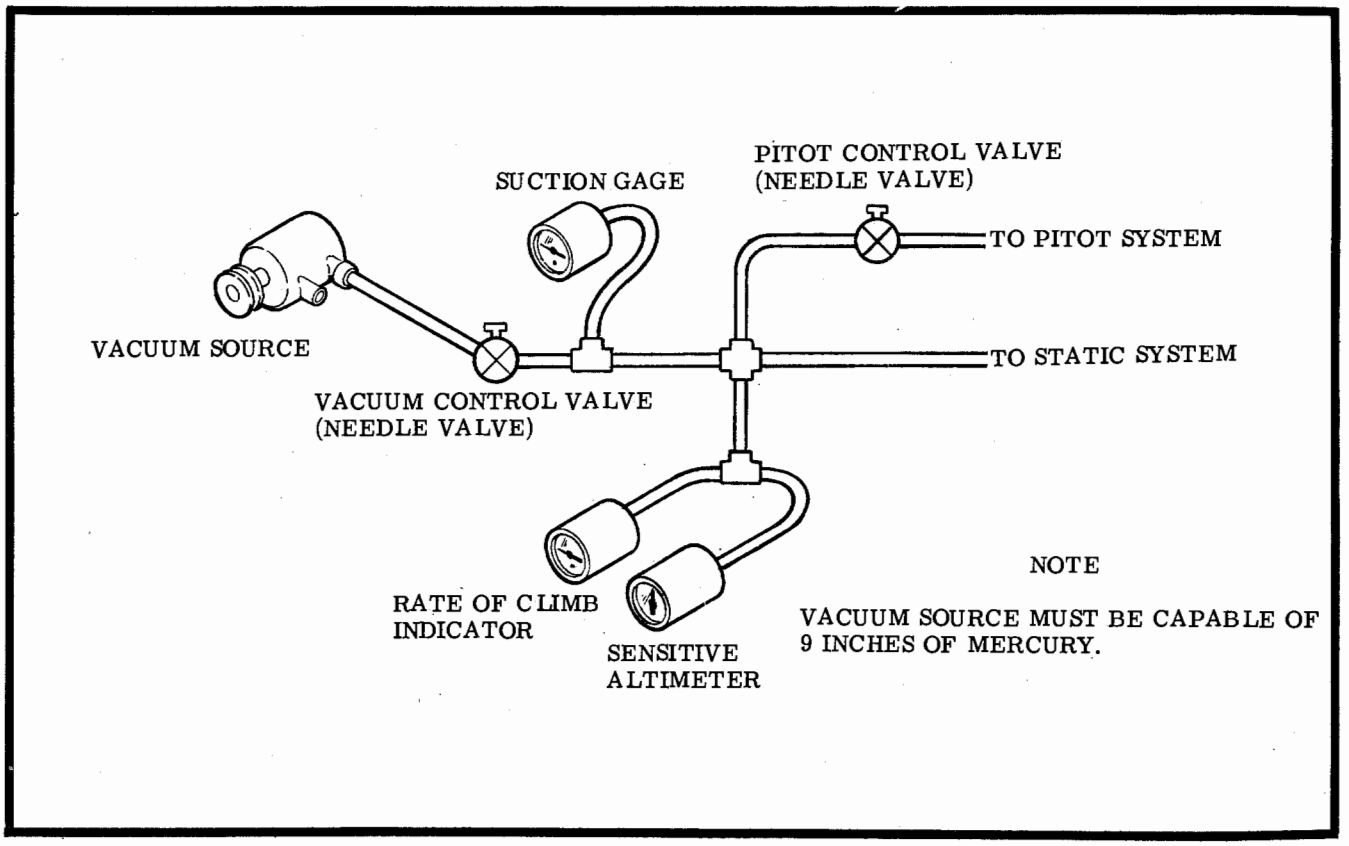
Do not apply suction to pitot pressure system unless static system is being tested.

Purging the Pitot or Static Lines.

Although the pitot system is designed to drain down to the pitot tube opening, condensation may collect at other points in the system and produce a partial obstruction. To clear the line, disconnect it at the airspeed indicator and, using low pressure air, blow from the indicator end of the line toward the pitot tube.

CAUTION

Never blow through the pitot or static lines toward the instruments. Doing so may damage them. If autopilot is installed with altitude hold, disconnect the static line from the computer before blowing out lines.




1. Pitot Control Valve
2. Sensitive Altimeter
3. Rate of Climb Indicator
4. Vacuum Control Valve
5. Vacuum Source
6. Suction Gage

Figure 12-11. Typical Static System Test Equipment

Like the pitot lines, the static pressure lines must be kept clear and the connections tight. The system has static source sumps that collect moisture and keep the system clear. However, when necessary, purge the system as follows:

a. Turn static source selector valve to alternate source.
b. Open static source drain line.
c. Plug one static port.
d. Purge system from the drain valve with clean moisture-free air for a period of at least two minutes.
e. Plug opposite static port and repeat step d.
f. Close static drain valve and turn static source selector valve to main system.
g. Check all static pressure line connections for tightness.
h. Replace hoses which have cracked, hardened or show other signs of deterioration.

Removal of Pitot Tube. (See figure 12-9.)

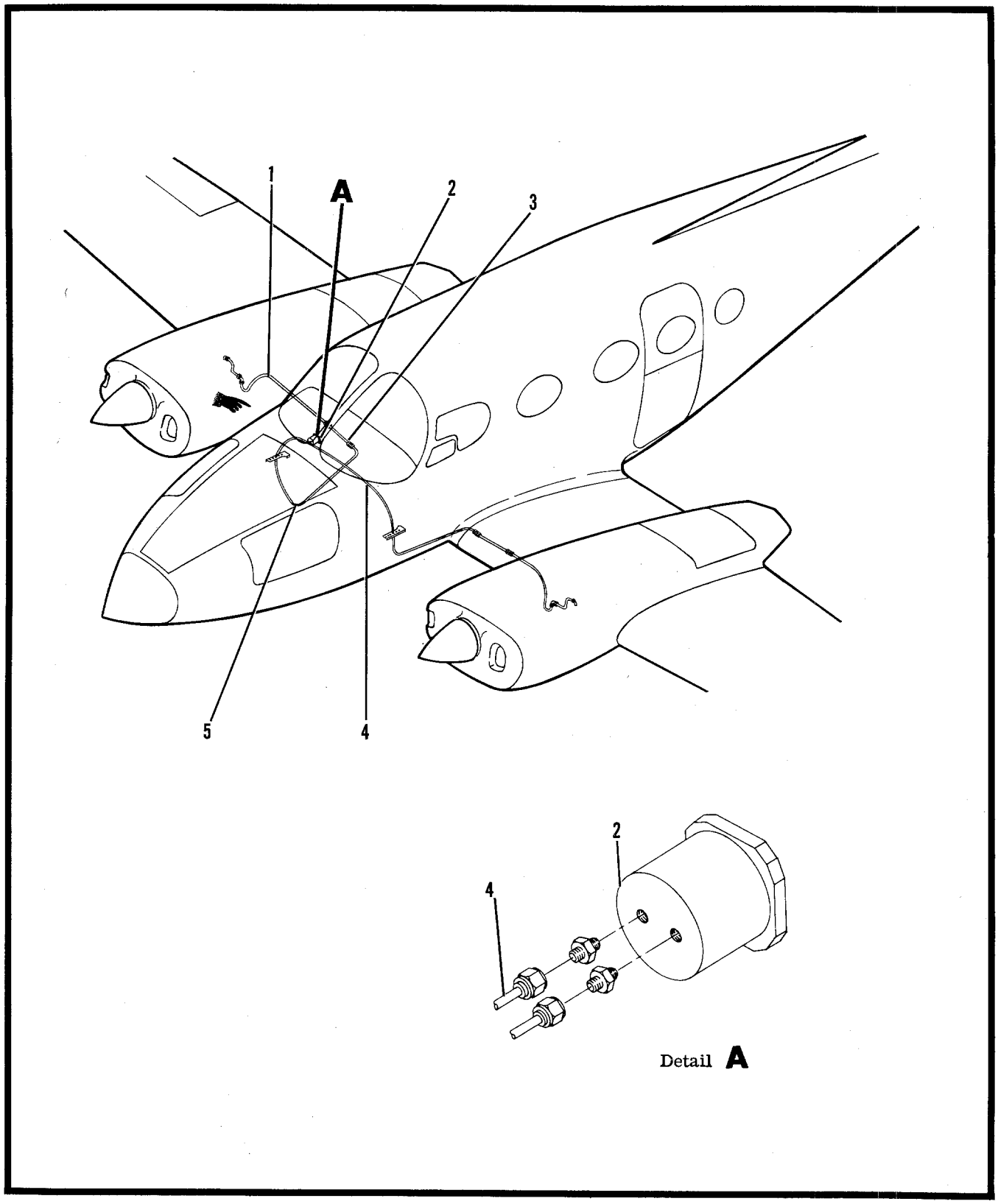
a. Remove screw and pull pitot tube (21) forward.
b. Disconnect heat element receptacle (20).
c. Disconnect line (18) from pitot tube (21).
d. Use denatured alcohol or tri-ethyl alcohol for cleaning the pitot tube.
e. Dry all parts with filtered compressed air.

Installation of Pitot Tube. (See figure 12-9.)

a. Connect line (18) to pitot tube assembly (21).
b. Connect heat element receptacle (20).
c. Position pitot tube (21) into sleeve and install screws.

MANIFOLD PRESSURE SYSTEM.

The manifold pressure system consists of a dual manifold pressure gage located in the engine group of the instrument panel. The manifold pressure lines are routed from the intake manifold of each engine to separate connections at the back of the gage. The gage is calibrated in inches of mercury, it indicates the absolute pressure in the intake manifold of each engine.




1. Wing Line
2. Manifold Pressure Gage
3. Cabin Line
4. Gage Line
5. Manifold Line

Figure 12-12. Manifold Pressure System

Removal of Manifold Pressure Plumbing. (See figure 12-12.)

NOTE

Removal procedure will be given for left engine installation only. Removal of right engine is basically the same.

a. Remove engine nacelle cowling.
b. Remove pilot's seat, copilot's seat, floorboards, carpet and forward upholstery side panels in accordance with Section 3.
c. (See figure 1-3.) Remove wing gap fairings.
d. Remove manifold line (5) by disconnecting at rear baffle and firewall bulkhead.
e. Remove wing line (1) by disconnecting from union at firewall bulkhead and from wing splice union.

NOTE

It may be necessary to bend the line slightly to facilitate removal, however, excessive bending should be avoided to prevent possible damage to the lines.

f. Remove cabin line (3) by disconnecting from union at wing splice and at support angle remove clamps then remove line.
g. Remove gage line (4) by disconnecting from union at support angle and from elbow at manifold gage (2).

Installation of Manifold Pressure Plumbing. (See figure 12-12.)

Installation of manifold pressure plumbing is the reversal of the removal procedures.

NOTE

Apply a small amount of suitable thread lubricant to male threads of all fittings before installation. Slight bending of the manifold pressure lines may be required to facilitate installation, however, excessive bending should be avoided.

SECTION 13

# UTILITY AND OPTIONAL SYSTEMS

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HEATING, VENTILATION AND DEFROSTING SYSTEM. (See figure 13-1.)

Air is routed from the compressor of each turbocharger to the heating, ventilation, cooling and cabin pressurization systems. Air enters the cabin from the turbocharger compressors and routes to a mixing valve, from these the air is distributed to the heat exchanger, or the cabin heat and ventilation system. Heat and ventilation air is routed to the right and left windshield defrost outlets, pilot, copilot and passenger heat outlets.

Six overhead individual outlets provide circulated cabin air, during pressurized or unpressurized flight. With ram air dump valve open fresh air enters a ram air scoop, located in the nose of the aircraft and is forced through the cabin outlets, using the cabin heater fan as a ventilating fan. The cabin heater controls the temperature of the ventilating air. The ventilation fan is operated by the use of either the cabin fan switch or the cabin heat switch.

During pressurized flight, ventilating air is ducted from the turbine compressor to the mixing valve. From the mixing valve air is directed to the cabin heat and vent system or through the heat exchanger. Modulated air may be routed to the heat and vent system and the heat exchanger by varying the mixing valve control. Pressurized air continually enters the cabin and is exhausted through a cabin pressure regulating valve located on the aft pressure bulkhead under the rear baggage shelf.

Description of Heater and Basic Components.

The cabin heater, a gasoline combustion type, is mounted in the right side of the nose section. Fuel is routed from the right main tank through the solenoid valve - and fuel filter by a heater fuel pump mounted on and driven by the combustion air blower. The heater fuel pump and filters are contained in a housing mounted to the combustion blower and have a vent and drain line for safety. The heater fuel filter and solenoid valve are mounted inboard of the right engine nacelle in the leading edge of the wing. Access to the heater fuel filter and solenoid valve is made through the engine controls access cover on the lower side of the wing. The spark plug is located forward of the ignition unit mounted on top of the heater. The thermostat is mounted in the outlet adapter at the aft end of the heater. The thermostat senses the ventilating air outlet temperature and is controlled from the operating controls mounted on the stationary instrument panel to the right of the flap preselect lever. For description and principles of operation information, refer to Heater and Components Overhaul/Parts Manual.

Troubleshooting the Heater.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| HEATER WILL NOT START, | Open circuit breaker. | Reset circuit breaker. |
| | Defective heater switch or wiring. | Replace switch or wiring as necessary. |
| VENT AIR BLOWER RUNS BUT COMBUSTION AIR BLOWER DOES NOT START | Overheat switch tripped. | Reset switch and find cause of overheating. |
| | Defective combustion air blower. | Replace blower assembly. |
| BOTH BLOWERS RUN BUT HEATER FAILS TO START | Breaker points defective. | Replace breaker points assembly. |
| | Defective spark plug. | Replace plug. |
| | Defective airvane switch. | Replace switch assembly. |
| | Obstruction in combustion air passage. | Remove obstruction. |
| | Defective ignition coil. | Replace coil. |
| | Open circuit in thermostat. | Replace thermostat. |
| | Defective solenoid. | Replace nozzle solenoid. |
| | Open circuit in duct limit switch. | Replace switch. |
| | Defective fuel pump. | Replace blower assembly. |
| | Defective supply solenoid. | Replace solenoid. |

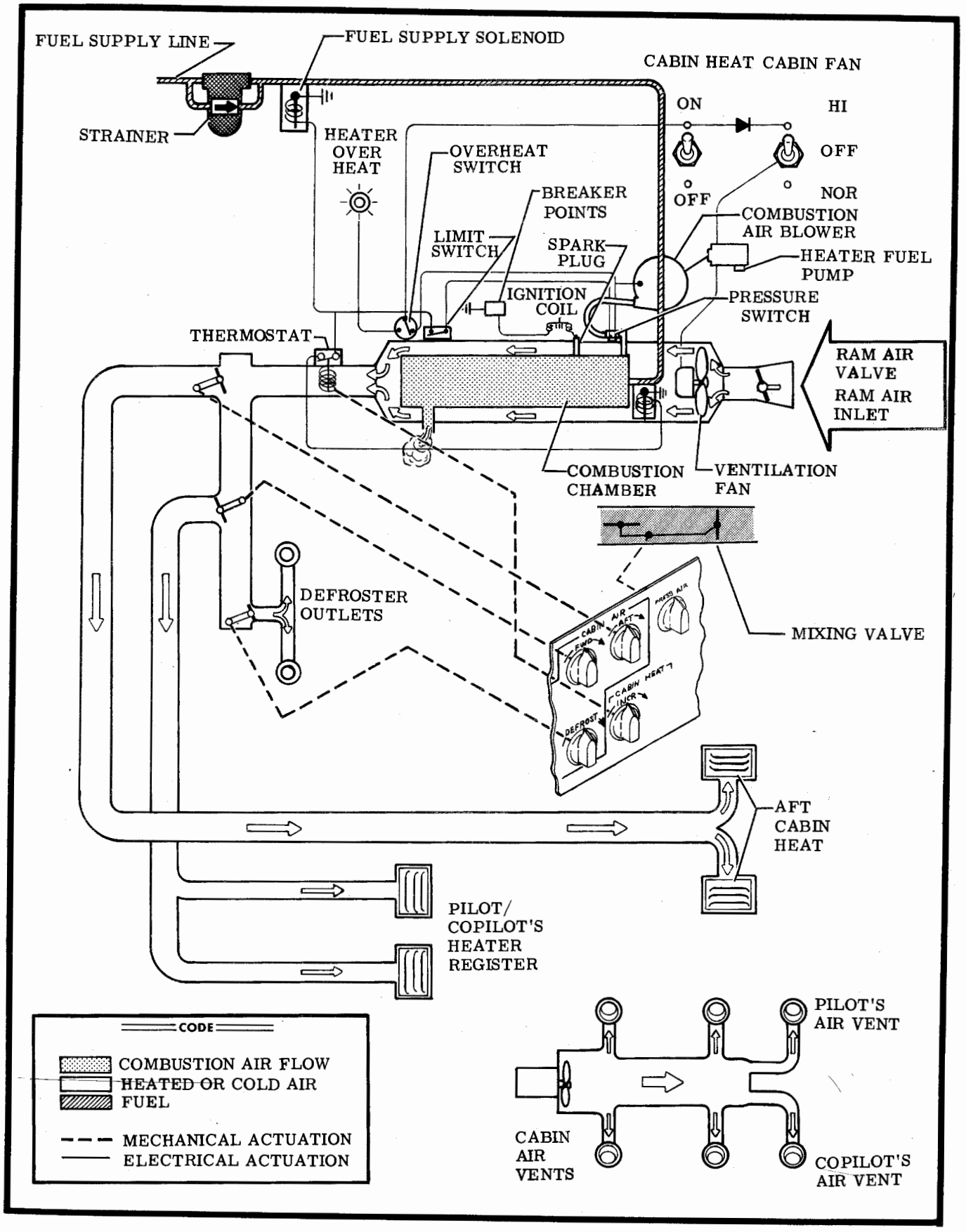



Figure 13-1. Heating, Ventilating and Defrosting System Schematic

Troubleshooting the Heater (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| HEATER BURNS BUT THERMOSTAT WILL NOT CONTROL TEMPERATURE | Defective thermostat. | Replace thermostat. |
| | Defective duct limit switch. | Replace switch. |
| OUTLET AIR TEMPERATURE TOO LOW | Excessive vent air flow. | Reduce vent air flow. |
| | Defective thermostat. | Replace thermostat. |
| | Defective duct limit switch. | Replace switch. |
| | Defective fuel supply solenoid. | Replace fuel supply solenoid. |
| | Defective solenoid valve. | Replace solenoid valve. |
| HEATER TRIPS OVERHEAT SWITCH | Defective overheat switch. | Replace switch. |
| | Insufficient vent air plus defective duct limit switch. | Replace duct limit switch and increase air rate. |
| SMOKING HEATER EXHAUST | Defective nozzle. | Replace nozzle. |
| | Leaking solenoid valve. | Replace valve. |
| HEATER POPS OR BANGS WHEN STARTING OR CYCLING | Leaking solenoid valve. | Replace valve. |
| | Delayed ignition caused by intermittent spark. | Replace spark plug or coil as necessary. |
| RUMBLE OR COMBUSTION NOISE IN HEATER | Loose burner assembly mounting screws. | Tighten mounting screws. |
| | Defective nozzle. | Replace nozzle. |

Removal of Heater. (See figure 13-2.)

a. Turn off all electrical power.
b. Remove the necessary access plates, radio and radio shelves to gain access to heater.
c. (See figure 1-3.) Remove access plate (55) on the lower side of the right wing; remove safety and turn heater fuel shutoff valve off.
d. Tag and disconnect electrical wires from heater terminal strip.
e. Disconnect combustion air tube by removing clamps.
f. Disconnect exhaust tube by removing clamps.
g. Remove clamps securing heater to bracket.
h. Disconnect and cap fuel line at heater fittings.

WARNING

Fuel accumulation in the nose is a fire hazard. Use caution when removing heater to prevent residual fuel from draining in the nose.

i. Remove clamp securing ventilating fan to heater.
j. Tilt the heater up, aft end first and raise straight up and out of the nose section.

NOTE

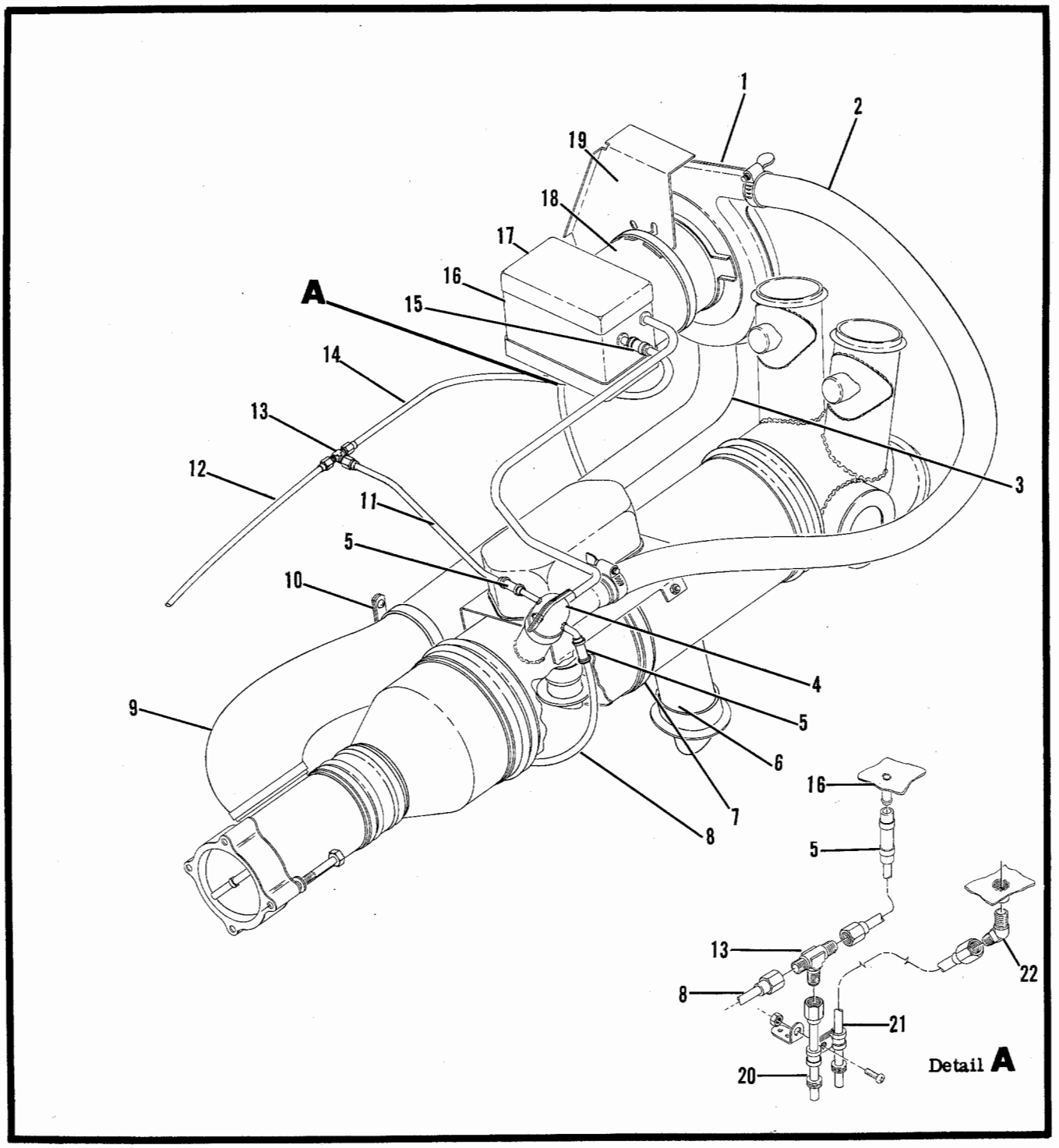
For disassembly, cleaning, inspection and overhaul, see Heater and Components Overhaul/Parts Manual.

Installation of Heater. (See figure 13-2.)

a. Install heater by reversing removal procedures.
b. Safety heater fuel shutoff valve in the ON position.

Removal and Installation of Ventilating Air Blower. (See figure 13-2.)

a. Turn off all electrical power.
b. Remove the necessary access plates, radio and radio shelves to gain access to ventilating air blower.
c. Remove clamp securing ventilating air blower to heater.
d. Remove forward duct clamp attaching ventilating air blower to forward duct assembly.
e. Tag and disconnect electrical wires from terminal strip.




1. Blower
2. Outlet Hose
3. Inlet Hose
4. Shroud
5. Hose
6. Exhaust Shroud
7. Strap
8. Shroud Drain Line
9. Air Duct
10. Clamp
11. Shroud Vent Line
12. Overboard Vent Line
13. Tee
14. Fuel Pump Vent Line
15. Hose
16. Fuel Pump Housing
17. Fuel Pump Housing Cover
18. Blower Motor
19. Support Bracket
20. Drain Line
21. Heater Drain Line
22. Elbow

Figure 13-2. Heater Installation

f. Remove ventilating air blower by lifting straight up and out.
g. Install ventilating air blower by reversing the removal procedures.

Removal and Installation of Combustion Air Blower. (See figure 13-2.)

a. Turn off all electrical power.
b. (See figure 1-3.) Remove access plate (55) on lower right wing; remove safety and turn heater fuel shutoff valve off.
c. Remove the necessary access plates, radio and radio shelves to gain access to the combustion air blower.
d. Tag and disconnect electrical wires.
e. Remove combustion air inlet and outlet ducts by removing clamps.
f. Disconnect fuel line from fuel pump and cap.

WARNING

Fuel accumulation in the nose is a fire hazard. Use caution when removing combustion air blower to prevent residual fuel from draining.

g. Disconnect drain line from fuel pump.
h. Remove screws securing combustion air blower to bracket, and carefully remove from the nose of the aircraft using care not to damage blower fan.
i. Install combustion air blower by reversing the removal procedures.
j. Safety heater fuel shutoff valve in the ON position.

NOTE

Check combustion air supply joints for leakage, seal by using Arno Ductape No. C-506 or equivalent and clamp as required.

Removal and Installation of Heater Spark Plug. (See figure 13-2.)

a. Turn off all electrical power.
b. Remove the necessary access plates, radio and radio shelves to gain access to heater.
c. Remove spark plug cover by removing screws securing cover to heater jacket.
d. Disconnect spark plug high tension lead.
e. Remove spark plug with a 1" deep socket making sure spark plug gasket is removed with plug.
f. Install spark plug by reversing the removal procedures.

NOTE

A new spark plug gasket should be installed on the spark plug. Torque spark plug 11 ±1 foot-pounds.

Removal and Installation of Thermostat. (See figure 13-2.)

a. Tag and disconnect electrical wires from terminals.
b. Loosen screw securing control wire to thermostat actuating arm.
c. Remove four screws securing thermostat to plenum duct then carefully remove thermostat and gasket.
d. Installation of the thermostat is the reversal of the removal procedures.
e. Adjust control wire in thermostat actuating arm for proper operation.

Removal and Installation of Heater Fuel Filter and Solenoid Valve. (See figure 13-2.)

a. Remove engine controls access cover on lower side of right wing.
b. Unsafety and turn shutoff valve to OFF.
c. Tag and disconnect electrical wires.
d. Disconnect and cap fuel lines.

WARNING

Fuel accumulation in the wing is a fire hazard. Use caution when removing heater to prevent residual fuel from draining in the wing.

e. Remove screws securing solenoid valve and heater fuel filter to bracket and remove from wing.

NOTE

The heater fuel filter element may be removed without removing the filter by removing safety wire and loosening filter bowl.

f. Refer to Section 2 for cleaning and inspection of the heater fuel filter.
g. Install solenoid valve and heater fuel filter by reversing the removal procedures.
h. Safety fuel shutoff valve in the ON position and check system for fuel leaks.

Removal and Installation of Cabin Heat Switch and Cabin Fan Switch.

a. Remove and install the cabin heat switch and cabin fan switch in accordance with Section 14, Typical Switch Removal.

Temperature and Airflow Controls.

The temperature control is located to the right of the flap preselect lever on the stationary instrument panel. The temperature control is a rotary type knob

and is labeled CABIN HEAT. Clockwise rotation increases the cabin temperature and counterclockwise rotation decreases the temperature. This knob controls the setting of the thermostat located in the outer adapter just aft of the heater. The thermostat maintains the cabin temperature selected by the temperature control knob by cycling the heater on and off.

The airflow controls provide control of the air to the pilot and copilot heat registers, the cabin heat registers and the defroster outlets.

Removal and Installation of Temperature and Airflow Controls.

a. Loosen setscrew in control knob and remove.
b. Remove nut securing control assembly to stationary instrument panel. Slide temperature control assembly forward until free of stationary instrument panel.
c. Remove clamps securing cable clamps.
d. Disconnect forward attached end of cable and pull control cable out into cabin area.
e. Install cables by reversing the removal procedures.
f. Seal cables at pressure bulkhead in accordance with sealing procedures (Section 16) given for continuous wire bundles.
g. Operate controls and check for free movement and proper travel.

Removal and Installation of Ram Air Valve Assembly. (See figure 13-2.)

a. (See figure 1-3.) Remove necessary access plates, radio and radio shelves to gain access to ram air valve assembly.
b. Disconnect control from actuator arm by removing nut and bolt from clevis.
c. Remove ducts from valve by loosening clamps and sliding duct aft.
d. Remove nuts, washers and bolts securing valve in place and lift the valve out. Retain gasket for reinstallation if not torn or mutilated.
e. Installation of ram air valve is the reversal of the removal procedures.
f. Check operation for proper travel.

Removal and Installation of Ram Air Control. (See figure 13-2.)

a. Disconnect control from actuator arm by removing nut and bolt from clevis.
b. Remove clamps securing cable from instrument panel forward to ram air valve.
c. Loosen the jamb nut on the aft side of the instrument panel.
d. Loosen jamb nut on the forward side of instrument panel and slide the control out.
e. Pull the control out into cabin area.
f. Install control by reversing the removal procedures.
g. Seal control cable at forward bulkhead in accordance with instructions given in Section 16 for sealing continuous wire bundles.
h. Check control travel for positive sealing of the inlet duct when in the closed position.

Cabin Heat and Vent Air Ducting.

The cabin is heated by four warm air vents and two defrost outlets. The air is routed from the heater through warm air ducting and expelled through heat outlets, on the forward pressure bulkhead and at the cabin outlets on each right and left sides of the cabin near the floor. Controls for the warm air are located on the right stationary panel.

Removal and Installation of Heat and Vent Air Ducting. (See figure 13-3.)

a. Remove the necessary seats, carpeting, floorboards and upholstery panels for removal of heat and vent air ducting, in accordance with removal procedures.
b. Remove forward ducts from mixing valve by removing clamps.
c. Remove aft ducts from mixing valve to outlets by loosening clamps.
d. Remove ducts connecting heat exchanger to mixing valve by loosening clamps.
e. Remove ducts from plenum and aft cabin outlets by loosening clamps and pulling ducting aft from under floorboard.
f. Install warm air ducting by reversing the removal procedures and leak checking.

Removal and Installation of Cool Air Ducting. (See figure 13-3.)

a. Remove the necessary seats, carpeting, floorboards and upholstery panels.
b. Loosen clamps and remove ducting.

NOTE

If ducting is not being replaced, be careful not to make sharp bends or kinks in ducting when removing.

c. Install ducting by routing ducting in place and securing with clamps.
d. Install upholstery panels, floorboards, carpeting and seats removed to facilitate removal of cool air ducting.

Recirculating Air Blower. (See figure 13-3.)

The recirculating air blower is located under the left floorboard approximately F. S. 191.00. The recirculating air blower circulates air within the cabin. If optional air conditioner is installed, refrigerated air is routed from the right evaporator to the recir-

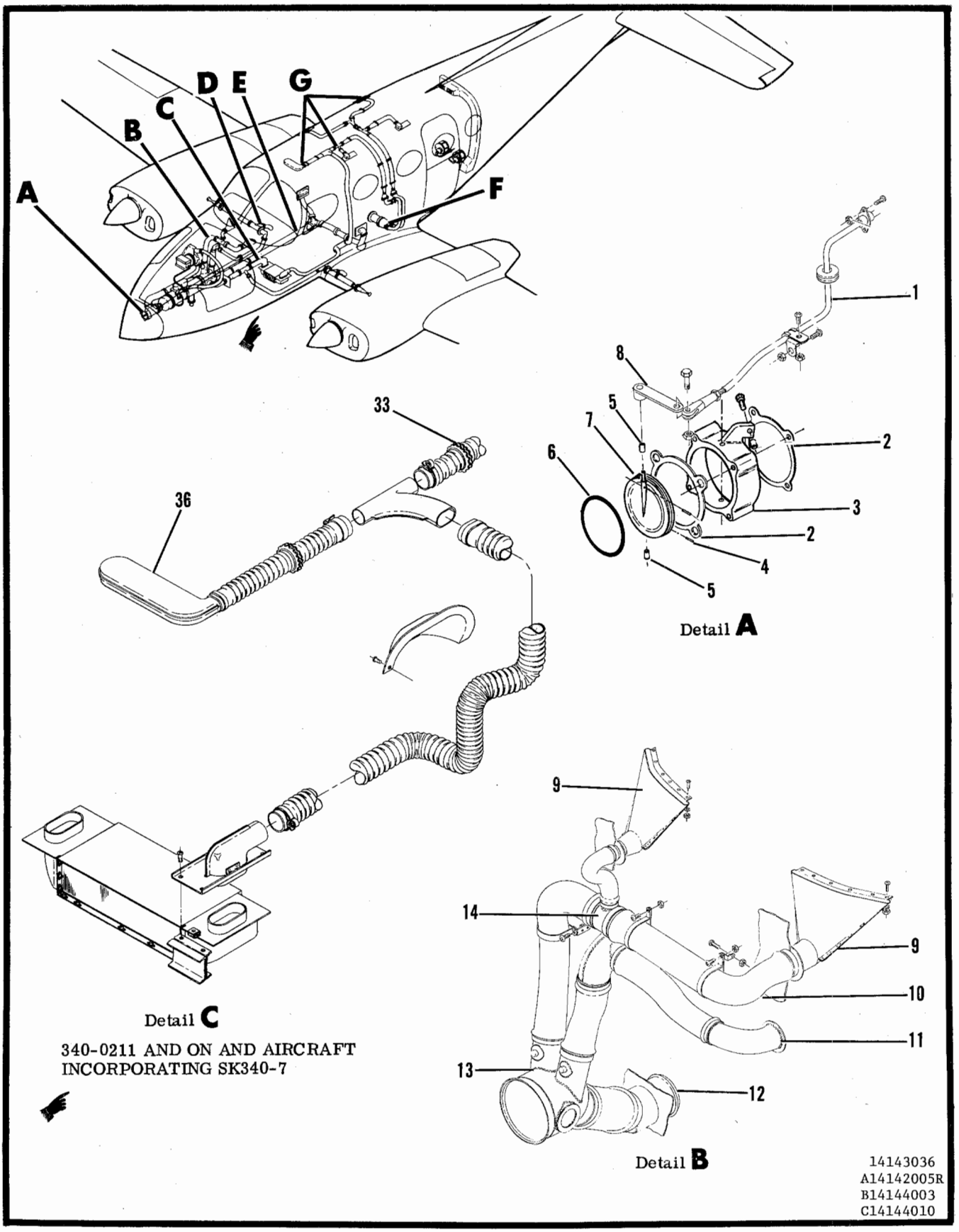



Figure 13-3. Air Distribution System (Sheet 1)

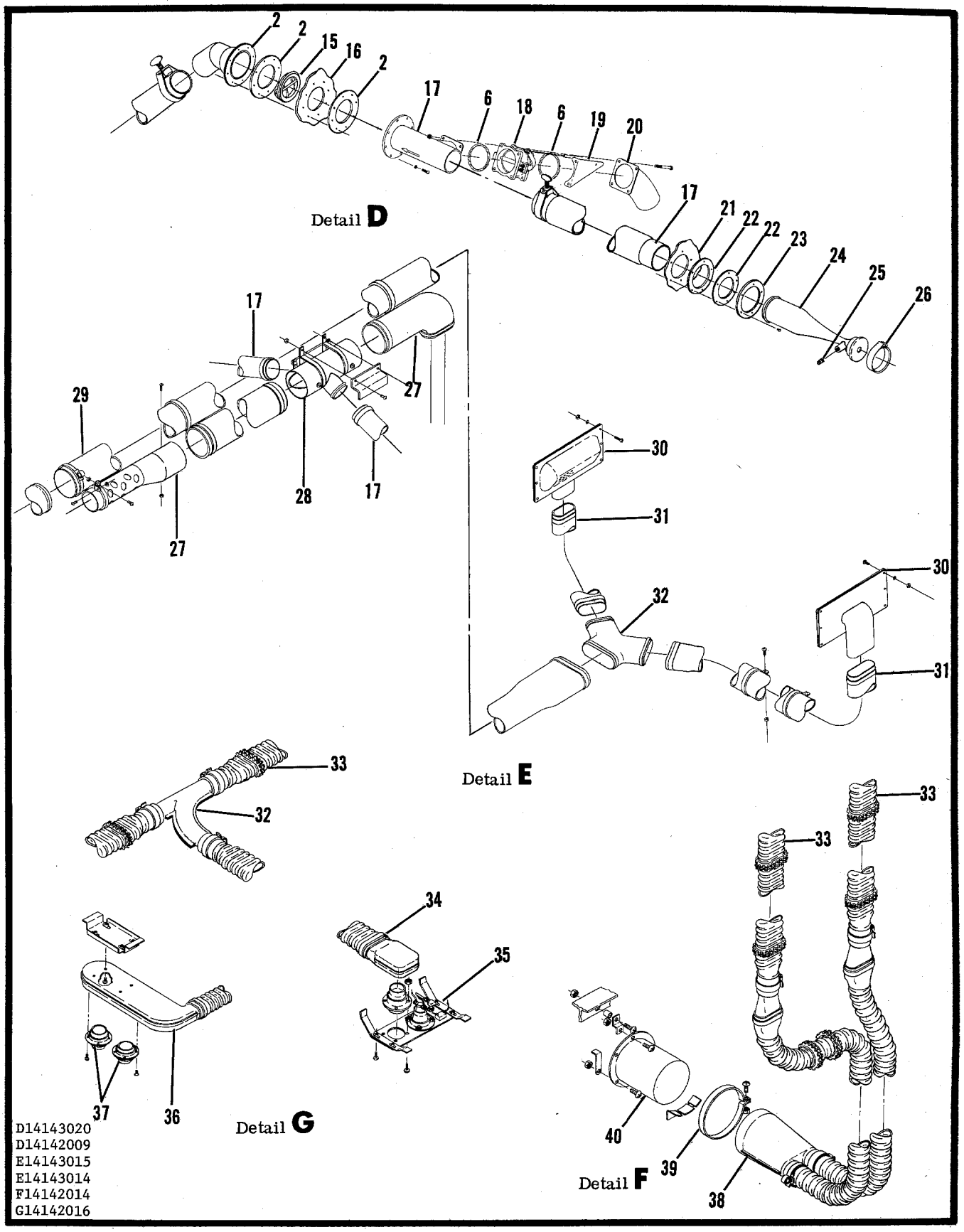



Figure 13-3. Air Distribution System (Sheet 2)

Figure 13-3. Air Distribution System Callouts

1. Control
2. Gasket
3. Body
4. Pin
5. Bearing
6. O-Ring
7. Disc
8. Arm
9. Defrost Outlet
10. Defrost Duct
11. Heater Duct
12. Adapter
13. Plenum
14. Tee
15. Check Valve
16. Fuselage Skin
17. Pressurization Duct
18. Dump Valve
19. Bracket
20. Overboard Tube
21. Firewall
22. Seal
23. Seal Plate
24. Venturi
25. Plug
26. Clamp
27. Heat Exchanger Duct
28. Mixing Valve
29. Aft Heat Duct
30. Aft Heat Outlet
31. Heat Duct
32. Wye
33. Overhead Air Duct
34. Outlet Duct
35. Passenger Outlet
36. Forward Outlet Plenum
37. Outlet Valve
38. Blower Plenum
39. Blower Clamp
40. Blower

culating air blower through the cool air ducting and out the overhead outlets.

Removal and Installation of Recirculating Air Blower. (See figure 13-3.)

a. Remove the necessary seats, carpets and floorboards in accordance with removal procedures.
b. Tag and disconnect electrical wires.
c. Remove nut and screw from clamps and remove clamp from clip.
d. Remove nut and screw securing blower to floorboard seat rail and remove recirculating air blower from aircraft.
e. Install recirculating air blower by reversing the removal procedures.

CABIN PRESSURIZATION SYSTEM.

The pressurization system provides a constant 8000 foot altitude to 20, 000 feet with a nominal differential pressure of 4. 2 PSIG. No pressurization is provided below 8000 feet with the standard system. Above 20, 000 feet a nominal differential pressure of 4. 2 ±0. 10 PSIG is maintained. Pressurization of the cabin is developed by the engine turbocharger compressor of each engine. One compressor will supply adequate pressurization in the event of a failure. Ram air is taken through a scoop on the side of the engine nacelle, compressed by the turbocharger compressor and directed through a sonic venturi type flow limiter to a mixing valve, which routes pressurized air either to the heat exchanger or cabin heat and vent system or modulated for both. From the heat exchanger, pressurized air is routed directly into the cabin, from the cabin heat and vent system, pressurized air is routed through the defroster outlets and heat and vent outlets. From the sonic venturi and ahead of the mixing valve check valves are installed to prevent back flow in the event of engine or turbocharger pressure failure. In the unpressurized, conventional mode of operation, the pressurized air is dumped overboard by means of two pressurization air dump valves located in the wing root leading edge of each wing. The pressurization air dump valves are manually actuated from the controls mounted on the left side of the stationary instrument panel. A cabin pressure regulator valve is located on the forward side of the aft cabin pressure bulkhead under the baggage shelf and is automatically operated. Also located adjacent to the cabin pressure regulator valve is a combination safety and cabin air dump valve. The dump function is solenoid operated by the squat switch located on the landing gear or the cabin pressurize - depressurize switch located on the stationary instrument panel. A pressure control panel is located on the left side of the stationary panel consisting of a combination cabin altitude and cabin ambient differential pressure gage, cabin altitude rate-of-change instrument, left and right pressurization air dump valve and nose ram air manual controls. A cabin altitude warning light, provided to warn the pilot of air oxygen requirement, is connected to a barometric pressure switch set to illuminate at a cabin altitude of 10, 000 ±350 feet and go off at 9000 feet minimum, and is located in the annunciator panel. The ram air shutoff control is mechanically linked to a butterfly valve located in the nose inlet scoop just forward of the cabin heater. When the control is pushed in, this allows the heater to recirculate the cabin air. When the control is pulled out, ram air is allowed to enter the cabin from the nose scoop.

CAUTION

Do not operate ram air control when cabin is pressurized. Severe personnel discomfort may result.

Troubleshooting the Pressurization System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| CABIN WILL NOT PRESSURIZE | Safety valve will not close. | Obstructed diaphragm - clean, repair or replace safety valve. |

Troubleshooting the Pressurization System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| | Outflow valve will not close. | Obstructed diaphragm - clean, repair or replace outflow valve. |
| | Insufficient cabin pressure. | Inadequate air supply. Check turbocharger compressor, venturi, connection joints and fittings for leaking and repair as required. |
| SAFETY VALVE WILL NOT CLOSE | Obstructed diaphragm. | Clean and/or repair or replace safety valve. |
| | Insufficient cabin pressure depression. | Inadequate air supply - check turbocharger compressor, venturi, connection joints and fittings for leaking and repair as required. |
| | Safety valve solenoid circuit malfunctioning. | Repair or replace solenoid and/or wiring. |
| | Screen obstructed. | Clean. |
| | Solenoid will not open. | Repair wiring circuit or replace solenoid. |
| OUTFLOW VALVE WILL NOT CONTROL | Restricted control line. | Clean line. |
| | Defective controller poppet valve. | Replace controller. |
| | Obstructed diaphragm movement. | Clean, repair or replace outflow valve. |
| | Outflow valve poppet leaking. | Replace outflow valve. |
| INSUFFICIENT AIR SUPPLY | Inadequate air supply. | Check turbocharger, compressor, venturi, connection joints and fittings for leaking and repair as required. |
| | Cabin leaking excessive. | Refer to pressurization system leak check procedures and repair. |
| INADEQUATE AIR SUPPLY | Defective turbocharger. | Refer to Section 9, repair or replace turbocharger. |
| | Dump valves rigged wrong or seals damaged. | Repair or replace damaged seals - rig dum valves correctly. |
| | Air supply duct clamps loose or hoses damaged. | Tighten clamps, and repair or replace as required. |
| | Restricted check valves. | Repair or replace check valves. |
| PRESSURIZATION SYSTEM OVER-SHOOTS ALTITUDE SELECTED ON CONTROL - ALTITUDE SELECTOR FOLLOWS AIRCRAFT | Safety valve not closing soon enough. | Replace valve. |
| | Insufficient cabin pressure. | Check turbocharger, compressor, venturi, connection joints and fittings for leaking and repair as required. |
| | Outflow valve not responding to controller. | Check control line and valve, clean and repair or replace. |
| | Control line to outflow valve restricted. | Clean and repair as required. |

Troubleshooting the Pressurization System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| PRESSURIZATION SYSTEM OVERSHOOTS ALTITUDE SELECTED ON CONTROL - ALTITUDE SELECTOR DOES NOT MOVE | Controller poppet defective. | Replace controller. |
| CABIN PRESSURE GOES TO MAXIMUM DIFFERENTIAL WITH NO RATE CONTROL | Outflow valve closes immediately. | Repair or replace open or leaking line. |
| OUTFLOW VALVE CLOSES IMMEDIATELY | Control line is open or leaking. | Tighten fittings, repair as required. |
| | Hole in diaphragm. | Replace outflow valve. |
| CONTROL RATES EXCESSIVELY HIGH OR LOW TO MECHANICAL STOP | Defective controller. | Replace controller. |
| CABIN DIFFERENTIAL LESS THAN 4.2 | Outflow valve calibration in error. | Replace valve. |
| | Cabin differential pressure gage out of calibration. | Replace gage. |
| | Excessive cabin leak or insufficient air supply. | Repair as required. |
| CABIN DIFFERENTIAL 4.5 | Differential pressure gage out of calibration. | Replace gage. |
| | Outflow valve and safety valve defective. | Replace valves. |
| CABIN PRESSURE ALTITUDE FLUCTUATES CONSTANTLY OR FOR LONG PERIODS OF TIME | Controller loose in panel. | Tighten. |
| | Loose control line. | Tighten. |
| | Outflow valve diaphragm flutters. | Replace outflow valve. |
| | Damaged outflow valve diaphragm. | Replace valve. |
| CABIN WILL NOT PRESSURIZE UNTIL ABOVE SELECTED ALTITUDE | Pressurization system is overshooting. | Refer to operational check procedures and determine if controller, safety valve or the outflow valve is defective and repair as necessary. |
| SUDDEN PRESSURIZATION OR DEPRESSURIZATION | Defective or improperly adjusted landing gear safety switch. | Adjust or repair as required. |
| | Loose solenoid on safety valve. | Tighten solenoid or replace safety valve. |
| | Electrical malfunction. | Troubleshoot and repair as required. |
| CONTROLLER WILL NOT MOVE TO SELECTED ALTITUDE | Electrical power failure in aircraft electrical system. | Troubleshoot and repair as required. |
| | Electrical or mechanical malfunction in controller. | Replace controller. |

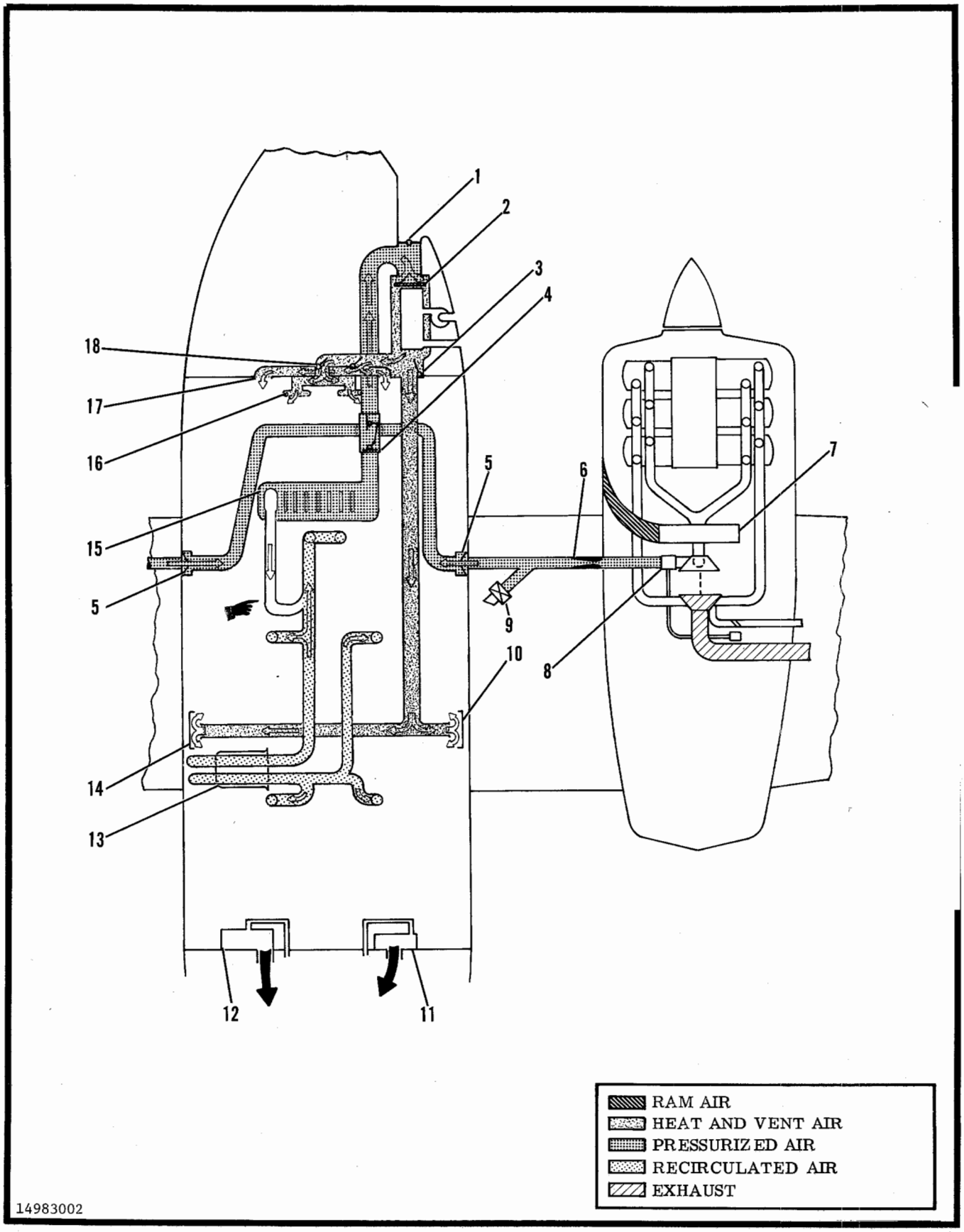
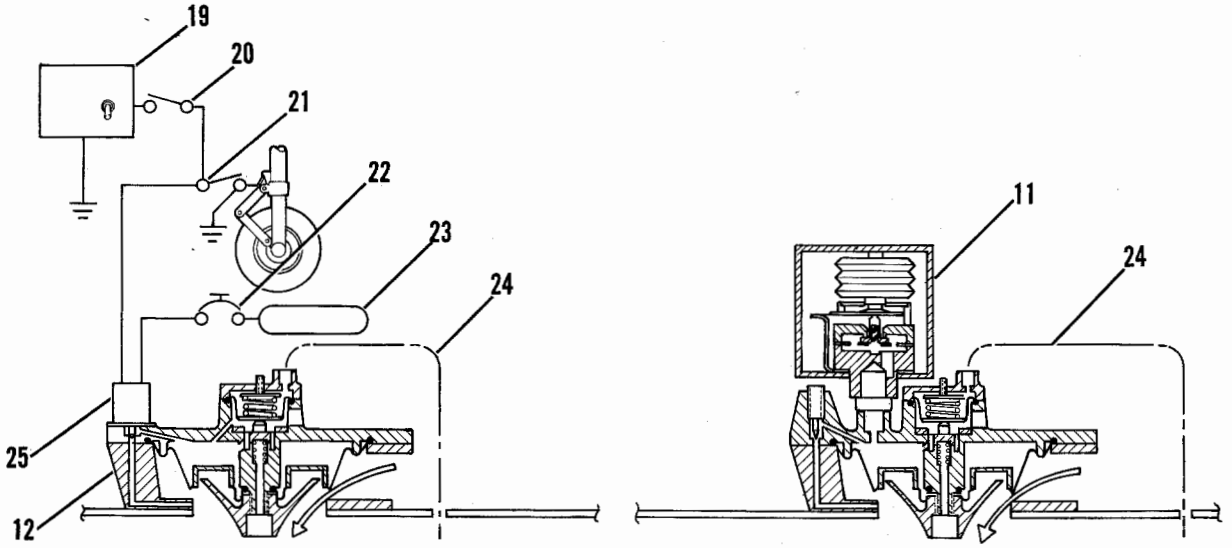
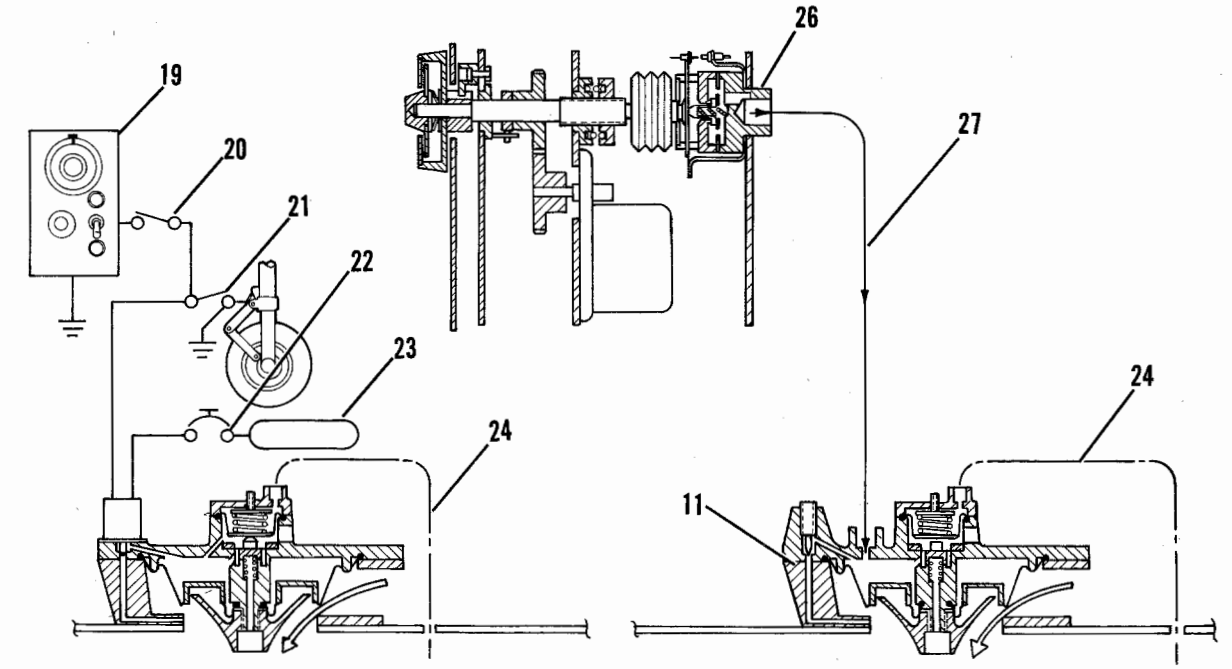



Figure 13-4. Pressurization System Schematic (Sheet 1)



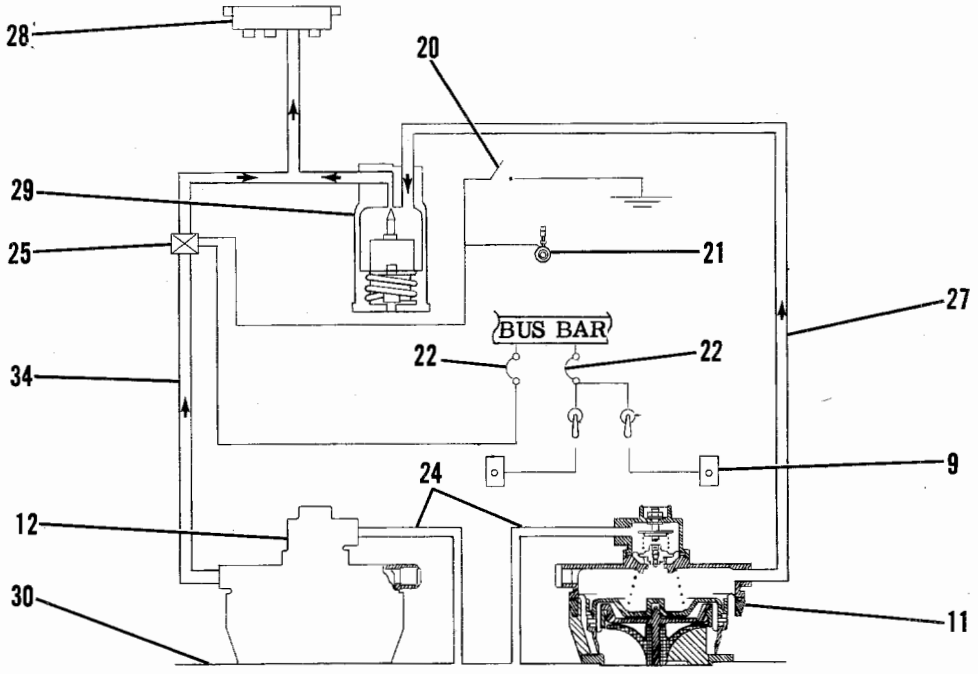

STANDARD PRESSURIZATION SYSTEM 340-0001 TO 340-0501



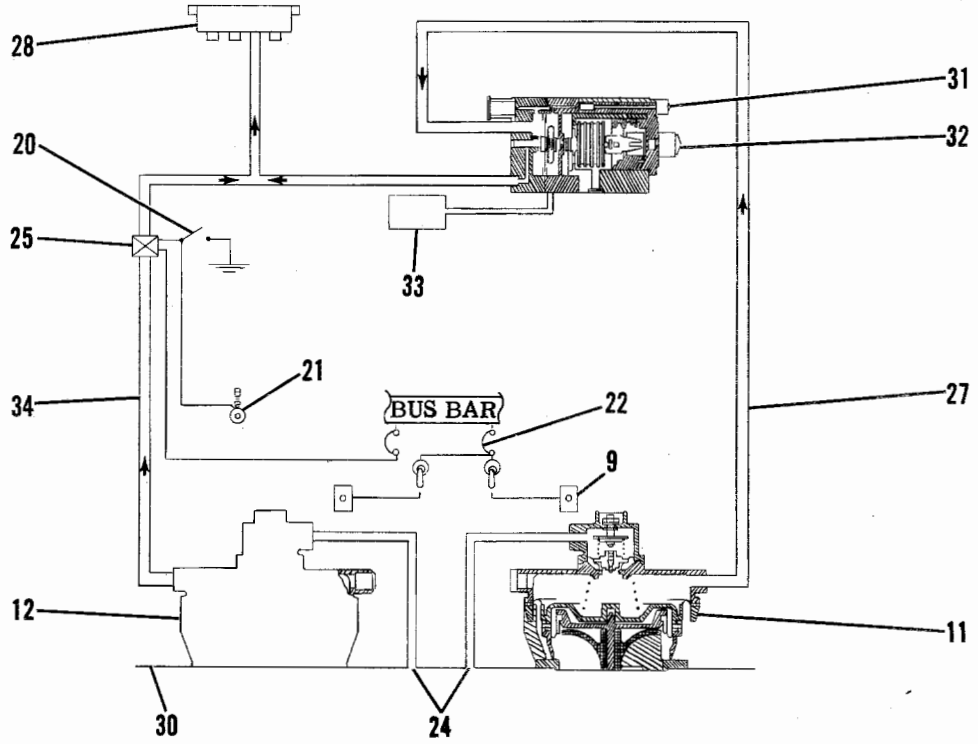

OPTIONAL PRESSURIZATION SYSTEM 340-0001 TO 340-0501

1. Ram Air Valve
2. Ventilating Air Blower
3. Aft Cabin Heat & Vent Valve
4. Mixing Valve
5. Check Valve
6. Venturi
7. Turbocharger
8. Pressure Ratio Controller
9. Bleed Air Dump Valve
10. Cabin Heat Outlet (Aft)
11. Outflow Valve
12. Safety Valve
13. Recirculating Blower
14. Air Outlet
15. Heat Exchanger
16. Defrost Outlet
17. Cabin Heat Outlet (Fwd)
18. Defrost Valve
19. Stationary Instrument Panel
20. "Press" "Depress" Switch
21. Landing Gear Safety Switch
22. Circuit Breaker
23. Bus
24. Static Line
25. Solenoid
26. Control
27. Control Line

Figure 13-4. Pressurization System Schematic (Sheet 2)




PRESSURIZATION CONTROL SYSTEM (STANDARD) 340-0501 AND ON

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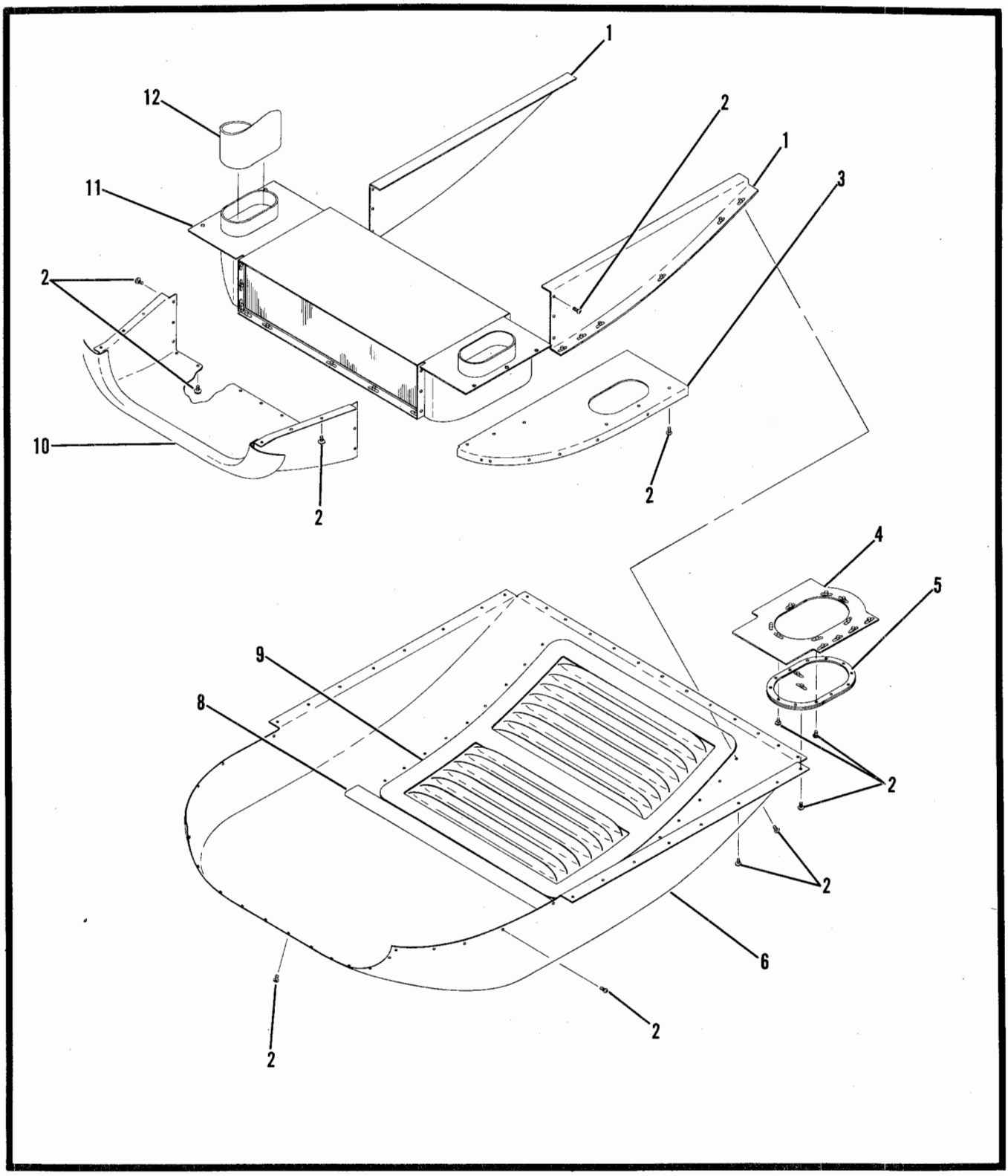
PRESSURIZATION CONTROL SYSTEM (OPTIONAL) 340-0501 AND ON

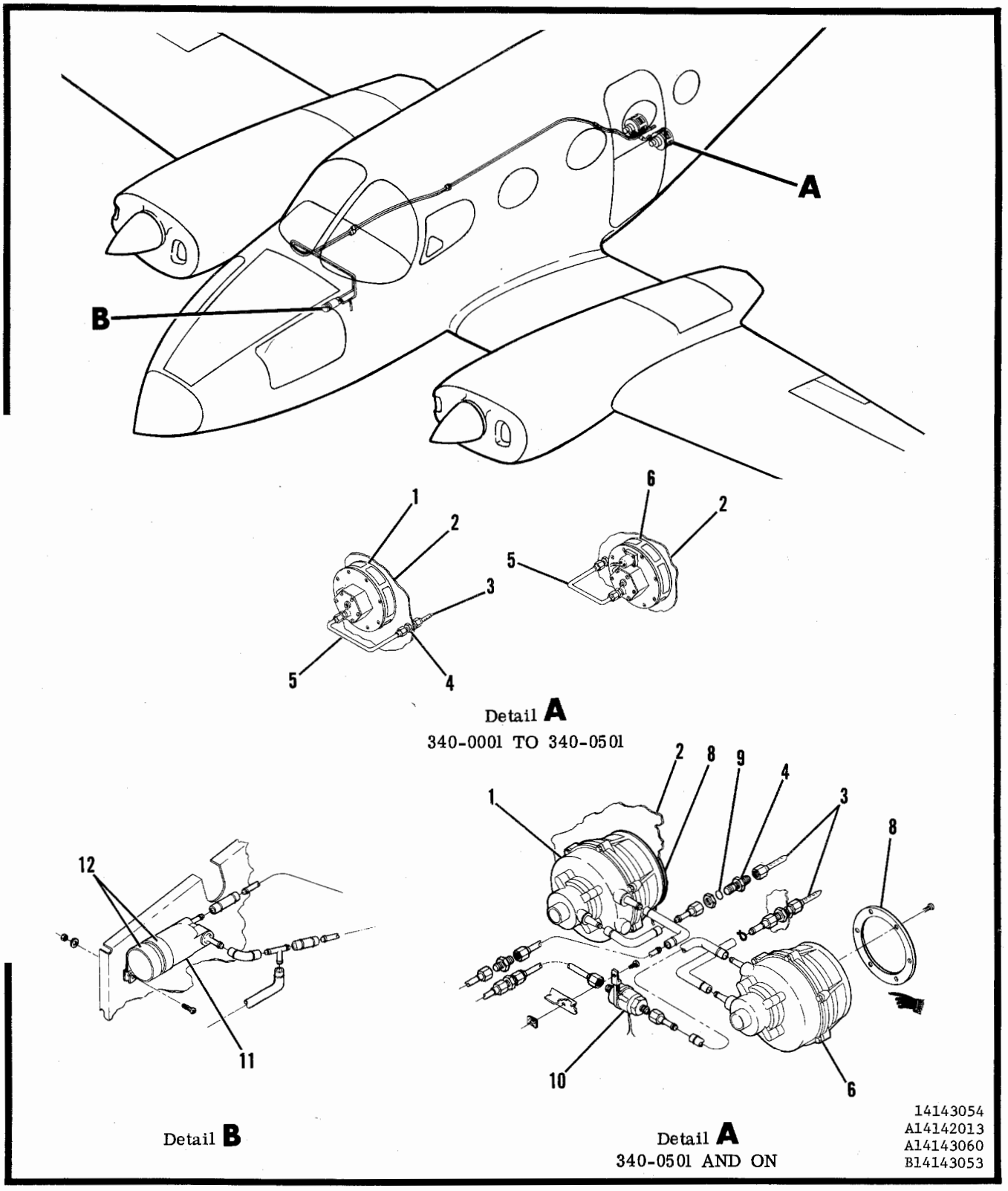
28. Vacuum Manifold
29. Cabin Altitude Control
30. Aft Pressure Bulkhead
31. Rate of Change Selector
32. Cabin Altitude Control
33. Volume Tank
34. Vacuum Line

Figure 13-4. Pressurization Schematic (Sheet 3)



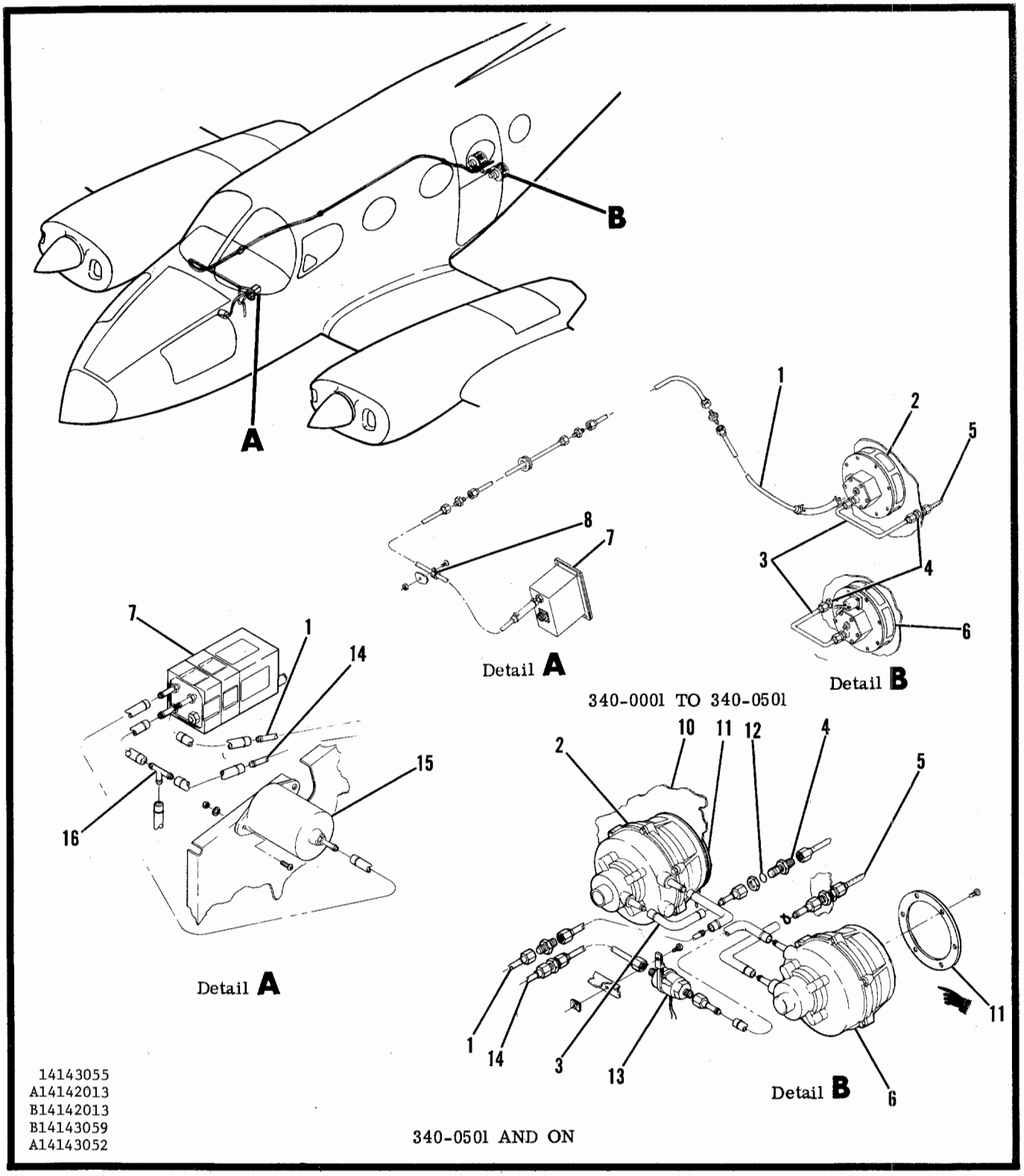

1. Bracket
2. Screw
3. Doubler
4. Doubler
5. Panel
6. Fairing
7. Louver
8. Seal
9. Louver Doubler
10. Inlet
11. Heat Exchanger
12. Duct

Figure 13-5. Heat Exchanger Installation




1. Outflow Valve
2. Aft Pressure Bulkhead
3. Piccolo Tube
4. Union
5. Static Line
6. Safety Valve
7. Deleted
8. Doubler
9. Lock-O-Seal
10. Solenoid Valve
11. Controller
12. Clamp

Figure 13-6. Cabin Pressurization Controls Installation (Standard)




1. Control Line
2. Outflow valve
3. Static Line
4. Union
5. Piccolo Tube
6. Safety Valve
7. Controller
8. Clamp
9. Deleted
10. Aft Pressure Bulkhead
11. Doubler
12. Lock-O-Seal
13. Solenoid Valve
14. Vacuum Line
15. Volume Tank
16. Tee

Figure 13-7. Cabin Pressurization Controls Installation (Optional)

Heat Exchanger and Pressurization Air Dump Valve.

The heat exchanger located on the belly of the aircraft allows the pressurized air to be cooled within 10 degrees of ambient temperature by ram air entering the intake and passing through the heat exchanger. A dump valve manually operated and individually controlled by the pilot is located in the wing root stub wing leading edge of each wing. In case of noxious fumes or contamination entering the cabin, either of the dump valves may be opened to allow fumes to be dumped overboard and still maintain cabin pressurization from the opposite side.

Removal and Installation of Heat Exchanger.

a. Remove screws securing shroud on belly of aircraft.
b. Remove seats, carpets, floorboards and disconnect inlet hoses.

CAUTION

Removal of the heat exchanger requires the services of two people. Always restrain heat exchanger when removing from belly of aircraft.

c. Remove screws and lower heat exchanger from belly of aircraft.
d. Installation of the heat exchanger is the reversal of the removal procedures.

Cabin Pressurization Components (Standard).

The main components of the standard cabin pressurization control system are the cabin altitude and differential pressure indicator, cabin rate-of-change indicator, outflow valve, safety valve, and switch. The outflow valve and safety valve are located on the aft cabin pressure bulkhead under the baggage floorboard. The standard system is completely automatic in operation and will maintain an 8000 foot cabin pressure altitude for flight pressure altitude from 8000 to 20,000 feet. Below 8000 feet the aircraft will not be pressurized while above 20,000 feet constant cabin pressure differential will be maintained. The switch located on the stationary instrument panel turns the pressurization system on or off.

Removal and Installation of Cabin Pressurization System Components (Standard). (See figure 13-6.)

a. Remove the necessary carpet, upholstery and baggage floorboard to gain access to outflow and safety valve.
b. Disconnect and cap static lines.
c. Tag and disconnect wires from safety valve.
d. Remove safety wire and screws securing safety valve and outflow valve to aft pressure bulkhead.
e. Installation procedures are the reversal of the removal procedures.

NOTE

Discard removed gaskets and seal valves to bulkhead with approximately 1/8" diameter bead of RTV-106 sealant. Torque attaching screws to 4-6 inch-pound in a diametrically opposed sequence. Safetywire screws in accordance with standard procedures.

Cabin Pressurization Components (Optional).

The optional cabin pressurization control system utilizes the same safety valve as the standard system. In addition to the panel mounted control head, a controllable outflow valve is utilized. The control head combines the function of cabin altitude select and rate control together with the pressurize-depressurize switch.

The optional cabin pressurization system allows maximum passenger comfort by providing selection of any cabin pressure altitude above sea level. The selected cabin altitude is automatically maintained by the control system until the aircraft reaches an altitude creating 4.2 ±0.10 PSI differential pressure. The pressure rate-of-change for the optional system can be selected by the pilot to provide maximum passenger comfort for all except extreme aircraft rate-of-ascent or descent.

Removal and Installation of the Optional Cabin Pressurization Components. (See figure 13-7.)

a. Remove necessary carpet, upholstery and baggage floorboard.
b. Disconnect and cap static lines.
c. Tag and disconnect wires from safety valve.
d. Remove safety wire and screws securing safety valve and outflow valve to aft pressure bulkhead.
e. Tag and disconnect wiring from control head.
f. Remove control head from stationary instrument panel by disconnecting control line and removing mounting screws securing control head.
g. Remove indicators in accordance with Typical Instrument Removal, Section 12.
h. Install optional cabin pressurization components by reversing the removal procedures and perform cabin pressurization check.

FUNCTIONAL TEST OF CABIN PRESSURIZATION INSTALLED COMPONENTS. (340-0001 TO 340-0501)

The following cabin pressurization operational check procedures pertain to checking the operation of the components installed in the aircraft.
a. Remove aft baggage shelf to visually observe safety and outflow valves during operational check.
b. Pull out turn and bank circuit breaker to reduce noise level in the cockpit.
c. Turn aircraft master switch on.
d. Operate pressurization system circuit breaker in and out. If an audible click of the safety valve solenoid is not heard, check the safety valve solenoid valve electrical circuitry. If an audible click is

heard proceed to step "e. "

e. Reset pressurization system circuit breaker and leave in.

f. Set the altitude select knob on the pressurization control to the Hi end (approximately 10, 500 feet). Set the rate control knob on the pressurization control to "MAX. " Listen to the pressurization control for motor operating noise. If no motor noise is heard, the electrical circuit of the motor should be checked. If the motor is operating proceed to step "g. "

g. Rotate the rate control knob on the pressurization control from "Max to Min" several times and observe there is a change in the motor operating speed.

h. Set rate control knob on the pressurization control at nominal (500 feet/min). Using a stop watch, check the time required for motor to operate to a complete stop (approximately 2 minutes to turn 1000 feet).

i. Observe the motor shuts off when altitude select knob rotates to align with index on the pressurization control panel.

j. Rotate altitude select knob on the pressurization control to minimum (approximately 300 feet below sea level), with the rate control knob set to "MAX. "

k. Listen to the pressurization control for motor operating noise. If no motor noise is heard, the electrical circuit of the motor should be checked. If the motor is operating repeat steps "g" and "h. "

l. Turn aircraft master switch off and disconnect control line at outflow valve and draw air through controller poppet valve to assure it is completely off the seat and open. If the poppet valve is closed (unable to draw air through poppet valve) the controller must be replaced. If the controller is open proceed to step "n. "

m. Connect the control line to outflow valve.

n. Place aircraft on jacks, with main gears fully extended.

o. Operate the press-depress switch on the control panel on and off. Check for an audible clicking of the solenoid on the safety valve when operating press-depress switch.

p. If no audible clicking noise is observed during operation check the rigging of the landing gear safety switch and the solenoid valve electrical circuit.

q. Remove aircraft from jacks and disconnect control line at the controller and the wires connected to the safety valve.

r. Close windows, door and dump valves.

s. Start both engines and allow to warm up.

t. Set engine power to approximately 24" Hg MP.

u. Using a hand held altimeter, observe the cabin pressure effect. The altimeter should indicate a minimum of 100 feet depression as the power comes up to insure sufficient pressure to actuate safety valve.

v. Visually checking, the safety valve should close. The outflow valve should also close.

w. If either valve does not close, shutdown engines and check the poppet valve operation on the defective valve in accordance with step "ae. "

x. Retard engine power to idle and connect control line at controller.

y. Set altitude select knob on the pressurization controller to MIN stop (approximately 300 feet below sea level).

z. When it stops increase engine power to approximately 24" Hg MP.

aa. Aircraft cabin should begin to pressurize, as indicated on hand held altimeter. The safety valve should close in 12 seconds or less and the outflow valve should move toward its seat but remain partially open. Observe that cabin pressure begins to climb (the closer the ambient field pressure is to sea level the less the pressure level will be). If the safety or outflow valves do not move, refer to step "ad" and check.

ab. If the outflow valves move toward the seat and the safety valve closes, retard engine power to idle and observe outflow valve. The diaphragm should move to its seat momentarily and then back off to full open.

ac. Shutdown engines, turn master switch off, reconnect the safety valve solenoid wires, and reset turn and bank circuit breaker.

ac. To check the poppet valve of the outflow and safety valve proceed as follows:

1. Remove tailcone access panel.

2. Using a small diameter hose and putty sealer, blow on aft end of safety valve or outflow valve cone. The system must be air tight.

ae. Disconnect control line from both controller and outflow valve.

af. Check control line for leaks using a static system leak tester. The line must be air tight.

ag. Reconnect control line to controller and outflow valve.

ah. Check diaphragms of both the outflow and safety valves for damage in the relaxed and extended positions.

ai. Check the cones of both the outflow and safety valves, the diaphragm seats, and the air inlet screens for cleanliness.

aj. Check tailcone static lines for security, check the fittings of aft side of pressure bulkhead to insure fittings are clear of obstructions and holes are open on both the outflow and safety valves.

ak. Check solenoid valve body for retention security on the safety valve.

al. Replace tailcone access panel and rear baggage shelf.

Outflow Valve Operational Check.

The outflow valve may be ground checked as follows:

a. Tag and disconnect wire from safety valve.

b. Disconnect line connecting the control unit to the outflow valve at the control unit.

c. Start engines and allow to warm up.

d. With the engines operating at 22" Hg manifold pressure, windows and doors closed and pressurization switch on, check safety valve for being closed.

e. The outflow valve should close and cabin pressure built to 0. 2 PSI or more depending on field elevation.

NOTE

No control of the valve exists when the hose is disconnected. The above procedures will determine if the outflow valve will respond to a signal from the control.

Pressurization System Leak Check. (340-0001 to 340-0501.)

NOTE

The standard pressurization system has no interconnecting plumbing. However, the optional pressurization system is operated by airflow and will not operate properly if there is a leak in the line.

a. Disconnect the line at the outflow valve and at the controller on the stationary instrument panel and plug the forward end of the line.
b. Attach an alternate source of vacuum (capable of 5 inches Hg.) to the aft end of the line and check for leaks.

NOTE

A pitot static test unit may be used in lieu of vacuum source.

c. With a vacuum of 5 inches Hg. on the system, leak rate should not exceed 0.02 inches Hg. per minute. (Using a pitot static test unit, leakage should not exceed 20 feet per minute with 5000 feet indicated on altimeter.)
d. Connect line at the outflow valve and at the controller.
e. Perform operational check in accordance with cabin pressurization check.
f. The diaphragm or poppet valves in the outflow and safety valves may develop leaks causing an unstable flow which upsets the controller signal and creates a pressurization fluctuation. If the outflow or safety valve is suspected, perform the following check:
1. Remove the outflow valve from the aircraft.
2. Set the outflow valve with exit cone up.
3. Tape over the two oval holes in the flange of the diaphragm seat with masking tape.
4. Apply clean dry air pressure of 1 PSI, to the port marked "TO CONTROLLER."
5. The diaphragm should extend and seal against the seat.
6. Seal off port marked "TO CONTROLLE R" where air pressure is applied.
7. Maintain the valve position with exit cone up. The diaphragm should remain extended against the seat for a minimum of 30 seconds. If the diaphragm collapses the valve is leaking and must be replaced.
8. Replace the outflow valve in the aircraft.
9. Remove safety valve from aircraft.
10. Set the safety valve with exit cone up.
11. Tape over the two oval bleed holes in the flange of the safety valve with masking tape.
12. Apply clean dry air pressure of 1 PSI to the inlet air screen on the side of the casting.

NOTE

Use a length of soft hose or modeling clay to provide an inlet port for the safety valve.

13. The diaphragm should extend and seal against the seat.
14. Seal off port where air pressure is being applied.
15. Maintain the valve position with exit cone up. The diaphragm should remain extended against the seat for a minimum of 30 seconds. If the diaphragm collapses the valve is leaking and must be replaced.

Leak Check of Pressurization Components. (See figure 13-7.) (340-0501 and On.)

a. Remove the orifice fitting from the rear of the controller. In its place screw an AN814-5D plug.
b. Disconnect the vacuum line from tee (16) to controller (7) at tee. Plug open end of line.
c. Disconnect the line connecting the outflow valve (2) to controller (7) at the outflow valve.
d. Connect an alternate source of vacuum to the disconnected line.
e. Set controller altitude and rate selection knobs to maximum values.
f. Pull a vacuum on the line. With 1 in. Hg. vacuum (2000 ft. on altimeter), there should be no leakage observed for three minutes.

CAUTION

Controller unit will be damaged if more than 1 in. Hg. vacuum is applied to line.

g. At completion of leak check reconnect line to outflow valve and remove AN814-5D plug from controller and install orifice fitting.
h. Remove plug from vacuum line and reconnect line to tee (16).

Preflight Ground Checkout Procedure. (Optional System.)

a. Place aircraft in pressurized mode: doors and windows closed, pressurized air switches in PRESSURIZE position, ram air valve control and dump valve control pushed full in.
b. Pull CABIN PRESS circuit breaker.
c. Start and run engines at 22 inches of manifold pressure. Confirm that aircraft vacuum is in the green range.
d. On cabin altitude control, place cabin altitude pointer on S. L. (sea level).
e. Set rate control arrow straight up (12 o'clock position) immediately after setting cabin altitude.
f. Observe cabin rate-of-change gage. It should reflect approximately 500 feet per minute reading until cabin altitude approaches sea level. After this time, it should drop to zero.
g. Observe cabin differential pressure gage. It should increase and then stabilize at approximately .00 psi at sea level. The cabin differential pressure

| ALTITUDE X 1000 FT | DIFFERENTIAL PRESSURE PSI | ALTITUDE X 1000 FT | DIFFERENTIAL PRESSURE PSI |
|---|---|---|---|
| 1 | .52 | 9 | 4.19 |
| 2 | 1.03 | 10 | 4.58 |
| 3 | 1.52 | 11 | 4.97 |
| 4 | 2.00 | 12 | 5.35 |
| 5 | 2.47 | 13 | 5.71 |
| 6 | 2.92 | 14 | 6.06 |
| 7 | 3.35 | 15 | 6.40 |
| 8 | 3.78 | 16 | 6.72 |
| (STANDARD DAY) | | | |

Figure 13-7A. Pressure/Altitude Chart

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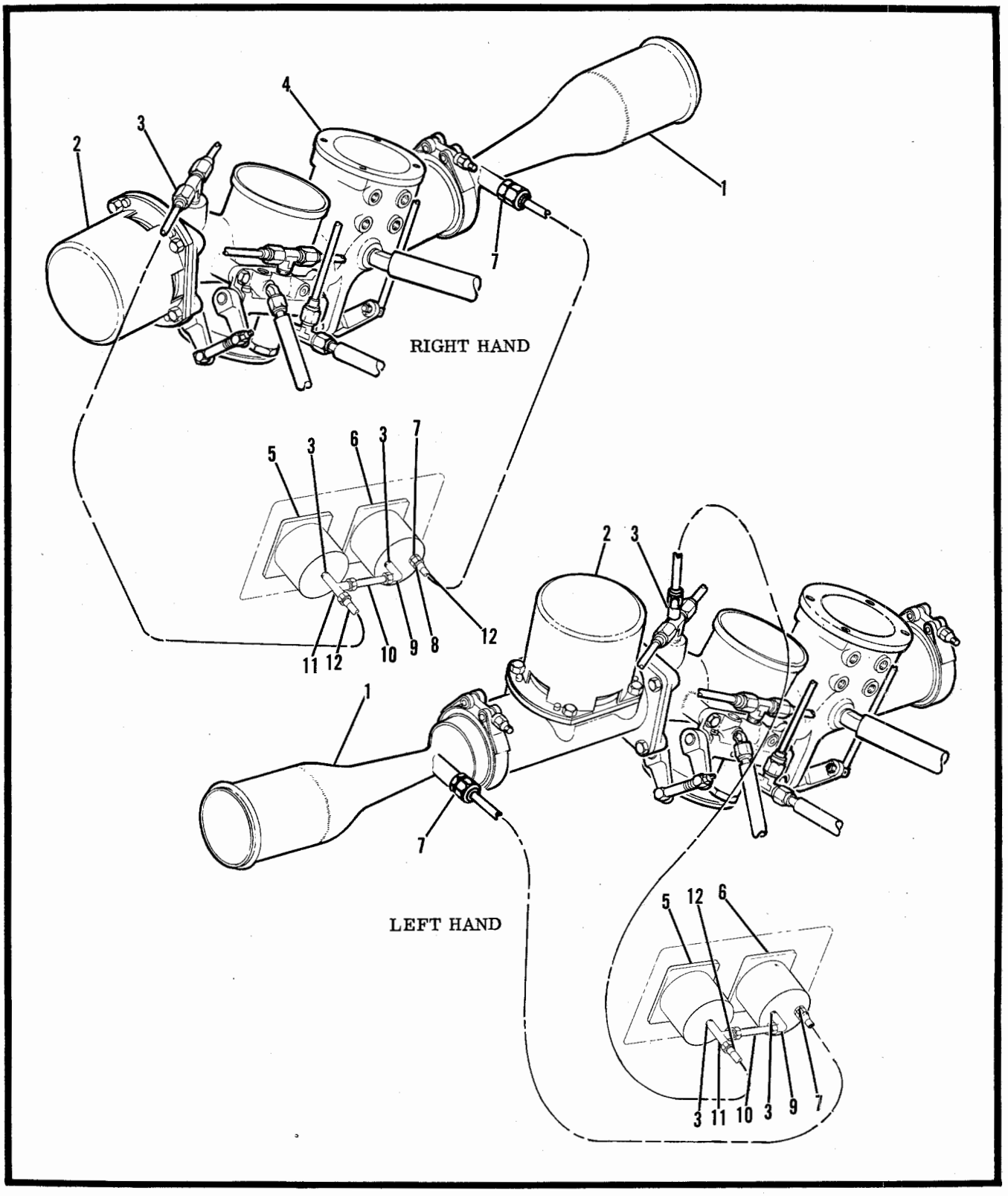



1. Sonic Venturi
2. Manifold Pressure Relief Valve
3. High Pressure Port
4. Throttle Body
5. Absolute Pressure Gage
6. Differential Pressure Gage
7. Low Pressure Port
8. Nipple
9. Elbow
10. Interconnect Hose
11. Tee
12. Instrument Hose

Figure 13-8. Cabin Pressurization Test Equipment

will increase approximately .50 psi per 1000 feet increase above sea level. See figure 13-7A.

h. Reselect a cabin altitude higher than field elevation and set rate control knob on maximum position by turning full clockwise.

i. Verify cabin has depressurized before concluding test. Reset CABIN PRESS circuit breaker.

Optional Cabin Pressurization System Flight Check (Preferred Method).

a. Conduct a Turbocharger System Operational Flight Check, refer to Section 9 for Turbocharger Operation Flight Check Procedures.

1. Remove necessary access panels to observe safety valve and outflow valve in flight.

2. Immediately after lift off the safety valve should begin to close. Anytime after the "Press-Depress" switch is positioned to the "Press" mode, altitude selection is not critical. The safety valve should move closed until it contacts softly against the seat, within 12 seconds.

3. After the aircraft passes through its selected altitude the outflow valve will begin to close and cabin pressure will start to rise. This valve will settle near the seat and modulate to maintain the selected cabin pressure.

b. During the climb to altitude, set cabin altitude control for a sea level cabin. A properly functioning system should maintain a sea level cabin to 8000 feet altitude. A 4.2 ±0.1 PSIG differential pressure should be maintained throughout the remainder of the climb. Monitor cabin altitude during the climb and compare cabin pressurization with the cabin pressurization schedule in the 340 Owner's Manual.

c. If the engines and turbochargers are functioning normally, according to the Turbocharger Operation Flight Check Procedures, Section 9, any malfunction of the cabin pressurization system should be isolated to the cabin area, its ducting seals and/or regulating equipment.

NOTE

If engines are not performing properly at altitude, the trouble should be corrected before proceeding further with this check.

d. While at cruise power and maximum differential pressure, check the following for air leaks: around the main cabin door, emergency exit window, cockpit storm windows, etc., refer to Pressurization Troubleshooting Checklist in this section for additional areas to check.

1. While at cruise airspeed and engine power, verify air flow from the crew wemacs is approximately doubled when the PRESS AIR HEAT knob is moved from the hot to the cold position. Flow in the cold position shall remain adequate when the wemac blower is turned off. There shall be no objectionable air noise with the control in the hot position, nor shall there be any flow through the wemacs if the wemac blower is turned off.

e. Check cabin pressure regulator and safety valve for escaping air pressure, both valves should be closed if 4.2 ±0.1 PSIG differential pressure is not being maintained.

f. Check operation of each engine and the pressurization air dump valves by dumping one valve at a time. A normal system will show a momentary change in cabin altitude followed by a return to a stable condition on the cabin rate-of-change indicator. Close the valve, returning the system to pressurization from both engines. Dump the opposite valve and observe the cabin rate-of-change indicator for change. The rate should become stable after a momentary change in cabin altitude.

CAUTION

Severe personnel discomfort will be encountered if both dump valves are opened at the same time.

A continuing rate-of-change indication and a loss of differential pressure at a constant power setting, while pressurizing with one engine, could indicate leaking in the dump valves or ducting in that system.

g. If 4.2 ±0.1 PSIG differential pressure was not maintained during the check flight, refer to the Pressurization Troubleshooting Checklist and perform the Cabin Pressurization System Inspection found in Section 2.

Cabin Pressurization System Ground Check (Alternate Method) (Standard and Optional Systems).

The following cabin pressurization ground check procedures, which is the alternate method, can be performed in lieu of the Cabin Pressurization Flight Check Procedures, using Cabin Pressurization System Test Kit, SK421-1.

a. Park the aircraft heading into the wind.

CAUTION

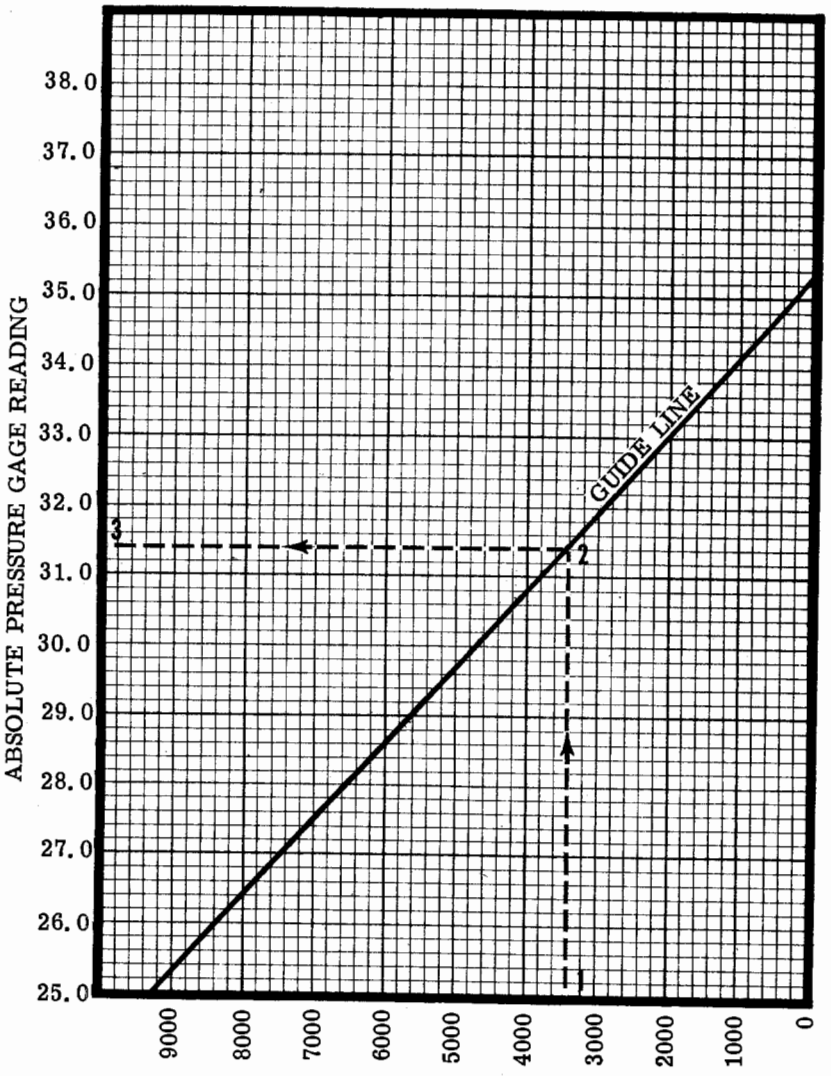
Conduct engine runup during the check with the cowling installed to prevent overheating. This check can be run using either engine.

b. With battery power only, or with engines at idle power, verify that the wemac blower provides low and high flow through the wemac distribution system. Position of the PRESS AIR HEAT control is not important at this time.

SAMPLE PROBLEM: (for Chart A)
1. Field Pressure Altitude - 3400 Ft.
2. Guide Line
3. Absolute Pressure Gage Reading - 31.4 in. Hg.

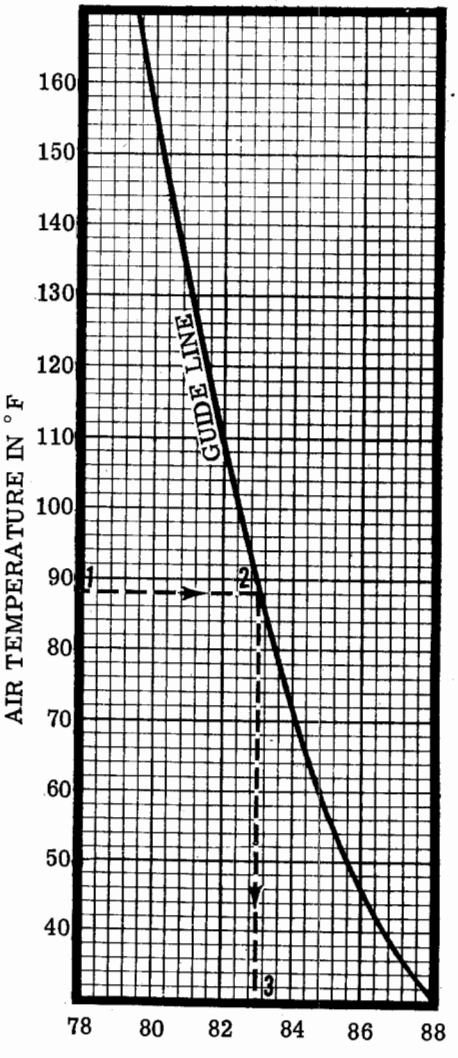
SAMPLE PROBLEM: (for Chart B)
1. Outside Air Temperature - 88°F
2. Guide Line
3. Differential Pressure Gage Allowance - 83 in. $H_2O$.

CHART **A**




FIELD PRESSURE ALTITUDE IN FEET
(ALTIMETER SET TO 29.92 IN. HG.)

CHART **B**




DIFFERENTIAL PRESSURE
GAGE (MAX ALLOWABLE)
INCHES $H_2O$

Figure 13-9. Leak Rate Chart

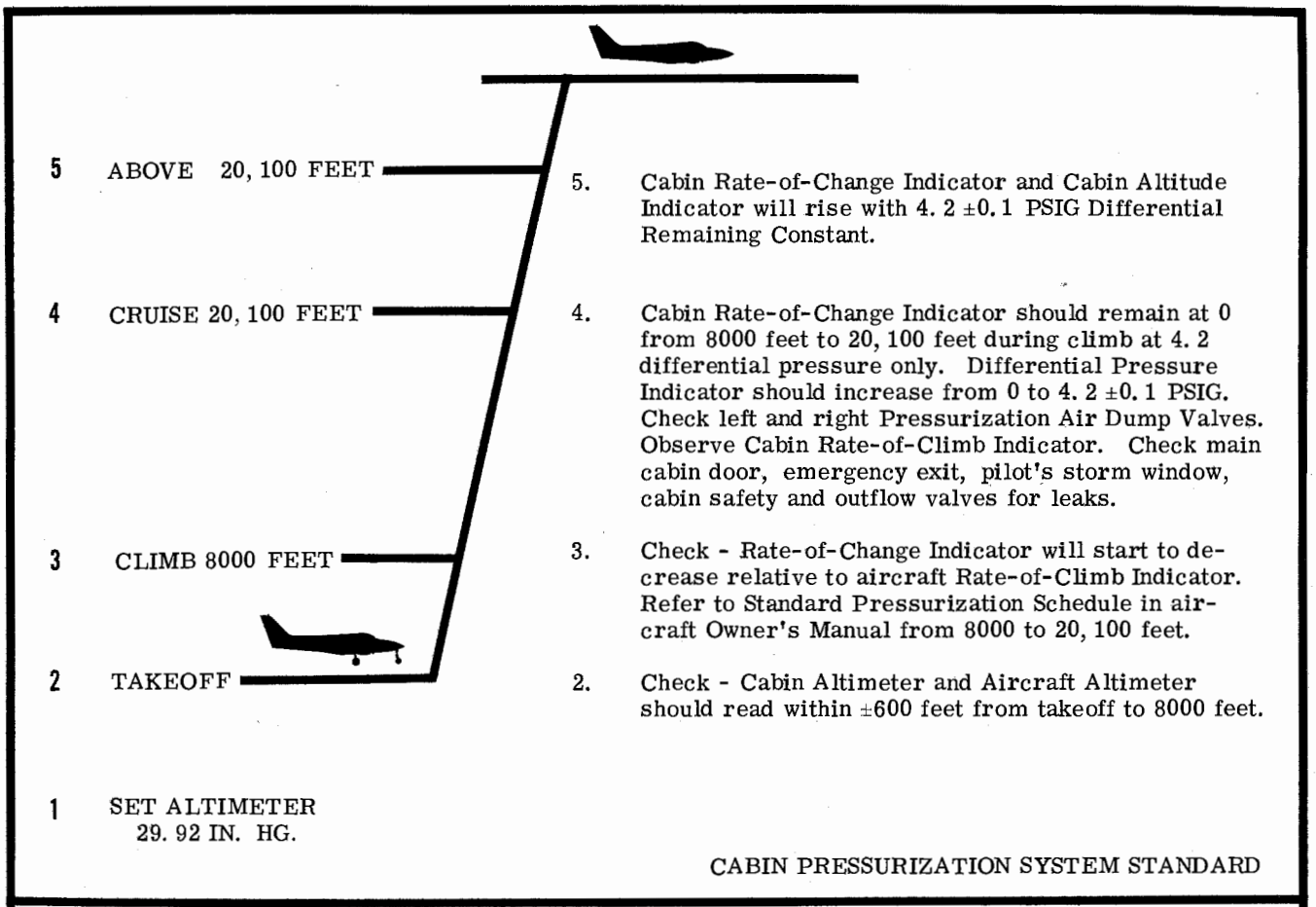



Figure 13-10. Cabin Pressurization Operation Flight Check Chart

NOTE

On aircraft 340-0211 and On, flow from the pilot and copilot wemacs will be slightly less than from the cabin outlets due to the tendency for some of the blower air to reverse flow down to the heat exchange area at low engine speeds.

c. With the PRESS AIR HEAT knob turned to the full cold (CCW) position, turn off the wemac blower and increase engine speed briefly to 2500 RPM. At approximately 2000 RPM and above, air will begin flowing through the pilot's and copilot's wemacs. Operation of the wemac blower in either low or high will proportionately increase this flow. Turn wemac blower off and PRESS AIR HEAT to hot (CW) position. There will be no flow through the wemac system. (The wemac blower, of course, can still be used if desired. ) Shut down engines.

d. Remove caps from high pressure ports located on the throttle body and low pressure ports located on the venturi. Connect gages as shown in figure 13-8.

e. Route instrument hoses out of nacelle through the cowl flap opening. Place instruments close to tip tank and tape lines to wing.

f. Remove aft baggage shelf to gain access to outflow valve.

g. Disconnect control line at outflow valve (optional system).

NOTE

On aircraft with standard pressurization system, the shipping plug must be removed from the outflow valve to allow pressurization.

h. Pull cabin "PRESS" circuit breaker.

i. Position ram air control valve to closed.

j. Close cabin windows and doors.

k. Set altimeter to 29. 92 inches Hg. and record field pressure altitude.

l. Start instrumented engine in accordance with Starting Procedures in aircraft Owner's Manual.

CAUTION

Do not allow engine manifold pressure to exceed 28. 0 inches Hg. when starting, to prevent damage to the differential pressure test gage. After the engines are started, the manifold pressure can be increased; however, the differential pressure test gage must be monitored to prevent rapid acceleration. To provide for personnel comfort, throttle movements (increase or decrease) should be monitored to maintain a cabin pressure rate-of-change of not more than 1000 feet per minute.

m. (See figure 13-9. ) The following step by step procedures are given to determine if the cabin is pressurizing properly.

1. Starting at field pressure altitude, recorded in step 1, on Chart A, project a line from field pressure altitude to the diagonal guide line then to absolute pressure reading.

2. Increase engine RPM until absolute pressure gage reading, as determined in step 1, is reached, and hold this reading for one minute. Record the differential pressure gage reading. This is measured cabin differential pressure.

3. Record the aircraft outside air temperature, then starting from this point on Chart B, project a line to the guide line then to differential pressure gage reading.

4. If the differential pressure gage reading obtained from Chart B is equal to or more than the actual differential pressure gage reading obtained in step 2, the cabin differential pressure rate is acceptable.

n. If the differential pressure is greater than that obtained from Chart B, the cabin pressurization system is not maintaining a proper differential pressure and the Cabin Pressurization System Inspection in this section should be performed.

o. After test is completed, remove all test equipment and restore aircraft to original configuration.

Pressurization Troubleshooting Checklist.

| LOCATION | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| Entrance Door* | Faulty seals and/or Lock-O-Seals. | Repair or replace seal. Refer to SK421-2. |
| Emergency Exit* | Faulty seal. | Replace seal. |
| Foul Weather Window | Faulty seals. | Replace seals. |
| Ram Air Valve | Faulty O-ring. | Replace O-ring. |
| Wire Bundles at Station 100. 00 Bulkhead | Sealant broken. | Reseal bundle. |
| Heater Hoses in Nose | Loose, cracked or damaged. | Replace heater hose. |

Pressurization Troubleshooting Checklist (Continued).

| LOCATION | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| Access Doors | Faulty seals. | Replace seals. |
| Windows | Sealant broken. | Replace sealant. |
| Nose Gear Push-pull Tube | Boot loose or torn. | Replace boot. |
| Main Gear Push-pull Tube | Boot loose or torn. | Replace boot. |
| Controls at Station 100. 00 Bulkhead | Sealant broken | Reseal controls. |
| Controls at Stub Wing | Sealant broken. | Reseal controls. |
| Safety Valve and Outflow Valves** | Faulty gaskets and/or diaphragm. | Replace gaskets or valve assemblies. |
| Dump Valves | Damaged O-ring. | Replace O-ring. |
| Inflow Lines | Cracked or broken. | Replace lines. |

*A small amount of leakage around these ares is normal.

**Valves have bleed orifices which are located in the inner face of the mounting flange (approximately cfm bleed at 4 psig each valve).

OXYGEN SYSTEM (OPTIONAL).

The oxygen system is designed to supply oxygen for a pilot and five passengers. The oxygen system consists of an oxygen cylinder, filler valve (located inside the left nose baggage door), plumbing, pressure gage, six outlet couplings, two permanent oxygen masks and four disposable type oxygen masks. An overboard vent line is incorporated in the regulator shutoff valve as a safety precaution. Two optional cylinders, an 11. 0 and a 76. 6 cubic foot, are provided which meet the air carrier oxygen requirements. On aircraft using the 76. 6 cubic foot cylinder, an altitude compensator is incorporated in the line from the regulator to the oxygen outlets. This compensator reduces oxygen expenditures at lower altitudes and increases the oxygen duration.

The plumbing from the forward cabin bulkhead to the six oxygen outlet couplings are standard equipment in the aircraft. Oxygen is routed from the high pressure cylinder through a regulator-shutoff valve. The regulator-shutoff valve reduces high cylinder pressure to a low usable pressure, and is controlled by a knob located just left of the pedestal. The low oxygen pressure is routed to six, outlet couplings which supply a continuous flow of oxygen to the oxygen mask whenever the mask hoses are plugged into the couplings. Each coupling contains a spring-loaded valve which prevents the flow of oxygen until the mask hose is plugged into the coupling. Each mask hose contains a flow indicator for visual proof of oxygen flow. The filler valve is located inside the nose baggage door and eliminates removal of the oxygen cylinder for refilling. The filler valve is a self-sealing automatic valve which required no manual opening or closing. A protective cap screws over the filler valve to prevent entry of foreign particles. The oxygen pressure gage is connected to the regulator-shutoff valve by a tube and indicates the amount of oxygen pressure in the oxygen cylinder.

WARNING

USE NO OIL. Keep equipment free of organic material (dust, lint, etc. ). Be sure hands and clothing are free of oil, grease, soap, lipstick, lip balm and other fatty materials.

CAUTION

Prior to initial use, refer to Purging the Oxygen System Procedures and purge the oxygen system in accordance with purging procedures for a period of ten (10) minutes by inserting mask fittings at each of the outlets. If the system has not been used for a period of two (2) years, the regulator shall be inspected and rubber materials replaced.

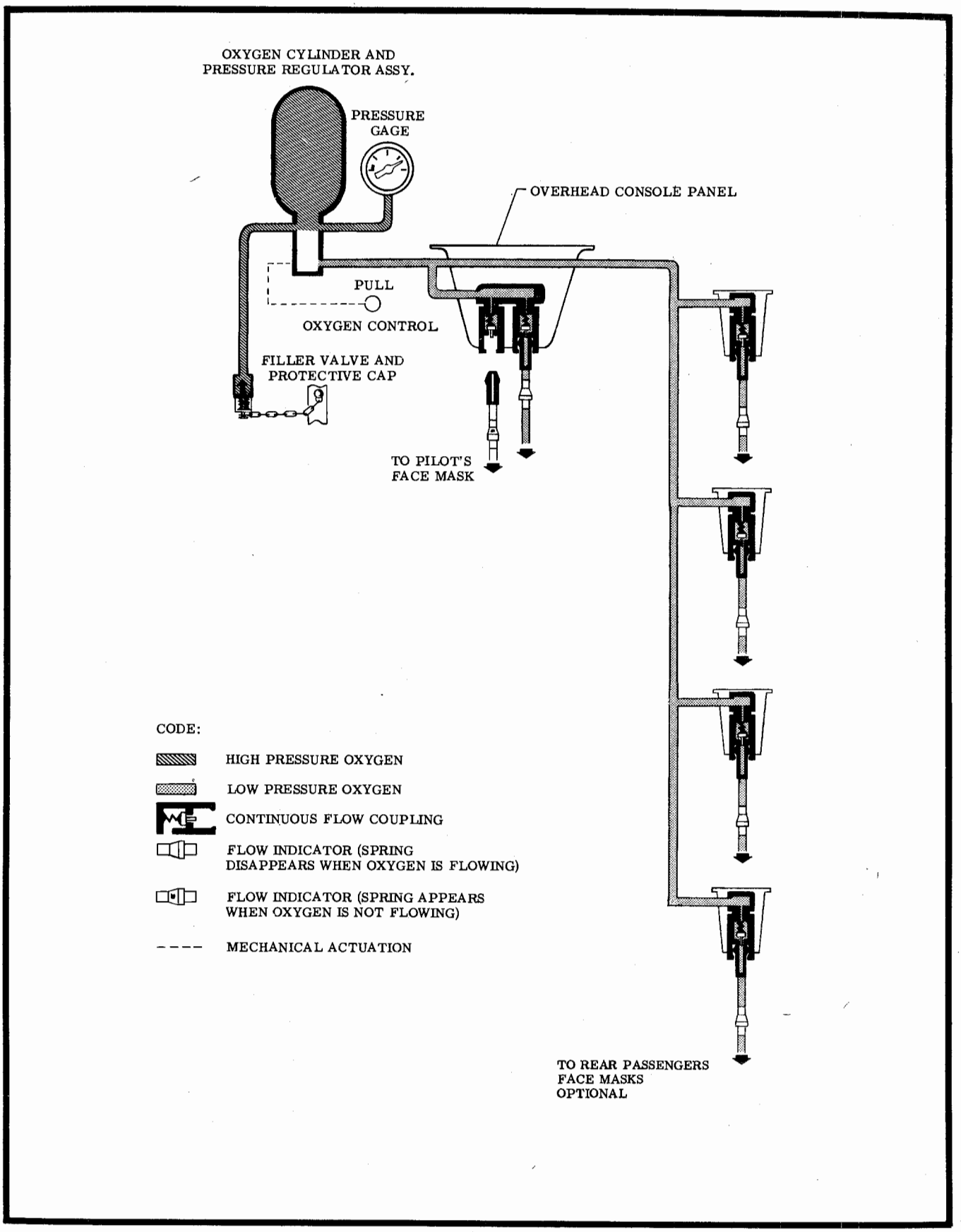



Figure 13-11. Oxygen System Schematic

Troubleshooting the Oxygen System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NO PRESSURE INDICATION ON PRESSURE GAGE | Leak in system has exhausted pressure. | Visually check pressure gage. Charge system and use detector fluids, type CG-1, MIL-25567A, or its equivalent, to check lines and fittings. Tighten or replace fittings as necessary. |
| | Defective pressure gage. | Pull knob out, insert mask hose into outlet and note flow indicator. Replace gage. |
| PRESSURE INDICATION NORMAL BUT OXYGEN FAILS TO FLOW | Defective oxygen cylinder-regulator assembly. | Replace oxygen cylinder-regulator assembly. |
| OXYGEN DURATION TOO SHORT | Leak in system. | Draw a line on gage cover glass directly over pointer with a grease pencil. Loss of oxygen should not exceed one percent of total supply for a 24-hour period. Charge system and use detector fluids. Type CG-1, MIL-25567A, or its equivalent, to check lines and fittings. Tighten or replace fittings as necessary. |

Maintenance of Oxygen System.

Before and during maintenance on oxygen systems, the following general rules must be followed:

a. Clean hands, tools and working area.

b. Keep grease, oil, water and all foreign matter from system.

c. Keep all lines dry and capped until installed.

d. All compounds used on fittings must conform to MIL-T-5542. No compound shall be used on aluminum alloy flared fittings. Compounds are used only on the first three threads of male fittings. No compound is used on coupling sleeves, or outside of tube flares.

CAUTION

Whenever a component of the oxygen system (lines, gages, cylinders or regulators, etc.) has been removed, reinstalled, replaced, or system has been disassembled in any way, the oxygen system must be leak checked and purged as per procedures outlined in this section.

e. Inspection of the cylinder is required before charging. Do not attempt to charge the cylinder if any of the following conditions exist:

1. Contamination or corroded fitting on cascade cylinder of filler valve.
2. Cylinder out of hydrostatic test date.
3. Cylinder bears no I. C. C. designation.
4. Cylinder completely empty after shutoff valve has been turned off for a length of time. Must be completely disassembled and inspected in an FAA approved facility before charging.

f. Fabrication of pressure lines is not recommended. Lines should be replaced from factory by part number.

g. Lines and fittings shall be clean and dry. One of the following methods may be used to clean lines:

1. A vapor degreasing solution of stabilized trichlorethylene conforming to Specification MIL-T-7003 followed by blowing tubing clean and dry with a stream of clean, dry, filtered air.

CAUTION

Most air compressors are oil lubricated, and a minute amount of oil may be carried by the air stream. A water lubricated compressor should be used to blow tubing clean.

2. Flush with naphtha conforming to Specification TT-N-95, then blow clean and dry with clean, dry, filtered air. Flush with anti-icing fluid conforming to MIL-F-5566 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water and dry with clean, dry filtered air.

NOTE

Cap lines at both ends immediately after drying to prevent moisture from entering.

Bleeding the Oxygen System. (See figure 13-12.)

a. Pull oxygen control knob (9) to ON position.
b. Remove tubing from mask end of one of the pas-

senger's oxygen masks and insert into oxygen outlet and route the hose outside the cabin area through the pilot's foul weather window.

WARNING

The bleeding procedure should be accomplished outdoors. If the bleeding is done indoors extreme care must be exercised to prevent oxygen flow from oils, grease, contaminants and electrical sparks. The area should be roped off and no smoking or open flame in or near the area.

c. Bleeding the oxygen system into the cabin area is not recommended.

Removal of Oxygen Cylinder-Regulator Assembly. (See figure 13-12.)

The following procedures given pertain to either 11.0 cubic feet, or 76.6 cubic feet oxygen cylinders. Access to the oxygen cylinders is made by removing the nose baggage access.

CAUTION

The oxygen cylinder-regulator may be removed with the cylinder charged; however, extreme care must be used to prevent damage during removal. The slightest scratch, nick or dent is cause for immediate condemnation of the cylinder.

a. Push oxygen control knob (9) to OFF position.
b. Disconnect lines from oxygen cylinder-regulator.
c. Disconnect control cable (14) from regulator (16) and safety wire shutoff arm in the OFF position.

CAUTION

Do not rotate control lever to the "ON" position with outlet ports (low pressure) open to atmosphere. Damage to regulator metering poppet will occur.

d. Remove control mounting clamp from regulator (16).
e. Loosen mounting clamp (19) from oxygen cylinder and remove cylinder from aircraft.

Installation of Oxygen Cylinder-Regulator Assembly. (See figure 13-12.)

WARNING

Extreme care must be exercised when installing or working near the oxygen cylinder-regulator to prevent damage to the cylinder. The slightest scratch, nick or dent is cause for immediate condemnation of the cylinder.

a. Install oxygen cylinder-regulator assembly in position on mounting clamps (19).

NOTE

Do not tighten mounting clamps (19) at this time.

b. Install clamp on oxygen regulator (16).
c. Align oxygen cylinder-regulator (16) with control (14) and tighten clamp on oxygen regulator (16).
d. Connect lines (15, 17 and 18) and tighten mounting clamps (19).
e. Remove safety wire and connect control (14).
f. If oxygen cylinder was empty when installed refer to Purging the Oxygen System procedures and purge oxygen system before filling.
g. Charge system and check for leakage.
h. Install access cover.

Removal of Altitude Compensating Oxygen Regulator. (See figure 13-12.)

a. Move oxygen control knob to the OFF position.

NOTE

Repair or maintenance of this unit is not recommended. If malfunction should occur, remove and replace.

b. Disconnect inlet and outlet lines from compensating regulator (21).
c. Loosen mounting clamp and remove compensating regulator from aircraft.
d. Install clean dry caps in inlet and outlet ports of compensating regulator and install clean dry plugs in disconnected oxygen lines.

Installation of Altitude Compensating Oxygen Regulator. (See figure 13-12.)

a. Remove protective caps and plugs from compensating regulator and supply lines.
b. Install compensating regulator in clamp mount.
c. Connect supply lines to compensating regulator.
d. Tighten clamp mount screws.

Removal of Oxygen Pressure Gage. (See figure 13-12.)

The oxygen pressure gage may be removed without bleeding the oxygen system. A check valve is installed in the gage pressure outlet of the regulator to provide a shutoff for the flow of oxygen from the cylinder when the capillary line is disconnected at the oxygen cylinder-regulator.

WARNING

Use non-sparking tools and make sure tools and hands are free from oils, grease and other contaminants when working with oxygen.

a. Disconnect capillary line (18) at regulator. The check valve should close as the capillary line is loosened.

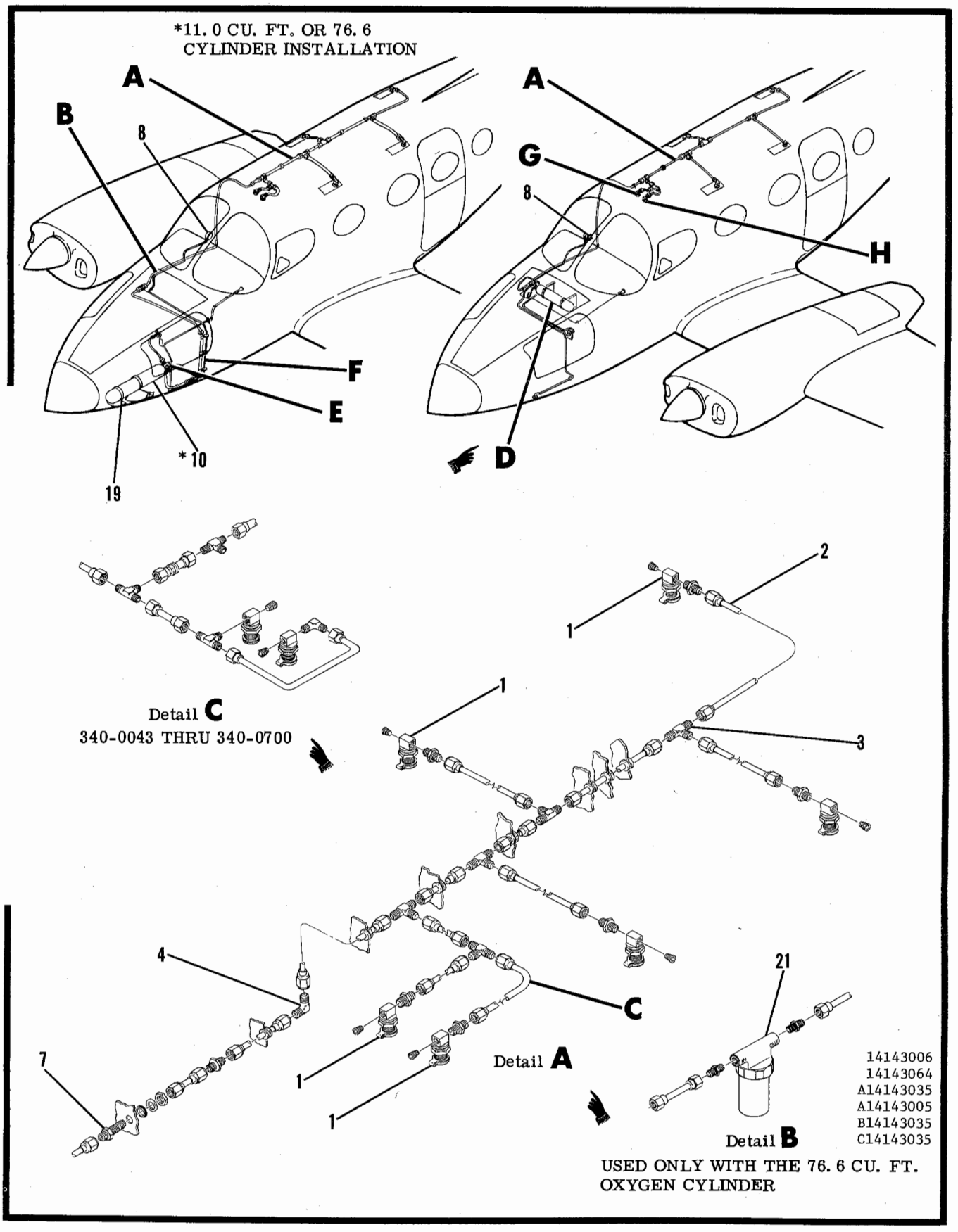
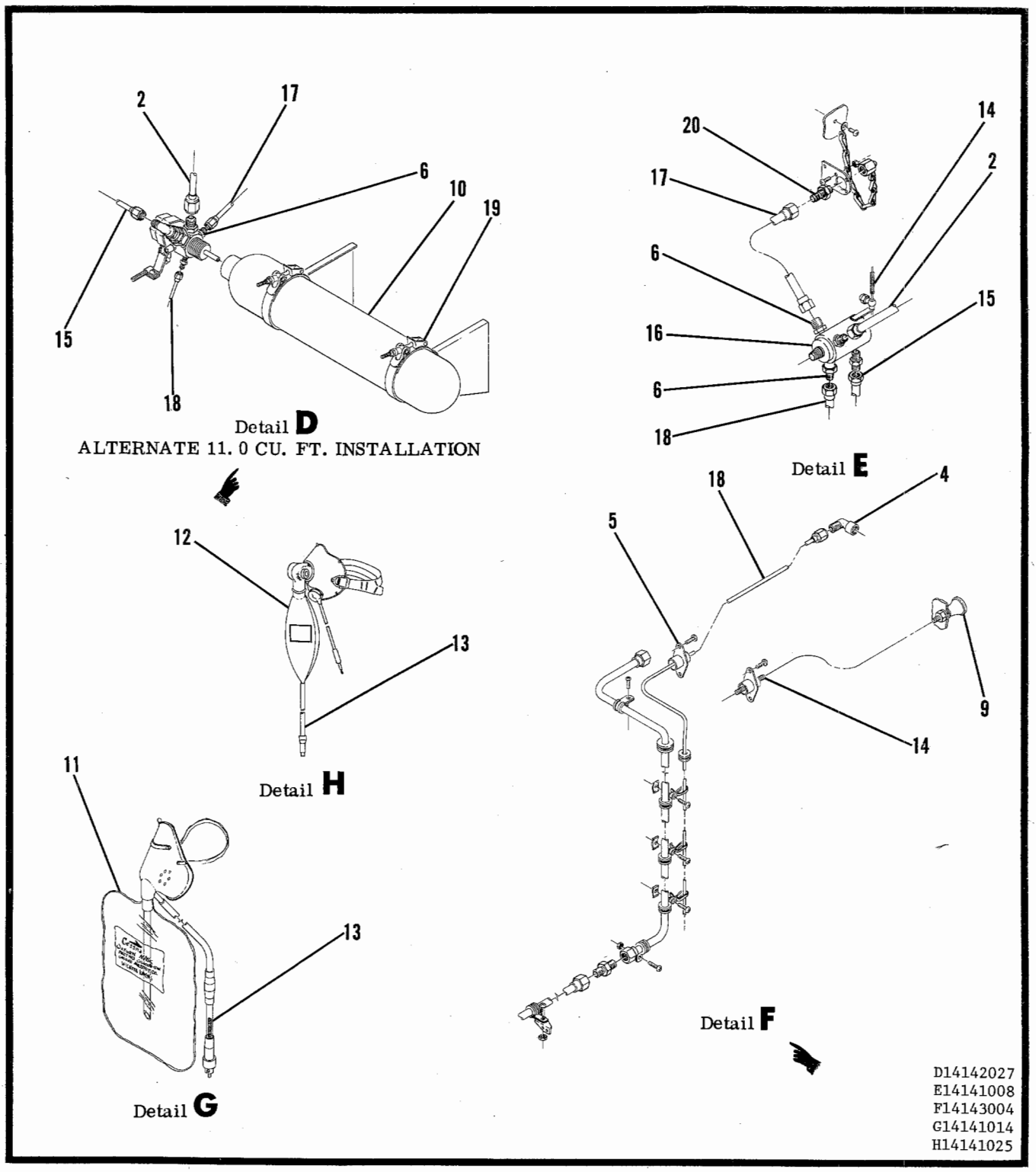



Figure 13-12. Oxygen System Installation (Sheet 1 of 2)




1. Oxygen Outlet
2. Oxygen Supply Line
3. Tee
4. Elbow
5. Seal Assembly
6. Check Valve
7. Union
8. Pressure Gage
9. Oxygen Control Knob
10. Oxygen Cylinder
11. Disposable Oxygen Mask
12. Oxygen Mask
13. Hose
14. Control Cable
15. Overboard Vent Line
16. Regulator
17. Filler Valve Line
18. Capillary Line
19. Clamp
20. Filler Valve
21. Compensating Oxygen Regulator

Figure 13-12. Oxygen System Installation (Sheet 2)

CAUTION

If oxygen continues to flow when line is loosened, reconnect line and bleed off pressure in accordance with bleeding procedures.

b. Disconnect capillary line (18) from nipple in back of pressure gage.
c. Cap all lines immediately after disconnecting.
d. Remove pressure gage by removing mounting screws.

Installation of Oxygen Pressure Gage. (See figure 13-12.)

a. Install oxygen pressure gage by reversing the removal procedures.

Removal of Oxygen Filler Valve. (See figure 13-12.)

The oxygen filler valve may be removed without bleeding the oxygen pressure system. A check valve is installed in the high pressure port of the oxygen regulator to shutoff flow of oxygen from the cylinder. When the high pressure filler line is disconnected from the oxygen cylinder-regulator.

WARNING

Use non-sparking tools and make sure tools and hands are free from oils, grease and other contaminants when working with oxygen.

a. Disconnect tne filler valve line (17) at regulator. The check valve should close as the filler valve line is loosened.

Each interconnected series of oxygen cylinders is equipped with a single gage. The trailer type cascade may also be equipped with a nitrogen cylinder (shown reversed) for filling landing gear struts, accumulators, etc. Cylinders are not available for direct purchase, but are usually leased and refilled by a local compressed gas supplier.

Service Kit SK310-32 (available through Cessna Dealers' Organization) contains an adapter, a pressure gage, hose, lines, and fittings for equipping two oxygen cylinders to service oxygen systems. As noted in the Service Kit, a tee (Part No. 11844) and a pigtail (Part No. 1243-2) should be ordered for each additional cylinder to be used in the cascade of cylinders. Be sure to ground the aircraft and ground servicing equipment before use.

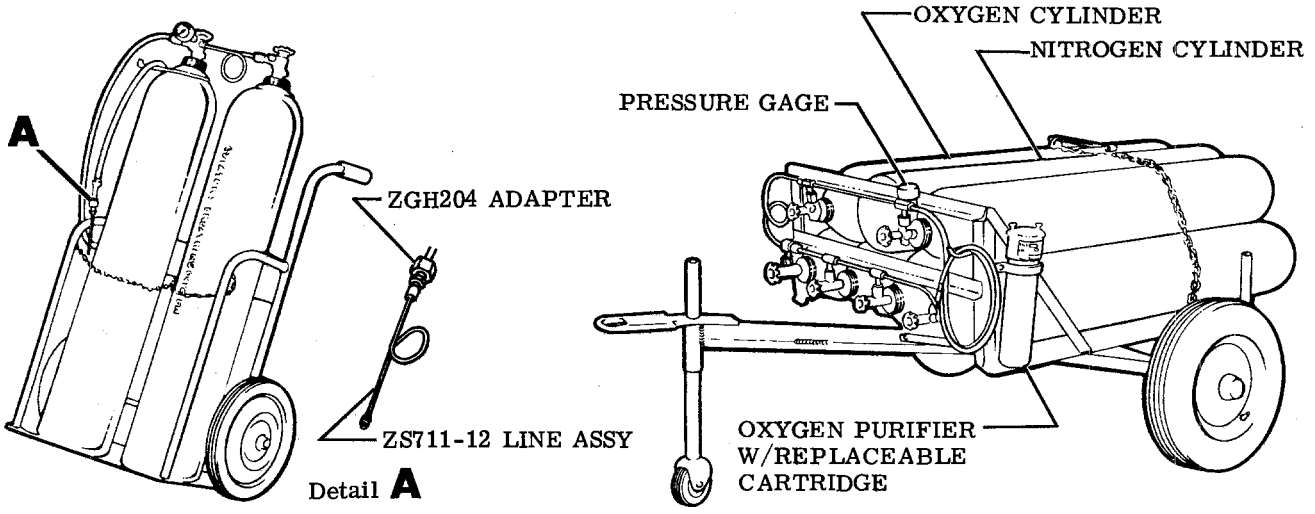



Figure 13-13. Typical Portable Oxygen Cascades

CAUTION

If oxygen continues to flow when the filler line is loosened, reconnect the line and bleed off oxygen pressure in accordance with bleeding procedures.

b. Cap all lines immediately after disconnecting.
c. Remove filler valve protective cap.
d. Remove filler valve by removing nut securing valve to bracket.

Installation of Oxygen Filler Valve. (See figure 13-12.)

a. Position filler valve in mounting and secure with nut.
b. Replace filler valve protective cap and connect filler valve line (17) to filler valve (20).

Removal of Oxygen Control Cable. (See figure 13-12.)

a. Disconnect control from regulator using Allen wrench.
b. Remove clamps securing control to structure.
c. Remove nut and washer securing control to support bracket.
d. Pull control aft through cabin bulkhead seal and remove cable.

Installation of Oxygen Control Cable. (See figure 13-12.)

a. Route cable from cabin through support bracket and secure to bracket with washer and nut.
b. Secure cable to structure with clamps.
c. Connect cable to cylinder by installing collar assemblies.
d. Secure collar assemblies in proper position by tightening Allen screws.
e. Verify proper operation of control and oxygen system.

INSPECTION CRITERIA FOR ACCEPTANCE OF OXYGEN CYLINDERS

The following data may be used to determine that oxygen cylinders are acceptable for service. This criteria should be used prior to charging cylinders.

| Discrepancies | Cylinder Classification | |
|---|---|---|
| | ICC-3AA 1800 | ICC-8HT 1800 |
| Isolated pitting or corrosion (Depth) | .020 2 3 | .010 2 3 |
| Local pitting or corrosion or line corrosion (Depth) | .010 3 4 | .005 3 4 |
| General corrosion | Not Allowed 5 | Not Allowed 5 |
| Cuts, Digs, Gouges (Depth) | .010 6 | .005 6 |
| Dents (Depth) | .062 7 | .031 7 |
| Fire Damage | Not Allowed 8 | Not Allowed 8 |
| Bulges | Not Allowed 9 | Not Allowed 9 |

2 Isolated pits of small cross section involving loss of wall thickness by corrosive media. Small isolated pits with a maximum depth as shown are acceptable.
3 If depth exceeds figure shown, cylinder must be returned to the manufacturer for disposition.
4 Local pitting or corrosion or line corrosion involving loss of wall thickness by corrosive media with a pattern of pits which are connected to others in a band or line. A small area with a minimum depth as shown is acceptable. Areas extending beyond 3 inches in diameter or 4 inches long shall be considered general corrosion.
5 General corrosion (sometimes accompanied by pitting) involving loss of wall thickness by corrosive media covering a considerable area. Cylinder must be returned to the manufacturer for hydrostatic testing.
6 Deformations caused by contact with a sharp object cutting or upsetting the material of the cylinder, decreasing the wall thickness. Maximum defect permissible without corrective action. If this depth is exceeded, the cylinder must be returned to the manufacturer for removal of defects and verification of cylinder strength by hydrostatic testing.
7 Deformations caused by contact with blunt objects in such manner that the thickness of the metal is not materially impaired. The major diameter of the dent must be equal to or greater than 32 times the depth of the dent. Sharper dents (or deeper dents) than this are considered too abrupt and must be returned to the cylinder manufacturer for disposition.
8 Fire damage is indicated by charring or burning or sintering of the metal, charring or burning of the paint, distortion of the cylinder, functioned safety relief devices, melting of valve parts, etc. Cylinders must be returned to the cylinder manufacturer for disposition.
9 Bulged cylinders are not acceptable. Cylinders must be returned to the cylinder manufacturer for disposition.

Figure 13-14. Inspection Criteria for Acceptance of Oxygen Cylinder

Oxygen Cylinder Identification.

a. Cylinder specification followed by service pressure such as "ICC-3AA1800" or "ICC-3HT1800" will be stamped on the shoulder, or neck of each cylinder.

NOTE

Effective January 1, 1970, all newly manufactured cylinders were stamped "DOT" (Department of Transportation) in lieu of "ICC" (Interstate Commerce Commission). An example for the new designation would be: "DOT-3HT1800."

b. Cylinder serial number will be stamped below or directly following the cylinder specification.
c. Hydrostatic test date will be stamped directly below the original manufacturer date and shall include the month and year of the hydrostatic test date.

Servicing and Inspection of Oxygen System.

Servicing and inspection of oxygen shall be accomplished as follows:

a. Hydrostatic Test requirement:
1. Standard weight (ICC or DOT-3AA1800) cylin-

ders must be hydrostatically tested to 5/3 their working pressure every five years starting with the date of the last hydrostatic test.

2. Lightweight (ICC or DOT-3HT1800) cylinders must be hydrostatically tested to 5/3 their working pressure every three years starting with the date of the last hydrostitic test.

NOTE

These test requirements are established by the Interstate Commerce Commission Code of Federal Regulations, Title 49, Chapter 1, paragraph 73.34.

b. Service Life requirements:

1. Standard weight (ICC or DOT-3AA1800) cylinders have no life limitations, and may continue to be used until they fail hydrostatic testing.

2. Lightweight (ICC or DOT-3HT1800) cylinders must be retired from service after 15 years or 4380 filling cycles after date of manufacture, whichever occurs first.

c. Servicing requirements:

Oxygen system regulators/reducers, mask mounted regulators, valves, outlets, hoses, lines and cylinders must be serviced every year or 1000 flight hours, whichever occurs first.

1. Service shall include for the above items, check of system line pressure, functional check of all moving components for operation and excessive wear, visual check for damage to components, visual check for the presence of contaminants (oil, grease, dirt, etc.); visual examination of both low and high pressure regulator relief mechanisms for damage and to insure freedom from obstruction.

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2. At any time upon notification of decaying cylinder pressure when oxygen is not in use, immediately check the system until leak is found (use only leak detector conforming to MIL-L-25567B).

d. Oxygen Inspection requirements:

1. A careful visual inspection of the cylinders should be performed during routine maintenance and periodic inspections. If any bad dents, scratches or areas of corrosion are found, the cylinder must be carefully checked per the criteria Table I.

NOTE

If the acceptability of the cylinder is questionable after using criteria Table I, do not hesitate to return cylinder to manufacturer.

e. Regulator shall be removed and overhauled by manufacturer or an FAA approved facility during hydrostatic testing.

f. Pressure Gage. The pressure gage shall be checked for accuracy and cleaned by the manufacturer every 3 years or 3000 flight hours, whichever occurs first.

g. Individual outlets shall be disassembled and inspected, and the sealing core, and/or all rubber parts replaced, regardless of condition every 3 years or 3000 flight hours, whichever occurs first.

h. On aircraft 340-0001 to 340-0038, the filler valve should be disassembled, inspected and the O-rings replaced, regardless of condition every 3 years or 3000 flight hours, whichever occurs first.

i. High pressure lines should be inspected for scratches, dents, cracks, deep gouges if a leak is indicated. Lines should be tested to not less than 3000 PSIG if trouble is indicated.

WARNING

Whenever components have been removed and replaced or oxygen system has been allowed to deplete to below 50 PSIG, the system must be purged in accordance with purging procedures before charging the system.

j. Mask and Hose.

1. Cleaning - Clean mask and hose with a mild solution of soap and water. Rinse thoroughly with clean water and allow to dry. Make sure all soap is removed after rinsing. Masks may be disinfected with a hospital type antiseptic spray or Zep Aero SBT-12.

NOTE

Remove mike from pilot's mask when cleaning.

2. Inspection - Inspect mask and hoses for breaks, cracks, deterioration. Check mask storage compartment for cleanliness and general condition. Check flow indicators for free movement, and inspect couplings for proper insertion.

WARNING

Whenever components have been removed or replaced or oxygen system has been allowed to deplete to below 50 PSI, the system must be purged before charging.

WARNING

When purging the oxygen system, the aircraft should be outdoors. If purging is done indoors extreme caution must be taken to prevent oxygen flow from contacting oils, grease, contaminants and electrical sparks. The area should be roped off, with no smoking or open flames allowed in or near the area. Make sure there is adequate ventilation in the area.

Purging the Oxygen System.

a. Charge the oxygen system in accordance with charging procedures.

b. Move aircraft outdoors if possible. If unable to move aircraft outdoors, make sure area is roped off, no smoking or open flame permitted in the area, no grease or lubricant near cabin area, cabin door and pilot's window open. Allow only qualified personnel to perform the purging operation.

c. Plug all masks into outlets and purge system by allowing the oxygen to flow for at least 10 minutes. Smell the oxygen flowing from the outlets and continue to purge until the oxygen is odorless. Refill cylinder as required, during and after purging.

Charging the Oxygen System.

The following procedures may be used in conjunction with the table of pressure/temperature values for charging the cylinder.

a. Connect the cascade connection to filler valve.
b. Slowly open valve of cylinder to be charged and observe pressure on cascade system.

NOTE

The oxygen bottle service line utilizes an AN805-3 nut and AN800-3 cone union. If nut or cone union is damaged replace defective parts.

c. Slowly open valve on cascade cylinders having lowest pressure and allow pressure to equalize.
d. Close cylinder valve on cascade cylinders, and slowly open valve on cylinder with next highest pressure until cylinder has been charged in accordance with chart.

TABLE OF FILLING PRESSURES

Initial temperature refers to ambient temperature in filling room. A rise of approximately 25° F may be expected as a result of compression. The cylinder should be filled as quickly as possible and allowed to cool by ambient air only.

| Initial Temp. | Filling Pressure | Initial Temp. | Filling Pressure |
|---|---|---|---|
| 0 | 1, 600 | 70 | 1, 925 |
| 10 | 1, 650 | 80 | 1, 950 |
| 20 | 1, 675 | 90 | 2, 000 |
| 30 | 1, 725 | 100 | 2, 050 |
| 40 | 1, 775 | 110 | 2, 100 |
| 50 | 1, 825 | 120 | 2, 150 |
| 60 | 1, 875 | 130 | 2, 200 |

Leak Testing the Oxygen System.

Test the oxygen system for leakage by applying detector fluids, which have been compounded for use with oxygen systems, to each fitting and observe for formation of bubbles. No visible leakage should occur. Remove all traces of solution and repair or replace leaky fittings and repeat preceding procedure. Further test the oxygen system for leakage by pressurizing it to service pressure. The leak rate should not exceed one percent of total supply per 24-hour period. After the test has been completed, wash away all traces of the leak detector.

Functional Testing the Oxygen System.

Whenever the oxygen system regulator (or regulator-cylinder assembly) has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

a. Fully charge the oxygen system per charging instructions.
b. Install an oxygen outlet adapter (Cessna Part Number C166005-0506) into a pressure gage (gage should be calibrated in one pound increments from 0 to 100 PSIG), and insert adapter into pilots oxygen outlet. Place control knob in the "ON" position. The gage pressure should be 70 ±10 PSIG.
c. Insert adapters (or mask and line assemblies if they are operating properly) into all remaining outlets. With oxygen flowing from all outlets, the pressure should be 70 ±10 PSIG. Flow check shall be accomplished with a ground check flow meter model 40400, or equivalent.
d. Place oxygen control knob in the "OFF" position and allow pressure to fall to 0 PSIG. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE

If pressures specified in the foregoing procedures are not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

e. Connect oxygen masks to each outlet and check each mask for proper operation.
f. Check proper function of pilot's mask microphone and control wheel switch. After checking, return all masks to mask case.
g. Recharge oxygen system as required.

SURFACE DEICE SYSTEM.

The optional surface deice system consists of gear driven wet vacuum pumps, inflatable rubber deice boots cemented to the leading edges of the horizontal and vertical stabilizer and outer wing leading edge panels. Air for inflation of the boots is supplied by the pressure side of the vacuum pump. Operation of the deicing system is through a six-second delay action control, labeled "Surface Deice" located on the left side switch panel. When the control is positioned to ON, the control valve closes its overboard air valve and redirects the air from the pressure side of the vacuum pump through a filter, shuttle valve, and into the deice boots for the inflation cycle. After the six-second inflation cycle is complete, the system returns to its off position. Everytime an inflation cycle is desired, the control must be momentarily positioned to ON. After six-second inflation is completed, the deflation cycle begins. Air pressure returns through the system and overboard through the control valve. When the shuttle valve has less than 1 PSIG against it, it closes and the vacuum side of the vacuum pump holds the boots in a deflated position. The pressure indicator light in the annunciator panel should light when the system reaches 10 PSIG. An optional left wing ice light is incorporated on the outboard side of the left engine nacelle to provide an aid in observing ice formation during night operation.

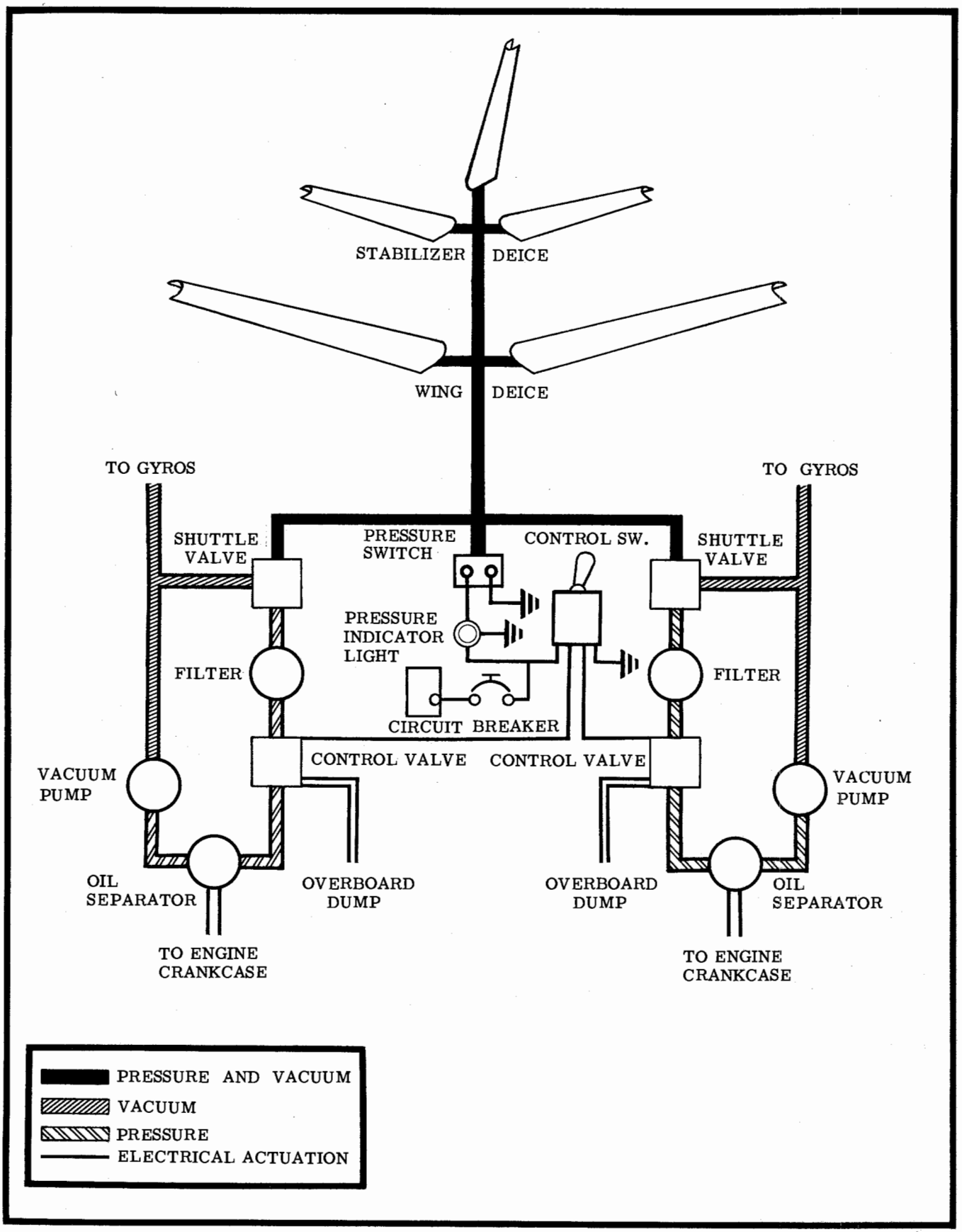



Figure 13-15. Surface Deice System Schematic

Removal of Deice Lines. (See figure 13-16.)

a. Remove seats, carpets, upholstery, floorboards, and tailcone access necessary for removal of deice lines.
b. Remove wing access panels, engine cowls in accordance with removal procedures given in Section 9.
c. Remove hoses from engine compartment by removing clamps and hoses from unions, engine oil separator, deice oil separator, pressure lines and fittings.
d. Disconnect lines (46 and 51) from elbow (45) bulkhead fitting (26) and control valve (53).
e. Loosen clamps from wing lines and hose at fittings and remove from wing.

NOTE

Repeat steps "a" through "e" for removal of lines in opposite wing.

f. Loosen clamps from fuselage lines and hose at fittings and remove from fuselage and tailcone.

g. Disconnect line from tee and hose elbows in tailcone at the vertical and horizontal stabilizer fittings, and remove lines.
h. To remove lines in horizontal and vertical stabilizer, remove in accordance with Section 3, then remove lines.

Installation of Deice Lines. (See figure 13-16.)

Install deice lines by reversing removal procedures.

NOTE

Apply a small amount of suitable thread lubricant to male threads of all metal fittings before installation.

Removal of Surface Deice Components. (See figure 13-16.)

a. Remove engine cowling.
b. Disconnect lines and hoses from shuttle valve (44) and filter (50).
c. Remove bolts attaching shuttle valve and filter to bracket (48) and remove the two components.
d. Disconnect hoses, lines, and the electrical connector from control valve.
e. Remove bolts attaching control valve to bracket (54) and remove control valve.
f. Disconnect hoses from deice oil separator (34).
g. Remove bolts attaching deice oil separator to bracket (41) and remove component.
h. Remove vacuum pump in accordance with the removal procedures in Section 12.

NOTE

Components of the surface deice system may be further disassembled by removing elbows and unions.

Installation of Surface Deice Components. (See figure 13-16.)

Install the surface deice components by reversing the removal procedures.

NOTE

Apply a small amount of suitable thread lubricant to male threads of all metal fittings before installation.

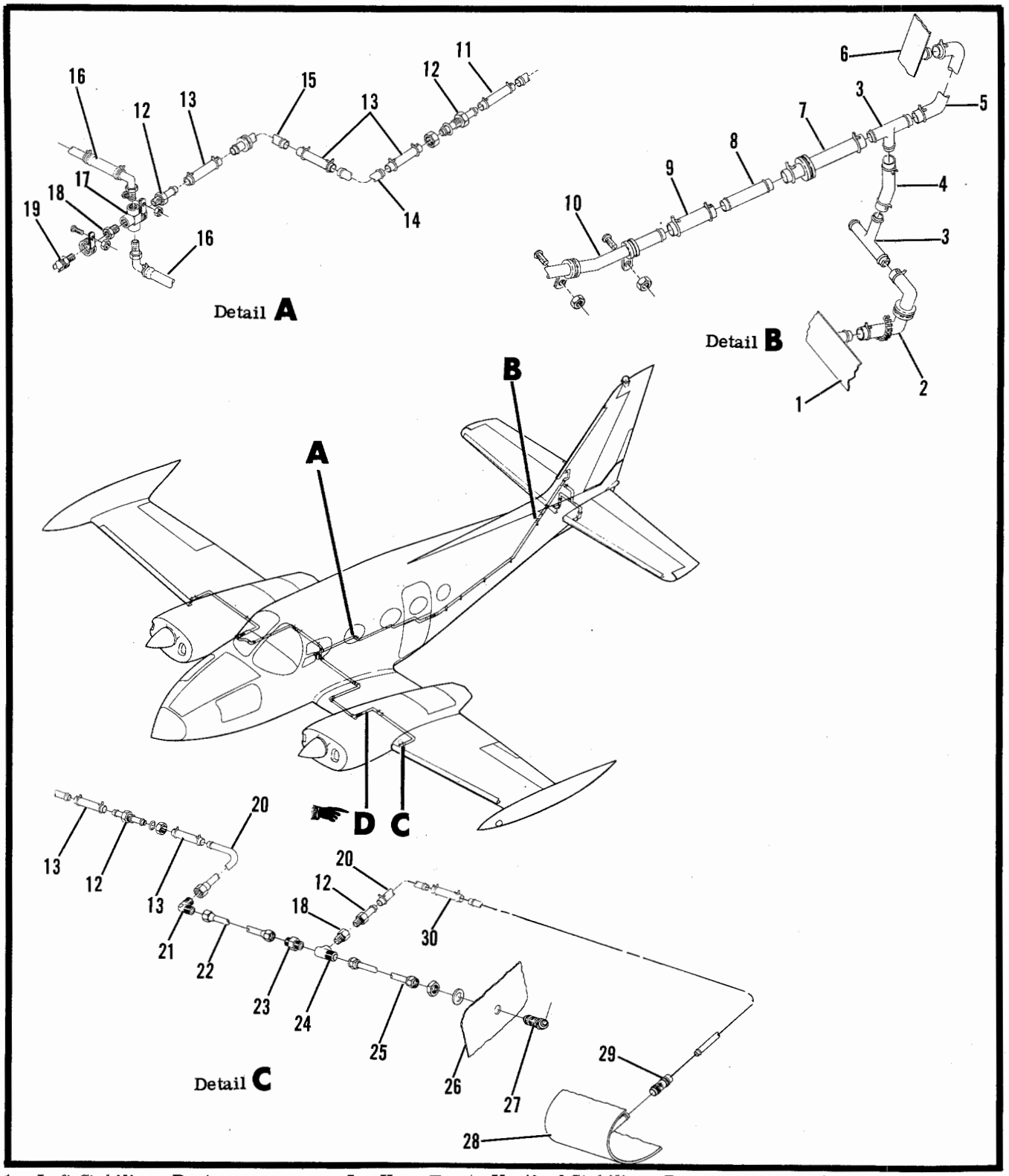
Surface Deice System Check.

a. Electrical Test:
1. Position deice control to OFF position.
2. Position aircraft battery switch to ON position.
3. Close circuit breaker.
4. Press test switch on annunciator panel to check light circuit and bulb.
5. Position deice control to ON position and repeat step 4.
6. If indicator light does not function in steps 4 and 5, the circuit breaker may have opened. Check for short in system. Reset circuit breaker and recheck step 5.

b. Air Leakage Test:
1. This test may be performed in either the left or right nacelle. The following steps refer to the left nacelle.
2. Disconnect pressure hose from the control valve inlet fitting.
3. Disconnect tube from overboard port and plug the port with an AN933-4 plug.
4. Connect a source of clean air to the control valve inlet port. It is necessary that the inlet pressure be a minimum of 18-20 PSIG to perform this test. Include a pressure gage in the air line to observe the system pressures.
5. Apply an 18 PSIG pressure to the system and by means of a hand-operated valve, trap the pressure in the deicer system. Observe the system for leakage. The leakage rate should not exceed a pressure drop of 4.0 PSIG per minute.
6. To check the pressure switch, apply 18 PSIG pressure to the system, turn on the aircraft battery switch with the circuit breaker closed. The indicator light should glow. Release the pressure and the indicator light should extinguish between 8 and 12 PSIG.
7. Remove test equipment, lubricate all threads and replace all system components.
8. Disassembly or rework of the operating equipment in this system should not be attempted, replace any unit which does not function correctly.

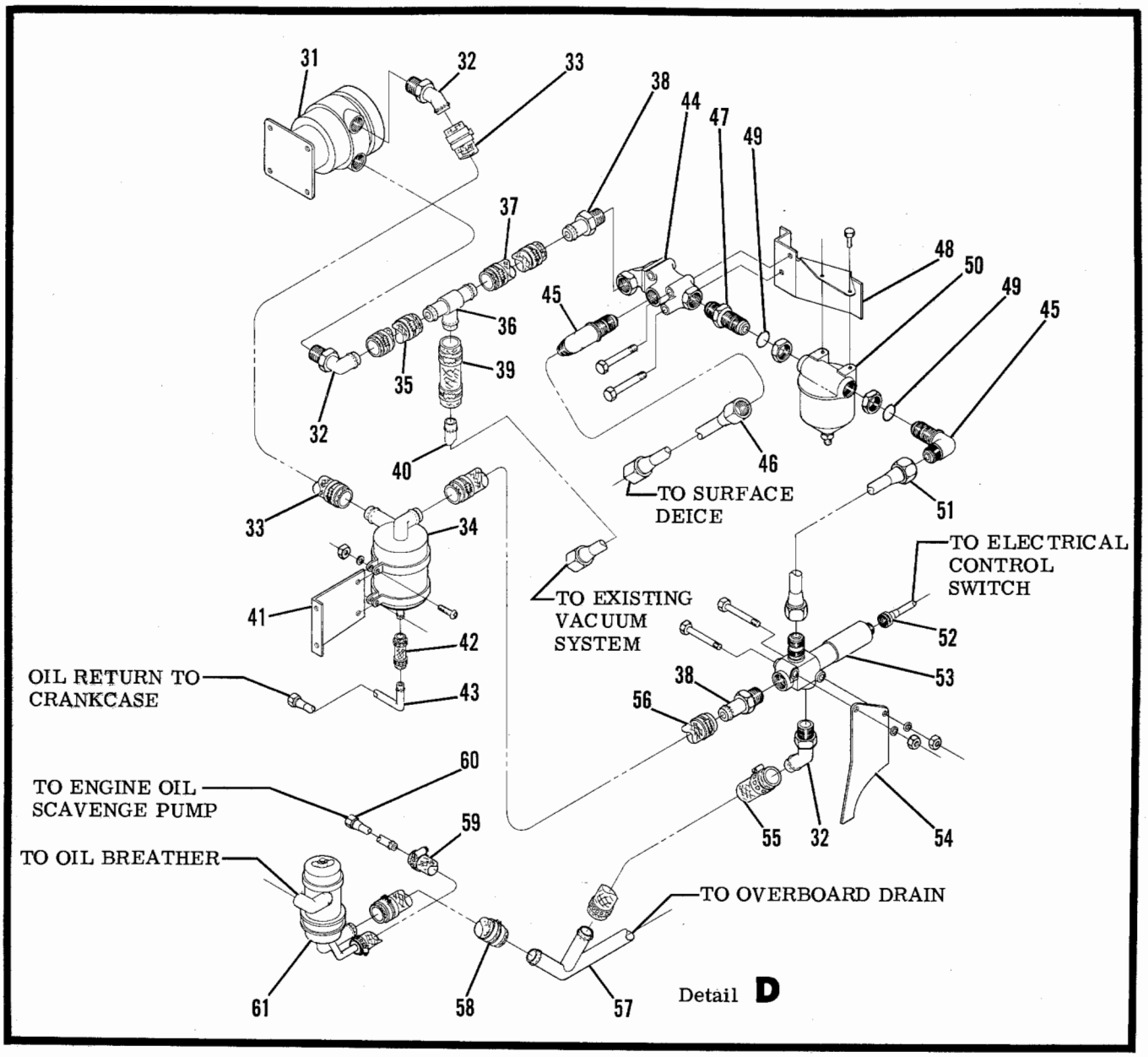
Cold Patch Repair of Deicer Boots.

There are four types or areas of damage that are most common to the deicer boots. An outline of the cold patch repair procedure for each follows:




1. Left Stabilizer Boot
2. Hose to Stabilizer Boot
3. Tee
4. Hose Tee to Tee
5. Hose Tee to Vertical Stabilizer Boot
6. Vertical Stabilizer Boot
7. Hose Tee to Bulkhead
8. Connector Line
9. Connector Hose
10. Hose Fuselage
11. Connector Hose
12. Bulkhead Fitting

Figure 13-16. Surface Deice System (Sheet 1)




13. Wing Connector Hose
14. Hose Elbow
16. Wing Boot Line
17. Cross
18. Reducer Fitting
19. Pressure Switch
20. Nacelle Elbow
21. Elbow
22. Line Elbow to Union
23. Union
24. Tee
25. Line Tee to Bulkhead
26. Bulkhead
27. Bulkhead Fitting
28. Wing Boot
29. Wing Connector Hose
30. Line Tee to Wing Boot
31. Vacuum Pump
32. Elbow
33. Hose (Elbow to Oil-Air Separator)
34. Deice Oil Separator
35. Hose (Elbow to Tee)
36. Tee
37. Hose (Tee to Union)
38. Union
39. Hose (Tee to Vacuum Line)
40. Line to Existing Vacuum System
41. Air-Oil Separator Bracket
42. Hose (Air-Oil Separator to Oil Return)
43. Line (Hose to Crankcase Oil Return)
44. Shuttle Valve
45. Elbow
46. Line (Elbow to Surface Deice)
47. Union
48. Filter Bracket
49. Lock-O-Seal
50. Filter
51. Line (Elbow to Control Valve)
52. Electrical Wire Bundle
53. Control Valve
54. Control Valve Bracket
55. Hose (Elbow to Wye)
56. Hose (Union to Air-Oil Separator)
57. Wye
58. Hose (Wye to Oil Separator)
59. Hose (Oil Separator to Engine Scavenge Pump)
60. Engine Oil Scavenge Pump Line
61. Engine Oil Separator

Figure 13-16. Surface Deice System (Sheet 2)

NOTE

When repairing the deicer boots and replacment layers are being installed, exercise care to prevent trapping air beneath the replacement layers. If air blisters appear after material is applied, remove them with a hypodermic needle. Should air blisters appear after boots have been installed for a length of time, it is permissible to cut a slit in the deicer boot, apply adhesive and repair in accordance with the following cold patch repair procedures. An alternate method of repair is to peel the deicer boot back using Ketone solvent, and reapply using normal adhesives.

a. Scuff or Surface Damage. This type of damage is the most commonly encountered and is usually caused by scuffing the outer surface of the deicer boots while using scaffolds, refueling hoses, ladders, etc. Repair is generally not necessary because the thick outer veneer provides protection to the natural rubber underneath. If the scuff is severe and has caused removal of the entire thickness of veneer (exposing the brown natural rubber underneath) the damage should be repaired as follows:

1. Select a patch (Part Number 3306-1, 3306-2, or 3306-3) of ample size to cover the damaged area.
2. Clean the area to be repaired with a cloth dampened slightly with solvent.
3. Buff the area around the damage with steel wool so that the area is moderately but completely roughened.
4. Wipe the buffed area clean with a cloth slightly dampened in solvent to remove all loose particles.
5. Apply one even, thorough coat of cement (Part Number 3306-16) to the patch and to the corresponding damaged area to the deicer boot. Allow cement to set a couple of minutes until it becomes tacky.
6. Apply patch to the deicer with an edge or the center adhering first, and work the remainder of the patch down, being careful to avoid trapping air pockets.
7. Roll the patch thoroughly with a stitcher-roller (Part Number 3306-10) and allow to set for ten to fifteen minutes.
8. Wipe the patch and surrounding area from the center of the patch outward, with a cloth slightly dampened with solvent.
9. Apply one light coat of A-56-B conductive cement (Part Number 3306-13) to the patched area.

NOTE

Satisfactory adhesion should be obtained in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes, the deicer boots may be inflated to check the repair.

b. Damage to Tube Area. This type of damage consists of cuts, tears, or ruptures to the inflatable tube area and a fabric reinforced patch must be used for this repair. Damage to the tube area should be repaired as outlined below:

1. Select a patch (Part Number 3306-4, 3306-5 or 3306-6) of ample size to extend at least 5/8" beyond the damaged area.

NOTE

If none of these patches are of the proper size, one may be cut to the size desired from one of the larger patches. If this is done, the edge should be beveled by cutting with the shears at an angle. These patches are manufactured so they will stretch in one direction only. Be sure to cut the patch selected so that the stretch is in the widthwise direction of the inflatable tubes.

2. Clean the area to be repaired with a cloth dampened slightly with solvent.
3. Buff the area around the damage with steel wool so that the area is moderately but completely roughened.
4. Wipe the buffed area clean with a cloth slightly dampened in solvent to remove all loose particles.
5. Apply one even, thorough coat of cement (Part Number 3306-16) to the patch and the corresponding damaged area of the deicer. Allow cement to set for a couple of minutes until it becomes tacky.
6. Apply the patch to the deicer with the stretch in the widthwise direction of the inflatable tubes, sticking edge of patch in place first and working remainder down with a slight pulling action so the injury is closed. Use care not to trap air between patch and deicer surface.
7. Roll the patch thoroughly with a stitcher-roller (Part Number 3306-10) and allow to set for ten to fifteen minutes.
8. Wipe the patch and surrounding area, from the center outward, with a cloth slightly dampened with solvent.
9. Apply one light coat of A-56-B conductive cement (Part Number 3306-13) to restore conductivity.

NOTE

Satisfactory adhesion of patch to deicer should be reached in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes the deicer boots may be inflated to check the repair.

c. Damage to Filler Area. This includes any tears or cuts to the tapered area aft of the inflatable tubes. Damage to the fillet area should be repaired as outlined below:

1. Trim damaged area square and remove excess material. Cut must be sharp and clean to permit good butt joint of inlay.
2. Cut inlay from tapered fillet (Part Number 3306-7) to match cutout area.
3. Using solvent, loosen edges of deicer around area approximately 1-1/2" from all edges.
4. Clean the area to be repaired with a cloth dampened slightly with solvent.
5. Lift back edges of cutout and apply one coat of EC-1403 cement to the underneath side of the loosened portion of the boot.
6. Apply one coat of EC-1300 cement to the wing

skin underneath the loosened edges of deicer and extending 1-1/2" beyond edges of deicer into the cutout area.

7. Apply second coat of cement to underneath side of deicer as outlined in step 5.
8. Apply one coat of EC-1300 to one side of a 2" wide neoprene coated fabric strip (Part Number 3306-8) and allow to dry and trim to size.
9. Reactivate cemented surfaces with solvent and apply reinforcing tape to wing skin, using care to center tape under all edges of cutout.
10. Roll down tape on wing skin with stitcher-roller (Part Number 3306-10) to assure a good adhesion, being careful to avoid air pockets.
11. Apply one coat of EC-1300 cement to top surface of tape and allow to dry approximately 5 to 10 minutes.
12. Reactivate cemented surfaces with solvent. Working toward the cutout, roll down the edges of the loosened deicer, being careful to avoid trapping air pockets. The edges should overlap on the tape approximately 1 inch.
13. Roughen back surface of inlay repair material (Part Number 3306-7, previously cut to size) with steel wool. Clean with solvent and apply one coat of EC-1300 cement.
14. Apply one coat of EC-1300 cement to wing skin inside of the cutout area and allow to dry.
15. Apply the second coat of EC-1300 cement to back side of inlay material and allow to dry.
16. Reactivate cemented surfaces with solvent and carefully insert inlay material with feathered edge aft. Working from the leading edge of wing aft, roll down the inlay material carefully, to avoid trapping air.
17. Roughen area on outer surface of deicer and inlay with steel wool 1-1/4" on each side of splice. Clean with solvent and apply one coat of EC-1300 cement to this area.
18. Apply one coat of EC-1300 cement to one side of 2" wide neoprene coated fabric tape (Part Number 3306-8) trim to size and center tape over splice on all three sides.
19. Roll down tape on deicer with stitcher-roller (Part Number 3306-10) to assure good adhesion, being careful to avoid air pockets.
20. Apply one light coat of A-56-B conductive cement (Part Number 3306-13) to restore conductivity.

d. Damaged Veneer - Loose from Deicer. If the veneer should become loosened from the deicer, repairs should be made as outlined below:

1. Peel and trim the loose veneer to the point where the adhesion of veneer to the deicer is good.
2. Roughen the area in which veneer is removed with steel wool, rubbing parallel to cut-edge of veneer ply to prevent loosening it.
3. Taper edges of veneer down to the tan rubber ply by rubbing parallel to the edges with steel wool and solvent.
4. Cut a piece of veneer material (Part Number 3306-9) to cover the damaged area and extend at least 1" beyond in all directions.
5. Mask off an area 1/2" larger in length and width than the size of veneer patch.
6. Apply one coat of EC-1300 cement to the damaged area and one coat to the veneer ply. Allow cement to set a couple of minutes until it becomes tacky.
7. Roll the veneer ply to the deicer with a 2" rubber roller, applying a slight tension on the veneer ply when applying to prevent trapping air.
8. Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.
9. Apply one light coat of A-56-B conductive cement (Part Number 3306-13) to restore conductivity.

Replacement of Surface Deice Boots.

a. Remove wing tip tank front fairings.
b. (LH wing only) Remove four screws securing the stall warning transmitter.
c. Refer to Removal and Installation of Propeller Deice Boots procedures and remove and install deice boots.
d. Install stall warning transmitter screws on left wing.
e. Replace tip tank front fairings.

400A NAV-O-MATIC AUTOPILOT SYSTEM. (See figure 13-17.)

CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

The Cessna 400A Nav-O-Matic Autopilot is a two-axis flight control system featuring vacuum gyros, altitude hold, synchronous pitch trim, heading preselect, omni intercept and track, turn command. The automatic pitch trim ILS approach coupler, and slaved directional gyro are optional offerings to the basic autopilot. The automatic pitch trim operates in conjunction with the aircraft's elevator trim tab. A sensor installed in the elevator servo cables actautes the elevator trim servo motor and in turn operates the elevator trim tab to provide a follow up system. The ILS approach coupler enables the pilot to fly inbound on ILS front course or back course, this option is installed in the computer and connects to the indicator at the nose junction box. The slaved directional gyro replaces the standard directional gyro and provides heading information for the 400A Nav-O-Matic.

For additional description of the 400A Nav-O-Matic Autopilot and components refer to Cessna 400A Nav-O-Matic Autopilot Service/Parts Manual.

Removal and Installation of Autopilot Elevator Control Cables. (See figure 13-17.)

Removal and Installation of Autopilot Elevator Control Cables. (See figure 13-17.)

a. Refer to Section 3 and remove tailcone access door and necessary access covers.
b. Remove safety and disconnect turnbuckle and remove cable (3) from elevator bellcrank (6) by removing cotter pin, nuts, washers and bolts.
c. Remove cable guard posts (1) from trim sensor (2) to free cables (3 and 4).
d. Route cable (3) from sprocket (14) and remove cable.
e. Install control cables by reversing the removal procedure.

NOTE

When installing chain over sprocket (14), the elevators must be neutral and the actuator in the center of travel.

f. Rig autopilot elevator cables in accordance with rigging procedures.

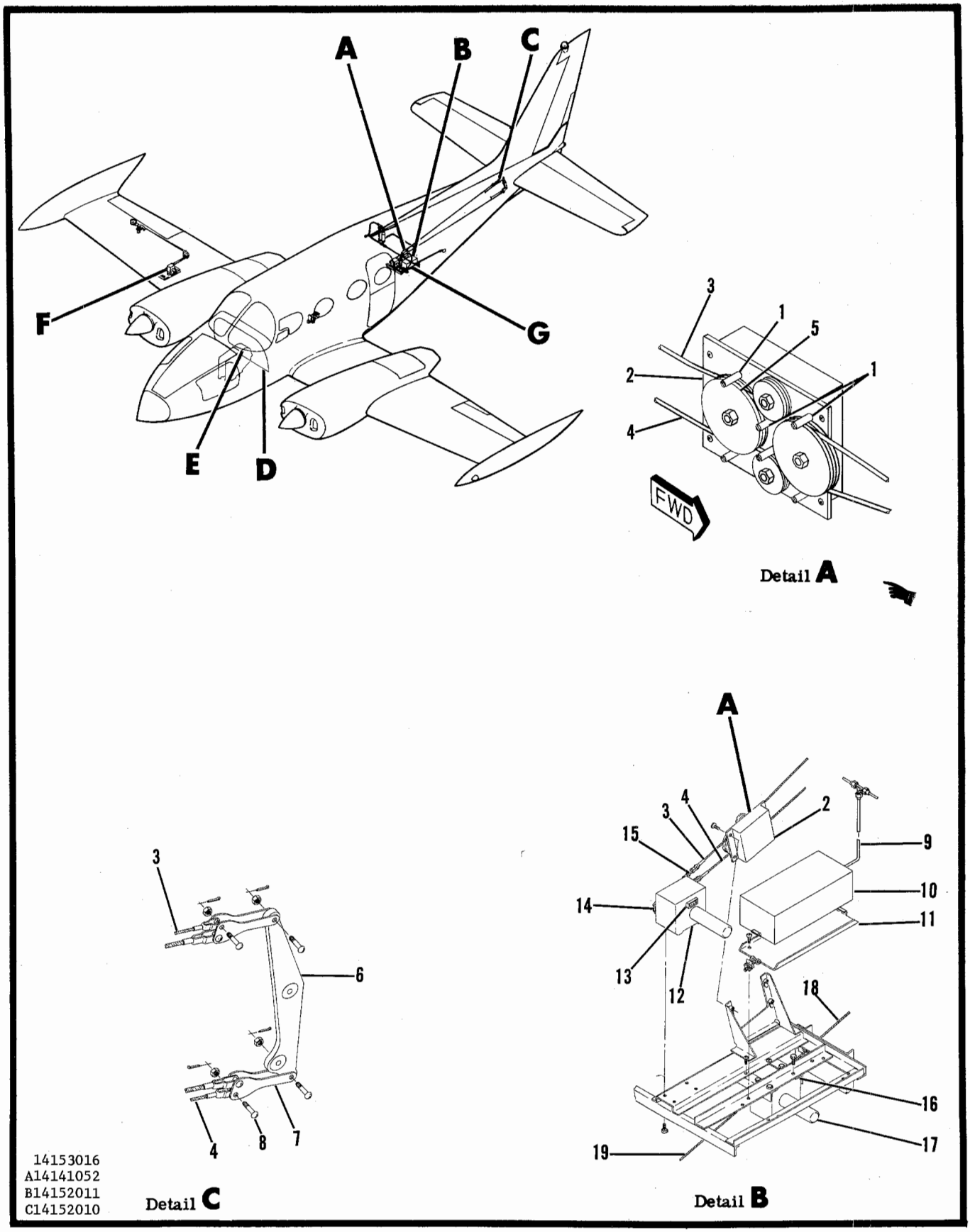
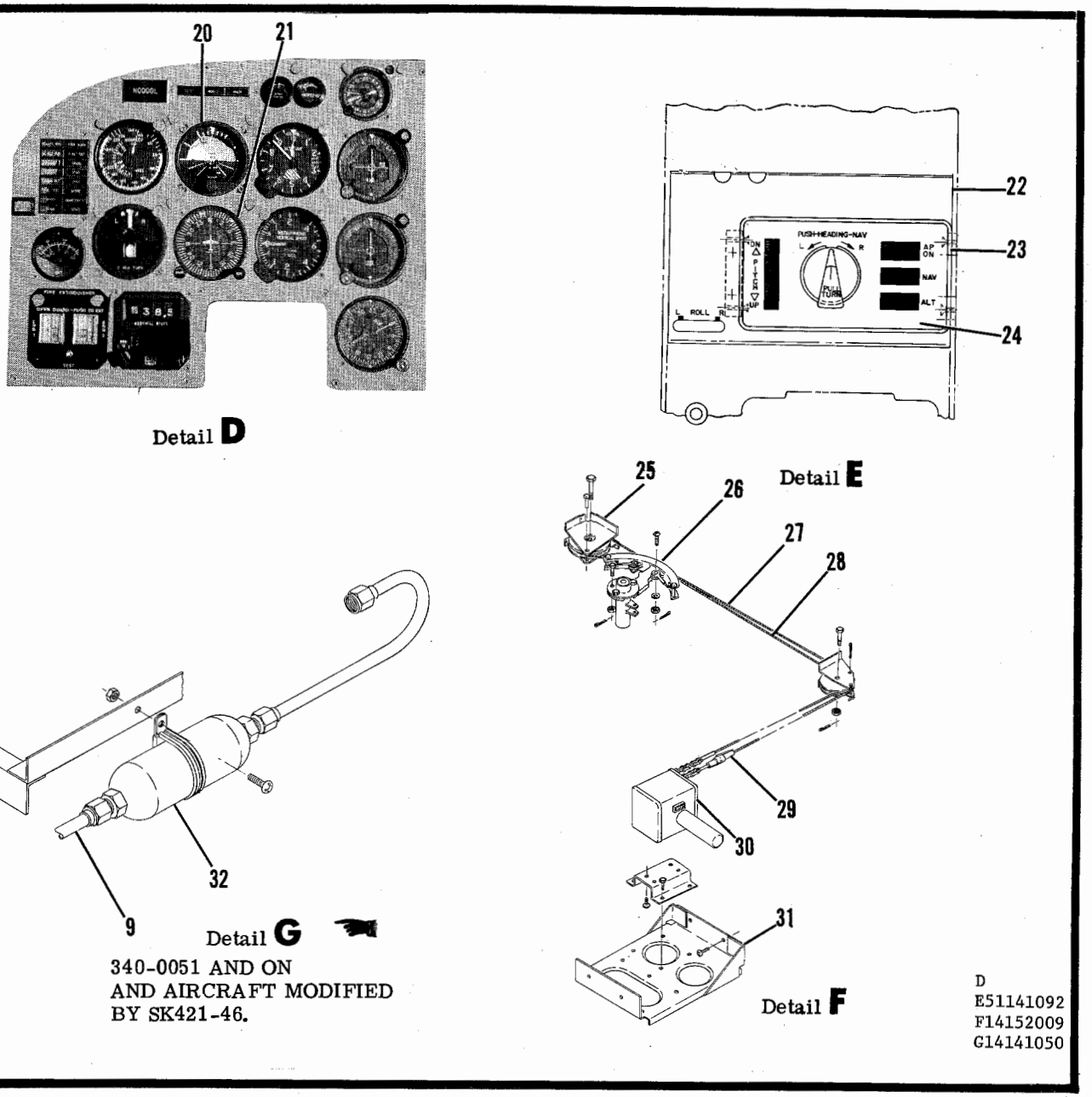



Figure 13-17. 400A Nav-O-Matic Autopilot Installation (Sheet 1)




1. Cable Guard Post
2. Sensor Unit
3. Elevator Cable Upper (Servo to Bellcrank)
4. Elevator Cable Lower (Servo to Bellcrank)
5. Pulley
6. Elevator Bellcrank
7. Connector Link
8. Screw
9. Static Line
10. Computer
11. Mount
12. Elevator Servo
13. Connector
14. Sprocket
15. Chain (Elevator Servo)
16. Bracket
17. Motor
18. Elevator Trim Tab Cable
19. Elevator Trim Follow Up
20. Gyro Horizon
21. Directional Gyro
22. Retainer
23. Bezel
24. Flight Controller
25. Pulley Bracket
26. Aileron Quadrant
27. Autopilot Cable (Upper)
28. Autopilot Cable (Lower)
29. Turnbuckle
30. Aileron Servo
31. Mounting Bracket
32. Sump

Figure 13-17. 400A Nav-O-Matic Autopilot Installation (Sheet 2)

NOTE

Adjust cable tension on autopilot elevator control cables to 22 ±2 pounds. Refer to 400A Nav-O-Matic Autopilot Service/Parts Manual for torque settings on elevator servo actuator.

NOTE

After rigging is complete, turn on autopilot and verify that the elevator responds in the correct direction. Assist the movement of the elevator by pulling back on the control wheel, this will aid in overcoming the counterbalance of the elevator bob weight.

Removal and Installation of Autopilot Aileron Control Cables. (See figure 13-17.)

a. Remove the necessary right wing and aileron access plates to gain access to aileron servo and aileron quadrant.
b. Disconnect cable from actuator by loosening turnbuckle at the servo and disengage chain from sprockets of actuator.
c. Remove cables from pulleys.

NOTE

Pulleys must be removed from pulley brackets before removing cables.

d. Remove cable from aileron autopilot quadrant by removing cotter pins, nuts and bolts.
e. Remove autopilot aileron control cables from aircraft.
f. Install autopilot aileron control cables by reversing the removal procedures.

CAUTION

When installing chain over actuator servo sprocket the ailerons must be neutral and the actuator in the center of travel.

g. Rig autopilot aileron control cables in accordance with rigging procedures.
h. Adjust cable tension on autopilot aileron control cables to 12 ±3 pounds.

NOTE

After rigging is complete, turn on autopilot and verify ailerons operate in the proper direction.

Removal and Installation of Aileron Servo. (See figure 13-17.)

a. Remove the necessary right wing access plates to gain access to aileron servo.
b. Remove safety and loosen turnbuckles.
c. Disengage chain assembly from sprocket.
d. Disconnect electrical wire bundle.
e. Remove aileron servo attaching nuts, washers and bolts, and remove servo from wing.
f. Install autopilot aileron servo by reversing the removal procedures.

NOTE

When installing autopilot aileron servo, make sure chain is centered over sprocket and ailerons are in neutral.

g. Rig autopilot aileron control cables in accordance with rigging procedures.
h. Adjust cable tension on autopilot aileron control cables to 12 ±3 pounds.

NOTE

After rigging is complete, turn on autopilot and verify ailerons operate in proper direction.

Removal and Installation of Autopilot Flap Actuator. (See figure 8-2.)

For removal and installation of autopilot flap actuator, refer to Section 8.

Removal and Installation of Elevator Servo and Computer. (See figure 13-17.)

a. Place a suitable support under tailcone.
b. Remove tailcone access panel and elevator bellcrank access covers.
c. Remove safety and loosen turnbuckle.
d. Disengage chain assembly (15) from sprocket (14).
e. Remove elevator servo attaching nuts, washers and bolts.
f. Disconnect electrical plug and remove servo.
g. Disconnect static line (9) from autopilot computer (10).
h. Remove attaching nuts, washers and bolts and remove computer from aircraft.
i. Install the elevator servo and computer by reversing the removal procedures.

NOTE

When installing elevator servo make sure chain is centered over sprocket (14) and elevator is in the neutral position.

j. Rig autopilot elevator cables in accordance with rigging procedures in Section 6.
k. Adjust cable tension on autopilot elevator control cables to 22 ±2 pounds.

NOTE

After rigging is complete turn on autopilot, and verify that the elevator responds in the correct direction. Assist the movement of

the elevator by pulling back on the control wheel, this will aid in overcoming the counterbalance of the elevator bob weight.

Removal and Installation of Autopilot Elevator Trim Follow-Up Sensor. (See figure 13-17.)

a. Place a suitable support under tailcone.
b. Remove tailcone access panel and elevator bellcrank access covers.
c. Remove cable guard posts (1) from sensor unit (2) to free cables (3 and 4).
d. Disconnect electrical plug from sensor unit.
e. Remove sensor unit (2) from bracket by removing attaching screws and nuts.

NOTE

Make sure sensor unit (2) is installed with over-hanging pulley (5) forward.
After installation is completed, check tension on autopilot elevator control cables in accordance with the Rigging Autopilot Control System procedures.

Removal and Installation of Autopilot Elevator Trim Follow-Up Motor. (See figure 13-17.)

a. Place a suitable support under tailcone.
b. Remove tailcone access panel and elevator bellcrank access covers.
c. Disconnect electrical plug from motor (17).
d. Loosen screws attaching motor to bracket (16).
e. Remove motor from cable (19).
f. Install motor by reversing the removal procedures.

NOTE

Elevator trim control cable must make two (2) full loops aroung the cable drum.

NOTE

After installation is completed, check tension on elevator trim control cables in accordance with Rigging Autopilot Control System procedures.

Removal and Installation of Controller. (See figure 13-17.)

a. Remove screws attaching controller to pedestal.
b. Pull controller out from center pedestal and disconnect electrical plug.
c. Install controller by connecting electrical plug and nserting controller in center pedestal and installing screws.
d. Check operation of controller and verify autopilot is operating the control surfaces in correct direction.

Removal and Installation of Autopilot Gyros. (See figure 13-17.)

a. Refer to Section 12 and remove gyros in accordance with typical instrument removal and installation.

NOTE

Disconnect electrical connection before removal.

Removal and Installation of Autopilot Switches. (See figure 13-17.)

a. Refer to Section 14 for typical removal and installation of electrical switches.

Rigging Autopilot Control System. (See figure 13-17.)

a. Rig autopilot aileron control system as follows:
1. Refer to Section 6 and verify that aileron control system is properly rigged.
2. Place aileron control surfaces to the neutral position and secure with a clamping device.
3. Insure that cables (27 and 28) are properly routed on pulleys and check the installation of cable guard pins.
4. Center chain assembly on sprocket and route cable over aileron control quadrant.
5. Rig aileron autopilot cable to 12 ±3 pounds by tightening turnbuckle (29).

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F. Allow aircraft temperature to stabilize for a period of 4 hours.

6. Safety turnbuckle.
b. Rig autopilot elevator control system as follows:
1. Refer to Section 6 and verify that the elevator control system is properly rigged.
2. Place elevator control surfaces in neutral position and secure using a clamping device.
3. With elevator control surface in neutral position, center chain assembly (15) on elevator servo sprocket (14), and attach cables (3 and 4) to links (7) on bellcrank (6).
4. Rig elevator actuator cables (3 and 4) to 22 ±2 pounds tension by tightening turnbuckle.
5. Safety turnbuckle.
c. Rig autopilot elevator trim control system as follows:
1. Refer to Section 6 and verify that the elevator trim control is properly rigged.
2. Place elevator trim control surfaces in neutral position and secure using a clamping device.
3. With elevator trim control surface in neutral position, check to see that cable (19) is looped twice around cable drum.
4. Check cable (19) tension (22 ±2 pounds). If optional electric elevator trim control motor is install-

ed, rig cable (19) to 22 ±2 pounds of tension.
d. Remove locking devices from control surfaces and move through entire travel. Observe chain assemblies (15) on servo sprockets for sufficient remaining links at extreme travel limits.

YAW DAMPER SYSTEM. (See figure 13-17A.)

The yaw damper system is an independent system consisting of a gyro computer (turn and bank indicator), control switch, yaw actuator, and the disengage switch.

The gyro computer picks up the signal, routes it through a built-in computer in the gyro, amplifies the signal and sends the amplified signal to the yaw actuator.

The yaw damper control switch is mounted separately from the flight controller on all installations except the 800 integrated flight control system. On aircraft incorporating the 800 integrated flight control system the yaw damper control switch is part of the autopilot flight controller. The yaw damper disengage switch in the control wheel is connected to the autopilot disengage switch; disengaging the autopilot will also disengage the yaw damper.

Troubleshooting

For troubleshooting the yaw damper system, refer to the Yaw Damper System Service/Parts manual.

Removal and Installation of Yaw Damper Actuator. (See figure 13-17B.)

a. Place a suitable support under tailcone.
b. Remove tailcone access panel and rudder bellcrank access covers.
c. Remove chain guard (11), loosen turnbuckle (7) and remove chain assembly from sprocket.
d. Disassemble actuator from structure in accordance with applicable detail in figure.
e. Disconnect electrical connector and remove actuator from aircraft.
f. Install the rudder yaw actuator by reversing the removal procedures.

NOTE

Secure bolts (9) with safetywire after tightening to proper torque

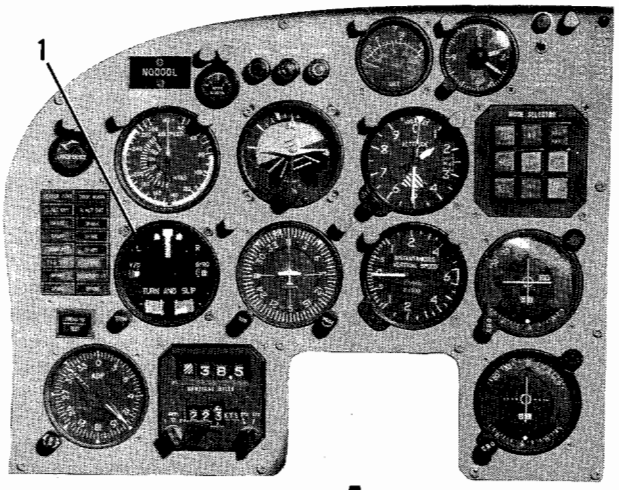
g. Rig cables in accordance with rigging procedures.

Rigging Yaw Damper Cables.

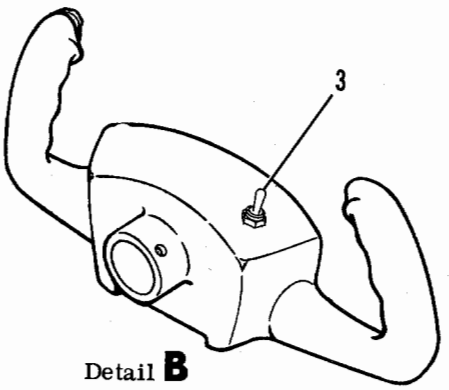
a. Refer to Section 7 and verify that rudder control system is properly rigged.
b. Place rudder in neutral position and secure in place.
c. Rig yaw actuator cables (3) and (8) to 16 +2, -2, pounds tension by tightening turnbuckle (7).
d. Safety turnbuckle.
e. Remove rudder lock and move rudder through entire travel. Observe chain assembly on yaw actuator for sufficient remaining links at extreme limits of travel.

Actuator Centering Adjustment. (340-0151 to 340-0501.)

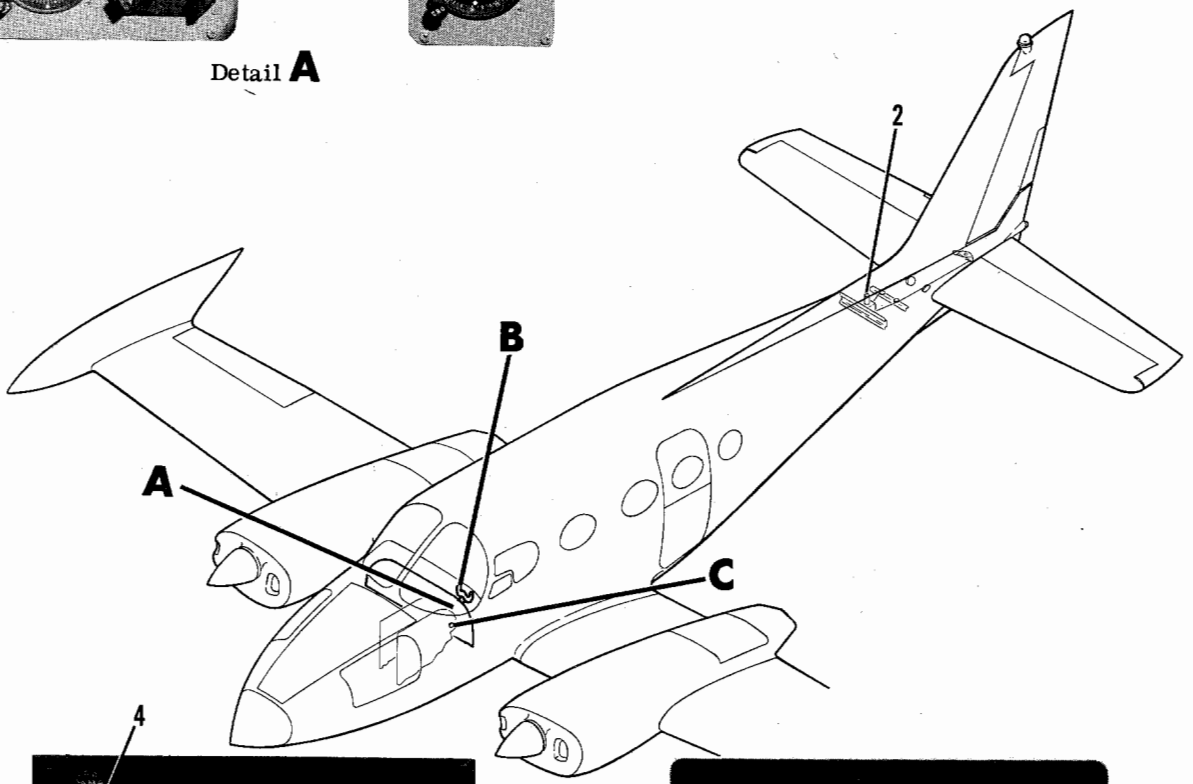
Before making actuator centering adjustments, assure that rudder system and yaw damper system is rigged in accordance with rigging procedures.

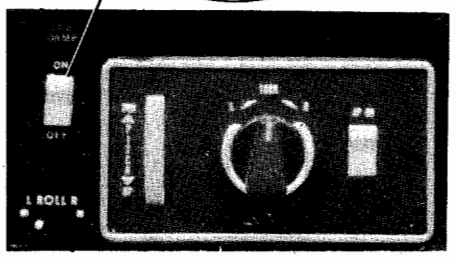



Detail **A**



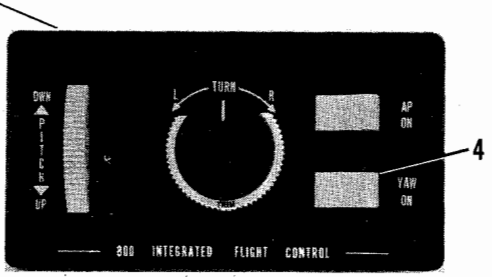

Detail **B**




300 AND 400 SERIES IFCS

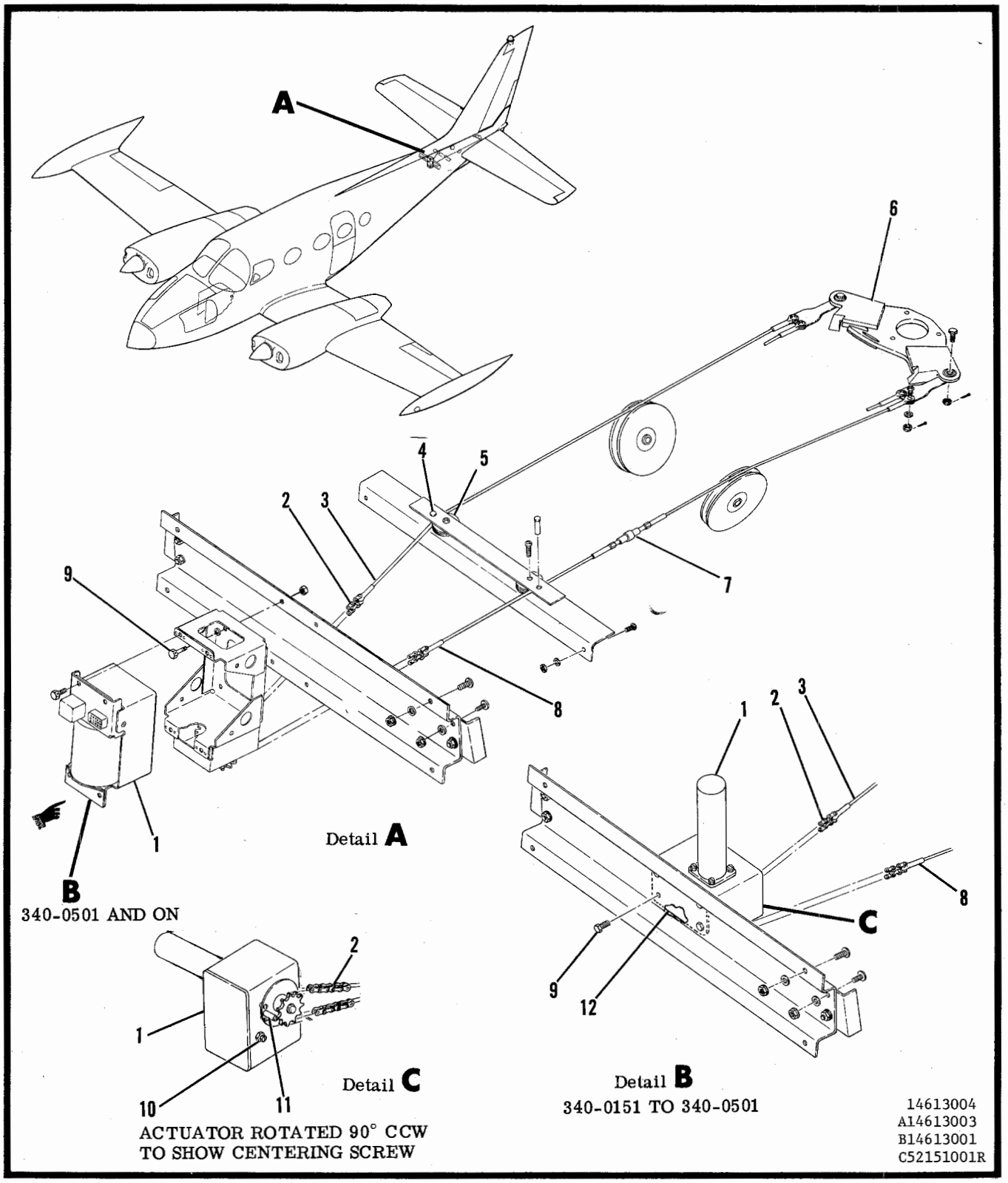
Detail **C**




800 IFCS

1. Turn and Bank Indicator
2. Actuator
3. Autopilot Disengage Switch
4. Yaw Actuator Switch

Figure 13-17A. Yaw Damper Control System




1. Actuator
2. Chain
3. Cable (Right)
4. Guard Pin
5. Pulley
6. Bellcrank
7. Turnbuckle
8. Cable (Left)
9. Bolt
10. Centering Screw
11. Chain Guard
12. Plate

Figure 13-17B. Yaw Damper Installation

a. Turn yaw damper system "ON."
b. Check position of rudder. If rudder deflects from neutral position, manually hold rudder in the assumed position and disengage yaw damper switch. Refer to figure 13-17B, turn and hold centering screw (10) in a full (CW) position while returning rudder to neutral position. Release adjusting screw on actuator.
c. Turn yaw damper system "ON" and recheck for zero rudder deflection.

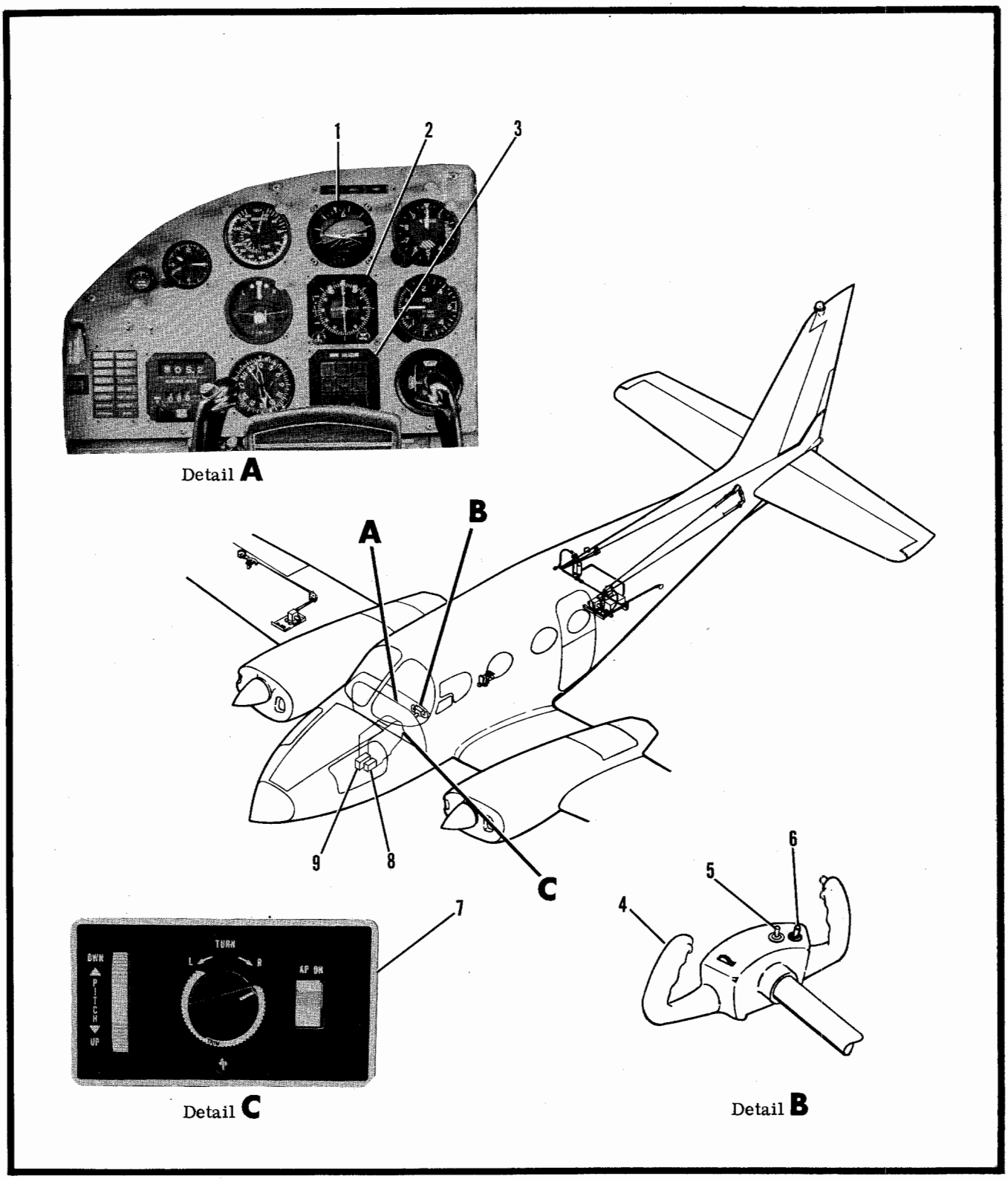
INTEGRATED FLIGHT CONTROL SYSTEM. (See figure 13-17C.)

The Integrated Flight Control System is a two axis (aileron and elevator) automatic flight control system consisting of the autopilot and flight director. Either the flight director or the autopilot may be used separately or as a combination. As an autopilot, in addition to holding the sings level and compensating for rotation about the pitch axis, the autopilot provides an automatic intercept and track of any magnetic heading or VOR radial. Also included is an automatic pitch trim, turn command, pitch command, altitude hold and an ILS approach feature. As a flight director the Integrated Flight Control System provides steering information, visually presented on the attitude director indicator (ADI), for climb, cruise, descent and altitude hold. Heading, VOR navigation, glide slope and ILS approaches are visually presented on the horizontal situation indicator (HSI).

For additional description, installation adjustments, troubleshooting, schematic and parts listing, refer to Cessna Integrated Flight Control System Service/Parts Manual.

300 and 400 Series Integrated Flight Control Systems.

The 300 and 400 Integrated Flight Control Systems consist of the 400A Nav-O-Matic autopilot and flight




1. ADI Indicator
2. HSI Indicator
3. Mode Selector
4. Pitch Synchronization Switch
5. Autopilot Disengage Switch
6. Go-Around Switch
7. Autopilot Controller
8. Inverter
9. Gyro

Figure 13-17C. Integrated Flight Control System

director, ILS coupler, slaved directional gyro, pitch synchronization and associated avionics. The 300 Integrated Flight Control System uses 300 avionics while the 400 Integrated Flight Control Systems uses 400 avionics. Simultaneous or independent operation of the autopilot and flight director are provided. Go-around commands selectable by the pilot are provided in addition to the pitch synchronization.

800 Series Integrated Flight Control System.

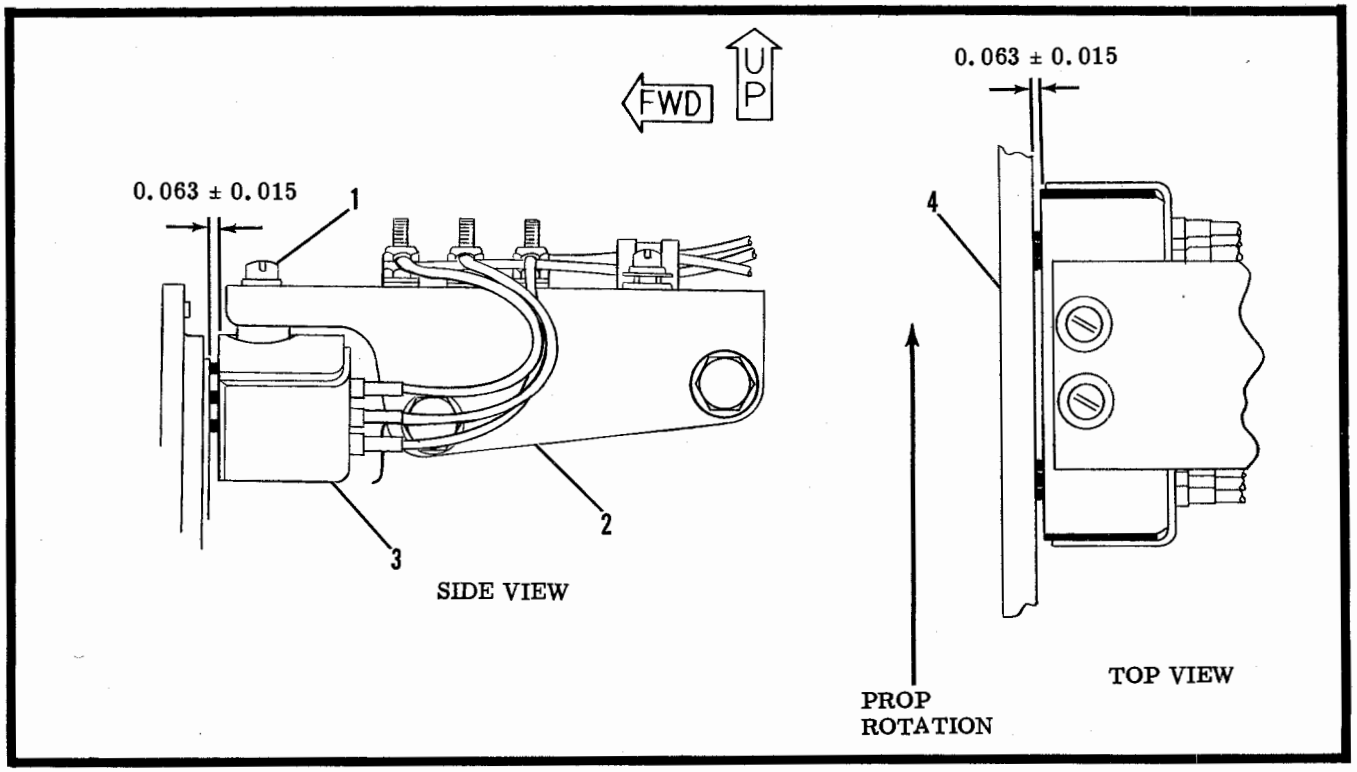
The 800 integrated Flight Control System consists of the 400A Nav-O-Matic autopilot and flight director, with yaw damper, altitude hold, automatic pitch trim, pitch synchronization, heading preselect, omni/ILS couplers and turn and pitch command. Simultaneous or independent operation of the autopilot and flight director is provided and in addition to the autopilot features, the flight director includes pitch synchronization and go-around commands as selected by the pilot. The 800 Integrated Flight Control System includes a vacuum, slaved directional gyro with ADF presentation and an horizontal situation indicator (HSI). Nav 1 is connected to the HSI and Nav 2 is connected to an individual course indicator. 400 or 800 avionics system may be used with the 800 Integrated Flight Control System.

Removal, Installation and Rigging the Integrated Flight Control System Components. (See figure 12-2 and figure 13-17.)

Refer to Removal, Installation and Rigging Procedures for the Nav-O-Matic 400A Autopilot Section 13 and Typical Instrument Removal and Installation Procedures Section 12 for removal, installation and rigging the Integrated Flight Control System Components.

PROPELLER DEICE SYSTEM.

The propeller deice system is the electrothermal type system, consisting of the following items: blade deicers bonded to the propeller blades, slip ring assembly mounted to the spinner bulkhead, brush holder assembly mounted to the engine crankcase, a repeat cycle timer, ammeter mounted in the instrument panel, a switch, and a circuit breaker. The deicing is accomplished by raising the temperature of the deice interface to a point, at which, centrifugal force removes the ice. The cycle timer used on the deicing system heats the propeller deicer from 28 to 40 seconds. The deicer outer elements cycle on the right propeller element from 28 to 40 seconds, then on the inner elements. It then cycles to the left propeller outer elements from 28 to 40 seconds, then to the left inner elements. It then returns to the right outer elements on the right-hand propeller and continues cycling action. The cycling is done in order to maintain a balance between the left and right propellers and reduce power drain on the electrical system.




1. Screw
2. Bracket Assembly
3. Brush Holder
4. Slip Ring

Figure 13-18. Deice Brush Holder Installation

Troubleshooting the Propeller Deice System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| NO HEAT AT PROPELLER BLADE ELEMENTS | Circuit breaker out. | Reset circuit breaker. |
| | Timer inoperative. | Replace timer. |
| | Brushes improperly adjusted or broken. | Repair or adjust brushes. |
| | Wiring broken. | Repair or replace wiring. |
| DEICE SYSTEM INTERMITTENT | Elements damaged. | Refer to inspection and testing procedures. |
| | Timer defective. | Repair/replace timer. Refer to inspection and testing procedures. |
| | Brushes broken or improperly adjusted. | Repair or replace brushes. Refer to adjustment procedures. |

Removal of Slip Ring. (See figure 13-20.)

a. Remove propeller in accordance with removal procedure.
b. Remove spinner bulkhead and slip ring from propeller hub by removing attaching nuts, washers, and bolts.
c. Disconnect deice boots (3) and slip ring (6) electrical leads from the spinner bulkhead (5) before removing bulkhead from propeller.

Installation of Slip Ring. (See figure 13-20.)

a. Reverse the slip ring removal procedures.

CAUTION

Make sure cable dimensions shown in figure are correct and attaching clamp is behind antislip ring (19) to prevent damage from centrifugal force or propeller feathering.

Removal of Brush Holder Assembly. (See figure 13-20.)

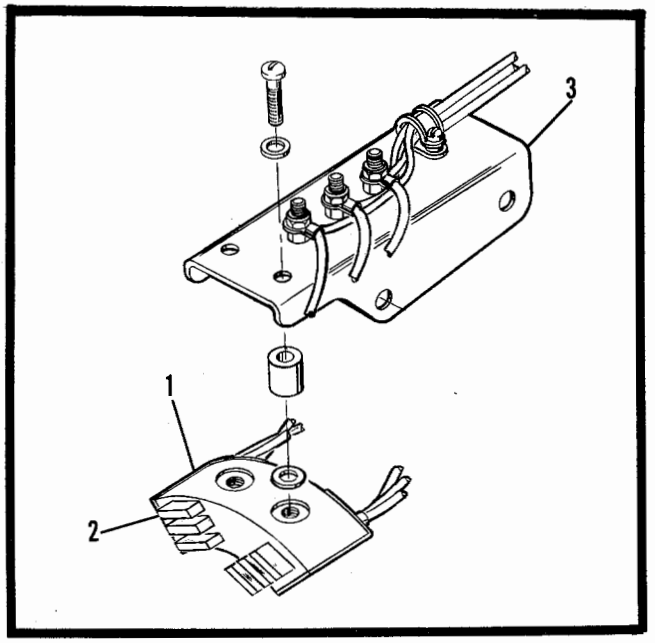
a. (See figure 9-1.) Remove upper cowl (1), LH nose cap (4) and RH nose cap (5).
b. Disconnect electrical leads from brush bracket (13).
c. Remove screws (12), washers (10) and spacers (8) from brush bracket (13).
d. Remove brush assembly (9) by sliding to one side or the other from underneath the brush bracket.

Installation of Brush Holder Assembly. (See figure 13-20.)

Reverse the brush holder assembly removal procedures.

NOTE

Allow a minimum of 5 hours of engine running time before turning on the propeller deice system. Ground checkout of the system is allowed, with the engines not running.

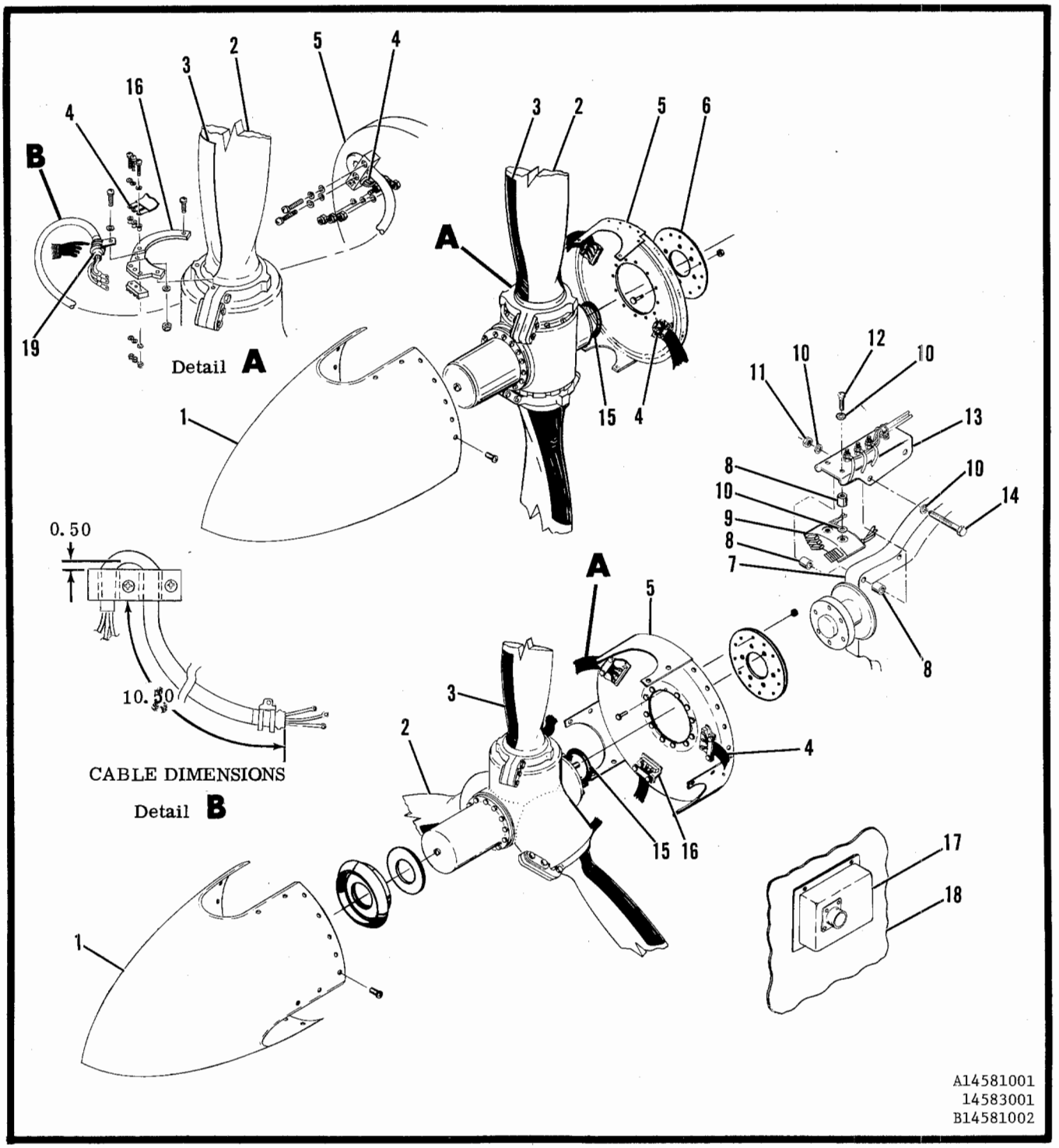



1. Brush Bracket 2. Brush 3. Brush Block

Figure 13-19. Brush Holder Assembly

Adjustment of Brush Assembly. (See figure 13-18.)

a. When a chattering or screeching noise is emitted from the brush slip ring area, the probable cause is the improper alignment of the brushes and slip ring.




1. Spinner
2. Propeller Blade
3. Deice Boot
4. Electrical Lead
5. Bulkhead
6. Slip Ring Assembly
7. Engine
8. Spacer
9. Brush Block
10. Washer
11. Nut
12. Screw
13. Brush Bracket
14. Bolt
15. O-Ring
16. Terminal Strip
17. Timer
18. F. S. 100.00 Bulkhead
19. Antislip Ring

Figure 13-20. Propeller Deice System

NOTE

If this chattering or screeching is noticed over idling engine noises, the trouble is severe and should be remedied immediately. A less severe chattering or screeching may be detected by pulling each propeller through slowly in the direction of rotation.

b. The brush block assembly should be positioned as follows:
1. Loosen the screws (1) through bracket assembly (2) and brush holder (3).
2. Adjust the brush block assembly, twist brush block assembly in brackets so that the brushes contact the slip rings in such a manner that the angle of the brushes to the slip rings is approximately 2° from a perpendicular to the slip ring surfaces. The angle is measured toward the direction of rotation of the slip rings.
3. Check each brush for correct alignment with slip ring surfaces through 360° rotation of slip rings.
4. Check the brush block assemblies for clearance from slip ring surfaces, a distance of 0.063 ±0.015 inches should be maintained. If a portion of the brush block assembly is closer to the slip ring surface through 360° rotation, the excess material on the brush block should be removed.

WARNING

Make sure the magneto switches are in the OFF position before rotating the propeller by hand.

Replacement of Brush Assembly. (See figure 13-19.)

NOTE

The brushes are deemed replaceable when 1/4 inch of brush material remains. It is considered good practice, however, to replace the brushes when 3/8 inch of the brush material still remains. The bursh block should be dismantled and the brush length measured periodically in order to determine usable remaining brush lengths.

a. To replace brushes, remove old brush assembly in accordance with the Removal of Brush Holder Assembly procedures.
b. Install new brush assembly by reversing the Removal of Brush Holder Assembly procedures.

Removal and Installation of Propeller Deice Ammeter.

To remove or install ammeter, see Section 12.

Removal and Installation of Propeller Deice Timer. (See figure 13-20.)

a. Turn off electrical power.
b. Disconnect electrical connector.
c. Remove screws securing timer to 100.00 bulkhead and remove timer.
d. Install timer by reversing the removal procedures.
e. Check operation of propeller deice system to verify each deicer boot is functioning.

Inspection and Testing of Propeller Deice System.

a. Visually check the completed installation.
1. Check propeller deicers for wrinkling or loose spots.
2. Check wiring connections for correctness and tightness.
3. Check continuity of wiring. Remove plug from timer. Using ohmmeter, check continuity from:
   (a) Pin C of the plug to Terminal A of one prop shoe on the right engine.
   (b) Pin D of the plug to Terminal B of one prop shoe on the right engine.
   (c) Pin E of the plug to Terminal A of one prop shoe on the left engine.
   (d) Pin F on the plug to Terminal B on one prop shoe on the left engine.
   (e) Pin G of the plug to ground.
   (f) Terminal C of one prop shoe on the right engine to ground.
   (g) Terminal C of one prop shoe on the left engine to ground.
b. System Tests.
1. Propeller Deicer Resistance Check:
   (a) Using an ohmmeter, check the resistance between Terminal A-C, B-C of prop shoes in both engines. Resistance should be 2.23 to 2.58 ohms.
2. Timer Tests:
   (a) Connect a jumper wire from Pin B of the timer receptacle to Terminal B of the connector plug and from Pin G of the timer receptacle to ground.
   (b) Place the prop deicing system switch in the "ON" position.
   (c) Using a voltmeter, check the DC volts to ground from Pin B of the timer. This should be approximately 24 volts DC.
   (d) Check DC volts to ground from Pins C, D, E, F; they are the points at which the system voltage is impressed in sequence to cycle power to the propeller deicers. The following cycling action of the timer should be:
      (1) Timing sequence Pin C, 30 seconds, right engine propeller outboard halves.
      (2) Timing sequence Pin D, 30 seconds, right engine propeller inboard halves.
      (3) Timing sequence Pin E, 30 seconds, left engine propeller outboard halves.
      (4) Timing sequence Pin F, 30 seconds, left engine propeller inboard halves.

NOTE

On time is approximately 30 seconds when operating on alternator voltage. When operating on battery voltage, as in this checkout procedure, on time may be longer.

NOTE

The timer does not reposition itself to start at Pin C when the system is turned off, but will begin its cycling at the same position in which it was last turned off. Cycling will then proceed in the order of C, D, E, F, as shown.

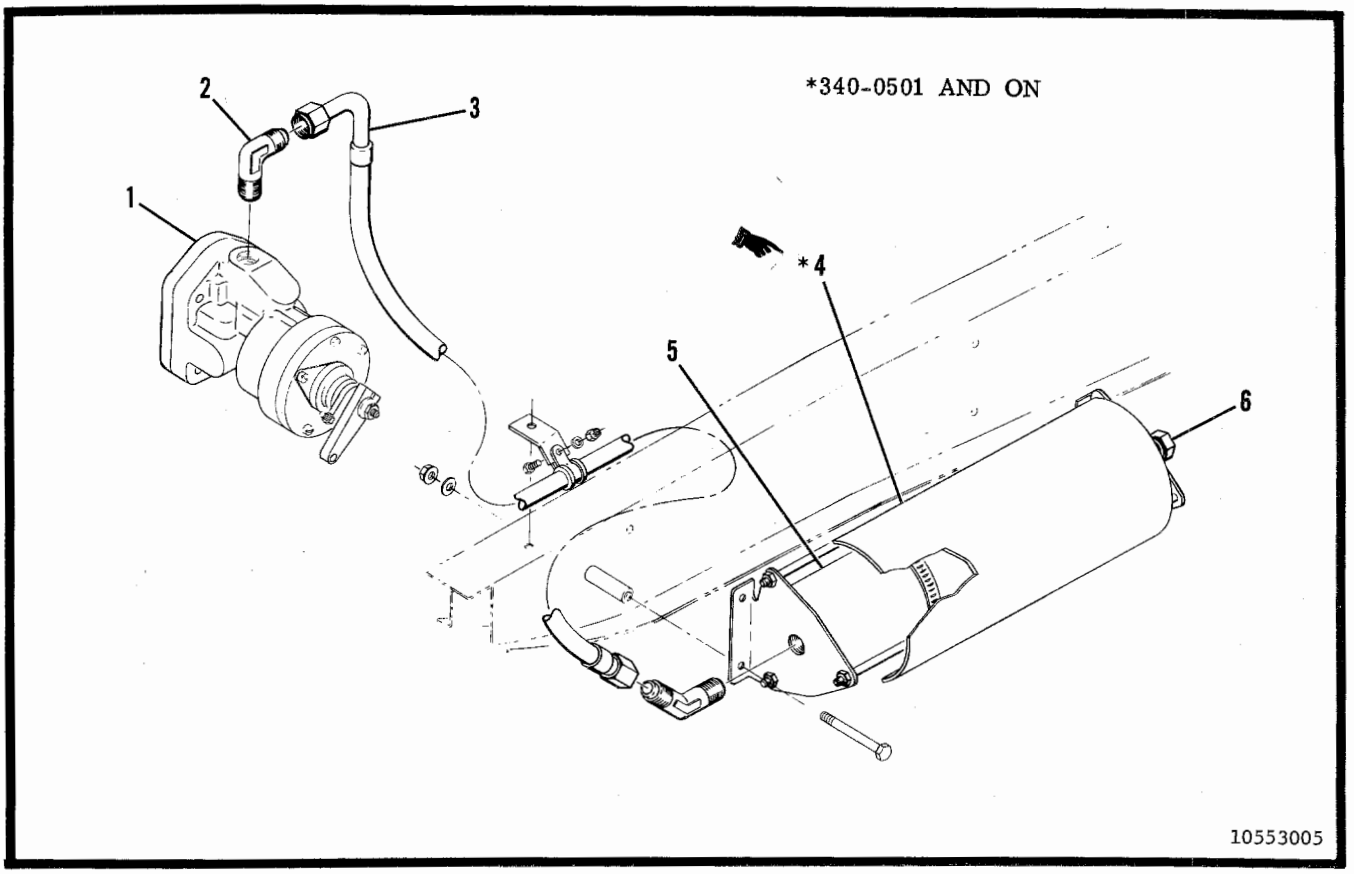
NOTE

Check Pins C, D, E, F, until a voltage reading of approximately 24 volts DC is obtained. Hold the voltmeter probe on the pin until the voltage drops to 0. Move the probe to the next pin in the sequence C, D, E, F. Check volts DC at each pin in sequence, 24 volts DC should be measured at each pin in the sequence C, D, E, F. When correctness of the cycling sequence is established, turn prop deicing system switch off at the beginning of one of the on time periods and record the letter of the pin at which the voltage supply is present.

3. Propeller Deicer Heat Test:
   (a) Remove the jumper wire installed in step b. 2. (a), and replace the connector plug in the timer receptacle.
   (b) Referring to the position in which the timer was left in step b. 2. (d), have an assistant place the prop deice system switch in the "ON" position. As the switch is turned on, place a hand on each of the two deicer areas which should be heated per step b. 2. (d).
   (c) The assistant in the cabin should note and record the prop deicer system ammeter reading. This should be 11 to 18 amps. Keep a close watch on the ammeter needle. The ammeter needle will deflect every 30 seconds because of the switching action of the timer. Each deflection will indicate a change in the heating areas of the prop deicers.

NOTE

The observer in the cabin should call out these 30 second interval deflections and the inspector at the propellers should change the position of his hands on the prop deicers accordingly, to check proper heating sequence of the prop deicer areas.




1. Governor
2. Elbow
3. Hose
4. Heatshield
5. Accumulator
6. Filler Valve

Figure 13-21. Propeller Unfeathering System

NOTE

If any irregularities are noted, recheck the wiring from the timer to the brush holder assembly and the prop deicer terminal connections. Make corrections as necessary and retest.

c. Slip Ring and Holder Assembly Check:

1. Check for out of flatness:

(a) Allowable tolerance is 0.008. If 0.008 is exceeded, shim under mounting bolts to bring within tolerance.

2. On all new brush and/or slip ring installations, allow five hours engine running time before using deice system.

NOTE

Ground checkout of the system is allowed, with engines not running. Allow a minimum of 5 hours of engine running time before turning on the propeller deice system.

Removal/Installation of Deice Boot.

a. Remove deice boot.

CAUTION

Do not use sharp tools or objects to remove boot as damage to the propeller may result.

1. Remove deice boot from the propeller by softening the bond line of boot with Toluol until loosened.

2. Pull deice boot slowly from propeller blade as bond line is loosened.

b. Install deice boot.

1. Place deice boot on hub end of propeller blade, centered on blade leading edge and lead strap (terminal end) of boot aligned and against attach holes of installed terminal bracket.

2. Mark off an area on propeller blade (using masking tape) 1/2" from each side and outer end of deice boot.

3. Remove boot and clean the masked area of propeller blade using Methyl-Ethyl-Keytone (MEK) cleaning solvent. For final cleaning, wipe the solvent film off quickly with a clean dry cloth before it has time to dry.

CAUTION

Methyl-Ethyl, Ketone (MEK must be used in a well ventilated area; avoid prolonged breathing of fumes. During all surface cleaning operations take precaution to guard against spark or open flame in work area.

4. Mix thoroughly the EC-1300 LP cement and apply one brush coat evenly to the cleaned metal surface. Allow to air dry for a minimum of one hour and then apply a second coat of EC-1300 LP cement.

5. Moisten a clean cloth with MEK and clean the unglazed back surface of the deice boot, changing cloth frequently to avoid contamination of the area.

6. Apply an even brush coat of EC-1300 LP cement to the unglazed back surface of the deice boot.

7. Allow cement to dry; then using a silver (non-graphite, greaseless) pencil, mark a centerline along the leading edge of the propeller blade and a corresponding centerline on the cemented side of the deice boot.

8. Reactivate the surfaces of the cement using a clean, lint-free cloth, heavily moistened with Toluol solvent. Avoid excessive rubbing of cement which would remove it from surfaces.

9. Position the deice boot centerline on the propeller leading edge, with all marks and terminal leads aligned. Tack the deice boot centerline to the leading edge of the propeller blade.

NOTE

If the deice boot is allowed to get off centerlines, pull up with a quick motion and reposition properly. Roll firmly along centerline with a rubber roller.

10. Roll outwardly from the centerline to the edge. If excessive material at the edges tend to form puckers, work them out smoothly and carefully with fingers.

11. Roll the tapered edges of the deice boot with a metal hand-stitch roller and ensure there are no bubbles entrapped under the boot and that all edges firmly adhere to the propeller.

NOTE

In the event it becomes necessary to remove or loosen installed, deice boots, Toluol shall be used to soften the "cement" line. A minimum amount of this solvent should be applied to the cement line as tension is applied to peel back the deice boot. The removal should be slow enough to allow the solvent to undercut the cement so that parts will not be damaged.

12. Apply one brush coat of EC539P coating, mixed per manufacturer's instructions, evenly around the edges of the installed deice boot.

13. Remove masking tape from the propeller blade and clean the surface of the blade with a clean cloth dampened with Toluol.

PROPELLER UNFEATHERING SYSTEM.

The optional unfeathering system consists of a nitrogen charged accumulator, a special governor, and a hose connecting the governor to the accumulator. The governor contains a spring-loaded check valve which is unseated while the propeller control is in any position except FEATHER, permitting governor pressurized oil to flow to and from the accumulator. When the propeller control is moved to the FEATHER position, the check valve is seated and oil under governor pressure is trapped in the accumulator and hose. As the propeller control is moved out of the FEATHER position, the trapped oil flows back through the governor to the propeller to unfeather it.

CAUTION

Always leave propeller control in the UNFEATHER position when the aircraft is on the ground. This procedure prevents the possibility of heat causing trapped oil to expand to pressures which could damage the accumulator.

Troubleshooting the Propeller Unfeathering System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| PROPELLER FAILS TO UNFEATHER | Improper accumulator pressure. | Charge accumulator in accordance with Section 2. |
| | Defective governor. | Repair or replace/rerig governor control. |

Removal, Service, Maintenance, and Installation of Propeller Governor.

For removal and installation of propeller governor, refer to removal and installation procedures in Section 9.

CAUTION

Always release system pressure by placing the propeller control in UNFEATHER position, and release accumulator pressure through the filler valve, before disconnecting the hose between accumulator and governor or removing accumulator.

Removal and Installation of Propeller Unfeathering Accumulator. (See figure 13-21.)

a. Remove engine cowling.
b. Disconnect the pressure line.

CAUTION

Always make sure pressure is bled-off the accumulator before disconnecting pressure line.

c. Remove the four screws securing accumulator to the engine mount and remove the accumulator.

NOTE

The elbow in the accumulator is installed and leak tested by the manufacturer; removal of the elbow is not recommended.

d. The installation of the propeller unfeathering accumulator is the reversal of the removal procedure.

Operational Check of Propeller Unfeathering System.

a. With engines operating at 2000 RPM, move propeller controls to the FEATHER position and mixture control to IDLE CUT-OFF. The propeller should be in the feathered position.
b. Move propeller controls to an unfeathered position, propellers should unfeather.
c. If propellers do not unfeather, check system for leaks and proper pressure.

NOTE

When propellers do not unfeather sufficiently to engage high pitch stop, bleed off accumulator pressure to 100 to 110 PSIG; then recheck operation.

HEATED STATIC PORTS.

Static port heaters may be installed to prevent freezing the static ports due to moisture of ice formation. Care must be exercised in removing and installing the static ports to prevent damage to the heaters and electrical leads.

Removal and Installation of Heated Static Port.

a. Disconnect static line and remove fitting from static port.
b. Drill out rivets securing static port, spacer and retainer to fuselage skin.
c. Disconnect electrical wiring and remove static port.
d. Install static port by assembling static port and spacer to outside of fuselage skin and retainer on the inside and secure with countersunk rivets.
e. Connect electrical wiring.
f. Perform static test in accordance with Section 12.

FLIGHT HOUR RECORDER.

The flight hour recorder instrument mounted in the right side of the stationary instrument panel, is activated by the landing gear safety switch. When the landing gear strut is extended, the switch is activated allowing the recorder to operate.

NOTE

It is possible during maintenance when aircraft is on jacks for the flight hour recorder to operate. The flight hour recorder fuse should be removed to deactivate flight hour recorder.

Removal and Installation of Flight Hour Recorder.

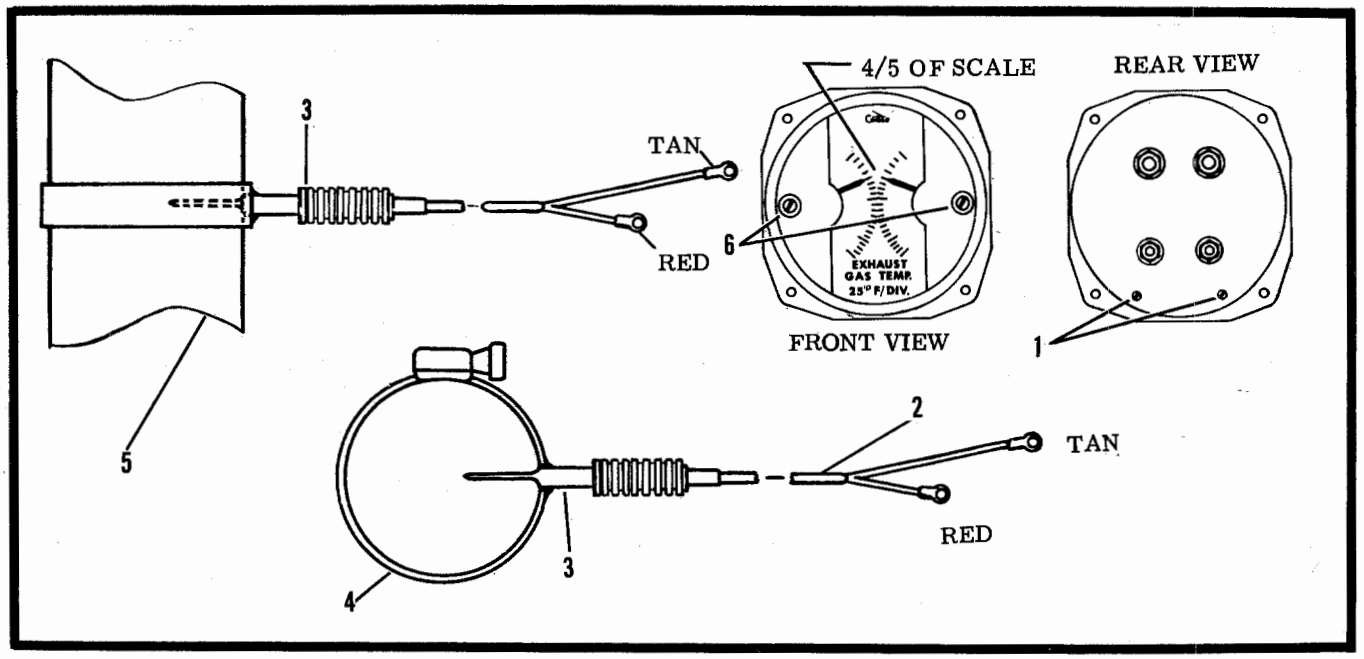
a. Remove and install flight hour recorder in accordance with Typical Instrument Removal and Installation, Section 12.

CESSNA ECONOMY MIXTURE INDICATOR.

The exhaust gas temperature (commonly referred to as EGT) sensing device is used to aid the pilot in selecting the most economical fuel-air mixture for cruising flight at a power setting of 75% or less. Exhaust gas temperature (EGT) varies with the ratio of fuel-to-air mixture entering the engine cylinders. Refer to the appropriate Owner's Manual for correct operation procedures of system.

Removal and Installation of EGT System. (See figure 13-22.)

a. Disconnect wires at probe by removing two screws connecting wires together.
b. Loosen clamp and remove from exhaust stack.
c. Remove EGT indicator in accordance with Typical Instrument Removal and Installation, Section 12.




1. Calibration Screw (Aft)
2. Thermocouple Wire
3. Probe
4. Clamp
5. Exhaust Stack
6. Calibration Screw (Forward)

Figure 13-22. Exhaust Gas Temperature System Installation

d. If wire is to be removed, pull wires from bundles routed to engine nacelle.

NOTE

The wiring is a thermocouple wire and is calibrated for a fixed resistance. Do not lengthen or shorten.

e. Installation of EGT system is the reversal of the removal procedures.

Calibration of EGT System. (See figure 13-22.)

a. To check calibration, obtain an average cruise condition of 65% power at 7500 feet and lean mixture to peak exhaust temperature on indicator.

NOTE

To obtain peak exhaust temperature, lean out mixture control slowly enough for pointer to follow. When the pointer stops going up and starts a downward movement, enrich mixture enough to regain peak reading.

b. Record reading achieved after system has stabilized.
c. Repeat step a. several times to insure a positive reading has been achieved.
d. If at average cruise conditions and peak exhaust temperature mixture the correction is not over ±75°F (three small divisions), adjust screw on face of the indicator to position the pointer at 4/5 scale.

CAUTION

This adjustment screw has a limited travel of ±15° to 20° beyond which internal damage will result.

e. If adjustment for more than ±75°F is required, perform the following steps:
1. Gain access to rear of indicator.
2. Viewing meter from rear, turn calibration screws one turn clockwise for increase in indicator reading 25°F (one division) or one turn counterclockwise for decrease.

PILOT AND COPILOT MANUAL AND ELECTRICAL ADJUSTABLE SEAT.

Removal of Pilot and Copilot Manual and Electrical Adjustable Seat. (See figure 13-23.)

The procedures given pertain to either the pilot's or copilot's manual or electrical adjustable seat. The difference between the manual and electrical is the electrical seat utilizes an electric motor in lieu of the manual crank for the up and down and tilting movements.

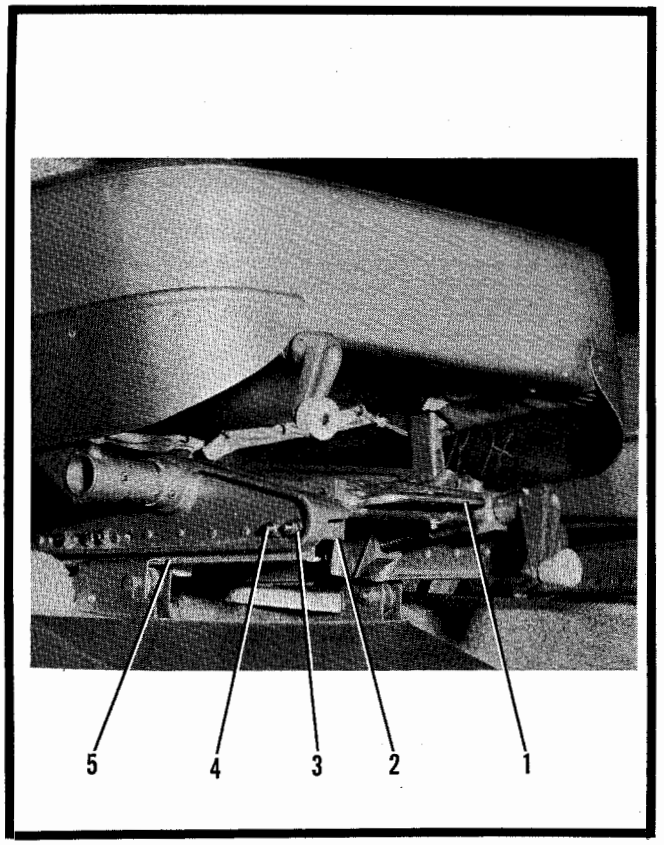
a. Raise seat to the highest position.
b. Remove seat stops on each side of the rail by removing nuts and screws.
c. Tag and disconnect wiring.
d. Pull up on seat stop handle and slide seat aft and remove seat from its mounting.

Disassembly of Pilot and Copilot Manual and Electrical Adjustable Seat.

a. Disassemble pilot's and copilot's manual and electrical adjustable seat in accordance with Figure 13-24.

Installation of Pilot's and Copilot's Manual and Electrical Adjustable Seat. (See figure 13-23.)

a. Insert seat on seat rails and slide forward.
b. Pull up on seat stop handle and allow seat to move forward far enough to install seat stops.
c. Connect wiring and remove tags.
d. Install seat stops with screws and nuts.
e. Turn on electrical power and check operation.
f. If seat is not electrical, check operation using crank provided on the front of the seats.




1. Adjust Handle
2. Seat Stop
3. Nut
4. Screw
5. Seat Rail

Figure 13-23. Pilot and Copilot Manual and Electrical Seat Installation

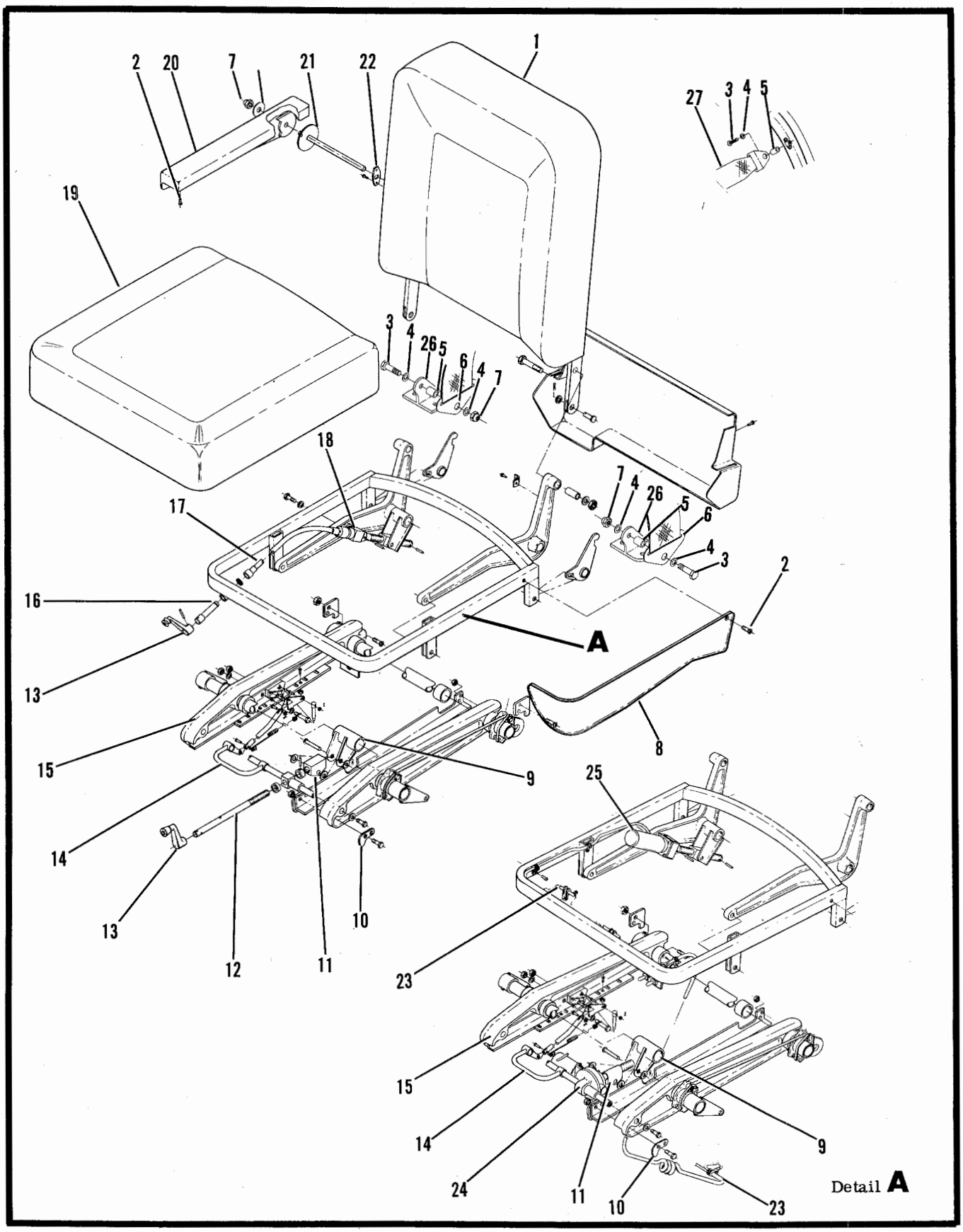



Figure 13-24. Pilot and Copilot Manual and Electrical Adjustable Seat

Figure 13-24. Pilot and Copilot Manual and Electrical Adjustable Seat Callouts

1. Seat Back
2. Screw
3. Bolt
4. Washer
5. Spacer
6. Seat Belt
7. Nut
8. Side Skirt
9. Seat Bellcrank
10. Seat Stop
11. Nut
12. Shaft
13. Crank
14. Seat Stop Handle
15. Seat Base
16. Shaft
17. Housing
18. Bearing Block
19. Seat Bottom
20. Arm Rest
21. Arm Rest Stop
22. Escutcheon
23. Wire Bundle
24. Vertical Adjust Motor
25. Recline Motor
26. Seat Belt Anchor
27. Shoulder Harness

TRUE AIRSPEED INDICATOR.

The true airspeed indicator is composed of three elements: airspeed, altitude and temperature. The altitude and temperature mechanisms are correlated to operate a rotating dial over which the indicated airspeed indicates the true airspeed. The true airspeed indicator senses changes in pressure and temperature. This combination of altitude and temperature change results in a sum total of airspeed corrections to indicate true airspeed.

Removal and Installation of True Airspeed Indicator. (See figure 13-25.)

Remove and install the true airspeed indicator in accordance with the Typical Instrument Removal and Installation procedures in Section 12.

STEREO TAPE PLAYER.

The stereo tape player is mounted on the right stationary instrument panel in the location previously occupied by the glove compartment. The eight track stereo player has a tape speed of 3.75 inches per second. Automatic switching, continuous play, push button control for immediate program change and a fully transistorized power supply for instantaneous operation.

Removal of Stereo Tape Player. (See figure 13-26.)

a. Turn off electrical power.
b. Remove screws securing stereo brackets to stationary instrument panel.
c. Carefully work stereo player forward, tag and disconnect wiring at the plug and remove stereo player unit.
d. Disassemble brackets in accordance with figure 13-26.

Installation of Stereo Tape Player. (See figure 13-26.)

a. Assemble brackets to stereo tape player.
b. Position in place and connect wiring and electrical plug.
c. Secure stereo tape player to stationary panel with four screws.
d. Check operation.

NOTE

During operational check if crosstalk is present, adjust the fine tuning control on the face of the stereo player until crosstalk is completely removed. The fine tuning control moves the tape head up and down to properly align cartridge tape and tape head.

ELECTRIC ELEVATOR TRIM.

See Section 6 for removal, installation and rigging of electric elevator trim control system.

STROBE LIGHT SYSTEM.

See Section 14 for removal and installation of strobe light system.

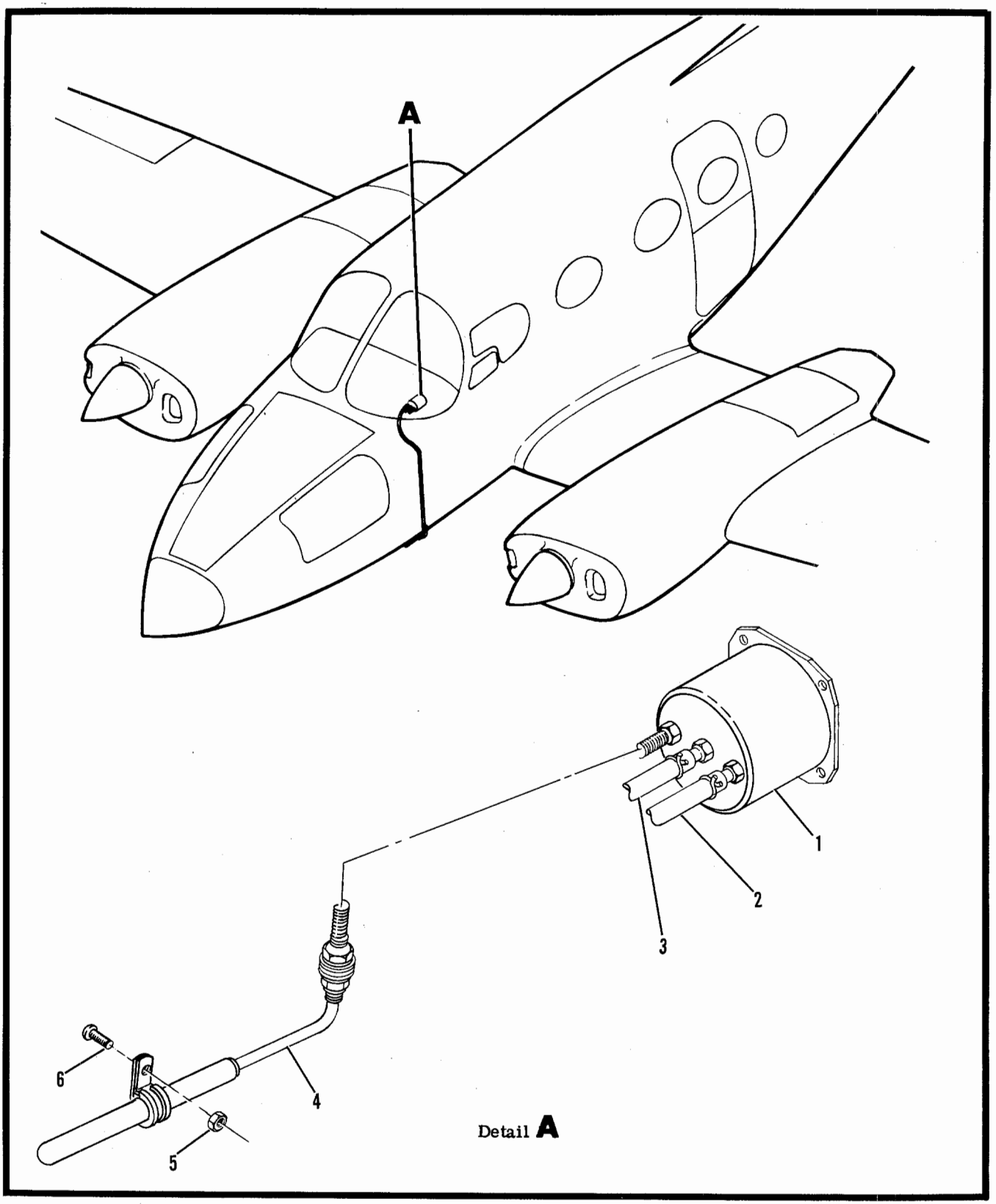
WING LOCKER FUEL SYSTEM.

See Section 11 for removal and installation of wing locker fuel system.

AIR CONDITIONING SYSTEM. (See figure 13-28.) (340-0001 TO 340-0301.)

The air conditioning system is comprised of three major installations; right-hand engine compartment, right-hand wing locker area, and the cockpit cabin area. The air conditioning system utilizing the vapor cycle concept and R-12 Freon as the refrigerant will deliver 14,500 BTU of cooling with an OAT of 100° Fahrenheit.

The right-hand engine compartment installation consists of a piston type light-weight compressor mounted to the nacelle structure and is belt driven from a pulley mounted on the aft end of scavenge pump housing. The compressor is engaged and disengaged by an electromagnetic clutch when the air conditioning switch is placed in the COOL mode position. The compressor does not cycle on and off for cooling, a bypass valve has been incorporated in the system to unload the compressor when less R-12 is needed.




1. True Airspeed Indicator
2. Static Line
3. Pitot Line
4. Air Temperature Probe
5. Nut
6. Screw

Figure 13-25. True Airspeed Installation

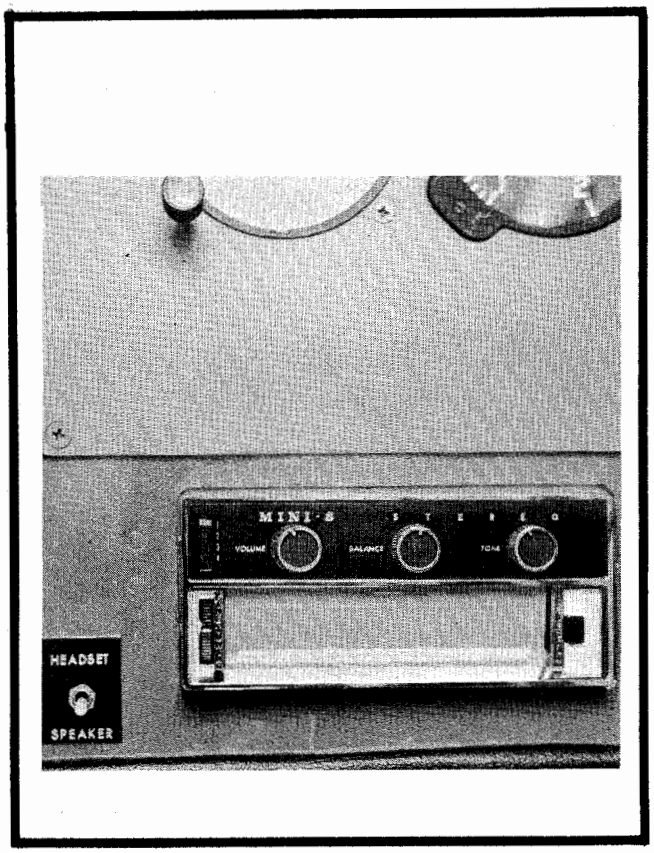



Figure 13-26. Stereo Tape Player

To protect the compressor from excessive liquid ingestion, a liquid trap is incorporated in the suction line, located just aft of the firewall.

The two condenser modules, receiver-dryer, bypass valve, a latching pressure switch located behind the access panel on the inboard side of the right wing locker, and the condenser blower assembly are mounted in the forward section of the right wing locker. In flight cooling is provided by air drawn in through the inlet scoop on the outboard side of the right engine nacelle passing over the condenser and expelled out through the nacelle outlet on the inboard side of the right engine nacelle. A condenser blower is wired to operate through the landing gear safety switch and operates only during ground operation. In the event during flight the condenser temperature becomes excessively high causing the output pressure to increase the condenser fan control switch will be turned on and allow the condenser blower to operate until the temperature is reduced and output pressure lowered. When the output pressure is reduced a sufficient amount the condenser fan control switch will turn the condenser blower off.

The purpose of the receiver-dryer is to store liquid refrigerant and filter out any moisture in the Freon during the systems operation cycle. The bypass valve allows refrigerant flow to the compressor whenever refrigerant solenoid valve is closed, and will maintain suction at a minimum pressure to prevent the evaporator coil from freezing. When less R-12 is needed by the system the bypass valve will unload the compressor.

The latching pressure switch located in the high pressure line provides protection for the refrigerant system. Should the thermostatic switch in the compressor fail or the temperature rise high enough to cause the pressure to exceed 350 PSI the latching pressure switch will open and disable the magnetic clutch on the compressor. If the latching pressure switch is activated it can be manually reset after aircraft is on the ground.

A cover is provided for access to the right wing locker area for service and maintenance of components.

In the cabin cockpit area are mounted two evaporator modules, the control panel and temperature control assembly, the refrigerant manifold assembly, the condensate drain valve, the air distribution ducts, the sight glass and charging ports.

The evaporator modules each contain an evaporator coil, an expansion valve, a shroud, and a scroll and blower assembly. The evaporator modules are located aft in the cabin under the baggage shelf. Cabin air is drawn through each evaporator coil and refrigerated air is routed into the distribution duct and cabin cockpit area.

The blower motor is manually controlled and has dual speed which may be used to provide cockpit cabin ventilation or air recirculation when the air conditioner is turned off or when the cabin heater is operating.

The refrigerant manifold, located under the cabin floor, consists of a temperature relay, low pressure switch and distribution manifold. The manifold is the junction point for the gaseous and liquid freon distributed between the evaporator modules and the compressor.

A temperature control assembly mounted on the aft evaporator module senses evaporator inlet air. When surrounding air approaches the preselected value, the temperature control switch will close to provide voltage to the temperature relay.

The temperature control switch provides power to the compressor clutch through the temperature relay.

The low pressure switch provides system protection in the event of loss of freon or operation during extremely low outside ambient temperatures.

The condensate drain valve is located under the cabin floor and automatically drains the condensate from the evaporator modules during ground operation and in flight. The valve provides a two stage orifice which permits maximum drainage at ground opera-

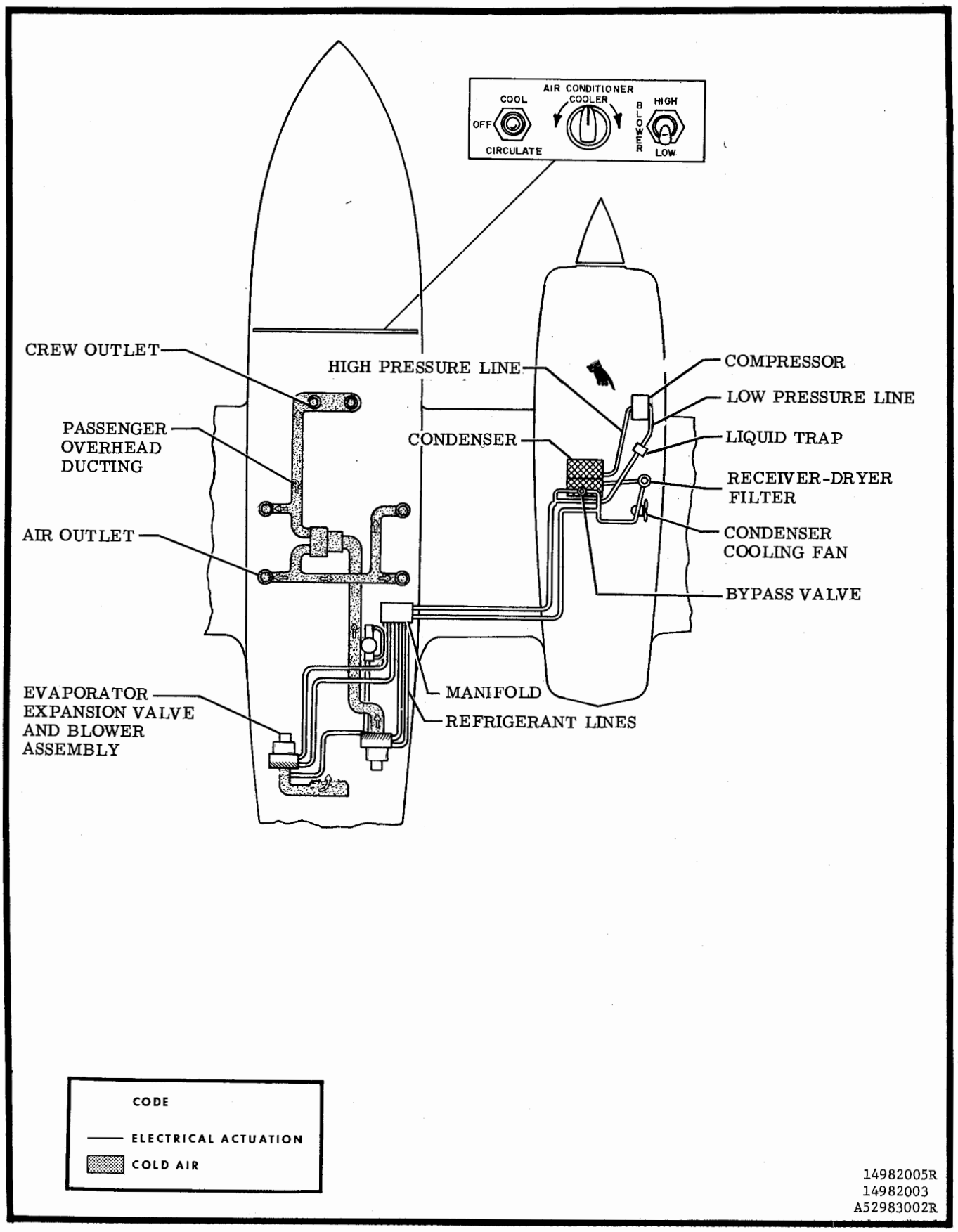



Figure 13-27. Air Conditioning Distribution Schematic

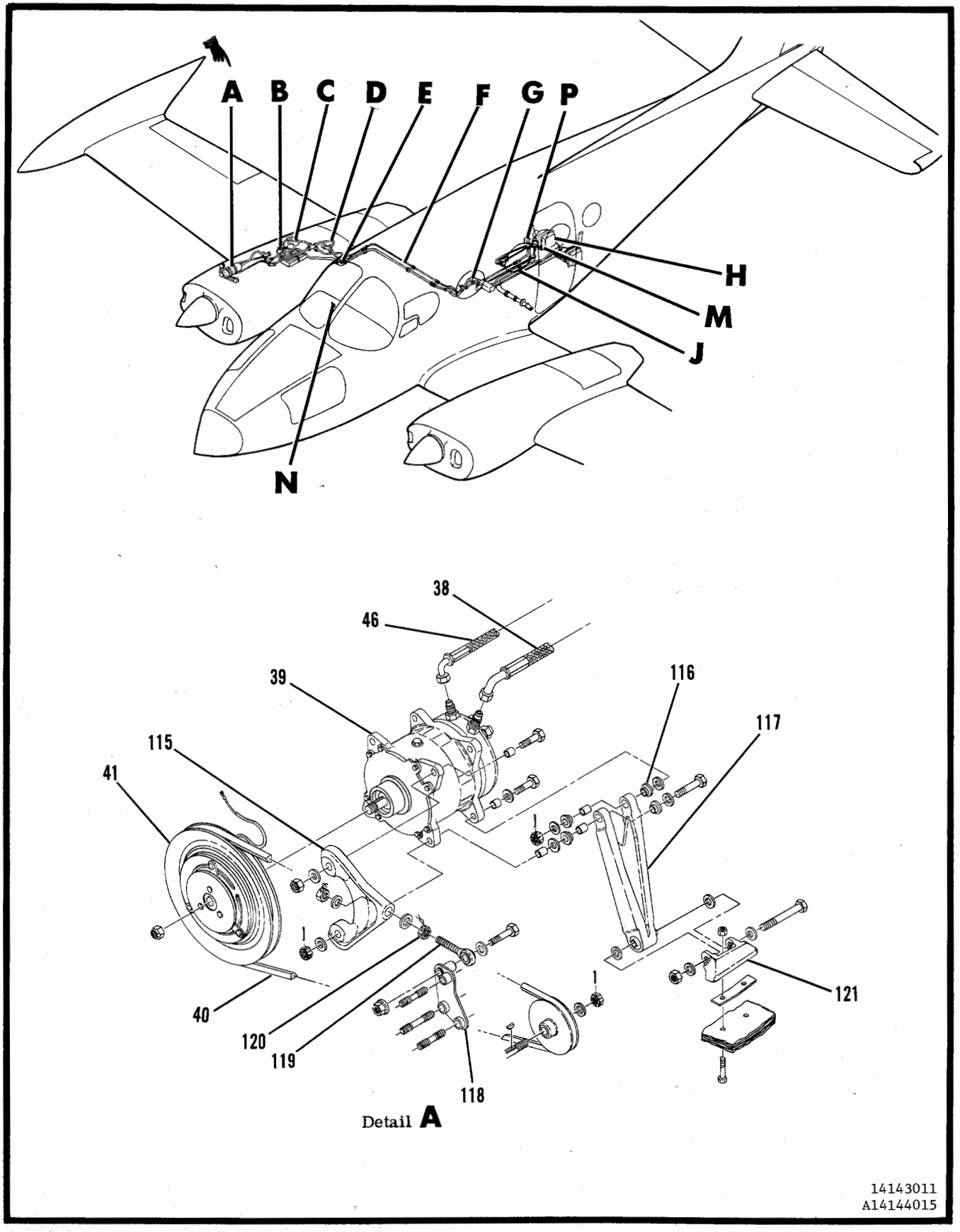



Figure 13-28. Air Conditioning System (Sheet 1 of 5)

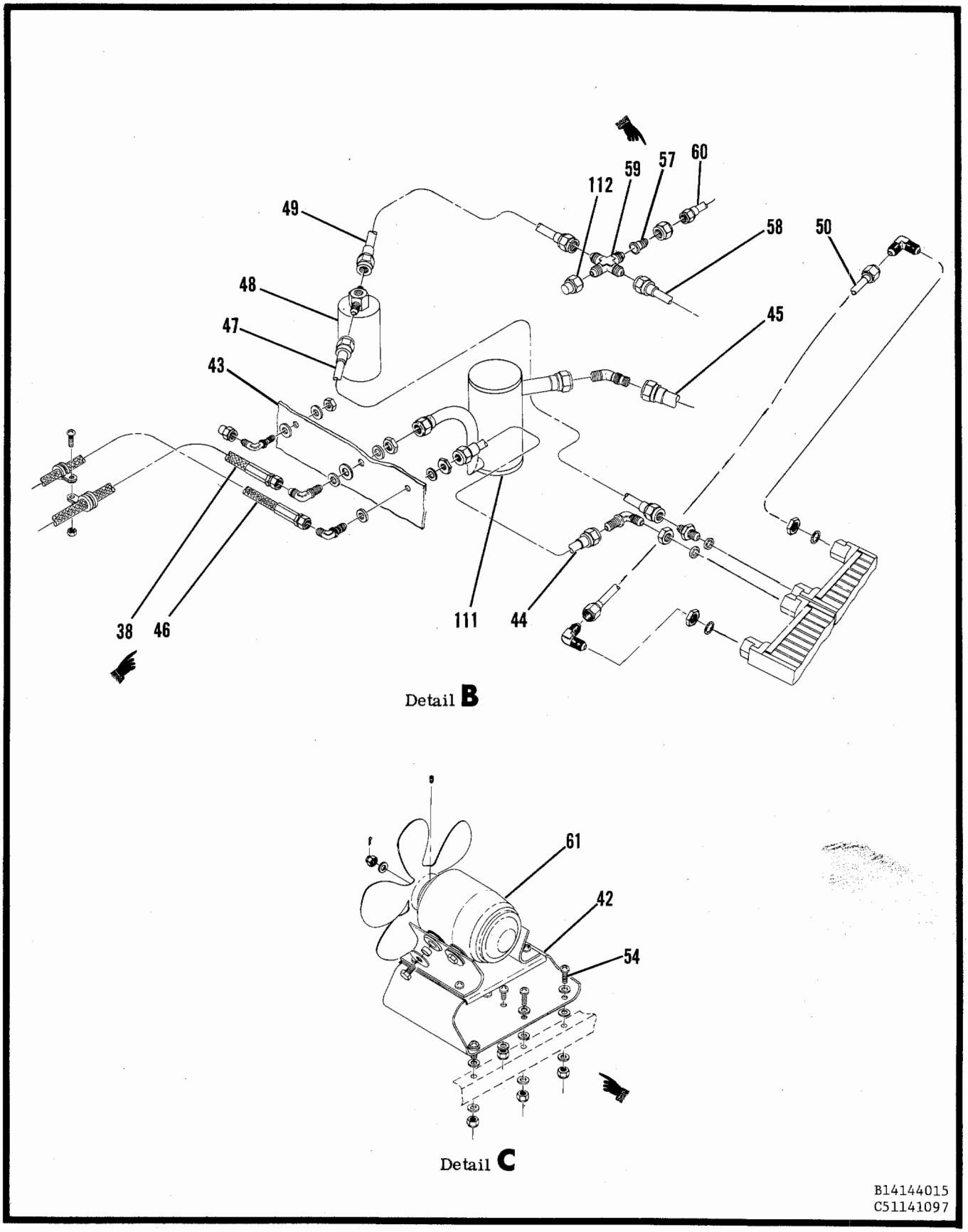



Figure 13-28. Air Conditioning System (Sheet 2)

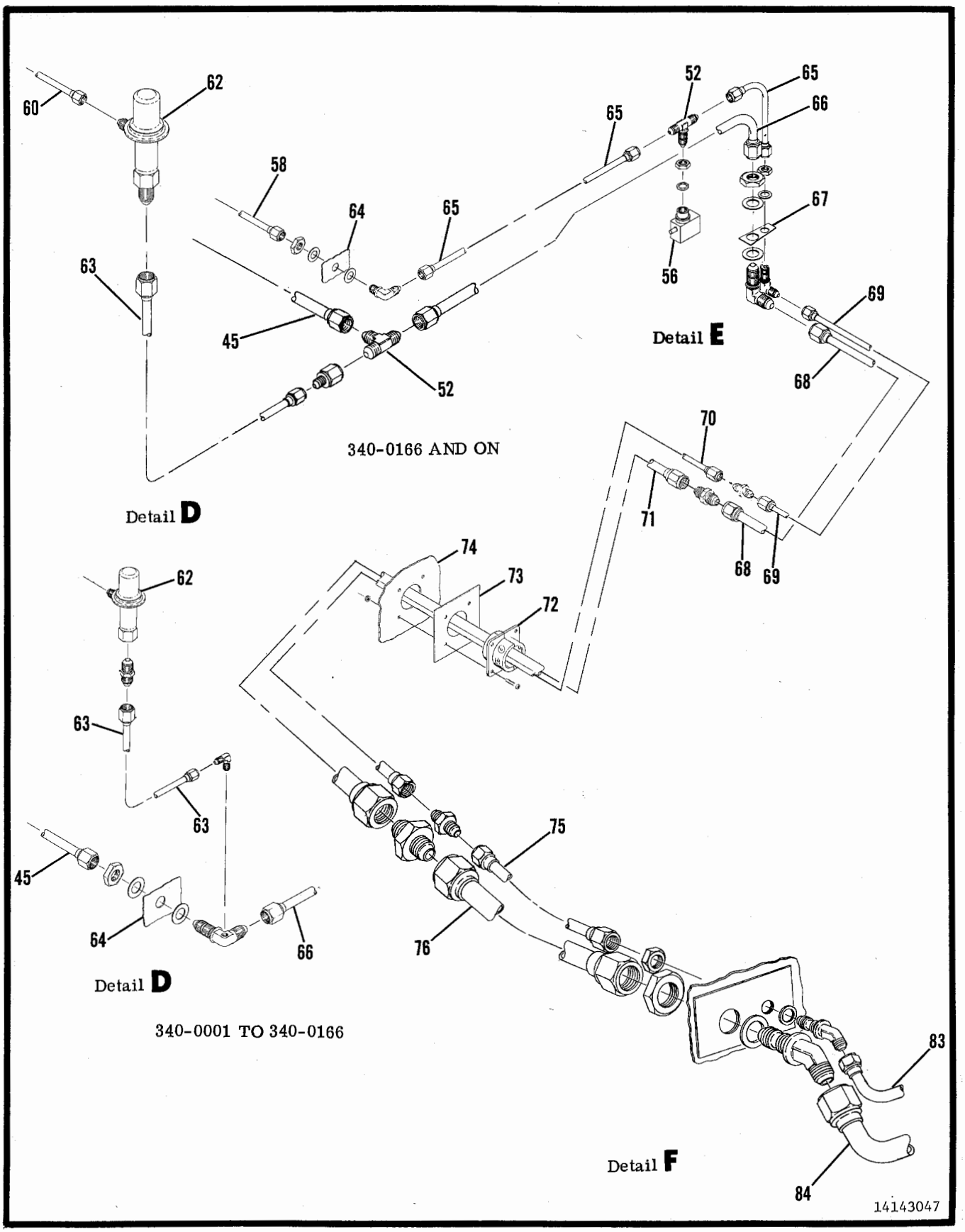



Figure 13-28. Air Conditioning System (Sheet 3)

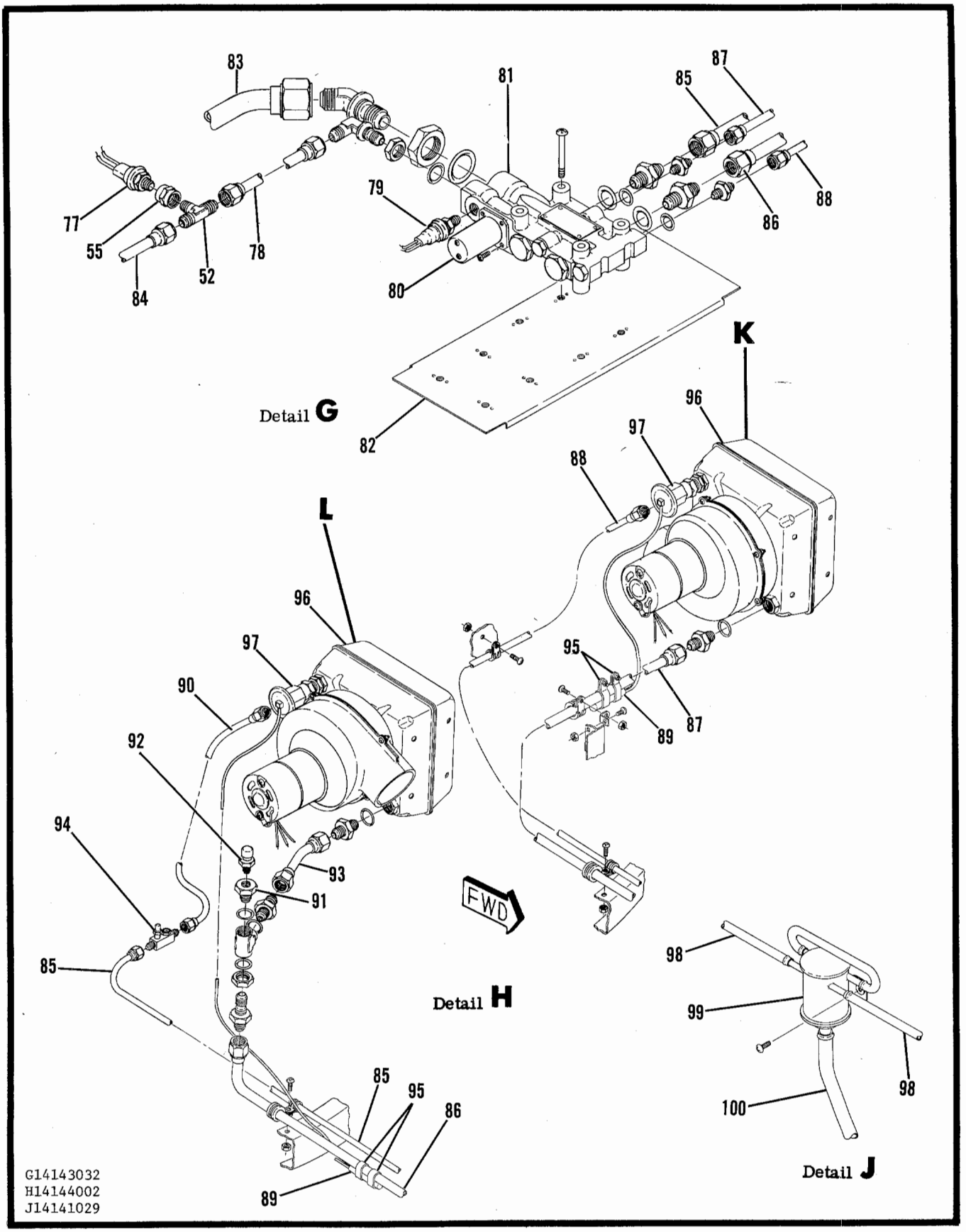



Figure 13-28. Air Conditioning System (Sheet 4)

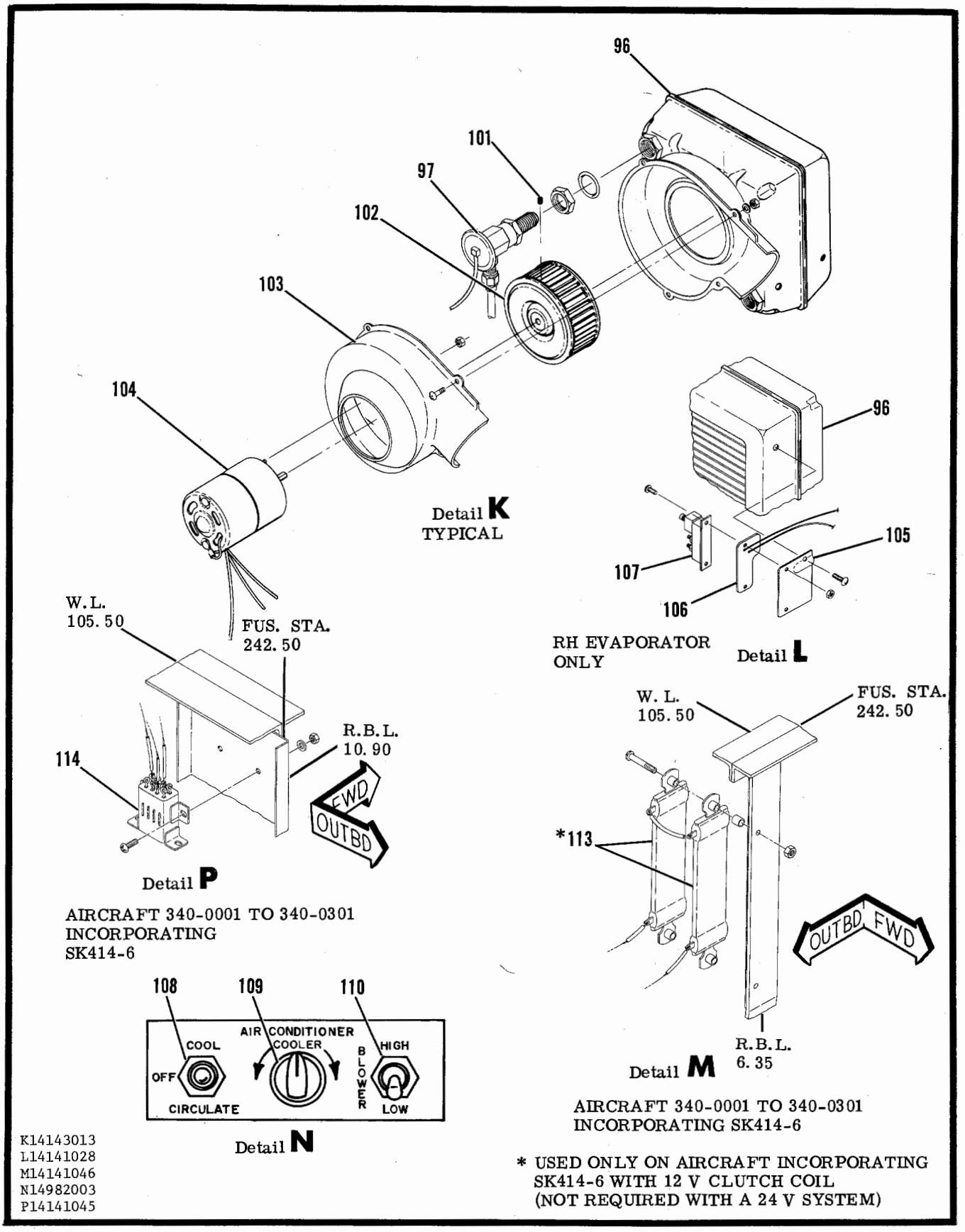



Figure 13-28. Air Conditioning System (Sheet 5)

Figure 13-28. Air Conditioning System Callouts

1. Thru 37. Deleted
38. Freon Suction Hose (Compressor to Firewall Elbow)
39. Compressor
40. Compressor Drive Belt
41. Compressor Drive Pulley
42. Blower Motor Mount
43. Firewall
44. Freon Discharge Line (Firewall Elbow to Condenser Union)
45. Gaseous Freon Suction Line (Firewall Elbow to Nacelle Skin Elbow)
46. Freon Discharge Hose (Compressor to Firewall Elbow)
47. Freon Discharge Line (Condenser Union to Receiver-Dryer)
48. Receiver-Dryer
49. Freon Discharge Line (Receiver-Dryer to Cross)
50. Crossover Line
51. Condenser
52. Tee
53. Deleted
54. Screw
55. Reducer
56. Latching Pressure Switch
57. Reducer
58. Freon Liquid Injection Line (Cross to Nacelle Skin Elbow)
59. Cross
60. Line (By-Pass Valve to Cross)
61. Blower Motor
62. By-Pass Valve
63. Line (By-Pass Valve to Elbow)
64. Nacelle Skin
65. Freon Liquid Injection Line (Nacelle Skin Elbow to Tee)
66. Gaseous Freon Suction Line (Nacelle Skin Elbow to Elbow)
67. Spacer
68. Gaseous Freon Suction Line (Elbow Spacer to Union)
69. Freon Liquid Injection Line (Elbow Spacer to Union)
70. Freon Liquid Injection Line (Union to Elbow
71. Gaseous Freon Suction Line (Union to Elbow)
72. Seal
73. Doubler
74. Fuselage Skin
75. Freon Liquid Injection Line (Elbow to Tee)
76. Gaseous Freon Suction Line (Elbow to Manifold Elbow)
77. High Pressure Switch
78. Freon Liquid Injection Line (High Pressure Switch Tee to Manifold Union)
79. Low Pressure Switch
80. Manifold Shutoff Solenoid Valve
81. Manifold
82. Manifold Mounting Bracket
83. Outlet Line Manifold
84. Freon Liquid Injection Line (Elbow to Manifold Tee)
85. RH Evaporator Outlet Line (Manifold to Elbow)
86. RH Evaporator Outlet Line (Manifold to Elbow)
87. RH Evaporator Outlet Line (Elbow to Union to Service Valve)
88. LH Evaporator Expansion Valve Line
89. Temperature Sense Bulb
90. RH Evaporator (Valve Line to Sight Glass Service Port)
91. Plug
92. Service Valve
93. RH Evaporator Outlet Line (Service Valve to RH Evaporator)
94. Sight Glass - Service Inlet Port
95. Clamp
96. Evaporator
97. Expansion Valve
98. Condensate Drain Line
99. Condensate Tank
100. Overboard Drain
101. Setscrew
102. Fan
103. Blower Housing
104. Motor
105. Temperature Control Bracket
106. Heat Temperature Control
107. Temperature Control Switch
108. Cool - Circulate Switch
109. Rheostat
110. Blower Switch
111. Liquid Trap
112. Cap
113. Resistor
114. Temperature Relay
115. Torque Link
116. Bushing
117. Support Bracket
118. Bracket
119. Rod End
120. Nut
121. Support Fitting

tion and limited drainage during cabin pressurized flight. The second stage orifice assures no significant loss in cabin pressurization.

The control panel located on the right side of the stationary instrument panel consists of a temperature selector rheostat, a mode switch and a blower speed selector.

Special service fittings for diagnosis and charging the Freon system are installed in the liquid line to the right-hand evaporator module expansion valve and in the suction line in the sight gage. These fittings contain a valve to prevent loss of freon during servicing.

System operation in the air conditioning mode, requires the right engine be operating at a minimum tachometer reading of 950 RPM to drive the freon compressor at its designed ground capacity.

Whenever the system mode switch is selected to the air conditioning mode, the magnetic clutch is energized and the compressor starts delivering a high pressure and temperature freon gas to the condensers. This gas is routed through the condensers where cool air from the fan assembly removes heat from the gas and condenses it into a high pressure liquid.

The liquid then enters the receiver-dryer where it is filtered, dried and gas is separated from the liquid. From the receiver-dryer, the liquid flows to the freon distribution manifold which directs the liquid to each evaporator module expansion valve. The expansion valve throttles the liquid into a sub-cooled gas before it enters the evaporator coil. Air from the cabin is pulled across the evaporator coil and is cooled by the sub-cooled freon gas. The refrigerated air is then routed into the air distribution ducts and exhausted into the cabin and cockpit.

NOTE

For troubleshooting the Air Conditioning System refer to Air Conditioning System Service/ Parts manual.

Removal of Compressor (See figure 13-28.)

a. Verify system power switch is in OFF position.
b. Remove RH cowling.
c. Discharge refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
d. Remove compressor drive belt in accordance with the Removal of Compressor Drive Belt Procedures.
e. Remove suction hose and discharge hose. Cap open ports and hoses.
f. Disconnect electrical wires at splices.
g. Remove bolt and nut securing rod end (119) to bracket (118).
h. Remove bolt, nut and washers securing support assembly (117) to support fitting (121).
i. Remove compressor (1), torque link (115) and support assembly (117) as a unit.
j. Disassemble compressor assembly components in accordance with figure 13-28.

Installation of Compressor (See figure 13-28.)

a. Drain all oil from the compressor in accordance with Air Conditioning System Service/Parts Manual.
b. Refill the compressor with 4 ounces of Suniso No. 5 or Texaco Capella E Grade, 500 viscosity oil or equivalent.

NOTE

Special care should be taken to assure that the system is not over-charged with oil, since an over-charge of oil in the system will decrease system performance.

NOTE

All openings in compressor shall be capped off to assure that oil in the compressor does not drain out during installation.

c. Assemble torque link (115) and support assembly (117) to compressor (39) as shown for proper placement of components.

NOTE

Bushings (116) may be lubricated with Dow-Corning DC4 (MIL-G-3278) silicone grease to facilitate installation. Bolts and nuts securing bushings must be snug but not so tight as to deform bushings. Ensure nuts are secured with cotter pins.

d. Position compressor assembly in place and secure support assembly (117) to support fitting (121) with bolt, nut and washers.

NOTE

Shift placement of washers as required to provide a static alignment of compressor pulley 0.15 inch forward of the engine drive pulley.

e. Position compressor drive belt on pulleys and secure torque link rod end (119) to bracket (118). Washers may be added between rod end and bracket if required to align pulleys. Make certain a minimum of 1-1/2 threads protrude through the nut.
f. Adjust belt tension in accordance with Removal and Installation of Compressor Drive Belt procedures.
g. Connect electrical wires.

NOTE

When replacing a compressor having a 12 volt clutch assembly with a compressor having a 24 volt clutch, make sure resistors (113) are removed from the circuit.

h. Connect suction hose and discharge hose.
i. Evacuate and charge system. Refer to Air Conditioning System Service/Parts Manual.
j. Leak check fittings. No leakage allowed.
k. Install cowlings.

Removal and Installation of Compressor Drive Belt. (See figure 13-28.)

a. Remove and install drive belt as follows:
1. Remove RH engine cowling.
2. Cut safety wire from nuts (120) and screw nut onto rod end (119) until belt can be removed.
3. Remove belt from compressor pulley and engine drive pulley.
4. Install new belt and adjust nuts (120) on rod end (119) to obtain proper tension. Belt tension to be measured by loading center of belt with 25 pounds tension pulling up and measuring .5 inch deflection, with a straight edge across top of belt between pulleys.
5. Safety wire nuts (120) to each other.

NOTE

Recheck belt tension after a 10 minute ground run. After 2 to 5 flight hours, check belt for stretching.

6. Reinstall RH engine cowling.

Removal of Manifold Assembly. (See figure 13-28.)

a. Remove cabin seats, carpeting and floorboards in the area between FS 197.14 and FS 209.41 on RH section of cabin.
b. Discharge refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
c. Disconnect wiring to solenoid (80) and low pressure switch (79) and tag.
d. Disconnect lines from manifold and cap off.
e. Remove four mounting bolts attaching manifold to bracket and remove manifold.

Installation of Manifold Assembly. (See figure 13-28.)

a. Installation of the refrigerant manifold assembly is the reversal of the removal procedures.
b. Evacuate and charge system. Refer to Air Conditioning Systems Service/Parts Manual.

Removal of Temperature Control Assembly. (See figure 13-28.)

a. Verify system mode switch is in OFF position.
b. Remove baggage compartment floorboards.
c. Disconnect switch and heater wiring and tag.
d. Remove two mounting screws and locknuts and lift switch and heater assembly free.

NOTE

Temperature control assembly support bracket is bonded to the evaporator module shroud and normally does not require removal.

Installation of Temperature Control Assembly. (See figure 13-28.)

a. Installation of the temperature control assembly is the reversal of the removal procedures.

Removal of Evaporator Blower Motor. (See figure 13-28.)

a. Verify system mode switch is in the OFF position.
b. Remove evaporator in accordance with the Removal of Evaporator Procedure.
c. Disconnect motor (104) wiring and tag.
d. Remove five screws and locknuts from blower housing (103).
e. Pull motor and front portion of scroll assembly away from evaporator module (96).
f. Remove blower wheel set screw (101) and slide wheel off motor shaft.
g. Remove two motor support nuts and lock washers. Pull motor away from scroll and motor support ring.

Installation of Evaporator Blower Motor. (See figure 13-28.)

a. Place new motor in support ring, align mounting studs and press motor in place.
b. Replace motor mount lock washers and nuts and tighten nuts.
c. Slide fan (102) on motor shaft until it stops. Tighten set screw.

NOTE

Verify that the back side of the wheel does not strike the motor mount studs.

d. Clean off both scroll mating surfaces and apply small bead of silicone rubber (RTV102) on scroll mating surface.
e. Install motor scroll assembly and align mounting screws holes and install screws.
f. Place lock nuts on mounting screws and tighten in random pattern.
g. Connect motor electrical wiring and check motor operation at both speeds.

NOTE

During motor operation listen for any excessive noise or rubbing.

h. Turn motor off, install evaporator in accordance with the Installation of Evaporator Procedures.

Removal of Expansion Valve. (See figure 13-28.)

The removal procedures are the same for the LH or RH evaporator expansion valve except for the valve being located in a different place on the evaporator.

a. Verify system power switch is OFF.
b. Remove evaporator in accordance with the Removal of Evaporator Procedures.
c. Disconnect blower motor (104), wiring and tag.
d. Remove five screws and lock nuts from module housing and remove motor housing assembly from evaporator module.
e. Disconnect 1/4 inch inlet line (88) from expansion valve (97).
f. Loosen jamb nut on valve (97) and unscrew valve.

CAUTION

While loosening jamb nut on valve use back-up wrench on evaporator boss.

g. Remove O-ring and jamb nut. Discard O-ring.

Installation of Expansion Valve. (See figure 13-28.)

The installation procedures are the same for the LH or RH evaporator expansion valve except for the valve being located in a different place on the evaporator.

a. Install jamb nut and new O-ring (NAS-1595-8) on the valve outlet fitting.
b. Screw valve assembly into coil inlet fitting until O-ring touches the inlet fitting.
c. Position valve to mate with inlet line and screw on inlet line fitting until finger tight.
d. Tighten jamb nut while using back-up wrench on evaporator boss.

CAUTION

Do not use wrench on valve outlet fitting.

e. Tighten fitting on 1/4 inch inlet line (88).
f. Clean motor housing and module housing mating surfaces and apply small bead of silicone rubber (RTV102).
g. Install motor housing assembly to module housing and align mounting holes.
h. Install five mounting screws and lock nuts and tighten at random.
i. Connect motor electrical wiring and checkout motor operation at both speeds. Listen for excessive noise or rubbing.
j. Install evaporator in accordance with the Installation of Evaporator Procedures.

Removal of High Pressure Switch. (See figure 13-28.)

a. Remove cabin seats, carpeting and flooring in the area between FS 197.14 and FS 209.41 on RH section of cabin.
b. Discharge refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
c. Locate high pressure switch (77) between lines (84 and 78).
d. Disconnect switch (77), disconnect wires and tag.
e. Turn pressure switch CCW to remove from coupling (55). Cap off hole.

Installation of High Pressure Switch. (See figure 13-28.)

a. Place small strip of Teflon tape on pressure switch threads, remove hole cap and install pressure switch in coupling (55).

CAUTION

Do not allow Teflon tape to extend over threads and enter system when torqued.

b. Screw switch CW until it is tight.
c. Connect electrical wires on switch, evacuate and charge the system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Leak check at threads. If leak is observed, tighten pressure switch fitting until no leakage is observed.
e. Replace flooring, carpeting and cabin seats.

Removal of Blower Fan Blade. (See figure 13-28.)

a. Verify system mode switch is in OFF position.
b. Remove RH nacelle air conditioning access cover.
c. For complete protection during fan blade removal, disconnect condenser motor ground lead.
d. Remove cotter pin and retaining nut.
e. Remove two Allen head set screws and loosen fan blade on shaft.
f. Loosen clamps securing electrical motor and slide motor inboard.
g. Remove fan blade from shroud.

Installation of Blower Fan Blade. (See figure 13-28.)

a. Install fan blade on motor shaft with fan hub 1/8 inch from motor front face.
b. Tighten set screws, retaining nut and install cotter pin.
c. Move fan motor outboard until fan blade protrudes 2/3 of its blade width into the shroud.

CAUTION

Make sure there is sufficient clearance between the fan blade and inside diameter of shroud.

d. Tighten electric motor mounting straps.
e. Connect motor ground lead.
f. Install access cover.
g. Place system mode switch to air conditioning and check blower assembly operation.

CAUTION

Take special care to keep fingers and debris from fan inlet.

h. Turn mode switch OFF.

Removal of Condenser Blower Motor. (See figure 13-28.)

a. Verify system mode switch in OFF position.
b. Remove RH nacelle air conditioning access cover.
c. Disconnect electrical wiring and tag.
d. Remove mounting clamps and slide motor (61) inboard.
e. Remove cotter pin, retaining nut and blade set screws.
f. Slide fan blade off motor shaft.
g. Remove motor.

Installation of Condenser Blower Motor. (See figure 13-28.)

a. Installation of the electric motor is the reverse of the removal procedure.

NOTE

Fan blade alignment and spacing must be performed as outlined in the fan blade removal and replacement procedure.

b. Perform electrical checkout of motor operation.

Removal of Receiver-Dryer. (See figure 13-28.)

a. Discharge refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
b. Remove RH nacelle air conditioning access cover.
c. Remove inlet and outlet lines (47 and 49) and cap.
d. Loosen mounting straps and remove receiver-dryer (48).

Installation of Receiver-Dryer. (See figure 13-28.)

a. Installation of the receiver-dryer (48) is the reverse of the removal procedures.

NOTE

The IN port of the receiver-dryer is connected to the plumbing from the last condenser outlet port.

b. Evacuate and charge system. Refer to Air Conditioning System Service/Parts Manual.
c. Leak check with H-10 leak detector. No leakage allowed.
d. Install access cover.

Removal of Liquid Trap (See figure 13-28.)

a. Discharge refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
b. Remove RH nacelle air conditioning access cover.
c. Disconnect fittings and remove liquid trap from system.

CAUTION

Care must be taken in removal and installation of the liquid trap to prevent twisting of the fittings which may cause cracks.

Installation of Liquid Trap (See figure 13-28.)

a. Position liquid trap in place with the outlet (curved tube) forward.
b. Tighten tube fittings while holding the elbow fittings to prevent twisting the fittings.

NOTE

Install liquid trap so that the body is within 5 degrees of vertical. Insulate liquid trap and elbow, using P-2 (2 inches wide x .19 inch thick) foam tape two layer wrap.

c. Evacuate and charge system. Refer to Air Conditioning Service/Parts Manual.
d. Leak check with H-10 leak detector. No leakage is allowed.
e. Install nacelle access cover.

Removal of Bypass Valve. (See figure 13-28.)

a. Discharge refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
b. Remove RH nacelle air conditioning access cover.
c. Disconnect inlet and outlet lines (60 and 63) and cap off.
d. Remove valve (62).

Installation of Bypass Valve. (See figure 13-28.)

a. Installation of bypass valve (62) is the reversal of the removal procedure.

NOTE

The bypass valve (62) is preset from the factory and should not be tampered with.

c. Evacuate and charge the system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Leak check valve plumbing. No leakage allowed.
e. Replace access cover.

Removal of Latching Pressure Switch. (See figure 13-28.)

a. Discharge system. Refer to Air Conditioning Systems Service/Parts Manual.
b. Remove air Conditioning access cover in RH nacelle.
c. Tag and disconnect wires.
d. Disconnect lines and remove latching pressure switch.
e. Cap lines.

Installation of Latching Pressure Switch. (See figure 13-28.)

a. Installation of latching pressure switch is the reversal of the removal procedures.
b. Evacuate and charge system. Refer to Air Conditioning Systems Service/Parts Manual.
c. Operational check in accordance with Operational Procedures.

Removal of Evaporators. (See figure 13-28. )

The removal procedures given pertain to the LH evaporator unit; however, the procedures are the same for the RH evaporator. Where there is a specific difference, reference will be made to the individual evaporator unit.

a. Remove seats and carpet.
b. Remove aft baggage compartment cover.
c. Discharge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Remove expansion valve temperature sense bulb clamps and remove bulb.
e. Disconnect lines from evaporator.
f. Tag and disconnect electrical wiring.
g. Remove bolts securing evaporator.
h. Disconnect drain tube from bottom of evaporator unit.
i. Remove air duct from evaporator.
j. Remove evaporator from aircraft.

Installation of Evaporator. (See figure 13-28. )

The installation procedures given pertain to the LH evaporator unit; however, the procedures are the same for the RH evaporator unit. Where there is a specific difference, reference will be made to the individual evaporator unit.

a. Place evaporator in mounting position.
b. Connect air duct with clamp.
c. Connect drain tube to bottom of evaporator unit.
d. Secure evaporator with bolts.
e. Connect electrical wiring.
f. Connect lines to evaporator.
g. Fasten expansion valve temperature sense bulb (89) to the bottom run of line at approximate 5 to 7 o'clock position and as close to the evaporator as possible. Insulate temperature sense bulbs and lines by wrapping with P-2 foam tape.
h. Evacuate and charge the refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
i. Perform operational check of system.
j. Install baggage shelf.
k. Install carpets and seats.

Removal of Condensers. (See figure 13-28. )

a. Remove RH nacelle air conditioning access cover.
b. Discharge system in accordance with Air Conditioning Systems Service/Parts Manual.
c. Disconnect lines (44, 47 and 50) from condenser units (51).
d. Remove upper bracket holding condensers in and remove condensers.

Installation of Condensers. (See figure 13-28. )

a. Install condensers by reversing the removal procedures.
b. Evacuate and charge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.

Removal and Installation of Evaporator Condensate Drain. (See figure 13-28. )

a. (See figure 1-3. ) Remove floorboards necessary to gain access.
b. Remove hose connections from evaporator condensate drain (99).
c. Loosen screws attaching condensate drain to front spar and remove condensate drain from bottom of aircraft.
d. Install condensate drain by reversing the removal procedures.

NOTE

After condensate drain has been installed in place, use Sealant CES2602, Class III, Type II to reseal drain hose in bottom of fuselage.

Removal of Air Conditioning Plumbing. (See figure 13-28. )

a. Remove all RH passenger seats, pilot and copilot seats, RH side of cabin carpeting.
b. (See figure 1-3. ) Remove all necessary access covers in RH floorboard area, RH engine cowling, RH nacelle air conditioning access cover and lower flaps to gain access to air conditioning plumbing.
c. Discharge system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Refer to figure and remove lines as required.

Installation of Air Conditioning Plumbing. (See figure 13-28. )

a. Installation of the air conditioning plumbing is the reversal of the removal procedures.
b. Reseal fuselage skin (74) in accordance with re-sealing procedures in Section 16 if lines (70 and 71) have been removed or replaced.
c. Evacuate and charge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Check for leaks with leak detector H-10 or equivalent.
e. Perform an operational check of the air conditioning system.

AIR CONDITIONING SYSTEM. (See figure 13-28A. ) (340-0301 and On. )

The air conditioning system is comprised of three major installations; right-hand engine compartment, right-hand wing locker area, and the fuselage cabin area. The air conditioning system utilizes the vapor cycle concept and R-12 Freon as the refrigerant. The system will deliver 14, 500 BTU of cooling with an OAT of 100° Fahrenheit.

The right engine compartment installation consists of a hydraulic pump mounted on the accessory pad of the engine with necessary lines and fittings routing to the wing locker.

The right wing locker houses the condensers, the compressor and its hydraulic drive motor, receiver-dryer, hydraulic manifold and valve assembly, condenser blower motor and fan, hydraulic fluid reservoir and drain valve, associated wing locker wiring and plumbing. In flight cooling is provided by air drawn through the inlet scoop on the outboard side of the engine nacelle being passed over the condensers and expelled through the nacelle outlet on the inboard side of the nacelle. The condenser blower is wired through the landing gear safety switch and normally operates during ground operation only; however, during flight in the event condenser temperature becomes excessively high, causing the output pressure temperature to increase, the fan will be turned on by the condenser high temperature switch, and remain on until temperature of the condensers are reduced, lowering the output pressure temperature. When the output pressure temperature is reduced the condenser high temperature switch will turn the fan off.

The purpose of the receiver-dryer is to store liquid refrigerant and filter out any moisture in the Freon during the system operation cycle.

The low pressure switch is utilized in the high pressure line and provides system protection in the event of loss of Freon or operation during extremely low outside ambient temperature. The switch senses Freon low pressure and opens the electrical circuit and disables the manifold and valve assembly which disengages the compressor.

The manifold and valve assembly is electrically operated and contains a solenoid by-pass valve, pressure relief valve and filter. The manifold and valve assembly is mounted in the hydraulic line from the engine driven pump to the hydraulic reservoir. The manifold and valve assembly is controlled by the temperature control on the air conditioning panel. When cooling is selected the manifold and valve assembly is energized and allows the hydraulic fluid under pressure to operate the motor on the compressor. After the temperature demand is reached the manifold and valve assembly will de-energize and compressor rotation ceases. A pressure switch is installed in the hydraulic pressure line at the valve assembly. The switch will actuate and illuminate the A COND HYD light on the annunciator panel with the air conditioning system ON and right engine running. The switch will deactivate and the light will go out when hydraulic fluid pressure falls below 400 psi. A cover is provided for access to the right wing locker area, for servicing and maintenance of components.

In the cockpit area are mounted two evaporator modules, the control panel and temperature control assembly, the condensate drain valve, the air distribution ducts, the sight glass and charging ports.

NOTE

For troubleshooting the Air Conditioning System, refer to Air Conditioning System Service Parts Manual.

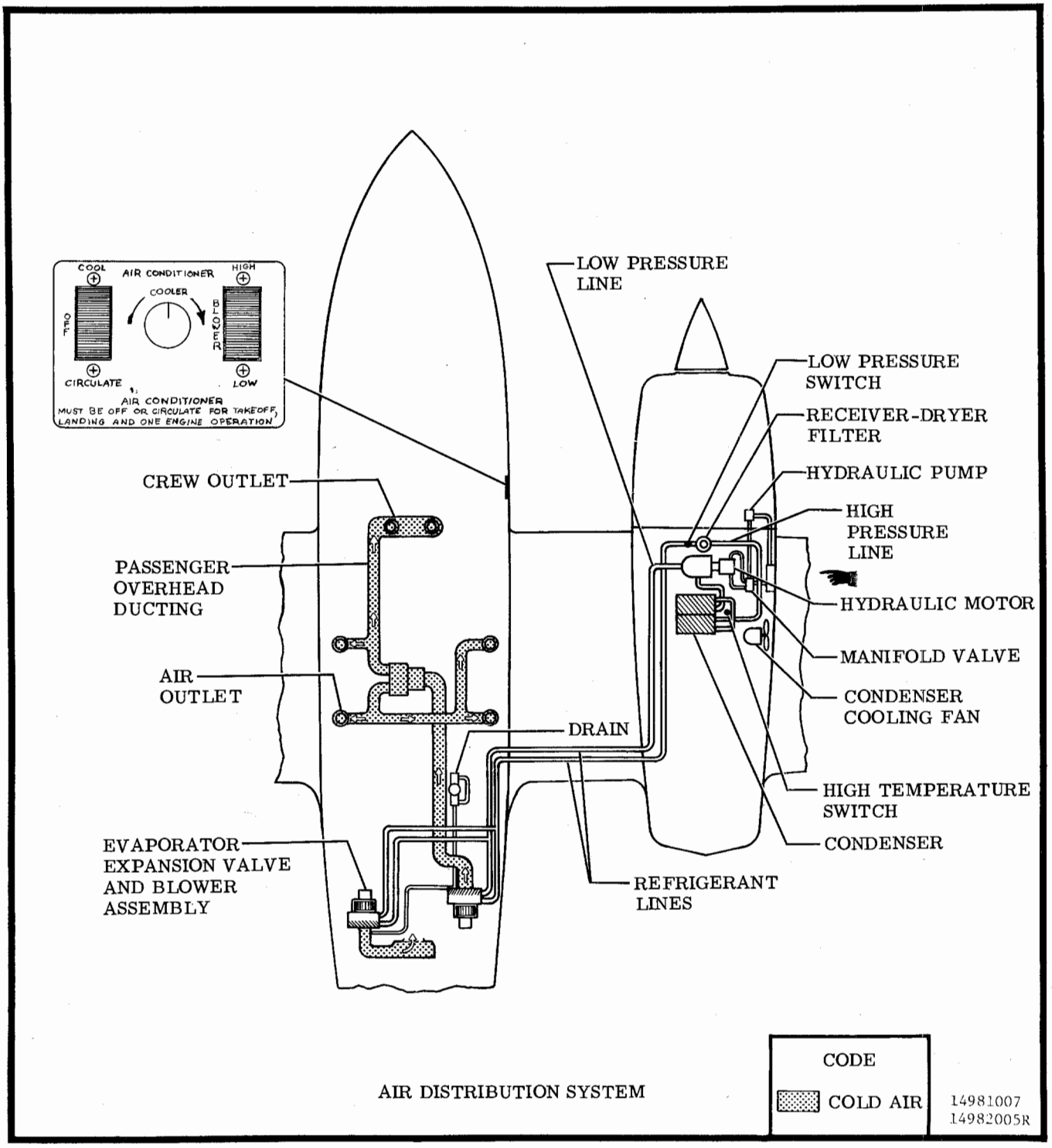



Figure 13-28A. Air Conditioning Schematic (Sheet 1 of 2)

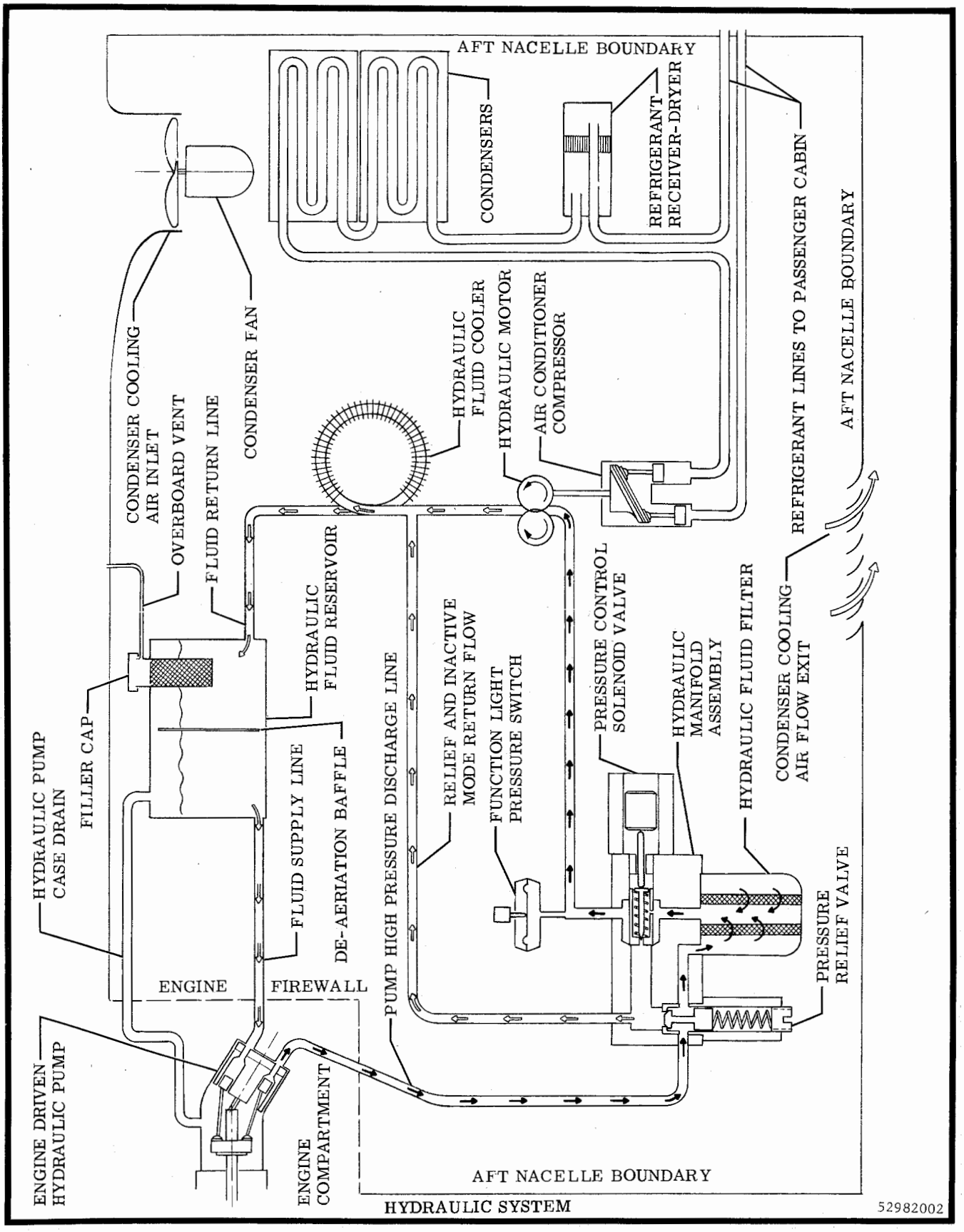
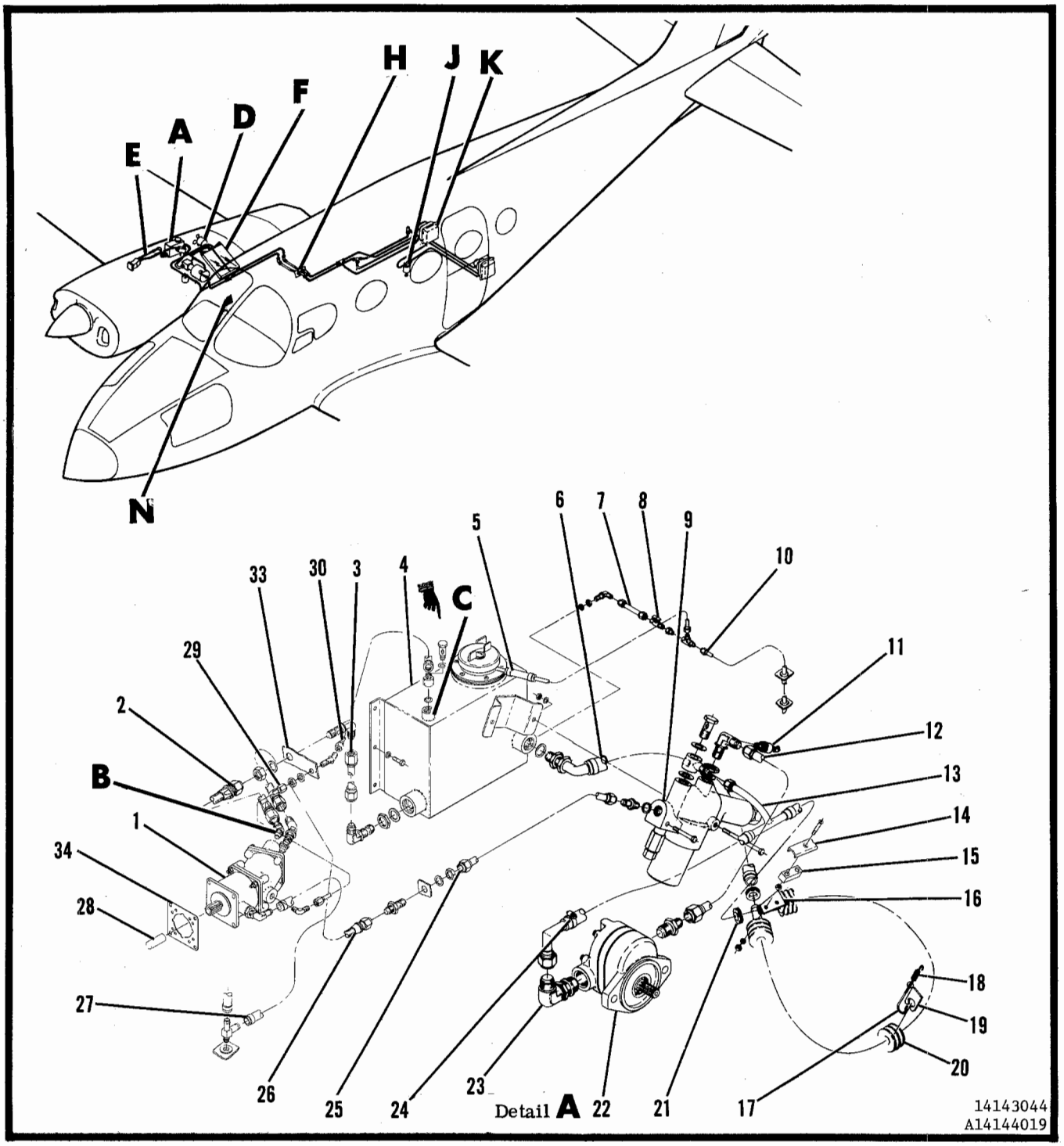
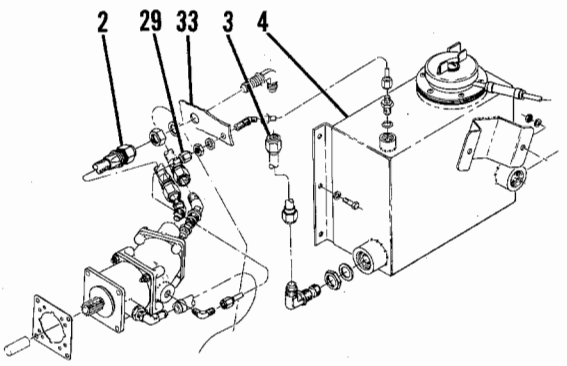



Figure 13-28A. Air Conditioning Schematic (Sheet 2)



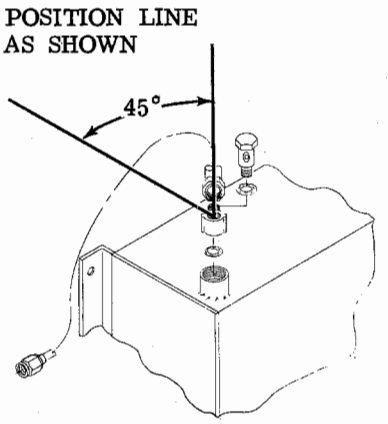

1. Pump (Hyd.)
2. Hose - Supply
3. Line - Supply
4. Reservoir (Hyd.)
5. Vent Line
6. Hose
7. Line
8. Drain Valve
9. Manifold and Valve Assembly
10. Line
11. Pressure Switch (Hyd.)
12. Line
13. Tee
14. Bracket (Lower)
15. Spacer
16. Bracket
17. Retainer
18. Spring
19. Clip
20. Cooling Coil
21. Grommet
22. Motor (Hyd.)
23. Elbow
24. Hose
25. Line
26. Hose
27. Drain Line

Figure 13-28B. Air Conditioning System (Sheet 1 of 6)



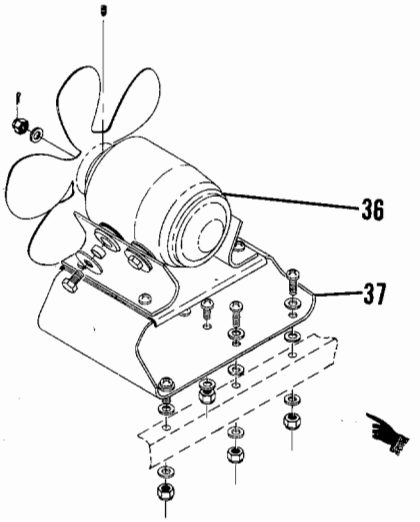

Detail **B**

340-0301 TO 340-0507




Detail **C**

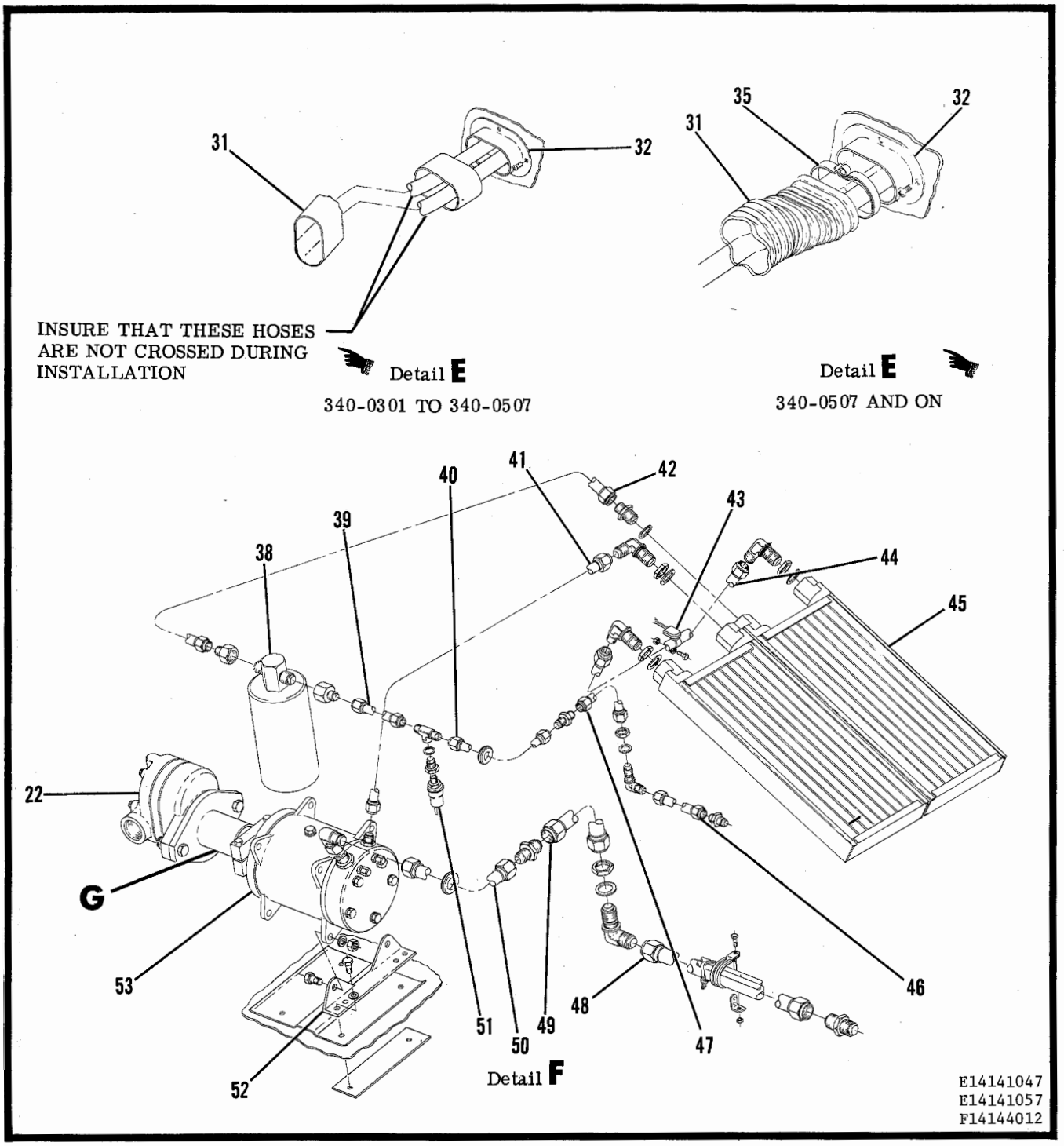
340-0507 AND ON




Detail **D**

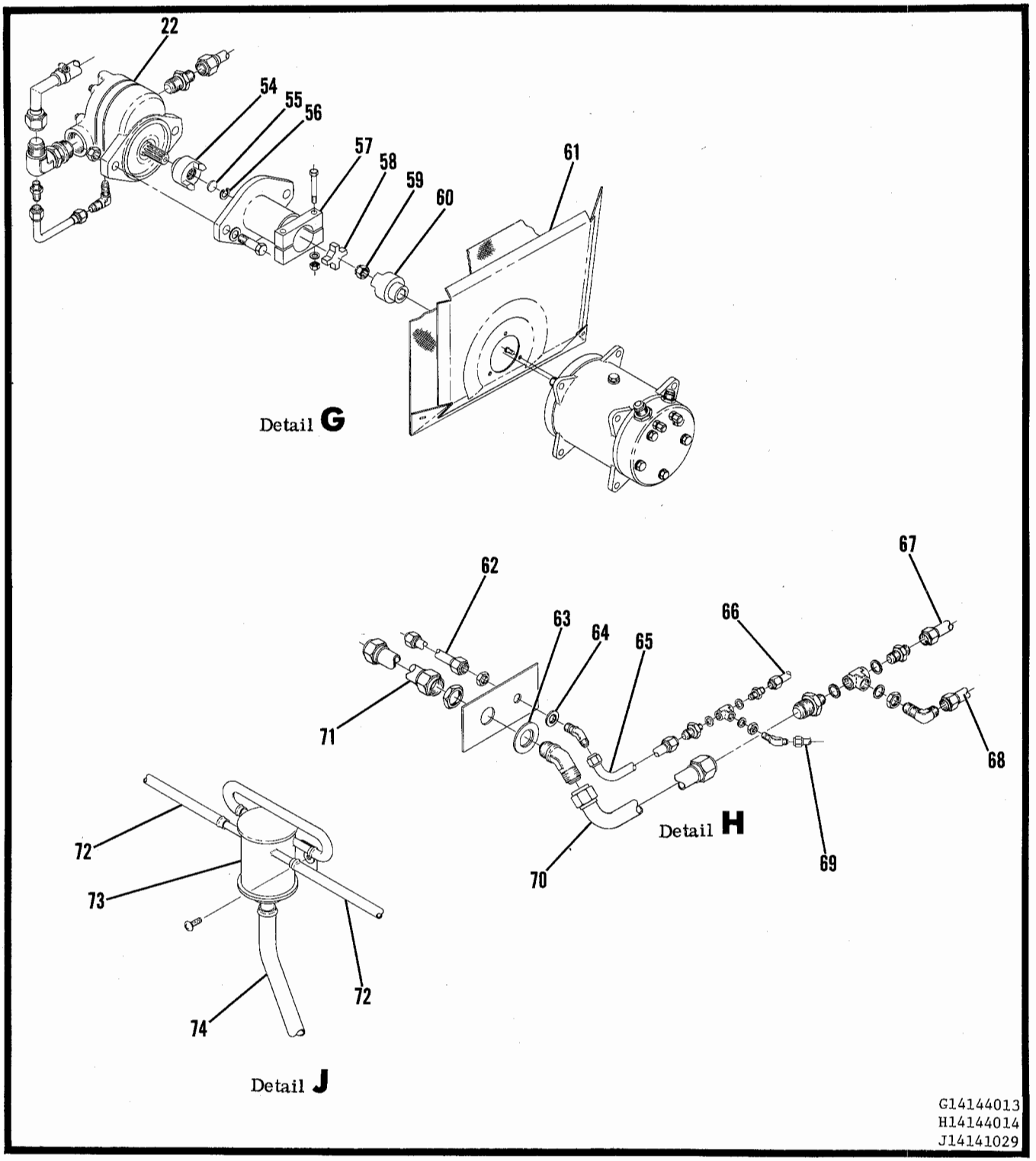
B14144016
C14141056
D51141097

Figure 13-28B. Air Conditioning System (Sheet 2)



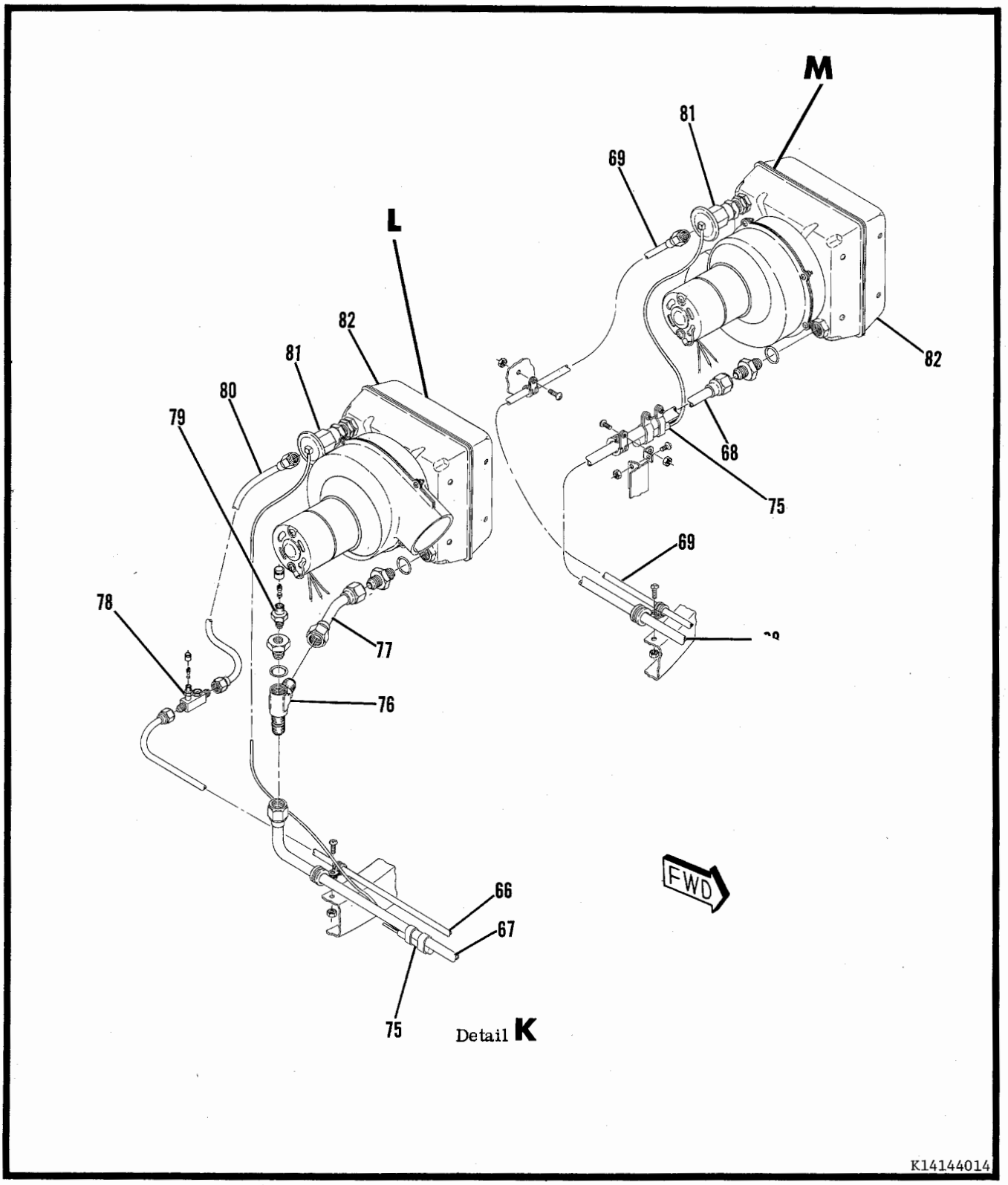

28. Spacer
29. Drain Line
30. Drain Line
31. Shroud
32. Adapter
33. Firewall
34. Gasket
35. Clamp
36. Blower Motor
37. Mount
38. Receiver-Dryer
39. Line
40. Line
41. Line
42. Line
43. High Pressure Switch
44. Line
45. Condensers
46. Line
47. Line
48. Line
49. Line
50. Line
51. Low Pressure Switch
52. Bracket
53. Compressor

Figure 13-28B. Air Conditioning System (Sheet 3)



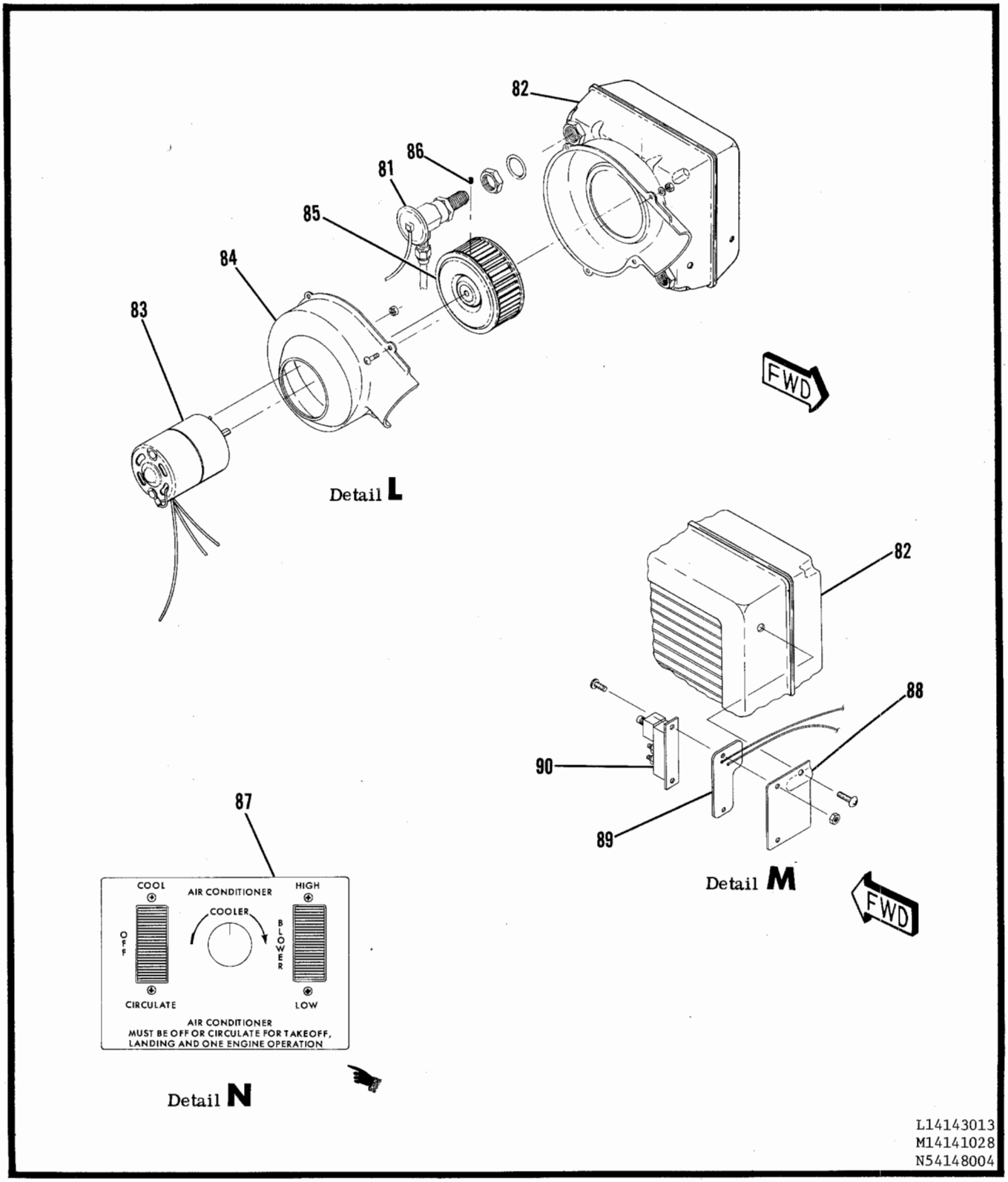

54. Coupling Half
55. Washer
56. Snap Ring
57. Adapter
58. Spacer
59. Nut
60. Coupling Half
61. Baffle
62. Line
63. Lock-O-Seal
64. Lock-O-Seal
65. Line
66. Line
67. Line
68. Line
69. Line
70. Line
71. Line
72. Drain Line
73. Condensate Tank
74. Condensate Drain Line

Figure 13-28B. Air Conditioning System (Sheet 4)




75. Temperature Sense Bulb
76. Service Valve
77. Line
78. Sight Glass
79. Plug
80. Line
81. Expansion Valve
82. Evaporator

Figure 13-28B. Air Conditioning System (Sheet 5)




83. Motor
84. Blower Housing
85. Wheel (Fan)
86. Set Screw
87. Control Panel
88. Temperature Control Bracket
89. Heat Temperature Control
90. Temperature Control Switch

Figure 13-28B. Air Conditioning System (Sheet 6)

The evaporator modules each contain an evaporator coil, an expansion valve, a shroud, and a scroll and blower assembly. The evaporator modules are located aft in the cabin under the baggage shelf. Cabin air is drawn through each evaporator coil and refrigerated air is routed into the distribution duct and cabin cockpit area.

The blower motor is manually controlled and has dual speed which may be used to provide cockpit cabin ventilation or air recirculation when the air conditioner is turned off or when the cabin heater is operating.

A temperature control assembly is mounted on the left-hand evaporator module. Whenever the surrounding air approaches the preselected valve, the control assembly will open the manifold and valve assembly, shutting off hydraulic fluid to the compressor motor.

The condensate drain valve is located under the cabin floor and automatically drains the condensate from the evaporator modules during ground operation and in flight. The valve provides a two stage orifice which permits maximum drainage at ground operation and limited drainage during cabin pressurized flight. The second stage orifice assures no significant loss of cabin pressurization.

The control panel, located on the right-hand side of the crew compartment, consists of a temperature selector rheostat, a mode switch and blower speed selector switch.

Special service fittings for diagnosis and charging the Freon system are installed in the liquid line to the right-hand evaporator module expansion valve and in the suction line in the sight gage. These fittings contain a valve to prevent loss of Freon during servicing. Service fittings are also located on the aft face of the compressor.

System operation in the air conditioning mode, requires the right engine to be operating at a minimum tachometer reading of 950 RPM to drive the Freon compressor at its designed ground capacity.

Whenever the system mode switch is selected to air conditioning mode, the manifold and valve assembly is closed and hydraulic fluid is supplied to the compressor motor which drives the compressor. The compressor starts delivering a high pressure and temperature Freon gas to the condensers. This gas is routed through the condensers where cool air from the fan assembly removes heat from the gas and condenses it into a high pressure liquid.

The liquid then enters the receiver-dryer where it is filtered, dried and gas is separated from the liquid. From the receiver-dryer, the liquid flows to each evaporator module expansion valve. The expansion valve throttles the liquid into a sub-cooled gas before it enters the evaporator coil. Air from the cabin is pulled across the evaporator coil and is cooled by the sub-cooled Freon gas. The refrigerated air is then routed into the air distribution ducts and exhausted into the cabin and cockpit.

Troubleshooting Air Conditioner Hydraulic System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| CABIN PRESSURE LIGHT OUT WITH SYSTEM IN OPERATION | Defective or misadjusted pressure switch. | Check pressure switch and associated components. Replace or adjust as necessary. Refer to Air Conditioning System Service/Parts Manual. |
| | Defective pressure light. | Replace light. |
| HYDRAULIC MOTOR FAILS TO TURN WHEN AIR CONDITIONER IS ACTIVATED | Defective solenoid. | Check solenoid for 24 VDC. Replace if necessary. |
| | Defective pressure relief valve. | Test manifold valve and adjust relief valve as necessary. Refer to Air Conditioning System Service/Parts Manual. |
| | Clogged filter. | Determine reason for contamination. |
| | Air conditioner compressor over-serviced. | Check compressor for proper freon charge. Refer to Air Conditioning System Service/ Parts Manual. |
| | Hydraulic pump inoperative. | Check drive spline for possible shear and/or that spacer is installed in the internal splined bore of the engine accessory drive shaft. |
| | | Defective pump. Replace if necessary. |
| | | Incorrect hydraulic pump. Check Parts Catalog for correct pump part number. |
| | Hydraulic motor defective. | Replace hydraulic motor. |
| | Defective manifold. | Pressure test manifold. Replace if necessary. Refer to Air Conditioning System Service/Parts Manual. |

NOTE

For troubleshooting the Air Conditioning System, refer to Air Conditioning System Service Parts Manual.

Hydraulic System Operational Test.

a. Conduct operational test using a hydraulic test cart as follows:
1. Ensure that all air conditioning system fittings, clamps and lines are tight.
2. Service air conditioner hydraulic reservoir with 2.75 quarts of MIL-H-5606 hydraulic fluid (red).
3. Ensure air conditioner compressor is serviced with proper amount of Freon. Refer to Air Conditioning System Service/Parts Manual.
4. Connect hydraulic test cart to inlet and outlet lines at the engine driven hydraulic pump.
5. Connect 28 VDC power source to aircraft.
6. Adjust hydraulic test cart to 3 gpm.
7. Turn air conditioner to COOL mode.
8. Check hydraulic system for leaks.

NOTE

Use caution in the area of the condenser fan.

9. Increase hydraulic pressure to 1250 psi and observe that air conditioner panel light is ON and hydraulic motor is rotating.
10. Increase hydraulic flow to 6 gpm and maintaining 1250 psi turn air conditioner mode switch OFF, observe the air conditioner panel light OUT.
11. Turn air conditioner mode switch to COOL and observe panel light ON and hydraulic motor rotation.
12. Operate air conditioner in this configuration for a period of not less than ten minutes. Observe for leaks and proper air conditioning operation.
13. Remove hydraulic test cart, reconnect inlet and outlet lines to hydraulic pump and check hydraulic reservoir fluid level.
b. Conduct operational test using engine operation as follows:
1. Ensure that all air conditioning system fittings, clamps and lines are tight.
2. Service air conditioner hydraulic reservoir with 2.75 quarts of MIL-H-5606 hydraulic fluid (red).

CAUTION

Hydraulic system must be complete and serviced before starting RH engine and pump inlet must be primed.

3. Ensure air conditioner compressor is serviced with the proper amount of Freon. Refer to Air Conditioning Service/Parts Manual.
4. Start RH engine and operate at approximately 1000 rpm and check for hydraulic fluid leaks.
5. Select COOL mode on the air conditioner switch and observe the air conditioner panel light is ON and hydraulic motor rotation.
6. Increase rpm to 2000 rpm.
7. Turn air conditioner mode switch to OFF position and observe that air conditioner panel light is OFF.
8. Turn air conditioner mode switch to COOL and observe the air conditioner panel light is ON and hydraulic motor rotating.
9. Operate engine at various rpm's while checking air conditioner hydraulic operation and air conditioner operation for a period of not less than 10 minutes.
10. Shut down engine and recheck reservoir fluid level.

Removal of Hydraulic Pump. (See figure 13-28B.)

a. Remove RH engine cowling.
b. Disconnect hoses (2 and 26) and drain lines (27 and 29) from hydraulic pump (1) and cap all openings.
c. Remove nuts and remove hydraulic pump (1) from engine.

Installation of Hydraulic Pump. (See figure 13-28B.)

NOTE

MAKE CERTAIN spacer (28) is installed in the internal splined bore of the engine accessory drive shaft before pump is installed.

a. Installation of the hydraulic pump (1) is the reversal of the removal procedures.
b. Fill reservoir (4) with hydraulic fluid.

CAUTION

Hydraulic system must be serviced and system complete before operation or pump should be removed from pad and pad cover installed. The pump inlet must be primed before cranking engine.

c. Check system operation and for hydraulic fluid leakage.
d. Install engine cowling.

Removal of Hydraulic Reservoir. (See figure 13-28B.)

a. Remove RH nacelle air conditioning access cover.
b. Place container under reservoir drain.
c. Cut safety wire; open drain valve (8) and drain hydraulic fluid from reservoir.
d. Disconnect vent line (5), line (7), hose (6), pump case drain and elbow from reservoir (4). Cap all openings.
e. Remove nuts, washers and bolts, securing manifold and valve assembly (9) to reservoir (4).
f. Remove bolts and washers from reservoir (4); remove reservoir (4).

Installation of Hydraulic Reservoir. (See figure 13-28B.)

a. Installation of reservoir (4) is the reversal of the removal procedures.
b. Close drain valve (8) and safety wire.
c. Fill reservoir (4) with hydraulic fluid.
d. Check system operation.

Removal of Hydraulic Motor. (See figure 13-28B. )

a. Remove RH wing nacelle air conditioning access cover.
b. Place container under reservoir drain.
c. Cut safety wire; open drain valve (8) and drain fluid from the reservoir.
d. Disconnect line (25) from manifold and valve assembly (9) and firewall fitting. Cap all openings.
e. Disconnect line (12) and hose (24) from hydraulic motor (22). Cap all openings.
f. Remove nuts, washers and bolts, securing hydraulic motor (22) to adapter (57).
g. Pull hydraulic motor (22) outboard and remove motor from compartment.

NOTE

Coupling half may be connected to motor spline, when motor is removed from the adapter. If coupling half is attached to spline, remove.

h. If further disassembly of hydraulic motor (22) is required, refer to Air Conditioning System Service/ Parts Manual.

Installation of Hydraulic Motor. (See figure 13-28B. )

NOTE

Before installing hydraulic motor, lubricate spline of motor with Dow Corning No. 4 Compound.

For ease of installation, assemble coupling half on motor spline before installing motor in adapter.

a. Insure spacer (58) is properly positioned in the opposite coupling half inside the adapter (57), before installing the hydraulic motor (22).
b. Slide the hydraulic motor (22) with coupling half attached to spline into the adapter. Insure that the two coupling halves and spacer are engaged properly.
c. Secure the hydraulic motor (22) to adapter (57) with bolts, washers and nuts.
d. Connection of lines and hose is the reversal of the removal procedures.
e. Close drain valve (8) and safety wire.
f. Fill reservoir (4) with hydraulic fluid.
g. Check system for operation and leakage.
h. Install RH nacelle air conditioning access cover.

Removal of Compressor. (See figure 13-28B. )

a. Discharge refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
b. Remove RH wing nacelle air conditioning access cover.
c. Disconnect lines (41 and 50) from compressor (53). Cap all openings.
d. Disconnect line (39) from receiver-dryer and low pressure switch (51) if necessary. Cap all openings.
e. Loosen bolts, securing adapter (57) to compressor (53).
f. Remove nuts, washers and mounting bolts, securing compressor (53) to brackets (52). Slide compressor (53) inboard and lift it out of the compartment.
g. Remove screws, securing baffle to compressor (53).
h. If further disassembly of compressor (53) is required refer to Air Conditioning System Service/ Parts Manual.

Installation of Compressor. (See figure 13-28B. )

a. Drain all oil from the compressor (53) in accordance with Air Conditioning System Service/Parts Manual.
b. Refill the compressor with 4 ounces of Suniso No. 5 or Texaco Capella E Grade, 500 viscosity oil or equivalent.

NOTE

Special care shall be taken to assure that the system is not over-charged with oil, since an over-charge of oil in the system will decrease system performance.

All openings in compressor shall be capped off to assure that oil in the compressor does not drain out during installation.

c. Secure baffle to compressor (53) with screws, before installation.
d. Position compressor (53) in the compartment. Slide the compressor (53) into the adapter (57). Insure compressor engages properly in the adapter.
e. Secure compressor (53) to brackets (52) with bolts, washer and nuts.
f. Torque adapter bolts to 125 inch-pounds +0, -10.
g. Connect lines (41 and 50) to the compressor (53).
h. If line (39) between receiver-dryer (38) and low pressure switch was disconnected, reconnect line.
i. Evacuate and charge system. Refer to Air Conditioning System Service/Parts Manual.
j. Leak check system.
k. Install RH nacelle air conditioning access cover.

Removal of Manifold and Valve Assembly. (See figure 13-28B. )

a. Verify electrical power to air conditioning system is turned OFF.
b. Remove RH nacelle air conditioning access cover.
c. Place container under reservoir drain.
d. Cut safety wire; open drain valve (8) and drain hydraulic fluid from reservoir (4).
e. Identify electrical wiring and disconnect.
f. Disconnect lines (12 and 25) and tee (13) from manifold and valve assembly (9). Cap all openings.
g. Remove nuts, washers and bolts; remove manifold and valve assembly (9).

Installation of Manifold and Valve Assembly. (See figure 13-28B. )

a. Installation of manifold and valve assembly (9) is the reversal of the removal procedures.
b. Close drain valve (8) and safety wire.
c. Fill reservoir with hydraulic fluid.
d. Check system operation.

Removal of Condenser Blower Motor. (See figure 13-28B. )

a. Verify electrical power to air conditioning system is turned OFF.
b. Remove RH nacelle air conditioning access cover.
c. Disconnect electrical wiring and tag.
d. Remove mounting clamps (35) and slide blower motor (36) inboard and remove motor.
e. If removal of fan blade is required, refer to Removal and Installation of Fan Blade procedures.

Installation of Condenser Blower Motor. (See figure 13-28B. )

a. Installation of the blower motor (36) is the reversal of the removal procedures.

NOTE

Fan blade alignment and spacing must be performed as outlined in the fan blade removal and installation procedures.

Removal of Blower Fan Blade. (See figure 13-28B. )

a. Verify system mode switch is in the OFF position.
b. Remove RH nacelle air conditioning access cover.
c. For complete protection during fan blade removal, disconnect and isolate condenser blower motor ground lead.
d. Loosen clamps, securing electric motor and slide motor inboard.
e. Remove cotter pin and retaining nut.
f. Remove two allen head set screws and loosen fan blade on shaft.
g. Remove fan blade from shroud.

Installation of Blower Fan Blade. (See figure 13-28B. )

a. Install fan blade on the motor shaft with fan hub 1/8 inch from motor front face.
b. Tighten set screws, retaining nut; install cotter pin.
c. Move fan motor outboard until fan blade protrudes 2/3 of its blade width into the shroud.

CAUTION

Make sure there is sufficient clearance between the fan blade and inside diameter of shroud.

d. Tighten blower motor mounting clamps (35).
e. Connect motor ground lead; if disconnected.
f. Apply electrical power to system; position air conditioning switch to COOL and check blower operation.

CAUTION

Take special care to keep fingers and debris from fan inlet.

g. Turn switch OFF.
h. Install access cover.

Removal of Condensers. (See figure 13-28B. )

a. Remove RH nacelle air conditioning access cover.
b. Discharge system in accordance with Air Conditioning System Service/Parts Manual.
c. Disconnect lines (41, 42 and 44) from condensers (45). Cap all lines and openings.
d. Remove retainers (17), springs (18) and washers securing cooling coil (20) to condensers (45).
e. Remove air seal securing condensers (45) and remove condensers.

Installation of Condensers. (See figure 13-28B. )

a. Installation of the condensers (45) is the reversal of the removal procedures.
b. Evacuate and charge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
c. Leak check all fittings. No leakage is allowed.

Removal of Receiver-Dryer. (See figure 13-28B. )

a. Discharge refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
b. Remove RH wing nacelle air conditioning access cover.
c. Disconnect lines (39 and 42) at receiver-dryer (38). Cap all lines and openings.
d. Loosen mounting clamp and remove receiver-dryer (38).

Installation of Receiver-Dryer. (See figure 13-28B. )

a. Installation of receiver-dryer (38) is the reversal of the removal procedures.

NOTE

The IN port of the receiver-dryer is connected to the plumbing from the condenser.

b. Evacuate and charge system. Refer to Air Conditioning System Service/Parts Manual.
c. Leak check with H-10 leak detector. No leakage allowed.
d. Install access panel.

Removal of Low Pressure Switch. (See figure 13-28B.)

a. Discharge refrigerant system. Refer to Air Conditioning System/Parts Manual.
b. Remove RH wing nacelle air conditioning access cover.
c. Locate low pressure switch (51) between lines (39 and 40).
d. Disconnect and tag electrical wires to low pressure switch (51).
e. Turn low pressure switch (51) CCW to remove from tee. Cap off hole.

Installation of Low Pressure Switch. (See figure 13-28B.)

a. Place small strip of Teflon tape on low pressure switch threads, remove hole cap and install low pressure switch (51) in tee.

CAUTION

Do not allow Teflon tape to extend over threads and enter system when torqued.

b. Screw low pressure switch (51) in tee until it is tight.
c. Connect electrical wires, evacuate and charge the system. Refer to Air Conditioning System Service/Parts Manual.
d. Leak check at threads. If leak is observed, tighten low pressure switch (51) fitting until no leakage is observed.
e. Install access cover.

Removal of High Temperature Switch. (See figure 13-28B.)

a. Remove RH wing nacelle air conditioning access cover.
b. Verify electrical power to system is turned OFF.
c. Disconnect and tag electrical wires to switch.
d. Remove nut and bolt and remove high temperature switch (43) from line (44).

Installation of High Temperature Switch. (See figure 13-28B.)

a. Installation of high temperature switch (43) is the reverse of the removal procedures.

Removal of Temperature Control Assembly. (See figure 13-28B.)

a. Verify electrical power to system is turned OFF.
b. Remove baggage compartment floorboards.
c. Disconnect electrical wiring and tag.
d. Remove mounting screws and nuts and lift switch and heater assembly free.

Installation of Temperature Control Assembly. (See figure 13-28B.)

a. Installation of the temperature control assembly is the reversal of the removal procedures.

Removal of Evaporator Blower Motor. (See figure 13-28B.)

a. Verify electrical power to system is turned OFF.
b. Remove evaporator in accordance with the Removal of Evaporator procedures.
c. Disconnect motor (83) wiring and tag.
d. Remove screws and locknuts from blower housing (84).
e. Pull motor and front portion of scroll assembly away from evaporator module (82).
f. Remove blower wheel set screw (86) and slide wheel (85) off motor shaft.
g. Remove two motor support nuts and lock washers. Pull motor away from scroll and motor support ring.

Installation of Evaporator Blower Motor. (See figure 13-28B.)

a. Place motor in support ring, align mounting studs and press motor in place.
b. Replace motor mount lock washers and nuts and tighten nuts.
c. Slide wheel (85) on motor shaft until it stops. Tighten set screw (86).

NOTE

Verify that the back side of the wheel does not strike the motor mount studs.

d. Clean off both scroll mating surfaces and apply small bead of silicone rubber (RTV102) on scroll mating surface.
e. Install motor scroll assembly and align mounting screw holes and install screws.
f. Place lock nuts on mounting screws and tighten in random pattern.
g. Connect motor electrical wiring and check motor operation at both speeds.

NOTE

During motor operation listen for any excessive noise or rubbing.

h. Turn motor off, install evaporator in accordance with the Installation of Evaporator procedures.

Removal of Expansion Valve. (See figure 13-28B.)

The removal procedures are the same for the LH or RH evaporator expansion valve except for the valve being located in a different place on the evaporator.

a. Verify system power switch is OFF.
b. Remove evaporator in accordance with the Removal of Evaporator Procedures.
c. Disconnect blower motor (83), wiring and tag.
d. Remove screws and lock nuts from module housing and remove motor housing assembly from evaporator module.
e. Disconnect 1/4 inch inlet line (80) from expansion valve.
f. Loosen jamb nut on valve (81) and unscrew valve.

CAUTION

While loosening jamb nut on valve use back-up wrench on evaporator boss.

g. Remove O-ring and jamb nut. Discard O-ring.

Installation of Expansion Valve. (See figure 13-28B.)

The installation procedures are the same for the LH or RH evaporator expansion valve except for the valve being located in a different place on the evaporator.

a. Install jamb nut and new O-ring (NAS-1595-8) on the valve outlet fitting.
b. Screw valve assembly into coil inlet fitting until O-ring touches the inlet fitting.
c. Position valve to mate with inlet line and screw on inlet line fitting until finger tight.
d. Tighten jamb nut while using back-up wrench on evaporator boss.

CAUTION

Do not use wrench on valve outlet fitting.

e. Tighten fitting on 1/4 inch inlet line (80).
f. Clean motor housing and module housing mating surfaces and apply small bead of silicone rubber (RTV102).
g. Install motor housing assembly to module housing and align mounting holes.
h. Install mounting screws and lock nuts and tighten at random.
i. Connect motor electrical wiring and checkout motor operation at both speeds. Listen for excessive noise or rubbing.
j. Install evaporator in accordance with the Installation of Evaporator Procedures.

Removal of Evaporators. (See figure 13-28B.)

The removal procedures given pertain to the LH evaporator unit; however, the procedures are the same for the RH evaporator. Where there is a specific difference, reference will be made to the individual evaporator unit.

a. Remove seats and carpet.
b. Remove aft baggage compartment cover.
c. Discharge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
d. Remove expansion valve temperature sense bulb clamps and remove bulb.
e. Disconnect lines from evaporator.
f. Tag and disconnect electrical wiring.
g. Remove bolts securing evaporator.
h. Disconnect drain tube from bottom of evaporator unit.
i. Remove air duct from evaporator.
j. Remove evaporator from aircraft.

Installation of Evaporators. (See figure 13-28B.)

The installation procedures given pertain to the LH evaporator unit; however, the procedures are the same for the RH evaporator unit. Where there is a specific difference, reference will be made to the individual evaporator unit.

a. Place evaporator in mounting position.
b. Connect air duct with clamp.
c. Connect drain tube to bottom of evaporator unit.
d. Secure evaporator with bolts.
e. Connect electrical wiring.
f. Connect lines to evaporator.
g. Fasten expansion valve temperature sense bulb (75) to the bottom run of line at the approximate 5 to 7 o'clock position and as close to the evaporator as possible. Insulate temperature sense bulbs and lines by wrapping with P-2 foam tape.
h. Evacuate and charge the refrigerant system. Refer to Air Conditioning Systems Service/Parts Manual.
i. Perform operational check of system.
j. Install baggage shelf.
k. Install carpets and seats.

Removal and Installation of Evaporator Condensate Drain. (See figure 13-28B.)

a. (See figure 1-3.) Remove floorboards necessary to gain access.
b. Remove hose connections from evaporator condensate tank (73).
c. Loosen screws attaching condensate drain to front spar and remove condensate drain from bottom of aircraft.
d. Install condensate drain by reversing the removal procedures.

NOTE

After condensate drain has been installed in place, use Sealant CES2602, Class III, Type II to reseal drain hose in bottom of fuselage.

Removal of Air Conditioning Plumbing. (See figure 13-28B.)

a. Remove all RH passenger seats, pilot and copilot seats, RH side of cabin carpeting.

b. (See figure 1-3.) Remove all necessary access covers in RH floorboard area, RH engine cowling, RH nacelle air conditioning access cover and lower flaps to gain access to plumbing in the wing.
c. Discharge system. Refer to Air Conditioning System Service/Parts Manual.
d. Cut safety wire and open drain valve (8) and drain hydraulic fluid from reservoir.

NOTE

Step d. applies only if hydraulic fluid plumbing of the air conditioning system is disturbed.

e. Refer to figure 13-28B for removal of air conditioning plumbing.

NOTE

All lines and openings shall be capped.

Installation of Air Conditioning Plumbing. (See figure 13-28B.)

a. Installation of the air conditioning plumbing is the reverse of the removal procedures.
b. Install lock-o-seals (63 and 64) on pressure side of fuselage if lines (65 and 70) have been removed.
c. If hydraulic fluid plumbing to air conditioning system has been disturbed, close drain valve (8) and safety wire and fill reservoir.
d. Evacuate and charge the refrigerant system. Refer to Air Conditioning System Service/Parts Manual.
e. Check for leaks with leak detector H-10 or equivalent.
f. Perform an operational check of the air conditioning system.

34

Dual Pitot and Static System. (See figure 13-36.)

On aircraft 340-0001 and On, an optional pitot system is provided for the copilot's airspeed indicator. It is independent of the pilot's airspeed indicator but uses a common static air source.

On aircraft 340-0501 and On, an optional static air source is provided for the copilot's flight instruments. It is identical to but independent of the pilot's flight instruments static system.

For maintenance and servicing of the dual pitot and static systems, refer to procedures for removal, installation, testing and purging of the standard systems, Section 12.

FIRE EXTINGUISHER. (See figure 13-38.)

The fire extinguisher mounted on the copilot's seat contains a pressurized Dry Chemical Charge. The fire extinguisher may be used on combustible, liquid, or electrical fires. The dry charge is non-toxic and non-corrosive. Residue left after use may be wiped off with a damp cloth or picked up with a vacuum source. The fire extinguisher may be recharged by most Fire Equipment Dealers.

ENGINE COMPARTMENT FIRE EXTINGUISHER.

The engine compartment fire extinguisher consists of three major components, control panel, thermal detectors, and the extinguishing unit. The control panel may be mounted in any unused standard three-inch instrument hole, the three thermal detectors are mounted in the high heat areas of the engine nacelle and the fire extinguisher is mounted in the nacelle area. One main discharge hose is routed from the fire extinguisher into the forward section of the engine where freon gas is expelled. A smaller discharge hose which routes off of the large discharge hose expells freon gas from the center of the nacelle area towards the inboard side of the nacelle.

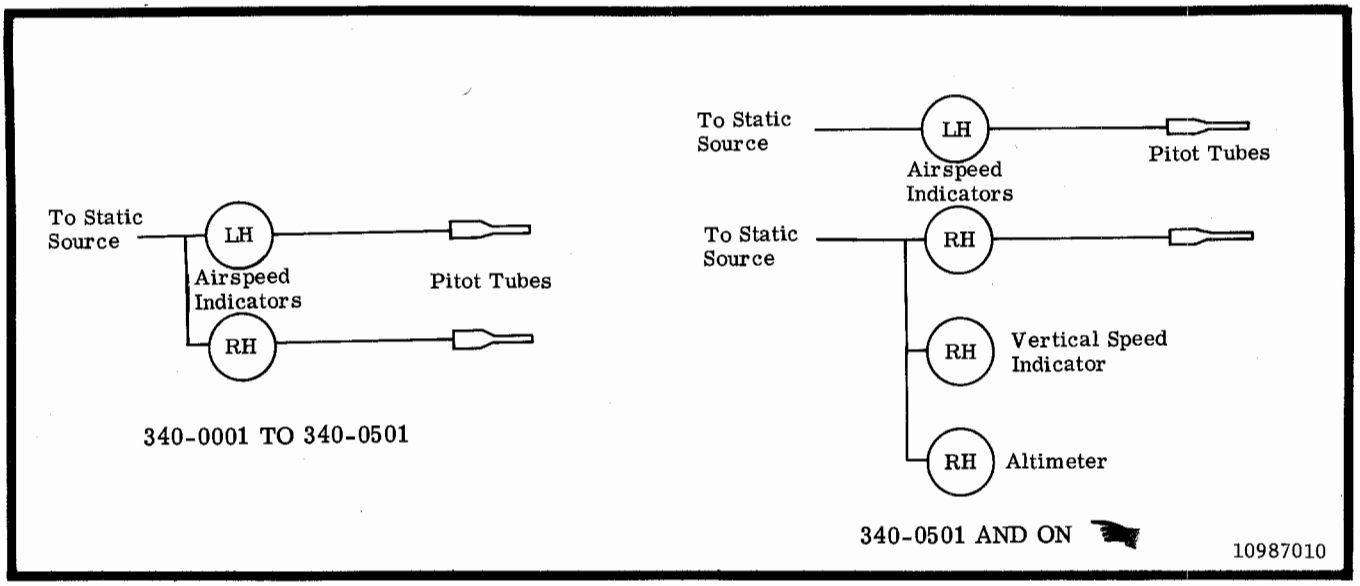
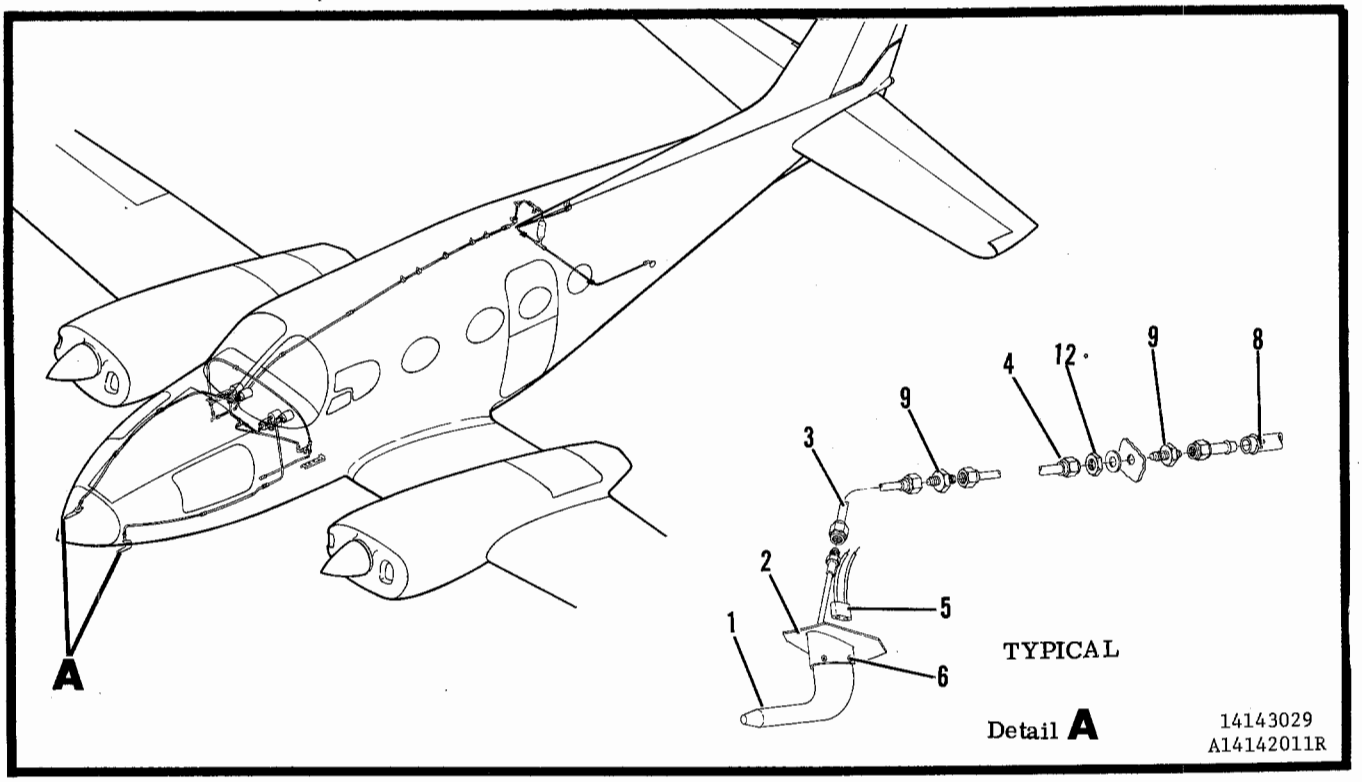



Figure 13-36. Dual Pitot System Schematic




1. Pitot Tube
2. Pitot Tube Bracket
3. Pitot Line
4. Pitot Pressure Line
5. Receptacle
6. Screw
7. Support Tube
8. Clamp
9. Nipple
10. Coupling
11. Insert
12. Nut

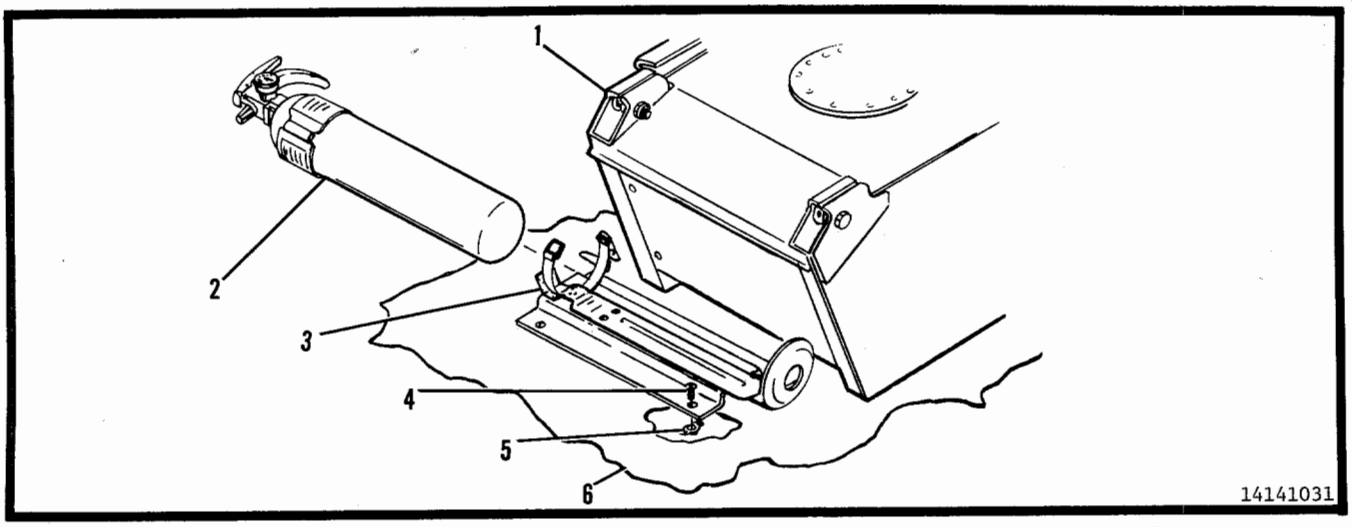
Figure 13-37. Dual Pitot Tube Installation

Troubleshooting Engine Fire Extinguisher.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| POWER ON TO INDICATOR PANEL TEST SWITCH DEPRESSED ALL LIGHTS FAIL TO ILLUMINATE | Open circuit breaker. | Close circuit breaker. |
| | Open circuit between pin A and B of connector at panel. (Pin A is ground. ) | Repair wiring. |
| | Voltage present between Pin A and B at panel connector. Faulty panel. | Replace panel. |
| GREEN LIGHT(S) ILLUMINATED LIGHT(S) FAIL TO LIGHT | Defective light bulb(s). | Replace bulb(s). |
| | (Bulb(s) good. ) Disconnect wire from bottom stud of cartridge. Ground wire, light(s) illuminate. Defective cartridge. | Replace cartridge. |
| | (Light(s) fail to illuminate. ) Open circuit between bottom stud wire of cartridge and panel connector. | Repair wiring. |
| | (Circuit exists between bottom wire of cartridge and connector. ) Faulty panel. | Replace panel. |
| RED (FIRE) LIGHT(S) FAIL TO ILLUMINATE | Defective light bulb(s). | Replace bulb(s). |
| | (Bulb(s) good. ) Defective panel. | Replace panel. |
| AMBER LIGHT (E) LIGHT(S) FAIL TO LIGHT | Defective light bulb(s). | Replace bulb(s). |
| | (Bulb(s) good. ) Defective panel. | Replace panel. |
| POWER ON TO INDICATOR PANEL TEST SWITCH NOT DEPRESSED. RED (FIRE) LIGHT(S) LIGHTED | Shorted detectors or shorts in detector wiring. (Check for shorts in detector wiring between pin C or D of harness connector and ground. ) | Replace shorted detector or correct shorted wiring. |
| | (No short in wiring or detector. ) Indicator panel defective. | Replace detector. |
| GREEN LIGHTS OUT LIGHT(S) LIGHTED | (Depress test switch. ) If light(s) stay on, indicator panel defective. Also, check affected cartridge for bridge-wire resistance. | Replace indicator panel. |
| AMBER (E) LIGHT(S) FLICKERING | Empty container. | Replace container. |

Troubleshooting Engine Fire Extinguisher (Cont.)

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| AMBER (E) LIGHT(S) FLICKERING (CONT.) | If container is full, unscrew cartridge, scratch some anodize off cartridge thread and reinstall. Torque 90 to 100 inch-pounds. If light is still intermittent, ground sensor wire to aircraft. Light goes out. | Replace container. |
| | If light does not go out. Probable open circuit between sensor wire and connector pin H or G. | Repair wiring. |
| | If circuit exists between sensor wire and connector pin H or G. Faulty panel. | Replace indicator panel. |
| AMBER (E) LIGHT)S) ON | Empty container. | Replace container. |
| | If container is full, unscrew cartridge, scratch some anodize of cartridge thread and reinstall. Torque 90 to 100 inch-pounds. If light is still on ground sensor wire to aircraft. Light goes out. | Replace container. |
| | If light does not go out. Probable open circuit between sensor wire and connector pin H or G. | Repair wiring. |
| | If circuit exists between sensor wire and connector pin H or G. Faulty panel. | Replace indicator panel. |




1. Seat Support
2. Fire Extinguisher
3. Bracket
4. Screw
5. Nut
6. Floorboard

Figure 13-38. Fire Extinguisher Installation

Removal of Fire Extinguisher. (See figure 13-39.)

a. Remove engine cowling.
b. Make sure battery switch is OFF.
c. Disconnect electrical wires from extinguisher.

WARNING

Install a grounding wire between ground terminal and squib terminal before attempting to remove a charged extinguisher unit or cartridge.

d. Disconnect discharge hose (20).
e. Remove clamps (8) securing extinguisher unit to mounting clips.
f. Remove extinguisher from nacelle.

Installation of Fire Extinguisher. (See figure 13-39.)

a. Position fire extinguisher in place and connect hose (20).

WARNING

Do not remove grounding wire from extinguisher unit or cartridge until installed in aircraft.

b. Clamp fire extinguisher in place with clamps (8).
c. Connect electrical wires.

WARNING

Before connecting electrical connectors to cartridges, check connectors with multimeter to ensure no voltage is present at connector.

d. Continuity check detector circuitry in accordance with Servicing Fire Extinguisher.
e. Turn on electrical power and check system for proper operation at the control panel. Press the test switch.
f. Install engine cowling.

Removal and Installation of Fire Extinguisher Thermal Detectors. (See figure 13-39.)

a. Make sure battery switch is OFF.
b. Remove engine cowling.
c. Loosen and remove bolts, washers and nuts attaching thermal detector (6) to bracket or clamp.
d. Disconnect electrical wire from detector.
e. Remove detector from nacelle.
f. The installation procedures for the fire extinguisher thermal detectors are the reversal of the removal procedures.
g. Continuity check detector circuitry in accordance with Servicing Fire Extinguisher.

Removal and Installation of Annunciator Panel. (See figure 13-39.)

a. The removal and installation procedures for the annunciator panel is the same as any Typical Instrument Removal and Installation Procedures found in Section 12.

NOTE

When removing annunciator panel or installing annunciator panel light bulbs, always make sure the battery switch is in the OFF position.

Servicing Fire Extinguisher.

The following item should be checked at every 100 hour inspection. Check the pressure gage on each bottle to ensure the pressures indicated in the Pressure-Temperature Correction Table. If these pressures are not indicated, the bottle must be serviced.

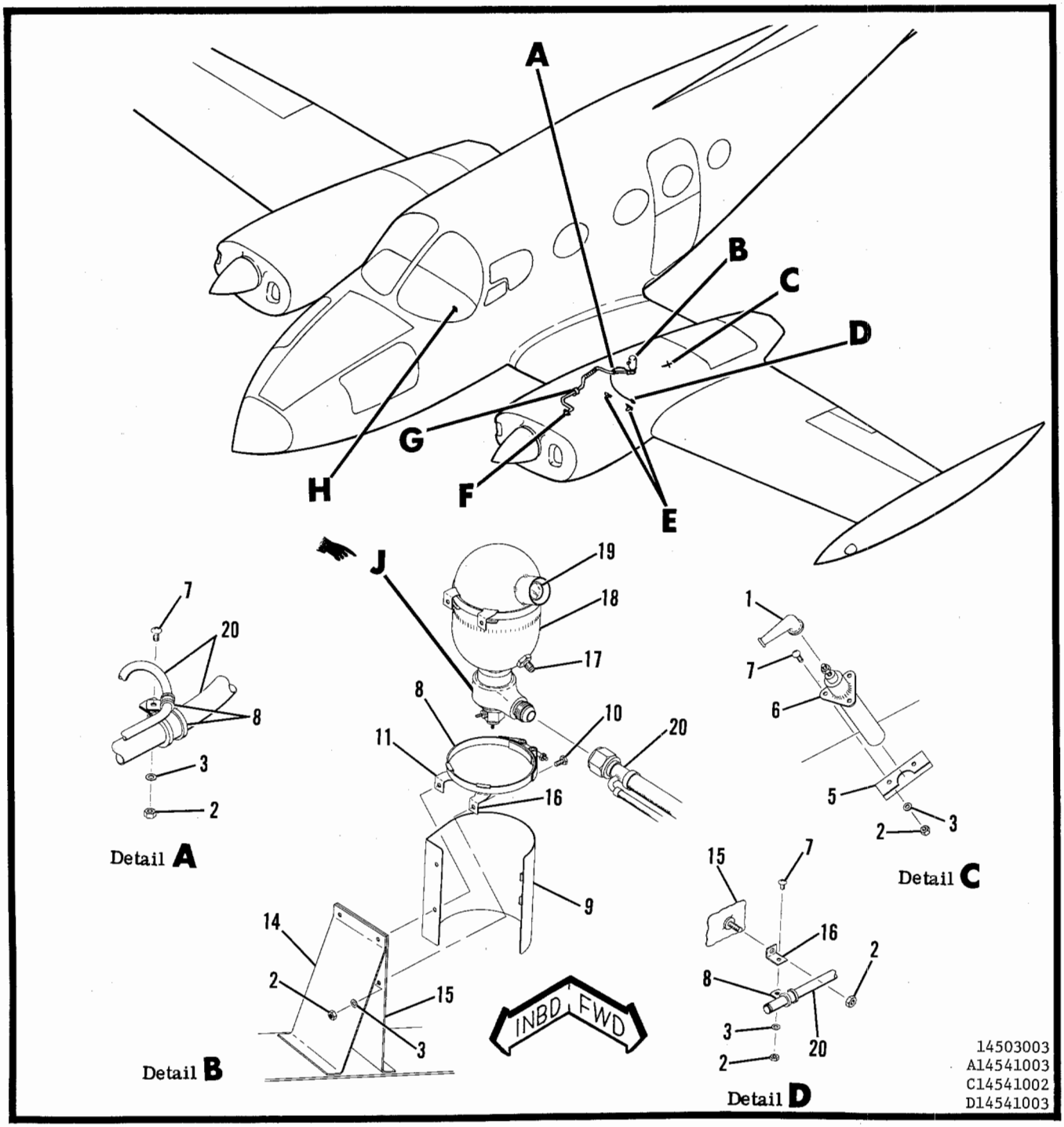
PRESSURE-TEMPERATURE CORRECTION TABLE

| | | | | | |
|---|---|---|---|---|---|
| F° Temp | -60 | -40 | -20 | 0 | +20 |
| Ind | 110 | 127 | 148 | 174 | 207 |
| Pressure | 134 | 155 | 180 | 212 | 251 |
| F° Temp | +40 | +60 | +80 | +100 | +120 |
| Ind | 249 | 304 | 367 | 442 | 532 |
| Pressure | 299 | 354 | 417 | 492 | 582 |

Every six months, remove containers and weigh. (The scale used must be a 5 to 10 pound scale with an accuracy of ±.1% full scale.) Weight of .25 pound below marked weight indicates a leaky container. After bottle has been replaced check the following:

a. Check the test function; if any light fails, replace bulb. If green light (OK) does not light after replacing bulb, replace firing cartridge *P/N 13083-5 in fire extinguisher. Any other light failure, after replacing bulbs and firing cartridge, indicates malfunction in the unit or associated wiring circuit.

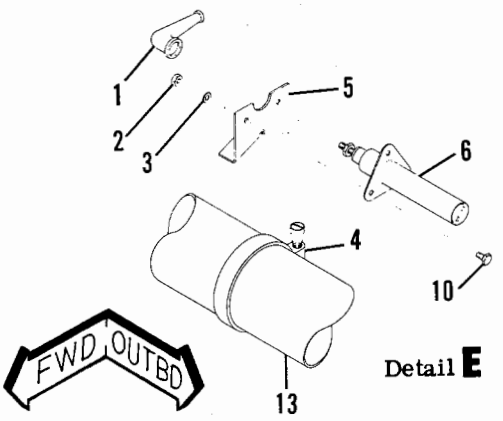
*P/N of HTL Industries, 1900 Walker Avenue, Monrovia, California, 91016.



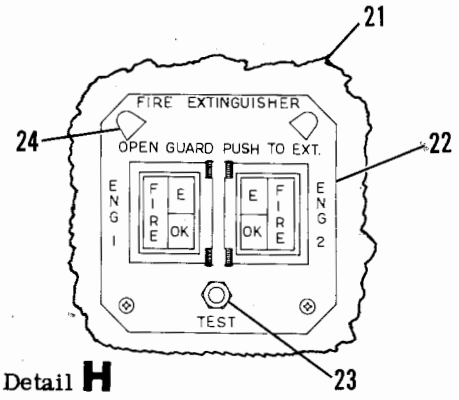

1. Rubber Sleeve
2. Nut
3. Washer
4. Clamp
5. Bracket
6. Thermal Detector
7. Screw
8. Clamp
9. Heat Shield
10. Bolt
11. Upper Mounting Clip
12. Washer
13. Intake Manifold
14. Support Bracket
15. Mounting Plate
16. Lower Mounting Clip
17. Pressure Relief Valve
18. Fire Extinguisher Cylinder
19. Pressure Gage
20. Discharge Hose
21. Instrument Panel
22. Control Panel
23. Test Switch
24. Post Light
25. Squib Terminal
26. Ground Terminal
27. Discharge Sensor Lead

Figure 13-39. Engine Compartment Fire Extinguisher Installation (Sheet 1 of 2)

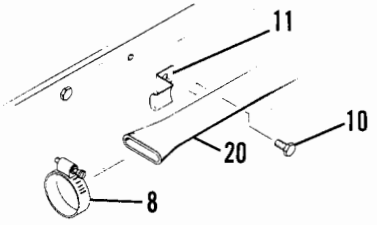
| Legend | Color | Cause of Illumination |
|---|---|---|
| Fire | Red | Fire condition existing in engine compartment |
| E | Amber | Fire extinguisher container empty |
| OK | Green | Fire cartridge and associated wiring is in operational condition |



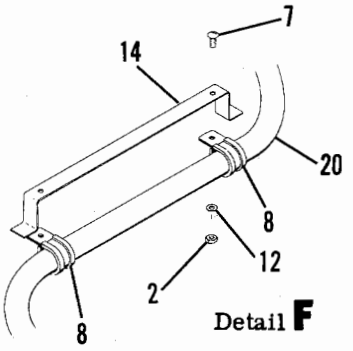

Detail **E**



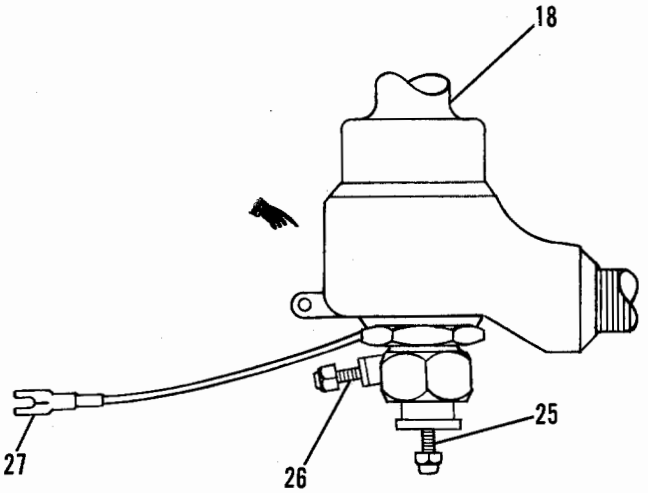

Detail **H**




Detail **G**




Detail **F**




Detail **J**

E14541005
F14541004
G14541004
H14141021
J14541008

Figure 13-39. Engine Compartment Fire Extinguisher Installation (Sheet 2)

NOTE

The test switch does not check the detector circuit.

b. Conduct a continuity check of detector circuitry as follows:

1. Apply power to the aircraft.
2. Disconnect sensor wire from fire extinguisher bottle. The EMPTY light should come on.
3. With sensor wire disconnected, press the Press-To-Test switch on the control panel. The OK light should come on indicating the squib is in operational condition.
4. Reconnect sensor wire to bottle.

WARNING

Do not attempt to check the continuity of the sensor and/or the squib with a V.O.M. tester. Most V.O.M. testers have enough AMP capability to fire the cartridge. Continuity of the circuit shall be checked only when using a 100 MA current regulated source.

c. Conduct fire detect thermo detector check as follows:

1. Apply power to the aircraft.
2. Using an Alpha Heat gun, apply heat to each thermo detector body for approximately ten seconds and observe that fire light on panel comes on.

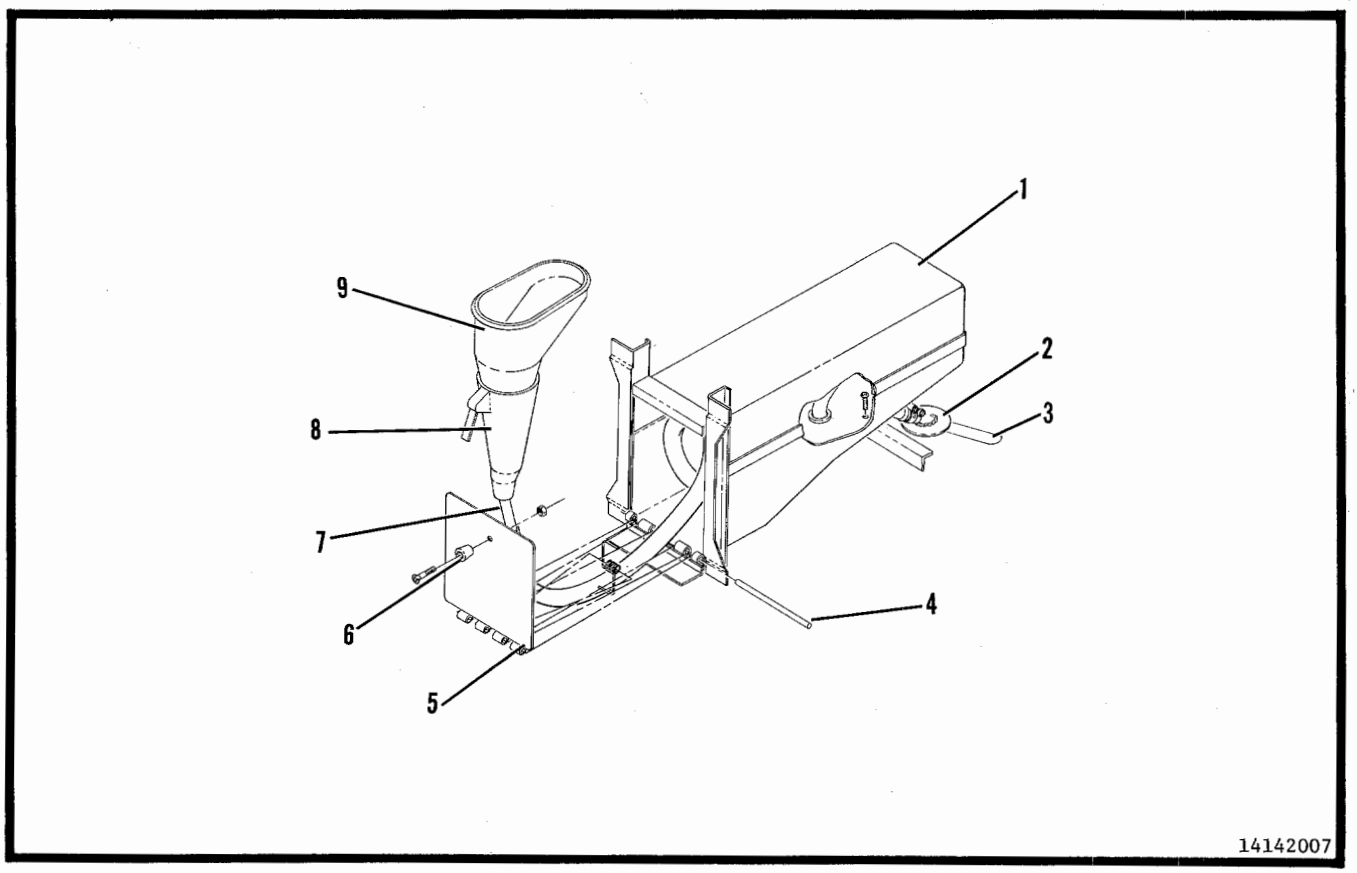
NOTE

Heat gun must have a capacity of 500° F or higher.

3. If light does not come on, remove thermo detector and check further in a temperature oven. Switch should actuate at 450° F.

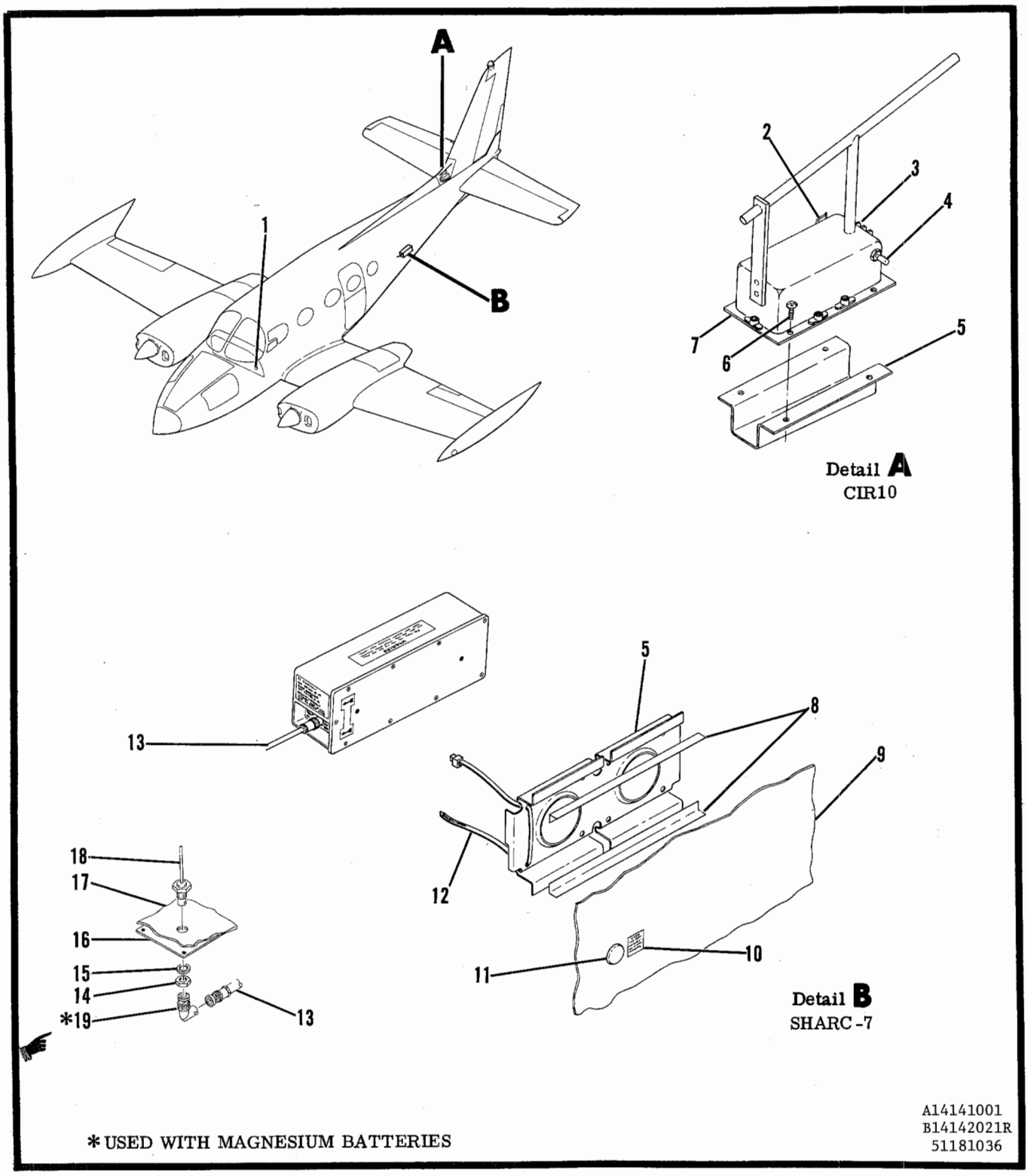
RELIEF TUBE. (See figure 13-40.)

The relief tube is enclosed in a compartment on the forward side of the baggage compartment shelf on the centerline of the aircraft. This tube and the female adapter should be cleaned on each post flight with a hospital disenfectant.




1. Baggage Shelf
2. Seal
3. Overboard Drain
4. Hinge Pin
5. Compartment Door
6. Knob
7. Hose
8. Relief Tube
9. Female Adapter

Figure 13-40. Relief Tube Installation




*USED WITH MAGNESIUM BATTERIES

1. Panel Switch
2. Power Switch
3. Terminal Block
4. Function Switch
5. Mount
6. Screw
7. Battery Access
8. Angle
9. Fuselage Skin
10. Placard
11. Plug
12. Sta-Strap
13. Antenna Lead
14. Nut
15. Lockwasher
16. Doubler
17. Upper Tailcone Skin
18. Antenna
19. Suppressor

Figure 13-41. Emergency Locator Transmitter System

EMERGENCY LOCATOR TRANSMITTER SYSTEM.

Description. The Emergency Locator Transmitter (ELT) is a self-contained, solid state unit, having its own power supply, with an external mounted antenna. The transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The Emergency Locator Transmitter P/N CIR10 is located in the leading edge of the dorsal fin at approximately F.S. 356.10 and Water Line 122.50. The SHARC-7 Emergency Locator Transmitter is mounted in the tailcond on the side of the fuselage.

On P/N CIR10, transmitter power is supplied from the aircraft system through a switch on the panel or the battery-pack located inside the transmitter. The SHARC-7 transmitter is entirely portable, operating on power supplied by a battery-pack. The battery-pack service life is placarded on the batteries and also on the outside of the cover on the end of the transmitter.

The transmitters broadcast tone is audio modulated in a swept manner over the range of 1600 to 300 Hz and is a distinct, easily recognizable distress signal for reception by search and rescue personnel, and others monitoring the emergency frequencies.

The transmitter meets or exceeds the requirements of the following specifications:

(1) R.S.S. 147 Issue 2, D.O.C.
(2) TSO C612, F.A.A.
(3) F.C.C. Part 87, F.C.C.
(4) TSO C91, F.A.A.

Under favorable conditions, a distress signal from the ELT can be intercepted at a distance of 100 miles. It exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet.

When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power, for a continuous period of at least 48 hours at temperatures from +55°C to -20°C after an emergency landing.

The military monitors 243.0 MHz. The 121.5 MHz frequency is monitored by the general aviation aircraft as well as C.A.P., D.O.T., F.A.A. and some commercial aircraft.

Operation. A three-position switch on the forward end of the unit controls operation. Placing the switch in the ON position will energize the unit to start transmitting emergency signals. In the OFF position, the unit is inoperative. Placing the switch in the ARM position will set the unit to start transmitting emergency signals only after the unit has received a 5g (tolerances are +2G and -0g) impact force. On Emergency Locator Transmitter P/N CIR10, a remote on-off switch is provided on the instrument panel in addition to the switch located on the front of the transmitter. Power is supplied from the aircraft battery or the self contained power pack located inside the transmitter.

NOTE

Do not leave the emergency locator transmitter in the ON position longer than 10 seconds or you may activate downed aircraft procedures by C.A.P., D.O.T. or F.A.A. personnel.

For additional details of operation and ELT hints, refer to the Cessna ELT (Emergency Locator Transmitter) Owner's Manual.

Removal of Emergency Locator Transmitter. (See Figure 13-41.)

The following Steps "a" through "d" pertain to Emergency Locator Transmitter P/N CIR10.

a. See figure 1-3 and remove access cover (6).
b. Assure aircraft electrical power is turned off and the on-off switch on the front of the transmitter is in the off position.
c. Disconnect electrical leads from transmitter.
d. Remove screws securing transmitter to mount and remove transmitter from dorsal fin.

Steps "e" through "g" pertain to the SHARC-7 Emergency Locator Transmitter.

e. Remove tailcone access door.
f. Disconnect coaxial cable from end of transmitter.
g. Cut Sta-Straps securing transmitter and remove transmitter from mounting bracket.

Installation of Emergency Locator Transmitter. (See Figure 13-41.)

The following Steps "a" through "c" pertain to Emergency Locator Transmitter P/N CIR10.

a. Position transmitter in mount and install four mounting screws.

NOTE

Before installting the Emergency Locator Transmitter to the mount, check condition of battery-pack and make sure function switch is in the ARM position and the power switch is in the OFF position.

b. Connect electrical leads.
c. Install access cover.

Steps "d" through "h" pertain to the SHARC-7 Emergency Locator Transmitter.

d. Assure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

e. Install transmitter in bracket and secure with new Sta-Straps.
f. Connect coaxial cable to antenna.
g. Position on-off switch to ARM position and install access covers.
h. Check operation of Emergency Locator Transmitter in accordance with your Owner's Manual.

Removal and Installation of the SHARC-7 Emergency Locator Transmitter Antenna.

a. Disconnect coaxial cable from base of antenna.
b. Remove nut and lockwasher attaching the antenna base to the fuselage and the antenna will be free to remove.
c. Install antenna by reversing the removal procedures.

Removal and Replacement of Battery-Pack.

a. Remove Emergency Locator Transmitter in accordance with removal procedures.
b. Remove screws attaching the cover to the case and remove cover. Remove rubber gasket to gain access to battery-pack.
c. When the battery-pack is supplied with a plastic connector attached to the battery leads, merely disconnect the old battery-pack and replace with a new battery-pack, making sure the plastic connectors are completely mated.

CAUTION

Some early transmitters were delivered with transmitter leads soldered directly to the battery-pack. Failure to observe proper polarity in connecting a new battery-pack in the transmitter may result in immediate failure of transistorized components attached to the printed circuit board in the transmitter.

NOTE

Before installing the new battery-pack, check to ensure that its voltage is 10.8 volts or greater.

NOTE

After relatively short periods of inactivation, the magnesium cell develops a coating over its anode which drastically reduces self-discharge and thereby gives the cell an extremely long storage life. This coating will exhibit a high resistance to the flow of electric current when the battery is first switched on. After a short while (less than 15 seconds), the battery current will completely dissolve this coating and enable the battery to operate normally. If this coating is present when your ELT is activated, there may be a few seconds delay before the transmitter reaches full power.

d. Replace the transmitter cover by positioning the rubber gasket on the cover and pressing the cover and case together and attach with screws. Care should be taken to avoid trapping the gasket and overtightening screws.
e. Remove the old battery placard from the end of transmitter and replace with new battery placard supplied with the new battery-pack.

CAUTION

Be sure to enter the new battery-pack expiration date in the aircraft records.

If the emergency locator transmitter is equipped with magnesium battery-pack, insure the static noise suppressor is installed between the antenna and transmitter - refer to Service Letter AV74-16.

f. Check operation in accordance with Section 2.
g. Refer to Section 2 and Inspection Chart, figure 2-7, for inspection interval.

TROUBLESHOOTING. Should your Emergency Locator Transmitter fail the Periodic or 100 Hours performance checks, it is possible to a limited degree, to isolate the fault to a particular area of the equipment.

CAUTION

In order to protect your warranty, troubleshooting should be conducted without removing the unit cover.

In performing the following troubleshooting procedure to test peak effective radiated power, you will be able to determine if battery replacement is necessary or if your unit should be returned to your dealer for repair.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 10 seconds. This could initiate downed aircraft search procedures by C. A. P., D. O. T. or F. A. A. personnel.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| *POWER LOW SHARC-7 | Low battery voltage. | 1. Set toggle switch to OFF.<br>2. Remove plastic plug from the remote jack and by means of a Switchcraft #750 jackplug, connect a Simpson 260 model voltmeter and measure voltage. If the voltage is 10-volts or less, the battery is below specification. |
| | Faulty transmitter. | 3. If the battery voltage is 10.8-volts or more, it is O.K. If the battery is O.K., check the transmitter as follows:<br>a. Remove the voltmeter.<br>b. By means of a Switchcraft #750 jackplug and 3-inch long maximum leads, connect a Simpson Model 1223 ammeter to the jack.<br>c. Set the toggle switch to ON and observe the ammeter current drain. If it is in the range 0-50 MA, the transmitter or the coaxial cable is faulty. |
| | Faulty coaxial antenna cable. | 4. Check coaxial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced. |
| *This test should be carried out with the coaxial cable provided with your unit. | | |
| POWER LOW CIR10 | Low battery voltage. | 1. Pull cabin lights circuit breaker.<br>2. Remove access cover to transmitter.<br>3. Remove transmitter from mount.<br>4. Remove battery access cover<br>5. Measure voltage at battery contacts.<br><br>NOTE<br><br>Transmitter should be turned on when measuring battery voltage.<br><br>6. If the battery voltage is 10 volts or less, the battery pack should be replaced. |
| | Faulty transmitter | If the battery voltage is greater than 10 volts, insert a 0-150 MA in series with power leads and check as follows:<br><br>1. Set power switch on transmitter to ON and observe current drain.<br>2. If the current drain is 0-50 MA, the transmitter or antenna is faulty and should be bench tested. |

ALCOHOL WINDSHIELD ANTI-ICE SYSTEM.

The alcohol windshield anti-ice system consists of a three gallon capacity tank which provides approximately one hour anti-icing capability, an electrically operated pump actuated by a switch breaker located on the LH console, and orificed tubes to disperse the anti-ice fluid over the windshield. A restrictor orifice is provided in the dispersal system to meter the alcohol for maximum efficiency. The system is serviced with isopropyl alcohol.

Removal of Alcohol Windshield Anti-Ice System. (See figure 13-42.)

a. Remove aft nacelle baggage compartment upholstery panel.
b. Disconnect line (7) at elbow (12) and using a suitable tube attached to the line, pump remaining fluid from tank (3).
c. Disconnect line (7) from tank and remove line (8).
d. Disconnect electrical wire from pump (4) at splice.
e. Remove pump (4) from tank by removing bolts (5).
f. Remove screws (1) securing tank (3) to structure.
g. Lift forward end of tank until vent tube clears bottom skin and carefully slide tank forward until clear of structure, then lift tank from aircraft.
h. Extend flaps and remove RH wing gap fairings to gain access to lines.
i. Remove clamps and remove lines (9 and 19).
j. Remove RH forward side upholstery panel to gain access to line (18). Remove clamp and remove line.

NOTE

Hold union (17) with wrench when removing lines to prevent turning and subsequent breaking of seal at cabin skin.

k. Working through RH nose baggage door, remove line (20), restrictor tee (21) and tubes (22 and 23).

Installation of Alcohol Windshield Anti-Ice System. (See figure 13-42.)

a. Position tank in place and secure in place with screws (1).

NOTE

Make certain vent extends below lower skin 0.40" and scarfed side is forward.

b. Install pump (4) with two bolts (5) and washers.
c. Install lines (7 and 8).
d. Install lines (9 and 19) and clamp in place.

NOTE

Hold union (17) with wrench when installing lines to prevent turning and subsequent breaking of seal at cabin skin.

e. Install line (18) and clamp in place.
f. Install line (20) and restrictor tee (21).

NOTE

Restrictor tee must be installed with restrictor end upstream and arrow pointing downstream of flow.

g. Install tubes (22 and 23) and clamp in place.

NOTE

Make certain tubes (22 and 23) maintain a minimum gap of 0.10" between tubes and windshield retainer.

h. Install forward right cabin upholstery panel, wing gap fairings and access covers.
i. Install aft nacelle baggage compartment upholstery panel.

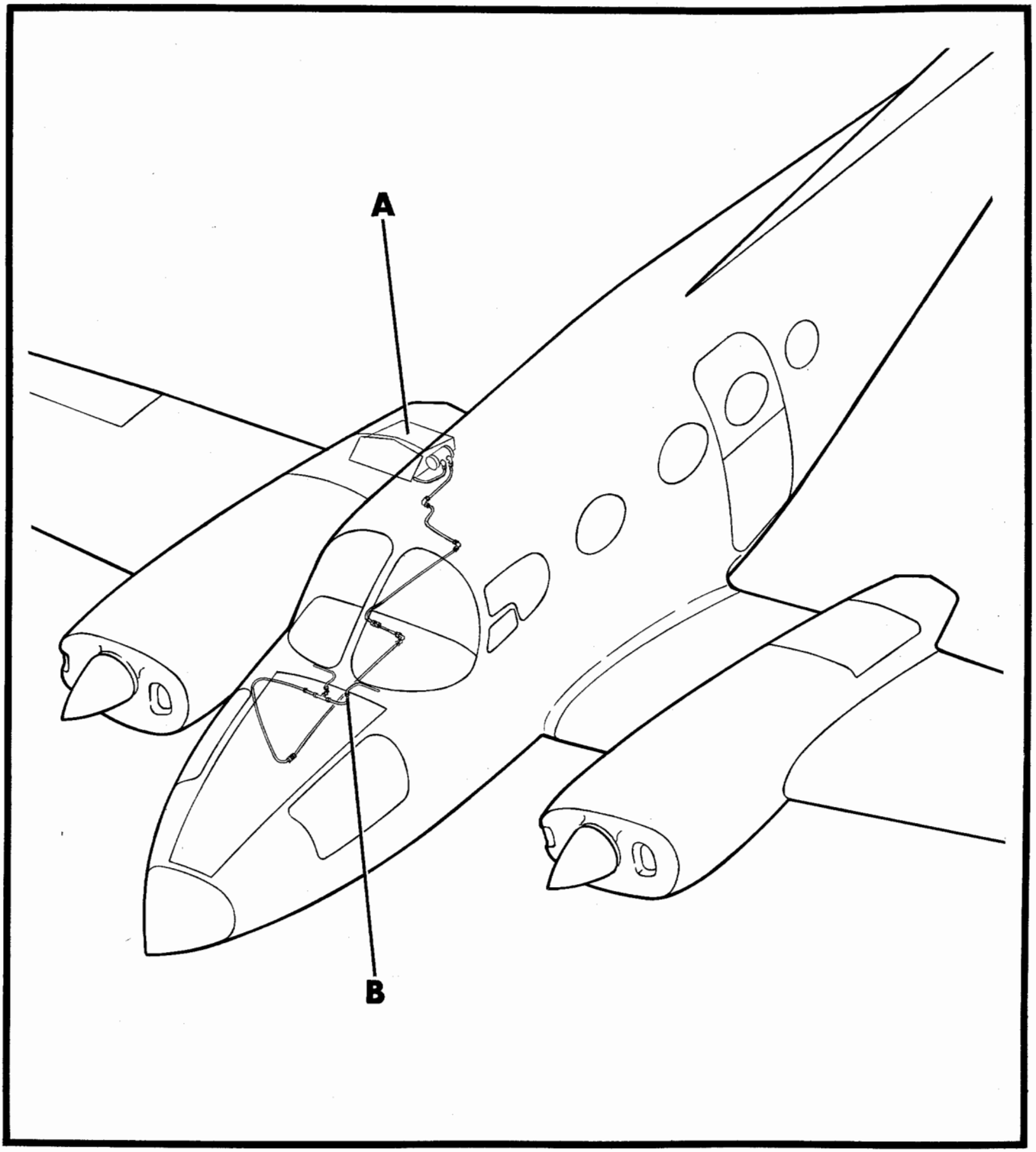
Operational Check of Windshield Anti-Ice System.

a. Fill reservoir with isopropyl alcohol (MIL-F-5566).
b. Turn master switch ON.
c. Switch windshield anti-ice switch ON.
d. Assure alcohol flows evenly from all five holes on each side. Nominal flow rate is approximately 20 minutes per gallon.

NOTE

The left hand spray pattern may be slightly greater than the right spray pattern. Spray should extend approximately 4 to 6 inches above nozzles during ground operation.

e. Turn windshield anti-ice switch OFF. Alcohol flow should cease.
f. If alcohol flow is irregular or fails to shut off properly, check pressure at pump. Pressure should be 4.00 to 4.75 PSIG.




1. Screw
2. Filler
3. Tank
4. Pump
5. Bolt
6. Elbow
7. Line (Pump to Elbow)
8. Line (Tank to Pump)
9. Line (Elbow to Elbow)
10. Nut
11. Washer
12. Elbow
13. Elbow
14. Line (Union to Union)
15. Cabin Skin
16. Lock-O-Seal
17. Union
18. Line (Union to Union)
19. Line (Union to Elbow)
20. Line (Union to Tee)
21. Restrictor Tee
22. Tube RH
23. Tube LH
24. Clamp

Figure 13-42. Alcohol Windshield Anti-Ice System (Sheet 1)

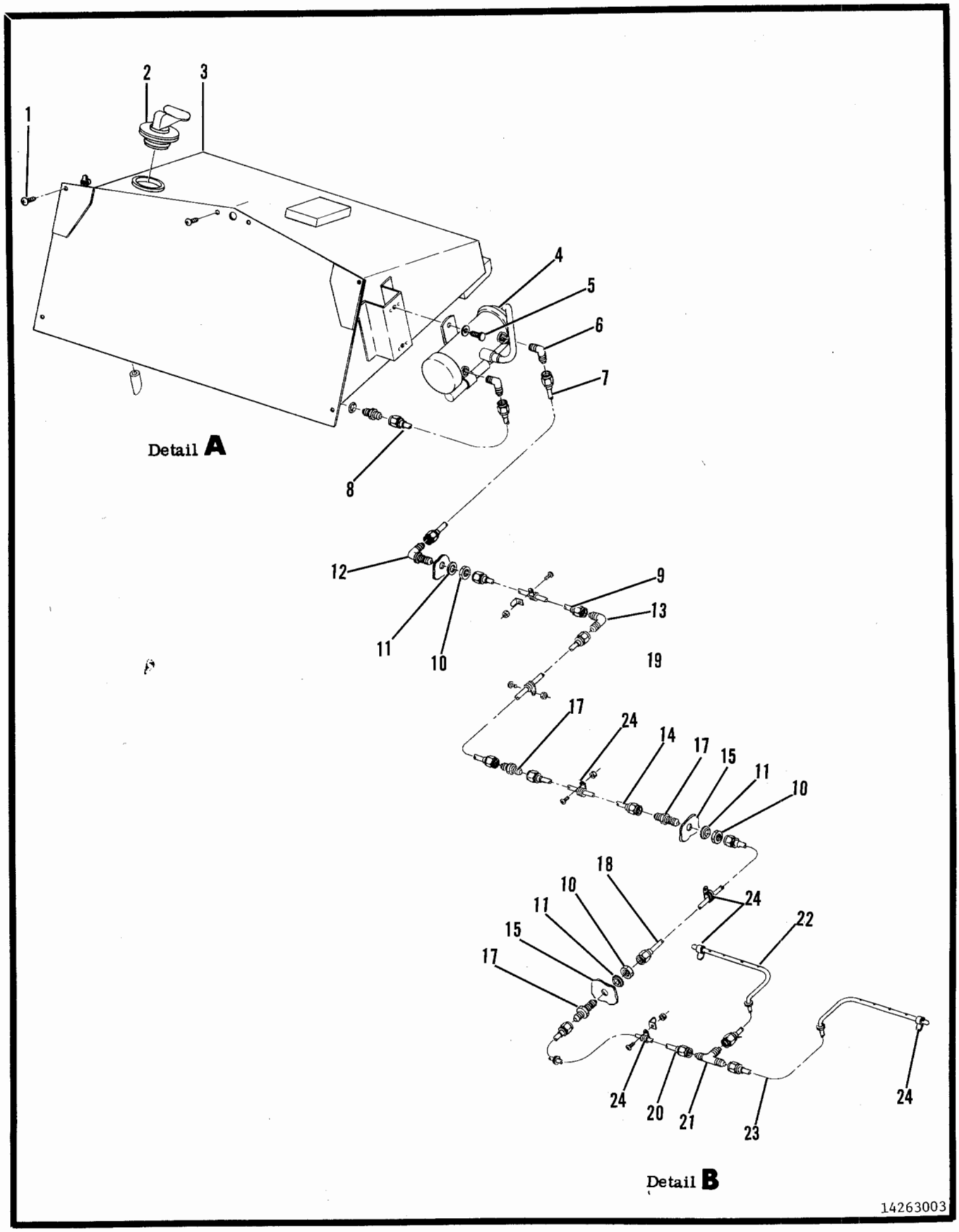
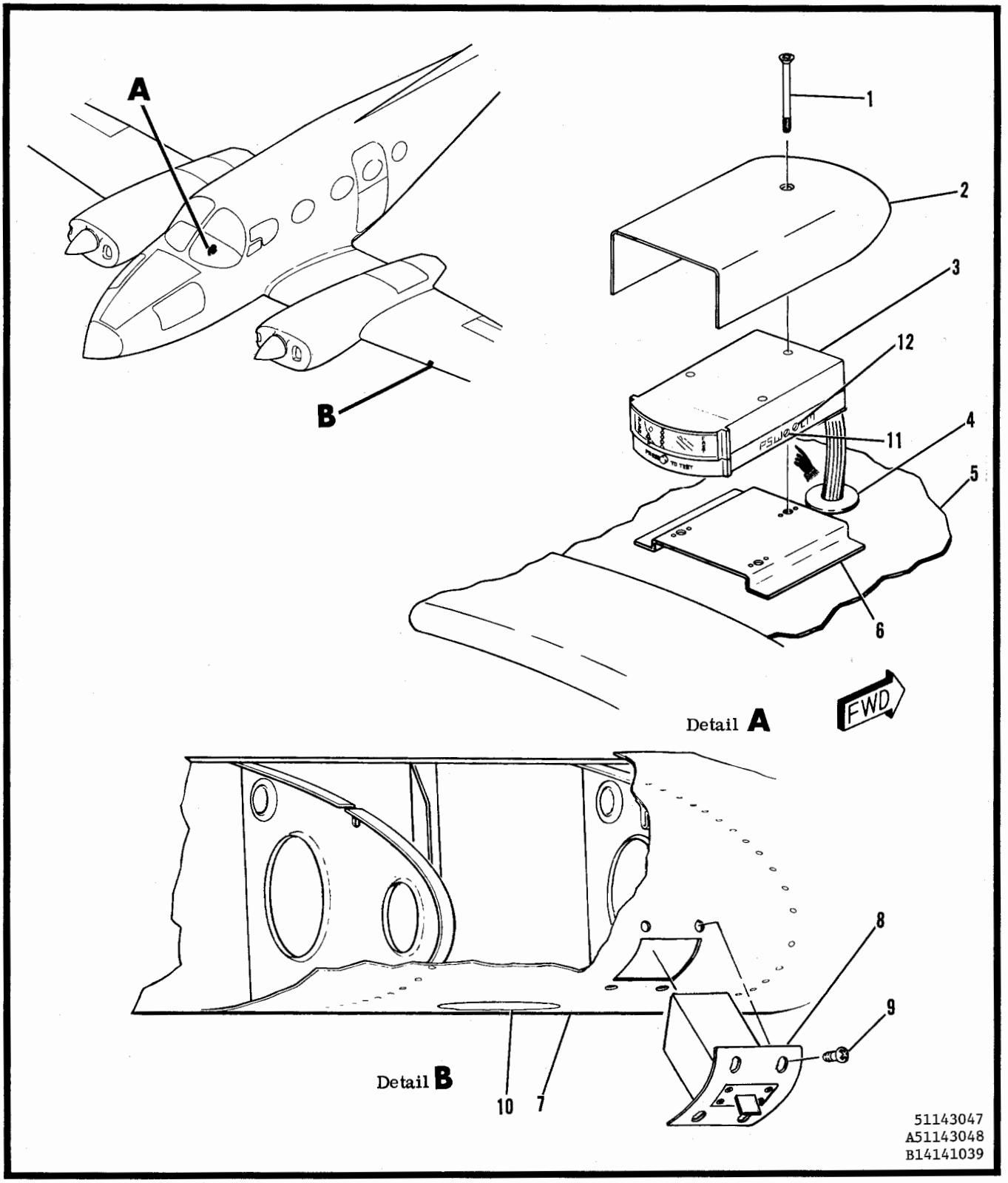



Figure 13-42. Alcohol Windshield Anti-Ice System (Sheet 2)




1. Screw
2. Cover
3. Indicator
4. Grommet
5. Deck Cover
6. Mounting Bracket
7. Wing Leading Edge
8. Transducer
9. Screw
10. Access Cover
11. PSW Screw
12. CM Screw

Figure 13-43. Angle of Attack System

ANGLE OF ATTACK SYSTEM. (340-0301 and On.)

The angle of attack system consists of an indicator incorporating a press to test circuit (for ground test or flight test of the system) and a transducer. The indicator is mounted forward of the glareshield and visually displays the angle of attack of the aircraft. The transducer is located on the leading edge of the left wing and transmits electrical signals to the indicator for angle of attack display. The transducer incorporates a heater element operated by the pitot heater switch, to prevent ice from hampering the transducer operation. The system also incorporates a stall warning circuit, when energized causes the stall warning horn to sound.

Removal of Angle of Attack Indicator. (See figure 13-43.)

a. Assure aircraft electrical power is off.
b. Disconnect electrical connector to indicator.
c. Remove screws securing indicator to mounting bracket.
d. Remove grommet from deck cover; remove indicator.

Installation of Angle of Attack Indicator. (See figure 13-43.)

a. Insert wire cable of indicator through hole in deck cover.
b. Install grommet in deck cover.
c. Position indicator on mounting bracket and secure with screws.
d. Reconnect electrical plug.

Removal of Angle of Attack Transducer. (See figure 13-43.)

NOTE

Before removal of transducer, it is important that the exact fore-aft location of the vane be marked on the wing so that the replacement unit may be adjusted identically.

a. Assure aircraft electrical power is off.
b. Remove access cover.
c. Disconnect electrical plug to transducer.
d. Remove screws securing transducer to leading edge and remove transducer.

Installation of Angle of Attack Transducer. (See figure 13-43.)

a. Insert wire cable of transducer through transducer mounting hole.
b. Secure transducer to leading edge with screws.
c. Reconnect transducer electrical plug.
d. Replace access cover.

Operational Check of Angle of Attack System.

a. Ground Check.
1. Move battery switch to ON position.
2. Push the "PRESS TO TEST" button on the indicator and check that the indicator needle moves to the left (SLOW) end of scale and the stall warning horn sounds with the needle in the red zone. The needle should return to the SLOW diamond when the button is released.
3. Turn the pitot heat switch ON and check to see that the transducer mounting plate on the left wing leading edge heats up.
4. Turn pitot heat OFF.

NOTE

The pitot heat switch should not be left on any longer than necessary to determine that mounting plate is heating.

5. Push the transducer vane gently aft (down). Check that the needle moves to the right (FAST) end of scale. When released, the vane should return to the approximate center of its travel and the needle should return to the SLOW diamond.
6. Push the transducer vane gently forward (up). The indicator needle should move to the left (SLOW) end of scale and the stall warning horn should sound. When released, the vane should return to the approximate center of travel, the needle to the slow diamond, and the stall warning horn should stop.

b. Ground Adjustment Check.
1. Before applying electrical power to the system, check the SLOW/FAST needle position. It should be at a position midway between the SLOW (left) diamond and the SLOW legend.
2. Turn on battery master switch. Check that the aircraft voltage is at least 24 volts.
3. Press the test button on the front of the indicator. The needle shall move to the left end of the scale and the pre-stall warning horn shall sound. Release the test button. The SLOW/FAST needle shall return to a position near the SLOW diamond and the pre-stall warning horn shall stop.
4. Remove cover, using a small screwdriver, turn the adjustment screw marked PSW (Pre-Stall Warning), located on the side of the indicator, clockwise until the pre-stall warning horn sounds. Then turn the PSW screw counterclockwise until the horn stops.
5. Push the vane on the lift transducer, located on the leading edge of the left wing forward (up). The pre-stall warning horn shall sound. Release the vane and the horn shall stop. If it does not stop within 3 to 4 seconds after the vane is released, turn the PSW adjustment screw counterclockwise one complete turn. Recheck by pushing the vane forward and releasing it to ensure that the horn will stop within 3 to 4 seconds after the vane is released. The system is now ready for flight check and adjustment.

c. Flight Check and Adjustment.

1. The flight check should be performed in smooth air at a safe altitude to perform stalls. Using the data recorded in the Flight Check portion of the Operational Check of Stall Warning System (Section 14), adjust the angle of attack system to provide an "on speed" indication when the indicated airspeed is within ±2 knots of the approach speed determined from the Approach and Stall Speed Chart, correct for weight at the time of the test for the following configurations:

(a) Landing gear down.
(b) Flaps full down.
(c) Power as required to maintain a stable rate of descent at 500 FPM.

2. With power off (IDLE), flaps down, gear down, trim the aircraft for a speed approximately 20 knots above the stall speed determined from the Approach and Stall Speed Chart. Then slowly reduce speed at no more than 1 knot per second, and observe the speed at which the pre-stall warning horn sounds. Continue to reduce speed at no more than 1 knot per second until the aircraft stalls, and observe the stall speed. The pre-stall warning horn shall sound 4 to 9 knots before stall. If it does not, proceed as in steps 3 and 4.

3. If the speed at which the horn sounded was greater than 9 knots before stall, turn the PSW (Pre-Stall Warning) adjustment screw on the side of the indicator counterclockwise approximately 1/2 turn for each knot the warning speed must be reduced. Then repeat step 2., until the warning horn sounds at 4 to 9 knots before stall speed. Do not allow the speed to decrease at greater than 1 knot per second during these checks.

4. If the speed at which the pre-stall warning sounded was less than 4 knots before stall, adjustment of the lift transducer location on the wing is required. Land and loosen the screws in the slotted holes in the corners of the lift transducer mounting plate, and slide the transducer forward (up) on the wing. Retighten screws and repeat step 2., and step 3., if necessary. Do not attempt to increase the warning horn speed by turning the PSW adjustment screw clockwise, as the maximum clockwise setting was determined in the ground adjustment check steps 4. and 5. Any further clockwise adjustment will cause the horn to sound when the aircraft is at rest on the ground.

5. After the pre-stall warning horn is properly adjusted, determine the weight of the aircraft. Using the Approach and Speed Chart, find the approach speed.

6. With flaps and gear down, trim the aircraft for level flight at speed determined in step 5. Altitude hold may be used to facilitate this adjustment, if available. Maintaining this speed, observe the position of the SLOW/FAST needle. It should be at the center mark. If the needle is to the left of the center mark, turn the adjustment screw marked CM (Center Mark), located on the side of the indicator, clockwise. If it is to the right of the center mark, turn the adjusting screw counterclockwise. Make the adjustment in steps of 2 to 3 turns in the appropriate direction, then recheck the needle position and the airspeed to ensure that the speed is being maintained at the proper value.

7. After completion of the flight check and alignment, replace the cover on the indicator and secure in place.

SECTION 14

# ELECTRICAL SYSTEMS

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POWER DISTRIBUTION.

Electrical energy for the aircraft is supplied by a 24 volt direct-current, single wire, negative ground electrical system. Storage batteries supply the power for starting and furnish a reserve source of electrical power for the electrical components in the event of an alternator failure. Two 24 volt, 50 ampere alternators supply the current needed to operate the electrical equipment and to charge the storage batteries. A battery voltage monitor light in the annunciator panel provides a warning when illuminated that the electrical system is operating on low voltage. The monitor assembly will illuminate the warning light with decreasing voltage between 24. 5 and 25. 5 volts and remain ON with voltage lower than turn on voltage. The warning light will turn OFF with increasing voltage between 24. 5 and 26. 0 and remain off with voltage higher than turn off voltage. The standard 50 amp alternator system has two regulators, one is used for regulation of the system, the second is used as a spare in the event of regulator failure. The system is protected against overvoltages by two circuit breaker type overvoltage devices. The alternator switches are mounted on the left stationary instrument panel. All other switches, are located on the left side panel. Electrical circuits in the aircraft are protected by circuit breakers, located in the circuit breaker panel on the left side panel. The 340 aircraft is equipped with standard navigation lights, upper ahd lower rotating beacon lights, landing light mounted in the tail cap of the left main fuel tank.
Interior lighting consists of overhead floodlights, passenger reading lights, map lights mounted in the control wheel, fuel selector lights, and the cabin door courtesy light. Instrument panel lighting consists of two post lights, mounted over each instrument, a compass light and radio call number light. Optional lights include high intensity strobe lights, wing deice lights, wing locker baggage lights, taxi light and the right landing light.

Battery and Starter Circuit.

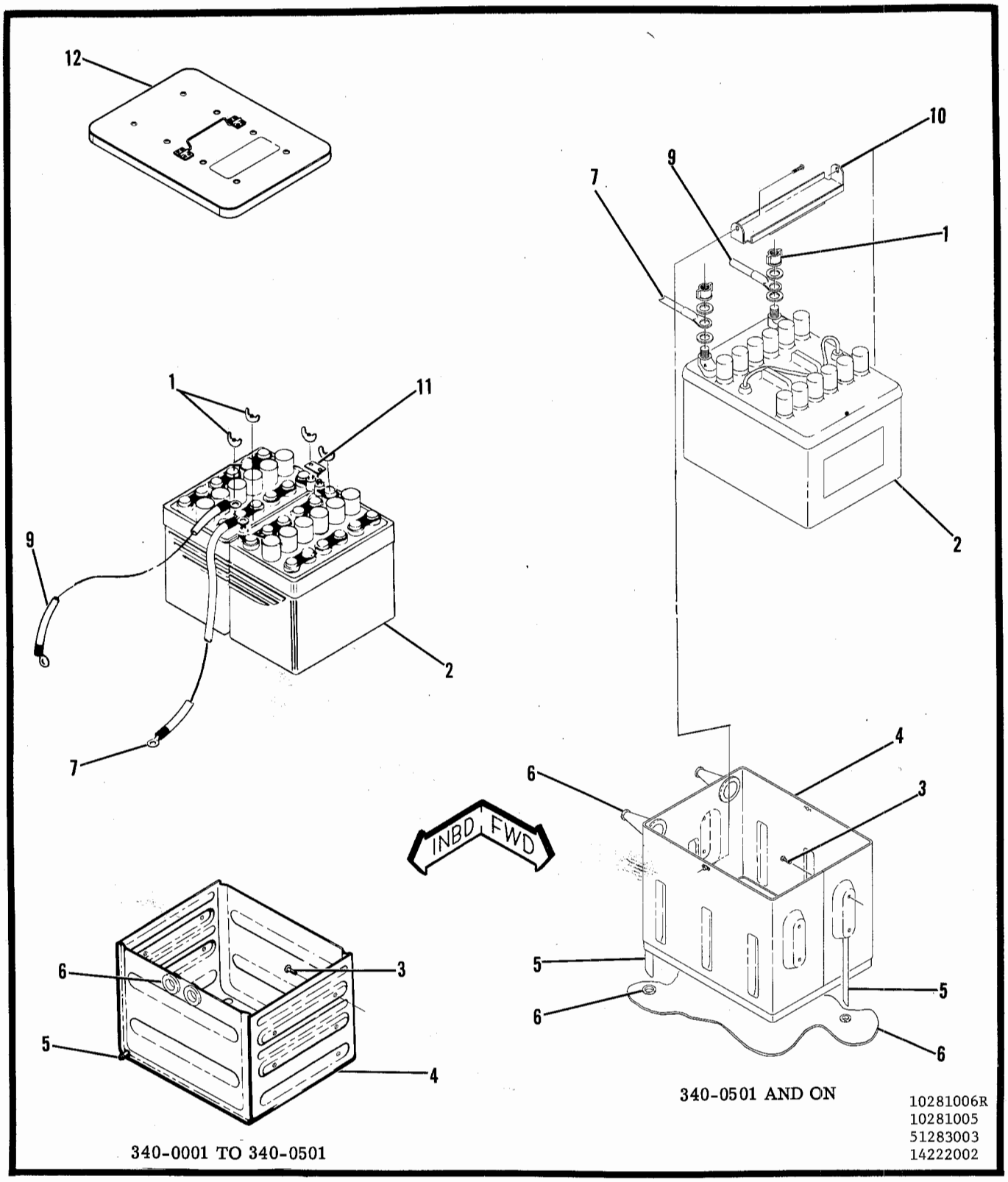
On aircraft 340-0001 to 340-0501, two 12 volt, 24 ampere hour batteries are installed in the left wing outboard of the engine nacelle. The batteries are connected in series and contained in a battery box equipped with an overboard vent to vent and drain the battery fluids. On aircraft 340-0501 and On, a single 24 volt battery is installed.

CAUTION

The use of an external power source is recommended for use during ground operation and maintenance.

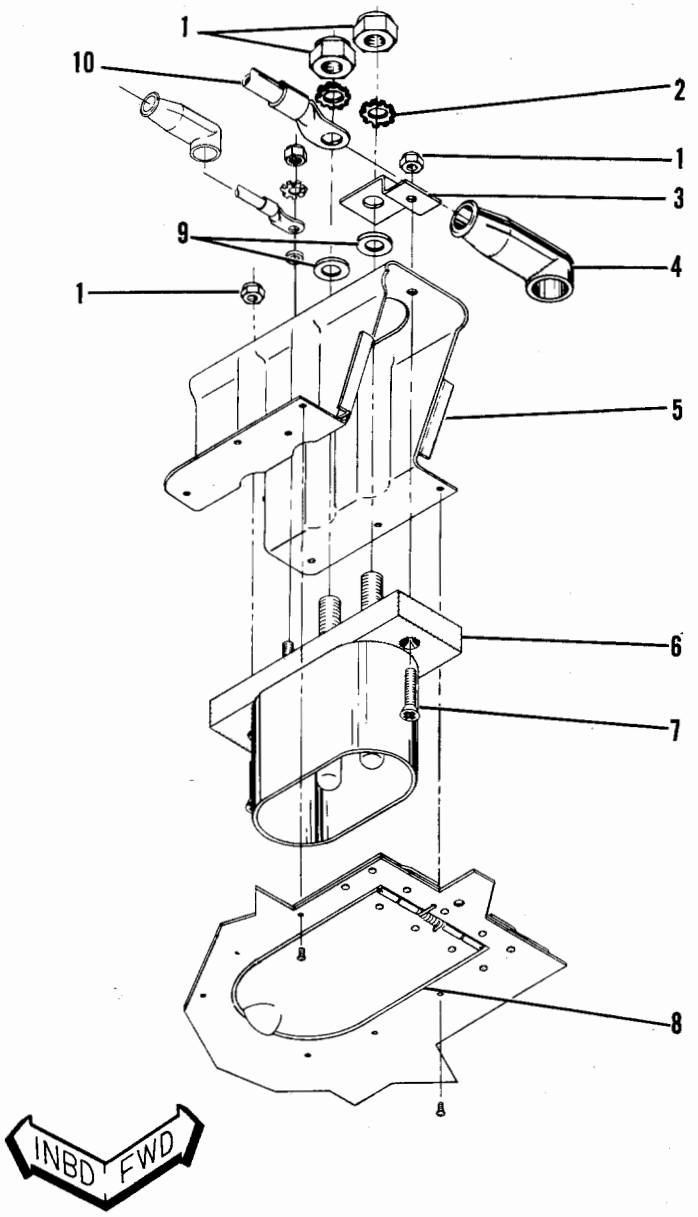
Troubleshooting the Battery and Starter Circuit.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| SLOW ENGINE CRANKING SPEED | Partially discharged batteries. | Charge or change batteries. |
| | Low capacity batteries. | Cycle batteries to improve capacity or replace them. |
| | Faulty cell in batteries. | Replace batteries. |
| | Loose or corroded terminals. | Clean and tighten terminals. |
| | Burned starter solenoid switch contacts. | Replace solenoid. |
| | Starter motor drags. | Overhaul starter motor. |
| STARTER ENGAGES BUT WILL NOT CRANK ENGINE | Partially discharged batteries. | Charge or change batteries. |
| | Faulty cells in batteries. | Replace battery or batteries. |
| | Damaged or shorted starter motor. | Overhaul starter motor. |
| | Faulty armature or field in starter motor. | Overhaul starter motor. |
| STARTER WILL NOT ENGAGE | Batteries fully discharged. | Replace or charge batteries. |
| | Disconnected battery cable. | Replace faulty cable. |
| | Shorted or open starter solenoid. | Replace solenoid. |

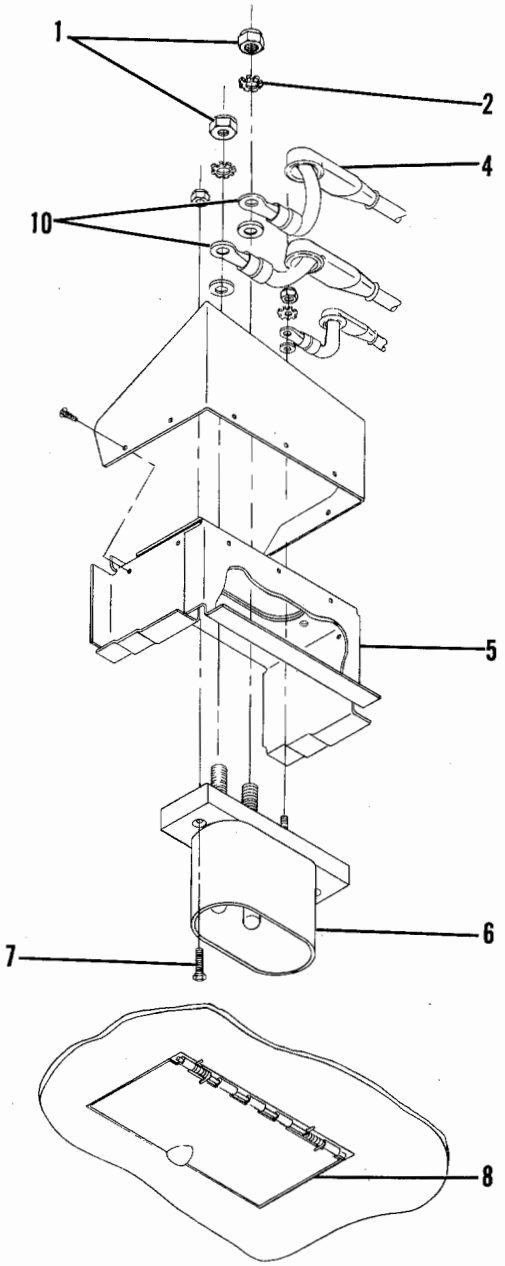



1. Wing Nut
2. Battery
3. Screw
4. Battery Box
5. Drain Outlets
6. Grommet
7. Power Cable
8. Deleted
9. Ground Cable
10. Tie Down Strap
11. Bar
12. Lid

Figure 14-1. Battery and Battery Box Installation




340-0001 TO 340-0501




340-0501 AND ON

NOTE:

POWER CABLE (10) CONNECTS THE EXTERNAL POWER RECEPTACLE TO THE BATTERY SOLENOID LOCATED IN THE LEFT ENGINE NACELLE OR LEFT WING.

14283002
14283003

1. Nut
2. Lockwasher
3. Ground Strap
4. Rubber Nipple
5. Bracket
6. Receptacle
7. Screw
8. Access Door
9. Washer
10. Power Cable

Figure 14-2. External Power Receptacle

Removal of Battery. (See figure 14-1.)

a. Release the fasteners securing the battery access cover and remove.

CAUTION

Always remove the ground cable first and install it last to prevent accidental short circuits.

b. Remove components as required in accordance with figure.

Installation of Battery. (See figure 14-1.)

a. Install and assemble components in accordance with figure. Make sure all connectors and components are secure.

NOTE

When attaching the battery cables to the battery, be sure cable grommets are properly placed over the edges of the battery box.

CAUTION

Make sure battery Master Switch is OFF. Use voltmeter to determine polarity. Reverse polarity will damage diodes in the alternators.

b. Replace the battery access cover and secure with fasteners.

Removal of Battery Box. (See figure 14-1.)

a. Remove battery in accordance with battery removal procedure.
b. Remove battery box in accordance with figure.

Installation of Battery Box. (See figure 14-1.)

a. Install and assemble battery box in accordance with figure.

CAUTION

Make sure battery box is properly vented overboard.

b. Install battery in accordance with installation procedures.

EXTERNAL POWER.

On aircraft 340-0001 to 340-0501, an optional external power receptacle is installed on the underside of the left wing outboard of the nacelle. On aircraft 340-0501 and On, the optional power receptacle is located on the underside aft end of the left wing locker. With an external power source connected to the external power receptacle, power is fed to the main bus when the battery switch is OFF. To conserve the battery, external power should be used for engine starting in cold temperatures and when testing electrical equipment on the ground. The pins on the external power receptacle should be lubricated periodically with petroleum jelly.

Removal of External Power Receptacle. (See figure 14-2.)

a. Remove receptacle in accordance with figure.

CAUTION

The battery switch must remain in the OFF position while the external power receptacle is being removed or installed. If there is any possibility of the switch being turned ON during this procedure, it is advisable to disconnect the ground cable from the battery.

Installation of External Power Receptacle. (See figure 14-2.)

a. Install and assemble components in accordance with figure.

ALTERNATORS AND REGULATORS.

The alternator is designed and constructed to give long periods of trouble-free service with a minimum amount of maintenance. The rotor is mounted on a ball bearing at the drive end, and each bearing has a grease reservoir. Only two brushes are required to carry through the two slip rings to the field coil which is mounted on the rotor. The brushes are extra long and under normal operating conditions will provide long periods of service.

The principal components of the alternator are the stator, the rotor, the slip ring end head, the drive end head and the rectifiers. The stator consists of a laminated iron core on which the three phase windings are wound in slots around the inside circumference. The stator contains a special lead which is connected to the center of the three phase windings and is used to activate low voltage warning systems. The manner in which the three windings are connected together makes the stator a "WYE" type. Leads are connected to each of the three points of the phase windings and each lead is connected to a pair of

diodes, one negative and one positive. The rotor consists of a single field coil encased between two four-poled, interleaved iron sections assembled on the shaft. The ends of the field coil are connected to a pair of slip rings which are insulated from each other and from the shaft. The slip ring end head supports the rectifier mounting plate and the negative rectifiers, a prelubricated bearing in which the rotor shaft rotates, the brush holders and brushes, the field and output terminals, and a ground screw or terminal. The drive end head supports a sealed, prelubricated ball bearing in which the drive end of the rotor shaft rotates. The negative rectifiers are pressed in the slip ring end head and the positive rectifiers are pressed into the heat sink (rectifier mounting plate) and are connected to the stator leads. The rectifiers are rated at 150 P. I. V. for transient voltage protection.

The principal components of the regulator are the transistors, the rectifier diode, the zener diode, and the resistors. The transistor is an electronic switch which can turn on and turn off the flow of current in an electric circuit. It has no mechanical or moving parts to wear out. The zener diode, in addition to passing current in the forward direction, will pass current in the reverse direction only when a particular value of voltage is applied in the reverse direction. It is this zener action which makes it adaptable for use as a voltage sensing device in the regulator. The resistors are used to limit the flow of current. The voltage at which the alternator operates is determined by the regulator adjustment.

On aircraft 340-0001 to 340-0151, there are two regulators installed on the aircraft; however, only one regulator is used, the second is a spare. In the event of a regulator failure, the regulator switch can be positioned to STANDBY. On aircraft 340-0151 and On, the regulator system incorporates two voltage regulators, one in the left and one in the right alternator system.

NOTE

On aircraft 340-0001 to 340-0151, any problem which seems to be in the voltage regulator or the overvoltage protector may be quickly isolated by simply switching the voltage regulator switch to STANDBY position. If the system then operates properly, the problem is with the main voltage regulator, overvoltage relay, fuses or other wiring. If the same problem still exists, the problem can then be assumed to be in some other portion of the system, probably in the alternators themselves.

Troubleshooting Alternators and Regulator System.

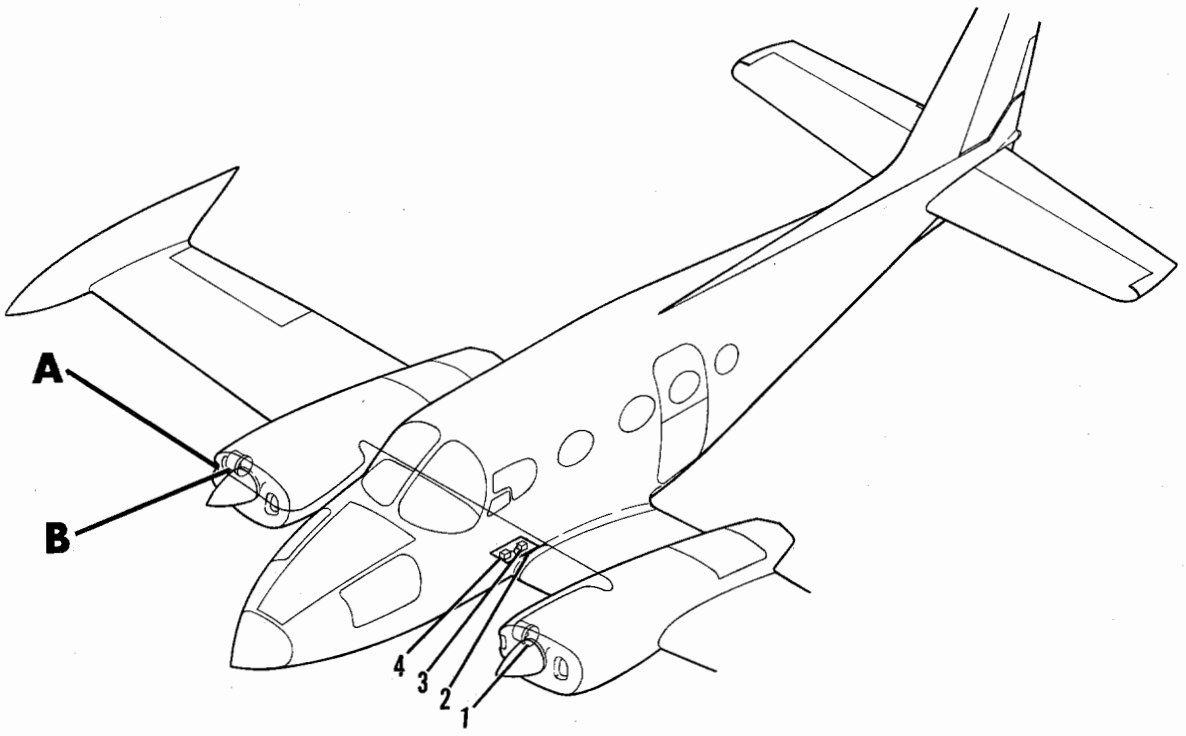
| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| BOTH ALTERNATORS FAIL TO OPERATE | Regulator power circuit breaker open. | Reset. |
| | Switch faulty. | Replace. |
| | Overvoltage protector tripped or faulty. | Reset or replace. |
| | Regulator faulty. | Replace. |
| | Alternator defective. | Replace or repair. |
| ALTERNATOR OUTPUT CONTINUOUSLY HIGH | Faulty wiring. | Correct as required. |
| | Regulator set too high. | Adjust to 27. 5 VDC. |
| | Regulator faulty. | Replace. |
| BATTERY CONSUMES WATER RAPIDLY | Faulty battery. | Replace. |
| | Regulator set too high. | Adjust to 27. 5 VDC. |
| BATTERY DOES NOT COME UP TO FULL CHARGE - ALTERNATORS OPERATING | Faulty battery. | Replace. |
| | Faulty wiring. | Correct as required. |
| | Regulator set too low. | Adjust to 27. 5 VDC. |

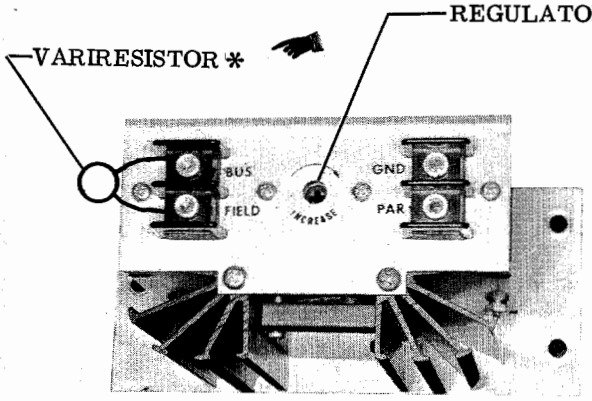
Troubleshooting Alternators and Regulator System (Continued).

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| AMMETER SHOWS HIGH DISCHARGE WHEN ALTERNATOR SWITCH AND BATTERY SWITCH TURNED ON (ENGINE NOT RUNNING) | Shorted diode inside alternator. | CAUTION<br>When checking diodes, stator or field, the alternator wiring must be disconnected at alternator terminals to prevent damage.<br>Disconnect negative battery terminal. Connect a #313 light bulb in series with a 24 volt battery. Connect test leads from battery and bulb to output terminal of alternator and alternator case. Reverse leads - light should light on one polarity only, if no diodes are shorted. If light should light on both directions of polarity - diodes are shorted and must be replaced. |
| REGULATOR POWER CIRCUIT BREAKER OPENS | Short in regulator or overvoltage protector. | Switch to standby regulator. Reset regulator power breaker. If breaker does not reopen, determine and replace faulty regulator or overvoltage protector. |
| | Faulty wiring (opens in standby regulator also). | Locate and repair. |
| ALTERNATOR FIELD FUSE OPENS | Wiring shorted. | Locate and repair. |
| | Alternator field shorted. | Check resistance with voltammeter between F1 and F2 terminals - resistance must be 10.7 to 11.60 ohms. Replace alternator. |
| OVERVOLTAGE PROTECTOR TRIPS | Regulator set too high. | Adjust to 27.5 VDC. |
| | Protector faulty. | Replace. |
| NO OUTPUT FROM ONE ALTERNATOR WITH BOTH ALTERNATOR SWITCHES ON | Alternator field fuse blown. | Replace. |
| | Alternator brushes worn. | Replace. |
| | Faulty wiring. | Repair. |
| | Faulty switch. | Replace. |
| ONE ALTERNATOR OUTPUT LOW | Faulty wiring. | Repair. |
| | Faulty alternator field. | Replace alternator. |
| | Shorted alternator diode. | Replace diode. |
| | Shorted stator. | Replace stator. |
| | Open diode. | Replace diode. |
| | Open stator | Replace stator. |

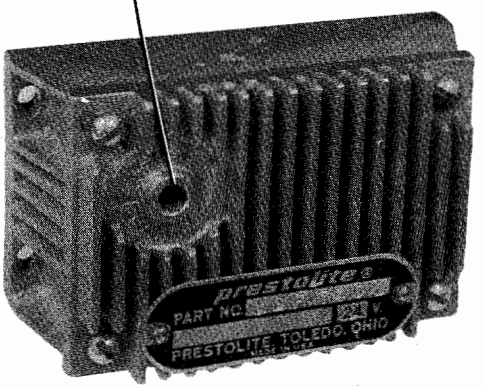
NOTE

Refer to Manufacturers Overhaul Parts Manual for replacement of alternator components.




340-0151 AND ON




340-0001 TO 340-0151

* USED WITH 9910126 REGULATOR ONLY

1. Left Alternator
2. Side Panel
3. Main Regulator
4. Spare Regulator
5. Right Alternator
6. Lockwasher
7. Nut
8. Washer
9. Washer
10. Nut
11. Cotter Pin
12. Hub
13. Key
14. Alternator-Out Sensor
15. Diode
16. Capacitor
17. Ground Cable

Figure 14-3. Alternator and Regulator Installation (Sheet 1 of 2)

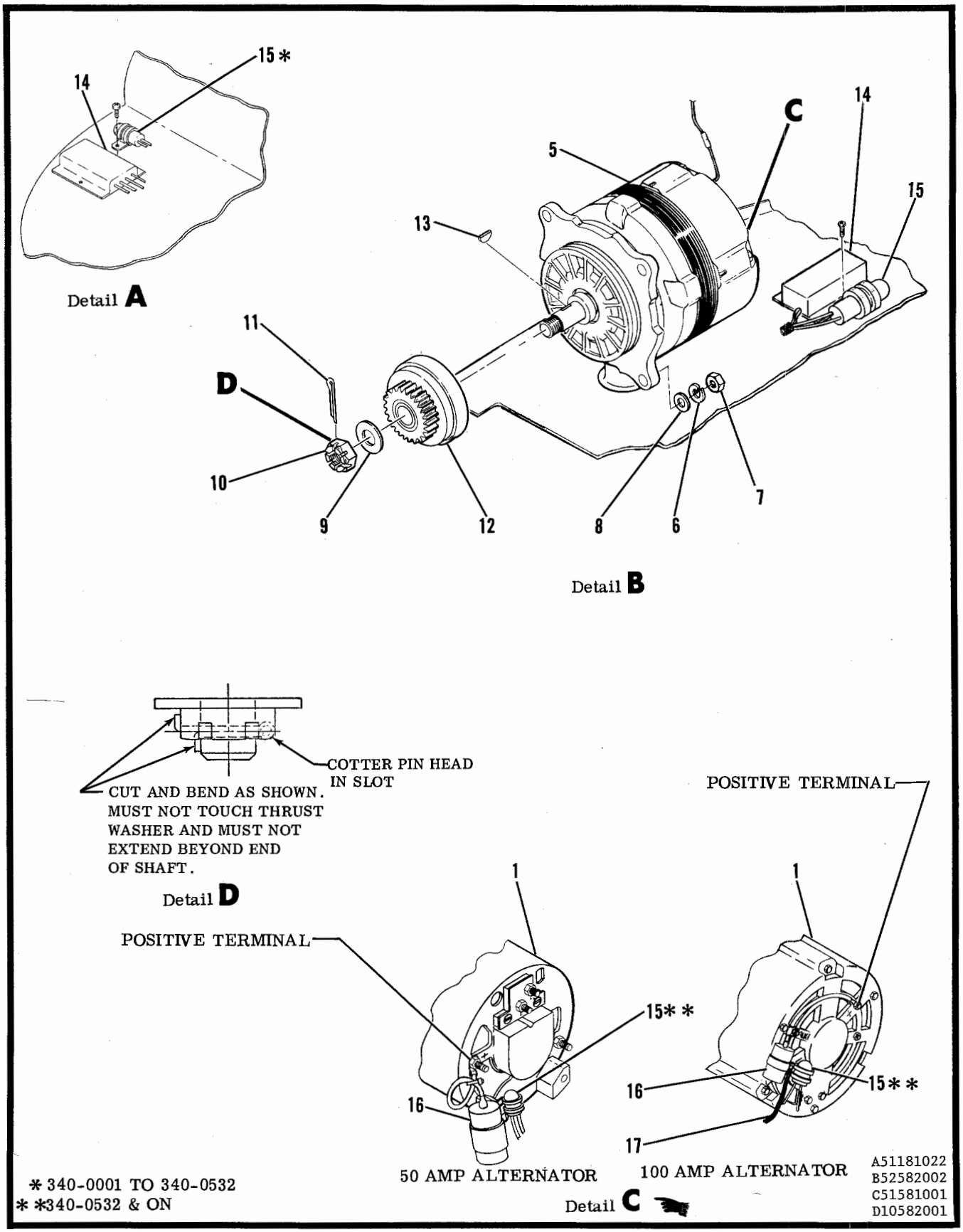



Figure 14-3. Alternator and Regulator Installation (Sheet 2)

Removal of Alternators. (See figure 14-3.)

The removal procedures pertain to the 50 and 100 Amp alternators.

a. Remove the upper cowling.
b. Remove the nose cap cowling.
c. Disconnect and tag wires from alternator and stow out of the area.
d. Remove nuts, lockwashers and washers securing alternator to the engine.
e. Carefully work the alternator from the engine pad.

CAUTION

Use care when removing alternator to prevent damage to splines on the alternator.

Alternator Hub Replacement. (See figure 14-3.)

a. Remove alternator hub as follows:
1. Remove cotter pin (11); then using special wrench, P/N 5090005-1, to hold shaft from turning, remove nut (10) and thrust washer (9).
2. Pull alternator drive gear hub (12) from alternator shaft using care not to damage hub assembly.
b. Install alternator hub as follows:
1. Apply clean engine oil to shaft of alternator and install key (13).
2. Slide alternator drive gear hub (12) onto shaft and onto key (13).
3. Install thrust washer (9) on alternator shaft with bearing material (copper color) side toward the hub.
4. Install nut (10), then using a special wrench P/N 5090005-1 to hold shaft from turning, torque nut to 450-500 inch-pounds.

NOTE

Ensure wrench 5090005-1 is aligned and seated in notch of alternator drive gear hub flange so that no damage will occur when torque is applied to nut.

5. Install cotter pin as shown in Detail B.

Installation of Alternator. (See figure 14-3.)

The installation of the alternators is the same for both engines and either 50 Amp or 100 Amp alternator.

a. Cover alternator drive opening to prevent spray from reaching internal components.
b. Degrease both mounting surfaces (crankcase pad and alternator flange) with No. 47 Locquic Primer, Grade "T."
c. Spray both surfaces with "Sprayon" No. 708 Teflon.
d. Spray both surfaces with No. 47 Locquic Primer, Grade "T."
e. Spread a thin film of No. 49 Loctite Instant Seal Plastic Gasket on the crankcase mounting pad. Keep away from stud threads and pilot hole inside diameter.
f. Position alternator on engine pad.

CAUTION

Before installing alternator, always make sure the nut on the drive shaft of the alternator is safetied with the cotter pin installed as shown in figure 14-3. If the nut is not safetied properly damage could result to the gears and alternator shaft.

g. Work alternator in position and install washers, lockwashers, and install the nuts securing alternators.
h. Torque nuts to 155 to 175 inch-pounds.
i. Connect electrical wiring.

CAUTION

Be sure alternator wiring is connected properly. Reverse polarity will destroy diodes in electrical system.

NOTE

When replacing 50 amp alternator with a 100 amp alternator, add ground wire from alternator to engine case bolt.

j. Install nose cap cowling.
k. Install upper cowl.

Operational Check of Alternator and Regulator.

a. With both engines operating at 1000 RPM and the battery and alternator switches on, check the following:
1. Select voltage position on voltmeter and assure bus voltage is 27.5 ±1.0 volts.
2. Select battery position on voltmeter and note battery is charging; charging amperage indication will vary as the battery builds up to normal charge.
3. Load electrical system with all external lights, fuel pumps, pitot heat, etc., and check the alternator output; it should be positive and equal within 10 amps when loaded up to 10 amps total load.

NOTE

If total load is below 15 amps, one alternator may show little or no output. If so, turn producing alternator OFF; the other alternator should then pick up the load. Also, when one alternator is not carrying any load, the corresponding light may come on or flicker on and off. This is normal.

Operational Check of Alternator Failure Circuit.

a. With both engines operating at idle RPM, place battery switch and alternator switches to OFF, and observe that failure lights are out.
b. Reduce electrical load to minimum to avoid discharging the battery.
c. Turn on battery switch and observe both alternator failure light illuminate full on.
d. Increase engine RPM to 1800 and ensure failure light remains ON.

NOTE

The reference voltage used for alternator out indication is approximately one half of whatever voltage the alternator is producing. When the alternator is turned OFF, it is capable of producing some voltage which will be a function of load and RPM of unit. At high RPM such as maximum power, the residual voltage at times can exceed the fail triggering level of the sensor, turning the failure lights OFF; this is acceptable.

e. With both alternators and battery switches ON and light electrical load of 15 amps, operate both engines at idle RPM and observe that lights remain off without any flickering. Increase RPM on both engines, together, to 1800 RPM and again observe lights for any flickering.

NOTE

It is important that both engine RPM be as close to each other as possible because at light loads, the alternator which is set at higher RPM will tend to take all of the load and the alternator running at lower RPM will be at a no load condition which will tend to give a false alternator out indication.

Operational Check of Alternator Warning System.

a. With both engines operating 1700 RPM and normal electrical load applied, push the press-to-test switch and hold in for at least 30 seconds, and ensure both alternator out lights are on.
b. Ensure that pushing the press-to-test switch does not trip the landing gear motor breaker.

Removal and Installation of Voltage Regulator. (See figure 14-3.)

The removal and installation of the voltage regulator is the same for either 50 Amp or 100 Amp system.

a. Remove voltage regulator cover by removing screws attaching cover.
b. Tag and disconnect electrical wiring.
c. Remove screws securing voltage regulator to shelving.
d. Remove regulator.
e. Install regulator by reversing the removal procedure.

NOTE

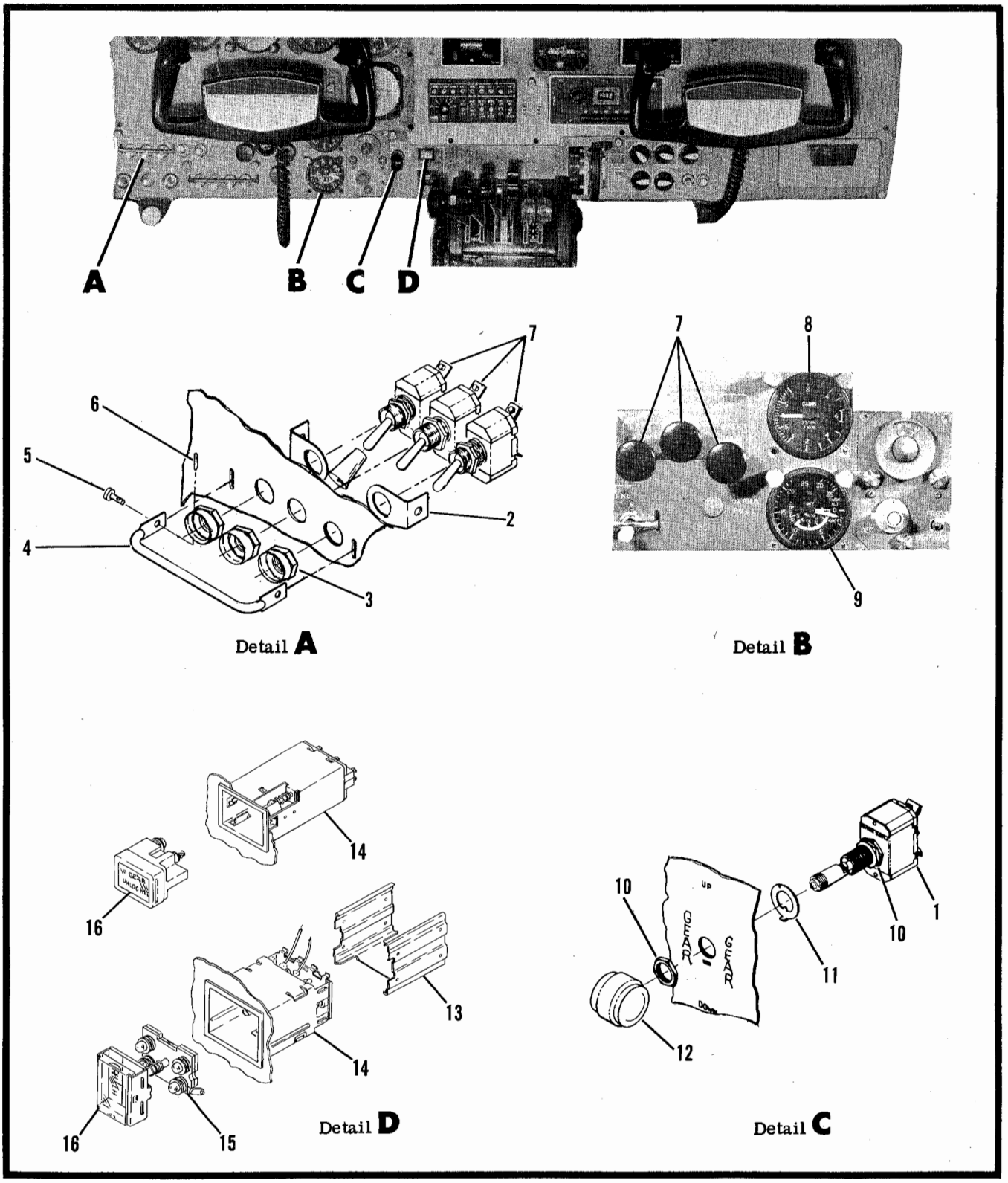
After voltage regulator has been mounted in position and wired, perform the Operational Check and Adjustment of Alternators and Regulators.

Operational Check and Adjustment of Alternators and Regulators. (340-0001 to 340-0151)

a. Remove wires from field terminals of each voltage regulator and check the resistance of alternator field; resistance should be approximately 15 ohms. Replace each wire after measuring resistance.
b. Remove wires from positive (+) terminals of left and right voltage regulator and measure voltage with battery and applicable alternator field switch on. Voltage should be battery voltage, approximately 24 volts DC. Each wire voltage should be interrupted by either opening battery switch or its own alternator field switch. Replace each wire after measuring voltage.
c. Start left engine per normal starting procedure. With left alternator switch ON, increase RPM slowly and monitor alternator output voltage. Adjust voltage if required to prevent voltage exceeding 29 volts DC. Operate engine at 1500 RPM. Allow system to warmup a minimum of 10 minutes with aircraft ammeter reading 30 to 50 Amps output, by loading the system with equipment when operation requires this amount of load. Adjust voltage regulator to 27.5 ±.25 volts DC. Record exact alternator output amperage. Shutdown engine.
d. Start right engine and repeat above procedure. Except after warmup, adjust regulator to obtain the same ammeter reading as recorded on left engine.
e. Operate both engines and warmup per above procedures. Check voltage setting for 27.5 volts on each alternator.

NOTE

To adjust voltage regulator, remove the plastic plug from the upper face of the regulator and insert a small flat blade screwdriver. Turn screw clockwise to increase and counterclockwise to decrease voltage. Replace plug after adjustment.




1. Switch
2. Bracket
3. Switch Guard
4. Switch Bar
5. Clevis Pin
6. Cotter Pin
7. Cabin Controls
8. Cabin Rate-of-Change
9. Differential Pressure Gage
10. Nut
11. Key Washer
12. Knob
13. Backshell
14. Locking Cam
15. Lamp Assembly
16. Lens Assembly

Figure 14-4. Stationary Instrument Panel Components

Operational Check and Adjustment of Alternators and Regulators. (340-0151 and On )

a. Install a 2% voltmeter connected to the aircraft power bus. (The power bus is considered to be between the alternator power circuit breakers and the individual circuit breakers for each system and not at the cigar lighter. )
b. Disconnect the paralleling wire (terminal marked "PAR") from either regulator and leave it disconnected thru step k.

NOTE

All adjustments are performed while operating only the LH engine. (RH engine shall not be running. )

c. With LH engine running at 1200 prop RPM, turn LH alternator field switch ON. (RH alternator switch must be OFF. ) Add 10 to 15 amp load to LH alternator. Run this load for at least 2 minutes.

NOTE

To adjust voltage regulator, remove the snap plug from the upper face of the regulator and insert allen wrench.

d. Adjust LH regulator adjustment to read 27. 5 volts on the voltmeter connected to the aircraft bus. Allow sufficient time for voltage to stabilize between adjustment.

NOTE

The aircraft voltameter shall not be used for voltage setting.

e. Replace the snap plug in the LH regulator adjustment access hole and do not make any further adjustments on the LH regulator.
f. While continuing to operate the LH engine and alternator with the same electrical load as before, turn the RH alternator field switch ON. (RH engine is still not running. )

g. The remaining adjustments should be made using either a Simpson 260 or a Triplett 630 VOM.

CAUTION

Observe with caution that the field circuits of either system never touch ground or other electrical circuits, even for an instant, or the regulators may be damaged.

h. Select VOM to 0-50V scale and connect VOM between the field terminals of the left and right regulators (plus side meter to LH regulator).
i. Now very slowly rotate the RH regulator voltage adjustment while observing the voltmeter which has been connected to the two field terminals.

1. If a reverse (downscale) reading is obtained, turn the RH regulator adjustment counterclockwise, this should bring the meter upscale.
2. Then very slowly turn RH regulator adjustment clockwise to the point where the field voltmeter will read near zero.

NOTE

A stable reading should not be expected, voltage will fluctuate.

3. Then using the 0-10 volt and 0-2. 5 volt scales on the VOM continue adjustment of the RH regulator to a lower voltage differential. (The 0-2. 5 volt scale is recommended for making the final adjustment. ) The correct adjustment has been achieved when the meter will remain briefly in the vicinity of zero, swinging both upscale and downscale.
j. Replace the snap plug in the RH regulator adjustment hole.
k. Shut down all power to the aircraft and disconnect VOM from field terminals.
l. Restore the paralleling wire removed by step b. above.
m. After aircraft has been restored to original configuration, the RH engine should be started, both alternators turned on and system should be operated at different loads to verify that paralleling is within 10% of load and bus voltage has remained within the 27. 5 ±. 25 volt limit.

STATIONARY INSTRUMENT PANEL SWITCHES. (See figure 14-4.)

Mounted on the left stationary instrument panel are the alternator start, prime, magneto, auxiliary fuel pumps, fuel transfer pumps, cabin pressurization, flap and landing gear switches. All switches with the exception of the flap switch may be removed and installed in accordance with the typical switch removal and installation procedures.

Removal of Battery and Alternator Switches. (See figure 14-4.)

a. Disconnect battery ground cable from the battery to prevent an accidental short circuit.
b. Remove decorative nut securing switch to stationary panel.
c. Tag and disconnect electrical wires from switch.

Installation of Battery and Alternator Switches. (See figure 14-4.)

a. Connect wires to switch and remove tags.
b. Insert switch in stationary instrument panel and install decorative nut.
c. Connect battery ground cable on battery and check switch for operation.

Typical Switch Removal and Installation. (See figure 14-4.)

a. Turn off all electrical power.
b. Loosen decorative nut and pull switch out far enough to remove wiring.
c. Tag and disconnect wiring.
d. Remove switch.
e. Install switch by reversing the removal procedures.

Removal and Installation of Starter Switches. (See figure 14-4.)

CAUTION

When removing starter switches, it is advisable to remove the negative cable from the battery to prevent the starter circuit from being energized during removal of switch.

a. Loosen switch guard and remove nut securing guard and switch to panel.
b. Tag and remove wires from switch.
c. To install switch, connect the wires to the switch and remove tags.
d. Install switch in the panel, secure with guard and nut.

Removal and Installation of Ignition Switches. (See figure 14-4.)

a. Turn off all electrical power.
b. Loosen switch guard and remove nut securing guard and switch to panel.
c. Tag and remove wires from switch.
d. Remove ignition switch.
e. Install ignition switch by reversing the removal procedures.

Removal and Installation of Landing Gear Switch. (See figure 14-4.)

a. Unscrew and remove wheel shaped knob from switch.
b. Remove the nut holding switch to the panel and pull the switch from the rear of the panel.
c. Tag and disconnect the wires from the switch.
d. To install landing gear switch, connect wires to switch and remove tags from wires.
e. Place two nuts on the switch shaft and run them down finger-tight against the switch body.
f. Place the keyed washer on the switch shaft and position the switch on the instrument panel.
g. Place another nut on the switch shaft from front of the instrument panel. Tighten only finger-tight.
h. Tighten nuts on back side of panel (counterclockwise) on switch shaft until the switch is secured against panel. Be sure the keyed washer mates the small hole in the panel below switch mounting hole.
k. Screw the wheel shaped knob on the switch toggle.

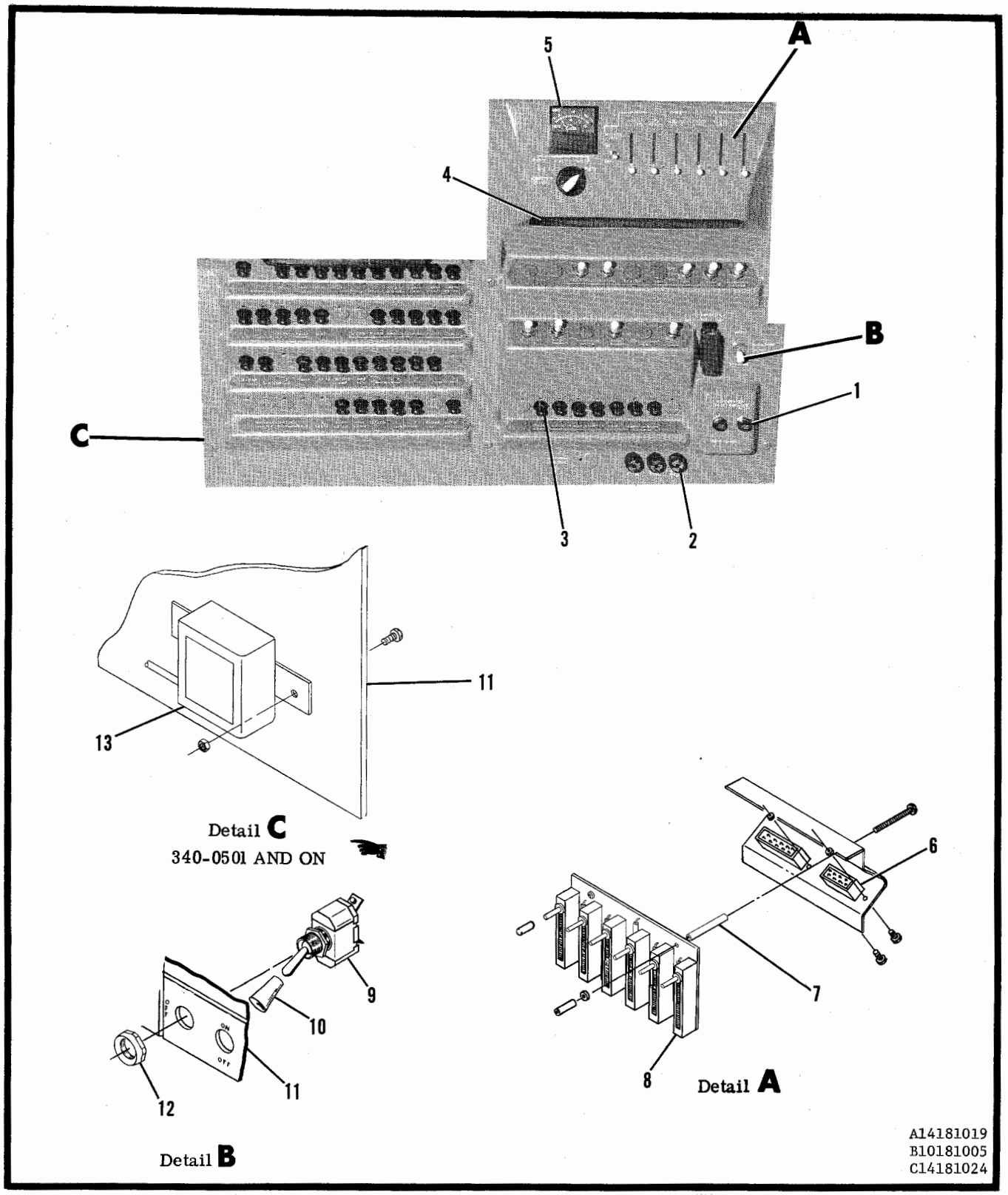
Removal and Installation of Dimming Control. (See figure 14-5.)

a. Turn off electrical power.
b. Remove side panel by removing securing screws.
c. Tag and disconnect all electrical wires.
d. Remove screws securing dimming control to panel.
e. Disassemble dimming control as shown in figure 14-5.
f. Install dimming control by reversing removal procedures.

Removal and Installation of Circuit Breakers. (See figure 14-5.)

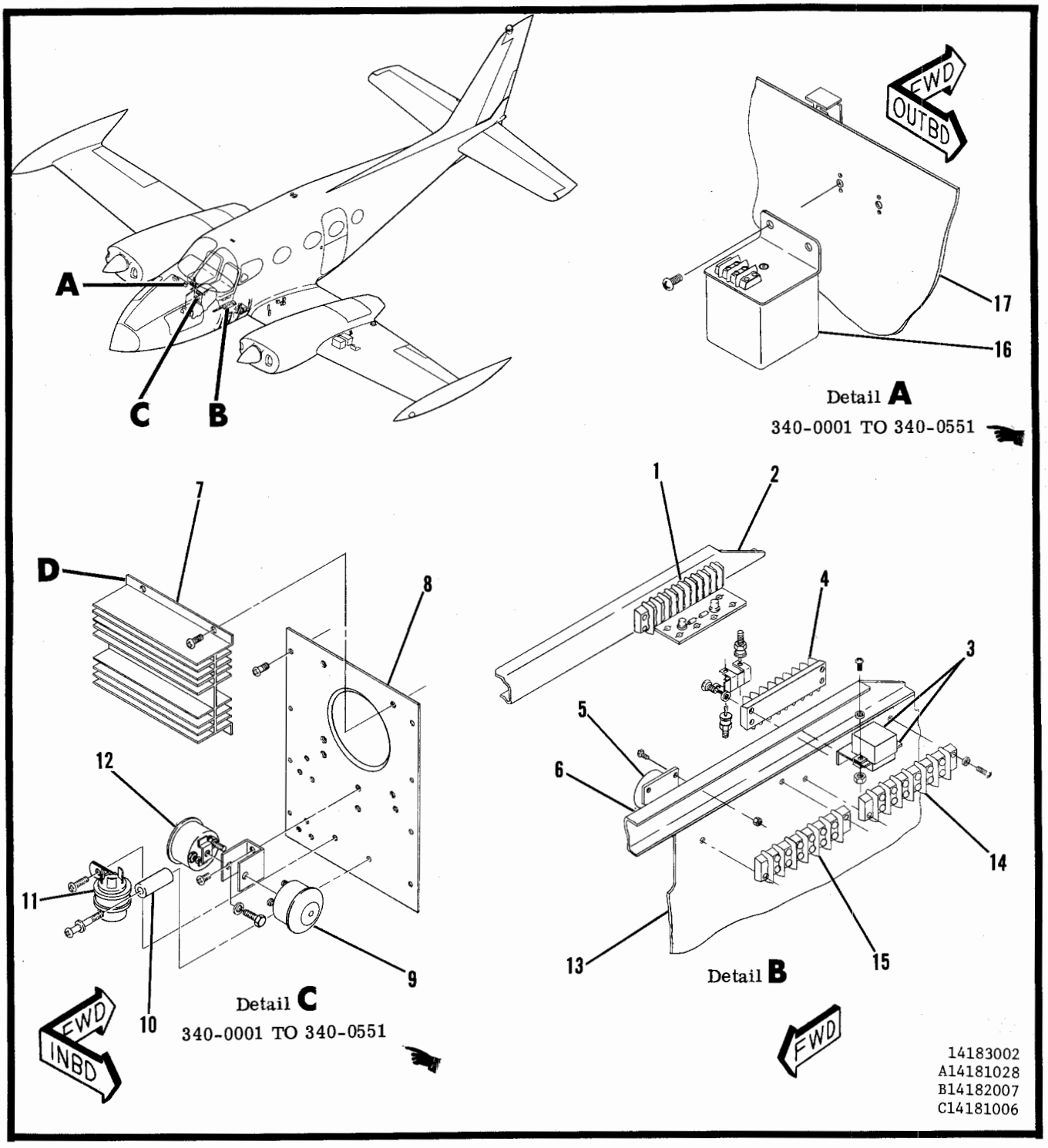
Procedures given pertain to circuit breakers or switch breakers.

a. Turn off electrical power.
b. Loosen nut securing breaker.
c. Disconnect wiring from bus and remove breaker.
d. Installation procedures are the reversal of the removal procedures.



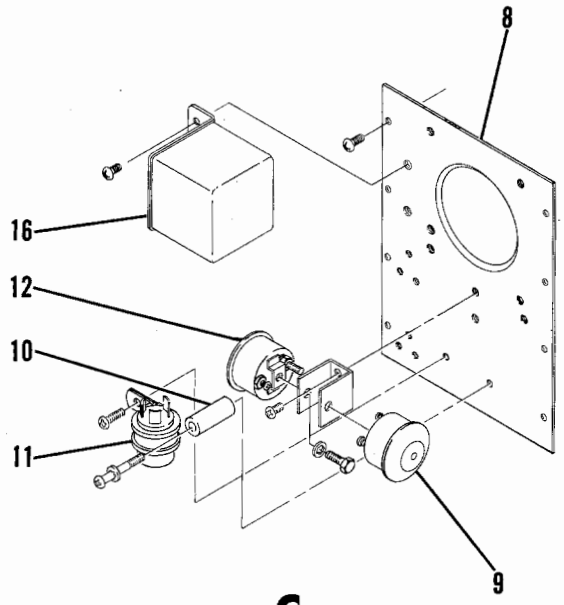

1. Alternator Circuit Breaker
2. Alternator Field Fuse
3. Circuit Breaker (Typ.)
4. Light Assembly
5. Voltammeter
6. Electrical Connector
7. Spacer
8. Slide Rheostat
9. Switch
10. Decorative Knob
11. Circuit Breaker Panel
12. Decorative Nut
13. Low Voltage Monitor

Figure 14-5. Switch and Circuit Breaker Panel Components



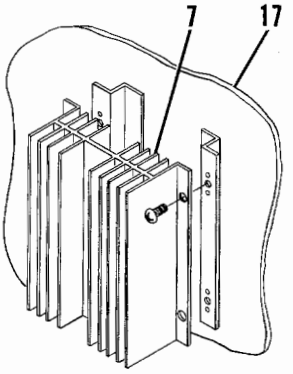

1. Auxiliary Fuel Quantity Light Dimmer Control
2. RH Control Support
3. Auxiliary Fuel Relay
4. Auxiliary Fuel Pump Terminal Block
5. Barometric Switch
6. LH Control Support
7. Heat Sink Assembly
8. Panel
9. Stall Warning Horn
10. Gear Warning Horn Resistor
11. Warning Horn Flasher
12. Gear Warning Horn
13. Center Pedestal
14. Terminal Block TB 6
15. Terminal Block TB 5
16. Starter Vibrator
17. Sta. 100.00 Bulkhead

Figure 14-5A. Electrical Components Installation (Sheet 1 of 2)




Detail **C**

340-0551 & ON




Detail **D**

340-0551 AND ON

C14181026
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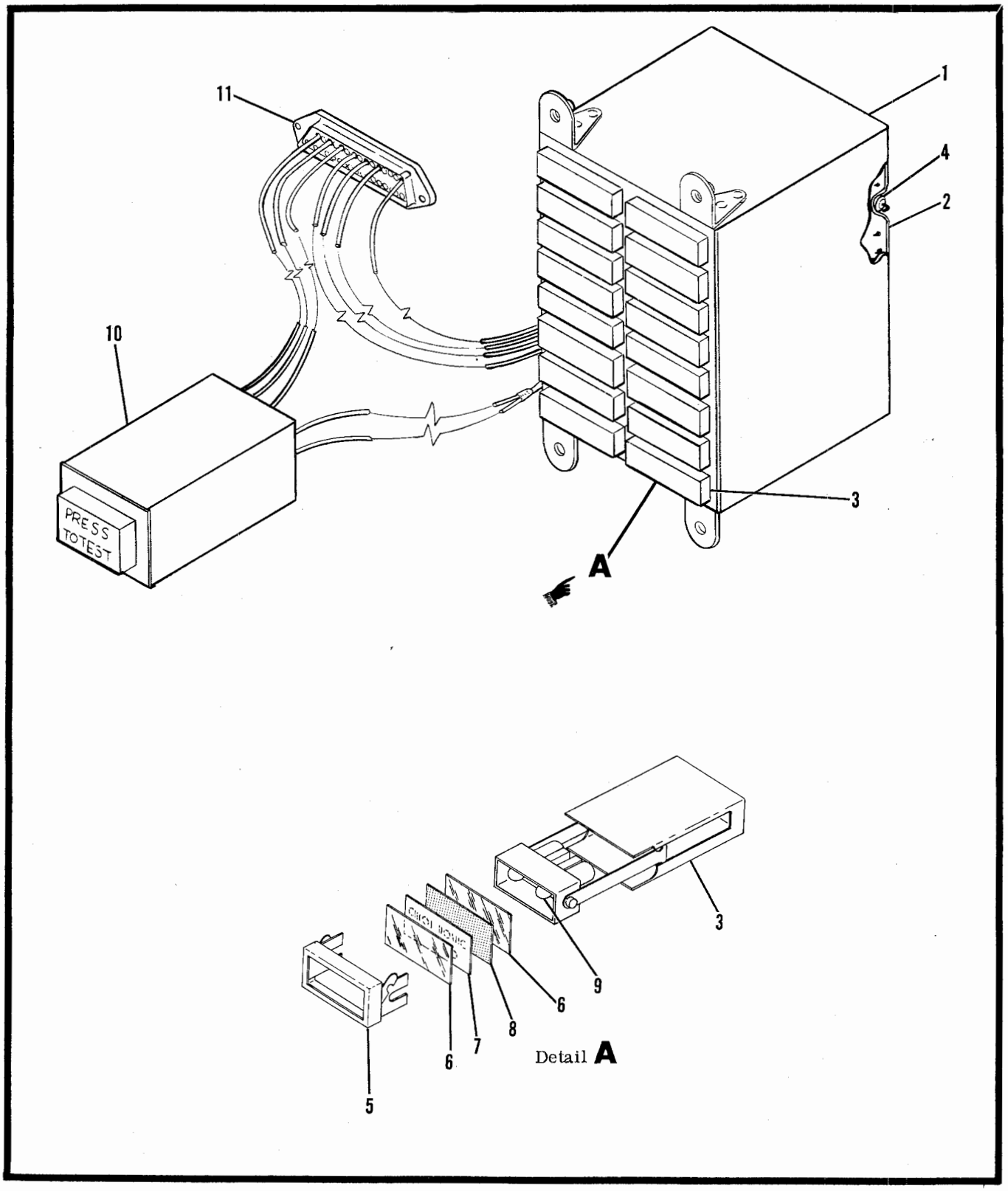
Figure 14-5A. Electrical Components Installation (Sheet 2)




1. Bracket
2. Circuit Board
3. Basic Unit
4. Diode
5. Light Capsule
6. Clear Lens
7. Legend
8. Color Filter
9. Lamp
10. Press To Test Switch
11. Plug

Figure 14-6. Annunciator Panel Installation

Removal and Installation of Instrument Lights. (See figure 14-7.)

a. To remove post instrument lights, remove wire connector from light and remove nut, lockwasher and spacer (if used) securing light to stationary instrument panel.
b. To install post instrument light, reverse the above procedure.

ANNUNCIATOR PANEL.

Sixteen annunciator lights stacked side by side, coupled by a printed circuit board on the rear and mounting brackets on the top and bottom make up the annunciator panel. These lights will illuminate within a circuit to indicate various functions, operations and failures during flight. A press to test button located to the left of the annunciator panel will, when pressed, cause all lights on the annunciator panel, along with the propeller synchronizer if installed, landing gear position, and auxiliary fuel tank indicator to illuminate.

Removal of Annunciator Panel. (See figure 14-6.)

a. Turn off all power.
b. Lower left hand instrument panel by removing mounting screws.
c. Tag and disconnect wiring.
d. Disconnect electrical plug.
e. Remove the four screws securing annunciator panel.
f. Remove press to test switch.
g. Carefully remove annunciator panel.

Removal and Replacement of Annunciator Panel Diodes. (See figure 14-6.)

a. Using a soldering iron and needle nose pliers, unsolder and remove old diode.
b. Solder new diode in place.

NOTE

When soldering printed circuit boards and diodes always use some means of heat sink such as needle nose pliers. Heat will cause damage to diodes.

Removal and Replacement of Individual Light Assembly. (See figure 14-6.)

a. With annunciator panel removed from shock panel remove mounting brackets, top or bottom, depending which is closest to light assembly to be removed.
b. Unsolder light from printed circuit board and remove light assembly.
c. Replace light assembly using caution to prevent damage to circuit board and diodes.
d. Install mounting brackets.

Removal and Replacement of Annunciator Light Lens. (See figure 14-6.)

a. Press light in and allow light capsule to pop out.
b. Rotate clip on each side of the lens housing, one side up, the other side down.
c. Carefully pull lens housing from light capsule.
d. Press out clear lens, filter, legend disperser, and clear lens.

CAUTION

Do not attempt to pry lens housing apart from lens, the housing will break.

e. Insert the clear lens, filter, legend disperser and clear lens in proper order.
f. Insert lens housing and lock into place with clip, one up, the other down.
g. Press light into panel.

Removal and Replacement of Annunciator Light Bulbs. (See figure 14-6.)

a. On the light with the bulb to be replaced push in on the frame of the light assembly and allow light to pop out.
b. Rotate the light capsule 90 degrees.
c. Lift bulb out of light capsule and insert new bulb.
d. Rotate light capsule in place and insert into position. Press firmly into proper place.

Installation of Annunciator Panel. (See figure 14-6.)

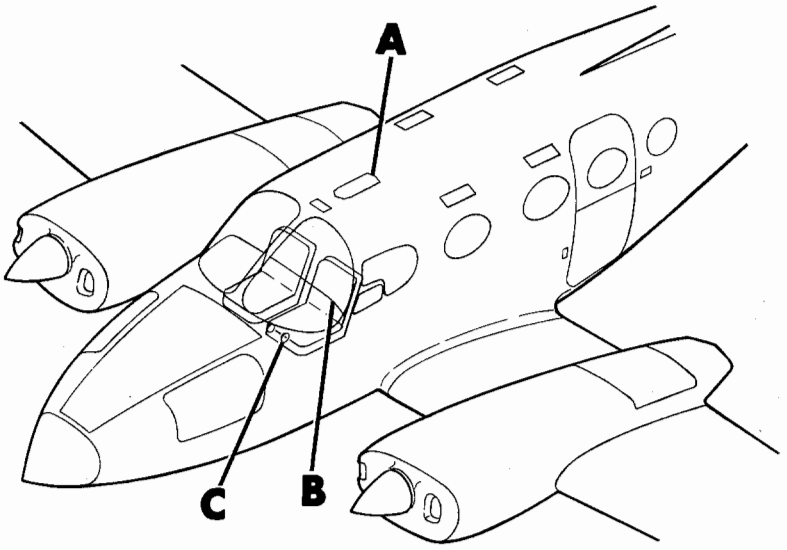
a. Position annunciator panel in place and install four screws.
b. Connect electrical plug.
c. Install press to test switch.
d. Connect wiring and remove tags.
e. Install instrument panel in place.
f. Turn on power and check operation of annunciator panel.
g. Refer to figure 14-6, for proper color coding.

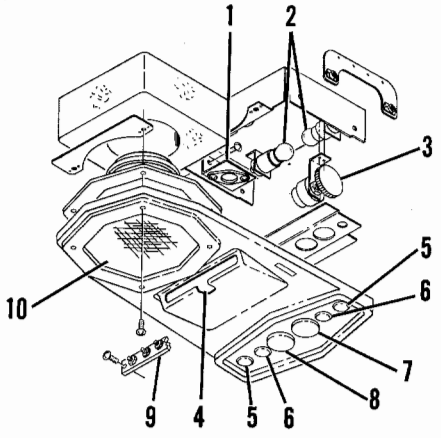
LIGHTING SYSTEM.

The standard exterior lighting system consists of the navigation lights, tail light, top and bottom rotating beacons and a left landing light. Optional exterior lights consist of the right landing light, deice light, taxi light and a strobe light. The standard interior lights consist of a cabin door entrance light, four cabin reading lights, overhead console lights, a map light, the left hand switch and circuit breaker panel lights, and fuel selector lights. The instrument panel lights consist of the warning lights, compass light, a call letter light, and the instrument mounted post lights. A light dimmer control and a transistor heat sink assembly controls light intensity. A dimming control for auxiliary fuel quantity lights is mounted on the forward side of the stationary panel above the center pedestal.

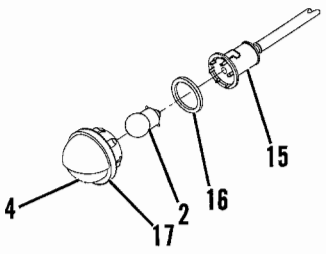
Troubleshooting the Lighting System.

| TROUBLE | PROBABLE CAUSE | CORRECTION |
|---|---|---|
| ONE NAVIGATION LIGHT IS OUT | Lamp burned out. | Replace lamp. |
| | Defective wiring. | Check/repair or replace wiring. |
| | Defective lamp socket. | Replace light assembly. |
| ALL NAVIGATION LIGHTS ARE OUT | Circuit breaker out. | Check/reset circuit breaker. |
| | Defective wiring or navigation light switch. | Check/repair or replace wiring. Replace navigation light switch. |
| LANDING LIGHT EXTENDS BUT DOES NOT LIGHT | Circuit breaker out. | Check/reset circuit breaker. |
| | Lamp burned out. | Replace lamp. |
| | Defective wiring. | Check/repair or replace wiring. |
| LANDING LIGHT WILL NOT EXTEND OR WHEN EXTENDED WILL NOT RETRACT | Circuit breaker out. | Check/reset circuit breaker. |
| | Defective wiring. | Check/repair or replace wiring. |
| | Defective switch. | Replace switch. |
| | Defective landing gear light. | Replace landing light. |
| ROTATING BEACON LIGHTS, BUT WILL NOT ROTATE | Defective motor. | Replace light. |
| | Defective wiring. | Check jumper wire in connector. |
| ROTATING BEACON LIGHT WILL NOT LIGHT | Lamp burned out. | Replace lamp. |
| | Defective wiring. | Check/repair wiring. |
| TAXI LIGHT DOES NOT OPERATE | Circuit breaker out. | Check/repair wiring and/or replace switch. |
| | Lamp burned out. | Replace lamp. |
| COURTESY LIGHT OUT | Circuit breaker out. | Check/reset circuit breaker. |
| | Defective switch or wiring. | Check/repair wiring and/or replace switch. |
| | Lamp burned out. | Replace lamp. |
| DEICE LIGHT OUT | Circuit breaker out. | Check/reset circuit breaker. |
| | Defective switch or wiring. | Check/repair wiring and/or replace switch. |
| | Lamp burned out. | Replace lamp. |
| INSTRUMENT LIGHTS OUT | Lamp(s) burned out. | Replace lamps. |
| GROUP OF INSTRUMENT LIGHTS OUT | Defective transistor heat sink assembly. | Replace defective transistor. |
| | Defective dimmer control. | Replace defective resistor and/or defective potentiometer. |

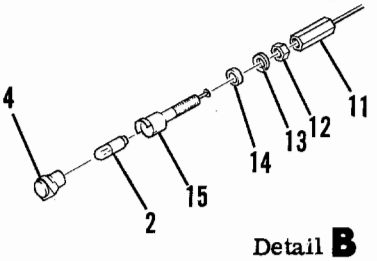



Detail A




Detail C




Detail B

1. Transistor Unit
2. Bulb
3. Rheostat
4. Lens
5. Headset Jack
6. Mike Jack
7. Oxygen Outlet (Pilot)
8. Oxygen Outlet (Copilot)
9. Terminal Strip
10. Speaker
11. Connector
12. Nut
13. Lock Washer
14. Washer
15. Socket
16. Gasket
17. Cover

Figure 14-7. Cockpit Lighting

Removal of Landing Gear Position Indicator Module. (See figure 14-4.)

a. Turn off all electrical power.
b. Press in on face of module to allow module to pop out.
c. After module has popped out rotate face 90° and pull module out.

NOTE

This will allow access to mounting screws.

d. Loosen mounting screws until module is loose in the instrument panel and free to remove.
e. Slide backshell aft and pull module out forward from instrument panel.
f. Install module by reversing the removal procedures.

Replacement of Landing Gear Position Indicator Module Bulbs. (See figure 14-4.)

a. Turn off all electrical power.
b. Press in on face of module to allow module to pop out.
c. After module has popped out rotate face 90° and pull module out.
d. Press bulbs out from socket and replace.

NOTE

Bulbs should be checked with an ohmmeter to determine condition.

e. Replace module by reversing the removal procedures.

Removal and Installation of Overhead Console Light Rheostats. (See figure 14-7.)

a. Remove screws securing cover panel and remove cover.
b. Loosen setscrew securing rheostat knob using a 3/32-inch allen wrench, then remove rheostat knob.
c. Remove nut securing rheostat to bracket and remove rheostat from bracket.
d. Tag and remove wires by unsoldering from rheostat connections.
e. To install overhead console light rheostats reverse this procedure.

Removal and Installation of Instrument Lights. (See figure 14-7.)

a. To remove post type instrument panel lights, remove wire from connector and remove nut, lockwashers and spacer (if used) securing light to instrument panel or stationary panel.
b. To install post instrument lights, reverse the above procedures.

Removal and Replacement of Switch and Circuit Breaker Panel Lights. (See figure 14-5.)

a. Remove screws securing lens and remove lens.
b. Remove bulbs from bayonet fittings.
c. Install lights by reversing the installation procedure.

Fuel Selector Valve Lights. (See figure 14-7.)

The fuel selector valve lights are located on the inboard side of pilot's and copilot's seats. These lights are controlled by the rheostat on the switch and circuit breaker panel.

Removal and Replacement of Fuel Selector Valve Light. (See figure 14-7.)

a. To remove fuel selector valve light, pry light loose from seat base.
b. To install fuel selector valve light, make sure wire is connected and insert light into hole. Press in firmly to insure tight fit.

Removal and Installation of Individual Reading Lights. (See figure 14-8.)

The individual reading lights are removed as follows:

a. Remove the four screws holding the escutcheon assembly in place.
b. Remove the four screws securing the light to the escutcheon and disconnect and tag wire.

CAUTION

Before disconnecting any wires from the individual reading lights or cabin door light, always disconnect the ground lead of the battery. These lights are not connected through the master switch and short circuiting may damage circuit wiring.

c. Removal of the individual reading light switch is accomplished by removing the screws securing switch to escutcheon.

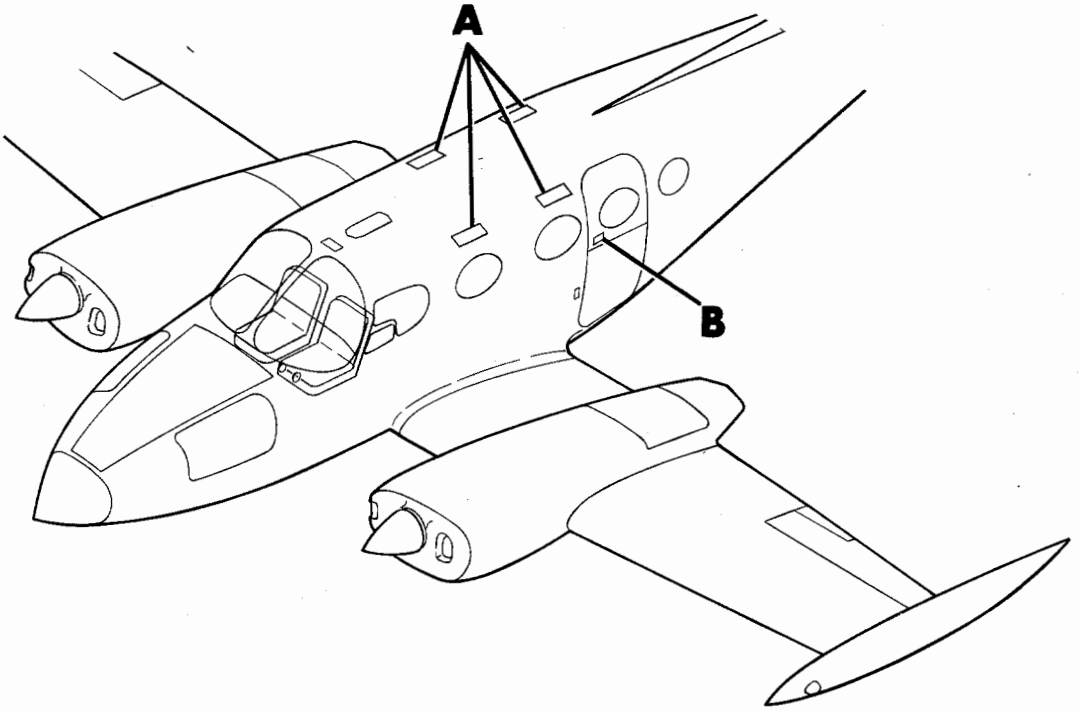
NOTE

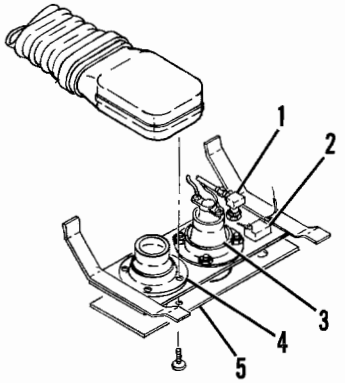
For convenience of replacing bulbs, the lens is removable from the light by an expansion type lens ring.

Removal and Installation of Cabin Door Light. (See figure 14-8.)

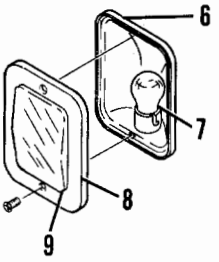
Removal and installation of cabin door light is restricted to the lens retainer, lens and bulb.

a. To remove the lens or bulb, remove two screws securing retainer to light assembly.



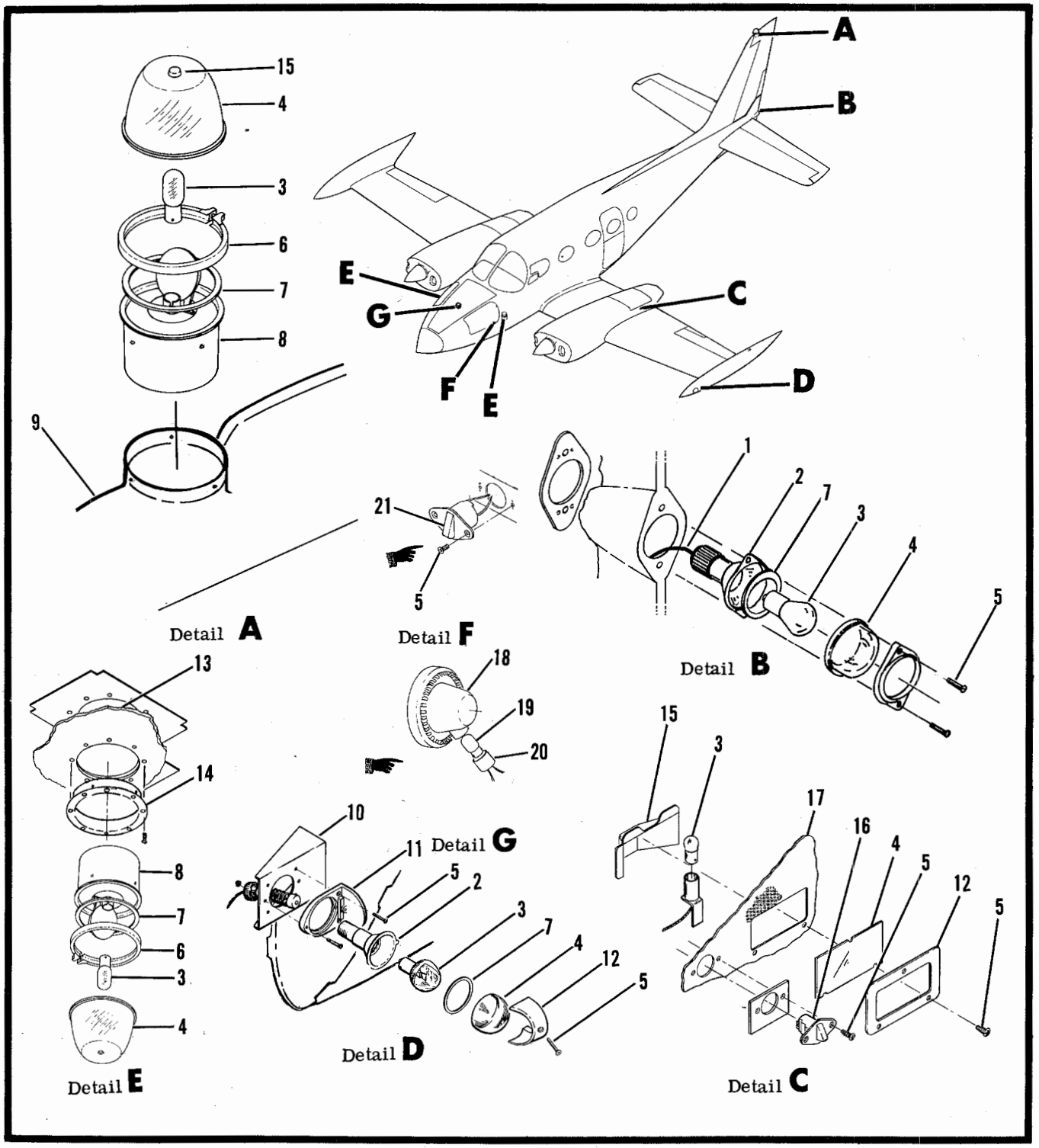

Detail **A**




Detail **B**

1. Oxygen Outlet
2. Switch
3. Reading Light
4. Air Outlet
5. Escutcheon
6. Courtesy Light
7. Bulb
8. Retainer
9. Lens

Figure 14-8. Cabin Lighting




1. Wire
2. Socket
3. Bulb
4. Lens
5. Screw
6. Clamp
7. Gasket
8. Beacon
9. Rudder Cap
10. Bracket
11. Base
12. Lens Retainer
13. Skin (Lower)
14. Mounting Ring
15. Reflector
16. Switch
17. Nacelle Structure
18. Light - Nose Baggage
19. Bulb
20. Light Socket
21. Switch

Figure 14-9. Exterior Lighting

Removal and Installation of Wing Navigation Lights. (See figure 14-9.)

a. Remove the tip tank nose cap.
b. Remove and install navigation light in sequence as shown.

Removal and Installation of Tail Navigation Lights. (See figure 14-9.)

a. Two screws secure the tail light assembly to the stinger. Removing these two screws and disconnecting the electrical connector from the rear of the light assembly will allow the tail light to be removed.
b. To replace the tail light, reverse the above procedure.

Removal and Installation of Rotating Beacons. (See figure 14-9.)

a. To remove the rudder-mounted rotating beacon, remove the screws in the fiberglass tip and lift rotating beacon out.
b. Disconnect electrical plug.
c. To remove the belly mounted rotating beacon, remove the screws in the flange mounting and lower rotating beacon from fuselage.
d. Disconnect the electrical plug.
e. Installation of the rotating beacons may be accomplished by reversal of the above procedure.

CAUTION

When replacing the bulb in the rotating beacons do not allow the reflector to move. Always grasp the bulb base and unscrew bulb from bayonet fittings. This will prevent drive spring damage.

NOTE

On the belly-mounted rotating beacon, make sure the gasket is installed between fuselage skin and rotating beacon. Seal around beacon from inside of fuselage in accordance with sealing procedures in Section 16.

Removal and Replacement of Wing Locker Courtesy Light. (See figure 14-9.)

a. Unlatch the wing locker door and place in the open position.
b. Remove three screws securing the lens retainer and lens to the nacelle structure.
c. Replace bulb by removing from socket.
d. Install lens retainer and lens to the nacelle structure by securing with three screws.
e. Close the wing locker door and latch.

Removal and Installation of Wing Locker Courtesy Light Switch. (See figure 14-9.)

a. Unlatch the wing locker door and place in the open position.
b. Remove two screws securing switch.
c. Tag and disconnect wires to switch.
d. Remove switch from aircraft.
e. Install the wing locker light switch by reversing the removal procedures.
f. Close the wing locker door and latch.

Removal and Installation of Nose Baggage Compartment Light. (See figure 14-9.) (340-0151 and On)

a. Open nose baggage door.
b. Pull light assembly (18) forward and lift out of mount hole in aft divider.

NOTE

Light assembly (18) is secured in place by spring tabs.

c. Disconnect socket assembly (20) and remove light assembly from aircraft.
d. To replace light bulb (19), remove from socket assembly and install a new bulb.
e. To reinstall light, reconnect to socket assembly, insert light assembly into hole in divider, push aft with a firm even hand pressure until spring tabs latch light assembly in place.
f. Close door, secure with lock fasteners.

Removal and Installation of Nose Baggage Compartment Light Switches. (See figure 14-9.) (340-0151 and On)

a. Open nose baggage doors.
b. Remove the two mount screws (5) securing the switch (21) in place.

NOTE

The switches are mounted just forward of the lower aft door latch in the door frame, one on the left and one on the right.

c. Tag and disconnect wires.
d. Remove switch from aircraft.
e. Install switch by reversing the foregoing procedure.
f. Close and secure doors with locking fasteners.

Removal of Landing Light. (See figure 4-10.)

a. Support the light assembly and remove screws which secure lamp housing to retainer band.
b. Lower the light assembly out of the tip tank tail cap and place on a stand of suitable height.

NOTE

The wiring to the light contains sufficient slack to permit the light assembly to be brought down below the tip tank tail cap for removal of light wiring.

c. Tag and remove the wires from the terminal block on the light.

d. To remove the lamp from the landing light, extend the light approximately 60 degrees and remove the lamp retainer ring. Pull the lamp from the inner canopy and disconnect the wires from the lamp.

NOTE

When the light assembly is removed from the aircraft, the light may be extended by applying a 28 volt power source across the OPEN and ground terminals.

e. Remove the two screws securing the power unit to the housing.

Installation of Landing Light. (See figure 14-10.)

a. Position power unit within drive housing of light assembly and secure with two screws.

b. To install a new lamp, connect the wires to the lamp and position the lamp within the canopy with the filament shield inboard. Position the lamp retainer band over the edges of the lamp and canopy with the flat side toward the apex of the canopy. Using needle nose pliers, pull the retainer band tight around the lamp and canopy and fasten the clip on the band.

NOTE

Before installing a new lamp, it will be necessary to extend the light approximately 60 degrees to gain access to the retainer band.

c. Position the retainer ring inside the tip tank tail cap with the open side forward and tape it to the tip tank tail cap to hold it in position temporarily while the light assembly is installed.
d. Connect the wires to the light assembly and remove the identification tags.
e. Place the light assembly into the wing and secure with screws.

NOTE

Start all screws through the nutplates on the retainer band before attempting to tighten any of them to prevent distortion or misalignment of the band.

Adjustment of Landing Light. (See figure 14-11.)

Landing lights are adjusted in the factory to extend to an angle of 80 degrees from the fully retracted position. The angle of extension may be altered by means of an adjustment screw as illustrated in figure 14-11.

NOTE

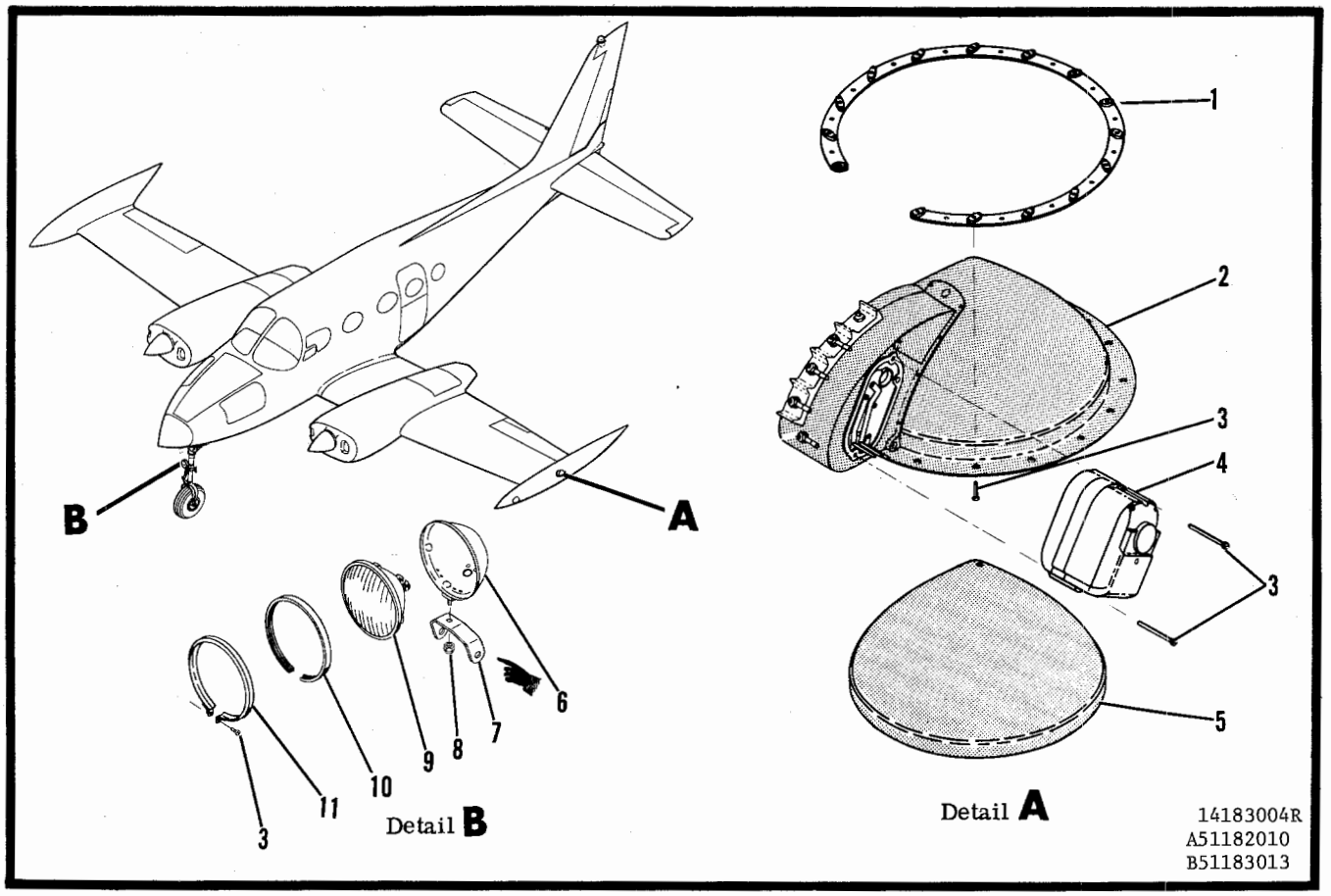
Do not turn the adjusting screw counterclockwise more than three full turns without closing and opening the light before additional adjustment. Excessive turns of the screw in a counterclockwise direction will distort an actuator contact within the assembly, thus changing the fixed setting which controls the light retract position.

The angle of extension of the landing light may be checked with a bubble protractor. Check the degree of opening according to the following steps:

a. Retract the landing light and place the flat surface of the protractor across the retainer band which secures the lamp within the inner canopy.

NOTE

Two blocks of equal thickness may be placed on the retainer band to raise the protractor so it will clear the surface of the lamp for a more positive location of the protractor.




1. Retainer Band
2. Lamp Housing
3. Screw
4. Power Unit
5. Lamp Assembly
6. Canopy Assembly
7. Bracket
8. Nut
9. Lamp
10. Gasket
11. Retainer Ring

Figure 14-10. Landing and Taxi Light Installation

b. Run the landing light full down and measure the angle of extension. If the light has not reached the desired degree of extension, turn the landing light adjustment screw in the direction necessary to achieve the desired angle of extension.

c. Retract the light to the full up position, fully extend the light, and check the angle of extension.

Removal and Installation of Taxi Light. (See figure 14-10.)

a. Remove nut securing lamp and remove lamp.
b. Tag and disconnect electrical wires.
c. Remove cotter pin, nut and washer securing light to strut bracket.
d. Installation of taxi light is a reversal of this procedure.

Adjustment of Taxi Light.

The taxi light should be adjusted to an angle of approximately three degrees below horizontal. The light should also be adjusted to point in the direction of the nose wheel. The fore and aft positions of the light may be adjusted by removing the cotter pin and loosening the nut to free the mounting bracket. The light may be aligned with the nose wheel by loosening the mounting nut and pivoting the light on the mounting bracket.

CAUTION

After adjustment, make sure the nut securing light to the bracket is tight and the bolt securing the bracket is tight and cotter pin installed.

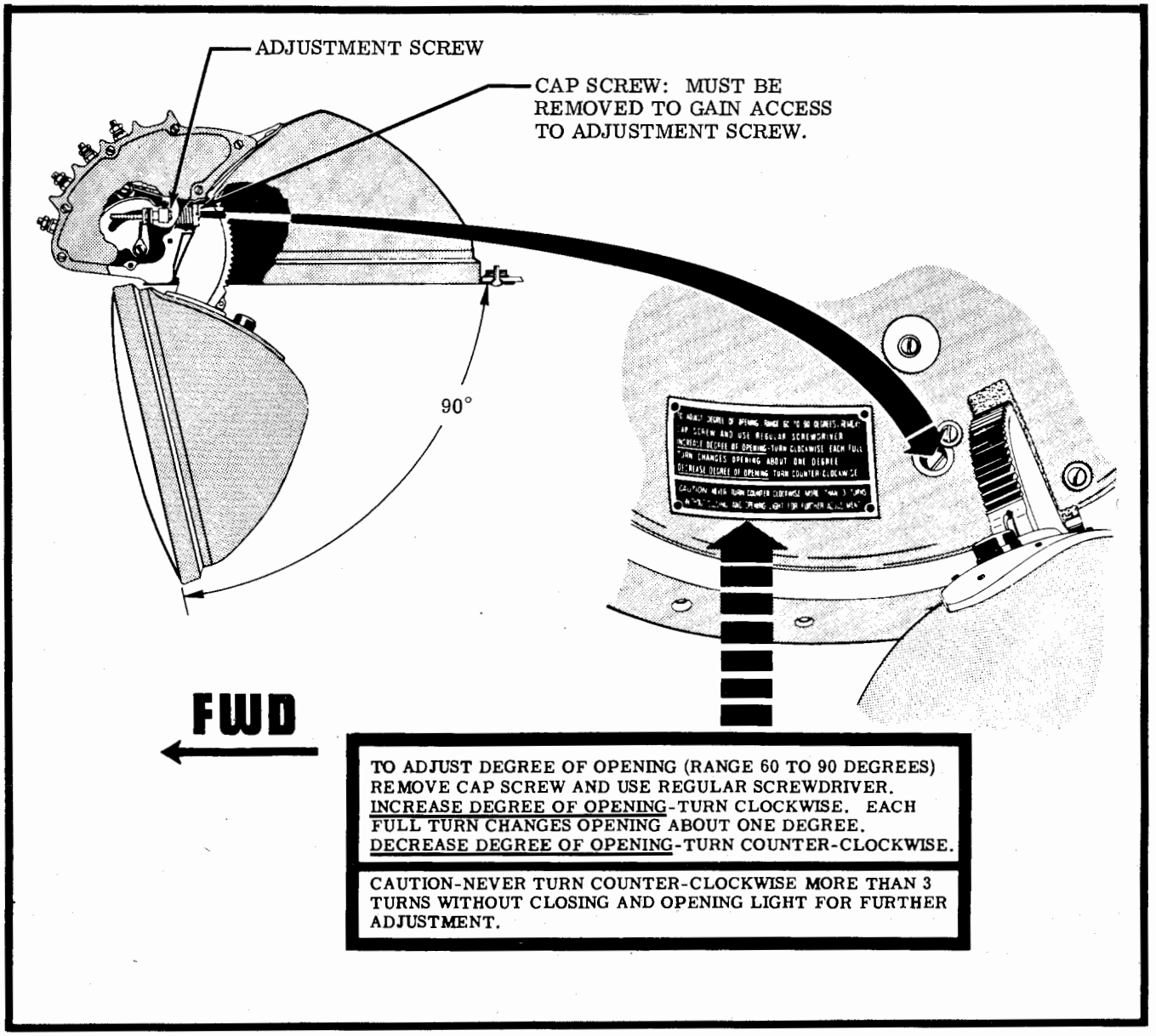



Figure 14-11. Adjustment of Landing Light

Removal and Installation of Deice Light. (See figure 14-12.)

a. Remove upper cowling from left engine.
b. Remove screws securing socket assembly and clamp holding wires.
c. Pull socket assembly apart from lamp shield to remove bulb.
d. If further disassembly is required, tag and remove wires. Drill out rivets securing shield assembly to nacelle skin.
e. Installation of deice light is accomplished by reversing this procedure.

Strobe Light System. (Optional)

The high intensity strobe light system consists of a strobe light located on each wing tip, a flasher unit and power supply unit located in the tail section of the aircraft, a switch circuit breaker located on the switch and circuit panel and a tail light unit located in the stringer. The wiring is shielded to guard against radio noise interference.

Removal and Installation of Strobe Light System Components. (See figure 14-13.)

a. Remove nose cap on each wing tip.

NOTE

If strobe light flash tube is being replaced, unsafety flash tube from clips and remove. Reinstall new flash tube and safety wire in position.

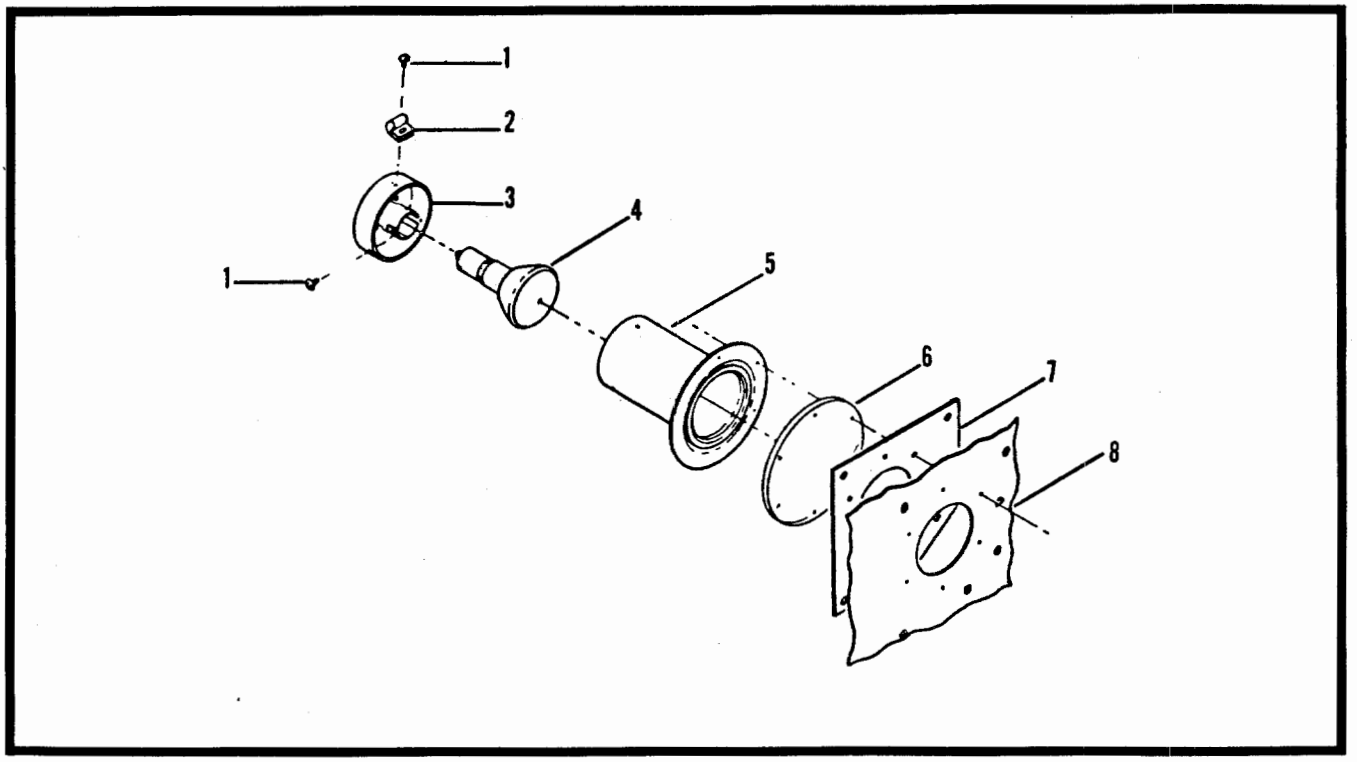
CAUTION

Insure flash tube is installed in clips with the trigger grid on flash tube positioned facing towards the lens and away from the reflector.

b. Disconnect electrical wiring to strobe light.
c. Remove strobe light unit from supporting bracket.
d. Remove tailcone access and disconnect electrical wiring from power supply and flasher unit.
e. Remove screws securing flasher and screws securing power supply and remove from tailcone.
f. Remove tail light by removing clamp, lens and gasket from tail light.
g. Installation of strobe light is the reversal of the removal procedures.

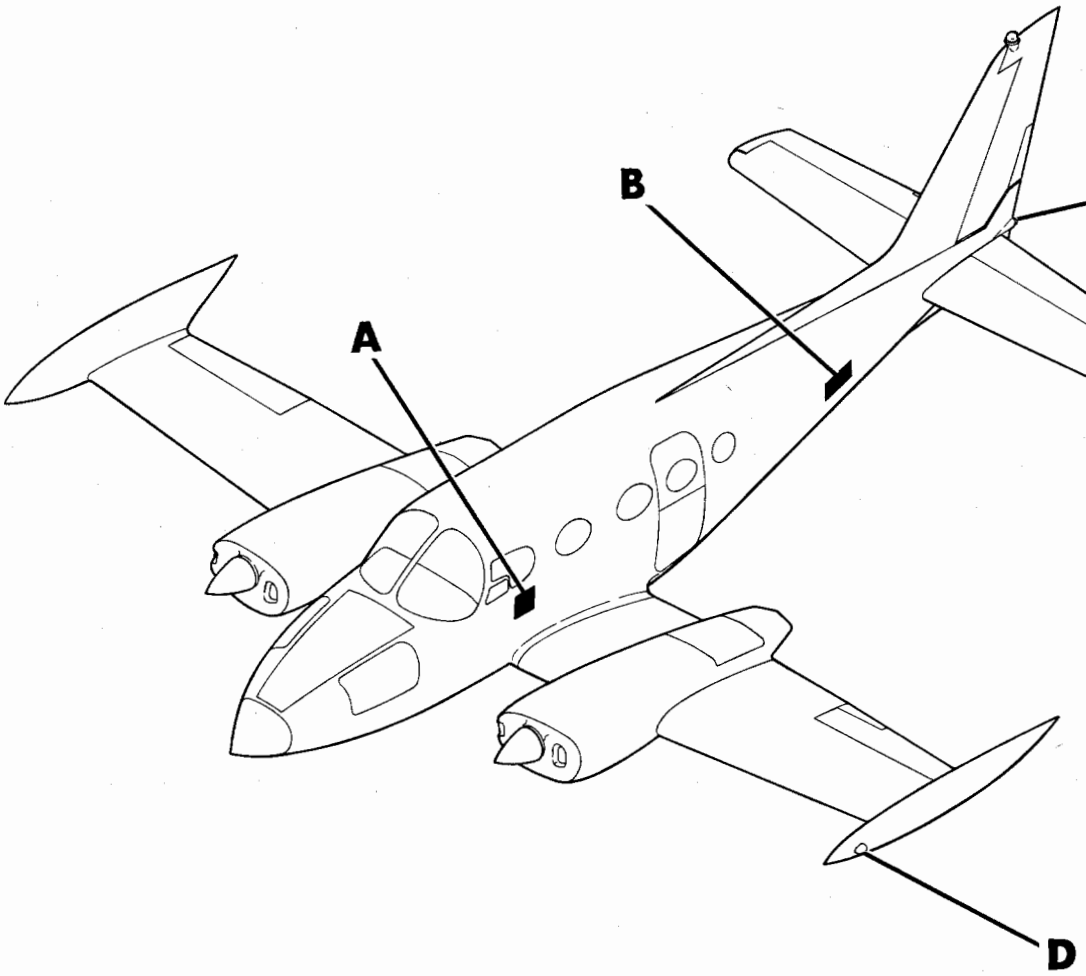
STALL WARNING SYSTEM.

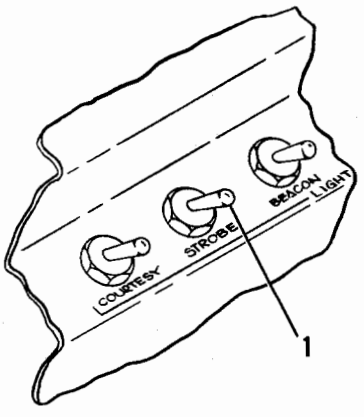
The stall warning system is comprised of a stall and landing gear warning horn mounted on the forward pressure bulkhead and the actuating switch mounted on the leading edge of the left wing. When the air-




1. Screw
2. Plastic Clamp
3. Socket Assembly
4. Lamp
5. Shield
6. Lens
7. Doubler
8. Nacelle Skin

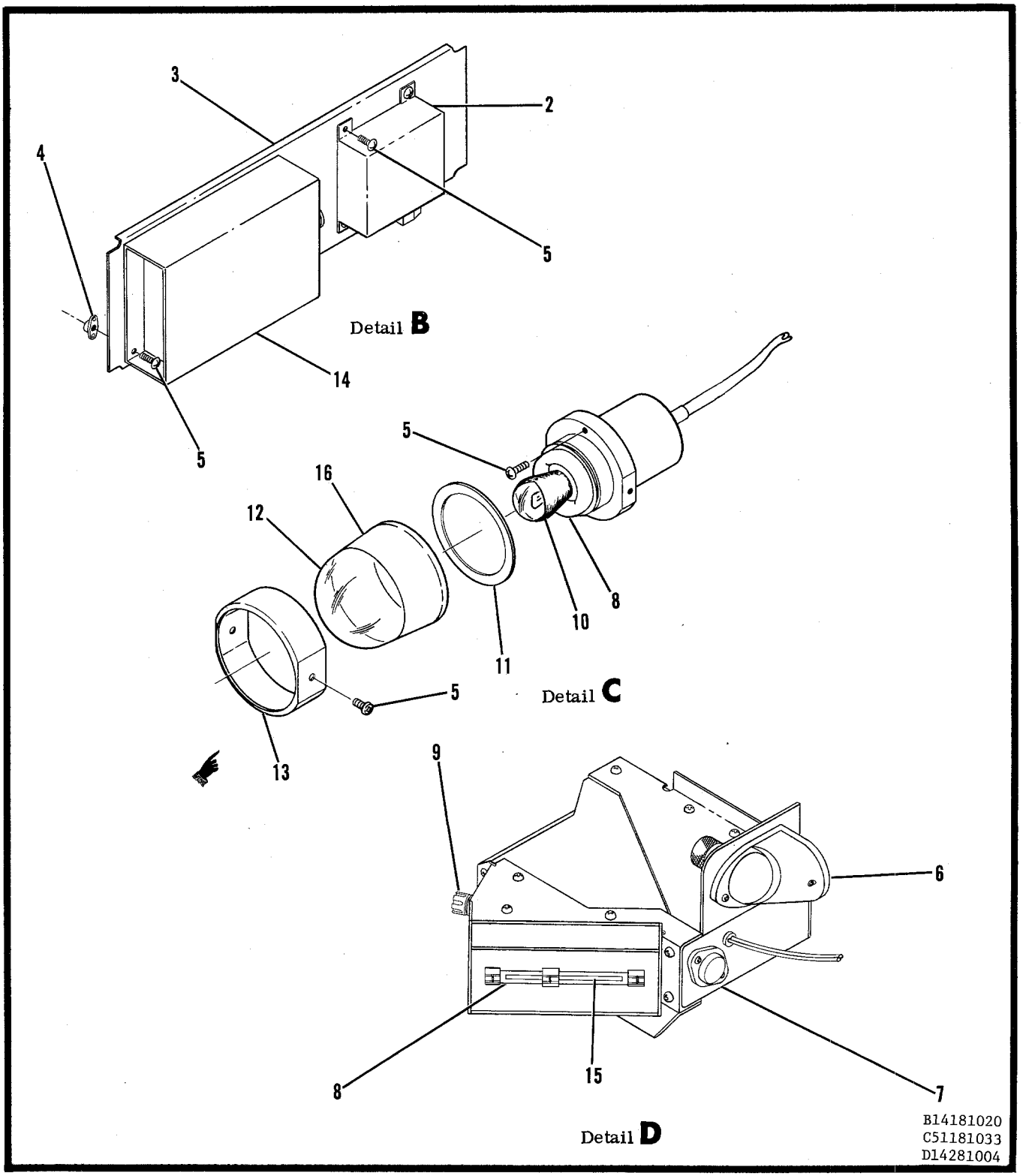
Figure 14-12. Wing Deice Light Installation




Detail A

Figure 14-13. Strobe Light System Installation (Sheet 1)




1. Breaker Switch
2. Flasher Unit
3. Support Assembly
4. Nutplate
5. Screw
6. Navigation Light
7. Power Supply (31-1721-1)
8. Flash Tube
9. Bracket Fuse
10. Lamp
11. Gasket
12. Lens
13. Retainer
14. Power Supply (60-1520-1)
15. Trigger Grid
16. Aluminum Tape

Figure 14-13. Strobe Light System Installation (Sheet 2)

craft approaches a stall the switch energizes the electrical circuit and causes the warning horn to sound. A heater element is provided in the actuating switch, to prevent ice from hampering the operation, is energized when the pitot heat switch is turned on.

Removal of Stall Warning Transmitter. (See figure 14-14.)

NOTE

Before removal of stall warning transmitter, it is important that the exact location of the vane be marked on the wing so that the replacement unit may be adjusted identically.

a. Remove access hole cover (7).
b. Remove four screws (5) attaching stall warning transmitter (3) to wing skin (4).
c. Tag and disconnect electrical wires (6) and remove stall warning transmitter (3).

Installation of Stall Warning Transmitter. (See figure 14-14.)

a. Attach electrical wires (6) as tagged at removal.
b. Secure stall warning transmitter (3) to wing skin (4) with four attaching screws (5).
c. Replace access hole cover (7).

Operational Check of Stall Warning System.

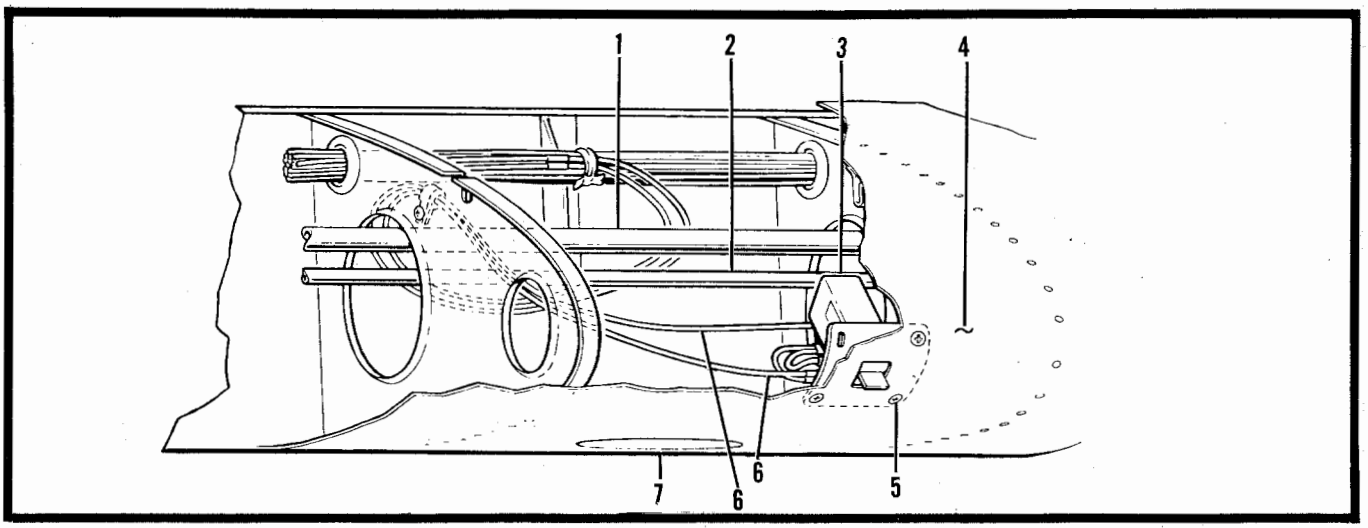
a. Ground Check.
1. Turn electrical power on.
2. Activate vane on stall warning transmitter and observe audible warning signal.
b. Flight Check.
1. Check the stall warning in two configurations: landing gear up, flaps up and gear down, flaps full down.
2. Check each configuration in step a at 65% power using power computer furnished with aircraft and at idle power.
3. Approach the stall by reducing airspeed at a rate as close as possible to 1 knot per second. In the stall the aircraft roll attitude should be controllable up to the time the aircraft nose pitches downward or full up elevator stop is reached. The fuel should be managed to minimize asymmetric fuel prior to conducting the stall.
4. The indicating stall speed in the landing configuration at idle power shall fall within ±4 knots of a line drawn from the light weight stalling speed to the heavy weight stalling speed as shown by the appropriate chart in Figure 14-15. The weight at the time of takeoff minus the fuel used shall be used for the weight at stall.
5. Record the stall speeds for each configuration.

Adjustment of Stall Warning System.

a. Using the data recorded in the Flight Check portion of the Operational Check of Stall Warning System, adjust the stall warning vane to provide a stall warning horn at 4 to 9 knots IAS prior to the idle power landing configuration stall.
b. Raising the stall warning vane position will increase the stall warning indication and lowering the stall warning vane will lower the stall warning indication.

PITOT AND STALL WARNING HEAT SYSTEMS.

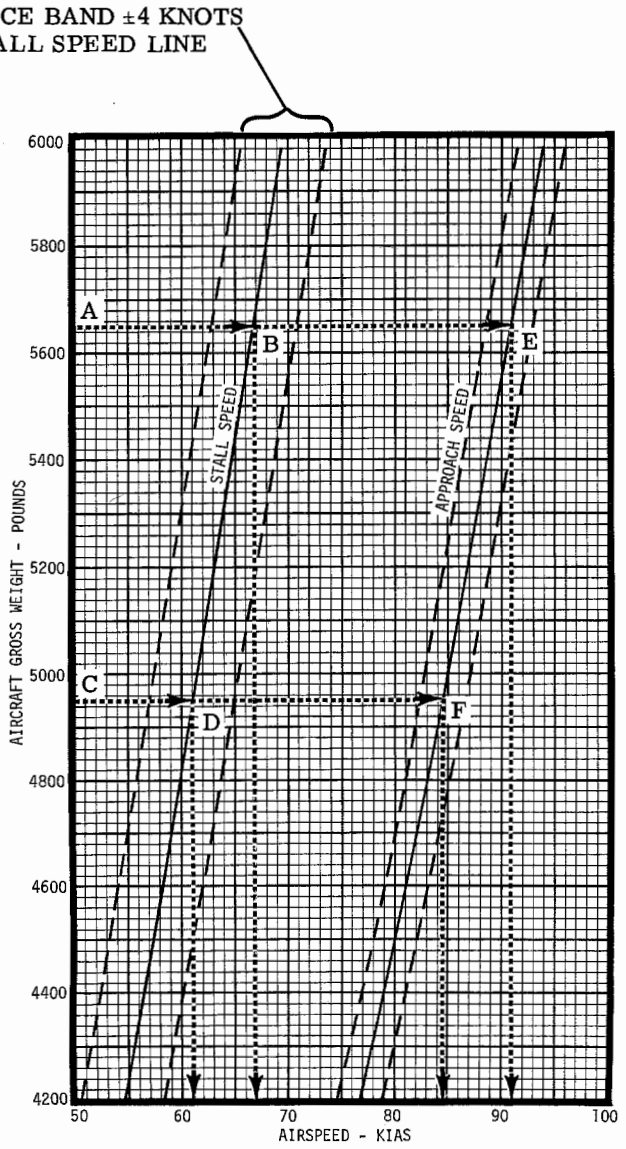
The pitot and stall warning heaters are resistance units mounted integrally in the pitot tube and stall warning transmitter. Both units are controlled by one switch.




1. Left Fuel Supply Line
2. Vapor Return Line
3. Stall Warning Transmitter
4. Wing Skin
5. Screw
6. Electrical Wires
7. Access Hole Cover

Figure 14-14. Stall Warning Transmitter

| TAKEOFF WEIGHT RANGE - LBS | TAKEOFF C.G. RANGE - % |
|---|---|
| 4950 - 5650 | 22 - 24 |




EXAMPLE

"A" POINT "A" WEIGHT (HEAVY WEIGHT)
"B" STALL SPEED AT POINT "A" WEIGHT (67. 0 KIAS)
"C" POINT "C" WEIGHT (LIGHT WEIGHT)
"D" STALL SPEED AT POINT "C" WEIGHT (61. 0 KIAS)
"E" APPROACH SPEED AT POINT "A" WEIGHT (91. 0 KIAS)
"F" APPROACH SPEED AT POINT "C" WEIGHT (84. 5 KIAS)

14986001

Figure 14-15. Approach and Stall Speed Chart

## NON-CONTINUOUS ELECTRICAL LOAD CHART

| | Amp Required |
|---|---|
| Battery | 8.00 |
| Landing Light LH | 9.10 |
| Landing Gear Motor | 18.00 |
| Flap Motor | 10.00 |
| Heater Overheat Indicator | .08 |
| Landing Gear Relay | .45 |
| Fuel Boost Relay (2) | .18 |
| Landing Gear Warning | .60 |
| Stall Warning | .20 |
| Door Warning Indicator | .08 |
| Door Courtesy Light | .30 |
| Alternator Failure Indicator (2) | .16 |
| Starter Vibrator | 2.50 |
| Cabin Altitude Warning Light | .08 |
| Wing Locker Fuel Lights (4) | .16 |
| Electric Seat (10.00 Amps each) | 20.00 |
| Deice Light - Wing (1) | 1.40 |
| Surface Deice Valve (2) | 2.80 |
| Surface Deice Indicator | .08 |
| Electric Trim | .60 |
| Landing Light - RH | 9.10 |
| Nacelle Baggage Lights (2) | 1.04 |

NOTE

This load chart is to be used for determining electrical load on the aircraft power distribution system. Amps given are approximate and based on the maximum allowable load in each installation. The loads are not to be used for troubleshooting.

CONTINUOUS ELECTRICAL LOAD CHART

| | Amp Required |
|---|---|
| Tip Tank Transfer Pump (2) | 1.20 |
| Tip Tank Auxiliary Fuel Pump (2) | 10.00 |
| Heater Air Blower (Vent) | 10.00 |
| Heater Combination Air Blower and Fuel Pump | 2.50 |
| Battery Relay | .60 |
| Landing Gear Down Indicators (4) | .16 |
| Nav Lights | 2.88 |
| Rotary Beacons (2) | 3.60 |
| Map Light, Wheel | .52 |
| Reading Lights (4) | 1.20 |
| Fuel Select Lights | .60 |
| Compass Light | .12 |
| Post Lights (40) | 1.60 |
| Circuit Breaker Lights (4) | .68 |
| Call Number Lights | .04 |
| Flood Light (2) | .64 |
| Flap Position Indicator (6) | .36 |
| Pitot Tube Heater | 4.30 |
| Tip Tank Vent Heater (2) | .48 |
| Heater Fuel Valve | .20 |
| Heater Fuel Solenoid | .20 |
| Engine Gages (2) | .64 |
| Fuel Quantity - System | .50 |
| Turn & Bank Indicator | .15 |
| Voltage Regulator (1) | 1.50 |
| Heater Ignition | .75 |
| Stall Warning Heater | 1.30 |
| Cabin Pressurization Dump Valve | .75 |
| Wemac Blower | 7.50 |
| Air Temperature Indicator | .08 |
| Map Light - RH Wheel | .52 |
| Stereo Tape Player | 1.00 |
| Auxiliary Fuel Pump, Wing Locker (2) | 3.80 |
| Propeller Synchronizer Actuator | 1.00 |
| Propeller Synchronizer Light | .04 |
| Taxi Light | 3.50 |
| Strobe Lights (3) | 3.00 |
| Post Lights (23) (.04 per Light) | .92 |
| Variable Rate Control | .25 |
| Fuel Quantity - Auxiliary Indicator Lights | .08 |
| Flight Hour Recorder | .04 |
| Static Source Heater | .72 |
| Propeller Deice Boots (4) (2 Blade Propeller) | 10.00 |
| Propeller Deice Boots (6) (3 Blade Propeller) | 15.00 |
| Vent Heater Wing Locker (2) | .58 |
| Turn & Bank Indicator RH | .15 |
| Windshield Alcohol Deice | .75 |

NOTE

Total continuous electrical load should not exceed 80% of the total rated alternator capacity.

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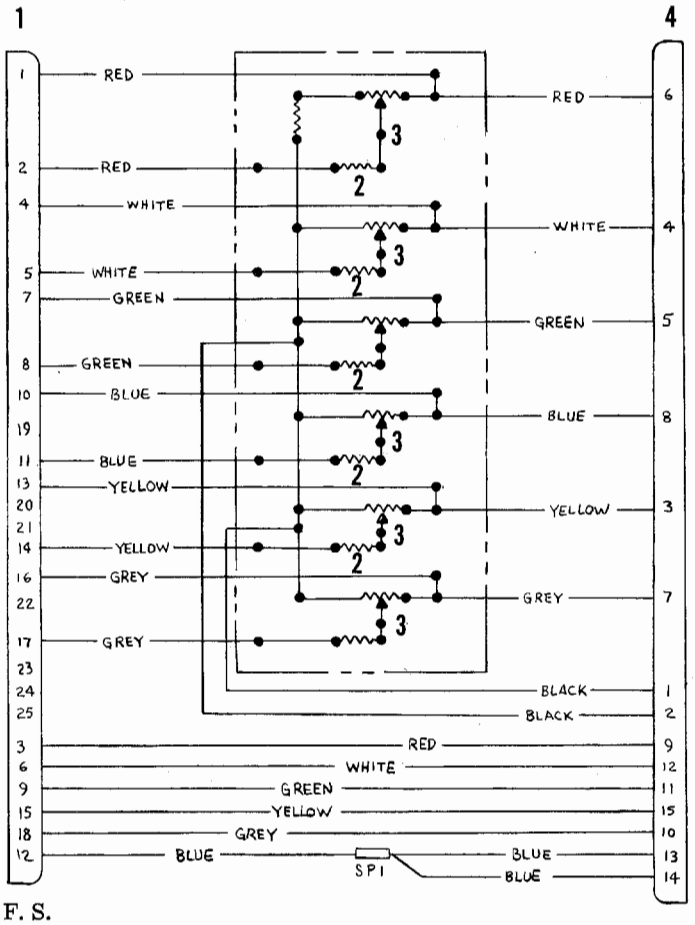


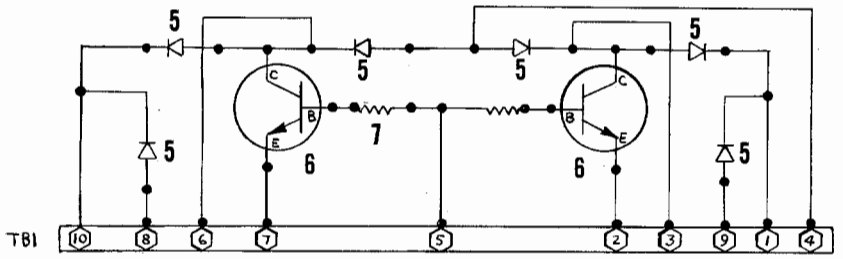

| Part Number | Nomenclature |
|---|---|
| 1. DB-25S | Receptacle |
| 2. RC-20GF151K | Resistor |
| 3. CM3535 | Potentiometer |
| 4. DA-15P | Plug |
| 5. IN5061 | Diode |
| 6. 2N3053 | Transistor |
| 7. RC20GF682K | Resistor |
| 8. RC20GF152K | Resistor |

REFER TO SHEET 5 FOR SYSTEM WIRING

F. S. 132. 00

F. S. 132. 00

LD1
LIGHT DIMMER CONTROL




AUXILIARY FUEL QUANTITY LIGHT

LD2
DIMMER CONTROL

REFER TO SHEET 7 FOR SYSTEM WIRING

Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: LIGHT DIMMER CONTROL WIRING

| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
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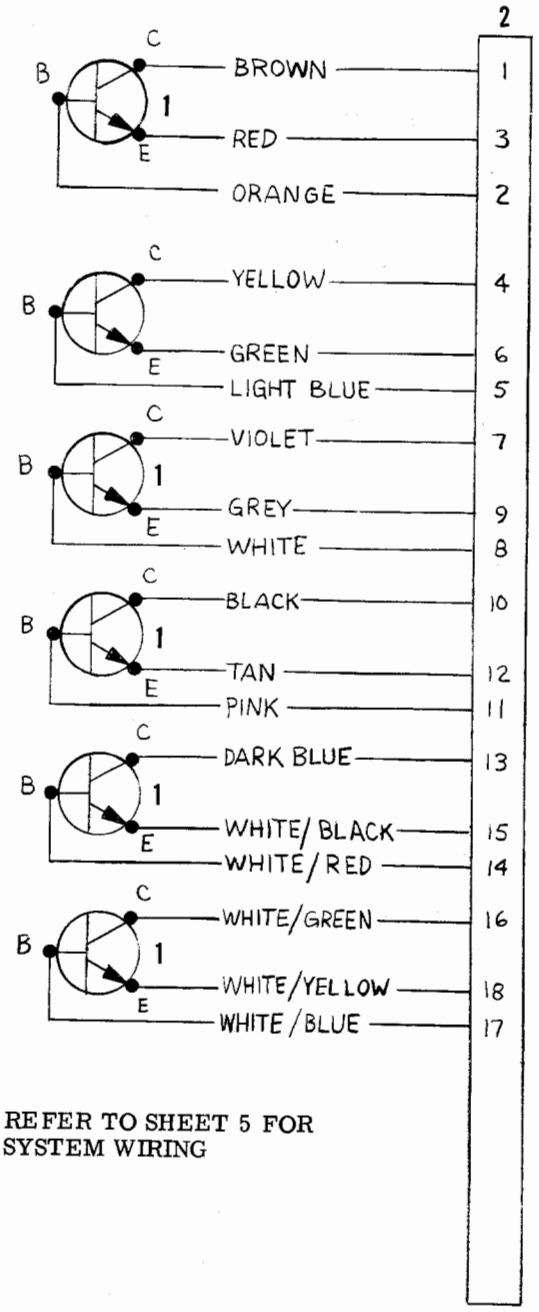


| Part Number | Nomenclature |
|---|---|
| 1. MJE3055 | Transistor |
| 2. DB-25S | Receptacle |

REFER TO SHEET 5 FOR SYSTEM WIRING

F. S. 100.00

Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: TRANSISTOR & HEAT SINK ASSEMBLY

| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5618008 |

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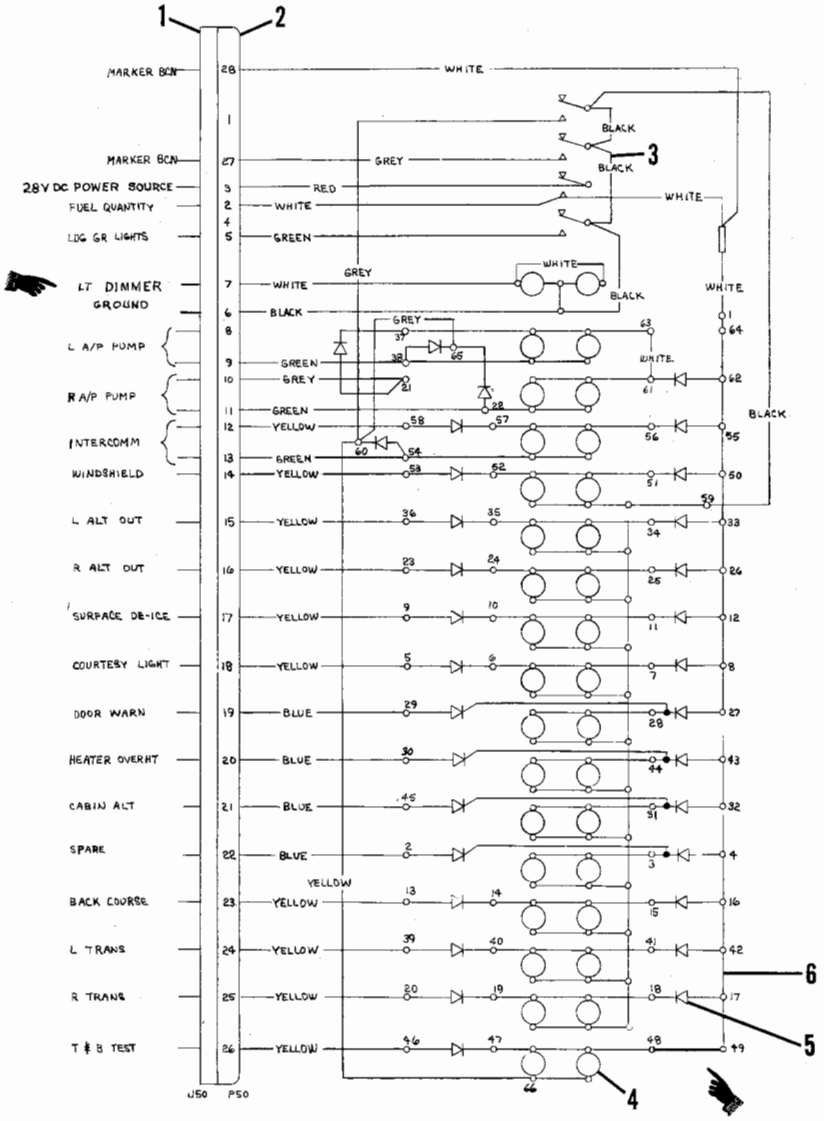
FUSELAGE
STATION
118.00

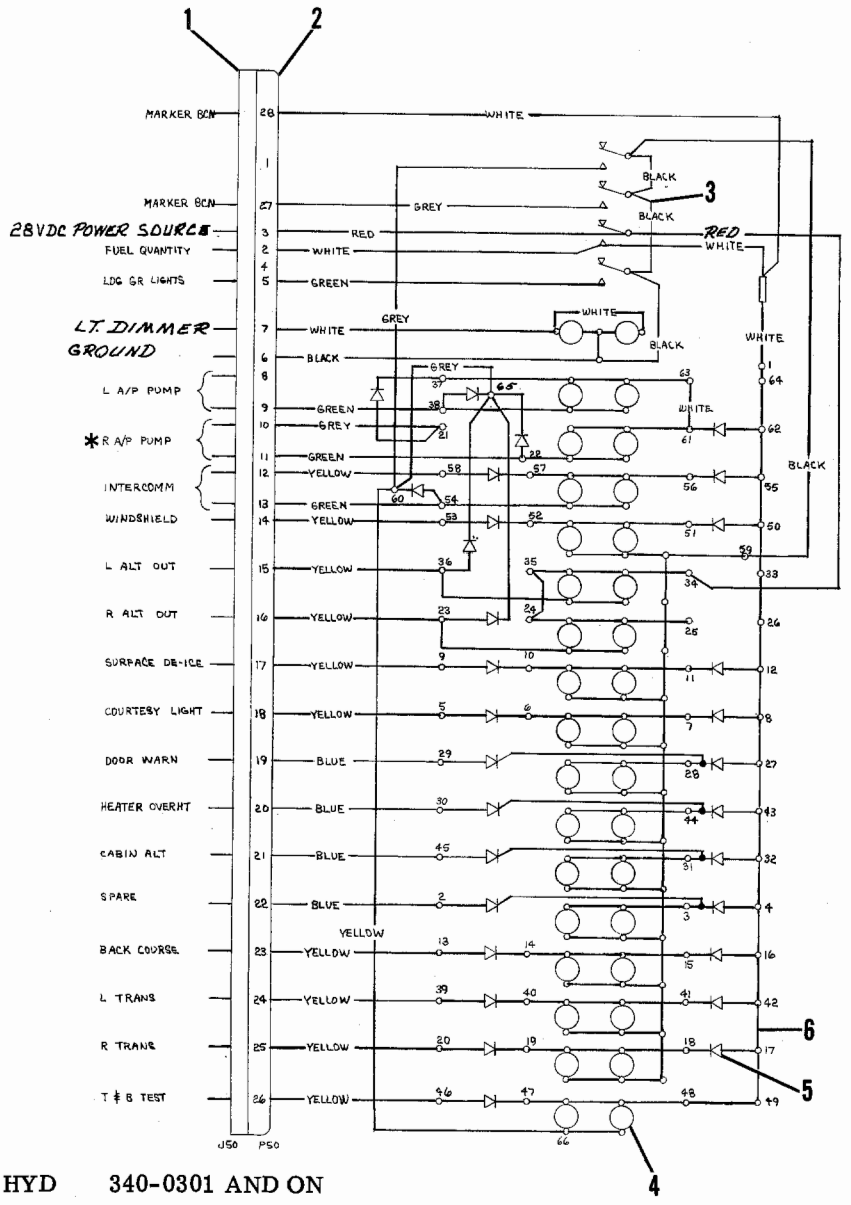



| PART NUMBER | NOMENCLATURE |
|---|---|
| 1. 17-10370 | RECEPTACLE |
| 2. 17-20370 | PLUG |
| 3. 1786-7 | SWITCH - PRESS TO TEST |
| 4. GE327 | BULB |
| 5. 1N5061 | DIODE |
| 6. 9910072-6 | CIRCUIT BOARD |

340-0001 TO 340-0151

ANNUNCIATOR INTERNAL
SCHEMATIC ONLY

| | | | |
|---|---|---|---|
| CONTRACT NO. | | Cessna. P. O. BOX 1977 WALLACE-PROSPECT PLANT WICHITA, KANSAS | |
| DATE | 3-24-69 | TITLE: ANNUNCIATOR ASSY | |
| DRAWN | K. WILKIN | | |
| GROUP | | | |
| CHECK | PPALMER | | |
| STRESS | | | |
| PROJ. | | SIZE J | CODE IDENT. NO. 71379 |
| OTHER | | DRAWING NO. 5618009 | |
| | | SCALE 2/1 | SHEET 1 OF 2 |




* A COND HYD 340-0301 AND ON

| PART NUMBER | NOMENCLATURE |
|---|---|
| 1. 17-10370 | RECEPTACLE |
| 2. 17-20370 | PLUG |
| 3. 1786-7 | SWITCH-PRESS TO TEST |
| 4. GE327 | BULB |
| 5. 1N5061 | DIODE |
| 6. 9910072-13 | CIRCUIT BOARD |

ANNUNCIATOR PANEL
SCHEMATIC ONLY

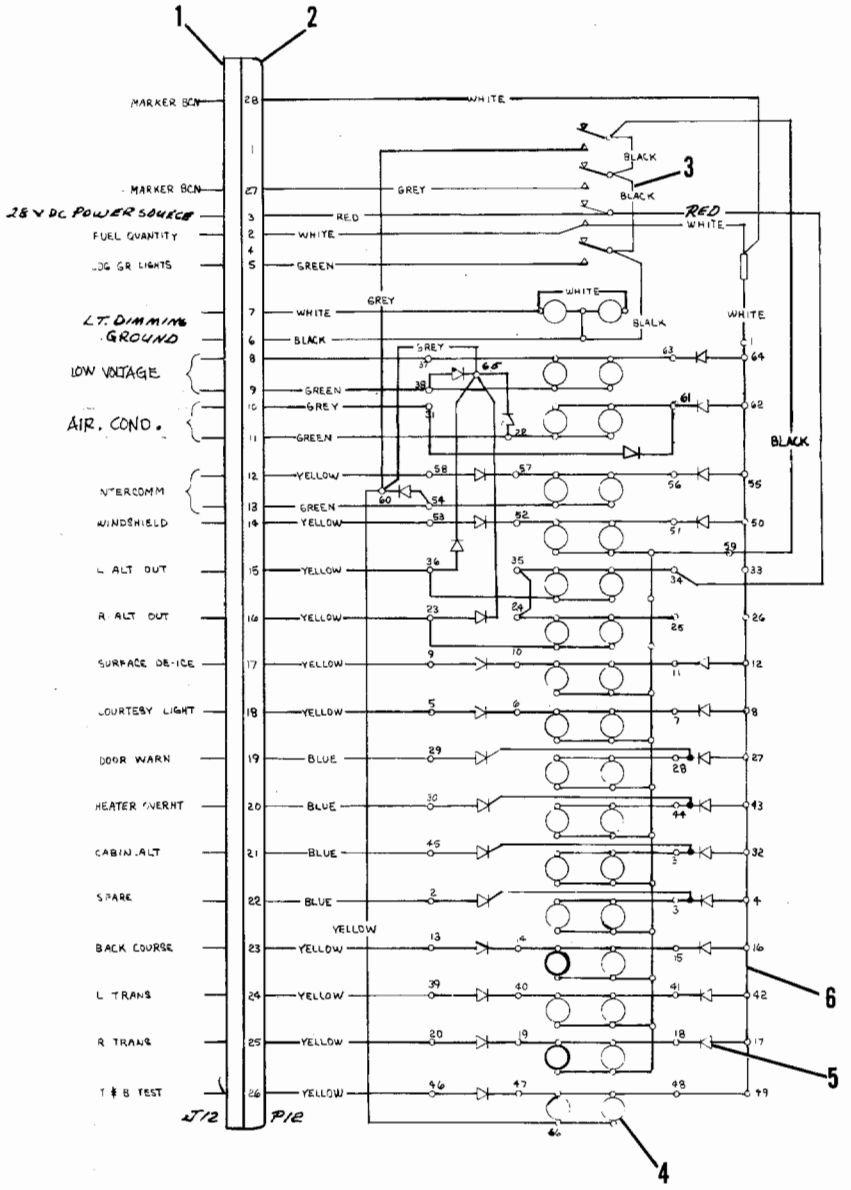
340-0151 TO 340-0501

Cessna. P. O. BOX 1977 WALLACE-PROSPECT PLANT WICHITA, KANSAS

TITLE: ANNUNCIATOR ASSY

SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5618009

SCALE: | SHEET

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| PART NUMBER | NOMENCLATURE |
|---|---|
| 1. 17-10370 | RECEPTACLE |
| 2. 17-20370 | PLUG |
| 3. SA24SDX11-1 | SWITCH-PRESS TO TEST |
| 4. GE327 | BULB |
| 5. 1N5061 | DIODE |
| 6. 9910072-13 | CIRCUIT BOARD |

ANNUNCIATOR INTERNAL SCHEMATIC ONLY

340-0501 AND ON

Cessna. P. O. BOX 1977 WALLACE-PROSPECT PLANT WICHITA, KANSAS

TITLE: ANNUNCIATOR ASSY

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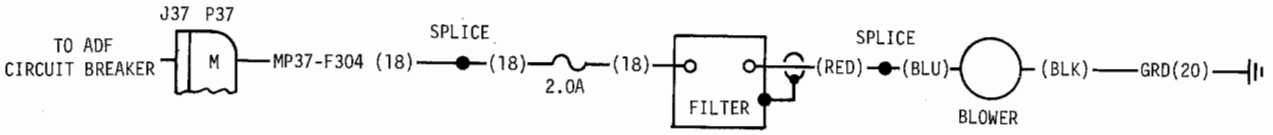
SCALE: NONE SHEET

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Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: AVIONICS COOLING BLOWER WIRING DIAGRAM

| SIZE | CODE IDENT. NO. | DRAWING NO |
|---|---|---|
| D | 71379 | 5511 2009 |

SCALE: NONE REF SHEET 1 OF 1

SECTION 15

# AVIONICS SYSTEMS

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## GENERAL DESCRIPTION.

This section contains information relative to electronic interference and troubleshooting. Wiring Diagram information is used in conjunction with the Wiring Diagram book furnished with each individual aircraft.

## ELECTRONIC INTERFERENCE.

### Radio Noise.

Radio noise is a problem of great importance to the aircraft industry. A noisy radio system may actually imperil the safety of the aircraft occupants. The performance of radio navigation equipment can be completely erroneous if radio noise is excessive. For this reason, radio installations should be made only by persons who are qualified. Radio noise is not generated in a properly operating radio set, but is merely presented to the listener in an audible form exactly the same way that a radio station is received. Many forms of noise can exist in any particular aircraft and, ironically, sometimes certain aircraft can be amazingly quiet. This condition is unusual and even though the aircraft is quiet without noise suppression, it cannot be released without proper suppression. A quiet aircraft without suppression may degenerate into a noisy aircraft with changes in age, temperature, and humidity. Common radio noise is generated by ordinary electrical devices in the aircraft such as flap or gear motors, navigation light flashers and ignition or alternator systems. By properly installing capacitive and inductive devices in these circuits, the noise can usually be reduced to a tolerable level. A more difficult type of noise to suppress, is that generated by friction between two components or by rectification. Another difficult problem is noise that is carried to sensitive areas by grounding loops. The following paragraphs contain solutions that have been effective for the factory. It is important to remember that each aircraft may present a slightly different problem and, therefore, a "fix" on one aircraft will not necessarily be effective in all cases.

### Alternator Noise.

While the alternators are relatively free from radio noise, there is the possibility of the alternators producing an audible noise in the radio and electronic systems. Inside the alternator a three phase AC voltage is applied to a full wave rectifier assembly, thus converting the AC voltage to DC. During the rectification, an AC ripple appears on top of the DC voltage, thus the bus voltage is actually fluctuating. While the battery acts as a capacitance, it is also necessary to have additional filtering. This is accomplished by the use of a capacitor from the output terminal to ground at the alternator. The use of

solid state regulators reduces the possibility of regulator noise to a minimum and will not require filtering.

Ignition Noise.

The sound of ignition noise is easily identified because of its timing. The 340 has a shielded magneto ignition system. Each secondary lead from the magneto to the plug is a shielded wire. Double shielded wiring is used in the primary circuit with a special suppressor in series with the switch lead. The suppressor is constructed coaxially with a shielded lead coming out of the end which is connected to the magneto cigarette cartridge. The double shielded wire is connected to the terminal end of the filter (the shield is grounded). The double shielded wire enters the cabin area through connectors in the wing root rib to prevent noise transfer to the junction box wiring. The double shielding is continued to the inside of the cabin to the magneto switch. The magneto switches are enclosed in a shielded case to which the double shield of the wire is grounded. If ignition noise is prevalent in the radio system, the entire magneto system should be checked for tight connections, especially in the root rib connectors and at the switch and suppressor. All ground connections in the circuit are critical and any oil or dirt accumulation should be cleaned from the connection and the metal should be brightened to provide the best possible ground. Ignition harness should be replaced if the shielding becomes questionable.

Flap and Landing Gear Motor Noise.

During a landing approach, an unfiltered motor in the flap or gear circuits can produce a startling volume of noise which is very distracting. There is also the possibility of the noise blanketing a message from the tower during the approach. It is possible that sufficient noise could be created through these circuits to blanket an ILS signal, creating a hazardous situation. For these reasons, the circuits have a filter section built into the motor. The filter should be very effective if the unit is properly grounded. If noise becomes excessive with a good grounding, a motor overhaul or replacement may be necessary.

Auxiliary Fuel Pump Noise.

Coaxial type capacitors produce effective results, when installed on the base of the fuel boost pumps. Because of the location of the fuel pump and capacitors, the connections must be kept tight to avoid any possible arcing. When proper filtering and grounding do not produce the desired filtering results, a new pump should be tried.

Lighting Circuit Noise.

All lighting components on the 340 have internal filters and usually do not require external capacity. The light wiring, however, because of its route to the extremities of the aircraft can, in unusual cases, conduct noise to vital areas. The light wires and electrical wiring bundles should be routed away from the antenna and loop antenna cables to prevent picking up noise in the radio systems. Shielding should be properly grounded.

ELECTRONIC INTERFERENCE TROUBLESHOOTING GUIDE.

The following general troubleshooting information is presented as a guide to determine the system or systems producing the interference.

a. Pinpoint the particular system causing the noise by the process of elimination.
b. Once the system causing a particular noise is isolated, investigate the particular system or systems to determine which component or components are causing the noise, by observing which components are actually operating when the noise occurs.
c. Check the component for proper operation or damage.
d. Check wiring connections and wiring coming in contact with moving parts.
e. Check wire routing for proper separation.
f. Check wire shielding where applicable.
g. Check all system grounds.

Alternator Noise.

If alternator noise is experienced and it is determined it is coming from the output of the alternator, the following troubleshooting should be accomplished before attempting additional filtering.

a. Check attenuator output bypass filter for broken leads or inadequate ground.
b. Check that lead attaching to alternator power (+) terminal is as short as possible or approximately 1 to 2 inches long.
c. Check alternator ground wire for any damage or improper contact or corrosion between terminal and grounding point.
d. Check alternator brushes for damage that could be arcing.
e. Check alternator brush tension for proper seating.

Regulator Noise.

If regulator noise is present and traced to the regulator and its associated control leads, the following checks should be made before attempting to add additional filtering.

a. Check regulator adjustment for proper setting (27.25 to 27.75 volts).
b. Check regulator noise filter for damage, loose wires, broken leads, or improper connections.
c. Check shield wire on regulator to alternator field wires for proper termination (single point

ground), shield damage, check for adequate coverage at termination ends.
d. Check alternator for brush arcing.

Electric Trim Motor Noise.

In the event of noise difficulties caused by the trim system motors the following should be checked to insure standard noise suppression equipment is properly installed.

a. Check that motor frame and actuator assembly are properly grounded.
b. Check capacitors inside of motor for broken leads or damage.
c. Check to make sure shielded wires are properly grounded at the actuator assembly and that the shields are not shorted in other areas to structure which could create noise loops.
d. If the filters are good and noise is not totally eliminated the following procedures should be attempted to eliminate the noise.
1. Change $C_1$ to .05 microfarad.
2. Add a 1.0 microfarad feed-thru capacitor with shielded lead to (+) lead of the side producing the noise. Attach the housing or capacitance ground to the actuator housing assembly.
3. Make sure shielding wire and motor frame are making good ground.
4. If the motor is noisy in both directions of rotation add a 1.0 microfarad feed-thru capacitor to both leads and insure that shield and housing or capacitor ground are attached to the actuator housing assembly.
5. The addition of larger capacitors, inductors or RF chokes is not recommended; experience has proven no significant change in additional filtering.

Fuel Boost and Auxiliary Transfer Pump Noise.

If boost pump noise is experienced in the audio system, check for the following:

a. Insure that wiring is properly shielded.
b. Insure shields are properly grounded.
c. Check loose wiring connections for looseness and breaks.

NOTE

If the cause of the noise cannot be eliminated, a .47 microfarad 50 WV feed-thru capacitor should be installed in the power (AX) lead as close to the pump as possible and insure the case of the capacitor is properly grounded to the airframe.

Tip Tank Transfer Pump Noise.

If the tip tank transfer pump is causing noise in the audio system, check the following:

a. Check capacitor case ground.
b. Check capacitor for damage, open circuit, short circuit, loose wiring and damaged shielding.
c. Substitute a capacitor of the same value known to be good in place of the original capacitor.

Rotating Beacon Noise.

If the rotating beacons are causing noise in the audio system, the following should be checked:

a. External light for proper ground to frame or structure of aircraft.
b. Lamp circuit for loose connections and wiring.
c. Bulb for loose socket.
d. Internal filter for damage.
e. Internal filter for proper ground.

Strobe Light Noise.

If the strobe lights are causing noise in the audio system from radiation or in-line interference, the following should be checked:

a. Make sure all power supply units are grounded properly to the airframe.
b. Insure the shielded wires and twisted pairs from the tail light are grounded.

NOTE

Grounds must be terminated at the power supply.

c. Insure tail Nav light is adequately grounded.

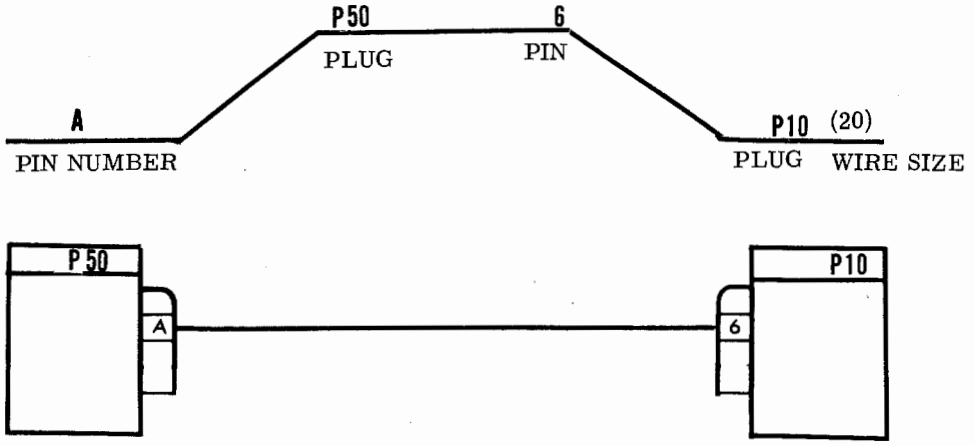
NOTE

If it is determined the noise is being radiated from the tail light, flash tube, the interference can be minimized by installing a strip of aluminum metalized tape on top of the existing white stripe painted on the glass and insuring the aluminum strip is grounded to the metal case of the light assembly.

WIRING CODE.

Wiring Diagrams contained in applicable aircraft wiring diagram book clearly show the complete wiring of each avionics system. The first segment of the wire number is the pin number, the second is the plug number followed by pin number and plug number of the opposite end of the wire. The last digit of the wire number is the wire size.

Example: AP50-6P10(20)




This coding provides a convenient way of identifying wires when installing new wiring or servicing existing wires. Some cabling is supplied by vendors of the electronics equipment and do not carry Cessna identification. The diagrams covering such wiring may refer to the instruction manuals of such equipment where a more complete wiring diagram may be found. The wiring code used by Cessna on the 340 is shown above.

AVIONICS MASTER SWITCHES AND CIRCUIT BREAKER.

Two avionics master switches are provided with factory-installed Avionics. Power is supplied from the battery, through a circuit breaker, located in the left wing outboard of the engine nacelle, to the AVIONICS MASTER switch breaker, located on the upper forward section of the side panel and on to avionics bus. The ALTERNATE AVIONICS power switch breaker located on the lower section of the side panel provides, backup power in the event the circuit breaker, switch breaker or their associated wiring and battery circuits become inoperative.

Access to the avionics circuit breaker is gained by removing access plate (46), figure 1-3.

AVIONICS COOLING BLOWER.

An optional avionics cooling blower, if installed, is located in the control pedestal. The blower system consists of a blower, filter, fuse holder, fuse and electrical wiring. The blower is utilized to cool the avionics equipment mounted on the radio panel of the instrument panel.

Removal of Avionics Cooling Blower. (See figure 15-1.)

a. Ensure electrical power is OFF.
b. Remove access panel (2) from control pedestal (1).
c. Identify and disconnect blower ground wire (black) from structure; disconnect blower wire (blue) at splice.
d. Remove blower (7) from bracket (4) by removing clamp (6).

Installation of Avionics Cooling Blower. (See figure 15-1.)

a. Position clamp on blower and secure clamp to bracket with bolts, washers and nuts.

NOTE

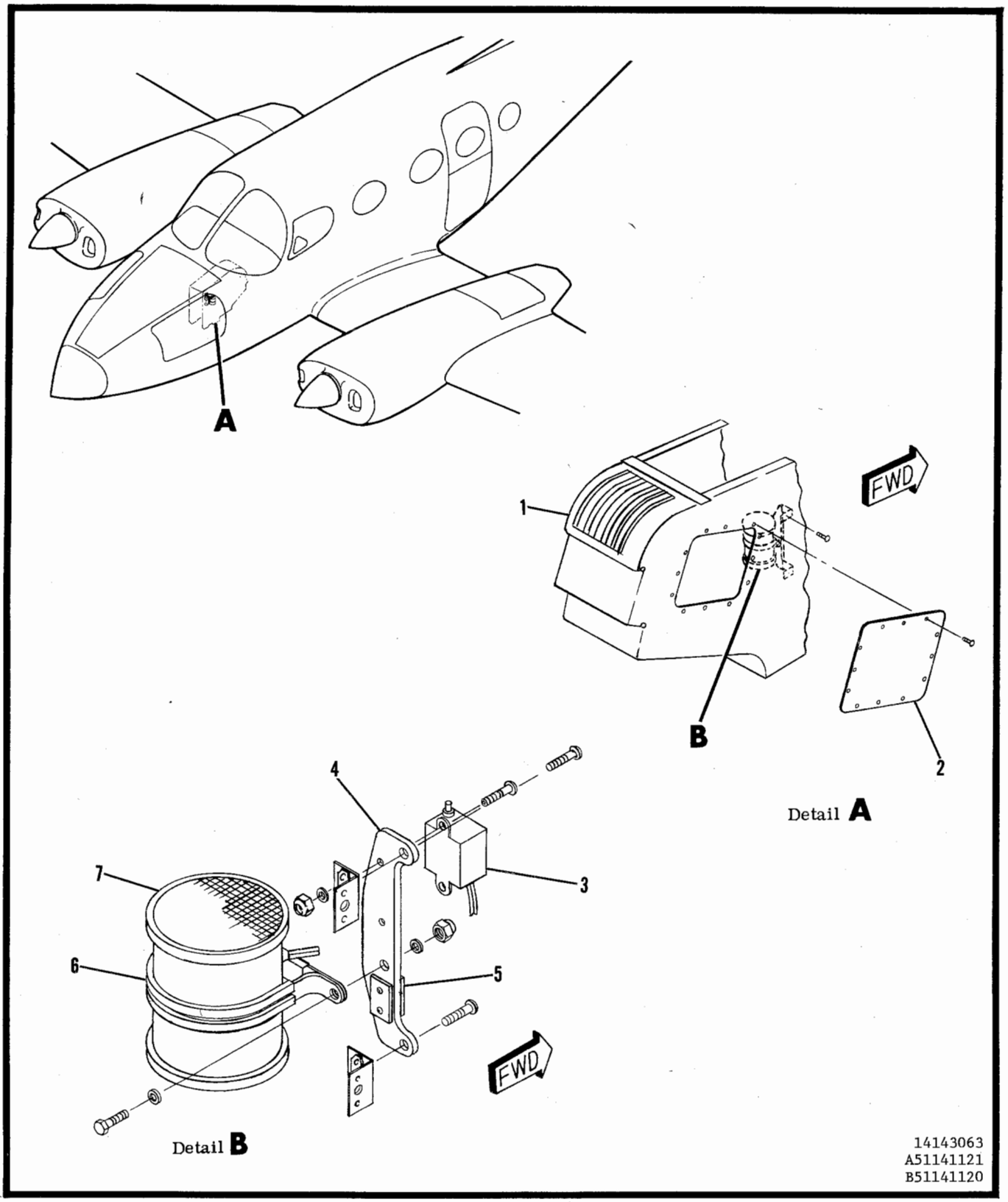
Clamp is to be positioned against stop block (5). Install blower with flow arrow pointing up.

b. Identify and connect electrical wires of blower.

NOTE

Ensure ground wire is properly grounded.

c. Conduct operational check to ensure proper directional flow of air.
d. Install access panel of control pedestal.




1. Control Pedestal
2. Access Panel
3. Filter
4. Bracket
5. Stop Block
6. Clamp
7. Blower

Figure 15-1. Avionics Cooling Blower

SECTION 16

# STRUCTURAL REPAIR

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## GENERAL.

### Type of Construction.

The 340 is an all metal aircraft of semimonocoque type construction with the skin carrying a portion of all structural loads. The fuselage is comprised of a nose section, cabin section and a tailcone. It is constructed of formed bulkhead rings, stringers, and stiffeners all of which are riveted to the external skin. The wing, horizontal stabilizer, and vertical fin are built up around two main spars, with ribs, formers, and riveted skin forming the basic structure. Torsional stiffness of this structure is afforded by the skin closure of areas between the spars forming enclosed "boxes." Each movable surface consists of a hinge support spar with ribs, formers, and riveted outer covering skin.

### Ground Handling.

Leveling, jacking, and other ground handling details are covered in Section 2.

### Investigation of Damage.

After a thorough cleaning of the damaged area, all structural parts should be carefully examined to determine the extent of damage. Frequently the force causing the initial damage is transmitted from one member to the next, causing strains and distortion. Abnormal stresses incurred by shock or impact forces on a rib, bulkhead, or similar structure may be transmitted to the extremity of the structural member, resulting in secondary damage such as sheared or stretched rivets, elongated bolt holes, canned skin plate or bulkheads. Points of attachment should be examined particularly for distortion and security of fastenings in the primary and secondary damage areas.

### Definition of Damage.

Structural damage to the aircraft is divided into the following classifications:

a. Negligible damage shall be considered damage that will not affect the airworthiness of the aircraft

and can be permitted to exist as is or can be corrected with a simple repair such as removing dents, burnishing scratches, and stop drilling cracks in non-structural parts.

b. Damage repairable by patching will be considered damage that may be repaired by covering or reinforcing a portion of the aircraft.

c. Damage repairable by insertion will be considered damage requiring replacement of a section with the correct repair material.

d. Damage necessitating replacement of parts will be considered as damage not repairable by patching or insertion, but that may be repaired by installing a new or reconditioned part. If a part or area of an assembly is damaged to the extent that it requires replacement and a replacement cannot be made because of tooling or jig requirements the entire assembly must be replaced.

Preparing Damaged Area for Repairs.

To prepare an area for repair, examine and classify the damage. Make a thorough check before beginning repairs. In some cases a damaged part may be classified as needing replacement when after removal, closer inspection indicates the part may be repaired. Take more time for the damage estimate and save man-hours on repairs. To prepare a damaged area for patch or inserting repairs:

a. Remove all ragged edges, dents, tears, cracks, punctures, and similar damages.

b. Leave edges, after removal of damaged area, parallel to any square or rectangular edges of the unit.

c. Round all square corners.

d. Smooth out abrasions and dents.

e. Brush Iridite all rough edges and scratches with a solution of Iridite mixed in a ratio of 1 ounce of Iridite to 1 gallon of water and rinse thoroughly.

NOTE

Damage adjacent to a previous repair requires removal of the old repair and inclusion of the entire area in the new repair.

Control Surface Rebalancing Data.

The control surfaces of the aircraft have been 100% statically balanced. After each repair or painting of the control surfaces, they must be rebalanced. Correct balance is restored by the addition or removal of lead ballast weights in the counterbalance sections of the surfaces (see figure 16-4).

WING.

The wings are all metal, full cantilever, semimonocoque type construction, utilizing two main spars. Each wing consists of a wing panel, aileron, flaps, engine nacelle, wing tanks, wing tip fuel tank, and main landing gear. The landing gear is attached to and retracts into the wing.

Access Openings.

Access openings with removable cover plates are located in the underside of the wing between the root rib and the tip section. These openings afford access to the aileron bellcranks, flap bellcranks, electrical wiring, pulleys, cables, and inspection of internal structure. When work is done on the trailing edge wing structure in the flap area, partial access can be provided by lowering the flaps. Outboard of this area, the trailing edge wing structure can be made available for repair by removing the aileron.

Wing Skin.

All wing, aileron, and flap skin thickness and temper are listed in figure 16-13.

a. Negligible Damage:

Any smooth dents in the wing skin that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair.

b. Repairable Damage:

Skin damage ahead of the front spar and also where the optimum in appearance is desired, should be repaired by the insertion method. Typical insertion repairs are illustrated in figure 16-29. Skin damage aft of the front spar which exceeds the negligible damage limit but is not extensive enough to necessitate replacement of a skin panel can be repaired by patching. Typical wing repairs are illustrated in the back of the section.

c. Damage Necessitating Replacement of Parts:

In case the skin is extensively damaged, repairs should be made by replacing an entire sheet panel from one structural member to the next. The repair seams should be made to lie along stiffening members, or bulkheads, and each seam should be made exactly the same in regard to rivet size, spacing, and rivet pattern as the manufactured seam at the edges of the original sheet. If the two manufactured seams are different, the stronger one should be copied.

Wing Ribs.

All ribs except those exposed to the wheel well contain flanged lightening holes. Flanged upper and lower edges of all ribs serve as cap-strips in addition to providing rigidity to the rib. The skin riveted

directly to each rib flange provides the cellular strength for each successive rib bay. The nose, center, and trailing edge rib segments are riveted together through the front and rear spars to form the basic airfoil sections. Spanwise extruded stringers stiffen the skin between ribs.

a. Negligible Damage:

Any smooth dents in the wing rib that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair.

b. Repairable Damage:

Repairs for wing rib webs and flanges are shown in figures 16-36 and 16-37. Before repairing is attempted, all cracks or deep scratches must be stop-drilled with a 3/32 inch drill, and all sharp corners and ragged edges must be trimmed and deburred.

c. Damage Necessitating Replacement of Parts:

Parts such as stiffeners, small ribs, clips, and brackets should be replaced if their damage exceeds that specified as negligible. These parts due to their size, are usually impractical to repair. In many instances, the time required to replace the damaged part may be considerable less than the time required to repair it. This should be considered carefully prior to making any repair whether it be only a small part or a complete component.

Flaps and Ailerons.

a. Negligible Damage:

Minor skin dents and nicks are considered negligible and can be worked out by burnishing.

b. Repairable Damage:

Skin damage exceeding that considered negligible damage can be repaired by patching. Typical skin repairs are illustrated in the back of the section.

c. Damage Necessitating Replacement of Parts:

Warped and cracked skin, ribs, hinge brackets and torque tubes are replaceable items. Any damage that covers more than half of the unit will require replacement of the entire unit.

Wing Spars.

Repair of spar damage affecting the alignment of the wing spar should not be attempted in the field. Permissible spar repairs are illustrated in the back of the section.

TAIL GROUP.

The all metal group is a full cantilever design, consisting of the conventional arrangement of vertical fin and rudder, horizontal stabilizer and elevators. The right elevator and rudder both contain flight adjustable trim tabs, actuated by a system of cables and pulleys controlled from the pilot's tab control wheels.

Vertical Fin and Dorsal Group.

The vertical fin and dorsal area are constructed jointly to form a single unit. Basically the unit consists of formed sheet metal spars and ribs to which the outer skin is attached. The front spar is reinforced at its root end and drilled to facilitate the installation of two attachment bolts. Stiffness to the entire fin and dorsal assembly is provided by the attachment of the skins and the forward leading edge skin.

a. Negligible Damage:

Any smooth dents in the vertical fin and dorsal group skin that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair.

b. Repairable Damage:

Repair of the skins, ribs, and spars can be accomplished as illustrated in the back of the section. Access to the internal fin structure is best gained by removing the skin attaching rivets on one side of the rear spar and springing back the skin.

c. Damage Necessitating Replacement of Parts:

Extrusion, hinge brackets, and small ribs should be replaced rather than repaired. In general, where parts are available, the easiest and most satisfactory repairs can be accomplished by replacing the damaged parts.

Rudder.

a. Negligible Damage:

Minor skin dents and nicks are considered negligible and will be worked out by burnishing.

b. Repairable Damage:

Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in the back of the section.

c. Damage Necessitating Replacement of Parts:

Warped and cracked skin, ribs, hinge brackets, and torque tubes are replaceable items. Any damage that covers more than half of the rudder will require replacement of the rudder.

Horizontal Stabilizer.

a. Negligible Damage:

Any smooth dents in the horizontal stabilizer skin that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair.

b. Repairable Damage:

Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in the back of the section. Repairing or splicing of horizontal stabilizer spar caps is not recommended. Access to the internal stabilizer structure may be gained by removing a portion of the rivets along the rear spar and ribs and springing back the skin. By using the proper bucking bars through holes in spar web, the skins may be closed with a minimum of blind rivets.

c. Damage Necessitating Replacement of Parts:

Extrusions, hinge brackets, stabilizer tab, spar and ribs should be replaced rather than repaired. In general, where parts are available, the easiest and most satisfactory repairs can be accomplished by replacing the damaged parts.

Elevators.

a. Negligible Damage:

Any smooth dents in the elevator skin that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair. The exception to negligible damage on the elevator surfaces is the front spar, a crack appearing in the web of the hinge fittings or in the tip rib which supports the overhanging balance weight is not considered negligible. Cracks in the overhanging tip rib, in the area at the front spar intersection with the web of the rib, also cannot be considered negligible.

b. Repairable Damage:

Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in the back of the section.

c. Damage Necessitating Replacement of Parts:

Warped and cracked skin, ribs, hinge brackets, and torque tubes are replaceable items. Any damage that covers more than half of the elevator will require replacement of the elevators.

FUSELAGE.

The fuselage is of semimonocoque construction consisting of formed bulkhead, longitudinal stringers, reinforcing channels, and skin platings. The fuselage nose section consists of the fuselage structure from the nose to fuselage station (FS) 100.00. The cabin section consists of the fuselage structure from FS 100.00 to FS 252.00. The tail section consists of the structure from FS 252.00 to FS 383.00. Formed bulkheads, channels, and extrusions constitute frame members of the cabin area. The cabin section is pressurized to the skin from FS 100.00 to FS 252.00. Drilling or any type of repairs of the pressurized cabin should be accomplished in a manner that will not change structural integrity or pressurization capabilities of the aircraft. The following instructions should be followed in repairing the cabin section:

1. Skin patches should be of same gage as the original skin. Back up doublers should be of the next heavier gage material.
2. All lap joints and skin patches should have two rows of rivets staggered. Spacing not to exceed 0.75".
3. Fay seal doublers and patches in accordance with sealing procedures of section to preserve pressurization requirements.
4. All repair parts must be free of metal chips, burrs or scratches.
5. Rivets used should be the same type and size as used in the original structure.
6. Do not countersink deeper than 75% of the material thickness.
7. The forward cabin pressure bulkhead at FS 100.00 and aft cabin pressure bulkhead at FS 252.00 are fabricated of honeycomb material. Standard repairs may be made using honeycomb material of same gage or original part for insert patches and 0.050 2024-T3 backup doublers.

a. Negligible Damage:

Any smooth dents in the fuselage skin that are free

from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage.

b. Repairable Damage:

Mild wrinkles occuring in the upper or lower skin panels in the bay forward of the horizontal stabilizers and which extend through the corners (shoulder areas) may be repaired by the addition of a stringer. A wrinkle, which is hand removable, should be reinforced by a 1/2 x 1/2 0.050 inch 2024-T42 extruded angle. The angle should be inserted fore and aft across the center of the wrinkle and should extend to within 1/16 to 1/8 inch of the fuselage bulkheads comprising the ends of the bay. If the wrinkles cannot be removed by hand, the damaged area should be repaired. Typical methods of repair of skins, bulkheads, stringers and channels are given in the back of this section. Before repairing is attempted, all cracks or deep scratches must be stop drilled with a #30 drill and all sharp corners and ragged edges must be trimmed and deburred.

c. Damage Necessitating Replacement of Parts:

All forgings and castings of any material and structural parts made of steel must be replaced if damaged. Structural members of a complicated nature that have been distorted or wrenched should be replaced. Major skin damage should be repaired by replacing the entire damaged sheet.

NOTE

When replacing entire skin panels, duplication of the forward edge on the original sheet is required. In effect, this flange is a structural member, carrying specific loads across the open areas.

BULKHEADS.

Bulkheads are composed of formed "U" channel sections. The principle material of construction is 2024-O alclad aluminum alloy, which after forming is heat treated to a 2024-T42 condition. All bulkheads in the fuselage are of the formed sheet metal or the reinforced formed sheet metal type.

a. Cracked Bulkhead Webs or Flanges:

Acceptable methods of repairing various types of cracks occuring in service are shown in the back of the section. Small holes (3/32-inch) should be drilled at extreme ends of the cracks to prevent further spreading. Reinforcement should be added to carry the stresses across the damaged portion and stiffen the joints. The condition causing such cracks to develop at a particular point may be stress concentration at that point, in conjunction with a repetion of stress (such as produced by vibration of the structure).

NOTE

An increase in sheet thickness alone is usually beneficial but does not necessarily remedy the conditions leading to cracking. Patch type repairs are generally employed and are usually satisfactory in restoring the original material strength characteristics.

b. Severely Bent, Kinked, or Torn Channels:

If practical, severely bent, kinked, or torn portions of bulkhead should be removed and a replacement section installed and joined at the original splice joint. If this is not justified, cutting away the damaged portion and inserting a trimmed portion of the original section, adequately reinforced by splice plates or doublers, will prove satisfactory. This is known as an insertion type repair.

LANDING GEAR.

The main gears are carried by the wings and are housed within the wing wheel wells when retracted. The nose gear retracts into the fuselage nose wheel well. Doors covering the wells are regarded as parts of the landing gear assemblies but the wells are structural features of the wings and fuselage.

a. Repairs of Landing Gear.

The landing gear assemblies are composed of parts that are not regarded as repairable. Minor repairs are permissible on the doors but when they are reinstalled there must be no distortion that will prevent perfect operation.

FIBERGLASS PARTS.

The nose cone, empennage tips, fairings, heat ducts, and other parts of the aircraft are made of fiberglass.

NOTE

Repair to the radome is not recommended. Due to the design and physical properties a radome will have certain electrical thickness for a certain narrow range of operating frequencies. This is the reason C-band radomes will not give optimum performance with X-band radar and vice versa.

a. Repairable Damage:

Damaged fiberglass parts may be repaired by the methods shown in figure 16-2. Cut and trim the area just beyond the noticeable damage. If the parts are painted, remove paint and sand clear an area at least two inches beyond the edge of the cutout. Prepare the necessary size and number of patches of glass cloth. Mix a sufficient amount of resin in accordance with the manufacturer's instructions.

WARNING

Always follow the manufacturer's mixing instructions carefully as the mixing of peroxide and cobalt together will result in a spontaneous fire.

Be sure that your hands are free from oil, grease and dirt. Apply an even coat of resin on the sanded area. Impregnate all the glass cloth patches by laying them on a clear paper and working the resin through the fabric with a small brush. Place the larger patch over the cutout area, working out all air bubbles and wrinkles. If the cutout is large enough to cause the patch to sag, place a suitable support behind the repair area. Coat the support with automobile wax or wax paper to prevent the resin from adhering to the support. Apply the second patch over the first patch etc., working out all wrinkles and air bubbles. After all the patches have been applied, brush the area with an even coat of resin and allow to cure. Smooth the patch area with fine sandpaper until the desired finish is obtained. Repaint the finished area with matching paint.

b. Damage Necessitating Replacement of Parts:

When the fiberglass parts are torn or cracked over a large area or show signs of rigidity through the use of too much pressure on the surface, then the parts should be removed and replaced.

ENGINE NACELLE.

The engine nacelle group, located in each wing, is composed of the semicantilever bed-type mount, the stainless steel firewall, and the cowling group. The engine mount structure is made of .063 inch 2024-T4 aluminum and 4130 cad-plated steel. The cowling is made up of three sections; the upper, the lower which includes the left and right access doors, and the two piece nose section which fastens in the center of the cowling. All sections fasten in place with Camloc quick fasteners. The nacelle firewall is made up of stainless steel sheet with a clad aluminum angle riveted around its contour.

a. Negligible Damage.

Minor dents in the firewall and cowling, is straightened, may be classified as negligible damage. Scratches and dents should be burnished out.

Engine Firewall.

a. Repair of Stainless Steel Firewall:

The firewall may be repaired by using the clear of structure-type patch, as shown in figure 16-43 of this section, providing the patch is of the same thickness as the firewall and monel rivets are used. Maximum diameter on holes that can be patched is 2 inches. The holes should be routed and repaired in accordance with figure 16-43. Cracks should be stop drilled and repaired in accordance with figure 16-43. Parts having cracks extending to the edge of the part must be replaced. Maximum allowable length of cracks to be repaired is 3 inches.

Engine Firewall Sealing.

The engine firewall should be sealed with Pro-Seal #700 (Coast Pro-Seal Company) using the following procedures:

a. Clean area on surface to be sealed with solvent.
b. Mix 1 part of Pro-Seal #700 curing agent with 100 parts of Pro-Seal #700 sealant.

NOTE

Sealant should be mixed by weight. It is important that accelerator be completely and uniformly dispersed throughout the base compound.

c. Using a spatula, caulking gun, or flow gun, apply a fillet of sealer along cracks, seams, joints and rows of rivets.

NOTE

If the sealing is done before the parts are mated, use enough sealing compound to completely fill the joint and wipe away the excess after parts are mated.

NOTE

If the sealant is applied with a brush or a brush flow gun, more than one coat of sealant will be necessary on very porous material. The sealant should be allowed to air dry 10 minutes between coats.

d. Pro-Seal #700 is the only sealant authorized for the stainless steel firewall. If sealant other than Pro-Seal #700 has been used it should be removed from the firewall and resealed using only the recommended sealant.

Engine Mounts.

Replacement of mount is the only recommended procedure.

Repair of Engine Cowling.

Skins, if damaged extensively, should be replaced with a section of original manufacture. Small damaged areas should be reinforced with a doubler installed on the inner side. Material selected should be of the same thickness and characteristics as the original part.

Repair of Cowling Reinforcement.

Cowl reinforcements, if damaged, should be replaced. Due to their small size and complex angles they are easier to replace than to repair.

Repair Procedures for Bonded Honeycomb Engine Cowls. (See figure 16-3.)

a. The Model 340 engine cowling is fabricated using a sandwich type honeycomb construction. Sometime during the life of the aircraft, damage may occur to the skin and/or honeycomb which will require repairs. In the event damage does occur, the following repair procedures have been developed with the objective of equaling, as nearly as possible, the strength of the original part with a minimum loss of aerodynamic characteristics, electrical properties and minimize increase in overall weight.

b. Damages to sandwich honeycomb construction are divided into classes according to severity and possible effect upon the airframe structure. Damage classifications are as follows:

Class 1. Dents, scars, scratches, cracks, etc., in the facings not accomplished by a puncture or a fracture.

Class 2. Punctures or fractures on one facing only, possibly accompanied by damage to the honeycomb core but without damage to the opposite facing.

Class 3. Holes or damage extending completely through the sandwich, affecting both facings and the core.

Class 4. Adhesive voids between skin and honeycomb core.

WARNING

Solvents used must be stored in, transported in, and used from safety containers. Adequate ventilation must be provided in storage and usage areas. The solvents specified are flammable and cuation to prevent fires must be taken. No smoking, sparks or open flames shall be permitted in the immediate area where the solvents are being used. Storage and usage areas shall be free from excessive heat, sparks, and open flames when possible and practical, rubber gloves shall be worn when performing solvent operations.

c. Repair of Class 1 damage shall be as follows:

1. Class 1 damage resulting in a hole not exceeding 1-1/2 inches diameter, dents, scratches or scars of 0.030 inch deep shall be repaired as follows:

(a) Remove paint to bare metal using either 400 or 600 grit wet sandpaper.
(b) Mask area adjacent to sanded area.
(c) Mix thoroughly equal portions, by volume, of Epon 828 and Versamid 125. Add aluminum powder until a thich non-flowing paste is obtained.

NOTE

Prepare only that quantity of material that will be used in 30 minutes.

(d) Fill damaged area with mix and smooth with a putty knife or spatula.
(e) Allow the mix to cure at room temperature until hard (approximately 4 hours).
(f) Wet sand the repaired area with 400 grit wet sandpaper until smooth.
(g) Clean the repaired area with a clean cloth moistened with Isopropyl Alcohol, Naphtha or Toluene. Allow to air dry.
(h) Brush a minimum of two coats of Zinc Chromate primer over the repaired area, allowing each coat to dry.
(i) Refer to Section 2, and paint in accordance with applicable finish specifications.

2. Class 1 damage resulting in cracks shall be repaired as follows:

(a) Stop drill crack at both ends with 3/16 inch diameter holes.
(b) Prepare a circular external patch, which will extend one inch beyond damage area, from 0.012 or 0.015 aluminum.
(c) Remove all paint and primer around damage area by sanding with 400 or 600 grit wet sandpaper.

NOTE

Sanded area must be approximately 1/2 inch wider than aluminum patch.

(d) Lightly sand entire damage area with 400 grit sandpaper until a satin finish is obtained. Mask off around damage area.
(e) Wipe damage area with a clean cloth moistened with Isopropyl Alcohol, Naphtha or Toluene. Wipe dry with a clean cloth.
(f) Mix thoroughly 100 parts (by weight) Epon VIII Adhesive with 6 parts (by weight) of curing agent "A."

NOTE

Prepare only that quantity of material that will be used in two hours.

(g) Work some of the adhesive in the crack and drilled holes. Apply a thin film over sanded surface.
(h) Prepare a one-ply No. 191 glass cloth or similar scrim cloth 1/8 inch wider than aluminum patch.
(i) Apply a thin film of the adhesive on the aluminum patch and assemble cloth between patch and damaged assembly and apply sufficient pressure to assure intimate contact.
(j) Using mylar or cellophane over aluminum patch, place a clamping device on patch to insure complete contact of all bonding surfaces.
(k) Remove excess adhesive with a clean cloth dampened with Naphtha or Toluene.
(l) Cure at 150° to 200° F using heat lamps or oven.
(m) Remove clamps, pressure pads, etc., and sand away remaining excessive adhesive.

(n) Brush a minimum of two coats of Zinc Chromate primer over the repaired area, allowing each coat to dry.
(o) Refer to Section 2, and paint in accordance with applicable finish specifications.

d. Repair of Class 2 damage shall be as follows:

1. Class 2 damage to upper cowl resulting in damages that extend completely through the aluminum outer skin and into the aluminum honeycomb core but without damage to the inner skin:

(a) Carefully trim out skin to a circular or oval shape with a hole saw or fly cutter removing honeycomb core completely to the opposite skin.

CAUTION

Extreme care should be taken not to damage the inner skin.

(b) Remove completely all the damaged honeycomb core.
(c) Prepare either an aluminum honeycomb core or balsa wood replacement plug as follows:
(1) If balsa wood is used, fabricate plug so that the grain will be perpendicular to the skins.
(2) Lightly sand balsa plug with 400 grit sandpaper and wipe off dust with a clean cloth.

NOTE

Do not touch the bare surface with bare hands after sanding. If the balsa wood is cut too short, the distance between shall be shimmed up until intimate contact is made with all surfaces.

(3) Wrap balsa plug in clean waxed paper until ready for use.
(4) When aluminum honeycomb plug is used, the core shall be the approximate density of the original core.
(5) Cut aluminum honeycomb plug so that the top edge will be even with the adjacent skins and completely fills the damaged area.
(d) Remove all paint and primer (approximately 1-1/2 inches larger in diameter than cutout) from around damage area with either 400 or 600 grit wet sandpaper.
(e) Mask around sanded area and cutout area.
(f) Mix thoroughly 100 parts (by weight) Epon VIII adhesive with 6 parts (by weight) of curing agent "A."

NOTE

Prepare only that quantity of material that can be used in two hours.

(g) If balsa plug is being used, spread the adhesive lightly over all surfaces. If aluminum plug is being used, brush or trowel adhesive on the internal side of the existing skin and where the plug will make contact with core.
(h) Position balsa wood or aluminum plug into place.
(i) Prepare a circular external patch, which will be one inch larger than plug hole, from 0.012 or 0.015 aluminum.
(j) Prepare a one-ply circular No. 191 glass cloth or similar scrim cloth 1/8 inch larger than plug hole.
(k) Apply a thin film of adhesive over sanded surfaces and place the No. 191 glass cloth or similar cloth over the plug.
(l) Clean the bond surface of aluminum patch and coat with adhesive.
(m) Assemble patch over glass cloth and plug and apply sufficient pressure to assure intimate contact.

NOTE

Care should be taken to insure that plug and glass cloth remain in place.

(n) Using mylar or cellophane over aluminum patch, place a clamping device on patch to insure complete contact of all bonding surfaces.
(o) Remove excessive adhesive with a clean cloth moistened with Naphtha or Toluene.
(p) Cure at 150° to 200° F using heat lamps or oven.
(q) Remove clamps, pressure pads, etc., and sand away remaining excessive adhesive.
(r) Brush a minimum of two coats of Zinc Chromate primer over the repaired area, allowing each coat to dry.
(s) Refer to Section 2, and paint in accordance with applicable finish specifications.

2. Class 2 damage to upper cowl resulting in damage which extends completely through the fiberglass inner skin and into aluminum honeycomb core but without damage to the outer aluminum skin.

(a) Carefully trim out skin to a circular or oval shape with a hole saw or fly cutter removing aluminum honeycomb core completely to opposite skin.
(b) Prepare a balsa wood or aluminum honeycomb plug as stated in step 1. (c) above.
(c) Sand undamaged fiberglass skin lightly approximately 2 inches out from around the hole.

CAUTION

Do not sand through fiberglass skin.

(d) Prepare two No. 181 glass fabric patches, 1/8 inch larger than hole diameter.
(e) Mix thoroughly 100 parts (by weight) Epon 828 and 10 parts (by weight) Diethlenetriamine (DTA).
(f) Coat plugs with Epon 828 and DTA mix as described in step 1. (g).
(g) Impregnate the two No. 181 glass patches with mixture to the content of approximately 50% and assemble patches over plug.

NOTE

Smooth out all wrinkles.

(h) Prepare one No. 181 glass fabric patch large enough to cover sanded area and impregnate with mixture.
(i) Assemble third patch over the two previous layers and remove all wrinkles as before.
(j) Using mylar or cellophane, cover patches and apply a clamping device.
(k) Cure assembly at 150° to 200° F for approximately 90 minutes.
(l) Remove clamps, pressure pads, etc., and sand smooth to original contour.

3. Class 2 damage to side cowl which extends completely through aluminum skin and the aluminum honeycomb core shall be repaired as follows:
(a) Repair damage as described under step 1. (d) except use Bloomingdale's HT-424 or Marmco's Metlbond 302 adhesives.
(b) The cure time for adhesives described in step (a) above, will be minimum of 5 hours.

4. Class 2 damage to side cowl which extends completely through fiberglass skin and aluminum honeycomb core shall be repaired as follows:
(a) Repair damage as described under step 2. (d) except use either Bloomingdal's HT-424 or Narmco's Metlbond 302 adhesives.
(b) The skins shall be fabricated from either Cordo's Pyropreg AC, U. S. Polymeric's Poly Preg 502, or Narmco's 506 (color black).
(c) The reinforcement shall be 181-150 Valan.
(d) Cure time for adhesives described in step (a) above, will be a minumum of 5 hours.

e. Repair of Class 3 damage is as follows:

1. Class 3 damage to upper and side cowls resulting in damage to both aluminum and fiberglass skins having a minimum damage size of 1. 0 inch or maximum damage size of 4 inches.
(a) Prepare surfaces, plugs and patches as described in step d.
(b) Fabricate a temporary mold or block to hold the plug in place while aluminum outer skin is being repaired.
(c) Repair outer aluminum skin in accordance with step d.
(d) Remove temporary mold or block and repair fiberglass skin in accordance with step d., and flare in patch with existing skin contour.

f. Repair of Class 4 damage is as follows:

1. Class 4 repairs are those repairs needed to fill voids between aluminum core and skin surfaces.
(a) Drill sufficient 1/8 inch holes in the fiberglass inner skin adjacent to voids.
(b) Remove all burrs around drilled holes.
(c) Mix thoroughly 100 parts (by weight) Epon 828 with 10 parts (by weight) curing agent "D. "

NOTE

Prepare only that quantity that can be used in one hour.

(d) Using a syringe or pressure gun, inject resin mix into the aluminum honeycomb cells until they become filled.
(e) Wipe off excess resin with a cloth that has been dampened with MIBK or MEK and cover the holes with masking tape.
(f) Position the structure so that both skins will be in intimate contact with resin.
(g) Cure adhesive for 2 hours at 150° to 200° F.
(h) Remove masking tape and sand away excess resin.

CHECKING WING TWIST AND LOCATION OF THRUST LINE. (See figure 16-1. )

a. Remove wing in accordance with wing removal procedures and place wing on suitable supports beneath the root and tip ribs.

NOTE

The wing tip tank must be removed during check.

b. Locate wing datum plane as follows:

1. Locate a line at the root rib (wing station 46. 89 which is 4. 52 inches up from the lower surface of the front spar, and 4. 00 inches up from the lower surface of the rear spar.

2. Locate a line at the tip rib (wing station 217. 66 which is 1. 44 inches up from the lower surface of the front spar, and 0. 80 inch up from the lower surface of the rear spar.

3. These two lines locate the wing datum plane, and the three degrees of twist will be present if the lines are parallel.

c. Refer to figure 16-1 (Details A, B, and C), locate the engine thrust line.

d. Install wing and wing tip tank in accordance with installation procedures.

RADOME REPAIR PROCEDURES.

a. Remove radome in accordance with Section 3. Repair procedures are developed with the objective of equaling as nearly as possible the electrical and strength properties of the original part with a minimum increase in weight. This can only be accomplished by repairing damaged parts with approved materials and working techniques. For convenience in presentation and for clarity in designating repair procedures to be used, damages to solid laminate radomes in this procedure shall be divided into classes according to severity, as follows:

1. Class I Repair: Surface scratches, scars or erosion not penetrating through the first ply of fabric.

2. Class II Repair: Punctures, delaminations, contaminates or fractures extending through the first ply down into the laminate but without damage to the opposite facing.

3. Class III Repair: Damage extending completely through the laminate affecting both facings.

4. Class IV Repair: Defect which does not exceed an area 0. 5 inch square and surface has not been broken and does not occur more than twice in any 1 foot square area.

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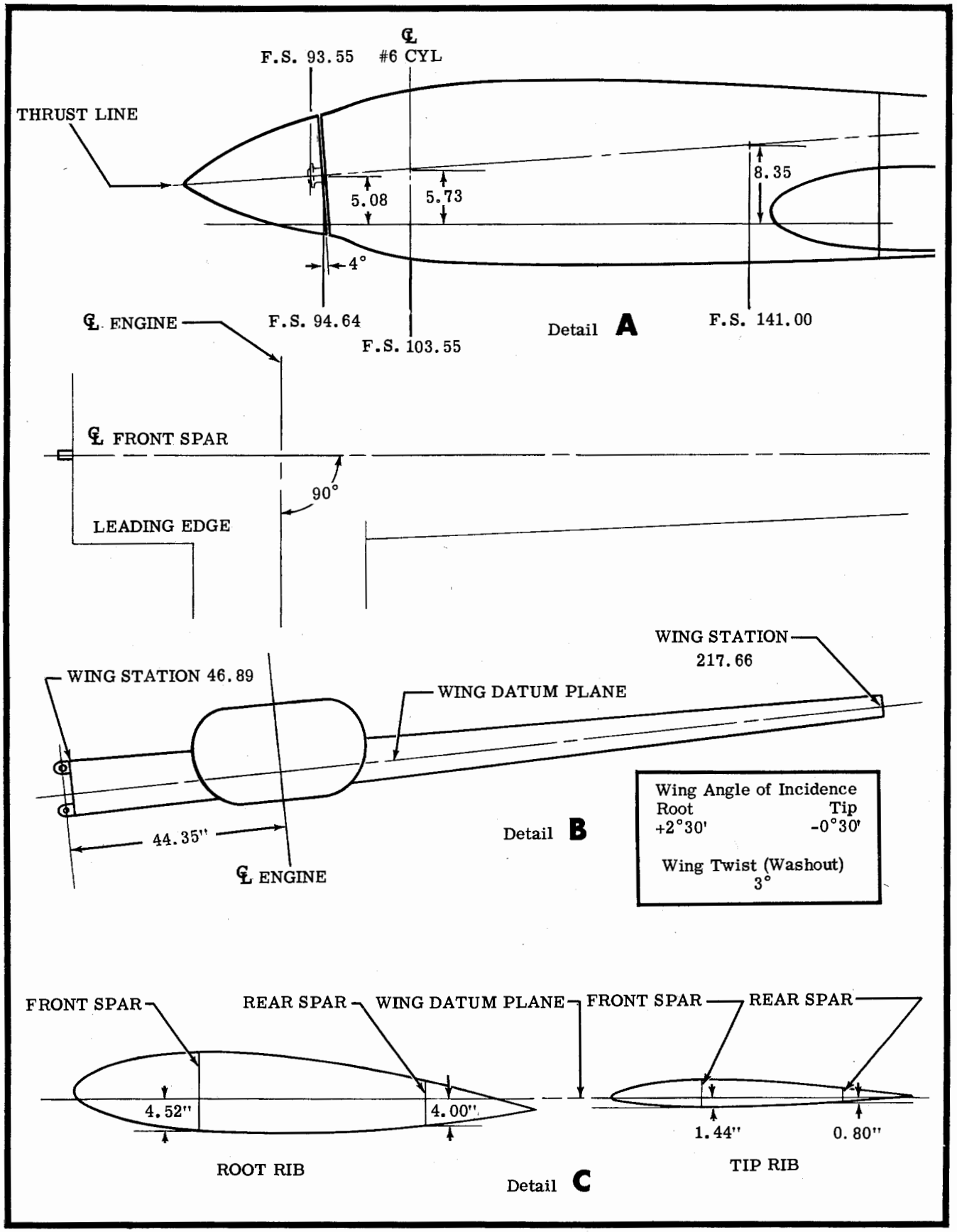



Figure 16-1. Wing Twist and Thrust Line Data

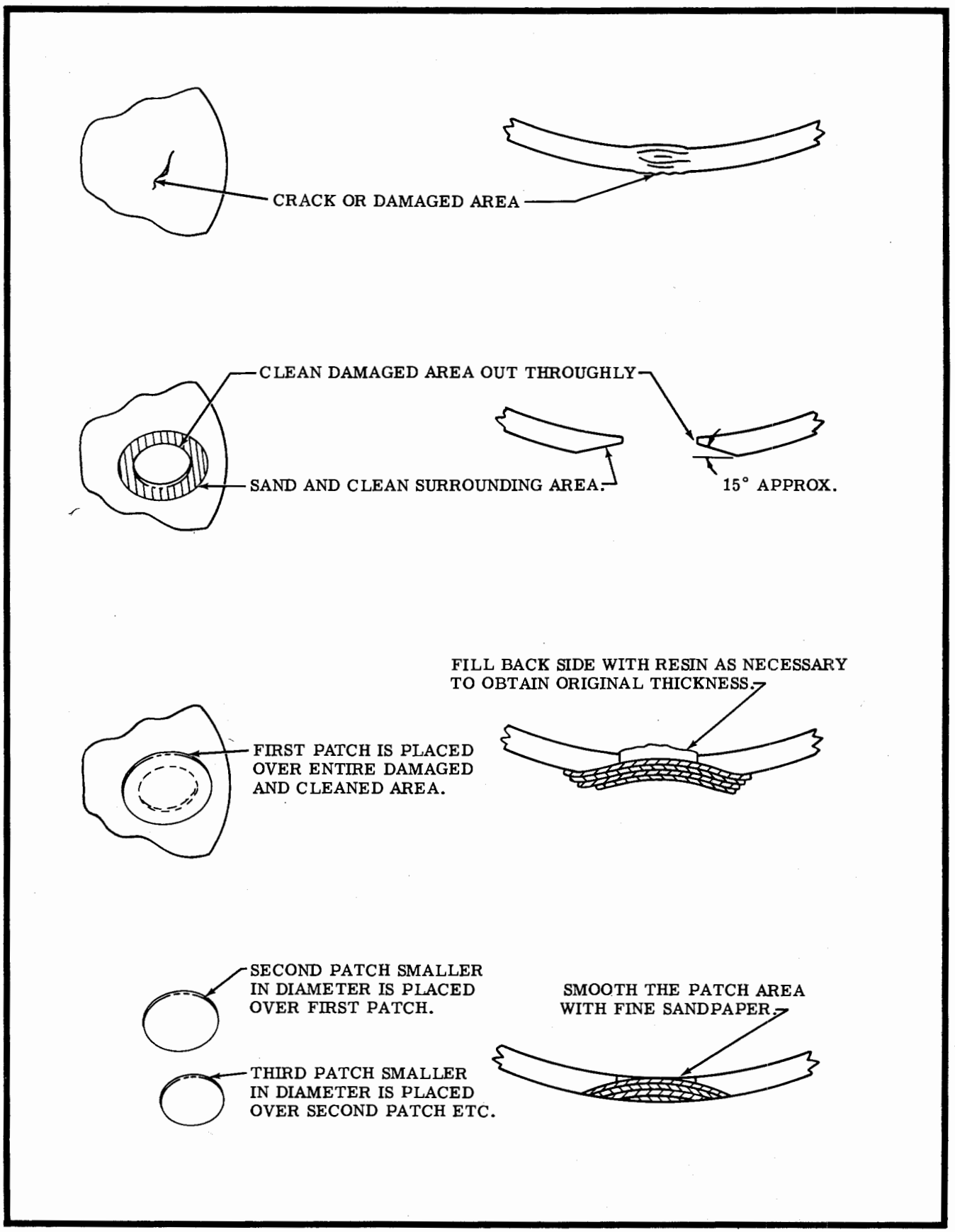



Figure 16-2. Typical Fiberglass Repair

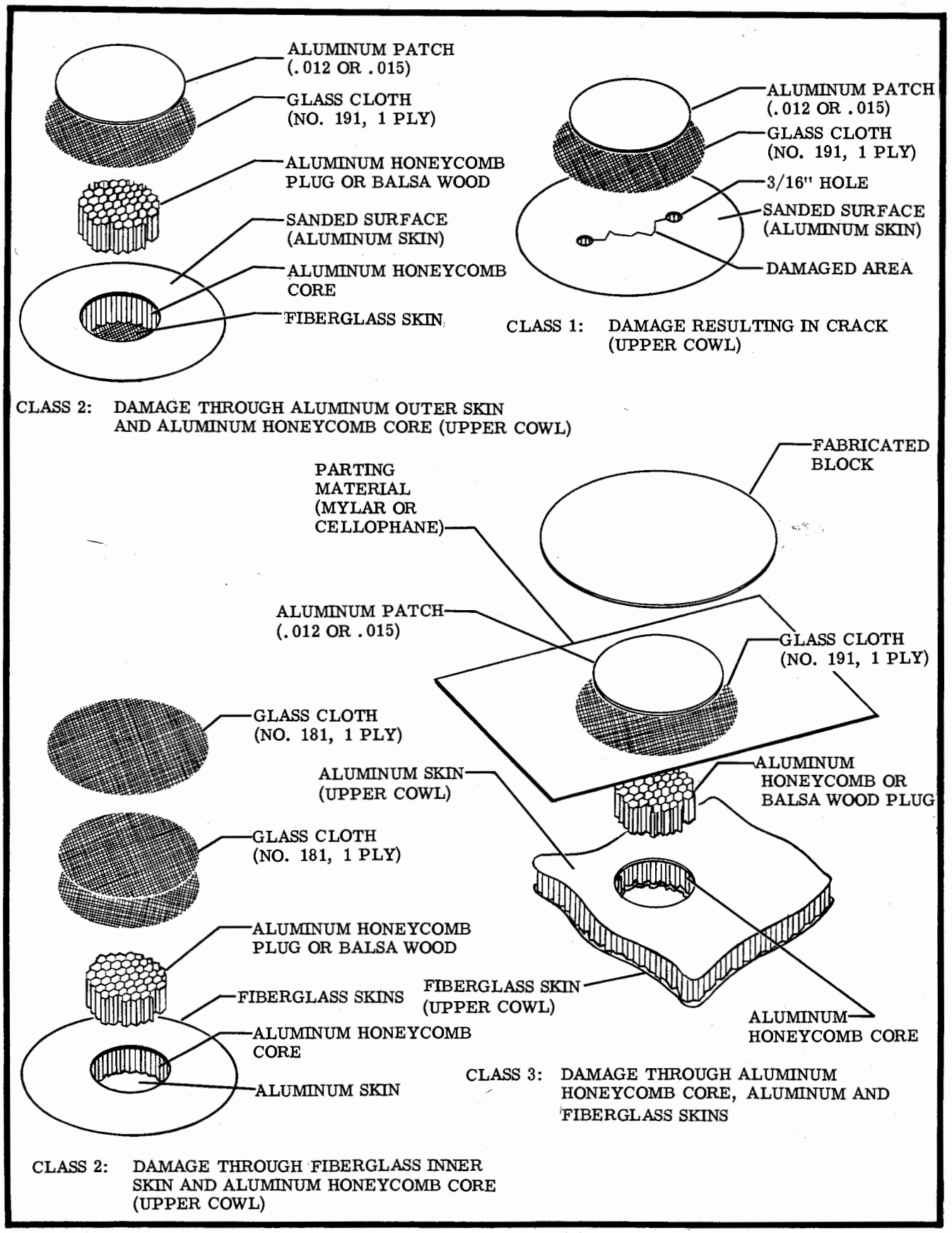



Figure 16-3. Repair of Upper and Side Engine Cowling

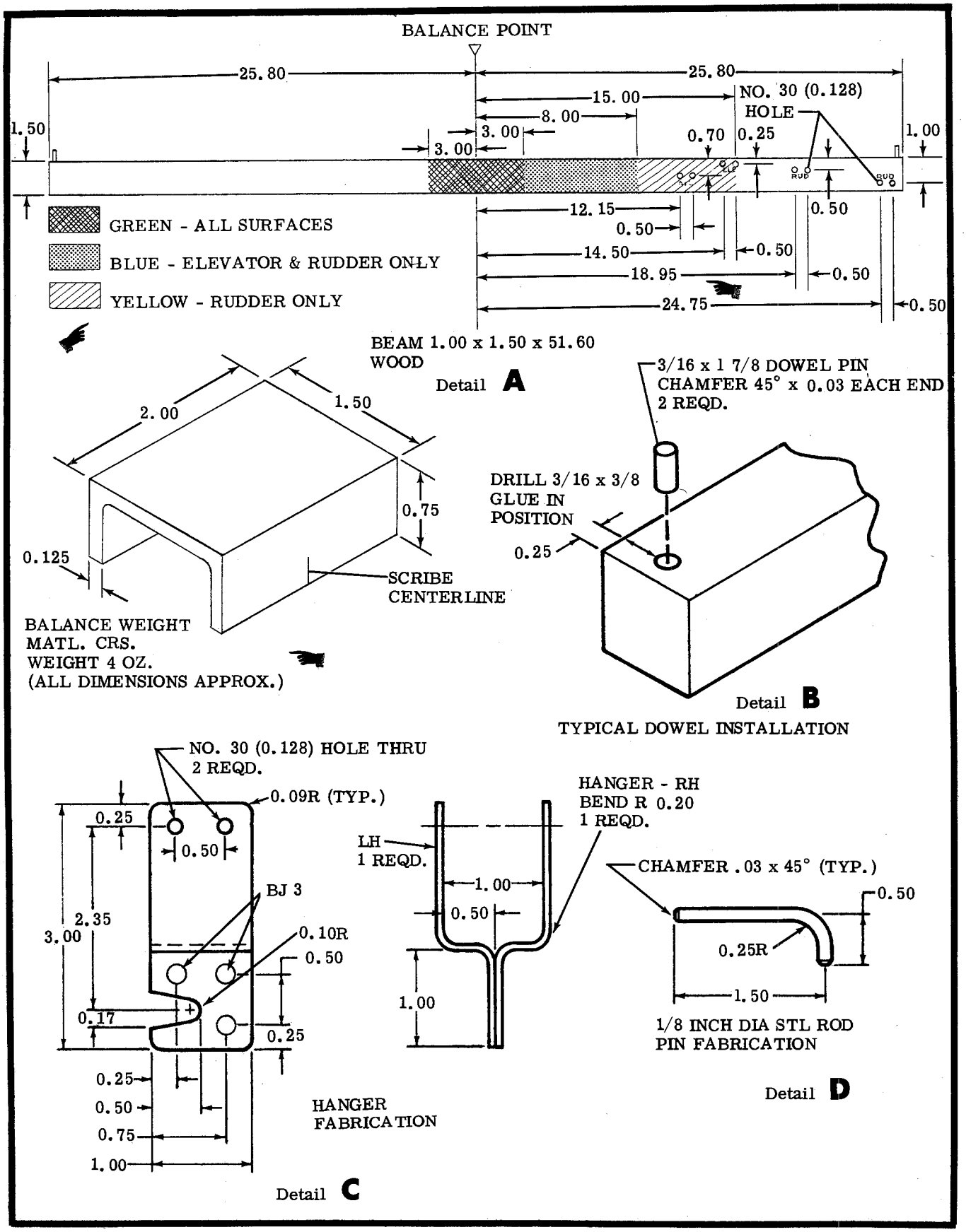
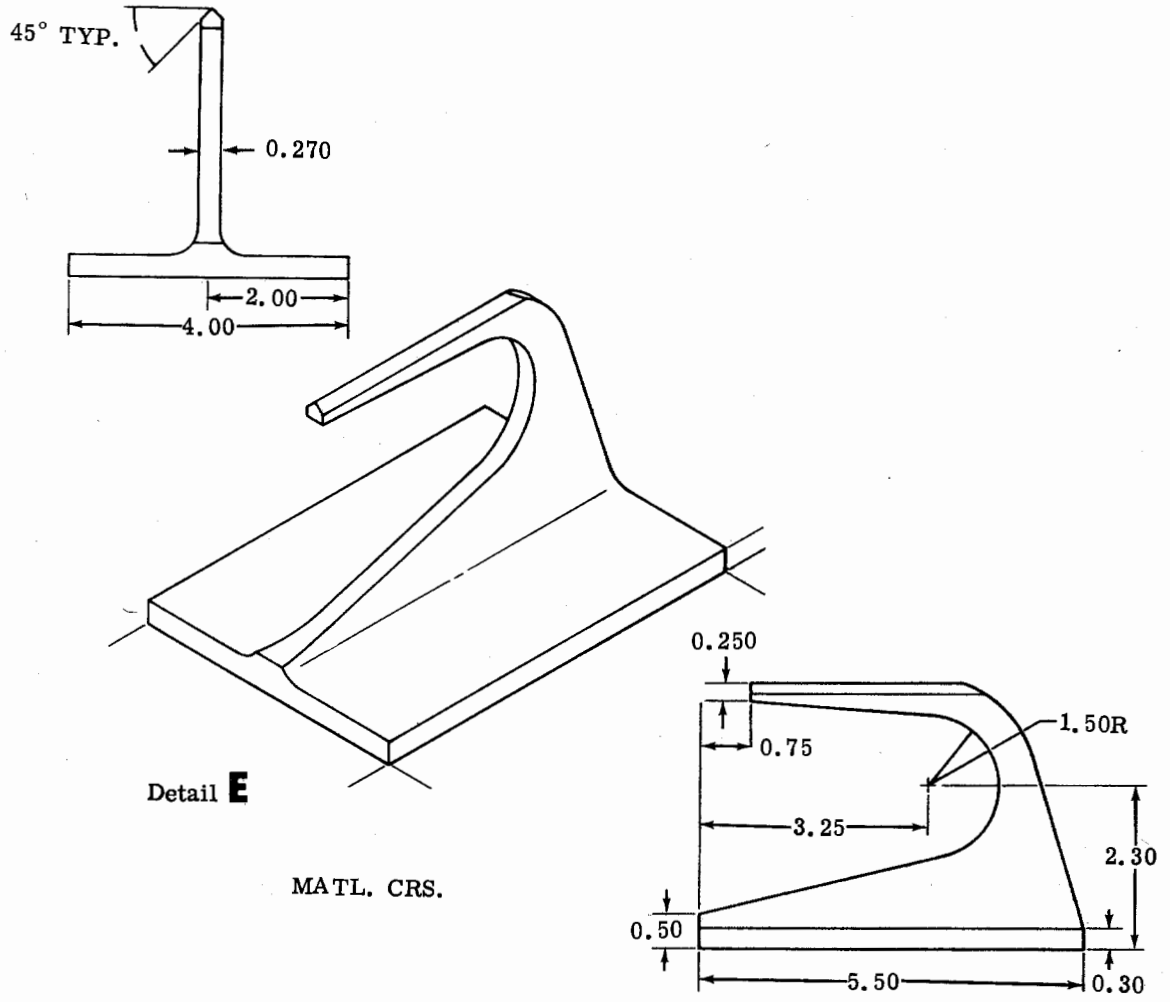



Figure 16-4. Balancing Fixture Fabrication (Sheet 1)




FABRICATION OF BALANCE FIXTURE.

Beam.

a. Fabricate beam from wood or equivalent one inch square stock.
b. Locate center of beam. (Should be 25.80 inches from end.)
c. Locate and drill holes in each end of beam 3/16 (.1875).
d. (See Detail B.) Fabricate dowel and install in beam using glue for security.
e. Measuring from the center point of beam or 25.80 inch Station, locate and drill No. 30 (.128) diameter holes for aileron, elevator and rudder hanger locations.
f. Mark off and paint the beam as indicated for aileron, rudder and elevator positions.

Hanger.

a. Fabricate right and left hanger halves per Detail C.
b. Assemble the hanger using three MS20470AD3-5 rivets.

Pin.

a. Fabricate pin from 1/8 stl. rod per Detail D.

Balance Weight.

a. Fabricate balance weight per Detail A.

NOTE

If necessary, grind or file balance weight to obtain four (4) ounce weight. Scribe centerline after fabrication.

Mandrel.

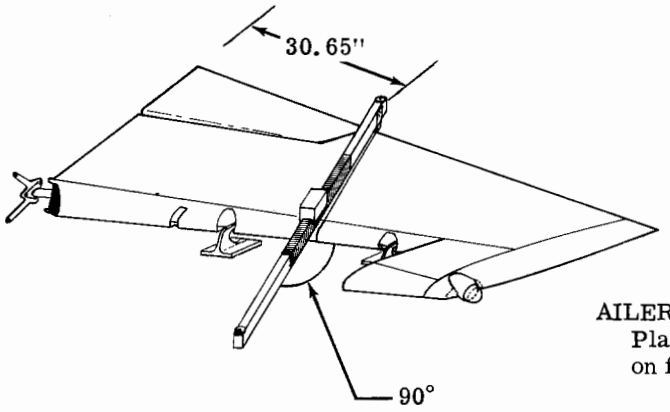
a. Fabricate mandrel in accordance with Detail E.

NOTE

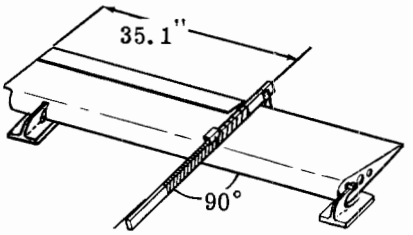
Mandrel may be fabricated from any suitable material.

Figure 16-4. Balancing Fixture Fabrication (Sheet 2)

LEFT-HAND SIDE SURFACE DOWN

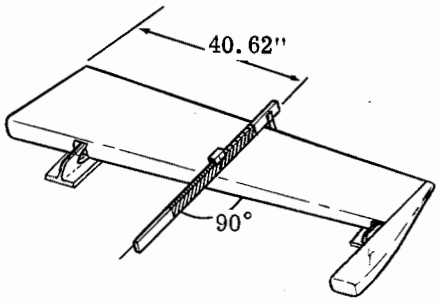



LOWER SURFACE DOWN

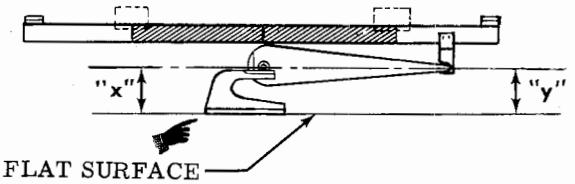



AILERON:
Place balanced fixture (refer to balancing procedure) on first rib line outboard of trim tab on the aileron

RUDDER:
Place balanced fixture (refer to balancing procedures) on first rib line above the trim tab on the rudder




LOWER SURFACE DOWN



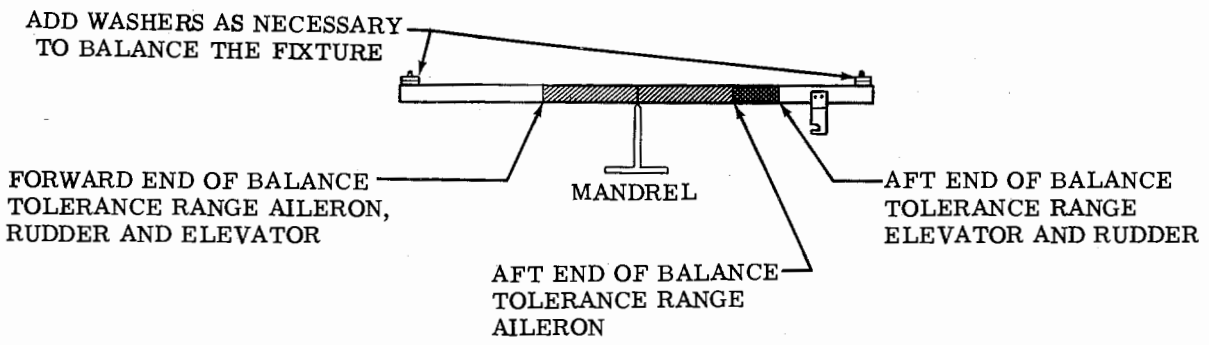

TYPICAL BALANCED CONTROL

NOTE
In a 100% static balanced condition dimensions x and y will be the same.

ELEVATOR:
Place balanced fixture (refer to balancing procedures) on first rib line outboard of trim tab on the elevator

| SURFACE | BALANCE TOLERANCE |
|---|---|
| AILERON | +.75 TO -.75 in. lb. |
| ELEVATOR | +.75 TO -2.00 in. lb. |
| RUDDER | +.75 TO -3.75 in. lb. |

Figure 16-5. Static Balancing Aileron, Rudder and Elevator (Sheet 1)




BALANCING PROCEDURES.

It is recommended that control surface balancing be accomplished in a draft-free room/area using the balancing equipment fabricated from instructions contained in figure 16-4.

NOTE

Be certain control surface weights are installed, surfaces are clean, all foreign matter inside control surfaces removed, painted and hinge bolts installed. Surfaces which have trim tabs incorporated must have the tab secured in a streamlined position and push-pull rods, with attaching hardware on the trim tab, and installed before starting balancing procedures.

BALANCING FIXTURE.

a. Install hanger assembly in the appropriate position for the surface being balanced.
b. Place mandrel on a table or other suitable flat surface and center balancing beam on mandrel at the centerline of bar.
c. Add washers to dowel pins until a balanced condition is obtained.

NOTE

When balancing fixture is in balance, it must assume a position parallel to the work surface.

RUDDER BALANCING PROCEDURE.

a. Remove rudder from aircraft in accordance with Section 7.
b. Tape rotating beacon wire along the leading edge of the rudder.
c. Insert hinge bolts in place and position rudder on mandrels with bolts resting on the knife edge.

NOTE

Make sure rudder control surface has freedom of movement and does not drag on mandrels and bonding wires do not interfere with movement of control.

d. Secure the rudder trim tab in a streamlined position and install associated hardware.
e. Locate the position for balancing fixture on the rudder and place balancing beam in position.

NOTE

If balancing beam position falls on a rivet line, it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline and the trailing edge of the rudder control surface must be firmly seated in the cutout of the hanger.

f. If the rudder assumes position parallel with base of mandrel and the balance weight is within the Green, Blue and Yellow range, the rudder is statically balanced.
g. If rudder assumes a position of trailing edge up, when balance weight is on aft end of range, rudder is overbalanced and needs weight removed.

NOTE

Remove overbalance by using a 1/2 inch drill to remove some of the weight.

h. If rudder control surface assumes position of trailing edge down, when balance weight is on forward end of range, rudder surface is underbalanced and needs more balance weight added.
i. The approximate amount of weight needed for underbalance may be determined by placing small amounts of loose weight in the balance weight area.
j. Additional balance weight may be added by

Figure 16-5. Static Balancing Aileron, Rudder and Elevator (Sheet 2)

pounding lead into existing holes of weight and staking. If holes are not available to insert added weight, it will be necessary to add 2 nutplates on each side of lightening hole and add a lead bar weight secured by two bolts.

NOTE

The rudder tip and mounting screws must be installed each time the rudder is checked for balance.

k. Install rudder in accordance with Section 7.

AILERON BALANCING PROCEDURE.

a. Remove aileron from aircraft in accordance with Section 5. (The outboard hinge is a pin.)
b. Balance the fixture for aileron control surface.
c. Insert hinge bolt in place and position aileron on the mandrels with bolt and pin resting on the knife edge.

CAUTION

Be sure bolt is inserted in correct hinge location (upper hole).

NOTE

Make sure aileron control surface has freedom of movement, does not drag on mandrels and the bonding straps are free.

d. Secure the trim tab on the left-hand aileron in a streamlined position and install associated hardware.
e. Locate the position for balancing fixture on the aileron and place balancing beam into position.

NOTE

If balancing beam position falls on a rivet line, it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline and trailing edge of the aileron control surface must be firmly seated in the cutout of the hanger.

f. If the aileron assumes a position parallel with base of mandrel and the balance weight is within Green range, the aileron is statically balanced.
g. If aileron assumes a position of trailing edge up, when balance weight is on aft end of range, the aileron is overbalanced and needs weight removed.

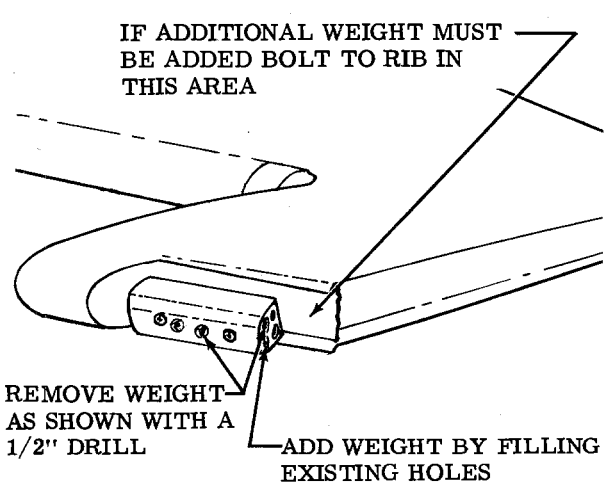
NOTE

Remove overbalance by removing weight as necessary.

h. If the aileron assumes position of trailing edge down, when balance weight is on forward end of range, aileron is underbalanced and needs more balance weight added.
i. The approximate amount of weight needed for underbalance may be determined by placing small amounts of loose weight in the balance weight area.
j. Addition of balance weight may be added by inserting lead into existing holes of the weight. If holes are not available additional weight may be added by removing existing screws and installing longer screws to attach added weight.

NOTE

The aileron balance weight must be removed from the aileron in order to remove excess weight.




RUDDER BALANCE WEIGHT

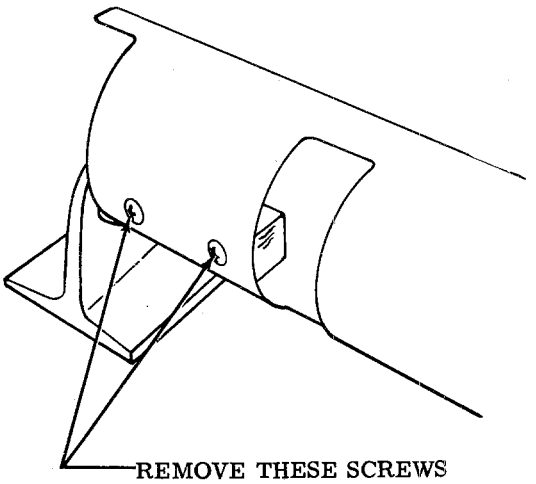



Figure 16-5. Static Balancing Aileron, Rudder and Elevator (Sheet 3)

CAUTION

Make certain bolts securing weight in place are tight before installing aileron on aircraft.

k. Install aileron in accordance with Section 5.

ELEVATOR BALANCING PROCEDURE.

a. Remove elevator in accordance with Section 6.
b. Balance the fixture for elevator control surface.
c. Insert hinge bolts in place and position elevator on the mandrels with bolts resting on the knife edge.

NOTE

Make sure elevator control surface has freedom of movement, does not drag on mandrels and bonding straps are free.

d. Secure the elevator trim tab on right-hand elevator in a streamlined position and install associated hardware.
e. Locate the position for balancing fixture on the elevator and place balancing beam into position.

NOTE

If balancing beam position falls on a rivet line it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline and trailing edge of the aileron control surface must be firmly seated in the cutout of the hanger.

f. If the elevator assumes a position parallel with base of mandrel, and the balance weight is within the Green and Blue range, the elevator is statically balanced.
g. If the elevator assumes a position of trailing edge up, when balance weight is on aft end of range, elevator is overbalanced and needs weight removed.

NOTE

Remove overbalance by using a 1/2 inch drill to remove some of the weight.

h. If the elevator assumes position of trailing edge down, when balance weight is on forward end of range, elevator is underbalanced and needs more balance weight added.
i. The approximate amount of weight needed for underbalance may be determined by placing small amount of loose weight in the balance weight area.
j. Additional balance weight may be added by inserting lead in existing holes of the weight. If holes are not available, additional weight may be added by bolting a lead bar in the center of existing weight.

NOTE

Each time the elevator is checked for weight and balance, the elevator tip must be installed and elevator tip screws must be in the proper location (short screws toward aft end of elevator).

k. Install elevator in accordance with Section 6.

ELEVATOR BALANCE WEIGHT

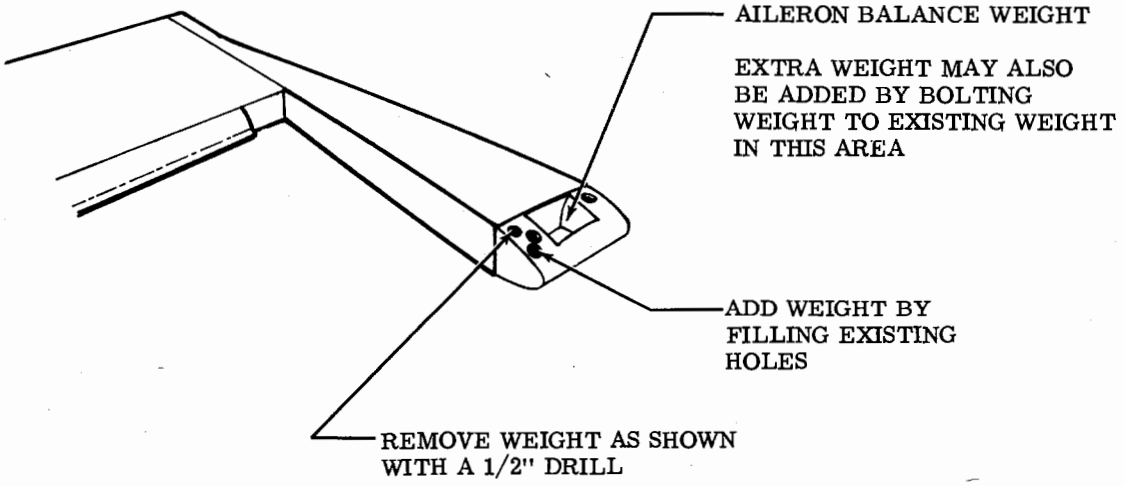



Figure 16-5. Static Balancing Aileron, Rudder and Elevator (Sheet 4)

5. Class V Repair: Delamination in edge bond extending up to 1/8 inch out from drilled holes; delaminations not extending more than 1/2 inch from trimmed edges and approximately 1 inch in size.

b. Repair Techniques:

1. Class I Repair: Surface scratches, scars or erosion not penetrating through the first ply shall be repaired as follows:

(a) Clean injured area thoroughly and carefully using a clean cloth saturated with methyl-ethyl-ketone or another approved cleaning agent.

(b) Lightly sand the damaged area, using No. 280 grit sandpaper, clean the sanded surface thoroughly, using methyl-ethyl-ketone, Specification TT-M-261. Moisture and solvents should be completely removed to prevent their inhibiting the cure of the resin.

(c) Apply one or two coats (depending on severity of the abrasion) of the following resin mix to the abraded surface.

Composition

| | |
|---|---|
| Resin Selectron 5003 (Alternate: Hetron 92) | 100 parts by weight |
| Luperson DDM | 0. 5 to 1. 5 parts by weight |
| Luperco ATC Paste | 0. 95 to 1. 05 parts by weight |
| Nuodex Cobalt | 4 to 8 drops/lb. resin |

Refer to end of this Section for Vendor information.

Mixing Procedure

Dissolve ATC Paste in the resin and thoroughly mix. Add Nuodex Cobalt and mix. Add DDM and thoroughly mix.

Bench Life

Approximately 30 minutes at room temperature.

(d) Over this coated surface, apply a sheet of colored cellophane or polyvinyl alcohol film extending two or three inches beyond the surface. The cellophane or PVA prevents exposure to the air and will provide a smooth surface against which the resin may cure.

(e) Tape cellophane or PVA in place and work out air bubbles and excessive resin with the hand or a rubber squeegee. Cure the resin as follows:

(1) Gel resin at any surface temperature from 80° F up to a maximum of 150° F.

(2) After gelation the repaired area is cured at a surface temperature of 120 to 150° F for 30 minutes. The surface temperature is then raised to 200-230° F and maintained for 30 minutes. Heat may be obtained by heat lamps, glo rods, etc.

(f) After the resin has cured or set, remove the cellophane or PVA from the cured resin and remove any excessive resin by sanding lightly.

2. Class II Repair: Punctures, delaminations, contaminates or fractures extending through the first ply down into the laminate but without damage to the opposite facing.

Method I (Stepped Joint Method)

(a) The preferred method of removing damaged plies in accomplishing a Class II Repair is by the stepped joint method. For small damages the scarf method of repair may be used.

(b) Ascertain the extent of the damaged area by visual inspection, using a strong light source, prior to beginning repair. With aid of a straight edge or compass, outline the damaged area by scribing a rectangle with rounded corners or circle that will necessitate removal of a minimum of sound material. Extend the sides of the circle a distance in inches equal to the number of plies to be removed less one inch. (Five inches if six plies are to be removed, four inches if five plies are to be removed, etc. ). Overlap should be at least one inch per ply of glass cloth.

(c) With the aid of a straight edge, use a sharp knife or other specially prepared cutter and cut along the lines scribed in the outermost ply. Use extreme care not to cut or score the underlying ply. A suggested method is to cut through the overlaying ply in a series of cuts rather than attempt to cut through the ply in one cut.

(d) Remove the cut outermost ply by inserting the knife blade under the corner and prying loose carefully. When this outermost ply is removed, scribe on the next exposed ply a similar outline except reducing the dimensions one inch in all directions. (Overlaps shall be one inch each ply. ) Repeat this procedure until all the damaged plies have been removed. (See figure 16-6. )

(e) Lightly sand exposed plies and clean surfaces using methyl-ethyl-ketone, Specification TT-M-261, and allow to dry thoroughly preparatory to completing repair buildup.

WARNING

The sanding operation on glass cloth reinforced laminates gives off a fine dust that may cause skin irritation. Breathing an excessive amount of this dust may be injurious; therefore, precaution as to skin and respiratory protection will be observed.

(f) Cut patches from the same type of fabric as was used in the original part. Cut the fabric patches to the size of each hole. Impregnate the cloth patches with the resin mix specified under Repair Method I, paragraph (c). Sandwich each patch ply between two sheets of

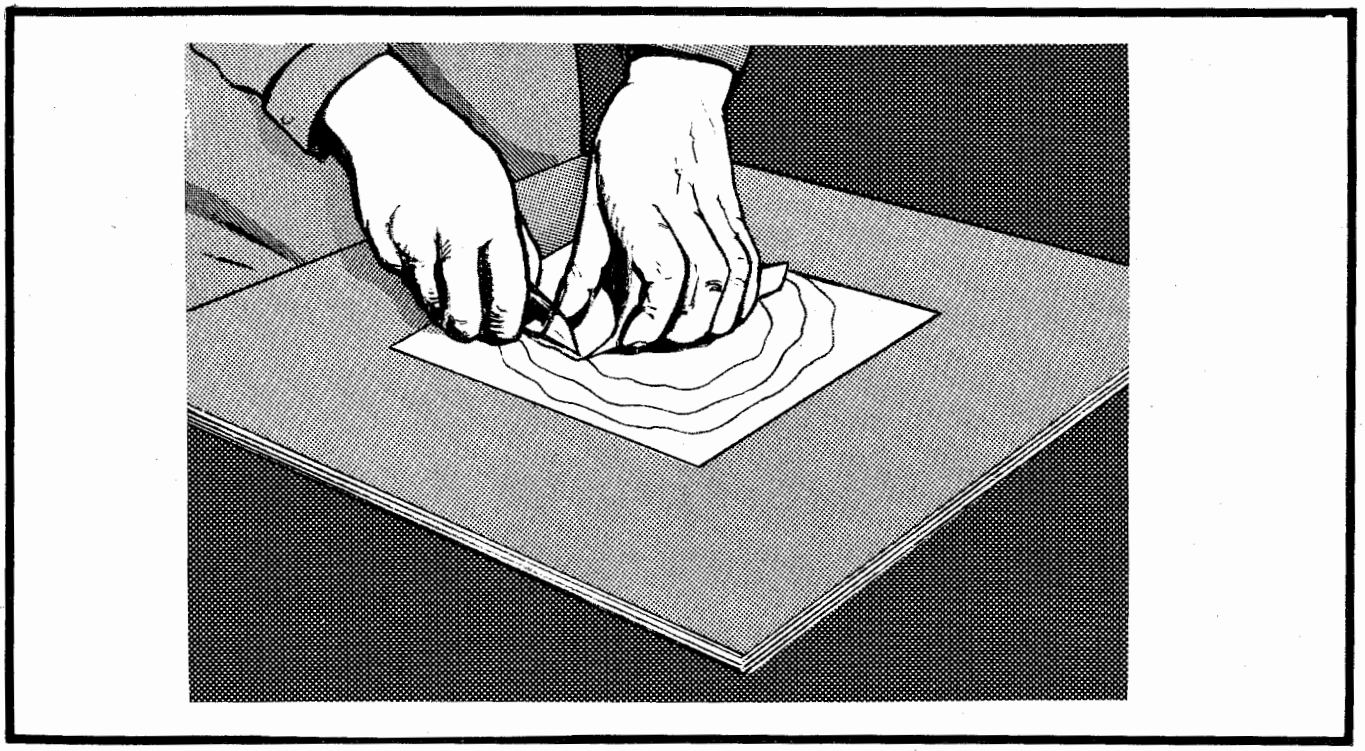


Figure 16-6. Removing Damaged Face Plies - Step Joint Method

PVA or cellophane larger than the patch by at least two inches on all sides. (See Figure 16-7 and Figure 16-8.) The impregnated glass cloth contains 45-50 percent of catalyzed resin after cellophane has been removed. (Weight of resin equal to weight of dry glass cloth comprises 50 percent resin content.) Brush a coat of resin on the surface of scarfed plies.

(g) Fit the smallest patch in place taking care to avoid entrapping air under the patch. Smooth out all wrinkles and trim to fit. Add seccessive plies in a like manner the warp direction of each patch ply approximately the same as that of the original ply.

(h) Surround the patch with a bleeder and cover the entire area with polyvinyl alcohol film and secure in an air tight seal with either double-backed tape or extruded sealing tape or both. Evacuate the area under the PVA film. Sweep out entrapped air and excess resin with the aid of a rubber squeegee or a similar device. The motion of the squeegee shall be slow enough so that the air bubbles will be swept clear of the laminate by the wave, or motion of the excess resin. The air bubbles may be observed through the transparent PVA sheeting and the wiping process will continue until all air bubbles are swept past the edge of the laminate. The working or wiping of the laminate will be stopped when the plies of fabric are firmly packed together. Further wiping will create air or vapor voids observable as a whitening and a loss of transparency. Should the PVA sheet be punctured during the void-free working or wiping process, the hole may be repaired with transparent tape and the air which has penetrated the bag shall be worked from the laminate. Vacuum pressure shall be maintained during the complete curing process.

(i) Cure repaired area as described under Repair Method I, paragraph (c). After the resin has cured, remove the PVA from the cured resin and remove any excessive resin by sanding lightly.

Method II (Scarf Joint Method)

(a) The scarf joint method may be used when the repair of a damaged area will require removal of an area less than three inches in diameter.

(b) The scarf method consists of sanding out the damaged plies to a circular or oval disc shape. (See figure 16-9.) The damaged plies will be scarfed back carefully to a distance of at least 50 times the total face ply thickness by using polisher-sander Stock No. 5130-537-3394, or by hand sanding using No. 180 grit sandpaper. The scarfing operation will be performed very accurately to provide a uniform taper and usually requires some practice before acceptable scarfs are obtained.

(c) The glass cloth laminations for the facing repairs are prepared with the largest piece being cut to the exact shape of the outside of the scarfed area. The smallest piece is cut so

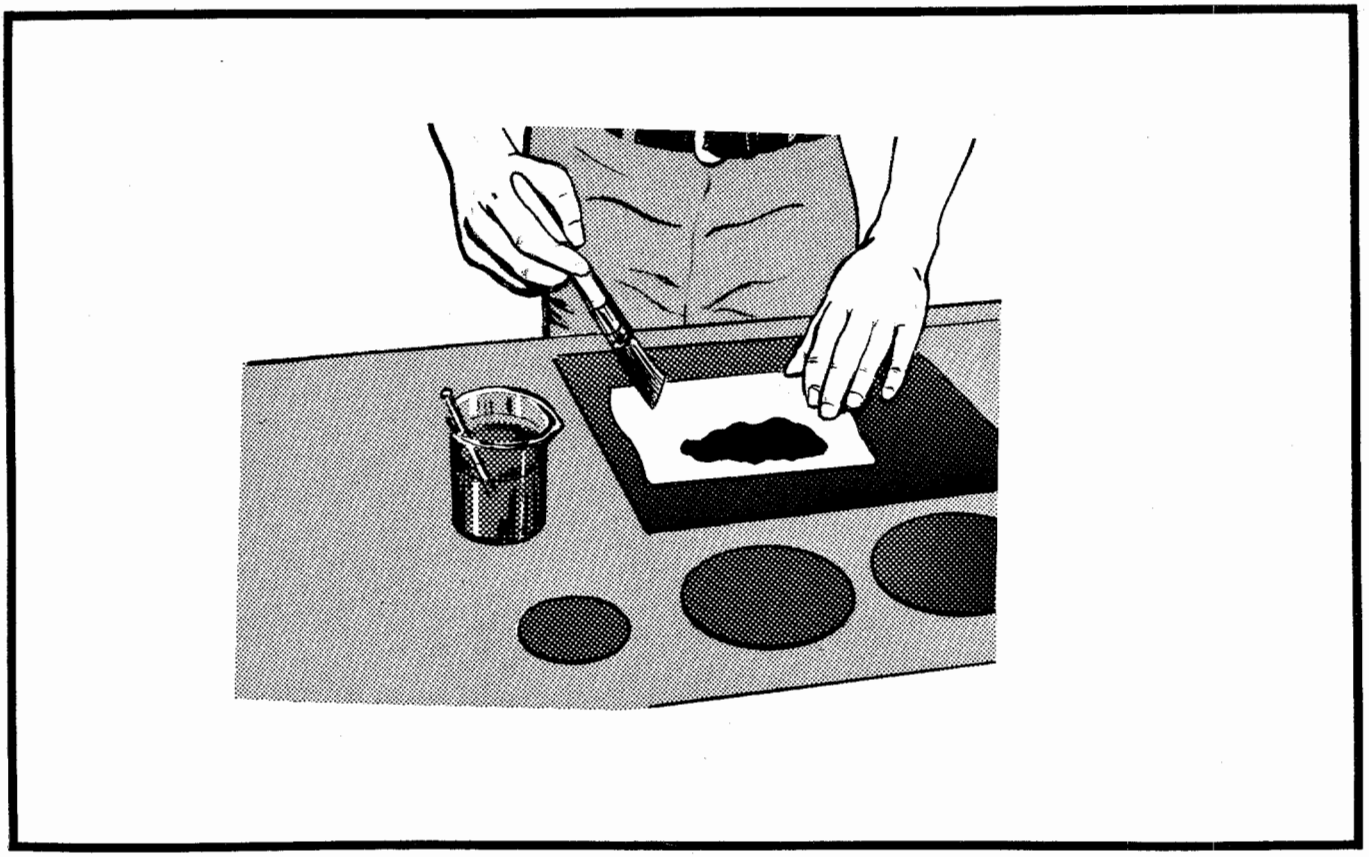


Figure 16-7. Suggested Method of Resin Impregnating Replacement Plies

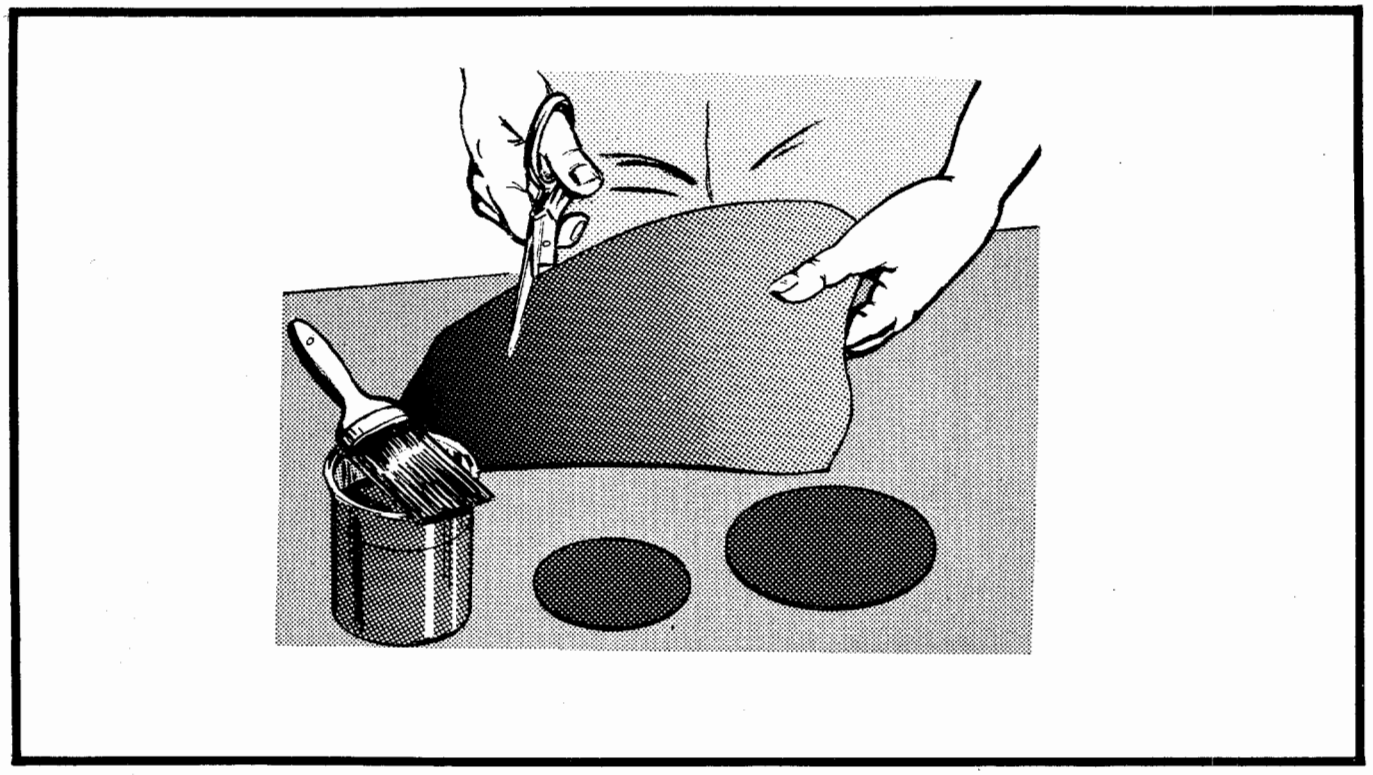


Figure 16-8. Cutting Replacement Plies from Impregnated Glass Cloth Sandwiched Between Sheet of Cellophane

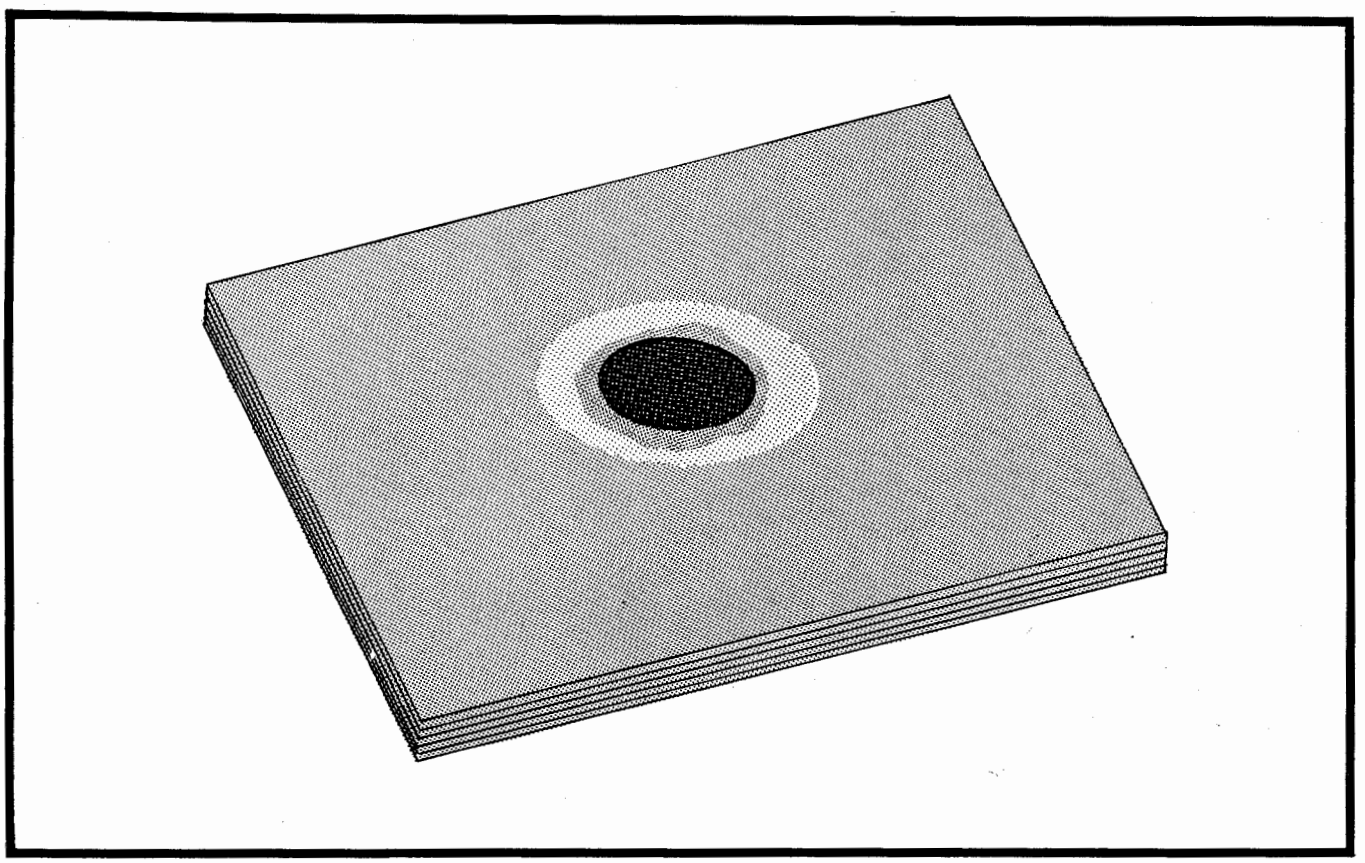


Figure 16-9. Damaged Face Plies Removed - Scarf Method

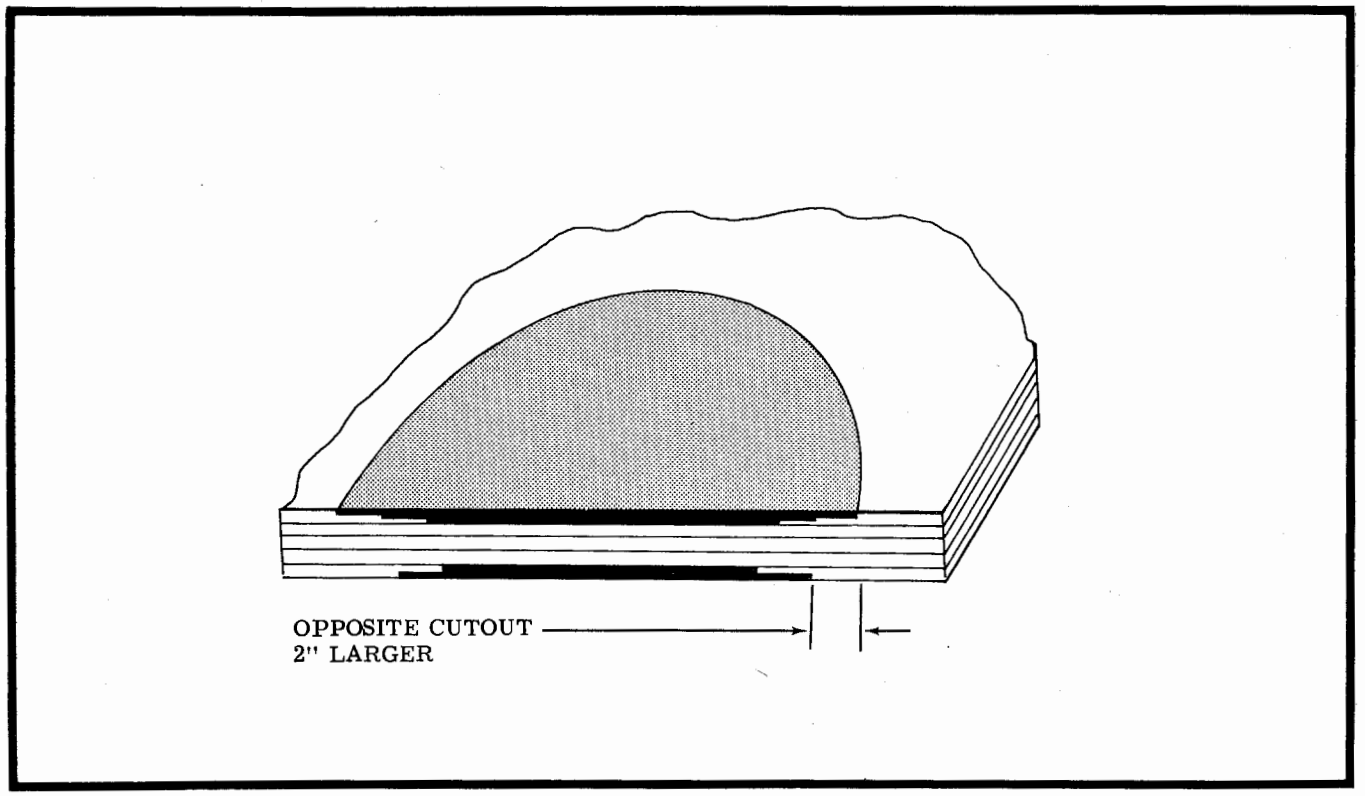



Figure 16-10. Completed Double Face Patch Repair

that is overlaps the scarfed area by its proportionate amount, depending on the number of plies in the repair and the intermediate pieces are cut so as to have equal taper.

(d) Process the prepared area in accordance with paragraphs (f), (g), (h) and (i) under Class II Repairs, Method I.

3. Class III Repair: Damage extending completely through the laminate affecting both facings.

(a) Damages completely through the laminate shall be repaired by removing and replacing the damaged material as previously outlined under Class II Repair. Never remove inner and outer radome face ply at the same time. One facing will be completed before repair is made on the opposite facing. On solid laminate radomes 1/2 of the damaged face plies will be removed from one side and the build-up repair completed, then repeat removal and new ply buildup procedures on opposite side.

(b) To accomplish Class III Repairs it is necessary that the opposite side of the laminate be provided with a temporary mold or block to hold the laminate in place during the first face ply buildup.

(c) The damaged facings shall be removed and replaced as previously outlined for removing and replacing damaged plies for Clsss II Repair. Repeat repair procedures on the opposite facing except the cut out ply area will be larger by approximately two inches than the first ply cut out area on the opposite face repair. This will prevent the joints of the inner and outer repair area from being in the same position. (See figure 16-10.)

4. Class IV Repair: Defects which do not exceed an area 0.5 inch square and the surface has not been broken and does not occur more than twice in any 1 foot square area.

(a) If surface is broken, sand smooth.

(b) Drill 2 to 3 No. 50 holes into the damaged skin spaced throughout the damaged area. Inject resin mix under Class I Repair, paragraph (c), with a hypodermic syringe and needle to insure contact with all surfaces and to obtain a maximum possible "wetting up" of the fractured skin.

(c) Cure as described under Class I Repair, paragraph (e).

5. Class V Repair: Delamination in edge band extending up to 1/8 inch out from drilled holes; delaminations not extending more than 1/2 inch inward from trimmed edges and approximately 1 inch in size.

(a) Work as much as possible resin mix under Class I Repair, paragraph (c), into the discrepant area. Resin may be injected into the delaminated area along the panel edges with a hypodermic syringe and needle through holes drilled with a No. 50 drill bit. Extruded Sealing Tape placed around the needle and against the panel will force the resin throughout the delaminated area.

(b) Apply pressure, if necessary, with C-clamps or vacuum blanket. Cure per paragraph (3), under Class I Repairs.

Radome Repair Procedures (340-0301 and On)

a. Remove radome in accordance with Chapter 3. Repair procedures are developed with the objective of equaling as nearly as possible the electrical and strength properties of the original part with a minimum increase in weight. This can only be accomplished by repairing damaged parts with approved materials and working techniques. For convenience in presentation and for clarity in designating repair procedures to be used, damages to radomes in this procedure shall be divided into classes according to severity, as follows:

1. Class I Repair. Surface scratches, scars or erosion not penetrating through the first ply of fabric.

2. Class II Repair. Punctures, delaminations, contaminates or fractures extending through the first ply.

3. Class III Repair. Damage extending completely through both face sheets.

b. Repair Techniques.

1. Class I Repair. Surface scratches, scars or erosion not penetrating through the first ply shall be repaired as follows:

(a) Clean damaged area thoroughly and carefully using a clean cloth saturated with methyl-ethyl-ketone or another approved cleaning agent.

(b) Lightly sand the damaged area, using No. 280 grit sandpaper, clean the sanded surface thoroughly, using methyl-ethyl-ketone, Specification TT-M-261.

(c) Apply one or two coats (depending on severity of the abrasion) of the following material to the abraded surface:

Composition: Bostik 464-3-1 Surfacer, CA-142 Catalyst, TL-52 Thinner.

Vendor: Bostik-Finch, Boston Street, Middleton, Mass.

Mixing Procedure: Mix in a ratio of 3 parts by volume 464-3-1 base to one part CA-142 catalyst. Surfacer may be thinned with TL-52 to approximately 25 seconds #2 Zahn cup.

(d) Material may be applied by spray gun. The coating will dry to sand in 3 hours at normal temperatures. Sand with 320 grit paper and reapply paint.

2. Class II Repair. Punctures, delaminations extending through the outside face sheet.

(a) Punctures outside the radar window, not exceeding one inch in diameter.

(1) Mix EA960F and apply to core area of damage. Allow to harden, sand smooth and paint.

(b) Punctures inside the radar window, not exceeding 1/2 inch in diameter.

(1) If face sheet and core are damaged beyond use, fill core with EA960F, allow to harden, sand smooth and paint.

(2) If face sheet and core are not damaged beyond use, bond back together with the following adhesive mix:

Composition: EA9309 Adhesive Mix.

Vendor: Hysol Division - The Dexter Corporation, Olean, New York 14760.

Mixing Procedure: Combine 100 parts "A" with 23 parts "B" by weight and mix thoroughly.

Bench Life: Approximately 40 minutes for one pound mass at 75° Fahrenheit.

(3) Sand, paint and gloss surface at least 1/2 inch around damaged area. Apply sufficient adhesive to face sheet to rebond to core. Impregnate a patch of 181 or 1581 dry glass cloth with the 9309 adhesive mix. The patch should be 1/2 inch larger than the damaged area. Apply this patch to damaged area. Over this tape a sheet of polyethylene until adhesive hardens. Remove, sand lightly and paint.

(c) Delaminations in the edge bond. Delamination in the attachment edge bond may be bonded back together with EA9309 adhesive. If several plys of glass cloth are damaged, remove and replace with equal number of 181 or 1581 glass. Impregnate the glass cloth with EA9309, apply and allow to harden. Sand to shape or fit and repaint.

3. Class III Repair. Damage through both face sheets. This damage covers 1/2 inch diameter in the radar window area and one inch outside the window area. Damage beyond these limits should require replacement of the radome.

(a) Remove damaged face sheet. Apply polyethylene sheet to core and backup with a thin sheet of metal. Tape in place. Apply EA960F to fill core flush. Allow to harden and remove sheet metal backup. Apply EA9309 impregnated patches over damaged area overlapping by 1/2 inch all around. Tape a polyethylene sheet over impregnated patches and rub polyethylene sheet to smooth the adhesive and remove air from patch. Allow to harden, remove polyethylene sheet and sand lightly.

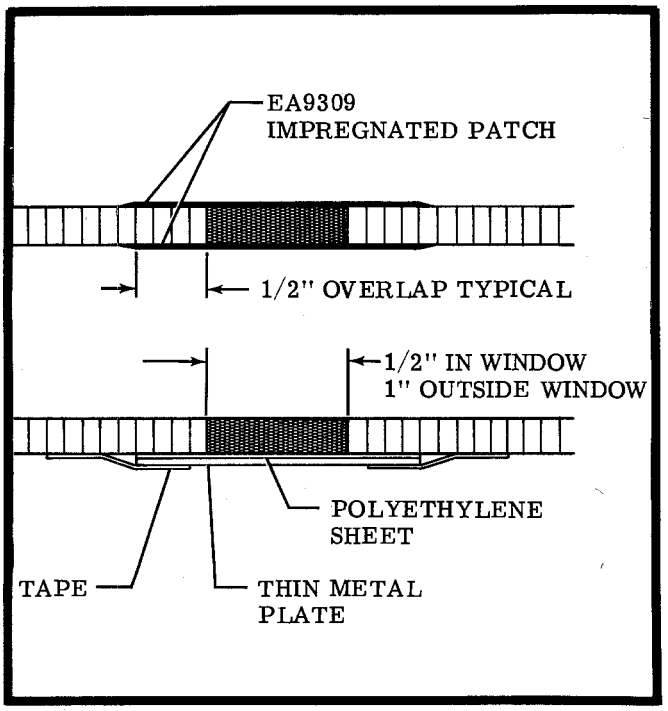



Figure 16-10A. Typical Class III Radome Repair

Rain Erosion Coating Application (Radome).

Rain erosion resistant coatings shall be repaired if worn away, blistered, peeled or otherwise defective. If the area is exposed to spilled or leaked oil, use only the epoxy enamel finish described later in this paragraph. Normal rain erosion coating specifications are:

MIL-C-7439, Coating Systems, Elastometeric, Rain Erosion Resistant and Rain Erosion Resistant with Anti-static Treatment for Exterior Aircraft and Missile Plastic Parts.

The repair materials are listed below, in order of their application:

Primer: Bostik No. 1007, made by B. B. Chemical Co., Cambridge, Mass. Methyl-ethyl Ketone is a suitable thinner.
Rain Erosion Resistant Coating: consists of No. 1801C Top Coat Cement and No. 983C Accelerator. Both made by Goodyear Tire and Rubber Co., Akron, Ohio.

The above items (Primer, Top Coat Cement and Accelerator) are included in Goodyear Kit No. 23-56 for brush application. For spraying, use Kit No. 23-56S which includes No. 1803C Diluting Solvent.

Goodyear Kit No. 23-57 (brushing) or No. 23-57S (spraying) Kits differ from Nos. 23-56 and 23-56S in that they include Anti-static Surfacer Cement No. 1804C and No. 983C Accelerator.

Gaco N-79 Rain Erosion Coating Kit may be used as an alternate and is manufactured by Gates Engineering Co., P. O. Box 1711, Wilmington, Deleware. This kit includes N-700-9 Top Coat Cement, N-300-9 Accelerator and N-450-9 Thinner (Methyl-ethyl Ketone or Toluene may be used as alternate).

All materials must be free of lumps, separation, gelation or dry skin on the surface of liquids. Accelerators must be stirred before mixing with other materials. Allowable age, work life, standing time at drying intervals for the materials shall all be governed by the manufacturer's instructions, where given. Damaged coatings should be removed by covering the area with a cloth pad saturated with toluene and allowing it to remain for several minutes. Remove loosened material with a stiff brush or by scraping with a dull edged metal or wooden scraper. The original surface should be exposed and remnants of the old coating removed by sanding if necessary. Rough places or pits in the fiberglass should be smoothed over by use of:

Tuf-on Putty, No. P244, manufactured by Brooklyn Varnish and Mfg. Co., Brooklyn, N. Y.

When the putty is dry, sand the surface with 180 grit or finer sandpaper, wash the fiberglass surfaces at least three times with a generous amount of xylene

(TT-X-916), if not available, use toluene (TT-T-548) or Trichloro-Ethylene Mili ry Specification MIL-T-7003. Avoid touching the surface with bare hands before applying finish. The work must be protected from dust and other contaminants during the drying periods. A sample strip should always be coated and examined before application to the aircraft parts. Apply the primer, properly thinned, to a total dried depth of 0. 001 to 0. 002 inch in two or three brushed coats. Allow to dry at least five minutes between coats and 20 minutes for the last coat to dry. Mix Top Coat Cement and Accelerator in the proportions of 16 parts Cement to 1. 37 parts Accelerator by volume. Apply about 4 brushed coats to a total dried thickness of 0. 008 to 0. 012 inch. Dry each application for a period of from ten to sixty minutes before applying the next. Air bubbles may be removed by spraying lightly with equal parts of Methyl-ethyl Ketone and toluene after each coat is applied. Protect from dust and allow the final coat to cure at room temperature until tack free. On the antenna housing only, follow with Anti-Static Surfacer Cement properly prepared by mixing with accelerator and thinning as required. Allowing a minimum of five and a maximum of 15 minutes between applications, apply three to four coats to give a total thickness of 0. 001 to 0. 003 inch when dry. Allow to cure to a tack free condition which requires about eight hours at room temperature of four hours if held at 65°C (149°F) +5°C. The oil resistant coating materials are:

MIL-C-8514 Wash (Pretreatment).
O-A-396 Alcohol-Ethyl, Grade III.
No. 3725 Black Enamel Epoxy, manufactured by Andrew Brown Co., Irving, Texas.
Catalyst Thinner for No. 3725 Black Enamel Epoxy, manufactured by Andrew Brown Co., Irving, Texas.

Prepare the surface as described above. Mix the Wash Primer by mixing one part of acid additive (supplied with primer) to four parts of the base primer. Thin as necessary by adding a maximum of 1 part of the Alcohol to 5 parts of well-stirred acidulated primer and again stirring. Brush or spray one coat to a cured film thickness of 0. 0002 to 0. 0003 inch. Allow not less than one hour nor more than four hours drying time before applying next material. The basic Epoxy Enamel and Catalyst Thinner are stirred, then mixed in equal parts and stirred well again. The mixture must then be tightly sealed and stored for one hour at 27°C (80°F). It must not be thinned or thickened but shall be discarded if not suitable for use. The mixture must be used within 24 hours or discarded. Apply in three spray coats, allowing 20 minutes between coats. For a smooth surface, sand with very fine abrasive when dry, between coats. Elevated temperature drying for 15 minutes at approximately 49°C (120°F) is permissible.

NOTE

In case of conflict between the above instructions and those supplied by the repair materials manufacturer, the latter will take precedence.

POLYCARBONATE AND ACRYLIC PLASTIC BONDING.

a. When it becomes necessary to bond Polycarbonate and acrylic - such as the magnetic compass base plate to the windshield - a 5% solution of methylene chloride is recommended as a bonding agent. This solution can be prepared as follows:

100 parts (by weight) Methylene Chloride
5 parts (by weight) Polycarbonate powder (such as Lexan 105 powder).

NOTE

Due to the short pot life of this solution, no more material than that which can be used in 30 minutes should be mixed.

b. Following coating of the parts to be bonded, intimate contact of the mating surfaces must be made within 10 to 15 seconds. A locally manufactured tool capable of exerting 50 to 60 psi should be used to hold the bonded parts for a minimum of 4 hours.

c. Curing the bond should be accomplished by allowing the bonded parts to remain at room temperature for at least 24 hours before any stress is applied.

REPAIR OF PLASTIC WINDOWS AND WINDSHIELD SURFACES. (See figure 16-11.)

NOTE

No repairs of any kind are recommended on highly stressed or compounded curves where the repair would be likely to affect the pilot's or copilot's field of vision.

a. When a crack appears in a panel, drill a hole at each end of the crack to prevent further spreading. The hole should be approximately 1/8 inch in diameter, depending on the length of the crack and the thickness of the material.

b. A temporary repair can be made on a curved surface by placing fabric patches over the affected areas. Secure the patches with airplane dope, Specification No. MIL-D-5549; or Lacquer, Specification No. MIL-L-7178. Lacquer Thinner, Specification No. MIL-T-6094 can also be used to secure the patch temporarily.

c. A temporary repair can be made by drilling small holes along sides of the crack 1/4 to 3/8 inch

apart and lacing the edges together with a soft wire. Small stranded antenna wire makes a good temporary lacing material. This type of repair is used as a temporary measure only, and as soon as facilities are available, the panel should be replaced.

d. Scratches on transparent plastic surfaces can be removed by hand-sanding operations followed by buffing and polishing, provided subsequent instructions are followed carefully. Wrap a piece of No. 320 (or finer) sandpaper or abrasive cloth around a rubber pad or wood block. Rub the surface around the scratch with a circular motion, keeping the abrasive constantly wet with clean water to prevent scratching of surface further. Use minimum pressure and cover an area large enough to prevent the formation of a "bull's-eye" or other optical distortions.

e. Continue the sanding operation, using progressively finer grade abrasives.

CAUTION

Do not use a coarse grade of abrasive. No. 320 is the maximum coarseness permitted.

f. When the scratches have been removed, wash the area thoroughly with clean water to remove all the gritty particles. The entire sanded area will be clouded with minute scratches which must be removed to restore transparency.

g. Apply fresh tallow and buffing compound to a motor-driven buffing wheel. Hold the wheel against the plastic surface, moving it constantly over the damaged area until the cloudy appearance disappears. A 2000-foot-per-minute surface speed is recommended to prevent heating, distortion, or burns.

NOTE

Polishing can be accomplished by hand, but it will require a considerably longer period of time to attain the same result as produced by buffing wheel.

h. When buffing is finished, wash the area thoroughly and dry it with a soft flannel cloth. Allow the surface to cool and inspect the area to determine if full transparency has been restored. Then apply a thin coat of hard wax and polish the surface lightly with a clean flannel cloth.

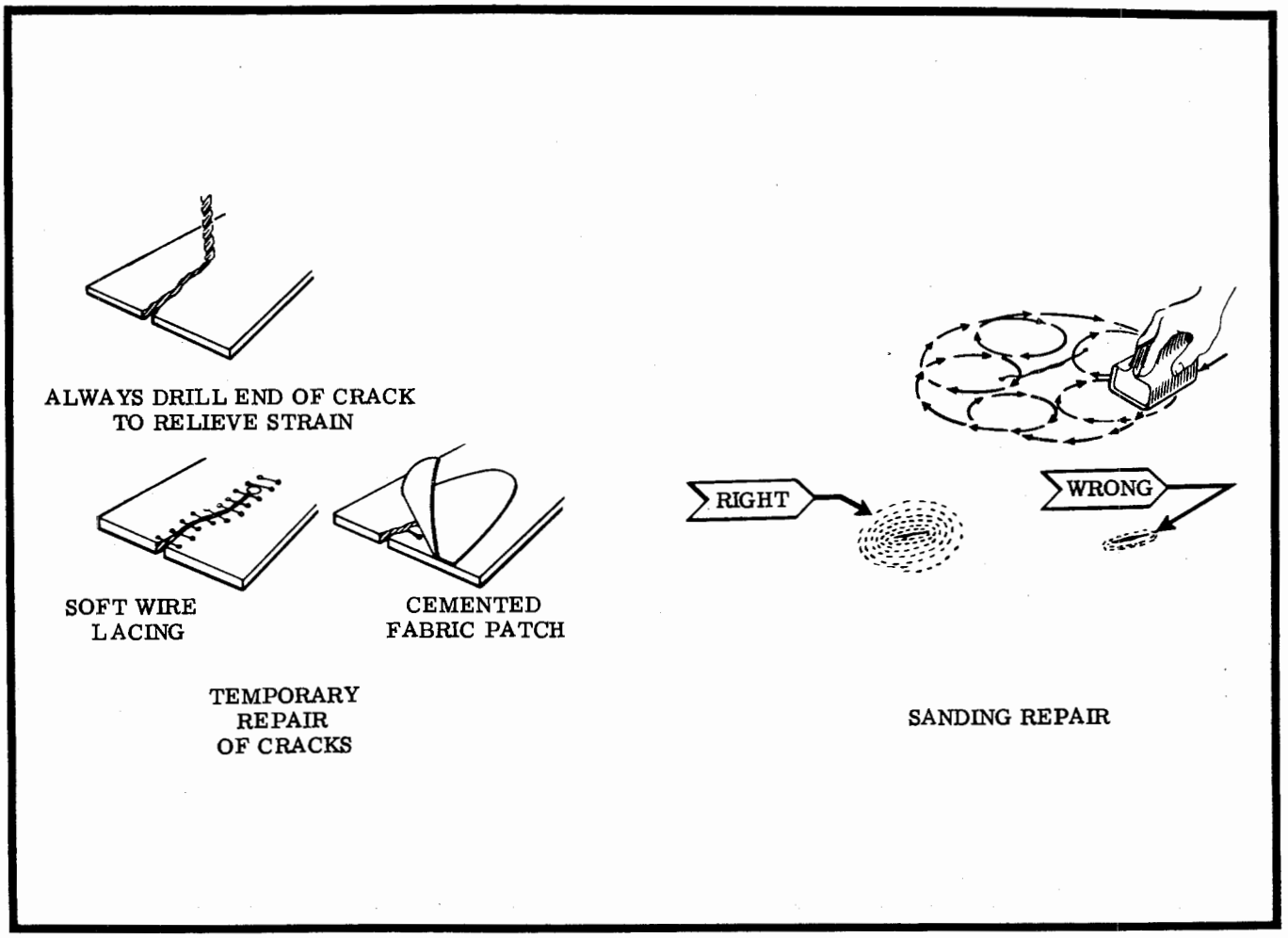



Figure 16-11. Plastic Repairs Diagram

1. FIBERGLASS
2. 0.016 INCH 2024 T3 ALCLAD
3. 0.025 INCH 2024 T3 ALCLAD
4. 0.025 INCH 2024 T42 ALCLAD
5. 0.032 INCH 2024 T3 ALCLAD
6. 0.020 INCH 2024 T3 ALCLAD
7. 0.032 INCH 2024 T42 ALCLAD
8. 0.025 INCH 2024 -0 ALCLAD
9. 0.040 INCH 2024 T3 ALCLAD
10. 0.020 INCH 2024 -0 ALCLAD
11. ROYALITE
12. POLYCARB
13. HONEYCOMB

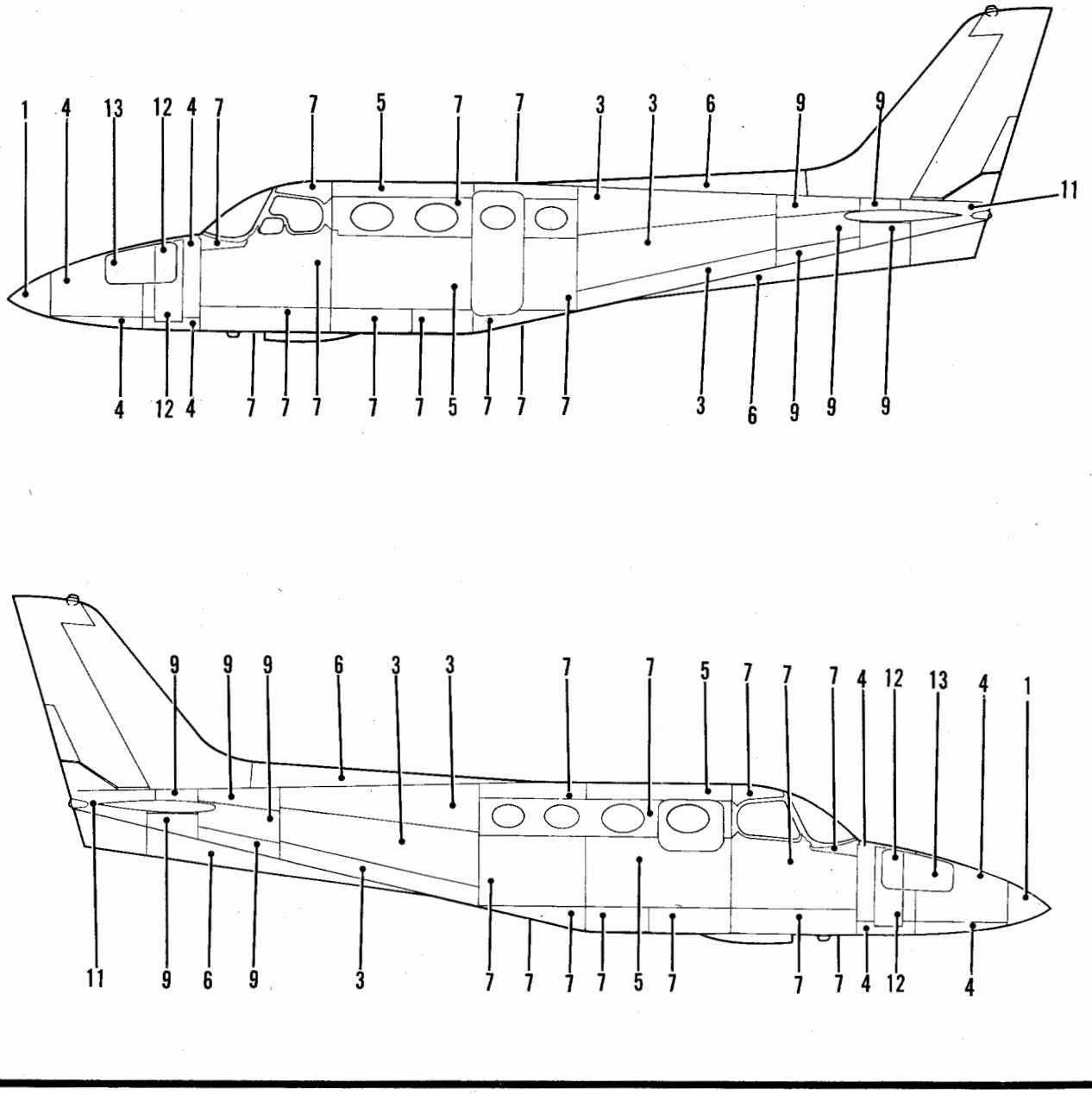
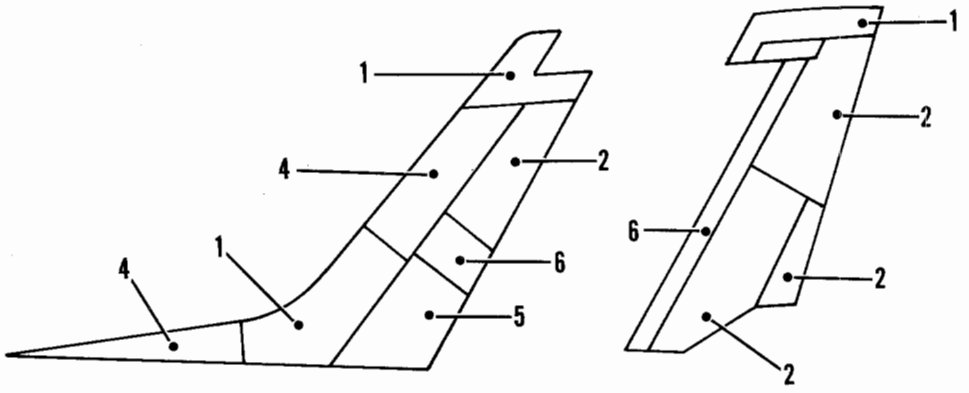
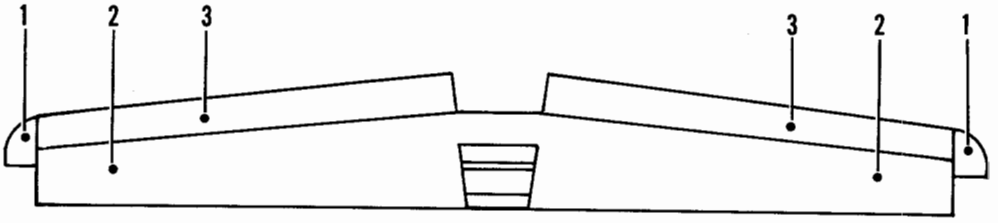



Figure 16-12. Fuselage and Empennage Skin (Sheet 1)

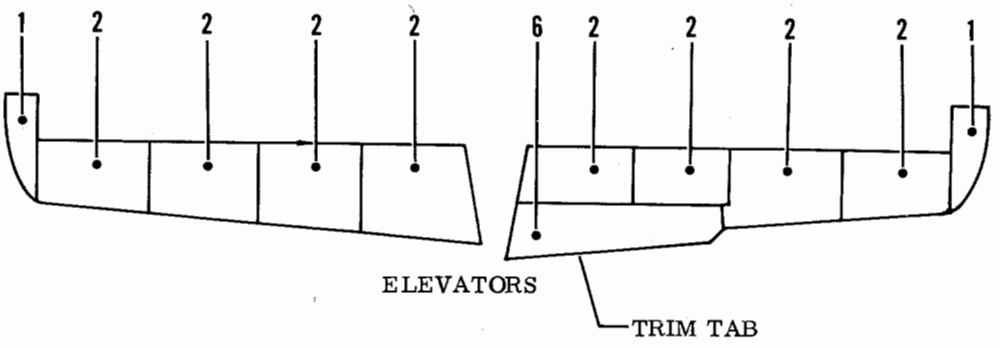
1. FIBERGLASS
2. .016 INCH 2024 T3 ALCLAD
3. .025 INCH 2024 T3 ALCLAD
4. .025 INCH 2024 T42 ALCLAD
5. .032 INCH 2024 T3 ALCLAD
6. .020 INCH 2024 T3 ALCLAD




VERTICAL FIN AND RUDDER

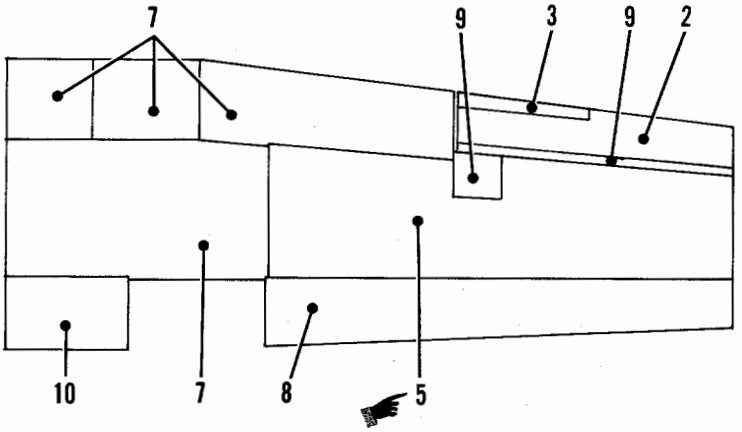



HORIZONTAL STABILIZER

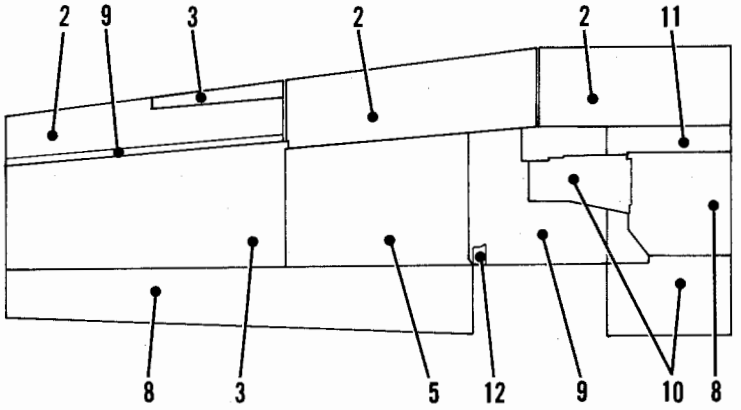



ELEVATORS

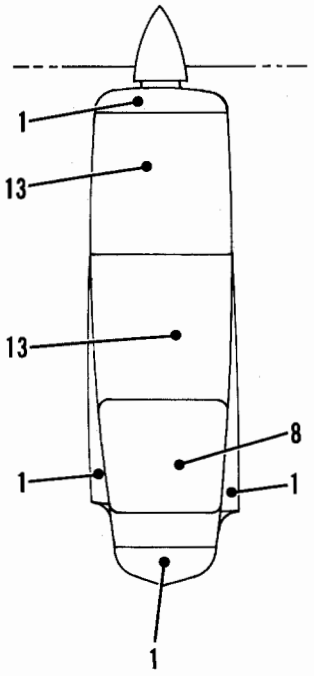
Figure 16-12. Fuselage and Empennage Skin (Sheet 2)

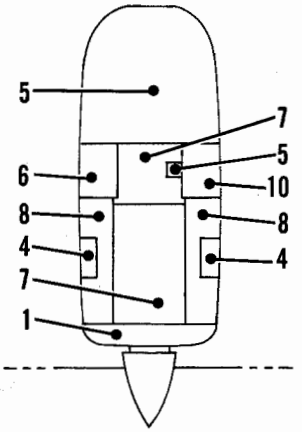



TOP VIEW LH WING




BOTTOM VIEW LH WING




1. FIBERGLASS
2. .016 T2024 T3 ALCLAD
3. .020 T2024 T3 ALCLAD
4. .020 T2024 T42 ALCLAD
5. .025 T2024 T3 ALCLAD
6. .025 T2024 T42 ALCLAD
7. .032 T2024 T3 ALCLAD
8. .032 T2024 T42 ALCLAD
9. .040 T2024 T3 ALCLAD
10. .050 T2024 T42 ALCLAD
11. .063 T2024 T3 ALCLAD
12. .020 321-347 STAINLESS STEEL
13. HONEYCOMB

Figure 16-13. Wing Skin

NOTE

Rubbing a plastic surface with a dry cloth will build up an electrostatic charge which attracts dirt particles and may eventually cause scratching of the surface. After the wax has hardened dissipate this charge by rubbing the surface with a slightly damp chamois. This will also remove the dust particles which have collected while the wax was hardening.

SEALING PROCEDURES.

The cabin area of the fuselage extending from FS 100.00 to FS 252.00 has been carefully sealed during the process of manufacturing. During maintenance and repair, it is necessary to maintain a good cabin seal. The following information is given to assist in the maintenance and repair of the pressurized cabin where sealing is required.

NOTE

- In rework or repair of faulty seal, the sealant must be completely removed or notched completely in the affected area to produce a solid residual material.
- Cutting tools should be made from material not harder than 2024T-3 aluminum. Acrylic plastic is preferred. Steel cutting tools should never be used.
- Sealant material should not be applied when the temperature of the structure is below 60°F.

WARNING

Sealing compounds are highly inflammable. Exercise precautions to prevent fire or explosion. These materials are toxic and should be applied in a well ventilated area.

Sealant Materials.

The following sealants are recommended:

a. Faying sealants.
1. EC1675 Class A Minnesota Mining and Manufacturing Co.
2. Pro-Seal 890 Class A Coast Pro-Seal Manufacturing Co.
3. PR1422 Class A Products Research and Chemical Corp.

b. Fillet sealants.
1. EC1675 Class B Minnesota Mining and Manufacturing Co.
2. Pro-Seal 890 Class B Coast Pro-Seal Manufacturing Co.
3. PR1422 Class B Products Research and Chemical Corp.

c. Hole filling compound.
1. Pro-Seal 567 Coast Pro-Seal Manufacturing Co.

d. Electrical connector and wire bundle sealing.
1. Pro-Seal 727 Coast Pro-Seal Manufacturing Co.

NOTE

Class A Sealant is a brushable material. Class B Sealant is a filleting or injectable material.

Cleaning Materials and Equipment.

a. Electrical.
1. Aliphatic Naptha (TT-N-95) Type II.
2. Mozels Cleaning Solvent #18 Mozel Chemical Company.

b. Structural.
1. Methyl Ethyl Ketone (MEK) cleaning solvent.

d. Clean rags.
e. Stiff bristle brushes (other than nylon).
f. Sealant gun (Pyle #950 or equivalent). Pyle Industries Inc., Southfield, Michigan.
g. Polyethylene nozzles for sealant gun.
h. Polyethylene cartridges for sealant gun.
i. Rubber gloves.

Cleaning Procedures.

a. Clean the surface immediately prior to the application of the sealing compound to insure the surface is free of dirt, grease and chips.
b. Metal cleaning should be done with a clean, soft lintless rag moistened with Methyl-ethyl Ketone (MEK). The solvent should always be poured on the cloth to refrain from contamination of the solvent. The solvent should never be poured or sprayed on the structure due to possibility of running between layers of structure and creeping out again after cleaning, bringing contamination to surface to which the sealant is to be applied.
c. Immediately dry the area thus cleaned with a dry, clean, lintless rag before the solvent has evaporated from the surface.
d. If primer is removed during cleaning, it should be touched up after all sealing operations are complete.
e. Always clean an area wider than the width of the finally applied sealant.
f. Cleaned areas should be handled with care to prevent surface contamination.

Application Sequence.

In order to accomplish an adequate seal in an efficient manner, the following sealant operations shall be accomplished in the following order:

a. Faying surface sealing as required on assembly.
b. Fill holes and slots as required.
c. Fill joggles and confined holes by injection as required.
d. Fillet seal seams and joints as required.
e. Seal fasteners as required.
f. Faying surface sealing of close-out panels as required.

Mixing Two Part Sealants.

a. The base compound should be matched with the appropriate batch numbered accelerator.
b. The two components must be weighed in proportions as marked on the container within a tolerance of ±2%.
c. If the entire preweighed kit is to be used, it is not necessary to weigh out the accelerator and base compound. Simply mix entire amount of the preweighed compounds in accordance with instructions outlined.
d. The two components should be mixed thoroughly so that the complete mixture is of uniform color.

NOTE

Care should be exercised to preclude the trapping of air in the sealing compound during the mixing procedure.

e. Mixed compound has a limited work life, so only enough should be mixed to satisfy the immediate requirement.

Application of Sealing Procedures.

Faying Surface Sealing.

a. Using sealant EC1675, Class A, apply to one surface with a brush, spatula or roller. Spread evenly to approximately 1/32 inch thick over the entire faying surface. The application should be accomplished with the sealing compound flowed on with a minimum of stroking to prevent formation of bubbles.
b. Avoid using excess amounts of sealing compound.
c. When the surfaces are fastened together, any extruded sealant should be faired out with a fairing tool, leaving a smooth fillet along the joint.
d. All permanent fasteners must be installed within the work life of the sealant. Sealant extruded through hole by rivet must be wiped from end of rivet before bucking. If permanent fasteners cannot be installed, use temporary fasteners and clamps as necessary to hold the parts firmly together until the sealant has cured. Remove individual temporary fasteners and replace immediately with permanent fasteners. Fresh sealant must be applied to the fasteners.

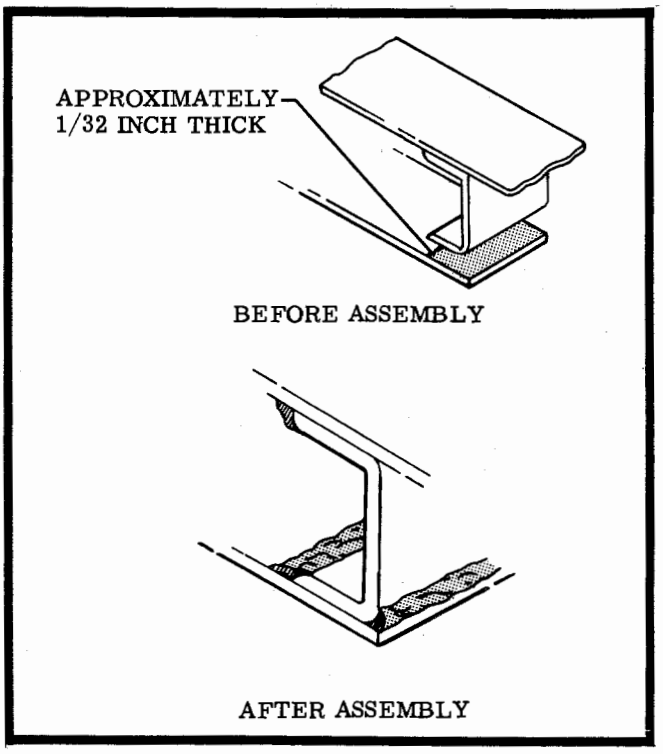



Figure 16-14. Fay Surface Sealing

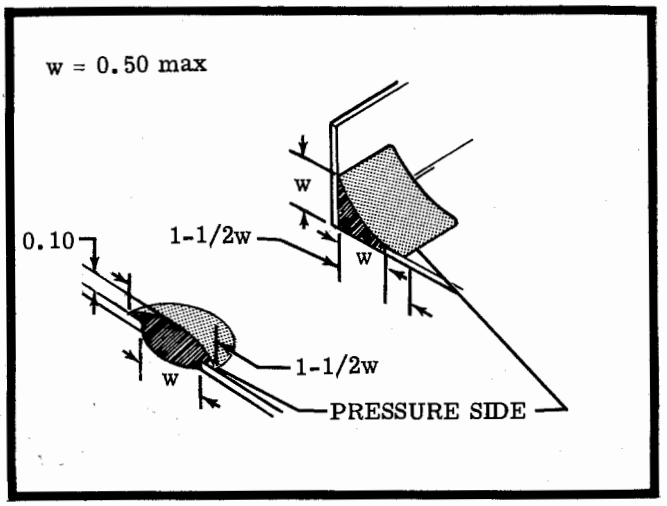



Figure 16-15. Hole Filling

NOTE

Any pressure testing required should not be done before the sealing compound has completely cured.

Hole Filling.

a. All tool and coordination holes through a pressure seal area should be plugged with soft rivets and overcoated with EC1675, Class A sealant.
b. Holes, gaps and other cavities that cannot be filled with one application of sealant should be filled with a void filling compound. Pro-Seal 567 is preferred. The compound should then be overcoated with sealant.

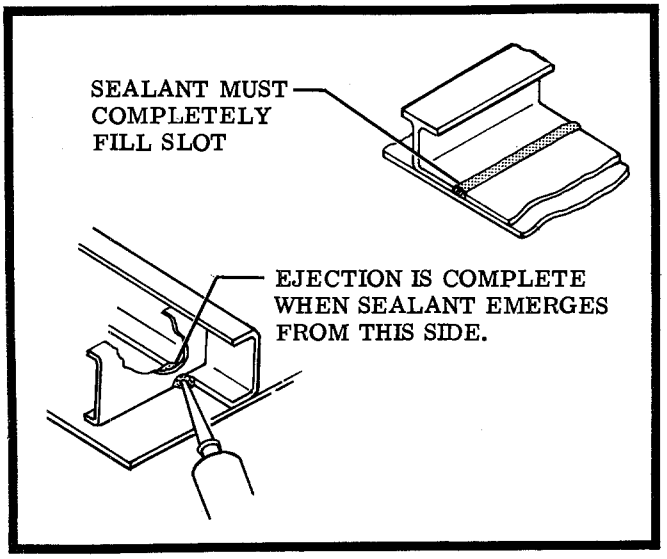



Figure 16-16. Injection Sealing

Injection Sealing.

a. Injection seal may be applied to provide continuity of seals where fillet seals are interrupted by holes, joggles or structure. Force EC1675, Class B sealant into one end of the cavity or injection hole, if provided, with a sealing gun until the sealant emerges from a prescribed opening for continuity of seal.

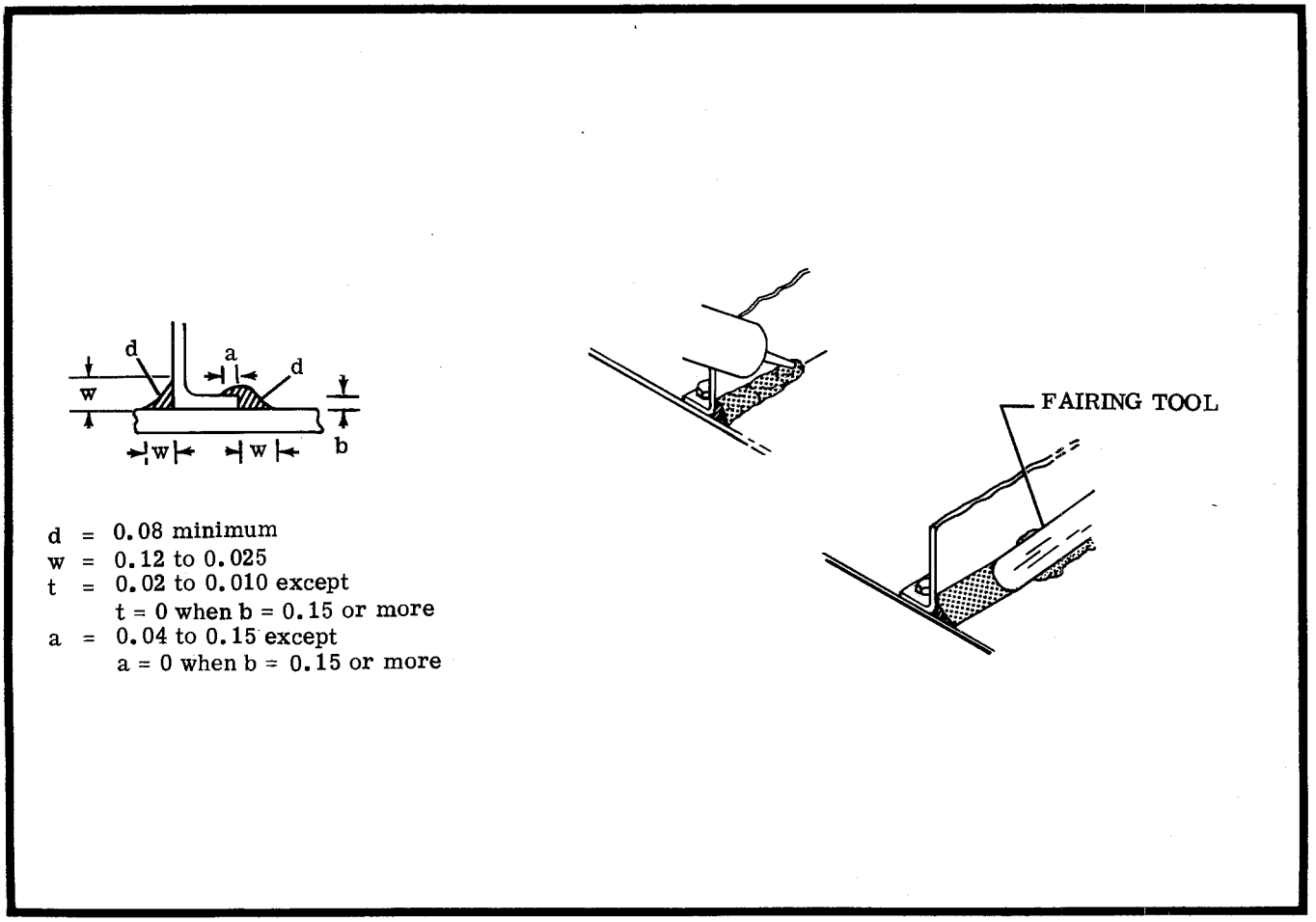
b. When a seal is made at the bottom of a slot, the sealant should be applied to fill and have a continuous contact with the bottom and sides of the slot.

Fillet Sealing.

a. Fillet sealing should be done with EC1675, Class B sealant, using a sealing gun for application. The nozzle tip should be pointed into the seam and maintained nearly perpendicular to the line of travel. A bead of sealant will be forced ahead of the nozzle tip.

b. Fillets may be worked into the surface with fairing tools or gun tip.

c. Fillet shapes and dimensions should conform to dimensions given in figure 16-17 as near as possible.




d = 0.08 minimum
w = 0.12 to 0.025
t = 0.02 to 0.010 except
t = 0 when b = 0.15 or more
a = 0.04 to 0.15 except
a = 0 when b = 0.15 or more

Figure 16-17. Fillet Sealing

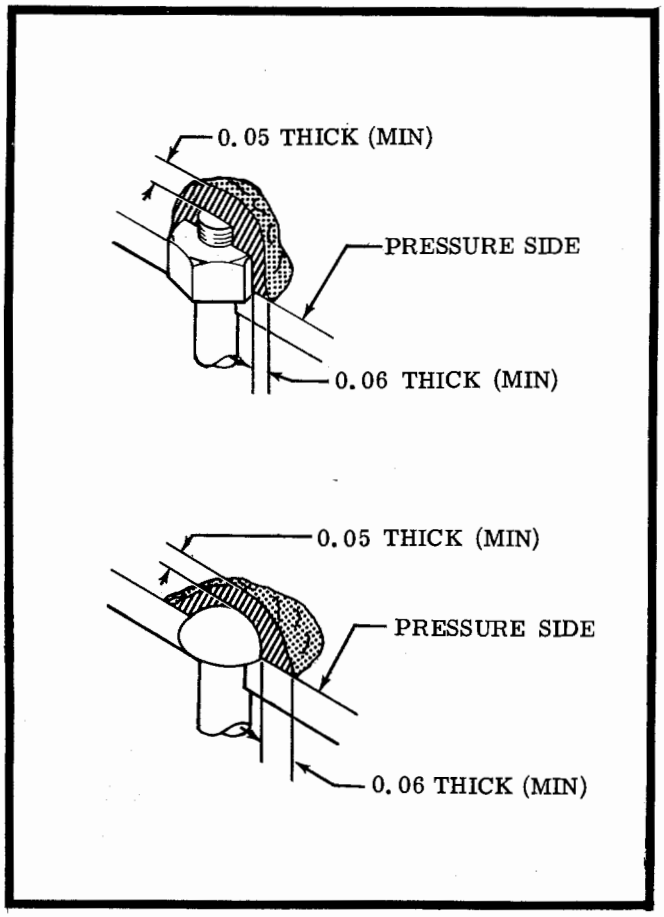



Figure 16-18. Fastener Sealing

Fastener Sealing.

a. Fasteners installed through a faying surface within the work life of the sealant need to further sealing.
b. Fasteners installed through a faying plane where no faying surface sealant is used would be sealed by one of the following methods:
1. Apply EC1675, Class A sealant to the fastener or hole on installation.
2. Brush the fastener with sealant after installation.

Window Sealing.

a. Apply masking tape to window and outside mating skin or fairing. If window is already masked, or otherwise protected, peel off the protective coating in areas to be in contact with the sealant.
b. Clean both surfaces thoroughly. Acrylic materials should be cleaned with Aliphatic Naptha (TT-N-95, Type II) and a clean lint-free cloth.

NOTE

Do not use ketone or any cleaner that may cause crazing of the acrylic type glass.

CAUTION

Windows are of acrylic materials and must be sealed with EC1675, Class B sealant with NONCRAZING accelerator.

c. Apply sealant to surfaces as required, consistent with the type of sealing.
d. Assemble mating surfaces allowing the sealant to extrude out the edge of the skin or fairing. Complete assembly using the appropriate fasteners and dabbing sealant into the dimpled or countersunk hole.
e. Fair extruded sealant over cloth wrap and over edge of masking tape.
f. After sealant is cured, remove masking tape.

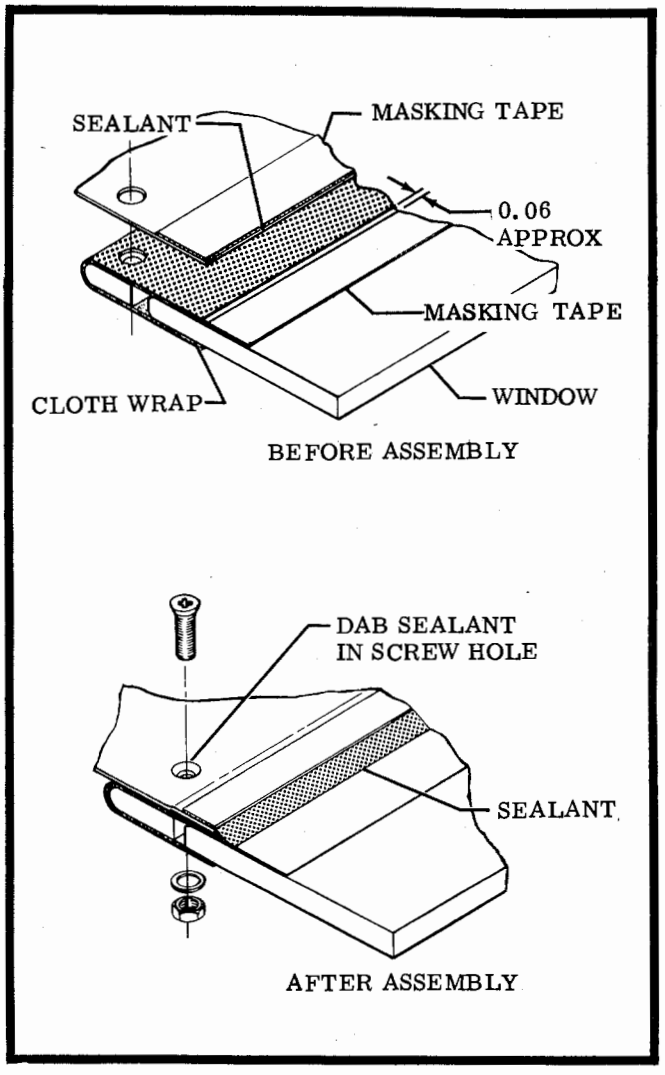



Figure 16-19. Window Sealing

Electrical Sealing.

When the wire bundles are continuous and pass through a pressurized bulkhead, they should be sealed in accordance with one of the following alternate methods using the S45 nylon seal fitting.

Injection Method.

a. Clean the metal area where the seal fitting will seat. Clean the wires and seal fittings with Mozel solvent #18.
b. Pass the wire bundle through the bulkhead cutout and secure, leaving approximately two inches of slack.
c. Bundle ties must not be placed within six inches of the seal assembly to facilitate penetration of sealant around individual wires.
d. Place the seal halves around the wire bundle on the pressure side and position in bulkhead cutout.
e. Wrap several turns of masking tape around the seal assembly ends and the wire bundle to center the bundle and retain the sealant when applied.
f. Secure the seal assembly to the bulkhead with the required fasteners.
g. Puncture the tape over the injection hole in the fitting.
h. Injection sealant should be Pro-seal 727 and should be used toward the beginning of its work life (freshly mixed) to obtain a good flow throughout the fitting and between the wires leaving no voids.
i. Inject sealant using a sealant gun at a pressure of approximately 100 psi until the sealant, without visible evidence of entrapped air, emerges from both notches in the outer periphery of the seal assembly mounting flanges.
j. Remove excess sealant which extrudes from the seal assembly mounting flanges.
k. Remove the masking tape after the sealant has cured.

Pre-Pack Method.

a. Accomplish steps a through d of injection method.
b. Place seal fitting halves around the wire bundle on the pressure side of the bulkhead.
c. Wrap several turns of masking tape around the seal assembly on the far end only to center the bundle and retain the sealant when applied.
d. Hold the seal assembly in a vertical position with the open end up and inject sealant in around the wires. Remove and reinject the nozzle at several locations within and around the bundle to fill all the voids between the wires and around the wires and the seal assembly.
e. Wrap the open end of the seal assembly with masking tape to center the bundle and retain the sealant.
f. Lay a heavy bead of sealant within the flange of the fitting so that when placed against the bulkhead, some would be extruded between the fitting and bulkhead.
g. Position fitting in the cutout and secure with the required fasteners.
h. Remove any excessive sealant which extrudes from the seal assembly mounting flanges.

Adding Additional Wires to Continuous Bundle.

When additional wires need to be added to a bundle which has been installed and sealed, one of the following procedures may be used:

a. Filler rods may have been added during manufacture to accommodate future wire installations. If so, remove as many filler rods as necessary to install the required wires. Several wires can be added through the same hole, but room must be retained to inject sealant around the wires. Remove the filler

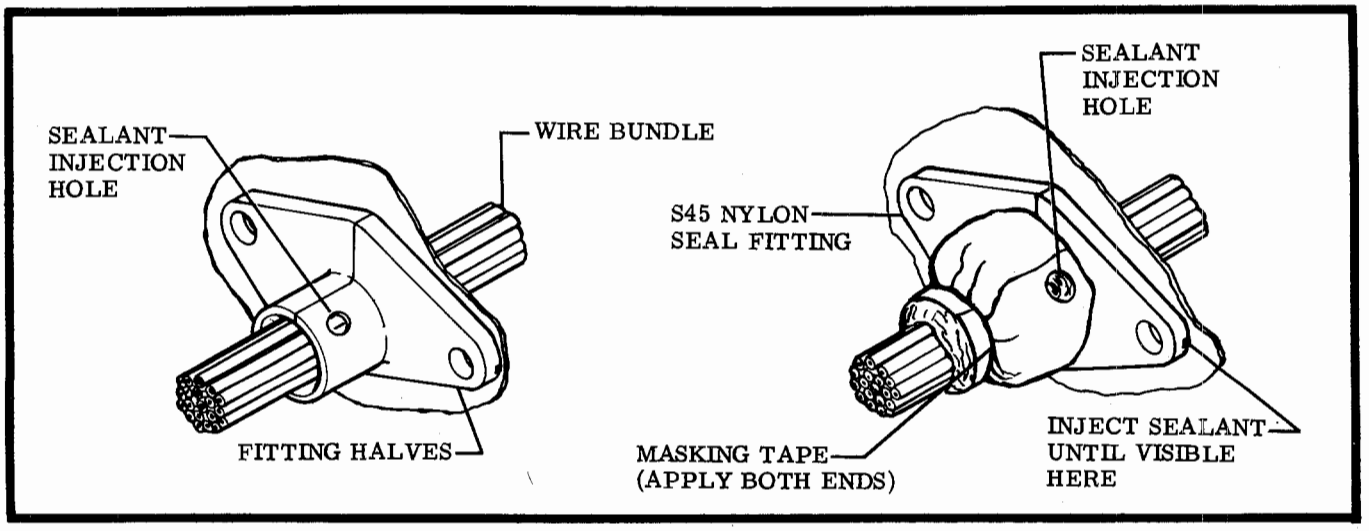



Figure 16-20. Electrical Sealing

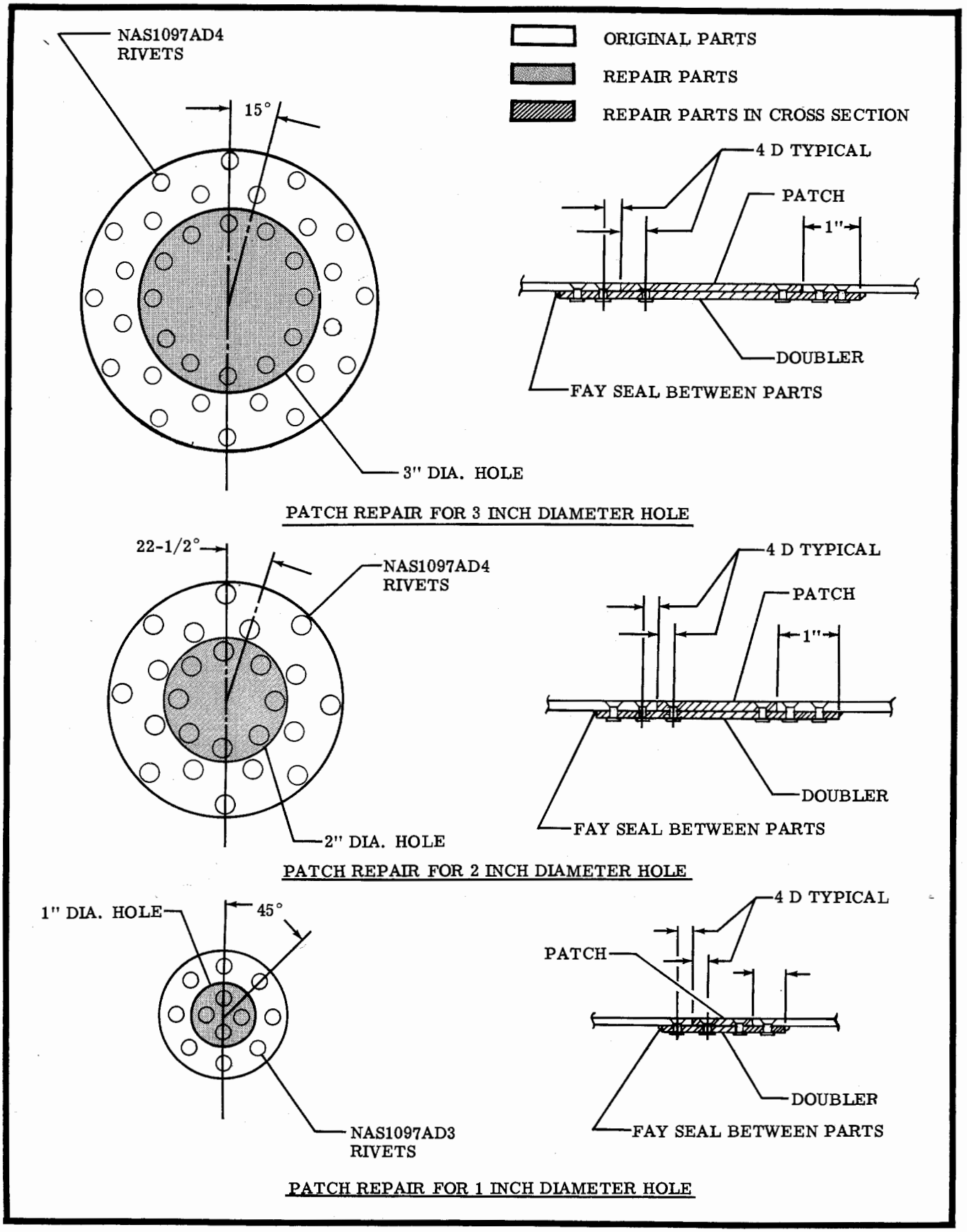



Figure 16-21. Typical Circular Hole Skin Repair in Pressure Cabin

rods by pulling straight from the hole with pliers.

b. Route and connect the wires prior to sealing.

c. Seal each cavity by injecting Pro-seal 727 sealing compound completely around the wires in the cavity.

d. Retie any remaining filler rods to the wire bundle on each side of the seal fitting approximately 1 inch from the end of the rods.

e. When there are no filler rods, it is necessary to remove the seal assembly from the structure by prying loose at the seal assembly mounting flanges.

f. Remove and discard the old seal fitting and remove all the original sealing material from the wires and structure. Care must be taken to avoid damage to the wire insulation.

g. Assemble and reseal the assembly in accordance with the appropriate methods.

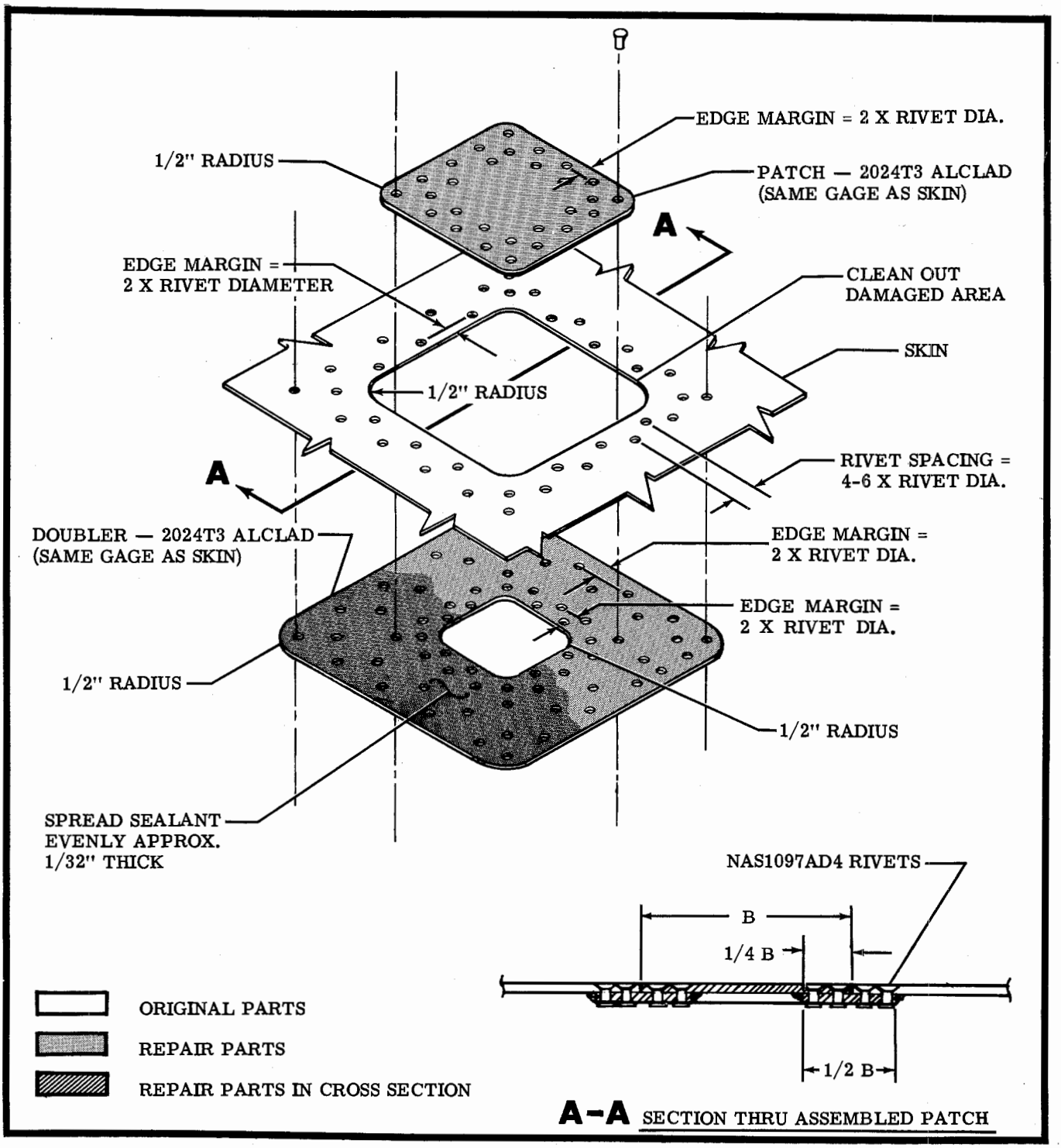



Figure 16-22. Typical Insert Patch in Pressure Cabin

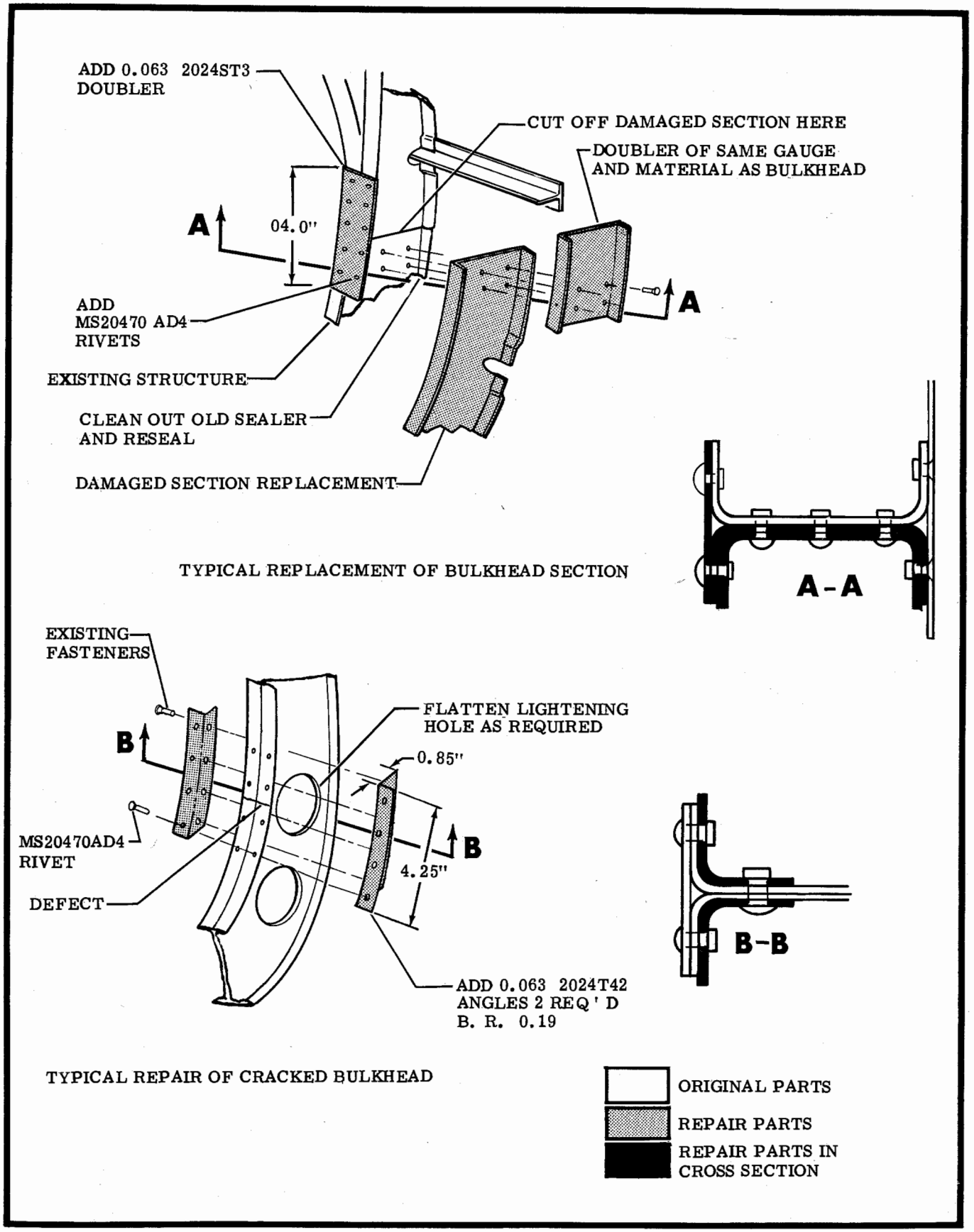
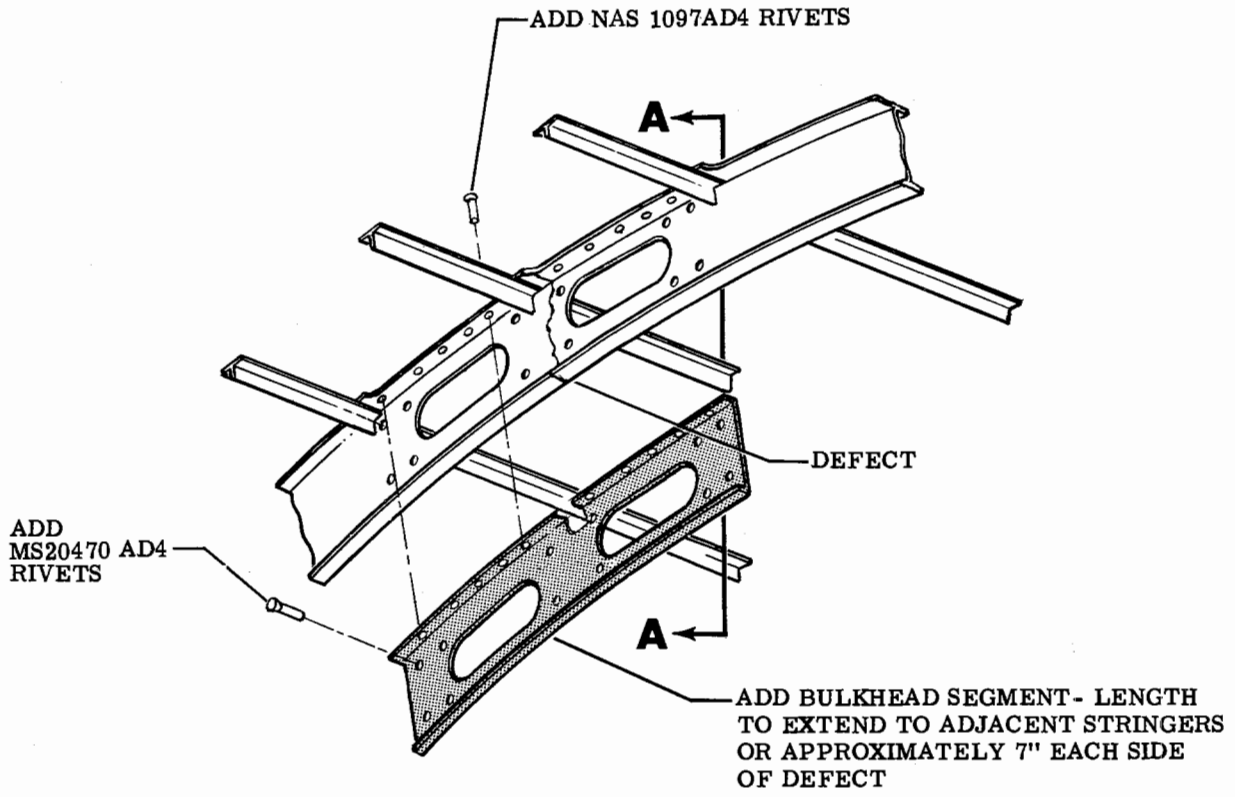
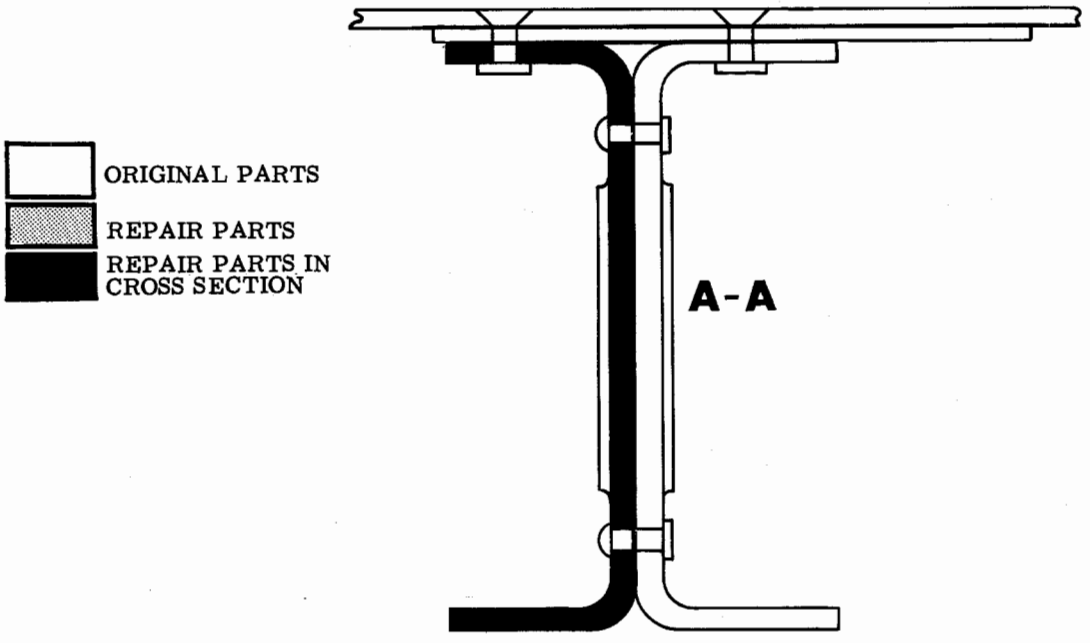



Figure 16-23. Typical Cabin Bulkhead Repair (Sheet 1)




TYPICAL CABIN BULKHEAD REPAIR

Figure 16-23. Typical Cabin Bulkhead Repair (Sheet 2)

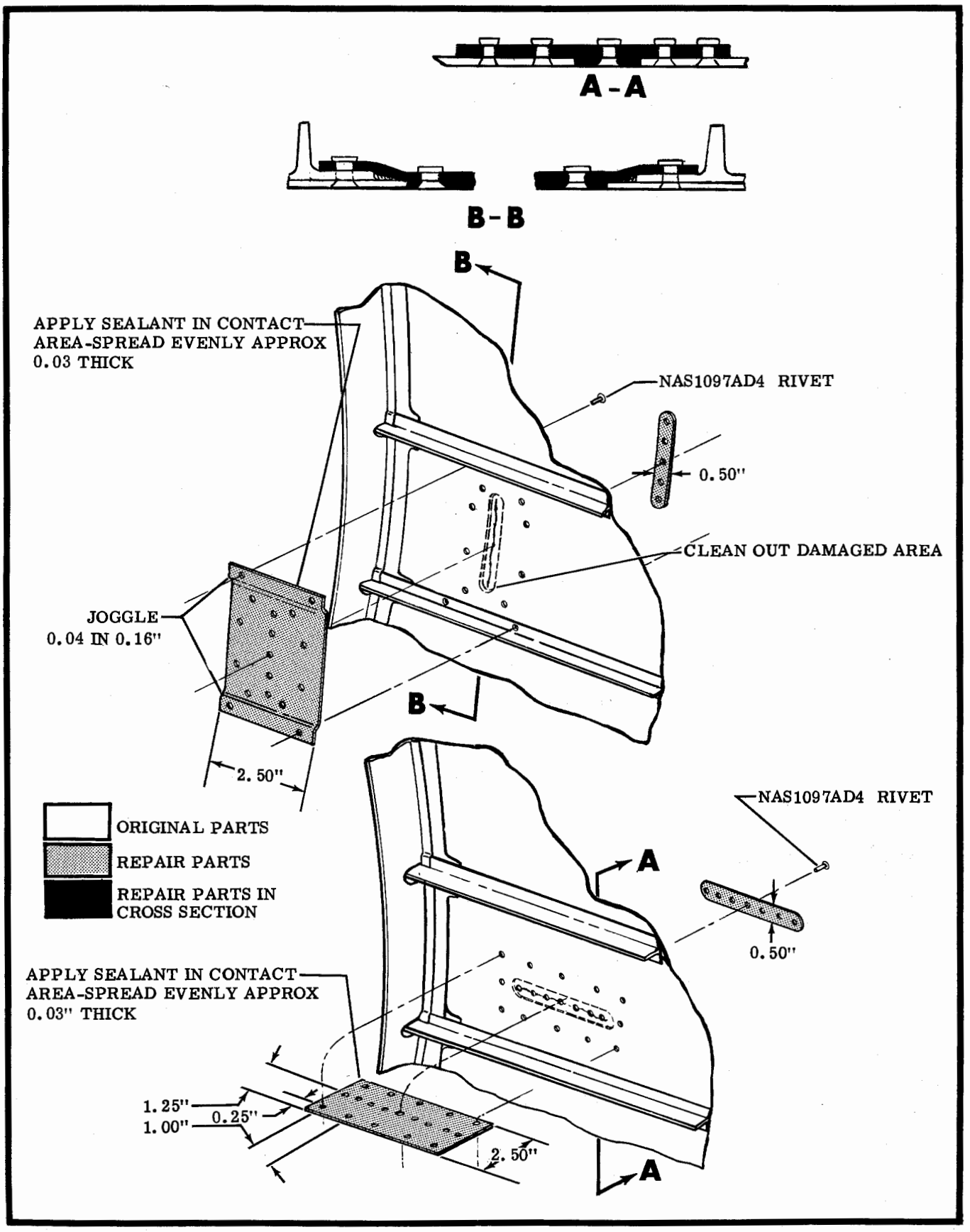



Figure 16-24. Typical Cabin Skin Crack Repair

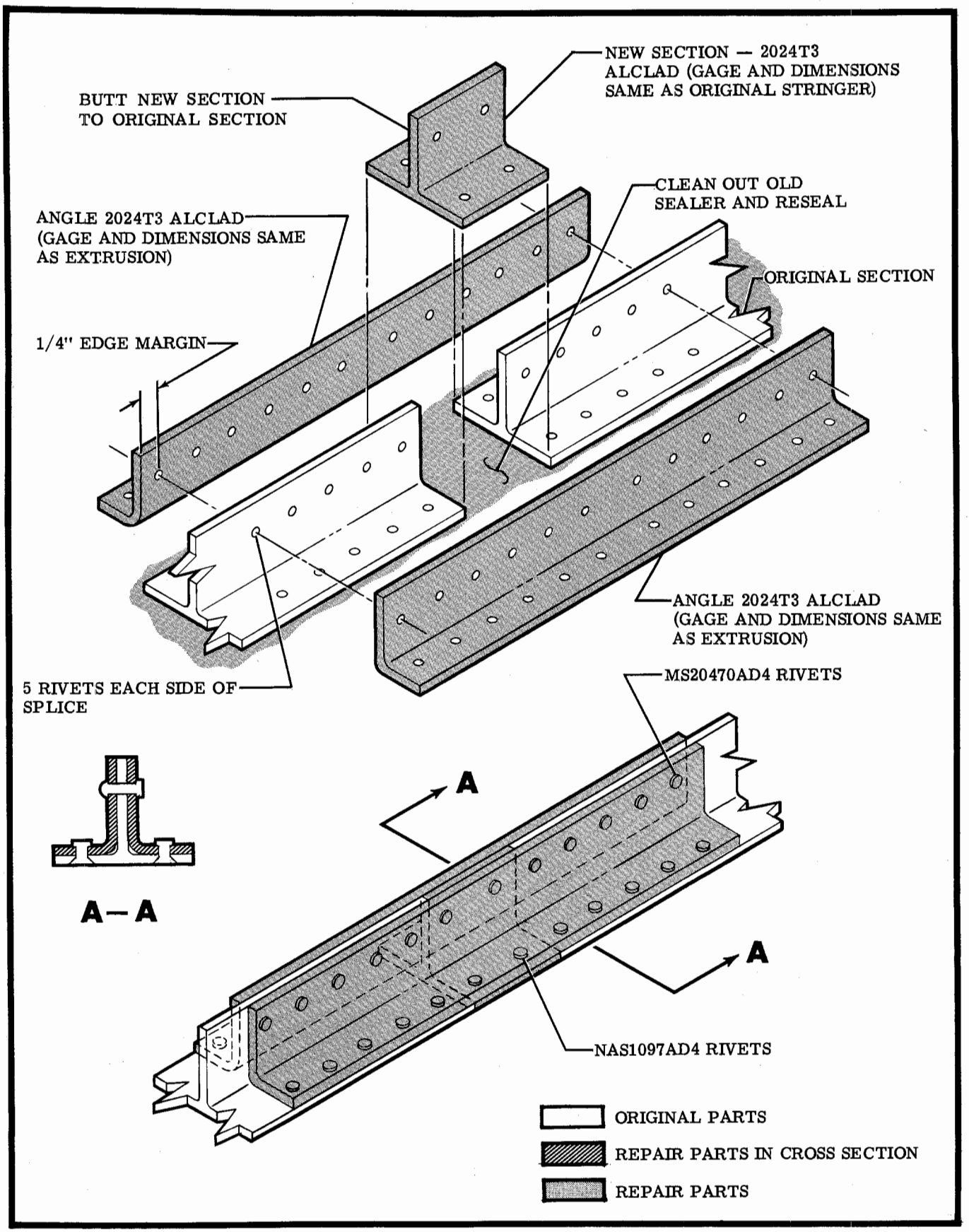
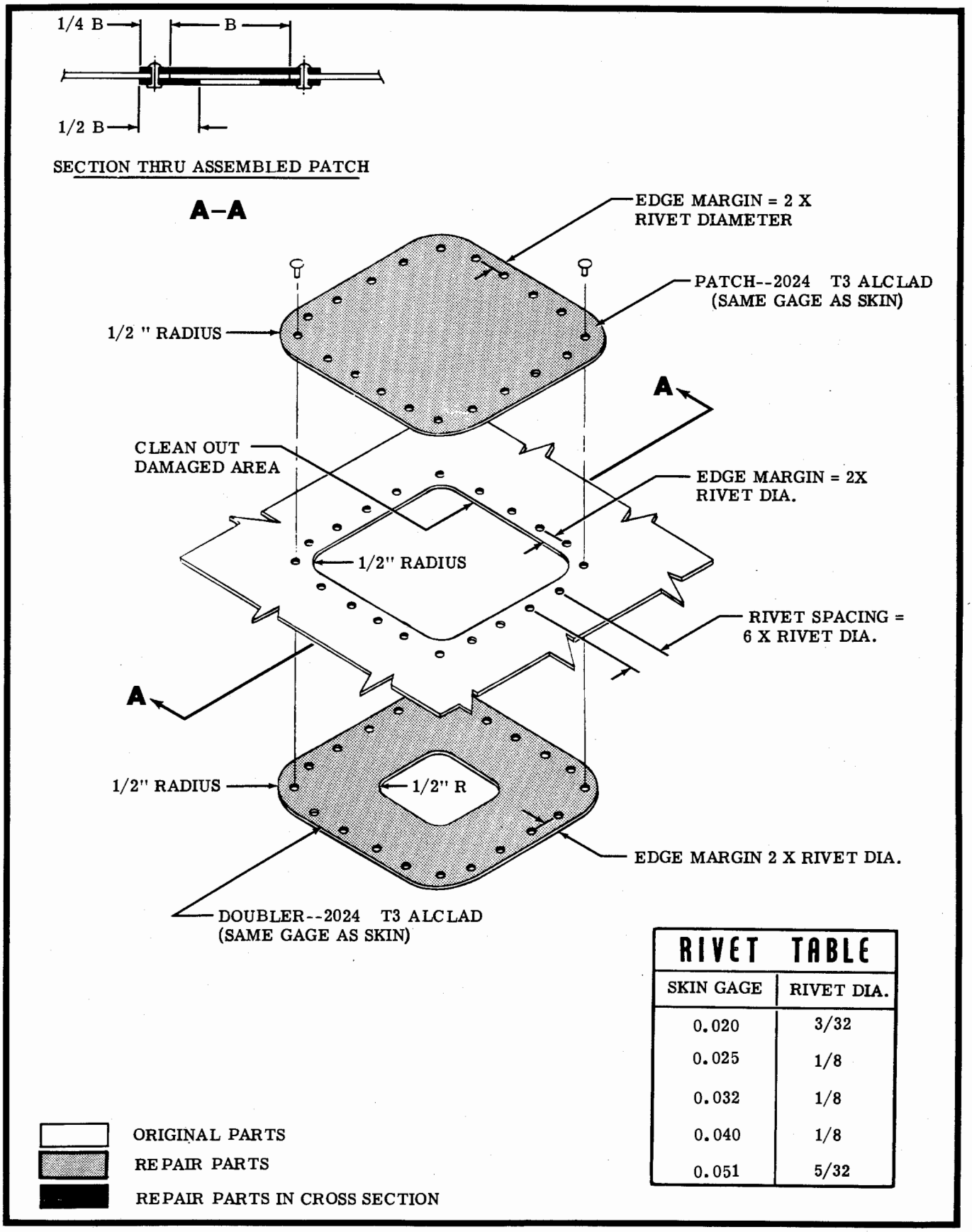



Figure 16-25. Typical Cabin Section Stringer Splice




| RIVET TABLE | |
|---|---|
| SKIN GAGE | RIVET DIA. |
| 0.020 | 3/32 |
| 0.025 | 1/8 |
| 0.032 | 1/8 |
| 0.040 | 1/8 |
| 0.051 | 5/32 |

Figure 16-26. Typical Clear of Structure Skin Repair

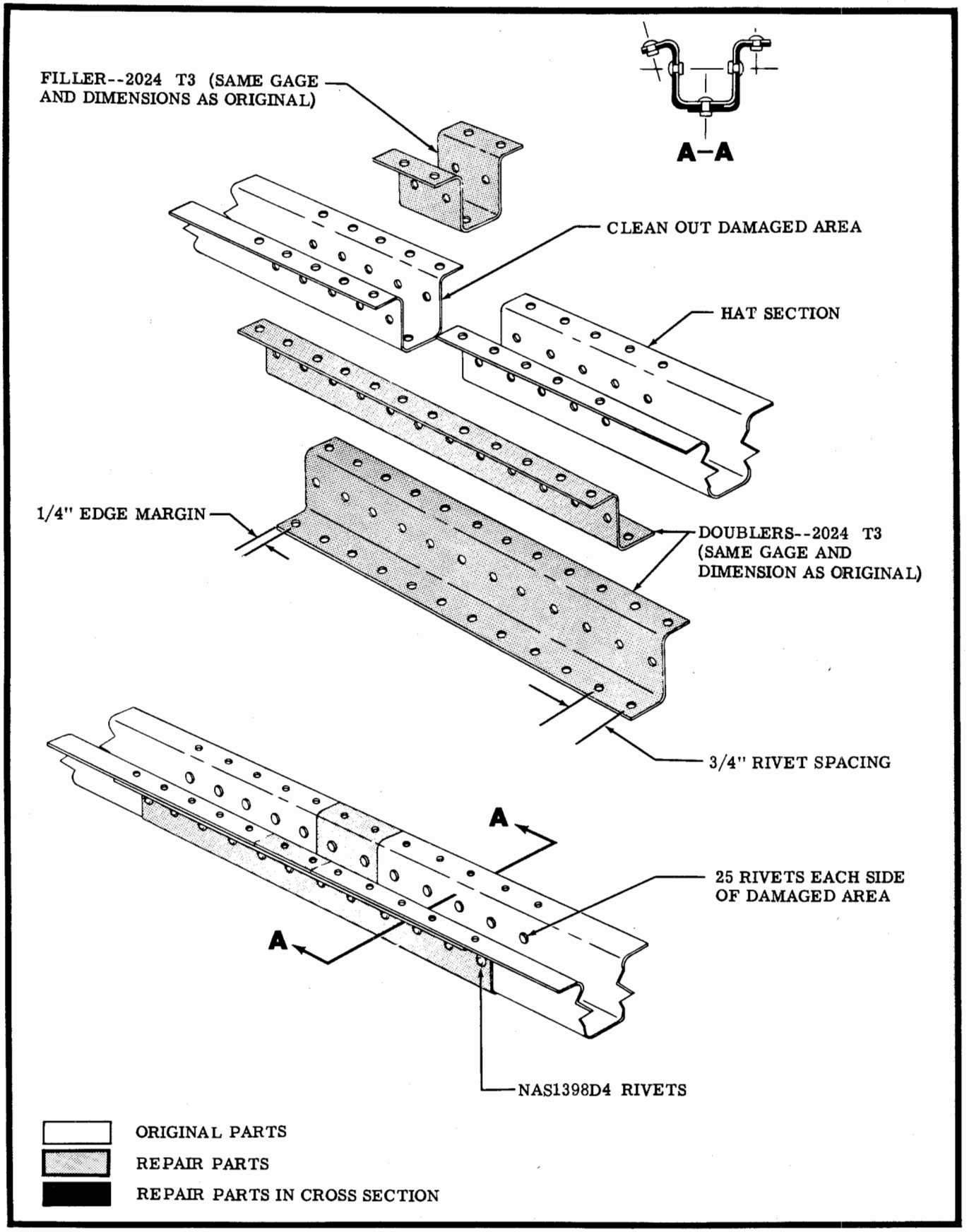
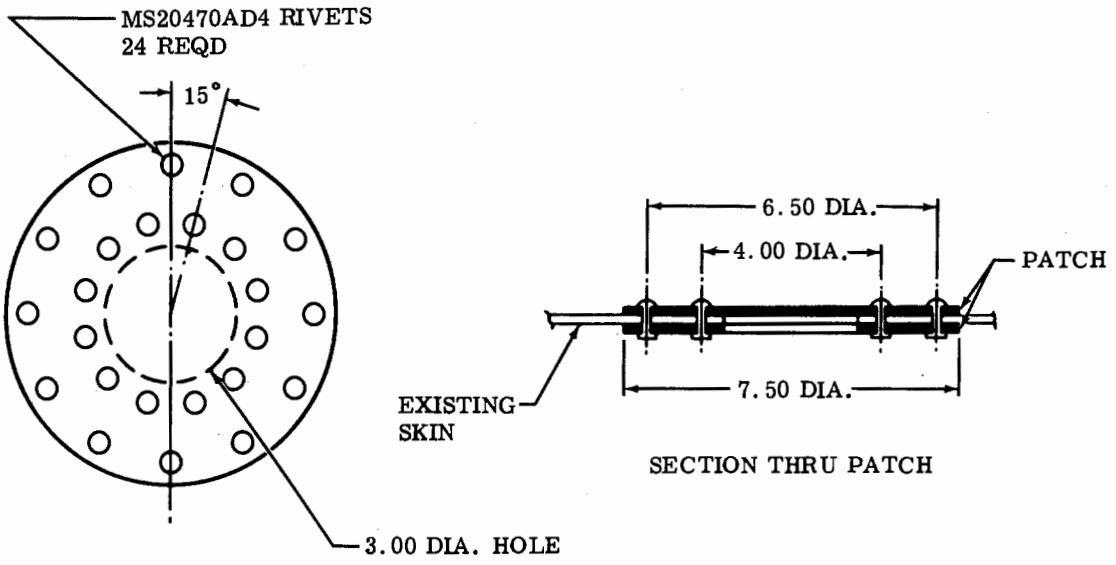
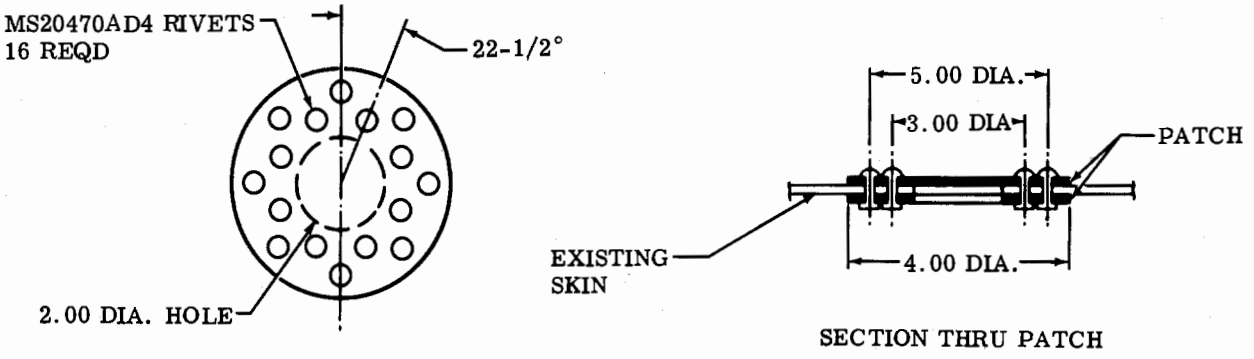


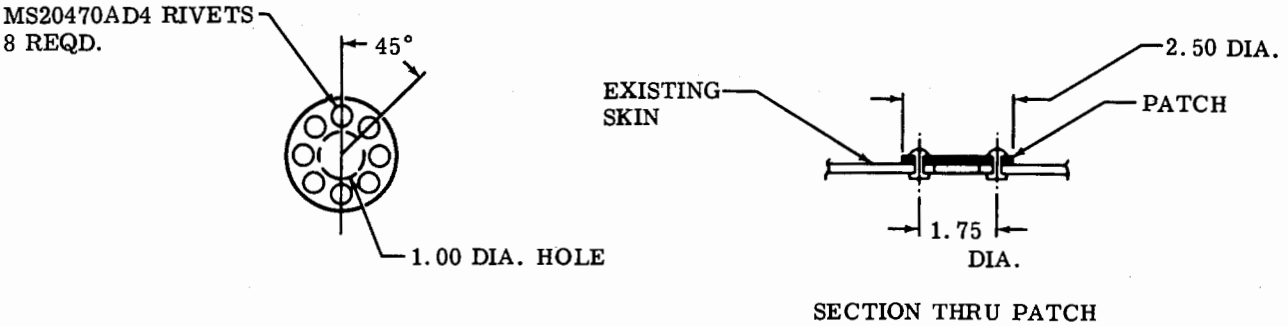

Figure 16-27. Typical Pressure Bulkhead Hat Section Repair




PATCH REPAIR FOR 3 INCH DIAMETER HOLE

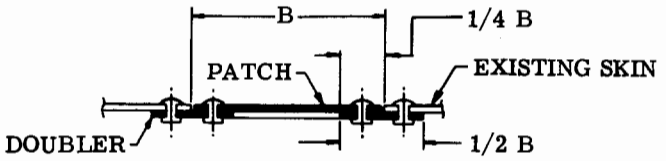



PATCH REPAIR FOR 2 INCH DIAMETER HOLE




PATCH REPAIR FOR 1 INCH DIAMETER HOLE

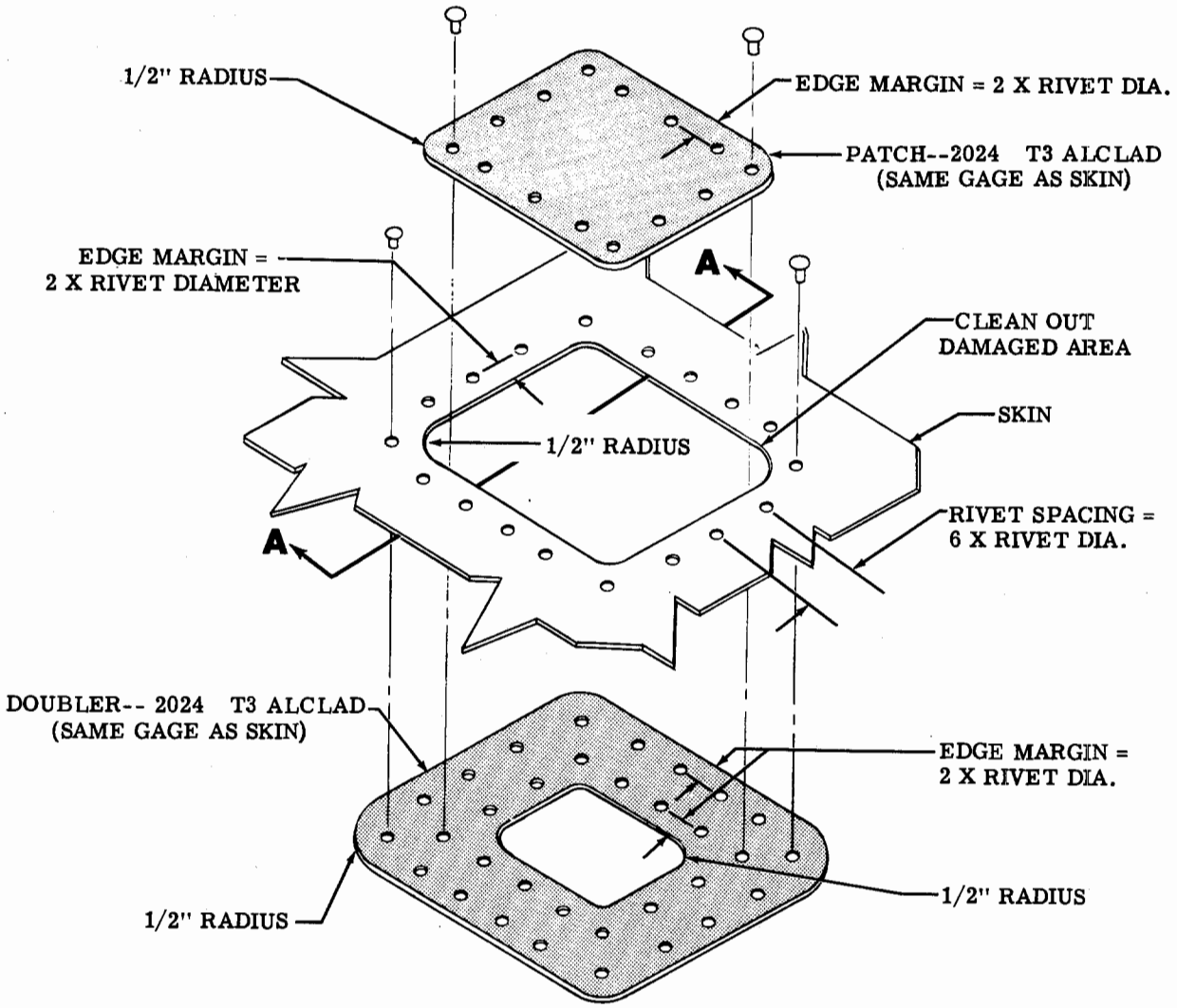
Figure 16-28. Typical Patch Repair of Circular Holes




SECTION THRU ASSEMBLED PATCH

**A–A**

| RIVET TABLE | |
|---|---|
| SKIN GAGE | RIVET DIA. |
| .020 | 3/32 |
| .025 | 1/8 |
| .032 | 1/8 |
| .040 | 1/8 |
| .051 | 5/32 |




ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 16-29. Typical Insert Patch

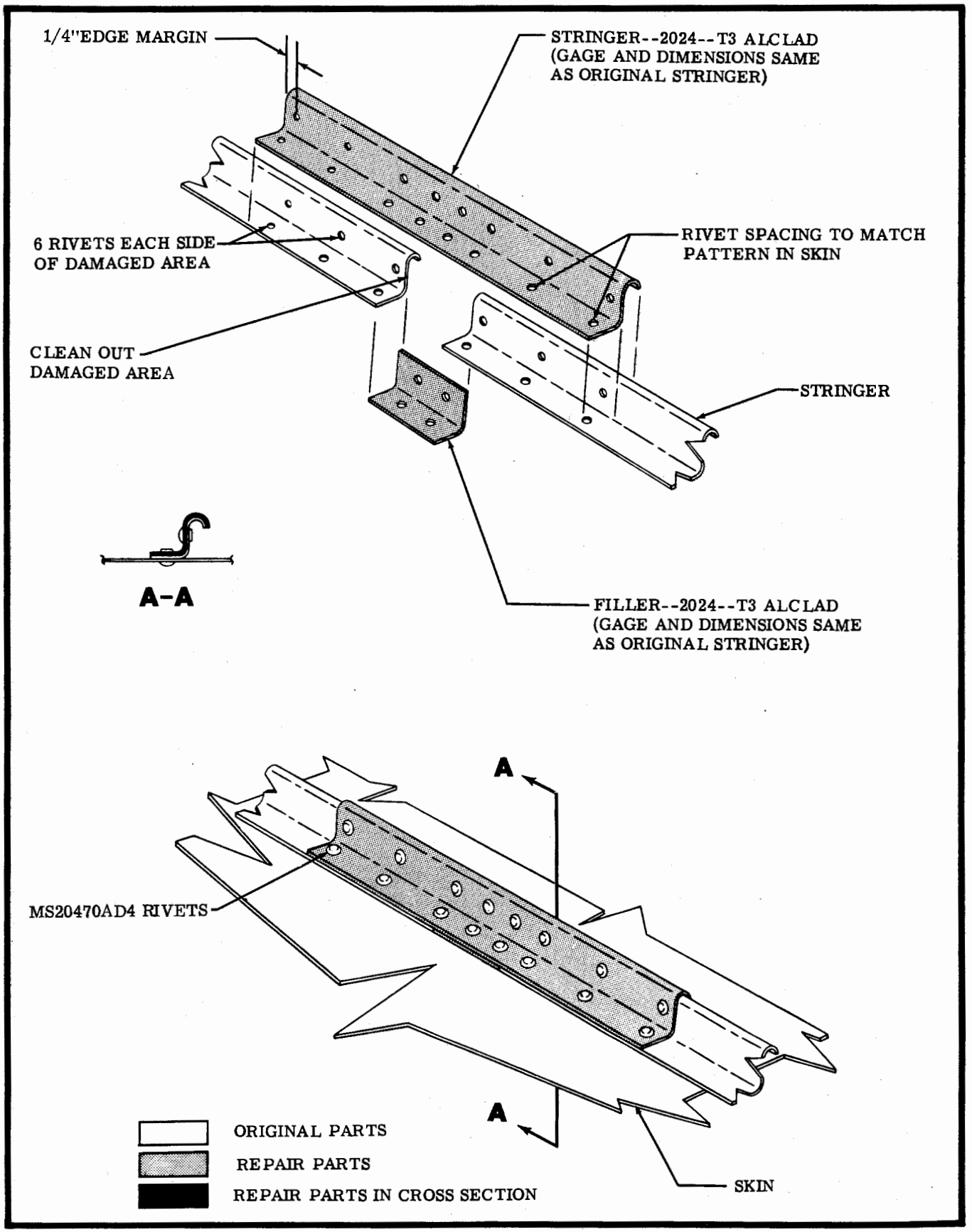



Figure 16-30. Typical Wing L. E. Stringer Repair

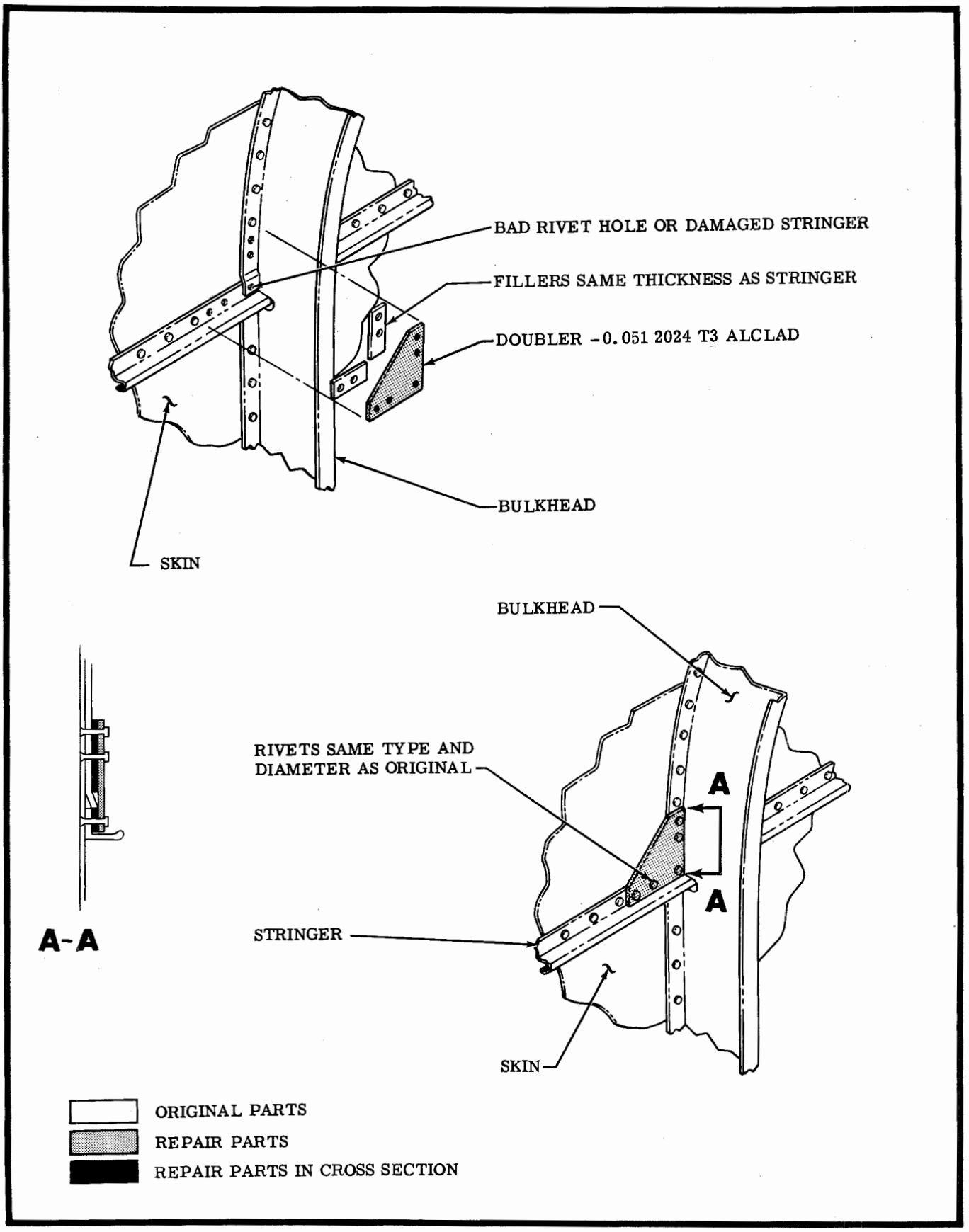



Figure 16-31. Typical Stringer to Bulkhead Repair

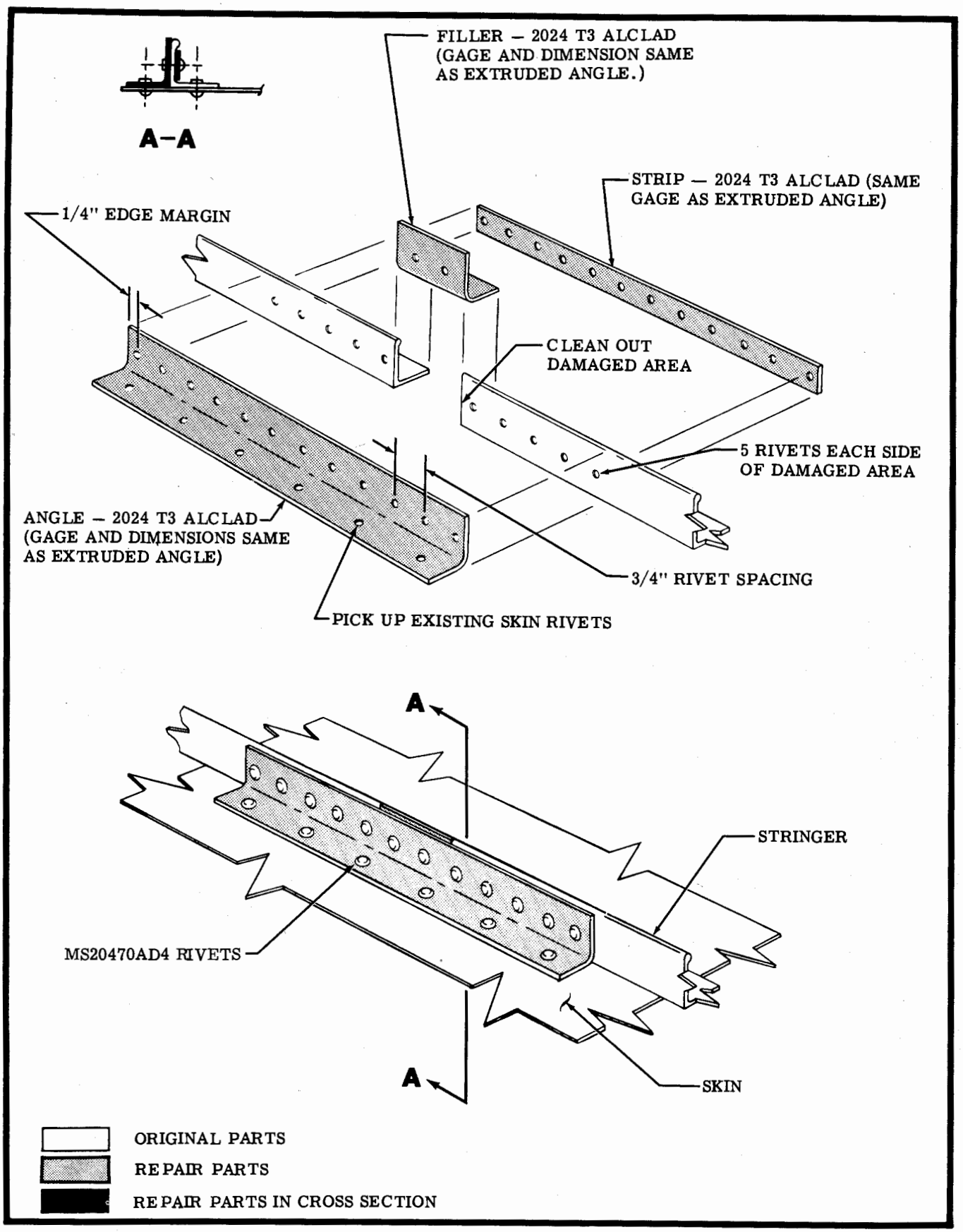



Figure 16-32. Typical Stringer Repair

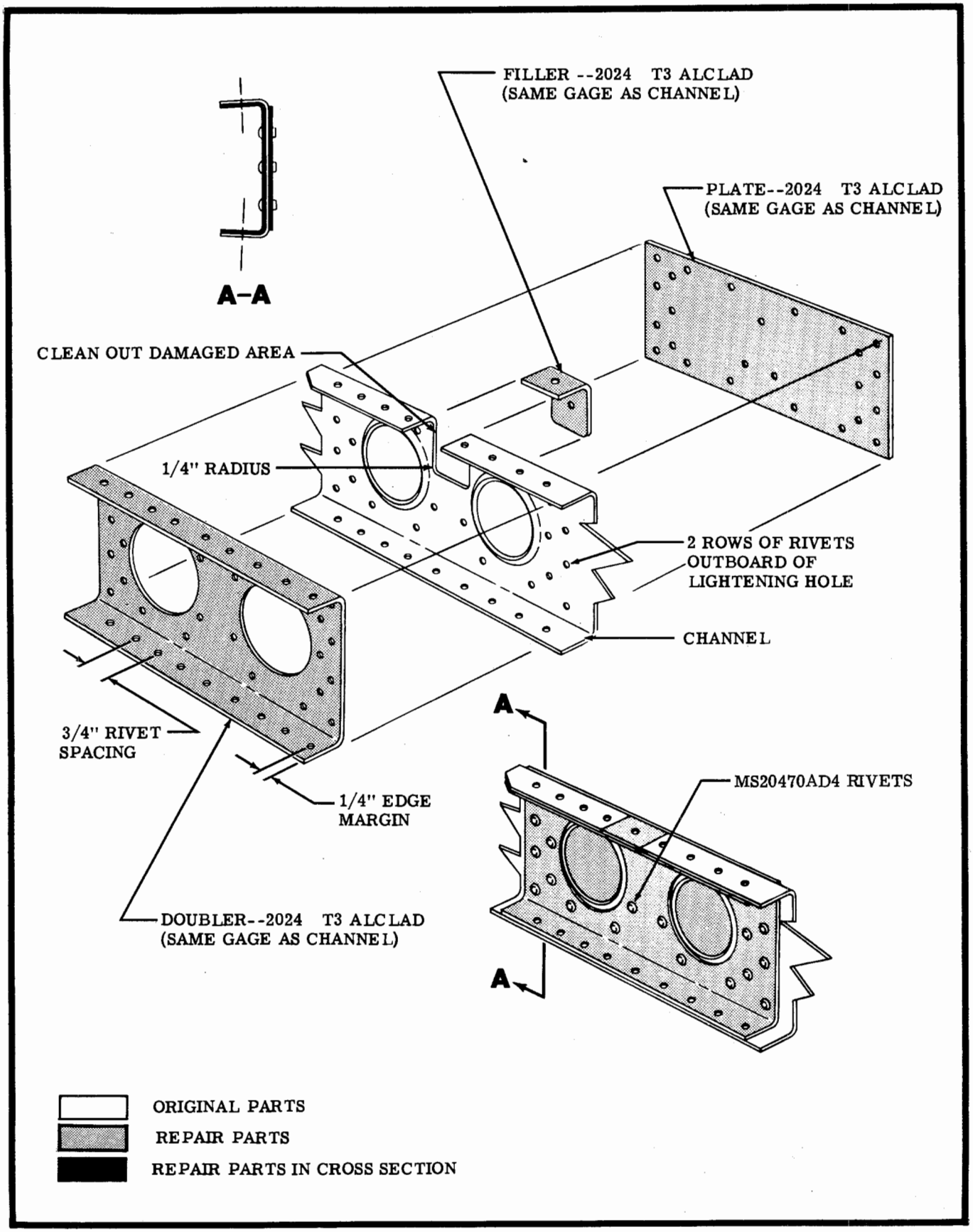



Figure 16-33. Typical Channel Flange Repair

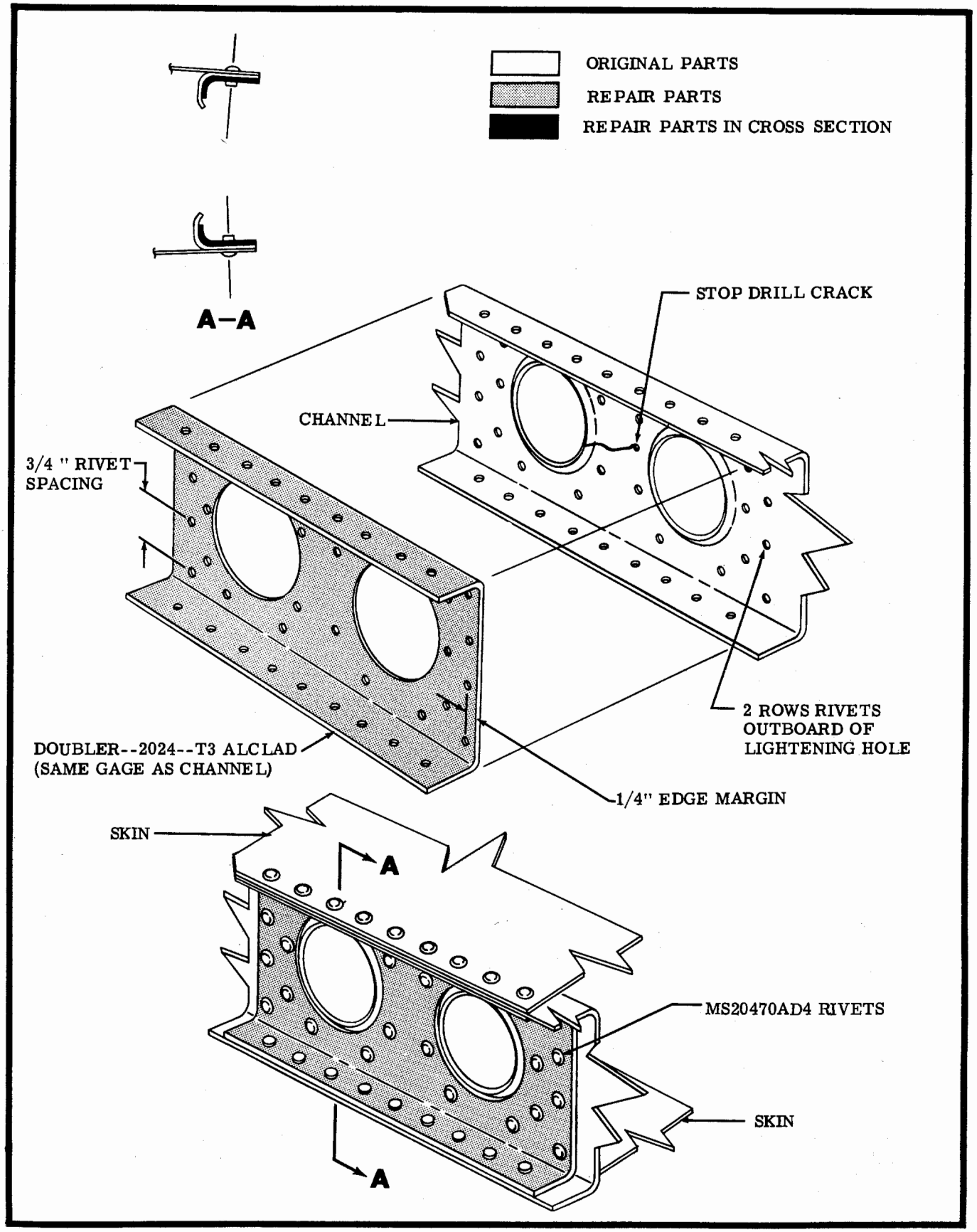



Figure 16-34. Typical Channel Repair

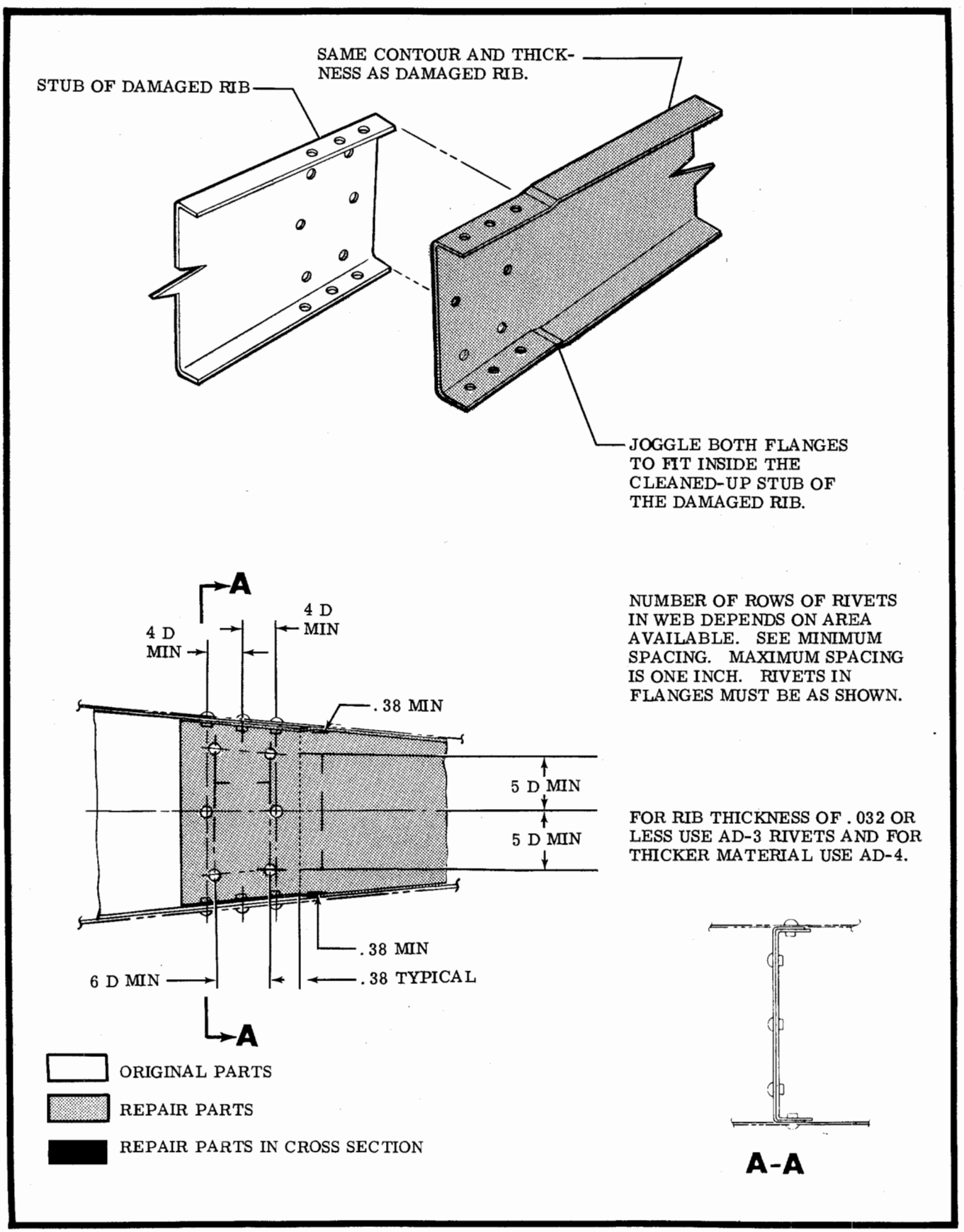
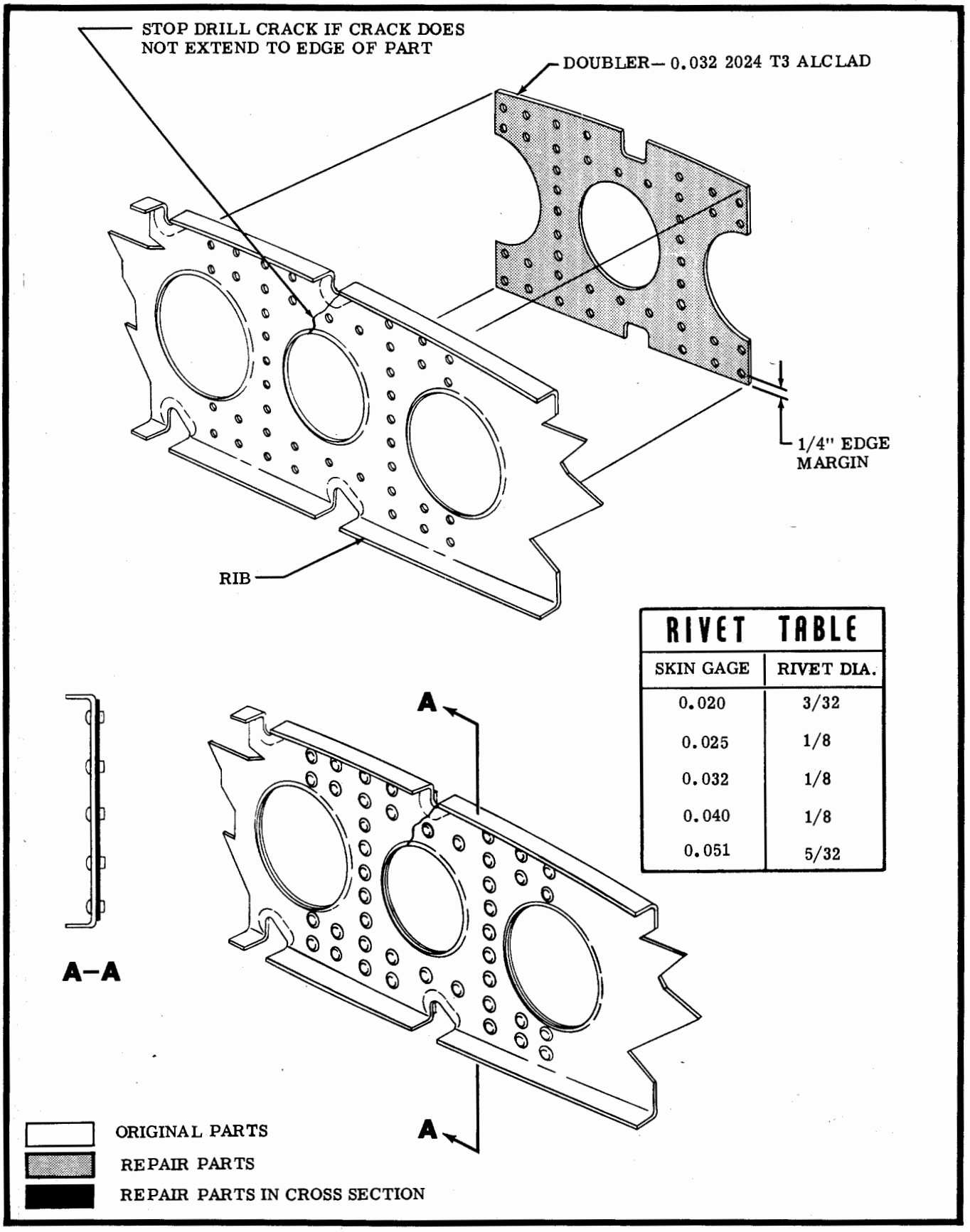



Figure 16-35. Typical Repair of Control Surface Rib




| RIVET TABLE | |
|---|---|
| SKIN GAGE | RIVET DIA. |
| 0.020 | 3/32 |
| 0.025 | 1/8 |
| 0.032 | 1/8 |
| 0.040 | 1/8 |
| 0.051 | 5/32 |

Figure 16-36. Typical Rib Web Repair

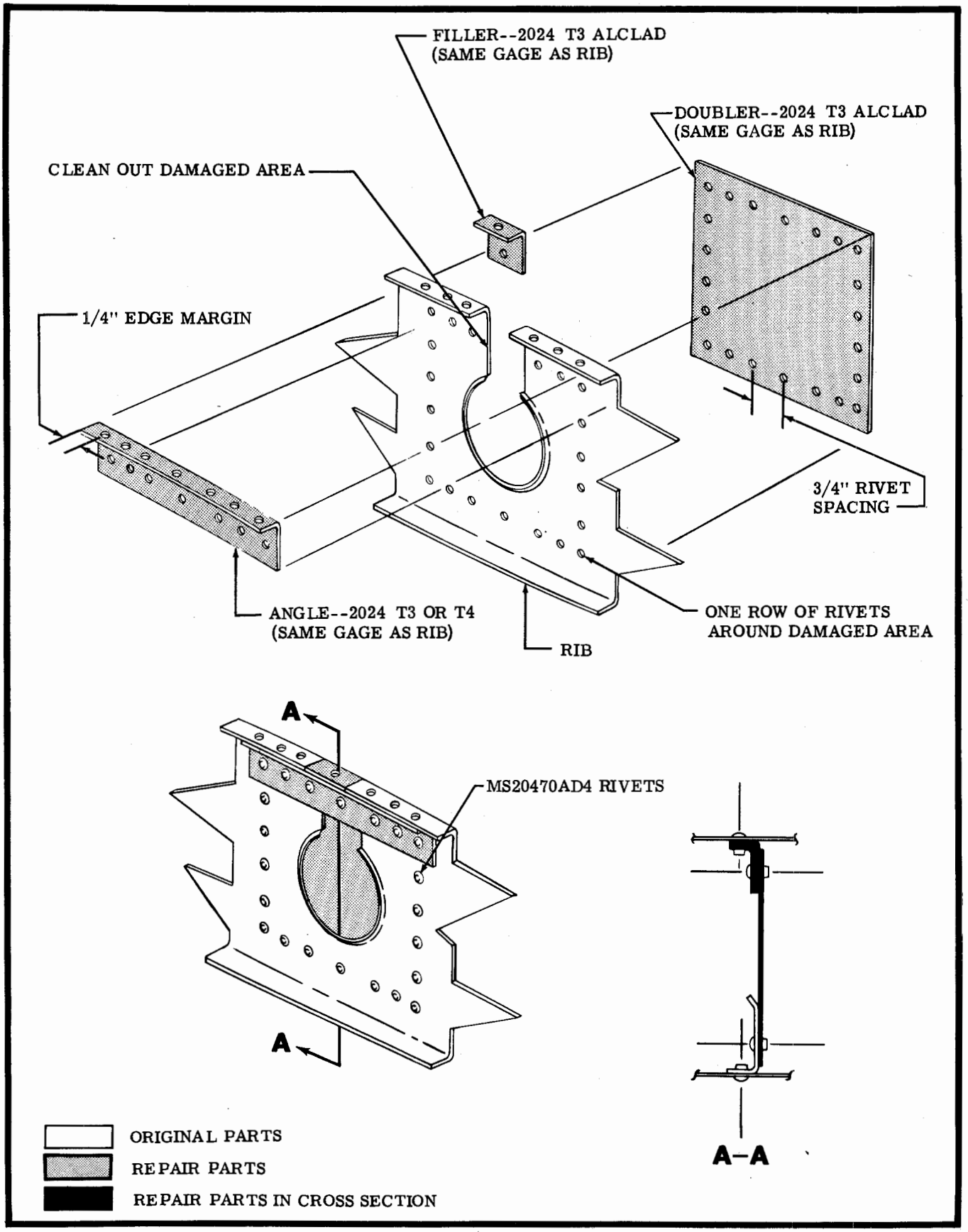



Figure 16-37. Typical Rib Flange Repair

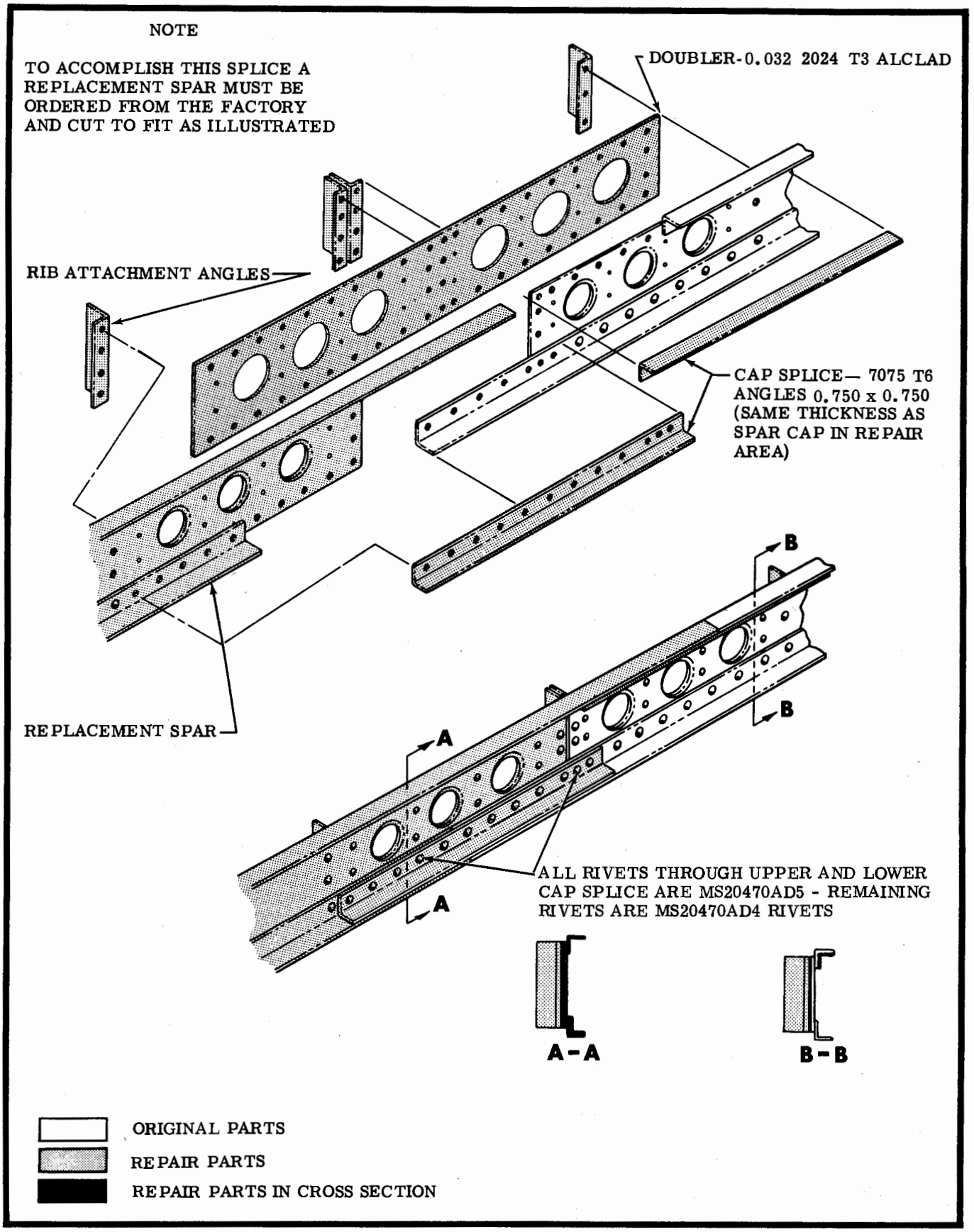



Figure 16-38. Typical Rear Spar Repair (Station 117.10 and Outboard)

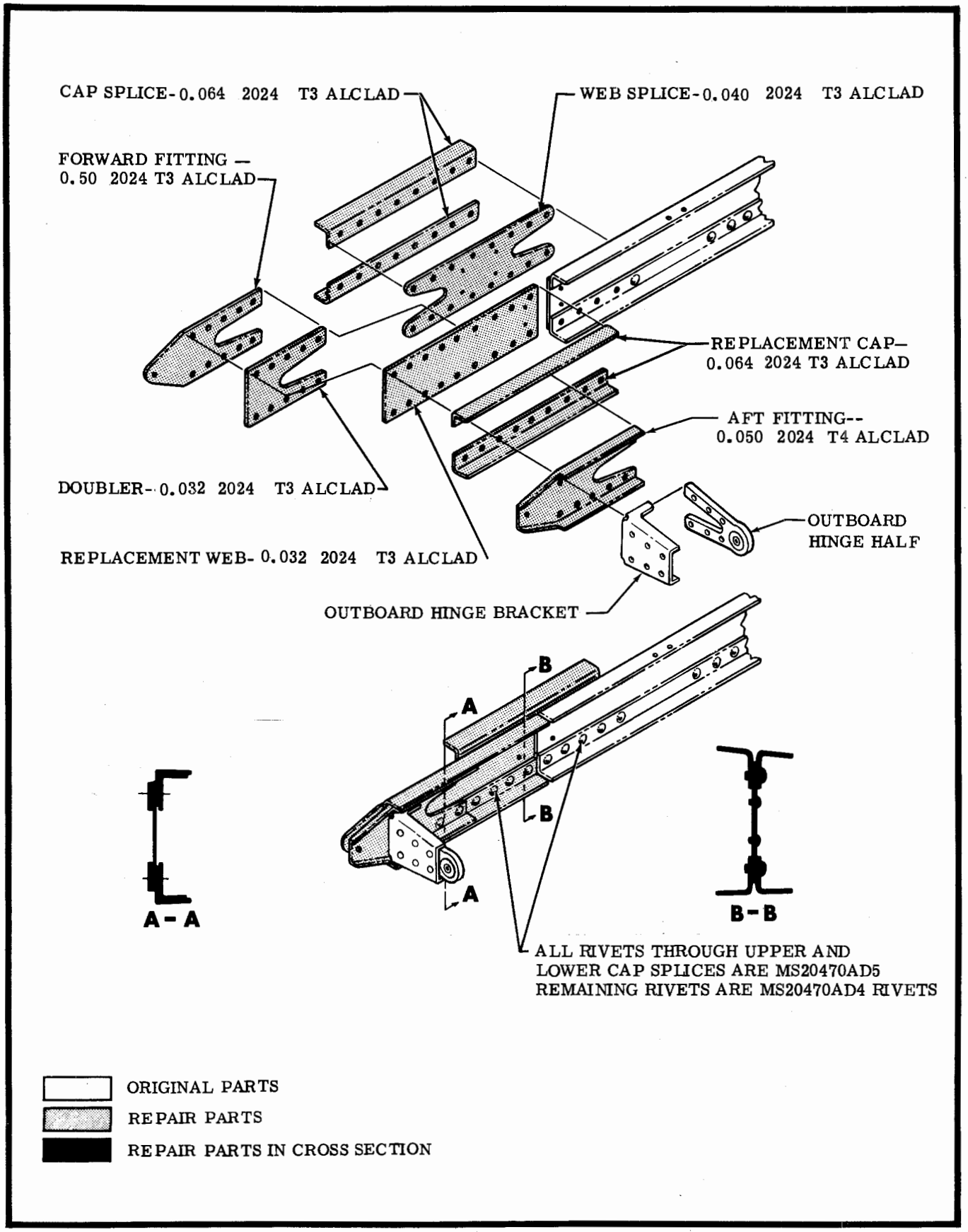



Figure 16-39. Typical Rear Spar Repair (Station 195.18 and Outboard)

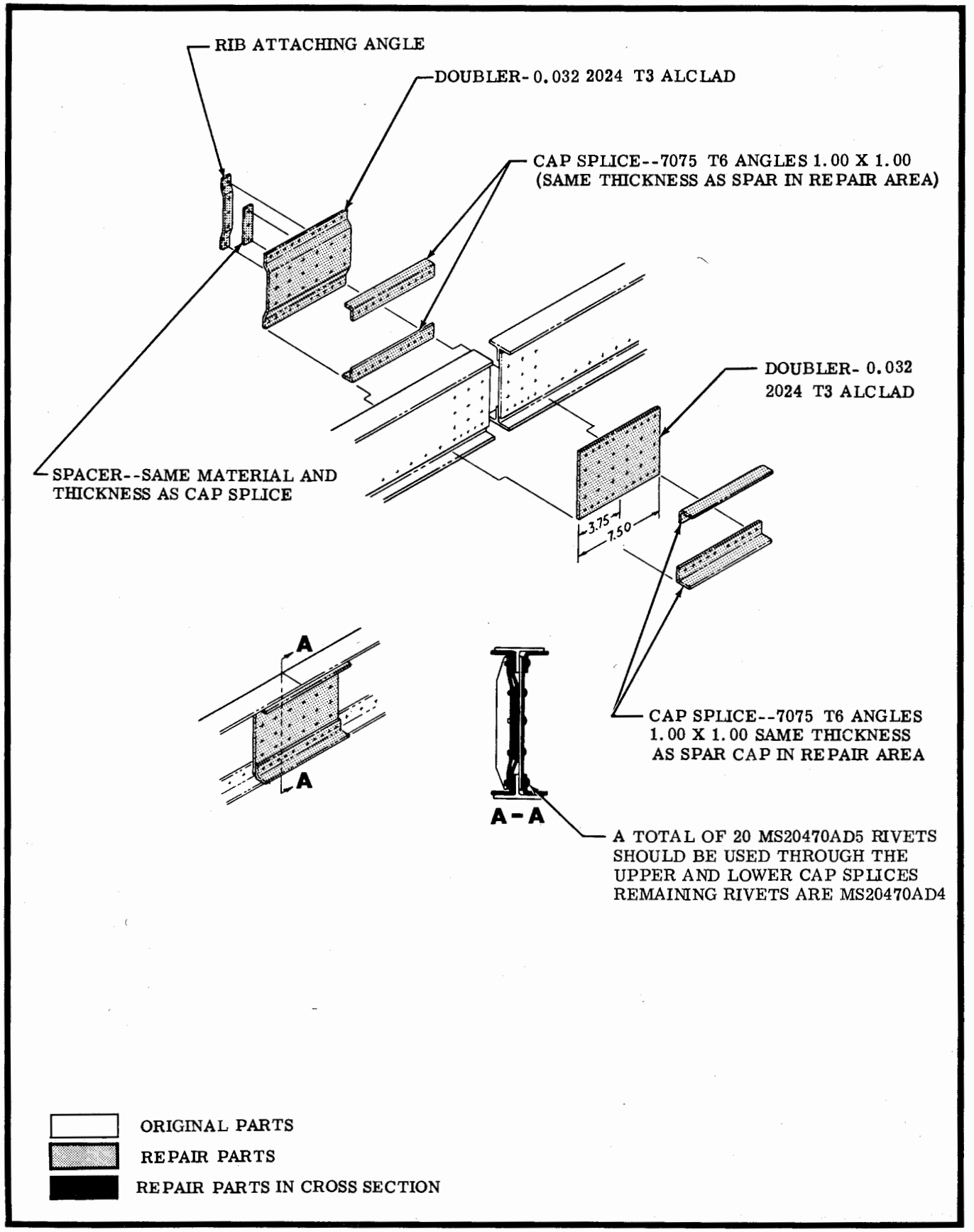



Figure 16-40. Typical Front Spar Repair (Station 174. 73 and Outboard)

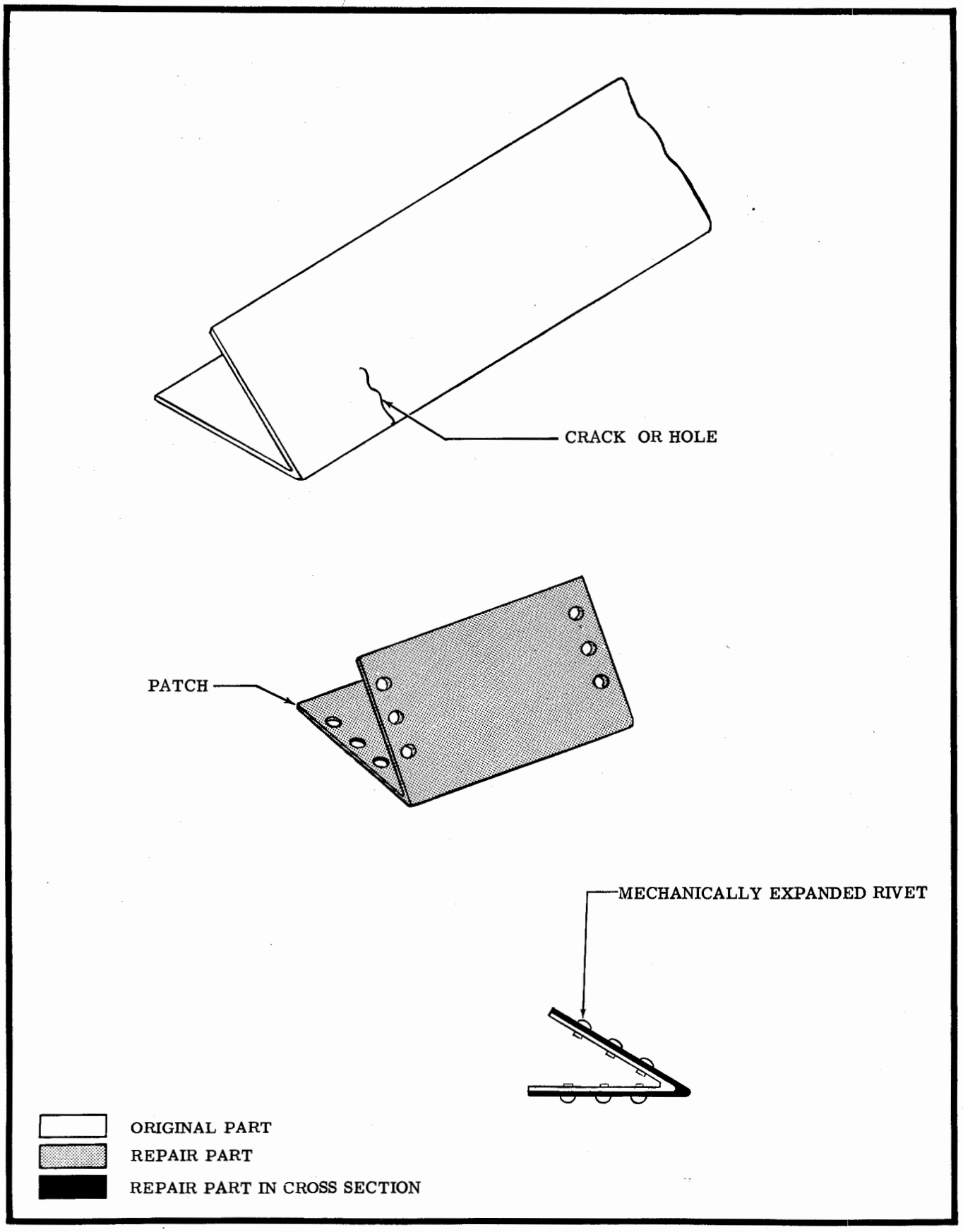



Figure 16-41. Typical Repair of Trailing Edge of a Control Surface

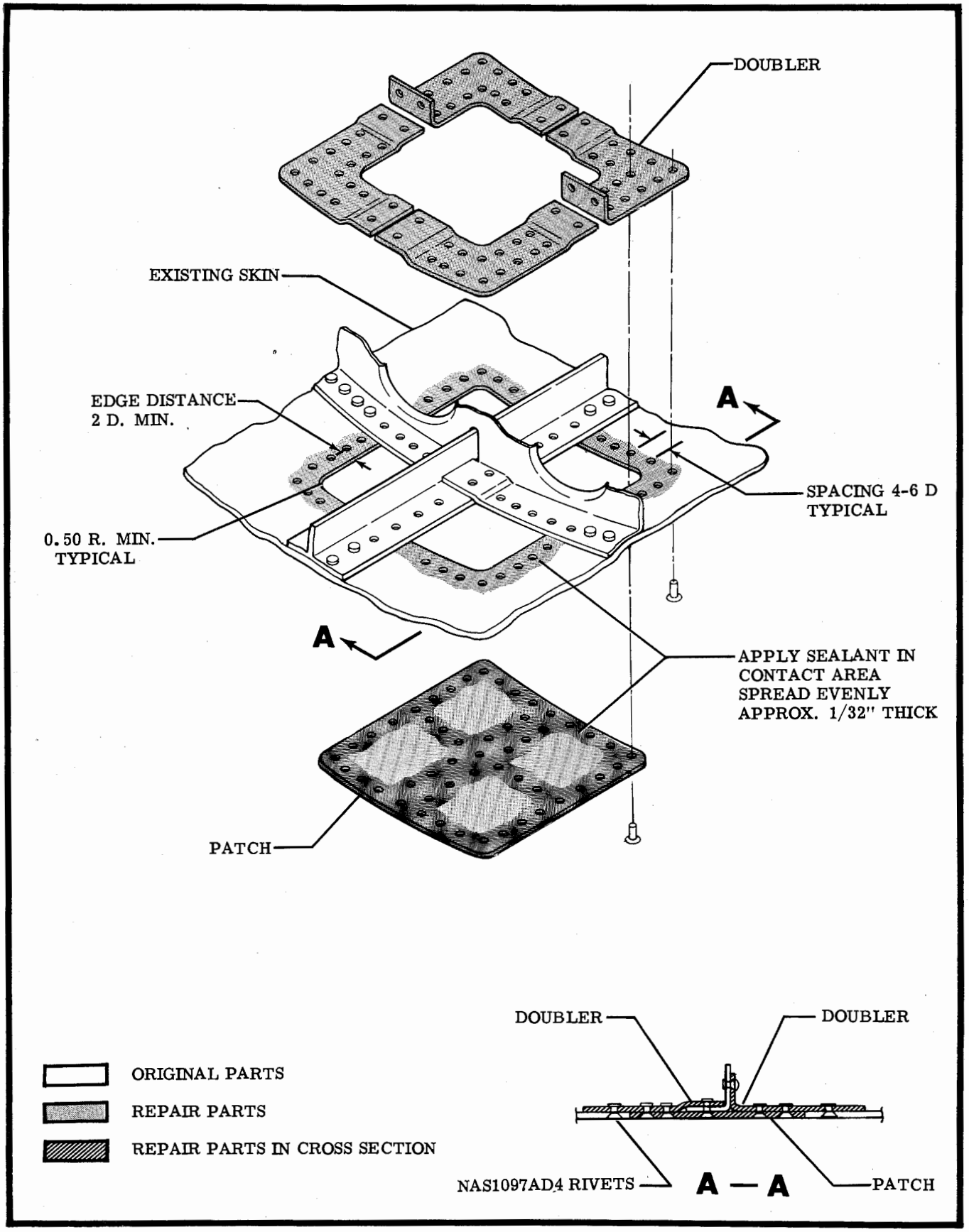



Figure 16-42. Over Structure Repair of Pressure Cabin

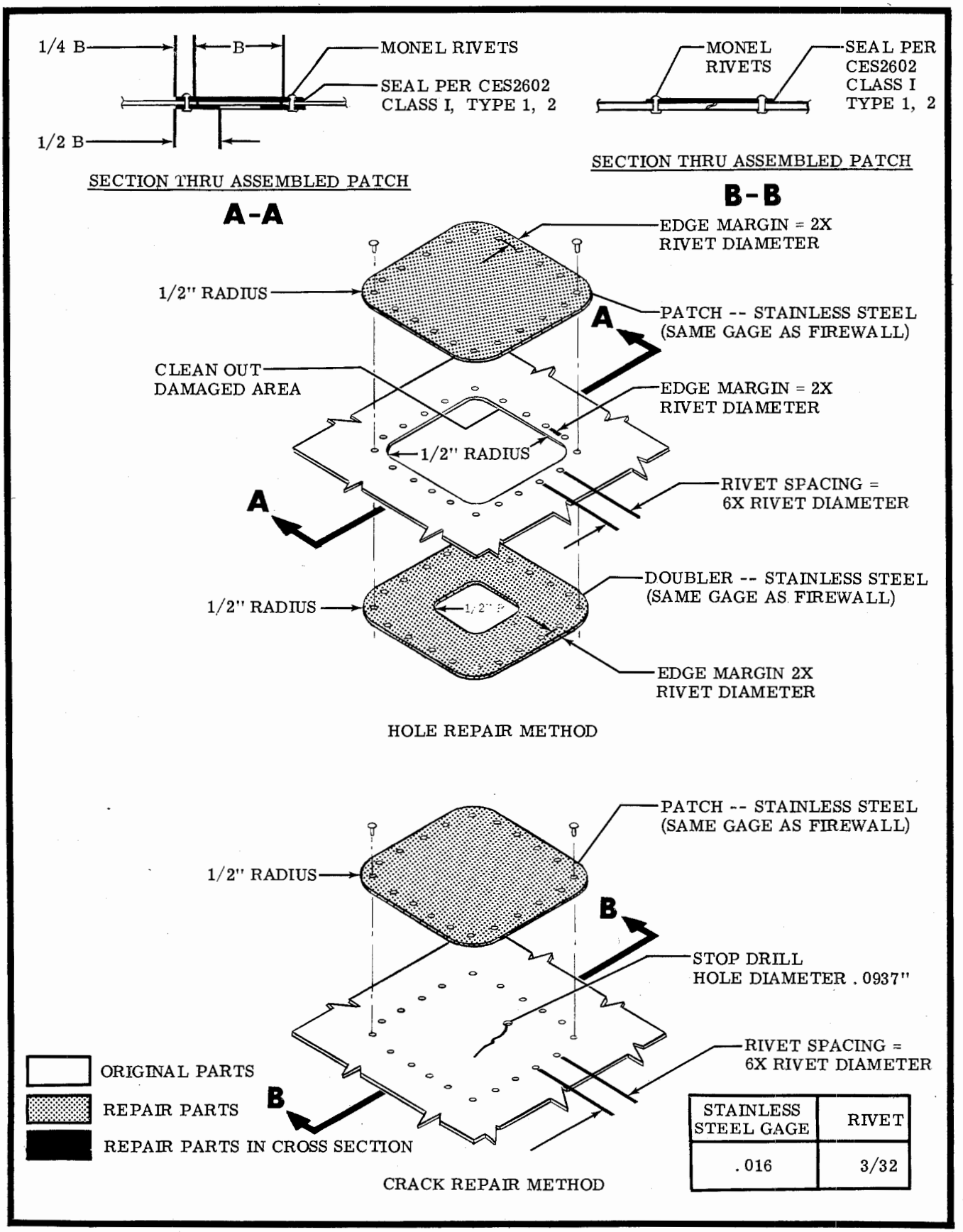
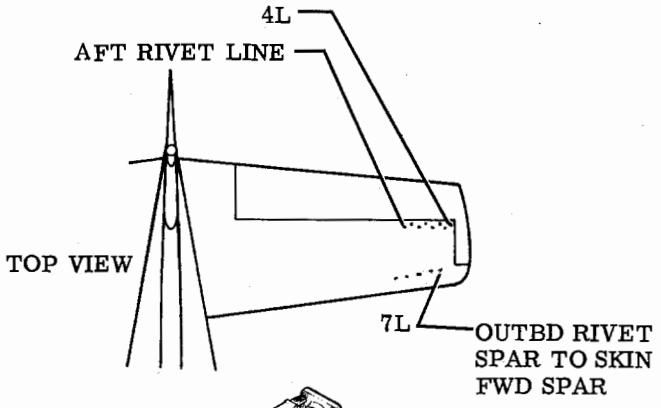
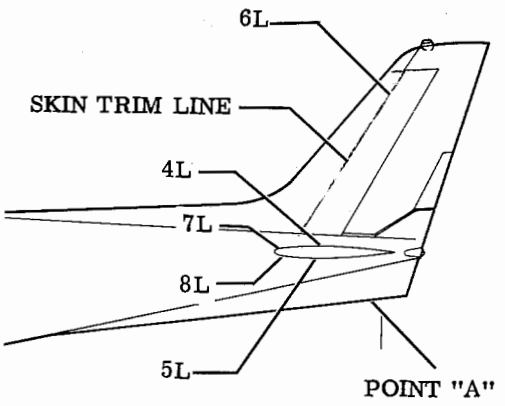


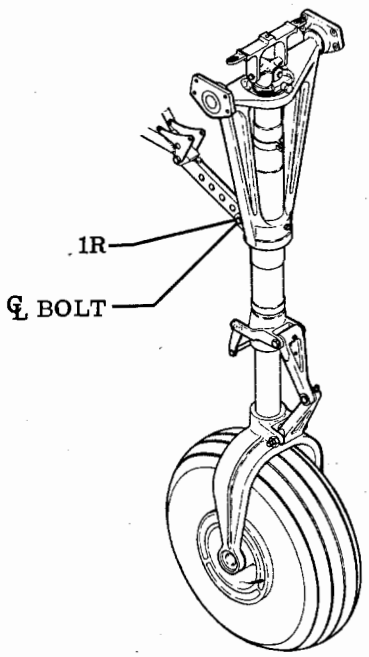

Figure 16-43. Repair of Firewall

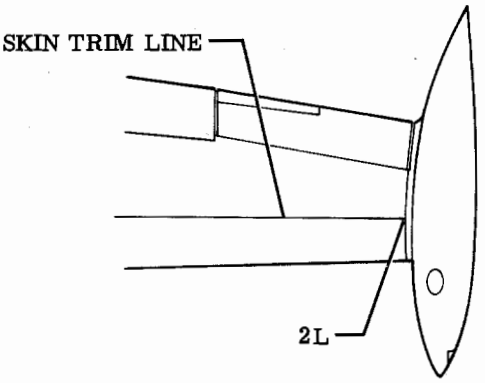
ALIGNMENT AND SYMMETRY CHECK. (See figure 16-44.)

Before making an alignment and symmetry check, the aircraft should be defueled and leveled in accordance with Section 2. Figure 16-44 provides the measurements and shows the relative elevation points to be measured during the alignment symmetry check. Measurements are made with a steel tape projected between alignment points.




TOP VIEW LH WING

Details of Check Points:

A. Centerline of the edge of tie down fitting.
1. Centerline of bolt at gear strut and drag brace attachment. Centerline head of bolt RH side and shank of bolt LH side.
2. Skin trim line and inboard edge of tip fairing at front spar.
3. Same as 2 except bottom of wing.
4. Centerline aft rivet line of forward stabilizer spar at outboard edge of stabilizer.
5. Same as 4 except bottom of stabilizer.
6. Skin trim line at forward fin spar and lower edge of tip cap.
7. Stabilizer outboard skin rivet forward spar.
8. Same as 7 except bottom of stabilizer.

| ALIGNMENT AND SYMMETRY CHECK | |
|---|---|
| POINTS | DISTANCE |
| 1L TO 3L<br>1R TO 3R | 230.00" ±1.25" |
| 2L TO 8L<br>2R TO 8R | 245.00" ±2.00" |
| 2L TO PA<br>2R TO PA | 308.25" ±1.50" |
| 4L TO 6L<br>4R TO 6R | 116.40" ±1.00" |
| 2L TO 6L<br>2R TO 6R | 333.00" ±2.00" |

Figure 16-44. Alignment and Symmetry Check (Sheet 1)

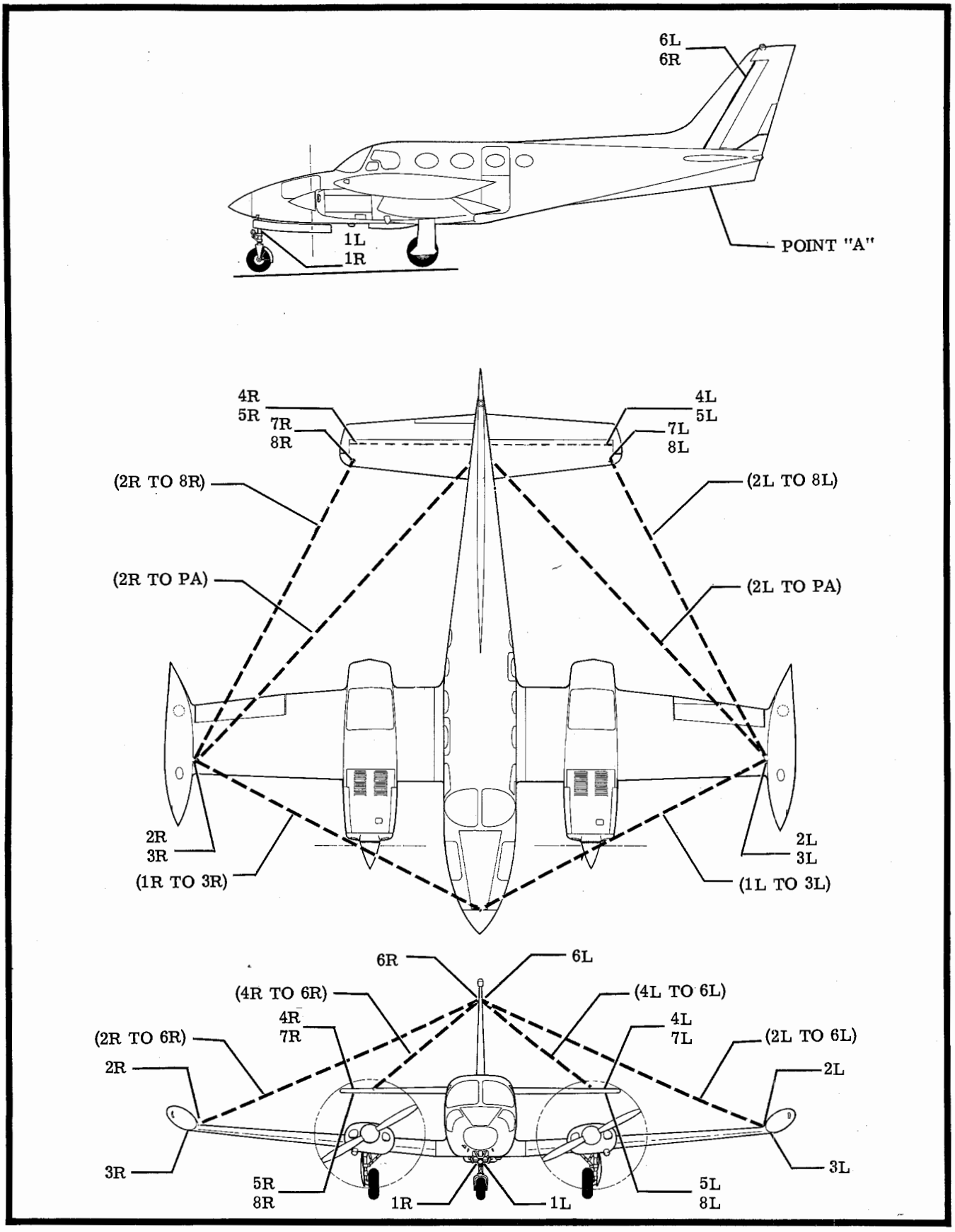



Figure 16-44. Alignment and Symmetry Check (Sheet 2)

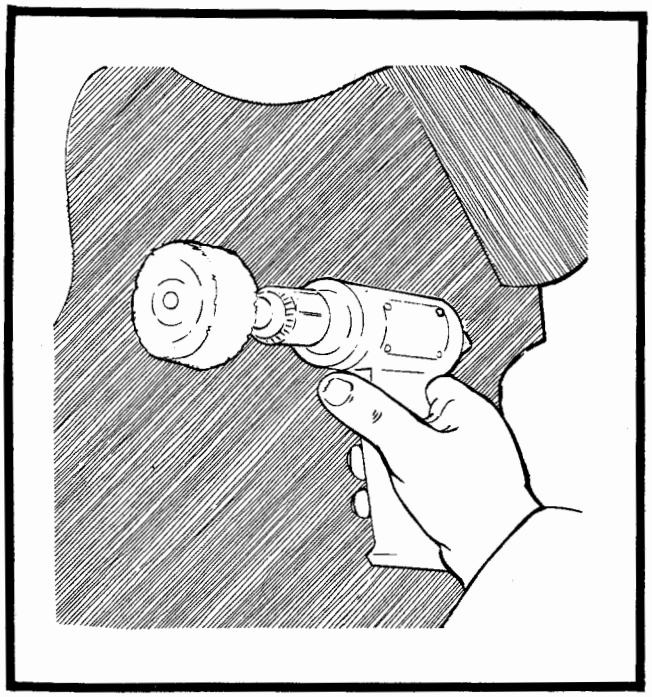


Figure 16-45. Buffing with Air Drill

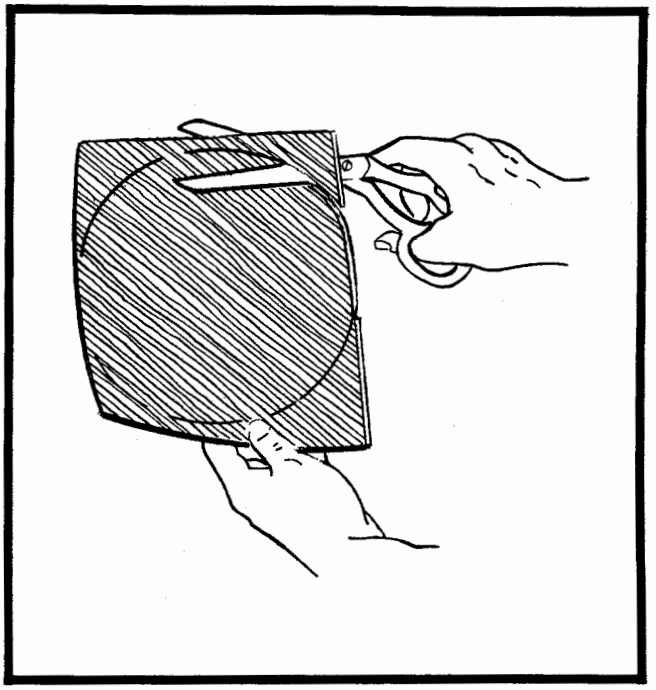


Figure 16-46. Fabrication of Patch

FUEL CELL REPAIR.

The fuel cells installed in the wings are a bladder-type, known as Construction BTC-39, manufactured by Goodyear Tire and Rubber Company. The following cold patch repair procedures are approved repair practices of Vithane BTC-39 fuel cells. These procedures apply only to BTC-39 fuel cells and deviations from these procedures should not be permitted.

CAUTION

Repair of the BTC-39 Vithane fuel cells is restricted to authorized personnel, and/or those certified or approved by factory trained schools.

a. The following equipment will be needed to make the cold patch repair.

1. Repair Kit, Drawing No. 2F1-3-35342, available from the Cessna Dealers' Organization, consisting of the following:
   (a) 2331 Repair Cement (1/2 pint cans, 173 cc in each can).
   (b) 2328C Cross-linker (1 ounce bottle, 28cc in each bottle).
   (c) Methyl-ethyl Ketone (1 pint cans).
   (d) FT-160 Repair Fabric (Sheet 12" x 12").
   (e) Cellophane (Sheet 12" x 24").
   (f) Foam rubber, cloth back (Sheet 12" x 12").
2. Paintbrush, 1-inch.
3. Roller, 1-inch diameter x 3/4" flat, or equivalent.

NOTE

The repair should be made on a well lighted table and natural contours maintained if possible. Prevent cell from contact with sharp edges, corners, dirty floors or other surfaces.

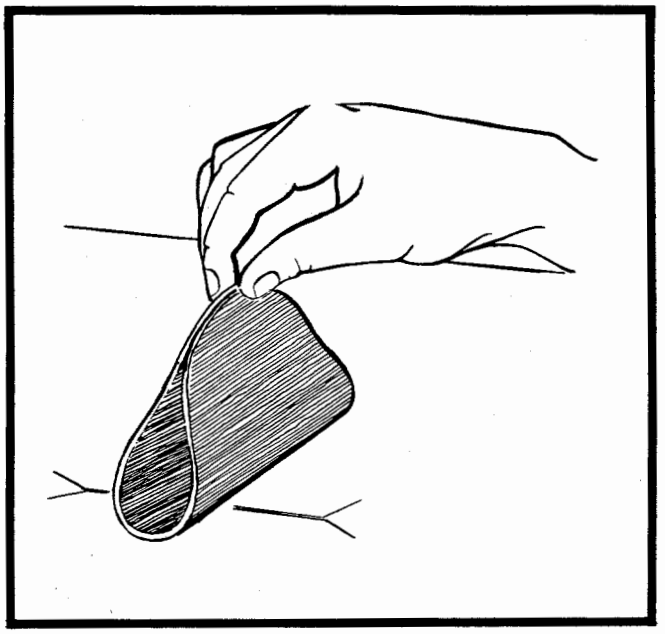


Figure 16-47. Centering Patch Over Injury

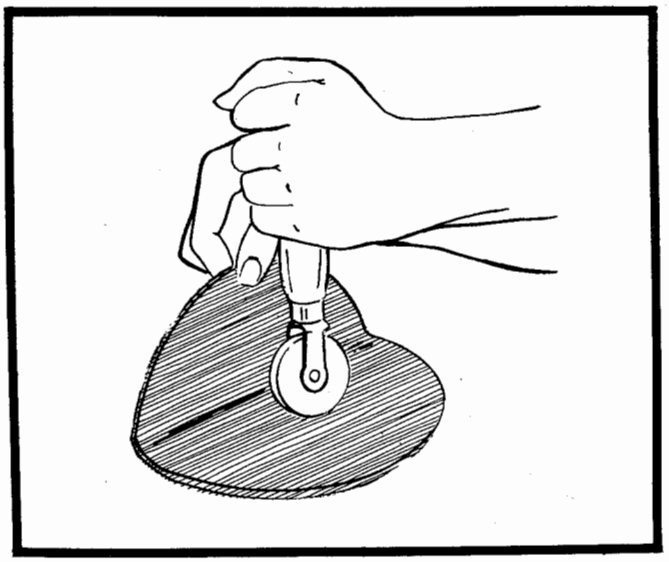


Figure 16-48. Use of Roller Stitcher

WARNING

Repair area must be well ventilated and no open flame or smoking in area of cell repair.

b. Repair Limitations.

1. FT-160 repair fabric is for repair of simple contours only. Patches referred to in these procedures are of this material.
2. Inside patches are to lap defect edges two-inches (2") in each direction.
3. Outside patches are to lap two and one-quarter inches (2-1/4") in each direction.
4. Outside patches are to be applied and cured prior to applying an inside patch.
5. Blisters between interliner and fabric larger than 1/4" in diameter, require an outside and an inside patch.
6. Separations between outer plies larger than one-inch (1") in diameter require an outside and inside patch. Holes and punctures require an outside and inside patch.
7. Slits and tears, up to three-inches (3") maximum length, require an outside and inside patch.
8. External abraded or scuffed areas, without fabric damage, require an outside patch only.
9. A loose lap may be trimmed, provided that a one-inch (1") effective bond remains.
10. Air cure repair patches are to remain clamped and undisturbed for 72 hours at room temperature of approximately 75° F.

c. Repair Patch.

1. Prepare exterior cell wall and exterior patch first. Cut repair patch from FT-160 material to size required (see figure 16-46) to insure proper lap over injury in all directions in accordance with Repair Limitations. Hole shears at an angle to produce a beveled edge (feather) on patch when cutting patch. Round corners of patch. Dull side of gum contact face of repair patch should be the largest surface after beveling.
2. Wash one square foot of cell wall surrounding injury, and repair patch contact side with a clean cloth, soaked with Methyl-ethyl Ketone solvent.
3. Abrade cell wall surface about injury and contact side of patch with fine emery cloth or emery buffer wheel (see figure 16-45) to remove shine.
4. Repeat Methyl-ethyl Ketone washings two more times. A total of three washings each surface.
5. Tape a piece of cellophane inside cell over injury.
6. When all the above preparatory work has been completed, and all has been positioned for patch application on repair table, mix the 2331C cement (173 cc) with the cross-linker 2328C (28cc), and stir mixture thoroughly.
7. Brush one even coat of mixed repair cement the cell wall around injury and on the contact side of repair patch. Allow to dry for twenty minutes.
8. Repeat a second mixing of repair cement and brush on a second coat.

CAUTION

DO NOT USE FIRST CAN OF MIXED CEMENT FOR THIS COAT.

9. Allow cement to dry approximately ten minutes and then center patch over injury as shown in figure 16-47.
10. (See figure 16-48.) Lay repair patch by rolling down on surface from center of edge without trapping air. Hold the unrolled portion of repair patch off the cemented surface until roller contact

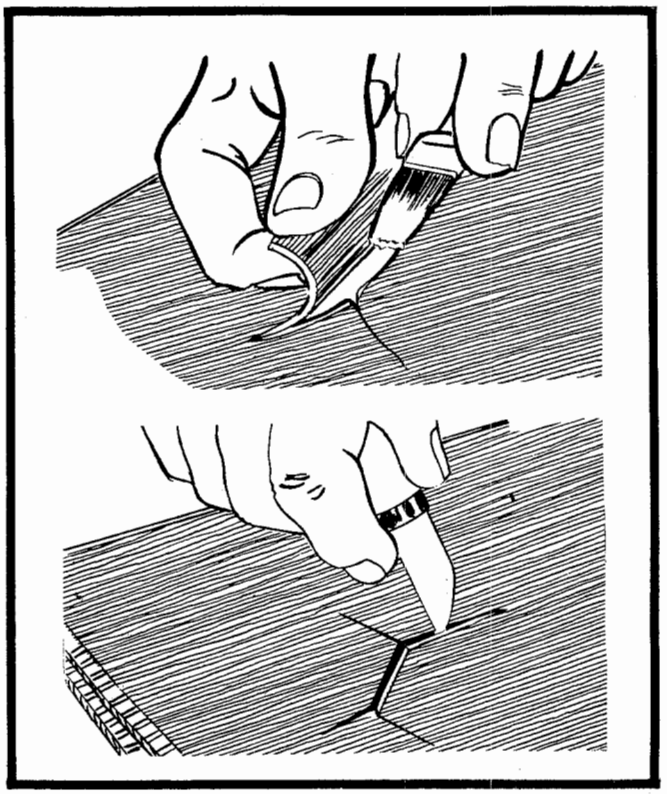


Figure 16-49. Repair of Blisters

insures an air-free union. At this time repair patch may be moved by hand on wet surface to improve lap. Do not lift repair patch, slide it.

CAUTION

Make sure cellophane inside cell over injury remains in place, because any cement will stick cell walls together without it as a separator.

11. Cover one smooth surface each of two aluminum plates (plates must be larger than patch, with 1/4" fabric-backed airfoam), fabric side out. Tape airfoam in place. Foam must cover edges of plate for protection.
12. Fold cell adjacent to patch and place prepared plates, one over repair patch, and one on opposite side.
13. Secure the assembly with a "C" clamp, tighten by hand. Check cement flow to determine pressure.

CAUTION

Make sure that cell fold is not clamped between plates. This would cause a hard permanent crease. Also, be sure patch does not move when clamp is tightened.

14. Inside patch is applied in the same manner as the outside patch. See Repair Limitations paragraph for size of inside patch, after outside patch has been cured.

CAUTION

Success of applying both an outside and inside repair simultaneously is doubtful and not recommended.

d. Metal Fitting - Sealing Surfaces.
1. Rub off roughness of affected area with a fine file, emery cloth or emery wheel as shown in figure 16-45.
2. Clean metal surfaces using a clean cloth dipped in Methyl-ethyl Ketone. Moisten cleaned surface with clean cloth dipped in water. Apply Alodine 1200 solution, undiluted, to the affected area with a small nylon brush. Allow solution to dry until a light golden color appears. When coating has been formed, remove excess solution by wiping with a clean water-moistened cloth. Wipe dry.

WARNING

Do not allow solution to come in contact with hands, eyes or clothing.

e. Accessory Replacement.
1. Obtain cured repair accessory from manufacturer.
2. Mark location of old accessory and preserve marking for guide lines to locate new part.
3. Remove old accessory by gradually loosening an edge with a blunt probe-like instrument.
4. When an edge is loose, grasp accessory by loose edge with pliers and gently pull accessory off fuel cell wall. Be careful not to pull cell lap open while peeling accessory off. Pull from blind side of cell lap toward the exposed edge.
5. Buff the cell surface under accessory with emery cloth or emery buffer wheel (see figure 16-45) to smooth roughness and prepare for cement.

NOTE

Removal of accessory may leave an uneven cavity and surface. The surface under accessory should be buffed even and smooth.

6. Prepare replacement accessory by buffing and washing contact surface. Also wash cell surface (see Repair Patch paragraph).
7. Apply mixed 2331C repair cement to both surfaces.
8. Roll new accessory into place as with a repair patch and place suitable padded plates in position to insure adequate pressure when clamped. Use cellophane separator to prevent cement sticking in wrong places.
9. Cure as with repair patch procedure cure method.

f. Defects Repair.
1. Blisters (see figure 16-49).
   (a) Remove loose material by buffing or trimming. Apply an outside and inside patch.
2. Holes, punctures, cuts, tears and deep abraded areas.
   (a) Trim away any ragged material and apply an outside and inside repair patch.
3. Loose seams.
   (a) Buff loose edge and contact surface. Wash three times with Methyl-ethyl Ketone. Apply 2331C mixed cement, two coats, as with repair patch. Clamp and cure. Loose seams may be trimmed if minimum lap remains.
4. Loose fitting flange - Inside.
   (a) Buff edge of flange and contact surface under flange.
   (b) Apply 2331C mixed repair cement, cellophane padded plates and clamp.
   (c) Follow procedure as outlined for repair patch except patch itself.
5. Missing coat.
   (a) Buff surface.
   (b) Wash three times with Methyl-ethyl Ketone.
   (c) Apply 2331C mixed cement two coats as with repair patch.
   (d) Clamp and cure.
6. Looseness against metal.
   (a) Prepare metal as per metal fitting-sealing surface.
   (b) Apply 2331C mixed cement and cure.

g. Testing.
1. Attach test plates to all fittings.
2. Inflate the cell with air to a pressure of 1/4 PSI maximum.
3. Apply soap suds to patched area and check for leaks.

REPAIR OF CABIN DOOR SEAL.

When repairing the cabin door seal the work area must be clean and dirt free. The cabin door seal need not be removed from the cabin door, only remove enough seal in the damaged area to allow installation of rubber mold.

NOTE

Seals with damaged area of holes or gaps in excess of six inches in length should not be repaired. The seal should be replaced.

a. The following equipment will be necessary before attempting to replace the cabin door seal:
1. SK421-2A available from Cessna Dealer's Organization.
2. Three (3) each small "C" clamps.
3. Blunt plastic tool for removing and installing seal in cabin door retainer.
4. Spatula.
b. (Refer to figure 16-50.) Mark seal and seal retainer to insure proper reinstallation of seal in seal retainer.
c. Remove damaged seal from retainer.

NOTE

Use extreme care in removing seal from seal retainer, use only plastic tools with blunt ends to prevent additional damage to seal.

d. (See figure 16-45.) Using buffing wheel or other suitable means, buff seal area to be repaired slightly and as required to obtain a smooth repairable surface.
e. If a large hole or gap exists in the seal, fill the void with a piece of foam rubber as shown in figure 16-50, Detail B, to help support the repair.

NOTE

Make sure the sponge rubber extends at least (0.50 inch) beyond ends of hole or gap and trimmed to mate inside surface of damaged area of seal.

NOTE

Insure only enough sponge rubber (R411N closed cell rubber) is used to support the seal material, for each applicable repair. Excess sponge rubber results in cabin door being difficult to close.

f. Cut a piece of CM507 material - Dacron fabric (included in SK421-2A) the width to extend (0.50) inch beyond ends of hole or gap in seal and long enough to wrap around seal as shown in figure 16-50, Detail B.
g. Cut a piece of extrusion rubber mold (included in SK421-2A) long enough to cover and overlap ends of CM507 material - Dacron fabric patch as shown in figure 16-50, Detail C.

NOTE

Fabricate four (4) metal plates 0.06 thickness same length and width as rubber mold.

h. Clean the entire surface area to be repaired with alcohol and let dry.
i. Remove cellophane liner from cut piece of CM507 material - Dacron fabric.
j. Apply a coat of silastic silicone rubber 140 adhesive approximately 0.005 thick to cleaned surface of seal and to cut piece of fabric spatula.
k. Allow applied silastic silicone rubber 140 adhesive to dry until tacky, but no longer transfers to the knuckles when touched, (usually between 5 and 30 minutes).

NOTE

Use the back of the knuckle to touch the adhesive surface instead of finger tips to minimize contamination.

l. Install CM507 material - Dacron fabric patch on seal with the adhesive surface mating and positioned over hole or gap per dimensions as shown in figure 16-50, Detail B.
m. Insure that seal retains its symetrical size and shape and that no wrinkles exist in patch or seal.
n. Apply a thin coat of packing agent (soapstone or talcum powder) to extrusion rubber mold to prevent seal sticking to rubber mold.
o. Place extrusion rubber mold over installed fabric patch, refer to figure 16-50, Detail C.
p. Apply light pressure to fabric patch during curing of adhesive, using fabricated metal plates and small "C" clamps as shown in figure 16-50, Detail C.

NOTE

When seal is only partially removed from retainer to make repair, support the seal and clamped rubber mold to prevent distortion of cabin door seal.

q. Allow adhesive to cure a minimum of 24 hours under pressure clamp before removing from rubber mold.
r. Remove seal from rubber mold.
s. Position seal on seal retainer with marks aligned and reinstall seal. Use a blunt tool and talcum powder or water as required to facilitate installation.

NOTE

Insure that door frame seal is installed with existing air holes in seal toward door opening and lower door seal with holes toward the top of door. Pressurized air from inside cabin enters the holes, inflating the seal to form a pressurized seal.

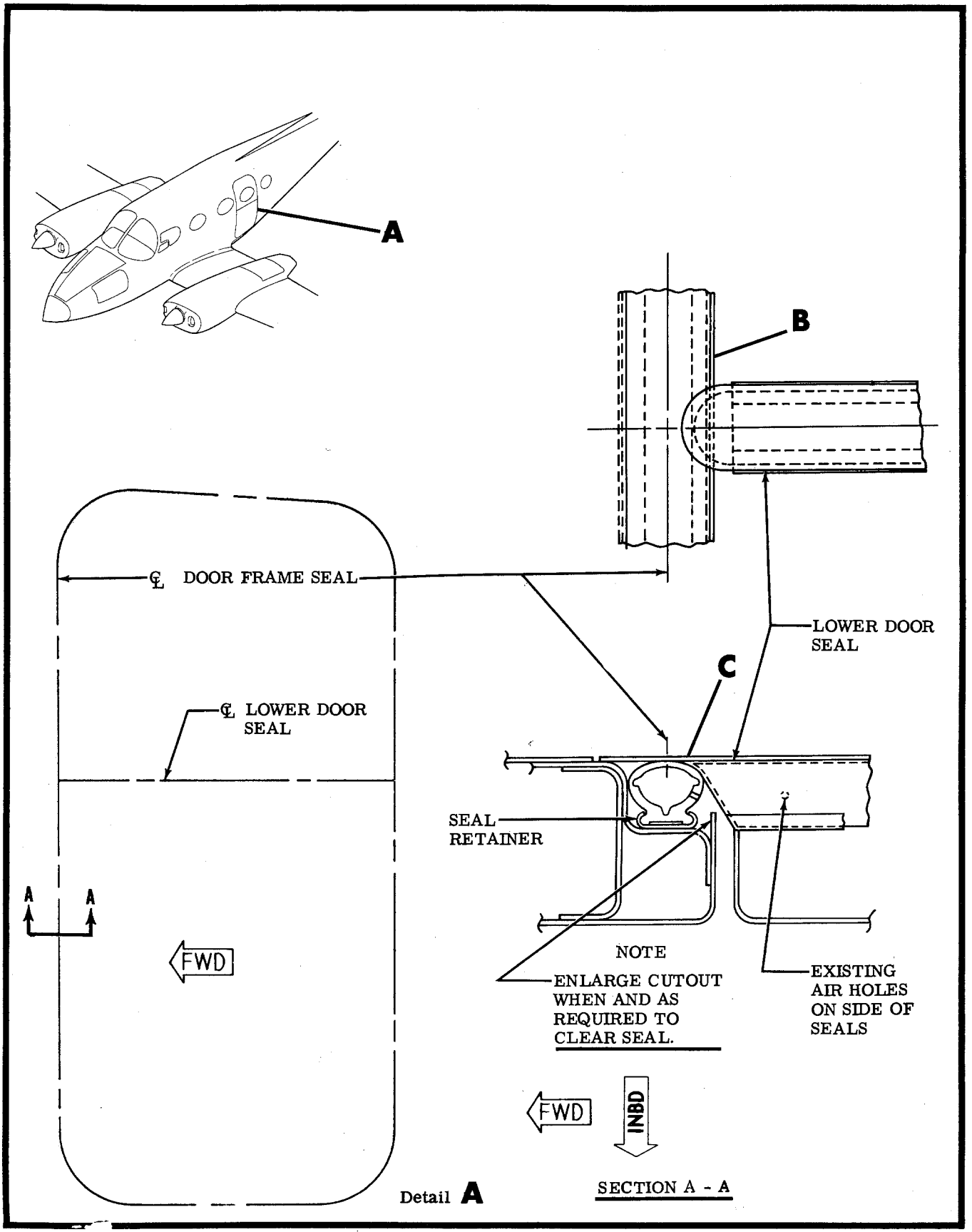



Figure 16-50. Cabin Door Seal Repair (Sheet 1)

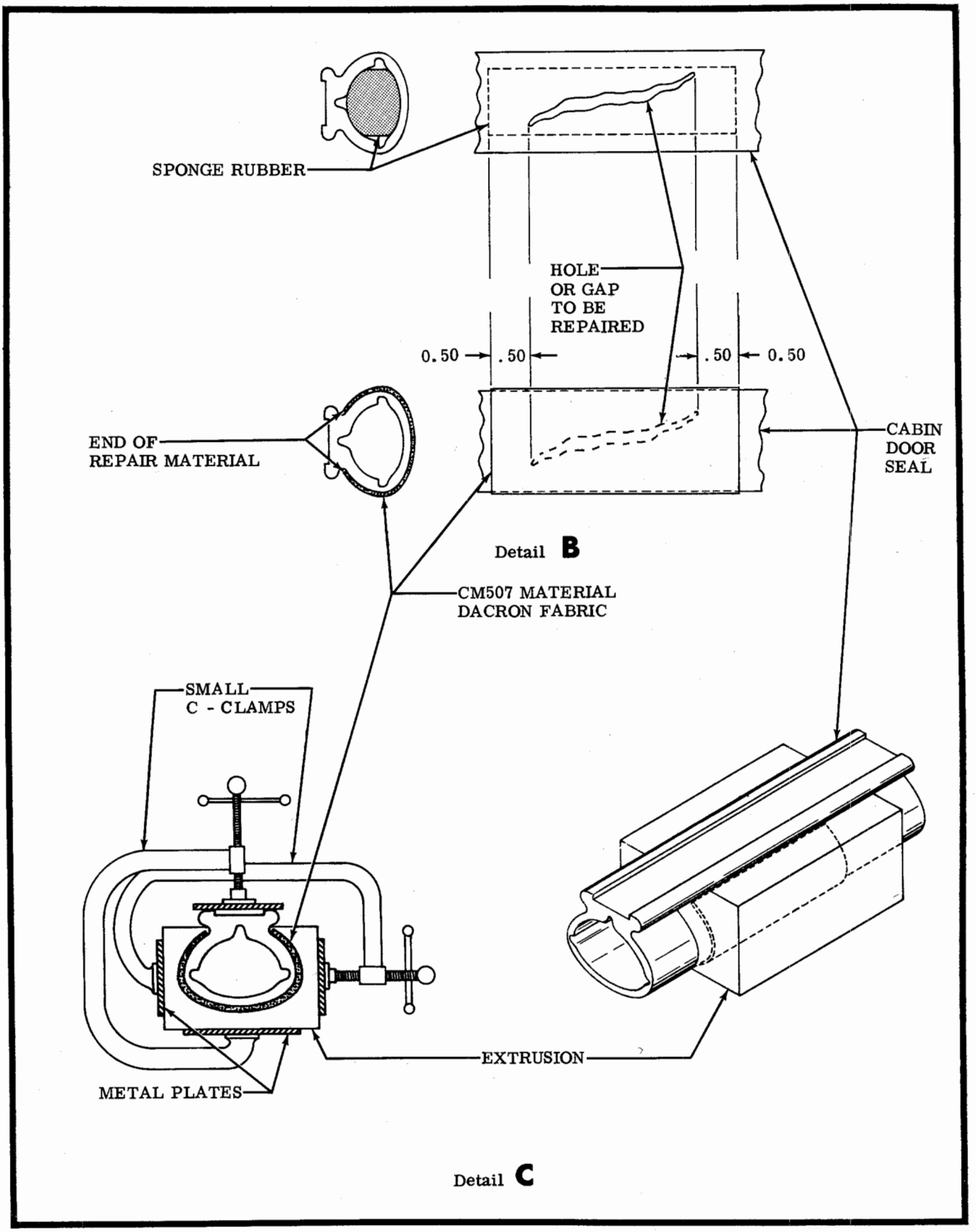
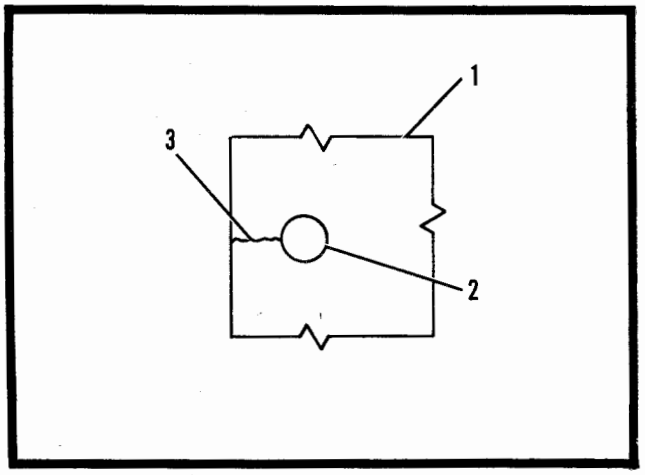
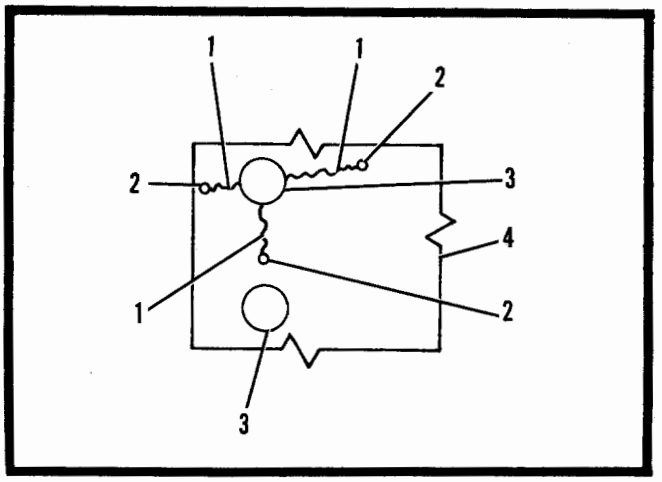



Figure 16-50 Cabin Door Seal Repair (Sheet 2)




1. Ice Protection Panel 2. Rivet 3. Crack

Figure 16-51. Repairing Crack in Ice Protection Panel




1. Crack
2. Stop Drill
3. Rivet
4. Ice Protection Panel

Figure 16-52. Repairing Combination of Cracks in Ice Protection Panel

REPAIR OF ICE PROTECTION PANELS.

The following repair procedures should be used for repairing the polycarbonate type ice protection panels. See figure 16-51 and figure 16-52 for types of cracks and method or repair. Figure 16-51 is an example of the cracks starting at a rivet hole propagating to the outer edge of the panel.

a. See figure 16-51, rout the crack using router bit. Rout material approximately 1/32 wide and 1/2 the depth of the panel thickness.

b. Clean routed crack with isopropyl or ethyl alcohol.

c. Fill crack with epibond 1331 in accordance with manufacturer's instructions.

NOTE

Epibond 1331 may be procurred from Furane Plastics, 4514 Brazil Street, Los Angeles, California 90039.

d. Figure 16-52 illustrates a combination of cracks which may occur. Cracks which do not extend to the outer edge of the ice protection panel, shall be drilled through the ice protection panel with a #40 drill.

e. Fill the stop drilled hole with Epibond 1331 as per manufacturer's instructions.

NOTE

Bondtite or Ditzler DX-666 may be used as an alternate for Epibond 1333.

f. Normal finishing, priming and painting shall be accomplished following the repair.

NOTE

Refer to Section 2 for painting polycarbonate.

RIVETS.

General.

The following rivets are commonly used in aircraft structures: standard solid shank, hi-shear and blind. Rivets used in aircraft construction are most generally fabricated from aluminum alloys. In special cases, monel, corrosion-resistant steel, mild steel, copper and iron rivets are used.

Types.

a. Standard solid shank rivets are those generally used in aircraft construction. They are fabricated in the following head types: roundhead, flathead, countersunk-head, and brazier-head. Roundhead rivets are generally used in the interior of aircraft except where clearance is required for adjacent members. Flathead rivets are generally used in the interior of the aircraft where head clearance is required. Countersunk-head rivets are used on the exterior surfaces of the aircraft to minimize turbulent airflow. Brazier-head rivets are used on the exterior surfaces of the aircraft where strength requirements necessitate a stronger rivet head than that of the countersunk-head rivet. Both the brazier-head and the countersunk-head rivets are used on the exterior of the aircraft where head clearance is required.

b. Hi-shear rivets are special patented rivets having a high shear strength equivalent to that of the standard AN bolts. They are used in special cases in locations where high shear loads are present, such as spars, wings and heavy bulkhead ribs. The rivet consists of a cadmium plated pin of alloy steel and a collar of aluminum alloy. The installed rivet can be readily identified by the presence of the attached collar in place of the formed head on standard rivets.

c. Blind rivets are used where strength requirements permit when one side of the structure is inaccessible making it impossible or impractical to drive standard solid shank rivets.

Substitution of Rivets.

a. Standard solid shank rivets.
1. In the replacement of rivets in installations which require the raised head rivets, it is desirable to use whichever of the rivets that correspond to the type of rivet removed.
2. Countersunk-head rivets are to be replaced by rivets of the same type and degree of countersink.
3. When rivet holes become enlarged, deformed, or otherwise damaged use the next larger size as replacement.
4. Replacements shall not be made with rivets of lower strength material unless they are larger than those removed.
5. In the absence of aluminum rivets, stainless, monel, or iron rivets may be used with generous application of zinc chromate primer only to permit necessary flights of aircraft. The proper replacement shall be made as soon as facilities are available.
b. Hi-shear rivets. When hi-shear rivets are not available, replacement of sizes 3/16 or greater shall be made with bolts of equal or greater strength than the rivet being replaced and with self-locking nuts of the same diameter. The flush-type hi-shear rivet may be temporarily replaced by like diameter flush-type steel screws of equal or greater strength and self-locking nuts provided the threaded part of screw does not extend into material being fastened together. This latter procedure is temporary only and replacement with the hi-shear flush-type rivet must be accomplished as soon as they become available.
c. Blind rivets. Blind rivets have higher deflection rates in shear than standard solid rivets. For this reason, it is not advisable to replace any considerable number of solid rivets in a given joint by blind rivets in as much as this may result in over-stressing the remaining solid rivets. The following specific instructions apply.
1. The hollow blind rivet shall not be used.
2. The blind rivet used shall be of the same or greater strength and one size larger than the rivet it replaces, except that blind rivets may be replaced size for size.
3. In cases of dimpled assembly, the rivet holes shall be drilled after the sheets are dimpled.
4. When possible, the exposed end of each clipped plug shall be coated with a 10 per cent chromic acid solution or with zinc chromate primer.
5. Blind rivets shall not be used in hulls, floats, or tanks except in cases of absolute necessity.
6. If blind fasteners other than blind rivets are encountered, it is recommended that replacements be made by either of these fasteners or by standard rivets.

Diameters.

a. Rivet diameters range from 3/32 inch to 3/8 inch. The 1/8, 5/32 and 3/32 inch sizes are the most frequently used.
b. Since smaller rivets lack the proper structural qualities and larger rivets may dangerously reduce the splice or patch area, care must be exercised before substituting other than specified sizes of rivet diameter.

Lengths.

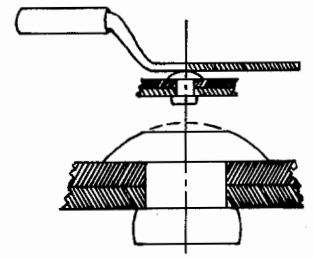
a. The proper length of rivet is an important part of the repair. Should too long a rivet be used, the formed head will be too large, or the rivet may bend or be forced between the sheets being riveted. Should too short a rivet be used the formed head will be too small or the riveted material will be damaged.
b. If proper length rivets are not available, longer rivets may be cut off to equal the proper length (not grip).
c. The rivet length is based on the grip.

Removal of Solid Rivets. (See figure 16-54.)

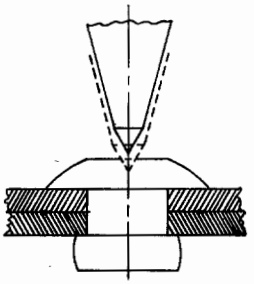
a. When it becomes necessary to replace rivets, great care should be taken in their removal so that the rivet hole will retain its original size and not acquire replacement with a larger size rivet.
b. To remove a rivet, file a flat surface on the manufactured head. It is always preferable to work on the original head rather than on the one that is bucking over, since the former will always be more symmetrical about the shank. Indent the flat surface with a counter-punch so the drill may be correctly centered. A drill slightly less in diameter than the rivet shank should be used to drill and weaken the head. Take care that rivet shank does not turn with the drill and cause a tear. If the other end of the rivet is supported, the head may be sheared off with a sharp chisel. This cutting should always be done along the directional of the plate edge. If shank is unduly tight after removal of the head, the rivet should be drilled out completely. It may be forced out with a counterpunch of a smaller diameter than the rivet, provided the sheet is properly supported from the opposite side; however, there is greater danger of damaging the sheet and enlarging the hole when using this method. This procedure will also apply to flush rivets.

Riveting Installation.

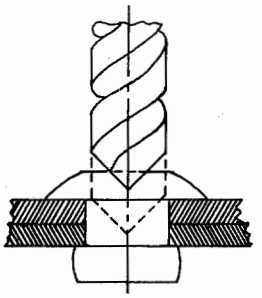
a. Riveting procedure. A large percentage of the riveting of aircraft structures is done on thin gage aluminum alloy and the work must be so accomplished that the material is not distorted by hammer blows or injured with riveting tools. All aircraft power riveting is done by upsetting or heading rivets against a bucking bar instead of striking the shank with a hammer.
1. To prevent deforming of its head a rivet set must be selected to fit each type. The depth of this set must be such that it does not touch the material being riveted.
2. Parts which are to be heat-treated should be heat-treated before riveting since heat treating after this process causes warping. This is also necessary when assemblies are heated in a salt bath as the salt cannot be entirely washed out of the cracks.



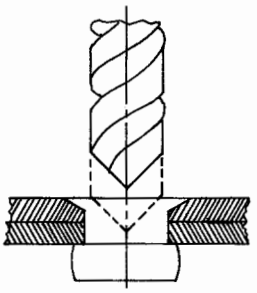
1. FILE A FLAT ON THE MANUFACTURED HEAD



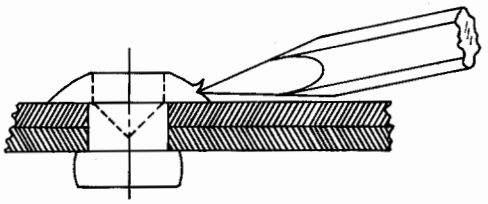
2. CENTER PUNCH THE FLAT



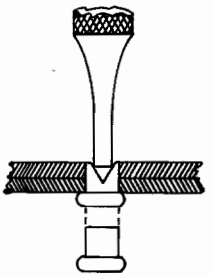
3. DRILL THROUGH HEAD USING DRILL ONE SIZE SMALLER THAN RIVET SHANK



4. DRILL THROUGH DIMPLE COUNTERSUNK OR COUNTERSUNK HEAD USING DRILL ONE SIZE SMALLER THAN RIVET SHANK



5. REMOVE WEAKENER HEAD WITH SHARP CHISEL



6. PUNCH OUT RIVET WITH MACHINE PUNCH

Figure 16-53. Removal of Rivets

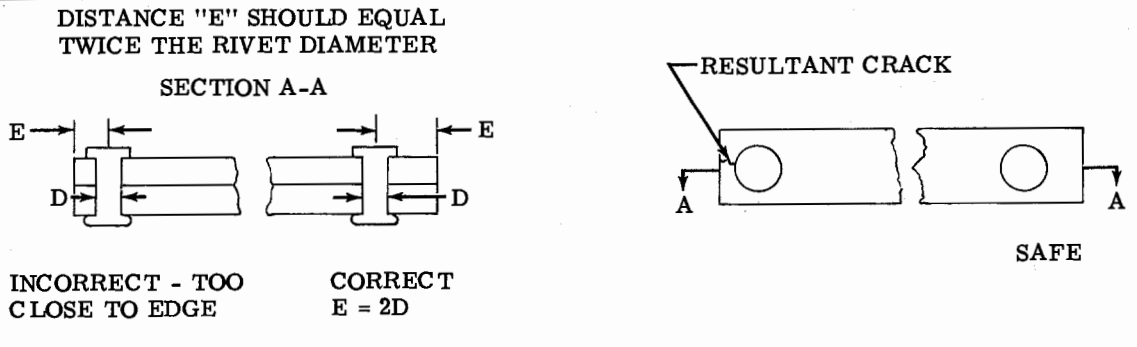



Figure 16-54. Rivet Edge Distance

3. Rivets of a diameter smaller than three thirty-seconds inch must not be used for any structural parts, control parts, wing covering, cowling, or similar sections of aircraft except where there are actual replacements.
4. Rivets through hollow tubes, which are loaded only in shear, should be hammered just enough to form a small head. No attempt should be made to form the standard round head as the amount of hammering required often causes the rivet to buckle inside the tube, with resultant injury to the member.
5. Aluminum alloy rivets must never be used in tension for structural, control or other critical parts of aircraft. Whenever such an installation is required, bolts should be used.
6. The use of hollow rivets in joining highly stressed parts is not permitted. When rivets cannot be driven because of the inaccessibility of the end for bucking or driving, the next size self-plugging cherry rivet may be used.
7. The selection of the proper rivet and proper number of rivets is very important.
8. The rivets must be of the proper length for the total thickness of the pieces being riveted. Ordinarily, from 1-1/2 to 2 times the diameter of the rivet is about the right amout for the rivet shank to protrude through the material to form the head. For heavy material such as plates or fittings, from 2 to 2-1/2 diameters may be used.
9. The rivet should not be too loose in the hole as this condition will cause it to bend over while being headed, and the shank will not be sufficiently expanded to completely fill the hole. A drill from 0.002 to 0.004 inch larger than the rivet should be used for sheet and plate riveting.
10. Pieces should be held firmly together by clamps, screws or bolts while they are being drilled and riveted.
11. Where rivets are headed on the inside of the structure, the bucking bar is held against the end of the rivet shank. Care must be exercised doing this operation to prevent unseating the rivet by the application of too much pressure. For the first few blows the bucking bar should be held lightly against the rivet shank so that it will receive the impact of the blow through the rivet. The bucking bar must be held square with rivet to avoid turning it over.
12. Only a sufficient number of blows should be struck to properly upset a rivet. The blows must be as uniform as possible.

b. Sparing and diameter of rivets. There are no specific rules which are applicable to every case or type of riveting. There are, however, certain general rules which should be understood and followed:

1. The edge distance of rivets should not be less than two diameters of the rivet measured from the edge of the sheet or plate to the center of the rivet hole. (See figure 16-54.)
2. The spacing between rivets, when in rows, depends upon several factors, principally the thickness of the sheet, the diameter of the rivets and the manner in which the sheet will be stressed. This spacing is seldom less than four diameters of the rivet, measured between the centers of the rivet holes. Rivets spaced four diameters apart are found in certain seams of monocoque and semimonocoque fuselages, webs of built-up spars, various plates or fittings, and floats or hulls.
3. Where there are two rows of rivets, they are usually staggered. The transverse pitch or distance between rows should be slightly less than the pitch of the rivets, 75% of rivet pitch being the usual practice.
4. An average spacing or pitch of rivets in the cover or skin of most structures, except at highly stressed joints, will be from 6 to 12 diameters of the rivet.
5. The best practice in repair jobs is to make the pitch of the rivets equal to those in the original structure.

Loose or Working Rivets in Outboard Section of Wing.

Loose or working rivets attaching skin to upper and lower front spar cap may be repaired by adding MS20470AD4 or equivalent rivets midway between and in line with existing working rivets and four rivets beyond the last loose rivet, starting repair at wing tip and working inboard. This repair is limited to the area between the nacelle and tip tank fitting.

NOTE

Care must be taken to avoid damage to fuel tanks and wiring.

Loose or Working Rivets.

a. Rivets which appear to be loose shall be checked by the use of a 0.002 feeler gage by inserting the gage around the head of the rivet in question. If the feeler gage can be inserted to the shank of the rivet shall be classified as a loose rivet and shall be replaced.
b. If the feeler gage can be inserted approximately half-way to the shank for 30% of the circumference of the rivet head, it shall not be classified as a loose rivet.
c. The feeler gage shall be used to check the shear section between the riveted members, such as skin to spar or different sections of skins in a similar manner to that used around the rivet head.
d. If the skin around the brazier-head or countersunk rivet can be moved by depressing the skin with finger pressure around the rivet, the rivet shall be replaced.
e. If rivets are found to turn by applying a rotating load to the head of the rivet, they should be replaced.
f. In areas where exterior paint has been applied to rivet heads, the paint may harden due to aging processes and show hairline cracks around the edge of the rivet heads. This should not be used as a basis for determining whether the rivet is loose or not. The hardened paint may crack at times and collect firt or exhaust fumes which will appear as discoloration. It is not possible to detect loose rivets visually.
g. When replacing rivets, it is desirable to replace them with like size and type. In some instances, it will be necessary to go to the next size larger diame-

ter. For general repair practices, the spacing between the centerlines of adjacent rivet holes shall be four diameters or greater. In areas where the spacing between rivets prohibits the use of the next size larger rivets, special repair instructions and procedures shall be utilized.

NOSE COMPARTMENT WATER SEALING. (See figure 16-56.)

When access panels have been removed or when repairs have been made in the nose section or water has entered the nose compartment, it will be necessary to seal the nose section in accordance with the following instructions.

a. Seal all skin joints, rivets and stringers in nose baggage and radio compartment by brushing the joints with PR1422, Class A2 sealant, using a small paint brush.
b. Remove nose access panel and seal with No. 5550 sealer.
c. Detach nose cone or radome and seal all voids between nose cone or radome assembly, aircraft skin and nose bulkhead using 576-1 sealer (Prestite-Permagum).
d. Seal around pitot tube using No. 5120C sealant.
e. Seal around rivets and voids of cabin heater inlet and nose section skin using PR810 sealant.
f. Seal any opening, all voids in nose wheel well, which might have water leakage possibilities using PR1422 or PR810 sealant.
g. Seal entire perimeter of all access panels using No. 5550 sealer.
h. Seal voids around baggage doors, lower latch assemblies, between lower door frame channel and aircraft skin with 576-1 sealer (Prestite-Permagum) or PR810 sealant.
i. If baggage door frame seal is replaced, use EC880 cement for sealant.

Preparations, Application and Procedures for Sealants, Cements and Surfaces.

a. All surfaces shall be free of dirt, grease, moisture or chips at the time of application of sealants or cements.
b. Metal surfaces shall be thoroughly cleaned with solvents such as Trichlorethylene, Stoddard Super Solvent or Methyl-ethyl Ketone. This is very important for sealant and cement adhesion.

NOTE

Do not use any of the above solvents on transparent plastic surfaces.

c. Use a lint-free cloth for application of solvent and another for wiping surfaces dry. Do not allow the solvent to evaporate; the area must be wiped dry. Blow faying surfaces free of solvent using filtered air.
d. Transparent plastic surfaces (windshield, windows) shall be cleaned by wiping lightly with a cloth or small paint brush saturated with Aliphatic Naphtha (TT-N-95, Type II) or equivalent, and dry with a clean cotton-flannel cloth.

CAUTION

All surface cleaning and all sealing must be done in a clean, well ventilated area. Take precautions to guard against sparks or open flame in the vicinity of the aircraft at all times. Observe all safety precautions and regulations.

WARNING

Avoid excessive skin contact and prolonged breathing of vapors of any solvent or sealant. Wash hands thoroughly after using sealants or solvents before smoking or eating.

e. EC612 fillet sealant is applied along cracks, seams and joints, where sealant is applicable, using a spatula or pressure extruder.
f. Allow EC612 sealant to air dry until quite tacky to the back of the knuckles (15 to 30 minutes) and then apply a coat of PR810 sealant over the entire fillet of EC612 sealant, using a spatula or extrusion gun.
g. Apply PR810 sealant using a spatula, calking gun, flow gun or brush along cracks, seams, joints and rows of screws or rivets as specified.
1. When sealing is done before parts are mated, use enough PR810 sealant to completely fill the joint and wipe away the excess after the parts are joined.
2. Joints shall not be flexed until sealant has cured to tack-free condition. Filler seals shall overlap the edges of all materials thinner than .20 and may or may not overlap materials over .20 inch.

NOTE

PR810 sealant cures by solvent release. Length of cure period depends on air circulation and temperature. Parts may be handled or installed after sealant has become tack-free. The tack-free condition can be determined by placing the knuckles firmly against the sealant. When the sealant does not adhere to the knuckles, the sealant is tack-free (approximately 2 hours).

h. PR1422, Class 2A sealing compound shall be mixed per manufacturer's instructions on container.

NOTE

Mix PR1422 sealing compound in a wax-free container and insure the two components are mixed thoroughly so that the mixture is uniform in color. Care should be taken in mixing to avoid incorporation of air by too rapid stirring or folding action.

NOTE

Mixed compound has a limited work life, mix only quantity of PR1422 sealing compound required to accomplish each sealing operation.

1. Mixing temperatures for PR1422, Class A2 sealant is 75° to 40° F.
2. Sealant shall not be applied at temperatures below 60° F or to structure that is below 60° F.

NOTE

PR1422, Class A2 tack-free condition can be determined by placing the knuckles firmly against the sealant. When sealant no longer adheres to the knuckles, (approximately 30 hours), the sealant is tack-free. Final curing time of sealant is approximately two and one-half times the tack-free curing time. All clean up must be done before sealant cures.

i. No. 5120C sealer is furnished in extruded beads or ribbons and can be cut to size and placed by hand in area indicated.
j. No. 5550 sealer is furnished in cartridges, use cartridge to apply sealer.

NOTE

If No. 5120C or No. 5550 sealers flow out after joints are mated, wipe off the excess material.

k. EC880 cement shall be applied in a thin even coat to each surface to be bonded and allowed to dry until quite tacky, but no longer transfers to the knuckles when touched, (usually between 5 and 30 minutes). Porous surfaces may require two coats.

NOTE

Use the back of the knuckle to touch the adhesive surface instead of fingertips to minimize contamination.

1. Place the two surfaces in contact and press firmly together to insure intimate contact. If less strength is required, only one surface need be coated (the less porous), in which case, the drying period will be from 5 to 8 minutes.
2. One hour should be allowed before the part is handled. Very good bond strength is obtained if parts are allowed to set for at least 24 hours.

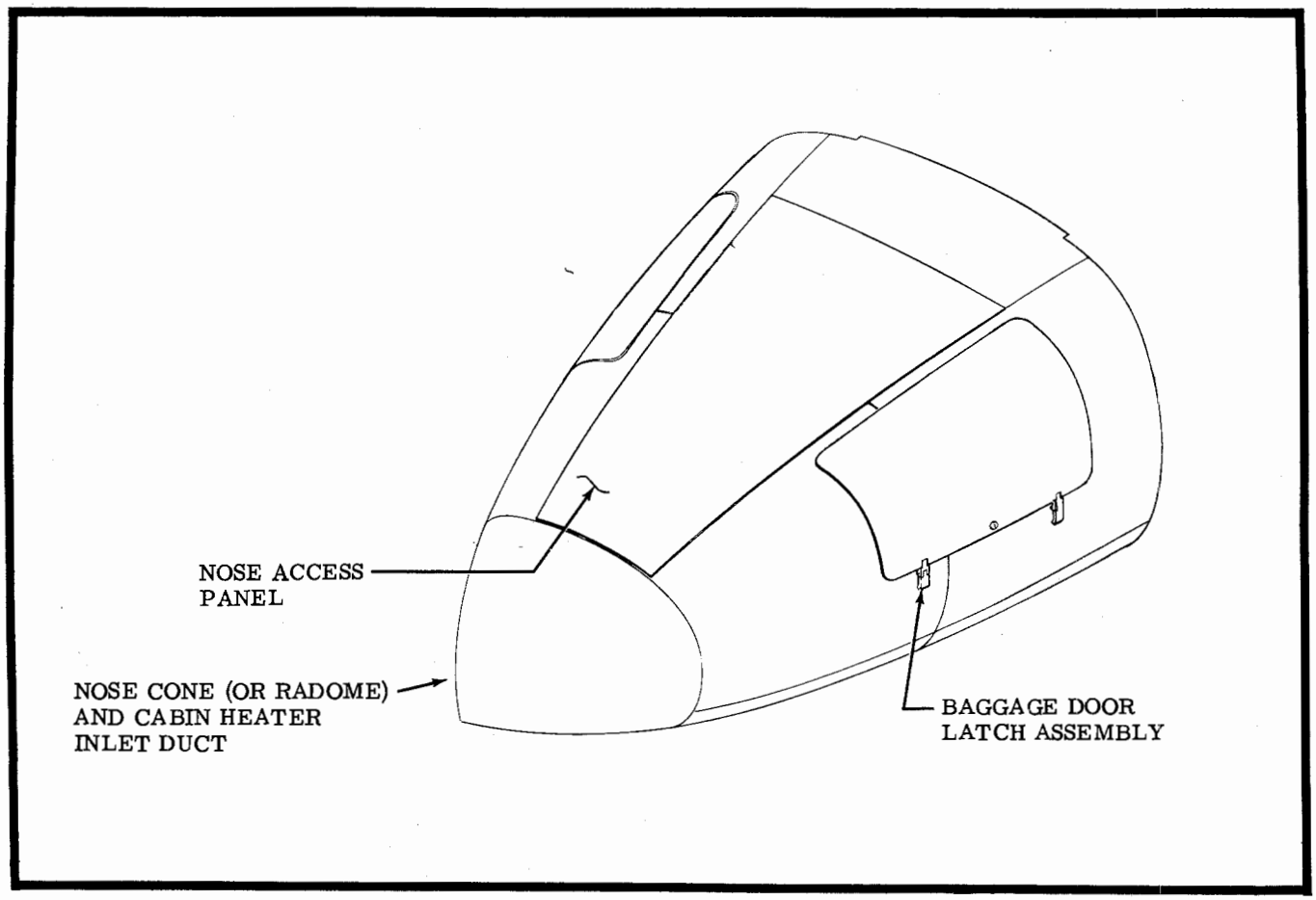



Figure 16-55. Nose Compartment Water Sealing

NOTE

Rubber seal materials shall be prepared by abrading or roughening the surface to be bonded to remove the surface gloss, then solvent cleaned.

Sealant Materials.

a. PR1422, Class A2 sealant, PR810 sealant, Products Research Company.
b. No. 5550 sealer, No. 5120C sealer, Schnee-Moorhead Chemicals, Inc.
c. 576-1 sealer, Prestite Engineering Company.
d. EC880 cement, 3M Company.

PRESSURE DRAIN SEAL.

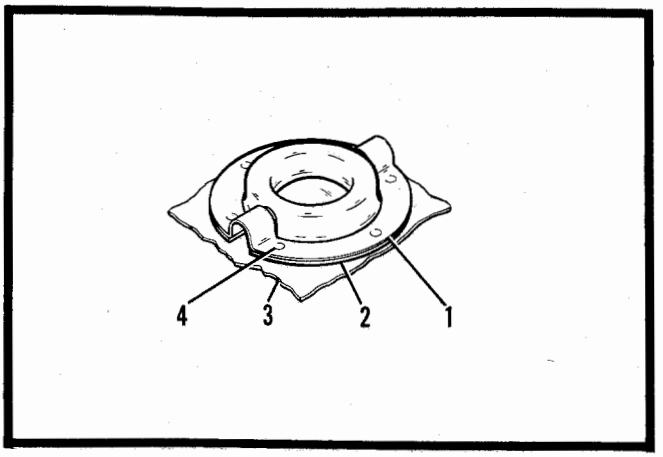
There are six pressure drain seals located in the lower skin of the fuselage. In the unpressurized mode, the seal is relaxed and will allow moisture to drain from the fuselage. In the pressurized mode, the seal expands closing the drain holes to prevent loss of pressurization.

CAUTION

Never insert sharp tools or metal objects into the drains. This will puncture the pressure seal.

Removal and Installation of Pressure Drain Seal. (See figure 16-56.)

a. Drill out the six rivets retaining the seal between the skin and retainer.
b. Remove seal from fuselage lower skin.
c. To install pressure drain, position seal between skin and retainer.
d. Rivet in six places using NAS1097AD4 rivets.




1. Retainer
2. Seal
3. Skin
4. Rivet (P/N NAS1097AD3)

Figure 16-56. Pressure Drain Seal Installation

Resin Selectron 5003 - Comparable to MIL-R-7575 - Vendor: PPG Industries, Inc., One Gateway Center, Pittsburg, Penn., Attention: International Dept.
a. Alternate: Hetron 92 - Comparable to MIL-R-7575 - Vendor: Hooker Electrochemical Co., Niagra Falls, N. Y.

Luperson DDM - No MIL specification - Vendor: Lucidol Division, Wallace and Tiernan, Inc., Buffalo, N. Y.

Luperco ATC Paste - No MIL specification - Vendor: Lucidol Division, Wallace and Tiernan, Inc., Buffalo, N. Y.

Nuodex Cobalt - Federal Standard TT-D-643 - Manufacturer: Nuodex Canada Lmt., 34 Industrial St., Toronto 352, Ontario, Canada.

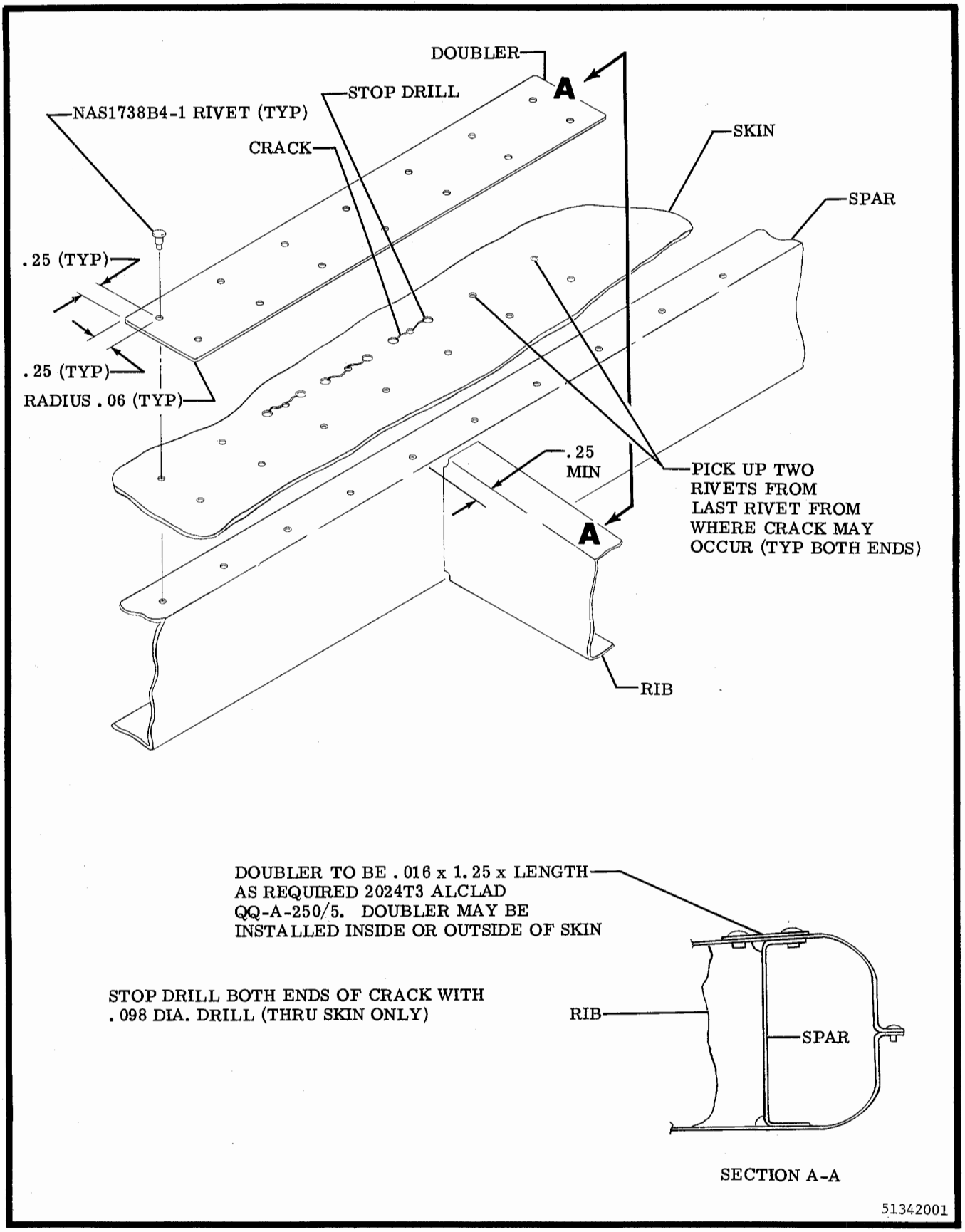
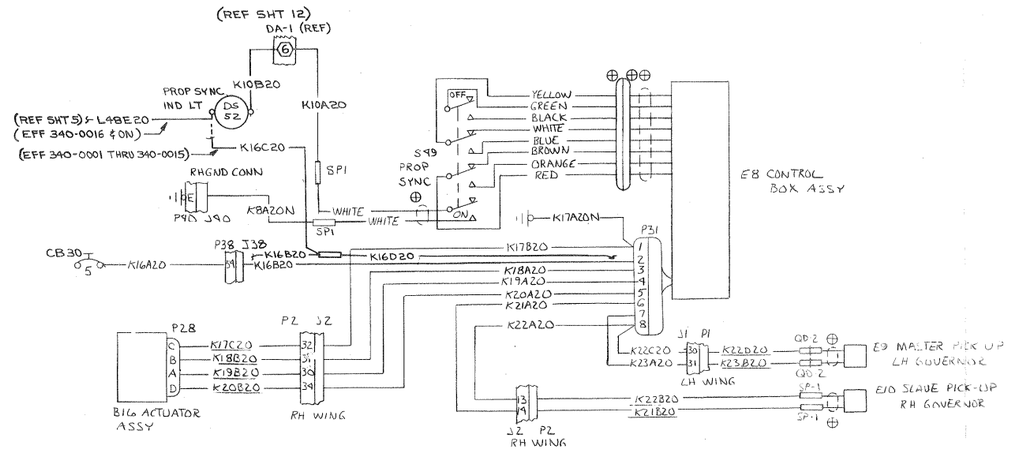
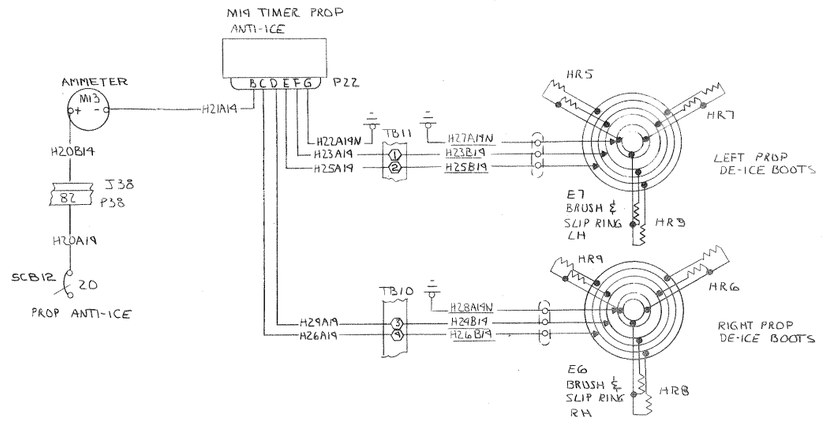


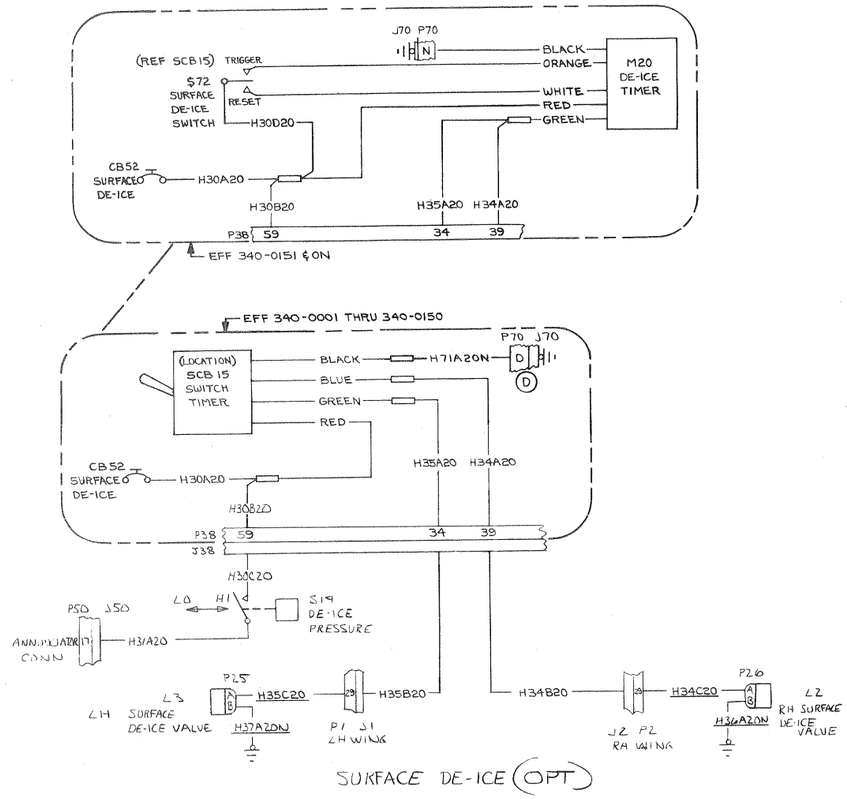

Figure 16-57. Typical Elevator Skin Repair




PROPELLER SYNCHRONIZER




PROPELLER ANTI-ICE (OPT)




SURFACE DE-ICE (OPT)

Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: SURFACE DEICE, PROP DE-ICE, PROP SYNCH, OPTIONAL WIRING DIAGRAM

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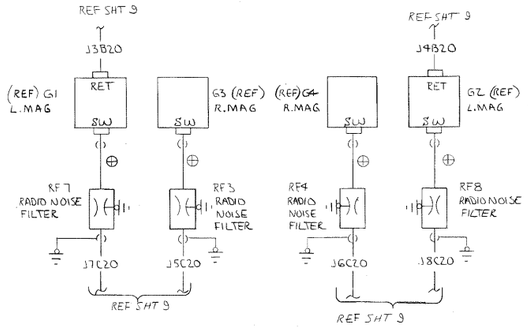
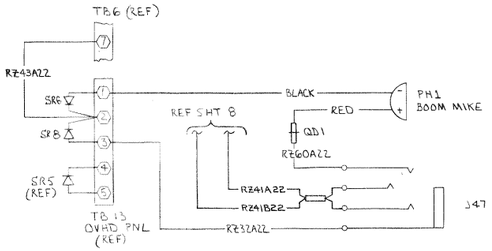
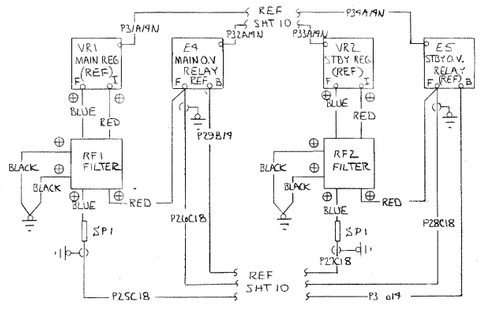



RADIO NOISE FILTERS-MAGNETOS (OPT)




BOOM MIKE (OPT)

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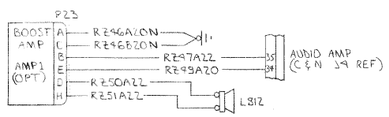
(EFF 340-0001 THRU 340-0150)




EXTERNAL P.A. (OPT)

Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

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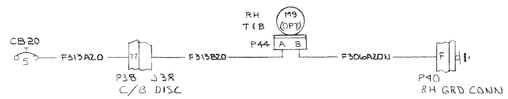
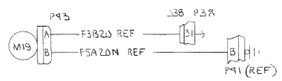
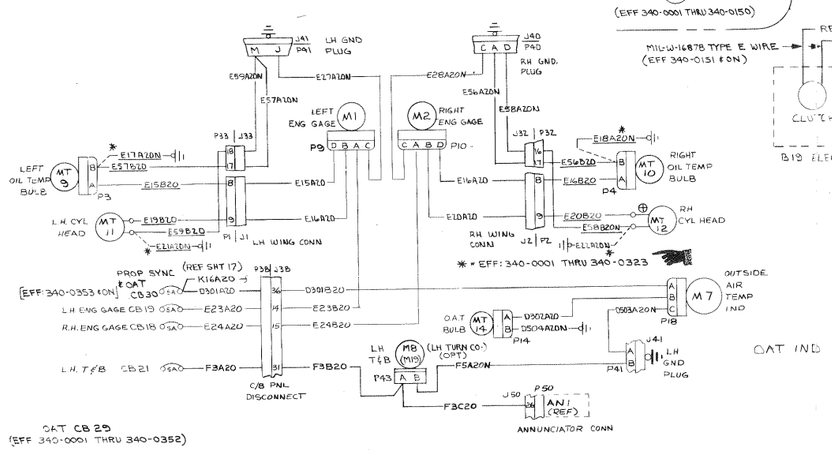
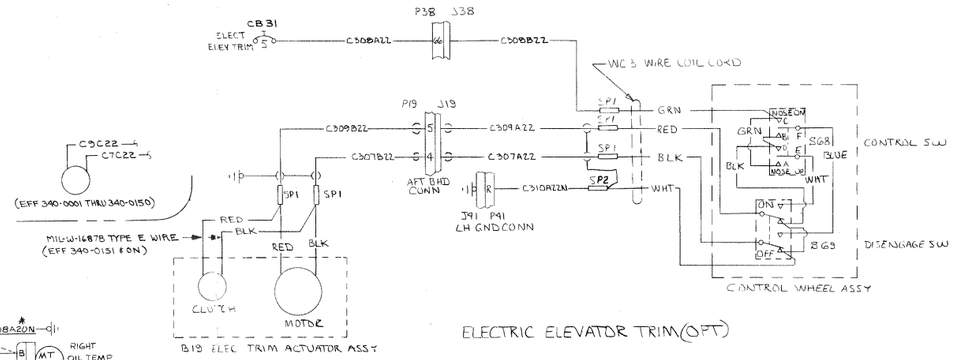



RH T & B (OPT)

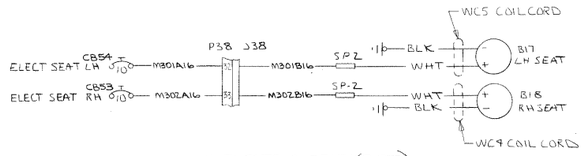



LH TURN COORDINATOR (OPT)

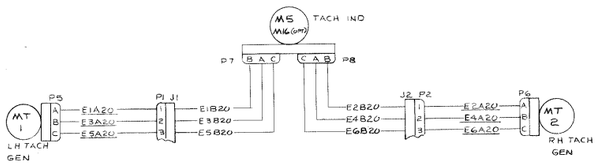


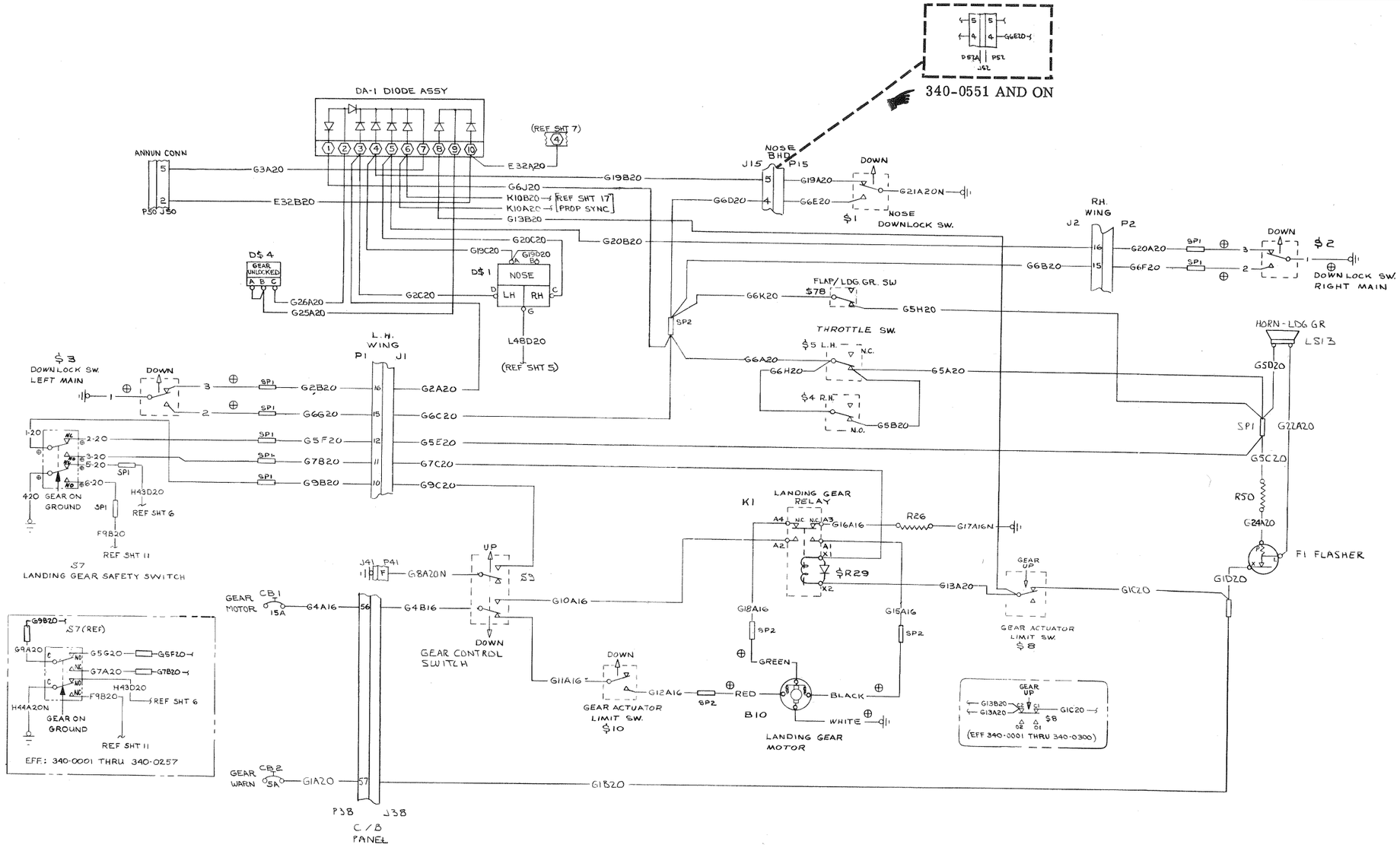

ELECTRIC ELEVATOR TRIM (OPT)




LH ELECTRIC SEAT (OPT)
RH ELECTRIC SEAT (OPT)




| | |
|---|---|
| Cessna AIRCRAFT CO. | P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201 |
| TITLE: | TACH GEN, ENGINE INSTRUMENTS, O.A.T., T&B (LH & RH), ELEC. SEAT (LH & RH), TURN COORD. LH, ELEC ELEV TRIM |
| SIZE: D | CODE IDENT. NO.: 71379 |
| DRAWING NO.: | 5308000 K |
| SCALE: NONE | REF: |
| SHEET 13 OF 20 | |




LANDING GEAR

(SHOWN WITH GEAR DOWN - AIRCRAFT ON GROUND)

Cessna® AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: LANDING GEAR WIRING DIAGRAM

| SIZE | CODE IDENT. NO. | DRAWING NO. | |
|---|---|---|---|
| D | 71379 | 5308000 | K |
| SCALE: NONE | | REF | SHEET 12 of 20 |

MODEL 340 WIRING REFERENCE DESIGNATOR REV D

| REFERENCE | SHEET | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| AMP1 | 16 | 5072422-1 | BOOST AMP |
| AMP3 | 7 | CMF860-4 | SIG COND |
| AMP3 | 7 | 9910082-2 | SIG COND |
| AMP4 | 7 | CMF860-4 | SIG COND |
| AMP4 | 7 | 9910082-2 | SIG COND |
| AMP5 | 20 | RR-45-FT | STEREO PLAYER |
| AN1 | GEN | 5618009-7 | ANNUNCIATOR |
| AR1 | 10 | 634445 | ALT |
| AR2 | 10 | 634445 | ALT |
| AR3 | 10 | 639229 | ALTERNATOR |
| AR4 | 10 | 639229 | ALTERNATOR |
| B1 | 14 | 0850420-1 | PUMP TIP TANK |
| B2 | 14 | 0850420-1 | PUMP TIP TANK |
| B5 | 14 | 4140-00-153 | FUEL PUMP |
| B6 | 14 | 4140-00-153 | FUEL PUMP |
| B7 | 6 | 9910113 | WEMAC BLOWER |
| B8 | 9 | 627841 | STARTER |
| B9 | 9 | 627841 | STARTER |
| B10 | 12 | 9910002-3 | MOTOR |
| B11 | 11 | 9910055-1 | MOTOR |
| B14 | 6 | G720702 | FUEL PUMP |
| B16 | 17 | 213100 | ACTUATOR |
| B17 | 13 Q | C812760-7 | LH SEAT |
| B18 | 13 | C812760-8 | RH SEAT |
| B19 | 13 | 5115231-7 | MTR-TRIM |
| B23 | 14 | 476284 | XFER PUMP |
| B24 | 14 | 476284 | XFER PUMP |
| B25 | 18 | 476411 | ALC WS DE-ICE |
| B30 | 19 | HE81280 | COMP&CLUTCH A |
| B31 | 19 | HE81300-4 | LH EVAP BLWR |
| B32 | 19 | HE81300-3 | RH EVAP BLWR |
| B34 | 19 | HE81229 | COND BLOWER |
| BB1 | 10 | 5318115-22 | BUS BAR |
| BB2 | 9 | 5008011-16 | BUS BAR |
| BB3 | 9 | 5008011-15 | BUS BAR |
| BB6 | 10 | MS25226-2-2 | BUS BAR |
| BB14 | 10 | 5318115-23 | BUS BAR |
| BB16 | 9 | 5008011-6 | BUS BAR |
| BB20 | 10 Q | C820001-1 | BUS BATTERY |
| BT1 | 10 | 0511319-1 | BATTERY |
| BT2 | 10 | 0511319-1 | BATTERY |
| CB1 | 12 | 7277-2-15 | CB GR MTR |
| CB2 | 12 | 7277-2-5 | CB GR WARN |
| CB3 | 11 | 7277-2-10 | CB FLAP MTR |
| CB4 | 9 | 7277-2-7.5 | CB STRT RELAY |
| CB5 | 14 | 7277-2-7.5 | CB R AUX PUMP |
| CB6 | 14 | 7277-2-7.5 | CB L AUX PUMP |
| CB7 | 11 | 7277-2-5 | CB STALL WARN |
| CB8 | 10.01 | 7277-2- | CB INV 2 |
| CB9 | 10.01 | 7277-2- | CB INV 1 |
| CB10 | 6 | 7277-2-5 | CB CABIN PRESS |
| CB11 | 6 | 7277-2-15 | CB CABIN HEAT |
| CB12 | 6 | 7277-2-15 | CB CABIN FAN |
| CB13 | 6 | 7277-2-15 | CB WEMAC BLWR |
| CB14 | 11 | 7277-2-5 | CB R PITOT HT |
| CB15 | 11 | 7277-2-5 | CB L PITOT HT |
| CB16 | 6 | 7277-2-5 | CB R FUEL GAGE |
| CB17 | 6 | 7277-2-5 | CB L FUEL GAGE |
| CB18 | 13 | 7277-2-5 | CB R ENG GAGE |
| CB19 | 13 | 7277-2-5 | CB L ENG GAGE |
| CB20 | 13 | 7277-2-5 | CB R T&B |
| CB21 | 13 | 7277-2-5 | CB L T&B |
| CB22 | 5 | 7277-2-5 | CB CABIN LTS |
| CB23 | 5 | 7277-2-5 | CB PILOT LTS |
| CB24 | 5 | 7277-2-5 | CB COPILOT LTS |
| CB25 | 5 | 7277-2-7.5 | CB RADIO LTS |
| CB26 | 15 | 7277-2-10 | CB R LDG LT |
| CB27 | 15 | 7277-2-10 | CB L LDG LT |
| CB28 | 20 | 7277-2-5 | STEREO |
| CB29 | 13 | 7277-2-5 | CB OAT |
| CB30 | 17 | 7277-2-5 | CB PROP SYNC |
| CB31 | 13 | 7277-2-5 | CB ELEV TRIM |
| CB32 | 14 | 7277-2-5 | CB R FUEL XFER |
| CB33 | 14 | 7277-2-5 | CB L FUEL XFER |
| CB34 | | 7277-2-10 | CB COMM 3 |
| CB35 | 10 | 7277-2-10 | CB COMM 2 |
| CB36 | 10 | 7277-2-10 | CB COMM 1 |
| CB37 | 10 | 7277-2-7.5 | CB NAV 2 |
| CB38 | 10 | 7277-2-7.5 | CB NAV 1 |
| CB39 | 10 | 7277-2-5 | CB MKR BCN |
| CB40 | 10 | 7277-2-5 | CB AUDIO AMP |
| CB41 | 10 | 7277-2-5 | CB XPDR |
| CB42 | 10 | 7277-2-5 | CB DME |
| CB43 | 10 | 7277-2-5 | CB ADF 2 |
| CB44 | 10 | 7277-2-5 | CB ADF 1 |
| CB45 | 10 | 7277-2-5 | CB RADAR |
| CB46 | 10 | 7277-2-7.5 | CB AUTO PILOT |
| CB47 | 10 | 7277-2-7.5 | CB RADAR ALT |
| CB48 | 10 | 7277-2-7.5 | CB GYRO PWR 2 |
| CB49 | 10 | 7277-2-7.5 | CB GYRO PWR 1 |
| CB50 | 10 | 7277-2-5 | CB RMI |
| CB51 | 10 | 7277-2-10 | CB FIRE WARN |
| CB52 | 17 | 7277-2-7.5 | CB SURF DE-ICE |
| CB53 | 13 | 7277-2-15 | CB R ELECT ST |
| CB54 | 13 | 7277-2-15 | CB L ELECT ST |
| CB55 | 19 | 7277-2-15 | CB CONTROL A/C |
| CB56 | 19 | 7271-8-25 | CB BLOWER A/C |
| CB57 | 10 | 7277-2- | CB FLT DIR |
| CB58 | 10 | 45-2-S-2N 100A | CB L ALT |
| CB59 | 10 | 45-2-S-2N 100A | CB R ALT |
| CB60 | 10 | PDM-40 | CB AVN PWR |
| CR5 | 10.01 | 1N4721 | DIODE |
| CR6 | 10.01 | 1N4721 | DIODE |
| CT1 | 18 | 88070-2 | CAB PRESS CONT |
| DA1 | 12 | 5118412-2 | DIODE ASSY |
| DS1 | 12 | 9910115-1 | NOSE DOWN LT |
| DS2 | 12 | 9910115-1 | R GR DOWN LT |
| DS3 | 12 | 9910115-1 | LH GR DOWN LT |
| DS4 | 12 | 9910115-2 | GR UNLOCKED LT |
| DS5 | 15 | 0823200-1 | LT-NAV |
| DS6 | 15 | 0823200-2 | LT-NAV |
| DS7 | 15 | C622001-0103 | LT-NAV |
| DS8 | 15 | C621002-0107 | LT-ROT BCN |
| DS9 | 15 | C621002-0106 | LT-ROT BCN |
| DS10 | 15 | 0842215-8 | LT TAXI |
| DS11 | 8 | 1309 | LT |
| DS12 | 8 | 1309 | LT |
| DS13 | 5 | 2393 | LT |
| DS14 | 5 | 2393 | LT |
| DS15 | 5 | 2393 | LT |
| DS16 | 5 | 2393 | LT |
| DS17 | 15 | 1309 | LT-NAC BAG |
| DS18 | 15 | 1309 | LT-NAC BAG |
| DS19 | 15 | 0820501-5 | LT-ICE |
| DS20 | 15 | 0870132-1 | LT-LDG RH |
| DS21 | 15 | 0870132-1 | LT-LDG LH |
| DS22 | 5 | CM2990 | POST LT |
| DS24 | 5 | 83550 | LT DOOR |
| DS25 | 5 | CM2990 | POST LT |
| DS26 | 5 | CM2990 | POST LT |
| DS27 | 5 | CM2990 | POST LT |
| DS28 | 5 | CM2990 | POST LT |
| DS29 | 5 | CM2990 | POST LT |
| DS30 | 5 | CM2990 | POST LT |
| DS31 | 5 | CM2990 | POST LT |
| DS32 | 5 | CM2990 | POST LT |
| DS33 | 5 | CM2990 | POST LT |
| DS34 | 5 | CM2990 | POST LT |
| DS35 | 5 | CM2990 | POST LT |
| DS36 | 5 | CM2990 | POST LT |
| DS37 | 5 | CM2990 | POST LT |
| DS38 | 5 | CM2990 | POST LT |
| DS39 | 5 | CM2990 | POST LT |
| DS40 | 5 | CM2990 | POST LT |
| DS41 | 5 | CM2990 | POST LT |
| DS42 | 5 | CM2990 | POST LT |
| DS43 | 5 | CM2990 | POST LT |
| DS44 | 5 | CM2990 | POST LT |
| DS45 | 5 | CM2990 | POST LT |
| DS46 | 5 | CM2990 | POST LT |
| DS47 | 5 | CM2990 | POST LT |
| DS48 | 5 | CM2990 | POST LT |
| DS49 | 5 | CM2990 | POST LT |
| DS50 | 5 | CM2990 | POST LT |
| DS51 | 5 | CM2990 | POST LT |
| DS52 | 17 | 85551-A-4-D | PROP SYNC IND |
| DS53 | 5 | CM2990 | POST LT |
| DS54 | 5 | CM2990 | POST LT |
| DS55 | 5 | CM2990 | POST LT |
| DS56 | 5 | CM2990 | POST LT |
| DS57 | 5 | 5115250-1 | FLAP IND BLK |
| DS58 | 5 | 5115223-1 | FLAP IND BLK |
| DS59 | 5 | CM2990 | POST LT |
| DS60 | 5 | CM2990 | POST LT |
| DS61 | 5 | D230-100-2 | LT |
| DS62 | 5 | D230-100-2 | LT |
| DS63 | 5 | 5318113-1 | CB PANEL LTS |
| DS64 | 5 | 5318113-1 | CB PANEL LTS |
| DS65 | 5 | 161619 | FUEL SELECT LT |
| DS66 | 5 | 161619 | FUEL SELECT LT |
| DS67 | 5 | CM2990 | POST LT |
| DS68 | 5 | CM2990 | POST LT |
| DS69 | 5 | CM2990 | POST LT |
| DS70 | 5 | CM2990 | POST LT |
| DS71 | 5 | CM2990 | POST LT |
| DS72 | 5 | CM2990 | POST LT |
| DS73 | 5 | CM2990 | POST LT |
| DS74 | 5 | CM2990 | POST LT |
| DS75 | 5 | CM2990 | POST LT |
| DS76 | 5 | CM2990 | POST LT |
| DS77 | 5 | CM2990 | POST LT |
| DS78 | 5 | CM2990 | POST LT |
| DS79 | 5 | CM2990 | POST LT |
| DS81 | 5 | 5318113-3 | CB PANEL LTS |
| DS82 | 5 | 5318113-2 | CB PANEL LTS |
| DS83 | 5 | 1309 | LT FLD |
| DS84 | 5 | 1309 | LT FLD |
| DS85 | 5 | 1309 | LT FLD |
| DS86 | 5 | CM2990 | POST LT |
| DS87 | 5 | CM2990 | POST LT |
| DS88 | 5 | CM2990 | POST LT |
| DS89 | 5 | CM2990 | POST LT |
| DS90 | 5 | CM2990 | POST LT |
| DS91 | 5 | CM2990 | POST LT |
| DS92 | 5 | CM2990 | POST LT |
| DS93 | 5 | CM2990 | POST LT |
| DS94 | 5 | CM2990 | POST LT |
| DS95 | 5 | CM2990 | POST LT |
| DS96 | 5 | CM2990 | POST LT |
| DS97 | 5 | CM2990 | POST LT |
| DS98 | 15 | C622002-0102 | LT NOSE BAG |
| DS105 | 15 | 0820501-5 | LT-ICE |
| DS106 | 7 | 85551-A-4-D | LT AUX FUEL |
| DS107 | 7 | 85551-A-4-D | LT AUX FUEL |
| DSS1 | 15 | 30-0515-1 | LT STROBE |
| DSS2 | 15 | 30-0515-1 | LT STROBE |
| DSS3 | 15 | 30-0516-5 | LT STROBE |
| E1 | 11 | AN5812-1 | PITOT |
| E2 | 11 | AN5812-1 | PITOT OPT |
| E3 | 6 | 8472-C24 | HTR CABIN |
| E4 | 10 | 9910068-1 | OV RELAY |
| E4 | 10.01 | 9910068-2 | OV RELAY |
| E5 | 10 | 9910068-1 | OV RELAY |
| E5 | 10.01 | 9910068-2 | OV RELAY |
| E6 | 17 | C40010 | BRUSH A |
| E7 | 17 | C40010 | BRUSH A |
| E8 | 17 | 213433 | CONTROL BOX |
| E9 | 17 | 8210446 | GOVERNOR |
| E10 | 17 | 8210446 | GOVERNOR |
| F1 | 12 | R102-12V | FLASHER |
| F2 | 10 | MTH-5 | FUSE |
| F3 | 11 | AGC3.0 | FUSE |
| F4 | 10 | MTH-5 | FUSE |
| F5 | 10 | MDX 3.0 AMP | FUSE |
| F5 | 10.01 | MDX 5.0 AMP | FUSE |
| F6 | 10 | MDX 3.0 AMP | FUSE |
| F6 | 10.01 | MDX 5.0 AMP | FUSE |
| F7 | 15 | 70-0075-1 | FLASHER STROBE |
| F8 | 10 | MTH-5 | FUSE |
| F9 | 10 | MTH-5 | FUSE |
| F14 | 19 | AGC 5 AMP | FUSE |
| G1 | 9 | S6LN-1201 | MAGNETO |
| G2 | 9 | S6LN-1201 | MAGNETO |
| G3 | 9 | S6LN-1205 | MAGNETO |
| G4 | 9 | S6LN-1205 | MAGNETO |
| G5 | 9 | 10-176487-242 | VIBRATOR START |
| HR4 | 17 | C165013-0201 | DE-ICE BOOT |
| HR5 | 17 | C165013-0201 | DE-ICE BOOT |
| HR6 | 17 | C165013-0201 | DE-ICE BOOT |
| HR7 | 17 | C165013-0201 | DE-ICE BOOT |
| HR8 | 17 | C165013-0201 | DE-ICE BOOT |
| HR9 | 17 | C165013-0201 | DE-ICE BOOT |
| HR11 | 11 | 105881 | HTR |
| HR12 | 11 | 105881 | HTR |
| HR13 | 11 | CM2933-5 | HTR |
| HR14 | 11 | CM2933-5 | HTR |
| HR15 | 11 | 105881 | HTR |
| HR16 | 11 | 105881 | HTR |
| HS1 | 5 | 5618008-1 | HT SINK |
| J1 | 3 | DS04-37S | RECEPTACLE |
| J2 | 3 | DS04-37S | RECEPTACLE |
| J3 | 9 | AN2552-3A | APU RECPT |
| J5 | 8 | S1102-1 | JACK |
| J6 | 8 | 1514209-6 | JACK |
| J7 | 8 | S1103-1 | JACK |
| J8 | 8 | S1103-1 | JACK |
| J9 | 8 | S1102-1 | JACK |
| J15 | 3 | DS04-27-25S | RECEPTACLE |
| J19 | 3 | DS04-27-25S | RECEPTACLE |
| J32 | 3 | DS04-37-2S | RECEPTACLE |
| J33 | 3 | DS04-37-2S | RECEPTACLE |
| J37 | 3 | 203735 | RECEPTACLE C&N |
| J38 | 3 | 1-203739-6 | RECEPTACLE |
| J40 | 3 | 203540-1 | GROUND RECEPT |
| J41 | 3 | 203540-1 | GROUND RECEPT |
| J47 | 16 | 5-13-8 | JACK |
| J48 | 5 | DA15S | RECEPTACLE |
| J49 | 5 | DB25S | RECEPTACLE |
| J50 | 3 | 17-10370 | RECEPTACLE |
| J70 | 3 | 203540-1 | GROUND RECEPT |
| J71 | 20 | 1625-12R-1 | RECPT STEREO |
| K1 | 12 | 6041H220 | RELAY |
| K2 | 10 | 0850469-1 | RELAY |
| K3 | 14 | FC215-136 | RELAY |
| K4 | 14 | FC215-136 | RELAY |
| K5 | 9 | 0850469-1 | RELAY |
| K6 | 9 | 0850469-1 | RELAY |
| K7 | 9 | 0850469-1 | RELAY |
| K11 | 19 | MS24187-D1 | RELAY COND BLR |
| K12 | 19 | MS24187-D1 | RELAY WMAC BLR |
| L1 | 6 | G700748 | FUEL VALVE |
| L2 | 17 | 3D1542-03 | VALVE |
| L3 | 17 | 3D1542-03 | VALVE |
| L6 | 6 | 3425-00-9 | VALVE PRESS |
| L20 | 19 | HF81089 | VALVE MANIFOLD |
| LS2 | 8 | T791 | SPKR |
| LS3 | 20 | C596506-0101 | SPEAKER |
| LS4 | 20 | C596506-0101 | SPEAKER |
| LS5 | 20 | 5118471-2 | TRANS ASSY |
| LS6 | 20 | 5118471-2 | TRANS ASSY |
| LS7 | 20 | 5118471-2 | TRANS ASSY |
| LS8 | 20 | 5118471-2 | TRANS ASSY |
| LS9 | 20 | C596506-0101 | SPEAKER |
| LS10 | 20 | C596506-0101 | SPEAKER |
| LS12 | 16 | F8WP | SPKR |
| LS13 | 12 | A2917 | HORN |
| LS14 | 11 | A2918 | HORN |
| M1 | 13 | C662019-0101 | ENG GAGE |
| M2 | 13 | C662019-0101 | ENG GAGE |
| M3 | 7 | DSF859-1 | FUEL IND |
| M3 | 7 | 9910082-1 | FUEL IND |
| M5 | 13 | C668017-0101 | TACH IND |
| M7 | 13 | C668520-0101 | UAT IND |
| M8 | 13 | C661031-0101 | T&B IND |
| M9 | 13 | C661032-0101 | T&B IND |
| M11 | 10 | 5118486-1 | VOLT AMMETER |
| M13 | 17 | C662503-0101 | AMMETER |
| M14 | 17 | 3E1150-3 | TIMER |
| M16 | 13 | C668016-0101 | TACH OPT |
| M17 | 11 | CM2926-1 | RECORDER |
| M19 | 13 | C661003-0203 | TURN COORD |
| M20 | 17 | EM211-2 | DE-ICE TIMER |
| MT1 | 13 | 0850350-4 | TACH GEN |
| MT2 | 13 | 0850350-4 | TACH GEN |
| MT3 | 7 | PAA700-3 | FUEL PROBE |
| MT3 | 7 | 9910082-3 | FUEL PROBE |
| MT4 | 7 | PAA700-3 | FUEL PROBE |
| MT4 | 7 | 9910082-3 | FUEL PROBE |
| MT5 | 7 | PAA700-2 | FUEL PROBE |
| MT5 | 7 | 9910082-5 | FUEL PROBE |
| MT6 | 7 | PAA700-2 | FUEL PROBE |
| MT6 | 7 | 9910082-5 | FUEL PROBE |
| MT9 | 13 | MS28034-3 | OIL TEMP BULB |
| MT10 | 13 | MS28034-3 | OIL TEMP BULB |
| MT11 | 13 | 0813601-6 | CYL TEMP BULB |
| MT12 | 13 | 0813601-6 | CYL TEMP BULB |
| MT14 | 13 | 0813601-8 | OAT BULB |
| MT17 | 11 | 0511062-14 | STALL SWITCH |
| MT21 | 7 | 9910082-8 | FUEL PROBE |
| MT22 | 7 | 9910082-8 | FUEL PROBE |
| MT23 | 7 | 9910082-14 | FUEL PROBE |
| MT24 | 7 | 9910082-14 | FUEL PROBE |
| P1 | 3 | DS07-37P | PLUG |
| P2 | 3 | DS07-37P | PLUG |
| P3 | 13 | MS3106-12S-3S | PLUG |
| P4 | 13 | MS3106-12S-3S | PLUG |
| P5 | 13 | MS3108A10SL-3S | PLUG |
| P6 | 13 | MS3108A10SL-3S | PLUG |
| P7 | 13 | MS3106A14S-2S | PLUG |
| P8 | 13 | MS3106A14S-2S | PLUG |
| P9 | 13 | MS3106A14S-2S | PLUG |
| P10 | 13 | MS3106A14S-2S | PLUG |
| P11 | 11 | AN3115-1 | PLUG |
| P12 | 7 | MS3106E-18-1S | PLUG |
| P12 | 7 | 75-68-618-1S | PLUG |
| P13 | 7 | MS3106E-18-1S | PLUG |
| P13 | 7 | 75-68-618-1S | PLUG |
| P14 | 13 | MS3106A12S-3S | PLUG |
| P15 | 3 | DS07-27-25P | PLUG NOSE |
| P17 | 7 | MS3106E-18-1S | PLUG |
| P18 | 13 | MS3106A14S-2S | PLUG |
| P19 | 3 | DS07-27-25P | PLUG TAIL |
| P20 | 15 | MS3106A10SL-3S | PLUG |
| P21 | 15 | MS3106A10SL-3S | PLUG |
| P22 | 17 | MS3106A20-15S | PLUG |
| P23 | 16 | 126-222 | PLUG |
| P25 | 17 | MS3108E12S-3S | PLUG |
| P26 | 17 | MS3108E12S-3S | PLUG |
| P28 | 17 | MS3106B-14S-2S | PLUG |
| P30 | 11 | AN3115-1 | PLUG |
| P31 | 17 | 233032 | PLUG |
| P32 | 3 | DS07-37-2P | PLUG |
| P33 | 3 | DS07-37-2P | PLUG |
| P37 | 3 | 203735-6 | PLUG C&N |
| P38 | 3 | 1-203739-5 | PLUG |
| P40 | 3 | 201298-1 | PLUG |
| P41 | 3 | 201298-1 | PLUG |
| P43 | 13 | MS3106A10SL-3S | PLUG |
| P44 | 13 | MS3106A10SL-3S | PLUG |
| P45 | 7 | PT06SE10-98S | PLUG (5R) |
| P46 | 7 | PT06SE10-98S | PLUG (5R) |
| P48 | 5 | DA15P | PLUG |
| P49 | 5 | DB25P | PLUG |
| P65 | 15 | 1-480305-0 | PLUG STROBE PS |
| P66 | 15 | 1625-5P | PLUG FLASHER |
| P70 | 3 | 201298-1 | PLUG GA GND |
| P71 | 20 | 1625-12P-1 | PLUG STEREO |
| P72 | 20 | 171143-002 | PLUG STEREO |
| P80 | 19 | MS3108E-10SL-4S | PLUG |
| PH1 | 16 | C596503-0102 | BOOM MIC |
| PS1 | 15 | 60-1520-3 | PWR SUPPLY |
| Q3 | 5 | 5618006-2 | ASISTOR A |
| QD1 | GEN | S-341-2 | DISCONNECT |
| QD2 | GEN | S-341-1 | DISCONNECT |
| QD3 | 7 | SEE NOTE 7 | DISCONNECT |
| R3 | 6 | OR-55-1 | RESISTOR |
| R5 | 14 | AR-75-10 | RESISTOR |
| R6 | 14 | AR-75-10 | RESISTOR |
| R7 | 10 | CM2916-125 | SHUNT |
| R8 | 10 | HS-1A-1(-7200 | RESISTOR |
| R11 | 10 | CM2916-125 | SHUNT |
| R12 | 10 | CM2916-125 | SHUNT |
| R13 | 5 | RC20GF151K | RESISTOR |
| R15 | 5 | CM34852 | RHEO |
| R17 | 8 | E-50-R-1-352A | RHEO |
| R18 | 8 | E-50-R-1-352A | RHEO |
| R21 | 6 | OR-55-1 | RESISTOR |
| R22 | 6 | OR-55-1 | RESISTOR |
| R26 | 12 | FR-100-5 | RESISTOR |
| R30 | 19 | HE81106-3 | TEMP CONTROL |
| R50 | 12 | 1 3/4-0-68-F-4 | RESISTOR |
| RF1 | 16 | JN14-13578-1 | NOISE FILTER |
| RF2 | 16 | JN14-13578-1 | NOISE FILTER |
| RF3 | 16 | MF-3A | NOISE FILTER |
| RF4 | 16 | MF-3A | NOISE FILTER |
| RF7 | 16 | MF-3A | NOISE FILTER |
| RF8 | 16 | MF-3A | NOISE FILTER |
| S1 | 12 | 2V81 | SWITCH |
| S2 | 12 | 1SE1 | SWITCH |
| S3 | 12 | 1SE1 | SWITCH |
| S4 | 12 | 1SM1 & JS-5 | SWITCH |
| S5 | 12 | 1SM1 & JS-5 | SWITCH |
| S7 | 12 | 2VA20 | SWITCH |
| S8 | 12 | BZ-3YT | SWITCH |
| S9 | 12 | 0813525-4 | SWITCH |
| S10 | 12 | BZ7RT04 | SW DOWN LIMIT |
| S11 | 14 | S392-1 | SWITCH |
| S12 | 14 | S392-1 | SWITCH |
| S13 | 14 | 1568-1 | SWITCH |
| S14 | 17 | 1D1194-1 | SWITCH |
| S15 | 11 | MS25253-1 | SWITCH |
| S16 | 11 | MS25253-1 | SWITCH |
| S17 | 10 | MS25068-23 | SW MAIN STBY |
| S18 | 10 | S382-3 | SW EMER PWR |
| S18 | 10.01 | S392-3 | SW EMER PWR |
| S19 | 11 | MS25253-1 | SWITCH |
| S20 | 14 | 0850452-7 | SWITCH |
| S21 | 14 | 0850452-7 | SWITCH |
| S22 | 8 | MS25253-1 | SWITCH |
| S23 | 5 | L-18366-3 | SWITCH LT |
| S24 | 5 | L-18366-3 | SWITCH LT |
| S25 | 5 | L-18366-3 | SWITCH LT |
| S26 | 5 | L-18366-3 | SWITCH LT |
| S27 | 15 | MS24524-21 | LDG GR LT SW |
| S28 | 6 | S382-1 | SWITCH |
| S29 | 9 | S382-2 | SWITCH |
| S30 | 9 | S382-2 | SWITCH |
| S31 | 9 | S382-2 | SWITCH |
| S32 | 9 | S382-2 | SWITCH |
| S33 | 9 | 14-104R | SWITCH |
| S34 | 9 | 14-104R | SWITCH |
| S35 | 10 | MS24524-22 | SWITCH |
| S36 | 10 | PA2003 | SW VOLT-AMP |
| S37 | 10 | MS24524-22 | SWITCH |
| S38 | 10 | MS24524-22 | SWITCH |
| S39 | 14 | 9910058-1 | SWITCH |
| S40 | 14 | 9910058-1 | SWITCH |
| S41 | 6 | 06496-1-A | THERMOSTAT |
| S42 | 6 | S382-2 | SWITCH |
| S43 | 6 | 9910095-1 | SWITCH |
| S44 | 6 | S382-1 | SWITCH |
| S45 | 8 | T2114 | SWITCH |
| S46 | 8 | 913 | SWITCH |
| S47 | 5 | S-382-2 | COURTESY LT SW |
| S48 | 5 | S1238-2-1 | SWITCH |
| S49 | 17 | MST205N | SWITCH |
| S50 | 8 | 913 | SWITCH |
| S53 | 15 | 8406K1 | SWITCH |
| S54 | 15 | 8406K1 | SWITCH |
| S56 | 6 | MS25085-1 | DUMP SW |
| S65 | 14 | MST205N | SWITCH |
| S66 | 14 | MST205N | SWITCH |
| S67 | 11 | MS25253-1 | SWITCH |
| S68 | 13 | 305-4308 | SWITCH |
| S69 | 13 | T2153 | SWITCH |
| S71 | 7 | 7415 | SWITCH |
| S72 | 17 | MS35058-27 | SWITCH DE-ICE |
| S73 | 5 | MST-405N | MASTER LT SW |
| S74 | 7 | MS24253-1 | SWITCH |
| S76 | 7 | MS24253-1 | SWITCH |
| S77 | 11 | S392-3 | PITOT HEAT SW |
| S78 | 12 | MS25253-1 | SW FLAP LDG GR |
| S80 | 19 | MS35059-21 | AIR COND SW |
| S81 | 19 | 9910093-1 | HI PRESS SW |
| S82 | 19 | HE81290 | TEMP CONTROL S |
| S83 | 19 | HE81214 | LOW PRESS SW |
| S84 | 19 | HE81400 | HI PRESS SW |
| S85 | 19 | MS35059-23 | BLOWER SW |
| S87 | 19 | S-1696-1 | SWITCH DALB |
| S88 | 20 | S-1696-1 | SWITCH STEREO |
| S91 | 15 | 8406K1 | SW NOSE BAG |
| S92 | 15 | 8406K1 | SW NOSE BAG |
| SCB1 | 10 | 112-235-101 | SCB AVIONICS |
| SCB2 | 15 | 112-507-101 | SCB TAXI LT |
| SCB3S27 | 15 | MS24524-21 | LDG GR LT SW |
| SCB4 | 15 | 112-205-101 | SCB NAV LTS |
| SCB5 | 15 | 112-205-101 | SCB BCN LTS |
| SCB6 | 15 | 112-507-101 | SCB STROBE LTS |
| SCB7S47 | 5 | S-382-2 | COURTESY LT SW |
| SCB8 | 15 | | SPARE |
| SCB9 | 15 | | SPARE |
| SCB10 | 15 | 112-205-101 | SCB DE-ICE LT |
| SCB11 | 11 | 112-205-101 | SCB STL-VNT HT |
| SCB12 | 17 | 112-215-101 | SCB PRP ANTICE |
| SCB13 | 18 | 112-210-101 | SCB W/S ANTICE |
| SCB14S77 | 11 | S392-3 | PITOT HEAT SW |
| SCB15 | 17 | 3D1748-2 | SURFACE DE-ICE |
| SCB16 | 10 | 7270-5-35 | SCB ALT AVN |
| SP1 | GEN | 320559 | SPLICE |
| SP2 | GEN | 320562 | SPLICE |
| SP3 | GEN | 320570 | SPLICE |
| SR1 | 8 | 1N2482 | DIODE |
| SR2 | 8 | 1N2482 | DIODE |
| SR3 | 8 | 1N2482 | DIODE |
| SR4 | 8 | 1N2482 | DIODE |
| SR6 | 16 | 1N2482 | DIODE |
| SR7 | 6 | 1N1201 | DIODE |
| SR8 | 16 | 1N2462 | DIODE |
| SR10 | 9 | 1N2482 | DIODE |
| SR11 | 9 | 1N2482 | DIODE |
| SR12 | 10 | 1N2482 | DIODE |
| SR13 | 9 | 1N2482 | DIODE |
| SR14 | 10 | 1N1201 | DIODE |
| SR15 | 10 | 1N1201 | DIODE |
| SR19 | 10 | 5118335-10 | DIODE A |
| SR20 | 10 | 5118335-10 | DIODE A |
| SR21 | 10 | 1N1201 | DIODE |
| SR22 | 10 | 1N1201 | DIODE |
| SR23 | 14 | 1N1201 | DIODE |
| SR24 | 14 | 1N1201 | DIODE |
| SR25 | 14 | 1N1201 | DIODE |
| SR26 | 14 | 1N1201 | DIODE |
| SR29 | 12 | 1N2482 | DIODE |
| SR36 | 9 | 1N2482 | DIODE |
| SR80 | 19 | 1N2482 | DIODE |
| SR81 | 19 | 1N2482 | DIODE |
| SR82 | 19 | 1N2482 | DIODE |
| ST3 | 10 | 9910094-1 | ALT FAIL SW |
| ST4 | 10 | 9910094-1 | ALT FAIL SW |
| TB1 | 10 | 8-140 | TERM BLK |
| TB2 | 14 | MS27212-6-10 | TERM BLK |
| TB5 | 8 | 10-140 | TERM BLK |
| TB6 | 8 | 10-140 | TERM BLK |
| TB8 | 10 | MS27212-4-2 | TERM BLK |
| TB9 | 10 | MS27212-4-3 | TERM BLK |
| TB10 | 17 | MS27212-6-4 | TERM BLK |
| TB11 | 4 | MS27212-6-2 | TERM BLK |
| TB13 | 4 | 5-140 | TERM BLK |
| TR1 | 19 | CIR-10-4 | EMER LOCATOR |
| VR1 | 10 | 639808 | VOLTAGE REG |
| VR2 | 10 | 639808 | VOLTAGE REG |
| VR3 | 20 | 5118473-1 | REGULATOR ASSY |
| VR4 | 10.01 | 8-00296-1 | VOLTAGE REG |
| VR5 | 10.01 | 8-00296-1 | VOLTAGE REG |
| WC1 | 8 | 877 | WIRE COIL CORD |
| WC2 | 8 | 877 | WIRE COIL CORD |
| WC3 | 13 | 877 | WIRE COIL CORD |
| WC4 | 13 | 891 | WIRE COIL CORD |
| WC5 | 13 | 891 | WIRE COIL CORD |
| WC6 | 14 | 4-78987 | WIRE COIL CORD |
| WC7 | 14 | 4-78987 | WIRE COIL CORD |

Cessna® AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: REFERENCE DESIGNATORS

SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000

SCALE: NONE | REF D | SHEET 2 OF 20

340-0001 AND ON

REFERENCE DESIGNATOR CODE:

Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out on the following page identifies by part number, the description and diagram sheet location.

EXAMPLE -

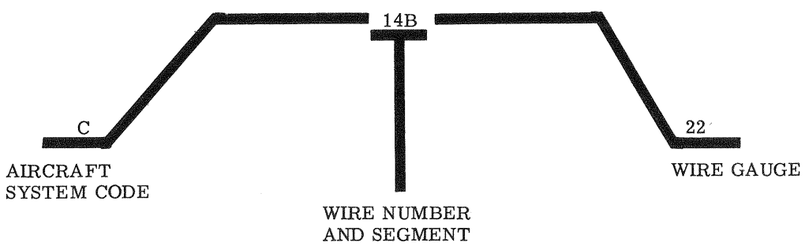
| REF. DESIGNATOR | DIA. SHT. NO. | PART NO. | DESCRIPTION |
|---|---|---|---|
| BB20 | 6 | 0820001-1 | Battery Bus |

NOTE

Part numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in the Wiring Diagram Index. The first portion of wire number indicates the Aircraft System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

EXAMPLE : C14B22




Three types of wire numbers are shown for optional equipment. An example of the various wire numbers is as follows:

E27B18 E327B18 E527B18

The only difference in the wire is in the installation schedule. The E27B wire numbering system was used on aircraft 340-0001 thru 340-0500. At 340-0501 and On, the same wire would be indicated as E327B18 or E527B18.

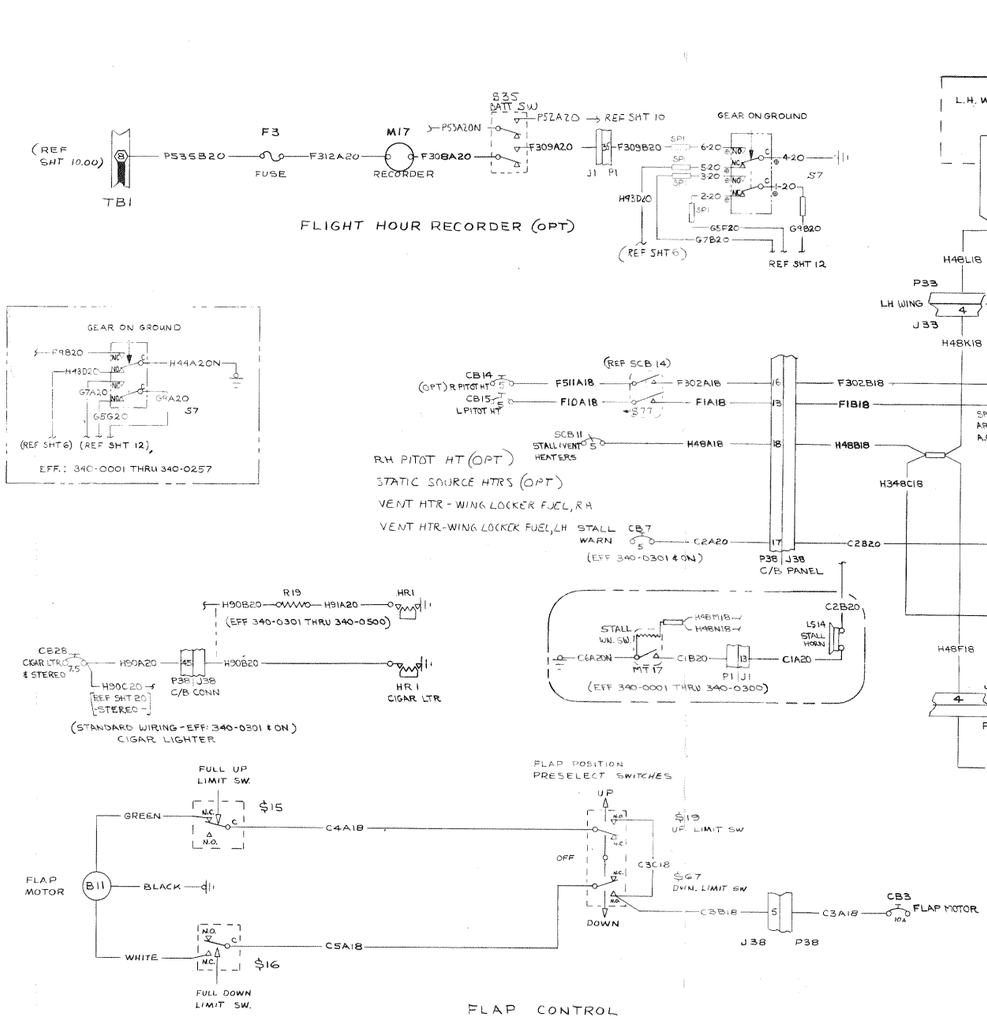
(REF SHT 10.00)
TBI
P535B20
F3
FUSE
F312A20
M17
RECORDER
F308A20
P53A20N
S35
BATT SW
P52A20
REF SHT 10
F309A20
J1 P1
F309B20
H93D20
GEAR ON GROUND
6-20
5-20
3-20
2-20
4-20
S7
65F20
G7B20
G9B20
(REF SHT 6)
REF SHT 12
FLIGHT HOUR RECORDER (OPT)

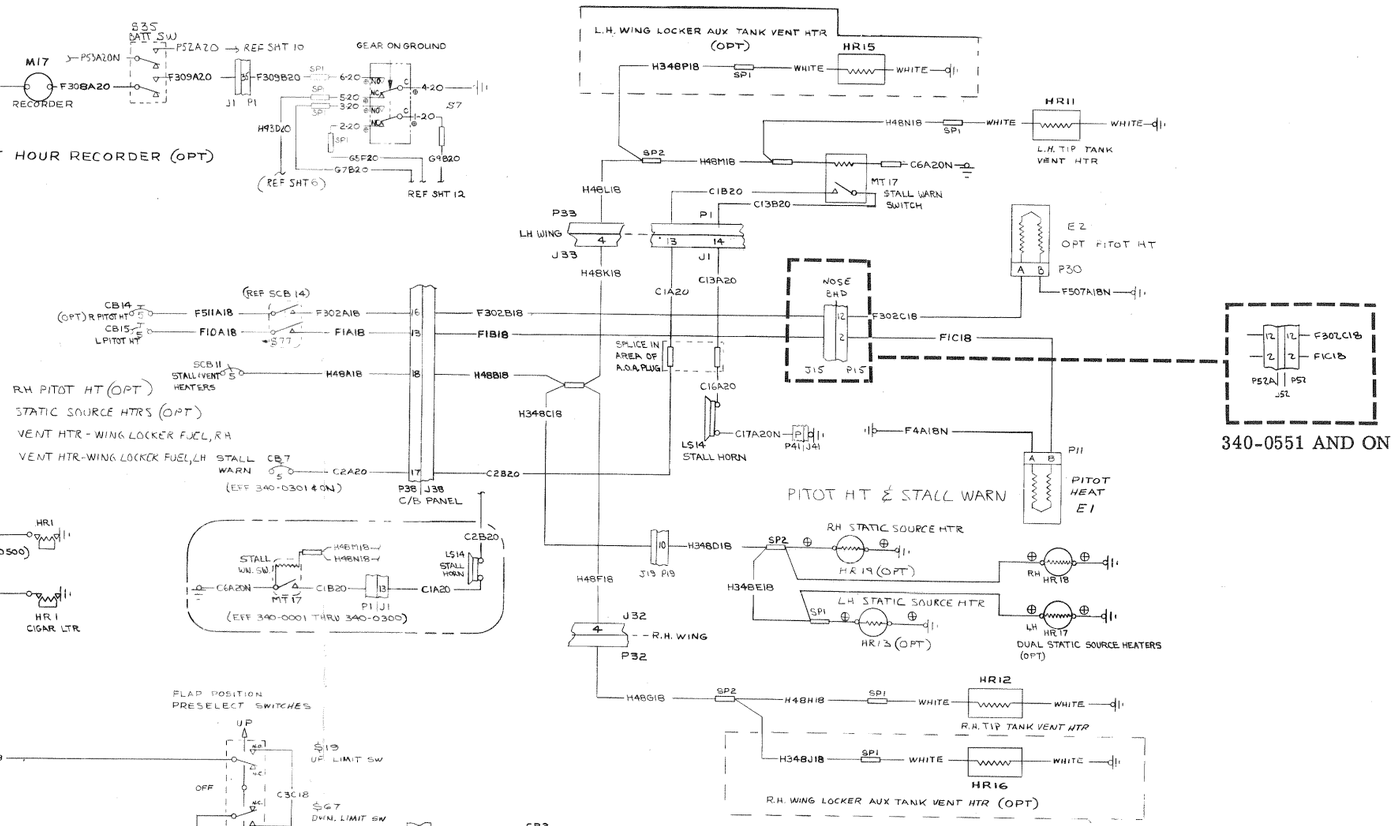

GEAR ON GROUND
P9B20
H44A20N
H43D20
G7A20
G9A20
S7
65G20
(REF SHT 6) (REF SHT 12)
EFF.: 340-0001 THRU 340-0257


R19
H90B20
H91A20
HR1
(EFF 340-0301 THRU 340-0500)
CB28
CIGAR LTR & STEREO
7.5
H90A20
45
H90B20
H90C20
(REF SHT 20 STEREO)
P38 J38
C/B CONN
HR1
CIGAR LTR
(STANDARD WIRING - EFF: 340-0301 & ON)
CIGAR LIGHTER

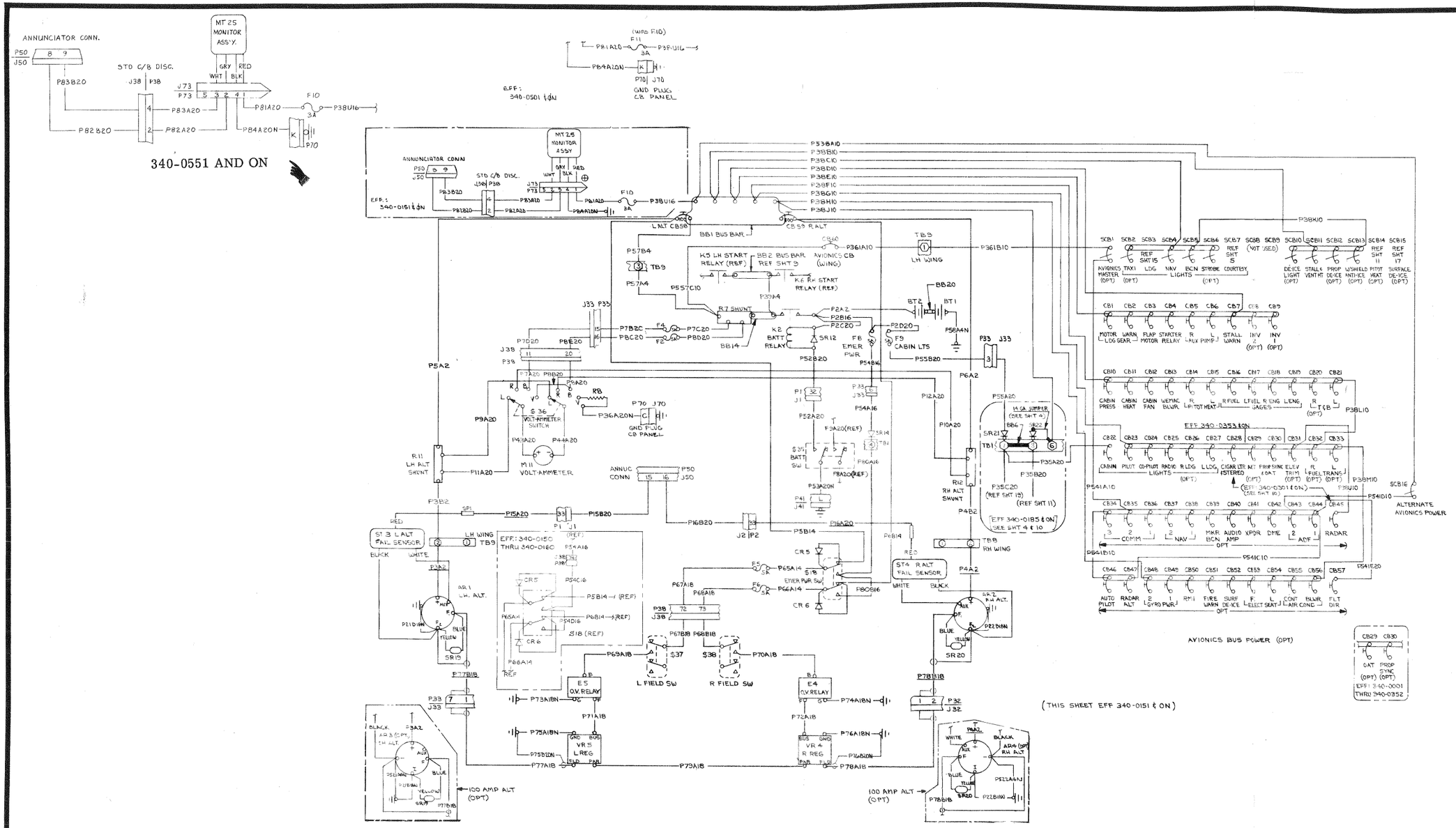

C2B20
STALL WN. SW
H48M1B
H48N1B
C6A20N
MT 17
C1B20
13
C1A20
P1 J1
LS14
STALL HORN
(EFF 340-0001 THRU 340-0300)


FULL UP LIMIT SW.
GREEN
N.C.
C
N.O.
C4A18
$15
FLAP MOTOR
B11
BLACK
WHITE
$16
C5A18
FULL DOWN LIMIT SW.
340-0501 AND ON


FULL UP LIMIT SW.
GREEN
$15
C4A18
FLAP MOTOR
B11
BLACK
WHITE
$16
C5A18
FULL DOWN LIMIT SW.
FLAP POSITION PRESELECT SWITCHES
UP
$19
UP LIMIT SW
OFF
C3C18
$G7
DWN. LIMIT SW
DOWN
C3B18
5
C3A18
CB3
10A
FLAP MOTOR
J38 P38
FLAP CONTROL


L.H. WING LOCKER AUX TANK VENT HTR (OPT)
H348P1B
SP1
WHITE
HR15
H48N1B
HR11
L.H. TIP TANK VENT HTR
MT 17 STALL WARN SWITCH
SP2
H48M1B
C6A20N
C1B20
C13B20
P38
LH WING
J33
H48L1B
P1
J1
H48K1B
C1A20
C13A20
NOSE END
J15 P15
E2
OPT PITOT HT
P30
F507A1BN
F302C1B
F1C1B
P52A
P57
J52
340-0551 AND ON
SPLICE IN AREA OF A.D.A. PLUG
C16A20
LS14
STALL HORN
C17A20N
P41 J41
F4A1BN
P11
PITOT HEAT E1
PITOT HT & STALL WARN
H348C1B
H348D1B
J19 P19
H48F1B
J32
R.H. WING
P32
RH STATIC SOURCE HTR
HR19 (OPT)
H348E1B
RH HR18
LH STATIC SOURCE HTR
HR13 (OPT)
LH HR17
DUAL STATIC SOURCE HEATERS (OPT)
H48G1B
HR12
R.H. TIP TANK VENT HTR
H348J1B
HR16
R.H. WING LOCKER AUX TANK VENT HTR (OPT)


CB14
(OPT) R PITOT HT
CB15
L PITOT HT
F511A1B
F1D A1B
(REF SCB 14)
S77
F302A1B
F1A1B
SCB 11
STALL VENT HEATERS
H49A1B
H48B1B
R.H PITOT HT (OPT)
STATIC SOURCE HTRS (OPT)
VENT HTR - WING LOCKER FUEL, R.H.
VENT HTR - WING LOCKER FUEL, L.H.
STALL WARN
CB7
C2A20
(EFF 340-0301 & ON)
F302B1B
F1B1B
H48B1B
C2B20
P38 J38
C/B PANEL

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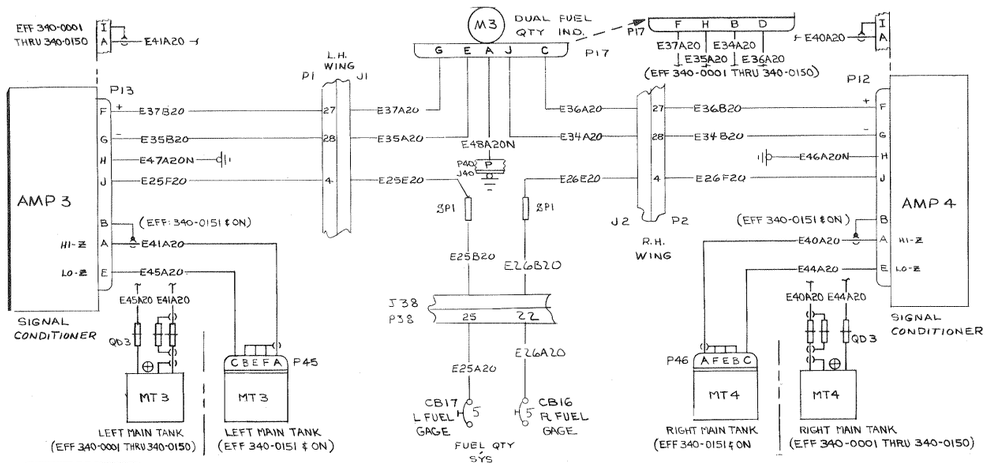
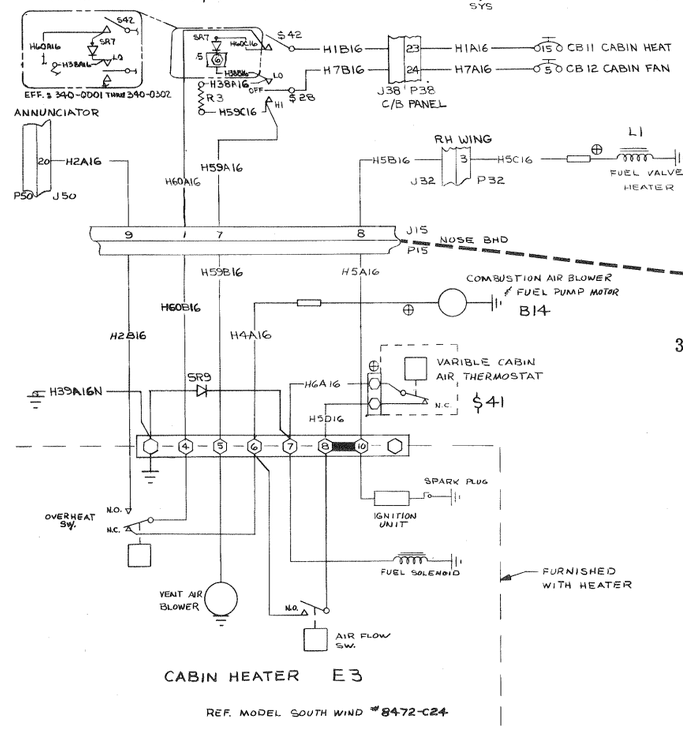
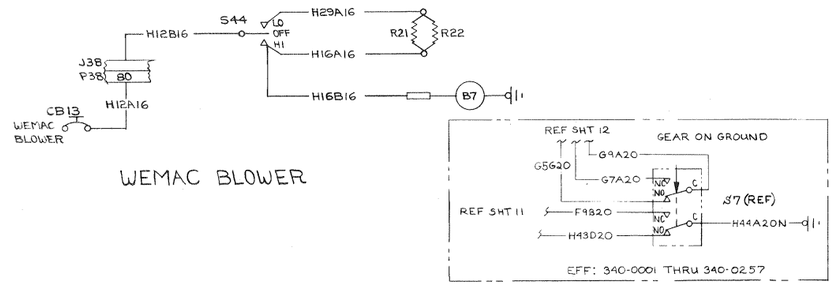
TITLE: POWER DISTRIBUTION

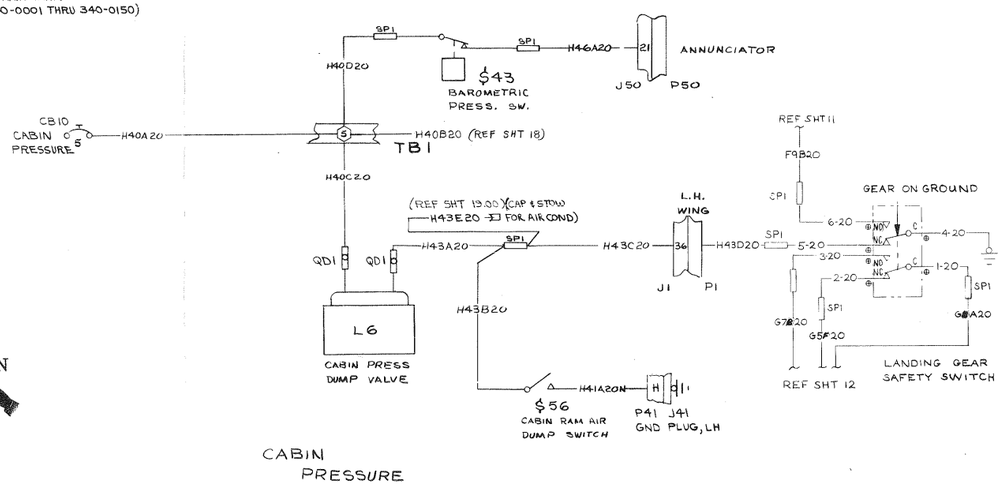
| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5308000 K |

SCALE: NONE REF 7320-7017 SHEET 10.01 OF 20




Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: CABIN HEAT, CABIN PRESSURE, FUEL QUANTITY SYSTEM (STD) & WEMAC BLOWER

SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000

SCALE: NONE | REF | SHEET 6 OF 20

340-0001 TO 340-0551

A

P50 J50 ANNUN CONN 3 6

P91 J91 C

L10E20 L21A20N

J38 P38 64

J48 P48 J49 P49

LD1 LIGHT DIMMER

A L2A20N 1
B L2B20N 2

J70 P70

L10C20

HS1 HEAT SINK

1 BROWN
2 ORANGE
3 RED
4 YELLOW
5 LT BLUE
6 GREEN
7 VIOLET
8 WHITE
9 GREY
10 BLACK
11 PINK
12 TAN
13 DK BLUE
14 WHITE/RED
15 WHITE/BLK
16 WHITE/GRN
17 WHITE/BLUE
18 WHITE/YELLOW

L10B20

PILOT INSTR & STA PNL LIGHTS CB23 5 L10A20

CO-PILOT & ENG INSTR LIGHTS CB24 5 L36A20 L36B20

RADIO PNL, C/B PNL & FUEL SELECT LIGHTS CB25 7.5 L54A20 W1A20 L50B20 (REF SHT 8)

$73 MASTER LT. SW. (REF SHT 3) RP21A20 L11A20 L11B20 L11C20 L53B20 L53C20 L53D20 L56A20 L45A20 L23A20 L10D20 L55A20

3 COMPASS LT
4 C/B PANEL
5 RADIO PNL
6 PILOT INSTR
7 FUEL SELECT
8 ENG INSTR
9 STA PNL

P38 J38

L69A20 55 L69B20
L71A20 62 L71B20
L70A20 58 L70B20
L68A20 47 L68B20
L57A20 52 L57B20
L48A20 41 L48B20
L36C20 46 L36D20

TO ANNUN. REF. SHT. 19.81

L48F20

TB6 1

L48D20 L48E20

E54A20

TO AUX FUEL DIMMER (OPT) (REF SHT 7)

TO PROP. SYNC. LT. (OPT) (REF SHT 17)

TO LDG GR. IND. (REF SHT 12)

R15 L42A20 L58A20N

OVERHEAD PANEL

L47A20 R13 L49A20 L36E20 Q3 TRANSISTOR

DS 84 OVERHEAD FLOOD LTS L49B20 DS 85

DS 83 COURTESY LIGHT L32C20

AMMETER LTS DS 61 DS 62 L23D20 L23E20 DS 63 DS 64 L23B20 DS 81 DS 82 L72E20N

L72C20N L72B20N C/B PANEL LIGHTS

L72A20N P70 F J70 CABIN LTS

(REF SCB7) (C/B PANEL) COURTESY LT. SW. S47 CB22 5 L28L20 L43A20 L44A20 L28A20

P38 J38 48 51 63

(DOOR) COURTESY LT. SW. S48 L43B20 L44B20 L32B20 SPL L32D20 18 ANNUNCIATOR CONN. J50 P50

L32A20 SPL WHITE DS 24 BLACK DOOR COURTESY LT.

L28B20 SPL L28C20 L28D20

READING LT S23 L30A20 DS 13 L31A20N L.H. FWD LT

READING LT S25 L30A20 DS 14 L31A20N L.H. AFT LT

L28F20 L28H20

READING LT S24 L30A20 DS 15 L31A20N R.H. FWD LT

READING LT S26 L30A20 DS 16 L31A20N R.H. AFT LT.

P50 J50 L68C20 SPI L68D20

COMPASS LT DS 36 L48C20 L68M20

PILOTS INST LTS STD

DS 27 A.S IND DS 28 L68E20 DS 31 HOR GYRO DS 32 L68F20 DS 35 ALT IND DS 36 L68G20 DS 37 CLOCK L68H20 (OPT) TO NAV IND L68K20 DS 42 SLAVE MTR L68J20 (OPT) TO NAV IND L68L20 TO ADF IND

DS 25 T&B DS 26 DS 29 D.G. DS 30 DS 33 VSI DS 39 DS 47 CALL LT

DS 38 EGT IND (OPT) DS 40 DS 41 OAT IND (OPT) E DME CONN (REF) L68N20

PILOTS INST LTS (OPT)

D (EFF 340-0001 THRU 340-0039 ONLY)

MASTER SW'S DS 44 DS 45 L69C20 DS 98 MAG SW'S DS 99

AUX PUMPS DS 96 L69D20 DS 51 CABIN DIFF PRESS DS 50

CABIN RATE OF CHANGE DS 58 DS 59 L69E20 DS 55 PRESS SW DS 56 ALT CONTROL

CABIN HTR CONTROLS DS 53 DS 60 L69G20 L69F20 DS 57 DS 58 FLAP IND BLOCKS SPI DS 22 PROP SYNC IND SILK-SCREEN (OPT)

STATIONARY PNL LTS

DS 65 LEFT FUEL SEL LT DS 66 RIGHT FUEL SEL LT L70C20 L70D20

MAN. PRESS IND DS 67 DS 68 L71C20 DS 69 DS 70 TACH

FUEL FLOW IND DS 71 DS 72 L71D20 DS 73 DS 74 L ENGINE GAGE

R ENGINE GAGE DS 75 DS 76 L71E20 DS 77 DS 78 FUEL QTY

SUCTION DS 79

DS 86 A.S IND DS 87 L71F20 DS 88 TCB DS 89 DS 80 HOR GYRO DS 91 L71G20 DS 92 D.G. DS 93 DS 94 ALT IND DS 95 DS 96 VSI DS 97

ENGINE INSTR LTS

CO-PILOT INST'S (OPT)

Detail A

CABIN FEED-THRU CONN. J52 P52Z P52A

HEAT SINK CONN. P51 J51

J49 P49 LD1 LIGHT DIMMER HS1 HEAT SINK

| | | | | | |
|---|---|---|---|---|---|
| 1 | L82A1D | 14 | L82B1D | 1 | BROWN |
| 2 | L83A1D | 15 | L83B1D | 2 | ORANGE |
| 3 | L84A1D | 16 | L84B1D | 3 | RED |
| 4 | L85A1D | 17 | L85B1D | 4 | YELLOW |
| 5 | L86A1D | 18 | L86B1D | 5 | LT BLUE |
| 6 | L87A1D | 19 | L87B1D | 6 | GREEN |
| 7 | L88A1D | 20 | L88B1D | 7 | VIOLET |
| 8 | L89A1D | 21 | L89B1D | 8 | WHITE |
| 9 | L90A1D | 22 | L90B1D | 9 | GREY |
| 10 | L91A1D | 23 | L91B1D | 10 | BLACK |
| 11 | L92A1D | 24 | L92B1D | 11 | PINK |
| 12 | L93A1D | 25 | L93B1D | 12 | TAN |
| 13 | L94A1D | 26 | L94B1D | 13 | DK BLUE |
| 14 | L95A1D | 27 | L95B1D | 14 | WHT/RED |
| 15 | L96A1D | 28 | L96B1D | 15 | WHT/BLK |
| 16 | L97A1D | 29 | L97B1D | 16 | WHT/GRN |
| 17 | L98A1D | 30 | L98B1D | 17 | WHT/BLUE |
| 18 | L99A1D | 31 | L99B1D | 18 | WHT/YELLOW |

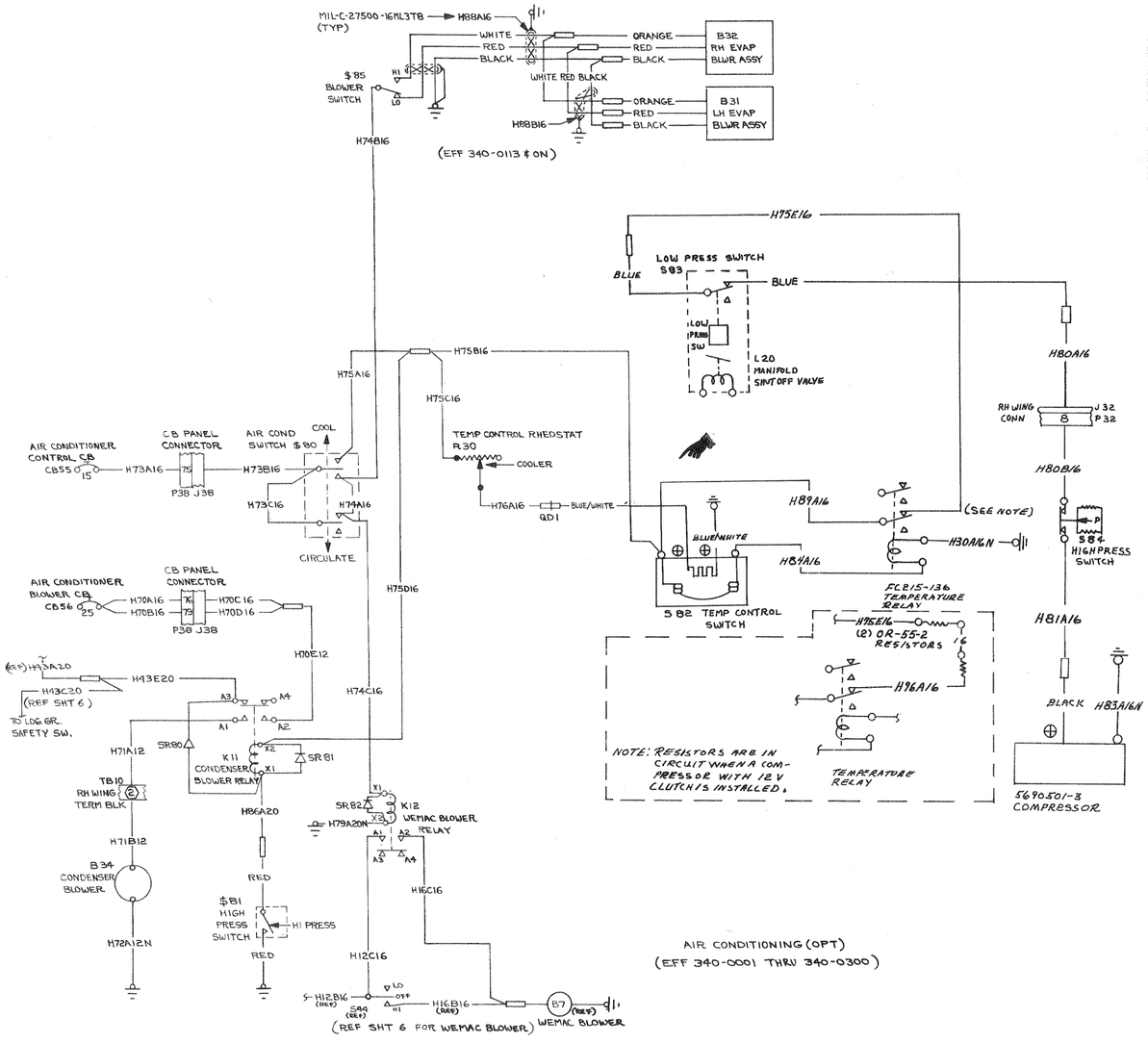
340-0551 AND ON

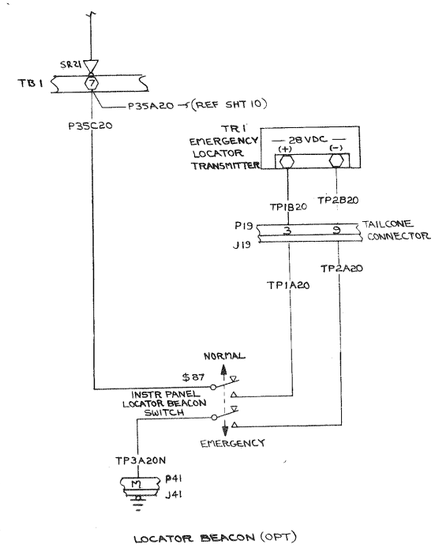
Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: DIMMABLE INTERIOR LIGHTING & DOOR COURTESY LT WIRING DIAGRAM

SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000

SCALE: NONE | SHEET 5 of 20



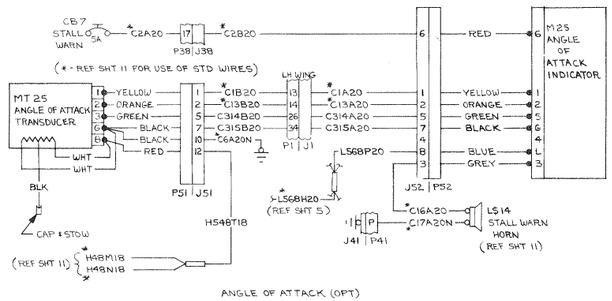




Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

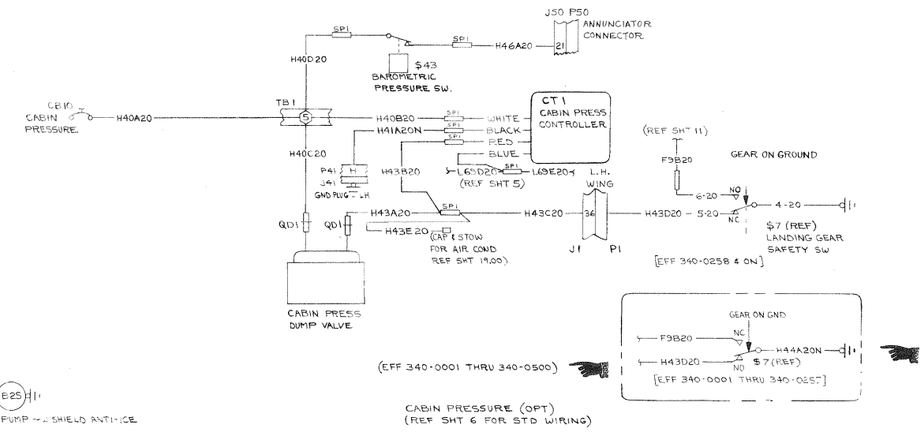
TITLE: AIR CONDITIONER & EMER. LOCATOR BEACON WIRING DIAGRAM

| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5309000 |

SCALE: NONE REF G SHEET 19 OF 20



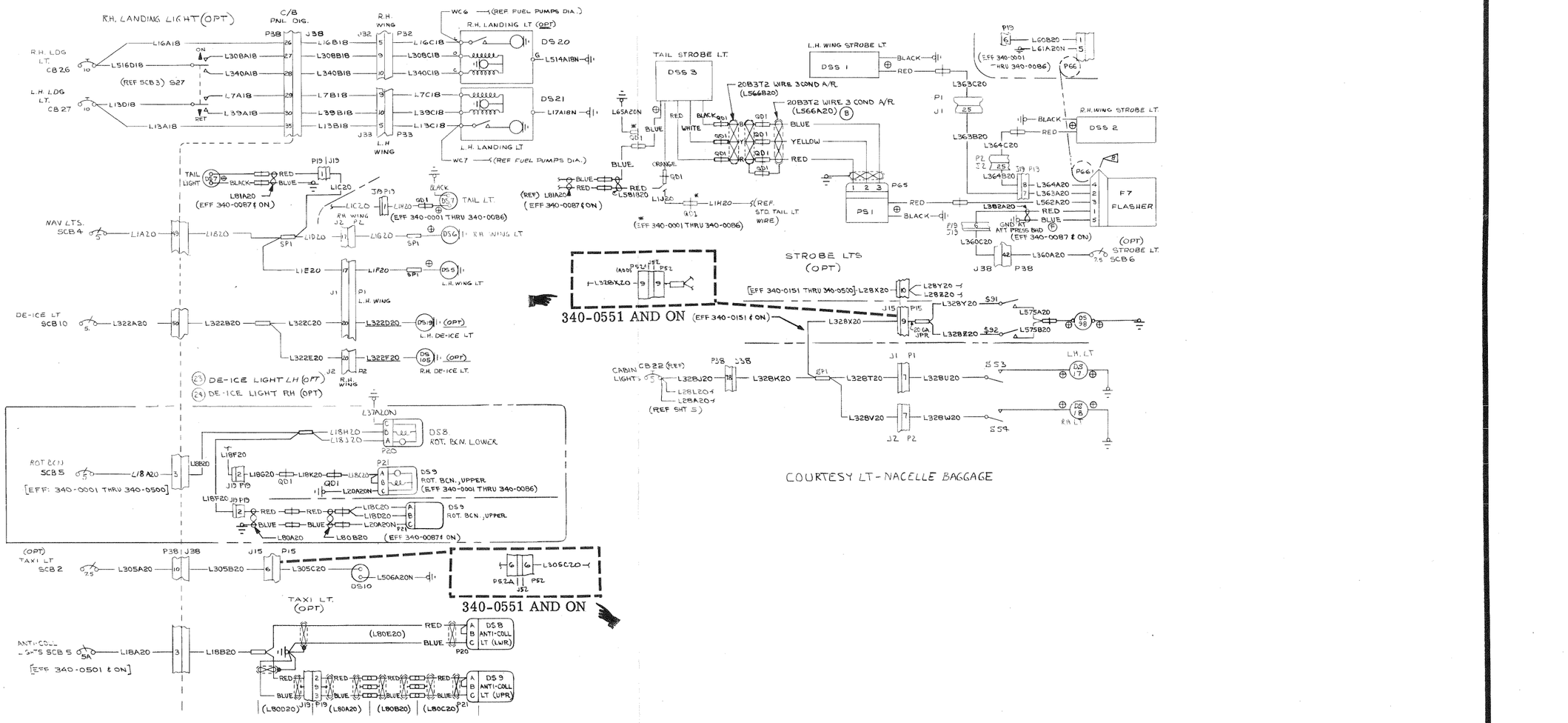

ANGLE OF ATTACK (OPT)




CABIN PRESSURE (OPT)
(REF SHT 6 FOR STD WIRING)

WINDSHIELD ANTI-ICE (OPT)

| | | | |
|---|---|---|---|
| Cessna® AIRCRAFT CO. | P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201 | | |
| TITLE: WINDSHIELD DE-ICE, CABIN PRESSURE & ANGLE OF ATTACK | | | |
| SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000 | K |
| SCALE: | | REF | SHEET 18 OF 20 |

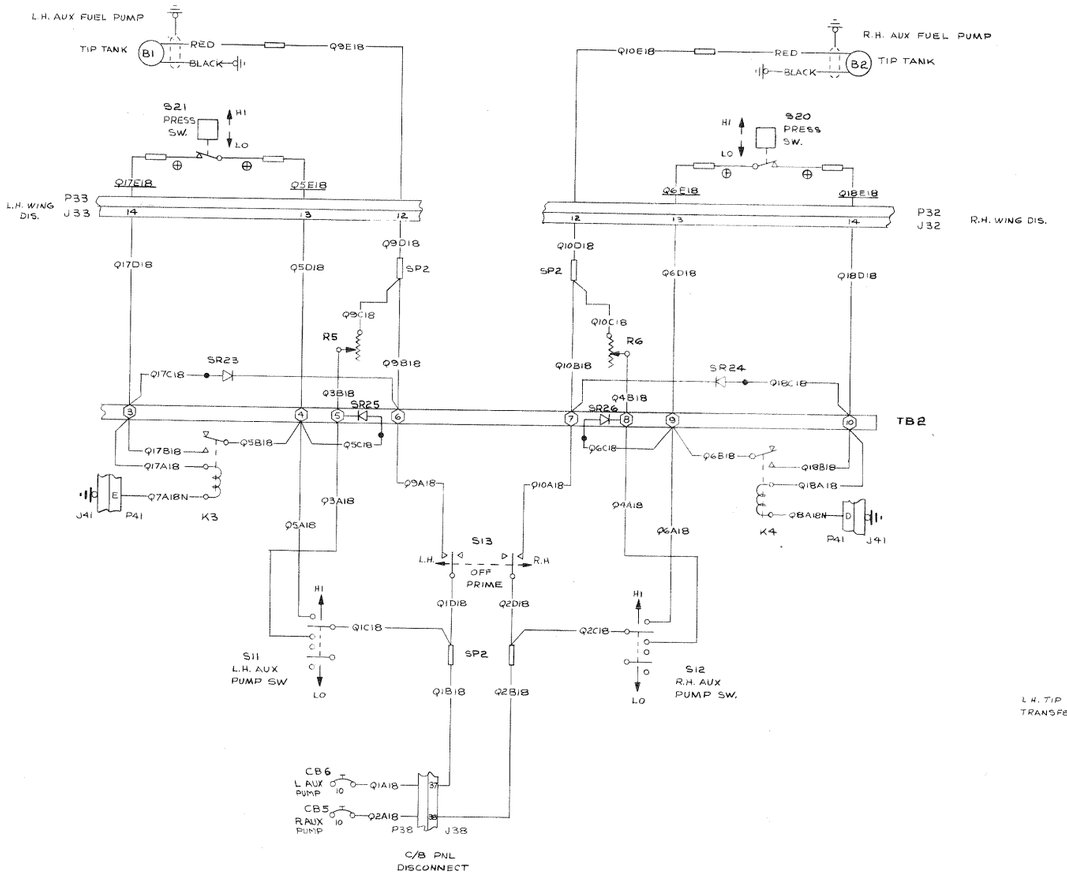


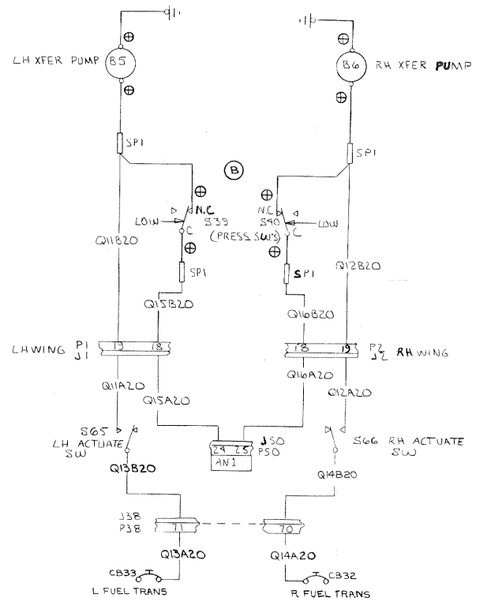

Cessna® AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: LIGHTING - EXTERIOR WIRING DIAGRAM

SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000 K

SCALE: NONE | REF | SHEET 15 OF 20




LH WING LOCKER FUEL XFER PUMPS (OPT)
RH WING LOCKER FUEL XFER PUMPS (OPT)

Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: FUEL PUMPS WIRING DIAGRAM

| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5308000 |

SCALE: NONE REF SHEET 9 OF 20

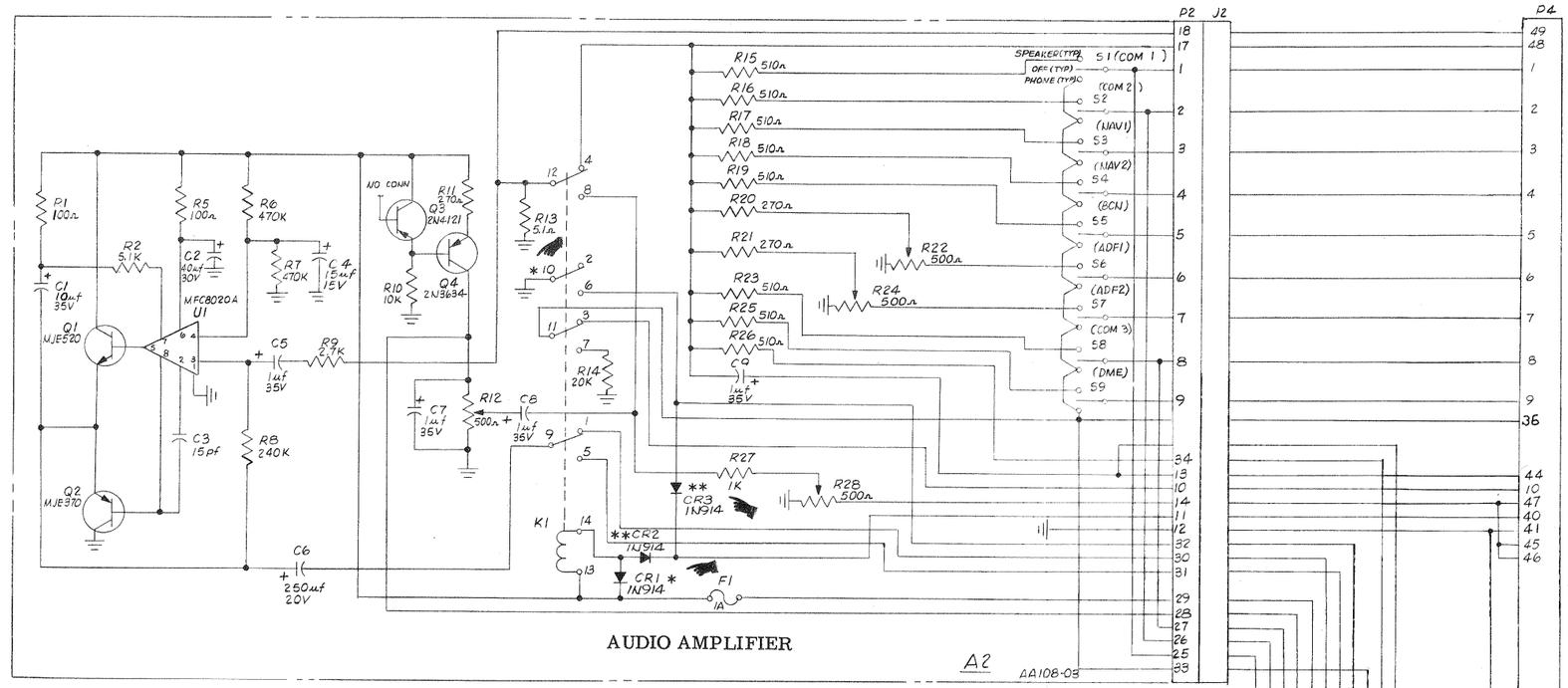
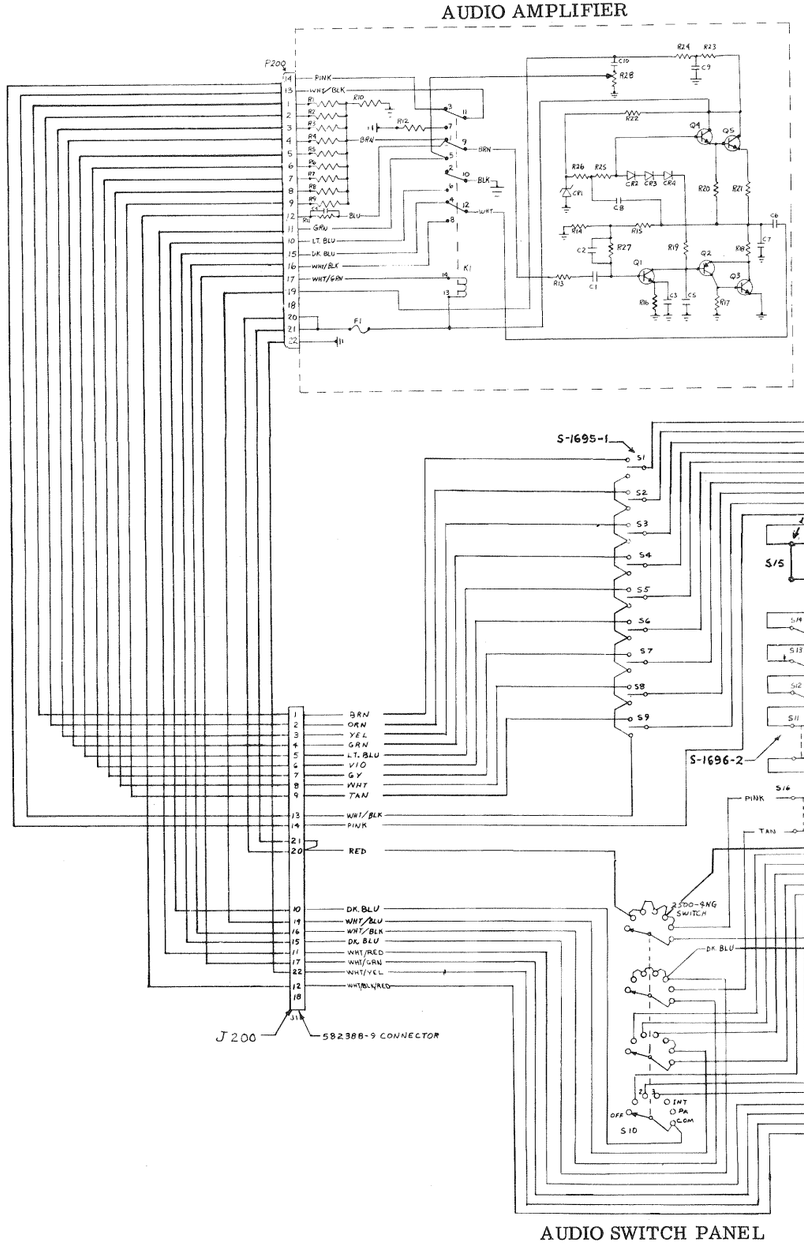



Figure 15-2. Audio Amplifier (Sheet 2)

AUDIO AMPLIFIER



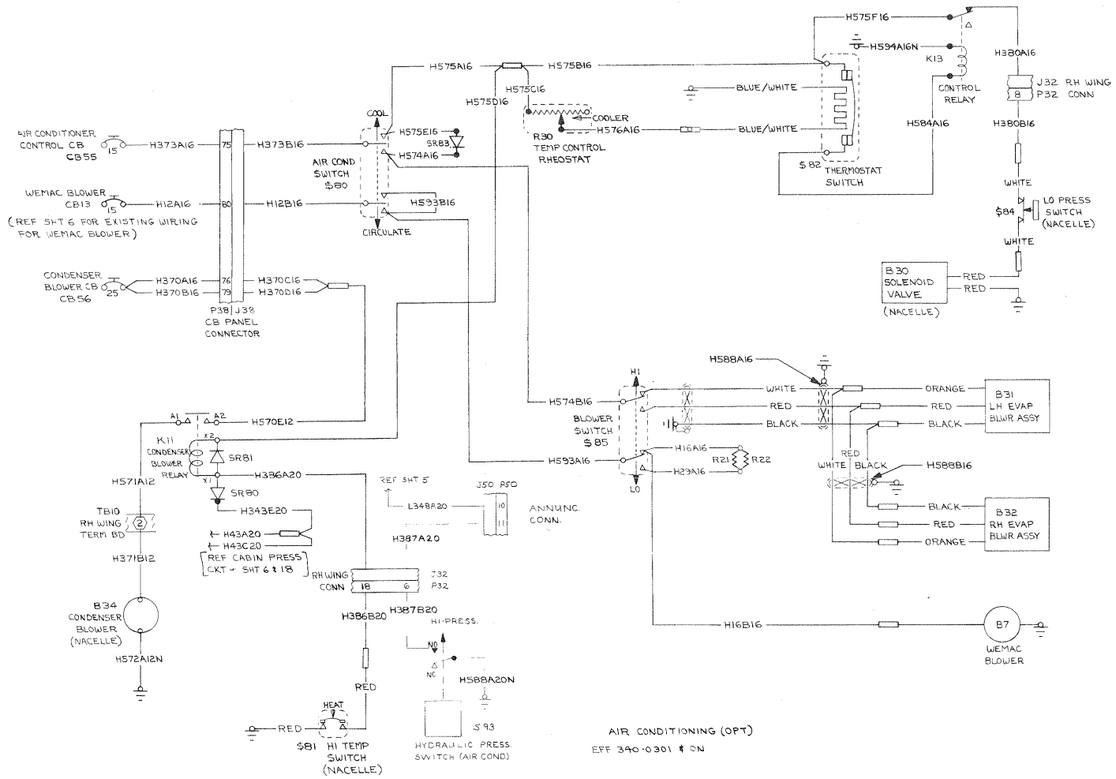

F1 - 315001 FUSE (LITTLE FUSE)
K1 - KHS17D11 RELAY
Q1 - 2N3565 TRANSISTOR
Q2 - 40319 TRANSISTOR
Q3 - 2N5293 TRANSISTOR
Q4 - 40408 TRANSISTOR
Q5 - 2N5293 TRANSISTOR
CR1 - VR18 ZENER DIODE
CR2 - IN3754 DIODE
CR3 - IN3754 DIODE
CR4 - IN3754 DIODE
C1 - NLW5-50 CAPACITOR
C2 - DPMS4S15 CAPACITOR
C3 - NLW50-6 CAPACITOR
C4 - NLW3-35 CAPACITOR
C5 - DPMS6D1 CAPACITOR
C6 - NLW250-6 CAPACITOR
C7 - DPMS4S1 CAPACITOR
C8 - NLW10-50 CAPACITOR
C9 - NLW50-50 CAPACITOR
C10 - NLW5-50 CAPACITOR
R1 - 470Ω 1/2 W RESISTOR
R2 - 470Ω 1/2 W RESISTOR
R3 - 470Ω 1/2 W RESISTOR
R4 - 470Ω 1/2 W RESISTOR
R5 - 470Ω 1/2 W RESISTOR
R6 - 470Ω 1/2 W RESISTOR
R7 - 470Ω 1/2 W RESISTOR
R8 - 470Ω 1/2 W RESISTOR
R9 - 470Ω 1/2 W RESISTOR
R10 - 47Ω 1/2 W RESISTOR
R11 - 220kΩ 1/2 W RESISTOR
R12 - 20 kΩ 1/4 W RESISTOR
*R13 - 1. 2kΩ 1/2 W RESISTOR
R14 - 6. 2kΩ 1/2 W RESISTOR
R15 - 43kΩ 1/2 W RESISTOR
R16 - 220Ω 1/2 W RESISTOR
R17 - 100Ω 1/2 W RESISTOR
R18 - 1Ω 1/2 W RESISTOR
R19 - 75Ω 1/2 W RESISTOR
R20 - 100Ω 1/2 W RESISTOR
R21 - 1Ω 1/2 W RESISTOR
R22 - 680Ω 1/2 W RESISTOR
R23 - 100Ω 1/2 W RESISTOR
R24 - 390Ω 2 W RESISTOR
R25 - 1. 8kΩ 1/2 W RESISTOR
R26 - 1. 5kΩ 1/2 W RESISTOR
R27 - 12kΩ 1/2 W RESISTOR
R28 - 271-1-502 5k TRIM POT

*R13-8. 2 K Ω 1/2 W Resistor
340-0177 TO 340-0301

TO J4 AUDIO MATING CONNECTOR
AIRCRAFT WIRING

340-0001 TO 340-0301

Figure 15-2. Audio Amplifier (Sheet 1 of 3)

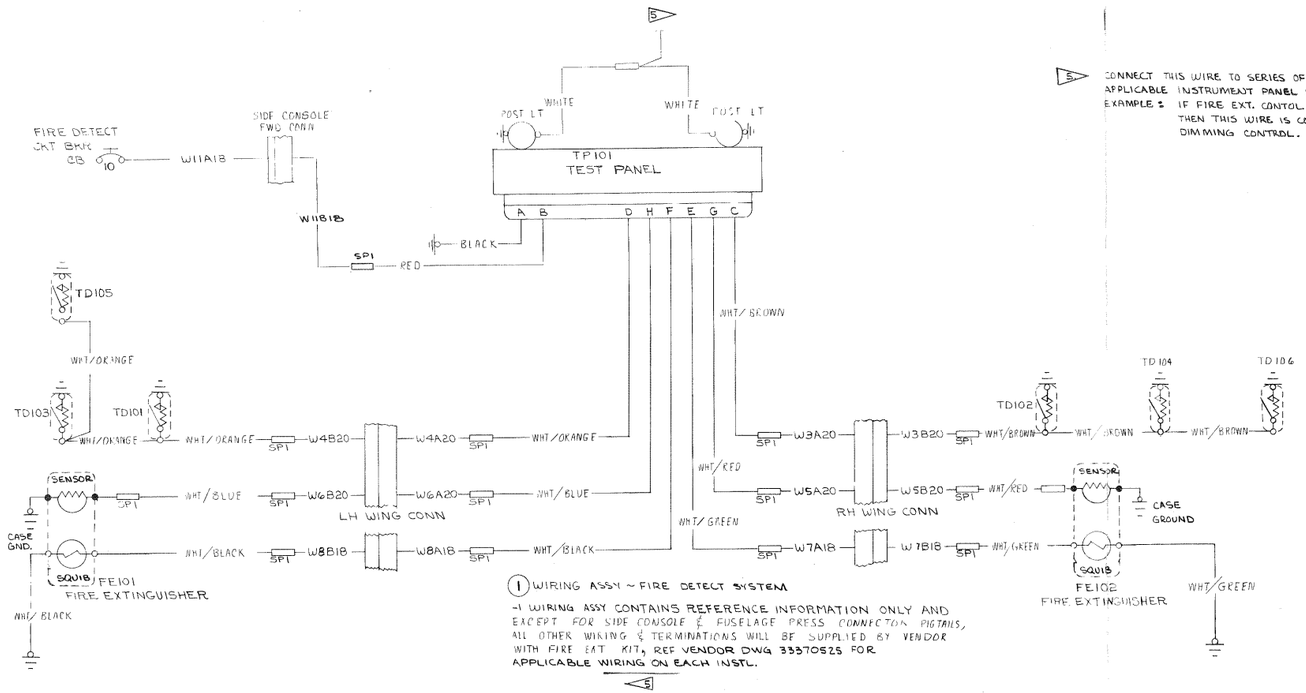



AIR CONDITIONING (OPT)
EFF 340-0301 & ON

Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: AIR CONDITIONER

| SIZE | CODE IDENT. NO. | DRAWING NO. | |
|---|---|---|---|
| D | 71379 | 5308000 | K |
| | | REV | SHT 19.01 of 20 |

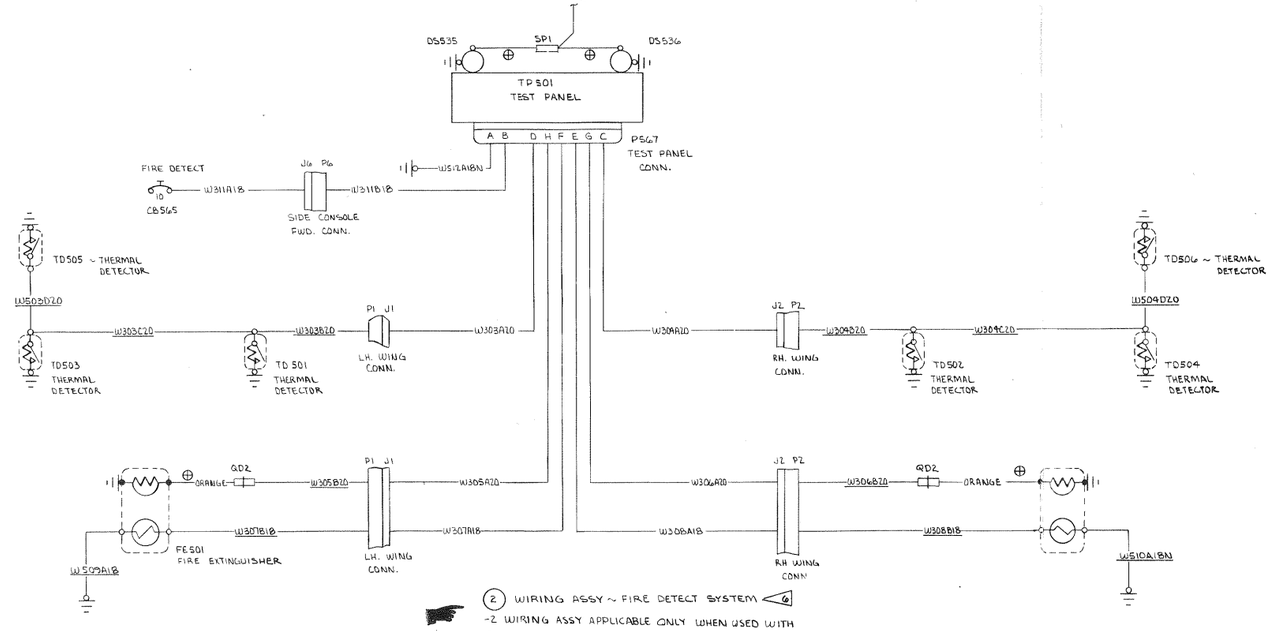



5 CONNECT THIS WIRE TO SERIES OF LIGHTS BEING CONTROLLED BY THE APPLICABLE INSTRUMENT PANEL SECTION DIMMING CONTROL.
EXAMPLE: IF FIRE EXT. CONTOL IS LOCATED ON RADIO PNL. THEN THIS WIRE IS CONNECTED TO RADIO PNL. DIMMING CONTROL.

| PARTS LIST (REFERENCE ONLY) | | |
|---|---|---|
| SYMBOL | PART NO. | PART NAME |
| CB | 7277-2-10 | CIRCUIT BREAKER |
| FE101 | 30101101 | FIRE EXTINGUISHER |
| FE102 | 30101101 | FIRE EXTINGUISHER |
| SP1 | S-1370-1 | SPLICE |
| TD101 | 107-700 | THERMAL DETECTOR |
| TD102 | 107-700 | THERMAL DETECTOR |
| TD103 | 107-700 | THERMAL DETECTOR |
| TD104 | 107-700 | THERMAL DETECTOR |
| TD105 | 107-700 | THERMAL DETECTOR |
| TD106 | 107-700 | THERMAL DETECTOR |
| TP101 | 33370500 | TEST PANEL |

FOR CONTAINERS WITH TWO WIRE CONFIGURATION ON MAIN DISCHARGE SENSOR

(1) WIRING ASSY ~ FIRE DETECT SYSTEM
-1 WIRING ASSY CONTAINS REFERENCE INFORMATION ONLY AND EXCEPT FOR SIDE CONSOLE & FUSELAGE PRESS CONNECTOR PIGTAILS, ALL OTHER WIRING & TERMINATIONS WILL BE SUPPLIED BY VENDOR WITH FIRE EXT KIT, REF VENDOR DWG 33370525 FOR APPLICABLE WIRING ON EACH INSTL.

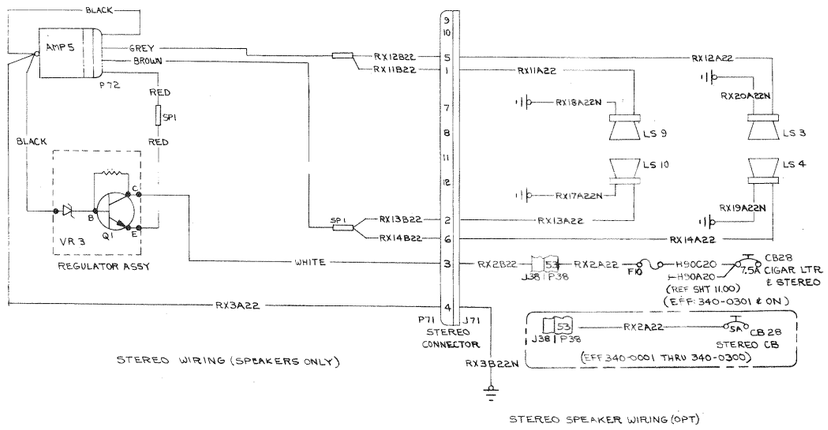



(2) WIRING ASSY ~ FIRE DETECT SYSTEM 6
-2 WIRING ASSY APPLICABLE ONLY WHEN USED WITH S130093 STRIPPED KIT.

Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

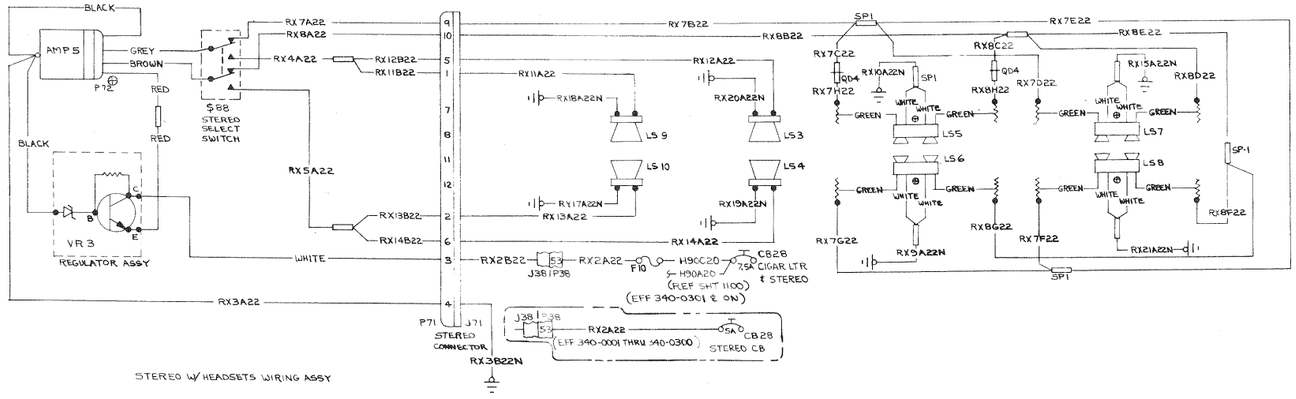
TITLE: FIRE DETECT SYSTEM WIRING ASSY

| SIZE | CODE IDENT. NO. | DRAWING NO. | |
|---|---|---|---|
| D | 71379 | 5118461 | C |
| SCALE: NONE | | REF | SHEET |




STEREO WIRING (SPEAKERS ONLY)

STEREO SPEAKER WIRING (OPT)




STEREO W/ HEADSETS WIRING ASSY

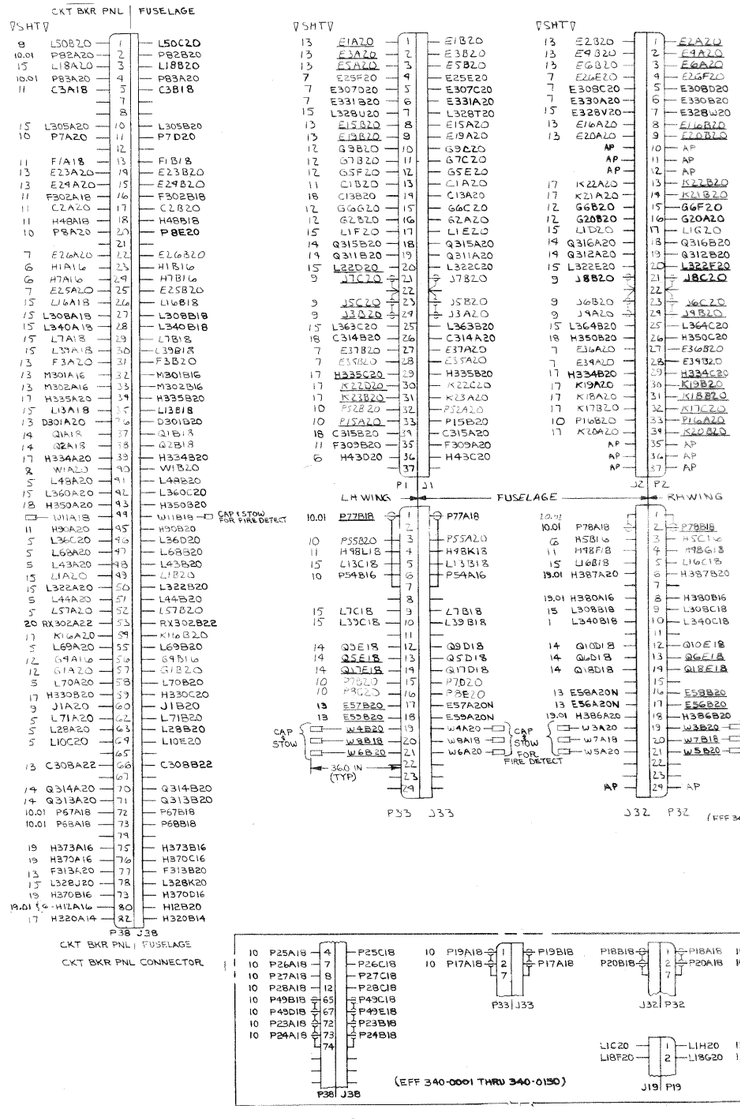
STEREO SPEAKER & HEADSET WIRING (OPT)

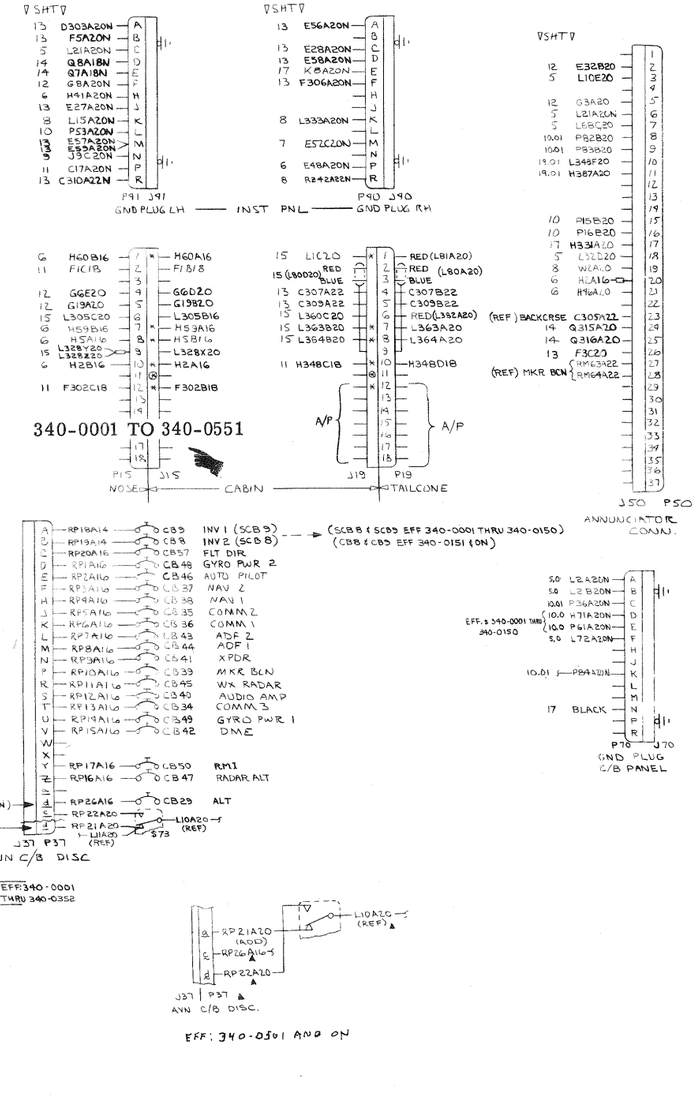
Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

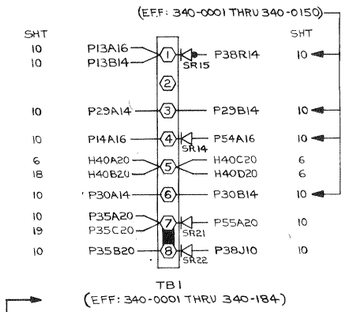
TITLE: STEREO - SPEAKERS & HEADSETS WIRING DIAGRAM

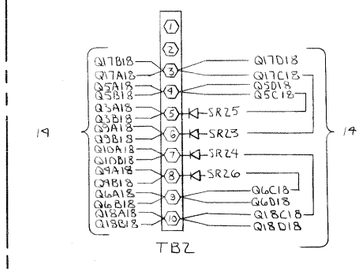
| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5308000 |

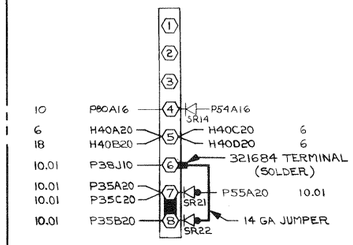
SCALE | REF | SHEET 20 of 20

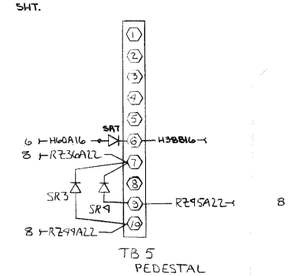

CKT BKR PNL | FUSELAGE
CAP & STOW FOR FIRE DETECT
P38 J38
CKT BKR PNL | FUSELAGE
CKT BKR PNL CONNECTOR
LH WING — FUSELAGE — RH WING
P1 J1
J2 P2
P33 J33
J32 P32
CAP STOW
CAP STOW FOR FIRE DETECT
360 IN (TYP)
(EFF 340-0001 THRU 340-0150)
P38 J38
P33 J33
J32 P32
J19 P19
(EFF 340-0001 THRU 340-0150)

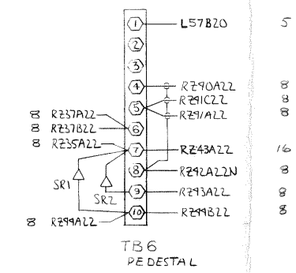

GND PLUG LH — INST PNL — GND PLUG RH
P91 J91
P90 J90
340-0001 TO 340-0551
NOSE — CABIN — TAILCONE
P15 J15
J19 P19
A/P
J37 P37
ANN C/B DISC
EFF 340-0001 THRU 340-0352
(EFF 340-0353 & ON)
INV 1 (SCB 9)
INV 2 (SCB 8)
(SCB & CB5 EFF 340-0001 THRU 340-0150)
(CB8 & CB5 EFF 340-0151 & ON)
FLT DIR
GYRO PWR 2
AUTO PILOT
NAV 2
COMM 2
COMM 1
ADF 2
ADF 1
XPDR
MKR BCN
WX RADAR
AUDIO AMP
COMM 3
GYRO PWR 1
DME
RM1
RADAR ALT
ALT
J37 P37
ANN C/B DISC.
EFF 340-0501 AND ON
J50 P50
ANNUNCIATOR CONN.
P78 J70
GND PLUG C/B PANEL
NOSE — CABIN
340-0551 AND ON

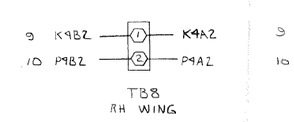


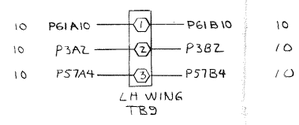



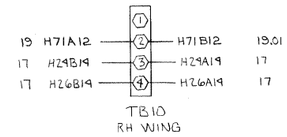



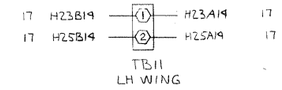



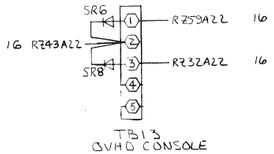



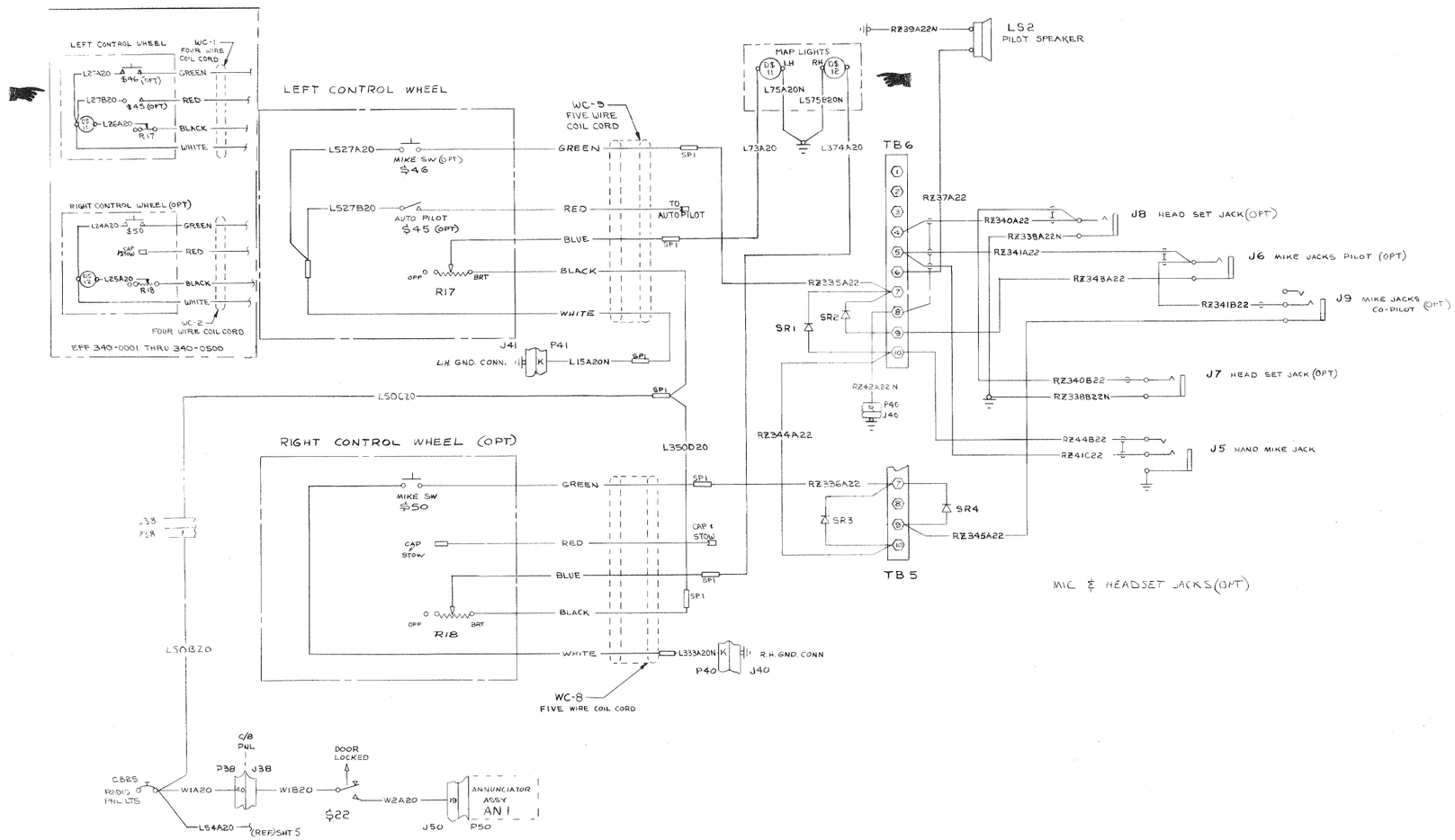



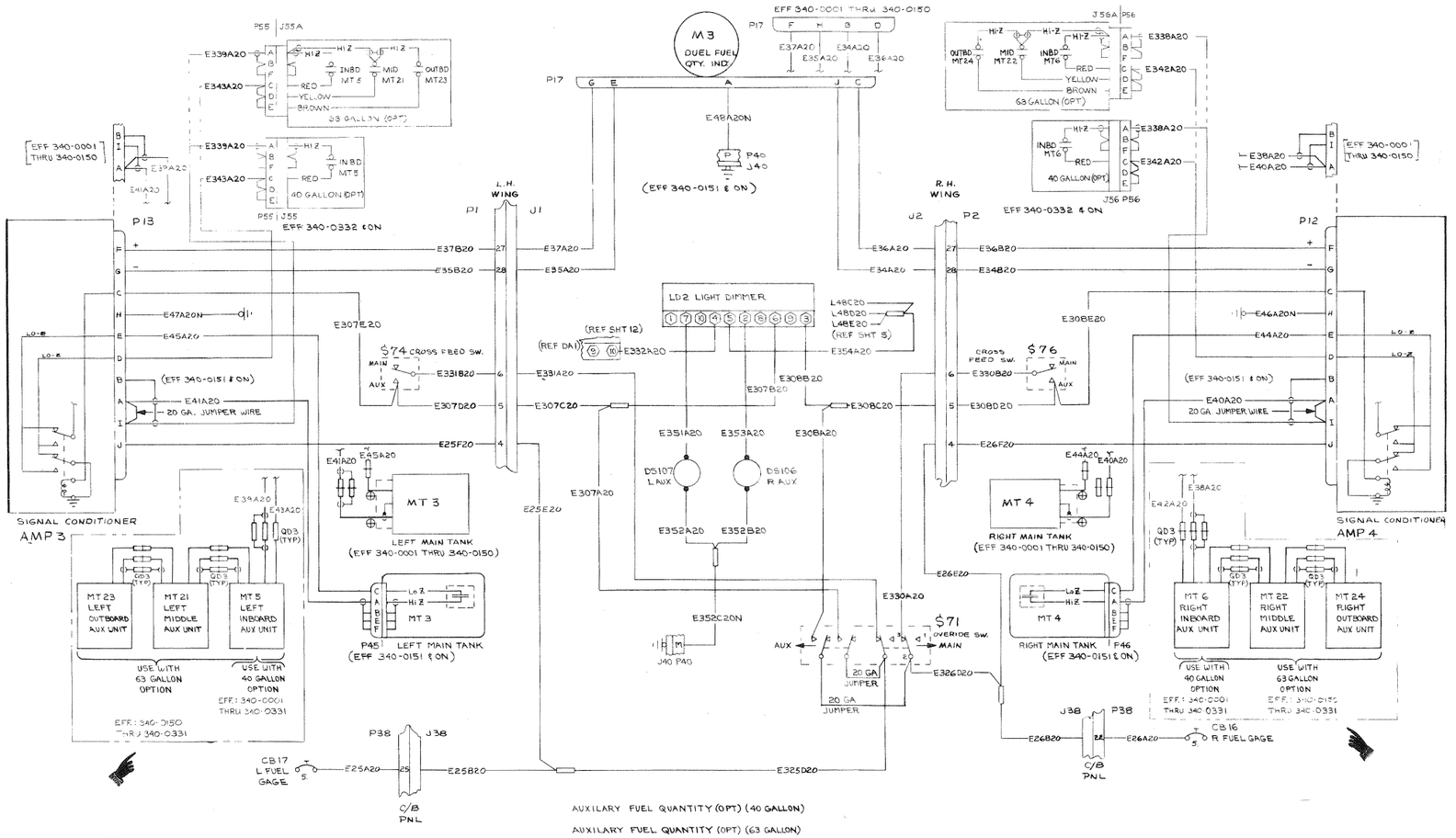




| | | | |
|---|---|---|---|
| Cessna AIRCRAFT CO. | P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201 | | |
| TITLE: TERMINAL BOARDS | | | |
| SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000 | |
| SCALE: | REF | SHEET 4 OF 20 | |




Cessna P. O. BOX 1977 WALLACE-PROSPECT PLANT WICHITA, KANSAS

| | | | |
|---|---|---|---|
| TITLE: MAP LIGHTS, AUDIO & DOOR WARNING WIRING DIAGRAM | | | |
| SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 3504000 K | |
| SCALE NONE | | | SHEET 5 OF 20 |

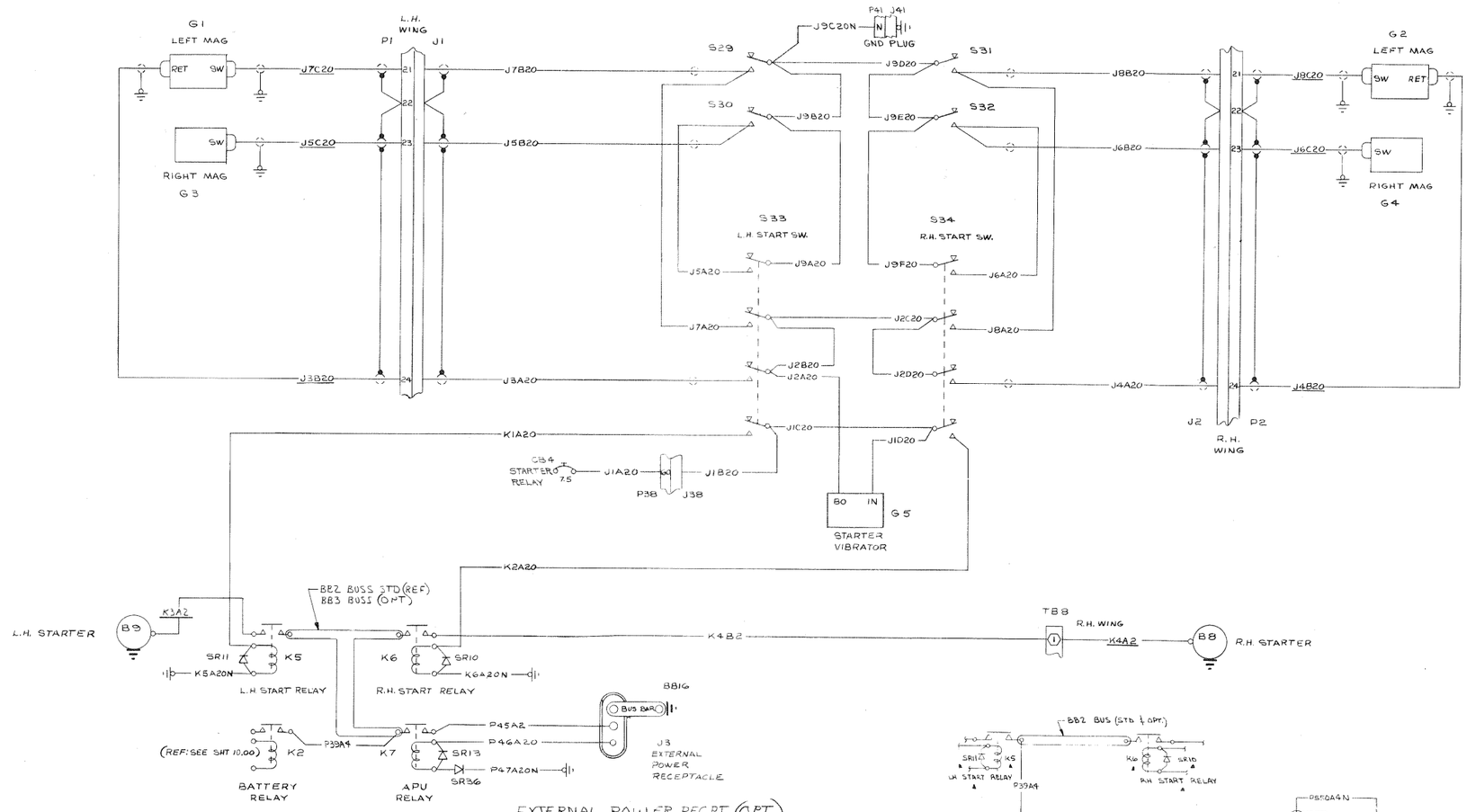



Cessna AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: AUXILARY FUEL QUANTITY

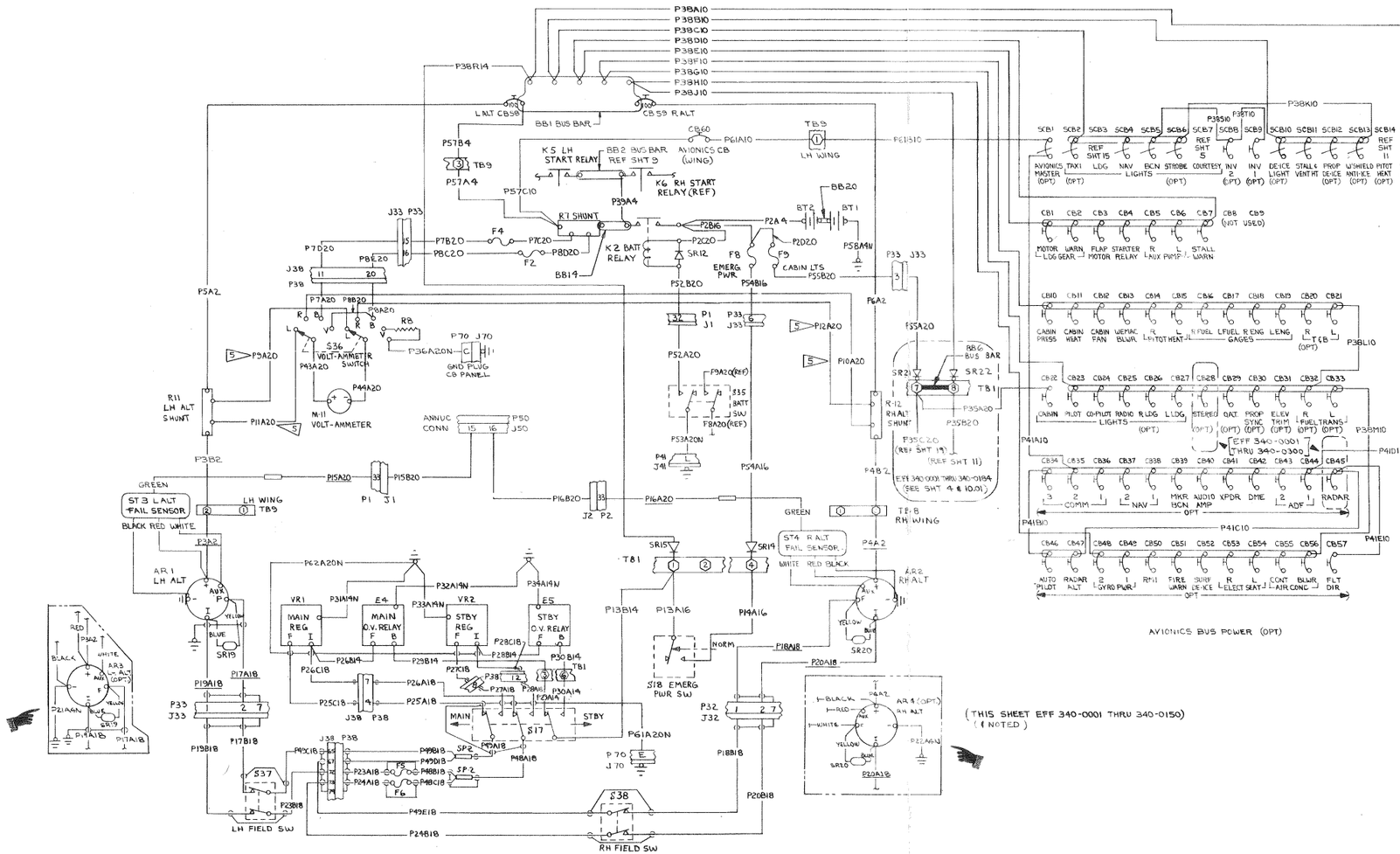
SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000 K

SCALE: NONE | SHEET 7 OF 30




Cessna AIRCRAFT CO. P. O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

| | | |
|---|---|---|
| TITLE | STARTER - IGNITION, AUX PWR WIRING DIAGRAM | |
| SIZE D | CODE IDENT. NO. 71379 | DRAWING NO. 5308000 |
| SCALE NONE | REF K | SHEET 3 of 20 |




Cessna® AIRCRAFT CO. P.O. BOX 1977 MILITARY & TWIN DIVISION WICHITA, KANSAS 67201

TITLE: POWER DISTRIBUTION

| SIZE | CODE IDENT. NO. | DRAWING NO. |
|---|---|---|
| D | 71379 | 5308000 K |

SCALE: NONE REF SHEET 10 of 20

TO AUDIO SWITCH PANEL

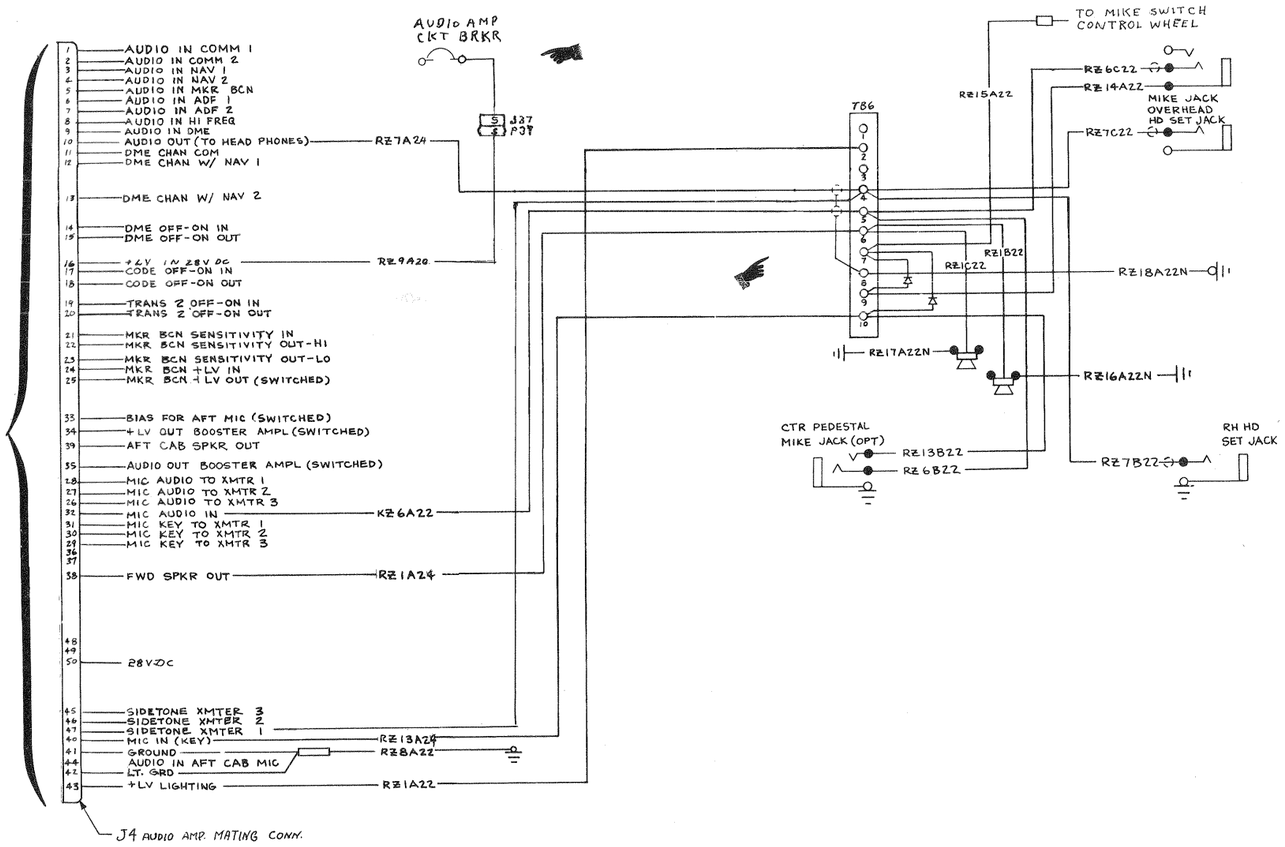



Figure 15-2. Audio Amplifier (Sheet 3)

start here

Detail A DISCONNECTING Landing Gear Doors

1. Disconnect nose and main landing gear doors.

CAUTION

When disconnecting the landing gear doors, always operate the landing gear up approximately 20 to 30 degrees and disconnect main gear door by removing attaching nut from actuator arm. On the nose gear doors, always remove the door link tubes to prevent the possibility of structural damage.

**-- READ THIS -- BEFORE STARTING**

NOSE AND MAIN LANDING GEAR RIGGING INSPECTION.

The nose and main landing gear rigging inspection should be performed indoors with proper jacks, 28 volt power supply, 0 to 150 pound spring scale and an 0860001 actuator arm tension tool available.

The aircraft should be placed on jacks, the necessary access plates, seats, cabin divider, carpets, floorboards removed, and the landing gears cleaned with a suitable solvent prior to inspection. Step by step procedures are presented and each step must be completed before performing the next step.

NOTE

The operational checks and tension measurement requirements of this inspection will require the services of two people.

CAUTION

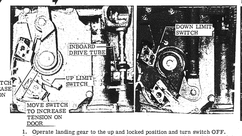
- When operating the landing gear always be prepared to stop to prevent damage to the system.
- After removal of retraction linkage, assist springs or component parts for checking, they must be reinstalled before proceeding to the next step.

The Landing Gear Rigging Inspection is given in alphabetical and/or alphanumerical sequence. The alphabetical details are the items to be checked. The alphanumerical detail is the related adjustment performed only when adjustment is necessary. The following table lists the details and the related adjustment to be checked.

TABLE 1

| Check | Adjustment If Required |
|---|---|
| Detail A | --- |
| Detail B | --- |
| Detail C | --- |
| Detail D | D-1 |
| Detail E | E-1 |
| Detail F | --- |
| Detail G | G-1 |
| Detail H | H-1 |
| Detail J | J-1 |
| Detail K | K-1 |
| Detail L | L-1 |
| Detail M | --- |
| Detail N | N-1 - N-2 |
| Detail P | --- |
| Detail Q | Q-1 |

Detail B CHECKING Up and Down Limit Switches




1. Operate landing gear to the up and locked position and turn switch OFF.
2. Engage manual extension crank and note the angular position of the crank handle.
3. Turn handle (CCW) AFT until the internal up stop in the actuator is reached.

NOTE

The internal stop should be reached in approximately 3/4 to 1-1/2 turns.

4. If the internal stop is not reached in 3/4 to 1-1/2 turns, run landing gear down and disconnect inboard main drive tube (D-1). Adjust up limit switch until the correct number of turns are obtained.

NOTE

Each time the actuator switches are adjusted the landing gear must be operated approximately half-way down then back up before noting the number of turns required to reach the internal stop.

5. Operate the landing gear to the down and locked position.
6. Engage manual extension crank and note the angular position of the crank handle.
7. Turn handle (CW) FWD until the internal down stop in the actuator is reached.

NOTE

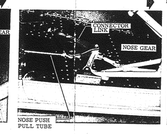
The internal stop should be reached in approximately 1 to 2 turns.

8. If the internal stop is not reached in 1 to 2 turns, the landing gear actuator down limit switch must be adjusted until the proper number of turns are obtained.

CAUTION

During manual extension of the landing gear, never release the manual extension crank, damage could result to personnel and the skirt of the pilot's seat.

Detail C Drive Tubes, Trunnions, Retracting Linkage, and Wheel Well Area



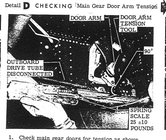

1. Check the operation of the landing gear. Visually inspect drive tubes, idlers, trunnions, and wheel well area for nicks, cracks, dents, bends, looseness, wear and other visual damage.

NOTE

If any part of the landing gear system is questionable, do not hesitate to reject it.

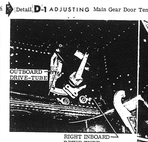
2. Inspect the landing gear retraction linkage for excessive wear, looseness, dents, cracks, bends, and deep scratches.
3. Check main gear trunnion roll pin in pivot shaft for looseness.

Detail D CHECKING Main Gear Door Arm Tension




1. Check main gear doors for tension as shown 25 ±10 pounds.

Detail D-1 ADJUSTING Main Gear Door Tension Detail D-2 Left Main Gear Door Tension



1. If the main gear door tension is not 25 ±10 pounds, adjust inboard drive tube rod end in half-turn increments to obtain proper tension.

NOTE

See Detail D-2, on the left inboard drive-tube it will be necessary to adjust the nuts on the fail turn mechanism. If half-turn increments are desired, operate the gear approximately half way down and bolt from actuator bellcrank and adjust turn end.

2. Shortening rod end will increase door tension (CCW).
3. Lengthening rod end will decrease door tension.
4. After checking door tension with the gear down, run the landing gear up and check the door tension.
5. The tension should be 25 ±10 pounds in the up position and a maximum of 10 pounds difference from the down position. Adjust up limit switch (see Detail B) to obtain proper tension.

NOTE

Check hand crank for number of turns in internal stop after obtaining tension. 3/4 to 1-1/2 turns.

Detail E CHECKING Main Landing Gear Free Fall

1. Check main gear free fall by breaking main lock links as shown, raise gear approximately six (6) inches by hand, then release.

NOTE

When checking main gear for free fall the outboard drive tube must be disconnected as shown in Detail D.

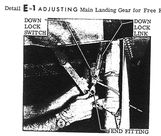
2. If the gear does free fall down and locked, disconnect end fitting and lengthen 1/2 turn, reconnect and check free fall.

NOTE

Lengthen end fitting in 1/2 turn increments until the gear will not free fall down and locked.

3. If the gear does not free fall to a down and lock position, visually check the following:
   a. Drive tubes for bends, breaks, binding and damage.
   b. Trunnion bolts for seizing, binding, alignment and lubrication.
   c. Lock link brace for alignment, overcenter travel, bending and breaks.
   d. Side brace for proper overcenter engagement, bolts for proper torque, (refer to Torque Chart, Section 1).
   e. Bolts in wheel well area for binding and interference.

Detail E-1 ADJUSTING Main Landing Gear for Free Fall



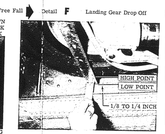

4. If items "a" thru "e" check satisfactorily, shorten adjusting screw in small increments until gear will free fall down and locked.

NOTE

Shorten adjustment screw in small increments to allow gear to free fall and the side brace, down links to go overcenter. Check safety and secure.

5. After adjusting, make sure the landing gear is down and locked and the down and lock indicator light is properly adjusted. (See Detail N.)

Detail F Landing Gear Drop-Off



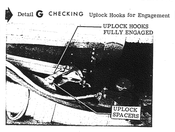

1. (See Detail G-1.) Disconnect uplock push pull tube.
2. Operate landing gear up and measure drop off as shown.
3. If drop-off is not 1/8 to 1/4 inch, refer to Detail D-1 and adjust outboard drive tube.

NOTE

Lengthen the outboard drive tube to decrease the amount of drop off. Shorten the outboard drive tube to increase drop off.

4. Reconnect uplock hooks.

Detail G CHECKING Uplock Hooks for Engagement

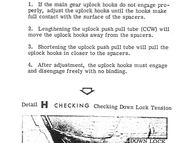



1. Inspect main gear uplock hooks for proper engagement, when gear is retracted.

Detail G-1 ADJUSTING Uplock Hook for Engagement

1. If the main gear uplock hooks do not engage properly, adjust hooks so that the hooks make full contact with the surface of the spacers.
2. Lengthening the uplock push pull tube (CCW) will move the uplock hooks away from the spacers.
3. Shortening the uplock push pull tube will pull the uplock hooks in closer to the spacers.
4. After adjustment, the uplock hooks must engage and disengage freely with no binding.

Detail H CHECKING Checking Down Lock Tension




1. Inspect main landing gear down lock for proper engagement and tension (60 to 80 pounds).

NOTE

When checking down lock tension always place finger on the down lock switch, pull scales at a right angle to the lock link and read scale at the point when a definite switch actuation is felt.

Detail Q-1 CHECKING Safety Switch Inspection

1. Refer to Section 4 for checking and Adjustment of Landing Gear Safety Switch.

After completing the inspection, make sure the gear is down and locked, lubricated and power turned OFF.

NOTE

If adjustments were made, make sure all bolts have been torqued, cotter pins installed and doors connected, before installing access plates, floorboards, seats, carpets and cabin divider and removing aircraft from jacks.

complete

Detail Q CHECKING Safety Switch Inspection

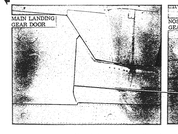
1. Turn battery master switch ON.
2. Close throttles and actuate landing gear safety switch by hand as shown.
3. Place landing gear switch handle in the UP position. The landing gear should remain down and locked and the horn should sound.

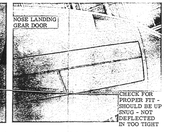
NOTE

If the horn does not sound, refer to Section 4, Troubleshooting. If the landing gear does not remain down and locked, the safety switch is defective and must be replaced.

4. If the landing gear remains down and locked return landing gear switch handle to DOWN position. Release the safety switch.

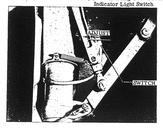
Detail P CHECKING Nose and Main Landing Gear Doors for Proper Fit



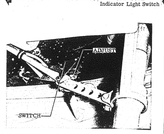




1. Operate the landing gear through one complete cycle and visually inspect nose and main landing gear doors for operation, proper fit and other damage.
2. Operate the landing gear through one complete cycle and check the gear indicator lights and warning horn. Check for operation with gear extended and retracted.

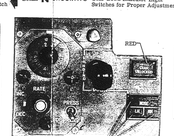
Detail N-2 ADJUSTING Main Landing Gear Down Indicator Light Switch




Detail N-1 ADJUSTING Nose Gear Down Indicator Light Switch




Detail N CHECKING Gear Down Indicator Light Switches for Proper Adjustment



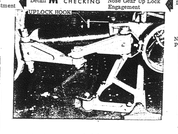

1. If the indicator lights do not illuminate within the required number of turns or the overcenter linkage is not overcenter when the lights illuminate make the following adjustments.
2. Adjust the nose gear down and locked indicator light switch by adjusting the switch actuating bolt. Turn bolt CCW to actuate switch farther from the internal stop inside the actuator. Turn bolt CW to actuate switch closer to the internal stop inside the actuator.
3. Adjust the main landing gear switches by repositioning. Loosen mounting screws and move switch towards the bellcrank to actuate switch farther from the internal stop in the actuator. Move the switch away from the bellcrank to actuate it closer to the internal stop in the actuator.

NOTE

After adjusting indicator switches, check to see that gear indicator lights do not illuminate before gear is down and locked by overcenter linkage.

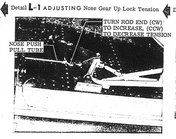
1. Retract landing gear approximately halfway.
2. Engage manual extension handle (see Detail B). Crank toward the down position and stop when green light comes on. Note the angular position of the manual extension handle.
3. Check applicable gear of illuminated light for being down and locked with the overcenter linkage overcenter.
4. Resume cranking toward the down position noting the number of turns required to reach the internal stop in the actuator.
5. The number of turns required to reach the internal stop should not be less than 8 or more than 14 for the nose gear. Not less than 4 or more than 8 on the main gear.

Detail M CHECKING Nose Gear Up Lock Engagement



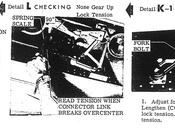

1. Inspect nose gear up lock for proper engagement.
2. Uplock hook must be fully engaged with hook against the nose strut bolt and spacer engages and disengages freely with no binding.
3. Uplock hook must be engaged with .003 to .060 inch clearance between the spacer on the nose strut and surface of the hook.

Detail L-1 ADJUSTING Nose Gear Up Lock Tension




1. If the nose gear up lock tension is not 75 +10 -15 pounds, adjust nose push-pull tube in half turn increments.
2. Lengthen the nose push-pull tube (CCW) to decrease the up lock tension.
3. Shorten nose push-pull tube to increase (CW) up lock tension.

Detail L CHECKING Nose Gear Up Lock Tension




1. Inspect nose gear up lock tension (75 +10 -15 pounds).

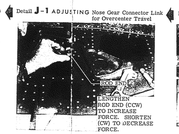
Detail K-1 ADJUSTING Nose Gear Down Lock Tension

1. Adjust fork bolt in half-turn increments. Lengthen (CCW) fork bolt to increase down lock tension. Shorten (CW) to decrease tension.

Detail K CHECKING Nose Gear Down Lock Tension

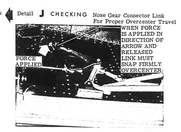
1. Disconnect spring.
2. Connect drive tube. (See Detail L-1.)
3. Inspect nose gear down lock tension (25 ±10 pounds). Make sure the overcenter spring is disconnected when checking tensions and adjustments.
4. If the nose gear down lock tension is not 25 ±10 pounds, make sure the nose gear fork bolt is properly adjusted (K-1).

Detail J-1 ADJUSTING Nose Gear Connector Link for Overcenter Travel



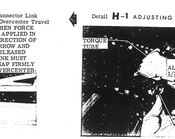

1. If the nose gear connector link is not snapping overcenter properly adjust rod end as shown.

Detail J CHECKING Nose Gear Connector Link For Proper Overcenter Travel




1. See Detail L-1 and disconnect drive tube.
2. Inspect nose gear connector link for proper overcenter adjustment.

Detail H-1 ADJUSTING Down Lock Tension




1. If the down lock tension is not 60 to 80 pounds, adjust push pull tube in one-half turn increments until proper tension is obtained. If the down lock tension is in excess of 80 pounds, the down lock tension should be rigged 40 to 50 pounds. Lengthening the push pull tube (CCW) decreases and shortening the push pull tube (CW) increases tension.

NOTE

When shortening or lengthening the outboard push-pull tube the fork bolt must be lengthened or shortened a corresponding amount of turns so that the combined length of the two parts does not change.

Figure 2-31. Nose and Main Landing Gear Rigging Inspection