Model 172 Skyhawk Series

1977

SERVICE MANUAL

1 JULY 1976

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CROSS REFERENCE LISTING OF POPULAR NAME VS. MODEL NUMBER AND SERIALS.

Aii aircraft, regardless of manufacturer, are certificated under model number designations. However, popular names are often used for marketing purposes. To provide a consistent method of referring to the various aircraft, model numbers will be used in this publication unless names are required to differentiate between versions of the same basic model. The following table provides a cross reference listing of popular name vs. model numbers.

POPULAR NAME	MODEL YEAR	MODEL	SERIALS	
			BEGINNING	ENDING
SKYHAWK or SKYHAWK II	1977	172N	17267585	
REIMS/CESSNA F172 SKYHAWK, SKYHAWK II	1977	F172N	F17201515	

FOREWORD

This manual contains factory recommended procedures and instructions for ground handling, servicing and maintaining Cessna Model 172-Series aircraft. This includes the Models Skyhawk, SkyhawkII, Reims/Cessna F172 Skyhawk and SkyhawkII. The Reims versions of these aircraft are of the same basic design as the domestic models. Besides serving as a reference for the experienced mechanic, this manual also covers step-by-step procedures for the less experienced man. This manual should be kept in a handy place for ready reference. If properly used, it well better enable the mechanic to maintain this series aircraft and thereby establish a reputation for reliable service.

The information in this 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 the 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 is available from the Cessna Service Parts Center 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 by the Cessna Customer Service Department.

Information for Nav-O-Matic Autopilots, Electronic Communications and Navigation Equipment are not included in this manual. These manuals are available from the Cessna Service Parts Center.

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SECTION 1

GENERAL DESCRIPTION

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1-1. GENERAL DESCRIPTION.

1-2. MODEL 172-SERIES.

1-3. DESCRIPTION. Cessna Model 172 Series aircraft, described in this manual, are high-wing monoplanes of all-metal, semimonocoque construction. Thexe aircraft are equipped with a fixed tricycle landing gear with tubular spring-steel main gear struts. The steerable nose gear is equipped with an air/hydraulic fluid shock strut. Four-place seating is standard, and a double-width, fold-up auxiliary rear seat may be installed as optional equipment. All are powered by four-cylinder, horizontally opposed, air-cooled Lycoming "Blue Streak" engines. Each of the engines drives are all-metal, fixed-pitch propeller. Model 172-Series aircraft feature rear side windows, a "wrap-around" rear window and a swept-back fin and rudder.

1-4. AIRCRAFT SPECIFICATIONS. Leading particulars of these aircraft, with dimensions based on gross weight, are given in figure 1-1. If these dimensions are used for constructing a hangar or computing clearances, remember that such factors as nose gear strut inflation, tire pressures, tire sizes and load distribution may result in some dimensions that are considerably different from those listed.

1-5. STATIONS. Station diagrams are shown in figures 1-2 to assist in locating equipment when a written description is inadequate or impractical.

1-6. TORQUE VALUES. A chart of recommended nut torque values is shown in figure 1-3. These torque values are recommended for all installation 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.

NOTE

These specifications are applicable to both Model 172 and F172-Series aircraft, except as indicated.

GROSS WEIGHT	2300 lb
FUEL CAPACITY	
Standard Wing (Total)	43 gal.
Standard Wing (Usable)	40 gal.
Long-Range Wing (Total)	54 gal.
Long-Range Wing (Usable)	50 gal.
OIL CAPACITY	
(Without External Filter)	6 qt
(With External Filter)	7 qt
ENGINE MODEL	
172-Series (Refer to Section 11 for Engine Data)	LYCOMING O-320 Series
F172-Series (Refer to Section 11 for Engine Data)	LYCOMING O-320 Series
PROPELLER (Fixed Pitch)	75" McCAULEY
MAIN WHEEL TIRES	6.00 x 6, 4-Ply Rating
Pressure	29 psi
NOSE WHEEL TIRE (Standard)	5.00 x 5, 4-Ply Rating
Pressure	31 psi
NOSE GEAR STRUT PRESSURE (Strut Extended)	45 psi
WHEEL ALIGNMENT (Tubular Spring Struts)	
Camber	2° to 4°
Toe-In	0" to .18"
* (Tubular Gear is non-adjustable)	
AILERON TRAVEL	
Up	20° ± 1°
Down	15° ± 1°
WING FLAP TRAVEL	0° to 40°, +0°- 2°
RUDDER TRAVEL (Measured parallel to water line)	
Right	16° 10' ±1°
Left	16° 10' ±1°
RUDDER TRAVEL (Measured perpendicular to hinge line)	
Right	17° 44' ±1°
Left	17° 44' ±1°
ELEVATOR TRAVEL	
Up	28°, +1° - 0°
Down	23°, +1° - 0°
ELEVATOR TRIM TAB TRAVEL	
Up	28°, +1° - 0°
Down	13°, +1° - 0°
PRINCIPAL DIMENSIONS	
Wing Span (Conical-Camber With Strobe Lights)	36'
Tail Span	11' 3"
Length	26' 11"
Fin Height (Maximum with Nose Gear Depressed and Flashing Beacon Installed on Fin	8' 9-1/2"
Track Width	8' 3-1/2"
BATTERY LOCATION	Firewall

* No provisions are made for aligning wheels on tubular gear aircraft. The tolerances provided are to be used only for checking existing wheel alignment.

Figure 1-1. Aircraft Specifications

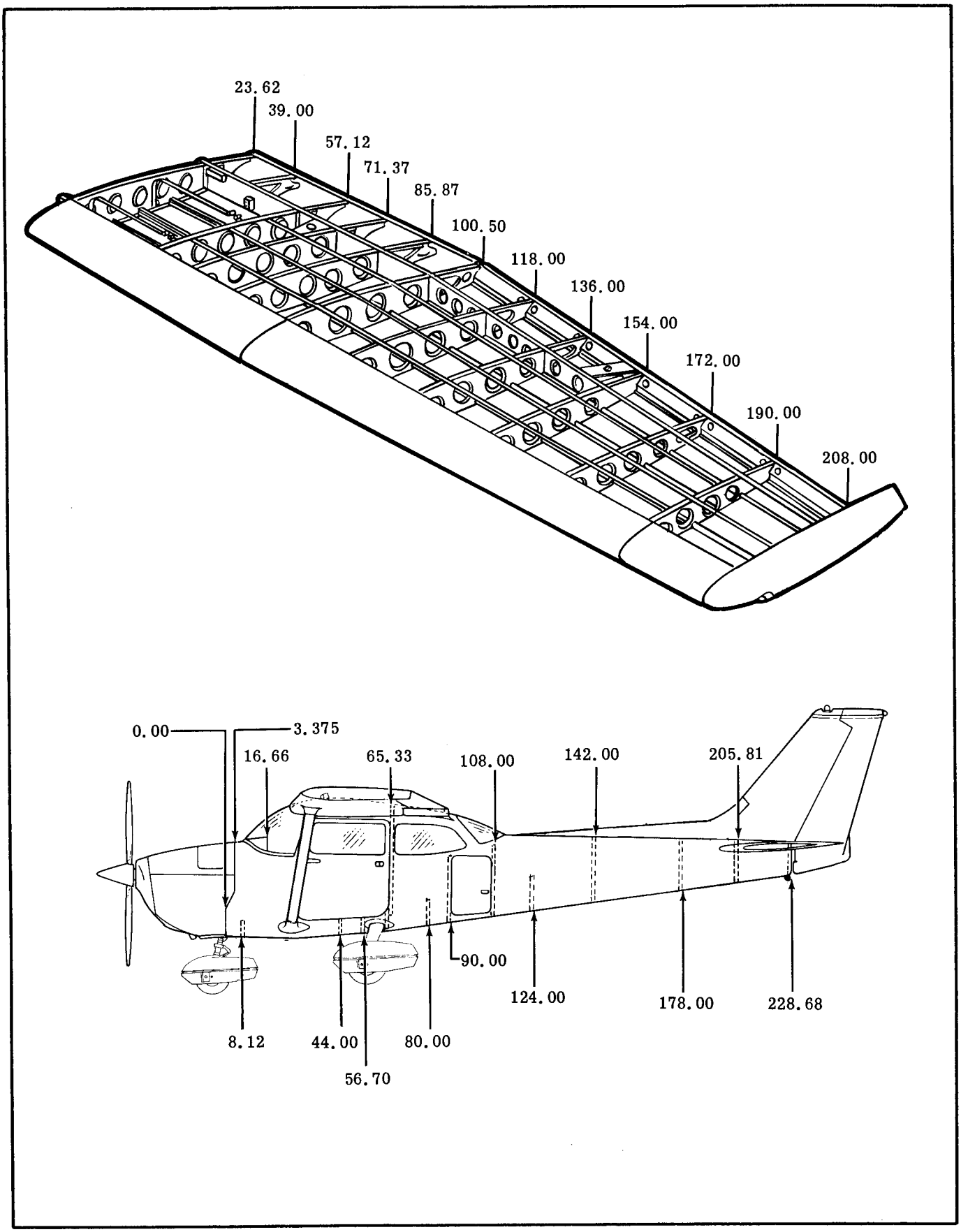

Figure 1-2. Reference Stations

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 TORQUE		SHEAR 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, AN363, MS20365, MS21042, MS21044, MS21045 and MS21046.
2. When using AN310 or AN320 castellated nuts where alignment between the bolt and cotter pin slots is not reached using normal torque values, use alternate torque values or replace the nut.
3. Covers AN316, AN320, MS20364 and MS21245.
4. Covers AN363, MS20365, MS21042, MS21043, MS21044, MS21045 and MS21046.
5. Covers AN340.

CAUTION

DO NOT REUSE SELF-LOCKING NUTS.

The above values are recommended for all installation 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 1-3. Torque Values

SECTION 2

GROUND HANDLING, SERVICING, CLEANING, LUBRICATION AND INSPECTION

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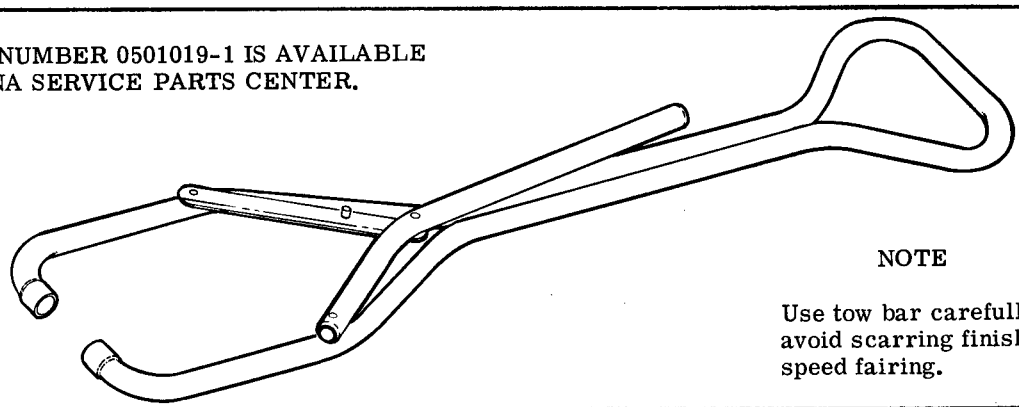
2-1. GROUND HANDLING.

2-2. TOWING. Moving the aircraft by hand is accomplished by using the wing struts and landing gear struts as push points. A tow bar attached to the nose gear should be used for steering and maneuvering the aircraft on the ground. When no tow bar is available, press down at the horizontal stabilizer front spar adjacent to the fuselage to raise the nose wheel off the ground. With the nose wheel clear of the ground, the aircraft can be turned by pivoting it about the main wheels.

CAUTION

When towing the aircraft, never turn the nose wheel more than 30 degrees either side of center or the nose gear will be damaged. Do not push on control surfaces or outboard empennage surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin.

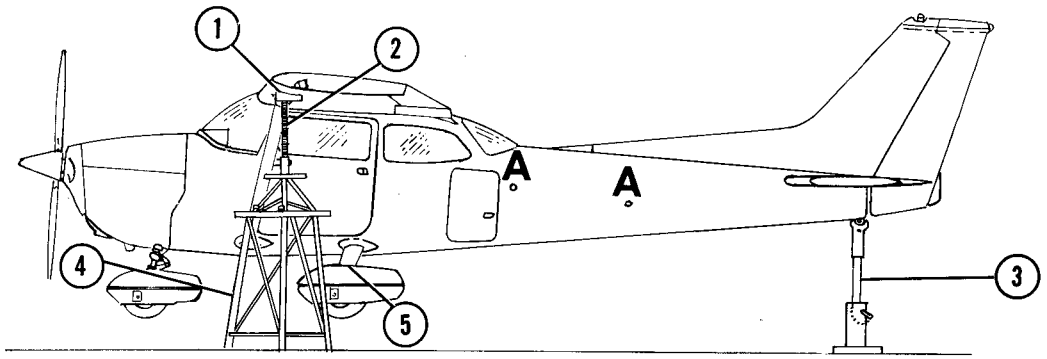
TOW BAR: PART NUMBER 0501019-1 IS AVAILABLE FROM THE CESSNA SERVICE PARTS CENTER.

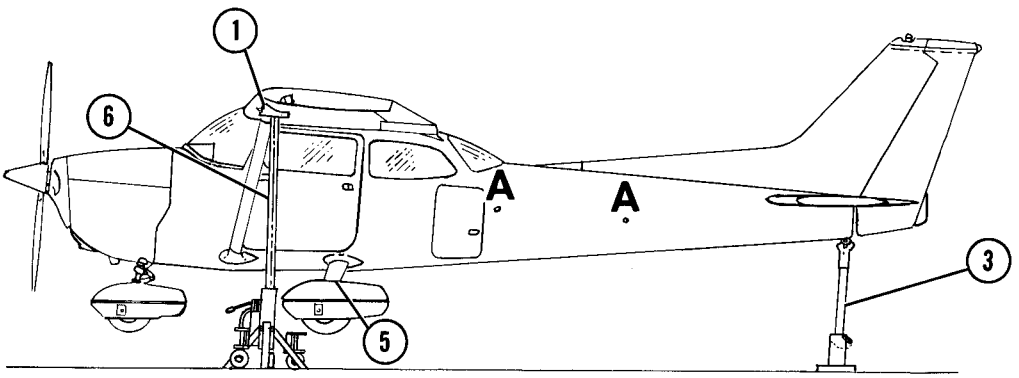


NOTE

Use tow bar carefully to avoid scarring finish on speed fairing.

Figure 2-1. Tow Bar





REFER TO SHEET 2
FOR JACKING
INFORMATION

NOTE

Corresponding points on both upper door sills may be used to level the aircraft laterally.

Reference points for longitudinal leveling of aircraft are two screws on left side of tailcone at zero waterline. These are indicated in illustration by **A**.

(Also refer to paragraph 2-5)

Figure 2-2. Jacking and Leveling (Sheet 1 of 2)

JACKING INFORMATION

ITEM NUMBER	TYPE AND NUMBER	REMARKS
(1)	Block (Jack point not available)	1x4x4 padded with 1/4" rubber
(2)	Jack	Any short jack of capable capacity
(3)	Universal tail stand	Any tail stand of capable capacity
(4)	Cessna #SE-576 (41-1/2" high)	Universal jack stand (FOR USE WITH ITEM 2)
(5)	Built-in jack pad	Part of step bracket (SEE CAUTION)
(6)	#2-170 Basic jack (includes #2-71 Slide tube: Liftstroke 22-1/2") #2-70 Slide tube: Liftstroke 22-1/2" #2-64 Extension cap #2-109 Leg extension	Min. closed height: 34" Max. extension height: 56-1/2" Min. closed height: 57-1/2" Max. extension height: 80" Adds 4" Adds 12"

1. Wing jacks are placed under front spar of wing just outboard of wing strut, and must extend far enough to raise wheels off ground, and must be of adequate strength.

2. Attach a suitable stand to the tie-down ring. Be sure tail stand weighs enough to keep tail down and under all conditions that it is strong enough to support any weight that might be placed on it (place shot bags or sand bags on tail stand. In addition, the base of adjustable tail stand is to be filled with concrete for additional weight as a safety factor.

3. Operate jacks evenly until desired height is reached.

CAUTION

When using built-in jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must be lowered for a second operation. Jacking both wheels simultaneously at built-in jack pads is not recommended. Jack pad may be used to raise only one main wheel. DO NOT USE brake casting as a jack point.

4. Items (4) and (6) are available from the Cessna Service Parts Center.

Figure 2-2. Jacking and Leveling (Sheet 2 of 2)

2-3. HOISTING. The aircraft may be lifted with a hoist of two-ton capacity by using hoisting rings, which are optional equipment, or by means of suitable slings. The front sling should be hooked to each upper engine mount at the firewall, and the aft sling should be positioned around the fuselage at the first bulkhead forward of the leading edge of the stabilizer. If the optional hoisting rings are used, a minimum cable length of 60 inches for each cable is required to prevent bending of the eyebolt-type hoisting rings. If desired, a spreader jig may be fabricated to apply vertical force to the eyebolts.

2-4. JACKING. Refer to figure 2-2 for jacking procedures.

2-5. LEVELING. Corresponding points on both upper door sills may be used to level the aircraft laterally. The reference points for longitudinally leveling the aircraft are the two screws located on the left side of the tailcone. Refer to figure 2-2 for screw locations.

2-6. PARKING. Parking precautions depend principally on local conditions. As a general precaution, set parking brake or chock the wheels and install the controls lock. In severe weather and high wind conditions, tie down the aircraft as outlined in paragraph 2-7 if a hangar is not available.

2-7. TIE-DOWN. When mooring the aircraft in the open, head into the wind if possible. Secure control surfaces with the internal control lock and set brakes.

CAUTION

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

After completing the preceding, proceed to moor the aircraft as follows:

a. Tie ropes, cables, or chains to the wing tie-down fittings located at the upper end of each wing strut. Secure the opposite ends of ropes, cables, or chains to ground anchors.

b. Secure rope (no chains or cables) to forward mooring ring and secure opposite end to ground anchor.

c. Secure the middle of a rope to the tail tie-down ring. Pull each end of rope away at a 45 degree angle and secure to ground anchors at each side of tail.

d. Secure control lock on pilot control column. If control lock is not available, tie pilot control wheel back with front seat belt.

e. These aircraft are equipped with a spring-loaded steering system which affords protection against normal wind gusts. However, if extremely high wind gusts are anticipated, additional external locks may be installed.

2-8. FLYABLE STORAGE. Flyable storage is defined as a maximum of 30 days non-operational storage and/or the first 25 hours of intermittent engine operation.

NOTE

The aircraft is delivered from Cessna with a corrosion preventative aircraft engine oil (MIL-C-6529, Type II). This engine oil is a blend of aviation grade straight mineral oil and a corrosion preventative compound. This engine oil should be used for the first 25 hours of engine operation. In the event it is necessary to add oil during the first 25 hours of operation, use only aviation grade straight mineral oil of the correct viscosity.

During the 30 day non-operational storage or the first 25 hours of intermittent engine operation, every seventh day the propeller shall be rotated through five revolutions, without running the engine. If the aircraft is stored outside, tie-down in accordance with paragraph 2-7. In addition, the pitot tube, static air vents, air vents, openings in the engine cowling, and other similar openings shall have protective covers installed to prevent entry of foreign material. After 30 days, aircraft should be flown for 30 minutes or ground run-up until oil has reached operating temperature.

CAUTION

Excessive ground operation shall be avoided.

2-9. RETURNING AIRCRAFT TO SERVICE. After flyable storage, returning the aircraft to service is accomplished by performing a thorough pre-flight inspection. At the end of the first 25 hours of engine operation, drain engine oil and clean oil screens (or change external oil filter). Service engine with correct grade and quantity of engine oil. Refer to figure 2-4 and paragraph 2-21 for correct grade of engine oil.

2-10. TEMPORARY STORAGE. Temporary storage is defined as aircraft in a non-operational status for a maximum of 90 days. The aircraft is constructed of corrosion resistant alclad aluminum, which will last indefinitely under normal conditions if kept clean, however, these alloys are subject to oxidation. The first indication of corrosion on unpainted surfaces is in the form of white deposits or spots. On painted surfaces, the paint is discolored or blistered. Storage in a dry hangar is essential to good preservation and should be procured if possible. Varying conditions will alter the measures of preservation, but under normal conditions in a dry hangar, and for storage periods not to exceed 90 days, the following methods of treatment are suggested:

a. Fill fuel tanks with correct grade of gasoline.

b. Clean and wax aircraft thoroughly.

c. Clean any oil or grease from tires and coat tires with a tire preservative. Cover tires to protect against grease and oil.

d. Either block up fuselage to relieve pressure on tires or rotate wheels every 30 days to change supporting points and prevent flat spotting the tires.

e. Lubricate all airframe items and seal or cover all openings which could allow moisture and/or dust to enter.

NOTE

The aircraft battery serial number is recorded in the aircraft equipment list. To assure accurate warranty records, the battery should be re-installed in the same aircraft from which it was removed. If the battery is returned to service in a different aircraft, appropriate record changes must be made and notification sent to the Cessna Claims Department.

f. Remove battery and store in a cool dry place; service the battery periodically and charge as required.

NOTE

An engine treated in accordance with the following may be considered protected against normal atmospheric corrosion for a period not to exceed 90 days.

g. Disconnect spark plug leads and remove upper and lower spark plugs from each cylinder.

NOTE

The preservative oil must be Lubricating Oil-Contact and Volatile, Corrosion Inhibited, MIL-L-46002, Grade 1 or equivalent. The following oils are approved for spraying operation by Lycoming, Socony Averex 901, or Esso Rust-Ban 626, or equivalent.

h. Using a portable pressure sprayer, atomize spray preservative oil through the upper spark plug hole of each cylinder with the piston in a down position. Rotate crankshaft as each pair of cylinders is sprayed.

i. After completing step "h," rotate crankshaft so that no piston is at a top position. If the aircraft is to be stored outside, stop two-bladed propeller so that blades are as near horizontal as possible to provide maximum clearance with passing aircraft.

j. Again spray each cylinder without moving the crankshaft to thoroughly cover all interior surfaces of the cylinder above the piston.

k. Install spark plugs and connect spark plug leads.

l. Apply preservative oil to the engine interior by spraying approximately two ounces of the preservative oil through the oil filler tube.

m. Seal all engine openings exposed to the atmosphere using suitable plugs or non-hygroscopic tape. Attach a red streamer at each point that a plug or tape is installed.

n. If the aircraft is to be stored outside, perform the procedures outlined in paragraph 2-7. In addition, the pitot tube, static source vents, air vents, openings in the engine cowling and other similar openings should have protective covers installed to prevent entry of foreign material.

o. Attach a warning placard to the propeller to the effect that the propeller shall not be moved while the engine is in storage.

2-11. INSPECTION DURING STORAGE.

a. Inspect airframe for corrosion at least once a month and remove dust collections as frequently as possible. Clean and wax as required.

b. Inspect the interior of at least one cylinder through the spark plug hole for corrosion at least once a month.

NOTE

Do not move crankshaft when inspecting interior of cylinder for corrosion.

c. If at the end of the 90 day period, the aircraft is to be continued in non-operational storage, again perform the procedural steps "g thru o" of paragraph 2-10.

2-12. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedures to return the aircraft to service.

a. Remove aircraft from blocks and check tires for proper inflation. Check for proper nose gear strut inflation. (Refer to figure 1-1.)

b. Check battery and install.

c. Check that oil sump has proper grade and quantity of engine oil.

d. Service induction air filter and remove warning placard from propeller.

e. Remove materials used to cover openings.

f. Remove spark plugs from engine.

g. While spark plugs are removed, rotate propeller several revolutions to clear excess rust preventive oil from cylinders.

h. Clean, gap and install spark plugs. Torque plugs to the value specified in Section 11 and connect spark plug leads.

i. Check fuel strainer. Remove and clean filter screen if necessary. Check fuel tanks and fuel lines for moisture and sediment, drain enough fuel to eliminate moisture and sediment.

j. Perform a thorough pre-flight inspection, then start and warm-up engine.

2-13. INDEFINITE STORAGE. Indefinite storage is defined as aircraft in a non-operational status for an indefinite period of time. Engines treated in accordance with the following may be considered protected against normal atmosphere corrosion, provided the procedure outlined in paragraph 2-14 are performed at the intervals specified.

a. Operate engine until oil temperature reaches normal operating range. Drain engine oil sump and reinstall drain plug.

b. Fill oil sump to normal operating capacity with corrosion preventive mixture which has been thoroughly mixed and pre-heated to a minimum of 221°F at the time it is added to the engine.

NOTE

Corrosion preventive mixture consists of one part compound MIL-C-6529, type I, mixed with three parts new lubricating oil of the grade recommended for service. Lycoming recommends Esso Rust-Ban 628 or equivalent. During all spraying operations corrosion mixture is pre-heated to 221° to 250°F.

c. Immediately after filling the oil sump with corrosion preventative mixture, fly the aircraft for a period of time not to exceed a maximum of 30 minutes.

d. With engine operating at 1200 to 1500 rpm and induction air filter removed, spray corrosion preventive mixture into induction airbox, at the rate of one-half gallon per minute, until heavy smoke comes from exhaust stack, then increase the spray until the engine is stopped.

CAUTION

Injecting corrosion-preventive mixture too fast can cause a hydrostatic lock.

e. Do not rotate propeller after completing step "d."

f. Remove all spark plugs and spray corrosion-preventive mixture, which has been pre-heated to 221° to 250°F, into all spark plug holes to thoroughly cover interior surfaces of cylinders.

g. Install lower spark plugs or install solid plugs, and install dehydrator plugs in upper spark plug holes. Be sure that dehydrator plugs are blue in color when installed.

h. Cover spark plug lead terminals with shipping plugs (AN4060-1) or other suitable covers.

i. With throttle in full open position, place a bag of desiccant in the carburetor intake and seal opening with moisture resistant paper and tape.

j. Place a bag of desiccant in the exhaust tailpipe(s) and seal openings with moisture resistant tape.

k. Seal cold air inlet to the heater muff with moisture resistant tape.

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

m. Seal all other engine openings exposed to atmosphere using suitable plugs or non-hygroscopic tape.

NOTE

Attach a red streamer to each place plugs or tape is installed. 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.

n. Drain corrosion-preventive mixture from engine sump and reinstall drain plug.

NOTE

The corrosion-preventive mixture is harmful to paint and should be wiped from painted surfaces immediately.

o. Attach a warning placard on the throttle control knob, to the effect that the engine contains no lubricating oil. Placard the propeller to the effect that it should not be moved while the engine is in storage.

p. Prepare airframe for storage as outlined in paragraph 2-10 thru step "f."

NOTE

As an alternate method of indefinite storage, the aircraft may be serviced in accordance with paragraph 2-10 providing the aircraft is run-up at maximum intervals of 90 days and then reserviced per paragraph 2-10.

2-14. INSPECTION DURING STORAGE. Aircraft in indefinite storage shall be inspected as follows:

a. Inspect cylinder protex plugs each 7 days.

b. Change protex plugs if their color indicates an unsafe condition.

c. If the dehydrator plugs have changed color in one half of the cylinders, all desiccant material in the engine shall be replaced with new material.

d. Every 6 months respray the cylinder interiors with corrosion-preventive mixture.

NOTE

Before spraying, inspect the interior of one cylinder for corrosion through the spark plug hole and remove at least one rocker box cover and inspect the valve mechanism.

2-15. RETURNING AIRCRAFT TO SERVICE. After indefinite storage, use the following procedure to return the aircraft to service.

a. Remove aircraft from blocks and check tires for correct inflation. Check for correct nose gear strut inflation.

b. Check battery and install.

c. Remove all materials used to seal and cover openings.

d. Remove warning placards posted at throttle and propeller.

e. Remove and clean engine oil screen, then reinstall and safety. On aircraft that are equipped with an external oil filter, install new filter element.

f. Remove oil sump drain plug and drain sump. Install and safety drain plug.

NOTE

The corrosion-preventive mixture will mix with the engine lubricating oil, so flushing the oil system is not necessary. Draining the oil sump will remove enough of the corrosion-preventive mixture.

g. Service and install the induction air filter.

h. Remove dehydrator plugs and spark plugs or

plugs installed in spark plug holes and rotate propeller by hand several revolutions to clear corrosion-preventive mixture from cylinders.

i. Clean, gap, and install spark plugs. Torque plugs to the value listed in Section 11.

j. Check fuel strainer. Remove and clean filter screen. Check fuel tanks and fuel lines for moisture and sediment, and drain enough fuel to eliminate.

k. Perform a thorough pre-flight inspection, then start and warm up engine.

l. Thoroughly clean aircraft and flight test aircraft.

2-16. SERVICING.

2-17. Servicing requirements are shown in figure 2-4. The following paragraphs supplement this figure by adding details not included in the figure.

2-18. FUEL. Fuel tanks should be filled immediately after flight to reduce condensation. Tank capacities are listed in figure 1-1. The recommended fuel grade to be used in given in figure 2-4.

2-19. FUEL DRAINS. Fuel drains are located at various places throughout the fuel system. Refer to Section 12 for location of the various drains in the system. The fuel tanks and fuel strainer have drain valves. To activate the tank drain valve for fuel sampling, place cup up to valve and depress valve with rod protruding from cup. See Section 12 for illustration of fuel tank drain valve. The strainer drain valve is an integral part of the fuel strainer assembly. The strainer drain is equipped with a control which is located adjacent to the oil dipstick. Access to the control is through the oil dipstick access door. Open drains and remove drain plugs at the intervals specified in figure 2-4. Also, during daily inspection of the fuel strainer or fuel tanks, if water is found in the fuel strainer all fuel drain plugs should be removed and all water drained from the system.

2-20. CARBURETOR DRAIN PLUG INSPECTION. In order to prevent the possibility of thread sealant contamination in the carburetor float chamber, cleaning and inspection of the carburetor should be accomplished at each 100-hour inspection and anytime water in the fuel is suspected.

a. With the fuel valve OFF, remove carburetor drain plug and clean off any sealant present on the end of the plug or in the threads on the plug.

b. Inspect drain plug hole in the carburetor and remove any sealant remaining in the hole.

c. Turn fuel valve to ON to flush float chamber and drain plug chamber while probing drain plug hole to ascertain that all residue of sealant material is dislodged and washed out of the chamber. Flushing operation should last 15 to 30 seconds.

d. A second flushing should then be accomplished and the drained fuel retained for inspection to insure that no sealant particles are present.

e. Install drain plug as follows:

1. Install drain plug in carburetor 1-1/2 to 2 turns.

2. Apply NS-40 (RAS-4) MIL-T-5544 (Antiseize, Graphite Petrolatum) or equivalent to plug threads.

3. Tighten and safety drain plug.

f. Turn fuel valve ON and inspect for evidence of fuel leakage.

2-21. ENGINE OIL. Check engine lubricating oil with the dipstick five to ten minutes after the engine has been stopped. The aircraft should be in as near a level position as possible when checking the engine oil, so that a true reading is obtained. Engine oil should be drained while the engine is still hot, and the nose of the aircraft should be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump. Engine oil should be changed every six months, even though less than the specified hours have accumulated. Reduce these intervals for prolonged operations in dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered, which cause sludging conditions. Always change oil and oil filter whenever oil on the dipstick appears dirty. Aviation grade oil conforming to AVCO Lycoming Specification No. 301 and Service Instruction No. 1014, and to any revisions or supplements thereto, shall be used in the "Blue Streak" (Lycoming) engine.

NOTE

New or newly-overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. If an ashless dispersant oil is used in a new or newly-overhauled engine, high oil consumption may be experienced. The anti-friction additives in detergent and dispersant oils will retard "break-in" of the pistons, rings and cylinder walls. This condition can be avoided by the use of straight mineral oil. The aircraft is delivered from Cessna with a Corrosion

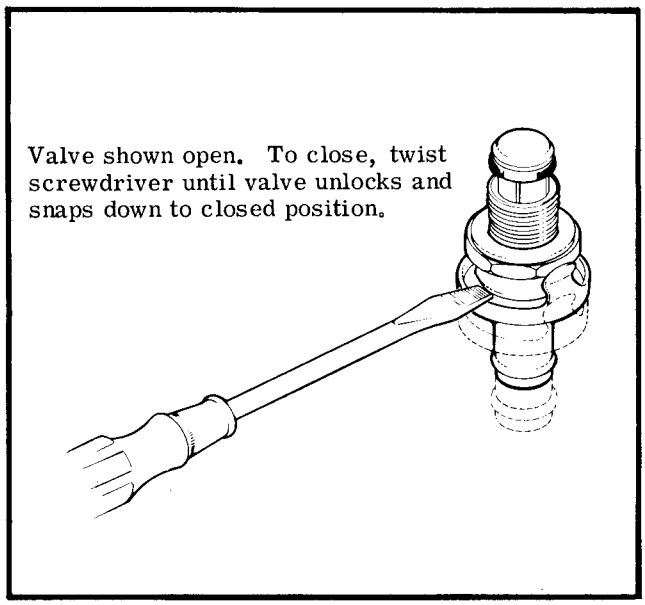


Figure 2-3. Quick-Drain Valve

Preventative Aircraft Engine Oil (MIL-C-6529, Type II, RUST BAN). If oil must be added during the first 25 hours, use only aviation grade straight mineral oil (non-detergent) conforming to Specification No. MIL-L-6082. After the first 25 hours of operation, drain engine oil sump and clean the oil suction strainer and pressure screen. If an external oil filter is installed change the oil filter. Refill sump with straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

When changing engine oil, if equipped with an external oil filter, install a new oil filter. An oil quick-drain valve may be installed. This valve provides a quicker and cleaner method of draining the engine oil. This valve is installed in the oil drain port of the oil sump and allows oil to be drained by attaching a hose over the fitting end and pushing up, causing the oil to drain through the hose into a container. To drain the engine oil, proceed as follows:

a. Operate engine until oil temperature is at normal operating temperature.

b. (With Quick-Drain Valve.) Attach a hose to the quick-drain valve in oil sump. Push up on quick-drain valve until it locks open, and allow oil to drain through hose into container.

c. (Without Quick-Drain Valve.) Remove oil drain plug from engine sump and allow oil to drain into a container.

d. After engine oil has drained, close quick-drain valve as shown in figure 2-3 and remove hose. Install and safety drain plug.

e. Change external oil filter if installed.

f. Service engine with correct quantity and grade of engine oil in accordance with figure 2-4.

NOTE

Refer to figure 2-4 for intervals for changing oil and filters.

SHOP NOTES:

2-22. ENGINE INDUCTION AIR FILTER. The induction air filter keeps dust and dirt from entering the induction system. The value of maintaining the air filter in a good clean condition can never be overstressed. More engine wear is caused through the use of a dirty or damaged air filter than is generally believed. The frequency with which the filter should be removed, inspected and cleaned will be determined primarily by aircraft operating conditions. A good general rule however, is to remove, inspect and clean the filter at least every 50 hours of engine operating time and more frequently if warranted by operating conditions. Some operators prefer to hold spare induction air filters at their home base of operation so that a clean filter is always readily available for use. Under extremely dusty conditions, daily servicing of the filter is recommended. To service the filter, proceed as follows:

a. Remove filter from aircraft.

NOTE

Use care to prevent damage to filter element when cleaning filter with compressed air.

b. Clean filter by blowing with compressed air (not over 100 psi) from direction opposite of normal air flow. Arrows on filter case indicate direction of normal air flow.

CAUTION

Do not use solvent or cleaning fluids to wash filter. Use only a water and household detergent solution when washing the filter.

c. After cleaning as outlined in step "b," the filter may be washed, if necessary, in a solution of warm water and a mild household detergent. A cold water solution may be used.

NOTE

The filter assembly may be cleaned with compressed air a maximum of 30 times or it may be washed a maximum of 20 times. A new filter should be installed after using 500 hours of engine operating time or one year, whichever should occur first. However, a new filter should be installed at anytime the existing filter is damaged. A damaged filter may have sharp or broken edges in the filtering panels which would allow unfiltered air to enter the induction system. Any filter that appears doubtful, shall have a new filter installed in its place.

d. After washing, rinse filter with clear water until rinse water draining from filter is clear. Allow water to drain from filter and dry with compressed air (not over 100 psi).

NOTE

The filtering panels of the filter may become distorted when wet, but they will return to their original shape when dry.

e. Be sure air box is clean, inspect filter. If filter is damaged, install a new filter.

f. Install filter at entrance to air box with gasket on aft face of filter frame and with air flow arrows on filter frame pointed in the correct direction.

2-23. VACUUM SYSTEM FILTER. The vacuum system central air filter keeps dirt and dust from entering the vacuum operated instruments. Change central air filter element every 500 hours of operating time and whenever suction gage reading drops below 4.6 inches of mercury. Also, do not operate the vacuum system with the filter removed, or a vacuum line disconnected as particles of dust or other foreign matter may enter the system and damage the gyros.

2-24. BATTERY. Battery servicing involves adding distilled water to maintain the electrolyte even with the horizontal baffle plate at the bottom of the filler holes, checking the battery cable connections, and neutralizing and cleaning off and spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and water to neutralize electrolyte or corrosion. Follow with a thorough flushing with water. Brighten cables and terminals with a wire brush, then coat with petroleum jelly before connecting. The battery box also should be checked and cleaned if any corrosion is noted. Distilled water, not acid or "rejuvenators," should be used to maintain electrolyte level. Check the battery every 50 hours (or at least every 30 days) oftener in hot weather. See Section 16 for detailed battery removal, installation and testing.

2-25. TIRES. Maintain tire pressure at the air pressures specified in figure 1-1. When checking tire pressure, examine tires for wear, cuts, bruises, and slippage. Remove oil, grease, and mud from tires with soap and water.

NOTE

Recommended tire pressures should be maintained. Especially in cold weather, remember that any drop in temperature of the air inside a tire causes a corresponding drop in air pressure.

2-26. NOSE GEAR SHOCK STRUT. The nose gear shock strut requires periodic checking to ensure that the strut is filled with hydraulic fluid and is inflated to the correct air pressure. To service the nose gear shock strut, proceed as follows:

a. Remove valve cap and release air pressure.

b. Remove valve housing.

c. Compress nose gear to its shortest length and fill strut with hydraulic fluid to the bottom of the filler hole.

d. Raise nose of aircraft, extend and compress strut several times to expel any entrapped air, then lower nose of aircraft and repeat step "c."

e. With strut compressed, install valve housing assembly.

f. With nose wheel off ground, inflate strut. Shock strut pressure is listed in Section 1.

NOTE

The nose landing gear shock strut will normally require only a minimum amount of service. Maintain the strut extension pressure, as shown in figure 1-1. Lubricate landing gear as shown in figure 2-5. Check the landing gear daily for general cleanliness, security of mounting, and for hydraulic fluid leakage. Keep machined surfaces wiped free of dirt and dust, using a clean lint-free cloth saturated with MIL-H-5606 hydraulic fluid or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-27. NOSE GEAR SHIMMY DAMPENER. The shimmy dampener should be serviced at least every 50 hours. The shimmy dampener must be filled completely with fluid, free of entrapped air, to serve its purpose. To service the shimmy dampener, proceed as follows:

a. Remove shimmy dampener from aircraft.

b. While holding the dampener in a vertical position with fitting end pointed downward, pull fitting end of the dampener shaft to its limit of travel.

c. While holding dampener in this position, fill dampener through open end of cylinder with hydraulic fluid.

d. Push the shaft upward slowly to seal off the filler hole.

e. Clean dampener with solvent. Be sure to keep the shaft protruding through the filler hole until dampener is installed on the aircraft.

f. Install dampener on aircraft.

NOTE

Keep the shimmy dampener, especially the exposed portions of the dampener piston shaft, clean to prevent collection of dust and grit which could cut the seals in the dampener barrel. Keep machined surfaces wiped free of dirt and dust, using a clean lint-free cloth saturated with MIL-H-5606 hydraulic fluid or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-28. HYDRAULIC BRAKE SYSTEMS. Check brake master cylinders and refill with hydraulic fluid as specified in the inspection charts. Bleed the brake system of entrapped air whenever there is a spongy response to the brake pedals. Refer to Section 5 for filling and bleeding of the brakes.

2-29. CLEANING.

2-30. Keeping the aircraft clean is important. Besides maintaining the trim appearance of the aircraft, cleaning lessens the possibility of corrosion and makes inspection and maintenance easier.

2-31. WINDSHIELD AND WINDOWS. Windshield and windows should be cleaned carefully with plenty of fresh water and a mild detergent, using the palm of the hand to feel and dislodge any caked dirt or mud. A sponge, soft cloth, or chamois may be used, but only as a means of carrying water to the plastic. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth as this builds up an electrostatic charge which attracts dust. Oil and grease may be removed by rubbing lightly with a soft cloth moistened with Stoddard solvent.

CAUTION

Do not use gasoline, alcohol, benzene, acetone, carbon tetrachloride, fire extinguisher fluid, de-icer fluid, lacquer thinner, or glass window cleaning spray. These solvents will soften and craze the plastic.

After washing, the plastic windshield and windows should be cleaned with an aircraft windshield cleaner. Apply the cleaner with soft cloths and rub with moderate pressure. Allow the cleaner to dry, then wipe it off with soft flannel cloths. A thin, even coat of wax, polished out by hand with soft flannel cloths, will fill in minor scratches and help prevent further scratching. Do not use a canvas cover on the windshield or windows unless freezing rain or sleet is anticipated since the cover may scratch the plastic surface.

2-32. PLASTIC TRIM. The instrument panel, plastic trim, and control knobs need only be wiped with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent. Volatile solvents, such as mentioned in paragraph 2-31, must never be used since they soften and craze the plastic.

2-33. PAINTED SURFACES. The painted exterior surfaces of the aircraft, under normal conditions, require a minimum of polishing and buffing. Approximately 15 days are required for acrylic or lacquer paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the aircraft. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by an experienced painter. Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or chamois. Harsh or abrasive soaps or detergents which could cause corrosion or make scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent. After the curing period, the aircraft may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wing and tail and on the engine nose cap will help reduce the abrasion encountered in these areas.

2-34. ALUMINUM SURFACES. The aluminum surfaces require a minimum of care, but should never be neglected. The aircraft may be washed with clean water to remove dirt and may be washed with non-alkaline grease solvents to remove oil and/or grease. Household type detergent soap powders are effective cleaners, but should be used cautiously since some of them are strongly alkaline. Many good aluminum cleaners, polishes, and waxes are available from

commercial suppliers of aircraft products.

2-35. ENGINE AND ENGINE COMPARTMENT. The engine should be kept clean since dirty cooling fins and baffle plates can cause overheating of the engine. Also, cleaning is essential to minimize any danger of fire and provide for easier inspection of components. The entire engine cowling may be removed to facilitate engine and interior cowl cleaning. Wash down the engine and components with a suitable solvent, such as Stoddard solvent or equivalent, then dry thoroughly with compressed air.

CAUTION

Particular care should be given to electrical equipment before cleaning. Solvent should not be allowed to enter magnetos, starters, alternators, voltage regulators, and the like. Hence, these components should be protected before saturating the engine with solvent. Any fuel, oil, and air openings should be covered before washing the engine with solvent. Caustic cleaning solutions should not be used. After cleaning engine, re-lubricate all control arms and moving parts.

2-36. UPHOLSTERY AND INTERIOR. Keeping the upholstery and interior trim clean prolongs upholstery fabric and interior trim life. To clean the interior proceed as follows:

a. Empty all ash trays and refuse containers.

b. Brush or vacuum clean the upholstery and carpet to remove dust and dirt.

c. Wipe leather and plastic trim with a damp cloth.

d. Soiled upholstery fabrics and carpet may be cleaned with a foam-type detergent used according to the manufacturer's instructions.

e. Oil spots and stains may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place in the fabric to be cleaned. Never saturate the fabric with volatile solvent; it may damage the padding and backing material.

f. Scrape sticky material from fabric with a dull knife, then spot clean the area.

2-37. PROPELLER. Wash hub and blade with a soft cloth and Stoddard cleaning solvent or equivalent, then dry thoroughly with compressed air. The propeller should be wiped occasionally with an oily cloth, then wiped with a dry cloth. In salt water areas this will assist in corrosion proofing the propeller.

2-38. WHEELS. The wheels should be washed periodically and examined for corrosion, chipped paint, and cracks or dents in the wheel halves or in the flanges or hubs. If defects are found remove and repair in accordance with Section 5. Discard cracked wheel halves, flanges or hubs and install new parts.

2-39. LUBRICATION.

2-40. Lubrication requirements are shown in figure 2-5. Before adding grease to grease fittings, wipe dirt from fitting. Lubricate until grease appears around parts being lubricated, and wipe excess grease from parts. The following paragraphs supplement figure 2-5 by adding details.

2-41. WHEEL BEARINGS. Clean and repack the wheel bearings at first 100-hour inspection and at each 500-hour inspection thereafter. If more than the usual number of take-offs and landings are made, extensive taxiing is required, or the aircraft is operated in dusty areas or under seacoast conditions, cleaning and lubrication of the wheel bearings shall be accomplished at each 100-hour inspection.

2-42. NOSE GEAR TORQUE LINKS. Lubricate nose gear torque links every 50 hours. When operating in dusty conditions, more frequent lubrication is required.

2-43. WING FLAP ACTUATOR. Clean and lubricate wing flap actuator jack screw each 100 hours as follows:

a. Expose jack screw by operating flaps to full-down position.

b. Clean jack screw threads with solvent rag and dry with compressed air.

NOTE

It is not necessary to remove actuator from aircraft to clean or lubricate threads.

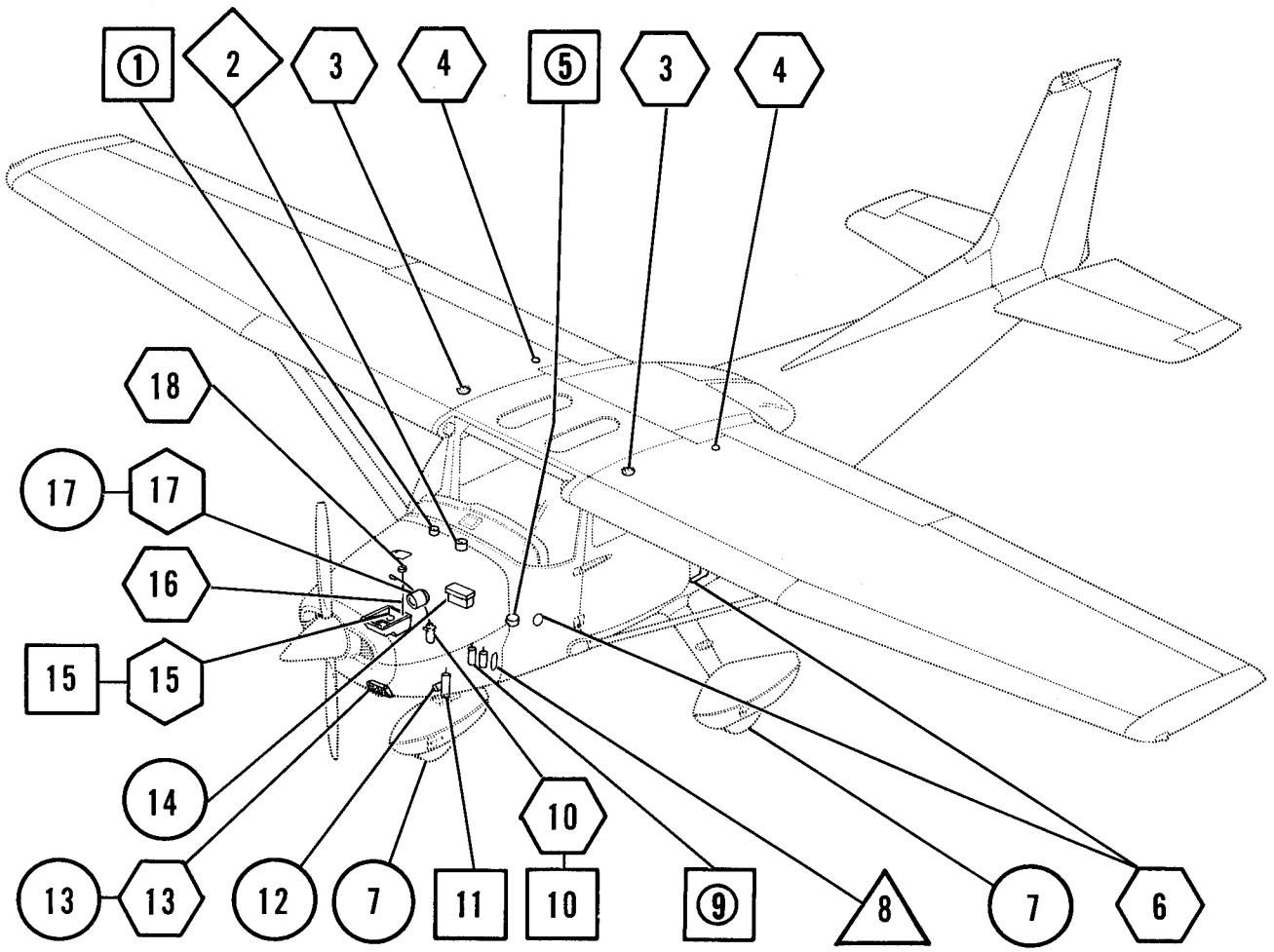
c. With oil can, apply light coat of No. 10 weight, non-detergent oil to threads of jack screw.

2-44. FUEL SELECTOR VALVE. At each 100 hour inspection, check the fuel selector valve and drive shaft for the following:

a. Valve control detent plate for cleanliness and excessive wear. Dirt accumulation on this plate can cause binding, poor detent feel and rapid wear of the plate.

b. All drive shaft attach points for security, binding, excessive wear and lubrication, if required.

c. Operate valve handle through all positions and check for proper operation, detent feel and freedom of movement.



HYDRAULIC FLUID:
SPEC. NO. MIL-H-5606

Refer to Sheet 2 for Fuel and Oil Specifications.

Figure 2-4. Servicing (Sheet 1 of 4)

SPECIFIED AVIATION GRADE FUELS:

WARNING

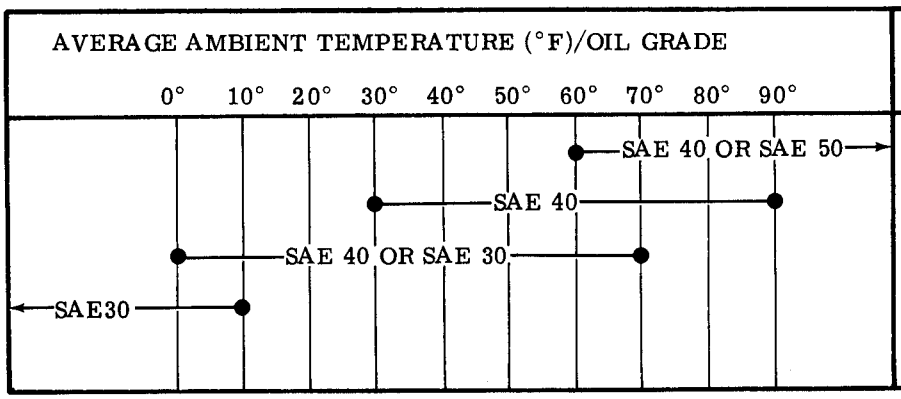
ONLY AVIATION GRADE FUELS ARE APPROVED FOR USE.

ENGINE MODEL	APPROVED FUEL GRADES	NOTE
LYCOMING O-320-H	100LL (blue)	1
	100 (green) (formerly 100/130)	1

NOTE

1. Compliance with Avco Lycoming Service Instruction No. 1070J, and all revisions thereto, must be accomplished.

SPECIFIED AVIATION GRADE OIL:



NOTE

The overlap of oil grades is based on a mid-range of ambient ground temperatures vs. maximum oil inlet temperature. Aviation Grade ashless dispersant oil conforming to Avco Lycoming Specification No. 301, and all revisions and supplements thereto, MUST BE USED except as noted in paragraph 2-21 herein. Refer to the latest Revision of Avco Lycoming Service Instruction No. 1014, and any applicable Service Bulletins or Service Letters, for further recommendations.

Oil capacities for the aircraft are given in the following chart. To minimize loss of oil through the breather, fill to specified oil level on dipstick for normal operation (flight of less than three hours duration). For extended flight, fill to FULL mark on dipstick. Do not operate with less than MINIMUM FOR FLIGHT quantities listed. If an external oil filter is installed, one additional quart of oil is required when filter is changed.

CAPACITY (TOTAL)	CAPACITY (TOTAL WITH FILTER)	NORMAL OPERATION	MINIMUM FOR FLIGHT
6	7	5	4

Figure 2-4. Servicing (Sheet 2 of 4)

DAILY

3 FUEL TANK FILLER
Service after each flight. Keep full to retard condensation. Refer to paragraph 2-18 for details.

4 FUEL TANK SUMP DRAINS
Drain off any water and sediment before first flight of the day.

6 PITOT AND STATIC PORTS
Check for obstructions before first flight of the day.

10 FUEL STRAINER
Drain off any water and sediment before the first flight of the day. Refer to paragraph 2-19 for details.

13 INDUCTION AIR FILTER
Inspect and service under dusty conditions. Refer to paragraph 2-22 for details.

16 OIL DIPSTICK
Check oil on preflight. Add oil as necessary. Refer to paragraph 2-21 for details.

18 OIL FILLER CAP:
Whenever oil is added, check that filler cap is tight and oil filler door is secure.

FIRST 25 HOURS

15, 17 ENGINE OIL SYSTEM
Refill with straight mineral oil (non-detergent) and use until a total of 50 hours has accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Refer to paragraph 2-21 for details.

50 HOURS

13 INDUCTION AIR FILTER
Clean filter per paragraph 2-22. Replace as required.

14 BATTERY
Check electrolyte level and clean battery compartment each 50 hours or each 30 days.

15 17 ENGINE OIL SYSTEM
Change oil each 50 hours if engine is NOT equipped with external oil filter. If engine is equipped with external oil filter, change filter each 50 hours and oil at each 100 hours, or every six months.

12 SHIMMY DAMPENER
Check fluid level and refill as required with hydraulic fluid. Refer to paragraph 2-27.

7 TIRES
Maintain correct tire pressure as listed in figure 1-1. Also refer to paragraph 2-25 for details.

Figure 2-4 Servicing (Sheet 3 of 4)

50 HOURS (Cont)

11 NOSE GEAR SHOCK STRUT
Keep strut filled and inflate to correct pressure. Refer to paragraph 2-26 for details.

100 HOURS

10 FUEL STRAINER
Disassemble and clean strainer bowl and screen.

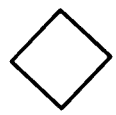
15,17 ENGINE OIL SYSTEM
If engine is equipped with external oil filter, change oil (and filter) every 100 hours, or every six months, whichever comes first.

200 HOURS

1 VACUUM RELIEF FILTER
Change each 1000 hours, or to coincide with engine overhauls.

5 SELECTOR VALVE DRAIN
Remove plug and drain off any water or sediment. Also refer to paragraph 2-19.

9 BRAKE MASTER CYLINDERS
Check fluid level and refill as required with hydraulic fluid. Refer to paragraph 2-28.



500 HOURS

2 VACUUM SYSTEM CENTRAL AIR FILTER
Replace every 500 hours.

AS REQUIRED

8 GROUND SERVICE RECEPTACLE
Connect to 12-volt DC, negative-ground power unit. Refer to paragraph 11-67 for details.

Figure 2-4. Servicing (Sheet 4 of 4)

FREQUENCY (HOURS)

50 | 100 | 500 | 1000

METHOD OF APPLICATION

HAND | GREASE GUN | OIL CAN | SYRINGE (FOR POWDERED GRAPHITE)

WHERE NO INTERVAL IS SPECIFIED, LUBRICATE AS REQUIRED AND WHEN ASSEMBLED OR INSTALLED.

NOTE

The military specifications listed are not mandatory, but are intended as guides in choosing satisfactory materials. Products of most reputable manufacturers meet or exceed these specifications.

LUBRICANTS

PG —	SS-G-659	POWDERED GRAPHITE
GR —	MIL-G-81322A	GENERAL PURPOSE GREASE
GH —	MIL-G-23827A	AIRCRAFT AND INSTRUMENT GREASE
GL —	MIL-G-21164C	MOLYBDENUM DISLULFIDE GREASE
OG —	MIL-L-7870A	GENERAL PURPOSE OIL
PL —	VV-P-236	PETROLATUM
GS —	MIL-S-8660	DC4 DOW CORNING
GP —		NO. 10-WEIGHT, NON-DETERGENT OIL

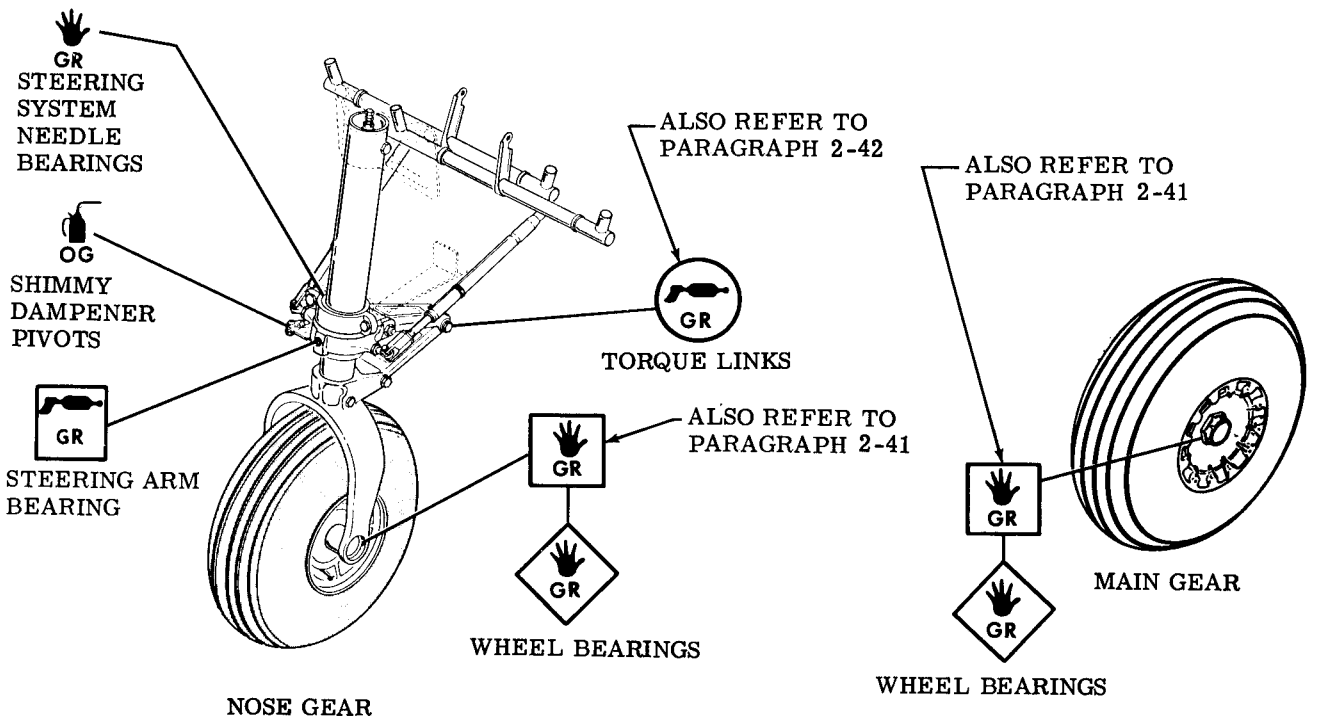


Figure 2-5. Lubrication (Sheet 1 of 3)

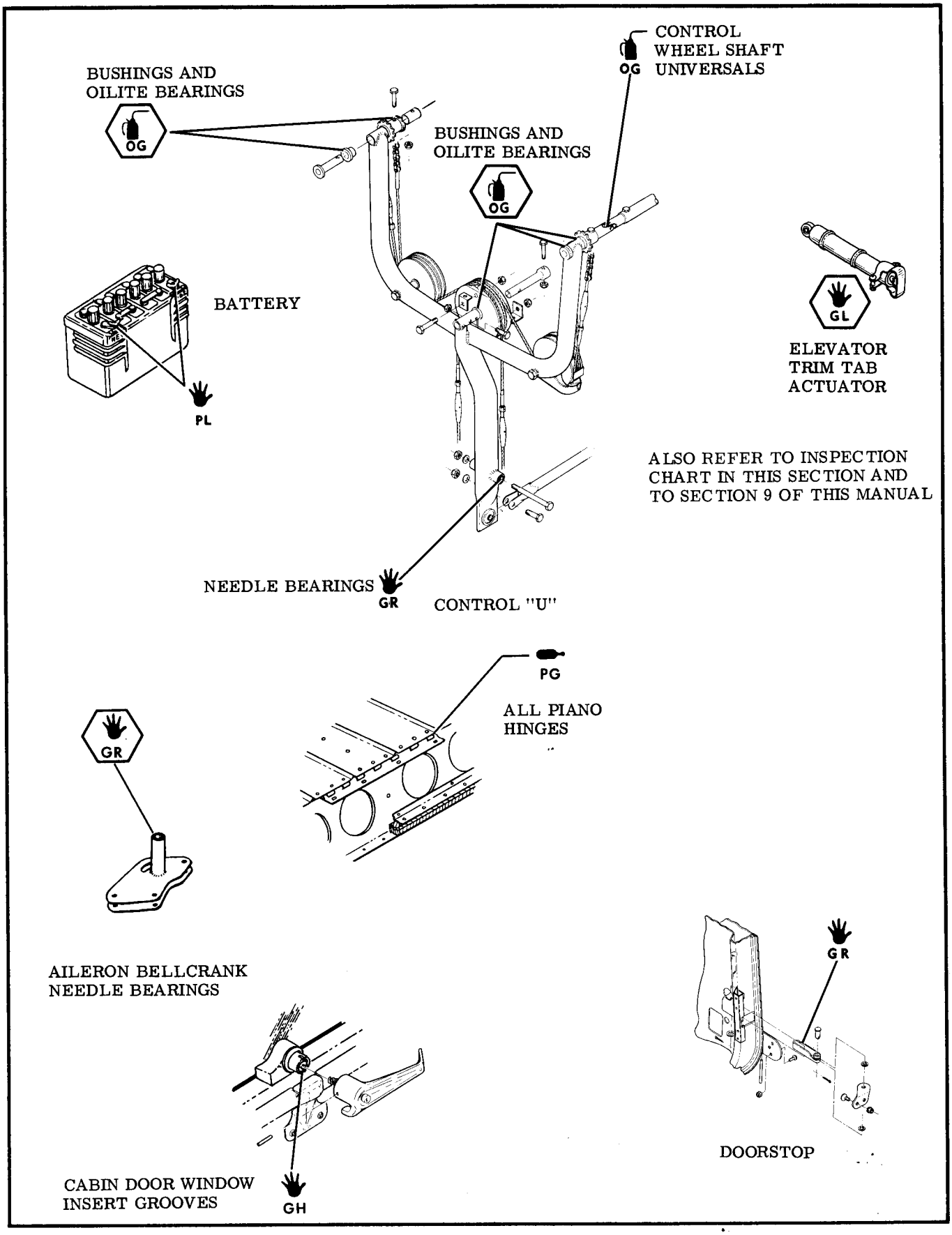
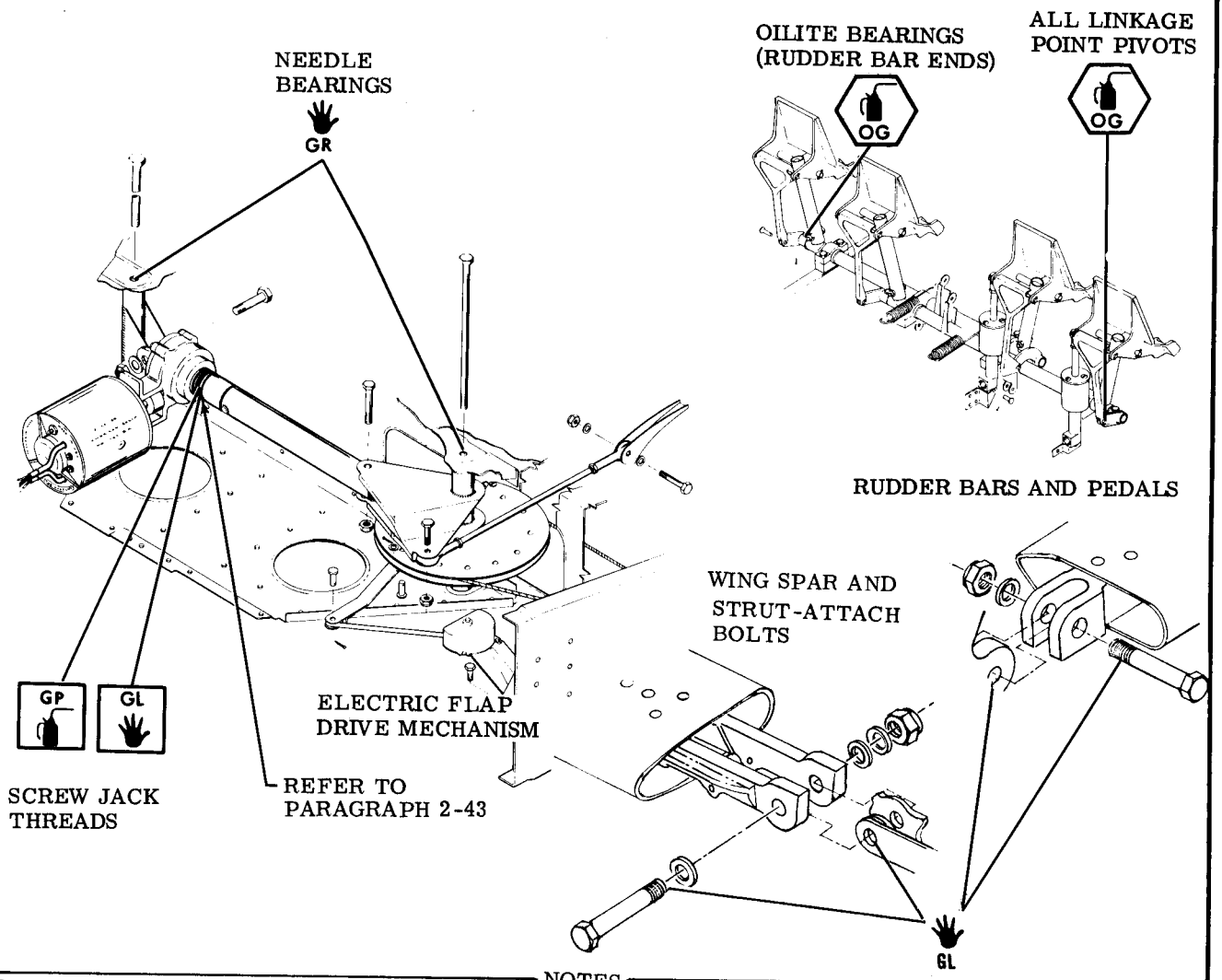


Figure 2-5. Lubrication (Sheet 2 of 3)



NOTES

Sealed bearings require no lubrication.

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 and hinge points, and any other friction point obviously needing lubrication, with general purpose oil every 1000 hours or oftener if required.

Paraffin wax rubbed on seat rails will ease sliding the seats fore and aft.

Lubricate door latching mechanism with MIL-G-81322A general purpose grease, applied sparingly to friction points, every 1000 hours or oftener, if binding occurs. No lubrication is recommended on the rotary clutch.

Figure 2-5. Lubrication (Sheet 3 of 3)

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 AIRCRAFT INSPECTION every 100 hours of operation.

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

Therefore, the Cessna Aircraft Company recommends PROGRESSIVE CARE for aircraft that are being flown 200 hours or more per year, and the 100 HOUR inspection for all other aircraft.

II INSPECTION CHARTS.

The following 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. An inspection conducted at 200 hour intervals would likewise include the 50 hour items and 100 hour items in addition to those at EACH 200 HOURS.

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 operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 100 hours and each 12 calendar months of operation. 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 (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. (Also refer to Section 11 of this Manual.)
3. Magneto drop. (Also refer to Section 11 of this Manual.)
4. Engine response to changes in power.
5. Any unusual engine noises.
6. Fuel selector and/or shut-off valve; operate engine(s) on each tank (or cell) position and OFF position long enough to ensure shut-off 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.

SHOP NOTES:

	SPECIAL INSPECTION ITEM	EACH 200 HOURS	EACH 100 HOURS	EACH 50 HOURS

IMPORTANT

READ ALL INSPECTION REQUIREMENTS PARAGRAPHS PRIOR TO USING THESE CHARTS.

PROPELLER

1.	Spinner			●	
2.	Spinner bulkhead		●		
3.	Blades			●	
4.	Bolts and/or nuts		●		
5.	Hub		●		

ENGINE COMPARTMENT

Check for evidence of oil and fuel leaks, then clean entire engine and compartment, if needed, prior to inspection.

1.	Engine oil, screen, filler cap, dipstick, drain plug and external oil filter			●	1
2.	Oil cooler		●		
3.	Induction air filter			●	2
4.	Induction airbox, air valves, doors and controls		●		
5.	Cold and hot air hoses		●		
6.	Engine baffles			●	
7.	Cylinders, rocker box covers and push rod housing		●		
8.	Crankcase, oil sump, accessory section and front crankshaft seal		●		
9.	Hoses, metal lines and fittings			●	3
10.	Intake and exhaust systems			●	4
11.	Ignition harness		●		
12.	Spark plugs		●		
13.	Compression check		●		
14.	Crankcase and vacuum system breather lines		●		
15.	Electrical wiring		●		
16.	Vacuum pump and oil separator		●		
17.	Vacuum relief valve filter (cabin area)		●		5
18.	Engine controls and linkage			●	6
19.	Engine shockmounts, mount structure and ground straps		●		
20.	Cabin heat valves, doors and controls		●		
21.	Starter, solenoid and electrical connections		●		

	SPECIAL INSPECTION ITEM	EACH 200 HOURS	EACH 100 HOURS	EACH 50 HOURS
22. Starter brushes, brush leads and commutator		●		
23. Alternator and electrical connections			●	
24. Alternator brushes, brush leads, commutator or slip rings	7			
25. Voltage regulator mounting and electrical leads			●	
26. Magnetos (externally) and electrical connections			●	
27. Magneto timing	8			
28. Carburetor and drain plug			●	
29. Firewall		●		
30. Engine cowling				●
FUEL SYSTEM				
1. Fuel strainer, drain valve and control				●
2. Fuel strainer screen and bowl			●	
3. Fuel tank vents, caps and placards				●
4. Fuel tanks, sump drains and fuel line drains		●		
5. Drain fuel and check tank interior, attachment and outlet screens	5			
6. Fuel vent valves		●		
7. Fuel vent line drain		●		
8. Fuel selector valve and placards				●
9. Fuel valve drain plug		●		
10. Engine primer			●	
LANDING GEAR				
1. Main gear wheels and fairings				●
2. Nose gear wheel, torque links, steering rods, boots and fairing				●
3. Wheel bearings	9			
4. Nose gear strut and shimmy dampener (service as required)				●
5. Tires				●
6. Brake fluid, lines and hoses, linings, discs, brake assemblies and master cylinders		●		
7. Parking brake system		●		

	SPECIAL INSPECTION ITEM	EACH 200 HOURS	EACH 100 HOURS	EACH 50 HOURS
8. Main gear springs		●		
9. Steering arm lubrication			●	
10. Torque link lubrication				●
11. Park brake and toe brakes - operational check				●
AIRFRAME				
1. Aircraft exterior				●
2. Aircraft structure		●		
3. Windows, windshield, doors and seals				●
4. Seat belts and shoulder harnesses				●
5. Seat stops, seat rails, upholstery, structure and mounting		●		
6. Control "U" bearings, sprockets, pulleys, cables, chains and turnbuckles		●		
7. Control lock, control wheel and control "U" mechanism		●		
8. Instruments and markings				●
9. Gyros central air filter	10	●		
10. Magnetic compass compensation	5			
11. Instrument wiring and plumbing		●		
12. Instrument panel, shockmounts, ground straps, cover, decals and labeling		●		
13. Defrosting, heating and ventilating systems and controls				●
14. Cabin upholstery, trim, sunvisors and ash trays		●		
15. Area beneath floor, lines, hoses, wires and control cables		●		
16. Lights, switches, circuit breakers, fuses and spare fuses				●
17. Exterior lights				●
18. Pitot and static systems		●		
19. Stall warning system		●		
20. Radios, radio controls, avionics and flight instruments				●
21. Antennas and cables		●		
22. Battery, battery box and battery cables				●
23. Battery electrolyte	11			
24. Emergency locator transmitter	12		●	

CONTROL SYSTEMS

In addition to the items listed below, always check for correct direction of movement, correct travel and correct cable tension.

		SPECIAL INSPECTION ITEM	EACH 200 HOURS	EACH 100 HOURS	EACH 50 HOURS
1.	Cables, terminals, pulleys, pulley brackets, cable guards, turnbuckles and fairleads			●	
2.	Chains, terminals, sprockets and chain guards			●	
3.	Trim control wheels, indicators, actuator and bungee				●
4.	Travel stops			●	
5.	Decals and labeling			●	
6.	Flap control switch, flap rollers and tracks and flap indicator				●
7.	Flap motor, transmission, limit switches, structure, linkage, bellcranks, etc.			●	
8.	Elevator and trim tab hinges, tips and control rods				●
9.	Elevator trim tab actuator lubrication and tab free-play inspection.	13			
10.	Rudder pedal assemblies and linkage			●	
11.	Skins (external) of control surfaces and tabs				●
12.	Internal structure of control surfaces			●	
13.	Balance weight attachment			●	
14.	Flap actuator jack screw threads	14			

SPECIAL INSPECTION ITEMS

1 First 25 hours: Refill with straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Change filter each 50 hours and oil at each 100 hours; or every six months, whichever comes first.

2 Clean filters per paragraph 2-22. Replace as required.

3 Replace hoses at engine overhaul or after 5 years, whichever comes first.

4 General inspection every 50 hours. Refer to Section 11 for 100 hour inspection.

5 Each 1000 hours, or to coincide with engine overhauls.

6 Each 50 hours for general condition and freedom of movement. These controls are not repairable. Replace as required at each engine overhaul.

7 Each 500 hours

8 INTERNAL TIMING AND MAGNETO-TO-ENGINE TIMING: First 25 hours, first 50 hours, first 100 hours and thereafter at each 100 hours, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. If magneto-to-engine timing is correct within plus zero degrees and minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine.

9 First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.

10 Replace each 500 hours.

11 Check electrolyte level and clean battery compartment each 50 hours or each 30 days.

12 Refer to Section 16 of this Manual.

13 Lubrication is required of the actuator each 1000 hours and/or 3 years, whichever comes first. Refer to figure 2-5 for grease specification.

Refer to Section 9 of this Manual for free-play limits, inspection, replacement and/or repair.

14 Refer to paragraph 2-43 for detailed instructions.

SECTION 3

FUSELAGE

TABLE OF CONTENTS

3-1. FUSELAGE.

3-2. WINDSHIELD AND WINDOWS.

3-3. DESCRIPTION. The windshield and windows are single-piece acrylic plastic panels set in sealing strips and held by formed retaining strips secured to the fuselage with screws and rivets. Presstite No. 579.6 sealing compound used in conjunction with a felt seal is applied to all edges of the windshield and windows with exception of wing root area. The wing root fairing has a heavy felt strip that completes the windshield sealing.

3-4. CLEANING. (Refer to Section 2.)

3-5. WAXING. Waxing will fill in minor scratches in clear plastic and help protect the surface from further abrasion. Use a good grade of commercial wax applied in a thin, even coat. Bring wax to a high polish by rubbing lightly with a clean, dry flannel cloth.

3-6. REPAIRS. Damaged window panels and windshield may be removed and replaced if damage is extensive. However, certain repairs as prescribed in the following paragraphs can be made successfully without removing damaged part from aircraft. Three types of temporary repairs for cracked plastic are possible. No repairs of any kind are recommended on highly-stressed or compound curves where repair would be likely to affect pilot's field of vision. Curved areas are more difficult to repair than flat areas and any repaired area is both structurally and optically inferior to the original surface.

3-7. SCRATCHES. Scratches on clear plastic surfaces can be removed by hand-sanding operations followed by buffing and polishing, if steps below are followed carefully.

a. Wrap a piece of No. 320 (or finer) sandpaper or abrasive cloth around a rubber pad or wood block. Rub surface around scratch with a circular motion, keeping abrasive constantly wet with clean water to prevent scratching surface further. Use minimum pressure and cover an area large enough to prevent formation of "bull's-eyes" or other optical distortions.

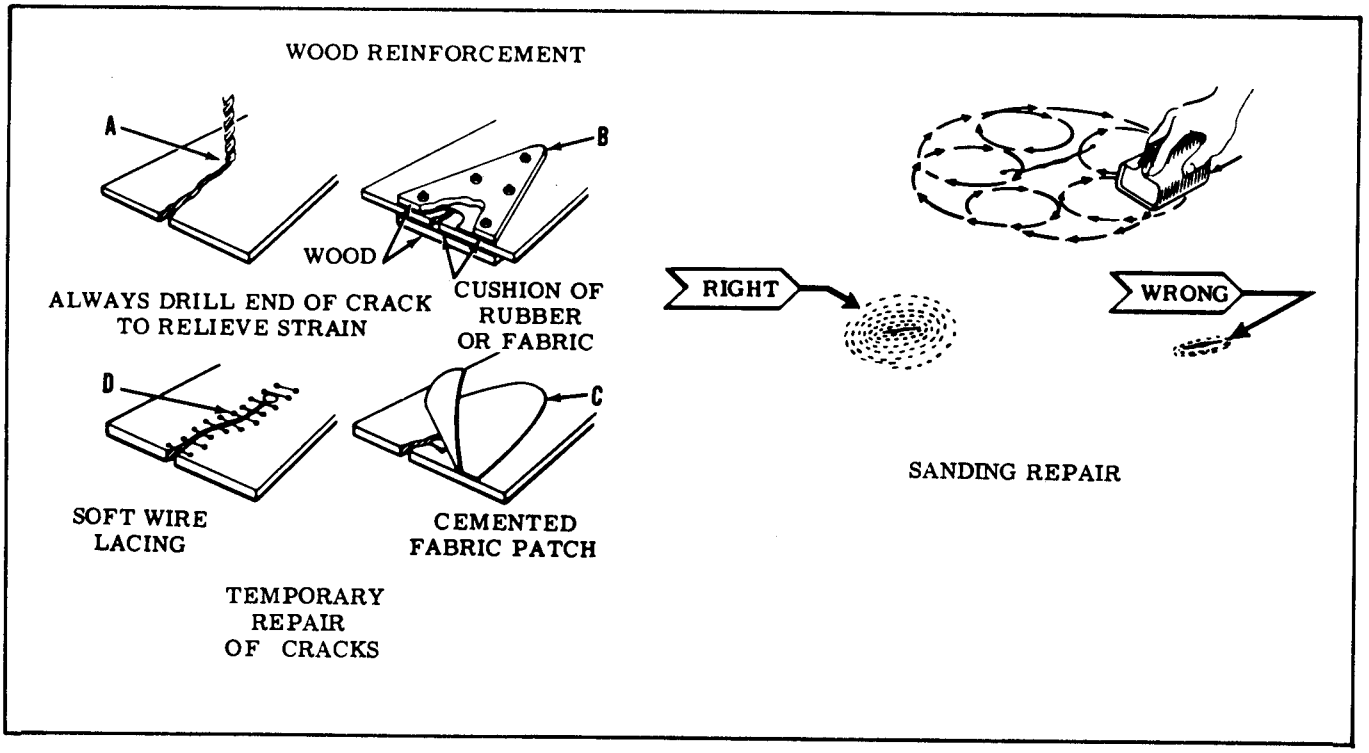


Figure 3-1. Repair of Windshield and Windows

CAUTION

Do not use a coarse grade of abrasive. No. 320 is of maximum coarseness.

b. Continue sanding operation, using progressively finer grade abrasives until scratches disappear.

c. When scratches have been removed, wash area thoroughly with clean water to remove all gritty particles. The entire sanded area will be clouded with minute scratches which must be removed to restore transparency.

d. Apply fresh tallow or buffing compound to a motor-driven buffing wheel. Hold wheel against plastic surface, moving it constantly over damaged area until cloudy appearance disappears. A 2000-foot-per-minute surface speed is recommended to prevent overheating and distortion. (Example: 750 rpm polishing machine with a 10 inch buffing bonnet.)

NOTE

Polishing can be accomplished by hand but will require a considerably longer period of time to attain the same result as produced by a buffing wheel.

e. When buffing is finished, wash area thoroughly and dry with a soft flannel cloth. Allow surface to cool and inspect area to determine if full transparency has been restored. Apply a thin coat of hard wax and polish surface lightly with a clean flannel cloth.

NOTE

Rubbing plastic surface with a dry cloth will build up an electrostatic charge which attracts dirt particles and may eventually cause scratching of surface. After wax has hardened, dissipate this charge by rubbing surface with a slightly damp chamois. This will also remove dust particles which have collected while wax is hardening.

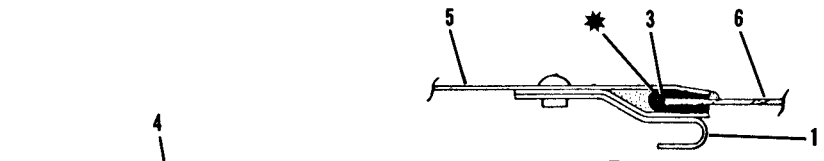
f. Minute hairline scratches can often be removed by rubbing with commercial automobile body cleaner or fine-grade rubbing compound. Apply with a soft, clean, dry cloth or imitation chamois.

3-8. CRACKS. (Refer to figure 3-1.)

a. When a crack appears, drill a hole at end of crack to prevent further spreading. Hole should be approximately 1/8 inch in diameter, depending on length of crack and thickness of material.

b. Temporary repairs to flat surfaces can be accomplished by placing a thin strip of wood over each side of surface and inserting small bolts through wood and plastic. A cushion of sheet rubber or aircraft fabric should be placed between wood and plastic on both sides.

c. A temporary repair can be made on a curved surface by placing fabric patches over affected areas. Secure patches with aircraft 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 patch.



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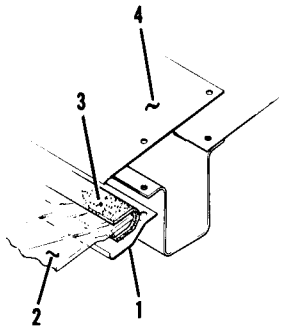
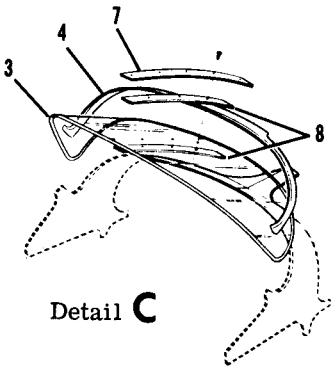


Detail **A**

NOTE

✸ Prestite No. 579.6 sealer and EC-1202 reinforced tape sealant should be applied to over-head cabin windows.



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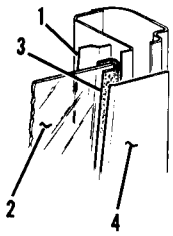

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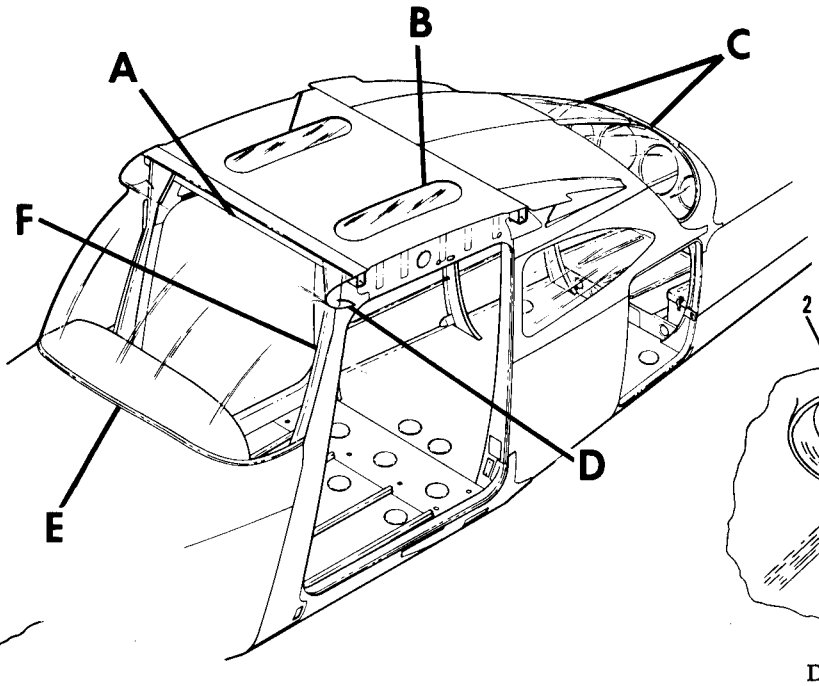

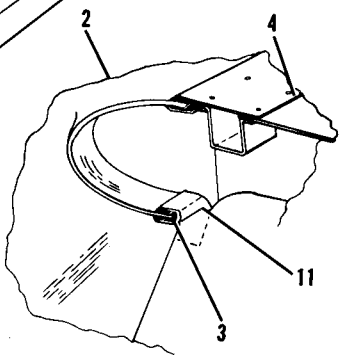

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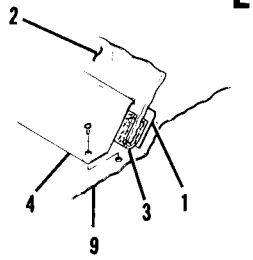
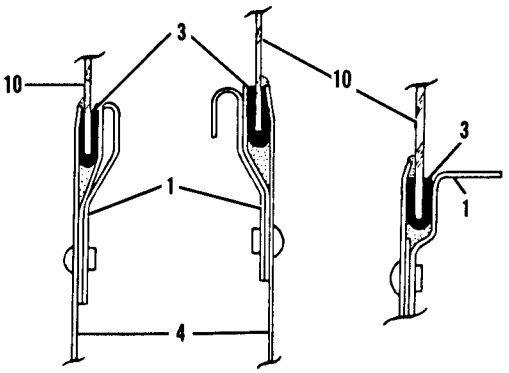


Detail **E**

NOTE

Presstite No. 579.6 sealer should be applied to all edges of windshield and windows when felt sealing strip (3) is used.



TYPICAL METHODS OF RETAINING FIXED WINDOWS

1. Inner Retainer
2. Windshield
3. Felt Seal
4. Outer Retainer
5. Cabin Top Skin
6. Overhead Cabin Window
7. External Centerstrip
8. Rear Window Sealer
9. Fuselage Structure
10. Window
11. Cover

Figure 3-2. Windshield and Fixed Window Installation

d. A temporary repair can be made by drilling small holes along both sides of crack 1/4 to 1/8 inch apart and lacing edges together with 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, panel should be replaced.

3-9. WINDSHIELD. (Refer to figure 3-2.)

3-10. REMOVAL.

a. Drill out rivets securing front retainer strip.
b. Remove wing fairings over windshield edges.
c. Pull windshield straight forward, out of side and top retainers. Remove top retainer if necessary.

3-11. INSTALLATION.

a. Apply felt strip and sealing compound or sealing tape to all edges of windshield to prevent leaks.
b. Reverse steps in preceding paragraph for installation.
c. When installing a new windshield, check fit and carefully file or grind away excess plastic.
d. Use care not to crack windshield when installing. If not previously removed, top retainer may be removed if necessary. Starting at upper corner and gradually working windshield into position is recommended.

NOTE

Screws and self-locking nuts may be used instead of rivets which fasten front retaining strip to cowl deck. If at least No. 6 screws are used, no loss of strength will result.

3-12. WINDOWS.

3-13. MOVABLE. (Refer to figure 3-3.) A movable window, hinged at the top, is installed in the left cabin door.

3-14. REMOVAL AND INSTALLATION.

a. Disconnect window stop (5).
b. Remove pins from window hinges (6).
c. Reverse preceding steps for installation. To remove frame from plastic panel, drill out blind rivets at frame splice. When replacing plastic panel in frame, ensure sealing strip and an adequate coating of Presstite No. 579.6 sealing compound is used around all edges of panel.

3-15. WRAP-AROUND REAR. (Refer to figure 3-2.) The rear window is a one-piece acrylic plastic panel set in sealing strips and held in place by retaining strips.

3-16. REMOVAL AND INSTALLATION.

a. Remove external centerstrip (7).
b. Remove upholstery as necessary to expose retainer strips inside cabin.
c. Drill out rivets as necessary to remove outer retainer strip along aft edge of window.
d. Remove window by lifting aft edge and pulling window aft. If difficulty is encountered, rivets securing retainer strips inside cabin may also be

SHOP NOTES:

drilled out and retainer strips loosened or removed.
e. Reverse preceding steps for installation. Apply felt strip and sealing compound to all edges of window to prevent leaks. Check fit and carefully file or grind away excess plastic. Use care not to crack plastic when installing.

3-17. OVERHEAD. (Refer to figure 3-2.) Overhead cabin windows, located in the cabin top, may be installed. These windows are one-piece acrylic plastic panels set in sealing strips and held in place by retaining strips.

3-18. REMOVAL AND INSTALLATION.
a. Remove headliner and trim panels.
b. Drill out rivets as necessary to remove retainer strips.
c. Reverse preceding steps for installation. Apply felt strip and sealing compound to all edges of window to prevent leaks. Check fit and carefully file or grind away excess plastic. Use care not to crack plastic when installing.

3-19. FIXED. (Refer to figure 3-2.) Fixed windows, mounted in sealing strips and sealing compound, are held in place by various retainer strips. To replace side windows, remove upholstery and trim panels as necessary and drill out rivets securing retainers. Apply felt strip and sealing compound to all edges of window to prevent leaks. Check fit and file or grind away excess plastic. Use care not to crack plastic when installing.

3-20. CABIN DOORS. (Refer to figure 3-3.)

3-21. DESCRIPTION. A cabin door is installed on each side of the aircraft consisting of a sheet outer skin chemically bonded to a formed inner pan assembly. To this rigid structure are attached the door latch assembly, a remote inside handle, a pair of external hinges and an integral doorstop assembly. A openable window is installed on the LH door and may also be optionally installed on the RH door.

3-22. REMOVAL AND INSTALLATION. Removal of cabin doors is accomplished either by removing screws attaching the door hinges or by removing hinge pins.

NOTE

Ensure clevis pin (index 21, figure 3-3) is removed before removing door.

During reinstallation permanent-type hinge pins may be replaced with clevis pins secured with cotter pins.

3-23. ADJUSTMENT. Cabin doors should be adjusted so that door skin fairs smoothly with fuselage skin. Slots at door latch plate permit re-positioning of latch assembly and hence bolt engagement with rotary clutch on door post. If fitting a new door assembly, some trimming of door flange may be necessary but gap between door skin and fuselage skin should be .09 inch or less.

CAUTION

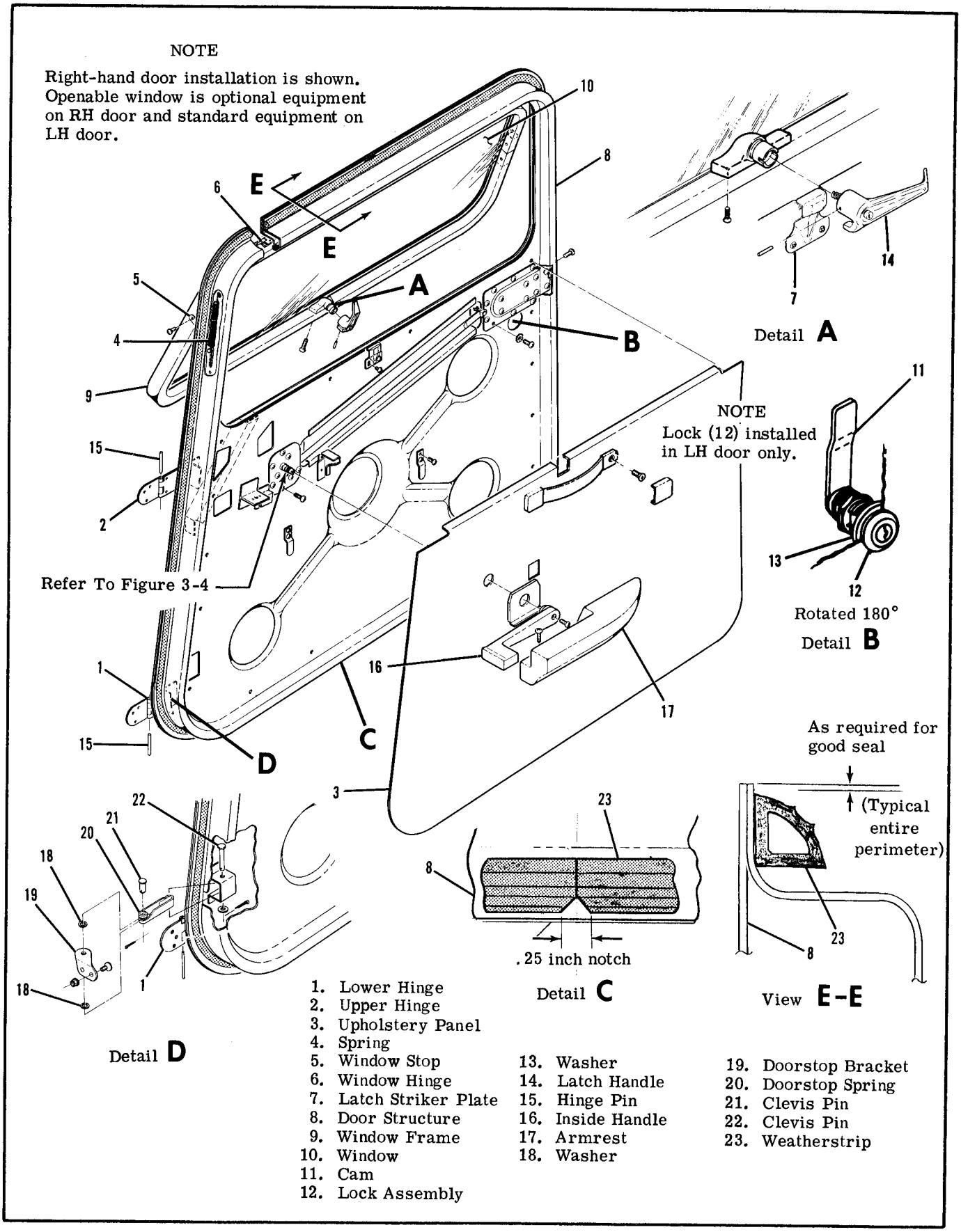
Reforming of bonded door flange by striking with soft mallet etc. is NOT permissible due to possible damage to bonded areas.

3-24. CABIN DOOR WEATHERSTRIP. A hollow fluted-type, rubber weatherstrip is cemented around all edges of the cabin door. When replacing weatherstrip, ensure that contact surfaces are clean and dry. Cut new weatherstrip to length using old weatherstrip as a guide. Cut small notch in butt ends of new weatherstrip to allow for drainage. Position splice with notch at door low point and apply a thin, even coat of EC-880 adhesive (3-M Company) or equivalent to both surfaces. Allow to dry until tacky before pressing into place on door. Do not stretch weatherstrip around door corners.

3-25. LATCHES. (Refer to figure 3-4.)

3-26. DESCRIPTION. The cabin door latch is a push-pull bolt type, utilizing a rotary clutch for posi-

SHOP NOTES:



1. Lower Hinge
2. Upper Hinge
3. Upholstery Panel
4. Spring
5. Window Stop
6. Window Hinge
7. Latch Striker Plate
8. Door Structure
9. Window Frame
10. Window
11. Cam
12. Lock Assembly
13. Washer
14. Latch Handle
15. Hinge Pin
16. Inside Handle
17. Armrest
18. Washer
19. Doorstop Bracket
20. Doorstop Spring
21. Clevis Pin
22. Clevis Pin
23. Weatherstrip

Figure 3-3. Cabin Door Installation

1. Bearing Assembly
2. Nut
3. Spacer
4. Push-Pull Rod
5. Base Plate
6. Roll Pin
7. Bolt
8. Housing
9. Outside Handle
10. Spring
11. Support
12. Shaff Assembly
13. Screw
14. Upholstery Panel
15. Armrest
16. Screw
17. Inside Handle
18. Placard

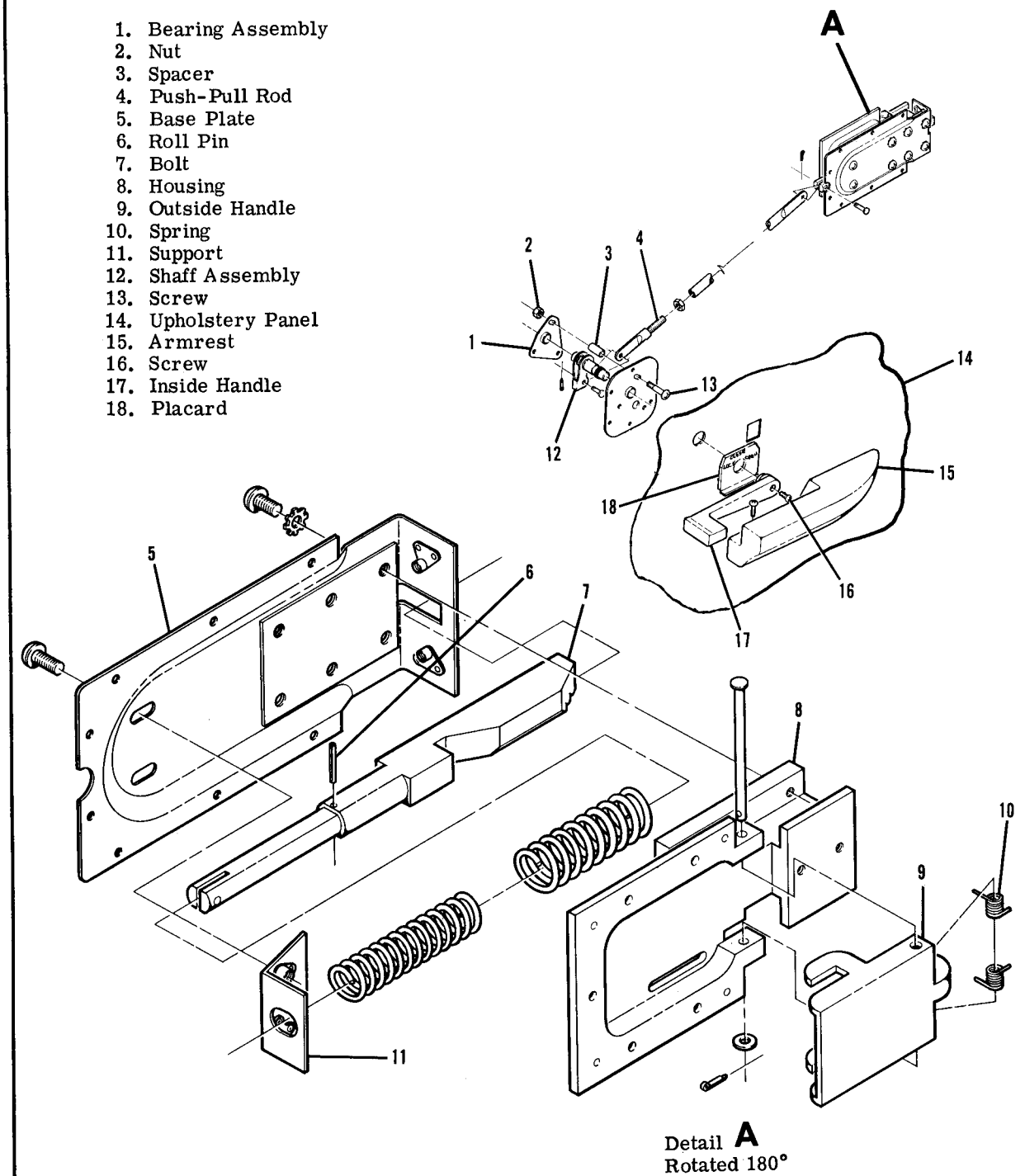
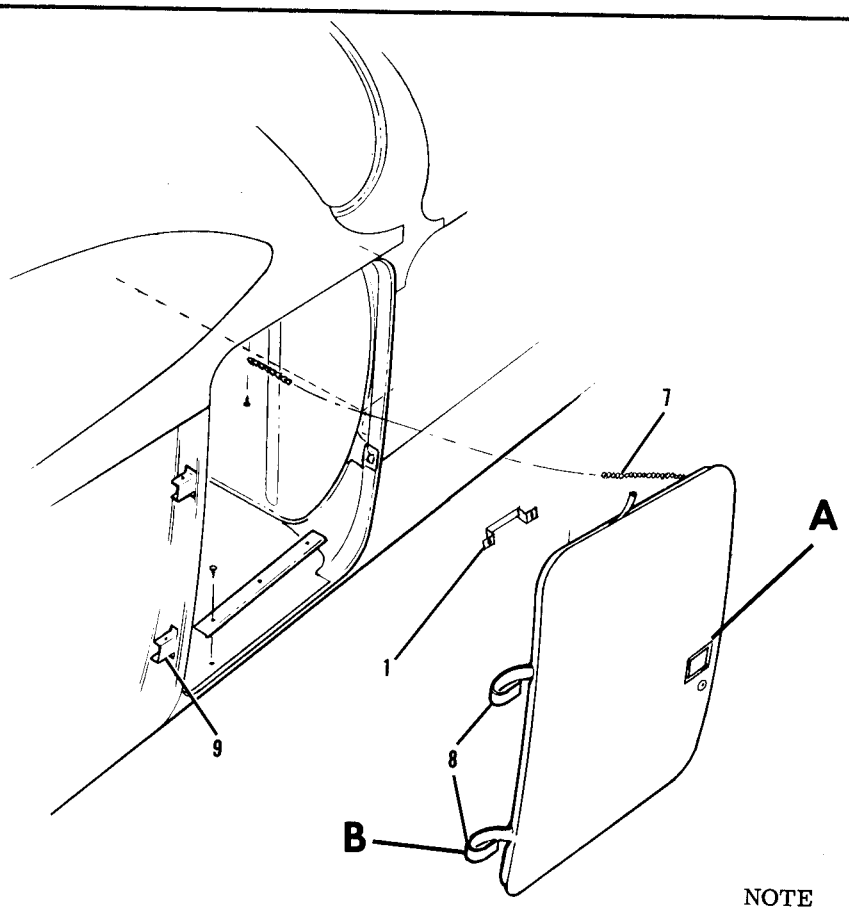
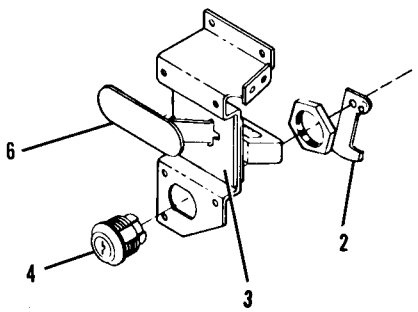


Figure 3-4. Door Latch Installation



NOTE

Reforming of the bonded door by striking with a soft mallet etc. is NOT permissible due to possible damage to the bonded areas.



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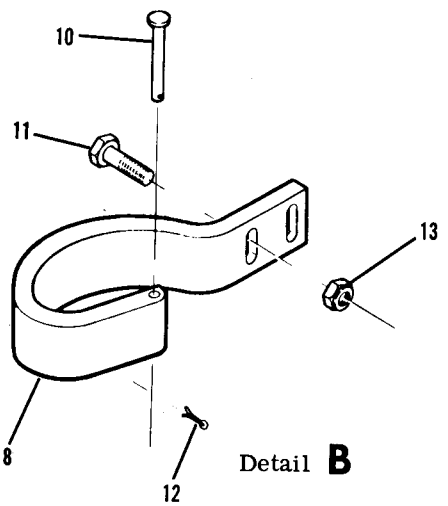


Detail **B**

1. Inside Handle
2. Cam
3. Latch Assembly
4. Lock Assembly
5. Shim
6. Outside Handle
7. Chain
8. Hinge
9. Hinge Bracket
10. Clevis Pin
11. Bolt
12. Cotter Pin
13. Nut

Figure 3-5. Baggage Door Installation

tive bolt engagement. As door is closed, teeth on underside of bolt engage gear teeth on clutch. The clutch gear rotates in one direction only and holds door until handle is moved to LOCK position, driving bolt into slot.

3-27. ADJUSTMENT. Adjustment of latch or clutch cover is afforded by oversize and/or slotted holes. This adjustment ensures sufficient gear-to-bolt engagement and proper alignement.

NOTE

Lubricate door latch per Section 2. No lubrication is recommended for rotary clutch.

3-28. LOCK. In addition to interior locks, a cylinder and key type lock is installed on left door. If lock is to be replaced, the new one may be modified to accept the original key. This is desirable, as the same key is used for ignition switch and cabin door lock. After removing old lock from door, proceed as follows:

a. Remove lock cylinder from new housing.
b. Insert original key into new cylinder and file off any protruding tumblers flush with cylinder. Without removing key, check that cylinder rotates freely in housing.
c. Install lock assembly in door and check lock operation with door open.
d. Destroy new key and disregard code number on cylinder.

3-29. INDEXING INSIDE HANDLE. (Refer to figure 3-4.) When inside door handle is removed, reinstall in relation to position of bolt (7) which is spring-loaded to CLOSE position. The following procedure may be used.

a. Temporarily install handle (17) on shaft assembly (12) approximately vertical.
b. Move handle (17) back and forth until handle centers in spring-loaded position.
c. Without rotating shaft assembly (12), remove handle (17) and install placard (18) with CLOSE index at top.
d. Install handle (17) to align with CLOSE index on placard (18), using screw (16).
e. Install arm rest (15) on upholstery panel (14).

3-30. BAGGAGE DOOR. (Refer to figure 3-5.)

3-31. REMOVAL AND INSTALLATION.

a. Remove door-pull handle (1).
b. Disconnect door-stop chain (7).
c. Remove buttons securing upholstery panel and remove panel.
d. Remove bolts (11) securing door to hinges.
e. Reverse preceding steps for installation.

CAUTION

Reforming of bonded door flange by striking with soft mallet etc. is NOT permissible due to possible damage to bonded areas.

3-32. BAGGAGE DOOR WEATHERSTRIP. A rubber weatherstrip is cemented around the edge of the baggage door and seals the door to the fuselage structure when the door is closed. A new seal can be installed after carefully cleaning door and weatherstrip contact surfaces. Apply a thin even coat of EC-880 adhesive, (3M Co.) or equivalent and allow to dry until tacky before pressing into place.

3-33. SEATS. (Refer to figure 3-6.)

3-34. PILOT AND COPILOT.

a. RECLINING BACK/FORE-AND-AFT ADJUST.
b. ARTICULATING RECLINE/VERTICAL ADJUST.

3-35. DESCRIPTION. These seats are manually operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-36. REMOVAL AND INSTALLATION.

a. Remove seat stops from rails.
b. Slide seat fore-and-aft to disengage seat rollers from rails.
c. Lift seat out.
d. Reverse preceding steps for installation. Ensure all seat stops are reinstalled.

WARNING

It is extremely important that pilot's seat stops are installed, since acceleration and deceleration could possibly permit seat to become disengaged from seat rails and create a hazardous situation, especially during takeoff and landing.

3-37. CENTER.

a. DOUBLE-WIDTH BOTTOM AND BACK/SINGLE RECLINING BACK.
b. DOUBLE-WIDTH BOTTOM/INDIVIDUAL RECLINING BACKS.

3-38. DESCRIPTION. These seats are permanently bolted to the cabin structure and incorporate no adjustment provisions other than manually-adjustable three position backs.

3-39. REMOVAL AND INSTALLATION.

a. Remove bolts securing seat to cabin structure.
b. Lift seat out.
c. Reverse preceding steps for installation.

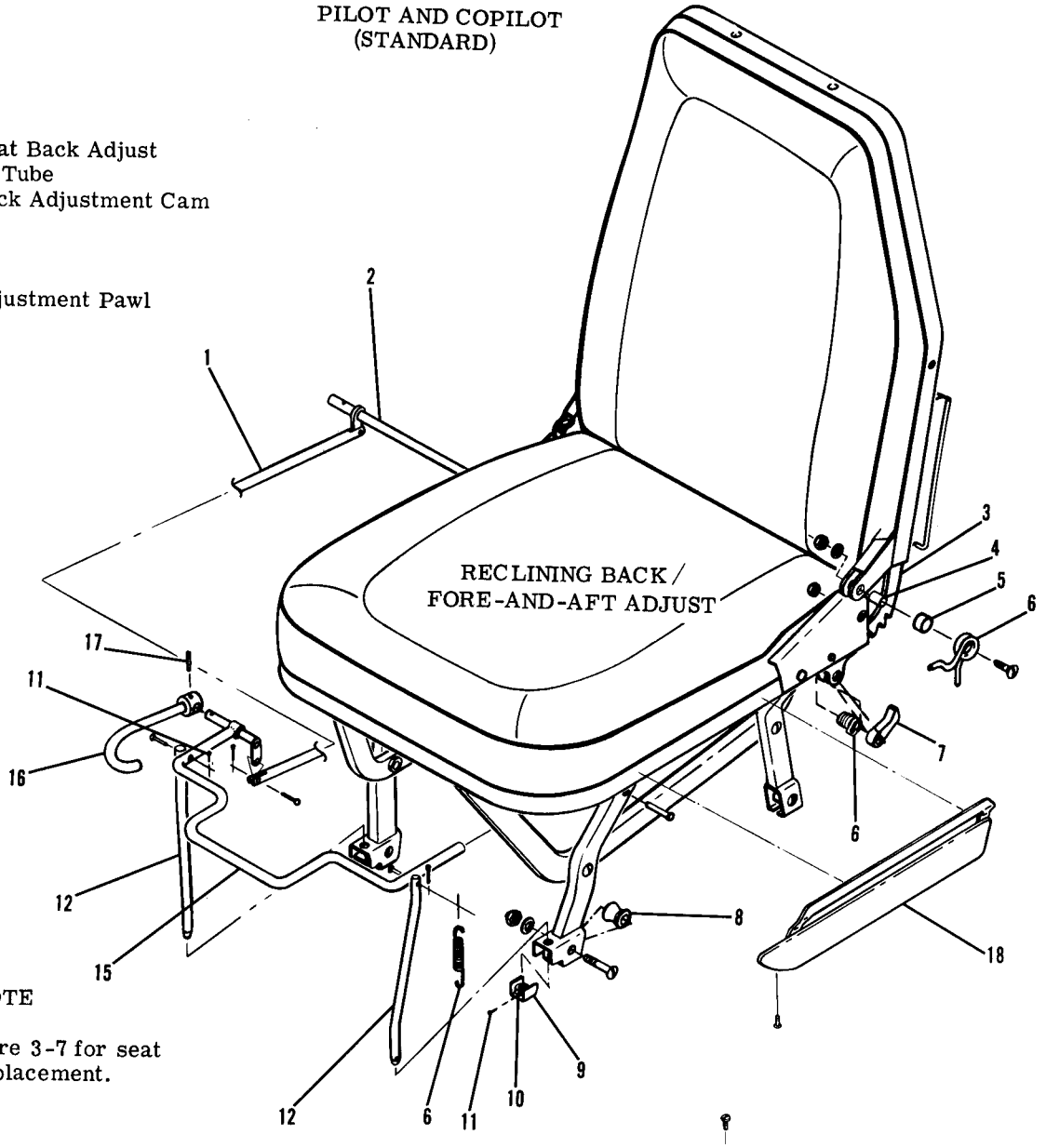
3-40. AUXILIARY.

a. FOLD-UP.

3-41. DESCRIPTION. These seats are permanently bolted to the cabin structure and have no adjustment provisions. The seat structure is mounted on hinge brackets with pivot bolts, thus allowing seat to be pivoted upward to acquire more baggage area.

PILOT AND COPILOT
(STANDARD)

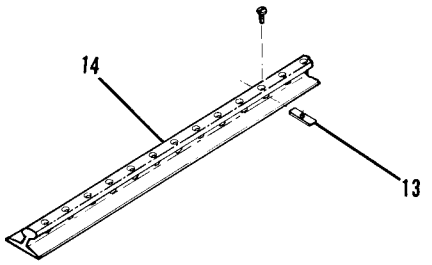
1. Link Seat Back Adjust
2. Torque Tube
3. Seat Back Adjustment Cam
4. Bushing
5. Spacer
6. Spring
7. Seat Adjustment Pawl
8. Roller
9. Bracket



NOTE

Refer to figure 3-7 for seat back cam replacement.

10. Washer
11. Pin
12. Adjustment Pin
13. Seat Stop
14. Seat Rail
15. Fore/Aft Adjustment Handle
16. Recline Handle
17. Roll Pin
18. Seat Belt Retainer



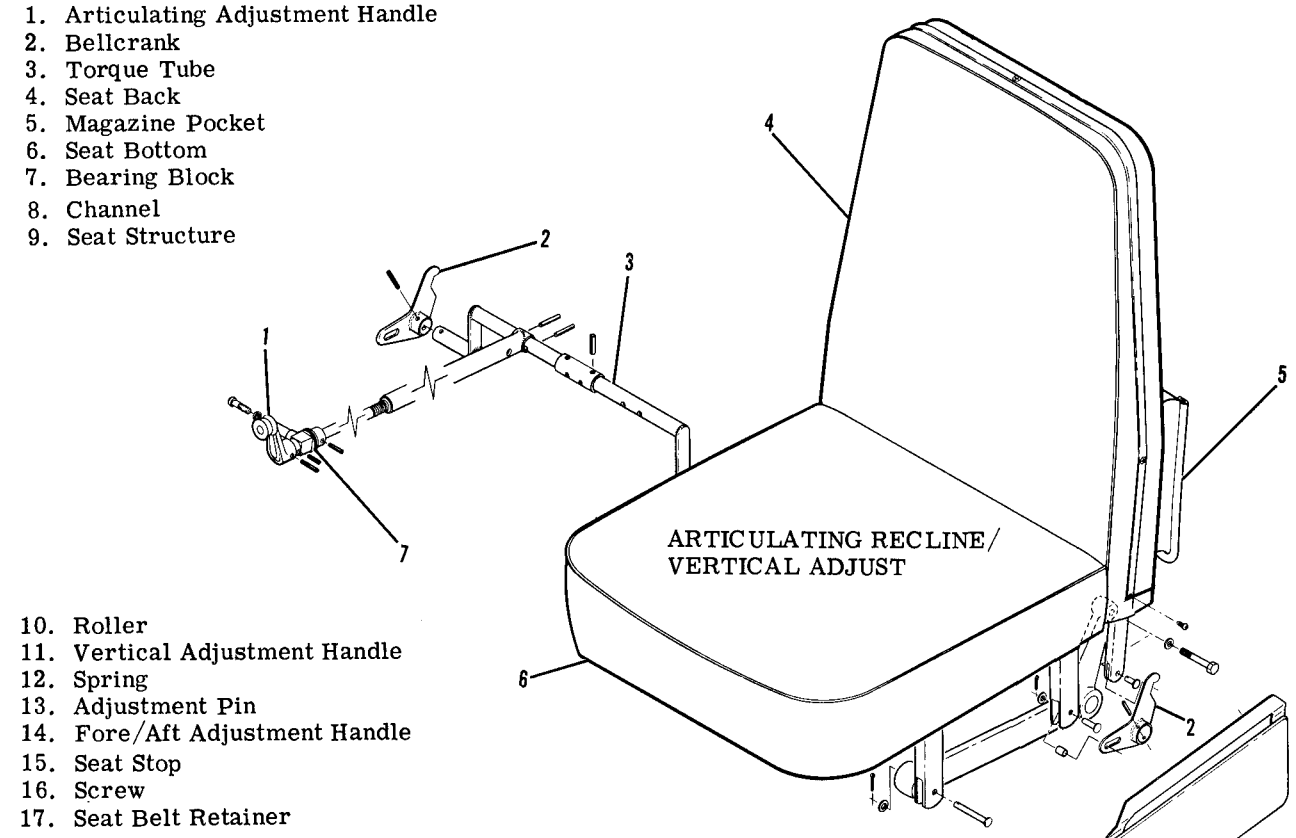
NOTE

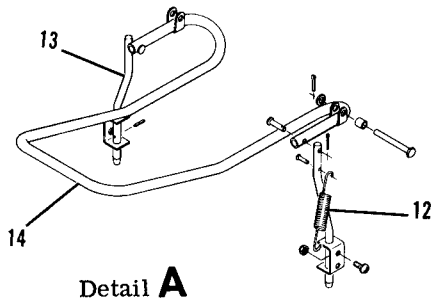
Install seat stop in eleventh hole from the front of the outboard seat rail.

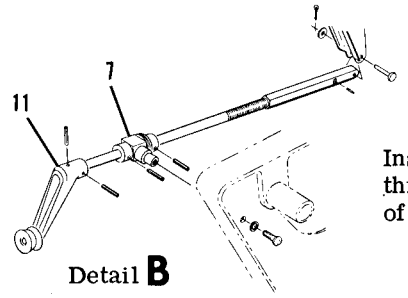
Figure 3-6. Seat Installation (Sheet 1 of 5)

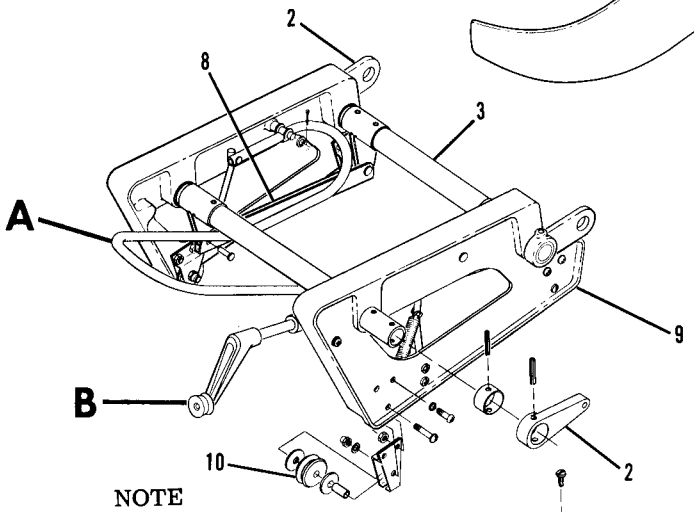
PILOT AND COPILOT SEATS
(OPTIONAL)

1. Articulating Adjustment Handle
2. Bellcrank
3. Torque Tube
4. Seat Back
5. Magazine Pocket
6. Seat Bottom
7. Bearing Block
8. Channel
9. Seat Structure
10. Roller
11. Vertical Adjustment Handle
12. Spring
13. Adjustment Pin
14. Fore/Aft Adjustment Handle
15. Seat Stop
16. Screw
17. Seat Belt Retainer









NOTE

Install seat stop in first and thirteenth hole from the front of the outboard seat rail.

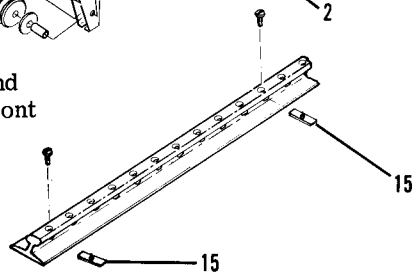
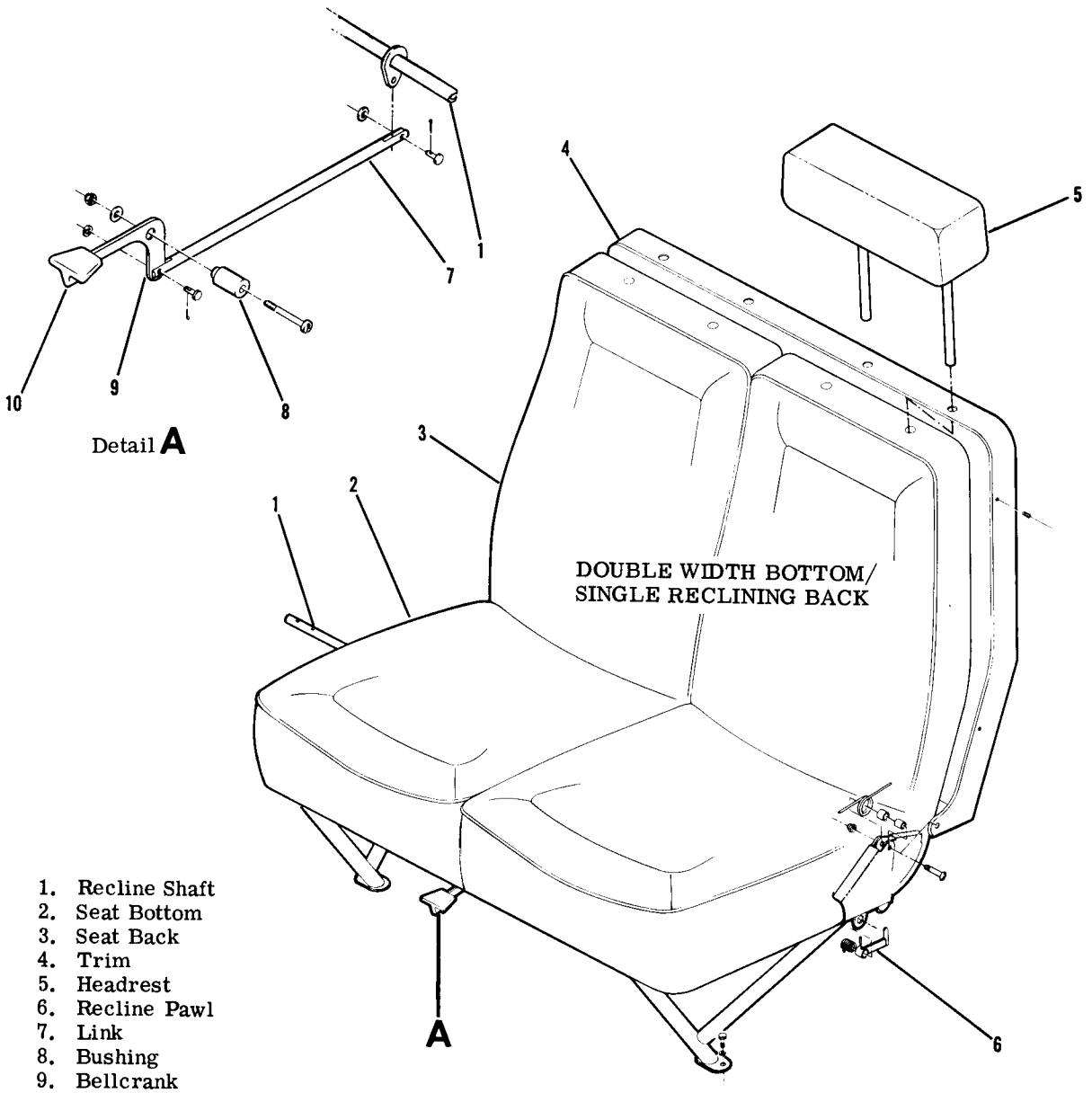


Figure 3-6. Seat Installation (Sheet 2 of 5)

CENTER SEAT
(STANDARD)



1. Recline Shaft
2. Seat Bottom
3. Seat Back
4. Trim
5. Headrest
6. Recline Pawl
7. Link
8. Bushing
9. Bellcrank
10. Knob

Figure 3-6. Seat Installation (Sheet 3 of 5)

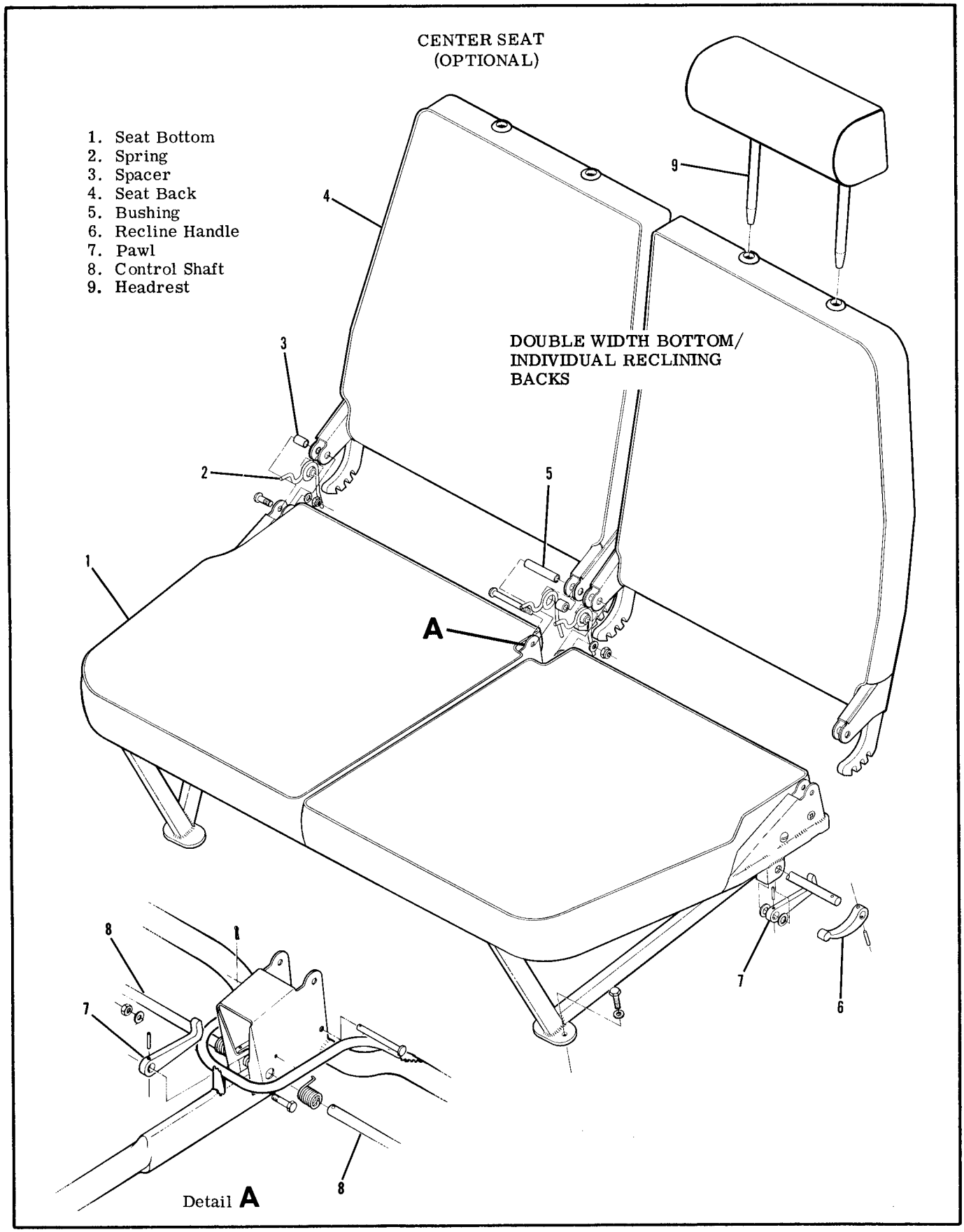


Figure 3-6. Seat Installation (Sheet 4 of 5)

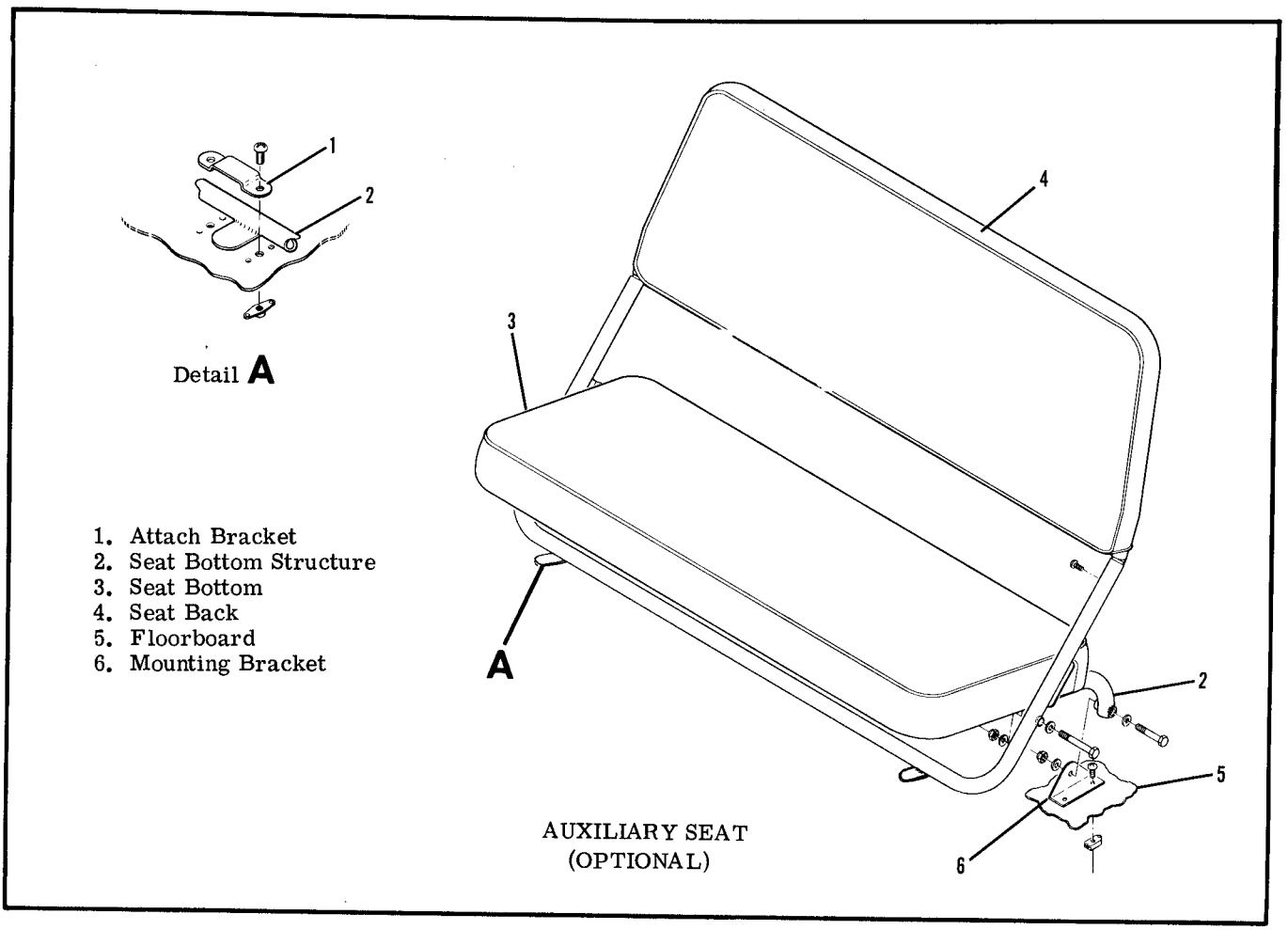


Figure 3-6. Seat Installation (Sheet 5 of 5)

3-42. REMOVAL AND INSTALLATION.

a. Remove bolts securing seat structure to hinge brackets.

b. Lift seat out.

c. Reverse preceding steps for installation.

3-43. REPAIR. Replacement of defective parts is recommended in repair of seats. However, a cracked framework may be welded, provided the crack is not in an area of stress concentration (close to a hinge or bearing point). The square-tube framework is 6061 aluminum, heat-treated to a T-6 condition. Use a heliarc weld on these seats, as torch welds will destroy heat-treatment of frame structure. Figure 3-7 outlines instructions for replacing defective cams on reclining bench-type seat backs.

3-44. CABIN UPHOLSTERY. Due to the wide selection of fabrics, styles and colors, it is impossible to depict each particular type of upholstery. The following paragraphs describe general procedures which will serve as a quide in removal and replacement of upholstery. Major work, if possible, should be done by an experienced mechanic. If the work must be done by a mechanic unfamiliar with upholstery practices, the mechanic should make careful notes during removal of each item to facilitate replacement later.

3-45. MATERIALS AND TOOLS. Materials and tools will vary with the job. Scissors for trimming upholstery to size and a dull-bladed putty knife for wedging material beneath retainer strips are the only tools required for most trim work. Use industrial rubber cement to hold soundproofing mats and fabric edges in place. Refer to Section 18 for thermo-plastic repairs.

3-46. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound deadener compound applied to inner surfaces of skin in most areas of cabin and baggage compartment. All soundproofing material should be replaced in its original position any time it is removed. A soundproofing panel is placed in gap between wing and fuselage and held in place by wing root fairings.

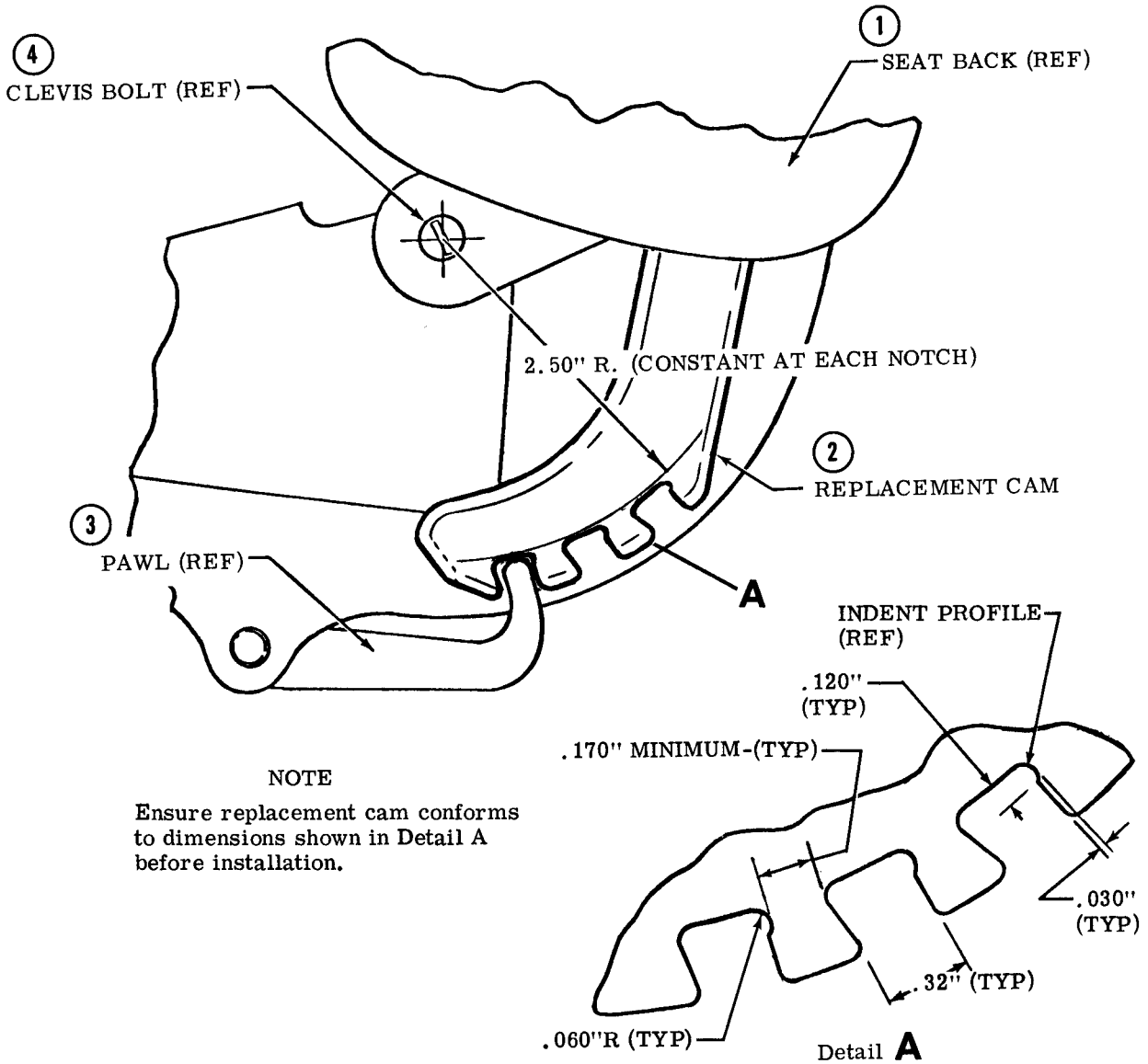
3-47. CABIN HEADLINER. (Refer to figure 3-8.)

3-48. REMOVAL AND INSTALLATION.

a. Remove sun visors, all inside finish strips and plates, overhead console, upper doorpost shields and any other visible retainers securing headliner.

b. Remove molding from fixed windows.

c. Remove screws securing headliner and carefully take down headliner.



NOTE

Ensure replacement cam conforms to dimensions shown in Detail A before installation.

REPLACEMENT PROCEDURE:

a. Remove seat from aircraft.

b. Remove plastic upholstery panels from aft side of seat back, then loosen upholstery retaining rings and upholstery material as required to expose rivets retaining old cam assembly.

c. Drill out existing rivets and insert new cam assembly (2). Position seat back so pawl (3) engages first cam slot as illustrated.

d. Position cam so each slot bottom aligns with the 2.50" radius as illustrated.

e. Clamp securely in this position and check travel of cam. Pawl must contact bottom of each cam slot. Using existing holes in seat frame, drill through new cam and secure with MS20470AD6 rivets.

f. Reinstall upholstery, upholstery panels and seat.

Figure 3-7. Seat Back Cam Replacement

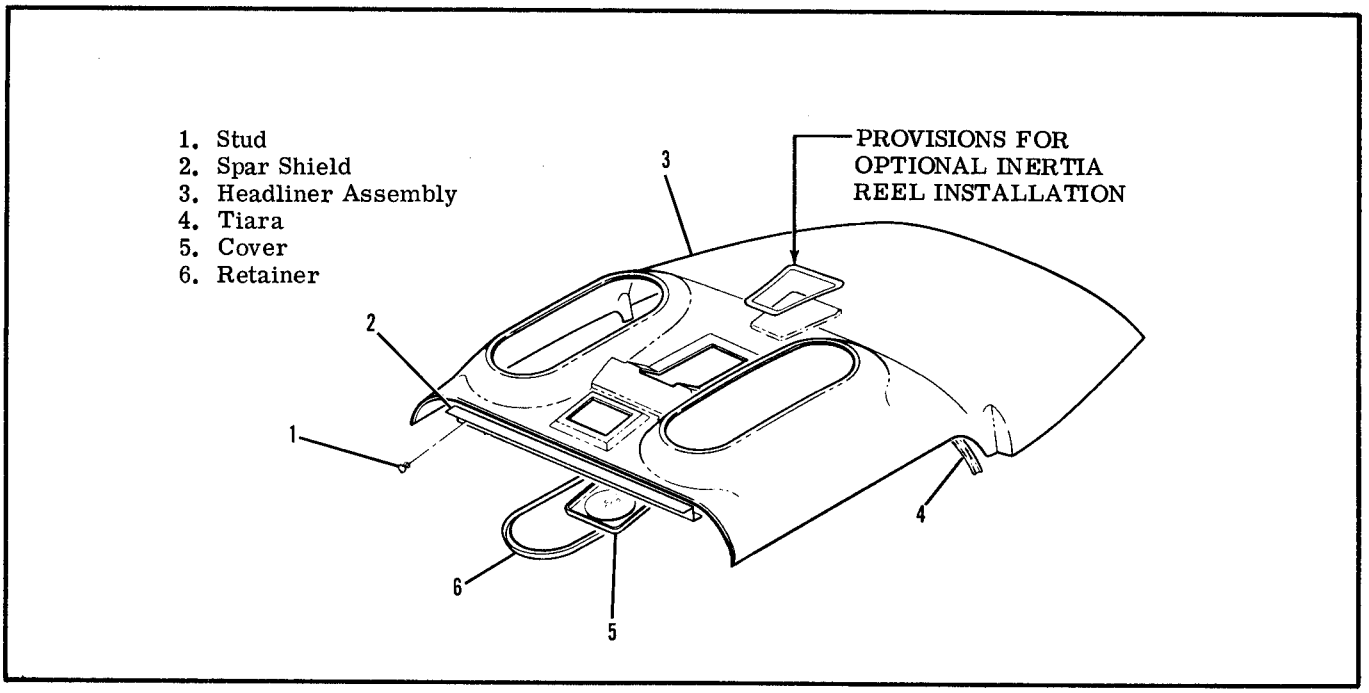


Figure 3-8. Cabin Headliner Installation

d. Remove spun glass soundproofing panels above headliner.

NOTE

The light weight soundproofing panels are held in place with industrial rubber cement.

e. Reverse preceding steps for installation. Before installation, check all items concealed by headliner for security. Use wide cloth tape to secure loose wires to fuselage and to seal openings in wing roots.

3-49. UPHOLSTERY SIDE PANELS. Removal of upholstery side panels is accomplished by removing seats for access, then removing parts attaching panels. Remove screws, retaining strips, arm rests and ash trays as required to free panels. Automotive type spring clips attach most door panels. A dull putty knife makes an excellent tool for prying clips loose. When installing side panels, do not overtighten screws. Larger screws may be used in enlarged holes as long as area behind hole is checked for electrical wiring, fuel lines and other components which might be damaged by using a longer screw.

3-50. CARPETING. Cabin are and baggage compartment carpeting is held in place by rubber cement, small sheet metal screws and retaining strips. When fitting a new carpet, use old one as a pattern for trimming and marking screw holes.

3-51. SAFETY PROVISIONS.

3-52. CARGO TIE-DOWNS. Cargo tie-downs are used to ensure baggage cannot enter seating area during flight. Methods of attaching tie-downs are illustrated in figure 3-9. The eyebolt and nutplate can be located at various points. The sliding tie-down lug also utilizes eyebolt and attaches to a seat rail.

3-53. SAFETY BELTS (Refer to figure 3-11). Safety belts should be replaced if frayed or cut, latches are defective or stitching is broken. Attaching parts should be replaced if excessively worn or defective.

3-54. SHOULDER HARNESS. (Refer to figure 3-11). Individual shoulder harnesses may be installed for each seat except auxiliary. Each harness is connected to the upper fuselage structure and to the seat safety belt buckle. Component parts should be replaced as outlined in the preceding paragraph.

3-55. GLIDER TOW-HOOK. A glider tow-hook, which is mounted in place of the tail tie-down ring, is available for all models.

3-56. REAR VIEW MIRROR. A rear view mirror may be installed on the cowl deck above the instrument panel. Figure 3-10 illustrates details for rear view mirror installation.

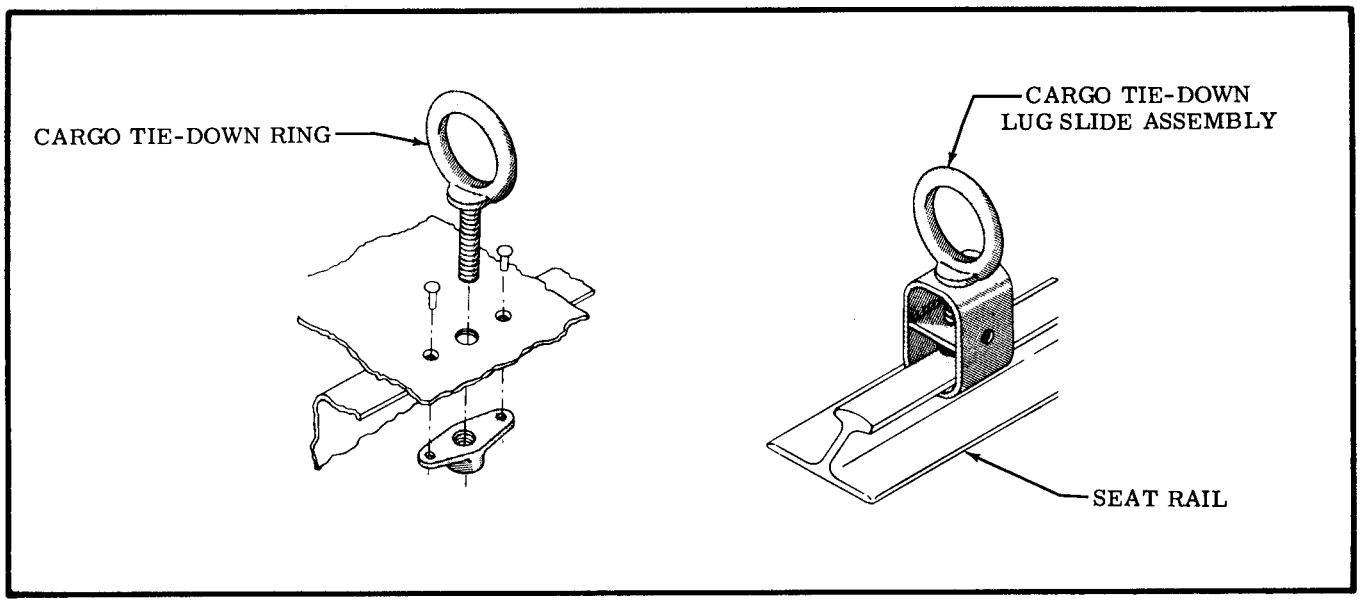


Figure 3-9. Cargo Tie-Down Rings

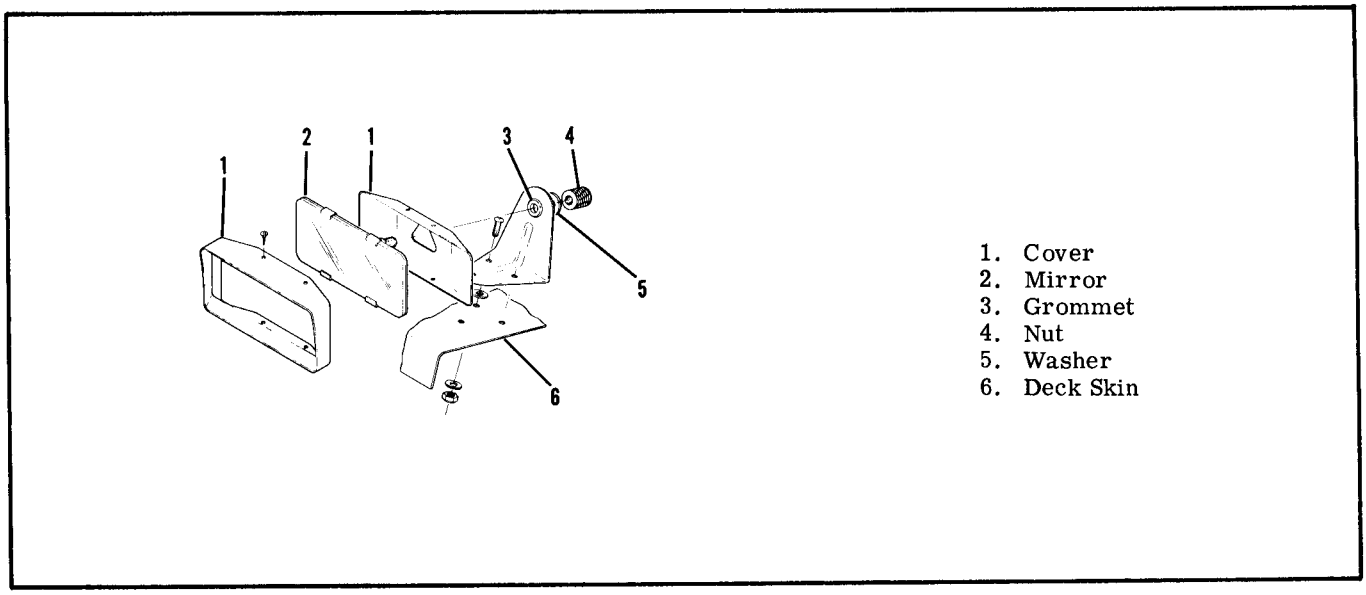
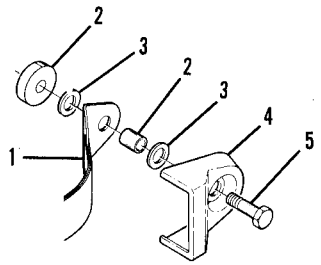
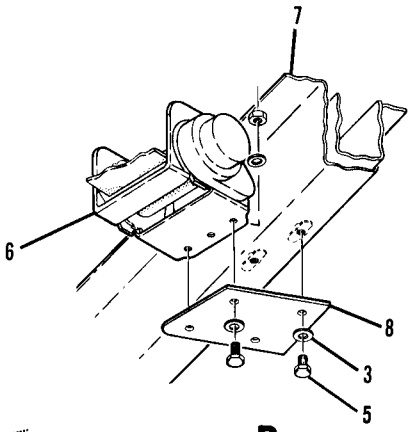


Figure 3-10. Rear View Mirror Installation

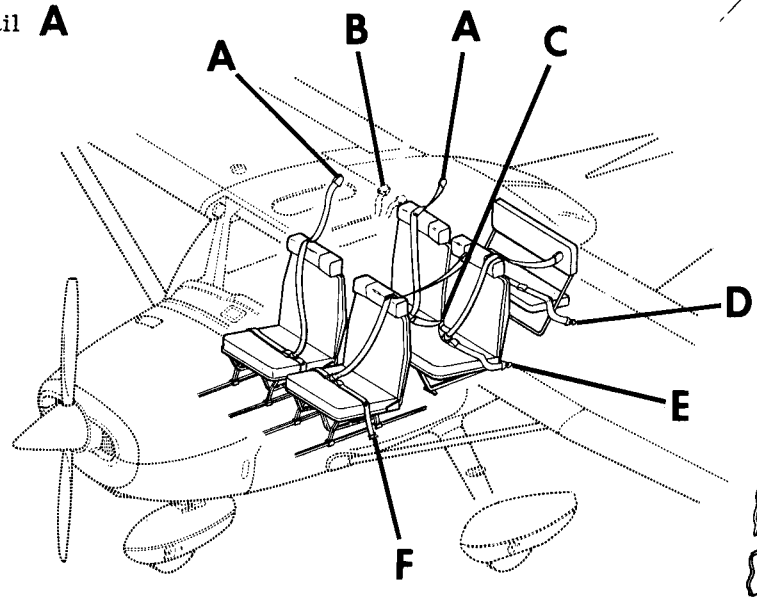
SHOP NOTES:

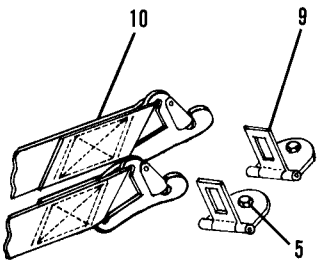


Detail **A**



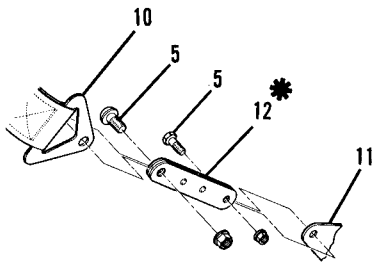
Detail **B**





Detail **C**

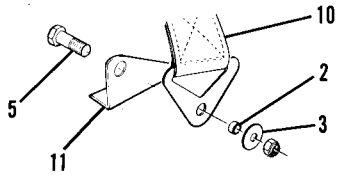
1. Shoulder Harness
2. Spacer
3. Washer
4. Cover
5. Bolt
6. Inertia Reel Assembly
7. Spar
8. Mounting Plate
9. Latch Assembly
10. Seat Belt
11. Bracket
12. Link



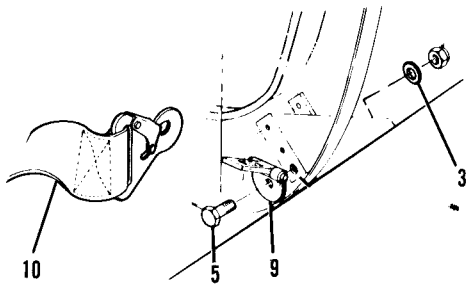
Detail **E**

* NOTE

Used on LH outboard side only



Detail **E** and **F**



Detail **D**

Figure 3-10. Seat Belt and Shoulder Harness Installation

SECTION 4

WINGS AND EMPENNAGE

TABLE OF CONTENTS

4-1. WINGS AND EMPENNAGE.

4-2. WINGS. (See figure 4-1.)

4-3. DESCRIPTION. Each all-metal wing is a semi-cantilever, semimonocoque type, with two main spars and suitable ribs for the attachment of the skin. Skin panels are riveted to ribs, spars and stringers to complete the structure. An all-metal, piano-hinged aileron, flap and a detachable wing tip are mounted on each wing assembly. A single metal fuel tank is mounted between the wing spars at the inboard end of each wing. Colored navigation lights are mounted at each wing tip.

4-4. REMOVAL. Wing panel removal is most easily accomplished if four men are available to handle the wing. Otherwise, the wing should be supported with a sling or maintenance stand when the fastenings are loosened.

a. Remove wing root fairings and fairing plates.
b. Remove all wing inspection plates.
c. Drain fuel from tank of wing being removed.
d. Disconnect:
1. Electrical wires at wing root disconnects.
2. Fuel lines at wing root. (Refer to precautions outlined in Section 12.
3. Pitot line (left wing only) at wing root.
4. Cabin ventilator hose at wing root.
e. Slack off tension on aileron cables by loosening turnbuckles, then disconnect cables at aileron bellcranks. Disconnect flap cables at turnbuckles above headliner, and pull cables into wing root area.

NOTE

To ease rerouting the cables, a guide wire may be attached to each cable before it is pulled free of the wing. Cable may then be disconnected from wire. Leave guide wire routed through the wing; it may be attached again to the cable during reinstallation and used to pull the cable into place.

f. Support wing at outboard end and disconnect strut at wing fitting. Tie the strut up with wire to prevent it from swinging down and straining strut-to-fuselage fitting. Loosen lower strut fairing and slide it up the strut, the strut may then be lowered without damage.

NOTE

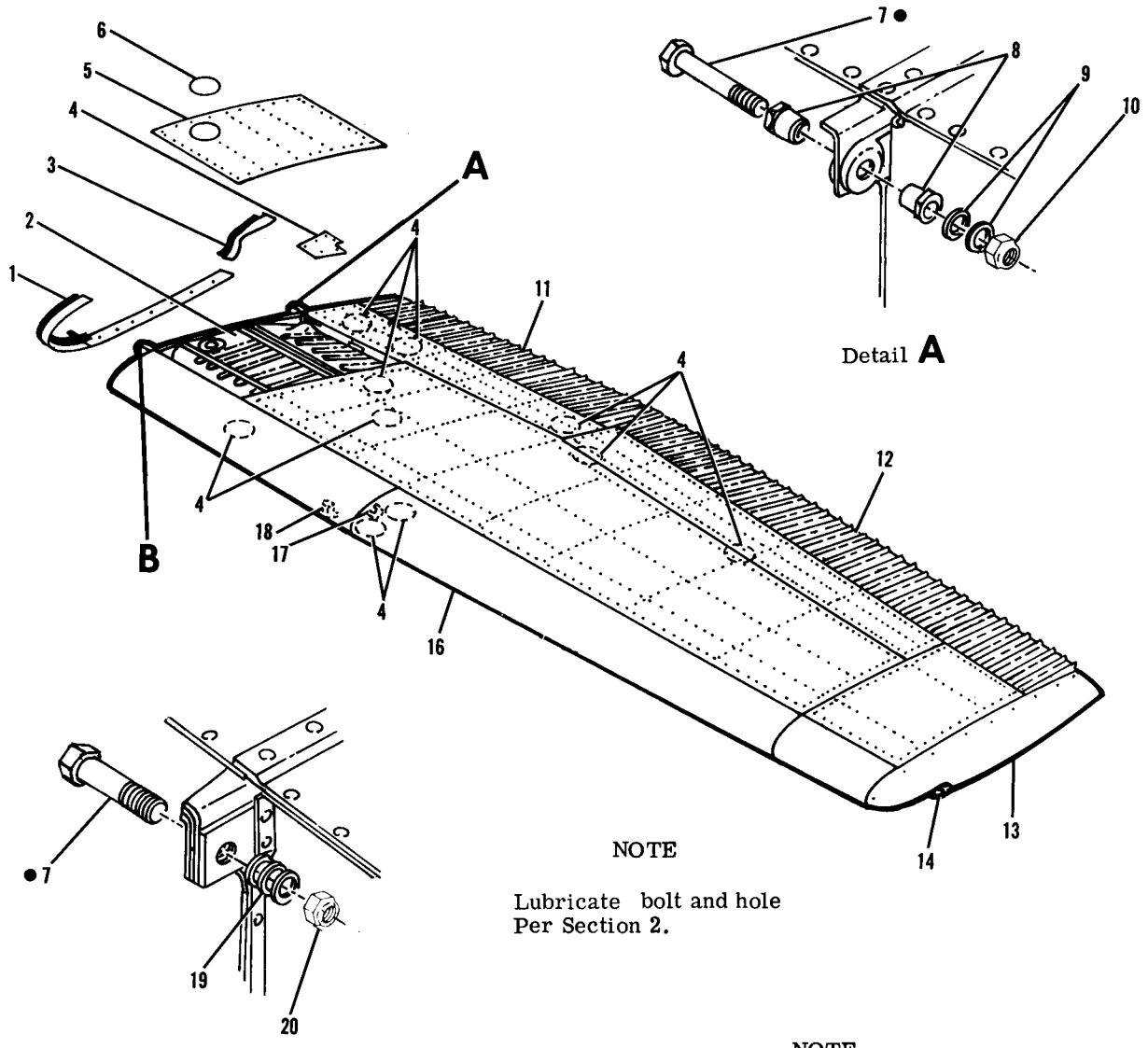
It is recommended that flap be secured in streamlined position with tape during wing removal to prevent damage, since flap will swing freely.

g. Mark position of wing attachment eccentric bushings (refer to figure 4-1); these bushings are used to rig out "wing heaviness."
h. Remove nuts, washers, bushings and bolts attaching wing spars to fuselage.

NOTE

It may be necessary to rock the wing slightly while pulling attaching bolts, or to use a long drift punch to drive out attaching bolts.

i. Remove wing and lay on padded stand.



NOTE

Lubricate bolt and hole
Per Section 2.

NOTE

Three washers (19) are installed under the nut on the front spar-to-fuselage fitting.

● MINIMUM TORQUE 300 LB-IN.

1. Fairing
2. Fuel Tank
3. Lower Rear Fairing
4. Inspection Plate
5. Fuel Tank Cover
6. Fuel Gage Access Cover
7. Bolt
8. Eccentric Bushings
9. Washer
10. Nut
11. Wing Flap
12. Aileron
13. Wing Tip
14. Navigation and Strobe Lights
15. Landing and Taxi Lights
16. Wing Assembly
17. Cover Plate
18. Stall Warning Unit
19. Washers
20. Nut

Figure 4-1. Wing Installation

4-5. REPAIR. A damaged wing may be repaired in accordance with instructions outlined in Section 18, which supplements Federal Aviation Regulation, Part 43. Extensive repairs of wing skin and structure are best accomplished by using the wing alignment repair jig, which may be obtained from Cessna. The wing jig serves not only as a holding fixture, making work on the wing easier, but also assures absolute alignment of the repaired wing.

4-6. INSTALLATION.

a. Hold wing in position and install bolts, bushings, washers and nuts attaching wing spars to fuselage fittings. Be sure eccentric bushings are positioned as marked.

b. Install bolts, spacers, and nuts to secure upper and lower ends of wing strut to wing and fuselage fittings.

c. Route flap and aileron cables, using guide wires. (See note in paragraph 4-4.)

d. Connect:

1. Electrical wires at wing root disconnects.
2. Fuel lines at wing root. (Refer to precautions outlined in Section 12).
3. Pitot line (if left wing is being installed).

e. Rig aileron system. (Section 6.)

f. Rig flap system (Section 7.)

g. Refuel wing tank and check for leaks. (Refer to precautions outlined in Section 12.)

h. Check operation of wing tip lights.

i. Check operation of fuel gage.

j. Install wing root fairings.

NOTE

Be sure to insert soundproofing panel in wing gap, if such a panel was installed originally, before replacing wing root fairings.

k. Install all wing inspection plates, interior panels and upholstery.

4-7. ADJUSTMENT (CORRECTING "WING-HEAVY" CONDITION.) (Refer to figure 4-1.) If considerable control wheel pressure is required to keep the wings level in normal flight, a wing-heavy condition exists.

a. Remove wing fairing strip on the wing-heavy side of the aircraft.

b. Loosen nut (10) and rotate bushings (8) simultaneously until the bushings are positioned with the thick side of the eccentrics up. This will lower the trailing edge of the wing, and decrease wing-heaviness by increasing angle-of-incidence of the wing.

CAUTION

Be sure to rotate the eccentric bushings simultaneously. Rotating them separately will destroy the alignment between the off-center bolt holes in the bushings, thus exerting a shearing force on the bolt, with possible damage to the hole in the wing spar.

c. Tighten nut and reinstall fairing strip.

d. Test-fly the aircraft. If the wing-heavy condition still exists, remove fairing strip on the "lighter" wing, loosen nut, and rotate bushings simultaneously until the bushings are positioned with the thick side of the eccentrics down. This will raise the trailing edge of the wing, thus increasing wing-heaviness to balance heaviness in the opposite wing.

e. Tighten nut, install fairing strip, and repeat test flight.

4-8. WING STRUTS. (Refer to figure 4-2.)

4-9. DESCRIPTION. Each wing has a single lift strut which transmits a part of the wing load to the lower portion of the fuselage. The strut consists of a streamlined tube riveted to two end fittings for attachment at the fuselage and wing.

4-10. REMOVAL AND INSTALLATION.

a. Remove screws from strut fairings and slide fairings along strut.

b. Remove fuselage and wing inspection plates at strut junction points.

c. Support wing securely, then remove nut and bolt securing strut to fuselage.

d. Remove nut, bolt, and spacer used to attach strut to wing, then remove strut from aircraft.

e. Reverse preceding steps to install strut.

4-11. REPAIR. Wing strut repair is limited to replacement of tie-downs and attaching parts. A badly dented, cracked, or deformed wing strut should be replaced.

4-12. FIN. (Refer to figure 4-3.)

4-13. DESCRIPTION. The fin is primarily of metal construction, consisting of ribs and spars covered with skin. Fin tips are of ABS construction. Hinge brackets at the fin rear spar attach the rudder.

4-14. REMOVAL. The vertical fin can be removed without first removing the rudder. However, for access and ease of handling, the rudder may be removed by following procedures outlined in Section 10.

a. Remove fairings on either side of fin.

b. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads, and rudder cables, if rudder has not been removed.

NOTE

The flashing beacon electric lead that routes into the fuselage may be cut, then spliced (or quick-disconnects used) at installation.

c. Remove screws attaching dorsal to fin.

d. Disconnect elevator cable from elevator bellcrank.

e. Remove bolts attaching fin rear spar to fuselage fitting. Remove upper elevator stop bolts.

f. Remove bolts attaching fin front spar to fuselage bulkhead, and remove fin.

g. Retain any shims installed between the rear spar of the fin and the fuselage fitting.

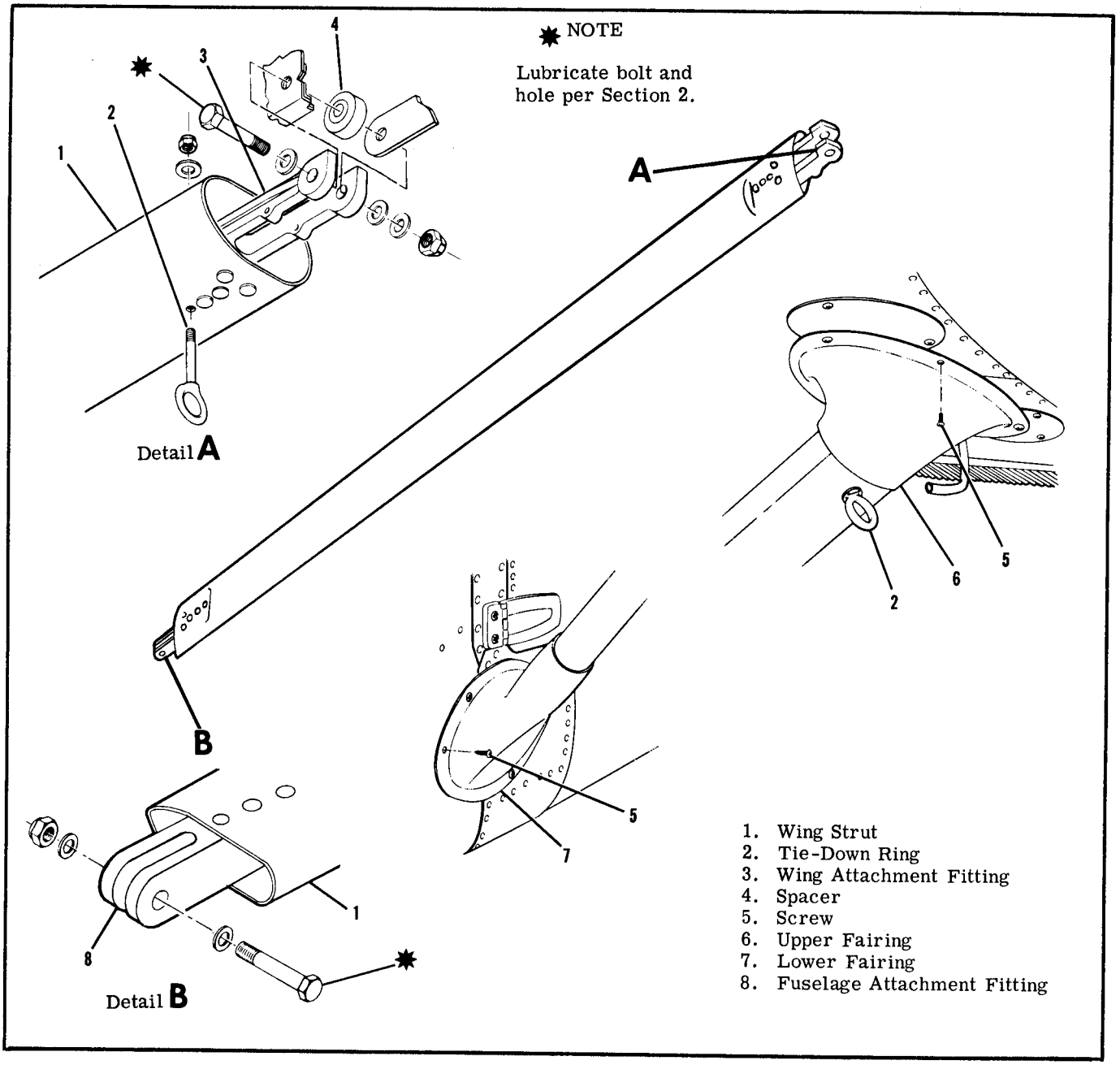


Figure 4-2. Wing Strut

4-15. REPAIR. Fin repair should be accomplished in accordance with applicable instructions outlined in Section 18.

4-16. INSTALLATION. Reverse the procedures outlined in paragraph 4-14 to install the vertical fin. Be sure to check and reset rudder and elevator travel.

a. Reinstall any shims removed from between the fin rear spar and the fuselage fitting. If a new fin is being installed, measure any gap existing between the fin rear spar and the fuselage fitting and use shims as follows:

.000" to .030" gap . . . . .No Shim
.030" to .050" gap . . . . .0531115-1 Shim (.020")
.050" to .070" gap . . . . .0531115-2 Shim (.040")

A maximum of one shim per bolt is permissible.

4-17. HORIZONTAL STABILIZER. (See figure 4-4.)

4-18. DESCRIPTION. The horizontal stabilizer is primarily of all-metal construction, consisting of ribs and spars covered with skin. Stabilizer tips are of ABS construction. A formed metal leading edge is riveted to the assembly to complete the structure. The elevator trim tab actuator is contained within the horizontal stabilizer. The underside of the stabilizer contains a covered opening which provides access to the actuator. Hinges are located on the rear spar assembly to support the elevators.

4-19. REMOVAL AND INSTALLATION.

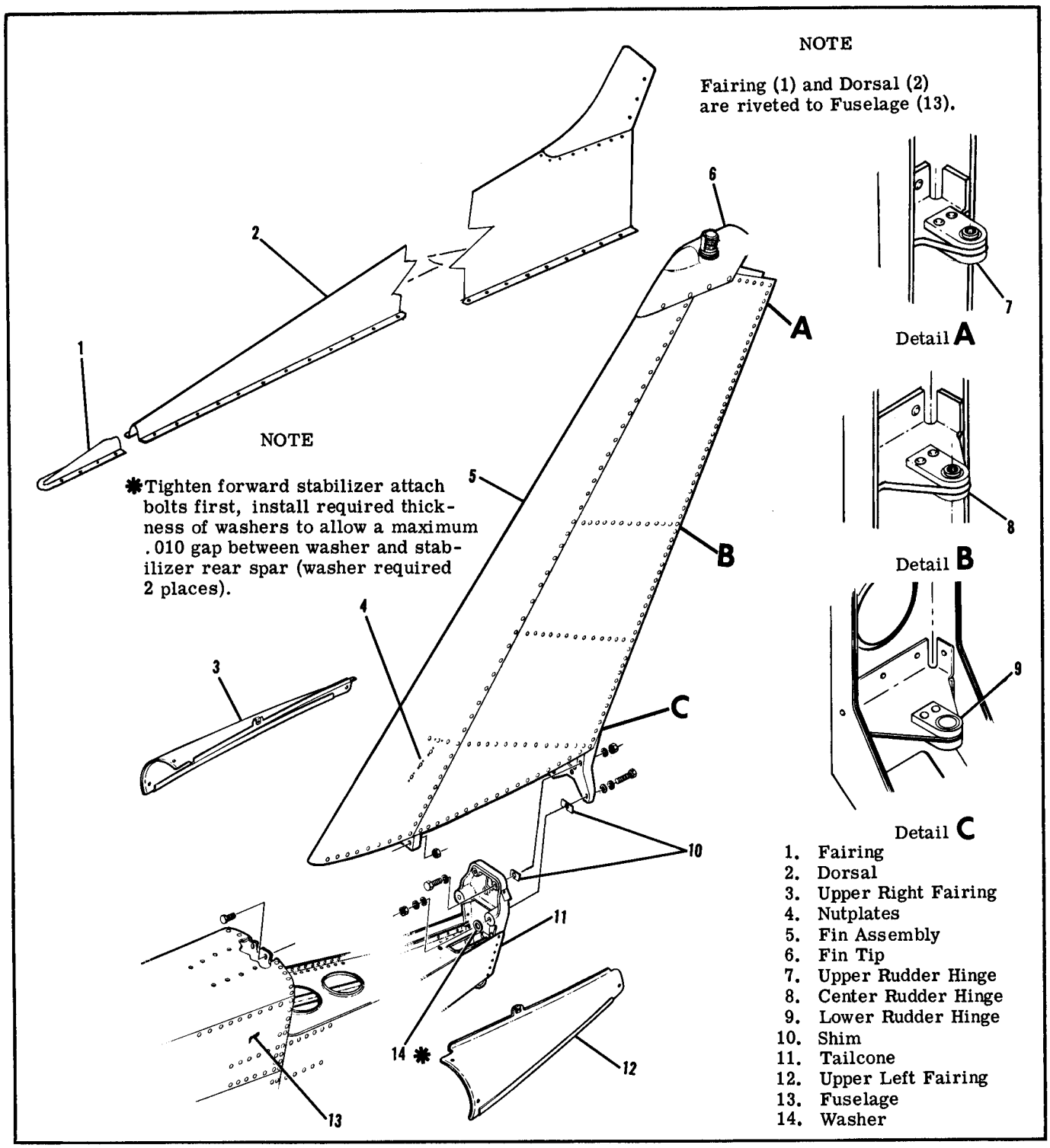


Figure 4-3. Vertical Fin

a. Remove elevators and rudder in accordance with procedures outlined in Sections 8 and 10.

b. Remove vertical fin in accordance with procedures outlined in paragraph 4-14.

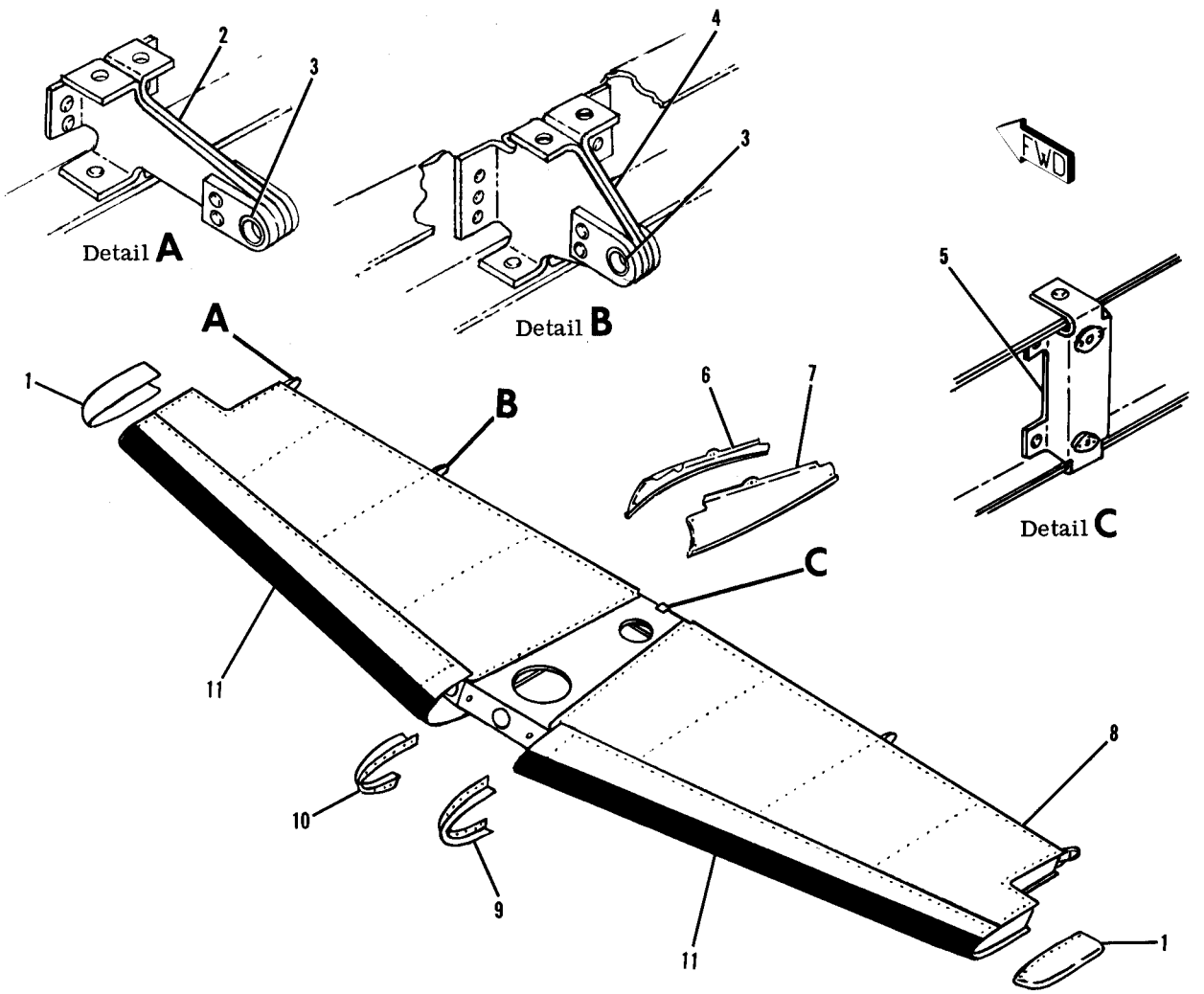
c. Disconnect elevator trim control cables at clevis and turnbuckle inside tailcone, remove pulleys which route the aft cables into horizontal stabilizer, and pull cables out of tailcone.

d. Remove bolts securing horizontal stabilizer to fuselage.

e. Remove horizontal stabilizer.

f. Reverse preceding steps to install horizontal stabilizer. Rig control systems as necessary, check operation of tail navigation light and flashing beacon.

4-20. REPAIR. Horizontal stabilizer repair should be accomplished in accordance with applicable instructions in Section 18.



NOTE

Refer to figure for stabilizer rear attach bolt installation.

1. Stabilizer Tip
2. Outboard Elevator Hinge
3. Bushing
4. Inboard Elevator Hinge
5. Bracket
6. Upper Right Fairing
7. Upper Left Fairing
8. Horizontal Stabilizer
9. Forward Left Fairing
10. Forward Right Fairing
11. Abrasion Boot

Figure 4-4. Horizontal Stabilizer

4-21. STABILIZER ABRASION BOOTS.

4-22. DESCRIPTION. The aircraft may be equipped with two extruded rubber abrasion boots, one on the leading edge of each horizontal stabilizer. These boots are installed to protect the stabilizer leading edge from damage caused by rocks thrown back by the propeller.

4-23. REMOVAL. The abrasion boots can be removed by loosening one end of the boot and pulling it off the stabilizer with an even pressure. Excess adhesive or rubber can be removed with Methyl-Ethyl-Ketone.

4-24. INSTALLATION. Install abrasion boots as outlined in the following procedures.

a. Trim boots to desired length.

b. Mask off boot area on leading edge of stabilizer with 1-inch masking tape, allowing 1/4-inch margin.

c. Clean metal surfaces of stabilizer, where boot is to be installed with Methyl-Ethyl-Ketone.

d. Clean inside surface of abrasion boot with Methyl-Ethyl-Ketone.

NOTE

Boots may be applied over epoxy primer, but if the surface has been painted, the paint shall be removed from the bond area. This shall be done by wiping the surfaces with a clean, lint-free rag, soaked with solvent, and then wiping the surfaces dry, before the solvent has time to evaporate, with a clean, dry lint-free rag.

e. Stir cement (EC-1300 Minnesota Mining and Manufacturing Co.) thoroughly.

f. Apply one even brush coat to the metal and the inner surface of the boot. Allow cement to air-dry for a minimum of 30 minutes, and then apply a second coat to each surface. Allow at least 30 minutes (preferably one-hour) for drying.

g. After the cement has thoroughly dried, reactivate the surface of the cement on the stabilizer and boot, using a clean, lint-free cloth, heavily moistened with toluol. Avoid excess rubbing which would remove the cement from the surfaces.

h. Position boot against leading edge, exercising care not to trap air between boot and stabilizer.

NOTE

Should boot be attached "off-course", pull it up immediately with a quick motion, and reposition properly.

i. Press or roll entire surface of boot to assure positive contact between the two surfaces.

j. Remove masking tape and clean stabilizer of excess material.

k. Mask to the edge of boot for painting stabilizer.

SHOP NOTES:

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SECTION 5

LANDING GEAR AND BRAKES

TABLE OF CONTENTS

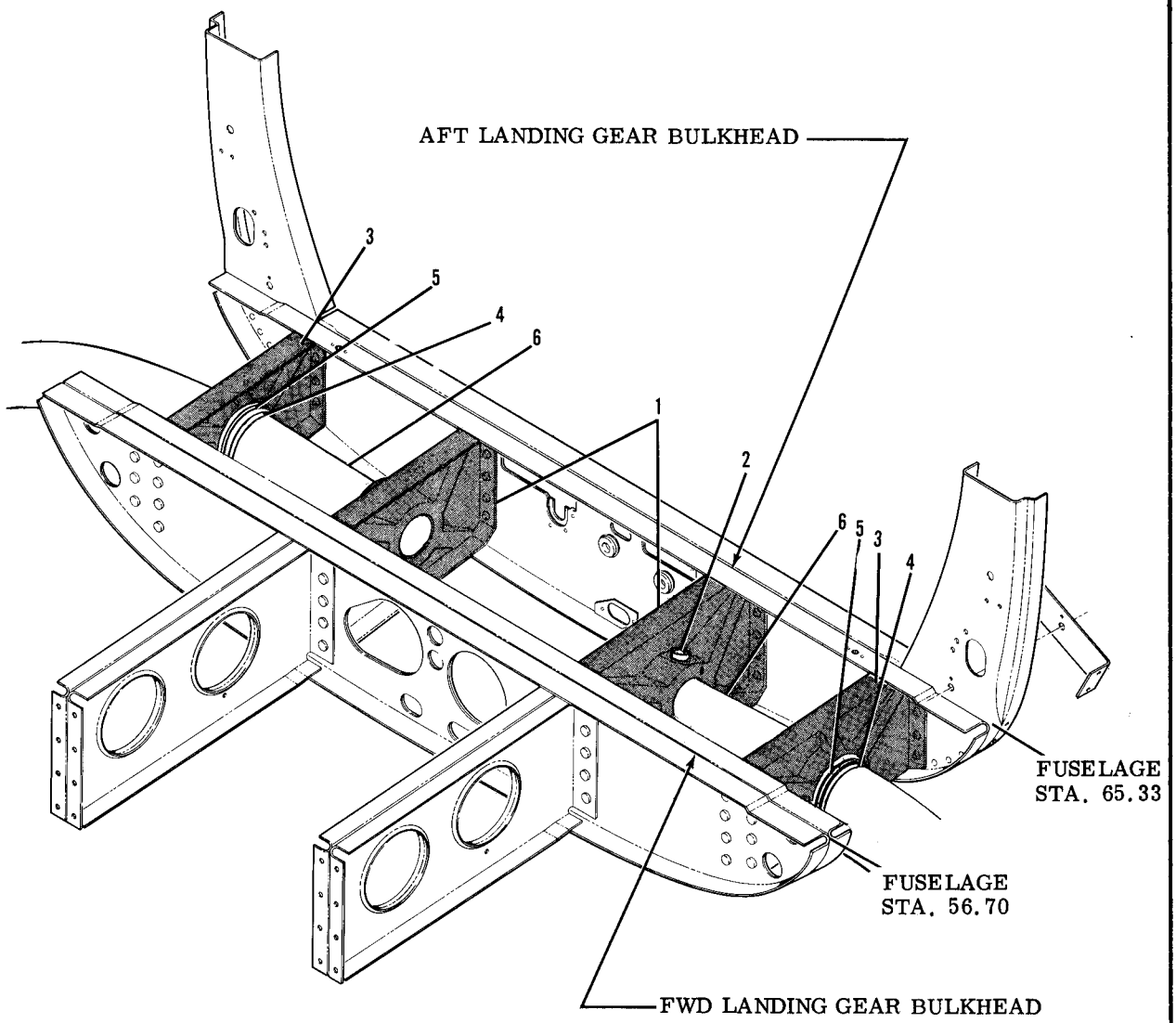
5-1. LANDING GEAR.

5-2. DESCRIPTION. The aircraft is equipped with a fixed tricycle landing gear, consisting of tubular spring-steel main gear struts, and an air/oil steerable nose gear shock strut. Wheels with disc-type brakes and tube-type tires are installed on the main landing gear struts, and a two-piece, die-cast aluminum wheel is mounted on the nose gear strut. The nose wheel is steerable with the rudder pedals up to a maximum pedal deflection, after which it becomes free-swiveling, up to a maximum of 30 degrees, each side of center. Nose and main wheel speed fairings are available for installation.

5-3. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to pressure specified in figure 1-1.
	Landing gear attaching parts not tight.	Tighten loose parts; replace defective parts with new parts.
	Landing gear spring excessively sprung.	Remove and install new part(s).
	Bent axles.	Install new part(s).
TIRES WEAR EXCESSIVELY.	Incorrect tire inflation.	Inflate to pressure specified in figure 1-1.
	Main wheels out of alignment.	Remove and install new part(s).
	Landing gear spring excessively sprung.	Remove and install new part(s).
	Bent axles.	Install new part(s).
	Dragging brakes.	Refer to paragraph 5-57.
	Wheel bearings excessively tight.	Adjust properly.
	Wheels out of balance.	Correct in accordance with paragraph 5-23.
	Loose torque links.	Add shims or install new parts as required.
WHEEL BOUNCE EVIDENT ON SMOOTH SURFACE.	Out of balance condition.	Refer to paragraph 5-23.

SHOP NOTES:



1. Inboard Forging
2. Bolt
3. Outboard Forging
4. Bushing
5. Bushing Retainer Ring
6. Tubular Strut
7. Brake Line
8. Clamp
9. Step
10. Step Bracket
11. Axle
12. Brake Torque Plate
13. Nut
14. Hub Cap
15. Wheel Assembly
16. Wheel Brake Assembly
17. Fuselage Fairing
18. Tubular Strut Fairing
19. Cap Fairing
20. Brake Fairing

Figure 5-1. Main Landing Gear Installation (Sheet 1 of 2)

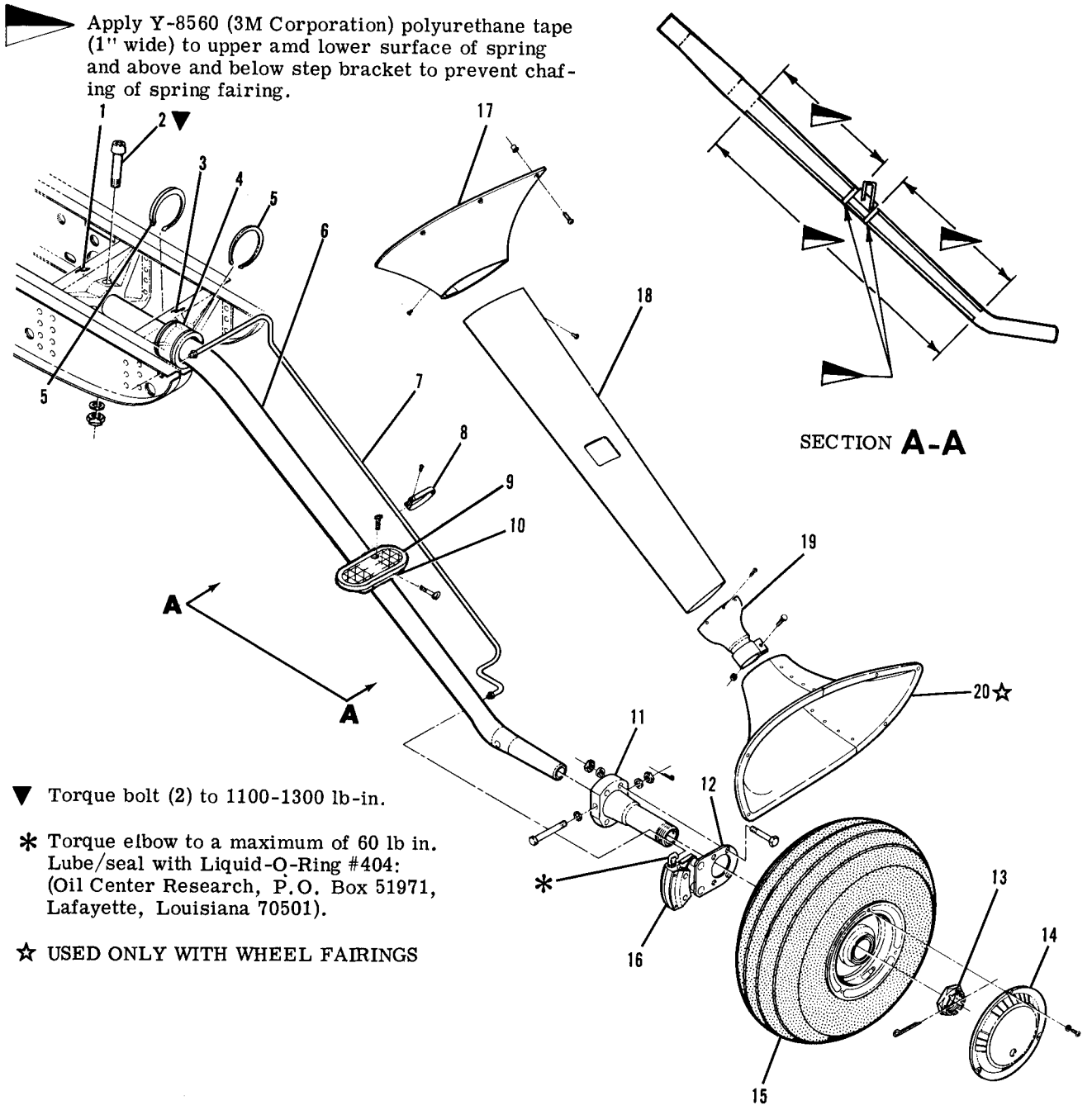


Figure 5-1. Main Landing Gear Installation (Sheet 2 of 2)

5-4. MAIN LANDING GEAR.

5-5. DESCRIPTION. The tubular, spring-steel main landing gear struts are attached to the aircraft at inboard and outboard forgings, located in the belly of the aircraft. A bracket is bonded to each strut for attachment of a step. Hydraulic brake lines are routed down and clamped to each main gear strut. The axles, main wheels and brake assemblies are installed at the lower end of each strut.

5-6. MAIN GEAR STRUT REMOVAL. (Refer to figure 5-1.)

NOTE

The following procedure removes the landing gear as a complete assembly. Refer to applicable paragraph for removal of individual components.

a. Remove floorboard access covers over inboard and outboard landing gear forgings (2) and (3).
b. Hoist or jack aircraft in accordance with procedures outlined in Section 2.
c. Remove screws attaching fairing (17) to fuselage. Remove screws at splice in fairing and work fairing off strut fairing.
d. Drain hydraulic fluid from brake line (7) on strut being removed.
e. Disconnect hydraulic brake line (7) at fitting where brake line emerges from fuselage skin. Cap or plug disconnected fittings.
f. Remove nut, washer and bolt attaching inboard end of tubular strut to the inboard landing gear bulkhead fitting.
g. Pull tubular strut from fitting and bushing. Use care when removing strut to prevent damage to hydraulic brake line.

NOTE

The tubular strut is a compression fit in the bushing in the outboard landing gear forging (3).

5-7. MAIN LANDING GEAR INSTALLATION. (Refer to figure 5-1.)

NOTE

The following procedure installs the landing gear as a complete assembly. Refer to applicable paragraphs for installation of individual components.

a. Install all parts removed from strut.
b. Apply Dow Corning Compound DC7 to approximately 11 inches on upper end of tubular strut.

NOTE

Avoid use of Dow Corning DC7 on surfaces to be painted. DC7 contains silicone which is harmful to painted areas.

c. Slide tubular strut into place through bushing in outboard strut fitting and into inboard strut fitting.
d. Align tubular strut in inboard fitting and install bolt through fitting and strut. Install washer and nut on bolt and tighten to torque value of 1100-1300 lb. in.
e. Connect hydraulic brake line to fitting. Fill and bleed brake system in accordance with applicable paragraph in this Section.
f. Install fuselage fairing.
g. Lower aircraft and install floorboard access covers.

5-8. STEP BRACKET INSTALLATION.

NOTE

The step bracket is secured to the tubular gear strut with EA9309, EC2216, EC2214, EC3445, or a similar epoxy base adhesive.

a. Mark position of the bracket so that the new step bracket will be installed in approximately the same position on the strut.
b. Remove all traces of the original bracket and adhesive as well as any rust, paint or scale with a wire brush and coarse sandpaper.
c. Leave surfaces slightly roughened or abraded, but deep scratches or nicks should be avoided.
d. Clean surfaces to be bonded together thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important that the bonding surfaces be clean and dry.
e. Check fit of step bracket on the tubular strut. A small gap is permissible between bracket and tubular strut.
f. Mix adhesive (any of those listed in note preceding step "a") in accordance with manufacturer's directions.
g. Spread a coat of adhesive on bonding surfaces, and place step bracket in position on the tubular strut. Clamp bracket to strut to ensure a good, tight fit.
h. Form a small fillet of the adhesive at all edges of the bonded surfaces. Remove excess adhesive with lacquer thinner.
i. Allow adhesive to cure thoroughly according to manufacturer's recommendations before flexing the tubular gear strut or applying loads to the strut.
j. Paint tubular strut and step bracket after curing is complete.

5-9. MAIN LANDING GEAR FAIRINGS. (Refer to figures 5-1 and 5-2.)

5-10. DESCRIPTION. Some aircraft are equipped with fuselage fairings, attached to the fuselage and the tubular strut fairings with screws. The tubular strut fairings cover the tubular landing gear struts, and attach to the fuselage fairings at the upper end and to fairing caps at the lower end. The fairing caps attach to the tubular strut fairings at the upper end and are clamped to the tubular struts at the lower end. Brake fairings are installed at the lower end of the tubular strut fairings and are attached to the wheel speed fairings by screws around their outer perimeters. The speed fairings are installed over the wheels and are attached to mounting plates, attached to the axles. The wheel fairings are equip-

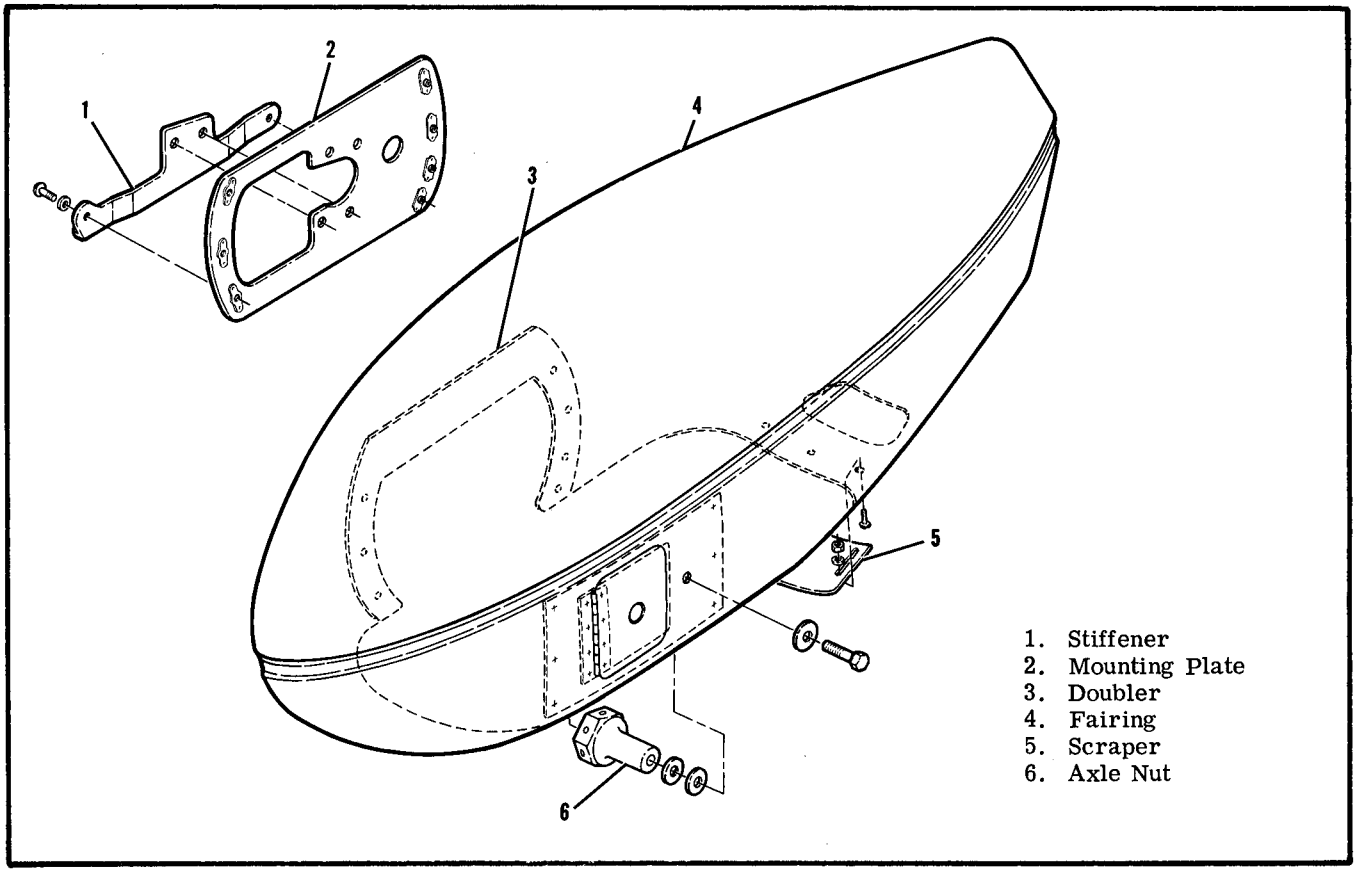


Figure 5-2. Main Wheel Speed Fairing

ped with adjustable scrapers, installed in the lower aft part of the fairings, directly behind the wheels.

5-11. REMOVAL AND INSTALLATION OF MAIN LANDING GEAR FAIRINGS. (Refer to figure 5-1.)

a. To remove brake fairing, proceed as follows:

1. Remove screws from perimeter of fairing.
2. Remove screws from nutplates holding two halves of fairing together; remove two fairing halves.
3. Reverse the preceding steps to install brake fairing.

b. To remove cap fairing, proceed as follows:

1. Remove three screws attaching fairing to tubular strut fairing.
2. Remove bolt and nut attaching clamp to tubular spring-strut.
3. Spring clamp open to slide over tubular gear strut; remove cap fairing.
4. Reverse the preceding steps to install cap fairing.

c. To remove fuselage fairing, proceed as follows:

1. Remove screws attaching fairing to fuselage.
2. Remove screws at splice in fairing.
3. Work fairing off strut fairing.
4. Reverse the preceding steps to install fuselage fairing.

d. To remove tubular gear strut fairing, proceed as follows:

1. Remove brake fairing as outlined in step "a".
2. Remove cap fairing as outlined in step "b".
3. Remove fuselage fairing as outlined in step "c".
4. Remove screws from nutplates on tubular gear strut fairing.
5. Spring fairing over tubular gear strut.
6. Reverse the preceding steps to install tubular gear strut fairing.

e. To remove step bracket cover, proceed as follows:

1. Remove tubular gear strut fairing as outlined in step "d".
2. Slide step bracket cover from step bracket on tubular gear strut.
3. Reverse the preceding steps to install cover.

5-12. MAIN WHEEL SPEED FAIRING REMOVAL. (Refer to figure 5-2.)

a. Remove wheel brake fairing (item 20, figure 5-1) by removing screws around perimeter of fairing, then removing screws from nutplates holding two halves of brake fairing together.
b. Remove screws attaching stiffener (1) and inboard side of wheel speed fairing (4) to attach plate (2), which is bolted to the axle.
c. Remove bolt securing outboard side of fairing to axle nut.
d. Loosen scraper, if necessary, and work speed fairing from wheel.

5-12A. MAIN WHEEL SPEED FAIRING INSTALLATION. (Refer to figure 5-2.)

a. Work speed fairing down over wheel.
b. Install bolt securing outboard side of fairing to axle nut.

c. Install screws attaching stiffener (1) and inboard side of wheel speed fairing (4) to mounting plate (2), which is bolted to the axle.
d. Install wheel brake fairing (item 20, figure 5-1) by installing screws in nutplates holding two halves of brake fairing together, then install screws around perimeter of fairing.
e. After installation, check scraper-to-tire clearance for a minimum of 0.25-inch to a maximum of 0.38-inch. Elongated holes are provided in the scraper for clearance adjustments.

CAUTION

Always check scraper-to-tire clearance after installing speed fairing, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. If the aircraft is flown from surfaces with mud, snow, or ice, the speed fairing should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Wipe fuel and oil from speed fairings to prevent stains and deterioration.

5-13. MAIN WHEEL REMOVAL. (Refer to figure 5-1.)

NOTE

It is not necessary to remove the main wheel to reline brakes or to remove brake parts, other than the brake disc on the torque plate.

a. Hoist or jack aircraft in accordance with procedures outlined in Section 2.
b. Remove speed fairing, if installed, as outlined in paragraph 5-12.
c. Remove hub caps, if installed, cotter pin and axle nut.
d. Remove bolts and washers attaching brake back plate to brake cylinder, and remove back plate.
e. Pull wheel from axle.

5-14. MAIN WHEEL DISASSEMBLY.

WARNING

Injury can result from attempting to remove wheel flanges with tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick in wheel flange could cause wheel failure.

a. Remove valve core and deflate tire and tube. Breake tire beads loose from wheel flanges.
b. Remove capscrews and washers from outboard wheel flange.
c. Remove capscrews and washers from inboard wheel flange.
d. Remove brake disc.
e. Separate wheel flanges from wheel hub. Retain spacers on each side of wheel hub.
f. Remove wheel hub from tire.
g. Remove retainer rings, grease seal retainers, grease seal felts and bearing cones.

NOTE

Bearing cups (races) are a press fit in the wheel hub and should not be removed unless a new part is to be installed. To remove the bearing cup, heat wheel hub in boiling water for 30 minutes, or in an oven not to exceed 121°C (250°F). Using an arbor press, if available, press out the bearing cup and press in the new bearing cup while the wheel hub is still hot.

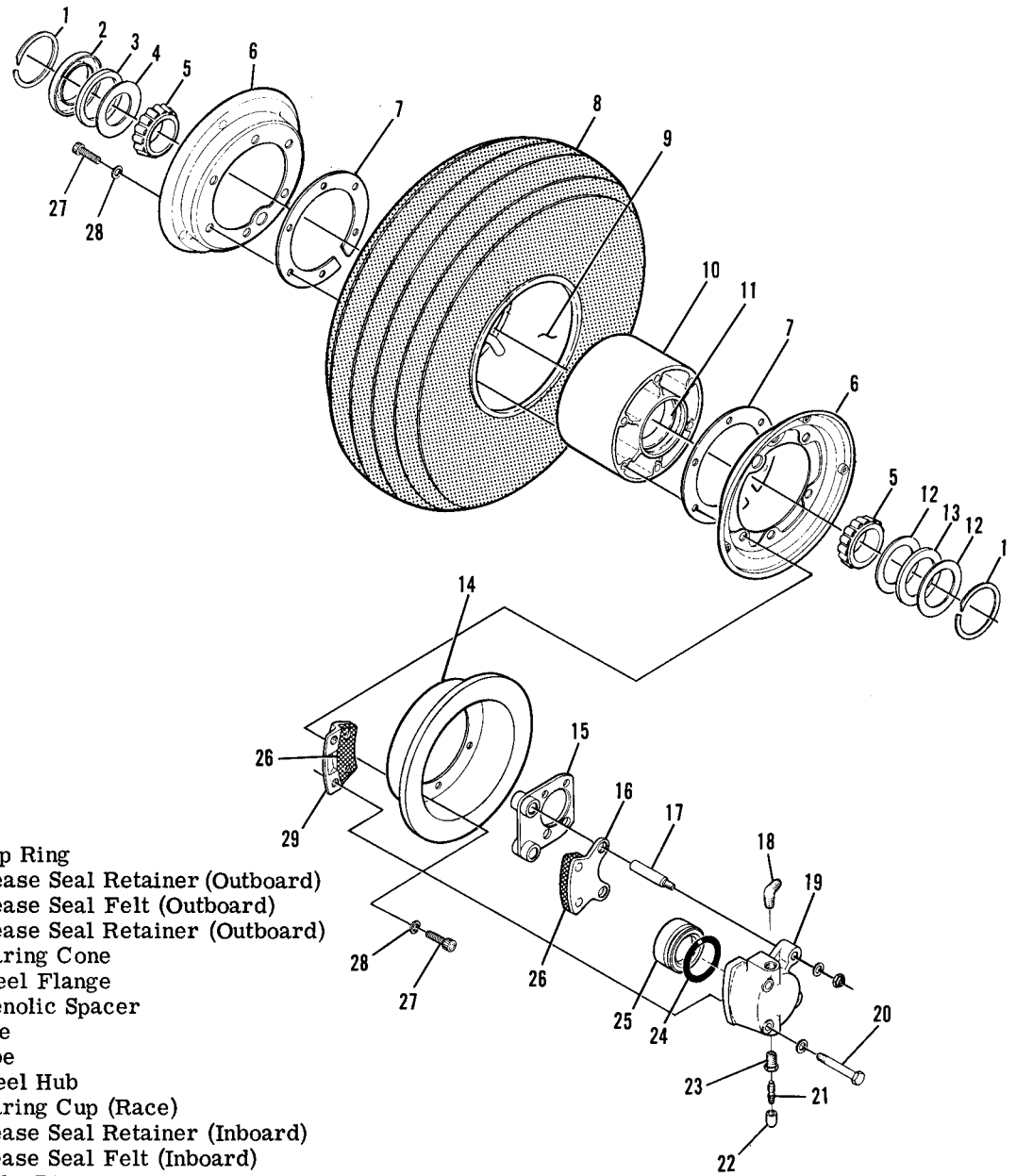
5-15. MAIN WHEEL INSPECTION AND REPAIR.
a. Clean all metal parts, grease seal felts and phenolic spacers in cleaning solvent and dry thoroughtly.
b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hub shall be discarded and new parts installed. Sand out smooth nicks, gouges and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.
c. If excessively warped or scored, or worn to a thickness of 0.190-inch, brake disc should be replaced with a new part. Sand smooth small nicks and scratches.
d. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease. Refer to Section 2 of this manual for grease type.

5-16. MAIN WHEEL REASSEMBLY.
a. Place wheel hub in tire and tube with tube inflation stem in hole of wheel hub.
b. Place spacer and wheel flange on inboard side of wheel hub (opposite of tube inflation stem).
c. Place washer under head of each capscrew, insert capscrew through brake disc, wheel flange and spacer, and start capscrews into wheel hub threads.

CAUTION

Be sure that spacers, wheel flanges and brake disc are seated on flange of wheel hub. Uneven or improper torque of capscrews can cause failure of capscrews or hub threads with resultant wheel failure.

d. Tighten capscrews evenly and torque to the value specified in figure 5-3.
e. Place spacer and wheel flange on outboard side of wheel hub and align valve stem hole in wheel flange.
f. Place washer under head of each capscrew, insert capscrew through wheel flange and spacer. Start capscrews into wheel hub threads.
g. Tighten capscrews evenly and torque to the value specified in figure 5-3.
h. Clean and pack bearing cones with clean aircraft wheel bearing grease. Refer to Section 2 of this manual for grease type.
i. Assemble bearing cones, grease seal felts and retainer into wheel hub.
j. Inflate tire to seat tire beads, then adjust to correct pressure. Refer to chart in Section 1 of this manual for correct tire pressure.



1. Snap Ring
2. Grease Seal Retainer (Outboard)
3. Grease Seal Felt (Outboard)
4. Grease Seal Retainer (Outboard)
5. Bearing Cone
6. Wheel Flange
7. Phenolic Spacer
8. Tire
9. Tube
10. Wheel Hub
11. Bearing Cup (Race)
12. Grease Seal Retainer (Inboard)
13. Grease Seal Felt (Inboard)
14. Brake Disc
15. Torque Plate
16. Pressure Plate
17. Anchor Bolt
18. Elbow
19. Brake Cylinder
20. Bolt
21. Bleeder Screw
22. Dust Cup
23. Bleeder Fitting
24. Piston O-Ring
25. Brake Piston
26. Brake Lining
27. Capscrew
28. Washer
29. Back Plate

Torque elbow (18) to a maximum of 60 lb-in. Lube/seal with Liquid O-Ring #404: (Oil Research, P.O. Box 51971, Lafayette, Louisiana 7050.)

Torque capscrews (27) to 190-200 lb-in.

Torque bolt (20) to 120-130 lb-in.

Torque bleeder screw (21) to 30-40 lb-in.

Figure 5-3. Main Wheel and Brake

5-17. MAIN WHEEL INSTALLATION.

a. Place wheel assembly on axle.

b. Install axle nut and tighten axle nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.

c. Place brake back plate in position and secure with bolts and washers.

d. Install hub cap. Install speed fairing (if used) as outlined in paragraph 5-12A.

CAUTION

Always check scraper-to-tire clearance after installing speed fairings, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. If the aircraft is flown from surfaces with mud, snow, or ice, the fairing should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Refer to paragraph 5-12A for correct scraper-to-tire clearance.

5-18. MAIN WHEEL AXLE REMOVAL.

NOTE

This procedure should be used if the axle is not bonded to the tubular strut. If the axle is bonded to the strut, refer to paragraph 5-20.

a. Remove speed fairing, if installed, in accordance with paragraph 5-12.

b. Remove wheel in accordance with paragraph 5-13.

c. Disconnect, drain and cap or plug hydraulic brake line at the wheel brake cylinder.

d. Remove bolts attaching brake torque plate and speed fairing mounting plate to axle.

e. Remove cotter pin, nut, washer and bolt attaching axle to tubular strut.

f. Remove axle from spring-strut.

5-19. MAIN WHEEL AXLE INSTALLATION.

NOTE

This procedure should be used if the axle is not to be bonded to the tubular strut. If the axle is to be bonded to the strut, refer to paragraph 5-21.

a. Install axle on spring-strut, using wet primer on faying surfaces of axle and spring-strut. Axle is installed with tapered edges to bottom.

b. Install bolt, washer and nut attaching axle to spring-strut. After tightening nut, install cotter pin.

c. Install brake components and speed fairing mounting plate to axle.

d. Install wheel on axle in accordance with paragraph 5-17.

e. Connect hydraulic brake line to wheel brake cylinder.

f. Fill and bleed hydraulic brake system in accordance with applicable paragraph in this section.

g. Install speed fairing, if used, in accordance with paragraph 5-12A.

5-20. BONDED MAIN WHEEL AXLE REMOVAL. (Refer to figure 5-4.)

NOTE

On some aircraft, due to axle looseness, axles have been bonded to the tubular landing gear strut. The following procedure should be used to remove a bonded axle.

a. Remove speed fairings, if installed, according to procedures outlined in applicable paragraph of this section.

b. Remove wheels in accordance with procedures outlined in applicable paragraph of this section.

c. Disconnect, drain and cap or plug hydraulic brake line at the wheel brake cylinder.

d. Remove cotter pin, nut and bolt attaching axle to spring strut.

e. Remove brake components and speed fairing plate from axle.

NOTE

Axles are bonded to the struts of some tubular gear aircraft with EA9309-25GR adhesive, which is available from the Cessna Service Parts Center. The bond is too strong to allow the axle to be removed without first weakening the bond strength. The only methods of weakening the bond are with heat or cryogenic cold; heat being the most practical. A temperature of approximately 500°F is sufficient to weaken the bond so the axle can be removed. This is still a low enough temperature to prevent damage to the tubular strut.

f. Remove axles as follows:

NOTE

Axles should be removed from strut, using electric heating tape, available from most scientific supply companies. One type can be obtained from Curtin Scientific Co., 6550 East 42nd St., P.O. Box 747, Tulsa, Oklahoma 74101. Tape should conform to the following: 192 watts, 24" long, 1" wide, flexible and heavily insulated.

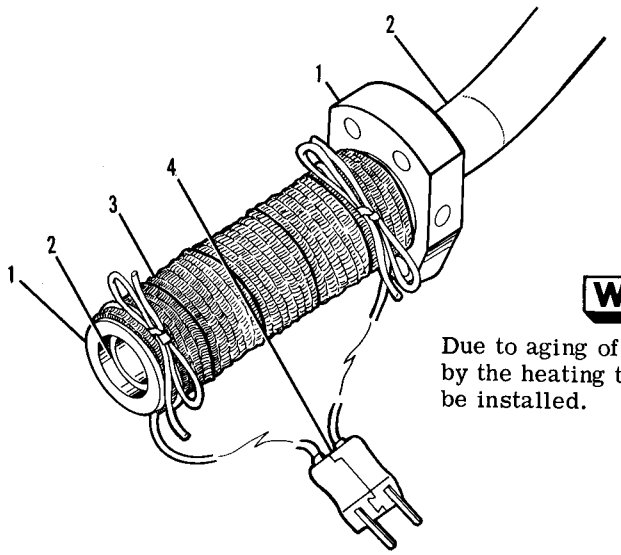
g. Wrap heating tape around axle from base head to outer end of axle and tie it on with string provided with the tape, as shown in the figure.

CAUTION

Do not place tape in direct contact with tubular gear spring.

h. Plug electric tape into 110 volt wall socket and heat for 20 to 30 minutes.

i. Unplug tape and remove from axle. Remove axle by striking axle base head with a few sharp blows.



Do not place tape in direct contact with tubular gear spring.

WARNING

Due to aging of the aluminum axle, caused by the heating tape, a new axle will have to be installed.

1. Axle
2. Tubular Gear Strut
3. Electrical Heating Tape
4. Plug

Figure 5-4. Bonded Main Wheel Axle Removal

j. Clean any old adhesive off landing gear spring with a wire brush. Brush strokes should run lengthwise along the spring. After old adhesive has been removed, wipe with clean rag saturated with acetone or alcohol. Immediately wipe dry with a clean, lint free cloth.

WARNING

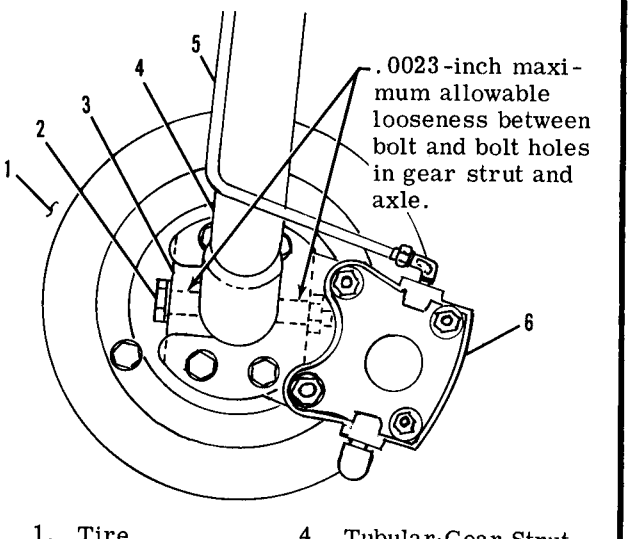
Due to aging of the aluminum axle, caused by the heating tape, a new axle will have to be installed.

5-21. BONDED MAIN WHEEL AXLE INSTALLATION.

NOTE

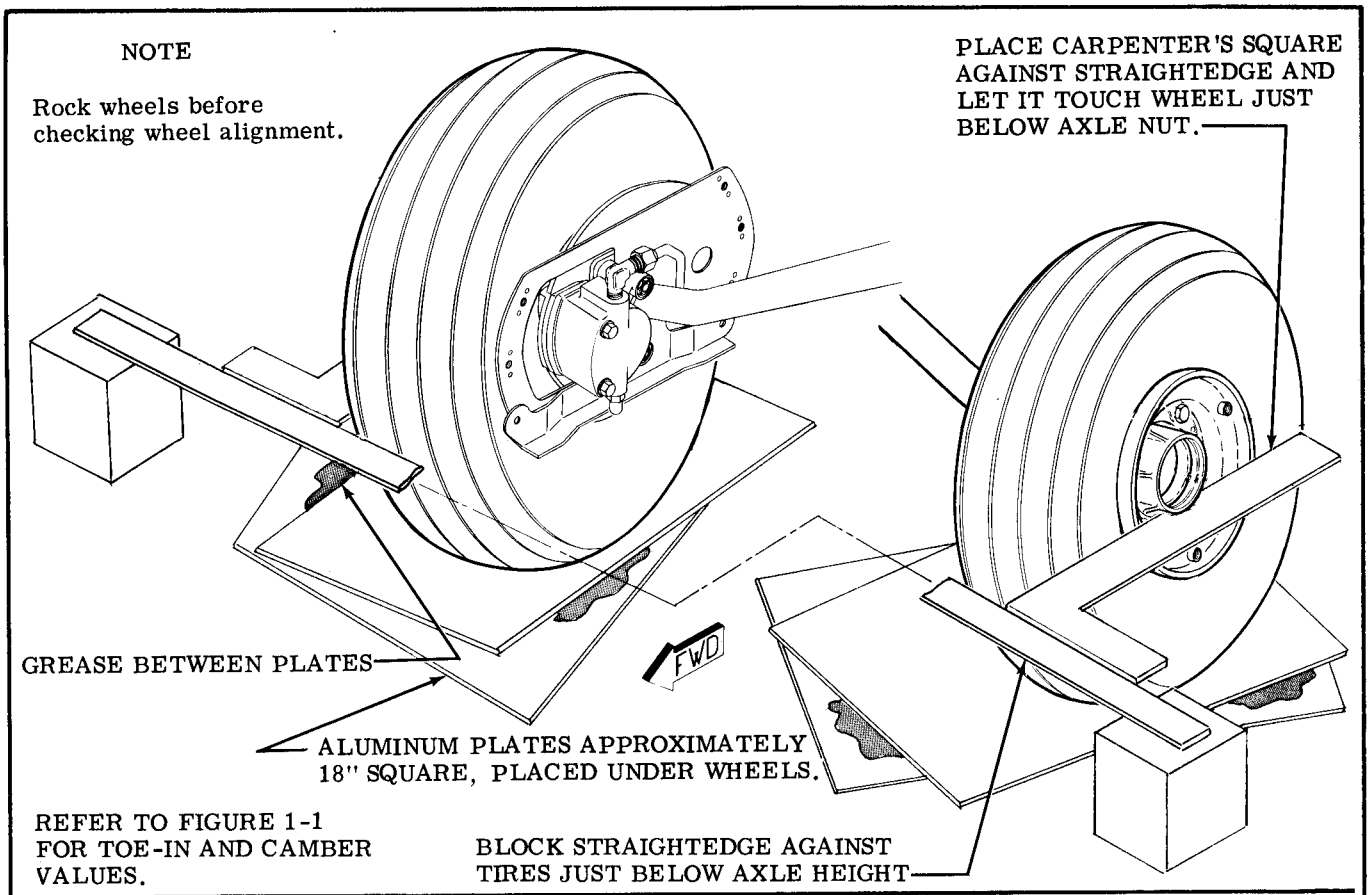
Refer to figure 5-4A for checking looseness of axle on tubular gear strut. If a maximum looseness of .0023-inch between mounting bolt and holes in tubular gear strut and axle is encountered, it is permissible to bond the axle to the strut. Do not allow the adhesive to enter the holes in gear strut or axle, or to contact bolt threads. The following procedure outlines the method for bonding axle to strut.

a. Prior to installing new axle, wipe outer surface of tubular gear and inside of axle with solvent, drying immediately with a clean, lint free cloth.
b. Mix EA9309-25GR adhesive, available from the Cessna Service Parts Center, in accordance with instructions in the package. Spread adhesive thinly and evenly on outer surface of landing gear spring in area that will be covered by axle.
c. Place axle on gear spring and rotate axle to assure even coverage between inner surface of axle and outer surface of spring.
d. Install retaining bolt, washers, nut and cotter pin. Tighten nut securely.
e. Allow 24 hours at 75°F for adhesive to cure, or 30 minutes at 250°F, if heating equipment is available.
f. Install brake components and speed fairing mounting plate to axle.
g. Install wheel on axle in accordance with procedures outlined in applicable paragraph of this section.
h. Connect hydraulic brake line to wheel brake cylinder.
i. Fill and bleed hydraulic brake system in accordance with applicable paragraph in this section.
j. Install speed fairings, if used, in accordance with applicable paragraph in this section.



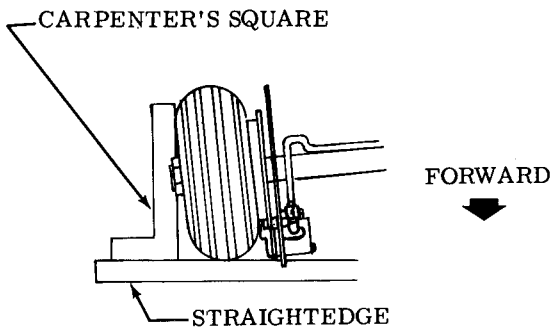
1. Tire
2. Attaching Bolt
3. Axle
4. Tubular Gear Strut
5. Brake Line
6. Brake

Figure 5-4A. Checking Axle Looseness



TOP VIEW OF TOE-IN CHECK

Measure toe-in at edges of wheel flange. Difference in measurements is toe-in for one wheel. (half of total toe-in.)



FRONT VIEW OF CAMBER CHECK

Measure camber by reading protractor level held vertically against outboard flanges of wheel.

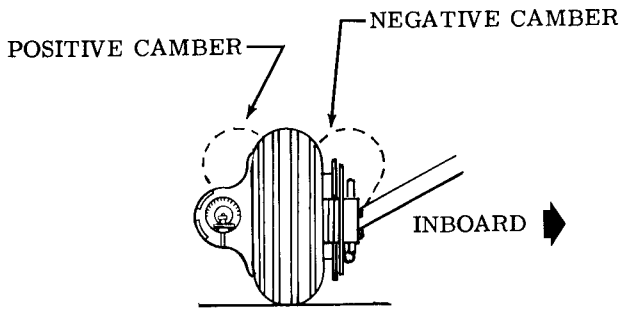


Figure 5-5. Wheel Alignment

5-22. MAIN WHEEL ALIGNMENT. Refer to the table in figure 1-1 for information.

5-23. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of this tire is marked with a red dot on the tire sidewall and the heavy-weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel shows evidence of unbalance during service, it may be statically balanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

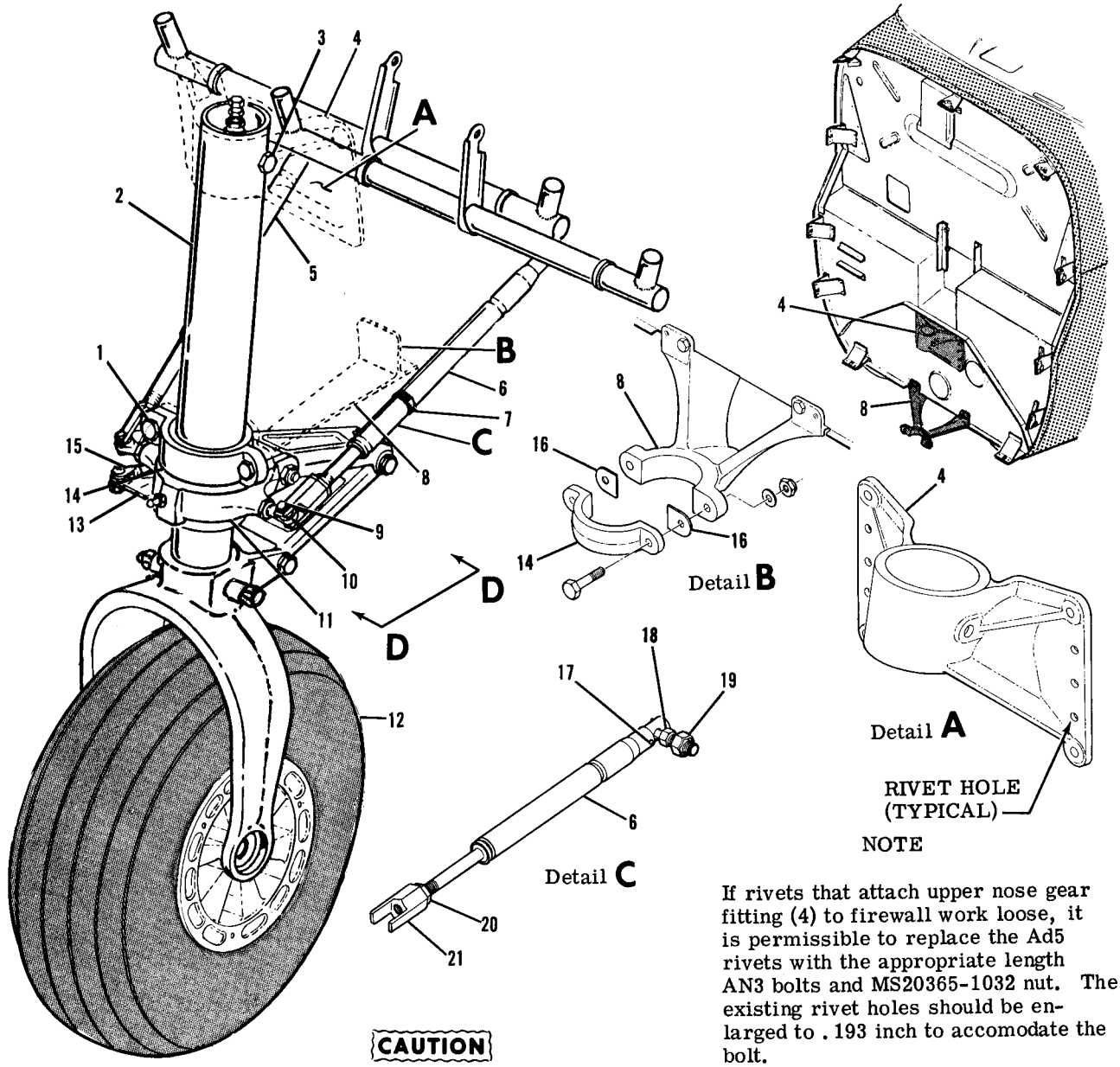
5-24. NOSE GEAR.

5-25. DESCRIPTION. A steerable nose wheel, mounted in a fork, attached to an air/oil (oleo) shock strut, make up the nose gear. The shock strut is attached to the firewall with upper and lower strut fittings. Nose wheel steering is accomplished by two steering tubes linking the nose gear steering collar to the rudder pedal bars. A hydraulic fluid-filled shimmy dampener is provided to minimize nose wheel shimmy. A nose wheel speed fairing may be installed on some aircraft.

5-26. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NOSE WHEEL SHIMMY.	Nose strut attaching bolts loose.	Tighten nose strut attaching bolts.
	Loose or worn nose wheel steering linkage.	Tighten. Replace defective parts with new parts.
	Nose wheel out of balance.	Refer to paragraph 5-36.
	Wheel bearings too loose.	Adjust properly.
	Defective shimmy dampener.	Repair, or install new dampener.
	Shimmy dampener fluid low.	Service in accordance with Section 2.
	Loose torque links.	Add shims, or install new parts as required.
NOSE STRUT DOES NOT HOLD AIR PRESSURE.	Defective or loose air filler valve.	Check gasket and tighten loose valve. Install new valve if defective.
	Defective strut seals.	Install new seals.
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.	Defective strut seals.	Install new seals.

SHOP NOTES:

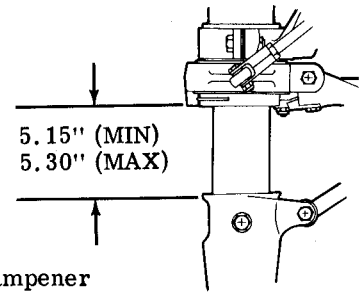


NOTE

If rivets that attach upper nose gear fitting (4) to firewall work loose, it is permissible to replace the Ad5 rivets with the appropriate length AN3 bolts and MS20365-1032 nut. The existing rivet holes should be enlarged to .193 inch to accomodate the bolt.

CAUTION

When installing cap (14), check gap between cap and strut fitting before attaching bolts are tightened. Gap tolerance is .010" minimum and .016" maximum. If gap exceeds maximum tolerance, install shims (16), Part No. 0543042-1 (.016") and Part No. 0543042-2 (.032"), as required, to obtain gap tolerance. Replace cap if gap is less than minimum, using shims to obtain proper gap. Install shims as equally as possible between sides.



Section **D-D**

1. Bolt
2. Strut Assembly
3. Bolt
4. Upper Nose Gear Fitting
5. RH Steering Tube
6. LH Steering Tube
7. Clamp
8. Lower Strut Fitting
9. Bolt
10. Rod End
11. Steering Arm Assembly
12. Wheel Assembly
13. Shimmy Dampener Arm
14. Strut Clamp Cap
15. Shimmy Dampener
16. Shim
17. Rivet
18. Ball Joint
19. Nut
20. Check Nut
21. Clevis

Figure 5-6. Nose Gear Installation

5-27. NOSE GEAR REMOVAL. (Refer to figure 5-6.)

a. Remove cowling for access.

b. Weight or tie down tail of aircraft to raise nose wheel off the floor.

c. Disconnect nose wheel steering tubes from nose gear steering collar.

d. Remove strut clamp cap and shims at lower strut fitting.

WARNING

Be sure strut is deflated completely before removing bolt at top of strut or before disconnecting torque links.

e. Deflate strut completely and telescope strut to its shortest length.

f. Remove bolt at top of strut.

g. Pull strut assembly down and out of upper attach forging.

5-28. NOSE GEAR INSTALLATION. (Refer to figure 5-6.)

a. Before inflating nose gear strut, insert top of strut in upper attach forging and attach with bolt.

b. Telescope strut to mate strut clamp cap with lower strut fitting on firewall.

c. Install shims and strut clamp cap attaching strut to lower strut fitting, observing the CAUTION in figure 5-6.

d. Inflate and service shock strut in accordance with procedures outlined in Section 2 of this manual.

e. Rig nose wheel steering tubes as outlined in applicable paragraph in Section 10.

5-29. NOSE WHEEL SPEED FAIRING REMOVAL.

a. Weight or tie down tail of aircraft to raise nose wheel off the floor.

b. Remove nose wheel axle stud.

WARNING

Nose wheel fairing cover plate is secured by the lower torque link attaching bolt. Deflate strut before removing this bolt. (Refer to Section 2 of this manual.)

c. Deflate strut and remove bolt securing cover plate to strut; remove cover plate.

d. Remove bolt securing speed fairing and tow-bar spacers to strut.

NOTE

Bolt attaching tow bar spacers also holds base plug in place. Cut head off an AN5 bolt and cut bolt to approximately 3-inches in length. When driving attaching bolt out, drive 3-inch headless bolt in to hold base plug and bushing in place.

e. Slide speed fairing up and remove nose wheel. Loosen scraper as necessary.

f. Rotate speed fairing 90 degrees and work fairing down over nose gear fork to remove.

5-30. NOSE WHEEL SPEED FAIRING INSTALLATION.

WARNING

Do not inflate or service shock strut until after speed fairing is installed.

a. Rotate speed fairing 90 degrees and work fairing up over nose gear fork to install.

b. Slide fairing up and install nose wheel; install axle stud.

c. Tighten axle stud nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pins.

d. Install bolt, tow-bar spacers, washers and nut attaching fairing to strut, driving out 3-inch headless bolt.

e. Install cover plate and bolt attaching cover plate to strut.

f. Inflate and service shock strut in accordance with applicable paragraph in Section 2 of this manual.

g. Adjust wheel scraper clearance in accordance with the following caution.

CAUTION

Always check scraper clearance after installing speed fairing, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. Set clearance between tire and scraper for a minimum of 0.25-inch to a maximum of 0.38-inch. Elongated holes in the scraper are provided for adjustment. If the aircraft is flown from surfaces with mud, snow, or ice, the speed fairing should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Wipe fuel and oil from speed fairing to prevent staining and deterioration of the fairing.

5-31. NOSE WHEEL REMOVAL.

a. Weight or tie down tail of aircraft to raise the nose wheel off the floor.

b. Remove nose wheel axle stud.

c. Pull nose wheel assembly from fork and remove axle tube from nose wheel. Loosen wheel scraper if necessary, if wheel is equipped with a speed fairing.

5-32. NOSE WHEEL DISASSEMBLY. (Refer to figure 5-8.)

WARNING

Serious injury can result from attempting to separate wheel halves with tire and tube inflated.

a. Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves (6).

b. Remove nuts (4) and washers (5).

c. Remove thru-bolts (8) and washers (5).

d. Separate and remove wheel halves (6) from tire and tube.

e. Remove retaining ring (1), grease seal retainer

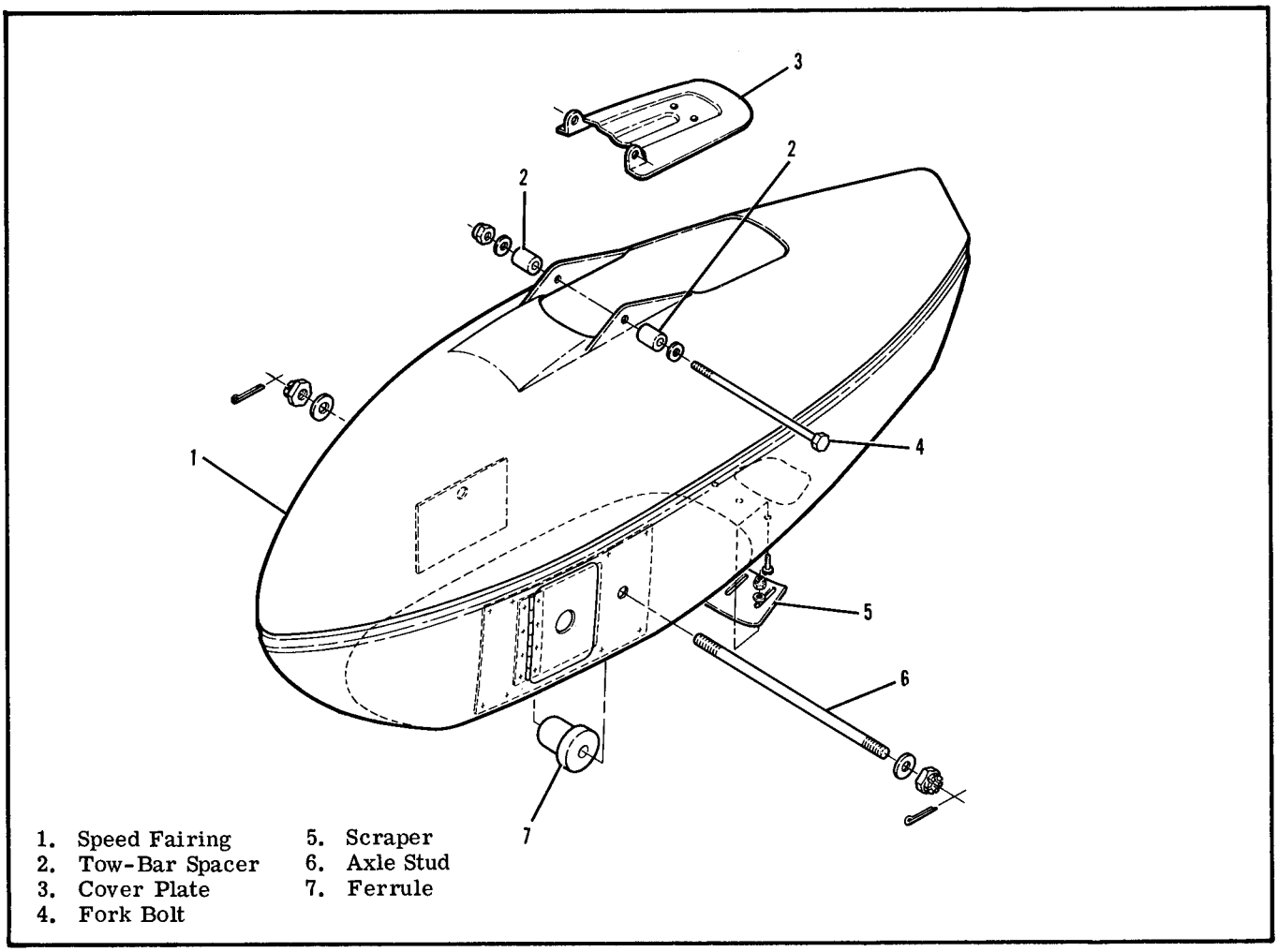


Figure 5-7. Nose Wheel Speed Fairing

(2), felt grease seal (3), grease retainer (2) and bearing cone (9) from each wheel half (6).

NOTE

Bearing cups (races) (7) are a press fit in wheel half (6) and should not be removed unless a new part is to be installed. To remove bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven, not to exceed 121°C (250°F). Using an arbor press, if available, press out bearing cup and press in new bearing cup while wheel half is still hot.

5-33. NOSE WHEEL INSPECTION AND REPAIR.

a. Clean all metal parts and felt grease seals in Stoddard solvent or equivalent, and dry thoroughly.

NOTE

A soft bristle brush may be used to remove hardened grease, dust or dirt.

b. Inspect wheel halves (6) for cracks or damage.

c. Inspect bearing cones (9), cups (7), retaining rings (1) and seals (2) and (3), for wear or damage.

d. Inspect thru-bolts (8) and nuts (4) for cracks in threads or cracks in radius

e. Replace cracked or damaged wheel half (6).

f. Replace damaged retaining rings (1) and seals (2) and (3).

g. Replace any worn or cracked thru bolts (8) or nuts (4).

h. Replace worn or damaged bearing cups (7) or cones (9).

i. Remove any corrosion or small nicks.

j. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.

k. Pack bearings with grease specified in Section 2 of this manual.

5-34. NOSE WHEEL REASSEMBLY. (Refer to figure 5-8.)

a. Assembly bearing cone (9), grease seal retainer (2), felt grease seal (3), grease seal retainer (2) and retaining ring (1) into both wheel halves (6).

b. Insert tube in tire, aligning index marks on tire and tube.

c. Place wheel half (6) into tire and tube (side opposite valve stem), aligning base of valve stem in valve slot. With washer (5) under head of thru-bolt (8), insert bolt through wheel half (6).

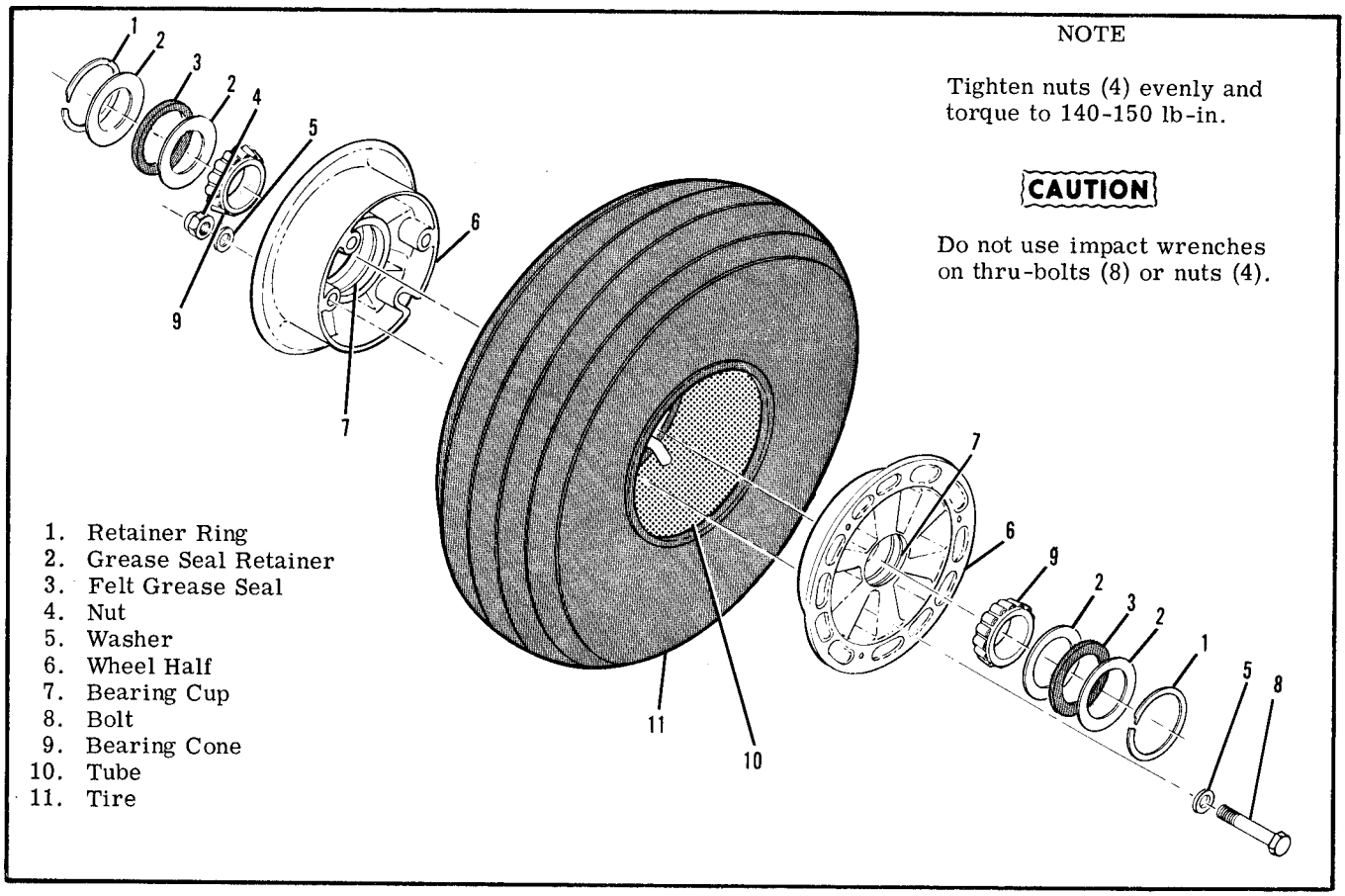


Figure 5-8. Nose Wheel Assembly

d. Place wheel half (6) into other side of tire and tube, aligning valve stem in valve slot.
e. Install washers (5) and nuts (4) on thru-bolts (8) and pre-torque to 10-50 lb. in.

CAUTION

Uneven or improper torque of the nuts can cause failure of the bolts with resultant wheel failure.

f. Prior to torquing nuts (4), inflate tube with approximately 10-15 psi air pressure to seat tire.

CAUTION

Do not use impact wrenches on thru-bolts or nuts.

g. Dry torque all nuts (4) evenly to a torque value of 140-150 lb. in.
h. Inflate tire to correct pressure specified in chart in Section 1 of this manual.

5-35. NOSE WHEEL INSTALLATION.
a. Install axle tube in nose wheel.
b. Install nose wheel assembly in fork and install nose wheel axle stud.
c. Tighten axle stud nut until a slight bearing drag is obvious when wheel is rotated. Back nut off to the nearest castellation and insert cotter pins.

CAUTION

On aircraft equipped with speed fairings, always check scraper-to-tire clearance after installing speed fairing, whenever a tire has been changed or whenever scraper adjustment has been disturbed. Set scraper clearance in accordance with instructions outlined in paragraph 5-30.

5-36. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of the tire is marked with a red dot on the tire sidewall, and the heavy-weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel shows evidence of unbalance during service, it may be statically balanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

5-37. NOSE GEAR SHOCK STRUT DISASSEMBLY. (Refer to figure 5-9.)

NOTE

The following procedures apply to the nose gear shock strut after it has been removed from the aircraft, and the speed fairing and the nose wheel have been removed. In many cases, separation of the upper and lower strut will permit inspection and parts installation without removal or complete disassembly of the strut.

WARNING

Be sure shock strut is completely deflated before removing lock ring in lower end of upper strut, or disconnecting torque links.

a. Remove shimmy dampener.
b. Remove torque links. Note position of washers, shims and spacers.
c. Remove lock ring from groove inside lower end of upper strut. A small hole is provided at the lock ring groove to facilitate removal of the lock ring.

NOTE

Hydraulic fluid will drain from strut halves as lower strut is pulled from upper strut.

d. Using a straight, sharp pull, separate upper and lower struts. Invert lower strut and drain hydraulic fluid.
e. Remove lock ring and bearing at upper end of lower strut assembly. Note top side of bearing.
f. Slide packing support ring, scraper ring, retaining ring and lock ring from lower strut, noting relative position and top side of each ring; wire or tape together, if desired.
g. Remove O-ring and back-up rings from packing support ring.
h. Remove bolt securing tow bar spacers.

NOTE

Bolt attaching tow bar spacers also holds bushing and base plug in place.

i. Remove bolt attaching fork to strut barrel, and remove bushing, base plug and metering pin from lower strut. Remove O-rings and metering pin from base plug.

NOTE

Lower strut barrel and fork are a press fit, drilled on assembly. Separation of these parts is not recommended, except for installation of a new part.

j. Remove retaining ring securing steering arm assembly on upper strut, and remove steering arm assembly, shims (if installed) and washer. If shims are installed, note number and position of each shim.
k. Push orifice support from upper strut and remove O-ring.
l. Remove filler valve from orifice support.

5-38. NOSE GEAR SHOCK STRUT INSPECTION AND REPAIR. (Refer to figure 5-9.)
a. Thoroughly clean all parts in cleaning solvent and inspect them carefully.
b. All worn or defective parts and all O-rings and back-up rings must be replaced with new parts.
c. Sharp metal edges should be smoothed with No. 400 emery paper, then cleaned with solvent.

5-39. NOSE GEAR SHOCK STRUT REASSEMBLY. (Refer to figure 5-9.)

NOTE

Used sparingly, Dow Corning Compound DC4 is recommended for O-ring lubrication. All other internal parts should be liberally coated with hydraulic fluid during reassembly.

a. Install washer (1) and shim(s) (2), if installed.
b. Lubricate needle bearings in steering collar (4), as shown in Section 2 of this manual, and install collar and retaining ring (5).
c. Check steering collar for snug fit against washer. Shims of variable thicknesses are available from the Cessna Service Parts Center to provide a snug fit for collar against washer.

NOTE

If shims are required, remove retaining ring and steering collar and add shims as necessary to provide a snug fit with steering collar retaining ring in place.

Part numbers of available shims and their thicknesses are listed as follows:

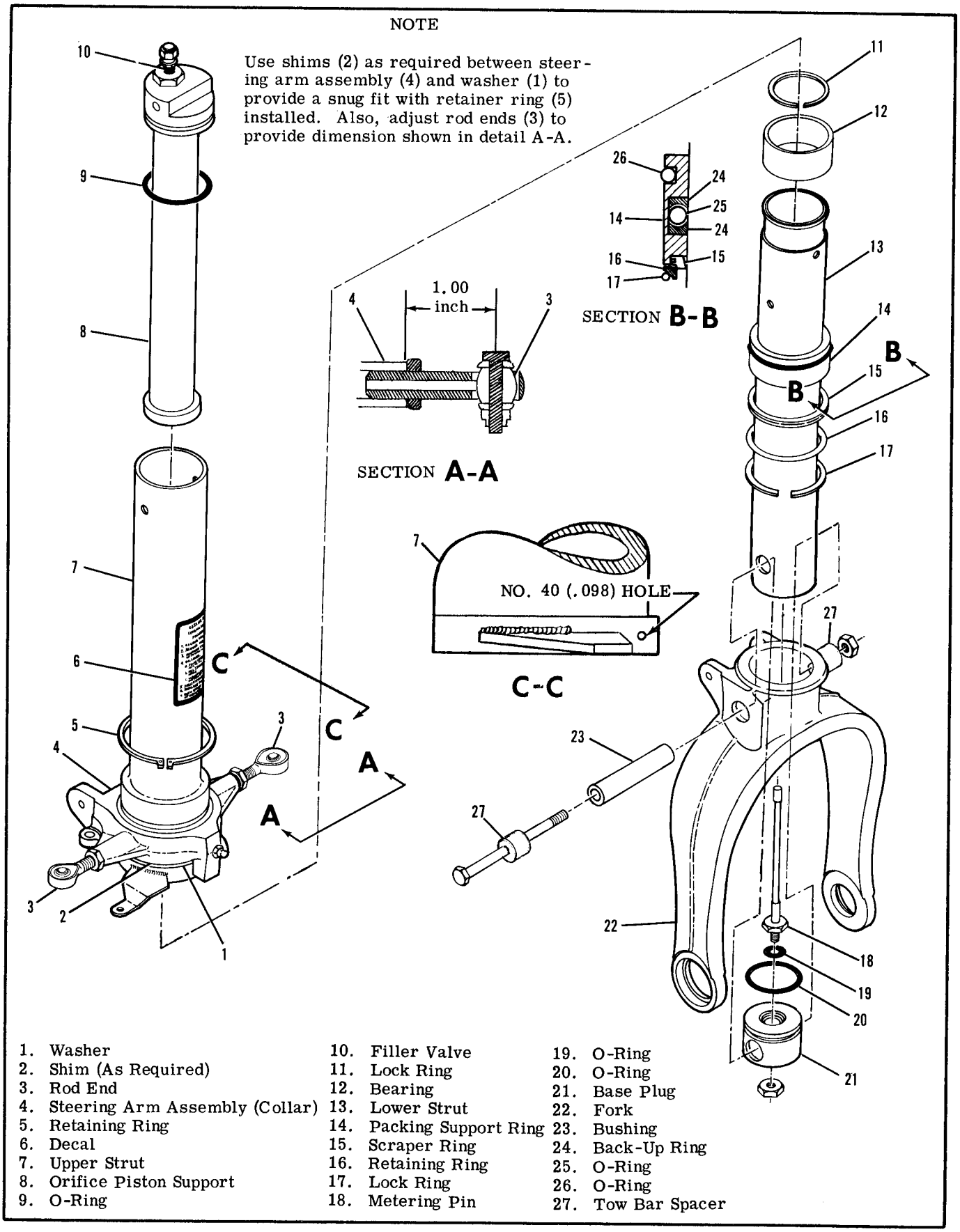
1243030-5	0.006
1243030-6	0.012
1243030-7	0.020

d. Install rod ends (3) in steering collar (4) and adjust rod ends to dimension specified in Section A-A in figure 5-9.
e. Install O-ring (9) and filler valve (10) in orifice piston support (8) and install orifice piston support in upper strut (7).
f. Install O-ring (20) and metering pin (18) with O-ring (19) in base plug (21); secure with nut.

NOTE

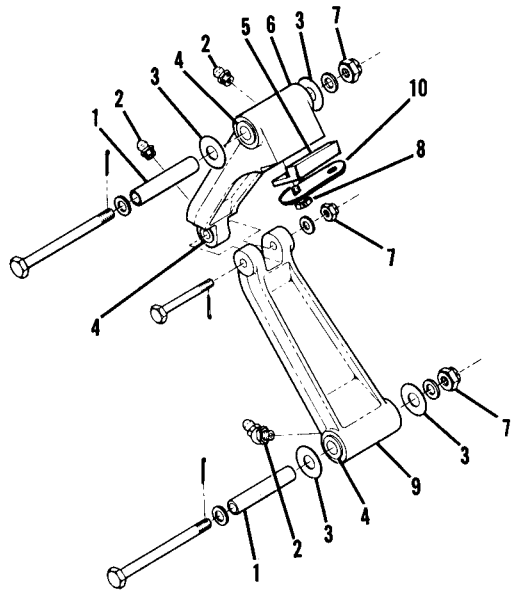
If base plug (21) is to be replaced, new part will need to be line-drilled to accept NAS75-5 bushing.

g. Install bushing (23) (if removed) in base plug (21), and install base plug assembly in lower strut (13).
h. Align holes of bushing, hole in lower strut, and hole in fork. Install tow bar spacer under head of bolt, and install bolt through fork, lower strut and bushing which is installed in base plug. Install tow



1. Washer
2. Shim (As Required)
3. Rod End
4. Steering Arm Assembly (Collar)
5. Retaining Ring
6. Decal
7. Upper Strut
8. Orifice Piston Support
9. O-Ring
10. Filler Valve
11. Lock Ring
12. Bearing
13. Lower Strut
14. Packing Support Ring
15. Scraper Ring
16. Retaining Ring
17. Lock Ring
18. Metering Pin
19. O-Ring
20. O-Ring
21. Base Plug
22. Fork
23. Bushing
24. Back-Up Ring
25. O-Ring
26. O-Ring
27. Tow Bar Spacer

Figure 5-9. Nose Gear Shock Strut Assembly



NOTE

Tighten bolts (8) to 20-25 pound-inches, then safety the bolts by bending tips of safety lug (10).

Tighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole.

Shims (3) are available to use as required to remove any looseness.

1. Spacer
2. Grease Fitting
3. Shim
4. Bushing
5. Stop Lug
6. Upper Torque Link
7. Nut
8. Bolt
9. Lower Torque Link
10. Safety Lug

Figure 5-10. Torque Links

bar spacer on threaded end of bolt, install and tighten nut.

i. Install lock ring (17), retaining ring (16) and scraper ring (15) on lower strut, making sure they are installed in same positions as they were removed.

j. Install O-rings (25) and (26) and back-up rings in packing support ring (14); slide packing support ring over lower strut (13).

k. Install bearing (12) and lock ring (11) at upper end of lower strut assembly. Note top side of bearing.

l. Install upper strut assembly over lower strut assembly.

m. Install lock ring (17) in groove in lower end of upper strut. Position lock ring so that one of its ends covers the small access hole in the lock ring groove (Section view C-C.)

n. Install torque links, positioning washers, shims and spacers exactly in positions as removed.

o. Install shimmy dampener.

p. After shock strut assembly is complete, install strut on aircraft as outlined in paragraph 5-28.

q. After strut is installed on aircraft, fill and inflate shock strut in accordance with procedures outlined in Section 2 of this manual.

5-40. TORQUE LINKS. (Refer to figure 5-10.)

5-41. DESCRIPTION. Torque links keep the lower strut aligned with the nose geat steering system, but permit shock strut action.

5-42. TORQUE LINK REMOVAL.

WARNING

Completely deflate strut before removing torque links.

a. Completely deflate shock strut.

b. Disconnect upper and lower attaching bolts, spacers, shims and nuts; remove torque links.

5-43. TORQUE LINK INSPECTION AND REPAIR. (Refer to figure 5-10.) Torque link bushings should not be removed except for replacement of parts; replace if excessively worn.

5-44. TORQUE LINK INSTALLATION. (Refer to figure 5-10.)

NOTE

If bolts (8), safety lug (10) and stop lug (5) were removed, upon installation, tighten bolts (8) to 20-25 pound-inches, then safety the bolts by bending tips of safety lug (10).

a. With shock strut completely deflated, install upper and lower torque link assemblies.

b. Install bolt attaching upper and lower assemblies.

c. Tighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole in bolt.

d. Check upper torque link (6) and lower torque link (9) for looseness. If looseness is apparent, remove nuts (7) and bolts and install shims (3) as necessary to take up any looseness. This will assist in preventing nose wheel shimmy.

e. Retighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole in bolt; install cotter pin.

f. Fill and inflate shock strut in accordance with procedures outlined in Section 2 of this manual.

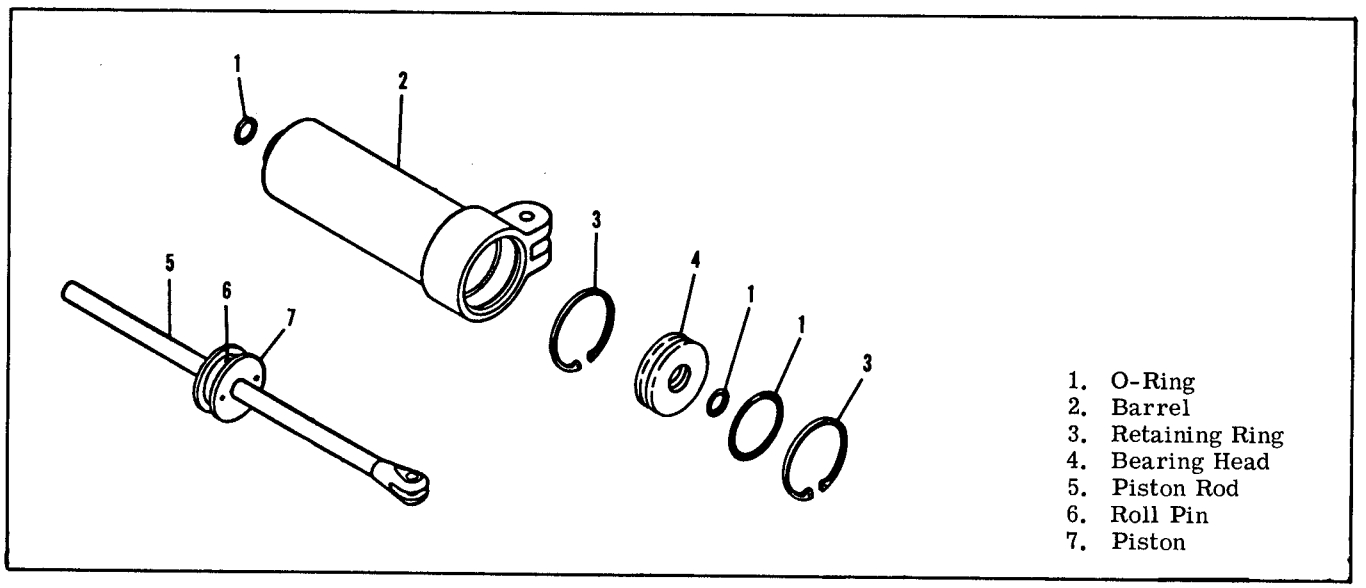


Figure 5-11. Shimmy Dampener

5-45. SHIMMY DAMPENER. (Refer to figure 5-11.)

5-46. DESCRIPTION. The shimmy dampener, provided for the nose gear, offers resistance to shimmy by forcing hydraulic fluid through small orifices in a piston. The dampener piston shaft is secured to a bracket, welded on the bottom of the upper strut tube. The shimmy dampener housing is secured to the steering arm assembly, which moves as the nose wheel is turned, causing relative motion between the dampener shaft and housing.

5-47. SHIMMY DAMPENER REMOVAL.

a. Remove cotter pin, nut, washers and bolt attaching shaft clevis to bracket welded on bottom of upper strut tube.

b. Remove cotter pin, nut, spacer and bolt attaching dampener housing to steering arm assembly.

c. Remove shimmy dampener.

5-48. DISASSEMBLY AND REASSEMBLY. (Refer to figure 5-11.) Refer to the figure for disassembling and reassembling the shimmy dampener. When reassembling dampener, install all new O-rings. Lubricate all parts with clean hydraulic fluid. When dampener is completely assembled, service in accordance with procedures outlined in Section 2 of this manual.

5-49. SHIMMY DAMPENER INSTALLATION.

a. Attach shimmy dampener housing to steering arm assembly with bolt, spacer, nut and cotter pin.

b. Attach dampener piston rod clevis to bracket welded on bottom of upper strut tube with bolt, washers (as required) and nut.

5-50. NOSE WHEEL STEERING SYSTEM.

5-51. DESCRIPTION. Nose wheel steering is accomplished through the use of the rudder pedals. Spring-loaded steering rod assemblies connect the nose gear steering arm assembly to arms on the rudder bars. Steering is afforded up to approximately 10 degrees each side of neutral, after which, brakes may be used to gain a maximum deflection of 30 degrees right or left of center. A flexible boot seals the fuselage entrance of the steering rod assembly.

5-52. NOSE WHEEL STEERING ROD ASSEMBLIES.

5-53. DESCRIPTION. The steering rods are connected by a clevis to the rod ends extending from the nose gear steering arm, and to an arm on the rudder pedal crossbars.

5-54. NOSE WHEEL STEERING ADJUSTMENT. Before attaching nose wheel steering rods to the rod ends protruding from the steering arm assembly, adjust rod ends to the dimension specified in section view A-A in figure 5-9. Since the nose wheel steering system and the rudder system are interconnected, adjustment to one system might affect the other system. Refer to Section 10 of this manual for instructions for rigging the nose wheel steering system and the rudder system.

5-55. BRAKE SYSTEM.

5-56. DESCRIPTION. The hydraulic brake system is comprised of two master cylinders, located immediately forward of the pilot's rudder pedals, brake lines and hoses connecting each master cylinder to its wheel brake cylinder, and the single-disc, floating cylinder-type brake assembly, located at each main gear wheel.

5-57. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Check and adjust properly.
	Parking brake linkage holding brake pedal down.	Check and adjust properly.
	Worn or broken piston return spring (in master cylinder.)	Repair, or install new cylinder.
	Insufficient Clearance at Lock-O-Seal or correct adjustment of cylinder overall length.	Adjust as outlined in paragraph 5-63.
	Restriction in hydraulic lines or restrictions in compensating port in brake master cylinder.	Drain brake line and clear the inside of the brake line with filtered compressed air. If cleaning the lines fails to give satisfactory results, the master cylinder may be faulty and should be repaired.
	Worn, scored or warped brake disc.	Install new disc and brake linings.
	Damaged or accumulated dirt restricting free movement of wheel brake parts.	Clean and repair or install new parts as necessary.
BRAKES FAIL TO OPERATE.	Leak in system.	If brake master cylinders or wheel cylinder assemblies are leaking, repair, or install new parts.
	Air in system.	Bleed system.
	Lack of fluid in master cylinders.	Fill and bleed system.
	Defective master cylinder.	Repair, or install new parts.

5-58. BRAKE MASTER CYLINDER.

5-59. DESCRIPTION. The brake master cylinders, located immediately forward of the pilot's rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder for the fluid supply. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.

5-60. BRAKE MASTER CYLINDER REMOVAL.
a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
b. Remove front seats and rudder bar shield for access to the brake master cylinders.
c. Disconnect parking brake linkage and disconnect brake master cylinders from rudder pedals.
d. Disconnect hydraulic hose from brake master cylinders and remove cylinders.
e. Plug or cap hydraulic fittings, hoses and lines, to prevent entry of foreign material.

5-61. BRAKE MASTER CYLINDER DISASSEMBLY. (Refer to figure 5-12.)
a. Unscrew clevis (1) and jamb nut (2).
b. Remove screw (18) and washer (19).
c. Remove filler plug (17) and setscrew (5).
d. Unscrew cover (4) and remove up over piston rod (3).
e. Remove piston rod (3) and compensating sleeve (16).
f. Slide sleeve (16) up over rod (3).
g. Unscrew nut (12) from threads of piston rod (3).
h. Remove spring (13) and O-ring (9) from piston (14).
i. Remove Lock-O-Seal (15).

5-62. BRAKE MASTER CYLINDER INSPECTION AND REPAIR. (Refer to figure 5-12.) Repair is limited to installation of new parts, cleaning and adjusting. (Refer to reassembly paragraph for adjustment.) Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinders. Inspect Lock-O-Seal (Parker Seal Co. P/N 800-001-6) and replace if damaged. Replace all O-rings. Filler plug (17) must be vented so pressure cannot build up in the reservoir during brake operation. Remove plug and drill 1/16-inch hole, 30° from vertical, if plug is not vented.

5-63. BRAKE MASTER CYLINDER REASSEMBLY. (Refer to figure 5-12.)
a. Install Lock-O-Seal (15) at bottom of piston rod (3).
b. Install O-ring (9) in groove in piston (14); insert piston spring (13) into piston, and slide assembly up on bottom threaded portion of piston rod (3).
c. Run nut (12) up threads to spring (13). Tighten nut (12) enough to obtain 0.040±0.005-inch clearance between top of piston and bottom of Lock-O-Seal, as shown in the figure.
d. Install piston return spring (11) into cylinder (10) portion of body-(7).
e. Install piston rod (3) end through spring (11).
f. Slide compensating sleeve (16) over rod (3).
g. Install cover (4), washer (19) and screw (18).
h. Install jamb nut (2) and clevis (1).
i. Install filler plug (17), making sure vent hole is open.
j. Install setscrew (5).

5-64. BRAKE MASTER CYLINDER INSTALLATION.
a. Connect hydraulic hoses to brake master cylinders and install cylinders.
b. Connect brake master cylinders to rudder pedals and connect parking brake linkage.
c. Install rudder bar shield and install front seats.
d. Install bleeder screw at wheel brake assembly and fill and bleed brake system in accordance with applicable paragraph in this Section.

5-65. HYDRAULIC BRAKE LINES.

5-66. DESCRIPTION. The brake lines are rigid tubing, except for flexible hose used at the brake master cylinders. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.

5-67. WHEEL BRAKE ASSEMBLIES. (Refer to figure 5-3.)

5-68. DESCRIPTION. The wheel brake assemblies use a floating brake assembly and a disc which is attached to the main wheel.

5-69. WHEEL BRAKE REMOVAL. (Refer to figure 5-3.) Wheel brake assemblies can be removed by disconnecting the brake line (drain hydraulic fluid when disconnecting line) and removing the brake back plate. The brake disc is removed after the wheel is removed and disassembled. To remove the torque plate, remove wheel and axle.

5-70. WHEEL BRAKE DISASSEMBLY. Refer to figure 5-3 for a breakdown of wheel brake parts. This figure may be used as a guide for disassembling the wheel brakes.

5-71. WHEEL BRAKE INSPECTION AND REPAIR.
a. Clean all parts except brake linings and O-rings in dry cleaning solvent and dry thoroughly.
b. Install all new O-rings. If O-ring reuse is necessary, wipe with a clean cloth saturated in hydraulic fluid and inspect for damage.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in the hydraulic brake system.

c. Check brake lining for deterioration and maximum permissible wear. (Refer to applicable paragraph for maximum wear limit.)
d. Inspect brake cylinder bore for scoring. A scored cylinder will leak or cause rapid O-ring wear. Install a new brake cylinder if the bore is scored.
e. If the anchor bolts on the brake assembly are nicked or gouged, they shall be sanded smooth to prevent binding with the pressure plate or torque plate. When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft

mallet.

f. Inspect wheel brake disc for a minimum thickness of 0.190-inch. If brake disc is below minimum thickness, install a new part.

5-72. WHEEL BRAKE REASSEMBLY. (Refer to figure 5-3.)

NOTE

Lubricate parts with clean hydraulic fluid during brake reassembly.

a. Refer to figure 5-3 as a guide while reassembling wheel brakes.

5-73. WHEEL BRAKE INSTALLATION.

a. Place brake assembly in position with pressure plate in place.

b. Install back plate.

NOTE

If torque plate was removed, install as the axle is installed, or install on axle. If the brake disc was removed, install as wheel is assembled.

5-74. CHECKING BRAKE LINING WEAR. New brake lining should be installed when the existing lining has worn to a minimum thickness of 3/32-inch. A 3/32-inch thick strip of material held adjacent to each lining can be used to determine amount of wear. The shank end of a drill bit of the correct size can also be used to determine wear of brake linings.

5-75. BRAKE LINING INSTALLATION. (Refer to figure 5-3.)

a. Remove bolts securing back plate, and remove back plate.

b. Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.

c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller) punch in the rolled rivet, and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate and pressure plate in the same manner.

NOTE

A rivet setting kit, Part No. R561, is available from the Cessna Service Parts Center. This kit consists of an anvil and punch.

d. Clamp the flat side of the anvil in a vise.

e. Align new lining on back plate and place brake rivet in hole with rivet head in the lining. Place the head against the anvil.

f. Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with hammer to set rivet. Repeat blows on punch until lining is firmly against back plate.

g. Realign the lining on the back plate and install and set rivets in the remaining holes.

h. Install a new lining on pressure plate in the same manner.

i. Position pressure plate on anchor bolts and place cylinder in position so that anchor bolts slide into the torque plate.

j. Install back plate with bolts and washers.

5-76. BRAKE SYSTEM BLEEDING.

NOTE

Bleeding with a clean hydraulic pressure source connected to the wheel cylinder bleeder is recommended.

a. Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into the filler hole at top of the master cylinder.

b. Immerse opposite end of flexible hose in a container with enough hydraulic fluid to cover end of the hose.

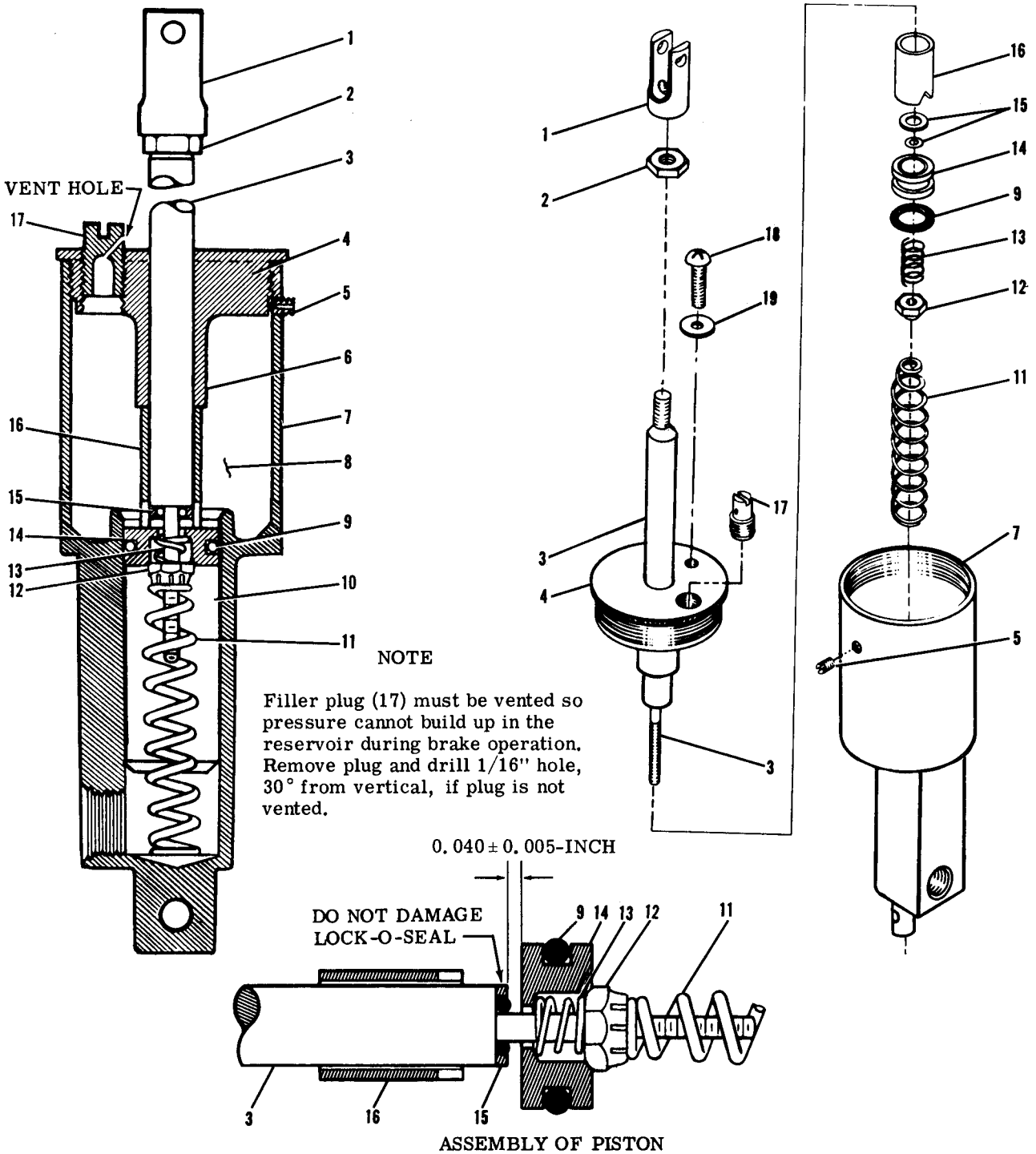
c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit, to the bleeder valve in the wheel cylinder.

d. As fluid is pumped into the system, observe the immersed end of the hose at the master brake cylinder for evidence of air bubbles being forced from the brake system. When bubbling has ceased, remove bleeder source from wheel cylinder, and tighten the bleeder valve.

5-77. PARKING BRAKE SYSTEM. (Refer to figure 5-13.)

5-78. DESCRIPTION. The parking brake system employs a handle and ratchet mechanism connected by a cable to linkage at the brake master cylinders. Pulling out on the handle depresses both master cylinder piston rods, and the handle ratchet locks the handle in this position until the handle is turned and released.

5-79. REMOVAL AND INSTALLATION OF COMPONENTS. Refer to the figure for relative location of system components. The figure may be used for removal and installation of parts of the system.



1. Clevis
2. Jam Nut
3. Piston Rod
4. Cover
5. Setscrew
6. Cover Boss
7. Body
8. Reservoir
9. O-Ring
10. Cylinder
11. Piston Return Spring
12. Nut
13. Piston Spring
14. Piston
15. Lock-O-Seal
16. Compensating Sleeve
17. Filler Plug
18. Screw
19. Washer

Figure 5-12. Brake Master Cylinder

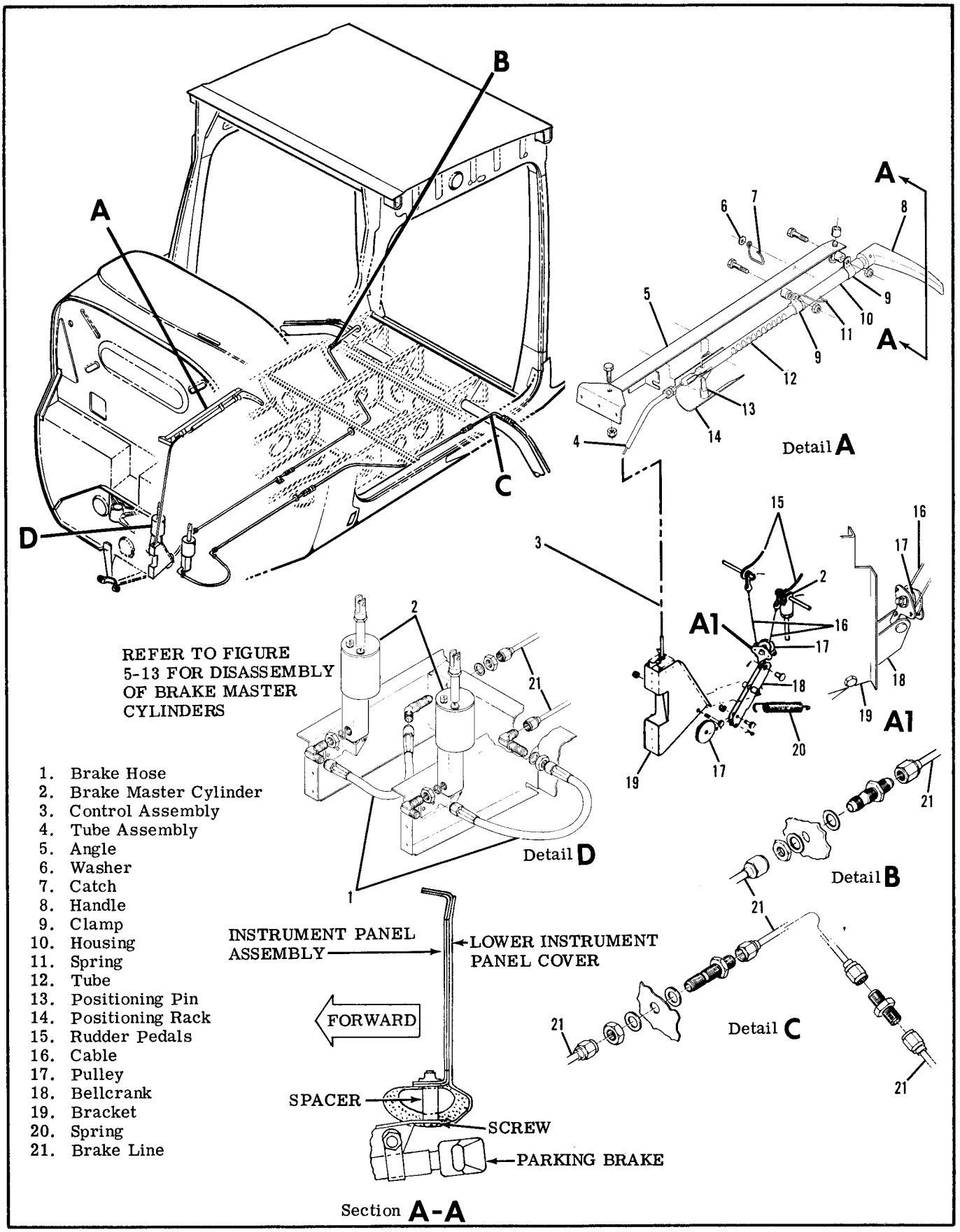


Figure 5-13. Brake Systems

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SECTION 6

AILERON CONTROL SYSTEM

TABLE OF CONTENTS

6-1. AILERON CONTROL SYSTEM. (Refer to figure 6-1.)

6-2. DESCRIPTION. The aileron control system consists of two control wheels, one for the pilot and one for the copilot, attached to columns and linked by universal joints to the control "U" located behind the instrument panel. Lateral rotation of either control wheel is transmitted to the ailerons, one per wing, via a series of sprockets, chains, pulleys, cables, bellcranks and push pull tubes.

6-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 6-18.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION IN CONTROL WHEEL.	Loose control cables.	Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Replace worn or broken parts, install cables correctly.
	Sprung bellcranks.	Replace bellcranks.
	Loose chains.	Adjust to proper tension.

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Adjust cables to proper tension.
	Pulleys binding or cable off.	Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Replace bellcrank.
	Clevis bolts in system too tight.	Loosen, then tighten properly and safety.
	Rusty chain.	Replace chain.
	Chain binding with sprockets.	Replace defective parts.
	Defective U-joints.	Replace defective U-joints.
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of chains or cables. With control wheel centered, aileron bellcrank stop bushing should be centered in slot (both left and right bellcranks).	Adjust in accordance with paragraph 6-18.
	Improper adjustment of aileron push-pull rods. If chains and cables are properly rigged and bellcrank stop bushings are centered in slots, push-pull rods are adjusted incorrectly.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Chains improperly adjusted.	Adjust in accordance with paragraph 6-18.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Adjust in accordance with paragraph 6-18.
	Worn bellcrank stop bushings or bellcrank slots.	Replace worn parts.

6-4. CONTROL "U". (Refer to figure 6-2.)

6-5. DESCRIPTION. The control "U" transforms rotation of the control wheels into pulling motion on the aileron cables by means of sprockets and chains. The "U" is pivoted at the lower end to operate the elevator control system.

6-6. REMOVAL AND INSTALLATION.

a. Disconnect battery cables and insulate terminals as a safety precaution.

b. Remove pedestal cover as outlined in paragraph 9-13.

c. Remove rudder bar shields, carpeting and plates as necessary for access to lower end of control "U".

d. Remove radios, radio cooling plans, dust covers and associated hardware as necessary.

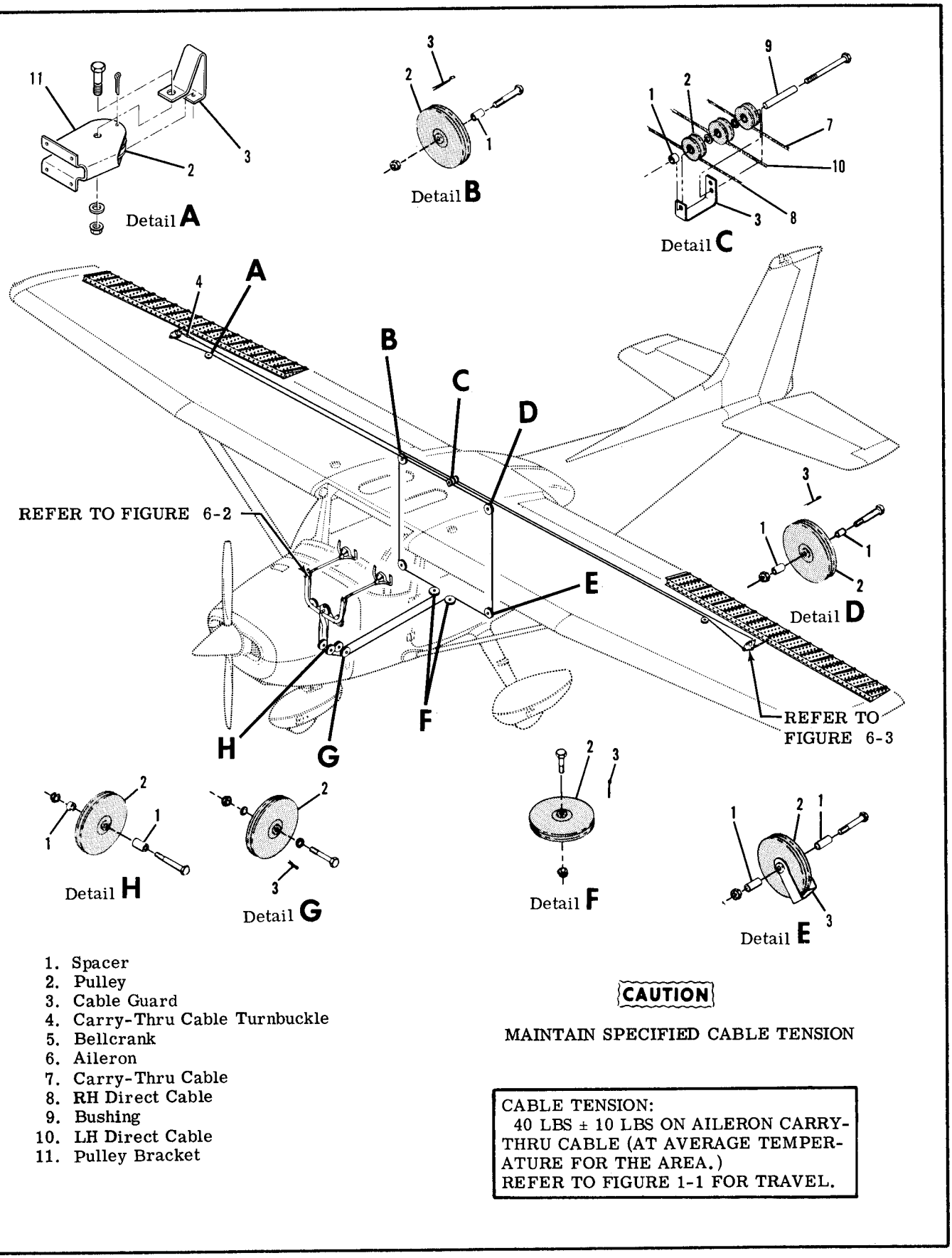
e. Remove glove box.

f. Remove cabin air cooling hose directly below right hand side of instrument panel.

g. Remove engine controls and cabin air controls as necessary.

h. Remove right hand forward side upholstery panel.

i. Remove bolt from each end of parking brake assembly and swing assembly away from working area.



1. Spacer
2. Pulley
3. Cable Guard
4. Carry-Thru Cable Turnbuckle
5. Bellcrank
6. Aileron
7. Carry-Thru Cable
8. RH Direct Cable
9. Bushing
10. LH Direct Cable
11. Pulley Bracket

CAUTION

MAINTAIN SPECIFIED CABLE TENSION

CABLE TENSION:
40 LBS ± 10 LBS ON AILERON CARRY-THRU CABLE (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 6-1. Aileron Control System

j. Remove bolt attaching bearing (11) to control "U" and remove bearing and associated hardware.
k. Drill out rivets attaching instrument panel support (after completion of step "j") and remove support.
l. Drill out rivets attaching right hand side panel to pedestal structure and remove panel.
m. Remove safety wire and disconnect turnbuckles (17).
n. Remove bolts (12) attaching control wheel tubes to universal joints (13).
o. Remove bolt (19) attaching push-pull tube (18) to control "U."
p. Remove pivot bolt (20) and carefully work control "U" out from under right hand side of instrument panel.
q. Reverse preceding steps for reinstallation.

NOTE

To prevent loss of strength and to ease reinstallation of right hand pedestal structure side panel, machine screws and nuts may be installed in the two upper rivet holes, provided at least No. 6 screws are installed.

r. Rig aileron control system in accordance with paragraph 6-18 and safety turnbuckles (17).
s. Check and/or rig elevator control system in accordance with paragraph 8-14.
t. Check and/or rig all engine and cabin air controls.
u. Check all radios and electrical components which may have been disconnected or become inoperative while performing the preceding steps.
v. Reinstall all items removed for access.

6-7. REPAIR. Repair consists of replacing worn, damaged or defective shafts, bearings, bushings, sprockets, roller chains, universal joints or other components. Refer to Section 2 for lubrication requirements.

6-8. AILERON BELLCRANK. (Refer to figure 6-3.)

6-9. REMOVAL.
a. Remove access plate inboard of each bellcrank on underside of wing.
b. Relieve control cable tension by loosening turnbuckle barrel (17).
c. Disconnect control cables from bellcrank. Retain all spacers (12).
d. Disconnect aileron push-pull rod (8) at bellcrank.
e. Remove nuts, washers and bolts securing bellcrank stop bushing (15) and bellcrank (7) to wing structure.
f. Remove bellcrank through access opening, using care that bushing (5) is not dropped from bellcrank.

NOTE

Brass washers (11) may be used as shims between lower end of bellcrank and wing channel (9). Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (6).

6-10. REPAIR. Repair of bellcranks consists of replacement of defective parts. If needle bearings are dirty or in need of lubrication, clean thoroughly and lubricate as outlined in Section 2.

6-11. INSTALLATION.
a. Place bushing (5) and stop-bushing (15) in bellcrank (7) and position bellcrank in wing.
b. Install brass washers (11) between lower end of bellcrank and wing channel (9) to shim out excess clearance.
c. Install bellcrank pivot bolt (4), washers and nut.
d. Position bellcrank stop-bushing and install attaching bolt (16), washers and nut.
e. Connect aileron cables and push-pull rod to bellcrank.
f. Rig aileron system in accordance with applicable paragraph in this section, safety turnbuckle (17) and reinstall all items removed for access.

6-12. CABLES AND PULLEYS. (Refer to figure 6-1.)

6-13. REMOVAL AND INSTALLATION.
a. Remove access plates, wing root fairings and upholstery as required.
b. Disconnect cables from aileron bellcranks and remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach cable being installed and use to pull cable into position.

c. After cable is routed, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
d. Rig aileron system in accordance with applicable paragraph in this section, safety turnbuckles and install access plates, fairings and upholstery removed in step "a."

6-14. AILERONS. (Refer to figure 6-3.)

6-15. REMOVAL.
a. Disconnect push-pull rod (8) at aileron.
b. Remove screws and nuts attaching aileron hinges (2) to trailing edge of wing.
c. Using care, pull aileron out and down to slide hinges from under wing skin and auxiliary spar reinforcements.

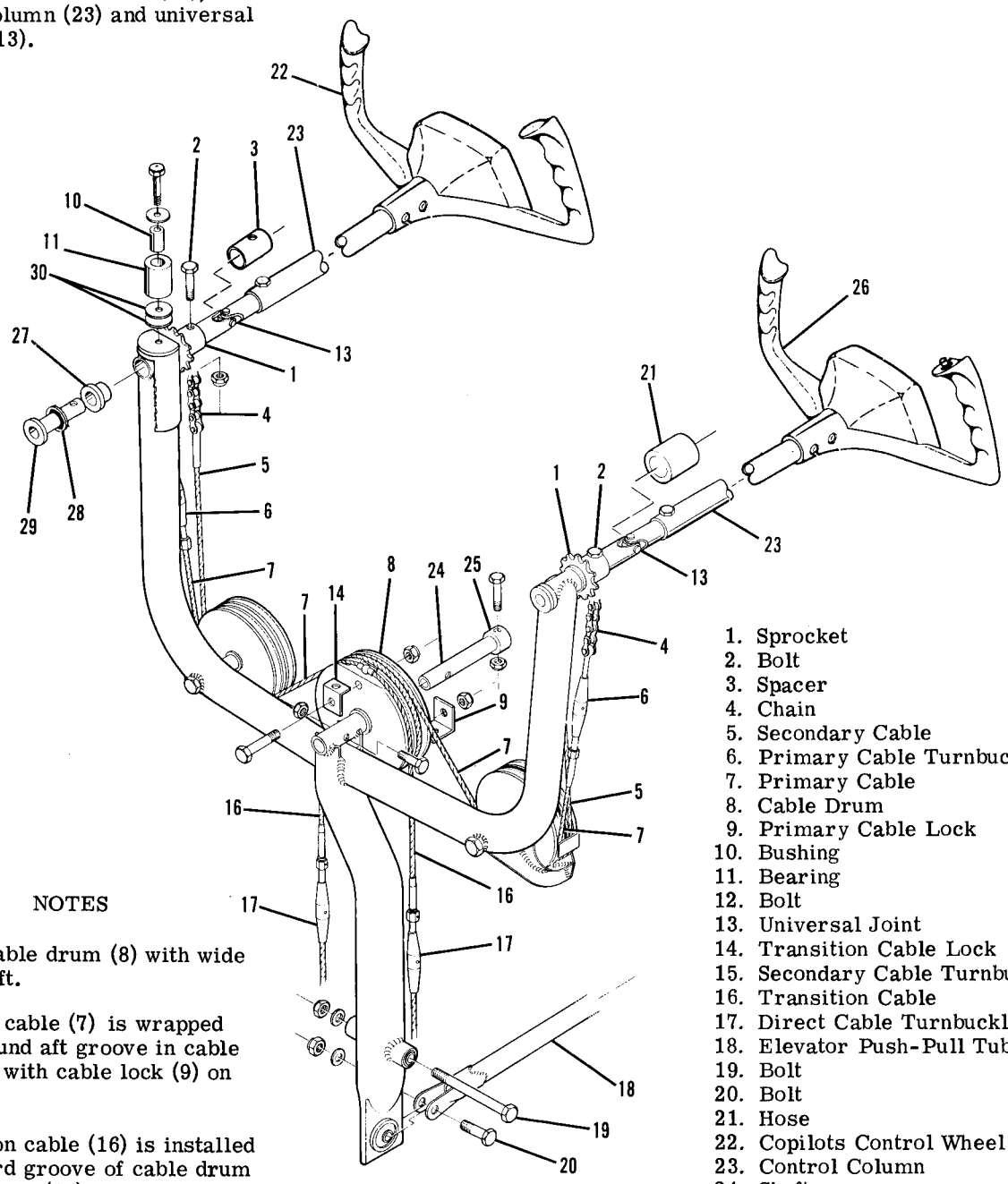
6-16. INSTALLATION.
a. Position aileron hinges between skin and auxiliary spar reinforcements and install screws and nuts attaching hinges to trailing edge of wing.
b. Attach push-pull rod (8) to aileron.

NOTE

If rigging was correct and push pull rod adjustment was not disturbed, it should not be necessary to rig system.

NOTE

When dual controls are NOT installed, spacer (3) replaces copilot's control wheel (22), control column (23) and universal joint (13).



NOTES

Install cable drum (8) with wide groove aft.

Primary cable (7) is wrapped once around aft groove in cable drum (8) with cable lock (9) on bottom

Transition cable (16) is installed in forward groove of cable drum (8) with lock (14) on top.

1. Sprocket
2. Bolt
3. Spacer
4. Chain
5. Secondary Cable
6. Primary Cable Turnbuckle
7. Primary Cable
8. Cable Drum
9. Primary Cable Lock
10. Bushing
11. Bearing
12. Bolt
13. Universal Joint
14. Transition Cable Lock
15. Secondary Cable Turnbuckle
16. Transition Cable
17. Direct Cable Turnbuckle
18. Elevator Push-Pull Tube
19. Bolt
20. Bolt
21. Hose
22. Copilots Control Wheel
23. Control Column
24. Shaft
25. Retainer
26. Pilot's Control Wheel
27. Bearing
28. Countersunk Washer
29. Shaft
30. Washer

Figure 6-2. Control "U" Installation

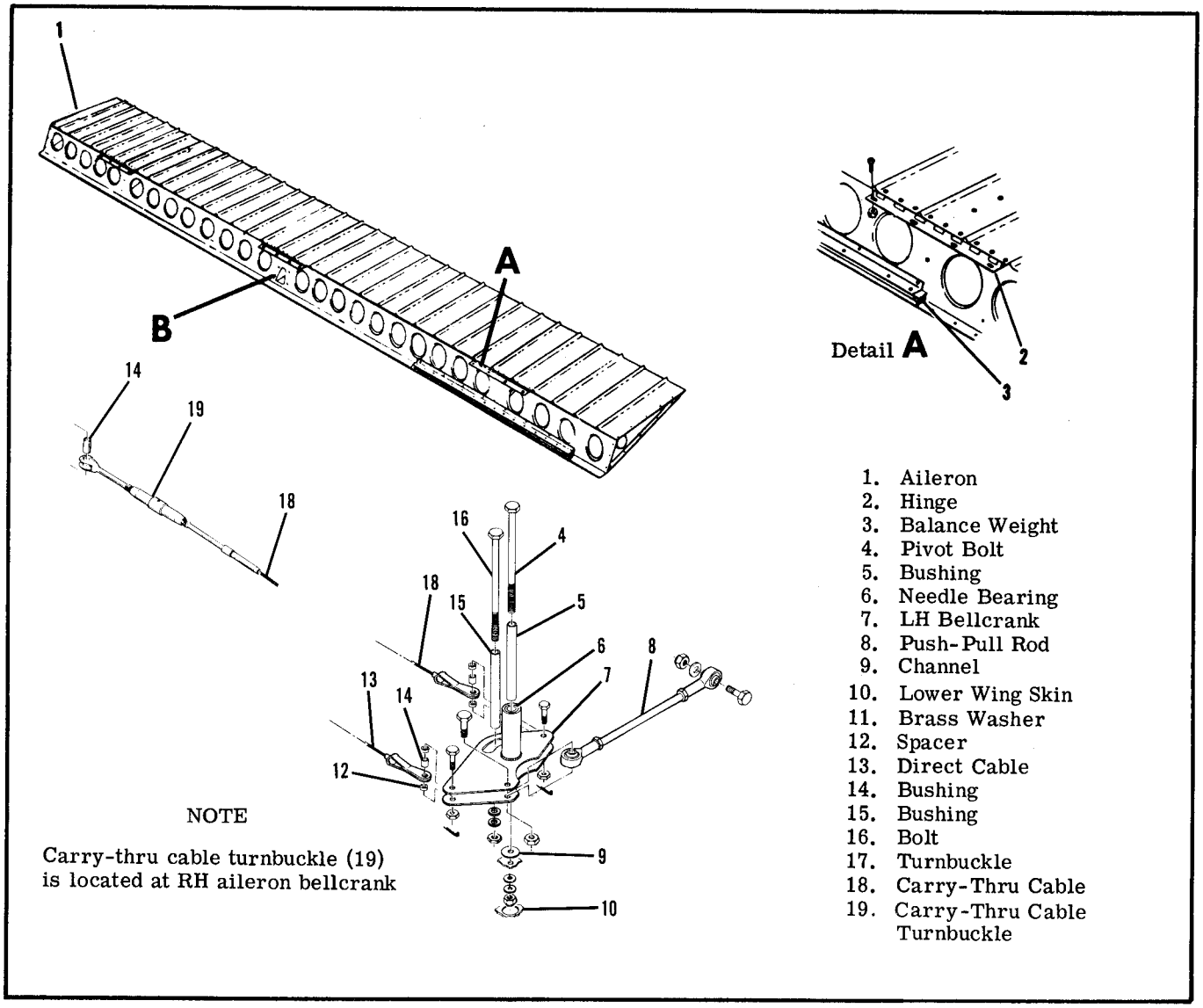


Figure 6-3. Aileron Installation

c. Check aileron travel and alignment, rig if necessary, in accordance with applicable paragraph in this section.

6-17. REPAIR. Aileron repair may be accomplished in accordance with instructions outlined in Section 17. Before installation, ensure balance weights and hinges are securely attached.

6-18. RIGGING. (Refer to figure 6-2.)

a. Check primary control cable (7) is in aft groove of cable drum (8) and wrapped once around drum. The primary cable lock (9) is installed at bottom of drum and transition cable lock (14) is installed at top.

b. With control wheels neutral, check chain ends (4) are approximately same distance from sprockets (1).

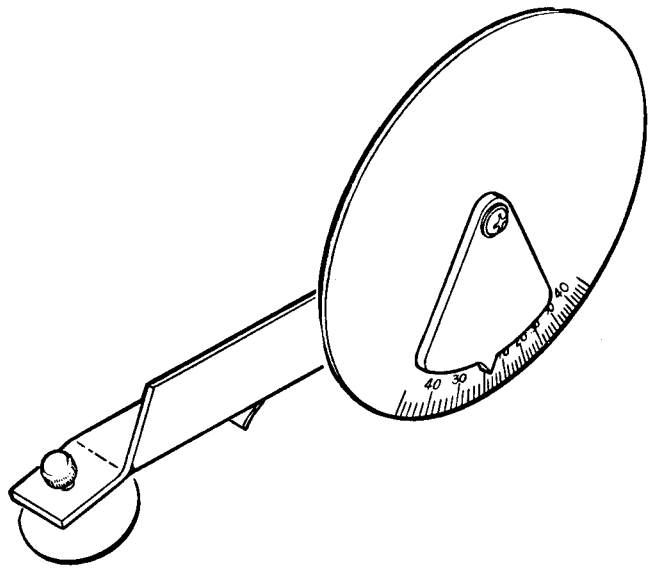
c. Keeping control wheels neutral, tighten turnbuckles (6) so control wheels are level in neutral position (synchronized), with enough tension on cables to remove slack from chains (4), without binding. Results of adjusting turnbuckles are as follows:

1. Loosening primary cable turnbuckles (6) and tightening secondary cable turnbuckle (15) at center of control "U" will move inboard sides of both control wheels down.

2. Tightening either primary control cable turnbuckle and loosening secondary cable turnbuckle at center of control "U" will move outboard side of applicable control wheel down.

d. Tape a bar across both control wheels to hold them in neutral position.

e. Adjust direct cable turnbuckles (17) below control "U" and single carry-thru turnbuckle (index 17, figure 6-3) at aileron bellcrank (index 7, figure 6-3)



AVAILABLE FROM CESSNA SERVICE PARTS CENTER (TOOL NO. SE 716)

Figure 6-4. Inclinometer for Measuring Control Surface Travel

so bellcrank stop bushings (index 15, figure 6-3) are centered in both bellcrank slots with 40 ± 10 pounds tension on aileron carry-thru cable (index 18, figure 6-3). Disregard tension on direct cables, which will be different than tension on carry-thru cable.

f. Adjust push-pull rods (index 8, figure 6-3) at each aileron until ailerons are neutral with reference to trailing edge of wing flaps. Be sure wing flaps are fully up when making this adjustment.

g. Safety all turnbuckles by the single-wrap method using 0.040-inch monel safety wire.

h. Remove bar from control wheels and install all items removed for access.

i. Check aileron travel, using inclinometer illustrated in figure 6-4.

WARNING

Be sure ailerons move in correct direction when operated by control wheel.

SHOP NOTES:

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SECTION 7

WING FLAP CONTROL SYSTEM

TABLE OF CONTENTS

7-1. WING FLAP CONTROL SYSTEM. (Refer to figure 7-1.)

7-2. DESCRIPTION. The wing flap control system is comprised of an electric motor and transmission assembly, drive pulleys, push-pull rods, cables and a follow-up control. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys, cables and push-pull rods. Electrical power to the motor is controlled by two microswitches mounted on a floating arm assembly, by a camming lever and a follow-up control. As the flap control lever is moved to the desired flap setting, the attached cam trips one of the microswitches, activating the flap motor. As the flaps move to the position selected, the floating arm is rotated by the follow-up control unitl the active microswitch clears the cam breaking the circuit and stopping the motor. To reverse flap direction, the control lever is moved in the opposite direction causing the cam to trip the second microswitch which reverses the flap motor. The follow-up control moves the cam until it is clear of the second switch, shutting off the flap motor. Limit switches at the flap actuator assembly control flap travel as the flaps reach the full UP or DOWN positions.

7-3. OPERATIONAL CHECK.

a. Operate flaps through their full range of travel observing for uneven travel or jumpy motion, binding or lost motion. Ensure flaps are moving together through their full range of travel.

b. Check for positive shut-off of motor at flap travel extremes to prevent damage to actuator assembly.

c. Check flaps for sluggishness in operation. In flight at 100 mph, indicated airspeed, flaps should fully extend in approximately 9 seconds and retract in approximately 5 seconds. On the ground, with engine running, the flaps should extend or retract in approximately 6 seconds.

d. With flaps full UP, mount an inclinometer on one flap and set to 0°. Lower flaps to full DOWN position and check flap angle as specified in figure 1-1. Check approximate mid-range percentage setting against degrees as indicated on inclinometer. Repeat the same procedure for the opposite flap.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

e. Remove access plates adjacent to flap drive pulleys and attempt to rock pulleys to check for bearing wear.

f. Inspect flap rollers and tracks for evidence of binding or defective parts.

7-4. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraphs 7-16 and 7-20.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO MOVE.	Popped circuit breaker.	Reset and check continuity. Replace breaker if defective.
	Defective switch.	Place jumper across switch. Replace switch if defective.
	Defective motor.	Remove and bench test. Replace motor if defective.
	Broken or disconnected wires.	Run continuity check of wiring. Connect or repair wiring as necessary.
	Disconnected or defective transmission.	Connect transmission. Remove, bench test and replace transmission if defective.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.
BINDING IN SYSTEM AS FLAPS ARE RAISED AND LOWERED.	Cables not riding on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Bind in drive pulleys.	Check drive pulleys in motion. Replace drive pulleys found defective.
	Broken or binding pulleys.	Check pulleys for free rotation or breaks. Replace defective pulleys.
	Frayed cable.	Check condition of cables. Replace defective cables.
	Flaps binding on tracks.	Observe flap tracks and rollers. Replace defective parts.
LEFT FLAP FAILS TO MOVE.	Disconnected or broken cable.	Check cable tension. Connect or replace cable.
	Disconnected push-pull rod.	Attach push-pull rod.
FLAPS FAIL TO RETRACT.	Defective or disconnected flaps UP operating switch	Check continuity of switch. Connect or replace switch.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-16.
	Defective operating switch.	Check continuity of switches. Replace switches found defective.

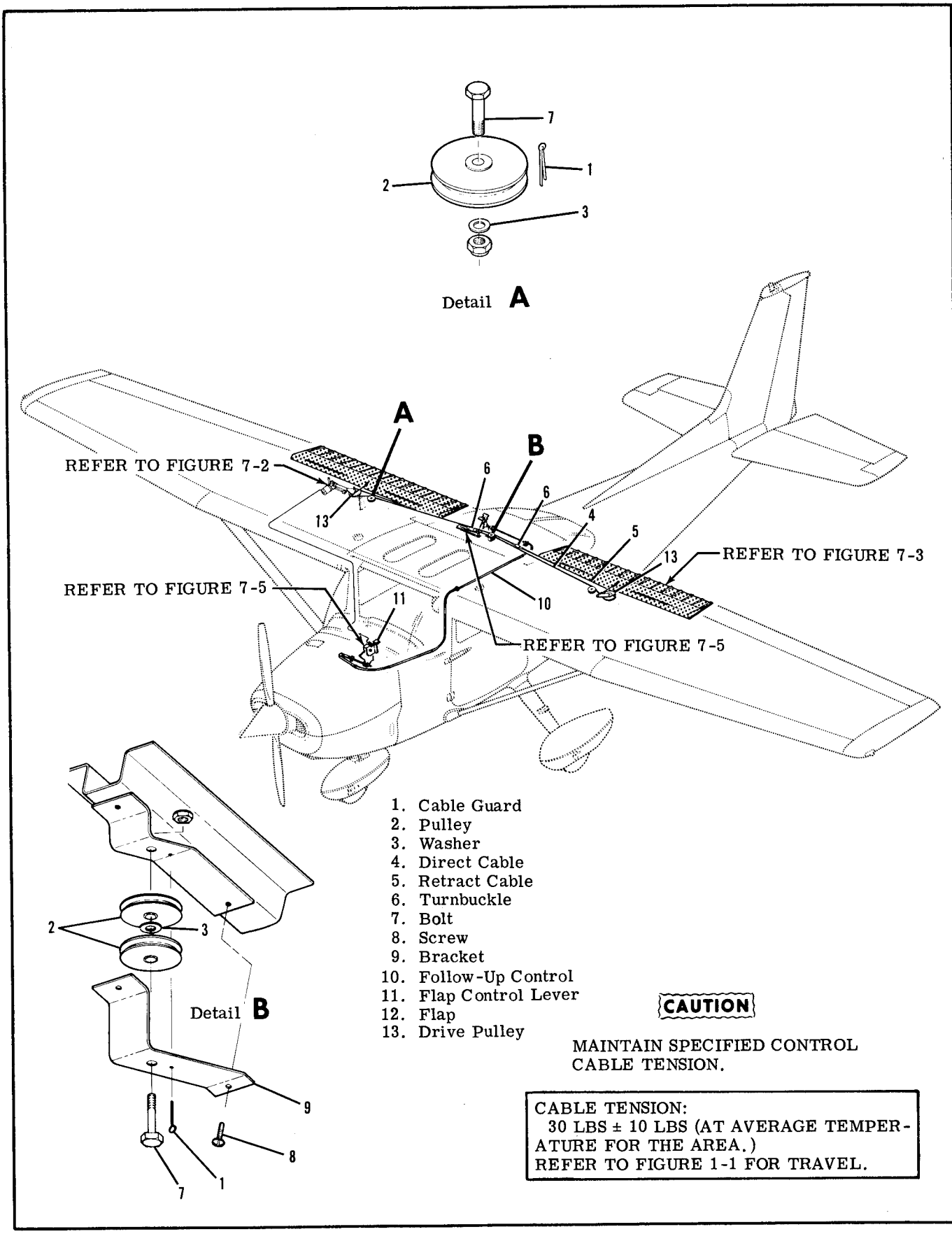


Figure 7-1. Wing Flap Control System

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO EXTEND.	Defective or disconnected flaps DOWN operating switch.	Check continuity of switch. Connect or replace switch.

7-5. FLAP MOTOR AND TRANSMISSION ASSEMBLY.

7-6. REMOVAL AND INSTALLATION (Refer to figure 7-2.)

a. Run flaps to full DOWN position.

b. Disconnect battery ground cable and insulate terminal as a safety precaution.

c. Remove access plates beneath flap motor and transmission assembly in right wing.

NOTE

Flap motor (10), transmission (8), hinge assembly (11) and actuating tube (5) are removed from the aircraft as a unit. On aircraft equipped with long range fuel tank, it may be easier to detach motor and transmission assembly to detach motor and tank before removal from wing.

d. Remove bolt (21) securing actuting tube (5) to drive pulley (14).

e. Secrew actuating tube (5) in toward transmission (8) as far as possible by hand.

f. Remove bolt (securing flap motor hinge (11) to wing. Retain brass washer between hinge and wing structure for use on reinstallation.

g. Disconnect motor electrical leads at quick-disconnects.

h. Disconnect wiring at limit switches (29 and 32).

i. Carefully work assembly from wing through access opening.

j. Reverse preceding steps for reinstallation. If hinge assembly (11) was removed from the transmission (8) for any reason, ensure that short end of hinge is reinstalled toward the top.

k. Complete operational check as outlined in paragraph 7-3 and rerig system in accordance with paragraph 7-16.

7-7. REPAIR. Repair consists of replacement of motor, transmission, actuating tube and associated hardware. Bearings in hinge assembly may also be replaced. Lubricate as outlined in Section 2.

7-8. DRIVE PULLEYS. (Refer to figure 7-2.)

7-9. REMOVAL AND INSTALLATION.

a. Remove access plate adjacent to drive pulley (14) in right wing.

b. Unzip or remove headliner as necessary for access to turnbuckles (index 6, figure 7-1), remove safety wire and loosen turnbuckles.

c. Remove bolt (20) securing flap push-pull rod (15) to drive pulley (14) and lower RIGHT flap gently.

d. Remove bolt (21) securing actuating tube (5) to drive pulley (14) lower LEFT flap gently. Retain bushing.

e. Remove cable locks (13) securing control cables to drive pulley (14). Tag cables for reference on reinstallation.

f. Remove bolt (12) attaching drive pulley (14) to wing structure.

g. Using care, remove drive pulley through access opening, being careful not to drop bushing. Retain brass washer between drive pulley and wing structure for use on reinstallation. Tape open ends of drive pulley after removal to protect bearings.

h. To remove left wing drive pulley, use this same procedure omitting step "d."

i. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-16, safety turnbuckles and reinstall all items removed for access.

7-10. REPAIR. Repair is limited to replacement of bearings. Cracked, bent or excessively worn drive pulleys must be replaced. Lubricate bearings as outlined in Section 2.

7-11. FLAPS. (Refer to figure 7-3.)

7-12. REMOVAL AND INSTALLATION.

a. Run flaps to full DOWN position.

b. Remove access plates (1) from top leading edge of flap.

c. Disconnect push-pull rod (6) at flap bracket (7).

d. Remove bolts (5) at each flap track. As flap is removed from wing, all washers, rollers and bushings will fall free. Retain these for reinstallation.

e. Reverse the preceding steps for reinstallation. If push-pull rod (6) adjustment is not disturbed, rerigging of system should not be necessary. Check flap travel and rig in accordance with paragraph 7-16, if necessary.

7-13. REPAIR. Flap repair may be accomplished in accordance with instructions outlined in Section 18.

7-14. CABLES AND PULLEYS. (Refer to figure 7-1.)

7-15. REMOVAL AND INSTALLATION.

a. Remove access plates, fairings, headliner and upholstery as necessary for access.

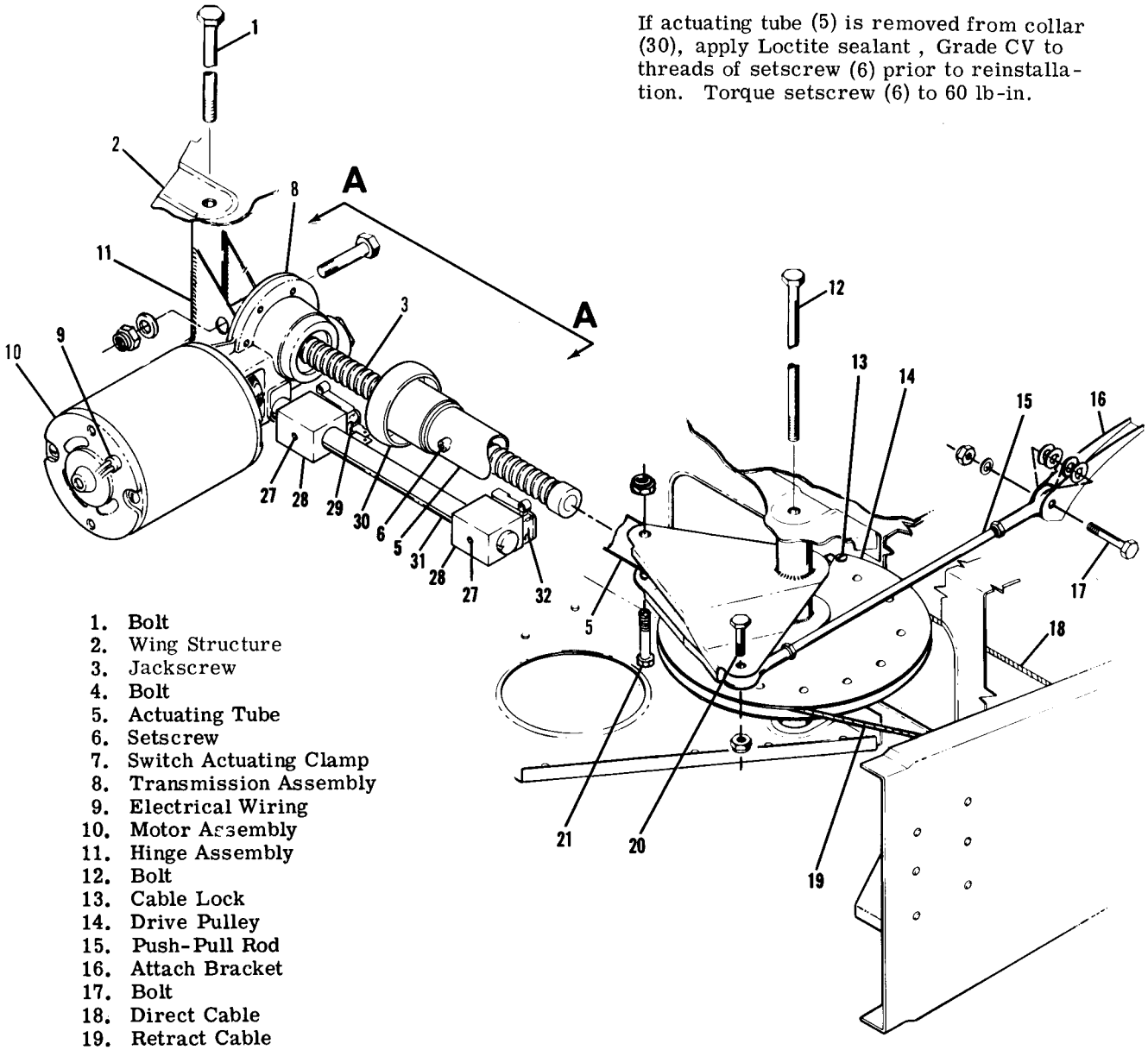
b. If direct cable (4) is to be removed, disconnect clamp (index 7, figure 7-5) from bellcrank (index 2, figure 7-5).

c. Remove safety wire, relieve cable tension, disconnect turnbuckles (6) and carefully lower LEFT flap.

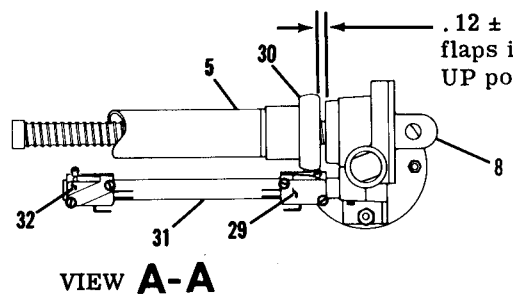
d. Disconnect cables at drive pulleys, remove

NOTE

If actuating tube (5) is removed from collar (30), apply Loctite sealant , Grade CV to threads of setscrew (6) prior to reinstallation. Torque setscrew (6) to 60 lb-in.



1. Bolt
2. Wing Structure
3. Jackscrew
4. Bolt
5. Actuating Tube
6. Setscrew
7. Switch Actuating Clamp
8. Transmission Assembly
9. Electrical Wiring
10. Motor Assembly
11. Hinge Assembly
12. Bolt
13. Cable Lock
14. Drive Pulley
15. Push-Pull Rod
16. Attach Bracket
17. Bolt
18. Direct Cable
19. Retract Cable
20. Bolt
21. Bolt
22. Snubber
23. Bracket
24. Spacer
25. Shim
26. Screw
27. Set Screw
28. Switch Adjustment Block
29. Up-Limit Switch
30. Switch Actuating Collar
31. Support
32. Down-Limit Switch



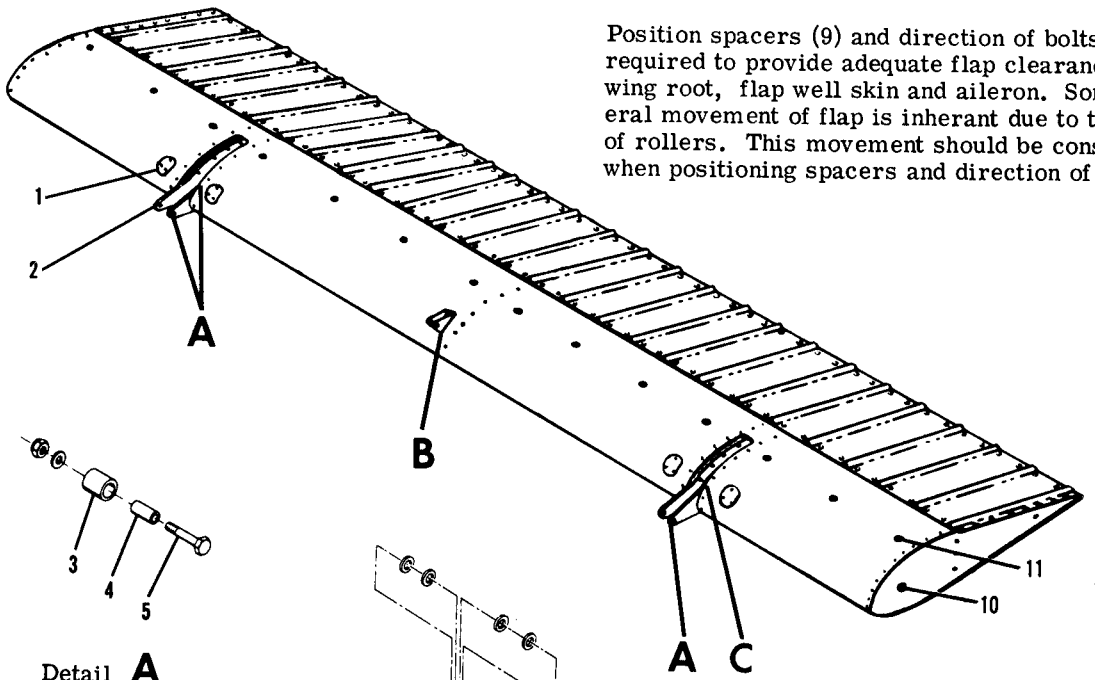
VIEW **A-A**

Figure 7-2. Flap Motor and Transmission Installation

NOTE

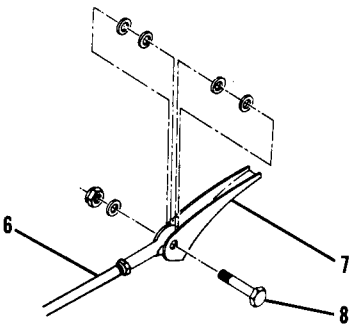
Bushings (4), rollers (3) and spacers (9) are first positioned through slots in flap tracks, then are secured to the flap roller supports (2) with attaching bolts, washers and nuts. Nylon plug buttons (11) prevent wing flap from chafing wing trailing edge.

Position spacers (9) and direction of bolts (5) as required to provide adequate flap clearance at wing root, flap well skin and aileron. Some lateral movement of flap is inherant due to the width of rollers. This movement should be considered when positioning spacers and direction of bolts.

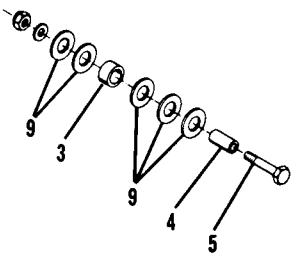


Detail **A**

INBOARD



Detail **B**



Detail **C**

OUTBOARD

1. Access Plate
2. Flap Support
3. Roller Assembly
4. Bushing
5. Bolt
6. Push-Pull Rod
7. Flap Bracket
8. Bolt
9. Spacer
10. Plug Button
11. Nylon Plug Button

Figure 7-3. Flap Installation

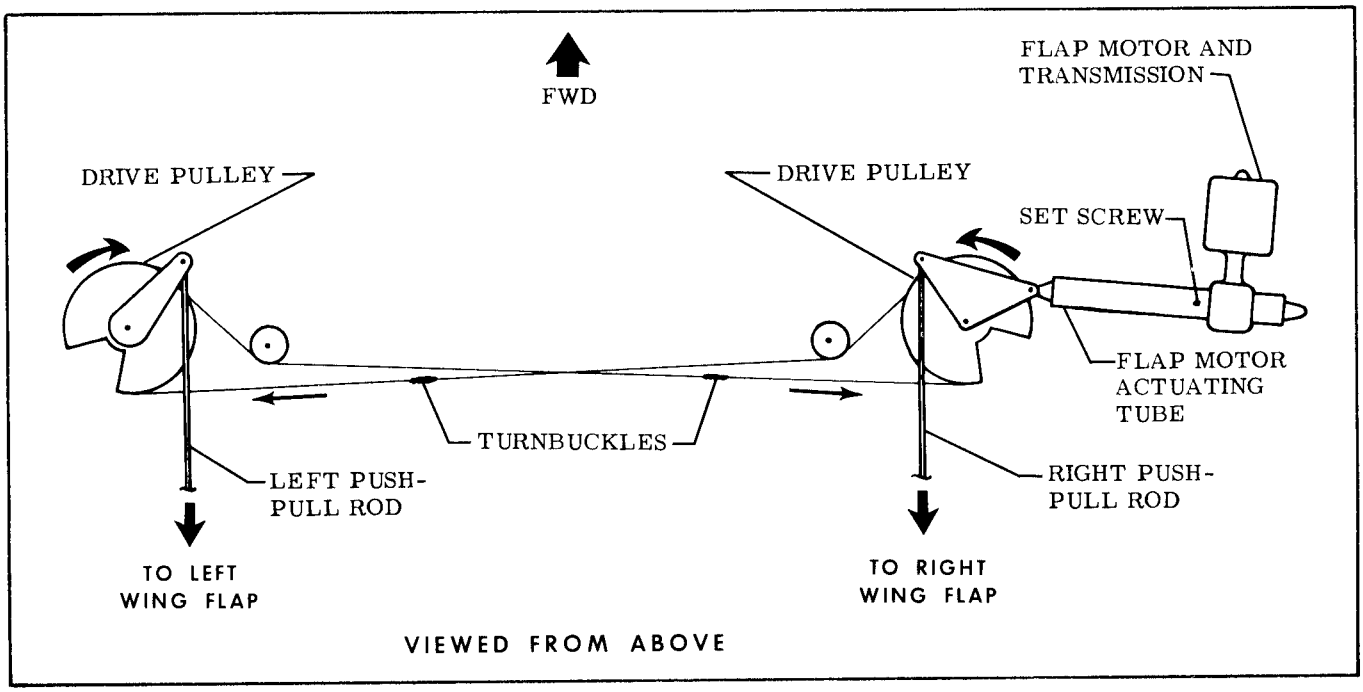


Figure 7-4. Flap System Schematic

cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to the end of cable being withdrawn from the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use wire to pull cable into position.

e. Reverse the preceding steps for reinstallation.
f. After cables are routed in position, install pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.
g. Re-rig flap system in accordance with paragraph 7-16 and safety turnbuckles.
h. Re-rig follow-up system in accordance with paragraph 7-20 and reinstall all items removed in step "a."

7-16. RIGGING.
a. (Refer to figure 7-1.) Unzip or remove headliner as necessary for access to turnbuckles (6).
b. With flaps in the full UP position, disconnect follow-up cable (index 4, figure 7-5) by removing clevis attaching follow-up cable to bellcrank (index 2, figure 7-5).
c. (Refer to figure 7-1.) Remove safety wire, relieve cable tension, disconnect turnbuckles (6) and carefully lower left flap.
d. (Refer to figure 7-2.) Disconnect push-pull rods (15) at drive pulleys (14) in both wings and lower RIGHT flap gently.
e. Disconnect actuating tube (5) from drive pulley (14).

NOTE

If control cables are not connected to left and right drive pulleys, actuating tube (5) and push-pull rods (15) must be disconnected before installing cables. If drive pulleys (14) are not installed, attach control cables before installing drive pulleys in the wings as illustrated in figure 7-4.

f. Adjust both push-pull rods (15) to 8.83±.12 inches between centers of rod end bearings and tighten locknuts on both ends. Connect push-pull rods to flaps and drive pulleys.

NOTE

Temporarily connect cables at turnbuckles (index 6, figure 7-1) and test flaps by hand to ensure both flaps extend and retract together. If they will not, the cables are incorrectly attached to the drive pulleys. Ensure that the right drive pulley rotates clockwise when viewed from below, as the flaps are extended. Tag cables for reference and disconnect turnbuckles again.

g. (Refer to figure 7-2.) Screw actuating tube (5) IN toward transmission (8) by hand to .12±.05 inches between switch actuating collar (30) and transmission as illustrated in View A-A.

h. Loosen setscrew (6) securing actuating tube (5) to switch actuating collar (30) and hold collar to maintain .12±.05 inch while holding RIGHT flap in the full UP position and adjust actuating tube (5) IN or OUT as necessary to align with attachment hole in drive pulley (14).

i. Apply Loctite grade CV sealant (or equivalent) to threads of setscrew (6) and torque to 60 pound-inches.

NOTE

If actuating tube (5) is too long to allow attachment to drive pulley after completion of step "h", proceed to step "j".

j. Disconnect push-pull rod (15) at drive pulley (14) to allow connecting actuating tube (5) to drive pulley.

k. Manually hold RIGHT flap in full UP position and readjust push-pull rod (15) to align with attachment hole in drive pulley. Connect push-pull rod and tighten locknuts.

NOTE

The right flap and actuator must be correctly rigged, before cables and left flap can be rigged.

l. With flaps in full UP position, loosen setscrew (27) and slide up limit switch adjustment block (28) on support (31) to just activate switch and shut off electrical power to motor at this position. Tighten setscrew.

m. Manually hold LEFT flap, full UP and connect control cables at turnbuckles (index 6, figure 7-1). Remove reference tags previously installed in step "f".

n. With flaps full UP, adjust turnbuckles to obtain 30±10 pounds tension on cables. Adjust retract cable (19) first.

NOTE

Ensure cables are positioned in pulley grooves and cable ends are positioned correctly at drive pulleys before tightening turnbuckles.

o. Disconnect push-pull rod at left drive pulley. Run motor to extend flaps approximately 20° and check tension on each flap cable. If necessary, readjust turnbuckles to maintain 30±10 pounds tension on each cable and safety turnbuckles.

p. Fully retract right flap. Manually hold left flap in full UP position and readjust push-pull rod to align with attaching hole in drive pulley. Connect push pull rod and tighten locknuts.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

q. Mount an inclinometer on RIGHT flap and adjust to 0°.

r. Run flaps to full DOWN position and adjust DOWN limit switch (32) to stop motor and flap at the degree of travel specified in figure 1-1. Repeat check on LEFT flap. Recheck limit switch through several flap cycles.

NOTE

All flap rollers may not bottom in the flap tracks at the travel extremes.

s. Reconnect and rerig the flap follow-up system in accordance with paragraph 7-20. Perform an operational check in accordance with paragraph 7-3, recheck all items for proper safetying and replace items removed for access.

7-17. FLAP FOLLOW-UP AND INDICATING SYSTEM. (Refer to figure 7-5.)

7-18. DESCRIPTION. The flap follow-up and indicating system consists of a sheathed cable assembly one end of which is attached to the flap operating switch mounting arm and the other end is clamped to the flap direct cable above the headliner in the rear cabin area. Motion of the flap cable is transmitted through the follow-up control to the pointer attached to the switch mounting arm, moving the pointer along a scale as the flaps are extended or retracted. When this motion of the switch mounting arm, to which the flap operating switches are attached, positions the "active" operating switch to clear a cam on the flap lever, the circuit to the flap motor is broken and the flaps stop at the selected position.

7-19. REMOVAL AND INSTALLATION. Figure 7-5 can be used as a guide to removal and installation of the flap follow-up and indicating system.

7-20. RIGGING. (Refer to figure 7-5.)

a. Flap control system must be rigged in accordance with paragraph 7-16 before flap follow-up system can be rigged.

b. Disconnect spring (21) from switch mounting arm (16).

c. With flaps and flap lever (13) in full UP position and holding flap position indicator (14) to a clearance of .03 inch maximum with top of instrument panel opening, pull center cable of flap follow-up (index 4, detail b) to remove slack. Connect cable thru clamp bolt (17) observing note of figure 7-5.

d. Connect spring (21) to switch mounting arm (16).

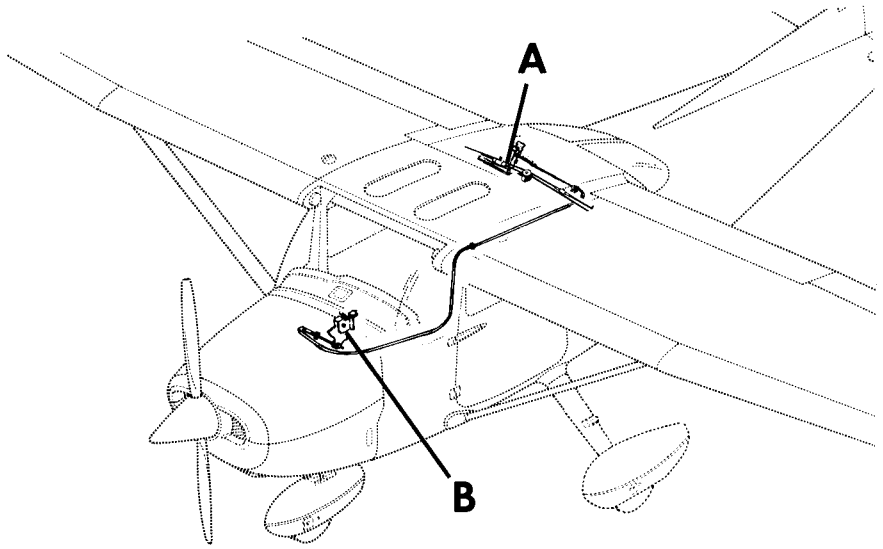
e. Adjust switches (18) and (20) in slotted holes in mounting arm (16) until cam (19) is centered between switch rollers.

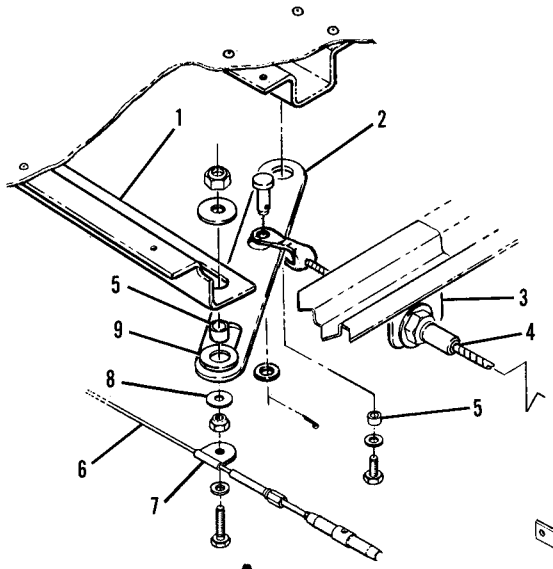
f. Mount an inclinometer on one flap and set to 0° (flaps full UP). Turn master switch ON and move flap lever (13) to 10° position.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

1. Guide
2. Bellcrank
3. Mounting Bracket
4. Follow-Up Cable
5. Bushing
6. Flap Direct Cable
7. Clamp
8. Washer
9. Teflon Washer
10. Support
11. Bracket

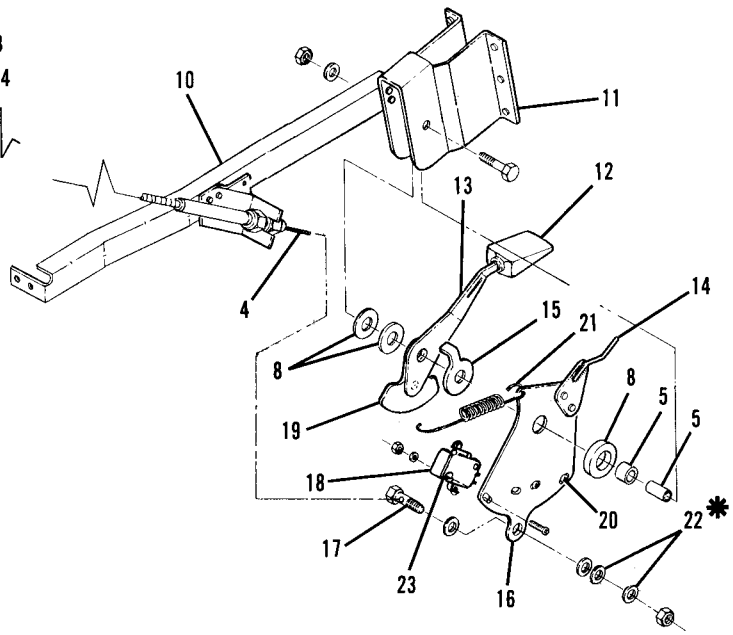




Detail **A**

*NOTE

Position center cable of flap follow-up (4) between washers (22)



Detail **B**

12. Knob
13. Flap Lever
14. Position Indicator
15. Spacer
16. Switch Mounting Arm
17. Clamp Bolt
18. Flaps DOWN Operating Switch
19. Cam
20. Flaps UP Operating Switch
21. Spring
22. Clamp Bolt Washer
23. Insulator

Figure 7-5. Flap Follow-Up Control and Position Indicator

g. Observe inclinometer reading when flaps stop. Adjust flaps DOWN operating switch (18) in slotted holes on mounting arm (16) as required to obtain flap travel of 10°±2°.

h. Adjust flaps UP operating switch (20) to obtain positive clearance with cam (19) when flaps DOWN operating switch has just opened in the 10° position.

i. Repeat steps g. and h. for 20° flap position (travel 20°±2°).

j. Run flaps to full DOWN position (40°+0°-2°) and check that flaps DOWN operating switch (18) remains closed as flap motor limit switch (index 32, figure 7-2) stops flaps of full DOWN position.

k. Check flaps through several cycles, recheck all components for security and replace items removed for access.

SHOP NOTES:

SECTION 8

ELEVATOR CONTROL SYSTEM

TABLE OF CONTENTS

8-1. ELEVATOR CONTROL SYSTEM.

8-2. DESCRIPTION. The elevators are operated by power transmitted through forward and aft movement of the control "U". This power reaches the elevators through a system consisting of a push-pull tube, cables and bellcranks. The elevator control cables, at their aft ends, are attached directly to a bellcrank, installed between the elevators. This bellcrank serves as an interconnect between the elevators and as a bearing point for the travel stop bolts. A trim tab is installed on the right elevator and is described in Section 9.

8-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 8-14.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.	Forward or aft end of push-pull tube disconnected.	Check visually and attach push-pull tube correctly.
	Cables disconnected.	Check visually, attach cables and rig system in accordance with paragraph 8-14.

8-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM.	Defective forward or rear bellcrank or bellcrank pivot bearing.	Move to check for play or binding. Replace bellcranks found defective.
	Cables slack.	Check tension and adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Nylon bearing on instrument panel binding.	Disconnect universal joint and check for binding. Replace bearing if binding is felt.
	Defective control "U" pivot bearing.	Disconnect elevator push-pull tube at lower end of "U" and check that control moves freely. Replace bearing if defective.
	Defective elevator hinges.	Move elevators by hand, checking hinges. Replace hinges found defective.
	Lubrication needed.	Lubricate in accordance with Section 2.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Defective pulleys or cable guards.	Open access plates and check visually. Replace defective parts and install guards properly.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	Check elevator travel with inclinometer. Rig in accordance with paragraph 8-14.
	Cables tightened unevenly.	Rig in accordance with paragraph 8-14.
	Interference at instrument panel.	Rig in accordance with paragraph 8-14.

8-4. ELEVATORS. (Refer to figure 8-2.)

8-5. REMOVAL AND INSTALLATION.

NOTE

This procedure is written primarily for the right elevator since the trim tab is attached to this elevator.

a. Disconnect trim tab push-pull channel (3) at tab actuator.

b. Remove bolts (6) securing elevators to bellcrank (9).

NOTE

If trim system is not moved and actuator screw is not turned, rigging of trim system should not be necessary after installation of elevator.

c. Remove bolts (16) from elevator hinges.
d. Using care, remove elevator.

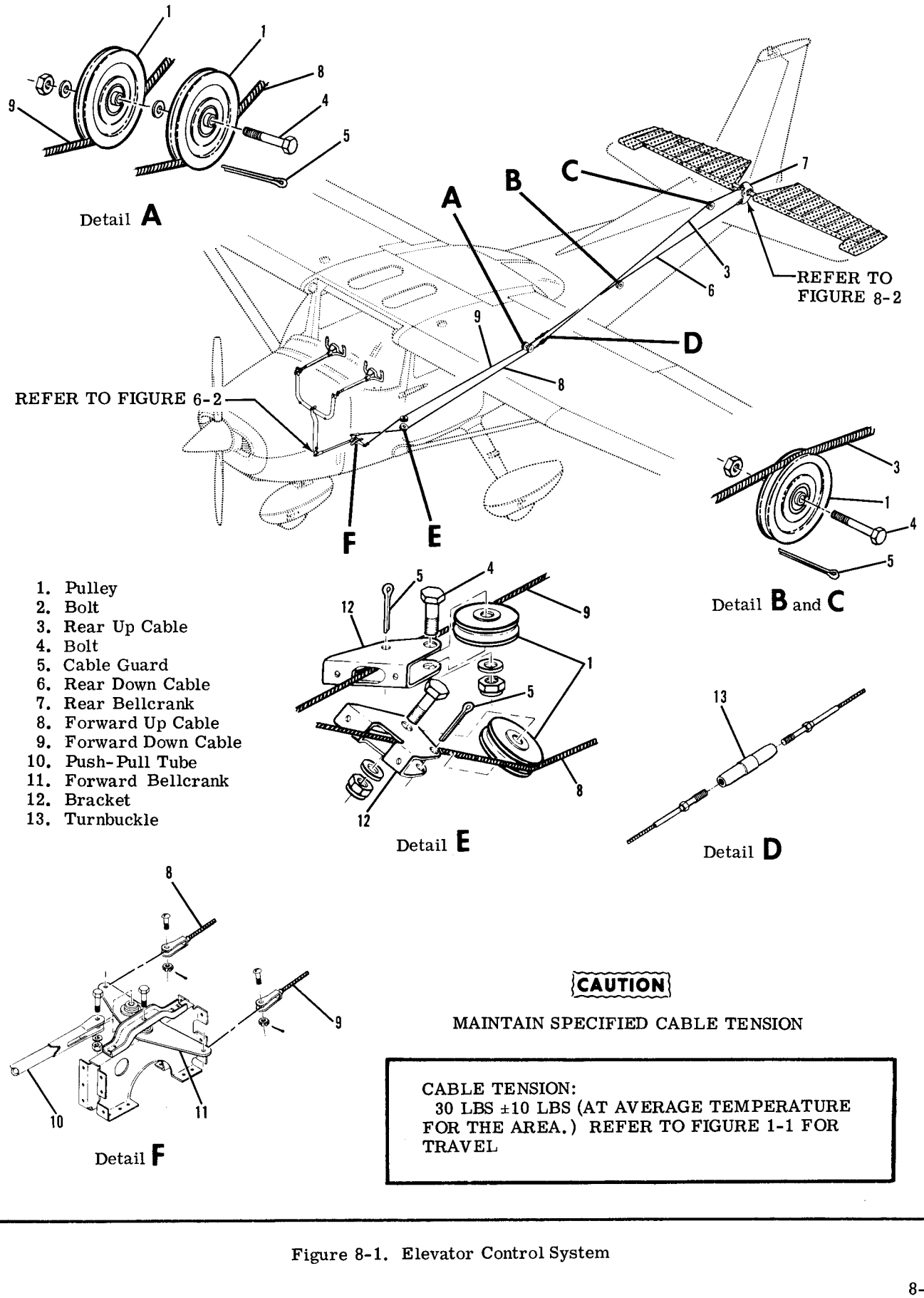


Figure 8-1. Elevator Control System

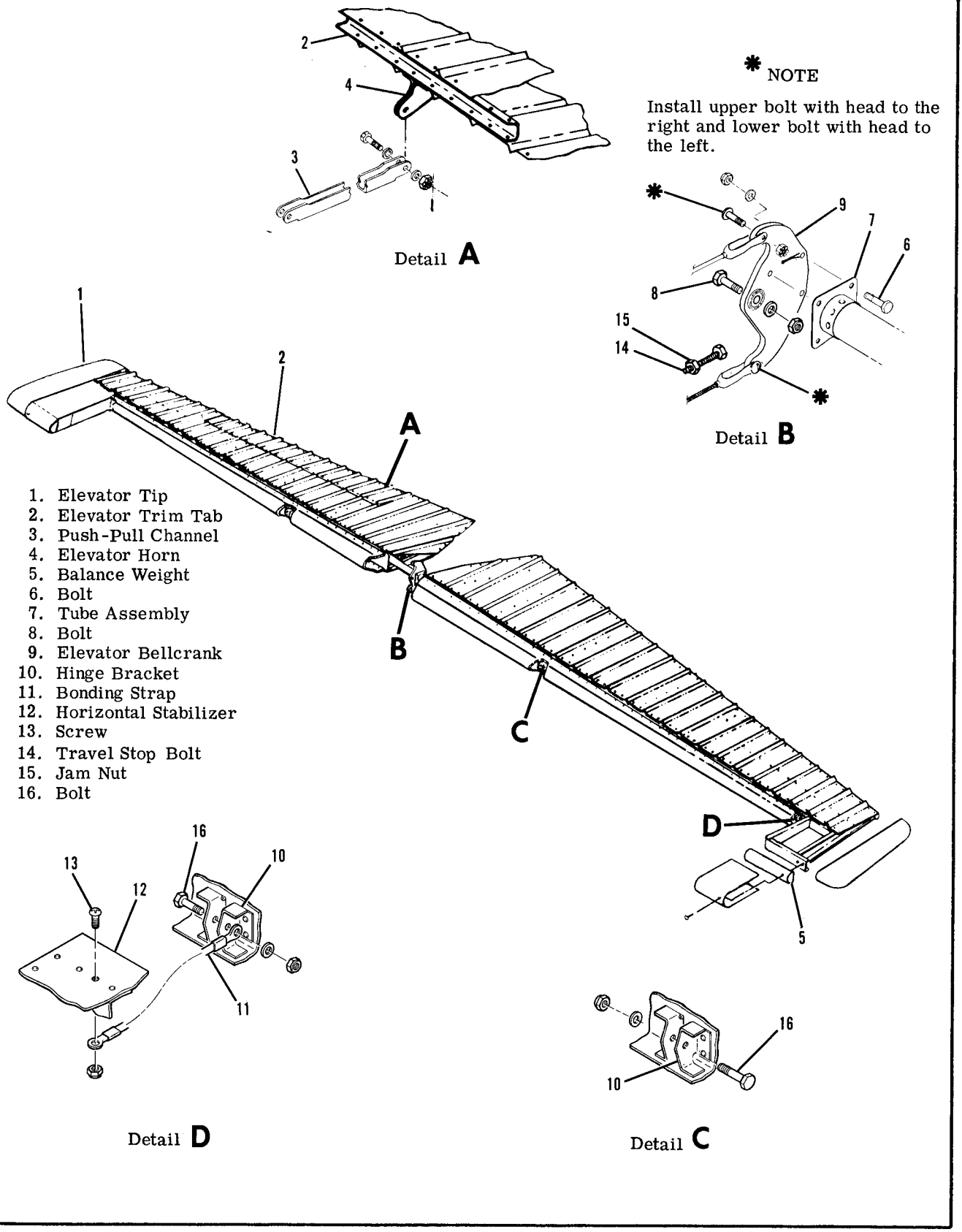


Figure 8-2. Elevator Installation

e. To remove left elevator use same procedure, omitting step "a".

f. Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section if necessary.

8-6. REPAIR. Repair may be accomplished as outlined in Section 18. If repair has affected static balance, check and rebalance as required.

8-7. BELLCRANKS.

8-8. FORWARD. (Refer to figure 8-1.)

8-9. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.

b. Relieve cable tension at turnbuckles (13) and disconnect cables from bellcrank (11).

c. Disconnect push-pull tube (10) from bellcrank (11).

d. Remove pivot bolt and remove bellcrank.

e. Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section, safety turnbuckles and reinstall all items removed in step "a".

8-10. REAR. (Refer to figure 8-2.)

8-11. REMOVAL AND INSTALLATION.

a. Remove rudder. (Refer to Section 10.)

b. Relieve cable tension at turnbuckles (index 13, figure 8-1) and disconnect cables from rear bellcrank (9).

c. Remove bolts (6) securing elevators to bellcrank.

d. Remove bellcrank pivot bolt (8) and slide bellcrank from between tube assemblies (7).

NOTE

It may be necessary to remove one of the stabilizer attaching bolts for clearance when removing the bellcrank pivot bolt.

e. Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section, safety turnbuckles and reinstall all items removed for access.

8-12. CABLES AND PULLEYS. (Refer to figure 8-1.)

8-13. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.

b. Relieve cable tension at turnbuckles (13).

c. Disconnect cables at forward bellcrank (11).

d. Disconnect cables at rear bellcrank (7).

e. Remove cable guards and pulleys as necessary to work cables free of aircraft.

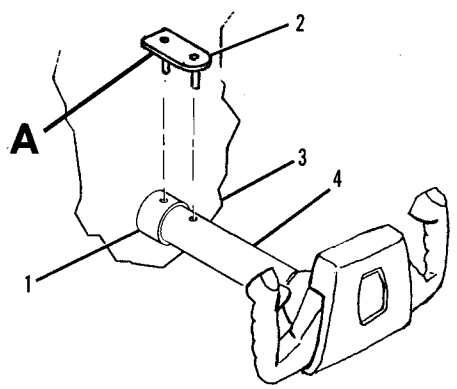
NOTE

To ease routing of cables, a length of wire may be attached to end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure, attach cable being installed and pull cable into position.

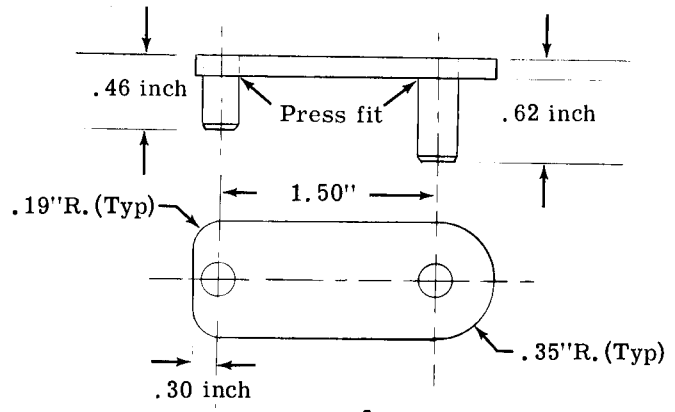
f. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards.

g. Rig system in accordance with applicable paragraph in this section, safety turnbuckles and reinstall all items removed in step "a".

SHOP NOTES:



1. Support
2. Neutral Rigging Tool
3. Instrument Panel
4. Pilot's Control Column



Detail **A**

Fabricate from .125 inch steel plate and .209 inch dia. drill rod according to dimensions shown.

Figure 8-3. Control Column Neutral Rigging Tool

8-14. RIGGING. (Refer to figure 8-1.)

a. Lock control column in netural position by installing neutral rigging tool (index 2, figure 8-3).

b. Streamline elevators to neutral with horizontal stabilizer.

NOTE

Disregard counterweight areas of elevators when streamlining since these areas are contoured to streamline elevator tips in cruise flight.

c. Holding elevators in neutral position, adjust turnbuckles (13) equally toobtain 30±10 lbs. cable tension.

d. Mount an inclinometer on elevator and keeping elevator streamlined with stabilizer, set inclinometer to 0°.

NOTE

An inclinometer for measuring control surface travel is available from Cessna Service Parts Center. Refer to figure 6-4.

e. Remove control column neutral rigging tool and adjust travel stop bolts (index 14, figure 8-2) to range of travel specified in figure 1-1.

f. Check that control "U" does NOT contact instrument panel in full UP position or firewall in the full DOWN position.

g. Safety turnbuckles (13) and travel stop bolts; check remainder of elevator control system for security and reinstall all items removed for access.

WARNING

Be sure elevators move in the correct direction when operated by controls.

SECTION 9

ELEVATOR TRIM CONTROL SYSTEM

TABLE OF CONTENTS

9-1. ELEVATOR TRIM CONTROL SYSTEM. (Refer to figure 9-1.)

9-2. DESCRIPTION. The elevator trim tab, located on the right elevator, is controlled by a trim wheel mounted in the pedestal. Power to operate the tab is transmitted from the trim control wheel by means of chains, cables and an actuator. A mechanical pointer, adjacent to the trim wheel indicates tab position. A "nose-up" setting results in a tab-down position.

9-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 9-14.

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE.	Cable tension too high.	Check and adjust tension as specified in figure 9-1.
	Pulleys binding or rubbing.	Open access plates and check visually. Repair or replace as necessary.
	Cables not in place on pulleys.	Open access plates and check visually. Install cables correctly.
	Trim tab hinge binding.	Disconnect actuator and move tab to check resistance. Lubricate or replace hinge as necessary.
	Defective trim tab actuator.	Remove chain from actuator sprocket and operate actuator manually. Replace actuator if defective.
	Rusty chain.	Check visually. Replace chain.
	Damaged sprocket.	Check visually. Replace sprockets.
	Bent sprocket shaft.	Observe motion of sprockets. Replace bent sprocket shafts.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION BETWEEN CONTROL WHEEL AND TRIM TAB.	Cable tension too low.	Check and adjust tension as specified in figure 9-1.
	Broken pulley.	Open access plates and check visually. Replace defective pulley.
	Cable not in place on pulleys.	Open access plates and check visually. Install cables correctly.
	Worn trim tab actuator.	Remove and replace worn actuator.
	Actuator attachment loose.	Check actuator for security. Tighten as necessary.
TRIM INDICATOR FAILS TO INDICATE CORRECT TRIM POSITION.	Indicator incorrectly engaged on wheel track.	Check visually and reset indicator as necessary.
INCORRECT TRIM TAB TRAVEL.	Stop blocks loose or incorrectly adjusted.	Adjust stop blocks on cables. Refer to figure 9-2.

9-4. TRIM TAB. (Refer to figure 8-2.)

9-5. REMOVAL AND INSTALLATION.

a. Disconnect push-pull channel (3) from horn assembly (4).

b. Drill out rivets attaching hinge to elevator.

NOTE

After tab has been removed and if hinge pin is to be removed, it is necessary to spread the crimped ends of the hinge before driving out pin. When a pin has been installed, crimp ends of hinge to prevent pin from working out.

c. Reverse preceding steps for installation.

9-6. TRIM TAB ACTUATOR.

9-7. REMOVAL AND INSTALLATION. (Refer to figure 9-1.)

CAUTION

Position a support stand under tail tie-down ring to prevent tailcone from dropping while working inside.

a. Remove baggage compartment aft wall for access.

b. Remove safety wire and relieve cable tension at turnbuckle (8).

c. Disconnect push-pull tube from actuator (3).

d. Remove access plate from underside of right hand stabilizer beneath actuator.

e. Remove chain guard (2) and disengage chain (4) from actuator sprocket.

f. Remove screws attaching actuator clamps to bracket and carefully work actuator out through access opening.

g. Reverse the preceding steps for reinstallation. Rig trim system in accordance with paragraph 9-14, safety turnbuckle (8) and reinstall all items removed for access.

9-8. DISASSEMBLY. (Refer to figure 9-3.)

a. Remove actuator in accordance with paragraph 9-7.

b. Disassemble actuator assembly (1) as illustrated in Detail A as follows:

1. Remove chain guard (3) if not previously removed in step "e" of paragraph 9-7.

2. Using suitable punch and hammer, remove groov-pins (8) securing sprocket (5) to screw (9) and remove sprocket from screw.

3. Unscrew threaded rod end (15) and remove rod end from actuator.

4. Remove groov-pins (10) securing bearings (6 and 14) at the housing ends.

5. Lightly tap screw (9) toward the sprocket end of housing, remove bearing (6) and collar (7).

6. Lightly tap screw (9) in the opposite direction from sprocket end, remove bearing (14), O-ring (13) and collar (7).

7. It is not necessary to remove retaining rings (11).

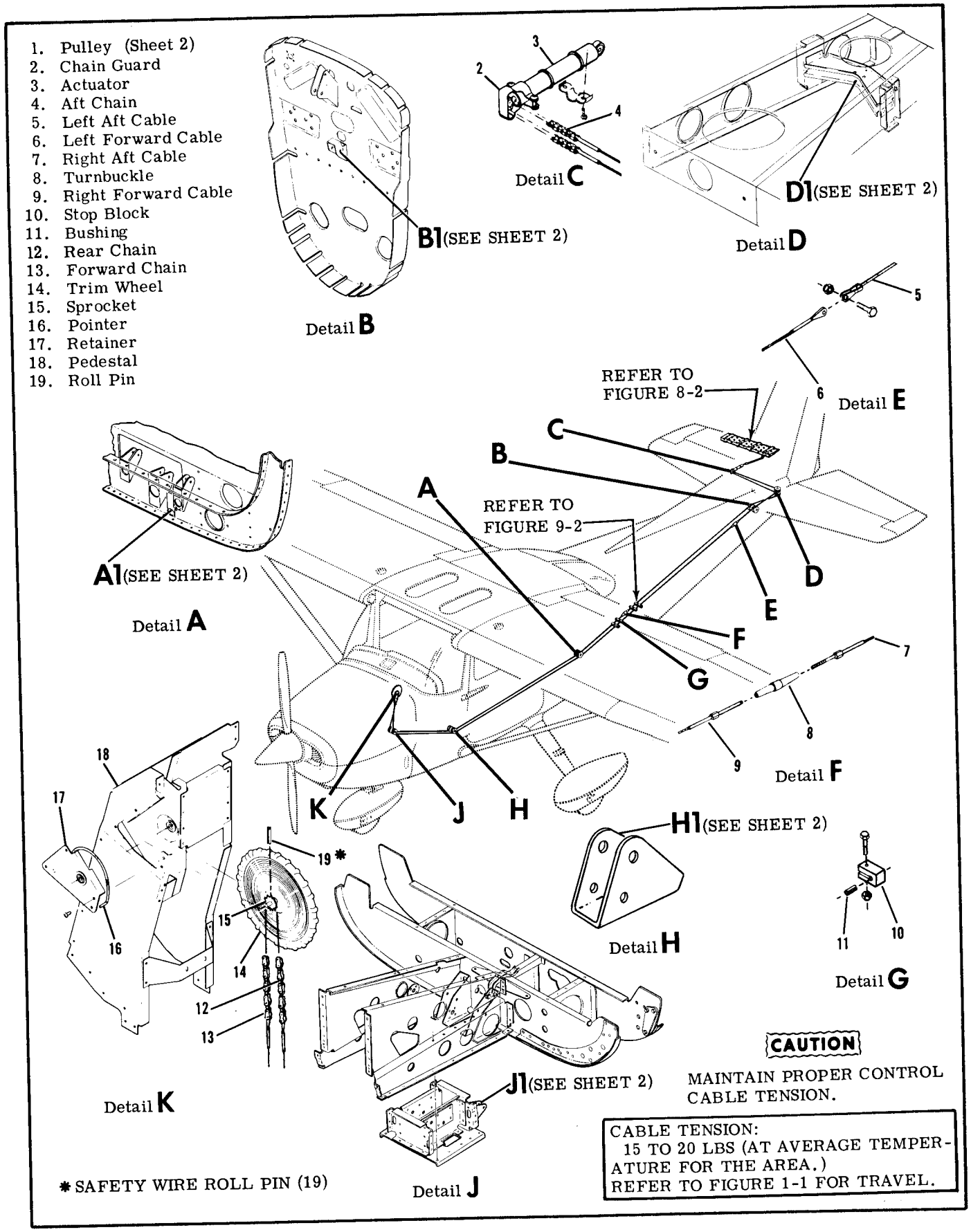
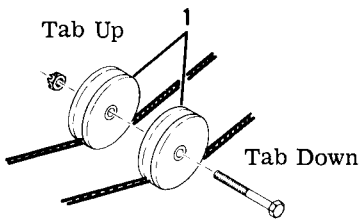
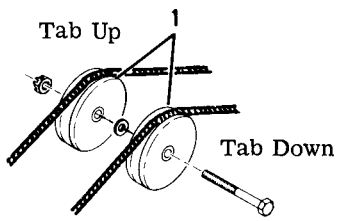


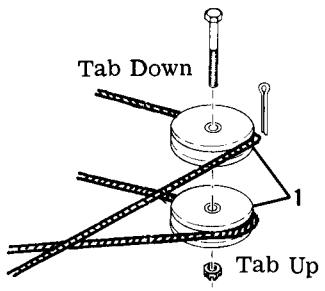
Figure 9-1. Elevator Trim Tab Control System (Sheet 1 of 2)



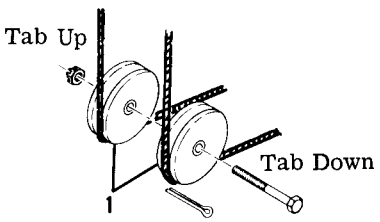
Detail **A1**



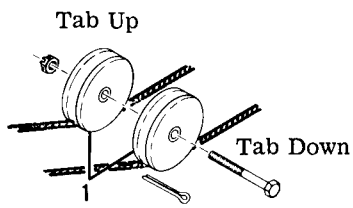
Detail **B1**



Detail **D1**



Detail **J1**



Detail **H1**

Figure 9-1. Elevator Trim Tab Control System (Sheet 2 of 2)

9-9. CLEANING, INSPECTION AND REPAIR. (Refer to figure 9-3.)

a. DO NOT remove bearing (16) from threaded rod end (15) unless replacement of bearing is necessary.

b. Clean all component parts, except bearing (16), by washing in Stoddard solvent or equivalent. Do not clean sealed bearing (16).

c. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.

d. Check bearings (6 and 14), screw (9) and threaded rod end (15) for excessive wear and scoring. Dimensions of the parts are as follows:

BEARING (6)	
INSIDE DIAMETER	0.373" MIN.
INSIDE DIAMETER	0.380" MAX.
BEARING (14)	
INSIDE DIAMETER	
SMALL HOLE	0.248" MIN.
SMALL HOLE	0.253" MAX.
LARGE HOLE	0.373" MIN.
LARGE HOLE	0.380" MAX.
THREADED ROD END (15)	
OUTSIDE DIAMETER (SHANK)	0.242" MIN.
	0.246" MAX.
SCREW (9)	
OUTSIDE DIAMETER	0.367" MIN.
	0.370" MAX.

NOTE

Relative linear movement between internal threaded screw (9) and bearing (14) should be 0.004 to 0.010 inch at room temperature.

e. Examine threaded rod end (15) and screw (9) for damaged threads or dirt particles that may impair smooth operation.

f. Check sprocket (5) for broken, chipped and/or worn teeth.

g. Check bearing (16) for smoothness of operation.

h. DO NOT attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.

9-10. REASSEMBLY. (Refer to figure 9-3.)

a. Always discard the following items and install new parts during reassembly:

1. Groov-Pins (8 and 10).
2. O-Ring (13).
3. Nuts (2).

b. During reassembly, lubricate collars (7), screw (9) and threaded rod end (15) in accordance with procedures outlined in Section 2.

c. Install collar (7) and bearing (6) on screw (9).

d. Press sprocket (5) into the end of screw (9), align groov-pin holes and install new groov-pins (8).

e. Insert screw (9), with assembled parts, into housing (12) until bearing (6) is flush with end of housing.

NOTE

When inserting screw (9) into housing (12), locate the sprocket (5) at the end of housing which is farther away from the groove for retaining ring (11).

The bearings (6 and 14) are not pre-drilled and must be drilled on assembly. The groov-pins (10) are 1/16 inch in diameter, therefore, requiring a 1/16 (0.0625) inch drill.

f. With bearing (6) flush with end of housing (12), carefully drill bearing so the drill will emerge from the hole on the opposite side of housing (12). DO NOT ENLARGE HOLES IN HOUSING.

g. Press new groov-pins (10) into pin holes.

h. Insert collar (7), new O-ring (13) and bearing (14) into opposite end of housing (12).

i. Complete steps "f" and "g" for bearing (14).

j. If a new bearing (16) is required, a new bearing may be pressed into the boss. Be sure force bears against the outer race of bearing.

k. Screw the threaded rod end (15) into screw (9).

l. Install retaining rings (11), if they were removed.

m. Test actuator assembly by rotating sprocket (5) with fingers while holding threaded rod end (15). The threaded rod end should travel in and out smoothly, with no indication of binding.

n. Reinstall actuator assembly in accordance with paragrpah 9-7.

9-11. TRIM TAB FREE-PLAY INSPECTION.

a. Place elevators and trim tab in the neutral position.

b. Using moderate pressure, move the trim tab trailing edge up and down by hand to check free-play.

c. A maximum of .131" (total motion up and down) measured at the trim tab trailing edge is permissible.

d. If the trim tab free-play is less than .131", the system is within prescribed limits.

e. If the trim tab free-play is more than .131", check the following items for looseness while moving the trim tab up and down.

1. Check push-pull channel to trim tab horn assembly attachment for looseness.
2. Check push-pull channel to actuator assembly threaded rod end attachment for looseness.
3. Check actuator assembly threaded rod end for looseness in the actuator assembly.

f. If looseness is apparent while checking steps e-1 and e-2, repair by installing new parts.

g. If looseness is apparent while checking step e-3, refer to paragraphs 9-6 through 9-10.

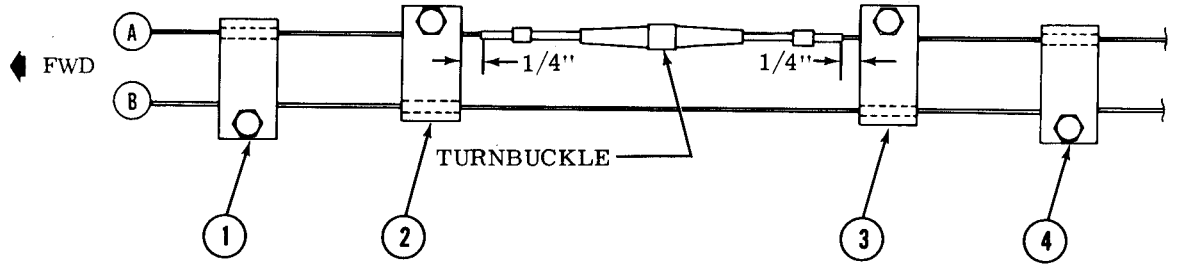
9-12. TRIM TAB CONTROL WHEEL. (Refer to figure 9-1.)

9-13. REMOVAL AND INSTALLATION.

a. Relieve cable tension at turnbuckle (8).

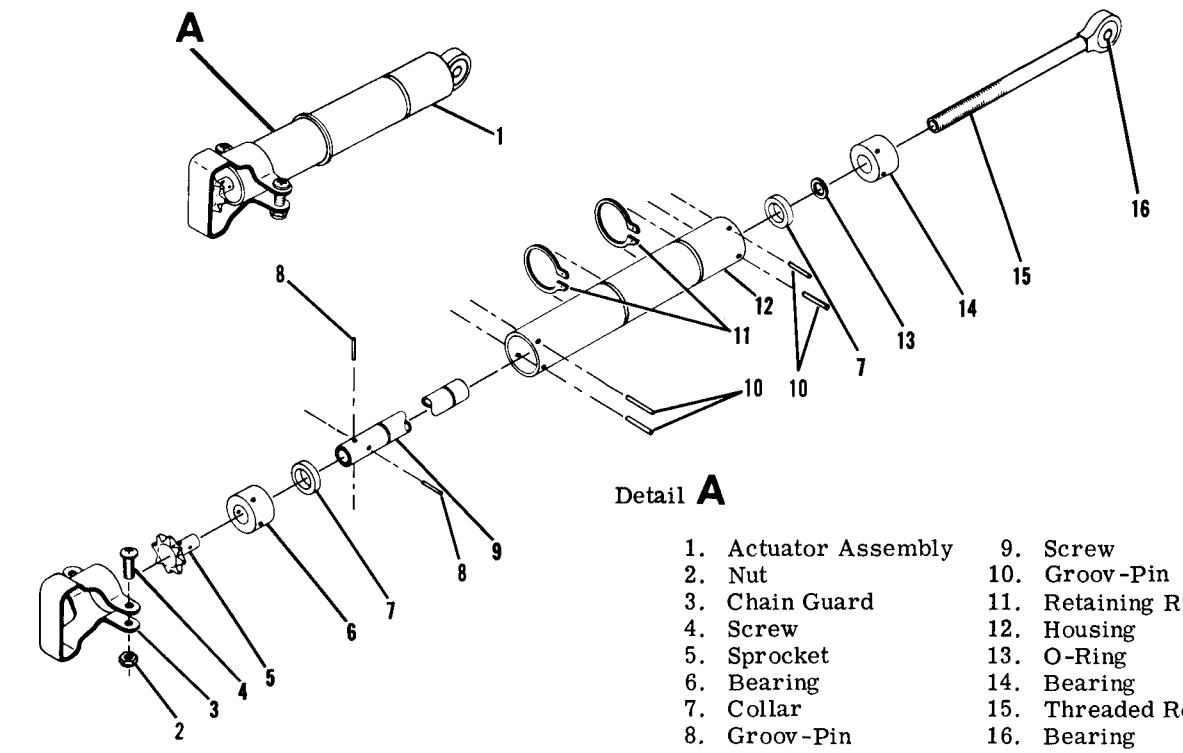
CAUTION

Position a support stand under tail tie-down ring to prevent tailcone from dropping while working inside.



1. With elevators in neutral, set trim tab to neutral (streamlined).
2. Position stop blocks (2) and (3) approximately 1/4" fore-and-aft of turnbuckle respectively, and secure to cable A.
3. Place inclinometer on trim tab and run tab to DOWN TRAVEL limit listed in Section 1.
4. Position stop block (4) against stop block (3) and secure to cable B.
5. Run trim tab to UP TRAVEL limit listed in Section 1, place stop block (1) against stop block (2) and secure to cable B.

Figure 9-2. Elevator Trim Tab Travel Adjustment



1. Actuator Assembly	9. Screw
2. Nut	10. Groov-Pin
3. Chain Guard	11. Retaining Ring
4. Screw	12. Housing
5. Sprocket	13. O-Ring
6. Bearing	14. Bearing
7. Collar	15. Threaded Rod End
8. Groov-Pin	16. Bearing

Figure 9-3. Elevator Trim Tab Actuator Assembly

b. Remove pedestal cover (12). (Refer to applicable paragraph in this section.)
c. Remove screws attaching control wheel retainer (17).
d. Remove retainer and pointer (16), using care not to drop control wheel (14).
e. Disengage roller chain (13) from sprocket (15) and remove control wheel.
f. Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section, safety turnbuckle and reinstall all items removed for access.

9-14. CABLES AND PULLEYS. (Refer to figure 9-1.)

9-15. REMOVAL AND INSTALLATION.
a. Remove seats, upholstery and access plates as necessary.
b. Disconnect cables at turnbuckle (8) and cable ends (5 and 6).
c. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure, attach cable being installed and pull cable into position.

d. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards.
e. Rig system in accordance with applicable paragraph in this section, safety turnbuckle and reinstall all items removed in step "a."

9-16. PEDESTAL COVER. (Refer to figure 9-1.)

9-17. REMOVAL AND INSTALLATION.
a. Remove fuel selector valve handle and placard.
b. Remove mike and remove mike jack mounting nut.
c. Remove screws attaching pedestal cover to structure and remove cover.

9-18. RIGGING. (Refer to figure 9-1.)

CAUTION

Position a support stand under tail tie-down ring to prevent tailcone from dropping while working inside.

a. Remove rear baggage compartment panel and access plates as necessary.
b. Loosen travel stop blocks (10) on cables.
c. Disconnect actuator (3) from trim tab push-pull channel.
d. Check cable tension and readjust turnbuckle (8) if necessary.

NOTE

If chains and/or cables are being installed, permit actuator screw to rotate freely as chains and cables are connected. Set cable tension.

e. Rotate trim wheel (14) full forward (nose down). Ensure pointer (16) does not restrict wheel movement. If necessary, reposition pointer using a thin screwdriver to pry trailing leg of pointer out of groove.

NOTE

Full forward (nose down) position of trim wheel is where further movement is prevented by chain or cable ends contacting sprockets or pulleys.

f. With elevator and trim tab both in neutral (streamlined), place inclinometer on tab and set to zero.

NOTE

An inclinometer for measuring control surface travel is available from Cessna Service Parts Center. Refer to figure 6-4.

g. Rotate actuator screw in or out as required to place tab up with a maximum of 2° overtravel, with actuator screw connected to push-pull channel.
h. Rotate trim wheel to position tab up and down, readjusting actuator screw as required to obtain overtravel in both directions.
i. Position stop blocks (10) and adjust as illustrated in figure 9-2 to limit travel as specified in Section 1.
j. Check trim wheel pointer travels the same distance from ends of slot in cover. Reposition trailing leg of pointer if necessary (refer to step "d").
k. Safety turnbuckle and reinstall all items removed in step "a".

WARNING

Be sure trim tab moves in correct direction when operated by trim wheel. Nose down trim corresponds to tab up position.

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SECTION 10

RUDDER AND RUDDER TRIM CONTROL SYSTEM

TABLE OF CONTENTS

10-1. RUDDER CONTROL SYSTEM. (Refer to figure 10-1.)

10-2. DESCRIPTION. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is comprised of rudder pedals, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering. Cable tension is automatically determined when the rudder pedals are rigged against return springs 6.50 inches from firewall.

10-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Open access plates and check visually. Connect or replace cables.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Refer to figure 10-2 for distance between firewall and pedals. Rig system in accordance with paragraph 10-11.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Open access plates and check visually. Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding. Replace bearing blocks.
	Defective rudder hinge bushings.	Check visually. Replace defective bushings.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Steering rods improperly adjusted.	Rig system in accordance with paragraph 10-11.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Refer to figure 10-2 for distance between firewall and pedals. Rig system in accordance with paragraph 10-11.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.

10-4. RUDDER PEDAL ASSEMBLY. (Refer to figure 10-2.)

10-5. REMOVAL AND INSTALLATION.

a. Remove carpeting, shields and soundproofing from pedal and tunnel areas as necessary.

b. Disconnect master cylinders (12) at pilot rudder pedals.

c. Disconnect parking brake cables at master cylinders.

d. Remove rudder pedals (2) and brake links (5).

e. Releive cable tension at clevises (index 11, figure 10-1).

f. Disconnect cables, return springs, trim bungee, and steering tubes from rudder bars.

g. Remove bolts securing bearing blocks (8) and work rudder bars out of tunnel area.

NOTE

Rudder bar assemblies should be checked for excessive wear before installation. The bearing blocks are nylon and require no lubrication unless binding occurs. A few drops of general purpose oil should eliminate such binding.

h. Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

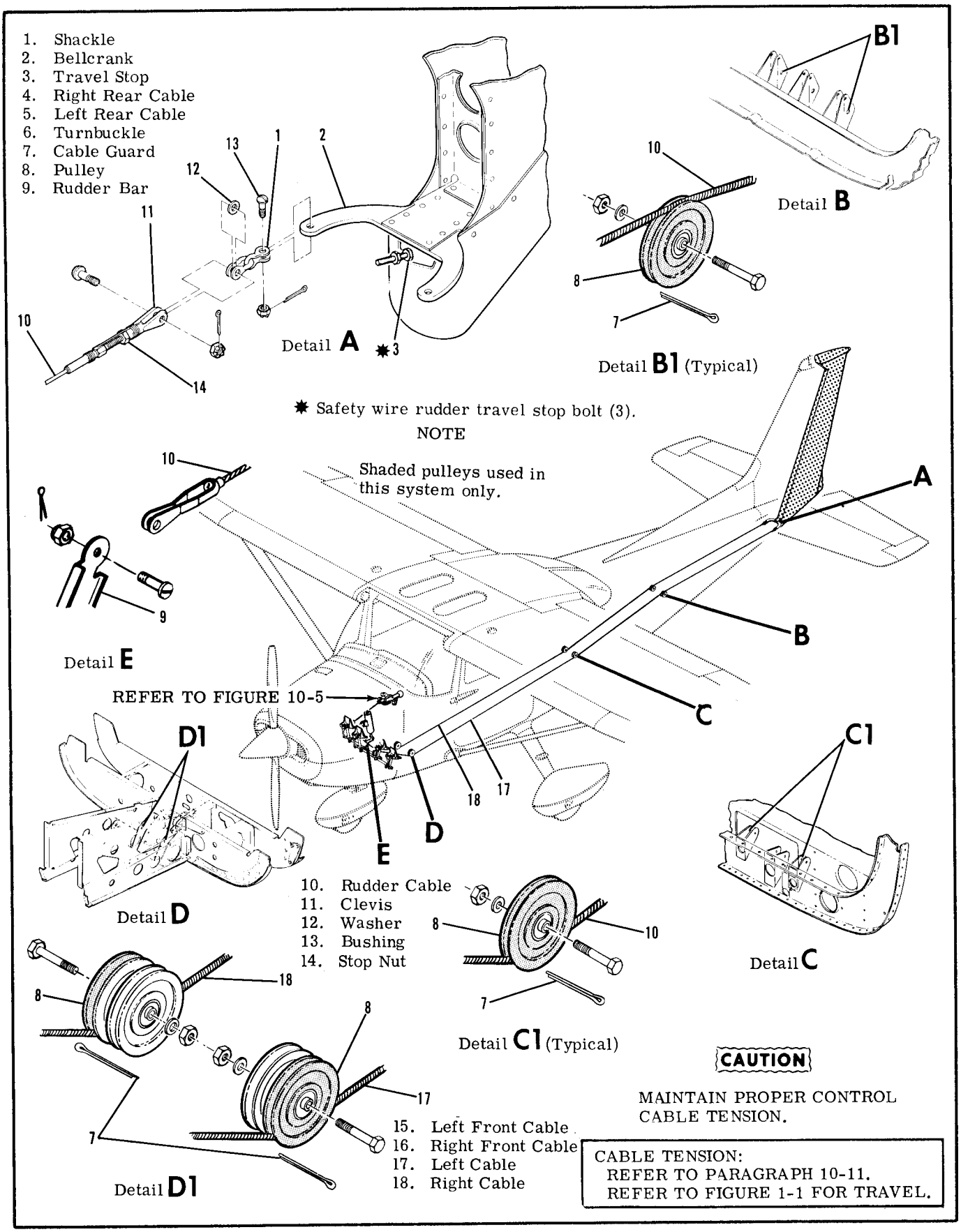
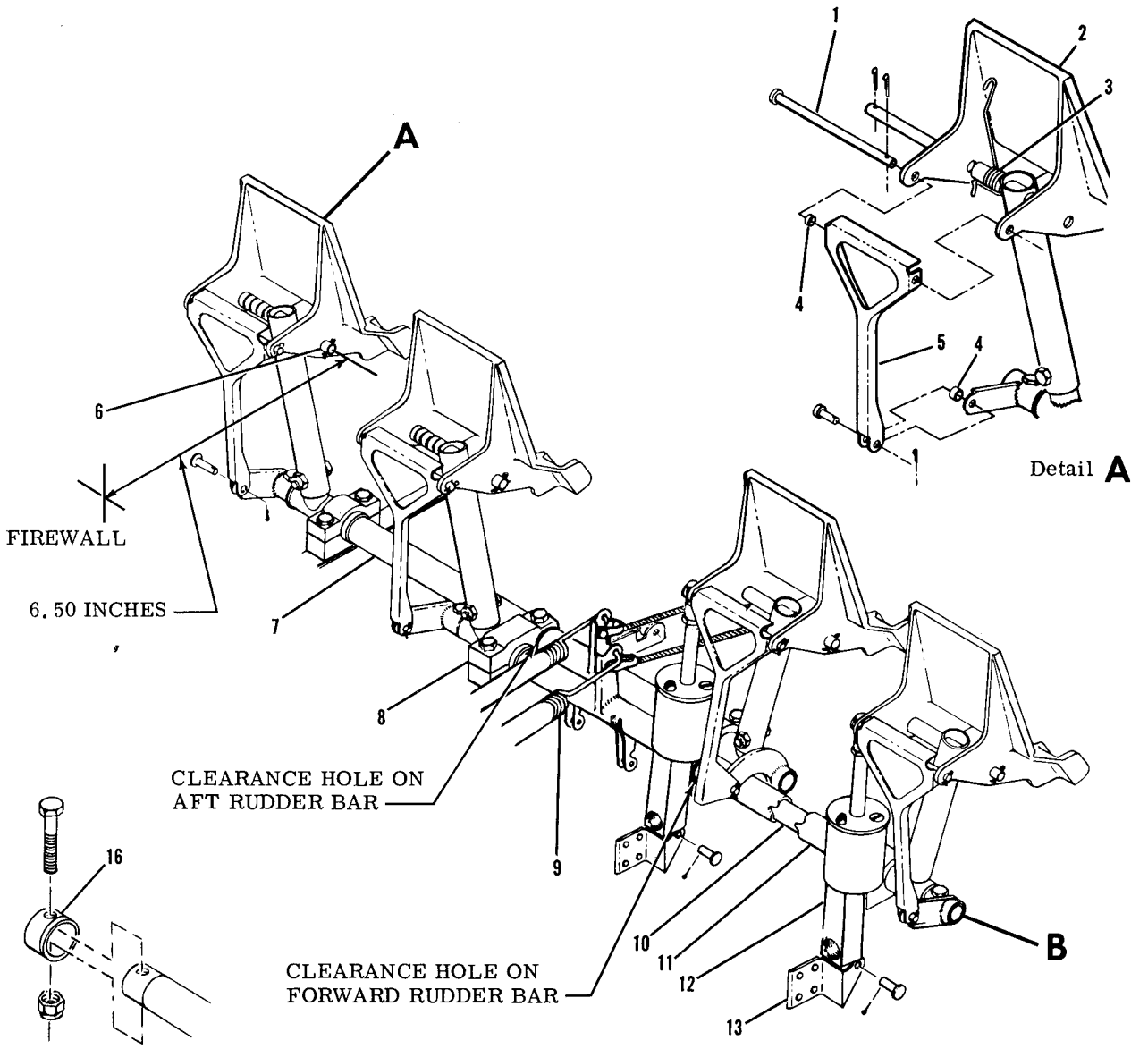


Figure 10-1. Rudder Control System



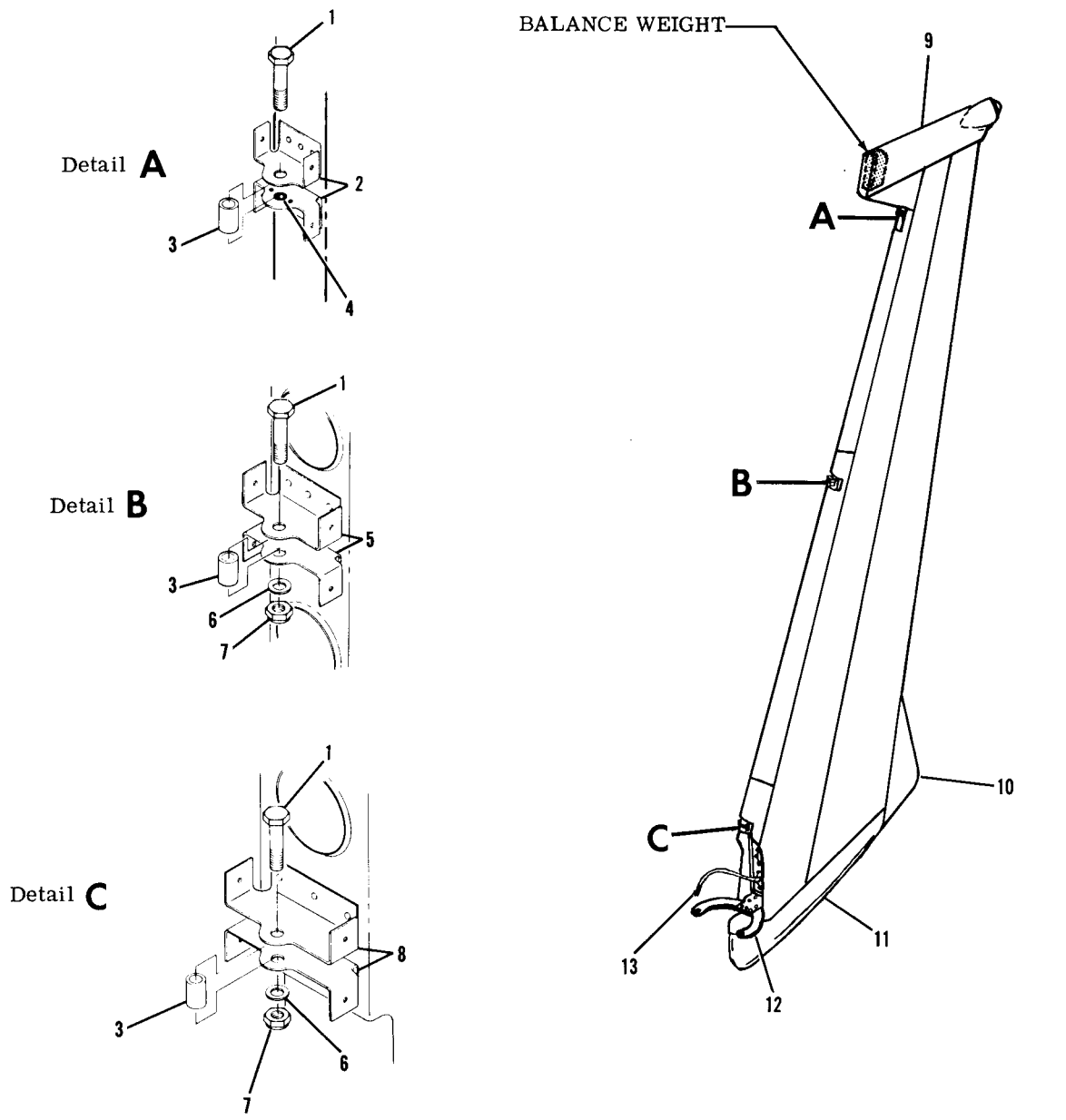
1. Shaft
2. Rudder Pedal
3. Anti-Rattle Spring
4. Spacer
5. Brake Link
6. Pivot Shaft
7. Aft Rudder Bar
8. Bearing Block
9. Return Spring
10. Brake Torque Tube
11. Forward Rudder Bar
12. Master Cylinder
13. Bracket
14. Bearing
15. Bellcrank
16. Single Controls Hub

NOTE

Brake links (5), bellcranks (15) and attaching parts are replaced with hubs when dual controls are NOT installed.

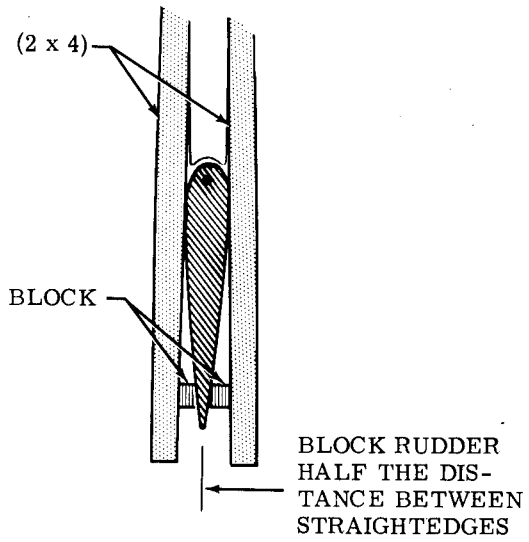
Nylon washers may be installed between shaft (1) and brake link (5) as required to eliminate excessive clearance when dual controls ARE installed.

Figure 10-2. Rudder Pedals Installation

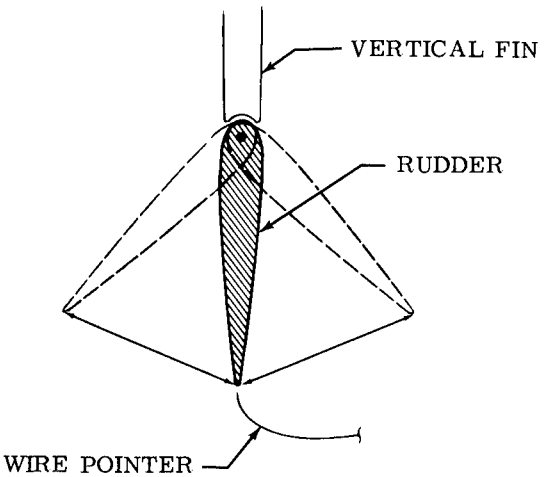


1. Bolt
2. Upper Hinge
3. Bushing
4. Nutplate
5. Center Hinge
6. Washer
7. Nut
8. Lower Hinge
9. Upper Tip
10. Trim Tab
11. Lower Tip
12. Bellcrank
13. Quick-Disconnect

Figure 10-3. Rudder Assembly



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 one elevator in such a manner that it can be bent to index with a point on rudder trailing edge just above the lower rudder tip (disregard fixed trim tab).
3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges.
5. Hold rudder against right, then left, rudder stop. Measure the distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 5.29" and 5.91".

Figure 10-4. Checking Rudder Travel

10-6. RUDDER. (Refer to figure 10-3.)

10-7. REMOVAL AND INSTALLATION.

a. Disconnect tail navigation light quick-disconnect (13).

b. Relieve cable tension at clevises (index 11, figure 10-1) and disconnect clevises form rudder bellcrank (12).

c. With rudder supported, remove hinge bolts (1) and lift rudder free of vertical fin.

d. Reverse preceding steps for installation. Rig system in accordance with appropriate paragraph in this section and safety turnbuckles or clevises, as applicable.

10-8. REPAIR. Repair may be accomplished as outlined in Section 18. Hinge bushings may be replaced as necessary.

10-9. CABLES AND PULLEYS. (Refer to figure 10-1.)

10-10. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.

b. Disconnect cable at rudder bar (9) and bellcrank (2).

c. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure, attach cable being installed and pull cable into position.

d. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
e. Rig system in accordance with appropriate paragraph in this section. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

10-11. RIGGING. (Refer to figure 10-1.)
a. Adjust travel stops (3) to attain travel specified in Section 1. Figure 10-4 illustrates correct travel and one method of checking.
b. Disconnect nose wheel steering tubes (refer to section 5) from nose strut.
c. Adjust cables at clevises (11) to align rudder and pedals in neutral position, 6.50 inches from firewall to pedal pivot shafts (index 6, figure 10-2). This step automatically determines cable tension because of the return springs (index 9, figure 10-2) attached to the rudder bar.

NOTE

Due to thickness of insulation on firewall, it is recommended that a piece of 1/16 inch welding rod be ground to a sharp point and notched at the 6.50 inch dimension. Pierce insulation on firewall and use notch to measure proper dimension.

d. Tie down or weight tail to raise nose wheel free of ground.
e. Center nose gear against external stop.
f. Extend steering tubes until free play is removed. DO NOT COMPRESS SPRINGS.
g. Adjust steering tube rod ends to 1.00 inch dimension between steering arm assembly and bolt hole as illustrated in section 5 and tighten jam nuts.
h. Adjust steering tube clevises to align with rod end bearings.

NOTE

Extend steering tubes to seat rods against internal springs but do not attempt to preload these springs by shortening rod end clevises after alignment. Preload is built into steering tubes.

i. Install clevises on rod ends.

NOTE

DO NOT adjust rudder trim with steering tubes. Degree of steering travel cannot be adjusted.

j. Rig rudder trim control system in accordance with paragraph 10-14.
i. Safety clevises (11) and install all items removed for access.

NOTE

Flight test aircraft to determine if ground adjustment of fixed trim tab is necessary. DO NOT rig rudder "off-center" unless trim tab does not provide adequate correction.

WARNING

Be sure rudder moves in correct direction when operated by pedals.

10-12. RUDDER TRIM CONTROL SYSTEM. (Refer to figure 10-5.)

10-13. DESCRIPTION. A lever assembly, actuated by the pilot, is linked via a bellcrank to a rudder trim bungee which is, in turn connected directly to the rudder bar assembly and hence to the rudder itself. The lever assembly is mounted on the center console structure and utilizes a pin to positively lock the trim system in any of 3 positions left or right of the center or "neutral" trim position. The lever also serves the trim position indicator.

10-14. RIGGING. (Refer to figure 10-5.)

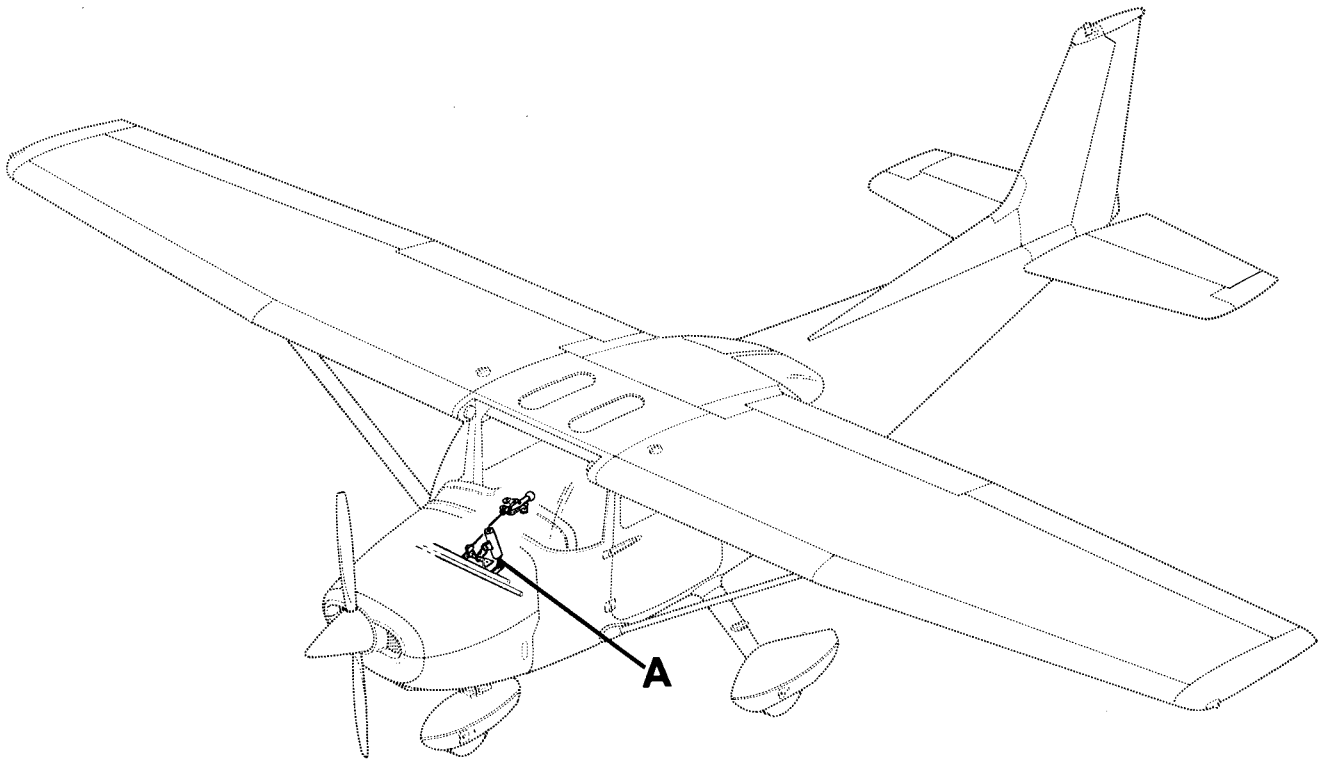
NOTE

The rudder control system MUST be rigged according to paragraph 10-11 prior to rigging the rudder trim control system.

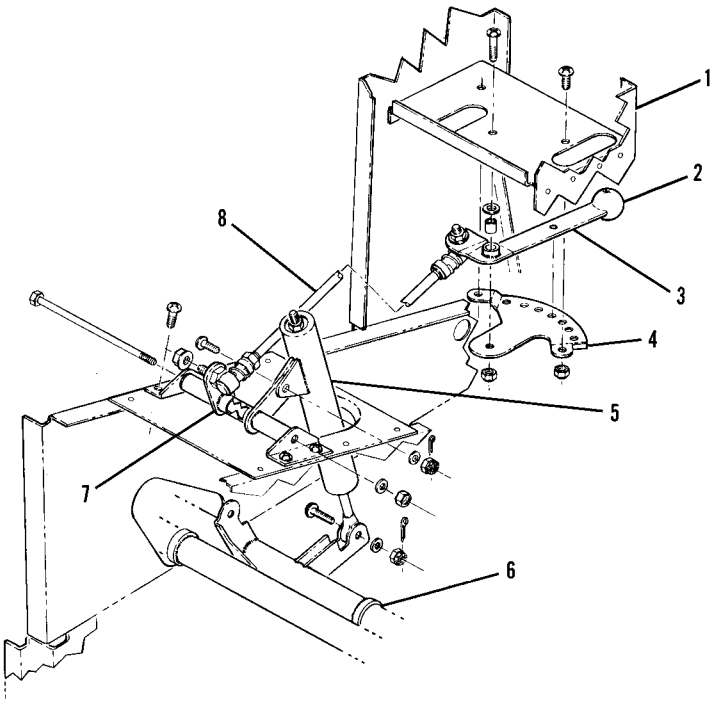
a. Tie down or weight tail of the aircraft to raise nose wheel clear of ground.
b. Ensure nose wheel, rudder and and rudder pedals are all in "neutral" position.
c. Ensure top nut on bungee assembly is adjusted to eliminate end play between shaft and housing.
d. Install bungee (5) between rudder bar (6), and bellcrank (7) as shown in fig 10-5, detail A.
e. Make sure lever assembly (3) is in neutral position or center hole of bracket (4).
f. Adjust ball ends of push rod (8) so that ball end studs align with holes in bellcrank (7) and lever assembly (3) and install push rod.
g. Check for security and safetying of all components and reinstall all items removed for access.

WARNING

Be sure rudder trim lever moves rudder in correct direction.



1. Console Structure
2. Knob
3. Lever
4. Bracket
5. Trim Bungee
6. Rudder Bar
7. Bellcrank
8. Pushrod



Detail **A**

Figure 10-5. Rudder Trim Control System

SECTION 11

ENGINE

TABLE OF CONTENTS

11-1. ENGINE COWLING.

11-2. DESCRIPTION. The engine cowling is comprised of an upper and lower cowling segment. Instead of attaching directly to the fuselage, the cowling attaches to shock mounts, which in turn, are fastened to the fuselage. A door in the top cowl provides access to the engine oil dipstick, oil filler neck and strainer drain control. Quick-disconnect fasteners are used at the cowling-to-shock-mounts and at the parting surfaces of the upper and lower cowl attach points. Machine screws secure the cowling segments together at the nose caps.

11-3. REMOVAL AND INSTALLATION.

a. Release the quick-disconnect fasteners attaching the cowling to the shock mounts and at the parting surfaces of the upper and lower cowling segments. (Refer to figure 1-1.)

b. Remove the machine screws securing the cowling nose caps together.

c. Disconnect electrical wiring at back of landing light.

d. Reverse the preceding steps for reinstallation. Be sure that the baffle seals are turned in the correct direction to confine and direct airflow around the engine. The vertical seals must fold forward and the side seals must fold upwards.

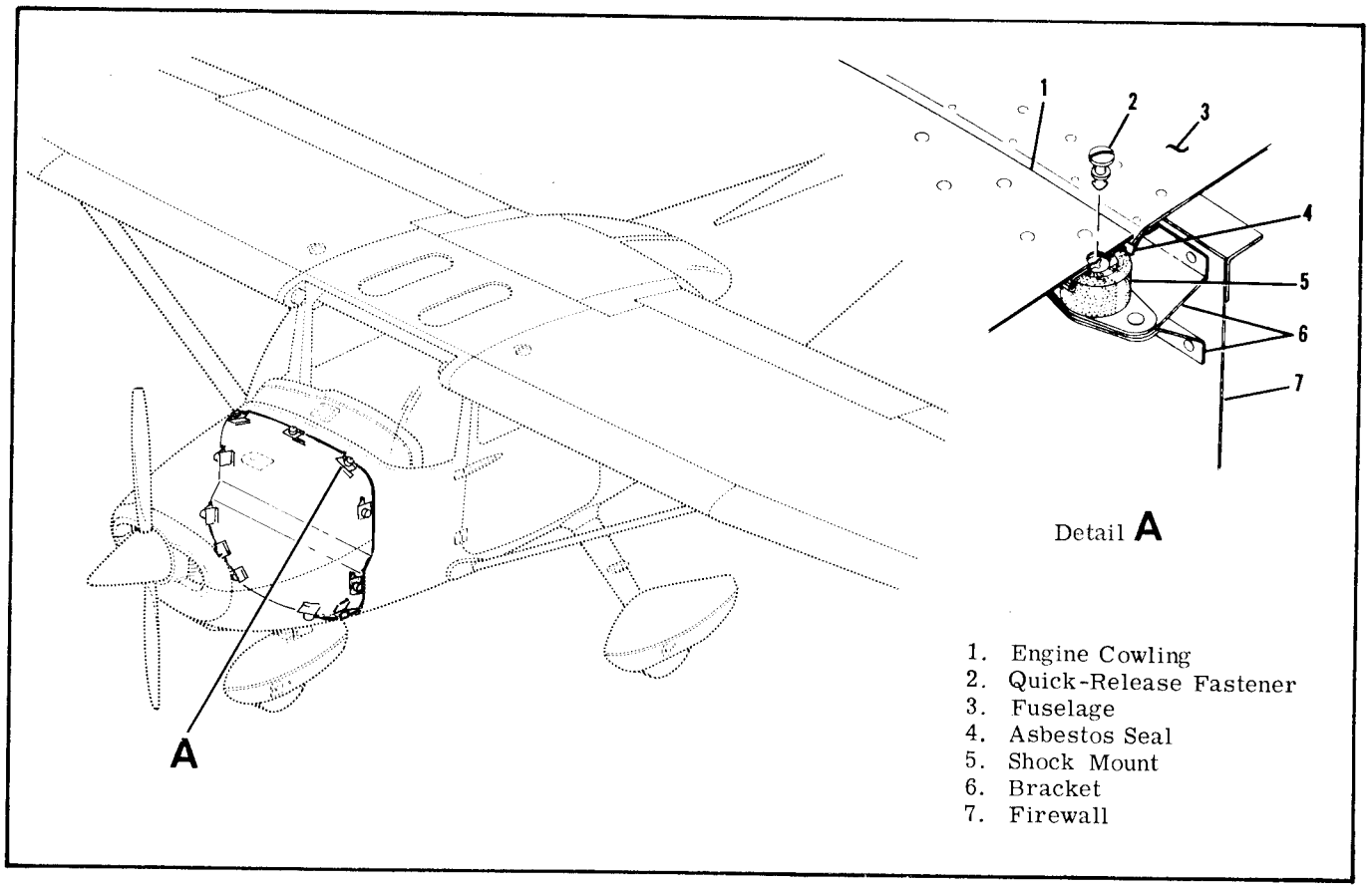


Figure 11-1. Engine Cowling Shock Mounts

NOTE

When new shock mounts or brackets are being installed, careful measurements should be made to position these parts correctly on the firewall. These service parts are not pre-drilled. Install shock mounts on brackets so that cowling stud and shock mount are correctly aligned. Sheet aluminum may be used as shims between bracket halves to provide proper cowling contour.

11-4. CLEANING AND INSPECTION. Wipe the inner surfaces of the cowling segments with a clean cloth saturated with cleaning solvent (Stoddard or equivalent). If the inside surface of the cowling is coated heavily with oil or dirt, allow solvent to soak until foreign material can be removed. Wash painted surfaces of the cowling with a solution of mild soap and water and rinse thoroughly. After washing, a coat of wax may be applied to the painted surfaces to prolong paint life. After cleaning, inspect cowling for dents, cracks, loose rivets and spot welds. Repair all defects to prevent spread of damage.

11-5. REPAIR. If cowling skins are extensively damaged, new complete sections of the cowling should be installed. Standard insert-type patches may be used for repair if repair parts are formed to fit contour of cowling. Small cracks may be stop-drilled and small dents straightened if they are reinforced on the inner surface with a doubler of the same material as the cowling skin. Damaged reinforcement angles should be replaced with new parts. Due to their small size, new reinforcement angles are easier to install than to repair the damaged part.

11-6. ENGINE.

11-7. DESCRIPTION. An air cooled, wet-sump, four-cylinder, horizontally-opposed, direct-drive, carbureted "Blue Streak" (Lycoming) O-320-H series engine is used to power the aircraft. The cylinders, numbered from front to rear, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right front cylinder is number 1 and cylinders on the right side are identified by odd numbers 1 and 3. The left front cylinder is number 2 and the cylinders on the left side are identified as numbers 2 and 4. Refer to paragraph 11-8 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Service Parts Center.

11-8. ENGINE DATA.

MODEL (Lycoming)	O-320-H2AD
BHP at RPM	160 BHP at 2700 RPM
Number of Cylinders	4-Horizontally Opposed
Displacement	319.8 Cubic Inches
Bore	5.125 Inches
Stroke	3.875 Inches
Compression Ratio	9.0:1
Magnetos (Dual)	Bendix D4RN-2021
Right Magneto	Fires 25° BTC 1-3 Lower and 2-4 Upper
Left Magneto	Fires 25° BTC 1-3 Upper and 2-4 Lower
Firing Order	1-3-2-4
Spark Plugs	18MM (Refer to Current Avco Lycoming Active Factory Approved Spark Plug Chart)
Torque Value	390±30 Lb-In.
Carburetor (Marvel-Schebler)	MA-4SPA
Oil Sump Capacity	6 U.S. Quarts
With Filter Change	7 U.S. Quarts
Tachometer	Mechanical
Approximate Dry Weight	283 Pounds (Weight is Approximate and Will
With Standard Accessories	Vary with Optional Equipment Installed)
Oil Pressure	
Minimum Idling	25 PSI
Normal	60 to 90 PSI
Maximum (Cold Oil Starting)	100 PSI
Oil Temperature	
Normal Operation	Within Green Arc
Maximum Permissible	Red Line (245°F)
Cylinder Head Temperature	500°F Maximum

11-9. TIME BETWEEN OVERHAUL (TBO). Refer to the latest Revision of Avco Lycoming Service Instruction No. 1009, and all applicable Service Letters or Service Bulletins, for recommendations applicable to O-320-H Series engines. At the time of overhaul engine accessories should be overhauled.

11-9A. OVERSPEED LIMITATIONS. The engine must not be operated above specified maximum continuous RPM. However, should inadvertant overspeed occur refer to the latest issue of Avco Lycoming Service Bulletin No. 369 and all applicable Service Letters and Service Instructions for obligatory recommendations.

11-10. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE WILL NOT START.	Improper use of starting procedure.	Review starting procedure.
	Fuel tanks empty.	Visually inspect tanks. Fill with proper grade and quantity of gasoline.
	Mixture control in the IDLE CUT-OFF position.	Move control to the full RICH position.
	Fuel selector valve in OFF position.	Place selector valve in the ON position to a tank known to contain gasoline.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Carburetor screen or fuel strainer plugged.	Remove carburetor and clean thoroughly. Refer to paragraph 11-42.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 11-76.
	Engine flooded.	Refer to paragraph 11-76.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective magneto switch or grounded magneto leads.	Check continuity. Repair or replace switch or leads.
	Spark plugs fouled.	Remove, clean and regap plugs. Test harness cables to persistently fouled plugs. Replace if defective.
ENGINE STARTS BUT DIES, OR WILL NOT IDLE.	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 11-43.
	Carburetor idling jet plugged.	Clean carburetor and fuel strainer. Refer to paragraph 11-42.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-55.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE. (Cont.)	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.	Refer to paragraph 11-76.
	Induction air leaks.	Check visually. Correct the cause of leaks.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Leaking float valve or float level set too high.	Perform an idle mixture check. Attempt to remove any rich indication with the idle mixture adjustment. If the rich indication cannot be removed, the float valve is leaking or the float level is set too high. Replace defective parts, reset float level.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY.	Restriction in aircraft fuel system.	Refer to Section 12.
	Worn or improperly rigged throttle or mixture control.	Check visually. Replace worn Linkage. Rig properly.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Defective ignition system.	Refer to paragraph 11-55.
	Defective or badly adjusted accelerating pump in carburetor.	Check setting of accelerating pump linkage and adjust as necessary.
	Float level set too low.	Check and reset float level.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.

11-10. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY. (Cont.)	Restricted carburetor air filter.	Check visually. Clean in accordance with Section 2.
	Cracked engine mount.	Inspect and repair or replace mount as required.
	Defective mounting bushings.	Inspect and install new bushings as required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Check that idle cut-off stop on carburetor is contacted. Replace worn linkage. Rig properly.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, it is defective. Repair or replace primer.
	Defective carburetor.	Repair or replace carburetor.
	Fuel contamination.	Check all screens in fuel system. Drain all fuel and flush out system. Clean all screens, lines, strainer and carburetor.

11-11. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft with the engine mount attached to the firewall.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Place fuel selector valve in the OFF position.
c. Remove engine cowling in accordance with paragraph 11-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine mount or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 13.

i. Disconnect throttle and mixture controls at carburetor. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.

j. Loosen clamps and remove flexible duct from engine baffle and oil cooler.

k. Loosen clamps and remove flexible duct from muffler shroud and heater valve.

l. Disconnect carburetor heat control at airbox and remove clamp attaching control to bracket. Pull control aft to clear engine.

m. Disconnect wires and cables as follows:

1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

2. Disconnect starter electrical cable at starter.
3. Disconnect cylinder head temperature wire at probe.
4. Disconnect electrical wires and wire shielding ground at alternator.
5. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.

n. Disconnect lines and hoses as follows:

1. Disconnect vacuum hose at firewall fitting.
2. Disconnect engine breather hose at top of accessory case.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

3. Disconnect oil temperature bulb at adapter.
4. Disconnect primer line at firewall fitting.
5. Disconnect fuel supply hose at carburetor.
6. Disconnect oil pressure line at firewall fitting.
7. Disconnect oil cooler hoses at cooler.

o. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.

p. Attach a hoist to the lifting eye at the top center of the engine crankcase. Life engine just enough to relieve the weight from the engine mounts.

CAUTION

Place a suitable stand under the tail tie-down ring before removing engine. The loss of engine weight will cause the aircraft to be tail heavy.

q. Remove bolts attaching engine to engine mount and slowly hoist engine and pull it forward. Checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.

11-12. CLEANING. Refer to Section 2 for cleaning of the engine.

11-13. ACCESSORIES REMOVAL. Removal of engine accessories for overhaul or for engine replacement involves stripping the engine of parts, accessories and components to reduce it to the bare engine. During the removal process, removed items should be examined carefully and defective parts should be tagged for repair or replacement with new components.

NOTE

Items easily confused with similar items should be tagged to provide a means of identification when being installed on a new engine. All openings exposed by the removal of an item should be closed by installing a suitable cover or cap over the opening. This will prevent entry of foreign material. If suitable covers are not available, tape may be used to cover the openings.

11-14. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.

a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.

b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.

c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.

d. Inspect for color bleaching of the end fittings or severe discoloration of the hoses.

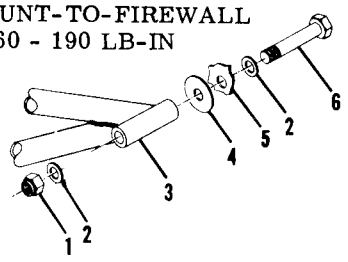
NOTE

Avoid excessive flexing and sharp bends when examining hoses for stiffness.

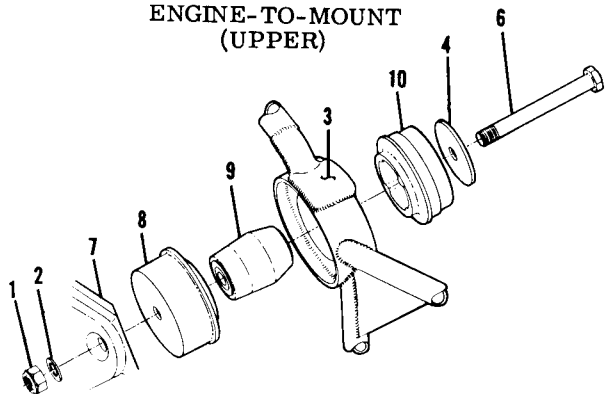
e. Refer to Section 2 for replacement intervals for flexible fluid carrying hoses.

MOUNT-TO-FIREWALL
(UPPER)

TORQUE MOUNT-TO-FIREWALL
BOLTS TO 160 - 190 LB-IN

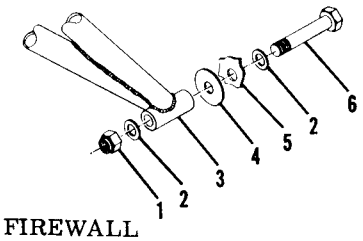


ENGINE-TO-MOUNT
(UPPER)

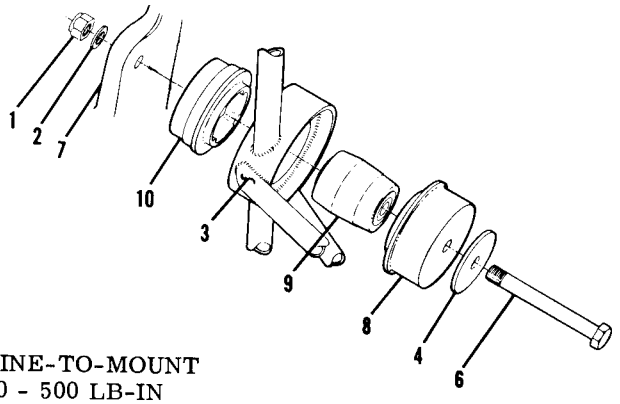


NOTE

When installing shock mounts, install shock mount pad (8) as shown for the upper and lower mounts.



MOUNT-TO-FIREWALL
(LOWER)



TORQUE ENGINE-TO-MOUNT
BOLTS TO 450 - 500 LB-IN

ENGINE-TO-MOUNT
(LOWER)

1. Nut
2. Washer
3. Engine Mount
4. Washer
5. Firewall
6. Bolt
7. Engine Mount Foot
8. Shock Mount Pad
9. Shock Mount Dampener
10. Shock Mount Pad

Figure 11-2. Engine Mount Details

f. For major engine repairs, refer to the manufacturer's overhaul and repair manual.

11-15. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lockwashers, nuts, gaskets and rubber connections should be new parts.

11-16. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point near the engine mount.
b. Install engine shock-mount pads as illustrated in figure 11-2.
c. Carefully lower engine slowly into place on the engine mount. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mount.

NOTE

Be sure engine shock-mount pads, spacers and washers are in place as the engine is lowered into position.

d. Install engine mount bolts, washers and nuts, then remove the hoist and tail support stand. Torque bolts to 450-500 lb-in.
e. Route throttle, mixture and carburetor heat controls to the carburetor and airbox and connect. Secure controls in position with clamps.

NOTE

Throughout the aircraft fuel system, from the tanks to the carburator, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

f. Connect lines and hoses as follows:
1. Connect oil cooler hoses at cooler.
2. Connect oil pressure line at firewall fitting.
3. Connect fuel supply hose at carburetor.
4. Connect primer line at firewall fitting.
5. Connect oil temperature bulb at adapter.
6. Connect engine breather hose at top of accessory case.
7. Connect vacuum hose at firewall fitting.
8. Install clamps and lacings attaching lines and hoses to engine, engine mount and brackets.

g. Connect wires and cables as follows:
1. Connect electrical wires and wire shielding ground at alternator.
2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

3. Connect starter electrical cable at starter.
4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Torque housing attach nut to 100 lb-in.
5. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.

h. Install flexible duct to heater valve and engine baffle and install clamps.
i. Install flexible duct to engine baffle and oil cooler and install clamps.
j. Install propeller and spinner in accordance with instructions outlined in Section 13.
k. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

l. Clean and install induction air filter.
m. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.
n. Check all switches are in the OFF position, and connect battery cables.
o. Rig engine controls in accordance with paragraphs 11-61, 11-62 and 11-63.
p. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
q. Install engine cowling in accordance with paragraph 11-3.
r. Perform an engine run-up and make final adjustments on the engine controls.

11-17. FLEXIBLE FLUID HOSES.

11-18. LEAK TEST.
a. After each 50 hours of engine operation, all flexible fluid hoses in the engine compartment should be checked for leaks as follows:
1. Examine the exterior of hoses for evidence of leakage or wetness.
2. Hoses found leaking should be replaced.
3. Refer to paragraph 11-14 for detailed inspection procedures for flexible hoses.

11-19. REPLACEMENT.

a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.

b. Provide as large a bend radius as possible.

c. Hoses should have a minimum of one-half inch clearance from other lines, ducts, hoses or surrounding objects or be butterfly clamped to them.

d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.

e. Refer to AC 43.13-1, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

11-20. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static RPM run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the RPM values obtained in step b. The resulting RPM figure should be within 60 RPM of 2340 RPM.

d. If the resulting average RPM figure is lower than stated above, the following checks are recommended to determine a possible deficiency.

1. Check carburetor heat control for proper rigging. If partially open it would cause a slight power loss.

2. Check magneto timing, spark plugs and ignition harness for settings and conditions.

3. Check condition of induction air filter. Clean if necessary.

4. Perform an engine compression check. (Refer to engine Manufacturer's Manual).

11-21. ENGINE BAFFLES.

11-22. DESCRIPTION. The sheet metal baffles installed on the engine directs the flow of air around the cylinders and other engine components to provide optimum cooling. These baffles incorporate rubber-asbestos composition seals at points of contact with the engine cowling and other engine components to help confine and direct the airflow to the desired area. It is very important to engine cooling that the baffles and seals are in good condition and installed correctly. The vertical seals must fold forward and the side seals must fold upwards. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any new baffle seals properly.

11-23. CLEANING AND INSPECTION. The engine baffles should be cleaned with a suitable solvent to remove oil and dirt.

NOTE

The rubber-asbestos seals are oil and grease resistant but should not be soaked in solvent for long periods.

Inspect baffles for cracks in the metal and for loose and/or torn seals. Repair or replace any defective parts.

11-24. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any replaced baffles and seals are installed correctly and that they seal to direct the airflow in the correct direction. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

11-25. REPAIR. Repair of an individual segment of engine baffle is generally impractical, since, due to the small size and formed shape of the part, replacement is usually more economical. However, small cracks may be stop-drilled and a reinforcing doubler installed. Other repairs may be made as long as strength and cooling requirements are met. Replace sealing strips if they do not seal properly.

11-26. ENGINE MOUNT. (Refer to figure 11-2.)

11-27. DESCRIPTION. The engine mount is composed of sections of steel tubing welded together and reinforced with gussets. The mount is fastened to the fuselage at four points. The engine is attached to the engine mount with shock-mount assemblies which absorb engine vibrations.

11-28. REMOVAL AND INSTALLATION. Removal of the engine mount is accomplished by removing the engine as outlined in paragraph 11-11, then removing the engine mount from the firewall. On reinstallation torque the mount-to-fuselage bolts to 160-190 lb-in. Torque the engine-to-mount bolts to 450-500 lb-in.

11-29. REPAIR. Repair of the engine mount shall be performed carefully as outlined in Section 18. The mount shall be painted with heat-resistant black enamel after welding or whenever the original finish has been removed. This will prevent corrosion.

11-30. ENGINE SHOCK MOUNT PADS. Refer to figure 11-2.) The bonded rubber and metal shock mounts are designed to reduce transmission of engine vibrations to the airframe. The rubber pads should be wiped clean with a clean dry cloth.

NOTE

Do not clean the rubber pads and dampener assembly with any type of cleaning solvent.

Inspect the metal parts for cracks and excessive wear due to aging and deterioration. Inspect the rubber pads for separation between the pad and metal backing, swelling, cracking or a pronounced set of the pad. Install new parts for all parts that show evidence of wear or damage.

11-31. ENGINE OIL SYSTEM.

11-32. DESCRIPTION. The lubricating system is of the full pressure, wet sump type. The main bearings, connecting rod bearing, camshaft bearings, valve tappets and push rods, are lubricated by positive pressure. The pistons, piston pins, cams, cylinder walls, valve rockers, valve stems and other internal moving parts are lubricated by oil collectors and oil spray. The pump, which is located in the accessory housing, draws oil through a drilled passage leading from the suction screen located in the sump. From the sump, the oil enters a drilled passage to a threaded connection and through a flexible hose to the cooler. Pressure oil from the cooler returns through a flexible return hose to a threaded connection. From there the oil flows through a drilled passage to the oil pressure screen (or oil filter). If cold oil or an obstruction should restrict the flow through the cooler, a cooler bypass valve is provided to pass the pressure oil directly from the pump to the oil screen (or oil filter). The oil is then fed through a drilled passage to the pressure relief valve which is located in the upper right side of the crankcase forward of the accessory housing. This relief valve regulates the engine oil pressure by allowing excessive oil to return to the sump, while the balance of the pressure oil is fed to the main oil gallery in the right half of the crankcase. The oil is distributed from the main gallery by means of a separate drilled passage to each main bearing of the crankshaft. The drilled passages to the bearings are located in such a manner as to form an inertia type filter, thus ensuring that only the cleanest oil will reach the bearings. Drilled passages from the rear main bearing supply pressure oil to the crankshaft idler gears. Angular holes are drilled through the main bearings to the rod journals where sludge removal tubes are located. Oil from the main gallery also flows to the cam and valve gear passages and then is conducted through branch passages to the hydraulic tappets and cam shaft bearings. Oil travels out through the hollow push rods to the valve rocker bearings and valve stems. Residual oil from the bearings, accessory drives and rocker boxes flows by gravity to the sump where it passes through the suction screen and is recirculated through the engine.

SHOP NOTES:

11-33. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken, disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Leak in pressure or suction line.	Inspect gasket between accessory housing and crankcase. Repair engine as required.
	Dirty oil screens.	Remove and clean oil screens.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective. Replace bulb.
	Oil cooler thermostatic valve/bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Attempt to drain cooler. Inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic valve or bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 RPM to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. Replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

11-33. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (CONT).	Oil congealed in cooler.	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	Replace.
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

11-34. FULL-FLOW OIL FILTER.

11-35. DESCRIPTION. An external full-flow oil filter may be installed on the engine. If the filter should become clogged, a bypass valve allows engine oil to flow directly to the engine oil passages.

11-36. REMOVAL AND INSTALLATION.

NOTE

Replacement filters are available from the Cessna Service Parts Center.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove safety wire from filter.
c. Unscrew filter from adapter.
d. Lightly lubricate gasket with engine oil only prior to installations.
e. Install spin-on filter on the stud and torque to 18-20 lb-ft or 3/4 to 1 full turn after gasket makes contact.
f. Safety wire filter to adapter.
g. After first engine run check for oil leaks.

11-37. OIL COOLER.

11-38. DESCRIPTION. The external oil cooler is mounted on the firewall. Flexible hoses carry the oil to and from the cooler. Cooling air for the cooler is ducted from the upper right engine baffle to the shroud covered oil cooler. Exhaust air from the cooler is discharged into the engine compartment. A bypass valve causes oil to bypass the cooler in the event of congealed oil or an obstruction in the cooler. At each engine oil change, drain the oil cooler.

11-39. ENGINE FUEL SYSTEM.

11-40. DESCRIPTION. A single barrel, float-type up-draft carburetor is installed on the engine. The carburetor is equipped with a manual mixture control and an idle cut-off. For repair and overhaul of the carburetor refer to the manufacturer's overhaul and repair manual.

11-41. CARBURETOR.

11-42. REMOVAL AND INSTALLATION.
a. Place fuel selector valve in the OFF position.
b. Remove engine cowling in accordance with paragraph 11-3.
c. Drain fuel from strainer and lines with strainer drain control.
d. Disconnect throttle and mixture controls at carburetor. Note the EXACT position, size and number of washers and spacers for reference on reinstallation.
e. Disconnect and cap or plug fuel line at carburetor.
f. Remove induction airbox.
g. Remove nuts and washers attaching carburetor to intake manifold and remove carburetor.
h. Reverse the preceding steps for reinstallation. Use new gasket between carburetor and intake manifold. Check carburetor throttle arm to idle stop arm attachment for security and proper safetying at each normal engine inspection in accordance with figure 11-3.

11-43. IDLE SPEED AND MIXTURE ADJUSTMENTS. Since idle RPM may be affected by idle mixture adjustment, it may be necessary to readjust idle RPM after setting the idle mixture.
a. Start and run engine until the oil and cylinder head temperature are in the normal operating range.
b. Check the magnetos for proper operation in accordance with paragraph 11-56.
c. Clear the engine by advancing the RPM to approxi-

mately 1000, then retard the throttle to the idle position. The engine RPM should stabilize at 600±25. If not, adjust the idle speed screw IN to increase and OUT to decrease RPM.

NOTE

An engine should idle smoothly, without excessive vibrations. The idle speed should be high enough to maintain idling oil pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

d. After the idle speed has stabilized (600±25 RPM), move the mixture control slowly toward the IDLE CUT-OFF position and observe the tachometer for any minute change during this manual leaning procedure.

e. Quickly return the mixture control to the FULL RICH position before the engine stops.

f. A momentary increase of approximately 25 RPM while slowly manually leaning the mixture is most desirable, an increase of more than 25 RPM indicates a rich idle mixture and an immediate decrease in RPM (if not preceded by a momentary increase) indicates a lean idle mixture.

g. If the idle mixture is too rich, turn the idle mixture adjustment center screw one or two notches in a clockwise direction as viewed from the aft end of the unit, then repeat steps "d" through "f."

NOTE

After each adjustment to the idle mixture, run engine up to approximately 1800 RPM to clear The engine of excess fuel and obtain a correct idle speed.

h. If the idle mixture is too lean, turn the idle mixture adjustment center screw one or two notches in a counterclockwise direction as viewed from the aft end of the unit, then repeat steps "d" thru "f."

i. This method of adjustment will give the desired idle RPM. If the adjustments do not remain stable, check the throttle and mixture linkage for evidence of wear and improper rigging. Any looseness of the throttle and mixture linkage will cause erratic idling. In all cases, allowance should be made for the effect of weather condition upon idling adjustment. The relation of the aircraft to the prevailing wind direction will have an effect on the propeller load and engine RPM. It is advisable to make idle adjustments with the aircraft crosswind.

11-44. INDUCTION AIR SYSTEM.

11-45. DESCRIPTION. Ram air to the engine enters the induction airbox through the induction air filter located in the forward part of the lower engine cowling. From the induction airbox the air is directed to the inlet of the carburetor, mounted on the lower side of the engine oil sump, through the carburetor to the center zone induction system, which is an integral part of the oil sump. From the center zone system, the fuel-air mixture is distributed to each cylinder by separate steel intake pipes. The intake pipes are attached to the center zone risers with hoses and clamps and to the cylinder with a two bolt flange which is sealed with a gasket. The induction airbox contains a valve, operated by the carburetor heat control in the cabin, which permits air from an exhaust heated source to be selected in the event carburetor icing or filter icing should be encountered.

11-46. REMOVAL AND INSTALLATION.

a. Remove cowling as required for access in accordance with paragraph 11-3.

b. Mark the intake pipes as they are removed from the engine so they may be reassembled in the same location from which they were removed.

c. Loosen hose clamps and slide hose connections from sump. Remove any clamps attaching wires and lines to the intake pipes.

d. Remove the nuts, washers and lock washers at cylinder.

e. Remove intake pipe and clean gasket from cylinder mounting pad and intake pipe flange.

f. Reverse the preceding steps for reinstallation. Use new gaskets and install intake pipes in the same location from which they were removed.

11-47. IGNITION SYSTEM.

11-48. DESCRIPTION. The ignition system is comprised of a dual magneto, two spark plugs in each cylinder, an ignition wiring harness, an ignition switch mounted on the instrument panel and required wiring between the ignition switch and magnetos.

SHOP NOTES:

11-49. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 11-55.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 11-55.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.

11-50. MAGNETO.

11-51. DESCRIPTION. The Bendix D-2000 series magneto consists of two electrically independent ignition circuits in one housing. A single four pole rotor provides the magnetic energy for both circuits. The magneto uses an impulse coupling to provide reliable ignition at engine cranking speed. Suppression of breaker contact point arcing is accomplished by feed-thru type capacitors mounted in the magneto cover which forms a part of the magneto harness assembly.

11-52. REMOVAL AND INSTALLATION.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Therefore, ground the breaker contact points or disconnect the high-tension wires from magneto or spark plugs.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove the eight screws securing the high-tension outlet cover to the magneto. The "P" leads may be disconnected for additional clearance if necessary.

NOTE

It is a good practice to position No. 1 cylinder at its approximate advanced firing position before removing the magneto.

c. Remove nuts, washers and clamps attaching the magneto to the engine accessory housing. Note the approximate angular position at which the magneto is installed, then remove the magneto.
d. Reverse the preceding steps for reinstallation and time magneto-to-engine in accordance with paragraph 11-54.

11-53. INTERNAL TIMING. (MAGNETO REMOVED FROM ENGINE.)

NOTE

A magneto, correctly timed internally, will have the red painted tooth of the large distributor gears approximately centered in the timing windows, the R ("E" gap) mark on the rotor shaft in alignment with the pointer and both sets of breaker contacts opening, all at the same time.

a. Remove breaker contact point assembly cover, if installed, by removing the cover screws, pulling cover directly aft away from housing and disconnecting both capacitor leads from breaker contact assemblies.
b. Remove timing inspection hole plugs from magneto.
c. Slowly turn the rotor shaft until the red painted tooth of the large distributor gear for each side is approximately centered in the inspection windows with the R ("E" gap) mark on the rotor aligned with the pointer. Lock the rotor in this EXACT position using Bendix Rotor Holding Tool, Part No. 11-8465 or equivalent.

NOTE

Position the 11-8465 Rotor Holding Tool on drive end of rotor shaft in the 4 o'clock position so that any shaft deflection caused by clamping action will be in a plane parallel to the breaker contacts.

d. Connect the timing light (Bendix Part No. 11-9110 or equivalent) black lead to any unpainted surface of the magneto. Connect the red lead to the left breaker contact terminal and the green lead to the right breaker contact terminal.
e. Carefully adjust the LEFT breaker contacts to just begin to open (light will go out) with the timing pointer within the width of the R ("E" gap) mark.
f. Repeat step 5 for the RIGHT breaker contacts.
g. Loosen the rotor holding tool and turn rotor shaft in normal direction of rotation until cam followers of contact assemblies are on the high point of cam lobes. Contact point clearance should be 0.016±0.002 inch and 0.016±0.004 inch on LEFT and RIGHT contacts respectively. If dimensions do not fall within limits, readjust contact points and recheck to be sure the points just begin to open when the timing pointer is within the width of the R ("E" gap) mark.

NOTES

Wire feeler gages are recommended when checking contact point clearance.

No attempt should be made to stone or dress contact points.

If the above conditions are met and within tolerance, the magneto is timed internally and ready for installation. If the above conditions are not within tolerance, proceed to step h.

h. While holding the rotor shaft, loosen the screw securing breaker contact cam to rotor shaft and back screw out approximately half way. Place the end of a broad bladed screw driver between the bottom of the cam and housing. Strike the screw driver handle with a sharp downward blow to "pop" the cam loose from taper of shaft.
i. Rotate cam until breaker contact cam followers are on the high point of cam lobes. Adjust breaker points to obtain a clearance of 0.016±0.002 inch and 0.016±0.004 inch on LEFT and RIGHT contacts respectively. Tighten breaker contact securing screws to 20-25 lb-in.
j. Repeat step c.
k. While holding rotor shaft in this EXACT position, rotate the breaker contact cam in the opposite direction of rotation a few degrees BEYOND where the breaker contacts close, then rotate cam in the normal direction of rotation until the breaker contacts just begin to open. Point opening should be determined by the use of a timing light. (Bendix Part No.

11-9110 or equivalent.)

l. While holding cam in this EXACT position, push cam on rotor shaft as far as possible with the fingers. Tighten cam securing screw thereby drawing the cam down evenly and tightly. Torque cam securing screw to 16-20 lb-in.

NOTE

Extreme care must be exercised in this operation. If cam adjustment is changed in the slightest degree, the timing of the magneto will be thrown off. Do not drive cam on rotor shaft with a mallet or other instrument.

m. Recheck timing to make sure both sets of breaker contacts begin to open within the width of the R ("E" gap) mark and that the contact point clearance is in accordance with dimensions in step g.

NOTE

When reinstalling the inspection hole plugs, make sure the ventilated plugs are installed in the ends of the magneto. Torque plugs to 12-15 lb-in.

11-54. MAGNETO-TO-ENGINE-TIMING. The magneto must be installed with its timing marks carefully aligned, with number one cylinder on its compression stroke and with the number one piston at its advanced firing position. Refer to paragraph 11-8 for the advanced firing position of number one piston. To locate the compression stroke of the number one cylinder, remove the lower spark plug from number 2, 3 and 4 cylinders. Remove the upper spark plug from number 1 cylinder. Place the thumb of one hand over the spark plug hole of number one cylinder and rotate crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is attained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one piston may be obtained by rotating the crankshaft opposite to its normal direction of rotation until it is approximately 30 degrees before top dead center (BTC) on the compression stroke of number one cylinder. Rotate crankshaft in a normal direction to align the timing mark on the front face of the starter ring gear support with the drilled hole in the starter, making sure the final motion of the ring gear is in the direction of normal rotation.

NOTE

An accurate top center indicator which screws into a spark plug mounting hole, and a pendulum pointer mounted on a 360-degree timing disc may also be used to locate the advanced firing position. The timing disc should be adapted to fit over the end of the propeller spinner in such a manner that it may be rotated as necessary. In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the engine is turned in its normal direction of rotation.

After the engine has been placed in the correct firing position, install the magneto to the engine in the following manner:

a. Remove the timing window plug from the most convenient side of the magneto housing.

b. Remove the rotor viewing location plug from the top center of the housing.

c. Turn the rotating magnet drive shaft in the normal direction of magneto rotation until the red painted tooth of the large distributor gear is centered in the timing hole (hole at each side of magneto).

d. Also observe at this time that the built in pointer just ahead of the rotor viewing window aligns with the R ("E" gap) mark on the rotor.

e. Install the magneto-to-engine gasket on the magneto flange.

WARNING

Do not attach harness spark plug leads to the spark plugs until all magneto-to-engine timing procedures are completed and the switch leads ("P" leads) are connected.

f. Remove the engine-to-magneto drive gear train backlash by turning magneto drive opposite to normal rotation as far as possible.

g. With the No. 1 cylinder at its correct firing position and on the compression stroke, hold the magneto as close to its No. 1 firing position as possible (red tooth in center of window and pointer over R ("E" gap) mark on rotor and install magneto to the engine. Loosely tighten magneto in position.

NOTE

To facilitate connection of a timing light to the switch lead ("P" lead) terminals, short adapter leads may be fabricated. These can be made by using two switch lead terminals and two short pieces of insulated wire. Install the fabricated adapter leads in the switch lead outlet terminals of the cover.

h. Attach the red lead of the timing light (Bendix Part No. 11-9110 or equivalent) to the left switch lead adapter, the green lead of the timing light to the right switch lead adapter and the black lead of the timing light to the magneto housing (common ground).

NOTE

An internal timing tolerance is allowed when adjusting the two main breakers. Therefore, one of the main breakers may open slightly before the other. Magneto-to-engine timing should be accomplished using the first main breaker to open as the reference point when the engine is in the firing position for No. 1 cylinder. This will insure that ignition

created by either spark plug will not occur prior to the desired engine firing point.

i. Turn the entire magneto in direction of rotor rotation until the timing lights are on.

j. Turn magneto in direction of rotor rotation, right-hand rotation to right and left-hand rotation to left, until one of the timing lights just goes off. Then tighten the magneto mounting clamps evenly in this position.

k. Back the engine up approximately 10° and then carefully "bump" the engine forward while observing the timing lights.

l. At the No. 1 cylinder firing position, one of the timing lights should go off. Continue turning the engine in its normal direction of rotation until the other timing light goes off. This should be not more than 3 engine degrees later than the first light. If not, repeat steps i thru k until these conditions are obtained.

m. Make sure the magneto clamps are tightened securely, recheck timing once more and remove timing equipment.

n. Reinstall inspection plugs and torque plugs to 12-15 lb-in.

11-55. MAINTENANCE. At the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour inspection, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. If magneto-to-engine timing is correct within plus zero and minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing (paragraph 11-53), then install and time to the engine.

NOTE

If engine operating troubles develop which appear to be caused by the ignition system, it is advisable to check the spark plugs and ignition harness first before working on the magnetos. If the trouble appears definitely associated with a magneto, the following may be used to help disclose the source of trouble without overhauling the magneto.

a. Moisture check.

1. Remove contact breaker point assembly cover and inspect cover, cables and capacitor for moisture in the area.

2. Inspect distributor block high tension outlets for moisture.

3. If any moisture is evident, lightly wipe with a soft, dry, clean, lint-free cloth.

CAUTION

Do not use gasoline or any other solvent, as these will remove the wax coating on some parts and cause an electrical leak.

b. Breaker contact compartment check.

1. Check all parts of the contact breaker assembly for security. Check distributor block high-tension outlet springs for evidence of spark erosion and proper height. The end of spring should not be more than 0.422 inch from top of tower.

2. Check breaker contact assembly points for excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard finish paper. If breaker points are found defective, install a new assembly. Make no attempts to stone or dress breaker points. Clean new breaker points with clean unleaded gasoline and hard finish paper before installing.

3. Check condition of the cam follower felt. Squeeze felt between thumb and finger. If fingers are not moistened with oil, re-oil using 2 or 3 drops of lubricant (Bendix Part No. 10-86527 or equivalent). Allow approximately 30 minutes for felt to absorb the lubricant. Blot off excess lubricant with a clean, lint-free cloth. Too much lubricant could foul breaker points and cause excessive burning.

4. Check capacitors for looseness in the magneto cover of the harness assembly and for any physical damage. If equipment is available, check the capacitors for leakage, series resistance and capacitance. The capacitance should be 0.34 to 0.41 microfarads.

NOTE

Spring in capacitor outlet may cause an indication of a short to ground if an adapter lead is not used.

c. If the trouble has not been corrected after accomplishing the moisture and breaker contact compartment check, check magneto-to-engine timing in accordance with paragraph 11-54. If timing is incorrect, remove magneto and adjust internal timing in accordance with paragraph 11-53.

d. Reinstall magneto and time to engine in accordance with paragraph 11-54.

e. If the trouble has not been corrected, magneto overhaul or replacement is indicated.

11-56. MAGNETO CHECK.

a. Start and run engine until the oil and cylinder head temperatures are in the normal operating ranges.

b. Advance engine speed to 1700 RPM.

c. Turn the ignition switch to the "R" position and note the RPM drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

d. Turn the switch to the "L" position and note the RPM drop, then return the switch to the "BOTH" position.

e. The RPM drop should not exceed 150 RPM on either magneto setting or show greater than 50 RPM differential between magneto settings. A smooth RPM drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp RPM drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or a higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition

system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

11-57. SPARK PLUGS. Two 18-mm spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

Refer to Section 2 for inspection interval. Remove, clean, inspect and regap all spark plugs at each inspection. Install lower spark plugs in upper portion of cylinders and install upper spark plugs in lower portion of cylinders. Since deterioration of lower spark plugs is usually more rapid than that of the upper spark plugs, rotating helps prolong spark plug life.

11-58. ENGINE CONTROLS.

11-59. DESCRIPTION. The throttle, mixture and carburetor heat controls are of the push-pull type. The mixture control is equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The mixture control also has a vernier adjustment. Turning the knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. The carburetor heat control has no locking device.

11-60. RIGGING. When adjusting any engine control, it is important to check that the control slides smoothly throughout its full range of travel, that it locks securely if equipped with a locking device and the arm or lever it operates moves through its full arc of travel.

CAUTION

Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

11-61. THROTTLE CONTROL.

NOTE

Before rigging throttle control shown in figure 11-3, check that staked connection (4) between rigid conduit (2) and flexible conduit (3) is secure. If any indication of looseness or breakage is apparent, replace the throttle control before continuing with the rigging procedure.

a. Pull throttle control out (idle position) and remove throttle control knob (1).
b. Screw jam nut (7) all the way down (clockwise) and install throttle knob. Screw the knob securely against the jam nut. Do not back jam nut out. This will prevent bottoming and possible damage to the staked connection.
c. Disconnect throttle control at the carburetor throttle arm, push throttle control in until jam nut hits friction lock (6) while the friction lock is loose, then pull control out approximately 1/8 inch for cushion. Note position of large washer at carburetor end of control. Install washer in same position when connecting control to arm.
d. Tighten friction lock (6), being careful not to change position of the throttle.
e. Move throttle arm on carburetor to full open, adjust rod end at end of throttle control to fit and connect to arm on carburetor.
f. Release friction lock and check full travel of arm on carburetor. If further adjustment is required, make all adjustment at the carburetor end of control. DO NOT change jam nut (7) setting.
g. Tighten rod end locknuts at carburetor end of control. Be sure to maintain sufficient thread engagement between rod end and control.

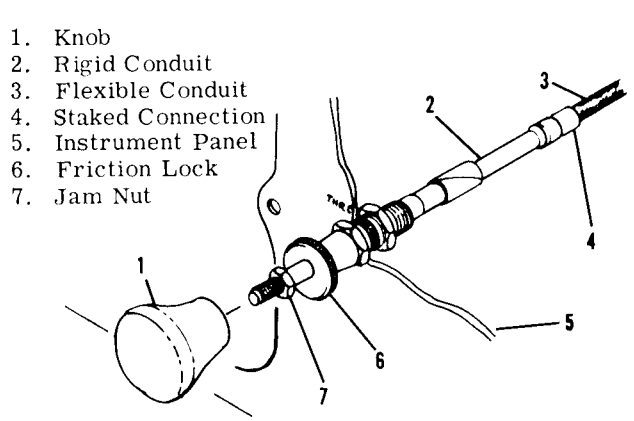
NOTE

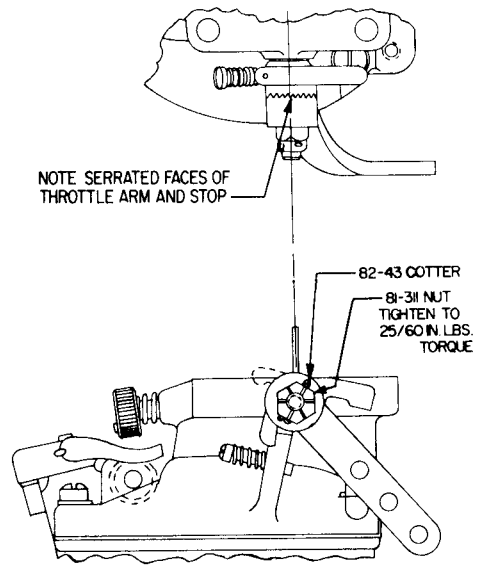
Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the throttle control.

11-62. MIXTURE CONTROL.
a. Push mixture control full in, then pull it out approximately 1/8 inch for cushion.
b. Loosen clamp securing the control to the engine.
c. Shift control housing in the clamp so that the mixture arm on the carburetor is in the full open position (RICH). Tighten the clamp in this position.
d. Unlock and pull mixture control full out. Check that idle mixture arm on carburetor is full closed (IDLE CUT-OFF).
e. Check that the bolt and nut at the mixture arm on carburetor secures the control wire and that the bolt will swivel in the arm.
f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.
g. When installing a new control, it may be necessary to shorten the wire and/or control housing.
h. The mixture arm on the carburetor must contact the stops in each direction, and the control should have approximately 1/8 inch cushion when pushed in.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.





NOTE

Although sequence and direction of tying may vary, idle stop arm, throttle arm and clamping screw must all be tied together.

Figure 11-3. Throttle Control

11-63. CARBURETOR HEAT CONTROL.

a. Loosen clamp securing the control to the bracket on engine.

b. Push control full in, then pull it out approximately 1/8 inch from panel for cushion.

c. Shift control housing in its clamp so that the valve in the airbox is seated in the full open position. Tighten clamp in this position.

d. Pull out on the control and check that the air valve inside the airbox seats in the opposite direction.

e. Check that bolt and nut on the air valve lever secures the control wire and that the bolt will swivel in the lever.

f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the carburetor heat control.

11-64. STARTING SYSTEM.

11-65. DESCRIPTION. The starting system employs an electrical starter motor mounted at the front (propeller end) lower left side of the engine. A starter solenoid is activated by the ignition key on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the starter motor. Initial rotation of the starter armature shaft, engaged with the reduction gear, drives the Bendix shaft and pinion. When the armature turns the reduction gear, the Bendix drive pinion meshes with the crankshaft ring gear assembly by inertia and action of the screw threads within the Bendix sleeve. A detent pin engages in a notch in the screw threads which prevents demeshing if the engine fails to start when the starting circuit is de-energized. When the engine reaches a predetermined speed, centrifugal action forces the detent pin out of the notch in the screw shaft and allows the pinion to demesh from the ring gear.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

11-66. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity of master switch and circuit. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity of switch and circuit. Install new switch or wires.
	Defective starter motor.	Check voltage to starter. If voltage is present. Remove, repair or install new starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANK-SHAFT.	Defective Bendix drive.	Remove starter and inspect Bendix drive. Replace defective parts.
	Damaged starter pinion gear or ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Inspect cable. Install new cable.
	Loose or dirty connections.	Inspect connections. Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Inspect commutator. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion gear or broken teeth on ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.

11-67. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean

and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new ones). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding.

11-68. STARTER MOTOR.

11-69. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

CAUTION

When disconnecting or connecting the starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between terminal and field coils causing the starter to be inoperative.

b. Disconnect electrical cable at starter motor. Insulate the disconnected cable terminal as a safety precaution.

c. Remove three nuts and washers and one bolt securing starter to crankcase. Work starter from engine.

d. To install starter, position starter on mounting pad, aligning dowel pins in starter mounting pad with holes in mounting pad on engine.

e. Secure starter with washer, lockwasher and nut in three places and install bolt and washers.

f. Tighten nuts and bolt evenly to a torque value of 150 lb-in.

g. Connect electrical cable to starter terminal and install engine cowling.

11-70. EXHAUST SYSTEM. (Refer to figure 11-4.)

11-71. DESCRIPTION. The exhaust system consists of an exhaust pipe from each cylinder to the muffler located beneath the engine. The muffler assembly is enclosed in a shroud which captures exhaust heat that is used to heat the aircraft cabin. A shroud on number three exhaust pipe is used to capture carburetor heat for the engine intake system. The tailpipe welded to the muffler routes the exhaust gasses overboard.

11-72. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Disconnect flexible ducts from shrouds on muffler assembly and exhaust pipe.

c. Remove nuts, bolts, washers and clamps attaching exhaust pipes to muffler assembly.

d. Loosen nuts attaching exhaust pipes to the cylinders and remove muffler assembly.

e. Remove nuts and washers attaching exhaust pipes to the cylinders and remove pipes and gaskets.

f. Reverse the preceding steps for reinstallation. Install a new copper-asbestos gasket between each exhaust pipe and its mounting pad. When installing the attaching nuts, install a plain washer, an internal tooth washer and nut. Make sure all clamps attaching muffler to exhaust pipes are tight and all air ducts are installed.

11-73. INSPECTION.

WARNING

Any time exhaust fumes are detected in the cabin, an immediate inspection must be performed.

The exhaust system must be throughly inspected, especially the heat exchange section of the muffler. An inspection of the exhaust system must be preformed every 100 hours of operating time. All components that show cracks and general deterioration must be replaced with new parts. Using a flashlight and mirror inspect diffuser tubes through the tailpipe. Replace muffler if defective.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Loosen or remove shrouds so that ALL surfaces of the exhaust system are visible.

c. Check for holes, cracks and burned spots. Especially check the areas adjacent to welds. Look for exhaust gas deposits in surrounding areas which indicate an exhaust leak.

d. Where a surface is not accessible for visual inspection or for a positive test, proceed as follows:

1. Remove exhaust pipes and muffler.
2. Remove shrouds.
3. Seal openings with expansion rubber plugs.
4. Using a manometer or gage, apply approximately 3 ± 1/2 psi (6 inches of mercury) air pressure while the unit is submerged in water. Any leaks will appear as bubbles and can be readily detected.
5. It is recommended that any components found defective be replaced with new parts before the next flight.
6. If no defects are found, remove plugs and dry components with compressed air.

e. Install the exhaust system and engine cowling.

11-74. EXTREME WEATHER MAINTENANCE.

11-75. COLD WEATHER. Cold weather starting is made easier by the installation of the manually-operated engine primer system. Fuel is supplied by a line from the fuel strainer to the plunger type primer. Operating the primer forces fuel to the intake valve port of the cylinder. Primer lines should be replaced when crushed or broken and should be properly clamped to prevent vibration and chafing. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 11-82 for use of the external power receptacle.

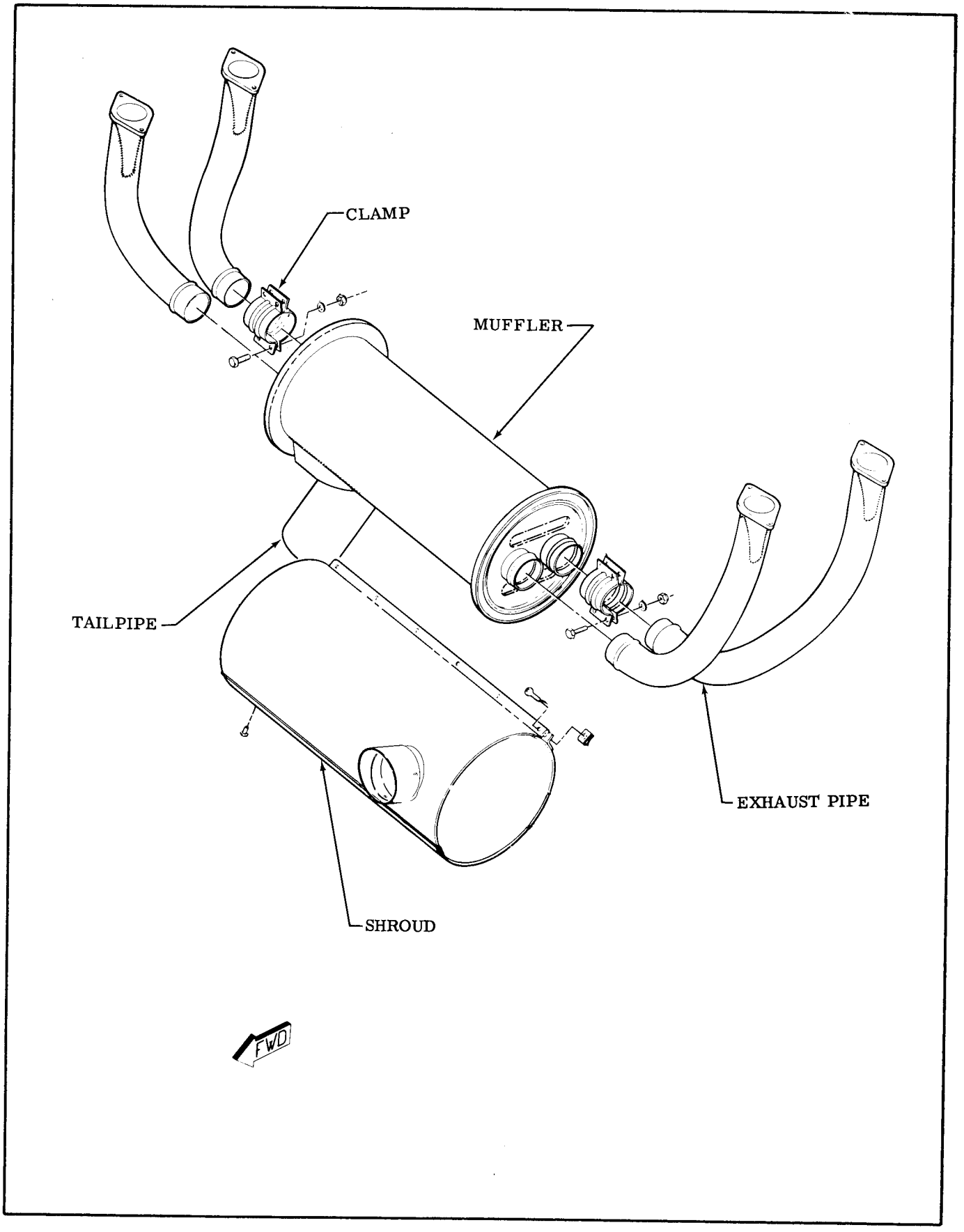


Figure 11-4. Exhaust System

The following may also be used to assist engine starting in extreme cold weather. After the last flight of the day, drain the engine oil into a clean container so the oil can be preheated. Cover the engine to prevent ice or snow from collecting inside the cowling. When preparing the aircraft for flight or engine run-up after these conditions have been followed, preheat the drained oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the oil, fuel may be mixed with the heated oil in a ratio of 1 part fuel to 12 parts oil before pouring into the engine oil sump. If the free air temperature is below -29°C (-20°F), the engine compartment should be preheated by a ground heater. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull the propeller through several revolutions by hand before starting engine.

CAUTION

Due to the desludging effect of the diluted oil, engine operation should be observed closely during the initial warm-up of the engine. Engines that have 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 engine. This residue will collect in the oil sump and possibly clog the screened inlet to the oil pump. Small deposits may actually enter the oil pump and be trapped by the main oil filter screen. Partial or complete loss of engine lubrication may result from either condition. If these conditions are anticipated after oil dilution, the engine should be run for several minutes at normal operating temperatures and then stopped and inspected for evidence of sludge and carbon deposits in the oil sump and oil filter screen. Future occurrence of this condition can be prevented by diluting the oil prior to each oil change. This will prevent the accumulation of the sludge and carbon deposits.

11-76. HOT WEATHER. Engine starting in hot weather or with a hot engine is sometimes hampered by vapor formation at certain points in the fuel system. To purge the vapor, remove the carburetor vent plug and purge the carburetor and lines by turning the fuel selector valve on. Purge the carburetor in this manner until fuel stands level with the vent plug opening. Replace the carburetor vent plug and operate the engine to make sure that the condition has been corrected.

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 procedure with the throttle approximately one-half OPEN and the mixture control in IDLE CUT-OFF. As the engine fires, move mixture control to full RICH and decrease the throttle setting to desired idling speed.

Engine mis-starts characterized by sufficient power to disengage the starter but dying after three to five revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting procedure with additional priming.

CAUTION

Never operate the starting motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods will shorten the life of the starter motor.

11-77. DUSTY CONDITIONS. Dust inducted into the intake system of the engine is probably the greatest single cause of early engine wear. When operating under high dust conditions, service the induction air filter daily as outlined in Section 2. Also, change engine oil and lubricate the airframe more often than specified.

11-78. SEACOAST AND HUMID AREAS. In salt water areas, special care should be taken to keep the engine and accessories clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensed moisture.

11-79. GROUND SERVICE RECEPTACLE. With the ground service receptacle installed, the use of an external power source is recommended for cold weather starting and lengthy maintenance of the aircraft electrical system with the exception of electronic equipment.

NOTE

Electrical power is supplied through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. In the split bus system, both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the semiconductors in the electronic equipment.

The ground service plug receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is correctly connected to the aircraft.

If the plug is accidentally connected backwards, no power will flow to the aircraft electrical system, thereby preventing any damage to electrical equipment.

The battery and external power circuits have been designed to completely eliminate the need to "jumper" across the battery contactors to close it. A special fused circuit in the external power system supplies the needed "jumper" across the contacts so that with a "dead" battery and an external power source applied, turning the master switch ON will close the battery contactor.

11-80. HAND CRANKING. A normal hand cranking procedure may be used to start the engine.

SHOP NOTES:

SECTION 12

FUEL SYSTEM

TABLE OF CONTENTS

12-1. FUEL SYSTEM.

12-2. DESCRIPTION. Fuel is gravity-fed from a metal tank in the inboard section of each wing, through a selector valve and a fuel strainer, to the carburetor. Positive ventilation is provided by a vent line and check valve assembly located in the left wing tank and a crossover vent line connecting the two tanks together. The vent line from the check valve assembly extends overboard through the lower wing skin adjacent to the left wing strut. The right wing tank incorporates a vented filler cap to further ensure positive venting of the system. The strainer is equipped with a quick-drain valve which provides a means of draining trapped water and sediment from the fuel system.

12-3. PRECAUTIONS.

NOTE

There are certain general precautions and rules concerning the fuel system which should be observed when performing the operations and procedures in this section. These are as follows:

a. During all fueling, defueling, tank purging, and tank repairing or disassembly, ground the aircraft to a suitable ground stake.

b. Residual fuel draining from lines and hose constitutes a fire hazard. Use caution to prevent the accumulation of fuel when lines or hose are disconnected.

c. Cap open lines and cover connections to prevent thread damage and the entrance of foreign matter.

NOTE

Throughout the aircraft fuel system, from the fuel tanks to the carburetor, use NS-40 (RAS-4) (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

12-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FUEL TO CARBURETOR.	Fuel selector valve not turned on.	Turn valve on.
	Fuel tanks empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Inlet elbow or inlet screen in carburetor plugged.	Clean and/or replace.
	Fuel tank outlet strainers plugged.	Remove and clean strainers and flush out fuel tanks.
	Defective fuel selector valve.	Repair or replace selector valve.
	Plugged fuel strainer.	Remove and clean strainer and screen.
	Fuel line plugged.	Clean out or replace fuel line.
FUEL STARVATION AFTER STARTING.	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Plugged fuel vent.	See paragraph 12-11.
	Water in fuel.	Drain fuel tank sumps, fuel lines and fuel strainer.
NO FUEL QUANTITY INDICATION.	Open circuit.	Reset circuit breaker. Refer to Section 15.
	Fuel tanks empty.	Service with proper grade and amount of fuel.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring. Refer to Section 20.
	Defective fuel quantity indicator or transmitter.	Refer to Section 15.
PRESSURIZED FUEL TANK.	Plugged bleed hole in fuel vent.	Check per paragraph 12-11.

SHOP NOTES:

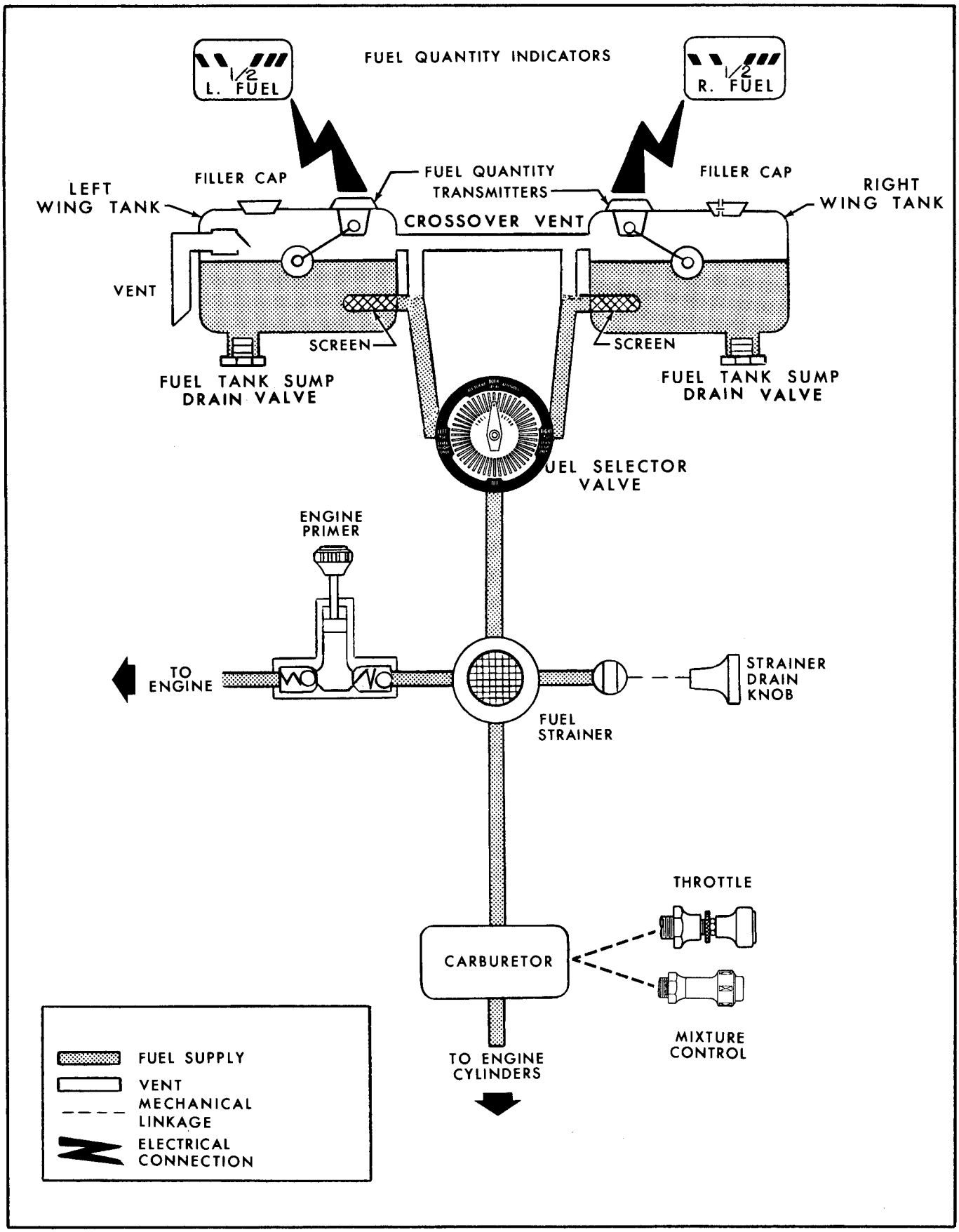
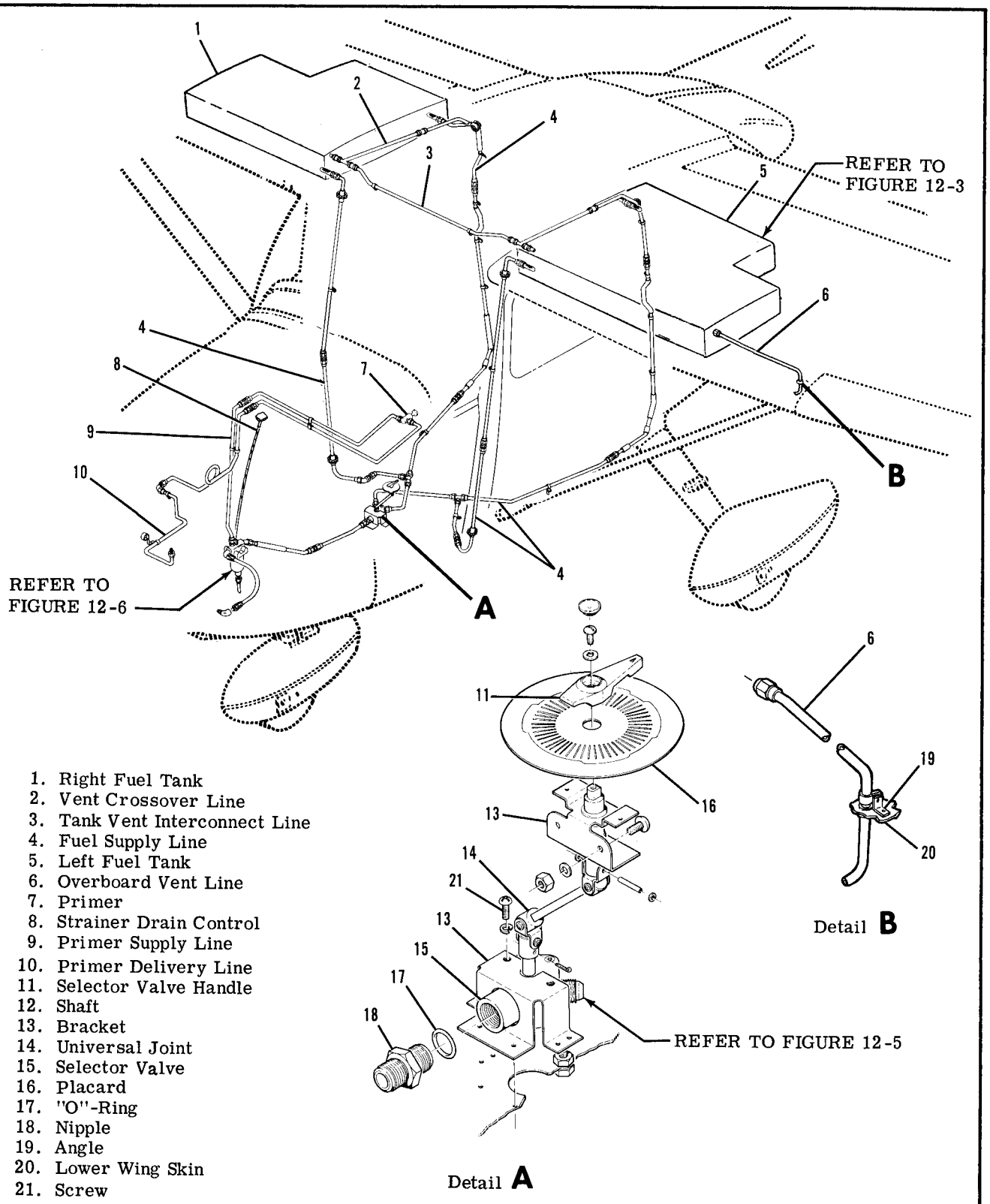


Figure 12-1. Fuel System Schematic



1. Right Fuel Tank
2. Vent Crossover Line
3. Tank Vent Interconnect Line
4. Fuel Supply Line
5. Left Fuel Tank
6. Overboard Vent Line
7. Primer
8. Strainer Drain Control
9. Primer Supply Line
10. Primer Delivery Line
11. Selector Valve Handle
12. Shaft
13. Bracket
14. Universal Joint
15. Selector Valve
16. Placard
17. "O"-Ring
18. Nipple
19. Angle
20. Lower Wing Skin
21. Screw

Figure 12-2. Fuel System

12-5. FUEL TANKS.

12-6. DESCRIPTION. A rigid metal tank is installed in the inboard panel of each wing. Sump drain valves, one in each tank, are provided for draining trapped water and sediment.

12-7. REMOVAL AND INSTALLATION.

a. Remove sump drain valve and drain fuel from applicable tank. (Observe precautions in paragraph 12-3.)

b. Remove fuel tank cover by removing attaching screws.

c. Remove wing root fairings.

d. Disconnect and plug or cap all fuel and vent lines from tank. Remove fittings as necessary for clearance when removing tank.

e. Disconnect electrical lead and ground strap from fuel quantity transmitter.

f. Disconnect straps securing fuel tank and remove tank. Use care to avoid damage to protruding fittings and hose connections when removing the tank.

g. To install tank, reverse the preceding steps. Be sure grounding is secure in accordance with figure 12-3.

12-8. FUEL QUANTITY TRANSMITTERS. Fuel quantity transmitters are installed in the top of fuel tanks. A complete description, along with procedures for removal, installation and adjustment are contained in Section 15.

12-9. FUEL VENTS.

12-10. DESCRIPTION. A vent line is installed in the outboard end of the left fuel tank and extends overboard down through the lower wing skin. The inboard end of the vent line extends into the fuel tank, then forward and slightly upward. A vent valve is installed on the inboard end of the vent line inside the fuel tank. A crossover line connects the two tanks together. A tee is installed on each end of the crossover line. A separate vent line is attached to the tees, connecting the crossover line to each of the aft fuel supply lines from each fuel tank. Refer to figure 12-2.

12-11. CHECKING. Field experience has demonstrated that the fuel vent can become plugged, with possible fuel starvation of the engine or collapse of the fuel tanks. Also, the bleed hole in the vent valve assembly could possibly become plugged, allowing pressure from expanding fuel to pressurize the tanks. The following procedure may be used to check the vent and bleed hole in the valve assembly.

a. Attach a rubber tube to the end of vent line beneath the wing.

b. Blow into tube to slightly pressurize tank. If air can be blown into tank, vent line is open.

c. After tank is slightly pressurized, insert end of rubber tube into a container of water and watch for a continuous stream of bubbles, which indicates the bleed hole in valve assembly is open and relieving pressure.

d. After completion of step "c", blow into tube again to slightly pressurize the tank, and loosen, but do not remove filler cap on opposite wing to check tank crossover line. If pressure escapes from filler cap, crossover line is open.

NOTE

Remember that a plugged vent line or bleed hole can cause either fuel starvation and collapsing of fuel tanks or the pressurization of tanks by fuel expansion.

e. Any fuel vent found plugged or restricted must be corrected prior to returning aircraft to service.

NOTE

The fuel vent line protruding beneath the wing near the wing strut must be correctly aligned to avoid possible icing of the vent tube. Dimensions are shown in figure 12-4.

SHOP NOTES:

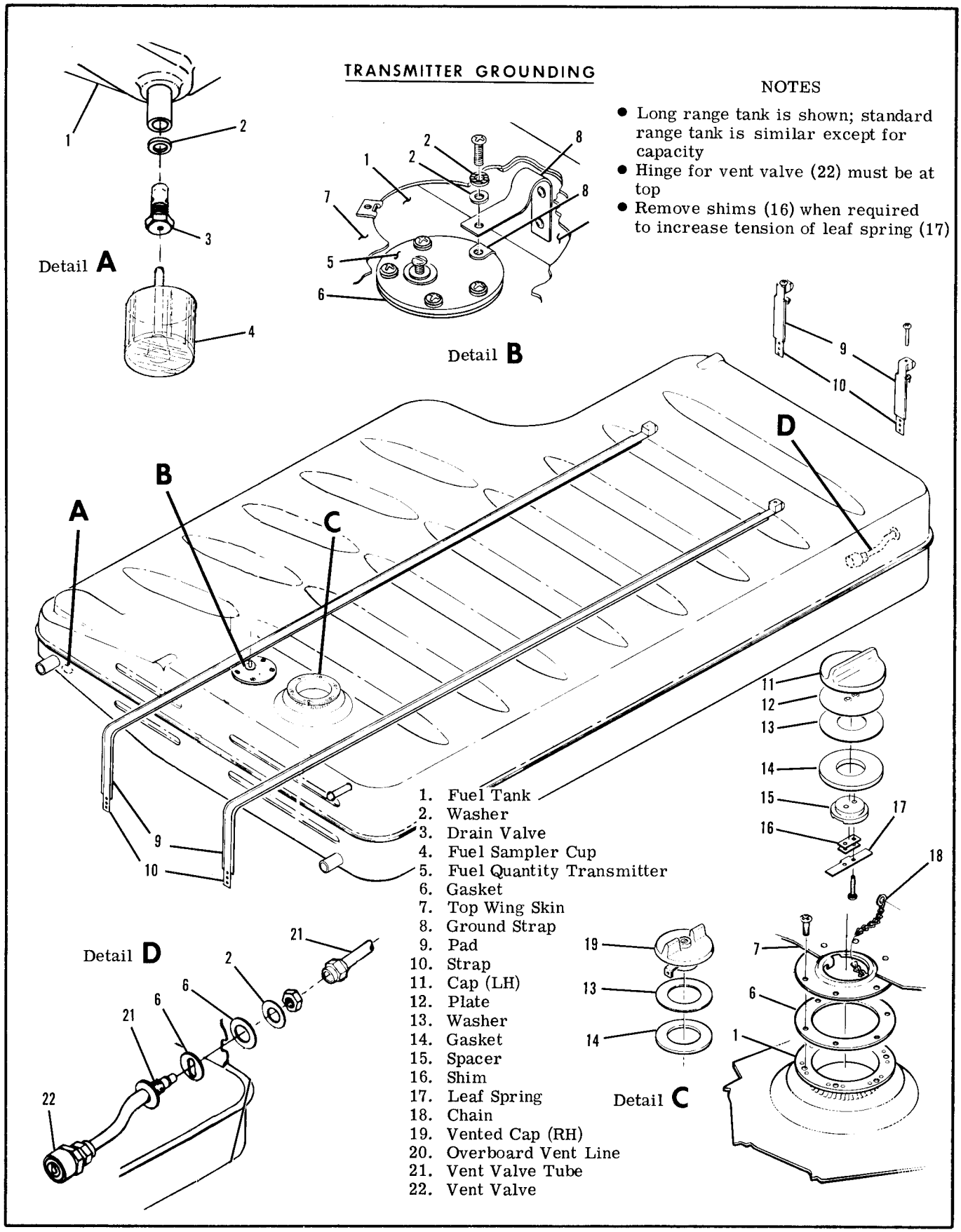


Figure 12-3. Fuel Tank

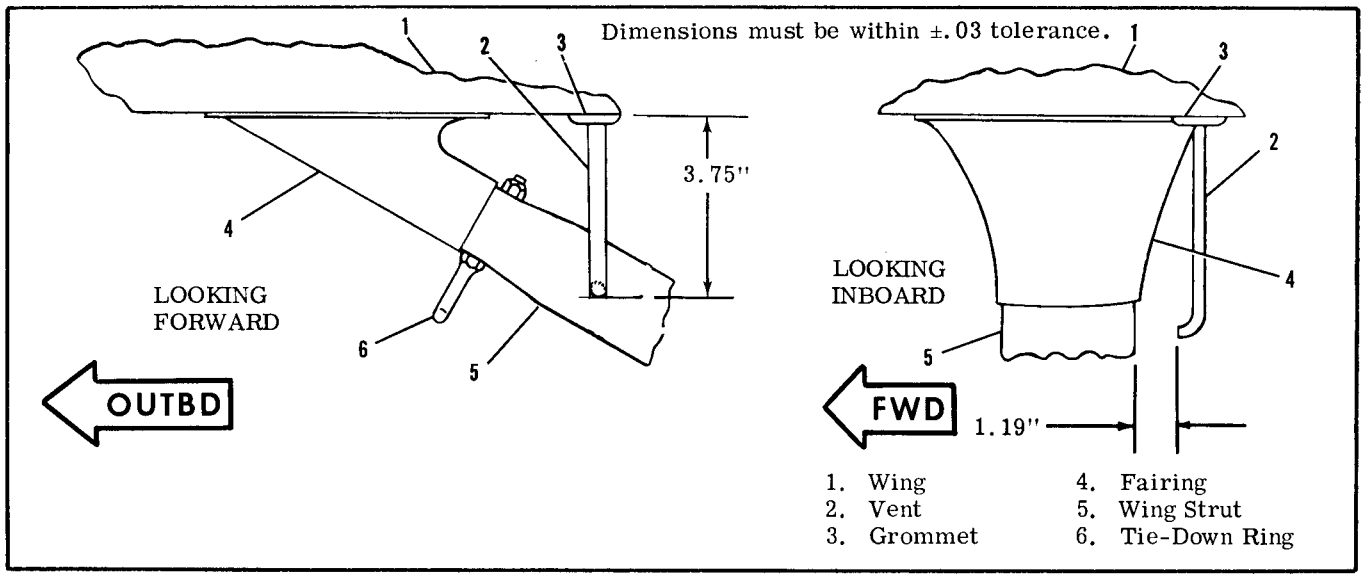


Figure 12-4. Fuel Vent Location

12-12. FUEL SELECTOR VALVE. (Refer to figure 12-5.)

12-13. DESCRIPTION. A four position fuel selector valve is located beneath the floorboard just aft and slightly to the left of the pedestal structure. A shaft incorporating two universal joints links the valve to a handle and shaft assembly mounted on the pedestal structure. The positions of the handle are labelled "OFF, LEFT, BOTH ON and RIGHT". Valve repair is limited to replacement of component parts only.

12-14. REMOVAL AND INSTALLATION. (Refer to figure 12-2)

a. Drain all fuel from wing tanks, fuel strainer, lines and selector valve, observing precautions outlined in paragraph 12-3.

b. Remove selector valve handle(11)and pedestal cover.

c. Peel back carpet as required to gain access to inspection plates aft of pedestal structure.

d. Disconnect lower universal joint(14)at valve shaft.

e. Disconnect and cap inlet and outlet fuel lines to valve.

f. Remove screws(21)attaching valve to mounting bracket(13)and withdraw valve.

g. Reverse preceding steps for installation. Service aircraft in accordance with section 2, turn fuel selector valve to ON position and check for leaks.

h. Replace items removed for access.

12-15. DISASSEMBLY. (Refer to figure 12-5)

a. Remove fuel selector valve in accordance with paragraph 12-14.

b. Remove screws (1) securing cover (2) to valve body (7) and carefully remove cover. Retain ball (3) and spring (4).

c. Slowly withdraw rotor (5) from valve body.

NOTE

Removal of rotor (5) will allow seal (8), "O"-ring (9), washer (10) and spring (11) (one each installed in both inlet ports) to pop free.

d. Remove "O"-ring (6), plug (13) and "O"-ring (12).

12-15. CLEANING, INSPECTION AND REPAIR.

NOTE

Repair of damaged or worn parts of the selector valve assembly is NOT authorized and therefore, is limited to replacement of component parts only.

a. Clean disassembled parts by washing in Stoddard solvent or equivalent. Blow parts dry using clean compressed air.

b. Inspect all parts for obvious wear or damage as follows:

1. Check detent holes in cover (2) for excessive wear and examine bearing surfaces with rotor (5).

2. Inspect shaft and bearing surfaces of rotor (5) for removal of black anodized finish indicating wear. Check for internal corrosion of drilled passages.

3. Examine valve body (7) for wear, cracks distortion and internal corrosion. Any damage to thread surfaces at inlet and outlet ports or cover attach screw holes is cause for rejection.

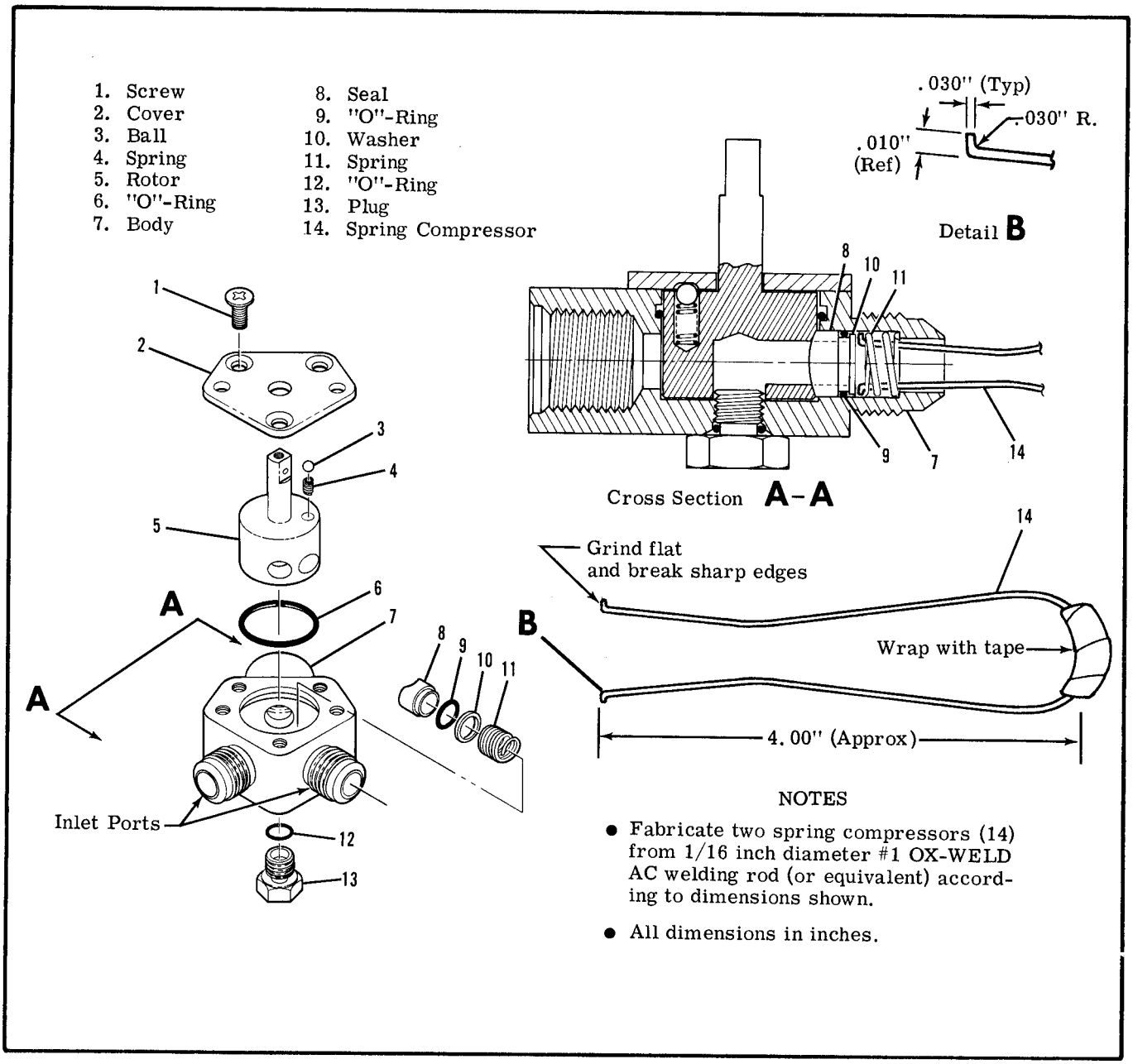


Figure 12-5. Fuel Selector Valve and Spring Compressor

SHOP NOTES:

12-16. REASSEMBLY. (Refer to figure 12-5)

NOTES

- Reassembly of selector valve is facilitated by mounting in a bench vise or equivalent bench support, ensuring valve body (7) is protected from damage.
- Fabrication of spring compressor (14) (2 required) is recommended before reassembly.
- Always replace "O"-rings (6 and 9) anytime rotor (5) is removed from body.

a. Ensure all component parts are clean, then coat sparingly with light-weight engine oil.
b. Insert springs (11) into inlet ports.
c. Insert new "O"-ring (6) into recess at top of valve body (7).
d. With spring compressors (14) in place as shown in section A-A of figure 12-5, compress springs (11) and install washers (10), new "O"-rings (9), seals (8) into inlet ports.
d. Holding springs compressed, carefully insert rotor (5) into valve body (7). Release spring compressors and check for proper seating of seals to rotor.
e. Lubricate spring (4) and ball (3) with lubricant conforming to Military Specification VV-P-236 (USP Petrolatum or equivalent), inserting spring into hole in top of rotor.
f. Place ball on spring and turn rotor as required to index one of the detent holes in cover (2).
g. Attach cover (2) and test rotation of rotor shaft for ease of operation and positive detent engagement.
h. Replace plug (13) using new "O"-ring (12).
i. Reinstall selector valve in accordance with paragraph 12-14.

12-17. FUEL STRAINER. (See figure 12-6.)

12-18. DESCRIPTION. The fuel strainer is mounted at the firewall in the lower engine compartment. The strainer is equipped with a quick-drain valve which provides a means of draining trapped water and sediment from the fuel system. The quick-drain control is located adjacent to the oil dipstick and is accessable through the oil dipstick door in the upper engine cowl.

NOTE

The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft. (Refer to paragraph 12-20.)

12-19. REMOVAL AND INSTALLATION. (See figure 12-6.)
a. Remove cowling as necessary to gain access to strainer.
b. With selector valve in "OFF" position, drain fuel from strainer and lines with strainer quick-drain control.
c. Disconnect and cap or plug all fuel lines and controls from strainer. (Observe precautions in paragraph 12-3.)
d. Remove bolts attaching assembly to firewall and remove strainer.
e. Reverse the preceding steps for installation. With selector valve in "ON" position check for leaks and proper operation of quick-drain valve.

12-20. DISASSEMBLY AND ASSEMBLY. (See figure 12-6.)
a. With selector valve in "OFF" position, drain fuel from bowl and lines with quick-drain control.
b. Remove drain tube, safety wire, nut and washer at bottom of filter bowl and remove bowl.
c. Carefully unscrew standpipe and remove.
d. Remove filter screen and gasket. Wash filter screen and bowl with solvent (Federal Specification P-S-661, or equivalent) and dry with compressed air.
e. Using a new gasket between filter screen and top assembly, install screen and standpipe. Tighten standpipe only finger tight.
f. Using all new O-rings, install bowl. Note that step-washer at bottom of bowl is installed so that step seats against O-ring. Connect drain tube.
g. With selector valve in "ON" position, check for leaks and proper operation of quick-drain valve.
h. Safety wire bottom nut to top assembly. Wire must have right hand wrap, at least 45 degrees.

12-21. PRIMING SYSTEM. (See figure 12-2.)

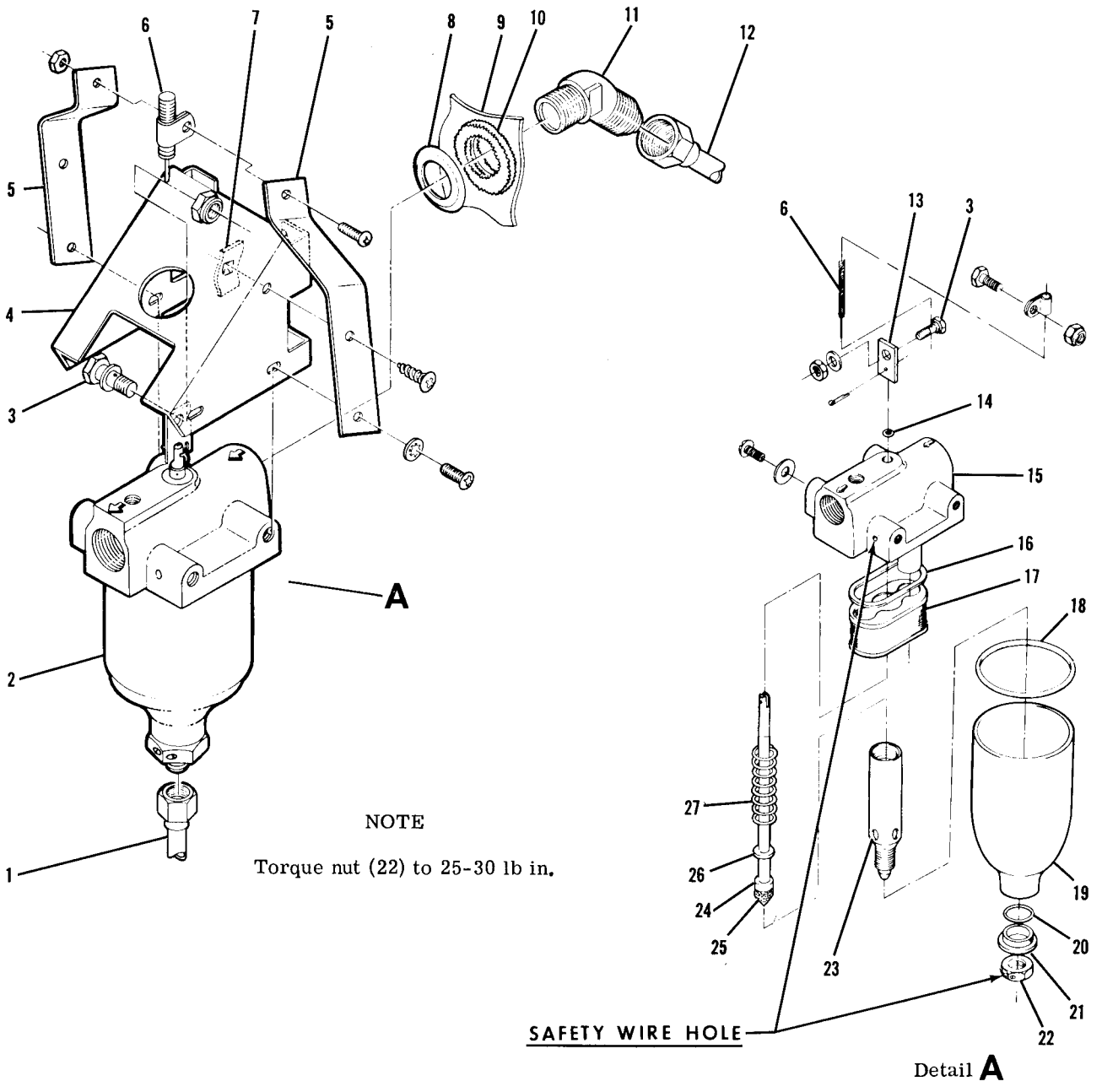
12-22. DESCRIPTION. The model 172-Series, equipped with a "Blue Streak" (Lycoming) engine, employs a standard manually-operated priming system which primes one cylinder. Fuel is supplied by a line from the strainer to the plunger-type primer. Operating the primer delivers fuel to the intake port of the cylinder. A three-cylinder priming system is available as optional equipment. Operating the primer on this optional system delivers fuel to the intake port of each individual cylinder except No. 3.

12-23. REMOVAL AND INSTALLATION.
a. Disconnect and cap all lines from primer.
b. Unscrew knurled nut and remove plunger from pump body.
c. Remove pump body from instrument panel.

NOTE

Visually inspect primer lines for crushed, kinked, or broken condition. Ensure proper clamping to prevent fatigue due to vibration and chafing.

d. Prior to installing a primer, check for proper pumping action and positive fuel shut-off in the locked position.
e. Reverse preceding steps for installation.



1. Drain Tube
2. Fuel Strainer
3. Clamp Bolt
4. Bracket
5. Bracket
6. Strainer Drain Control
7. Nutplate
8. Shield
9. Firewall
10. Grommet
11. Elbow
12. Fuel Line
13. Plate
14. O-Ring
15. Top Assembly
16. Gasket
17. Filter
18. O-Ring
19. Bowl
20. O-Ring
21. Step Washer
22. Nut
23. Standpipe
24. Collar
25. Plunger
26. Washer
27. Spring

Figure 12-6. Fuel Strainer

SECTION 13

PROPELLER

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13-1. PROPELLER.

13-2. DESCRIPTION. An all-metal, fixed-pitch propeller, equipped with a spinner, is used on the aircraft. Refer to figures 13-1 and 13-2 for the different installations of the propeller and spinners.

13-3. REPAIR. Repair of a metal propeller first involves evaluating the damage and determining whether the repair is to be a major or minor one. Federal Aviation Regulations, Part 43 (FAR 43) and Federal Aviation Agency Advisory Circular No. 43.13 (FAA AC No. 43.13), define major and minor repairs, alterations and who may accomplish them. When making alterations or repairs to a propeller, FAR 43, FAA AC 43.13 and the propeller manufacturer's instructions must be observed. The propeller manufacturer's Service Manual may be obtained from the Cessna Service Parts Center.

13-4. REMOVAL. (Refer to figure 13-1.)

WARNING

Be sure magneto switch is in OFF position before turning propeller.

a. Remove spinner (1).
b. Remove mounting bolts (2) and remove forward spinner bulkhead (3), propeller (4), rear spinner bulkhead (9) and spacer (8).
c. If removal of the ring gear support assembly (7) is necessary, loosen the alternator adjusting arm and disengage the drive pulley belt from pulley on the aft face of the starter ring gear support assembly.

13-4. INSTALLATION. (Refer to figure 13-1.)

WARNING

Be sure magneto switch is in OFF position before turning propeller.

a. If the starter ring gear support assembly (7) was removed, clean the mating surface of support assembly and engine crankshaft.
b. Place alternator drive belt in the pulley groove of the starter ring gear support. Fit support assembly over propeller flange bushing of the crankshaft.

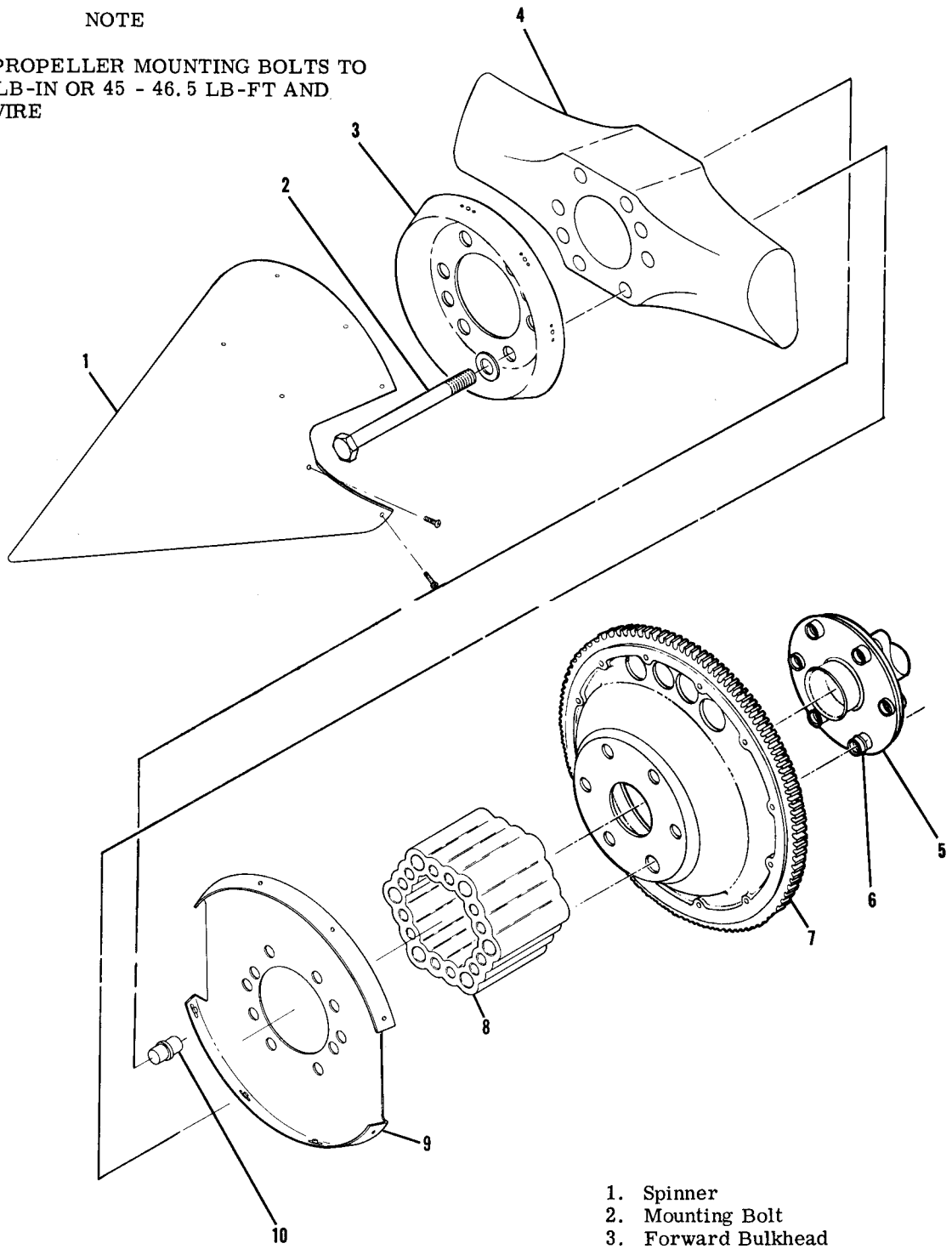
NOTE

Make sure the bushing hole in the ring gear support that bears the identification "O," is assembled at the "O" identified crankshaft flange bushing. This bushing is marked "O" by an etching on the crankshaft flange next to the bushing. The starter ring gear must be located correctly to assure proper alignment of the timing marks on the ring gear.

c. Clean mating surfaces of the propeller, bulkheads and spacer and assemble as illustrated in figure 13-1.
d. Find the top center (TC) mark on the aft face of the starter ring gear support. Locate one of the propeller blades over the TC mark, rotate the propeller clockwise (as viewed from front of engine) to the first bushing and install propeller.
e. Tighten propeller mounting bolts evenly and torque bolts to 45 lb-ft.
f. Install spinner.
g. Adjust alternator drive belt tension as outlined in Section 16.

NOTE

TORQUE PROPELLER MOUNTING BOLTS TO 540 - 560 LB-IN OR 45 - 46.5 LB-FT AND SAFETY WIRE



NOTE

Index propeller blades in the first hole clockwise (CW) from the T.C. mark located on the aft side of the ring gear as viewed from the front of the engine.

1. Spinner
2. Mounting Bolt
3. Forward Bulkhead
4. Propeller
5. Engine Crankshaft
6. Crankshaft Bushing
7. Ring Gear Support Assembly
8. Spacer
9. Aft Bulkhead
10. Dowel Pin

13-1. Propeller Installation

SECTION 14

UTILITY SYSTEMS

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14-1. UTILITY SYSTEMS.

14-2. HEATING SYSTEM.

14-3. DESCRIPTION. The heating system is comprised of the heat exchange section of the exhaust muffler, a shut-off valve, mounted on the right forward side of the firewall, a push-pull control on the instrument panel, outlets and flexible ducting connecting the system.

14-4. SYSTEM OPERATION. Ram air is ducted through an engine baffle inlet and heat exchange section of the exhaust muffler, to the shut-off valve at the firewall. The heated air flows from the shut-off valve into a duct across the aft side of the firewall, where it is distributed into the cabin. The shut-off valve, operated by a push-pull control marked "CABIN HT," located on the instrument panel, regulates the volume of heated air entering the system. Pulling the control full out supplies maximum flow, and pushing control in gradually decreases flow, shutting off flow completely when the control is pushed full in.

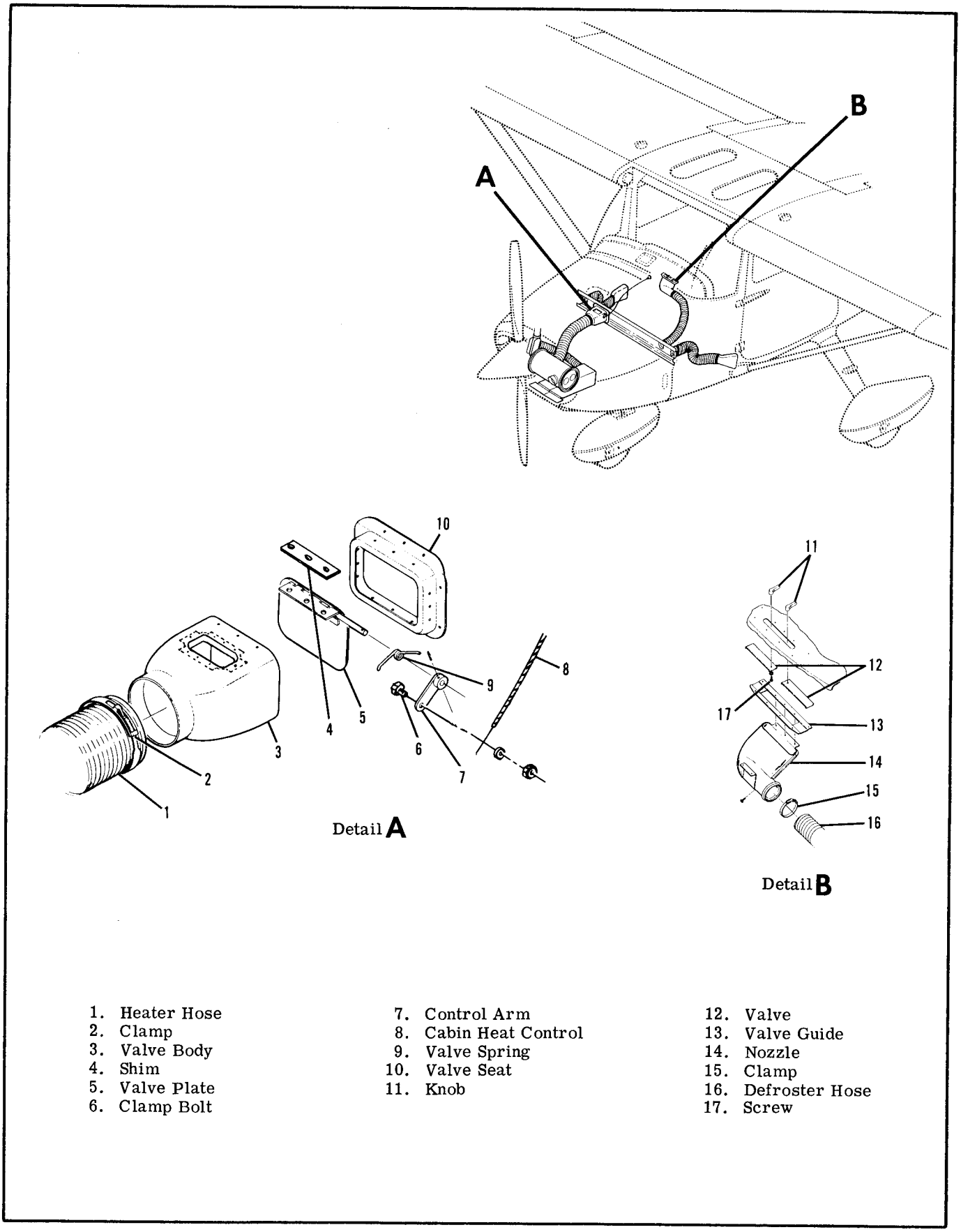
14-5. TROUBLE SHOOTING. Most of the operational troubles in the heating, defrosting and ventilating systems are caused by sticking or binding air valves and/or their controls, damaged air ducting, or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. Damaged or broken parts must be repaired or replaced. When checking controls, ensure that valves respond freely to control movement, that they move in the correct direction, and that they move through their complete range of travel and seal properly. Check that hoses are properly secured, and replace hoses that are burned, frayed or crushed. If fumes are detected in the cabin, a thorough inspection of the exhaust system should be accomplished. Refer to applicable paragraph in Section 11 for this inspection. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in shut-off valves or openings at the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound.

14-6. REMOVAL, REPAIR AND INSTALLATION. The heating and defrosting systems are illustrated in figure 14-1. The figure may be used as a guide for removal, repair or installation of system components. Burned, frayed or crushed hose must be replaced with new hose, cut to correct length and installed in the original routing. Trim hose windings shorter than complete hose length to allow clamps to be installed. Defective air valves should be repaired or replaced. Check for correct operation of valves and their controls after repair and/or installation.

14-7. DEFROSTER SYSTEM.

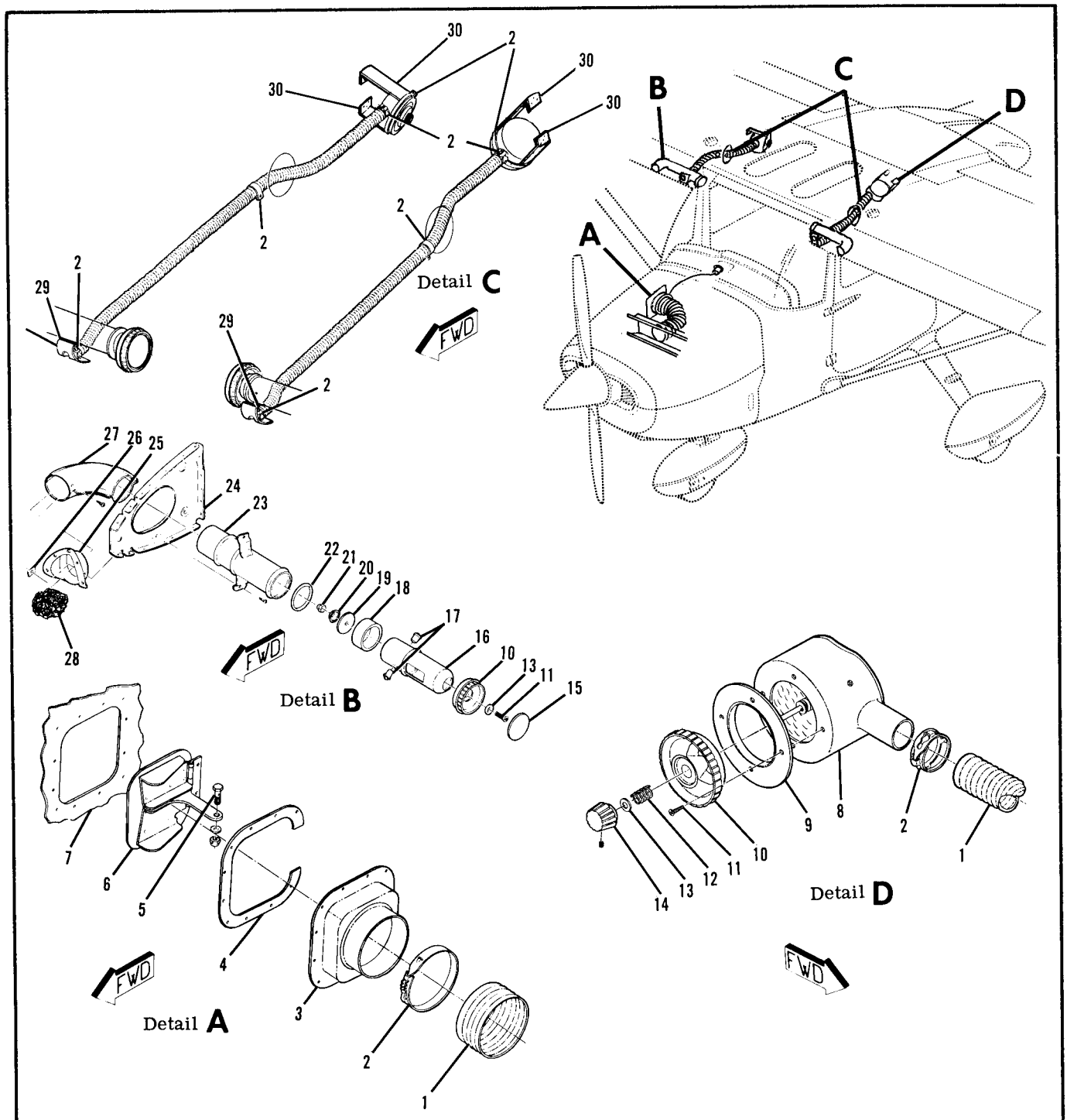
14-8. DESCRIPTION. The defrosting system is comprised of a duct across the aft side of the firewall, defroster outlets, mounted on the cowl deck, immediately aft of the windshield, and flexible ducting connecting the system.

14-9. SYSTEM OPERATION. Air from the duct across the aft side of the firewall flows through the flexible ducting to the defroster outlet. Temperature



1. Heater Hose
2. Clamp
3. Valve Body
4. Shim
5. Valve Plate
6. Clamp Bolt
7. Control Arm
8. Cabin Heat Control
9. Valve Spring
10. Valve Seat
11. Knob
12. Valve
13. Valve Guide
14. Nozzle
15. Clamp
16. Defroster Hose
17. Screw

Figure 14-1. Heating and Defrosting Systems



1. Hose
2. Clamp
3. Inlet
4. Seal
5. Clamp Bolt
6. Air Vent Door
7. Fuselage Skin
8. Air Vent Silencer
9. Escutcheon
10. Knob
11. Screw
12. Spring
13. Washer
14. Knob
15. Insert
16. Outlet Assembly
17. Bullet Catch
18. Seal
19. Washer
20. Washer
21. Nut
22. Felt Washer
23. Tube Assembly
24. Rib
25. Airscoop
26. Nutplate
27. Elbow
28. Element
29. Adapter
30. Bracket

Figure 14-2. Ventilating Systems

and volume of this air is controlled by settings of the heater system control.

14-10. TROUBLE SHOOTING. Since the defrosting system depends on proper operation of the heating system, trouble shooting procedures outlined in paragraph 14-5 should be followed for checking the defroster system.

14-11. REMOVAL, REPAIR AND INSTALLATION. The defroster system is illustrated in figure 14-1 in conjunction with the heating system. The figure may be used as a guide for removal, repair or installation of system components. Burned, frayed or crushed hose must be replaced with new hose, cut to correct length and installed in the original routing. Trim hose windings shorter than complete hose length to allow clamps to be installed. A defective defroster outlet should be repaired or replaced. Check for correct operation of control after repair and/or installation.

14-12. VENTILATING SYSTEMS.

14-13. DESCRIPTION. Three separate systems are installed for cabin ventilation. One system is comprised of an airscoop, located in each wing root fillet, with flexible ducting connecting each airscoop to an adjustable air vent silencer unit, located on each side of the rear cabin area. Another system is comprised of an airscoop, located in the leading edge of each wing, just outboard of the airscoop in the wing root fillets. These airscoops are connected to cabin outlets, installed on each side of the cabin, near the upper corners of the windshield. These outlets are manually-adjustable with knobs on the outlet assemblies. A third system is comprised of a fresh airscoop door on the right side of the fuselage, just forward of the copilot seat. Flexible ducting connects this airscoop to the duct across the aft side of the firewall. This system is controlled by a push-pull control on the instrument panel.

14-14. SYSTEMS OPERATION. Heating, defrosting and ventilating systems work together to provide the conditions desired by the pilot. The heating system, defrosting system and one ventilating system receive air from the duct across the aft side of the firewall. As long as the "CABIN HT" control is pushed in, no heated air can enter the firewall duct; therefore, if the "CABIN AIR" control (to the scoop door on the right forward fuselage) is pulled out, only fresh air from the scoop will flow through the duct into the cabin. As the "CABIN HT" control is gradually pulled out, more and more heated air will blend with the fresh air from the scoop, and be distributed into the cabin. Either one, or both of the controls may be set at any position from full open to full closed. Rear seat ventilation is provided by air vent silencer assemblies, mounted in the left and right rear cabin wing root areas. These units receive ram air from the airscoops in the wing root fillets. Each silencer assembly is equipped with a valve which meters incoming cabin ventilating air, which greatly reduces inlet air noise. The outlet assemblies, installed near the upper corners of the windshield are manually operated, increasing or decreasing flow of ram air into the cabin.

14-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating systems are caused by sticking or binding of the inlet scoop door or its control. Check airscoop filter elements in the wing leading edges for obstructions. The elements may be removed and cleaned or replaced. Since air passing through the filters is emitted into the cabin, do not use a cleaning solution which would contaminate the air. The filters may be removed to increase air flow. However, their removal will cause a slight increase in noise level.

14-16. REMOVAL, REPAIR AND INSTALLATION. The ventilating system is illustrated in figure 14-2. The figure may be used as a guide for removal, repair or installation of system components. A defective ventilator or scoop must be repaired or replaced. Check for proper operation of controls after repair and/or installation.

SHOP NOTES:

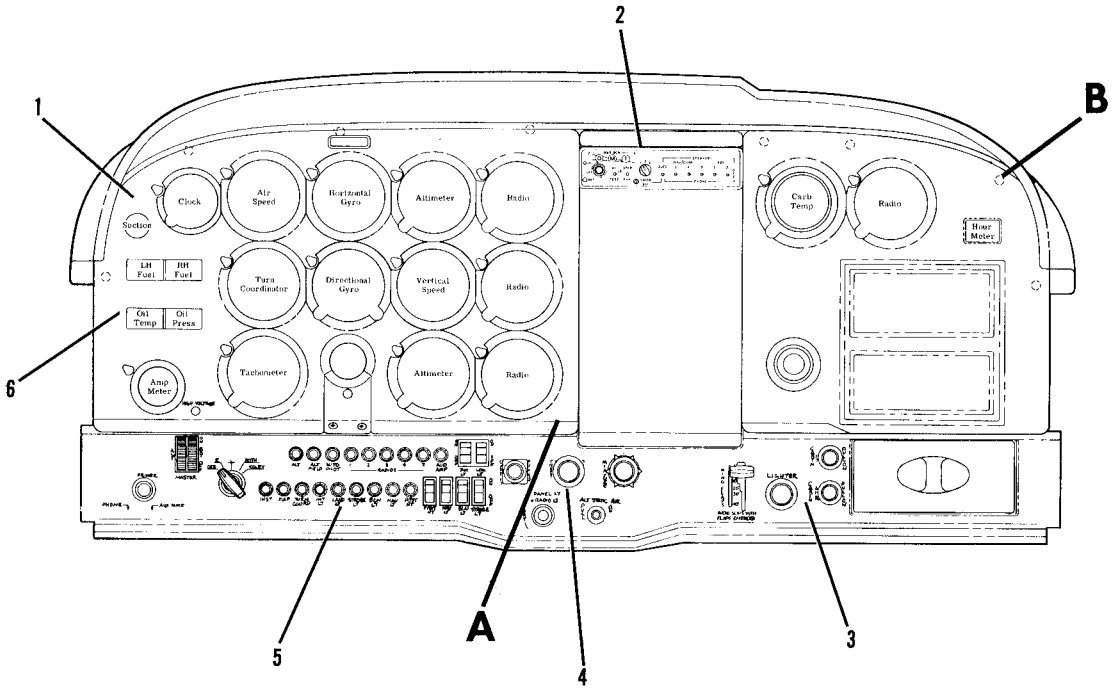
SECTION 15

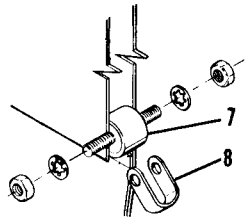
INSTRUMENTS AND INSTRUMENT SYSTEMS

TABLE OF CONTENTS

15-1. INSTRUMENTS AND INSTRUMENT SYSTEMS.

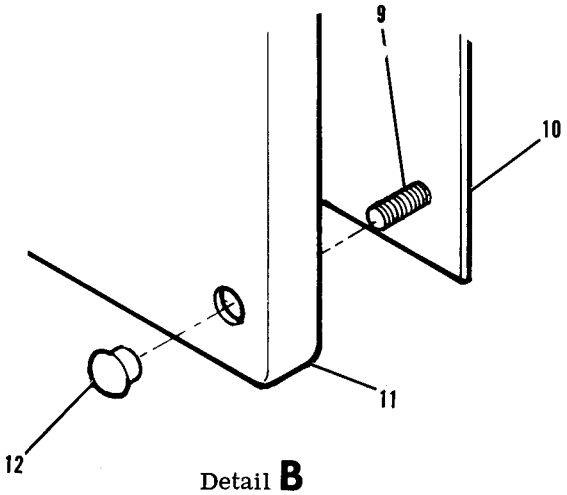
15-2. GENERAL. This section describes typical instrument installations and their respective operating systems. Emphasis is placed on trouble shooting and corrective measures only. It does NOT deal with specific instrument repairs since this usually requires special equipment and data and should be handled by instrument specialists. Federal Aviation Regulations require malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to manufacturer for servicing. Our concern here is with preventive maintenance on various instrument systems and correction of system faults which result in instrument malfunctions. The descriptive material, maintenance and trouble shooting information in this section is intended to help the mechanic determine malfunctions and correct them, up to the defective instrument itself, at which point an instrument technician should be called in. Some instruments, such as fuel quantity and oil pressure gages, are so simple and inexpensive, repairs usually will be more costly than a new instrument. On the other hand, aneroid and gyro instruments usually are well worth repairing. The words "replace instrument" in the text, therefore, should be taken only in the sense of physical replacement in aircraft. Whether replacement is to be with a new instrument, an exchange one, or original instrument is to be repaired must be decided on basis of individual circumstances.





NOTE POSITION OF GROUND STRAP AND SEQUENCE OF ATTACHING PARTS WHEN REMOVING OR INSTALLING SHOCK PANEL.

Detail **A**



Detail **B**

1. Shock-Mounted Panel
2. Radio Panel
3. Heating and Ventilating Controls
4. Engine Controls
5. Switch and Circuit Breaker Panel
6. Engine Instruments
7. Shock-Mount
8. Ground Strap
9. Stud
10. Instrument Panel
11. Decorative Cover
12. Threaded Button

Figure 15-1. Typical Instrument Panel

15-3. INSTRUMENT PANEL.

15-4. DESCRIPTION. The instrument panel assembly consist of a stationary and shock-mounted panel. The stationary panel contains instruments which are NOT sensitive to vibration. The shock-mounted panel contains major flight instruments such as horizontal and directional gyros which are affected by vibration. Most of the instruments are screw-mounted on the panel backs.

15-5. REMOVAL AND INSTALLATION. (Refer to figure 15-1.) The stationary panel is secured to engine mount stringers and a forward fuselage bulkhead and ordinarily is not considered removable. The shock-mounted panel is secured to the stationary panel with rubber shock-mounted assemblies. To remove shock-mounted panel proceed as follows:

a. Unscrew threaded buttons securing decorative cover and remove cover.
b. Remove nuts and washers from shock-mounts.
c. Tag and disconnect instrument wiring.
d. Disconnect plumbing and cap all open fittings and lines.
e. Pull panel straight back to remove.
f. For installation reverse the preceding procedure. Ensure ground strap is properly installed.

15-6. SHOCK MOUNTS. Service life of instruments is directly related to adequate shock-mounting of panel. If removal of panel is necessary, check mounts for deterioration.

15-7. INSTRUMENTS.

15-8. REMOVAL. (Refer to figure 15-1.) Most instruments are secured to panel with screws inserted through panel face. To remove an instrument, remove decorative cover, disconnect wiring or plumbing to instrument, remove mounting screws and take instrument out from behind, or in some cases, from front of panel. Instrument clusters are installed as units and are secured by a screw at each end. A cluster must be removed from panel to replace an individual gage. In all cases when an instrument is removed, disconnect lines or wires should be protected. Cap open lines and cover pressure connections on instrument to prevent thread damage and entrance of foreign matter. Wire terminals should be insulated or tied up to prevent accidental grounding or short-circuiting.

15-9. INSTALLATION. Generally, installation procedure is the reverse of removal procedure. Ensure mounting screw nuts are tightened firmly, but do not over-tighten, particularly on instruments having plastic cases. The same rule applies to connecting plumbing and wiring.

NOTE

All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through Cessna Service Parts Center.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change calibration of gages.

15-10. PITOT AND STATIC SYSTEMS. (Refer to figure 15-2.)

15-11. DESCRIPTION. The pitot system conveys ram air pressure to the airspeed indicator. The static system vents vertical speed indicator, altimeter and airspeed indicator to atmospheric pressure through plastic tubing connected to a static port. A static line sump is installed at source button to collect condensation in static system. A pitot tube heater may be installed. The heating element is controlled by a switch at instrument panel and powered by the electrical system. An alternate static source valve may be installed in the static system for use when the external static source is malfunctioning. Refer to the Owner's Manual for flight operation using the alternate static source.

15-12. MAINTENANCE. Proper maintenance of pitot and static system is essential for proper operation of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in pitot system will result in false airspeed indications, while static system malfunctions will affect readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the prinicpal rules for system maintenance. The pitot tube and static ports MUST be kept clean and unobstructed.

15-13. STATIC PRESSURE SYSTEM INSPECTION AND LEAKAGE TEST. The following procedure outlines inspection and testing of static pressure system, assuming altimeter has been tested and inspected in accordance with current Federal Aviation Regulations.

a. Ensure static system is free from entrapped moisture and restrictions.
b. Ensure no alternations or deformations of airframe surface have been made which would affect the relationship between air pressure in static pressure system and true ambient static air pressure for any flight configuration.
c. Close static pressure alternate source control, if installed.
d. Attach a source of suction to static pressure

source opening. Figure 15-3 shows one method of obtaining suction.

e. Slowly apply suction until altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed range of vertical speed indicator or airpseed indicator.

f. Cut off suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on altimeter.

g. If leakage rate is within tolerance, slowly release suction source.

NOTE

If leakage rate exceeds maximum allowable, first tighten all connections, then repeat leakage test. If leakage rate still exceeds maximum allowable, use following procedure.

h. Disconnect static pressure lines from airspeed indicator and vertical speed indicator. Use suitable fittings to connect lines together so altimeter is the only instrument still connected into static pressure system.

i. Repeat leakage test to check whether static pressure system or the bypassed instruments are cause of leakage. If instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If static pressure system is at fault, use following procedure to locate leakage.

j. Attach a source of positive pressure to static source opening. Figure 15-3 shows one method of obtaining positive pressure.

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected to static pressure system.

k. Slowly apply positive pressure until altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections and static source flange with solution of mild soap and water, watching for bubbles to locate leaks.

l. Tighten leaking connections. Repair or replace parts found defective.

m. Reconnect airspeed and vertical speed indicators into static pressure system and repeat leakage test per steps "c" thru "g".

15-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check pitot system for leaks, place a piece of taps over small hole in lower aft end of pitot tube, fasten a piece of rubber or plastic tubing over pitot tube, close opposite end of tubing and slowly roll up tube until airspeed indicator registers in cruise range. Secure tube and after a few minutes recheck airspeed indicator. Any leakage will have reduced the pressure in system, resulting in a lower airspeed indication. Slowly unroll tubing before removing it, so pressure is reduced gradually. Otherwise instrument may be damaged. If test reveals leak in system, check all connections for tightness.

15-15. BLOWING OUT LINES. Although pitot system is designed to drain down to pitot tube opening, condensation may collect at other points in system and produce a partial obstruction. To clear line, disconnect at airspeed indicator. Using low pressure air, blow from indicator end of line toward pitot tube.

CAUTION

Never blow through pitot or static lines toward instruments.

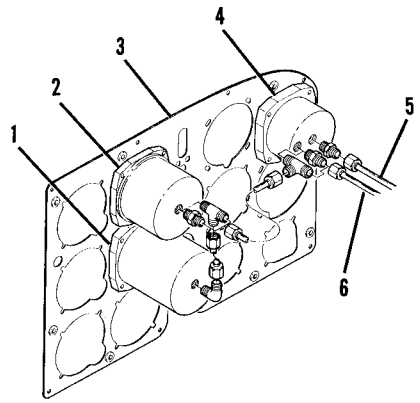
Like pitot lines, static pressure lines must be kept clear and connections tight. All models have a static source sump which collects moisture and keeps system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow line clear with low-pressure air. Check all static pressure line connections for tightness. If hose or hose connections are used, check for general condition and clamps for security. Replace hose which have cracked, hardened or show other signs of deterioration.

15-16. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 15-2.) To remove pitot mast remove four mounting screws on side of connector (13) and pull mast out of connector far enough to disconnect pitot line (5). Electrical connections to heater assembly (if installed) may be disconnected through wing access opening just inboard of mast. Pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Installation of tubing will be simpler if a guide wire is drawn in as tubing is removed from wing. The tubing may be removed from wing. The tubing may be removed intact by drawing it out through cabin and right door. Tighten connections firmly but avoid overtightening and distorting fittings. It twisting of plastic tubing is encountered when tightening fittings, VV-P-236 (USP Petrolatum), may be applied sparingly between tubing and fittings.

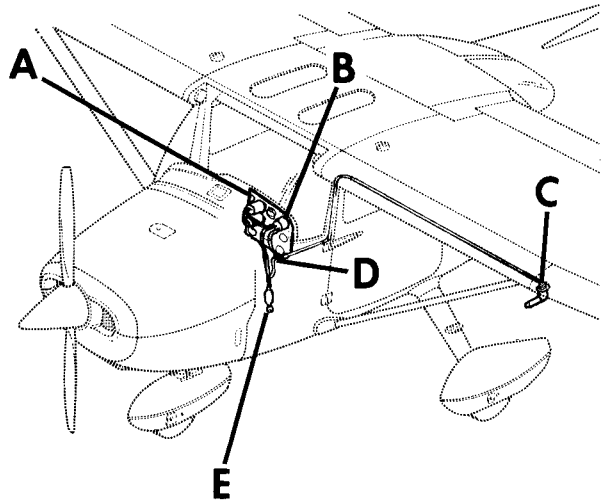
15-17. ENCODING ALTIMETER.

15-18. DESCRIPTION. An encoding altimeter may be installed which is also connected to static system pressure. The encoding altimeter supplies coded altitude signals to the aircraft's transponder for transmission to ground based interrogating radar. The encoding altimeter installation requires the use of a fully operational secondary altimeter as backup.

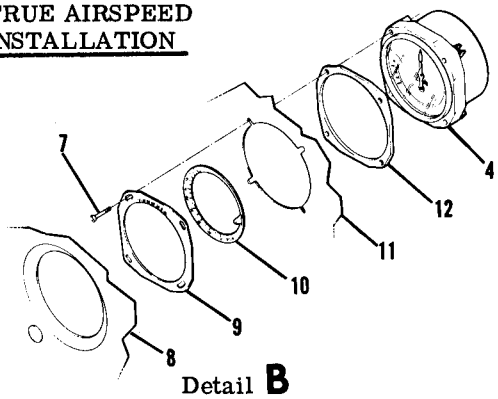
15-19. REMOVAL AND INSTALLATION. Figure 15-2, sheet 2 may be used as a guide for removal and installation of the encoding altimeter.



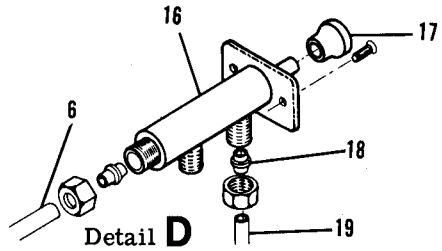
Detail A



TRUE AIRSPEED INSTALLATION

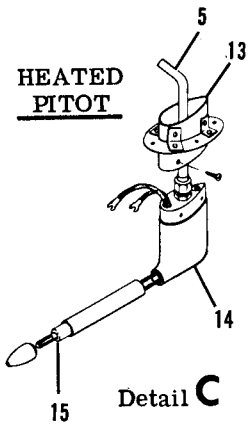


Detail B

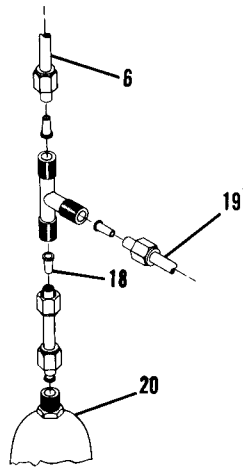


Detail D

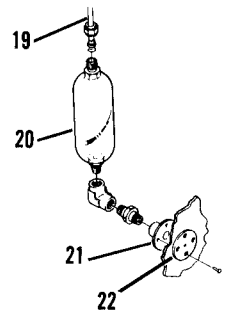
HEATED PITOT



Detail C



Detail E



Detail E

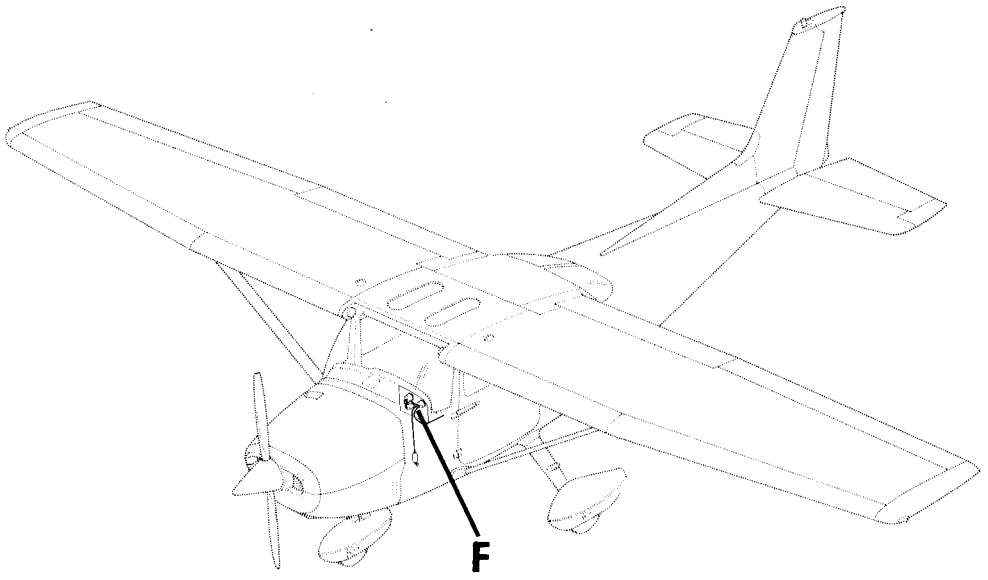
1. Vertical Speed Indicator
2. Altimeter
3. Shock-Mounted Panel
4. Airspeed Indicator
5. Pitot Line
6. Static Line
7. Mounting Screw
8. Cover
9. Retainer
10. True Airspeed Ring
11. Instrument Panel
12. Spacer
13. Connector
14. Mast Body
15. Heater Element
16. Valve
17. Knob
18. Insert
19. Line (to Sump)
20. Static Sump
21. Flange
22. Static Port

NOTE

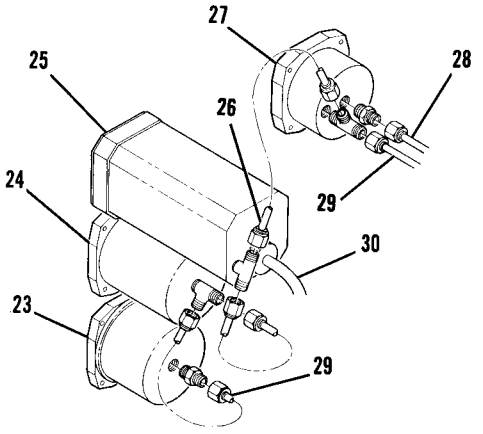
Do not overtighten screws (7) and do not lubricate any parts.

Use spacers (12) as required for adequate friction on ring assembly (10).

Figure 15-2. Pitot Static Systems (Sheet 1 of 2)



ENCODING ALTIMETER INSTALLATION



Detail **F**

23. Backup Altimeter
24. Vertical Speed Indicator
25. Encoding Altimeter
26. Static Line
27. Airspeed Indicator
28. Pitot Line
29. Static Line
30. Cable (to Transponder)

Figure 15-2. Pitot Static Systems (Sheet 2 of 2)

15-20. TROUBLE SHOOTING--PITOT STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIRSPEED INDICATION. (Normal altimeter and vertical speed.)	Pitot tube obstructed, leak or obstruction in pitot line.	Test pitot tube and line for leaks or obstructions. Blow out tube and line, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE. (all three instruments.)	Leaks or obstruction in static line.	Test line for leaks and obstructions. Repair or replace line, blow out obstructed line.

15-21. TRUE AIRSPEED INDICATOR.

15-22. DESCRIPTION. The true airspeed indicator is equipped with a conversion ring, which may be rotated until pressure altitude is aligned with outside air temperature, then airspeed indicated on the instrument is read as true airspeed on the adjustable ring.

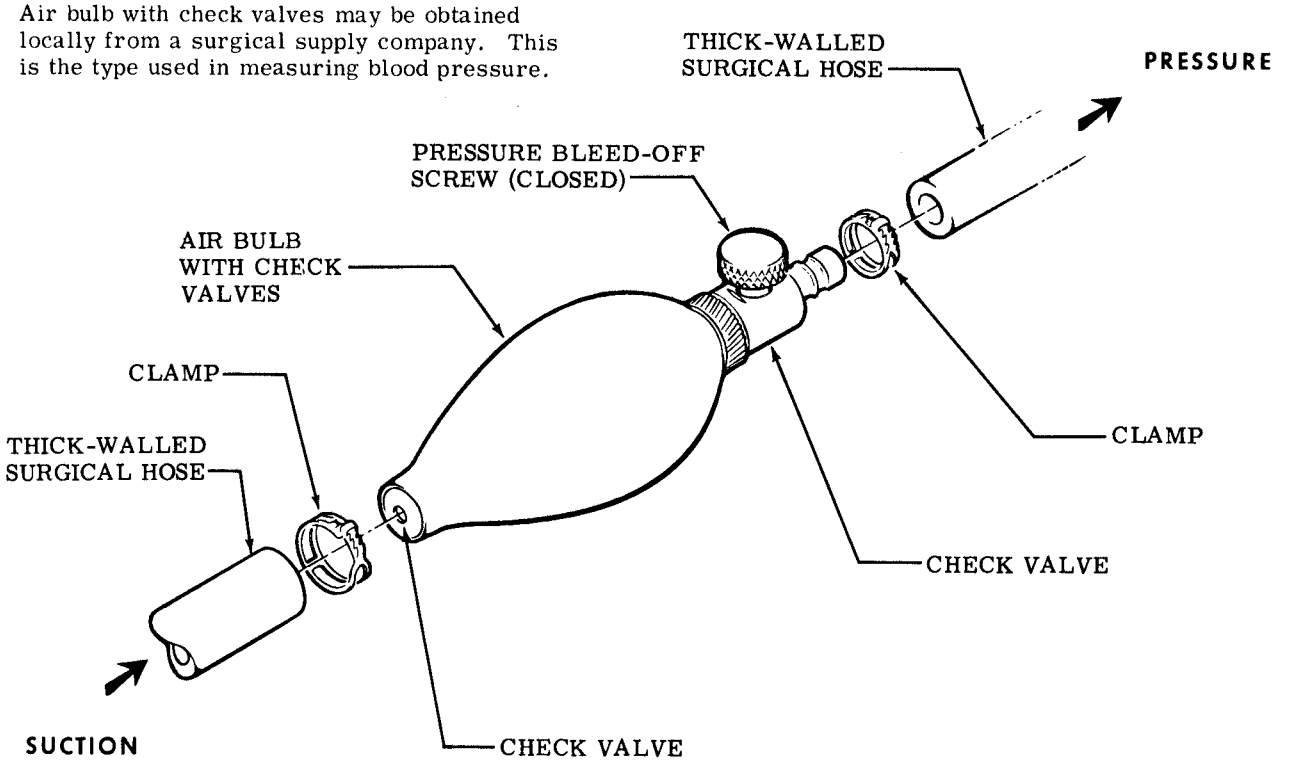
15-23. REMOVAL AND INSTALLATION. (Refer to figure 15-2.) Upon installation, before tightening mounting screws (7), calibrate instrument as follows: Rotate ring (10) until 105 knots on the adjustment ring aligns with 105 knots on the indicator. Holding this setting, move retainer (9) until 60°F aligns with zero pressure altitude, then tighten mounting screws (7) and replace decorative cover (8).

15-24. TROUBLE SHOOTING--AIRSPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Test line and connection for leaks. Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Check line for obstructions. Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Defective mechanism or leaking diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check panel shock mounts. Replace defective shock mounts.
	Excessive tubing vibration.	Check clamps and line connections for security. Tighten clamps and connections, replace tubing with flexible hose.

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 APPLY SUCTION:

1. Squeeze air bulb to expel as much air as possible.
2. Hold suction hose firmly against static pressure source opening.
3. Slowly release air bulb to obtain desired suction, then pinch hose shut tightly to trap suction in system.
4. After leak test, release suction slowly by intermittently allowing a small amount of air to enter static system. To do this, tilt end of suction hose away from opening, then immediately tilt it back against opening. Wait until vertical speed indicator approaches zero, then repeat. Continue to admit this small amount of air intermittently until all suction is released, then remove test equipment.

TO APPLY PRESSURE:

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected into static system.

1. Hold pressure hose firmly against static pressure source opening.
2. Slowly squeeze air bulb to apply desired pressure to static 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 15-3. Static Test Equipment

15-25. TROUBLE SHOOTING--ALTIMETER

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines.
	Defective mechanism.	Substitute known-good altimeter and check reading. Replace instrument.
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Substitute known-good altimeter and check reading. Replace instrument.
	Pointers out of calibration.	Compare reading with known-good altimeter. Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Check lines for obstruction or leaks. Blow out lines, tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Check other instruments and system plumbing for leaks. Blow out lines, tighten connections.

15-26. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines.
	Static line broken.	Check line for damage, connections for security. Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Check line for obstructions. Blow out lines.
	Ruptured diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
	Pointer off zero.	Reset pointer to zero. Reset pointer to zero.
POINTER OSCILLATES.	Partially plugged static line.	Check line for obstructions. Blow out lines.

15-26. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR. (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
POINTER OSCILLATES. (cont).	Leak in static line.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check shock mounts. Replace defective shock mounts.
	Defective diaphragm.	Substitute known-good indicator and check for vibration. Replace instrument.

15-27. TROUBLE SHOOTING--PITOT TUBE HEATER.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF."	Turn switch "ON."
	Blown fuse.	Check fuse. Replace fuse.
	Break in wiring.	Test for open circuit. Repair wiring.
	Heating element burned out.	Check resistance of heating element. Replace element.

15-28. VACUUM SYSTEM.

15-29. DESCRIPTION. Suction to operate the gyros is provided by a dry-type engine-driven vacuum pump, gear-driven through a spline-type coupling. A suction relief valve, to control system pressure, is connected between the pump inlet and the instruments. In the cabin, the vacuum line is routed from gyro instruments to the relief valve at the firewall. A throw away type central air filtering unit is installed. The reading of the suction gage indicates net difference in suction before and after air passes through a gyro. This differential pressure will gradually decrease as the central air filter becomes dirty, causing a lower reading on the suction gage.

15-30. TROUBLE SHOOTING--VACUUM SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS.	Gyros function normally-relief valve screen clogged, relief valve malfunction.	Check screen, than valve. Compare gage readings with new gage. Clean screen, reset valve. Replace gage.
NORMAL SUCTION GAGE READING, SLUGGISH OR ERRATIC GYRO RESPONSE.	Instrument air filters clogged.	Check filter, if dirty replace filter.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Check lines for leaks, disconnect and test pump. Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Central air filter dirty.	Check filter, if dirty replace filter.
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Check suction with test gage. Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace valve.

15-31. TROUBLE SHOOTING--GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central filter dirty.	Check filter. Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro response. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.

15-31. TROUBLE SHOOTING--GYROS. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central filter dirty.	Check filter. Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Check filter. Clean or replace filter.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.

SHOP NOTES:

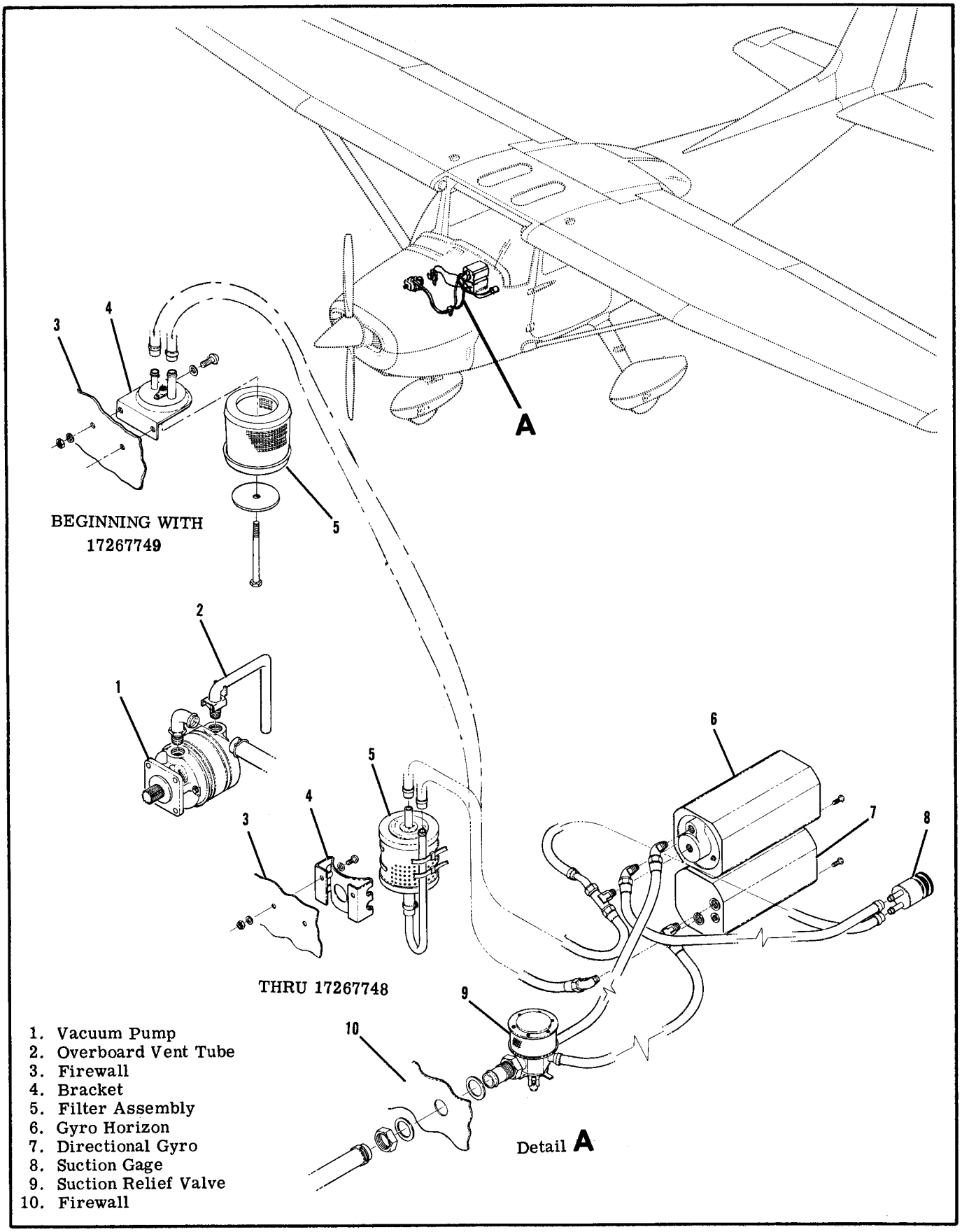


Figure 15-4. Vacuum System

15-32. TROUBLE SHOOTING--VACUUM PUMP.

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve filter clogged.	Check filter for obstructions. Clean or replace filter.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Substitute known-good pump and check pump suction. Replace vacuum pump.
LOW PRESSURE.	Safety valve leaking.	Replace safety valve.
	Vacuum pump failure.	Substitute known-good pump and check pump pressure. Replace vacuum pump.

15-33. REMOVAL AND INSTALLATION: For removal and installation of vacuum system components refer to figure 15-4. The various components of vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. When replacing a vacuum system component, ensure connections are made correctly. Use no thread-lube on any connections. Teflon tape may be used on male threads. Avoid over-tightening connections. Before re-installing a vacuum pump, place mounting pad gasket over studs. After installing pump, before connecting plumbing, start engine and check for evidence of oil in the discharge which would indicate a leaking engine drive seal.

15-34. CLEANING. In general, low-pressure, dry compressed air should be used in cleaning vacuum system components. Suction relief valve, exposed to engine oil and dirt, should be washed with Stoddatd solvent, then dried with a low-pressure air blast. Check hose for collapsed inner liners as well as external damage.

CAUTION

Never apply compressed air to lines or components installed in aircraft. The excessive pressures will damage gyros. If an obstructed line is to be blown out, disconnect at both ends and blow from instrument panel out.

15-35. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches of mercury is desirable for gyro instruments. However, a range of 4.6 to 5.4 inches of mercury is acceptable. To adjust the relief valve, remove control air filter, run engine to 2200 rpm on the ground and adjust relief valve to 5.3 ±.1 inches of mercury.

CAUTION

Do not exceed maximum engine temperature.

Be sure filter element is clean before installing. If reading drops noticeably, install new filter element.

15-36. ENGINE INDICATORS.

15-37. TACHOMETER.

15-38. DESCRIPTION. The tachometer used on Cessna single-engine aircraft is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulities will be found in the drive-shaft. To function properly, shaft housing must be free of kinks, dents and sharp bends. There should be no bend on a radius shorter than six inches and no bend within three inches of either terminal. If a tachometer is noisy or pointer oscillates, check cable housing for kinks, sharp bends and damage. Disconnect cable at tachometer and pull it out of housing. Check cable for worn spots, breaks and kinks.

NOTE

Before replacing a tachometer cable in housing, coat lower two thirds with AC Type ST-640 speedometer cable grease or Lubriplate No. 110. Insert cable in housing as far as possible, then slowly rotate to make sure it is seated in engine fitting. Insert cable in tachometer, making sure it is seated in drive shaft, then reconnect housing and torque to 50 pound-inches (at instrument).

15-39. OIL PRESSURE GAGE.

15-40. DESCRIPTION. The Bourdon tube-type oil pressure gage is a direct-reading instrument, operated by a pressure pickup line connected to the engine main oil gallery. The oil pressure line from the instrument to the engine should be filled with kerosene, especially during cold weather operation, to attain an immediate oil indication.

15-41. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Clean line.
	Pressure line broken.	Check line for leaks and damage. Repair or replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on staff.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Check line for obstructions. Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Check line for leaks and damage. Repair or replace damaged line.

15-42. OIL TEMPERATURE GAGE.

15-43. DESCRIPTION. The oil temperature gage is an electrically operated indicator mounted in the instrument cluster with the oil pressure gage. One electrical lead is routed from the indicator to the sending unit, installed in the engine. The other lead supplies power from the bus bar to the indicator.

15-44. CARBURETOR AIR TEMPERATURE GAGE.

15-45. DESCRIPTION. The carburetor air temperature gage is of the resistance-bridge type. Changes in electrical resistance of the element are indicated by the gage, calibrated for temperature. The system requires power from the aircraft electrical system and operates only when the master switch is on. Although both instrument and sensing bulb are grounded, two leads are used to avoid possibility of instrument error introduced by poor electrical bonds in the air frame.

15-46. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE POINTER STAYS OFF LOW END OF SCALE.	Circuit breaker out.	Check visually. Reset breaker.
	Master switch OFF or switch defective.	Check switch ON. Replace defective switch.
	Broken or grounded leads between gage and sensing unit.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE POINTER GOES OFF HIGH END OF SCALE.	Broken or grounded lead.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE OPERATES INTERMITTENTLY.	Defective master switch, broken or grounded lead.	Check circuit wiring. Replace switch, repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
EXCESSIVE POINTER OSCILLATION.	Loose or broken lead.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
	Excessive panel vibration.	Check panel shock-mounts. Replace defective shock-mounts.
OBVIOUSLY INCORRECT TEMPERATURE READING.	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
POINTER FAILS TO GO OFF SCALE WITH CURRENT OFF.	Defective master switch.	Replace switch.
	Defective gage.	Substitute known-good gage. Replace gage.

15-47. FUEL QUANTITY INDICATING SYSTEM.

15-48. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel tank. The full position of float produces a minimum resistance through transmitter, permitting maximum current flow through the fuel quantity indicator and maximum pointer deflection. As fuel level is lowered, resistance in transmitter is increased, producing a decreased current flow through fuel quantity indicator and a smaller pointer deflection.

15-49. REMOVAL AND INSTALLATION OF FUEL QUANTITY TRANSMITTERS.

a. Drain fuel from tank. (Observe precautions in Section 12.

b. Remove access plate above fuel tank for access to transmitter.

c. Disconnect electrical lead and ground strap from transmitter.

d. Remove screws attaching transmitter and carefully work transmitter from tank. DO NOT BEND FLOAT ARM.

e. Install transmitter by reversing preceding steps, using new gaskets around opening in fuel tank and under screw heads.

f. Service fuel tanks. Check for leaks and correct quantity indication.

NOTE

Ensure transmitter is properly grounded in accordance with Section 12.

15-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO INDICATE.	No power to indicator or transmitter. (Pointer stays below E.)	Check fuse and inspect for open circuit. Replace fuse, repair or replace defective wire.
	Grounded wire. (Pointer stays above F.)	Check for partial ground between transmitter and gage. Repair or replace defective wire.
	Low voltage.	Check voltage at indicator. Correct voltage.
	Defective indicator.	Substitute known-good indicator. Replace indicator.
OFF CALIBRATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Defective transmitter.	Substitute known-good transmitter. Recalibrate or replace.
	Low or high voltage.	Check voltage at indicator. Correct voltage.
STICKY OR SLUGGISH INDICATOR OPERATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Low voltage.	Check voltage at indicator. Correct voltag
ERRATIC READINGS.	Loose or broken wiring on indicator or transmitter.	Inspect circuit wiring. Repair or replace defective wire.
	Defective indicator or transmitter.	Substitute known-good component. Replace indicator or transmitter.
	Defective master switch.	Replace switch.

15-51. TRANSMITTER CALIBRATION. Possibility of transmitter calibration changing in normal service is remote, however, it is possible that float arm or float arm stops may become bent if transmitter is removed from the tank. Transmitter calibration is obtained by adjusting float travel. Float travel is limited by the float arm stops.

WARNING

Use extreme caution while working with electrical components of the fuel system. The possibility of electrical sparks around an empty fuel tank creates a hazardous situation.

Before installing transmitter, attach electrical wires and place master switch in ON position. Allow the float arm to rest against lower float arm stop and read indicator. The pointer should be on E (empty) position. Adjust lower stop with float arm against stop so that pointer indicator is on E (empty). Raise float arm until it is against upper stop and adjust stop to permit indicator pointer to be on F (full). Install transmitter in accordance with paragraph 15-49.

15-52. HOURMETER.

15-53. DESCRIPTION. The hourmeter is electrically operated and is actuated by a pressure switch in the oil pressure system. Electrical power is supplied through a one-amp fuse from the electrical clock circuit and therefore, will operate independent of the master switch. If no clock is installed, a line direct from the battery contactor provides power independent of the master switch through a one-amp fuse located adjacent to the battery box. An indicator on the dial face rotates when the meter is actuated. If the meter is inoperative and clock is operating, the meter or its wiring is faulty and must be replaced.

15-54. MAGNETIC COMPASS.

15-55. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from front of case. The compass is internally lighted, controlled by the panel lights rheostat. No maintenance is required on compass except on occasional check on a compass rose for adjustment of compensation and replacement of lamp.

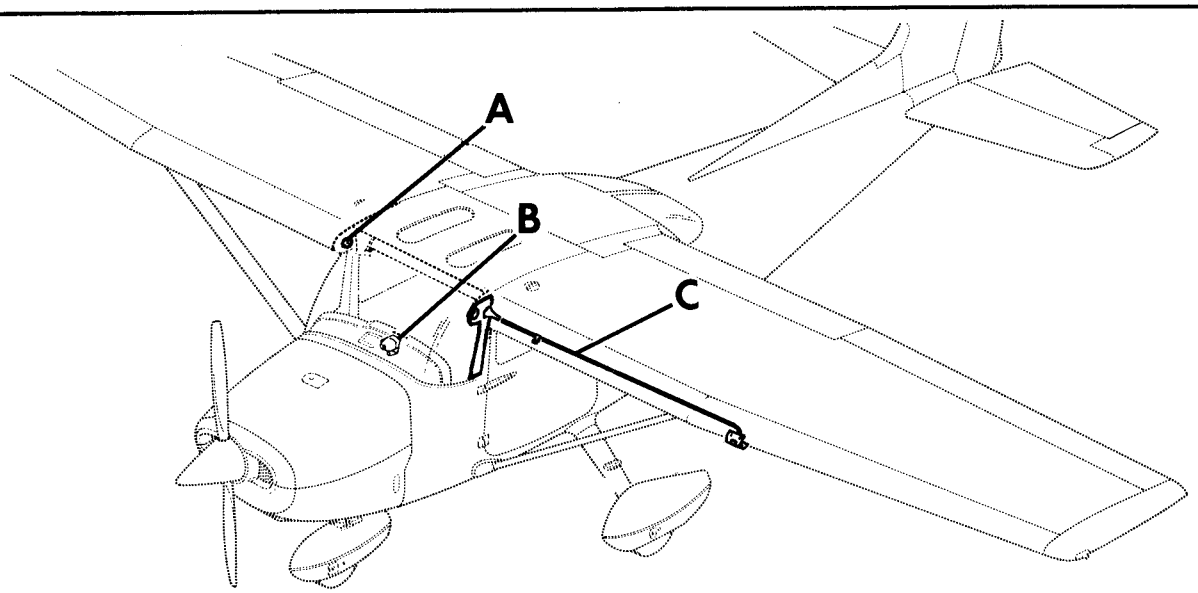
15-56. REMOVAL AND INSTALLATION. Refer to figure 15-5 for removal and installation.

15-57. STALL WARNING SYSTEM.

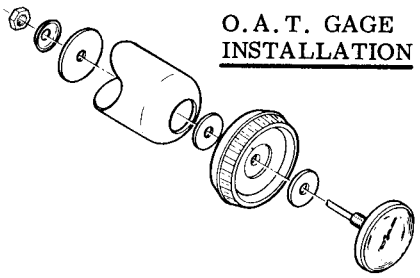
15-58. DESCRIPTION. The system is composed of an adjustable plate on left wing leading edge, connected to a reed type horn by means of plastic tubing. The horn is actuated approximately 5 to 10 miles per hour above stalling speed as a negative air pressure area at wing leading edge causes a reverse flow of air through horn. By moving adjustable plate (6) up, actuation of horn will occur at a higher speed and moving plate down causes actuation to occur at a slower speed. Center adjustable plate opening in wing leading edge upon installation, then flight test aircraft, observing horn actuation during stall. Readjust plate to obtain desired result, if necessary. Approximately 3/32 inch adjustment of plate will change speed at which horn actuation occurs by 5 miles per hour. To test horn operation, cover opening in plate (6) with a clean cloth, such as a handkerchief and apply a slight suction by mouth to draw air through horn.

15-59. REMOVAL AND INSTALLATION. Refer to figure 15-5 for removal and installation.

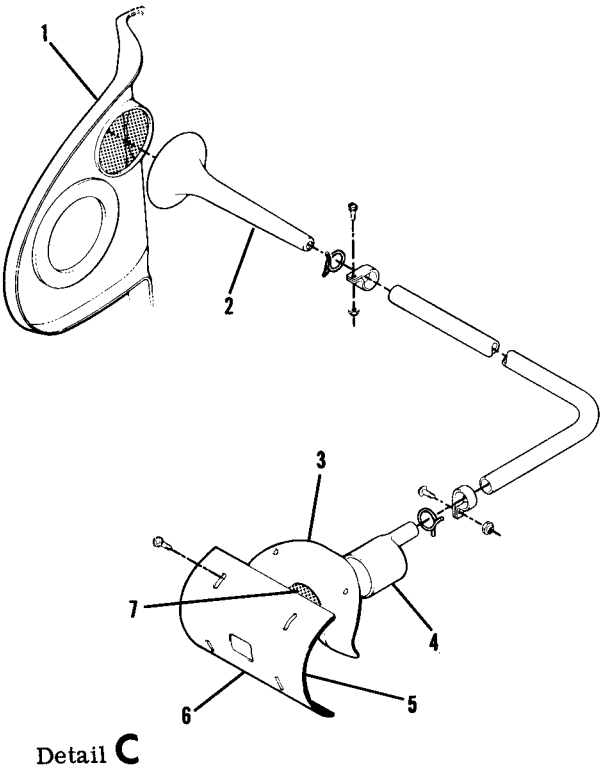
SHOP NOTES:



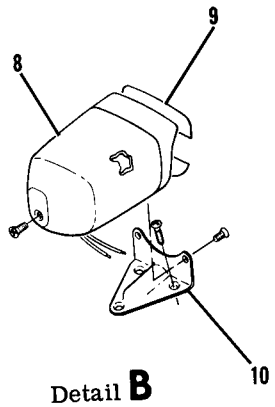
O.A.T. GAGE INSTALLATION



Detail A



Detail C



Detail B

NOTE

Bug screen (7) should be inspected and cleaned periodically.

1. Doorpost Cover
2. Horn Assembly
3. Scoop
4. Adapter
5. Felt Seal
6. Adjustable Plate
7. Screen
8. Compass
9. Compass Card
10. Bracket

Figure 15-5. Stall Warning System and Compass Installation

15-60. TURN COORDINATOR.

15-61. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-rate turn indicator. Its gyro simultaneously senses rate of motion roll and yaw axes which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an a. e. brushless spin motor with a solid state inverter.

15-62. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator damping.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Measure voltage at instrument. Correct voltage.
	Inverter frequency changed.	Replace instrument.
NOISY MOTOR	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	Check continuity and voltage. Correct voltage or replace faulty wire.
	Inverter malfunctioning.	Replace instrument.
	Motor shorted.	Replace instrument.
	Bearings frozen.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at instrument. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage to instrument. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

15-63. TURN-AND-SLIP INDICATOR.

15-64. DESCRIPTION. The turn-and-slip indicator is an electrically operated instrument powered by the aircraft electrical system, therefore, operating only when the master switch is ON.

15-65. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Internal fuse blown.	Check wiring for continuity, check voltage at indicator. Replace fuse, if fuse still blows, replace instrument.
	Master switch "OFF" or switch defective.	Check switch "ON." Replace defective switch.
	Broken or grounded lead to indicator.	Check circuit wiring. Repair or replace defective wiring.
	Indicator not grounded.	Check ground wire. Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage at indicator. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

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SECTION 16

ELECTRICAL SYSTEMS

TABLE OF CONTENTS

16-1. ELECTRICAL SYSTEMS.

16-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Aircraft Lighting System, Pitot Heater, Cigar Lighter and Electrical Load Analysis Chart.

16-3. ELECTRICAL POWER SUPPLY SYSTEM.

16-4. DESCRIPTION. Electrical energy for the aircraft is supplied by a 12-volt, direct current, single-wire, negative ground electrical system. A single 12-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. An engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by a voltage regulator. An external power receptacle is offered as optional equipment to supplement the battery system for starting and ground operation.

16-5. SPLIT BUS BAR.

16-6. DESCRIPTION. Electrical power is supplied through a split bus bar. One side of the bus bar supplies power to the electrical equipment while the other side supplies the electronic installations. When the master switch is closed, the battery contactor engages and the battery power is supplied to the electrical side of the split bus bar. The electrical bus feeds battery power to the electronics bus.

16-7. MASTER SWITCH.

16-8. DESCRIPTION. The operation of the battery and alternator systems are controlled by a master switch. This switch is an interlocking split rocker with battery mode on the right hand side and alternator mode on the left hand side. This arrangement allows the battery to be on the line without the alternator, however, operation of the alternator without the battery on the line is not possible.

16-9. AMMETER.

16-10. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed, the ammeter will show the full alternator output. When the battery is fully charged and cruise is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

16-11. BATTERY POWER SYSTEM.

16-12. BATTERY.

16-13. DESCRIPTION. The battery is 12 volts and is approximately 25 ampere-hour capacity. The battery is mounted on the forward side of the firewall and is equipped with non-spill filler caps.

SHOP NOTES:

16-14. TROUBLE SHOOTING THE BATTERY POWER SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE.	Battery discharged.	1. Measure voltage at "BAT" terminal of battery contactor with master switch and a suitable load such as a taxi light turned on. Normal battery will indicate 11.5 volts or more. If voltage is low, proceed to step 2. If voltage is normal, proceed to step 3.
	Battery faulty.	2. Check fluid level in cells and charge battery at 20 amps for approximately 30 minutes or until the battery voltage rises to 15 volts. Check battery with a load type tester. If tester indicates a good battery, the malfunction may be assumed to be a discharged battery. If the tester indicates a faulty battery, replace the battery.
	Faulty contactor or wiring between contactor or master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained check wiring between contactor and master switch. Also check master switch.
	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 16 to 24 ohms (Master switch open). If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil, proceed to step 5.
	Faulty contactor contacts.	5. Check voltage on "bus" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittant, replace contactor. If voltage is normal, proceed to step 6.
	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

16-15. REMOVAL AND INSTALLATION. (Refer to figure 16-1.)

a. Remove upper half of cowl.
b. Remove battery box cover.
c. Disconnect the ground cable from the negative battery terminal.

CAUTION

- When installing or removing battery always observe the proper polarity with the aircraft electrical system (negative to ground), reversing the polarity, even momentarily, may result in failure of semiconductor devices (alternator diodes, radio proteaction diodes and radio transistors).

- Always remove the battery ground cable first and replace it last to prevent accidental short circuits.

d. Disconnect the cable from the positive terminal of the battery.
e. Lift the battery out of the battery box.
f. To replace the battery, reverse this procedure.

16-16. CLEANING THE BATTERY. For maximum efficiency the battery and connections should be kept clean at all times.

a. Remove the battery and connections in accordance with the preceding paragraph.
b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.
c. Wipe the battery cable ends, battery terminals and the entire surface of the battery with a clean cloth moistened with a solution of bicarbonate of soda (baking soda) and water.
d. Rinse with clear water, wipe off excess water and allow battery to dry.
e. Brighten up cable ends and battery terminals with emery cloth or a wire brush.
f. Install the battery according to the preceding paragraph.
g. Coat the battery terminals with petroleum jelly or an ignition spray product to reduce corrosion.

16-17. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water, however will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level with the horizontal baffle plate or the split ring on the filler neck inside the battery. When "dry charged" batteries are put into service fill as directed with electrolyte. When the electrolyte level falls below normal with use, add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

16-18. TESTING THE BATTERY. The specific gravity of the battery may be measured with a hydrometer to determine the state of battery charge. If the hydrometer reading is low, slow-charge the battery and retest. Hydrometer readings of the electrolyte must be compensated for the temperature of the electrolyte. Some hydrometers have a built-in thermometer and conversion chart. The following chart shows the battery condition for various hydrometer readings with an electrolyte temperature of 80° Fahrenheit.

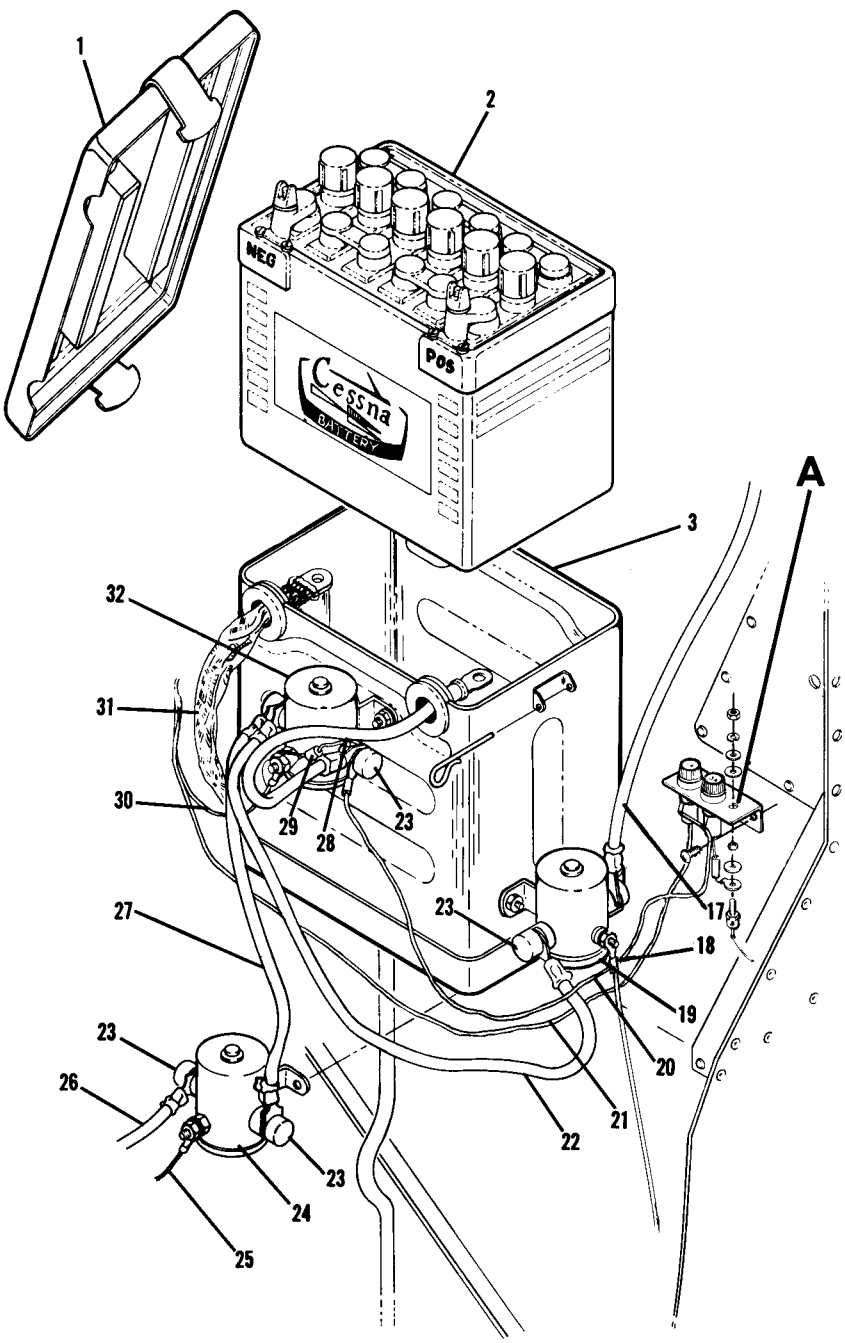
BATTERY HYDROMETER READINGS

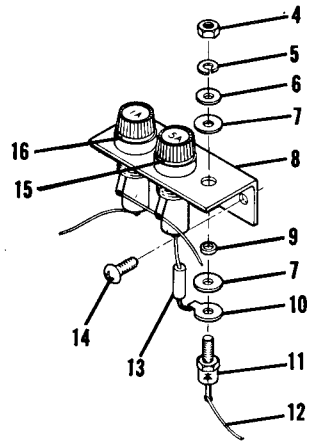
READINGS	BATTERY CONDITION
1.280 Specific Gravity	100% Charged
1.250 Specific Gravity	75% Charged
1.220 Specific Gravity	50% Charged
1.190 Specific Gravity	25% Charged
1.160 Specific Gravity	Practically Dead

NOTE

All readings shown are for an electrolyte temperature of 80° Fahrenheit. For higher temperatures the readings will be slightly lower. For cooler temperatures the readings will be slightly higher. Some hydrometers will have a built-in temperature compensation chart and thermometer. If this type tester is used, disregard this chart.

16-19. CHARGING THE BATTERY. When the battery is to be charged, the level of the electrolyte should be checked and adjusted by adding distilled water to cover the tops of the internal battery plates. Remove the battery from the aircraft and place in a well ventilated area for charging.





Detail **A**

1. Battery Box Lid
2. Battery
3. Battery Box
4. Nut
5. Lockwasher
6. Washer
7. Insulating Washer
8. Bracket
9. Spacer
10. Solder Terminal
11. Diode
12. Wire to Battery Contactor
13. Resistor
14. Screw
15. Fuse - Battery Contactor Closing Circuit
16. Fuse - Clock
17. Wire to Ground Service Receptacle
18. Wire to Diode Board
19. Ground Service Receptacle Contactor
20. Wire from Fuse to Battery Contactor
21. Wire to Clock
22. Wire from Starter Contactor to Battery Contactor
23. Cover
24. Starter Contactor
25. Wire to Ignition Switch
26. Wire to Starter
27. Wire from Starter Contactor to Battery Contactor
28. Positive Battery Lead
29. Diode Assembly
30. Wire to Master Switch
31. Negative Ground Strap
32. Battery Contactor

Figure 16-1. Battery and Electrical Equipment Installations

WARNING

When a battery is being charged, hydrogen and oxygen gases are generated. Accumulation of these gases can create a hazardous explosive condition. Always keep sparks and open flame away from the battery.

Allow unrestricted ventilation of the battery area during charging.

The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Test the battery with a hydrometer to determine the amount of charge. Decrease the charging rate or stop charging temporarily if the battery temperature exceeds 125° F.

16-20. BATTERY BOX.

16-21. DESCRIPTION. The battery is completely enclosed in a box which is painted with acid proof paint. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape. The battery box is riveted to the forward side of the firewall.

16-22. REMOVAL AND INSTALLATION. (Refer to figure 16-1.) The battery box is riveted to mounting brackets on the firewall. The rivets must be drilled out to remove the box. When a battery box is installed and riveted into place, all rivets and scratches inside the box should be painted with acidproof lacquer Part No. CES1054-381, available from the Cessna Service Parts Center.

16-23. MAINTENANCE OF BATTERY BOX. The battery box should be inspected and cleaned periodically. The box and cover should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water. Hard deposits may be removed with a wire brush. When all corrosive deposits have been removed from the box, flush it thoroughly with clean water.

WARNING

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.

Inspect the cleaned box and cover for physical damage and for areas lacking proper acid proofing. A badly damaged or corroded box should be replaced. If the box or lid require acid proofing, paint the area with acid proof lacquer Part No. CES1054-381, available from the Cessna Service Parts Center.

16-24. BATTERY CONTACTOR.

16-25. DESCRIPTION. The battery contactor is bolted to the side of the battery box. The contactor is a plunger type contactor which is actuated by turning the master switch on. When the master switch is off, the battery is disconnected from the electrical system. A silicon diode is used to eliminate spiking of transistorized radio equipment. The large terminal of the diode connects to the battery terminal of the battery contactor. The small terminal of the diode and the master switch wire connect to the minus terminal of the contactor coil. A nylon cover is installed on the contactor terminals to prevent accidental short circuits.

16-26. REMOVAL AND INSTALLATION. (Refer to figure 16-1.)

a. Remove upper half of engine cowl.
b. Remove battery box cover and disconnect ground cable from negative battery terminal.
c. Cut sta-straps and remove nylon covers from terminals.
d. Remove nuts, washers securing battery cable and starter contactor cable.
e. Remove nut, washer securing ignition switch wire.
f. Remove bolt, washer and nut securing each side of the battery contactor to the battery box and remove contactor.
g. To install battery contactor, reverse the preceding steps, be sure to install diode assembly if removed.

16-27. BATTERY CONTACTOR CLOSING CIRCUIT.

16-28. DESCRIPTION. This circuit consists of a 5 amp fuse, a resistor and a diode located on the firewall fuse bracket adjacent to the battery. This serves to shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself.

16-29. GROUND SERVICE RECEPTACLE.

16-30. DESCRIPTION. A ground service receptacle is offered as optional equipment to permit use of external power for cold weather starting or when performing lengthy electrical maintenance. A reverse polarity protection system is utilized whereby ground power must pass through an external power contactor to be connected to the bus. A silicon junction diode is connected in series with the coil on the external power contactor so that if the ground power source is inadvertently connected with a reverse polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices used in the aircraft from possible reverse polarity damage.

NOTE

Maintenance of the electronic installation cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronics bus. For lengthy ground testing of electronic systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for 14 volts and close the master switch.

NOTE

When using ground power to start the aircraft close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field in the event that the battery is completely dead.

CAUTION

Failure to observe polarity when connecting an external power source directly to the battery or directly to the battery side of the battery contactor will damage the diodes in the alternator and other semiconductor devices used in the aircraft.

16-31. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	Check wiring to, and condition of diode mounted on the split bus relay bracket adjacent to the magneto switch. Correct wiring. Replace diode board assembly.
GROUND POWER WILL NOT CRANK ENGINE.	Ground service connector wired incorrectly.	1. Check for voltage at all three terminals of external power contactor with ground power connected and master switch off. If voltage is present on input and coil terminals but not on the output terminal, proceed to step 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals, check wiring between contactor and bus.
		2. Check for voltage at small terminal of ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.
	Open or mis-wired diode on ground service diode board assembly.	3. Check polarity and continuity of diode on diode board at rear of ground service receptacle. If diode is open or improperly wired, replace diode board assembly.
	Faulty external power contactor.	4. Check resistance from small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged . Normal indication is 16-24 ohms. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE (Cont.)	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

16-32. REMOVAL AND INSTALLATION. (Refer to figure 16-2.)

a. Open battery box and disconnect the ground cable from the negative terminal of the battery and pull the cable from the battery box.

b. Remove the nuts, washers, ground strap and diode board from the studs of the receptacle and remove the battery cable.

c. Remove the screws and nuts holding the receptacle. The receptacle will then be free from the bracket.

d. To install a ground service receptacle, reverse this procedure. Be sure to place the ground strap on the negative stud of the receptacle.

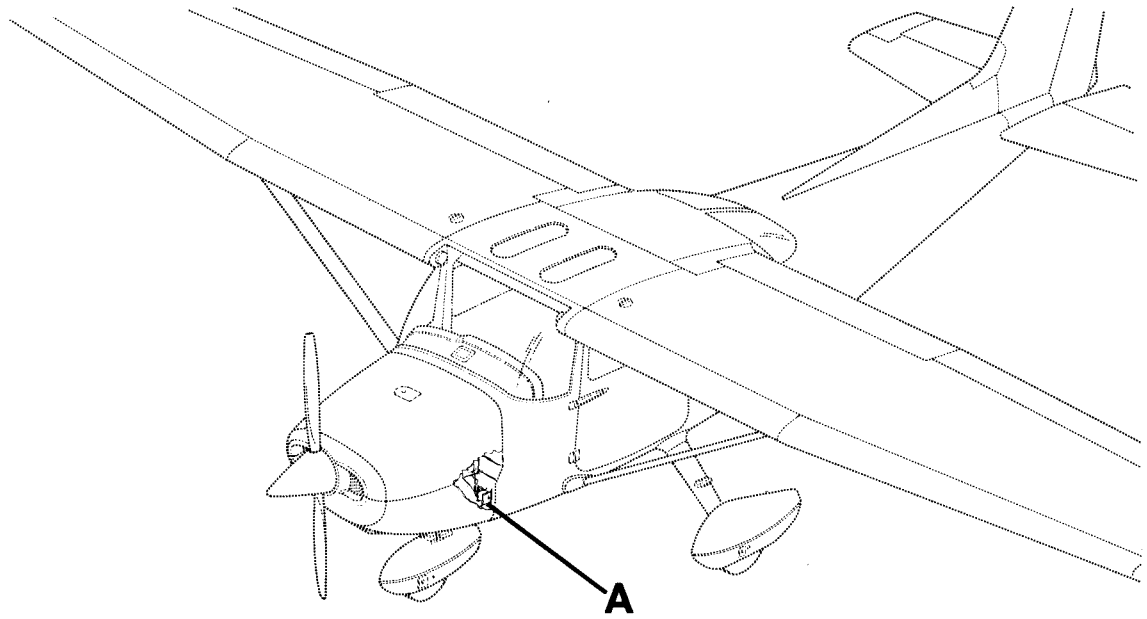
16-33. ALTERNATOR POWER SYSTEM.

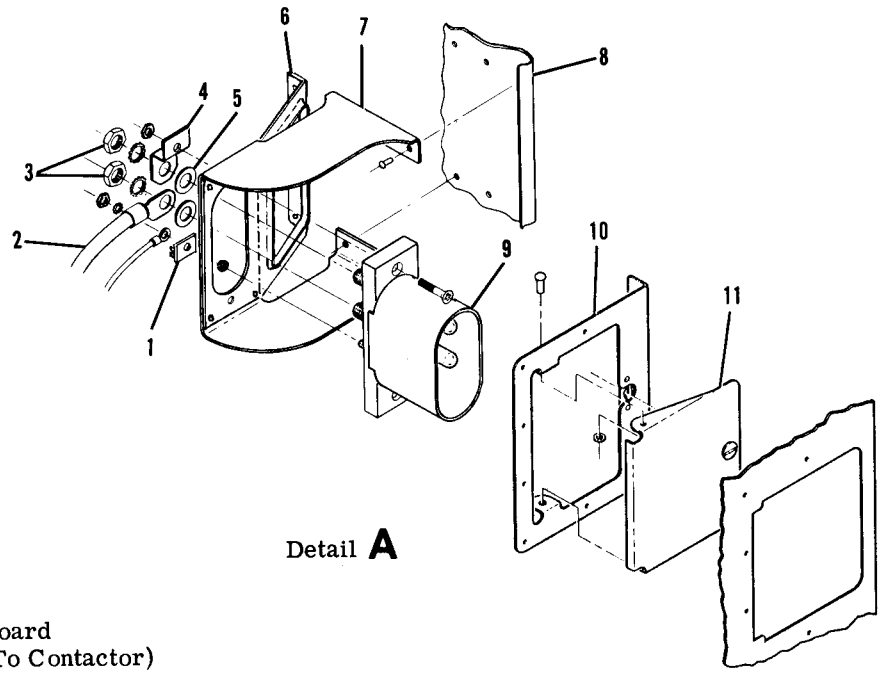
16-34. DESCRIPTION. The alternator system consists of an engine alternator, voltage regulator muunted on the left hand side of the firewall and a circuit breaker located on the instrument panel. The system is controlled by the left hand portion of the split rocker master switch labeled "ALT"; an over-voltage sensor switch and red warning light labeled "HIGH VOLTAGE" are incorporated, ,to protects the system. The aircraft battery supplies the source of power for excitation of the alternator.

16-35. ALTERNATOR.

16-36. DESCRIPTION. The 60-ampere alternator is three phase, delta connected with integral silicon diode rectifiers. The alternator is belt driven and is rated at 14 volts at 60 amperes continous output.

SHOP NOTES:





Detail **A**

1. Diode Board
2. Cable (To Contactor)
3. Nut
4. Ground Strap
5. Washer
6. Brace
7. Bracket Assembly
8. Firewall
9. Receptacle
10. Doubler
11. Door
12. Cowl Skin

Figure 16-2. Ground Service Receptacle Installation.

16-37. TROUBLE SHOOTING THE ALTERNATOR SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON.	Shorted radio noise filter or shorted wire.	1. Remove cable from output terminal of alternator. Check resistance from end of cable to ground (MASTER SWITCH MUST BE OFF). If resistance does not indicate a direct short, proceed to step 4. If resistance indicates a direct short, proceed to step 2.
		2. Remove cable connections from radio noise filter. Check resistance from the filter input terminal to ground. Normal indication is infinite resistance. If reading indicates a direct short, replace filter. If no short is evident, proceed to step 3.
		3. Check resistance from ground to the free ends of the wires which were connected to the radio noise filter (or alternator is no noise filter is installed). Normal indication does not show a direct short. If a short exists in wires, repair or replace wiring.
	Shorted diodes in alternator.	4. Check resistance from output terminal of alternator to alternator case. Reverse leads and check again. Resistance reading may show continuity in one direction but should show an infinite reading in the other direction. If an infinite reading is not obtained in at least one direction, repair or replace alternator.
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.	Regulator faulty or improperly adjusted.	1. Start engine and adjust for 1500 RPM. Ammeter should indicate a heavy charge rate with all electrical equipment turned off. Rate should taper off in 1-3 minutes. A voltage check at the bus should indicate a reading consistant with the voltage ex temperature chart in the Cessna Alternator Charging System Service/Parts Manual. If charge rate tapers off very quickly and voltage is normal, check battery for malfunction. If ammeter shows a low charge rate or any discharge rate, and voltage is low, proceed to step 2.

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED. (cont)	Regulator faulty or improperly adjusted. (cont)	2. Stop engine, remove cowl, and remove cover from voltage regulator. Turn master switch ON/OFF several times and observe field relay in regulator. Relay should open and close with master switch and small arc should be seen as contacts open. If relay is inoperative, proceed to step 3. If relay operates, proceed to step 4.
		3. Check voltage at "S" terminal of regulator with master switch closed. Meter should indicate bus voltage. If voltage is present, replace regulator. If voltage is not present, check wiring between regulator and bus.
		4. Remove plug from regulator and start engine. Momentarily jumper the "A+" and "F" terminals together on the plug. Ship's ammeter should show heavy rate of charge. If heavy charge rate is observed, replace regulator. If heavy charge rate is not observed, proceed to step 5.
		5. Check resistance from "F" terminal of regulator to "F" terminal of alternator. Normal indication is a very low resistance. If reading indicates no, or poor continuity, repair or replace wiring from regulator to alternator.
		6. Check resistance from "F" terminal of alternator to alternator case. Normal indication is 6-7 ohms. If resistance is high or low, repair or replace alternator.
		7. Check resistance from case of alternator to airframe ground. Normal indication is very low resistance. If reading indicates no, or poor continuity, repair or replace alternator ground wiring.
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with the Cessna Alternator Charging system Service/Parts Manual. Observe ship's ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.

16-37. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
OVER-VOLTAGE WARNING LIGHT ON.	Regulator faulty or improperly adjusted. Faulty sensor switch.	1. With engine running turn off and on battery portion of the master switch. If the light stays on shut down engine then turn on the "BAT" and "ALT" portion the master switch. Check for voltage at the "S" terminal of the voltage regulator. If voltage is present adjust or replace regulator. If voltage is not present check master switch and wiring for short or open condition. If wiring and switch are normal replace sensor.

16-38. REMOVAL AND INSTALLATION. (Refer to figure 16-3.)

a. Ensure that the master switch is off and the negative lead is disconnected from the battery.

b. Remove wiring from the alternator and label.

c. Remove safety wire from the upper adjusting bolt and loosen bolt.

d. Remove safety wire from lower adjusting bolt and remove bolt.

e. Remove the locknut from the alternator mounting bolt.

f. Remove the alternator drive belt and the alternator mounting bolt, the alternator will then be free for removal.

g. To replace the alternator, reverse this procedure.

h. Apply a torque wrench to the nut on alternator pulley and adjust the belt tension so the belt slips when the following torque value is applied.

TORQUE VALUES
FOR
CHECKING ALTERNATOR BELT TENSION

Used Belt	New Belt
Slips At 7 to 9 Ft. Lbs.	Skips At 11 to 13 Ft. Lbs.

NOTE

Whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

i. Tighten and safety wire upper and lower adjusting bolts.

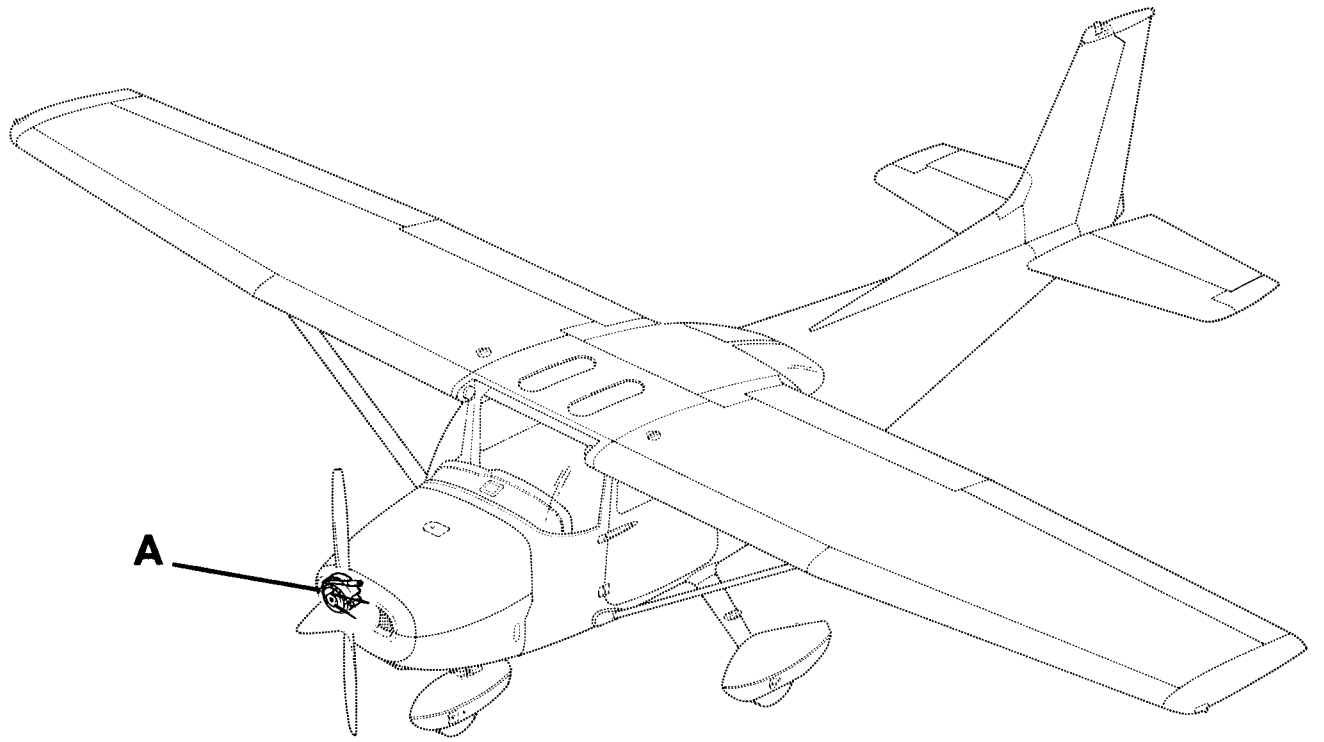
j. Tighten alternator mounting bolt.

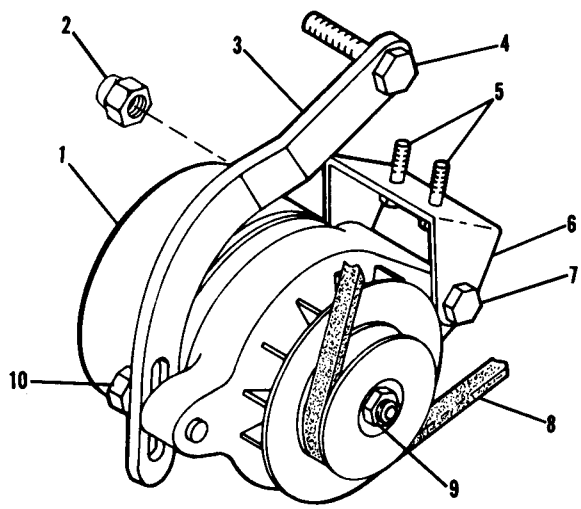
16-39. OVER-VOLTAGE WARNING SYSTEM.

16-40. DESCRIPTION. The over-voltage system consists of an over-voltage sensor switch and a red warning light labeled "HIGH VOLTAGE". The over-voltage sensor is attached to the wire bundle behind the instrument panel and the light is located on the right hand side of the instrument panel. When an over-voltage tripoff occurs the over-voltage sensor turns off the alternator system and the red warning light comes on. The ammeter will show a discharge. Turn off both sections of the master switch to recycle the over-voltage sensor. If the over-voltage condition was transient, the normal alternator charging will resume and no further action is necessary. If the over-voltage tripoff recurs, then a generating system malfunction has occurred such that the electrical accessories must be operated from the aircraft battery only. Conservation of electrical energy must be practiced until the flight can be terminated. The over-voltage light filament may be tested at any time by turning off the "Alternator" portion of the master switch and leaving the battery portion on. This test does not induce an over-voltage condition on the electrical system.

NOTE

The over-voltage sensor switch contains solid state devices. Observe proper polarity before supplying power. Grounding the orange lead or interconnecting orange and black leads will destroy the device. When removal is required for replacement, identify (tag) wiring and follow the wiring diagram in Section 20 for rewiring.





Detail **A**

1. Alternator
2. Locknut
3. Adjusting Bracket
4. Upper Adjusting Bolt
5. Mounting Bracket Bolt
6. Mounting Bracket
7. Alternator Mounting Bolt
8. Drive Belt
9. Alternator Pulley Nut
10. Lower Adjusting Bolt

Figure 16-3. Belt-Driven Alternator Installation

16-41. ALTERNATOR VOLTAGE REGULATOR.

16-42. DESCRIPTION. The voltage regulator is semi-solid state. The mechanical relay in the regulator is actuated by the aircraft master switch and connects the regulator to the battery. The solid state portion is voltage sensitive and controls the current applied to the field windings of the alternator. The regulator is a remove and replace item and not repairable. The regulator is adjustable, but adjustment on the aircraft is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.

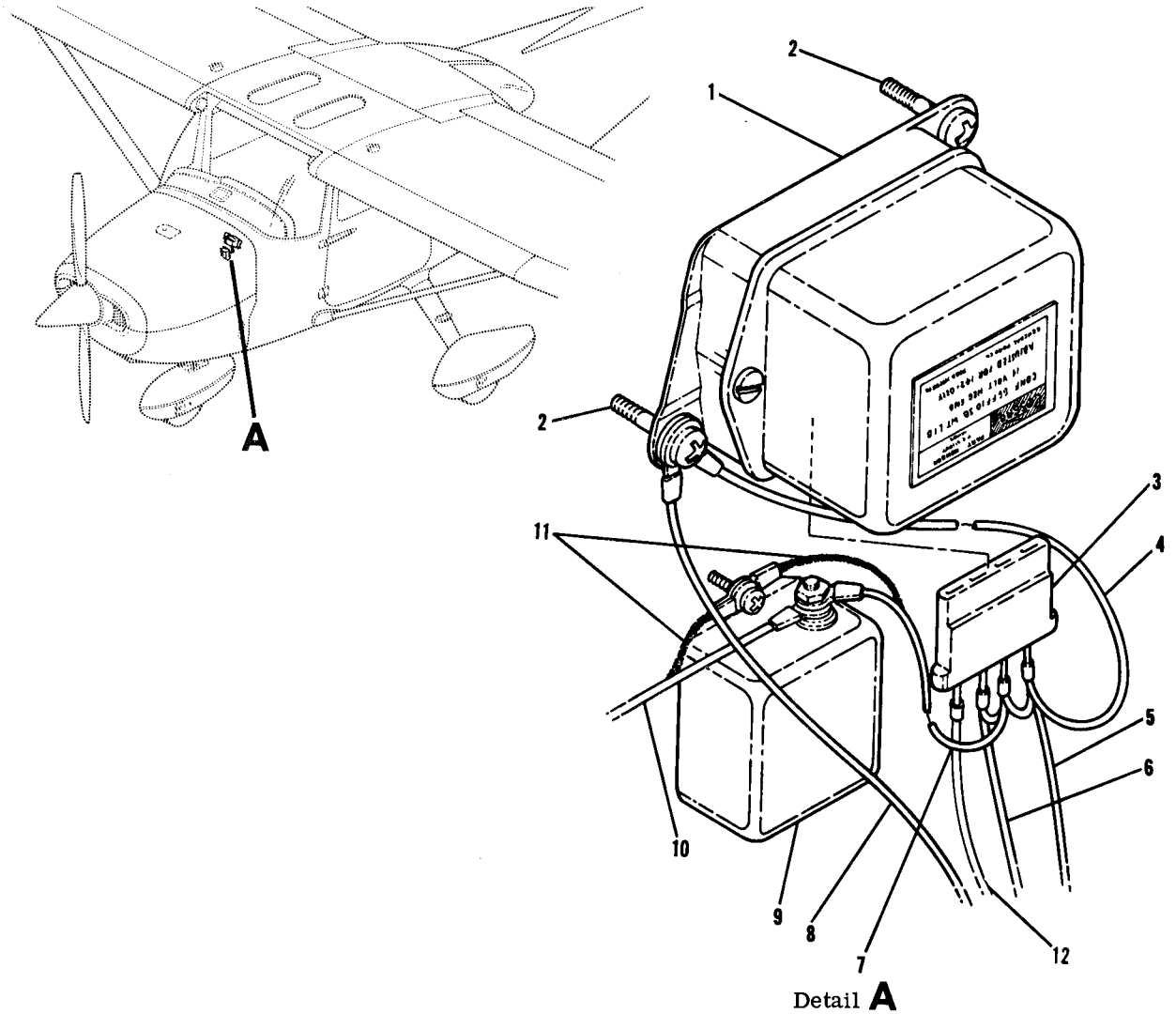
16-43. REMOVAL AND INSTALLATION. (Refer to figure 16-4.)

a. Place master switch in the off position and disconnect the negative lead from the battery.

b. Remove the connector plug from the regulator.

c. Remove two screws, securing the regulator to the firewall.

d. To install regulator, reverse the preceding steps. Be sure that connections for grounding the alternator, wiring shields and the base of the regulator are clean and bright before assembly. Otherwise, poor voltage regulator and/or excessive radio noise may reslut.



1. Voltage Regulator
2. Screw
3. Housing
4. Wire Shields to Ground
5. Wire to Alternator "F"
6. Wire to Alternator "A+"
7. Wire to Filter
8. Wire to Alternator Ground
9. Filter - Radio Noise
10. Wire to Master Switch
11. Shield - Ground
12. Wire to Overvoltage Light

Figure 16-4. Voltage Regulator Installation

16-44. AIRCRAFT LIGHTING SYSTEM.

16-45. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, anti-collision strobe lights, flashing beacon light, dome, instrument flood lights and courtesy light, map light, control wheel map light, compass and radio dial lights.

16-46. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHT(S) OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING AND/OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	5. Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.

16-46. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALL NAV LIGHTS OUT. (Cont).	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.

WARNING

The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.
		2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies, one at a time. If circuit breaker opens on one strobe power supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not open proceed to step 4.
		3. Check aircraft wiring. Repair or replace as necessary.
		4. Inspect strobe power supply ground wire for contact with wing structure.

16-46. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
	CAUTION Extreme care should be taken when exchanging flash tube. The tube is fragile and can easily be cracked in a place where it will not be obvious visually. Make sure the tube is seated properly on the base of the nav light assembly and is centered in the dome. NOTE When checking defective power supply and flash tube, units from opposite wing may be used. Be sure power leads are protected properly when unit is removed to prevent short circuit.	
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT.	Defective Strobe Power Supply, or flash tube.	1. Connect voltmeter to red lead between aircraft power supply (battery/external power) and strobe power supply, connecting negative lead to wing structure. Check for 12 volts. If OK proceed to step 2. If not, check aircraft power supply (battery/external power).
		2. Replace flash tube with known good flash tube. If system still does not work, replace strobe power supply.
DOME LIGHT TROUBLE.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with ohmeter or new lamp. Replace lamp.
	Defective switch.	5. Check for voltage at dome light with master and dome light switch on. Should read battery voltage. Replace switch.

16-46. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT.	Short circuit wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K., proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to Step 4.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in brighter position. Replace potentiometer.
	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.
INSTRUMENT LIGHTS WILL NOT DIM.	Open resistor or wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replace defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is O.K., proceed to step 4.
	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring.
		4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.

16-47. LANDING AND TAXI LIGHT.

16-48. DESCRIPTION. The landing and taxi light is mounted in the nose cap of the lower engine cowl. The lamp is controlled by a rocker type switch on the instrument panel. A circuit breaker on the panel protects the system.

16-49. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

a. Remove upper half of engine cowl.
b. Disconnect lamp wires then remove lower half of cowl.
c. Remove screws (7) and remove lamp assembly.

NOTE

Note position and number of washers between support (2) and bracket (3).

d. Remove screws (9) and remove lamp.
e. To install reverse the preceding steps.

16-50. ADJUSTMENT OF LANDING AND TAXI LIGHT (Refer to figure 16-5.) Adjustment of the landing and taxi light is pre-set at the factory, however changes to this adjustment may be made as desired by adding or subtracting from the number of washers (8). A maximum of two washers may be used.

16-51. LANDING AND TAXI LIGHTS (DUAL).

16-52. DESCRIPTION. Optional, dual, cowl mounted landing and taxi lights may be installed. The left hand light is used for taxi and the right hand for landing. Two rocker type switches on the pilots switch panel control the lights. A 20 amp circuit breaker is installed to protect the system.

16-53. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

a. Remove screws (1) and pull bracket assembly (2) from nose cap to gain access to electrical leads.
b. Disconnect electrical leads from lamps making sure switches are off and leads do not short out.
c. Remove screws (9) from plate (7) and remove lamp assembly from bracket (2). If left hand (taxi) light is being removed, note position of spacers (3) and (11) for reinstallation.
d. Remove screws (10) from bracket (4) to disassemble lamp assembly.
e. Install new lamp and reassemble.

16-54. NAVIGATION LIGHTS.

16-55. DESCRIPTION. The navigation lights are mounted on each wing tip and the aft end of the vertical fin tip. The lights are controlled by a rocker type switch located on the instrument panel. A circuit breaker is installed on the panel to protect the system.

16-56. REMOVAL AND INSTALLATION. For removal and installation of navigation lights refer to figure 16-6.

16-57. ANTI-COLLISION STROBE LIGHTS.

16-58. DESCRIPTION. A white strobe light may be installed on each wing tip with the navigation lights. Strobe lights are vibration resistant and operate on the principle of a capacitor discharge into a xenon tube, producing an extremely high intensity flash. Energy is supplied to the lights from individual power supplies mounted on each wing tip rib.

16-59. REMOVAL AND INSTALLATION. For removal and installation of strobe light and power supply refer to figure 16-6.

WARNING

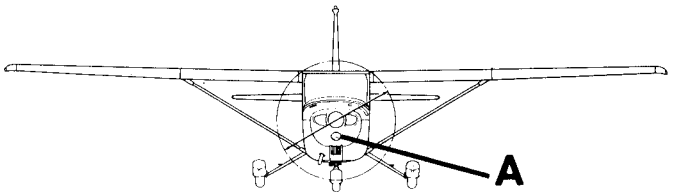
The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

16-60. OPERATIONAL REQUIREMENTS.

CAUTION

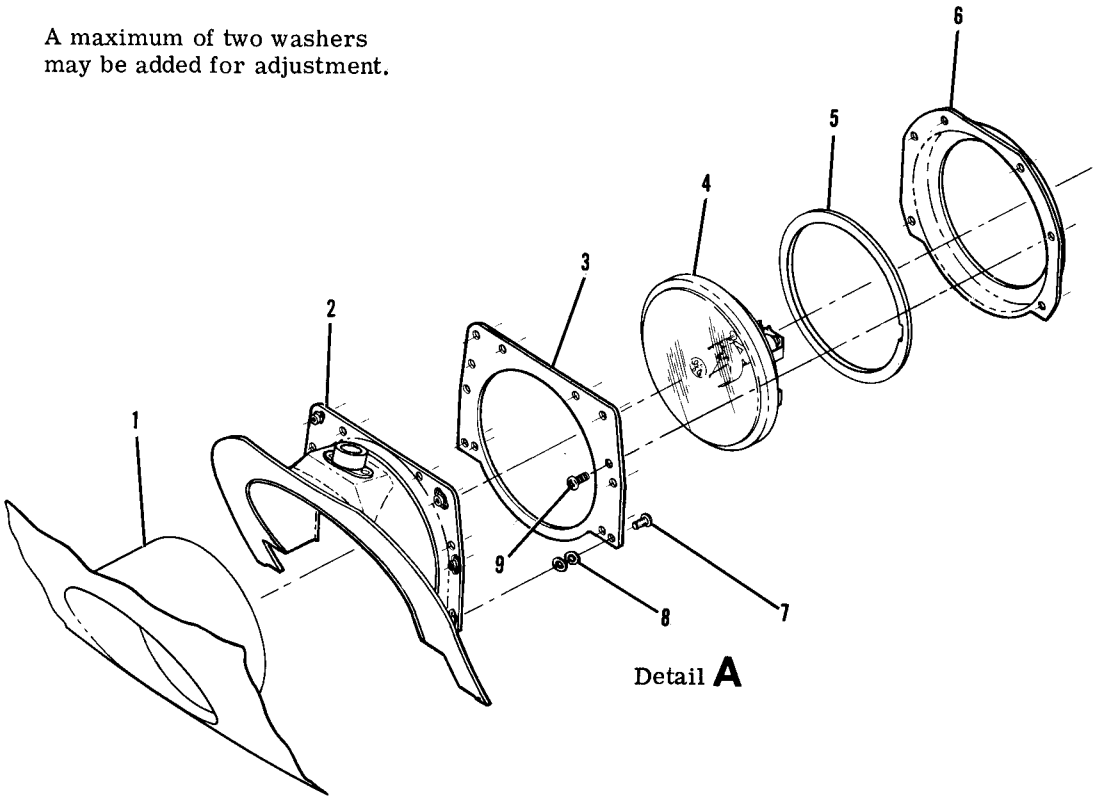
The capacitors in the strobe light power supplies must be reformed if not used for a period of (6) months. The following procedure must be used.

Connect the power supply, red wire to plus, black to ground to 6 volt DC source. Do Not connect strobe tube. Turn on 6 volt supply. Note current draw after one minute. If less than 1 ampere, continue operation for 24 hours. Turn off DC power source. Then connect to the proper voltage, 12 volt. Connect tube to output of strobe power supply and allow to operate, flashing, for 15 minutes. Remove strobe tube. Operating power supply at 12 volts, note the current drain after one minute. If less than 0.5 amperes, operate for 6 hours. If current draw is greater than 0.5 amperes, reject the unit.



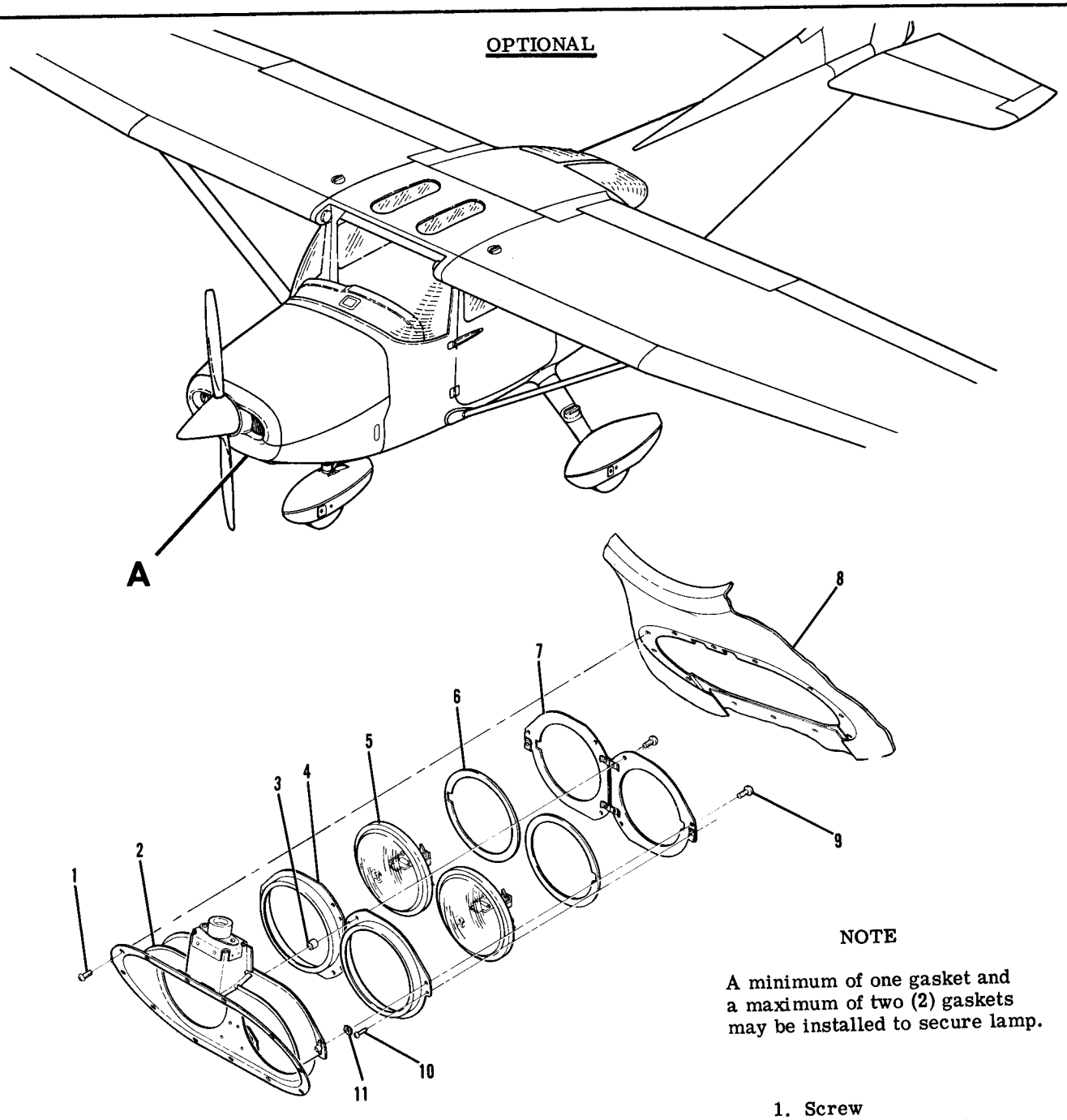
NOTE

A maximum of two washers may be added for adjustment.



1. Landing Light Support
2. Bracket Assembly
3. Plate
4. Lamp
5. Gasket
6. Bracket
7. Adjustment Screw
8. Washer
9. Screw

Figure 16-5. Landing and Taxi Light Installation (Sheet 1 of 2)



Detail **A**

NOTE

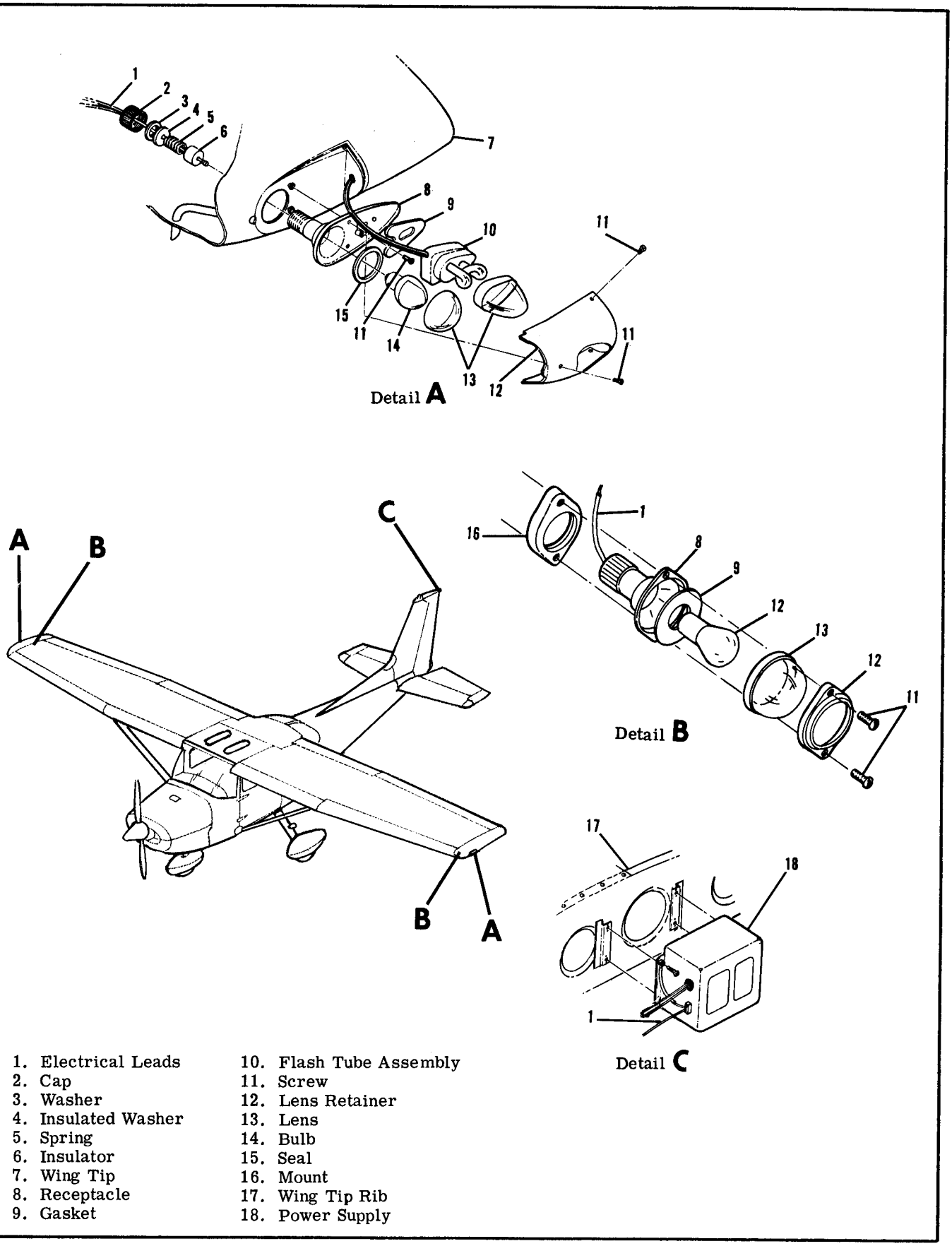
A minimum of one gasket and a maximum of two (2) gaskets may be installed to secure lamp.

NOTE

A maximum of two washers on each screw may be used for adjustment.

1. Screw
2. Bracket Assembly
3. Spacer
4. Bracket
5. Lamp
6. Gasket
7. Plate
8. Nose Cap
9. Screw
10. Screw
11. Washer

Figure 16-5. Landing and Taxi Light Installation (Sheet 2 of 2)



1. Electrical Leads
2. Cap
3. Washer
4. Insulated Washer
5. Spring
6. Insulator
7. Wing Tip
8. Receptacle
9. Gasket
10. Flash Tube Assembly
11. Screw
12. Lens Retainer
13. Lens
14. Bulb
15. Seal
16. Mount
17. Wing Tip Rib
18. Power Supply

Figure 16-6. Navigation and Anti-Collision Strobe Light Installation

16-61. FLASHING BEACON.

16-62. DESCRIPTION. The flashing beacon light is attached to the vertical fin tip. The lamp is iodine-vapor, electrically switched by a solid-state flasher assembly. The flasher assembly is mounted in the aft section of the tailcone. The switching frequency of the flasher assembly operates the beacon at approximately 45 flasher per minute. A 1.5 ohm, 75 watt resistor is installed to eliminate a pulsing effect on the cabin lighting and ammeter.

16-63. REMOVAL AND INSTALLATION. For removal and installation of flashing beacon refer to figure 16-7.

16-64. INSTRUMENT AND DOME LIGHTS.

16-65. DESCRIPTION. The instrument flood light and dome light are installed in the overhead console. The dome light consists of a frosted lens and a single bulb controlled by a switch mounted forward of the light. The instrument flood light consists of a red lens and a single bulb controlled by an off/on switch mounted aft of the light. Intensity of the lamp is controlled by a rheostat switch located on the instrument panel.

16-66. REMOVAL AND INSTALLATION. For removal and installation of instrument and dome light, refer to figure 16-8.

16-67. COURTESY LIGHTS.

16-68. DESCRIPTION. The courtesy lights are m mounted in the underside of each wing, inboard of the upper wing strut attach. The light consists of a lens socket and a single bulb. The lights are controlled by the dome light switch.

16-69. REMOVAL AND INSTALLATION. For removal and installation of the courtesy lights refer to figure 16-8.

16-70. COMPASS AND RADIO DIAL LIGHTING.

16-71. DESCRIPTION. The compass and radio dial lights are contained within the individual units. The lights are controlled by the instrument flood light switch on the overhead console. Intensity is controlled by a rheostat located on the instrument panel.

16-72. INSTRUMENT POST LIGHTING.

16-73. DESCRIPTION. Individual post lighting may be installed to provide nonglare instrument lighting. The post light consists of a cap and a clean lamp assembly with a tinted lens bonded to the decorative covers. The intensity of the post lights is controlled by the radio light dimming rheostat located on the instrument panel.

16-74. REMOVAL AND INSTALLATION. For removal and installation of post lamp, slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

16-75. TRANSISTORIZED LIGHT DIMMING.

16-76. DESCRIPTION. A remotely located, two-circuit transistorized dimming assembly is installed to control instrument lighting. One circuit controls the compass light, map light and instrument flood lights. The other circuit controls radio lighting. A concentric knob arrangement on a dual rheostat assembly mounted on the instrument panel.

16-77. REMOVAL AND INSTALLATION. For removal and installation of transistorized dimming assembly, refer to figure 16-9.

16-78. MAP LIGHTING.

16-79. DESCRIPTION. White map lighting and red-non-glare instrument lighting are provided by an adjustable light mounted on the upper forward part of the left door post. The switch is a three position type with red, white and off positions. The map light contains a white bulb for general purpose lighting and a red bulb for adjustable instrument lighting. The intensisty of the red bulb is controlled by the center portion of a concentric knob arrangement thru a dual rheostat assembly located on the pilot's switch panel.

16-80. REMOVAL AND INSTALLATION. (Refer to figure 16-10.)

a. For replacement of defective lamp slide the hood and lens from the map light assembly and remove the bayonet type bulb.

b. For removal of the map light assembly, remove the screws from the front door post shield. Remove the washer and nut attaching the map light. Remove the ground wire from the map light screw. Detach the wires at the quick disconnect fasteners and remove the map light assembly.

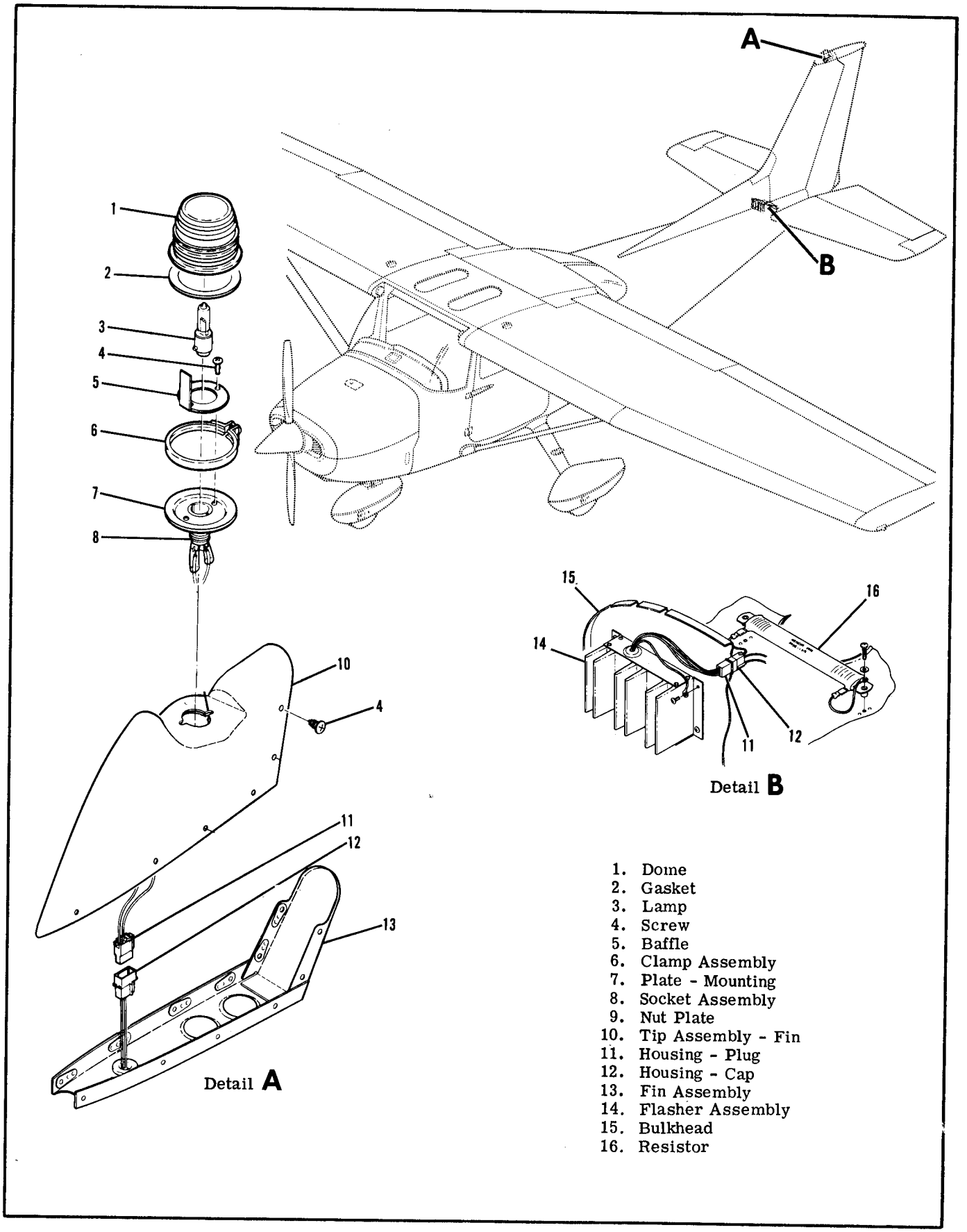
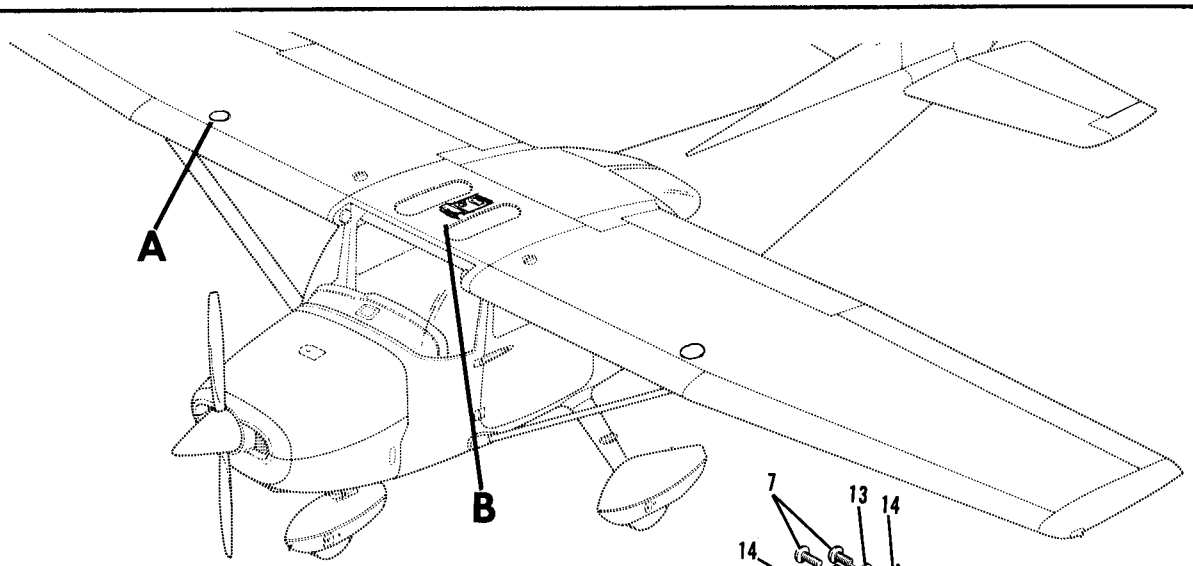
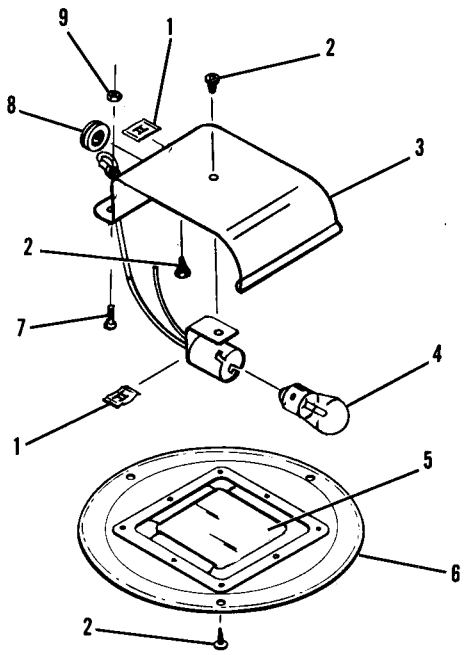
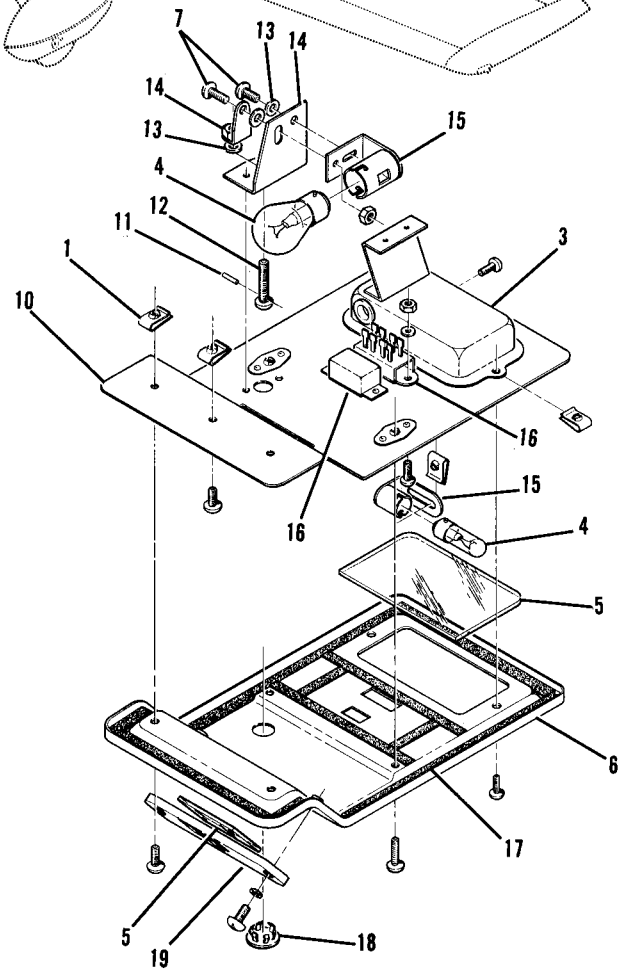


Figure 16-7. Flashing Beacon Light Installation.





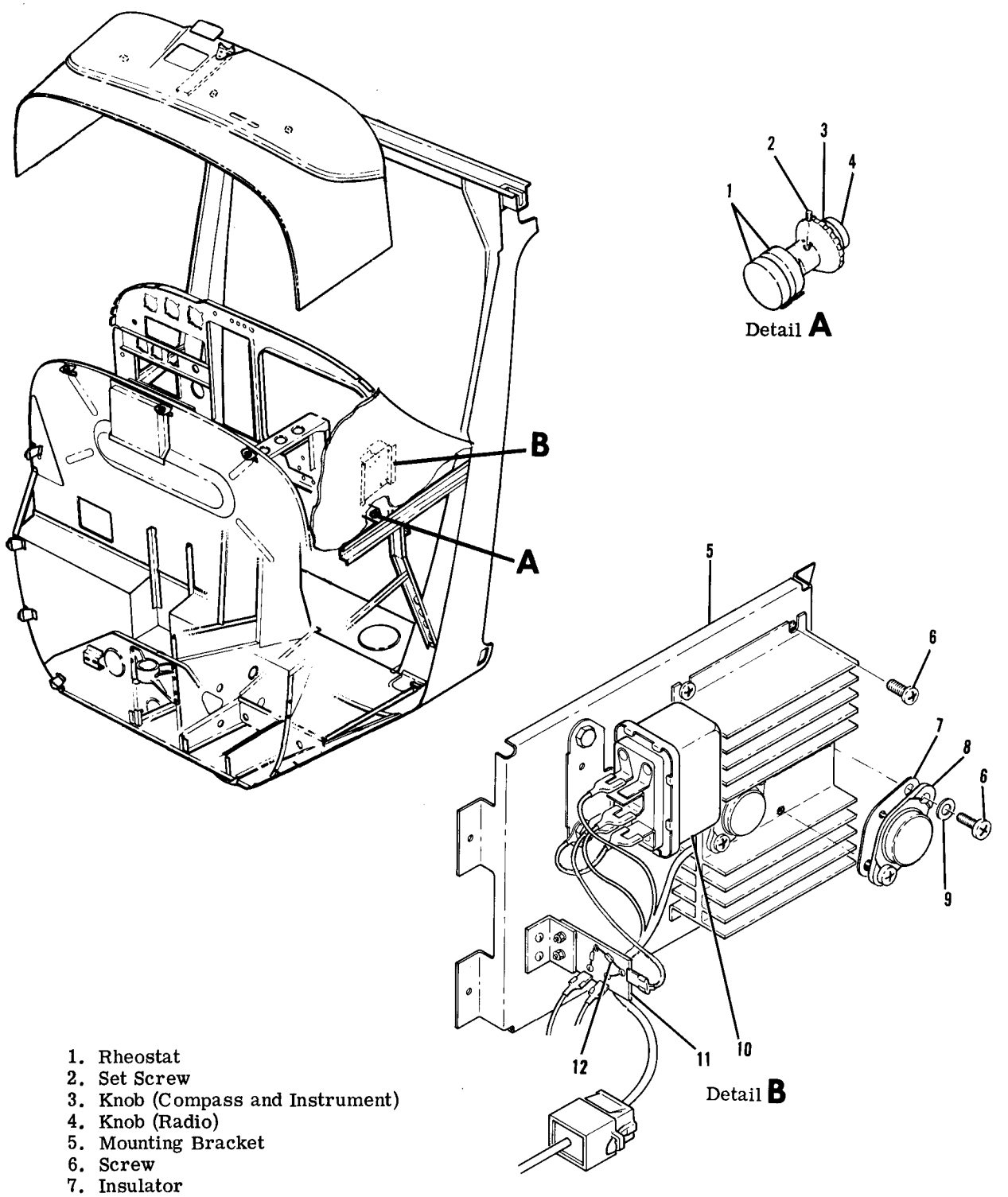
Detail **A**



Detail **B**

1. Tinnerman Nut
2. Tinnerman Screw
3. Reflector
4. Lamp
5. Lens
6. Cover
7. Machine Screw
8. Grommet
9. Nut
10. Support
11. Pin
12. Adjustment Screw
13. Washer
14. Nut Plate
15. Socket
16. Switch
17. Seal
18. Plug Button
19. Lens Retainer

Figure 16-8. Instrument, Dome and Courtesy Light Installation.



1. Rheostat
2. Set Screw
3. Knob (Compass and Instrument)
4. Knob (Radio)
5. Mounting Bracket
6. Screw
7. Insulator
8. Transistor
9. Washer
10. Relay
11. Diode Board
12. Diode

Figure 16-9. Transistorized Dimming

16-81. CONTROL WHEEL MAP LIGHT.

16-82. DESCRIPTION. The control wheel map light is mounted on the lower side of the control wheel. Light intensity is controlled by a thumb operated rheostat. For dimming the rheostat should be turned clockwise.

16-83. REMOVAL AND INSTALLATION. (Refer to figure 16-11.)

a. For easy access to the map light assembly rotate the control wheel 90°.

b. Label the wires connecting to the map light assembly (terminal block) and remove the screws securing the wires to the terminal block.

c. The assembly should now be free for removal. Remove the two screws securing the map light to the control wheel and remove the map light assembly.

d. For reassembly reverse this procedure.

16-84. PITOT HEATER.

16-85. DESCRIPTION. An electrical heater unit is installed in some pitot tubes. The heater offsets the possibility of ice formations on the pitot tube. The heater is integrally mounted in the pitot tube and is operated by a pull type switch on the instrument panel. (See figure 16-12.)

16-86. CIGAR LIGHTER.

16-87. DESCRIPTION. The cigar lighter (located on the instrument panel) is equipped with a thermal-actuated circuit breaker which is attached to the rear of the cigar lighter. The circuit breaker will open if the lighter becomes jammed in the socket or held in position too long. The circuit breaker may be reset by inserting a small probe into the .078 diameter hole in the back of the circuit breaker and pushing lightly until a click is heard.

CAUTION

Make sure master switch is "OFF" before inserting probe into circuit breaker on cigar lighter to reset.

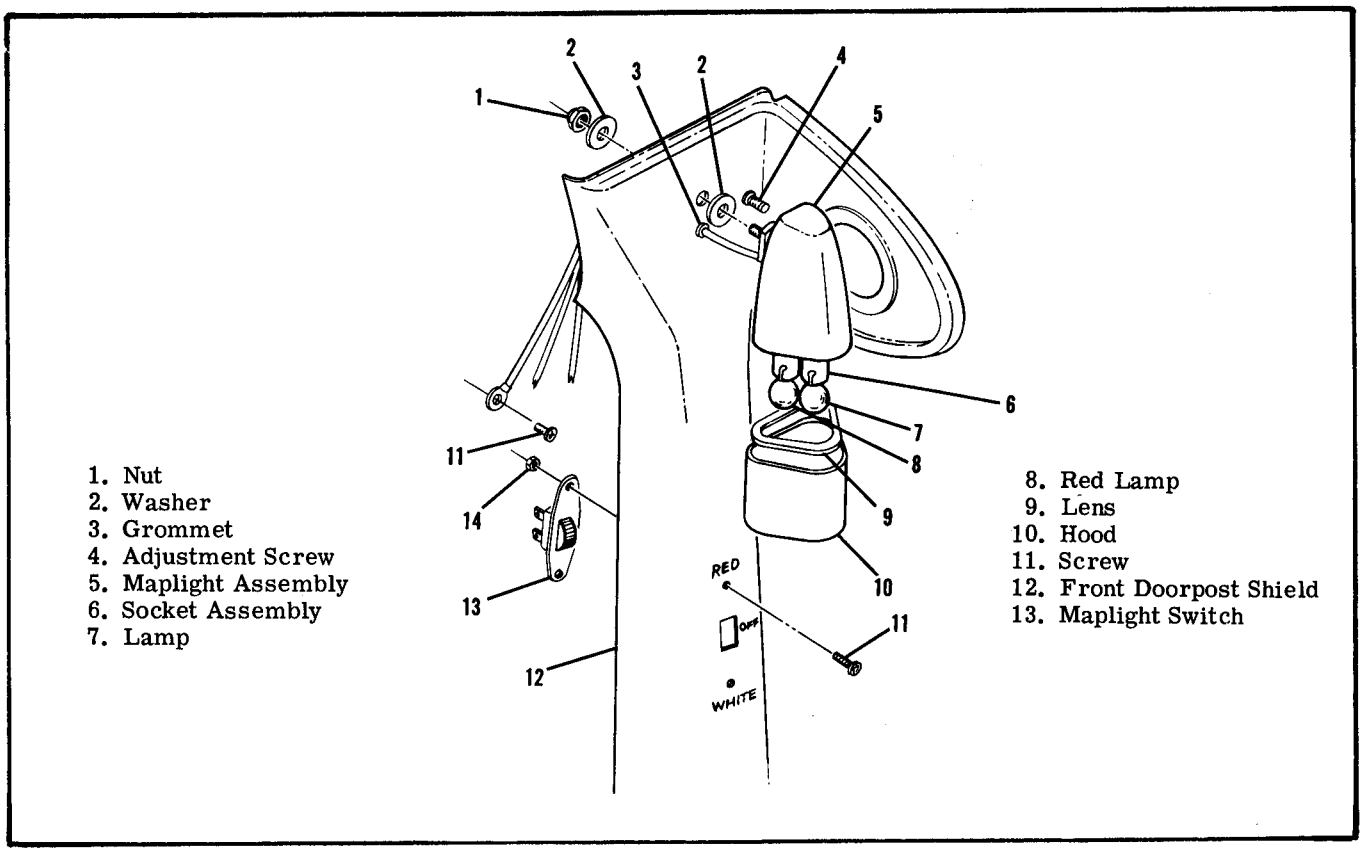
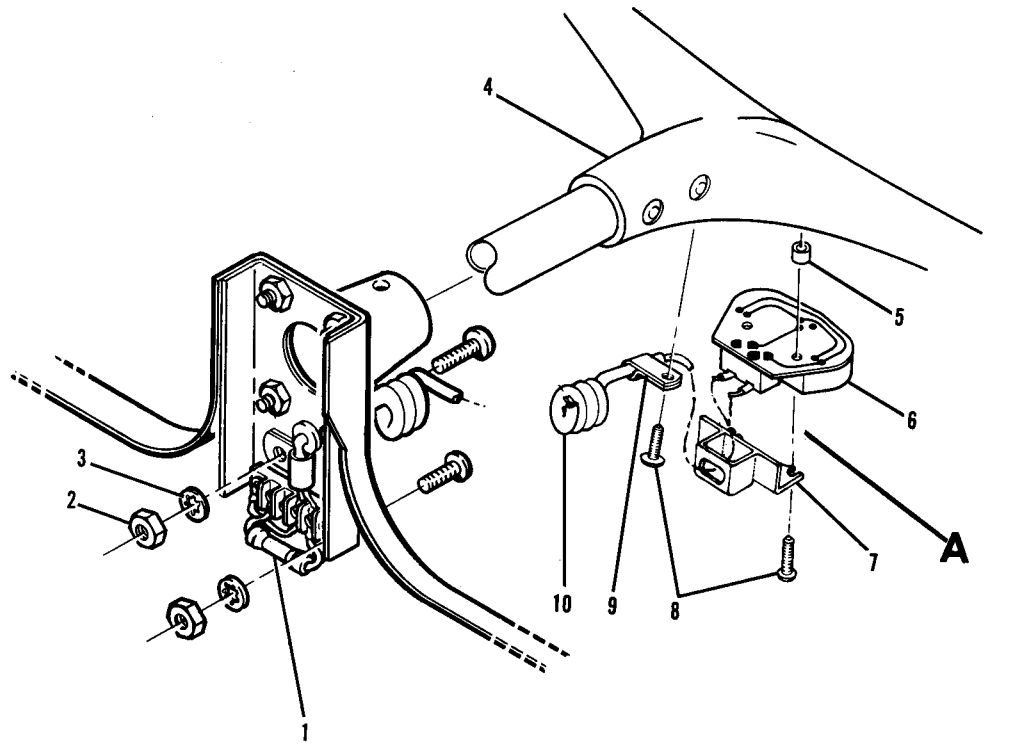
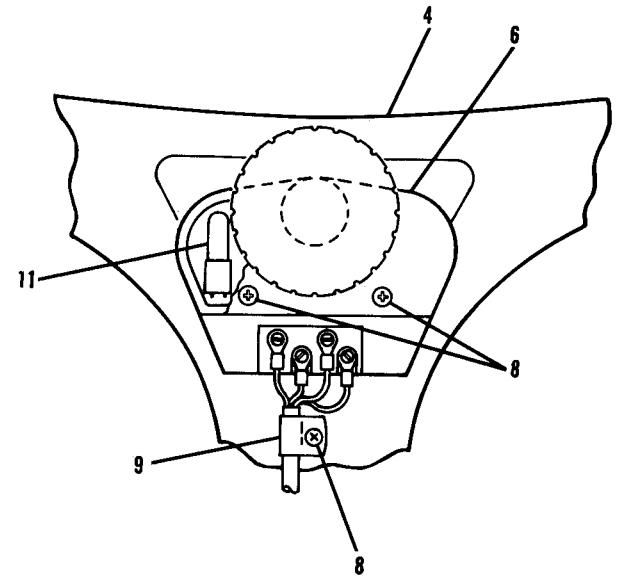


Figure 16-10. Map Light Installation

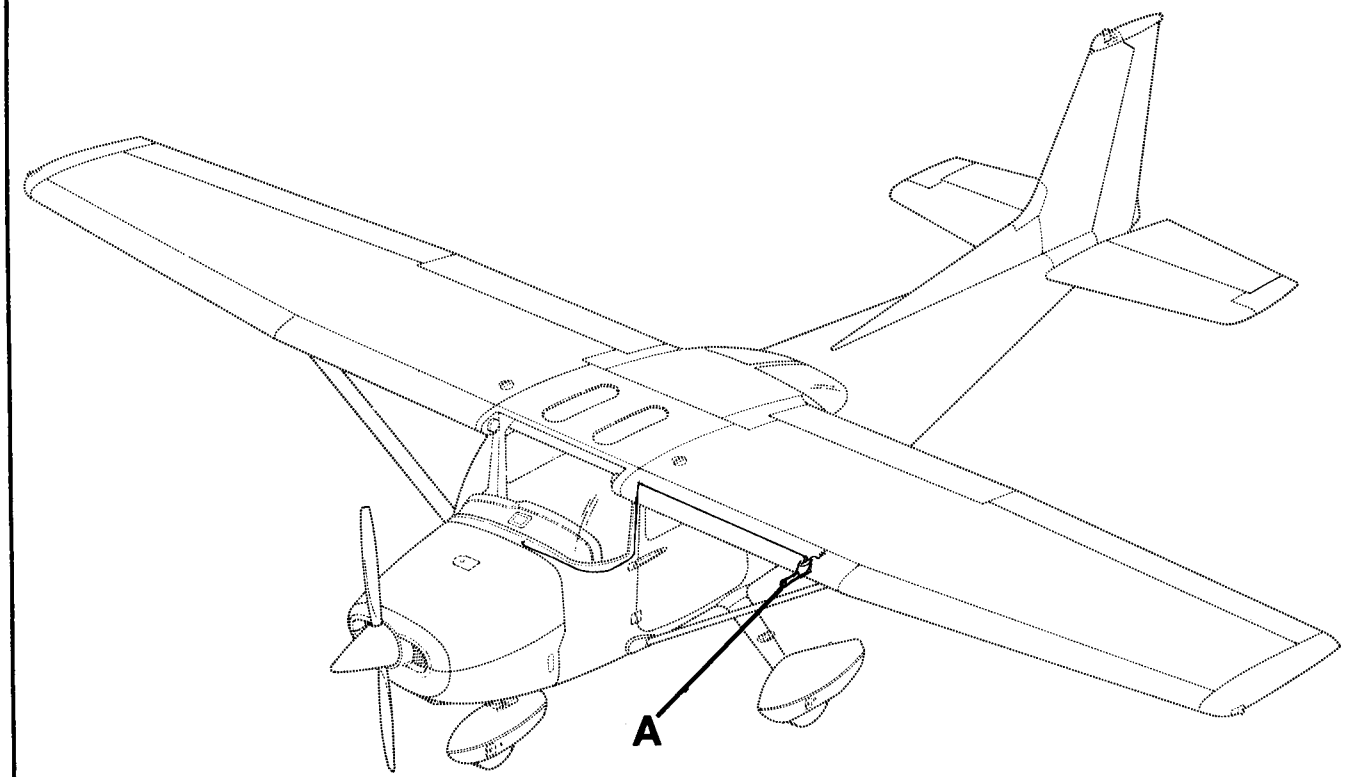


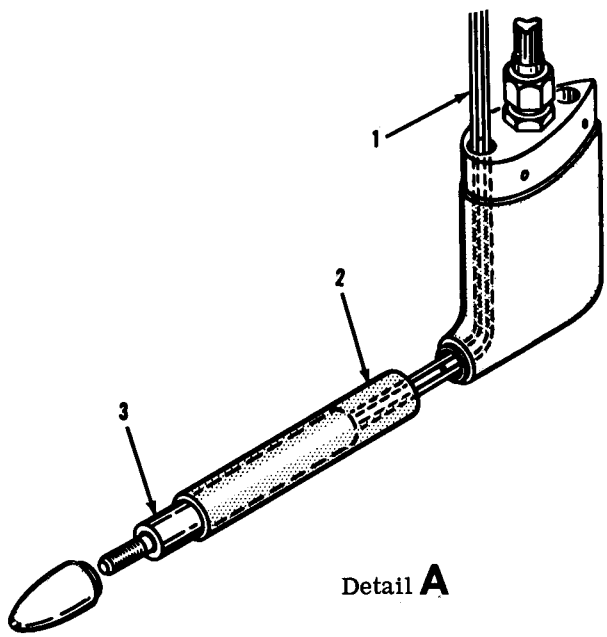


Detail **A**

1. Fuse
2. Nut
3. Washer
4. Control Wheel Assembly
5. Spacer
6. Map Light Assembly
7. Cover
8. Screw
9. Clamp
10. Cable Assembly
11. Lamp

Figure 16-11. Control Wheel Map Light Installation





1. Electrical Leads
2. Pitot Tube
3. Heating Element

Detail **A**

Figure 16-12. Heated Pitot Installation

16-88. EMERGENCY LOCATOR TRANSMITTER.

16-89. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The C589510-0209 transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The C589510-0211 transmitter used for Canadian registry, operates on 121.5 only. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a distinct, easily recognizable distress signal for reception by search and rescue personnel and others monitoring the emergency frequencies. Power is supplied to the transmitter by a battery-pack which has the service life of the batteries placarded on the batteries and also on the outside end of the transmitter. ELT's are equipped with a battery-pack containing four lithium "D" size batteries which are stacked in two's (See figure 16-13). The ELT 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 (75 MW-minimum), for a continuous period of time as listed in the following table.

TRANSMITTER LIFE
TO 75 MILLIWATTS OUTPUT

Temperature	4 Cell Lithium Battery Pack
+130°F	115 hrs
+ 70°F	115 hrs
- 4°F	95 hrs
- 40°F	23 hrs

Battery-packs have a normal shelf life of five to ten (5-10) years and must be replaced at 1/2 of normal shelf life in accordance with TSO-C91. Cessna specifies 5 years replacement of lithium (4-cell) battery packs.

16-90. 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, for a duration of 11-16 milliseconds.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 5 seconds or you may activate downed aircraft procedures by C.A.P., D.O.T. or F.A.A. personnel.

16-91. CHECKOUT INTERVAL:

100 HOURS.

a. Turn aircraft master switch ON.
b. Turn aircraft transceiver ON and set frequency on receiver to 121.5 MHZ.
c. Remove the ELT's antenna cable from the ELT unit.
d. Place the ELT's function selector switch in the ON position for 5 seconds or less. Immediately replace the ELT function selector switch in the ARM position after testing ELT.
e. Test should be conducted only within the time period made up of the first five minutes after any hour.

CAUTION

Tests with the antenna connected should be approved and confirmed by the nearest control tower.

NOTE

Without its antenna connected, the ELT will produce sufficient signal to reach your receiver, yet it will not disturb other communications or damage output circuitry.

NOTE

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

f. 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.

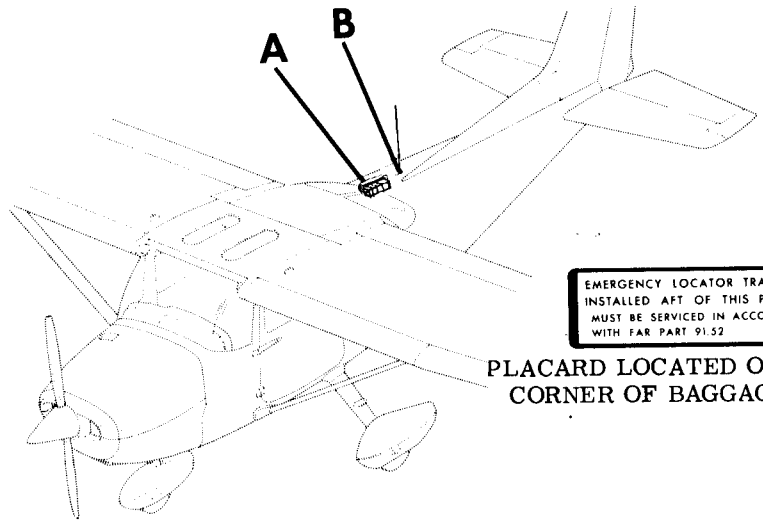
16-92. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 16-13.)
a. Remove baggage curtain to gain access to the transmitter and antenna.
b. Disconnect co-axial cable from end of transmitter.
c. Cut sta-strap securing antenna cable and unlatch metal strap to remove transmitter.

NOTE

Transmitter is also attached to the mounting bracket by velcro strips; pull transmitter to free from mounting bracket and velcro.

NOTE

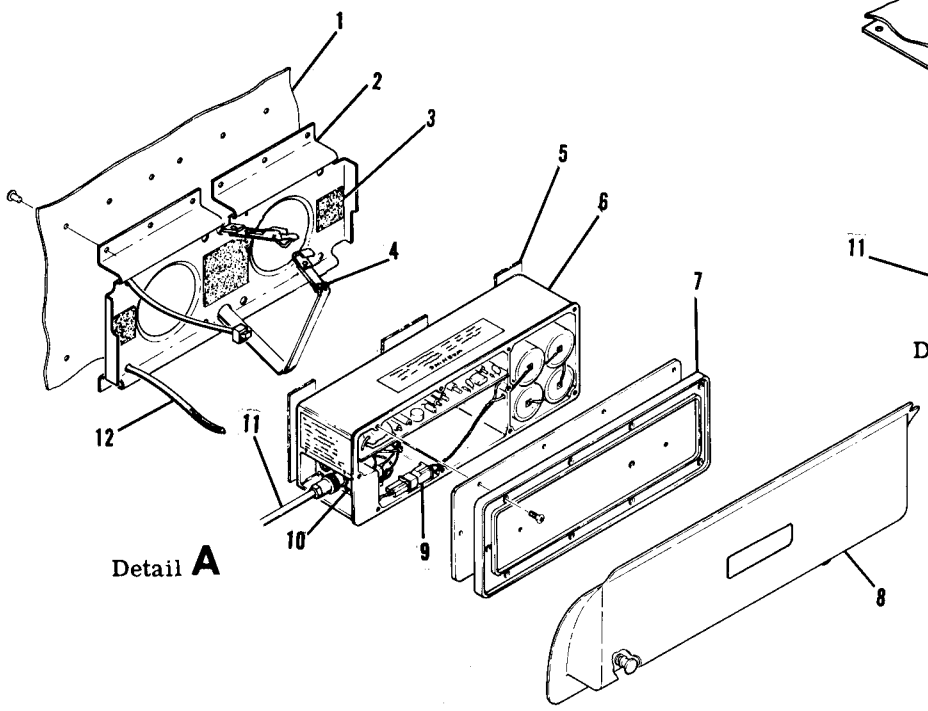
To replace velcro strips, clean surface thoroughly with clean cloth saturated in one of the following solvents: Trichloric thylene, Aliphatic Napthas, Methyl Ethyl Ketone or Enmar 6094 Lacquer Thinner. Cloth should be folded each time the surface is wiped to present a clean area and avoid redepositing of grease. Wipe surface immediately with clean dry cloth, do not allow solvent to dry on surface. Apply Velcro #40 adhesive to

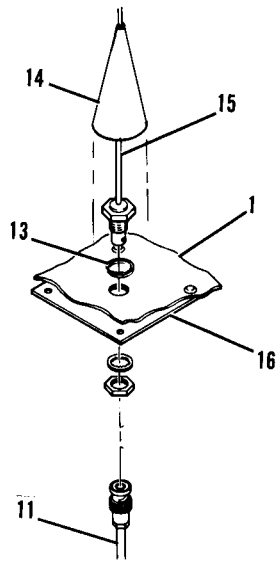


PLACARD LOCATED ON UPPER R. H. CORNER OF BAGGAGE CURTAIN

NOTE

Metal Strap (4) must be positioned so that latch is on top of transmitter as installed in the aircraft and not across transmitter cover.





1. Tailcone Skin
2. Bracket
3. Fabric Fastener - Hook
4. Metal Strap
5. Fabric Fastener - Pile
6. Transmitter
7. Cover
8. Access Cover
9. Connector
10. Arm Switch
11. Co-axial Cable
12. Sta-strap
13. Rubber Washer
14. Rubber Boot
15. Antenna
16. Doubler

Figure 16-13. Emergency Locator Transmitter Installation

each surface in a thin even coat and allow to dry until quite tacky, but no longer transfers to the finger when touched (usually between 5 and 30 minutes). Porous surfaces may require two coats. Place the two surfaces in contact and press firmly together to ensure intimate contact. Allow 24 hours for complete cure.

d. To reinstall transmitter, reverse preceding steps.

NOTE

An installation tool is required to properly secure sta-strap. This tool may be purchased locally or ordered from the Panduit Corporation, Tinley Park, Ill., part number GS-2B (Conforms to MS90387-1).

CAUTION

Ensure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

16-93. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 16-13.)

a. Disconnect co-axial cable from base of antenna.

b. Remove the nut and lockwasher attaching the antenna base to the fuselage and the antenna will be free for removal.

c. To reinstall the antenna, reverse the preceding steps.

NOTE

Upon reinstallation of antenna, cement rubber boot (14) using RTV102, General Electric Co. or equivalent, to antenna whip only; do not apply adhesive to fuselage skin or damage to paint may result.

16-94. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 16-14.)

NOTE

Transmitters equipped with the 4 cell battery-pack can only be replaced with another 4 cell battery-pack.

a. After the transmitter has been removed from aircraft in accordance with para, 16-92, place the transmitter switch in the OFF position.

b. Remove the nine screws attaching the cover to the case and then remove the cover to gain access to the battery pack.

NOTE

Retain the rubber gasket and screws for reinstallation.

c. Disconnect the battery-pack electrical connector and remove battery-pack.

d. Place new battery-pack in the transmitter with four batteries as shown in the case in figure 16-14.

e. Connect the electrical connector as shown in figure 16-14.

NOTE

Before installing the new 4 cell battery-pack, check to ensure that its voltage is 11.2 volts or greater.

CAUTION

It is desirable to replace adhesive material on the 4 cell battery-pack, use only 3M Jet Melt Adhesive #3738. Do not use other adhesive materials since other materials may corrode the printed circuit board assembly.

f. Replace the transmitter cover and gasket.

g. Remove the old battery-pack placard from the end of transmitter and replace with new battery-pack placard supplied with the new battery-pack.

CAUTION

Be sure to enter the new battery-pack expiration date in the aircraft records. It is also recommended this date be placed in your ELT Owner's Manual for quick reference.

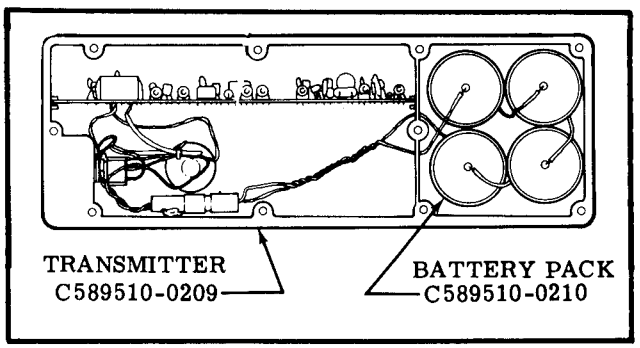


Figure 16-14. Lithium 4 Cell Battery Pack Installations

16-95. TROUBLE SHOOTING. Should your Emergency Locating Transmitter fail the 100 Hours performance checks, it is possible to a limited degree to isolate the fault to a particular area of the equipment. In performing the following trouble shooting procedures 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.

16-95. TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
*POWER LOW	Low battery voltage.	1. Set toggle switch to off. 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 battery pack transmitters is 11.2 volts or less, the battery pack is below specification.
	Faulty transmitter.	3. If the battery-pack voltage meets the specifications in step 2, the battery-pack is O.K. If the battery is O.K., check the transmitter as follows: a. Remove the voltmeter. b. By means of a switchcraft 750 jackplug and 3 inch maximum long leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to ON and observe the ammeter current drain. If the current-drain is in the 85-100 ma range, the transmitter or the co-axial cable is faulty.
	Faulty co-axial antenna cable.	4. Check co-axial 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 co-axial cable provided with your unit.

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD 1977
Battery Contactor	0.6
Fuel Indicators	0.4
Flashing Beacon Light	7.0
Instrument Lights	1.3
Position Lights	5.6
Turn Coordinator	0.8
OPTIONAL EQUIPMENT (RUNNING LOAD)	
Strobe Lights	4.0
Cessna 300 ADF (Type R-546E)	1.0
Cessna 300 Nav/Com (100 Channel-Type RT-308C)	1.5
Cessna 300 HF Transceiver (PT10-A)	1.5
Cessna 300 Transceiver (Type RT-524A)	3.2
Cessna 300 Transponder (RT-359A)	1.0
Cessna 400 Glideslope (Type R-443B) (40 Channel)	.4
Cessna 400 Marker Beacon (Type R-402A)	.3
Sunair SS Band HF Transceiver (Type ASB-125)	5.0
Cessna 300A Navomatic (Type AF-395A)	2.0
Cessna 200 Navomatic (Type AF-295B)	2.0
Cessna EA-401A Encoding Altimeter	.065
Cessna 300 Nav/Com (720 Channel-RT-328T)	1.5
Narco 190 DME	3.0
Cessna 400 XPDR (ARC Type RT-459A)	1.0★
Bendix GM-247A Marker Beacon	.1★
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD	
Cigarette Lighter	10.0
Clock	†
Control Wheel Map Light	.33
Courtesy & Dome Lights	2.5
Flap Motor	15.0
Landing and Taxi Light (Cowl Mounted)	2 .0
Landing and Taxi Lights (Cowl Mounted)	15.6
Map Light	.33

†Negligible
★EXPORT ONLY

SECTION 18

STRUCTURAL REPAIR

TABLE OF CONTENTS

18-1. STRUCTURAL REPAIR.

18-2. REPAIR CRITERIA. Although this section outlines repair permissible on structure of the aircraft, the decision of whether to repair or replace a major unit of structure will be influenced by such factors as time and labor available, and by a comparison of labor costs with the price of replacement assemblies. Past experience indicates that replacement, in many cases, is less costly than major repair. Certainly, when the aircraft must be restored to its airworthy condition in a limited length of time,

replacement is preferable. Restoration of a damaged aircraft to its original design strength, shape, and alignment involves careful evaluation of the damage, followed by exacting workmanship in performing the repairs. This section suggests the extent of structural repair practicable on the aircraft, and supplements Federal Aviation Regulation, Part 43. Consult the factory when in doubt about a repair not specifically mentioned here.

18-3. EQUIPMENT AND TOOLS.

18-4. SUPPORT STANDS. Padded, reinforced sawhorse or tripod type support stands, sturdy enough to support any assembly placed upon them, must be used to store a removed wing or tailcone. Plans for local fabrication of support stands are contained in figure 18-1. The fuselage assembly, from the tailcone to the firewall, must NOT be supported from the underside, since the skin bulkheads are not designed for this purpose. Adapt support stands to fasten to the wing attach points or landing gear attach points when supporting a fuselage.

18-5. FUSELAGE REPAIR JIGS. Whenever a repair is to be made which could affect structural alignment, suitable jigs must be used to assure correct alignment of major attach points, such as fuselage, firewall, wing and landing gear. These fuselage repair jigs are obtainable from the factory.

18-6. WING JIGS. These jigs serve as a holding fixture during extensive repair of a damaged wing, and locates the root rib, leading edge and tip rib of the wing. These jigs are also obtainable from the factory.

18-7. WING TWIST AND STABILIZER ANGLE-OF-INCIDENCE.

18-8. Wing twist (washout) and horizontal stabilizer angle fo incidence are shown below. Stabilizers do not have twist. Wings have no twist from the root to the lift strut station. All twist in the wing panel occurs between this station and the tip rib. Refer to figure 18-2 for wing twist measurement.

WING	
Twist (Washout)	3° 37'
STABILIZER	
Angle of Incidence	-3° 30'

18-9. REPAIR MATERIALS. Thickness of a material on which a repair is to be made can easily be determined by measuring with a micrometer. In general, material used in Cessna aircraft covered in this manual is made from 2024 aluminum alloy, heat treated to a -T3, -T4, or -T42 condition. If the type of material cannot readily be determined, 2024-T3 may be used in making repairs, since the strength of -T3 is greater than -T4 or -T42 (-T4 and -T42 may be used interchangeably, but they may not be substituted for -T3). When necessary to form a part with a smaller bend radius than the standard cold bending radius for 2024-T4, use 2024-0 and heat treat to 2024-T42 after forming. The repair material used in making a repair must equal the gauge of the material being replaced unless otherwise noted. It is often practical to cut repair pieces from service parts listed in the Parts Catalog. A few components (empennage tips, for example) are fabricated from thermo-formed plastic or glass-fiber constructed material.

18-10. WING.

18-11. DESCRIPTION. The wing assemblies are a semicantilever type employing semimoncoque type of structure. Basically, the internal structure consists of built-up front and rear spar assemblies, a formed auxiliary spar assembly and formed sheet metal nose, intermediate, and trailing edge ribs. Stressed skin, riveted to the rib and spar structures, completes the rigid structure. Access openings (hand holes with removable cover plates) are located in the underside of the wing between the wing root and tip section. These openings afford access to aileron bellcranks, flap bellcranks, electrical wiring, strut attach fittings, control cables and pulleys, and control disconnect points.

18-12. WING SKIN.

18-13. 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 and material edges. Stop drilling is considered a temporary repair and a permanent repair must be made as soon as practicable.

18-14. REPAIRABLE DAMAGE. Figure 18-4 outlines typical repair to be employed in patching skin. Before installing a patch, trim the damaged area to form a retangular pattern, leaving at least a one-half inch radius at each corner, and de-burr. The sides of the hole should lie span-wise or chord-wise. A circular patch may also be used. If the patch is in an area where flush rivets are used, make a flush patch type of repair; if in an area where flush rivets

are not used, make an overlapping type of repair. Where optimum appearance and airflow are desired, the flush patch may be used. Careful workmanship will eliminate gaps at butt-joints; however, an epoxy type filler may be used at such joints.

18-15. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a skin is badly damaged, repair must be made by replacing an entire skin panel, from one structural member to the next. Repair seams must be made to lie along structural members and each seam must be made exactly the same in regard to rivet size, spacing, and pattern as the manufactured seams at the edges of the original sheet. If the manufactured seams are different, the stronger must be copied. If the repair ends at a structural member where no seam is used, enough repair panel must be used to allow an extra row of staggered rivets, with sufficient edge margin, to be installed.

18-16. WING STRINGERS.

18-17. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-18. REPAIRABLE DAMAGE. Figure 18-5 outlines a typical wing stringer repair. Two such repairs may be used to splice a new section of stringer material in position, without the filler material.

18-19. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a stringer is so badly damaged that more than one section must be spliced, replacement is recommended.

18-20. WING AUXILIARY SPARS.

18-21. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-22. REPAIRABLE DAMAGE. Figure 18-8 illustrates a typical auxiliary spar repair.

18-23. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If damage to an auxiliary spar would require a repair which could not be made between adjacent ribs, the auxiliary spar must be replaced.

18-24. WING RIBS.

18-25. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-26. REPAIRABLE DAMAGE. Figure 18-6 illustrates a typical wing rib repair.

18-27. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Leading and trailing edge ribs that are extensively damaged can be replaced. However, due to the necessity of unfastening an excessive amount of skin in order to replace the rib, they should be repaired if practicable. Center ribs, between the front and rear spar should always be repaired if practicable.

18-28. WING SPARS.

18-29. NEGLIGIBLE DAMAGE. Due to the stress which wing spars encounter, very little damage can be considered negligible. All cracks, stress wrinkles, deep scratches, and sharp dents must be repaired. Smooth dents, light scratches and abrasions may be considered negligible.

18-30. REPAIRABLE DAMAGE. Figure 18-7 illustrates typical spar repairs. It is often practical to cut repair pieces from service parts listed in the Parts Catalog. Service Kits are available for certain types of spar repairs.

18-31. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Damage so extensive that repair is not practicable requires replacement of a complete wing spar. Also refer to paragraph 18-2.

18-32. AILERONS.

18-33. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-34. REPAIRABLE DAMAGE. The repair shown in figure 18-9 may be used to repair damage to aileron leading edge skins. Figure 18-4 may be used to repair damage to flat surfaces between corrugations, when damage area includes corrugations refer to figure 18-3A. It is recommended that material used for repair be cut from spare parts of the same guage and corrugation spacing. Following repair the aileron must be balanced. Refer to paragraph 18-36 and figure 18-3 for balancing the aileron. If damage would require a repair which could not be made between adjacent ribs, see the following paragraph.

18-35. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damage would require a repair which could not be made between adjacent ribs, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occured, replacement of the aileron assembly is recommended. After repair and/or replacement, balance aileron in accordance with paragraph 18-36 and figure 18-3.

18-36. AILERON BALANCING. Following repair, replacement or painting, the aileron must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-37. WING FLAPS.

18-38. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-39. REPAIRABLE DAMAGE. Flap repairs should be similar to aileron repairs discussed in paragraph 18-34. A flap leading edge repair is shown in figure 18-10. If an overlapping patch is to be used, be sure it will not interfere with the wing during flap operation.

18-40. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Flap repairs which require replacement of parts should be similar to aileron repairs discussed in paragraph 18-35. Since the flap is not considered a moveable control surface, no balancing is required.

18-41. WING LEADING EDGE.

18-42. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-43. REPAIRABLE DAMAGE. A typical leading edge skin repair is shown in figure 18-9. An epoxy-type filler may be used to fill gaps at butt-joints. To facilitate repair, extra access holes may be installed in the locations noted in figure 18-11. If the damage would require a repair which could not be made between adjacent ribs, refer to the following paragraph.

18-44. DAMAGE NECESSITATING REPLACEMENT OF PARTS. For extensive damage, complete leading edge skin panels must be replaced. To facilitate replacement, extra access holes may be installed in the locations noted in figure 18-11.

18-45. ELEVATORS AND RUDDER.

18-46. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13. The exception to negligible damage on the elevator surfaces is the front spar, where a crack appearing in the web at the hinge fittings or in the structure 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.

18-47. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage between corrugations. For skin damage which includes corrugations, refer to figure 18-3A. Following repair the elevator/rudder must be balanced. Refer to figure 18-3 for balancing. If damage would require a repair which could not be made between adjacent ribs, see the following paragraph.

18-48. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the entire assembly is recommended. After repair and/or replacement, balance elevators and rudder in accordance with paragraph 18-49 and figure 18-3.

18-49. ELEVATOR AND RUDDER BALANCING. Following repair, replacement or painting, the elevators and rudder must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-50. FIN AND STABILIZER.

18-51. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13.

18-52. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Access to the dorsal area of the fin may be gained by removing the horizontal closing rib at the bottom of the fin. Access to the internal fin structure is best gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. Access to the stabilizer structure may be gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. If the damaged area would require a repair which could not be made between adjacent ribs, or a repair would be located in an area with compound curves, see the following paragraph.

18-53. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, or the repair would be located in an area with compound curves, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where damage is extensive, replacement of the entire assembly is recommended.

18-54. FUSELAGE.

18-55. DESCRIPTION. The fuselage is of semi-monocoque construction, consisting of formed bulkheads, longitudinal stringers, reinforcing channels, and skin panels.

18-56. NEGLIGIBLE DAMAGE. Refer to paragraph 18-13. Mild corrosion appearing upon alclad surfaces does not necessarily indicate incipient failure of the base metal. However, corrosion of all types must be carefully considered, and approved remedial action taken. Small cans appear in the skin structure of all metal aircraft. It is strongly recommended however, that wrinkles which appear to have originated from other sources, or which do not follow the general appearance of the remainder of the skin panels, be thoroughly investigated. Except in the landing gear bulkhead areas, wrinkles occurring over stringers which disappear when the rivet pattern is removed, may be considered negligible. However, the stringer rivet holes may not align perfectly with the skin holes because of a permanent "set" in the stringer. If this is apparent, replacement of the stringer will usually restore the original strength characteristics of the area.

NOTE

Wrinkles occurring in the skin of the main landing gear bulkhead areas must not be considered negligible. The skin panel must be opened sufficiently to permit a thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

Wrinkles occurring in open areas which disappear when the rivets at the edge of the sheet are removed, or a wrinkle which is hand removable, may often be repaired by the addition of a 1/2 x 1/2 x .060 inch 2024-T4 extruded angle, riveted over the wrinkle and extended to within 1/16 to 1/8 inch of the nearest structural members. Rivet pattern should be identical to existing manufactured seam at edge of sheet. Negligible damage to stringers, formed skin flanges, bulkhead channels, and like parts is similar to that for the wing skin, given in paragraph 18-13.

18-57. REPAIRABLE DAMAGE. Fuselage skin repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 18-14. Stringers, formed skin flanges, bulkhead channels and similar parts may be repaired as shown in figure 18-5.

18-58. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Fuselage skin major repairs may be accomplished in the same manner as the wing repairs outlined in paragraph 18-15. Damaged fittings must be replaced. Seat rails serve as structural parts of the fuselage and must be replaced if damaged.

18-58A. BONDED DOORS.

18-58B. REPAIRABLE DAMAGE. Bonded doors may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in doors may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43.13-1 are also applicable to bonded doors.

18-59. BULKHEADS.

18-60. LANDING GEAR BULKHEADS. Since these bulkheads are highly stressed members, irregularly formed to provide clearance for control cables, fuel lines, etc., the patch-type repairs will be, for the most part, impractical. Minor damage, consisting of small nicks or scratches, may be repaired by dressing out the damaged area, or by replacement of rivets. Any other damage must be repaired by replacing the landing gear support assembly as an aligned unit.

18-61. REPAIR AFTER HARD LANDING. Buckled skin or floorboards, and loose or sheared rivets in the area of the main gear support will give evidence of damage to the structure from an extremely hard landing. When such evidence is present, the entire support structure must be examined, and all support forgings must be checked for cracks, using a dye penetrant and proper magnification. Bulkheads in the damaged area must be checked for alignment, and deformation of the bulkhead webs must be determined with the aid of a straightedge. Damaged support structure, buckled floorboards and skins, and damaged or questionable forgings must be replaced.

18-62. REPLACEMENT OF HI-SHEAR RIVETS. Hi-shear rivet replacement with close tolerance bolts or other commercial fasteners of equivalent strength properties is permissible. Holes must not be elongated, and the Hi-shear substitute must be a smooth push fit. Field replacement of main landing gear forgings on bulkheads may be accomplished by using:

a. NAS464P* Bolt, MS21042-* Nut and AN960-* washer in place of Hi-Shear Rivets for forgings with machined flat surface around attachment holes.

b. NAS464P* Bolt, ESNA 2935* (S-1925-1) Mating Base Ring, ESNA LH 2935* (S-1924-1) Nut for forgings (with draft angle of up to a maximum of 8°) without machined flat surface around attachment holes.

*Dash numbers to be determined according to the size of the holes and the grip lengths required. The bolts grip length should be chosen so that No threads remain in the bearing area.

18-63. FIREWALL DAMAGE. Firewalls may be repaired by removing the damaged material and splicing in a new section. The new portion must be lapped over the old material, sealed with Pro-Seal #700 (Coast Pro-Seal Co., Chemical Division, 2235 Beverly Blvd, Los Angeles, California), compound or equivalent, and secured with stainless steel rivets. Damaged or deformed angles and stiffeners may be repaired as shown in figure 18-12, or they may be replaced. A severely damaged firewall must be replaced as a unit.

18-64. ENGINE MOUNT.

18-65. DESCRIPTION. The mount for the aircraft engine is constructed of 4130 chrome-molybdenum steel tubing. A truss structure, fastened to the firewall at four points, supports a cradle arrangement. This cradle arrangement with its supporting lugs, forms the base for rubber shock mounted engine supports.

18-66. GENERAL CONSIDERATIONS. All welding on the engine mount must be of the highest quality since the tendency of vibration is to accentuate any minor defect present and cause fatigue cracks. Engine mount members are preferably repaired by using a larger diameter replacement tube, telescoped over the stub of the original member using fishmouth and rosette type welds. However, reinforced 30-degree scarf welds in place of the fishmouth welds are considered satisfactory for engine mount repair work.

18-67. ENGINE MOUNT SUPPORT CRADLE DAMAGE. Minor damage such as a crack adjacent to an engine attaching lug may be repaired by rewelding the cradle tube and extending a gusset past the damaged area. Extensively damaged parts must be replaced.

18-68. DAMAGE INVOLVING ENGINE MOUNTING LUGS AND ENGINE MOUNT TO FUSELAGE ATTACHING FITTINGS. Engine mounting lugs and engine mount-to-fuselage attaching fittings should not be repaired but must be replaced.

18-69. BAFFLES. Baffles ordinarily require replacement if damaged for cracked. However, small plate reinforcements riveted to the baffle will often prove satisfactory both to the strength and cooling requirements of the unit.

18-70. ENGINE COWLING.

18-71. REPAIR OF COWLING SKINS. If extensively damaged, complete sections of cowling must be replaced. Standard insert-type skin patches, however, may be used if repair parts are formed to fit. Small

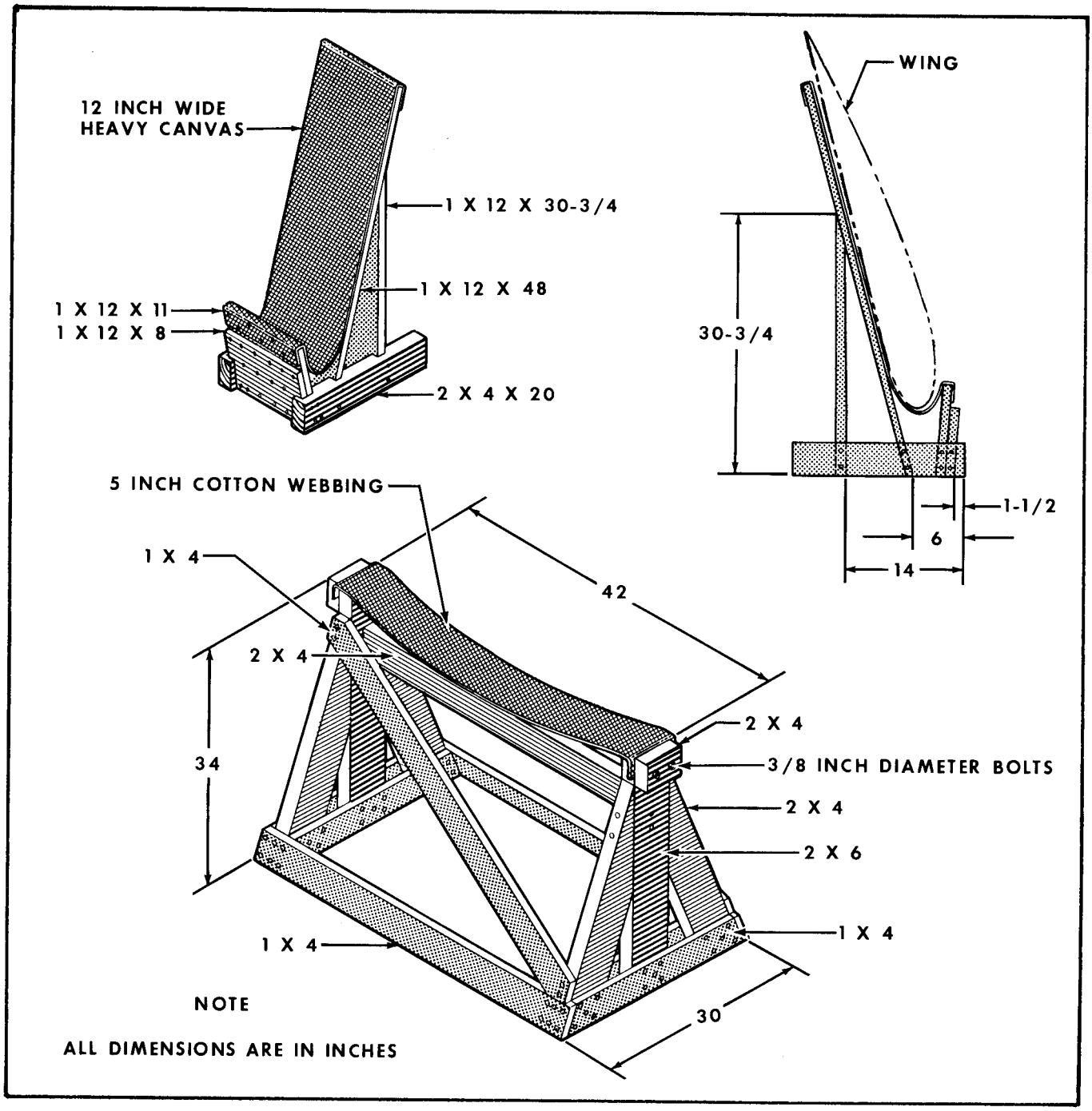
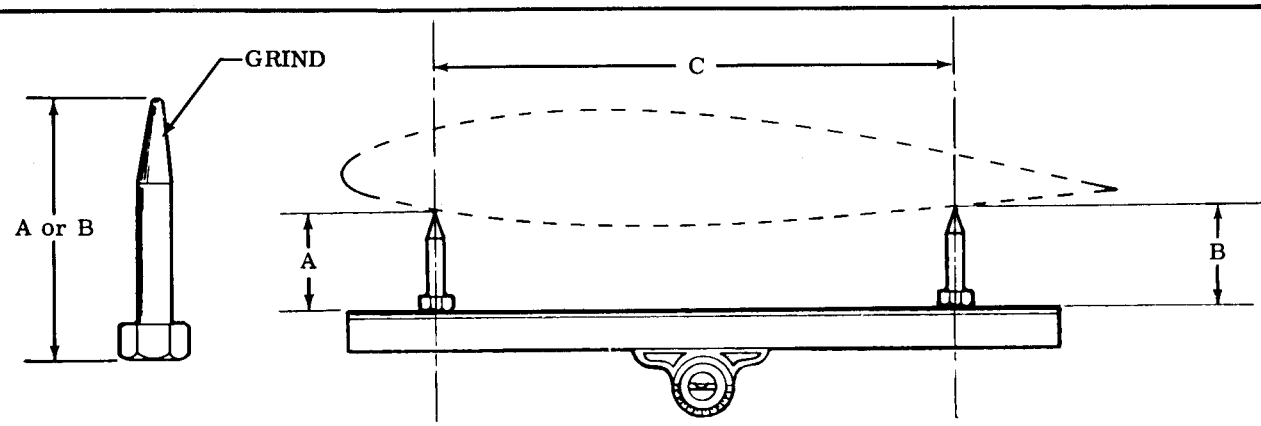


Figure 18-1. Wing and Fuselage Support Stands

cracks may be stop-drilled and dents straightened if they are reinforced on the inner side with a doubler of the same material. Bonded cowling may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in cowling may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43. 13-1 are also applicable to cowling.

18-72. REPAIR OF REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to thier small size they are easier to replace than to repair.

18-73. REPAIR OF ABS COMPONENTS. Rezolin Repair Kit Number 404 may be obtained from the Cessna Service Parts Center for repair of ABS components.



A	B	C	WING STATION
2.00	1.00	29.50	39.00
2.00	1.00	29.50	100.50
.45	1.00	24.00	207.00

ALL WING TWIST OCCURS BETWEEN STA. 100.50 AND STA, 207.00.
(Refer to paragraph 18-7 for angle of incidence).

MEASURING WING TWIST

If damage has occurred to a wing, it is advisable to check the twist. The following method can be used with a minimum of equipment, which includes a straightedge (32" minimum length of angle, or equivalent), three modified bolts for a specific wing, and a protractor head with level.

1. Check chart for applicable dimension for bolt length (A or B).
2. Grind bolt shanks to a rounded point as illustrated, checking length periodically.
3. Tape two bolts to straightedge according to dimension C.
4. Locate inboard wing station to be checked and make a pencil mark approximately one-half inch aft of the lateral row of rivets in the wing leading edge spar flange.
5. Holding straightedge parallel to wing station (stating as clear as possible from "cans"), place longer bolt on pencil mark and set protractor head against lower edge of straightedge.
6. Set bubble in level to center and lock protractor to hold this reading.
7. Omitting step 6, repeat procedure for each wing station, using dimensions specified in chart. Check to see that protractor bubble is still centered.
8. Proper twist is present in wing if protractor readings are the same (parallel). Forward or aft bolt may be lowered from wing .10 inch mazimum to attain parallelism.

Figure 18-2. Checking Wing Twist

18-74. REPAIR OF GLASS-FIBER CONSTRUCTED COMPONENTS. Glass-fiber constructed components on the aircraft may be repaired as stipulated in instructions furnished in Service Kit SK182-12. Observe the resin manufacturer's recommendations concerning mixing and application of the resin. Epoxy resins are preferable for making repairs, since epoxy compounds are usually more stable and predictable than polyester and, in addition, give better adhesion.

BALANCING PROCEDURES

1. Balance control surfaces in an enclosed draft free area.

2. Control surface to be balanced must be in the final flight configuration, painted (if applicable) trim tabs installed, and all foreign matter removed from inside control surface.

3. If control surface is to be painted remove all existing paint prior to repainting and rebalancing. Good workmanship and standard repair practices should not result in excessive additional balance weight.

4. Place balancing mandrels (detail B) on a table or other suitable FLAT, LEVELED surface. Mandrels must be placed at 90° to the hinge line of the control surface.

5. On control surfaces with the piano type hinges, insert inboard and outboard hinges into slotted ends of the balancing mandrels, making sure that balancing mandrels are 90° to the hinge line. On control surfaces with the bearing type hinge point, bolts or pins are inserted through the attaching brackets, then placed on the knife edges of the mandrels as illustrated in (detail H).

6. AILERONS.
   a.
      (1) Block up the trailing edge of the aileron until a spirit-level protractor placed on the front face of the aileron spar at W. S. 154.00 (± 6.00), (detail E), indicates 57° 10', (detail D).

      (2) ALTERNATE METHOD:
      Measure the vertical distance from the aileron hinge point to the leveled surface. Subtract 1.80 inches, then block up trailing edge of the aileron to this measurement.

   b. With the aileron blocked in position place the balancing beam (detail A) at W. S. 154.00, (90° to the hinge line), and adjust the trailing edge support on the balancing beam (detail D) until the beam is level. If the aileron has not been disturbed during this operation, the beam is now parallel to the aileron chord line at W. S. 154.00 (detail D).

NOTE

The above procedure must be performed with care. Small angular discrepancies will produce large balancing errors.

   c. Remove balancing beam and balance the beam by itself at the knife edges by adding washers as shown, (detail C).

   d. Place the balancing beam on the aileron in its original position, then remove the blocks from beneath the trailing edge.

   e. Place the sliding weight (detail D) on the forward end of the balancing beam, moving it along the beam until the beam is again level. A small, lightweight, spirit-level may be used for this purpose provided it is symmetrical about its bubble reference and this reference is placed on the beam directly over the aileron hinge line (detail D).

   f. If aileron is correctly balanced, the position of the sliding weight with respect to the aileron hinge line, will produce a moment about the hinge line somewhere within the underbalance tolerance listed in the chart on (Sheet 5 of 5).

   g. If modification of the aileron balance weight is necessary to correct an out-of-tolerance condition, the balance weight can be lightened by drilling out part of the weight on the inboard end. The weight can be increased by a reasonable amount by ordering additional weight and gang channel listed in the applicable Parts Catalog, and installing next to the inboard weight the minimum amount necessary for correct balance. The minimum amount that must be installed, however, must contain at least two attaching rivets. If this minimum amount results in an over-balanced condition, the new weight and/or old weights can be lightened.

Figure 18-3. Control Surface Balancing (Sheet 1 of 5)

7. RUDDER AND ELEVATORS.

a. With the rudder/elevator set upon a FLAT, LEVELED surface, block up the trailing edge until a center line through the attaching bolt and the trailing edge is equal distance from the leveling surface (detail H).

b. Place the balancing beam (detail A) on the rudder/elevator near the center attaching bracket, (90° to the hinge line). Adjust the trailing edge support on the balancing beam (detail H) until the beam is level. If the rudder/elevator has not been disturbed during this operation, the beam is now parallel to the chord line of the rudder/elevator.

NOTE

The above procedure must be performed with care. Small angular discrepancies will produce large balancing errors.

c. Mark position of the balancing beam, then remove and balance the beam by itself at the knife edges by adding washers as shown in (detail C).

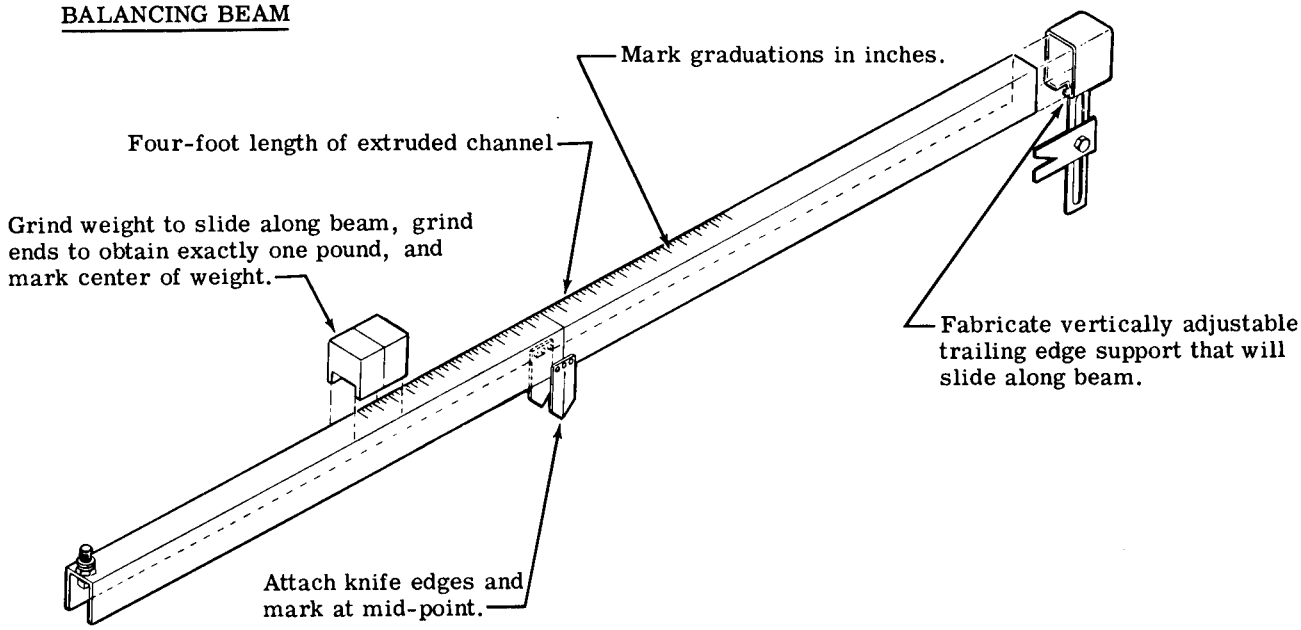
d. Place the balancing beam on the rudder/elevator in its original position, then remove the block from beneath the trailing edge.

e. Place the sliding weight (detail H) on the forward end of the balance beam, move it along the beam until the beam is again level. A small, lightweight, spirit-level may be used for this purpose provided it is symmetrical about its bubble reference and this reference is placed on the beam directly over the rudder/elevator hinge line (detail H).

f. If the rudder/elevator is correctly balanced, the position of the sliding weight with respect to the rudder/elevator hinge line, will produce a moment about the hinge line somewhere within the underbalance tolerance listed in the chart on (Sheet 5 of 5).

g. If modification of the rudder/elevator balance weight is necessary to correct an out-of-balance condition, the balance weight can be lightened by drilling out part of the weight. The weight can be increased by fusing bar stock solder to the weight after removal from rudder/elevator.

BALANCING BEAM



Detail **A**

Figure 18-3. Control Surface Balancing (Sheet 2 of 5)

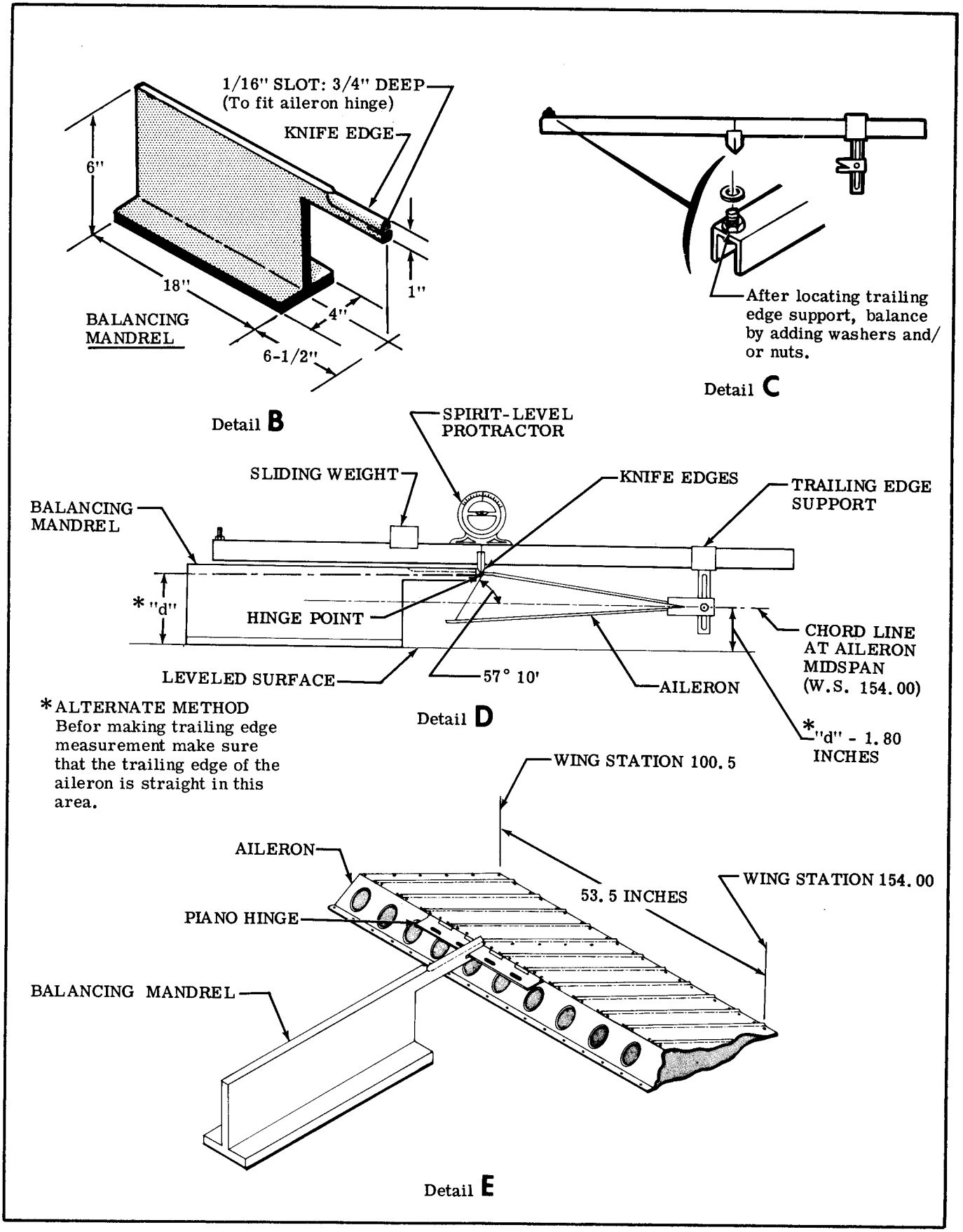


Figure 18-3. Control Surface Balancing (Sheet 3 of 5)

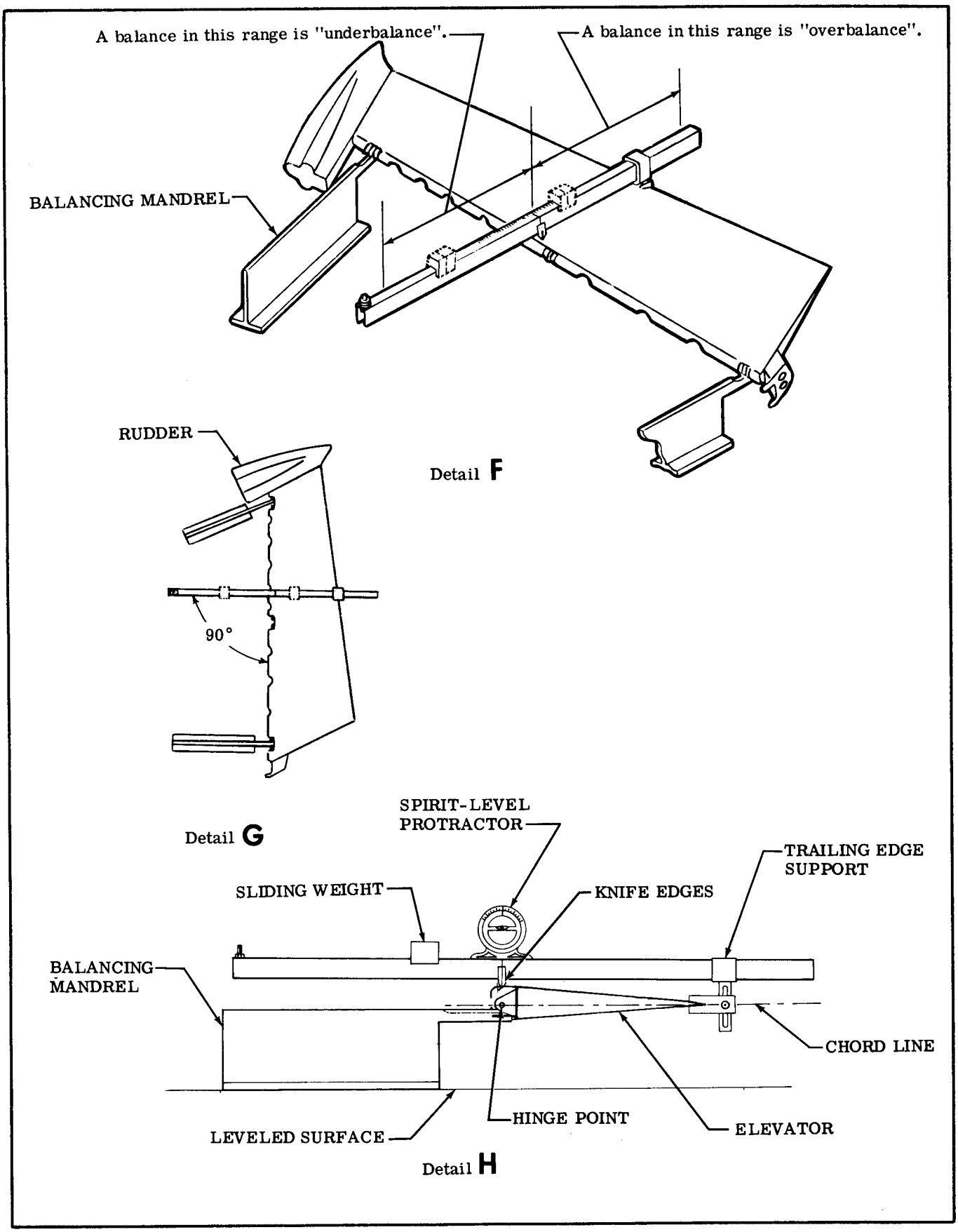


Figure 18-3. Control Surface Balancing (Sheet 4 of 5)

CONTROL SURFACE BALANCE REQUIREMENTS

NOTE

Unpainted values are not limits which must be met. They are given as guides, in order that the unbalance of the control surface in the final aircraft configuration may be predicted. If the control surface in the unpainted condition falls within the unpainted limit, the mechanic may feel confident that the control surface will be acceptable after painting. However, if the surface in the unpainted condition exceeds the unpainted limit, the balance must be checked again after final painting to assure that the control surface falls within the painted unbalance limit. Refer to GENERAL NOTES on sheet 3 for specific conditions.

DEFINITIONS:

UNDERBALANCE is defined as the condition that exists when the control surface is trailing edge heavy, and is symbolized by a plus (+).

OVERBALANCE is defined as the condition that exists when the control surface is leading edge heavy, and is symbolized by a minus (-).

CONTROL: AILERON

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to + 11.31	0.0 to + 9.23

CONTROL: RUDDER

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to + 6.7	0.0 to + 3.61

CONTROL: RIGHT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to + 24.5	0.0 to + 21.5

CONTROL: LEFT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to + 18.5	0.0 to + 15.5

Figure 18-3. Control Surface Balancing (Sheet 5 of 5)

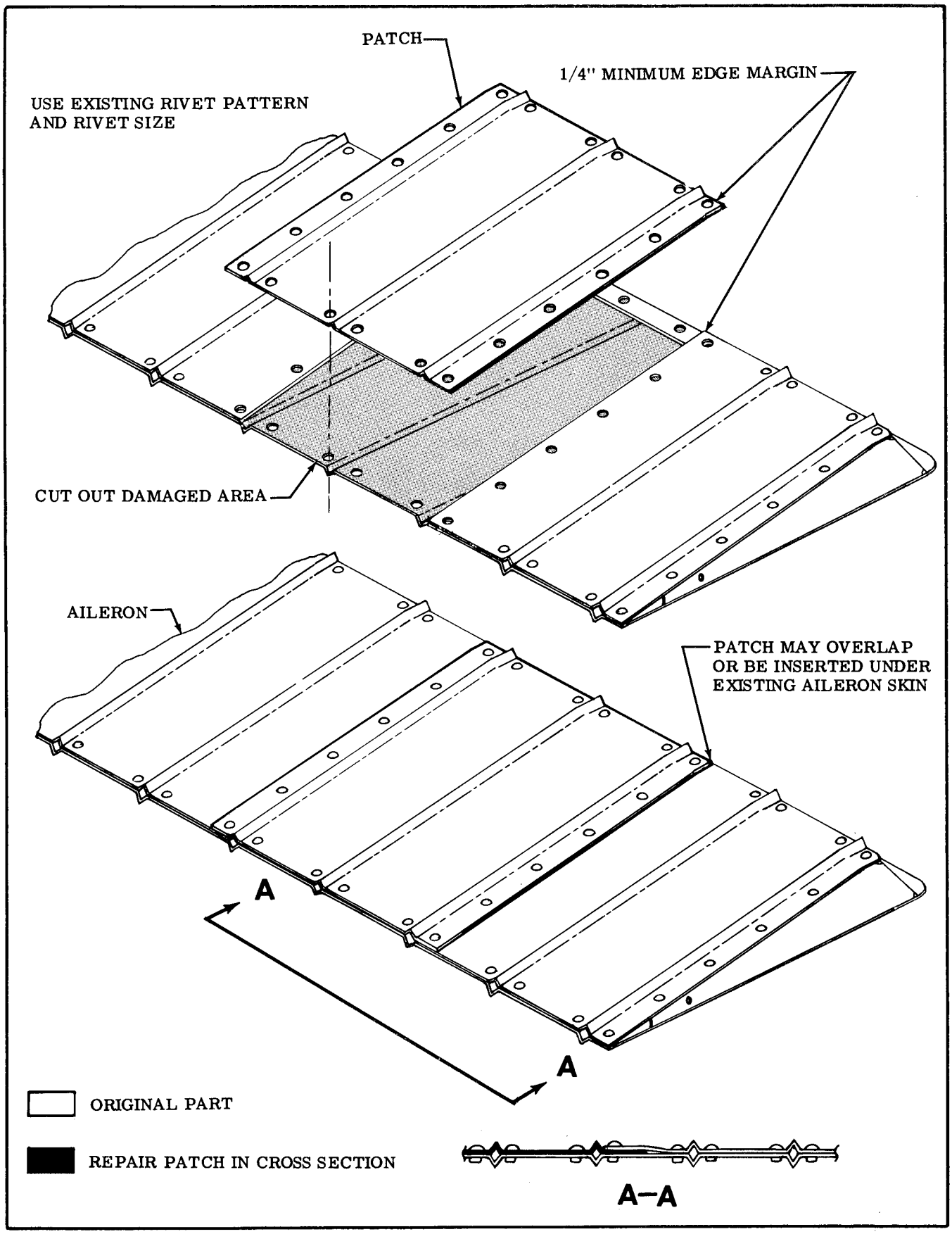


Figure 18-3A. Corrugated Skin Repair

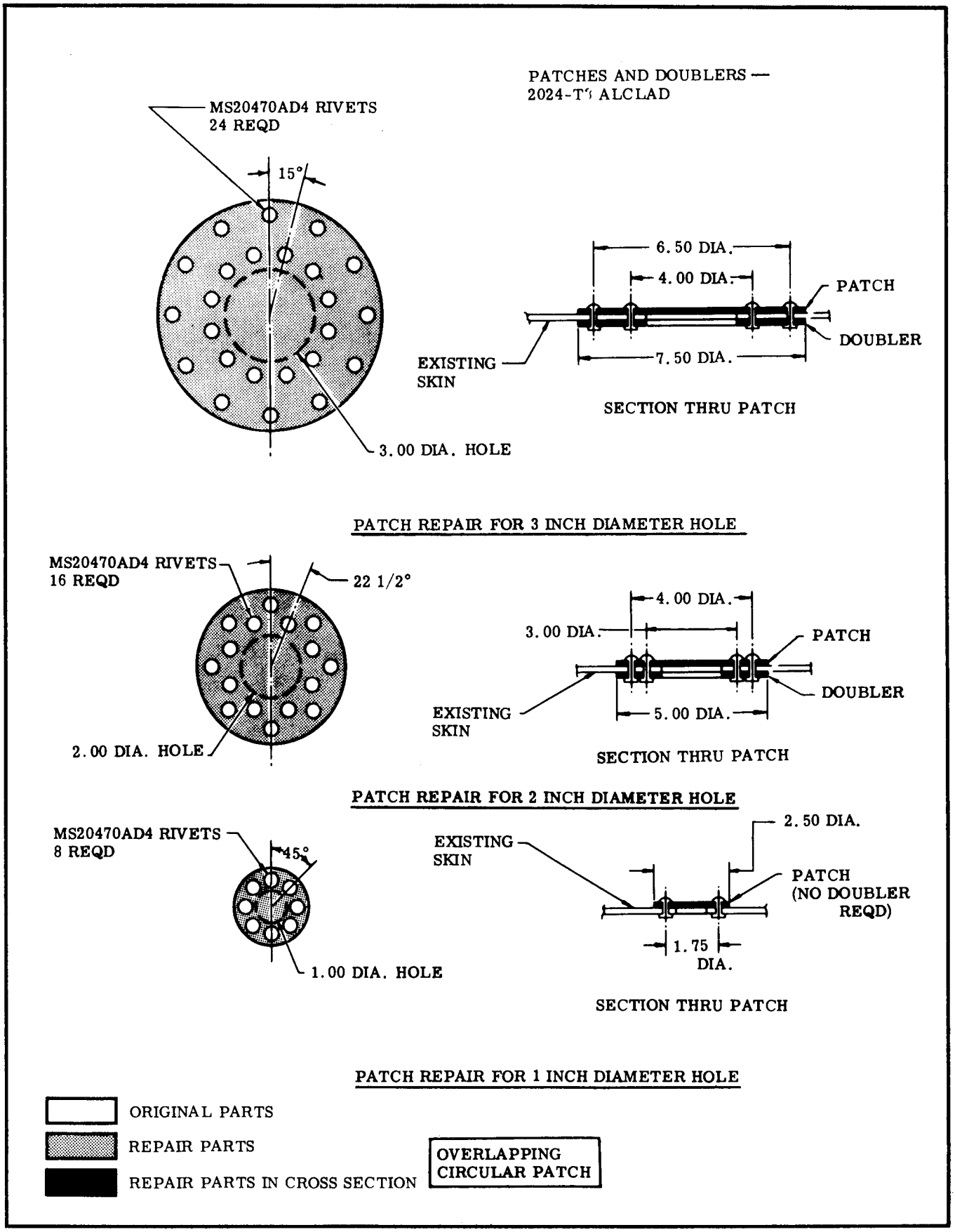
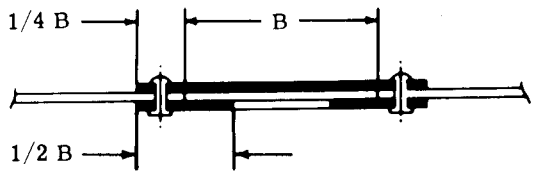
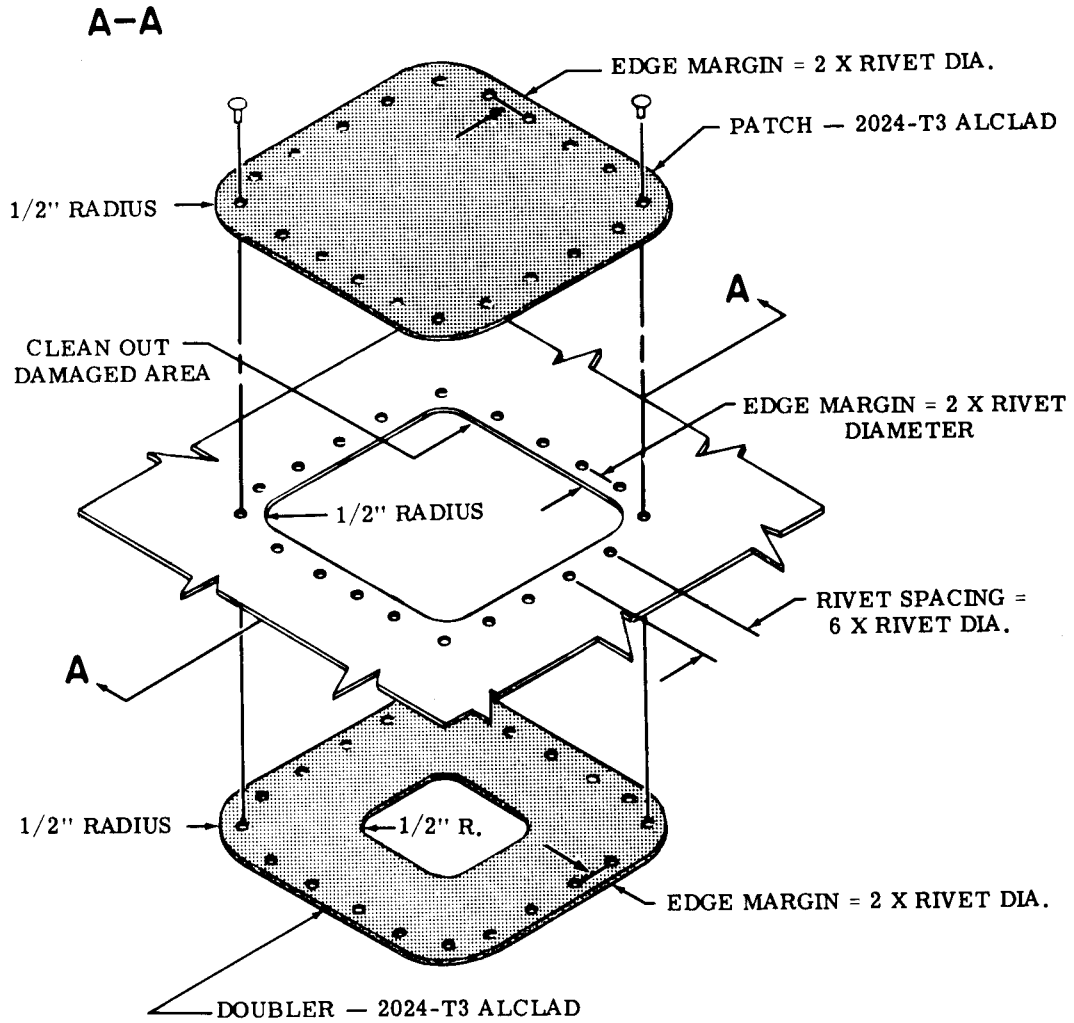


Figure 18-4. Skin Repair (Sheet 1 of 6)



SECTION THRU ASSEMBLED PATCH



OVERLAPPING RECTANGULAR PATCH

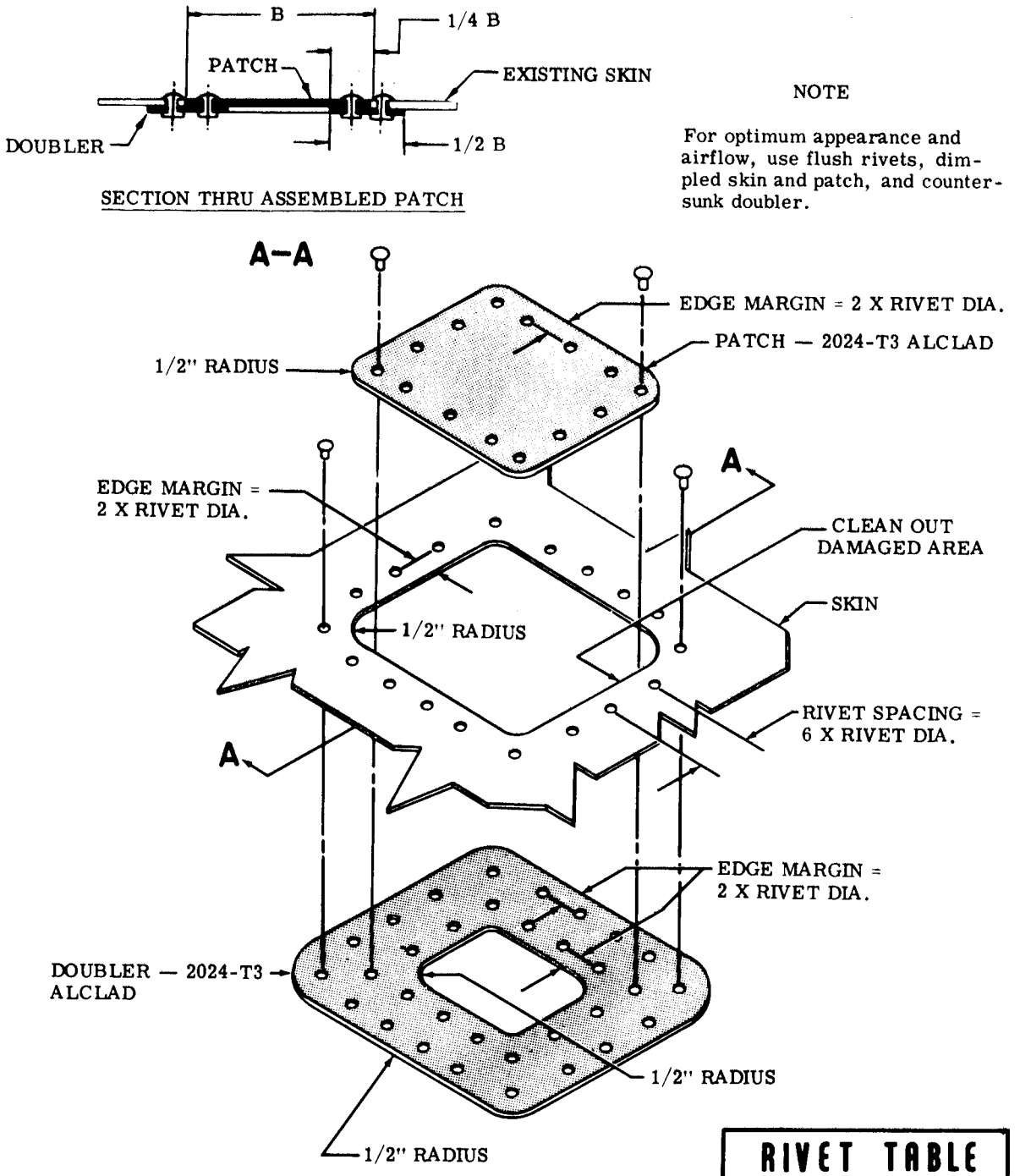
RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

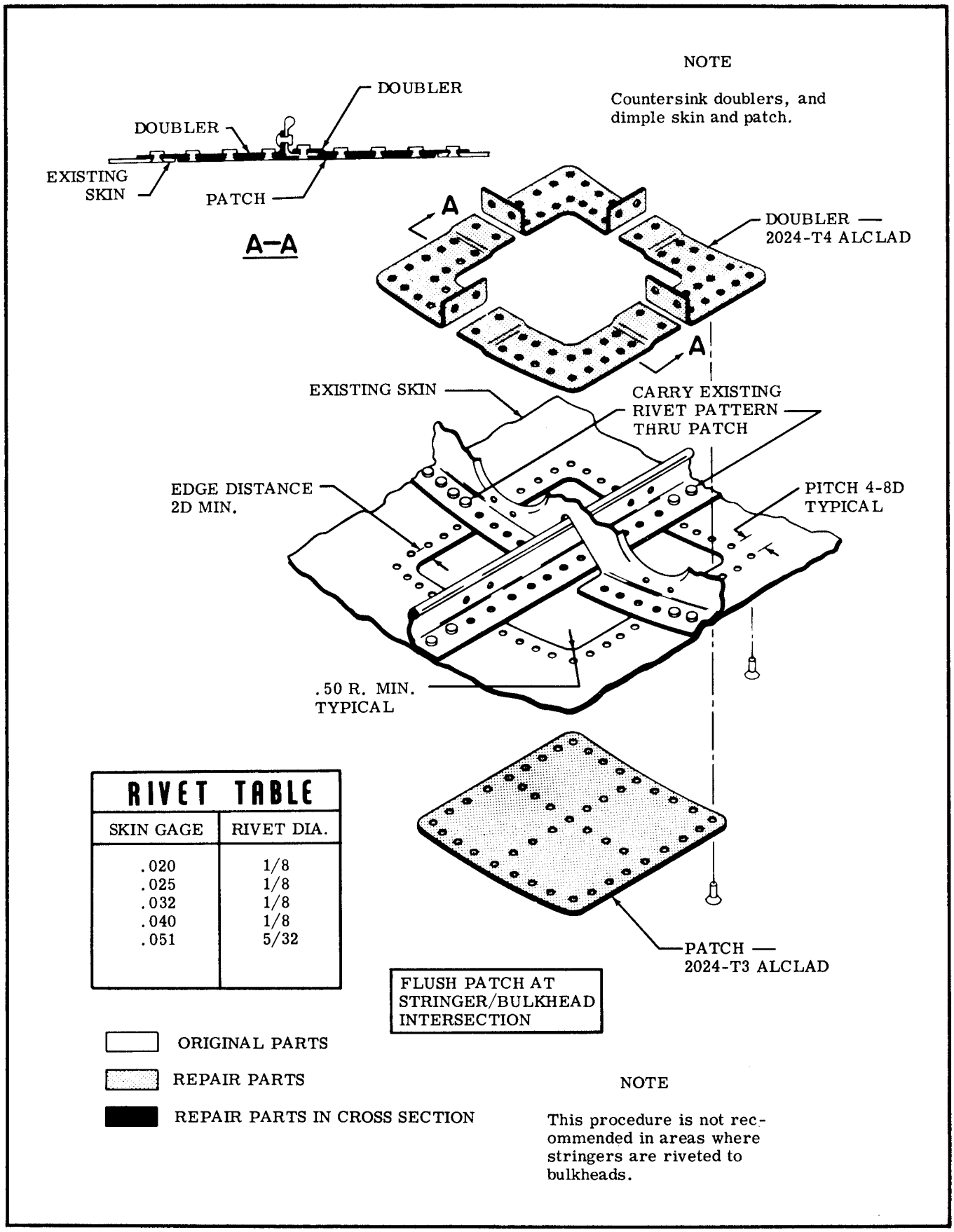
Figure 18-4. Skin Repair (Sheet 2 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

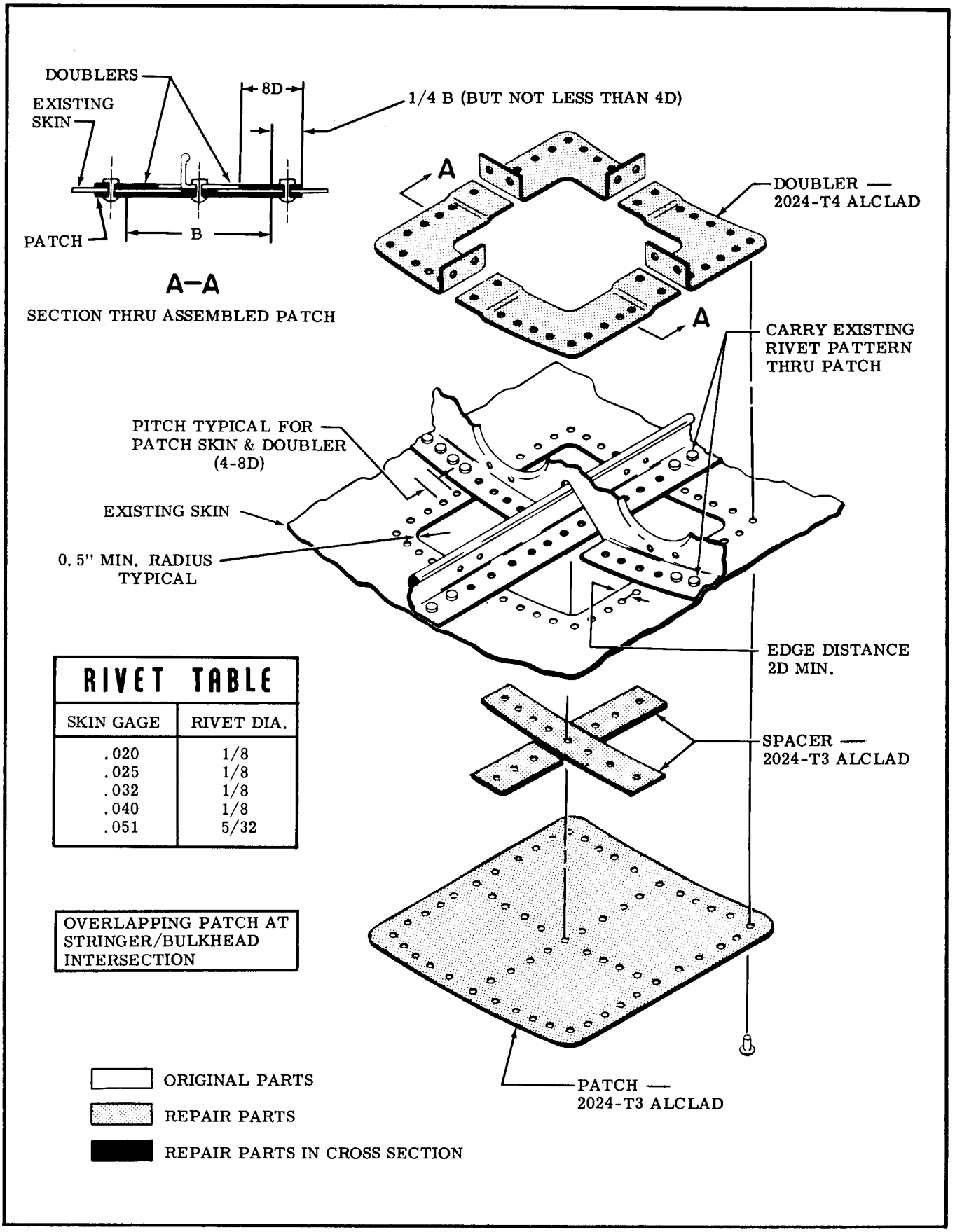
Figure 18-4. Skin Repair (Sheet 3 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 4 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 5 of 6)

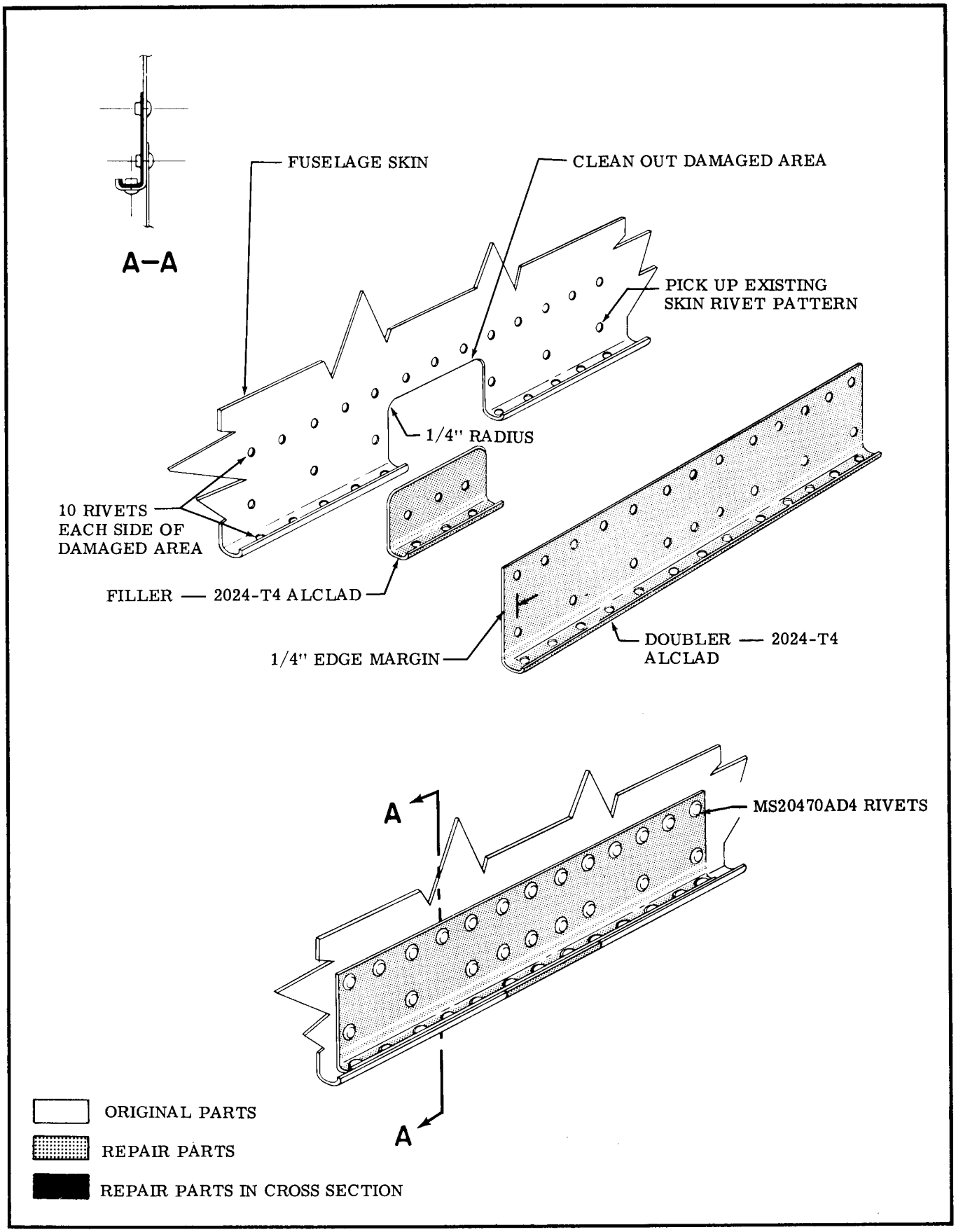


Figure 18-4. Skin Repair (Sheet 6 of 6)

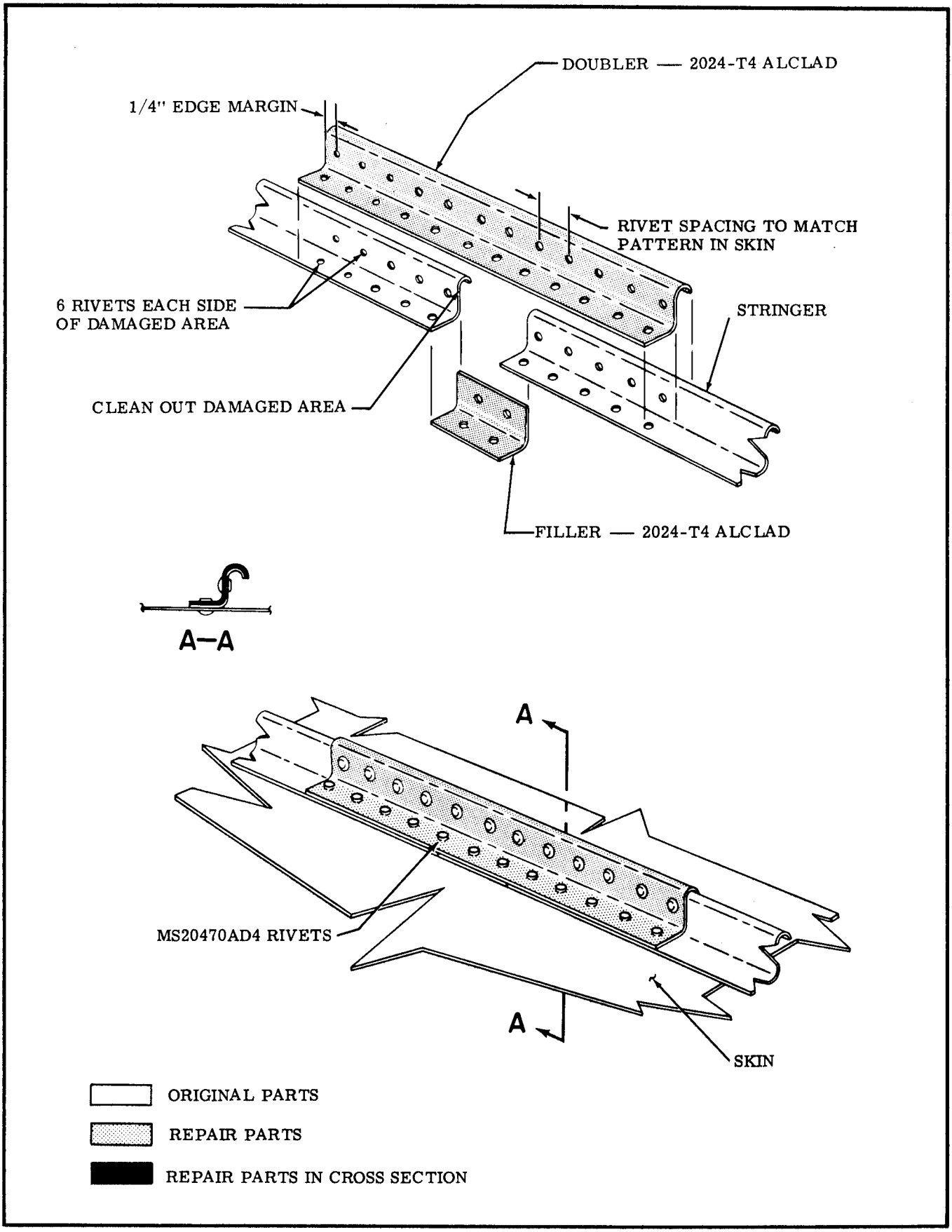


Figure 18-5. Stringer and Channel Repair (Sheet 1 of 4)

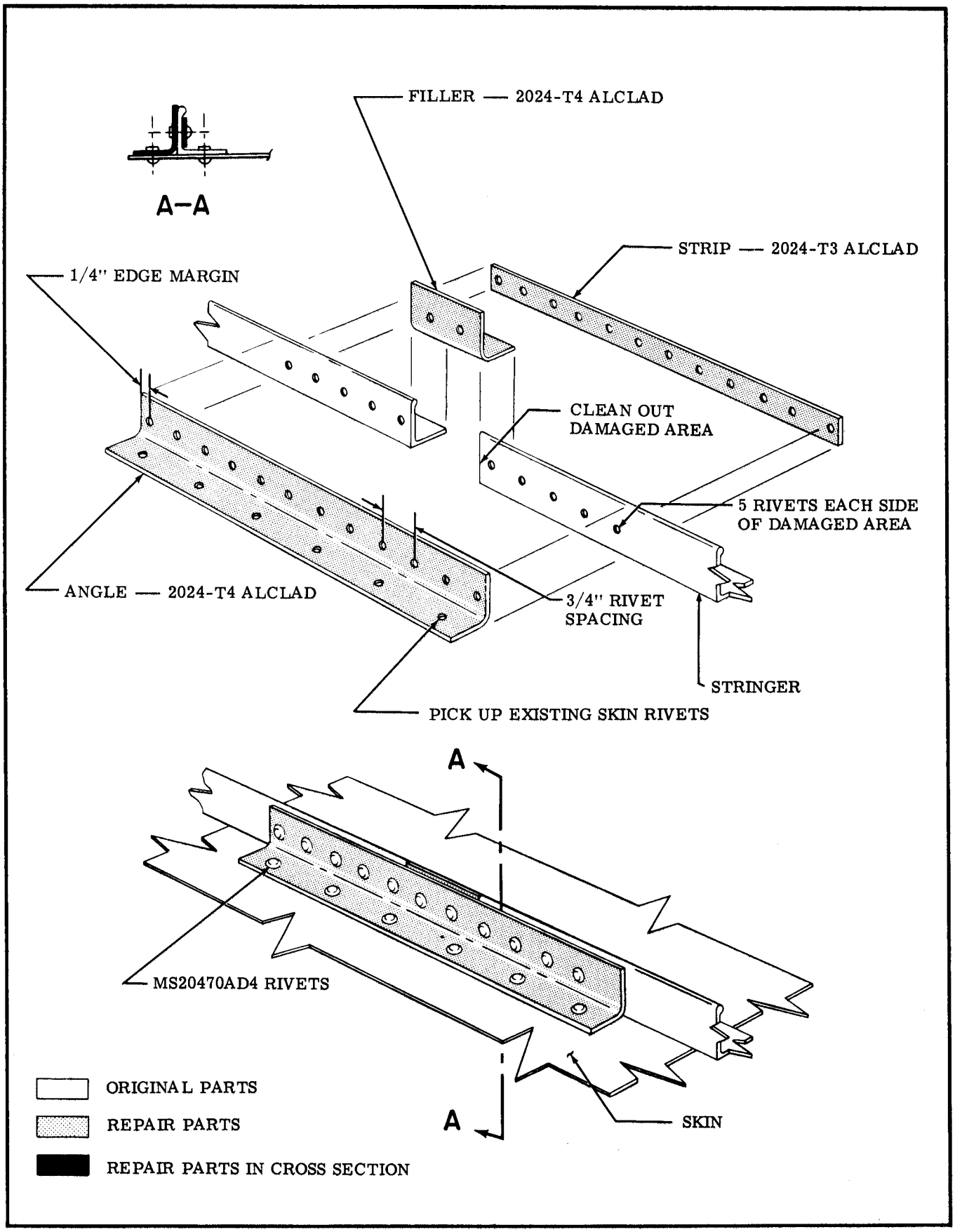


Figure 18-5. Stringer and Channel Repair (Sheet 2 of 4)

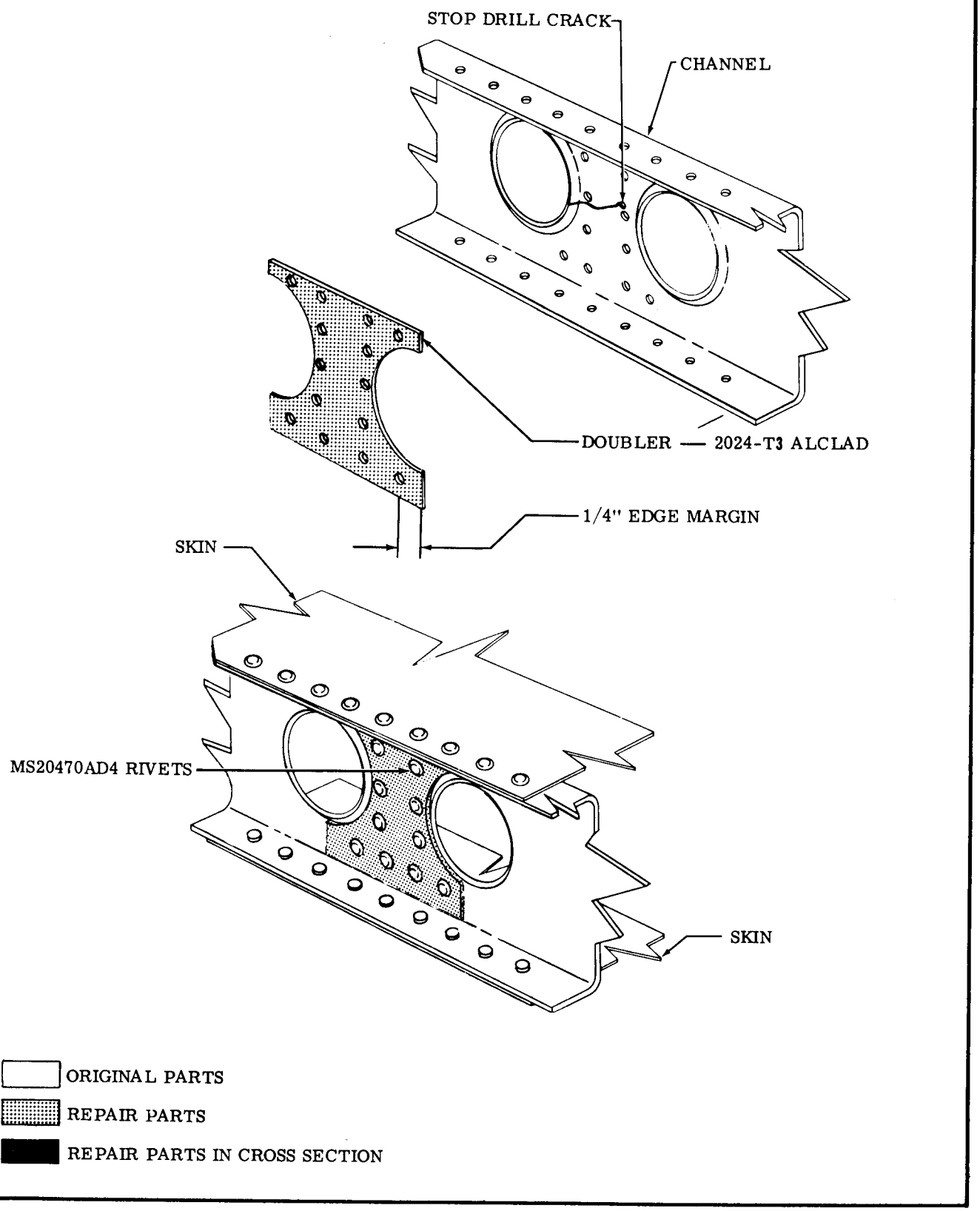


Figure 18-5. Stringer and Channel Repair (Sheet 3 of 4)

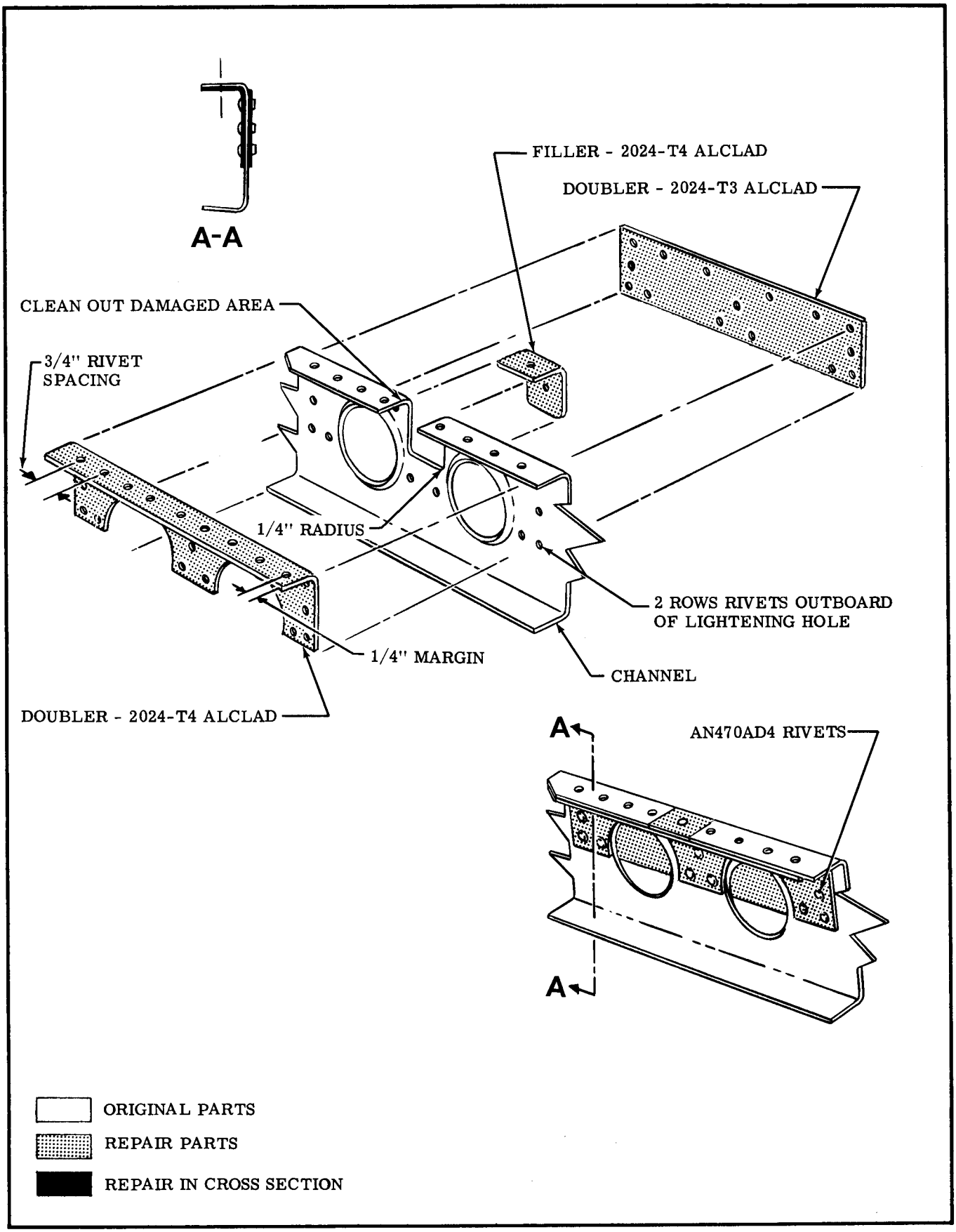


Figure 18-5. Stringer and Channel Repair (Sheet 4 of 4)

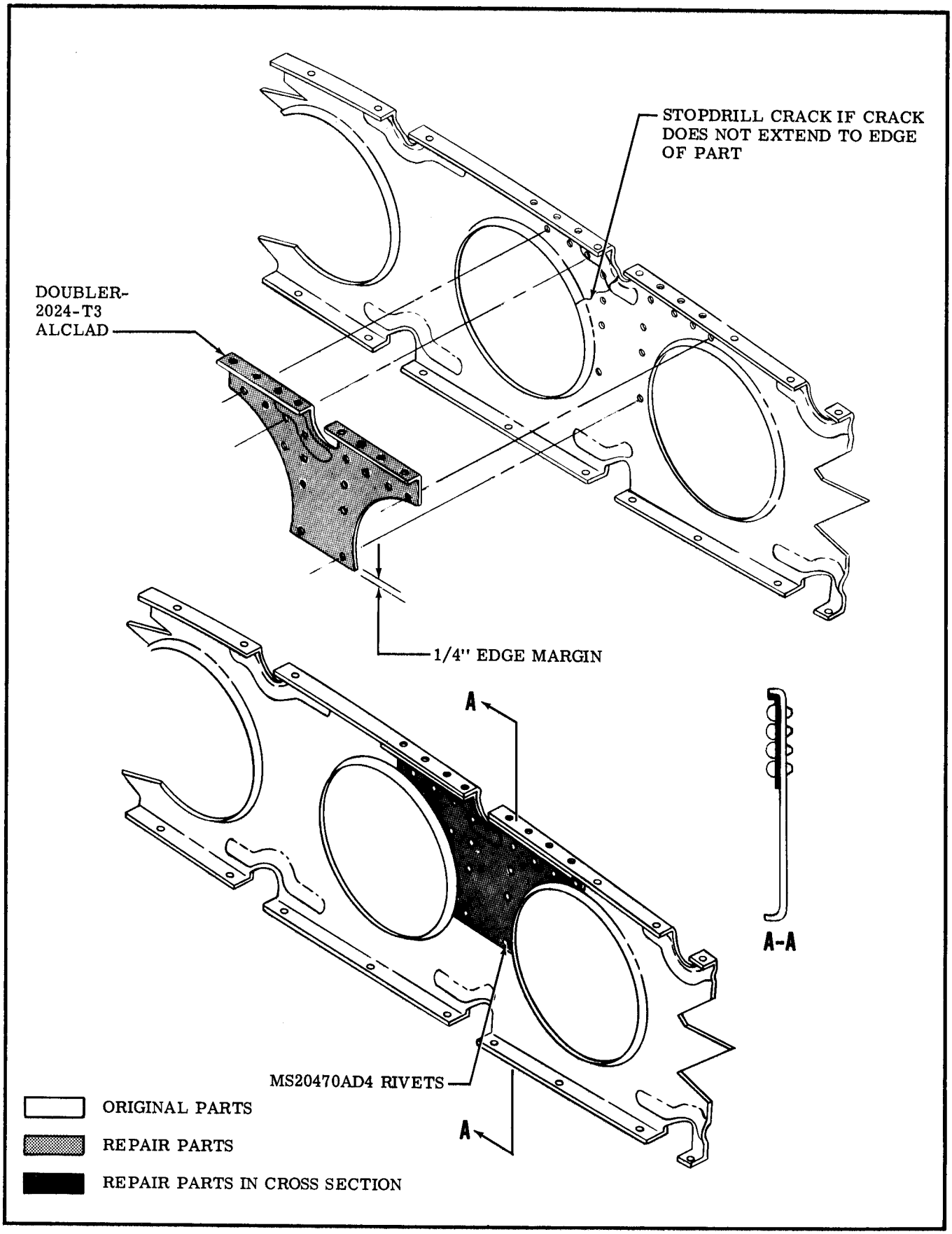


Figure 18-6. Rib Repair (Sheet 1 of 2)

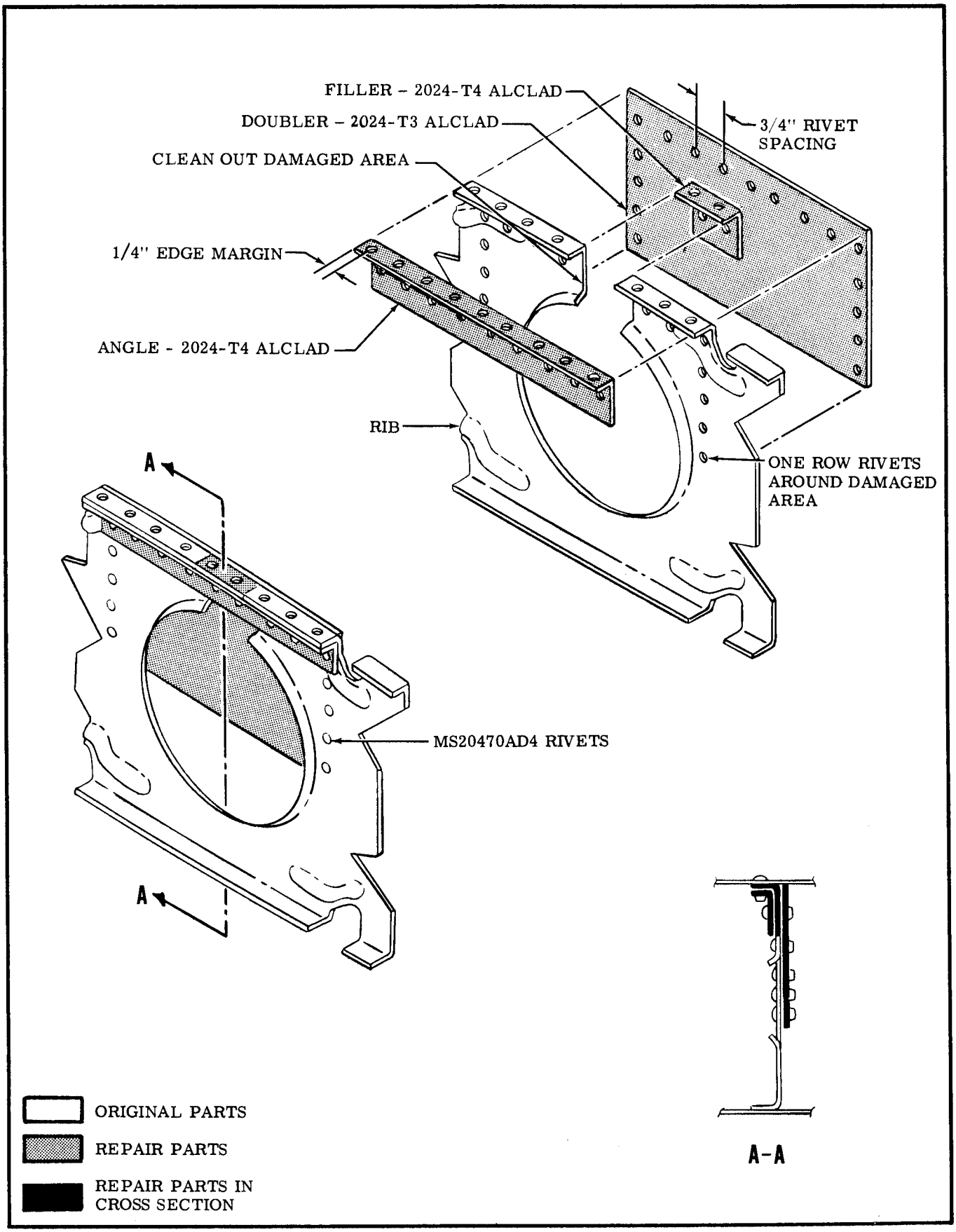


Figure 18-6. Rib Repair (Sheet 2 of 2)

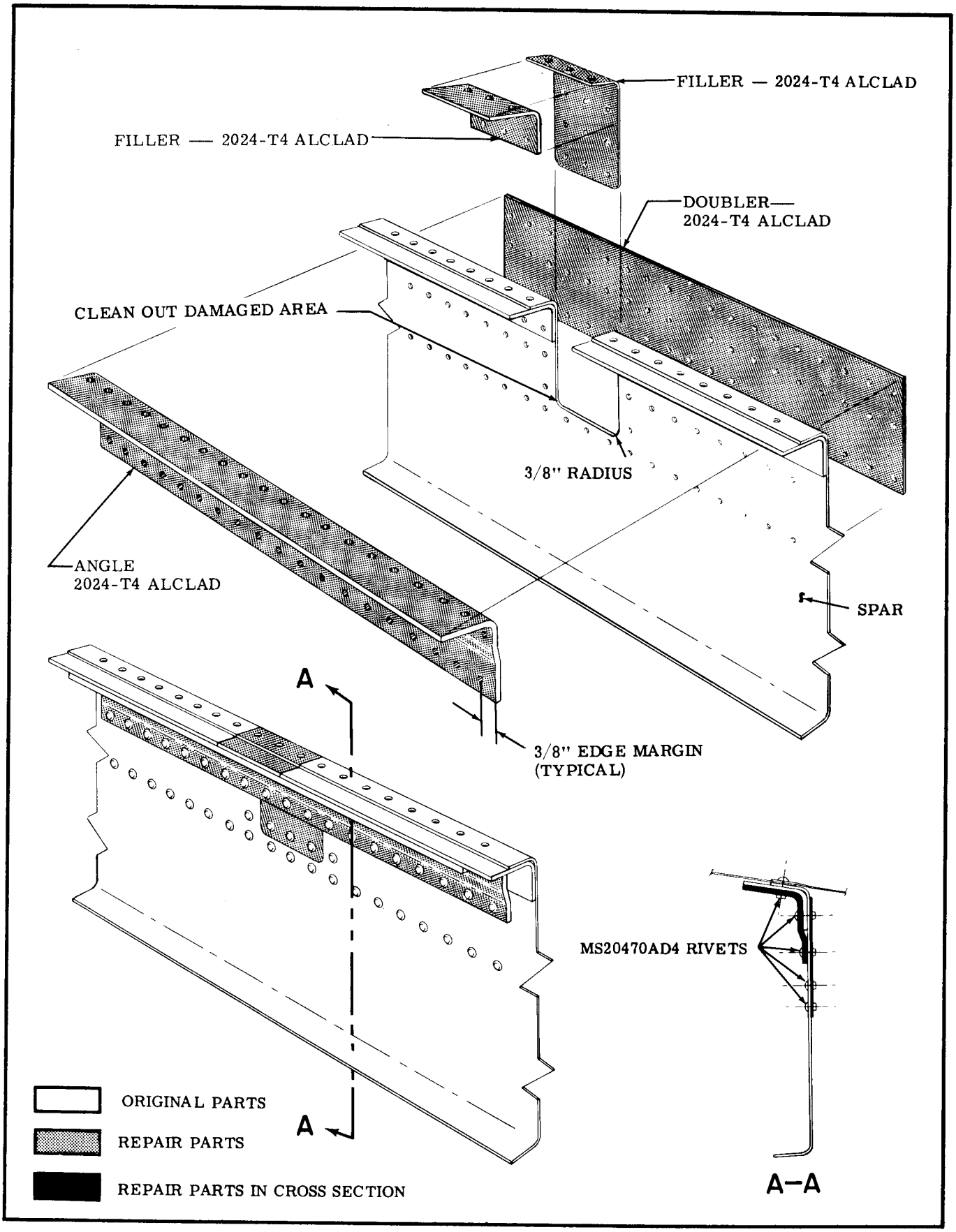


Figure 18-7. Wing Spar Repair (Sheet 1 of 3)

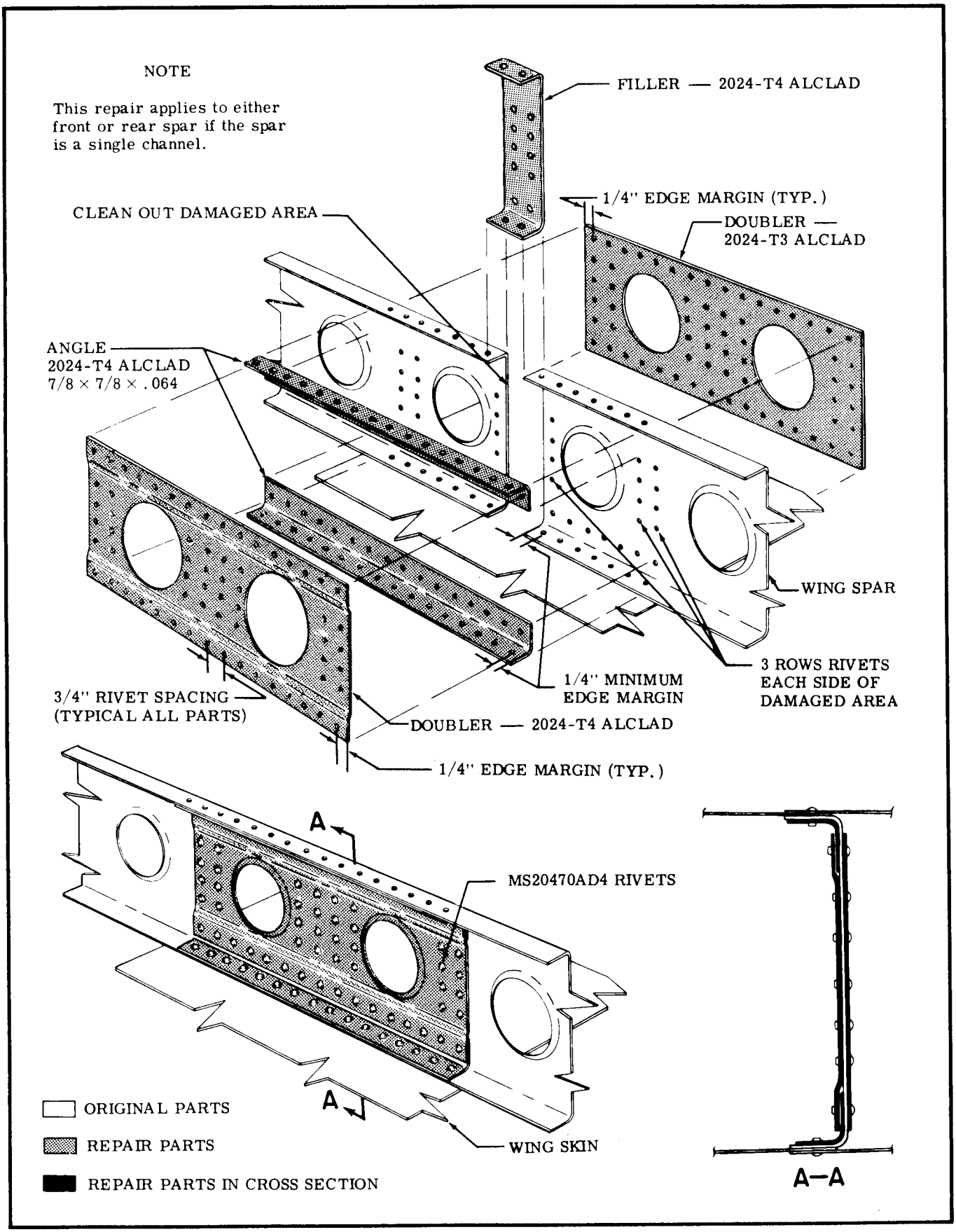


Figure 18-7. Wing Spar Repair (Sheet 2 of 3)

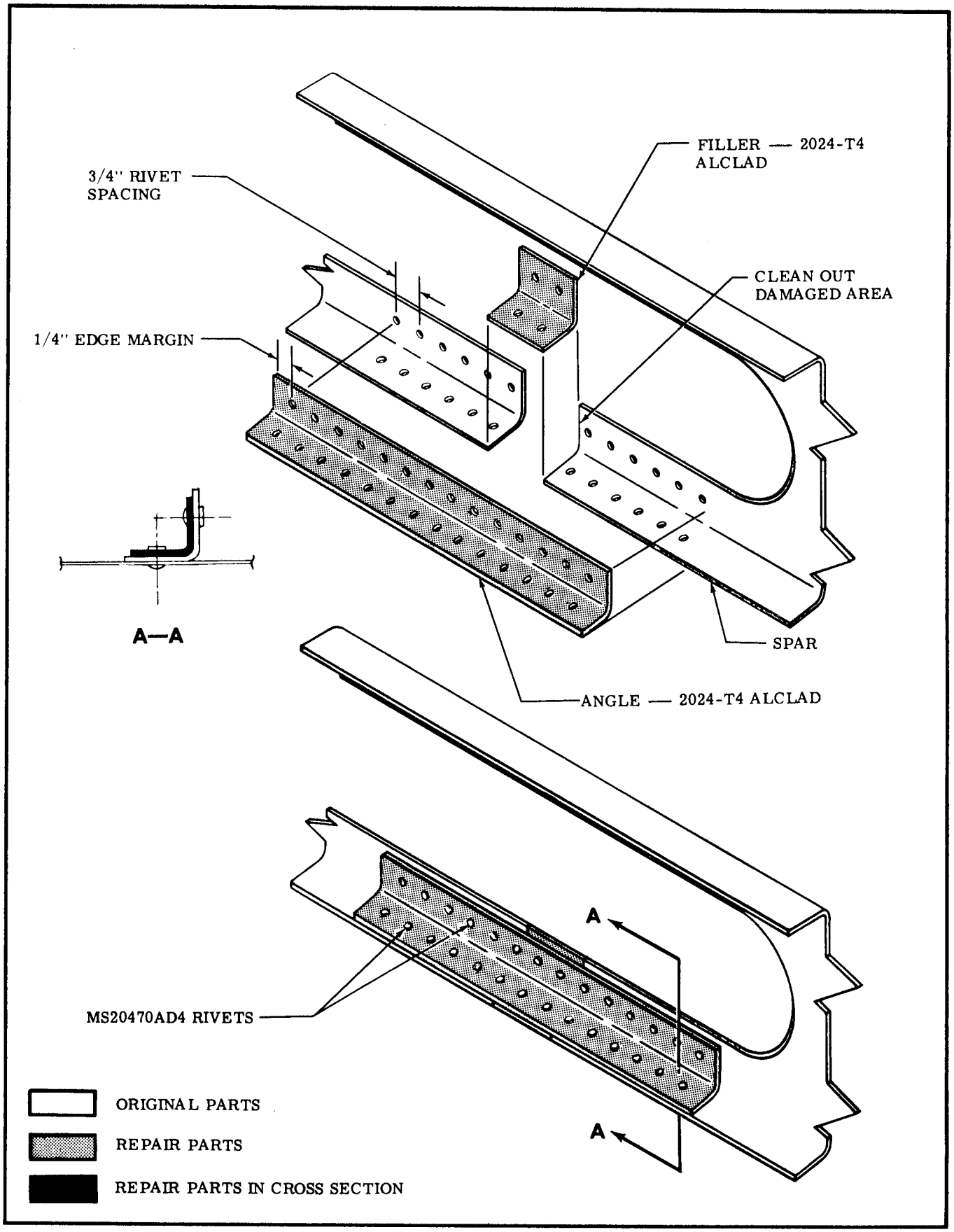


Figure 18-7. Wing Spar Repair (Sheet 3 of 3)

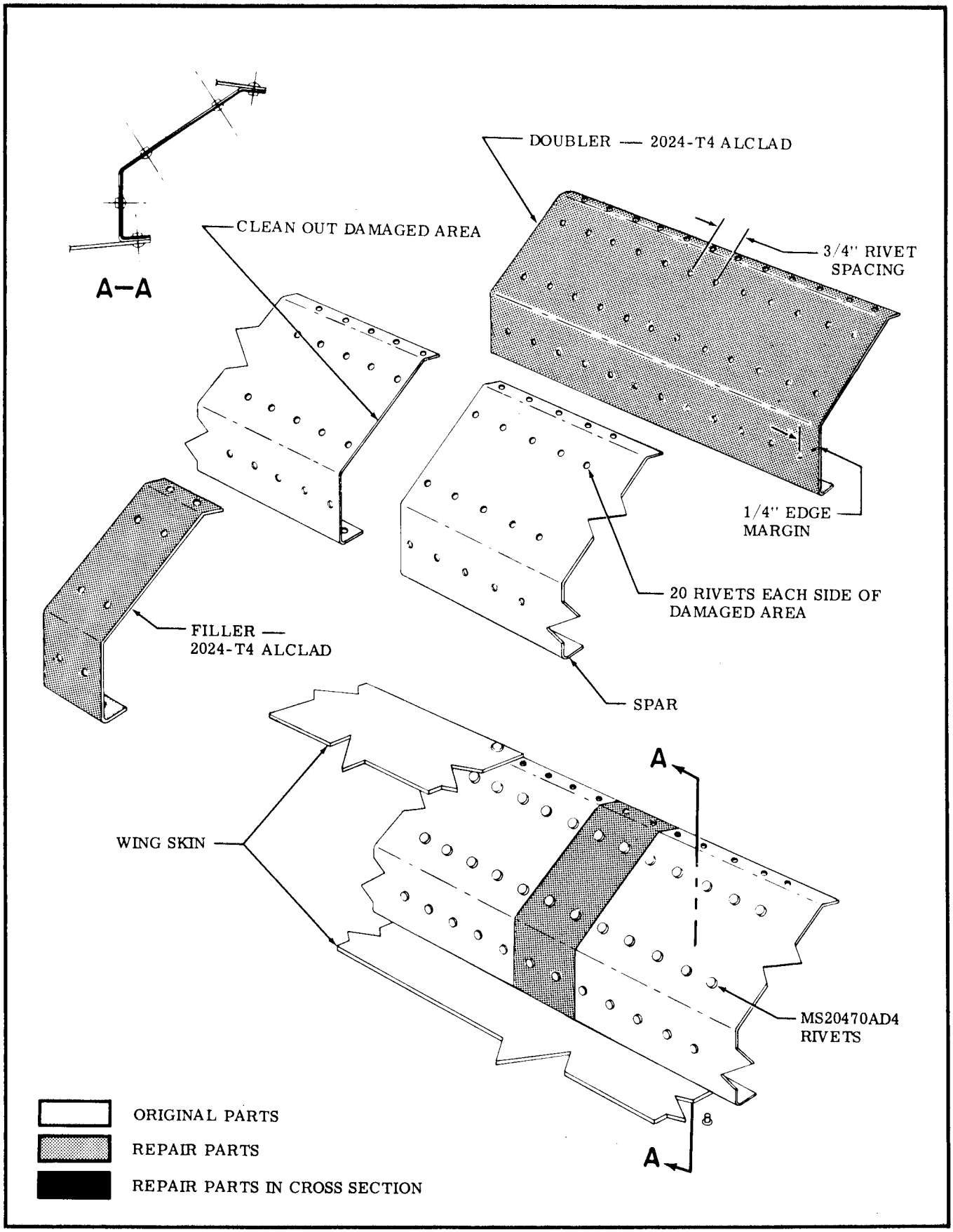


Figure 18-8. Auxiliary Spar Repair

NOTES:

1. Dimple leading edge skin and filler material; countersink the doubler.
2. Use MS20426AD4 rivets to install doubler.
3. Use MS20426AD4 rivets to install filler, except where bucking is impossible. Use CR162-4 Cherry (blind) rivets where regular rivets cannot be bucked.
4. Contour must be maintained; after repair has been completed, use epoxy filler as necessary and sand smooth before painting.
5. Vertical size is limited by ability to install doubler clear of front spar.
6. Lateral size is limited to seven inches across trimmed out area.
7. Number of repairs is limited to one in each bay.

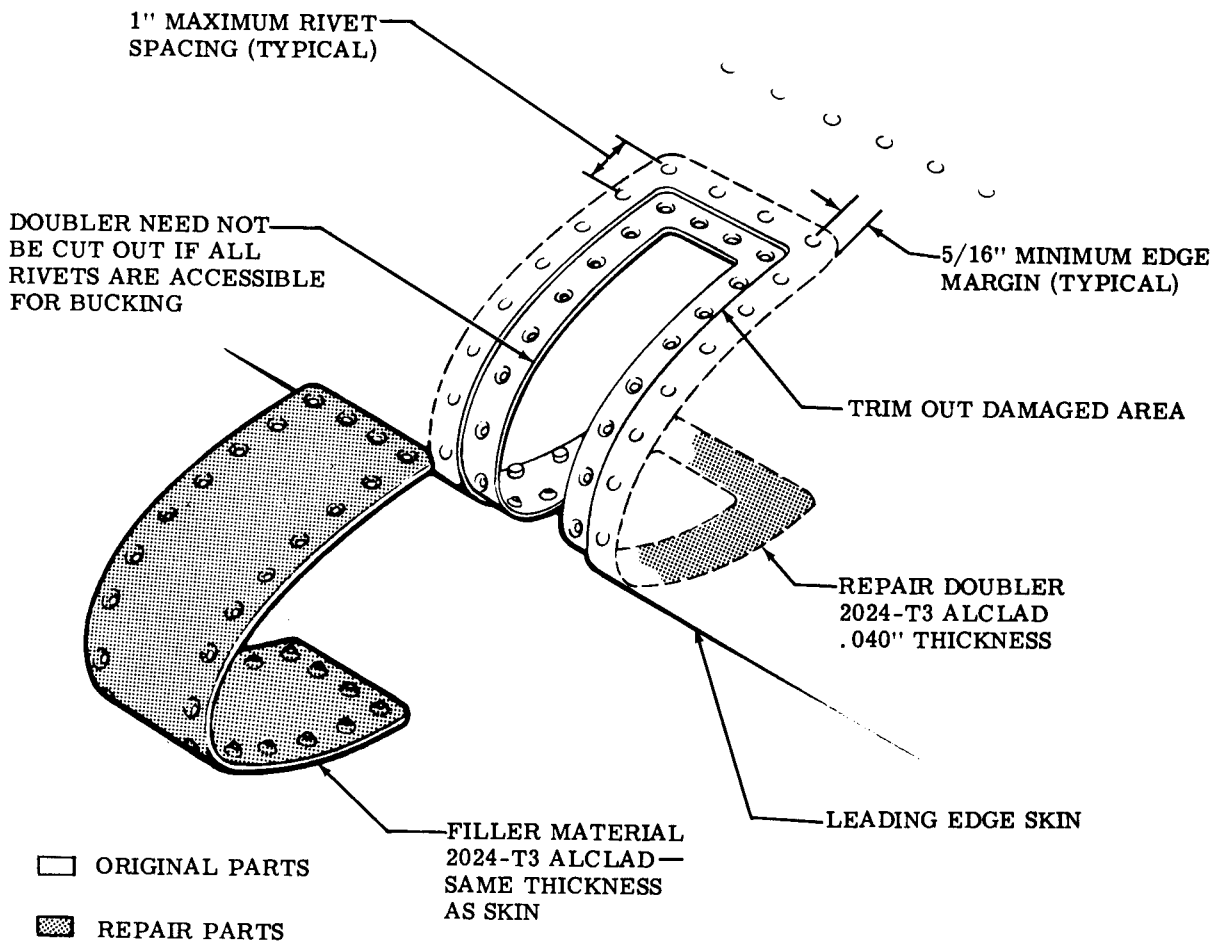


Figure 18-9. Leading Edge Repair

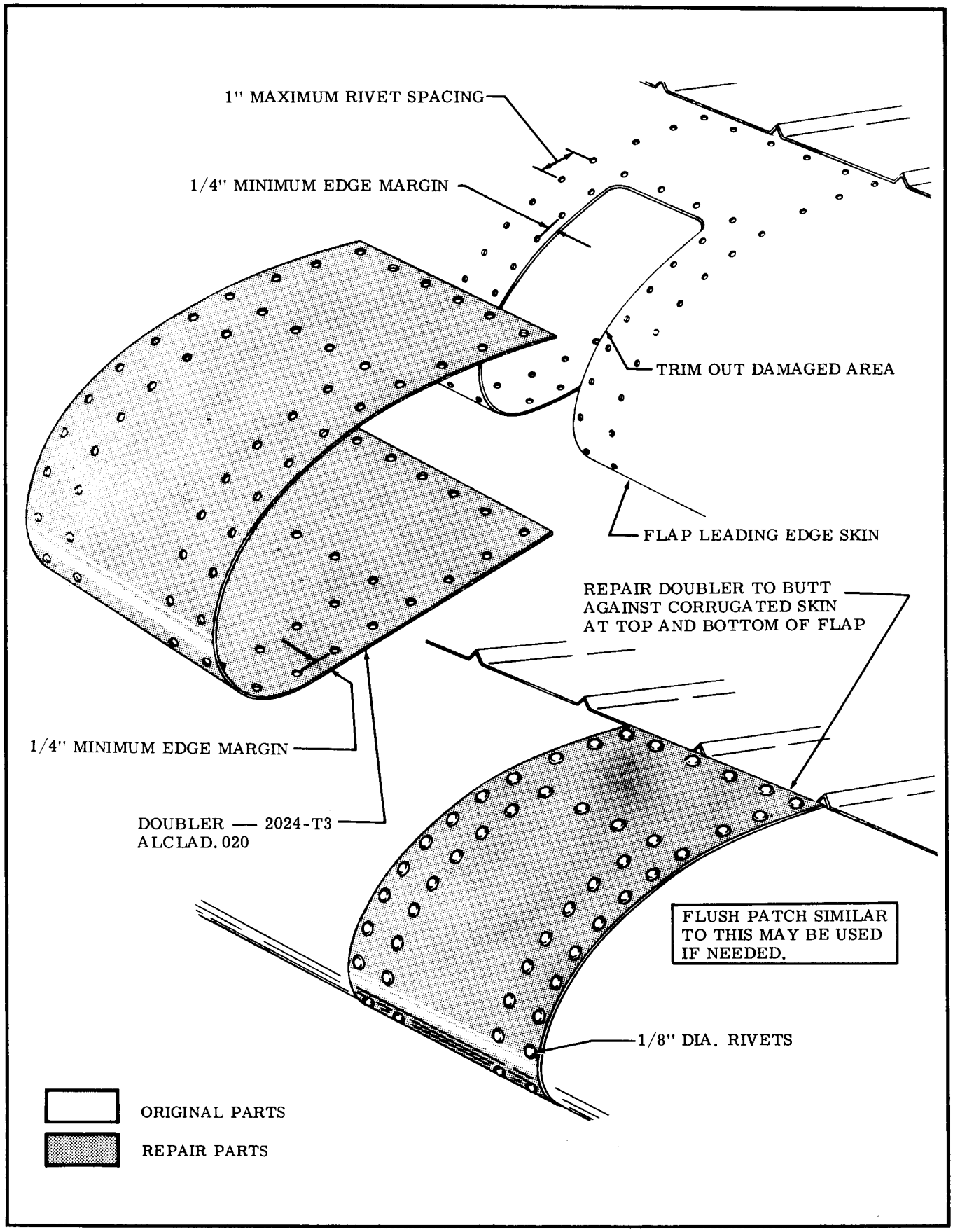
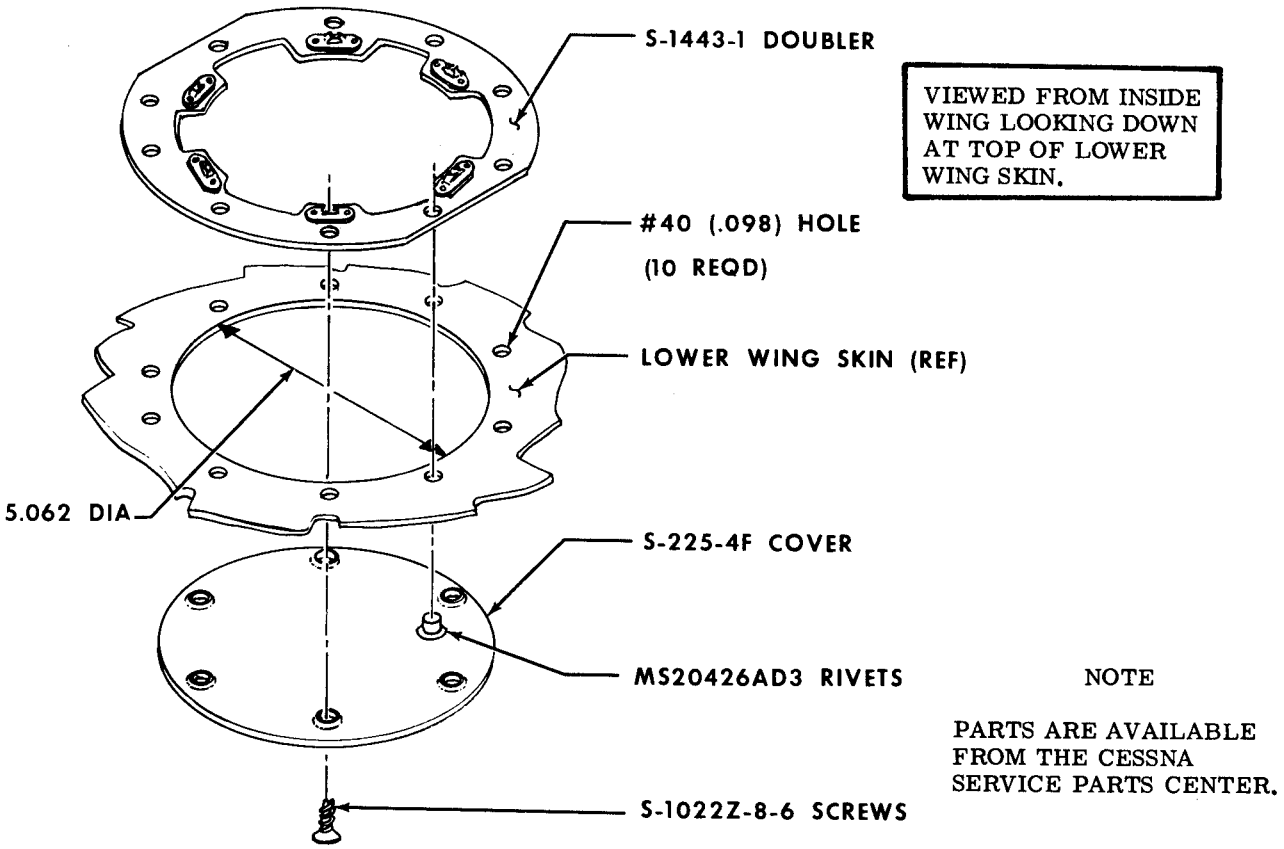


Figure 18-10. Flap Leading Edge Repair



PRECAUTIONS

1. Add the minimum number of access holes necessary.
2. Any circular or rectangular access hole which is used with approved optional equipment installations may be added in lieu of the access hole illustrated.
3. Do not add access holes at outboard end of wing; remove wing tip instead.
4. Do not add an access hole in the same bay where one is already located.
5. Locate new access holes near the center of a bay (spanwise).
6. Locate new access holes forward of the front spars as close to the front spar as practicable.
7. Locate new access holes aft of the front spar between the first and second stringers aft of the spar. When installing the doubler, rotate it so the two straight edges are closest to the stringers.
8. Alternate bays, with new access holes staggered forward and aft of the front spar, are preferable.
9. A maximum of five new access holes in each wing is permissible; if more are required, contact the Cessna Service Department.
10. When a complete leading edge skin is being replaced, the wing should be supported in such a manner so that wing alignment is maintained.

a. Establish exact location for inspection cover and inscribe centerlines.

b. Determine position of doubler on wing skin and center over centerlines. Mark the ten rivet hole locations and drill to size shown.

c. Cutout access hole, using dimension shown.

d. Flex doubler and insert through access hole, and rivet in place.

e. Position cover and secure, using screws as shown.

Figure 18-11. Access Hole Installation

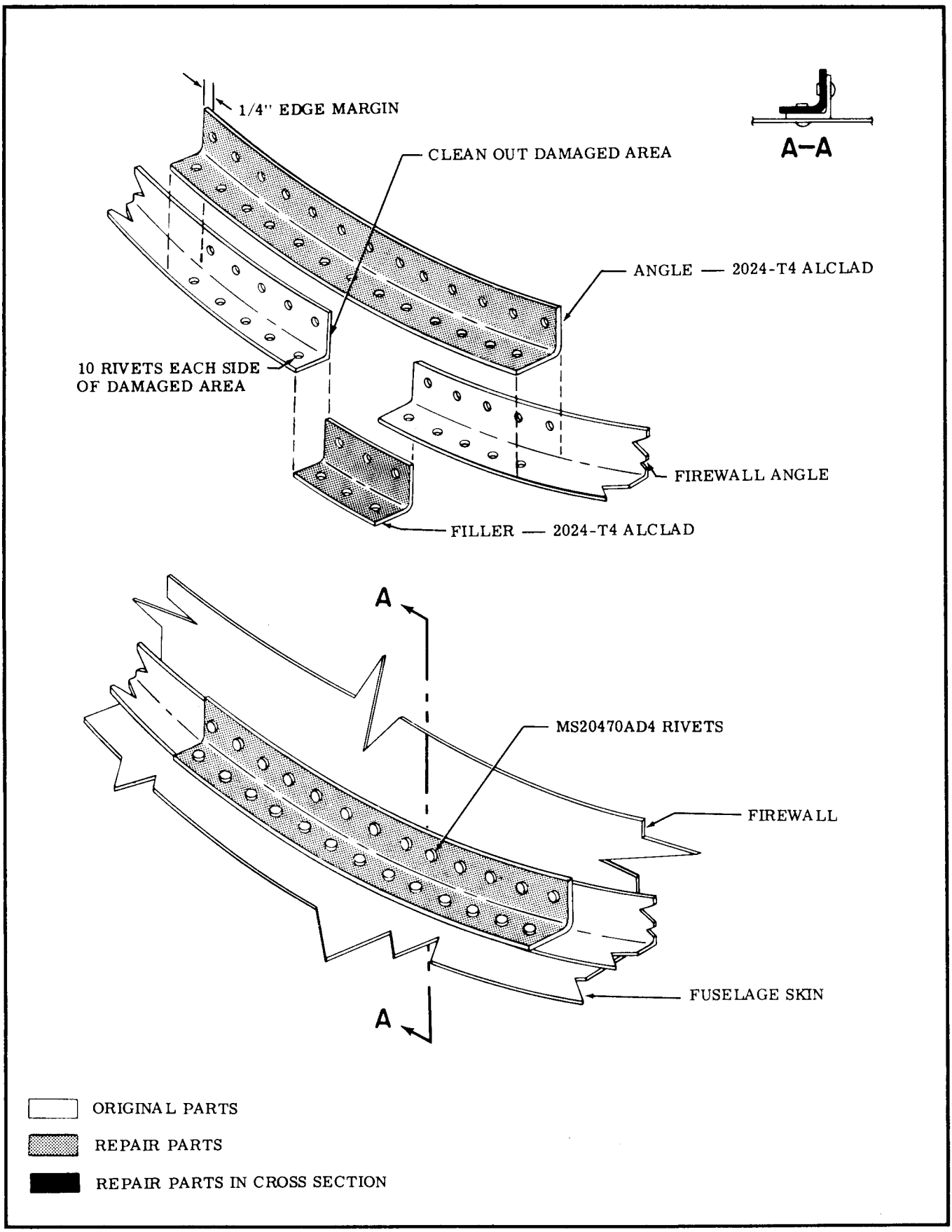


Figure 18-12. Firewall Angle Repair

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SECTION 19

PAINTING

NOTE

This Section contains standard factory materials listing and area of application. For paint number and color, refer to Aircraft Trim Plate and Parts Catalog. In all cases determine the type of paint on the aircraft as some types of paint are not compatible. Materials may be obtained from Cessna Service Parts Center.

MATERIAL	NO/TYPE	DOMESTIC	FRENCH	AREA OF APPLICATION
PAINT	ACRYLIC LACQUER	X		NOTE 1
	LACQUER		X	
PRIMER	P60G2 WITH R7K44 REDUCER	X	X	NOTE 2
	EX-TR-7 WITH T-ER-4 REDUCER	X	X	
THINNER	T-8402A	X		NOTE 4
	T-6094A	X	X	NOTE 3
SOLVENT	Methyl Ethyl Keytone (MEK)	X	X	NOTE 5

NOTE

Do not paint Pitot Tube, Gas Caps or Aileron Gap Seals. Also do not paint Antenna Covers which were not painted at the factory.

NOTES

1. Used on aircraft exterior.
2. Used with lacquer or acrylic lacquer on aircraft exterior.
3. Used to thin lacquer and for burndown.
4. Used to thin acrylic lacquer and for burndown.
5. Used to clean aircraft exterior prior to priming.

19-1. PAINTING OF FORMED ABS PLASTIC PARTS. The following procedures outline some basic steps which are useful during touchup or painting of formed ABS plastic parts.

19-2. INTERIOR PARTS (Finish Coat of Lacquer)

a. Painting of Spare Parts.

1. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

2. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to ensure adhesion.

b. Touch Up of Previously Painted Parts.

1. Light sanding is acceptable to remove scratches and repair the surface but care must be exercised to maintain the surface texture or grain.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to ensure adhesion.

NOTE

Lacquer paints can be successfully spotted in.

19-3. EXTERIOR PARTS (Acrylic Topcoat)

a. Painting of Spare Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned with appropriate acrylic thinner and applied as a wet coat to ensure adhesion.

b. Touch Up of Previously Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a compatible primer - surfacer and sealer.

4. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned and applied as a wet coat to ensure adhesion.

NOTE

Acrylic topcoats can be successfully spotted in.

19-4. EXTERIOR PARTS (Epoxy or Polyurethane Topcoat)

a. Painting of Spare Parts and Touch Up of Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a primer compatible with Epoxy or Polyurethane topcoat.

4. After the part is thoroughly dry it is ready for the topcoat.

NOTE

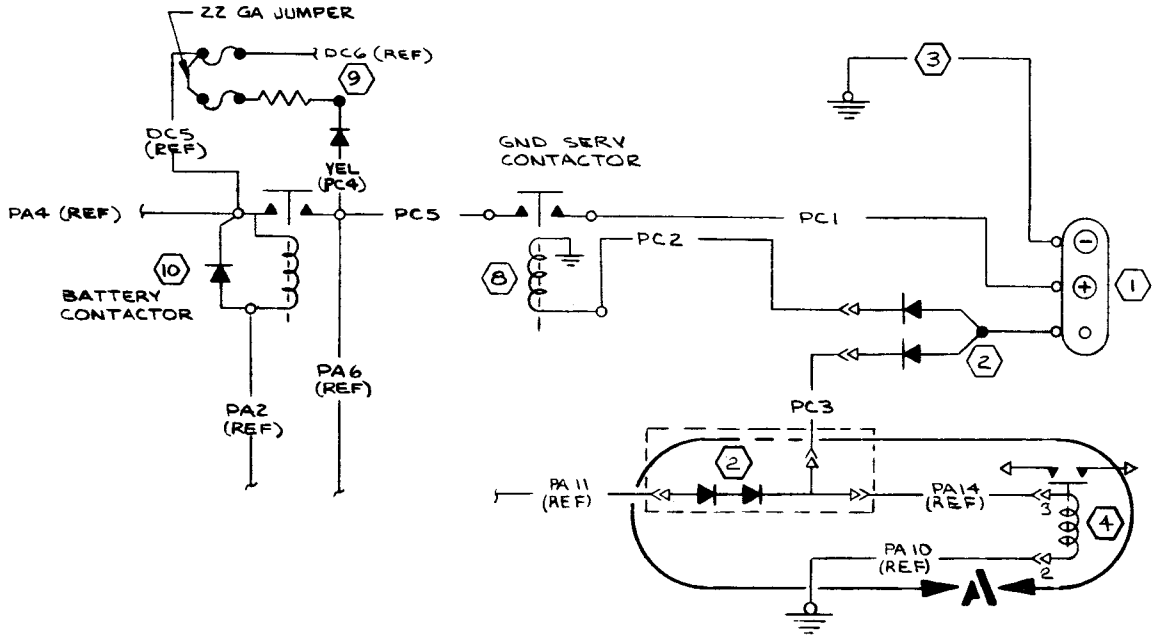
Epoxy or Polyurethane topcoats cannot be successfully spotted in - finish should be applied in areas with natural breaks such as skin laps or stripe lines.

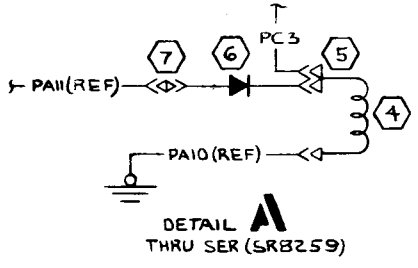
When painting interior and exterior polycarbonate parts, or where the part material is questionable, a "barrier primer" should be applied prior to the Enamel, Lacquer, Epoxy or Polyurethane topcoat.

SECTION 20

WIRING DIAGRAMS

TABLE OF CONTENTS





REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD PA14(REF); DELETE S-2064-1; 1570043 WAS 0710719-2 (SR8259)	RS 5-23-75	JCY 6-16-75 JRB RF
B	BY REV: ADD DETAIL 'A' (SR8259)	6-16-75 RS	JCY 10-14-75 JRB RE RF

ITEM NO.	PART NO.	DESCRIPTION
10	S-1579-2	CONTACTOR
9	0712031	FUSE & DIODE ASSY
8	S-1660-1	CONTACTOR
7	S-2064-1	CONTACTOR
6	0770719-2	DIODE ASSY
5	S-2023-1	ADAPTER
4	S-1917-1	RELAY
3	0312155	GROUND STRAP
2	1570043	DIODE ASSY
1	AN2552-3A	RECEPTACLE

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESSNA SPEC. NO. S-XXX OR CMXXXX-CESSNA STD. NO.

SUPERSEDES: 0500062 P4.4.1

SUPERSEDED BY:

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
PC5	2		16	S-1367-7-13	S-1367-7-13	
YEL PC4	18	-18-4	18	S-1367-1-13	SOLDER	
PC3	18		66	S-1493-1	S-1493-1	
PC2	18		12	S-1493-1	S-1367-1-10	
PC1	2		12	S-1367-7-14	S-1367-7-13	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-17-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-29-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FREE	
APPD	JRB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

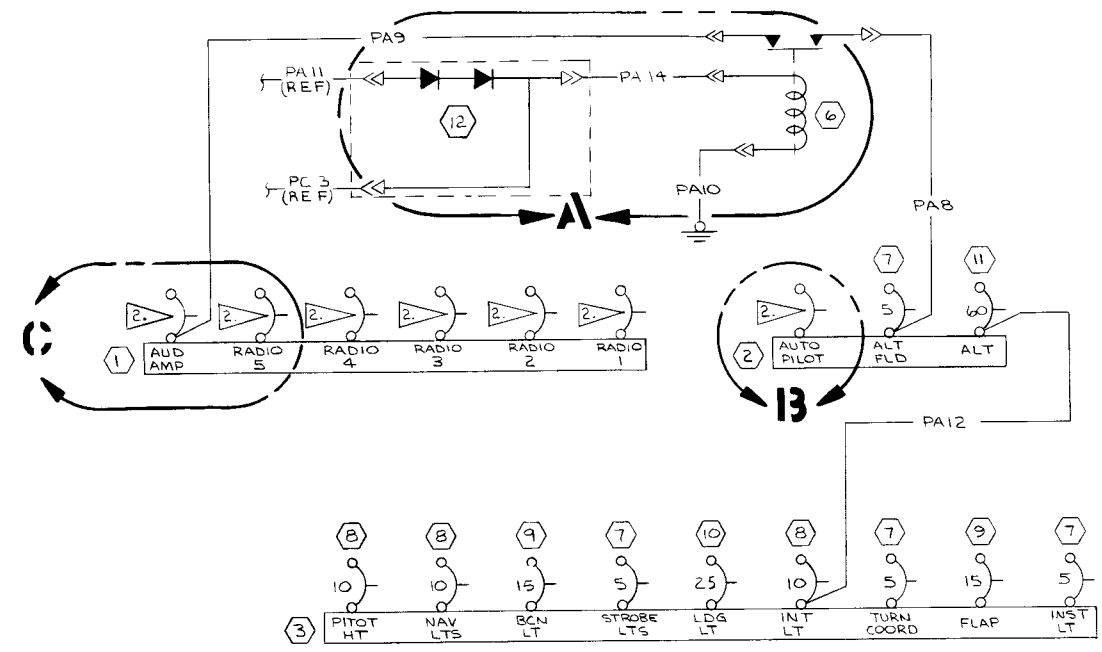
TITLE
WIRING DIAGRAM — GROUND SERVICE RECEPTACLE (OPT)

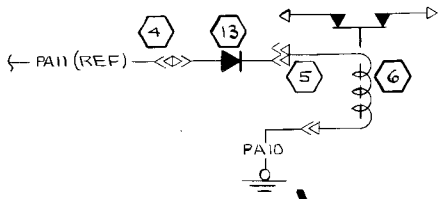
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) PAGE: 4.2.0

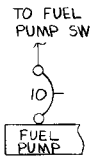
03-231-0905

172 & F172

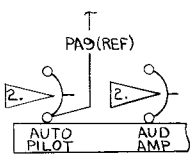




DETAIL A
THRU SER (SRB259) (172GS782, FI721495 & FR1720581)



DETAIL B
(APPLIES TO FR172 & R172 ONLY)



DETAIL C
(APPLIES TO FR172 & R172 ONLY)

34-0905
33-0905
46-0905

NOTES:

1. ~~THIS LOCATION FOR FUEL PUMP CIRCUIT BREAKER ON FR172 ONLY~~
2. VALUE OF THESE CIRCUIT BREAKERS VARY WITH OPTIONAL EQUIPMENT INSTALLED

ITEM NO.	PART NO.	DESCRIPTION
13	0770719	DIODE ASSY
12	1570043	DIODE BOARD ASSY
11	S-1596-60L	CIRCUIT BREAKER
10	S-1360-25L	CIRCUIT BREAKER
9	S-1360-15L	CIRCUIT BREAKER
8	S-1360-10L	CIRCUIT BREAKER
7	S-1360-5L	CIRCUIT BREAKER
6	S-1917-1	RELAY
5	S-2023-1	ADAPTER
4	S-2064-1	CONNECTOR
3	0570419-1	BUS BAR
2	0570419-2	BUS BAR
1	0570419-3	BUS BAR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 0500062 P 4.8.1

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1360-15L WAS S-1360-10L AT BCN LT CKT BKR (SR7903)(SR7904)	BAH 5-13-75	
B	BY REV: ADD PA14; 1570043 WAS 0770719-2; DELETE S-2064-1 (SRB259)	RS 5-23-75	
C	BY REV: ADD DETAIL "A" S-2023-1, S-2064-1 & 0770719 (SRB259)	RS 6-16-75	
D	BY REV: DELETE NOTE 1 & PART NOS. FROM CKT BKRS REFERED TO BY NOTE 2; ADD NOTE 2 & DETAILS "B" & "C" (SR7904)	TMS 7-23-75	
E	BY REV: S-1360-25L WAS S-1360-20L ADD R172 (SR8133)(SR8134)(SR8146)	2-25-76	

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
PA14	18			S-1493-1	S-1493-1	SER (SRB259) & ON
PA12	8		6	S-1367-46	S-1367-410	
PA10	18		2	S-1493-1	S-1367-1-6	
PA9	12		22	S-1493-3	S-1367-3-6	
PA8	12		16	S-1493-3	S-1367-3-8	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	12.11.74
GROUP	B. HAIDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BUS BAR, PRIMARY, ALTERNATOR & ELECTRONIC

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 4.3.0

172, F172, FR172 R172
172GS685, F1720385, FR1720560 & 562,

20-3

FORM NO. 80-215B

NOTES:

1. OBSERVE POLARITY SYMBOL ON DIODE WHEN INSTALLING ON SWITCH TO AVOID DIODE FAILURE

2. AMP TERM 42281-2 ON CONDUCTOR, AMP TERM 2-323931-2 ON SHIELD & GND WIRE

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A" (SR7904)	TMS 3-10-75	SCY WHH JRB RF
B	BY REV: F WAS A+ & A+ WAS F (NOW SHOP PRACTICE)	RJP 10-8-75	SCY WHH JRB RF
C	BY REV: DELETE NOTE 1, 0770719-2; ADD R172 (NOW SHOP PRACTICE) (SR8146)	MDS 2-25-76	SCY WHH JRB RF

46-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
PB16	8	S-1562-8-9		S-1493-3	S-1367-4-12	
PB15	18S			S-1367-1-10 S-1367-2-10	◁2	
PB14	18S			S-1367-1-10 S-1367-2-10	◁2	
PB13	8S	S-1534-8-9		S-1843-2 S-1367-3-10	S-1367-4-10	
PB12	18		4	S-1367-1-8	S-1493-1	
PB11	16		4	S-1367-2-12	◁2	
PB10	8	S-1562-8-9	53	S-1493-3	S-1367-4-12	
PB9	18S		54	S-1367-1-10 S-1367-2-10	◁2	
PB8	18S		54	S-1367-1-10 S-1367-2-10	◁2	
PB7	18S		35	S-1493-1	S-1636-2 S-1636-2	
PB6	18S		3	S-1367-1-6 S-1367-1-8	◁2	
PB4	8S	S-1534-8-9		S-1843-2 S-1367-3-10	S-1367-4-10	
PB3	22		34	S-1635-1	42281-2	
PB1	22		6	S-1367-1-6	S-1635-1	

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
16	S-2135-1	LIGHT ASSY
15	S-1360-5L	CIRCUIT BREAKER
13	S-1596-60L	CIRCUIT BREAKER
12	S-1637-2	HOUSING
11	S-1637-1	HOUSING
10	TVA-1315	CAPACITOR
9	C593001-0101	OVERVOLTAGE SENSOR
8	S-1994-1-1	SWITCH
4	0770038-2	FILTER
3	C611501-0102	ALTERNATOR ASSY
2	C6AB-10A730A	HOUSING
1	C611001-0201	REGULATOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 4.11.1
0500062 P 4.14.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	C. FIFE	1-4-75
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM, 60 AMP

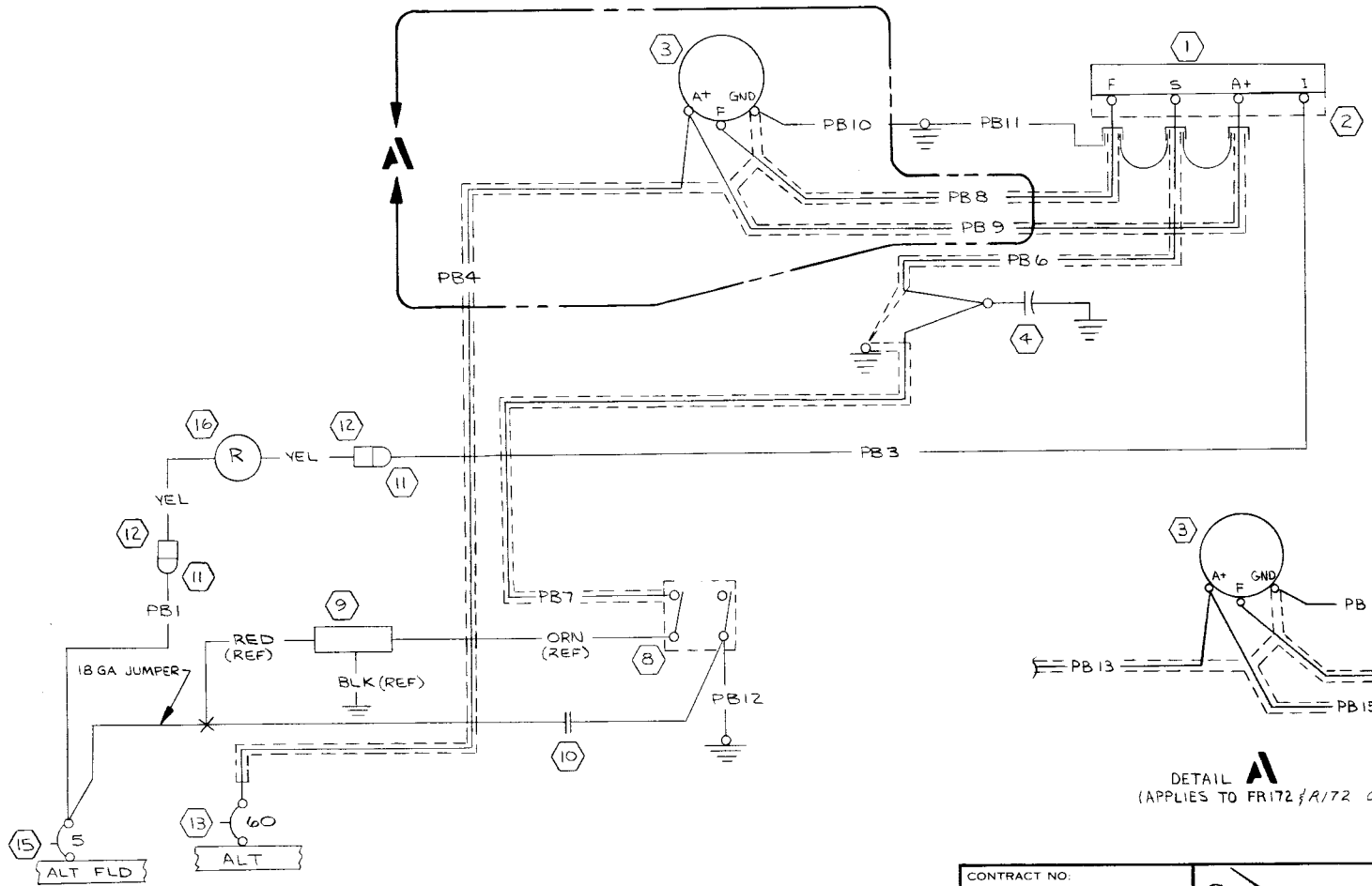
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 4.4.0

FORM NO. 80-215B

1726585, F1720138S, FR1720054D & S62

REVISION			
LET	DESCRIPTION	DATE	APPD
C	FOR REVISION SEE PAGE 4.4.0		



DETAIL A
(APPLIES TO FR172 & R172 ONLY)

46-0905

CONTRACT NO:		
	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HAGEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. TOUEL	12-6-74
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM - ALTERNATOR SYSTEM, 60 AMP

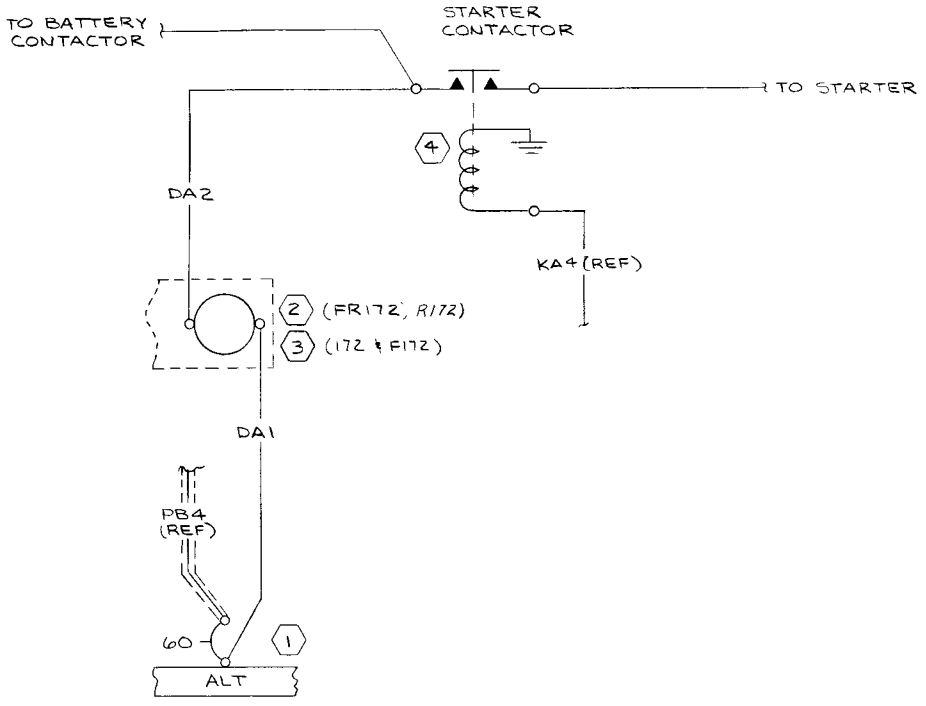
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0570101

SCALE: NONE | (SR1903)(SR1904) | PAGE: 4.4.1

172-55685, FR172-0135, FR172-0056 thru 62

FORM NO. 80-216A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD R172 (SR 8146)	MB 3 2-25-76	



46-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
DA2	8		64	S-13674-10	S-1367-414	
DA1	8		15	S-1367-410	S-13674-10	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
4	S-1991-1	CONTACTOR
3	S-1320-5	INDICATOR
2	C6669514-0101	INST CLUSTER
1	S-1596-60L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 D 4.15 D 4.16

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP		
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	P. FIFE	1-75
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — AMMETER

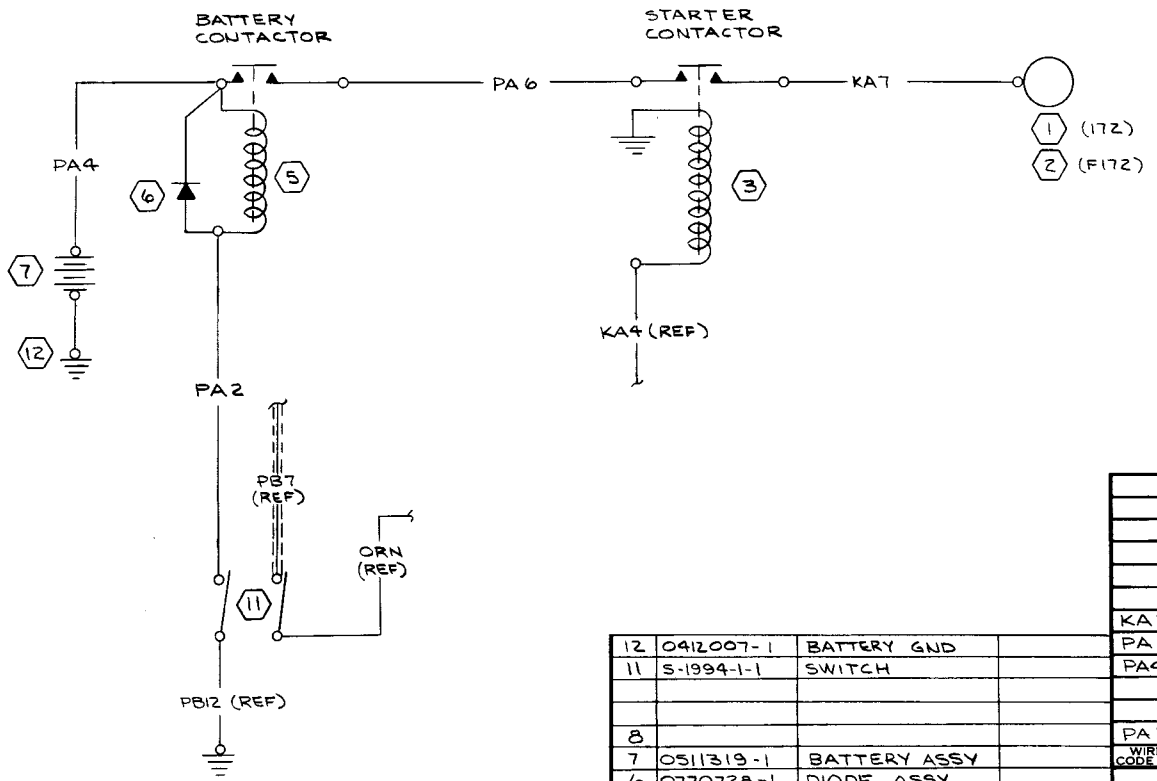
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 4.5.0

FORM NO. 80-215B

172, F172, FR172, R172
172G SCBS, F17201 BS, FR17200 SCBS GE

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE 0770719-2 (NOW SHOP PRACTICE)	DDB 2-25-76	XX WHH RF JRS mkw



ITEM NO.	PART NO.	DESCRIPTION
12	0412007-1	BATTERY GND
11	S-1994-1-1	SWITCH
8		
7	0511319-1	BATTERY ASSY
6	0770728-1	DIODE ASSY
5	S-1579-2	CONTACTOR
4		
3	S-1991-1	CONTACTOR
2	6312612	STARTER
1	76211	STARTER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 4.1.5

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
KA7	4		30	S-1367-615	S-1367-613	
PA 6	4		16	S-1367-613	S-1367-613	
PA4	4		6	S-1367-614	S-1367-14	
PA 2	22		57	S-1493-1	S-1367-8	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-29-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-A-75
APPD	JRS-EDB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM—
BATTERY CIRCUIT

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

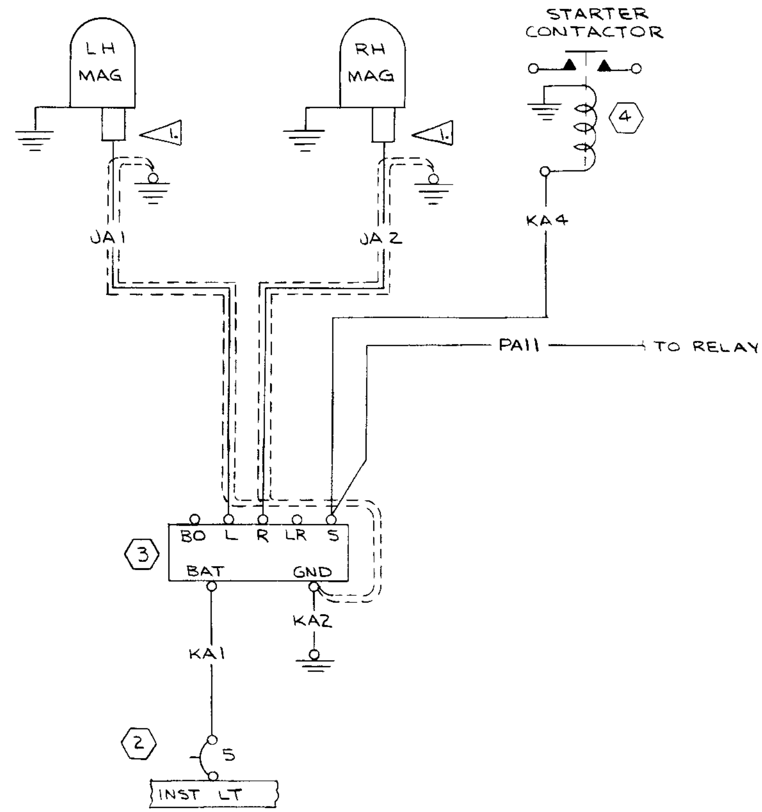
SCALE: NONE | (SR7903) | PAGE: 4.7.0

03-231-0905

172 & F172
172C858 & F172D1385

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD



04-231-0905
03-231-0905

NOTES:

1. ADD S-1488-1 NIPPLES TO MAG END OF WIRES

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
PA11	18		8	S-1367-1-6	S-1493-1		
JA2	18S		50	S-1367-1-6	S-1367-1-6 S-1367-2-6		
JA1	18S		45	S-1367-1-6	S-1367-1-6 S-1367-2-6		
KA4	18		52	S-1367-1-6	S-1367-1-10		
KA2	18		8	S-1367-1-6	S-1367-1-8		
KA1	22		16	S-1367-1-6	S-1367-1-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	S-1991-1	CONTACTOR	
3	C292501-0105	IGNITION SWITCH	
2	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 5.1.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRS	
OTHER		

Cessna® AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — MAGNETO SYSTEM

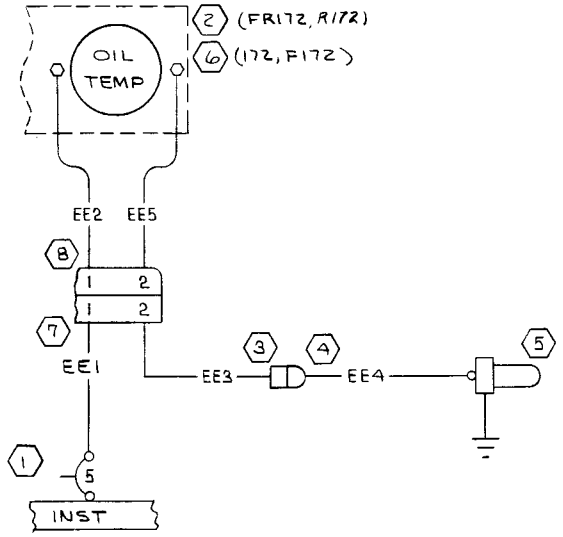
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 5.1.0

FORM NO. 80-215B

172, F172, FR172
17265685, F17201385, FR17200560 & 562

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C669512-0102 WAS C669511-0102; (SR7904)	BLA 1-22-75	
B	BY REV: DELETE EE2 (SR1903)(REF)(SR7904)(REF)	RJP 6-6-75	
C	BY REV: ADD EE2, EE5, S-1640-9 & S-1691-9; S-1636-1 WAS SOLDER / EE1 & EE3, S-1360-5L WAS S-1360-10L, S-1367-1-10 WAS SOLDER / EE5 & EE1, C669512-0103 WAS C669512-0101 (NOW SHOP PRACTICE)	RJP 10-8-75	
D	BY REV: ADD R172 (SR8146)	DDB 2-25-76	



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
EE5	20			S-1635-1	S-1367-1-10		
EE4	20			S-1635-1	S-1367-1-10		
EE3	20			S-1636-1	S-1636-1		
EE2	20			S-1635-1	S-1367-1-10		
EE1	20			S-1636-1	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
8	S-1640-9	CONNECTOR
7	S-1691-9	CONNECTOR
6	C669512-0103	INST CLUSTER
5	S-1630-1	SENDING UNIT
4	S-1637-1	HOUSING
3	S-1637-2	HOUSING
2	C669512-0102	INST CLUSTER
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX•CESSNA SPEC. NO.
S-XXX OR CMXXXX•CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	1-2-75
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	GRS 1-8-75	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM—
OIL TEMPERATURE

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR1903)(SR7904) | PAGE: 7.2.0

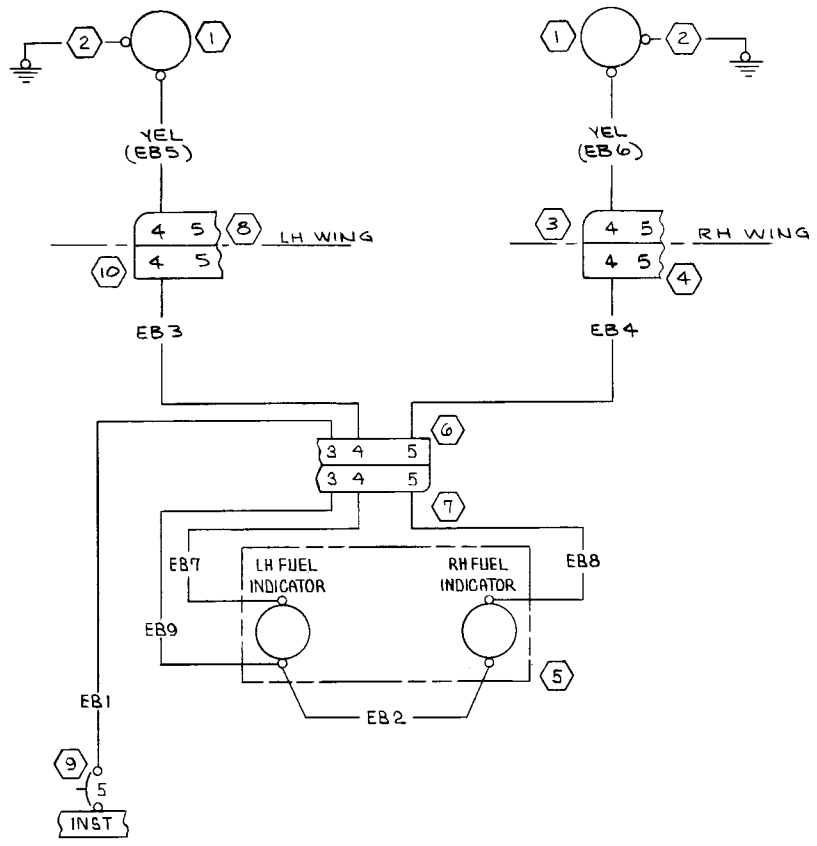
46-0905

20-9

FORM NO. 80-215B

172GS685, F1720385, FR172 0560 & 562

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD EB7, EB8, EB9, S-1640-9 & S-1641-9; S-1640-6 WAS S-1640-1, S-1636-1 WAS S-1367-1-10/EB1, S-1636-1 WAS S-1367-1-10/EB3 & S-1636-1 WAS S-1367-1-10/EB4 (NOW SHOP PRACTICE)	RJP 10-8-75	JCW 11-11-75 GRS RF



04-231-0905
03-231-0905

ITEM NO.	PART NO.	DESCRIPTION
10	S-1641-6	HOUSING
9	S-13605L	CIRCUIT BREAKER
8	S-1640-6	HOUSING
7	S-1640-9	CONNECTOR
6	S-1641-9	CONNECTOR
5	C669511-0102	INST CLUSTER
4	S-1641-6	HOUSING
3	S-1640-6	HOUSING
2	0413247	STRAP-GND
1	0523557-1	XMTR-FUEL GAGE

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESSNA SPEC. NO. S-XXX OR CMXXXX-CESSNA STD. NO.

SUPERSEDES: 0500062 P 8.1.2 P 8.1.3

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
EB9	22			S-1635-1	S-1367-1-10		
EB8	22			S-1367-1-10	S-1635-1		
EB7	22			S-1367-1-10	S-1635-1		
EB6 (YEL)	22	-18-4	38	S-1635-1	S-1367-1-10		
EB5 (YEL)	22	-18-4	38	S-1635-1	S-1367-1-10		
EB4			82	S-1636-1	S-1636-1		
EB3			45	S-1636-1	S-1636-1		
EB2			3	S-1367-1-10	S-1367-1-10		
EB1	22		16	S-1367-1-6	S-1636-1		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-1-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRS 2-11-75	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: **WIRING DIAGRAM — FUEL GAGE & TRANSMITTER**

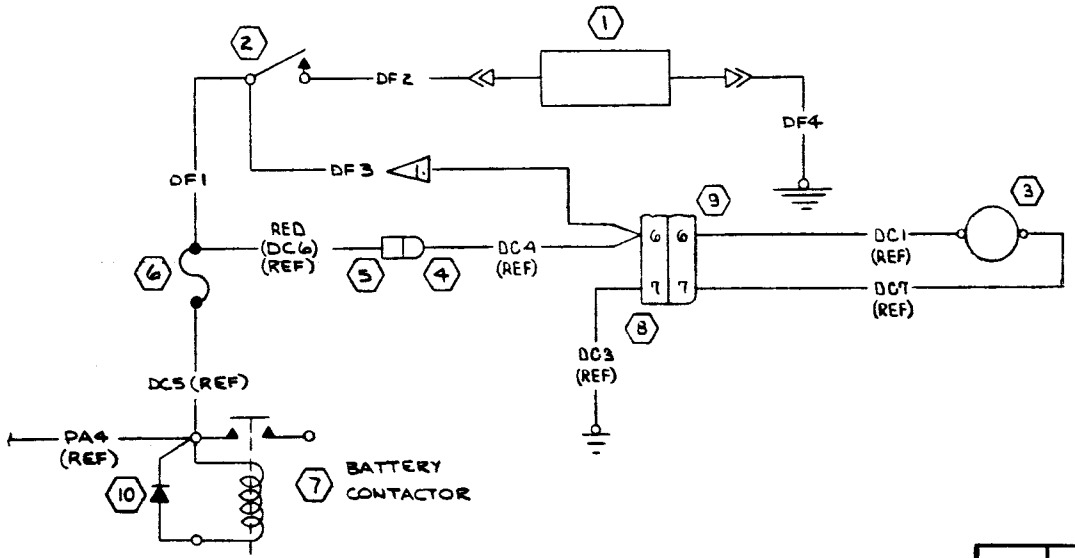
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR1903) (SR1904) PAGE: 8.1.0

FORM NO. 80-215B

172, F172, FR172
172GS GBS, F172 01385, FR17200506 DFSG2

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C664508-0101 WAS S-1317N2 (SR7904)	BLA 1-22-75	
B	BY REV: ADD S-1640-9, S-1641-9, DC1(REF), DC7(REF); DC4(REF) WAS DC2(REF), S-1636-2 WAS S-1367-1-8/DF3; ADD 0770728-1 (NOW SHOP PRACTICE)	RJP 10-8-75	



NOTES:

1. WHEN OPTIONAL CLOCK IS INSTALLED, DF1 WIRE IS OMITTED & DF3 WIRE IS USED

ITEM NO.	PART NO.	DESCRIPTION
10	0770728-1	DIODE ASSY
9	S-1640-9	CONNECTOR
8	S-1641-9	CONNECTOR
7	S-1579-2	CONTACTOR
6	S-1091-1	FUSE
5	S-1637-2	HOUSING
4	S-1637-1	HOUSING
3	C664508-0101	CLOCK
2	S-1711-1	SWITCH-OIL PRESS
1	C664502-0101	HOURMETER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX-CESSNA SPEC. NO.
S-XXX OR CMXXXX-CESSNA STD. NO.

SUPERSEDES: 0300062 P 8.3

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
DF4	22		32	S-1493-1	S-1367-1-6	
DF3	22		51	S-1367-1-6	S-1636-2	
DF2	22		52	S-1493-1	S-1367-1-8	
DF1	22		52	S-1367-1-6	SOLDER	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	12-11-74
GROUP	B HANSEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HOURMETER (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 0570101

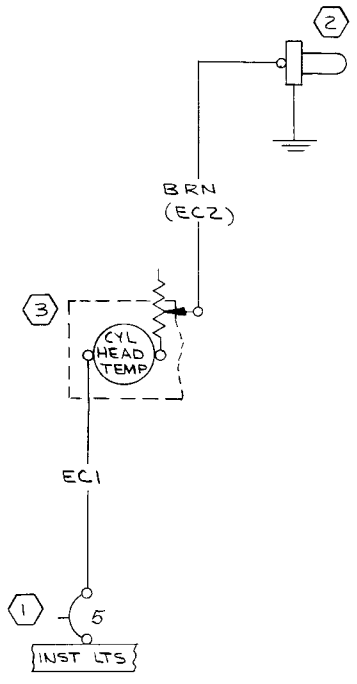
SCALE: NONE | (SR7903) | PAGE: 8.2.0

03-231-0905

20-11

172, F172

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S1360-5L WAS S1360-10L, HT1921 IN NOTE 1 WAS HT1719-C (SR7904)(REF.)	J.M.S. 10-8-75	JCT 10-8-75 JRS RF
B	BY REV: ADD NOTE 2 (NOW SHOP PRACTICE)	1-30-76 JRS	JRS MHL RF



NOTES:

1. CRIMP S-1636-5 TERMINAL AROUND WIRE INSULATION, BEND .25 OF STRIPPED WIRE BACK OVER CRIMP & SOLDER PER CES 1040. USE MOLEX HT-1921 CRIMPING TOOL ONLY
2. MATERIAL IS ALPHA 5857-7 (VENDOR CODE 92194) OR BELDEN 83009-1 (VENDOR CODE 70903)

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BRN EC2	18	<2>		S-1367-1-8	S-1636-5	<1>	
EC1	18			S-1367-1-8	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	C669514-0101	INST CLUSTER
2	S-1372-2	TEMP BULB
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 8.4

SUPERSEDED BY:

	NAME	DATE
CONTRACT NO:		
DESIGN	G STAMM	1-2-75
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R FIFE	1-4-75
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — CYLINDER HEAD TEMP

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7904) PAGE: 8.3.0

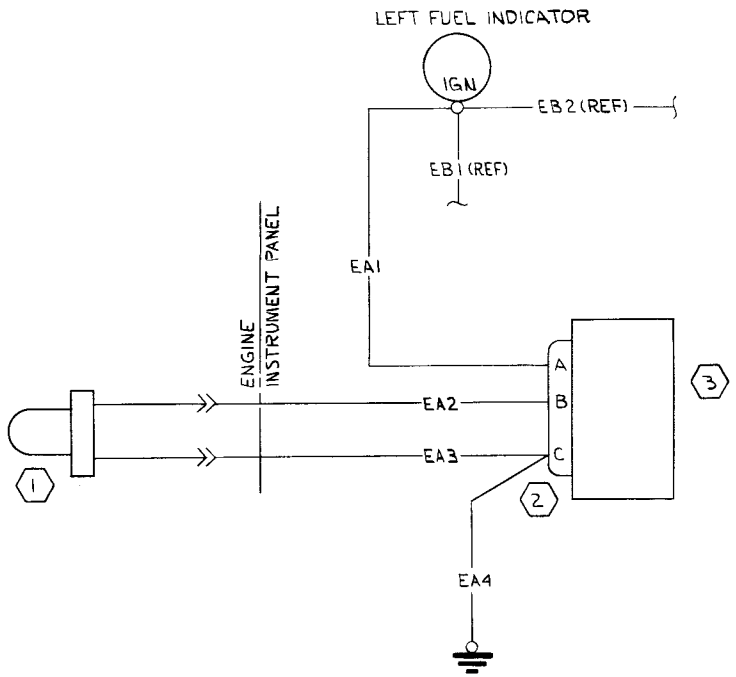
04-231-0905

FORM NO. 80-2158

FR172

MODEL APPLICATION		
MODEL	BEGIN	END
172	SR7903	
FR172	SR7904	

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD EA4 TO S-1311-3 (SR7903)(REF)(SR7904)(REF)	JMS 10-13-75	JCY JRS RF



NOTES:

1. TERMINALS ARE YZ14-H AND FURNISHED BY VENDOR (09922)

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
EA4	18			SOLDER	S-1367-1-8	
EA3	18			SOLDER		
EA2	18			SOLDER		
EA1	18			SOLDER	S-1367-1-10	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	S-1311-3	INDICATOR
2	MS3106A-14S-7S	PLUG
1	0550209-1	PROBE-CARB AIR TEMP

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 PG. 8.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	8-4-75
GROUP	W H Harden	8-23-75
DRAWN	WHITSON	7-31-75
CHECK	Youel	7-31-75
STRESS		
PROJ	Fife	8-25-75
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CARBURETOR AIR TEMPERATURE GAUGE

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE PAGE: 8.5

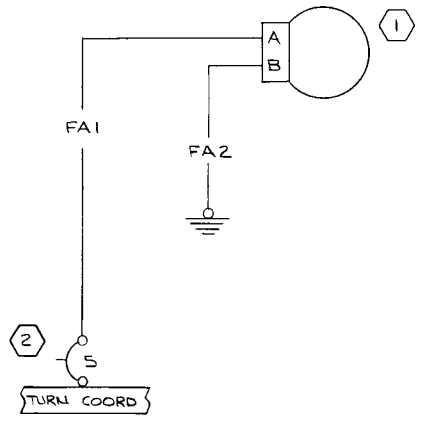
03-231-0905 04-231-0905

20-13

FORM NO. 80-215B

(SR7903)(REF)(SR7904)(REF)
172GS685, F1720138S, FR172D0560&562

REVISION			
LET	DESCRIPTION	DATE	APPD



04-231-0905
03-231-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
FA2	18		12	S-1367-1-8	SOLDER		
FA1	22		10	S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
2	S-1360-5L	CIRCUIT BREAKER
1	C661003-0501	TURN COORDINATOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 0500062 P 9.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	12-11-74
GROUP	D HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. TOUEL	12-6-74
STRESS		
PROJ	R FIFE	1-5-75
APPD	JPS 1-7-75	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM—
TURN COORDINATOR

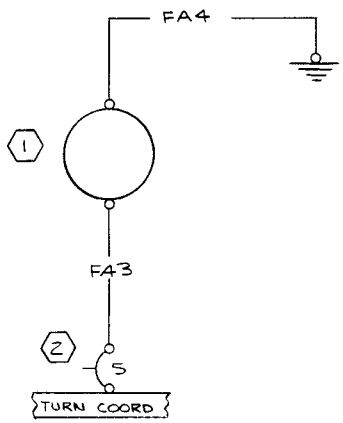
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR7903) (SR7904) | PAGE: 9.1.0

FORM NO. 80-215B

172, F172, FR172
1726586S, F1720385, FR17200560$ SC2

REVISION			
LET	DESCRIPTION	DATE	APPD



04-231-0905
03-231-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
FA4	18		12	S-1367-1-8	S-1367-1-8	
FA3	22		10	S-1367-1-6	S-1367-1-8	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
2	S-1360-5L	CIRCUIT BREAKER
1	S-1413-2	TURN & BANK IND

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 9.4

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-5-75
APPD	JPG 2DA	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — TURN & BANK INDICATOR (OPT)

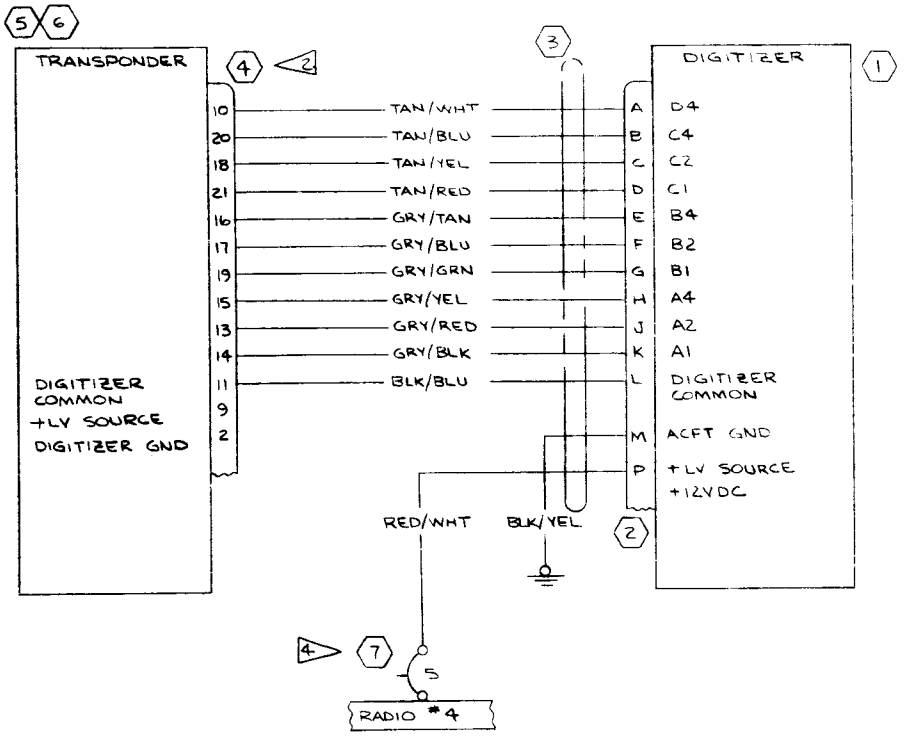
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 9.2.0

172, F172, FR172
1726585, F17201385, FR17200560 & 562

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD FR172 REQUIREMENTS (SR7304)	TMS 1-27-75	
B	BY REV: ADD RT-459A (SR8255)	DLP 2-5-75	



NOTES:

1. FOR WIRE & WIRE TERMINALS REFER TO 1270625 PAGE 9.7
2. TRANSPONDER CONNECTOR HOUSING IS PART OF TRANSPONDER CABLE ASSY
3. FOR WIRING DIAGRAM OF 300 & 400 TRANSPONDER REFER TO 3920143
4. ATTACH BOTH TRANSPONDER AND ENCODING ALTIMETER TO THE NO. 4 CIRCUIT BREAKER

ITEM NO.	PART NO.	DESCRIPTION
7	S-1360-5L	CIRCUIT BREAKER
6	RT-459A	TRANSPONDER
5	RT-359A	TRANSPONDER
4	S-2189-1	CONNECTOR
3	1570312-3	CABLE ASSY
2	42816	CONNECTOR
1	EA-401A	ALT DIGITIZER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 9.6

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

CONTRACT NO:

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

	NAME	DATE
DESIGN	G STAMM	12-11-74
GROUP	P. HARDIN	
DRAWN	MERRICK	10-31-74
CHECK	J. TOUEL	12-6-74
STRESS		
PROJ		
APPD		
OTHER		

TITLE: WIRING DIAGRAM — ENCODING ALTIMETER (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

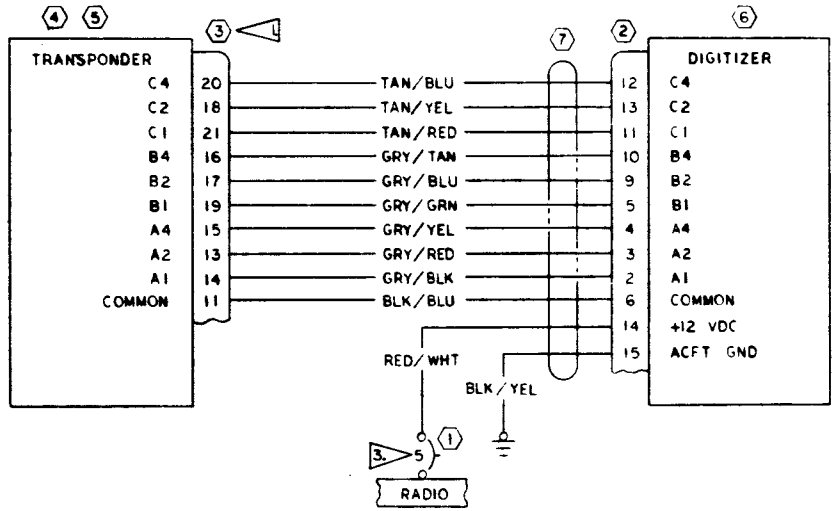
SCALE: NONE | FR172 (SR7304) | PAGE: 9.3.0

04-231-0905

FORM NO. 80-2158

172, FR172

REVISION			
LET	DESCRIPTION	DATE	APPD



NOTES:

1. TRANSPONDER CONNECTOR HOUSING IS PART OF TRANSPONDER CABLE ASSY
2. FOR WIRING DIAGRAM OF 300 & 400 TRANSPONDER REFER TO 3920168
3. ATTACH BOTH TRANSPONDER AND ENCODING ALTIMETER TO THE NO. 4 CIRCUIT BREAKER

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
TAN/BLU	22	22-10-6		S-2190-1	SOLDER	
TAN/YEL		22-10-4				
TAN/RED		22-10-2				
GRY/TAN		22-8-10				
GRY/BLU		22-8-6				
GRY/GRN		22-8-5				
GRY/YEL		22-8-4				
GRY/RED		22-8-3				
GRY/BLK		22-8-0				
BLK/BLU		22-0-6		S-2190-1		
BLK/YEL		22 0-4		S-36?-1-5		
RF /WHT	22	22 2 9		S-36?-1-5	SOLDER	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	0470404	CABLE ASSY
6	C744001-0101	ALT DIGITIZER
5	RT-459A	TRANSPONDER
4	RT-359A	TRANSPONDER
3	S-2189-1	CONNECTOR
2	DA-15S	CONNECTOR
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESSNA SPEC. NO. S-XXX OR CMXXXX-CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	4-23-76
GROUP		5-5-76
DRAWN	R. KLEIN	4-22-76
CHECK		4-22-76
STRESS		
PROJ		5-6-76
APPD		5-5-76
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
BLIND ENCODER
172, F172, R172, FR172

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | SER (SR 8490) | PAGE: 9.4

FORM NO. 60-2158

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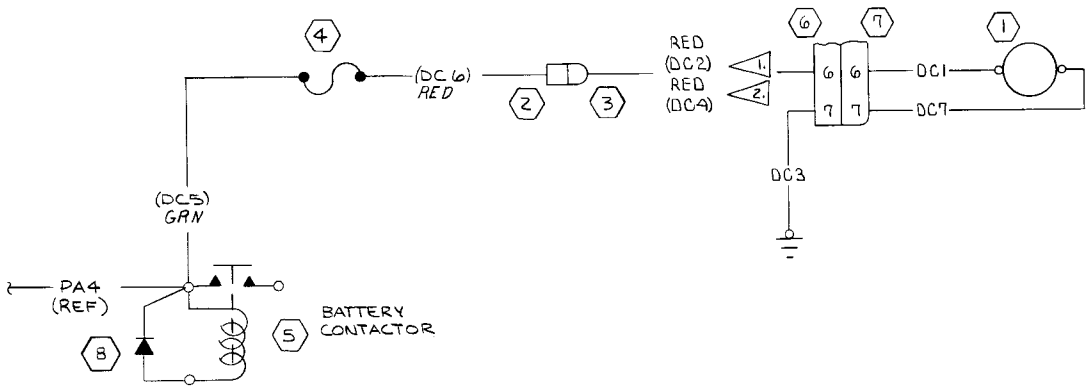
REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DC1, DC7, S-1640-9, S-1691-9; S-1636-2 WAS S-1367-1-8/DC2 & DC4, S-1636-1 WAS S-1367-1-8/DC3, C664508-0101 WAS S-1317N2; ADD 0770728-1 (NOW SHOP PRACTICE)	RJP 10-8-75	JCY WHH JHS RF
B	BY REV: ADD R172 (SRB146)	JDB 2-25-76	JCY WHH JHS RF JRS



NOTES:

1. APPLIES TO FR172 & R172 ONLY
2. APPLIES TO 172 & F172 ONLY

ITEM NO.	PART NO.	DESCRIPTION
8	0770728-1	DIODE ASSY
7	S-1690-9	CONNECTOR
6	S-1691-9	CONNECTOR
5	S-1579-2	CONTACTOR
4	S-1091-1	FUSE
3	S-1637-1	HOUSING
2	S-1637-2	HOUSING
1	C664508-0101	CLOCK

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 10,2

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
RED (DC6)	22	-22-2		SOLDER	S-1636-1	
GRN (DC5)	22	-22-4	10	S-1367-1HD	SOLDER	
RED (DC4)	22	-22-2	716	S-1635-1	S-1636-2	
DC3	22		18	S-1636-1	S-1367-1-6	
DC7	22			S-1367-1-8	S-1635-1	
RED (DC2)	22	-22-2	150	S-1635-1	S-1636-2	
DC1	22			S-1695-1	S-1367-1-8	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CLOCK (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

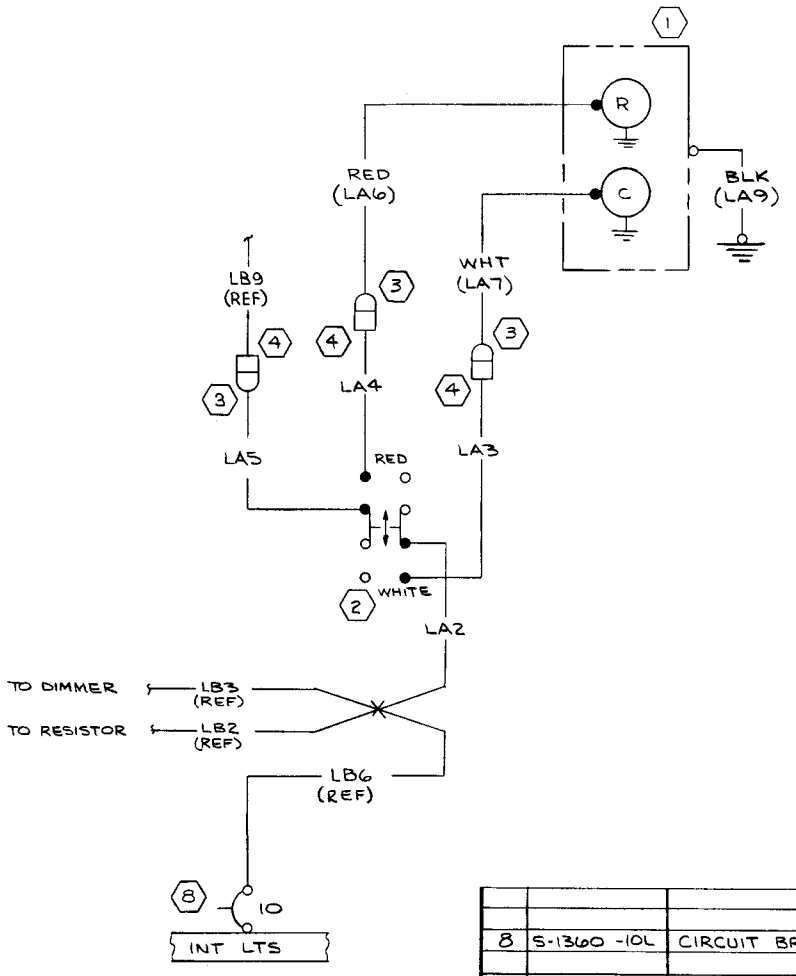
SCALE: NONE (SR1903) (SR1904) PAGE: 10.1.0

5960 46 0905

FORM NO. 80-215B

172, F172, FR172, R172
172056 BS, F17201385, FR17200560ES69, R1722000

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE: S-1640-6, S-1691-6, LA8, & LB11(REF); ADD LB9(REF) (NOW SHOP PRACTICE)	RJP 10-8-75	



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
BLK (LA9)	18	-18-0	12	S-1367-1-10	S-1367-1-8	
WHT (LA7)	18	-18-9	10	S-1635-2	SOLDER	
RED (LA6)		-18-2	10	S-1635-2	SOLDER	
LA5			8	SOLDER	S-1636-1	
LA4			6	SOLDER	S-1636-1	
LA3			7	SOLDER	S-1636-1	
LA2	18		7	SOLDER	SEE LB6	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
8	S-1360-10L	CIRCUIT BREAKER
4	S-1637-2	HOUSING
3	S-1637-1	HOUSING
2	S-1501-1	SWITCH
1	1470089-14	LIGHT ASSY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX-CESSNA SPEC. NO.
S-XXX OR CMXXXX-CESSNA
STD. NO.

SUPERSEDES: 0500062 P11.1.3

SUPERSEDED BY:

CONTRACT NO:

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	G. STAMM	12-1-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRS 2nd DB	
OTHER		

TITLE
WIRING DIAGRAM — MAP & AUXILLARY INSTRUMENT LIGHT (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR1903) (SR1904) PAGE: 11.1.0

04-231-0905
03-231-0903

FORM NO. 80-215B

172, F172, FR172
172G5685, F172G0385, FR1720056 & SUB

NOTES:

1. THESE WIRES VENDOR FURNISHED
2. OPTIONAL WITH POST LIGHTS INSTL

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 34003-55-3410 WAS 34003-55 DELETE 18 GA JUMPER (SR7903)(SR7904)	TMS 2-27-75	JCY WHH ARS RF
B	BY REV: ADD S-1640-9, S-1641-9 & LB25; LB1 WAS LB14, LB7 WAS LB13, S-1636-1 WAS S-1370-3/LB8, S-1635-2 WAS S-1636-2/ LB10, S-1635-1 WAS S-1636-1/LB10, BLU (REF) WAS BRN (REF) & TAN (REF) WAS WHT (REF) DELETE LB11; ADD LA5 (REF) (NOW SHOP PRACTICE)	RJP 10-8-75	JCY WHH ARS RF
C	BY REV: MS 15584-2 WAS 0511481, C660501-0101 WAS 0713068, ADD R172 DELETE C669513-0101 (SR8133)(SR8134)(SR8146)	RDB 2-25-76	JCY WHH ARS mwh RF

34-0905
33-0905
46-0905

ITEM NO.	PART NO.	DESCRIPTION
20	S-1641-9	CONNECTOR
19	S-1640-9	CONNECTOR
18	C669514-0101	INST CLUSTER
16	C669512-0103	INST CLUSTER
15	1270479-12	LIGHT ASSY
14	C669512-0102	INST CLUSTER
13	C669511-0102	INST CLUSTER
12	MS15584-2	LAMP
11	C660501-0101	COMPASS ASSY
10	S-1640-6	HOUSING
9	S-1641-6	HOUSING
8	15701166-1	DIMMING ASSY
7	S-1637-1	HOUSING
6	S-1637-2	HOUSING
5	1270479-10	LIGHT ASSY
4	S2000B270J	RESISTOR
3	S-2091-5	RESISTOR ASSY
2	34003-55-3410	TERMINAL BOARD
1	S-1360-10L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P11.2.4

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
LB7	20		20	S-1635-1	S-1367-1-10	
LB12	18		4	SOLDER	S-1367-1-10	
LB10	20		76	S-1635-2	S-1635-1	
LB9	20		25	S-1636-1	SEE LB10	
LB8	18			S-1636-1	S-1829-1	
LB25	18			S-1370-3	S-1635-1	
LB1	18			S-1635-1	S-1829-1	
LB5	18		15	SOLDER	S-1636-1	
LB4	18		15	SOLDER	S-1635-1	
LB3	18		5	S-1635-1	SEE LB6	
LB2	18		13	SOLDER	SEE LB6	
LB6	18		5	S-1367-1-6	S-1370-2	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	1-2-75
GROUP	B HARDEN	1-3-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	ARS EDS	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — COMPASS & INSTRUMENT LIGHTS

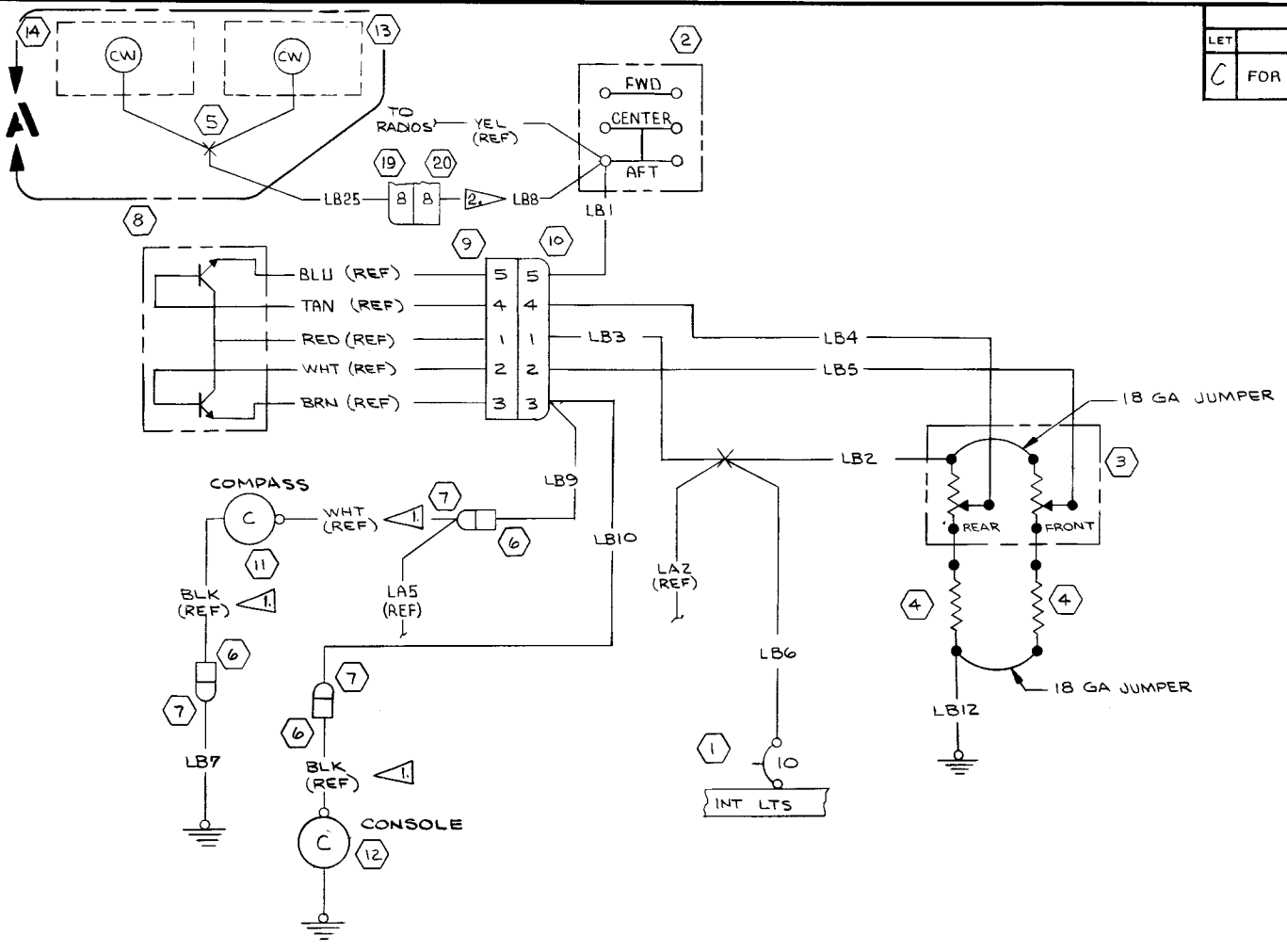
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

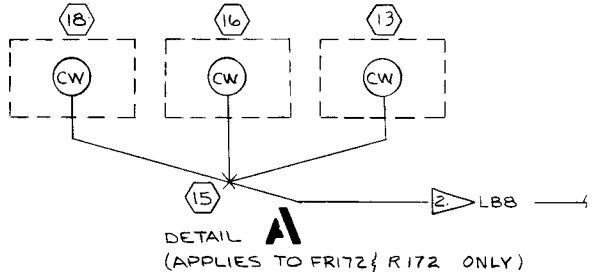
SCALE: NONE | (SR7903) (SR7904) | PAGE: 11.2.0

172, F172, FR172, R172
17265685, F1720385, FR17200560 SG2

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
C	FOR REVISION SEE PAGE 11.2.0		





33-0905 34-0905 46-0905

CONTRACT NO:		
	NAME	DATE
DESIGN	G STAMM	1-2-75
GROUP	B. HARDEN	1-3-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	APB	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM-
COMPASS & INSTRUMENT
LIGHTS

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 11.2.1

FORM NO. 80-216A

172, F172, FR172, R172
17265685, F172D1385, FR17200560 & 562

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE S-1641-6, S-1640-6 & LB11(REF); ADD BLK/LB21 & 23, RED/YEL/LB22 & LB24; 0513454 WAS 0511481 & 1213379 WAS 1213379-9 (NOW SHOP PRACTICE)	RJP 10-8-75	JCY JRG RF

NOTES:

1. SEE PG. 11.2.0 & PG 11.2.1 FOR INSTRUMENT CLUSTER LIGHTS

04-231-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
RED/YEL	22	-22-2-4		SOLDER	SOLDER		
BLK	22	-22-0		SOLDER	↕		
RED/YEL (LB24)	22	-22-2-4		S-1635-1			
BLK (LB23)	22	-22-0		S-1636-1			
RED/YEL (LB22)	22	-22-2-4		S-1635-1			
BLK (LB21)	22	-22-0		S-1636-1	SOLDER		
LB20	22			S-1635-1	S-1367-1-8		
LB19	22			S-1635-1	S-1367-1-8		
LB18	22			S-1636-2	S-1636-1		
LB17	22			S-1636-1	SEE LB18		
LB16	18			S-1635-2	S-1635-1		
LB15	18			S-1636-1	S-1635-1		
LB14	18			S-1636-1	SOLDER		
LB13	18			S-1636-1	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	0513454	INST LT	
8	S-1501-1	SWITCH	
7	S-1641-6	HOUSING	
4	1213379	POST LT ASSY	
3	S-1640-6	HOUSING	
2	S-1637-2	HOUSING	
1	S-1637-1	HOUSING	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 11.2.5.1 P 11.2.5.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	1-2-75
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRG EDB	
OTHER		

Cessna® AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — INSTRUMENT PANEL POST LIGHTING (OPT)

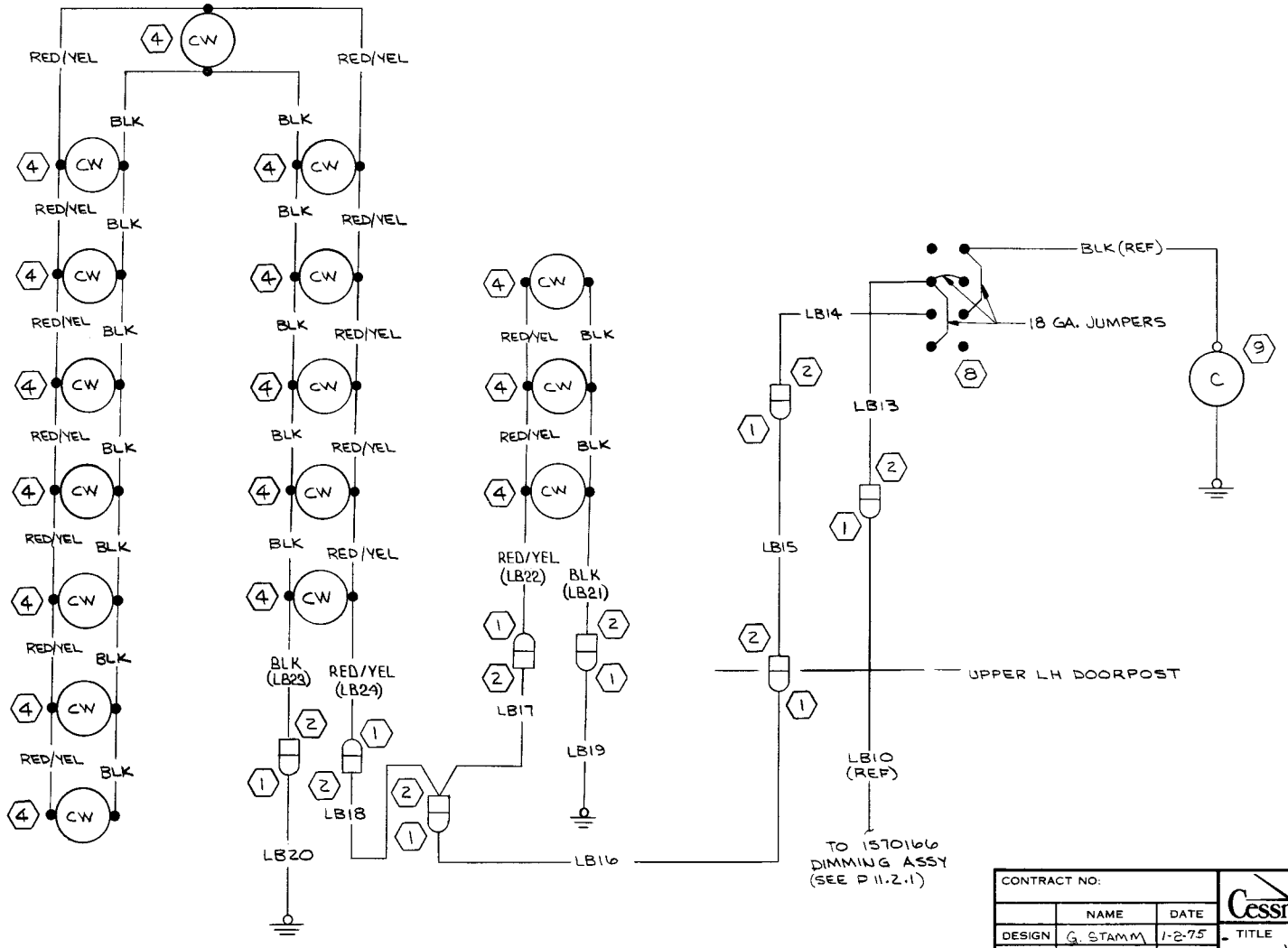
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7904)(SR7903) PAGE: 11.3.0

172, F172, FR172
17265685, F17201385, FR17200560 & 562

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	SEE P. 11.3.0 FOR REVISIONS		



CONTRACT NO:		
	NAME	DATE
DESIGN	G. STAMM	1-2-75
GROUP	B HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-74
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

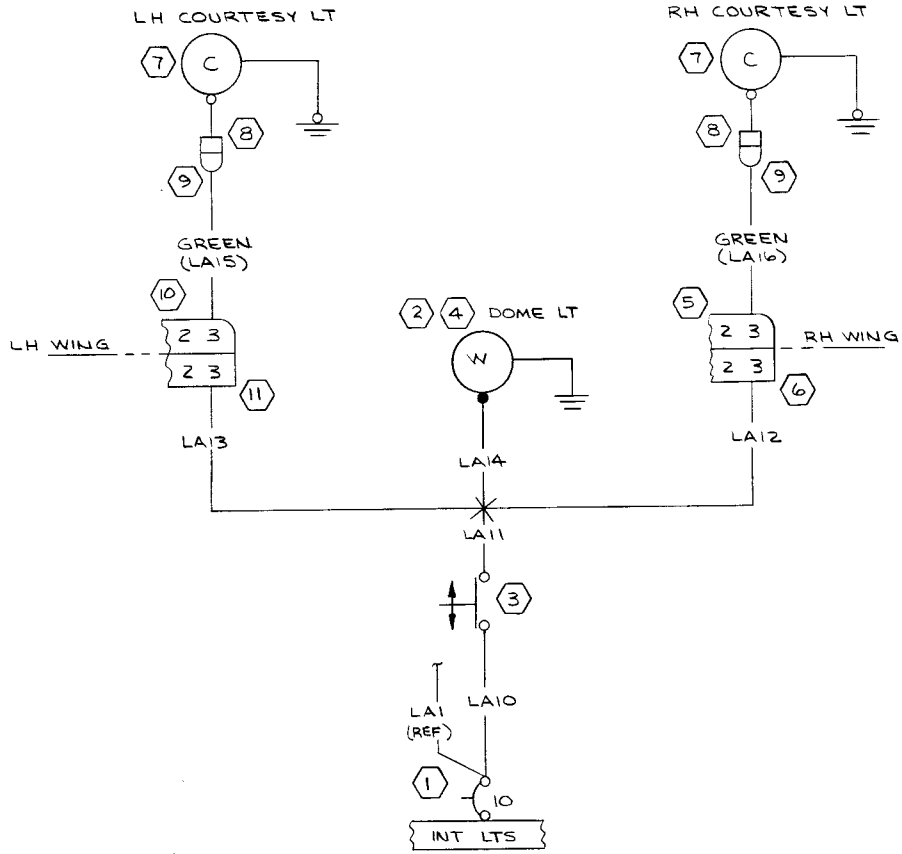
TITLE
WIRING DIAGRAM - INSTRUMENT PANEL POST LIGHTING (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0570101

SCALE: NONE (SR7904) (SR7903) PAGE: 11.3.1

FORM NO. 80-216A

172, F172, FR172
17265685, F17201385, FR17200560 & 562



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S-1876-1, 0513208 WAS 0511481, R172 (SR8133)(SR8134) (SR8146)	BDB 2-25-76	

GREEN LA16	18	-18-5	117	S-1635-1	S-1635-1		
GREEN LA15		-18-5	117	S-1635-1	S-1635-1		
LA14			6	SOLDER	SEE LA11		
LA13			45	S-1636-1	SEE LA11		
LA12			45	S-1636-1	SEE LA11		
LA11			6	S-1830-1	S-1370-3		
LA10	18		84	S-1830-1	S-1360-1-10		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
11	S-1641-6	HOUSING
10	S-1640-6	HOUSING
9	S-1637-1	HOUSING
8	S-1637-2	HOUSING
7	0521101	COURTESY LT
6	S-1641-9	HOUSING
5	S-1640-9	HOUSING
4	0513208	SOCKET
3	S-1831-1	SWITCH
2	S-1876-1	LIGHT
1	S-1360-10L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 0500062 P 11.7.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOWEL	12-6-74
STRESS		
PROJ	R. FIFE	1-14-75
APPD	JRB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM—
DOME & COURTESY LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 11.4.0

33-0905, 34-0905, 46-0905

20-23

FORM NO. 80-215B

172, F172, FR172, A172
172656&5, F17201385, FR17200560(562) A1722000

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: EXCHANGE TAXI LT & LDG LT, TAN(LE2) & GRAY(LC2), LE1 & LC1, LE4 & LC5, (SR7903)(SR7904)	TMS 3-10-75	WHH HRB RF
B	BY REV: ADD HC2(REF), 4522 WAS 4509 S-1360-25L WAS S-1360-20L, ADD R172 (SR8133)(SR8134)(SR8146)	MDB 2-25-76	WHH HRB RF

34-0905
33-0905
46-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LC5	12			S-1493-3	S-13674-6		
LE4	12			S-1493-3	S-1367-1-6		
BLK/WHT LE3	12	-12-0-9	6	S-1367-3-8	S-1367-3-8		
TAN LE2		-12-8	36	S-1493-3	S-13673-8		
LE1			50	S-1493-3	S-1493-3		
BLK/WHT LC4		-12-0-9	28	S-1493-3	S-1367-3-6		
BLK/WHT LC3		-12-0-9	33	S-1367-3-8	S-1493-3		
GRAY LC2		-12-10	32	S-1493-3	S-1367-3-8		
LC1	12		50	S-1493-3	S-1493-3		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	4522	LAMP
6	S-2160-5	SWITCH
5	4509	LAMP
4	S-2064-1	CONNECTOR
3	S-2160-4	SWITCH
1	S-1360-25L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX-CESSNA SPEC. NO.
S-XXX OR CMXXXX-CESSNA
STD. NO.

SUPERSEDES: 0500062 P11.8.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. TOUEL	12-6-74
STRESS		
PROJ	R FIFE	1-14-75
APPD	GPS RDB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING & TAXI LIGHT (OPT)

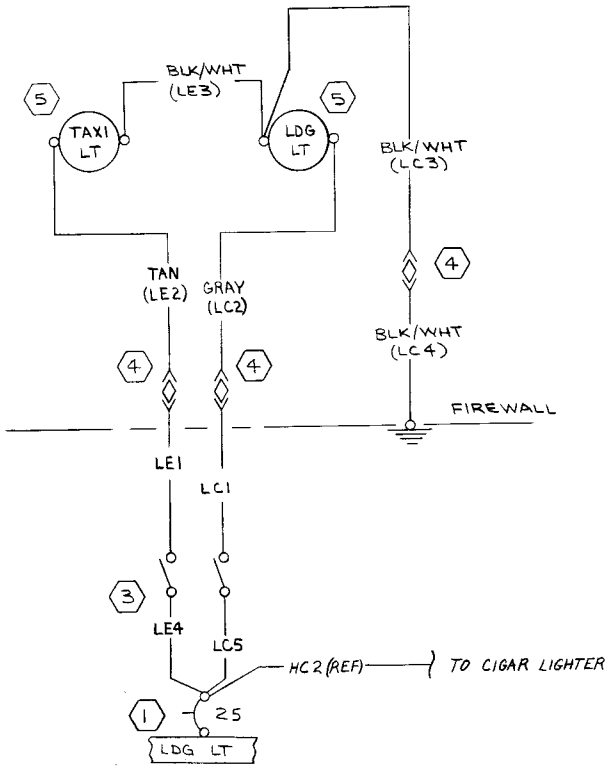
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR7903) (SR7904) | PAGE: 11.5.0

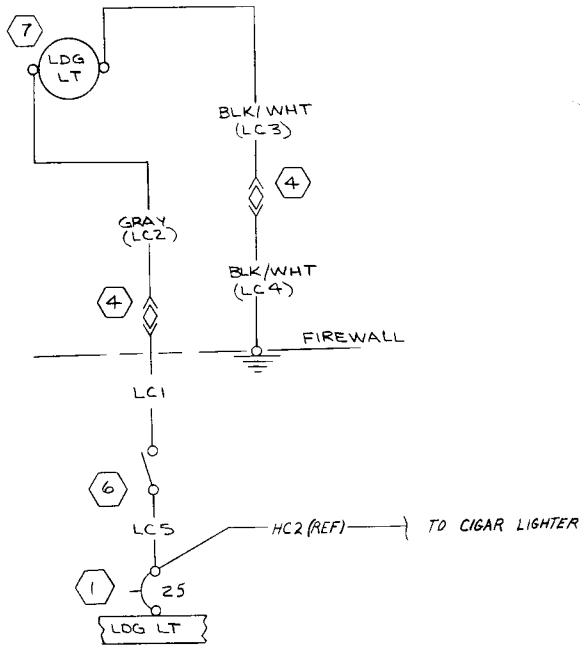
FORM NO. 80-215B

172, F172, FR172, R172
17265685, F17201385, FR17200560F562, R1722000

REVISION			
LET	DESCRIPTION	DATE	APPD
B	FOR REVISION SEE SHEET 11.5.0		



APPLICABLE TO F172, FR172, R172 & ALTERNATE OPTION ON 172



APPLICABLE TO 172 ONLY

46 0905

CONTRACT NO:		
	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM
LANDING & TAXI LIGHT
(OPT)

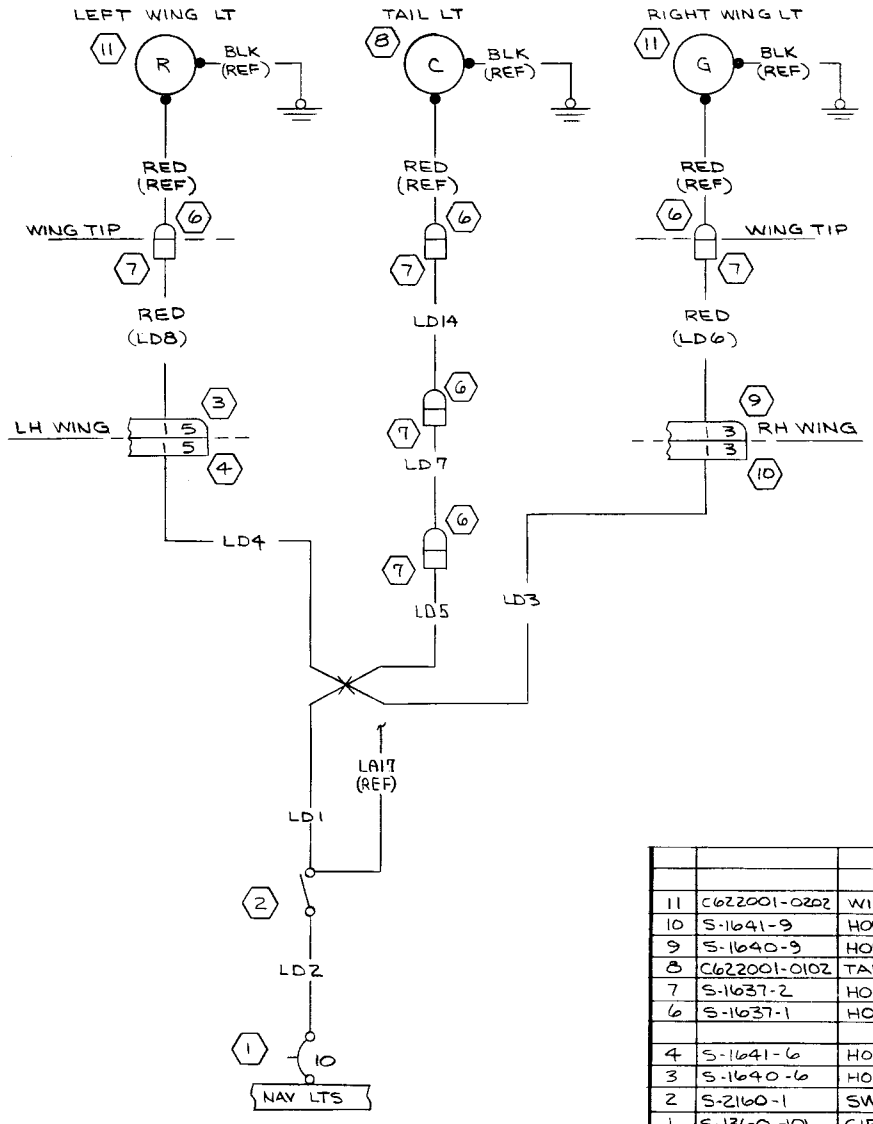
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 11.5-1

172, F172, FR172 R172
17265685, F17201385, FR17200506562, R17220000

20-25

FORM NO. 80-216A



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD LD14 & LA17 (REF); S-1635-1 WAS S-1636-1/LD7 & S-1636-1 WAS S-1635-1/LD5 (NOW SHOP PRACTICE)	RJP 10-8-75	

04-231-0905
03-231-0905

ITEM NO.	PART NO.	DESCRIPTION
11	C622001-0202	WING LIGHT
10	S-1641-9	HOUSING
9	S-1640-9	HOUSING
8	C622001-0102	TAIL LIGHT
7	S-1637-2	HOUSING
6	S-1637-1	HOUSING
4	S-1641-6	HOUSING
3	S-1640-6	HOUSING
2	S-2160-1	SWITCH
1	S-1360-10L	CIRCUIT BREAKER

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LD14	18		75	S-1635-1	S-1636-1		
RED LD8	18	-18-2	200	S-1635-1	S-1636-1		
LD7			290	S-1635-1	S-1636-1		
RED LD6		-18-2	200	S-1635-1	S-1636-1		
LD5			18	S-1370-2	S-1636-1		
LD4			40	SEE LD5	S-1636-1		
LD3	18		60	SEE LD5	S-1636-1		
LD2	18			S-1493-1	S-1367-1-6		
LD1	18		6	S-1493-1	SEE LD5		

WIRE TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P11.9.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	18-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-14-75
APPD	JAS LDB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

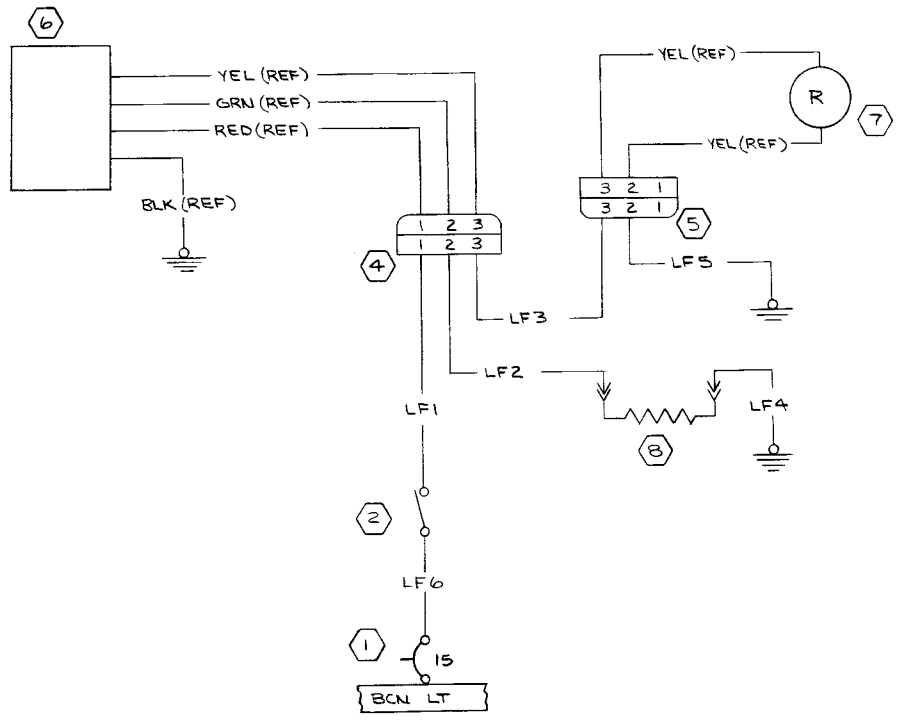
TITLE
WIRING DIAGRAM — NAVIGATION LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR1903) (SR1904) PAGE: 11.6.0

FORM NO. 80-215B

172, F172, FR172
172GS685, F1720385, FR17200560\$62



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV. S-1367-2-8 WAS S-1367-2-6 PER LF4 S-1367-2-6 WAS S-1367-2-8 PER LF5 (SR7903) (SR1904)	RS 2-6-75	VCF WWH GRS RF
B	BY REV: S-1360-15L WAS S-1360-10L; LF1 & LF6/16 GA WIRE WAS 18 GA (SR7903)(SR7904)	BAH 5-13-75	PAM LDB RF

04-231-0905
03-231-0905

LF6	16			S-1493-2	S-1367-2-6		
LF5	18		4	S-1635-2	S-1367-2-6		
LF4	18		8	S-1493-2	S-1367-2-8		
LF3	18		60	S-1635-2	S-1636-2	STD	
LF2	18		8	S-1493-2	S-1636-2		
LF1	16		250	S-1493-2	S-1635-2	STD	
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
8	OR95-1.5	RESISTOR
7	C6021001-0106	LIGHT ASSY
6	C594502-0101	FLASHER ASSY
5	S-1638-2	HOUSING
4	S-1638-1	HOUSING
2	S-2160-1	SWITCH
1	S-1360-15L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P11.10.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	GRS	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LIGHT-FLASHING BEACON (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

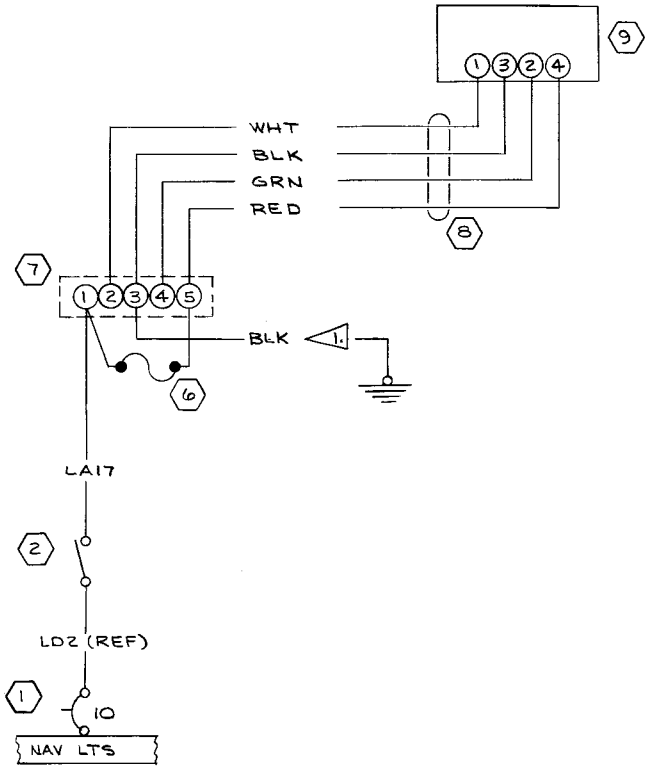
SCALE: NONE | (SR7903) (SR7904) | PAGE: 11.7.0

20-27

FORM NO. 80-215B

172, F172, FR172
172G5485, F17201385, FR17200540&562

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 329636 WAS 329626/NOTE 2 NOW SHOP PRACTICE	RLY 6-11-75	



04-231-0905
03-231-0905

NOTES:

1. THIS WIRE NOT REQUIRED WHEN BOOM MIKE IS INSTALLED, REFER TO 0570400 PAGE 2.35 FOR REPLACEMENT WIRING WHEN BOOM MIKE IS INSTALLED

2. VENDOR FOR 320733 & 329636 IS (00779)
VENDOR FOR 8409 IS (70903)
VENDOR FOR 351-11-05-001 IS (71785)

ITEM NO.	PART NO.	DESCRIPTION	
9	0570088-1	MAP LIGHT ASSY	
8	8409	CABLE	2.
7	351-11-05-001	TERMINAL STRIP	2.
6	1570141-1	FUSE ASSY	
2	S-2160-1	SWITCH	
1	S-1360-10L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 11.11.1

SUPERSEDED BY:

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
WHT		8409		320733	320733	2.	
BLK		↕		↕	↕	↕	
GRN		↕		↕	↕	↕	
RED		8409		320733	320733		
BLK	20	-20-0	3	S-13671-8	329626		
LA17	20		8	329626	S-1493-1	2.	

WIRE TABLE

CONTRACT NO:	NAME	DATE
DESIGN	G. STAMM	10-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JPS 1-8-75	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

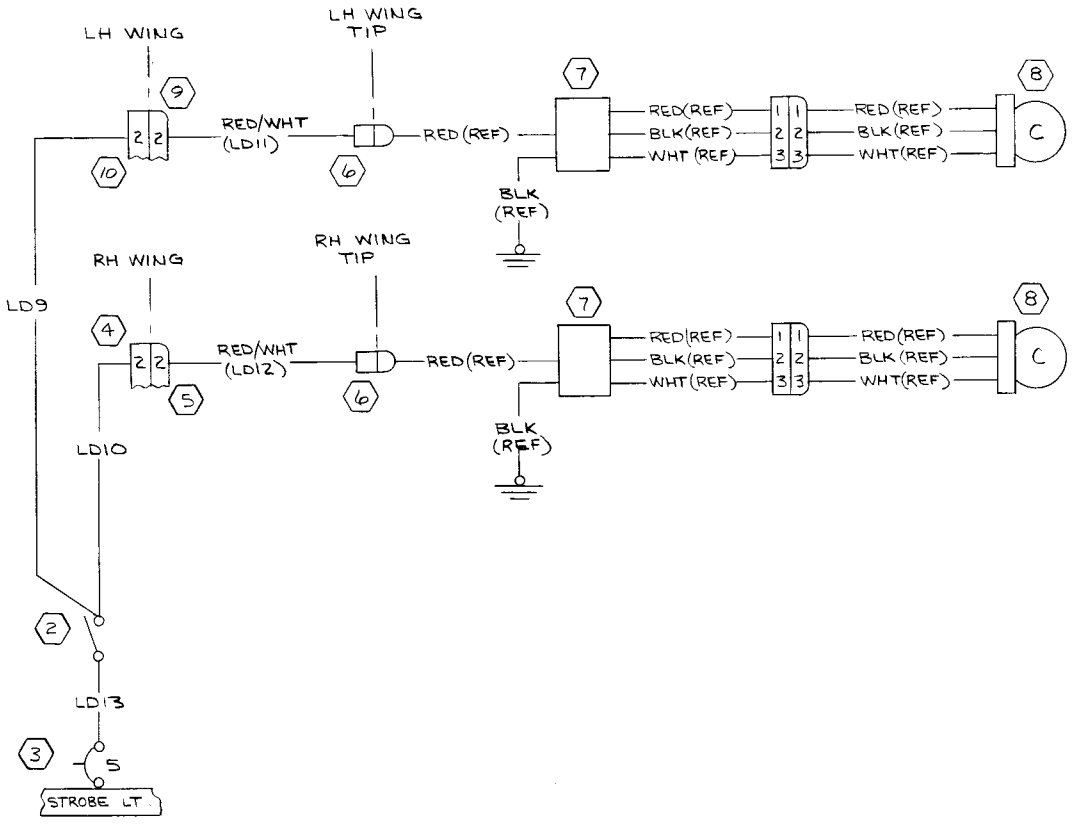
TITLE
WIRING DIAGRAM—
MAP LIGHT - CONTROL WHEEL (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE (SR7903) (SR7904) PAGE: 11.8.0

FORM NO. 80-2158

172, F172, FR172
17265685, F17201385, FR17200560 & 562



REVISION			
LET	DESCRIPTION	DATE	APPD

04-231-0905
03-231-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
LD13	22			S-1493-1	S-13674-6		
RED/WHT LD12	22	-18-2-9	216	S-1636-1	S-1635-1	(STD)	
RED/WHT LD11	22	-18-2-9	216	S-1636-1	S-1635-1	(STD)	
LD10	22		58	S-1493-1	S-16316-1	(STD)	
LD9	22		50	SEE LD10	S-1636-1	(STD)	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	S-1641-6	HOUSING
9	S-1640-6	HOUSING
8	C622006-0101	LAMP ASSY
7	C622007-0101	POWER ASSY
6	S-1637-2	HOUSING
5	S-1640-9	HOUSING
4	S-1641-9	HOUSING
3	S-1360-5L	CIRCUIT BREAKER
2	S-2160-1	SWITCH

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 11.14.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — WING TIP STROBE LIGHT (OPT)

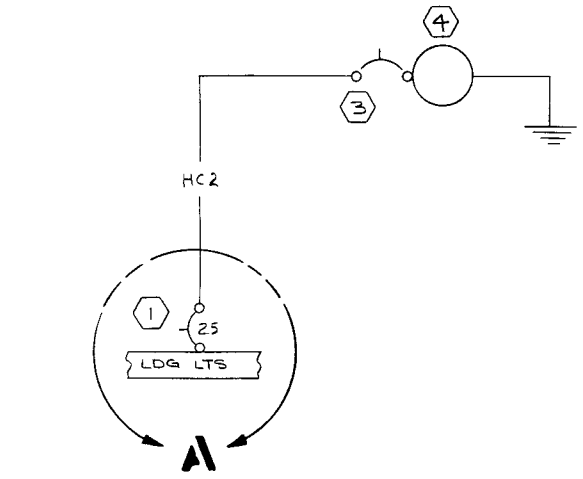
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR1903) (SR7904) | PAGE: 11.9.0

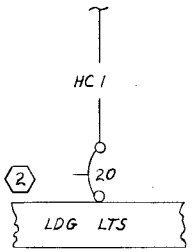
FORM NO. 80-215B

172, F172, FR172
17265685, F17201385, FR17200560&562

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT HC1, ADD HC2 & SER, DETAIL A & R172; 51360-25L WAS 51360-20L (SR8133) (SR8134) (SR8146)	DDR 2-25-76	SY WAH mkey JRS



34-0905
33-0905
46-0905



DETAIL A
EFF THRU SER (SR8133)(SR8134)

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
HC2	12		18	S-1367-2-10	S-1367-2-8		(SR8133)(SR8134) & ON
HC1	16		18	S-1367-2-10	S-1367-2-8		THRU (SR8133)(SR8134)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
4	0513052-3	CIGAR LIGHTER
3	60232-1	CIRCUIT BREAKER
2	S-1360-20L	CIRCUIT BREAKER
1	S-1360-25L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0500062 P 13.1.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J. YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JRS 208	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIGAR LIGHTER

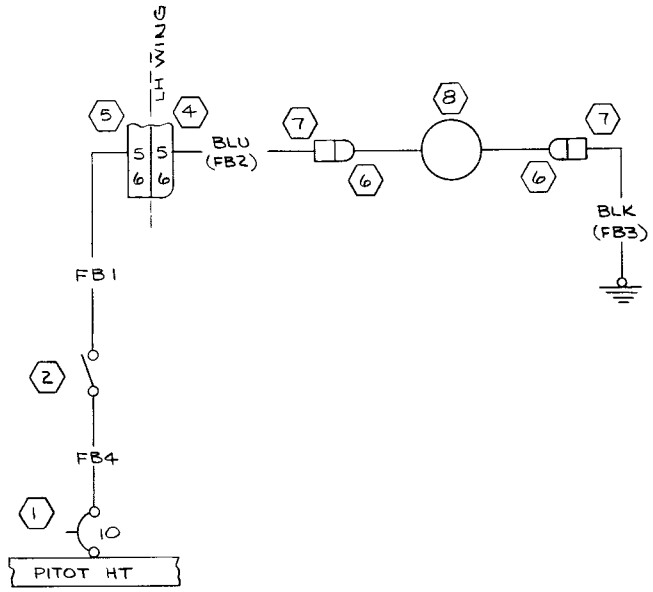
SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR7903) (SR7909) | PAGE: 13.1.0

FORM NO. 80-215B

172, F172, FR172 R172
1726S685, F1720385, FR17200560562, R1722000

REVISION			
LET	DESCRIPTION	DATE	APPD



04-231-0905
03-231-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
FB4	18			S-1493-1	S-1367-1-6		
BLK FB3	18	-18-0	14	S-1636-2	S-1367-1-8		
BLU FB2	18	-16-6	48	S-1636-2	S-1636-2	(STD)	
FB1	18		48	S-1493-1	S-1635-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
8	0721105	PITOT HEATER
7	S-1637-2	HOUSING
6	S-1637-1	HOUSING
5	S-1641-6	HOUSING
4	S-1640-6	HOUSING
2	S-2160-1	SWITCH
1	S-1360 -10L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 0500062 P 13.3.1

SUPERSEDED BY:

CONTRACT NO:

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	G. STAMM	12-11-74
GROUP	B. HARDEN	1-2-75
DRAWN	MERRICK	10-31-74
CHECK	J YOUEL	12-6-74
STRESS		
PROJ	R. FIFE	1-4-75
APPD	JPS per	
OTHER		

TITLE
WIRING DIAGRAM — PITOT - HEATED (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

SCALE: NONE | (SR7903) (SR7904) | PAGE: 13.2.0

172, F172, FR172
17265685, F1720138S, FR17200560&562

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SEE CC23 WAS S-1367-2-6 FOR CC24; S-1367-2-4 WAS S-1367-2-6 FOR CC23, CC22, CC21, CC20, CC19 AND CC18. (SR8133)	REK 3-20-76	

NOTES:

1. THESE SWITCHES PART OF C301002-0101 ACTUATOR ASSY

33-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
CC24	16			SEE CC23	S-1367-2-8	
CC23				S-1367-2-4	S-1367-2-4	
CC22				S-1367-2-4	S-1367-2-6	
CC21				S-1367-2-4	S-1636-2	
CC20				S-1367-2-4	S-1636-2	
CC19				S-1367-2-4	S-1636-2	
CC18				S-1367-2-4	S-1636-2	
BLK CC17		-16-0	13	S-1636-2	S-1493-2	
VIO CC16		-16-7	19	S-1493-2	S-1367-2-8	
VIO CC15		-16-7	19	S-1493-2	S-1367-2-8	
RED CC14		-16-2	13	S-1636-2	S-1635-2	
BLU CC13		-16-6	13	S-1635-2	S-1493-2	
GRN CC12		-16-5	13	S-1635-2	S-1493-2	
ORN CC11		-16-3	13	S-1635-2	S-1493-2	
RED CC10		-16-2	75	S-1636-2	S-1635-2	
BLU CC9		-16-6	75	S-1636-2	S-1635-2	
GRN CC8		-16-5	75	S-1636-2	S-1635-2	
ORN CC7	16	-16-3	75	S-1636-2	S-1635-2	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	C301002-0101	ACTUATOR ASSY
9	S-1638-2	HOUSING
8	S-1638-1	HOUSING
7	S-1641-6	HOUSING
6	S-1640-6	HOUSING
5	S-1641-9	HOUSING
4	S-1640-9	HOUSING
3	S-1906-1	SWITCH
2	S-1360-15L	CKT BKR
1	V3-1-D9	SWITCH

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 14.1.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	W. H. Harden	2-4-76
DRAWN	PAPE	2-3-76
CHECK	J. Youel	2-3-76
STRESS		
PROJ	[signature]	2-4-76
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — WING FLAPS — ELECTRIC

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0570101

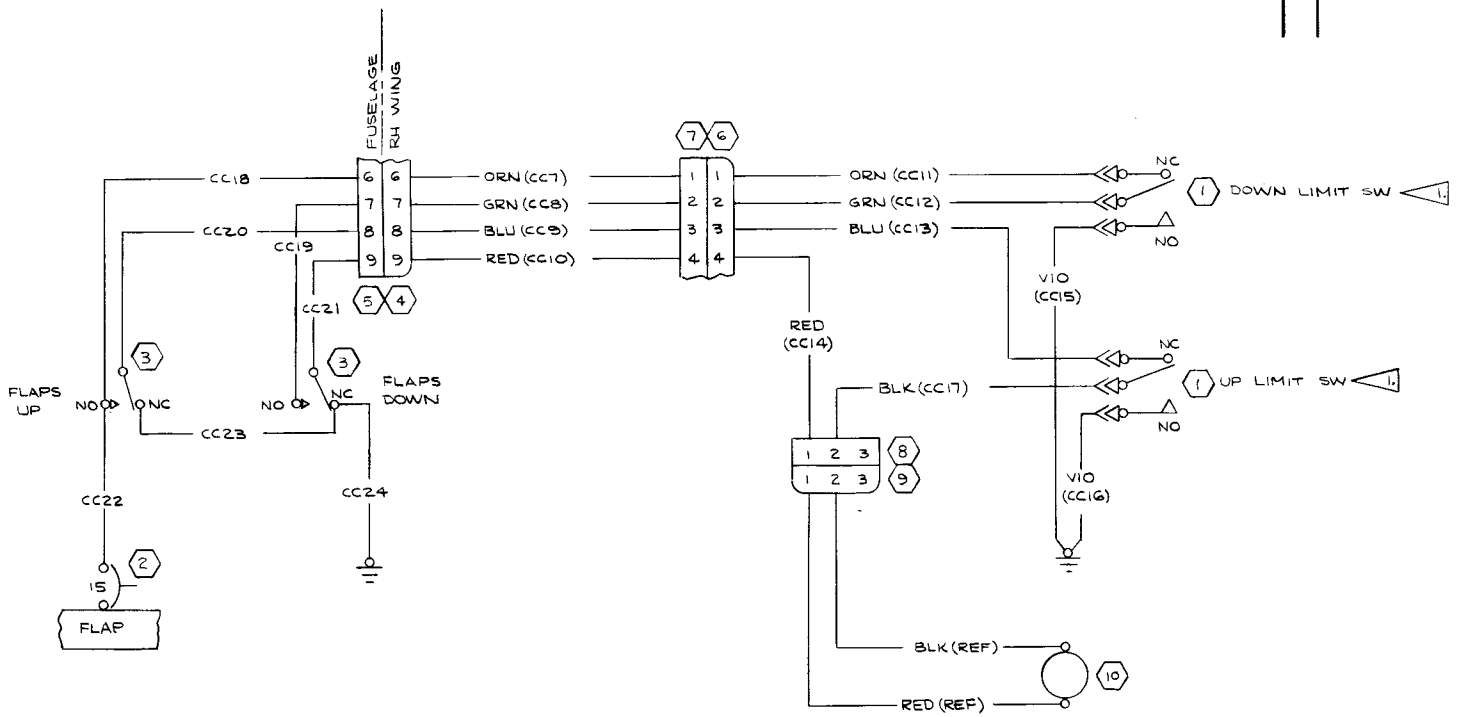
SCALE: NONE

PAGE: 14.3.0

FORM NO. 80-215B

(SR8133)
17267585

REVISION			
LET	DESCRIPTION	DATE	APPD



33-0905

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	W.J. Harden	2-4-76
DRAWN	PAPE	2-3-76
CHECK	J. TOUEL	2-3-76
STRESS		
PROJ	G. Fife	2-4-76
APPD		
OTHER		

Cessna® AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — WING FLAPS — ELECTRIC

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0570101

SCALE: NONE

PAGE: 14.3.1

FORM NO. 80-216A

(SR8133)
17267585

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