
Service Manual

1969 THRU 1976

MODEL 182

AND SKYLANE SERIES



FAA APPROVAL HAS BEEN OBTAINED ON TECHNICAL DATA IN THIS PUBLICATION THAT AFFECTS AIRPLANE TYPE DESIGN.

REVISION 4 TO THE BASIC MANUAL IS BEING SUPPLIED TO PROVIDE ADDITIONAL INFORMATION NECESSARY TO MAINTAIN THE AIRPLANE AND INCORPORATES TEMPORARY CHANGE 1 DATED 5 SEPTEMBER 1977, TEMPORARY REVISION 1 DATED 3 OCTOBER 1994, TEMPORARY REVISION 2 DATED 7 JANUARY 2000, AND TEMPORARY REVISION 3 DATED 7 OCTOBER 2002.

CESSNA AIRCRAFT COMPANY
MODEL 182 SKYHAWK SERIES
 SERVICE MANUAL

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INTRODUCTION

1. General.

WARNING: ALL INSPECTION INTERVALS, REPLACEMENT TIME LIMITS, OVERHAUL TIME LIMITS, THE METHOD OF INSPECTION, LIFE LIMITS, CYCLE LIMITS, ETC., RECOMMENDED BY CESSNA ARE SOLELY BASED ON THE USE OF NEW REMANUFACTURED, OR OVERHAULED CESSNA APPROVED PARTS. IF PARTS ARE DESIGNED, MANUFACTURED, REMANUFACTURED, OVERHAULED, AND/OR APPROVED BY ENTITIES OTHER THAN CESSNA, THEN THE DATA IN CESSNA'S MAINTENANCE/SERVICE MANUALS AND PARTS CATALOGS ARE NO LONGER APPLICABLE AND THE PURCHASER IS WARNED NOT TO RELY ON SUCH DATA FOR NON CESSNA PARTS. ALL INSPECTION INTERVALS, REPLACEMENT TIME LIMITS, OVERHAUL TIME LIMITS, THE METHOD OF INSPECTION, LIFE LIMITS, CYCLE LIMITS, ETC., FOR SUCH NON-CESSNA PARTS MUST BE OBTAINED FROM THE MANUFACTURER AND/OR SELLER OF SUCH NON-CESSNA PARTS.

- A. The information in this publication is based on data available at the time of publication and is updated, supplemented, and automatically amended by all information issued in Service Newsletters, Service Bulletins, Supplier Service Notices, Publication Changes, Revisions, Reissues and Temporary Revisions. All such amendments become part of and are specifically incorporated within this publication. Users are urged to keep abreast of the latest amendments to this publication through information available at Cessna Authorized Service Stations or through the Cessna Propeller Aircraft Product Support subscription services. Cessna Service Stations have also been supplied with a group of supplier publications which provide disassembly, overhaul, and parts breakdowns for some of the various supplier equipment items. Suppliers publications are updated, supplemented, and specifically amended by supplier issued revisions and service information which may be reissued by Cessna thereby automatically amending this publication and are communicated to the field through Cessna's Authorized Service Stations and/or through Cessna's subscription services.
- B. Inspection, maintenance and parts requirements for STC installations are not included in this manual. When an STC installation is incorporated on the airplane, those portions of the airplane affected by the installation must be inspected in accordance with the inspection program published by the owner of the STC. Since STC installations may change systems interface, operating characteristics and component loads or stresses on adjacent structures, Cessna provided inspection criteria may not be valid for airplanes with STC installation.
- C. REVISIONS, REISSUES, and TEMPORARY REVISIONS can be purchased from your Cessna Service Station or directly from Cessna Propeller Aircraft Product Support, Department 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706.
- D. This manual contains factory recommended procedures and instructions for ground handling, servicing and maintaining Cessna Model 182-Series and F182-Series aircraft. This includes the Model A182, which is manufactured by Fuerza Aerea Argentina, Area de Material, Cordoba.
- E. All supplemental service information concerning this manual is supplied to all appropriate Cessna Service Stations so they have the latest authoritative recommendations for servicing these Cessna airplanes. It is recommended that Cessna owners utilize the knowledge and experience of the Cessna Service Station.

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2. CROSS REFERENCE LISTING OF POPULAR NAME VS. MODEL NUMBERS AND SERIALS

A. All aircraft, regardless of manufacturer, are certified under model number designations. However, popular names are 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	BEGINNING SERIAL NUMBER	ENDING SERIAL NUMBER
182 or SKYLANE	1969	182M	18259306	18260055
	1970	182N	18260056	18260445
	1971	182N	18260446	18260825
	1972	182P	18260826	18261425
	1973	182P	18261426	18262465
	1974	182P	18262466	18263475
	1975	182P	18263476	18264295
SKYLANE ONLY	1976	182P	18264296	18265175
REIMS	1976	F182P	F1820001	F18200025
ARGENTINE 182	1969	A182M	NONE	A182-0136
	1970	A182N	A182-0117	
	1971	A182N	NONE	
AMC 182	1972	A182N	NONE	A182-0146
	1973	A182N	A182-0137	
	1974	A182N	NONE	
	1975	A182N	NONE	
	1976	A182N	NONE	

3. Coverage and Format.

- A. The Cessna Model 182-Series Service Manual has been prepared to help maintenance personnel in servicing and maintaining the Model 182-Series. This manual provides the necessary information required to enable the mechanic to service, inspect, troubleshoot, remove and replace components or repair systems.
- B. Technical Publications are also available for the various components and systems which are not covered in this manual. These manuals must be utilized as required for maintenance of those components and systems, and may be purchased from the manufacturer.

4. Temporary Revisions.

- A. Additional information which becomes available may be provided by temporary revision. This service is used to provide, without delay, new information which will assist in maintaining safe flight/ground operations. Temporary revisions are numbered consecutively. Temporary revisions are normally incorporated into the maintenance manual at the next regularly scheduled revision.

5. Material Presentation.

- A. This Service Manual is available on paper, microfiche or Compact Disc (CD-ROM); The CD ROM contains the Service Manuals, Illustrated Parts Catalogs and Avionics Manuals.

SECTION 1
GENERAL DESCRIPTION

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1-1. GENERAL DESCRIPTION.

1-2. MODEL 182-SERIES.

1-3. DESCRIPTION. Cessna Model 182-Series aircraft, described in this manual, are high-wing, strut-braced monoplanes of all-metal, semimonocoque construction. These aircraft are equipped with a fixed tricycle landing gear. Thru aircraft Serial 18260825, the aircraft employ flat spring-steel main landing gear struts. Beginning with aircraft Serial 18260826, the aircraft are equipped 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 two-place child's seat may be installed as optional equipment. Model 182-Series aircraft are equipped with a six-cylinder horizontally opposed, air cooled O-470-Series Continental engine, driving an all-metal, constant speed propeller. These 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. A station diagram is shown in figure 1-2 to assist in locating equipment where 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.

MODELS 182 and A182

GROSS WEIGHT	
(Thru 1969 Model 182N)	2800 lb
Take-Off (Thru 1971 Model 182N)	2950 lb
Landing (Thru 1971 Model 182N)	2800 lb
(Beginning with 1972 Model 182P)	2950 lb
FUEL CAPACITY	
Standard Wing (Total)	65 gal.
Standard Wing (Usable)	60 gal.
Long-Range (Total)	84 gal.
Long-Range (Usable)	79 gal.
Standard Wing (Total)	61 gal.
Standard Wing (Usable)	56 gal.
Long-Range (Total)	80 gal.
Long-Range (Usable)	75 gal.
	When not modified by Cessna Single-Engine Service Letter SE75-7 and prior to 18262251.
	When modified by Cessna Single-Engine Service Letter 75-7 and beginning with 18262251.
OIL CAPACITY	
(Without External Filter)	12 qt
(With External Filter)	13 qt
ENGINE MODEL	CONTINENTAL O-470 Series
PROPELLER (Constant Speed)	82" McCauley
MAIN WHEEL TIRES (Standard)	6.00 x 6, 6-Ply rating
Pressure (Thru 1971 Model 182N)	32 psi
Pressure (Beginning with 1972 Model 182P)	42 psi
Pressure (Model A182)	32 psi
MAIN WHEEL TIRES (Optional)	8.00 x 6, 6-Ply rating
Pressure	25 psi to 35 psi
NOSE WHEEL TIRE (Standard)	5.00 x 5, 6-Ply rating
Pressure (Thru 1971 Model 182N)	50 psi
Pressure (Beginning with 1972 Model 182P)	49 psi
Pressure (Model A182)	50 psi
NOSE WHEEL TIRE (Optional)	6.00 x 6, 4-Ply rating
Pressure	30 psi
NOSE GEAR STRUT PRESSURE (Strut Extended)	55 psi to 60 psi
WHEEL ALIGNMENT	
Camber	5° to 7°
Toe-In	0" to .06"
AILERON TRAVEL	
Up	20° ± 2°
Down	15° ± 2°
WING FLAP TRAVEL	0° to 40°, +1° -2°
RUDDER TRAVEL (Measured parallel to water line)	
Right	24° ± 1°
Left	24° ± 1°
RUDDER TRAVEL (Measured perpendicular to hinge line)	
Right	27° 13' ± 1°
Left	27° 13' ± 1°
ELEVATOR TRAVEL (Relative to Stabilizer)	
Up	26° ± 1°
Down	17° ± 1°
ELEVATOR TRIM TAB TRAVEL	
Up	25° ± 2°
Down	15° ± 1°
PRINCIPAL DIMENSIONS	
Wing Span (Conventional Wing Tip)	36' 2"
Wing Span (Conical-Camber Wing Tip)	35' 10"
Tail Span	11' 8"
Length (Thru 1971 Model 182N)	28' 1/2"
Length (Beginning with 1972 Model 182P)	28' 2" (Add 2" for strobe lights)
Fin Height (Maximum with Nose Gear Depressed and Flashing Beacon Installed on Fin)	
(Thru 1971 Model 182N)	8' 10-1 1/2"
(Beginning with 1972 Model 182P)	9' 1-1/2"
Track Width (Thru 1971 Model 182N)	7' 11-1/2"
Track Width (Beginning with 1972 Model 182P)	9' 1"
BATTERY LOCATION	Aft of Baggage Compartment

Figure 1-1. Aircraft Specifications

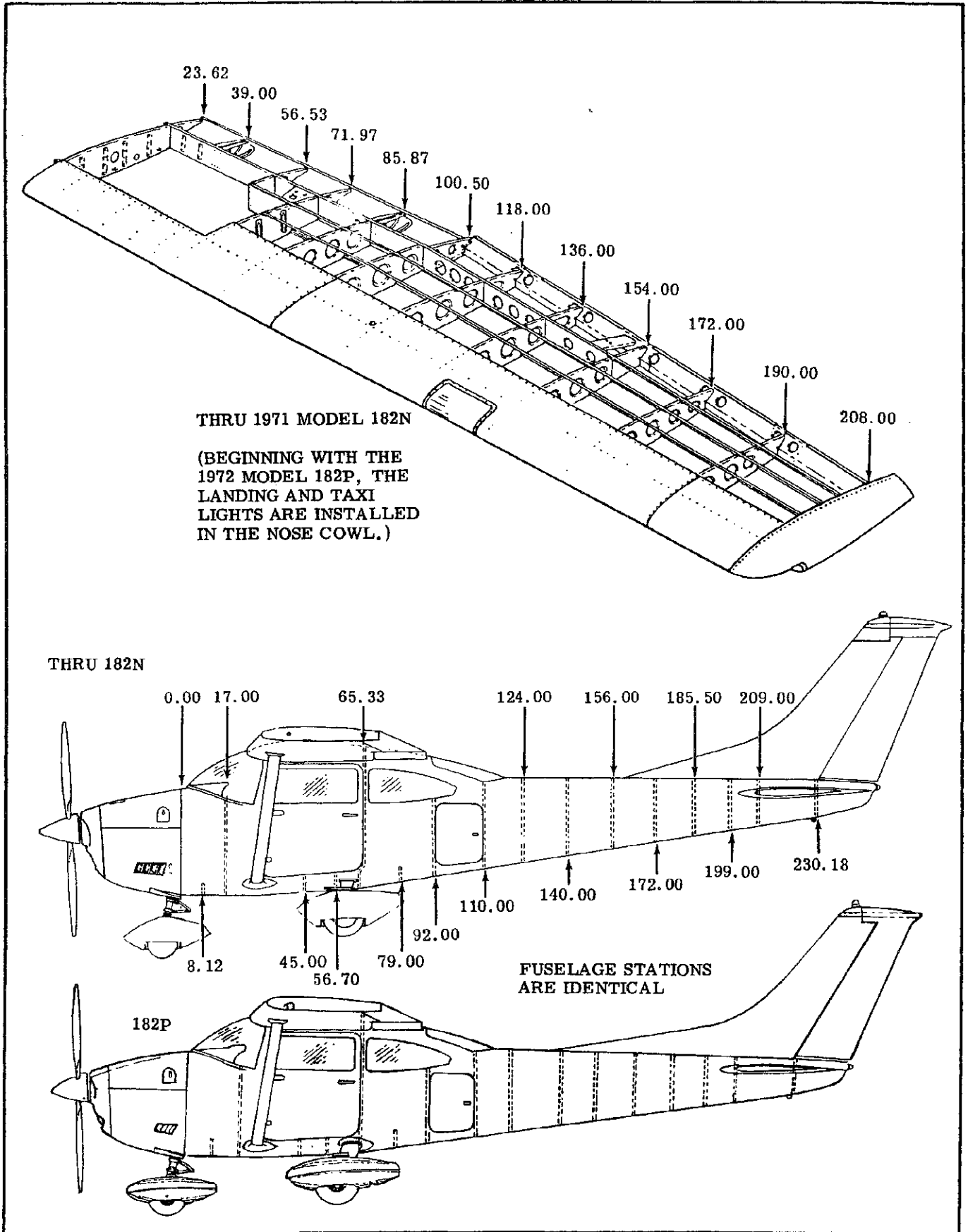


Figure 1-2. Reference Stations

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		SHEAR	
	TORQUE		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)	
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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, SERVICING, CLEANING, LUBRICATION AND INSPECTION.

2-2. GROUND HANDLING.

2-3. 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.

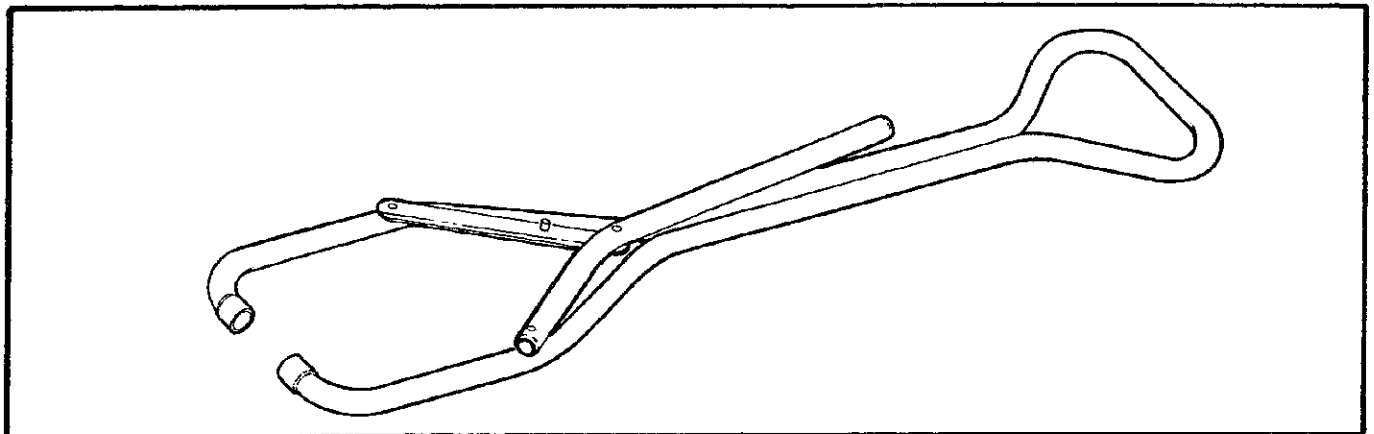
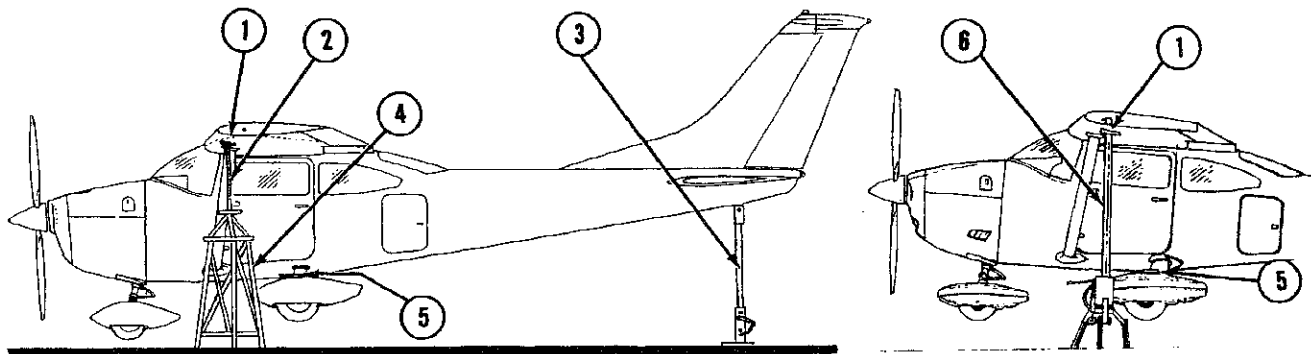


Figure 2-1. Tow Bar



ITEM NUMBER	TYPE AND PART NUMBER	REMARKS
①	Block (Jack point not available)	1x4x4 padded with 1/4" rubber
②	Jack	Any short jack of capable capacity
③	Cessna #SE -767	Universal tail stand (SEE NOTE 1)
④	Cessna #SE-576 (41-1/2" high)	Universal jack stand (FOR USE WITH ITEM 2)
⑤	Cessna #10004-98	Jack point (SEE NOTE 2)
⑥	#2-170 Basic jack #2-109 Leg Extension #2-70 Slide tube extension	Closed height: 69-1/2 inches; extended height: 92 inches (Insert slide tube extension into basic jack).

1. Weighted adjustable stand attaches to tie-down ring.
2. Cessna #10004-98 jack point may be used to raise only one wheel. Do not use brake casting as a jack point.
3. Items (3), (4), (5) and (6) are available from the Cessna Service Parts Center.

JACKING PROCEDURE

- a. Lower aircraft tail so that wing jack can be placed under front spar just outboard of wing strut.
- b. Raise aircraft tail and attach tail stand to tie-down ring. BE SURE that tail stand weighs enough to keep tail down under all conditions and is strong enough to support aircraft weight.
- c. Raise jacks evenly until desired height is reached.

When using the universal jack point, flexibility of the gear strut will cause the main wheel to slide in-board as the wheel is raised, tilting the jack. The jack must be lowered for a second operation. Jacking both main wheels simultaneously with universal jack points is not recommended.

Figure 2-2. Jacking Details

2-4. **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.

2-5. **JACKING.** Refer to figure 2-2 for jacking procedures.

2-6. **LEVELING.** Corresponding points on both upper door sills may be used to level the aircraft laterally. Reference point for leveling the aircraft longitudinally is the top of the tailcone between the rear window and vertical fin.

2-7. **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 2-8 if a hangar is not available.

2-8. **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.

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 a tie-down rope (no chains or cables) to upper strut of the nose gear, and secure opposite end of rope to a 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 bungee which affords protection against normal wind gusts. However, if extremely high wind gusts are anticipated, additional external locks may be installed.

2-9. **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 Preventive Aircraft Engine Oil (Military Specification MIL-C-6529 Type II Rust Ban). This engine oil is a blend of aviation grade straight mineral oil and a corrosion preventive compound. This engine oil should be used for the first 25 hours of engine operation. Refer to paragraph 2-21 for oil changes during the first 50 hours of operation.

During the 30 day non-operational storage or the first 25 hours of intermittent engine operation, the propeller shall be rotated through five revolutions every seventh day, without running the engine. If the aircraft is stored outside, tie it down in accordance with paragraph 2-8. 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.

2-10. **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, clean oil screens and change external oil filter element. Service engine with correct grade and quantity of engine oil. Refer to figure 2-3 and paragraph 2-21 for correct grade of engine oil.

2-11. **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 cells 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 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 reinstalled 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 battery periodically and charge as required.

NOTE

An engine treated in accordance with the following may be considered being 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 by Teledyne Continental Motors: Nucle Oil 105-Daubert Chemicals Co., 4700 So. Central Ave., Chicago, Illinois; Petractec VA-Pennsylvania Refining Co., Butler, Pennsylvania, and Ferro-Gard 1009G-Ranco Laboratories, Inc., 3617 Brownsville Road, Pittsburgh, Pennsylvania.

h. Using a portable pressure sprayer, 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 2-8. 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.

2-12. INSPECTION DURING STORAGE.

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

b. Inspect the interior of at least one cylinder through the spark plug hole for corrosion at least once each 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, repeat the procedural steps "g" thru "o" of paragraph 2-11.

2-13. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedures to return the aircraft to service.

a. Remove aircraft from blocks. Check tires for proper inflation.

b. Check and install battery.

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, clean and gap spark plugs.

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

h. Install spark plugs and torque to value specified in Section 11. Connect spark plug leads.

i. Check fuel strainer. Remove and clean filter screen, if necessary. Check fuel cells 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.

2-14. 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 procedures outlined in paragraph 2-15 are performed at the intervals specified.

a. Operate engine until oil temperature reaches normal operating range. Drain engine oil sump in accordance with procedures outlined in paragraph 2-16. Close drain valve or install drain plug.

b. Fill oil sump to normal operating capacity with corrosion preventive mixture recommended in the following note. Thoroughly mix and preheat the preventive 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-6529C, Type I, mixed with three parts new lubricating oil of the grade recommended for service. Continental Motors Corporation recommends Cosmo-line No. 1223, supplied by E. F. Houghton & Co., 305 W. LeHigh Avenue, Philadelphia, Pa. During all spraying operations, corrosion preventive mixture is preheated to 221° to 250°F.

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

d. After flight, 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. Spray until heavy black smoke comes from exhaust stack. Then increase the spray until engine is stopped.

CAUTION

Spraying the 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 preheated to 221° to 240°F., into all spark plug holes to thoroughly cover interior surfaces of cylinders.

g. Install spark plugs or solid plugs into the lower spark plug holes and install dehydrator plugs in the 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 induction air intake and seal opening with moisture resistant paper and tape.

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

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

l. Seal engine breather tube 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 location where plugs or tapes are installed. Either attach red streamers outside 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 or close drain valve.

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 2-11 thru step "f."

NOTE

As an alternate method of indefinite storage, the aircraft may be serviced in accordance with paragraph 2-11, providing the aircraft is run-up at maximum intervals of 90 days and then reserviced per paragraph 2-11.

2-15. **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 protex plugs have changed color in one half of the cylinders, all desiccant material in the engine should be replaced with new material.

d. Respray the cylinder interiors with corrosion preventive mixture every 6 months.

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.

2-16. **RETURNING AIRCRAFT TO SERVICE.** After indefinite storage, use the following procedure to return the aircraft to service.

a. Remove aircraft from blocks. Check tires for correct inflation.

b. Check and install battery.

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 equipped with an external oil filter, install new filter element.

f. Remove oil sump drain plug or open drain valve and drain sump. Install or close drain valve and safety.

g. Service and install the induction air filter.

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.

h. Remove protex plugs and spark plugs or plugs installed in spark plug holes. Rotate propeller several revolutions by hand to clear corrosion preventive mixture from cylinders.

i. Clean, gap and install spark plugs. Torque spark plugs to value specified in Section 11. Connect leads.

j. Check fuel strainer. Remove and clean filter screen. Check fuel cells and fuel lines for moisture

and sediment. Drain enough fuel to eliminate moisture and sediment.

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

1. Thoroughly clean and test-fly aircraft.

2-17. SERVICING.

2-18. GENERAL DESCRIPTION. Servicing requirements are shown in figure 2-3. The following paragraphs supplement this figure by adding details not included in the figure.

2-19. FUEL. Fuel tanks should be filled immediately after flight to lessen condensation in the tanks and lines. Tank capacities are listed in figure 1-1. The recommended fuel grade to be used is given in figure

2-20. 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 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. Remove drain plugs and open drain valves at the intervals specified in the inspection charts in this Section. Also, during daily inspection of the fuel strainer, if water is found in the strainer, there is a possibility that the wing tank sumps or fuel lines contain water. Therefore, all drain plugs/valves should be removed and all water drained from the system. To activate drain valve for fuel sampling, place cup up to valve and depress valve with rod protruding from cup. (Refer to figure 12-3.)

2-21A. 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. Install drain plug as follows:
 1. Install drain plug in carburetor 1-1/2 to 2 turns.
 2. Apply sealant to drain plug threads (use Never-Seez RAS-4 or equivalent).
 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, clean oil screens and clean and/or change external filter element whenever oil on the dipstick appears dirty. Aviation grade ashless dispersant oil conforming to Continental Motors Specification MHS-24 and all revisions or supplements thereto and conforming with current Continental Aircraft Engine Service Bulletins shall be used in the Continental Engines.

NOTE

New or newly overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. The aircraft is delivered from Cessna with straight mineral 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 conforming to Specification MIL-6082. After the first 25 hours of operation, drain engine oil sump and clean both the oil suction strainer and the oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with straight mineral oil 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, remove and clean oil screens, or install a new filter element on aircraft equipped with an external oil filter. An oil quick-drain valve may be installed. This valve provides a quick and cleaner method of draining the engine oil. This valve is installed in the oil drain port of the oil sump. To drain the oil, proceed as follows:

- a. Operate engine until oil temperature is at a normal operating temperature.
- b. (With Quick-Drain Valve) Attach a hose to the quick-drain valve in oil sump. Push upon 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, if installed, and remove hose. Install and safety drain plug.
- e. Remove and clean oil screen.
- f. Service engine with correct quantity and grade of engine oil.

NOTE

Refer to inspection charts for intervals for changing oil and filter elements. Refer to figure 2-3 for correct grade of engine oil, and refer to figure 1-1 for correct capacities.

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 induction air 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 dust and dirt from entering the vacuum operated instruments. Inspect the filter every 200 hours for damage and cleanliness. Change central air filter element every 500 hours of operating time and whenever suction 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 vacuum operated instruments.

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 pressure 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 figure 1-1.
- g. Check strut extension by measuring distance "A", as indicated in figure 5-5.

NOTE

The nose landing gear shock strut will normally require only a minimum amount of service. Maintain the strut extension pressure as shown in Section 1. Lubricate landing gear as shown in figure 2-4. 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 hydraulic fluid (MIL-H-5606) or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-27. NOSE GEAR SHIMMY DAMPENER. The nose gear shimmy dampener contains a compensating mechanism within the hollow piston rod. This is for thermal expansion and contraction of the hydraulic fluid in the dampener. The shimmy dampener must be filled completely with hydraulic fluid, free of entrapped air with the compensating piston bottomed in the piston rod. Before servicing the shimmy dampener, ascertain that the compensating piston is bottomed in the piston rod. Service the shimmy dampener at least every 50 hours as follows:

- a. Remove shimmy dampener from the aircraft.
- b. While holding the shimmy dampener in a vertical position with the filler plug pointed upward, loosen filler plug to allow excess fluid to escape.
- c. Allow the spring to bottom out the floating piston inside the shimmy dampener rod.
- d. When the fluid stops flowing, insert a length of stiff wire through the air bleed hole in the setscrew at the end of the piston rod until it touches the floating piston. The depth of insertion should be 3-13/16 inches.

NOTE

If the wire insertion is less than 3-13/16 inches, the floating piston is lodged in the shaft. If the wire cannot be used to free the piston, the rod assembly and piston should be replaced.

- e. After determining that floating piston is bottomed, move dampener rod to place piston to the end of the barrel opposite the filler plug.
- f. Remove filler plug and fill shimmy dampener with hydraulic fluid.

NOTE

Be sure that the shimmy dampener and hydraulic fluid are at 70° to 80°F while filling the shimmy dampener.

- g. Install filler plug, and wash dampener in cleaning solvent and wipe dry with a clean cloth.
- h. Install dampener on aircraft.

NOTE

Keep 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 hydraulic fluid (MIL-H-5606) 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 required every 200 hours. 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 brake systems.

2-29. CLEANING.

2-30. GENERAL DESCRIPTION. 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 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. **INTERIOR TRIM.** The instrument panel, interior plastic trim, and control knobs need only be wiped with a damp cloth. Oil and grease on the control wheels and control knobs can be removed with a cloth moistened with Stoddard solvent. Volatile solvents, mentioned in the caution note of paragraph 2-31, must never be used since they soften and craze the plastic trim.

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 COMPARTMENT** cleaning is essential to minimize any danger of fire, and for proper inspection of components. The engine compartment may be washed down with a suitable solvent, such as Stoddard solvent or equivalent, then dried thoroughly.

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 be used cautiously and should always be properly neutralized after their use.

2-36. **UPHOLSTERY AND INTERIOR** cleaning pro-

longs upholstery fabrics and interior trim. 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.** The propeller should be wiped occasionally with an oily cloth to remove grass and bug stains. In salt water areas this will assist in corrosion proofing the propeller.

2-38. **WHEELS** should be washed periodically and examined for corrosion, chipped paint, and cracks or dents in the wheel castings. Sand smooth, prime, and repaint or repair minor defects.

2-39. **LUBRICATION.**

2-40. **GENERAL DESCRIPTION.** Lubrication requirements are shown in figure 2-4. Before adding lubricant to a fitting, wipe fitting free of dirt. Lubricate until grease appears around part being lubricated, and wipe excess grease from parts. The following paragraphs supplement figure 2-4 by adding details not shown in the figure.

2-41. **TACHOMETER DRIVE SHAFT.** Refer to Section 15 for details on lubrication of the drive shaft.

2-42. **WHEEL BEARINGS.** Clean and repack the wheel bearings at the 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.

2-43. **NOSE GEAR TORQUE LINKS.** Lubricate nose gear torque links every 50 hours. When operating from a dirt strip or in extremely areas, more frequent lubrication of the torque links is required.

2-44. **WING FLAP ACTUATOR.**

a. On aircraft prior to Serials 18260698 & A182-0136 which have not been modified by Service Kit SK150-37, proceed as follows:

1. At each 100 hour inspection, inspect wing flap actuator jack screw and ball retainer assembly for lubrication, and lubricate if required. Also, remove, clean and lubricate jack screw whenever actuator slippage is experienced. If lubrication is required, proceed as follows:

a. Gain access to actuator by removing appropriate inspection plates on lower surface of

wing.

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

c. Wipe a small amount of lubricant from jack screw with a rag and examine for condition. Lubricant should not be dirty, sticky, gummy or frothy in appearance.

d. Inspect wiped area on jack screw for presence of hard scale deposit. Previous wiping action will have exposed bare metal if no deposit is present.

e. If any of the preceding conditions exist, clean and relubricate jack screw as outlined in steps "f" thru "r".

f. Remove actuator from aircraft in accordance with procedures outlined in Section 7.

g. Remove all existing lubricant from jack screw and torque tube by running the nut assembly to the end of the jack screw away from the gearbox, and soaking the nut assembly and jack screw in Stoddard solvent.

NOTE

Care must be taken to prevent solvent from entering gearbox. The gearbox lubricant is not affected and should not be disturbed.

h. After soaking, clean entire length of jack screw with a wire brush, rinse with solvent and dry with compressed air.

NOTE

Do not disassemble nut and ball retainer assembly.

i. Relubricate jack screw with MIL-G-21164 (Molybdenum Disulfide Grease) as outlined in steps "j" thru "m".

j. Rotate nut down screw toward the motor.

k. Coat screw and thread end of nut with grease and run nut to full extension.

l. Repeat the process and pack lubricant in the cavity between the nut and ball retainer at the

threaded end of the nut.

m. Repeat the process and work nut back and forth several times.

n. Remove excess grease.

o. Reinstall actuator in aircraft in accordance with instructions outlined in Section 7.

b. On aircraft prior to Serials 18260698 & A182-0136 which have been modified by Service Kit SK150-37, proceed as follows:

1. At each 100 hour inspection, expose jack screw by operating flaps to full-down position, and inspect wing flap actuator jack screw for proper lubrication. If lubrication is required, proceed as follows:

a. Clean jack screw with solvent rag, if necessary, and dry with compressed air.

b. Relubricate jack screw with MIL-G-21164 (Molybdenum Disulfide Grease) as required.

c. On aircraft beginning with Serials 18260698 & A182-0136, clean and lubricate wing flap actuator jack screw each 100 hours as follows:

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

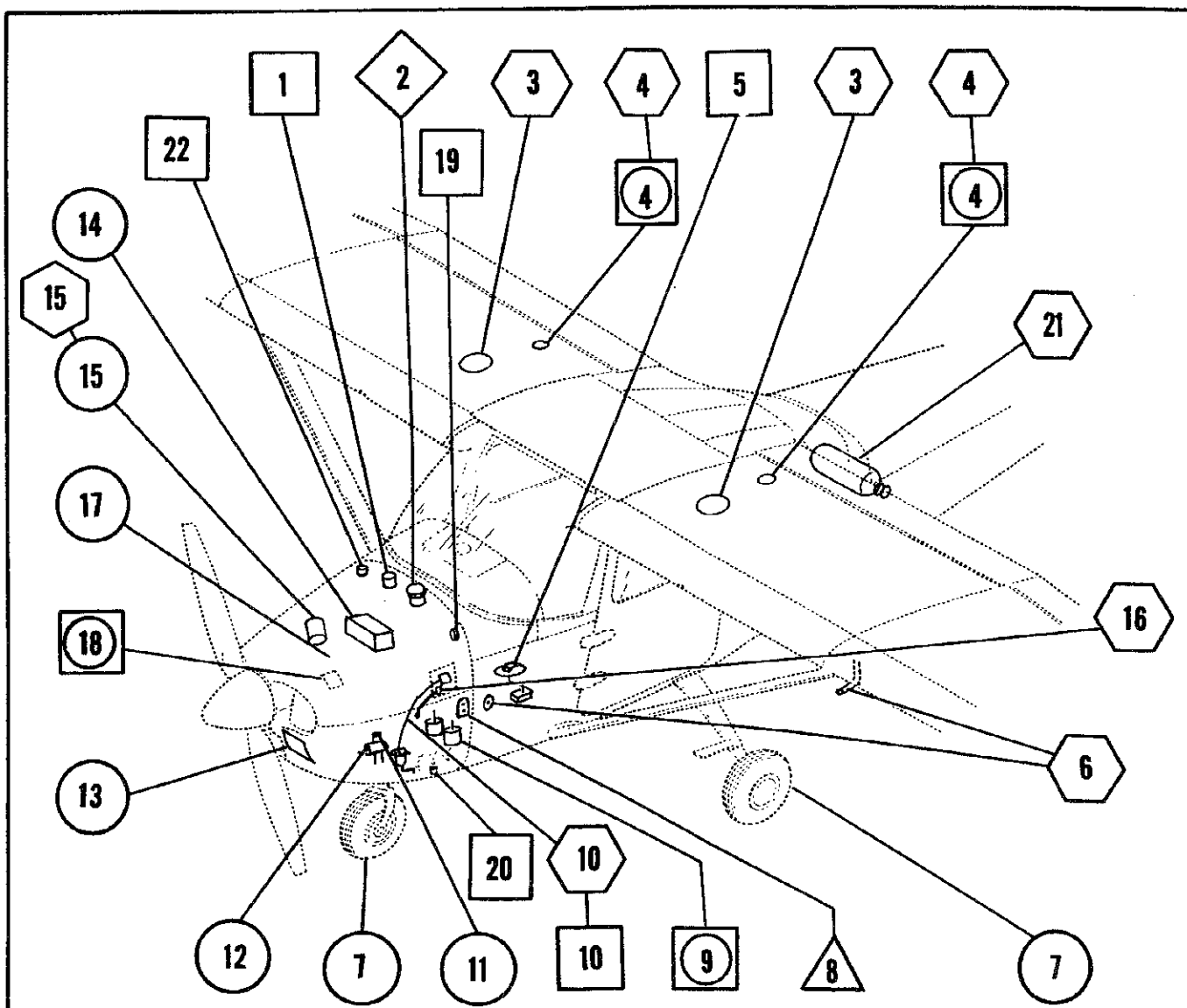
2. Clean jack screw threads with solvent rag and dry with compressed air.

NOTE

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

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

2-45. ROD END BEARINGS. Periodic inspection and lubrication is required to prevent corrosion of the bearing in the rod end. At each 100-hour inspection, disconnect the control rods at the aileron and nose gear steering bungee, and inspect each rod end for corrosion. If no corrosion is found, wipe the surface of the rod end balls with general purpose oil and rotate ball freely to distribute the oil over its entire surface and connect the control rods to their respective units. If corrosion is detected during the inspection, install new rod ends.



HYDRAULIC FLUID:
 SPEC. NO. MIL-H-5606
 OXYGEN:
 SPEC. NO. MIL-O-27210D

RECOMMENDED FUEL:

ENGINE MODEL O-470-Series CONTINENTAL

Compliance with conditions stated in Continental aircraft engine Service Bulletins M74-6 and M75-2 and supplements or revisions thereto, are recommended when using alternate fuel.

- FUEL:**
1. MINIMUM: 80/87 Aviation grade
 2. ALTERNATES:
 - a. 100/130 Low Lead Avgas (with lead content limited to a maximum of 2 cc Tetraethyl lead per gallon).
 - b. 100/130 Higher Lead Avgas (with lead content limited to a maximum of 4.6 cc Tetraethyl lead per gallon).

Figure 2-3. Servicing (Sheet 1 of 3)

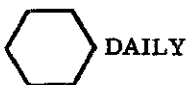
RECOMMENDED ENGINE OIL:

ENGINE MODEL O-470-Series CONTINENTAL

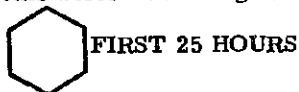
AVIATION GRADE:

ABOVE: SAE 50
BELOW: SAE 30

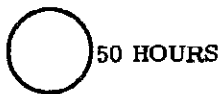
Aviation Grade ashless dispersant oil, conforming to Continental Motors Specification MHS-24 and all revisions and supplements thereto, must be used except as noted in paragraph 2-21. Refer to Continental Aircraft Engine Service Bulletin M75-2 and any superseding bulletins, revisions or supplements thereto, for further recommendations.



- 3 FUEL CELLS:**
Service after each flight. Keep full to retard condensation. Refer to paragraph 2-19.
- 4 FUEL CELL SUMP DRAINS:**
Drain off any water and sediment before first flight of the day.
- 10 FUEL STRAINER:**
Drain off any water and sediment before first flight of the day.
- 16 OIL DIPSTICK:**
Check on preflight. Add oil as necessary. Refer to paragraph 2-21 for details. Check that filler cap is tight and oil filler is secure.
- 6 PITOT AND STATIC PORTS:**
Check for obstructions before first flight of the day.
- 21 OXYGEN CYLINDER:**
Check for anticipated requirements before each flight. Refer to Section 14.




- 15 ENGINE OIL SYSTEM:**
Refill with straight mineral oil and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Refer to paragraph 2-21.




- 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 ENGINE OIL SYSTEM:**
Change oil each 50 hours if engine is NOT equipped with external filter; if equipped with external filter, change filter element each 50 hours and oil at least at each 100 hours, or every 6 months.
- 12 SHIMMY DAMPENER:**
Check fluid level and refill as required in accordance with paragraph 2-27.

Figure 2-3. Servicing (Sheet 2 of 3)

 50 HOURS (Cont.)


- 7 **TIRES:**
Maintain correct tire inflation as listed in figure 1-1. Refer to paragraph 2-25.
- 11 **NOSE GEAR SHOCK STRUT:**
Keep strut filled and inflated to correct pressure. Refer to paragraph 2-26.
- 17 **SPARK PLUGS:**
Remove, clean and re-gap all spark plugs. Refer to Section 11.

 100 HOURS


- 22 **VACUUM SYSTEM OIL SEPARATOR:**
Remove, flush with solvent, and dry with compressed air.
- 20 **CARBURETOR DRAIN PLUG:**
Check for thread sealant residue in float chamber. Refer to paragraph 2-20.
- 10 **FUEL STRAINER:**
Disassemble and clean strainer bowl and screen.
- 5 **SELECTOR VALVE DRAIN:**
Remove plug and drain off any water or sediment. Refer to paragraph 2-20.
- 19 **ALTERNATOR SUPPORT BRACKET:**
Check alternator support bracket for security and cracking.
(Also refer to Service Letter SE71-42.)

 200 HOURS

- 18 **VACUUM RELIEF VALVE FILTER:**
Change every 100 hours or to coincide with engine overhauls.
- 4 **FUEL BAY SUMP DRAINS:**
Drain off any water or sediment.
- 9 **BRAKE MASTER CYLINDERS:**
Check fluid level and fill as required with hydraulic fluid.

 500 HOURS

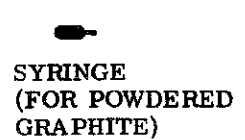
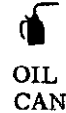
- 2 **VACUUM SYSTEM CENTRAL AIR FILTER:**
Replace every 500 hours.

 AS REQUIRED

- 8 **GROUND SERVICE RECEPTACLE:**
Connect to 12-volt DC, negative-ground power unit. Refer to Section 16.

FREQUENCY (HOURS)

METHOD OF APPLICATION



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	HIGH AND LOW TEMPERATURE 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

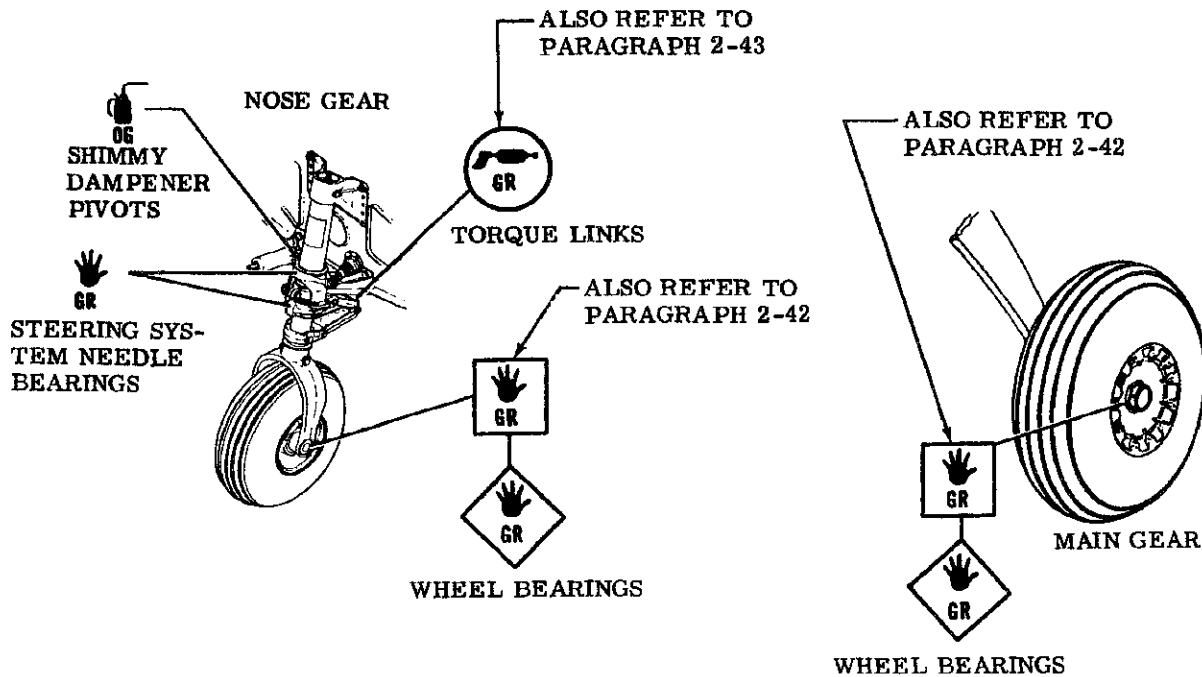


Figure 2-4. Lubrication (Sheet 1 of 3)

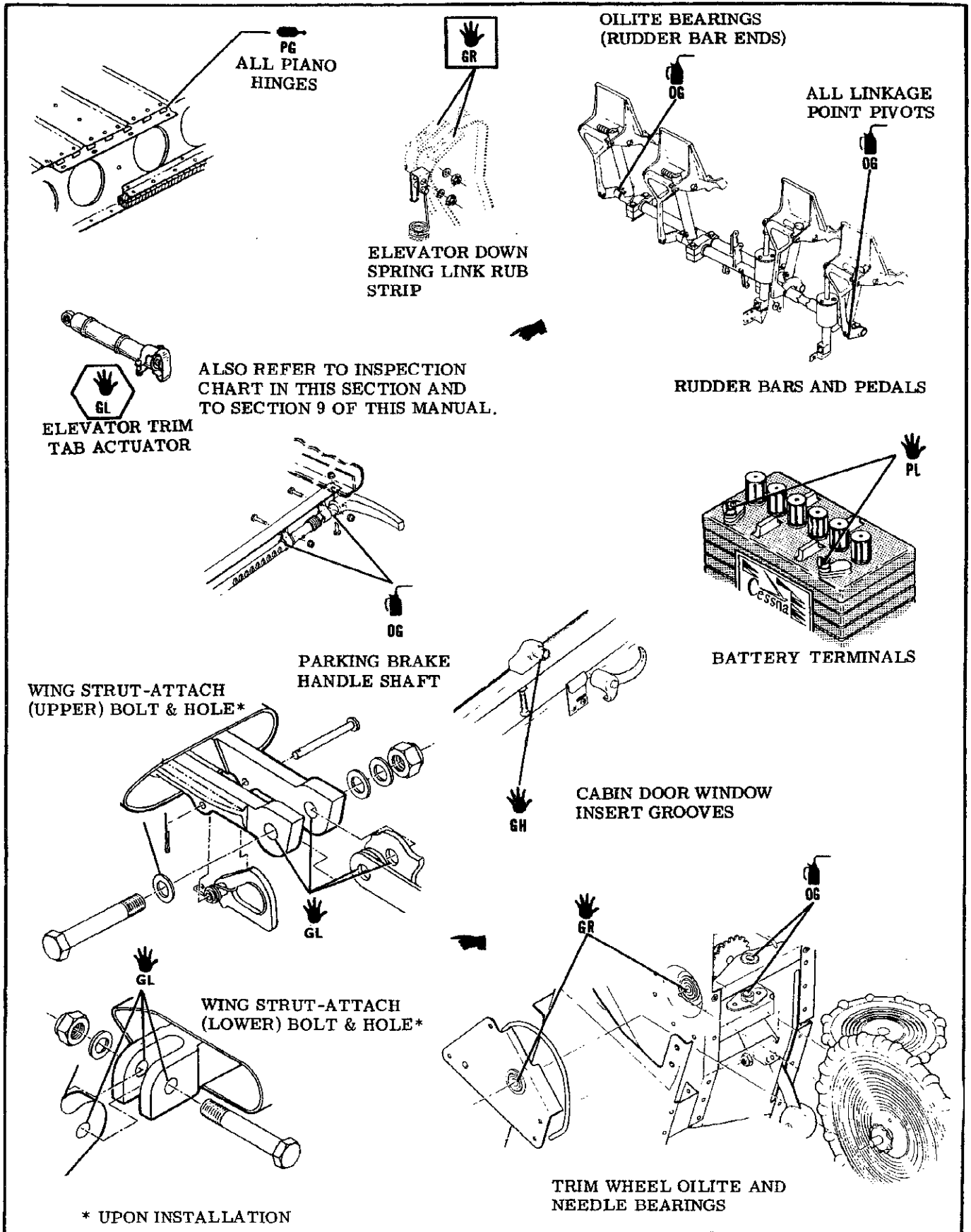
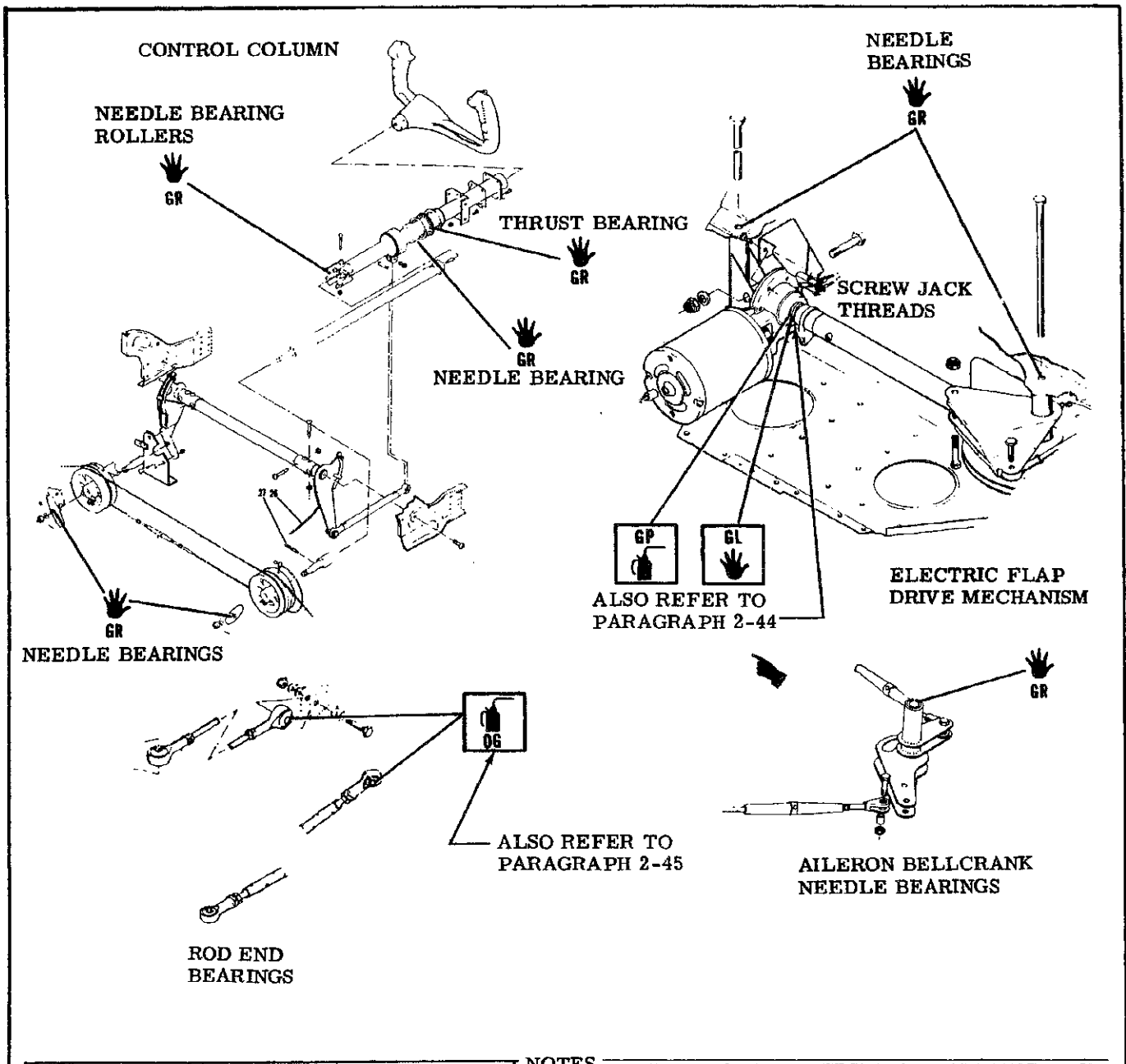


Figure 2-4. Lubrication (Sheet 2 of 3)



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 2-4. 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, safetizing, 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:

IMPORTANT

READ ALL INSPECTION REQUIREMENTS PARAGRAPHS PRIOR TO USING THESE CHARTS.

SPECIAL INSPECTION ITEM

EACH 200 HOURS

EACH 100 HOURS

EACH 50 HOURS

PROPELLER

- 1. Spinner ●
- 2. Spinner bulkhead ●
- 3. Blades ●
- 4. Bolts and nuts ●
- 5. Hub ●
- 6. Governor and control ●

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 filter element ● 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 housings ●
- 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, oil separator and relief valve ●
- 17. Vacuum relief valve filter ● 5
- 18. Engine controls and linkage ● 6
- 19. Engine shock mounts, mount structure and ground straps ●

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		SPECIAL INSPECTION ITEM
		EACH 200 HOURS
		EACH 100 HOURS
		EACH 50 HOURS
20. Cabin heat valves, doors and controls	•	
21. Starter, solenoid and electrical connections.....	•	
22. Starter brushes, brush leads, commutator	•	
23. Alternator and electrical connections	•	
24. Alternator brushes, brush leads, commutator or slip ring.....	•	7
25. Voltage regulator mounting and electrical leads	•	
26. Magnetos (External) and electrical connections	•	
27. Magneto timing	•	8
28. Carburetor and drain plug (Refer to Service Letter (SE73-13.)	•	
29. Firewall	•	
30. Engine cowl flaps and controls.....	•	
31. Engine cowling	•	
32. Cowl flap hinges and hinge pins (Refer to Service Letter SE71-27.).....	•	
33. Carburetor throttle arm attachment (Refer to Service Letter SE71-17.)	•	
34. Alternator support bracket for security (Refer to Service Letter SE71-42.).....	•	
FUEL SYSTEM		
1. Fuel strainer, drain valve and control, fuel cell vents, caps and placards.....	•	
2. Fuel strainer screen and bowl	•	
3. Drain fuel and check cell interior, attachment and outlet screens.....	•	5
4. Fuel cells and sump drains.....	•	
5. Fuel selector valve and placards (Refer to Service Letter SE74-1.)	•	
6. Engine primer	•	
7. Fuel quantity indicators and transmitters.....	•	
8. Perform a fuel quantity indicating system operational test. Refer to Section 15 for detailed accomplishment instructions.	•	16
LANDING GEAR		
1. Brake fluid, lines and hose, linings, discs, brake assemblies and master cylinders	•	
2. Main gear wheels	•	
3. Wheel bearings.....	•	9
4. Main gear springs.....	•	

SPECIAL INSPECTION ITEM

EACH 200 HOURS

EACH 100 HOURS

EACH 50 HOURS

- 5. Tires ●
- 6. Torque link lubrication ●
- 7. Parking brake system ●
- 8. Nose gear strut and shimmy dampener (service as required) ●
- 9. Nose gear wheel ●
- 10. Nose gear fork ●
- 11. Nose gear steering system ●
- 12. Park brake and toe brakes operational test ●

AIRFRAME

- 1. Aircraft exterior ●
- 2. Aircraft structure (Refer to Service Letters SE72-3 and SE72-29.) ●
- 3. Windows, windshield, doors and seals ●
- 4. Seat stops, seat rails, upholstery, structure and mounting ●
- 5. Seat belts and shoulder harnesses ●
- 6. Control column bearings, pulleys, cables and turnbuckles ●
- 7. Control lock, control wheel and control column mechanism ●
- 8. Instruments and markings ●
- 9. Gyros central air filter ●
- 10. Magnetic compass compensation ●
- 11. Instrument wiring and plumbing ●
- 12. Instrument panel, shock mounts, 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, hose, wires and control cables ●
- 16. Lights, switches, circuit breakers, fuses and spare fuses ●
- 17. Exterior lights ●
- 18. Pitot and static systems ●
- 19. Stall warning unit and pitot heater ●
- 20. Radios, radio controls, avionics and flight instruments ●

10
5

SPECIAL INSPECTION ITEM

EACH 200 HOURS

EACH 100 HOURS

EACH 50 HOURS

- 21. Antennas and cables
- 22. Battery, battery box and battery cables
- 23. Battery electrolyte
- 24. Emergency locator transmitter
- 25. Oxygen system
- 26. Oxygen supply, masks and hose

11
12
13

CONTROL SYSTEMS

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

- 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 flap position indicator
- 7. Flap motor, transmission, limit switches, structure, linkage, bellcranks, etc. . . .
- 8. Flap actuator jackscrew threads
- 9. Elevators, trim tab, hinges and push-pull tube
- 10. Elevator trim tab actuator lubrication and tab free-play inspection
- 11. Rudder pedal assemblies and linkage
- 12. External skins of control surfaces and tabs
- 13. Internal structure of control surfaces
- 14. Balance weight attachment

14
15

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1. First 25 hours; (refill with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized) then change to ashless dispersant oil. Change oil each 50 hours if engine is NOT equipped with external oil filter; if equipped with an external oil filter, change filter element at each 50 hours and oil at each 100 hours or every six months.
2. Clean filter per paragraph 2-22. Replace as required.
3. Replace engine compartment hoses (Cessna-installed only) every 5 years or at engine overhaul whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. Engine flexible hoses, (Continental Motors installed) refer to Continental Motors Maintenance Manual and Continental Motors Engine Service Bulletins.
4. General inspection every 50 hours. Refer to Section 11 for 100 hour inspection.
5. Each 1000 hours, or to coincide with engine overhaul.
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 limits are described in detail in Section 11.
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 30 days.
12. Refer to Section 16 of this Service Manual.
13. Inspect masks, hose fittings for condition, routing and support. Test, operate and check for leaks.
14. Refer to paragraph 2-44 for detailed instructions for various serial ranges.
15. Lubrication of the actuator is required each 1000 hours and/or 3 years, whichever comes first. Refer to Figure 2-4 for grease specification.

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

16. Fuel quantity indicating system operational test is required every 12 months. Refer to Section 15 for detailed accomplishment instructions.

NOTE: A high time inspection is merely a 100-hour inspection with the addition of an engine overhaul. Refer to Teledyne Continental Service Information Letter SIL98-9, or latest revision, for recommended time between overhaul for O-470 series engines. At the time of overhaul, engine accessories should be overhauled.

Propeller overhaul should coincide with engine overhaul, but intervals between overhauls of the propeller shall not exceed 1200 hours, except as stipulated in current issues of the McCauley Accessory Division Service Information Summary and currently effective Service Manuals, Bulletins and Letters.

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2-46. COMPONENT TIME LIMITS

1. General

- A. Most components listed throughout Section 2 should be inspected as detailed elsewhere in this section and repaired, overhauled or replaced as required. Some components, however, have a time or life limit, and must be overhauled or replaced on or before the specified time limit.

NOTE: The terms overhaul and replacement as used within this section are defined as follows:

Overhaul – Item may be overhauled as defined in CFR 43.2 or it can be replaced.

Replacement – Item must be replaced with a new item or a serviceable item that is within its service life and time limits or has been rebuilt as defined in CFR 43.2.

- B. This section provides a list of items which must be overhauled or replaced at specific time limits. Table 1 lists those items which Cessna has mandated must be overhauled or replaced at specific time limits. Table 2 lists component time limits which have been established by a supplier to Cessna for the supplier's product.
- C. In addition to these limits, the components listed herein are also inspected at regular time intervals set forth in the Inspection Charts, and may require overhaul/replacement before the time limit is reached, based on service usage and inspection results.

2. Cessna established replacement Time Limits

- A. The following component time limits have been established by Cessna Aircraft Company.

Table 1: Cessna-Established Replacement Time Limits

COMPONENT	REPLACEMENT TIME	OVERHAUL
Restraint Assembly Pilot Copilot And Passenger Seats	10 years	NO
Trim Tab Actuator	1,000 hours or 3 years, Whichever occurs first	YES
Vacuum System Filter	500 hours	NO
Vacuum System Hoses	10 years	NO
Pitot and Static System Hoses	10 years	NO
Vacuum Relief/Regulator Valve Filter (If Installed)	500 hours	NO
Engine Compartment Flexible Fluid-Carrying Teflon Hoses (Cessna-Installed) Except Drain Hoses (Drain hoses are replaced on condition)	10 years or engine overhaul, whichever occurs first (Note 1)	NO

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COMPONENT	REPLACEMENT TIME	OVERHAUL
Engine Compartment Flexible Fluid-Carrying Rubber Hoses (Cessna-Installed) Except Drain Hoses (Drain hoses are replaced on condition)	5 years or engine overhaul, whichever occurs first (Note 1)	NO
Engine Air Filter	500 hours or 36 months, whichever occurs first (Note 9)	NO
Engine Mixture, Throttle, and Propeller Controls	At engine TBO	NO
Oxygen Bottle – Lightweight Steel (ICC-3HT, DOT-3HT)	Every 24 years or 4380 cycles, whichever occurs first	NO
Oxygen Bottle – Composite (DOT-E8162)	Every 15 years	NO
Engine-Driven Dry Vacuum Pump Drive Coupling (Not lubricated with engine oil)	6 Years or at vacuum pump replacement, whichever occurs first	NO
Engine-Driven Dry Vacuum Pump (Not lubricated with engine oil)	500 hours (Note 10)	NO
Standby Dry Vacuum Pump	500 hours or 10 Years, whichever occurs first (Note 10)	NO

3. Supplier-Established Replacement Time Limits

A. The following component time limits have been established by specific suppliers and are reproduced as follows:

Table 2: Supplier-Established Replacement Time Limits

COMPONENT	REPLACEMENT TIME	OVERHAUL
ELT Battery	(Note 3)	NO
Vacuum Manifold	(Note 4)	NO
Magnetos	(Note 5)	YES
Engine	(Note 6)	YES
Engine Flexible Hoses (TCM-Installed)	(Note 2)	NO
Auxiliary Electric Fuel Pump	(Note 7)	YES
Propeller	(Note 8)	YES

CESSNA AIRCRAFT COMPANY
MODEL 182 AND SKYLANE SERIES
SERVICE MANUAL

NOTES:

NOTE 1: This life limit is not intended to allow flexible fluid-carrying Teflon or rubber hoses in a deteriorated or damaged condition to remain in service. Replace engine compartment flexible Teflon (AE3663819BXXX series hose) fluid-carrying hoses (Cessna-installed only) every ten years or at engine overhaul, whichever occurs first. Replace engine compartment flexible rubber fluid-carrying hoses (Cessna-installed only) every five years or at engine overhaul, whichever occurs first (this does not include drain hoses). Hoses which are beyond these limits and are in a serviceable condition must be placed on order immediately and then be replaced within 120 days after receiving the new hose from Cessna.

NOTE 2: For TCM engines, refer to Teledyne Continental Service Bulletin SB97-6, or latest revision.

NOTE 3: Refer to FAR 91.207 for battery replacement time limits.

NOTE 4: Refer to Airborne Air & Fuel Product Reference Memo No. 39, or latest revision, for replacement time limits.

NOTE 5: For airplanes equipped with Slick magnetos, refer to Slick Service Bulletin SB2-80C, or latest revision, for time limits.

For airplanes equipped with TCM/Bendix magnetos, refer to Teledyne Continental Motors Service Bulletin No. 643, or latest revision, for time limits.

NOTE 6: Refer to Teledyne Continental Service Information Letter SIL98-9, or latest revision, for time limits.

NOTE 7: Refer to Cessna Service Bulletin SEB94-7 Revision 1/Dukes Inc. Service Bulletin No. 0003, or latest revision.

NOTE 8: Refer to the applicable McCauley Service Bulletins and Overhaul Manual for replacement and overhaul information.

NOTE 9: The Air Filter may be cleaned. Refer to Section 2 of this service manual and for airplanes equipped with an air filter manufactured by Donaldson. Refer to Donaldson Aircraft Filters Service Instructions P46-9075 for detailed servicing instructions.

The address for Donaldson Aircraft Filters is:

Customer Service
115 E. Steels Corners RD
Stow, OH 44224

Do not over service the air filter. Over servicing increases the risk of damage to the air filter from excessive handling. A damaged/worn air filter may expose the engine to unfiltered air and result in damage/excessive wear to the engine.

NOTE 10: Replace engine driven dry vacuum pump not equipped with a wear indicator every 500 hours of operation, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first.

Replace standby vacuum pump not equipped with a wear indicator every 500 hours of operation or 10 years, whichever occurs first, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever comes first.

For a vacuum pump equipped with a wear indicator, replace pump according to the vacuum pump manufacturer's recommended inspection and replacement intervals.

SECTION 3

FUSELAGE

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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 windshield and windows with exception of wing root area. The wing root fairing has a heavy felt strip which 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

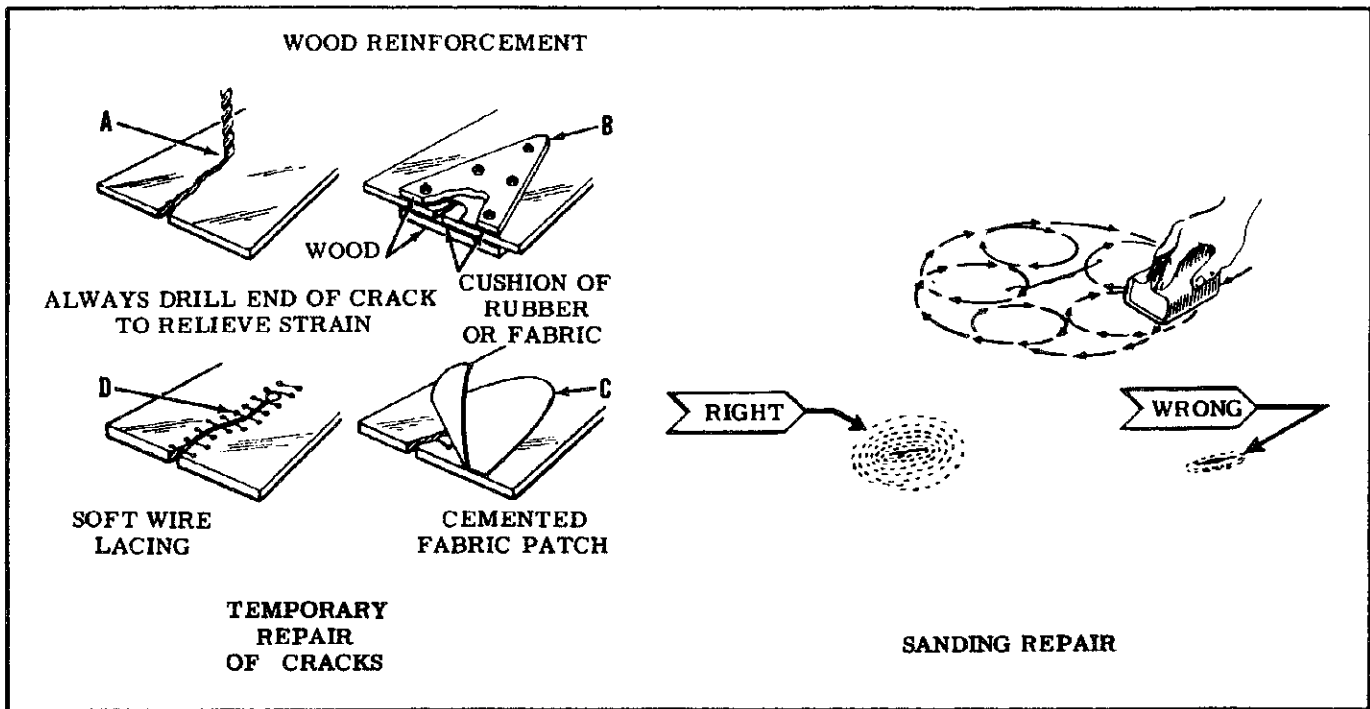


Figure 3-1. Repair of Windshield and Windows

pressure and cover an area large enough to prevent formation of "bull's-eyes" or other optical distortions.

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 the 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.

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

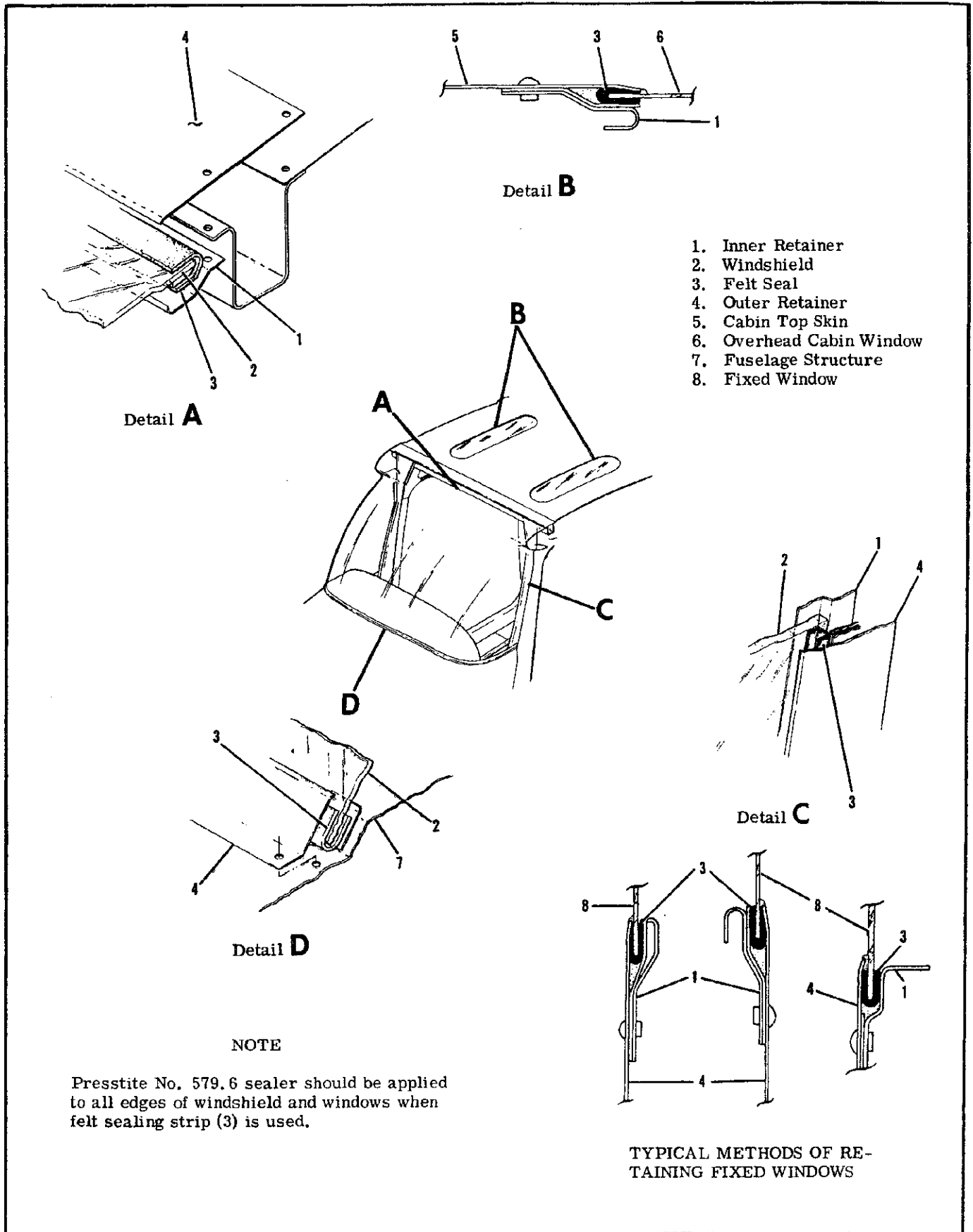


Figure 3-2. Windshield and Fixed Window Installation

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.

NOTE

Remove and tape compass clear of work area. Do not disconnect electrical wiring.

- 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 thru 1975 models and beginning with 1976 may also be installed in the RH door. Beginning with 1974 models a close fitting window frame is employed with an improved seal. The seal is attached to the door frame using EC-880 (3-M Company) or equivalent.

3-14. REMOVAL AND INSTALLATION.

- a. Disconnect window stop (5).
- b. Remove pins from window hinges (6).
- c. Reverse preceding steps for reinstallation. 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. 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 upholstery as necessary to expose retainer strips inside cabin.
- b. Drill out rivets as necessary to remove retainers on both sides and lower edge of window.

- c. Remove window by starting at aft edge and pulling window into cabin area.

d. Reverse preceding steps for reinstallation. Apply sealing strips and an adequate coating of sealing compound to prevent leaks. When installing a new window, check fit, use care not to crack panel and file or grind away excess plastic.

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 reinstallation. 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.

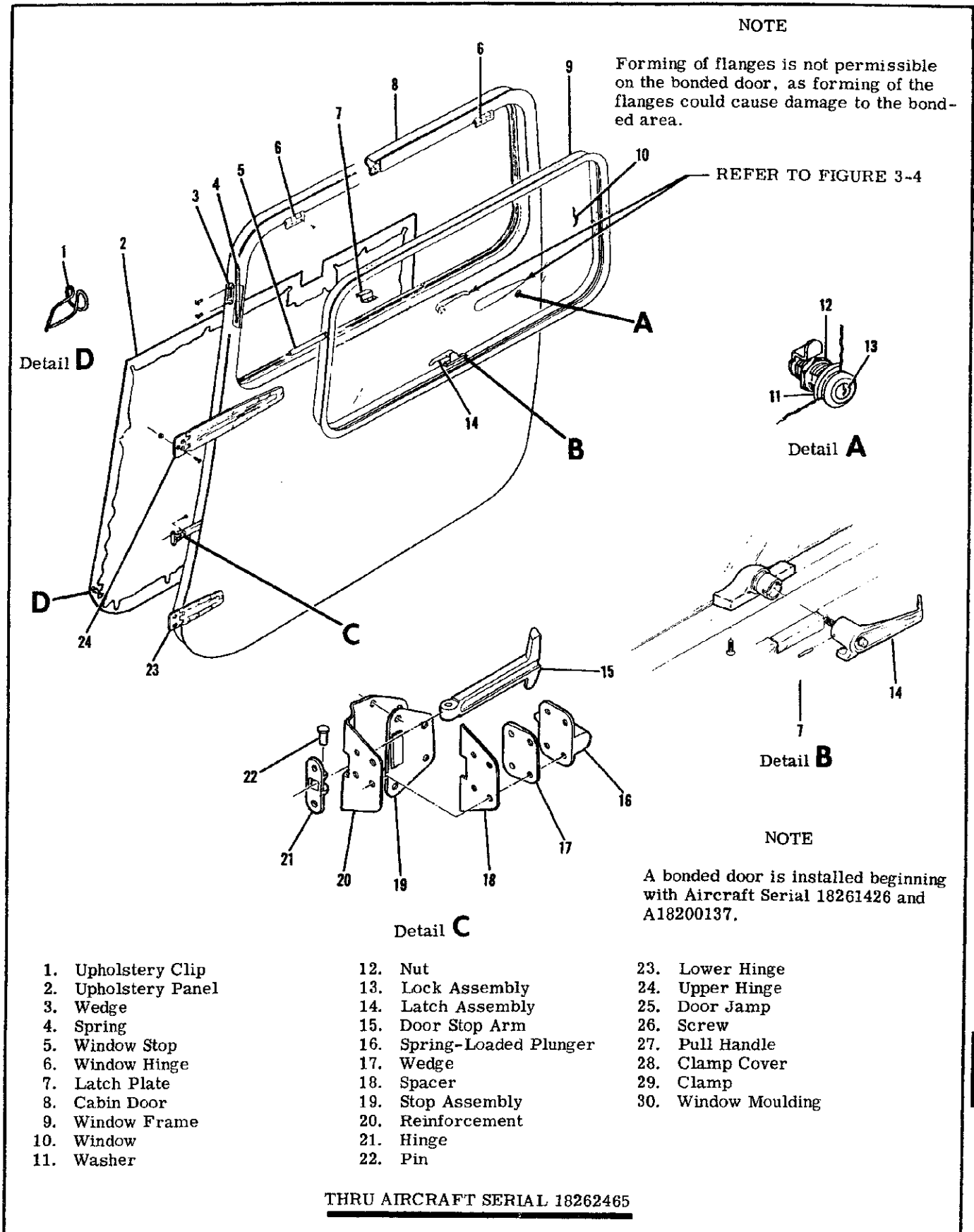
3-20. CABIN DOORS. (Refer to figure 3-3.)

3-21. REMOVAL AND INSTALLATION. Removal of cabin doors is accomplished either by removing screws which attach hinges and door stop or by removing hinge pins attaching hinges and door stop. If permanent hinge pins are removed, they may be replaced by clevis pins secured with cotter pins or new hinge pins may be installed and "spin-brad-ded." When fitting a new door, some trimming of door skin at edges and some reforming with a soft mallet may be necessary to achieve a good fit.

3-22. ADJUSTMENT. Cabin doors should be adjusted so skin fairs with fuselage skin. Slots at the latch plate permit re-positioning of striker plate. Depth of latch engagement may be changed by adding or removing washers or shims between striker plate and doorpost.

3-23. WEATHERSTRIP. Rubber extruded seals are installed around the edges of the door. Beginning with serial 18263830 an improved type door seal is used which has a hollow center and small flutes extending along its length. When replacing door seals ensure mating surfaces are clean, dry and free of oil and grease. Position butt ends of seal at door low point and cut a small notch in the hollow seal for drainage. Apply a thin, even coat of EC-880 adhesive (3-M Co.) or equivalent to each surface and allow to dry until tacky before pressing into place.

3-24. WEDGE ADJUSTMENT. Wedges at upper for-

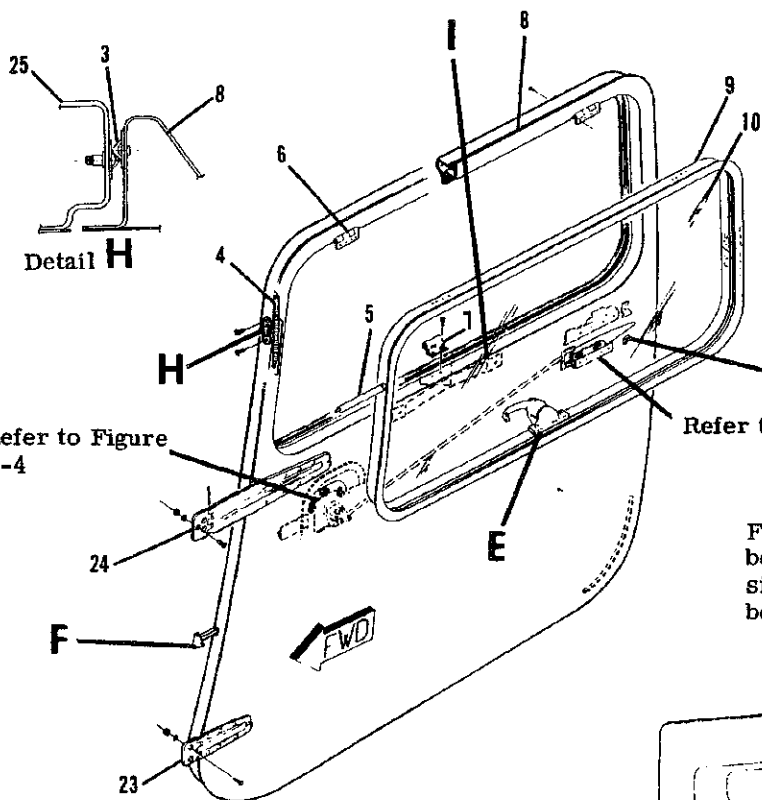


- | | | |
|---------------------|---------------------------|---------------------|
| 1. Upholstery Clip | 12. Nut | 23. Lower Hinge |
| 2. Upholstery Panel | 13. Lock Assembly | 24. Upper Hinge |
| 3. Wedge | 14. Latch Assembly | 25. Door Jump |
| 4. Spring | 15. Door Stop Arm | 26. Screw |
| 5. Window Stop | 16. Spring-Loaded Plunger | 27. Pull Handle |
| 6. Window Hinge | 17. Wedge | 28. Clamp Cover |
| 7. Latch Plate | 18. Spacer | 29. Clamp |
| 8. Cabin Door | 19. Stop Assembly | 30. Window Moulding |
| 9. Window Frame | 20. Reinforcement | |
| 10. Window | 21. Hinge | |
| 11. Washer | 22. Pin | |

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

NOTE

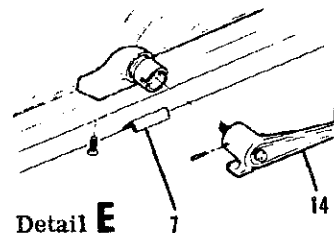
Beginning with serial 18264296 an openable window may be installed in the RH cabin door. Procedures are similar to door illustrated.



Detail H

Refer to Figure 3-4

Refer to Figure 3-4

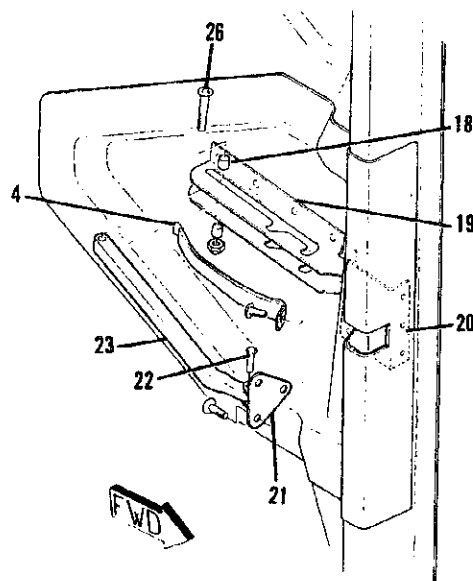


Detail E

Rotated 180°

NOTE

Forming of the flanges on the bonded door is not permissible since damage may occur to the bonded areas.



Rotated 90° CCW

NOTE

After tightening screw (26) spacers (18) should turn freely.

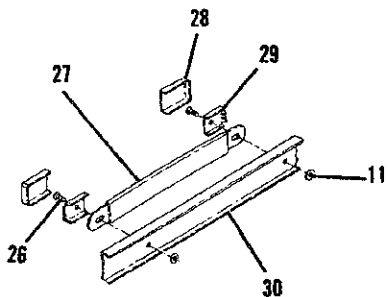


Detail G

NOTE

Spray cabin door and window seals with MS-122 (18598) or equivalent. Caution, do not overspray, confine to the seal.

Detail I
BEGINNING WITH 18262976



NOTE

Lubricate surface of spring (4) in contact with spacers (18) with silicone grease.

**DOOR INSTALLATION
BEGINNING WITH AIRCRAFT
SERIAL 18262466**

NOTE

Trim cutout in inner door pan if necessary to maintain .10 minimum clearance with door stop arm.

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

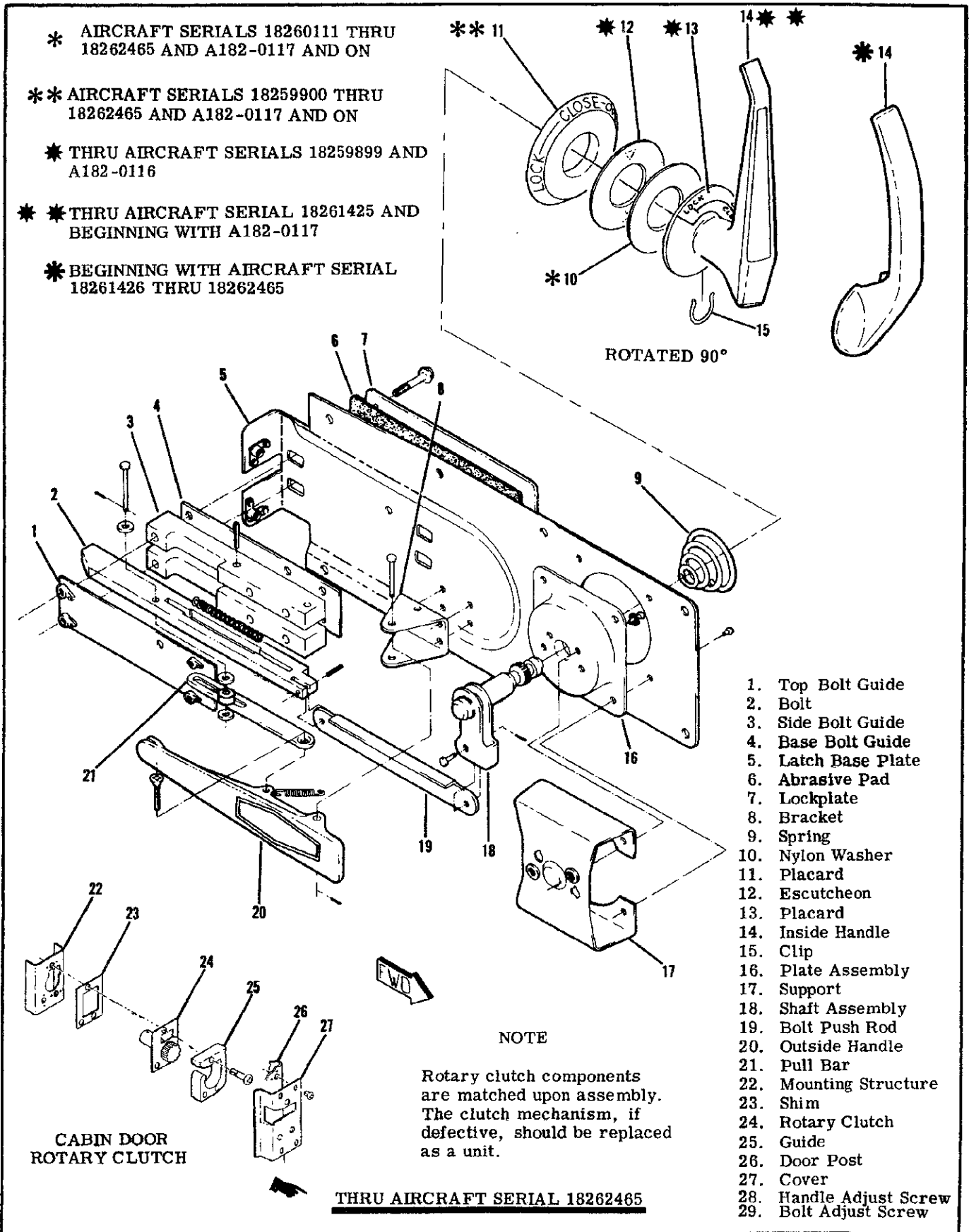


Figure 3-4. Door Latch Installation (Sheet 1 of 2)

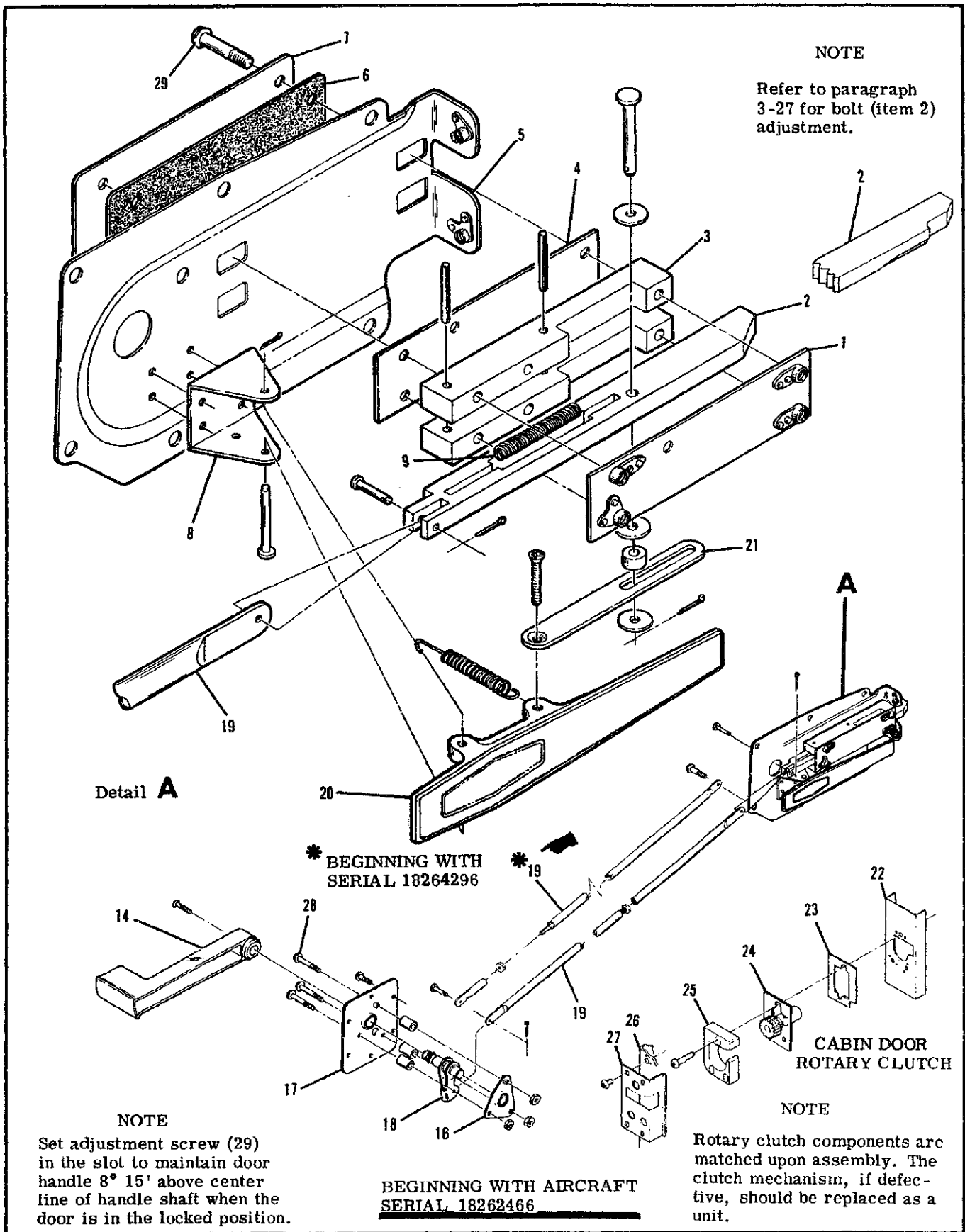


Figure 3-4. Door Latch and Rotary Clutch Components (Sheet 2 of 2)

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 positive 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.

NOTE

On some aircraft the bolt will have a notch in the aft end to allow for a better contour fit between door and fuselage.

3-27. ADJUSTMENT. Vertical adjustment of the rotary clutch is afforded by slotted holes which ensures sufficient gear-to-bolt engagement and proper alignment. The extension or retraction of the bolt item (2) is controlled by adjusting mounting bolts item (29) in the slotted holes. Loosen screws sufficient to move latch base forward on the door to retract bolt and aft to extend bolt.

CAUTION

Close door carefully after adjustment and check clearance between bolt and door jamb and clutch engagement.

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 (2) which is spring-loaded to CLOSE position. The following procedure may be used:

- a. Temporarily install handle (14) on shaft assembly (18) approximately vertical.
 - b. Move handle (14) back and forth until handle centers in spring-loaded position.
 - c. Without rotating shaft assembly (18), remove handle and install placard (11) with CLOSE index at top and press placard to seat prongs.
 - d. Install nylon washer (10).
 - e. Install handle (14) to align with CLOSE index on placard (11) and install clip (15).
 - f. Ensure bolt (2) clears doorpost and teeth engage clutch gear when handle (14) is in CLOSE position.
- Beginning with 1974 models the inside handle is moved forward on the door and fits into the armrest when it is moved to the locked position. Install the handle on the serrated shaft so that the forward end of the handle

is 8° 15' above the centerline of the handle shaft when in the locked position. A small amount of adjustment can be accomplished by loosening the shaft mounting bolts and moving bolt item (28) in the slot to raise or lower the forward end of the handle.

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

3-31. REMOVAL AND INSTALLATION.

- a. Disconnect door-stop chain (9).
- b. Remove inside door handle (2) if installed.
- c. Remove screws securing upholstery panel and remove panel.
- d. Remove bolts (11) securing door to hinges or remove clevis pins (10) securing hinges to brackets.
- e. Reverse preceding steps for reinstallation.

3-31A. ASSIST STRAPS (Refer to figure 3-3)

3-31B. REMOVAL AND INSTALLATION. Figure 3-3 may be used as a guide for removal and installation of the assist straps.

3-32. SEATS. (Refer to figure 3-6.)

3-33. PILOT AND COPILOT.

- a. RECLINING BACK.
- b. VERTICAL ADJUST/RECLINING BACK.
- c. ARTICULATING RECLINE/VERTICAL ADJUST.

3-34. DESCRIPTION. These seats are manually operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-35. 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 reinstallation. 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 take-off and landing.

3-36. CENTER.

- a. DOUBLE-WIDTH BOTTOM/INDIVIDUAL RECLINING BACKS.

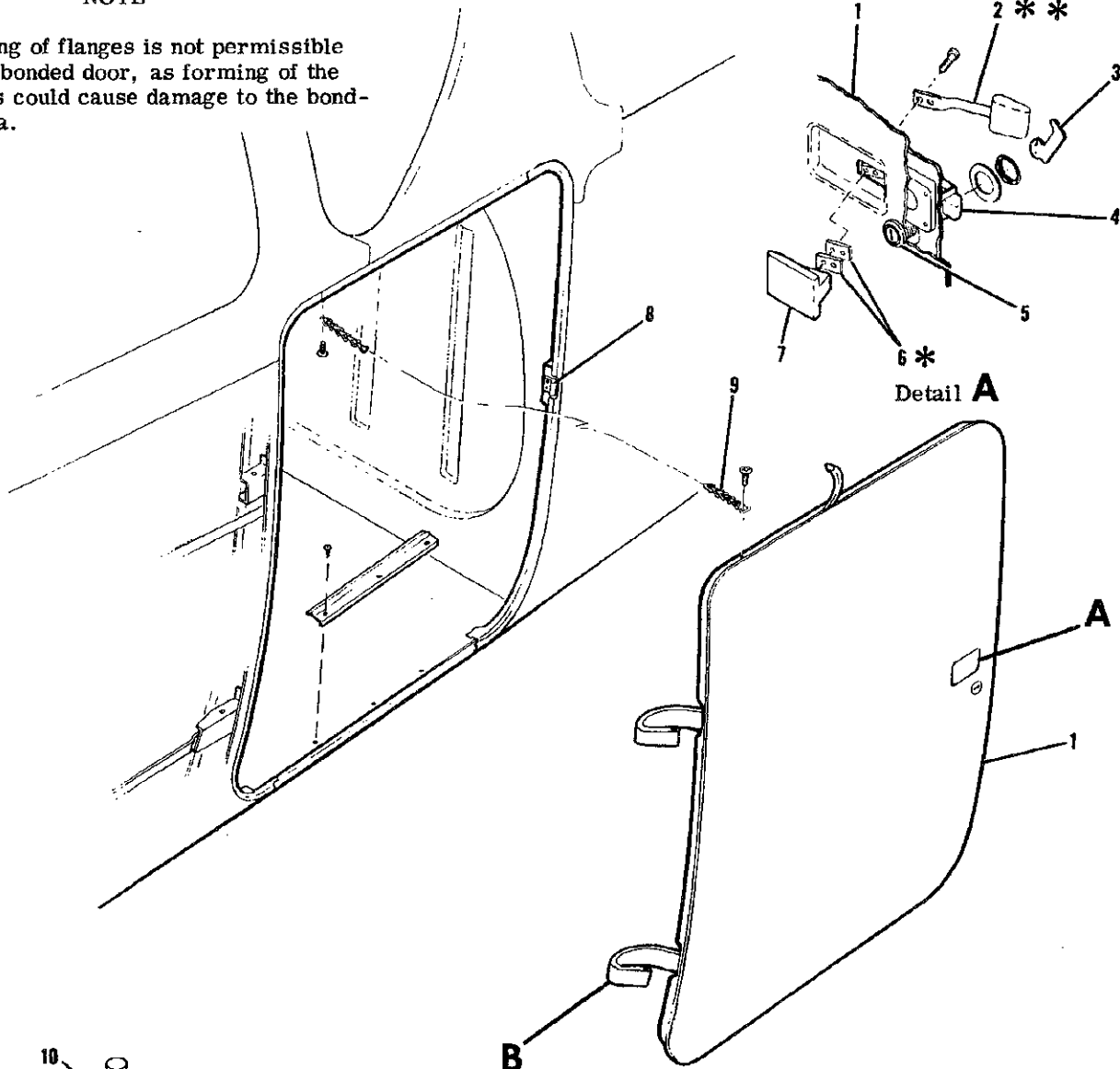
3-37. DESCRIPTION. These seats are permanently bolted to the cabin structure and incorporate no adjustment provisions other than manually-adjustable three position backs.

3-38. REMOVAL AND INSTALLATION.

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

NOTE

Forming of flanges is not permissible on the bonded door, as forming of the flanges could cause damage to the bonded area.



NOTE

AIRCRAFT SERIALS 18260446 AND ON AND A182-0138 AND ON INCORPORATE A BONDED BAGGAGE DOOR.

* Use spacer and shims (6) as required to align outside handle (7) flush with door skin.

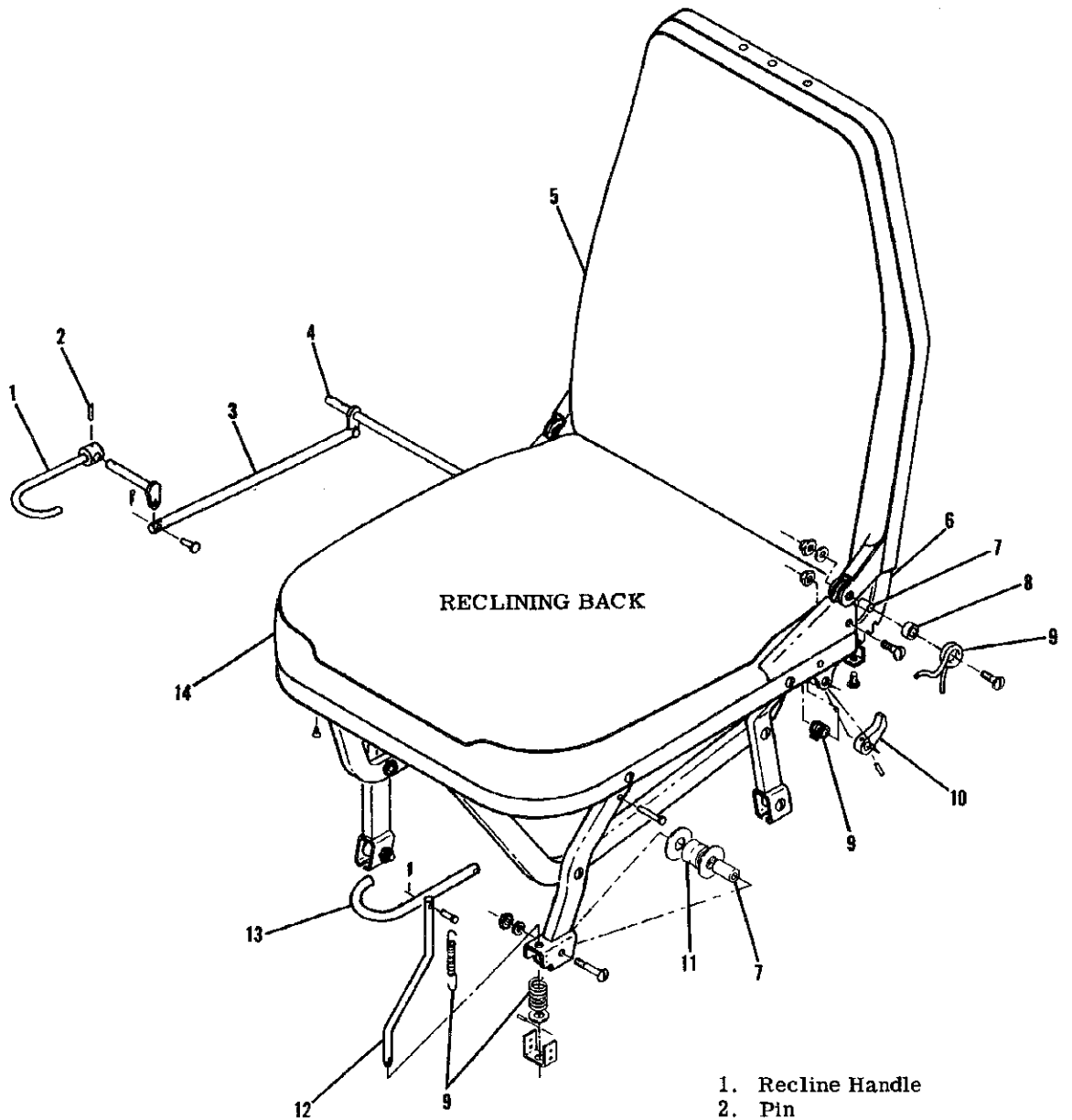
** Beginning with 1971 Model year, inside handle (2) is not installed.

- 1. Baggage Door
- 2. Inside Handle
- 3. Cam
- 4. Latch Assembly
- 5. Lock Assembly
- 6. Shim or Spacer
- 7. Outside Handle
- 8. Striker Plate
- 9. Chain
- 10. Clevis Pin
- 11. Bolt
- 12. Hinge

Detail **B**

Figure 3-5. Baggage Door Installation

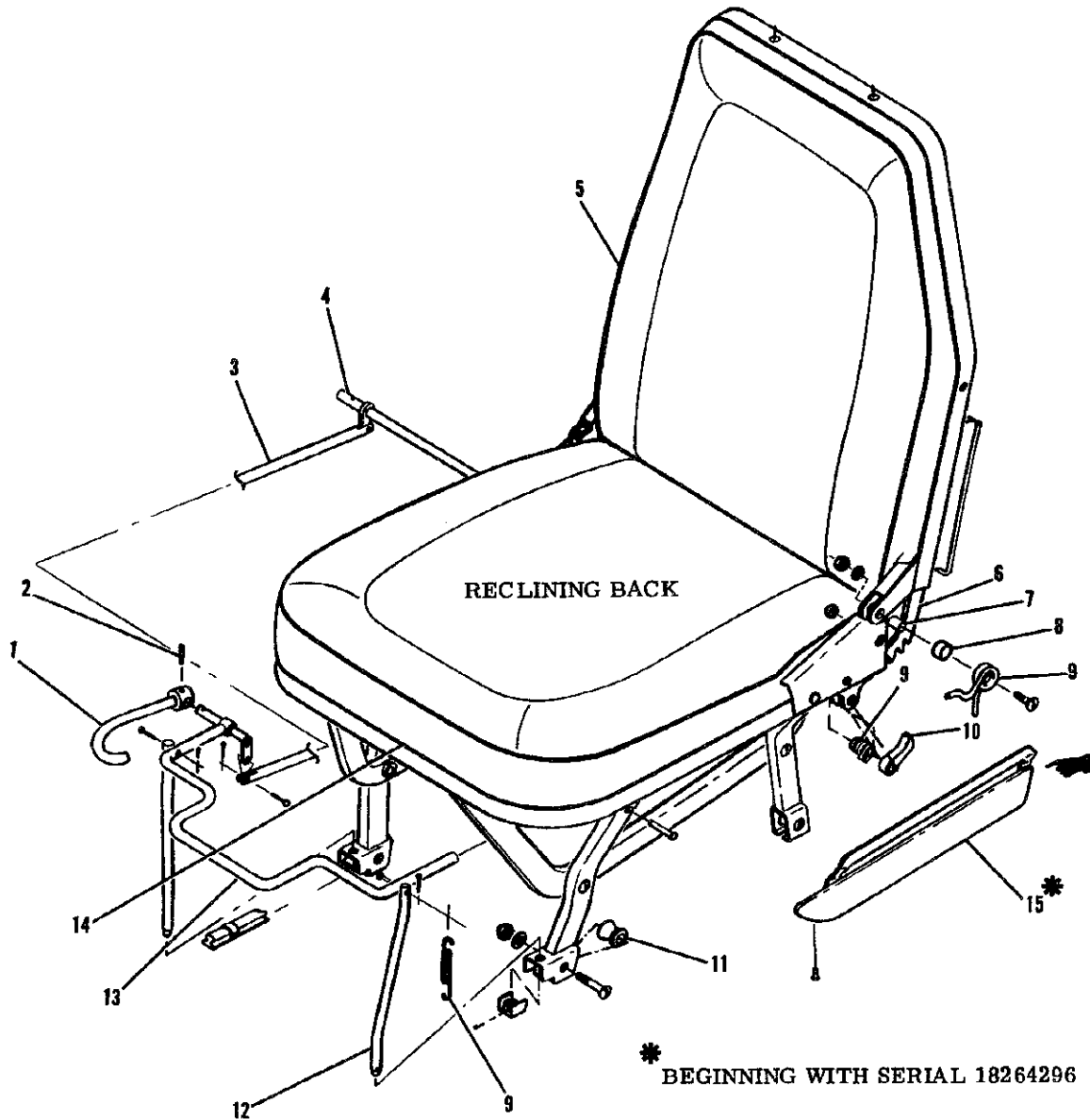
PILOT AND COPILOT SEAT
(STANDARD THRU 1972)



- 1. Recline Handle
- 2. Pin
- 3. Link Assembly
- 4. Torque Tube
- 5. Seat Back
- 6. Recline Cam
- 7. Bushing
- 8. Spacer
- 9. Spring
- 10. Pawl
- 11. Roller
- 12. Adjustment Pin
- 13. Fore/Aft Adjustment Handle
- 14. Seat Bottom

Figure 3-6. Seat Installation (Sheet 1 of 8)

**PILOT AND COPILOT SEAT
(STANDARD BEGINNING WITH 1973)**



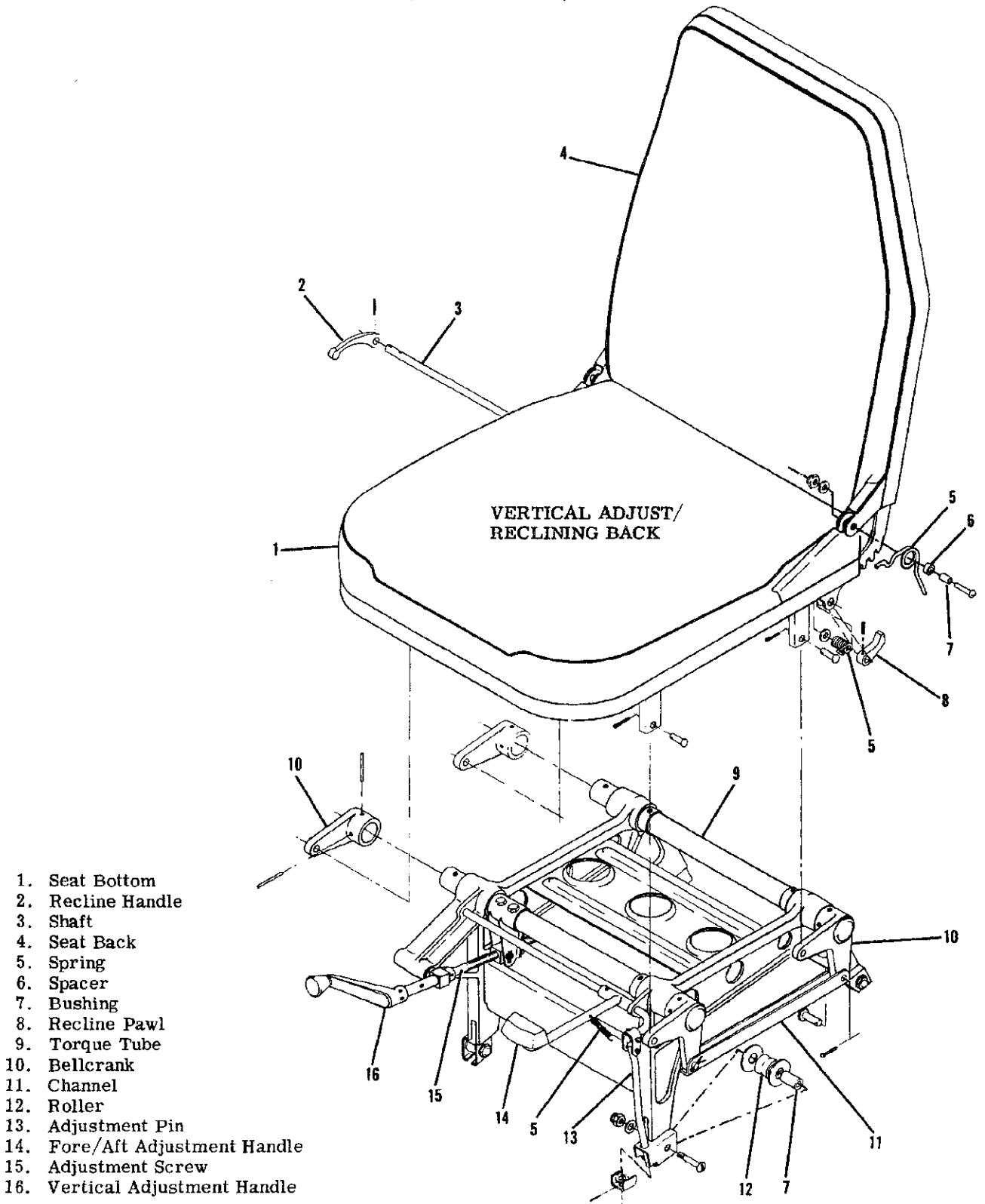
* BEGINNING WITH SERIAL 18264296

- 1. Recline Handle
- 2. Pin
- 3. Link Assembly
- 4. Torque Tube
- 5. Seat Back
- 6. Recline Cam
- 7. Bushing
- 8. Spacer
- 9. Spring
- 10. Pawl
- 11. Roller
- 12. Adjustment Pin
- 13. Fore/Aft Adjustment Handle
- 14. Seat Bottom
- 15. Seat Belt Retainer

Figure 3-6. Seat Installation (2 of 8)

PILOT AND COPILOT SEAT

(OPTIONAL 1969)

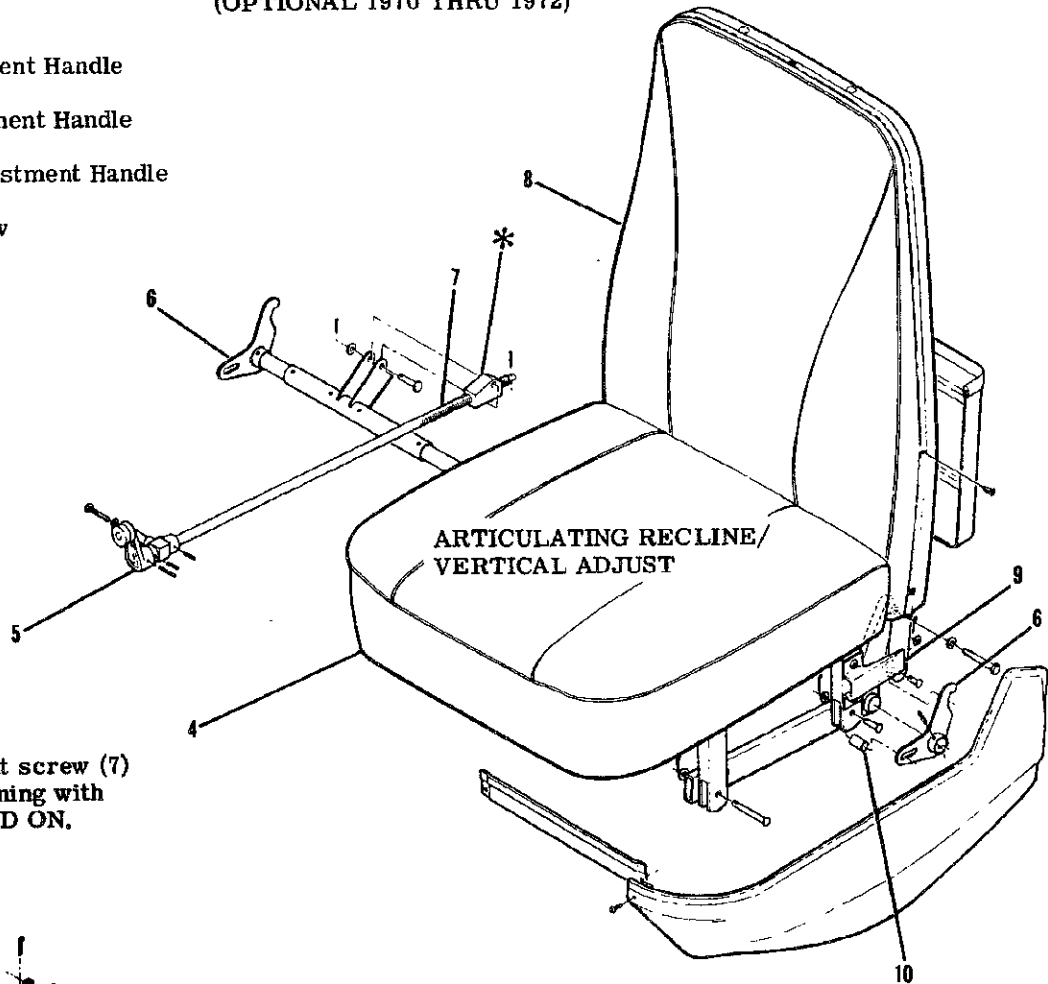


- 1. Seat Bottom
- 2. Recline Handle
- 3. Shaft
- 4. Seat Back
- 5. Spring
- 6. Spacer
- 7. Bushing
- 8. Recline Pawl
- 9. Torque Tube
- 10. Bellcrank
- 11. Channel
- 12. Roller
- 13. Adjustment Pin
- 14. Fore/Aft Adjustment Handle
- 15. Adjustment Screw
- 16. Vertical Adjustment Handle

Figure 3-6. Seat Installation (Sheet 3 of 8)

**PILOT AND COPILOT SEAT
(OPTIONAL 1970 THRU 1972)**

- 1. Vertical Adjustment Handle
- 2. Adjustment Pin
- 3. Fore/Aft Adjustment Handle
- 4. Seat Bottom
- 5. Articulating Adjustment Handle
- 6. Bellcrank
- 7. Adjustment Screw
- 8. Seat Back
- 9. Trim Bracket
- 10. Spacer
- 11. Channel
- 12. Torque Tube
- 13. Seat Structure
- 14. Roller



*** NOTE**

The nut on adjustment screw (7) is rotated 180° beginning with SERIAL 18260826 AND ON.

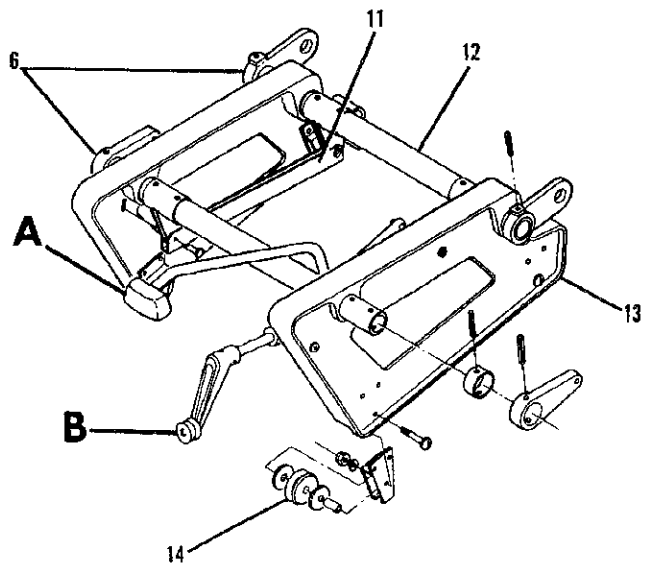
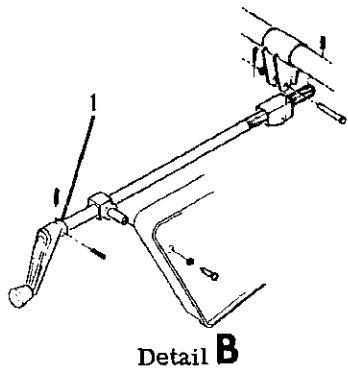
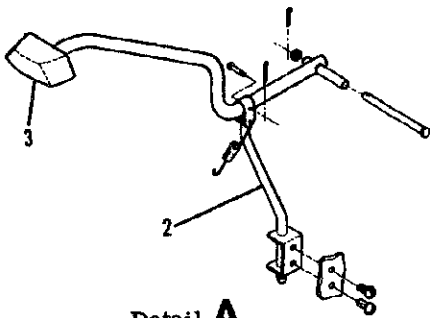
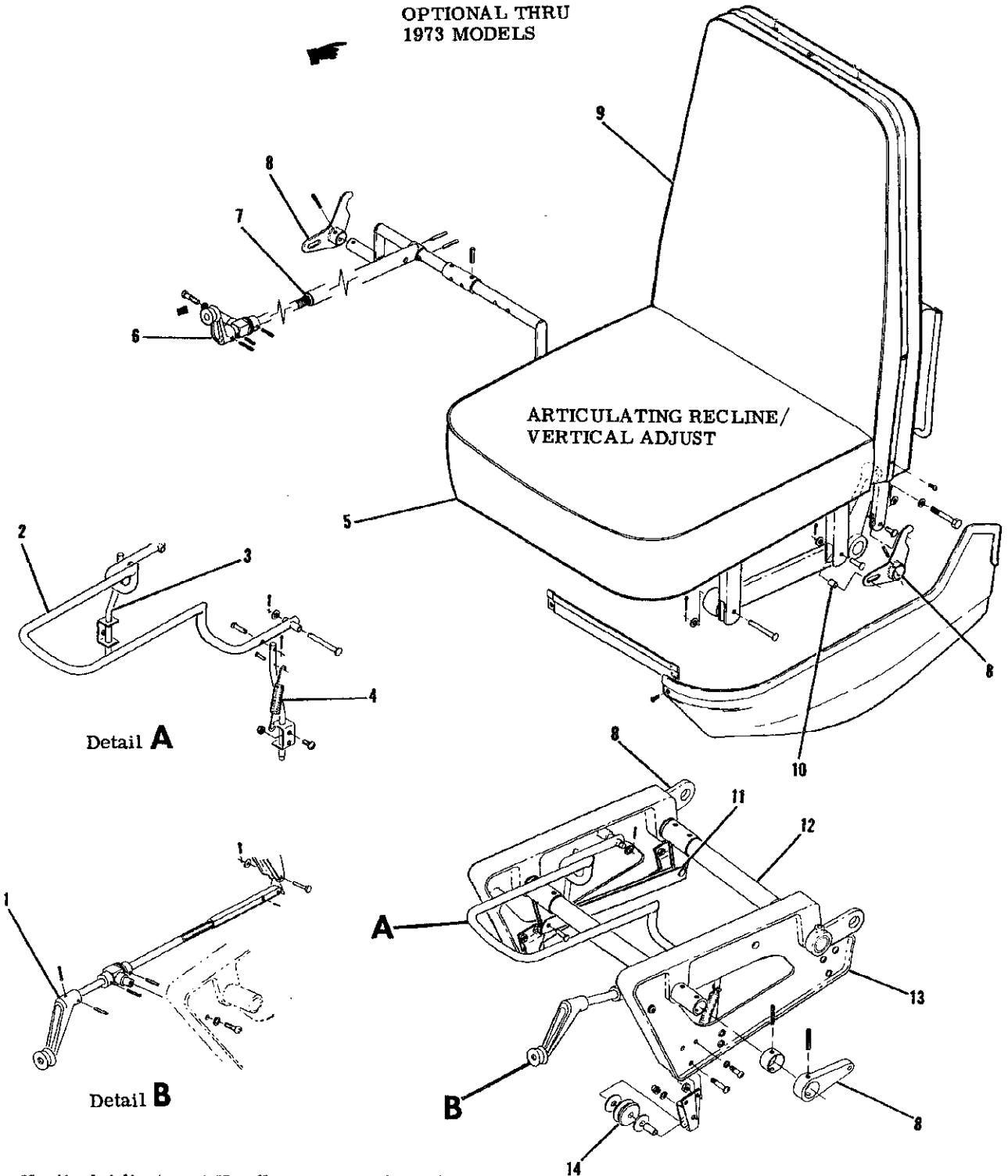


Figure 3-6. Seat Installation (Sheet 4 of 8)

PILOT AND COPILOT SEAT

OPTIONAL THRU
1973 MODELS



- | | |
|-----------------------------------|--------------------|
| 1. Vertical Adjustment Handle | 8. Bellcrank |
| 2. Fore/Aft Adjustment Handle | 9. Seat Back |
| 3. Adjustment Pin | 10. Spacer |
| 4. Spring | 11. Channel |
| 5. Seat Bottom | 12. Torque Tube |
| 6. Articulating Adjustment Handle | 13. Seat Structure |
| 7. Adjustment Screw | 14. Roller |

Figure 3-6. Seat Installation (Sheet 5 of 8)

**PILOT AND COPILOT SEAT
BEGINNING WITH 1974 MODELS
(OPTIONAL INSTALLATION)**

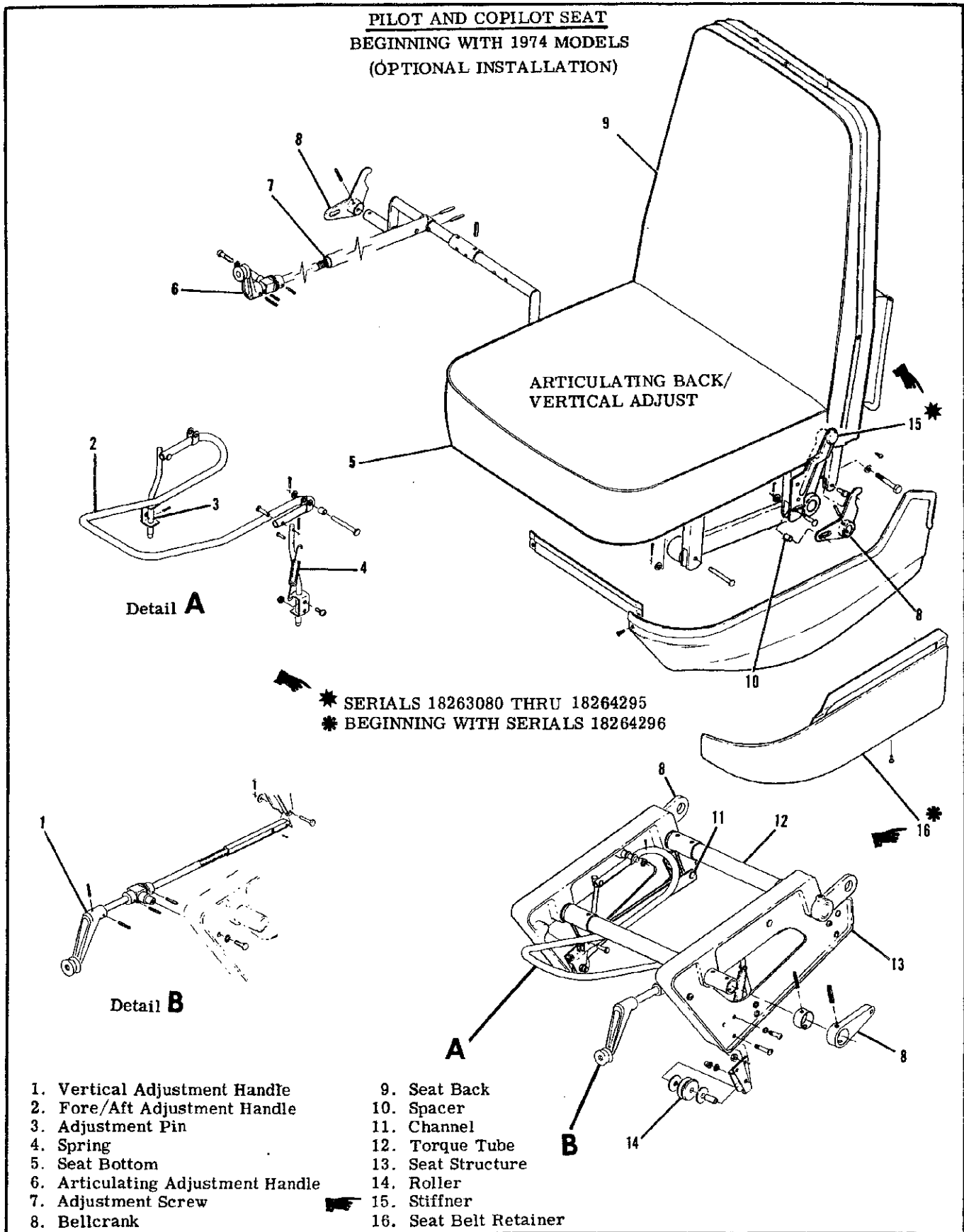


Figure 3-6. Seat Installation (Sheet 6 of 8)

CENTER SEAT
(STANDARD)

1. Seat Bottom
2. Spring
3. Bushing
4. Seat Back
5. Recline Cam
6. Recline Handle
7. Recline Pawl
8. Control Shaft

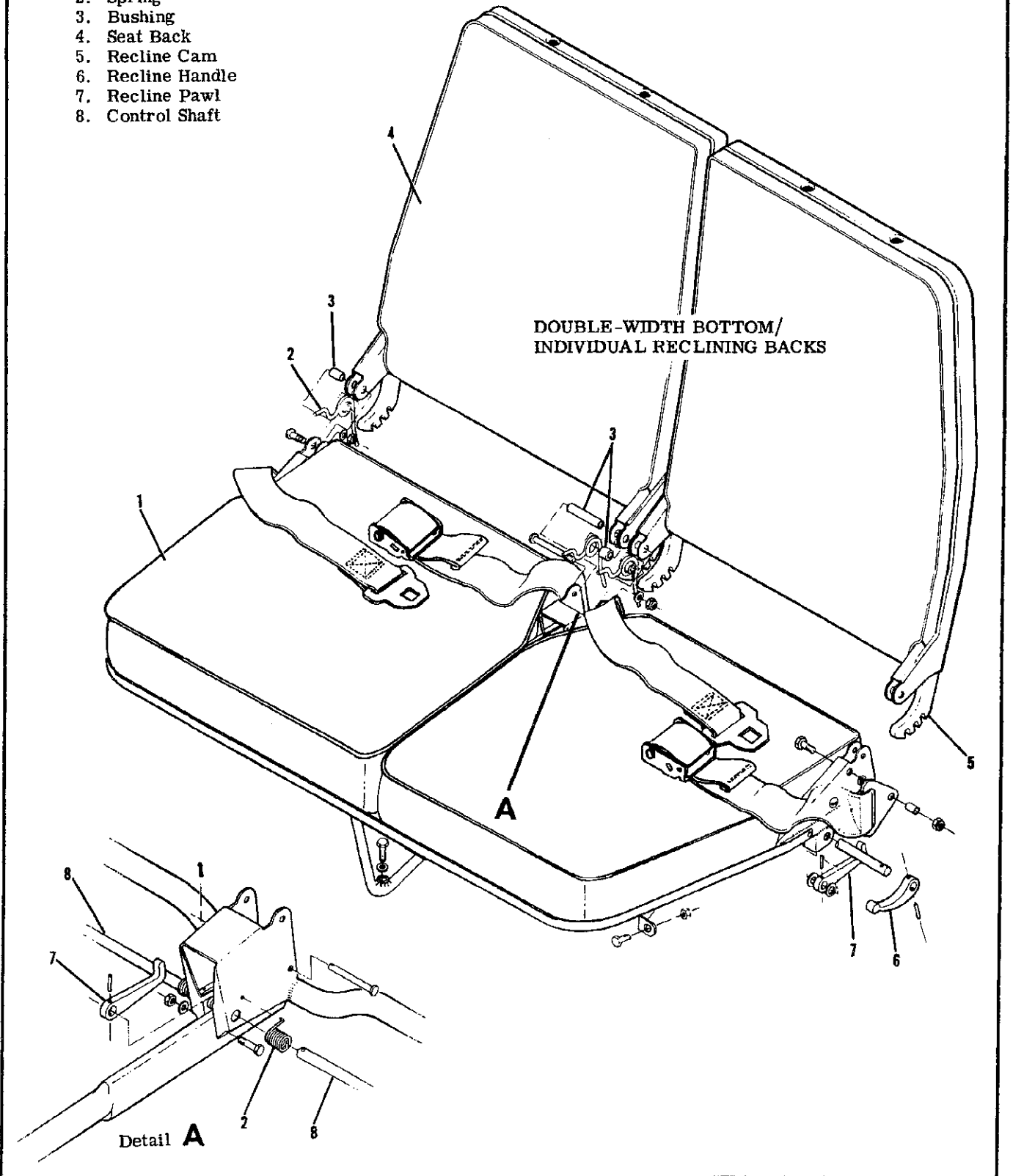


Figure 3-6. Seat Installation (Sheet 7 of 8)

**AUXILIARY SEATS
(OPTIONAL)**

**THRU AIRCRAFT SERIALS
18260055 AND A182-0116**

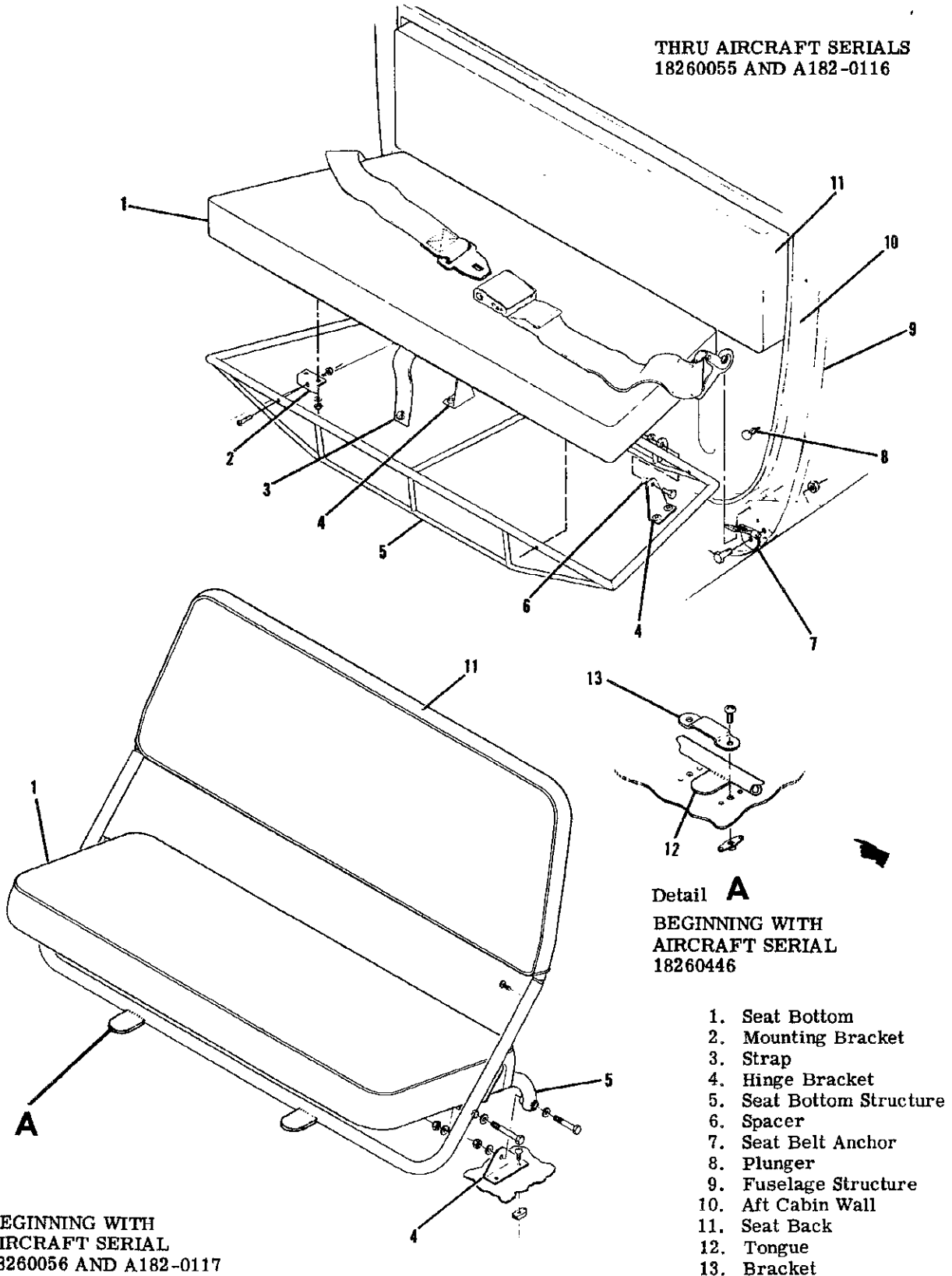
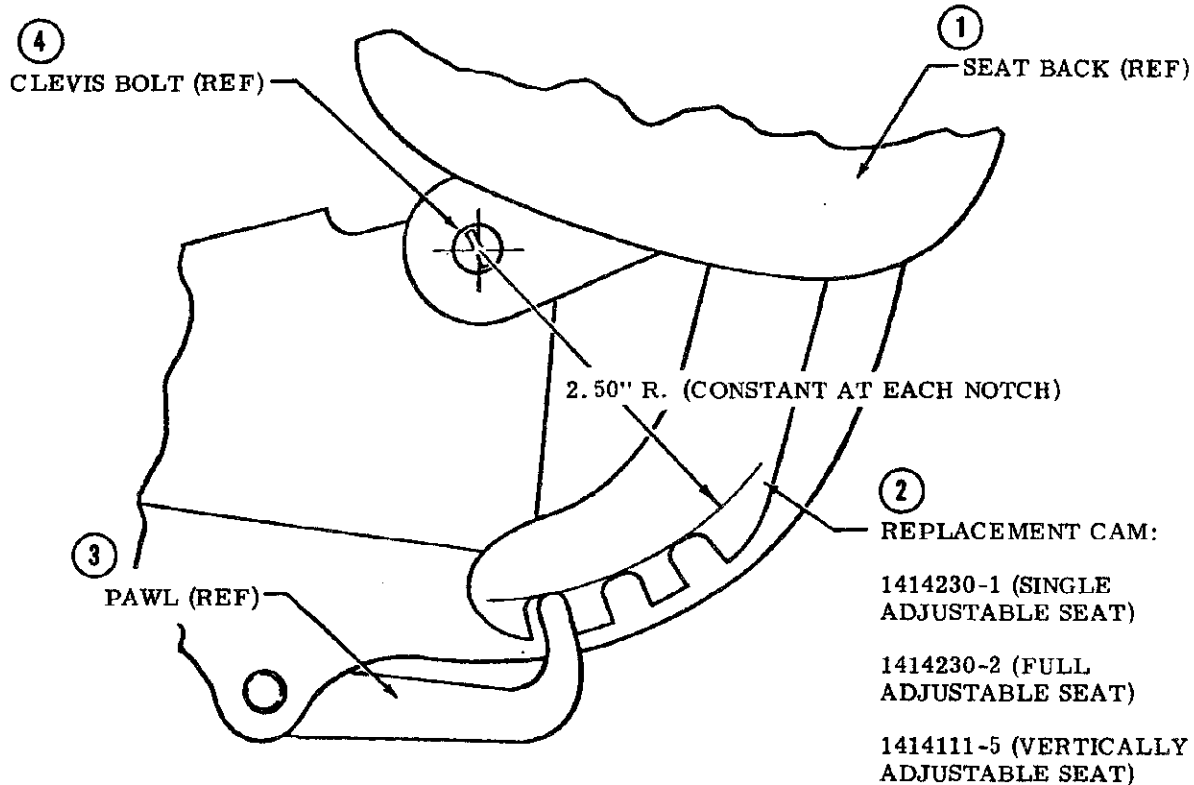


Figure 3-6. Seat Installation (8 of 8)



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

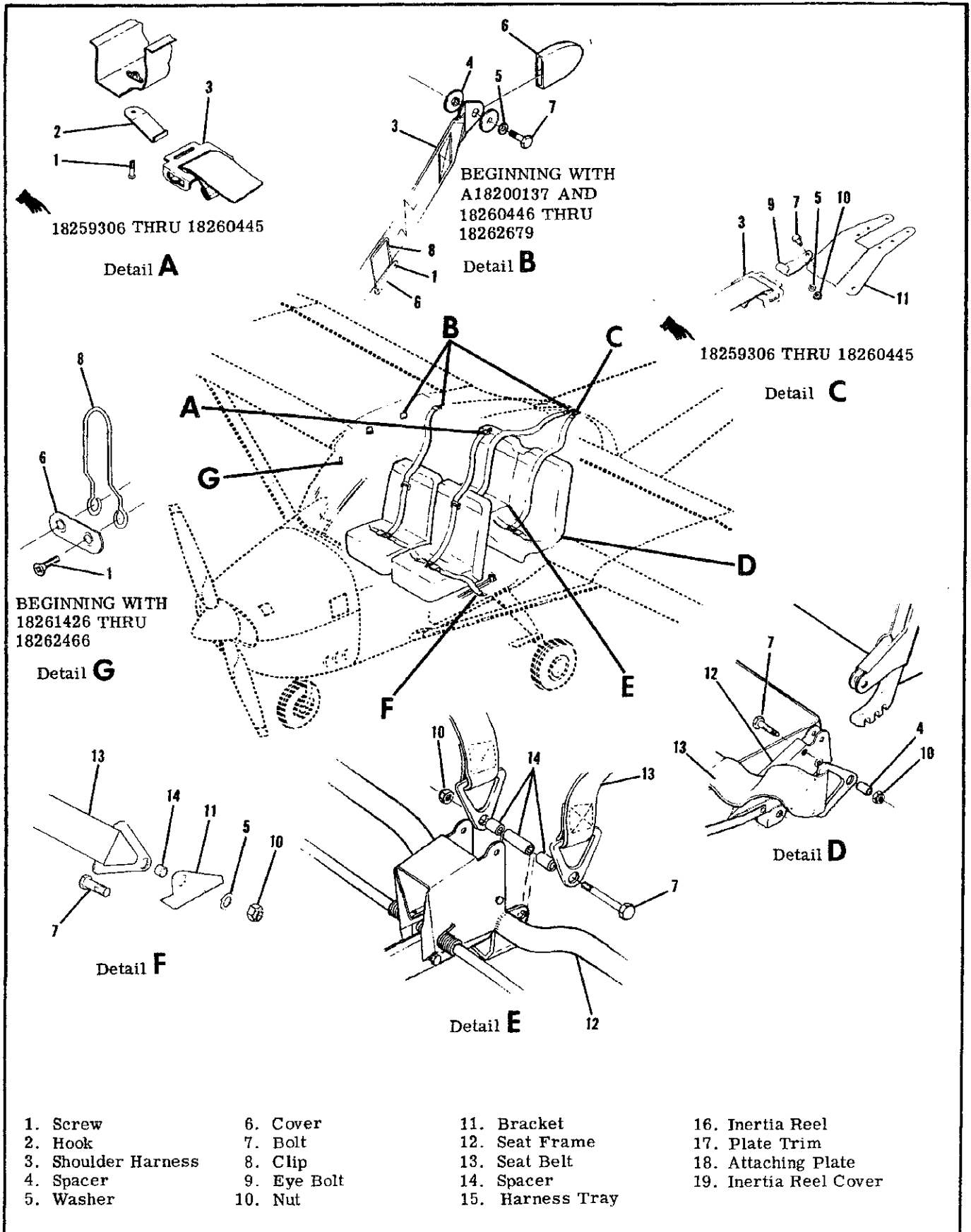


Figure 3-8. Seat Belt and Shoulder Harness Installation (Sheet 1 of 3)

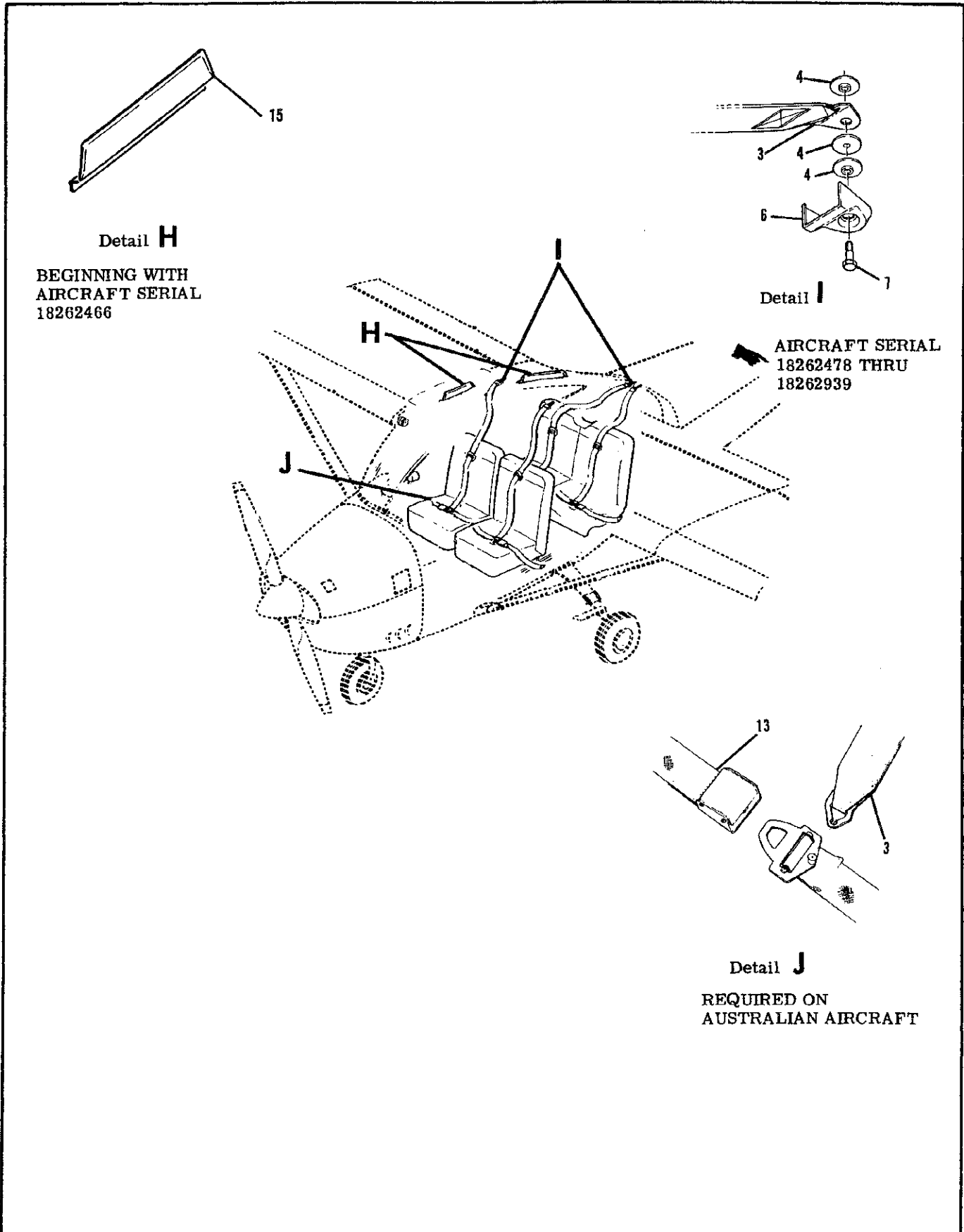
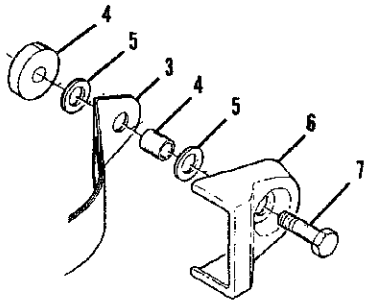
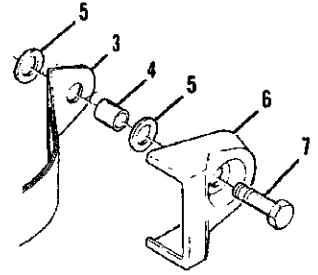


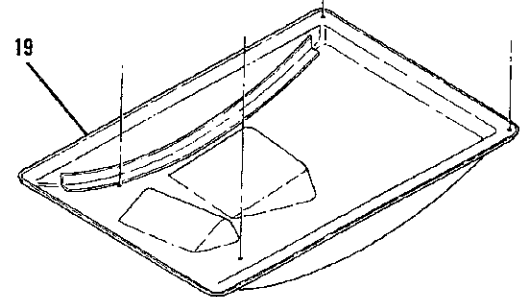
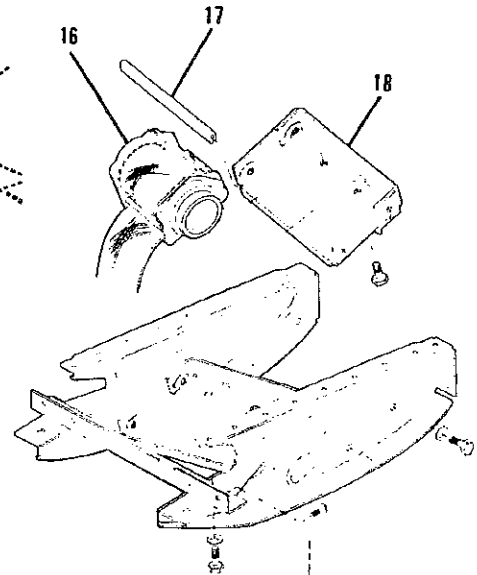
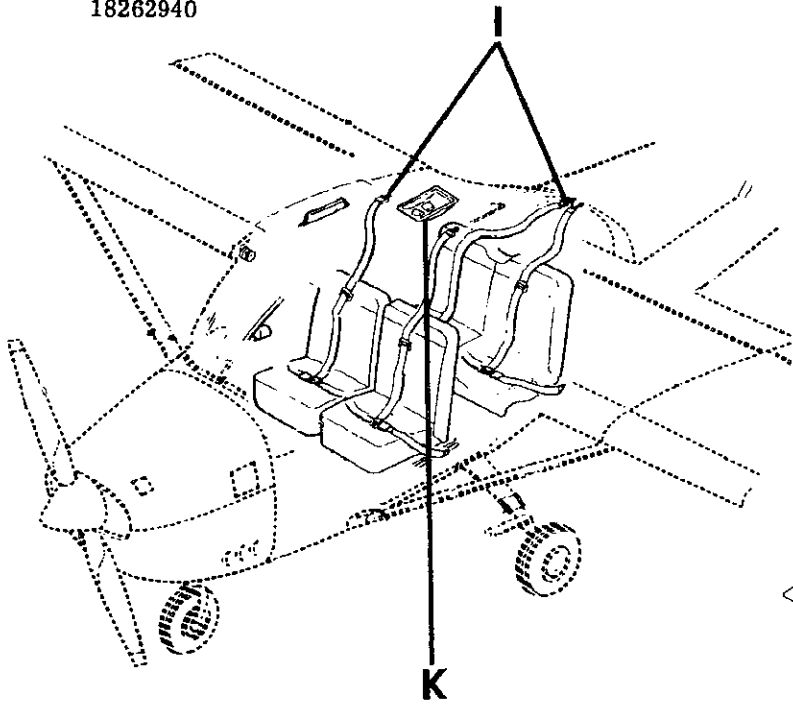
Figure 3-8. Seat Belt and Shoulder Harness Installation (Sheet 2 of 3)



Detail I
FRONT SEAT
BEGINNING WITH
AIRCRAFT SERIAL
18262940



Detail J
REAR SEAT
BEGINNING WITH
AIRCRAFT SERIAL
18262940



Detail K
INERTIA REEL
BEGINNING WITH
AIRCRAFT SERIAL
18262940

Figure 3-8. Seat Belt and Shoulder Harness Installation(Sheet 3 of 3)

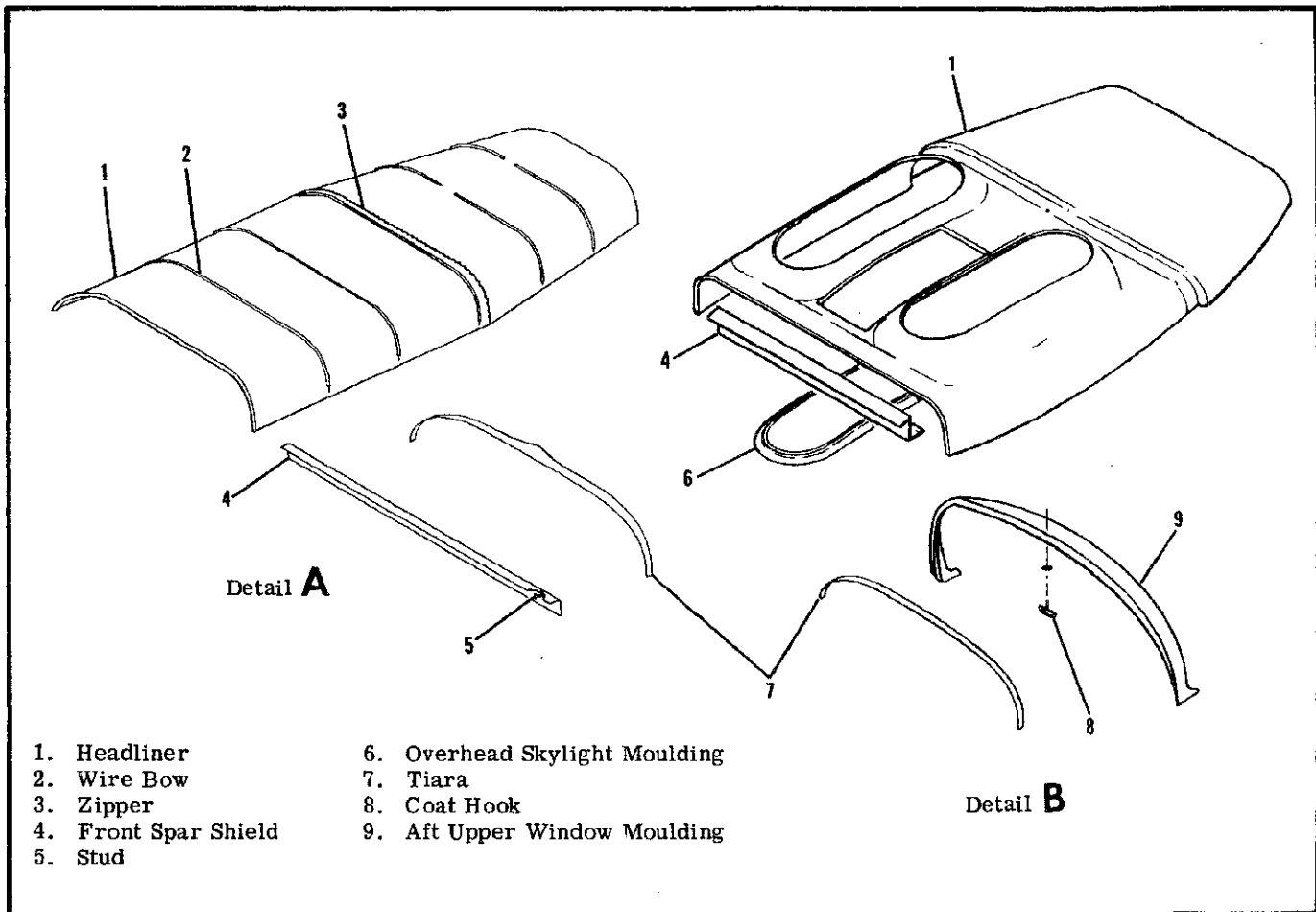


Figure 3-9. Cabin Headliner Installation

3-39. AUXILIARY.
a. FOLD-UP.

3-40. 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.

3-41. REMOVAL AND INSTALLATION.

- a. Remove bolts securing seat structure to hinge brackets.
- b. Unsnap seat back from aft cabin wall. (1968 and 1969 Models).
- c. Lift seat out.
- d. Reverse preceding steps for reinstallation.

3-42. 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 seat backs.

3-43. CABIN UPHOLSTERY. Due to the wide selec-

tion 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 guide 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.

3-44. 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.

3-45. 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.

3-46. CABIN HEADLINER. (Refer to figure 3-9.)

3-47. REMOVAL AND INSTALLATION.

a. Detail A.

1. Remove sun visors, all inside finish strips and plates, doorpost upper shields, front spar trim shield, dome lights and any other visible retainers securing headliner.
2. Work edges of headliner free from metal teeth which hold fabric.
3. Starting at front of headliner, work headliner down, removing screws through metal tabs which hold wire bows to cabin top. Pry loose outer ends of bows from retainers above doors. Detach each wire bow in succession.

NOTE

Always work from front to rear when removing headliner.

4. Remove headliner assembly and bows from aircraft.

NOTE

Due to difference in length and contour of wire bows, each bow should be tagged to assure proper location in headliner.

5. Remove spun glass soundproofing panels.

NOTE

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

6. Reverse preceding steps for reinstallation. 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. Straighten tabs bent during removal of headliner.
7. Apply cement to inside of skin in areas where soundproofing panels are not supported by wire bows and press soundproofing in place.
8. Insert wire bows into headliner seams and secure two bows at rear of headliner. Stretch material along edges to properly center, but do not stretch it tight enough to destroy ceiling contours or distort wire bows. Secure edges of headliner with metal teeth.
9. Work headliner forward, installing each wire bow in place with metal tabs. Wedge ends of wire bows into the retainer strips. Stretch headliner just taut enough to avoid wrinkles and maintain a smooth contour.
10. When all bows are in place and fabric edges are secured, trim off excess fabric and reinstall all items removed.

b. Detail B.

1. Remove sun visors, all inside finish strips and plates, overhead console, upper doorpost shields and any other visible retainers securing headliner.
2. Remove molding from fixed windows.
3. Remove screws securing headliner and carefully take down headliner.
4. Remove spun glass soundproofing panels

above headliner.

NOTE

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

5. Reverse preceding steps for reinstallation. 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.

3-48. 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 over-tighten 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.

3-49. CARPETING. Cabin area and baggage compartment carpeting is held in place by rubber cement, small sheet metal screws and retaining strips through the 1970 model aircraft. Beginning with 1971 model aircraft the carpeting is secured by Velcro fasteners for quick-removal and inspection. When fitting a new carpet, use the old one as a pattern for trimming and marking screw holes.

3-50. SAFETY PROVISIONS.

3-51. 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 3-10. The eyebolt and nutplate can be located at various points. The sliding tie-down lug also utilizes the eyebolt and attaches to a seat rail. A baggage net can be secured to the aft cabin wall and floor for baggage security.

3-52. SAFETY BELTS. 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. The front seat safety belts are attached to brackets bolted to the cabin floor and the center seat safety belts are attached to the seats themselves. The auxiliary seat is provided with only one safety belt and is snapped into clips bolted to the aircraft structure. Refer to figure 3-8.

NOTE

Through 1970 model aircraft, when installing front and center seat safety belts be sure the belt half with the buckle is installed on the in-board side of the seat. Beginning with 1971 models the belt half with the buckle should be installed on the outboard side of the seat to ensure proper operation of the shoulder harness.

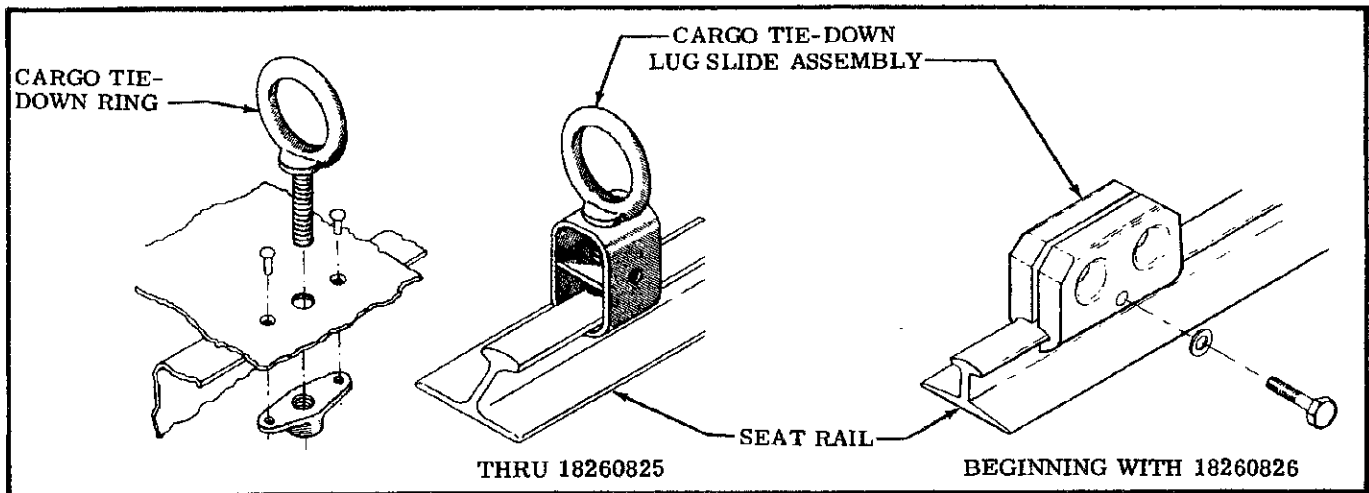


Figure 3-10. Cargo Tie-Down Rings

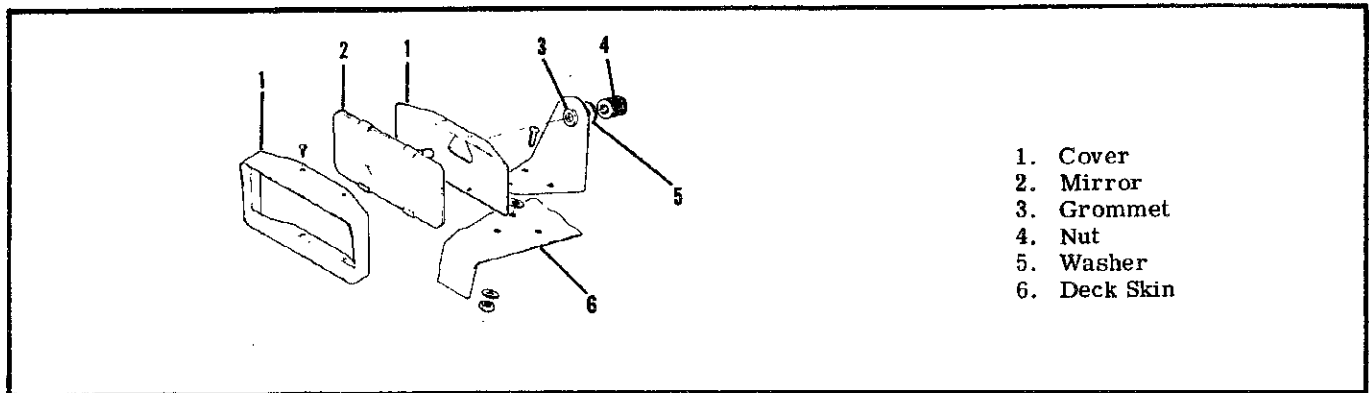


Figure 3-11. Rear View Mirror Installation

3-53. **SHOULDER HARNESS.** Individual shoulder harnesses may be installed for each seat except auxiliary. Through 1970 model aircraft each harness is attached to a clip bolted to the upper fuselage structure. Beginning with 1971 model aircraft the pilot and copilot harnesses are bolted to the upper rear doorposts and the center seat harnesses are bolted to the aft cabin structure. Component parts should be replaced as outlined in the preceding paragraph. Refer to figure 3-8. Beginning with aircraft 18262940, an inertia reel installation is offered.

Refer to figure 3-8 for installation.

3-54. **GLIDER TOW-HOOK.** A glider tow-hook, which is mounted in place of the tail tie-down ring, is available for all models.

3-55. **REAR VIEW MIRROR.** A rear view mirror may be installed on the cowl deck above instrument panel. Figure 3-10 shows details for rear view mirror installation.

SHOP NOTES:

SECTION 4

WINGS AND EMPENNAGE

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4-1. WINGS AND EMPENNAGE.

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

4-3. DESCRIPTION. Each all-metal wing panel is a semicantilever, 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, rubberized, bladder-type fuel cell is mounted in the inboard end of each wing. The leading edge of the left wing may be equipped with landing and taxi lights. Navigation/strobe 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 cell of wing being removed.
- d. Disconnect:
 1. Electrical wires at wing root disconnects.
 2. Fuel lines at wing root. (Observe precautions outlined in paragraph 12-3.)
 3. Pitot line (left wing only) at wing root.
 4. Wing leveler vacuum tube, if installed, at wing root.
- e. Slack off tension on aileron cables by loosening turnbuckles, then disconnect cables at aileron bell-cranks. 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 then may 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. (Refer to paragraph 4-10.) Tie the strut up with wire to prevent it from swinging down and straining strut-to-fuselage fitting. Loosen lower strut fairing and slide fairing up the strut; the strut may then be lowered without damage.

NOTE

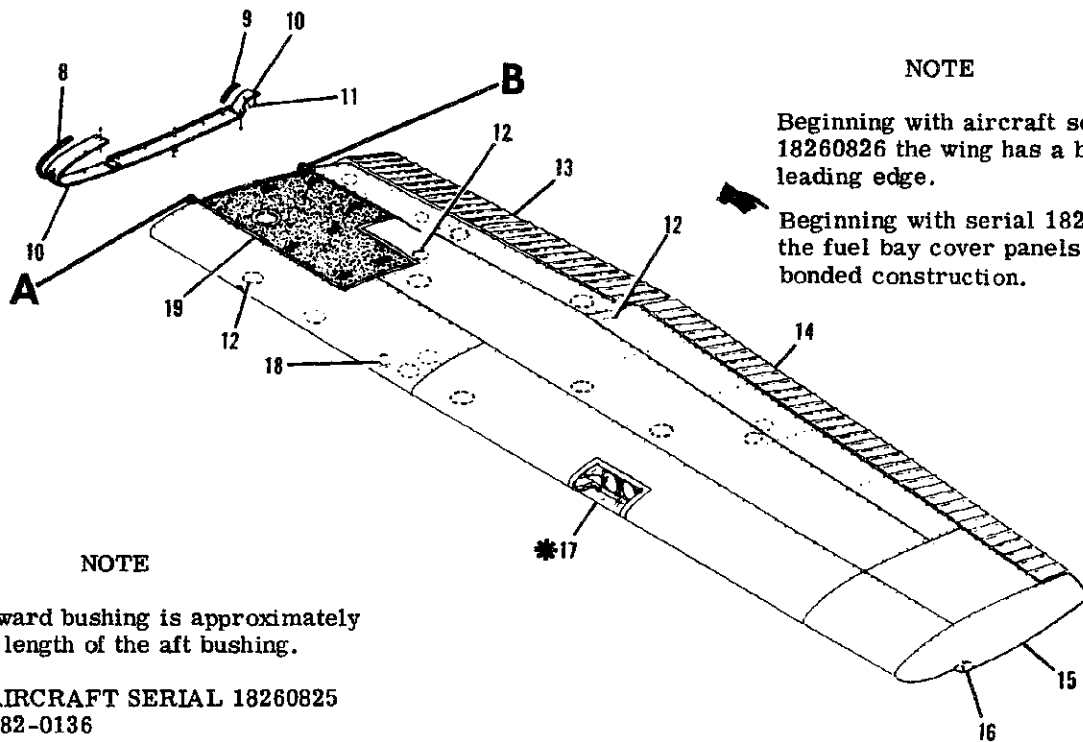
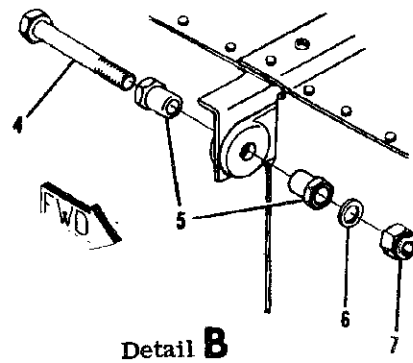
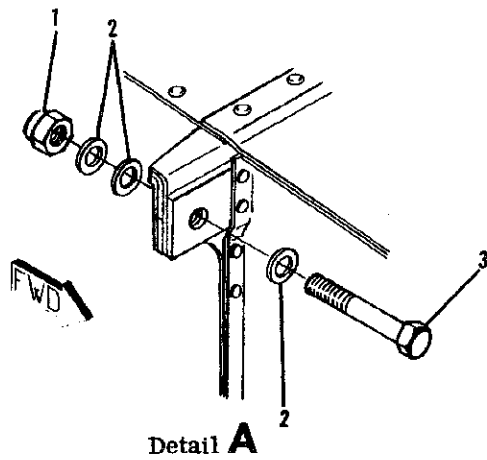
It is recommended that flap be secured in streamlined position with tape during wing removal to prevent damage, since flap will swing freely.

- 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 wings 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

Beginning with aircraft serial 18260826 the wing has a bonded leading edge.

Beginning with serial 18264296 the fuel bay cover panels are of bonded construction.

NOTE

The forward bushing is approximately half the length of the aft bushing.

*THRU AIRCRAFT SERIAL 18260825 AND A182-0136

- 1. Nut
- 2. Washer
- 3. Bolt
- 4. Bolt
- 5. Bushing
- 6. Washer

- 7. Nut
- 8. Rub Strip
- 9. Moulding
- 10. Fairing
- 11. Screw
- 12. Inspection Plate
- 13. Flap

- 14. Aileron
- 15. Wing Tip
- 16. Navigation/Strobe Light
- 17. Landing and Taxi Lights
- 18. Stall Warning Unit
- 19. Fuel Cell

Figure 4-1. Wing Installation

4-5. REPAIR. A damaged wing panel may be repaired in accordance with instructions outlined in Section 18. Extensive repairs of wing skin or structure are best accomplished using the wing 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 the 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. (Refer to note in paragraph 4-4.)
- d. Connect:
 1. Electric wires at wing root disconnects.
 2. Fuel lines at wing root. (Observe precautions outlined in Section 12).
 3. Pitot line (if left wing is being installed.)
 4. Cabin ventilator hose at wing root.
 5. Wing leveler vacuum tube, if installed, at wing root.
- e. Rig aileron system (Section 6).
- f. Rig flap system (Section 7).
- g. Refill wing fuel cell and check for leaks. (Observe precautions outlined in Section 12).
- h. Check operation of wing tip lights and landing and taxi lights.
- i. Check operation of fuel quantity indicator.
- 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 (7) and rotate bushings (5) simultaneously until the bushings are positioned with the thick sides of the eccentrics up. This will lower the trailing edge of the wing, and decrease "wing-heaviness" by increasing the 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 fitting.

- 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. (See 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. (See figure 4-3.)

4-13. DESCRIPTION. The vertical 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 may 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 electrical lead that routes into the fuselage may be cut, then spliced (or quick-disconnects used) at installation.

- c. Remove screws attaching dorsal to fuselage.
- d. Remove bolts attaching fin rear spar to fuselage fitting.
- e. Remove bolts attaching fin front spar to fuselage, and remove fin.

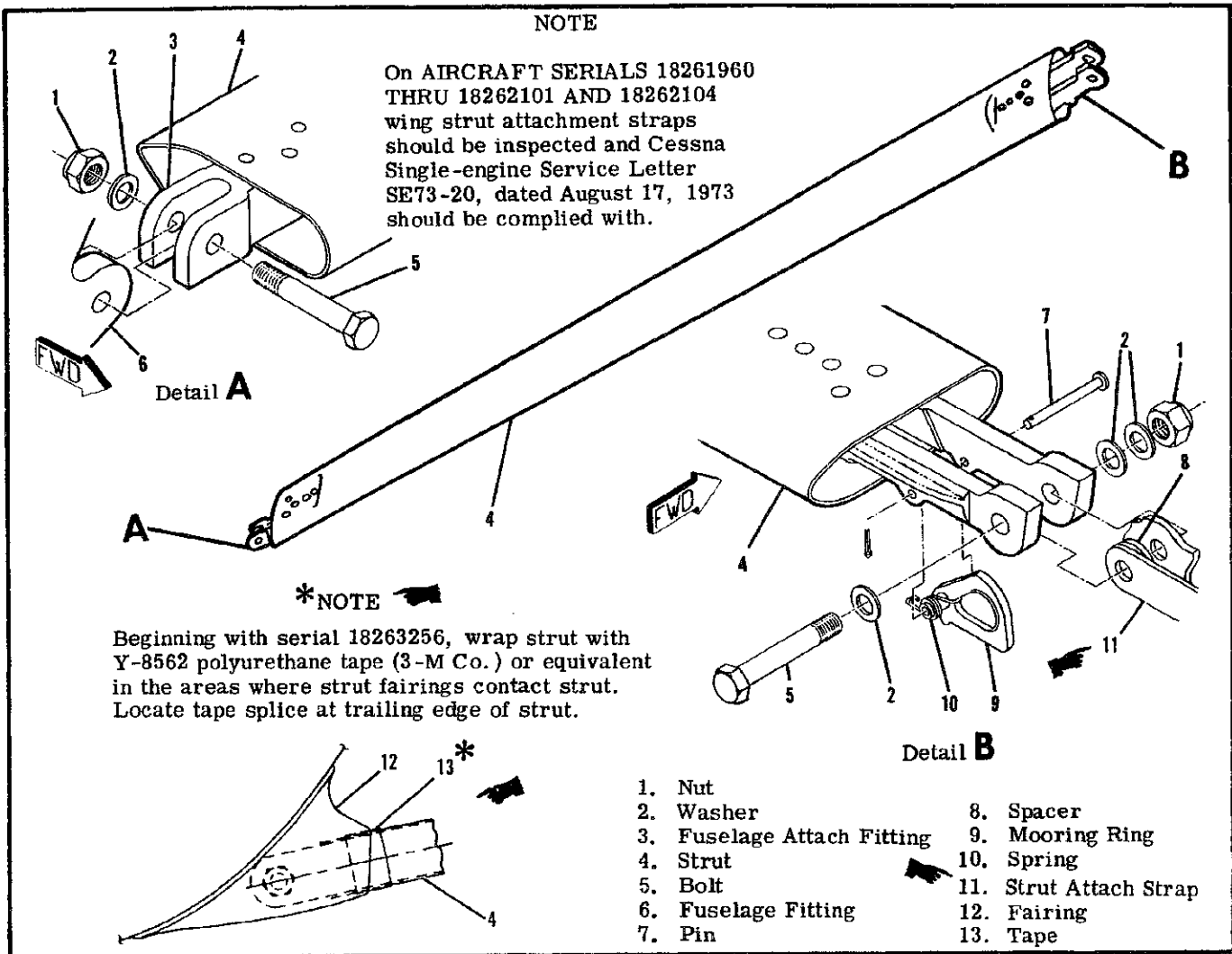


Figure 4-2. Wing Strut

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. If any stop bolts were removed or settings disturbed, the systems will have to be rigged. Refer to applicable sections in this manual for rigging procedures.

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.**

- 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 cable ends and turnbuckle inside tailcone. Remove stop blocks, then remove pulleys which route the aft cables into horizontal stabilizer. Pull cables out of tailcone.

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

4-21. **INSTALLATION.** Reverse procedures outlined in paragraph 4-19 to install the horizontal stabilizer. Rig elevator, elevator trim and rudder systems as outlined in Sections 8, 9 and 10 consecutively. Check operation of tail navigation light and flashing beacon.

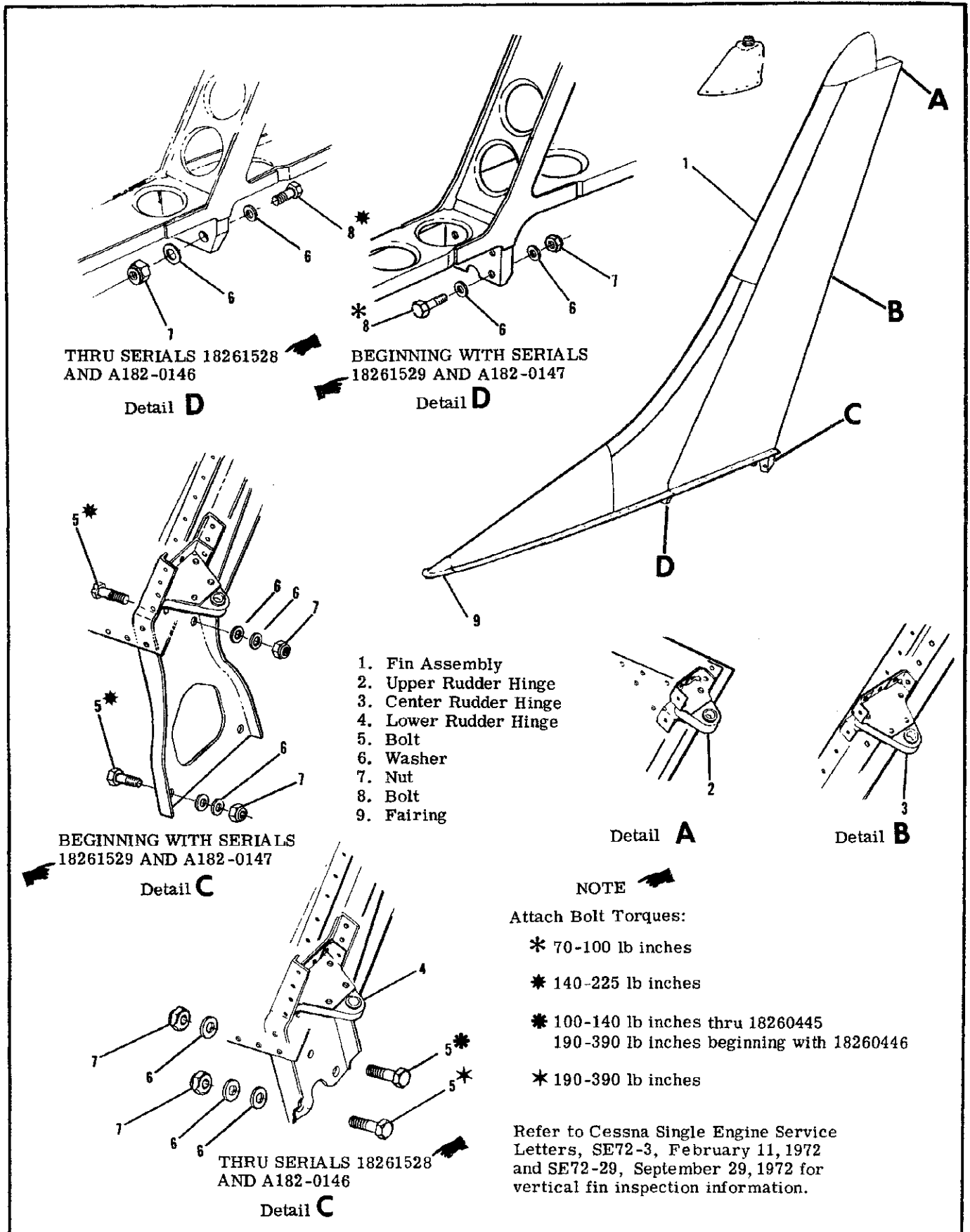
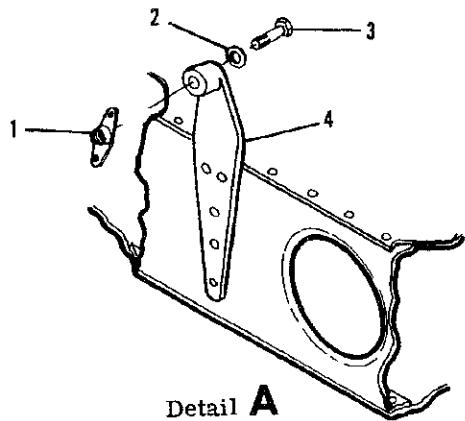
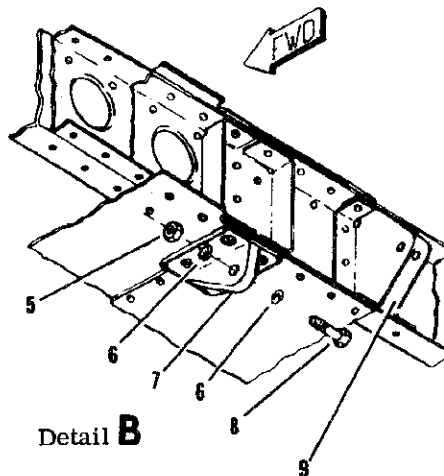


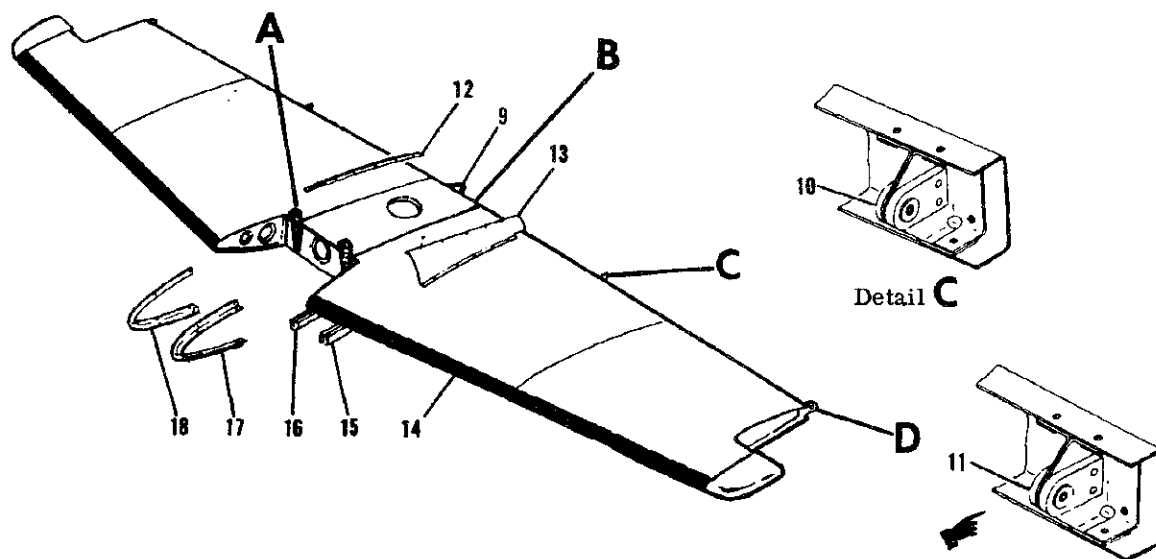
Figure 4-3. Vertical Fin



Detail A



Detail B



NOTE

A kit is available from the Cessna Service Parts Center for replacement of the abrasion boots.

- | | | |
|-------------|-----------------------------|---------------------------|
| 1. Nutplate | 7. Bracket | 13. Upper Left Fairing |
| 2. Washer | 8. Bolt | 14. Abrasion Boot |
| 3. Bolt | 9. Elevator Pylon Bracket | 15. Lower Left Moulding |
| 4. Bracket | 10. Elevator Inboard Hinge | 16. Lower Right Moulding |
| 5. Nut | 11. Elevator Outboard Hinge | 17. Forward Left Fairing |
| 6. Washer | 12. Upper Right Fairing | 18. Forward Right Fairing |

Figure 4-4. Horizontal Stabilizer

CESSNA AIRCRAFT COMPANY
MODEL 182 AND SKYLANE SERIES
 SERVICE MANUAL

SECTION 5

LANDING GEAR AND BRAKES

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Parking Brake System.....	5-26

5-1. LANDING GEAR.

5-2. DESCRIPTION. Aircraft through Serial 18260825 are equipped with non-retractable, tricycle landing gear, utilizing flat spring-steel main gear struts. A bracket to attach a step to each strut is bonded to the main landing gear spring-strut with a thermo-setting, high-strength cement. Beginning with aircraft Serial 18260826, these aircraft are equipped with tubular spring-steel main gear struts, also equipped with step brackets. The main gear struts are enclosed by streamlined fairings. Wheel brake lines are routed through the fairings to each main wheel. Disc-type brakes and tube-type tires are installed on the axle at the lower end of the strut. Speed fairings or heavy-duty wheels may be installed on some aircraft. The nose gear is a combination of a conventional air/oil (oleo) strut and fork, incorporating a shimmy dampener. 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 travel of 30 degrees right or left of center. Through the use of the brakes, the aircraft can be pivoted about the outer wing strut fitting. A speed fairing or a heavy-duty shock strut and wheel may be installed on some aircraft.

5-3. MAIN LANDING GEAR.

5-4. TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to correct pressure.
	Loose or defective landing gear attaching parts.	Tighten or install new parts.
	Landing gear spring excessively sprung.	Install new landing gear spring-strut.
	Incorrect shimming at inboard end of spring-strut. (flat gear)	Install shims as required.
	Bent axle(s).	Install new axle(s).
TIRES WEAR EXCESSIVELY.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align wheels in accordance with paragraph 5-19 and figure 5-5.
	Landing gear spring excessively sprung.	Install new landing gear spring-strut.
	Incorrect shimming at inboard end of spring-strut.	Install shims as required. Refer to figure 5-1.
	Bent axle(s).	Install new axle(s).
	Dragging brakes.	Refer to paragraph 5-43.
	Loose or defective wheel bearings.	Adjust. See paragraphs 5-16 and 5-25.
	Wheels out of balance.	Correct in accordance with paragraph 5-20.
WHEEL BOUNCE EVIDENT EVEN ON SMOOTH SURFACE.	Out of balance condition.	Correct in accordance with paragraph 5-20.

5-5. REMOVAL. (Thru 18260825, refer to figure 5-1, sheet 1.) This procedure removes the landing gear as a complete assembly. Refer to applicable paragraphs for removal of individual components.

- a. Remove floorboard access covers over spring-strut being removed.
- b. Hoist or jack aircraft in accordance with paragraph 2-4 or 2-5.
- c. Remove screws and slide external fairing plate and seal down around spring-strut.
- d. Drain hydraulic brake fluid from brake line on spring-strut being removed.
- e. Disconnect hydraulic brake line at bulkhead fitting near inboard end of spring-strut so that brake line is removed with the spring-strut. Cap or plug disconnect fittings to prevent entry of foreign material into the fittings or line.
- f. Remove channel at outboard forging by removing

nuts, washers, and bolts.

g. Remove bolt attaching inboard end of spring-strut to inboard forging and work entire gear out of fuselage. Note shims placed under inboard end of spring-strut and mark or tape shims together to be sure they are installed correctly at installation of the spring-strut.

5-6. REMOVAL. (Beginning with 18260826, refer to figure 5-1, sheet 2.) This procedure removed the landing gear as a complete assembly. Refer to applicable paragraphs for removal of individual components.

- a. Jack or hoist aircraft as outlined in Section 2.
- b. Remove brake bleeder screw and drain hydraulic fluid from brake on gear being removed.
- c. Remove screws from fuselage fairing and slide down strut fairing for access to brake line.

- d. Disconnect and cap or plug brake line at upper end of strut.
- e. Remove seats as necessary, peel back carpet and remove access plates as necessary for access to strut.
- f. Remove snap ring (1) for strut-attaching pin (2).
- g. Remove plug button (25) from belly of aircraft below gear forging.
- h. Using a punch, drive attaching pin upward out of inboard fitting (26).
- i. Pull strut outboard out of fittings (24) and (26).

NOTE

To replace bushing from outboard fitting (24), remove retaining ring at inboard end and slide bushing outboard from forging. (Refer to Section A-A.)

5-7. INSTALLATION. (Thru 18260825, refer to figure 5-1, sheet 1.)

- a. Slide landing gear fairing plate and seal over upper end of landing gear spring-strut.
- b. Slide spring-strut into place and work shims in position under inboard end of spring-strut. Install bolt, washer, and nut to secure inboard end of spring-strut and shims to inboard forging.

NOTE

Shims (P/N 0541105) are installed under the inboard end of the spring-strut to level the wings within a tolerance of three inches. Maximum number of shims permissible is two.

- c. Install channel at outboard forging with bolts, washers, and nuts. Make sure arrow on channel points outboard; it is possible to install channel incorrectly. Tighten channel attaching bolts evenly to 660-750 pound-inches with at least 80 per cent contact between channel and spring-strut. Also, tighten inboard attach bolt to the correct torque for the size bolt and nut. Torque chart for bolt and nuts sizes are shown in figure 1-3.
- d. Attach seal and external fairing with screws.
- e. Lower aircraft and remove jack or hoist.
- f. Connect hydraulic brake line; fill and bleed brake system.
- g. Install floorboard access covers and other components removed for access.

5-8. INSTALLATION. (Beginning with 18260826, refer to figure 5-1, sheet 2.)

- a. Reinstall all parts removed from strut.
- b. Clean and polish machined surface on upper end of strut. Prime fitting (10) per note, if required.
- c. Apply Dow Corning Compound DC7 to unpainted area on upper end of strut.
- d. Slide strut through bushing into inboard forging and align attaching pin holes.
- e. Install attaching pin and snap ring.
- f. Install access plates and plug button.
- g. Remove caps or plugs and connect brake line.
- h. Fill and bleed brake system in accordance with paragraph 5-55.
- i. Install fuselage fairing.

- j. Lower aircraft to ground.
- k. Reinstall carpet and seats removed.
- l. Check wheel alignment in accordance with figure 5-4.

5-9. STEP BRACKET INSTALLATION

NOTE

The step bracket is secured to the landing gear spring strut with EA9309, or a similar epoxy base adhesive. (Refer to figure 5-3.)

- 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 the step bracket on the strut. A small gap is permissible between bracket and strut.
- f. Mix adhesive (EA9309) in accordance with manufacturer's directions.
- g. Spread a coat of adhesive on bonding surfaces, and place step bracket in position on strut. On the flat spring-strut, tap the bracket upward on the strut to ensure a good tight fit of the bracket on the strut. 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 the adhesive to cure thoroughly according to the manufacturer's recommendations before flexing the strut or applying loads to the step.
- j. Paint the strut and step bracket after curing is completed.

5-10. BRAKE LINE FAIRING REPLACEMENT. (Refer to figure 5-1, sheet 1.)

- a. Disconnect brake line at wheel and drain fluid, or plug line to avoid draining. Flex brake line away.
- b. Remove all traces of the original adhesive as well as any rust, paint or scale with a wire brush and coarse sandpaper. Sand inner surface of fairing strip, running sanding marks lengthwise.
- c. Leave surfaces slightly roughened or abraded. Deep scratches or nicks should be avoided.
- d. Clean surfaces to be bonded thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important for the surfaces to be clean and dry. Solvent should not be used on the vinyl fairing strip.
- e. Mix the adhesive (Saco 326 or Hysol EA-9311) according to manufacturer's directions.
- f. Apply a thin, uniform coat of adhesive to each bonding surface. Pot life of Saco 326 is approximately 20 minutes at 77°F. Pot life of Hysol EA-9311 is approximately 5 minutes at 77°F. The material will cure to 90% of its ultimate strength in one hour, with complete cure in 24 hours.

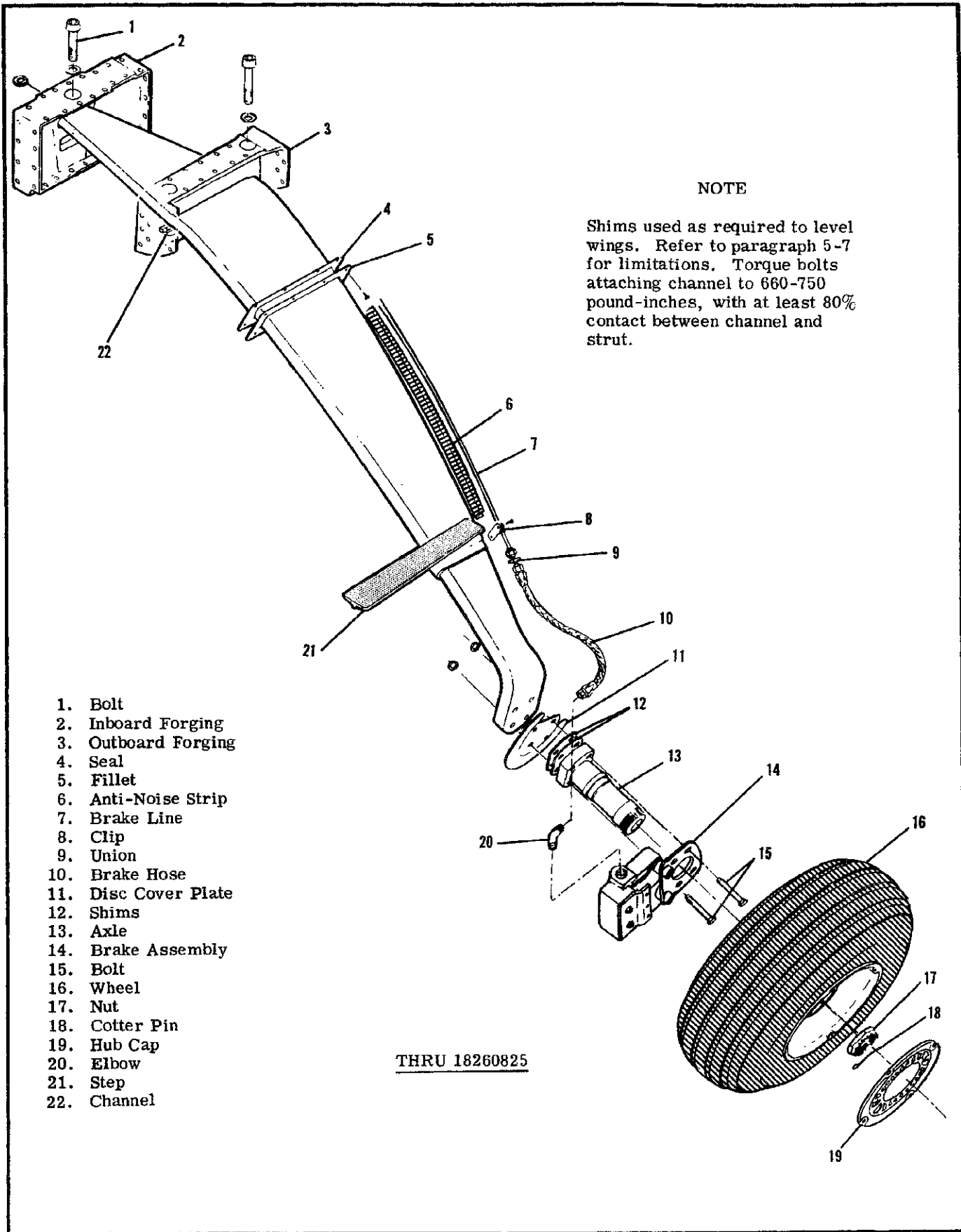


Figure 5-1. Main Landing Gear (Sheet 1 of 2)

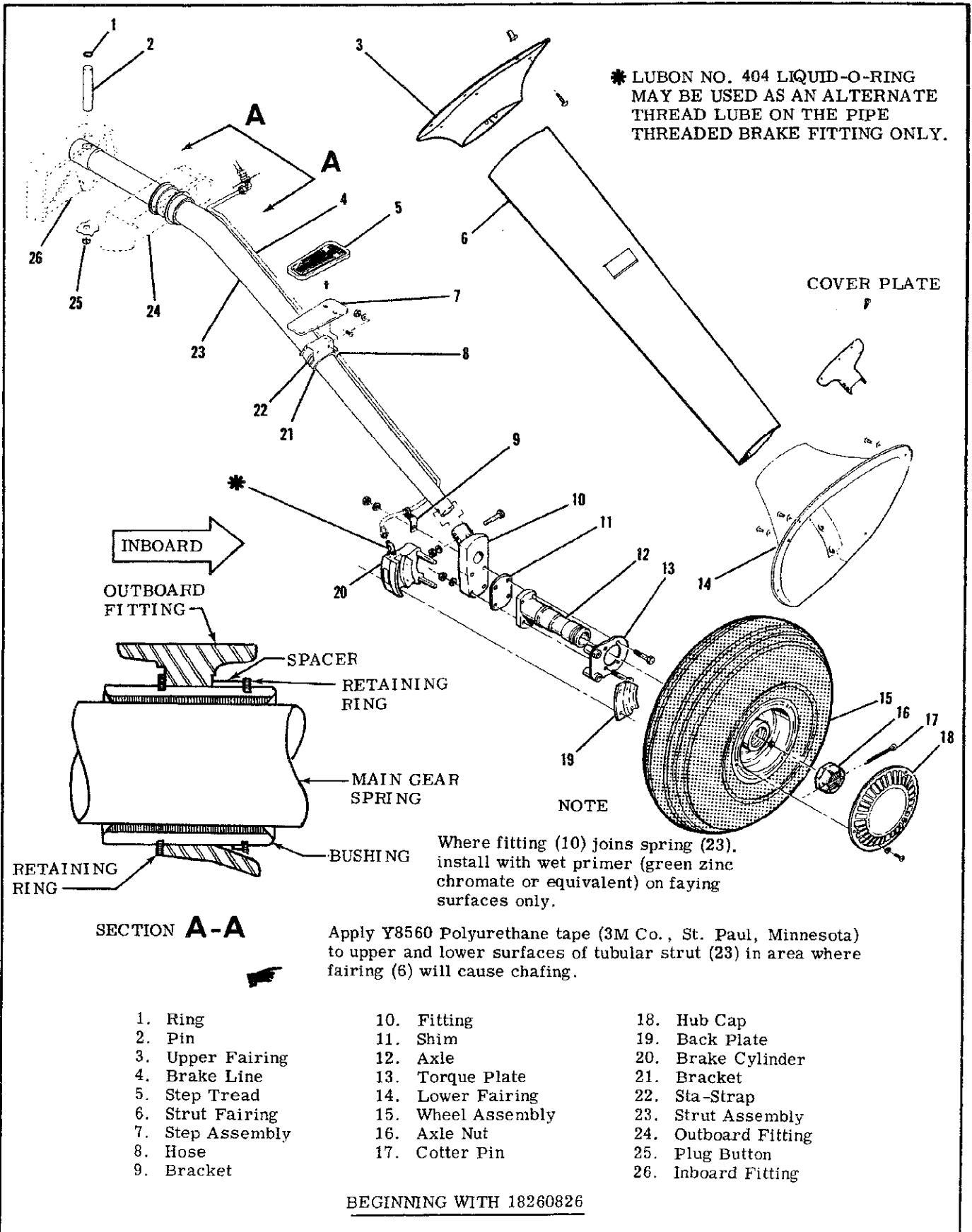
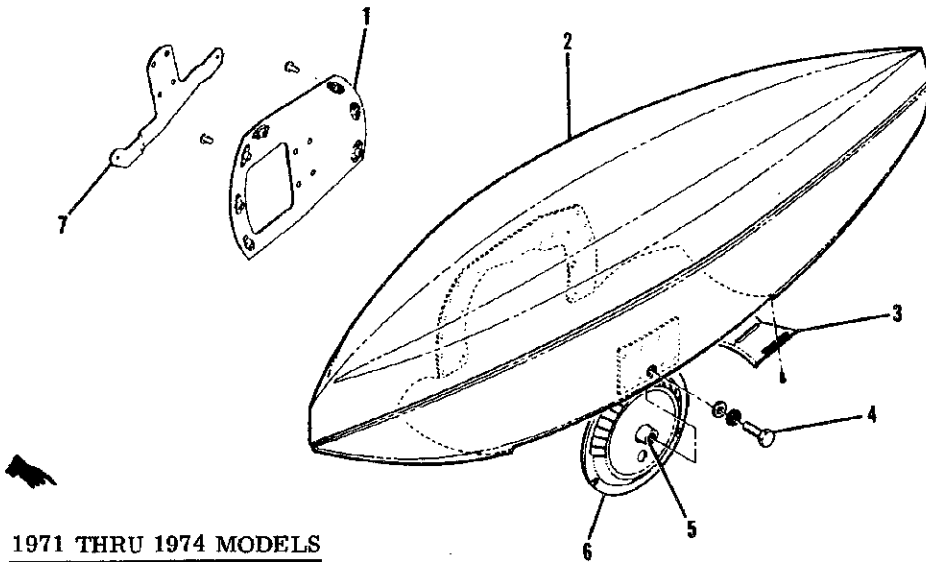
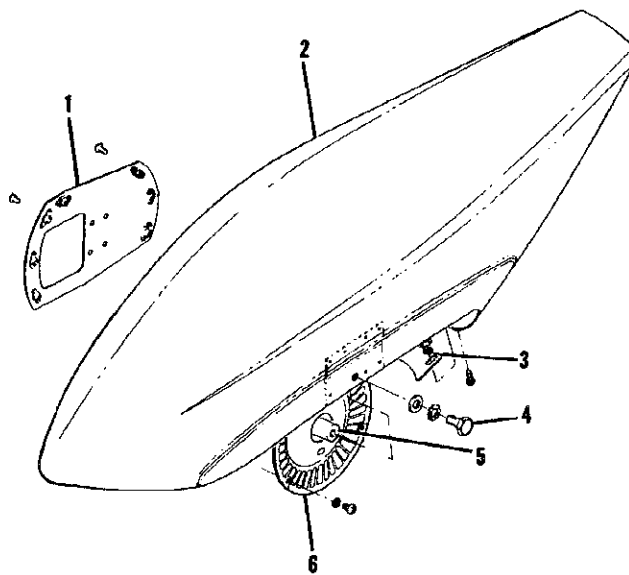


Figure 5-1. Main Landing Gear (Sheet 2 of 2)



1971 THRU 1974 MODELS



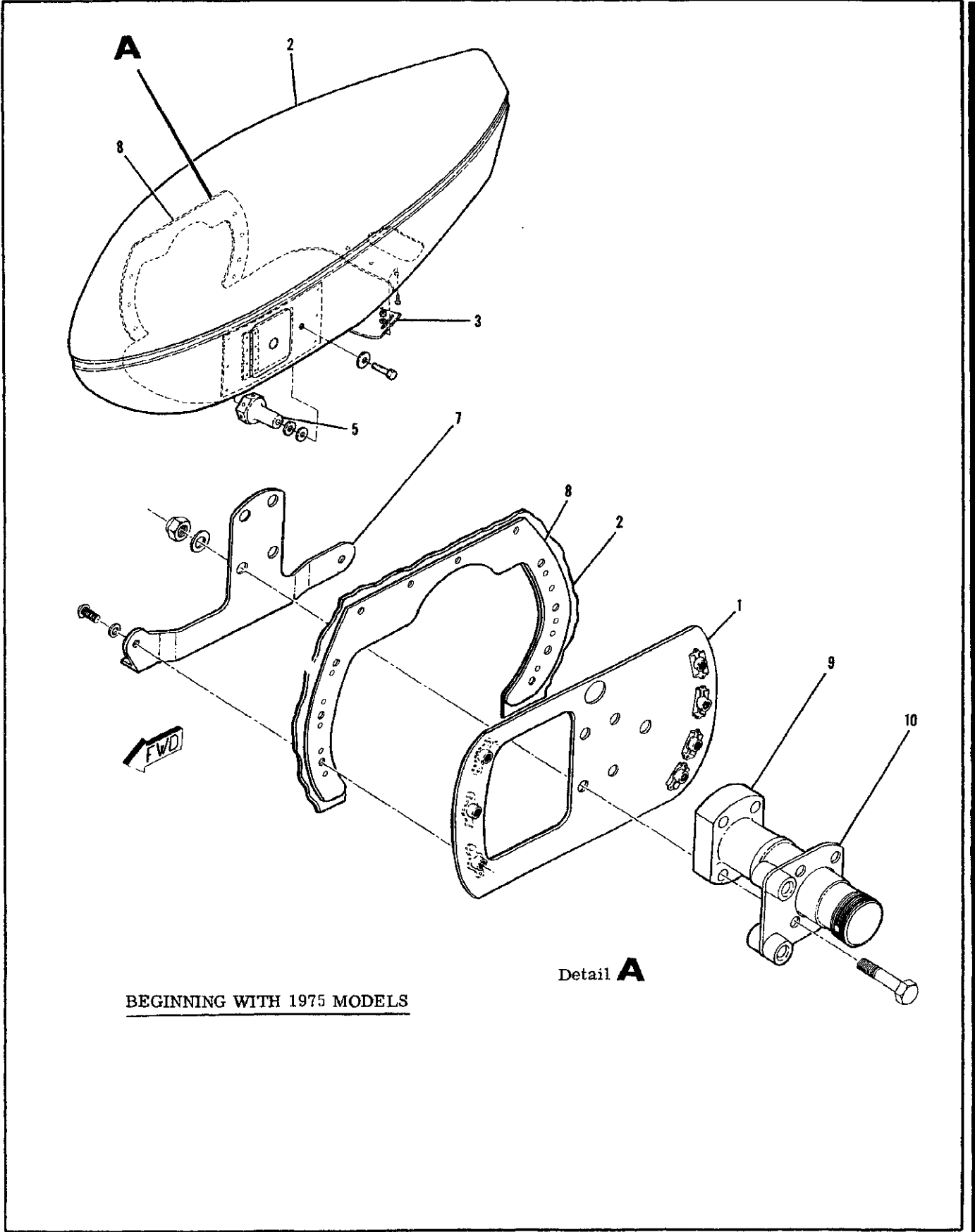
PRIOR TO 1971 MODEL

- 1. Mounting Plate
- 2. Speed Fairing
- 3. Scraper

- 4. Bolt
- 5. Axle Nut
- 6. Hub Cap
- 7. Stiffener

- 8. Doubler
- 9. Axle
- 10. Torque Plate

Figure 5-2. Main Wheel Fairings (Sheet 1 of 2)



BEGINNING WITH 1975 MODELS

Detail **A**

Figure 5-2. Main Wheel Fairings (Sheet 2 of 2)

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B3703

NOTE: After installation of screw (6), cement entire forward half of step tread (5) to step (7) with EC880, EC1300 or equivalent. (Refer to shaded area.)

- | | | |
|--------------------------|---------------|----------|
| 1. Step Support Assembly | 4. Brake Line | 6. Screw |
| 2. Sta-Strap | 5. Step Tread | 7. Step |
| 3. Spring Strut | | 8. Hose |

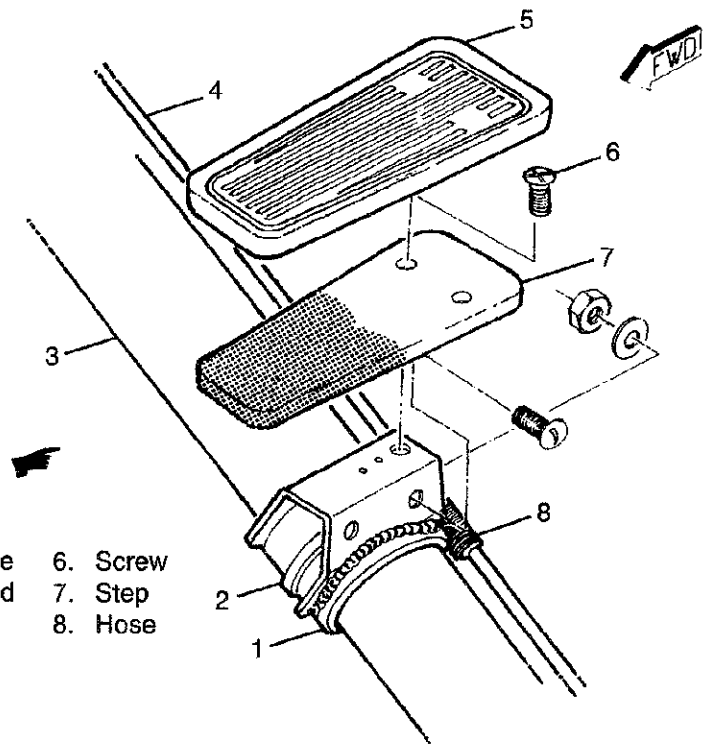


Figure 5-3. Step Bracket Installation

- G. Position fairing strip between brake line and strut, and press firmly against strut. Press brake line into groove of fairing strip and wrap immediately with masking tape in five equally-spaced places. Excess adhesive may be removed with solvents.
- H. Allow adhesive to cure thoroughly according to manufacturer's directions before flexing the gear.
- I. After recommended curing time, remove tape and connect brake line.
- J. Paint area as required.
- K. Fill and bleed brake system.

5-11. **MAIN WHEEL SPEED FAIRING REMOVAL AND INSTALLATION.** Main wheel speed fairings are removed by removing the screws attaching the inboard side of the wheel speed fairing to the attach plate, which is bolted to the axle, and removing the bolt securing the outboard side of the wheel speed fairing to the axle nut. Loosen the scraper when necessary and work speed fairing from the wheel. Installation is the reversal of the removal. After installation, check scraper-to-tire clearance for a minimum clearance of 0.56-inch (9/16 inch) to a maximum of 0.69 inch (11/16 inch). Elongated holes in the scraper are provided so the scraper can be adjusted. Refer to Service Kit SK182-12 for repair of the wheel speed fairings used on 1969-1970 model aircraft.

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, SPEED FAIRINGS 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.

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- 5-11A. REMOVAL OF TUBULAR STRUT FAIRING. (Refer to Figure 5-1, Sheet 2.)
- A. Remove 6 screws from perimeter and 3 screws from lower side of fuselage fairing (3).
 - B. Twist fuselage fairing and remove from strut fairing (6).
 - C. Repeat steps "A" and "B" for lower fairing (14) if speed fairings are installed.
 - D. Remove screws attaching step assembly (7); remove step assembly.
 - E. Remove 9 screws from strut fairing (6).
 - F. Spread fairing (6) far enough to remove from strut (23).
 - G. If speed fairings are not installed, remove screws attaching cover plate.
 - H. Reverse preceding steps to install fairings.

- 5-12. MAIN WHEEL REMOVAL. (See Figure 5-4.)

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

- a. Hoist or jack aircraft as outlined in Section 2.
- b. Remove speed fairing, if installed, in accordance with paragraph 5-11.
- c. Remove hub cap, cotter pin, and axle nut.
- d. Remove bolts and washers attaching back plate to brake cylinder and remove back plate.
- e. Pull wheel from axle.

5-13. MAIN WHEEL DISASSEMBLY (Cleveland).

- a. Remove valve core and deflate tire. Break tire beads loose from wheel rims.

WARNING

Injury can result from attempting to separate wheel halves with the tire inflated. Avoid damaging wheel flanged when breaking tire beads loose.

- b. Remove thru-bolts and separate wheel halves, removing tire and tube and brake disc.
- c. Remove the grease seal rings, felts, and bearing cones from the wheel halves.

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless a new part is to be installed. To remove the bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven not to exceed 149°C (300°F). Using an arbor press, if available, press out the bearing cup and press in the new cup while the wheel is still hot.

5-14. INSPECTION AND REPAIR (Cleveland).

- a. Clean all metal parts and grease seal felts in cleaning solvent and dry thoroughly.
- b. Inspect wheel halves for cracks. Cracked wheel halves shall be discarded and new parts used. Sand out small 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. Inspect brake disc. If excessively warped, scored, or worn to a thickness of 0.190-inch, the 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 (figure 2-5) before installing in wheel half.

5-15. MAIN WHEEL ASSEMBLY (Cleveland).

- a. Insert thru-bolts through brake disc and position in the inner wheel half, using the bolts to guide the disc. Ascertain that the disc is bottomed in the wheel half.
- b. Position tire and tube with the tube inflation valve through hole in outboard wheel half.
- c. Place the inner wheel half in position on outboard wheel half. Apply a light force to bring wheel halves together. While maintaining the light force, assemble a washer and nut on one thru-bolt and tighten snugly. Assemble the remaining washers and nuts on the thru-bolts and torque to the value stipulated in figure 5-4A.

CAUTION

Uneven or improper torque of thru-bolt nuts can cause failure of bolts, with resultant wheel failure.

- d. Clean and pack bearing cones with clean aircraft bearing grease (figure 2-5).
- e. Assemble bearing cones, grease seal felts, and rings into wheel halves.
- f. Inflate tire to seat tire beads, then adjust tire to correct pressure.

5-15A. MAIN WHEEL DISASSEMBLY. (McCauley Wheel.) (Refer to figure 5-4.)

- a. Remove valve core and deflate tire and tube. Break tire beads loose from wheel flanges.

WARNING

Injury can result from attempting to remove wheel flanges with the tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose.

- b. Remove thru bolts, nuts and washers or cap-screws and washers (whichever are installed.)
- c. Separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.
- d. Remove wheel hub from tire and tube.
- e. Remove retainer rings, grease seal retainers, grease seal felts and bearing cones from wheel hub.

NOTE

The bearing cups 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.

5-15B. MAIN WHEEL INSPECTION AND REPAIR. (McCauley Wheel.)

- a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.
- b. Inspect wheel flanges and wheel hub for cracks. Discard cracked wheel flanges or hub and install new parts. Sand out nicks, gouges and corroded areas. When protective coating has been removed, clean the area thoroughly, prime with zinc chromate and paint 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) before installing in the wheel hub.

5-15C. MAIN WHEEL REASSEMBLY. (McCauley Wheel.)

- a. Place wheel hub in tire and tube with tube inflation

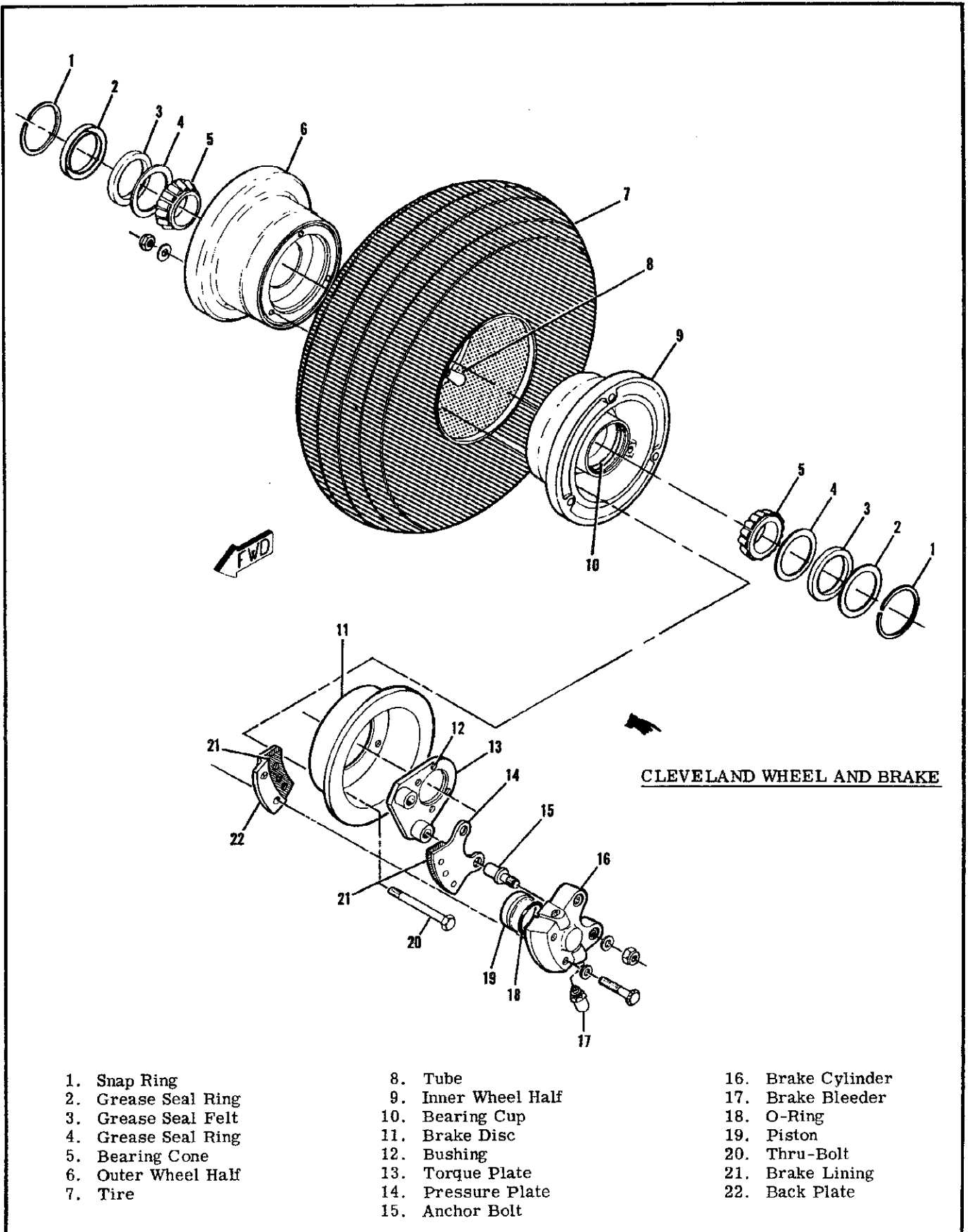


Figure 5-4. Wheel and Brake Assembly (Sheet 1 of 2)

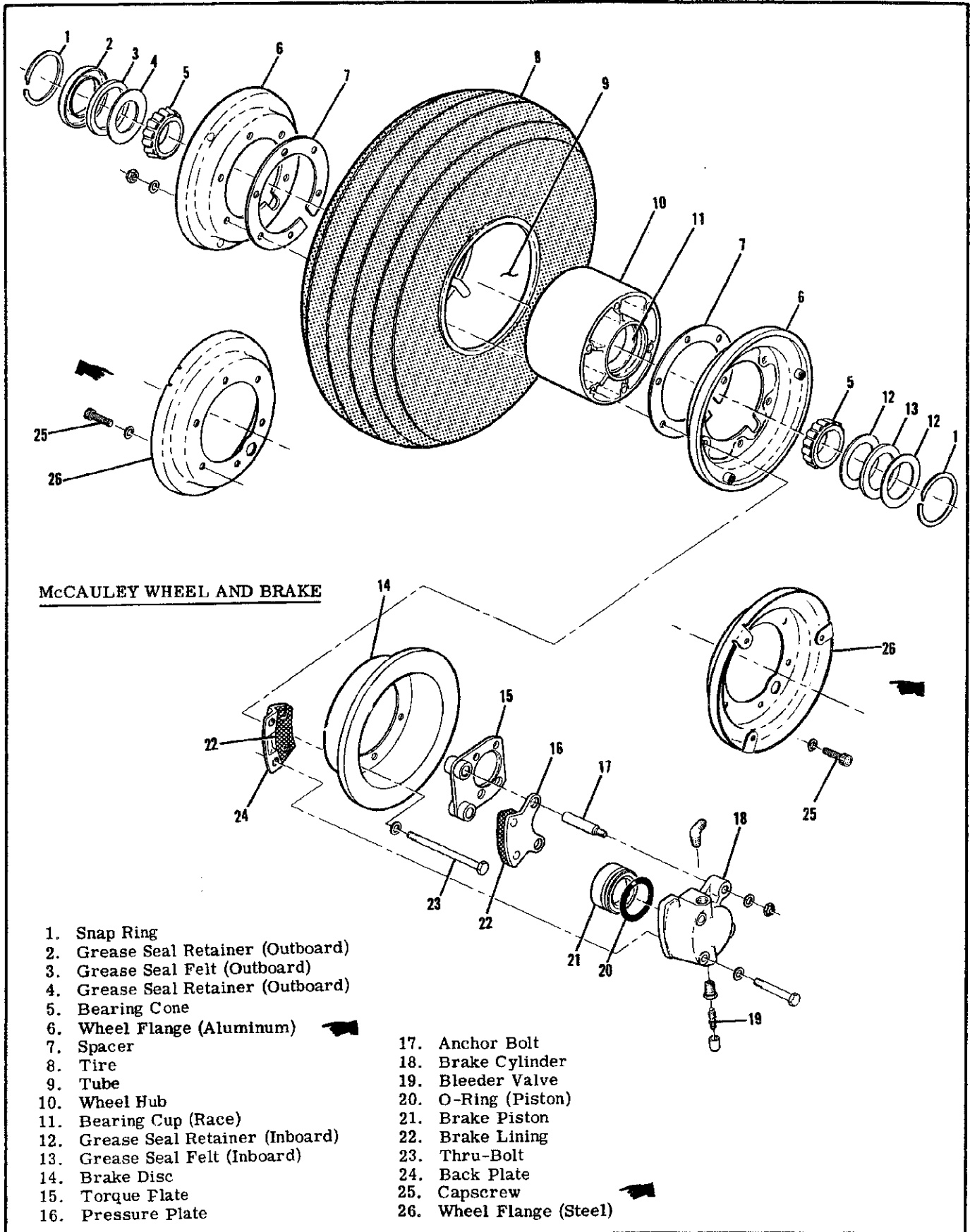


Figure 5-4. Wheel and Brake Assembly (Sheet 2 of 2)

MAIN GEAR	NOSE GEAR	WHEEL NUMBER	SIZE	MANUFACTURER	NUT/ CAP SCREW TORQUE	FLANGE
	X	1241156-11	6.00 X 6	CLEVELAND	150 lb-in	MAGNESIUM
	X	1241156-12	5.00 X 5	CLEVELAND	90 lb-in	MAGNESIUM
	X	C163002-0201	5.00 X 5	MC CAULEY	90-100 lb-in	ALUMINUM
	X	C163003-0201	5.00 X 5	MC CAULEY	90-100 lb-in	STEEL
	X	C163003-0401	5.00 X 5	MC CAULEY	*190-200 lb-in	STEEL
X		C163001-0103	6.00 X 6	CLEVELAND	150 lb-in	MAGNESIUM
X		C163001-0104	6.00 X 6	CLEVELAND	90 lb-in	ALUMINUM
X		C163002-0101	6.00 X 6	MC CAULEY	90-100 lb-in	ALUMINUM
X		C163003-0102	6.00 X 6	MC CAULEY	*190-200 lb-in	STEEL

Figure 5-4A. Main and Nose Wheel Thru-Bolt Nut or Capscrew Torque Values

stem in cutout 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 thru-bolt and insert bolt through wheel flange and wheel hub, or place washer under head of each capscrew and start capscrews into wheel hub threads.

d. Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange.

e. Install washers and nuts on thru-bolts or place washer under head of each capscrew and start capscrews into wheel hub threads.

WARNING

Be sure that spacers and wheel flanges are seated on flange of wheel hub. Uneven or improper torque of thru-bolt nuts or capscrews can cause failure of the bolts or capscrews, with resultant wheel failure.

f. Tighten thru-bolt nuts or capscrews evenly and torque to values specified in figure 5-2A.

g. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)

h. Assemble bearing cones, grease seal felts and retainer into wheel hub.

i. Inflate tire to seat tire beads, then adjust to correct tire pressure. Refer to figure 1-1 for correct tire pressure.

5-15D. MAIN AND NOSE WHEEL THRU-BOLT NUT OR CAPSCREW TORQUE VALUES. (Refer to figure 5-4A.) During assembly of the main or nose wheel, thru-bolt nuts or capscrews should be tightened evenly and torqued to the values specified in figure 5-4A.

To facilitate identification of wheel manufacturers, solid wheels are manufactured by Cleveland Products Co., and webbed wheels are manufactured by McCauley Industrial Corporation. Cleveland wheels are also identified by having two wheel halves as shown in figure 5-4 (sheet 1 of 2) and figure 5-7. McCauley wheels are identified by having two wheel flanges and a hub as illustrated in figure 5-4 (sheet 2 of 2) and figure 5-7. The differences between McCauley steel-flange and aluminum-flange wheels are illustrated in figures 5-4 (sheet 2 of 2) and figure 5-7.

5-16. MAIN WHEEL INSTALLATION.

a. Place wheel assembly on axle.

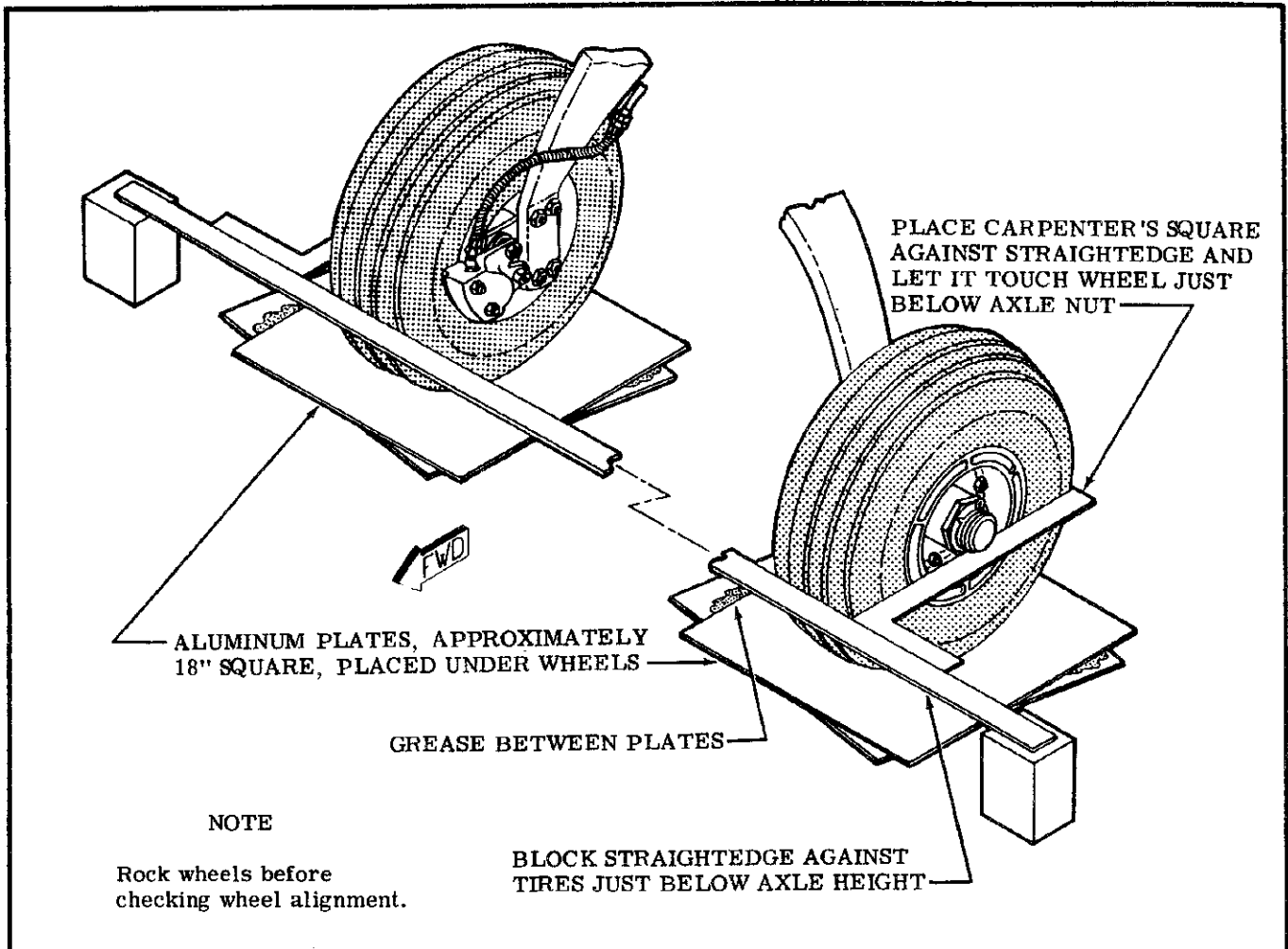
b. Install axle nut and tighten nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.

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 5-11.

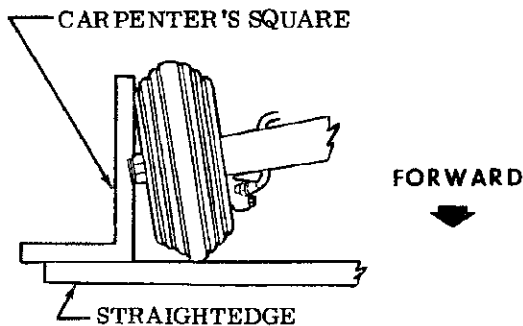
CAUTION

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 5-9 for correct scraper-to-tire clearance.



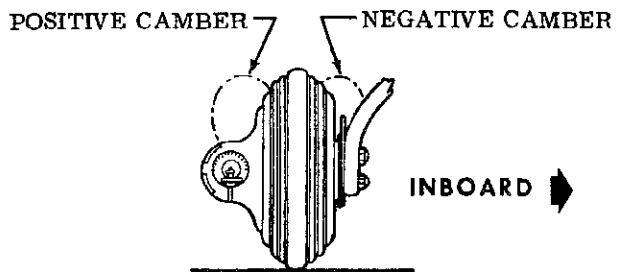
TOP VIEW OF TOE-IN CHECK

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.



NOTE

Setting toe-in and camber within these tolerances while the cabin and fuel tanks are empty will give approximately zero toe-in and zero camber at gross weight. Therefore, if normal operation is at less than gross weight and abnormal tire wear occurs, realign the wheels to attain the ideal setting for the load conditions. Refer to sheet 2 of this figure for shims availability and their usage. Always use the least number of shims possible to obtain the desired result.

Figure 5-5. Main Wheel Alignment (Sheet 1 of 2)

SHIM PART NO.	POSITION OF THICKEST CORNER OR EDGE OF SHIM	CORRECTION IMPOSED ON WHEEL			
		TOE-IN	TOE-OUT	POS. CAMBER	NEG. CAMBER
0541157-1	AFT FWD	.06" ----	---- .06"	---- 0°3'	0°3' ----
0541157-2	UP DOWN	.006" ----	---- .006"	0°30' ----	---- 0°30'
1241061-1	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	.03" .06" ---- ----	---- ---- .06" .03"	2°50' 2°49' ---- ----	---- ---- 2°49' 2°50'
0441139-5	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .12" ---- .11"	.11" ---- .12" ----	0°25' 0°11' ---- ----	---- ---- 0°11' 0°25'
0441139-6	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .24" ---- .22"	.22" ---- .24" ----	0°50' 0°22' ---- ----	---- ---- 0°22' 0°50'
0541157-3	AFT FWD	.12" ----	---- .12"	---- 0°7'	0°7' ----

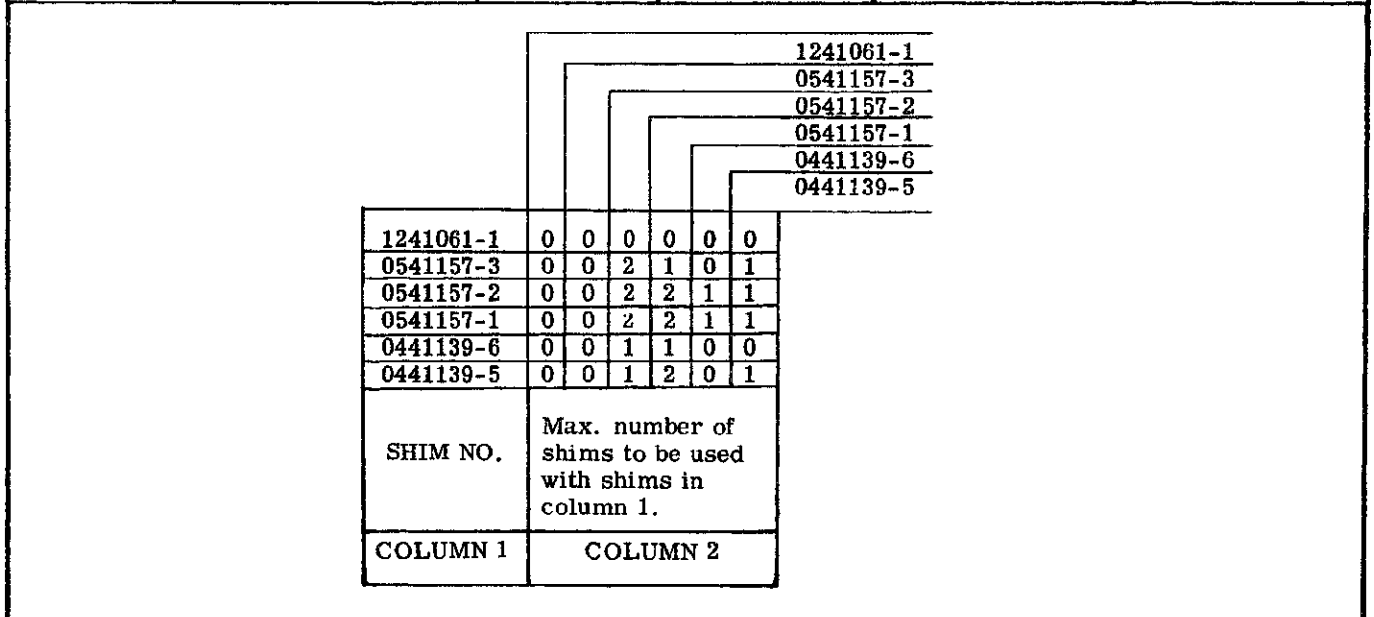


Figure 5-5. Main Wheel Alignment (Sheet 2 of 2)

5-17. MAIN WHEEL AXLE REMOVAL.

- Remove speed fairing in accordance with paragraph 5-11.
- Remove wheel in accordance with paragraph 5-12.
- Disconnect, drain, and plug or cap the hydraulic brake line at the wheel brake cylinder.
- Remove nuts, washers and bolts securing axle, brake components and speed fairing mounting plate, if used, to strut (flat gear) or strut-attach fitting (tubular gear).

NOTE

When removing axle from strut or strut-attach fitting, note number and position of wheel alignment shims between axle and strut or attach fitting. Mark shims or tape together carefully so they can be installed in exactly the same position to ensure wheel alignment is not disturbed.

5-18. MAIN WHEEL AXLE INSTALLATION.

- Secure axle and brake components to strut or

strut-attach fitting, assuring that wheel alignment shims and speed fairing mounting plate, if used, are installed in their original positions.

b. Install wheel assembly on axle in accordance with paragraph 5-16.

c. Connect hydraulic brake line to wheel brake cylinder.

d. Fill and bleed affected brake system in accordance with paragraph 5-55.

e. Install speed fairing, if used, in accordance with paragraph 5-11.

5-19. **MAIN WHEEL ALIGNMENT.** Correct main wheel alignment is obtained through the use of tapered shims between the flange of the axle and spring strut. See figure 5-5 for procedure to use in wheel alignment. Wheel shims and the correction imposed on the wheel by the various shims are listed in the illustration.

NOTE

Failure to obtain acceptable wheel alignment through the use of the shims indicate a deformed main gear spring-strut or strut attaching bulkhead out of alignment.

5-20. **WHEEL BALANCING.** Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire probably will 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 becomes unbalanced during service, it may be statically balanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

5-21. **NOSE GEAR.**

5-22. **TROUBLE SHOOTING.**

TROUBLE	PROBABLE CAUSE	REMEDY
TIRES WEAR EXCESSIVELY.	Loose nose gear torque links.	Check looseness and add shims as required or install new parts. See figure 5-10.
NOSE WHEEL SHIMMY.	Nose gear strut attaching clamps loose.	Tighten nose gear strut attaching clamp bolts.
	Shimmy dampener needs fluid.	Service in accordance with Section 2.
	Defective shimmy dampener.	Repair or install new shimmy dampener.
	Loose or worn nose wheel steering linkage.	Tighten loose linkage or replace defective parts.
HYDRAULIC FLUID LEAKAGE FROM NOSE GEAR STRUT.	Defective nose gear strut seals or defective parts.	Strut overhaul in accordance with paragraphs 5-34 and 5-35.
NOSE GEAR STRUT WILL NOT HOLD AIR PRESSURE.	Defective air filler valve or valve not tight.	Check gasket and tighten loose valve. Install new valve if defective.
	Defective nose gear strut seals.	Install new seals. See paragraphs 5-34 and 5-35.

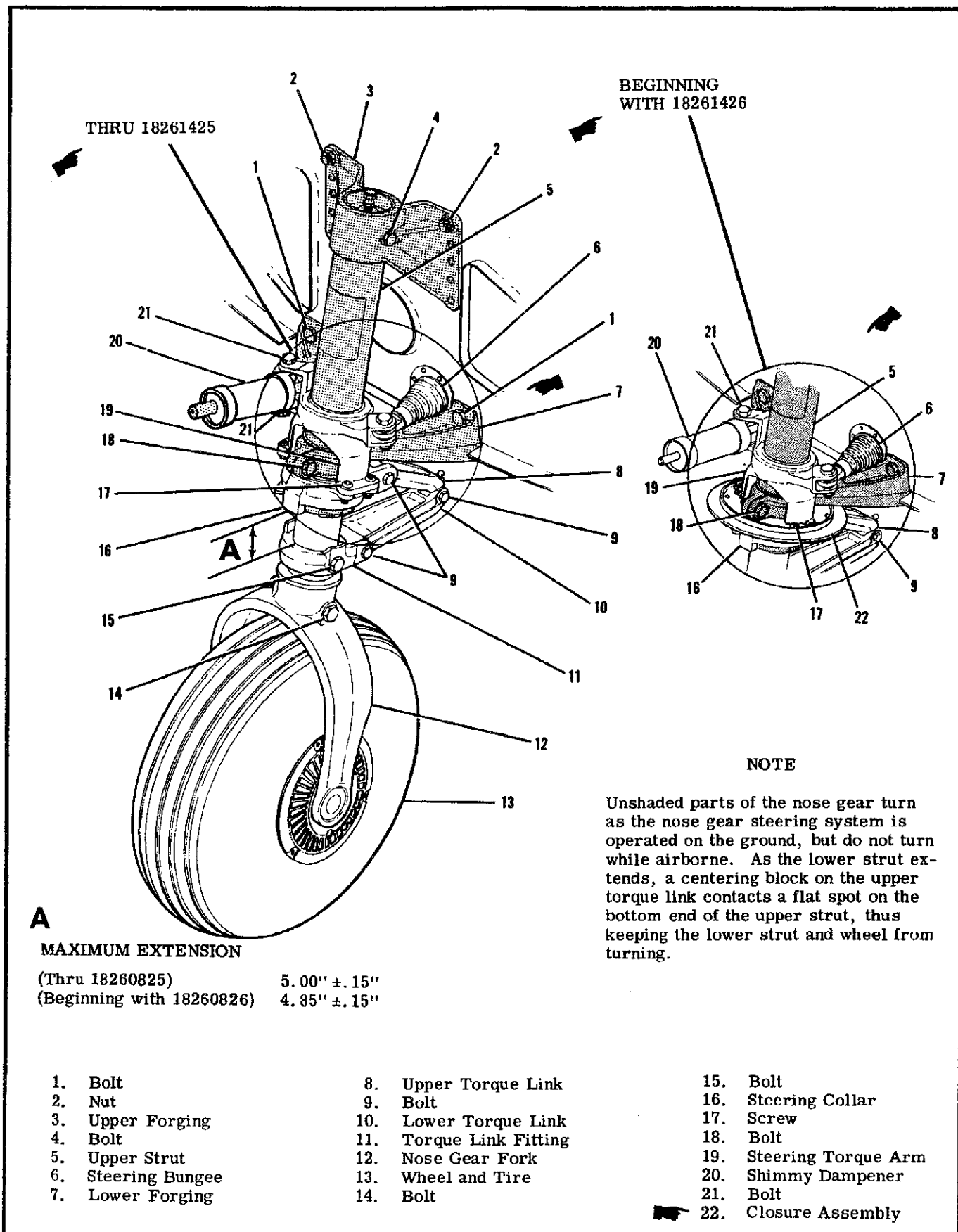


Figure 5-6. Nose Gear Installation

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MODEL 182 AND SKYLANE SERIES
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5-23. REMOVAL AND INSTALLATION.

- A. Remove engine cowling for access.
- B. Weight or tie down the tail to raise nose wheel off ground.
- C. Disconnect bungee and shimmy dampener from nose gear.
- D. Remove air filler valve core and deflate strut completely and telescope strut to its shortest length.

WARNING: BE SURE THE STRUT IS DEFLATED COMPLETELY BEFORE REMOVING BOLT AT TOP OF STRUT.

- E. Remove bolt through upper forging and strut.
- F. Either of two methods may be used to remove the strut from the aircraft. The following procedure outlines removing the strut along with the lower forging at the fuselage. An alternate method is to remove and disconnect parts as required to slide the strut down through the lower forging, leaving the forging attached to the fuselage.
 - 1. Remove four bolts attaching lower forging to fuselage. Remove rudder bar shields from inside the cabin for access to the nuts.
 - 2. Pull strut assembly down, out of upper forging to remove.
- G. Installation of the nose gear strut is the reversal of the preceding steps. Always install bolt at top forging before clamping strut in lower forging to prevent misalignment.

5-24. NOSE WHEEL SPEED FAIRING REMOVAL AND INSTALLATION.

- A. Weight or tie down tail of aircraft to raise nose wheel off the floor.
- B. Remove nose wheel axle stud.

WARNING: DEFLATE STRUT BEFORE REMOVING BOLT ATTACHING COVER PLATE, FAIRING, AND TOW BAR SPACERS.

- C. Deflate strut and remove bolts securing cover plate, fairing, and tow bar spacers to strut. Remove cover plate.
- D. Slide speed fairing up and remove nose wheel. Loosen scraper as necessary.
- G. Install speed fairing by reversing the preceding steps. Tighten axle stud until a slight bearing drag is obvious when the wheel is rotated. Back off nut to the nearest castellation and install cotter pins.
- H. Service shock strut after installation has been completed.

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 TO A MINIMUM OF 0.56 INCH (9/16 INCH) TO A MAXIMUM OF 0.69 INCH (11/16 INCH). ELONGATED HOLES IN THE SCRAPER ARE PROVIDED FOR ADJUSTMENT. IF THE AIRCRAFT IS FLOWN FROM SURFACES WITH MUD, SNOW OR ICE, SPEED FAIRINGS 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.

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5-25. NOSE WHEEL REMOVAL AND INSTALLATION.

- A. Weight or tie down tail of aircraft to raise the nose wheel off the ground.
- B. Remove nose wheel axle bolt.
- C. Pull nose wheel assembly from fork and remove spacers and axle tube from nose wheel. Loosen scraper if necessary.
- D. Reverse the preceding steps to install nose wheel. Tighten axle bolt until a slight bearing drag is obvious when wheel is rotated. Back the nut off to the nearest castellation and install cotter pin.

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 PARAGRAPH 5-24.

5-26. NOSE WHEEL DISASSEMBLY (Cleveland Wheel).

- A. Remove hub cap, completely deflate tire and break tire beads loose.

WARNING: INJURY CAN RESULT FROM ATTEMPTING TO SEPARATE WHEEL HALVES WITH THE TIRE INFLATED. AVOID DAMAGING WHEEL FLANGES WHEN BREAKING TIRE BEADS LOOSE.

- B. Remove thru-bolts and separate wheel halves.
- C. Remove tire and tube from wheel halves.
- D. Remove bearing retaining rings, grease felt seals and bearing cones.

NOTE: The bearing cups are a press-fit in the wheel halves and should not be removed unless a new part is to be installed. To remove the bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven not to exceed 149°C (300°F). Using an arbor press, if available, press out the bearing cup and press in the new cup while the wheel is still hot.

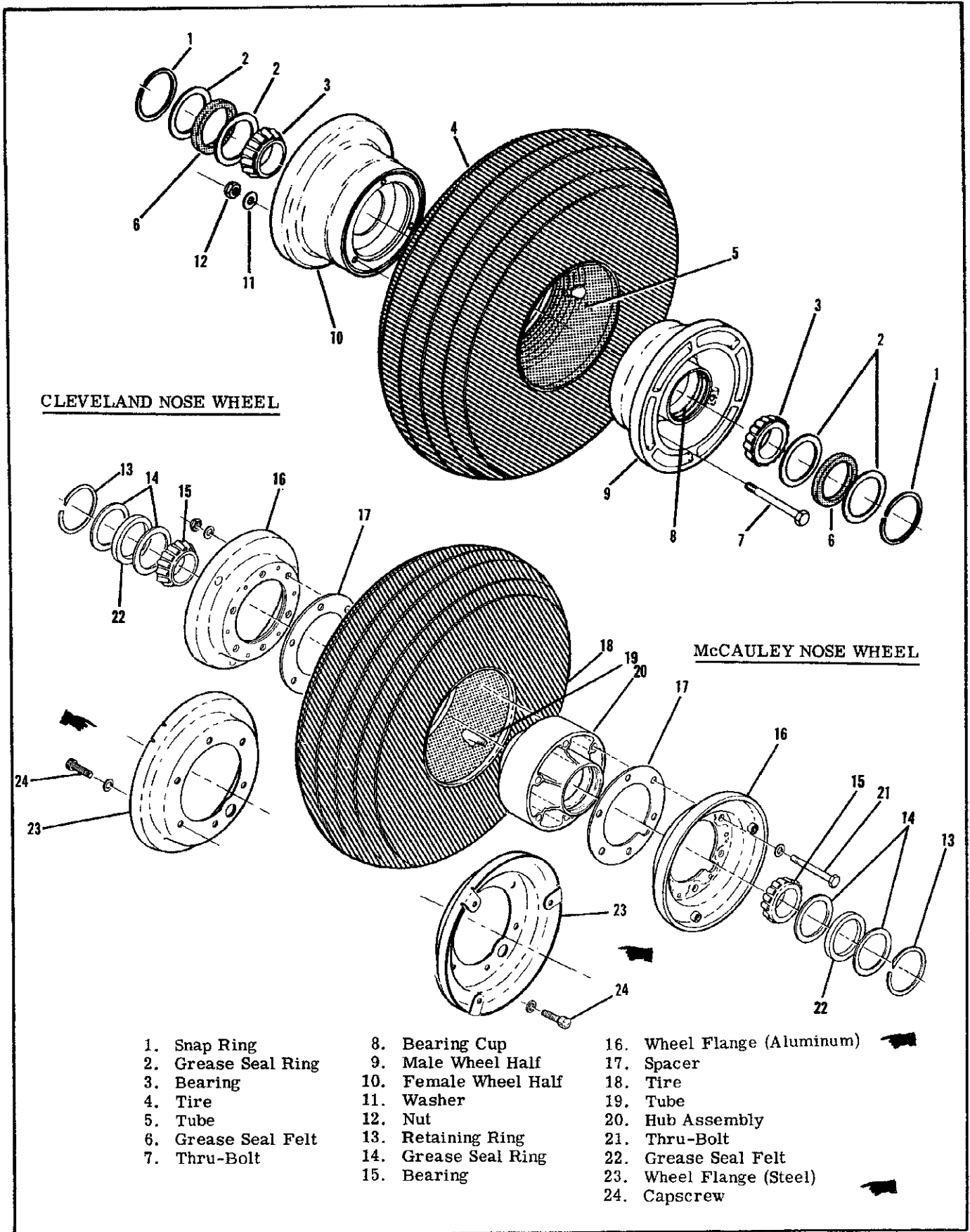
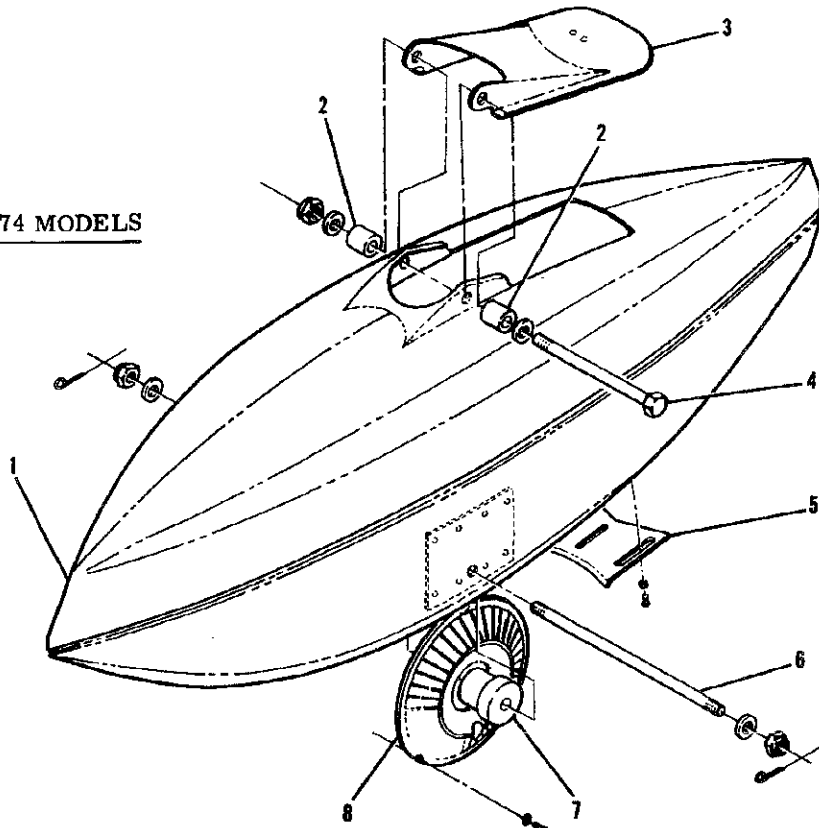
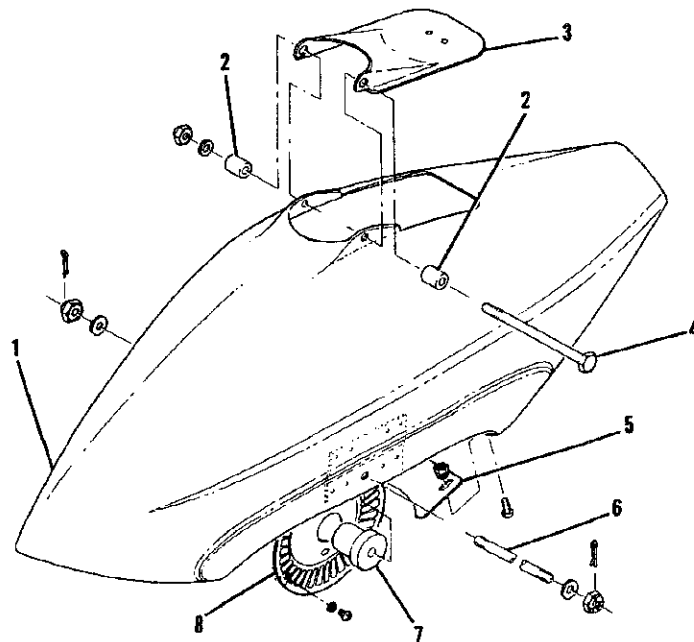


Figure 5-7. Nose Wheels

1971 THRU 1974 MODELS



PRIOR TO 1971 MODEL



- 1. Speed Fairing
- 2. Tow-Bar Spacer
- 3. Cover Plate

- 4. Fork Bolt
- 5. Scraper
- 6. Axle Stud

- 7. Ferrule
- 8. Hub Cap
- 9. Access Door

Figure 5-8. Nose Wheel Speed Fairings (Sheet 1 of 2)

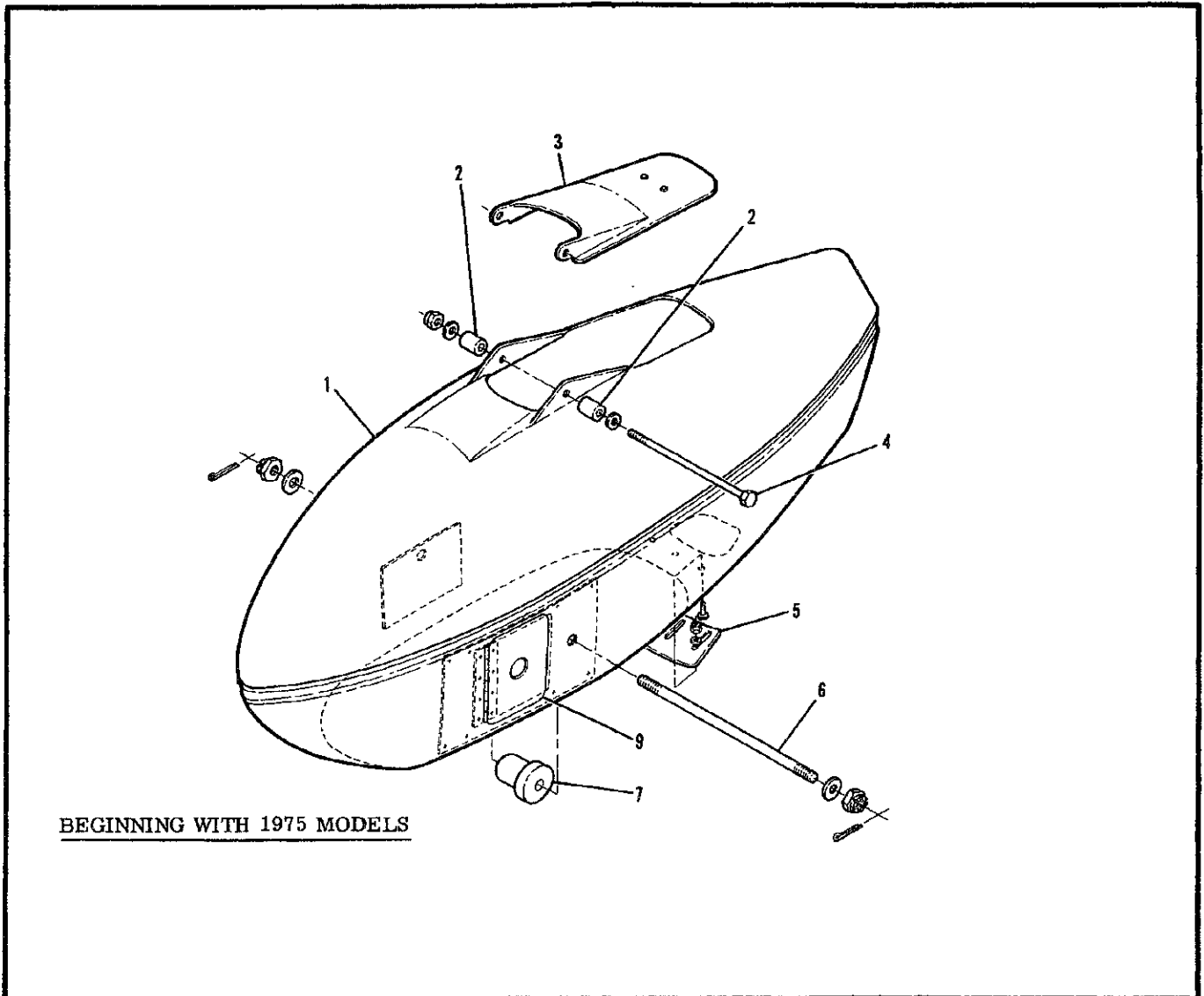


Figure 5-8. Nose Wheel Speed Fairings (Sheet 2 of 2)

5-27. NOSE WHEEL INSPECTION AND REPAIR (Cleveland Wheel).

Instructions outlined in paragraph 5-14 for the main wheel may be used as a guide for inspection and repair of the nose wheel.

5-28. NOSE WHEEL ASSEMBLY (Cleveland Wheel).

- a. Insert tire and tube on wheel half and position valve stem through hole in wheel half.
- b. Insert thru-bolts, position other wheel half, and secure with nuts and washers. Take care to avoid pinching tube between wheel halves. Tighten bolts evenly to torque value stipulated in figure 5-4A.

CAUTION

Uneven or improper torque on the thru-bolt nuts may cause bolt failure with resultant wheel failure.

- c. Clean and pack bearing cones with clean aircraft wheel bearing grease (figure 2-5).

- d. Assemble bearing cones, seals, and retainers into the wheel halves.

e. Inflate tire to seat tire beads, then adjust to correct pressure.

- f. Install spacers, axle tube and hub cups, and install wheel assembly in accordance with paragraph 5-25.

5-29. NOSE WHEEL DISASSEMBLY. (McCauley Wheel.)

- a. Remove hub caps, completely deflate tire and break tire beads loose at wheel flanges.

WARNING

Injury can result from attempting to remove wheel flanges with tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose.

- b. Remove thru-bolt nut, washers and thru-bolts or capscrews and washers.

- c. Separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.
- d. Remove wheel hub from tire and tube.
- e. Remove retainer rings and remove grease seal retainers, grease seal felts and bearing cones from wheel hub.

NOTE

The bearing cups 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.

5-30. NOSE WHEEL INSPECTION AND REPAIR. (McCauley Wheel.)

- a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.
- b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hubs shall be discarded and new parts installed. Sand out smooth all 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. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease before installing in the wheel hub. (Refer to Section 2 for grease type.)

5-31. NOSE WHEEL ASSEMBLY. (McCauley Wheel.)

- a. Insert tube in tire, aligning index marks on tire and tube.
- b. Place wheel hub in tire with valve stem in cutout of wheel hub.
- c. Place spacer and wheel flange on one side of hub.
- d. Place washer under head of each thru-bolt and insert bolt through wheel flange and wheel hub, or place washer under head of each capscrew and start capscrews into wheel hub threads.

- e. Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange.
- f. Install washers and nuts on thru-bolts, or place washer under head of each capscrew and start capscrews into wheel hub threads.

CAUTION

Be sure that spacers and wheel flanges are seated on flange of wheel hub. Uneven or improper torque of thru-bolt nuts or capscrews can cause failure of the bolts or capscrews with resultant wheel failure.

- g. Tighten thru-bolts or capscrews evenly and torque to the values specified in figure 5-2A.
- h. Clean and pack bearing cones with clean aircraft grease. (Refer to Section 2 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 tire pressure. (Refer to Section 1.)

5-32. WHEEL BALANCING. Refer to paragraph 5-20 for wheel balancing information.

5-33. NOSE GEAR SHOCK STRUT. (Refer to figure 5-8.) Removal and installation of the nose gear is accomplished as outlined in paragraph 5-23. Speed fairing and wheel removal and installation information is outlined in paragraph 5-24 and 5-25. The heavy-duty nose gear is illustrated in figure 5-11 which may be used as a guide during maintenance. Removal, installation, disassembly and assembly procedures are the same as those outlined for the standard nose gear strut except for the differences illustrated in figure 5-11.

5-34. NOSE GEAR SHOCK STRUT DISASSEMBLY. (Refer to figure 5-8.) This procedure applies to disassembly of the nose gear shock strut after it has been removed from the aircraft, and the speed fairing and 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.

SHOP NOTES:

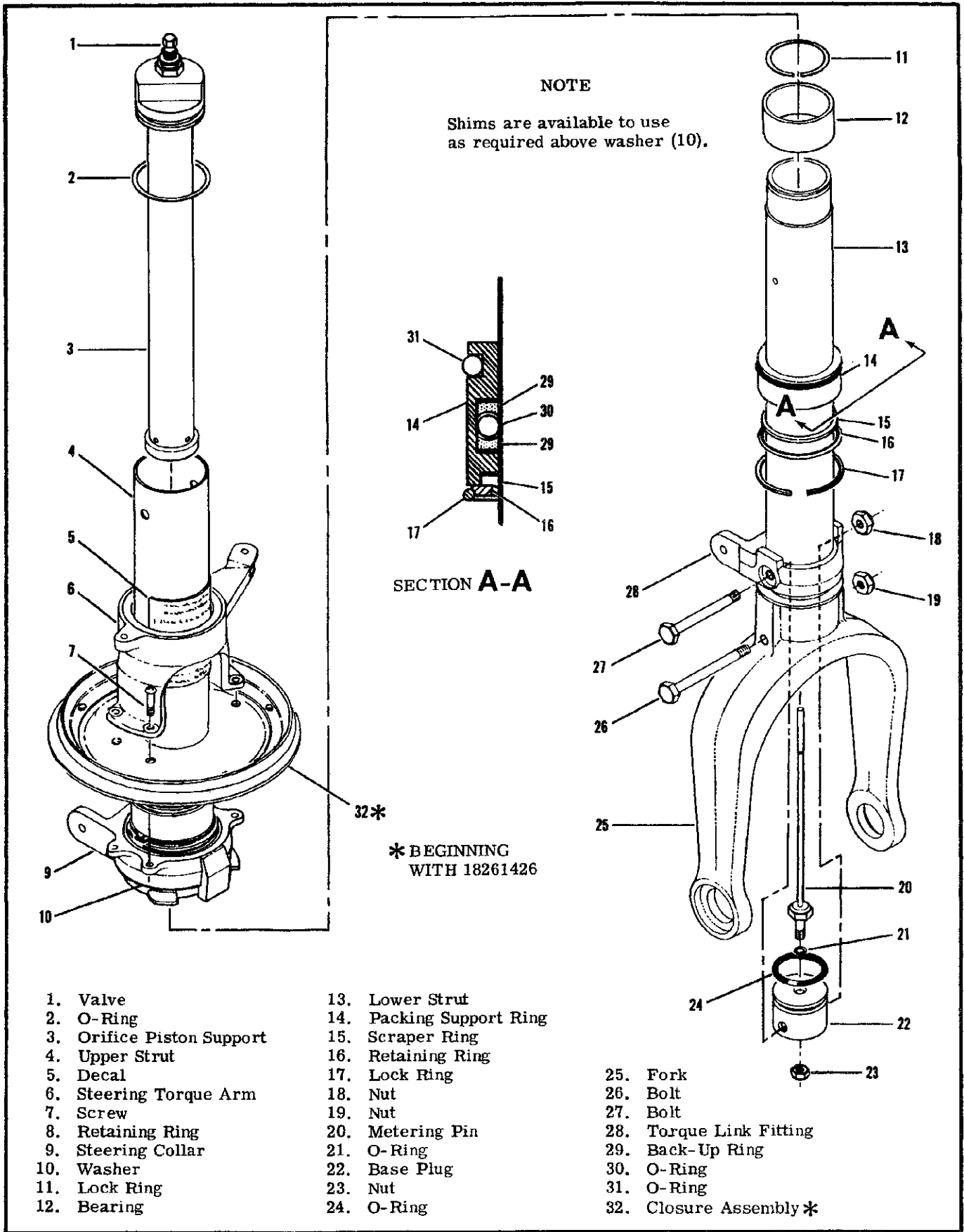


Figure 5-9. Nose Gear Shock Strut

WARNING

Be sure 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 steering torque arm and lower forging if these items have not been removed previously.
- d. 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 as lower strut is pulled from upper strut.

- e. Use a straight, sharp pull to separate upper and lower struts. Invert lower strut and drain remaining hydraulic fluid.
- f. Remove lock ring and bearing at top of lower strut.
- g. Slide packing support ring, scraper ring, retaining ring, and lock ring from lower strut, noting relative position and top side of each ring; wire together if desired.
- h. Remove O-rings and back-up rings from packing support ring.
- i. Remove attaching torque link fitting and remove torque link fitting from lower strut.

NOTE

Bolt attaching torque link fitting also holds metering pin base plug in place.

- j. Push metering pin and base plug assembly from lower strut. Remove O-rings and metering pin from base plug.

NOTE

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

- k. Remove retaining ring securing steering arm assembly on upper strut and remove steering arm, shims, and washer.
 - l. Push orifice support from upper strut and remove O-ring.

5-35. NOSE GEAR SHOCK STRUT ASSEMBLY. (Refer to figure 5-9.)

- a. Thoroughly clean all parts in cleaning solvent and inspect them carefully. Replace all worn or defective parts and all O-rings and back-up rings with new parts.
- b. Assemble the strut by reversing the order of the procedure outlined in paragraph 5-35 with the exception that special attention must be paid to the following procedures.

- c. Sharp metal edges should be smoothed with No. 400 emery paper, then thoroughly cleaned with solvent.
- d. Used sparingly, Dow Corning DC-4 compound is recommended for O-ring lubrication. All other internal parts should be liberally coated with hydraulic fluid during assembly.

NOTE

Cleanliness and proper lubrication, along with careful workmanship are important during assembly of the shock strut.

- e. When installing steering torque arm, lubricate needle bearing in torque arm with general purpose grease (figure 2-5) before installing. If needle bearing is defective, install new steering torque arm assembly. Use shims as required between steering torque arm and washer to provide a snug fit with retainer ring installed. Shims are available from the Cessna Service Parts Center as follows:

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

- f. When installing lock ring 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 at the bottom of the upper strut.
- g. Temporary bolts or pins of correct diameter and length are useful tools for holding parts in correct relation to each other during assembly and installation.
- h. After assembly of strut, install in accordance with paragraph 5-33.
- i. After installation, service shock strut as outlined in Section 2.

5-36. **TORQUE LINKS.** (Refer to figure 5-10.) The illustration may be used as a guide during disassembly and assembly. The torque links keep the lower strut aligned with the nose gear steering system, but permit shock strut action. Torque link bushings should not be removed except for replacement with new parts. Excessively worn parts should be replaced with new parts.

WARNING

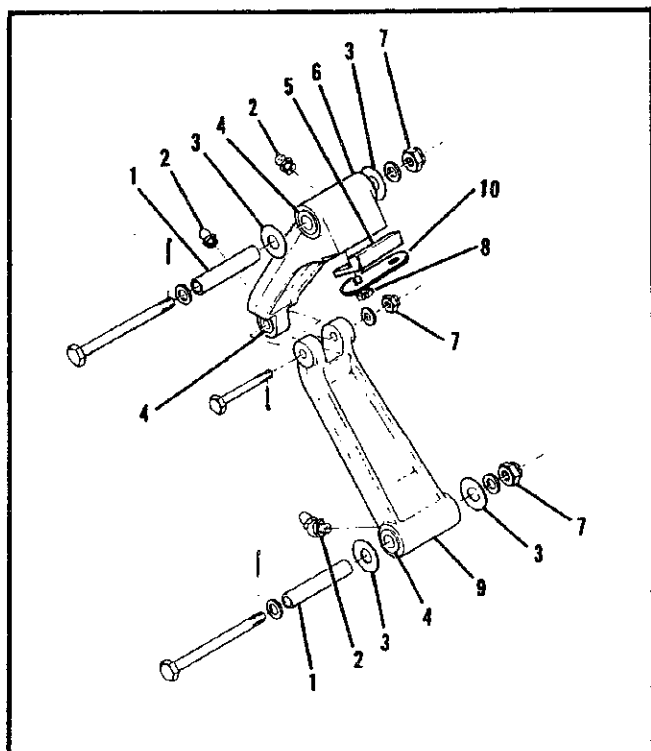
Always deflate nose gear strut before disconnecting torque links.

5-37. **SHIMMY DAMPENER.** The shimmy dampener offers resistance to shimmy by forcing hydraulic fluid through small orifices in a piston. The dampener piston shaft is secured to a stationary part, and the housing is secured to the nose wheel steering torque arm assembly, which moves as the nose wheel is turned, causing relative motion between the dampener shaft and housing. The shimmy dampener is illustrated in figure 5-12, which may be used as a guide during disassembly and assembly. When assembling the dampener, use new O-rings. Lubricate parts with clean hydraulic fluid during assembly. Refer to Section 2 for servicing procedures.

5-38. NOSE WHEEL STEERING SYSTEM. Nose wheel steering is accomplished through the use of the rudder pedals. A steering bungee links the nose gear to a whiffletree which is operated by push-pull rods connected to the rudder bars. Steering is afforded up to approximately 10 degrees each side of center, after which brakes may be used to gain a maximum deflection of 30 degrees right or left of center. A flexible boot is used to seal the fuselage entrance of the steering bungee. A sprocket-operated screw mechanism to provide rudder trim is incorporated at the aft end of the bungee. Refer to Section 10 for the rudder trim system.

5-39. STEERING BUNGEE ASSEMBLY. The bungee assembly is spring-loaded and should not be disassembled internally. The steering bungee is connected to the steering torque arm on the strut by a bearing end assembly and to the steering whiffletree by a rod end assembly.

5-40. NOSE WHEEL STEERING ADJUSTMENT. Since the nose wheel steering, rudder system, and rudder trim systems are interconnected, adjustments to one system will affect the others. Section 10 contains rigging instructions for the nose wheel steering system as well as the rudder and rudder trim systems.



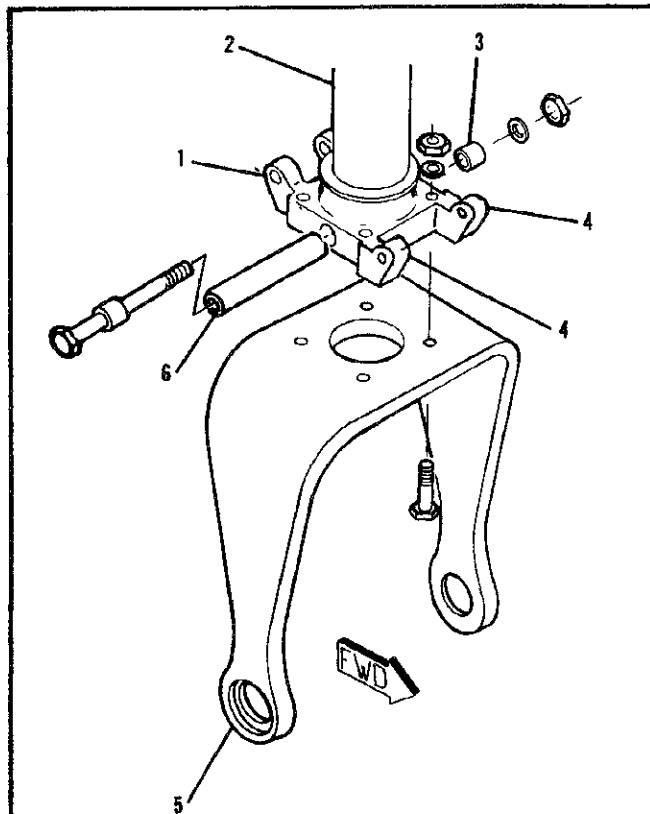
NOTE

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



Refer to figure 5-9 for remainder of strut.

- | | |
|-------------------|------------|
| 1. Hub | 4. Lugs |
| 2. Lower Strut | 5. Fork |
| 3. Tow-Bar Spacer | 6. Bushing |

Figure 5-10. Torque Links

Figure 5-11. Heavy-Duty Shock Strut

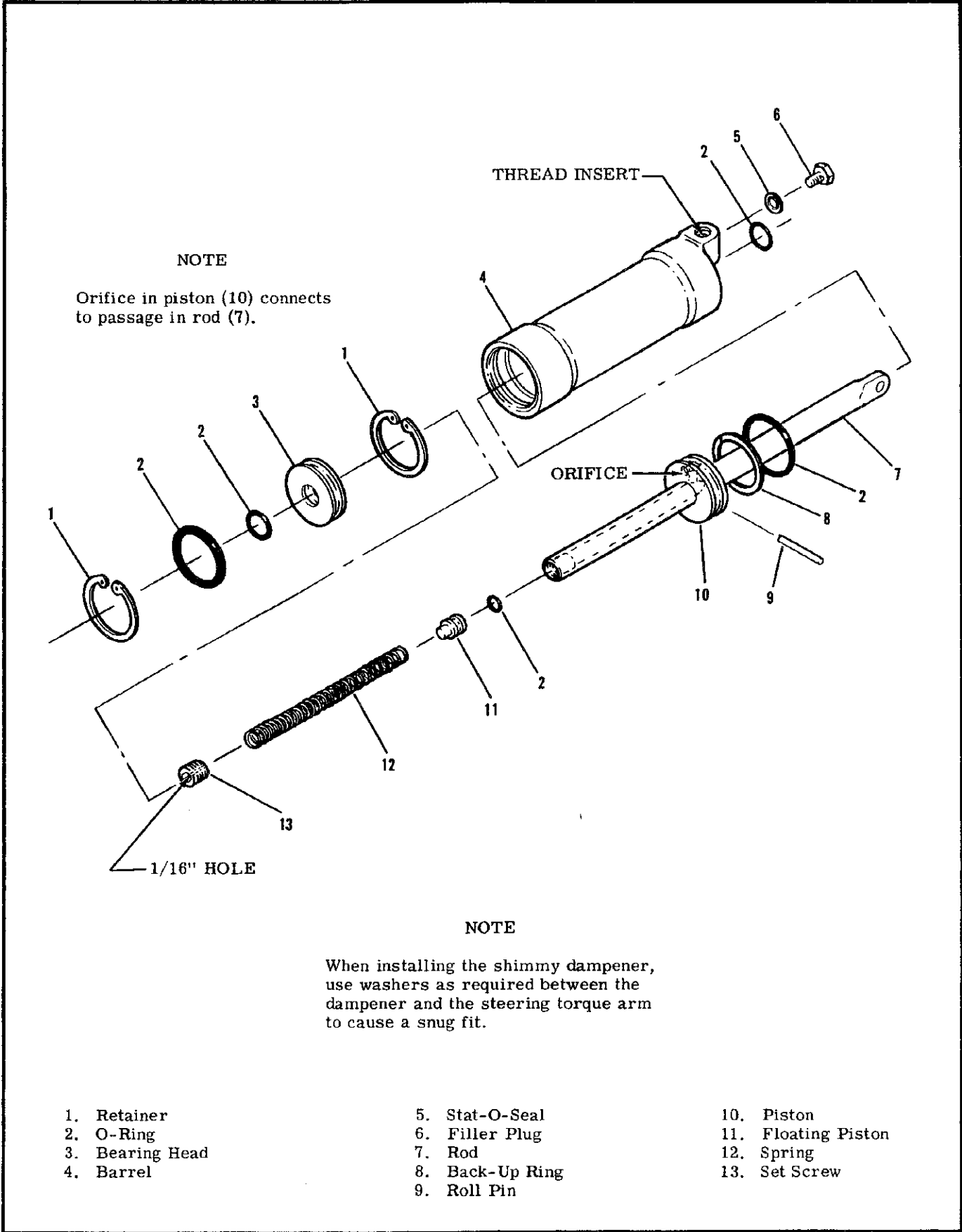


Figure 5-12. Shimmy Dampener

5-41. BRAKE SYSTEM.

5-42. DESCRIPTION. The hydraulic brake system is comprised of two master brake cylinders, located immediately forward of the rudder pedals, brake

lines connecting each master cylinder to its wheel brake cylinder, and the single-disc, floating cylinder-type brake assembly, located at each main landing gear wheel

5-43. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Lubricate pivot points; replace or repair defective parts.
	Weak or broken piston return spring in master cylinder.	Repair or replace master cylinder.
	Parking brake control improperly adjusted.	Adjust properly.
	Insufficient clearance between lock-O-seal and piston in master cylinder.	Adjust clearance per figure 5-13.
	Restriction in hydraulic lines or in passage in master cylinder compensating sleeve.	Remove restrictions; flush brake system with denatured alcohol. Repair or replace master cylinder.
	Warped or badly scored brake disc.	Replace disc and linings.
	Damage or accumulated dirt restricting free movement of wheel brakes.	Clean and repair or replace brake parts.
BRAKES FAIL TO OPERATE.	Fluid low in master cylinder or wheel cylinder.	Fill system and bleed brakes.
	Faulty O-rings in master cylinder or wheel cylinder.	Replace O-rings.
	Faulty lock-O-seal in master cylinder.	Replace lock-O-seal.
	Excessive clearance between lock-O-seal and piston.	Adjust clearance per figure 5-13.
	Internal damage to hose and O-rings due to use of wrong type of hydraulic fluid.	Replace damaged parts. Flush system with denatured alcohol. Fill and bleed brake system.
	Pressure leak in system.	Tighten connection; repair or replace faulty parts.
	Brake linings worn out.	Replace linings.
	Oil or grease on brake linings or new linings just installed.	Clean linings with carbon tetrachloride.

5-44. **BRAKE MASTER CYLINDERS.** The brake master cylinders, located just forward of the pilot rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder to supply it with fluid. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.

5-45. **REMOVAL AND INSTALLATION.**

- a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinder.
- 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 brake master cylinders at lower attach points.
- e. Disconnect hydraulic hose from brake master cylinders and remove cylinders.
- f. Plug or cap hydraulic fittings, hose, and lines to prevent entry of foreign matter.
- g. Reverse the preceding steps to install brake master cylinders, then fill and bleed brake system in accordance with paragraph 5-55.

5-46. **REPAIR.** (Refer to figure 5-13.) Cylinder breakdown is shown in the figure which may be used as a guide during disassembly, adjustment and assembly. Repair is limited to installation of new parts, cleaning and adjustment. During assembly, use clean hydraulic fluid as a lubricant.

5-47. **HYDRAULIC BRAKE LINES.** The lines are of rigid tubing, except for flexible hose used at the brake master cylinders and at the wheel cylinders on the flat spring strut equipped aircraft. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.

5-48. **WHEEL BRAKE ASSEMBLY.** (Refer to figure 5-3.) The wheel brake assemblies use a disc which is attached to the main wheel with the wheel thru-bolts. The brake assemblies are also equipped with a floating brake assembly.

5-49. **REMOVAL.** (Refer to figure 5-1.) Wheel brake assemblies are the floating type and can be removed after disconnecting the brake hose and removing the back plate.

NOTE

The brake disc is removed after wheel removal and disassembly. To remove the torque plate, remove wheel and axle as outlined in paragraph 5-17.

5-50. **INSPECTION AND REPAIR.**

- a. Clean all parts except brake linings and O-rings in dry cleaning solvent and dry thoroughly.
- b. New O-rings are usually installed at each overhaul. If O-ring re-use is necessary, they should be wiped with a clean cloth soaked in hydraulic fluid and inspected 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. See paragraph 5-53.
- d. Inspect brake cylinder wall for scoring. A scored cylinder will leak or cause rapid O-ring wear. Install new brake cylinder.
- 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 drive new bolts in with a soft mallet.
- f. Inspect wheel brake disc for a minimum thickness of 0.190-inch. If brake disc is below minimum thickness, warped or out of round, install a new part.

5-51. **ASSEMBLY.** (Refer to figure 5-4.) The figure may be used as a guide during assembly. Lubricate parts with clean hydraulic fluid and assemble parts with care to prevent damage to O-rings.

5-52. **INSTALLATION.** Place brake assembly in position with pressure plate in place, then install back plate. If torque plate was removed, install as the axle is installed. If the brake disc was removed from the wheel, install as wheel is assembled.

5-53. **CHECKING BRAKE LINING THICKNESS.** Lining should be replaced if worn to a minimum thickness of 3/32-inch. Visually compare a 3/32-inch strip of material held adjacent to each lining to measure thickness of the lining. The shank end of the correct size drill bit makes an excellent tool for checking minimum thickness of brake linings.

5-54. **BRAKE LINING INSTALLATION.** (Refer to figure 5-4.)

- a. Remove bolts securing back plate and remove back plate.
- b. Pull the 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 rivet head against the anvil.
- f. Center the rivet setting punch on the lips of the rivet. While holding the back plate down firmly

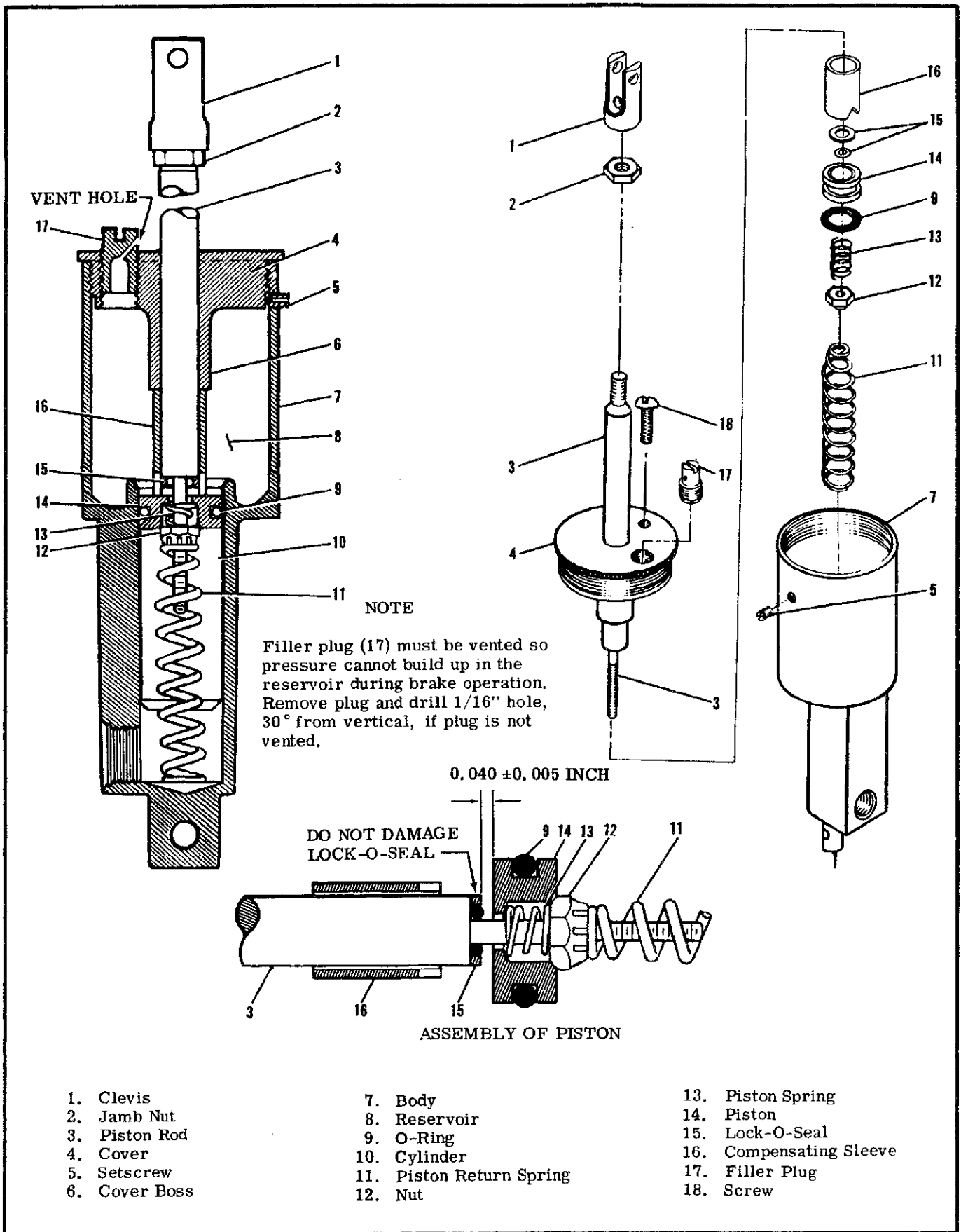


Figure 5-13. Brake Master Cylinder

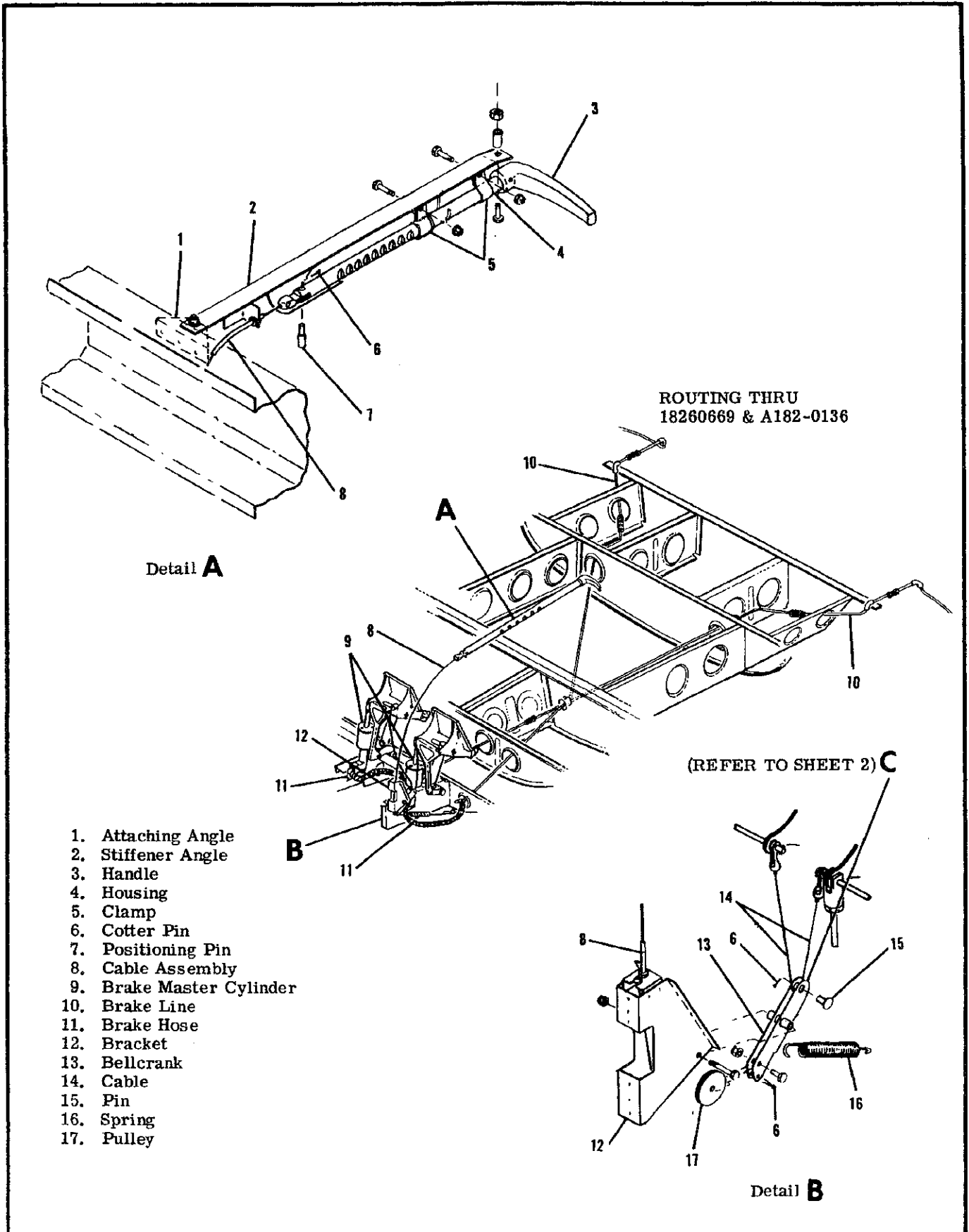


Figure 5-14. Parking Brake System (Sheet 1 of 2)

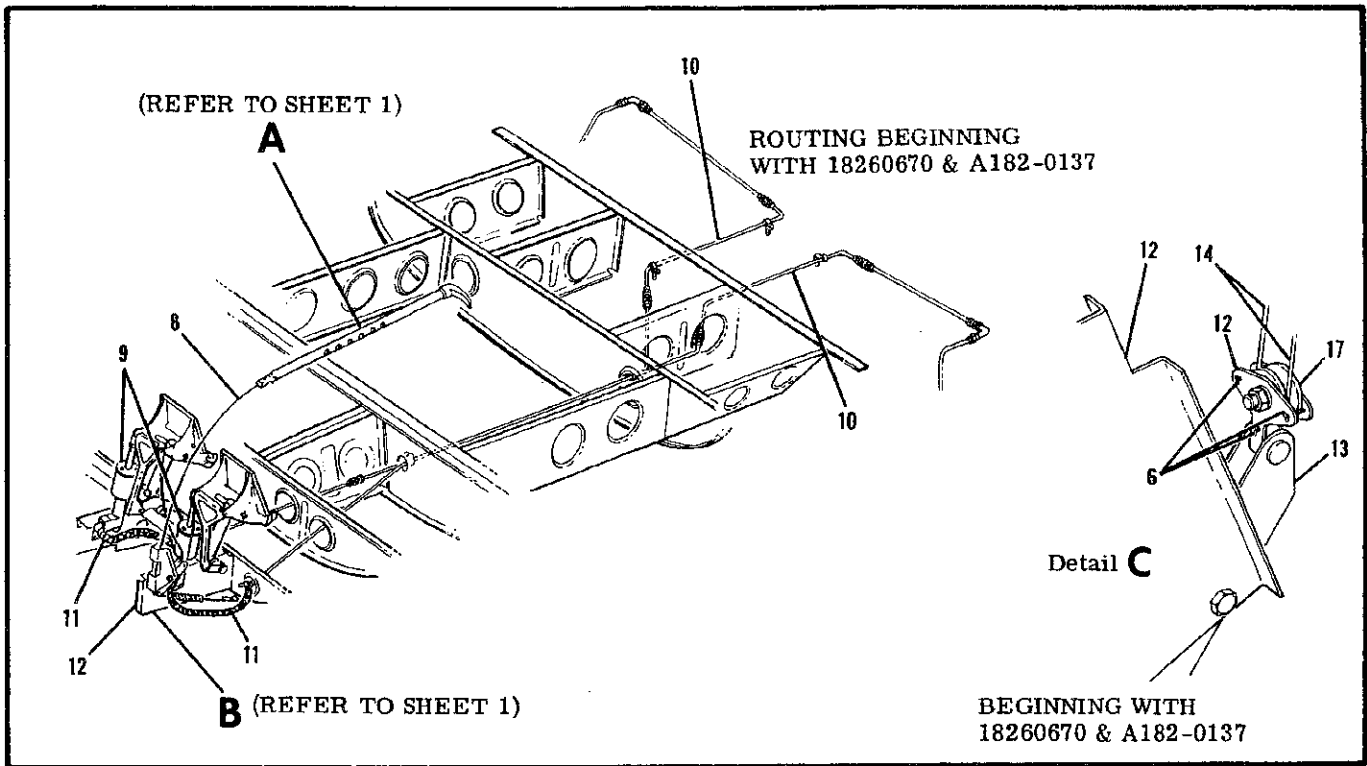


Figure 5-14. Parking Brake System (Sheet 2 of 2)

against the lining, hit the punch with a hammer to set the rivet. Repeat blows on the punch until lining is firmly against the back plate.

g. Realign the lining on the back plate and install 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.

5-55. BRAKE BLEEDING. Standard 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 master cylinder. Immerse the free end of the hose in a container with enough hydraulic fluid to cover the end of the hose.

b. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro Fill unit, to the

bleeder valve in the wheel cylinder.

c. As fluid is pumped into the system, observe the immersed end of the hose at the brake master 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.

NOTE

Ensure that the free end of the hose from the master cylinder remains immersed during the entire bleeding process.

5-56. PARKING BRAKE SYSTEM. (Refer to figure 5-14.)

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

SECTION 6

AILERON CONTROL SYSTEM

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

comprised of push-pull rods, bellcranks, cables, pulleys, cable drums and components forward of the instrument panel, all of which, link the control wheels to the ailerons.

6-2. DESCRIPTION. The aileron control system is

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.	Check cable tension. Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Check visually. Replace worn or broken parts, install cables correctly.
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Check cable tension. Adjust cables to proper tension.
	Pulleys binding or cable off.	Observe motion of the pulleys. Check cables visually. Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Check visually. Replace defective bellcrank.
	Defective quadrant assembly.	Check visually. Replace defective quadrant.
	Clevis bolts in system too tight.	Check connections where used. Loosen, then tighten properly and safety.

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of cables.	Refer to paragraph 6-18.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Cables improperly adjusted.	Refer to paragraph 6-18.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Refer to paragraph 6-18.
	Incorrect adjustment of travel stop bolts.	Refer to paragraph 6-18.

6-4. CONTROL COLUMN. (Refer to figure 6-2.)

6-5. DESCRIPTION. Rotation of the control wheel rotates four bearing roller assemblies (3) on the end of the control wheel tube (13), which in turn, rotates a square control tube assembly (15) inside and extending from the control wheel tube (13). Attached to this square tube (15) is a quadrant (24) which operates the aileron system. This same arrangement is provided for both control wheels. Synchronization of the control wheels is obtained by the interconnect cable (29), turnbuckle (30) and adjustment terminals (27). The forward end of the square control tube (15) is mounted in a bearing block (21) on firewall (31) and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies (3) on the end of the control wheel tube reduce friction as the control wheel is moved fore-and-aft for elevator system operation. A sleeve weld assembly (5), containing bearings which permit the control wheel tube to rotate within it, is secured to the control wheel tube by a sleeve and retaining ring in such a manner it moves fore-and-aft with the control wheel tube. This movement allows the push-pull tube (16) attached to the sleeve weld assembly (5) to operate an elevator arm assembly (18), to which one elevator cable (20) is attached. A torque tube (19) connects this arm assembly (18) to the one on the opposite end of the torque tube (19), to which the other elevator cable is attached. When dual controls are installed, the copilot's control wheel is linked to the aileron and elevator control systems in the same manner as the pilot's control wheel.

6-6. REMOVAL AND INSTALLATION.

a. PILOT'S CONTROL COLUMN.

1. (THRU AIRCRAFT SERIAL 18260825.) (Refer to figure 6-2, sheet 1.) Remove screws attaching control wheel (2) to control wheel tube assembly (13) and remove wheel. Disconnect electrical wiring to map light and mike switch, if installed.

2. (BEGINNING WITH AIRCRAFT SERIAL 182-60826.) (Refer to figure 6-2, sheet 2.) Slide cover (2) toward instrument panel to expose adapter (3). Remove screws securing adapter (3) to control wheel tube assembly (1) and remove control wheel assembly. Disconnect electrical wiring to map light and mike switch at connector (17), if installed. Slide cover (2) off control wheel tube assembly (1).

3. (Refer to figure 6-2, sheet 1.) Remove decorative cover from instrument panel.

4. Remove screw securing adjustable glide plug (14) to control tube assembly (15) and remove plug and glide assembly.

5. Disconnect push-pull tube (16) at sleeve weld assembly (5).

6. Remove screws securing support plate (10) at instrument panel.

NOTE

To ease removal of control wheel tube assembly (13), snap ring (9) may be removed from its locking groove to allow sleeve weld assembly (5) additional movement.

7. Using care, pull control wheel tube assembly (13) aft and work assembly out through instrument panel.

NOTE

If removal of control tube assembly (15) or quadrant (24) is necessary, proceed to step 8.

8. Remove safety wire and relieve direct cable tension at turnbuckles (index 8, figure 6-1).

9. Remove safety wire and relieve interconnect cable tension at turnbuckle (30).

10. Remove safety wire and remove roll pin (28) through quadrant (24) and control tube assembly (15).

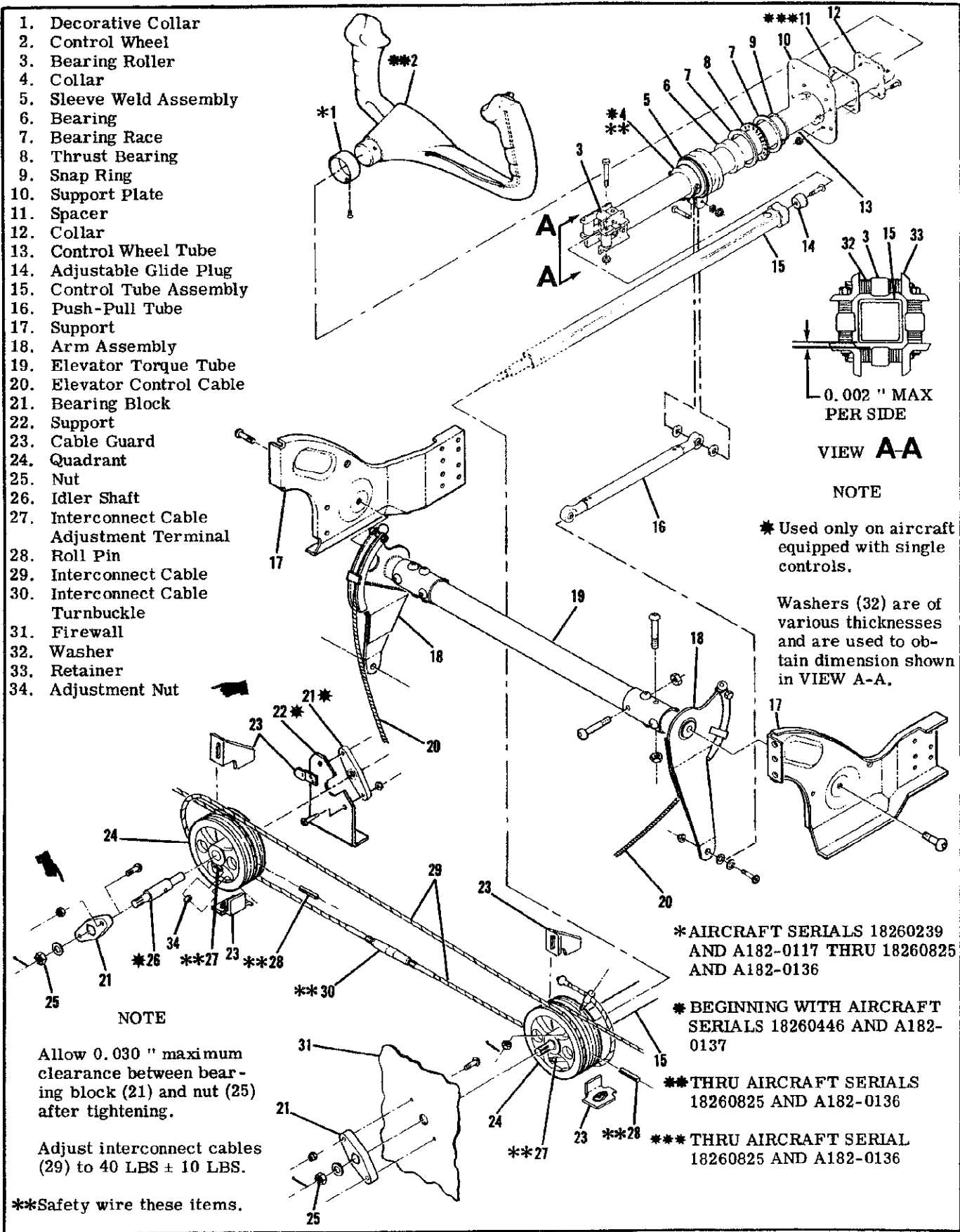
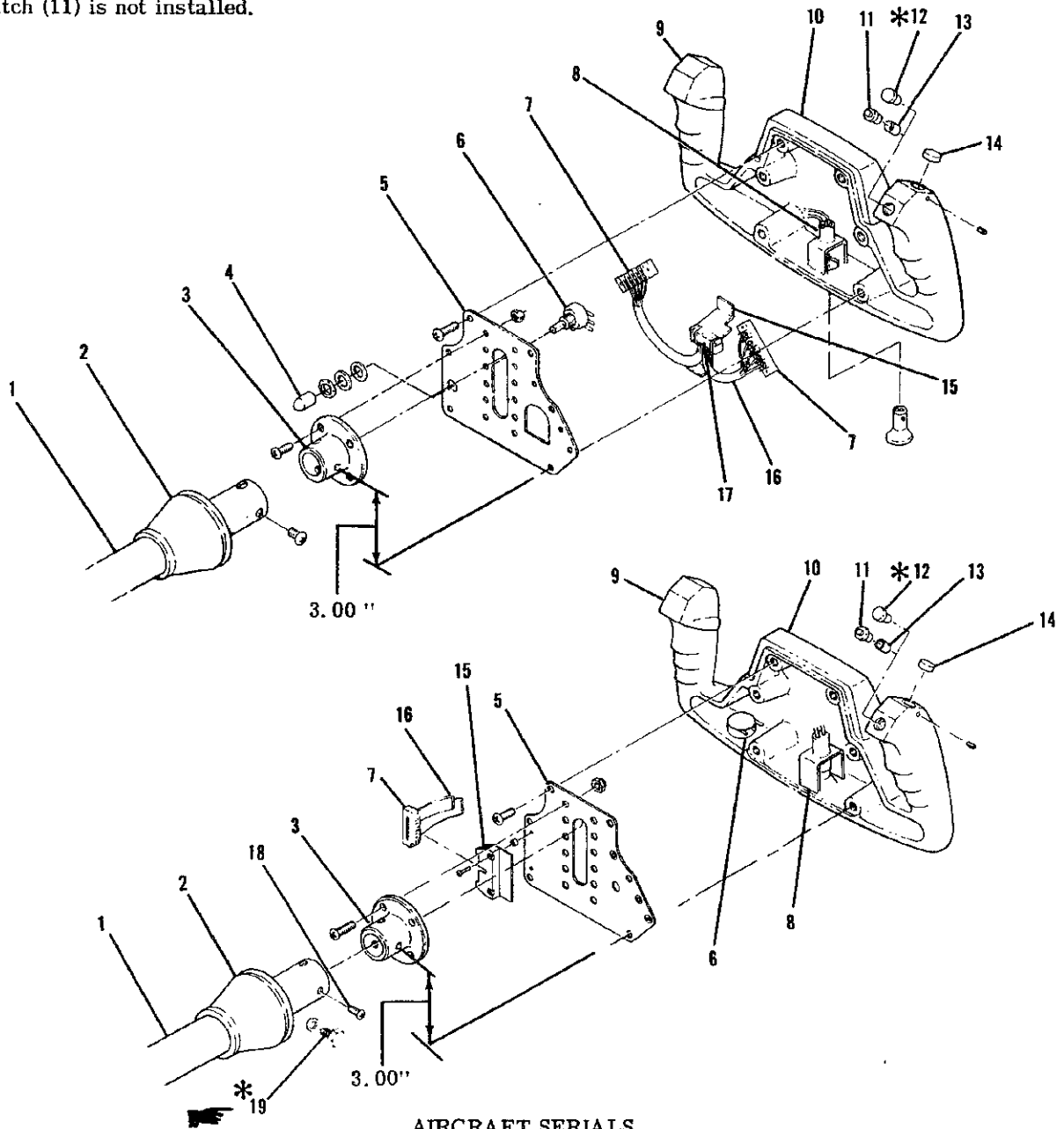


Figure 6-2. Control Column Installation (Sheet 1 of 2)

AIRCRAFT SERIALS 18260826
THRU 18263475

* Plug (12) is used when mike
switch (11) is not installed.



AIRCRAFT SERIALS
18263476 AND ON

* BEGINNING WITH SERIAL 18264296

NOTE

Torque bolt (19) to 30 lb-inches

- | | |
|--------------------------|-----------------|
| 1. Control Tube Assembly | 11. Mike Switch |
| 2. Cover | 12. Plug |
| 3. Adapter | 13. Insulator |
| 4. Rubber Cover | 14. Plug |
| 5. Plate | 15. Bracket |
| 6. Map Light Rheostat | 16. Cable |
| 7. Terminal Block | 17. Connector |
| 8. Map Light Assembly | 18. Screw |
| 9. Control Wheel | 19. Bolt |
| 10. Pad | |

Figure 6-2. Control Column Installation (Sheet 2 of 2)

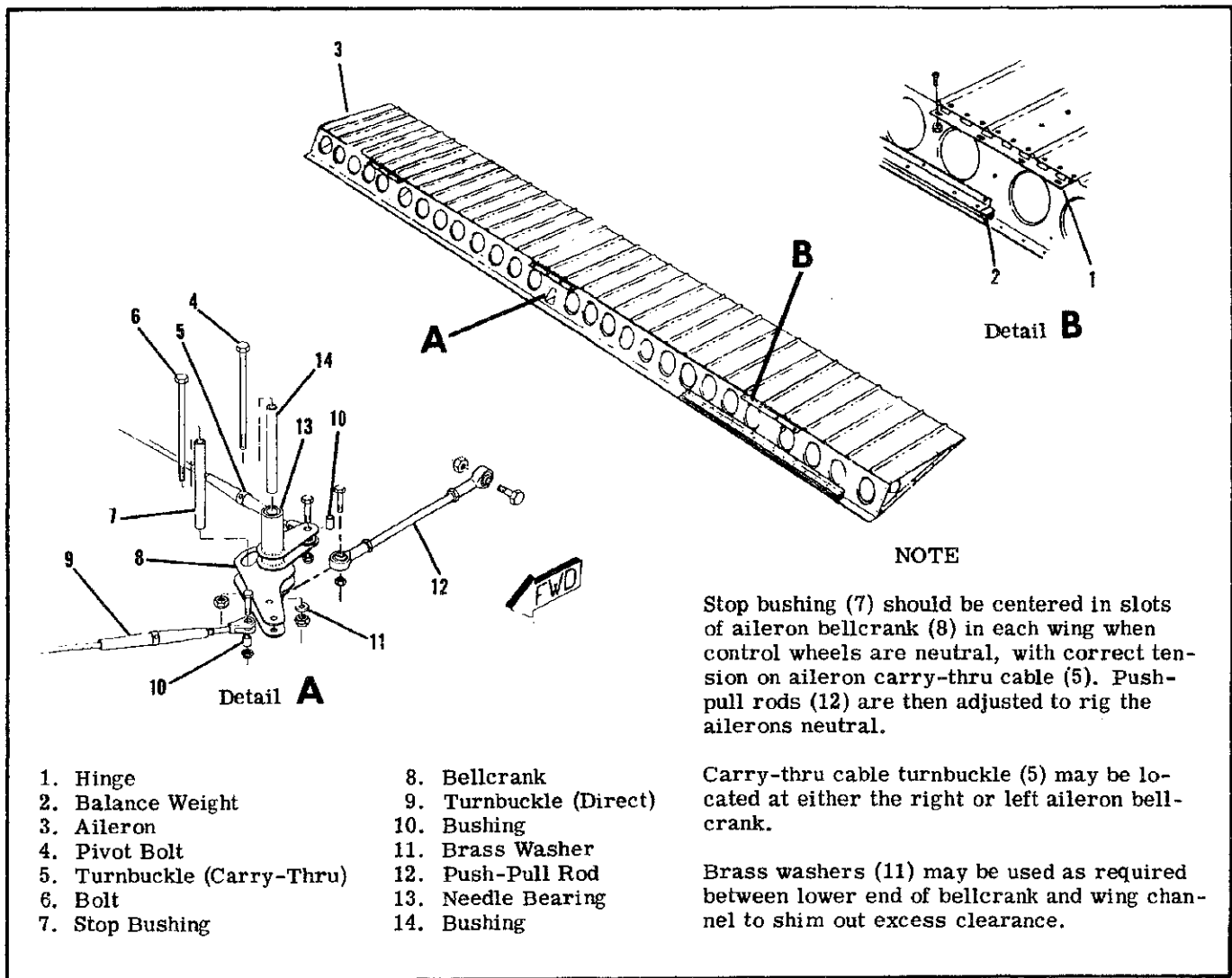


Figure 6-3. Aileron Installation

11. Remove pin, nut (25) and washer from control tube assembly (15) protruding through bearing block (21) on forward side of firewall (31).

12. Using care, pull control tube assembly (15) aft and remove quadrant (24).

13. Reverse the preceding steps for reinstallation. Safety wire all items previously safetied, check rigging of aileron and elevator control systems and rig, if necessary, in accordance with paragraph 6-18 and 8-14 respectively.

b. COPILOT'S CONTROL COLUMN.

1. Complete steps 1, 2, 3, 5, 6, 8, 9, 10 and 11 of subparagraph "a."

2. Using care, pull control tube assemblies (13 and 15) aft and remove quadrant (24).

3. Remove radios, radio dust covers, cooling pans and associated equipment as necessary to work control wheel tube assembly (13) out from under instrument panel.

4. Complete step 13 of subparagraph "a."

6-7. **REPAIR.** Worn, damaged or defective shafts, bearings, drums, cables or other components should be replaced. 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 (8) on underside of wing.

b. Remove safety wire and relieve cable tension at turnbuckle (5).

c. Disconnect control cables from bellcrank (8). Retain all spacers and bushings.

d. Disconnect push-pull rod (12) at bellcrank.

e. Remove nuts, washers and bolts securing bellcrank stop bushing (7) and bellcrank (8) to wing structure.

f. Remove bellcrank through access opening, using care that bushing (14) is not dropped from bellcrank.

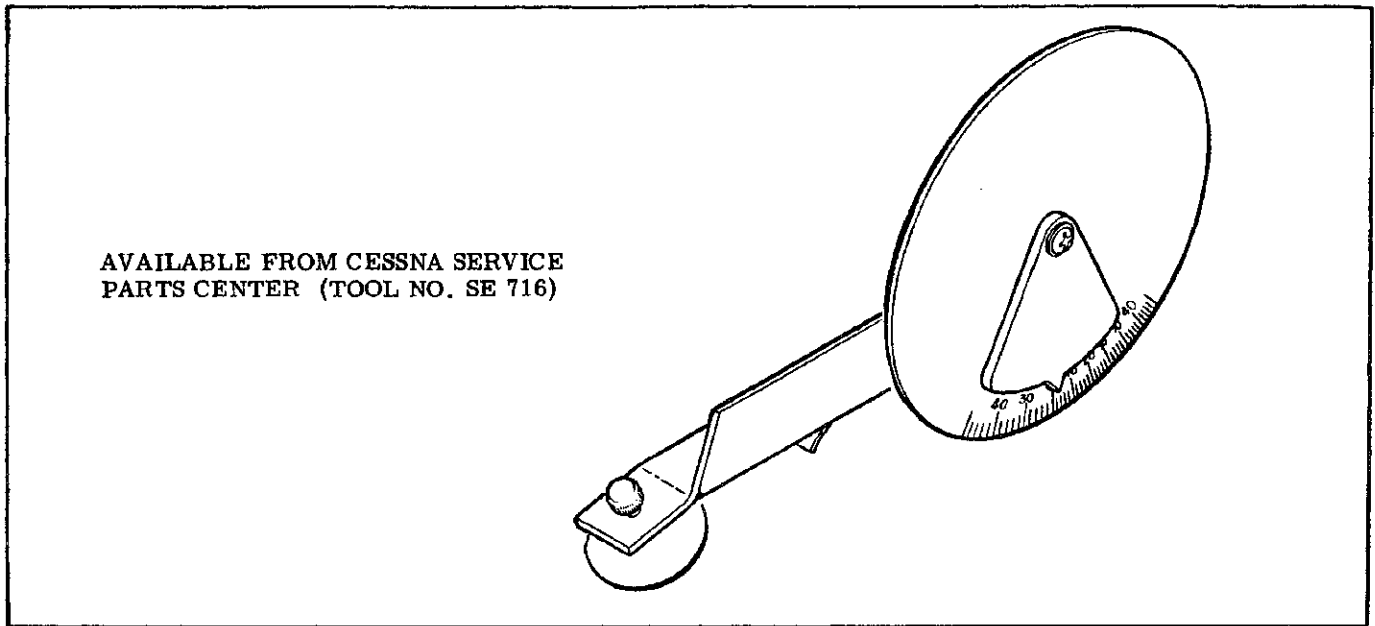


Figure 6-4. Inclinometer for Measuring Control Surface Travel

NOTE

Brass washers (11) may be used as shims between lower end of bellcrank and wing structure. Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (13).

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 (14) and stop bushing (7) in bellcrank (8) and position bellcrank in wing.
- b. Install brass washers (11) between lower end of bellcrank (8) and wing structure to shim out excess clearance.
- c. Install bellcrank pivot bolt (4).
- d. Position bellcrank stop-bushing (7) and install attaching bolt (6).
- e. Connect control cables to bellcrank.
- f. Connect push-pull rod (12) to bellcrank.
- g. Re-rig aileron system in accordance with paragraph 6-18, safety turnbuckle (5) 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. Remove safety wire and relieve cable tension at turnbuckles (8).
- c. Disconnect cables from aileron bellcranks (7) and quadrants (index 24, figure 6-2).

- d. 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.

- e. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
- f. Re-rig aileron system in accordance with paragraph 6-18, 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 (12) at aileron.
- b. Remove screws and nuts attaching aileron hinges (1) 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 (12) to aileron.

NOTE

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

c. Check aileron travel and alignment, re-rig if necessary, in accordance with paragraph 6-18.

6-17. REPAIR. Aileron repair may be accomplished in accordance with instructions outlined in Section 18. Before installation, ensure balance weights and hinges are securely attached.

6-18. RIGGING. (Refer to figure 6-1.)

a. Remove safety wire and relieve cable tension at turnbuckles (6 and 8).

b. Disconnect push-pull rods at bellcranks (7).

c. Adjust interconnect cable turnbuckle (index 30, figure 6-2) and adjustment terminals (index 27, figure 6-2) to remove cable slack, acquire proper tension (40 ± 10 pounds) and position control wheels level (synchronized).

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

e. Adjust direct cable turnbuckles (8) and carry-thru cable turnbuckle (6) so bellcrank stop-bushings (index 7, figure 6-3) are centered in both bellcrank

slots with 40 ± 10 pounds tension on carry-thru cable. Disregard tension on direct cables.

f. Adjust push-pull rods (index 12, figure 6-3) at each aileron until ailerons are neutral with reference to trailing edge of wing flaps. Be sure wing flaps are full UP when making this adjustment.

g. With ailerons in neutral position (streamlined), mount an inclinometer on trailing edge of one aileron and set to 0° . (Refer to figure 6-4 for inclinometer.)

h. Remove bar from control wheels and check degree of travel as specified in figure 1-1. If travel is not within specified limits, readjust push-pull rods and cables as necessary.

i. Ensure all turnbuckles are safetied, all cables and cable guards are properly installed, all jam nuts are tight and replace all items removed for access.

WARNING

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

SECTION 7

WING FLAP CONTROL SYSTEM

TABLE OF CONTENTS	Page		
WING FLAP CONTROL SYSTEM	7-1	Removal and Installation	7-8
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Trouble Shooting	7-2	Removal and Installation	7-8
Flap Motor and Transmission Assembly	7-4	Repair	7-8
Removal and Installation	7-4	Cables and Pulleys	7-8
Repair	7-4	Removal and Installation	7-8
Flap Control Lever	7-4	Rigging - Flaps	7-8
Removal and Installation	7-4	Rigging - Flap Control Lever and	
Drive Pulley	7-8	Follow-Up	7-13

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

7-2. DESCRIPTION. The wing flap control system consists of an electric motor and transmission assembly, drive pulleys, push-pull rods, cables, pulleys and follow-up control. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys and cables. Electrical power to the motor is controlled by two micro-switches mounted on a "floating" arm, a camming lever and a follow-up control. As the camming lever is moved to the desired flap setting, it trips a switch actuating the flap motor. As the flaps move, the floating arm is rotated by the follow-up control until the active switch clears the camming lever, breaking the circuit. To reverse direction of travel, the control lever is moved in the opposite direction. When its cam contacts the second switch it reverses the flap motor. Likewise the follow-up control moves the floating arm until the second switch is clear of the camming lever. Limit switches at the drive pulley are connected in series with the switches on the floating arm to prevent over-travel of the flaps in the full UP or DOWN position.

7-3. OPERATIONAL CHECK.

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

b. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN NOT MODI-

FIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Attempt to overrun travel extremes and check for transmission free-wheeling at full up and full down positions.

c. BEGINNING WITH AIRCRAFT SERIALS 18260699 AND A182-0137 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Operate flaps and check up-limit and down-limit switch actuation in their respective positions.

d. Check that flaps are not sluggish in operation. In flight at 110 mph, indicated airspeed, flaps should fully extend in approximately 16.6 seconds and retract in approximately 7.0 seconds. On the ground, with engine running, the flaps should extend in approximately 9.2 seconds and retract in approximately 8.2 seconds.

e. 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 mid-range percentage setting, (approximate), against degrees as indicated on inclinometer. Repeat the same procedure for opposite flap.

NOTE

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

f. Remove access plates and attempt to rock drive pulleys to check for bearing wear.

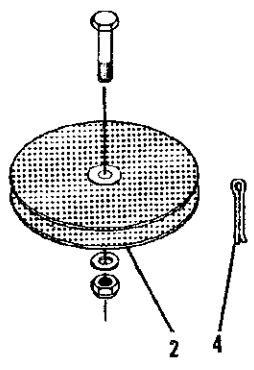
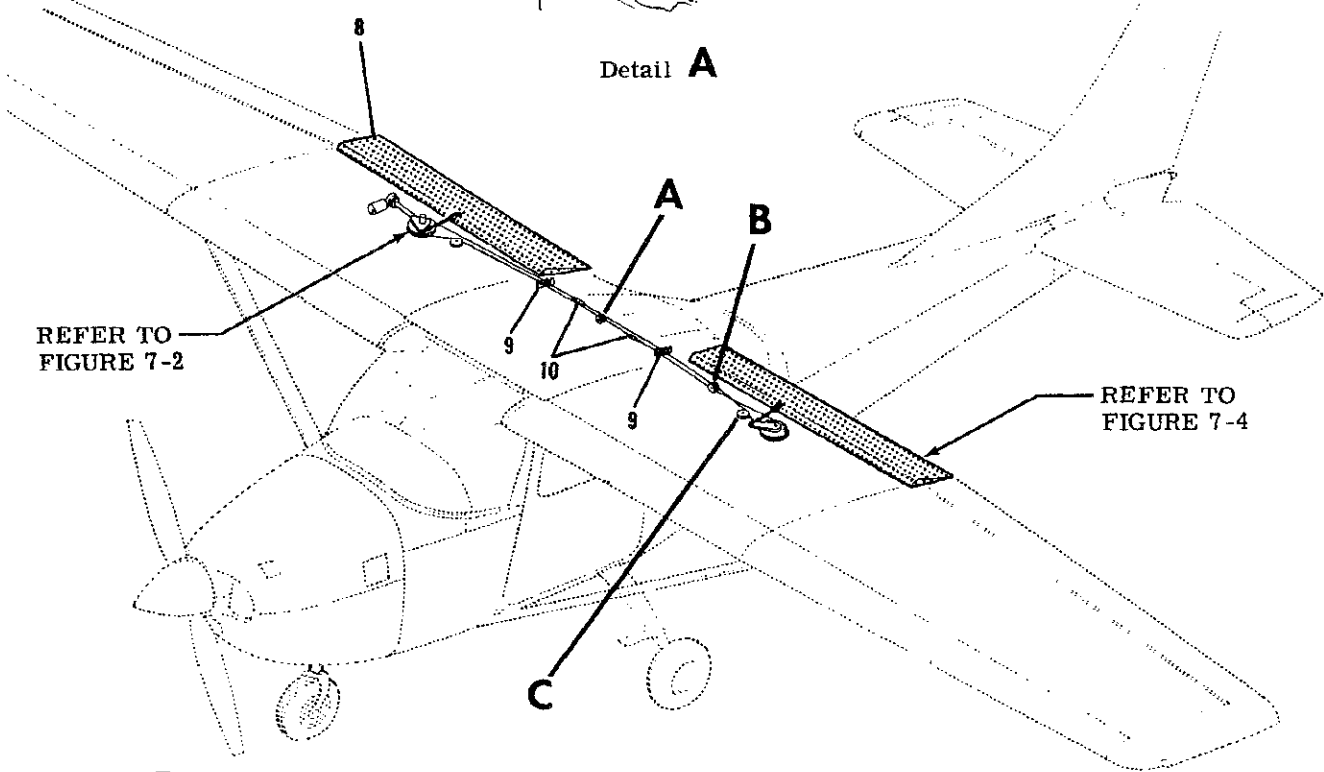
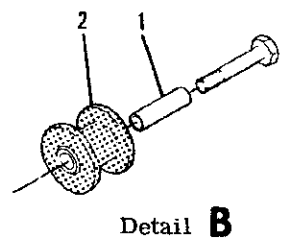
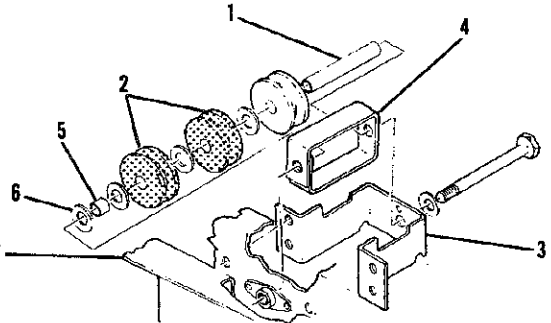
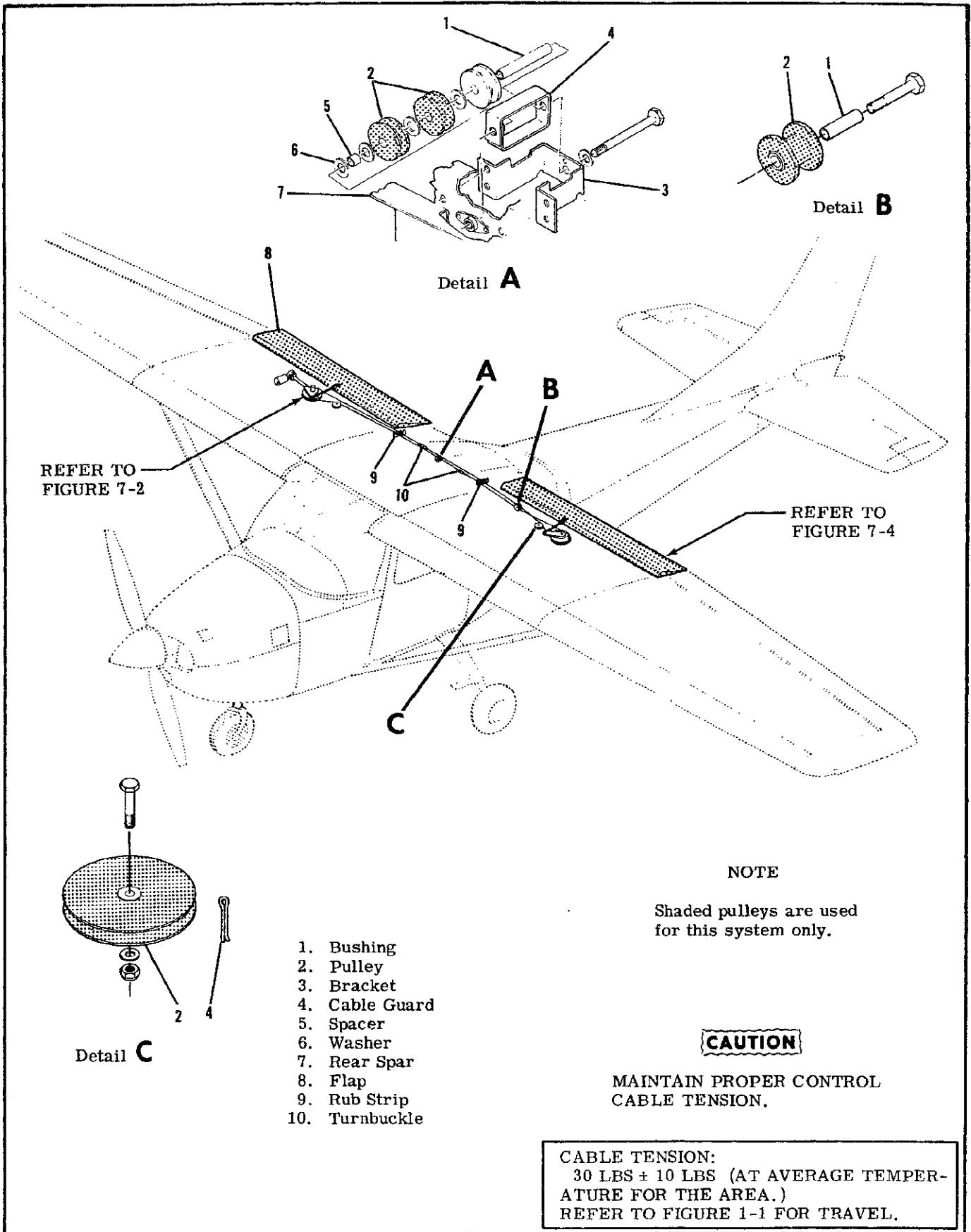
g. Inspect flap rollers and tracks for evidence of binding and defective parts.

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 7-18 and 7-19.

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.
	Follow-up control disconnected or slipping.	Secure control or replace if 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.	Disconnected or defective UP limit switch.	Check continuity of switch. Connect or replace switch.



1. Bushing
2. Pulley
3. Bracket
4. Cable Guard
5. Spacer
6. Washer
7. Rear Spar
8. Flap
9. Rub Strip
10. Turnbuckle

Figure 7-1. Wing Flap Control System

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO EXTEND.	Disconnected or defective DOWN limit switch.	Check continuity of switch. Connect or replace switch.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-18.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.

7-5. FLAP MOTOR AND TRANSMISSION ASSEMBLY.

7-6. REMOVAL AND INSTALLATION.

a. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN NOT MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 1.)

1. Run flaps to full DOWN position.
2. Disconnect battery cables at the battery and insulate cable terminals as a safety precaution.
3. Remove access plates adjacent to drive pulley and motor assembly on right wing.

NOTE

Remove motor (1), transmission (4), hinge assembly (2) and actuating tube (8) from aircraft as a unit on aircraft equipped with standard fuel cells. On aircraft equipped with long range cells, detach motor and transmission assembly from hinge assembly (2) prior to removal.

4. Remove bolt (18) securing actuating tube (8) to drive pulley (17).
5. Screw actuating tube (8) IN toward transmission (4) by hand to its shortest length.
6. Remove bolt (3) securing flap motor hinge (2) to wing, or if long range fuel cells are installed, remove bolt (5) securing transmission to hinge assembly. Retain brass washer between hinge and wing structure for use on reinstallation.
7. Disconnect motor electrical wiring (21) at quick-disconnects.
8. Using care, work assembly from wing through access opening.
9. Reverse the preceding steps for reinstallation. If the hinge assembly (2) was removed from the transmission (4) for any reason, ensure the short end of hinge is reinstalled toward the top.
10. Complete an operational check as outlined in paragraph 7-3 and re-rig system in accordance with paragraph 7-18.

b. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 2.)

1. Complete steps 1, 3 and 4 of subparagraph "a."
2. Run flap motor to place actuating tube (8) IN to its shortest length.
3. Complete steps 2, 6, 7, 8, 9 and 10 of subparagraph "a."

c. BEGINNING WITH AIRCRAFT SERIALS 182-60699 AND A182-0137 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 2.)

1. Complete steps 1 thru 7 of subparagraph "a."
2. Disconnect electrical wiring at limit switches (29 and 32).
3. Complete steps 8, 9 and 10 of subparagraph "a."

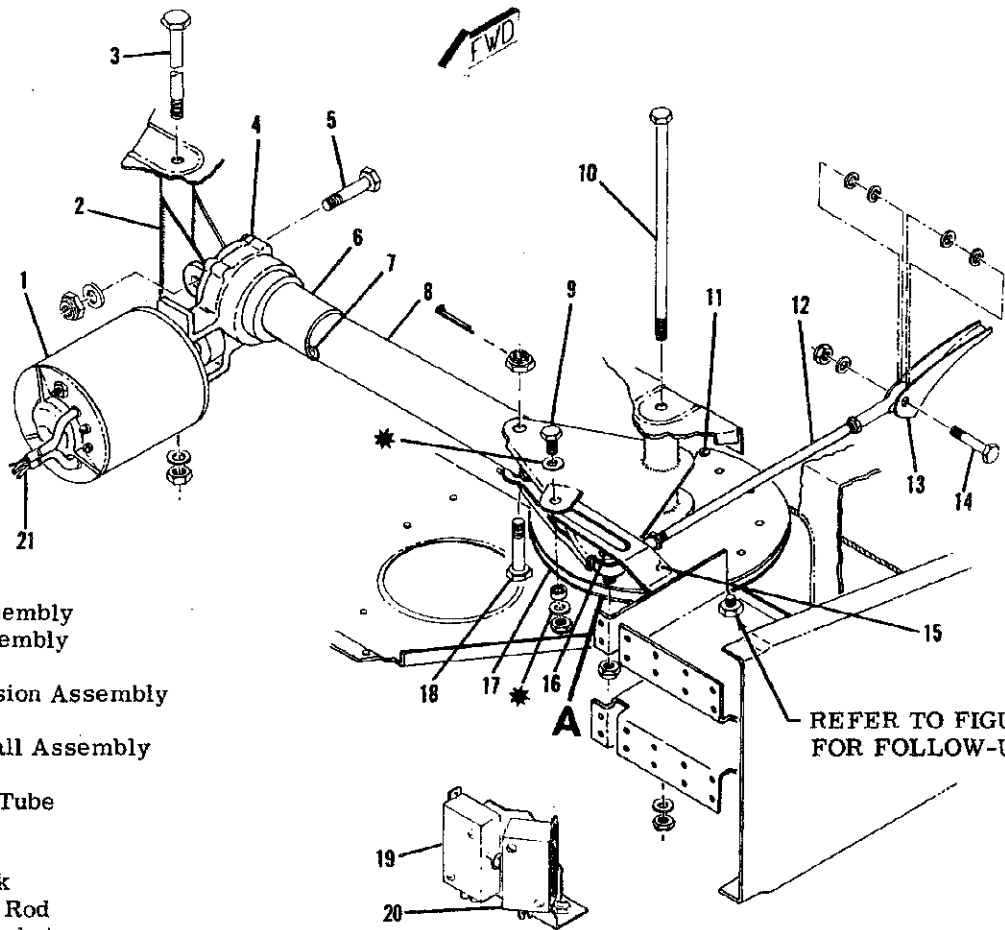
7-7. REPAIR. Repair consists of replacement of motor, transmission, coupling, actuating tube and associated hardware. Bearing in hinge assembly may also be replaced. Lubricate as outlined in Section 2.

7-8. FLAP CONTROL LEVER.

7-9. REMOVAL AND INSTALLATION.

a. THRU AIRCRAFT SERIALS 18260445 AND A182-0136. (Refer to figure 7-3, sheet 1.)

1. Remove follow-up control (1) from switch mounting arm (15).
2. Remove flap operating switches (12 and 13) from switch mounting arm (15). DO NOT disconnect electrical wiring at switches.
3. Remove knob from control lever (11).
4. Remove remaining items by removing bolt (18). Use care not to drop parts into tunnel area.
5. Reverse the preceding steps for reinstallation. Do not overtighten bolt (18) causing lever (11) to bind. Rig system in accordance with paragraphs 7-18 and 7-19.



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

REFER TO FIGURE 7-3
FOR FOLLOW-UP SYSTEM

Detail A

NOTES

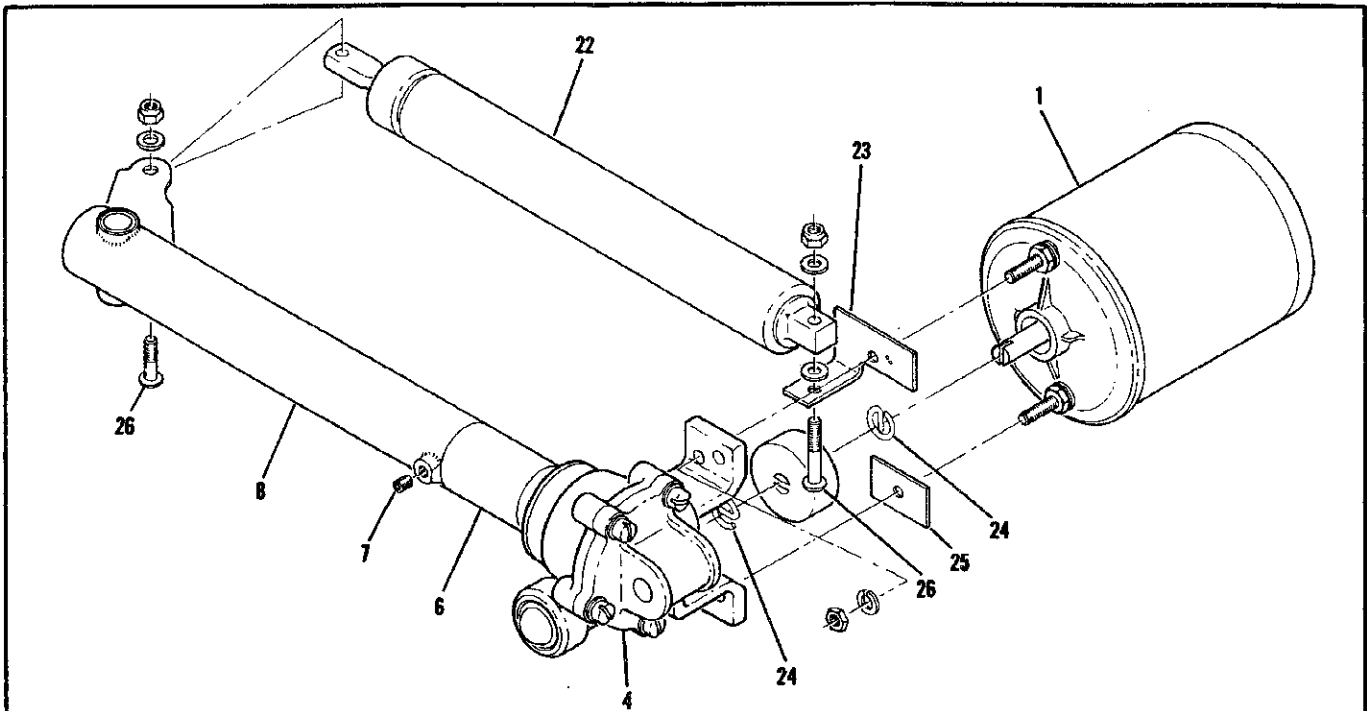
Use Loctite Sealant, Grade "C" on threads of set-screw (7) after final adjustment.

Ensure shortest end of hinge (2) is at top.

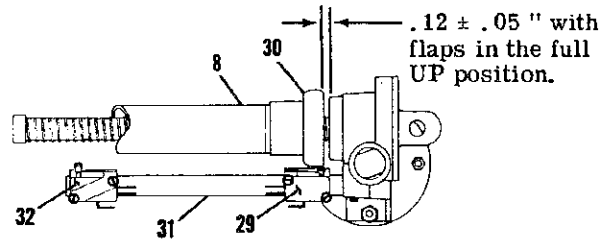
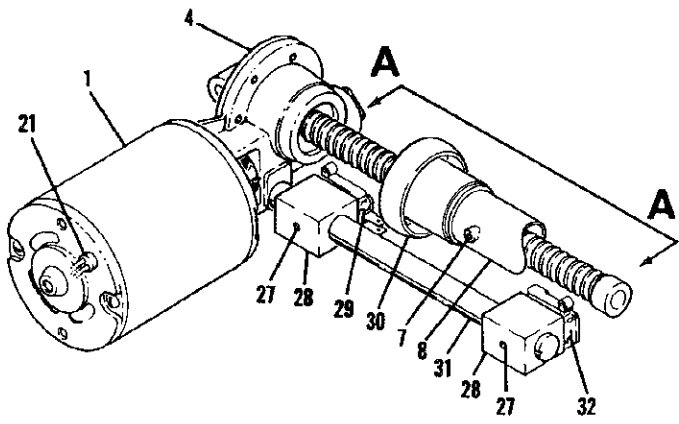
*Beginning with aircraft serials 18259992 and A182-0117.

AIRCRAFT SERIALS 18259306 THRU 18260698
AND A182-0117 THRU A182-0136 WHEN NOT
MODIFIED IN ACCORDANCE WITH SK150-37

Figure 7-2. Flap Motor and Transmission Assembly (Sheet 1 of 3)



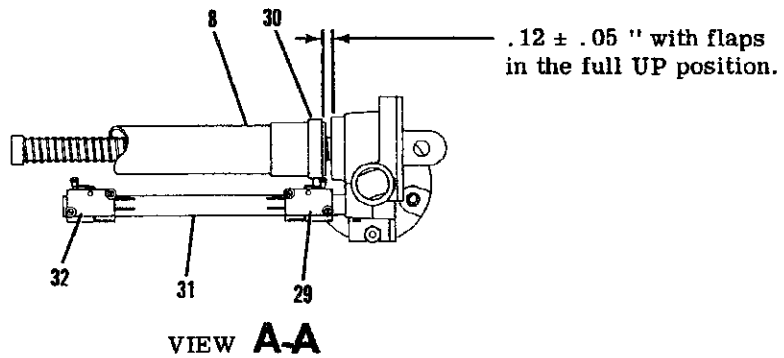
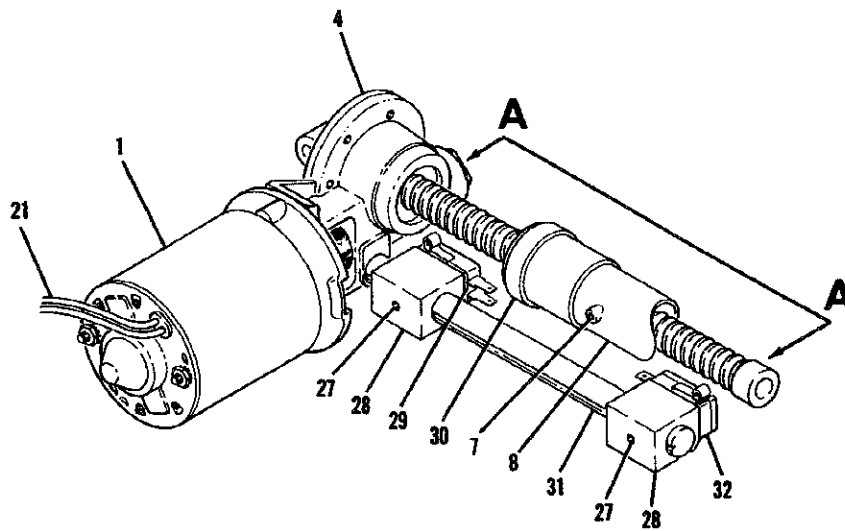
AIRCRAFT SERIALS 18259306 THRU 18260698
 AND A182-0117 THRU A182-0136 WHEN MOD-
 IFIED IN ACCORDANCE WITH SK150-37



VIEW A-A

BEGINNING WITH AIRCRAFT SERIALS
 18260699 AND A182-0137

Figure 7-2. Flap Motor and Transmission Assembly (Sheet 2 of 3)



THIS FLAP ACTUATOR INSTALLATION IS EFFECTIVE FOR AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN USED AS A REPLACEMENT SPARE FOR SK150-37 OR PRODUCTION FLAP ACTUATOR INSTALLATIONS PRIOR TO AIRCRAFT SERIALS 18260699 AND A182-0137

Figure 7-2. Flap Motor and Transmission Assembly (Sheet 3 of 3)

b. **BEGINNING WITH AIRCRAFT SERIALS 182-60446 AND A182-0137.** (Refer to figure 7-3, sheet 2.)

1. Remove follow-up control torque tube (32) from switch mounting arm (15).

2. Remove flap operating switches (12 and 13) from switch mounting arm (15). **DO NOT** disconnect electrical wiring at switches.

3. Remove knob (34) from control lever (11).

4. Remove remaining items by removing bolt (18). Use care not to drop parts into tunnel area.

5. Reverse the preceding steps for reinstallation. Do not overtighten bolt (18) causing lever (11) to bind. Rig system in accordance with paragraphs 7-18 and 7-19.

7-10. **DRIVE PULLEY.** (Refer to figure 7-2.)

7-11. **REMOVAL AND INSTALLATION.**

a. Remove access plates adjacent to drive pulley (17) in right wing.

b. Unzip or remove headliner as necessary for access to turnbuckles (index 10, figure 7-1), remove safety wire and loosen turnbuckles.

c. Remove bolt (16) securing flap push-pull rod (12) to drive pulley (17) and lower **RIGHT** flap gently.

d. Remove bolt (18) securing actuating tube (8) to drive pulley (17) and lower **LEFT** flap gently. Retain bushing.

e. Remove cable locks (11) securing control cables to drive pulley (17). Tag cables for reference on reinstallation.

f. **THRU AIRCRAFT SERIALS 18260445 AND A182-0136.** Remove bolt (9) attaching follow-up control bellcrank (15) to drive pulley (17).

g. Remove bolt (10) attaching drive pulley (17) to wing structure.

h. 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.

i. To remove left wing drive pulley, use this same procedure omitting steps "d" and "f."

j. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraphs 7-18 and 7-19, safety turnbuckles and reinstall all items removed for access.

7-12. **REPAIR.** Repair is limited to replacement of bearings. Cracked, bent or excessively worn drive pulleys must be replaced. Lubricate drive pulley bearings as outlined in Section 2.

7-13. **FLAPS.** (Refer to figure 7-4.)

7-14. **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, re-rigging of system should not be necessary. Check

flap travel and rig, if necessary, in accordance with paragraphs 7-18 and 7-19.

7-15. **REPAIR.** Flap repair may be accomplished in accordance with instructions outlined in Section 18.

7-16. **CABLES AND PULLEYS.** (Refer to figure 7-1.)

7-17. **REMOVAL AND INSTALLATION.**

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

b. Remove safety wire, relieve cable tension, disconnect turnbuckles (10) and carefully lower **LEFT** flap.

c. Disconnect cables at drive pulleys, 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 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.

d. Reverse the preceding steps for reinstallation.

e. After cables are routed in position, install pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.

f. Re-rig flap system in accordance with paragraphs 7-18 and 7-19, safety turnbuckles and reinstall all items removed in step "a."

7-18. **RIGGING-FLAPS.** (Refer to figure 7-2.)

a. Unzip or remove headliner as necessary for access to turnbuckles (index 10, figure 7-1).

b. Remove safety wire, relieve cable tension, disconnect turnbuckles and carefully lower **LEFT** flap.

c. Disconnect push-pull rods (12) at drive pulleys (17) in both wings and lower **RIGHT** flap gently.

d. Disconnect actuating tube (8) from drive pulley (17).

NOTE

If control cables are not connected to left and right drive pulleys, actuating tube (8) and push-pull rods (12) must be disconnected before installing cables. If drive pulleys (17) are not installed, attach control cables before installing drive pulleys in the wings as illustrated in figure 7-5.

e. The 3/32 inch retract cable connects to the forward side of the right drive pulley and to the aft side of the left drive pulley. The 1/8 inch direct cable connects to the aft side of the right drive pulley and to the forward side of the left drive pulley.

f. Adjust both push-pull rods (12) 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.

THRU AIRCRAFT SERIALS
18260445 AND A182-0136

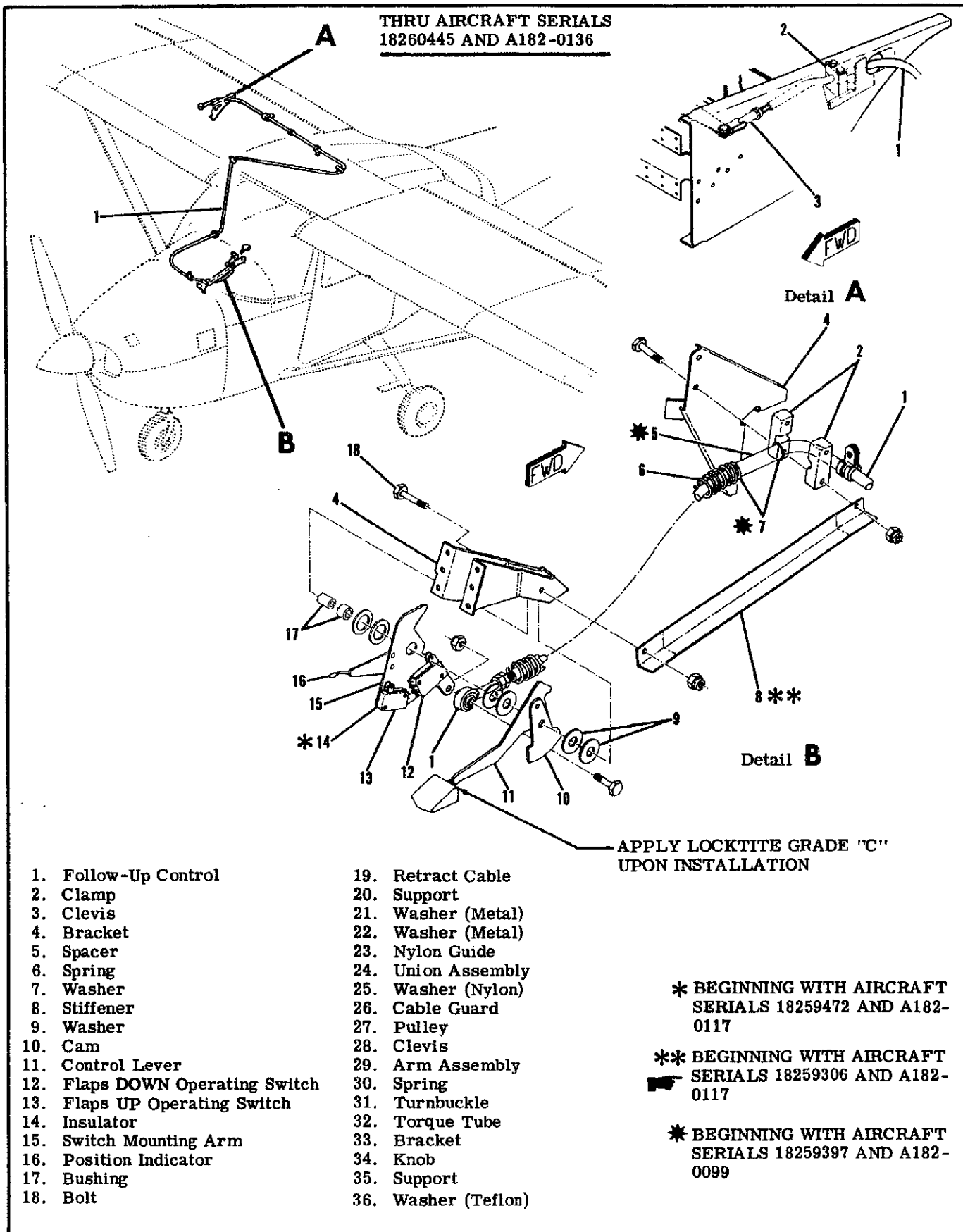


Figure 7-3. Flap Control Lever and Follow-Up Installation (Sheet 1 of 2)

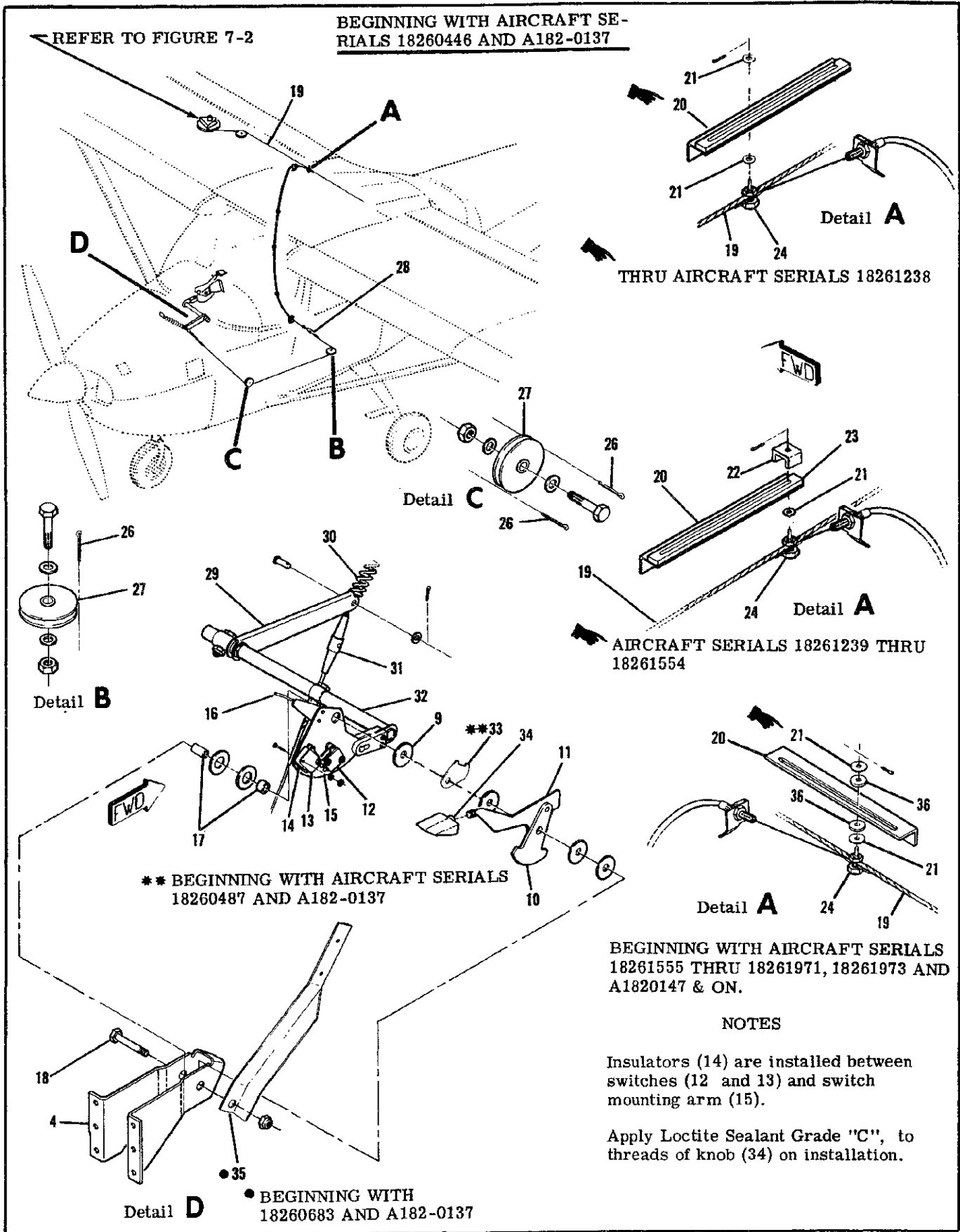


Figure 7-3. Flap Control Lever and Follow-Up Installation (Sheet 2 of 2)

NOTE

Temporarily connect cables at turnbuckles (index 10, 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. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN NOT MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Screw actuating tube (8) IN toward transmission (4) by hand to its shortest length (flaps full up position). Loosen setscrew (7) securing actuating tube (8) to nut and ball assembly (6), hold nut and ball assembly so that it will not move, hold RIGHT flap in the full UP position and adjust actuating tube (8) IN or OUT as necessary to align with attachment hole in drive pulley (17). Tighten set screw (7) and secure tube to drive pulley with bolt (18).

h. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 WHEN MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Operate flap motor until actuating tube (8) is IN to its shortest length (flaps full up position). Hold RIGHT flap in the full UP position and check actuating tube (8) to drive pulley (17) attachment holes for alignment. Operate flap motor toward the DOWN position until bolt (18) can be installed freely. Loosen setscrew (7) and rotate nut and ball assembly (6) IN against transmission (4). Tighten setscrew (7) and bolt (18).

i. BEGINNING WITH AIRCRAFT SERIALS 182-60699 AND A182-0137 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Screw actuating tube (8) IN toward transmission (4) by hand to .12±.05 inches between switch actuating collar (30) and transmission as illustrated in VIEW A-A. Loosen setscrew (7) securing actuating tube (8) to switch actuating collar (30), hold actuating collar to maintain .12±.05", hold RIGHT flap in the full UP position and adjust actuating tube (8) IN or OUT as necessary to align with attachment hole in drive pulley (17). Tighten setscrew (7) in accordance with procedures outlined in the following note and secure tube to drive pulley with bolt (18).

NOTE

Thru Aircraft Serial 18262541 and beginning with A182-0136: Tighten setscrew (7). Aircraft Serials 18262542 thru 18262544, 18262546 thru 18263011: Apply grade CV sealant to setscrew (7) threads and torque to 45 lb-in. Beginning with Aircraft Serial 18263012: Apply grade CV sealant to setscrew (7) threads and torque to 60 lb-in.

If actuating tube (8) is too long to allow attachment to drive pulley after completion

of steps "g", "h" and "i", proceed to step "j".

j. Disconnect push-pull rod (12) at drive pulley (17), then connect actuating tube (8) to drive pulley.

k. Manually hold RIGHT flap in full UP position and readjust push-pull rod (12) 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. Mount an inclinometer on trailing edge of RIGHT flap.

NOTE

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

m. AIRCRAFT SERIALS 18259306 THRU 18260698 AND A182-0117 THRU A182-0136 AND ALL AIRCRAFT NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3.

1. With RIGHT flap in full UP position, adjust UP-LIMIT switch (20) to operate and shut-off electrical power to motor at degree of travel specified in figure 1-1.

2. Run RIGHT flap to DOWN position and adjust DOWN-LIMIT switch (19) to operate and shut-off electrical power to motor at degree of travel specified in figure 1-1.

n. BEGINNING WITH AIRCRAFT SERIALS 18260699 AND A182-0137 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3.

1. With RIGHT flap in full UP position, loosen setscrew (27) and slide UP-LIMIT switch (29) adjustment block (28) on support (30) to operate switch and shut-off electrical power to motor at degree of travel specified in figure 1-1. Tighten setscrew (27).

2. Run RIGHT flap to DOWN position and adjust DOWN-LIMIT switch (32) adjustment block (28) on support (31) to operate switch and shut-off electrical power to motor at degree of travel specified in figure 1-1. Tighten setscrew (27).

o. Run RIGHT flap to full UP position, manually hold LEFT flap full UP and connect control cables at turnbuckles (index 10, figure 7-1). Remove reference tags previously installed in step "f" as turnbuckles are connected.

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

NOTE

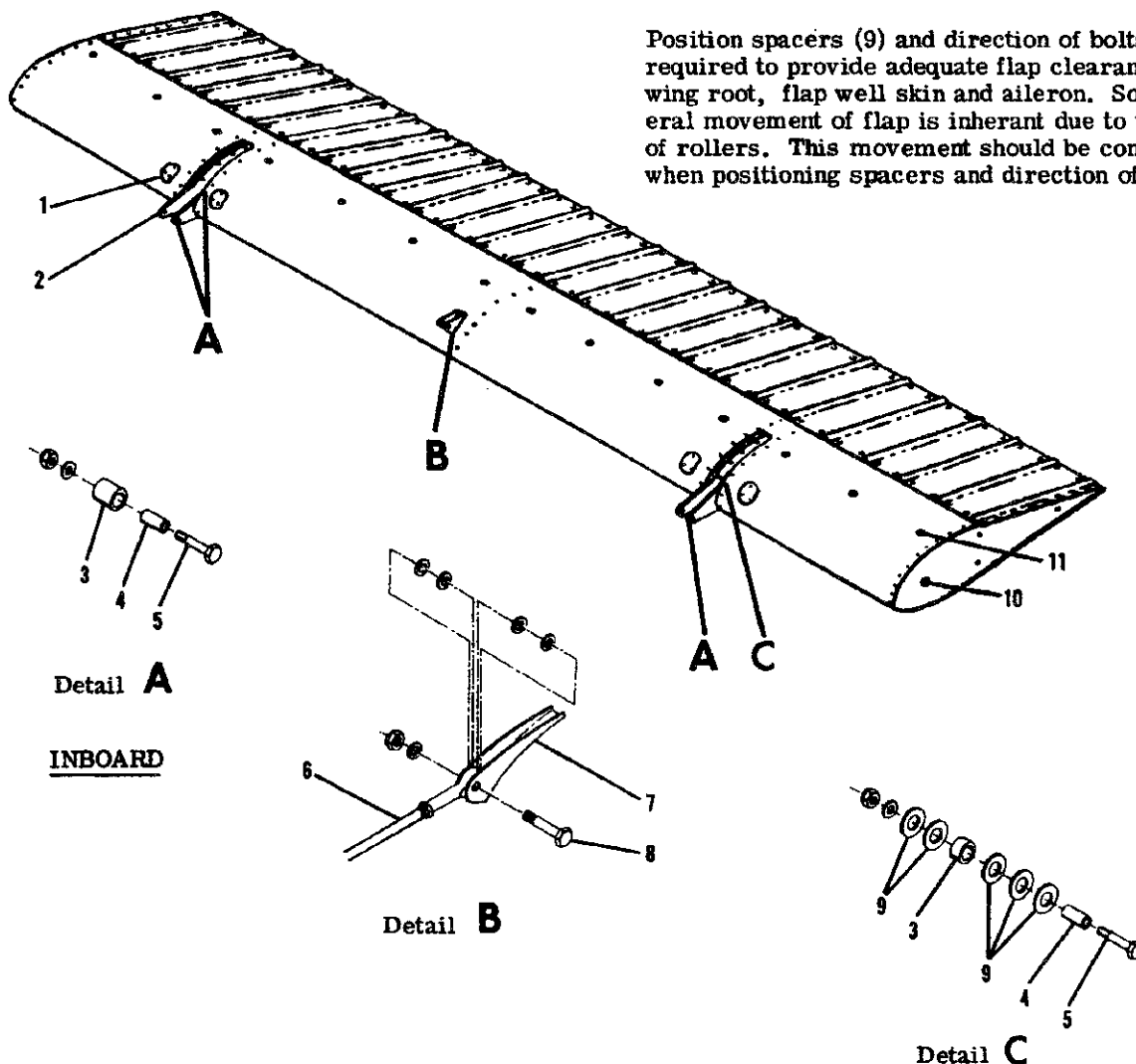
Ensure cables are positioned in pulley grooves and cable ends are positioned correctly at drive pulleys before tightening turnbuckles.

q. Disconnect push-pull rod at left drive pulley. Run motor to extend flaps approximately 20° and

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 inherent 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 7-4. Flap Installation

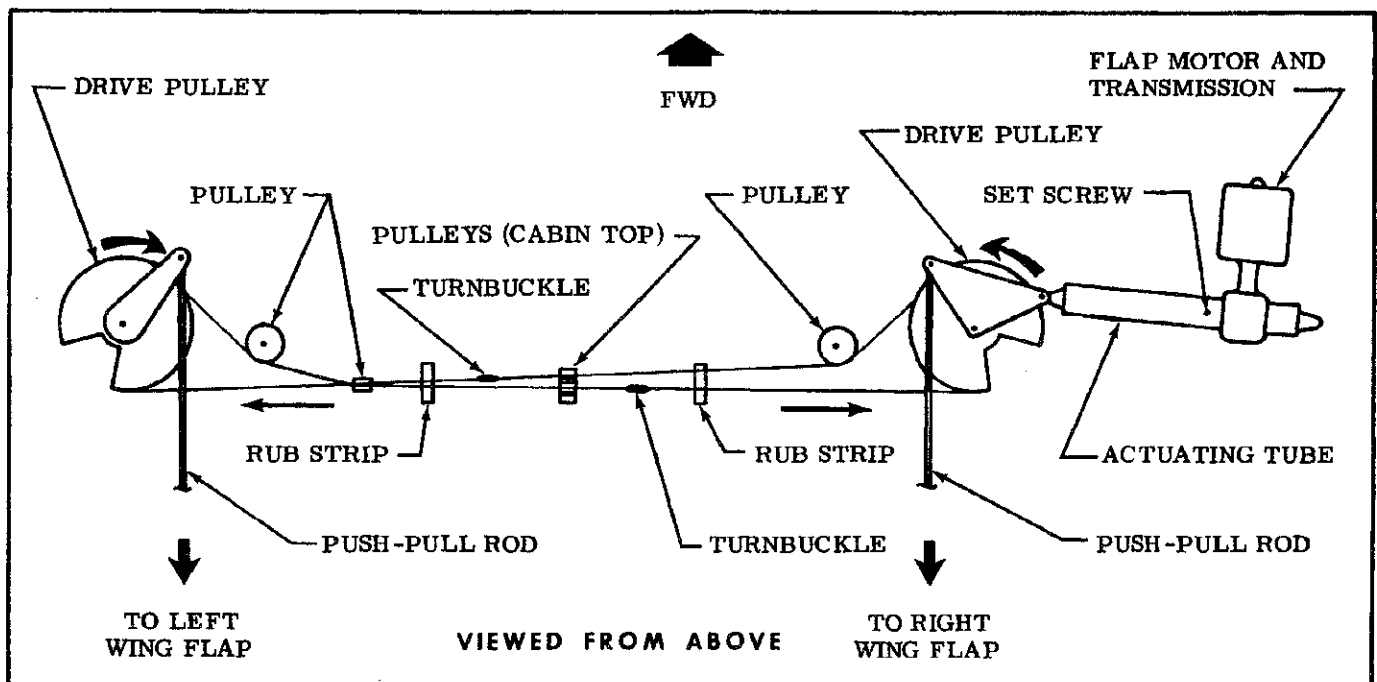


Figure 7-5. Flap System Schematic

check tension on each flap cable. If necessary, re-adjust turnbuckles to maintain 30 ± 10 pounds tension on each cable and safety turnbuckles.

r. 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.

s. After completion of steps "a" thru "r", operate flaps and check for positive shut-off of flap motor through several cycles. Check for specified flap travel with inclinometer mounted on each flap separately.

NOTE

Since the flap rollers may not bottom in the flap tracks with flaps fully extended, some free play may be noticed in this position.

7-19. RIGGING-FLAP CONTROL LEVER AND FOLLOW-UP.

a. THRU AIRCRAFT SERIALS 18260445 AND A182-0136. (Refer to figure 7-3, sheet 1.)

1. Disconnect follow-up control rod end (1) at switch mounting arm (15).

2. Move control lever (11) to full UP position, then without moving control lever, move switch mounting arm (15) until cam (10) is centered between switches (12 and 13). Adjust follow-up control rod end to align with the attaching hole in the switch mounting arm and secure rod end to mounting arm maintaining this position.

3. Adjust flaps DOWN operating switch (12) in slotted holes until switch roller just clears cam (10) and secure. This adjustment should provide flaps down operation to $10^\circ \pm 2^\circ$ and $20^\circ \pm 2^\circ$.

4. Adjust flaps UP operating switch (13) in slotted holes for .062 inch clearance between switch roller and cam (10) when the flaps DOWN operating switch has just opened in the 10° and 20° position.

NOTE

Flap travel on UP cycle may deviate a maximum of 4° from indicated position.

5. Turn master switch ON and run flaps through several cycles, stopping at various mid-range settings and checking that cable tension is within limits. Retract cable tension may increase to 90 pounds when flaps are fully retracted.

6. Check all rod ends and clevis ends for sufficient thread engagement, all jam nuts are tight and reinstall all items removed for access.

7. Flight test aircraft and check that follow-up control does not cause automatic cycling of flaps. If cycling occurs, readjust operating switches as necessary per steps 3 and 4.

b. BEGINNING WITH AIRCRAFT SERIALS 182-60446 AND A182-0137. (Refer to figure 7-3, sheet 2.)

1. Run flaps to full UP position.

2. Remove upholstery and headliner as necessary.

3. Secure follow-up control cable to retract cable (19) with union assembly (24). Ensure union assembly is at end of slot in support (20).

4. Pull all slack from follow-up control cable and with position indicator (16) in full UP position, connect turnbuckle (31) to follow-up cable.

5. Connect spring (30) to arm assembly (29).

6. Make minor cable length adjustments using turnbuckle (31) to position indicator at 0° flaps.

SECTION 8

ELEVATOR CONTROL SYSTEM

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Repair	8-2	Rigging	8-6

8-1. ELEVATOR CONTROL SYSTEM. (Refer to figure 8-1.)

8-2. DESCRIPTION. The elevators are operated by power transmitted through fore-and-aft movement of the pilot or copilot control wheels. The system is comprised of control columns, an elevator torque

tube, cables and pulleys. The elevator control cables, at their aft ends, are attached to a bellcrank mounted on a bulkhead in the tailcone. A push-pull tube connects this bellcrank to the elevator arm assembly, installed between the elevators. An elevator trim tab is installed in the trailing edge of 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.	Attach push-pull tube correctly.
	Cables disconnected.	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 bellcrank or arm assembly pivot bearings or push-pull tube attach bearings.	Replace defective parts.
	Cables slack.	Adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Route cables correctly over pulleys.
	Nylon grommet on instrument panel binding.	Replace grommet.
	Defective control column bearing rollers.	Replace defective rollers.
	Defective control column torque tube bearings.	Replace defective bearings.
	Control guide on aft end of control square tube adjusted too tightly.	Loosen screw and tapered plug in end of control tube enough to eliminate binding.
	Defective elevator hinges.	Replace defective hinges.
	Defective pulleys or cable guards.	Replace defective parts and install guards properly.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	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. CONTROL COLUMN. (Refer to figure 6-2.)
Section 6 outlines removal, installation and repair of control column.

8-5. ELEVATORS. (Refer to figure 8-2.)

8-6. REMOVAL AND INSTALLATION.

- a. Remove stinger.
- b. Disconnect trim tab push-pull tube (6) at tab actuator.

NOTE

If trim system is not moved and actuator screw is not turned, re-rigging of trim system should not be necessary after re-installation of elevator.

- c. Remove bolts (13) securing elevator torque tubes (3) to arm assembly (4).
- d. Remove bolts (14) from elevator hinges.

- e. Using care, remove elevator.
- f. To remove left elevator use same procedure, omitting step "b".
- g. Reverse the preceding steps for reinstallation.

8-7. REPAIR. Repair may be accomplished as outlined in Section 18. Hinge bearings may be replaced as necessary. If repair has affected static balance, check and rebalance as required.

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

8-9. REMOVAL AND INSTALLATION.

- a. Remove access plate below bellcrank on tailcone.

CAUTION

Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

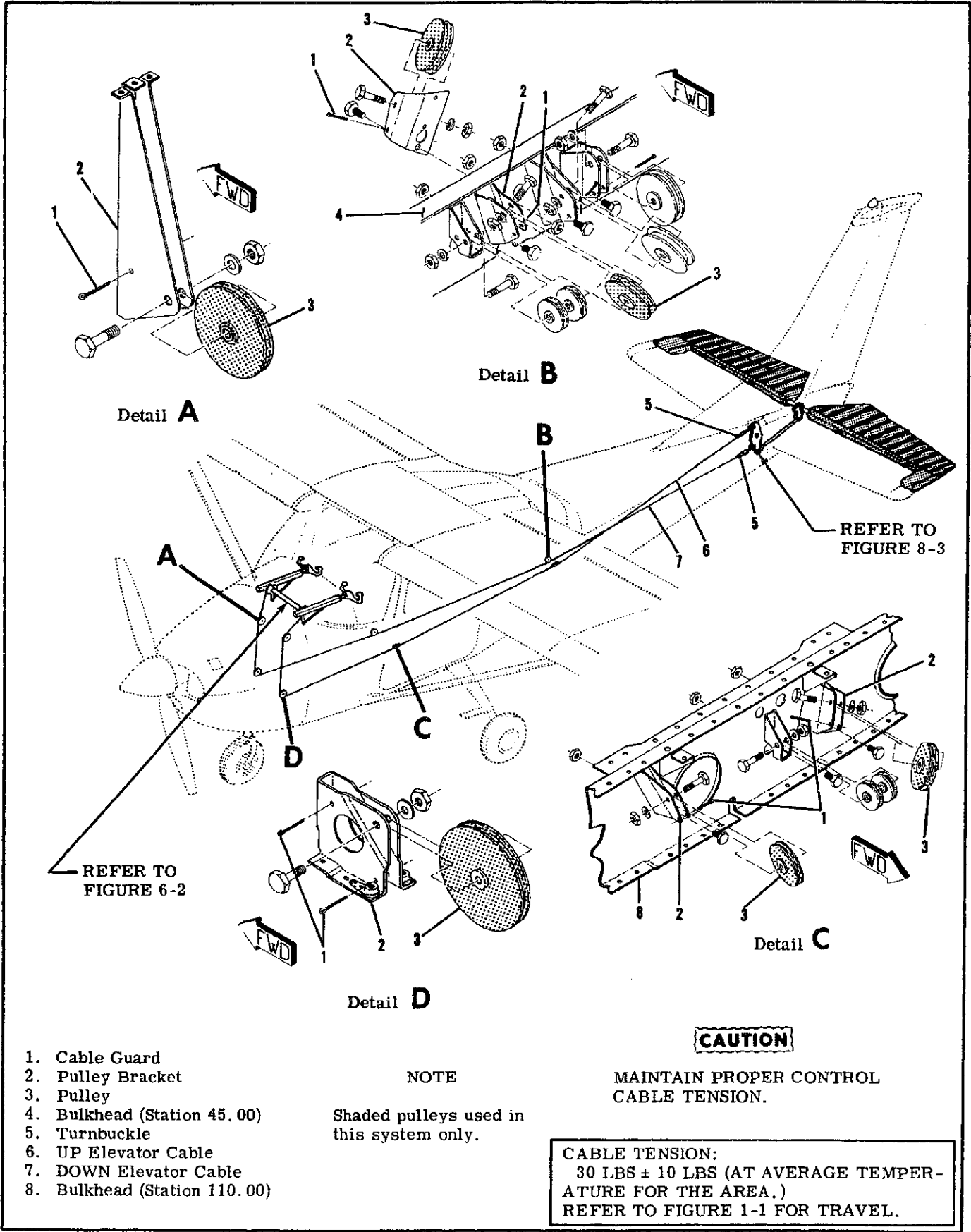
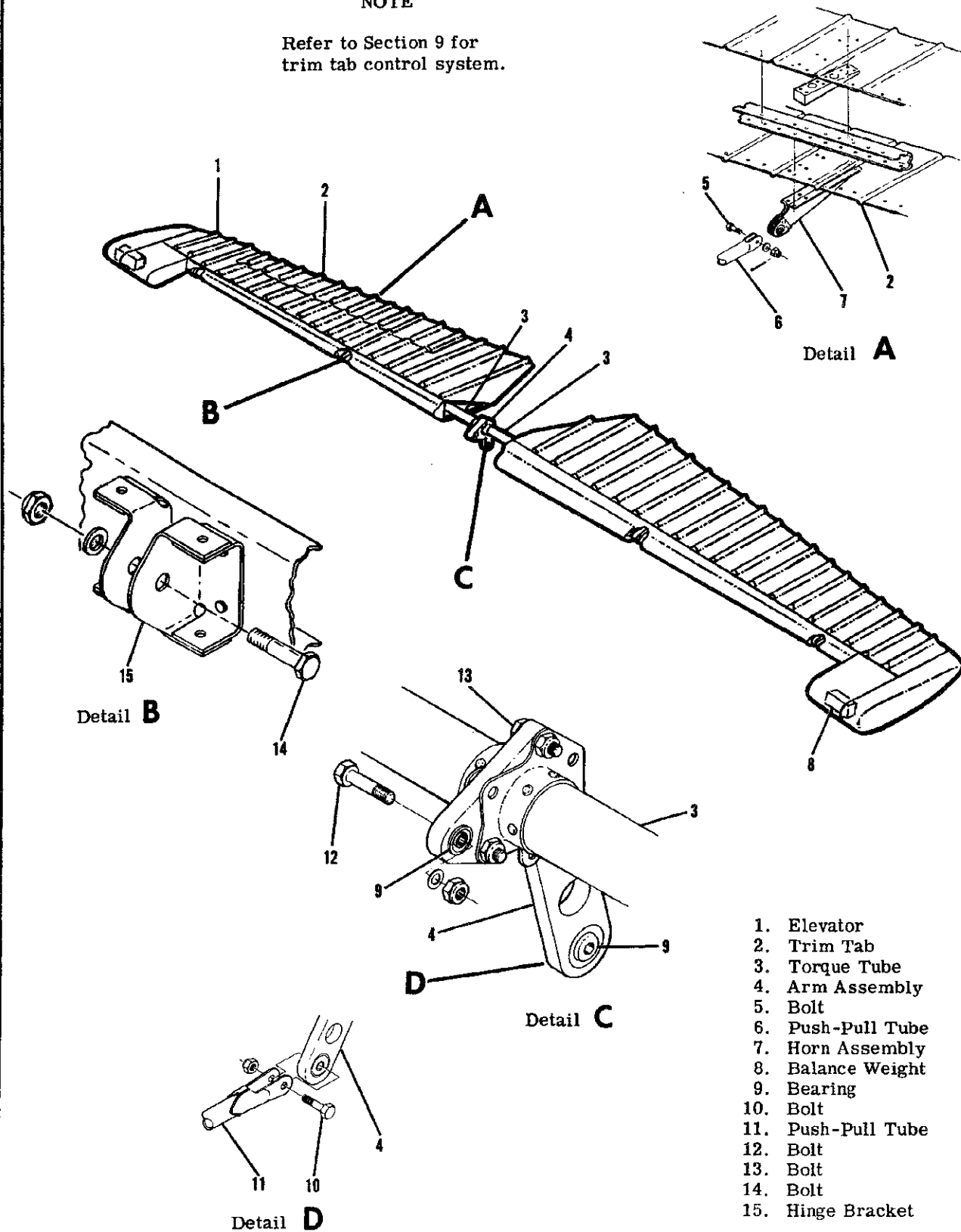


Figure 8-1. Elevator Control System

NOTE

Refer to Section 9 for trim tab control system.



- 1. Elevator
- 2. Trim Tab
- 3. Torque Tube
- 4. Arm Assembly
- 5. Bolt
- 6. Push-Pull Tube
- 7. Horn Assembly
- 8. Balance Weight
- 9. Bearing
- 10. Bolt
- 11. Push-Pull Tube
- 12. Bolt
- 13. Bolt
- 14. Bolt
- 15. Hinge Bracket

Figure 8-2. Elevator Installation

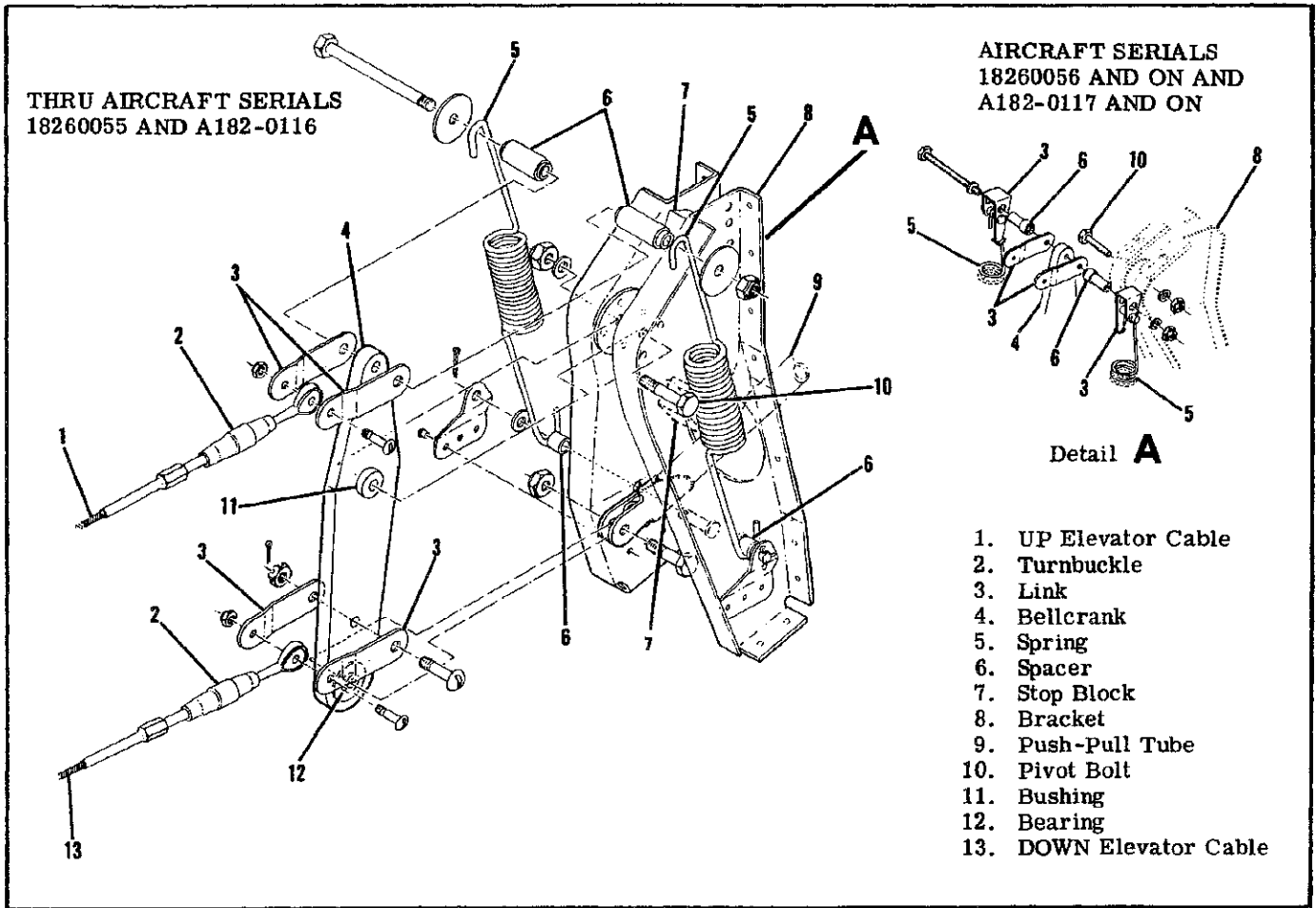


Figure 8-3. Elevator Bellcrank Installation

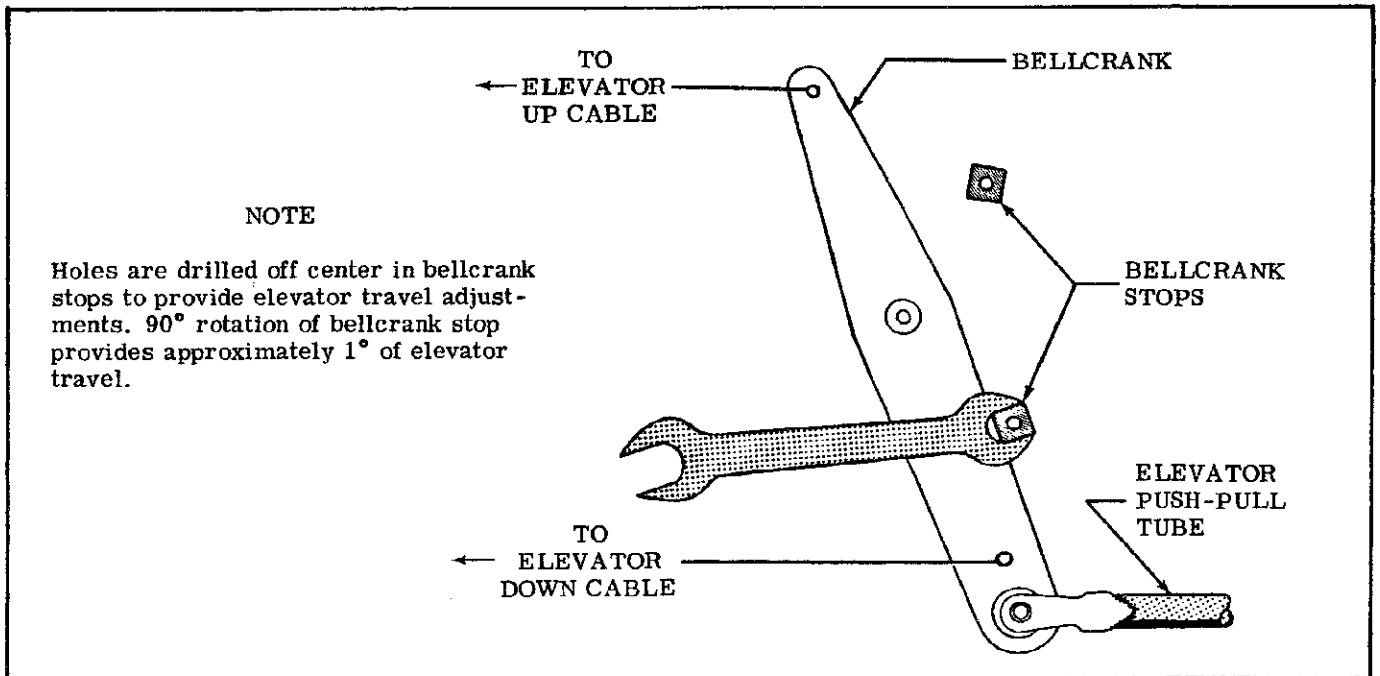


Figure 8-4. Elevator Bellcrank Travel Stop Adjustment

- b. Remove safety wire, relieve cable tension at turnbuckles (2) and disconnect turnbuckle eyes at bellcrank links (3).
- c. Disconnect elevator down-springs (5) at bellcrank (4).
- d. Disconnect push-pull tube (9) at bellcrank (4).
- e. Remove pivot bolt (10) attaching bellcrank (4) to brackets (8). Remove bellcrank.
- f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed for access.

8-10. ARM ASSEMBLY. (Refer to figure 8-2.)

8-11. REMOVAL AND INSTALLATION.

- a. Remove stinger.
- b. Remove bolt (10) securing push-pull tube (11) to arm assembly (4).
- c. Remove bolts (13) attaching elevator torque tubes (3) to arm assembly (4).
- d. Remove pivot bolt (12) securing arm assembly (4) and slide assembly from between elevator torque tubes.
- e. Reverse the preceding steps for reinstallation and reinstall all items removed for access.

8-12. CABLES AND PULLEYS. (Refer to figure 8-1.)

8-13. REMOVAL AND INSTALLATION.

CAUTION

Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

- a. Remove seats, upholstery and access plates as necessary.
- b. Remove safety wire and relieve cable tension at turnbuckles (5).
- c. Disconnect cables at control column arm assemblies (index 18, figure 6-2).
- d. Disconnect cables at bellcrank links (index 3, figure 8-3).
- 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 the end of cable being withdrawn from aircraft. Leave wire in

place, routed through structure; then attach the 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. Re-rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed in step "a".

8-14. RIGGING. (Refer to figure 8-3.)

CAUTION

Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

- a. Streamline elevators, mount an inclinometer on one elevator and set to 0°.

NOTE

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

- b. Adjust bellcrank stop blocks (7) at brackets (8) to degree of travel specified in figure 1-1.

NOTE

The bellcrank stop blocks (7) are four-sided bushings, drilled off-center so they may be rotated to any one of four positions to attain correct elevator travel. Each 90-degree rotation of the stop, changes the elevator travel approximately one degree.

- c. Adjust turnbuckles (2) equally to tension specified in figure 8-1.
- d. Check sponge at control column in both UP and DOWN positions and if necessary, readjust turnbuckles (2) to prevent the control column from hitting the instrument panel or firewall.
- e. Safety turnbuckles and reinstall all items removed for access.

WARNING

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

SHOP NOTES:

SECTION 9

ELEVATOR TRIM TAB CONTROL SYSTEM

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9-1. ELEVATOR TRIM TAB CONTROL SYSTEM.

9-2. DESCRIPTION. The elevator trim tab, located on the trailing edge of 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 roller chains, cables, an actuator and a push-pull tube. A mechanical pointer, adjacent to the trim wheel indicates tab position. A "nose-up" setting results in a tab-down position. Beginning with serial 18264296, an electric trim assist system may be installed. This system is described in paragraph 9-15.

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. Install cables correctly.
	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 9-1, sheet 2.)

CAUTION

9-5. REMOVAL AND INSTALLATION.

a. Disconnect push-pull tube (16) from horn assembly (17).

Position a support stand under the tail tie-down ring to prevent tailcone from dropping while working inside.

NOTE

If trim system is not moved and actuator screw is not turned, re-rigging of system should not be necessary after installation of tab.

b. Drill out rivets securing trim tab hinge to elevator and remove trim tab.

- b. Disconnect push-pull tube (16) at actuator (12).
- c. Remove access plate beneath actuator.
- d. Remove chain guard (11) and disengage chain from actuator sprocket (8).
- e. Remove screws attaching clamps (13) to bracket (10) and remove actuator (12) through access opening.
- f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-14, safety turnbuckle and reinstall all items removed for access.

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 the preceding steps for reinstallation. Rig system if necessary in accordance with paragraph 9-14.

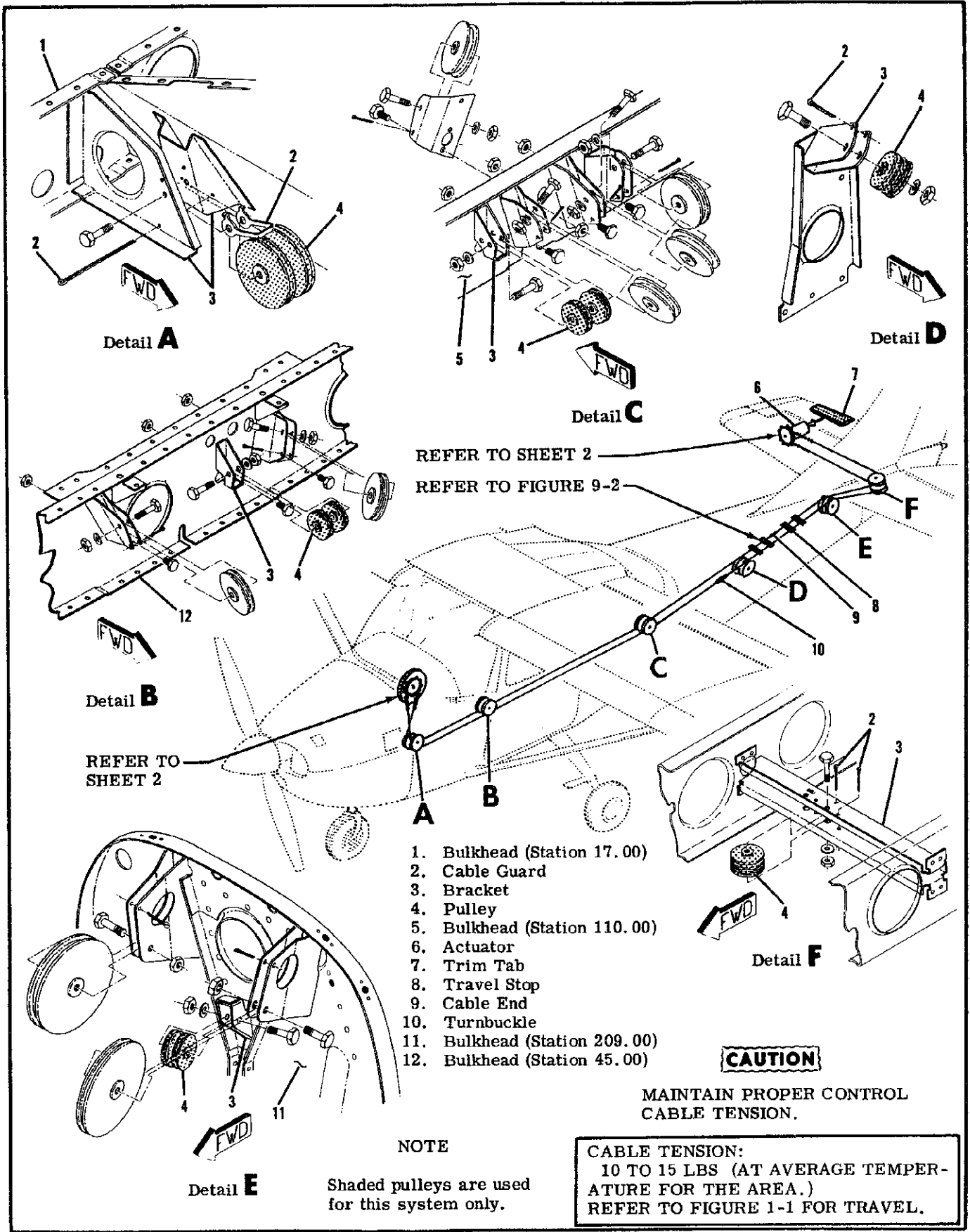
9-7A. DISASSEMBLY. (Refer to figure 9-2A.)

- 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 roll 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 roll 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).

9-6. TRIM TAB ACTUATOR. (Refer to figure 9-1, sheet 2.)

9-7. REMOVAL AND INSTALLATION.

a. Relieve cable tension at turnbuckle (index 10, figure 9-1, sheet 1).



Detail A

Detail D

Detail C

Detail B

Detail F

Detail E

REFER TO SHEET 2
REFER TO FIGURE 9-2

REFER TO SHEET 2

- 1. Bulkhead (Station 17.00)
- 2. Cable Guard
- 3. Bracket
- 4. Pulley
- 5. Bulkhead (Station 110.00)
- 6. Actuator
- 7. Trim Tab
- 8. Travel Stop
- 9. Cable End
- 10. Turnbuckle
- 11. Bulkhead (Station 209.00)
- 12. Bulkhead (Station 45.00)

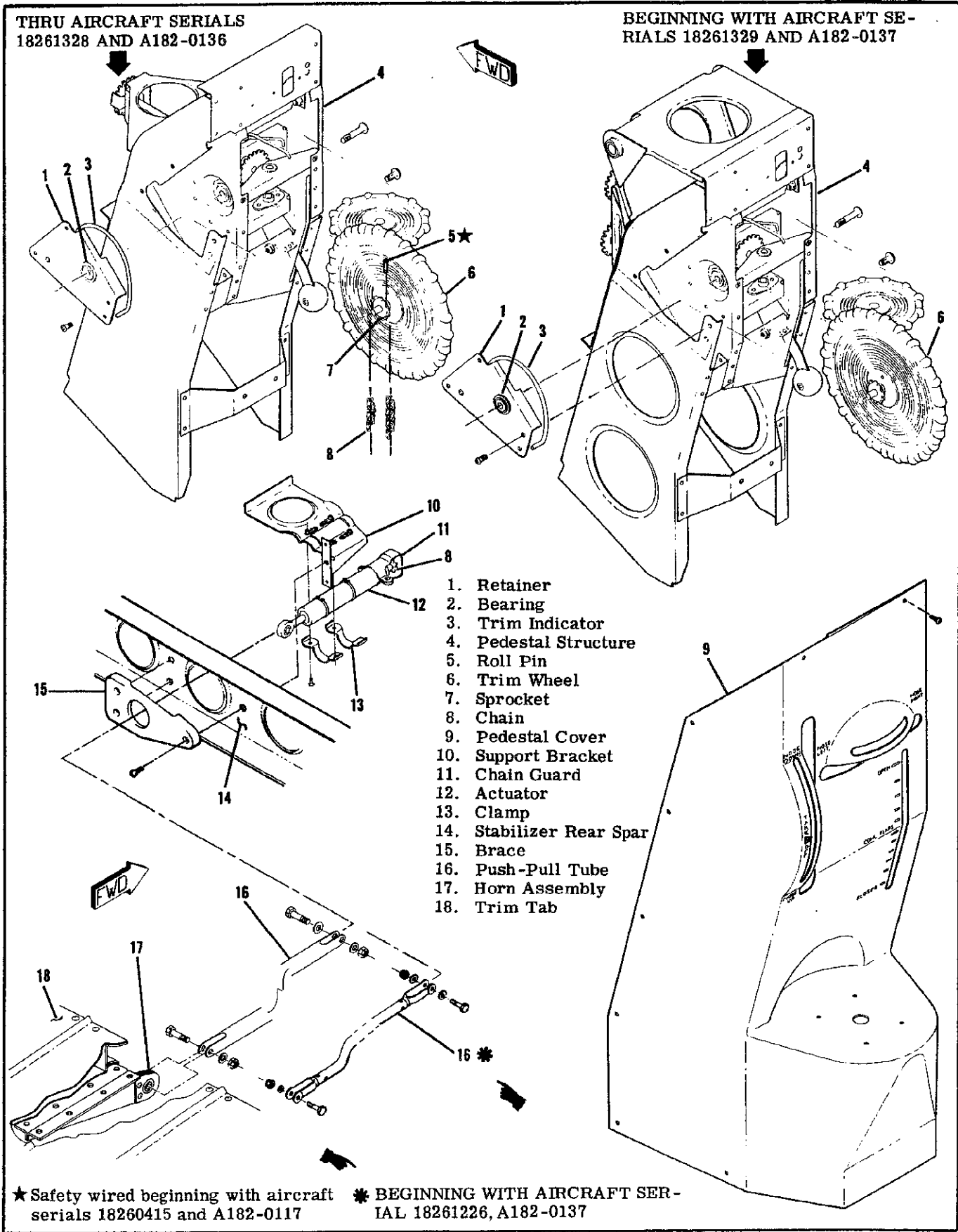
CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

NOTE
Shaded pulleys are used for this system only.

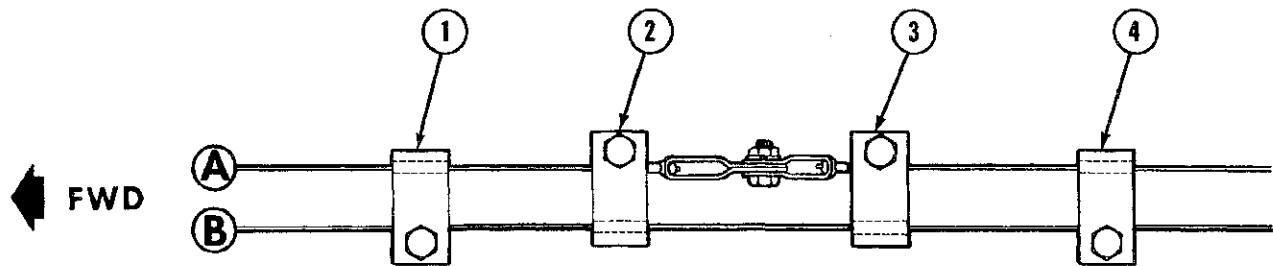
CABLE TENSION:
10 TO 15 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 9-1. Elevator Trim Tab Control System (Sheet 1 of 2)



★ Safety wired beginning with aircraft serials 18260415 and A182-0117 * BEGINNING WITH AIRCRAFT SERIAL 18261226, A182-0137

Figure 9-1. Elevator Trim Tab Control System (Sheet 2 of 2)



1. With elevators in neutral, set trim tab to neutral (streamlined).
2. Position stop blocks (2 and 3) against cable ends and secure to cable A.
3. Place inclinometer on trim tab and lower to degree specified in figure 1-1.
4. Position stop block (4) against stop block (3) and secure to cable B.
5. Raise trim tab to specified degree, place stop block (1) against stop block (2) and secure to cable B.

Figure 9-2. Elevator Trim Tab Travel Stop Adjustment

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).

9-7B. 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	0.370" MIN.
INSIDE DIAMETER	0.373" 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.

9-7C. REASSEMBLY. (Refer to figure 9-3.)

- a. Always discard the following items and install new parts during reassembly.
 1. Bearings (6 and 14)
 2. Roll Pins (8 and 10)
 3. O-Ring (13)
 4. Nuts (2).
- b. During reassembly, lubricate collars (7), screw (9) and threaded rod end (15) in accordance with Section 2.
- c. Press sprocket (5) into the end of screw (9), align roll pin holes and install new roll pins (8).
- d. Slip bearing (6) and collar (7) on screw (9) and slide them down against sprocket (5).
- e. Insert screw (9), with assembled parts, into housing (12) until bearing (6) is flush with the 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 roll 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 roll 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 paragraph 9-7.

9-7D. 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 .163" (total motion up and down) measured at the trim tab trailing edge is permissible.
- d. If the trim tab free-play is less than .163", the system is within prescribed limits.
- e. If the trim tab free-play is more than .163", check the following items for looseness while moving the trim tab up and down.
 1. Check push-pull tube to trim tab horn assembly attachment for looseness.
 2. Check push-pull tube to actuator assembly threaded rod end attachment for looseness.
 3. Check actuator assembly threaded rod end for looseness in the actuator assembly with push-pull tube disconnected.
 - 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 9-7C. Recheck trim tab free-play.

9-8. TRIM TAB CONTROL WHEEL. (Refer to figure 9-1, sheet 2.)

9-9. REMOVAL AND INSTALLATION.

- a. Relieve cable tension at turnbuckle (index 10, figure 9-1, sheet 1).

CAUTION

Position a support stand under the tail tie-down ring to prevent tailcone from dropping while working inside.

- b. Remove pedestal cover (9) in accordance with paragraph 9-13.
- c. Remove screws attaching control wheel retainer (1) to left side of pedestal structure (4).
- d. Remove retainer (1) and indicator (3), using care not to drop control wheel (6).
- e. Disengage roller chain (8) from sprocket (7) and remove control wheel (6).

NOTE

Removal of the sprocket (7) from control wheel shaft is not recommended except for replacement of parts.

- f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-14, safety turnbuckle and reinstall all items removed for access.

9-10. CABLES AND PULLEYS. (Refer to figure 9-1, sheet 1.)

9-11. REMOVAL AND INSTALLATION.

- a. Remove seats, upholstery, pedestal cover and access plates as necessary.

CAUTION

Position a support stand under the tail tie-down ring to prevent tailcone from dropping while working inside.

- b. Remove travel stop blocks (8) from control cables.
- c. Disconnect control cables at turnbuckles (10) and at cable ends (9).
- d. Remove cable guards and pulleys as necessary to work cables free of aircraft. Disengage roller chains from sprockets to ease cable removal.

NOTE

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

- e. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards. Ensure roller chains are positioned correctly over sprockets.
- f. Re-rig system in accordance with paragraph 9-14, safety turnbuckle and reinstall all items removed in step "a."

9-12. PEDESTAL COVER. (Refer to figure 9-1, sheet 2.)

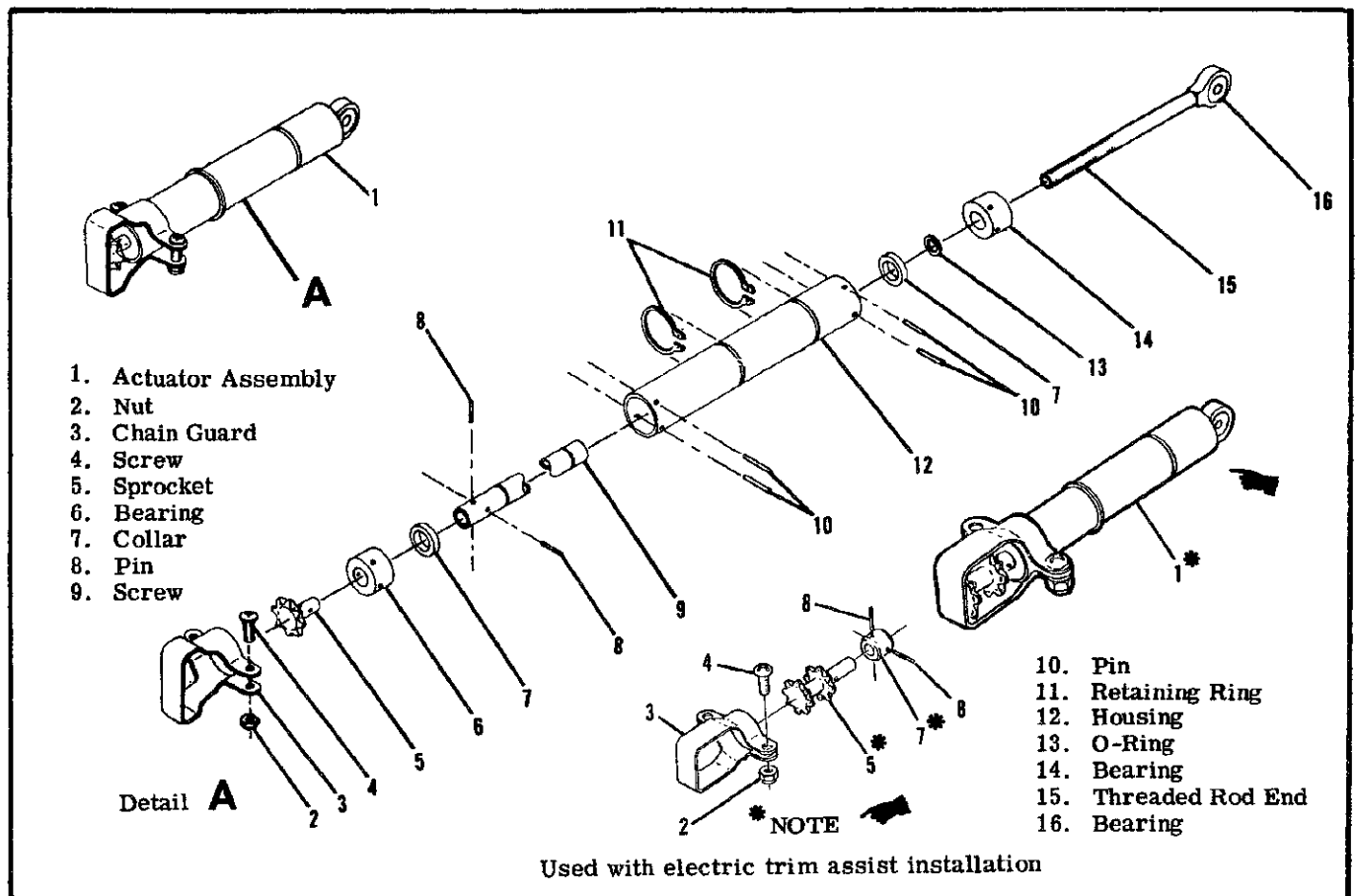


Figure 9-2A Elevator Trim Tab Actuator Assembly

9-13. REMOVAL AND INSTALLATION.

- a. Remove fuel selector valve handle and placard.
- b. Remove mike and remove mike mounting bracket.
- c. Remove cowl flap control knob.
- d. Disconnect electrical wiring to pedestal lights.
- e. Remove screws securing pedestal cover to structure and remove cover.
- f. Reverse the preceding steps for reinstallation.

9-14. RIGGING. (Refer to figure 9-1, sheet 1.)

CAUTION

Position a support stand under the tail tie-down ring to prevent tailcone from dropping while working inside.

- a. Remove rear baggage compartment wall and access plates as necessary.
- b. Loosen travel stop blocks (8) on trim tab cables.
- c. Disconnect push-pull tube from actuator (6).
- d. Check cable tension and readjust turnbuckle (10) if necessary.

NOTE

If chains and/or cables are being installed, permit actuator screw to rotate freely as chains and cables are connected. Adjust cable tension and safety turnbuckle (10).

- e. (Refer to figure 9-1, sheet 2.) Rotate trim control wheel (6) full forward (nose down). Ensure pointer (3) 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 the chain or cable ends contacting sprockets or pulleys.

- f. With elevator and trim tab both in neutral (streamlined), mount an inclinometer on tab and set to 0°. Disregard counterweight areas of elevators when streamlining. These areas are contoured so they will be approximately 3° down at cruising speed.

NOTE

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

- g. Rotate actuator screw in or out as required to place trim tab up with a maximum of 2° overtravel, with actuator screw connected to push-pull tube (16).

h. Rotate trim wheel to position trim tab up and down, readjusting actuator screw as required to obtain overtravel in both directions.

i. Position stop blocks and adjust as illustrated in figure 9-2 to degree of trim tab travel specified in figure 1-1.

j. Install pedestal cover and adjust trim tab pointer to the center of the "TAKE-OFF" triangle with the trim tab set at 0°.

k. Safety turnbuckle and reinstall all items removed in step "a."

WARNING

Be sure trim tab moves in correct direction when operated by the trim control wheel. Nose down trim corresponds to tab up position.

9-15. ELECTRIC ELEVATOR TRIM INSTALLATION BEGINNING WITH SERIAL 18264296. (Refer to figure 9-3.)

9-16. DESCRIPTION. An electric elevator trim assist system may be installed consisting of 2 switches mounted on the pilot's control wheel, a circuit breaker mounted in the center instrument pedestal, fuselage wiring running aft to the 12 Volt D. C.

electric drive assembly and a chain connecting the drive assembly to an additional sprocket mounted on the standard elevator trim actuator. The electric drive assembly includes a motor, sprockets and a chain driven solenoid type adjustable clutch. The electric drive assembly chain connects to the FORWARD sprocket of the trim tab actuator while the manual trim chain connects to the AFT sprocket of the actuator. When the clutch or the drive assembly is not energized, the drive assembly "free wheels" and, therefore, has no effect on manual operation.

9-17. TROUBLE SHOOTING.

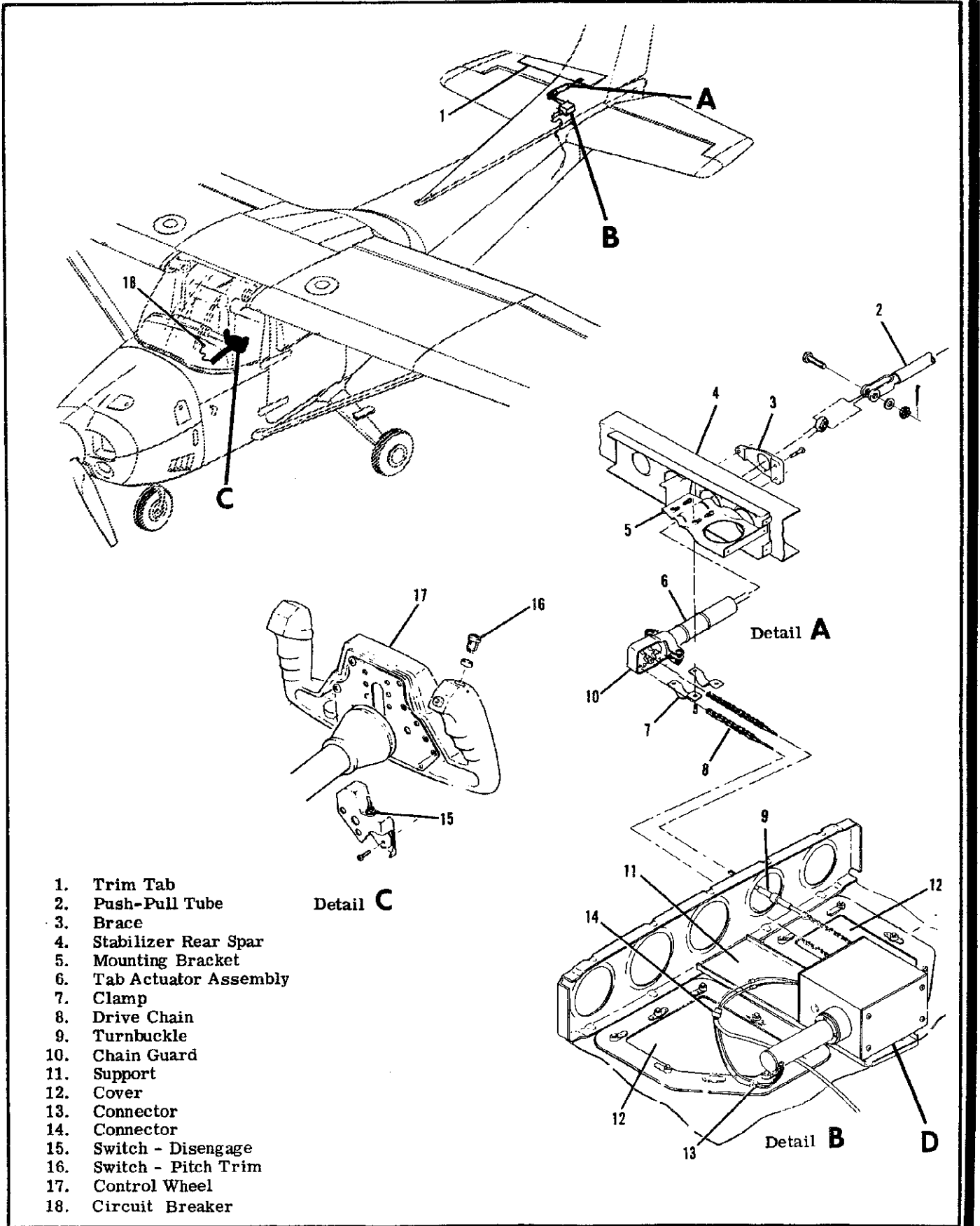
TROUBLE	PROBABLE CAUSE	REMEDY
SYSTEM INOPERATIVE.	Circuit breaker out.	Check visually. Reset breaker.
	Defective circuit breaker.	Check continuity. Replace defective breaker.
	Defective wiring.	Check continuity. Repair wiring.
	Defective trim switch.	Check continuity. Replace defective switch.
	Defective trim motor.	Remove and bench test. Replace defective motor.
TRIM MOTOR OPERATING - TRIM TAB FAILS TO MOVE.	Defective clutch solenoid.	Check continuity. Replace solenoid.
	Improperly adjusted clutch tension.	Check and adjust spanner nuts for proper tension.
	Disconnected or broken cable.	Operate manual trim wheel. Connect or replace cable.
	Defective actuator.	Check actuator operation. Replace actuator.

9-18. REMOVAL AND INSTALLATION. (Refer to figure 9-3.)

- a. Remove covers (12) beneath tab actuator assembly (6) and drive assembly.
- b. Disconnect electrical connectors (13 and 14) and relieve tension on drive chain (8) at turnbuckle (9).
- c. Remove chain guard (10) from tab actuator.
- d. Remove mounting bolts from drive assembly and tab actuator and remove units from the aircraft.
- e. Reverse preceding steps for reinstallation. Check system rigging in accordance with paragraph 9-20.
- f. Reinstall all items removed for access.

9-19. CLUTCH ADJUSTMENT. (Refer to figure 9-3.)

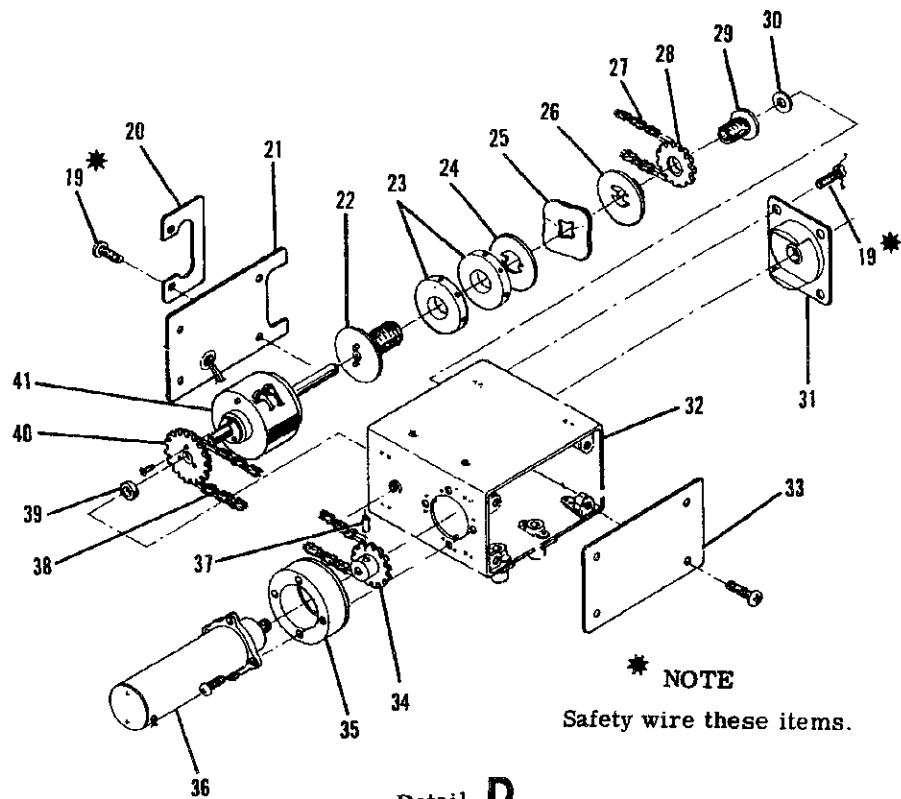
- a. Remove access covers (12) below drive assembly.
- b. Remove safety wire and relieve drive chain tension at turnbuckle (9).
- c. Disconnect electric motor by unplugging electrical connectors (13) leading to motor assembly.
- d. Remove mounting bolts from drive assembly. It is necessary to remove unit from aircraft to make necessary adjustments to clutch.



- 1. Trim Tab
- 2. Push-Pull Tube
- 3. Brace
- 4. Stabilizer Rear Spar
- 5. Mounting Bracket
- 6. Tab Actuator Assembly
- 7. Clamp
- 8. Drive Chain
- 9. Turnbuckle
- 10. Chain Guard
- 11. Support
- 12. Cover
- 13. Connector
- 14. Connector
- 15. Switch - Disengage
- 16. Switch - Pitch Trim
- 17. Control Wheel
- 18. Circuit Breaker

Figure 9-3. Electric Trim Installation (Sheet 1 of 2)

- 19. Screw
- 20. Rub Strip
- 21. Cover Assembly
- 22. Shaft Assembly
- 23. Nut
- 24. Washer
- 25. Spring Washer
- 26. Washer Assembly
- 27. Chain
- 28. Sprocket
- 29. Shaft
- 30. Washer
- 31. Mounting Plate Assembly
- 32. Housing
- 33. Cover
- 34. Sprocket
- 35. Mounting Plate
- 36. Motor
- 37. Pin
- 38. Chain
- 39. Bushing
- 40. Sprocket
- 41. Clutch Assembly



* NOTE
Safety wire these items.

Detail **D**

Figure 9-3. Electric Trim Installation (Sheet 2 of 2)

NOTE

Step 3 isolates the motor assembly from the remainder of the electric trim system so it cannot be engaged during clutch adjustment.

- e. Remove screws securing covers (20) and (21) to housing (32) and slide the cover down over electrical wiring far enough to expose the clutch assembly.
- f. Ensure the electric trim circuit breaker on the pedestal cover is pushed in and place master switch in ON position.
- g. Place disengage switch (15) in ON position.
- h. Operate pitch trim switch (16) UP or DOWN to energize the solenoid clutch (41).
- i. Attach a spring scale to drive chain and slowly pull scale till clutch slippage occurs.

NOTE

During step i, attach scale to drive chain so that sprocket rotates clockwise as viewed from the drive end to ensure proper clutch adjustment.

- j. Repeat steps h and i several times to break initial friction of clutch.

- k. Repeat step i verly slowly while watching indicator on spring scale. Slippage should occur between 29.1 and 32.9 pounds.

- l. If tension is not within tolerance, loosen OUTSIDE spanner nut (23) which acts as a lock.

- m. Tighten INSIDE spanner nut to increase clutch tension and loosen nut to decrease clutch tension.

- n. When clutch tension is within tolerance, tighten outside spanner nut against inside nut.

- o. Connect electrical wiring removed in step 3, and reinstall drive assembly in aircraft.

- p. Rerig trim system in accordance with paragraph 9-20 and reinstall all items removed for access.

9-20. RIGGING - ELECTRIC TRIM ASSIST. (Refer to figure 9-3.)

- a. The standard manual elevator trim system MUST be rigged in accordance with paragraph 9-14 before rigging electric trim assist.

- b. Move elevator trim tab to full "NOSE UP" position.

- c. Locate NAS228 terminal of turnbuckle (9) at a point 0.75 inch from drive assembly housing.

- d. Adjust AN155 barrel until chain deflection between sprockets is approximately 0.25 inch.

- i. Resafety turnbuckle and reinstall all items removed for access.

SECTION 10

RUDDER AND RUDDER TRIM CONTROL SYSTEMS

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10-1. **RUDDER CONTROL SYSTEM.** (Refer to figure 10-1.)

prised of the rudder pedals installation, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering.

10-2. **DESCRIPTION.** Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is com-

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 10-1 for cable tension. 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 10-1 for cable tension. 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 the rudder pedal and tunnel areas as necessary for access.
- b. Disconnect brake master cylinders (15) and parking brake cables at pilot's rudder pedals.
- c. Remove rudder pedals (2) and brake links (5).
- d. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1).
- e. Disconnect cables (6 and 7) from rudder bar arms (8).
- f. Disconnect wiffletree push-pull rods (index 12, figure 10-5) at rudder bar arms (11).
- g. Remove bolts securing bearing blocks (10) and carefully work rudder bars out of tunnel area.

NOTE

The two inboard bearing blocks contain clearance holes for the rudder bars at one end and a bearing hole at the other. Tag these bearing blocks for reference on reinstallation.

- h. Reverse the preceding steps for reinstallation. Lubricate rudder bar assemblies as outlined in Section 2. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

10-6. RUDDER. (Refer to figure 10-3.)

10-7. REMOVAL AND INSTALLATION.

- a. Disconnect tail navigation light.
- b. Remove stinger.
- c. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1.)

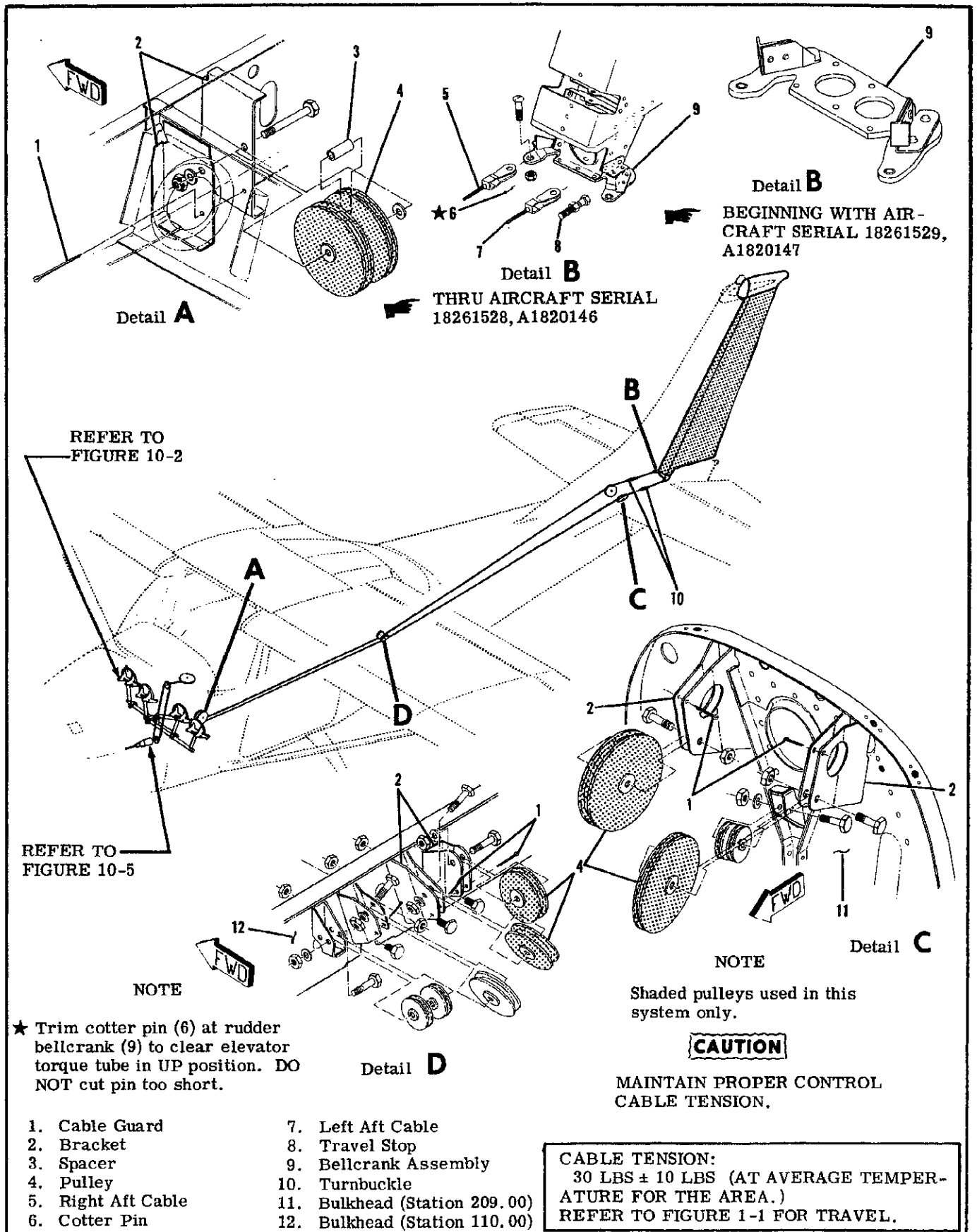
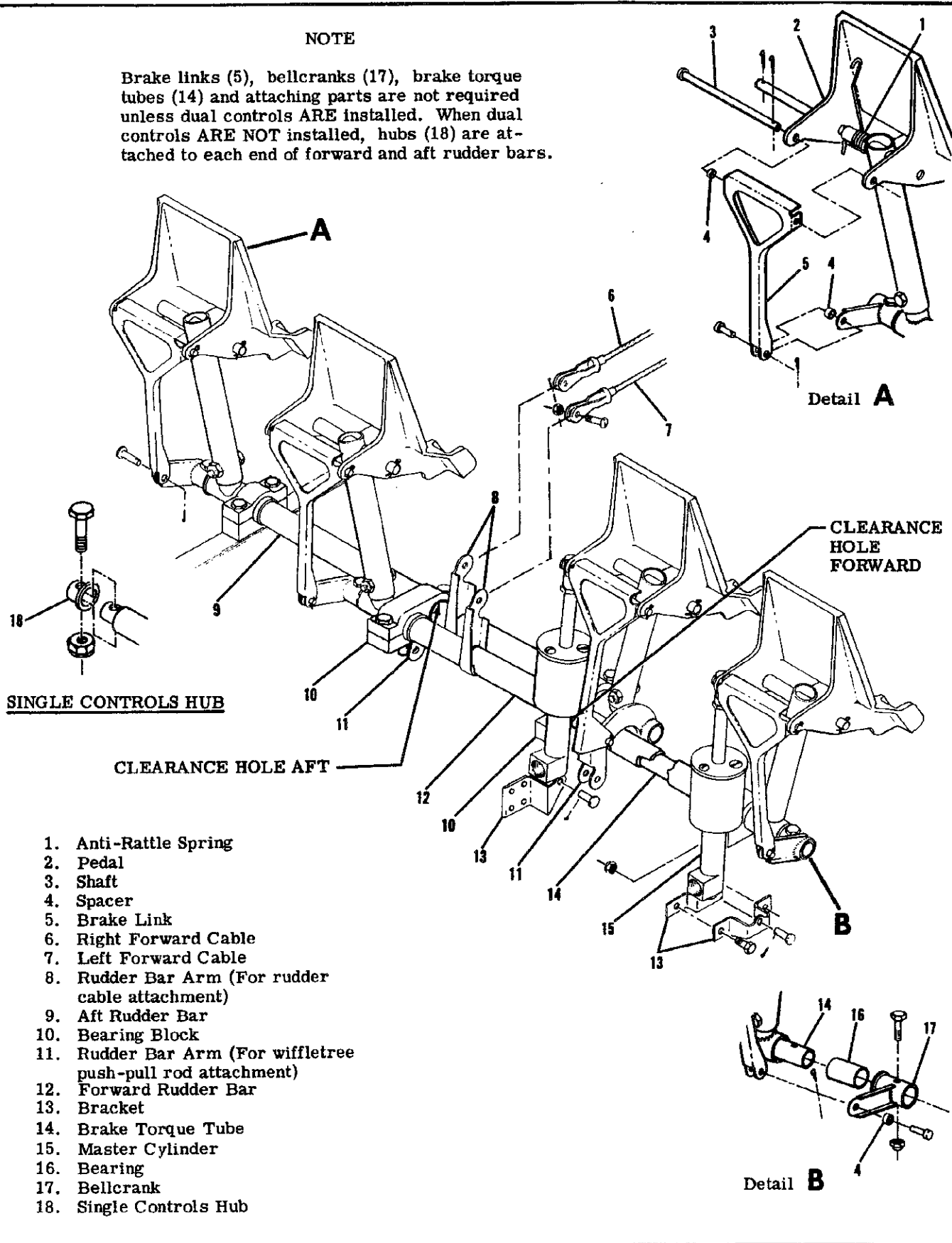


Figure 10-1. Rudder Control System

NOTE

Brake links (5), bellcranks (17), brake torque tubes (14) and attaching parts are not required unless dual controls ARE installed. When dual controls ARE NOT installed, hubs (18) are attached to each end of forward and aft rudder bars.



SINGLE CONTROLS HUB

CLEARANCE HOLE AFT

CLEARANCE HOLE FORWARD

- 1. Anti-Rattle Spring
- 2. Pedal
- 3. Shaft
- 4. Spacer
- 5. Brake Link
- 6. Right Forward Cable
- 7. Left Forward Cable
- 8. Rudder Bar Arm (For rudder cable attachment)
- 9. Aft Rudder Bar
- 10. Bearing Block
- 11. Rudder Bar Arm (For wiffletree push-pull rod attachment)
- 12. Forward Rudder Bar
- 13. Bracket
- 14. Brake Torque Tube
- 15. Master Cylinder
- 16. Bearing
- 17. Bellcrank
- 18. Single Controls Hub

Detail B

Figure 10-2. Rudder Pedals Installation

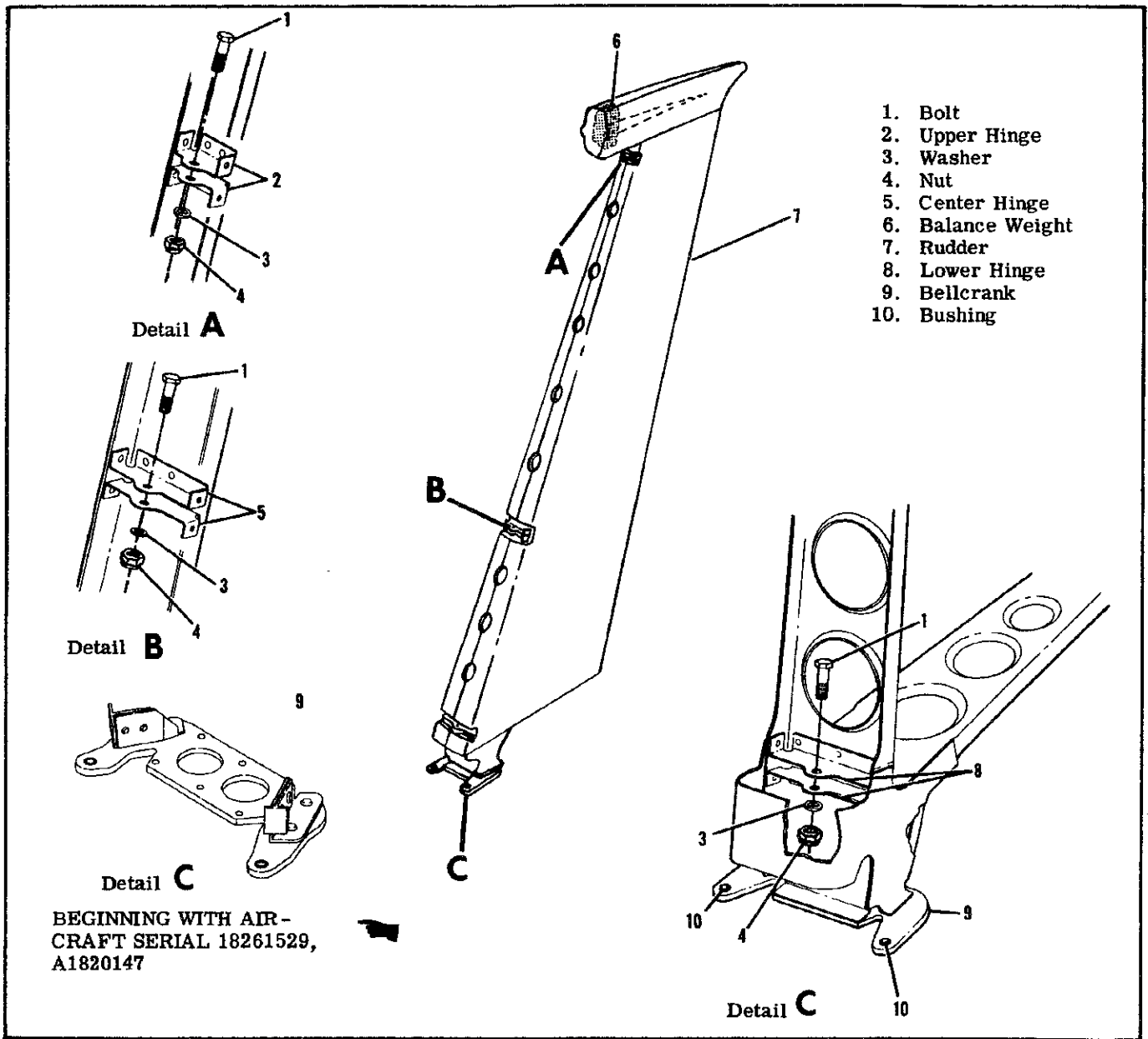


Figure 10-3. Rudder Installation

d. Disconnect cables (index 5 and 7, figure 10-1) from rudder bellcrank.

e. With rudder supported, remove all hinge bolts, and using care, lift rudder free of vertical fin.

f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

10-8. REPAIR. Repair may be accomplished as outlined in Section 18.

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. Relieve cable tension at turnbuckles (10) and disconnect cables.

c. Disconnect cables (index 6 and 7, figure 10-2) from rudder bar arms.

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

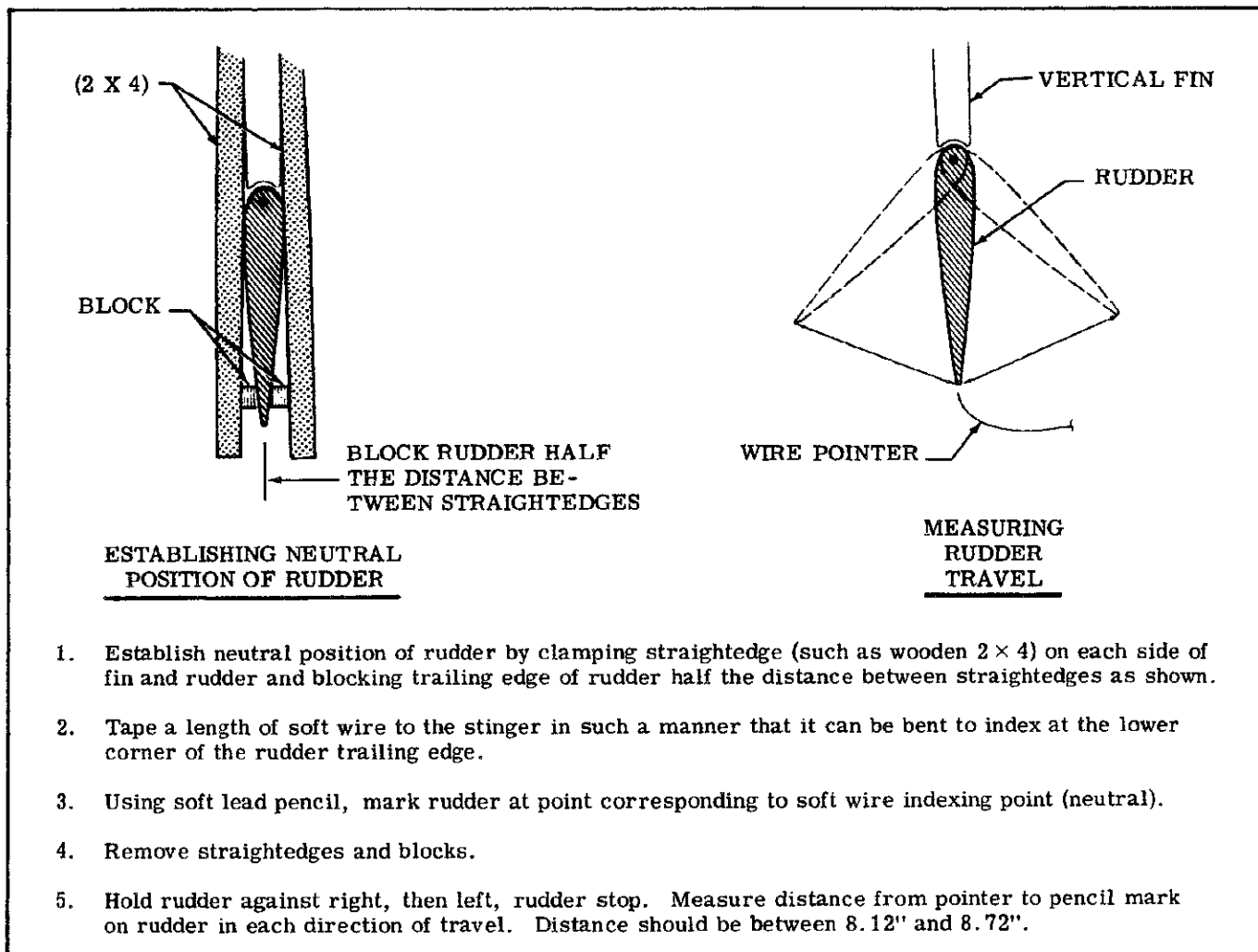


Figure 10-4. Checking Rudder Travel

NOTE

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

- e. Reverse the preceding steps for reinstallation.
- f. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards.
- g. Re-rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed in step "a."

10-11. RIGGING. (Refer to figure 10-5.)

a. Adjust travel stop bolts (index 8, figure 10-1) to attain correct rudder travel as specified in figure 1-1. Figure 10-4 illustrates correct travel and one method of checking.

b. **THRU AIRCRAFT SERIALS 18261328 AND A182-0136.** Remove rudder trim chain (10) by removing the lower screws from support bracket (7), using care not to drop washers (20). These washers are used as shims to adjust chain (10) tension by raising or lowering support bracket (7). Spring bracket (7) downward until chain (10) can be disengaged from sprockets (9 and 19).

c. **BEGINNING WITH AIRCRAFT SERIALS 182-61329 AND A182-0137.** Loosen adjustable idler sprocket (25) and disengage chain from sprockets (9 and 19).

d. Disconnect steering bungee adjustable rod end (26) from wiffletree (14).

e. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension at turnbuckles (index 10, figure 10-1).

f. Clamp rudder pedals in neutral position and center wiffletree (14) by adjusting push-pull rods (12). Wiffletree is centered when the bolts in each end are the same distance from the bulkhead just forward of the wiffletree. Tighten jam nuts.

g. Maintaining rudder pedals in neutral position, adjust turnbuckles (index 10, figure 10-1) to specified tension with the rudder offset one degree to the right, (5/16 inch at lower trailing edge). Safety turnbuckles.

NOTE

After completing the preceding steps, the rudder control system is rigged. The rudder control system **MUST** be correctly rigged prior to rigging the rudder trim and nosewheel steering system. Refer to paragraph 10-15 for rigging the rudder trim and nosewheel steering system.

10-12. **RUDDER TRIM AND NOSEWHEEL STEERING SYSTEM.** (Refer to figure 10-5.)

10-13. **DESCRIPTION.** A sprocket-operated screw mechanism to provide rudder trim is incorporated at the aft end of the steering bungee (16). The trim system is operated by a trim control wheel (4), mounted in the pedestal. Nosewheel steering is accomplished through use of the rudder pedals. The steering bungee (16) links the nose gear to a wiffle-tree (14) which is operated by push-pull rods (12) connected to the rudder pedal bar arms (13).

NOTE

The rudder control system, rudder trim control system and nosewheel steering systems are interconnected. Adjustments to any one of these systems will affect the others. For maintenance to the nose gear steering, other than rigging, refer to Section 5.

10-14. **TROUBLE SHOOTING.**

NOTE

This trouble shooting chart should be used in conjunction with the trouble shooting chart in paragraph 10-3.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-15.

TROUBLE	PROBABLE CAUSE	REMEDY
FALSE READING ON TRIM POSITION INDICATOR.	Improper rigging.	Refer to paragraph 10-15.
	Worn, bent or disconnected linkage.	Check visually. Repair or replace parts as necessary.
HARD OR SLUGGISH OPERATION OF TRIM WHEEL.	Worn, bent or binding linkage.	Check visually. Repair or replace parts as necessary.
	Incorrect rudder cable tension.	Check and adjust rudder cable tension.
FULL TRIM TRAVEL NOT OBTAINED.	Rudder trim system improperly rigged.	Refer to paragraph 10-15.

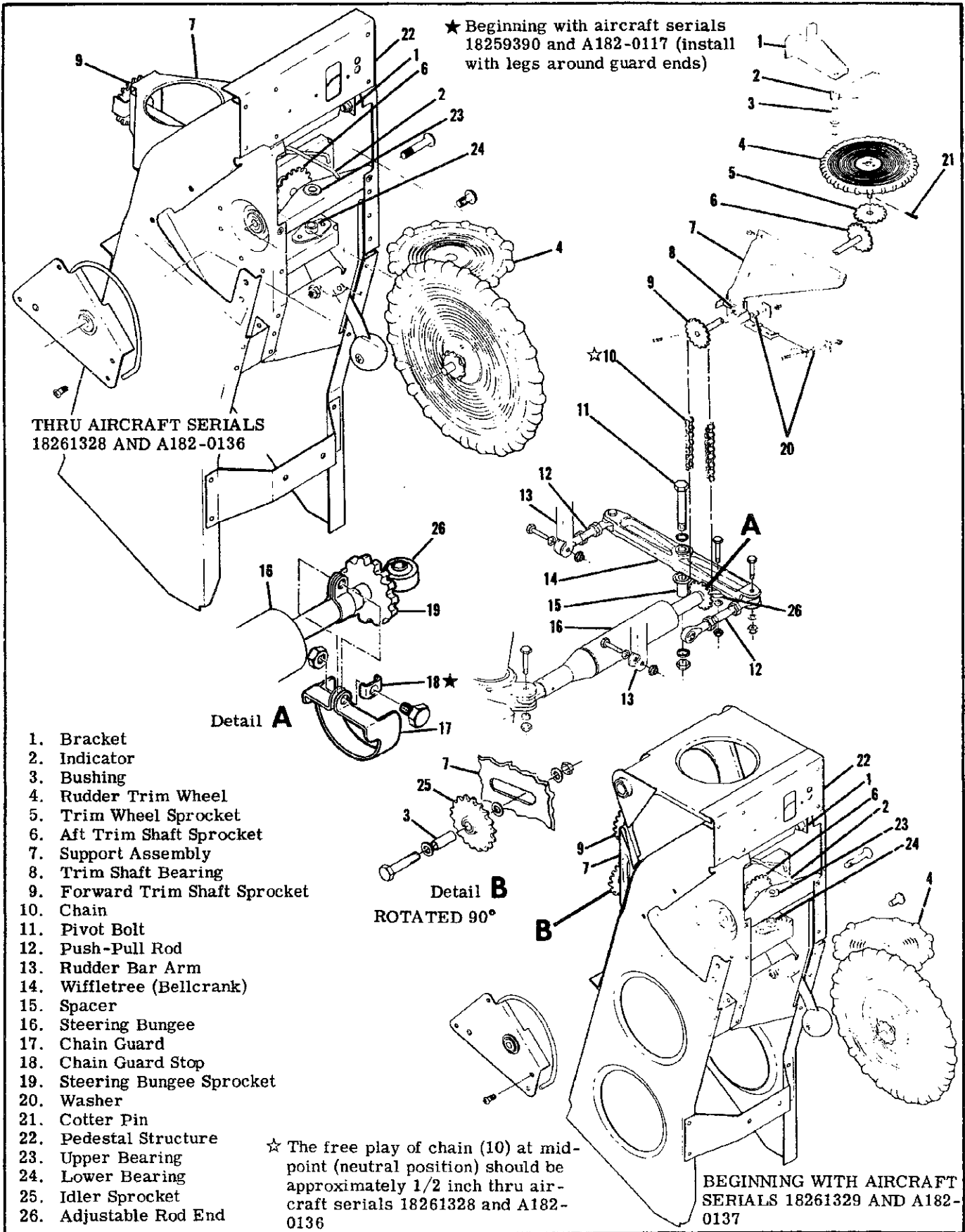


Figure 10-5. Rudder Trim Control System

SECTION 11

ENGINE

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Hand-Cranking	11-30

11-1. ENGINE COWLING.

11-2. DESCRIPTION. The engine cowling is divided into two major removable segments. The upper cowling segment has two access doors, one at the upper front provides access to the oil filler neck and one at the left aft side provides access to the oil dipstick and remote strainer drain control. Controllable cowl flaps are attached to the trailing edge of the lower cowl segment to aid in controlling the engine temperature. Screws fasten the upper and lower segments together at the nose cap. Quick-release fasteners are used along the parting surfaces and aft end, allowing the removal of either segment individually. Beginning with aircraft serial 18260826, cowl-mounted landing and taxi lights are mounted in the lower cowling nose cap. Beginning with aircraft serial 182-61426, instead of attaching directly to the fuselage, the cowling attaches to shock-mounts, which in turn, are fastened to the fuselage.

11-3. REMOVAL AND INSTALLATION.

- a. Disconnect cowl flap control clevises at cowl flaps.
- b. Remove screws securing upper and lower cowling segments together at the nose cap.
- c. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the upper and lower segments.
- d. (BEGINNING WITH AIRCRAFT SERIAL 182-60826.) Disconnect the landing and taxi light wires at the quick-disconnects.
- e. Disconnect air induction duct on lower cowl segment at airbox and carefully remove cowling.
- f. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct air flow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards. Check cowl flap rigging and re-rig, if necessary, in accordance with paragraph 11-9.

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. COWL FLAPS.

11-7. DESCRIPTION. Cowl flaps are provided to aid in controlling engine temperature. Two cowl flaps, operated by a single control in the cabin, are located at the aft edge of the lower cowl segment.

11-8. REMOVAL AND INSTALLATION. (Refer to figure 11-1.)

- a. Place cowl flap control lever (11) in the OPEN position.
- b. Disconnect cowl flap control clevises (6) from cowl flap shock-mounts (7).
- c. Remove safety wire securing hinge pins to cowl flaps, pull pins from hinges and remove flaps.
- d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 11-9.

11-9. RIGGING. (Refer to figure 11-1.)

- a. Disconnect cowl flap control clevises (6) from cowl flap shock-mounts (7).
- b. Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.
- c. Place cowl flap control lever (11) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (3) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (10) to position control lever in bottom hole of position bracket (9).
- d. With the control lever in CLOSED position, hold one cowl flap closed, streamlined with trailing edge of lower cowl. Loosen jam nut and adjust clevis (6) on the control to hold cowl flap in this position and install bolt.

NOTE

If the lower control clevis (6) cannot be adjusted far enough to streamline flap and still maintain sufficient thread engagement, loosen the lower control housing clamp (4) and slide housing in clamp as necessary. Be sure threads are visible in clevis inspection holes.

- e. Repeat the preceding step for the opposite cowl flap.
- f. When the cowl flaps are lowered, they should be open $13^{\circ}+3^{\circ}-1^{\circ}$ measured in a straight line from the fuselage to the trailing edge of cowl flaps.
- g. Check that all clamps and jam nuts are tight.

11-10. ENGINE.

11-11. DESCRIPTION. An air cooled, wet-sump, six-cylinder, horizontally-opposed, direct-drive, carbureted, Continental O-470 series engine driving a constant-speed propeller is used to power the aircraft. The cylinders, numbered from rear to front are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side

are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as numbers 2, 4 and 6. Refer to paragraph 11-12 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.

11-12. ENGINE DATA.

Aircraft Series	182 and SKYLANE
MODEL (Continental)	O-470-R
Rated Horsepower at RPM	230 at 2600
Number of Cylinders	6 Horizontally-Opposed
Displacement	470 Cubic Inches
Bore	5.00 Inches
Stroke	4.00 Inches
Compression Ratio	7.00:1
Magnetos	Slick No. 662
Right Magneto	Fires 22° BTC, Lower Left, Upper Right
Left Magneto	Fires 22° BTC, Upper Left, Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18 MM (Refer to current Continental active factory approved spark plug chart.)
Torque	330 ± 30 LB-IN.
Carburetor (Marvel-Schebler)	MA-4-5
Tachometer	Mechanical Drive
Oil Sump Capacity	12 U.S. Quarts
With External Filter	13 U.S. Quarts
Oil Pressure (PSI)	
Normal	30-60
Minimum Idling	10
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cylinder
Oil Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (225°F.)
Probe location	Below Oil Cooler
Cylinder Head Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (460°F.)
Probe Location	Lower side of Number 6 Cylinder (THRU SERIALS 18260055 AND A182-0116. Lower side of Number 3 Cylinder (18260056 THRU 18260825 AND A182-0117 AND ON.) Lower side of Number 2 Cylinder (18260826 THRU 18262465.) Lower side of Number 1 Cylinder (BEGINNING WITH 18262466.
Direction of Crankshaft Rotation (Viewed from Rear)	Clockwise
Dry Weight-With Accessories	438 LB (Weight is approximate and will vary with optional accessories installed.)

11-12. ENGINE DATA. (Cont.)

Aircraft Series	182 and Skylane
MODEL (Continental)	0-470-S
Rated Horsepower at RPM	230 at 2600
Number of Cylinders	6-Horizontally-Opposed
Displacement	470 Cubic Inches
Bore	5.00 Inches
Stroke	4.00 Inches
Compression Ratio	7.00:1
Magnetos	Slick No. 662
Right Magneto	Fires 22° BTC, Lower Left, Upper Right
Left Magneto	Fires 22° BTC, Upper Left Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18 MM (Refer to current Continental active factory approved spark plug chart.)
Torque	330 # 30 LB-IN.
Carburetor (Marvel-Schebler)	MA-4-5
Tachometer	Mechanical Drive
Oil Sump Capacity	12 U. S. Quarts
With External Filter	13 U. S. Quarts
Oil Pressure (PSI)	
Normal	30-60
Minimum Idling	10
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cyl.
Oil Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (240°F)
Probe Location	Below Oil Cooler
Cylinder Head Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line 460°F.)
Probe Location	Lower side of Number 3 Cylinder
Direction of Crankshaft Rotation (Viewed from Rear)	Clockwise
Dry Weight-With Accessories	438 LB (Weight is approximate and will vary with optional accessories installed.)

NOTE

The 0-470-S engine is an acceptable replacement for the 0-470-R engine beginning with aircraft serial 18260826. When the 0-470-S engine is installed, SK182-50 must be complied with.

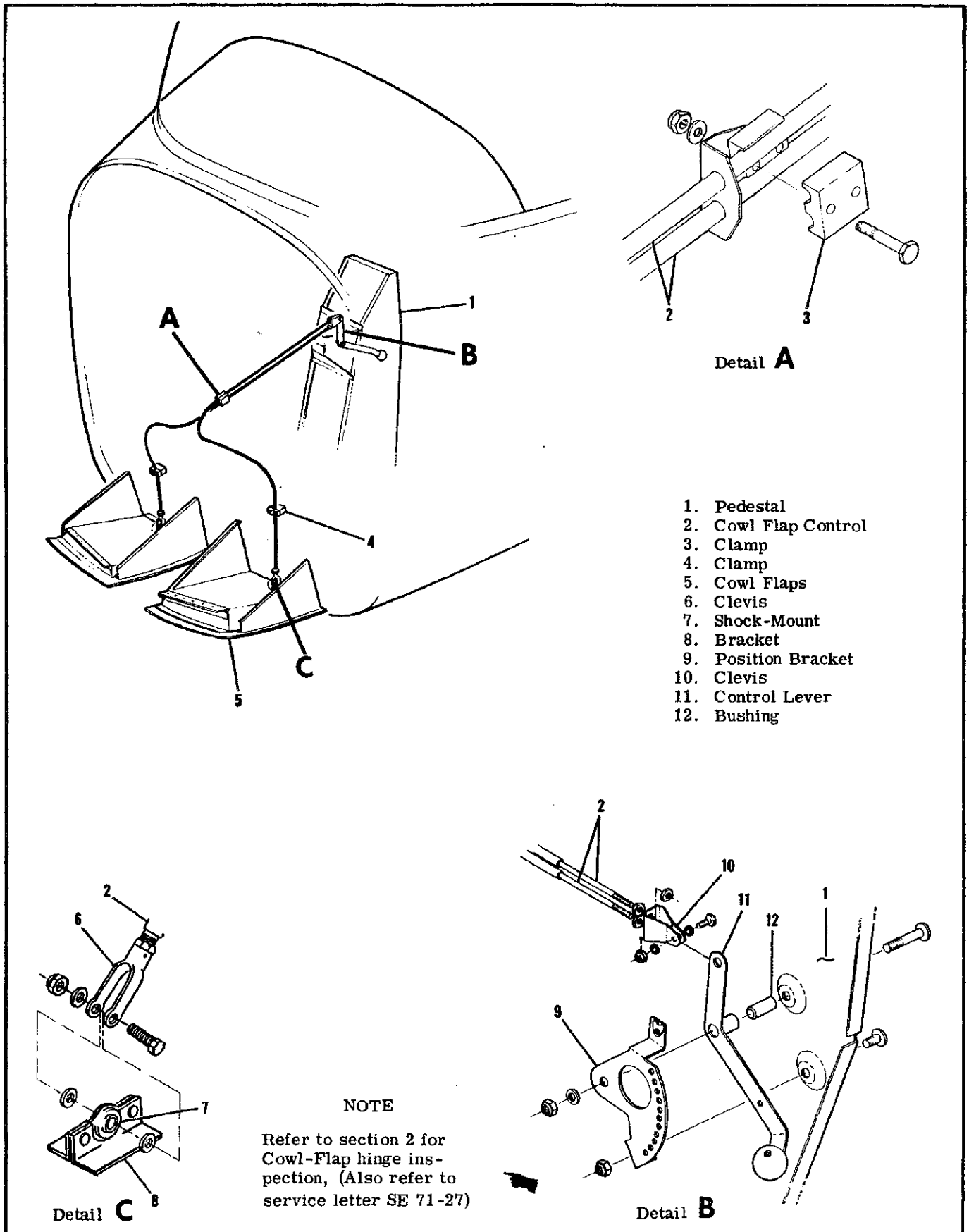


Figure 11-1. Cowl Flaps Installation

11-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE WILL NOT START.	Improper use of starting procedure.	Review starting procedure. Refer to Owner's Manual.
	Fuel tanks empty.	Visually inspect cells. 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 cell 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 11-48.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine).	Refer to paragraph 11-89.
	Engine flooded.	Refer to paragraph 11-89.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel cell sumps, lines, strainer and carburetor.
	Defective aircraft fuel system.	Refer to Section 12.
	Fuel contamination.	Drain all fuel and flush out fuel system. Clean all screens, fuel lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-67.
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.	

11-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
<p>ENGINE STARTS BUT DIES, OR WILL NOT IDLE.</p>	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 11-49.
	Carburetor idling jet plugged.	Clean carburetor and fuel strainer. Refer to paragraph 11-48.
	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 cell sumps, lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-67.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine).	Refer to paragraph 11-89.
	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.
Propeller control set in high pitch position (low rpm).	Use low pitch (high rpm) position for all ground operation.	
Defective fuel system.	Refer to Section 12.	
<p>ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER.</p>	Restriction in aircraft fuel system.	Refer to Section 12.
	Worn or improperly rigged throttle or mixture control.	Check visually. Replace worn linkage. Rig properly.

11-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER. (Cont.)	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Defective ignition system.	Refer to paragraph 11-67.
	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.
	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.
	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) position for all ground operations.
Fuel contamination.	Check all screens in fuel system. Drain all fuel and flush out system. Clean all screens, lines, strainer and carburetor.	
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.

11-13A. **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 results of the RPM obtained. It should be within 50 RPM of 2575 RPM.
- d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

1. Check governor control for proper rigging. It should be determined that the governor control arm travels to the high RPM stop on the governor and that the high RPM stop screw is adjusted properly. (Refer to Section 13 for procedures.)

NOTE

If verification of governor operation is necessary, the governor may be removed from the engine and a flat plate installed over the engine pad. Run-up engine to determine that governor was adjusted properly.

2. Check carburetor heat control (carburetor equipped engines) for proper rigging. If partially open it would cause a slight power loss. On fuel injected engines check operation of alternate air door spring or magnetic lock to make sure door will remain closed in normal operation.

- 3. Check magneto timing, spark plugs and ignition harness for settings and conditions.
- 4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.
- 5. Check condition of induction air filter. Clean if required.
- 6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

11-14. **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.

SHOP NOTES:

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. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.

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. Disconnect propeller governor control at governor. Note EXACT position, size and number of attaching washers for reference on reinstallation. Remove clamps attaching control to engine and pull control aft clear of engine.

k. Disconnect all hot and cold air flexible ducts and remove.

l. Remove exhaust system in accordance with paragraph 11-85.

m. Disconnect carburetor heat control from arm on airbox. Remove clamps and pull control clear of engine.

- n. 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 carburetor air temperature wires at quick-disconnects.
- 5. Disconnect electrical wires and wire shielding ground at alternator.
- 6. Disconnect exhaust gas temperature wires at quick-disconnects.
- 7. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.
- o. Disconnect lines and hoses as follows:
 - 1. Disconnect vacuum hose at vacuum pump.
 - 2. Disconnect oil breather and vacuum system oil separator vent lines where secured to the engine.

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 below cooler.
- 4. Disconnect primer line at firewall fitting.
- 5. Disconnect fuel supply hose at fuel strainer.
- 6. Disconnect oil pressure line at firewall fitting.
- 7. Disconnect manifold pressure line at firewall.
- p. 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.

SHOP NOTES:

CAUTION

Place a suitable stand under tail tie-down ring before removing engine. The loss of engine weight will cause the aircraft to be tail heavy.

q. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mount pads.

r. Remove bolts attaching engine to engine mount pads and slowly hoist engine and pull it forward. Check 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.

s. Remove engine shock-mount pads and bonding straps.

11-15. **CLEANING.** The engine may be cleaned with Stoddard solvent or equivalent, then dried thoroughly.

CAUTION

Particular care should be given to electrical equipment before cleaning. Cleaning fluids should not be allowed to enter magnetos, starter, alternator, etc. Protect these components before saturating the engine with solvent. All other openings should also be covered before cleaning the engine assembly. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

11-16. **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.

11-17. **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. All flexible fluid carrying hoses in the engine compartment should be replaced at engine overhaul or every five years, whichever occurs first.

f. For major engine repairs, refer to the manufacturer's overhaul and repair manual.

11-18. **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, lock-washers, nuts, gaskets and rubber connections should be new parts.

11-19. **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 and bonding straps 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 pads.

NOTE

Be sure engine shock-mount pads, spacers and washers are in place as the engine is lowered into position.

d. Install engine-to-mount bolts, then remove the hoist and support stand placed under tail tie-down fitting. Torque bolts to 450-500 lb-in.

e. Route throttle, mixture and propeller controls to their respective units and connect. Secure controls in position with clamps.

f. Route carburetor heat control to airbox and connect. Secure control in position with clamps.

NOTE

Throughout the aircraft fuel system, from the fuel cells 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, 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.

g. Connect lines and hoses as follows:

1. Connect manifold pressure line at firewall fitting.
 2. Connect oil pressure line at firewall fitting.
 3. Connect fuel supply hose at fuel strainer.
 4. Connect primer line at firewall fitting.
 5. Connect oil temperature bulb below cooler.
 6. Connect oil breather and vacuum system oil separator vent lines where secured to the engine.
 7. Connect vacuum hose at vacuum pump.
- h. 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. Connect exhaust gas temperature wires and carburetor air temperature wires at quick-disconnects.
6. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.
 - i. Install exhaust system in accordance with paragraph 11-85.
 - j. Connect all hot and cold air flexible ducts.
 - k. Install propeller and spinner in accordance with instructions outlined in Section 13.
 - l. 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.

- m. Clean and install induction air filter in accordance with Section 2.
- n. 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.

- o. Check all switches are in the OFF position and connect battery cables.
- p. Rig engine controls in accordance with paragraphs 11-73, 11-74, 11-75 and 11-76.
- q. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
- r. Install engine cowling in accordance with paragraph 11-3. Rig cowl flaps in accordance with paragraph 11-9.
- s. Perform an engine run-up and make final adjustments on the engine controls.

11-20. FLEXIBLE FLUID HOSES.

11-21. 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 11-17 for detailed inspection procedures for flexible hoses.

11-22. 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.

11-23. ENGINE BAFFLES.

11-24. DESCRIPTION. The sheet metal baffles installed on the engine direct the flow of air around the cylinders and other engine components to provide optimum cooling. These baffles incorporate rubber-astbestos 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 baffles seal properly.

11-25. CLEANING AND INSPECTION. The engine baffles should be cleaned with a suitable solvent to remove oil and dirt.

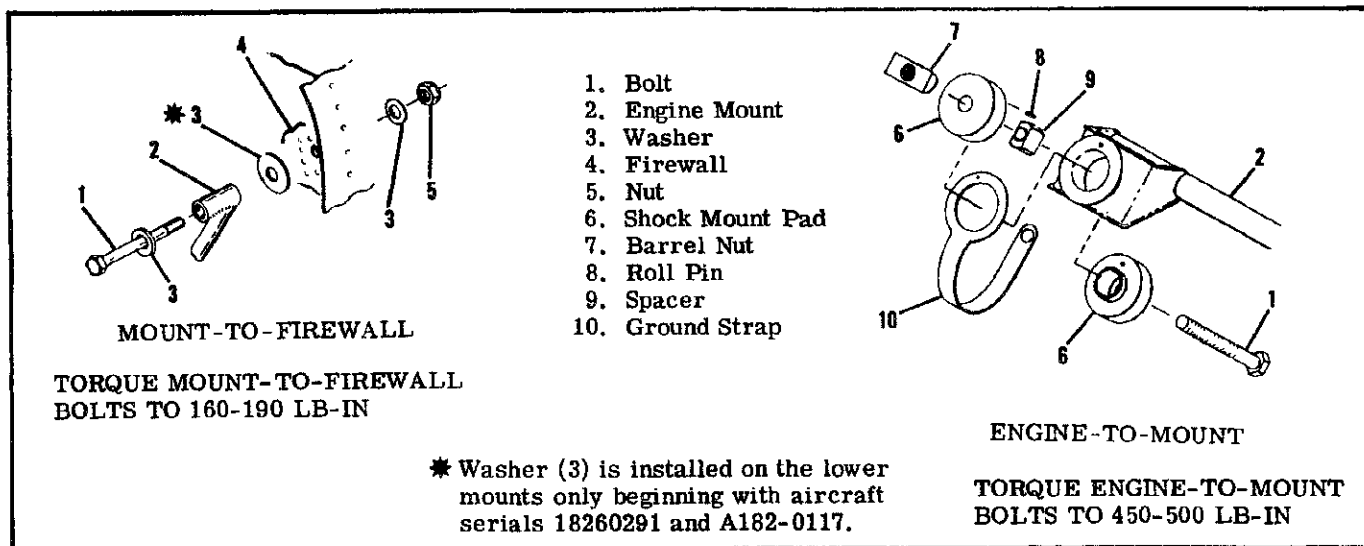


Figure 11-2. Engine Mount Details

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.

11-26. **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.

11-27. **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.

11-28. **ENGINE MOUNT.** (Refer to figure 11-2.)

11-29. **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. Each engine mount pad has a small hole for a locating pin which serves as a locating dowel for the engine shock-mounts.

11-30. **REMOVAL AND INSTALLATION.**

a. Remove engine in accordance with paragraph 11-14.

b. Remove bolts from upper and lower mount-to-fuselage structure and carefully remove engine mount.
c. Reverse the preceding steps for reinstallation. Torque bolts to 160-190 lb-in. Reinstall engine in accordance with paragraph 11-19.

11-31. **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.

11-32. **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.

11-33. **ENGINE OIL SYSTEM.** (Refer to figure 11-3.)

11-34. **DESCRIPTION.** A wet-sump, pressure-lubricating oil system is employed in the engine. Oil under pressure from the oil pump is fed through drilled crankcase passages which supply oil to the crankshaft main bearings and camshaft bearings. Connecting rod bearings are pressure-lubricated through internal passages in the crankshaft. Valve mechanisms are lubricated through the hollow push-

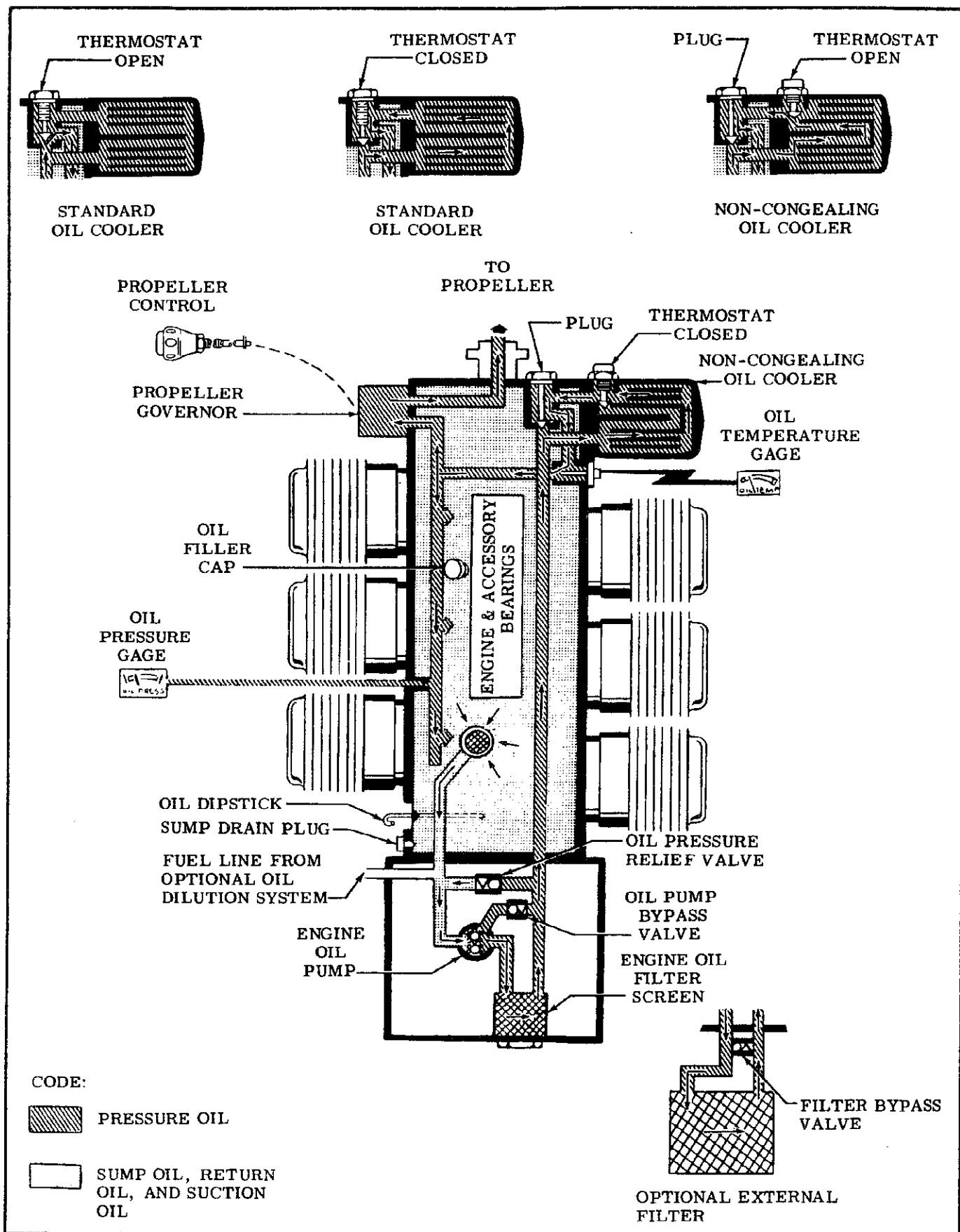


Figure 11-3. Engine Oil Schematic

rods, which are supplied with oil from the crankcase oil passages. The propeller is supplied oil, boosted by the governor through the forward end of the crankshaft. Oil is returned by gravity to the engine oil sump. Cylinder walls and piston pins are spray-lubricated by oil escaping from connecting rod bearings. The engine is equipped with an oil cooler and

a thermostat valve to regulate engine oil temperature. A pressure relief valve is installed to maintain proper oil pressure at higher engine speeds. Removable oil filter screens are provided within the oil system. An external, replaceable element oil filter is available as optional equipment. The engine may also be equipped with a non-congealing oil cooler.

11-35. 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.
	Dirty oil screens.	Remove and clean oil screens.

11-35. TROUBLE SHOOTING (Cont).

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 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 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.

11-35. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (Cont.)	Secondary effect of low oil pressure.	Observe oil pressure gage for low indication. Determine and correct reason for low oil pressure.
	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.

11-36. FULL-FLOW OIL FILTER.

11-37. DESCRIPTION. An external oil filter may be installed on the engine. The filter and filter adapter replace the regular engine oil pressure screen. The filter adapter incorporates a bypass valve which will open allowing pressure oil from the oil pump to flow to the engine oil passages if the filter element should become clogged.

11-38. REMOVAL AND INSTALLATION. (Refer to figure 11-4.)

NOTE

Filter element replacement kits are available from the Cessna Service Parts Center.

- a. Remove engine cowling in accordance with paragraph 11-3.
- b. Remove both safety wires from filter can and unscrew hollow stud (1) to detach filter assembly from adapter (10) as a unit. Remove filter assembly from aircraft and discard gasket (9). Oil will drain from filter as assembly is removed from adapter.
- c. Press downward on hollow stud (1) to remove from filter element (5) and can (4). Discard metal gasket (2) on stud (1).
- d. Lift lid (7) off filter can (4) and discard lower gasket (6).
- e. Pull filter element (5) out of filter can (4).

NOTE

Before discarding removed filter element (5), remove the outer perforated paper cover; using a sharp knife, cut through the folds of

the filter element at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. In new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by impacting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

- f. Wash lid (7), hollow stud (1) and filter can (4) in solvent and dry with compressed air.

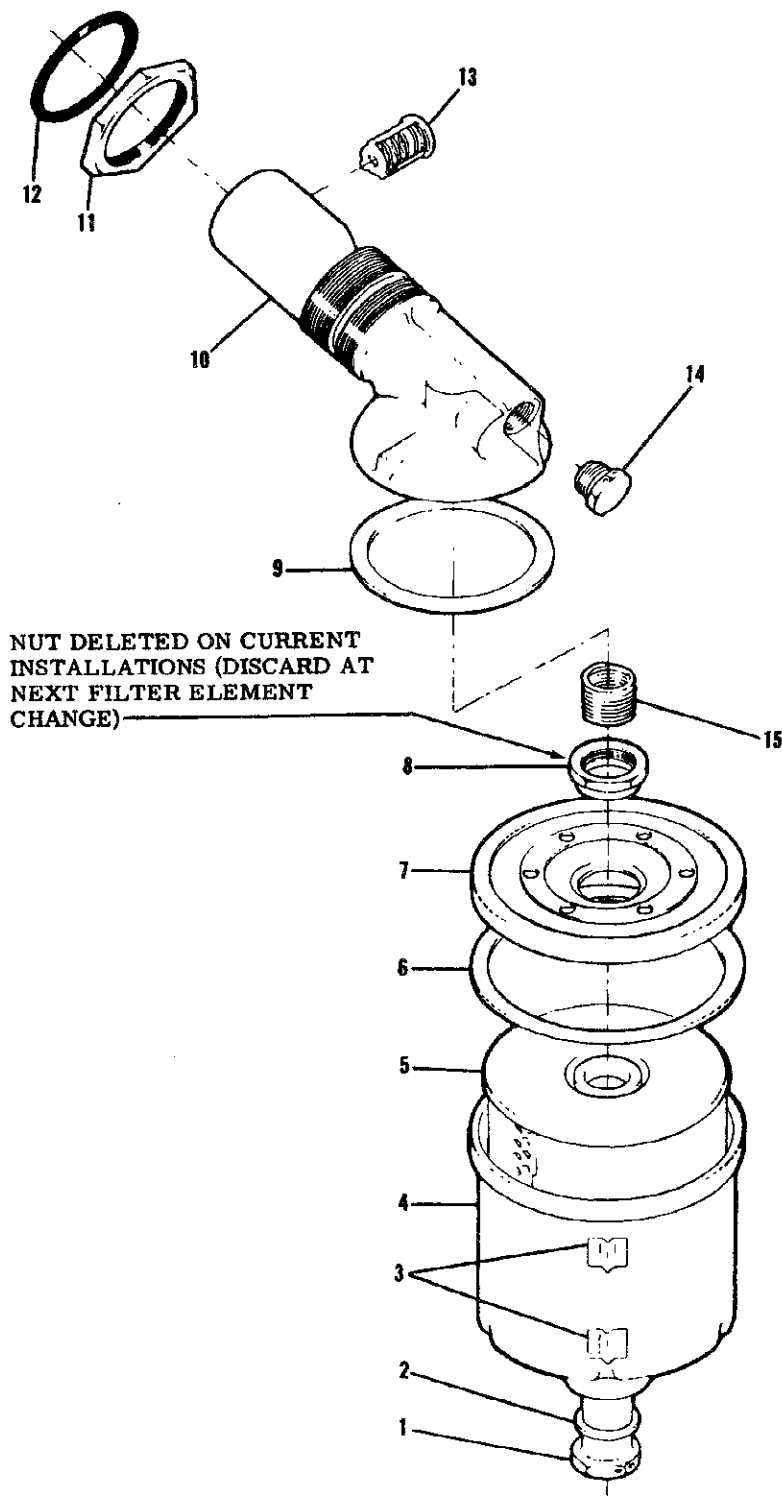
NOTES

When installing a new filter element (5), it is important that all gaskets are clean, lubricated and positioned properly, and that the correct amount of torque is applied to the hollow stud (1). If the stud is under-torqued, oil leakage will occur. If the stud is over-torqued, the filter can might possibly be deformed, again causing oil leakage.

- Lubricate all rubber grommets in the new filter element, lid gaskets and metal gasket with clean engine oil or general purpose grease before installation. Dry gaskets may cause false torque readings, again resulting in oil leakage.

NOTE

Do NOT substitute automotive gaskets for any gaskets used in this assembly. Use only approved gaskets listed in the Parts Catalogs.



NUT DELETED ON CURRENT INSTALLATIONS (DISCARD AT NEXT FILTER ELEMENT CHANGE)

1. Hollow Stud
2. Metal Gasket
3. Safety Wire Tabs
4. Can
5. Filter Element
6. Lower Gasket
7. Lid
8. Nut
9. Upper Gasket
10. Adapter
11. Adapter Nut
12. O-Ring
13. Bypass Valve
14. Plug
15. Thread Insert

Figure 11-4. Full Flow Oil Filter

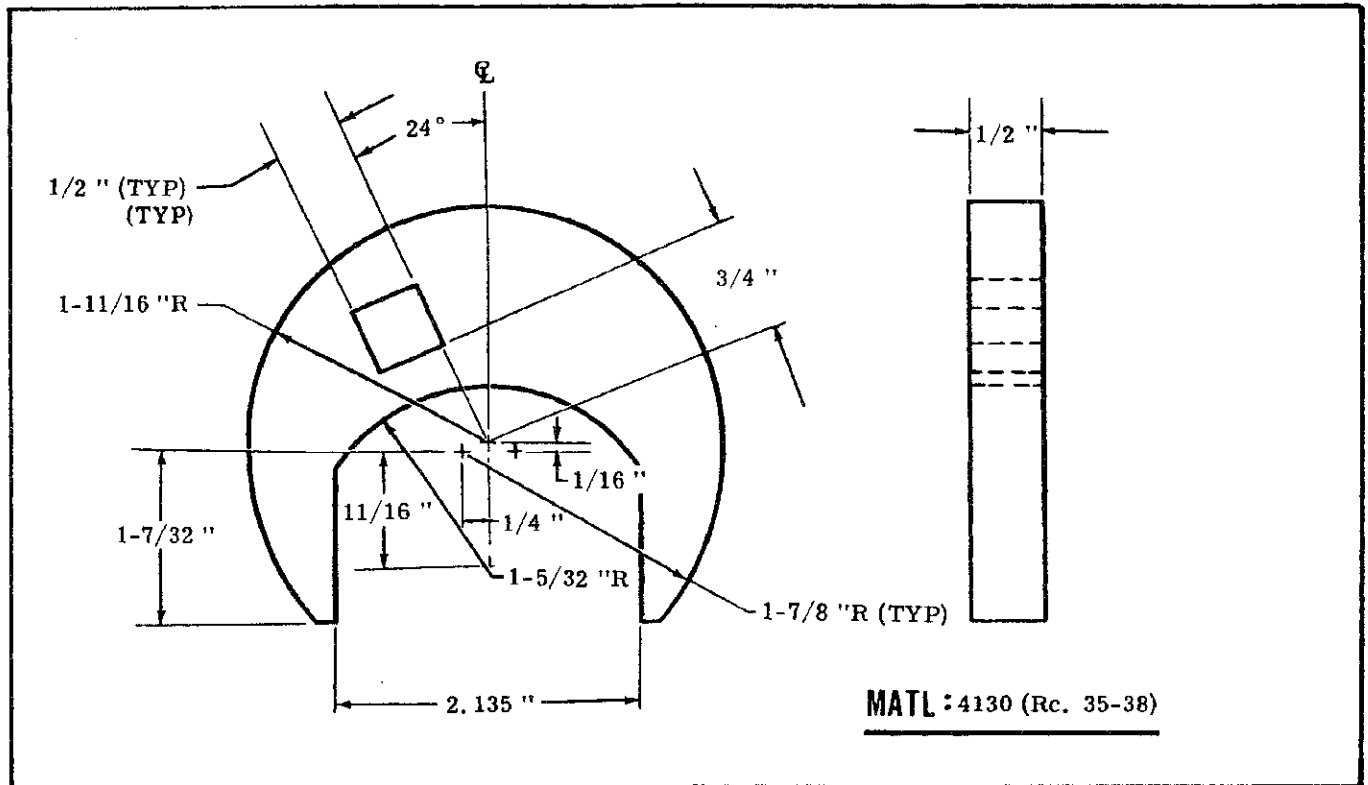


Figure 11-5. Oil Filter Adapter Wrench Fabrication

- Before assembly, place a straightedge across bottom of filter can. Check for distortion or out-of-flat condition greater than 0.010 inch. Install a new filter can if either of these conditions exist.

- After installing a new gasket on lid, turn lid over. If gaskets falls, try a different gasket and repeat test. If this gasket falls off, install a new lid.

g. Inspect the adapter gasket seat for gouges, deep scratches, wrench marks and mutilation. If any of these conditions are found, install a new adapter.

h. Place a new filter element (5) in can (4) and insert the hollow stud (1) with a new metal gasket (2) in place, through the filter can and element.

i. Position a new gasket (6) inside flange of lid (7) and place lid in position on filter can.

j. With new gasket (9) on face of lid, install filter can assembly on adapter (10). While holding filter can to prevent turning, tighten hollow stud (1) and torque to 20-25 lb-ft (240-300 lb-in), using a torque wrench.

k. Install all parts removed for access and service the engine with the proper grade and quantity of engine oil. One additional quart of oil is required each time the filter element is changed.

l. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.

m. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).

n. Check to make sure filter can has not been making contact with any adjacent parts due to engine torque.

o. While engine is still warm, recheck torque on hollow stud (1) then safety stud to lower tab (3) on filter can and safety adapter (10) to upper tab on filter can.

11-39. FILTER ADAPTER.

11-40. REMOVAL. (Refer to figure 11-4.)

a. Remove filter assembly in accordance with paragraph 11-38.

NOTE

A special wrench adapter for adapter nut (11) (Part No. SE-709) is available from the Cessna Service Parts Center, or one may be fabricated as shown in figure 11-5. Remove any engine accessory that interferes with removal of the adapter.

b. Note angular position of adapter (10), then remove safety wire and loosen adapter nut (11).

c. Unscrew adapter and remove from engine. Discard adapter O-ring (12).

11-41. DISASSEMBLY, INSPECTION AND REASSEMBLY. Figure 11-4 shows the relative position of the internal parts of the filter adapter and may be used as a guide during installation of parts. The bypass valve is to be installed as a complete unit, with the

valve being staked three places. The heli-coil type insert (15) in the adapter may be replaced, although special tools are required. Follow instructions of the tool manufacturer for their use. Inspect threads on adapter and in engine for damage. Clean adapter in solvent and dry with compressed air. Ascertain that all passages in the adapter are open and free of foreign material. Also, check that bypass valve is seated properly.

11-42. INSTALLATION.

a. Assemble adapter nut (11) and new O-ring (12) on adapter (10) in sequence illustrated in figure 11-4.

b. Lubricate O-ring on adapter with clean engine oil. Tighten adapter nut until O-ring is centered in its groove on the adapter.

c. Apply anti-seize compound sparingly to the adapter threads, then simultaneously screw adapter and adapter nut into engine until O-ring seats against engine boss without turning adapter nut (11). Rotate adapter to approximate angular position noted during removal. Do not tighten adapter nut at this time.

d. Temporarily install filter assembly on adapter, and position so adequate clearance with adjacent parts is attained. Maintaining this position of the adapter, tighten adapter nut to 50-60 lb-ft (600-700 lb-in) and safety. Use a torque wrench, extension and adapter as necessary when tightening adapter nut.

e. Using new gaskets, install filter assembly as outlined in paragraph 11-38. Be sure to service the engine oil system.

11-43. OIL COOLER.

11-44. DESCRIPTION. A non-congealing oil cooler may be installed on the aircraft. The cooler is mounted on the right forward side of the engine crankcase directly in front of number five cylinder and has no external oil lines. Ram air passes through the oil cooler and is discharged into the engine compartment. Oil circulating through the engine is allowed to circulate continuously through warm-up passages to prevent the oil from congealing when operating in low temperatures. On the standard and non-congealing oil coolers, as the oil increases to a certain temperature, the thermostat valve closes, causing the oil to be routed to all of the cooler passages for cooling. Oil returning to the engine from the cooler is routed through the internally drilled oil passages.

11-45. ENGINE FUEL SYSTEM.

11-46. DESCRIPTION. The engine is equipped with a carburetor mounted at the lower side of the engine. The carburetor is of the plain-tube fixed-jet type and has such features as an enclosed accelerating pump mechanism, simplified fuel passages to prevent vapor locking, idle cut-off to prevent starting of the engine accidentally and manual mixture control for leaning. For overhaul and repair of the carburetor, refer to the manufacturer's overhaul and repair manual.

11-47. CARBURETOR.

11-48. 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. Remove airbox in accordance with paragraph 11-53.

e. Disconnect throttle and mixture controls at carburetor. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.

f. Disconnect and cap or plug fuel line at carburetor.

g. Remove safety wire, nuts and washers attaching carburetor to intake manifold and remove carburetor and mounting gasket.

h. Reverse the preceding steps for reinstallation. Use new gaskets when installing carburetor. Rig controls in accordance with paragraphs 11-73, 11-74 and 11-75. (Check carburetor throttle arm to idle stop arm attachment for security and proper safing at each normal engine inspection in accordance with figure 11-8.)

11-49. IDLE SPEED AND MIXTURE ADJUSTMENTS.

Idle speed and mixture adjustment should be accomplished after the engine has been warmed up. Since idle rpm may be affected by idle mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture correctly.

a. Set the throttle stop screw (idle rpm) to obtain 600 ± 25 rpm, with throttle control pulled full out against idle stop.

NOTE

Engine idle speed may vary among different engines. An engine should idle smoothly, without excessive vibration and 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.

b. Advance throttle to increase engine speed to approximately 1000 rpm.

c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.

d. Adjust mixture adjusting screw at upper end of carburetor intake throat to obtain a slight and momentary gain of 25 rpm maximum at 1000 rpm engine speed as mixture control is moved from full IN (RICH) toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.

e. If mixture is set too LEAN, engine speed will stop immediately, thus requiring a richer mixture.

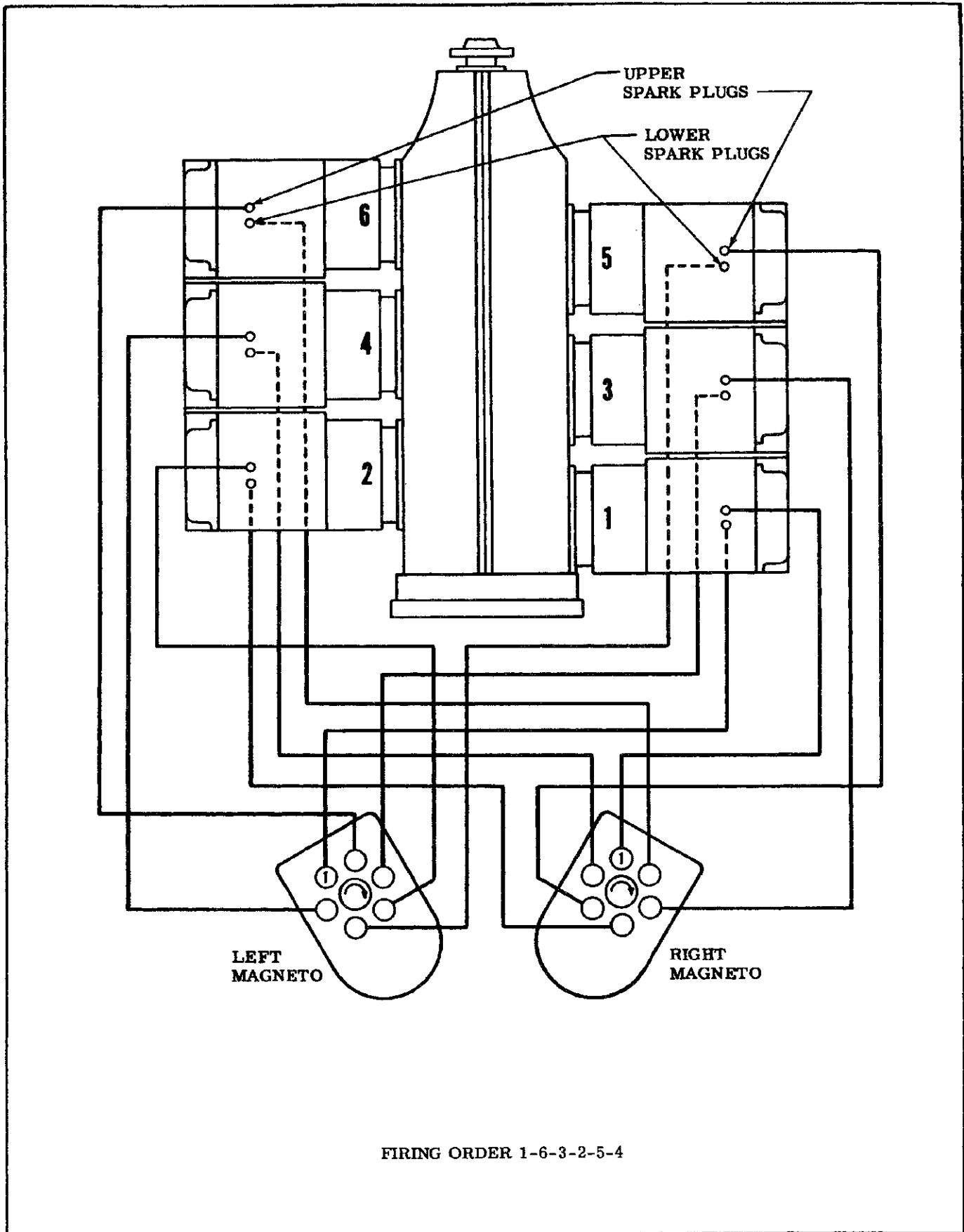


Figure 11-6. Ignition Schematic

11-61. 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 11-67.
	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 11-67.
ENGINE WILL NOT IDLE OR RUN PROPERLY (Cont).	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.

11-62. MAGNETOS.

11-63. DESCRIPTION. The magnetos contain a conventional two-pole rotating magnet (rotor), mounted in ball bearings. Driven by the engine through an impulse coupling at one end, the rotor shaft operates the breaker points at the other end of the shaft. The nylon rotor gear drives a nylon distributor gear which transfers high tension current from the wedge-mounted coil to the proper outlet in the distributor block. A coaxial capacitor is mounted in the distributor block housing to serve as the condenser as well as a radio noise suppressor. Both nylon gears are provided with timing marks for clockwise or counterclockwise rotation. The distributor gear and distributor block have timing marks, visible through the air vent holes, for timing to the engine. A timing hole is provided in the bottom of the magneto adjacent to the magneto flange. A timing pin or 6-penny nail can be inserted through this timing hole into the mating hole in the rotor shaft to lock the magneto approximately in the proper firing position. The breaker assembly is accessible only after removing the screws fastening the magneto halves together and disconnecting the capacitor slip terminal. Do not separate magneto halves while it is installed on the engine or internal timing may be disturbed.

11-64. REMOVAL.

- a. Remove engine cowling in accordance with paragraph 11-3.
- b. Tag for identification and remove high tension wires from the magneto being removed.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Remove the high tension wires from magneto or disconnect spark plug leads from the spark plugs to prevent accidental firing.

- c. Disconnect switch wire from condenser terminal at magneto. Tag wire for identification so it may be installed correctly.
- d. Rotate propeller in direction of normal rotation until No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate the installation of a replacement magneto, it is good practice to position the crankshaft at the advanced firing angle for No. 1 cylinder during step "d." Any standard timing device or method can be used, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

- e. Remove magneto retainer clamps, nuts and washers and pull magneto from crankcase mounting pad.

NOTE

As the magneto is removed from its mounting, be sure that the drive coupling rubber bushing and retainer do not become dislodged from the gear hub and fall into the engine.

NOTE

For inspection of impulse coupling on aircraft serials 18256685 THRU 18263179 refer to Cessna Single-engine Service Letter SE74-21, dated September 27, 1974.

11-65. INTERNAL TIMING.

- a. Whenever the gear on the rotor shaft or the cam (which also serves as the key for the gear) has been removed, be sure that the gear and cam are installed so the timing mark on the gear aligns with the "O" etched on the rotor shaft.
- b. When replacing breaker assembly or adjusting contact breaker points, place a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. Adjusting contact breaker points so they are just starting to open in this position will give the correct point setting. Temporarily assemble the magneto halves and capacitor slip terminal and use a timing light to check that the timing marks, visible through the ventilation plug holes are approximately aligned.

NOTE

The side of the magneto with the manufacturer's insignia has a red timing mark and the side opposite to the insignia has a black timing mark viewed through the vent plug holes. The distributor gear also has a red timing mark and a black timing mark. These marks are used for reference only when installing magneto on the engine. Do not place red and black lines together on the same side.

- c. Whenever the large distributor gear and rotor gear have been disengaged, they must be engaged with their timing marks aligned for correct rotation. Align the timing mark on the rotor gear with the "RH" on the distributor gear. Care must be taken to keep these two gears meshed in this position until the magneto halves are assembled.

11-66. INSTALLATION AND TIMING TO ENGINE. The magneto MUST be installed with its timing marks correctly aligned, with the number one cylinder on its compression stroke and with number one piston at its advanced firing position. Refer to paragraph 11-12 for the advanced firing position of number one piston.

WARNING

The magneto is grounded through the ignition switch, therefore, any time the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, remove the high tension wires from the magneto or disconnect all spark plug leads to prevent accidental firing of the engine.

To locate the compression stroke of number one cylinder, remove the lower spark plugs from each cylinder except number one cylinder. Remove the top plug from number one cylinder. Place thumb of one hand over the number one cylinder spark plug hole and rotate the 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 obtained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one cylinder may be obtained by use of a timing disc and pointer, Timrite, protractor and piston locating gage or external engine timing marks alignment.

NOTE

External engine timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

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 crankshaft is turned in its normal direction of rotation. After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushings into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with the chamfered edges facing toward the front of the engine.

- a. Turn the magneto shaft until the timing marks visible through the ventilation plug holes are aligned (red-to-red or black-to-black) and insert a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. This locks the magneto approximately in the firing position while installing on the engine.

NOTE

If the magneto drive gear was disengaged during magneto removal, hold the magneto in the horizontal position it will occupy when installed, make certain that the drive

gear coupling slot is aligned with the magneto coupling lugs. If it is not aligned, pull the magneto drive gear out of mesh with its drive gear and rotate it to the aligned angle, then push it back into mesh. **DO NOT WITHDRAW THE MAGNETO DRIVE GEAR FROM ITS OIL SEAL.**

- b. After magneto gasket is in place, position the magneto on the engine and secure, then remove the timing pin from the magneto. Be sure to remove this pin before turning the propeller.
- c. Connect a timing light to the capacitor terminal at the front of the magneto and to a good ground.
- d. Turn propeller back a few degrees (opposite of normal rotation) to close the contact points.

NOTE

Do not turn the propeller back far enough to engage the impulse coupling or the propeller will have to be turned in normal direction of rotation until the impulse coupling releases, then backed up to slightly before the firing position.

- e. Slowly advance the propeller in the normal direction of rotation until the timing light indicates the contact points breaking. Magneto mounting clamps may be loosened so that the magneto may be shifted to break the points at the correct firing position.
- f. Tighten magneto mounting nuts and recheck timing.
- g. Repeat steps "a" through "f" for the other magneto.
- h. After both magnetos have been timed, check synchronization of both magnetos. Magnetos must fire at the same time.
- i. Remove timing devices from magneto and engine.
- j. Connect spark plug leads to their correct magneto outlets.

NOTE

The No. 1 magneto outlet is the one closest to the ventilation plug on the side of the magneto having the manufacturer's insignia. The magneto fires at each successive outlet in clockwise direction. Connect No. 1 magneto outlet to No. 1 cylinder spark plug lead, No. 2 outlet to the next cylinder to fire, etc. Engine firing order is listed in paragraph 11-12.

- k. Connect toggle switch (primary) lead to the capacitor terminal on the magneto.
 1. Inspect magneto installation and install engine cowling in accordance with paragraph 11-3.

11-67. MAINTENANCE. At the first 25-hour inspection and at each 100-hour inspection thereafter, the breaker compartment should be inspected. Magneto-to-engine timing should be checked at the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour inspection. If timing is 22° (plus zero, minus 2°),

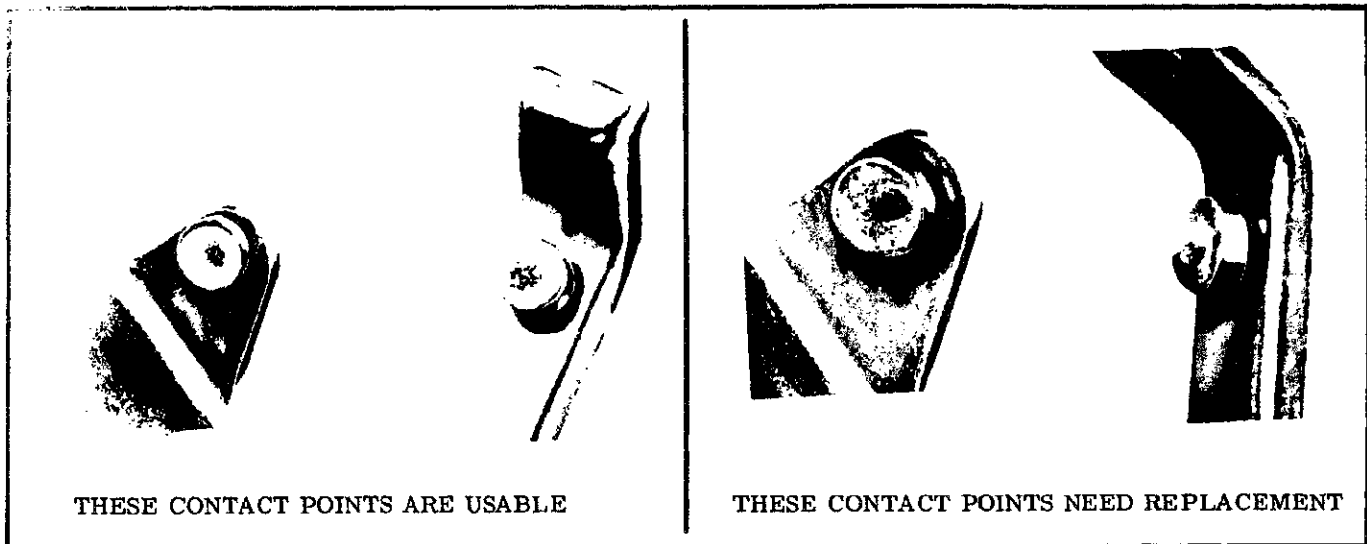


Figure 11-7. Magneto Contact Breaker Points

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. In the event the magneto internal timing marks are off more than plus or minus five degrees when the breaker points open to fire number one cylinder, remove the magneto and check the magneto internal timing. Whenever the magneto halves are separated the breaker point assembly should always be checked. As long as internal timing and magneto-to-engine timing are within the preceding tolerances, it is recommended that the magneto be checked internally only at 500 hour intervals. It is normal for contact points to burn and the cam to wear a comparable amount so the magneto will remain in time within itself. This is accomplished by having a good area making contact on the surface between the points and the correct amount of spring pressure on the cam. The area on the points should be twenty-five percent of the area making contact. The spring pressure at the cam should be 10.5 to 12.5 ounces. When the contact points burn, the area becomes irregular, which is not detrimental to the operation of the points unless metal transfer is too great which will cause the engine to misfire. Figure 11-7 illustrates good and bad contact points. A small dent will appear on the nylon insulator between the cam follower and the breaker bar. This is normal and does not require replacement.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble definitely is associated with a magneto, use the following to help disclose the source of trouble without overhauling the magneto.

a. Moisture Check.

1. Remove magneto from engine and remove screws securing the magneto halves together, disconnect capacitor slip terminal and remove distributor. Inspect for moisture.

2. Check distributor gear finger and carbon brush for moisture.

3. Check breaker point assembly for moisture, especially on the surfaces of the breaker points.

4. If any moisture is evident in the preceding places, wipe with a soft, dry, clean, lint-free cloth.

b. Breaker Compartment Check.

1. Check all parts of the breaker point assembly for security.

2. Check breaker point surfaces for evidence of excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard-finish paper. If breaker point assembly is defective, install a new assembly. Make no attempt to stone or dress the breaker points. Clean new breaker points with clean, unleaded gasoline and hard-finish paper before installing.

3. Check capacitor mounting bracket for cracks or looseness.

4. Check the carbon brush on the distributor gear for excessive wear. The brush must extend a minimum of 1/32 inch beyond the end of the gear shaft. The spring which the carbon brush contacts should be bent out approximately 20 degrees from vertical, since spring pressure on the brush holds the distributor gear shaft against the thrust bearing in the distributor cap.

5. Oil the bearings at each end of the distributor gear shaft with a drop of SAE 20 oil. Wipe excess oil from parts.

6. Make sure internal timing is correct and reassemble magneto. Install and properly time magneto to engine.

11-68. **MAGNETO CHECK.** Advanced timing settings in some cases, is the result of the erroneous practice of bumping magnetos up in timing in order to reduce RPM drop on single ignition. NEVER ADVANCE TIMING BEYOND SPECIFICATIONS IN ORDER TO REDUCE RPM DROP. Too much importance is being attached to RPM drop on single ignition. RPM drop on single ignition is a natural characteristic of dual ignition design. The purpose of the following magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, etc. In fact, absence of RPM drop should be cause for suspicion that the magneto timing has been bumped up and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

- a. Start and run engine until the oil and cylinder head temperature is in the normal operating range.
- b. Place the propeller control in the full low pitch (high rpm) position.
- c. Advance engine speed to 1700 rpm.
- d. 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.
- e. Turn the switch to the "L" position and note the rpm drop, then return the switch to the "BOTH" position.
- f. The rpm drop should not exceed 150 rpm on either magneto or show greater than 50 rpm differential between magnetos. 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 at 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.

11-69. **SPARK PLUGS.** Two 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 service 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

At each 100-hour inspection, remove, clean, inspect and regap all spark plugs. 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.

11-70. ENGINE CONTROLS.

11-71. **DESCRIPTION.** The throttle, mixture, propeller and carburetor heat controls are of the push-pull type. The propeller and mixture controls are 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 propeller and mixture controls also have a vernier adjustment. Turning the control 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.

NOTE

Some controls have intricate parts that will fall out and possibly be lost if the control is pulled from the housing while it is disconnected.

11-72. **RIGGING.** When adjusting any engine control, it is important to check that the control slides smoothly throughout its full travel, that it locks securely if equipped with a locking device and the arm or lever which it operates moves through its full arc of travel.

CAUTION

Some engine controls have a small retaining ring brazed (or attached with epoxy resin) near the threaded end (engine end) of the control. The purpose of these retaining rings is to prevent inadvertent withdrawal of and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

- 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.

11-73. THROTTLE CONTROL.

NOTE

Before rigging throttle control shown in figure 11-8, 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.

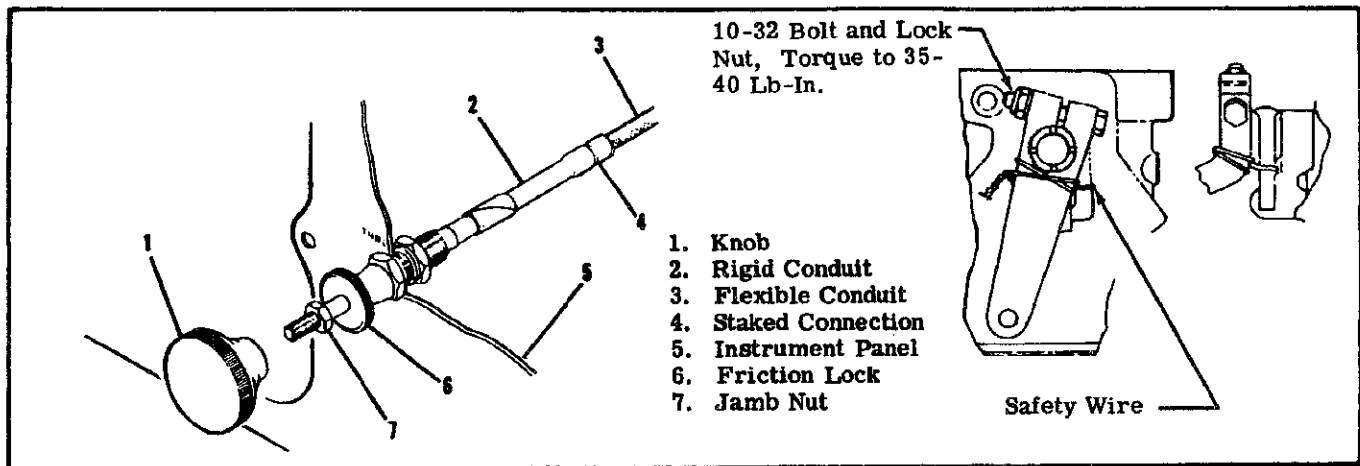


Figure 11-8. Throttle Control and Throttle Arm to Idle Stop Attachment

- 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.

11-74. 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.

11-75. CARBURETOR HEAT CONTROL.

- a. Loosen clamp securing the control to the bracket on the airbox.
- 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.

11-76. PROPELLER CONTROL. Refer to Section 13.

11-77. STARTING SYSTEM.

11-78. DESCRIPTION. The automatically-engaged starting system employs an electrical starter motor mounted to a 90-degree adapter. A solenoid is activated by the ignition switch on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the motor. Initial rotation of the motor engages the starter through an overrunning clutch in the starter adapter, which incorporates worm reduction gears. The starter motor is located just aft of the right rear cylinder.

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.

11-79. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity. Install new switch or wires.
	Defective starter motor.	Check electrical power to motor. Repair or replace starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANK-SHAFT.	Defective overrunning clutch or drive.	Check visually. Install new starter adapter.
	Starter motor shaft broken.	Check visually. Install new starter motor.
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.	Check visually. Install new cable.
	Loose or dirty 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.	Check visually. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion.	Remove and inspect. Replace starter drive.
	Worn or broken teeth on crankshaft gears.	Check visually. Replace crankshaft gear.

11-80. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of 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 brushes). 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 operations.

11-81. STARTER MOTOR.

11-82. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

CAUTION

When disconnecting starter electrical cable, do not permit terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

- b. Disconnect battery cables and insulate as a safety precaution.
- c. Disconnect electrical cable at starter motor.
- d. Remove nuts and washers securing motor to starter adapter and remove motor. Refer to engine manufacturer's overhaul manual for adapter removal.
- e. Reverse the preceding steps for reinstallation. Install a new O-ring seal on motor, then install motor. Be sure motor drive engages with the adapter drive when installing.

11-83. EXHAUST SYSTEM.

11-84. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, for the left and right bank of cylinders. Each cylinder has a riser pipe attached to the exhaust port. The three risers at each bank of cylinders are joined together into a collector pipe forming an exhaust stack assembly. The center riser on each bank is detachable, but the front and aft risers are welded to the collector pipe. Each exhaust stack assembly connects to the muffler beneath the engine. The muffler is enclosed in a shroud which captures exhaust heat which is used to heat the cabin.

The tailpipe is welded to the muffler. A shroud is attached to the left exhaust stack to provide heated air for the carburetor heat source.

11-85. REMOVAL AND INSTALLATION. (Refer to figure 11-9.)

- a. Remove engine cowling in accordance with paragraph 11-3.
- b. Disconnect ducts from heater shroud on muffler assembly.
- c. Disconnect duct from shroud on left exhaust stack assembly.
- d. Remove nuts, bolts and clamps attaching stack assemblies to the muffler.
- e. Loosen nuts attaching exhaust stacks to the cylinders and remove muffler assembly.
- f. Remove nuts attaching exhaust stack assemblies to the cylinders and remove exhaust stacks and gaskets.
- g. Reverse the preceding steps for reinstallation. Install a new copper-asbestos gasket between each riser and its mounting pad on each cylinder, regardless of apparent condition of those removed. Torque exhaust stack nuts at cylinders to 100-110 pound-inches.

11-86. INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 100 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of engine power. To inspect the engine exhaust system, proceed as follows:

- a. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visually inspected.

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

b. After visual inspection, an air leak check should be made on the exhaust system as follows:

1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

NOTE

The inside of vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually by feel, or by using a soap and water solution and watching for bubbles. Forming of bubbles is considered acceptable, if bubbles are blown away system is not considered acceptable.

- c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.

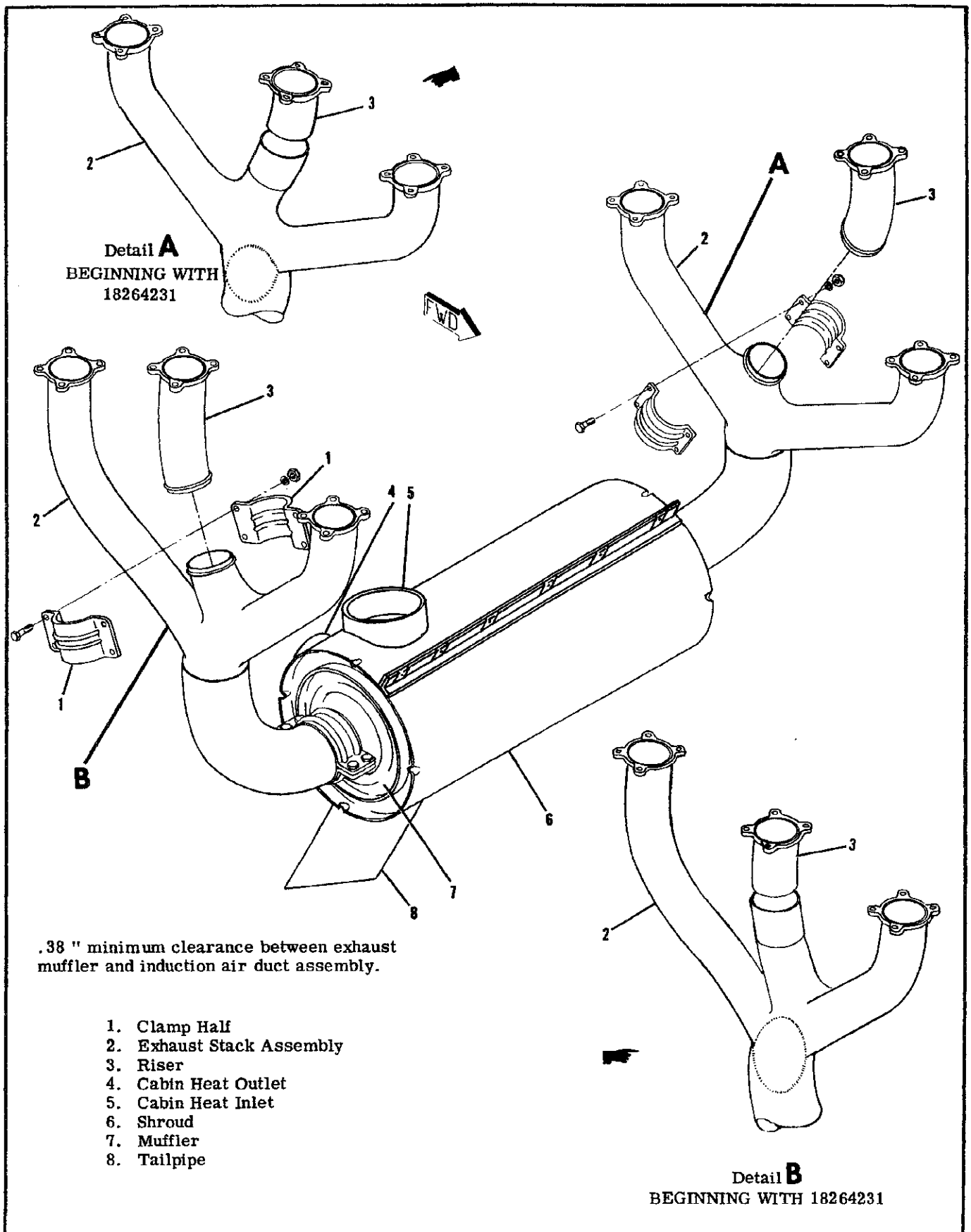


Figure 11-9. Exhaust System

1. Remove exhaust stack assemblies.
 2. Use rubber expansion plugs to seal openings.
 3. Using a manometer or gage, apply approximately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.
 4. It is recommended that exhaust stacks found defective be replaced before the next flight.
- d. After installation of exhaust system components perform the inspection in step "b" of this paragraph to ascertain that system is acceptable.

11-87. EXTREME WEATHER MAINTENANCE.

11-88. COLD WEATHER. Cold weather starting will be made easier by the installation of an oil dilution system, an engine primer system and a ground service receptacle. The primer system is manually operated from the cabin. Fuel is supplied by a line from the fuel strainer to the plunger. Operating the primer forces fuel to the engine. 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 11-92 for use of the external power receptacle.

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 runup after these conditions have been followed, preheat the drained engine 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 engine oil, gasoline may be mixed with the heated oil in a ratio of 1 part gasoline to 12 parts engine oil before pouring into the engine oil sump. If the free air temperature is below minus 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 propeller through several revolutions by hand before attempting to start the 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 sump. Small deposits may actually enter the oil sump 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 engine oil change. This will also prevent the accumulation of the sludge and carbon deposits.

11-89. HOT WEATHER. Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhaust are caused by over-priming or flooding. This situation is more apt to develop in hot weather or when the engine is hot. If it occurs, repeat the starting routine with the throttle approximately one-half OPEN and the mixture control in IDLE CUT-OFF. As the engine fires, move the mixture control to full RICH and decrease the throttle to desired idling speed.

Engine mis-starts characterized by sufficient power to disengage the starter but dying after 3 to 5 revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting routine 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.

11-90. SEACOAST AND HUMID AREAS. In salt water areas special care should be taken to keep the engine, accessories and airframe clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

11-91. DUSTY AREAS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating in high dust conditions, service the induction air filter daily as outlined in Section 2. Also change engine oil and lubricate airframe items more often than specified.

11-92. GROUND SERVICE RECEPTACLE. With the ground service receptacle installed, the use of an external power source is recommended for cold weather starting, low battery starting and lengthy maintenance of the aircraft electrical system. Refer to Section 16 for additional information.

11-93. HAND-CRANKING. A normal hand-cranking procedure may be used to start the engine.

SECTION 12

FUEL SYSTEM

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12-1. FUEL SYSTEM.

12-2. DESCRIPTION. A rubberized bladder-type fuel cell is located in the inboard bay of each wing. Fuel is gravity-fed from the cells through the finger strainers, selector valve and fuel strainer to the carburetor. Positive ventilation is provided by a vent line and check valve assembly located in the left wing cell. The vent line from the check valve assembly extends overboard through the lower wing skin adjacent to the left wing strut. The fuel supply line from the lower forward corner of each cell serves as a combination fuel feed and vapor return line and is teed into the cell crossover vent line. 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, purging, 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 cells to the carburetor, use NS-40 RAS-4 (Snap-On Tool Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound), Antiseize, Graphite-Petrolatum) or equivalent, as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. 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 FLOW TO CARBURETOR	Fuel selector valve not turned on.	Turn valve on.
	Fuel cells empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Fuel cell outlet screens plugged.	Remove and clean screens and flush out fuel cells.
	Defective fuel selector valve.	Repair or replace selector valve.
	Inlet elbow or inlet screen in carburetor plugged.	Clean or replace.
	Plugged fuel strainer.	Remove and clean strainer and screen.
	Fuel line plugged.	Clean or replace fuel line.
FUEL STARVATION AFTER STARTING	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Plugged fuel vent.	Refer to paragraph 12-22.
	Water in fuel.	Drain fuel cell sumps, lines and strainer.
NO FUEL QUANTITY INDICATION	Fuel cell empty.	Service with proper grade and amount of fuel.
	Open or defective circuit breaker.	Reset. Replace if defective.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective fuel quantity indicator or transmitter.	Refer to Section 15.
PRESSURIZED FUEL CELL	Plugged bleed hole in fuel vent.	Refer to paragraph 12-22.

SHOP NOTES:

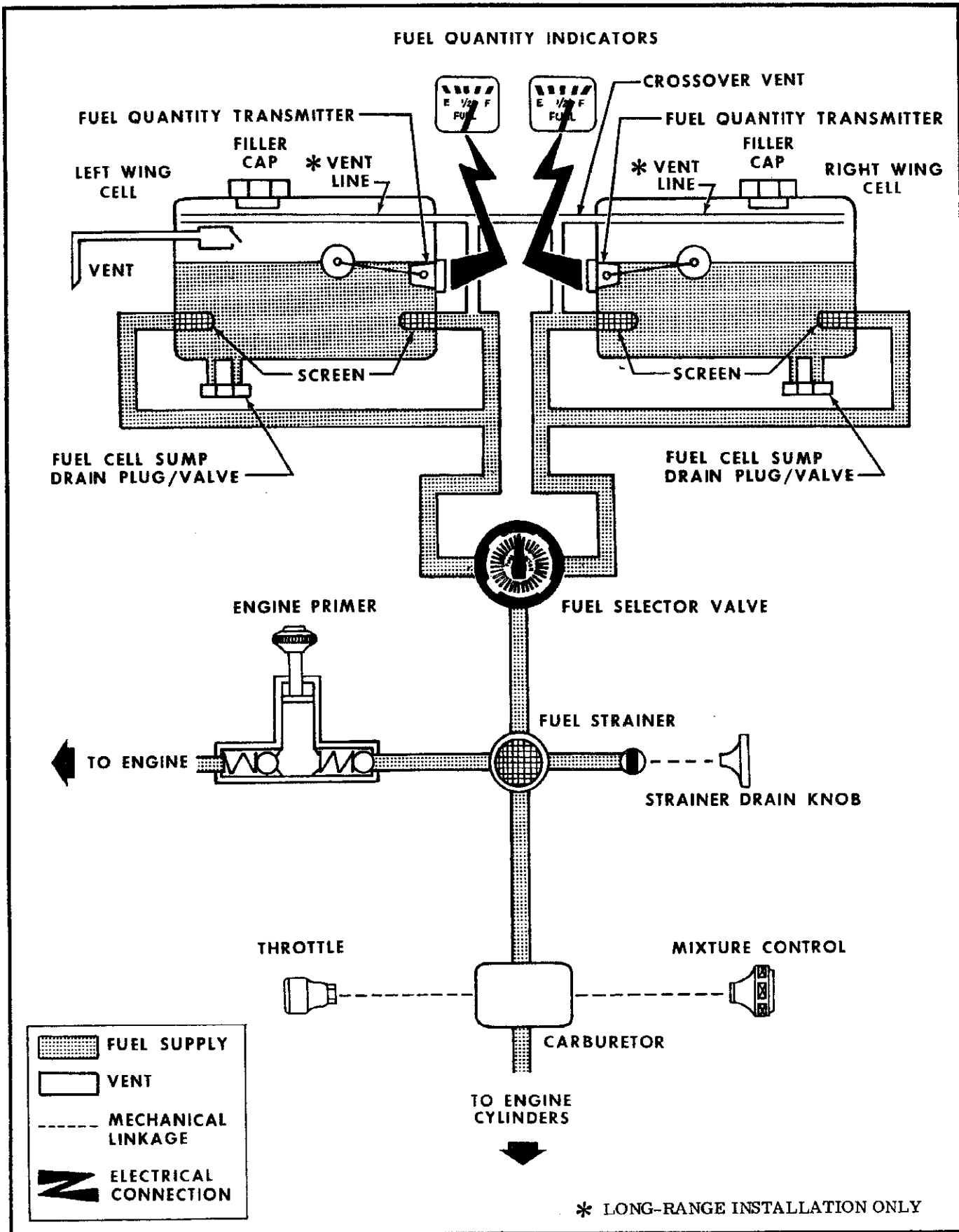


Figure 12-1. Fuel System Schematic

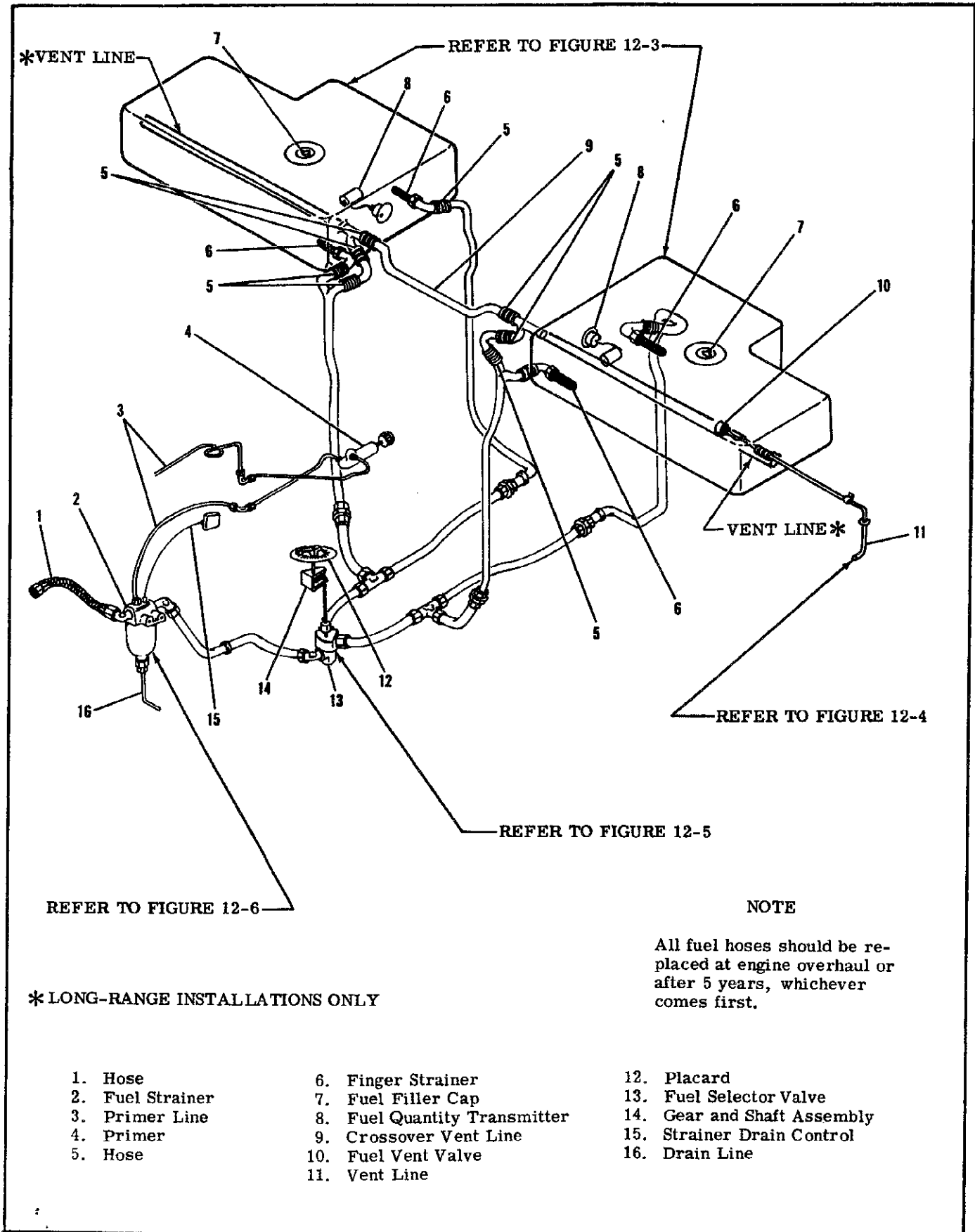


Figure 12-2. Fuel System

12-5. FUEL CELLS. (RUBBERIZED)

12-6. DESCRIPTION. Rubberized, bladder-type fuel cells are installed in the inboard bay of each wing panel. These cells are secured by fasteners to prevent collapse of the flexible cells.

12-7. GENERAL PRECAUTIONS. When storing, inspecting or handling rubberized, bladder-type fuel cells, the following precautions should be adhered to:

- a. Fold cells as smoothly and lightly as possible with a minimum number of folds. Place protective wadding between folds.
- b. Wrap cell in moisture-proof paper and place in a suitable container. Do not crowd cell in container. Use wadding to prevent movement.
- c. Stack boxed cells to allow access to oldest cell first. Do not allow stacks to crush bottom boxes. Leave cells in boxes until used.
- d. Storage area must be cool, +30°F to 85°, and free of exposure to sunlight, dirt and damage.
 - . Used cells must be cleaned with soap and warm water prior to storage. Dry and package as outlined in the preceding steps.
- f. Do not carry cells by fittings. Maintain original cell contours or folds when refolding for boxing.

12-8. FUEL CELL REMOVAL.

- a. Drain fuel from applicable cell.

NOTE

Prior to removal of cell, drain fuel, purge with fresh air, and swab out to remove all traces of fuel.

- b. Remove wing root fairings and disconnect fuel lines at wing root.
- c. Remove clamps from forward and aft fuel cell bosses at wing root and carefully work fuel strainers and lines from cell bosses.
- d. Disconnect electrical lead and ground strap from fuel quantity transmitter and carefully work transmitter from fuel cell and wing rib.
- e. Remove screws attaching drain adapter to lower surface of wing.
- f. Remove clamps attaching crossover vent line to fuel cells and work vent line out of cell being removed. In aircraft equipped with long-range cells, remove vent extension tube from inside cell. Vent extension tube is attached to the crossover vent bars on the cell.
- g. Remove fuel filler adapter and gaskets by removing screws attaching adapter to wing and fuel cell. On aircraft equipped with long-range cells, remove cover plate and gaskets, and remove nylon vent tube from inside cell.
- h. Working through filler neck opening, loosen snap fasteners. Tilt snap fasteners slightly when pulling cell free, to prevent tearing rubber.
- i. Collapse and carefully fold cell for removal, then work cell out of fuel bay through filler opening in upper wing surface. Use care when removing to prevent damage to cell.
- j. Unfold cell and remove fittings, snap fasteners and fuel sump drain adapter.

12-9. FUEL CELL REPAIR.

NOTE

For fuel cell repair information, refer to Cessna Service News Letter dated August 28, 1970. For minor repair, a fuel cell repair kit is available from Goodyear, complete with required materials and instructions.

12-10. Deleted.

12-11. Deleted.

12-12. Deleted.

12-13. Deleted.

12-14. Deleted.

12-15. Deleted.

12-16. FUEL CELL INSTALLATION.

- a. Cell compartment must be thoroughly cleaned of all filings, trimmings, loose washers, bolts, nuts, etc.
- b. All sharp edges of cell compartment must be rounded off and protective tape applied over any other sharp edges and protruding rivets.
- c. Inspect cell compartment just prior to installation of a cell for conditions noted in the preceding steps.
- d. Install fuel drain adapter and snap fasteners.
- e. Check to ensure cell is warm enough to be flexible and fold as necessary to fit through fuel cell access opening.
- f. Place cell in compartment, develop it out to full size and attach fasteners, then reverse procedures outlined in preceding paragraph for installation. Install all new gaskets when installing cell.
- g. On aircraft equipped with long-range cells, install nylon vent tube inside cell, inserting tube through four hangers in top of cell. If a replacement cell is being installed, use nylon vent tube removed from old cell and/or order tube from applicable Parts Catalog.
- h. When tightening screw-type clamps, apply a maximum of 20 pound-inches torque to clamp screws. No oil is to be applied to fittings prior to installation.
- i. When installing filler adapter, cover plate and fuel quantity transmitter to the wing and fuel cell, tighten attaching screw evenly. The sealing or compression surfaces must be assembled when absolutely dry (NO SEALING PASTE IS TO BE USED).
- j. After installation has been completed, cell should be inspected for final fit within compartment, making certain that cell is extended out to the structure and no corners are folded in.
- k. The final inspection, prior to closing the cell, should be a close check to ensure that cell is free of foreign matter such as lint, dust, oil or any installation equipment. If a cell is not thoroughly clean, it should be cleaned with a lint-free cloth, soaked in water, alcohol or kerosene. NO OTHER SOLVENT SHALL BE USED.

Hinge for vent valve (11) must be at top. Tube for vent extends into fuel cell, then is offset upward. Vent valve (11) is used in the left wing fuel cell only.

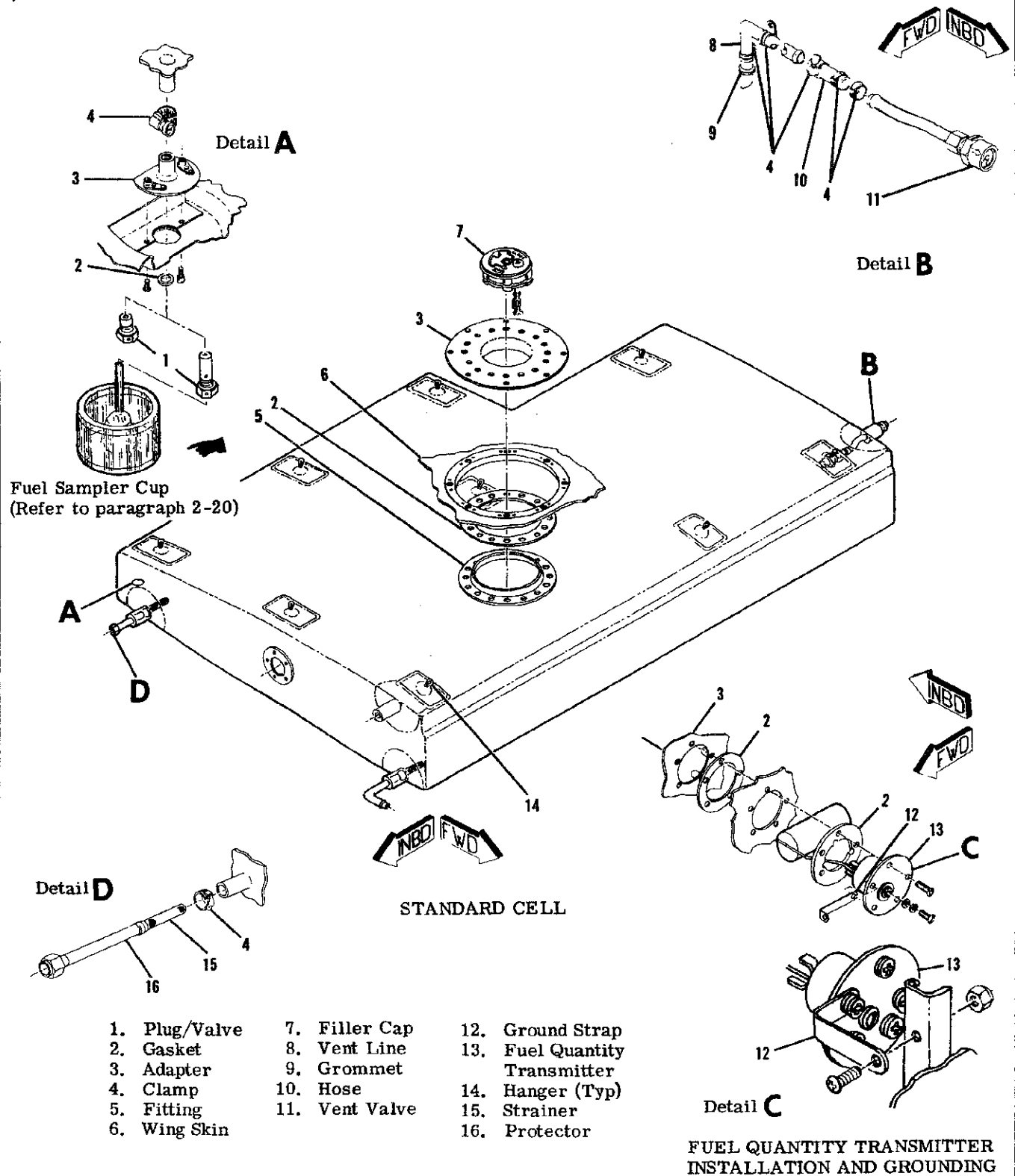
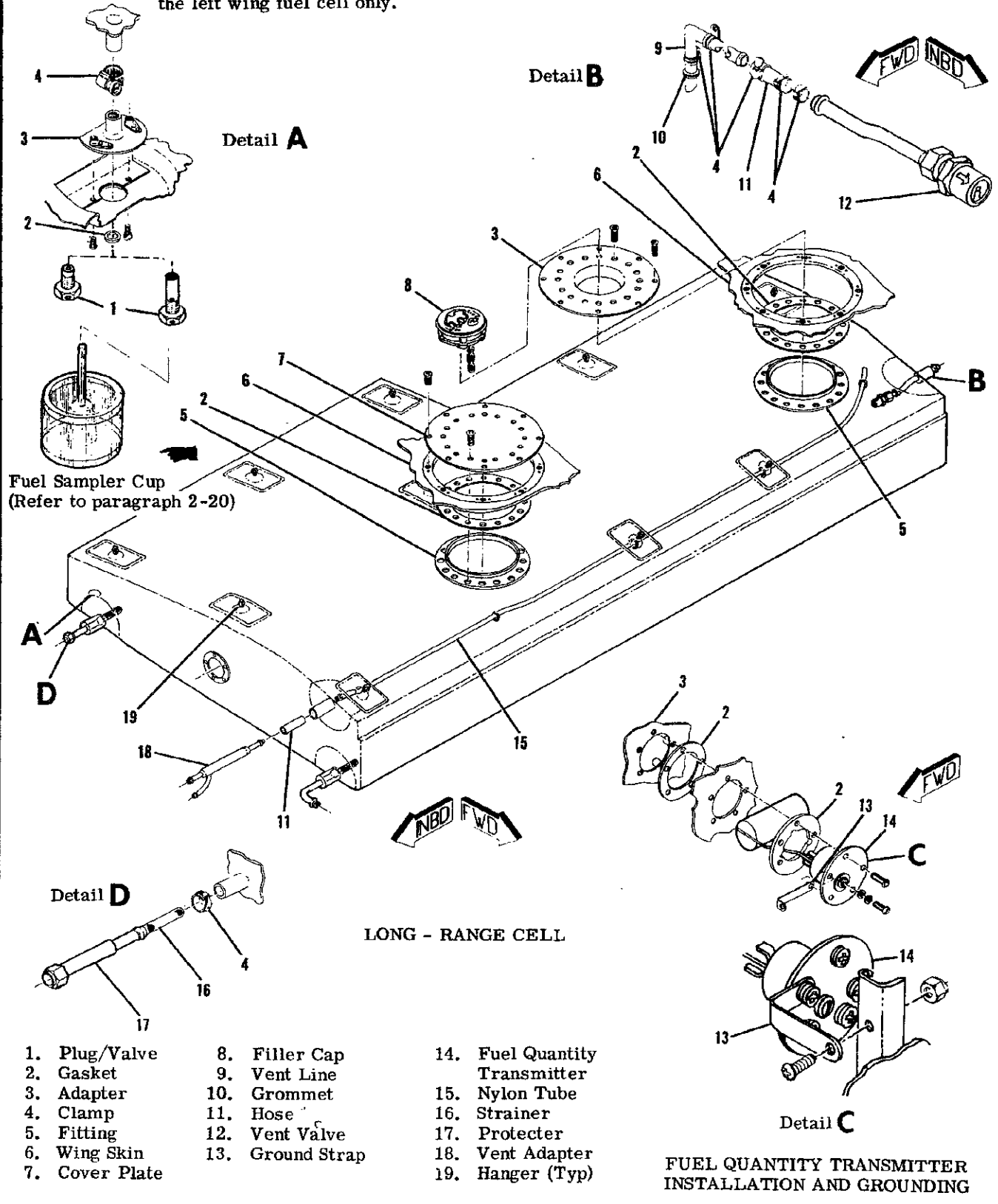


Figure 12-3. Fuel Cell Installation (Sheet 1 of 2)

Hinge for vent valve (12) must be at top. Tube for valve extends into fuel cell, then is offset upward. Vent valve (12) is used in the left wing fuel cell only.



Fuel Sampler Cup
(Refer to paragraph 2-20)

LONG - RANGE CELL

FUEL QUANTITY TRANSMITTER
INSTALLATION AND GROUNDING

Figure 12-3. Fuel Cell Installation (Sheet 2 of 2)

NOTE

Throughout the aircraft fuel system, from the fuel cells to the carburetor, use NS-40 RAS-4 (Snap-On Tool Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound), Antiseize, Graphite-Petrolatum) or equivalent, as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

12-17. FUEL QUANTITY TRANSMITTERS.

12-18. DESCRIPTION. Refer to Section 15 for a complete description of the transmitters.

12-19. REMOVAL AND INSTALLATION. Refer to Section 15 for procedures.

12-20. FUEL VENTS.

12-21. DESCRIPTION. A vent line is installed in the outboard end of the left fuel cell and extends overboard through the lower wing skin. The inboard end of the vent line extends into the fuel cell, then forward and slightly upward. A vent valve is installed on the inboard end of the vent line inside the fuel cell, and a crossover line connects the cells together. On aircraft equipped with long-range cells, a nylon vent tube is attached to the crossover line at the inboard end of each cell. This vent tube extends into the fuel cell, and is suspended by four hangers in the top of the cell.

12-22. CHECKING. Field experience has demonstrated that the fuel vent can become plugged, with possible fuel starvation of the engine or collapse of the fuel cells. Also, the bleed hole in the vent valve assembly could possibly become plugged, allowing pressure from expanding fuel to pressurize the cells. 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 cell. If air can be blown into cell, vent line is open.

c. After cell 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 cell. Crimp rubber tube to retain pressure within the cell. Loosen, but do not remove filler cap on opposite wing to check cell crossover line. If pressure escapes from filler cap, crossover line is open. Remove rubber tube from end of vent line beneath the wing after completion of check.

NOTE

Remember that a plugged vent line or bleed hole can cause either fuel starvation and collapsing of fuel cells or the pressurization of cells 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.

12-23. FUEL SELECTOR VALVE.

12-24. DESCRIPTION. A four position fuel selector valve is located between the pilot and copilot positions on the pedestal. The positions on the valve are labeled "OFF, LEFT, BOTH ON and RIGHT." Valve repair consists of replacement of O-rings and washers. Figure 12-5 illustrates the proper relationship of parts and may be used as a guide during disassembly and assembly.

12-25. REMOVAL AND INSTALLATION. (See figure 12-5.)

a. Completely drain all fuel from cells, lines,

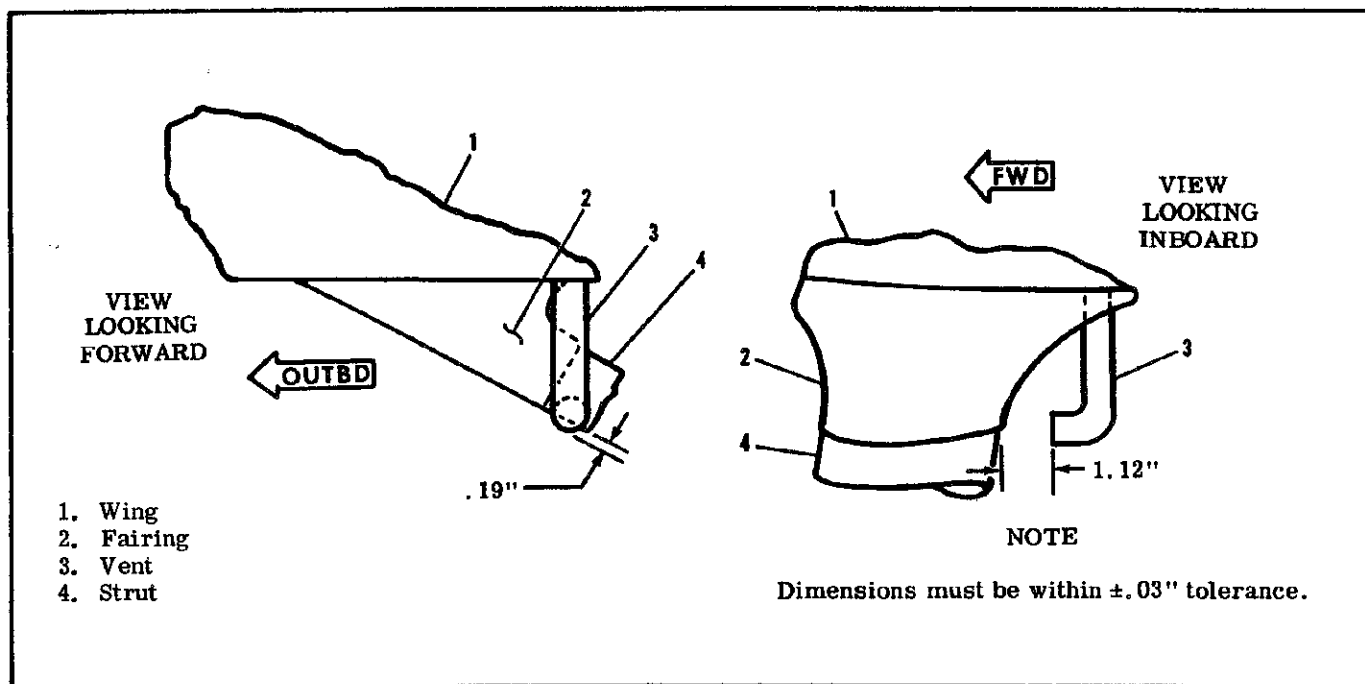


Figure 12-4. Fuel Vent Location

strainer and selector valve. (Observe precautions in paragraph 12-3.)

- b. Remove selector valve handle.
 - c. Remove pedestal cover.
 - d. Remove carpeting as necessary to gain access to plates at bottom and aft of pedestal.
 - e. Disconnect handle drive shaft from valve.
 - f. Disconnect and cap or plug all fuel lines at valve.
 - g. Remove screws attaching valve to structure and remove valve.
 - h. Reverse the preceding steps for installation.
- Prior to installing access plates, service fuel cells and check for leaks.

12-26. FUEL STRAINER. (See figure 12-6.)

12-27. DESCRIPTION. The fuel strainer is mounted at the firewall in the lower engine compartment and 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 accessible through the oil dipstick door.

NOTE

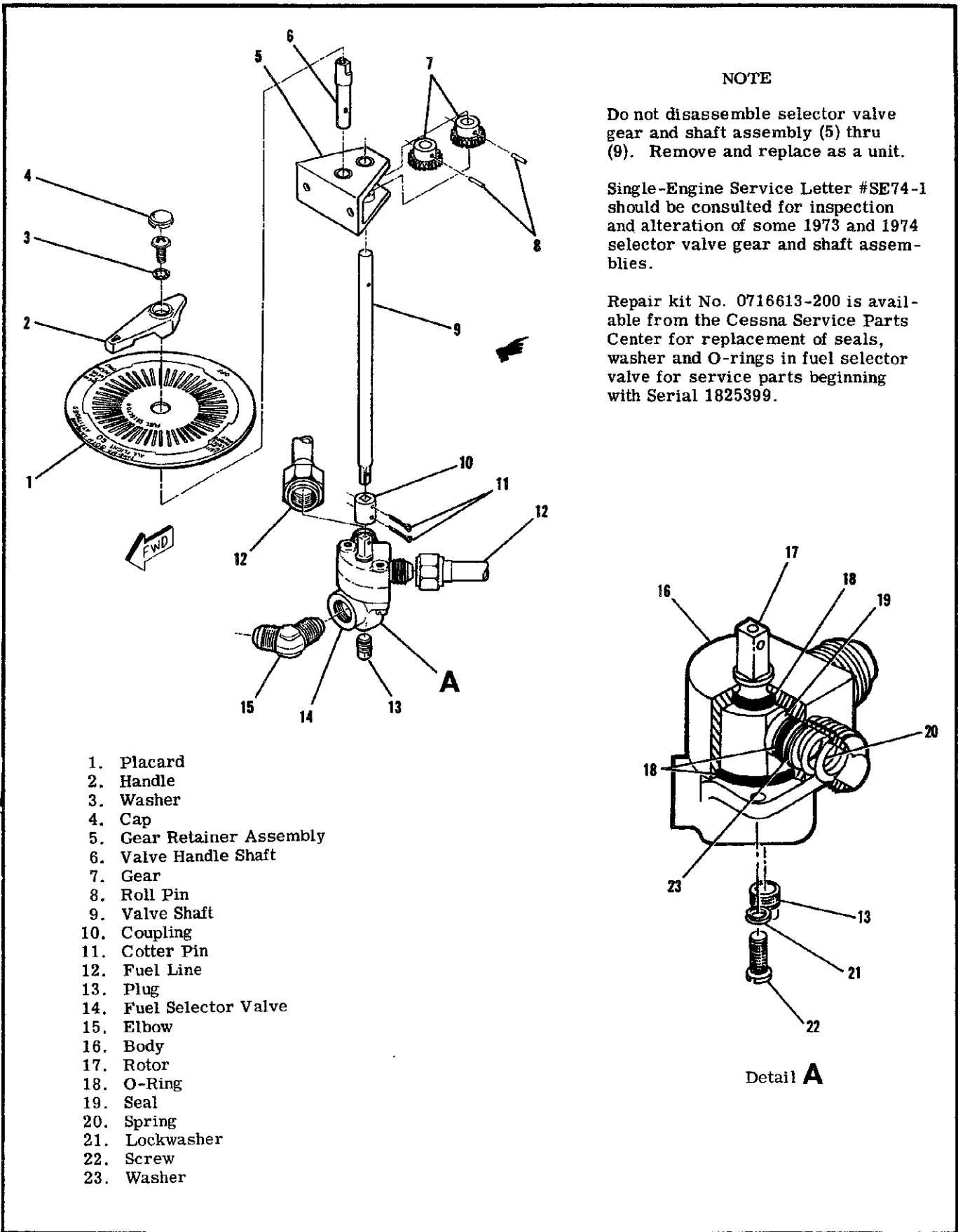
The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft. (Refer to paragraph 12-29.)

12-28. 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.

12-29. 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.



NOTE

Do not disassemble selector valve gear and shaft assembly (5) thru (9). Remove and replace as a unit.

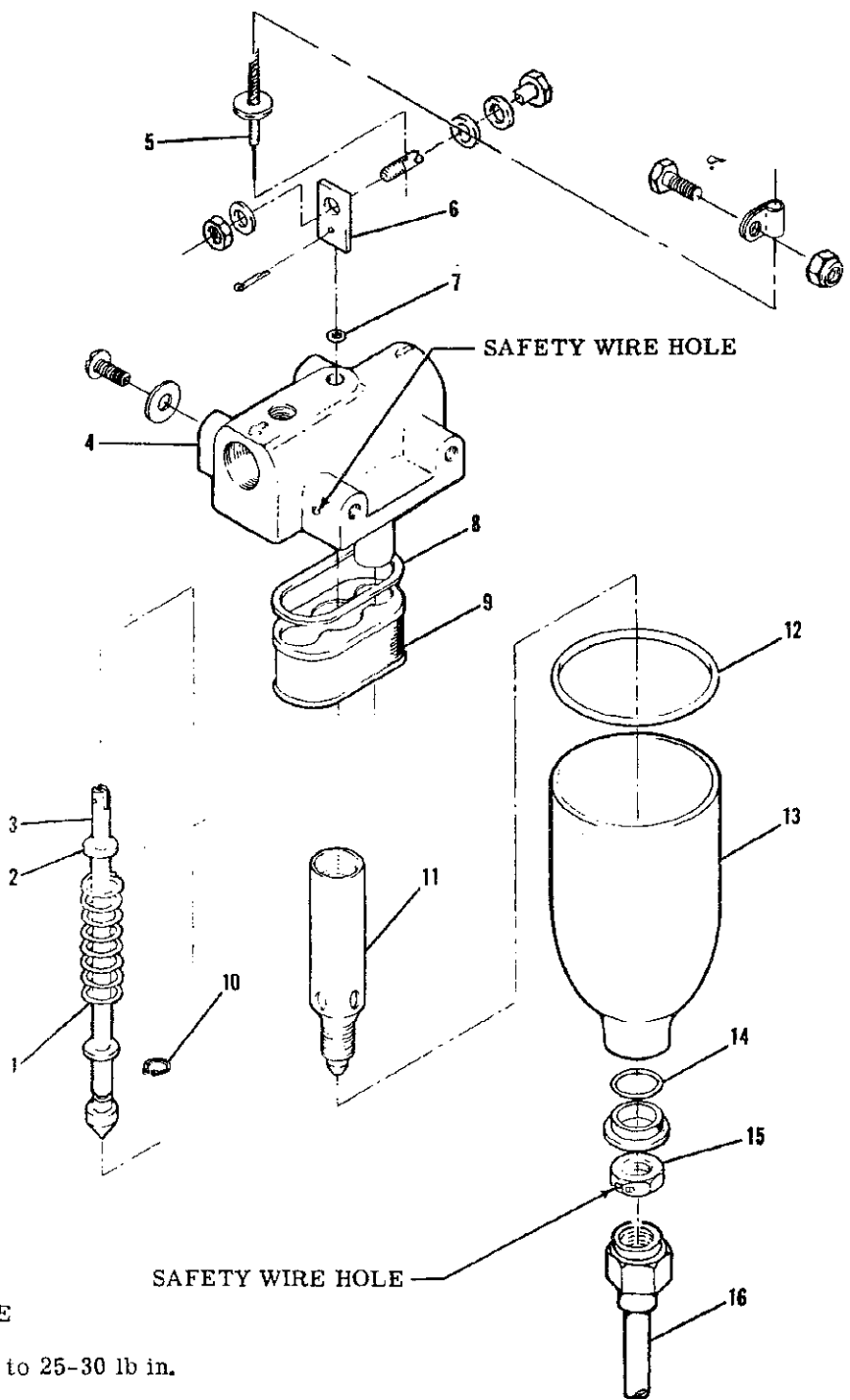
Single-Engine Service Letter #SE74-1 should be consulted for inspection and alteration of some 1973 and 1974 selector valve gear and shaft assemblies.

Repair kit No. 0716613-200 is available from the Cessna Service Parts Center for replacement of seals, washer and O-rings in fuel selector valve for service parts beginning with Serial 1825399.

- 1. Placard
- 2. Handle
- 3. Washer
- 4. Cap
- 5. Gear Retainer Assembly
- 6. Valve Handle Shaft
- 7. Gear
- 8. Roll Pin
- 9. Valve Shaft
- 10. Coupling
- 11. Cotter Pin
- 12. Fuel Line
- 13. Plug
- 14. Fuel Selector Valve
- 15. Elbow
- 16. Body
- 17. Rotor
- 18. O-Ring
- 19. Seal
- 20. Spring
- 21. Lockwasher
- 22. Screw
- 23. Washer

Detail **A**

Figure 12-5. Fuel Selector Valve



NOTE

Torque nut (15) to 25-30 lb in.

- | | | |
|------------------|-------------------|----------------|
| 1. Spring | 6. Plate | 12. O-Ring |
| 2. Washer | 7. O-Ring | 13. Bowl |
| 3. Plunger | 8. Gasket | 14. O-Ring |
| 4. Top | 9. Filter | 15. Nut |
| 5. Drain Control | 10. Retainer Ring | 16. Drain Line |
| | 11. Standpipe | |

Figure 12-6. Fuel Strainer

12-30. PRIMING SYSTEM.

12-31. DESCRIPTION. The priming system is comprised of a plunger-type manually-operated primer, which draws fuel from the strainer and forces it through a tee fitting to the aft end of each intake manifold. Injecting the fuel into each manifold primes both banks of cylinders.

12-32. REMOVAL AND INSTALLATION.

- a. With selector valve in "OFF" position, drain fuel from strainer and lines with quick-drain control.
- b. Disconnect and cap or plug all fuel lines at primer. (Observe precautions in paragraph 12-3.)
- c. Unscrew knurled nut and remove plunger from pump body.

- d. 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.

- e. Prior to installing a primer, check for proper pumping action and positive fuel shut-off in the locked position.
- f. Reverse the preceding steps for installation. With selector valve in "BOTH" position, check for leaks and proper pumping action.

SECTION 13

PROPELLERS AND PROPELLER GOVERNORS

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13-1. PROPELLERS.

13-2. DESCRIPTION. The aircraft is equipped with an all-metal, constant-speed, governor-regulated propeller. The constant-speed propeller is single-acting, in which engine oil pressure, boosted and regulated by the governor is used to obtain the correct blade pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the crankshaft. The amount and pressure of the oil supplied is controlled by the engine-driven governor. Increasing engine speed will cause oil to be admitted to the piston, thereby increasing the blade pitch. Conversely, decreasing engine speed will result in oil leaving the piston, thus decreasing the blade pitch. During the 1969 model year, a new

threadless blade propeller is installed. With this type blades, the propeller balance weights are moved to a bracket on the propeller cylinder nearer the center line of the propeller. Figure 13-1 illustrates the different propellers used on the aircraft.

13-3. REPAIR. Metal propeller repair first involves evaluating the damage and determining whether the repair will 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 repairs or alterations to a propeller FAR 43, FAA AC No. 43.13 and the propeller manufacturer's instructions must be observed.

13-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO CHANGE PITCH.	Governor control disconnected or broken.	Check visually. Connect or replace control.
	Governor not correct for propeller. (Sensing wrong.)	Check that correct governor is installed. Replace governor.
	Defective governor.	Refer to paragraph 13-9.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 13-9.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
STATIC RPM TOO HIGH OR TOO LOW.	Improper propeller governor adjustments.	Perform static RPM check. Refer to Section 11 for procedures.
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 13-9.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to take-off after propeller has been reinstalled or has been idle for an extended period.
	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 13-9.

SHOP NOTES:

13-4. TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	Damaged O-ring and seal between engine crankshaft flange and propeller.	Check visually. Remove propeller and install O-ring seal.
	Foreign material between engine crankshaft flange and propeller mating surfaces or mounting nuts not tight.	Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in figure 13-1.
OIL LEAKAGE AT ANY OTHER PLACE.	Defective seals, gaskets, threads, etc., or incorrect assembly.	Propeller repair or replacement is required.

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

- a. Remove spinner attaching screws and remove spinner (1), spinner support (2) and spacers (3). Retain spacers (3).
- b. Remove cowling as required for access to mounting nuts (14).
- c. Loosen all mounting nuts (14) approximately 1/4 inch and pull propeller (6) forward until stopped by nuts.

NOTE

As the propeller (6) is separated from the engine crankshaft flange, oil will drain from the propeller and engine cavities.

- d. Remove all propeller mounting nuts (14) and pull propeller forward to remove from engine crankshaft (11).
- e. If desired, the spinner bulkhead (12) can be removed by removing screws and nuts attaching lugs (13) to bulkhead. Note direction of lugs (13) and lug attaching screws.

13-6. INSTALLATION.

- a. If the spinner bulkhead (12) was removed, position bulkhead so the propeller blades will emerge from the spinner (1) with ample clearance and install spinner bulkhead attaching lugs and screws.

CAUTION

Avoid scraping metal from bore of spinner bulkhead and wedging scrapings between engine flange and propeller. Trim the inside diameter of the bulkhead as necessary when installing a new spinner bulkhead.

- b. Clean propeller hub cavity and mating surfaces of propeller and crankshaft.
- c. Lightly lubricate a new O-ring (9) and the crankshaft pilot with clean engine oil and install the O-ring in the propeller hub.

- d. Align propeller mounting studs and dowel pins with proper holes in engine crankshaft flange and slide propeller carefully over crankshaft pilot until mating surfaces of propeller and crankshaft flange are approximately 1/4 inch apart.

- e. Install propeller attaching nuts (14) and work propeller aft as far as possible, then tighten nuts evenly and torque to 660-780 lb-in.

- f. Install any spacers (3) used between spinner support and propeller cylinder, then install spinner support and spinner. The spacers are used as required to cause a snug fit between the spinner (1) and the spinner support (2).

13-7. PROPELLER GOVERNORS.

13-8. DESCRIPTION. The propeller governor is a single-acting, centrifugal type, which boosts oil pressure from the engine and directs it to the propeller where the oil is used to increase blade pitch. A single-acting governor uses oil pressure to effect a pitch change in one direction only; a pitch change in the opposite direction results from a combination of centrifugal twisting moment of rotating blades and compressed springs. Oil pressure is boosted in the governor by a gear type oil pump. A pilot valve, fly weight and speeder spring act together to open and close governor oil passages as required to maintain a constant engine speed.

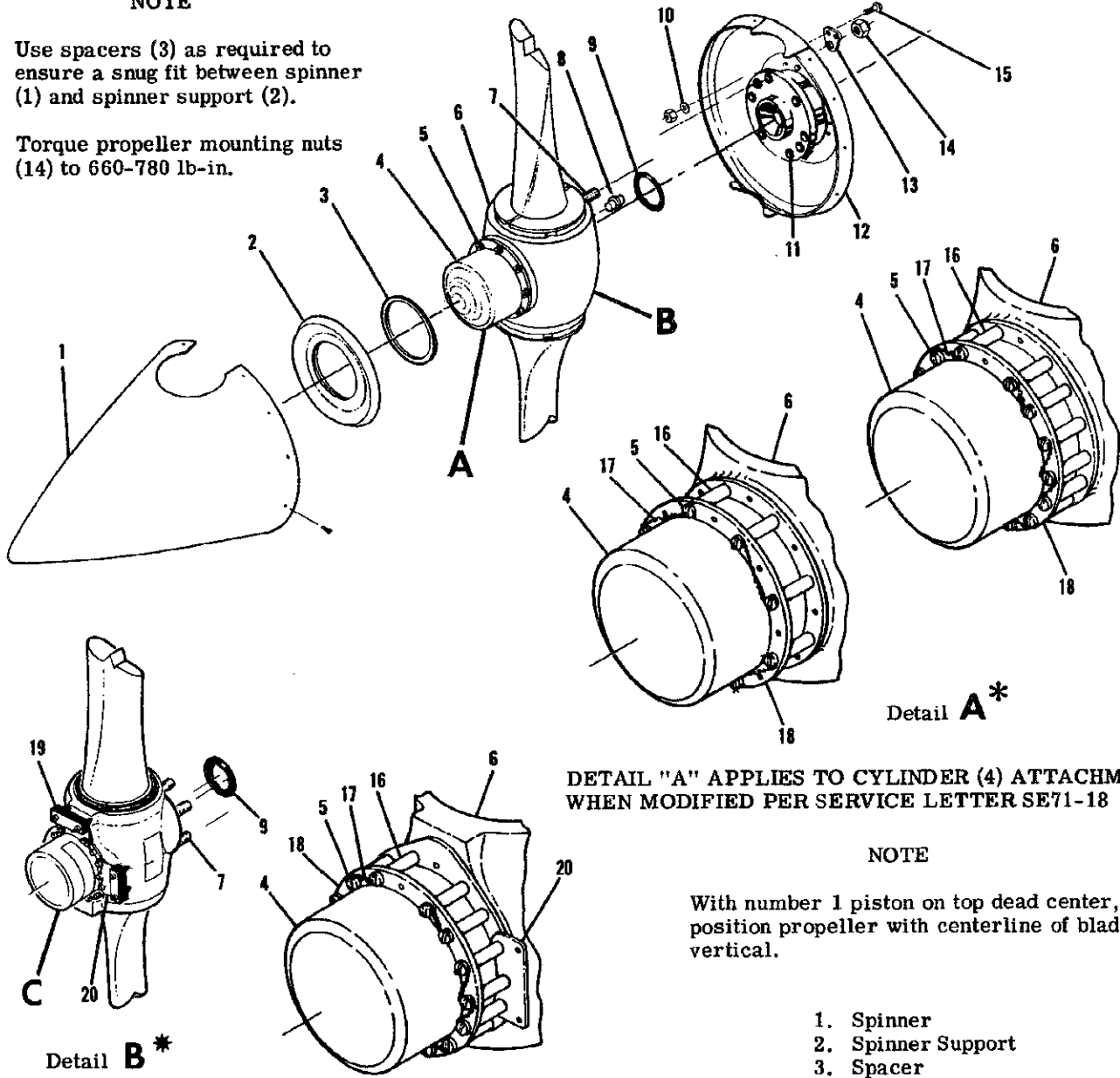
NOTE

Outward physical appearance of specific governors is the same, but internal parts determine whether it uses oil pressure to increase or decrease blade pitch. The propellers used on these aircraft require governors which "sense" in a certain manner. "Sensing" is determined by the type pilot valve installed inside the governor. Since the basic governor may be set to "sense" oppositely, it is important to ascertain that the governor is correct for the propeller being used.

NOTE

Use spacers (3) as required to ensure a snug fit between spinner (1) and spinner support (2).

Torque propeller mounting nuts (14) to 660-780 lb-in.



DETAIL "A" APPLIES TO CYLINDER (4) ATTACHMENT WHEN MODIFIED PER SERVICE LETTER SE71-18

NOTE

With number 1 piston on top dead center, position propeller with centerline of blades vertical.

DETAIL "C" APPLIES TO CYLINDER (4) ATTACHMENT WHEN MODIFIED PER SERVICE LETTER SE71-18

- 1. Spinner
- 2. Spinner Support
- 3. Spacer
- 4. Cylinder
- 5. Screw
- 6. Propeller
- 7. Stud
- 8. Dowel Pin
- 9. O-Ring
- 10. Washer
- 11. Engine Crankshaft
- 12. Spinner Bulkhead
- 13. Lug
- 14. Mounting Nut
- 15. Screw
- 16. Tube
- 17. Safety Wire
- 18. Ring
- 19. Balance Weight
- 20. Balance Weight Bracket

* THRU AIRCRAFT SERIALS 18259421 AND A182-0116

* BEGINNING WITH AIRCRAFT SERIALS 18259422 AND A182-0117

Figure 13-1. Propeller Installation

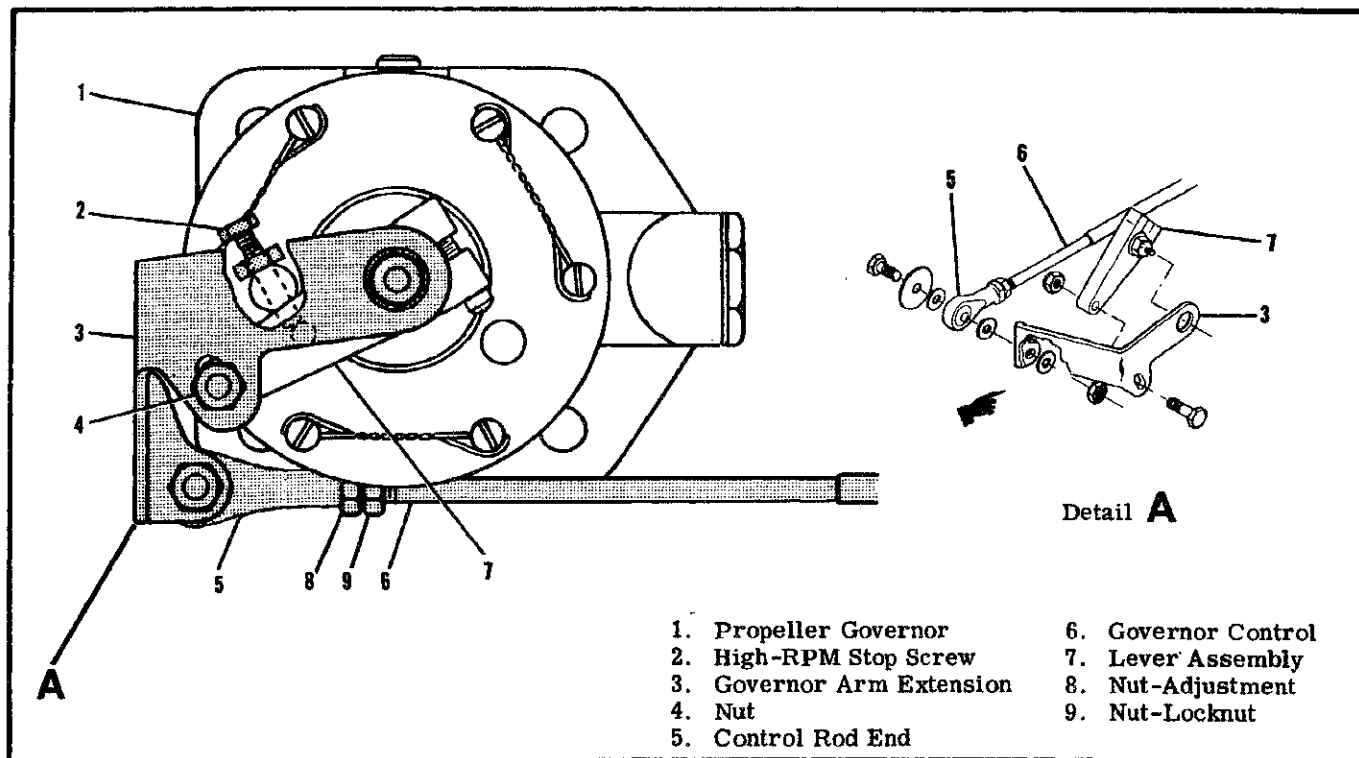


Figure 13-2. Governor and Control Adjustments

13-9. TROUBLE SHOOTING. When trouble shooting the propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault. Removal and replacement, rigging, high-speed stop adjustment, desludging and replacement of the governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classed as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

13-10. REMOVAL.

- a. Remove cowling and engine baffles as required for access to governor.
- b. Disconnect governor control from governor extension arm.

NOTE

Note EXACT position of all washers so that washers may be installed in the same position on reinstallation.

- c. Remove four sets of nuts and washers securing governor to engine and pull governor from mounting studs.
- d. Remove gasket from between governor and engine mounting pad.

13-11. INSTALLATION.

- a. Wipe governor and engine mounting pad clean.
- b. Install a new gasket on the mounting studs. Install gasket with raised surface of the gasket screen toward the governor.
- c. Position governor on mounting studs, aligning governor drive splines with splines in the engine and install mounting nuts and washers. Do not force spline engagement. Rotate engine crankshaft slightly and splines will engage smoothly when properly aligned.
- d. Connect governor control to governor arm extension and rig control as outlined in paragraph 13-13.
- e. Reinstall all items removed for access.

13-12. HIGH-RPM STOP ADJUSTMENT.

- a. Remove engine cowling and baffles as required for access.
- b. Remove safety wire and loosen the high-speed stop screw locknut.
- c. Turn the stop screw IN to decrease maximum rpm and OUT to increase maximum rpm. One full turn of the stop screw causes a change of approximately 25 rpm.
- d. Tighten stop screw locknut, safety wire stop screw and make propeller control linkage adjustment as necessary to maintain full travel.
- e. Install baffles and cowling.
- f. Test operate propeller and governor.

NOTE

It is possible for either the propeller low pitch (high-rpm) stop or the governor high-rpm stop to be the high-rpm limiting factor. It is desirable for the governor stop to limit the high-rpm at the maximum rated rpm for a particular aircraft. Due to climatic conditions, field elevation, low-pitch blade angle and other considerations, an engine may not reach rated rpm on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated rpm when airborne.

13-13. RIGGING PROPELLER GOVERNOR CONTROL.

- a. Disconnect governor control from governor extension arm.
- b. Place propeller governor control, in cabin, full forward, then pull back approximately 1/8 inch and lock in this position. This will allow "cushion" to assure full contact of the governor arm with the governor high-rpm stop screw.

c. Place governor arm against high-rpm stop screw.

d. Loosen jam nuts and adjust control rod end until attaching holes align while governor arm is against high-rpm stop screw. Be sure to maintain sufficient thread engagement of the control and rod end. If necessary, shift control in the clamps to achieve this.

e. Attach rod end to the governor arm extension. Be sure all washers are installed correctly.

f. Operate the control to see that the governor arm bottoms out against the low pitch stop and bottoms out against or a maximum of .12 " from the high pitch stop on the governor before reaching the end of control cable travel.

NOTE

The governors are equipped with an offset extension to the governor arm. The offset extension has an elongated slot to permit further adjustment. The preceding steps may still be used as an outline in the rigging procedure.

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. OPERATION. Ram air is ducted through engine baffle inlets 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 labeled "CABIN HEAT," 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 and defrosting systems are caused by sticking or binding valves and 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 valves respond freely to control movement, that they move in the correct direction, that they move through their full range of travel and

seal properly. Check that hose are properly secured and replace hose 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 heater ducts across the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound or equivalent compound.

14-6. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 may be used as a guide during removal, installation and repair of heating system components. Burned, frayed or crushed hose must be replaced with new hose, cut to length and installed in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. Defective air valves must be repaired or replaced. Check for proper operation of valves and their controls after repair or replacement.

14-7. DEFROSTER SYSTEM.

14-8. DESCRIPTION. The defrosting system is comprised of a duct across the aft side of the firewall, a defroster outlet and shut-off valve assembly mounted on the left side of the cowl deck immediately aft of the windshield, a shut-off valve control on the instrument panel and flexible ducting connecting the system.

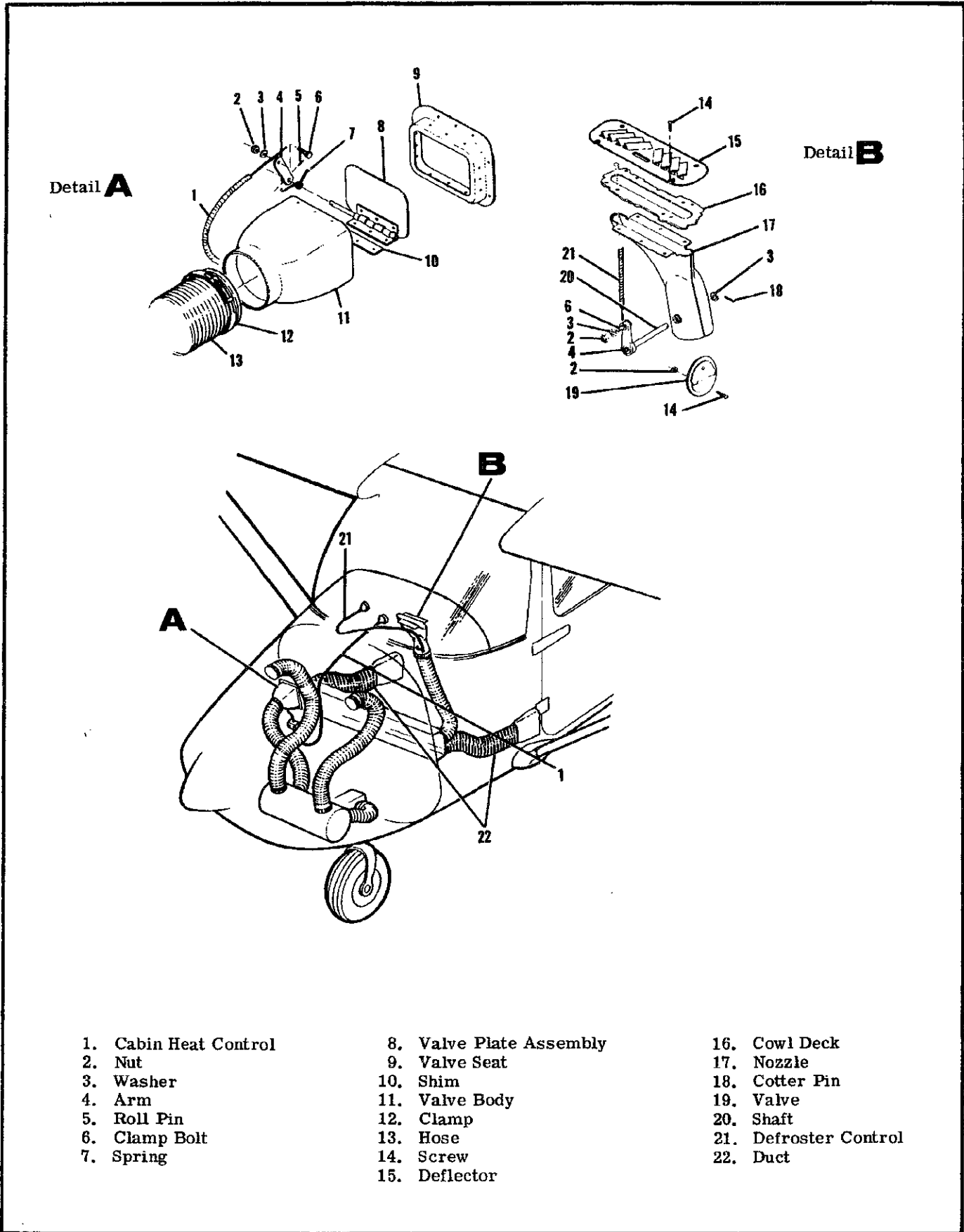


Figure 14-1. Heating and Defrosting Systems

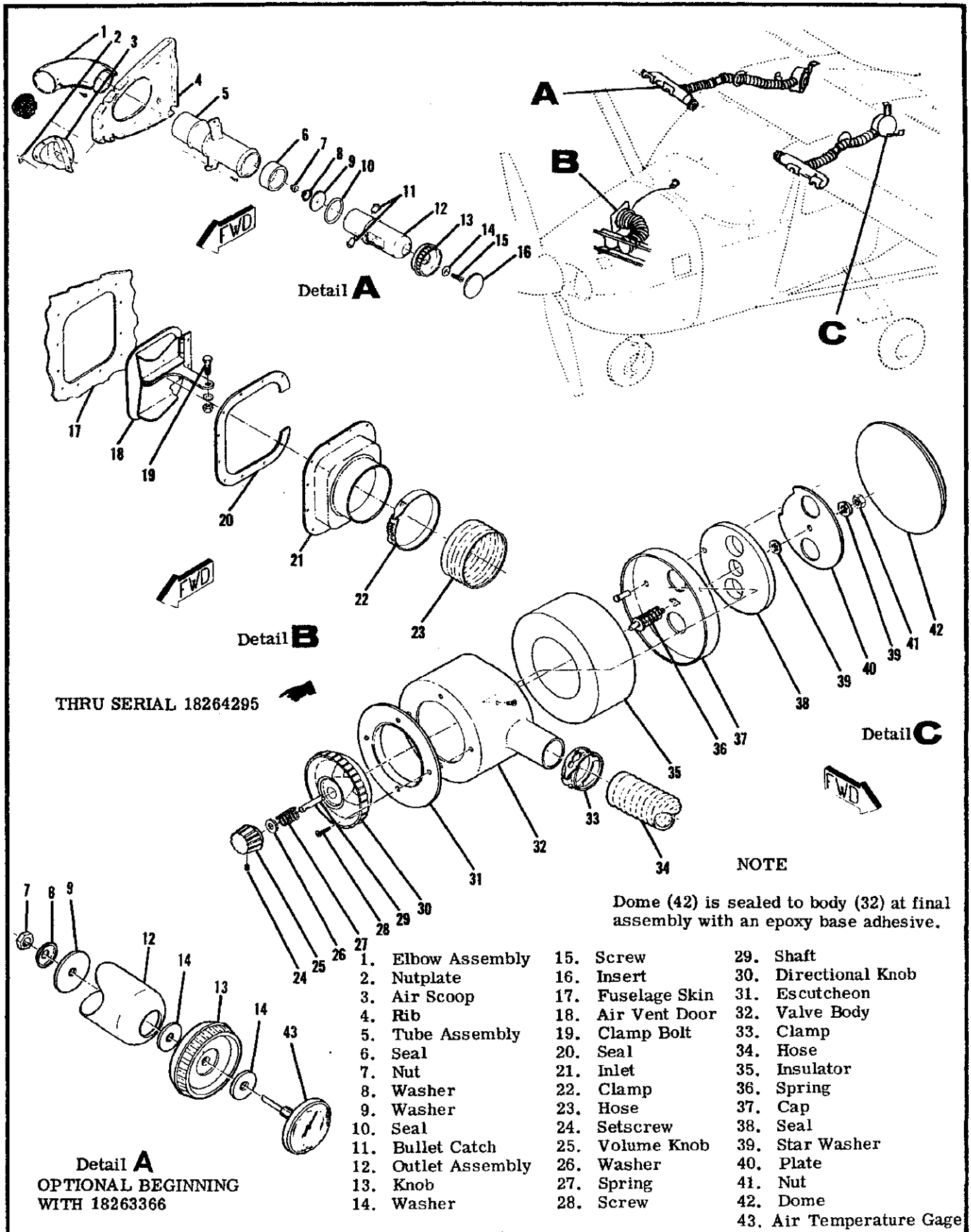


Figure 14-2. Ventilating Systems

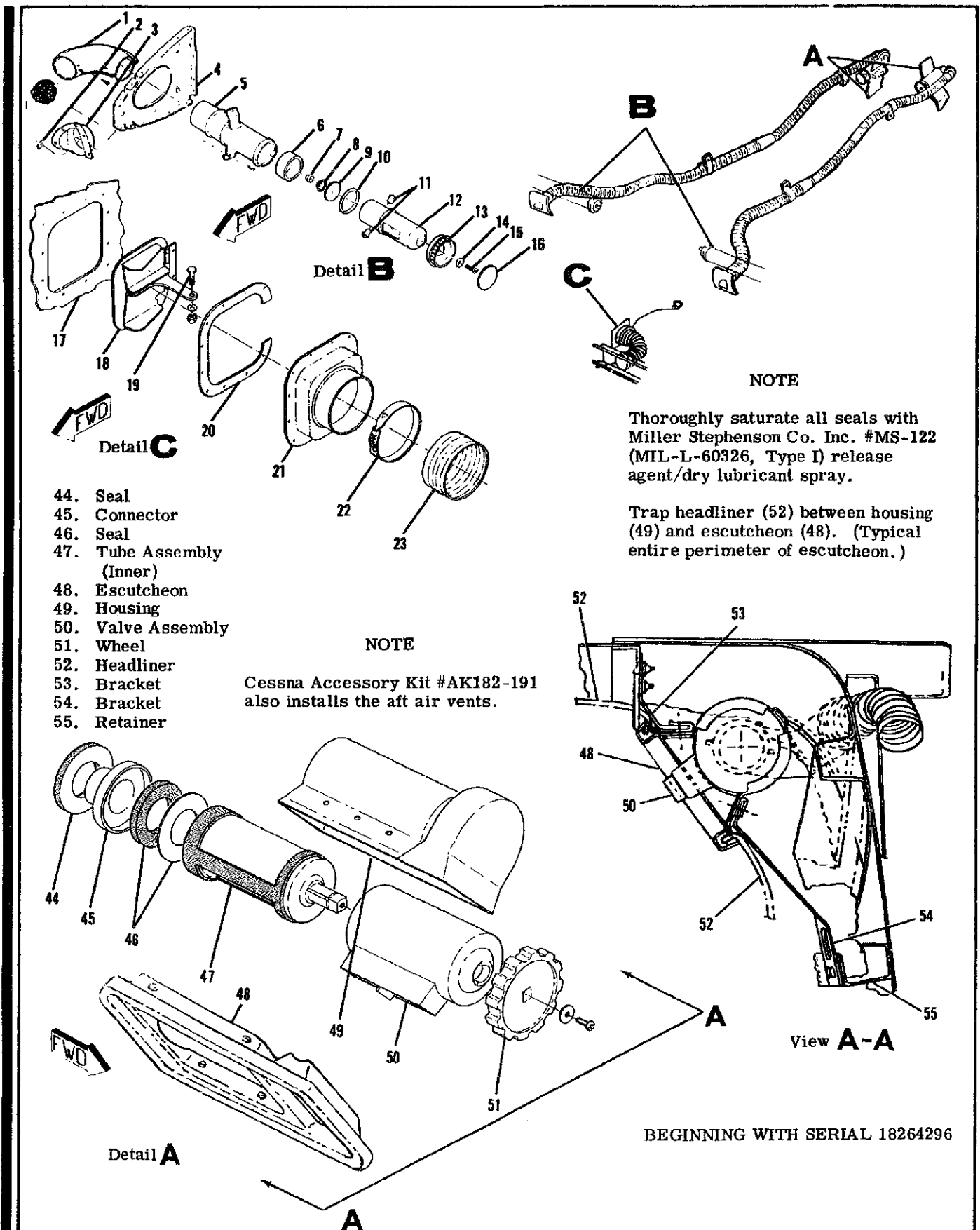


Figure 14-2. Ventilating Systems (Sheet 2 of 2)

14-9. OPERATION. Air from the duct across the aft side of the firewall flows through a flexible duct to the defroster outlet. The temperature and volume of this air is controlled by the settings of the heater system control.

14-10. TROUBLE SHOOTING. Since the defrosting system depends on proper operation of the heating system, refer to paragraph 14-5 for trouble shooting the defrosting system.

14-11. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 may be used as a guide during removal, installation and repair of defrosting system components. Cut hose to length and install in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. A defective defroster outlet must be repaired or replaced.

14-12. VENTILATING SYSTEM.

14-13. DESCRIPTION. The ventilating system is comprised of two airscoops mounted in the inboard leading edge of each wing, a manually-adjustable ventilator installed on each side of the cabin near the upper corners of the windshield, two plenum chambers mounted in the rear cabin wing root areas, a fresh airscoop door on the right side of the fuselage just forward of the copilot's seat, a control knob on the instrument panel and flexible ducting connecting the system. Beginning with aircraft serial 18263366, the outside air temperature gage may be located in the right forward air vent. Refer to figure 14-2 for removal and installation.

14-14. OPERATION. Air received from scoops mounted in the inboard leading edges of the wing is ducted to adjustable ventilators mounted on each side of the cabin near the upper corners of the windshield. Rear seat ventilation is provided by plenum chambers mounted in the left and right rear cabin wing root areas. These plenum chambers receive ram air from the airscoops in the inboard leading edges of the

wings. Each plenum chamber is equipped with a valve which meters the incoming cabin ventilation air. This provides a chamber of expansion of cabin air which greatly reduces inlet air noise. Filters at the air inlets are primarily noise reduction filters. Forward cabin ventilation is provided by a fresh air-scoop door mounted on the right side of the fuselage, just forward of the copilot seat. The scoop door is operated by a control in the instrument panel marked "CABIN AIR." Fresh air from the scoop door is routed to the duct across the aft side of the firewall, where it is distributed into the cabin. As long as the "CABIN HEAT" control is pushed in, no heated air can enter the firewall duct; therefore, when the "CABIN AIR" control is pulled out, only fresh air from the scoop will flow through the duct into the cabin. As the "CABIN HEAT" 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.

14-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating system are caused by sticking or binding of the inlet scoop door or its control. Check the 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, INSTALLATION AND REPAIR. Figure 14-2 may be used as a guide during removal, installation and repair of the ventilating system components. A defective ventilator or scoop must be repaired or replaced. Check for proper operation of ventilating controls after installation or repair.

SHOP NOTES:

14-11. OXYGEN SYSTEM.

WARNING

Under NO circumstances should the ON-OFF control on the oxygen regulator be turned to the "ON" position with the outlet (low pressure) ports open to atmosphere. Operation of these units in this manner will induce serious damage to the regulators and having the following results:

1. Loss of outlet set pressure.
2. Loss of oxygen flow through the regulator which will result in inadequate oxygen being fed through the aircraft system.
3. Internal leakage of oxygen through the regulator.

Opening of the control lever with the outlet ports open to atmosphere, results in an "overshoot" of the regulator metering device due to the extreme flow demand through the regulator. After overshooting, the metering poppet device goes into oscillation, creating serious damage to the poppet seat and diaphragm metering probe. This condition can occur even by turning the control lever on and then turning it quickly off.

A potential hazard exists to aircraft in the field where inexperienced personnel might remove the cylinder and regulator assembly from the aircraft and for some reason, attempt to turn the regulator to the "ON" position with the outlet ports open. Unfortunately, after the units have been improperly operated as noted, there is no outward appearance indicating that damage has occurred.

Testing these regulators should be accomplished only after installation in the aircraft, with the "down-stream" low pressure line attached.

14-12. DESCRIPTION. The system is comprised of an oxygen cylinder and regulator assembly, filler valve, pressure gage, pressure lines, outlets and mask assemblies. The oxygen cylinder is mounted aft of the baggage compartment. Locations of system components are shown in figure 14-3. The pilot's supply line is designed to receive a greater flow of oxygen than the passengers. The pilot's mask is equipped with a microphone, keyed by a switch button on the pilot's control wheel. The filler valve is located on the aft baggage curtain and access is gained through the baggage door.

WARNING

Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

14-13. MAINTENANCE PRECAUTIONS.

- a. Working area, tools and hands must be clean.
- b. Keep oil, grease, water, dirt, dust and all other foreign matter from system.

- c. Keep all lines dry and capped until installed.
- d. Use only MIL-T-5542 thread compound or teflon lubricating tape on threads of oxygen valves, tubing connectors, fittings and parts of assemblies which might, under any conditions, come in contact with oxygen. The thread compound must be applied sparingly and carefully to only the first three threads of the male fitting. No compound shall be used on aluminum flared fittings or on the coupling sleeves or on the outside of the tube flares. The teflon tape shall be used in accordance with the instructions listed following this step. Extreme care must be exercised to prevent contamination of the thread compound or teflon tape with oil, grease or other lubricants.

1. Lay tape on threads close to end of fitting: Clockwise on standard threads, opposite on left-hand threads.
 2. Apply enough tension while winding so tape forms into thread grooves.
 3. After wrap is complete, maintain tension and tear tape by pulling apart in direction it was applied. Resulted ragged end is the key to the tape staying in place. (If sheared or cut, tape may unwind.)
 4. Press tape well into threads.
 5. Make connections.
- e. Fabrication of oxygen pressure lines is not recommended. Lines should be replaced by part numbers called out in the aircraft Parts Catalog.
- f. Lines and fittings must be clean and dry. One of the following methods may be used.
1. Clean by degreasing with stabilized trichlorethylene, conforming to Federal Specifications O-T-634 or MIL-T-27602. These items can be obtained from American Mineral Spirits of Houston, Texas.

NOTE

Most air compressors are oil lubricated, and a minute amount of oil may be carried by the airstream. If only an oil lubricated air compressor is available, drying must be accomplished by heating at a temperature of 250° to 300°F for a suitable period.

2. Flush with naphtha, conforming to Specification TT-N-95 (aliphatic naphtha). Blow clean and dry off all solvents with clean, dry, oil-free, filtered air. Flush with anti-icing fluid conforming to Specification TT-T-735 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water. Dry thoroughly with a stream of clean, dry, oil-free, filtered air.

3. Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with clean, dry, filtered air.

NOTE

Cap lines at both ends immediately after drying to prevent contamination.

14-14. REPLACEMENT OF COMPONENTS. Removal, disassembly, assembly and installation of system components may be accomplished while using figure 14-3 as a guide.

CAUTION

The pressure regulator, pressure gage and line and filler valve should be removed and replaced only by personnel familiar with high-pressure fittings. Observe the maintenance precautions listed in the preceding paragraph.

NOTE

Oxygen cylinder and regulator assemblies may not always be installed in the field exactly as illustrated in figure 14-3, which shows factory installation. Important points to remember are as follows.

- a. Before removing cylinder, release low-pressure line by opening cabin outlets. Disconnect push-pull control cable, filler line, pressure gage line and outlet line from regulator. **CAP ALL LINES IMMEDIATELY.**
- b. If it is necessary to replace filler valve O-rings, remove parts necessary for access to filler valve. Remove line from quick-disconnect valve at the regulator, then disconnect chain, but do not remove cap from filler valve. Remove screws securing valve and disconnect pressure line. Referring to applicable figure, cap pressure line and seat. Disassemble valve, replace O-rings and reassemble valve. Install filler valve by reversing procedures outlined in this step.
- c. A cabin outlet is illustrated in figure 14-3. Repair kit, (part no. C166006-0108), available from the Cessna Service Parts Center, may be used for replacement of components of the outlet assembly.
- d. To remove entire oxygen system, headliner must be lowered and soundproofing removed to expose lines. Refer to Section 3 for headliner removal.

14-15. OXYGEN CYLINDER GENERAL INFORMATION. The following information is permanently steel stamped on the shoulder, top head or neck of each oxygen cylinder:

- a. Cylinder specification, followed by service pressure (e. g. "ICC-3AA1800" and "ICC-3HT1850" for standard and light weight cylinders respectively).

NOTE

Effective 1 January 1970, all newly-manufactured cylinders are stamped "DOT" (Department of Transportation), rather than "ICC" (Interstate Commerce Commission). An example of the new designation would be: "DOT-3HT1850".

- b. Cylinder serial number is stamped below or directly following cylinder specification. The symbol of the purchaser, user or maker, if registered with the Bureau of Explosives, may be located directly below or following the serial number. The cylinder serial number may be stamped in an alternate location on the cylinder top head.
- c. Inspector's official mark near serial number.
- d. Date of manufacture: This is the date of the

first hydrostatic test (such as 4-69 for April 1969). The dash between the month and the year figures may be replaced with the mark of the testing or inspection agency (e. g. 4L69).

e. Hydrostatic test date: The dates of subsequent hydrostatic tests shall be steel stamped (month and year) directly below the original manufacture date. The dash between the month and year figures can be replaced with the mark of the testing agency.

f. A Cessna identification placard is located near the center of the cylinder body.

g. Halogen test stamp: "Halogen Tested", date of test (month, day and year) and inspector's mark appears directly underneath the Cessna identification placard.

14-16. OXYGEN CYLINDER SERVICE REQUIREMENTS.

- a. Hydrostatic test requirements:
 1. Standard weight (ICC or DOT-3AA1800) cylinders must be hydrostatically tested to 5/3 their working pressure every five years commencing with the date of the last hydrostatic test.
 2. Light weight (ICC or DOT-3HT1850) cylinders must be hydrostatically tested to 5/3 their working pressure every three years commencing with the date of the last hydrostatic test.
- b. Service life requirements:
 1. Standard weight (ICC or DOT-3AA1800) cylinders have no age life limitations and may continue to be used until they fail hydrostatic test.
 2. Light weight (ICC or DOT-3HT1850) cylinders must be retired from service after 12 years or 4,380 filling cycles after date of manufacture, whichever occurs first.

NOTE

These test periods and life limitations are established by the Interstate Commerce Commission Code of Federal Regulations, Title 49, Chapter 1, Para. 73.34.

14-17. OXYGEN CYLINDER INSPECTION REQUIREMENTS.

- a. Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges and strap chafing.
- b. Examine the neck of cylinder for cracks, distortion or damaged threads.
- c. Check the cylinders to determine if markings are legible.
- d. Check date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.
- e. Inspect the cylinder mounting bracket, bracket hold-down bolts and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.
- f. In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing, deformation or deterioration.

14-18. OXYGEN SYSTEM COMPONENT SERVICE REQUIREMENTS.

- a. **PRESSURE REGULATOR.** The regulator shall

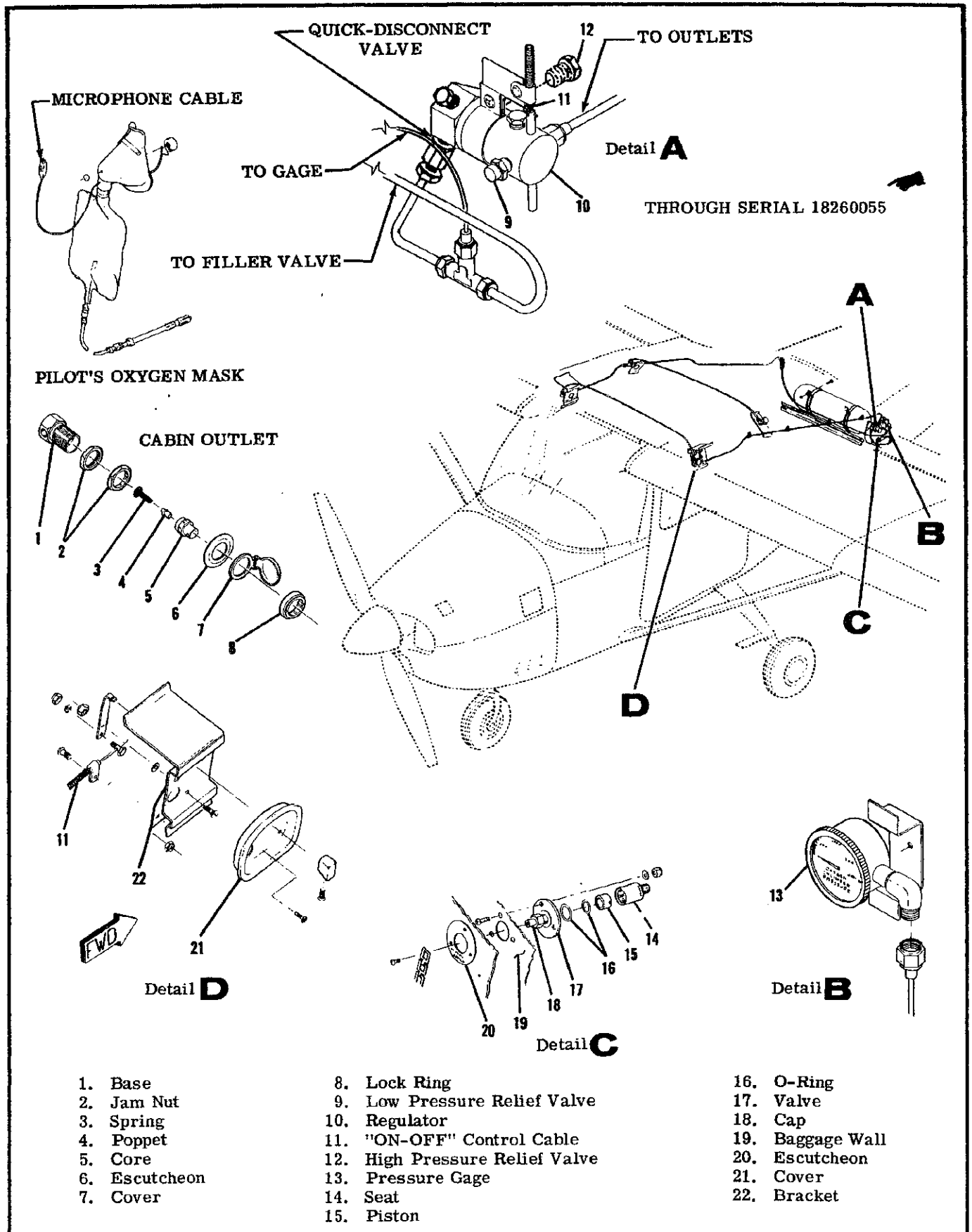
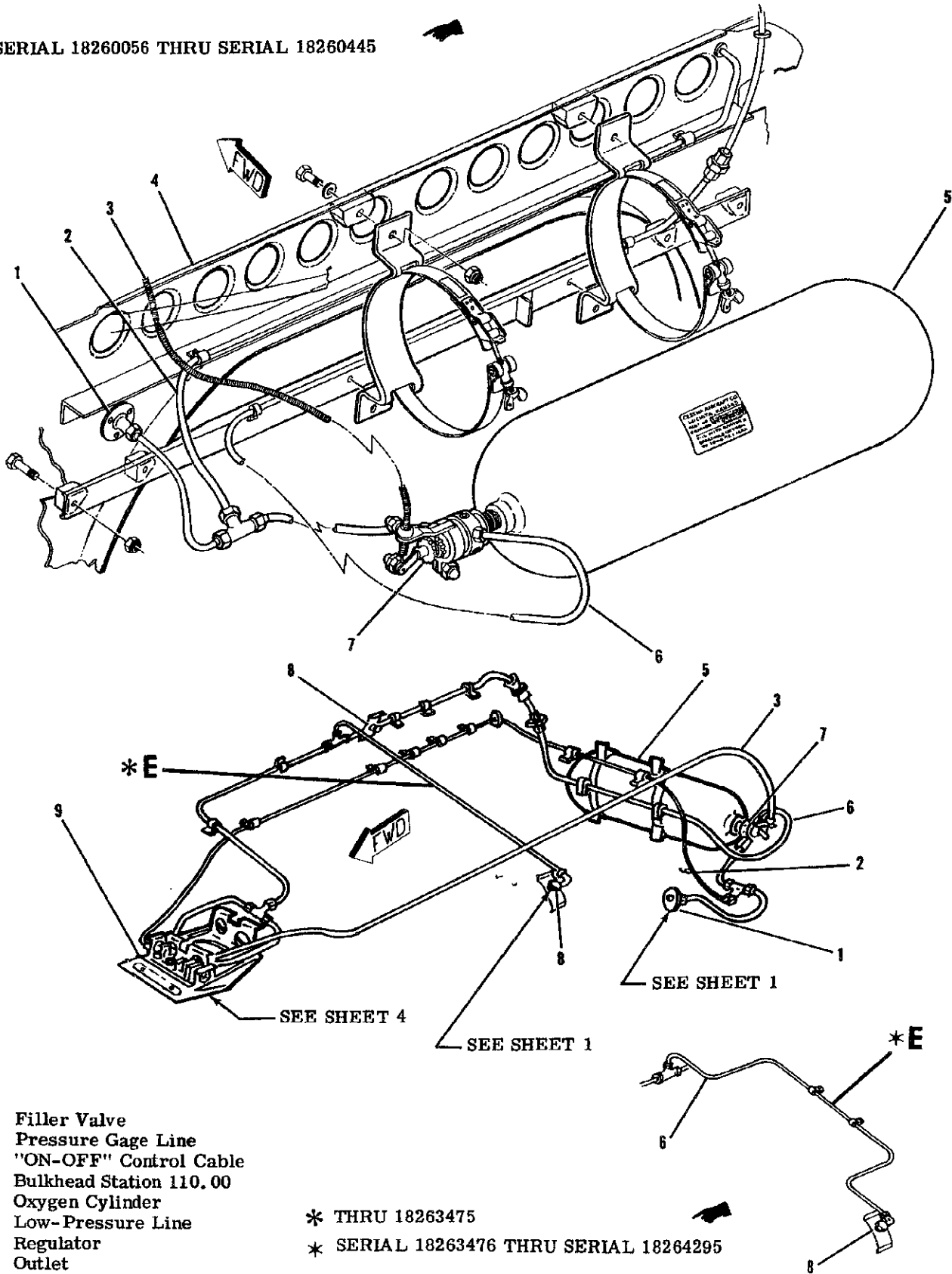


Figure 14-3. Oxygen System (Sheet 1 of 5)

SERIAL 18260056 THRU SERIAL 18260445

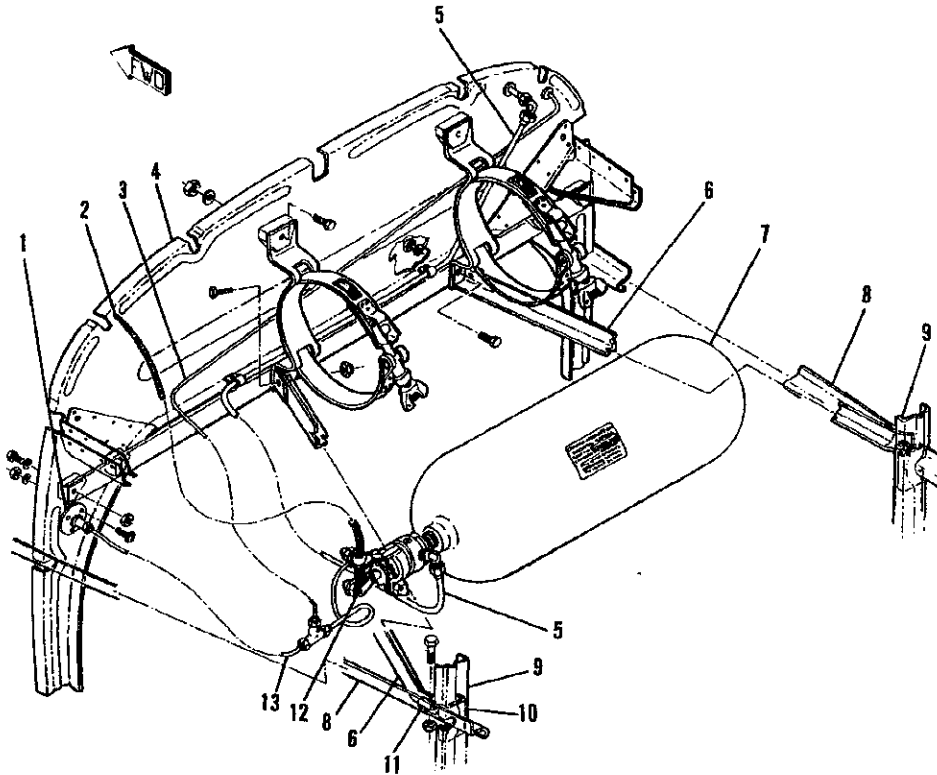


- 1. Filler Valve
- 2. Pressure Gage Line
- 3. "ON-OFF" Control Cable
- 4. Bulkhead Station 110.00
- 5. Oxygen Cylinder
- 6. Low-Pressure Line
- 7. Regulator
- 8. Outlet
- 9. Overhead Console

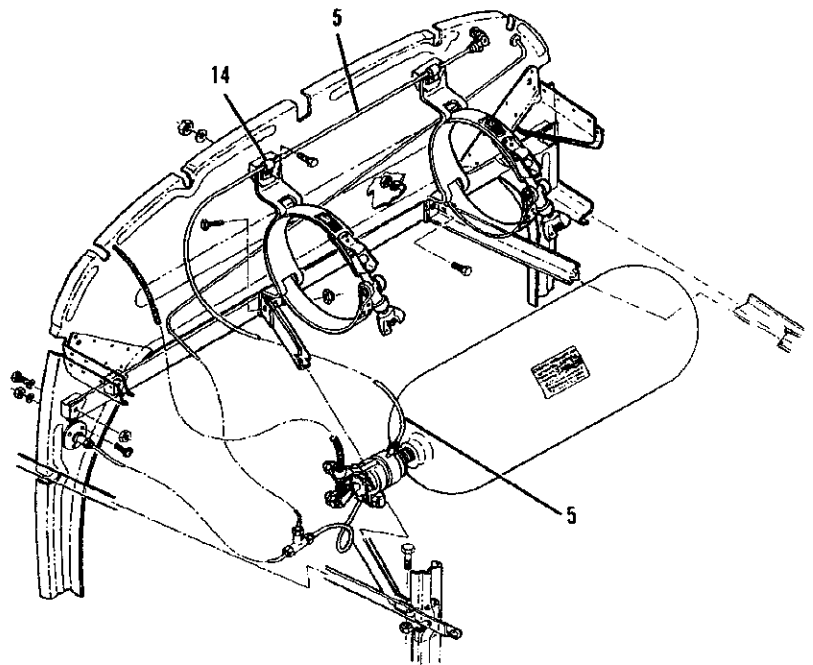
* THRU 18263475

* SERIAL 18263476 THRU SERIAL 18264295

Figure 14-3. Oxygen System (Sheet 2 of 5)



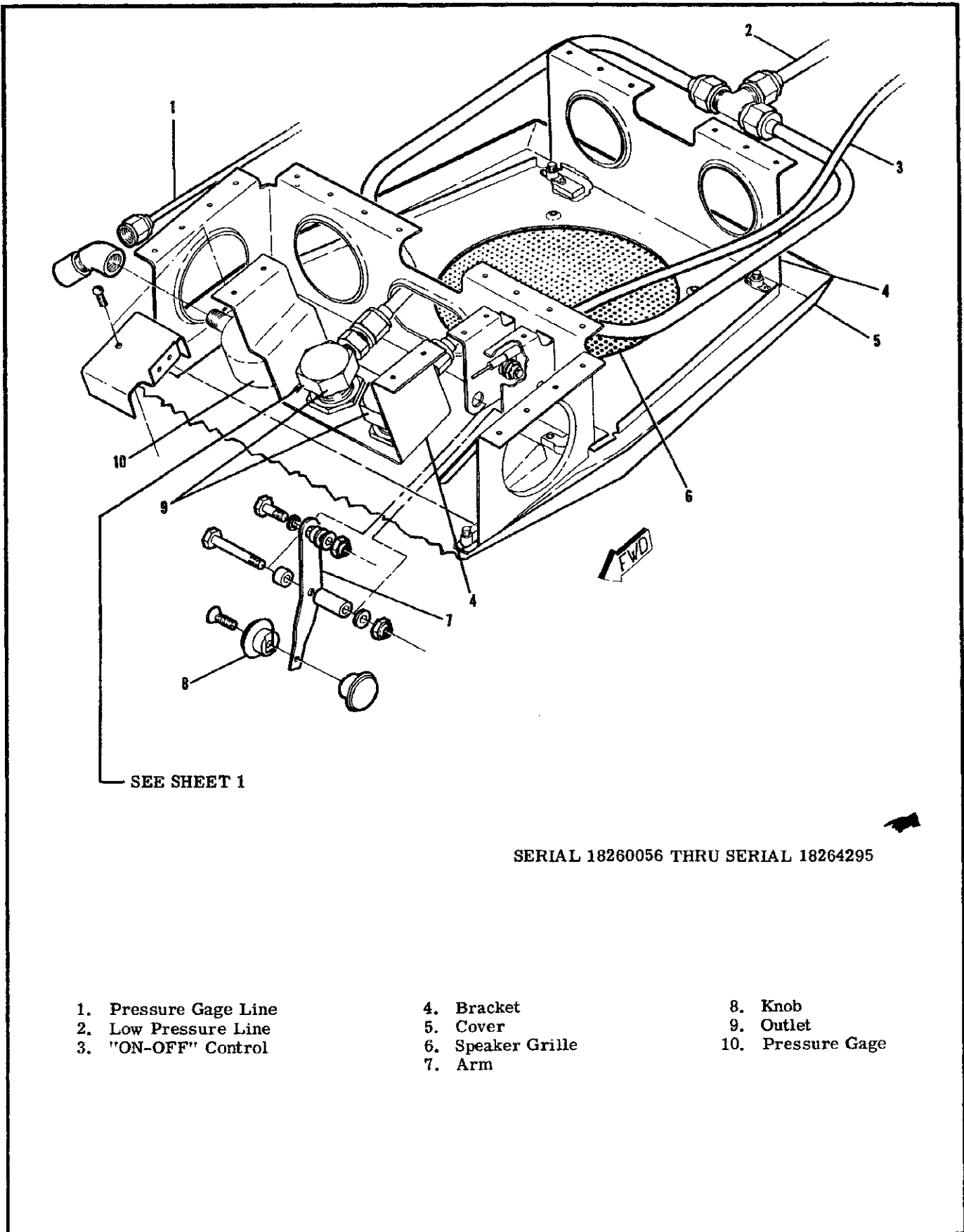
SERIAL 18260446 THRU 18264295



1. Filler Valve
2. "ON-OFF" Control Cable
3. Pressure Gage Line
4. Bulkhead Station 124.00
5. Low-Pressure Line
6. Support
7. Oxygen Cylinder
8. Fuselage Stringer
9. Bulkhead Station 140.00
10. Bracket
11. Bracket
12. Regulator
13. Filler Line
14. Clamp

ON SERIALS 18263476 THRU 18264295,
LOW-PRESSURE LINE (5) IS ROUTED
AS SHOWN.

Figure 14-3. Oxygen System (Sheet 3 of 5)



- | | | |
|-----------------------|-------------------|-------------------|
| 1. Pressure Gage Line | 4. Bracket | 8. Knob |
| 2. Low Pressure Line | 5. Cover | 9. Outlet |
| 3. "ON-OFF" Control | 6. Speaker Grille | 10. Pressure Gage |
| | 7. Arm | |

Figure 14-3. Oxygen System (Sheet 4 of 5)

be functionally tested every two years or 1,000 hours for aircraft operating under 15,000 ft. and one year for aircraft operating over 15,000 ft. The regulator shall be overhauled every five years or at time of hydrostatic test.

b. **FILLER VALVE.** The valve shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.

c. **QUICK-RELEASE COUPLING.** The coupling shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.

d. **PRESSURE GAGE.** The gage shall be checked for accuracy and overhauled by an FAA approved facility every five years.

e. **OUTLETS.** The outlets shall be disassembled and inspected and the sealing core replaced, regardless of condition, every five years.

14-19. OXYGEN SYSTEM COMPONENT INSPECTION REQUIREMENTS.

a. Examine all parts for cracks, nicks, damaged threads or other apparent damage.

b. Actuate regulator controls and valve to check for ease of operation.

c. Determine if the gage is functioning properly by observing the pressure build-up and the return to zero when the system oxygen is bled off.

d. Replace any oxygen line that is chafed, rusted, corroded, dented, cracked or kinked.

e. Check fittings for corrosion around the threaded area where lines are joined together. Pressurize the system and check for leaks.

14-20. MASKS AND HOSE.

a. Check oxygen masks for fabric cracks and rough face seals. If the mask is a full-faced model, inspect glass or plastic for cleanliness and state of repair.

b. Flex the mask hose gently over its entirety and check for evidence of deterioration or dirt.

c. Examine mask and hose storage compartment for cleanliness and general condition.

14-21. MAINTENANCE AND CLEANING.

a. Clean and disinfect mask assemblies after use, as appropriate.

NOTE

Use care to avoid damaging microphone assembly while cleaning and sterilizing.

b. Wash mask with a mild soap solution and rinse it with clear water.

c. To sterilize, swab mask thoroughly with a gauze or sponge soaked in a water/merthiolate solution. This solution should contain 1/5 teaspoon of merthiolate per one quart of water. Wipe the mask with a clean cloth and let air dry.

d. Observe that each mask breathing tube end is free of nicks and that the tube end will slip into the cabin oxygen receptacle with ease and will not leak.

e. If a mask assembly is defective (leaks, does not allow breathing or contains a defective microphone) it is advisable to return the mask assembly to the manufacturer or a repair station.

f. Replace hose if it shows evidence of deterioration.

g. Hose may be cleaned in the same manner as the mask.

14-22. **SYSTEM PURGING.** Whenever components have been removed and reinstalled or replaced, it is advisable to purge the system. Charge oxygen system in accordance with procedures outlined in paragraph 14-25. Plug masks into all outlets and turn the pilot's control to ON position and purge system by allowing oxygen to flow for at least 10 minutes. Smell oxygen flowing from outlets and continue to purge until system is odorless. Refill cylinders as required during and after purging.

14-23. **FUNCTIONAL TESTING.** Whenever the regulator and cylinder assembly has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

a. Fully charge oxygen system in accordance with procedures outlined in paragraph 14-25.

b. Disconnect line and fitting assembly from pilot's mask and line assembly. Insert outlet end of line and fitting assembly into cabin outlet and attach opposite end of line to a pressure gage (gage should be calibrated in one-pound increments from 0 to 100 PSI). Place control lever in ON position. Gage pressure should read 75±10 PSI.

c. Insert mask and line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, test gage pressure should still be 75±10 PSI.

d. Place oxygen control lever in OFF position and allow test gage pressure to fall to 0 PSI. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE

If pressures specified in the foregoing procedures are not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

e. Connect mask and line assemblies to each cabin outlet and check each mask for proper operation.

f. Check pilot's mask microphone and control wheel switch for proper operation. After checking, return all masks to mask case.

g. Recharge oxygen system in accordance with procedures outlined in paragraph 14-25.

14-24. **SYSTEM LEAK TEST.** When oxygen is being lost from a system through leakage, a sequence of steps may be necessary to locate the opening. Leakage may often be detected by listening for the distinct hissing of escaping gas. If this check proves negative, it will be necessary to soap-test all lines and connections with a castile soap and water solution or specially compounded leak-test material. Make the solution thick enough to adhere to the contours of the fittings. At the completion of the leakage test, remove all traces of the leak detector or

soap and water solution.

CAUTION

Do not attempt to tighten any connections while the system is charged.

14-25. SYSTEM CHARGING.

WARNING

BE SURE TO GROUND AIRCRAFT AND GROUND SERVICING EQUIPMENT BEFORE CHARGING OXYGEN SYSTEM.

- a. Do not attempt to charge oxygen cylinders if servicing equipment fittings or filler valve are corroded or contaminated. If in doubt, clean with stabilized trichlorethylene and let air dry. Do not allow solvent to enter any internal parts.
- b. If cylinder is completely empty, do not charge, as the cylinder must then be removed, inspected and cleaned.

CAUTION

A cylinder which is completely empty may well be contaminated. The regulator and cylinder assembly must then be disassembled, inspected and cleaned by an FAA approved facility, before filling. Contamination, as used here, means dirt, dust or any other foreign material, as well as ordinary air in large quantities. If a gage line or filler line is disconnected and the fittings capped immediately, the cylinder will not become contaminated unless temperature variation has created a suction within the cylinder. Ordinary air contains water vapor which could condense and freeze. Since there are very small orifices in the system, it is very important that this condition not be allowed to occur.

- c. Connect cylinder valve outlet or outside filler valve to manifold or portable oxygen cascade.
- d. Slowly open valve on cascade cylinder or manifold with lowest pressure, as noted on pressure gage, allow pressure to equalize, then close cascade cylinder valve.
- e. Repeat this procedure, using a progressively higher pressure cascade cylinder, until system has been charged to the pressure indicated in the chart immediately following step "f" of this paragraph.
- f. Ambient temperature listed in the chart is the air temperature in the area where the system is to be charged. Filling pressure refers to the pressure to which aircraft cylinders should be filled. This table gives approximations only and assumes a rise in temperature of approximately 25° F. due to heat of compression. This table also assumes the aircraft cylinders will be filled as quickly as possible and that they will only be cooled by ambient air; no water bath or other means of cooling be used.
Example: If ambient temperature is 70° F., fill aircraft cylinders to approximately 1,975 psi or as close to this pressure as the gage may read. Upon cooling, cylinders should have approximately 1,850 psi pressure.

TABLE OF FILLING PRESSURES

Ambient Temp. °F	Filling Press. psig	Ambient Temp. °F	Filling Press. psig
0	1650	50	1875
10	1700	60	1925
20	1725	70	1975
30	1775	80	2000
40	1825	90	2050

NOTE

Each interconnected series of oxygen cylinders is equipped with a single gage. The trailer type cascade may also be equipped with a nitrogen cylinder (shown reversed) for filling landing gear struts, accumulators, etc. Cylinders are not available for direct purchase, but are usually leased and refilled by a local compressed gas supplier.

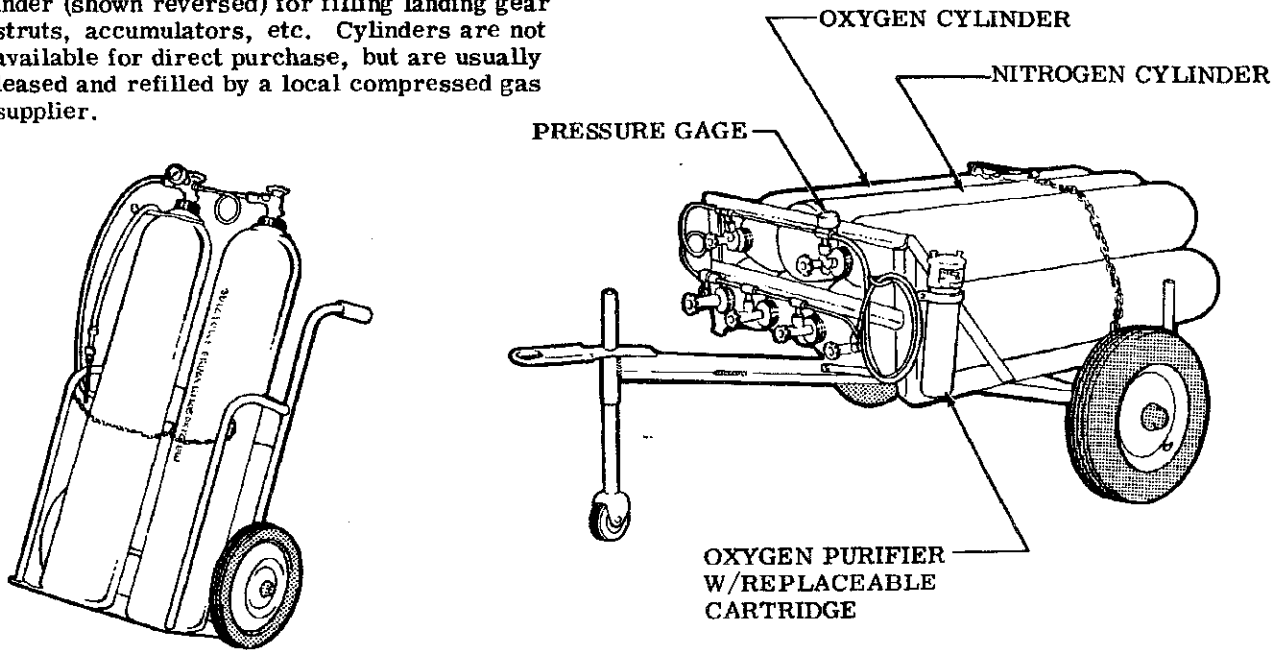


Figure 14-4. Portable Oxygen Cascades

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SECTION 15

INSTRUMENTS AND INSTRUMENT SYSTEMS

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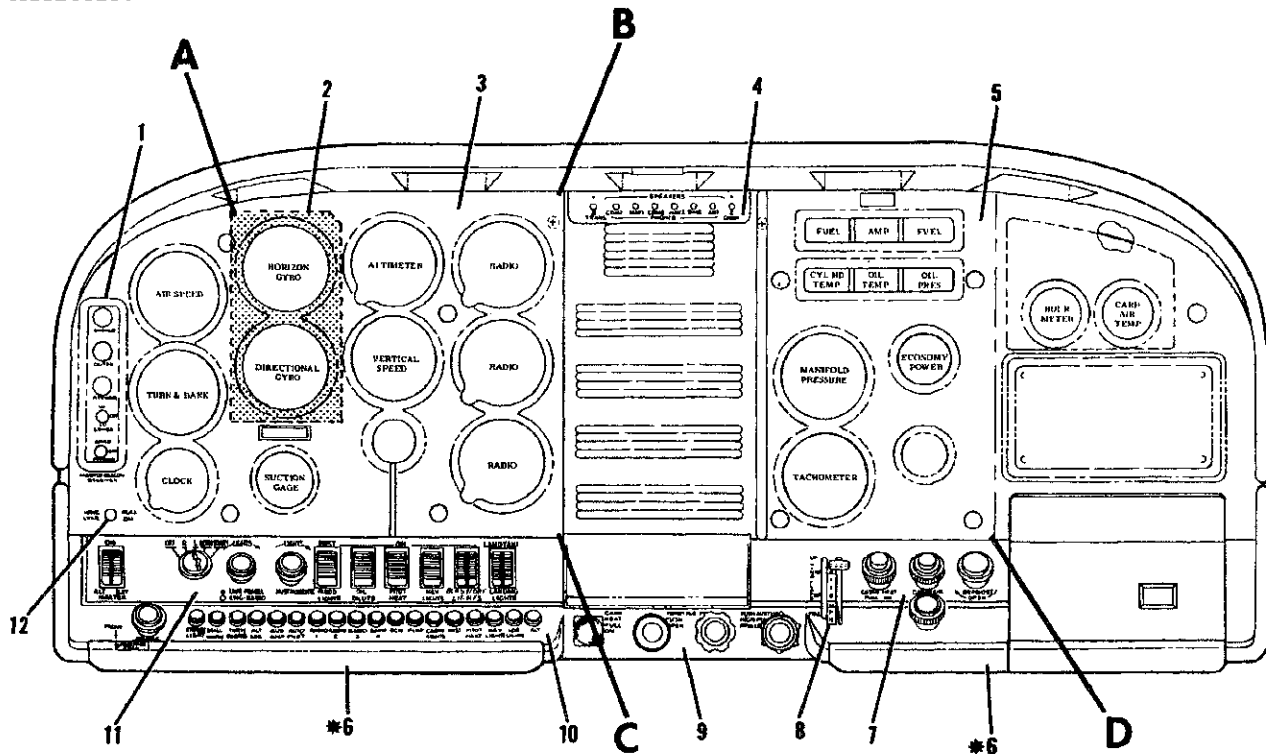
15-1. INSTRUMENTS AND INSTRUMENT SYSTEMS.

15-2. GENERAL. This section describes typical instrument installations and their respective operating systems. Emphasis is placed on troubleshooting 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

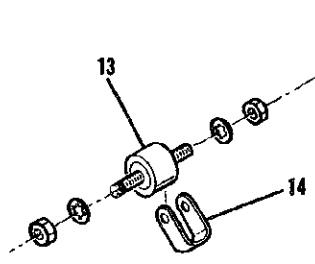
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descriptive material, maintenance and troubleshooting information in this section is intended to help the mechanic determine malfunctions and correct them, up to the defective instrument itself, at which point an instrument technician should be called 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.

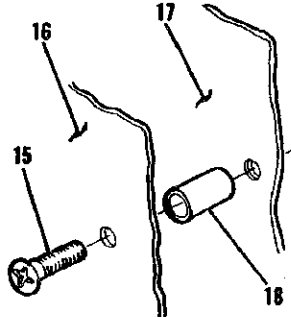
*BEGINNING WITH 18260446 AND
A18200137



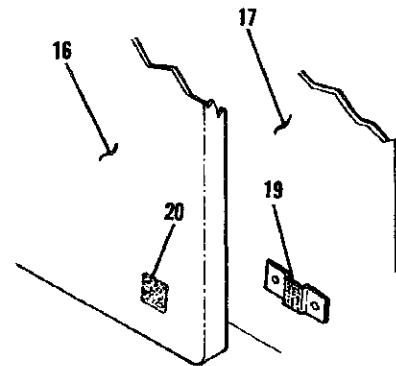
THRU AIRCRAFT SERIAL 18261425 AND
BEGINNING WITH A18200137



Detail A



Detail B



Detail C

NOTE POSITION OF GROUND STRAP AND
SEQUENCE OF ATTACHING PARTS WHEN
REMOVING OR INSTALLING SHOCK PANEL

NOTE

Detail A and B also
apply to sheet 2.

18260826 THRU 18261425 AND
BEGINNING WITH A18200137

1. Marker Beacon Controls
2. Shock Mounted Panel
3. Removeable Panel
4. Radio and Switch Panel
5. Fuel and Engine Instruments
6. Knee Pad
7. Heating and Ventilating Controls
8. Wing Flap Control

9. Engine Controls
10. Circuit Breaker Panel
11. Switch Panel
12. Wing Leveler Control
13. Shock Mount
14. Ground Strap
15. Screw
16. Decorative Cover

17. Panel
18. Spacer
19. Hook
20. Pile
21. Shim
22. Guide Pin
23. Rubber Grommet

Figure 15-1. Instrument Panel (Sheet 1 of 2)

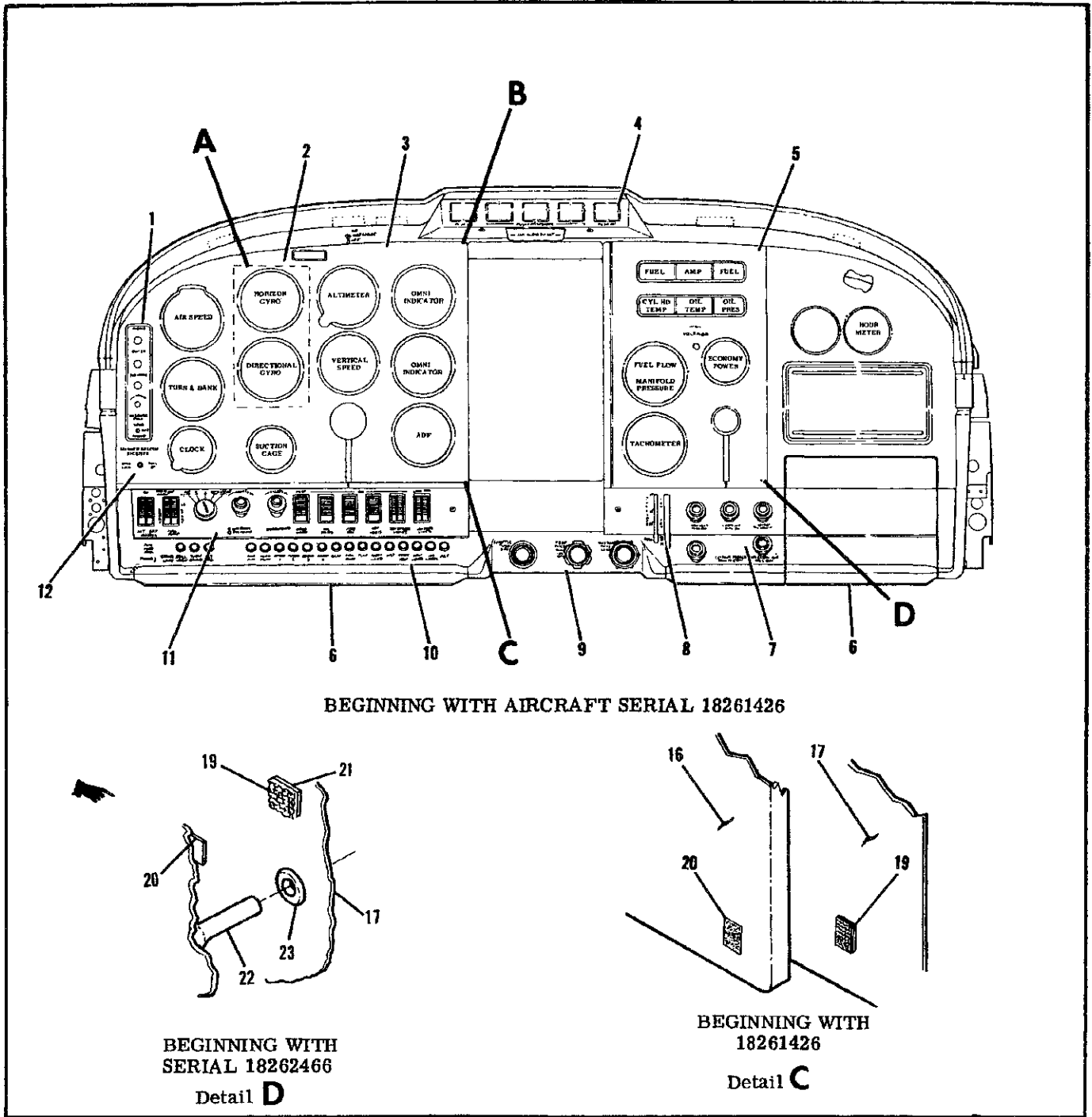


Figure 15-1. Instrument Panel (Sheet 2 of 2)

15-3. INSTRUMENT PANEL. (Refer to figure 15-1.)

15-4. DESCRIPTION. The instrument panel assembly consists of a stationary panel, a removable flight instrument panel and a shock-mounted panel. The

stationary panel, containing fuel and engine instruments is secured to the engine mount stringers and a forward fuselage bulkhead. The removable panel, containing flight instruments such as airspeed, verti-

cal speed and altimeter is secured to the stationary panel with screws. The shock-mounted panel, containing major flight instruments such as the horizontal and directional gyros is secured to the removable panel with rubber shock-mounted assemblies. Most of the instruments are screw mounted on the panel.

15-5. REMOVAL AND INSTALLATION.

a. FLIGHT INSTRUMENT PANEL.

1. (Thru 1971) Remove retainer clips securing decorative cover by carefully prying under clip buttons. Do not drop spacers attached to clips. 1972 Models and on decorative covers are installed with Velcro fasteners. 1974 models and on use a combination of Velcro fasteners and a pin and rubber grommet arrangement to hold the decorative covers. To remove pry loose and gently pull in a straight line.

2. Remove switch mounting nuts and switches as necessary and remove decorative cover.

3. Tag and disconnect plumbing and wiring.

4. Remove screws securing flight instrument panel to stationary panel and pull panel straight back.

5. Reverse preceding steps for reinstallation.

b. SHOCK-MOUNTED PANEL.

NOTE

Due to the difficulty encountered when removing the shock-mounted panel with the gyros installed, it is recommended that the directional gyro be disconnected and removed prior to removal of the shock-mounted panel.

1. Complete steps 1 and 2 above.

2. Tag and disconnect gyro plumbing.

3. Remove directional gyro mounting screws and remove gyro from shock-mounted panel.

4. Remove shock-mount nuts and work shock-mounted panel out from behind flight instrument panel. The horizontal gyro may also be removed from shock-mounted panel, if desired.

5. Reverse preceding steps for reinstallation.

15-6. SHOCK-MOUNTS. Service life of shock-mounted instruments is directly related to adequate shock-mounting of the panel. If removal of shock-mounted panel is necessary, check mounts for deterioration and replace as necessary.

15-7. INSTRUMENTS. (Refer to figure 15-1.)

15-8. REMOVAL. Most instruments are secured to the panel with screws inserted through the panel face, under the decorative cover. 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, disconnected 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

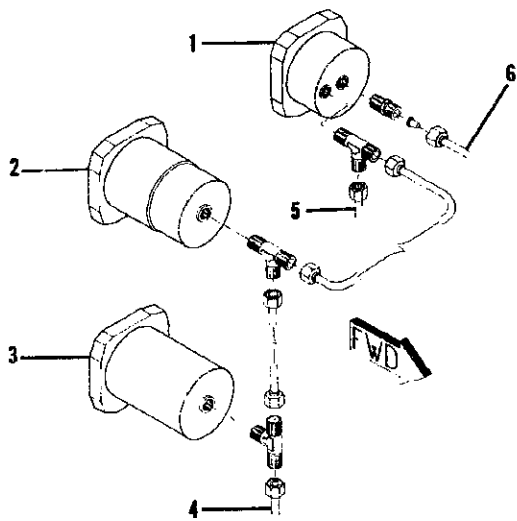
All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through the Cessna Service Parts Center.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change the 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 static ports. A static line sump is installed at each source button to collect condensation in static system. A pitot tube heater may be installed. The heating element is controlled by a switch at the instrument panel and powered by the electrical system. A static pressure alternate source valve may be installed in the static system for use when the external static source is malfunctioning. This valve also permits draining condensate from the static lines. Refer to Owner's Manual for flight operation using alternate static source pressure. Beginning with 18263476, an encoding altimeter and a standby altimeter may be installed. The encoding altimeter supplies an altimeter reading to the optional 300 or 400 transponder for signal transmission. The standby altimeter is connected to the static system by a tube to the vertical speed indicator. The static tube installation will vary when an alternate static source is installed. Figure 15-3A may be used as a guide for removal and installation of the encoding altimeter system.

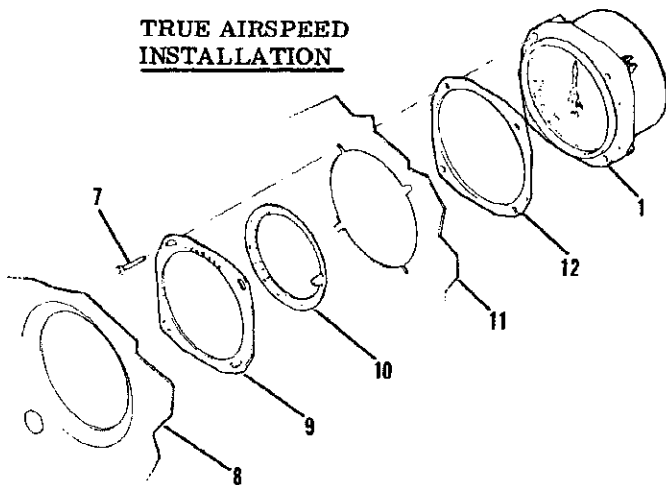
15-12. MAINTENANCE. Proper maintenance of pitot and static system is essential for proper operation of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in pitot system will result in false airspeed indications, while static system malfunctions will affect readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the principal rules for system maintenance. The pitot tube and static ports MUST be kept clean and unobstructed.



Detail A

1. Airspeed Indicator
2. Altimeter
3. Vertical Speed Indicator
4. Static Line (To Right Sump)
5. Static Line (To Left Sump)
6. Pitot Line (To Pitot Tube)
7. Mounting Screw
8. Decorative Cover
9. Retainer
10. True Airspeed Ring
11. Instrument Panel
12. Spacer
13. Sump
14. Static Port
15. Fuselage Skin
16. Heater Element (Heated Pitot Only)
17. Mast Body
18. Connector

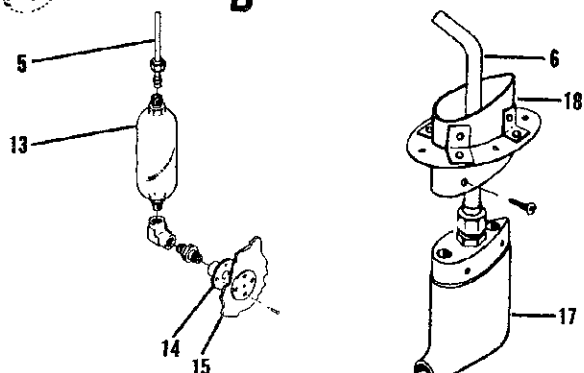
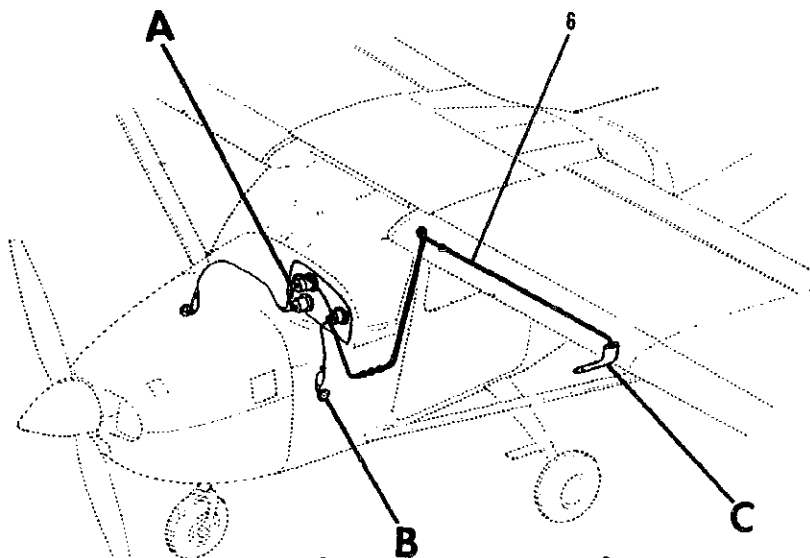
**TRUE AIRSPEED
INSTALLATION**



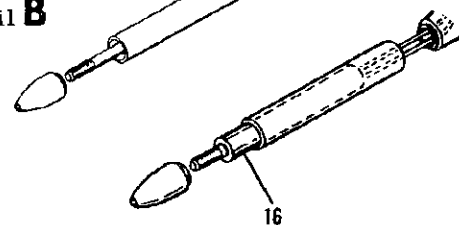
NOTE

Do not overtighten screws (7) and do not lubricate any parts.

Use spacers (12) as required for adequate friction on ring assembly (10).

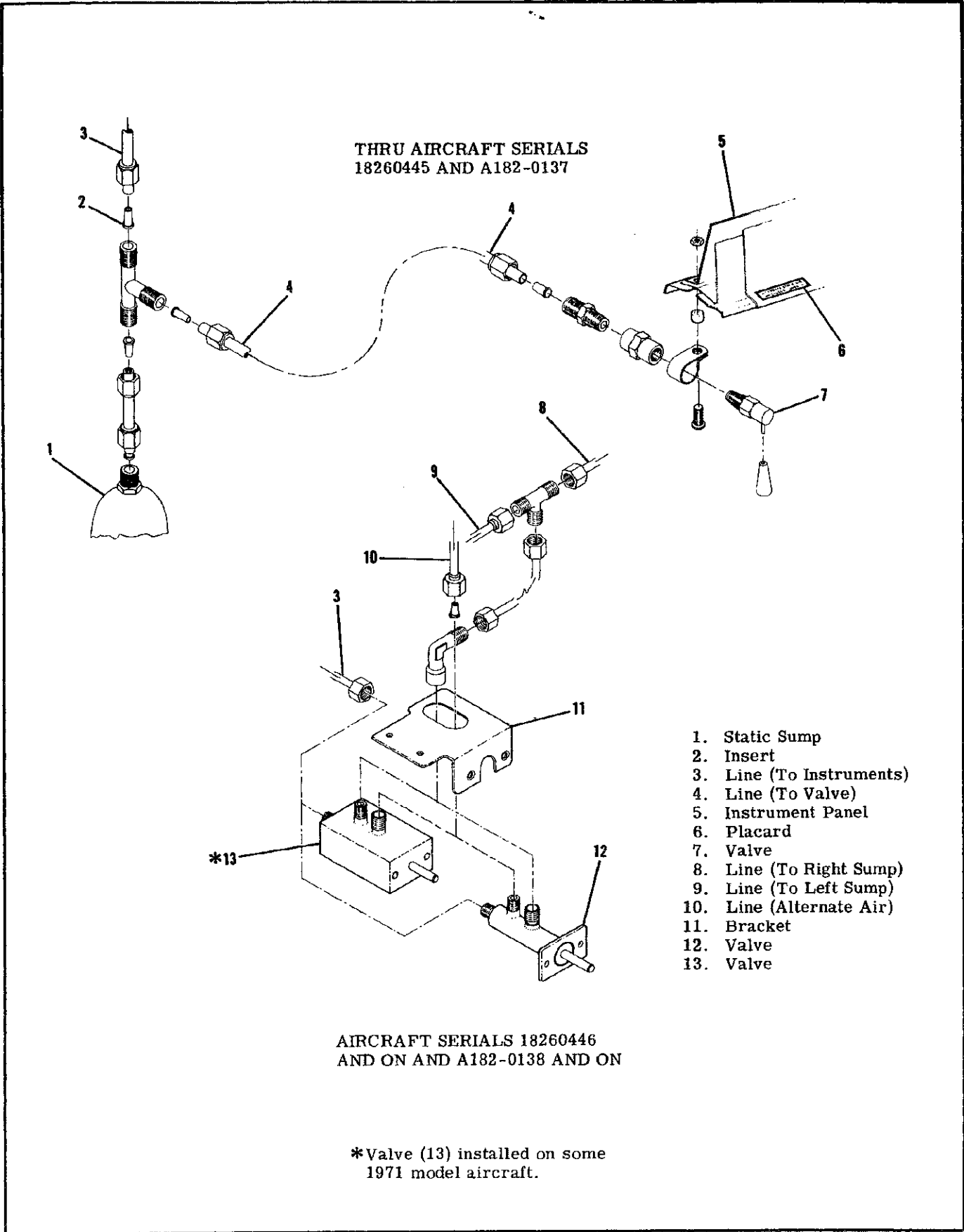


Detail B



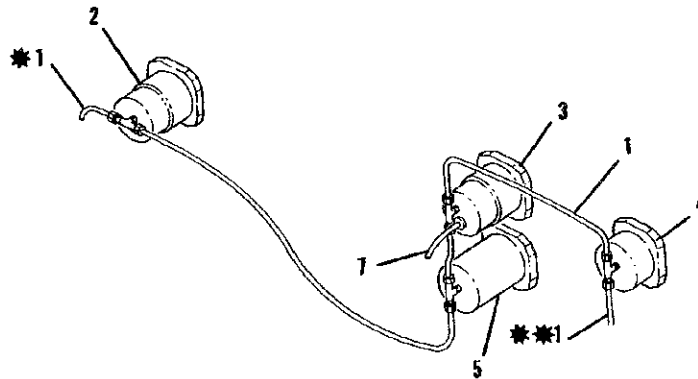
Detail C

Figure 15-2. Pitot-Static Systems

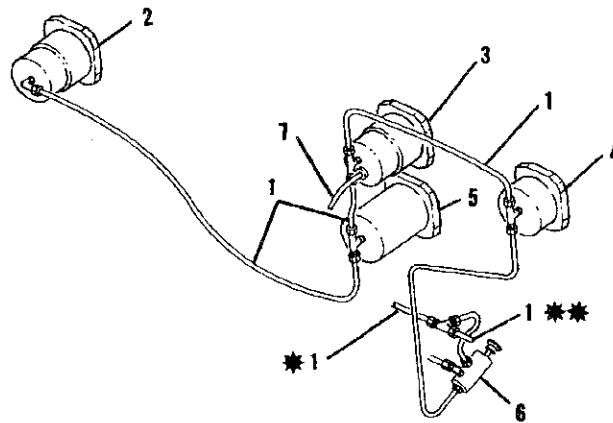


- 1. Static Sump
- 2. Insert
- 3. Line (To Instruments)
- 4. Line (To Valve)
- 5. Instrument Panel
- 6. Placard
- 7. Valve
- 8. Line (To Right Sump)
- 9. Line (To Left Sump)
- 10. Line (Alternate Air)
- 11. Bracket
- 12. Valve
- 13. Valve

Figure 15-3. Alternate Static Air System



WITHOUT ALTERNATE STATIC SOURCE INSTALLED



WITH ALTERNATE STATIC SOURCE INSTALLED

BEGINNING WITH 18263476

1. Static Line
2. Standby Altimeter
3. Encoding Altimeter
4. Airspeed Indicator
5. Vertical Speed Indicator
6. Alternate Static Source
7. Line (To Transponder)

NOTE

- * TO R/H STATIC SOURCE
- ** TO L/H STATIC SOURCE

NOTE

IF VERTICAL SPEED INDICATOR IS NOT INSTALLED, ROUTE THE STATIC LINE DIRECT TO THE ENCODING ALTIMETER

Figure 15-3A Encoding Altimeter Installation

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 alterations 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. Seal one static source port with pressure sensitive tape. This seal must be air tight.
- d. Close static pressure alternate source valve, if installed.
- e. Attach a source of suction to the remaining static pressure source opening. Figure 15-4 shows one method of obtaining suction.
- f. 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 airspeed indicator.

- g. 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.
- h. If leakage rate is within tolerance, slowly release suction source and remove tape from static port.

NOTE

If leakage rate exceeds the maximum allowable, first tighten all connections, then repeat leakage test. If leakage rate still exceeds the maximum allowable, use following procedure.

- i. 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.
- j. 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.
- k. Attach a source of positive pressure to static source opening. Figure 15-4 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.

- l. 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 LEAK-TEC or a solution of mild soap and water, watching for bubbles to locate leaks.
- m. Tighten leaking connections. Repair or replace parts found defective.
- n. Reconnect airspeed and vertical speed indicators into static pressure system and repeat leakage test per steps "c" thru "h".

15-14. **PITOT SYSTEM INSPECTION AND LEAKAGE TEST.** To check pitot system for leaks, place a piece of tape 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 a leak in system, check all connections for tightness.

15-15. **BLOWING OUT LINES.** Although the 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 the line, disconnect it at airspeed indicator. Using low pressure air, blow from indicator end of line toward the pitot tube.

CAUTION

Never blow through pitot or static lines toward the instruments.

Like the pitot lines, static pressure lines must be kept clear and connections tight. Static source sumps collect moisture and keeps system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow line to clear with low pressure air.

NOTE

On aircraft equipped with alternate static source, use the same procedure, opening alternate static source valve momentarily to clear line, then close valve and clear remainder of system.

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 (18) and pull mast out of connector far enough to disconnect pitot line (6). 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 intact by drawing it out through cabin and right door. When replacing components of pitot and static pressure systems, use anti-seize compound sparingly on male threads on both metal and plastic connections. Avoid excess compound which might enter lines. Tighten connections firmly, but avoid overtightening and distorting fittings. If twisting of

15-17. TROUBLE SHOOTING--PITOT-STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIRSPEED INDICATION.	Normal altimeter and vertical speed - pitot tube deformed, leak or obstruction in pitot line.	Straighten tube, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE.	All three instruments - leaks or obstruction in static line.	Repair or replace line.
	Alternate static source valve open.	Close for normal operation.

plastic tubing is encountered when tightening fittings, VV-P-236 (USP Petrolatum), may be applied sparingly between tubing and fittings.

15-18. TRUE AIRSPEED INDICATOR. A true airspeed indicator may be installed. This indicator, equipped with a conversion ring, 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. Refer to figure 15-2 for removal and installation. Upon in-

stallation, before tightening mounting screws (7), calibrate the instrument as follows: Rotate ring (10) until 120 mph on adjustable ring aligns with 120 mph on indicator. Holding this setting, move retainer (9) until 60°F aligns with zero pressure altitude, then tighten mounting screws (7) and replace decorative cover.

NOTE

Beginning with aircraft serial 18264296, true airspeed indicators are graduated in knots. Therefore, use 105 knots instead of 120 miles per hour in the above calibration procedure.

15-19. TROUBLE SHOOTING.

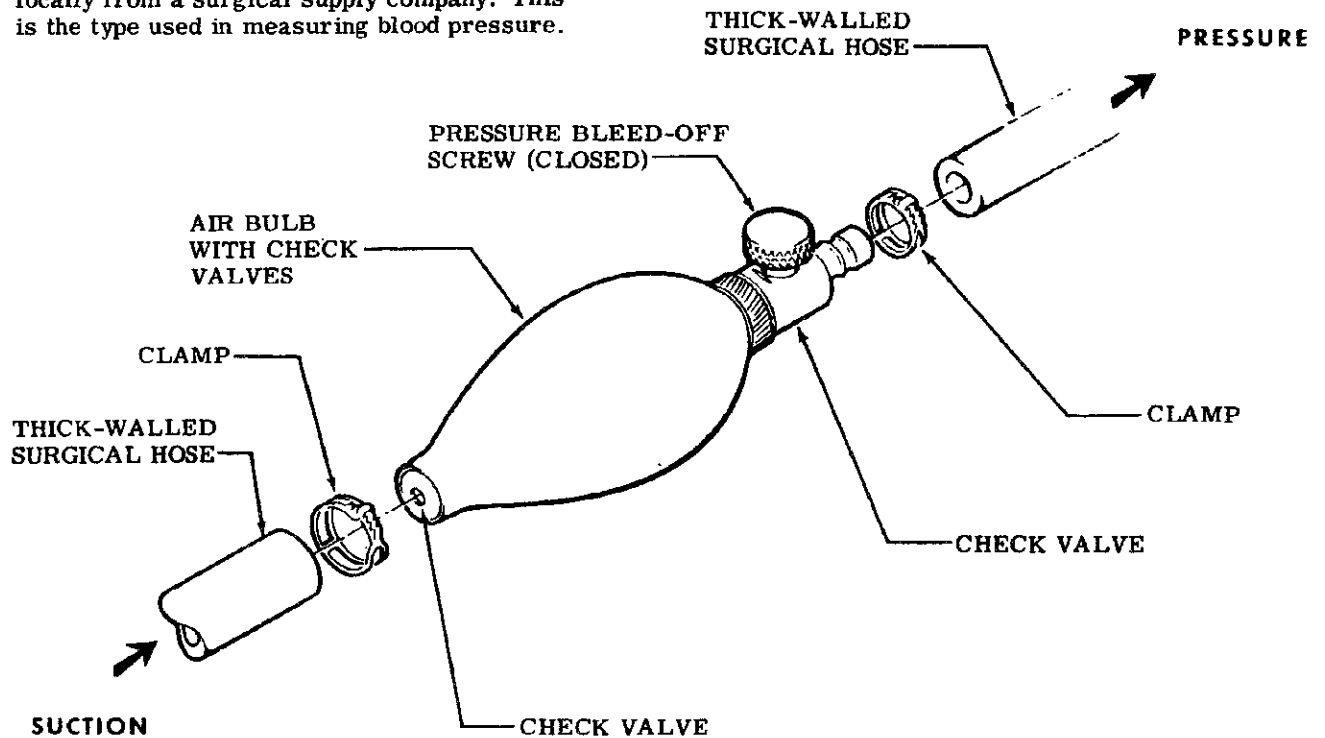
NOTE

Refer to paragraph 15-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Repair or replace damaged lines, tighten connections.
	Defective mechanism.	Replace instrument.
	Leaking diaphragm.	Replace instrument.
	Alternate static source valve open.	Close for normal operation.
HAND VIBRATES.	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
	Excessive tubing vibration.	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 15-4. Static System Test Equipment

15-20. TROUBLE SHOOTING -- ALTIMETER.

NOTE

Refer to paragraph 15-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Defective mechanism.	Replace instrument.
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Replace instrument.
	Pointers out of calibration.	Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Blow out lines, tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Blow out lines, tighten connections.

15-21. TROUBLE SHOOTING -- VERTICAL SPEED INDICATOR.

NOTE

Refer to paragraph 15-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Static line broken.	Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Blow out lines.
	Ruptured diaphragm.	Replace instrument.
	Pointer off zero.	Reset pointer to zero.
POINTER OSCILLATES.	Partially plugged static line.	Blow out lines.
	Leak in static line.	Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Replace instrument.

15-22. TROUBLE SHOOTING -- PITOT TUBE HEATER.

NOTE

Refer to paragraph 15-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF."	Turn switch "ON."
	Popped circuit breaker.	Reset breaker.
	Break in wiring.	Repair wiring.
	Heating element burned out.	Replace element.

15-23. VACUUM SYSTEM (Refer to Figure 15-5.)

15-24. DESCRIPTION. Through Aircraft Serial 182060445 suction to operate the gyros is provided by an engine-driven vacuum pump, gear-driven through a spline-type coupling. The vacuum pump discharge air passes through an oil separator, where the oil, which passes through the pump for lubrication, is returned to the engine and the air is expelled overboard. Beginning with Aircraft Serial 18260446 a dry vacuum system is installed. This system utilizes a sealed bearing, engine-driven vacuum pump, which eliminates the oil separation components from the system. A discharge tube is connected to the

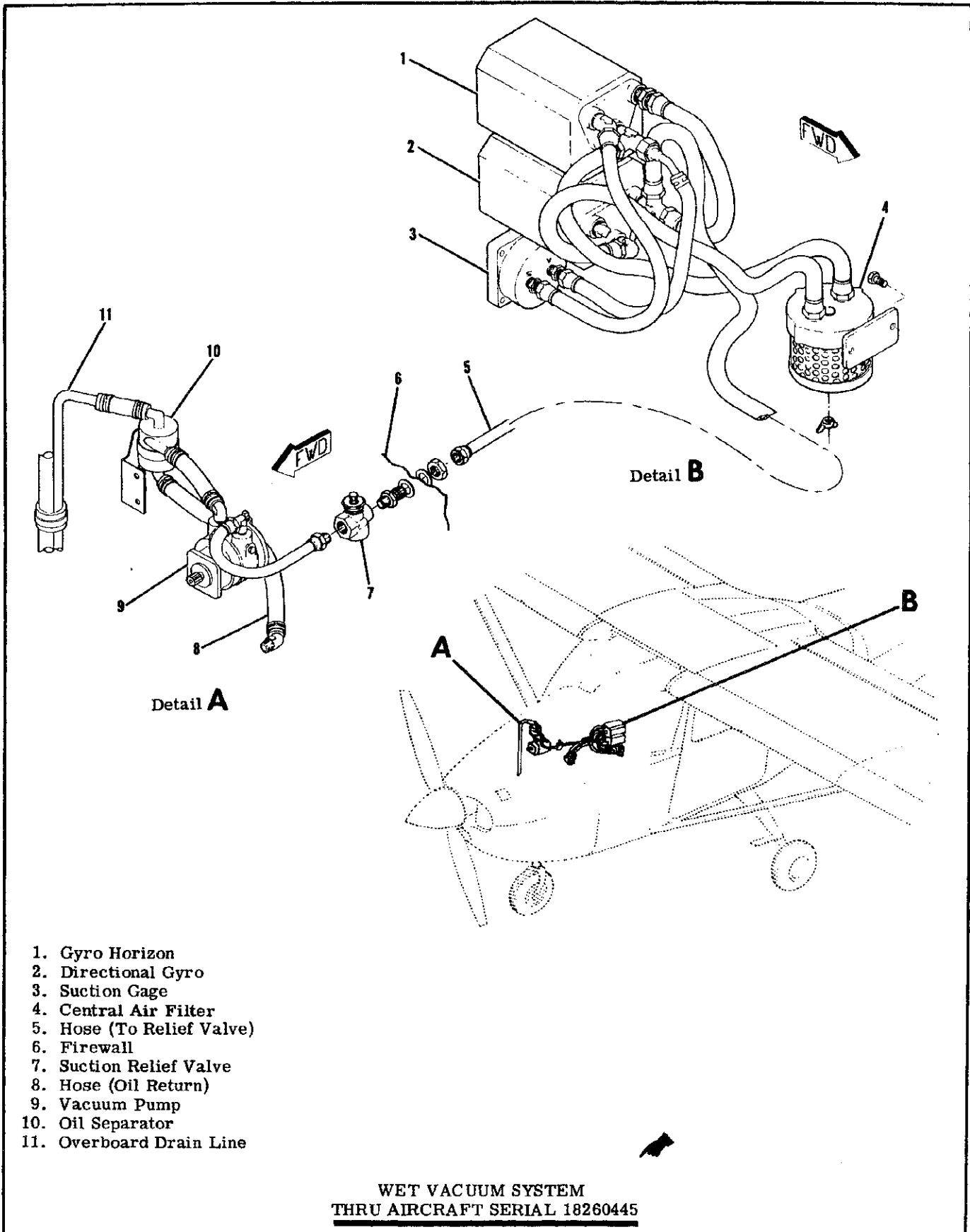
pump to expell the air from the pump overboard. A suction relief valve is used to control system pressure and is connected between the pump inlet and the instruments. In the cabin, the vacuum line is routed from the gyro instruments to the relief valve at the firewall. A central air filtering system is utilized. Beginning with aircraft serial 18263970 a throw away type central air filter will be installed using strap installation for quick change capability. 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.

15-25. TROUBLE SHOOTING -- VACUUM SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS. (Gyros function normally.)	Relief valve screen clogged, relief valve malfunction.	Clean screen, reset valve. Replace gage.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Restriction in oil separator or pump discharge line. (Wet system only.)	Clean oil separator.
	Central air filter dirty.	Clean or replace filter.
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace it.

15-26. TROUBLE SHOOTING -- GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Replace defective shock panel mounts.
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Defective mechanism.	Replace instrument.
	Excessive vibration.	Replace defective shock panel mounts.
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Clean or replace filter.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Replace instrument.



- 1. Gyro Horizon
- 2. Directional Gyro
- 3. Suction Gage
- 4. Central Air Filter
- 5. Hose (To Relief Valve)
- 6. Firewall
- 7. Suction Relief Valve
- 8. Hose (Oil Return)
- 9. Vacuum Pump
- 10. Oil Separator
- 11. Overboard Drain Line

**WET VACUUM SYSTEM
THRU AIRCRAFT SERIAL 18260445**

Figure 15-5. Vacuum System (Sheet 1 of 2)

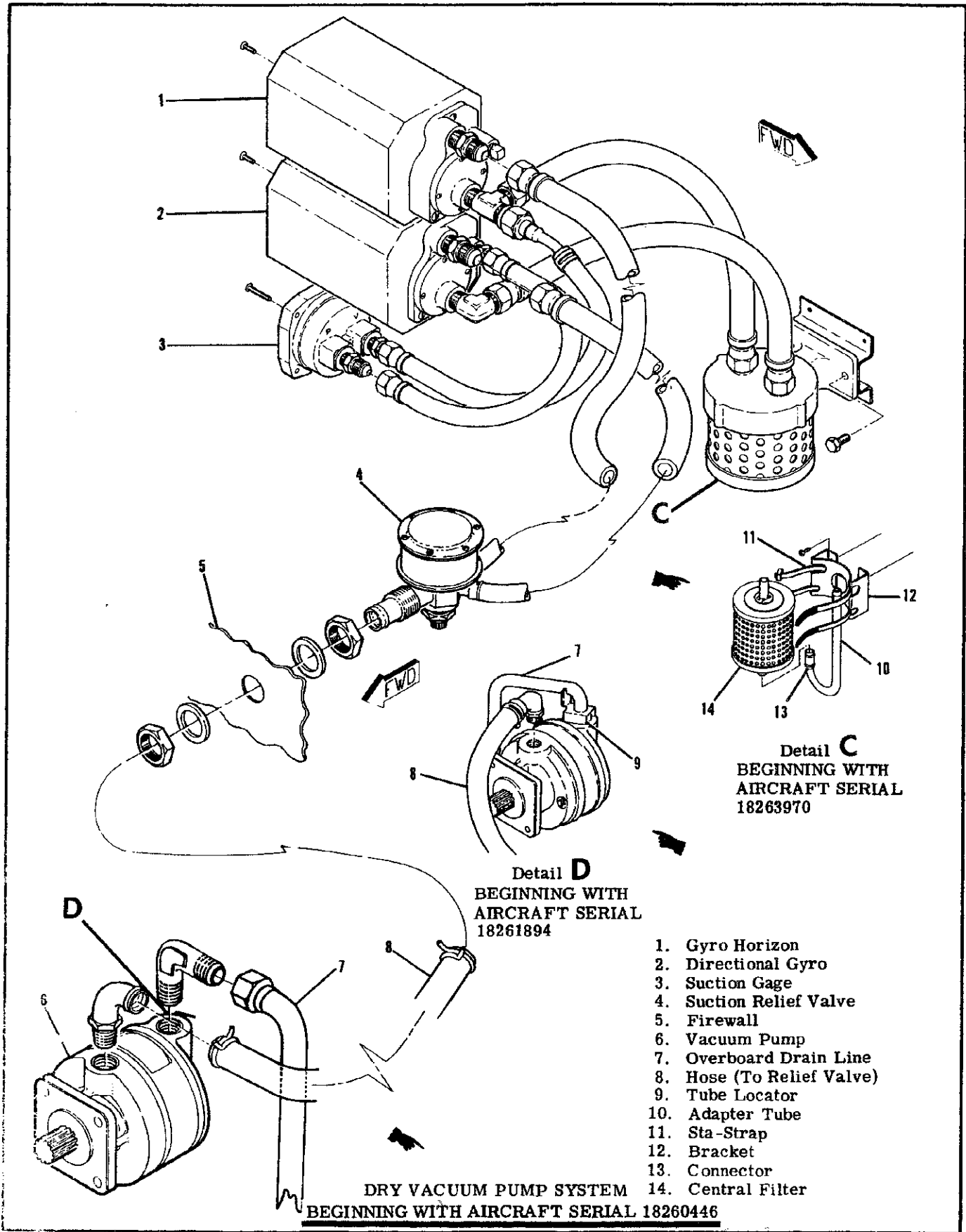


Figure 15-5. Vacuum System (Sheet 2 of 2)

15-27. TROUBLE SHOOTING -- VACUUM PUMP.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
	Oil separator clogged, oil return line obstructed, excessive oil flow through pump. (Wet system only)	Clean oil separator with Stoddard solvent, then blow dry. Blow out lines. If pump oil consumption is excessive, replace oil metering pin in pump.
HIGH SUCTION.	Suction relief valve screen clogged.	Clean or replace screen.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

15-28. REMOVAL AND INSTALLATION OF COMPONENTS (WET SYSTEM). Through aircraft serial 18260445 the components of the 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 thread lubricant sparingly and only on male threads. Avoid over-tightening connections. Before reinstalling a vacuum pump, probe oil passages in pump and engine, to make sure they are open. Place mounting pad gasket in position over studs and ensure it does not block oil passages. Coat pump drive splines lightly with a high-temperature grease such Dow Silicone #30 (Dow-Corning Co., Midland, Mich.). After installing pump, before connecting plumbing, start engine and hold a piece of paper over pump discharge to check for proper lubrication. Proper oil flow through pump is one to four fluid ounces per hour.

15-28A. REMOVAL AND INSTALLATION OF COMPONENTS (DRY SYSTEM). Beginning with aircraft serial 18260446 the components of the vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. Cap open lines and fitting to prevent dirt from entering the system. When replacing a vacuum system component, ensure connections are made correctly. Use no lubricants on any components when assembling a dry vacuum system. Avoid over-tightening connections. Before installing the vacuum pump, place mounting pad gasket in position over studs. Be sure all lines and fittings are open and caps are removed.

15-29. CLEANING. Low pressure, dry compressed air should be used in cleaning vacuum system components. The suction relief valve should be washed with Stoddard solvent then dried with low-pressure air. Refer to Section 2 for central air filter. 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.

15-30. 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 relief valve, remove central air filter, run engine to 1900 rpm on ground and adjust relief valve to $5.3 \pm .1$ 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.

15-31. ENGINE INDICATORS.

15-32. TACHOMETER.

15-33. DESCRIPTION. The tachometer is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the drive-shaft. To function properly, the 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 the 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.

15-34. MANIFOLD PRESSURE GAGE.

is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury.

15-35. DESCRIPTION. The manifold pressure gage

15-36. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Blow out line.
JERKY MOVEMENT OF POINTER.	Excessive internal friction.	Replace instrument.
	Rocker shaft screws tight.	Replace instrument.
	Link springs too tight.	Replace instrument.
	Dirty pivot bearings.	Replace instrument.
	Defective mechanism.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
SLUGGISH OPERATION OF POINTER.	Foreign matter in line.	Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
EXCESSIVE POINTER VIBRATION.	Tight rocker pivot bearings.	Replace instrument.
IMPROPER CALIBRATION.	Faulty mechanism.	Replace instrument.
NO POINTER MOVEMENT.	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Repair or replace damaged line.

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15-37. CYLINDER HEAD TEMPERATURE GAGE

15-38. DESCRIPTION. The temperature sending unit regulates electrical power through the cylinder head temperature gage. The gage and sending unit require little or no maintenance other than cleaning, making sure lead is properly supported and all connections are clean, tight and properly insulated. When replacing a sending unit, install as a matched pair. The Rochester and Stewart Warner gages are connected the same, but the Rochester gage does not have a calibration pot and cannot be adjusted. Refer to Table 2, on page 15-20B when troubleshooting the cylinder head temperature gage.

NOTE: A Cylinder Head Temperature Gage Calibration Unit, (SK182-43) is available and may be ordered through the Cessna Supply Division.

15-39. TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE	No current to circuit.	Repair electrical circuit.
	Defective gage, bulb or circuit.	Repair or replace defective items.
GAGE FLUCTUATES RAPIDLY	Loose or broken wire permitting alternate make and break of gage circuit.	Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE	High voltage.	Check "A" terminal.
	Gage off calibration.	Replace gage.
GAGE READS TOO LOW ON SCALE	Low voltage.	Check voltage supply and "D" terminal.
	Gage off calibration.	Replace gage.
GAGE READS OFF SCALE AT HIGH END.	Break in bulb.	Replace bulb.
	Break in bulb lead.	Replace bulb.
	Internal break gage.	Replace gage.
OBVIOUSLY INCORRECT READING	Defective gage mechanism.	Replace gage.
	Incorrect calibration.	Calibrate system.

15-40. OIL PRESSURE GAGE

15-41. 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.

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15-42. TROUBLESHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER	Pressure line clogged.	Clean line.
	Pressure line broken.	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.	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 pressured line.	Repair or replace damaged line.

15-43. OIL TEMPERATURE GAGE.

15-44. DESCRIPTION. On some airplanes, the oil temperature gage is a Bourdon tube type pressure instrument connected by armored capillary tubing to a temperature bulb in the engine. The temperature bulb, capillary tube and gage are filled with fluid and sealed. Expansion and contraction of fluid in the bulb with temperature changes operates the gage. Checking capillary tube for damage and fittings for security is the only maintenance required. Since the tubes inside diameter is small, small dents and kinks, which would be acceptable in larger tubing, may partially or completely close off the capillary, making the gage inoperative. Some airplanes are equipped with gages that are electrically actuated and are not adjustable. Refer to Table 1, on page 15-20A when troubleshooting the oil temperature gage.

15-45. CARBURETOR AIR TEMPERATURE GAGE.

15-46. 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 induced by poor electrical bonds in the airframe.

15-47. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE POINTER STAYS OFF LOW END OF SCALE.	Popped circuit breaker.	Reset breaker.
	Master switch "OFF" or switch defective.	Replace defective switch.
	Broken or grounded leads between gage and sensing unit.	Repair or replace defective wiring.
	Defective gage or sensing unit.	Replace gage or sensing unit.
GAGE POINTER GOES OFF HIGH END OF SCALE.	Broken or grounded lead.	Repair or replace defective wiring.
	Defective gage or sensing unit.	Replace gage or sensing unit.
GAGE OPERATES INTERMITTENTLY.	Defective master switch, broken or grounded lead.	Replace switch, repair or replace defective wiring.
	Defective gage or sensing unit.	Replace gage or sensing unit.
EXCESSIVE POINTER OSCILLATION.	Loose or broken lead.	Repair or replace defective wiring.
	Defective gage or sensing unit.	Replace gage or sensing unit.
	Excessive panel vibration.	Tighten panel mounting screws.
OBVIOUSLY INCORRECT TEMPERATURE READING.	Defective 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.	Replace gage.

15-48. FUEL QUANTITY INDICATING SYSTEM.

15-49. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel cell. The full position of float produced a minimum resistance through the transmitter, permitting maximum current flow through the fuel quantity indicator and maximum pointer deflection. As fuel level is lowered, resistance in the transmitter is increased, producing a decreased current flow through the fuel quantity indicator and a smaller pointer deflection.

15-49A. REMOVAL AND INSTALLATION TRANSMITTER. (Refer to section 12 figure 12-3).

- a. Drain fuel from cell. (Observe the precautions in Section 12, paragraph 12-3.)
- b. Remove wing root fairing.
- c. Disconnect electrical lead and ground strap from transmitter.
- d. Remove screws attaching transmitter and carefully work transmitter from cell. DO NOT BEND FLOAT ARM.
- e. Reverse preceding steps for installation, using new gaskets around opening and under screw heads.

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15-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO INDICATE	No power to indicator or transmitter. (Pointer stays below E.)	Check and reset breaker, repair or replace defective wiring.
	Grounded wire. (Pointer stays above F.)	Repair or replace defective wire.
	Low voltage.	Correct voltage.
	Defective indicator.	Replace indicator.
SYSTEM OFF CALIBRATION	Defective indicator.	Replace indicator.
	Defective transmitter.	Recalibrate or replace.
	Low or high voltage	Correct voltage.
STICKY OR SLUGGISH INDICATOR OPERATION	Defective indicator.	Replace indicator.
	Low voltage	Correct voltage.
ERRATIC READINGS	Loose or broken wiring on indicator or transmitter.	Repair or replace defective wire.
	Defective indicator or transmitter.	Replace indicator or transmitter.
	Defective master switch.	Replace switch.

15-51. TRANSMITTER ADJUSTMENT

WARNING: USING THE FOLLOWING FUEL TRANSMITTER CALIBRATION PROCEDURES ON COMPONENTS OTHER THAN THE ORIGINALLY INSTALLED (STEWART WARNER) COMPONENTS WILL RESULT IN A FAULTY FUEL QUANTITY READING.

15-51A. STEWART WARNER GAGE TRANSMITTER CALIBRATION

Chances of transmitter calibration changing in normal service is remote; however it is possible that the float arm or the float arm stops may become bent if the transmitter is removed from the fuel cell/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 CELL CREATES A HAZARDOUS SITUATION.

Before installing transmitter, attach electrical wires and place the master switch in the "ON" position. Allow float arm to rest against lower float arm stop and read indicator. The pointer should be on E (empty) position. Adjust the float arm against the lower stop so pointer indicator is on E. Raise float until arm is against upper stop to permit indicator pointer to be on F (full). Install transmitter in accordance with paragraph 15-49A.

15-51B ROCHESTER FUEL GAGE TRANSMITTER

Do not attempt to adjust float arm or stop. No adjustment is allowed.

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15-51C. FUEL QUANTITY INDICATING SYSTEM OPERATIONAL TEST

WARNING: REMOVE ALL IGNITION SOURCES FROM THE AIRPLANE AND VAPOR HAZARD AREA. SOME TYPICAL EXAMPLES OF IGNITION SOURCES ARE STATIC ELECTRICITY, ELECTRICALLY POWERED EQUIPMENT (TOOLS OR ELECTRONIC TEST EQUIPMENT – BOTH INSTALLED ON THE AIRPLANE AND GROUND SUPPORT EQUIPMENT), SMOKING AND SPARKS FROM METAL TOOLS.

WARNING: OBSERVE ALL STANDARD FUEL SYSTEM FIRE AND SAFETY PRACTICES.

1. Disconnect all electrical power from the airplane. Attach maintenance warning tags to the battery connector and external power receptacle stating:

DO NOT CONNECT ELECTRICAL POWER, MAINTENANCE IN PROGRESS.

2. Electrically ground the airplane.
3. Level the airplane and drain all fuel from wing fuel tanks.
4. Gain access to each fuel transmitter float arm and actuate the arm through the transmitter's full range of travel.
 - A. Ensure the transmitter float arm moves freely and consistently through this range of travel. Replace any transmitter that does not move freely or consistently.

WARNING: USE EXTREME CAUTION WHILE WORKING WITH ELECTRICAL COMPONENTS OF THE FUEL SYSTEM. THE POSSIBILITY OF ELECTRICAL SPARKS AROUND AN "EMPTY" FUEL CELL CREATES A HAZARDOUS SITUATION.

- B. While the transmitter float arm is being actuated, apply airplane battery electrical power as required to ensure that the fuel quantity indicator follows the movement of the transmitter float arm. If this does not occur, troubleshoot, repair and/or replace components as required until the results are achieved as stated.

NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to paragraph 15-51A for instructions for adjusting Stewart Warner fuel indicating systems. Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

5. With the fuel selector valve in the "OFF" position, add unusable fuel to each fuel tank.
6. Apply electrical power as required to verify the fuel quantity indicator indicates "EMPTY".
 - A. If "EMPTY" is not indicated, adjust, troubleshoot, repair and/or replace fuel indicating components as required until the "EMPTY" indication is achieved.

NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to paragraph 15-51A for instructions for adjusting Stewart Warner fuel indicating systems. Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

CESSNA AIRCRAFT COMPANY
MODEL 182 AND SKYLANE SERIES
 SERVICE MANUAL

7. Fill tanks to capacity, apply electrical power as required and verify fuel quantity indicator indicates "FULL".

A. If "FULL" is not indicated, adjust, troubleshoot, repair and/or replace fuel indicating components as required until the "Full" indication is achieved.

NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to paragraph 15-15A for instructions for adjusting Stewart Warner fuel indicating systems. Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

8. Install any items and/or equipment removed to accomplish this procedure, remove maintenance warning tags and connect the airplane battery.

15-51D. OIL TEMPERATURE INDICATING SYSTEM RESISTANCE TABLE 1

The following table is provided to assist in troubleshooting the oil temperature indicating system components.

Select the oil temperature sending unit part number that is used in your airplane from the left column and the temperature from the column headings. Read the ohms value under the appropriate temperature column.

Part Number	Type	72°F	120°F	165°F	220°F	250°F
S1630-1	Oil Temp				46.4Ω	
S1630-3	Oil Temp		620.0 Ω			52.4 Ω
S1630-4	Oil Temp		620.0 Ω			52.4 Ω
S1630-5	Oil Temp			192.0 Ω		
S2335-1	Oil Temp	990.0 Ω				34.0 Ω

15-51E. CYLINDER HEAD TEMPERATURE INDICATING SYSTEM RESISTANCE TABLE 2

The following table is provided to assist in the troubleshooting the oil temperature indicating system components.

Select the cylinder head temperature sending unit part number that is used in your airplane from the left column and the temperature from the column headings. Read the ohms value under the appropriate temperature column.

Part Number	Type	200°F	220°F	450°F	475°F
S1372-1	CHT		310.0 Ω	34.8 Ω	46.4Ω
S1372-2	CHT		310.0 Ω	34.8 Ω	
S1372-3	CHT			113.0 Ω	
S1372-4	CHT			113.0 Ω	
S2334-3	CHT	745.0 Ω			38.0 Ω
S2334-4	CHT	745.0 Ω			38.0 Ω

15-52. HOURMETER.

15-53. DESCRIPTION. The hourmeter is an electrically operated instrument, actuated by a pressure switch in the oil pressure gage line. Electrical power is supplied through a one-amp fuse from the electrical clock circuit, and therefore will operate independent of the master switch.

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15-54. ECONOMY MIXTURE INDICATOR.

15-55. DESCRIPTION. The economy mixture indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 75% power. Exhaust gas temperature (EGT) varies with ratio of fuel-to-air mixture entering the engine cylinders. Refer to the Owner's Manual for operating procedure of the system.

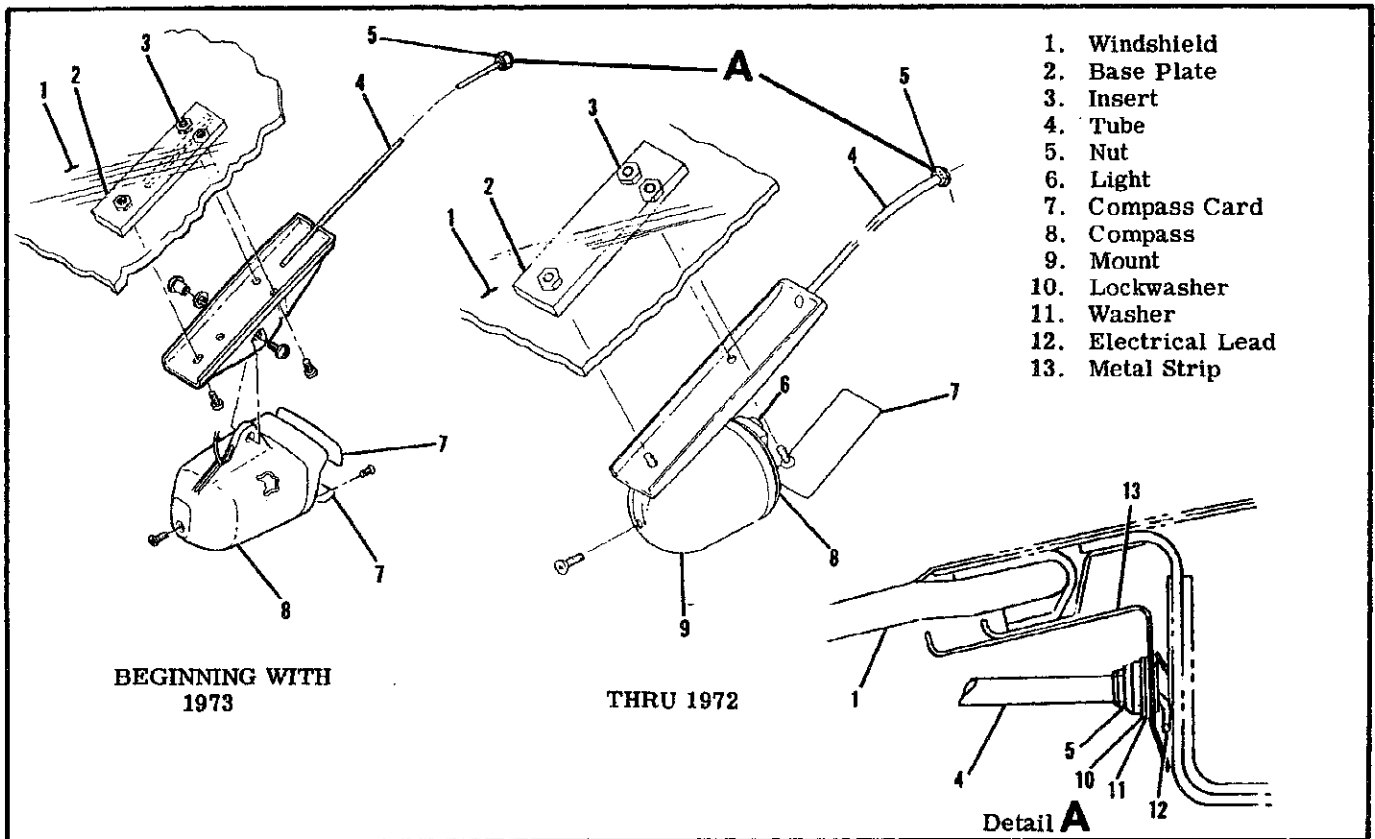


Figure 15-6. Magnetic Compass Installation

15-56. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	Defective gage, probe or circuit.	Repair or replace defective part.
INCORRECT READING.	Indicator needs calibrating.	Calibrate indicator in accordance with paragraph 15-57.
FLUCTUATING READING.	Loose, frayed or broken lead, permitting alternate make and break of current.	Tighten connections and repair or replace defective leads.

15-57. CALIBRATION. A potentiometer adjustment screw is provided behind the plastic cap at the back of the instrument for calibration. This adjustment screw is used to position the pointer over the reference increment line (4/5 of scale) at peak EGT. Establish 75% power in level flight, then carefully lean mixture to peak EGT. After the pointer has peaked, using the adjustment screw, position the pointer over reference increment line (4/5 of scale).

NOTE

This setting will provide relative temperature indications for normal cruise power settings within range of the instrument.

Turning the screw clockwise increases the meter reading and counterclockwise decreases the meter reading. There is a stop in each direction and damage

can occur if too much torque is applied against stops. Approximately 600°F total adjustment is provided. The adjustable yellow pointer on the face of the instrument is a reference pointer only.

15-58. REMOVAL AND INSTALLATION. Removal of the indicator is accomplished by removing the mounting screws and disconnecting the leads. Tag leads to facilitate installation. The thermocouple probe is secured to the exhaust stack with a clamp. When installing probe, tighten clamp to 45 pound-inches and safety as required.

15-59. MAGNETIC COMPASS. (Refer to figure 15-6.)

15-60. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from the front of the case. The compass is internally lighted, controlled by the instrument lights rheostat switch. No maintenance is required on the compass except an occasional check on a compass rose and replacement of lamp. The compass mount is attached by three screws to a base plate which is bonded to windshield with methylene chloride. A tube containing the compass light wires is attached to the metal strip at the top of the windshield. Removal of the compass is

accomplished by removing the screw at forward end of compass mount, unfastening the metal strip at the top of windshield and cutting the two wire splices. Removal of the compass mount is accomplished by removing three screws attaching mount to the base plate. Access to the inner screw is gained through a hole in the bottom of mount, through which a thin screwdriver may be inserted. When installing the compass, it will be necessary to splice the compass light wires.

15-61. STALL WARNING HORN AND TRANSMITTER.

15-62. DESCRIPTION. The stall warning horn is mounted on the glove box. It is electrically operated and controlled by a stall warning transmitter mounted on the leading edge of the left wing. For further information on the warning horn and transmitter, refer to Section 16.

15-63. TURN COORDINATOR.

15-64. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-turn rate indicator. Its gyro simultaneously senses rate of motion roll and yaw axis which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an ac brushless spin motor with a solid state inverter.

15-65. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator dampening.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Correct voltage.
	Inverter frequency changed	Replace instrument.
NOISY MOTOR.	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	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.	Correct voltage.

15-65. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
NOISY GYRO.	High voltage.	Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

15-66. TURN-AND-SLIP INDICATOR.

operates ONLY when the master switch is on. Its circuit is protected by an automatically-resetting circuit breaker.

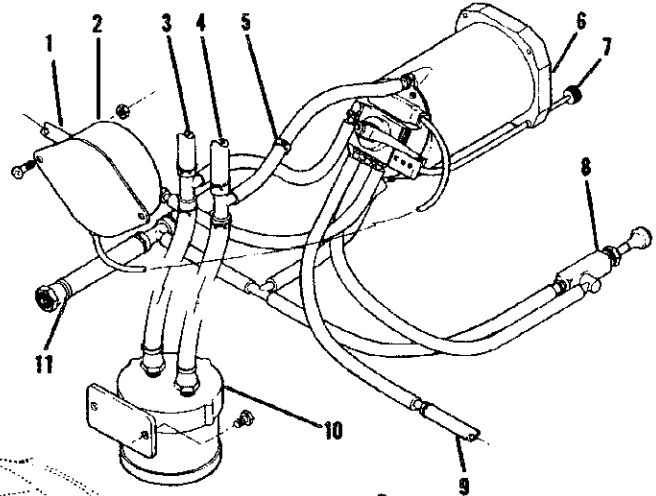
15-67. DESCRIPTION. The turn-and-slip indicator is operated by the aircraft electrical system and

15-68. TROUBLE SHOOTING.

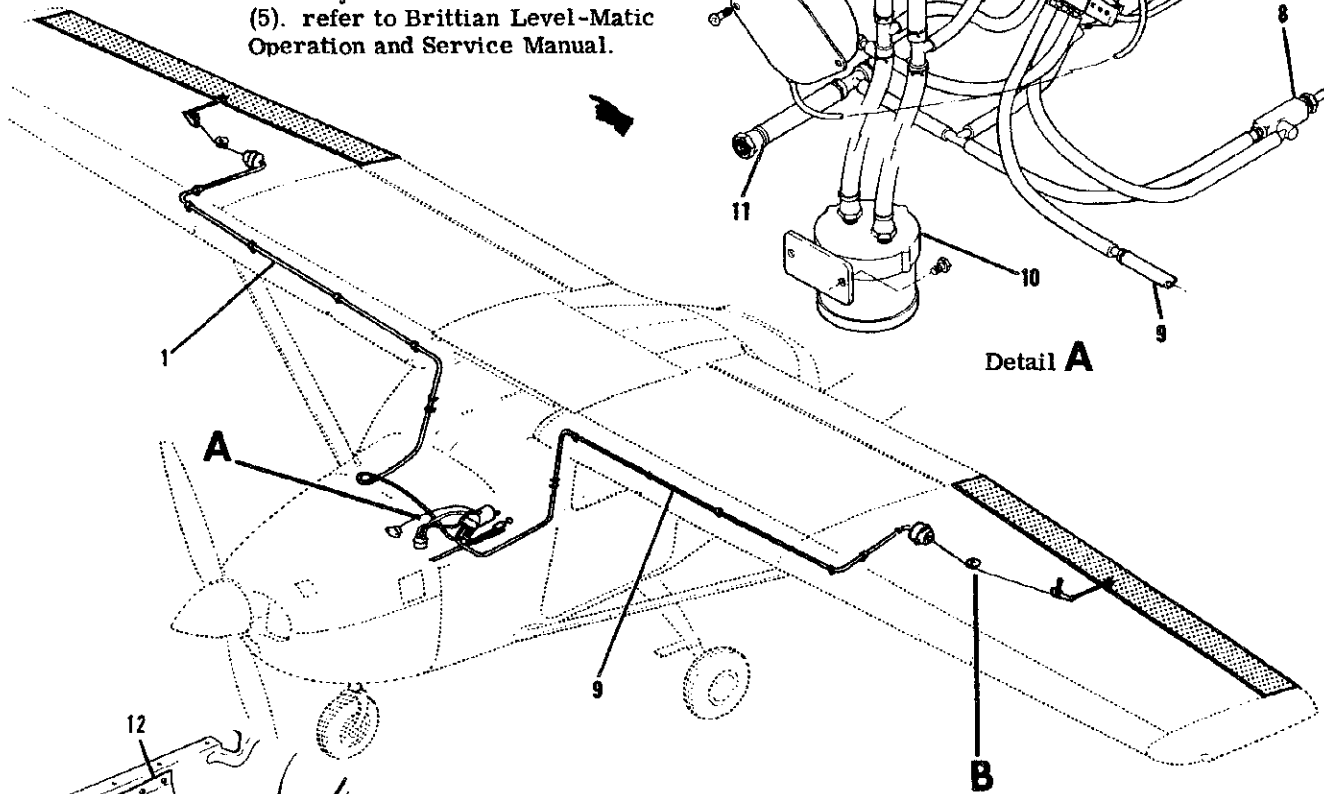
TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Automatic resetting circuit breaker defective.	Replace circuit breaker.
	Master switch "OFF" or switch defective.	Replace defective switch.
	Broken or grounded lead to indicator.	Repair or replace defective wiring.
	Indicator not grounded.	Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	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.	Correct voltage.

NOTE

Inverter (2), turn coordinator (6) and restrictor valve (5) must be replaced as a matched set. For field adjustment of restrictor valve (5), refer to Brittan Level-Matic Operation and Service Manual.

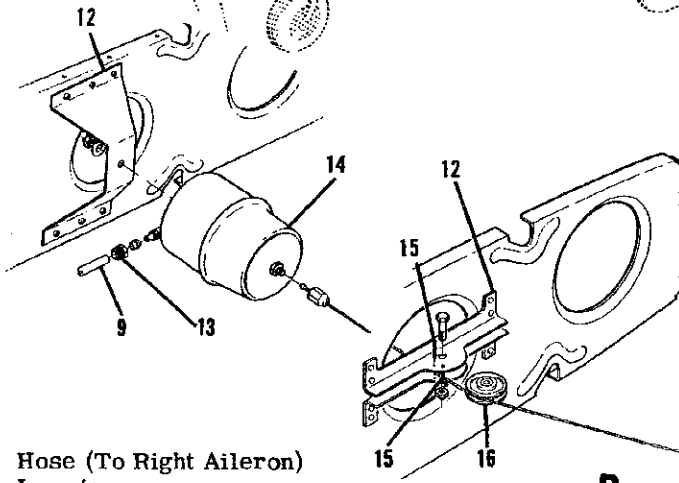


Detail A

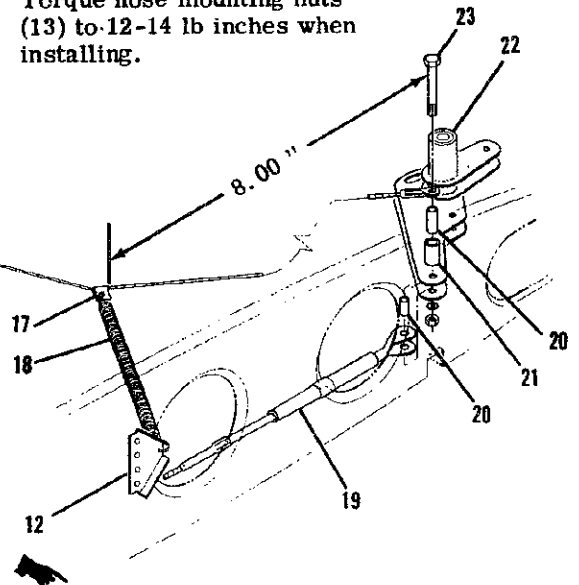


NOTE

Torque hose mounting nuts (13) to 12-14 lb inches when installing.



Detail B



- | | |
|---------------------------------|---------------------------------------|
| 1. Hose (To Right Aileron) | 16. Pulley |
| 2. Inverter | 17. Clamp |
| 3. Hose (To Directional Gyro) | 18. Spring |
| 4. Hose (To Gyro Horizon) | 19. Turnbuckle (Aileron Direct Cable) |
| 5. Restrictor Valve | 20. Bushing |
| 6. Turn Coordinator | 21. Spacer |
| 7. Roll Trim Knob | 22. Bellcrank |
| 8. ON-OFF Control Valve | 23. Bolt |
| 9. Hose (To Left Aileron Servo) | |
| 10. Central Air Filter | |
| 11. Hose (To Relief Valve) | |
| 12. Bracket | |
| 13. Nut | |
| 14. Servo | |
| 15. Cable Guard | |

THRU AIRCRAFT SERIAL 18262465

Figure 15-7. Wing Leveler Control System

SECTION 16

ELECTRICAL SYSTEMS

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16-13. BATTERY POWER SYSTEM.

16-14. BATTERY.

16-15. DESCRIPTION. The battery is 12-volts and is approximately 33 ampere hour capacity. The battery is located in the tailcone and is equipped with non-spill filler caps.

16-16. TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
<p>BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE.</p>	<p>Battery discharged.</p>	<p>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.</p>
	<p>Battery faulty.</p>	<p>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.</p>
	<p>Faulty contactor or wiring between contactor or master switch.</p>	<p>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.</p>
	<p>Open coil on contactor.</p>	<p>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.</p>
	<p>Faulty contactor contacts.</p>	<p>5. Check voltage on "BUS" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittent, replace contactor. If voltage is normal, proceed to step 6.</p>

16-16. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE (cont).	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

16-17. REMOVAL AND INSTALLATION

(Refer to figure 16-1.)

- a. Remove aft baggage wall.
- b. Remove the 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 protection 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.

16-18. 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.

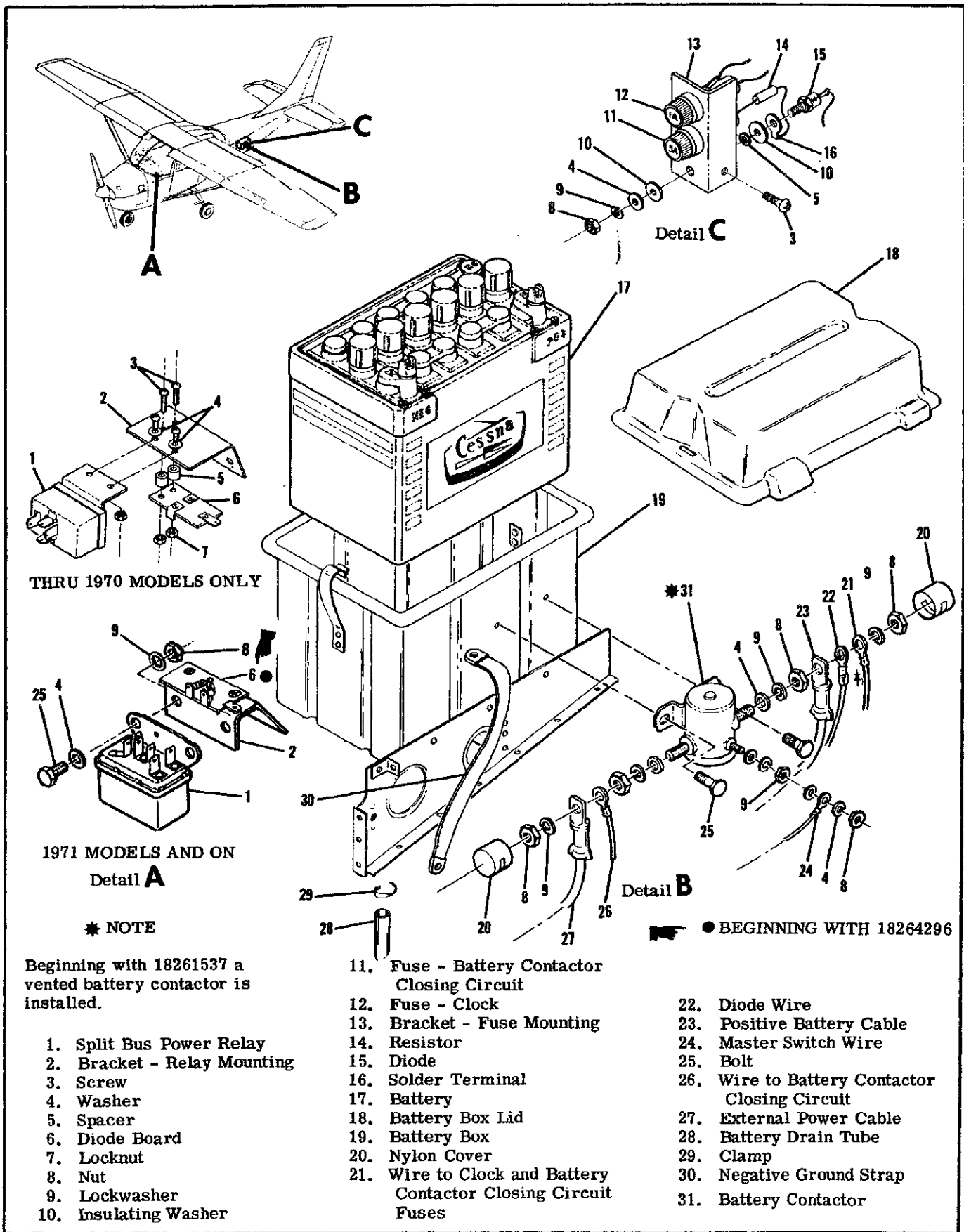
16-19. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid 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.

16-20. 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.

SHOP NOTES:



THRU 1970 MODELS ONLY

1971 MODELS AND ON
Detail A

* NOTE

Beginning with 18261537 a vented battery contactor is installed.

- 1. Split Bus Power Relay
- 2. Bracket - Relay Mounting
- 3. Screw
- 4. Washer
- 5. Spacer
- 6. Diode Board
- 7. Locknut
- 8. Nut
- 9. Lockwasher
- 10. Insulating Washer

- 11. Fuse - Battery Contactor Closing Circuit
- 12. Fuse - Clock
- 13. Bracket - Fuse Mounting
- 14. Resistor
- 15. Diode
- 16. Solder Terminal
- 17. Battery
- 18. Battery Box Lid
- 19. Battery Box
- 20. Nylon Cover
- 21. Wire to Clock and Battery Contactor Closing Circuit
- 22. Diode Wire
- 23. Positive Battery Cable
- 24. Master Switch Wire
- 25. Bolt
- 26. Wire to Battery Contactor Closing Circuit
- 27. External Power Cable
- 28. Battery Drain Tube
- 29. Clamp
- 30. Negative Ground Strap
- 31. Battery Contactor

● BEGINNING WITH 18264296

Figure 16-1. Battery and Electrical Equipment Installation

BATTERY HYDROMETER READINGS

<u>READINGS</u>	<u>BATTERY CONDITION</u>
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 a thermometer. If this type tester is used, disregard this chart.

16-21. 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.

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.

16-22. BATTERY BOX.

16-23. DESCRIPTION. The battery is completely enclosed in an acid resistant plastic box which is riveted to mounting brackets in the tailcone. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape.

16-24. REMOVAL AND INSTALLATION. (Refer to figure 16-1.) The battery box is riveted to

the mounting brackets in the tailcone. The rivets must be drilled out to remove the box.

16-25. 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 paint Part No. CES 1054-529, available from the Cessna Service Parts Center.

16-26. BATTERY CONTACTOR.

16-27. 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 coil terminal of the battery contactor. Nylon covers are installed on the contactor terminals to prevent accidental shorts. (See figure 16-1.)

16-28. REMOVAL AND INSTALLATION.

(Refer to figure 16-1.)

- Remove the battery box cover and disconnect the ground cable from the negative battery terminal and pull cable clear of battery box.
- Remove the nut, lockwasher and the two plain washers securing the battery cables to the battery contactor.
- Remove the nut, lockwasher and the two plain washers securing the wire which is routed to the master switch.
- Remove the silicon diode which is connected to the battery terminal and the coil terminal.
- Remove the bolt, washer and nut securing each side of the battery contactor to the battery box. The contactor will now be free for removal.
- To replace the contactor, reverse this procedure.

16-29. BATTERY CONTACTOR CLOSING CIRCUIT.

16-30. DESCRIPTION. This circuit consists of a 5-amp fuse, a resistor and a diode mounted on a bracket on the side of the battery box. This serves to shunt a small charge around the battery contactor

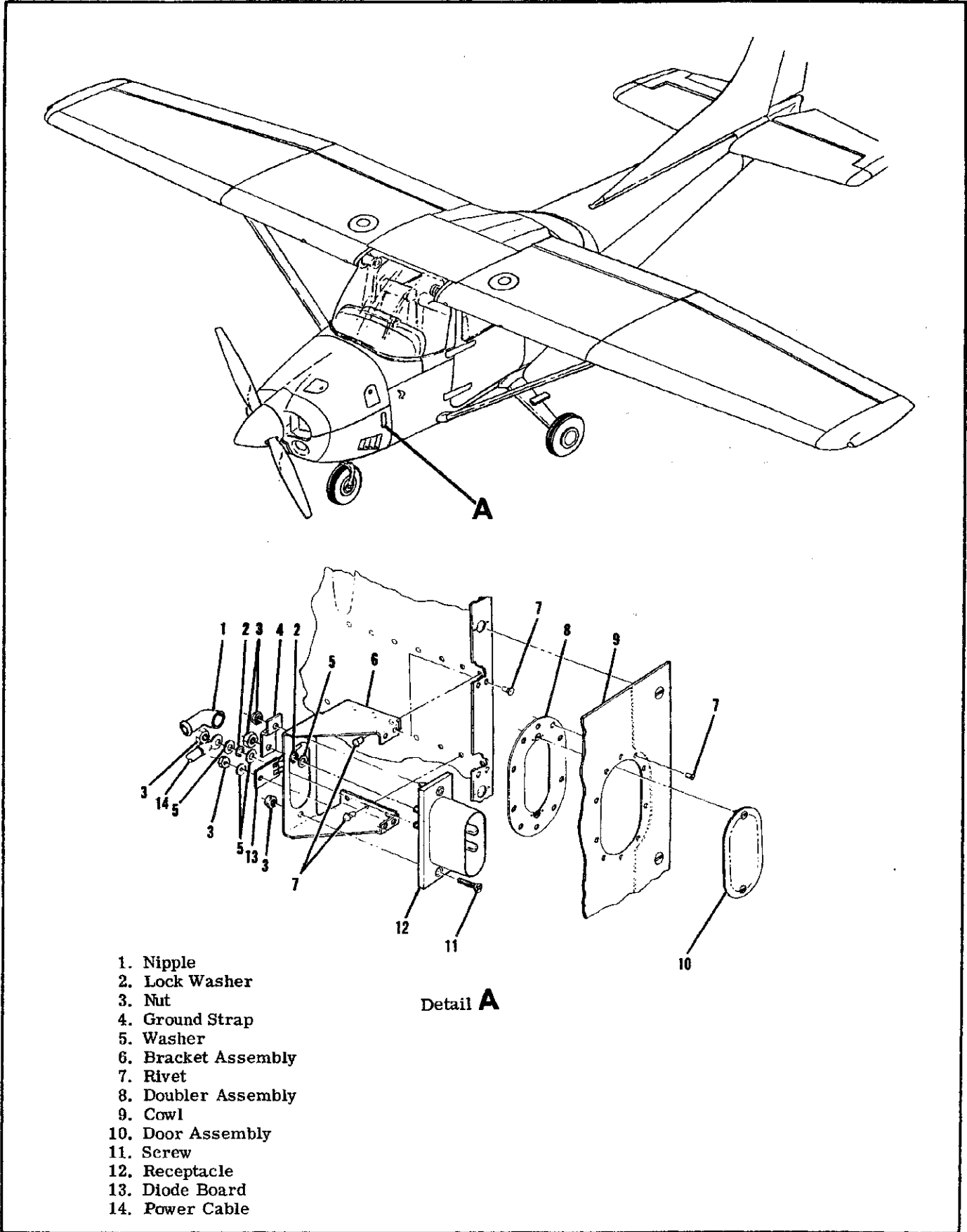


Figure 16-2. Ground Service Receptacle Installation

so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself.

16-31. GROUND SERVICE RECEPTACLE.

16-32. 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 electronic 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 in the aircraft.

WARNING

External power receptacle must be functionally checked after wiring, or after replacement of components of the external power or split bus systems. Incorrect wiring or malfunctioned components can cause immediate engagement of starter when ground service plug is inserted.

16-33. 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.

16-33. TROUBLE SHOOTING. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE. (Cont).	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.
	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.

16-34. REMOVAL AND INSTALLATION.

(Refer to figure 16-2.)

- a. Open the 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.

16-35. ALTERNATOR POWER SYSTEM.

16-36. DESCRIPTION. The alternator system consists of an engine driven alternator, a voltage regulator mounted 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. Beginning with 1972 models an over-voltage sensor switch and red warning light labeled HIGH VOLTAGE are incorporated to protect the system, (refer to paragraph 16-46). The aircraft battery supplies the source of power for excitation of the alternator.

16-37. ALTERNATOR.

16-38. DESCRIPTION. The 60-ampere alternators used on the 182 model are three-phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 14-volts at 60-amperes continuous output. The moving center part of the alternator (rotor) consists of an axial winding with radial interlocking poles which surround the winding. With excitation applied to the winding through slip rings, the pole pieces assume magnetic polarity. The rotor is mounted in bearings and rotates inside the stator which contains the windings in which the ac is generated. The stator windings are three-phase, delta connected, and are attached to two diode plates, each of which contain three silicon diodes.

The diode plates are connected to accomplish full-wave, rectification of the ac. The resulting dc output is applied to the aircraft bus and sensed by the voltage regulator. The regulator controls the excitation applied to the alternator field, thus controlling the output voltage of the alternator.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
<p>AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON.</p>	<p>Shorted radio noise filter or shorted wire.</p>	<p>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.</p>
		<p>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.</p>
		<p>3. Check resistance from ground to the free ends of the wires which were connected to the radio noise filter (or alternator if no noise filter is installed). Normal indication does not show a direct short. If a short exists in wires, repair or replace wiring.</p>
	<p>Shorted diodes in alternator.</p>	<p>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.</p>
<p>ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.</p>	<p>Regulator faulty or improperly adjusted.</p>	<p>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 consistent with the voltage vs temperature chart on page 16-14. 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.</p>

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
<p>ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED (Cont).</p>	<p>Regulator faulty or improperly adjusted. (Cont.)</p>	<p>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.</p>
		<p>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.</p>
		<p>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.</p>
	<p>Faulty wiring between alternator and regulator, or faulty alternator.</p>	<p>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.</p>
		<p>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.</p>
		<p>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.</p>

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with voltage vs temperature chart on page 16-13. Observe ship's ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.
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" portions of 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.

16-40. REMOVAL AND INSTALLATION. (Refer to figure 16-3.)

- a. Make sure the master switch remains in the off position or disconnect the negative lead from the battery.
- b. Disconnect and label the wiring from the alternator.
- c. Remove the safety wire from the upper adjusting bolt and remove the bolt from the alternator.
- d. Remove the nut and washer from the lower mounting bolt.
- e. Remove the alternator drive belt and the lower mounting bolt to remove alternator.
- f. To replace alternator, reverse this procedure.
- g. Adjust belt tension to obtain 3/8" deflection at center of belt when applying 12 pounds of pressure. After belt is adjusted and the bolt is safety wired, tighten the bottom bolt to 100-140 lb-in. torque to remove any play between alternator mounting foot and U-shaped support assembly. Whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

NOTE

When tightening the alternator belt, apply pry bar pressure only to the end of the alternator nearest the pulley.

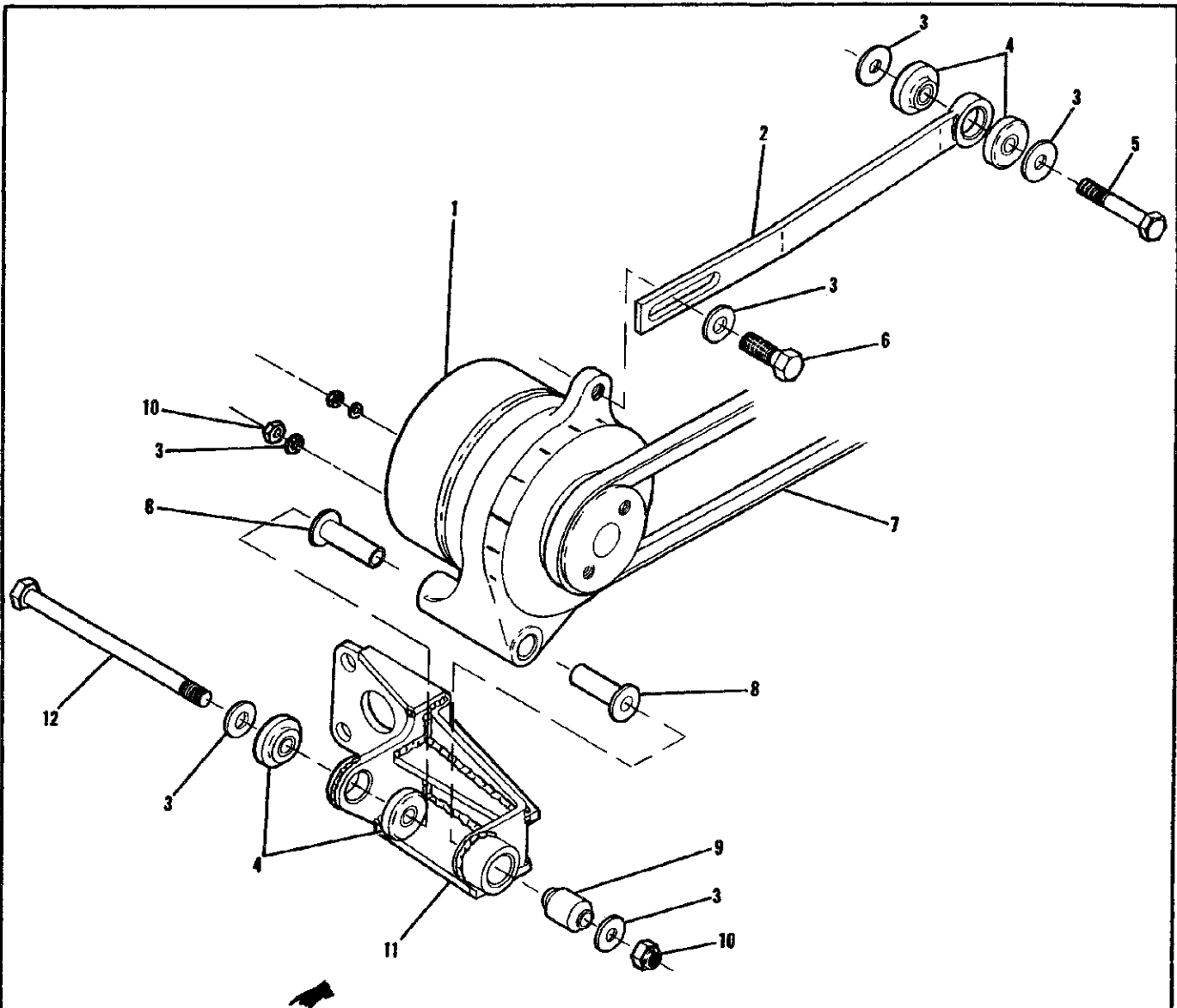
16-41. ALTERNATOR FIELD CIRCUIT PROTECTION. On models prior to 1970, a 2-amp automatic resetting circuit breaker located on the back of the instrument panel is provided to protect the alternator field circuit. On 1970 models and on, a manually-

resettable circuit breaker located on the switch panel is provided to protect the alternator field circuit.

16-42. ALTERNATOR VOLTAGE REGULATOR.

16-43. DESCRIPTION. The alternator voltage regulator contains two relays. One relay is actuated by the aircraft master switch and connects the regulator to the battery. The second relay is a two-stage, voltage sensitive device, which is used to control the current applied to the field winding of the alternator. When the upper set of contacts on the voltage regulator relay are closed, full bus voltage is applied to the field. This condition will exist when the battery is being heavily charged or when a very heavy load is applied to the system. When the upper contacts open, as the voltage begins to rise toward normal bus voltage to the alternator field is reduced through a resistor network in the base of the regulator, thus reducing the output from the alternator. As the voltage continues to rise, assuming a very light load on the system, the lower contacts will close and ground the alternator field and shut the alternator completely off. Under lightly loaded conditions the voltage relay will vibrate between the intermediate charge rate and the lower (completely off) contacts. Under a moderate load, the relay will vibrate between the intermediate charge rate and the upper (full output) contacts.

The voltage relay is temperature compensated so that the battery is supplied with the proper charging voltage for all operating temperatures. With the battery fully charged (ship's ammeter indicating at or near



NOTE

At each 100 hour engine compartment inspection, Cessna Single-engine Service Letter SE71-42 dated December 10, 1971 should be complied with.

- 1. Alternator
- 2. Adjusting Arm
- 3. Washer
- 4. Rubber Bushing
- 5. Bolt
- 6. Upper Adjusting Bolt
- 7. Drive Belt
- 8. Bushing
- 9. Bonded Mount
- 10. Nut
- 11. Support Assembly
- 12. Lower Mounting Bolt

WARNING

On models manufactured prior to mid 1971 should alternator thru-bolt loosening or breaking occur, Cessna Service Letter SE71-40 dated November 24, 1971 should be complied with. On models manufactured after mid 1971 a new high strength thru-bolt and a K shaped retainer are installed. Torque bolts 45 to 55 pound-inches.

Figure 16-3. Alternator Installation

zero) and a moderate load applied to the system (a taxi light turned on), the voltage at the bus bar should be within the range shown according to the air temperature on the following chart:

Beginning with 18264296 a solid state voltage regulator is installed. The voltage limiter relay in this regulator is replaced by a circuit board. The regulator is a remove and replace item and not repairable. The regulator may be adjusted by removing the cover and adjusting the potentiometer either up or down.

TEMPERATURE	BUS VOLTAGE
60 - 74°F	13.8 - 14.1
75 - 90°F	13.7 - 14.0
91 - 100°F	13.6 - 13.9

The voltage regulator is adjustable but adjustment on the airplane is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.

The voltage 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.

16-44. TROUBLE SHOOTING. For trouble shooting the voltage regulator, refer to paragraph 16-39.

16-45. REMOVAL AND INSTALLATION. (Refer to figure 16-4.)

a. Make sure that the master switch is off, or disconnect the negative lead from the battery.

- b. Remove the connector plug from the regulator.
- c. Remove two screws holding the regulator on the firewall.
- d. To replace the regulator, reverse the procedure. Be sure that the connections for grounding the alternator, wiring shields and the base of the regulator are clean and bright before assembly. Otherwise, poor voltage regulation and/or excessive radio noise may result.

16-46. OVER-VOLTAGE WARNING SYSTEM.

16-47. DESCRIPTION. Beginning with 1972 Models, an over-voltage warning system is incorporated in the aircraft. The over-voltage warning system consists of an over-voltage sensor switch and a red warning light labeled, "HIGH VOLTAGE", on 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 tripout 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 red warning light filament can be tested by turning off the Alternator portion of the Master Switch and leaving the Battery portion turned on. This test does not induce an over-voltage condition on the electrical system. On models prior to aircraft serial 18260942, should nuisance trip-outs occur caused by voltage spikes or transient voltage, Cessna Single-engine Service Letter SE72-15 dated April 21, 1972 should be complied with.

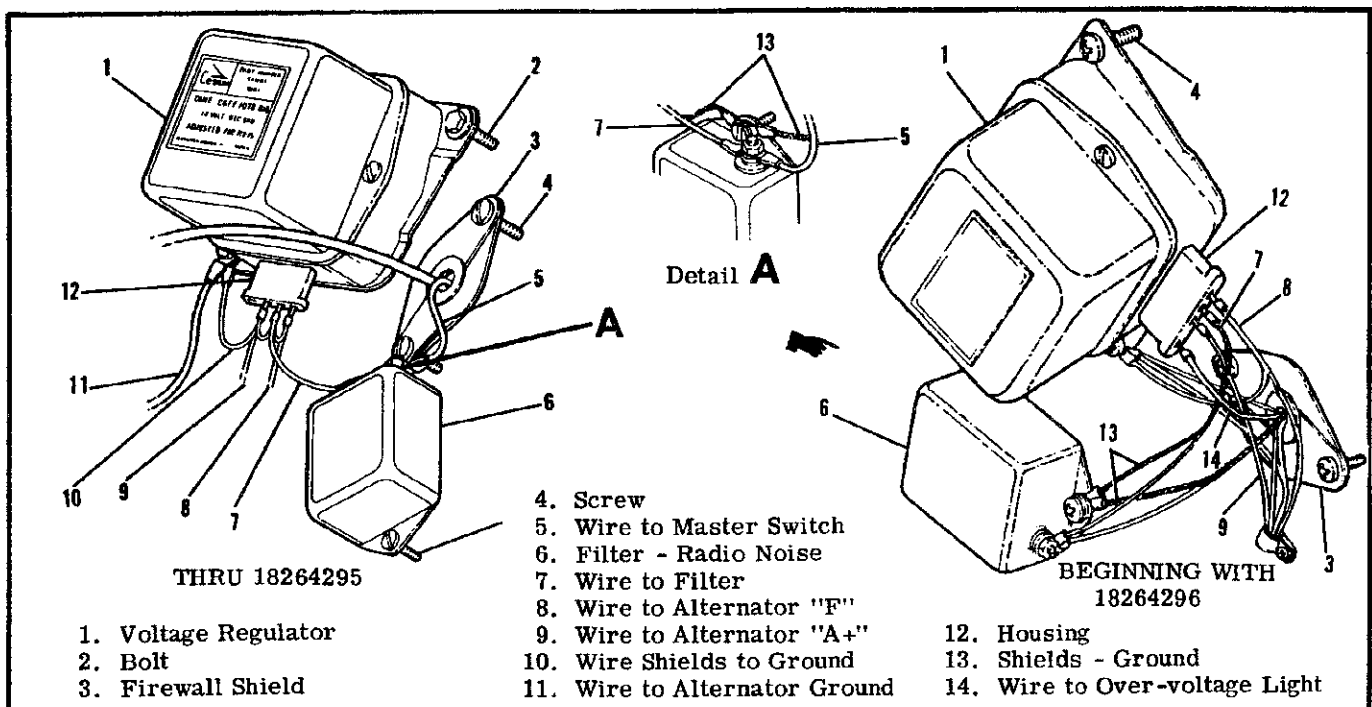


Figure 16-4. Voltage Regulator Installation

16-48. AIRCRAFT LIGHTING SYSTEM.

16-49. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, flashing beacon light, anti-collision strobe lights, dome and instrument flood lights, courtesy lights, control wheel map light, compass and radio dial lights.

On 1969 models & on, snap-in type rocker switches are introduced. These switches have a design feature which permits them to snap into the panel from the panel side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

16-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHTS OUT.	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 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 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 OK, 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.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
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 OK, proceed to step 3.
	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.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. THRU 1972 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS.	Circuit breaker open.	Inspect. Reset.
	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.
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. BEGINNING WITH 1973 MODELS.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
<p>BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS. Cont.</p>	<p>Open circuit breaker. Cont.</p>	<p>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, replace 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.</p>
		<p>3. Check aircraft wiring. Repair or replace as necessary.</p>
		<p>4. Inspect strobe power supply ground wire for contact with wing structure.</p>
<p>CAUTION</p> <p>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.</p> <p>NOTE</p> <p>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.</p>		
<p>ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.</p>	<p>Defective Strobe Power Supply, or flash tube.</p>	<p>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).</p> <p>2. Replace flash tube with known good flash tube. If system still does not work, replace strobe power supply.</p>
<p>DOMES LIGHT TROUBLE.</p>	<p>Short circuit in wiring.</p>	<p>1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.</p>
	<p>Defective wiring.</p>	<p>2. Test circuit until short is located. Repair or replace wiring.</p>

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DOME LIGHT TROUBLE Cont.	Defective wiring Cont.	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 ohmmeter 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.
INSTRUMENT LIGHTS WILL NOT LIGHT. (THRU 1969 MODELS).	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.
	Defective rheostat.	4. Check voltage at instrument light with master switch on. Should read battery voltage with rheostat turned full clockwise and voltage should decrease as rheostat is turned counterclockwise. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Lamp burned out.	5. Test lamp with ohmmeter or new lamp. Replace lamp.

SHOP NOTES:

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT (1970 MODELS & ON).	Short circuit 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.
	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 (1970 MODELS & ON).	Open resistor wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replaces defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT THRU 1969 AIRCRAFT ONLY.	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 OK, 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.

CAUTION

Failure to observe polarity shown on wiring diagrams 11.11.0, will result in immediate failure of the transistor on the map light circuit board assembly.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT 1970 AIRCRAFT & ON.	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 OK, 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.

16-51. LANDING AND TAXI LIGHTS. (THRU 1971 MODELS.)

16-52. DESCRIPTION. The landing and taxi lights are mounted in the leading edge of the left wing. A clear plastic cover provides weather protection for the lamps and is shaped to maintain the leading edge curvature of the wing. The landing lamp is mounted on the inboard side and adjusted to throw its beam further forward than the taxi light. Both lights are controlled by a single switch.

SHOP NOTES:

16-53. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

- a. Remove the screws securing the landing light window assembly and remove assembly.
- b. Remove the four attaching screws (6) from the bracket assembly and remove bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws (2). If adjustment is required, refer to figure 16-5.

- c. Remove the two screws securing the wiring to the lamp contacts and remove the lamp.
- d. Install new lamp and reassemble.

16-54. LANDING AND TAXI LIGHTS. (BEGINNING WITH 1972 MODELS.)

16-55. DESCRIPTION. Beginning with 1972 models the landing and taxi lights are mounted in the lower half of the engine cowl. Both lights are used for landing and the right hand for taxi. Lights are controlled by a interlocking split rocker type switch thru 1973 models. Beginning with 1974 models two rocker type switches are installed with a jumper wire and a diode across the switches. With this arrangement the switches operate the same as the interlocking split rocker switch, the taxi light may be operated individually but when the landing lights are operated both landing and taxi lights are turned on.

16-56. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

- a. Remove the lower cowl and disconnect wires from the landing and taxi lamps.
- b. Remove screws (8) securing lamp assembly to support (2) and remove lamp assembly.
- c. Remove screws (7) securing bracket (6) to plate (3) and remove lamp.
- d. To reinstall reverse this procedure.

16-57. ADJUSTMENT OF LANDING AND TAXI LIGHT. Refer to figure 16-5. Adjustment of the landing and taxi lights is pre-set at the factory with adjustment screws bottomed out against the bracket. Should Further adjustment be desired proceed as follows.

- a. Remove the lamp for access to adjustment screws. (See figure 16-5.)
- b. Thru 1971 Models adjustment is accomplished by turning the screws until desired setting is obtained. Beginning with 1972 Models washers must be added on adjustment screws to change the setting.

NOTE

A maximum of two washers may be used to adjust setting.

CAUTION

Should removal of the cowling be desired to make adjustments, ensure the landing and taxi light wiring is disconnected before removing the bottom cowling.

- c. Remove cowling as outlined in Section 11.

16-58. NAVIGATION LIGHTS.

16-59. DESCRIPTION. The navigation lights are located on each wing tip. The lights are controlled by a single switch located on the instrument panel.

16-60. REMOVAL AND INSTALLATION. For removal and installation of navigation lights, refer to figure 16-6.

16-61. FLASHING BEACON LIGHT.

16-62. DESCRIPTION. The flashing beacon light is attached to the vertical fin tip. The flashing beacon is an iodine-vapor lamp electrically switched by a solid-state flasher assembly. The flasher assembly is located in the vertical fin under the fin tip. The switching frequency of the flasher assembly operates the lamp at approximately 45 flashes per minute. On late 1970 models and on, a 1.5 ohm, 95 watt resistor has been added to the unused dual flasher lead to provide a dummy load which is designed to eliminate a "pulsing" effect on the cabin lighting and ammeter.

16-63. REMOVAL AND INSTALLATION. For removal and installation of the flashing beacon light, refer to figure 16-7.

16-64. ANTI-COLLISION STROBE LIGHTS.

16-65. DESCRIPTION. A white strobe light is installed on each wing tip. These 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 strobe lights from a power supply located inside the left wing on the rib at wing station 136.00, just aft of the landing light, thru 1972 models. Beginning with 1973 models each strobe light is equipped with its own power supply, located on the wing tip ribs.

16-65A. OPERATIONAL REQUIREMENTS.

WARNING

The capacitors in the strobe light power supplies must be reformed if not used for a period of six (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.

16-66. REMOVAL AND INSTALLATION. Refer to figure 16-6 as a guide for removal and installation of the anti-collision strobe light components.

WARNING

This 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.

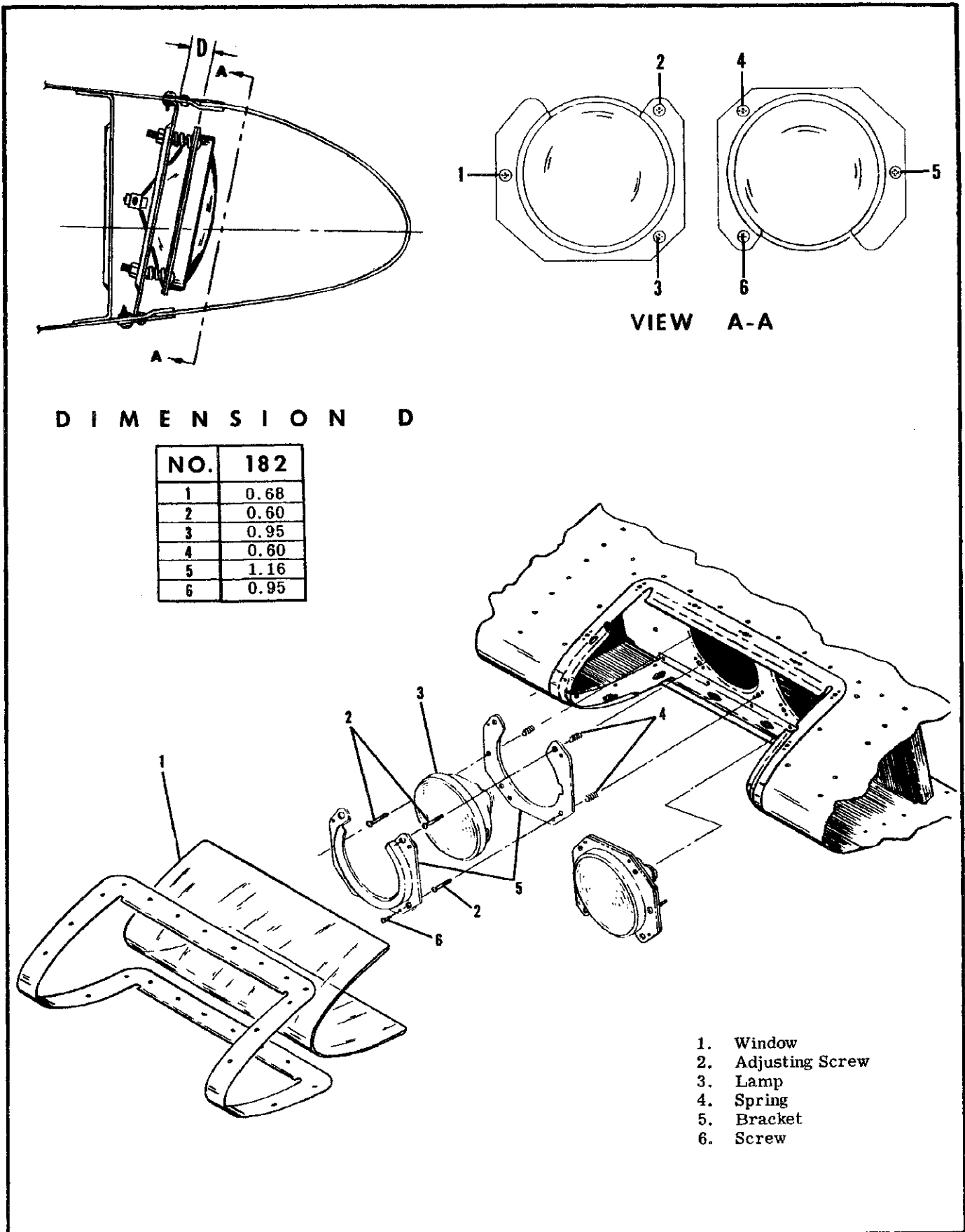


Figure 16-5. Landing and Taxi Light Installation (Sheet 1 of 2)

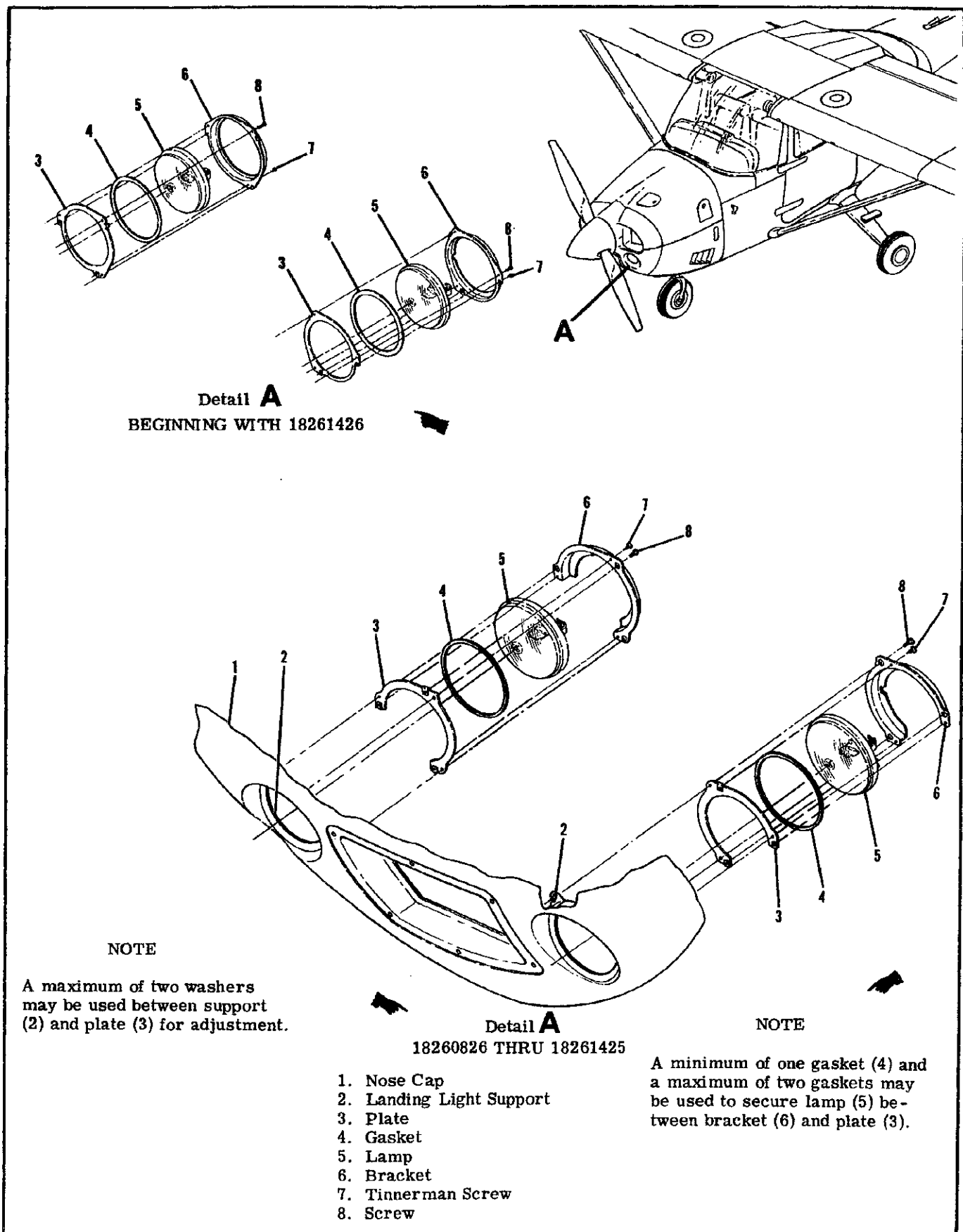


Figure 16-5. Landing and Taxi Light Installation (Sheet 2 of 2)

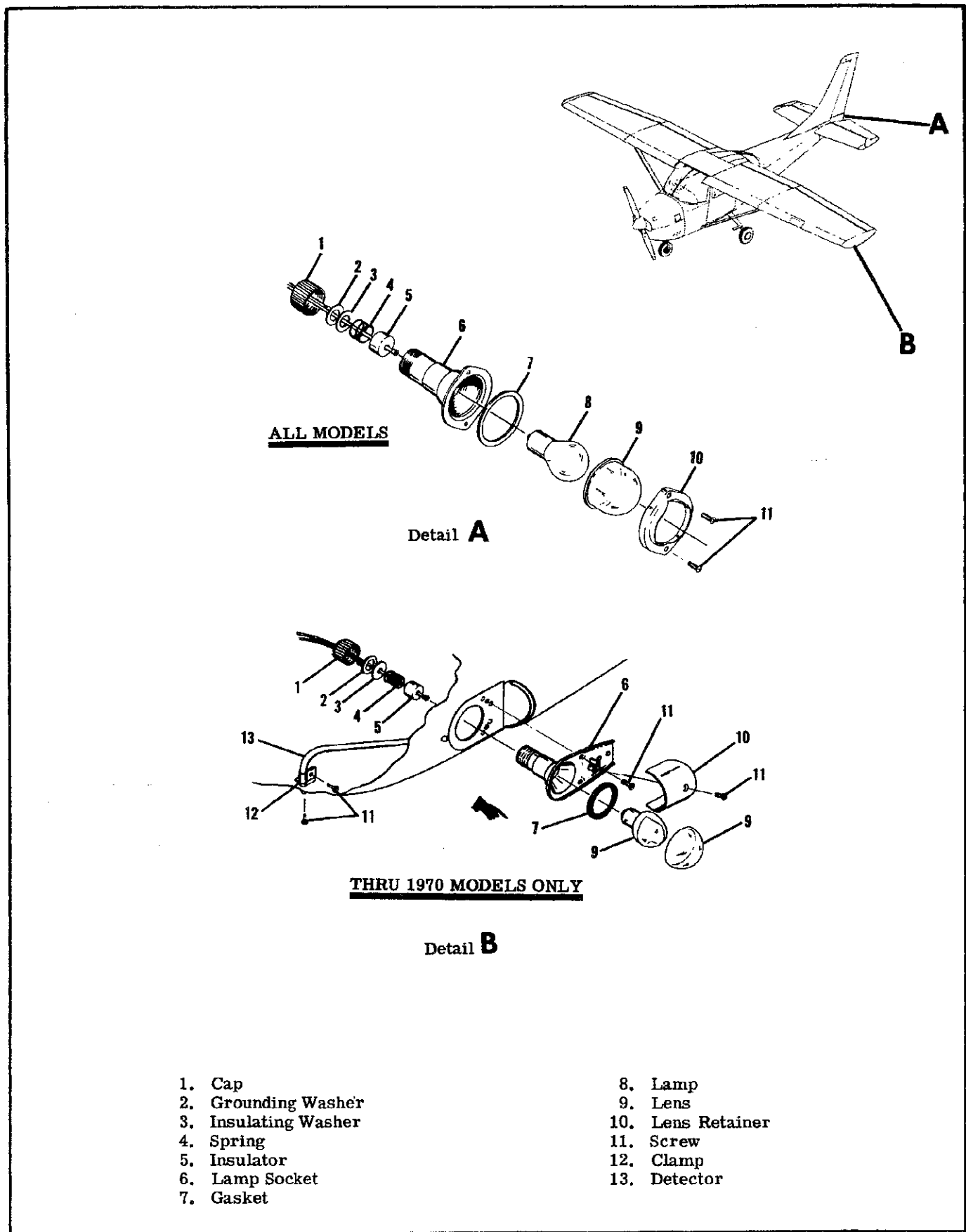


Figure 16-6. Navigation and Anti-Collision Strobe Lights Installation (Sheet 1 of 2)

* 18253594 THRU 182558505
 * BEGINNING WITH 18258506

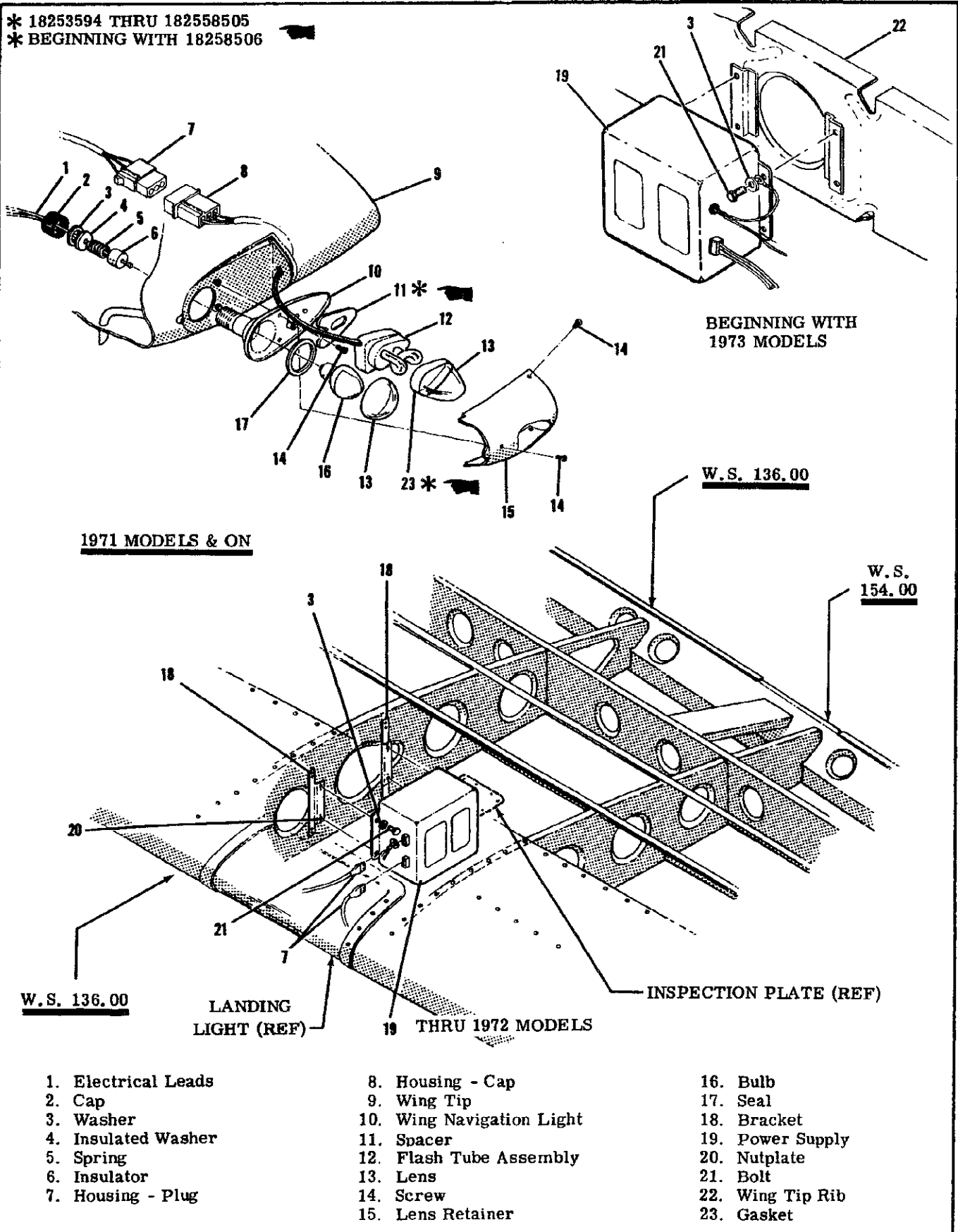


Figure 16-6. Navigation and Anti-Collision Strobe Lights Installation (Sheet 2 of 2)

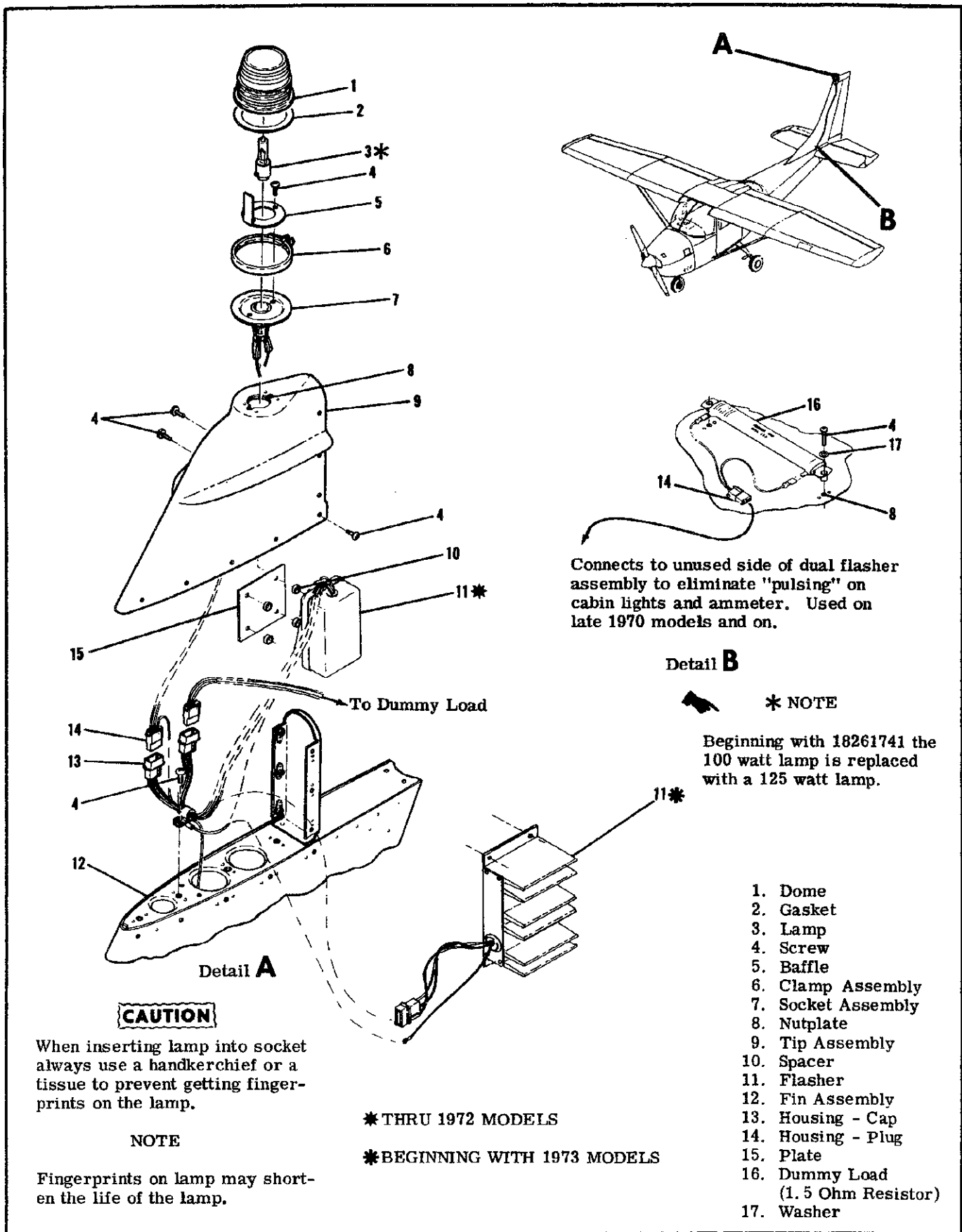


Figure 16-7. Flashing Beacon Light Installation

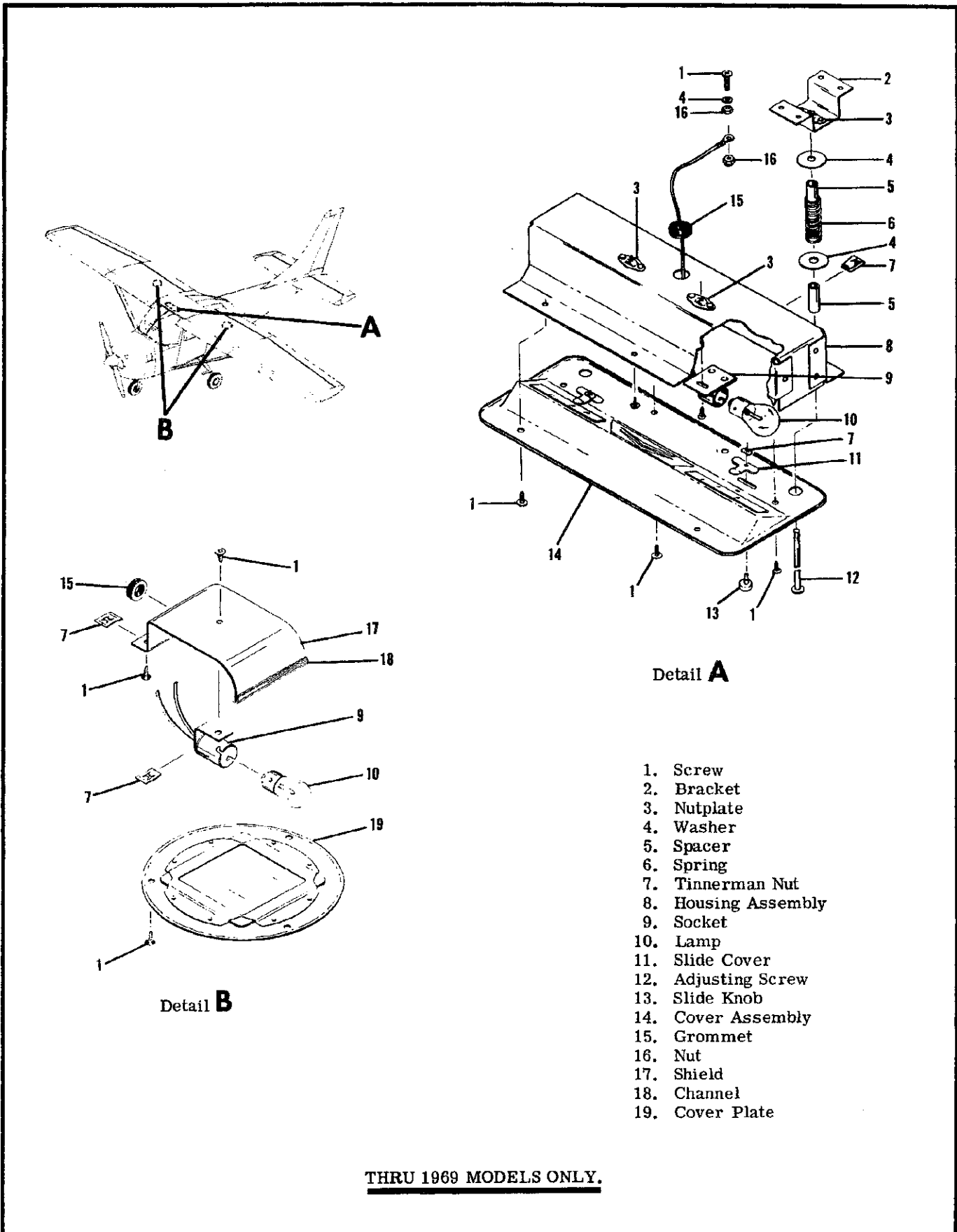
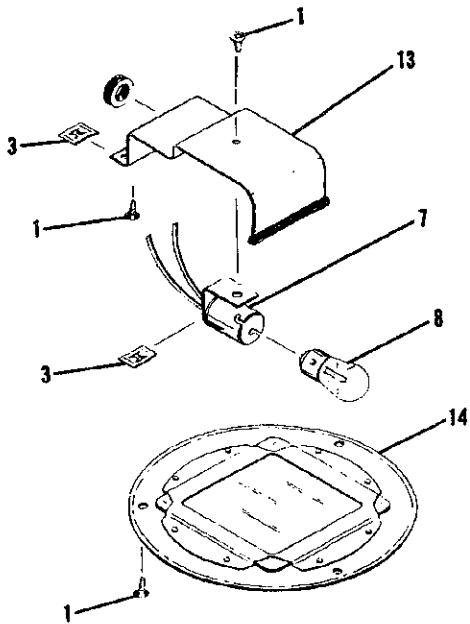
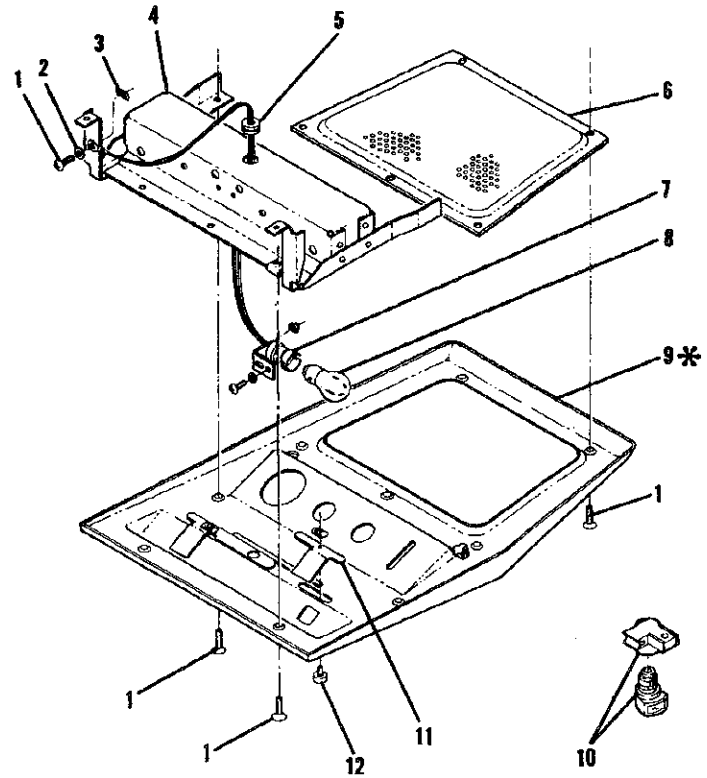
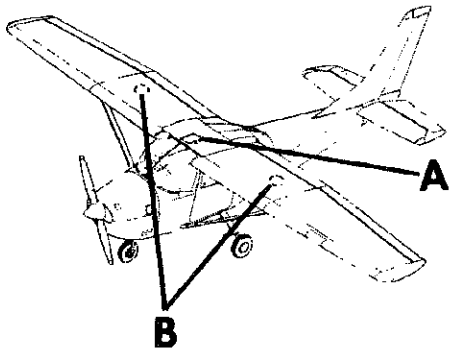


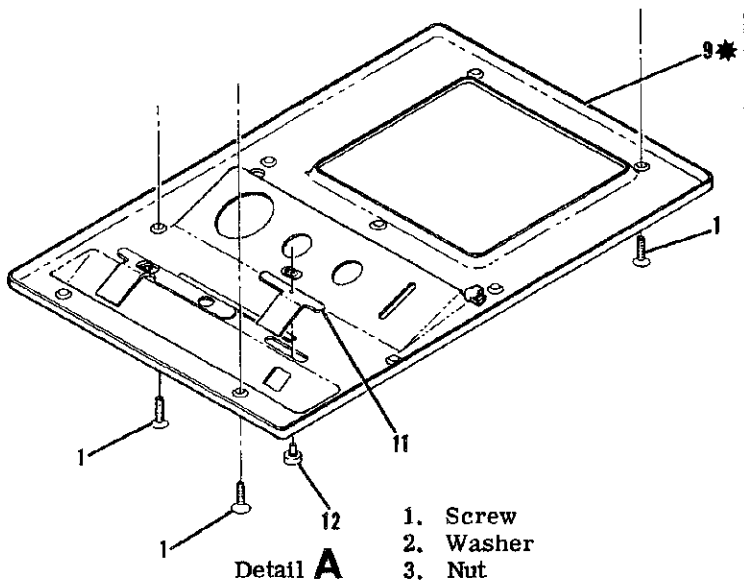
Figure 16-8. Overhead Console and Courtesy Light Installation (Sheet 1 of 2)

*THRU 1972 MODELS

*BEGINNING WITH 1973 MODELS



Detail B



Detail A

- 1. Screw
- 2. Washer
- 3. Nut
- 4. Housing Assembly
- 5. Grommet
- 6. Grill - Speaker
- 7. Socket
- 8. Lamp
- 9. Cover Assembly
- 10. Oxygen Post Light
- 11. Slide Cover
- 12. Slide Knob
- 13. Shield
- 14. Cover Plate

1970 MODELS AND ON.

Figure 16-8. Overhead Console and Courtesy Light Installation (Sheet 2 of 2)

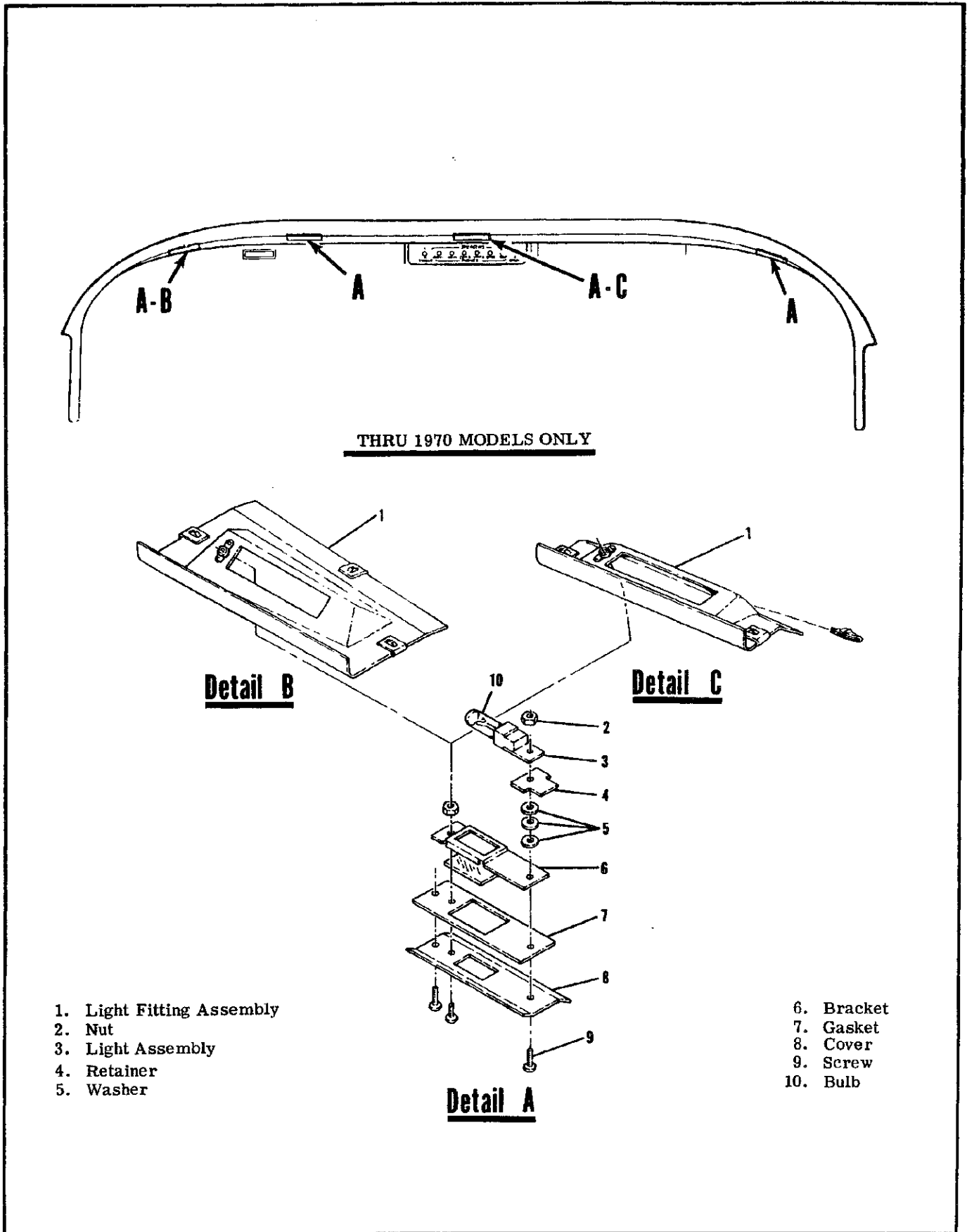


Figure 16-9. Instrument Panel Glareshield Light Installation (Sheet 1 of 2)

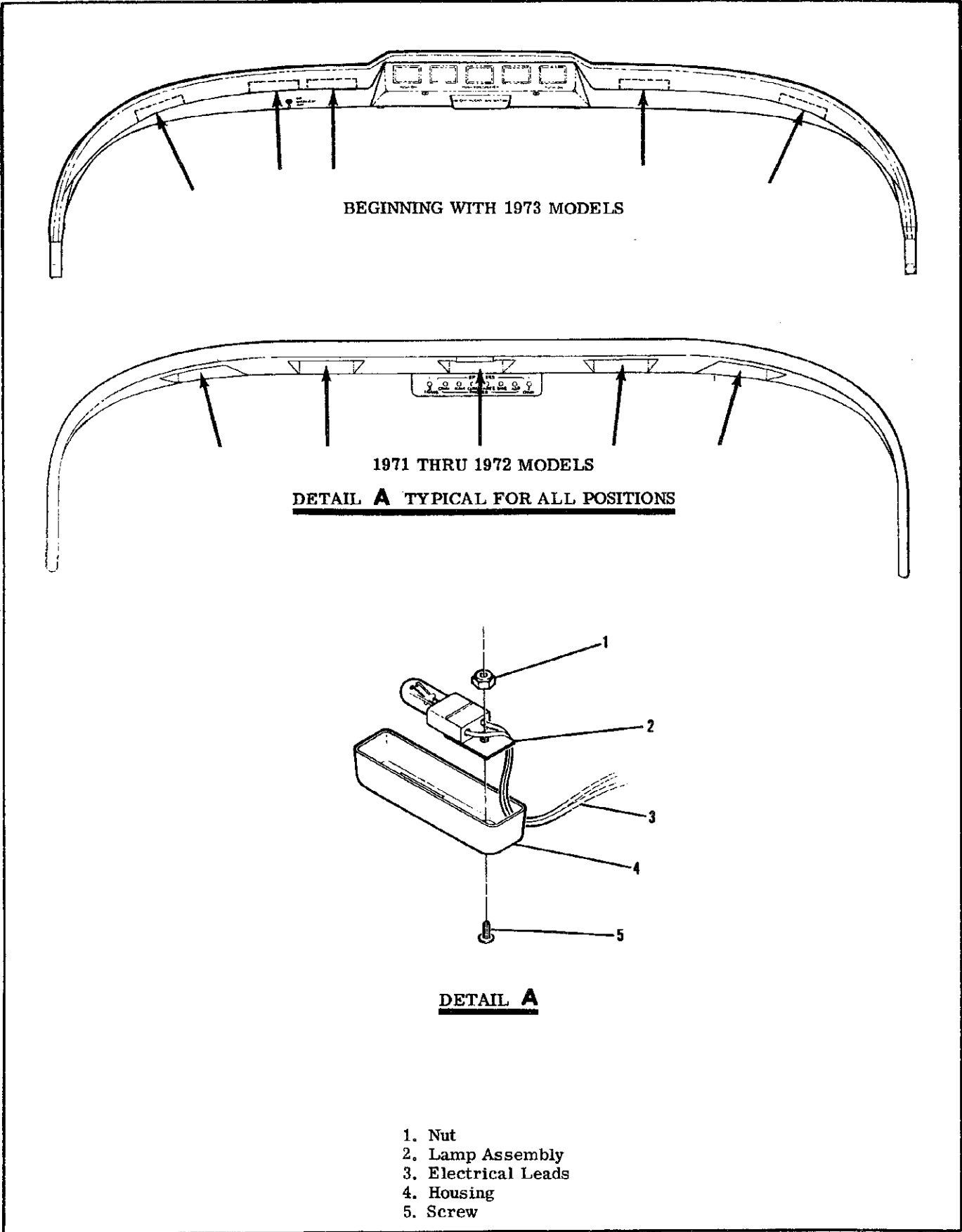


Figure 16-9. Instrument Panel Glareshield Light Installation (Sheet 2 of 2)

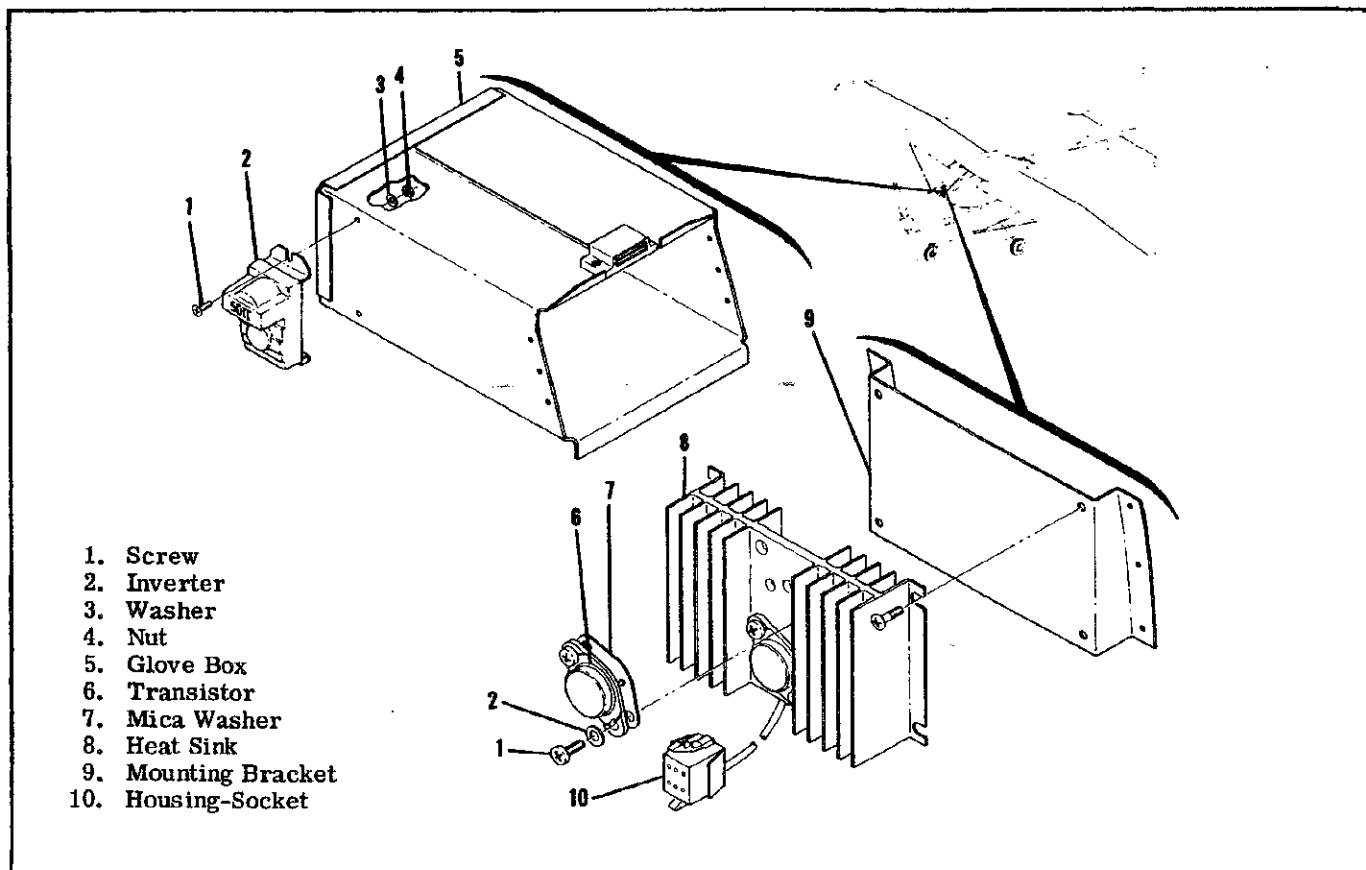


Figure 16-10. Transistorized Light Dimming and Electro-luminescent Light Inverter Installations

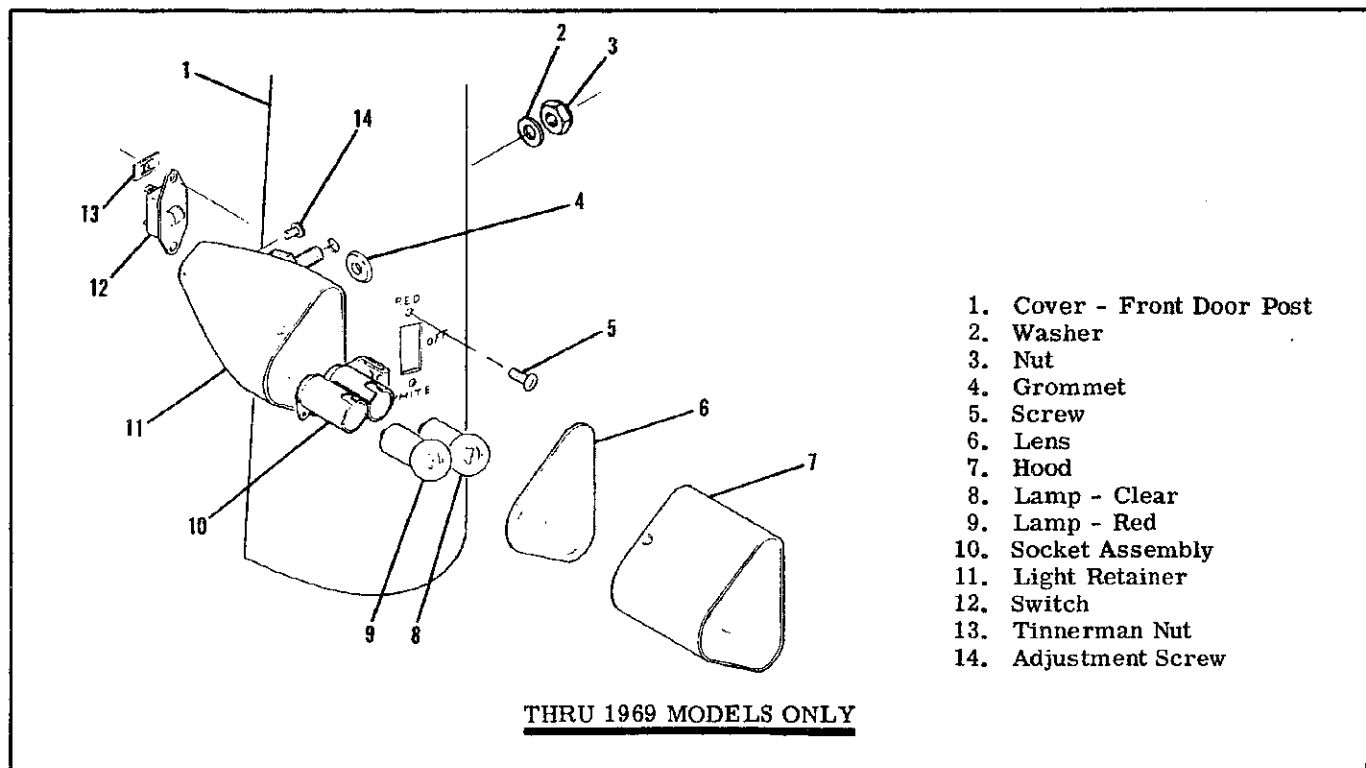


Figure 16-11. Map Light Installation

16-67. OVERHEAD CONSOLE.

16-68. DESCRIPTION. The overhead console contains a map light and the instrument flood lights. The intensity of the instrument flood lights are controlled by a rheostat mounted on the switch panel. The map light can be exposed by moving the slide covers from the opening holes in the console.

16-69. REMOVAL AND INSTALLATION. For removal and installation, refer to figure 16-8.

16-70. INSTRUMENT LIGHTING.

16-71. DESCRIPTION. The instrument panel lighting is fabricated in two separate sections. The lower two-thirds of the instrument panel is illuminated by two lights mounted in the overhead light console. The lighting for the upper one-third of the instrument panel is provided by four (thru 1970 only) or five (1971 and on) small lights located in the instrument panel glare shield. The intensity of the instrument panel lighting is controlled by the instrument light dimming rheostat located on the switch panel.

16-72. REMOVAL AND INSTALLATION. For removal and installation, refer to figure 16-8 and 16-9.

16-73. ELECTROLUMINESCENT PANEL LIGHTING.

16-74. DESCRIPTION. The electroluminescent lighting consists of two "EL" panels; the switch panel and the comfort control panel. The ac voltage required to drive the "EL" panels is supplied by a small invertapak (power supply) located behind the instrument panel. The intensity of the "EL" panel lighting is controlled by a rheostat located on the instrument panel. (Refer to 16-10).

16-75. INSTRUMENT POST LIGHTING.

16-76. DESCRIPTION. Individual post lighting may be installed as optional equipment to provide for non-glare instrument lighting. The post light consists of a cap and a clear lamp assembly with a tinted lens. The intensity of the instrument post lights are controlled by the radio light dimming rheostat located on the switch panel.

16-77. REMOVAL AND INSTALLATION. For removal and installation of the post lamp, slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

16-78. TRANSISTORIZED LIGHT DIMMING.

16-79. DESCRIPTION. A remotely located two-circuit, transistorized dimmer is installed as standard equipment to control the instrument panel lighting on 1970 and on models. Panel lighting dimming controls are increased from two to three. This is accomplished by concentric knob arrangement on one of the existing control knobs. Transistor light dimming is used on two of three circuits, thereby allowing greater dimming load variation and better linearity of

control. One circuit controls the engine instruments and radio lights while the other circuit controls the instrument flood lights and post lights.

16-80. REMOVAL AND INSTALLATION. For removal and installation, refer to figure 16-10.

16-81. DOME LIGHT. Thru 1972 models there are two dome lights, one on each side of the cabin. Each light assembly consists of a lens, lamp, socket and retainer. Both dome lights are controlled by a single switch located on the left rear door post. Beginning with 1973 models the dome light is overhead just aft of the console. The light is controlled by a switch on the assembly.

16-82. REMOVAL AND INSTALLATION. Thru 1972 models for removal and replacement of dome lamps, pry light assembly out of retainer then pry socket out of light assembly. Twist the bayonet type lamp from the socket and replace. Beginning with 1973 models the lens snap out for access to the lamp.

16-83. MAP LIGHTING.

16-84. DESCRIPTION. On models prior to 1970, white map lighting and red, non-glare instrument lighting are provided by an adjustable light mounted on the side of the left forward 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 intensity of the red bulb is controlled by the instrument light dimming rheostat located on the switch panel. When instrument post lights are installed, an extra map light mounted on the right forward door post is included.

16-85. REMOVAL AND INSTALLATION. (Refer to figure 16-11.)

- a. For replacement of defective lamp, slide the hood and lens from the map light assembly and remove the bayonet type lamp.
- b. For removal of the map light assembly, remove the screws from the front door post shield.
- c. Remove the washer and nut attaching the map light.
- d. Remove the screw securing the ground wire.
- e. Detach the wires at the quick disconnect fasteners and remove the map light assembly.
- f. To replace the map light assembly, reverse this procedure.

NOTE

If map light swivels too freely, tighten the tension screw on the underside of map light.

16-86. CONTROL WHEEL MAP LIGHT. (THRU 1969 MODELS.) An optional control wheel map light is available on the 1969 182 models. The map light is mounted on the underside of the control wheel and the light intensity is controlled by a thumb operated rheostat. For dimming, the rheostat should be turned clockwise.

16-87. REMOVAL AND INSTALLATION. (Refer to figure 16-12.)

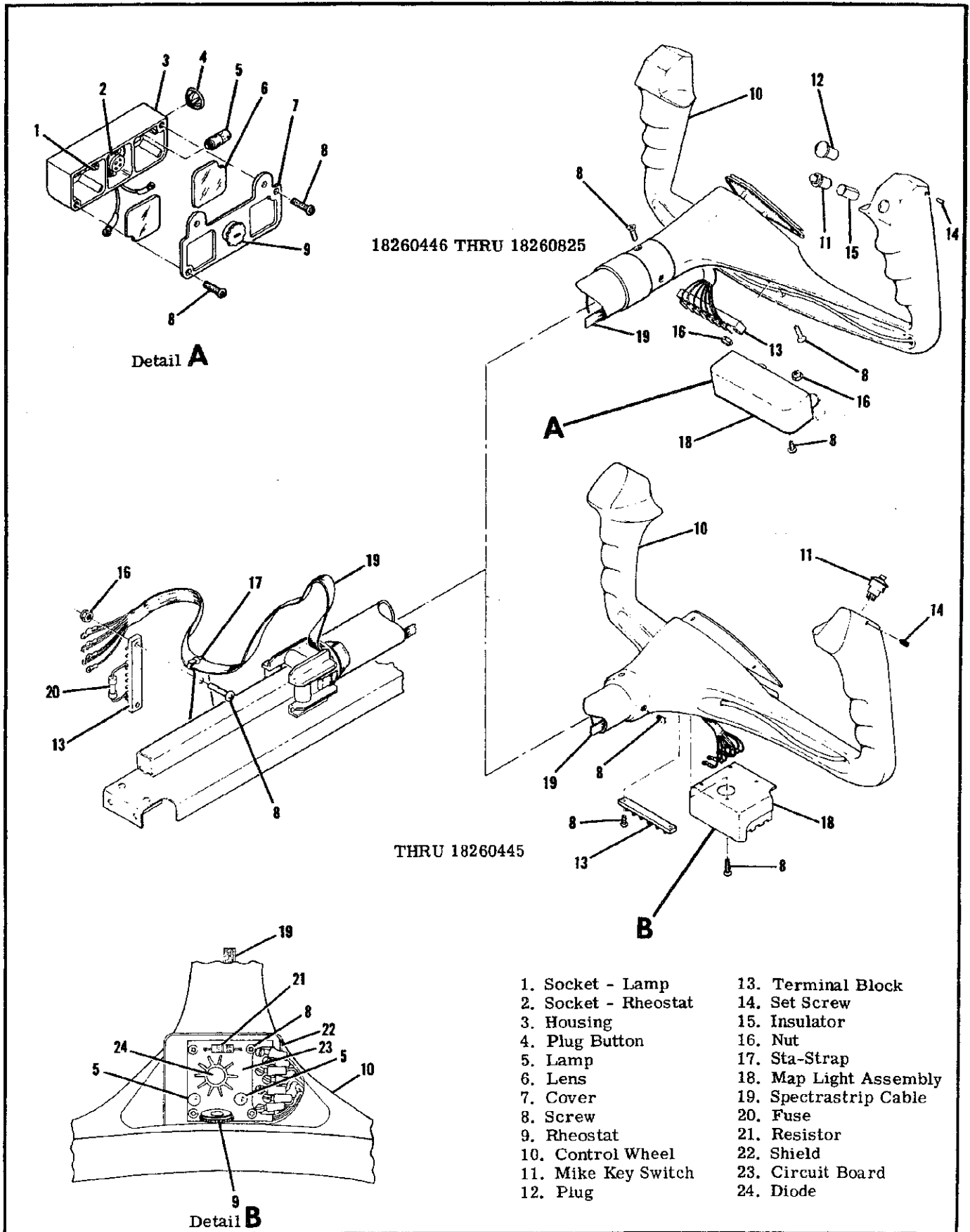
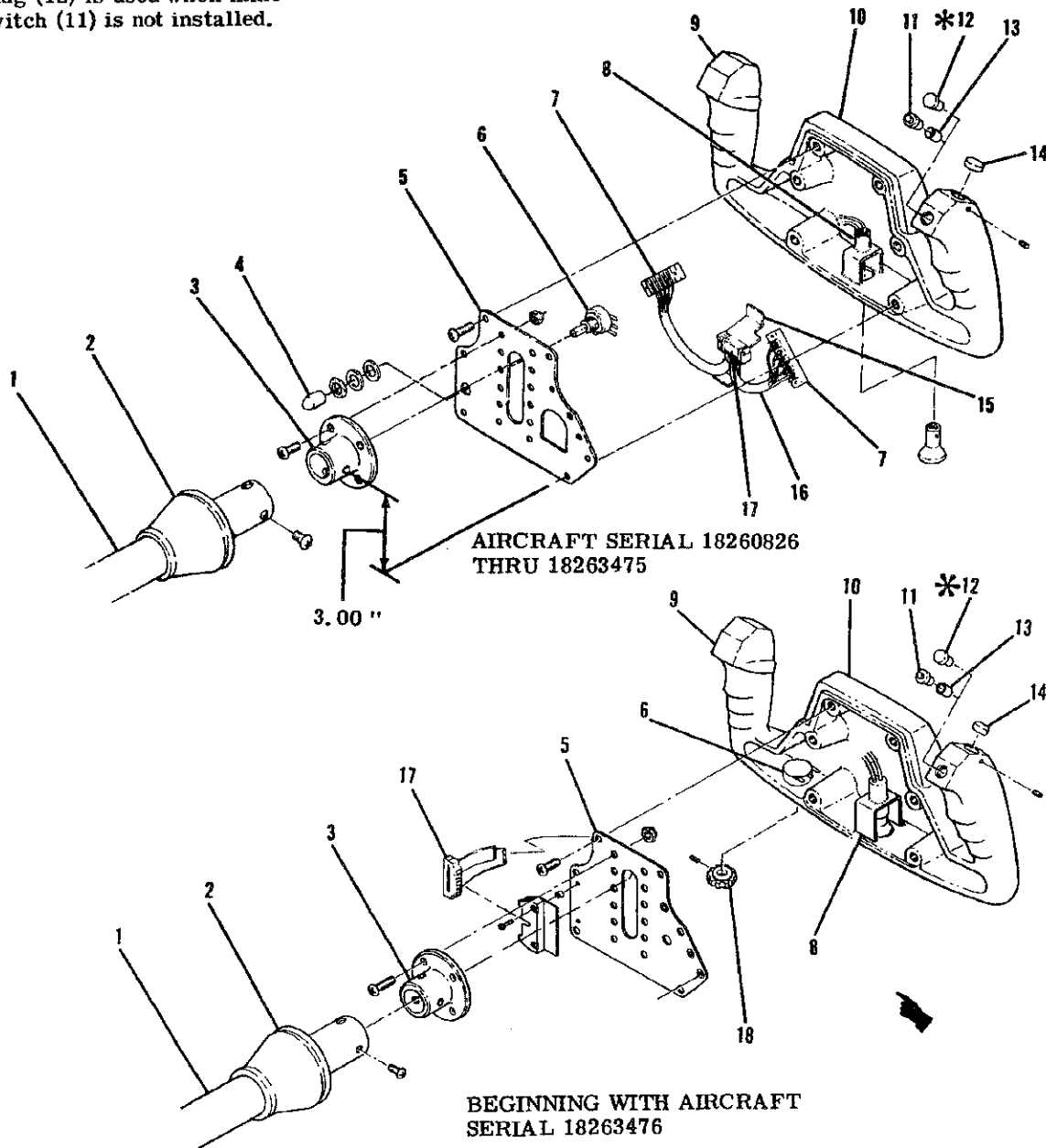


Figure 16-12. Control Wheel Map Light and Mike Key Switch Installation (Sheet 1 of 2)

* Plug (12) is used when mike switch (11) is not installed.



1. Control Tube Assembly
2. Cover
3. Adapter
4. Rubber Cover
5. Plate
6. Map Light Rheostat
7. Terminal Block
8. Map Light Assembly
9. Control Wheel

10. Pad
11. Mike Switch
12. Plug
13. Insulator
14. Plug
15. Bracket
16. Cable
17. Connector
18. Knob (Map Light)

Figure 16-12. Control Wheel Map Light and Mike Key Switch Installation (Sheet 2 of 2)

- a. For easy access of the map light assembly, rotate the control wheel 90°.
- b. Remove the four screws from the map light circuit board. The map light assembly will then be free for removal.
- c. Label the wires connecting to the map light circuit board assembly and remove the screws securing the wires to the circuit board assembly.
- d. To install the map light reverse this procedure.

CAUTION

Failure to observe polarity shown on wiring diagram (page 20-37), will result in immediate failure of the transistor on the map light circuit board.

16-88. CONTROL WHEEL MAP LIGHT (1970 THRU 1971 MODELS.)

16-89. DESCRIPTION. Beginning with the 1970 models, a new type optional map light is installed on the underside of the pilots control wheel. The new map light consists of a rectangle shaped housing containing two small lamps and a small rheostat.

16-90. REMOVAL AND INSTALLATION. (Refer to figure 16-12.)

- a. Rotate the control wheel 90° to the left to gain access to the underside of the wheel.
- b. Remove two screws and nuts holding map light assembly to control wheel.
- c. Detach two wires from the terminal strip above the map light. Note the connection and mark for reference when replacing the wires.
- d. To install the control wheel map light reverse this procedure.
- e. For replacement of defective lamps, remove two screws holding map light cover in place and unplug rheostat to remove cover.
- f. Unsnap lamp sockets and replace lamps.
- g. To reassemble, reverse this procedure.

16-91. CONTROL WHEEL MAP LIGHT. (BEGINNING WITH 1972 MODELS.)

16-92. DESCRIPTION. The control wheel map light is internally mounted in the control wheel. A rheostat switch located on the forward side of the control wheel, thru 1974 models and on the lower side of the control wheel beginning with 1975 models, controls the map light.

16-93. REMOVAL AND INSTALLATION. (Refer to figure 16-12.) To remove, push upward on the lamp and turn. The lamp and reflector is replaced as a unit.

16-94. STALL WARNING SYSTEM.

16-95. DESCRIPTION. The stall warning circuit is comprised of a warning horn and an actuating switch. The switch is installed in the leading edge of the left wing and is actuated by airflow over the surface of the wing. The switch will close as a stall condition is approached, actuating the warning horn which is mounted on the glove box. The stall warning unit should actuate the stall warning horn approximately five to ten miles per hour above the airplane stall speed. Install the lip of the warning unit approximately one-sixteenth of an inch below the centerline of the wing skin cutout. Test fly the aircraft to determine if the unit actuates the warning horn at the desired speed. If the unit actuates the warning horn at a speed in excess of ten miles per hour above stall speed, loosen the mounting screws and move the unit down. If the unit actuates the horn five miles per hour below stall speed, loosen the mounting screws and move the unit up.

16-96. PITOT AND STALL WARNING HEATERS.

16-97. DESCRIPTION. Electrical heater units are incorporated in some pitot tubes and stall warning switch units. The heaters offset the possibility of ice formations on the pitot tube and stall warning actuator switch. The heaters are integrally mounted in the pitot tube and the stall warning actuator switch. Both heaters are operated by the pitot heat switch.

16-98. CIGAR LIGHTER.

16-99. 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 the master switch is "OFF" before inserting probe into the circuit breaker on cigar lighter to reset.

16-100. REMOVAL AND INSTALLATION. (Refer to figure 16-14.)

- a. Ensure that the master switch is "OFF."
- b. Remove cigar lighter element.
- c. Disconnect wire on back of lighter.
- d. Remove shell that screws on socket back of panel.
- e. The socket will then be free for removal.
- f. To install a cigar lighter, reverse this procedure.

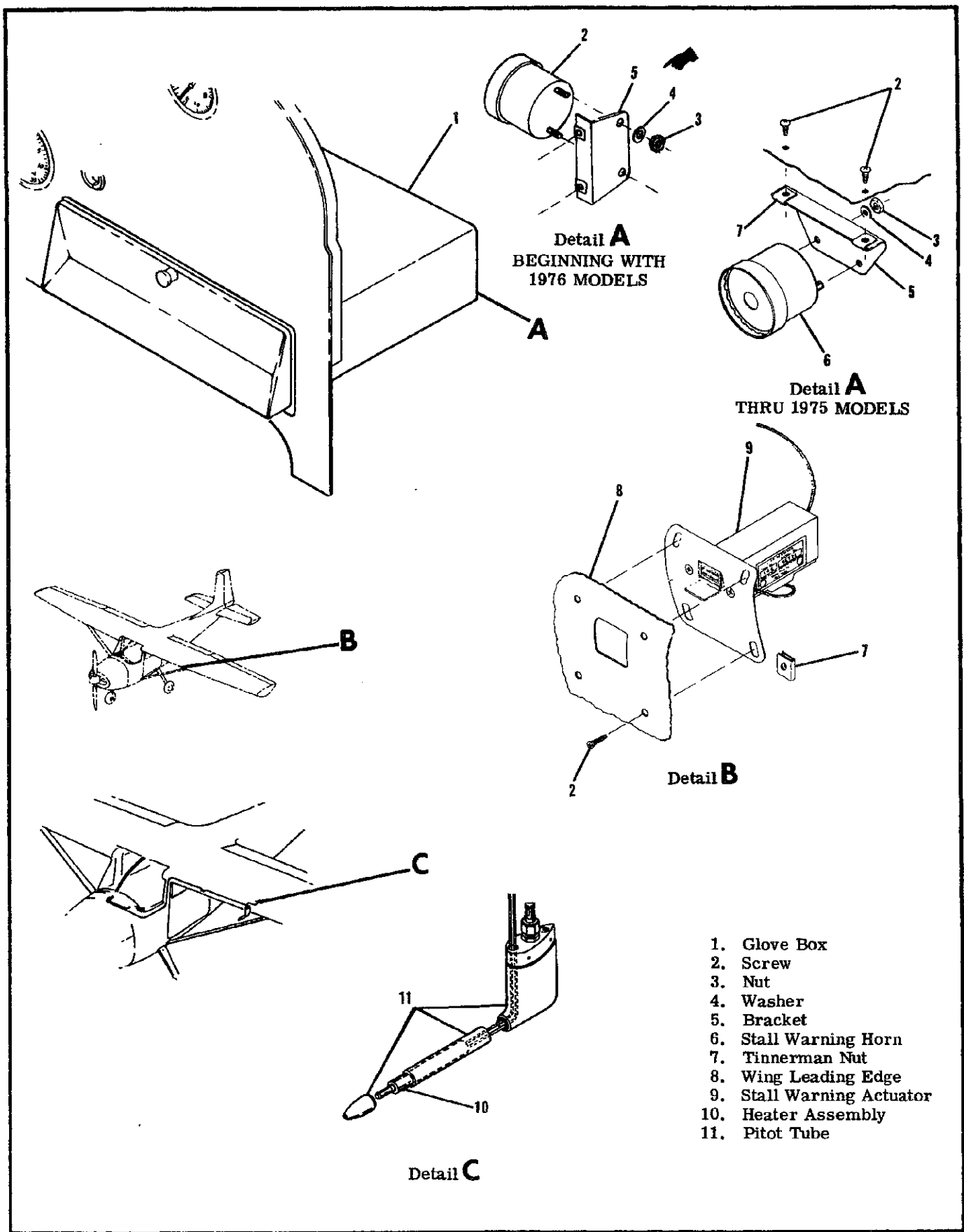


Figure 16-13. Pitot Heat and Stall Warning Installation

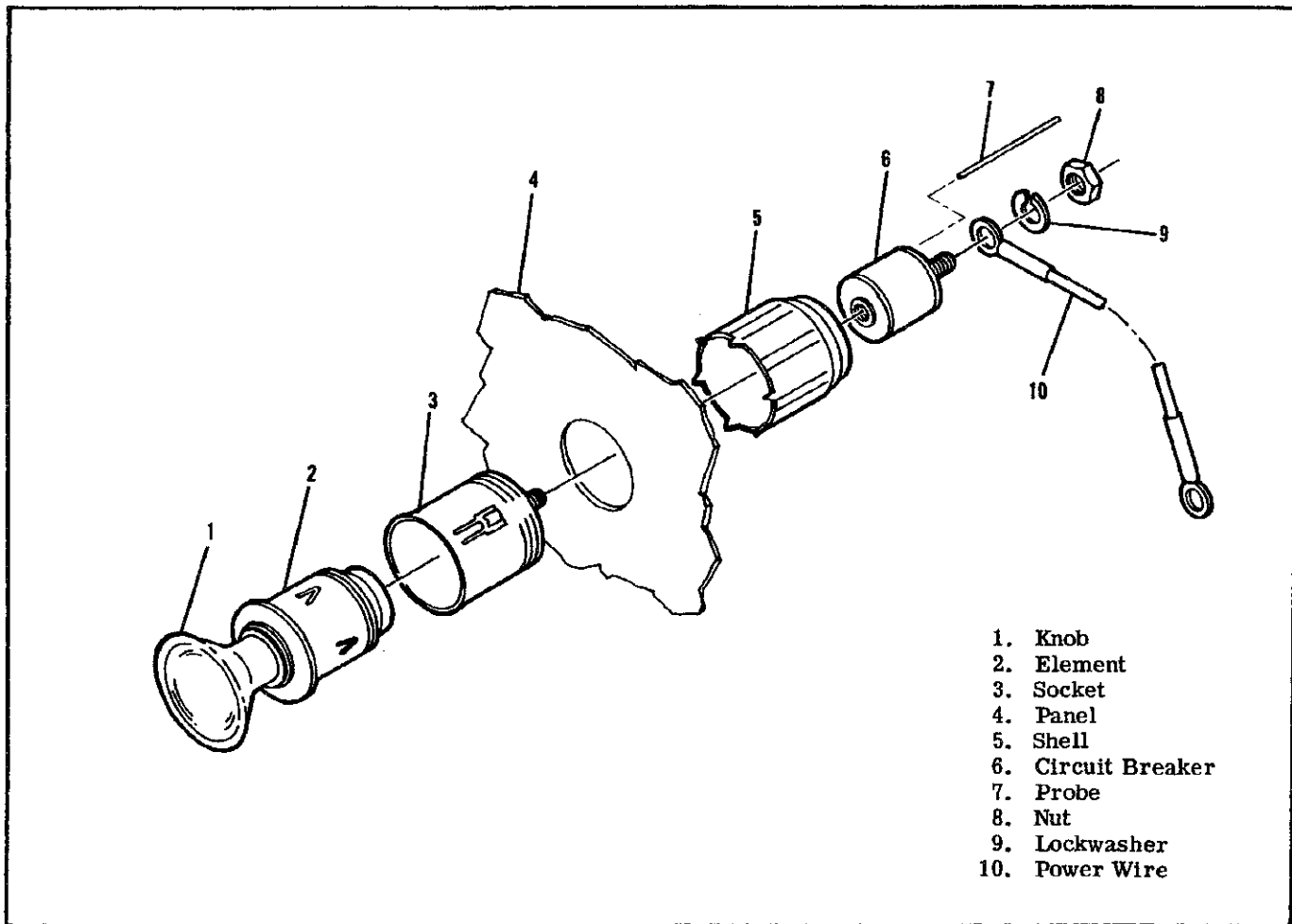


Figure 16-14. Cigar Lighter Installation

SHOP NOTES:

16-101. EMERGENCY LOCATOR TRANSMITTER.

16-102. DESCRIPTION. Several types of Emergency Locator Transmitters (ELT) have been installed in Cessna aircraft. Each of the ELT's is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The transmitters are designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. All units are 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 thru early 1974 models, were equipped with a battery-pack containing six magnesium "D" size dry cell batteries wired in series. (See figure 16-14) Mid 1974 thru early 1975, ELT's are equipped with a battery-pack containing four "in-line" lithium "D" size batteries wired in series. Early 1975 and on ELT's are equipped with a battery-pack containing four lithium "D" size batteries which are stacked in two's (See fig. 16-15). 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	6 Cell Magnesium Battery Pack	4 Cell Lithium Battery Pack
+130°F	89 hrs	115 hrs
+ 70°F	95 hrs	115 hrs
- 4°F	49 hrs	95 hrs
- 40°F	23 hrs	70 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 3 years replacement of magnesium (6-cell) battery-packs and 5 years replacement of lithium (4-cell) battery packs.

16-103. 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.

WARNING

Magnesium (6-cell) battery-packs (excluding 4 cell lithium battery-packs) after prolonged continuous use (1 hour) in a sealed environment give off explosive gas. If your ELT has operated for this time period or longer, as a precautionary measure, loosen the ELT cover screws, lift the cover to break air tight seal and let stand for 15 minutes before tightening screws. Keep sparks, flames and lighted cigarettes away from battery-pack.

NOTE

After relatively short periods of inactivation, the magnesium (6-cell) battery-pack develops a coating over its anode which drastically reduces self discharge and thereby gives the cell an extremely long storage life. This coating will exhibit a high resistance to the flow of electric current when the battery is first switched on. After a short while (less than 15 seconds), the battery current will completely dissolve this coating and enable the battery to operate normally. If this coating is present when your ELT is activated, there may be a few seconds delay before the transmitter reaches full power.

16-104. CHECKOUT INTERVAL:

100 HOURS.

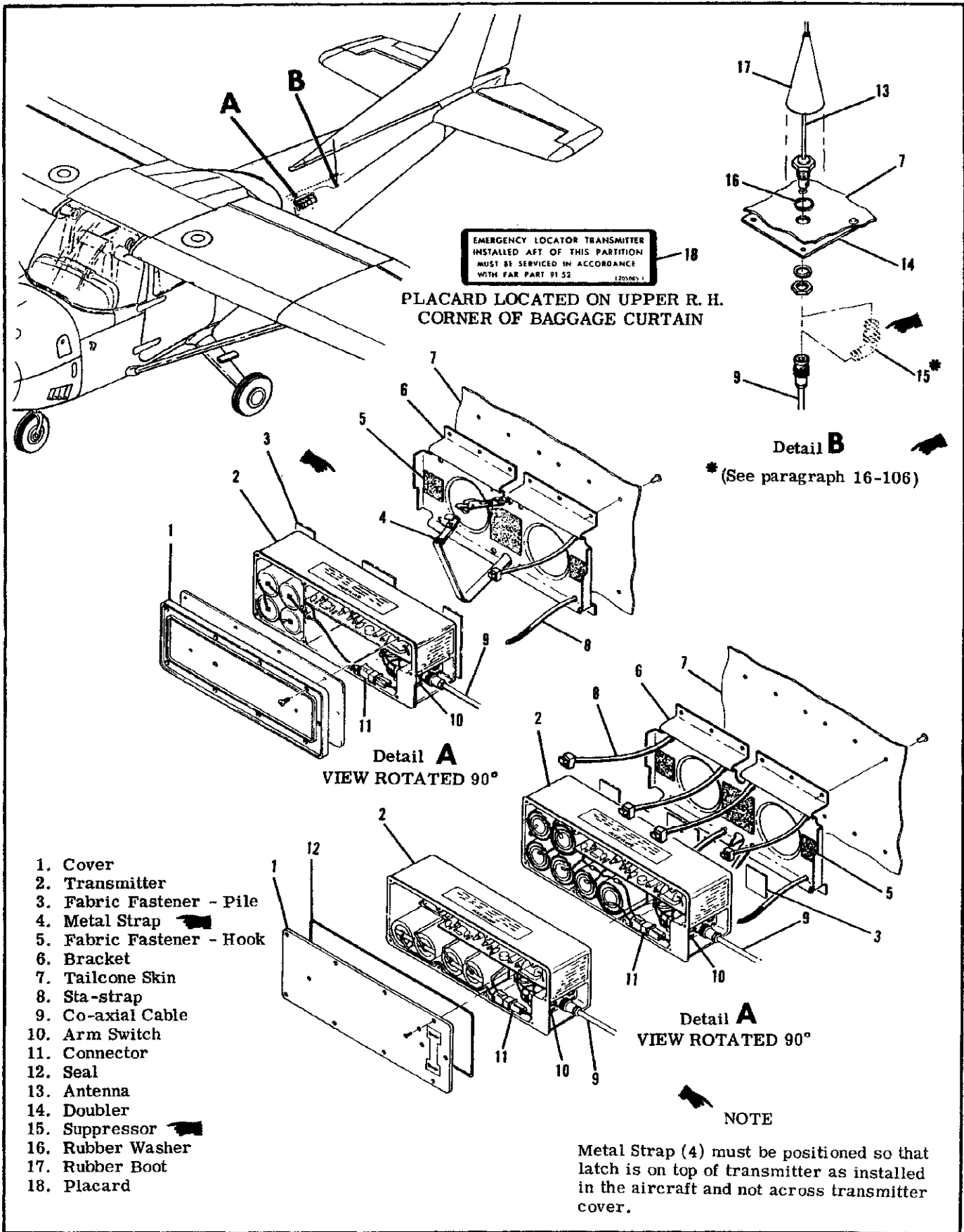
- a. Turn aircraft master switch ON.
- b. Turn aircraft transceiver ON and set frequency on receiver to 121.5 MHz.
- c. Remove the ELT's antenna cable from the ELT unit.
- d. Place the ELT's function selector switch in the ON position for 5 seconds or less. Immediately replace the ELT function selector 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.



1. Cover
2. Transmitter
3. Fabric Fastener - Pile
4. Metal Strap
5. Fabric Fastener - Hook
6. Bracket
7. Tailcone Skin
8. Sta-strap
9. Co-axial Cable
10. Arm Switch
11. Connector
12. Seal
13. Antenna
14. Doubler
15. Suppressor
16. Rubber Washer
17. Rubber Boot
18. Placard

Figure 16-15. Emergency Locator Transmitter Installation

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.

16-105. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 16-15.)

a. Remove the baggage curtain to gain access to the transmitter and antenna.

b. Disconnect co-axial cable from end of transmitter.

c. Depending upon the particular installation, either cut four sta-straps and remove transmitter or 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 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 insure intimate contact. Allow 24 hours for complete cure.

e. To reinstall transmitter, reverse preceding steps.

NOTE

An installation tool is required to properly secure sta-straps on units installed with sta-straps. This tool may be purchased locally or ordered from the Pandiut 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.

16-106. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 16-15.)

a. Disconnect co-axial cable from base of antenna.
b. Remove the nut and lockwasher attaching the antenna base of 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.

CAUTION

In-service 6 cell magnesium battery-pack powered ELT's require the installation of a static electricity suppressor in the antenna cable to prevent the possibility of damage to the case of the ELT. Refer to Cessna Avionics Service Letter AV74-16 and figure 16-13.

16-107. REMOVAL AND INSTALLATION OF MAGNESIUM SIX (6) CELL BATTERY-PACK. (Refer to figure 16-16.)

NOTE

On aircraft incorporating Cessna ELT's manufactured by Leigh (Shark 7 series), when replacing battery-pack refer to Cessna Avionics Service Letter AV75-5 dated July 3, 1975.

NOTE

Since replacement 6 cell magnesium battery-packs are no longer available, when in-service units require replacement, use the 4 cell lithium battery-pack. Refer to paragraph 16-108.

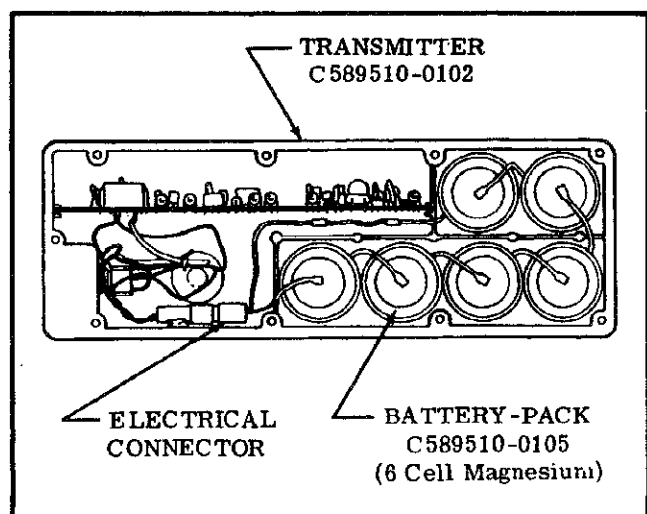


Figure 16-16. Magnesium 6 Cell Battery-Pack Installation

16-108. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 16-17.)

NOTE

On aircraft incorporating Cessna ELT's manufactured by Leigh (Shark 7 series) when replacing battery-pack refer to Cessna Avionics Service Letter AV75-5 dated July 3, 1975.

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. 16-105, 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 "O" ring gasket, rubber washers 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 16-17.
- e. Connect the electrical connector as shown in figure 16-17.

NOTE

Before installing the new 4 cell battery-pack, check to ensure that its voltage is 11.2 volts or greater.

CAUTION

If 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 by positioning the rubber "O" ring gasket, if installed, on the cover and pressing the cover and case together. Attach cover with nine screws and rubber washers.
- 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.

SHOP NOTES:

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.

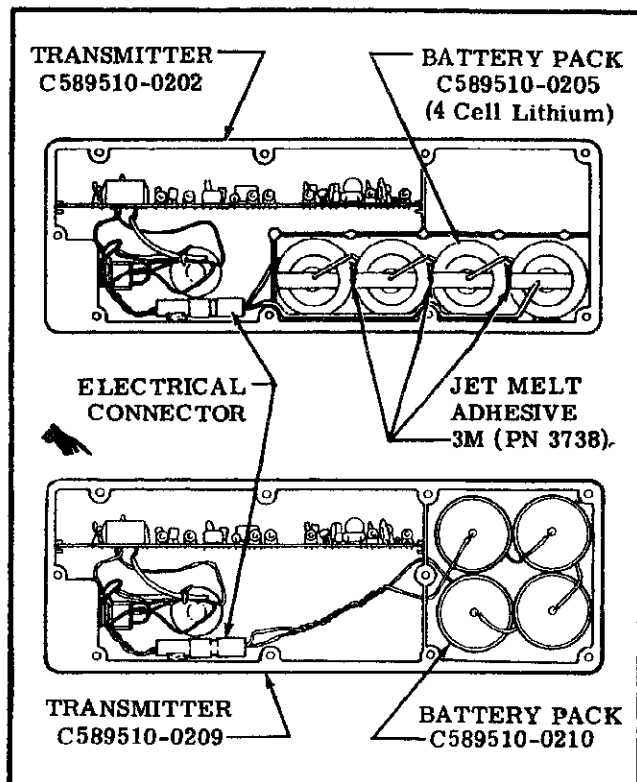


Figure 16-17. Lithium 4 Cell Battery Pack Installations

16-109. 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.

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 voltage on the 6-cell magnesium battery pack transmitter is 10.8 volts or less, and on the 4-cell lithium 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.

SHOP NOTES:

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (Running Load)	AMPS REQD							
	1969	1970	1971	1972	1973	1974	1975	1976
Instrument Lights:								
a. EL Panel . . . . .	.75	.75	.75	.75	.75	0.04	0.04	0.04
b. Cluster	0.3	0.3	0.3	0.3	0.3	0.32	0.32	0.32
c. Console*	2.0	2.0	2.0	2.0	2.0	2.08	2.08	2.08
d. Compass	0.1	0.1	0.1	0.1	0.1	0.08	0.08	0.08
e. Pedestal . . . . .	.2	.2	.2	.2	.2	0.16	0.16	0.16
Position Lights	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Battery Contactor	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fuel Quantity Indicators	0.4	0.4	0.4	0.4	0.4	0.10	0.10	0.10
Cylinder Head Temperature Indicators	0.2	0.2	0.2	0.2	0.2	0.05	0.05	0.05
Turn Coordinator#	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Clock	†	†	†	†	†	†	†	†
OPTIONAL EQUIPMENT (Running Load)								
Heated-Pitot (thru 1973) (Both Pitot and Stall warning 1974)								
	6.5	6.5	6.5	6.5	6.5	10.0	10.0	10.0
Strobe Lights	—	—	4.0	4.0	4.0	4.0	4.0	4.0
Carburetor Air Temp	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cessna 200A Navomatic (Type AF-295A)	—	—	—	—	—	2.0	—	—
Cessna 200A Navomatic (Type AF-295B)	—	—	—	—	—	—	2.0	2.0
Cessna 300 ADF (Type R-521B)	1.6	1.6	1.6	—	—	—	—	—
Cessna 300 ADF (Type R-546A)	—	—	—	1.0	1.0	1.0	1.0	1.0
Cessna 300 ADF (Type R-546E)	—	—	—	1.0	1.0	1.0	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B) . . . . .	.02	.02	.02	.02	.02	.02	.02	.02
Cessna 300 Nav/Com (90 Channel-Type RT-517R)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-508A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-308C)	—	—	—	—	—	1.5	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)	—	—	—	—	1.9	1.9	1.9	1.9
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	—	—	—	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-328C)	—	—	—	—	—	1.5	—	—
Cessna 300 Nav/Com (720 Channel-Type RT-328D)	—	—	—	—	—	—	1.5	1.5
Cessna 300 Transceiver (Type RT-524A)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Cessna 300 HF Transceiver (Type PT10A)	—	—	1.5	1.5	1.5	1.5	—	—
Cessna 300 Transponder (Type KT-75R)	1.5	1.5	1.5	1.5	—	—	—	—
Cessna 300 Transponder (Type KT-76 & KT-78)	—	—	—	1.3	1.3	—	—	—
Cessna 300 Transponder (Type RT-359A)	—	—	—	—	—	1.0	1.0	1.0
Cessna 300 Navomatic (Type AF-512C)	2.0	2.0	2.0	—	—	—	—	—
Cessna 300 Navomatic (Type AF-512D)	—	—	—	2.0	—	—	—	—
Cessna 300 Navomatic (Type AF-394A)	—	—	—	—	2.0	2.0	—	—
Cessna 300A Navomatic (Type AF-395A)	—	—	—	—	—	—	2.0	2.0
Cessna 300 DME (Type KN-60B)	3.0	3.0	3.0	—	—	—	—	—
Cessna 300 DME (Type KN-60C)	—	—	—	3.0	3.0	3.0	—	—
Cessna 400 ADF (Type R-324A)	2.0	2.0	2.0	—	—	—	—	—
Cessna 400 ADF (Type R-346A)	—	—	—	1.0	1.0	1.0	—	—
Cessna 400 ADF (Type R-446A)	—	—	—	—	—	—	1.3	1.3
Cessna 400 Glideslope (Type R-543B)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cessna 400 Glideslope (Type R-443A)	—	—	—	—	0.4	—	—	—
Cessna 400 Glideslope (Type R-443B)	—	—	—	—	—	0.4	0.4	0.4
Cessna 400 Nav/Com (Type RT-522A)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cessna 400 Nav/Com (Type RT-422A)	—	—	—	—	2.5	2.5	—	—
Cessna 400 Transceiver (Type RT-532A)	1.5	1.5	1.5	1.5	1.5	1.5	—	—
Cessna 400 Transceiver (Type RT-432A)	—	—	—	—	1.4	1.4	—	—
Cessna 400 Transponder (Type RT-506A)	3.0	3.0	3.0	3.0	3.0	—	—	—
Cessna 400 Transponder (Type RT-459A)	—	—	—	—	—	1.0	1.0	1.0

ELECTRICAL LOAD ANALYSIS CHART

OPTIONAL EQUIPMENT (Running Load) (CONT)	AMPS REQD							
	1969	1970	1971	1972	1973	1974	1975	1976
Sunair SSB Transceiver (Type ASB-125)	—	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flashing Beacon	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
King KN-60C DME	—	—	—	—	—	—	3.0	—
King KN-65 DME	—	—	—	—	—	—	—	2.8
Narco Mark 12A Nav/Com	4.6	—	—	—	—	—	—	—
Narco Mark 12B Nav/Com with VOA-40 or VOA-50	4.6	4.6	4.6	—	—	—	—	—
Narco UGR-2 Glideslope Receiver . . . . .	.23	.23	.23	—	—	—	—	—
Pantronics PT10-A HF Transceiver	—	—	—	—	—	—	1.5	1.5
Brittain Wing Leveler . . . . .	.32	.32	.32	.32	.32	—	—	—
Post Lights*	2.0	2.0	2.0	2.0	2.0	1.52	1.52	1.52
Mkr Bcn E L Panel	—	—	—	—	—	—	—	0.02
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD								
Cigarette Lighter	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Stall Warning Horn . . . . .	.25	.25	.25	.25	.25	.25	.25	.25
Oil Dilution System	1.0	1.0	1.0	1.0	1.0	—	—	—
Wing Courtesy Lights and Cabin Lights	3.3	3.3	3.3	3.3	2.5	2.5	2.5	2.5
Landing Lights	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Flap Motor	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0

†Negligible *Only one or the other may be used at one time #Standard on Skylane Only

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SECTION 18

STRUCTURAL REPAIR

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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 of 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°
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-O 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 semimonocoque 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

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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 rectangular 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. 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.

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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. **WING LEADING EDGES.**

18-33. **NEGLIGIBLE DAMAGE.** Refer to paragraph 18-13.

18-34. **REPAIRABLE DAMAGE.** Wing skin repairs, outlined in paragraph 18-14, may be used to repair leading edge skins, although the flush-type patches should be used. To facilitate repair, extra access holes may be installed in locations noted in figure 18-13. If the damage would require a repair which could not be made between adjacent ribs, refer to the following paragraph.

18-35. **DAMAGE NECESSITATING REPLACEMENT OF PARTS.** Where extreme damage has occurred, complete leading edge skin panels should be replaced. Extra access holes may be installed (refer to figure 18-13) to facilitate replacement.

18-36. **BONDED LEADING EDGES REPAIR.**

18-37. **NEGLIGIBLE DAMAGE.** Refer to paragraph 18-13.

18-38. **REPAIRABLE DAMAGE.** (Refer to figure 18-11.) Cut out damaged area, as shown, to the edge of undamaged ribs. Using a corresponding section from a new leading edge skin, overlap ribs and secure to wing using rivet pattern as shown in the figure.

18-39. **AILERONS.**

18-40. **NEGLIGIBLE DAMAGE.** Refer to paragraph 18-13.

18-40A. **CRACKS IN CORRUGATED AILERON SKINS.**

1. It is permissible to stop drill crack(s) that originate at the trailing edge of the control surface provided the crack is not more than 2 inches in length.
2. Stop drill crack using a #30 (0.128 inch) drill.
3. A crack may only be stop drilled once.

NOTE: A crack that passes through a trailing edge rivet and does not extend to the trailing edge of the skin may be stop-drilled at both ends of the crack.

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4. Any control surface that has a crack that progresses past a stop-drilled hole shall be repaired. Refer to paragraphs 18-40, 18-41, and 18-42 as applicable for repair information.
5. A control surface that has any of the following conditions shall have a repair made as soon as practicable:
 - a. A crack that is longer than 2 inches.
 - b. A crack that does not originate from the trailing edge of a trailing edge rivet.
 - c. Cracks in more than six trailing edge rivet locations per skin.

Refer to paragraphs 18-40, 18-41, and 18-42 as applicable for repair information.

6. Affected control surfaces with corrugated skins and having a stop drilled crack that does not extend past the stop-drilled hole, may remain in service without additional repair.

18-41. **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 as a guide to repair damage to the flat surface between corrugations, when damaged area includes corrugations refer to figure 18-12. It is recommended that material used for repair be cut from spare parts of the same gauge and corrugation spacing. Following repair the aileron must be balanced. Refer to paragraph 18-43 for balancing. If damage would require a repair which could not be made between adjacent ribs, refer to paragraph 18-42.

18-42. **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 occurred, replacement of the aileron assembly is recommended. After repair and/or replacement, balance aileron in accordance with paragraph 18-43 and figure 18-3.

18-43. **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.

18-44. **WING FLAPS.**

18-45. **NEGLIGIBLE DAMAGE.** Refer to paragraph 18-13.

18-45A. **CRACKS IN CORRUGATED FLAP SKINS.**

1. It is permissible to stop drill crack(s) that originate at the trailing edge of the control surface provided the crack is not more than 2 inches in length.
2. Stop drill crack using a #30 (.128 inch) drill.
3. A crack may only be stop-drilled once.

NOTE: A crack that passes through a trailing edge rivet and does not extend to the trailing edge of the skin may be stop drilled at both ends of the crack.

4. Any control surface that has a crack that progresses past a stop-drilled hole shall be repaired. Refer to paragraphs 18-45, 18-46, and 18-47 as applicable for repair information.
5. A control surface that has any of the following conditions shall have a repair made as soon as practicable:
 - a. A crack that is longer than 2 inches.

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- b. A crack that does not originate from the trailing edge of a trailing edge rivet.
- c. Cracks in more than six trailing edge rivet locations per skin.

Refer to paragraphs 18-45, 18-46, and 18-47 as applicable for repair information.

- 6. Affected control surfaces with corrugated skins and having a stop drilled crack that does not extend past the stop drilled hole, may remain in service without additional repair.

18-46. **REPAIRABLE DAMAGE.** Flap repairs should be similar to aileron repairs discussed in paragraph

18-41. A flap leading edge repair is shown in figure 18-10.

18-47. **DAMAGE NECESSITATING REPLACEMENT OF PARTS.** Flap repairs which require replacement of parts should be similar to aileron repairs discussed in paragraph 18-42. Since the flap is not considered a movable control surface, no balancing is required.

18-48. **ELEVATORS AND RUDDER.**

18-49. **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.

18-49A. **CRACKS IN CORRUGATED ELEVATOR SKINS.**

- 1. It is permissible to stop-drill crack(s) that originate at the trailing edge of the control surface provided the crack is not more than 2 inches in length.
- 2. Stop-drill crack using a #30 (.0128 inch) drill.
- 3. A crack may only be stop-drilled once.

NOTE: A crack that passes through a trailing edge rivet and does not extend to the trailing edge of the skin may be stop-drilled at both ends of the crack.

- 4. Any control surface that has a crack that progresses past a stop-drilled hole shall be repaired. Refer to paragraphs 18-45, 18-46, and 18-47 as applicable for repair information.
- 5. A control surface that has any of the following conditions shall have a repair made as soon as practicable:
 - a. A crack that is longer than 2 inches.
 - b. A crack that does not originate from the trailing edge of a trailing edge rivet.
 - c. Cracks in more than six trailing edge rivet locations per skin.

Refer to paragraphs 18-49, 18-50, and 18-51 as applicable for repair information.

- 6. Affected control surfaces with corrugated skins and having a stop-drilled crack that does not extend past the stop drilled hole, may remain in service without additional repair.

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18-50. **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 18-12. 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 paragraph 18-51.

18-51. **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 18-52 and figure 18-3.

18-52. **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.

18-53. **FIN AND STABILIZER.**

18-54. **NEGLIGIBLE DAMAGE.** Refer to paragraph 18-13.

18-55. **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.

18-56. **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.

18-57. **FUSELAGE.**

18-58. **DESCRIPTION.** The fuselage is of semimonocoque construction, consisting of formed bulkheads, longitudinal stringer, reinforcing channels, and skin panels.

18-59. **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 1/18 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.

18-60. 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.

18-61. 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.

18-62. BULKHEADS.

18-63. 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.

18-64. 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.

18-65. 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. NAS 464P* Bolt, ESNA 2935* Mating Base Ring, ESNA LH 2935* 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.

18-66. 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 18-14, or they may be replaced. A severely damaged firewall must be replaced as a unit.

18-67. ENGINE MOUNT.

18-68. 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.

18-69. 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.

18-70. 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.

18-71. 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.

18-72. BAFFLES. Baffles ordinarily require replacement if damaged or cracked. However, small plate reinforcements riveted to the baffle will often prove satisfactory both to the strength and cooling requirements of the unit.

18-73. ENGINE COWLING.

18-74. 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 cracks may be stop-drilled and dents straightened if they are reinforced on the inner side with a doubler of the same material.

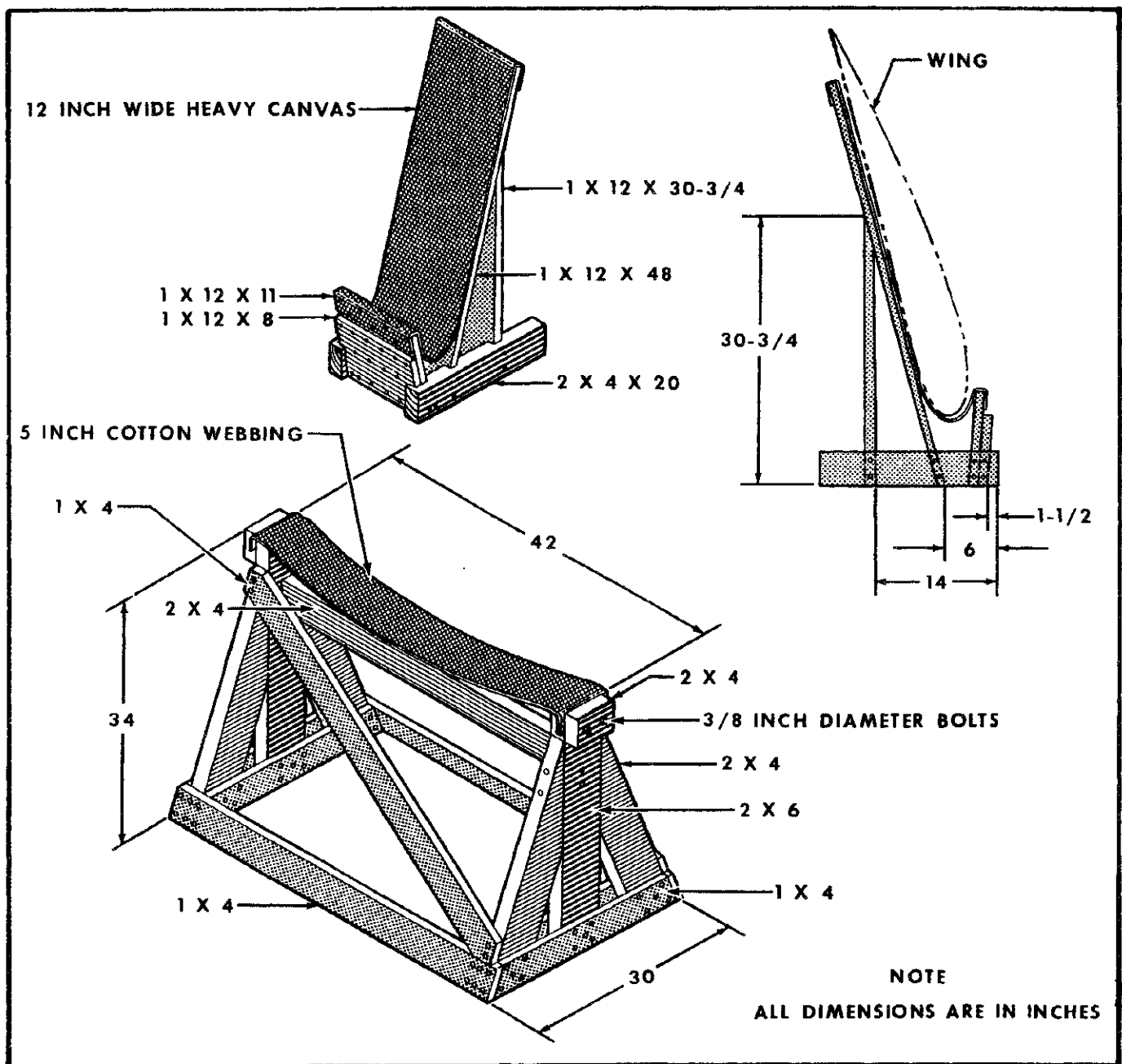


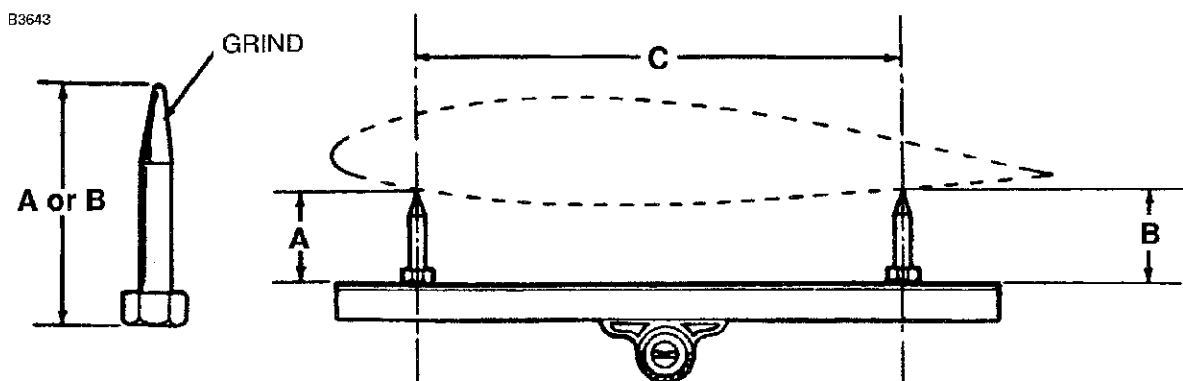
Figure 18-1. Wing and Fuselage Support Stands

18-75. REPAIR OR REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to their small size they are easier to replace than to repair.

18-76. REPAIR OF ABS COMPONENTS. Rezolin Repair Kit, Number 404 may be obtained from the Cessna Service Parts Center for repair of ABS components.

18-77. 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 resins. Epoxy resins are preferable for making repairs, since epoxy compounds are usually more stable and predictable than polyester and, in addition, give better adhesion.

CESSNA AIRCRAFT COMPANY
MODEL 182 AND SKYLANE SERIES
 SERVICE MANUAL



*THRU 1971 MODELS

●BEGINNING WITH 1972 MODELS

A	B	C	WING STATION
2.00	1.00	29.50	39.00
2.00	1.00	29.50	100.50
* 0.59	1.00	24.00	207.00
● 0.45	1.00	24.00	207.00

ALL WING TWIST OCCURS BETWEEN STA. 100.50
 AND STA. 207.00

(Refer to paragraph 18-7).

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 inch 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 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 (staying 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 0.10 inch maximum to attain parallelism.

Figure 18-2. Checking Wing Twist

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 $57^\circ 10'$, (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.

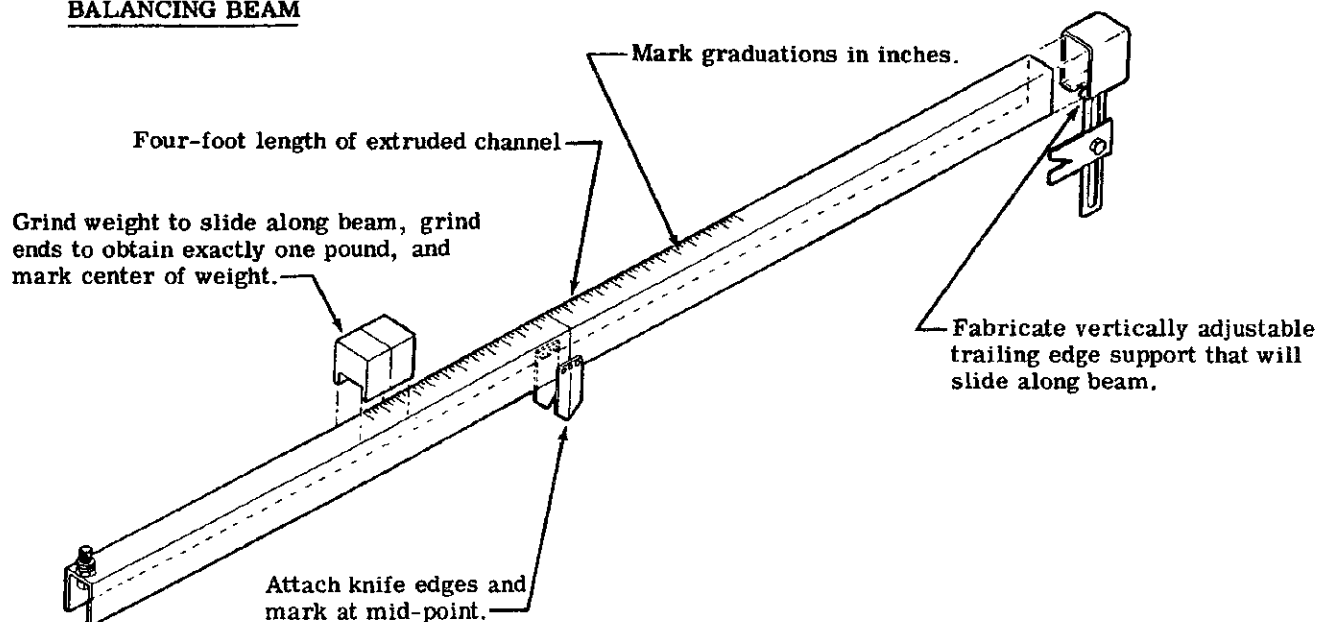
- a. With the rudder/elevator set upon a FLAT, LEVELED surface, block up the trailing edge until a center line through the attaching bolt and the trailing edge is equal distance from the leveling surface (detail H).
- b. Place the balancing beam (detail A) on the rudder/elevator near the center attaching 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)

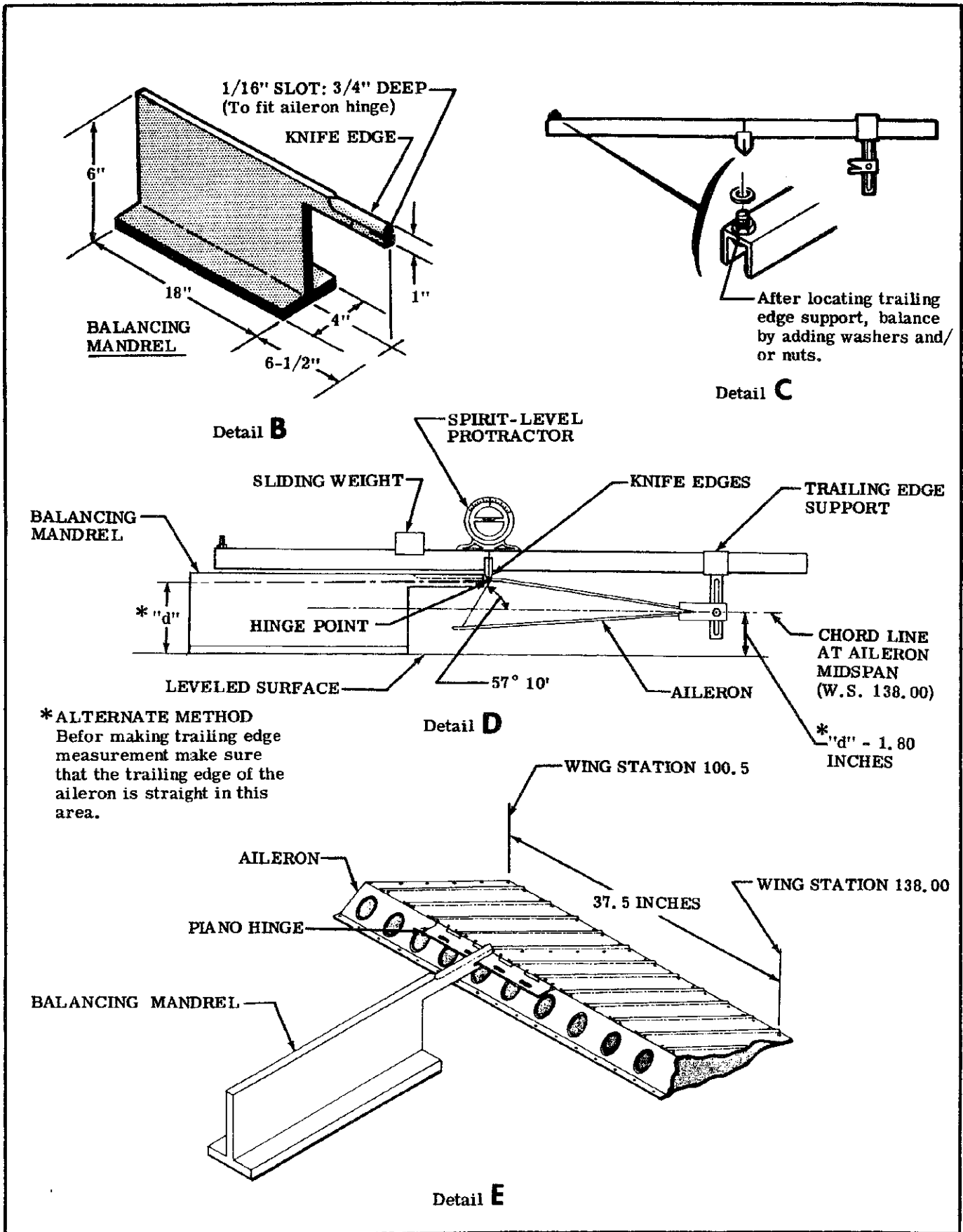


Figure 18-3. Control Surface Balancing (Sheet 3 of 5)

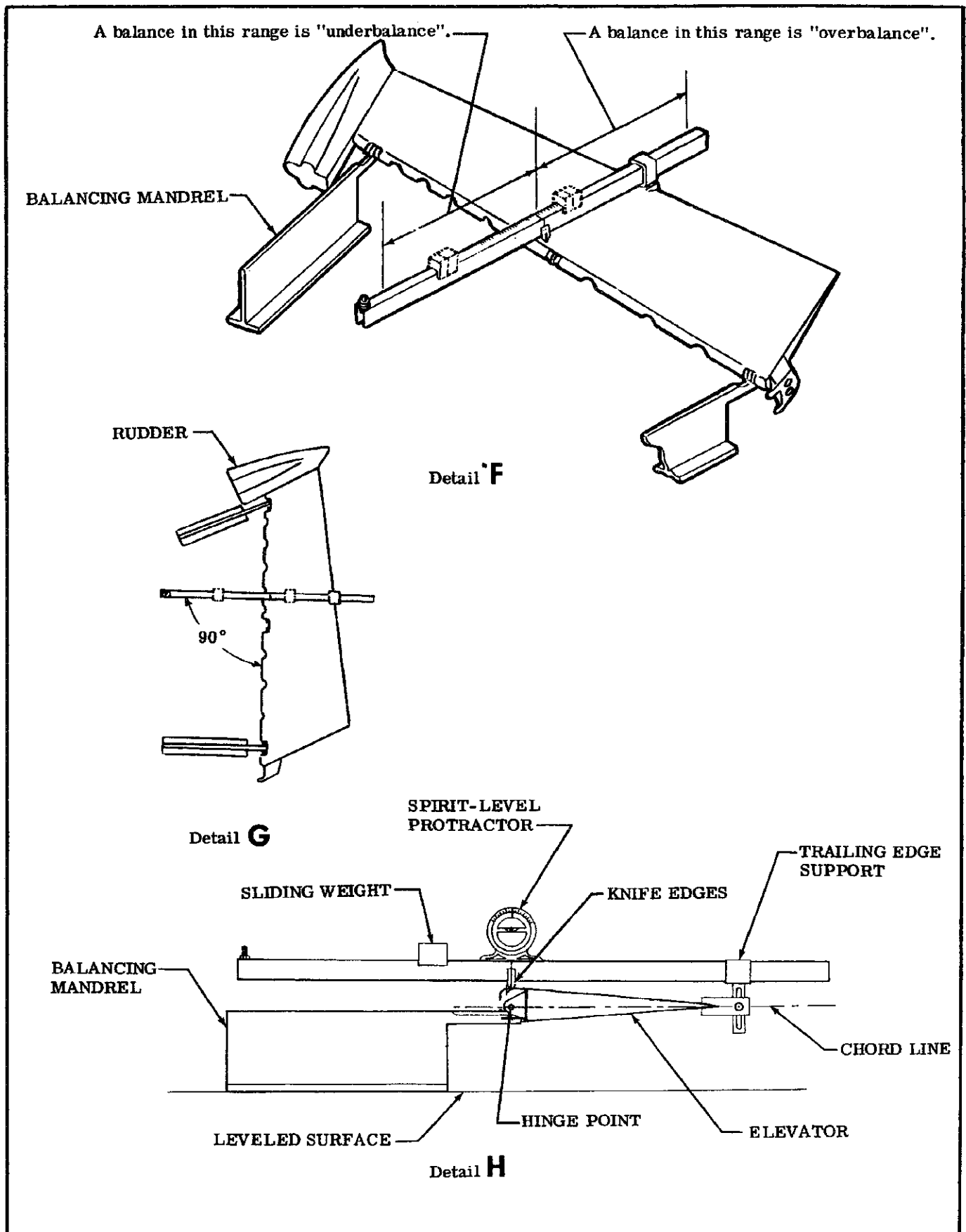


Figure 18-3. Control Surface Balancing (Sheet 4 of 5)

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 unbalance 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 (-).

NOTE

The "Balance Limits" columns list the moment tolerances within which the control surface must balance. The tolerances must never be exceeded in the final flight configuration.

CONTROL: AILERON

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +9.64	0.0 to +7.07

CONTROL: RUDDER

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +6.0	0.0 to +4.0

CONTROL: RIGHT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +20.47	0.0 to +18.1

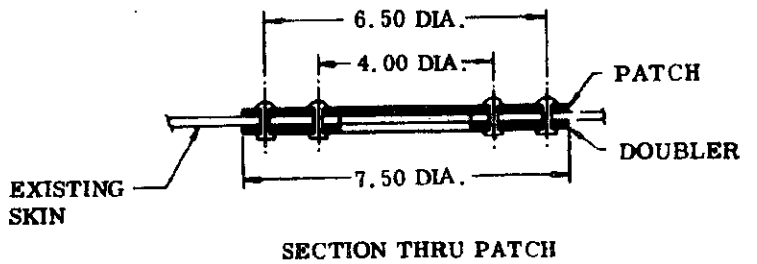
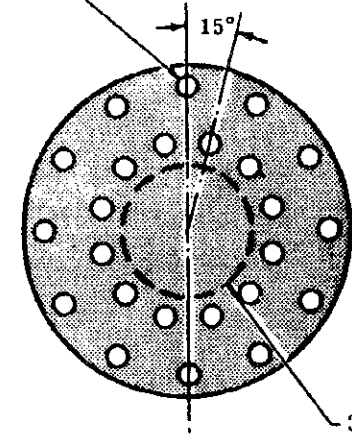
CONTROL: LEFT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +20.47	0.0 to +18.1

Figure 18-3. Control Surface Balancing (Sheet 5 of 5)

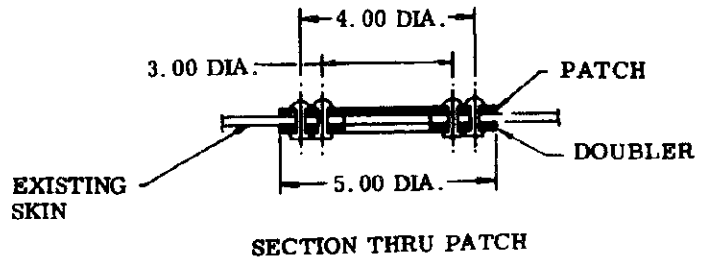
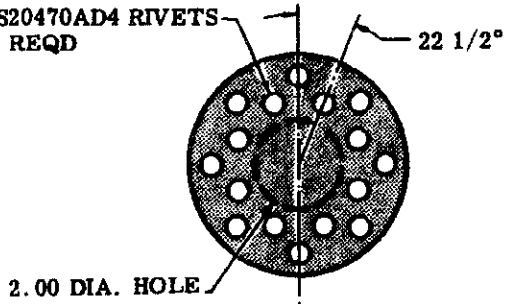
PATCHES AND DOUBLERS —
2024-T3 ALCLAD

MS20470AD4 RIVETS
24 REQD



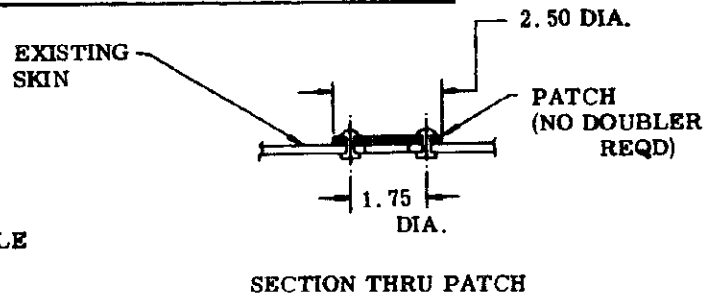
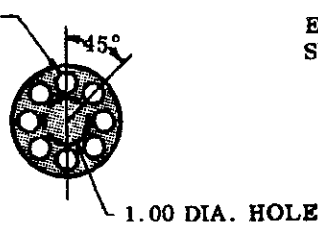
PATCH REPAIR FOR 3 INCH DIAMETER HOLE

MS20470AD4 RIVETS
16 REQD






PATCH REPAIR FOR 2 INCH DIAMETER HOLE

MS20470AD4 RIVETS
8 REQD

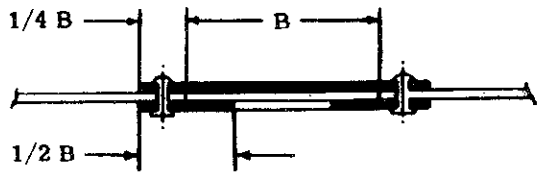


PATCH REPAIR FOR 1 INCH DIAMETER HOLE

-  ORIGINAL PARTS
-  REPAIR PARTS
-  REPAIR PARTS IN CROSS SECTION

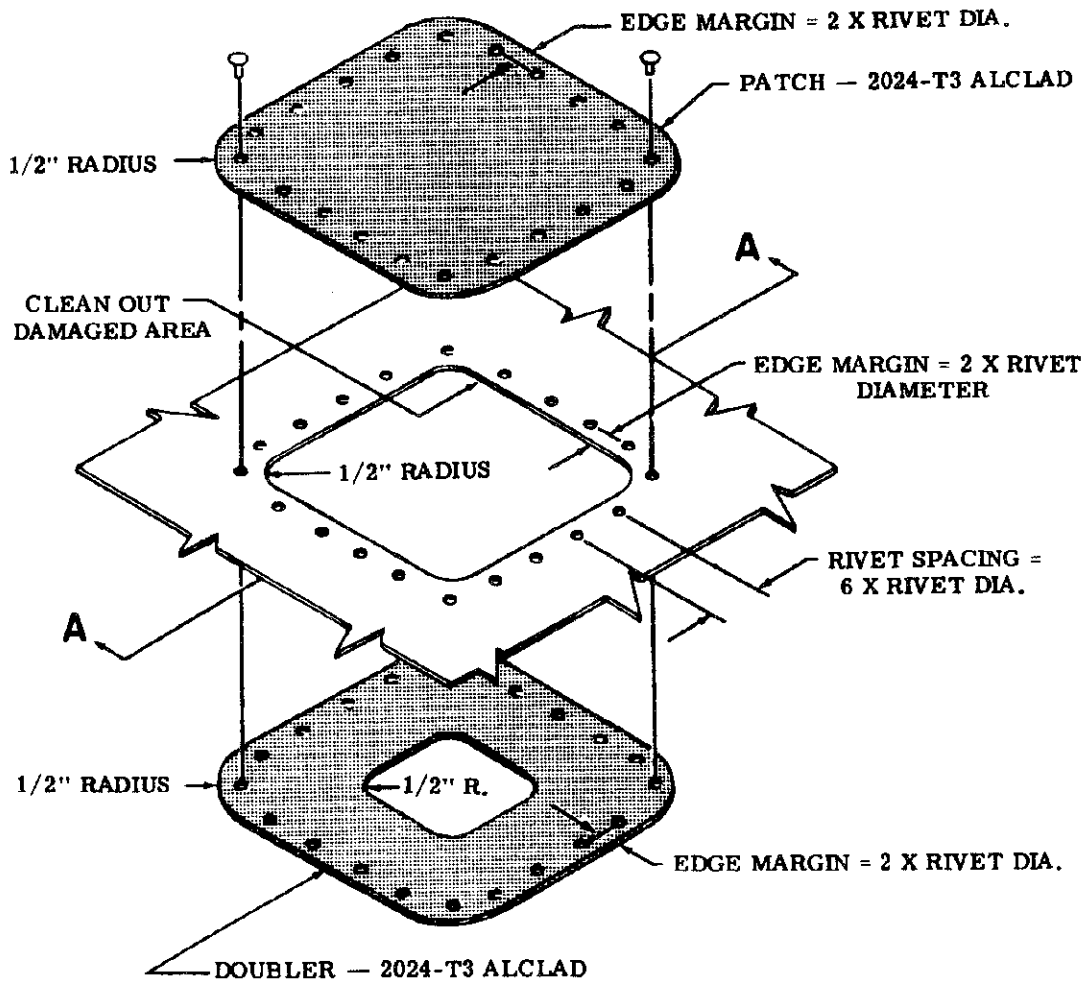
OVERLAPPING
CIRCULAR PATCH

Figure 18-4. Skin Repair (Sheet 1 of 6)



SECTION THRU ASSEMBLED PATCH

A-A

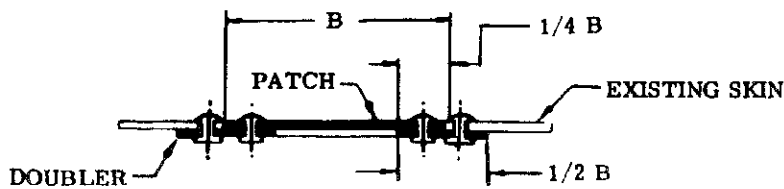


- ORIGINAL PARTS
- REPAIR PARTS
- REPAIR PARTS IN CROSS SECTION

OVERLAPPING REC-TANGULAR PATCH

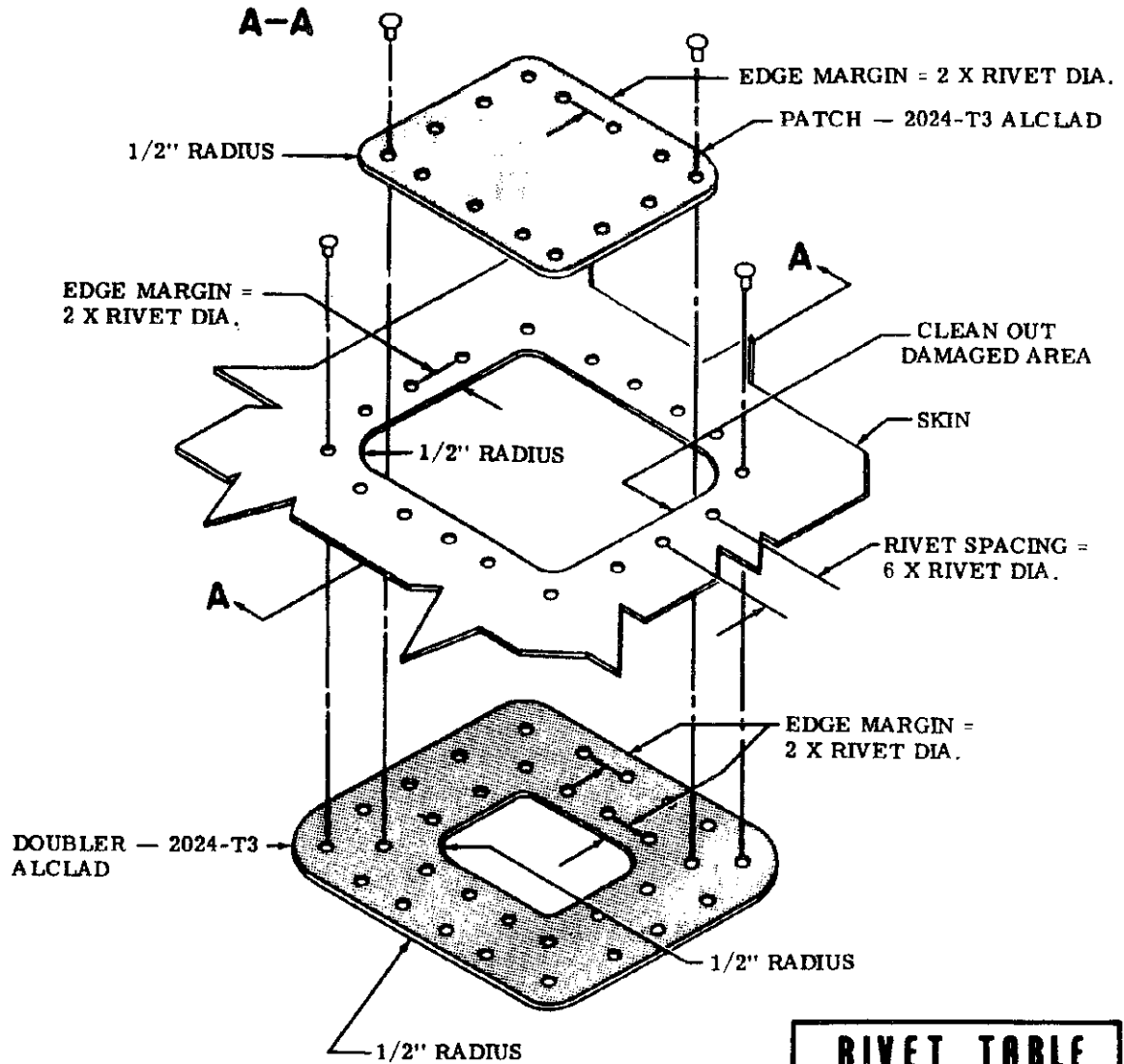
RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 2 of 6)



NOTE

For optimum appearance and airflow, use flush rivets, dimpled skin and patch, and counter-sunk doubler.

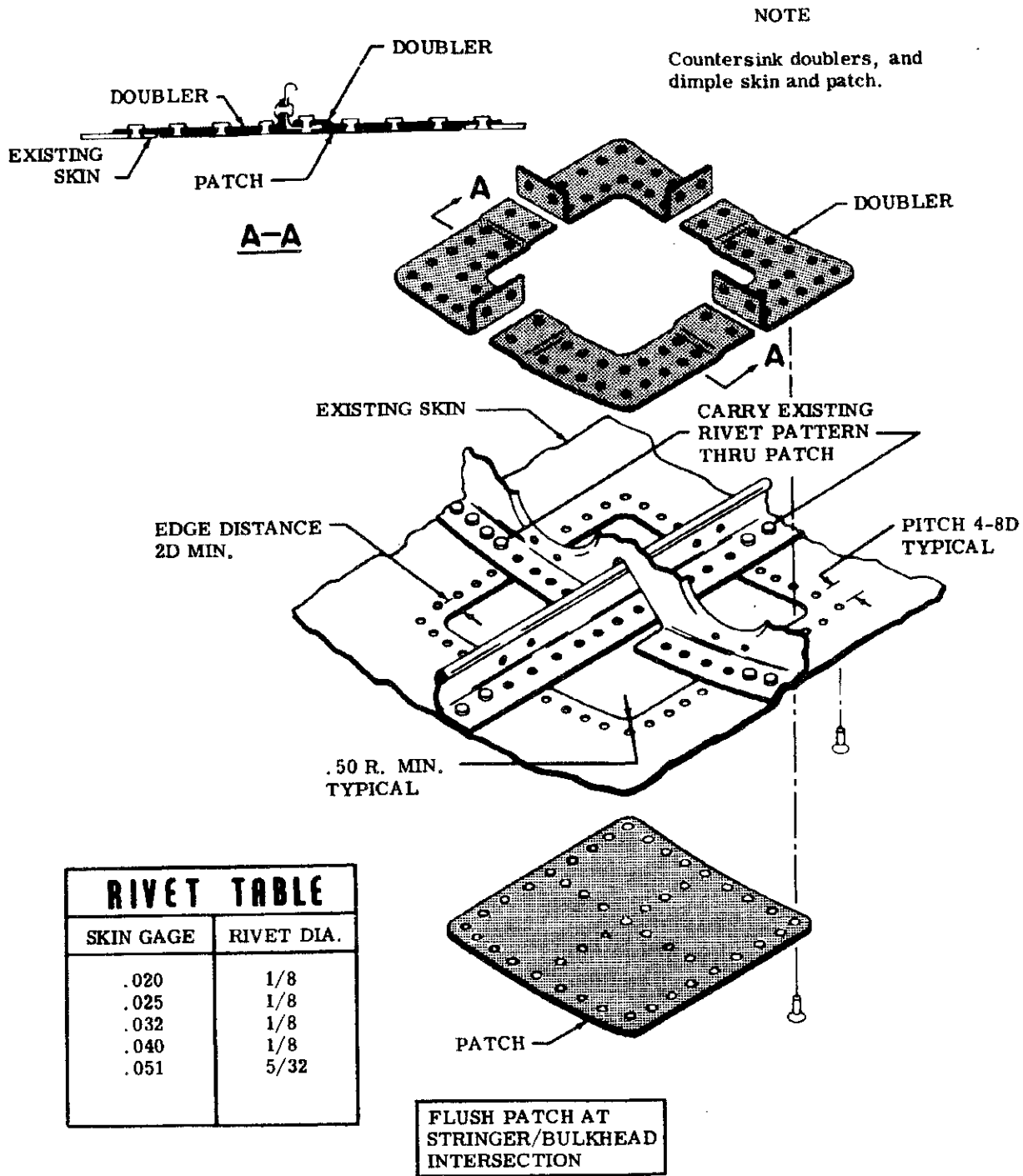





- ORIGINAL PARTS
- REPAIR PARTS
- REPAIR PARTS IN CROSS SECTION

FLUSH RECTANGULAR PATCH
 (CIRCULAR FLUSH PATCH IS
 SIMILAR)

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)



-  ORIGINAL PARTS
-  REPAIR PARTS
-  REPAIR PARTS IN CROSS SECTION

NOTE

This procedure is not recommended in areas where stringers are riveted to bulkheads.

Figure 18-4. Skin Repair (Sheet 4 of 6)

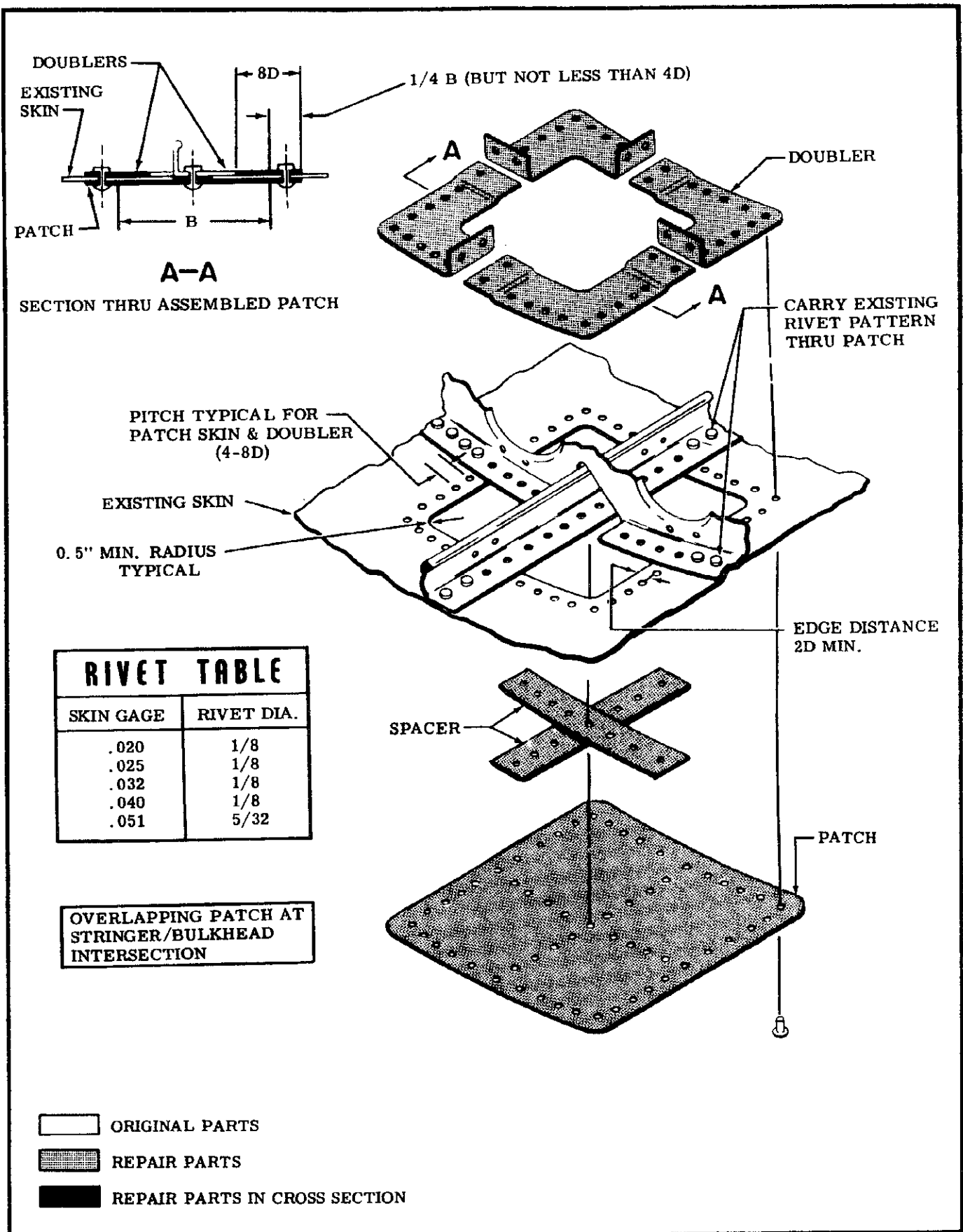


Figure 18-4. Skin Repair (Sheet 5 of 6)

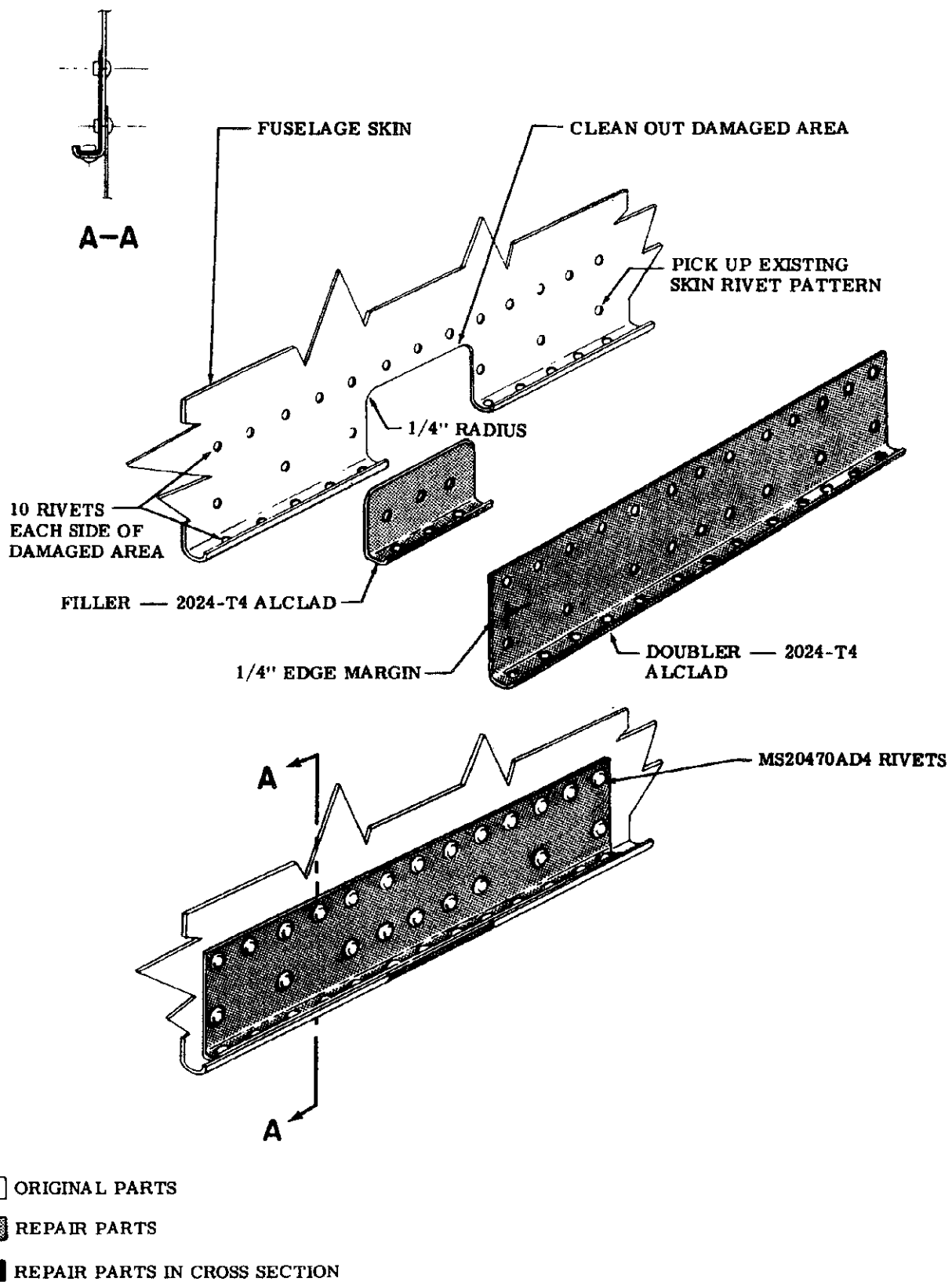


Figure 18-4. Skin Repair (Sheet 6 of 6)

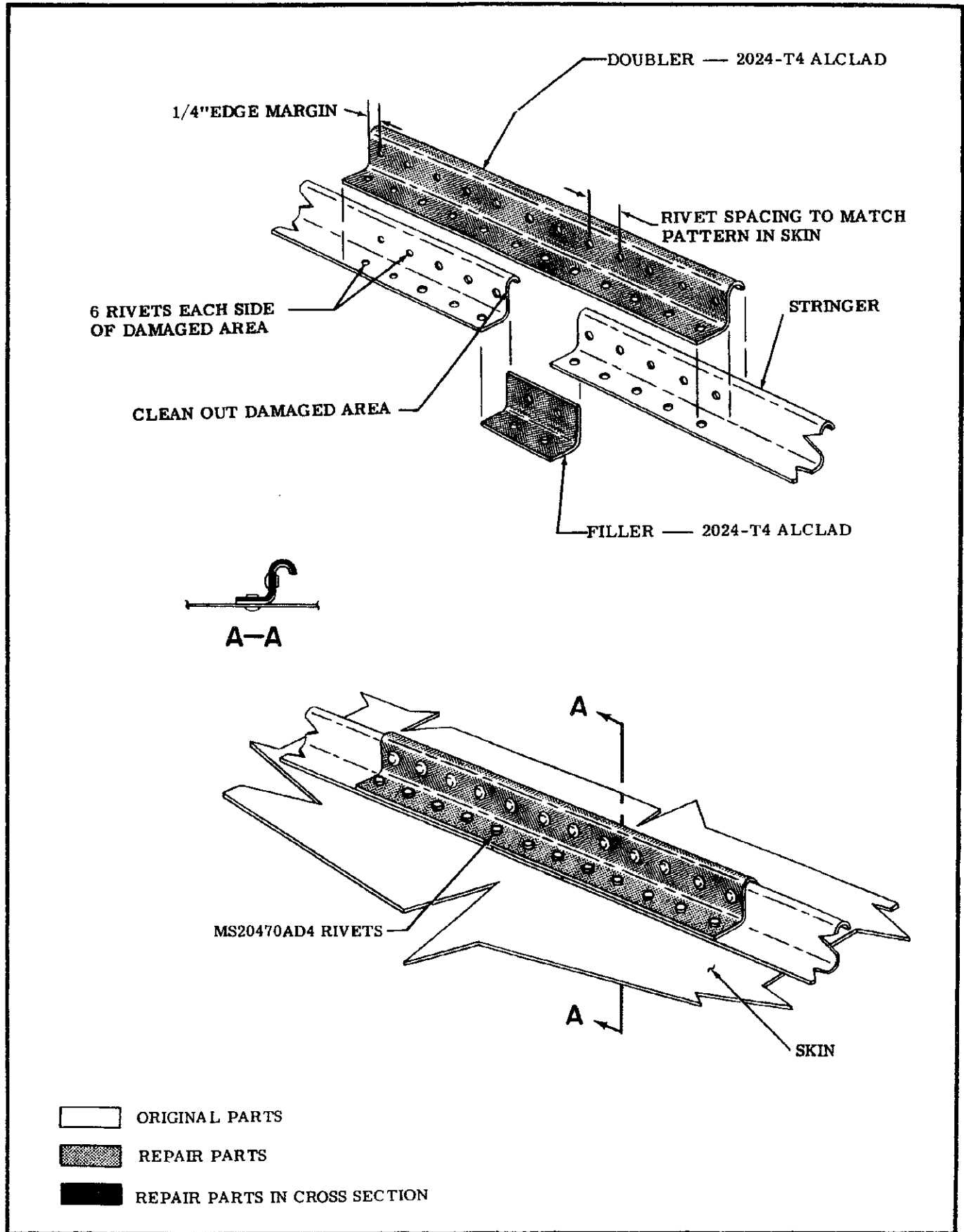


Figure 18-5. Stringer and Channel Repair (Sheet 1 of 4)

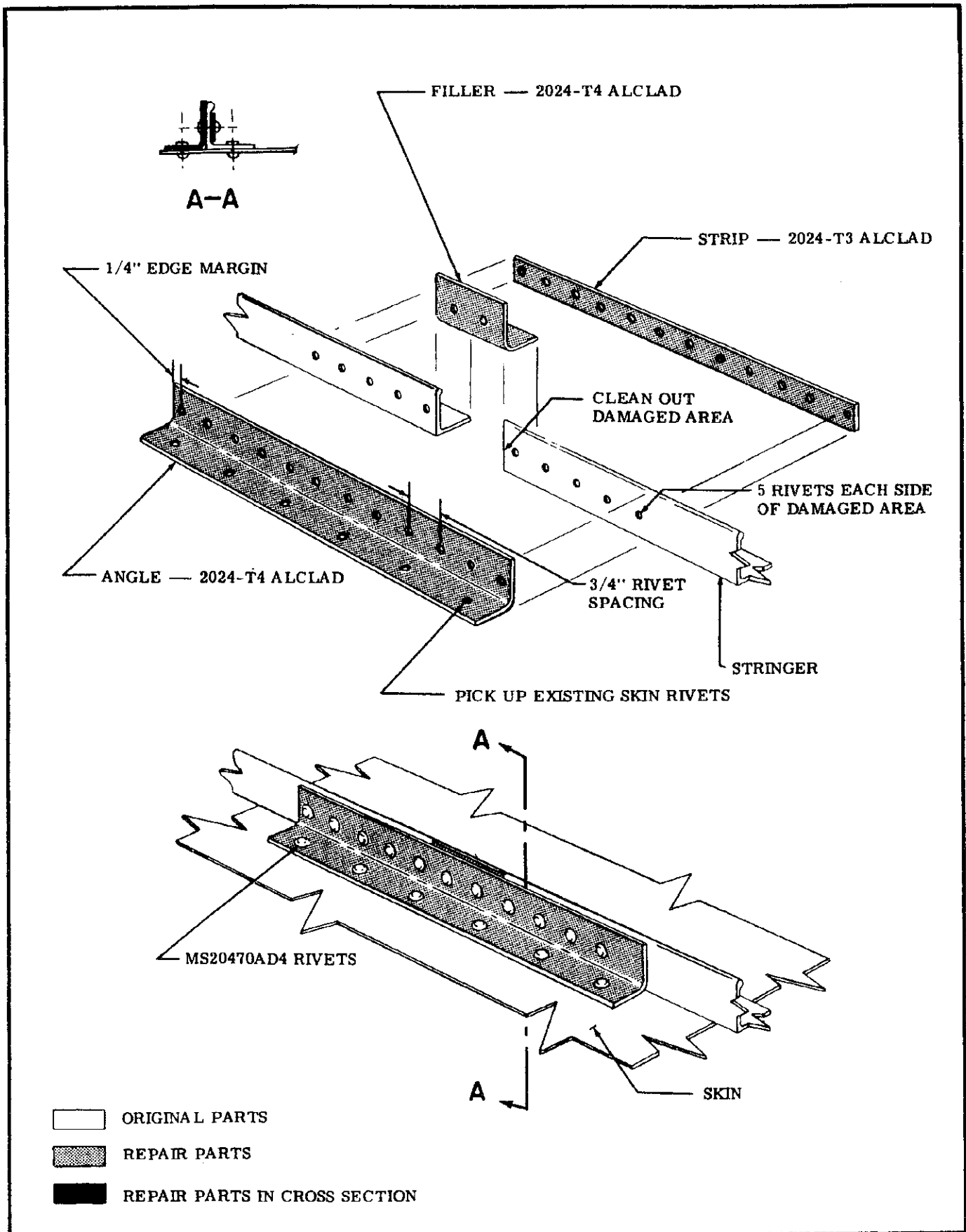


Figure 18-5. Stringer and Channel Repair (Sheet 2 of 4)

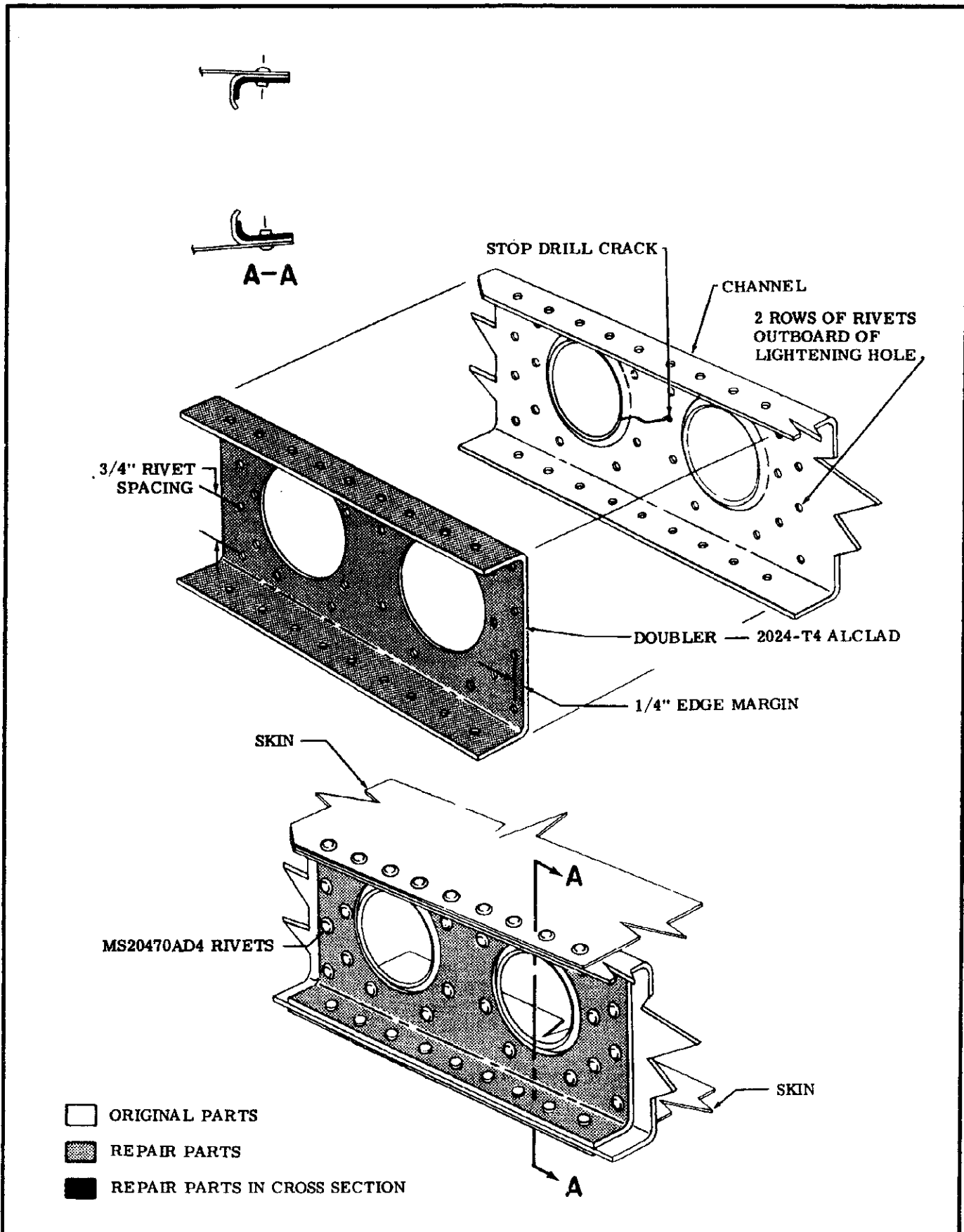


Figure 18-5. Stringer and Channel Repair (Sheet 3 of 4)

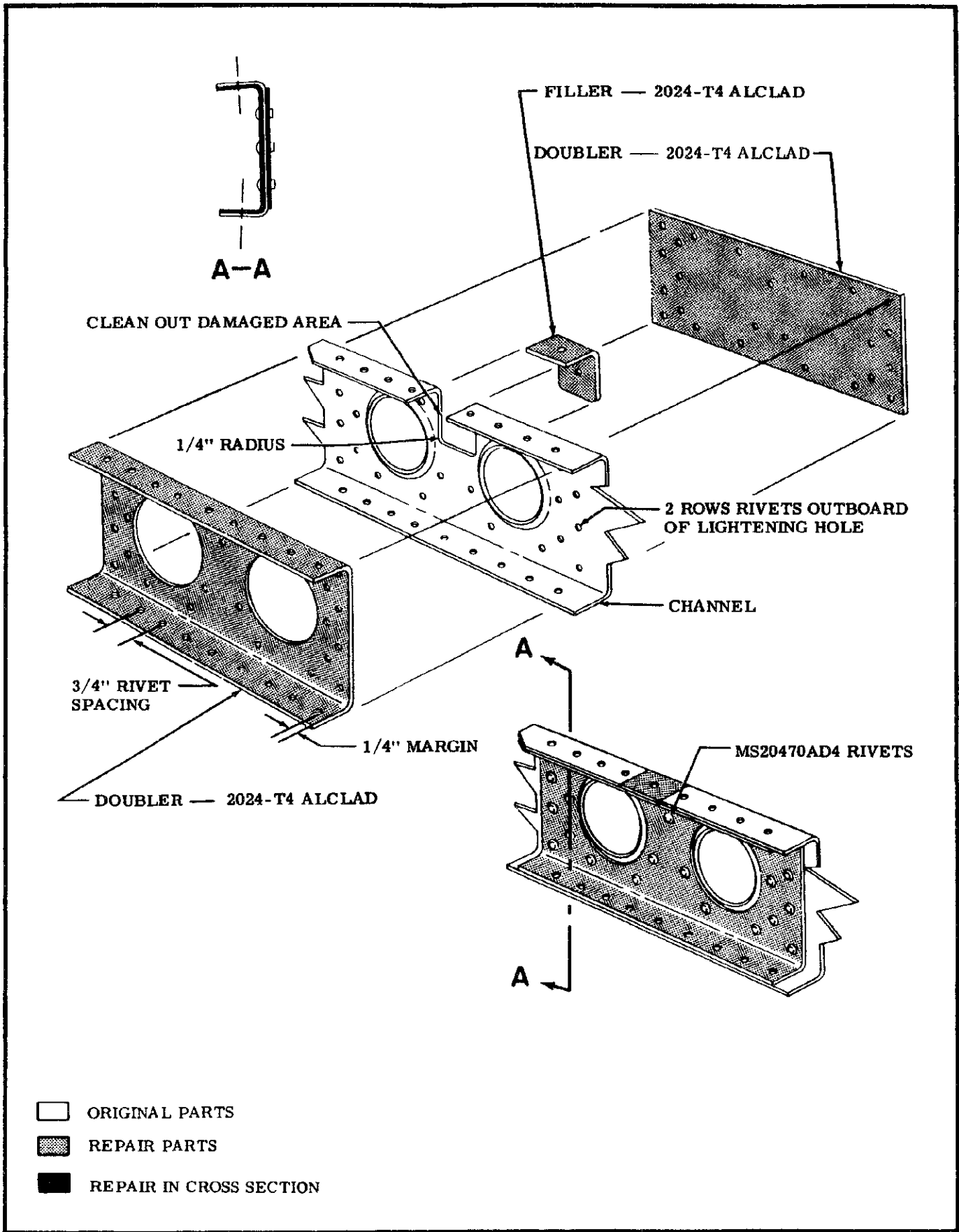


Figure 18-5. Stringer and Channel Repair (Sheet 4 of 4)

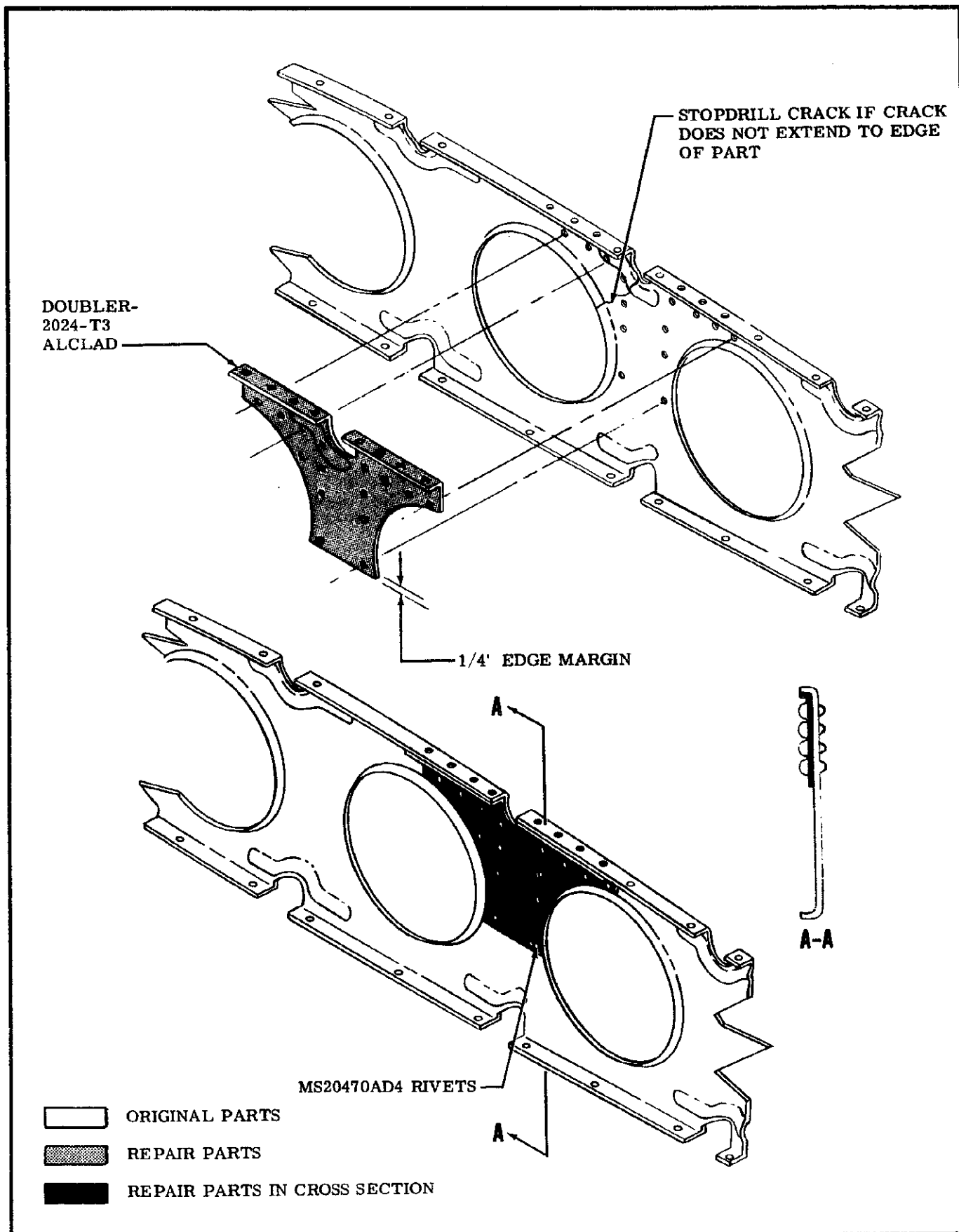


Figure 18-6. Rib Repair (Sheet 1 of 2)

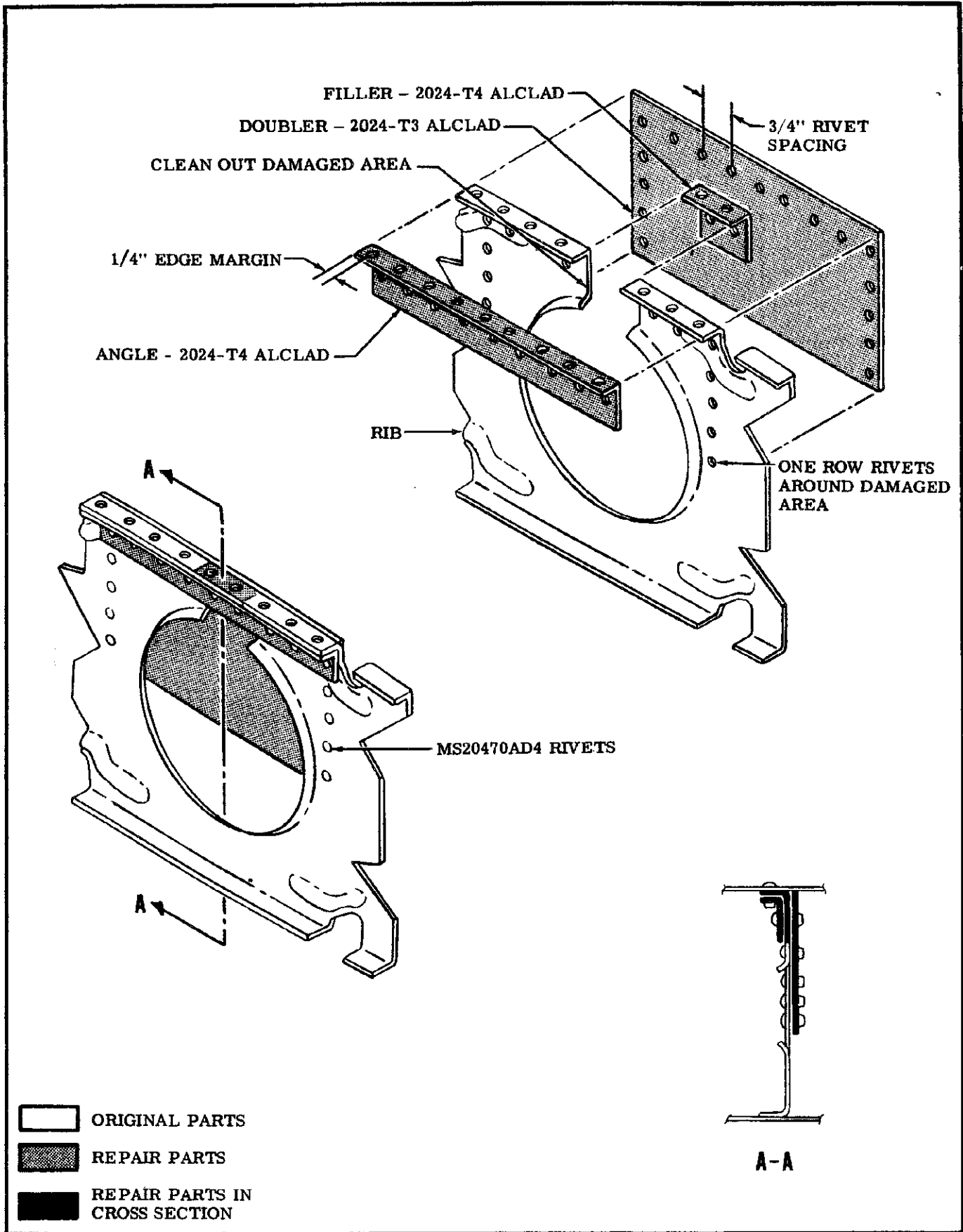


Figure 18-6. Rib Repair (Sheet 2 of 2)

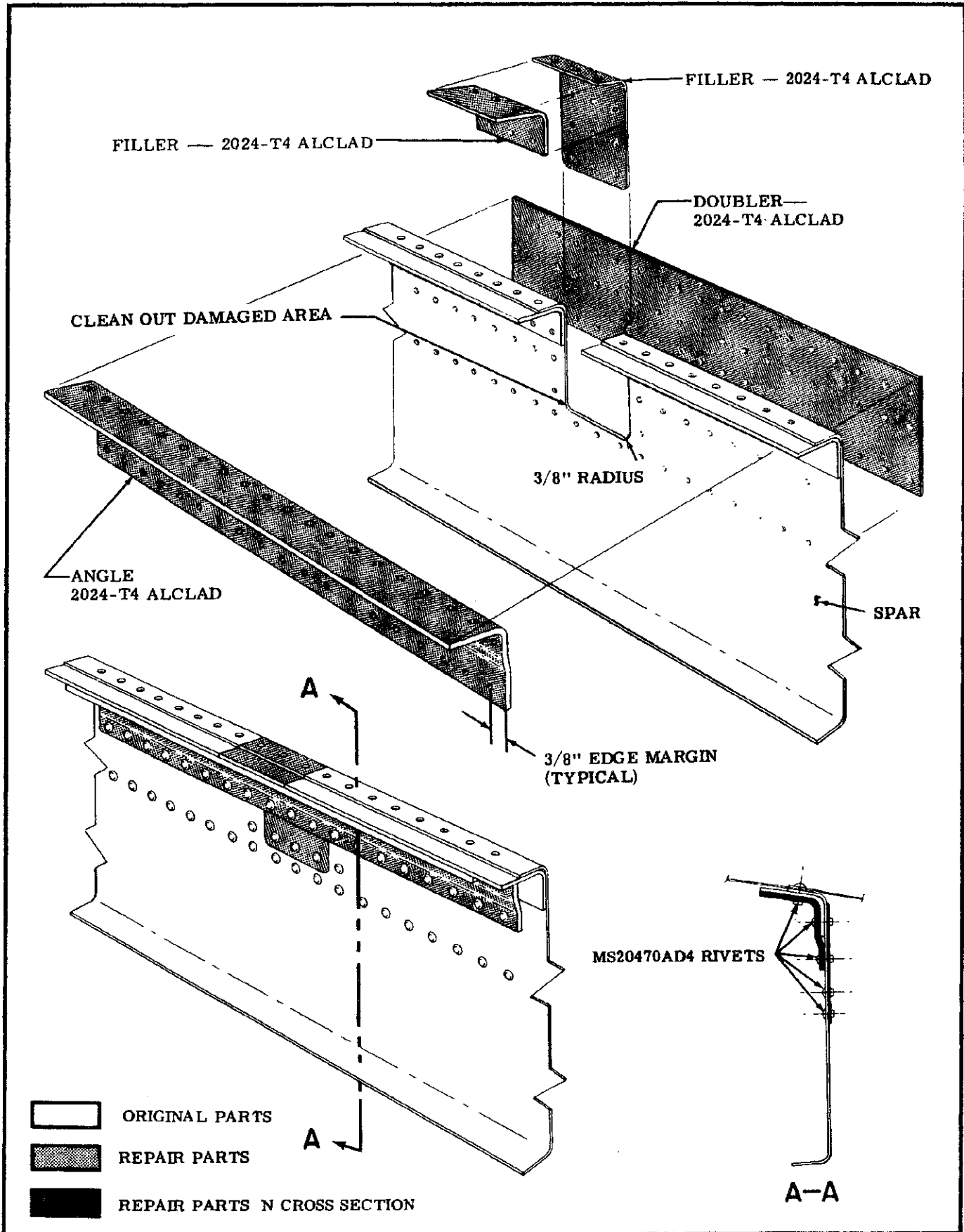


Figure 18-7. Wing Spar Repair (Sheet 1 of 4)

NOTE

This repair applies to either front or rear spar if the spar is a single channel.

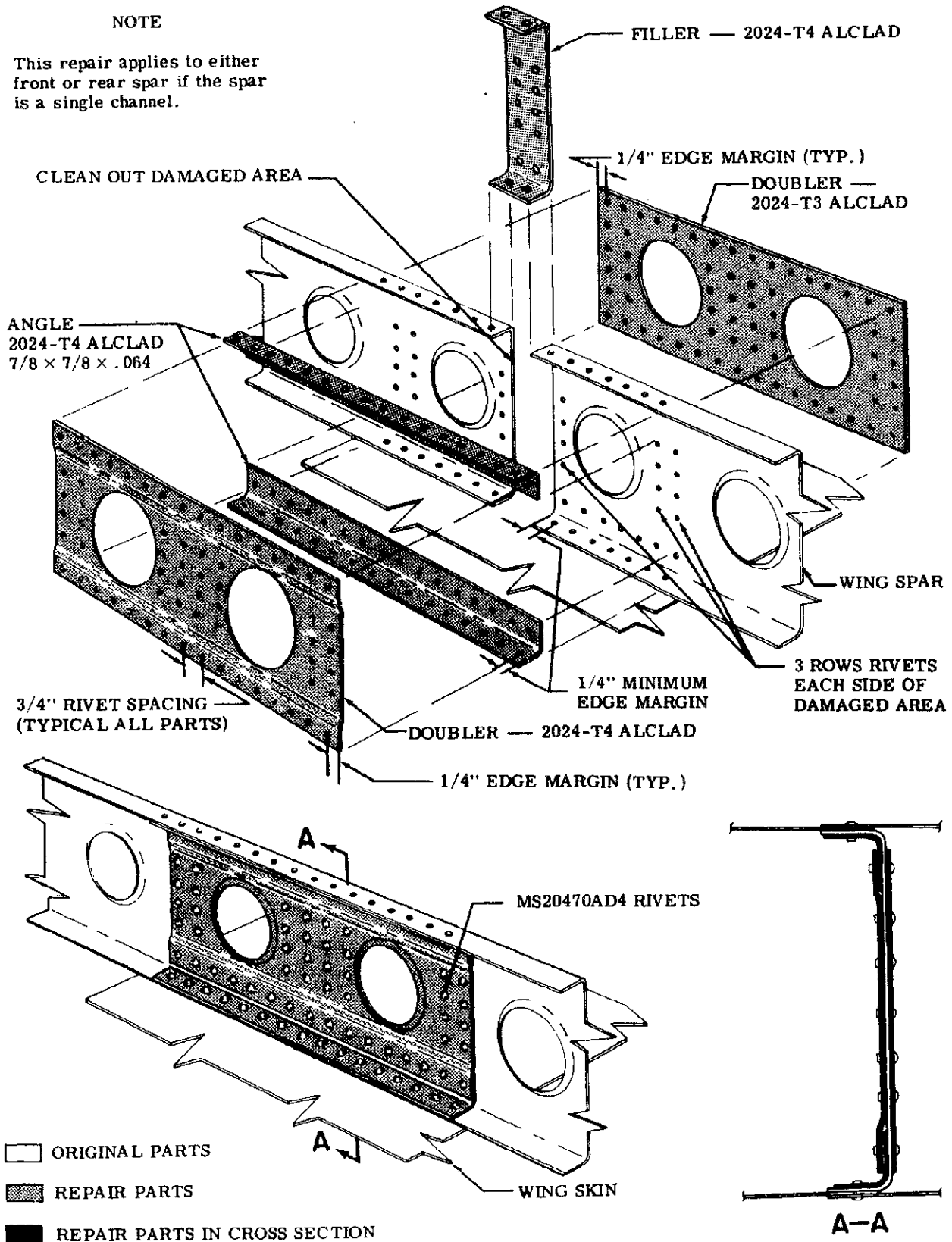


Figure 18-7. Wing Spar Repair (Sheet 2 of 4)

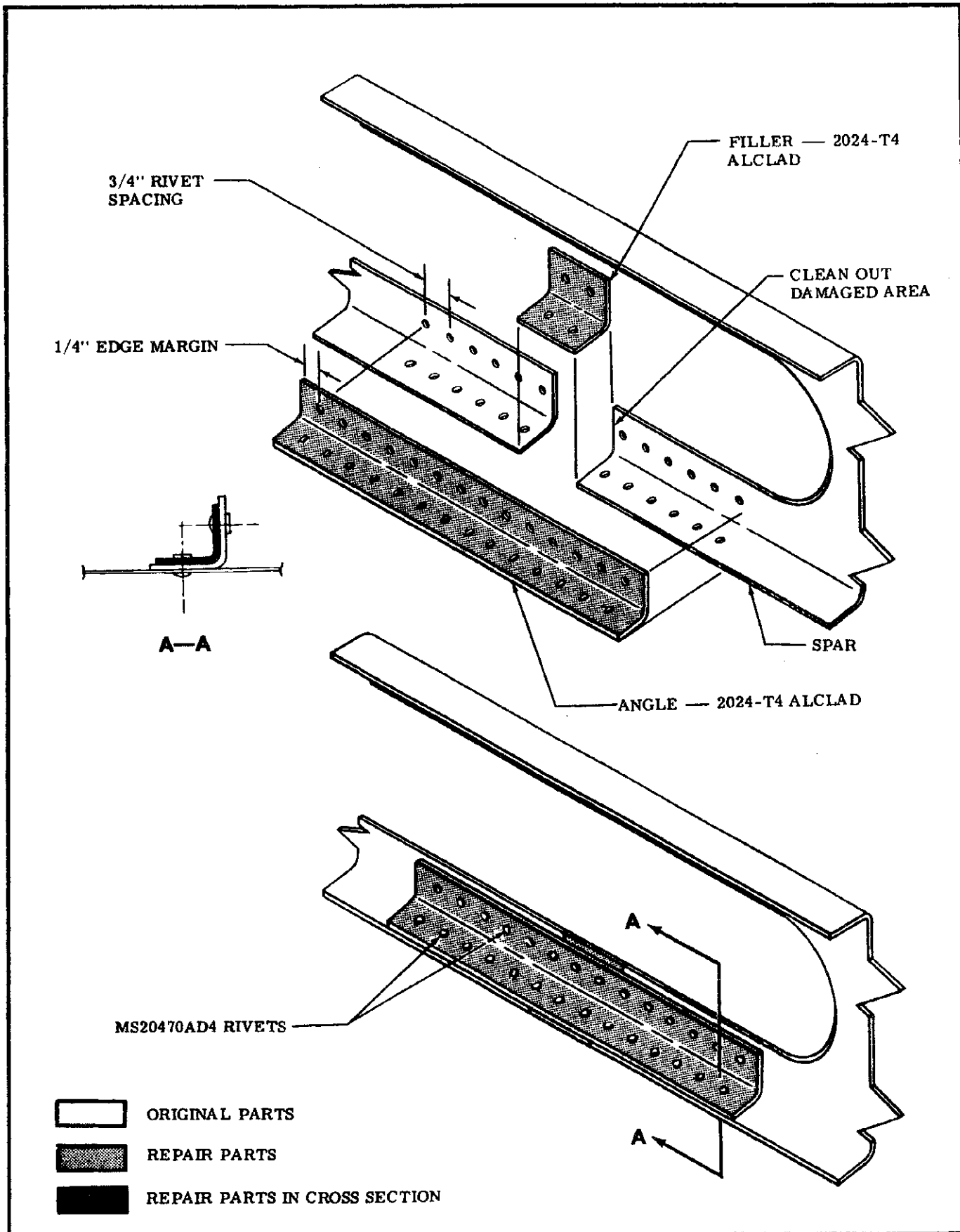


Figure 18-7. Wing Spar Repair (Sheet 3 of 4)

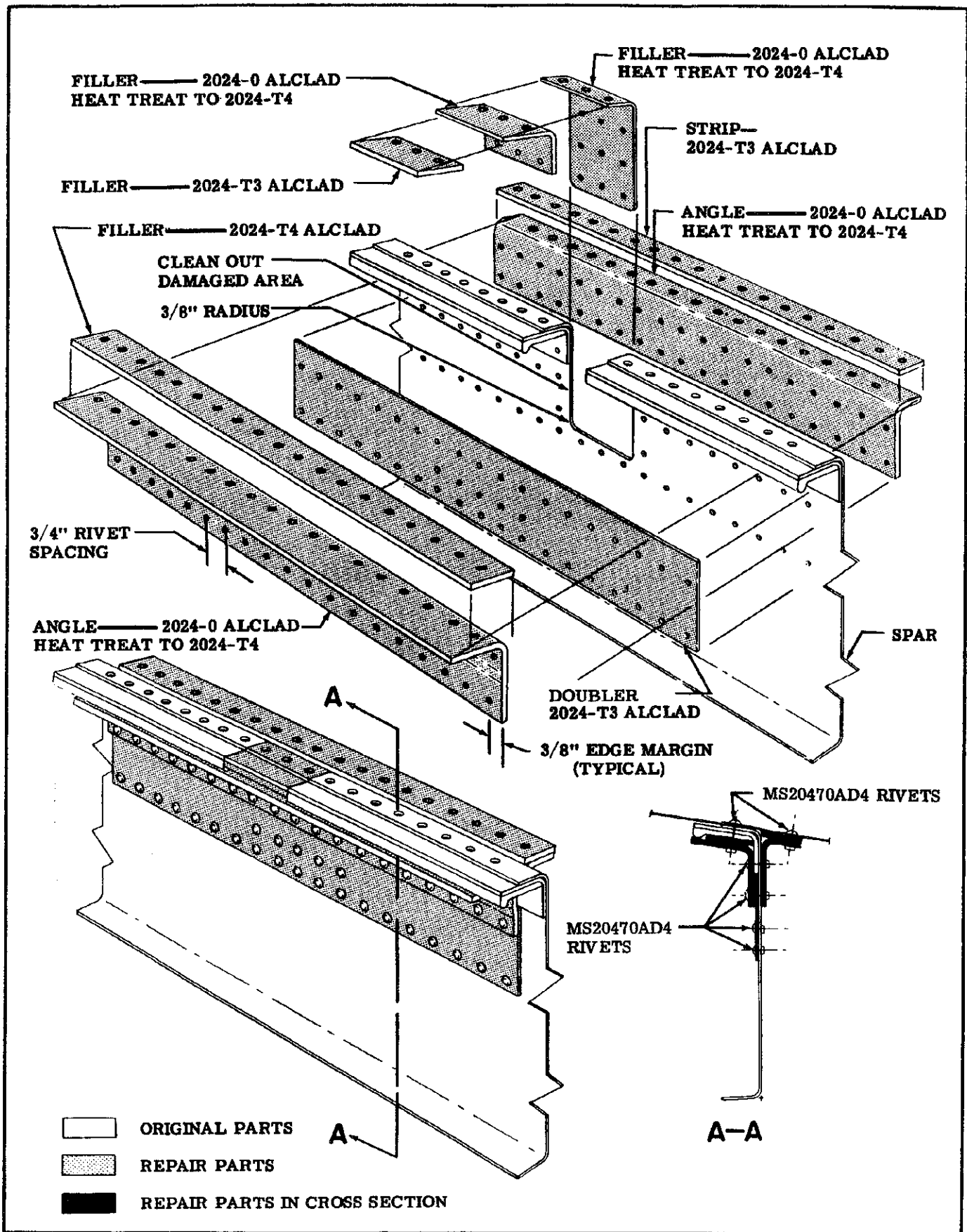


Figure 18-7. Wing Spar Repair (Sheet 4 of 4)

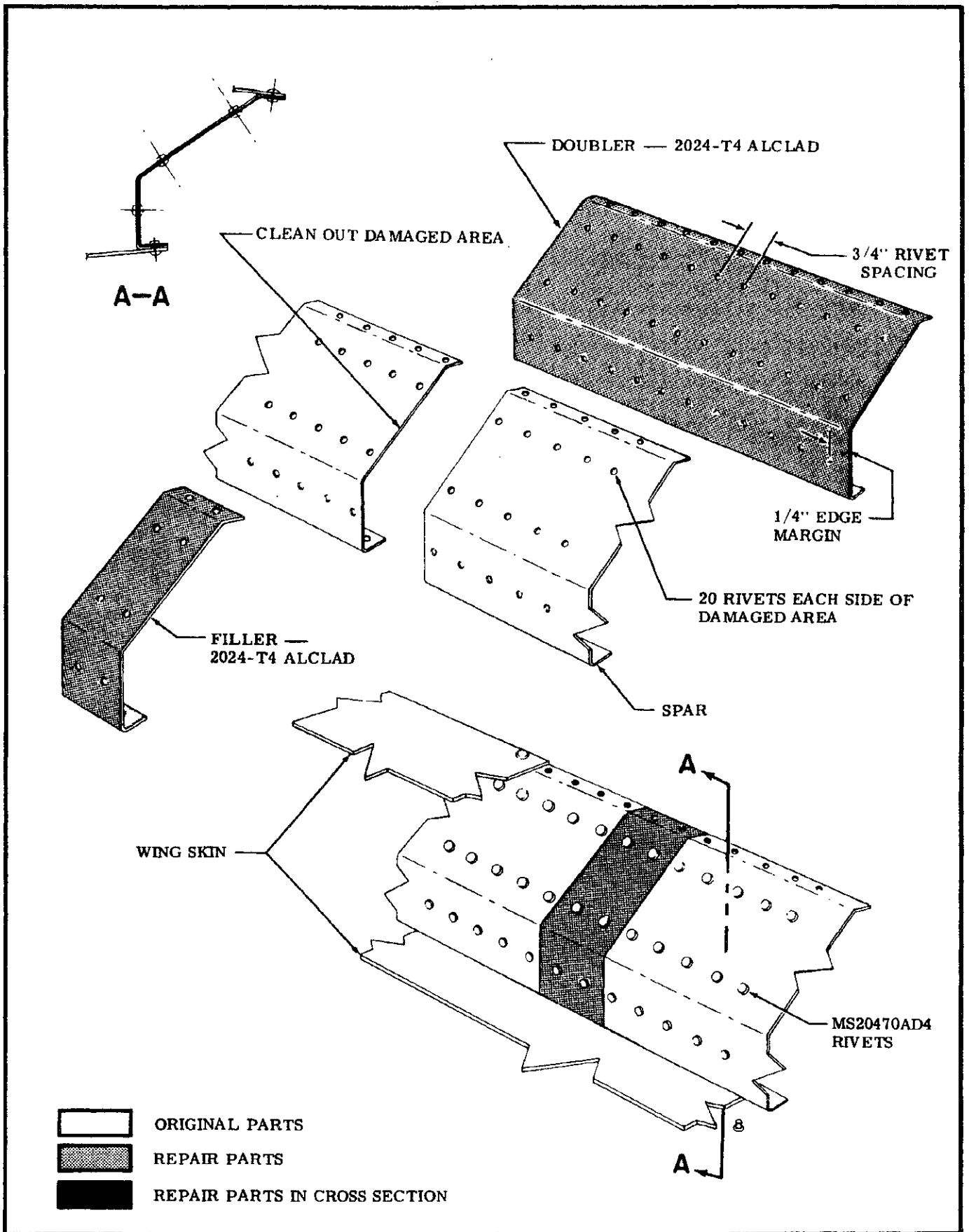


Figure 18-8. Auxiliary Spar Repair

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.

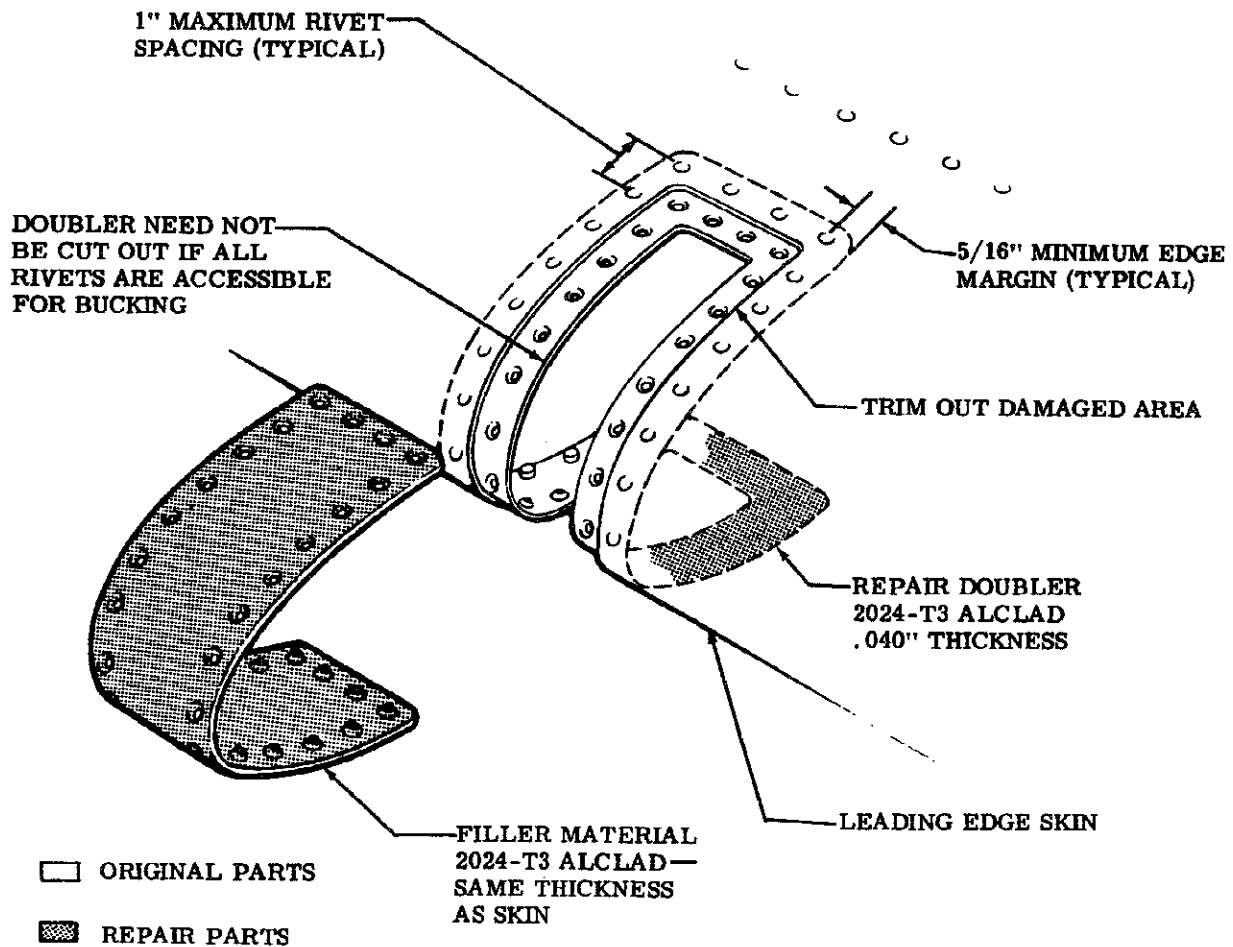


Figure 18-9. Leading Edge Repair

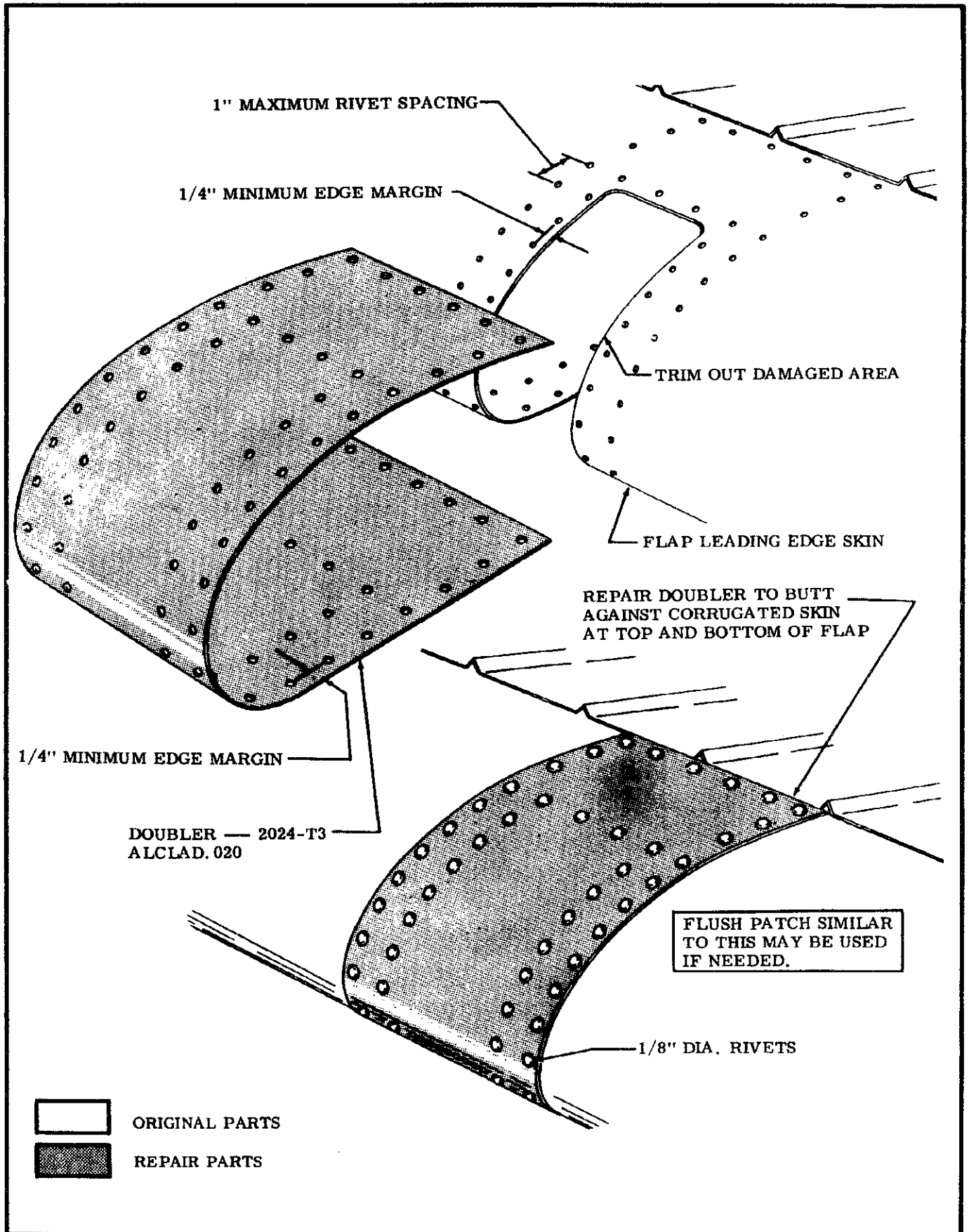


Figure 18-10. Flap Leading Edge Repair

NOTES

Use rivet pattern at wing station 23.62 for repair from wing station 23.62 to wing station 85.87. Use rivet pattern at wing station 100.50 for lap splice patterns from wing station 100.50 to 190.00. Refer to figure 1-2 for wing stations.

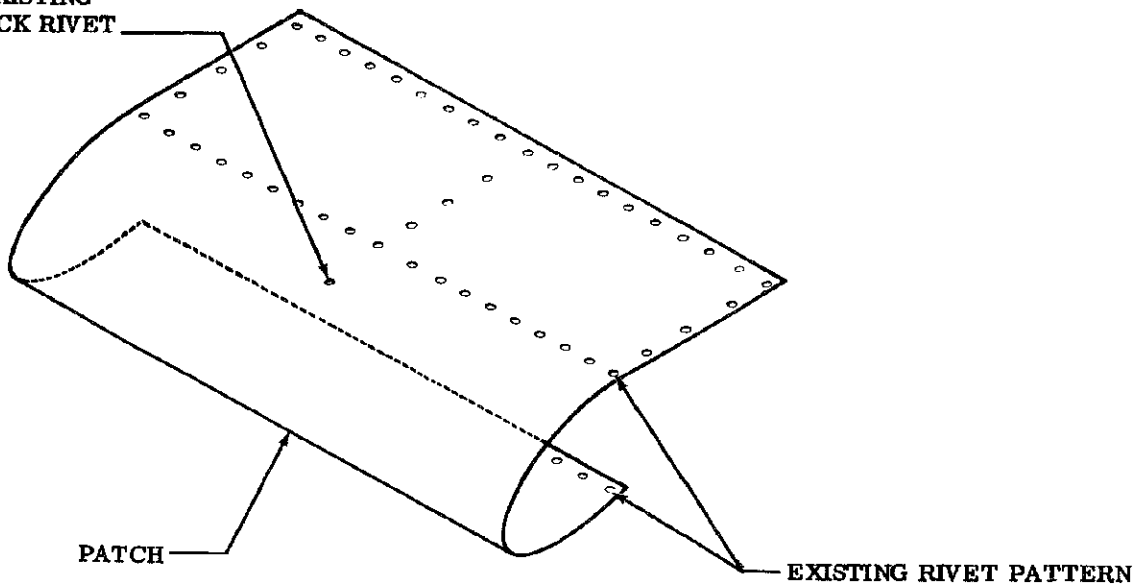
Use rivet spacing similar to the pattern at wing station 100.00 with the number of BB4 dimpled rivets at leading edge ribs between lap splices as shown:

STATION	* NO. OF BB4 RIVETS	* NO. OF CR2248-4 DIMPLED RIVETS
118	18	22
136	15	18
154	11	13
172	10	12
190	10	12

* NO. OF CR2249-4 RIVETS

27
23
17
15
15

EXISTING TACK RIVET



TYPICAL LEADING EDGE SECTION

* NOTE

The Bulbed Cherrylock rivets listed may be substituted for BB4 dimpled rivets in inaccessible areas, provided the number of rivets installed is increased proportionately. Blind rivets should not be installed in the wing spar.

Figure 18-11. Bonded Leading Edge Repair

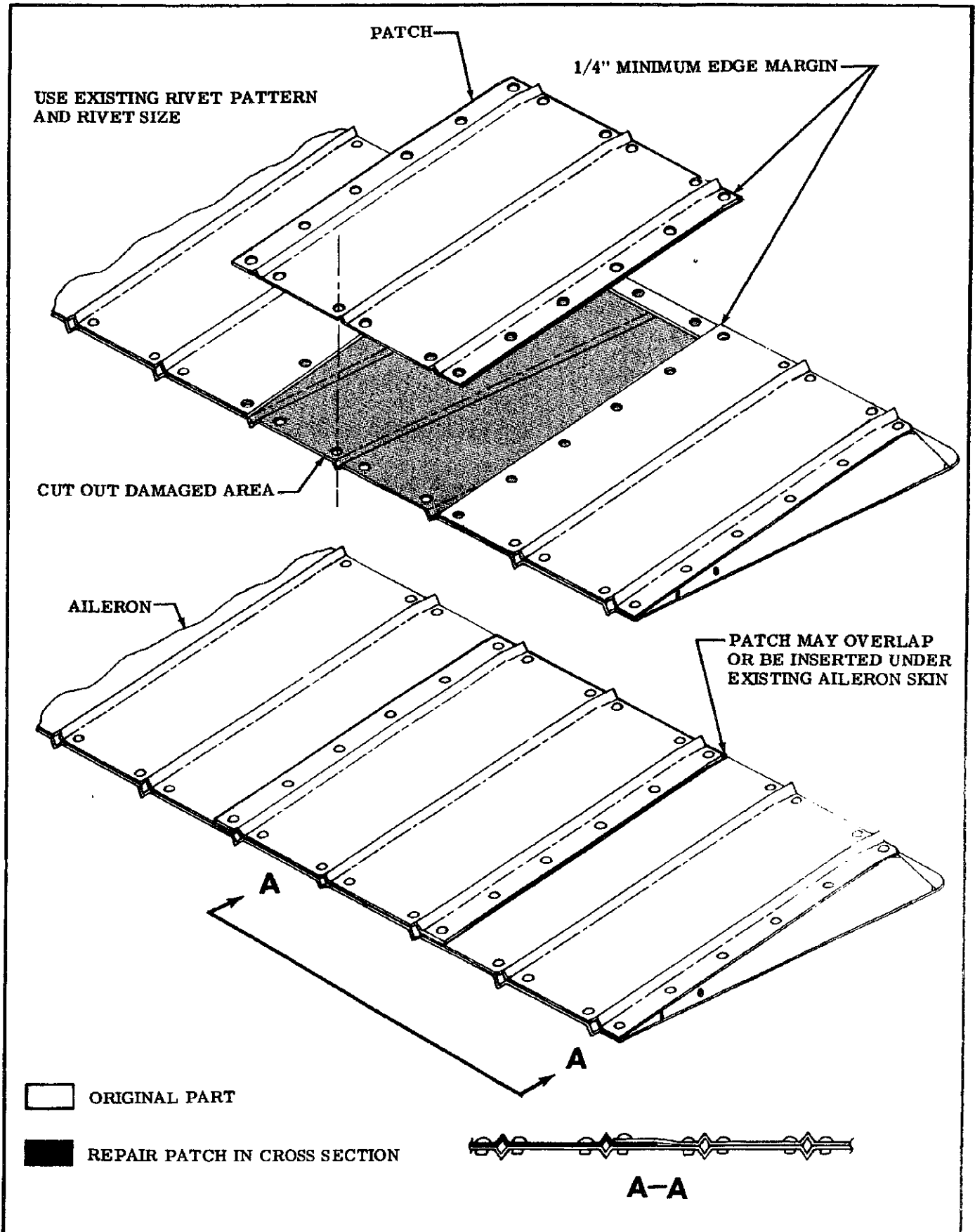
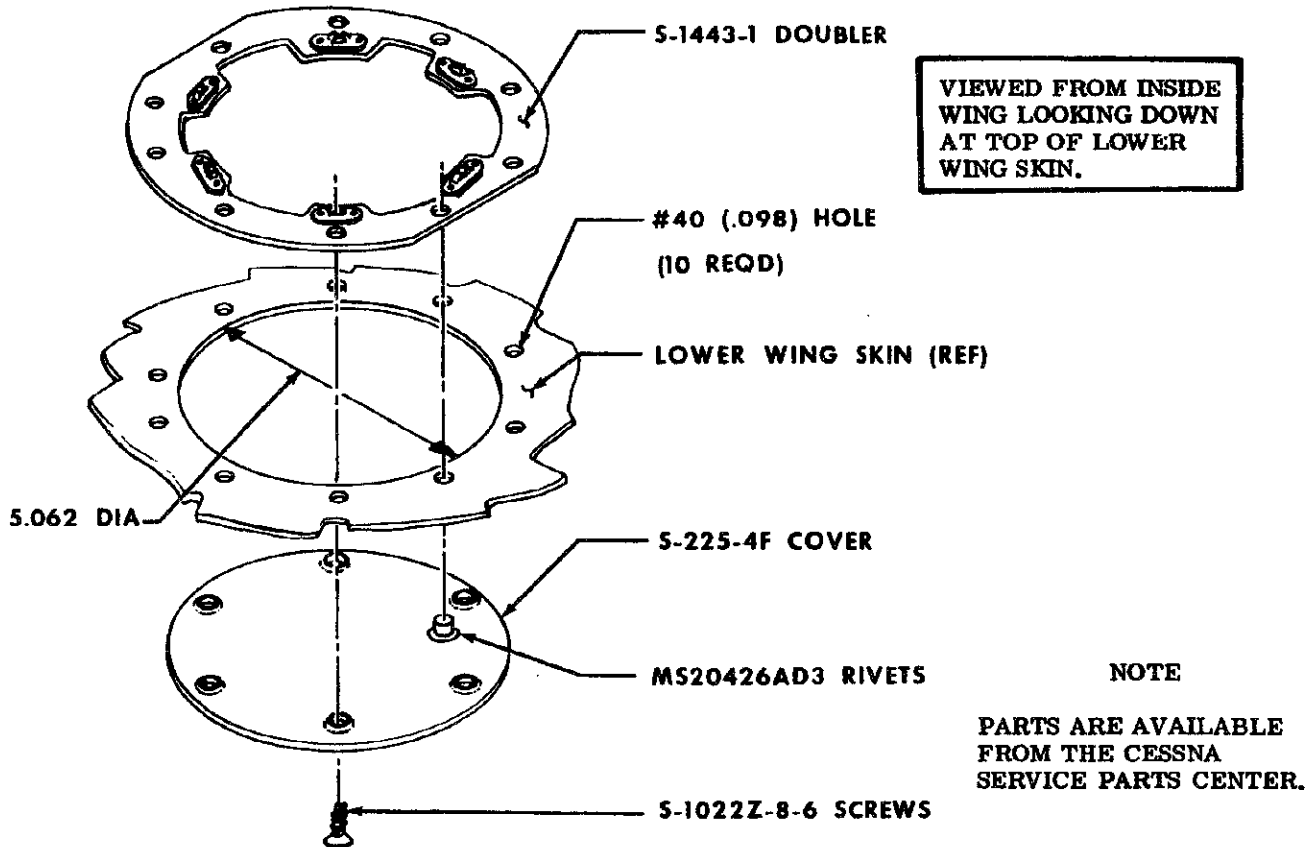


Figure 18-12. Corrugated Skin Repair



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. Use landing light installations instead of adding access holes where possible. 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 18-13. Access Hole Installation

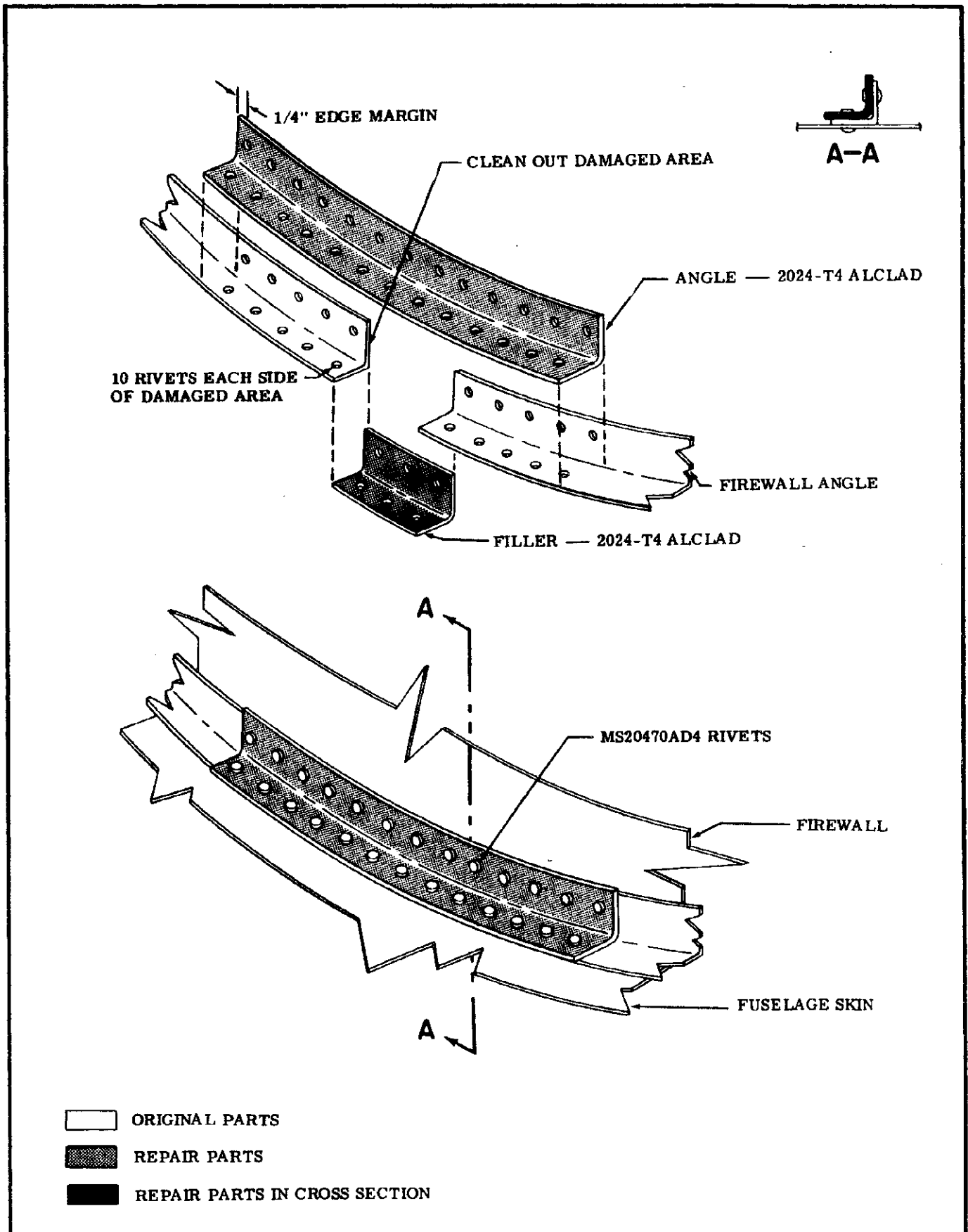


Figure 18-14. Firewall Angle Repair

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 the Cessna Service Parts Center.

NOTE

The information in the following chart DOES NOT apply to the A182 Series Aircraft.

CAUTION

When stripping aircraft of paint, use caution to avoid stripper coming in contact with ABS parts.

MATERIAL	NO /TYPE	AREA OF APPLICATION
PAINT	ACRYLIC LACQUER	Used on exterior airframe.
PAINT	EPOXY PAINT	Used on nose gear fairing on 1969 Models.
PRIMER	ER-7 WITH ER-4 ACTIVATOR	Used with acrylic lacquer.
PRIMER	P60G2 WITH R7K46 ACTIVATOR	Used with acrylic lacquer.
THINNER	T-8402A	Used to thin acrylic lacquer and for burndown.
THINNER	T-3871	Used with epoxy (Du Pont).
THINNER	T-6487	Used with epoxy (Enmar).
SOLVENT	#2 SOLVENT	Used to clean aircraft exterior prior to priming.

NOTE

Do not paint Pitot Tube, Gas Caps or Antenna covers which were not painted at the factory.

19-1. INTERIOR PARTS (Finish Coat of Lacquer)

a. Painting of Spare Parts.

1. Insure 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 insure 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. Insure 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 insure adhesion.

NOTE

Lacquer paints can be successfully spotted in.

19-2. EXTERIOR PARTS (Acrylic Topcoat)

a. Painting of Spare Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Insure 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 insure

adhesion.

b. Touch Up of Previously Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Insure 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 insure adhesion.

NOTE

Acrylic topcoats can be successfully spotted in.

19-3. 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. Insure 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.

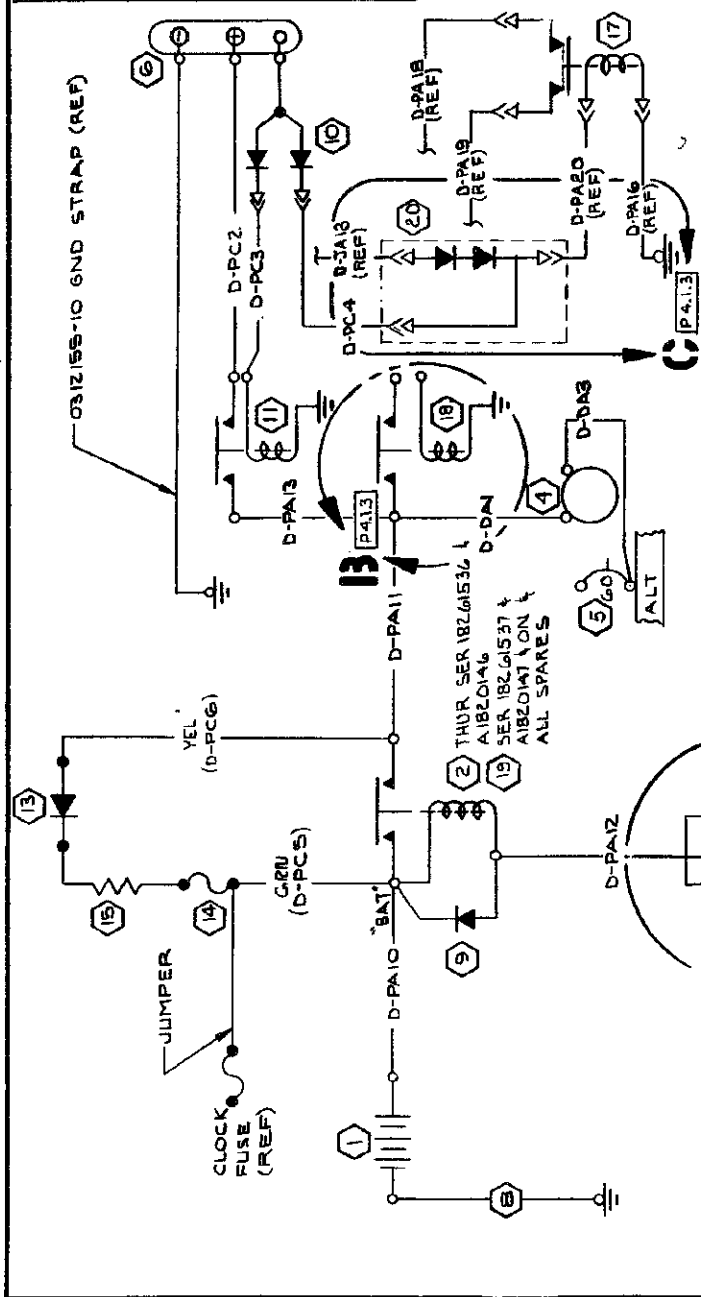
When painting interior and exterior polycarbonate parts, or where the part material is questionable, a "barrier primer" should be applied prior to the Enamel, Lacquer, Epoxy or Polyurethane topcoat.

SECTION 20

WIRING DIAGRAMS

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LET	REVISION DESCRIPTION	DATE	APPD
A	BY REVISER OUT S-1844-113 SER IN DLB 825 WED 2/16/72 S-1994-113 ADD DETAIL A, NOTE 1, SR, DETAIL B, S-1991-1 & SR, NOTE 1, ED & RR 10472 (SR6222) ED & RR 10486 (SR6030) II	6-11-72	WED 2/16/72
B	BY REV: SER OUT S-1579-1 ADD (SER 201)	6-11-72	WED 2/16/72
C	BY REV: ADD WIRE COLORS YEL D-PC6 GRN D-PC5; LG18 WAS 15/YEL & GRN (NOW SHOP PRACTICE)	2-15-74	WED 2/16/72
D	BY REV: IN2101WMS 1510043-1, ADDED DETAIL C & SER. (SER 1521082A)	6-11-72	WED 2/16/72
E	BY REV: ADD SB 4-1.1.3, DETAIL C, 1870043 & PA20 (REF)	6-11-72	WED 2/16/72



QTY	DESCRIPTION	WIRE CODE NO.	MATERIAL	LG	TERMINALS	SERIALS
10	15700-43 DIODE BOARD ASSY	10	S-1367-H-18 SOLDER			
19	S-1579-2 CONTACTOR	10	S-1367-H-18 SOLDER			
18	S-1991-1 CONTACTOR	10	S-1493-1 S-1493-1			
17	S-1994-1-1 SWITCH	5	S-1493-1 S-1493-1			
16	071019-2 DIODE ASSY	5	S-1493-1 S-1493-1			
15	X26263 75.0 RESISTOR	9	S-1367-H-18 S-1367-H-18			
14	S-1091-5 FUSE	31	S-1367-H-18 S-1367-H-18			
13	ZOH3P DIODE (84910)	57	S-1367-H-18 S-1367-H-18			
12	1N2070 DIODE	15	S-1367-H-18 S-1367-H-18			
11	S-1660-1 CONTACTOR	2075	S-1493-1 S-1493-1			
10	15700-43-3 DIODE BOARD ASSY	190	S-1367-H-18 S-1367-H-18			
9	071072B-1 DIODE ASSY	8	S-1367-H-18 S-1367-H-18			
8	041200T-1 BAT. GND	4	S-1493-1 S-1493-1			
7	S-1673-1 STARTER CONTACTOR					
6	AN252-3A RECEPTACLE					
5	S-1596-60 CKT BKR					
4	C609502-020 INST CLUSTER KIT					
3	S-1844-1-1 MASTER SWITCH					
2	S-1579 BATTERY CONTACTOR					
1	071260S-1 BATTERY ASSY					

NOTES:
 1. OBSERVE POLARITY SYMBOLS ON DIODE WHEN INSTALLING ON MASTER SWITCH TERMINALS OR DIODE WILL FAIL WHEN SYSTEM IS ENERGIZED

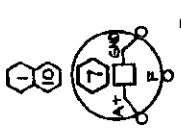
NAME	DATE	DESIGN	GROUP	DRAWN	CHECK	STRESS	PROJECT	APPD
ROSSIA AIRCRAFT CO.	6/16/72	71-9140	62-50	W. J. ...	...	...	...	...

CONTRACT NO.	TITLE	SCALE	PAGE
COMMERCIAL AIRCRAFT DIV. BOOTH #100 WICHITA, KANSAS	WIRING DIAGRAM - BATTERY & EXTERNAL POWER SYSTEMS	NONE	4-1-2

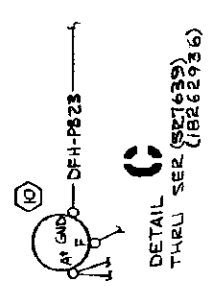
EQUIPMENT TABLE	SUPERSEDES:								
<table border="1"> <thead> <tr> <th>PART NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>071260S-1 BATTERY ASSY</td> </tr> </tbody> </table>	PART NO.	DESCRIPTION	1	071260S-1 BATTERY ASSY	<table border="1"> <thead> <tr> <th>STANDARD NO.</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>P 4-1-1</td> <td></td> </tr> </tbody> </table>	STANDARD NO.	DESCRIPTION	P 4-1-1	
PART NO.	DESCRIPTION								
1	071260S-1 BATTERY ASSY								
STANDARD NO.	DESCRIPTION								
P 4-1-1									

LET	REVISION DESCRIPTION	DATE	APPROVED
A	BY REV: SER OUT C611501-0102 & SER IN C611501-0102 (SR6292)	10/22/42	W. J. W. / M. J. W.
B	BY REV ADD: C593001-0101 OVERVOLTAGE SENSOR, S-2135-1 LIGHT ASSY, WIRES D-PB32, D-PB32, S-1943-2 WAS S-1943-1 (SR6754)IX	11/10/42	W. J. W. / M. J. W.
C	BY REV: REPLACED S-1370-1 TERM WITH S-1635-1 TERM ON PB31 & PB32 WIRES. ADDED S-1637-1, S-1637-2 TO EQUIP TABLE. ADD TVA-1B15 CAPACITOR TO EQ & F/D SER 18260315 & 18260316	11/10/42	W. J. W. / M. J. W.
D	BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)	5-278	W. J. W. / M. J. W.
E	BY REV: SER 18260216 & ON WAS SER 18260796 & ON; ADD DETAIL 'C', C611001-0102, PB33 & SER; SER OUT C611001-0101 & DFH-PB23 (SR7624) & (SR7639)	5-278	W. J. W. / M. J. W.
F	BY REV: SER OUT C611001-0102 & SER IN: C611001-0201 SER (SR7912)	5-278	W. J. W. / M. J. W.
G	BY REV: CHANGE CONTROL NUMBER (2-150-014) WAS 12-173-0905 (621912)	10-28-42	W. J. W. / M. J. W.

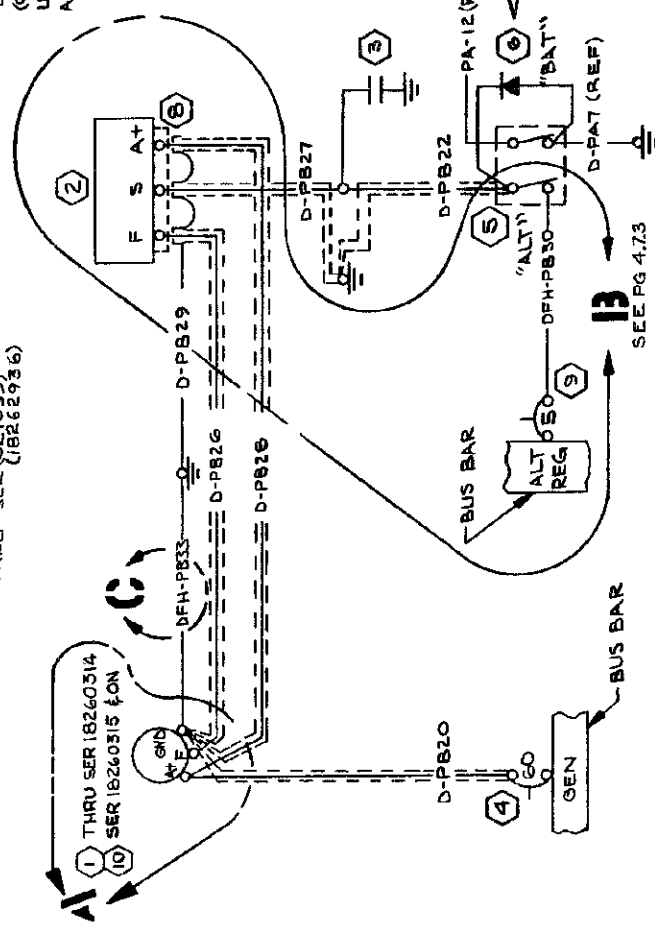
LET	REVISION DESCRIPTION	DATE	APPROVED
A	BY REV: SER OUT C611501-0101 & SER IN C611501-0102 (SR6292)	10/22/42	W. J. W. / M. J. W.
B	BY REV ADD: C593001-0101 OVERVOLTAGE SENSOR, S-2135-1 LIGHT ASSY, WIRES D-PB32, D-PB32, S-1943-2 WAS S-1943-1 (SR6754)IX	11/10/42	W. J. W. / M. J. W.
C	BY REV: REPLACED S-1370-1 TERM WITH S-1635-1 TERM ON PB31 & PB32 WIRES. ADDED S-1637-1, S-1637-2 TO EQUIP TABLE. ADD TVA-1B15 CAPACITOR TO EQ & F/D SER 18260315 & 18260316	11/10/42	W. J. W. / M. J. W.
D	BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)	5-278	W. J. W. / M. J. W.
E	BY REV: SER 18260216 & ON WAS SER 18260796 & ON; ADD DETAIL 'C', C611001-0102, PB33 & SER; SER OUT C611001-0101 & DFH-PB23 (SR7624) & (SR7639)	5-278	W. J. W. / M. J. W.
F	BY REV: SER OUT C611001-0102 & SER IN: C611001-0201 SER (SR7912)	5-278	W. J. W. / M. J. W.
G	BY REV: CHANGE CONTROL NUMBER (2-150-014) WAS 12-173-0905 (621912)	10-28-42	W. J. W. / M. J. W.



DETAIL (OPTIONAL) USED WITH ADF INSTL



DETAIL SER (SR7639) (18262936)



SEE PG 4.7.3

- NOTES:
- 1 AMP TERMINAL 42281-2 ON CONDUCTOR
 - 2 AMP TERMINAL 2-323931-2 ON SHIELD & GND WIRE
 - 3 8 GAUGE SHIELDED WIRE MATERIAL PER S-1934-B
 - 4 -9 OBSERVE POLARITY SYMBOL ON DIODE WHEN INSTALLING ON SWITCH TERMINALS OR DIODE WILL FAIL WHEN SYSTEM IS ENERGIZED

ITEM NO	DESCRIPTION	QUANTITY
12	C593001-0101 OVERVOLTAGE SENSOR	1
11	S-2135-1 LIGHT ASSY	1
10	C611501-0102 ALTERNATOR ASSY	1
9	S-1360-5 CKT BKR	1
8	C611001-0101 HOUSING (80690)	1
7	S-1915-1 FILTER	1
6	OT1019-2 DIODE ASSY	1
5	S-1924-1 SWITCH	1
4	S-1936-60 CKT BKR	1
3	OT10038-2 FILTER	1
2	C611001-0101 REGULATOR	1
1	C611501-0101 ALTERNATOR ASSY	1

DESIGN	NAME	DATE
H	W. J. W.	7-18-42
GROUP	A. J. W.	7-18-42
DRAWN	D. L. BURKE	5-12-42
CHECK	S. J. W.	5-24-42
STRESS	W. C. DALE	7-17-47
PROJECT	W. J. W.	7-18-42
APPD	W. J. W.	7-18-42

CONTRACT NO.	NAME	DATE
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	S. J. W.	5-24-42
	W. C. DALE	7-17-47
	W. J. W.	7-18-42
	W. J. W.	7-18-42

LET	REVISION DESCRIPTION	DATE	APPROVED
A	BY REV: SER OUT C611501-0101 & SER IN C611501-0102 (SR6292)	10/22/42	W. J. W. / M. J. W.
B	BY REV ADD: C593001-0101 OVERVOLTAGE SENSOR, S-2135-1 LIGHT ASSY, WIRES D-PB32, D-PB32, S-1943-2 WAS S-1943-1 (SR6754)IX	11/10/42	W. J. W. / M. J. W.
C	BY REV: REPLACED S-1370-1 TERM WITH S-1635-1 TERM ON PB31 & PB32 WIRES. ADDED S-1637-1, S-1637-2 TO EQUIP TABLE. ADD TVA-1B15 CAPACITOR TO EQ & F/D SER 18260315 & 18260316	11/10/42	W. J. W. / M. J. W.
D	BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)	5-278	W. J. W. / M. J. W.
E	BY REV: SER 18260216 & ON WAS SER 18260796 & ON; ADD DETAIL 'C', C611001-0102, PB33 & SER; SER OUT C611001-0101 & DFH-PB23 (SR7624) & (SR7639)	5-278	W. J. W. / M. J. W.
F	BY REV: SER OUT C611001-0102 & SER IN: C611001-0201 SER (SR7912)	5-278	W. J. W. / M. J. W.
G	BY REV: CHANGE CONTROL NUMBER (2-150-014) WAS 12-173-0905 (621912)	10-28-42	W. J. W. / M. J. W.

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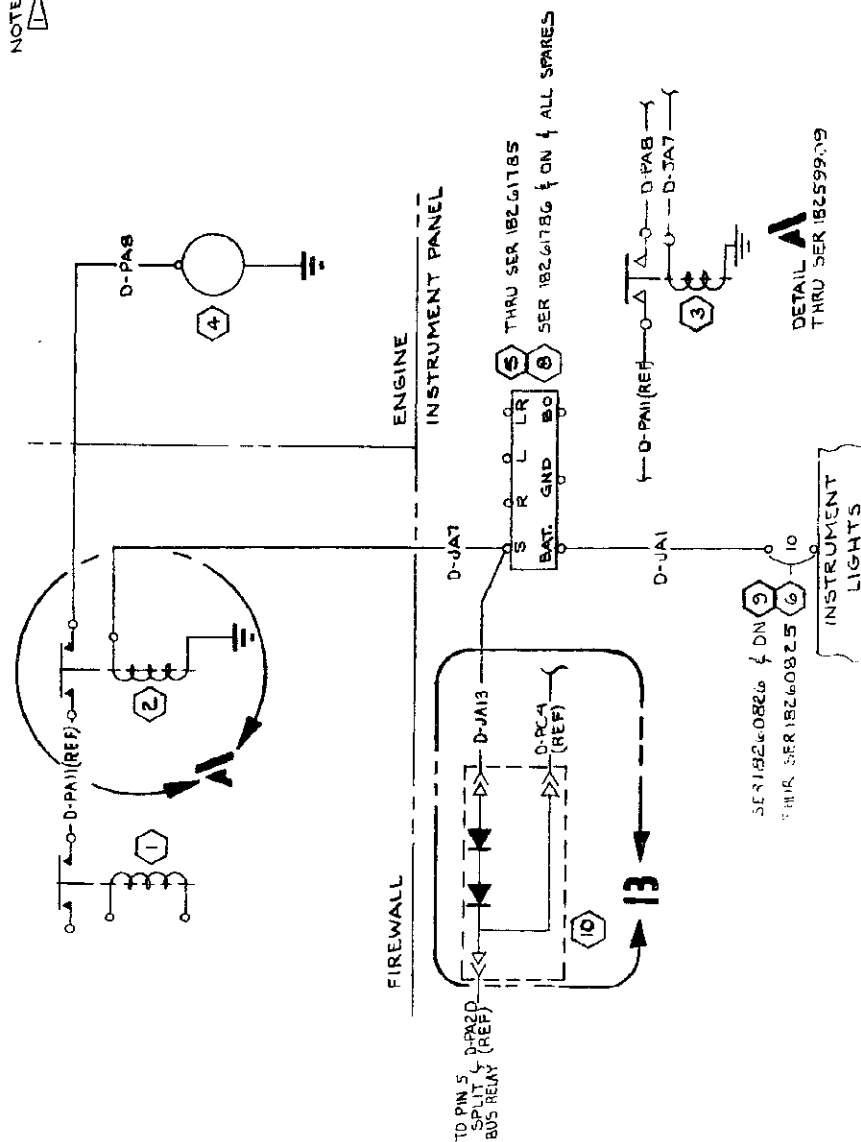
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	W. J. W.	7-18-42
	W. J. W.	7-18-42

Change 3 20-5

NOTES:
 ▷ PART OF OT50201 ENGINE INSTALLATION.



WIRE CODE NO.	GA	MATERIAL	LO	TERMINALS	SERIALS
D-JA13 1B		S-1493-1		S-1367-14	SER (SR8259) 1 ON
D-JA12 1B		S-1370-1		S-1367-14	SER 18260826 THRU 18260825
D-JA11 1B		S-1493-1		S-1367-14	SER 18257220 THRU 18257225
D-PAS 2		S-1367-14		S-1367-14	
D-JA1 1B		S-1367-14		S-1367-14	
D-JA1 1B		S-1367-14		S-1367-14	

WIRE CODE NO.	GA	MATERIAL	LO	TERMINALS	SERIALS
10		S-1360-10L			
9		L292501-01AS			
7		IN2070			
5		S-1360-10			
4		C292501-01AS			
3		S-1673-1			
2		S-1991-1			
1		0112603-2			

PART NO.	DESCRIPTION	INSTALLED ON
13	DIODE BOARD ASSY	
9	CIRCUIT BREAKER	
7	DIODE	
5	CIRCUIT BREAKER	
4	STARTER	
3	START SOLENOID	
2	CONTACTOR	
1	CONTACTOR BATTERY	

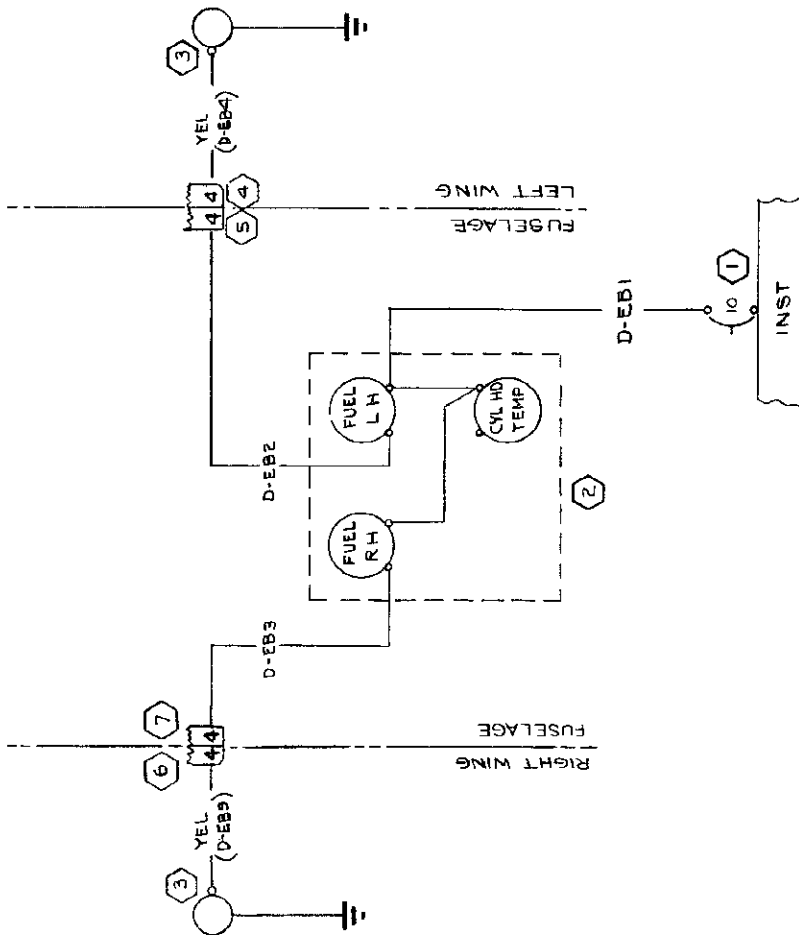
REV	DATE	BY	CHKD	REVISION
A	10-1-54	WUR	WUR	INST WAS INSTRUMENT LIGHTS REMOVED 9-13-70 6-1 BUS BAR FROM EXT-S-100-10 WAS 9-13-70 REMOVED D-PAS FROM EXT; ADDED WIRE LENGTHS TO WLT
B	10-1-54	WUR	WUR	ADD D-JA11, 18700821 D-PAL (REF) WAS D-PAS (REF) (SR8259)
C	10-1-54	WUR	WUR	BY REV: S-1073-1 WAS OT50027-1 1510043-1 WAS 1510042-1
D	10-1-54	WUR	WUR	BY REV: ADD DETAIL A; S-1991-1 & SR ED, R.R. 10472 (SR6222)
E	10-1-54	WUR	WUR	BY REV: C292501-0101 WAS C18129-1; SER OUT C292501-0101; SER IN C292501-0105; SER OUT S-1860-10; SER IN S-1860-10L (SR7126) (SR675A) (REF)
F	10-1-54	WUR	WUR	BY REV: ADDED WIRE LENGTHS (LOW SHOP PRACTICE)
G	10-1-54	WUR	WUR	BY REV: IN2070 WAS 1570043-1 ADDED DETAIL 'B'; SER OUT D-JA11; SER IN D-JA12. DELETE D-PCA (REF) SER 18260826
H	10-1-54	WUR	WUR	BY REV: ADD 1570043 JA13 & DETAIL 'B'; SER OUT JA1Z & DETAIL 'B' (SR8259)

NAME	DATE	TITLE
RIDDER-11-62		WIRING DIAGRAM - STARTER SYSTEM
GROUP		
CHECK		
APPROV		

DESIGNED BY	DATE	REV	GA	MODEL	PAGE
		182			6-1

FORM NO.	ISSUED
80-181	10-1-54

CHG LEFT	REVISION	BY	DATE	CHK APPD
A	ADDED WIRE FROM BATT BUS TO INST. TERMINAL WAS S-1632-10; CARGO DOOR WAS S-1632-10; CARGO DOOR WAS S-1632-10; INST WAS INST LIGHTS	WJR	7-24-63	
B	BY REV: S-1636-2/EB2 & EB3 WAS S-341-2/EB2 & EB3; ADD S-1637-2 & S-1637-2 (NOW SIOP PRACT.)	SEC	4-6-75	
C	BY REV: S-1640-6 WAS S-1637-1 LEFT WING; S-1641-6 WAS S-1637-2 LEFT WING; S-1640-9 WAS S-1637-1 RIGHT WING; S-1641-9 WAS S-1637-2 RIGHT WING, ADD LG 35/ YEL (EBS) & 18/YEL (EB 4) (MER 182E019) (SR 80372)	BRF	5-27-74	



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		
18		S-1367-10	S-1635-2		

DATE	BY	FILE
9-14-62	RIDDER	
10-17-62		
10-22-62		
10-27-62		

DRAWN: RIDDER
 CHECKED: R. L. L. (10-22-62)
 APPROVED: R. L. L. (10-27-62)

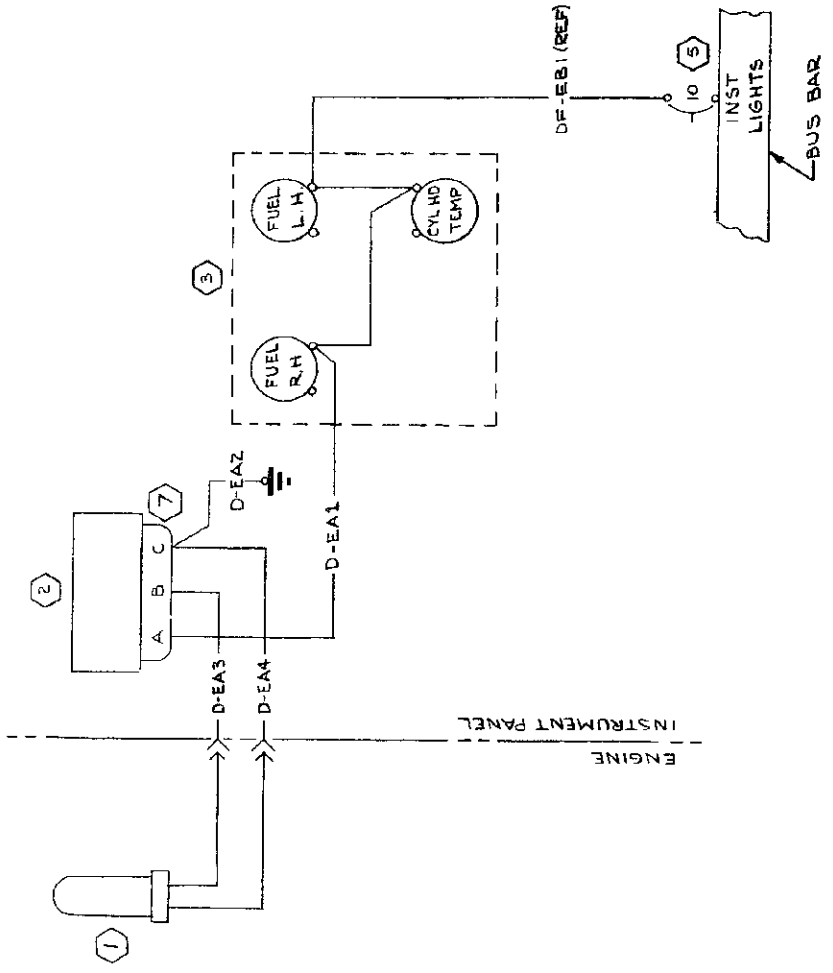
CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS
WIRING DIAGRAM — FUEL QUANTITY INDICATOR
 PART NO. 0770610
 REV. B. PAGE 9.2

PART NO.	DESCRIPTION	INSTALLED ON
7	S-1641-9 HOUSING	
6	S-1640-9 HOUSING	
5	S-1641-6 HOUSING	
4	S-1640-6 HOUSING	
3	0726110-1 XMTY FUEL LEVEL	
2	669502-0103 INST CLUSTER KIT	
1	S-1360-10 CIRCUIT BREAKER	

APPROVED BY	SUPPLIERS	MODEL	182	REV	B	PAGE	9.2
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CHK LET	REVISION	BY	CHK
A	WIRE REPAIR MAN TERMINALS TO OTHER TERMINAL ON R.H. FUEL GAUGE	H L W 1-2-53	WLD 1-2-53
B	BY REV: 5-1360-10 WAS 5-1232-10, DELETE DF-BB1 & CT13706-1 FROM EQUIP TABLE; CG69502-020'S WAS CT13602-1; DF-BB1 (REF) WAS ITEM 4.	J H 7-21-57	WLD 7-21-57
C	BY REV: CG69502-0201 WAS CG69502-0208 ED 4 22 10 9 83 (NEW SHOP PRFT)	ELY 7-7-70	WLD 7-7-70

NOTES:
 BURNDY YE14-H FURNISHED WITH 0550209-1



WIRE CODE NO.	GA.	MATERIAL	LG.	TERMINALS	SERIALS
D-EA4	18	105 YE14-H	SOLDER		
D-EA3	18	105 YE14-H			
D-EAZ	18	105 YE14-H			
D-EA1	18	105 YE14-H	SOLDER		

NO.	DESCRIPTION	PART NO.	INSTALLED ON
7	MS306A-K5-T5 PLUG		
6	5-1360-10 CIRCUIT BREAKER		
4	CG69502-0201 INST CLUSTER		
2	S-TB1-1 INDICATOR		
1	0550209-1 BULB-CARB AIR		

DRW	DATE	TITLE
RIDDER	7-14-52	WIRING DIAGRAM - CARBURETOR AIR TEMP (OPT)
CHECK	10-5-52	
APPROV	10-12-52	

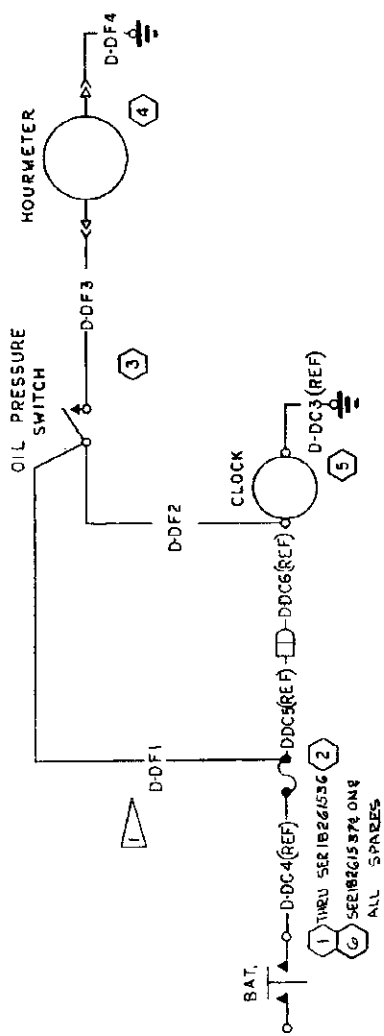
ISSUED BY	EXPRESS	MODEL	182	REV	C	PAGE	8.3
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CISSNA REPAIR CO COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS
 0770610

SEE 182-58354-1 ON

REV	DATE	BY	CHKD	APPROV
A	5-1579-2	SRH	WLD	
B	5-272	SRH	WLD	

REVISION
 A BY REV: SEE OUT 5-1579-1
 LADD 5-1579-2 (SECTION)
 B BY REV: ADDED WIRE LENGTHS
 5-1807-1-B WAS 5-1807-1-G
 PER D-DF1, D-DF2 & D-DF3
 (NOW SHOP PRACTICE)



NOTE:
 1 WHEN AN OPTIONAL ELECTRIC CLOCK IS INSTALLED, WHEN ELECTRIC CLOCK IS NOT INSTALLED WIRE D-DF1 CONNECTS PRESSURE SWITCH TO FUSEHOLDER. INSTALL 5-1091-1 FUSE AND 5-1090-22 FUSEHOLDER.

WIRE	GAUGE	TERMINALS	SIGNALS
D-DF4	18	24	5-1493-1 5-1367-18
D-DF3	18	50	5-1493-1 5-1367-18
D-DF2	18	100	5-1367-18 5-1367-18
D-DF1	18	205	5-1367-18 SOLDER

DATE	BY	CHKD	APPROV
5-1579-2	SRH	WLD	
5-272	SRH	WLD	

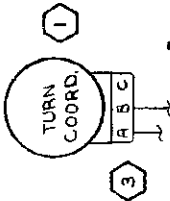
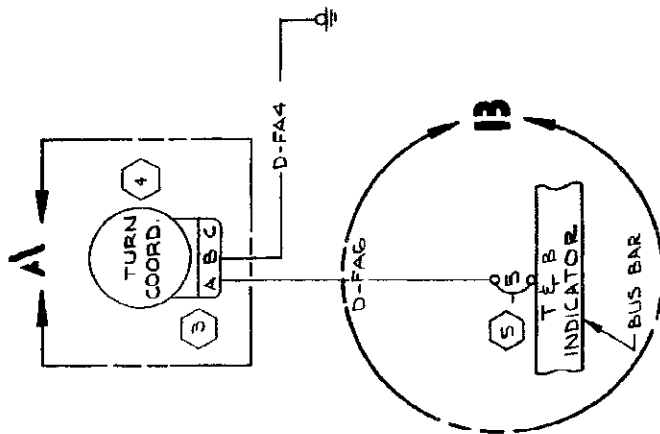
WIRING DIAGRAM
 HOURMETER
 (OPT)

0770610

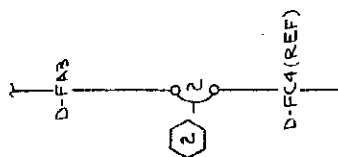
REV B PAGE 8.4

PART NO.	DESCRIPTION	INSTALLED ON
5-1579-2	CONTACTOR	
5-1371-1	CLOCK	
C66450-0101	HOURMETER	
5-1711-1	OIL PRESSURE SW	
5-1091-1	FUSE	
5-1579-1	BAT. CONTACTOR	

REV	DESCRIPTION	DATE	APPD
A	BY REV: ADDED DETAIL A ITEM 4; DELETE (OPT) FROM TITLE. ED: RRO2376 (SR 5852) II	6-18-68	YFG XFW DGA
B	BY REV: SER OUT CA-2 & D-FA3; SER IN S-1360-S & D-FA6; ADD DETAIL B ED: RRR 10508 (SR 6030) II	DLB MOS XFW HMC	
C	BY REV: ADDED WIRE LENGTHS & S-1367-1-U WAS S-1547-1-B PER D-FA6 (NOW SHOP PRACTICE)	BRM XFW NML	



DETAIL A
THRU SER 18259305



DETAIL B
THRU SER 18260055

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
D-FA6	18	S-1360-S SOLDER	17		SER 18260056 10N
D-FA4	18	S-1360-S SOLDER	20		
D-FA3	18	S-1360-S SOLDER			THRU SER 18260055

WIRE TABLE

CONTRACT NO.		COMMERCIAL AIRCRAFT DIV. PORT WICHITA, KANSAS	
DESIGN	NAME	DATE	TITLE
GROUP	H. H. HARRIS	9-13-67	WIRING DIAGRAM --
DRAWN	HARRIS	9-8-67	TURN COORDINATOR
CHECK	LAURIE	9-9-67	
STRESS	Bank	9-11-67	
PROJECT	H. H. HARRIS	9-14-67	
APPD	E. L. BANKS	9-14-67	
SIZE	NO.	DWG NO.	
C	71379	0770610	
SCALE:	NONE	182	PAGE: 8.9

5	S-1360-S	CIRCUIT BREAKER
4	C661003-0501	TURN COORDINATOR
3	MS3106A105L35	CONNECTOR
2	CA-2	CIRCUIT BREAKER (80602)
1	C661003-0201	TURN COORDINATOR

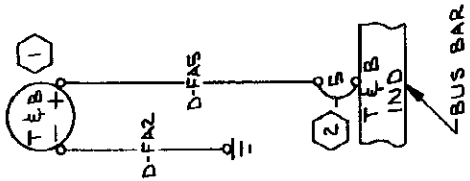
EQUIPMENT TABLE

SUPERSEDES:
CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESNA SPEC. NO.
S-XXX OR CMXXX=CESNA
STD. NO.

SUPERSEDED BY:



REVISION		
LET	DESCRIPTION	DATE
A	BY REV: ADDED WIRE LENGTHS & S-1801-1-4 WAS S-1801-1-8 PER D-FAS (NOW SHOP PRACTICE)	BRM 5-2-73
		BY M/G M/C



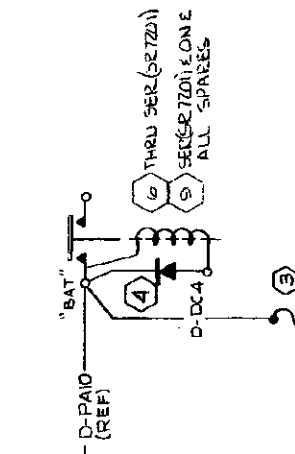
WIRE TABLE					
WIRE CODE NO.	G.A.	MATERIAL	LG.	TERMINALS	SERIALS
D-FAS 1B			10	S-1801-1-8	
D-FAS 1B			11	S-1801-1-8	

CONTRACT NO.		COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS	
DESIGN H. WISE	DATE 7-18-69	TITLE Cessna Aircraft Co.	
GROUP H. WISE	DATE 7-18-69	WIRING DIAGRAM -	
DRAWN D.L. BURKE	DATE 5-12-69	TURN & BANK INDICATOR -	
CHECK E. YOUNGER	DATE 2-2-70	(OPTIONAL)	
STRESS W.C. DALE	DATE 7-17-69	SIZE C	CODE IDENT. DWG NO.
PROJ. H. W. COLE	DATE 7-11-67	NO. 71379	0770610
APPD. <i>[Signature]</i>		SCALE: NONE	1B2
OTHER			PAGE: 9.5

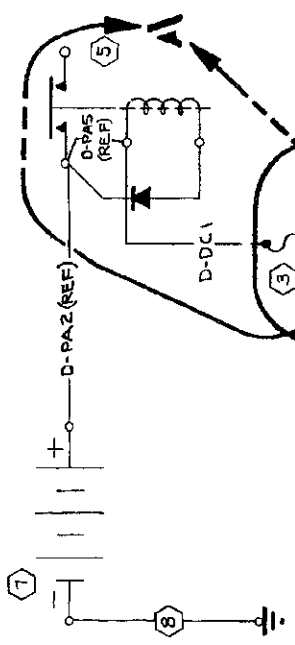
2	S-1360-5	CIRCUIT BKR
1	S-1302-1	INDICATOR T & B
	PART NO.	DESCRIPTION
		EQUIPMENT TABLE
SUPPERSEDES: P 9.1 SUPPERSEDED BY:		
CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESNA SPEC. NO. S-XXX OR CXXXX-CESNA STD. NO.		

CHG	REV	BY	DATE	DESCRIPTION
A	1	WJK	7-15-64	ADDED WIRE LENGTHS TO W/171 REMOVED D-PAZ & D-PAS FROM E/T
B	2	WJK	7-15-64	BY REV: ADD DETAIL A, D-DC4, SERIALS, ITEM 6 INACTIVATED D-DC1
C	3	WJK	7-15-64	ADD DETAIL B, D-DC5 & D-DC6 INACTIVATED D-DC2
D	4	WJK	7-15-64	BY REV: S-1579Z WAS 5-1517N1
E	5	WJK	7-15-64	BY REV: SER OUT S-1579Z ADD S-1579-2 (SER 720)
F	6	WJK	7-15-64	BY REV: ADDED WIRE LENGTHS (NON-SHOP PRACTICE) 5-272
G	7	WJK	7-15-64	BY REV: SER OUT DETAIL A ADD WIRE COLOR REW D-DC5 LG, 18 W/AS 15 REF D-DC5 SER 18257626 MFR 18257626

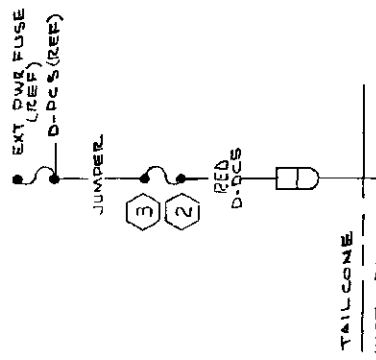
SER 1825668B THRU
SER 18257626



DETAIL A
SER 1825668B THRU
SER 18257626



DETAIL B
SER 18257626 THRU
SER 1825668B



WIRE	GA	MATERIAL	LG	TERMINALS	SERIALS
D-DC1	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC2	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC3	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC4	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC5	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC6	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B

WIRE	GA	MATERIAL	LG	TERMINALS	SERIALS
D-DC1	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC2	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC3	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC4	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC5	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC6	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B

WIRE	GA	MATERIAL	LG	TERMINALS	SERIALS
D-DC1	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC2	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC3	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC4	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC5	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B
D-DC6	18	SOLDER	200	SOLDER	INACTIVE THRU SER 1825668B

WIRE TABLE

CESSNA AIRCRAFT CO COMMERCIAL AIRCRAFT DIVISION WICHITA, KANSAS

WIRING DIAGRAM
CLOCK

DATE: 10-8-62
DRAWN: RIDDER
CHECKED: [Signature]
APP'D: [Signature]

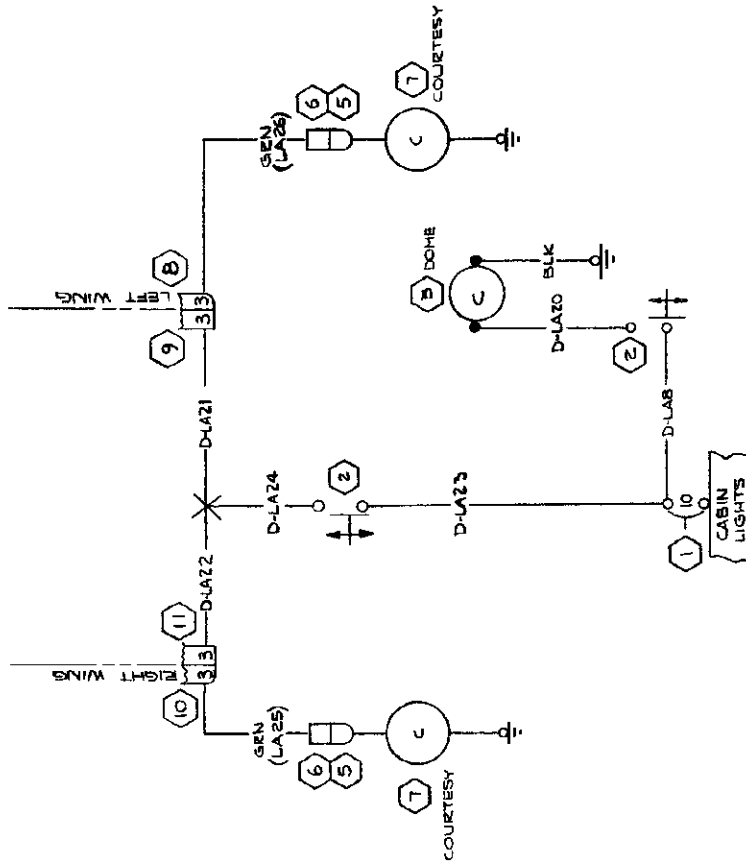
REV: 6
PAGE: 10.1

0770610

PART NO.	DESCRIPTION	INSTALLED ON
5-1579-2	CONTACTOR	
04-12007-1	STRAP-BAT. GND	
0712-605-1	BATTERY	
5-1579-1	CONTACTOR-BAT.	
0712603-2	CONTACTOR-BAT.	
0710128-1	DIODE ASSY.	
5-1091-1	FUSE	
5-1090-22	FUSE HOLDER	
5-1579Z	CLOCK	

PART NO.	DESCRIPTION	INSTALLED ON
5-1579-2	CONTACTOR	
04-12007-1	STRAP-BAT. GND	
0712-605-1	BATTERY	
5-1579-1	CONTACTOR-BAT.	
0712603-2	CONTACTOR-BAT.	
0710128-1	DIODE ASSY.	
5-1091-1	FUSE	
5-1090-22	FUSE HOLDER	
5-1579Z	CLOCK	

LET	REVISION	DESCRIPTION	DATE	APPD
A	BY REV: DELETE D-LA1 & D-LA2; ADD D-LA24; D-LA23 WAS D-LA1 (SR 7350)II		DLO 7-24-73	DLO 7/24/73
B	BY REV: S-1640-6 WAS S-1637-1 LEFT WING; S-1641-6 WAS S-1637-2 LEFT WING; S-1641-9 WAS S-1637-1 RIGHT WING; GRN(LA26) & GRN(LA25) WAS GRN, ADD LG135/GRN 4120/GRN (MER 182EC196) (SR 80872)		BRF 5-21-74	BRF 5/21/74



WIRE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
120	S-1635-2	S-1636-2			
	S-1830-1	S-1830-2			
	S-1837-1	S-1830-1			
	S-1867-1	S-1867-1			
	S-1635-2	S-1636-2			
	S-1642-1	S-1636-2			
	S-1642-1	S-1636-2			
	S-1830-1	SOLDER			
	S-1867-1	S-1830-1			

CONTRACT NO.	NAME	DATE
	CESSNA AIRCRAFT CO.	
	COMMERCIAL AIRCRAFT DIV.	
	8800 E. PAWNEE	
	WICHITA, KANSAS	

DESIGN	GROUP	DATE
	H. W. W.	2-22-73
DRAWN	PAPER	2-22-73
CHECK	EXAMINER	2-22-73
STRESS	DATE	8 Aug 77
PROJ	NO.	2-22-73
APPD	BY	
OTHER		

TITLE	SIZE	CODE IDENT.	DWG NO
CESSNA AIRCRAFT CO.	C	71379	0770610
WIRING DIAGRAM -			
DOMO & COURTESY LIGHTS			
(OPT)			

SCALE	PAGE	NO.	TOTAL
1:1	132		

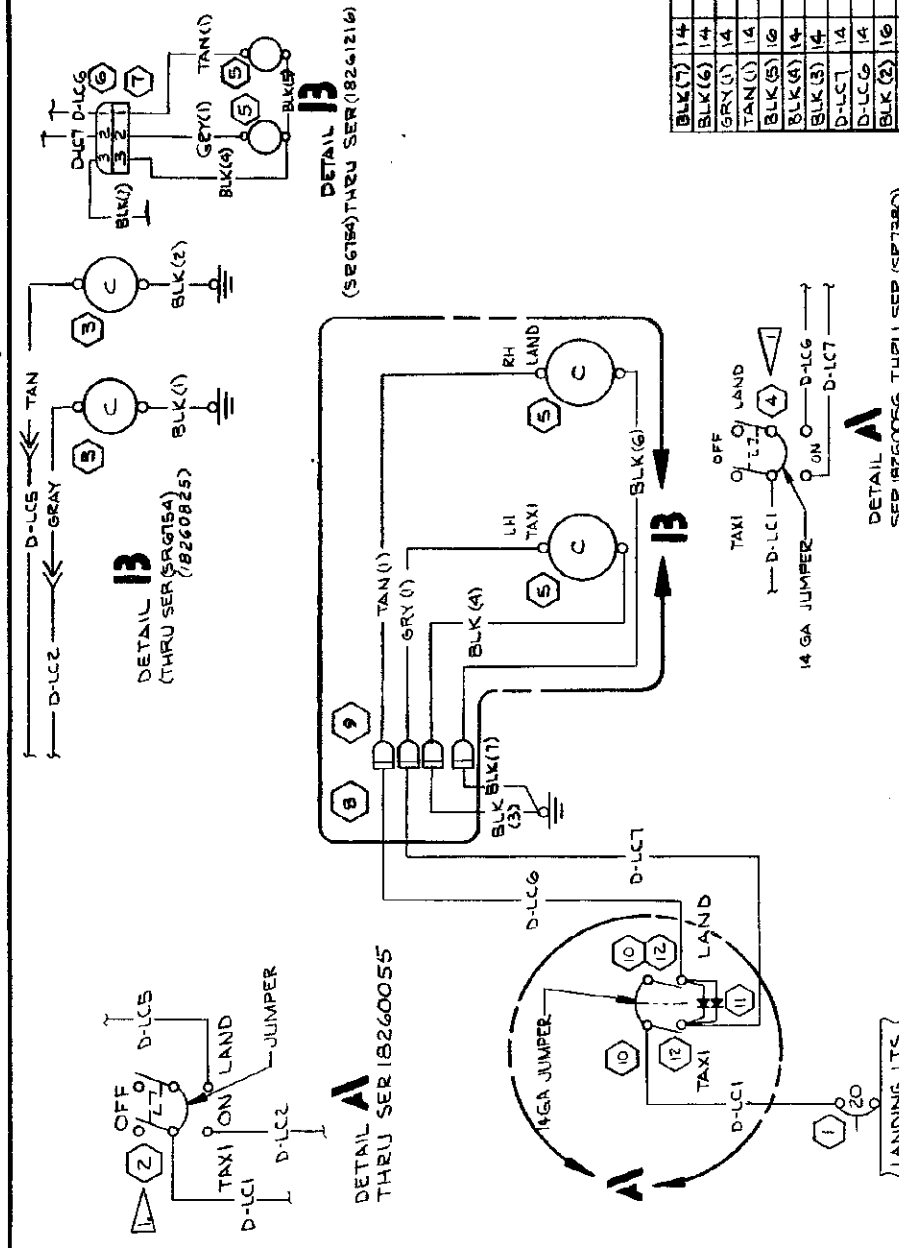
NO.	DESCRIPTION
11	S-1641-9 HOUSING - SCKT
10	S-1640-9 HOUSING - PIN
9	S-1641-6 HOUSING - SCKT
8	S-1640-6 HOUSING - PIN
7	MS15584-2 LAMP
6	S-1637-2 HOUSING
5	S-1637-1 HOUSING
4	
3	S-1876-1 LAMP
2	S-1831-1 SWITCH
1	S-1860-10L CKT SKZ

PART NO.	DESCRIPTION

EQUIPMENT TABLE	

CESS-1000 IS APPLICABLE
 VENDOR CODES PER S-1400
 CES-XXXX-CESSNA SPEC. NO.
 S-XXX OR CXXXX-CESSNA
 STD. NO.

SUPERSEDED BY:
 P 11-1



LET	REVISION	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT S-1846-1-13 SER IN S-1846-1-13; ADD DETAIL A ED ERR 10486		DLB 5-12-68	WJW
B	BY REV: SER OUT D-LC2, D-LC3, TAN, GRAY, BLK(1), BLK(2), D-LS21B-1; SER IN D-LC6, D-LC7, BLK(3), BLK(4), BLK(5), TAN(1), GRAY(1), 4509, S-1638-1-1-2; ADD DETAIL B (SRG15A) II		RLX 9-2-71	WJW
C	BY REV: SER OUT BLK(5), ITEMS 6 & 7; ADD DETAIL B, ITEMS 8 & 9; (SER 18261216) I		VBS 5-31-72	WJW
D	BY REV: ADD S-2160-1, 127088, S-2023-1 (SER 18261216) II		DUP 1-4-73	WJW
E	BY REV: ADDED WIRE LENGTHS & S-1847-2-12 WAS S-1847-2-8 PER BLK(5) & BLK(7); S-1638-2 WAS S-1638-2 PER BLK(3). (NOW SHOP PRACTICE)		BRM 5-2-73	WJW

INACTIVE: SEE 1826254-2
 SER 18261216
 SER 1826254-2

ITEM NO.	DESCRIPTION	VENDOR
12	S-2023-1	TERM ADAPTER
11	127082-2	DIODE ASSY
10	S-2160-1	SWITCH
9	S-1637-1	HOUSING
8	S-1637-2	HOUSING
7	S-1638-2	HOUSING
6	S-1638-1	HOUSING
5	4509	LANDING LIGHT (2AA4G)
4	S-1846-1-13	SWITCH
3	052318-1	LANDING LIGHTS
2	S-1846-1-1	SWITCH
1	S-1360-20	CIRCUIT BKR

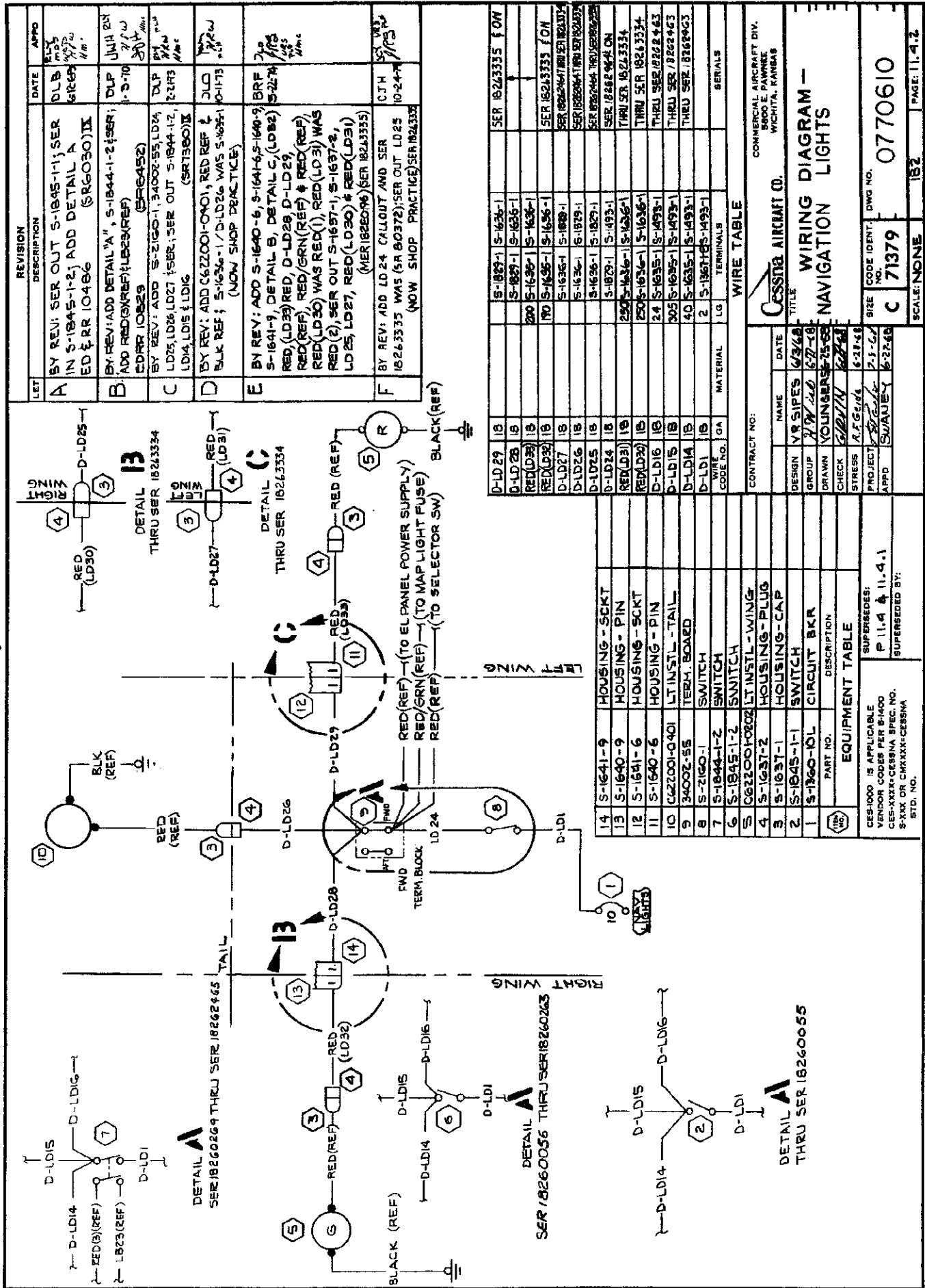
NOTES:
 SWITCH IS MECHANICALLY INTERCONNECTED SO THAT DEPRESSING 'LAND' PORTION OF SWITCH TO 'ON' POSITION ALSO CARRIES 'TAXI' PORTION OF SWITCH TO 'ON' POSITION

ITEM NO.	DESCRIPTION	VENDOR
BLK(7) 14	-14-O 23 S-1636-2 S-1847-2-2	SER 18261216 (ON)
BLK(6) 14	-14-O 74 S-1635-2 S-1367-2-8	SER 18262082 (ON)
GRY(1) 14	-14-B 74 S-1635-2 S-1367-2-8	SER 18262082 (ON)
TAN(1) 14	-14-10 50 S-1635-2 S-1367-2-8	SER 18262082 (ON)
BLK(5) 16	-16-O 8 S-1367-2-8 S-1367-2-8	THRU SER 18261216
BLK(4) 14	-14-O 50 S-1367-2-8 S-1635-2	SER 18262082 (ON)
BLK(3) 14	-14-O 23 S-1847-2 S-1636-2	SER 18262082 (ON)
D-LC1 14	52 S-1493-2 S-1636-2	SER 18262082 (ON)
D-LC6 14	52 S-1493-2 S-1636-2	SER 18262082 (ON)
BLK(2) 16	-16-O 7 S-1367-2-8 S-1367-2-8	THRU SER 18262082
BLK(1) 16	-16-O 7 S-1367-2-8 S-1367-2-8	THRU SER 18262082
TAN 14	160 S-341-1 S-1367-2-8	THRU SER 18262082
GRAY 14	160 S-341-1 S-1367-2-8	THRU SER 18262082
D-LC5 14	26 S-1493-2 S-341-1	THRU SER 18262082
D-LC2 14	26 S-1493-2 S-341-1	THRU SER 18262082
D-LC1 14	3 S-1493-2 S-1367-2-8	THRU SER 18262082

CONTRACT NO.	NAME	DATE
	CESNA AIRCRAFT CO. <td>8/7/68</td>	8/7/68
	DESIGN	8/7/68
	GROUP	8/7/68
	DRAWN	8/7/68
	CHECK	8/7/68
	STRESS	8/7/68
	PROJECT	8/7/68
	APPD	8/7/68

WIRE NO.	WIRE	TERMINAL
1	14 GA	1
2	14 GA	2
3	14 GA	3
4	14 GA	4
5	14 GA	5
6	14 GA	6
7	14 GA	7
8	14 GA	8
9	14 GA	9
10	14 GA	10
11	14 GA	11
12	14 GA	12
13	14 GA	13
14	14 GA	14

DESIGN	DATE	APPD
WIRING DIAGRAM	8/7/68	WJW
LANDING LIGHTS	8/7/68	WJW
SIZE	CODE IDENT	DWG NO.
C	71379	0770610
SCALE: NONE	182	PAGE: 11.3.1



LET	REVISION DESCRIPTION	DATE	APPO
A	BY REV: SER OUT S-1845-1-2; ADD DETAIL A IN S-1845-1-2; ADD DETAIL A ED & RR 10486 (SRG030)IX	DLB 6-18-68	MD5 7/10/68
B	BY REV: ADD DETAIL "A", S-1844-1-2 (SER); ADD RED (REF) (LD28) (REF)	DLP 1-3-70	JWH 2/1/70
C	BY REV: ADD S-2160-1, S-4002-55, LD24, LD25, LD26, LD27 (SER); SER OUT S-1844-1-2, LD14, LD15 & LD16 (SR1380)IX	DLP 2-21-70	MD5 7/10/68
D	BY REV: ADD C622001-0401, RED REF & BLK REF; S-1636-1/1 D-LD26 WAS S-1635-1 (NOW SHOP PRACTICE)	DLD 10-11-73	JWH 2/1/70
E	BY REV: ADD S-1640-6, S-1641-6 (S-1640-9), RED (LD33) RED, D-LD28, D-LD29, RED (REF), RED (GRN) (REF) & RED (REF) (REF) (LD30) WAS RED (1), RED (LD3) WAS RED (2), SER OUT S-1637-1, S-1637-2, LD25, LD27, RED (LD30) & RED (LD31) (MER1826096) (SER 18243335)	BRF 9-22-74	JWS 1/15/75
F	BY REV: ADD LD 24 CALLOUT AND SER 18243335 WAS (SR B0372); SER OUT LD25 (NOW SHOP PRACTICE) (SER 18243335)	CJH 10-24-74	JWS 1/15/75

WIRE NO.	WIRE	TERMINALS	LG	MATERIAL
D-LD29	18	S-1827-1 S-1636-1		SER 18243335 F ON
D-LD28	18	S-1829-1 S-1636-1		
RED (LD28)	18	200 S-1636-1 S-1636-1		
RED (LD32)	18	190 S-1636-1 S-1636-1		SER 18243335 F ON
D-LD27	18	S-1636-1 S-1636-1		SER 18243335 F ON
D-LD26	18	S-1636-1 S-1636-1		SER 18243335 F ON
D-LD25	18	S-1636-1 S-1636-1		SER 18243335 F ON
D-LD24	18	S-1829-1 S-1636-1		SER 18243335 F ON
RED (LD31)	18	290 S-1636-1 S-1636-1		THRU SER 18243334
RED (LD29)	18	250 S-1636-1 S-1636-1		THRU SER 18243334
D-LD16	18	24 S-1635-1 S-1493-1		THRU SER 18243334
D-LD15	18	205 S-1635-1 S-1493-1		THRU SER 18243334
D-LD14	18	40 S-1635-1 S-1493-1		THRU SER 18243334
D-LD1	18	2 S-1637-1 S-1493-1		THRU SER 18243334

CONTRACT NO.	NAME	DATE
	VR SIPS	6-21-68
	GROUP	2/1/70
	DRAWN	6-21-68
	CHECK	6-21-68
	STRESS	6-21-68
	PROJCT	2-1-70
	APPR	6-21-68

DESIGN	DATE
S-1845-1-2	6-21-68
S-1637-2	6-21-68
S-1637-1	6-21-68
S-1845-1-1	6-21-68
S-1860-10L	6-21-68

PART NO.	DESCRIPTION
14	S-1641-9 HOUSING - SKT
13	S-1640-9 HOUSING - PIN
12	S-1641-6 HOUSING - SKT
11	S-1640-6 HOUSING - PIN
10	C622001-0401 LT INSTL - TAIL
9	34002-55 TERM. BOARD
8	S-2160-1 SWITCH
7	S-1844-1-2 SWITCH
6	S-1845-1-2 SWITCH
5	C622001-0402 LT INSTL - WING
4	S-1637-2 HOUSING - PLUG
3	S-1637-1 HOUSING - CAP
2	S-1845-1-1 SWITCH BKR
1	S-1860-10L CIRCUIT BKR

EQUIPMENT TABLE
CES-1000 IS APPLICABLE
VENDOR CODES PER 8-1400
CES-XXXX-CESNA SPEC. NO.
S-XXX OR CM-XXX-CESNA
STD. NO.

SCALE	NO. OF SHEETS	SHEET NO.
1:1	1	1

WIRING DIAGRAM - NAVIGATION LIGHTS

CSSTB AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
3800 E. PARKWAY
MORTAL, KANSAS

SIZE: C

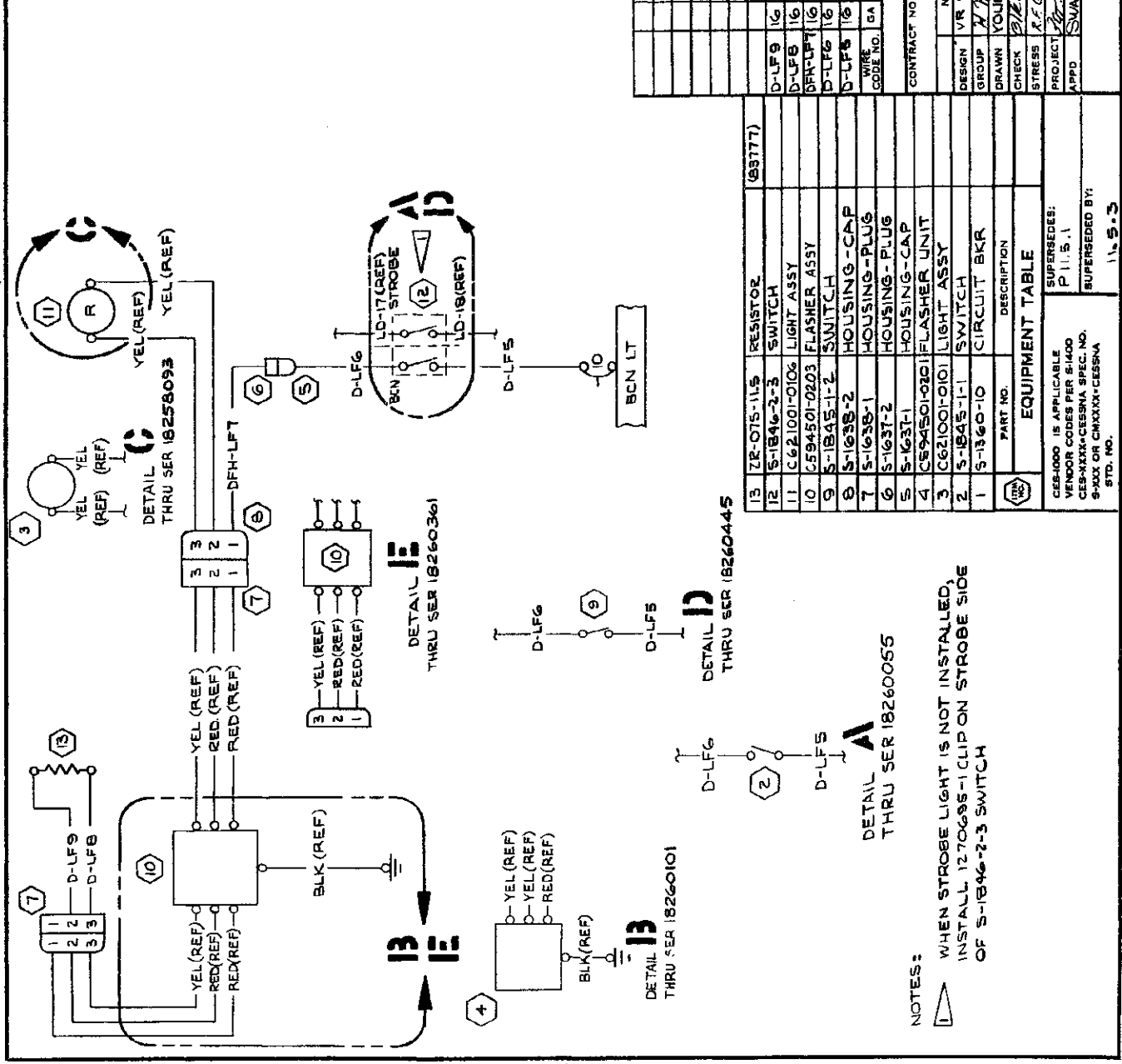
CODE IDENT. NO.: 0770610

SCALE: NONE

ED & RR 02383 SER 182593064 ON

LET	REVISION	DESCRIPTION	DATE	APPD
A		BY REV: SER OUT S-1845-1-1, SER IN S-1845-1-2, ADD DETAIL A & B DETAIL C, C594501-0203 & C621001-0103 ED & RR 10486 (SR 6030) II ED & RR 10540 (SR 6264)	P6P 7/23/69	RLY MOS APPW MOS MOS
B		BY REV: ADD S-1846-2-3, DETAIL D & NOTE 1 (SR 6392) II ED & RR 10831	JDR 12/18/68	JDR MOS DLS MOS
C		BY REV: ADD DETAIL E, D-LFG, D-LF9 & ZR-075-11-5 ED & RR 10879 (SR 6265)	RLY 3-6-70	RLY MOS MOS MOS MOS
D		BY REV: C621001-0106 WAS C621001-0108 DLP	DLP 1/17/73	DLP MOS
E		BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)	SRM 5-2-73	SRM MOS

INACTIVE BE 612
YES 8-25-72
MOS
MOS
MOS



WIRE TABLE	WIRE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
	D-LF9	16		75	S-1636-2	S-1493-2
	D-LF8	16		75	S-1636-2	S-1493-2
	DFH-LFT	16		70	S-1636-2	S-1635-2
	D-LF6	16		300	S-1493-2	S-1635-2
	D-LF5	16		6	S-1637-2	S-1493-2
	WIRE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS

CONTRACT NO: _____

NAME: _____ DATE: 6/9/78

DESIGN: VR STP'S 6/9/78

GROUP: M. H. W. 6/27/78

DRAWN: YOUNGERS 6/27/78

CHECK: B. E. G. 6/27/78

STRESS: B. E. G. 6/27/78

PROJECT: 7-2-G-2

APPD: SWANEY 6-27-68

COMMERCIAL AIRCRAFT DIV.
BRAC E. FAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM - FLASHING BEACON LIGHT (OPT)

SIZE: CODE IDENT. DWG NO. 0770610

NO. 71379

SCALE: NONE

PAGE: 11.5.2

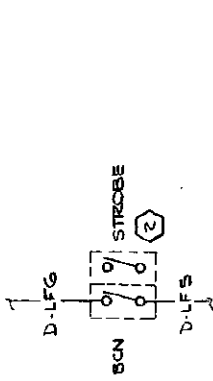
RESISTOR	SWITCH	FLASHER ASSY	HOUSING-CAP	HOUSING-PLUG	HOUSING-PLUG	HOUSING-PLUG	FLASHER UNIT	LIGHT ASSY	SWITCH	CIRCUIT BKR		
13 ZR-075-11-5	12 S-1846-2-3	11 C621001-0106	10 C594501-0203	9 S-1845-1-2	8 S-1638-2	7 S-1638-1	6 S-1637-2	5 S-1637-1	4 C594501-0201	3 C621001-0101	2 S-1845-1-1	1 S-1840-10

EQUIPMENT TABLE
SUPERSEDES: P 11.5.1
SUPERSEDED BY: 11.5.3

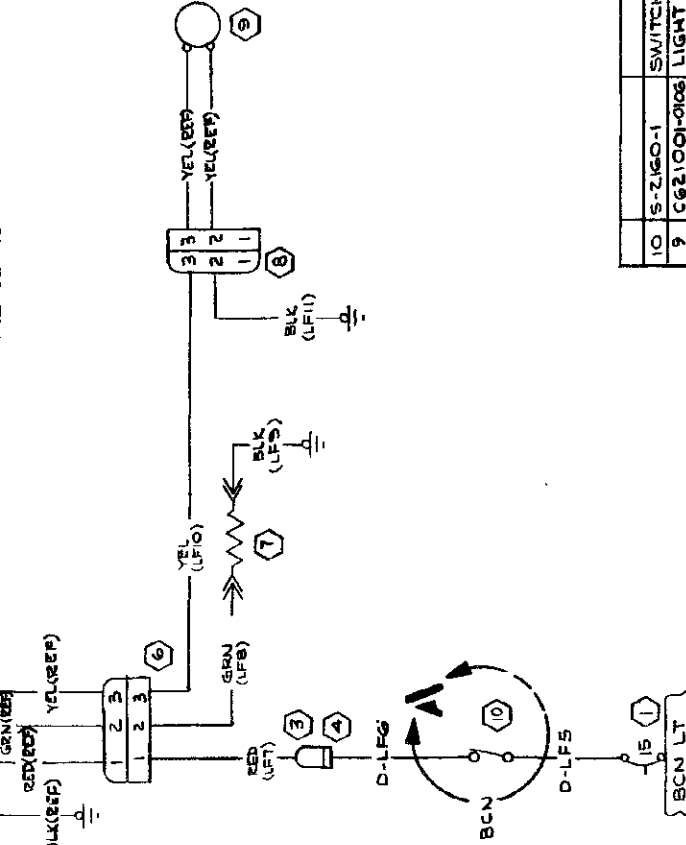
NOTES:

WHEN STROBE LIGHT IS NOT INSTALLED, INSTALL 1270695-1 CLIP ON STROBE SIDE OF S-1846-2-3 SWITCH

REV	DESCRIPTION	DATE	APP'D
A	BY REV: ADD S-2160-1, RED (REF), YEL (REF), BLK (SER), SER OUT S-1846-2-3, LFT, LFB, LFS, LFI0, LFI1; ADD NOTE 1; C621001-0106 WAS C621001-0103 (SER 18261862)	DUP 1-10-73	BY MAG
B	BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)	ARM 5-2-73	BY MAG
C	BY REV: S-1846-15L WAS S-1360-10L; LFS, LFB * LFT 14 GA WIRE WAS 16 GA (S-18260)	BAH 5-13-75	BY MAG



DETAIL A
THRU SER 18262465



NOTES:
1. COLORED WIRES BEARING CESSNA CODING IN PARENTHESES SHALL NOT BE STAMPED. CESSNA CODING ON THESE WIRES IS FOR PARTS LIST USE ONLY

REV	DESCRIPTION	DATE	APP'D
6	S-1695-2	S-182628	SER 18261863 (ON)
6	S-1636-2	S-1635-2	SER 18261863 (ON)
6	S-1693-2	S-182628	SER 18261863 (ON)
15	S-1636-2	S-1693-2	SER 18261863 (ON)
15	S-1636-2	S-1636-2	SER 18261863 (ON)
6	S-1693-2	S-182628	THRU SER 18261862
6	S-1636-2	S-1635-2	THRU SER 18261862
3	S-1497-2	S-182628	THRU SER 18261862
15	S-1636-2	S-1693-2	THRU SER 18261862
15	S-1636-2	S-1636-2	THRU SER 18261862
6	S-1693-2	S-1493-2	THRU SER 18261862
6	S-1693-2	S-1493-2	THRU SER 18261862

WIRE TABLE

CONTRACT NO. _____

NAME _____ DATE _____

DESIGN VE SIPS 3/25/72

GROUP 7/7/40 5-2372

DRAWN VE SIPS 5-2372

CHECK WHITE 5-23-72

STRESS _____

PROJ 11/16/74 5-23-72

APP'D _____

OTHER _____

COMMERCIAL AIRCRAFT DIV.
8500 E. FAHWEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM --
FLASHING BEACON
LIGHT

SIZE CODE IDENT. DWG NO
C 71379 0770610

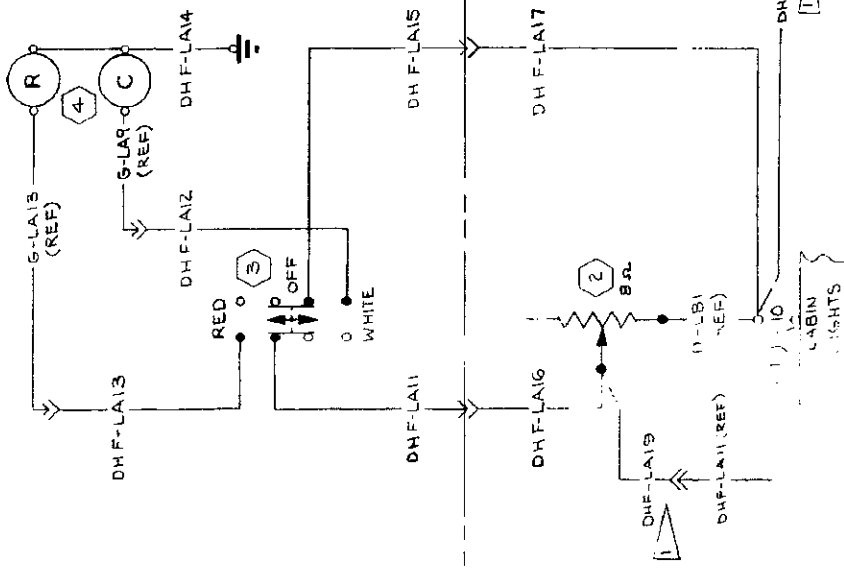
SCALE: NONE 1:1

PAGE: 11.9.3

NO	DESCRIPTION	VENDOR
10	S-2160-1 SWITCH	
9	C621001-0106 LIGHT ASSY	
8	S-1636-2 HOUSING - CAP	
7	OR95-1-5 RESISTOR	B3111
6	S-1636-1 HOUSING - PLUG	
5	C594502-0101 FLASHER ASSY	
4	S-1637-2 HOUSING - PLUG	
3	S-1846-2-3 HOUSING - CAP	
2	S-1846-2-3 SWITCH	
1	S-1360-15-4 CIRCUIT BREAKER	

EQUIPMENT TABLE	
CEB-1000 IS APPLICABLE	SUPERSEDES: PG 11.5.2
VENDOR CODES PER S-1400	SUPERSEDED BY:
CESSXXX-CESNA SPEC. NO.	S-XXX OR CMTXXX-CESNA
STD. NO.	

NOTES:
 WIRES DHF-LA18 & DHF-LA19 READ
 FOR 'R.H. MAP LT. INSTL ARE OPT
 (INSTALLED WITH OPT POST LTS).



INACTIVE:
 TRU SER 1825-845
 11/1/69
 MAR 10
 1825-845

CHG LET	REVISION	BY	CHK
A	REMOVED NOTE 18-1 & JUMPER.	11/1/69	11/1/69
B	REMOVED OPT FROM T/S ADD WIRES DHF-LA18, DHF-LA19 & NOTE 1. REMOVED 18-1 FROM RECORD FIELD.	JH	11/1/69
C	CHANGED R12 1/2-B-RS 34 TO XR6657 (RHEOSTAT SR6657).	YR	11/1/69

WIRE CODE NO	GA	MATERIAL	LC	TERMINALS	SERIALS
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)
DHF-LA18	18	SOLDER	S-341-2	0770725	(OPT)

INSURULATOR	61073
1 470089-14 LIGHT ASSY	
1 S-1501-1 SWITCH	
2 XR6657 RHEOSTAT (S-3177)	
1 S-1360-10 CIRCUIT BREAKER	

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

WIRING DIAGRAM — MAP LIGHT

0770610

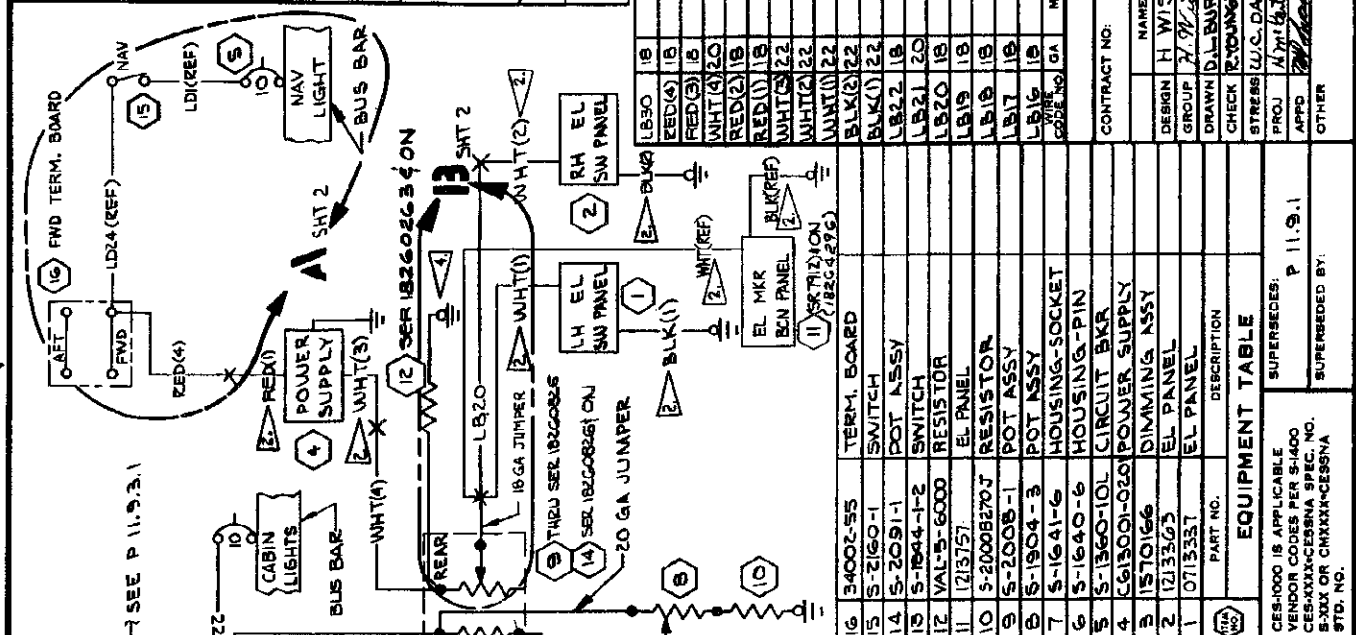
11.6.1

182

0770610

11.6.1

LET	DESCRIPTION	REVISION	DATE	APPD
A	BY REV: ADD NOTE 4, REFR, LB23, LB44-12, VAL-5-6000, DETAIL A, 9 SER: SER OUT REVD 1-5-70 ED: RR 10528 (SER: 6522)		DLP 1-5-70	JUN 82
B	BY REV: 270MM 1/2 W RESISTOR WAS 47 OHM 1/2 W ED: RR 10001 (NOW SHOP PRACTICE)		J.G. 4-20-70	904
C	BY REV: ADD S-2091-1 & SER; SER OUT S-2008-1 SEE 18240815		RCA 9-20-72	877
D	BY REV: ADD S-2160-1, S-4002-55, SER: 1 & SER; SER OUT S-1844-1-2, REVD(8) LB30; LB30 WAS LB23 (SER: 1380) II		DLP 2-21-73	877
E	BY REV: ADD WIRE LENGTHS, S-1870-1 WAS S-1870-2 PER LB20 (NOW SHOP PRACTICE)		SRM 5-2-73	877
F	BY REV: DELETE S-6X, 2W 10% RESISTOR ADD: 18 GA JUMPER S-1370-2 WAS S-1370-1/2-74 LB20; DELETE: 270MM 1/2 W RESISTOR ON FRONT RHEOSTAT; SER: 18242285 MER ED: 542 SER: 5879(2)		CJH 12-74	877
G	BY REV: ADD WIRING FOR 121571 EL MKR BCN PANEL (SER: 712)		BAH 2-28-75	877
H	BY REV: 013531 WAS 121507, 1213363 WAS 121392 ADD PG. 14, 9, 2, 1. DETAIL 'B' & SECS 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100		GW 6-23-75	877

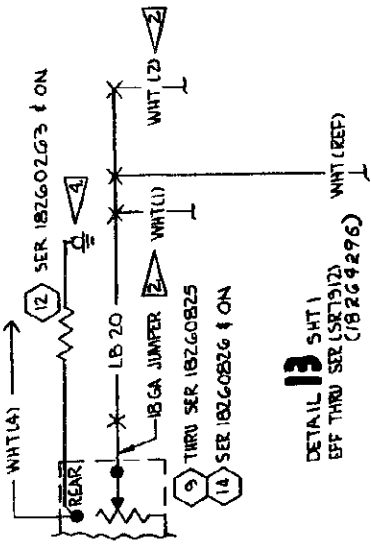


ITEM NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
16	34002-55 TERM. BOARD	1	PCB	
15	S-2160-1 SWITCH	1	SW	
14	S-2091-1 POT ASSY	1	POT	
13	S-1844-1-2 SWITCH	1	SW	
12	VAL-5-6000 RESISTOR	1	RES	
11	1213757 EL PANEL	1	PAN	
10	S-20082707 RESISTOR	1	RES	
9	S-2008-1 POT ASSY	1	POT	
8	S-1904-3 POT ASSY	1	POT	
7	S-1641-6 HOUSING-SOCKET	1	SOCK	
6	S-1640-6 HOUSING-PIN	1	PIN	
5	S-1360-101 CIRCUIT BKR	1	BKR	
4	C613001-020 POWER SUPPLY	1	SPLY	
3	1570166 DIMMING ASSY	1	ASSY	
2	1213363 EL PANEL	1	PAN	
1	0713337 EL PANEL	1	PAN	

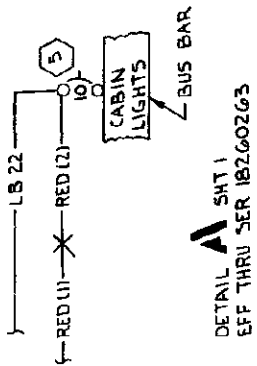
NOTES:

- 1 TO BE RETAINED IN TERMINAL, WIRE MUST BE STRIPPED, DOUBLED & TWISTED
- 2 THESE WIRES VENDOR FURNISHED
- 3 WHEN POST LIGHTS ARE INSTALLED, S-1493-1 TERMINAL REPLACES S-1829-1 TERMINAL
- 4 THIS END OF RESISTOR TERMINATED WITH S-1367-1-14 TERMINAL & INSTALLED ON SHAFT OF TANDERM POT ASSY. DUE TO HEAT DISSIPATION, RESISTOR MUST BE KEPT FROM WIRE BUNDLE

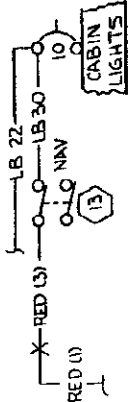
REVISION		DATE	APPRO
LET	DESCRIPTION		
H	SEE PG. 11.9.2 FOR REVISION		



DETAIL B SHT 1
EFF THRU SER 1B2G02G3
(1B2G0B26)



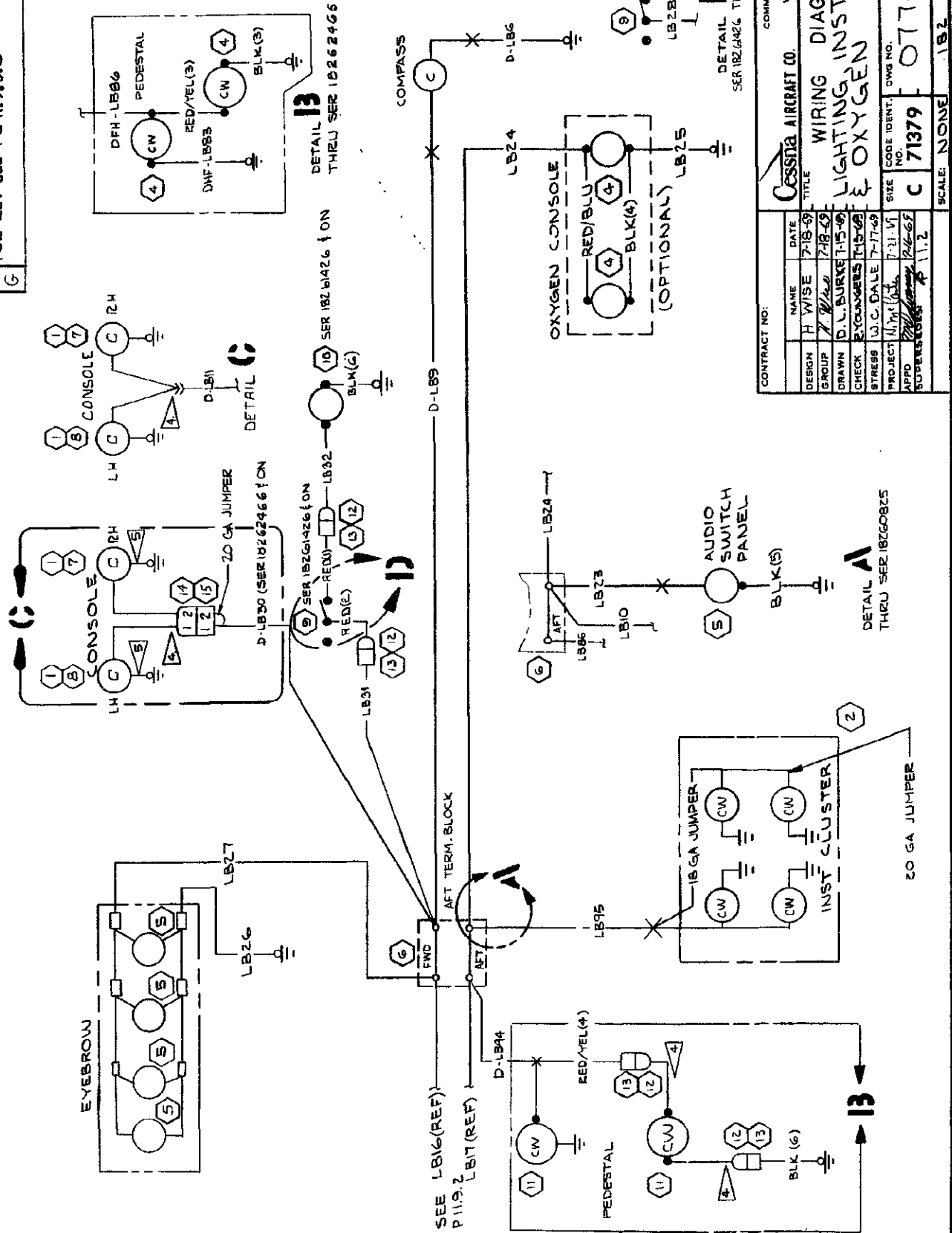
DETAIL A SHT 1
EFF THRU SER 1B2G02G3



DETAIL A SHT 1
SER 1B2G02G4 THRU SER 1B2G24G5

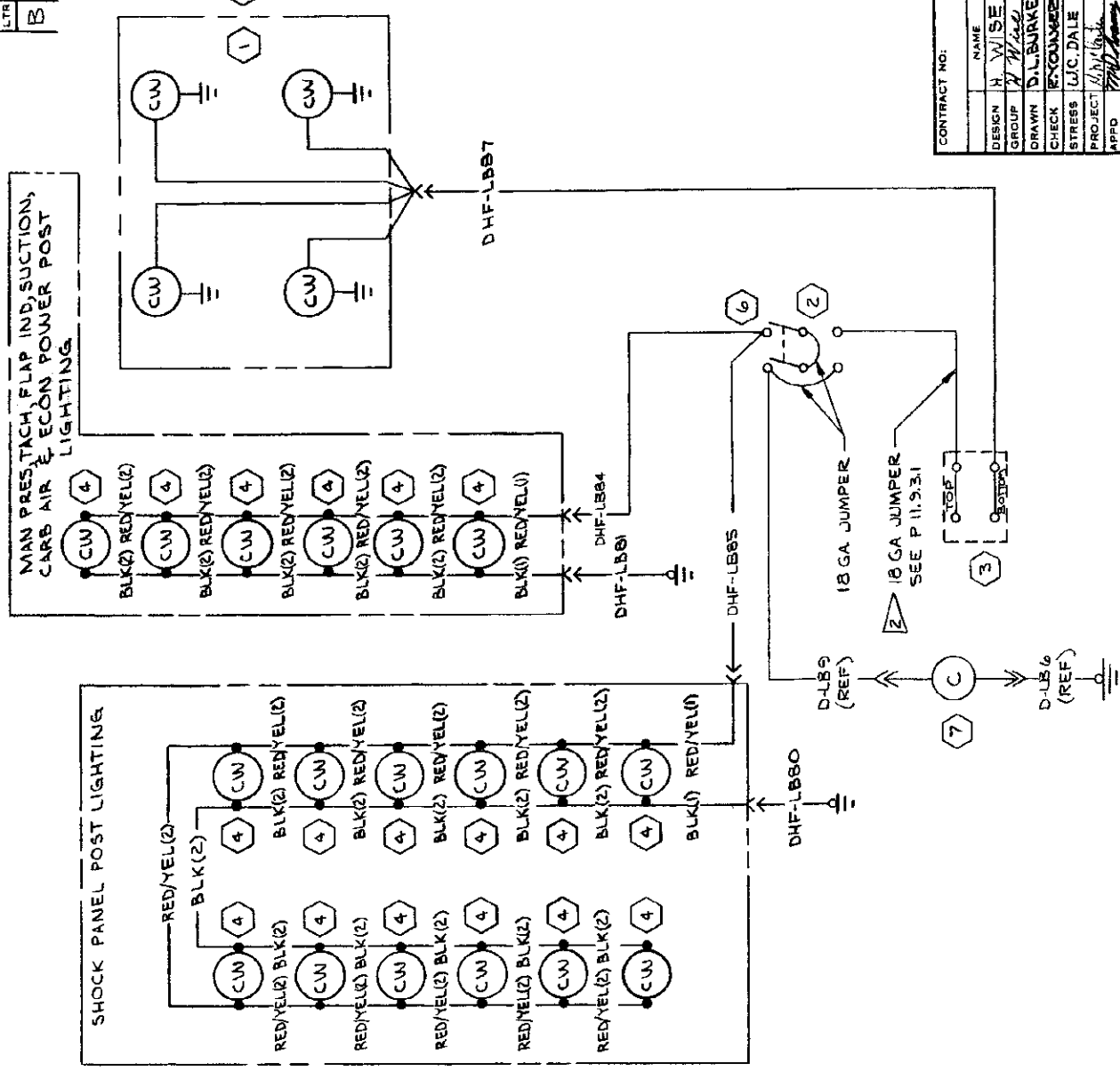
CONTRACT NO.		PAWNEE DIVISION 8800 E. PAWNEE WICHITA, KANSAS	
NAME	DATE	Cossida AIRCRAFT CO.	
DESIGN	6-23-75	TITLE	
GROUP	6-23-75	WIRING DIAGRAM -	
DRAWN	6-23-75	ELECTRO LUMINESCENT	
CHECK	6-24-75	PANEL	
STRESS		SIZE	CODE IDENT.
PROJ	4.1.1	C	71379
APPD		DWG NO.	0770610
OTHER		SCALE: NONE	1B2
			PAGE: 11.9.2.1

REVISIONS		DATE	APPROVED
LTR	DESCRIPTION		
G	FOR REV SEE PG 11.9.3.0		



CONTRACT NO:		Cessna AIRCRAFT CO.	
NAME	DATE	COMMERCIAL AIRCRAFT DIV. WICHITA, KANSAS	
DESIGN	7-18-69	TITLE	
GROUP	7-18-69	WIRING DIAGRAM - LIGHTING INSTRUMENT & OXYGEN	
DRAWN	D. L. BURKETT-15-69	SIZE	
CHECK	W. C. DALE 7-17-69	CODE IDENT.	
PROJECT	11.9.3.0	DWG NO.	
APPROD	11.9.3.0	C 71379	
SUPERSEDES	11.2	SCALE: NONE	
		PAGE: 11.9.3.1	

REVISIONS	DATE	APPROVED
LTR		
B	SEE P 11.9.4 FOR REV.	



INACTIVE: SEE 18-25-6
 THROUGH SEP 1962 45
 BY: [Signature]
 DATE: [Signature]

CONTRACT NO.		C 71379	
DESIGN	H W SE	DATE	7-18-67
GROUP	A W	DATE	7-18-67
DRAWN	D. BURKE	DATE	6-13-69
CHECK	EXCHANGES	DATE	6-24-69
STRESS	W.C. DALE	DATE	7-17-67
PROJECT	11.9.6	DATE	7-11-67
APPD	[Signature]	DATE	7-18-67
SUPP BASE	SEE P 11.10.2		
SUPERSEDED BY: 11.9.6		SCALE: NONE	182
PAGE: 11.9.5		ED & RR 10528 (SR6030)IX	

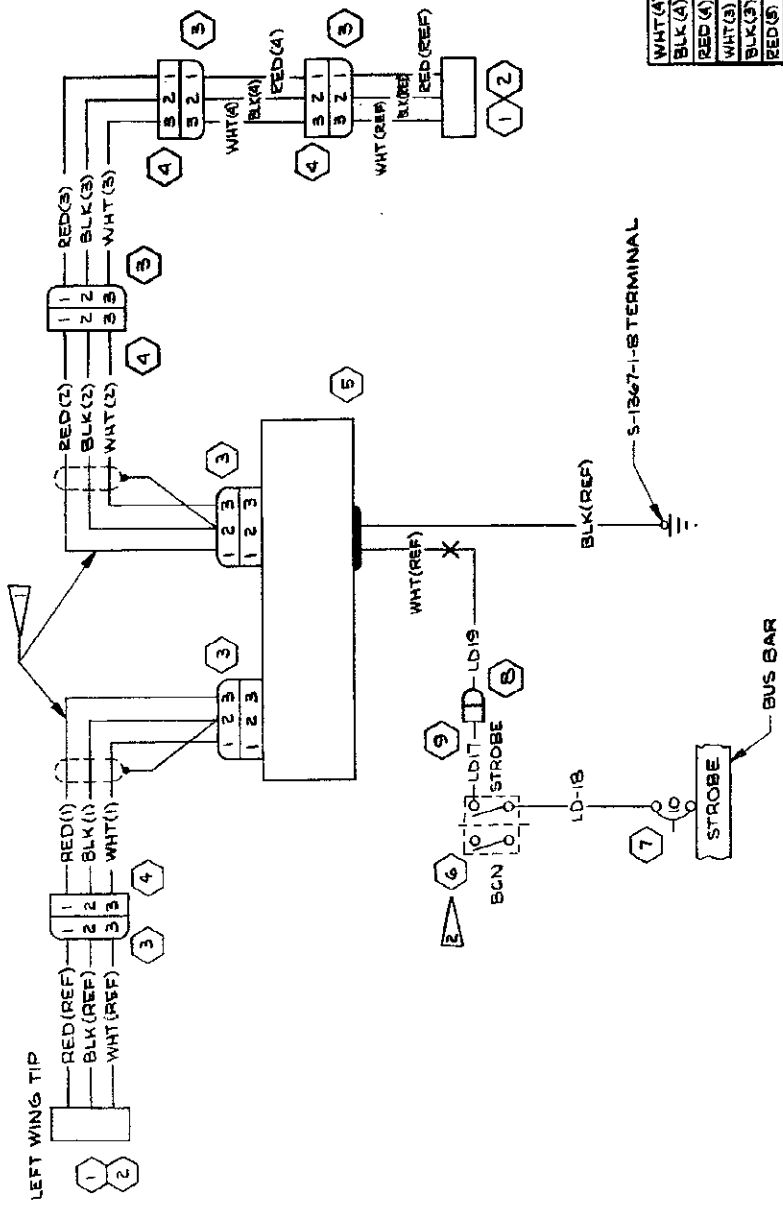
CESSNA AIRCRAFT CO.
 COMMERCIAL AIRCRAFT DIV.
 5800 E. PAWNEE
 WICHITA, KANSAS

TITLE: WIRING DIAGRAM -
 POST LIGHTING(OPT)

SIZE: C
 CODE IDENT: 0770610
 DWG NO: 0770610

LET	REVISION	DESCRIPTION	DATE	APFD
A	BY REV: 186A WAS 206A/LD17 & LD18		6-23-70	W/W H/W
B	BY REV: ADD LD19, S-1635-1 S-1636-1; C622004-0103 WAS C622004-0101; ADD RED(3), BLK(3), WHT(3), RED(4), BLK(4), WHT(4) ED18Z WAS (NOW SHOP PRACTICE)		1-21-70	W/W H/W H/S
C	BY REV: ADDED WIRE LENGTHS & BRM S-1636-2 WAS S-1636-1 PER LD17 S-1637-1-6 WAS S-1637-1-8 PER LD18 (NOW SHOP PRACTICE)		5-2-73	H/W H/W H/W

INACTIVE
 EFF FROM 1826/125
 W/W
 H/W
 H/S



- NOTES:
- THREE CONDUCTOR CABLE BELDEN (70903) PART NO. 8770 OR EQUIVALENT TO BE USED
 - WHEN BCN LIGHT IS NOT INSTALLED, INSTALL 1270695-2 CLIP ON BCN SIDE OF S-1846-2-3 SWITCH

WIRE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
1	18	WHT(4)			
2	18	BLK(4)			
3	18	RED(4)			
4	18	WHT(3)			
5	18	BLK(3)			
6	18	RED(3)			
7	18	LD19			
8	18	WHT(2)			
9	18	BLK(2)			
10	18	RED(2)			
11	18	WHT(1)			
12	18	BLK(1)			
13	18	RED(1)			
14	18	LD-17			
15	18	LD-18			
16	18	LD-19			
17	18	LD-20			
18	18	LD-21			
19	18	LD-22			
20	18	LD-23			
21	18	LD-24			
22	18	LD-25			
23	18	LD-26			
24	18	LD-27			
25	18	LD-28			
26	18	LD-29			
27	18	LD-30			
28	18	LD-31			
29	18	LD-32			
30	18	LD-33			
31	18	LD-34			
32	18	LD-35			
33	18	LD-36			
34	18	LD-37			
35	18	LD-38			
36	18	LD-39			
37	18	LD-40			
38	18	LD-41			
39	18	LD-42			
40	18	LD-43			
41	18	LD-44			
42	18	LD-45			
43	18	LD-46			
44	18	LD-47			
45	18	LD-48			
46	18	LD-49			
47	18	LD-50			
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91	18	LD-94			
92	18	LD-95			
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94	18	LD-97			
95	18	LD-98			
96	18	LD-99			
97	18	LD-100			

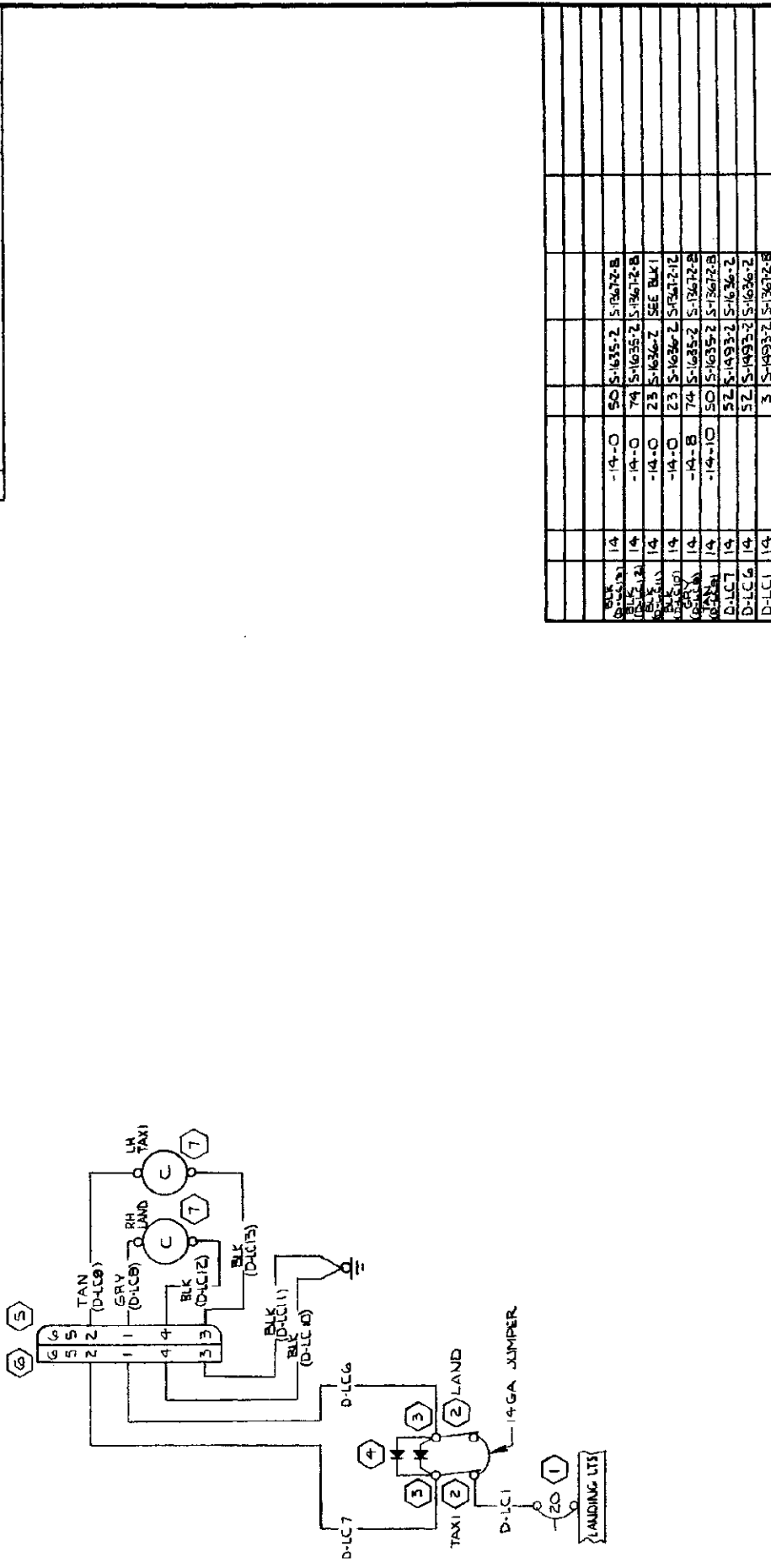
CONTRACT NO.	NAME	DATE	DESIGN	GROUP	DRAWN	CHECK	STRESS	PROJ	APPD	OTHER
	W. B. BUCK	12-14-64	1219-64	1219-64	J. D. RAINES	11/17/65		W. B. BUCK		
	J. D. RAINES	11/17/65								
	HARRIS	12-18-64								
EQUIPMENT TABLE SUPPLIES: C62-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESNA SPEC. NO. S-XXX OR CXXXXX-CESNA STD. NO.										

CONTRACT NO.	NAME	DATE	DESIGN	GROUP	DRAWN	CHECK	STRESS	PROJ	APPD	OTHER
	W. B. BUCK	12-14-64	1219-64	1219-64	J. D. RAINES	11/17/65		W. B. BUCK		
	J. D. RAINES	11/17/65								
	HARRIS	12-18-64								
EQUIPMENT TABLE SUPPLIES: C62-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESNA SPEC. NO. S-XXX OR CXXXXX-CESNA STD. NO.										

CONTRACT NO.	NAME	DATE	DESIGN	GROUP	DRAWN	CHECK	STRESS	PROJ	APPD	OTHER
	W. B. BUCK	12-14-64	1219-64	1219-64	J. D. RAINES	11/17/65		W. B. BUCK		
	J. D. RAINES	11/17/65								
	HARRIS	12-18-64								
EQUIPMENT TABLE SUPPLIES: C62-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESNA SPEC. NO. S-XXX OR CXXXXX-CESNA STD. NO.										

CONTRACT NO.	NAME	DATE	DESIGN	GROUP	DRAWN	CHECK	STRESS	PROJ	APPD	OTHER
	W. B. BUCK	12-14-64	1219-64	1219-64	J. D. RAINES	11/17/65		W. B. BUCK		
	J. D. RAINES	11/17/65								
	HARRIS	12-18-64								
EQUIPMENT TABLE SUPPLIES: C62-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX-CESNA SPEC. NO. S-XXX OR CXXXXX-CESNA STD. NO.										

LET	REVISION	DESCRIPTION	DATE	APPD
A	BY REV. TAN (LCB) WAS GRAY (LCB) & GRAY (LCB) WAS TAN (LCB) (NOW SHOP PRACTICE.)	RS	4-18-74	PHB



WIRE CODE NO.	GA.	MATERIAL	LG.	TERMINALS	SERIALS
14					
50	S-1635-2	S-13672-B			
74	S-1635-2	S-13672-B			
23	S-1636-2	SEE BLK 1			
23	S-1636-2	S-13672-B			
74	S-1635-2	S-13672-B			
50	S-1635-2	S-13672-B			
52	S-1633-2	S-1636-2			
52	S-1633-2	S-1636-2			
3	S-1633-2	S-13672-B			

CONTRACT NO.	NAME	DATE
	W. W. WALKER	10-11-73
	W. W. WALKER	10-11-73
	W. W. WALKER	10-11-73

DESIGN	GROUP	DRAWN	CHECK	STRESS
	W. W. WALKER	W. W. WALKER	W. W. WALKER	
	W. W. WALKER	W. W. WALKER	W. W. WALKER	
	W. W. WALKER	W. W. WALKER	W. W. WALKER	

PROJ.	APPD.	OTHER
W. W. WALKER	W. W. WALKER	
W. W. WALKER	W. W. WALKER	
W. W. WALKER	W. W. WALKER	

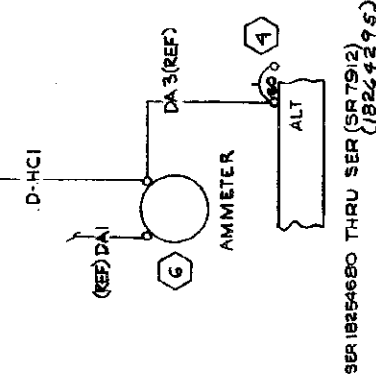
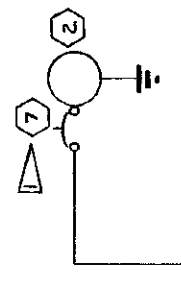
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C	71379	0770610

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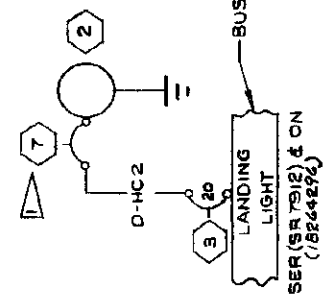
FORM NO. 8921B

CHK LET	REVISION	BY	DATE
A	ADD 60232-1 CMT BKR TO CIGAR LIGHTER. ADD D-HCI WIRE. ADD MORE (SR 4081)	GLW	12-10-52
B	ADDED WIRE LENGTH TO W/T. S-1360-20 (MOR 5-1232-50) REMOVED 07132-07-1 (0770610 -DAS FROM E/T)	BAH	2-4-78
C	BY REV: ADD DA(REF), DAS(REF), (NOW SHOP PRACTICE)	BAH	2-4-78
D	BY REV: SER IN D-HCI, S-1360-20L & SER OUT D-HCI (SRTS2(MER LO 320))	BLA	10-77

12-179-0908



THRU SER 18254679



THRU SER 18254679

NOTE: CIRCUIT BREAKER IS RESET BY INSERTING A PROBE INTO THE 1/8 DIA HOLE IN BREAKER FACE AND PUSHING LIGHTLY UNTIL A CLICK IS HEARD.

WIRE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
D-HCI 16		S-1367-25	8-1367-8-8		SER(SR7912) & ON
D-HCI 16		S-1367-2-10S	1367-2-8		SER 18254680 THRU SER(SR7912)

NAME	DATE	TITLE
RIDDER	10-5-62	WIRING DIAGRAM - CIGAR LIGHTER
CHENG	10-28-62	
PROJ	10-28-62	

PART NO.	DESCRIPTION	INSTALLED ON
7	60232-1 CMT BKR (CUE)	
6	6069502-003 INST CLUSTER KIT	
5		
4	S-1360-60 CIRCUIT BREAKER	
3	S-1360-20 CIRCUIT BREAKER	
2	0513052-3 CIGAR LIGHTER	
1	S-1232-10 CIRCUIT BREAKER	

ISSUED BY: **18Z** MODEL: **13.1** REV: **2** PAGE: **13.1**

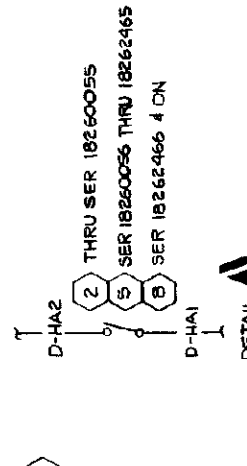
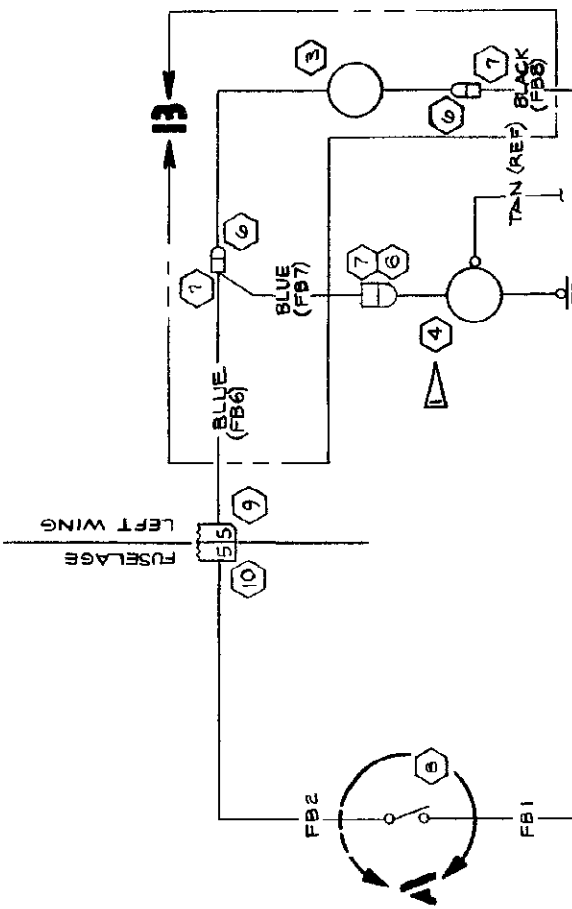
WIRE TABLE

CASSINA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WINDY HARBOR, CALIF.

CASSINA.

0770610

REV	DESCRIPTION	DATE	APPD
A	BY: SER OUT S-1845-1; SER IN S-1845-1-2; ADD DETAIL A EDERR 10486 (SR6030)IX	6-12-68	W.D. W.D.
B	BY REV: SER OUT BLU (1) BLU(2) & BLACK; SER IN BLU(1) BLU(4) & BLK(1); ADD DETAIL B & SER (SR 7320)	11-6-72	W.D. W.D.
C	BY REV: ADD S-2160-1; SER OUT S-1845-1-2 (SR7360)IX	11-4-75	W.D. W.D.
D	BY REV: S-1635-1/BLU (3) WAS S-3411/BLU (3); S-1636-2/HAZ 2 WAS S-3411/HAZ 2 (NOW SHOP PRACTICE.)	11-6-73	W.D. W.D.
E	BY REV: S-1640-6 WAS S-1637-1; S-1641-6 WAS S-1637-2; SER IN FB1 # FB2, SER OUT HAI & HAZ, 35/BLU(FB7) WAS 46, 55/BLU(FB6) WAS 75, BLU(FB8) WAS BLU(1), BLU(FB4) WAS BLU(2), BLK(FB5) WAS BLK, BLU(FB6) WAS BLU(3), BLU(FB7) WAS BLU(4), BLK (FB8) WAS BLK(1) (MER 1826196) (SR 80372)	5-22-74	W.D. W.D.



NOTES:
 ▲ ONLY HEATER CIRCUIT SHOWN, FOR STALL WARNING CIRCUIT SEE PAGE 15.1

WIRE CODE NO.	MATERIAL	LG	TERMINALS	SERIALS
95	S-1493-2	18	S-1636-2	SER 1826240 4 ON
7	S-1624-2	18	S-1636-2	SER 1826240 4 ON
18-0	B	18	S-1636-2	SER 18261798 4 ON
16-6	35	18	S-1636-2	SER 18261798 4 ON
16-6	55	18	S-1636-2	SER 18261798 4 ON
16-6	8	18	S-1636-2	THRU SER 18261797
16-6	46	18	S-1636-2	THRU SER 18261797
16-6	73	18	S-3411	THRU SER 18261797
2	S-1493-2	18	S-1636-2	THRU SER 1826239
2	S-1672-5	18	S-1493-2	THRU SER 1826239

CONTRACT NO.	NAME	DATE	TITLE
	SWANEY	6-27-68	WIRING DIAGRAM - HEATED STALL WARNING (OPT)
	YOUNGERS	6-27-68	
	W.D.	6-27-68	
	W.D.	6-27-68	

DESIGN	GROUP	CHECK	STRESS	PROJECT	APPD
S-1845-1-2	1	W.D.	W.D.	W.D.	W.D.
S-1845-1-1	2	W.D.	W.D.	W.D.	W.D.
S-1360-15L	4	W.D.	W.D.	W.D.	W.D.
S-1845-1-1	1	W.D.	W.D.	W.D.	W.D.
S-1360-15L	4	W.D.	W.D.	W.D.	W.D.

WIRE CODE NO.	MATERIAL	LG	TERMINALS	SERIALS
95	S-1493-2	18	S-1636-2	SER 1826240 4 ON
7	S-1624-2	18	S-1636-2	SER 1826240 4 ON
18-0	B	18	S-1636-2	SER 18261798 4 ON
16-6	35	18	S-1636-2	SER 18261798 4 ON
16-6	55	18	S-1636-2	SER 18261798 4 ON
16-6	8	18	S-1636-2	THRU SER 18261797
16-6	46	18	S-1636-2	THRU SER 18261797
16-6	73	18	S-3411	THRU SER 18261797
2	S-1493-2	18	S-1636-2	THRU SER 1826239
2	S-1672-5	18	S-1493-2	THRU SER 1826239

COMMERCIAL AIRCRAFT DIV.
 WICHITA, KANSAS

WIRING DIAGRAM - HEATED STALL WARNING (OPT)

CODE IDENT: DWG NO. 0770610

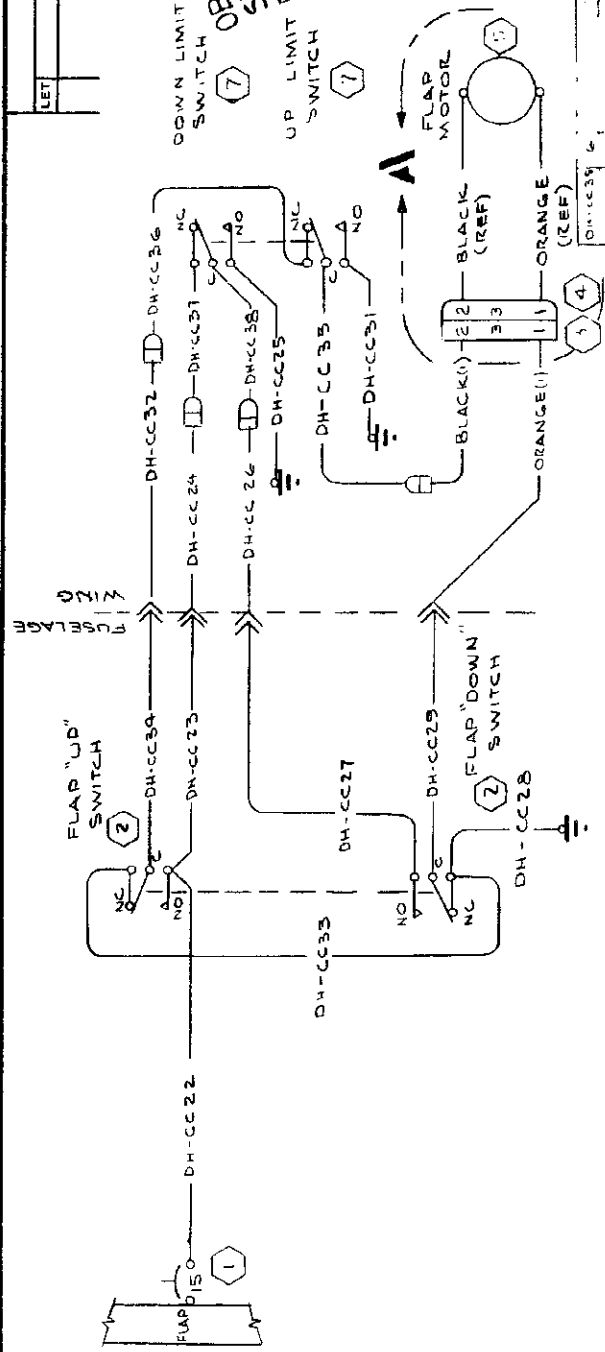
SCALE: NONE

PAGE: 13.3

EDERR02388 (SR5852) IX

REVISION	DESCRIPTION	DATE	APPRO
LET			

DOWN LIMIT SWITCH (7)
 UP LIMIT SWITCH (7)
 FLAP MOTOR
 BLACK (REF)
 ORANGE (REF)

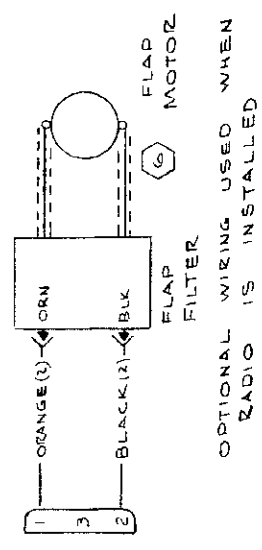


STOCKS EXHAUSTED THRU 550056
 SER 18258506
 EFF SER 18258506
 SER 18258506
 EDGOTS
 P61616
 MID 5
 NM

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
DH-CC34	16	S-1638-2			
DH-CC31	16	S-1638-2			
DH-CC34	16	S-1638-2			
TRN(2)	16	S-1638-2			
ELN(2)	16	S-1638-2			
ORN(1)	16	S-1638-2			
BLK(1)	16	S-1638-2			
DH-CC35	16	S-1638-2			
DH-CC34	16	S-1638-2			
DH-CC33	16	S-1638-2			
DH-CC31	16	S-1638-2			
DH-CC29	16	S-1638-2			
DH-CC28	16	S-1638-2			
DH-CC27	16	S-1638-2			
DH-CC26	16	S-1638-2			
DH-CC25	16	S-1638-2			
DH-CC24	16	S-1638-2			
DH-CC23	16	S-1638-2			
DH-CC22	16	S-1638-2			

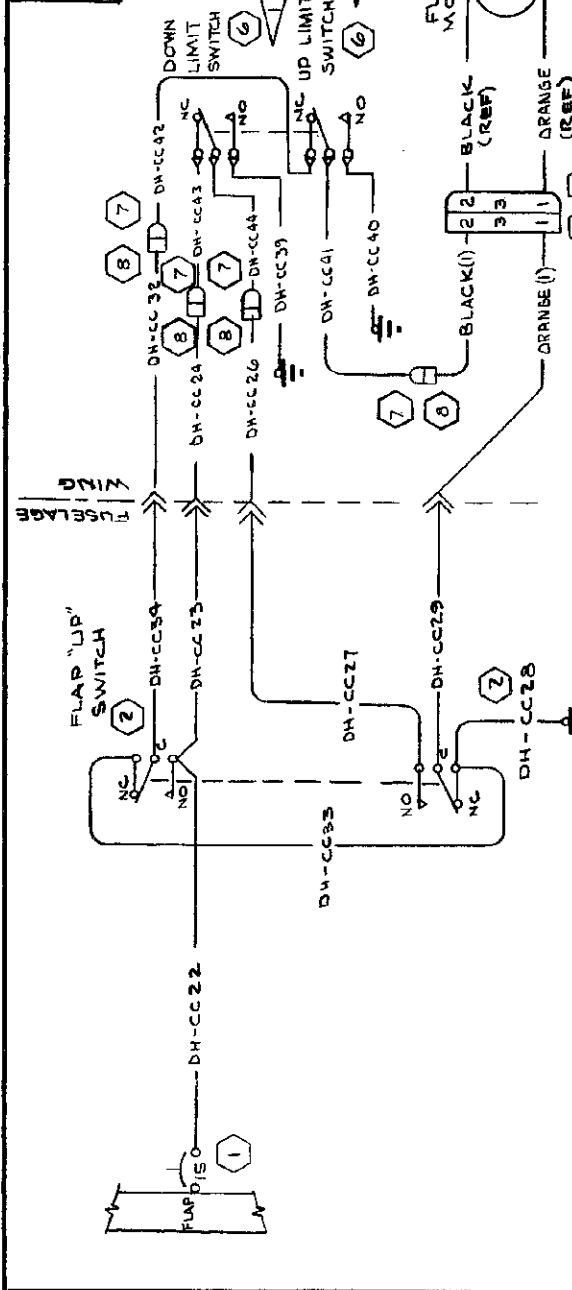
CONTRACT NO.		TITLE	
NAME	DATE	NAME	DATE
G. WOOD	7-21-67	H. WOOD	8-21-67
J. HUSTON	7-21-67	J. HUSTON	7-21-67
CHECK	8-21-67	CHECK	8-21-67
PROJECT		PROJECT	
APPRO		APPRO	

EQUIPMENT TABLE	
PART NO.	DESCRIPTION
7	MS 25252-1 SWITCH
8	ACTUATOR ASSY
5	ACTUATOR ASSY
4	HOUSING - CAP
3	HOUSING - CAP
2	SWITCH - PLUG
1	CIRCUIT BREAKER

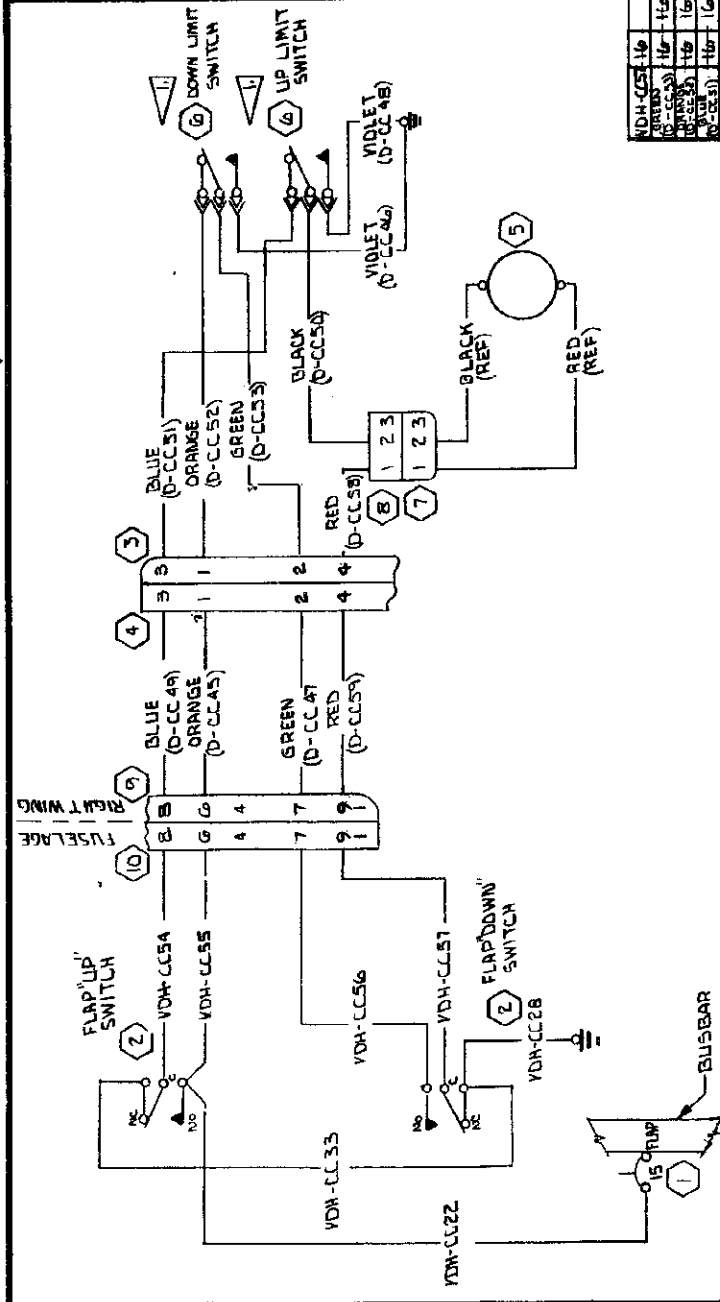


COMMERCIAL AIRCRAFT DIV.
 WICHITA, KANSAS
Cessna AIRCRAFT CO.
 WIRING DIAGRAM -
 WING FLAPS
 SCALE: NONE
 DWG NO. 0770610
 SER 18258506
 PAGE: 14.3.0

LET	REVISION	DESCRIPTION	DATE	APPRO
A	BY REV: ADDED WIRE LENGTHS (NOW SHOP PRACTICE)		8/21/54	



WIRE NO.	DESCRIPTION	DATE	APPRO
1	FLAP MOTOR		
2	FLAP UP SWITCH		
3	FLAP DOWN SWITCH		
4	FLAP UP LIMIT SWITCH		
5	FLAP DOWN LIMIT SWITCH		
6	FLAP UP ACTUATOR		
7	FLAP DOWN ACTUATOR		
8	FLAP UP HOUSING		
9	FLAP DOWN HOUSING		
10	FLAP UP SWITCH		
11	FLAP DOWN SWITCH		
12	FLAP UP CIRCUIT BREAKER		
13	FLAP DOWN CIRCUIT BREAKER		
14	FLAP UP HOUSING - PLUG		
15	FLAP DOWN HOUSING - PLUG		
16	FLAP UP SWITCH		
17	FLAP DOWN SWITCH		
18	FLAP UP CIRCUIT BREAKER		
19	FLAP DOWN CIRCUIT BREAKER		
20	FLAP UP HOUSING - PLUG		
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24	FLAP UP CIRCUIT BREAKER		
25	FLAP DOWN CIRCUIT BREAKER		
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NOTES:
 1. THESE SWITCHES PART OF C301002-0101 ACTUATOR ASSY

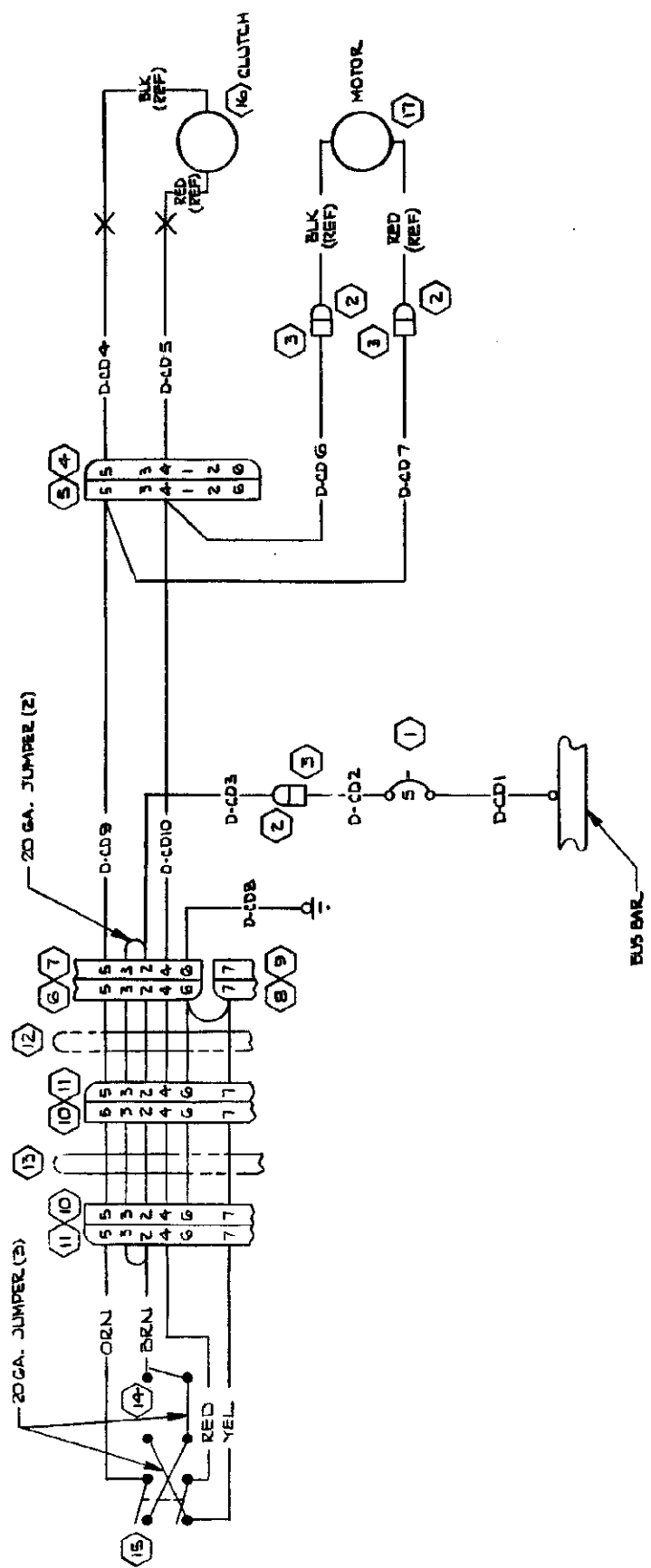
LET	REVISION	DESCRIPTION	DATE	APPRO
A		BY REV: ITEM 10 WAS S-1641-G, ITEM 9 WAS S-1640-G, WIRE LENGTH ON CC57 WAS 32, CC49 WAS 140, CC47 WAS 140, CC45 WAS 140, CC54 WAS 140, CC55 WAS 32, CC56 WAS 32, ADD WIRE LENGTH TO CC53, CC52, CC51, CC50, CC48, CC46, & CC58. NOW SHOP PRACTICE.	4-2-74	APPRO 4/2/74 T.M.C.
B		BY REV: LG105 WAS 140/RED (CC39) ORN (CC45) GRN (CC47) & BLU (CC49); PIN 8 WAS PIN 6, PIN 6 WAS PIN 5, PIN 7 WAS PIN 5 & PIN 9 WAS PIN 2 ON S-1640-G & S-1641-G (SER 1828010%) (SRB0572)	5-22-74	APPRO 5/22/74 T.M.C.
C		BY REV: VDH WAS DH/CC54, CC55, CC56, CC57, CC58, & CC59 (SR 76439)	6-15-74	MEM 6-15-74 T.M.C.
D		BY REV: ITEM 8 & 4; PIN 3 WAS PIN 1, PIN 1 WAS PIN 2, PIN 2 WAS PIN 3.	9-4-75	BLA 9-4-75 T.M.C.

WIRE NO.	GA	MATERIAL	TERMINALS	SERIALS
102	16	5-1636-2	5-1636-2	
103	16	5-1635-2	5-1635-2	
104	16	5-1635-2	5-1635-2	
105	16	5-1636-2	5-1636-2	
106	16	5-1635-2	5-1635-2	
107	16	5-1635-2	5-1635-2	
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111	16	5-1636-2	5-1636-2	
112	16	5-1635-2	5-1635-2	
113	16	5-1635-2	5-1635-2	
114	16	5-1636-2	5-1636-2	
115	16	5-1635-2	5-1635-2	
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117	16	5-1636-2	5-1636-2	
118	16	5-1635-2	5-1635-2	
119	16	5-1635-2	5-1635-2	
120	16	5-1636-2	5-1636-2	
121	16	5-1635-2	5-1635-2	
122	16	5-1636-2	5-1636-2	
123	16	5-1635-2	5-1635-2	
124	16	5-1636-2	5-1636-2	
125	16	5-1635-2	5-1635-2	
126	16	5-1636-2	5-1636-2	
127	16	5-1635-2	5-1635-2	
128	16	5-1636-2	5-1636-2	
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198	16	5-1636-2	5-1636-2	
199	16	5-1635-2	5-1635-2	
200	16	5-1636-2	5-1636-2	

CONTRACT NO.		TITLE	
COMMERCIAL AIRCRAFT DIV. 5800 E. PARKWAY WICHITA, KANSAS		WIRING DIAGRAM - WING FLAPS	
DESIGN	DATE	GROUP	DATE
102-23	10-27-73	102-23	10-27-73
DRAWN	INSTRUMENTED	CHECK	DATE
MEAGUIAN	MEAGUIAN	MEAGUIAN	10-27-73
STRESS	PROJ	APPD	OTHER
	MEAGUIAN	MEAGUIAN	
EQUIPMENT TABLE			
PART NO.	DESCRIPTION	QTY	REMARKS
5-1641-9	HOUSING - SOCKET		
5-1640-9	HOUSING - PIN		
5-1638-1	HOUSING - PLUG		
5-1638-2	HOUSING - CAP		
V3-1-D9	SWITCH		
C301002-0101	ACTUATOR ASSY		
5-1641-6	HOUSING - PLUG		
5-1640-6	HOUSING - PIN		
5-1906-1	SWITCH		
5-1363-15L	CIRCUIT BREAKER		

SIZE	CODE IDENT.	DWG NO
C	71379	0770610
SCALE	NONE	1B2
PAGE: 14.3.3		

REVISIONS		DATE	APPROVED
LTR	DESCRIPTION		

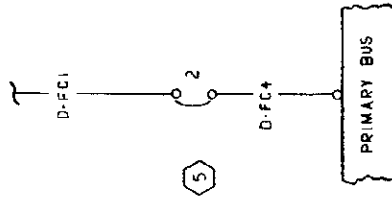
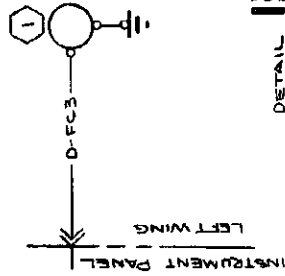
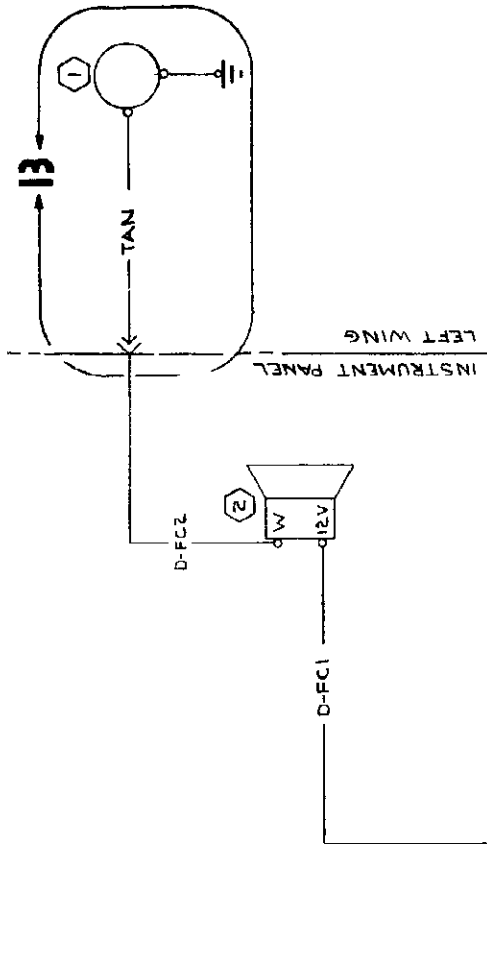


CONTRACT NO:		COMMERCIAL AIRCRAFT DIV.	
NAME		5800 E. PARKWAY	
DATE		MICHIGAN, ANN ARBOR	
DESIGN	V.F. SALES	DATE	6-24-74
GROUP	J. B. SALES	DATE	7-15-74
DRAWN	S. COLLIER	DATE	7-15-74
CHECK	S. YOUNG	DATE	7-15-74
STRESS			
PROJECT	ARM/PAH	DATE	11-27-74
APPD	PA		
SIZE		CODE IDENT.	DWG NO.
C		71379	0770610
SCALE		NOMINAL	1/8" = 1"
PAGE:		19 OF 21	

Cessna AIRCRAFT CO.
 WIRING DIAGRAM
 ELECTRIC TRIM
 (OPTIONAL)

(SEE FIG. 17) &
 (18864296)

CHG LIST	REVISION	BY	CHK APPD
A	ADDED WIRE LENGTHS TO W/T S-1407 & WAS CHG'D; APPROVED BY 13700-1 & D-DBI FROM C/T: ADDED DETAIL A (SRR-451)	WJR	M
B	RE-MOUNTED TAIL A WIRE; D-FC1 WIRE TO ADD RESISTOR (R); D-FC2 WIRE TO ADD RESISTOR (R)	DVS	285
C	BY RELEASE D-FC1 (SRR-408)	JTW	285
D	INACTIVATED D-FC3; ADDED TAN WIRE (SRR-905)	WJR	285



INACTIVE
THRU OTHER
SERIES
SER 18260055

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	SERIALS
TAN	18	S-1460-18-10	110	S-1367-1-6 S-341-2	SER 18257626 40N
D-FC4	18	S-1367-1-6	S-1367-1-6	S-341-2	INACTIVATED SER 18257625
D-FC3	18	S-1367-1-6	S-341-2	S-341-2	
D-FC2	18	S-1367-1-6	S-341-2	S-341-2	
D-FC1	18	S-1367-1-6	S-1367-1-6	S-1367-1-6	

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA, KANSAS

WIRE TABLE

NAME: RIDDER DATE: 7-17-62
 GROUP: 10-33-44
 CHECK: R. L. H. 10-33-44
 PROJ: H. M. G. 10-33-44

WIRING DIAGRAM - STALL WARNING SYSTEM (NON-HEATED)

ISSUED: 0770610
 REV: D PAGE: 15.1

SUPPLEMENTED BY: P 15.2 SUPPLIES: MODEL: 182

QTY	PART NO.	DESCRIPTION	INSTALLED ON
5	CA-2	CRT BKR (ATCC)	
4			
3	S-14-07-6	HORN ASSY	
2	0511062-4	MTFR, STALL WARNG	
1			

EQUIPMENT TABLE



D2006-4-13