Cessna
A Textron Company

Service Manual

1980
Thru
1985

MODEL 172RG
SERIES

Member of GAMA

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

REVISION 1 TO THE BASIC MANUAL INCORPORATES TEMPORARY REVISION 1, DATED 3 OCTOBER, 1994.

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Cessna
A Textron Company

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SECTION	PAGE	AEROFICHE FICHE/FRAME	SECTION	PAGE	AEROFICHE FICHE/FRAME
2	41	1/C09			
2	42	1/C10			
2	42A/Deleted	NA			
2	47	1/C15			
2	48	Added			
2	48A/Deleted	NA			
2	49	Added			
2	50	Added			
15	34C	Added			
15	34D	Added			

REASON FOR TEMPORARY REVISION

1. To add a Component Time Limits section and a fuel quantity indicating system operational test.

FILING INSTRUCTIONS FOR THIS TEMPORARY REVISION

1. For Paper Publications, file this cover sheet behind the publication's title page to identify the inclusion of the Temporary Revision into the manual. Insert the new pages into the publication at the appropriate locations and remove and discard the superseded pages.

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TEMPORARY REVISION NUMBER 3

DATED 7 January 2000

MANUAL TITLE MODEL 172RG SERIES 1980 THRU 1985 SERVICE MANUAL

MANUAL NUMBER - PAPER COPY D2066-1-13 **AEROFICHE** D2066-1-13AF

TEMPORARY REVISION NUMBER PAPER COPY D2066-1TR3 **AEROFICHE** N/A

MANUAL DATE 20 February 1985 **REVISION NUMBER** 1 **DATE** 2 OCTOBER 1995

This Temporary Revision consists of the following pages, which affect existing pages in the paper copy manual and supersede aerofiche information.

SECTION	PAGE	AEROFICHE FICHE/FRAME	SECTION	PAGE	AEROFICHE FICHE/FRAME
2	42A	Added			
2	48A	Added			
17	6A	Added			
17	6B	Added			

REASON FOR TEMPORARY REVISION

To include the inspection requirements of Cessna Service Bulletin SEB99-18.

To provide additional information for the stop drilling of cracks that originate at the trailing edge of control surfaces with corrugated skins.

FILING INSTRUCTIONS FOR THIS TEMPORARY REVISION

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TEMPORARY REVISION NUMBER 2

DATED July 1, 1997

MANUAL TITLE Model 172RG Series 1980 thru 1985 Service Manual

MANUAL NUMBER - PAPER COPY D2066-1-13 **AEROFICHE** D2066-1-13AF

TEMPORARY REVISION NUMBER - PAPER COPY D2066-1TR2-13 **AEROFICHE** N/A

MANUAL DATE February 20, 1985 **REVISION NUMBER** 1 **DATE** 2 Oct. 1995

This Temporary Revision consists of the following pages, which affect and replace existing pages in the paper copy manual and supersede aerofiche information.

CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME	CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME
2	41	1 C09			
2	47	1 C15			

REASON FOR TEMPORARY REVISION

To update inspection procedures for Main Landing Gear Pivot.

FILING INSTRUCTIONS FOR THIS TEMPORARY REVISION

For Paper Publications:

File this cover sheet behind the publication's title page to identify inclusion of the temporary revision in the manual. Insert the new pages in the publication at the appropriate locations and remove and discard the superseded pages.

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LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

NOTE

The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands.

Original ... 0 .... 20 February 1985
Revision .. 1 .... 2 October 1995

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 566.

* The asterisk indicates pages changed, added, or deleted by the current change.

Page No.	Revision No.
*Title	1
*A thru B	1
*C Blank	1
i	0
*ii thru iv	1
1-1 thru 1-5	0
1-6 Blank	0
2-1 thru 2-39	0
*2-40 thru 2-41	1
2-42 thru 2-45	0
*2-46 thru 2-47	1
2-48 Blank	1
3-1 thru 3-2	0
3-2A	0
3-2B	0
3-3 thru 3-12	0
3-12A thru 3-12F	0
3-13 thru 3-29	0
3-30 Blank	0
4-1 thru 4-4	0
4-4A	0
4-4B Blank	0
5-1 thru 5-38	0
5-38A	0
5-38B Blank	0
5-39 thru 5-46	0
5-46A	0
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5-47 thru 5-82	0
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5-84 thru 5-85	0
5-86 Blank	0
6-1 thru 6-12	0
7-1 thru 7-6	0
*7-7	1
7-8 thru 7-14	0
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9-1 thru 9-11	0
9-12 Blank	0
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12-1 thru 12-6	0
*12-7 thru 12-8	1
12-9 thru 12-10	0
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12-11 thru 12-30	0
13-1 thru 13-8	0
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14-8 Blank	0
*15-1	1
15-2 thru 15-28	0
*15-29	1
15-30	0
*15-31	1

LIST OF EFFECTIVE PAGES

Page No.	Revision No.
15-32	0
*15-33	1
15-34	0
*15-34A thru 15-34B	1
15-35 thru 15-38	0
16-1 thru 16-24	0
16-24A	0
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16-44A	0
16-44B	0
16-45 thru 16-54	0
17-1 thru 17-8	0
17-8A thru 17-8C	0
17-8D Blank	0
17-9 thru 17-51	0
17-52 Blank	0
18-1 thru 18-6	0
19-1 thru 19-45	0
19-46 Blank	0

TABLE OF CONTENTS

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

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

All aircraft, regardless of manufacturer, are certified under model number designations. However, popular names are often used for marketing purposes. To provide a consistent method of referring to these aircraft, the model number will be used in this publication unless the popular name is necessary to differentiate between versions of the same basic model. The following table provides a listing of popular name, model number and serial number.

	MODEL		SERIAL	
POPULAR NAME	YEAR	MODEL	BEGINNING	ENDING
CUTLASS RG CUTLASS RGII	1980	172RG	172RG0001	172RG0570
CUTLASS RG CUTLASS RGII	1981	172RG	172RG0571	172RG0890
CUTLASS RG CUTLASS RGII	1982	172RG	172RG0891	172RG1099
CUTLASS RG CUTLASS RGII	1983	172RG	172RG1100	172RG1144
CUTLASS RG CUTLASS RGII	1984	172RG	172RG1145	172RG1177
CUTLASS RG CUTLASS RGII	1985	172RG	172RG1178	172RG1191

INTRODUCTION

This manual contains factory-recommended procedures and instructions for ground handling, servicing, and maintaining Cessna 172RG Series airplanes. Besides serving as a reference for the experienced mechanic, this manual also covers step-by-step procedures for the less experienced. If properly used, it will better enable the mechanic to maintain Cessna 172RG Series airplanes and thereby establish a reputation for reliable service.

This service manual is designed for aerofiche presentation. To facilitate the use of the aerofiche, refer to the aerofiche header for basic information.

KEEPING CESSNA PUBLICATIONS CURRENT

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 News Letters, 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 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 is communicated to the field through Cessna's Authorized Service Stations and/or through Cessna's subscription services.

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1. REVISIONS/CHANGES. These are issued to the Service Stations by Cessna Aircraft Company for this publication as required, and include only pages that require updating.
2. REISSUE. Manual is reissued to Service Stations as required, and is a complete manual incorporating all the latest information and outstanding revisions/changes. It supersedes and replaces previous issue(s).

REVISIONS/CHANGES and REISSUES can be purchased from your Cessna Service Station or directly from the Cessna Parts Distribution, (CPD 2) Dept. 701, Cessna Aircraft Company, 5800 East Pawnee, Wichita, Kansas 67218.

All supplemental service information concerning this manual is supplied to all appropriate Cessna Service Stations so that they have the latest authoritative recommendations for servicing these Cessna aircraft. Therefore, it is recommended that Cessna owners utilize the knowledge and experience of the Cessna Service Station Organization.

CUSTOMER CARE SUPPLIES AND PUBLICATIONS CATALOG

A Customer Care Supplies and Publications Catalog is available from your Cessna Service Station or directly from the Cessna Parts Distribution, (CPD 2) Dept. 701, Cessna Aircraft Company, 5800 East Pawnee, Wichita, Kansas 67218. The Supplies and Publications catalog lists all publications and Customer Care Supplies available from Cessna for prior year models as well as new products.

SUPPLEMENTAL TYPE CERTIFICATE INSTALLATIONS

Inspection, maintenance and parts requirements for supplemental type certificate (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 installations.

CUSTOMER COMMENTS ON MANUAL

Cessna Aircraft Company has endeavored to furnish you with an accurate, useful, up-to-date manual. This manual can be improved with your help. Please use the return card, provided with your manual, to report any errors, discrepancies, and omissions in this manual as well as any comments you wish to make.

SECTION 1

GENERAL DESCRIPTION

1-1. GENERAL DESCRIPTION.

1-2. MODEL 172RG.

1-3. DESCRIPTION. Cessna Model 172RG aircraft are high-wing monoplanes of all-metal semimonocoque construction. These aircraft are equipped with fully retractable tricycle landing gear consisting of tubular spring-steel main gear struts and a steerable nose gear. The steerable nose gear is equipped with an air/hydraulic fluid shock strut. Four-place seating is standard. All are powered by a four-cylinder, horizontally-opposed air-cooled Lycoming engine which drives an all-metal, constant-speed propeller. Model 172RG aircraft feature rear side windows, a "wrap-around" rear window and a swept-back fin and rudder.

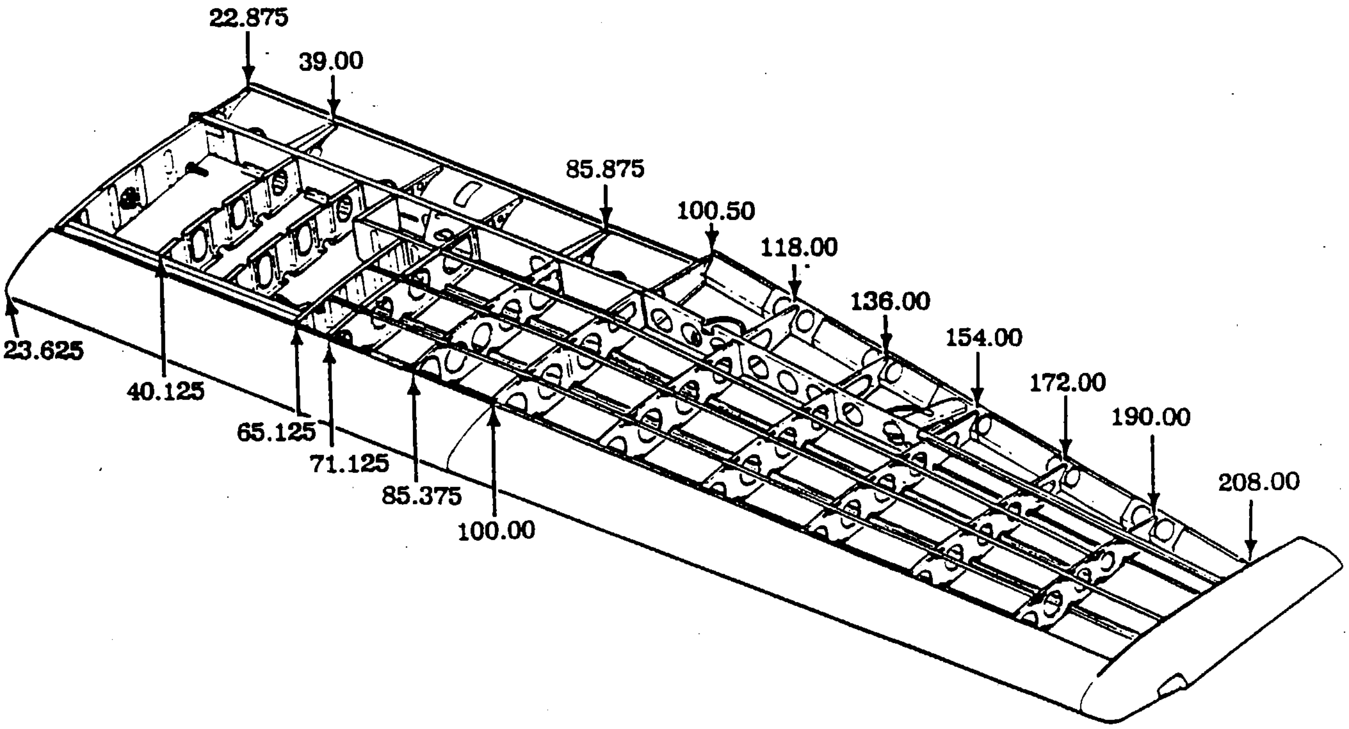
1-4. AIRCRAFT SPECIFICATIONS. Leading particulars and measurements are based on static gross weight unless otherwise indicated, and are shown in figure 1-1. If these dimensions are used for constructing a hangar or computing clearances, remember that such factors as nose gear strut inflation, tire pressure,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

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

GROSS WEIGHT Takeoff and Landing	2650 Lbs.
Ramp	2658 Lbs.
FUEL CAPACITY	
Total	66 Gal.
Usable	62 Gal.
OIL CAPACITY	8 Quarts
With Oil Filter	9 Quarts
ENGINE MODEL	
(Refer to Section 11 for Engine Data)	O-360-Series Lycoming
PROPELLER	76.5 inch Diameter McCauley
MAIN WHEELS	15-6.00 x 6, 6 Ply
Pressure	60 to 68 Psig
NOSE WHEELS	5.00 x 5, 6 Ply
Pressure	40 to 50 Psig
Nose Gear Strut Pressure (Strut Extended)	55 Psig
WHEEL ALIGNMENT	
●Camber	3° ± 1°
●Toe-in	0° + .06-.00
AILERON TRAVEL	
Up	20° ± 1°
Down	15° ± 1°
WING FLAP TRAVEL	
Up	0° ± 0°
Down	30° ± 2°
RUDDER TRAVEL (Measured Parallel to Water Line)	
Right	16° 10' ±1°
Left	16° 10' ±1°
RUDDER TRAVEL (Measured Perpendicular to Hinge Line)	
Right	17° 44' ±1°
Left	17° 44' ±1°
ELEVATOR TRAVEL	
Up	28° + 1°- 0°
Down	23° + 1°- 0°
ELEVATOR TRIM TAB TRAVEL	
Up	22° + 1°- 0°
Down	19° + 1°- 0°
PRINCIPAL DIMENSIONS	
Length	328.87 Inches
Wing Span	429.84 Inches
Horizontal Tail Span	135.14 Inches
Track Width	101.88 Inches
Vertical Tail	105.30 Inches
BATTERY LOCATION	Aft of Wheel Well RH Side

●Measure At Rim With Aircraft Empty

Figure 1-1. Specifications.



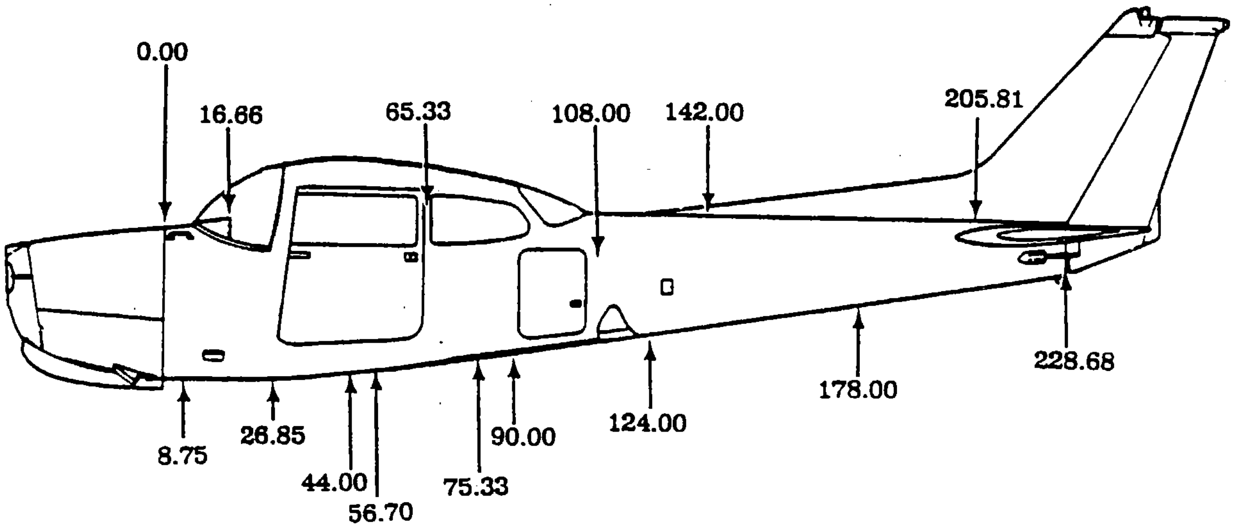


Figure 1-2. Reference Stations

1-6. BOLT TORQUES. The importance of correct application cannot be overemphasized. Undertorque can result in unnecessary wear of nuts and bolts as well as parts they are holding together. When insufficient pressures are applied, uneven loads will be transmitted throughout assembly, which may result in excessive wear or premature failure due to fatique. Overtorque can be equally damaging because of failure of a bolt or nut from overstressing threaded areas. There are a few simple, but very important, procedures that should be followed to assure that correct torque is applied:

a. Calibrate torque wrench periodically to assure accuracy; and recheck frequently.
b. Be sure that bolt and nut threads are clean and dry unless otherwise specified.
c. Run nut down to near contact with washer or bearing surface and check "friction drag torque" required to turn nut.
d. Add friction drag torque to desired torque recommended or obtain desired torque as shown in figure 1-3. This is referred to as final torque which should register on indicator or setting for a snapover-type wrench.
e. Apply a smooth even pull when applying torque pressure. If chattering or a jerking motion occurs during final torque, back off and re-torque.
f. When installing a castle nut, start alignment with cotter pin hole at minimum recommended torque, plus friction drag torque, and do not exceed maximum plus friction drag. If hole and nut castellation do not align, change washers or nut and try again. Exceeding maximum recommended torque is not recommended unless specifically allowed or recommended for that particular installation.

BOLT TORQUE VALUES

BOLTS Steel Tension
AN3 thru AN20 AN42 thru AN49 AN73 thru AN81 AN173 thru AN186 MS20033 thru MS20046 MS20073 MS20074 AN509NK9 MS24694 AN525NK525 MS27039

NUTS Steel Tension	Steel Shear
AN310 AN315 AN363 AN365 NAS1021 MS17825 MS21045 MS20365 MS20500 NAS679	AN320 AN364 NAS1022 MS17826 MS20364

FINE THREAD SERIES

Nut-bolt size	Torque Limits in.-lbs.		Torque Limits in.-lbs.	
	Min.	Max.	Min.	Max.
8-36	12	15	7	9
10-32	20	25	12	15
1/4-28	50	70	30	40
5/16-24	100	140	60	85
3/8-24	160	190	95	110
7/16-20	450	500	270	300
1/2-20	480	690	290	410
9/16-18	800	1000	480	600
5/8-18	1100	1300	660	780
3/4-16	2300	2500	1300	1500
7/8-14	2500	3000	1500	1800
1-14	3700	4500	2200	3300
1-1/8-12	5000	7000	3000	4200
1-1/4-12	9000	11000	5400	6600

COARSE THREAD SERIES

Nut-bolt size	Torque Limits in.-lbs.		Torque Limits in.-lbs.	
	Min.	Max.	Min.	Max.
8-32	12	15	7	9
10-24	20	25	12	15
1/4-20	40	50	25	30
5/16-18	80	90	48	55
3/8-16	160	185	95	110
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

Steel Tension BOLTS	Steel Shear
MS20004 thru MS20024 NAS144 thru NAS148 NAS333 thru NAS340 NAS585 thru NAS590 NAS624 thru NAS644 NAS1303 thru NAS1320 NAS172 NAS174 NAS517	NAS464

NUTS Steel Tension	Steel Shear
AN310 AN315 AN363 AN365 MS17825 MS20365 MS21045 NAS1021 NAS679 NAS1291	AN320 AN364 NAS1022 MS17826 MS20364

FINE THREAD SERIES

Nut-bolt size	Torque Limits in.-lbs.		Torque Limits in.-lbs.	
	Min.	Max.	Min.	Max.
10-32	25	30	15	20
1/4-28	80	100	50	60
5/16-24	120	145	70	90
3/8-24	200	250	120	150
7/16-20	520	630	300	400
1/2-20	770	950	450	550
9/16-18	1100	1300	650	800
5/8-18	1250	1550	750	950
3/4-16	2650	3200	1600	1900
7/8-14	3550	4350	2100	2600
1-14	4500	5500	2700	3300
1-1/8-12	6000	7300	3600	4400
1-1/4-12	11000	13400	6600	8000

COARSE THREAD SERIES NOT USED

Figure 1-3. Torque Values

SECTION 2

GROUND HANDLING, SERVICING, CLEANING, LUBRICATION AND INSPECTION

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

2-1. GROUND HANDLING.

2-2. TOWING. Moving the aircraft by hand is accomplished by using the wing struts and landing gear struts as push points. A tow bar attached to the nose gear should be used for steering and maneuvering the aircraft on the ground. The tow bar is stowed under the rear seat with the handle secured behind the forward seat legs.

CAUTION

When towing the aircraft, never turn the nose wheel more than 29 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.

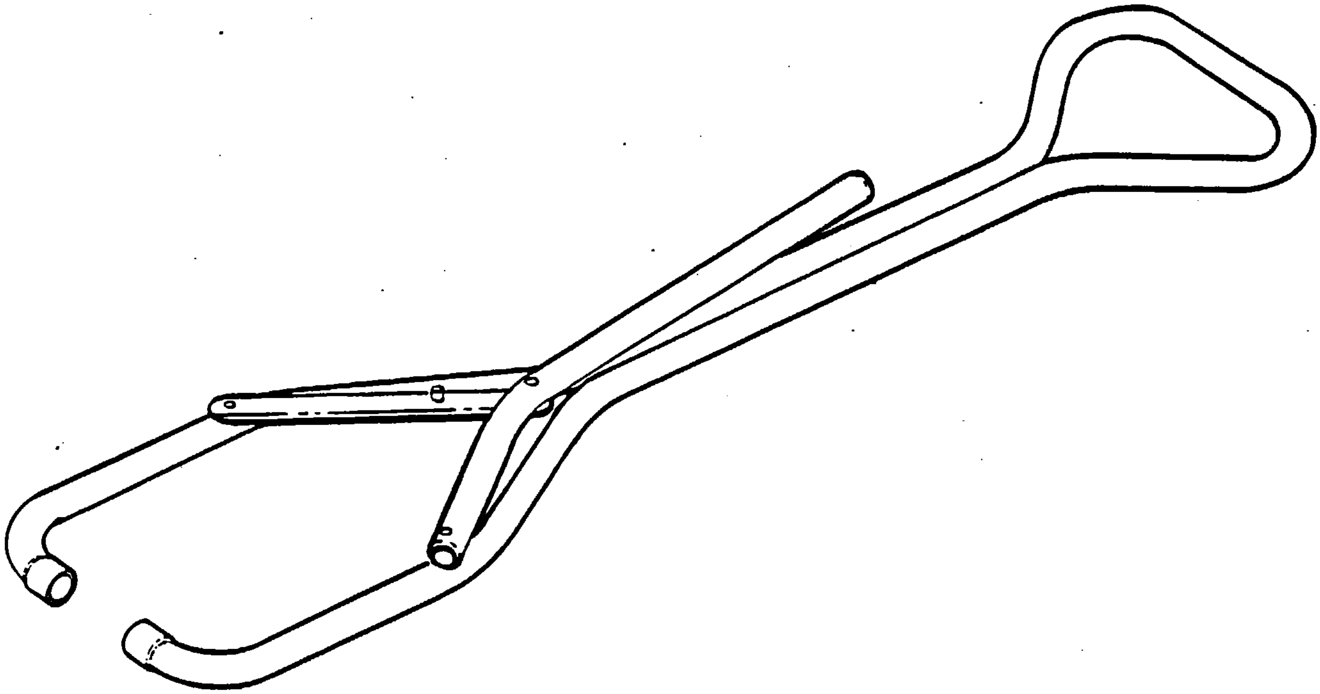
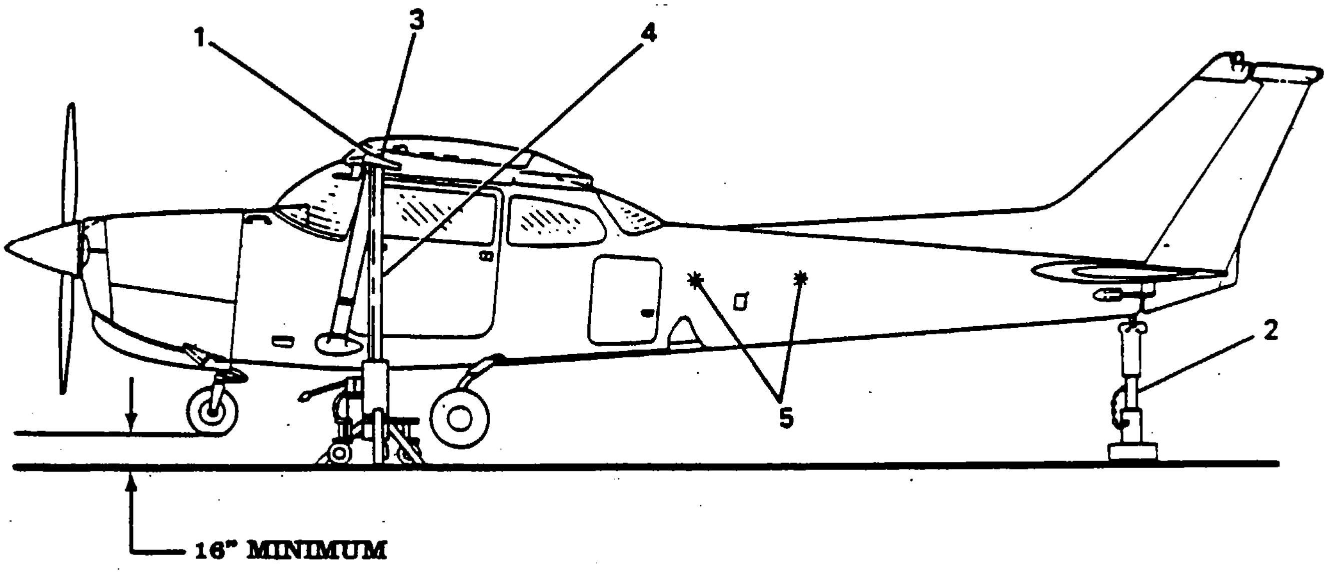


Figure 2-1. Typical Tow Bar



NOTE

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

Reference points for longitudinal leveling of aircraft are two nutplates (5) on the left side of the tailcone at stations 108.62 and 140.63.

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

JACKING INFORMATION

ITEM	TYPE AND NUMBER	REMARKS
1	Block (Jack points are available)	1×4×4 padded with 1/4" rubber
2	Cessna No. 2-168	Tail Tie-Down Stand
3	Built-in jack pad	Part of step bracket (SEE CAUTION)
4	No. 2-170 Basic jack (includes	Min. closed height: 34"
	No. 2-71 Slide tube: Liftstroke 22-1/2")	Max. extension height: 56-1/2"
	No. 2-70 Slide tube: Liftstroke 22-1/2"	Min. closed height: 57-1/2"
		Max. extension height: 80"
	No. 2-591 Extension cap	Adds 4"
	No. 2-109 Leg extension	Adds 12"

1. Wing jacks (4) are placed under front spar of wing at station 99.62, using the jack points or blocks and must be extended far enough to raise wheels off ground, and must be of adequate strength.
2. Be sure tail stand weighs enough to keep tail down under all conditions and that it is strong enough to support any weight that might be placed on it (place shot bags or sand bags on tail stand). In addition, the base of adjustable tail stand is to be filled with concrete for additional weight as a safety factor.
3. Operate jacks evenly until desired height is reached.
4. Items 2 and 3 are available from the Cessna Supply Division.

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

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

2-4. JACKING. See figure 2-2 for jacking procedures.

2-5. LEVELING. Corresponding points on both upper door sills may be used to level the aircraft laterally. Leveling point nutplates are provided on the left side of the tailcone at Sta. 108.62 and 140.63. Use these points for leveling the aircraft by removing the screws and installing suitable studs to support a level.

2-6. WEIGHING. Refer to Pilot's Operating Handbook.

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 when they are overheated or during cold weather when accumulated moisture may freeze them.

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 the nose gear strut, and secure opposite end of rope to ground anchor.
c. Secure the middle of a rope to the tail tie-down ring. Pull each end of rope away at a 45 degree angle and secure to ground anchors at each side of tail.
d. Secure control lock on pilot control column. If control lock is not available, tie pilot control wheel back with front seat belt.
e. These aircraft are equipped with a spring-loaded steering 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 nonoperational storage and/or the first 25 hours of intermittent engine operation.

NOTE

> The aircraft was delivered from Cessna with MIL-L-6082 aviation grade straight mineral oil. This engine oil should be used for the first 25 hours of engine operation. If if becomes necessary to add oil during this period, use oil of the recommended viscosity conforming to MIL-L-6082.

During the 30 day nonoperational 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.

CAUTION

> Excessive ground operation shall be avoided.

2-10. RETURNING AIRCRAFT TO SERVICE. After flyable storage, returning the aircraft to service is accomplished by performing a thorough preflight inspection. At the end of the first 25 hours of engine operation, drain engine oil, change external oil filter element, and service engine with correct grade and quantity of engine oil. See figure 2-4 and paragraph 2-22 for correct grade of engine oil.

2-11. TEMPORARY STORAGE. Temporary storage is defined as aircraft in a nonoperational 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 bays with the correct grade of aviation fuel.
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

Corrosion-preventive mixture should conform to MIL-L-6529C Type I heated to 220°F to 250°F spray nozzle temperature.

h. Using a portable pressure sprayer, atomize spray preservative oil through the upper spark plug hole in each cylinder with the piston in a down position. Rotate crankshaft about five revolutions as each cylinder 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 propeller so that blades are as near horizontal as possible to provide maximum clearance for 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 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 bays and fuel lines for moisture and sediment. Drain enough fuel to eliminate moisture and sediment.
j. Perform a thorough preflight inspection, then start and warmup engine.

2-14. INDEFINITE STORAGE. Indefinite storage is defined as aircraft in a nonoperational 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 2-22.

b. Fill oil sump to normal operating capacity with corrosion preventive mixture which has been thoroughly mixed.

NOTE

Corrosion-preventive mixture consists of one part by volume MIL-C-6529C, type I. added to three parts by volume of MIL-L-6082C mineral aircraft engine oil.

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 220°F to 250°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 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 in accordance with the procedures outlined in paragraph 2-22. 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 runup 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 seven 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 six months.

NOTE

Before spraying, inspect the interior of one cylinder for corrosion through the spark plug hole and remove at lease 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. Drain engine oil sump in accordance with the procedures outlined in paragraph 2-22.
- f. Change engine oil filter. Service engine with oil in accordance with figure 2-5 of this manual.
- g. 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 plugs 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 bays and fuel lines for moisture and sediment, and drain enough fuel to eliminate.
- k. Perform a thorough preflight inspection, then start and warm-up engine.
- l. Thoroughly clean and flight test aircraft.

2-17. SERVICING.

2-18. GENERAL DESCRIPTION. Servicing requirements are shown in figure 2-5. The following paragraphs supplement this figure by adding details not included in the figure.

2-19. FUEL. Fuel bays should be filled immediately after flight to lessen moisture condensation. Bay capacities are listed in Section 1. The recommended fuel grade to be used is given in figure 2-5.

2-20. USE OF FUEL ADDITIVES FOR COLD WEATHER OPERATION.

Strict adherence to recommended preflight draining instructions will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of: (1) use of certain fuels, with (2) high humidity conditions on the ground (3) followed by flight at high altitude and low temperature. Under these unusual conditions, small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occuring under these unusual conditions it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply. See Figure 2-3 for fuel additive mixing ratio.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects: (1) it absorbs the dissolved water from the gasoline and (2) alcohol has a freezing temperature depressant effect.

Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To insure proper mixing the following is recommended:

1. For best results the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transfer this mixture to the tank prior to the fuel operation.

Any high quality isopropyl alcohol may be used, such as:

Anti-icing fluid (MIL-F-5566) or
Isopropyl alcohol (Federal Specification TT-I-735a).

Ethylene glycol monomethyl ether (EGME) compound in compliance with MIL-I-27686 or Phillips PFA-55MB, if used, must be carefully mixed with the fuel in concentrations not to exceed 0.15% by volume.

CAUTION

Mixing of the EGME compound with the fuel is extremely important because concentration in excess of that recommended (0.15 percent by volume maximum) will result in detrimental affects to the fuel tanks, such as deterioration of protective primer and sealants and damage to O-rings and seals in the fuel system and engine components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.

Do not allow the concentrated EGME compound to come in contact with the airplane finish or fuel cell as damage can result.

Prolonged storage of the airplane will result in a water build-up in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

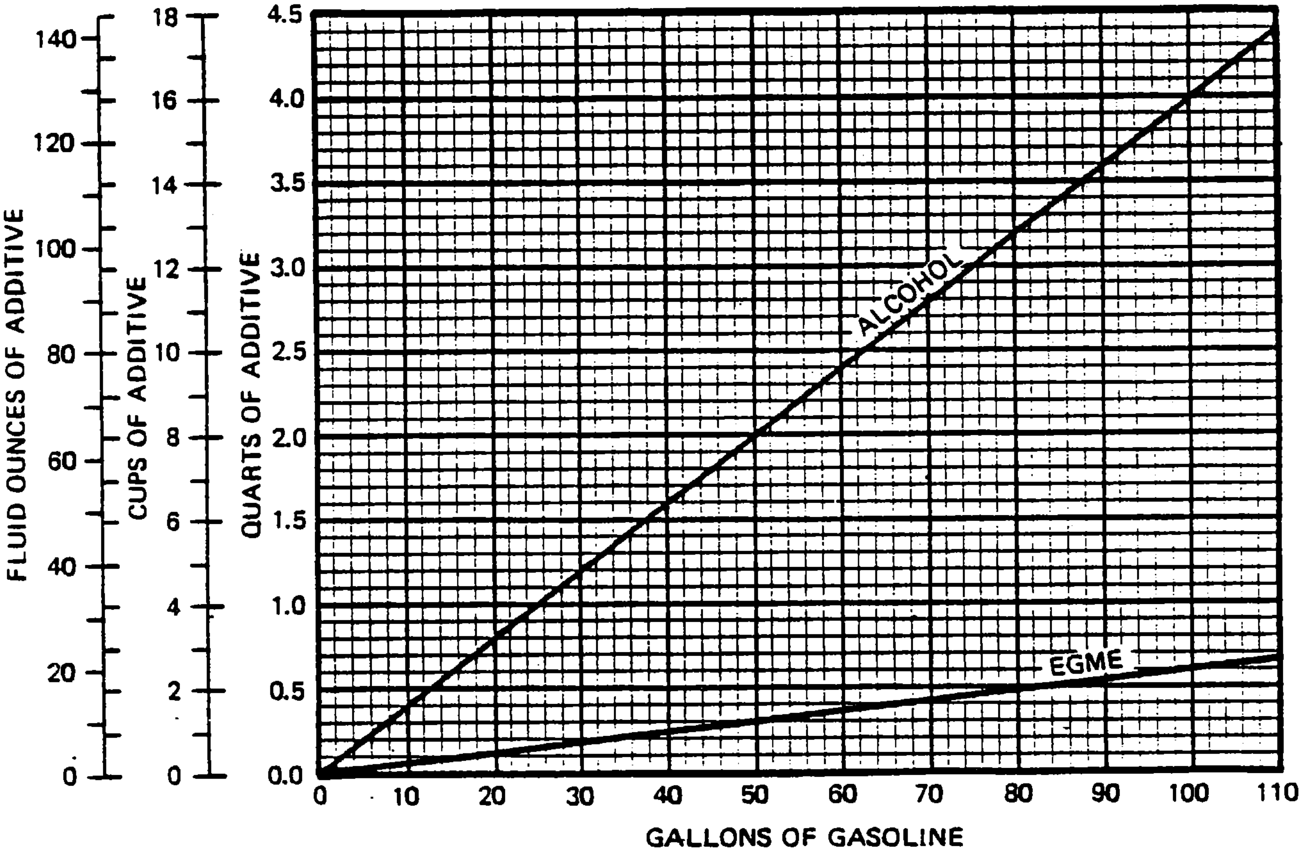


Figure 2-3. Fuel Additive Mixing Ratio Chart

2-21. **FUEL DRAINS.** On aircraft serials 172RG0001 thru 172RG0890, the fuel drains are located in the fuel bays, fuel strainer, fuel selector valve, and carburetor. Drain plugs are installed in the fuel selector valve and carburetor; drain valves are located in the fuel bays and fuel strainer. Beginning with 172RG0891, a drain valve is located in the bottom of the fuel selector valve for sampling and draining of fuel. To activate the drain valves for fuel sampling, place cup up to valve and depress valve with rod protruding from cup. Refer to Section 12 for illustration of fuel bay drain valve. The strainer valve is an integral part of the fuel strainer assembly. The strainer drain is equipped with a control which is located adjacent to the oil dipstick. Access to the control is through the oil dipstick access door. Open drains and remove drain plugs at intervals specified in figure 2-5. Also, during daily inspection of the fuel strainer, fuel selector, and bays, if water is found in the system, all fuel drain plugs should be removed and all water drained from the system.

2-22. 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 any time water in the fuel is suspected.

a. With the fuel selector valve OFF, remove carburetor drain plug and clean off any sealant present on the end of the plug or in the threads on the plug.
b. Inspect drain plug hole in the carburetor and remove any sealant remaining in the hole.
c. Turn fuel selector valve to ON to flush float chamber and drain plug chamber while probing drain plug hole to ascertain that all residue of sealant material is dislodged and washed out of the chamber. Flushing operation should last 15 to 30 seconds.
d. A second flushing should then be accomplished and the drained fuel retained for inspection to insure that no sealant particles are present.
e. Install drain plug as follows:
    1. Install drain plug in carburetor 1-1/2 to 2 turns.
    2. Apply sealant to drain plug threads (use NS-40 (RAS-4) or equivalent).
    3. Tighten and safety drain plug.
f. Turn fuel selector valve ON and inspect for evidence of fuel leakage.

2-23. ENGINE OIL. Check engine lubricating oil with the dipstick five to ten minutes after the engine has been stopped. The aircraft should be in as near a level position as possible when checking the engine oil, so that a true reading is obtained. Engine oil should be drained while the engine is still hot, and the nose of the aircraft should be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump. Engine oil should be changed every six months, even though less than the specified hours have accumulated. Reduce these intervals for prolonged operations in dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered, which cause sludging conditions. Always change oil and oil filter whenever oil on the dipstick appears dirty. Aviation grade oil conforming to AVCO Lycoming Service Instruction No. 1014, and any revisions or supplements thereto, shall be used in the Lycoming engine.

NOTE

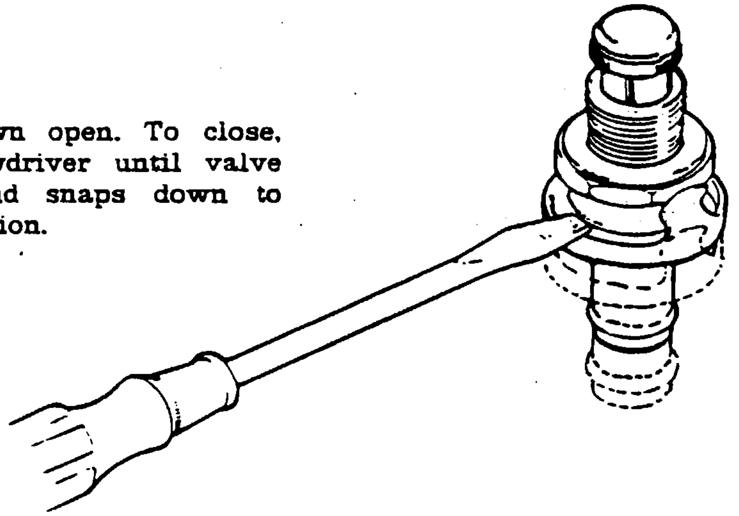
New or newly-overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. If an ashless dispersant oil is used in a new or newly-overhauled engine, high oil consumption may be experienced. The anti-friction additives in detergent and dispersant oils will retard "break-in" of the pistons, rings and cylinder walls. This condition can be avoided by the use of straight mineral oil. The aircraft is delivered from Cessna with MIL-L-6082 mineral oil. If oil must be added during the first 25 hours, use only aviation grade straight mineral oil (non-detergent) conforming to MIL-L-6082. After the first 25 hours of operation, drain engine oil sump and change the oil filter. Refill sump with aviation grade straight mineral oil (non-detergent) conforming to MIL-L-6082 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, install a new 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 normal operating temperature and then shut down.
b. (With Quick-Drain Valve) Attach a hose to the quick-drain valve in the oil sump. Push on quick drain valve until it locks open, and allow oil to drain through the hose into the 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 or install and safety drain plug.
e. Change external oil filter.
f. Service engine with correct quantity and viscosity of aviation grade engine oil.

NOTE

See figure 2-5 for oil and filter change interval.



Valve shown open. To close, twist screwdriver until valve unlocks and snaps down to closed position.

Figure 2-4. Quick-Drain Valve

2-24. ENGINE OIL COOLER. Oil coolers can be a cause of internal engine damage if not properly serviced. Trapped air in the lines and cooler, as a result of draining oil from the oil cooler, can cause oil aeration, which gives insufficient valve train lubrication resulting in premature engine wear. Therefore, anytime oil is drained, for changing or flushing, the following procedures should be used to eliminate trapped air.

a. Prior to starting, remove lower spark plugs. If available, the use of an Auxiliary Power Cart is recommended.
b. With mixture in idle cut off, and magneto switch on "START", rotate engine with the starter. Rotate engine to stabilize oil pressure, but DO NOT CRANK LONGER THAN THIRTY (30) SECONDS EACH TIME. ALLOW AT LEAST ONE (1) FULL MINUTE BETWEEN CYCLES FOR STARTER MOTOR COOLING. After oil pressure gage stabilizes, crank an additional ten (10) seconds, IF WITHIN THE THIRTY SECONDS LIMIT.
c. Repeat this procedure at least four (4) times, but DO NOT EXCEED THIRTY (30) SECONDS "ON" nor ONE (1) MINUTE "OFF" Limitation.
d. Reinstall the lower spark plugs.
e. Start engine and run at 900 - 1,000 RPM for approximately five (5) minutes. Shut engine down, and check oil level. Add oil as necessary to fill crankcase to full mark on dipstick. Ensure that oil filter is safety wired.

2-25. 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 100 hours of engine operating time and more frequently if warranted by operating conditions. 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 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. Ensure that the air box is clean and the filter and filter gasket are undamaged and serviceable.
f. Install filter in air box with gasket on aft face of filter frame pointed in the correct direction.

2-26. 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 of operating time for damage. Change central air filter element every 500 hours of operating time and whenever it becomes sufficiently clogged to cause suction gage readings to drop 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.

CAUTION

Excessive smoking will cause premature filter clogging.

2-27. 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 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. 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), more often in hot weather. See Section 16 for detailed battery removal, installation and testing. Refer to Service Letter SE80-4 for information concerning proper charging and servicing of 24 volt lead acid batteries, currently used in 1978 and 1979 models of Cessna Single Engine Aircraft.

2-28. 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.

2-29. 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 core and fully compress strut. (Fork and outer barrel in contact.)
b. Remove upper filler plug.
c. Extend strut one inch, fill to overflow with MIL-H-5606 Hydraulic fluid and replace filler plug.
d. Compress strut. If strut compresses fully, repeat operation "c" and "d" until strut will no longer compress fully.
e. Remove filler plug, compress strut fully and allow fluid to overflow.
f. Replace filler plug and valve core.
g. With no load on strut inflate to 55 PSI.

NOTE

The nose landing gear shock strut will normally require only a minimum amount of service. Maintain the strut extension air pressure shown in figure 1-1. Lubricate landing gear as shown in figure 2-6. Check landing gear daily for general cleanliness, security of mounting, and for hydraulic fluid leakage. Keep machined surface of strut barrel wiped free of dirt and dust, using a clean, lint-free cloth moistened with hydraulic fluid (MIL-H-5606) or kerosene. All surfaces should be wiped free of excess hydraulic fluid or kerosene. Leave a light film of fluid on the machine surface of the strut barrel.

2-30. SHIMMY DAMPENER. The shimmy dampener contains a compensating mechanism within the hollow piston rod for thermal expansion and contraction of the hydraulic fluid. The shimmy dampener must be filled completely with fluid, free of entrapped air, to serve its purpose. In addition, the piston rod must also be partially full of fluid before the temperature compensating mechanism will function properly. It should be noted that the fluid is under pressure exerted against the floating piston by a spring, and that loosening or removing the filler plug will cause loss of fluid and necessitate removal and refilling of the shimmy dampener and piston rod.

NOTE

The shimmy dampener should be checked at each 50-hour inspection to see if it should be serviced.

Use the following procedure to fill the shimmy dampener.

a. Using the tow bar, turn the nose wheel strut to the extreme right position against the stop. This will place the shimmy dampener piston to the rear of the cylinder and eliminate the possibility of trapping air in the cylinder.
b. Remove the filler plug and fill with hydraulic fluid.
c. Replace filler plug and turn nose wheel strut through its entire travel several times.
d. Return strut to the extreme right position against the stop.
e. Remove filler plug and add whatever fluid is needed to fill the cylinder.
f. Replace and safety the filler plug.

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.

2-31. HYDRAULIC FLUID SAMPLING AND CONTAMINATION CHECK. At the first 50 and first 100-hour inspection and thereafter at each 500-hour inspection or one year, whichever should occur first, a sample of fluid should be taken and examined for sediment and discoloration. This may be done as follows:

a. Place aircraft master switch in OFF position and place aircraft on jacks as shown in figure 2-2. Bleed pressure from system by moving landing gear selector handle to a neutral position, after 15 seconds, return gear selector handle to the DOWN position.

CAUTION

Do not turn master switch ON while hydraulic system is open to atmosphere. The pump will automatically start, causing hydraulic fluid to spray from any open line.

b. Remove cap plug from tee fitting on right hand side of power pack and place a non-metal container below opening.
c. Operate emergency hand pump to pump fluid into container.
d. If the drain fluid is clear and is not appreciably darker in color than new fluid, continue to use the present fluid.
e. If the fluid color is doubtful, place fluid sample in a non-metallic container and insert a strip of polished copper in the fluid.
f. Keep copper in the fluid for six hours at a temperature of 70°F or more. A slight darkening of the copper is permissible, but there should be no pitting or etching visible up to 20X magnification. If pitting or etching is evident, drain fluid from power pack reservoir. Fill power pack with MIL-H-5606 hydraulic fluid and bleed air from system.

2-32. LANDING GEAR HYDRAULIC RETRACTION SYSTEM. Draining, filling and bleeding of the landing gear hydraulic retraction system can be accomplished by the following method.

a. Place aircraft master switch in OFF position and place aircraft on jacks as shown in figure 2-2. Bleed pressure from system by moving landing gear selector handle to a neutral position, after 15 seconds, return gear selector handle to the DOWN position.

CAUTION

Do not turn master switch ON while hydraulic system is open to atmosphere. The pump will automatically start, causing hydraulic fluid to spray from any open line.

b. Drain system by removing cap plug from tee fitting on right hand side of power pack and attaching a drain hose to opening. Place end of hose in a container of at least one gallon capaity and using emergency hand pump, pump fluid into container. When power pack reservoir is empty, replace cap plug on tee fitting.
c. Fill power pack reservoir with MIL-H-5606 hydraulic fluid by inserting funnel or filler hose in dipstick opening on top of power pack body.
d. Bleed system by cycling landing gear through several cycles. Refill power pack reservoir with MIL-H-5606 hydraulic fluid and remove aircraft from jacks.

2-33. HYDRAULIC BRAKE SYSTEMS. Check brake master cylinders and refill with MIL-H-5606 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.

2-34. CLEANING.

2-35. GENERAL DESCRIPTION. Keeping the aircraft clean is important. Besides maintaining the trim appearance of the aircraft, cleaning lessens the possiblity of corrosion and makes inspection and maintenance easier.

2-36. WINDSHIELD AND WINDOWS. Windshield and windows should be cleaned carefully with plenty of fresh water and a mild detergent, using the palm of the hand to feel and dislodge any caked dirt or mud. A sponge, soft cloth or chamois may be used, but only as a means of carrying water to the plastic. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth as this builds up an electrostatic charge which attracts dust. Oil and grease may be removed by rubbing lightly with a soft cloth moistened with Stoddard solvent.

CAUTION

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

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

2-37. 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 2-36, must never be used since they soften and craze the plastic trim.

2-38. PAINTED SURFACES. The painted exterior surfaces of your new Cessna have a durable, long lasting finish. Approximately 10 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

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 a chamois. Harsh or abrasive soaps or detergents which cause corrosion or scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent.

To seal any minor surface chips or scratches and protect against corrosion, the airplane should be waxed regularly with a good automotive wax applied in accordance with the manufacturer's instructions. If the airplane is operated in a seacoast or other salt water environment, it must be washed and waxed more frequently to assure adequate protection. Special care should be taken to seal around rivet heads and skin laps, which are the areas most susceptible to corrosion. A heavier coating of wax on the leading edges of the wings and tail and on the cowl nose cap and propeller spinner will help reduce the abrasion encountered in these areas. Reapplication of wax will generally be necessary after cleaning with soap solutions or after chemical de-icing operations.

2-39. 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 nonalkaline 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.

2-40. ENGINE AND ENGINE COMPARTMENT. An engine and accessories wash-down should be accomplished during each 100-hour inspection to remove oil, grease, salt corrosion or other residue that might conceal component defects during inspection. Also, periodic cleaning can be very effective in preventive maintenance.

Precautions should be taken when working with cleaning agents such as wearing of rubber gloves, an apron or coveralls and a face shield or goggles. Use the least toxic of available cleaning agents that will satisfactorily accomplish the work. These cleaning agents include: (1) Stoddard Solvent (Specification P-D-680 type II), (2) A water alkaline detergent cleaner (MIL-C-25769J) mixed, 1 part cleaner, 2 to 3 parts water and 8 to 12 parts Stoddard solvent or (3) A solvent base emulsion cleaner (MIL-C-4361B) mixed 1 part cleaner and 3 parts Stoddard solvent.

CAUTION

> Do not use gasoline or other highly flammable substances for wash down.

Perform all cleaning operations in well ventilated work areas and ensure that adequate fire-fighting and safety equipment is available. Do not smoke or expose a flame, within 100 feet of the cleaning area. Compressed air, used for cleaning agent, application or drying , should be regulated to the lowest practical pressure. Use of a stiff bristle brush rather than a steel brush is recommended if cleaning agents do not remove excess grease and grime during spraying.

A recommended procedure for cleaning an engine and accessories is as follows:

CAUTION

> Do not attempt to wash an engine which is still hot or running. Allow the engine to cool before cleaning.

a. Remove engine cowling.
b. Carefully cover the coupling area between the vacuum pump and the engine drive shaft so that no cleaning solvent can reach the coupling or seal.
c. Cover the open end of the vacuum discharge tube.
d. Cover the vacuum relief valve filter, if installed in the engine compartment.
e. Use fresh water for wash-down when the engine is contaminated with salt or corrosive chemicals. A cleaning agent such as described previously may then be used to remove oil and grime.

CAUTION

> Care should be exercised to not direct cleaning agents or water streams at openings on the starter, magnetos, alternator or vacuum pump.

f. Thoroughly rinse with clean warm water to remove all traces of cleaning agents.

CAUTION

> Cleaning agents should never be left on engine components for an extended period of time. Failure to remove them may cause damage to components such as neoprene seals and silicone fire sleeves, and could cause additional corrosion.

g. Completely dry engine and accessories using clean, dry compressed air.
h. Remove the cover over the coupling area.
i. Remove the cover from the vacuum discharge tube.
j. Remove the cover from the vacuum relief valve filter, if installed.
k. If desired, engine cowling may be washed with the same cleaning agents, then rinsed thoroughly and wiped dry. After cleaning engine, relubricate all control arms and moving parts as required.
l. Reinstall engine cowling.

WARNING

For maximum safety, check that the magneto switches are OFF, the throttle is closed, the mixture control is in the idle cut-off position, and the airplane is secured before rotating the propeller by hand. Do not stand within the arc of the propeller blades while turning the propeller.

m. Before starting engine, rotate the propeller by hand no less than four complete revolutions.

2-41. UPHOLSTERY AND INTERIOR cleaning prolongs the life of 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 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.

NOTE

Repair kits are available for the repair of cracks in ABS, PBC, PVCP, graphite and fiberglass material. (Cessna Supply Division, P.O. Box 949, Wichita, KS 67201, 316/685-9111, Telex 417-489.)

2-42. 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.

2-43. WHEELS. The wheels should be washed periodically and examined for corrosion, chipped paint, and cracks or dents in the wheel halves or in the flanges or hubs. If defects are found, remove and repair in accordance with Section 5. Discard cracked wheel halves, flanges or hubs and install new parts.

2-44. LUBRICATION.

WARNING

Thoroughly wash used oil off skin as soon as possible with soap and water. A waterless hand cleaner can be used when soap and water are not available. Apply skin cream after using waterless hand cleaner.

2-45. GENERAL DESCRIPTION. Lubrication requirements are shown in figure 2-6. 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 2-6 by adding details not shown in the figure.

2-46. TACHOMETER DRIVE SHAFT. Refer to Section 15.

2-47. 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 takeoffs 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.

2-48. NOSE GEAR TORQUE LINKS. Lubricate nose gear torque links every 50 hours. When operating from a dirt strip or in extremely dusty areas, more frequent lubrication of the torque links is required.

2-49. WING FLAP ACTUATOR. Clean and lubricate wing flap actuator jack screw each 100 hours as follows:

a. Expose jack screw by operating flaps to full down position.
b. Clean jack screw threads with solvent rag and dry with compressed air.

NOTE

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

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

2-50. 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, flap 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.

2-51. NOSE GEAR STEERING COLLAR. Lubricate nose gear steering collar spindle links at each 100-hour inspection.

2-52. NOSE GEAR PIVOTS. Lubricate all nose gear pivot points at each 100-hour inspection, including the drag link pivot points. More frequent lubrication may be required when operating in dusty areas.

2-53. MAIN GEAR PIVOT POINTS. Lubricate main landing gear pivot assembly at each 500-hour inspection. If more than the usual number of takeoffs and landings are made, lubrication of the pivot assembly should be accomplished at each 100-hour inspection.

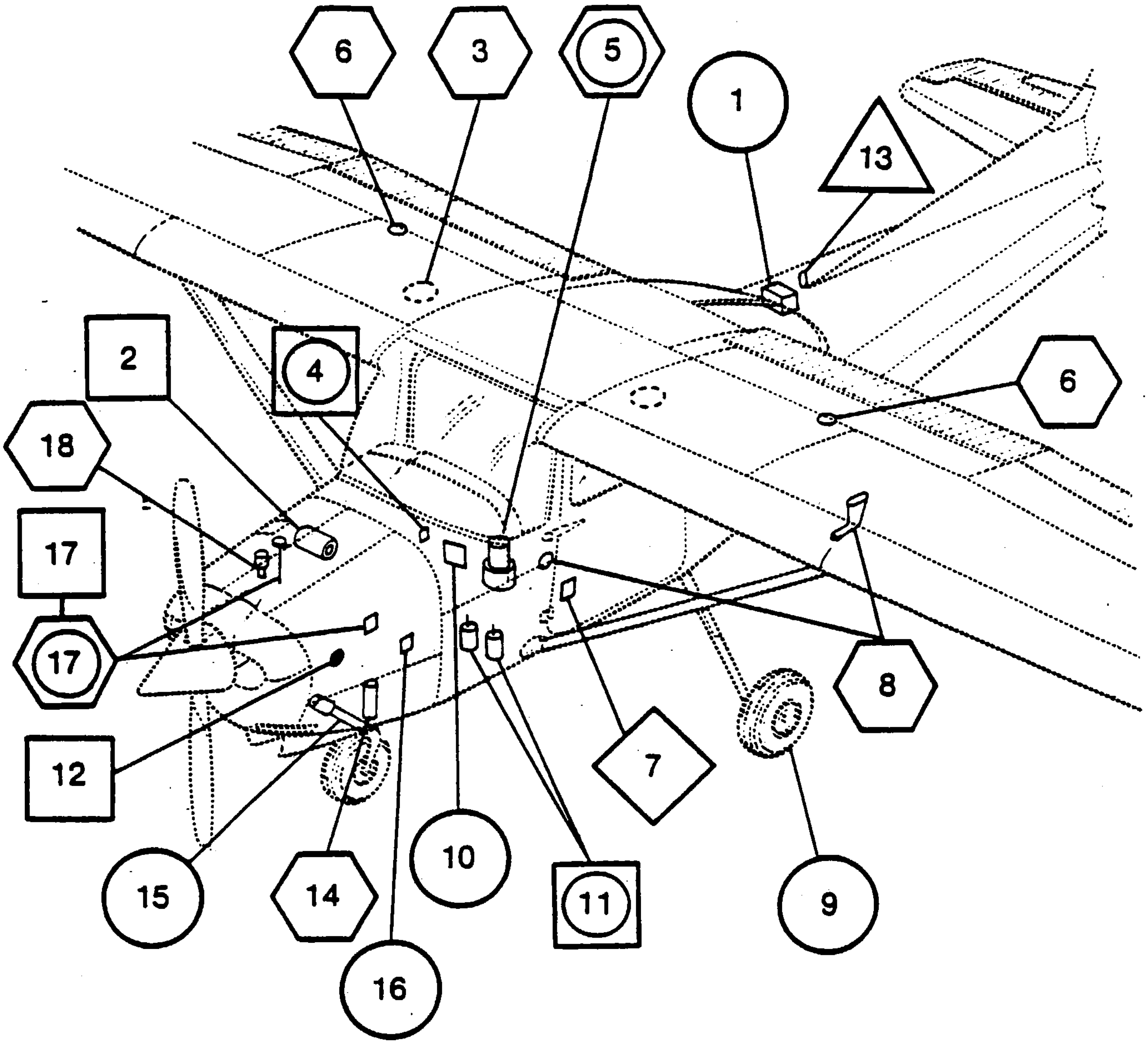


Figure 2-5. Servicing (Sheet 1 of 4)

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

SPECIFIED AVIATION GRADE FUELS:

WARNING

ONLY AVIATION GRADE FUELS ARE APPROVED FOR USE.

ENGINE MODEL

LYCOMING 0-360-F1A6

APPROVED FUEL GRADES

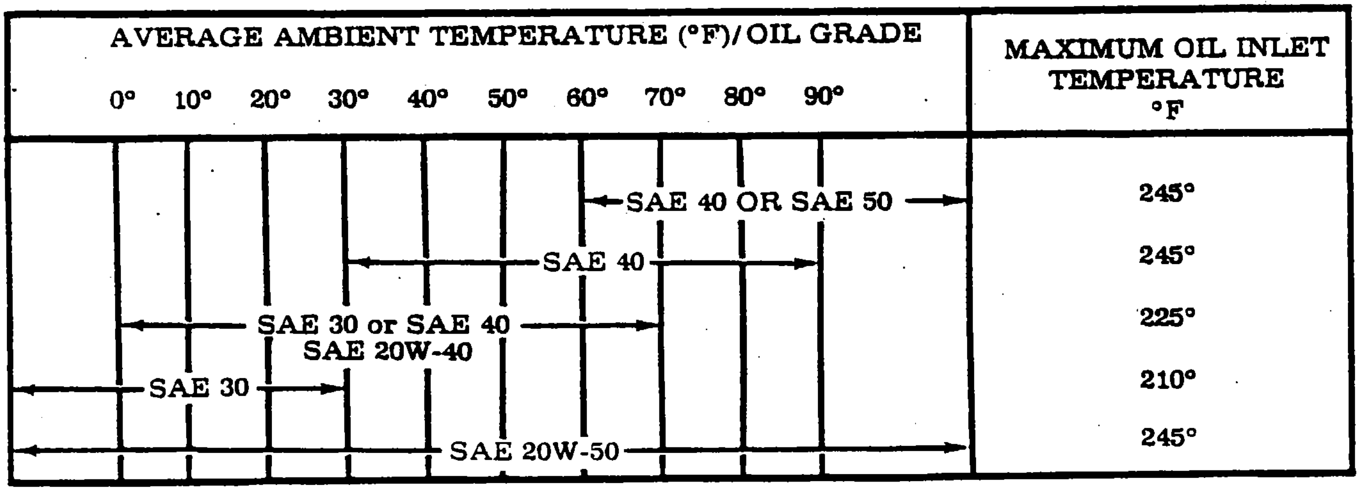
100LL (blue)

100 (formerly 100/130, green)

NOTE

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

SPECIFIED AVIATION GRADE OIL:



NOTE

The overlap of oil grades is based on a mid-range of ambient ground temperatures vs. maximum oil inlet temperature. Aviation Grade ashless dispersant oil conforming to Avco Lycoming Service Instruction No. 1014 and all revisions and supplements thereto, MUST BE USED except as noted in paragraph 2-23.

CAPACITY (TOTAL)	EXTENDED FLIGHT	NORMAL OPERATION	MINIMUM FOR FLIGHT
9	8	7	5

Figure 2-5. Servicing (Sheet 2 of 4)

⬡ DAILY

3 FUEL BAYS:
Service after each flight. Keep full to retard condensation. Refer to paragraph 2-21.

10 FUEL SELECTOR VALVE DRAIN:
Drain off any water or sediment. Refer to paragraph 2-21.

6 FUEL BAY SUMP DRAINS:
Drain off any water and sediment before first flight of the day.

18 FUEL STRAINER:
Drain off any water and sediment before first flight of the day.

17 OIL DIPSTICK:
Check on preflight. Add oil as necessary. Refer to paragraph 2-23 for details. Check that filler cap is tight and secure.

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

14 NOSE GEAR SHOCK STRUT:
Check on preflight. Check inner barrel showing below outer barrel to be approximately two inches. Deviation from these dimensions is cause to check and service strut per paragraph 2-29.

⏣ 25 HOURS

17 ENGINE OIL SYSTEM: FIRST 25 HOURS
Refill with straight mineral oil, non-detergent, and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Refer to paragraph 2-23.

5 HYDRAULIC POWER PACK:
Check fluid level, and after a gear extension which uses the hydraulic hand pump.

○ 50 HOURS

16 INDUCTION AIR FILTER:
Clean filter per paragraph 2-25. Replace as required.

1 BATTERY:
Check electrolyte level and clean battery each 50 hours or each 30 days.

15 SHIMMY DAMPENER:
Check fluid level and refill as required in accordance with paragraph 2-30.

9 TIRES:
Maintain correct tire inflation as listed in figure 1-1. Refer to paragraph 2-28.

14 NOSE GEAR SHOCK STRUT:
Keep strut filled and inflated to correct pressure. Refer to paragraph 2-29.

Figure 2-5. Servicing (Sheet 3 of 4)

○ 50 HOURS (Cont.)

10 FUEL SELECTOR VALVE DRAIN:
Drain off any water or sediment. Refer to paragraph 2-21.

5 HYDRAULIC FLUID RESERVOIR:
At first 50 and first 100 hours, thereafter at each 500 hours or one year, whichever comes first, a sample of hydraulic fluid should be examined for sediment and discoloration as outlined in paragraph 2-31.

□ 100 HOURS

12 CARBURETOR DRAIN PLUG:
Check for thread sealant residue in float chamber. Refer to paragraph 2-22.

2 ENGINE OIL FILTER:
Change filter every 100 hours.

4 VACUUM RELIEF VALVE FILTER:
Replace every 100 hours.

18 FUEL STRAINER:
Disassemble and clean strainer bowl and screen.

17 ENGINE OIL:
Change oil at least every 100 hours or every six months.

⧇ 200 HOURS

7 VACUUM SYSTEM CENTRAL AIR FILTER:
Inspect for damage.

11 BRAKE MASTER CYLINDERS:
Check fluid level and fill as required with hydraulic fluid.

◇ 500 HOURS

7 VACUUM SYSTEM CENTRAL AIR FILTER:
Replace every 500 hours.

△ AS REQUIRED

13 GROUND SERVICE RECEPTACLE:
Connect to 24-volt DC. negative-ground power unit. Refer to Section 16.

Figure 2-5. Servicing (Sheet 4 of 4)

FREQUENCY (HOURS)

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
GP		NO. 10-WEIGHT, NON-DETERGENT OIL
OL	VV-L-800A	LIGHT OIL

Figure 2-6. Lubrication (Sheet 1 of 6)

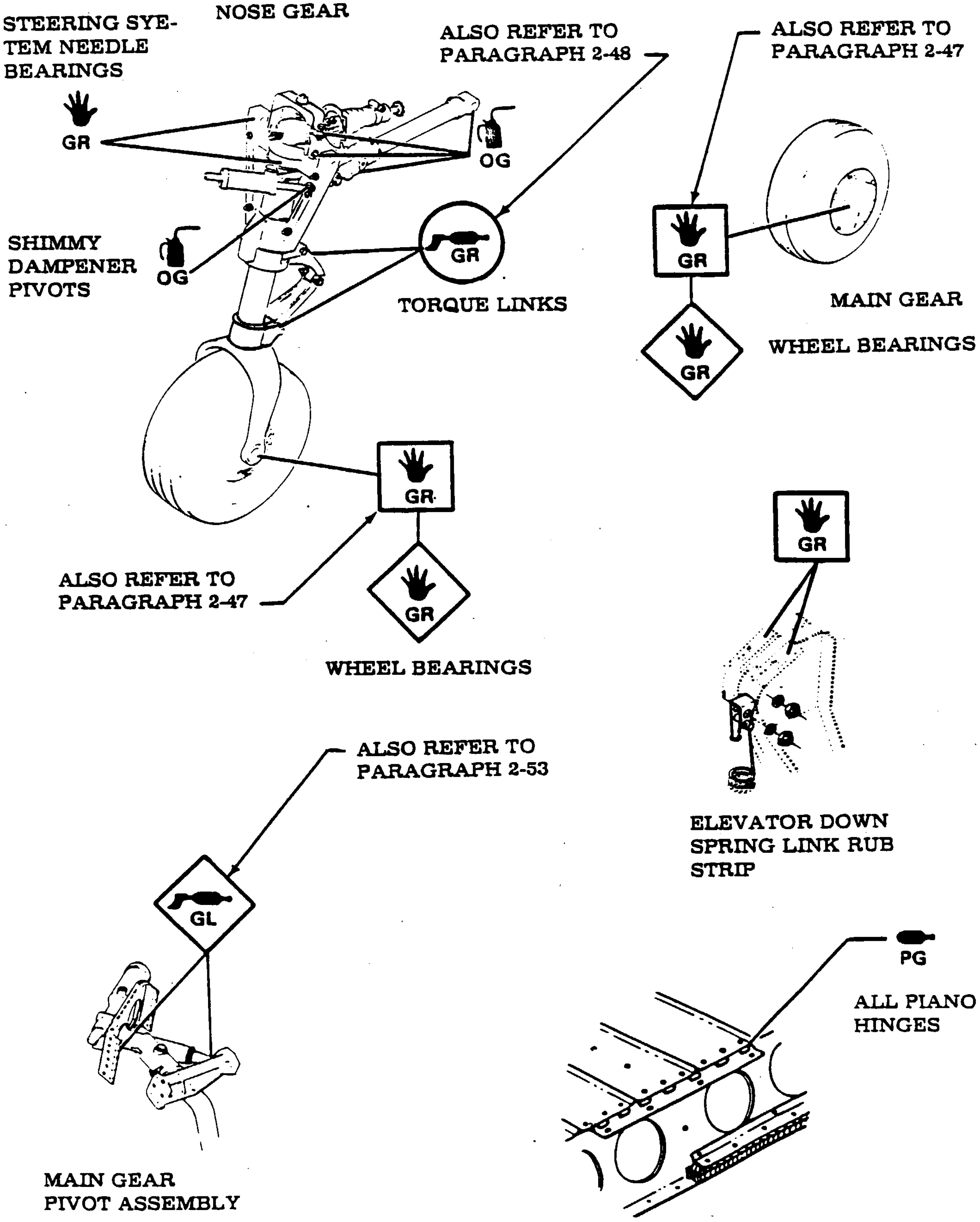
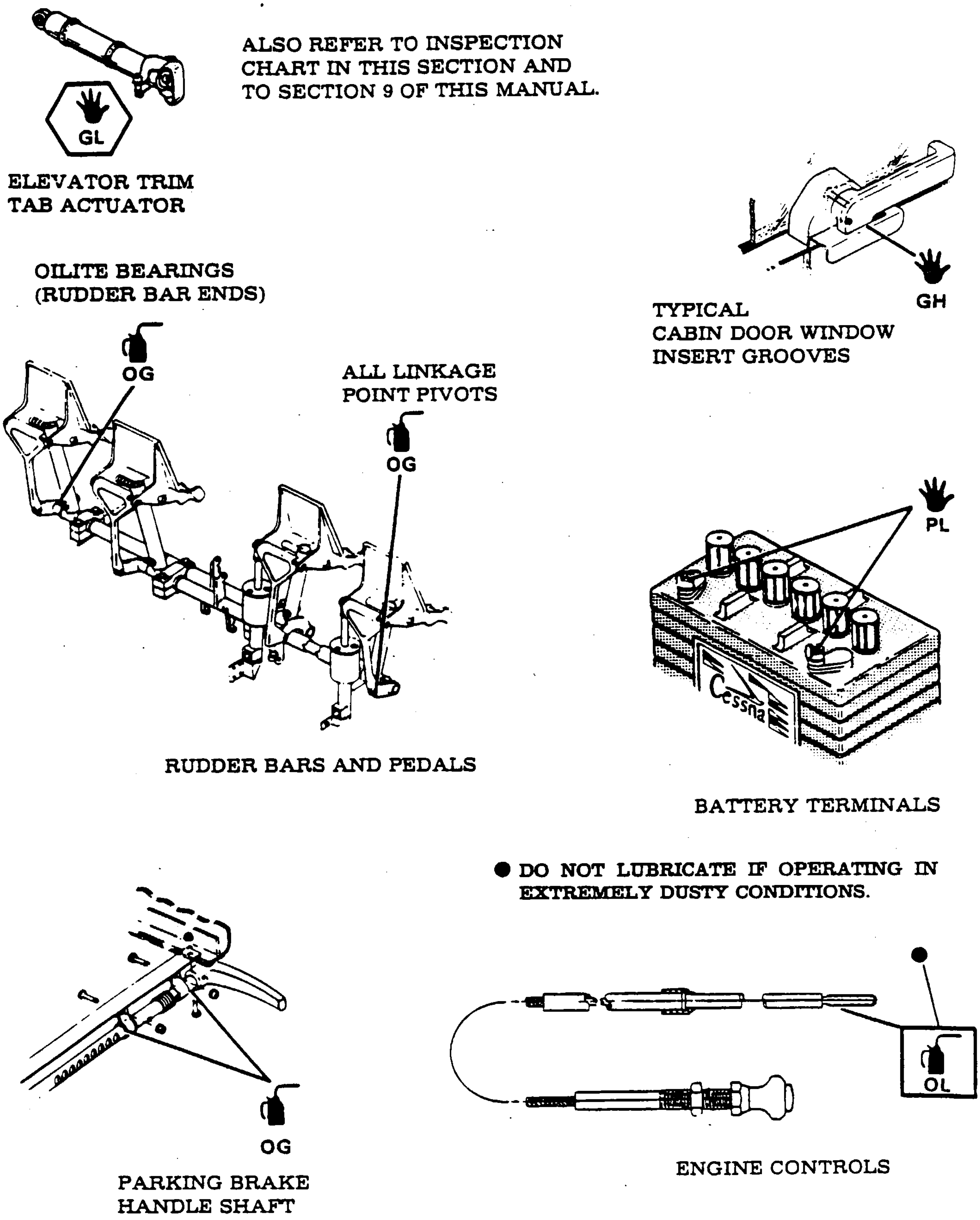


Figure 2-6. Lubrication (Sheet 2 of 6)

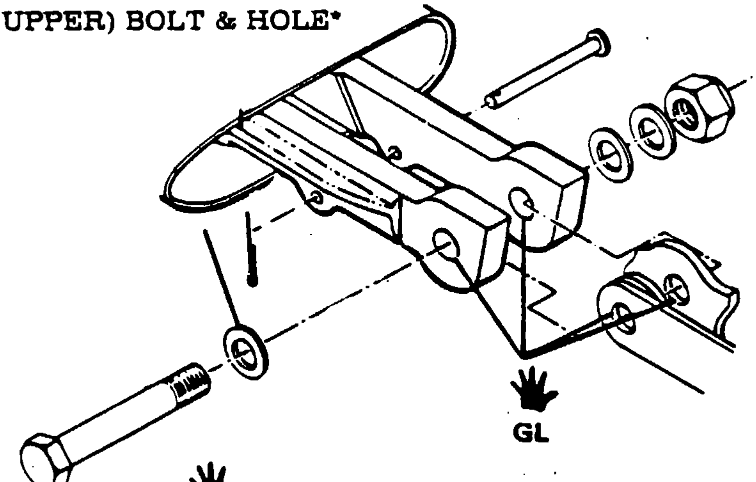


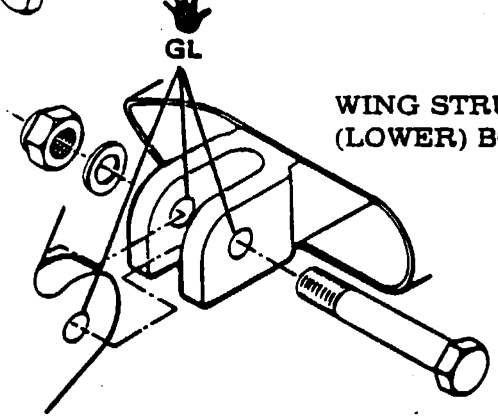
ALSO REFER TO INSPECTION CHART IN THIS SECTION AND TO SECTION 9 OF THIS MANUAL.

● DO NOT LUBRICATE IF OPERATING IN EXTREMELY DUSTY CONDITIONS.

Figure 2-6. Lubrication (Sheet 3 of 6)

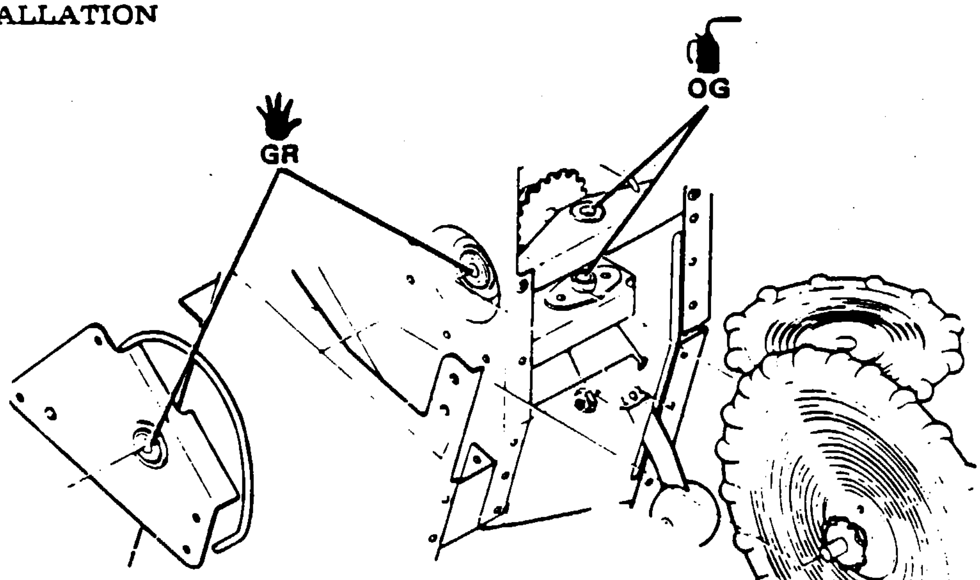
WING STRUT-ATTACH
(UPPER) BOLT & HOLE*





WING STRUT-ATTACH
(LOWER) BOLT & HOLE*

*UPON INSTALLATION



TRIM WHEEL OILITE AND
NEEDLE BEARINGS

Figure 2-6. Lubrication (Sheet 4 of 6)

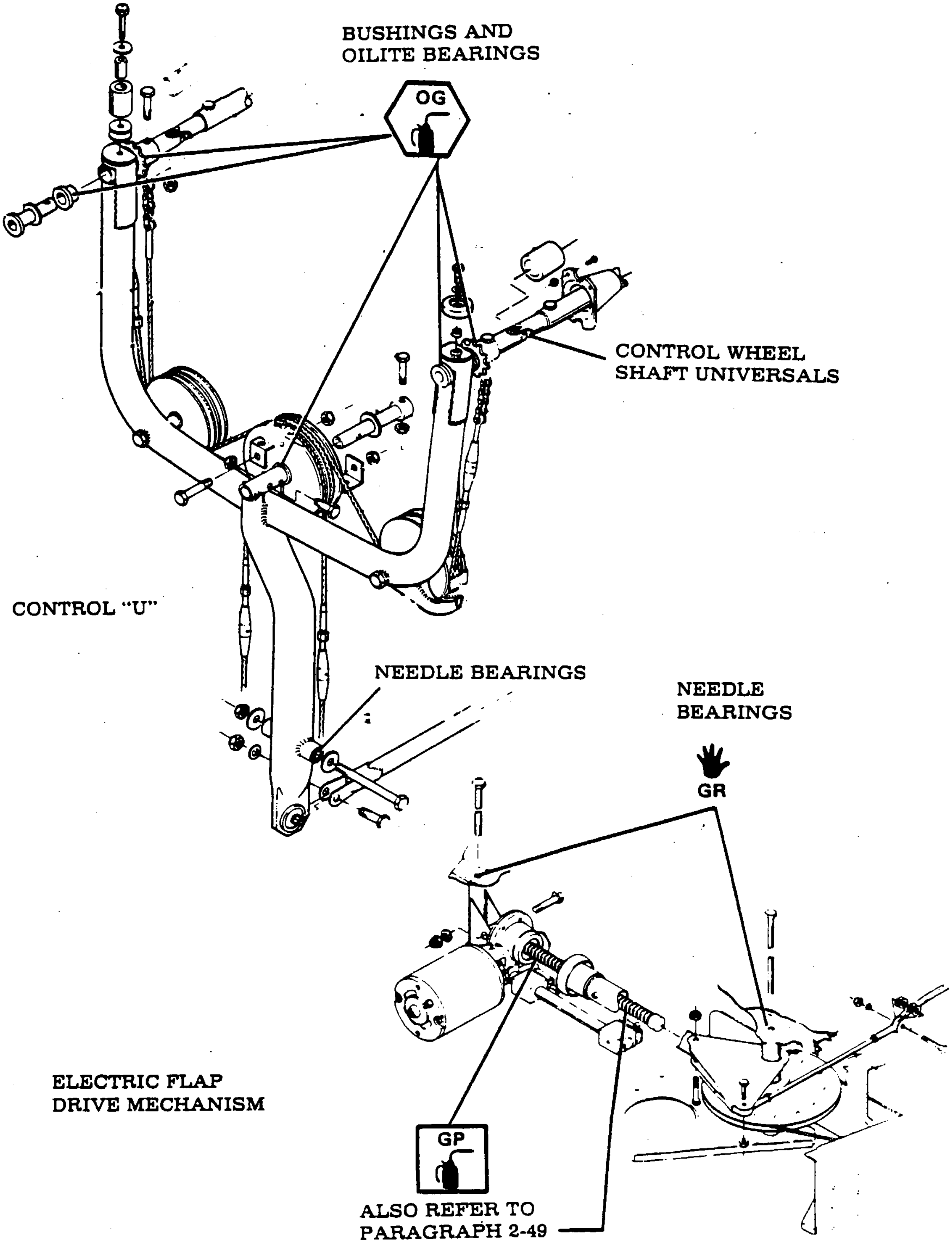
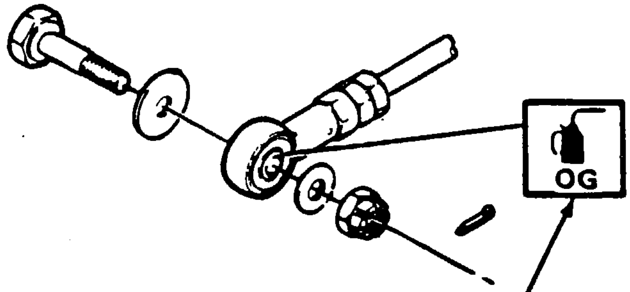
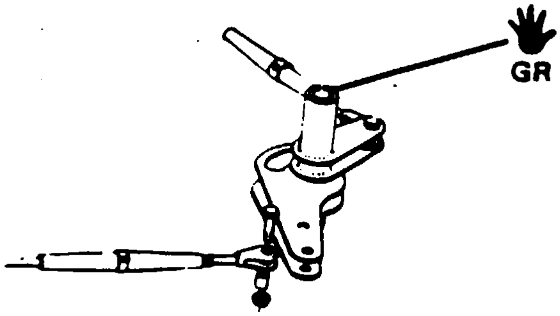


Figure 2-6. Lubrication (Sheet 5 of 6)



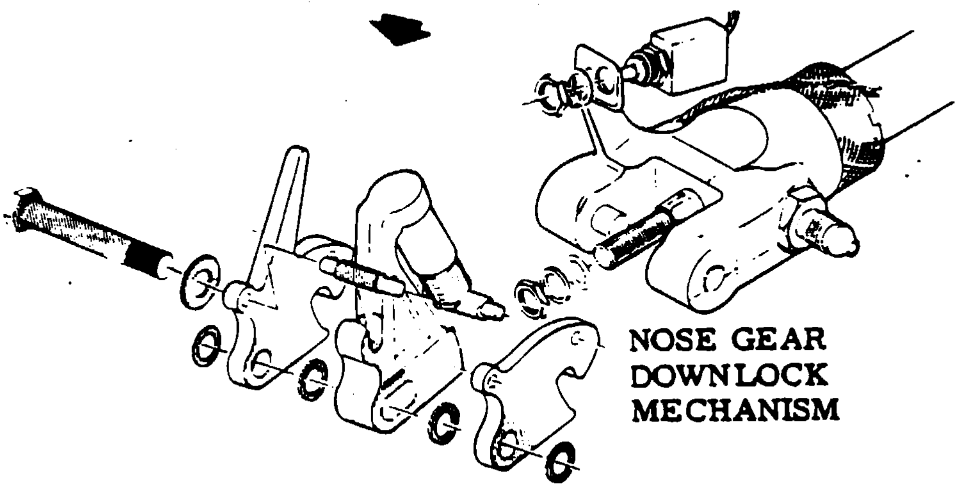
ROD END
BEARINGS

ALSO REFER TO
PARAGRAPH 2-50



AILERON BELLCRANK
NEEDLE BEARINGS

SPRAY BOTH SIDES OF SHADED AREAS WITH ELECTROFILM LUBRI-BOND "A" WHICH IS AVAILABLE IN AEROSOL SPRAY CANS, OR AN EQUIVALENT LUBRICANT. TORQUE ATTACHING BOLT TO 10-20 LB-IN.



NOSE GEAR
DOWNLOCK
MECHANISM

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 for 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 2-6. Lubrication (Sheet 6 of 6)

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. 50 HOUR INSPECTIONS: (Refer to the Inspection Charts, Column 1.) This inspection requires each item marked with a symbol • to be inspected at each 50 hours of flight time.

b. 100 HOUR AND/OR ANNUAL INSPECTIONS: (Refer to the Inspection Charts, Column 2.) This inspection requires each item marked with a symbol • to be inspected at each 100 hours of flight time and/or each 12th month following the last inspection recorded for the aircraft.

c. 200 HOUR INSPECTIONS: (Refer to the Inspection Charts, Column 3.) This inspection requires each item marked with a symbol • to be inspected at each 200 hours of flight time.

d. SPECIAL INSPECTIONS: (Refer to the Inspection Charts, Column 4.) This inspection requires each item that has a numeral inserted in the column be inspected in accordance with the corresponding numeral listed in the back of the Inspection Charts.

e. PROGRESSIVE INSPECTION: In lieu of the conventional 100 hour/annual inspection as covered in Part 91.169 of the Federal Aviation Regulations, an aircraft may be Inspected in accordance with a progressive inspection. Progressive Inspection allows the inspection work load to be divided into smaller operations that can be accomplished in a shorter time period and offers increased safety reliability, and utility while decreasing downtime. Aircraft on this program do not require the 100 hour/annual inspection. "Cessna Progressive Care" has been designed for this purpose. It is highly recommended for aircraft being flown 200 hours or more per year.

NOTE

The inspection intervals shown in Column 5 are presented for comparitive purposes only and SHALL NOT BE USED AS THE PROGRESSIVE CARE INSPECTION SCHEDULE. A complete program and operations manual are available for this purpose.

Cessna Progressive Care has been designed for use Worldwide. While the development of the Cessna Progressive Care Program has been coordinated primarily with the Federal Aviation Administration in the United States, program information has been in the United States, program information has been forwarded to and discussed with the Governmental Aviation Agencies in many countries throughout the World. These Governments are in basic agreement with Progressive Care. Therefore, Export Agencies and Dealers are directed to contact the Governmental Aviation Agency in their areas prior to placing the first aircraft on Progressive Care, to make certain they are in basic accord with the program.

f. INSPECTION GUIDE-LINES. The guide-lines shown, preceeding the Inspection Charts, are suggested for your use when making the detailed inspections listed in the Inspection Charts. In 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 Supply Division, P.O. Box 949, Wichita, KS 67201, 316/685-9111, Telex 417-489.)

IV INSPECTION GUIDE LINES.

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

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

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

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

(e) BOLTS IN CRITICAL AREAS for: correct torque in accordance with torque values given in the chart in Section 1, when installed or when 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.
3. Pilot's Operating Handbook.

To be made available upon request:
1. Aircraft Log Book and Engine Log Book.

(h) ENGINE RUNUP.

Before beginning the step-by-step inspection. start. run up and shut down the engine in accordance with instructions in the Pilot's Operating Handbook. 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 valve; operate engine on each bay position and OFF position long enough to ensure that selector valve functions properly.
7. Idling speed and mixture; proper idle cut-off.
8. Alternator and ammeter.
9. Suction gage.

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

INSPECTION CHARTS

IMPORTANT

READ ALL PRECEDING PARAGRAPHS FOR INSPECTION REQUIREMENTS PRIOR TO USING THESE CHARTS.

TYPE OF INSPECTION

PROPELLER

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Spinner	●			
2. Spinner bulkhead		●		
3. Blades	●			
4. Bolts and nuts		●		
5. Hub		●		
6. Governor and control		●		15

ENGINE COMPARTMENT

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

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Engine oil 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		●		

TYPE OF INSPECTION

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
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		●		6
19. Engine shock mounts, mount structure and ground straps			●	
20. Cabin heat valves, doors and controls			●	
21. Starter, solenoid and electrical connections		●		
22. Starter brushes, brush leads and commutator			●	23
23. Alternator, belt and electrical connections		●		19
24. Alternator brushes, brush leads, commutator or slip ring				7
25. Alternator support bracket for security		●		
26. Voltage regulator mounting and electrical leads		●		
27. Magnetos (externally/internally) and electrical connections		●		8
28. Magneto timing				8
29. Carburetor and drain plug		●		
30. Firewall			●	
31. Engine cowl flaps and controls	●			
32. Engine cowling	●			
33. Cowl flap hinges and hinge pins	●			
34. Carburetor throttle arm attachment	●			
FUEL SYSTEM				
1. Fuel strainer, drain valve and control, fuel bay vents, caps and placards	●			

TYPE OF INSPECTION

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
2. Fuel strainer screen and bowl	●			
3. Drain fuel and check bay interior and outlet screens				21
4. Fuel bays and sump drains			●	
5. Fuel selector valve and placards	●			
6. Engine primer		●		
7. Fuel quantity indicators and transmitters		●		
8. Auxiliary fuel pump		●		22
9. Engine-driven fuel pump		●		
10. Perform a fuel quantity indicating system operational test. Refer to Section 15 for detailed accomplishment instructions.				24

LANDING GEAR, BRAKE SYSTEM AND RETRACTION SYSTEM

MAIN GEAR

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Wheels	●			
2. Bearings				9
3. Tires	●			
4. Tubular struts			●	
5. Pivot		●		17

BRAKE SYSTEM

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Brake Fluid			●	
2. Lines and hoses			●	16
3. Linings			●	
4. Discs			●	
5. Brake assemblies			●	
6. Master cylinders			●	16
7. Parking brake system			●	
8. Park brake and toe brakes operational test	●			

TYPE OF INSPECTION

NOSE GEAR

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Wheel	•			
2. Bearings				9
3. Tire	•			
4. Shock strut (service as required)	•			
5. Shimmy dampener (service as required)	•			

RETRACTION SYSTEM

NOTE

When performing an inspection of the landing gear retraction system, the aircraft must be placed on jacks and an external power source of at least 60 amps should be used to prevent drain on the airplane's battery when operating the system.

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Operate the landing gear through five fault-free cycles		•		

NOTE

Less than 6 seconds to extend
Less than 8 seconds to retract

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
2. Check main gear downlock engagement		•		
3. Check main gear strut-to-pivot attachment		•		
4. Check adjustment and operation of the main gear up and down indicator switches, nose gear up and down indicator switches and nose gear squat switch. Check indicator for proper operation.		•		
5. Check nose gear doors for at last ¼ inch clearance with any part of the landing gear during operation, and for proper fit when closed.		•		

TYPE OF INSPECTION

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
6. Check nose gear door linkage for security, wear of pivot points and bearings, and for distortion or other damage		●		
7. Check condition of all springs		●		
8. Check all hydraulic system components for security hydraulic leaks and any apparent external damage to components or mounting structure		●		16
9. Check operation of emergency hand pump			●	
10. Hydraulic contamination check				18
11. Clean hydraulic power pack fluid filter screen		●		
12. Retraction system components as follows:				
a. Main gear downlock actuators			●	
b. Main and nose gear actuators			●	
c. Landing gear selector valve			●	
d. Pressure switch			●	
13. Electrical and hydraulic power pack pressure checks			●	

CAUTION

Before installing access plates, inspect area beneath floorboard for loose screws, washers, shavings and other foreign material which could enter landing gear bevel gears and cause damage.

AIRFRAME

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
1. Aircraft exterior	●			
2. Aircraft structure			●	
3. Windows, windshield, doors and seals	●			

TYPE OF INSPECTION

	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
4. Seat stops, seat rails, upholstery, structure and mounting			●	20
5. Seat belts and shoulder harnesses	●			
6. Control column bearings, pulleys, cables, chains and turnbuckles			●	
7. Control lock, control wheel and control column mechanism			●	
8. Instruments and markings	●			
9. Gyros central air filter			●	10
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	●			
21. Antennas and cables			●	
22. Battery and battery cables	●			
23. Battery electrolyte				11
24. Emergency locator transmitter				12

CONTROL SYSTEMS

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

	TYPE OF INSPECTION			
	1. 50 HOURS	2. 100 HOURS	3. 200 HOURS	4. SPECIAL
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				13
9. Elevators, trim tab, hinges and push-pull tube	●			
10. Elevator trim tab actuator lubrication and tab free-play inspection		●		14
11. Rudder pedal assemblies and linkage			●	
12. External skins of control surfaces and tabs	●			
13. Internal structure of control surfaces			●	
14. Balance weight attachment			●	
15. Ailerons, hinges and push-pull rod	●			

SPECIAL INSPECTION ITEM

1 First 25 hours: 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. Change oil and filter element each 100 hours ; or every six months, whichever comes first.

2 Clean filter per paragraph 2-25. Replace if required.

3 (This life limit is not intended to allow flexible fluid carrying rubber hoses in a deteriorated or damaged condition to remain in service.) Replace engine compartment flexible fluid carrying hoses (Cessna installed only) manufactured of rubber material 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.

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

5 Replace every 100 hours.

6 Each 100 hours for general condition and freedom of movement. These controls are not repairable. Replace every 1500 hours or whenever maximum linear movement exceeds .050-inch.

7 Inspect each 500 hours.

8 At the first 50 hours, first 100 hours and thereafter at each 100 hours, the magneto-to-engine timing should be checked. If magneto-to-engine timing is not within plus zero degrees and minus two degrees, the magneto should be retimed to the engine. Refer to Section 11 for magneto timing details (Slick 4191). Replace all 4000/4100 Series Slick magnetos with appropriate 4300 Series magnetos after 800 hours total time in service. Refer to Slick Service Bulletin SB2-80C. Slick 4251 magnetos are installed on aircraft 172RG0017, 172RG0031, 172RG0033, 172RG0034, 172RG0038, 172RG0044, 172RG0054 and 172RG0056 and On. Refer to Section 11 for special inspection and maintenance procedures.

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

10 Inspect for damage each 200 hours. Replace each 500 hours.

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

SPECIAL INSPECTION ITEMS

12. Refer to Section 16 of this manual for emergency locator transmitter.
13. Refer to paragraph 2-49 for detailed instructions on flap actuator jackscrew threads.
14. Lubrication for the actuator is required each 1000 hours or 3 years, whichever comes first. Refer to Figure 2-6 for grease specifications.

NOTE

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

15. If leakage is evident, refer to McCauley Service Manual.
16. Each 5 years, overhaul all retraction and brake system components. Check for wear and replace all rubber packings and back-ups.
17. With airplane on jacks, check main landing gear pivot for any sign of end play in bearings by grasping gear tube and attempting to move up and down and end to end. If any bearing end play is noticed, tighten pivot per installation instructions in Section 5. If bearing end play cannot be adjusted out, replace pivot. Visually inspect pivots for signs of bushings working loose or any brake or hydraulic fluid leakage onto lower skin.
18. At first 50 hours, first 100 hours and thereafter each 500 hours, or one year, whichever comes first.
19. Refer to Section 16, for interval and procedure.
20. Inspect seat rails for cracks every 50 hours. See figure 3-15.
21. Each 100 hours to coincide with engine overhaul.
22. Each 10 years, replace or overhaul the auxiliary fuel pump in accordance with Dukes Inc. Service Bulletin No. 003.
23. For Prestolite starters only, inspect the commutator and brushes every 1500 hours.
24. Fuel quantity indicating system operational test is required every 12 months. Refer to Section 15 for detailed accomplishment instructions.

2-54. 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: Overhaul - Item may be overhauled as defined in FAR 43.2 or it can be replaced.

   NOTE: 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 FAR 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 time 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

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
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 (Lycoming-Installed)	(Note 2)	NO
Auxiliary Electric Fuel Pump	(Note 7)	YES
Propeller	(Note 8)	YES

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 (AE3663819BXXXX 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 otherwise 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 Textron Lycoming engines, refer to latest Textron Lycoming Engine Service Bulletins.

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 Textron Lycoming Service Instruction S.I. 1009AJ, 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 overservice the air filter. Overservicing 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 occurs 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

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. REPAIR. Replace extensively damaged transparent plastic rather than repair whenever possible, since even a carefully patched part is not the equal of a new section, either optically or structurally. At the first sign of crack development, drill a small hole at the extreme end of the crack as shown in figure 3-1. This serves to localize the cracks and to prevent further splitting by distributing the strain over a large area. If the cracks are small, stopping them with drilled holes will usually suffice until replacement or more permanent repair can be made. The following repairs are permissible; however, they are not to be located in the pilot's line of vision during landing or normal flight.

a. SURFACE PATCH. If a surface patch is to be installed, trim away the damaged area and round all corners. Cut a piece of plastic of sufficient size to cover the damaged area and extend at least 3/4-inch on each side of the crack or hole. Bevel the edges as shown in figure 3-1. If the section to be repaired is curved, shape the patch to the same contour by heating it in an oil bath at a temperature of 248° to 302°F., or it may be heated on a hot plate until soft. Boiling water should not be used for heating. Coat the patch evenly with plastic solvent adhesive and place immediately over the hole. Maintain a uniform pressure of from 5 to 10 psi on the patch for a minimum of 3 hours. Allow the patch to dry 24 to 36 hours before sanding or polishing is attempted.

b. PLUG PATCH. In using inserted patches to repair holes in plastic structures, trim the holes to a perfect circle or oval and bevel the edges slightly. Make the patch slightly thicker than the material being repaired, and similarly bevel the edges. Install patches in accordance with procedure illustrated in figure 3-1. Heat the plug until soft and press into the hole without cement and allow to cool to make a perfect fit. Remove the plug, coat the edges with adhesive, and then reinsert in the hole. Maintain a firm light pressure until the cement has set, then sand or file the edges level with the surface; buff and polish.

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

CAUTION

Do not use coarse grade abrasive. Number 320 grit or finer is recommended.

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.

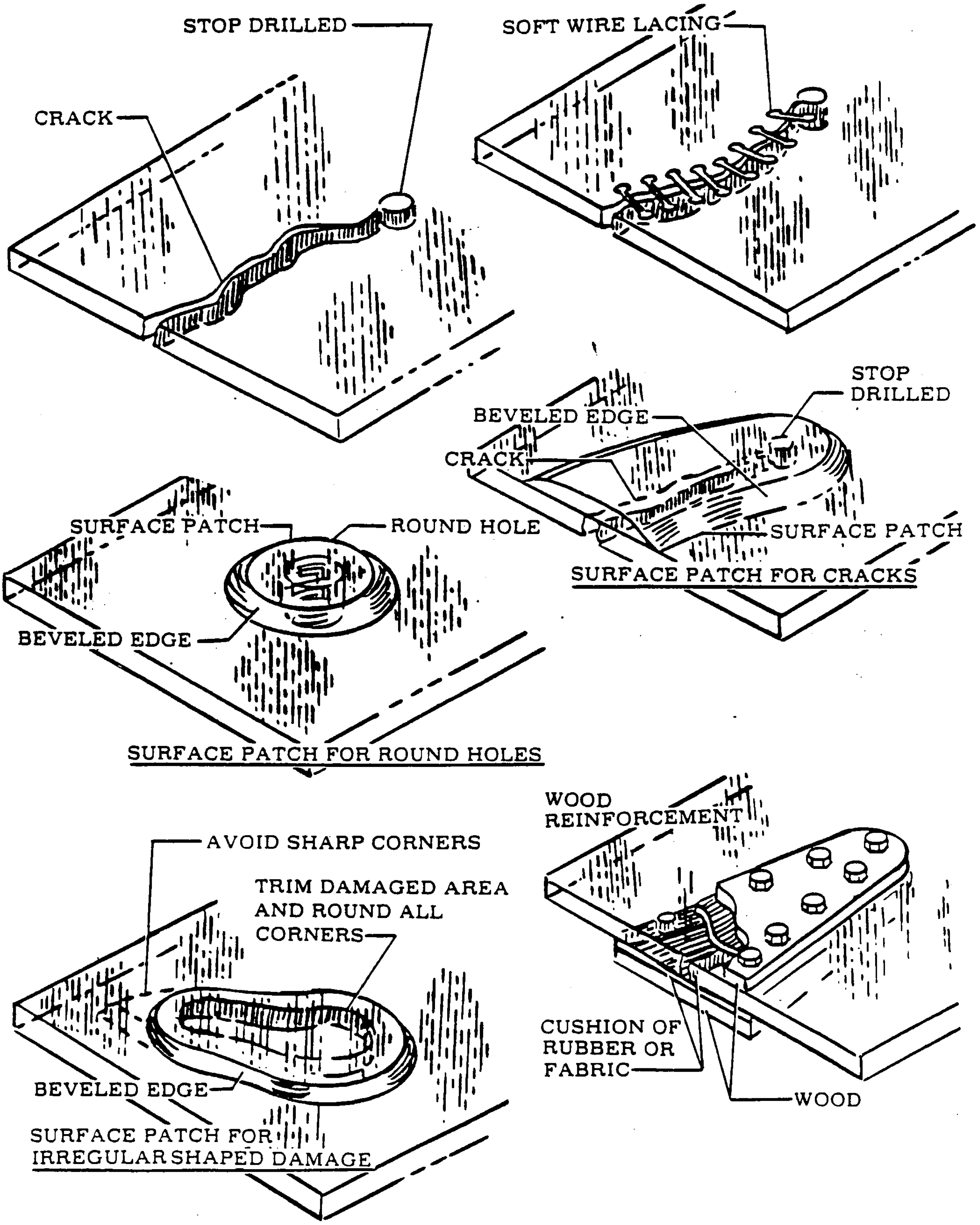
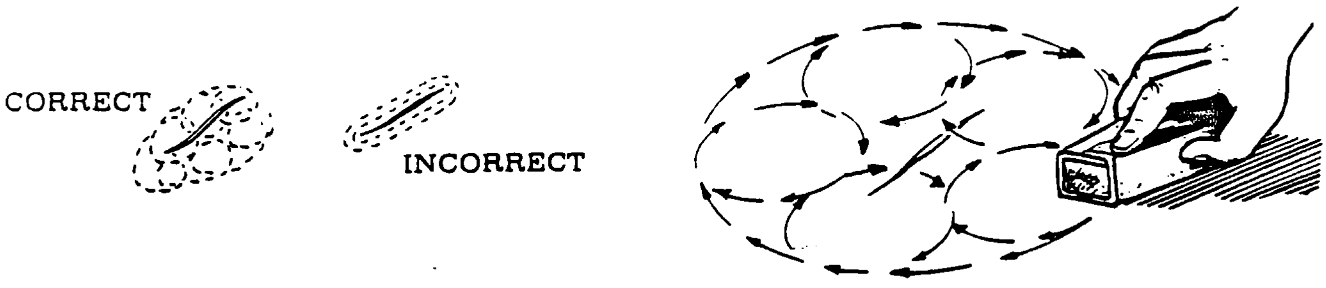
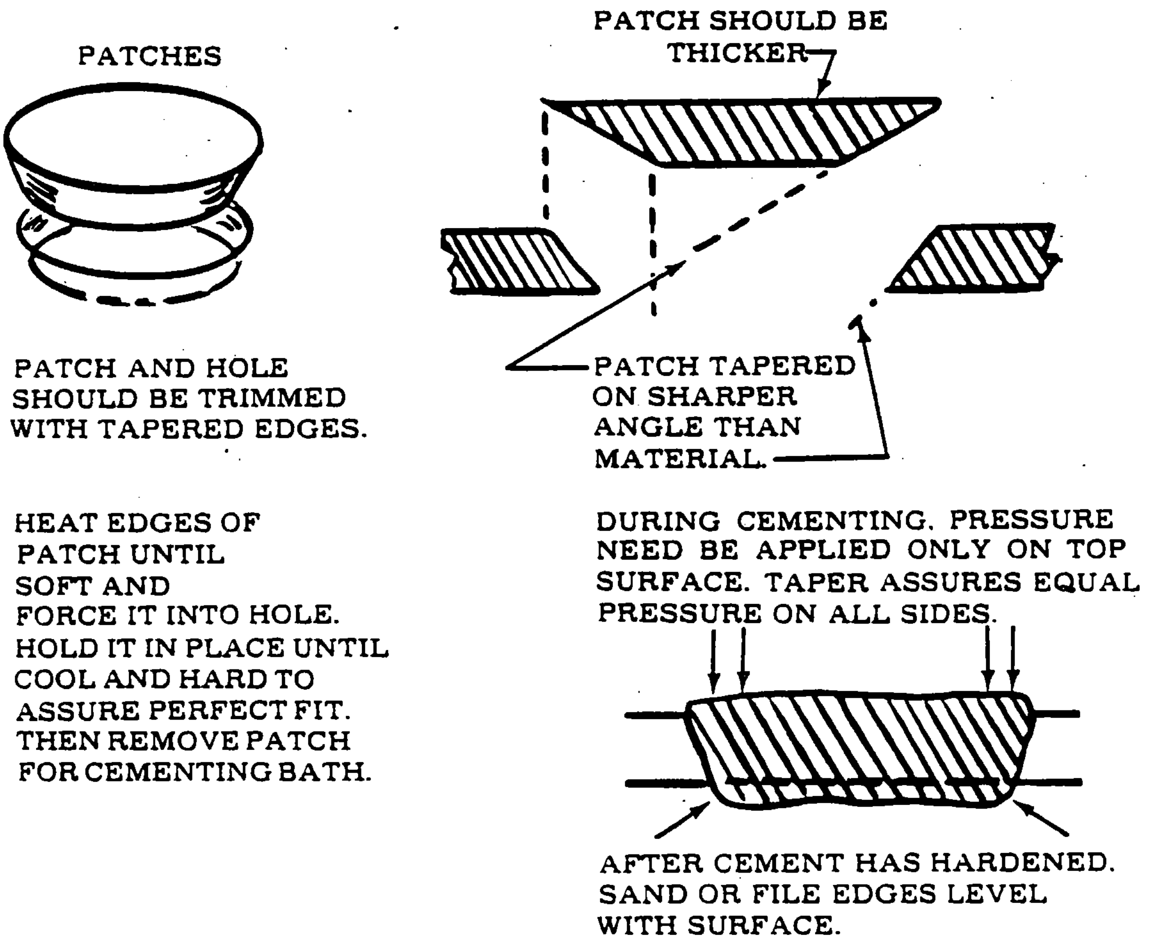


Figure 3-1. Repair of Windshield and Windows (Sheet 1 of 2)



SANDING REPAIR



PATCH AND HOLE SHOULD BE TRIMMED WITH TAPERED EDGES.

HEAT EDGES OF PATCH UNTIL SOFT AND FORCE IT INTO HOLE. HOLD IT IN PLACE UNTIL COOL AND HARD TO ASSURE PERFECT FIT. THEN REMOVE PATCH FOR CEMENTING BATH.

DURING CEMENTING. PRESSURE NEED BE APPLIED ONLY ON TOP SURFACE. TAPER ASSURES EQUAL PRESSURE ON ALL SIDES.

AFTER CEMENT HAS HARDENED. SAND OR FILE EDGES LEVEL WITH SURFACE.

Figure 3-1. Repair of Windshield and Windows (Sheet 2 of 2)

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. (See figure 3-1.)

a. When a crack appears, drill a hole at end of crack to prevent further spreading. Hole should be approximtely 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 by drilling small holes along both sides of crack 1/4 to 1/8 inch apart and lacing edges together with soft wire. Small-stranded antenna wire makes a good temporary lacing material. This type of repair is used as a temporary measure ONLY, and as soon as facilities are available, panel should be replaced.

3-9. WINDSHIELD. (See figure 3-2.)

3-10. REMOVAL.

a. Remove wing fairings.

b. Remove air vent tubes.

CAUTION

If windshield is to be reinstalled, be sure to protect windshield during removal.

c. With two people sitting in the airplane placing their feet against the windshield, just above the centerline, press upward on windshield forcing it out of lower retainers.

d. Clean sealer from inner sidewalls and bottom of retainers.

3-11. INSTALLATION.

a. If windshield is to be reinstalled, clean off old sealer and felt, then install new felt around edges of windshield.

b. If new windshield is to be installed, remove protective cover and clean, take care not to scratch windshield.

c. Apply new felt to edges of windshield.

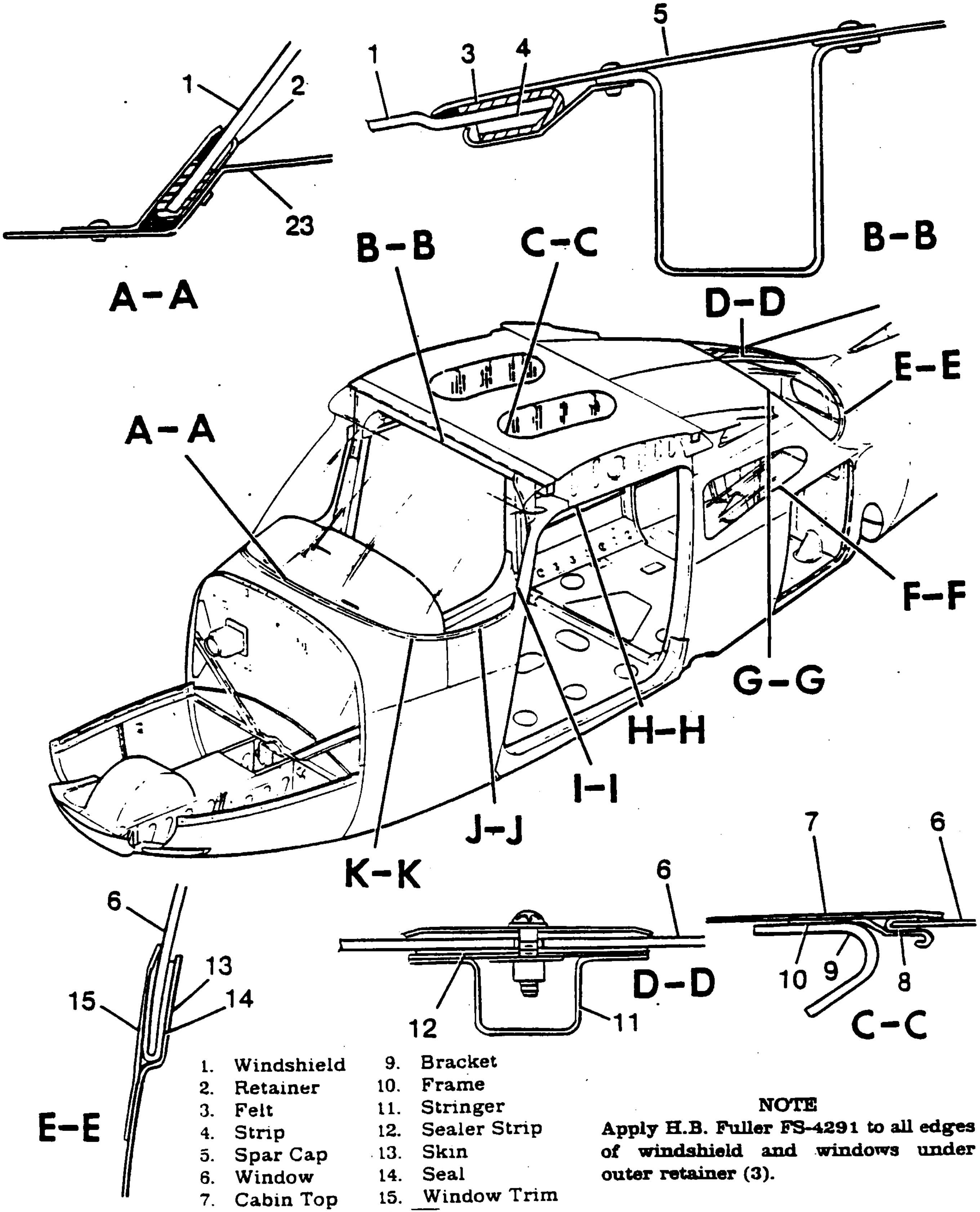
d. Apply a strip of sealer (H.B. Fuller FS-4291) along the sides and bottom of felt.

e. Position the bottom edge of windshield into lower retainer.

f. Using a piece of bent sheetmetal (8 in. wide x length of top edge of windshield) placed under top edge of upper retainer, bow windshield and guide top edge of windshield into upper retainer using bent sheet metal in a shoe horn effect.

g. Install air vent tubes.

h. Install wing fairings.

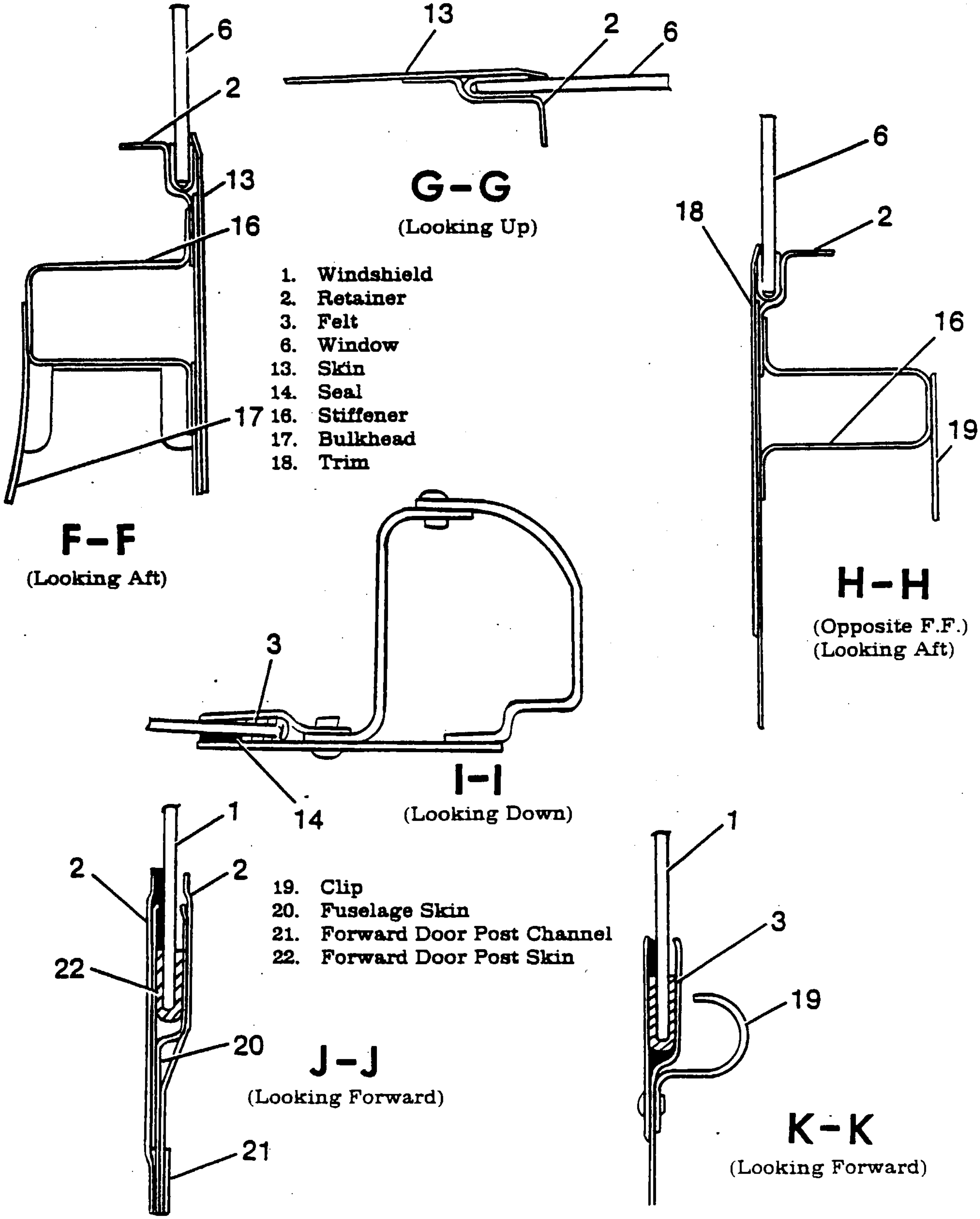


1.	Windshield	9.	Bracket
2.	Retainer	10.	Frame
3.	Felt	11.	Stringer
4.	Strip	12.	Sealer Strip
5.	Spar Cap	13.	Skin
6.	Window	14.	Seal
7.	Cabin Top	15.	Window Trim
8.	Channel	23.	Cowl Deck

NOTE

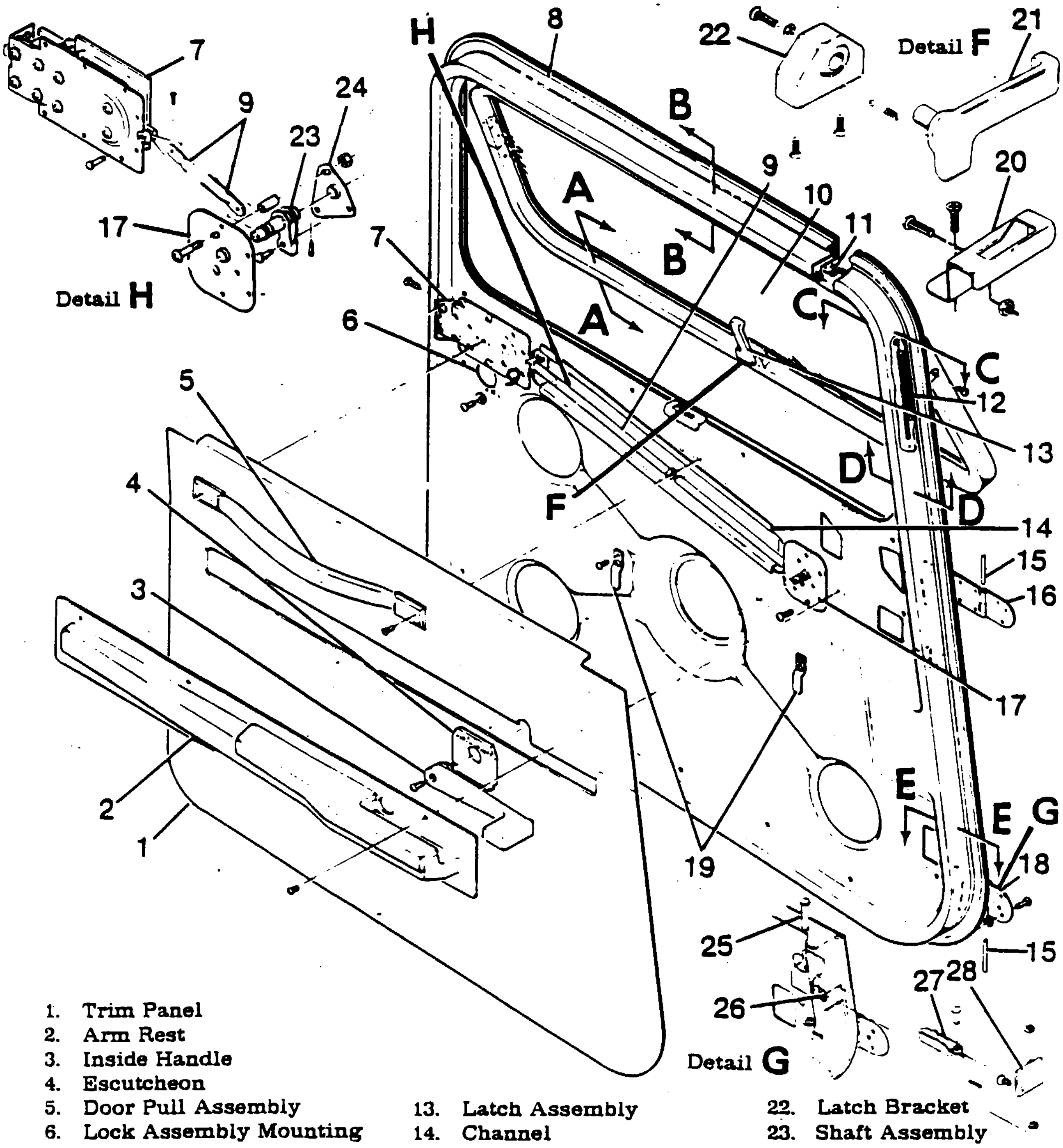
Apply H.B. Fuller FS-4291 to all edges of windshield and windows under outer retainer (3).

Figure 3-2. Windshield and Fixed Window Installation (Sheet 1 of 2)



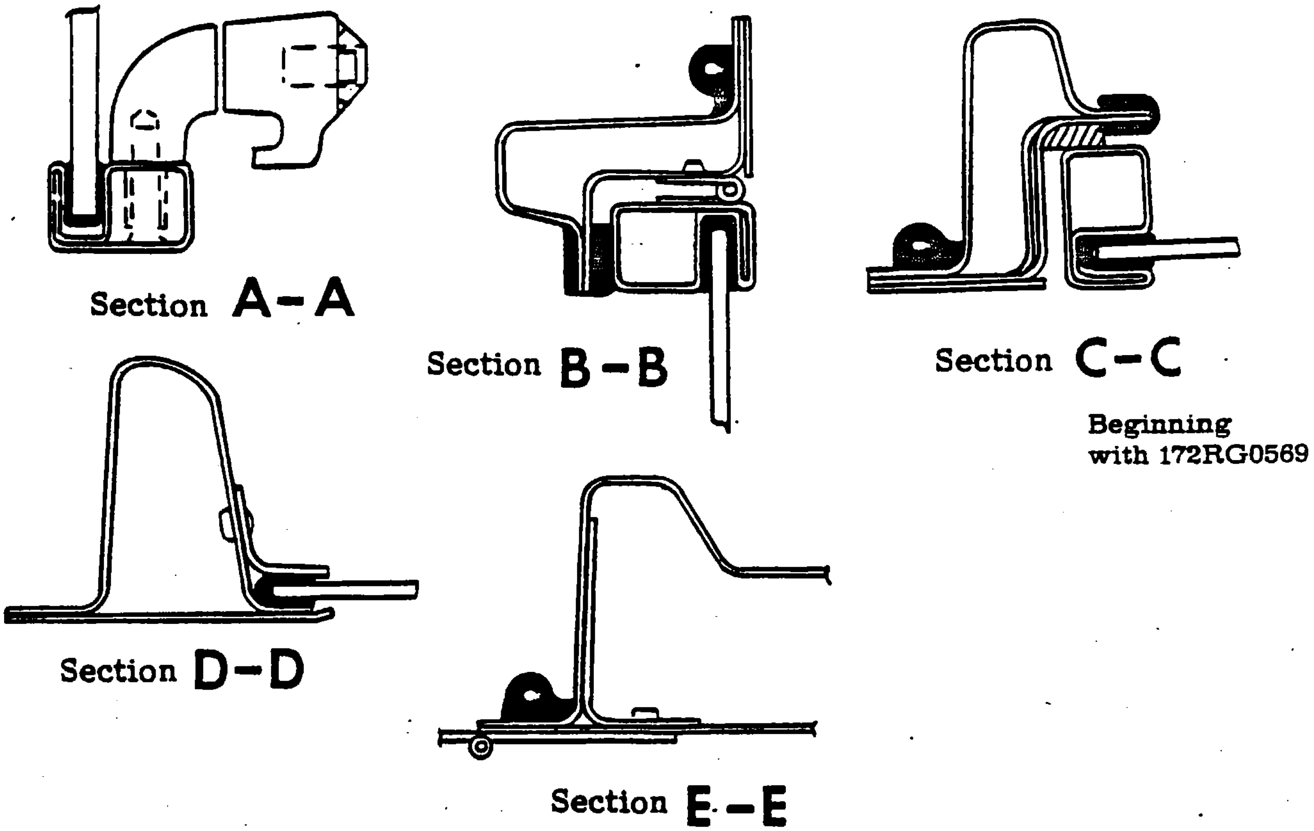
1.	Windshield
2.	Retainer
3.	Felt
6.	Window
13.	Skin
14.	Seal
16.	Stiffener
17.	Bulkhead
18.	Trim
19.	Clip
20.	Fuselage Skin
21.	Forward Door Post Channel
22.	Forward Door Post Skin

Figure 3-2. Windshield and Fixed Window Installation (Sheet 2 of 2)



1. Trim Panel
2. Arm Rest
3. Inside Handle
4. Escutcheon
5. Door Pull Assembly
6. Lock Assembly Mounting Hole
7. Latch Assembly
8. Weatherstrip
9. Push-Pull Rod
10. Window Assembly
11. Window Hinge
12. Spring
13. Latch Assembly
14. Channel
15. Hinge Pin
16. Upper Hinge
17. Base Plate
18. Lower Hinge
19. Upholstery Clip
20. Striker Plate
21. Window Latch Handle
22. Latch Bracket
23. Shaft Assembly
24. Bearing Assembly
25. Pin
26. Doorstop Bracket
27. Doorstop Spring
28. Doorpost Bracket

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



Section A-A

Section B-B

Section C-C

Beginning with 172RG0569

Section D-D

Section E-E

Figure 3-3. Left Cabin Door Assembly (Sheet 2 of 2)

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. (See figures 3-2 thru 3-5.)

3-13. OPENABLE WINDOW. (See figures 3-3 and 3-5.) A openable window, hinged at the top, is installed in the left cabin door, and in an optional version of the right cabin door.

3-14. REMOVAL AND INSTALLATION. (See figure 3-3 for typical procedures.)

a. Disconnect window stop, located just outboard of spring (12).
b. Remove pins from window hinges (11).
c. Reverse preceding steps for installation. To remove frame from plastic panel, drill out blind rivets at frame splice. When replacing plastic panel in frame, ensure sealing strip and an adequate coating of Presstite No. 579.6 sealing compound is used around all edges of panel.

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

3-16. REMOVAL AND INSTALLATION. (See figure 3-2.)

a. Removal external centerstrip (Detail D-D).
b. Remove upholstery as necessary to expose retainer strips inside cabin.
c. Drill out rivets as necessary to remove outer retainer strip along aft edge of window.
d. Remove window by lifting aft edge, and pulling window aft. If difficulty is encountered, rivets securing retainer strips inside cabin may also be drilled out, and retainer strips loosened or removed.
e. Reverse preceding steps for installation. Apply felt strip and sealing compound to all edges of window to prevent leaks. Check fit and carefully file or grind away excess plastic. Use care not to crack plastic while installing.

3-17. OVERHEAD WINDOW. (See 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. (See figure 3-2.)

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

3-19. FIXED WINDOWS. (See 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 strips and sealing compound to all edges of windows to prevent leaks. Check fit and file or grind away excess plastic. Use care not to crack plaster, when installing.

3-20. CABIN DOORS. (See figures 3-3 thru 3-5.)

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

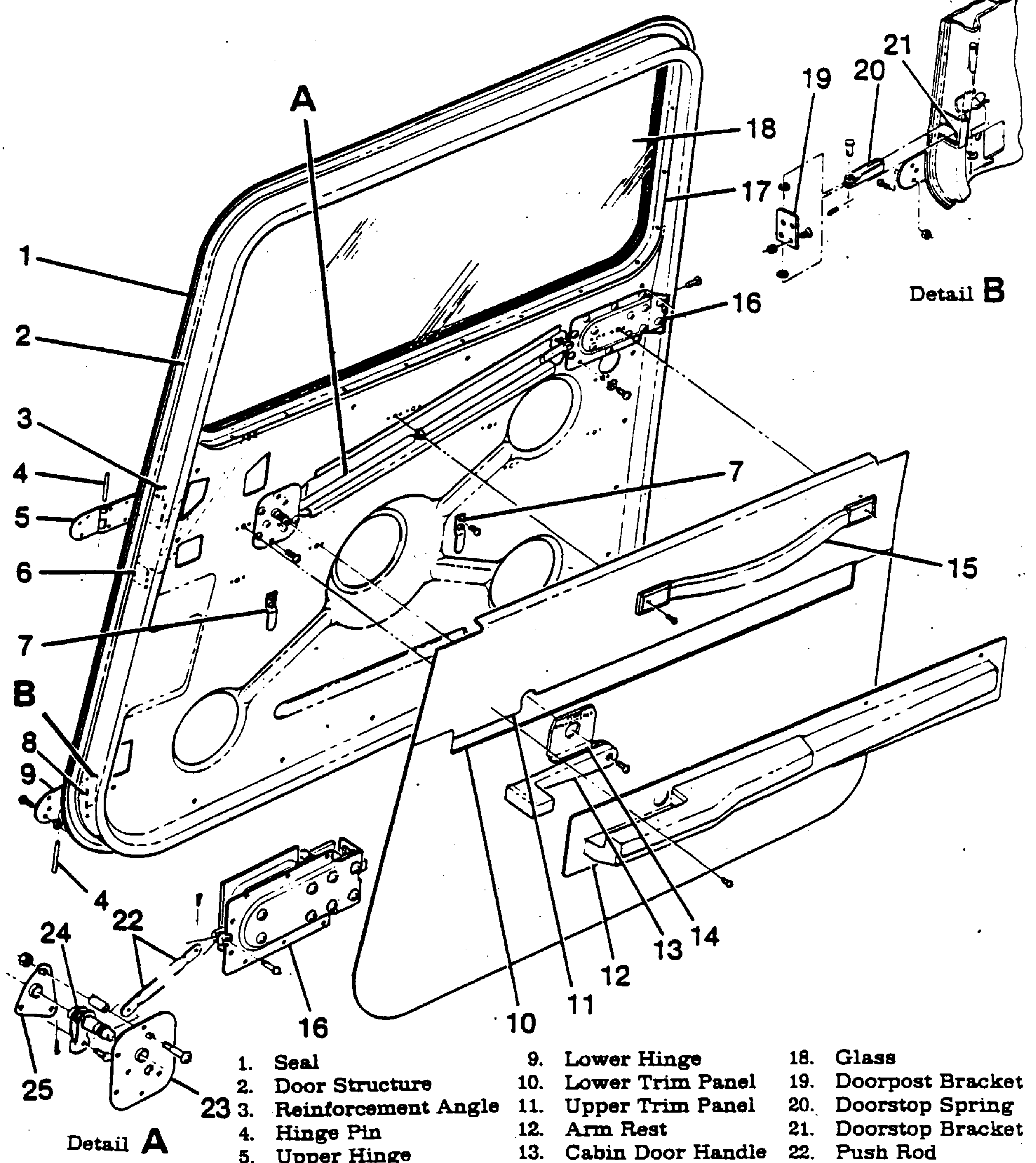
3-22. REMOVAL AND INSTALLATION. (See figures 3-3 thru 3-5.) Removal of cabin doors is accomplished either by removing screws attaching the door hinges, or by removing hinge pins.

3-23. ADJUSTMENT. Cabin doors should be adjusted so that door skin fairs smoothly with fuselage skin. Slots in door latch plate permit re-positioning of latch assembly and bolt engagement with rotary clutch on door post. If fitting a new door assembly, some trimming of door flange may be necessary, but gap between door skin and fuselage skin should be 0.09-inch or less.

CAUTION

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

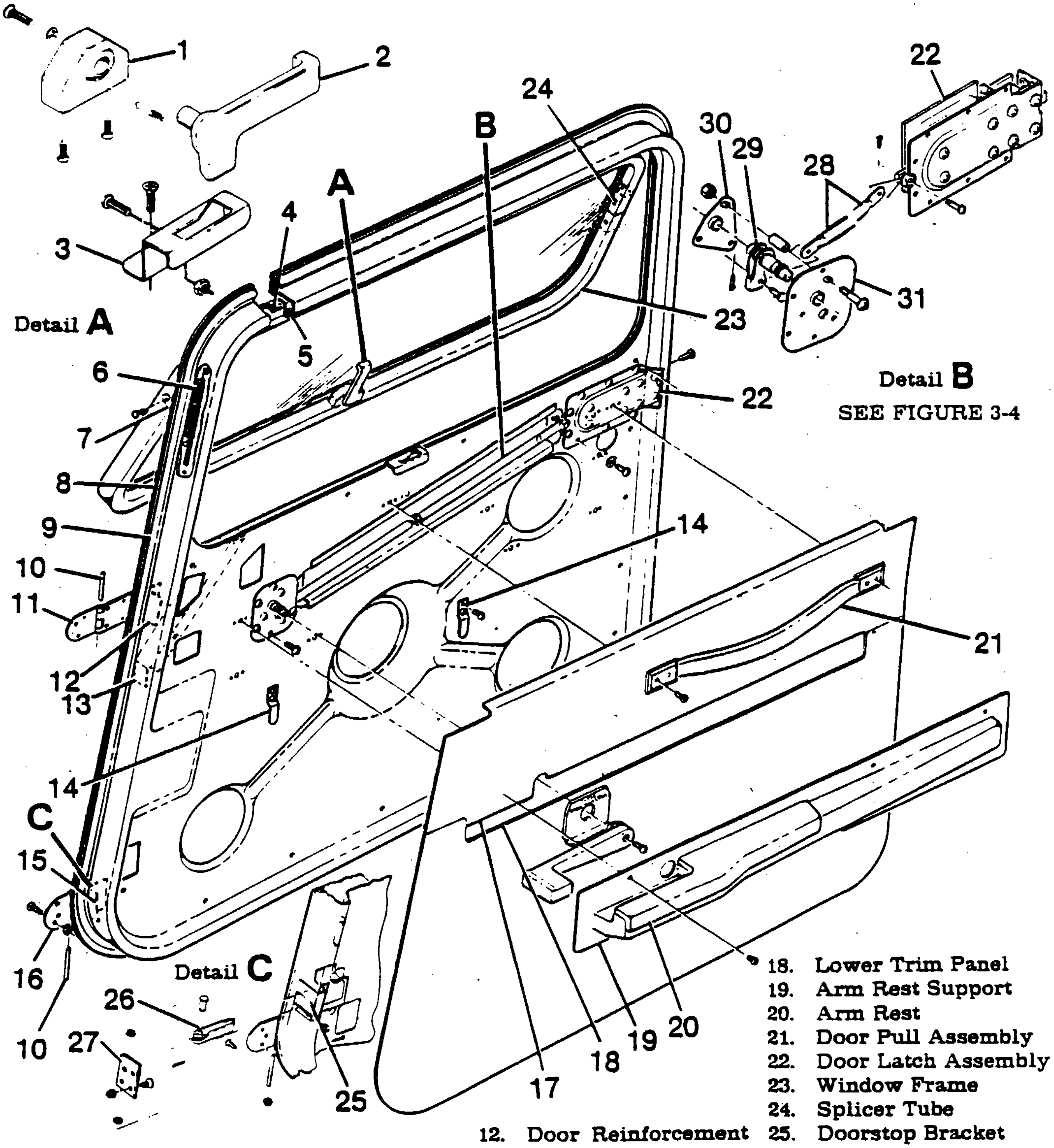
THRU 1981 MODELS



1. Seal
2. Door Structure
3. Reinforcement Angle
4. Hinge Pin
5. Upper Hinge
6. Hinge Bracket
7. Upholstery Clip
8. Hinge Reinforcement
9. Lower Hinge
10. Lower Trim Panel
11. Upper Trim Panel
12. Arm Rest
13. Cabin Door Handle
14. Escutcheon
15. Door Pull Assembly
16. Cabin Door Latch
17. Window Retainer
18. Glass
19. Doorpost Bracket
20. Doorstop Spring
21. Doorstop Bracket
22. Push Rod
23. Plate Assembly
24. Shaft Assembly
25. Bearing Assembly

Figure 3-4. Right Cabin Door Assembly

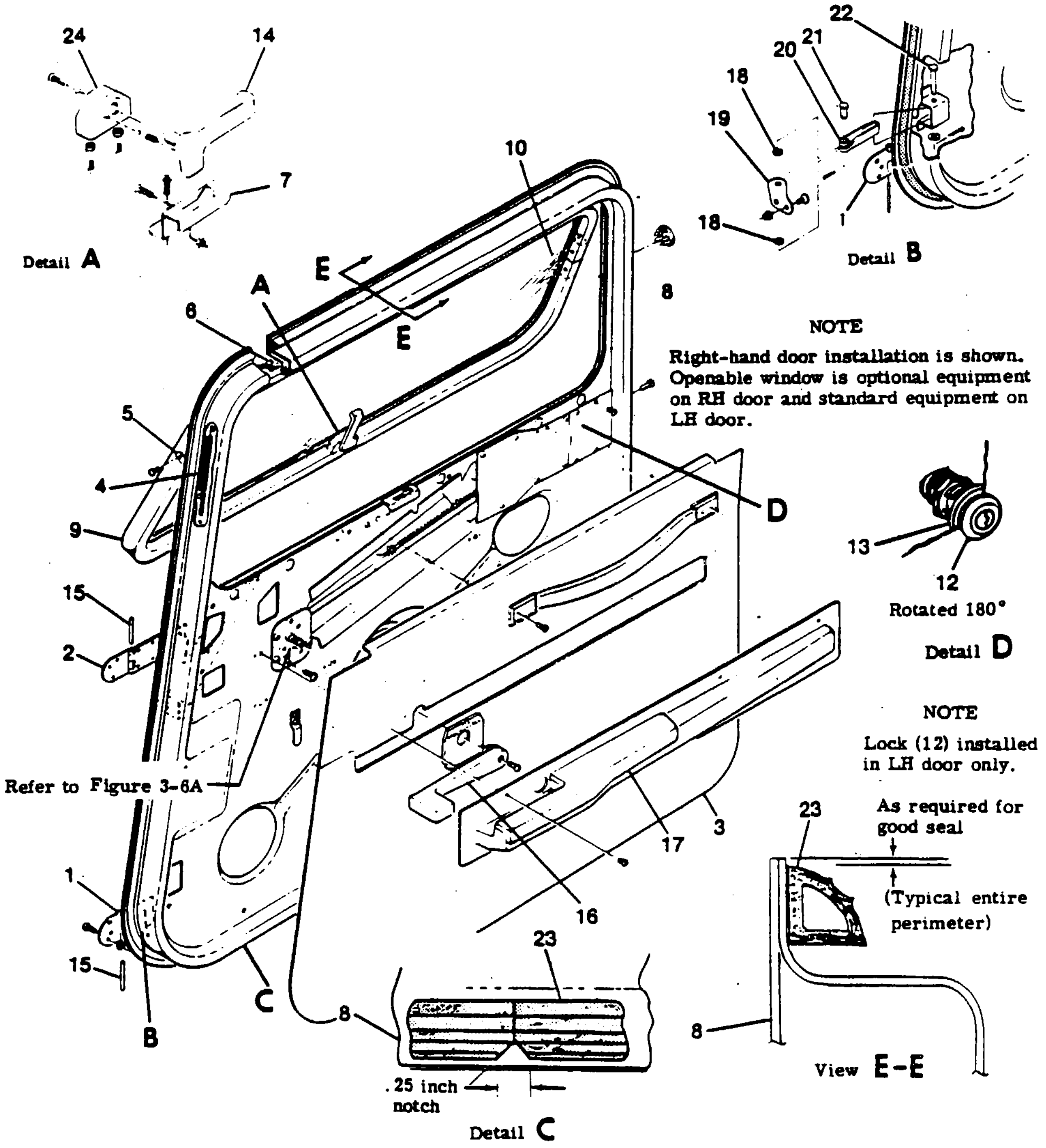
THRU 1981 MODELS



1. Latch Bracket
2. Latch Handle
3. Striker Plate
4. Window Hinge
5. Window Trim
6. Spring
7. Arm Assembly
8. Seal
9. Door Structure
10. Hinge Pin
11. Upper Hinge
12. Door Reinforcement Angle
13. Hinge Bracket
14. Upholstery Clip
15. Hinge Reinforcement
16. Lower Hinge
17. Upper Trim Panel
18. Lower Trim Panel
19. Arm Rest Support
20. Arm Rest
21. Door Pull Assembly
22. Door Latch Assembly
23. Window Frame
24. Splicer Tube
25. Doorstop Bracket
26. Doorstop Spring
27. Doorpost Bracket
28. Push Rod Assembly
29. Shaft Assembly
30. Bearing Assembly
31. Plate Assembly

Figure 3-5. Right Cabin Door Assembly (Openable Window)

BEGINNING WITH 1982 MODELS



NOTE

Right-hand door installation is shown. Openable window is optional equipment on RH door and standard equipment on LH door.

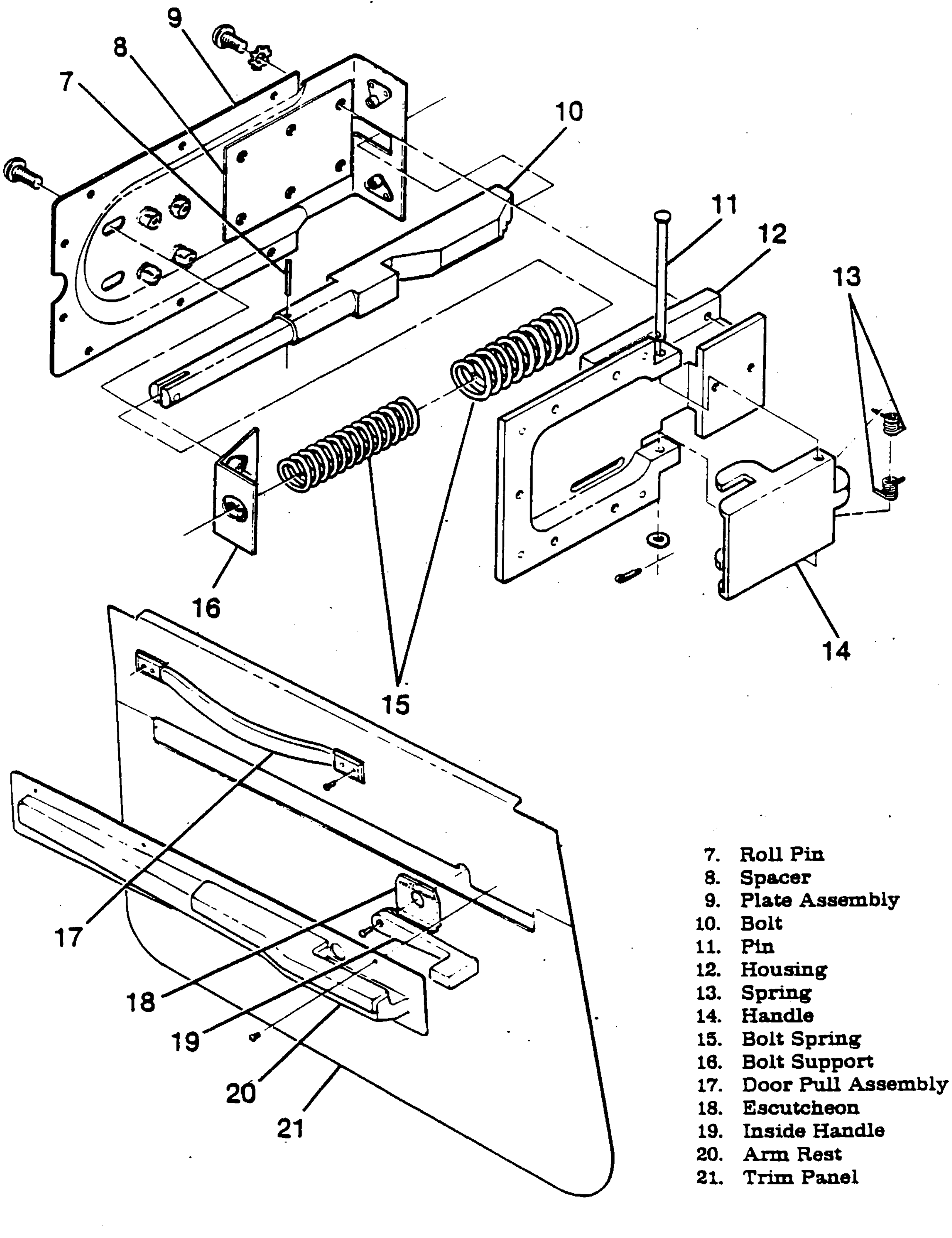
NOTE

Lock (12) installed in LH door only.

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

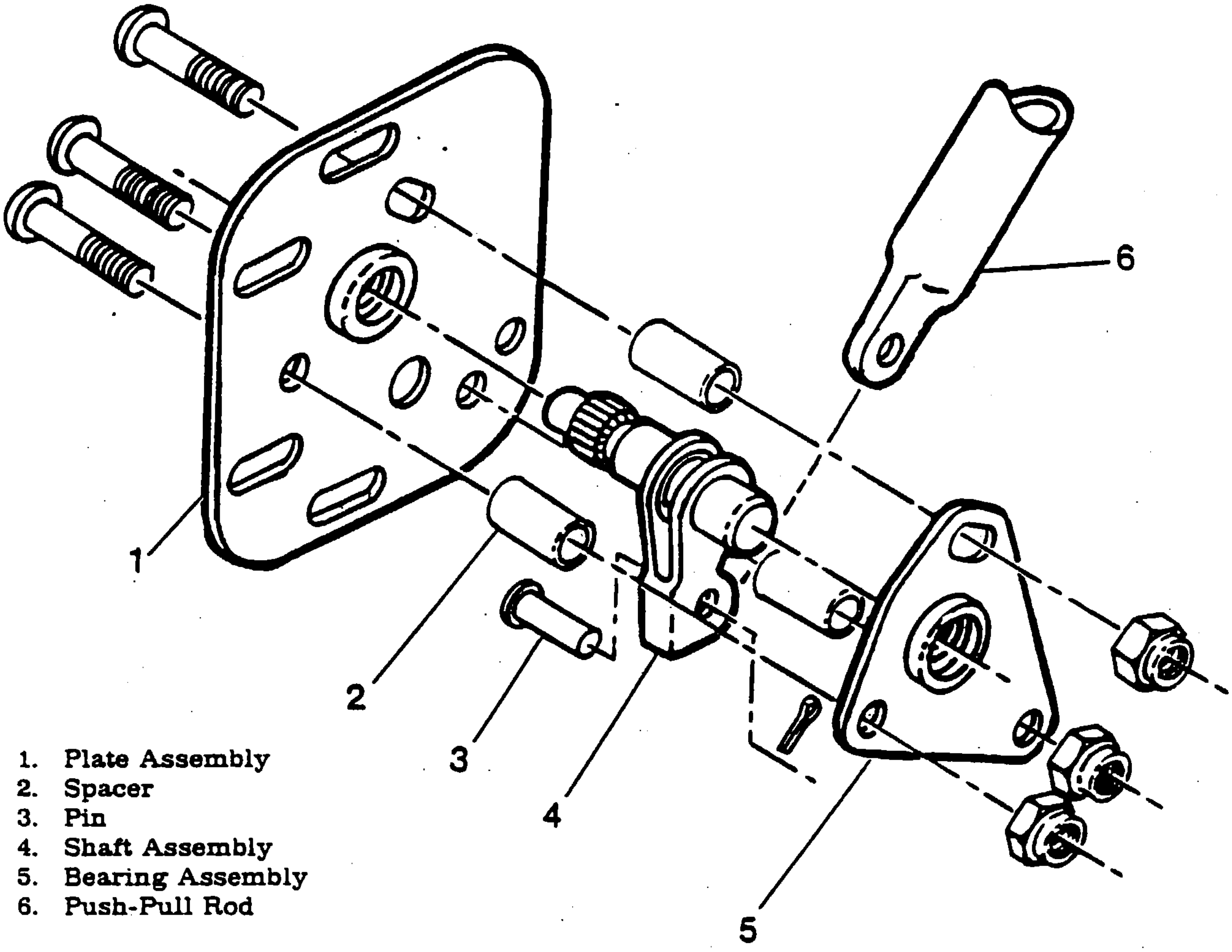
Figure 3-5A. Cabin Door Assembly

THRU 1981 MODELS



7. Roll Pin
8. Spacer
9. Plate Assembly
10. Bolt
11. Pin
12. Housing
13. Spring
14. Handle
15. Bolt Spring
16. Bolt Support
17. Door Pull Assembly
18. Escutcheon
19. Inside Handle
20. Arm Rest
21. Trim Panel

Figure 3-6. Door Latch Installation (Sheet 1 of 2)



1. Plate Assembly
2. Spacer
3. Pin
4. Shaft Assembly
5. Bearing Assembly
6. Push-Pull Rod

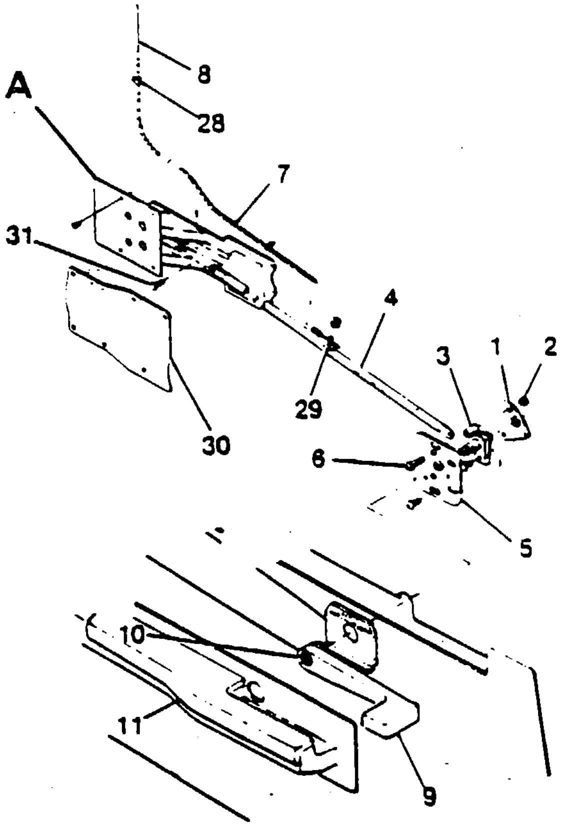
Figure 3-6. Door Latch Installation (Sheet 2 of 2)

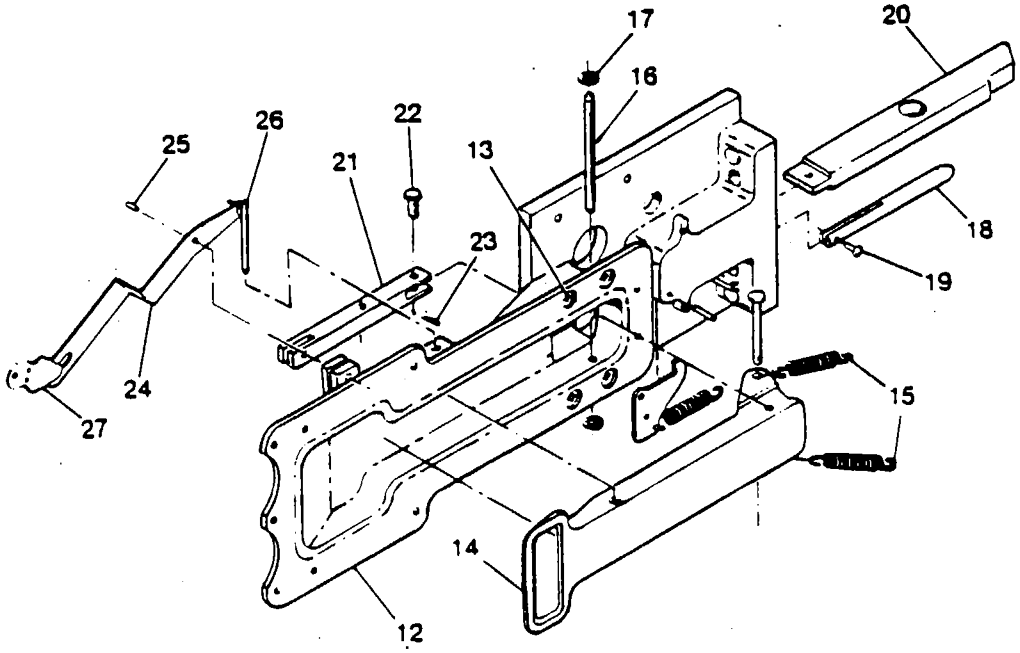
3-24. **CABIN DOOR WEATHERSTRIP. A hollow, fluted-type, rubber weatherstrip, is cemented around all edges of the cabin door. When replacing weatherstrip, ensure that contact surfaces are clean and dry. Cut new weatherstrip to length, using old weatherstrip as a pattern. Cut small notch in butt ends of new weatherstrip to allow for drainage. Position splice with notch at door low point, and apply a thin, even coat of EC-1300L adhesive (3M Company), or equivalent, to both surfaces. Allow to dry until tacky before pressing into place on door. Do not stretch weatherstrip around door corners.**

3-25. CABIN DOOR LATCHES. **(THRU 172RG0890.) (See figure 3-6.)**

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.

1. Bearing Assembly
2. Nut
3. Spacer
4. Push-Pull Rod
5. Pivot Base Plate
6. Bolt
7. Cable
8. Pin
9. Inside Handle
10. Screw
11. Armrest
12. Base Assembly
13. Screw
14. Outside Handle
15. Spring
16. Pin
17. Washer
18. Push Rod
19. Pin
20. Pull Bar
21. Catch
22. Pin
23. Cotter Pin
24. Locking Arm
25. Pin
26. Pin
27. Cam Assembly
28. Clamp
29. Clamp Bolt
30. Cover Assembly
31. Pin





BEGINNING WITH 1982 MODELS

Figure 3-6A. Door Latch Installation

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

NOTE

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

3-28. LOCK. In addition to interior locks, a cylinder and key-type lock is installed on the left door. If lock is to be replaced, the new lock 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 DOOR HANDLE. (See figure 3-6.) When inside door handle is removed, reinstall in relation to position of bolt (10), which is spring-loaded to the CLOSE position. The following procedure may be used.

a. Temporarily install handle (19) on shaft assembly (4), approximately vertical.
b. Move handle (19) back and forth until handle centers in spring-loaded position.
c. Without rotating shaft assembly (4), remove handle (19) and install escutcheon (18) with CLOSE index at top.
d. Install handle (19) to align with CLOSE index on escutcheon (18), using screw securing handle (19).
e. Install arm rest (20) on trim panel (21).

3-29A. **LATCHES (Beginning with 172RG0891). (See figure 3-6A).**

3-29B. DESCRIPTION. The cabin door latch consists of a two-piece nylon latch base, exterior handle, spring-loaded latch bolt/pull-bar assembly, and a spring-loaded catch/trigger pin assembly. The interior handle base plate assembly is directly connected to the cabin door latch by means of an adjustable push rod assembly. This push rod assembly has one clamp on the main rod. This clamp is used to operate a cable assembly that drives a cable pin from the upper aft end of the cabin door into the aft upper door sill. When the cabin door is open, the door latch exterior handle should be extended (out), held in this position by means of the spring-loaded latch catch engaged with the latch bolt through the beveled hole in the bolt. The push rod assembly will be moved forward, and the attached cable assembly will be retracted from the upper door sill with the cable pin recessed in the pin guide, located in the upper aft corner of the door. The interior handle, being directly connected by means of the push rod, will be moved approximately 15° aft of the vertical position. Closing the cabin door drives the trigger pin over the nylon actuator attached to the cover plate, located on the rear doorpost. As the trigger pin is driven forward, it disengages the latch catch from the latch bolt. The extended extension springs, attached to the latch handle and bolt/pull bar assembly, compress, pulling the latch handle in, and driving the latch bolt over the latch striker, located on the rear doorpost. Pushing the exterior handle flush with the fuselage skin. The push rod assembly, attached to the latch bolt/pull bar assembly, moves aft, which also drives the cable pin from the pin guide in the door into the upper aft door sill receptacle. The interior door handle has now moved from approximately 15° aft of vertical to approximately 45° forward of vertical. Pushing the interior handle to the horizontal position, flush with the arm rest, will overcenter the door latch, securing the door for flight. The cabin door latch assembly also incorporates a locking arm and locking pin, used with a key lock to secure the aircraft after use. With the cabin door closed, and the exterior latch handle flush, actuating the key lock drives the locking pin into the exterior latch handle, locking the aircraft. It is important to note that since the cabin door latch assembly and the interior handle base plate assembly are directly connected by the push rod assembly, that any amount of force applied to the outside handle is subsequently applied to the inside handle. If the push rod assembly is not properly adjusted, it is possible to lock one's self out of the aircraft by applying too much force to the exterior handle when closing the cabin door. Therefore, it is important to adhere to all of the rigging and adjustment specifications pertaining to the preload forces of the interior door handle, Refer to the rigging and adjusting procedures in the following paragraphs.

3-29C. INSTALLATION, RIGGING AND ADJUSTMENT PROCEDURES. (See figure 3-6A.)

3-29D. INSTALLATION OF LOCK ASSEMBLY ON LATCH ASSEMBLY. (See figure 3-6A.)

a. Assemble locking arm (24) with pin assembly (25) by placing one washer on each side of locking arm (24). Swage pin (25) so that there is a minimal amount of looseness between parts. Cut excessive material from pin (25).
b. Place pin (25) in 1/8-inch hole of base assembly (12).
c. Align .099-inch hole of locking arm (24) with .094-inch hole in latch base (12), and install pin.
d. Assemble cam assembly (27) to locking arm (24). Cam should be on latch side of locking arm. Use 3 washers between cam (27) and locking arm.

3-29E. INSTALLATION OF LOCK ASSEMBLY. (See figure 3-6A.)

NOTE

Install with latch in CLOSED position.

a. Install latch assembly between door pan and door skin.
b. Cable assembly (7) should be forward of latch base attach plate, and inboard of latch base cup.
c. Extend latch handle through cutout in door skin. This will pull latch bolt back far enough to allow latch to fall into place.
d. Push latch assembly aft so that bolt (20) and push rod (18) extend through their respective holes.
e. Trip push rod (18) so that bolt (20) is fully extended and handle (14) is flush.
f. Secure latch to door pan with four NAS220-5 screws (13) through base assembly (12) and two AN525-10R6 screws through aft flange of door pan.
g. Ensure door skin fits properly around latch assembly, then drill eleven .128-inch holes to align with latch base.

NOTE

Do not oversize holes in the latch base and do not rivet base to skin at this time.

3-29F. INSTALLATION OF CABLE ASSEMBLY. (See figure 3-6A.)

a. On pin end of cable assembly (7), attach clamp (28) and nut, one-inch from end of casing.
b. Insert pin end of cable between door pan and door skin at aft end of door. Push pin end of cable to top of door.
c. Remove plug button (30, figure 3-1 of this Supplement) and align pin on cable with pin guide, and insert pin through guide. Access is gained through .875-inch diame-

ter hole after removal of plug button (30).

d. Align clamp on cable casing with hole located one-inch below .875-inch hole and install screw.

e. Check operation of cable. If sluggish operation of cable is encountered, add S1450-2A4-062 washers as required to facilitate smoother cable operation.

3-29G. RIGGING CABLE ASSEMBLY. (See figure 3-6A.)

a. Pull excess slack out of cable (7). Attach clamp (28) and nut to cable so that it aligns with .193-inch hole in door pan, and attach.

NOTE

Make sure door latch is in OPEN position before proceeding.

b. Cut casing of cable assembly approximately two inches from clamp bolt (29) on push rod assembly (4).

c. Insert core of cable through clamp (29).

d. Pull core through clamp bolt so that pin (8) extends approximately 1/8-inch from door pan contour.

e. Cut core approximately one inch forward of push rod clamp (29).

f. Secure two nuts to push rod clamp bolt.

g. Operate latch several times to ensure latch works freely. If latch binds up and will not work freely, remove cable core from clamp (29) and operate latch. If cable operates easily without cable attachment, check cable for possible adjustments to facilitate ease of operation.

h. After cable operates freely, install cover assembly (30) and recheck cable for operation.

3-29H. RIGGING INSIDE DOOR HANDLE. (See figure 3-6A.)

a. With latch secured to door pan, attach push pull rod assembly (4) to catch (21), and secure with pin (31).

NOTE

Do not install cotter pin (23).

b. Ensure that latch is in CLOSED position.

c. By removing pin (31) that connects push pull rod to latch base assembly, rotate rod in or out (180°) for adjustment. Adjust rod so that it takes a load of 6 pounds to 12 pounds at the end of the inner handle to move it from closed position to overcenter position.

NOTE

Rod must be attached to latch assembly before rigging can be accomplished.

d. For fine adjustment for overcentering latch assembly, proceed as follows:

1. Cabin door must be installed and completely fitted to fuselage.
2. Cabin door latch must be in OPEN position. Latch must operate smoothly and freely.
3. Adjust striker plate forward by installing shims as required, so that there is a minimal clearance between pull bar (20) and striker plate.

NOTE

This adjustment will ensure that when the door is opened from the outside, the push rod will engage the latch catch, and the exterior handle will stay open until the door is closed again.

NOTE

If cabin door is located too far forward such that the door latch will not operate, this will not allow latch assembly push rod (18) to ride up on actuator and trigger the pull bar (20). Install shims as required beneath actuator, located on cover assembly.

4. Close the cabin door from inside the aircraft. When latch is overcentered, the exterior handle should pull flush. If it does not pull flush, the connecting push pull rod from the door latch to the inside handle assembly should be adjusted "out" (lengthened).

NOTE

When making this adjustment on the overcentering of the latch, it may be noticed that there is a sharp, loud canning noise when the inside handle is pushed down. It is preferred that the outside door handle be flush, even if the canning noise is noticeable.

5. When adjusting push pull rod (4), it may need only be adjusted 1/2 turn. To accomplish this, base plate should be removed.
6. To make 1/2 turn adjustment, remove smaller end of push pull rod (4) and turn it over (180°). Then reinstall base plate assembly (5).
7. When closing cabin door from the outside, by using a large, sharp force on the outside handle, it is possible to overcenter the inside handle, thus locking one's self out. To prevent this from occurring when adjusting the push pull rod in step "4", adjust the push pull rod so there is sufficient force (6 to 12 pounds) against the inside handle to prevent it from overcentering when closing the door from the outside.
8. Do not file, grind or sand any portion of the pull bar (20).
9. Recheck clamps that secure cable. There must not be any slippage between cable casing and clamp.
10. After overcenter adjustment has been made, install cotter pin (23) in clevis pin (22).

e. Rivet latch base (12) to door skin with MS20426A4-3 rivets.
f. Attach lock assembly casing (13, figure 3-3 of this Supplement) to door skin with nut provided.
g. Install tumblers and attach cam to tumblers with screw and lockwasher provided.

NOTE

After installing cam, seal over head of screw and washer with RTV-102 (white) or RTV-103 (black) silicone rubber sealant (General Electric, Waterford, N. Y.).

h. Operate lock several times to assure that all components function properly.

NOTE

Steps "f", "g" and "h" apply to LH door only.

3-29I. REPLACING LOCK ASSEMBLY.

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.

3-29J. INDEXING INSIDE DOOR HANDLE. When inside door handle is removed, reinstall and index as noted in paragraph 3-29.

3-30. BAGGAGE DOOR. (See figure 3-7).

3-31. REMOVAL AND INSTALLATION. (See figure 3-7.)

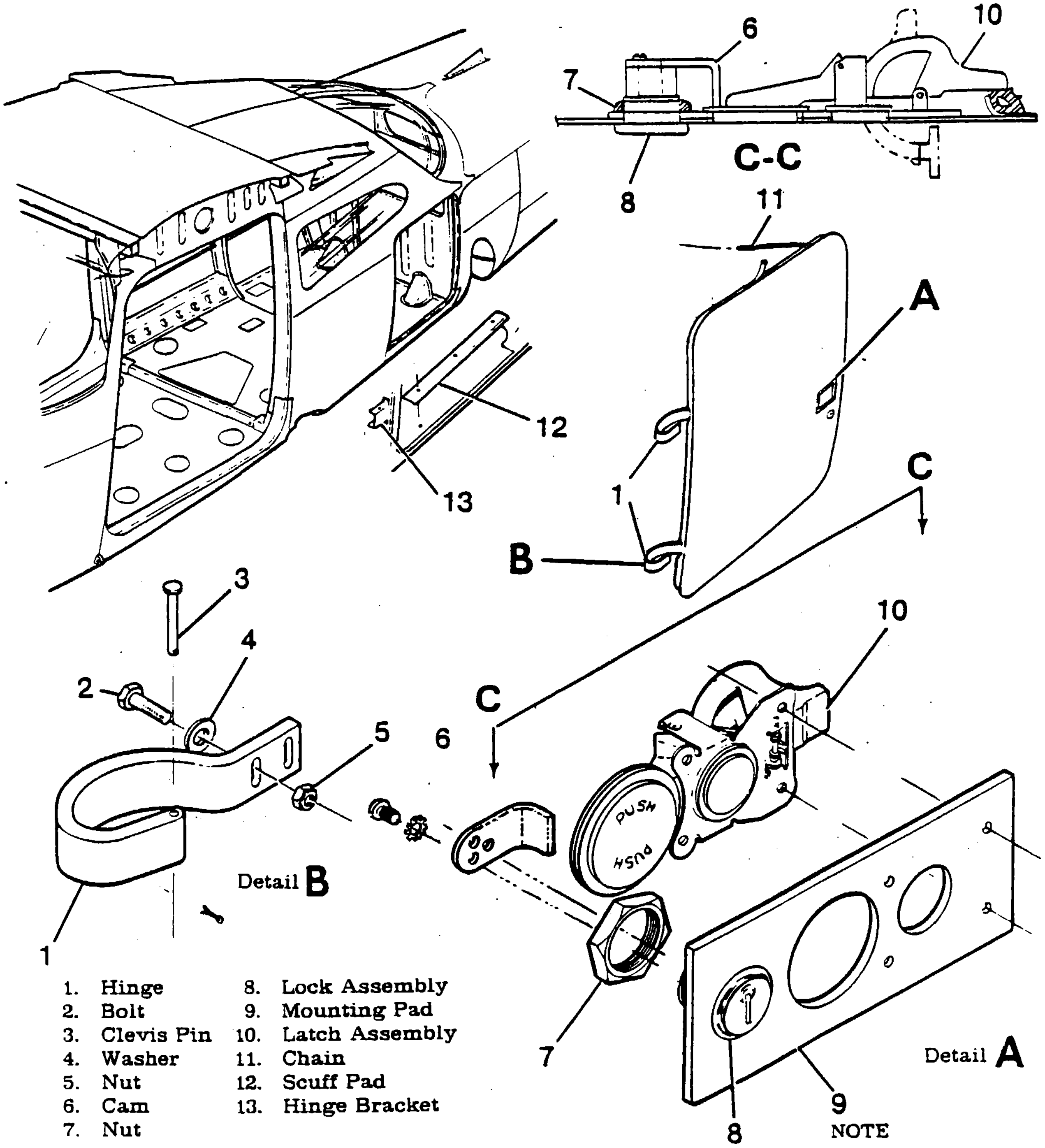
a. Remove door pull handle.
b. Disconnect chain (11).
c. Remove buttons securing upholstery panel, and remove panel.
d. Remove bolts (2) securing door to hinges (1).
e. Reverse preceding steps to install baggage door.

CAUTION

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

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

3-33. SEATS.



1. Hinge
2. Bolt
3. Clevis Pin
4. Washer
5. Nut
6. Cam
7. Nut
8. Lock Assembly
9. Mounting Pad
10. Latch Assembly
11. Chain
12. Scuff Pad
13. Hinge Bracket

NOTE

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

NOTE

After installing cam (6) to lock assembly (8) with washer and screw, apply RTV-102 Sealant to screw head.

Figure 3-7. Baggage Door Installation

3-34. DESCRIPTION. The seating arrangement consists of two individually-adjustable, four-way or six-way seats for the pilot and front seat passenger, and a split-backed fixed seat for the rear seat passengers. The four-way seats may be moved forward or aft, and the seat back angle adjusted to any comfortable angle. To position either seat, lift the tubular handle under the center of the seat, slide the seat into position, release the handle, and check that the seat is locked in place. The seat back angle is controlled by a cylinder lock release button; spring-loaded to the locked position, located on the inboard side, below the forward corner of the seat cushion. To adjust the angle of the seat back, push up on the cylinder lock release button, position the seat back to the desired angle and release the button. When the seat is not occupied, the seat back will automatically fold forward whenever the cylinder lock release button is pushed up. The six-way seats may be moved forward or aft, and are infinitely-adjustable for height and seat back angle. To position the seat, lift the tubular handle under the center of the seat bottom, slide the seat into position, release the handle, and check that the seat is locked in place. Raise or lower the seat by rotating the large crank under the inboard corner of either seat. The seat back is adjusted by rotating the small crank under the outboard corner of either seat. The seat bottom angle will change as the seat back angle changes, providing proper support. The seat backs will also fold forward. The rear passengers' seat consists of a fixed one-piece seat bottom with individually adjustable seat backs. The seat backs are adjustable by cylinder lock release buttons, recessed in skirts, located below the seat frame at the outboard ends of the seat. To adjust a seat back, push up on the adjacent cylinder lock release button, which is spring-loaded to the locked position, recline the seat back to the desired position and release the button. When the seat is not occupied, the seat backs will automatically fold forward whenever the cylinder lock release button is pushed up. Headrests are available for any of the seat configurations. To adjust the headrest, apply enough pressure to it to raise or lower it to the desired level. The headrest may be removed by raising it until it disengages from the top of the seat back.

3-35. PILOT AND COPILOT SEAT ASSEMBLY-STANDARD. (See figure 3-8.)

WARNING

It is extremely important that the 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, expecially during takeoff and landing.

3-36. PILOT AND COPILOT SEAT ASSEMBLY-OPTIONAL. (See figure 3-9.)

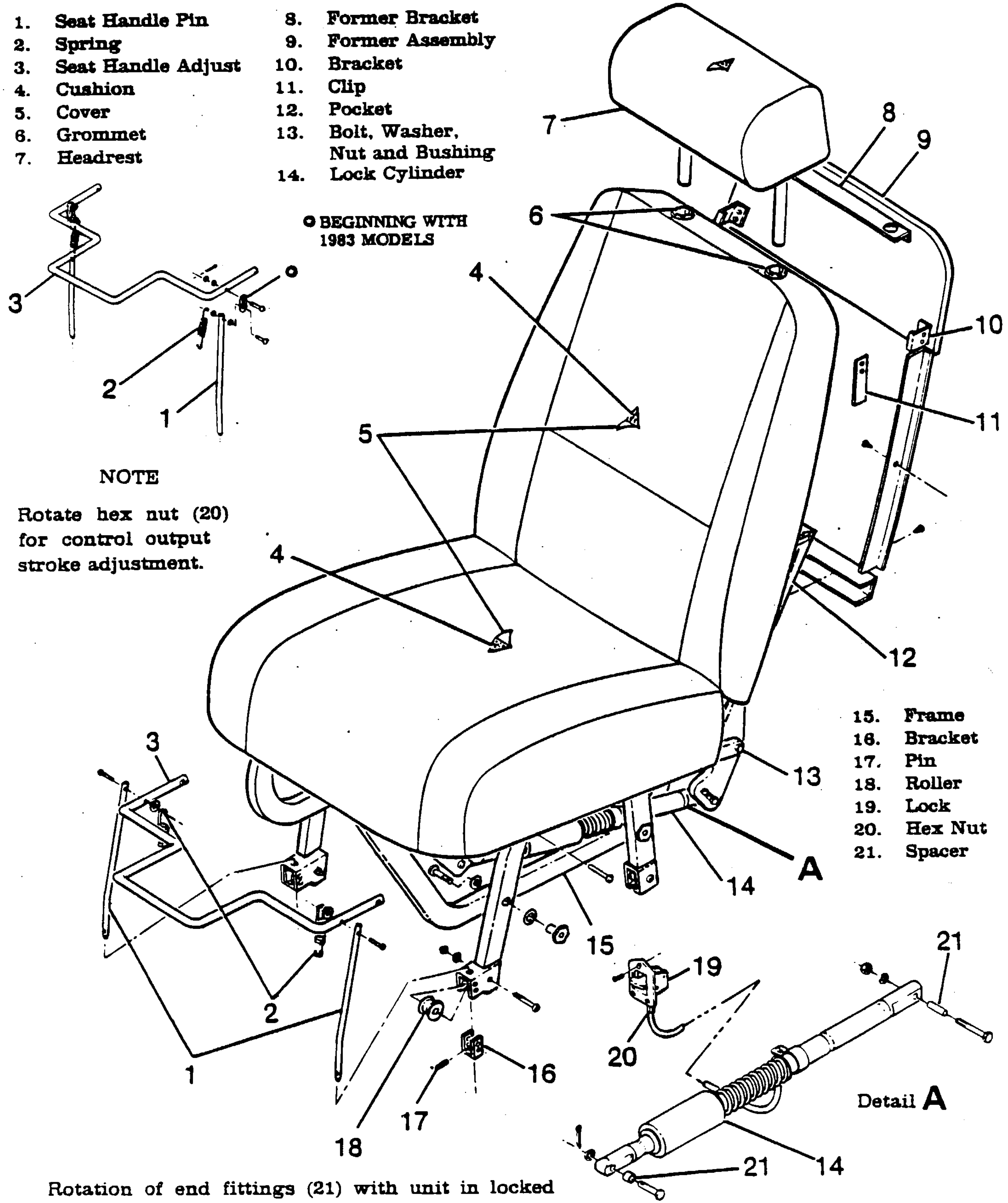
3-37. REMOVAL AND INSTALLATION-STD AND OPT. (See figure 3-8 or 3-9.)

a. Remove seat stops from rails.
b. Disengage seat belts by slipping buckle ends through seat belt retainer.
c. Crank vertical adjust seats to their maximum height.
d. Slide seat forward to disengage front rollers from seat rails.
e. Slide seat aft to disengage rear rollers from seat rails.
f. Lift seat out.
g. Reverse preceding steps for installation. Ensure that all seat stops are installed.

3-38. INFINITELY-ADJUSTABLE FRONT SEAT. (See figure 3-9.)

1. Seat Handle Pin
2. Spring
3. Seat Handle Adjust
4. Cushion
5. Cover
6. Grommet
7. Headrest
8. Former Bracket
9. Former Assembly
10. Bracket
11. Clip
12. Pocket
13. Bolt, Washer, Nut and Bushing
14. Lock Cylinder

○ BEGINNING WITH 1983 MODELS



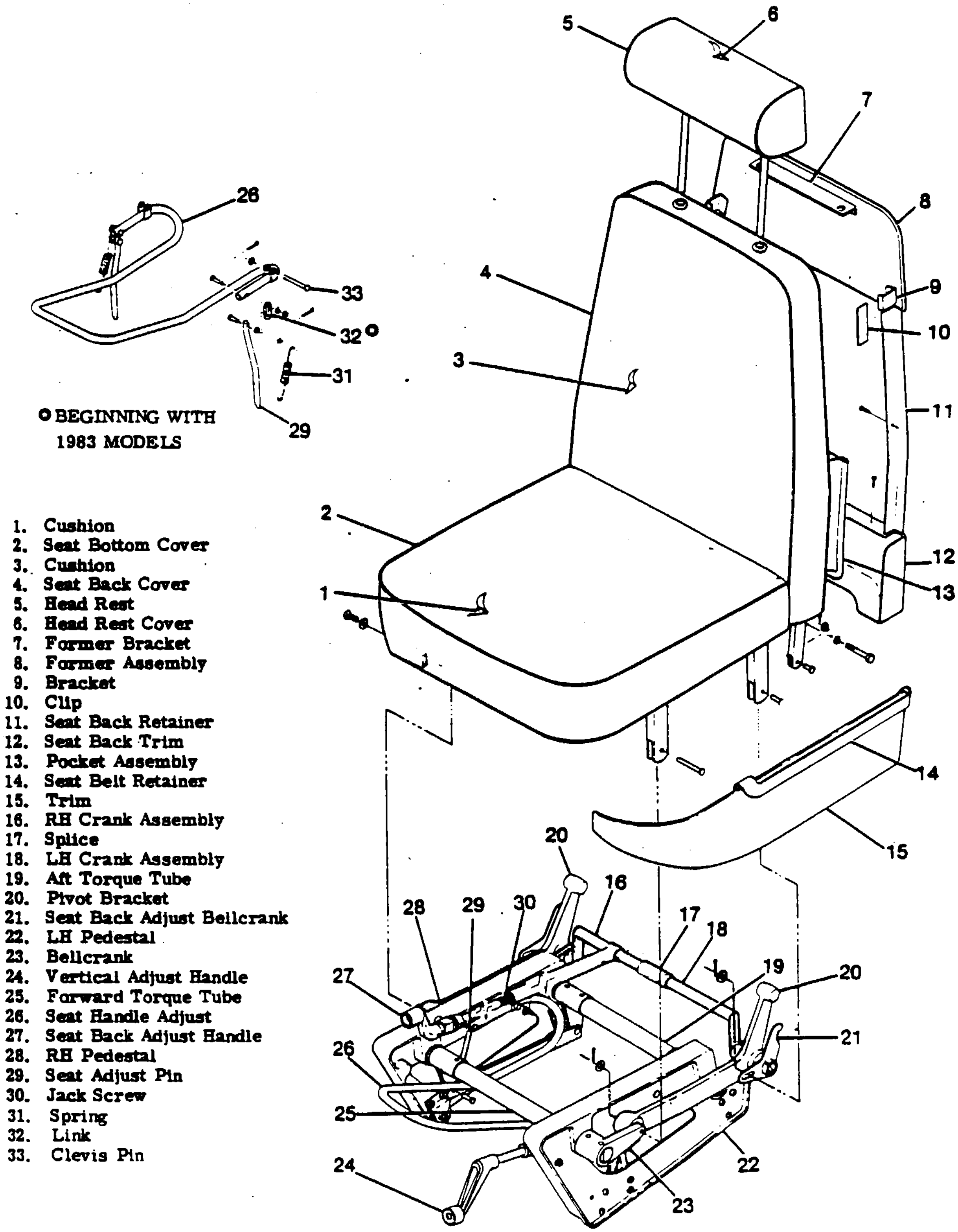
15. Frame
16. Bracket
17. Pin
18. Roller
19. Lock
20. Hex Nut
21. Spacer

NOTE

Rotate hex nut (20) for control output stroke adjustment.

Rotation of end fittings (21) with unit in locked position may cause internal damage.

Figure 3-8. Pilot and Copilot Seat Assembly-Standard

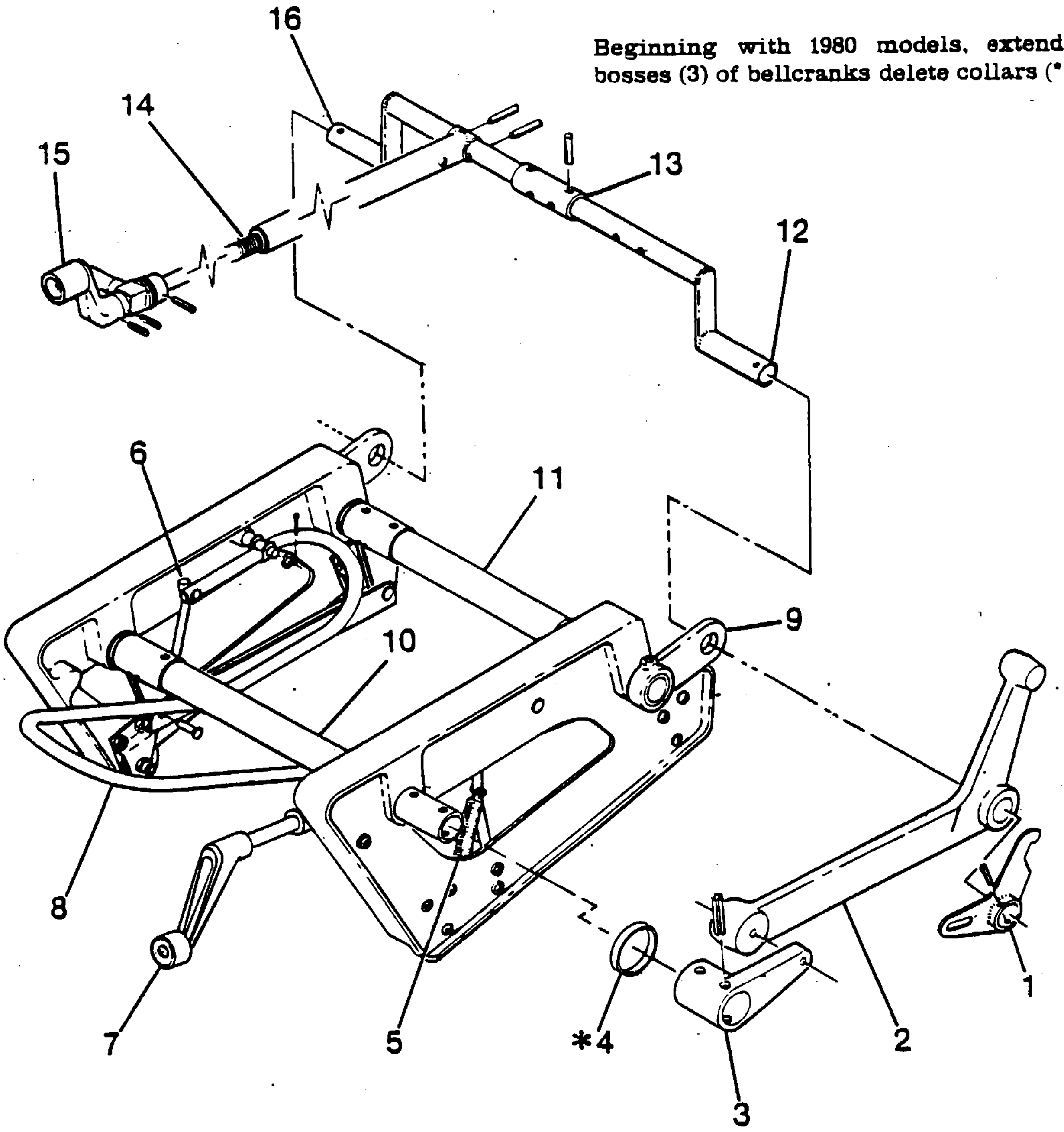


1.	Cushion
2.	Seat Bottom Cover
3.	Cushion
4.	Seat Back Cover
5.	Head Rest
6.	Head Rest Cover
7.	Former Bracket
8.	Former Assembly
9.	Bracket
10.	Clip
11.	Seat Back Retainer
12.	Seat Back Trim
13.	Pocket Assembly
14.	Seat Belt Retainer
15.	Trim
16.	RH Crank Assembly
17.	Splice
18.	LH Crank Assembly
19.	Aft Torque Tube
20.	Pivot Bracket
21.	Seat Back Adjust Bellcrank
22.	LH Pedestal
23.	Bellcrank
24.	Vertical Adjust Handle
25.	Forward Torque Tube
26.	Seat Handle Adjust
27.	Seat Back Adjust Handle
28.	RH Pedestal
29.	Seat Adjust Pin
30.	Jack Screw
31.	Spring
32.	Link
33.	Clevis Pin

Figure 3-9. Infinitely-Adjustable Pilot and Copilot Seat Assembly-Optional (Sheet 1 of 2)

NOTE

Beginning with 1980 models, extended bosses (3) of bellcranks delete collars (*4).



1. Seat Back Adjust Bellcrank
2. Pivot Bracket
3. Bellcrank
4. Collar
5. Spring
6. Seat Adjust Pin
7. Vertical Adjust Handle
8. Seat Adjust Handle
9. Torque Tube Bellcrank
10. Forward Torque Tube
11. Aft Torque Tube
12. LH Crank Assembly
13. Splice
14. Jack Screw
15. Seat Back Adjust
16. RH Crank Assembly

Figure 3-9. Infinitely-Adjustable Pilot and Copilot Seat Assembly-Optional (Sheet 2 of 2)

1. Cover
2. Cushion
3. Skirt
4. Lock
5. Grommet
6. Back Panel
7. Head Rest

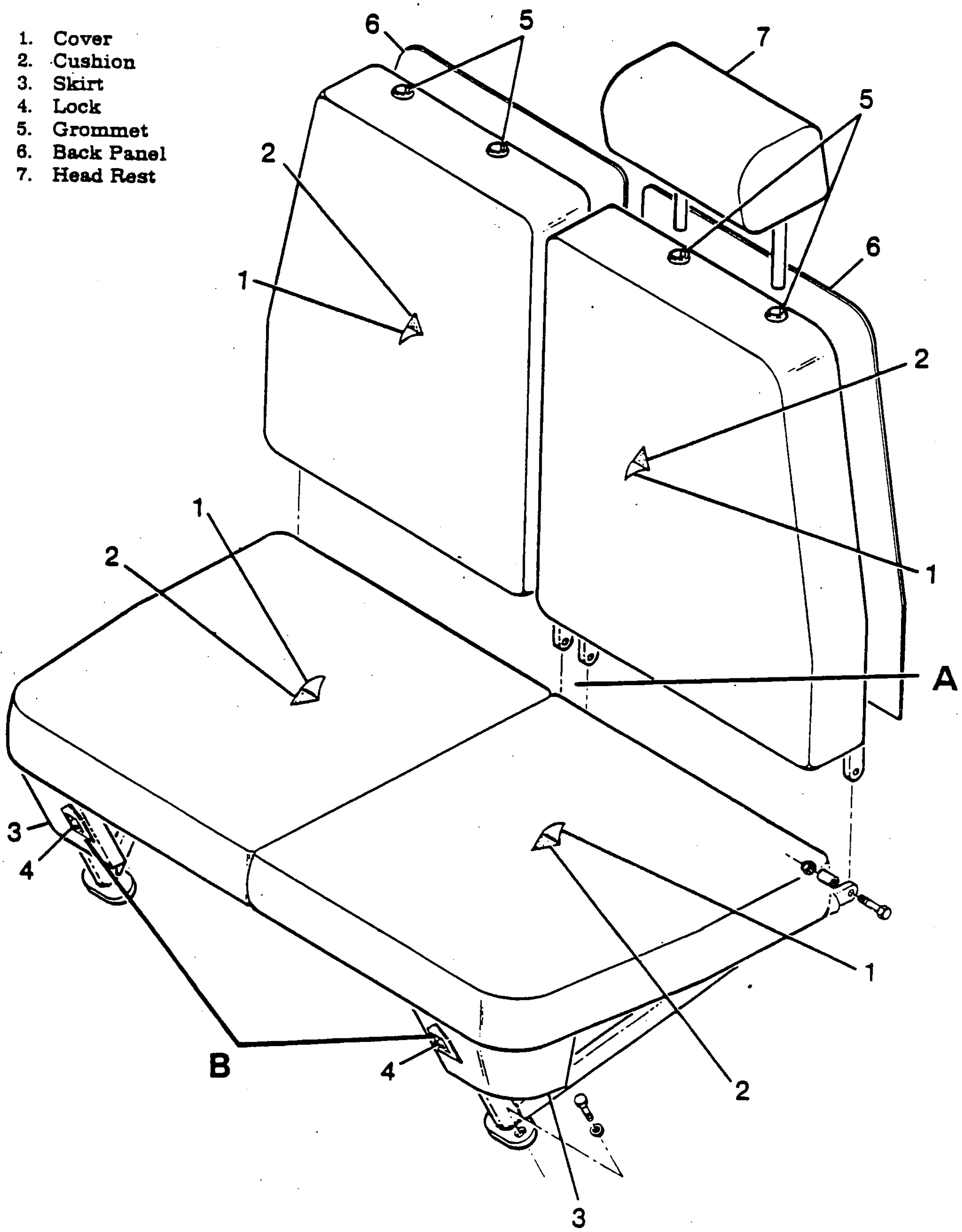


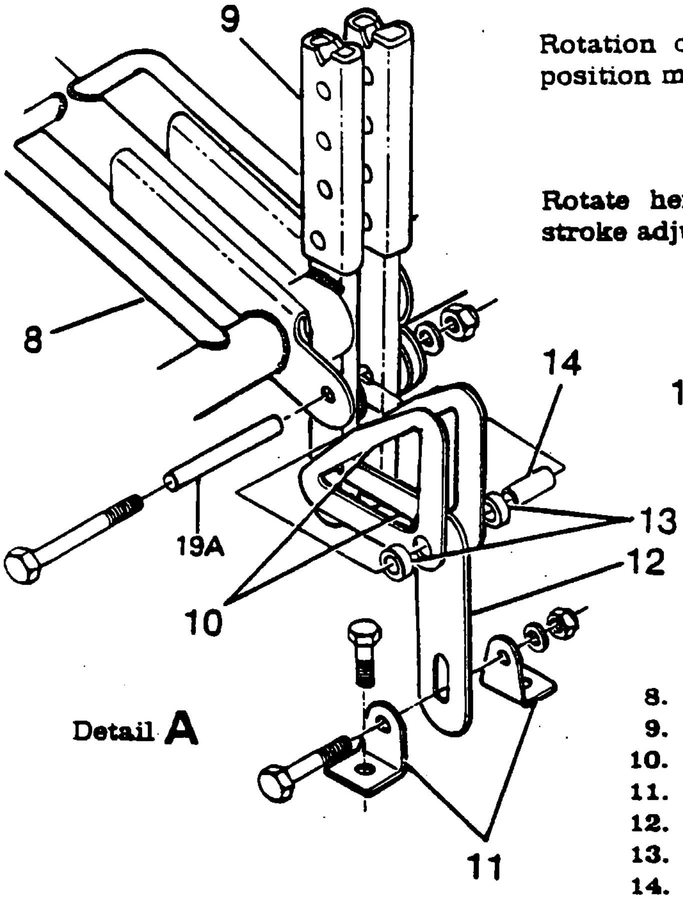
Figure 3-10. Split Back Rear Seat (Sheet 1 of 2)

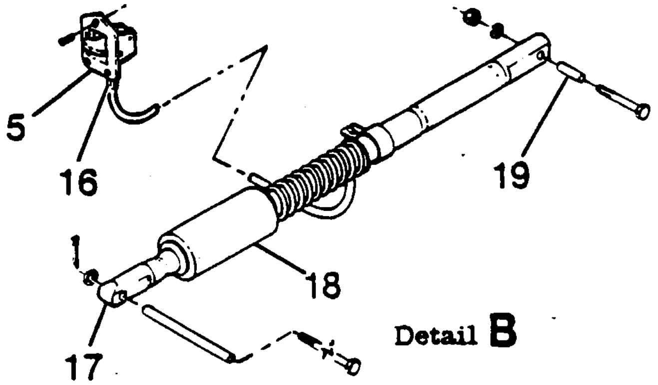
CAUTION

Rotation of end fittings (17) with unit in locked position may cause internal damage.

NOTE

Rotate hex nut (16) for control output stroke adjustment.





8.	**Seat Bottom**	15.	**Lock**
9.	**Seat Back Legs**	16.	**Hex Nut**
10.	**Seat Belt Stirrup**	17.	**Spacer**
11.	**Bracket**	18.	**Lock Cyliner**
12.	**Link**	19.	**Spacer**
13.	**Spacer**	19A.	**Bushing**
14.	**Spacer**		

Figure 3-10. Split Back Rear Seat (Sheet 2 of 2)

3-39. REMOVAL AND INSTALLATION. (See figure 3-9.)

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

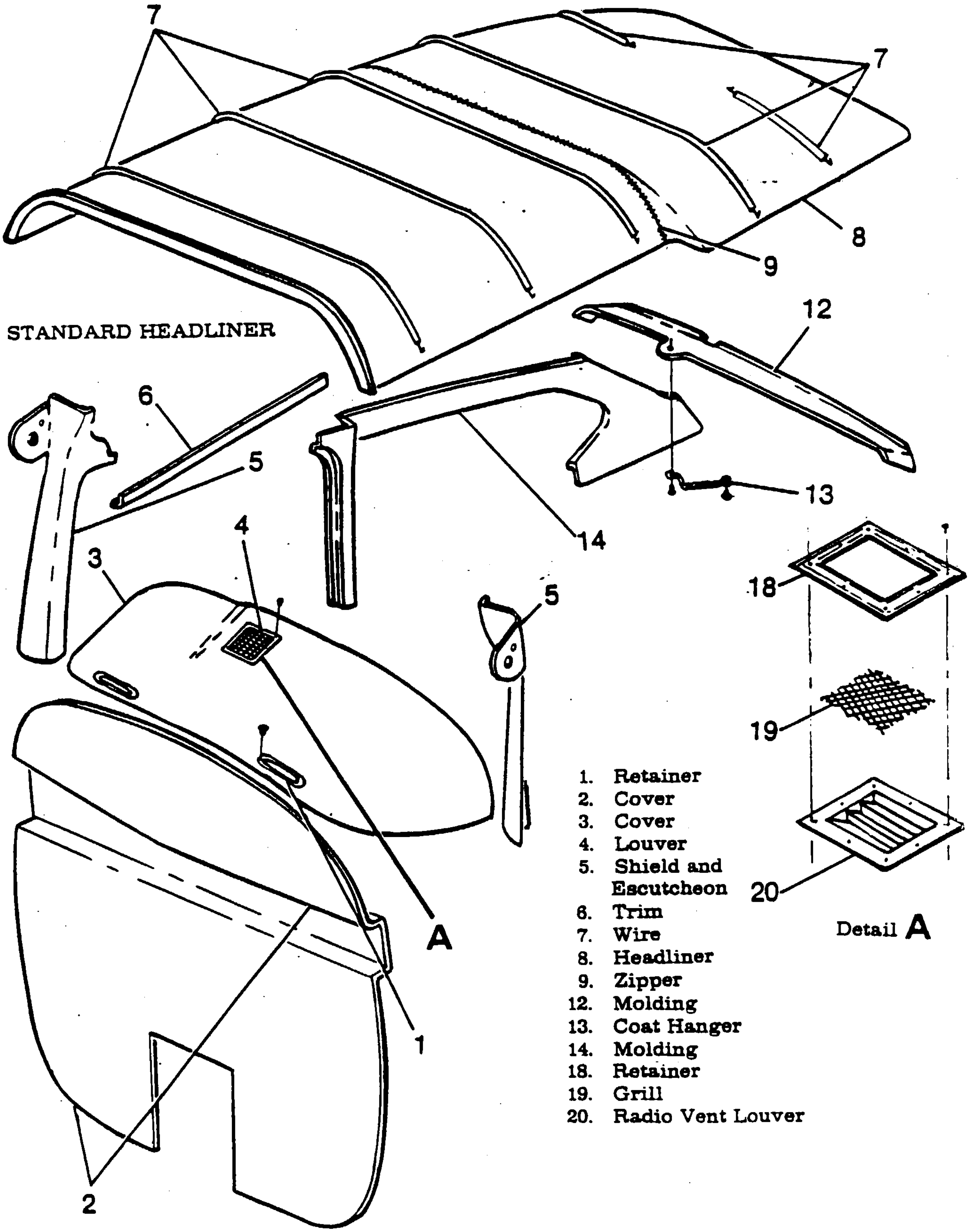
3-40. SPLIT-BACKED FIXED REAR SEAT. (See figure 3-10.)

3-41. REMOVAL AND INSTALLATION. (See figure 3-10.)

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

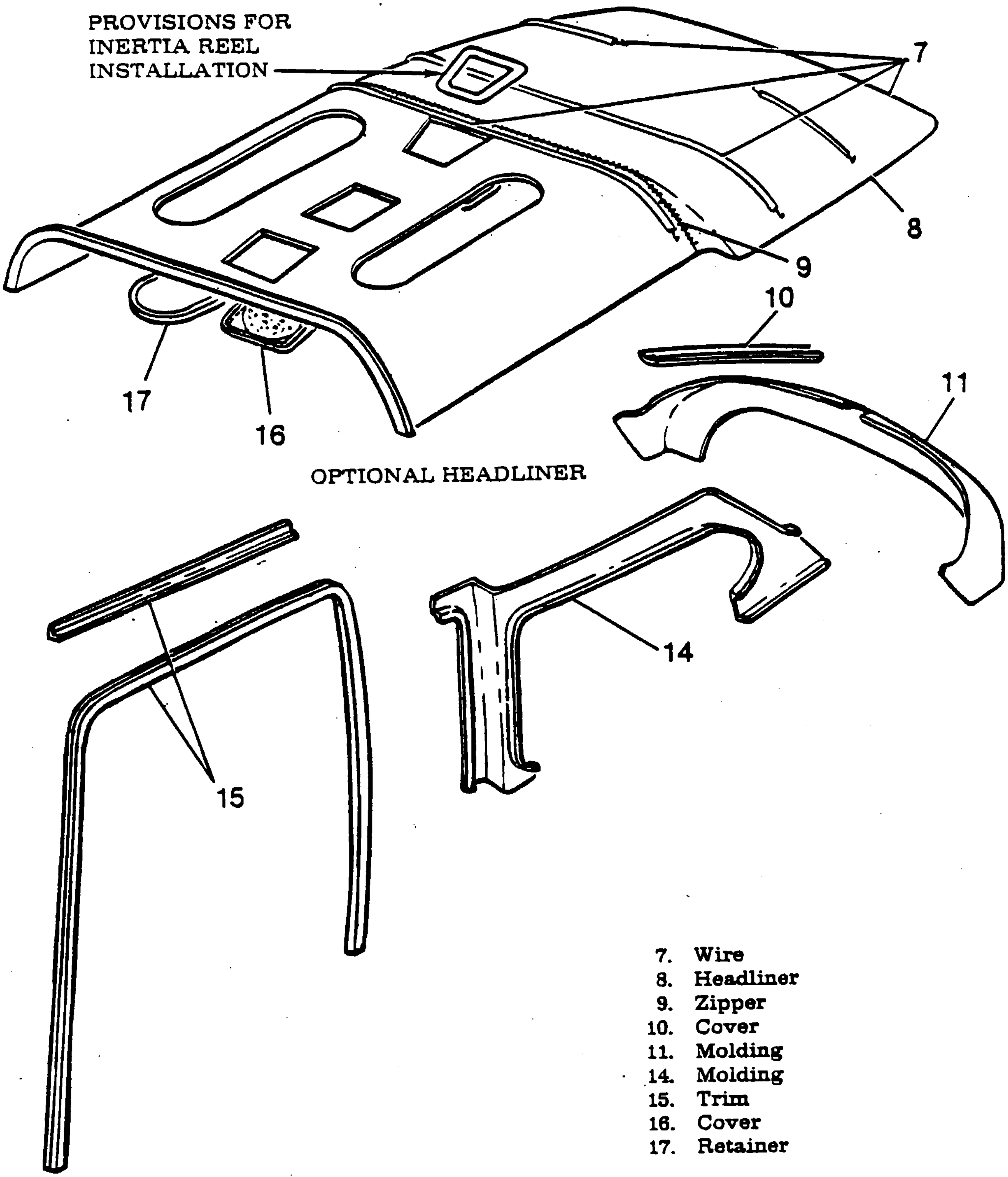
3-42. SEAT REPAIR. Replacement of defective parts is recommended in repair of seats.

3-43. CABIN UPHOLSTERY. Due to the wide selection of fabrics, styles and colors, it is impossible to depict each particular type of upholstery. The following paragraphs describe general procedures which will serve as guides 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



1. Retainer
2. Cover
3. Cover
4. Louver
5. Shield and Escutcheon
6. Trim
7. Wire
8. Headliner
9. Zipper
12. Molding
13. Coat Hanger
14. Molding
18. Retainer
19. Grill
20. Radio Vent Louver

Figure 3-11. Cabin Headliner and Trim Installation (Sheet 1 of 2)



7. Wire
8. Headliner
9. Zipper
10. Cover
11. Molding
14. Molding
15. Trim
16. Cover
17. Retainer

Figure 3-11. Cabin Headliner and Trim Installation (Sheet 2 of 2)

1. Cargo Tie-Down Ring
2. Nutplate
3. Lug Slide Assembly
4. Seat Rail

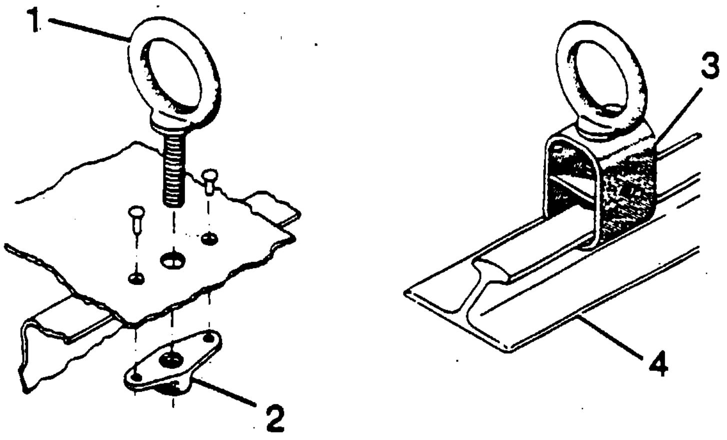


Figure 3-12. Cargo Tie-Down Rings

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 17 for repair of glass-fiber constructed components.

3-45. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound-deadening compound, applied to inner surfaces of skin in most areas of the cabin and the baggage compartment. All soundproofing material should be replaced in its original position anytime 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. (See figure 3-11.)**

3-47. **REMOVAL AND INSTALLATION. (See figure 3-11.)**

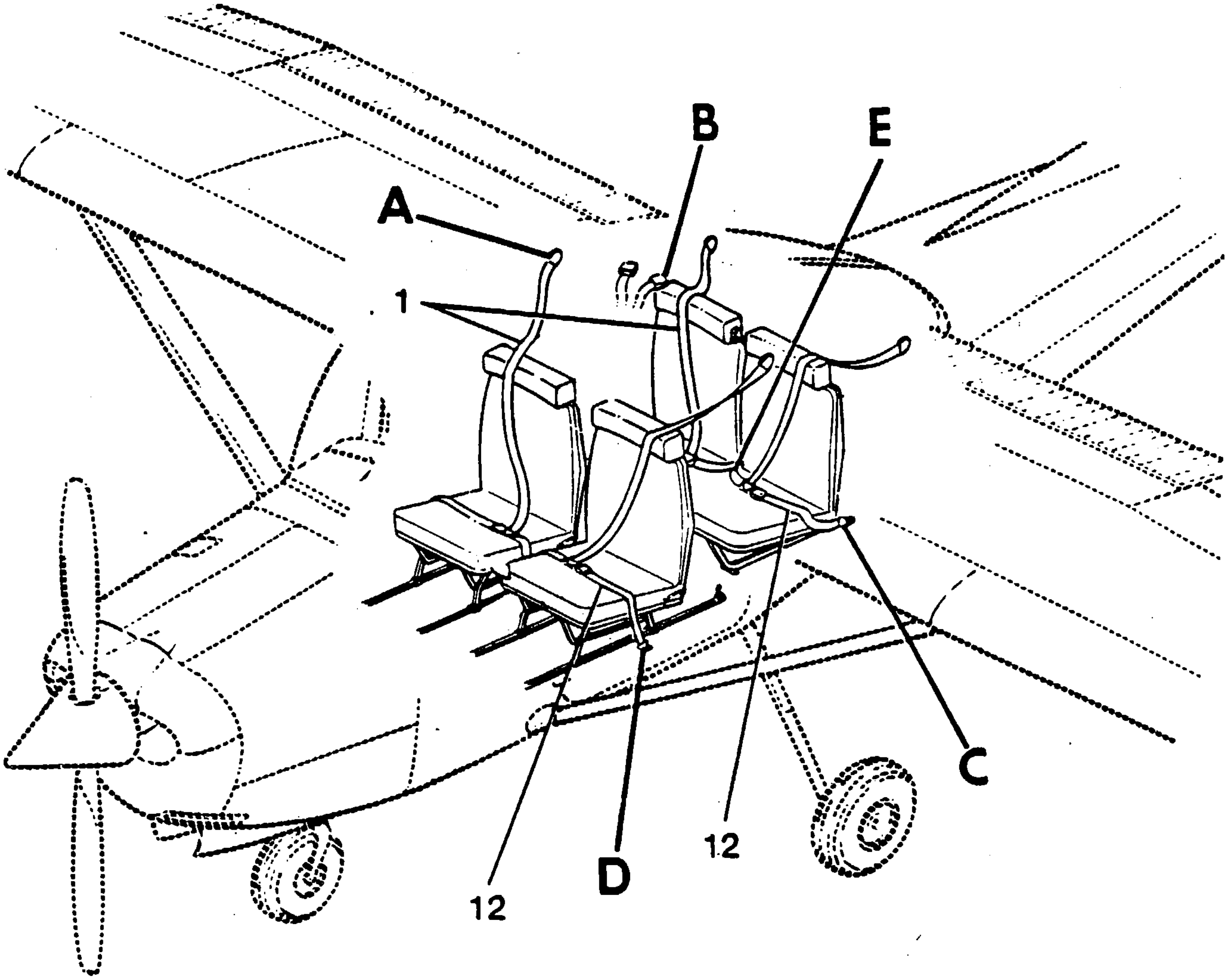
a. Remove sun visors, all inside finish strips and plates, overhead console, upper doorpost shields and any other visible retainers securing headliner.
b. Remove molding from fixed windows.
c. Remove screws securing headliner, and carefully take down headliner.
d. Remove spun glass soundproofing panels above headliner.

NOTE

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

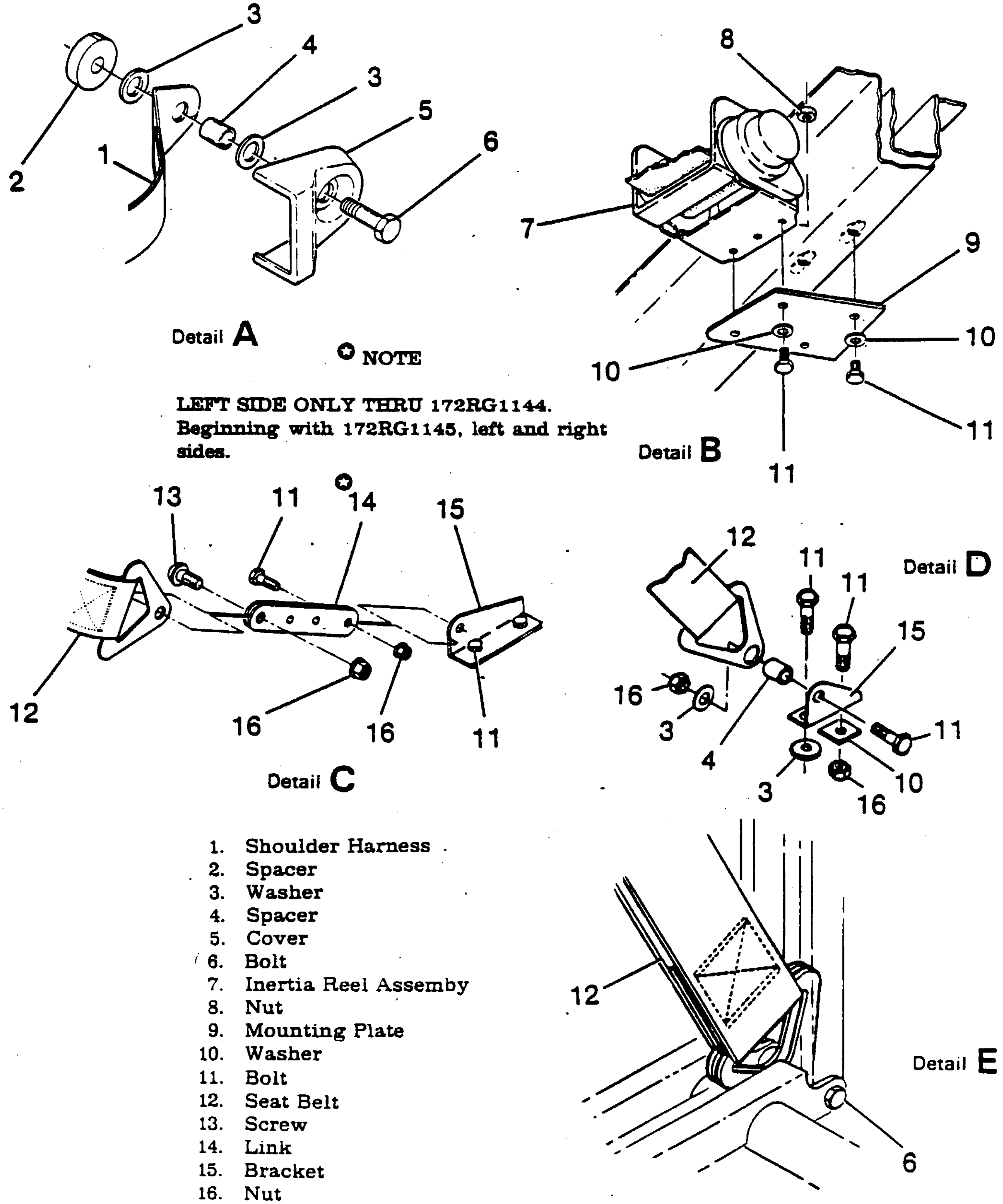
e. Reverse preceding steps for installation. Before installation, check all items concealed by headliner for security. Use wide cloth tape to secure loose wires to fuselage and to seal openings in wing roots.

3-48. 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



1. Shoulder Harness
12. Seat Belt

Figure 3-13. Seat Belt and Shoulder Harness Installation (Sheet 1 of 2)



✪ NOTE

LEFT SIDE ONLY THRU 172RG1144. Beginning with 172RG1145, left and right sides.

1. Shoulder Harness
2. Spacer
3. Washer
4. Spacer
5. Cover
6. Bolt
7. Inertia Reel Assemby
8. Nut
9. Mounting Plate
10. Washer
11. Bolt
12. Seat Belt
13. Screw
14. Link
15. Bracket
16. Nut

Figure 3-13. Seat Belt and Shoulder Harness Installation (Sheet 2 of 2) 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. When fitting a new carpet, use old carpet as a pattern for trimming and for marking screw holes.

3-50. SAFETY PROVISIONS.

3-51. CARGO TIE-DOWNS. (See figure 3-12.) Cargo tie-downs are used to ensure that baggage cannot shift and enter the seating area during flight. Methods of attaching tie-downs are illustrated in the figure. The eyebolt and nutplate are illustrated in the figure. The eyebolt and nutplate can be located at various points. The sliding tie-down lug also utilized eyebolt and attaches to a seal rail.

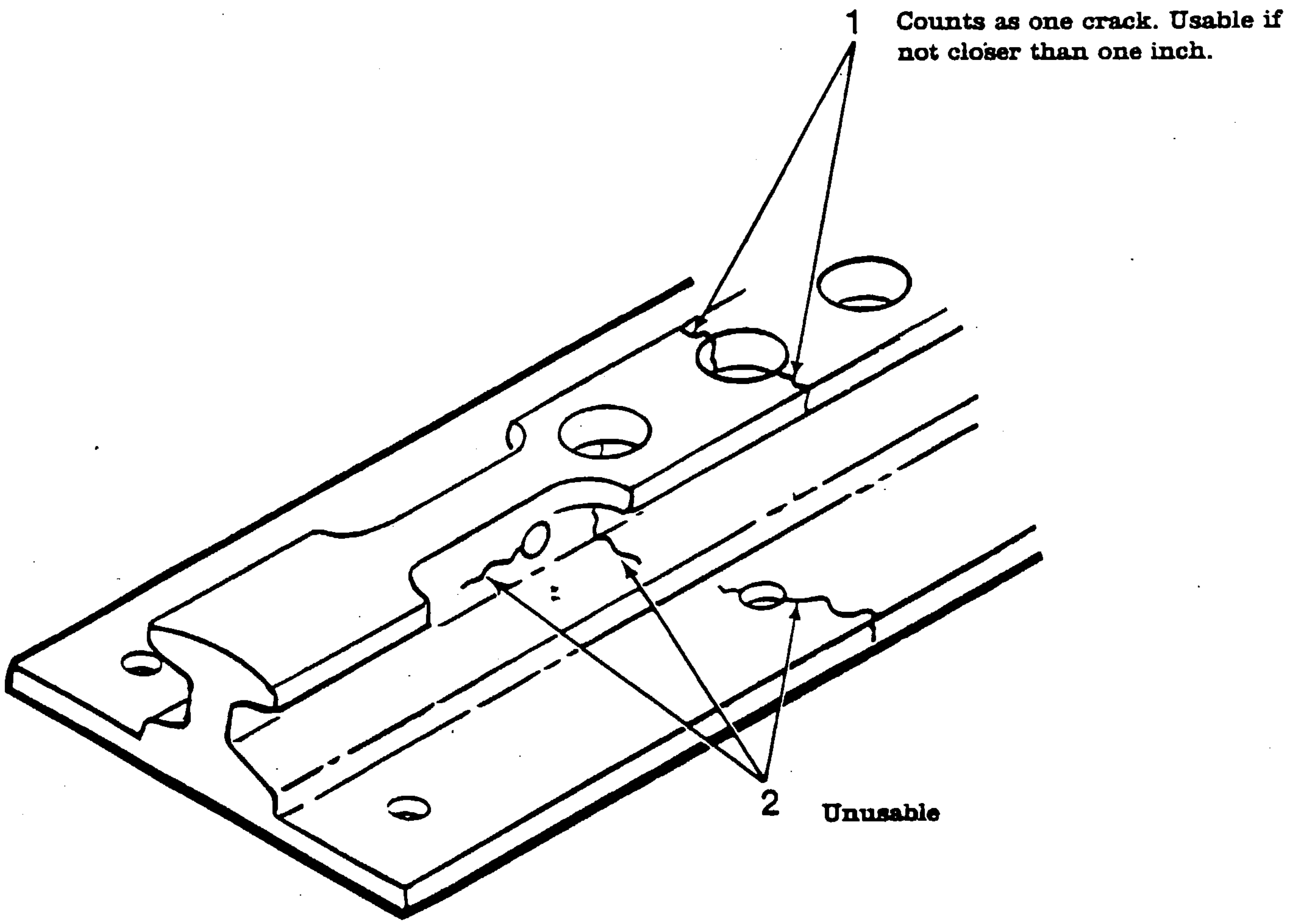
3-52. SAFETY BELTS. (See figure 3-13.) Safety belts should be replaced if frayed or cut, latches are defective or stitching is broken. Attaching parts should be replaced if excessively worn or defective.

NOTE

A special seat belt shortener Service Kit is now available which repositions the belt buckle/shoulder harness connection. Repositioning of the buckle is recommended to prevent inadvertent loosening of the seat belt. (Refer to Service Information Letter SE82-43.)

3-53. SHOULDER HARNESS. (See figure 3-13.) Individual shoulder harnesses may be installed for each seat. Each harness is connected to the upper fuselage structure and to the seat safety belt buckle. Component parts should be replaced as outlined in the preceding paragraph.

3-54. SEAT RAIL INSPECTION. A special inspection of seat rails should be conducted each 50 hours. See Figure 3-14 for inspection procedures.



REPLACE SEAT RAIL WHEN:

a. Any portion of web or lower flange is cracked (index 2).
b. Any crack in crown of rail is in any direction other than right angle to length of rail.
c. Number of cracks on any one rail exceeds four, or any two cracks (index 1) are closer than one inch.

NOTE

Use of seat rail cargo tie-downs is not permissible on seat rails with cracks.

Figure 3-14. Seat Rail Inspection

SECTION 4

WINGS AND EMPENNAGE

4-1. WINGS AND EMPENNAGE.

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

4-3. DESCRIPTION. Each all-metal wing 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. An integral fuel bay is formed between the wing spars at the inboard end of each wing. Colored navigation lights are mounted at each wing tip. Beginning with 1982 models, the aircraft landing lights are located in the left-hand wing leading edge.

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 fuel bay of wing being removed.
d. Disconnect:
   1. Electrical wires at wing root disconnects.
   2. Fuel lines at wing root. (Refer to precautions outlined in Section 12.)
   3. Pitot line (left wing only) at wing root.
   4. Cabin ventilator hose at wing root.
e. Reduce aileron cable tension by loosening turnbuckles and disconnect cables at aileron bellcranks. Disconnect flap cables at turnbuckles above headliner, and pull cables into wing root area.

NOTE

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

f. Remove screws from strut fairings and slide fairings toward center of strut.
g. Support wing at outboard end and remove strut-to-wing attach bolt.
h. Lower strut carefully to avoid damage to lower strut-to-fuselage fitting.

NOTE

Tape flaps in the streamlined position during wing removal. This will prevent flap damage due to the unsecured free-swinging action when handling the wing.

i. Mark position of wing-attachment eccentric bushings (See figure 4-1.) These bushings are used to rig out "wing heaviness".
j. Remove nuts, washers, bushings and bolts attaching wing spars to fuselage.

NOTE

It may be necessary to rock the wings slightly and/or to use a long drift punch to remove attaching bolts.

k. Remove wing and lay on padded stand.

NOTE

Plans for fabrication of padded wing support stands are illustrated in Section 17 of this manual.

4-5. REPAIR. A damaged wing panel may be repaired in accordance with instructions outlined in Section 17, which supplements Federal Aviation Regulation, Part 43. Extensive repairs of wing skin or structure are best accomplished by using the wing alignment repair jig, which may be obtained from Cessna. The wing jig serves not only as a holding fixture, making work on the wing easier, but also assures absolute alignment of the repaired wing.

4-6. INSTALLATION. (See figure 4-1.)

NOTE

The forward wing spar fittings are attached to the fuselage fittings with AN8-23 bolts, and the aft wing spar fittings are attached to the fuselage fittings with AN7-24 bolts. Minimum torque on the AN8-23 bolts is 300 lb-in and the maximum torque is 690 lb-in. Minimum torque on the AN7-24 bolts is 300 lb-in, and the maximum torque is 500 lb-in.

NOTE

Upon installation of bolts, coat holes and bolts lightly with Electro-Moly No. 11 (MIL-G-121164) grease.

a. Hold wing in position and install bolts, bushings, washers and nuts attaching wing spars to fuselage fittings. Ensure eccentric bushings are positioned as marked. Torque nuts to values stipulated in note preceding this step.
b. Install bolts, spacers, and nuts to secure upper and lower ends of wing strut to wing and fuselage fittings.

NOTE

Upon installation of bolts, coat holes and bolts lightly with Electro-Moly No. 11 (MIL-G-121164) grease.

Seal opening in fuselage skin around lower wing strut fitting with 579.6 Sealer (Inmont Corp., St. Louis, Missouri) or equivalent.

c. Route flap and aileron cables, using guide wires. (See note in paragraph 4-4.)
d. Connect:
   1. Electrical wires at wing root disconnects.
   2. Fuel lines at wing root. (Refer to precautions outlined in Section 12.)
   3. Pitot line (if left wing is being installed.)
e. Rig aileron system (Section 6).
f. Rig flap system (Section 7).
g. Refuel fuel bays and check for leaks. (Refer to precautions outlined in Section 12.)
h. Check operation of wing tip lights.
i. Check operation of fuel gage.
j. Seal all openings common to fuselage root rib and adjacent to fuel cell with cloth-backed waterproof tape. Tapes recommended for usage are: Polyken 224, 230 or 231, Permacel P-69, P-670 or P-672, or Tuck 92T.
k. 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.

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

4-7. ADJUSTMENT (Correcting "Wing-Heavy" Condition). (See figure 4-1.) If considerable control wheel pressure is required to keep the wings level in normal flight, a "wing-heavy" condition exists.

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

CAUTION

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

c. Tighten nut (10) 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. Torque nut (10), install fairing strip, and repeat flight test.

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.

NOTE

> Seal opening in fuselage skin around lower wing strut fitting with 579.6 Sealant (Inmont Corp., St. Louis, Missouri) or equivalent.

4-11. REPAIR.

a. For grooves in wing strut caused by strut fairings, the following applies:

   1. If groove exceeds .010 inch in depth and is less than .75 inch from a rivet center, the strut should be replaced.
   2. If groove exceeds .030 inch in depth and is more than .75 inch from a rivet center, the strut should be replaced.
   3. If groove depth is less than .030 inch and is more than .75 inch from a rivet center, strut should be repaired by tapering gradually to the original surface and burnishing out to a smooth finish. The local area should be checked with dye penetrant to ensure that no crack has developed.

b. The following applies to wing struts with grooves worn in the lower trailing edge. This type damage can occur after extensive cabin door usage with a missing or improperly adjusted door stop which allows the door to bang against the aft edge of the strut at the lower end.

NOTE

> Struts with a groove deeper than 50% of the original material thickness should be replaced. Lesser damage may be repaired as follows:

1. Without making the damage deeper, remove strut material on each side of groove to reduce notch effect of damage. Smooth and blend the surface to provide a gradual transition of strut tube material thickness in damaged area. The local area should be checked with dye penetrant to insure that no crack has developed.
2. Apply brush alodine or zink chromate primer and repaint area.
3. Re-rig the door stop and/or re-form the lower portion of the door pan and skin inboard to prevent the door from rubbing the strut tube. If these actions prove to be ineffective, install some form of protective bumper, either on strut or lower portion of door, to prevent further damage. A short, hard rubber strip bonded to the trailing edge of the strut where the door comes close to strut is a possibility.

NOTE

> It should be noted that the above disposition applies only to the damage caused by strikes from cabin door. The criteria set forth for strut fairing damage still applies as a general criteria for the remainer of the strut.

c. Tie-downs and attaching parts may be replaced. If the strut is badly dented, cracked or deformed, it should be replaced.

4-12. FIN. (See figure 4-3.)

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

4-14. REMOVAL. The fin may be removed without first removing the rudder. However, for access and ease of handling, the rudder may be removed in accordance with procedures outlined in Section 10 of this manual. Remove fin as follows:

a. Remove fairings on either side of fin.
b. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads, and rudder cables, if rudder has not been removed.

NOTE

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

c. Remove screws attaching dorsal to fin.
d. Disconnect elevator cable from elevator bellcrank.
e. Remove bolts attaching fin rear spar to fuselage fitting. Remove upper elevator stop bolts.
f. Remove bolts attaching fin front spar to fuselage bulkhead, and remove fin.
g. Retain any shims installed between the rear spar of the fin and the fuselage fitting.

4-15. REPAIR. Fin repair should be accomplished in accordance with applicable instructions outlined in Section 17.

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

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

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

A maximum of one shim per bolt is permissible.

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

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

4-19. REMOVAL AND INSTALLATION.

a. Remove elevators and rudder in accordance with procedures outlined in Sections 8 and 10.
b. Remove vertical fin in accordance with procedures outlined in paragraph 4-14.
c. Disconnect elevator trim control cables at clevis and turnbuckle inside tailcone, remove pulleys which route the aft cables into horizontal stabilizer, and pull cables out of tailcone.
d. Remove bolts securing horizontal stabilizer to fuselage.
e. Remove horizontal stabilizer.
f. Reverse preceding steps to install horizontal stabilizer.

NOTE

Tighten forward stabilizer-attach bolts first. Install required thickness of washers to allow a maximum .010-inch gap between washer and stabilizer rear spar. Washers are required in 2 places. The following washers are available from the Cessna Supply Division.
S1450-5A20-100
S1450-5A20-080
S1450-5A20-063

g. Check operation of tail navigation light and flashing beacon.
h. Rig control systems as necessary.

4-20. REPAIR. Horizontal stabilizer repair should be accomplished in accordance with applicable instructions outlined in Section 17.

4-21. STABILIZER ABRASION BOOTS.

NOTE

An Accessory Kit (AK182-217) is available from the Cessna Supply Division for installation of abrasion boots on aircraft not so equipped.

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

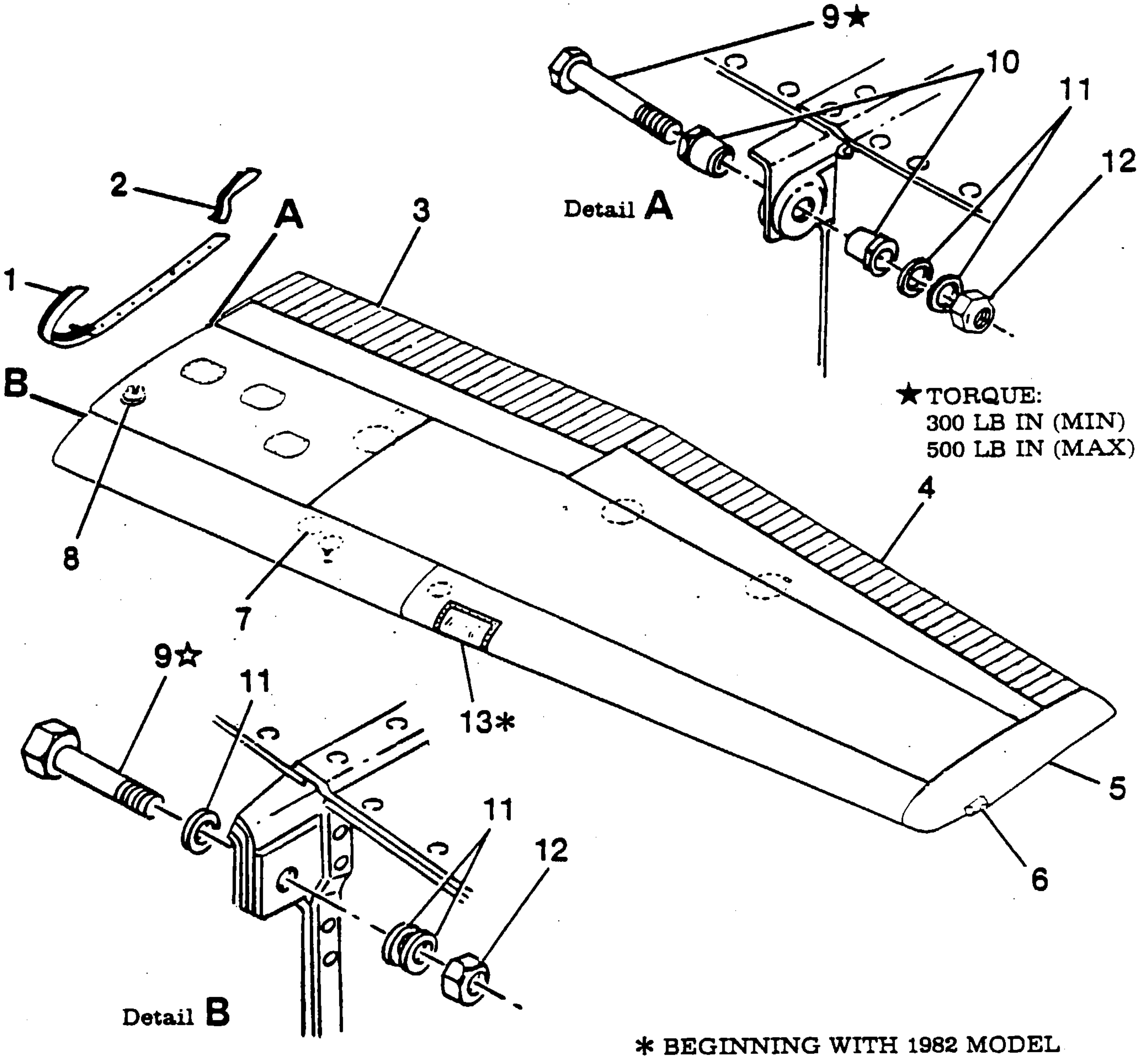
4-23. REMOVAL. The abrasion boots can be removed by loosening one end of the boot and pulling it off the stabilizer with an even pressure. Excess adhesive or rubber can be removed with Methyl-Ethyl-Ketone.

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

a. Trim boots to desired length.
b. Mask off boot area on leading edge of stabilizer with 1-inch masking tape, allowing 1/4-inch margin.
c. Clean metal surfaces of stabilizer, where boot is to be installed with Methyl-Ethyl-Ketone.
d. Clean inside of abrasion boot with Methyl-Ethyl-Ketone and a Scotch Brite pad to ensure complete removal of paraffin/talc. Then a normal wipedown with Methyl-Ethyl-Ketone on a cloth will leave surface suitable for bonding to the aluminum.

NOTE

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



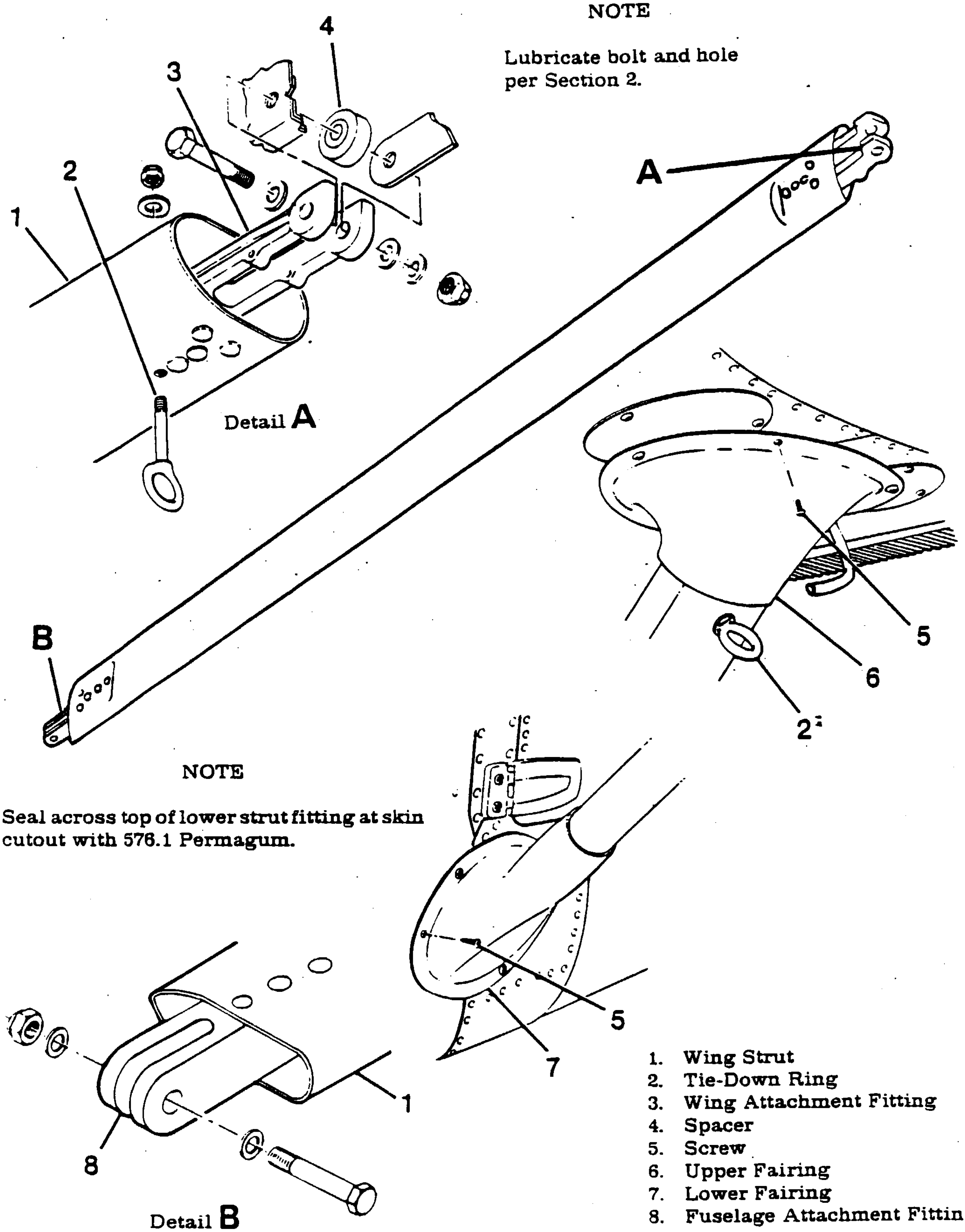
★TORQUE:
300 LB IN (MIN)
500 LB IN (MAX)

* BEGINNING WITH 1982 MODEL

☆ TORQUE:
300 LB IN (MIN)
690 LB IN (MAX)

1. Fairing
2. Lower Rear Fairing
3. Wing Flap
4. Aileron
5. Wing Tip
6. Navigation and Strobe Lights
7. Courtesy Light
8. Fuel Filler Cap
9. Bolt
10. Eccentric Bushings
11. Washers
12. Nut
13. Wing-Mounted Landing Light

Figure 4-1. Wing Installation



NOTE

Lubricate bolt and hole per Section 2.

NOTE

Seal across top of lower strut fitting at skin cutout with 576.1 Permagum.

1. Wing Strut
2. Tie-Down Ring
3. Wing Attachment Fitting
4. Spacer
5. Screw
6. Upper Fairing
7. Lower Fairing
8. Fuselage Attachment Fitting

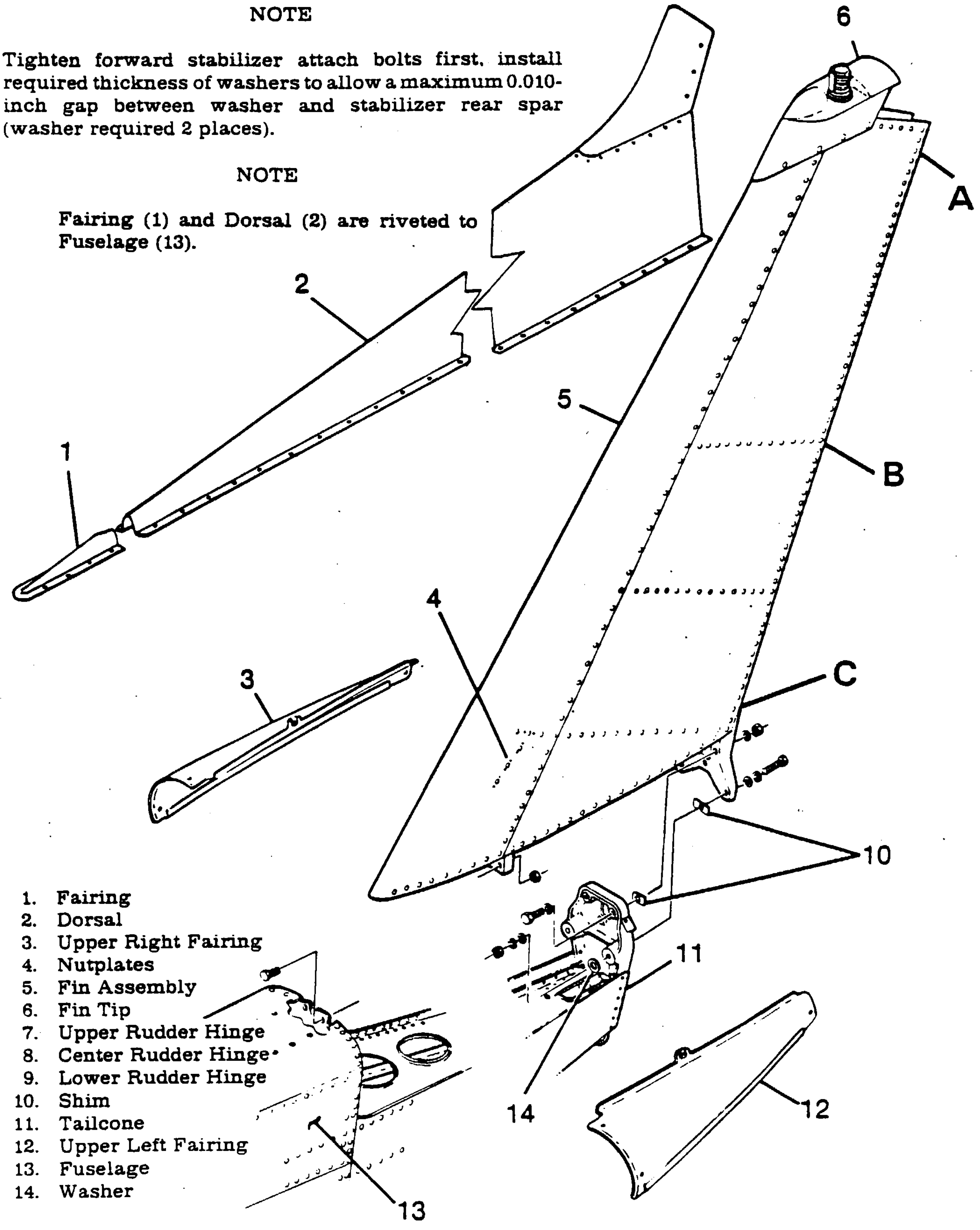
Figure 4-2. Wing Strut

NOTE

Tighten forward stabilizer attach bolts first, install required thickness of washers to allow a maximum 0.010-inch gap between washer and stabilizer rear spar (washer required 2 places).

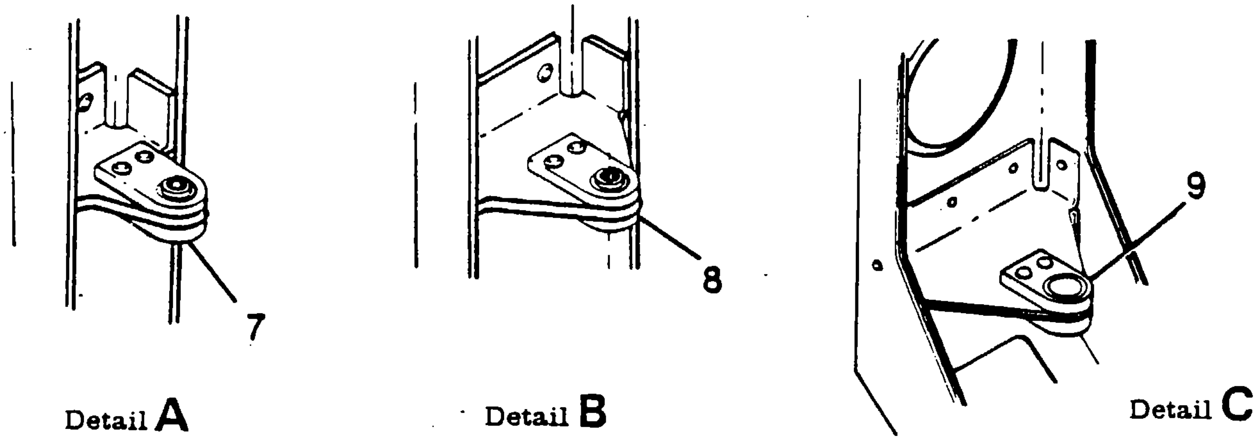
NOTE

Fairing (1) and Dorsal (2) are riveted to Fuselage (13).



1. Fairing
2. Dorsal
3. Upper Right Fairing
4. Nutplates
5. Fin Assembly
6. Fin Tip
7. Upper Rudder Hinge
8. Center Rudder Hinge
9. Lower Rudder Hinge
10. Shim
11. Tailcone
12. Upper Left Fairing
13. Fuselage
14. Washer

Figure 4-3. Vertical Fin (Sheet 1 of 2)

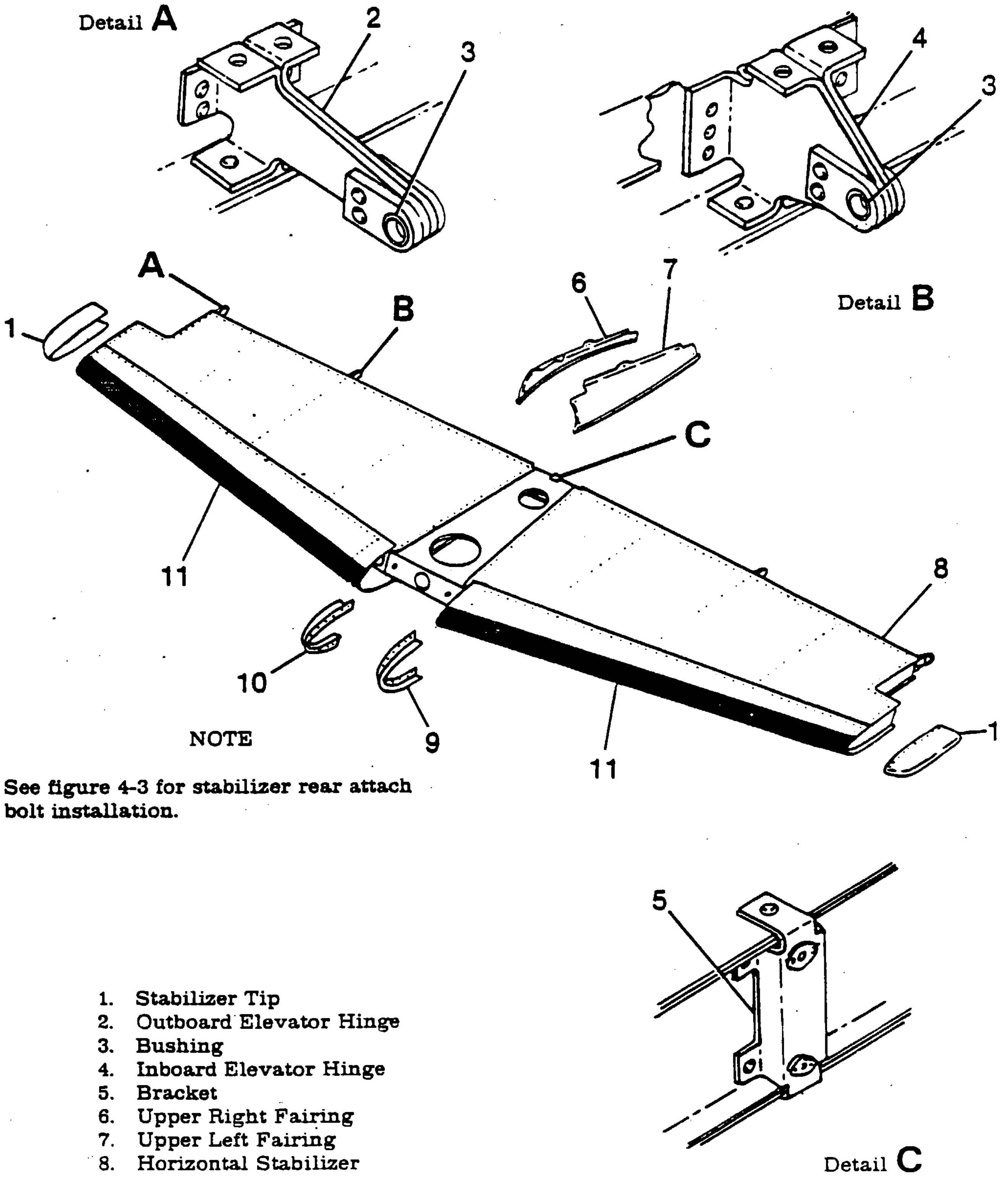


Detail A

Detail B

Detail C

Figure 4-3. Vertical Fin (Sheet 2 of 2)



NOTE

See figure 4-3 for stabilizer rear attach bolt installation.

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

Figure 4-4. Horizontal Stabilizer

e. Stir cement (EC-1300 Minnesota Mining and Manufacturing Co.) thoroughly.
f. Apply one even brush coat to the metal and the inner surface of the boot. Allow cement to air-dry for a minimum of 30 minutes, and then apply a second coat to each surface. Allow at least 30 minutes (preferably one-hour) for drying.
g. After the cement has thoroughly dried, reactivate the surface of the cement on the stabilizer and boot, using a clean, lint-free cloth, heavily moistened with toluol. Avoid excess rubbing which would remove the cement from the surfaces.
h. Position boot against leading edge, exercising care not to trap air between boot and stabilizer.

NOTE

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

i. Press or roll entire surface of boot to assure positive contact between the two surfaces.
j. Apply a coat of GACO N700A sealer, or equivalent, conforming to MIL-C-21067, along the trailing edges of the boots to the surface of the skin to form a neat, straight fillet.
k. Remove masking tape and clean stabilizer of excess material.
l. Mask to the edge of boot for painting stabilizer.

SECTION 5

LANDING GEAR, BRAKES AND HYDRAULIC SYSTEM

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

5-1. LANDING GEAR RETRACTION SYSTEM.

5-2. GENERAL DESCRIPTION. Retraction and extension of the landing gear is accomplished by a hydraulically-powered system, integrated with electrical circuits which help control and indicate gear position. Retraction and extension of the landing gear incorporates a nose gear actuator and two main gear actuators which control the main gear struts through a sector gear arrangement. The nose gear doors are mechanically-operated. The doors are closed with the gear retracted and are open with the landing gear extended. The main gears have no doors. Hydraulic fluid is supplied to the landing gear actuating cylinders by an electrically-powered power pack assembly, located in the cabin, forward of the center console. The hydraulic reservoir is an integral part of the power pack assembly. Gear selection is accomplished manually by moving a gear selector handle, located immediately left of center, in the switch panel. It is necessary to pull out on the gear selector to move the handle up or down. For emergency extension of the gear, the selector handle must be in the DOWN position before the hand pump will energize the system. A pressure switch is mounted on the power pack. This switch opens the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open until pressure in the system drops to approximately 1000 psi. This will occur whether the gear selector handle is in either the UP or DOWN position. During a normal cycle, landing gear extended and locked can be detected by illumination of the DOWN indicator (green) light. Indication of gear retracted is provided by illumination of the UP indicator (amber) light. The nose gear squat switch, actuated by the nose gear, prevents gear retraction whenever the nose gear is compressed by the weight of the aircraft. Beginning with 1983 models, the UP indicator (amber) light is replaced with a GEAR UNSAFE indicator (red) light. The GEAR UNSAFE (red) light is on anytime the gear is in transit (retract cycle), or whenever system pressure drops below 1000 psi with the safety (squat) switch closed.

NOTE

It is possible to have the red and green lights on momentarily at the same time after the completion of the extend cycle, or when rotating during takeoff. However, if both stay on after the completion of the extend cycle, or if the red light stays on longer than 5 to 7 seconds during the retract cycle, a malfunction has occurred.

5-3. TROUBLE SHOOTING -- LANDING GEAR SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR FAILS TO RETRACT.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of open circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Nose gear squat switch inoperative.	Install new switch.
	Pressure switch defective.	Install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Hydraulic pump motor ground.	Check for ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
	Battery low or dead.	Check battery condition. Install new battery.
GEAR RETRACTION OR EXTENSION EXTREMELY SLOW.	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
	Restriction in hydraulic system.	Isolate and remove restrictions.
	Power pack suction screen damaged or excessive clearance between screen and body.	Replace suction screen.
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.

5-3. TROUBLE SHOOTING -- LANDING GEAR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED (Cont).	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of open circuit breaker.
	Pressure switch out of adjustment.	Remove, adjust or install new switch.
	Restriction in hydraulic system, allowing pressure to build up and shut off pump motor before gear is retracted.	Isolate and determine cause. Remove restrictions.
PUMP MOTOR STOPS BEFORE GEAR IS EXTENDED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of open circuit breaker.
PUMP CONTINUES TO RUN AFTER GEAR IS FULLY RETRACTED OR EXTENDED.	Pressure switch defective.	Install new switch.
	Pressure switch out of adjustment.	Remove, adjust, or install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.
	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.
	Power pack relief valve out of adjustment.	Disassemble and repair or replace valve assembly.
	Hydraulic motor solenoid defective.	Install new solenoid.
PUMP MOTOR CYCLES EXCESSIVELY AFTER GEAR IS RETRACTED.	Pressure switch out of adjustment.	Remove, adjust or install new switch.
	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.

5-3. TROUBLE SHOOTING -- LANDING GEAR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP MOTOR CYCLES EXCESSIVELY AFTER GEAR IS RETRACTED (Cont).	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.
GEAR DOES NOT FULLY RETRACT, BUT PUMP MOTOR CONTINUES TO RUN.	Internal leakage in system.	Check gear actuators for internal leakage. Repair or install new actuators.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
LANDING GEAR FAILS TO EXTEND.	Battery low or dead.	Check battery condition. Install new battery.
	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Landing gear circuit breaker open.	Reset circuit breaker. Determine cause of open circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Hydraulic pump motor grounded.	Check for ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid. (Refer to Section 2.)
	Nose gear stop bolts incorrectly adjusted.	Adjust stop bolts.

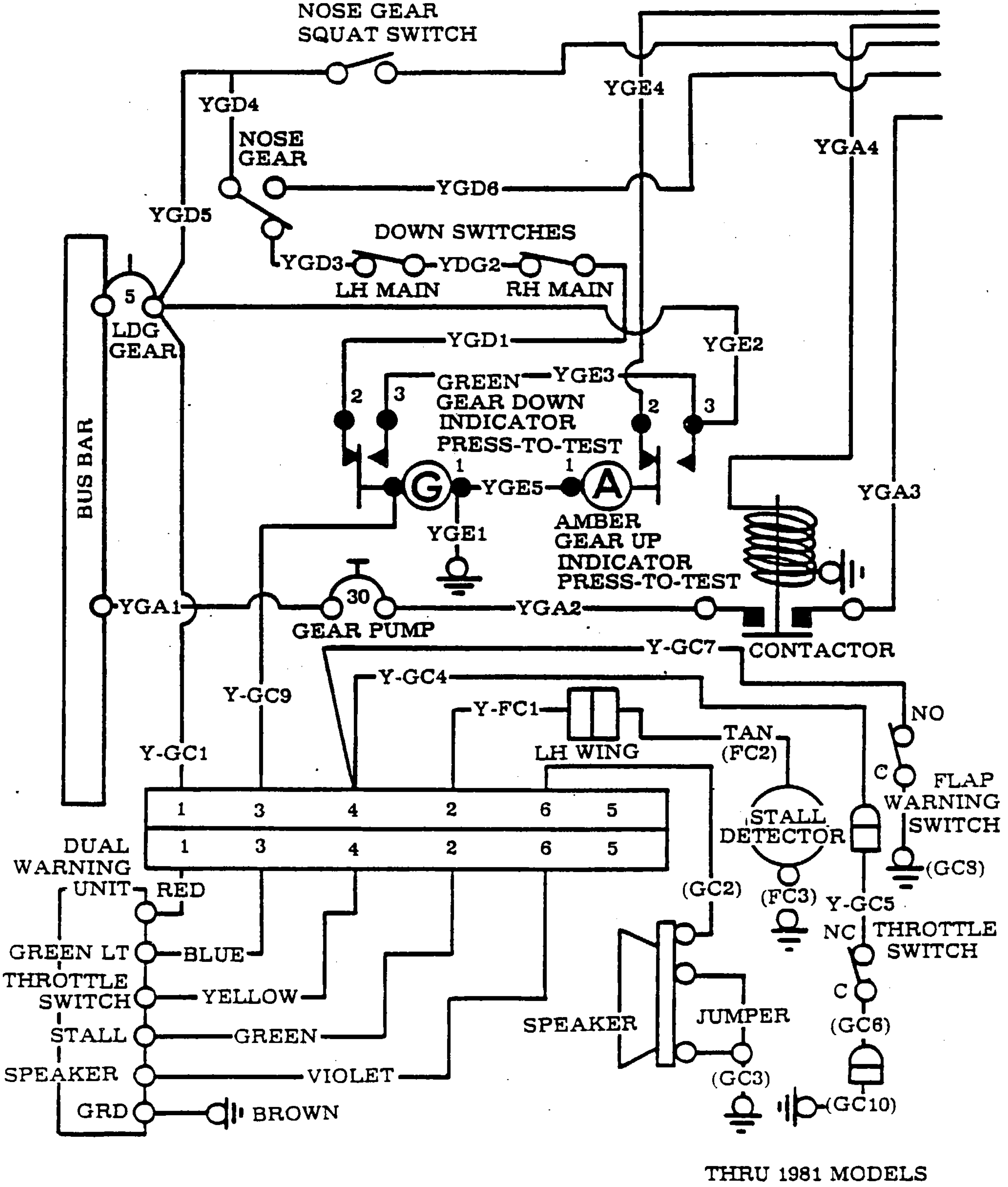
5-4. HYDRAULIC SYSTEM LEAK CHECK.

a. Jack aircraft in accordance with the procedures in Section 2 of this manual.
b. To relieve system pressure pull the GEAR PUMP circuit breaker to OFF and move the gear selector handle to UP and back to the DOWN position.
c. Install a 0-2000 PSI gage at the service tee on the right-hand side of the power pack.
d. Push the GEAR PUMP circuit breaker to the ON position, turn ON the master switch and move the gear selector handle to the UP position.
e. Monitor pressure gage after retraction cycle is complete for pressure bleed down.
f. If bleed down occurs, it can be an internal or external leak anywhere in the system.

NOTE

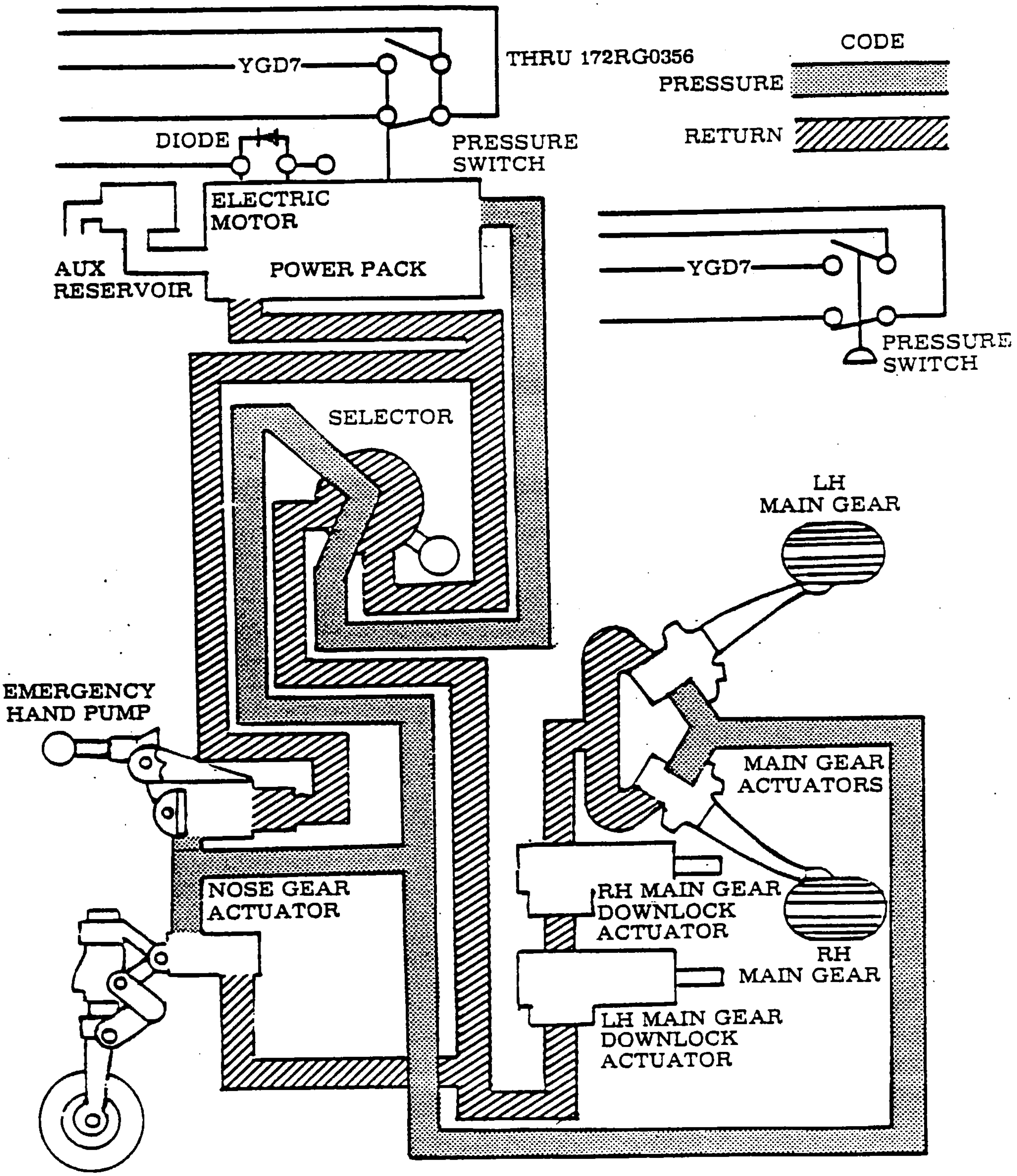
When any line is disconnected be prepared for fluid leakage.

g. Disconnect the return line from the gear selector. If fluid comes from the selector, the internal leak is in the system.
h. If no leak-by is found, it can be assumed there is an internal leak in the power pack. If leak is found proceed to step "j". Reconnect the return line.
i. Power pack internal leakage can only be attributed to a bad thermal relief valve, check valve or check valve O-ring. There isn't any way to isolate part that is leaking, so first replace the check valve O-ring, check valve and then thermal relief valve. Repeat leak test after replacement of each part to ensure leak correction.
j. Remove gear DOWN line from the selector. If fluid comes from the line, one or more of the gear actuators is leaking. To locate the leaking actuator, disconnect the return line from each actuator, the leaking actuator will have fluid draining from the actuator port. Following the appropriate paragraphs in this section remove, overhaul and reinstall the actuator.
k. Reconnect gear down line to the selector.
l. Recheck all lines that were disconnected for security.
m. Lower the landing gear. Following the procedures in step "b" relieve the system pressure.
n. Remove the pressure gage from the service tee.
o. In accordance with the procedures in Section 2 of this manual replenish the power pack reservoir with MIL-H-5606 hydraulic fluid and bleed the system.
p. Remove aircraft from jacks.



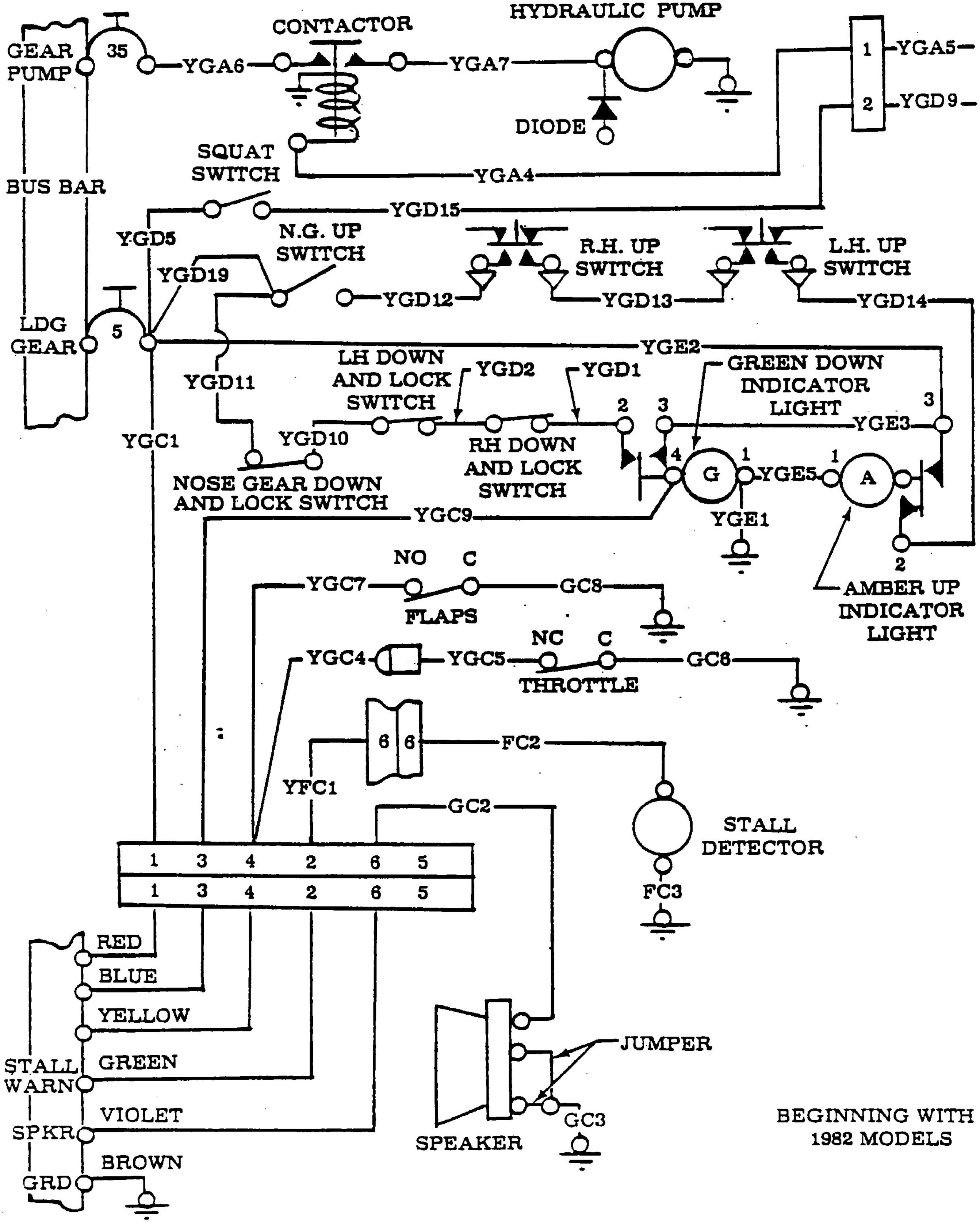
THRU 1981 MODELS

Figure 5-1. Landing Gear System Schematic (Sheet 1 of 5)



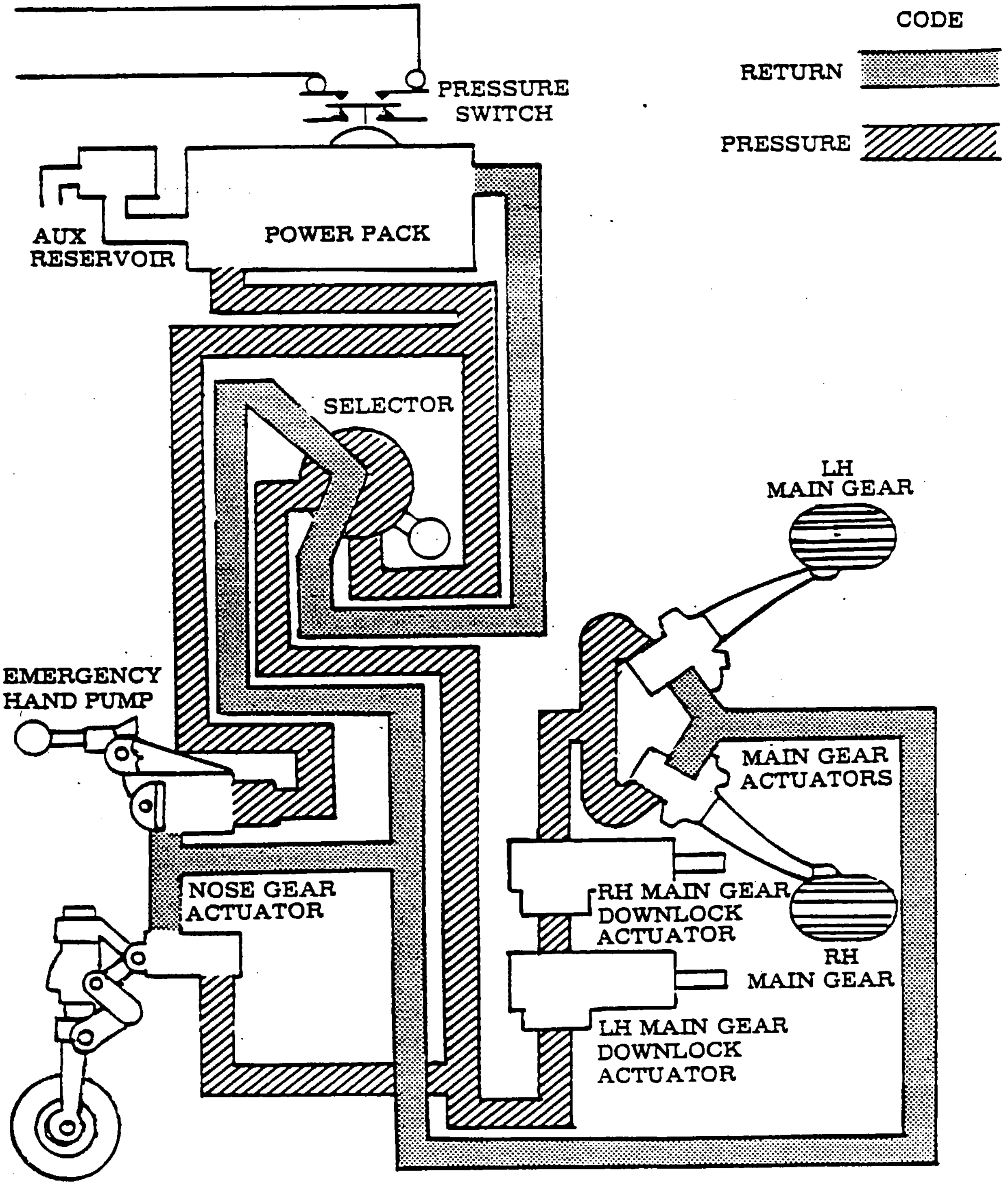
THRU 1981 MODELS

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



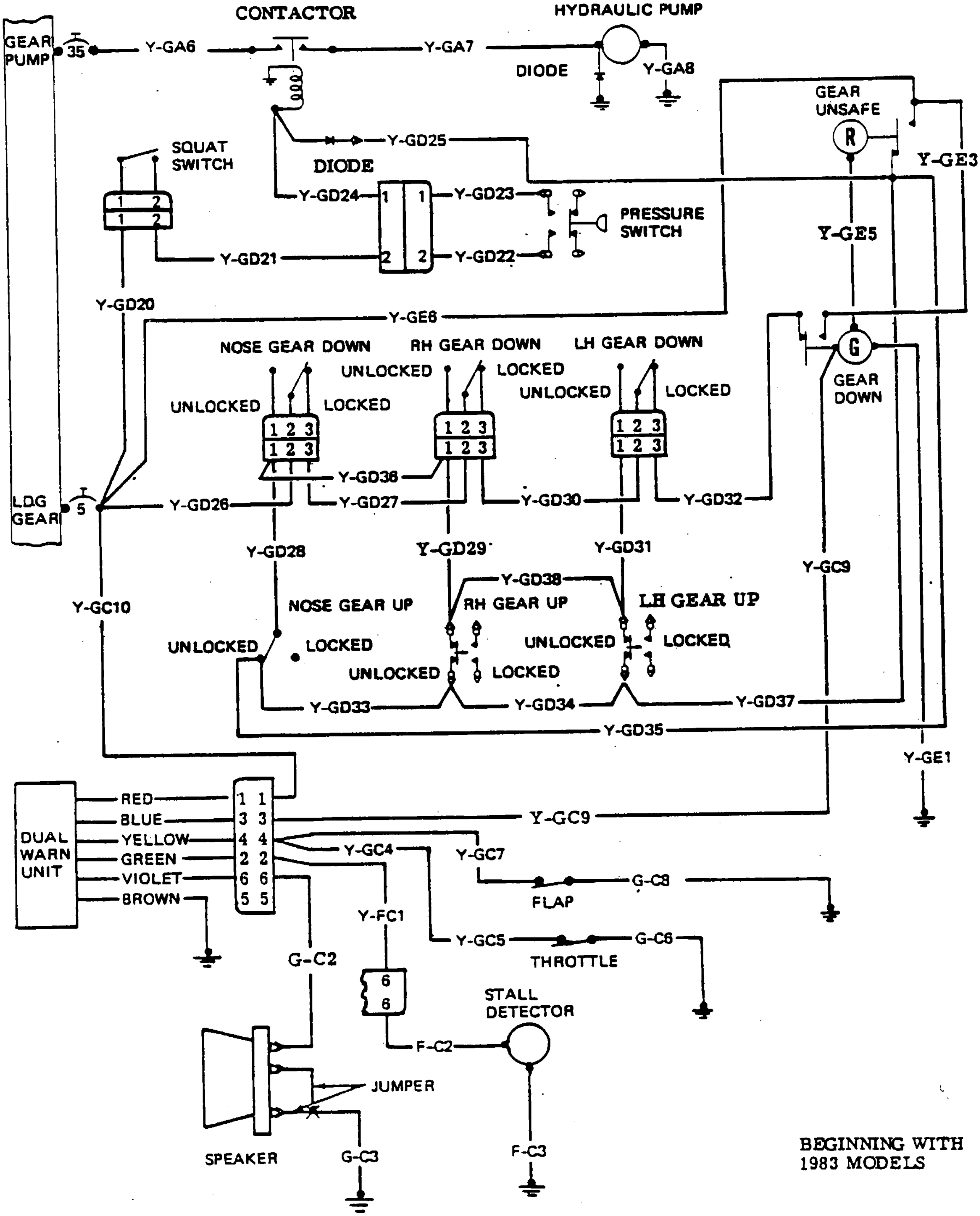
BEGINNING WITH
1982 MODELS

Figure 5-1. Landing Gear System Schematic (Sheet 3 of 5)



BEGINNING WITH
1982 MODELS

Figure 5-1. Landing Gear System Schematic (Sheet 4 of 5)



BEGINNING WITH
1983 MODELS

Figure 5-1. Landing Gear System Schematic (Sheet 5 of 5)

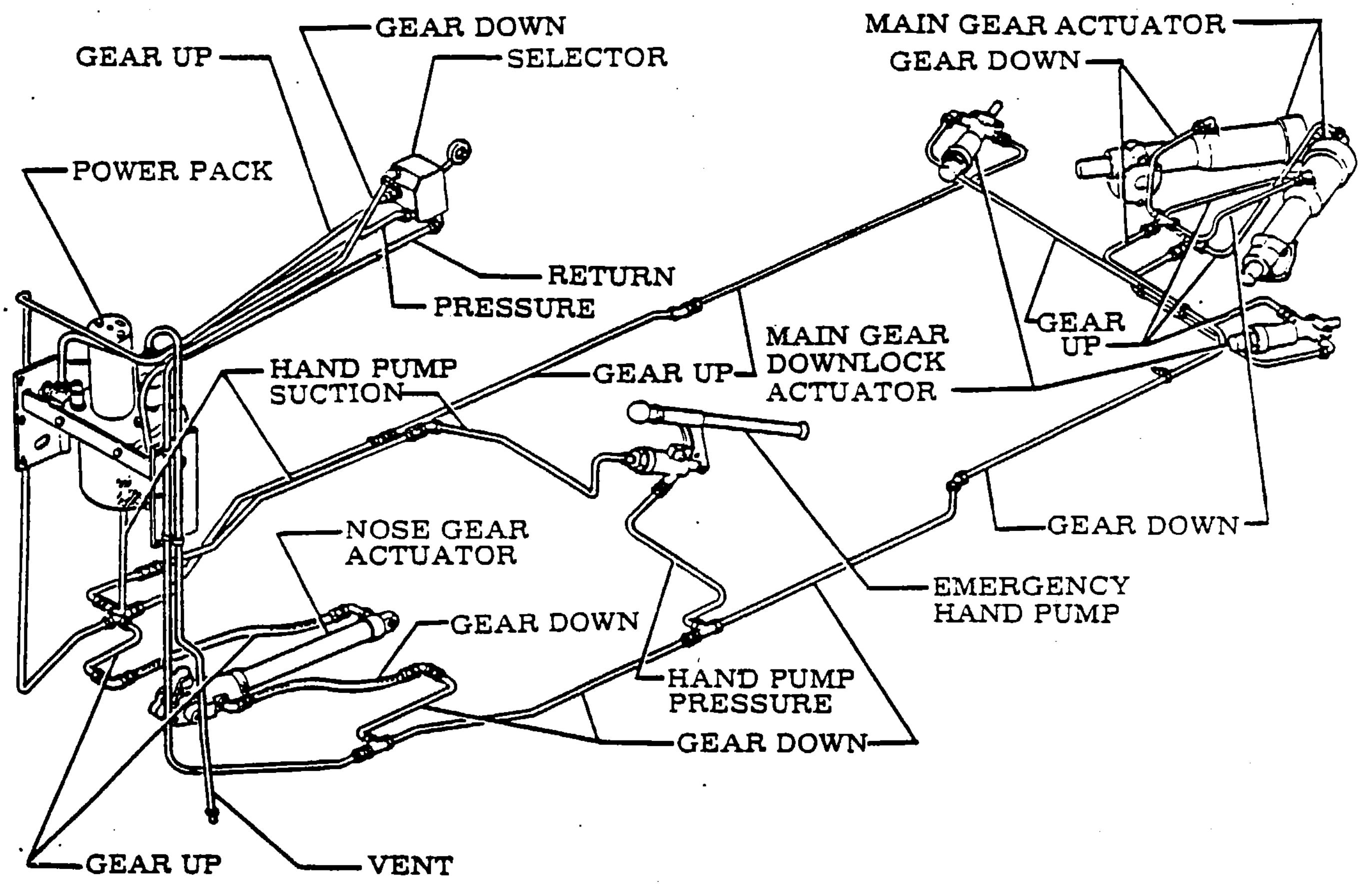


Figure 5-2. Landing Gear System Component Locator (Sheet 1 of 2)

5-5. POWER PACK. (See figure 5-3.)

5-6. DESCRIPTION. The power pack assembly, located in the cabin, forward of the center console, is a multi-purpose unit. It contains a hydraulic reservoir, valves, an electrically-driven motor and the pump, and the pressure switch. An emergency hand pump, located between the pilot and copilot seats, uses reservoir fluid to permit extension of the landing gear.

5-7. REMOVAL. (See figure 5-3.)

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Turn master switch OFF and place gear selector handle in a neutral position to relieve system pressure. After 15 seconds, return gear selector handle to DOWN position.

NOTE

As hydraulic lines are disconnected or removed, plug or cap all openings to prevent entry of foreign material into the lines or fittings.

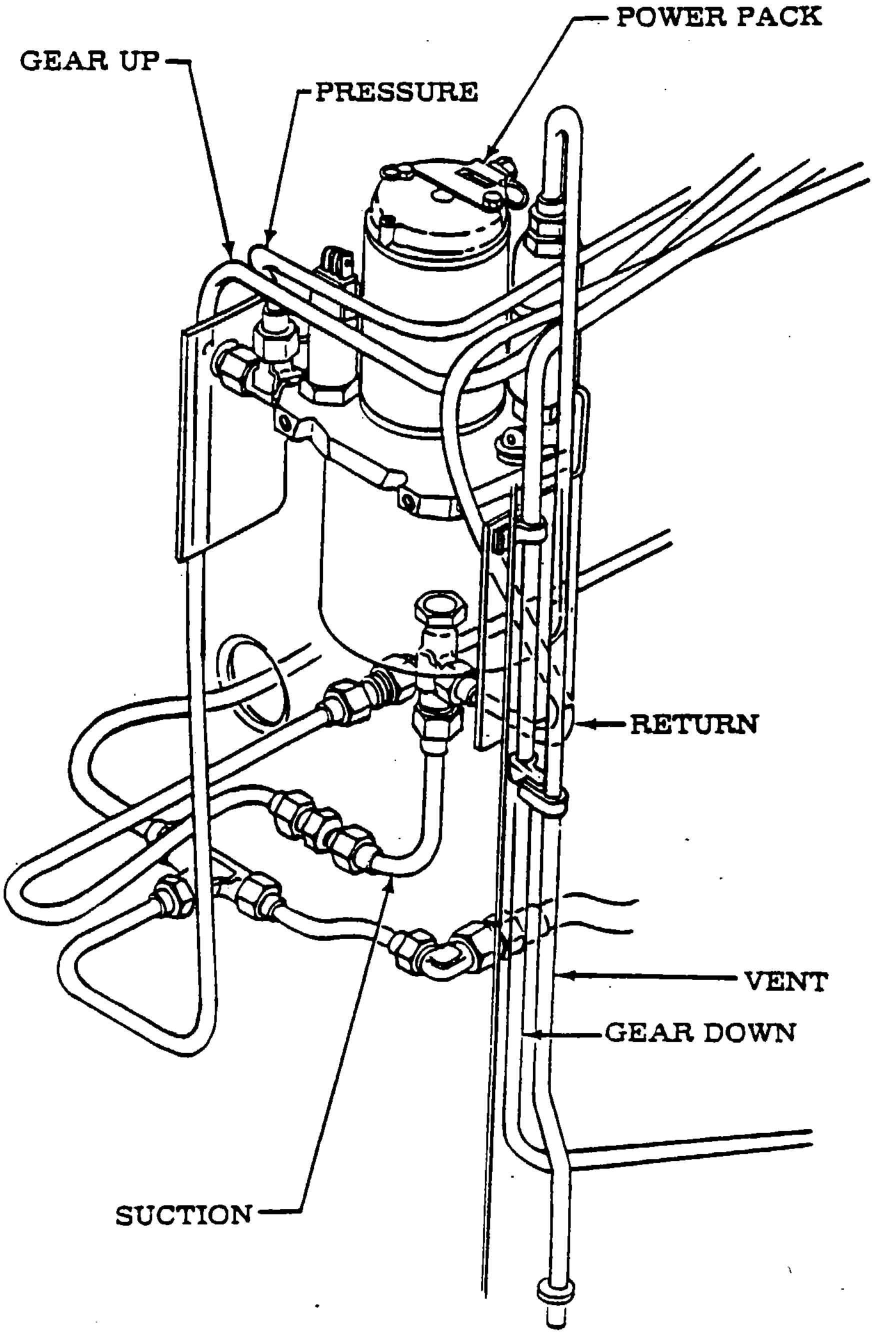


Figure 5-2. Landing Gear System Component Locator (Sheet 2 of 2)

CAUTION

The power pack reservoir must be drained to prevent any large amount of hydraulic fluid from spilling into the cabin area. To accomplish this, peel carpeting back from work area and spread a large, absorbent drip cloth below power pack. Remove the cap from tee fitting, located on the right-hand side of the power pack body. Attach a flexible line to the tee fitting and place the other end of the line in a container of at least one gallon capacity. Pump fluid from reservoir using emergency hand pump. Remove line and replace cap.

NOTE

Ensure that the master switch is in the OFF position before disconnecting electrical leads.

CAUTION

A small diode assembly wire spans across the positive and negative posts on the motor. It is very important that this diode assembly, if removed or being replaced, be installed on the motor with the marking band of the diode toward the positive post. (See figure 5-3.)

c. Pull control wheel all the way aft and secure in this position.
d. Move left seat to full aft position and spread a drip cloth beneath the power pack.
e. Disconnect ground wire and solenoid wire from top of motor. Disconnect pressure switch wires at splice connector. Tag all wires so they may be installed in the source location.
f. Disconnect vent line from top of sump. Disconnect pressure line from tee fitting on right-hand side of power pack. Disconnect return and hand pump suction lines from tee fitting in bottom of reservoir. Cap or plug all openings and lines.
g. Remove six screws and two clamps, attaching power pack bracket to firewall fitting. Remove power pack with the bracket attached.

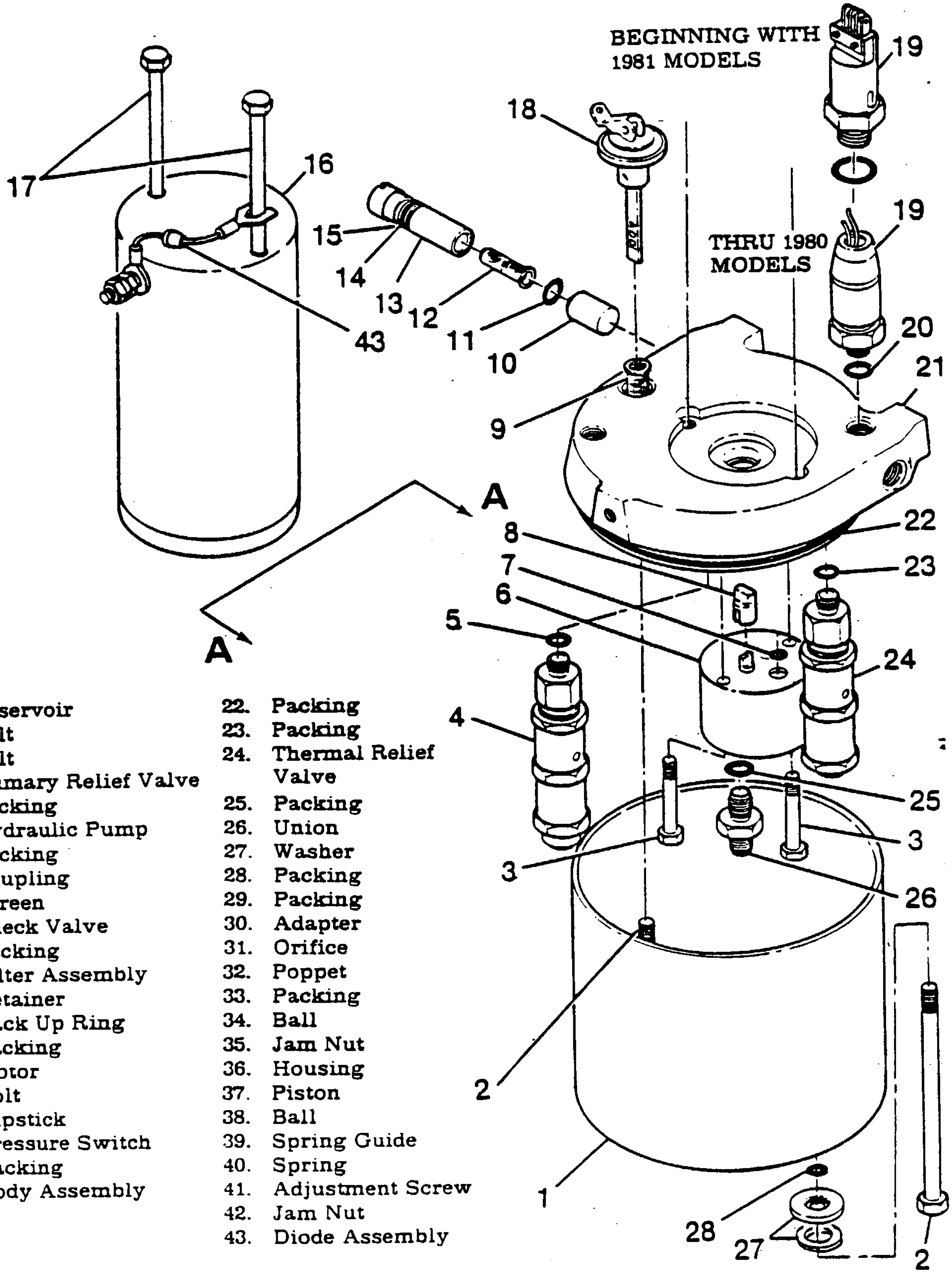
5-8. DISASSEMBLY. (See figure 5-3.)

a. Remove bolts (2), washers (27) and packings (28) from reservoir (1).
b. Remove reservoir (1) from body assembly (21).

NOTE

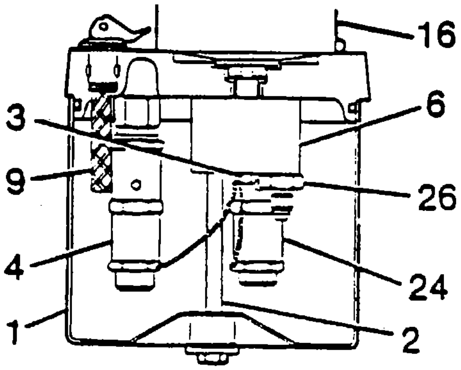
If reservoir will not disengage from body, install a capped fitting in the pressure and return openings of the power pack assembly and attach an air hose to vent fitting at top of body assembly (21). Apply air pressure (not to exceed 15 psi, reservoir proof pressure), and remove reservoir. A strap clamp is not recommended as clamp may damage reservoir.

c. Remove packing (22) from body assembly (21).

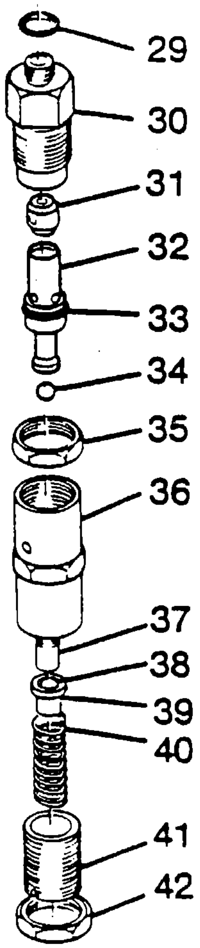


1. Reservoir
2. Bolt
3. Bolt
4. Primary Relief Valve
5. Packing
6. Hydraulic Pump
7. Packing
8. Coupling
9. Screen
10. Check Valve
11. Packing
12. Filter Assembly
13. Retainer
14. Back Up Ring
15. Packing
16. Motor
17. Bolt
18. Dipstick
19. Pressure Switch
20. Packing
21. Body Assembly
22. Packing
23. Packing
24. Thermal Relief Valve
25. Packing
26. Union
27. Washer
28. Packing
29. Packing
30. Adapter
31. Orifice
32. Poppet
33. Packing
34. Ball
35. Jam Nut
36. Housing
37. Piston
38. Ball
39. Spring Guide
40. Spring
41. Adjustment Screw
42. Jam Nut
43. Diode Assembly

Figure 5-3. Hydraulic Power Pack Assembly (Sheet 1 of 2)



A-A



1. Reservoir
2. Bolt
3. Bolt
4. Primary Relief Valve
6. Hydraulic Pump
9. Screen
16. Motor
24. Thermal Relief Valve
26. Union
29. Packing
30. Adapter
31. Orifice
32. Poppet
33. Packing
34. Ball
35. Jam-Nut
36. Housing
37. Piston
38. Ball
39. Spring Guide
40. Spring
41. Adjustment Screw
42. Jam-Nut

Figure 5-3. Hydraulic Power Pack Assembly (Sheet 2 of 2)

☐ SERIAL 172RG0001 thru 172RG0948
172RG0956 thru 172RG0992
* SERIAL 172RG0949 thru 172RG0955
172RG0993 & ON

NOTE

Disassembly of relief valves (4) and (24) is normally not required. Refer to applicable paragraphs for specific instructions regarding relief valves. Before removal, tag each relief valve (primary) or (thermal) to ensure correct reinstallation.

d. Cut safety wire from bolts (3) and relief valve assemblies (4) and (24) and remove valve assemblies from body assembly (21).
e. Remove dipstick (18) and screen (9) from body assembly (21).
f. Remove retainer (13), screen filter assembly (12), back up ring (14), packing (15), packing (11) and check valve (10) from body assembly (21).

NOTE

If check valve (10) will not fall from hole in body assembly, place a drift or punch made of soft material into the pressure opening of body assembly, and tap valve from body.

g. Remove pressure switch (19) and packing (20) from body assembly.
☐ h. Remove bolts (3) attaching hydraulic pump (6) to body assembly, and remove pump and coupling (8) from body. Remove union (26) and packing (25) and (7) from pump.
* i. Cut safety wire and remove bolts (3) attaching hydraulic pump (6) to body assembly, and remove pump and coupling (8) from body. Remove packing (7) from pump.
j. Cut safety wire from bolts (17) and remove bolts and motor (16) from body assembly (21).

5-9. INSPECTION. (See figure 5-3.)
a. Wash all parts in cleaning solvent (Federal Specification P-S-611, or equivalent, and dry with filtered air.
b. Inspect all threaded surfaces for serviceable condition and cleanliness.
c. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.
d. Clean to ensure that all screens and filters are completely clean and undamaged.

5-10. REASSEMBLY. (See figure 5-3.)

NOTE

Use all new packings and back up rings when reassembling power pack. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow Corning DC-7. Do not use DC-7 on surfaces to be painted.

☐ a. Using new packing (25), install union (26) on hydraulic pump (6). Install hydraulic pump and coupling (8) with new packing (7) into body assembly (21) with bolts (3). Torque bolts (3) to 30 lb-in.

✱ b. Using new packing (7), install hydraulic pump (6) and coupling (8) into body assembly (21) with bolts (3). Torque bolts to 30 lb-in. and safety-wire bolts.

c. Align coupling (8) to match mating part in motor assembly (16), secure motor to body with bolts(17), tighten and safety-wire bolts.

d. Using new packing (20), install and tighten pressure switch (19) onto body assembly (21).

e. Using new back up ring (14) and packings (15) and (11), install and tighten check valve (10), filter assembly (12) and retainer (13) into body assembly (21).

f. Install relief valve assemblies (4) and (24), along with packings (5) and (23), onto body assembly (21). Safety-wire bolts as shown in View A-A.

CAUTION

Ensure that relief valves are installed in their correct locations. See View A-A.

NOTE

Safety wire relief valves (4) and (24) to hydraulic pump mounting bolts (3) as shown in View A-A.

g. Install screen assembly (9) and dipstick (18) into body assembly (21).

h. Using new packing (22), washers (27) and packings (28), install and tighten reservoir (1) onto body assembly (21). Torque bolts (2) to 30-35 inch-pounds.

5-11. INSTALLATION.

a. Place power pack with support attached with three bolts, in aircraft. Attach support to firewall fittings with six screws and two clamps.

NOTE

Ensure that master switch is in OFF position before connecting electrical leads to power pack assembly.

CAUTION

A small diode assembly wire (43) spans across positive and negative posts on motor. It is very important that this diode assembly, if removed or being replaced, be installed on motor with marking band of diode toward positive post. (See figure 5-3.)

b. Ensure that diode assembly wire is correctly installed on motor, and connect ground wire and solenoid wire to motor.
c. Connect pressure switch wires at splice connectors, being careful to match tags on wires.
d. Remove caps or plugs, and connect return and hand pump suction lines to tee fitting at bottom of reservoir. Connect pressure line to tee fitting on right-hand side of power pack. Connect vent line at top of sump.
e. Untie control wheel and return to original position.

5-12. PRIMARY AND THERMAL RELIEF VALVE ASSEMBLIES. (See figure 5-3.) The primary relief valve, located between check valve and pump, serves to limit amount of pressure which can be generated by the pump. The thermal relief valve, located on the system side of the check valve, serves to limit system pressure. System pressure can increase due to thermal expansion. Both valves are identical, the only difference being the pressure setting.

5-13. REMOVAL. (See figure 5-3.)

a. Cut safety wire and remove relief valve assemblies from body assembly (21).

5-14. DISASSEMBLY. (See figure 5-3.)

NOTE

Relief valve assemblies are preset by the factory and normally will not require disassembly. Refer to paragraph 5-15 to determine if disassembly or adjustment is necessary.

a. Remove jam nut (42) and adjustment screw (41) from housing (36).
b. Remove spring (40), guide (39), ball (38), piston (37) and ball (34) from housing (36).
c. Loosen jam nut (35) and remove adapter (30) from housing (36).
d. Remove poppet (32) and orifice (31) from adapter (30).

5-15. INSPECTION. (See figure 5-3.)

a. Wash all parts in cleaning solvent (Federal Specification P-S-611 or equivalent), and dry with filtered air.
b. Inspect all threaded surfaces for serviceable condition and cleanliness.
c. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.

5-16. ASSEMBLY AND ADJUSTMENT. (See figure 5-3.)

NOTE

Use new packings during reassembly. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted.

a. Install orifice (31) and poppet (32) into adapter (30). (New packing (33) must be installed on poppet.)
b. Install jam nut (35) and housing (36) on adapter (30).
c. Tighten adapter (30) into housing (36) and torque to 100-150 lb-in.
d. Tighten jam nut (35) against housing (36) and torque to 100-150 lb-in.
e. Install ball (38) into housing (36), so that it rests on poppet (32). Install piston (37) into housing (36), then install ball (38) into end of piston (37).
f. Install guide (39) and spring (40) into housing (36), making sure that balls (34) and (38) and piston (37) remain in correct positions.
g. Turn adjustment screw (41) into housing (36) until it just contacts spring (40), then turn in one additional turn. Start jam nut (42) onto adjustment screw (41) and snug against housing (36).

NOTE

To determine if disassembly or adjustment is necessary, the relief valves can be bench-tested. The thermal relief valve can be tested with a hand pump, connected to a hydraulic reservoir, a pressure gage with 2500 psi capacity and a hose with appropriate fittings, connected from the hand pump to the fitting on the thermal relief valve. The thermal relief valve shall be set not to open in excess of 2250 psi. If adjustment of thermal relief valve is necessary, loosen jam-nut (42) and turn adjustment screw (41) in to increase pressure; back adjustment screw out to decrease pressure. Tighten jam-nut (42) against housing (36) and torque jam-nut from 100 to 150 lb. in. Recheck pressure adjustments. Testing the primary relief valve will require a hydraulie pump with a flow rate of 0.5 to 0.7 gal.-per-min., connected to a hydraulic reservoir, a pressure gage with 2500 psi capacity and a hose with appropriate fittings, connected from the hydraulic pump to the fitting on the primary relief valve. Adequate precautions should be taken to recover hydraulic fluid which will be expelled from the primary relief valve while under pressure. The primary relief valve shall be set to open at 1800, +0, -50 psi. If adjustment of primary relief valve is necessary, loosen jam-nut (42) and turn adjustment screw (41) in to increase pressure; back adjustment screw out to decrease pressure. Tighten jam-nut (42) against housing (36) and torque jam-nut from 100 to 150 lb. in. Recheck pressure adjustments.

5-17. INSTALLATION. (See figure 5-3.)

a. Install relief valves along with packings onto body assembly of power pack.

CAUTION

Ensure that relief valves are installed in their correct locations. See figure 5-3, View A-A for locations.

5-18. PRESSURE SWITCH. (See figure 5-4, sheet 1 of 2.)

5-19. DESCRIPTION. A pressure switch is located in the cover of the power pack. The switch opens the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open until pressure in the system drops to approximtely 1000 psi, at which time the pump will again operate to build up pressure to approximately 1500 psi, regardless of gear selector handle position. The pressure switch also activates the amber GEAR UP indicator light.

5-20. REMOVAL AND INSTALLATION. (Thru 172RG0356.) (See figure 5-4, sheet 1 of 2.)

a. Move left seat to full aft position and spread a drip cloth beneath the power pack.
b. Assure that master switch is OFF, and disconnect wires from pressure switch.
c. Disconnect pressure switch from power pack.
d. Reverse preceding steps for installation.

5-21. DISASSEMBLY. (See figure 5-4.)

a. Remove pin (11).
b. Unscrew cap and housing assembly (10) from fitting (2).
c. Remove spring (9).
d. Remove washers (8) from flange of stop (7).

NOTE

Chart in figure 5-4 lists washers by part number, thickness and effect on operating pressure (psi).

e. Unscrew guide (6) from fitting (2).

CAUTION

Do not damage lip of guide (6). Guide threads and threads of fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

f. Remove piston (4).
g. Remove seal (3) and packing (5).
h. Remove snubber (1) from fitting (2).

CAUTION

Threads of snubber (1) and fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

5-22. INSPECTION AND REPAIR. (See figure 5-4, sheet 1 of 2.)

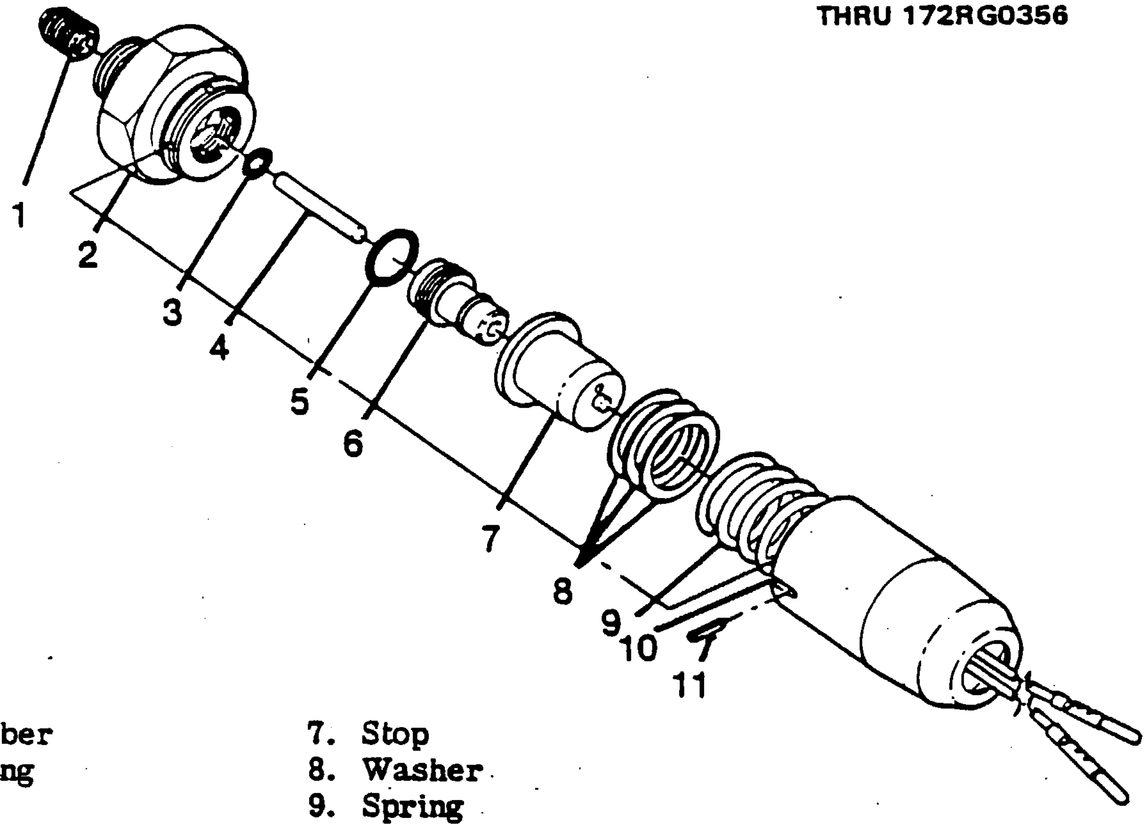
a. Clean sealant from threads of snubber (1), fitting (2) and guide (6) with wire brush.
b. Clean all parts with cleaning solvent (Federal Specification P-S-661, or equivalent) and dry thoroughly.
c. Discard seal (3) and packing (5), and replace with new parts.
d. Inspect all pressure switch parts for scratches, scores, chips, cracks and indications of wear.
e. All damaged parts shall be replaced with new parts.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in hydraulic systems. Carefulness and proper handling of parts to prevent damage must be observed at all times.

f. Snubber (1) can be cleaned with solvent, then blown out with high pressure compressed air.
g. Assure that .062-inch vent hole is open in stop (7).

THRU 172RG0356



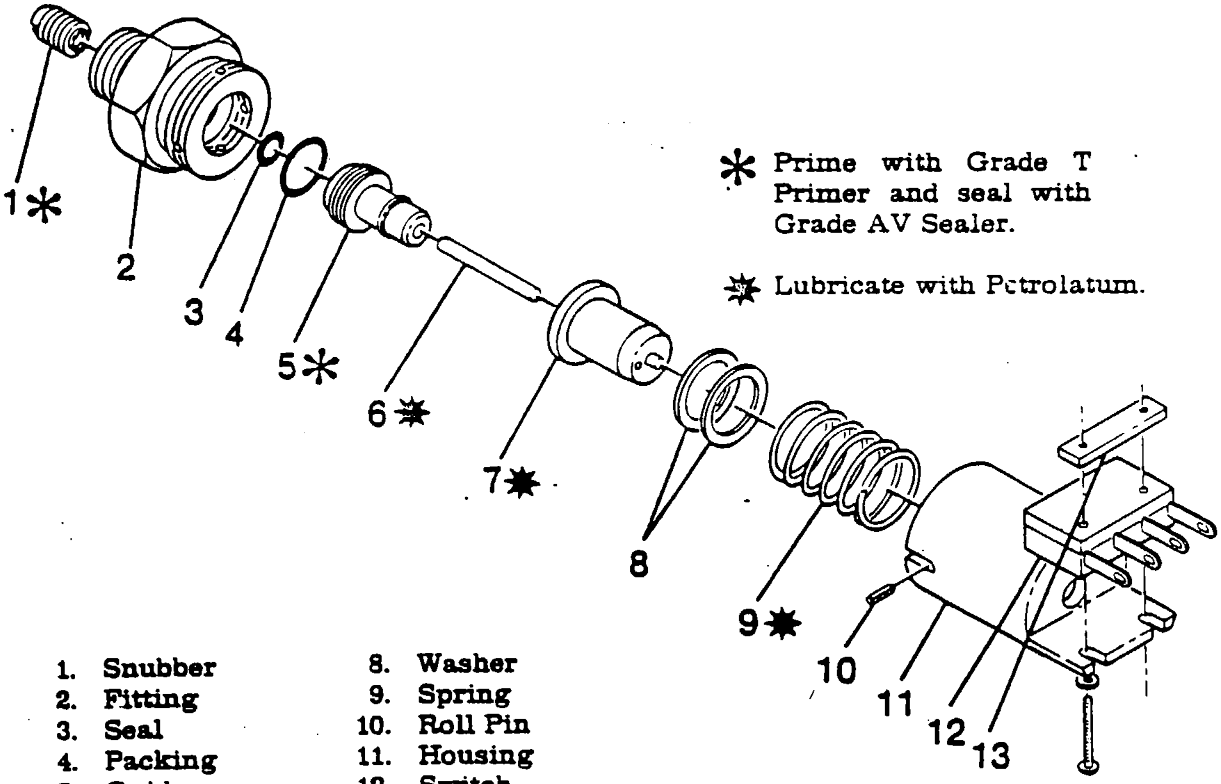
1. Snubber
2. Fitting
3. Seal
4. Needle Roller
5. Packing
6. Guide
7. Stop
8. Washer
9. Spring
10. Cap and Housing Assembly
11. Pin

WASHER APPLICABILITY

WASHER PART NO.	THICKNESS	MATERIAL	EFFECT IN PRESSURE (PSI)
S1358-7	.014	"MYLAR" POLYESTER FILM TYPE A	55
S1358-8	.005	"MYLAR" POLYESTER FILM TYPE A	20

Figure 5-4. Pressure Switch (Sheet 1 of 2)

BEGINNING WITH 172RG0357



✱ Prime with Grade T Primer and seal with Grade AV Sealer.

✸ Lubricate with Petrolatum.

1. **Snubber**
2. **Fitting**
3. **Seal**
4. **Packing**
5. **Guide**
6. **Needle Roller**
7. **Stop**
8. **Washer**
9. **Spring**
10. **Roll Pin**
11. **Housing**
12. **Switch**
13. **Plate**

WASHER APPLICABILITY
(Beginning with 1981 Models)

WASHER PART NO.	THICKNESS	MATERIAL	EFFECT IN PRESSURE (PSI)
S1358-7	.014-inch	"MYLAR" POLYESTER FILM TYPE A	55
S1358-8	.005-inch	"MYLAR" POLYESTER FILM TYPE A	20

Figure 5-4. Pressure Switch (Sheet 2 of 2)

5-23. REASSEMBLY. (See figure 5-4, sheet 1 of 2.)

a. Prime threads of snubber (1) and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of snubber (1). Install snubber into fitting and tighten with slotted screwdriver.

NOTE

Lubricate new seals and packing, guide (excluding threads), piston, stop and spring with Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted.

b. Install packing (5) in fitting (2).
c. Install packing (3) in guide (6).
inLubricate seal (3) with Petrolatum, and install in guide (5).
d. Prime threads of guide and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of guide (6). Install guide into fitting; and finger-tighten.

NOTE

It is possible to assemble, fill and test the pressure switch in the aircraft. This can be accomplished by the installation of a test gage in the capped port of the tee fitting on the right-hand side of the power pack, and pumping the emergency hand pump. Master switch must be OFF and selector handle must be in DOWN position.

e. After installing test fitting and assuring that sealant in fitting (2) is dry, screw fitting assembly into power pack body.
f. Pump emergency hand pump just enough for fluid to seep from top of guide (6). (Refer to Section 2 of this manual.)
g. Install piston (4) into hole in guide (6).
h. Install stop (7) over guide (6).
i. Install exact number and thickness of washers removed.
Lubricate and insert needle roller into hole in guide (5).

NOTE

If same number of washers (8) are installed as were removed, pressure should not require readjustment. If readjustment is necessary, a chart of washer part numbers, thickness and effect in pressure adjustment is shown in figure 5-4.

j. Install spring (9) over washers (8).
k. Screw cap and housing assembly on fitting (2).
l. check fluid level in power pack reservoir. Refer to Section 2 of this manual.

5-24. ADJUSTMENT. (See figure 5-4, sheet 1 of 2:)

a. Jack aircraft as outlined in Section 2 of this manual.
b. Screw cap and housing assembly on fitting (2), enough to bottom needle roller out in stop (7).
c. Turn cap and housing assembly back from full thread engagement one turn, plus 0, minus one-fourth turn to locate hole in fitting (2) in slot in skirt of cap and piston assembly.
d. Attach electrical connections to pressure switch and attach external power source.
e. Turn master switch ON.
f. Pump hand pump to obtain 1500 psi on test gage.
g. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi.
h. If switch opens electrical circuit prematurely, disassemble pressure switch down to washers (8) and add shims as necessary to obtain desired pressure; repeat steps (b) and (c).

NOTE

The chart in figure 5-4 lists washers by part number, thickness and the effect in psi each washer will have on switch operation.

i. If switch opens electrical circuit later than 1500 ±50 psi, disassemble pressure switch down to washers (8) and remove washers as necessary to obtain desired pressure; repeat steps (b) and (c). After final adjustment of pressure switch, secure cap and housing assembly (10) to fitting (2) with pin (11).
j. Turn master switch OFF.

5-25. REMOVAL AND INSTALLATION. (Beginning with 172RG0357.) (See figure 5-4, sheet 2.)

a. Move left seat to full aft position and spread a drip cloth beneath power pack.
b. Assure that master switch is OFF, and disconnect leads at terminals at pressure switch.
c. Remove pressure switch from power pack.
d. Reverse procedures for installation.

5-26. DISASSEMBLY. (See figure 5-4, sheet 2.)

a. Remove pin (10).
b. Unscrew housing (11) from fitting (2).
c. Remove spring (9).
d. Remove washers (8) from flange of stop (7).

NOTE

Chart in figure 5-4 lists washers by part number, thickness and effect on operating pressure (psi).

e. Unscrew guide (5) from fitting (2).

NOTE

Do not damage lip of guide (5). Guide threads and threads of fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

f. Remove needle roller (6).
g. Remove seal (3) and packing (4).
h. Remove snubber (1) from fitting (2).

CAUTION

Threads of snubber (1) and fitting (2) are primed with Loctite Grade T Primer and sealed with Loctite Grade AV Sealer.

5-27. INSPECTION AND REPAIR. (See figure 5-4, sheet 2.)

a. Clean sealant from threads of snubber (1), fitting (2) and guide (5) with wire brush.
b. Clean all parts with cleaning solvent (Federal Specification P-S-661, or equivalent and dry thoroughly.
c. Discard seal (3) and packing (4), and replace with new parts.
d. Inspect all pressure switch parts for scratches, scores, chips, cracks and indications of wear.
e. All damaged parts shall be replaced with new parts.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in hydraulic systems. Carefulness and proper handling of parts to prevent damage must be observed at all times.

f. Snubber (1) can be cleaned with solvent, then blown out with high pressure compressed air.
g. Assure that 0.062-inch vent hole is open in stop (7).

5-28. REASSEMBLY. (See figure 5-4, sheet 2.)

a. Prime threads of snubber (1) and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of snubber (1). Install snubber into fitting and tighten with slotted screwdriver.

NOTE

Lubricate seal (3) and packing (4) with Petrolatum during assembly.

b. Install packing (4) in fitting (2).
c. Lubricate seal (3) with Petrolatum, and install in guide (5).
d. Lubricate guide (5) with Petrolatum (excluding threads). Prime threads of guide and internal threads of fitting (2) with Loctite Grade T Primer and apply Loctite Grade AV Sealer to threads of guide (5). Install guide into fitting, and finger-tighten.

NOTE

It is possible to assemble, fill and test the pressure switch in the aircraft. This can be accomplished by the installation of a test gage in the capped port of the tee fitting on the right-hand side of the power pack, and pumping the emergency hand pump. Master switch must be OFF and selector handle must be in DOWN position.

e. After installing test fitting and assuring that sealant in fitting (2) is dry, screw fitting assembly into power pack body.
f. Pump emergency hand pump just enough for fluid to seep from top of guide (5). (Refer to Section 2 of this manual.)
g. Lubricate and insert needle roller into hole in guide (5).
h. Lubricate stop (7) with Petrolatum, and install over guide (6).
i. Install exact number and thickness of washers removed.

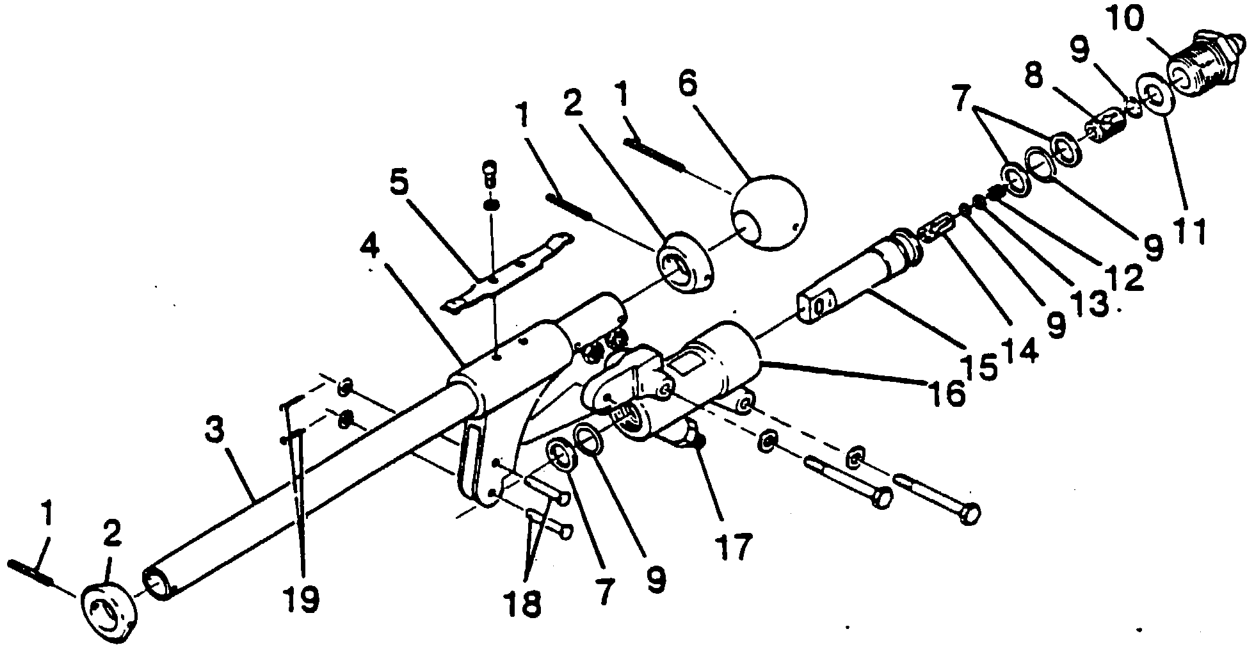
NOTE

If same number of washers (8) are installed as were removed, pressure should not require readjustment. If readjustment is necessary, a chart of washer part numbers, thickness and effect in pressure adjustment is shown in the figure.

j. Lubricate spring (9) with Petrolatum and install over washers (8).
k. Screw housing assembly on fitting (2).
l. Check fluid level in power pack reservoir. (Refer to Section 2 of this manual.)

5-29. **ADJUSTMENT. (Beginning with 172RG0357.) (See figure 5-4, sheet 2 of 2.)**

a. Jack aircraft as outlined in Section 2 of this manual.
b. Screw housing (11) on fitting (2), enough to bottom out against stop (7).
b'. Adjust switch (12) to bottom out plunger against stop (7).
c. Turn housing (11) back from full thread engagement one to one and one-fourth turn to locate hole in fitting (2) in slot in skirt of housing assembly.
d. Attach electrical connections to pressure switch and attach external power source.
e. Turn master switch ON.
f. Pump emergency hand pump to obtain 1500 ±50 psi.
g. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 ±50 psi.
h. If switch opens electrical circuit prematurely, disassemble pressure switch down to washers (8) and add washers as necessary to obtain desired pressure; repeat steps "b" and "c" only if switch (12) was loosened during this step.(but not b'.)
i. If switch opens electrical circuit later than 1500 ±50 psi, disassemble pressure switch down to washers (8) and remove washers as necessary to obtain desired pres-



1. Roll Pin
2. Stop
3. Handle
4. Fork
5. Spring
6. Knob
7. Back Up Ring
8. Check Valve
9. Packing
10. Fitting
11. Washer
12. Setscrew
13. Spacer
14. Kep-O-Seal Valve
15. Piston
16. Pump Body
17. Union and Packing
18. Latching Pins
19. Cotter pins

Figure 5-5. Emergency Hand Pump Disassembly

sure; repeat steps "b" and "c" only if switch was loosened with this step.

j. After final pressure adjustment, install pin (10) in slot of housing.
k. Turn master switch OFF.

5-30. EMERGENCY HAND PUMP. (See figure 5-5.)

5-31. DESCRIPTION. The emergency hand pump is mounted below the floor between the pilot and copilot seats. The pump handle extends into the cabin and is enclosed by a hinged cover. The pump supplies a flow of pressurized hydraulic fluid to extend the landing gear in the event of normal hydraulic pump failure.

5-32. REMOVAL AND INSTALLATION. (See figure 5-5.)

a. Remove seats as required for access.
b. Remove screws attaching cover over hand pump; remove cover.
c. Peel back carpet as required for access to pump mounting bolts.
d. Wedge cloth under hydraulic fittings to absorb fluid, then disconnect the two hydraulic lines and plug or cap open fittings to prevent entry of foreign material.
e. Remove two bolts, washers and nuts securing pump to mounting bracket.
f. Work pump from aircraft.

g. Install hand pump by reversing preceding steps, ensuring seat stops are installed after seats are installed, bleeding lines and pump as lines are connected.
h. Fill reservoir as required.

5-33. DISASSEMBLY. (See figure 5-5.)

NOTE

After emergency hand pump has been removed from aircraft and ports are capped or plugged, spray with cleaning solvent (Federal Specification P-S-611, or equivalent) to remove all accumulated dust or dirt. Dry with filtered compressed air.

a. Remove handle (3) by removing pivot and latching pins (18) after removing cotter pins (19).
b. Remove fitting (10) from pump body assembly (16).
c. Push piston (15) from body assembly.
d. Remove retaining washer (11) from pump body to remove valve assemblies.
e. Remove and discard all O-rings and back up rings.

5-34. INSPECTION AND REPAIR. (See figure 5-5.)

a. Inspect seating surfaces of valves.
b. Inspect piston for scores, burrs or scratches which could cut O-rings. This is a major cause of external and internal leakage. The piston may be polished with extremely fine emery paper. Never use paper coarser than No. 600 to remove scratches or burrs. If defects do not polish out, replace piston.

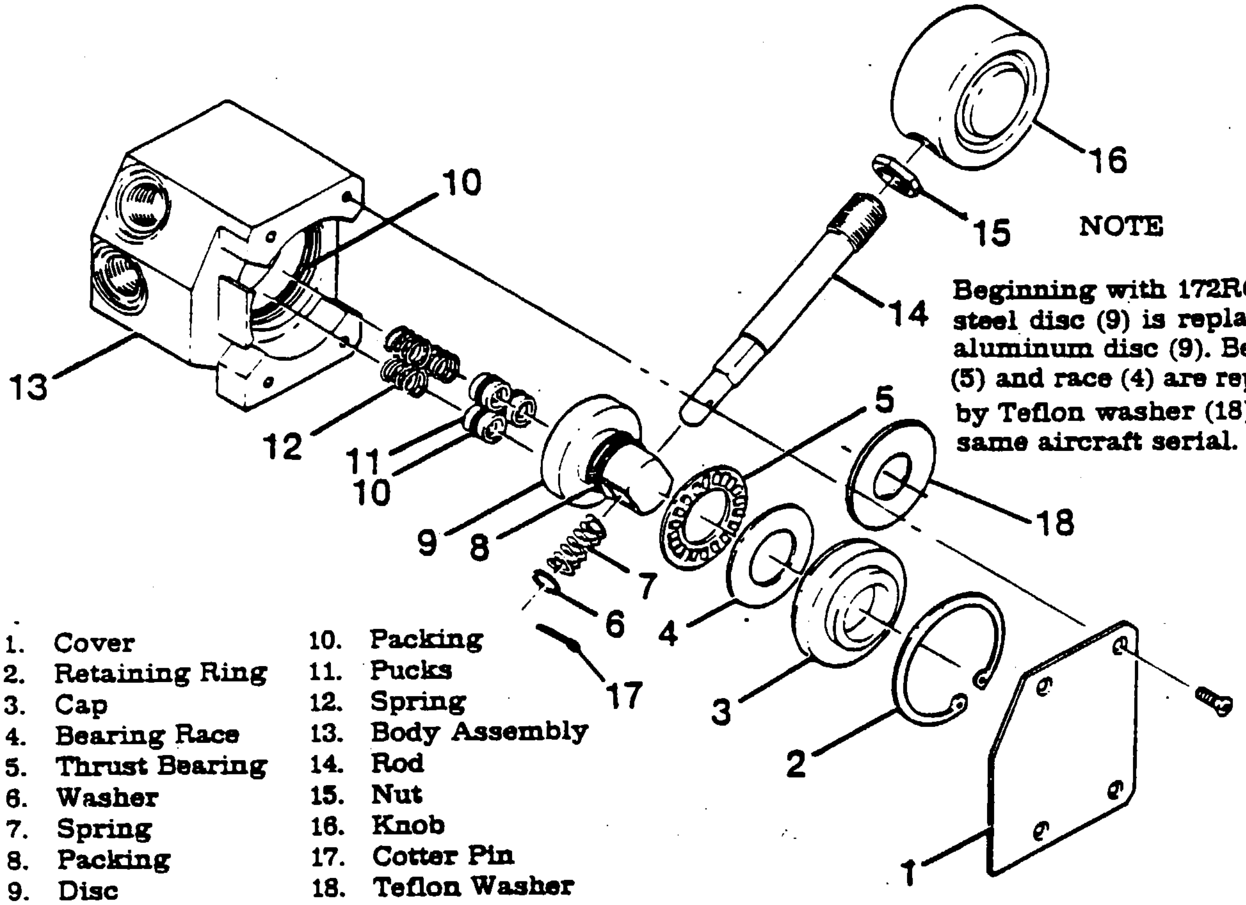
NOTE

Use new packings during reassembly. Assemble parts, lubricated with a film of Petrolatum VV-P-236, hydraulic fluic MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted.

5-35. REASSEMBLY. (See figure 5-5.) Assemble the emergency hand pump, using the figure as a guide. Also, for detailed instructions, reverse the procedures outlined in paragraph 5-32. During assembly, prime parts with Primer T. Fill first three threads of fitting (10) with Loctite Hydraulic Sealant. Install fitting in pump body (16), and allow parts to set up for one hour at 72°F. Pump should be held vertically, with fitting (10) at top during setting up of sealant.

5-36. LANDING GEAR SELECTOR VALVE. (See figure 5-6.)

5-37. DESCRIPTION. A mechanical gear position selector valve is located in the switch panel. The pilot shuttles the valve mechanically when he changes gear handle position. The handle must be pulled out prior to selecting gear position. Moving the selector rod opens and closes ports in the valve, enabling fluid under pressure to flow to the various system components to retract or extend the landing gear.



NOTE

Beginning with 172RG0214, steel disc (9) is replaced by aluminum disc (9). Bearing (5) and race (4) are replaced by Teflon washer (18) at the same aircraft serial.

1. Cover
2. Retaining Ring
3. Cap
4. Bearing Race
5. Thrust Bearing
6. Washer
7. Spring
8. Packing
9. Disc
10. Packing
11. Pucks
12. Spring
13. Body Assembly
14. Rod
15. Nut
16. Knob
17. Cotter Pin
18. Teflon Washer

Figure 5-6. Landing Gear Selector Valve

5-38. REMOVAL AND INSTALLATION. (See figure 5-6.)

a. Loosen nut (15) and remove knob (16).

CAUTION

As hydraulic lines are disconnected, fluid will leak. Precautions must be taken to prevent excessive leakage, such as spreading drip cloths under fittings and capping lines and fittings.

b. Disconnect hydraulic lines routed to valve.
c. Remove screws attaching valve to instrument panel.
d. Remove selector valve.
e. Reverse preceding steps to install gear selector valve.

5-39. DISASSEMBLY AND REASSEMBLY. (See figure 5-6.)

a. Remove cover (1), retaining ring (2), cap (3), race (4) and bearing (5).
b. Remove cotter pin (17), washer (6) and spring (7).
c. Pull rod (14) from disc (9); remove disc.
d. Remove pucks (11) and springs (12).
e. Reverse preceding steps for reassembly.

5-40. INSPECTION AND REPAIR. (See figure 5-6.) Replace packings (8) and (10). Check valve for wear, foreign or abrasive materials. Disc (9) may be refaced (lapped) if worn. Check rollers in bearings (5).

5-41. RIGGING THROTTLE-OPERATED GEAR WARNING HORN MICROSWITCH. (See figure 5-7.)

a. Jack aircraft in accordance with procedures outlined in Section 2.
b. Remove upper left engine cowl.
c. Turn master switch ON and retract landing gear; turn master switch OFF.
d. Close throttle control at panel (PULL FULL OUT.)

NOTE

Assure that throttle friction locknut is snug but still will allow throttle to move.

e. Mark throttle (9) 0.40-inch aft of friction locknut (8).
f. At engine, loosen screws attaching switch (3) to bracket (4). Raise switch to approximate middle of slots in bracket; tighten screws.
g. Loosen nut attaching cam (12). Rotate cam to cause switch to actuate just as switch roller breaks over peak of cam. Tighten cam-attach nut.
h. Open throttle (PUSH FULL IN) and turn master switch ON.
i. Pull throttle OUT to mark; gear warning horn should sound.
j. Readjust if necessary.
k. Extend landing gear, turn master switch OFF and lower aircraft; install engine cowling.
l. Test fly aircraft. At approximately 2500 feet pressure altitude, close throttle to mark on control. Warning horn should sound and manifold pressure gage should indicate 11.5 to 12.5 inches of mercury.

NOTE

If manifold pressure gage does not indicate 11.5 to 12.5 inches of mercury at mark on throttle control (9), erase mark and mark correctly upon closing throttle at 11.5 to 12.5 inches of mercury in flight. Upon landing, readjust microswitch in bracket slots or rotate cam as necessary to cause switch to actuate as roller breaks over peak of cam.

m. Test fly aircraft and recheck adjustment.

5-42. RIGGING FLAP-OPERATED GEAR WARNING SYSTEM.

NOTE

Throttle-operated gear warning system, flap control system and flap follow-up system must be rigged in accordance with procedures outlined in Sections 5 and 7 of this manual before rigging of flap warning system can be accomplished.

a. Remove headliner as necessary to gain access to flap warning switch, located in cabin ceiling area, directly aft of right-hand rear doorpost.

LOOKING INBOARD AND FORWARD
FROM LEFT SIDE OF FIREWALL

1. Jumper
2. Insulator
3. Switch and Actuator
4. Bracket
5. Plate Assembly
6. Carburetor
7. Panel
8. Friction Lock Nut
9. Throttle Control
10. Knob
11. Throttle Lever Arm
12. Cam
13. Spacer
14. Rod End
15. Washer

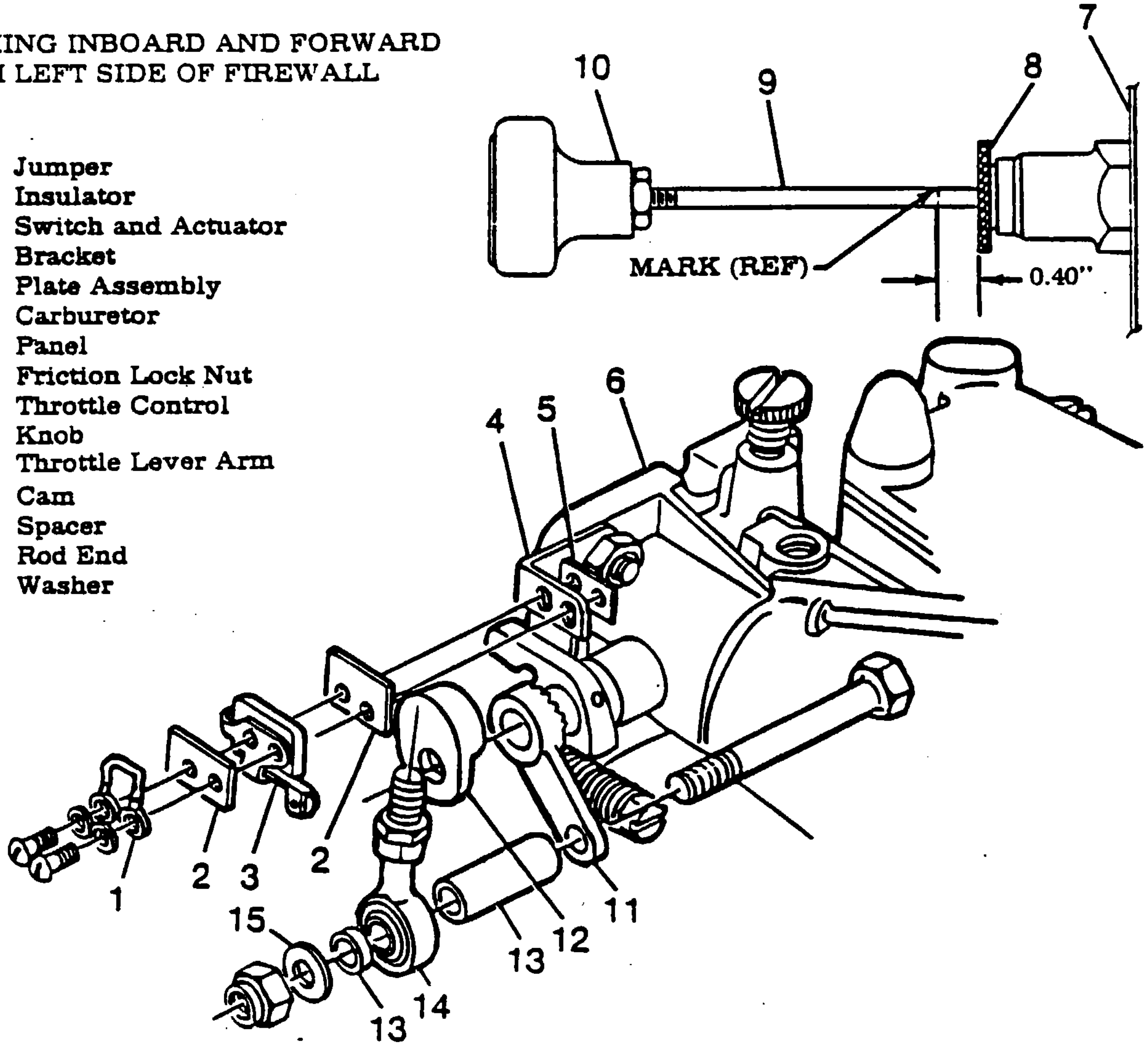


Figure 5-7. Rigging Throttle-Operated Gear Warning Horn Microswitch

b. Loosen screws attaching gear warning microswitch in slots of mounting bracket.
c. Mount an inclinometer on one flap and set to 0° (flaps full UP). Turn master switch ON and move flap selector lever to obtain 23° flap deflection.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division.

d. Rotate microswitch in slots of mounting bracket until switch contacts are just closed, and tighten switch mounting screws.
e. Move flap selector lever to 0° position (flaps full UP).
f. Move flap lever to 30° position and horn should not sound. Move flap selector handle back to 0° position.
g. With throttle full FORWARD, push landing gear DOWN press-to-test button, and

move flap selector handle to 30° position: horn should sound as flaps extend past 23°. Move flap selector handle back to 20° position, and horn should not sound.

h. Readjust switch as necessary to cause horn to sound when flaps reach 23° position when press-to-test button is pushed.
i. Turn master switch OFF, remove inclinometer, and reinstall headliner.

5-43. MAIN LANDING GEAR AND COMPONENTS. (See figure 5-8.)

5-44. MAIN LANDING GEAR. (See figure 5-8.)

5-45. DESCRIPTION. The tubular main gear struts rotate aft and inboard to stow the main wheels beneath the baggage compartment. The main gear utilizes hydraulic pressure for positive uplock, and mechanical downlocks. Main gear uplock pressure is maintained automatically by the pump assembly. Rotation of the gear to extend or retract the struts is achieved through pivot assemblies, which are in turn bolted through a splined shaft, to the hydraulic rotary actuators.

CAUTION

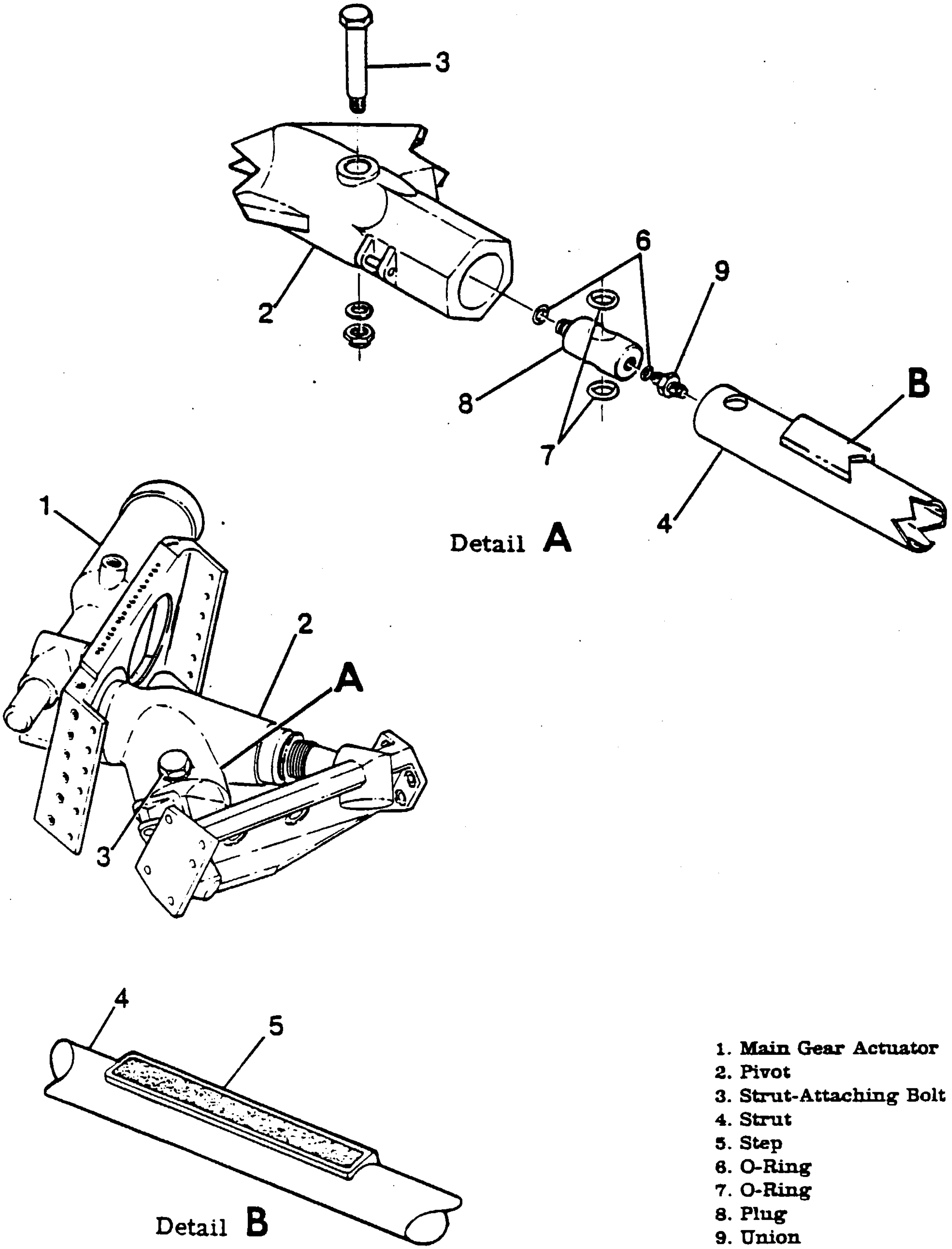
Use of recapped tires or new tires not listed on the aircraft equipment list are not recommended due to possible interference between the tire and structure when landing gear is in the retracted position.

5-46. TROUBLE SHOOTING -- MAIN LANDING GEAR.

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to correct pressure.
	Sprung main gear strut.	Remove and replace strut.
	Bent axle.	Install new axle.
UNEVEN OR EXCESSIVE TIRE WEAR.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align wheels.
	Wheels out of balance.	Balance wheels.
	Sprung main gear strut.	Replace strut.
	Bent axle.	Replace axle.
	Dragging brakes.	Jack wheel and check brake.
	Wheel bearings not adjusted properly.	Tighten axle nut properly.

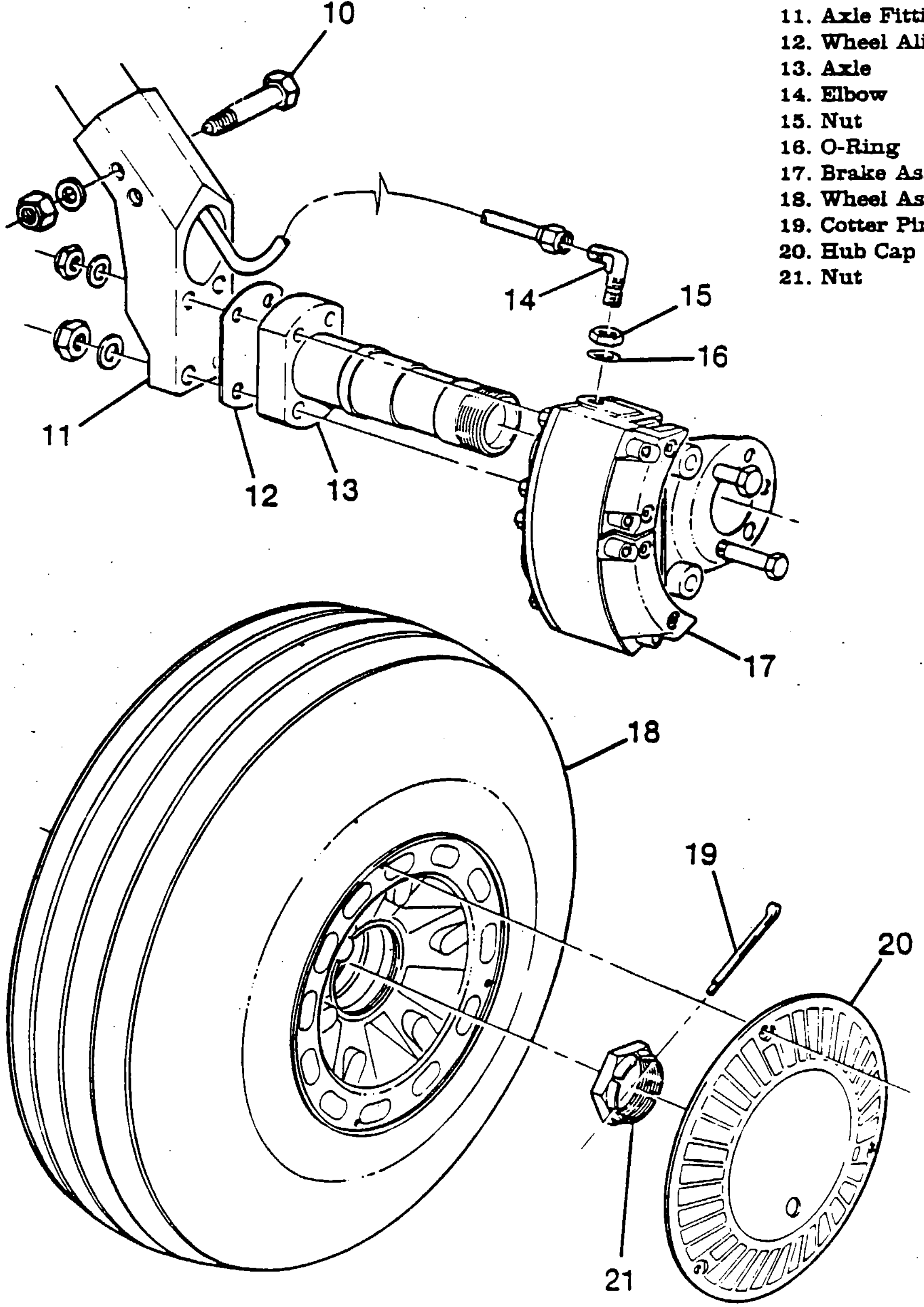
5-47. MAIN GEAR STRUT REMOVAL. (See figure 5-8.)

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Bleed fluid from brake line at wheel brake cylinder.
c. Turn master switch OFF; move gear position selector valve handle to UP position.



1. Main Gear Actuator
2. Pivot
3. Strut-Attaching Bolt
4. Strut
5. Step
6. O-Ring
7. O-Ring
8. Plug
9. Union

Figure 5-8. Main Landing Gear (Sheet 1 of 2)



10. Bolt
11. Axle Fitting
12. Wheel Alignment Shim
13. Axle
14. Elbow
15. Nut
16. O-Ring
17. Brake Assembly
18. Wheel Assembly
19. Cotter Pin
20. Hub Cap
21. Nut

Figure 5-8. Main Landing Gear (Sheet 2 of 2)

Then, turn master switch ON until main gear downlocks disengage. Turn master switch OFF and pull pump motor circuit breaker to ensure that pump cannot be actuated accidentally. Place gear selector handle in a neutral position so that gear rotates freely.

NOTE

If the pump motor cannot be used to unlock the main gear because of an opening in the hydraulic system, the spring-loaded main gear downlocks can be manually unlocked by pushing them forward with a screwdriver or other similar tool, and holding them forward until the main gear is rotated past.

WARNING

It is advisable to have an assistant hold the gear strut up while the locks are pushed forward to prevent the strut from rotating suddenly, possibly causing personal injury. Ensure that master switch is OFF, and gear pump circuit breaker is pulled.

d. Remove strut-attach bolt (3), and work strut (4) and plug (8) from pivot (2).
e. Disconnect brake line from union (9) and cap plug union and brake line.
f. Remove O-rings (6) and (7) from plug (8), and clean plug (8) and strut (4).

5-48 MAIN GEAR STRUT INSTALLATION. (See figure 5-8.)

a. Lubricate new O-rings (6) and (7), plug (8) and end of strut (4) with Petrolatum VV-P-236, hydraulic fluid MIL-L-5606, or Corning DC-7 (keep DC-7 away from areas to be painted) before installation. Install O-rings (6) and (7) on plug (8).
b. Remove cap and plug from union (9) and brake line, attach brake line to union and work plug (8) and strut (4) into pivot (2).

NOTE

When installing a new pivot (2), burnishing the 2.100" I.D. bore may be required to facilitate assembly of the landing gear strut (4).

c. Align hole in plug (8) and holes in pivot (2) using special tool No. SE 934.

NOTE

Special tool No. SE 934 is available from the Cessna Supply Division. This tool is designed to install the strut attaching bolt (3) without damaging the O-rings (7).

d. Install the strut attaching bolt (3) by pushing the SE 934 tool through the aligned holes of the pivot (2), strut (4) and plug (8) with the threaded end of the strut-attaching bolt (3). Install washer and nut and tighten nut on the strut-attaching bolt.
e. Fill and bleed brake system in accordance with paragraph 5-159 of this section.
f. Rig landing gear in accordance with paragraph 5-49 of this section.

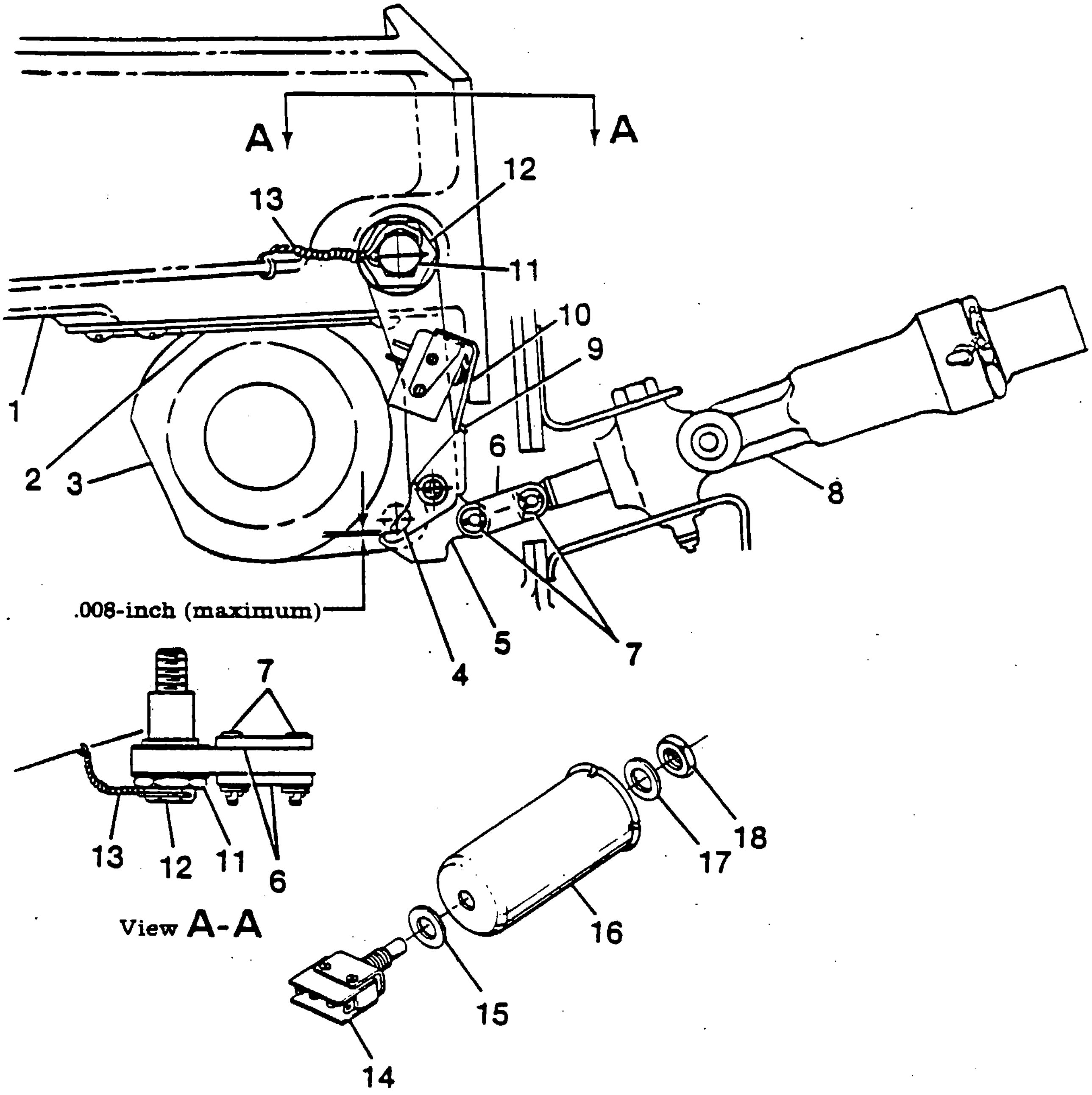
5-49 RIGGING. (See figure 5-9.)

a. Jack aircraft in accordance with procedures outlined in Section 2.
b. Place gear position selector handle in DOWN position and push GEAR PUMP circuit breaker in. Turn master switch ON and allow gear to rotate to full DOWN position.

WARNING

Turn master switch OFF and pull GEAR PUMP circuit breaker to prevent accidental extension or retraction of landing gear whenever work is being performed in the wheel well or pivot area.

c. Check clearance between downlock hook (5) and pivot lock pin (4). Clearance must not exceed .008-inch.
d. If adjustment of hook (5) is necessary, move seats to forward position, remove rear seats, and peel back carpet as necessary to uncover access panels above main gear pivot assemblies.



1. Outboard Support
2. Support Pad
3. Main Gear Pivot
4. Pivot Lock Pin
5. Downlock Hook
6. Link
7. Pin
8. Downlock Actuator
9. Switch Actuator
10. Down Limit Switch
11. Eccentric Bushing
12. Hook Pivot Bolt
13. Safety Wire
14. Switch
15. Washer
16. Main Gear Actuator End Cap
17. Washer
18. Nut

Figure 5-9. Main Landing Gear Rigging

e. Working through access opening, remove safety wire (13).
f. Loosen hook pivot bolt (12), and turn eccentric bushing (11) until clearance is within tolerance; tighten bolt (12).
g. Unlock gear and insert a .025-inch shim (Special tool number SE997-1 or -2) between main gear pivot and support pad (2). Return gear to full DOWN position. Downlock hooks (5) shall not engage, and down limit switch (10) shall be open.
h. Unlock gear and remove special tool.
i. Place gear position selector handle in DOWN position, reset GEAR PUMP circuit breaker, turn master switch ON, and allow gear to rotate to full DOWN position, leaving master switch ON.
j. With gear in DOWN and locked position with no shim, light should be ON and hook shall engage pivot pin freely.

NOTE

No switch adjustment is necessary.

k. Pull GEAR PUMP circuit breaker, turn master switch OFF, and install safety wire (13).
l. Reset GEAR PUMP circuit breaker, place gear position selector handle in UP position, turn master switch ON, and allow gear to fully retract; pull GEAR PUMP circuit breaker and turn master switch OFF. Check tire clearance in wells.
m. Beginning with 1982 Models, check up indicator switches for actuation when main gear reaches one-inch from being full retracted.
n. To adjust up indicator switches, remove end caps (16) from main gear actuators and remove washers (15) as necessary to cause switches (35) to actuate earlier. Add washers (15) to cause switches (35) to actuate later; replace end caps (16).
o. Reset GEAR PUMP circuit breaker, place gear position selector handle in DOWN position, turn master switch ON and check gear extension time to be less than six seconds.
p. Place gear position selector handle in UP position and check gear retraction time to be less than eight seconds.
q. Operate landing gear through five fault-free cycles.
r. Place gear position selector handle in DOWN position and allow gear to fully extend and lock. Pull GEAR PUMP circuit breaker and turn master switch OFF.
s. Replace panels, carpeting and items removed for access. Move seats to original position, and install rear seats, ensuring that all seat stops are installed properly.
t. Remove aircraft from jacks.

5-50. MAIN WHEEL AND TIRE ASSEMBLY. (See figure 5-10.)

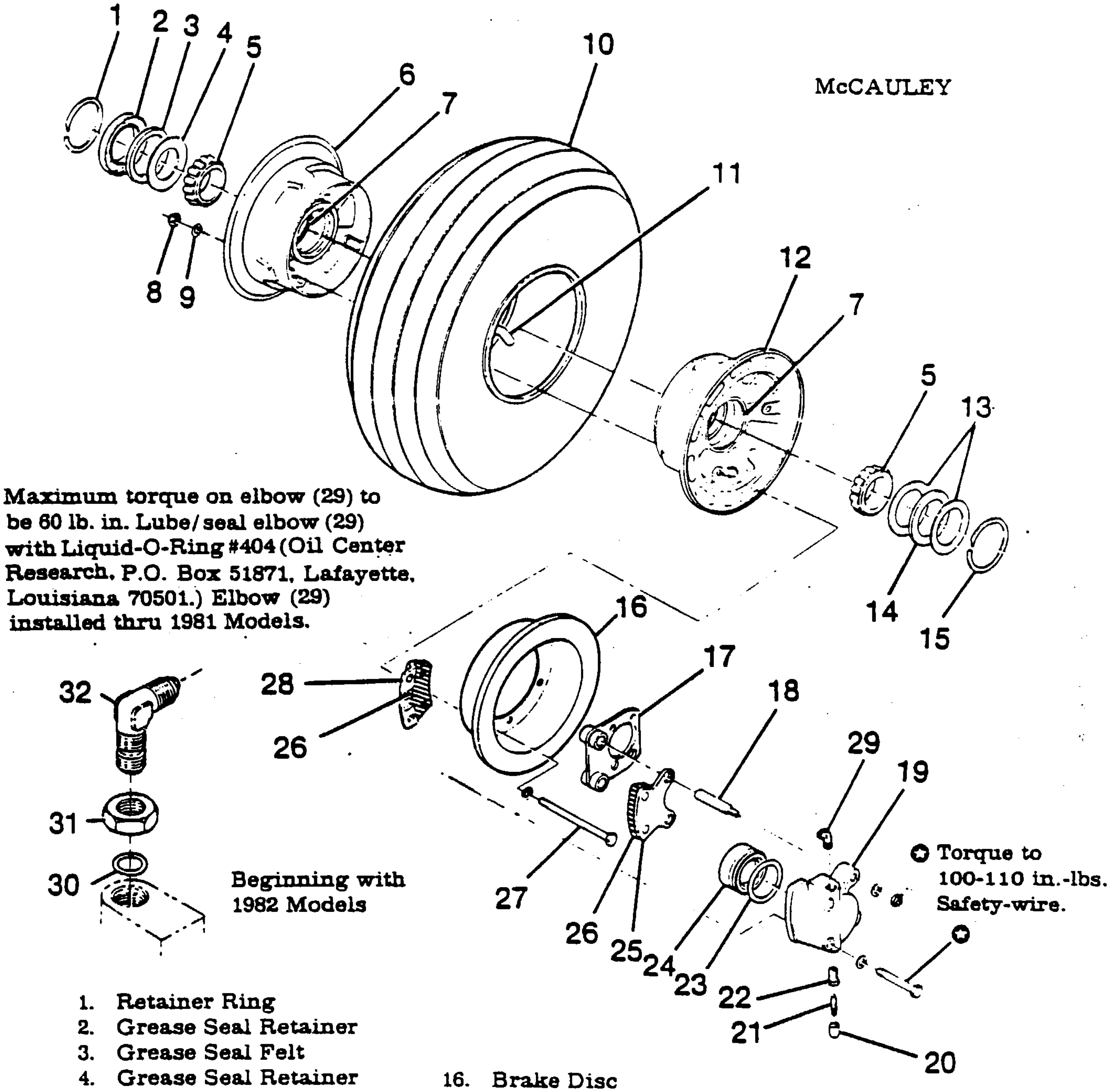
5-51. DESCRIPTION. The aircraft is equipped with two-piece McCauley wheel and tire assemblies or Cleveland wheel and tire assemblies.

5-52. REMOVAL. (See figure 5-10.)

NOTE

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

a. Using an individual jack pad, jack the wheel as outlined in Section 2 of this manual..
b. Remove hub cap.



McCAULEY

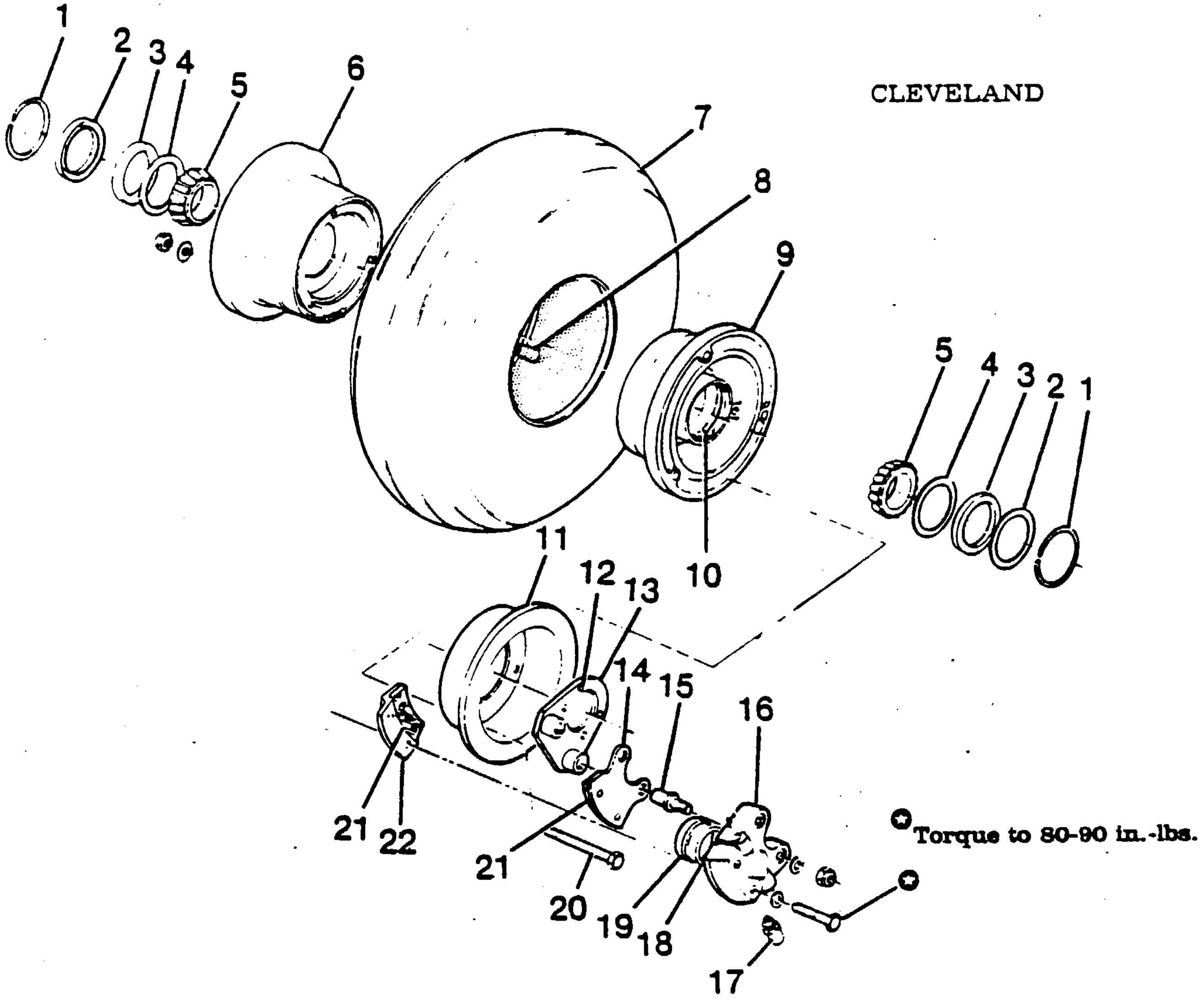
Maximum torque on elbow (29) to be 60 lb. in. Lube/seal elbow (29) with Liquid-O-Ring #404 (Oil Center Research, P.O. Box 51871, Lafayette, Louisiana 70501.) Elbow (29) installed thru 1981 Models.

Beginning with 1982 Models

✪ Torque to 100-110 in.-lbs. Safety-wire.

1. Retainer Ring
2. Grease Seal Retainer
3. Grease Seal Felt
4. Grease Seal Retainer
5. Bearing Cone
6. Wheel Half
7. Bearing Cup
8. Nut
9. Washer
10. Tire
11. Tube
12. Wheel Half
13. Grease Seal Retainer
14. Grease Seal Felt
15. Retainer Ring
16. Brake Disc
17. Torque Plate
18. Anchor Bolt
19. Brake Cylinder
20. Cap
21. Bleeder Fitting
22. Bleeder Fitting
23. O-Ring
24. Piston
25. Pressure Plate
26. Lining
27. Bolt
28. Back Plate
29. Elbow
30. O-Ring
31. Nut
32. Elbow

Figure 5-10. Main Wheel and Brake (Sheet 1 of 2)



CLEVELAND

✪Torque to 80-90 in.-lbs.

1. Snap Ring
2. Grease Seal Ring
3. Grease Seal Felt
4. Grease Seal Ring
5. Bearing Cone
6. Outer Wheel Half
7. Tire
8. Tube
9. Inner Wheel Half
10. Bearing Cup
11. Brake Disc
12. Bushing
13. Torque Plate
14. Pressure Plate
15. Anchor Bolt
16. Brake Cylinder
17. Brake Bleeder
18. O-Ring
19. Piston
20. Thru-Bolt
21. Brake Lining
22. Back Plate

Figure 5-10. Main Wheel and Brake (Sheet 2 of 2)

c. Remove cotter pin and axle nut.
d. Remove bolts and washers attaching back plate to brake assembly, and remove back plate.
e. Pull wheel assembly from axle.

5-53. DISASSEMBLY. (McCauley) (See figure 5-10.)

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

WARNING

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

b. Remove nuts (8) and washers (9).
c. Remove thru-bolts (27) and washers.
d. Separate and remove wheel halves (6) from tire and tube.
e. Remove retaining rings (1), grease seal retainers (2), grease seal felts (3), grease seal retainers (4) and bearing cones (5) from both wheel halves (6).

WARNING

Bearing cups (races) (7) are a press fit in the wheel halves (6), 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 121°C (250°F). Using an arbor press, if available, press out bearing cup and press in new bearing cup while wheel half is still hot.

5-54. INSPECTION AND REPAIR. (McCauley) (See figure 5-10.)

a. Clean all metal parts and grease seal felts in Stoddard solvent or equivalent and dry thoroughly.

NOTE

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

b. Inspect wheel halves (6) for cracks or damage.
c. Inspect bearing cones (5), cups (7), retaining rings (1), grease seal retainers (2), grease seal felts (3) and grease seal retainers (4) for wear or damage.
d. Inspect thru-bolts (27) and nuts (8) for cracks in threads or cracks in radius under bolt heads.
e. Replace cracked or damaged wheel halves (6).
f. Replace damaged retainer rings (1) and seals (2), (3) and (4).
g. Replace worn or damaged bearing cups (7) and cones (5).
h. Replace any worn or cracked thru-bolts (27) or nuts (8).
i. Remove any corrosion or small nicks.
j. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.
k. Pack bearings with grease specified in Section 2 of this manual.
l. Inspect brakes per paragraph 5-154.

5-55. REASSEMBLY. (McCauley) (See figure 5-10.)

a. Assemble bearing cone (5), grease seal retainer (4), grease seal felt (3), grease seal retainer (2) and retaining ring (1) into each wheel half (6).

b. Insert tube in tire, aligning index marks on tire and tube.
c. Place wheel half (6) into tire and tube (side opposite valve stem), aligning base of valve stem in valve slot. With washer under head of thru-bolt (27), insert bolt through wheel half (6).
d. Place wheel half (6) into other side of tire and tube, aligning valve stem in valve slot.
e. Insert washers (9) and nuts (8) on thru-bolts (27) and pretorque to 10-15 lb-in.

CAUTION

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

f. Prior to torquing nuts (8), inflate tube with 10-15 psi. air pressure to seal tire (10).

CAUTION

Do not use impact wrenches on thru bolts or nuts.

g. Dry torque all nuts (8) to a torque value of 140-150 lb-in.
h. Inflate to correct pressure specified in figure 1-1 of this manual.

5-56. DISASSEMBLY. (Cleveland) (See figure 5-10.)

a. Deflate tire and tube and break tire beads loose at wheel flanges.

CAUTION

Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick may cause wheel failure.

b. Remove thru bolts (20) and separate wheel halves (6) and (9), removing tire (7), tube (8) and brake disc (11).
c. Remove snap rings (1), grease seal rings (2) and (4), felts (3) and bearing cones (5) from wheel halves (6) and (9).

NOTE

Bearing cups are a press fit in the wheel halves and should not be removed unless new bearing cups are to be installed. To remove the bearing cup, heat wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out the bearing cup and press in new cup while wheel is still hot.

5-57. INSPECTION AND REPAIR. (Cleveland) (See figure 5-10.)

a. Clean all metal parts and grease seal felts in cleaning solvent and dry thoroughly.
b. Install wheel halves for cracks. Cracked wheel halves must be rejected and new parts installed. Sand out nicks, gouges and corroded areas. When the protective coating has been removed, the area should be thoroughly cleaned, primed with zinc chromate and painted with aluminum lacquer.
c. Inspect brakes per paragraph 5-154.
d. Bearing cups and cones must be inspected carefully for damage and discoloration. After cleaning, pack bearing cone with clean aircraft wheel bearing grease before installation in the wheel half.

5-58. REASSEMBLY. (Cleveland) (See figure 5-10.)

a. Insert thru-bolts (20) through brake disc (11), and position brake disc in the inner wheel half (9), using thru-bolts to guide disc. Assure that disc is seated in wheel half.
b. Insert tube (8) in tire (7), aligning index marks on tire and tube.
c. Position tire and tube with inflation valve through hole in outboard wheel half (6). Place inner wheel half (9) in position with thru-bolts (20) in outboard wheel half (6). Apply light force to bring wheel halves together, and assemble a washer and nut on thru-bolts. Tighten thru-bolt nuts evenly to a torque value of 90 lb-in.

5-59. BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The lightweight 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 Supply Division.

5-60. INSTALLATION. (See figure 5-8.)

a. Place wheel assembly on axle.
b. Install axle nut and tighten axle nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.
c. Place brake back plate in position and secure with bolts and washers.
d. Install hub cap.
e. Remove jack and jack pad.

5-61. ALIGNMENT. Correct main wheel alignment is obtained through the use of tapered shims between the gear strut fitting and the flange of the axle. See figure 5-11 for procedures to be used in checking wheel alignment. Wheel shims and the corrections imposed on the wheel by various shims are listed in the illustration.

NOTE

Failure to obtain acceptable wheel alignment through the use of the shims, indicates a deformed main gear strut or a bent axle.

5-62. MAIN WHEEL AND AXLE. (See figure 5-8.)

5-63. REMOVAL. (See figure 5-8.)

a. Using an individual jack pad, jack the wheel in accordance with procedures outlined in Section 2 of this manual.
b. Remove wheel assembly in accordance with procedures outlines in paragraph 5-52.
c. Disconnect and drain brake line at brake assembly. Cap or plug open fittings to prevent entry of foreign material.
d. Disconnect brake line from fitting in brake line and attach bracket.
e. Remove nuts, washers and bolts securing axle, brake torque plate, brake line bracket and wheel alignment shims.

REFER TO FIGURE 1-1 FOR TOE-IN AND CAMBER VALUES

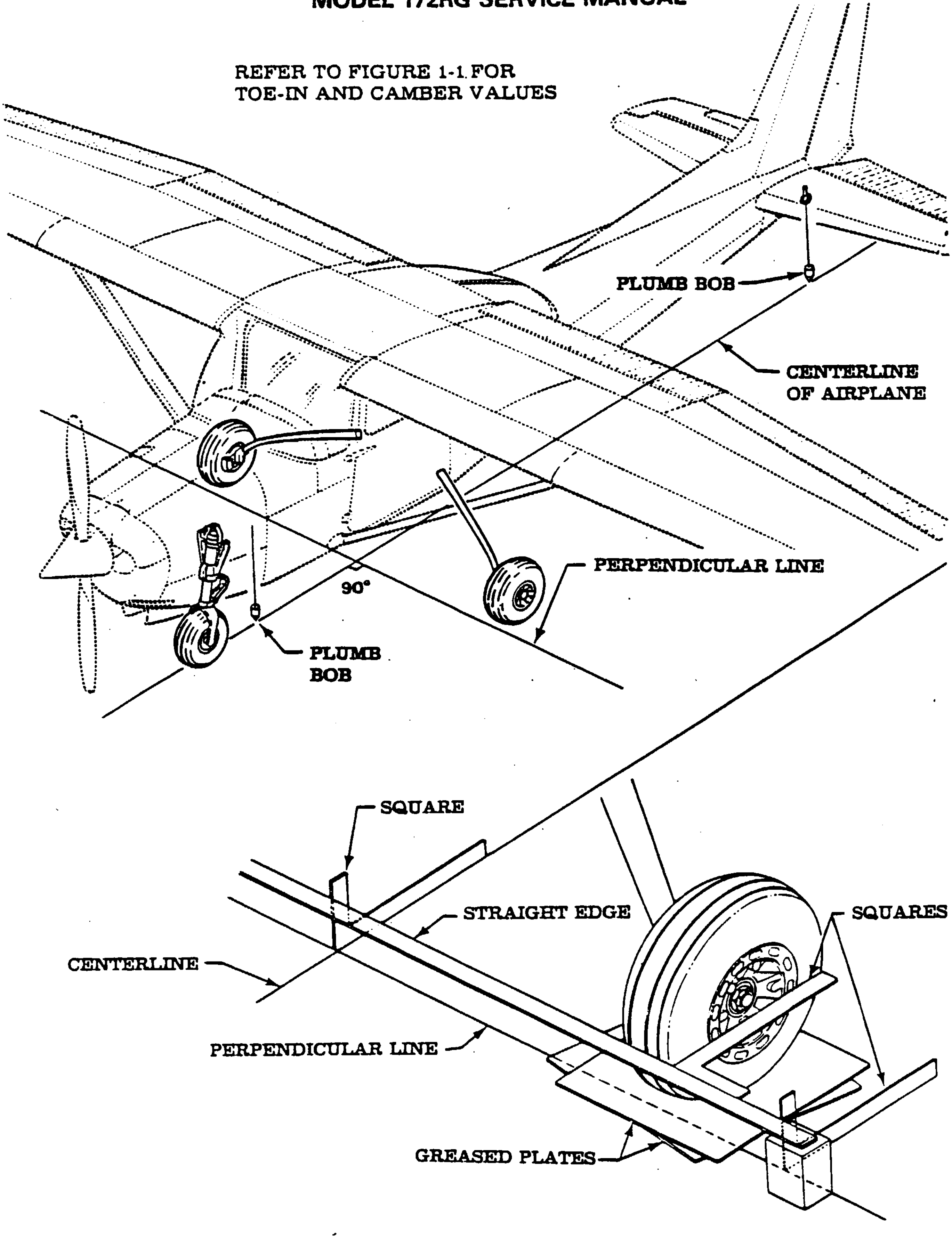
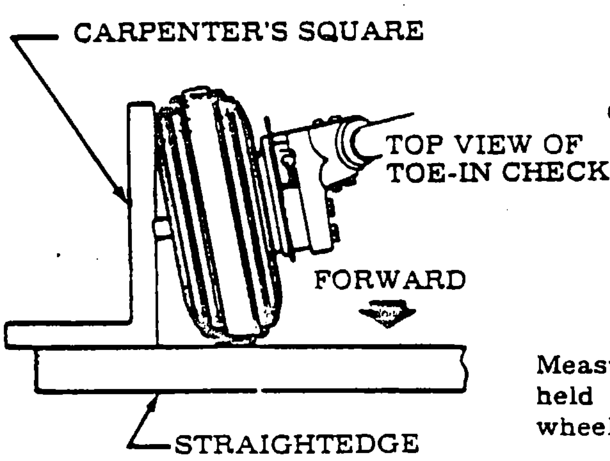
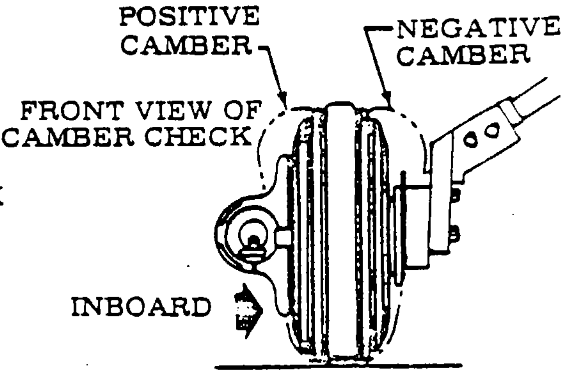


Figure 5-11. Main Wheel Alignment (Sheet 1 of 3)

Measure toe-in at edges of wheel flange. Difference in measurements is toe-in for one wheel.





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

NOTE

Setting to-in and camber within these tolerances while the cabin and fuel bays are empty will give approximately zero toe-in and zero camber at gross weight. Ideal setting is zero toe-in and zero camber at normal operating weight. Therefore, if normally operated at less than gross weight and abnormal tire wear occurs, realign the wheels to attain the ideal setting for the load conditions under which the aircraft normally operates. Refer to the following page for shims available and their usage. Always use the least number of shims possible to obtain the desired result.

	0541157-1	0541157-2	0541147-3	1241061-1	0441139-5	0441139-6
0541157-1	2	2	2	0	2	1
0541157-2	2	2	2	0	2	1
0541147-3	2	2	1	0	1	0
1241061-1	0	0	0	0	0	0
0441139-5	2	2	1	0	1	0
0441139-6	1	1	0	0	0	0
SHIM NO.	Max. number of shims to be used with shims in column 1.					
COLUMN 1	COLUMN 2					

REQD BOLT	SHIM THICKNESS AT BOLT
TOP AN5-26A	LESS THAN .125
AN5-27A	GREATER THAN .125
BOTTOM AN6-21A	LESS THAN .125
AN6-22A	GREATER THAN .125

Figure 5-11. Main Wheel Alignment (Sheet 2 of 3)

SHIM CHART

SHIM PART NO.	POSITION OF THICKEST CORNER OR EDGE OF SHIM	CORRECTION IMPOSED ON WHEEL			
		TOE-IN	TOE-OUT	POSITIVE CAMBER	NEGATIVE CAMBER
0541157-1	AFT	.064	----	----	----
	FWD	----	.064	----	----
0541157-2	UP	----	----	0° 30'	----
	DOWN	----	----	----	0° 30'
0541147-3	AFT	.131	----	----	----
	FWD	----	.131	----	----
1241061-1	UP & FWD	----	.019	2° 46'	----
	UP & AFT	.019	----	2° 46'	----
	DOWN & FWD	----	.019	----	2° 46'
	DOWN & AFT	.019	----	----	2° 46'
0441139-5	UP & FWD	----	.125	0° 19'	----
	UP & AFT	.125	----	0° 19'	----
	DOWN & FWD	----	.125	----	0° 19'
	DOWN & AFT	.125	----	----	0° 19'
0441139-6	UP & FWD	----	.249	0° 37'	----
	UP & AFT	.249	----	0° 37'	----
	DOWN & FWD	----	.249	----	0° 37'
	DOWN & AFT	.249	----	----	0° 37'

Figure 5-11. Main Wheel Alignment (Sheet 3 of 3)

NOTE

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

5-64. INSTALLATION. (See figure 5-8.)

a. Place axle, alignment shims, brake line bracket and brake torque plate in position. Make sure wheel alignment shims and brake line bracket are in their original positions. Insert bushings in brake torque plate and install bolts, washers and nuts securing components to strut fitting.
b. Connect hydraulic brake line to fitting at brake line bracket.

CAUTION

Correct clocking of the brake line elbow on the wheel brake cylinder is very important in order to avoid interference with aircraft structure during retraction

c. Install wheel assembly in accordance with procedures outlined in paragraph 5-53.
d. Connect hydraulic brake hose to brake cylinder.
e. Fill and bleed affected brake system.
f. Lower aircraft and check main wheel alignment.

5-64A. MAIN GEAR ACTUATOR. (See figure 5-12.)

5-65. **DESCRIPTION. Each main landing gear strut has a separate linear-rotary hydraulic actuator. The actuators consist of a linear acting piston assembly, the shaft of which is also a rack, a matching pinion, bearings and a rotary output shaft from the actuator to a pivot casting. An end cap is installed in the rack end of the actuator. Beginning with 1982 Models, a gear-up indicator switch is installed in the end cap, and is actuated by the rack.**

5-66. REMOVAL. (See figure 5-12.)

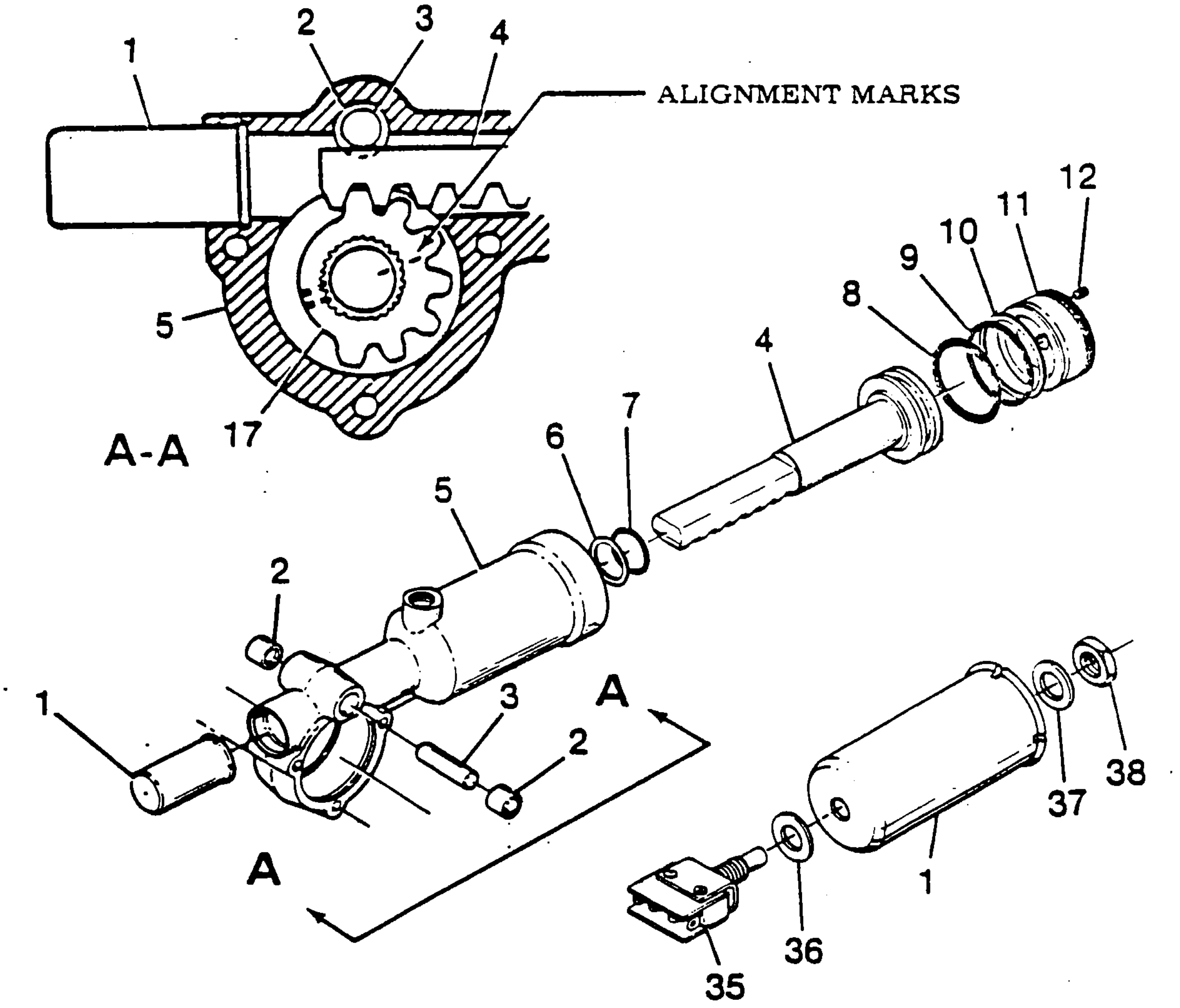
a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Remove seats and peel back carpet as necessary to gain access to center access plate above actuators; remove access plate.
c. Disconnect and drain hydraulic brake line at wheel brake cylinder.
d. Disconnect and cap or plug all hydraulic lines at actuator.
e. Remove bolts attaching cap (15) and actuator (5) to bulkhead forging. Remove actuator from aircraft.

5-67. DISASSEMBLY. (See figure 5-12.)

Leading particulars of the actuator are as follows:

Cylinder Bore Diameter	2.126 in.
Piston Rod Diameter	0.998 in.
Piston Stroke	2.970 in.

a. Remove setscrew (12) and remove end gland (11) by unscrewing from actuator body (5).
b. Remove cap (1) from end of actuator.
c. Using a small rod, push piston (4) from actuator body.



1. End Cap
2. Bearing
3. Roller
4. Piston/Rack
5. Actuator Body
6. Back up Ring
7. Packing
8. Packing
9. Packing
10. Back up Ring
11. End Gland
12. Setscrew
13. Actuator Bolt
14. Swivel Fitting
15. Cap
16. Setscrew
17. Sector Gear
18. Bearing
19. Seal
20. Bearing
21. Race
22. Downlock Pin
23. Packing
24. Packing
25. Union
26. Packing
27. Plug
28. Packing
29. Jam Nut
30. Shaft
31. Lockwasher
32. Setscrew
33. Pivot
34. Strut Bolt
35. Up Indicator Switch
36. Washer
37. Washer
38. Nut

Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 1 of 3)

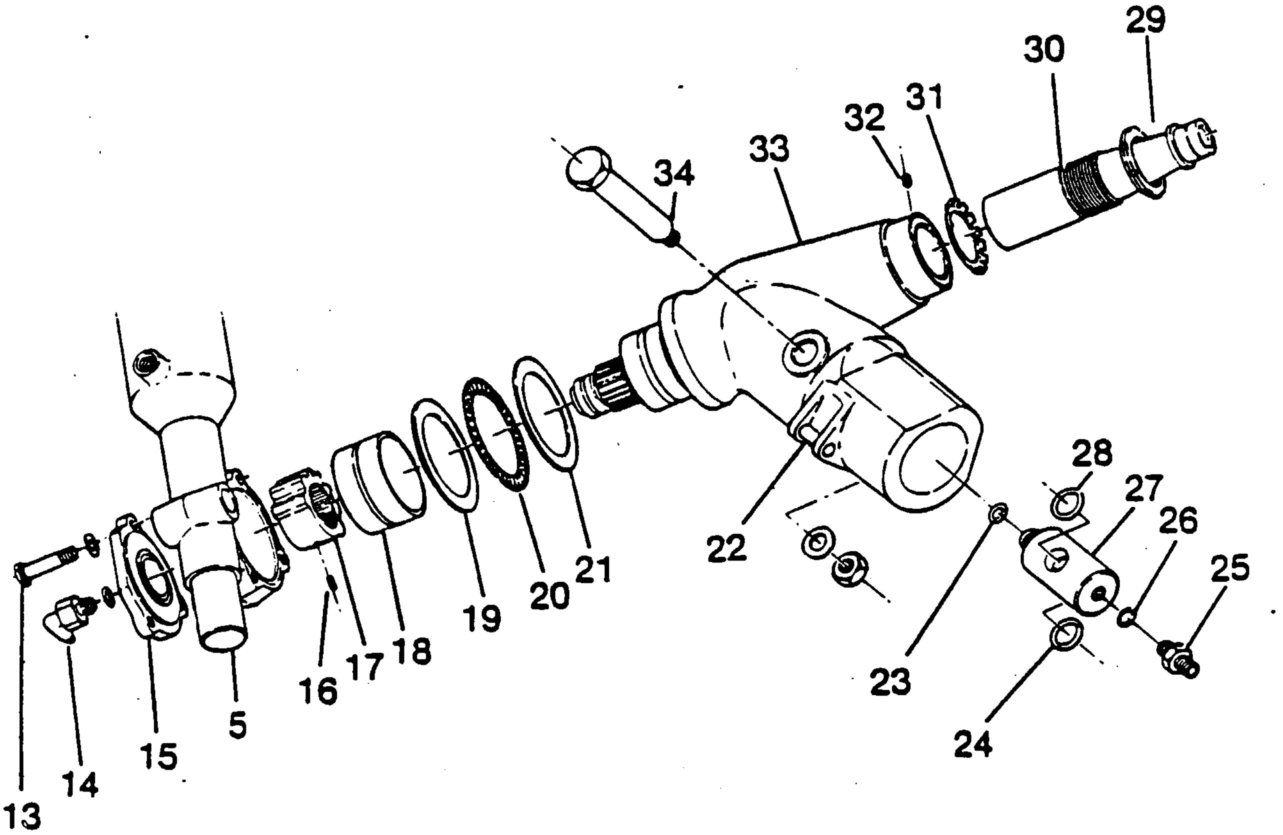


Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 2 of 3)

NOTE

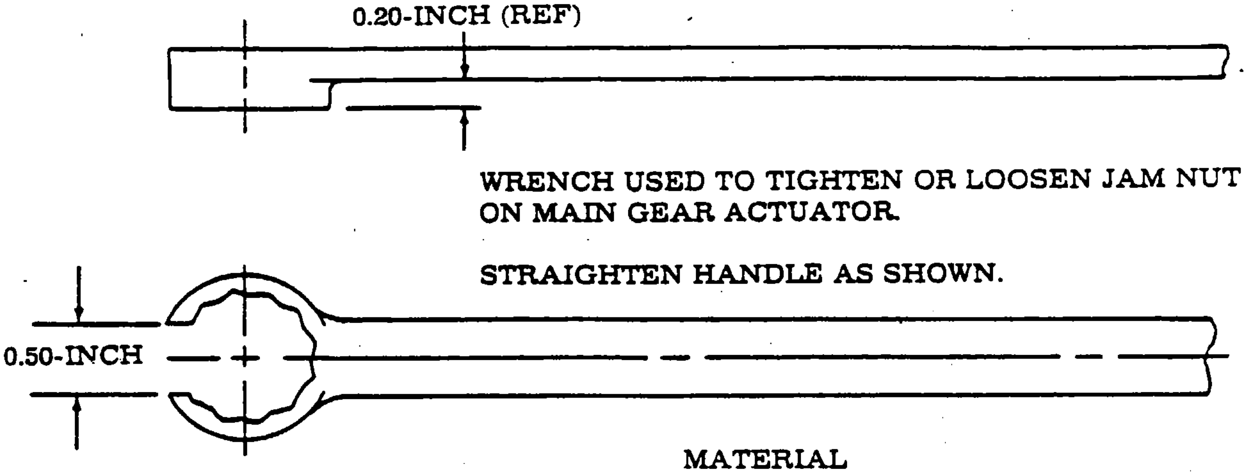
Unless defective, do not remove nameplate, bearing (2) or roller (3).

d. Remove packing (7) and back up ring (6) from cylinder body (5). Discard packing (7).
e. Remove packing (9) and back up ring (10) from end gland (11). Discard packing (9).
f. Remove and discard packing (9) from piston (4).

5-68. INSPECTION. (See figure 5-12.)

a. Thoroughly clean all parts in cleaning solvent (Federal Specification PS-661, or equivalent).
b. Inspect all threaded surfaces for cleanliness, cracks and wear.
c. Inspect caps (1) and (15), swivel fitting (14), piston (4), roller (3), if removed, and actuator body (5) for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall operation of the actuator.
d. Inspect bearings (2), if removed, for freedom of motion, scores, scratches or Brinnel marks.
e. Inspect sector gear (17) attached to pivot in aircraft. (See applicable paragraph for removal of sector gear if replacement is required.)

5-69. PARTS REPAIR/REPLACEMENT. (See figure 5-12.) Repair of small parts of the main landing gear actuator is impractical. Replace all defective parts. Minor scratches or score marks may be removed by polishing with abrasive crocus cloth (Federal Specification P-C-

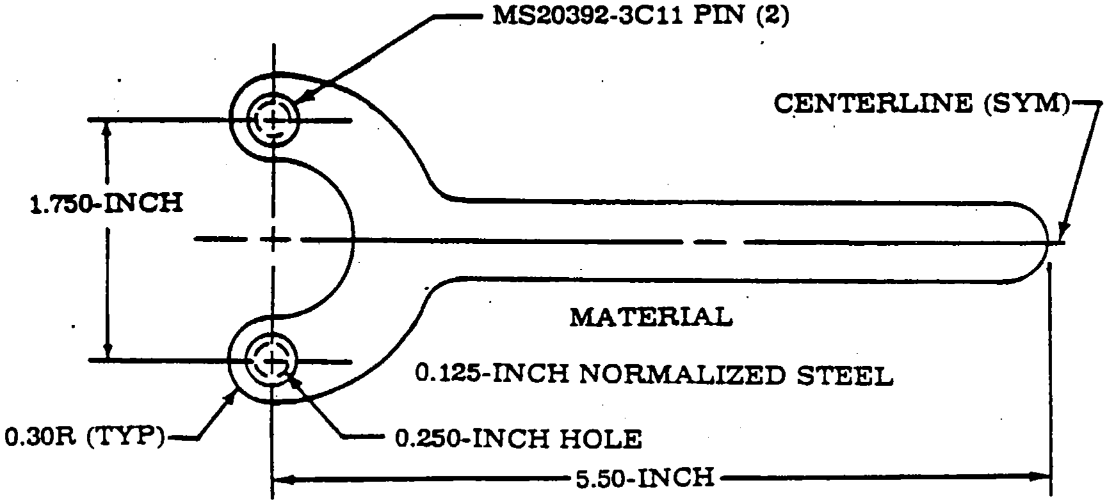


WRENCH USED TO TIGHTEN OR LOOSEN JAM NUT ON MAIN GEAR ACTUATOR.

STRAIGHTEN HANDLE AS SHOWN.

MATERIAL

7/8-INCH BOX END WRENCH
(SEARS CRAFTSMAN, OR EQUIVALENT).



MATERIAL

0.125-INCH NORMALIZED STEEL

WRENCH USED TO INSTALL OR REMOVE END GLAND ON MAIN GEAR ACTUATOR.

INSERT PINS THROUGH HOLES IN WRENCH AND TORCH BRAZE, USING BRAZING ROD (SIL-BOND 45, UNITED WIRE AND SUPPLY) OR EQUIVALENT.

TORCH BRAZING-Flux joint and filler material thoroughly. Filler material may be either pre-positioned or hand-fed. The torch shall be adjusted for a non-oxidizing flame, and manipulated in such a manner as to braze in the direction the flame is pointing. This will tend to prevent flux inclusion and entrapment of foreign particles. After the assembly has solidified, the excess flux shall be removed with hot water (180°F, approximately).

Figure 5-12. Main Gear Actuator and Pivot Assembly (Sheet 3 of 3)

458), providing their removal does not affect operation of the unit. During assembly, install all new packings.

5-70. REASSEMBLY. (See figure 5-12.)

NOTE

Use MIL-G-21164C lubricant on roller (3) and bearings (2), if removed.

a. If bearings (2) and roller (3) were removed, press one bearing into actuator body until it is flush. Install roller and press second bearing in place to hold roller. Use care to prevent damage to bearing or roller.
b. Install back up ring (6) and packing (7) in actuator body bore. Install new packing (8) on piston (4).

NOTE

Assemble packings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

c. Slide piston (4) into cylinder body.

NOTE

Lubricate piston rack gears with MIL-G-21164C lubricant. Apply lubricant sparingly. Over-greasing might cause contamination of hydraulic cylinder assembly with grease which might work past packing.

d. Install back up ring (10) and new packing (9) on end gland (11).
e. Install end gland (11) in cylinder and tighten until end of gland is flush with end of cylinder body. Install and tighten screw (12).
f. Install end cap (1) at end of actuator assembly.

5-71. INSTALLATION. (See figure 5-12.)

a. With main landing gear in the DOWN and locked position, install actuator onto inboard forging so that piston rack gear and sector gear engage as shown in Section A-A.
b. Lubricate swivel fitting (14) with MIL-G-21164C lubricant, and bolt actuator and cap (15) to inboard forging. Thru serials 172RG1163, torque bolts (13) to 60-85 inch-pounds; serials 172RG1164 and on, torque bolts (13) to 100-140 inch-pounds and safety-wire. Install swivel fitting into cap (15).
c. Connect all hydraulic lines to their source locations. Lubricate threads with Petrolatum. Install new safety wire on swivel fitting at actuator.
d. Connect brake line at wheel cylinder. Fill and bleed brake system in accordance with applicable paragraph in this Section.
e. Rig landing gear in accordance with procedures outlined in applicable paragraph in this Section.
f. Remove aircraft from jacks and install access covers, carpeting, seats and seat stops removed for access.

5-72. MAIN LANDING GEAR PIVOT ASSEMBLY. (See figure 5-12.)

5-73. REMOVAL. (See figure 5-12.)

a. Remove tubular gear strut from pivot assembly in accordance with procedures outlined in applicable paragraph in this Section.
b. Remove actuator in accordance with procedures outlined in applicable paragraph in this Section.
c. Remove setscrew (16) from sector gear (17).
d. Bend tangs of lockwasher (31) from notches in jam nut (29) and completely unscrew jam nut from threaded area of shaft (30).
e. Push shaft (30) into pivot assembly and pull pivot assembly free of bearing (18).

5-74. INSPECTION AND REPAIR. (See figure 5-12.)

a. Thoroughly clean all parts in cleaning solvent (Federal Specification PS-661 or equivalent.)
b. Inspect all parts for indications of damage, cracks, or excessive wear, and replace as necessary.
c. Inspect outboard pivot bushing and inboard pivot bearing (18) (pressed into bulkhead forgings in aircraft) for damage and excessive wear. Replace bushing or bearing as required.

NOTE

Outboard pivot bushing is locked into the bulkhead forging by a setscrew located above bushing. This setscrew must be turned out several turns before the bushing can be removed.

5-75. INSTALLATION. (See figure 5-12.)

a. Lubricate all bushings and bearings with MIL-G-21164C grease. Slide shaft (30) onto pivot (33).
b. Install pivot, with bearing (20) and race (21), into inboard bearing in bulkhead forging. Pull shaft from pivot and install lockwasher (31) and jam nut (29) on shaft.
c. Insert end of shaft into outboard bushing in bulkhead forging. Hand-tighten nut to remove all end play and safety in place by bending corresponding tang of washer into notch of nut. Pivot must rotate freely.
d. Install seal (19) and sector gear (17) on inboard end of pivot assembly so that the alignment marks on pivot and sector are matched as shown in Section View A-A.
e. Install setscrew (16) into sector (17) with Loctite 242 locking compound. Ensure that setscrew enters keyway on pivot, and tighten screw (16).

5-76. GEAR POSITION INDICATOR SWITCHES. (See figures 5-9 and 5-13.)

5-77. DESCRIPTION. The downlock indicator switches are attached to the downlock hooks, which are attached to the outboard pivot support bulkhead forgings. Beginning with 1982 Models, a main gear up-indicator switch is mounted in the end cap of each main gear actuator.

5-78. MAIN GEAR DOWNLOCK ACTUATOR. (See figure 5-13.)

5-79. DESCRIPTION. The main gear downlock actuators consist of a piston/rod and a ball and seat priority valve. The body has two separate hydraulic chambers. Internal springs hold the piston/rod in the extended position (locked) at all times except when the gear position handle is placed in the up position and the system is pressurized. Fluid, entering the actuator during the gear up cycle, is blocked by the ball and seat, and forced to flow into the piston chamber, causing the piston to move, pulling the rod into the actuator body. As the rod

1. Actuator Body
2. Packing
3. Back up Ring
4. Fitting
5. Packing
6. Spring
7. Ball
8. Ball
9. Piston/Rod
10. Packing
11. Packing
12. Packing
13. Spring
14. Spring
15. Plug

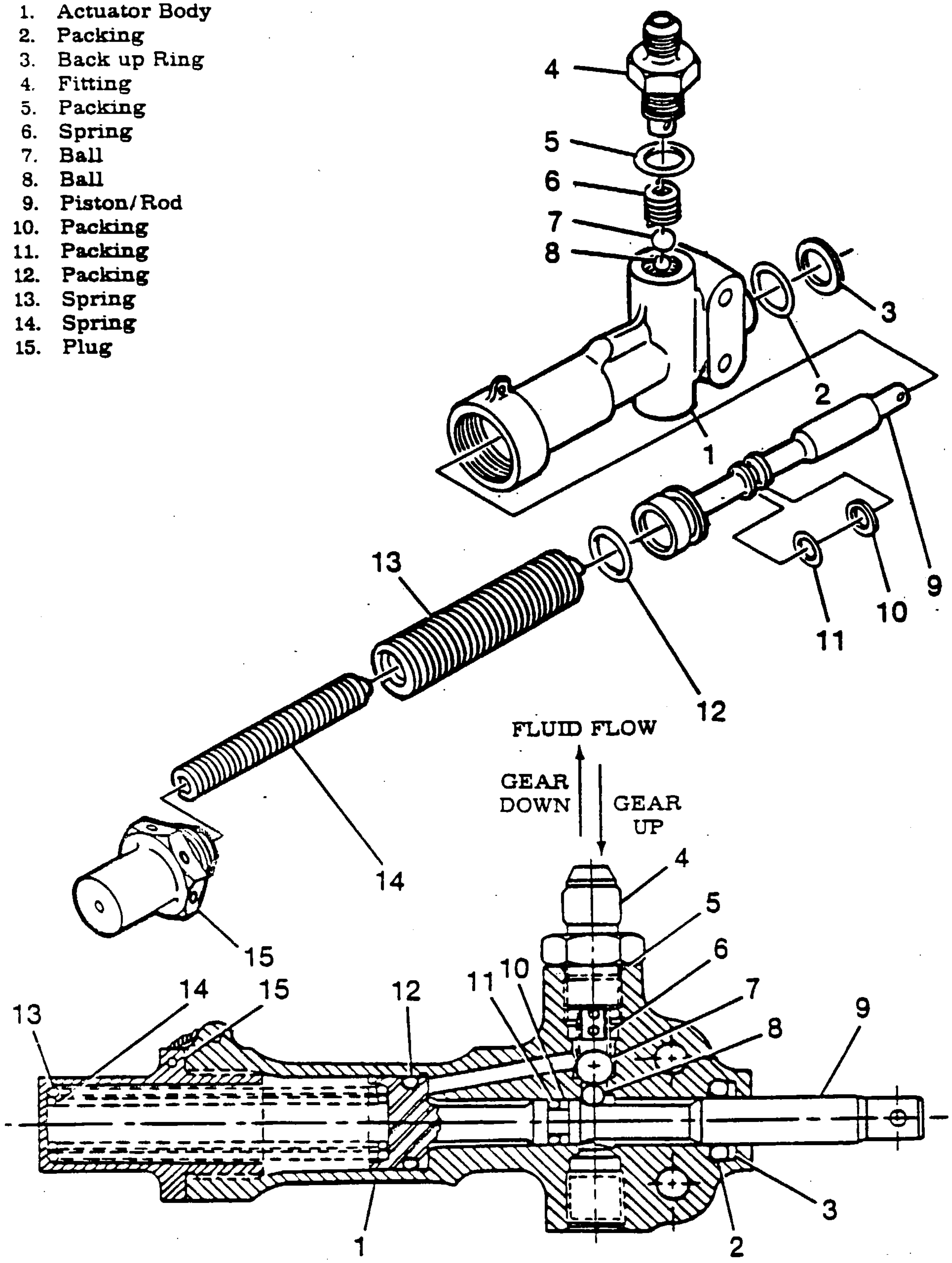
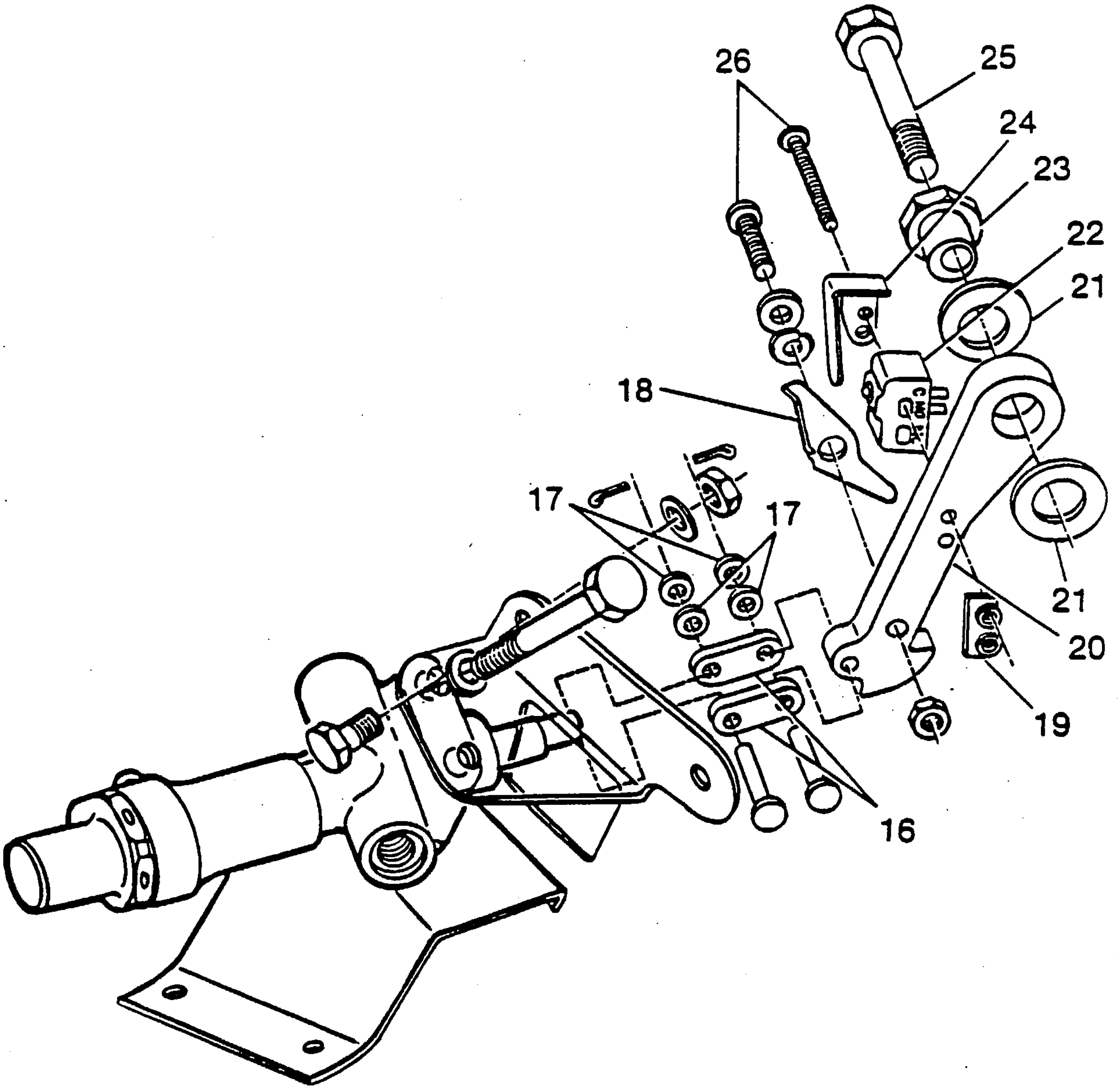


Figure 5-13. Main Gear Downlock Actuator (Sheet 1 of 2)



16. Links
17. Washers
18. Actuator
19. Switch-Attach Plate
20. Downlock Hook
21. Washers
22. Switch
23. Eccentric Bushing
24. Actuator
25. Bolt
26. Screw

Figure 5-13. Main Gear Downlock Actuator (Sheet 2 of 2)

moves, it draws the latch away from the downlock pin, unlocking the gear. When the rod is retracted into the actuator body, a raised portion of the rod forces a small ball to push the larger valve ball away from the seat, and allows fluid to flow through the downlock actuator to the main landing gear actuator. When the landing gear selector handle is placed in the down position, fluid flow is reversed and unaffected by the ball and seat. Internal spring pressure forces the piston to move, causing the rod to extend, placing the latch or hook in the locked position. As the landing gear pivot assembly rotates to the down position, the lock pin strikes the angled bottom of the latch or hook, forcing the latch or hook to move away until the lock pin clears the latch or hook. Internal spring pressure on the piston/rod causes the latch to snap back to the locked position as the pin clears the latch.

5-80. REMOVAL AND INSTALLATION. **(See figure 5-13.)**

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Place master switch in OFF position and move gear selector handle to UP position.
c. Turn master switch ON and allow gear to retract halfway. Turn master switch OFF and pull pump motor circuit breaker to prevent accidental activation of the pump.
d. Move seat to forward position and peel back carpet as necessary to uncover access panel above actuator; remove panel.
e. Remove cotter pin and clevis pin from links (16).
f. Remove bolts attaching actuator to mounting brackets.
g. Remove and cap or plug hydraulic lines from actuator.
h. Reverse preceding steps to install actuator.

5-81. DISASSEMBLY. **(See figure 5-13.)**

Leading particulars of the actuators are as follows:

Cylinder Bore Diameter	**0.749+.002,-.000 in.**
Piston Diameter	**0.747+.000,-.001 in.**
Stroke (to unseat valve)	**0.719±.031 in.**

a. Remove fitting (4), spring (6) and balls (7) and (8).
b. Cut safety wire and unscrew end plug (15) from barrel and actuator body (1).
c. Remove springs (13) and (14), and push piston (9) from barrel and actuator body (1).
d. Remove and discard all packings and back up rings.

5-82. INSPECTION. (See figure 5-13.)

a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.
b. Inspect ball spring (6) for evidence of breaks and distortion.
c. Inspect inner and outer piston springs (13) and (14) for evidence of breaks and distortion.
d. Inspect end fitting, piston and rod, barrel, valve body, balls and ball seats for cracks, scratches, scoring, wear or surface irregularities which might affect their function or the overall function of the unit.

e. Repair of most parts of the downlock actuator is impractical. Replace defective parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect operation of the unit.

5-83. REASSEMBLY. (See figure 5-13.)

NOTE

Install all new packings and back up rings during reassembly of the actuator.

a. Install new packing, and back up rings in grooves of piston and rod (9).
b. Install new packings and back up rings in grooves of actuator body (1).
c. Slide piston and rod into barrel and actuator body (1). Use care to prevent damage to packing and back up rings.
d. Insert piston springs (13) and (14), then install and safety wire end plug (15) to barrel and actuator body.
e. Insert balls (8) and (7) and spring (6) in barrel and valve body.
f. Install new packing (5) on fitting (4). Install and tighten fitting.

5-84. MAIN GEAR STRUT STEP. (See figure 5-8.)

5-85. DESCRIPTION. The step is constructed of Uralite 3121 polyurethane casting, with a molded depression area, located in the top of the step. An adhesive backed "Walkway" material with rough surface is pressed into the depressed area of the strut.

5-86. REMOVAL. (See figure 5-8.)

NOTE

The step is bonded to the landing gear strut with Uralite 3121 bonding material.

a. Using a heat gun, heat step at a temperature of 200°F to 250°F, until step material becomes pliable.
b. Using a sharp knife, remove step material down to the metal strut.
c. Clean off remaining step material with a wire wheel and sandpaper. Leave surface slightly rough or abraded.

5-87. INSTALLATION. (See figure 5-8.)
a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Mark position of removed step so new step will be installed in approximately the same position on the strut.
c. 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 thoroughly dry.
d. Mix adhesive (Uralite 3121), in accordance with manufacturer's direction. Note pot life.
e. Spread a coat of mixed adhesive on bonding surfaces of strut and step; install step on strut.

NOTE

Top of step should be parallel to the ground (±5°) when gear is in down position.

f. Cycle landing gear to check clearance of step in tunnel.
g. Form a small fillet of adhesive at all edges of bonding surfaces. Remove excess adhesive.
h. Remove aircraft from jacks.
i. Allow adhesive to thoroughly cure according to manufacturer's recommendations before flexing gear spring or applying loads to step.
j. Paint gear spring strut and step after curing is completed.

5-88. NOSE GEAR SYSTEM. (See figure 5-14.)

5-89. DESCRIPTION. The nose gear consists of a pneudraulic shock assembly, mounted in a trunnion assembly, a nose gear steering system with bungee, a shimmy dampener, nose wheel, tire and tube, hub cap, bearings, seals and a double-acting hydraulic actuator for extension and retraction. A claw-like hook on the actuator serves as a downlock for the nose gear. Stop bolts, located in the lower aft well, prevent inadvertent nose gear collapse.

5-90. OPERATION. The nose gear shock strut is pivoted at the firewall. Retraction and extension of the nose gear is accomplished by a double-acting hydraulic cylinder, the forward edge of which contains the nose gear downlock. Initial action of the cylinder disengages the downlock before retraction begins. As the strut moves into the gear well, the forward side of the nose gear fork boss contacts an actuator assembly, causing the doors to close. The nose gear is held in the UP position by hydraulic pressure.

5-91. TROUBLE SHOOTING -- NOSE GEAR SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
FLUID LEAKAGE FROM STRUT.	Defective strut seals.	Install new seals.
STRUT LOSES AIR PRESSURE.	Defective strut seals.	Install new seals.
	Defective or loose air filler valve.	Check gasket: tighten or replace valve.
EXCESSIVE TIRE WEAR.	Loose torque links.	Add shim washers: replace links.

5-92. REMOVAL AND INSTALLATION OF NOSE GEAR STRUT ASSEMBLY. (See figure 5-14.)

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.

WARNING

Turn master switch OFF and pull pump motor circuit breaker when working in wheel well area.

1. **Hub Cap**
2. **Wheel and Tire**
3. **Fork**
4. **Shim**
5. **Centering Block**
6. **Trunnion**
7. **Shimmy Damper**
8. High-Pressure Air Valve
9. Steering Rod
10. Bungee Boot
11. Bellcrank
12. Bungee
13. Nose Gear Actuator
14. Downlock Assembly
15. Upper Torque Link
16. Lower Torque Link
17. Squat Switch
18. Clevis

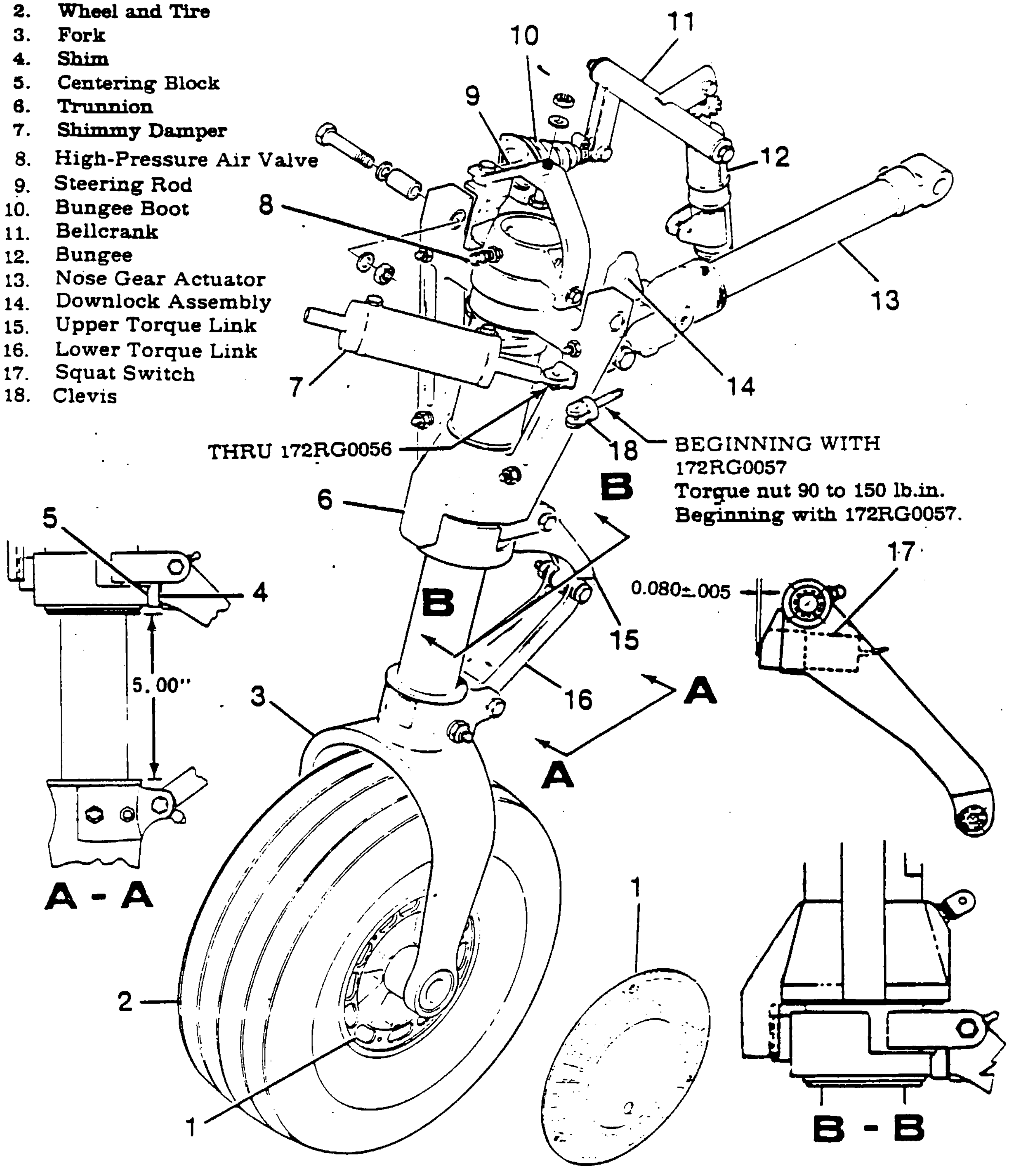
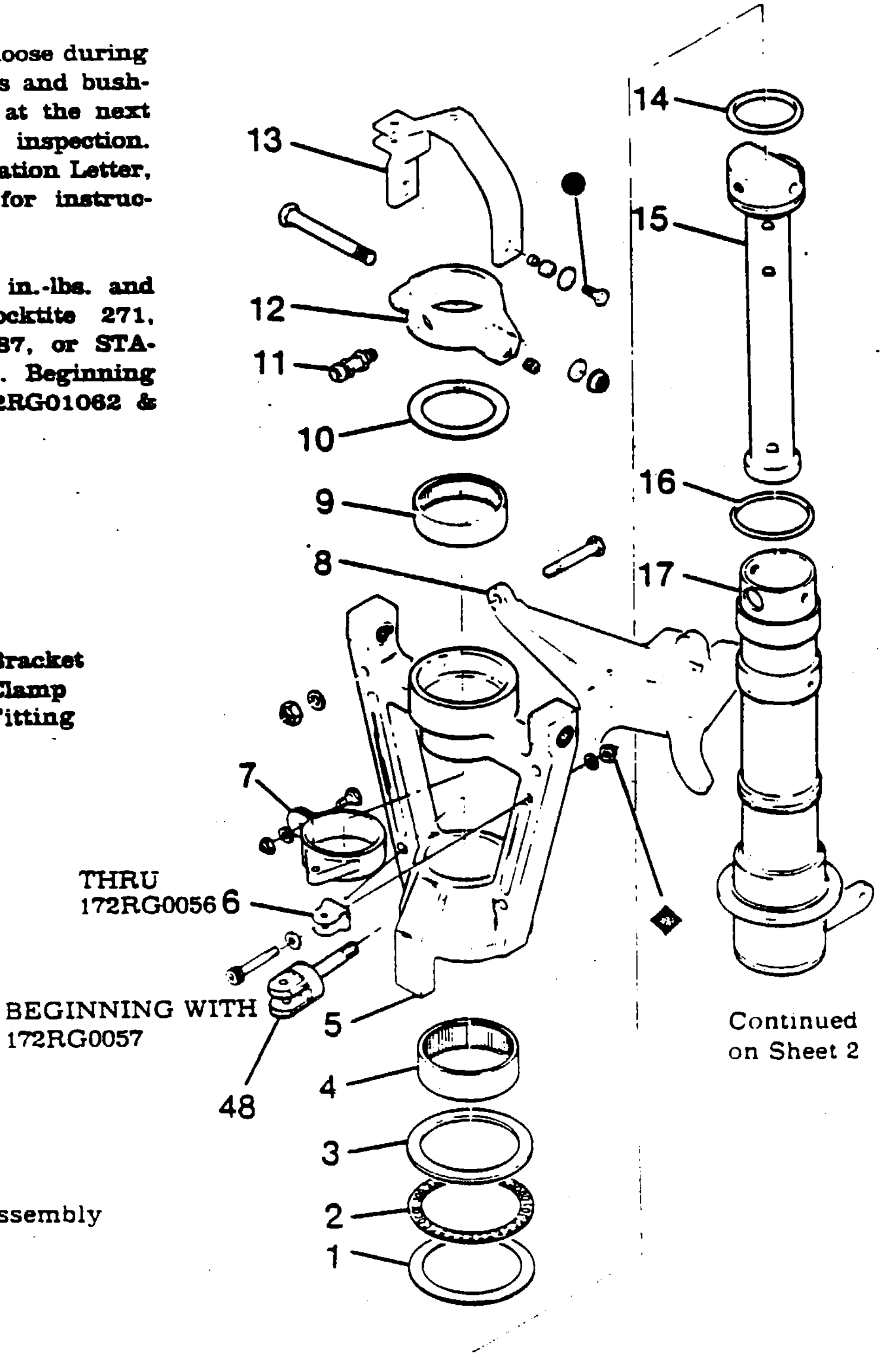


Figure 5-14. Nose Gear Assembly

NOTE

- If bolts are found to be loose during routine inspection, bolts and bushings must be replaced at the next 100-hour or annual inspection. Refer to Service Information Letter, SE82-37, Revision 1, for instructions.
- Torque bolts to 50-60 in.-lbs. and seal threads with Locktite 271, Locktite Catalog No. 87, or STA-LOK Catalog No. 800. Beginning with 172RG01058, 172RG01062 & On.

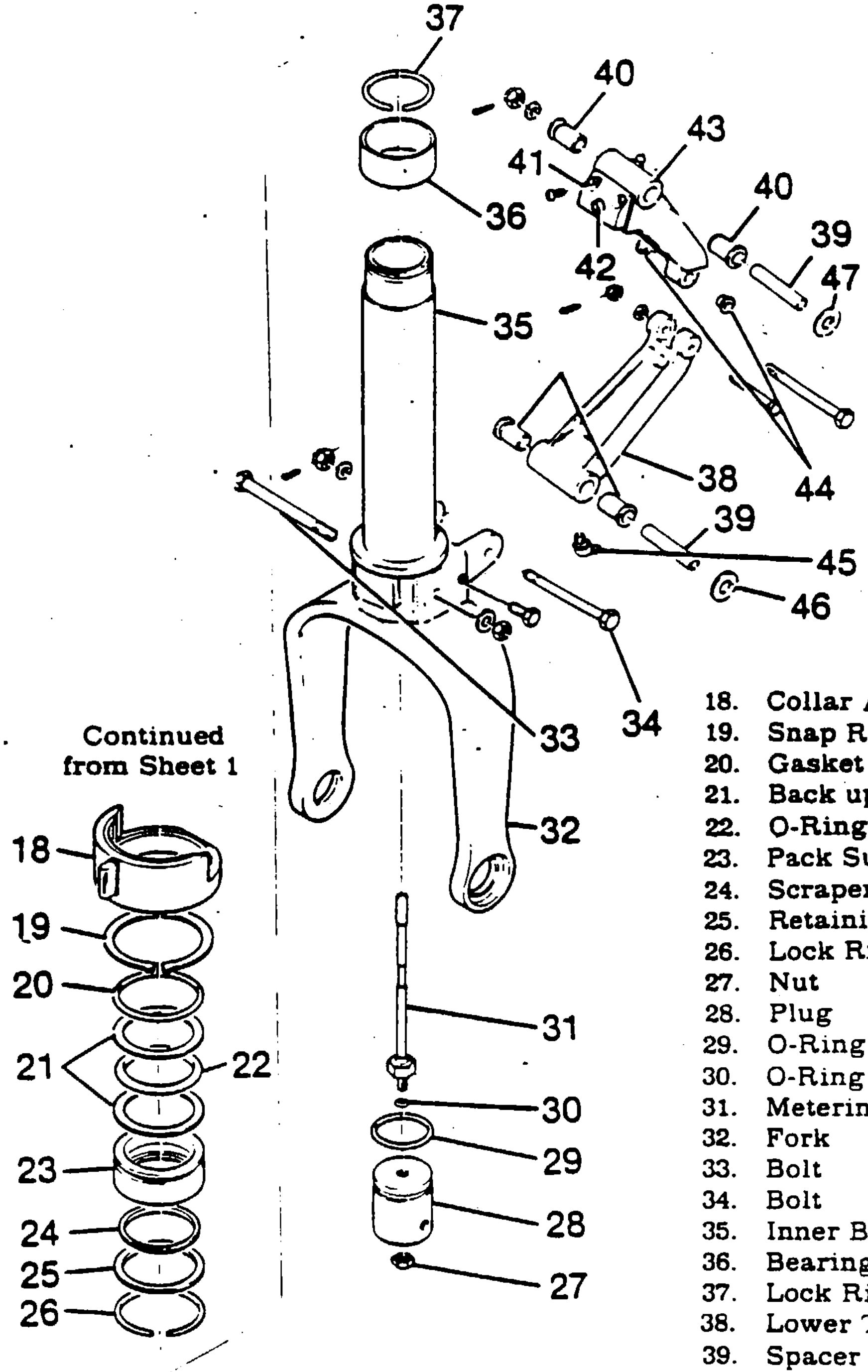
1. **Race**
2. **Bearing**
3. **Race**
4. **Bearing**
5. **Trunnion**
6. **Shimmy Damper Bracket**
7. **Shimmy Damper Clamp**
8. Actuator-Attach Fitting
9. Bearing
10. Washer
11. Valve Assembly
12. Collar Assembly



13. Bellcrank
14. Gasket
15. Head and Tube Assembly
16. O-Ring
17. Outer Barrel
48. Clevis

◆ Torque nut 90 to 150 lb. in.
Beginning with 172RG0057

Figure 5-15. Nose Gear Strut (Sheet 1 of 2)



18. Collar Assembly
19. Snap Ring
20. Gasket
21. Back up Ring
22. O-Ring
23. Pack Support Ring
24. Scraper Ring
25. Retaining Ring
26. Lock Ring
27. Nut
28. Plug
29. O-Ring
30. O-Ring
31. Metering Pin
32. Fork
33. Bolt
34. Bolt
35. Inner Barrel
36. Bearing
37. Lock Ring
38. Lower Torque Link
39. Spacer
40. Bushing
41. Centering Block
42. Squat Switch
43. Upper Torque Link
44. Bushing
45. Grease Fitting
46. Shim
47. Shim

Figure 5-15. Nose Gear Strut (Sheet 2 of 2)

b. Disconnect electrical leads from squat switch on upper torque link and tag for indentification.
c. Disconnect steering rod (9) at bellcrank (11).
d. Remove bolt attaching actuator (13) to trunnion, being careful to contain the washers and other downlock components held by attaching bolt.
e. Remove trunnion pivot bolts and remove strut from aircraft.

5-93. DISASSEMBLY. (See figure 5-15.)

a. Bleed pressure from strut through valve (11).
b. Remove shimmy dampener from strut.
c. Remove torque links (38) and (43).
d. Remove bellcrank (13), collar (12) and valve (11) from top of strut assembly.
e. Remove flat snap ring (19) and collar (18) from lower end of outer barrel (17).
f. Remove wire lock ring (26) from inside groove at lower end of outer barrel (17). A small hole is drilled through the outer barrel to aid in the removal of the lock ring.
g. Pull inner barrel (35) from outer barrel (17) and drain hydraulic fluid from inner barrel.
h. Remove wire lock ring (37) from groove at upper end of inner barrel (35) and remove bearing (36) and pack support ring (23) from inner barrel.
i. Remove plug (28) and metering pin (31) from inner barrel by removing bolt (33) through fork (32) and plug (28). Remove metering pin (31) from plug (28).

5-94. INSPECTION AND REPAIR. (See figure 5-15.)

a. Thoroughly clean all parts in cleaning solvent, and examine the parts carefully.
b. Install all new O-rings and back up rings.
c. Sharp metal edges should be smoothed with No. 400 emery paper, then thoroughly cleaned with solvent.
d. If outer barrel (17) was removed from trunnion, lubricate needle bearings in accordance with the lubrication chart in Section 2 of this manual.

5-95. REASSEMBLY. (Refer to figure 5-15.)

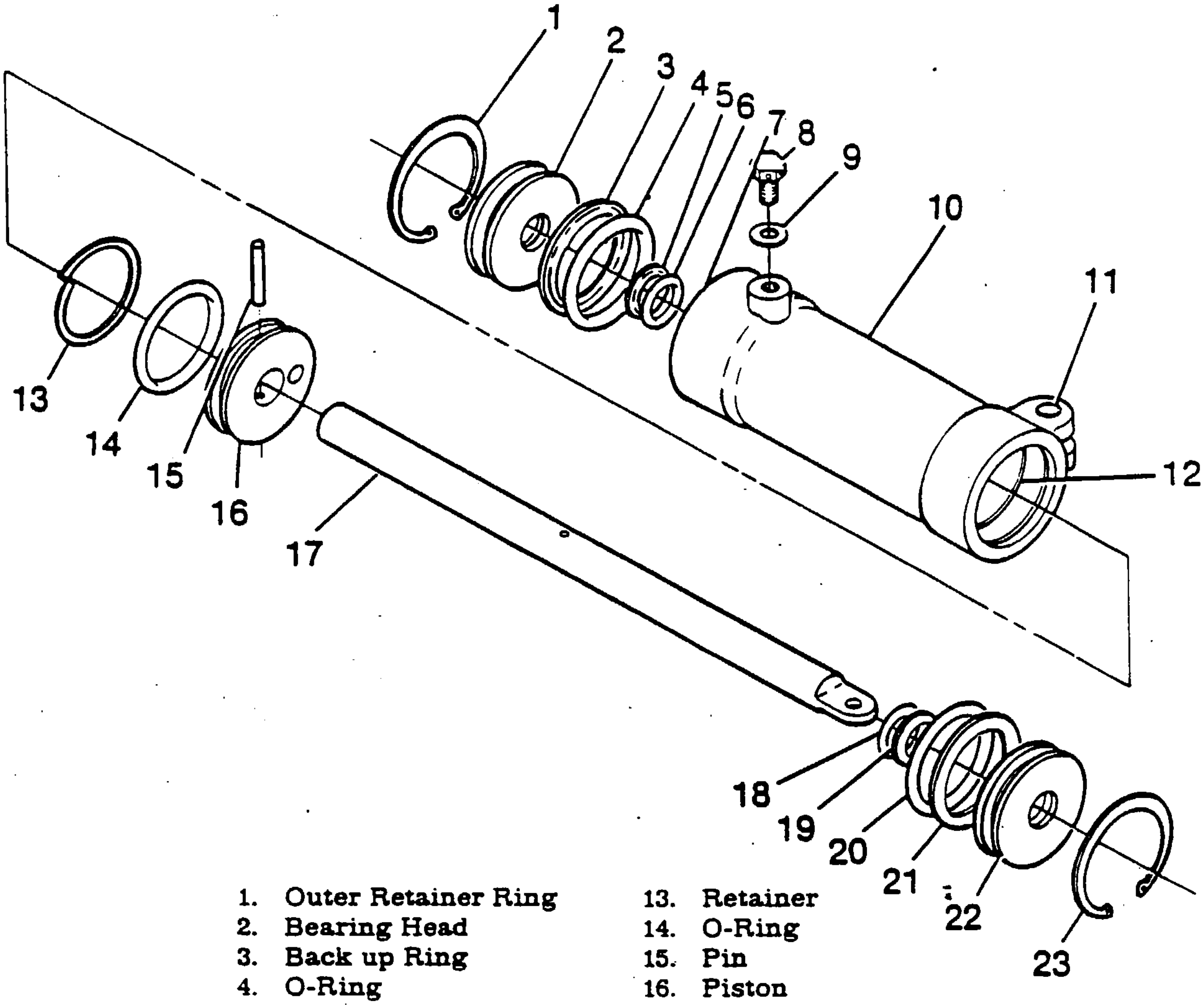
a. Lubricate and install all new O-rings and back up rings.
b. Lubricate bearings as required with MIL-G-23827A grease, or equivalent.
c. Reassemble strut, reversing procedures outlined in paragraph 5-93.

NOTE

Do not overtighten nut at clamp (7), to cause excessive bending of clamp ears. Assemble head and tube assembly (15), packings and lock rings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7. Do not use DC-7 on surfaces to be painted. Tighten nut on bolt attaching upper and lower torque links (43) and (38) snug, plus one additional castellation. Add or delete shims between centering block (41) and upper torque link (43) to maintain 5.0-in. in dimension shown in View A-A., figure 5-14.

5-96. SHIMMY DAMPER. (See figure 5-16.)

5-97. DESCRIPTION. The shimmy damper is a self-contained hydraulic cylinder which acts as a restrictor. When the steering system reacts too rapidly, the shimmy damper maintains pressure against the steering arm by means of a piston which permits a restricted flow of hydraulic fluid from either end of the cylinder to the other through an orifice in the piston.



1. Outer Retainer Ring
2. Bearing Head
3. Back up Ring
4. O-Ring
5. O-Ring
6. O-Ring
7. Inner Retaining Ring
8. Bolt
9. Lock-O-Seal
10. Barrel
11. Bushing
12. Inner Retaining Ring
13. Retainer
14. O-Ring
15. Pin
16. Piston
17. Rod
18. O-Ring
19. O-Ring
20. O-Ring
21. Back up Ring
22. Bearing Head
23. Outer Retaining Ring

Figure 5-16. Shimmy Damper

5-98. REMOVAL AND INSTALLATION. (See figure 5-14.)

a. Remove bolt and nut securing rod end of shimmy damper to bracket or eyebolt (18) on trunnion (6).
b. Remove bolt, washer, nut and cotter pin securing shimmy damper to clamp (7) (see figure 5-15).
c. Remove shimmy damper. Reverse preceding steps for installation.

5-99. DISASSEMBLY. (See figure 5-16.)

a. Remove outer retaining rings (1) and (23).
b. Remove bearing heads (2) and (22).
c. Remove bolt (8) and Lock-O-Seal (9).
d. Remove inner retaining rings (7) and (12).
e. Remove O-rings (5), (6), (18) and (19).
f. Remove rod (17).
g. Remove pin (15) from piston (16) and rod (17).
h. Remove retainer (13), O-ring (14) and piston (16).
i. Remove O-ring (4) and back up ring (3) from bearing head (2).
j. Remove O-ring (20) and back up ring (21) from bearing head (22).

5-100. INSPECTION AND REPAIR. (See figure 5-16.)

NOTE

Assemble new O-rings and back up rings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

a. Thoroughly clean all parts in solvent and inspect carefully.
b. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect the operation of the unit.
c. Replace all worn or defective parts.

5-101. REASSEMBLY. (See figure 5-16.)

a. Install O-ring (20) and back up ring (21) on bearing head (22).
b. Install O-ring (4) and back up ring (3) on bearing head (2).
c. Install pin (15) in piston (16) and rod (17).
d. Install retainer (13) and O-ring (14) on piston (16).
e. Install rod and piston assembly in barrel (10).
f. Install inner retaining rings (7) and (12).
g. Install bearing head assemblies.
h. Install outer retaining ring assemblies.
i. Install Lock-O-Seal (9) and bolt (8).
j. Fill shimmy damper as outlined in Section 2 of this manual.

5-102. TORQUE LINKS. (See figure 5-15.)

5-103. DESCRIPTION. Torque links keep the lower strut aligned with the nose gear steering system, but permit shock strut action. The squat switch is installed in the upper torque link.

5-104. REMOVAL. (See figure 5-15.)

WARNING

Completely deflate strut before removing torque links.

a. Disconnect upper torque link (43) from lower torque link (38), noting positions of washers and spacers.
b. Disconnect upper torque link (43) from lugs on outer barrel (17); remove upper torque link.
c. Remove screws attaching centering block (41) to upper torque link.

NOTE

Retain any shims removed from between centering block (41) and upper torque link (43) for reinstallation.

d. Remove lower torque link (38) from lugs on fork assembly (32).

NOTE

Squat switch is installed in upper torque link.

5-105. INSPECTION AND REPAIR. (See figure 5-15.) Torque link bushings and grease fitting should not be removed except for replacement of parts: replace if excessively worn. Shims (46) and (47) are available to be used to remove any looseness.

5-106. INSTALLATION. (See figure 5-15.)

a. Install lower torque link (38) on lugs of fork assembly (32).

NOTE

Ensure that same number of shims are installed as were removed from between centering block (41) and upper torque link (43).

b. Attach centering block (41) and shims, if applicable, to upper torque link (43).
c. Install upper torque link (43) on lugs of outer barrel (17).
d. Connect upper torque link (43) to lower torque link (38). Tighten all nuts snugly, then tighten to align next castellation with cotter pin hole.

5-107. SQUAT SWITCH. (See figure 5-15.)

5-108. DESCRIPTION. The squat (or safety) switch interrupts the landing gear circuit, preventing landing gear retraction while the aircraft is resting on the ground. Also, while airborne, the switch prevents the nose gear from retracting into the well, except when the nose wheel is in alignment. The squat switch is installed through a hole in the upper torque link, and is threaded into a centering block, attached to the forward side of the torque link. A portion of the squat switch plunger protrudes from the forward side of the centering block .080±.005-inch. The threaded portion of the switch is sealed in the threads of the centering block with Loctite 242, Loctite Catalog 85 or 83, or STA-LOK Catalog No. 500 or 400.

5-109. REMOVAL. (See figure 5-15.)

WARNING

Turn master switch OFF and pull pump motor circuit breaker when working in wheel well area.

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Mark positions of sta-straps along routing of wires from squat switch at upper torque link to splices. Mark wires to facilitate correct installation of replacement leads; cut sta-straps.
c. Disconnect or cut wires at splices and remove wires from routing down to squat switch at upper torque link.
d. Deflate shock strut completely.
e. Disconnect upper torque link from lower torque link, noting positions of washers and spacers.
f. Disconnect upper torque link from lugs on outer barrel; remove upper torque link.
g. Remove two screws attaching centering block to upper torque link.
h. Retain any shims removed from between centering block and torque link for reinstallation.
i. Break loose sealant in threads and remove squat switch from centering block. Remove all sealant from threads.

5-110. INSTALLATION. (See figure 5-15.)

a. Install two wire leads from replacement squat switch through hole in centering block.
b. Apply Loctite 242, Loctite Catalog 85 or 83, or STA-LOK Catalog No. 500 or 400 to threads in centering block.
c. Screw replacement squat switch into centering block, ensuring that leads remain untwisted.
d. Adjust squat switch by screwing or unscrewing into centering block to allow switch plunger to protrude .080±.005-inch.
e. After sealant has cured, attach centering block to upper torque link with two screws, and insert leads and squat switch through hole in torque link.
f. Attach torque link to outer barrel, installing washers and spacers in positions from which they were removed.
g. Attach upper torque link to lower torque link.

NOTE

Tighten bolt snugly, then tighten one more castellation and install cotter pin.

h. With strut fully extended, check amount of extension. Add or delete shims as necessary until strut extends 5.00-inches.
i. Inflate shock strut as outlined in Section 2 of this manual.
j. Route squat switch leads to match routing of removed wires.
k. Install sta-straps in locations marked during removal.
l. Splice squat switch leads, or connect at quick-disconnects to existing wires which were tagged during removal of old leads.
m. Remove aircraft from jacks.

5-111. NOSE GEAR DOWNLOCK MECHANISM. (See figure 5-17.) The downlock mechanism consists of hooks on either side of the nose gear actuator rod end, which are spring loaded in the locked position. As the gear moves to the full down position, the hooks engage lock pins on the actuator head, preventing retraction of the landing gear. As the gear up cycle begins, the slotted hole in the actuator rod end allows the rod end to move forward slightly, pushing against the cross bar connecting the hooks, and causing the hooks to rotate up from the lock pins. As the rod continues to move forward, the free travel afforded by the slotted hole, is taken up, and retraction of the gear begins.

5-112. REMOVAL, INSTALLATION AND RIGGING. (See figure 5-17.)

a. Refer to paragraphs 5-114 thru 5-118 and figures 5-17 and 5-21 which outline and illustrate procedures for removal, disassembly, inspection, repair, reassembly, installation and rigging of nose gear downlock mechanism components.
b. Refer to applicable paragraph for rigging procedure.

5-113. NOSE GEAR ACTUATOR. (See figure 5-17.)

5-114. DESCRIPTION. The nose gear actuator extends and retracts the nose gear and serves as a rigid drag strut in the gear down position.

5-115. REMOVAL. (See figure 5-17.)

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Tag for identification and disconnect electrical wires at the gear down switch, located at the forward end of the actuator.
c. Disconnect hydraulic hoses from actuator. Cap or plug hose and fitting openings to prevent entry of foreign material.
d. Disconnect actuator from fitting attached to trunnion.
e. Disconnect and retain components of downlock mechanism.
f. Disconnect actuator from fitting in aft nose gear well.

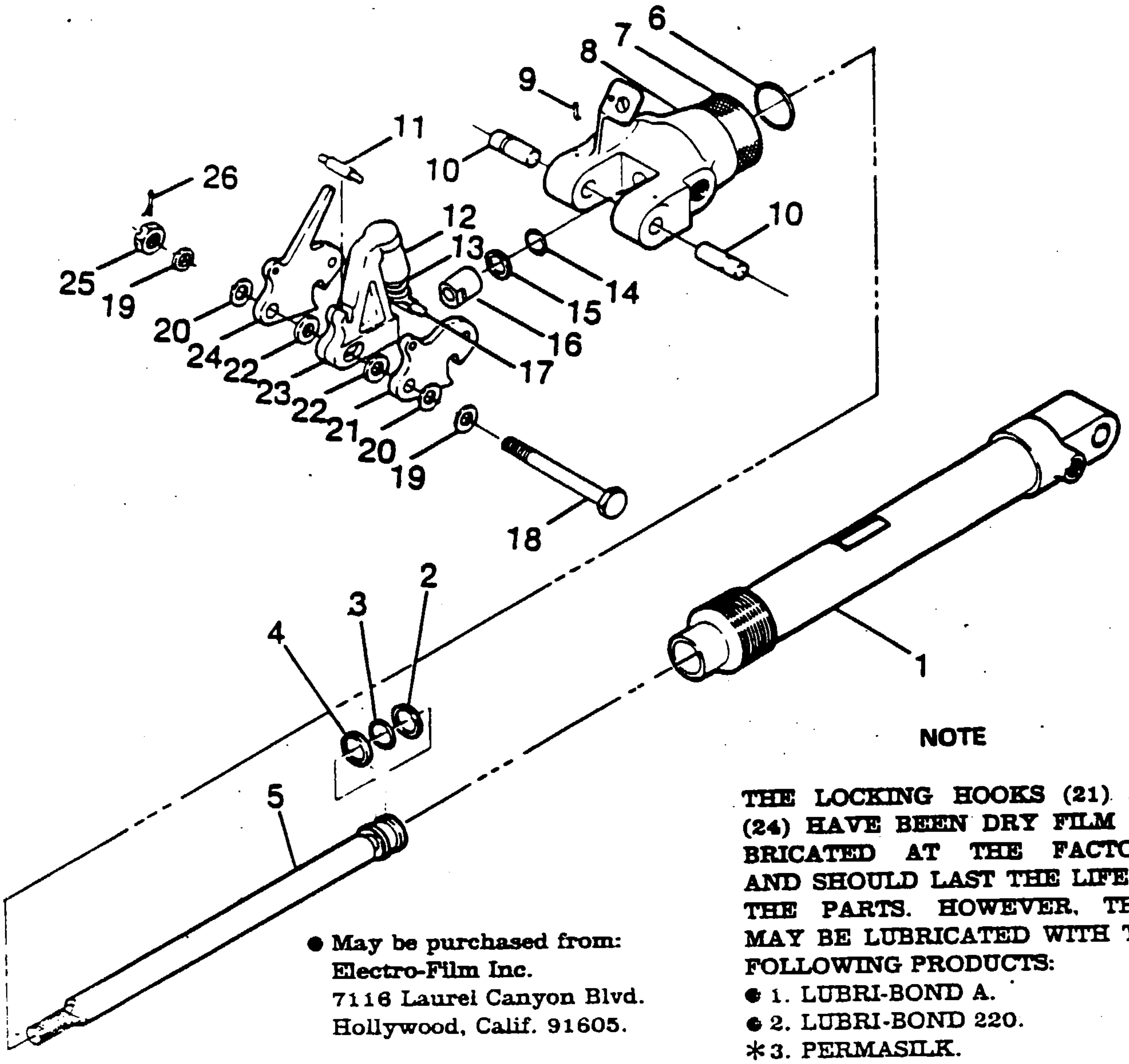
5-116. DISASSEMBLY. (See figure 5-17.)

a. Loosen lock nut (16) at end of piston/rod (5) and remove rod end assembly as a unit: remove lock nut (16).
b. Remove safety wire from, and loosen knurled nut (7).
c. Remove bearing head (8) from cylinder (1). Remove nut (7).
d. Pull piston/rod (5) from cylinder (1).
e. Remove packings and back up rings from bearing head and piston/rod.
f. Disassemble hook assembly.

5-117. INSPECTION AND REPAIR. (See figure 5-17.)

a. Inspect all threaded surfaces for cleanliness and for cracks or excessive wear.
b. Inspect downlock hook spring for evidence of breaks and distortion. Free length of spring must be 2.406±0.080-inches, and compressed to 2.00-inches under 19.80±2.0 pound load.
c. Inspect hooks, spring guide, bearing head, piston, cylinder and bushing for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall function of the nose gear actuator.
d. Repair of most parts of the actuator assembly is impractical. Replace defective parts with serviceable parts.
e. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect operation of the unit.

5-118. REASSEMBLY. (See figure 5-17.)



● May be purchased from:
Electro-Film Inc.
7116 Laurel Canyon Blvd.
Hollywood, Calif. 91605.

✱ May be purchased from:
Everlube Corp.
P.O. Box 2200
Hi-Way 52 N.W.
West Lafayette, Ind. 47906

NOTE

THE LOCKING HOOKS (21) and (24) HAVE BEEN DRY FILM LUBRICATED AT THE FACTORY AND SHOULD LAST THE LIFE OF THE PARTS. HOWEVER, THEY MAY BE LUBRICATED WITH THE FOLLOWING PRODUCTS:
● 1. LUBRI-BOND A.
● 2. LUBRI-BOND 220.
✱ 3. PERMASILK.
AFTER APPLICATION, ALLOW PARTS TO AIR DRY FOR SIX HOURS, OR DRY ONE HOUR AT 120° F.

1. Cylinder
2. Back-up Ring
3. Packing
4. Back-up Ring
5. Piston/Rod
6. Packing
7. Knurled Nut
8. Bearing Head
9. Pin
10. Lock Pin
11. Cross Bar
12. Shield
13. Spring
14. Packing
15. Back-up Ring
16. Lock Nut
17. Spring Guide
18. Bolt
19. Washer
20. Washer
21. Downlock Hook
22. Washer
23. Rod End
24. Downlock Hook
25. Nut
26. Cotter Pin

Figure 5-17. Nose Gear Actuator/Downlock Assembly

NOTE

Assemble internal parts, new packings and back up rings, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

a. Install packings and back up rings in bearing head (8).
b. Install packing, and back up ring on piston/rod (5).
c. Insert piston/rod (5) into cylinder (1). Do not damage packings and back up rings.
d. With knurled nut (7) on cylinder (1), install bearing head (8) on cylinder (1). Use care to avoid damage to packings and back up rings when installing bearing head (8) on cylinder (1).

NOTE

Centerline of lock pins (10) and centerline of bushing hole must align within 0.005-inch with cylinder assembled at a length of 13.58±0.03-inches, measured from centerline of pins to centerline of bushing in cylinder at cylinder anchor end.

e. Tighten and safety wire knurled nut (7).
f. Install nut (16) on end of piston/rod (5).
g. Assemble and install hook assembly on piston.

5-119. INSTALLATION. (See figure 5-14.)

NOTE

Before installing nose gear actuator, check condition of fit and attaching bolts and bushings. Replace any defective parts. Fill actuator with hydraulic fluid.

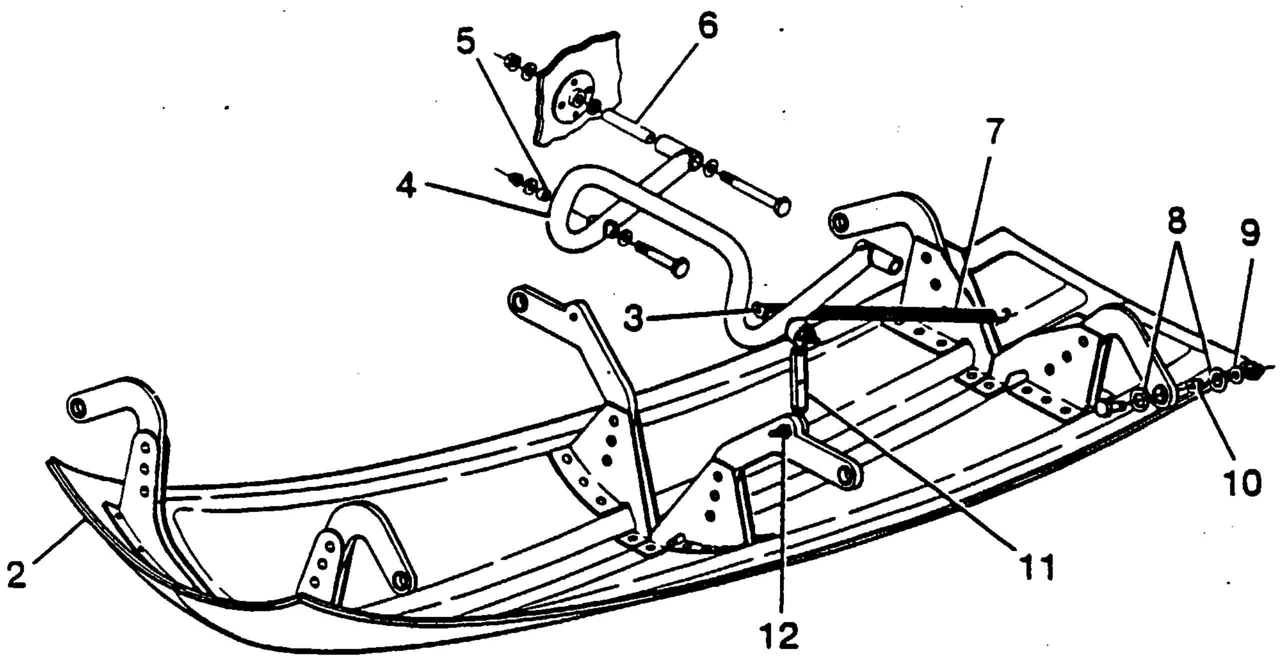
a. Attach aft end of actuator to fitting in aft end of gear well. Safety nut with cotter pin.
b. Assemble and attach downlock mechanism to trunnion as shown in figure 5-14.
c. Connect lines to actuator, and connect electrical wires to gear down switch on downlock assembly.
d. Refer to "Nose Gear Rigging" paragraph for adjustment and checking of downlock.

5-120. NOSE GEAR DOORS. (See figure 5-18.)

5-121. DESCRIPTION. The nose gear door system is comprised of a left and right-hand door, interconnected by a crossover actuator assembly. As the gear is retracted, the forward side of the nose gear fork boss contacts the actuator crossover, causing the doors to close. Overcentering springs, attached to the actuator crossover, serve to hold the doors in the full open or closed position.

5-122. REMOVAL. (See figure 5-18.)

a. Remove hinge bolts and related nuts, washers and bushings (10).
b. Disconnect adjusting rod assemblies (11) from center hinges and remove doors.
c. Disconnect spring (7), and remove actuator pivot bolts and related nuts, washers and bushings (6).



1. LH Door	4. Actuator Assembly	7. Spring	10. Bushing
2. RH Door	5. Bushing	8. AN 960-616 L Washer	11. Rod Assembly
3. Eyebolt	6. Bushing	9. AN 960-10L Washer	12. Nut

Figure 5-18. Nose Gear Doors

5-123. **INSTALLATION. (See figure 5-18.) Reverse procedures outlined in paragraph 5-122 to install doors.**

NOTE

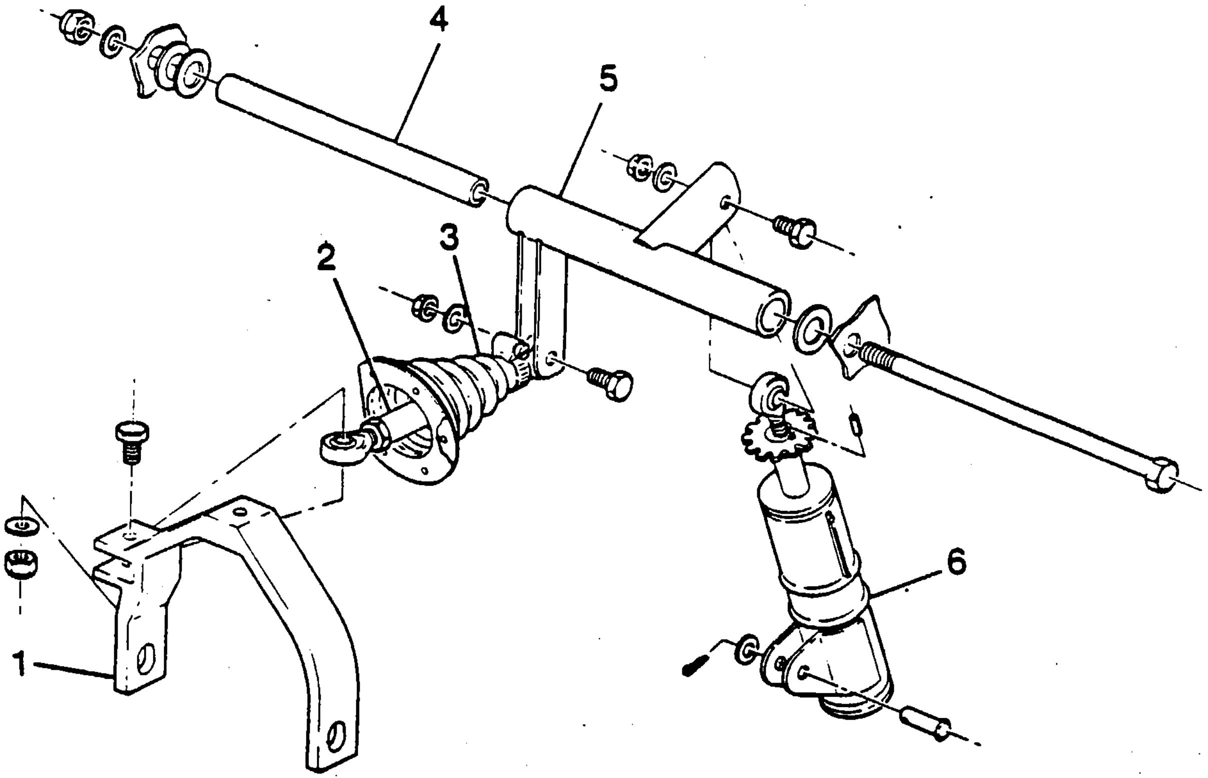
Check clearance between nose gear door and lower cowl skin to be .10 + .06, -0.00 inch. Safety wire rod assemblies (11) after having adjusted rod assemblies to fair nose gear doors in closed position. Adjust stop bolts on AN743-13 brackets to contact actuator when nose gear doors are in full open position.

5-124. NOSE WHEEL STEERING SYSTEM. (See figure 5-19.)

5-125. DESCRIPTION. The nose wheel steering system links the rudder pedals to the nose wheel fork. affording steering control through use of the rudder pedals. Kinematics of the system automatically straighten the nose wheel as the landing gear is retracted. During retraction. the centering block on the upper torque link aligns and locks the nose wheel in the neutral position. Continued free movement of the rudder pedals is assured by the steering bungee.

5-126. REMOVAL AND INSTALLATION OF NOSE WHEEL STEERING SYSTEM COMPONENTS. (See figure 5-19.) Refer to the figure as a guide in determining relationship of steering system components.

5-127. RIGGING NOSE WHEEL STEERING SYSTEM. Since the nose wheel steering system is



1. **Bellcrank**
2. **Steering Rod**
3. **Boot**
4. **Bushing**
5. **Bellcrank**
6. **Bungee**

Figure 5-19. Nose Gear Steering

connected with the rudder control system, adjustment to one system would directly affect the other. Refer to Section 10 of this manual for rigging procedure for the rudder system and the nose wheel steering system.

5-128. NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

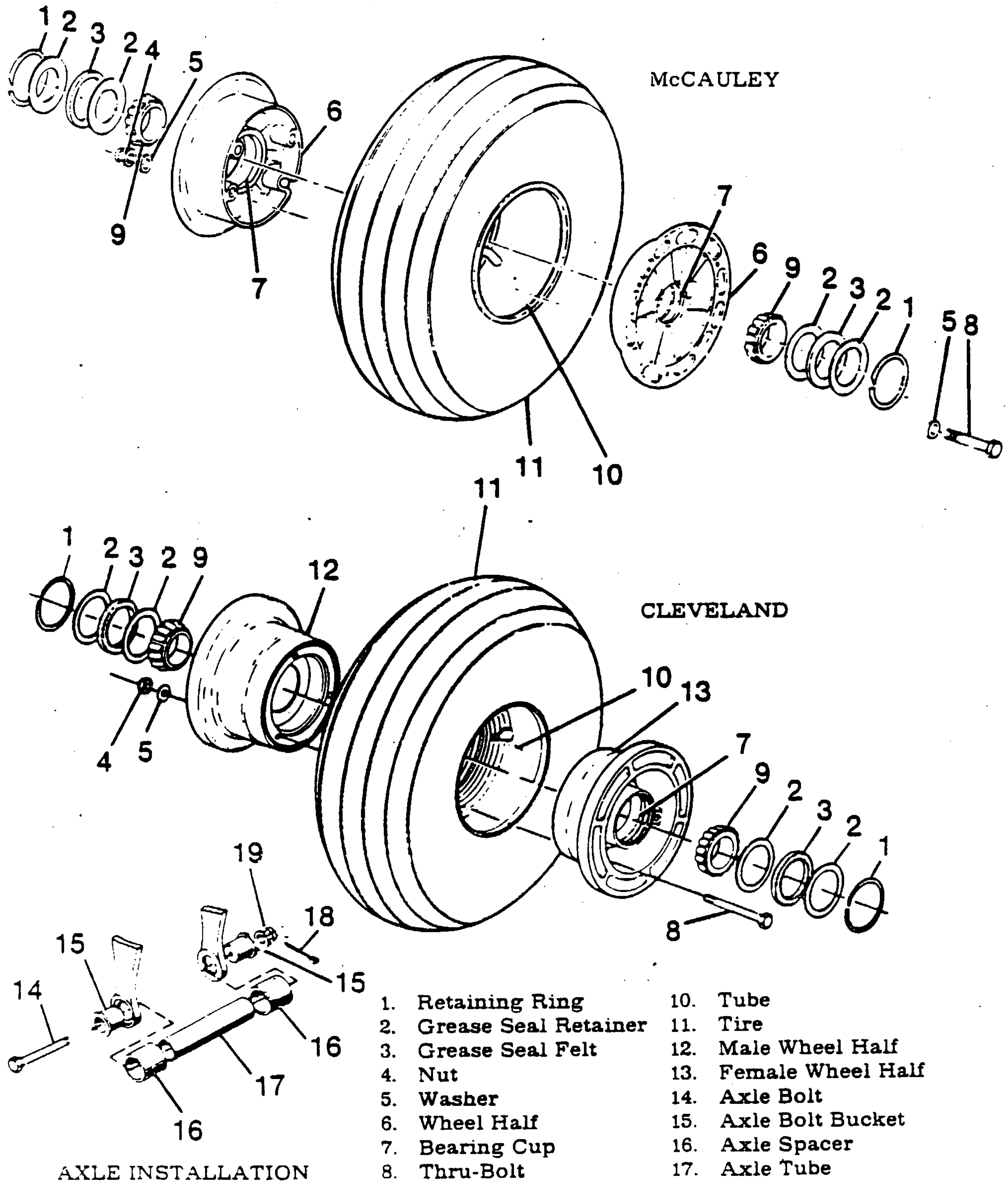
5-129. DESCRIPTION. The aircraft may be equipped with either Cleveland or McCauley wheel assemblies. Separate disassembly, inspection and reassembly procedures are provided for each type. Basic differences of the two types are illustrated in figure 5-20.

CAUTION

Use of recapped tires or new tires not listed on the aircraft equipment list are not recommended due to possible interference between the tire and structure when landing gear is in the retracted position.

5-130. REMOVAL AND INSTALLATION. (See figure 5-20.)

a. Weight or tie-down tail of aircraft to raise the nose wheel off floor.
b. Remove cotter pin, castellated nut and nose wheel axle bolt.
c. Beginning with 1980 models, remove hub cap.



1. Retaining Ring
2. Grease Seal Retainer
3. Grease Seal Felt
4. Nut
5. Washer
6. Wheel Half
7. Bearing Cup
8. Thru-Bolt
9. Bearing Cone
10. Tube
11. Tire
12. Male Wheel Half
13. Female Wheel Half
14. Axle Bolt
15. Axle Bolt Bucket
16. Axle Spacer
17. Axle Tube
18. Cotter Pin
19. Nut

Figure 5-20. Nose Wheel and Tire Assembly

d. Use a rod or long punch inserted through one axle bolt ferrule to tap the opposite ferrule out of fork. Remove both ferrules and pull nose wheel from fork.
e. Remove spacers and axle tube from nose wheel.
f. Reverse preceding steps to install wheel.

5-131. DISASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

a. Remove hub cap, completely deflate tire, and break tire beads loose from wheel rims.

WARNING

Injury can result from attempting to separate wheel halves with tire inflated. Avoid damaging wheel flanges when breaking tire beads loose. Do not use impact wrenches on thru-bolts or nuts.

b. Remove thru-bolts and separate wheel halves.
c. Remove tire and tube from wheel halves.
d. Remove bearing retaining rings, grease seals and bearing cones.

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless installation of new cups is necessary. To remove, heat wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out the bearing cup and press in the new one while the wheel is still hot.

5-132. INSPECTION AND REPAIR OF CLEVELAND WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

a. Clean all metal parts and grease seal felts in cleaning solvent and dry thoroughly.
b. Inspect wheel halves for cracks. Cracked wheel halves must be rejected and new parts installed. Sand out 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. Bearing cups and cones must be inspected carefully for damage and discoloration. After cleaning, repack cones with clean aircraft wheel bearing grease before installation in the wheel half.

5-133. REASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

a. Insert tube in tire, aligning index marks on tire and tube.
b. Place tire and tube on wheel half and position valve stem through hole in wheel half.
c. Insert thru-bolts, position opposite wheel half, and secure with washers and nuts. Take care and avoid pinching tube between wheel halves. Torque thru-bolt nuts evenly to 140-150-in.

CAUTION

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

d. Clean and repack bearing cones with clean aircraft wheel bearing grease.
e. Assemble bearing cones, seals, and retainers into wheel halves.

f. Inflate tire to seat tire beads, then adjust to pressure stipulated in Section 1 of this manual.
g. Install hub caps and install wheel in accordance with paragraph 5-123.

5-134. DISASSEMBLY OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY. (See figure 5-20.)

WARNING

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

a. **Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.**
b. **Remove nuts and washers.**
c. **Remove thru-bolts and washers.**
d. **Separate and remove wheel halves from tire and tube.**
e. **Remove retaining ring, grease seal retainer, felt grease seal, grease retainer and bearing cone from each wheel half.**

NOTE

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

5-135. INSPECTION AND REPAIR OF McCAULEY WHEEL AND TIRE ASSEMBLY. (See fige 5-20.)

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

NOTE

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

b. Inspect wheel halves for cracks or damage.
c. Inspect bearing cones, cups, retaining rings and seals for wear or damage.
d. Inspect thru-bolts and nuts for cracks in threads or cracks in radius under bolt head.
e. Replace cracked or damaged wheel halves.
f. Replace damaged retaining rings and seals.
g. Remove any corrosion or small nicks.
h. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer.
i. Pack bearings with grease specified in Section 2 of this manual.

5-136. REASSEMBLY OF McCAULEY NOSE WHEEL. (See figure 5-20.)

a. Assemble bearing cone, grease seal retainer, grease seal felt, grease seal retainer and retaining rings in each wheel half.
b. Insert tube in tire, aligning index marks on tube and tire.
c. Place wheel half into tire and tube (side opposite valve stem), aligning base of valve

stem in valve slot. With washer under head of thru-bolt, insert bolt through wheel half.

d. Place wheel half into other side of tire and tube, aligning valve stem in valve slot.
e. Install washers and nuts on thru-bolts and pre-torque to 10-50 lb-in.
f. Prior to torquing nuts, inflate tube with approximately 10-15 psi air pressure to seat tire.
g. Dry torque all nuts evenly to a torque value of 140-150 lb-in.

CAUTION

Uneven or improper torque of the thru-bolt nuts can cause failure of the bolts with resultant wheel failure. Do not use impact wrenches on thru-bolts or nuts.

h. Inflate tire to pressure stipulated in Section 1 of this manual.

5-137. BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of the tire is marked with a red dot on the tire sidewall, and the heavy-weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel becomes unbalanced during service, it may be statically balanced. Wheel balancing equipment is available from the Cessna Supply Division.

5-137A. NOSE GEAR POSITION INDICATOR SWITCHES. (See figure 5-21.)

5-137B. DESCRIPTION. The downlock indicator switch is located on the nose gear actuator and is operated by the downlock hook. Beginning with 1982 models, the nose gear -up indicator switch is installed on a bracket mounted on the nose gear tunnel top.

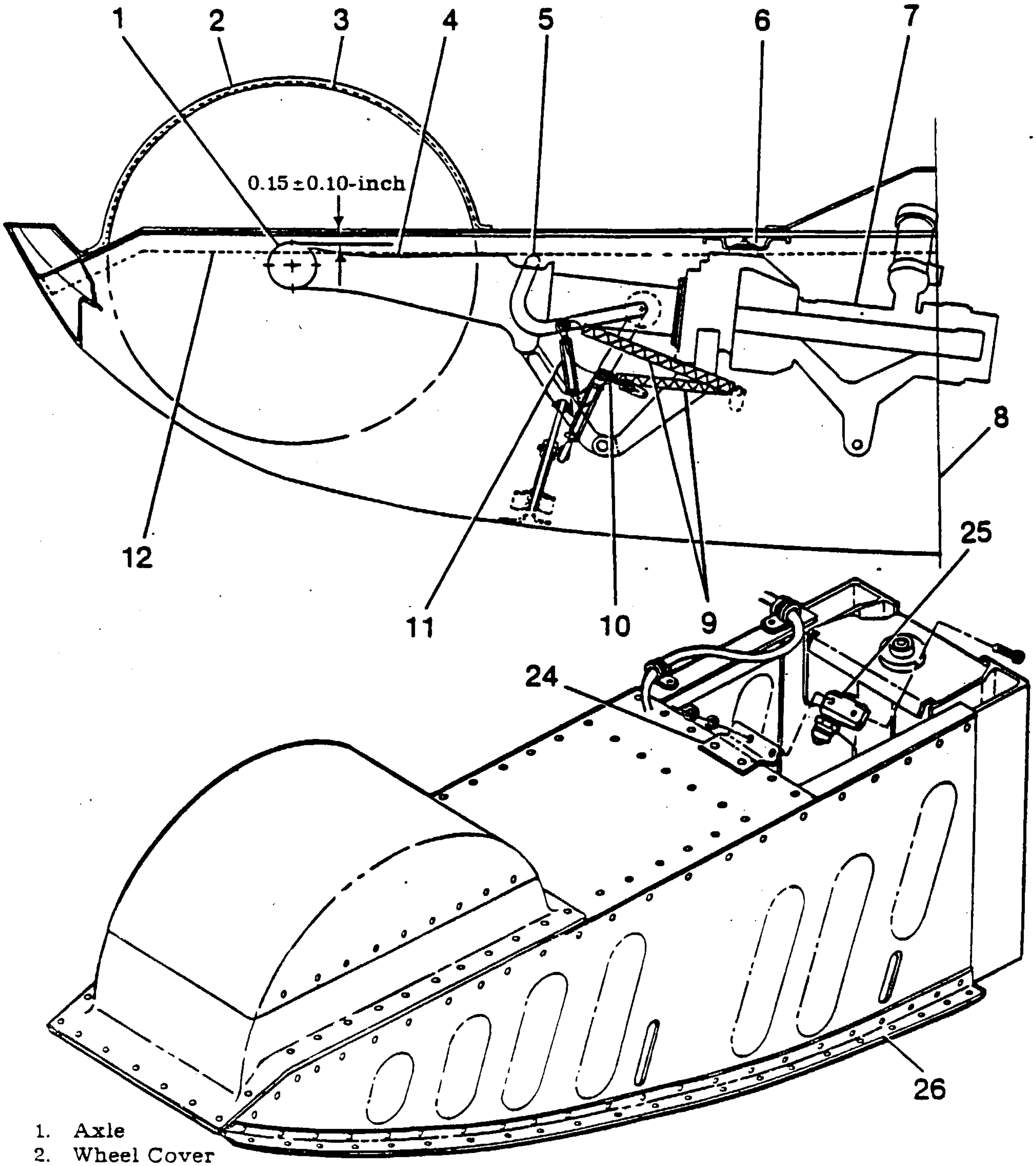
5-138. NOSE GEAR RIGGING. (See figure 5-21.)

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Place gear selector handle in DOWN position. Turn master switch ON, and allow system to pressurize. Turn master switch OFF and pull gear pump circuit breaker.
c. See figure 5-14, view A-A, for correct amount of strut extension.

WARNING

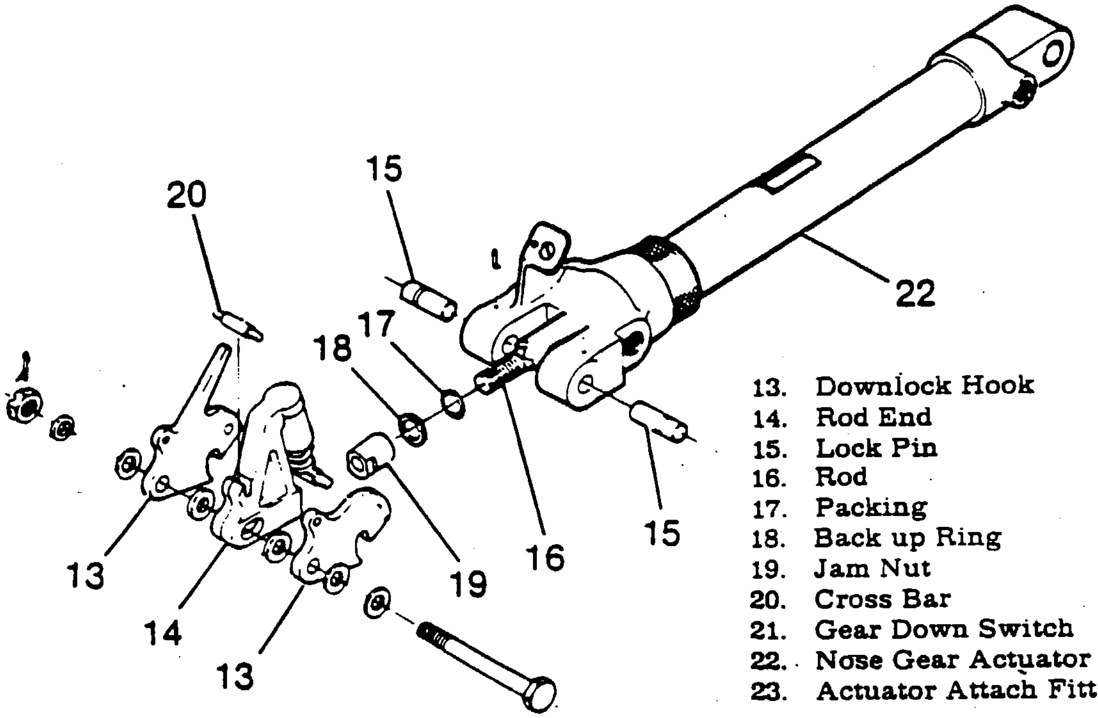
If clearance is not as specified, completely deflate nose gear strut and disconnect torque links.

d. Add or delete shims as required between centering block and upper torque link until specified extension is obtained with strut fully extended.
e. Disconnect adjusting rods (11) from gear doors, and secure doors in full open position with tape.
f. Turn master switch ON and place landing gear selector handle in UP position.
g. Top edge of axle must be within 0.15±0.10-inch of bottom flange surface of attach angle (12). Adjust bumper plate (6) as necessary to position axle correctly.

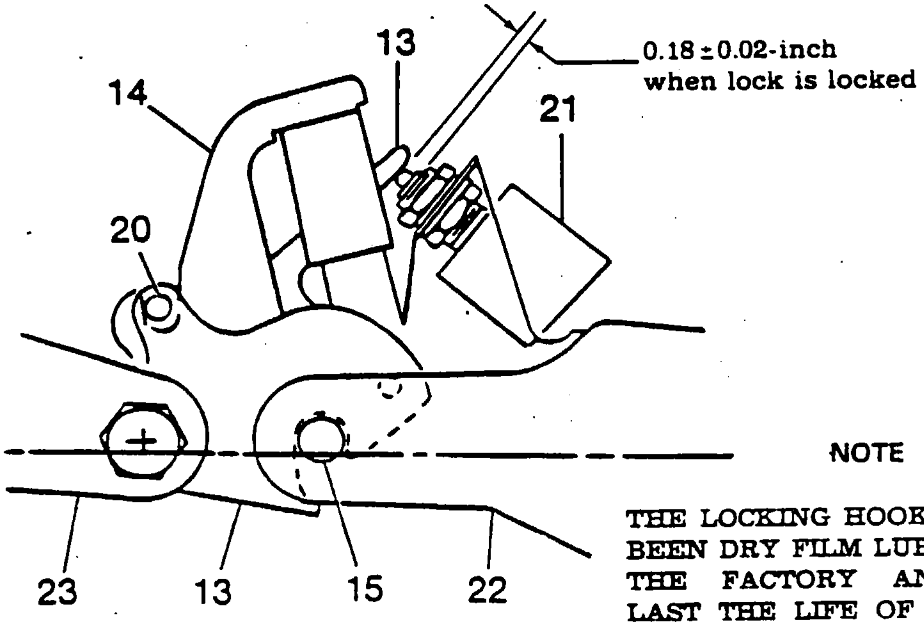


1. Axle
2. Wheel Cover
3. Nose Wheel
4. Fork
5. Actuator Assembly
6. Bumper Plate
7. Nose Gear Strut
8. Firewall
9. Spring
10. Stop Bolt
11. Adjusting Rod
12. Attach Angle
24. Bracket
25. Up Indicator Switch
26. Nose Gear Tunnel

Figure 5-21. Nose Gear Rigging (Sheet 1 of 2)



13. Downlock Hook
14. Rod End
15. Lock Pin
16. Rod
17. Packing
18. Back up Ring
19. Jam Nut
20. Cross Bar
21. Gear Down Switch
22. Nose Gear Actuator
23. Actuator Attach Fitting



0.18 ± 0.02-inch
when lock is locked

● May be purchased from:
Electro-Film Inc.
7116 Laurel Canyon Blvd.
Hollywood, Calif. 91605.

* May be purchased from:
Everlube Corp.
P.O. Box 2200
Hi-Way 52 N.W.
West Lafayette, Ind. 47906

NOTE

THE LOCKING HOOKS (13) HAVE BEEN DRY FILM LUBRICATED AT THE FACTORY AND SHOULD LAST THE LIFE OF THE PARTS. HOWEVER, THEY MAY BE LUBRICATED WITH THE FOLLOWING PRODUCTS:

● 1. LUBRI-BOND A.
● 2. LUBRI-BOND 220.
* 3. PERMASILK.

AFTER APPLICATION, ALLOW PARTS TO AIR DRY FOR SIX HOURS, OR DRY ONE HOUR AT 120°F.

Figure 5-21. Nose Gear Rigging (Sheet 2 of 2)

h. Close gear doors, one at a time, and attach adjusting rods (11). Adjust length of rods until doors fair with cowling. Remove rods from doors, and secure doors in full open position with tape.
i. Run gear down to midway position. Turn master switch OFF.
j. Attach rods (11) to doors and swing gear by hand to ensure that doors clear any part of the nose gear assembly by a minimum of 0.25-inch clearance. Check clearance between nose gear door and lower cowl skin to be .10 + *.06, -.00 inch.*
k. Run gear to full UP position and check that doors fair. If necessary, make final adjustments to rods (11). Tighten jam nuts on rods. Safety wire rod assemblies. Check that gear-up indicator actuates and up light illuminates. Beginning with 1983 models, check that the GEAR UNSAFE light is off.
l. Run gear to full DOWN position and turn master switch OFF. Adjust stop bolts (10) to provide simultaneous contact with actuator (5) on each side with minimum stop bolt extension. Start with stop bolts turned all the way in. Linkage must be overcenter when doors are fully open.
m. Cycle gear several times, using ship's power pack, and at least twice, using the system's emergency hand pump. A 28-volt DC, 60-amp electric power supply may be used.
n. Run gear to full DOWN position and remove aircraft from jacks.

5-139. BRAKE SYSTEM. (See figure 5-24.)

5-140. DESCRIPTION. **The hydraulic brake system is comprised of two master cylinders, located immediately forward of the rudder pedals, brake hose and lines connecting each master cylinder to its wheel brake cylinder, and the disc-type brake assembly, located at each main landing gear wheel.**

5-141. TROUBLE SHOOTING -- BRAKE SYSTEM.

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.
	Restriction in hydraulic lines or in passage in master cylinder compensating sleeve.	Remove restrictions: flush brake system with hydraulic fluid. Repair or replace master cylinder.
	Warped or badly scored brake disc.	Replace disc and linings.

5-141. TROUBLE SHOOTING -- BRAKE SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
	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.
	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.

5-142. BRAKE MASTER CYLINDER. (See figure 5-22.)

5-143. DESCRIPTION. The brake master cylinders, located immediately forward of the pilot's rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder for the fluid supply. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.

5-144. REMOVAL. (See figure 5-22.)

a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
b. Remove front seats and rudder bar shield for access to brake master cylinders.
c. Disconnect parking brake linkage and disconnect brake master cylinders from rudder pedals.

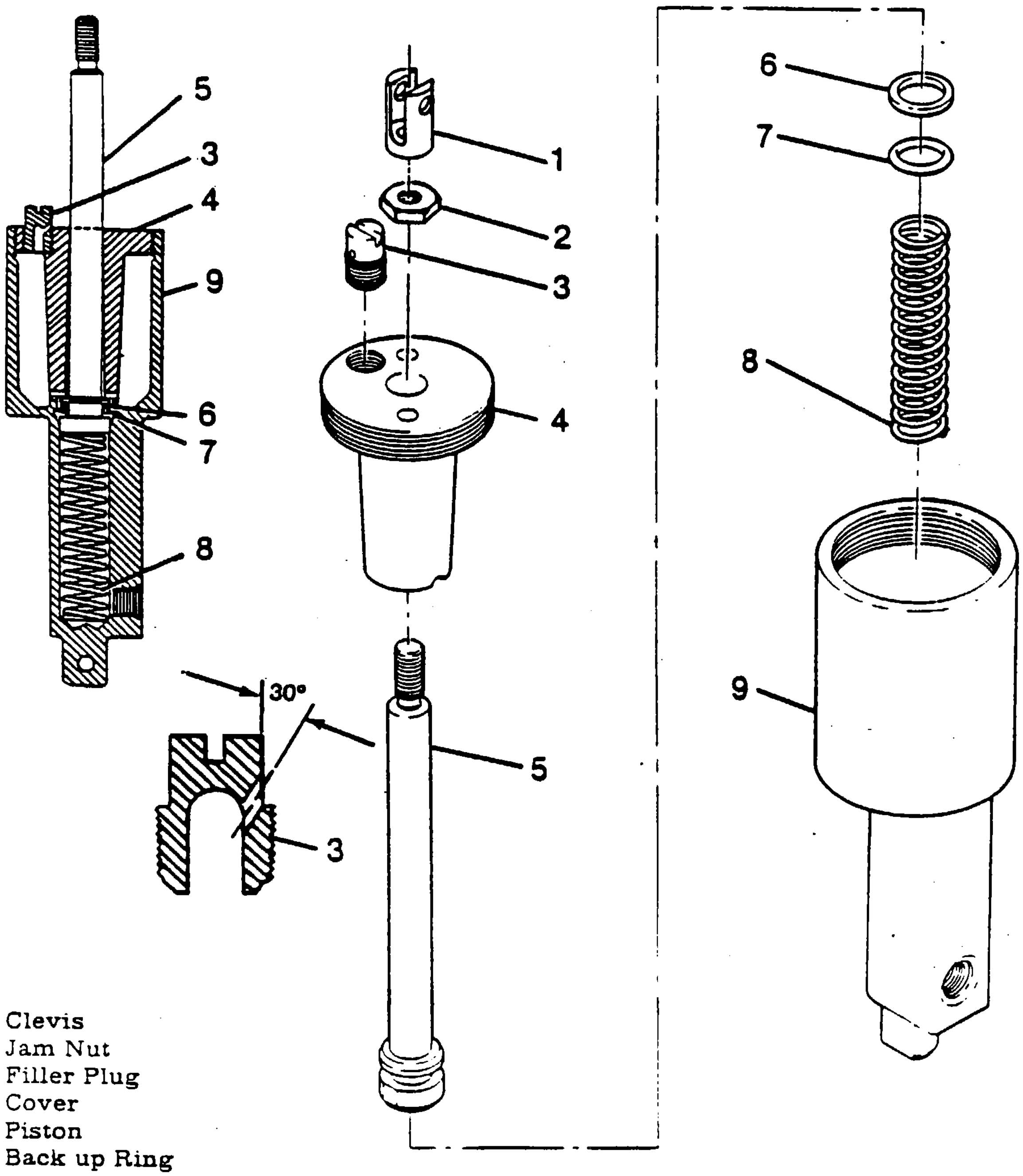
5-145. DISASSEMBLY. (See figure 5-22.)

a. Unscrew clevis (1) and jam nut (2).
b. Remove filler plug (3).

NOTE

A special tool, brake master cylinder wrench No. 34-101 is available from the Cessna Supply Division to accomplish the following step.

c. Unscrew cover (4), and remove up over piston rod (5).
d. Remove piston (5) and spring (8).
e. Remove packing (7) and back up ring (6) from piston.



1. Clevis
2. Jam Nut
3. Filler Plug
4. Cover
5. Piston
6. Back up Ring
7. Packing
8. Spring
9. Cylinder Body

Figure 5-22. Brake Master Cylinder

5-146. INSPECTION AND REPAIR. (See figure 5-22.) Repair is limited to installation of new parts and cleaning. Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinder. Replace packing and back up ring. Filler plug (3) must be vented so pressure cannot build up during brake operation.

5-147. REASSEMBLY. (See figure 5-22.)

a. Install spring (8) into cylinder body (9).
b. Install back up ring (6) and packing (7) in groove of piston (5).
c. Install piston (5) in cylinder body (9).
d. Install cover (4) over piston (5) and screw cover into cylinder body (9).
e. Install nut (2) and clevis (1).
f. Install filler plug (3), making sure vent hole is open.

5-148. HYDRAULIC BRAKE LINES.

5-149. DESCRIPTION. Brake lines are of rigid tubing, except for flexible hose used at the brake master cylinders. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.

5-150. WHEEL BRAKE ASSEMBLIES. (See figure 5-10.)

5-151. DESCRIPTION. The wheel brake assemblies employ a floating brake assembly and a disc which is attached to the main wheel.

5-152. REMOVAL. (See figure 5-8.) Disconnect and drain brake line and remove back plate. The brake disc is removed after the wheel is removed and disassembled. To remove torque plate, remove wheels and axles.

5-153. DISASSEMBLY. (See figure 5-10.) Refer to the figure for breakdown of wheel brake parts. The figure may be used as a guide for disassembling the wheel brakes.

5-154. INSPECTION AND REPAIR. (See figure 5-10.)

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

NOTE

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

c. Check brake lining for deterioration and maximum permissible wear. (Refer to applicable paragraph for maximum wear limit.)
d. Inspect brake cylinder bore for scoring. A scored cylinder will leak or cause rapid O-ring wear. Install a new brake cylinder if the bore is scored.
e. If the anchor bolts on the brake assemblies are nicked or gouged, they shall be sanded smooth to prevent binding with the pressure plate or torque plate. When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft mallet.
f. Inspect wheel brake disc for a minimum thickness of .190-inch (McCauley) or .190-inch (Cleveland). If brake disc is below minimum thickness, install new part.

5-155. REASSEMBLY. (See figure 5-10.)

NOTE

Lubricate parts with clean hydraulic fluid during brake reassembly.

a. See figure 5-10 and use the figure as a guide while reassembling wheel brakes.

5-156. INSTALLATION. (5-10.)

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

NOTE

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

CAUTION

Correct clocking of the brake line elbow on the wheel brake cylinder is very important in order to avoid interference with aircraft structure during retraction of the gear.

5-157. CHECKING BRAKE LINING WEAR. New brake lining should be installed when the existing lining has worn to a thickness of 3/32-inch. A 3/32-inch thick strip of material held adjacent to each lining can be used to determine amount of wear. The shank end of a drill bit of the correct size can also be used to determine wear of brake linings.

5-158. BRAKE LINING INSTALLATION. (See figure 5-10.)

a. Remove bolts securing back plate; remove back plate.
b. Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.
c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller) punch in the rolled rivet, and hit the punch sharply with a hammer. Punch out all rivets securing lines to back plate and pressure plate in the same manner.

NOTE

A rivet setting kit, Part No. 199-00100 is available fron the Cessna Supply Division. 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 head against anvil.
f. Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with hammer to set rivet. Repeat blows on punch until lining is firmly against back plate.
g. Realign lining on the back plate and install and set rivets in 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 torque plate.
j. Install back plate with bolts and washers.

5-159. BRAKE SYSTEM BLEEDING.

NOTE

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

a. Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into the filler hole at top of the brake master cylinder.
b. Immerse opposite end of flexible hose into a container with enough hydraulic fluid to cover end of hose.
c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro - Fill unit to the bleeder valve in the wheel cylinder.
d. As fluid is pumped into the system, observe the immersed end of the hose at the 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.

5-159A. BRAKE LINING BURN-IN. The brake pads are equipped with either a non-asbestos organic lining or an iron based metallic lining. These materials must be properly conditioned (glazed) in order to provide maximum performance and service life. This is accomplished by a brake burn-in.

a. Non-asbestos organic lining.
    1. Taxi airplane for 1500 feet with engine at 1700 RPM applying brake pedal force as needed to develop a 5 to 9 knots taxi speed.
    2. Allow brakes to cool for 10 to 15 minutes.
    3. Apply brakes and check to see if a high throttle static run up may be held with normal pedal force. If so, burn-in is completed.
    4. If static run up cannot be held, repeat steps 1 thru 3 as needed to successfully hold.
b. Iron based metallic lining.
    1. Perform two consecutive full stop braking applications from 30 to 35 knots. Do not allow the brake discs to cool substantially between stops.

NOTE

Light brake usage can cause the glaze to wear off, resulting in reduced brake performance. In such cases, the lining may be conditioned again following the instructions set forth in this burn-in procedure.

5-160. PARKING BRAKE SYSTEM. (See figure 5-23.)

5-161. DESCRIPTION. The parking brake system consists of a handle and ratchet mechanism, connected by a cable to linkage at the brake master cylinders. Pulling out on the handle depresses both brake master cylinder piston rods and the handle ratchet locks the handle in this position until the handle is turned and released.

5-162. REMOVAL AND INSTALLATION. See figure 5-23 for relative location of system components. The illustration may be used as a guide during removal and installation of components.

5-163. INSPECTION AND REPAIR OF SYSTEM COMPONENTS. Inspect lines for leaks, cracks. dents. chafing, improper radius, security, corrosion, deterioration, obstructions and foreign matter. Check brake master cylinders and repair as outlined in applicable paragraph in this Section. Check parking brake handle and ratchet for proper operation and release. Replace worn or damaged parts.

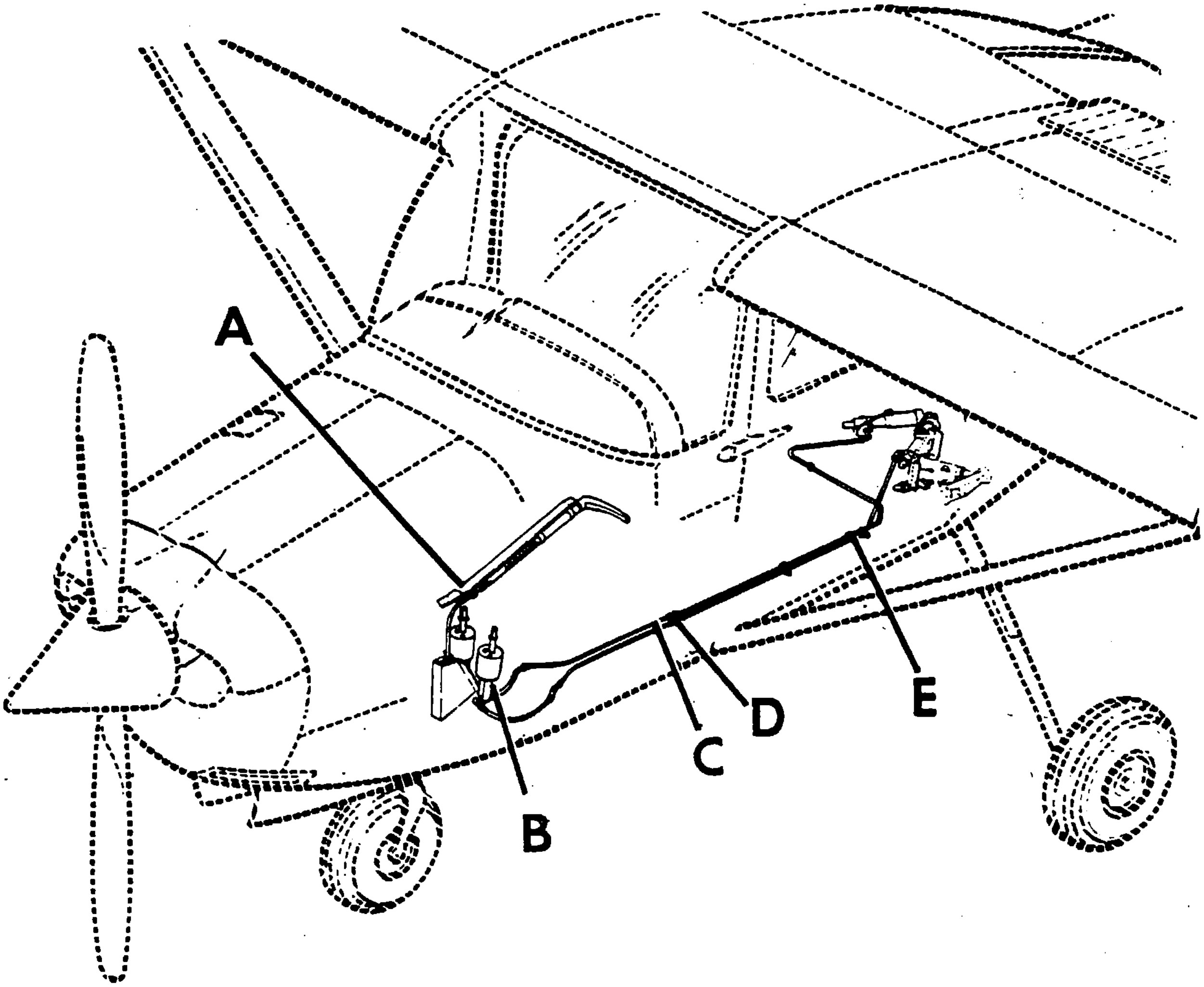
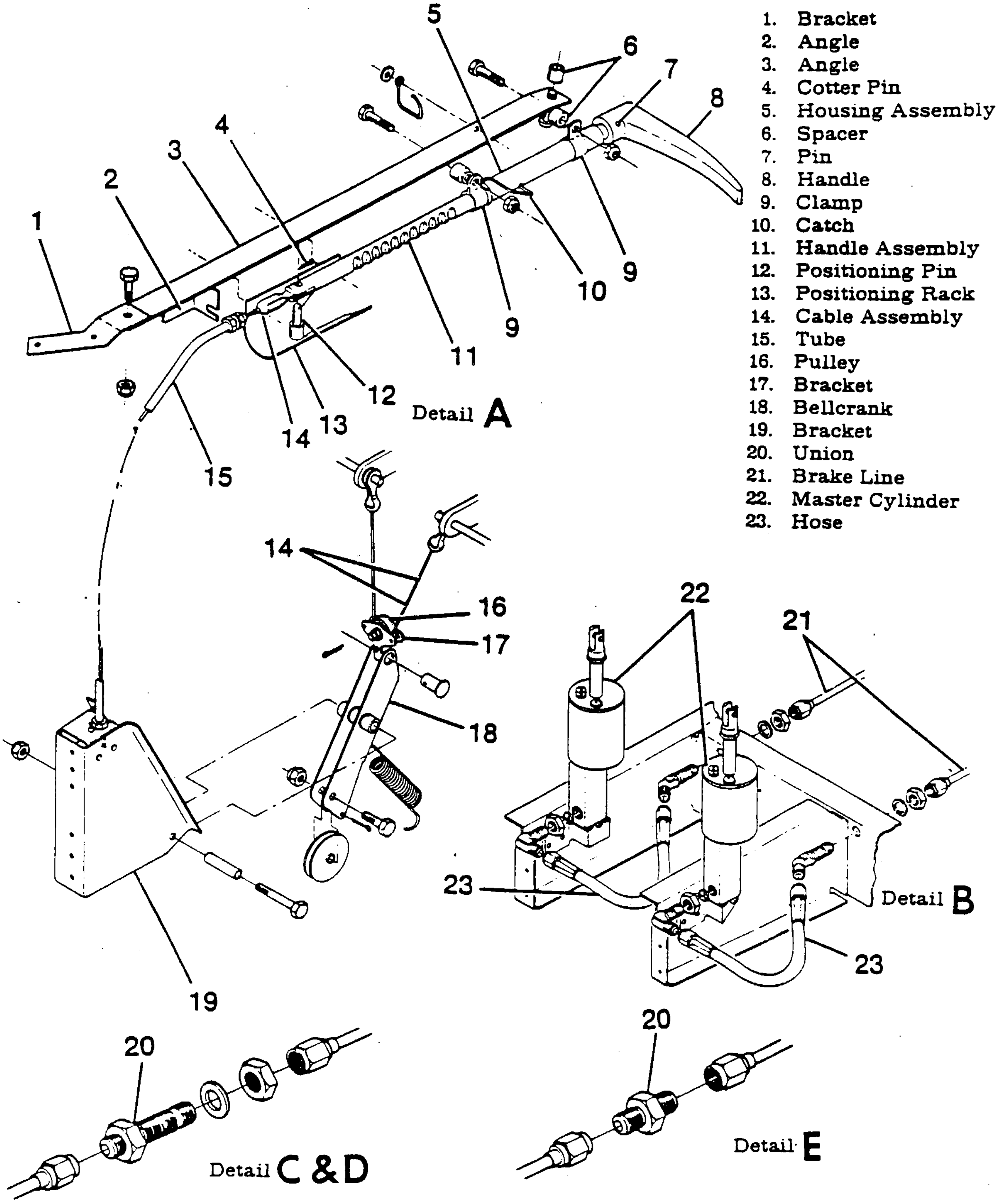


Figure 5-23. Brake System (Sheet 1 of 2)



1. Bracket
2. Angle
3. Angle
4. Cotter Pin
5. Housing Assembly
6. Spacer
7. Pin
8. Handle
9. Clamp
10. Catch
11. Handle Assembly
12. Positioning Pin
13. Positioning Rack
14. Cable Assembly
15. Tube
16. Pulley
17. Bracket
18. Bellcrank
19. Bracket
20. Union
21. Brake Line
22. Master Cylinder
23. Hose

Figure 5-23. Brake System (Sheet 2 of 2)

SECTION 6

AILERON CONTROL SYSTEM

6-1. AILERON CONTROL SYSTEM. (See figure 6-1.)

6-2. DESCRIPTION. The aileron control system is a mechanically operated system consisting of a series of sprockets, chains, pulleys, cables, bellcranks and push-pull tubes which control the ailerons from the control wheels. Rotation of the control wheel transmits rotation to a sprocket at the forward end of the control column (either pilot's or copilot's). The sprocket drives a chain which is attached to a cable and the cable wraps once around the cable drum, located on the control "U", and in turn drives the opposite sprocket. The cable drum synchronizes the rotation of the opposite control wheel (if installed) and the LH and RH ailerons through the attached cable pulleys, turnbuckles, bellcranks and push-pull tubes.

6-3. TROUBLE SHOOTING.

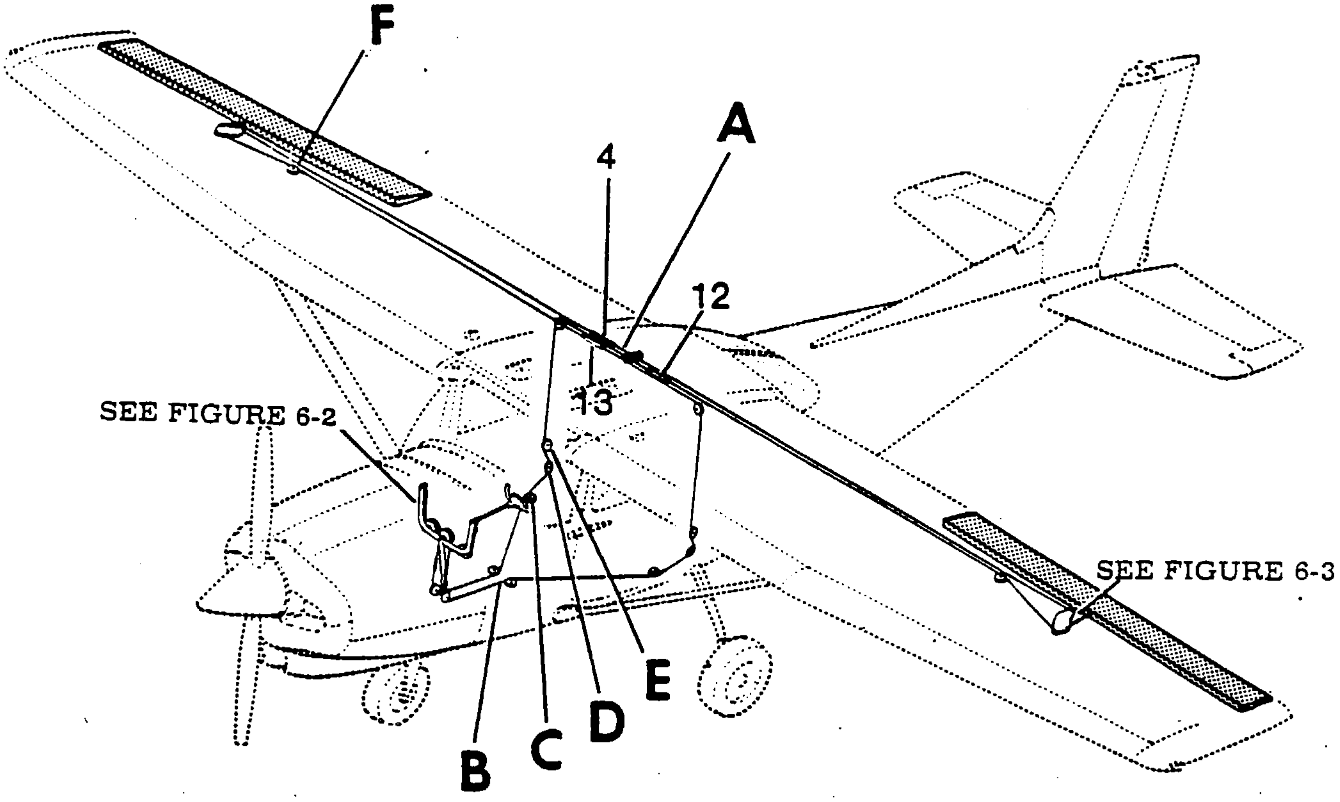
NOTE

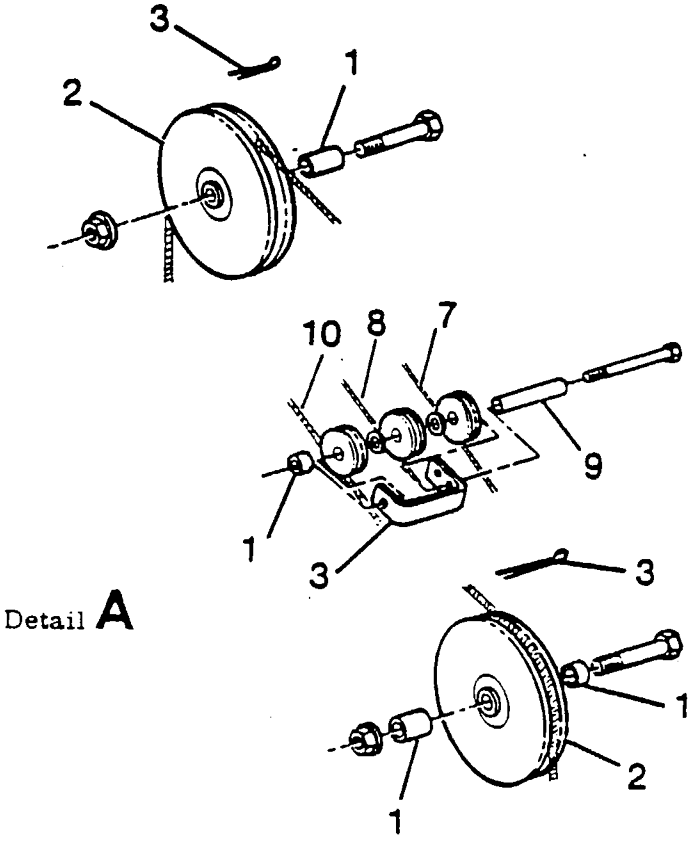
Due to remedy procedures in the following trouble shooting chart it may be necessary to rerig system, refer to paragraph 6-18.

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

6-3. TROUBLE SHOOTING (Cont).

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





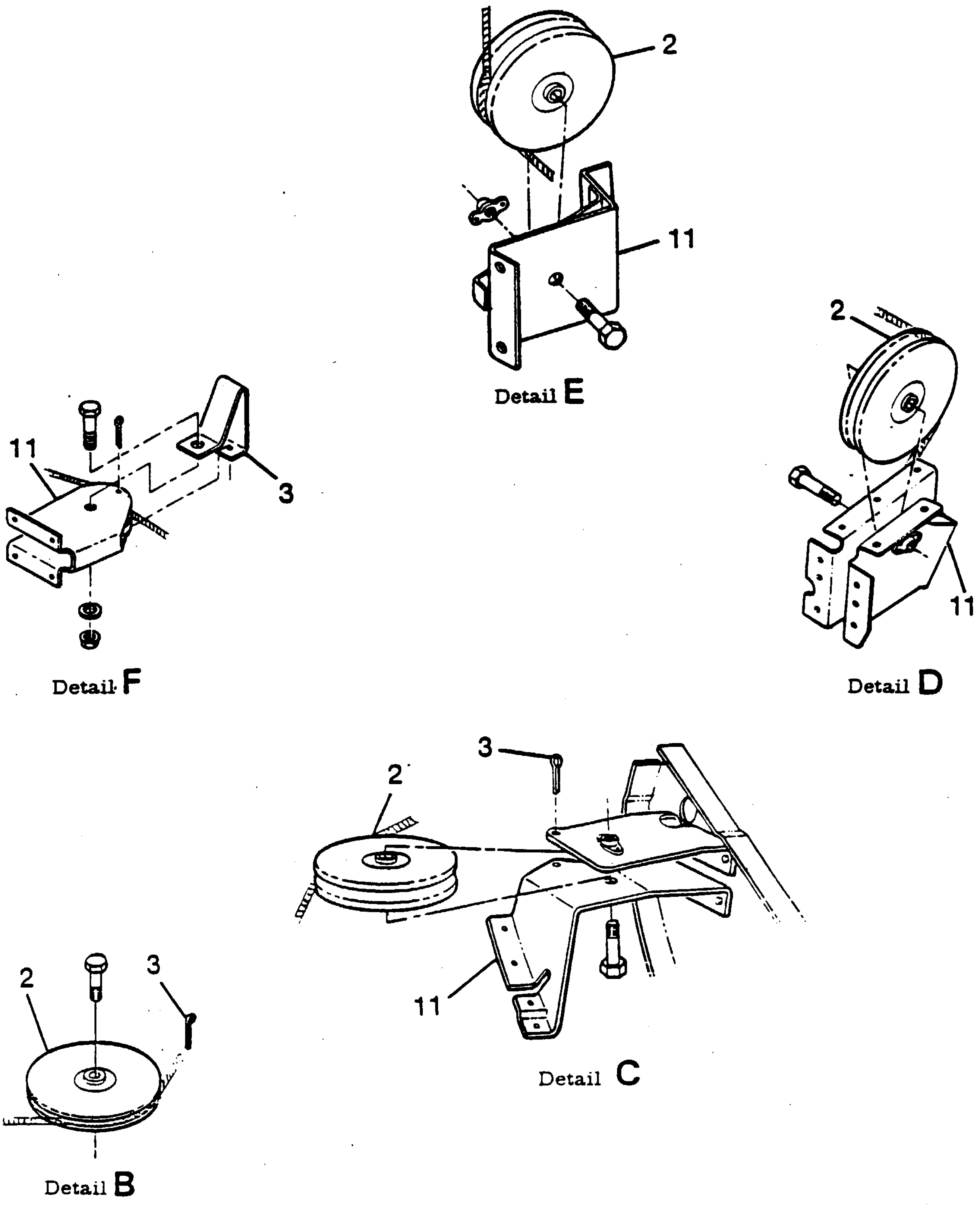
1. Spacer
2. Pulley
3. Cable Guard
4. Carry-Thru Cable Turnbuckle
5. Bellcrank
6. Aileron
7. Carry-Thru Cable
8. RH Direct Cable
9. Bushing
10. LH Direct Cable
11. Pulley Bracket
12. RH Direct Cable Turnbuckle
13. LH Direct Cable Turnbuckle

CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

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

Figure 6-1. Aileron Control System (Sheet 1 of 2)



Detail E

Detail F

Detail D

Detail C

Detail B

Figure 6-1. Aileron Control System (Sheet 2 of 2)

6-4. CONTROL "U". (See figure 6-2.)

6-5. DESCRIPTION. The control "U" transforms motion applied to the control wheel(s) to the ailerons and the elevator through cables. Forward and aft movements of the control wheel(s) pivot the control "U" which in turn operates the elevator. Rotation of the control wheels operates the ailerons.

6-6. REMOVAL.

a. Disconnect battery cables and insulate terminals as a safety precaution.
b. Remove pedestal cover as outlined in Section 9.
c. Remove rudder bar shields, carpeting and plates as necessary for access to lower end of control "U".
d. Remove radios, radio cooling plans, dust covers and associated hardware as necessary.
e. Remove glove box.
f. Remove cabin air cooling hose directly below right hand side of instrument panel.
g. Remove engine controls and cabin air controls as necessary.
h. Remove right hand forward side upholstery panel.
i. Remove bolt from each end of parking brake assembly and swing assembly away from working area.
j. Remove roller (26), spacer (25) and attaching hardware from the pilot's side of the control "U", bearing (27) and bushing (28) from copilot's side.
k. Drill out rivets attaching instrument panel support (after completion of step j.) and remove support.
l. Drill out rivets attaching right hand side panel to pedestal structure and remove panel.
m. Remove safety wire and disconnect the direct cable turnbuckles (12).
n. Remove bolts attaching the control columns (18) to universal joints (9) and remove columns.
o. Remove hose (16) from universal joints.
p. Remove bolt (15) attaching push-pull tube (13) to the control "U".
q. Remove pivot bolt (14) and carefully work control "U" from under right hand side of instrument panel.

6-6A. INSTALLATION.

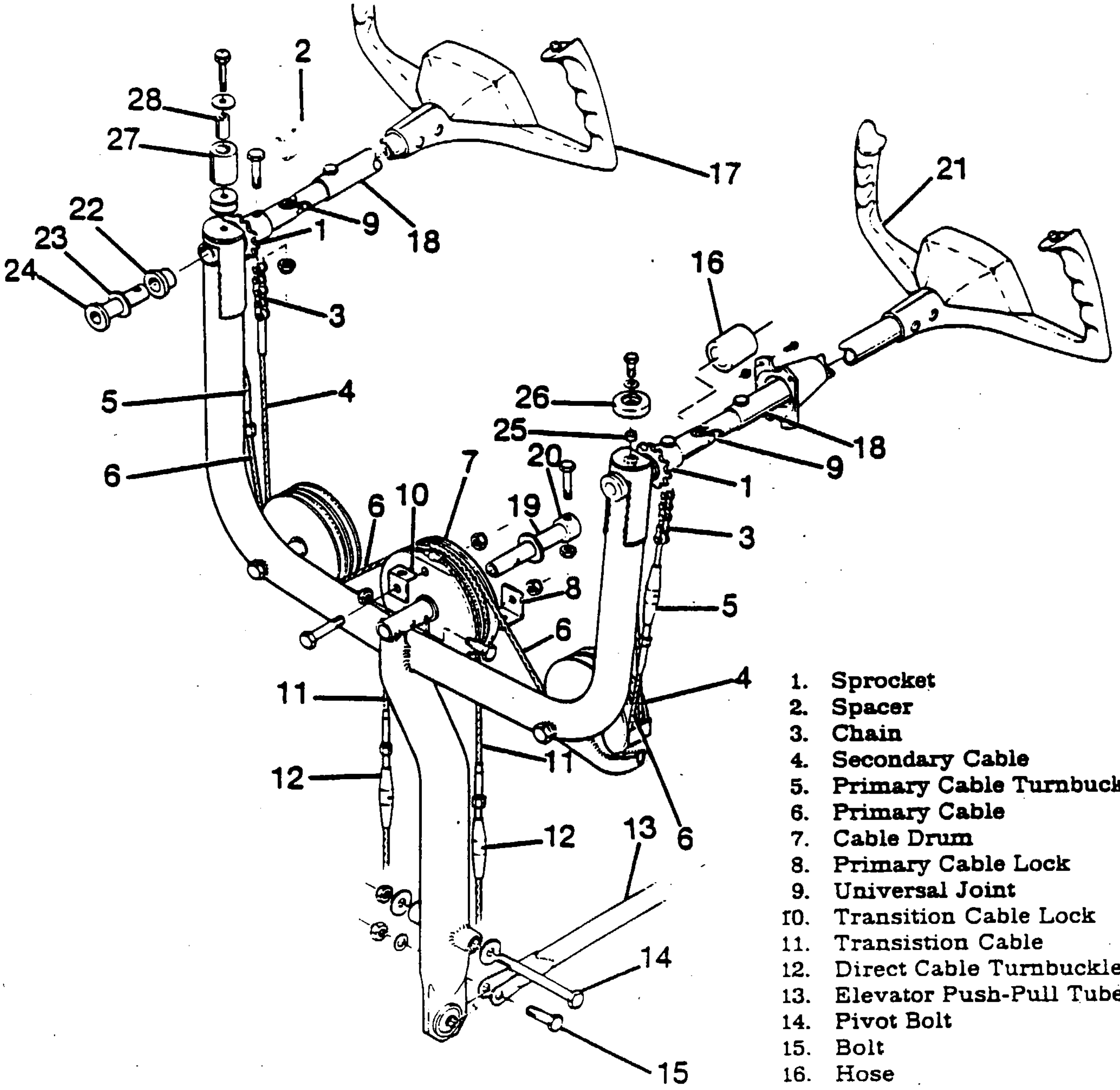
a. Reverse steps given under REMOVAL (Refer to paragraph 6-6.)

NOTE

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

NOTE

See figure 6-2. Install cable drum (7) with wide groove aft. Primary cable (6) is wrapped once around aft groove in cable drum (7) with cable lock (8) on bottom. Transition cable (11) is installed in forward groove of cable drum (7) with lock (10) on top. When dual control are NOT installed, spacer (2) replaces copilot's control wheel (17), control column (18), universal joint (9) and hose (16).



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

Figure 6-2. Control "U" Installation

b. Rig aileron control system in accordance with paragraph 6-18.
c. Check and/or rig elevator control system in accordance with Section 8.
d. Check and/or rig all engine and cabin air controls.
e. Check all radios and electrical equipment which may have been disconnected.
f. Reinstall all items removed for access.

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

6-8. AILERON BELLCRANK. (See figure 6-3.)

6-9. REMOVAL.

a. Remove access plate inboard of each bellcrank on underside of wing.
b. Relieve control cable tension by loosening turnbuckle barrel (18)
c. Disconnect control cables from bellcrank. Retain all spacers (12).
d. Disconnect aileron push-pull rod (8) at bellcrank.
e. Remove nuts, washers and bolts securing bellcrank stop bushing (15) and bellcrank (7) to wing structure.
f. Remove bellcrank through access opening, using care that bushing (5) is not dropped from bellcrank.

NOTE

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

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

6-11. INSTALLATION.

a. Place bushing (5) and stop-bushing (15) in bellcrank (7) and position bellcrank in wing.
b. Install brass washers (11) between lower end of bellcrank and wing channel (9) to shim out excess clearance.
c. Install bellcrank pivot bolt (4), washers and nut.
d. Position bellcrank stop-bushing and install attaching bolt (16), washers and nut.
e. Connect aileron cables and push-pull rod to bellcrank.
f. Rig aileron system in accordance with applicable paragraph in this section, safety turnbuckle (18) and reinstall all items removed for access.

6-12. CABLES AND PULLEYS. (See figure 6-1.)

6-13. REMOVAL AND INSTALLATION.

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

NOTE

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

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

6-14. AILERONS. (See figure 6-3.)

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

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

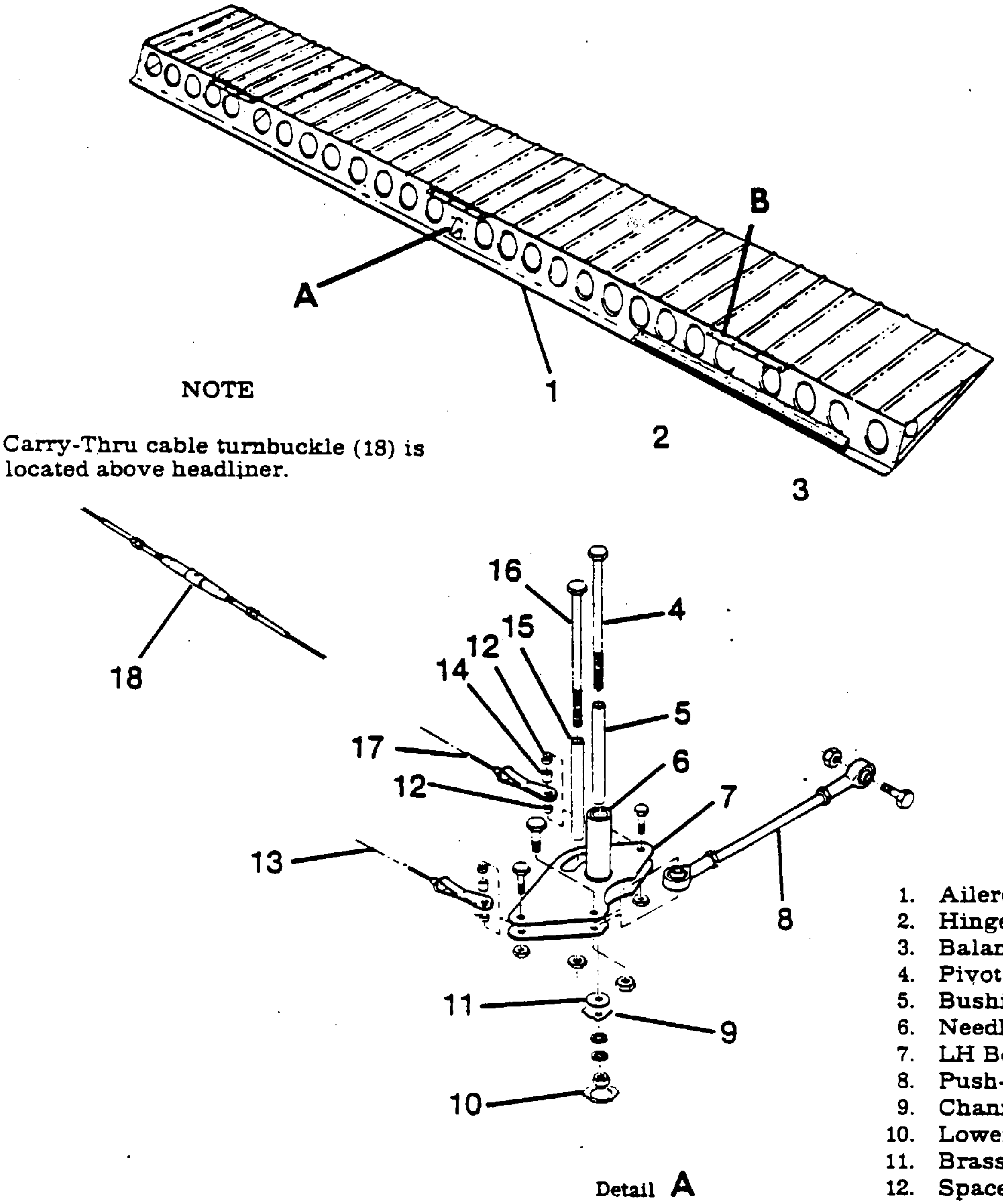
NOTE

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

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

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

6-18. RIGGING. (See figure 6-2.)
a. Gain access to the control "U" (paragraph 6-6), aileron bellcranks (paragraph 6-9), carry-thru cable turnbuckle and direct cable turnbuckles (remove headliner, see figure 6-1.)
b. Install primary control cable (6) in the large aft groove of cable drum (7), wrapping the cable once around the drum. The primary cable is routed from the top of the aft cable drum groove to the forward pulleys on each side. The secondary cable is routed to the aft groove of the two pulleys and is attached by the secondary cable turnbuckle just aft of the cable drum.
c. Tape a bar across both control wheels to hold them in neutral position.
d. With control wheels neutral, check that chain ends (3) are approximately equal distance from respective sprockets (1).
e. Install primary cable lock (8) at bottom of the cable drum.
f. Keeping control wheels neutral, tighten the primary turnbuckles (5) and the secondary cable turnbuckle just enough to apply a minimal amount of tension on the chains. Results of adjusting turnbuckles are as follows:
   1. Loosening primary cable turnbuckles (5) and tightening secondary cable turnbuckle will move inboard sides of both control wheels down.
   2. Tightening either primary control cable turnbuckle and loosening secondary cable turnbuckle will move outboard side of applicable control wheel down.



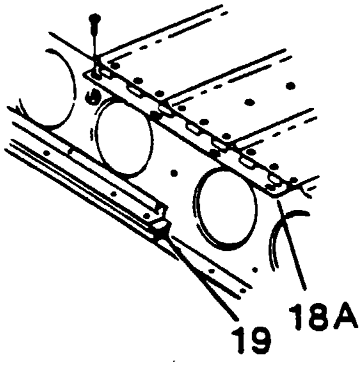
NOTE

Carry-Thru cable turnbuckle (18) is located above headliner.

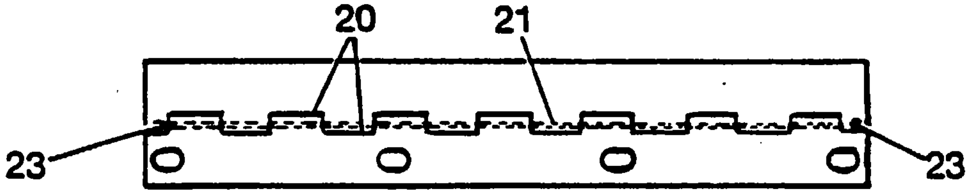
1. Aileron
2. Hinge
3. Balance Weight
4. Pivot Bolt
5. Bushing
6. Needle Bearing
7. LH Bellcrank
8. Push-Pull Rod
9. Channel
10. Lower Wing Skin
11. Brass Washer
12. Spacer
13. Direct Cable
14. Bushing
15. Bushing
16. Bolt
17. Carry-Thru Cable
18. Carry-Thru Cable Turnbuckle

Figure 6-3. Aileron Installation (Sheet 1 of 3)

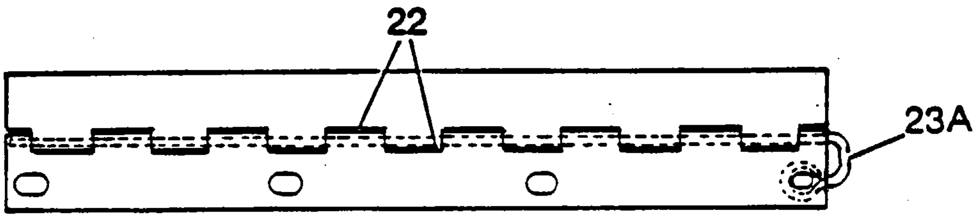
18A. Hinge
19. Balance Weight
20. Hinge
21. Hinge Pin
22. Hinge
23. Cotter Pin
23A. Hinge Pin



Detail B

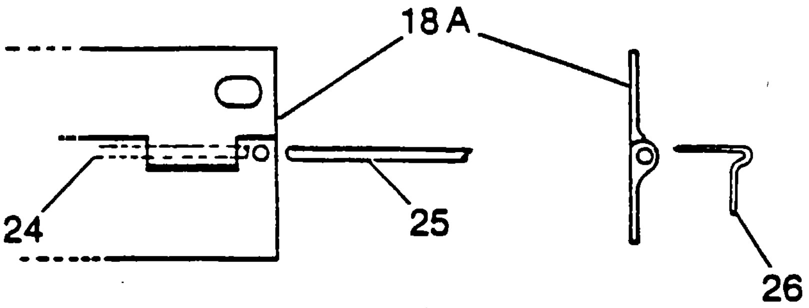


AILERON HINGE (TYP)
Used through 1984 Models



AILERON HINGE (TYP)
Beginning 1985 and ON

Figure 6-3. Aileron Installation (Sheet 2 of 3)



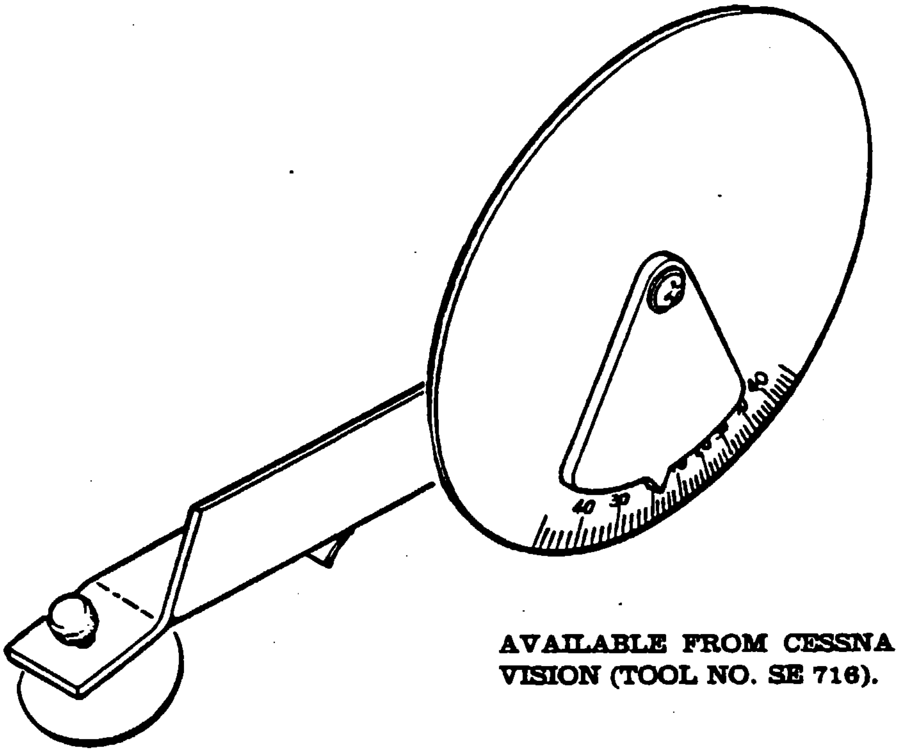
Detail C

18A. Hinge
24. Hinge Pin
25. 0.89 Diameter Drill Rod
26. MS24665 Cotter Pin

NOTE

The following method may be utilized to check for wear on aileron hinges used prior to 1985 models:

Figure 6-3. Aileron Installation (Sheet 3 of 3)



AVAILABLE FROM CESSNA SUPPLY DIVISION (TOOL NO. SE 716).

Figure 6-4. Inclinometer for Measuring Control Surface Travel

g. Check transition cable is in place on the forward (narrow) groove of the cable drum and that transition cable lock (10) is installed.

h. Disconnect push-pull rod (index 8, figure 6-3) at aileron on each wing.

i. Adjust direct cable turnbuckles (12) so that aileron bellcrank stop bushings (figure 6-3) are centered in both bellcrank slots.

j. Adjust carry-thru turnbuckle (figure 6-1) to obtain 40 ± 10 pounds tension on the carry-thru cable. Disregard tension of direct cables, which will be different than tension on carry-thru cables.

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

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

m. Remove bar from control wheels and check degree of travel as specified in figure 1-1.

   1. If travel is not within specified limits check the aileron bellcranks (figure 6-3) to ensure that the stop bushings are centered with ailerons in streamlined position.
   2. Adjust direct cables and carry-thru cables as necessary to obtain the correct amount of travel, adjust carry-thru cable to 40 ± 10 pounds tension.

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

WARNING

Be sure ailerons travel in the correct direction when operated by the control wheel(s).

SECTION 7

WING FLAP CONTROL SYSTEM

TABLE OF CONTENTS

7-1. WING FLAP CONTROL SYSTEM. (See figure 7-1.)

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

7-3. OPERATIONAL CHECK.

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

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

c. With flaps full UP, mount an inclinometer on one flap and set to 0°. Lower flaps to full DOWN position and check flap angle is 30°±2°. Check approximate mid-range percentage settings against degrees as indicated on inclinometer. Repeat the same procedure for the opposite flap.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

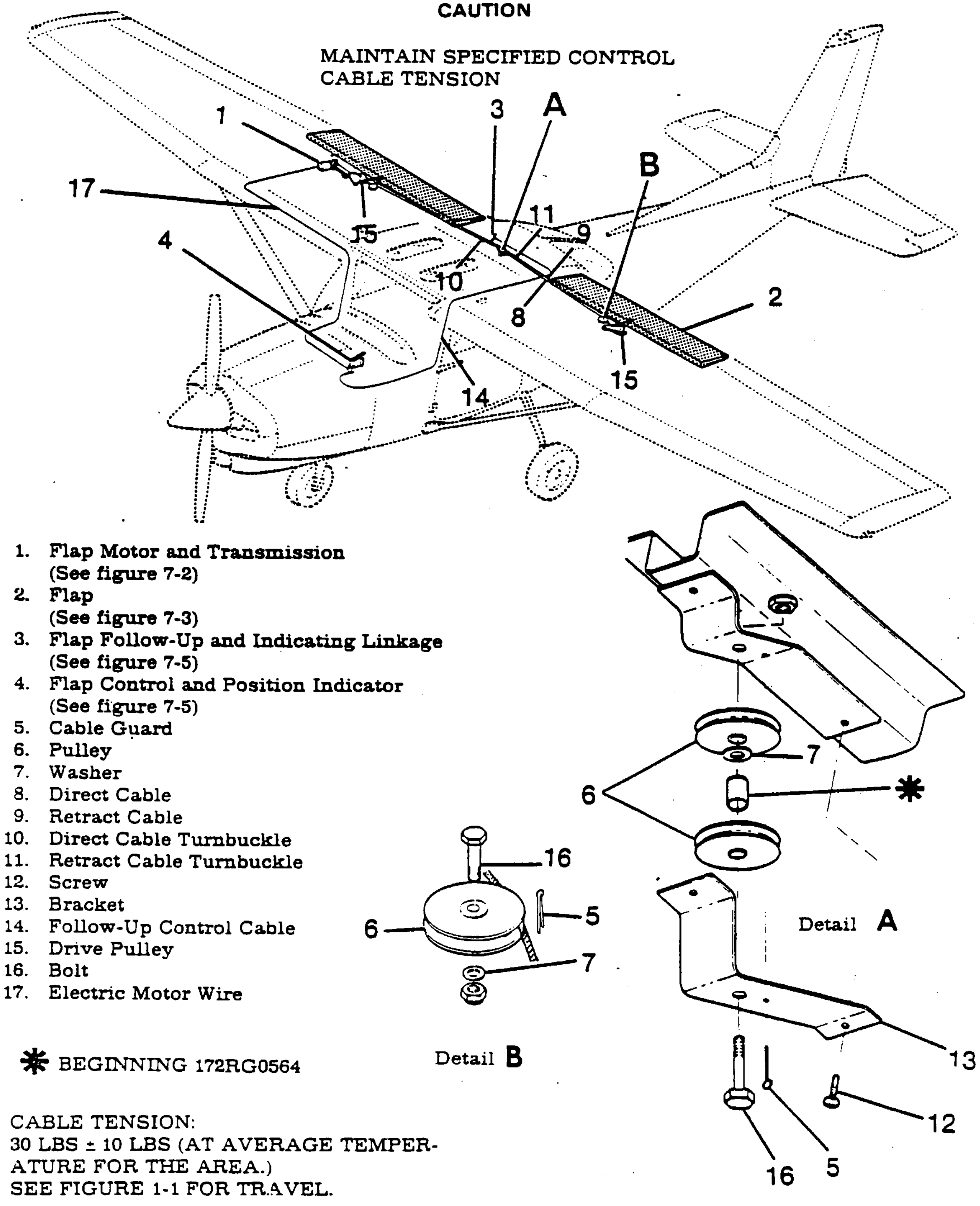
d. Remove access plates adjacent to flap drive pulleys and attempt to rock pulleys to check for bearing wear.
e. Inspect flap rollers and tracks for evidence of binding or defective parts.

7-4. TROUBLE SHOOTING.

NOTE

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

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO MOVE.	Popped circuit breaker.	Reset and check continuity. Replace breaker if defective.
	Defective switch.	Place jumper across switch. Replace switch if defective.
	Defective motor.	Remove and bench test. Replace motor if defective.
	Broken or disconnected wires.	Run continuity check of wiring. Connect or repair wiring as necessary.
	Disconnected or defective transmission.	Connect transmission. Remove, bench test and replace transmission if defective.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.
BINDING IN SYSTEM AS FLAPS ARE RAISED AND LOWERED.	Cables not riding on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Bind in drive pulleys.	Check drive pulleys in motion. Replace drive pulleys found defective.
	Broken or binding pulleys.	Check pulleys for free rotation or breaks. Replace defective pulleys.
	Frayed cable.	Check condition of cables. Replace defective cables.
	Flaps binding on tracks.	Observe flap tracks and rollers. Replace defective parts.



CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

1. **Flap Motor and Transmission (See figure 7-2)**
2. **Flap (See figure 7-3)**
3. **Flap Follow-Up and Indicating Linkage (See figure 7-5)**
4. **Flap Control and Position Indicator (See figure 7-5)**
5. Cable Guard
6. Pulley
7. Washer
8. Direct Cable
9. Retract Cable
10. Direct Cable Turnbuckle
11. Retract Cable Turnbuckle
12. Screw
13. Bracket
14. Follow-Up Control Cable
15. Drive Pulley
16. Bolt
17. Electric Motor Wire

* BEGINNING 172RG0564

CABLE TENSION:
30 LBS ± 10 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
SEE FIGURE 1-1 FOR TRAVEL.

Figure 7-1. Wing Flap Control System

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
LEFT FLAP FAILS TO MOVE.	Disconnected or broken cable.	Check cable tension. Connect or replace cable.
	Disconnected push-pull rod.	Attach push-pull rod.
FLAPS FAIL TO RETRACT.	Defective or disconnected flaps UP operating switch.	Check continuity of switch. Connect or replace switch.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-16.
	Defective operating switch.	Check continuity of switches. Replace switches found defective.
FLAPS FAIL TO EXTEND.	Defective or disconnected flaps DOWN operating switch.	Check continuity of switch. Connect or replace switch.

7-5. FLAP MOTOR AND TRANSMISSION ASSEMBLY.

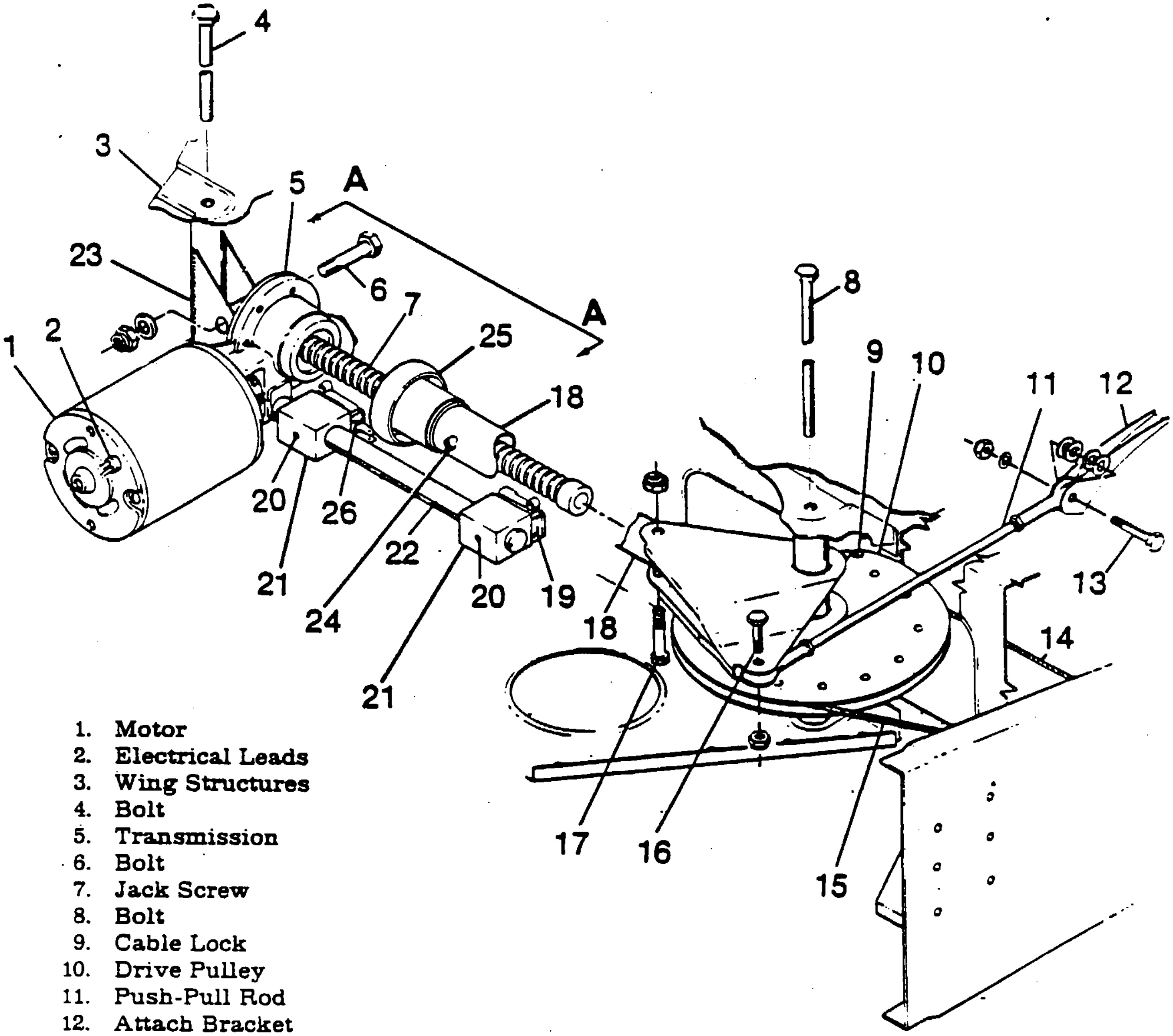
7-6. REMOVAL AND INSTALLATION. (See figure 7-2.)

a. Run flaps to full DOWN position.
b. Disconnect battery ground cable and insulate terminal as a safety precaution.
c. Remove access plates beneath flap motor and transmission assembly in right wing.

NOTE

Flap motor (1), transmission (5), hinge assembly (23) and actuating tube (18) are removed from the aircraft as a unit. It may be easier to detach motor and transmission assembly before removal from wing.

d. Remove bolt (17) securing actuating tube (18) to drive pulley (10).
e. Screw actuating tube (18) in toward transmission (5) as far as possible by hand.
f. Remove bolt (4) securing flap motor hinge (23) to wing. Retain brass washer between hinge and wing structure for use on reinstallation.
g. Disconnect motor electrical leads at quick-disconnects.
h. Disconnect wiring at limit switches (19 and 26).
i. Carefully work assembly from wing through access opening.
j. Reverse preceding steps for reinstallation. If hinge assembly (23) was removed from the transmission (5) for any reason, ensure that short end of hinge is reinstalled toward the top.
k. Use Loctite grade CV adhesive on threads on setscrew (24) and collar (25) whenever actuating tube (18) is removed. Torque setscrew to 60 inch-pounds.
l. Complete operational check as outlined in paragraph 7-3 and rerig system in accordance with paragraph 7-16.



1. Motor
2. Electrical Leads
3. Wing Structures
4. Bolt
5. Transmission
6. Bolt
7. Jack Screw
8. Bolt
9. Cable Lock
10. Drive Pulley
11. Push-Pull Rod
12. Attach Bracket
13. Bolt
14. Direct Cable
15. Retract Cable
16. Bolt
17. Bolt
18. Actuating Tube
19. Down Limit Switch
20. Setscrew
21. Adjustment Block
22. Support
23. Hinge
24. Setscrew
25. Actuating Collar
26. Up Limit Switch

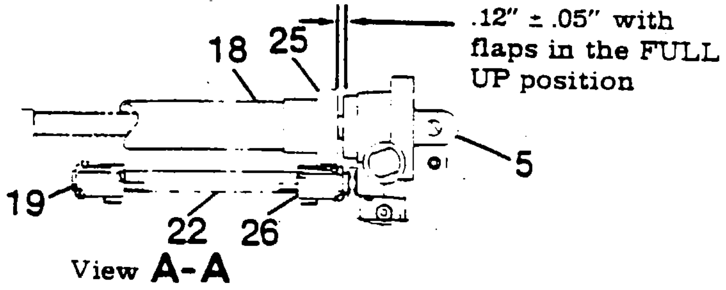


Figure 7-2. Flap Motor and Transmission Installation

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

7-8. DRIVE PULLEYS. (See figure 7-2.)

7-9. REMOVAL AND INSTALLATION.

a. Remove access plate adjacent to drive pulley (10) in right wing.
b. Remove headliner as necessary for access to turnbuckles (index 10 and 11, figure 7-1), remove safety wire and loosen turnbuckles.
c. Remove bolt (16) securing flap push-pull rod (11) to drive pulley (10) and lower RIGHT flap gently.
d. Remove bolt (17) securing actuating tube (18) to drive pulley (10) and lower LEFT flap gently. Retain bushing.
e. Remove cable locks (9) securing control cables to drive pulley (10). Tag cables for reference on reinstallation.
f. Remove bolt (8) attaching drive pulley (10) to wing structure.
g. Using care, remove drive pulley through access opening, being careful not to drop bushing. Retain brass washer between drive pulley and wing structure for use on reinstallation. Tape open ends of drive pulley after removal to protect bearings.
h. To remove left wing drive pulley, use this same procedure omitting step "d".
i. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-16, safety turnbuckles and reinstall items removed for access.

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

7-11. FLAPS. (See figure 7-3.)

7-12. REMOVAL.

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.

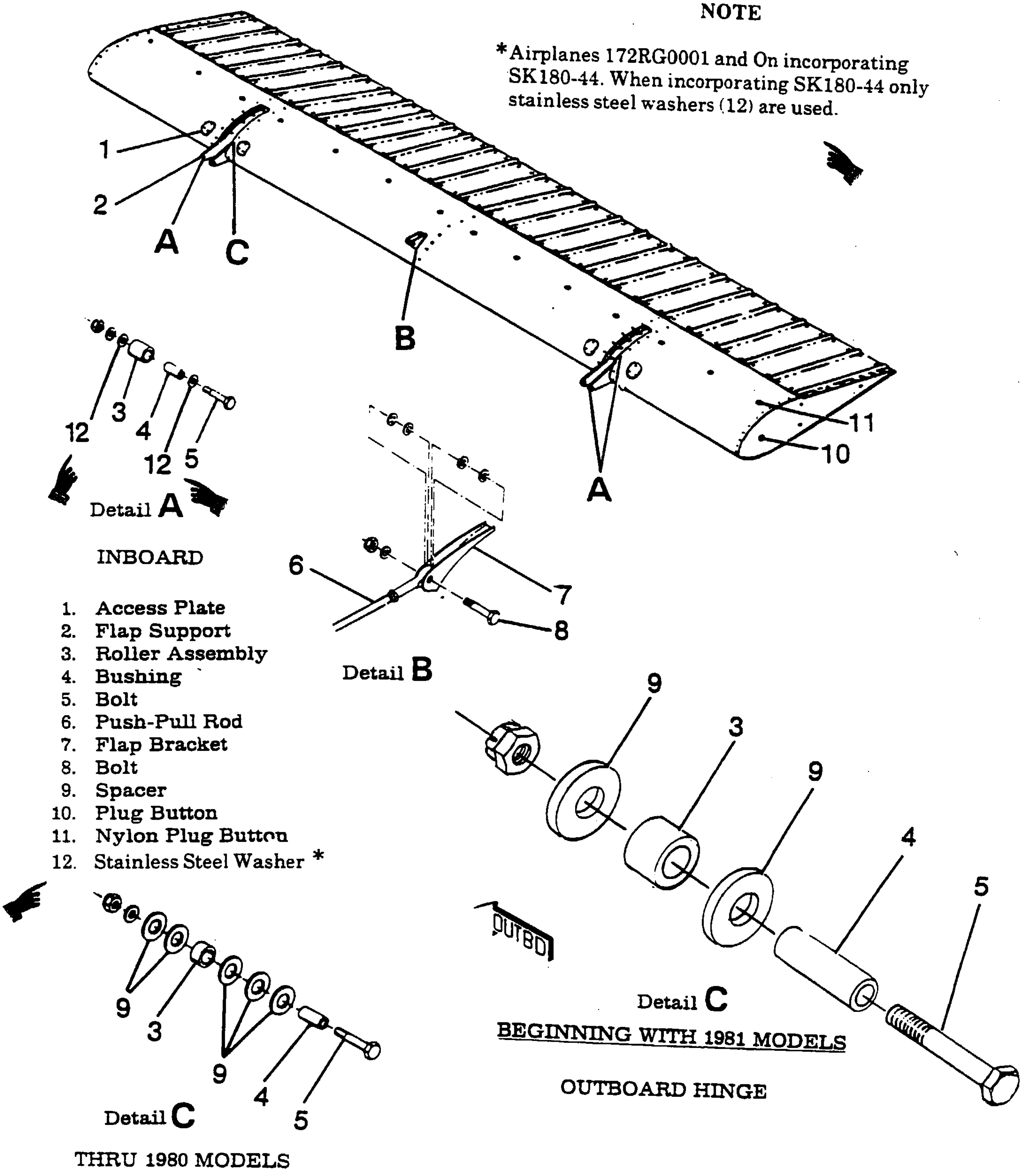
7-12A. INSTALLATION.

a. Position bushings (4), rollers (3) and spacers (9) through slots in flap tracks to allow for adequate flap clearance at wing root, flap well skin and aileron.

NOTE

Some lateral movement of flap is inherant due to the width of rollers. This movement should be considered when positioning spacers and the direction of the bolts.

b. Secure the flap to the wing with bolts (5) through the flap roller supports (2). Check for adequate flap clearance.
c. Connect push-pull rod (6) at flap bracket (7).
d. Check flap travel and rig in accordance with paragraph 7-16 if necessary. If push-pull rod adjustment was not disturbed, rerigging of the system should not be necessary.
e. Reinstall access plates.



NOTE

*Airplanes 172RG0001 and On incorporating SK180-44. When incorporating SK180-44 only stainless steel washers (12) are used.

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
12. Stainless Steel Washer *

Figure 7-3. Flap Installation

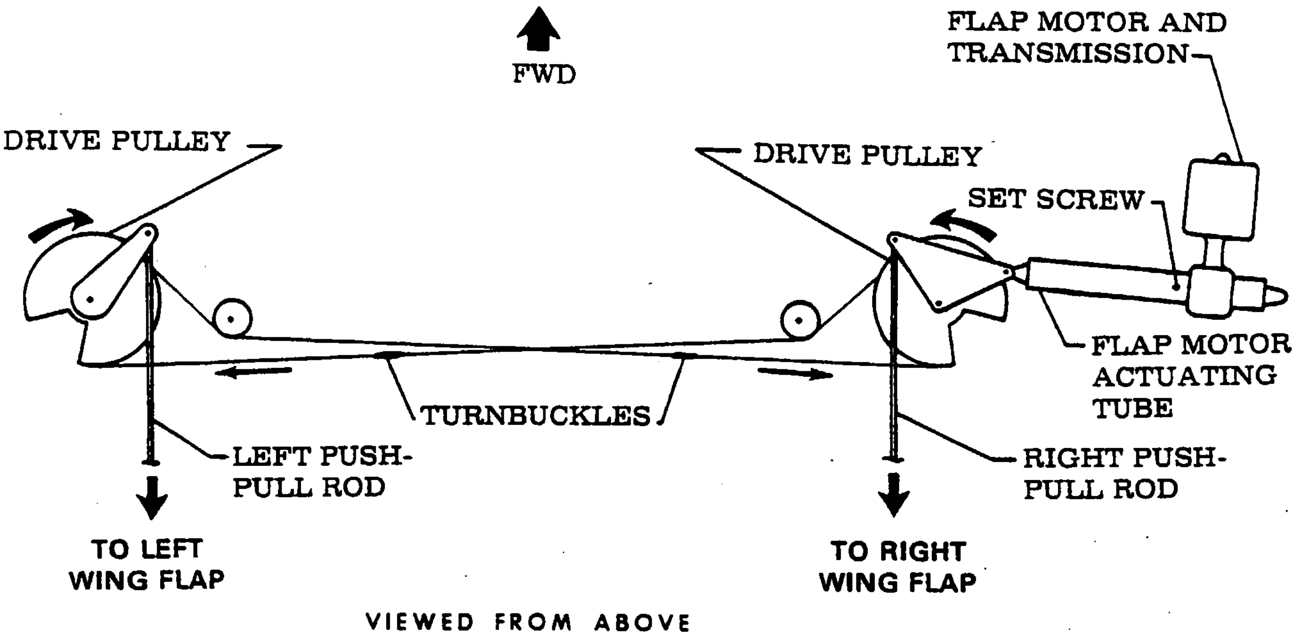


Figure 7-4. Flap System Schematic

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

7-14. CABLES AND PULLEYS. (See figure 7-1.)

7-15. REMOVAL AND INSTALLATION.

a. Remove access plates, fairings, headliner and upholstery as necessary for access.
b. If direct cable (8) is to be removed, disconnect clamp (index 7, figure 7-5) from bellcrank (index 2, figure 7-5).
c. Remove safety wire, relieve cable tension, disconnect turnbuckles (10 and 11) and carefully lower LEFT flap.
d. 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.

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

7-16. RIGGING.

a. (See figure 7-1.) Remove headliner as necessary for access to turnbuckles (10 and 11).

b. With flaps in the full UP position. disconnect follow-up cable (index 4. figure 7-5) by removing clevis attaching follow-up cable to bellcrank (index 2. figure 7-5).

c. (See figure 7-1.) Remove safety wire, relieve cable tension. disconnect turnbuckles (10) and (11) and carefully lower left flap.

d. (See figure 7-2.) Disconnect push-pull rods (11) at drive pulleys (10) in both wings and lower RIGHT flap gently.

e. Disconnect actuating tube (18) from drive pulley (10).

NOTE

If control cables are not connected to left and right drive pulleys, actuating tube (18) and push-pull rods (11) must be disconnected before installing cables. If drive pulleys (10) are not installed, attach control cables before installing drive pulleys in the wings as illustrated in figure 7-4.

f. Adjust both push-pull rods (11) to 8.83 ± .12 inches between centers of rod end bearings and tighten locknuts on both ends. Connect push-pull rods to flaps and drive pulleys.

NOTE

Temporarily connect cables at turnbuckles 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.

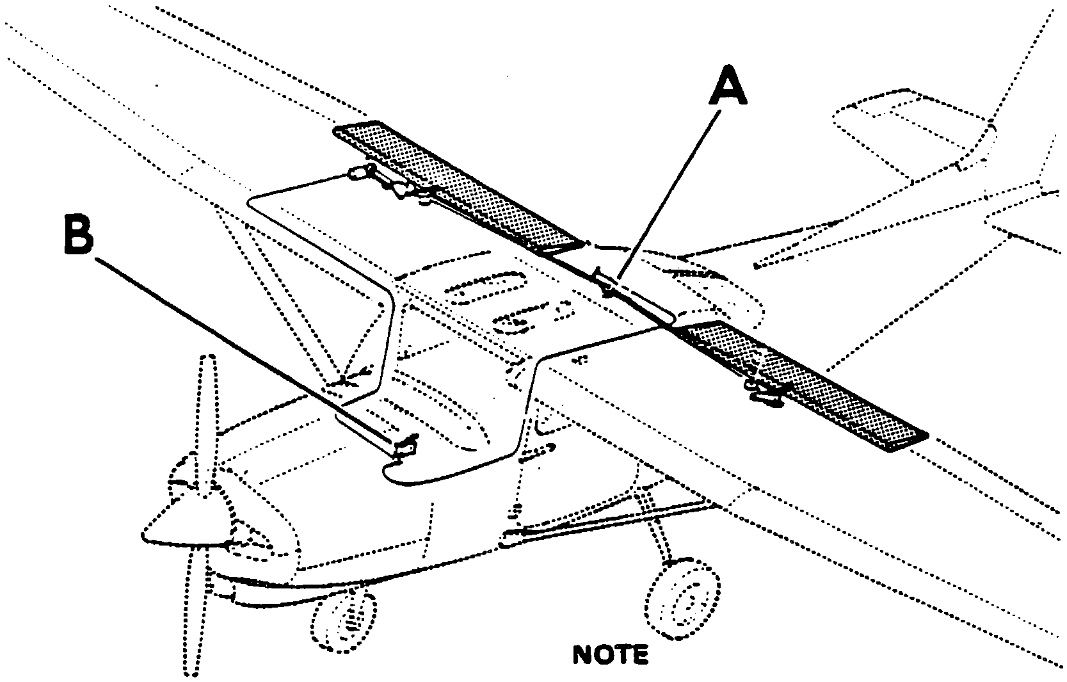
g. (See figure 7-2.) Screw actuating tube (18) IN toward transmission (5) by hand to .12 ± .05 inches between switch actuating collar (25) and transmission as illustrated in View A-A.

h. Loosen setscrew (24) securing actuating tube (18) to switch actuating collar (25) and hold collar to maintain .12 ± .05 inch while holding RIGHT flap in the full UP position and adjust actuating tube (18) IN or OUT, as necessary to align with attachment hole in drive pulley (10).

i. Apply Loctite grade CV sealant (or equivalent) to threads of setscrew (24) and torque to 60 inch-pounds.

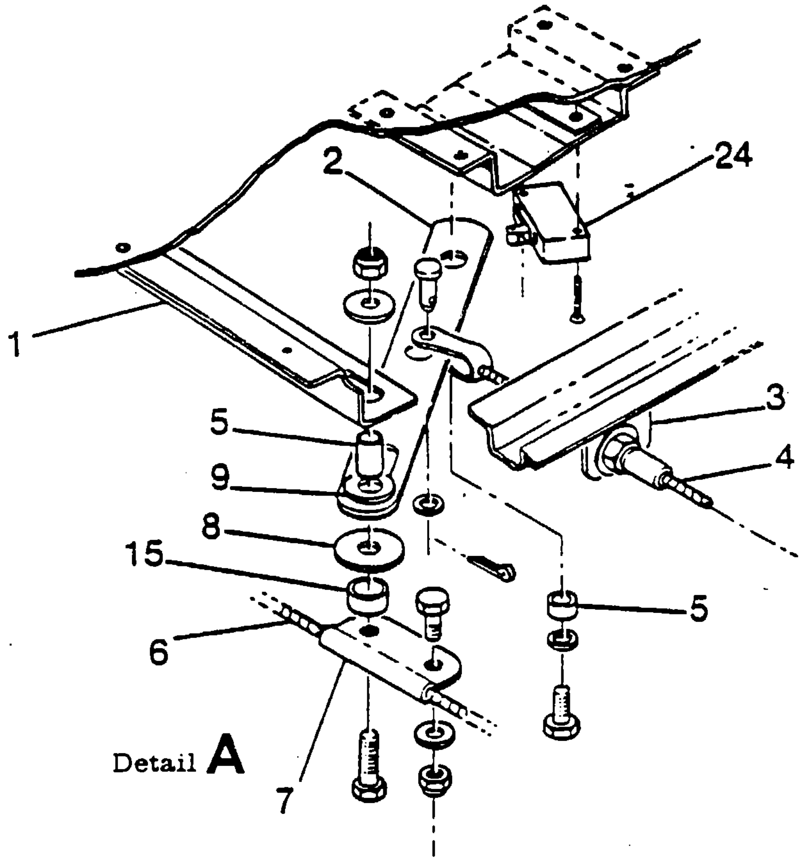
NOTE

If actuating tube (18) is too long to allow attachment to drive pulley after completion of step "h", proceed to step "j".



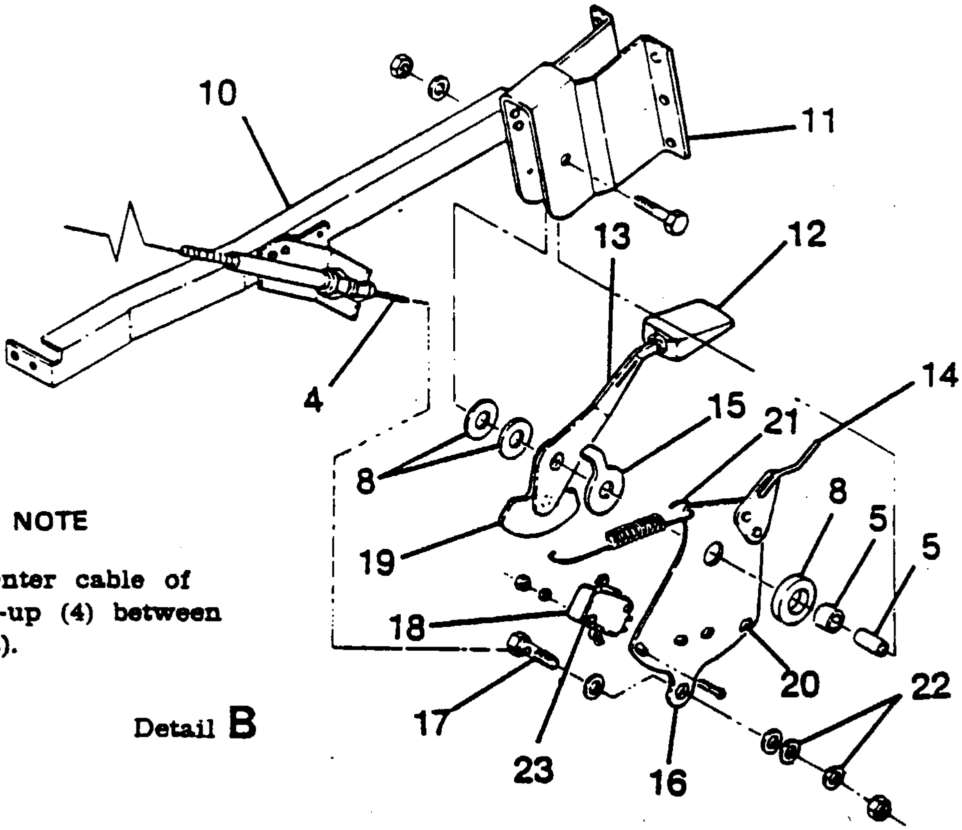
NOTE

Lubricate slots of guide (1) and bellcrank (2) with Lubri-Bond "A" or Lubri-Bond 220 (Electrofilm Inc.) North Hollywood, California, or Perma-Silk (Everlube Corp.), North Hollywood, California.



1. Guide
2. Bellcrank
3. Mounting Bracket
4. Follow-Up Cable
5. Bushing
6. Flap Direct Cable
7. Clamp
8. Washer
9. Teflon Washer
10. Support
11. Bracket
12. Knob
13. Flap Lever
14. Position Indicator
15. Spacer
16. Switch Mounting Arm
17. Clamp Bolt
18. Flaps Down Operating Switch
19. Cam
20. Flaps Up Operating Switch
21. Spring
22. Washer
23. Insulator
24. Gear Warning Switch

Figure 7-5. Flap Follow-Up Control and Position Indicator (Sheet 1 of 2)



NOTE

Position center cable of flap follow-up (4) between washers (22).

Detail **B**

Figure 7-5. Flap Follow-Up Control and Position Indicator (Sheet 2 of 2)

j. Disconnect push-pull rod (11) at drive pulley (10) to allow connecting actuating tube (18) to drive pulley.
k. Manually hold RIGHT flap in full UP position and readjust push-pull (11) to align with attachment hole in drive pulley. Connect push-pull rod and tighten locknuts.

NOTE

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

l. With flaps in full UP position, loosen setscrew (20) and slide up limit switch adjustment block (2) on support (22) to just activate switch and shut off electrical power to motor at this position. Tighten setscrew.
m. Manually hold LEFT flap, full UP and connect control cables at turnbuckles (index 10 and 11, figure 7-1). Remove reference tags previously installed.
n. With flaps full UP, adjust turnbuckles to obtain 30±10 pounds tension on cables. Adjust retract cable (9) first.

NOTE

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

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

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

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

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

r. **Run flaps to full DOWN position and adjust DOWN limit switch (19) to stop motor and flap at 30°+0°-2° on RIGHT flap. Recheck limit switch through several flap cycles. Repeat check on LEFT flap.**

NOTE

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

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

NOTE

If knob (12) works loose on flap lever (13), remove knob and clean threads on flap lever with MEK or equivalent. After threads have thoroughly dried, prime with grade T primer, and allow primer to flash off or dry from three to five minutes. Apply grade CU Loctite (MIL-S-22473), Loctite 271, STA-LOK Catalog No. 800, or equivalent to threads of flap lever (13). Install knob (12) and allow Loctite to cure from five to twenty minutes before service use.

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

7-18. DESCRIPTION. The flap follow-up and indicating system consists of a sheathed cable assembly, pointers and microswitches. One end of the cable is attached to the flap operating switch operating arm. The other end is clamped to the flap direct cable, above the headliner in the rear cabin area. Motion of the flap cable is transmitted through the follow-up control to the pointer, attached to the switch mounting arm. Pointer moves along a scale as the flaps are extended or retracted. When the motion of the switch mounting arm with the attached operating switches positions the "active" operating switch to clear the cam on flap lever, flap motor circuit is broken and flaps stop at selected position.

7-19. REMOVAL AND INSTALLATION. Figure 7-5 can be used as a guide to removal and installation of the flap follow-up and indicating system.

7-20. RIGGING. (See figure 7-5.)

a. Flap control system must be rigged in accordance with paragraph 7-16 before flap follow-up system can be rigged.

b. Disconnect spring (21) from switch mounting arm (16).
c. With flaps and flap lever (13) in full UP position and holding flap position indicator (14) to a clearance of .03 inch maximum with top of instrument panel opening, pull center cable of flap follow-up (index 4, detail b) to remove slack. Connect cable thru clamp bolt (17) observing note of figure 7-5.
d. Connect spring (21) to switch mounting arm (16).
e. Adjust switches (18) and (20) in slotted holes in mounting arm (16) until cam (19) is centered between switch rollers.
f. Mount an inclinometer on one flap and set to 0° (flaps full UP). Turn master switch ON and move flap lever (13) to 10° position.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

g. Observe inclinometer reading when flaps stop. Adjust flaps DOWN operating switch (18) in slotted holes on mounting arm (16) as required to obtain flap travel of 10° +0° -2°.
h. Adjust flaps UP operating switch (20) to obtain positive clearance with cam (19) when flaps DOWN operating switch has just opened in the 10° position.
i. Repeat steps "g" and "h" for 20° flap position (travel 20° +0° -2°).
j. Run flaps to full DOWN position (30° ±2°) and check that flaps DOWN operating switch (18) remains closed as flap motor limit switch (index 19, figure 7-2) stops flaps at full DOWN position.
k. Check flaps through several cycles, recheck all components for security and replace items removed for access.

7-21. FLAP OPERATED GEAR WARNING SYSTEM. (See figure 7-5.)

7-22. REMOVAL AND INSTALLATION.

a. Remove headliner as necessary to gain access to flap warning switch, located in cabin ceiling area.
b. Remove screws attaching gear warning switch in slots of bracket for bellcrank (2).
c. Remove washers and insulator between switch and bracket.
d. Reverse the preceding steps for reinstallation.
e. Rig gear warning switch per paragraph 7-23.

7-23. RIGGING.

NOTE

Throttle operated gear warning system, flap control system and flap follow-up system must be rigged in accordance with procedures outlined in Section 5 and 7 before rigging of flap warning system can be accomplished.

a. Remove headliner as necessary to gain access to flap warning switch.
b. Loosen screws attaching gear warning microswitch in slots of bracket for bellcrank (2).
c. Mount an inclinometer on one flap and set to 0° (flaps full UP). Turn master switch ON and move flap selector lever to obtain 23° flap deflection.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

d. Rotate microswitch in slots of bracket until switch contacts are just closed, and tighten switch mounting screws.
e. Move flap selector lever to 0° position (flaps full UP).
f. Move flap lever to 30° position and horn should not sound. Move flap selector handle back to 0° position.
g. With throttle full FORWARD, push landing gear DOWN press-to-test button, and move flap selector handle to 30° position; horn should sound as flaps extend past 23°. Move flap selector handle back to 20° position, and horn should not sound.
h. Redjust switch as necessary to cause horn to sound when flaps reach 23° when press-to-test button is pushed.
i. Turn master switch OFF, remove inclinometer, reinstall headliner.

SECTION 8

ELEVATOR CONTROL SYSTEM

TABLE OF CONTENTS

8-1. ELEVATOR CONTROL SYSTEM. (See figure 8-1.)

8-2. DESCRIPTION. The elevators are operated by forward and aft movement of the control wheels. The control wheels force pivotal movement of the control "U" (see figure 6-2) which transmits movement to the elevator through a push-pull tube, forward bellcrank, cables and pulleys and an aft bellcrank.

The elevator consists of a right side and a left side which are interconnected by the aft elevator bellcrank. There is also an elevator trim tab which is located on the right elevator and is described in Section 9.

8-3. TROUBLE SHOOTING.

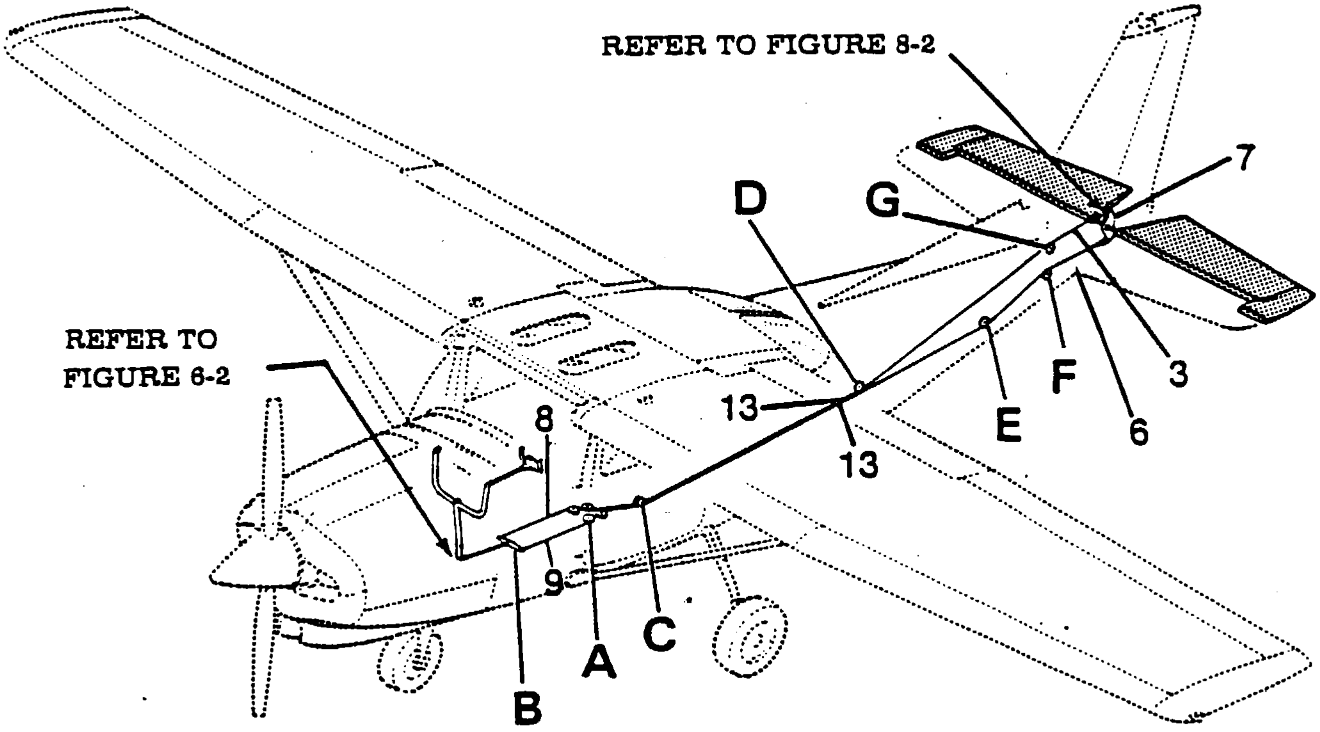
NOTE

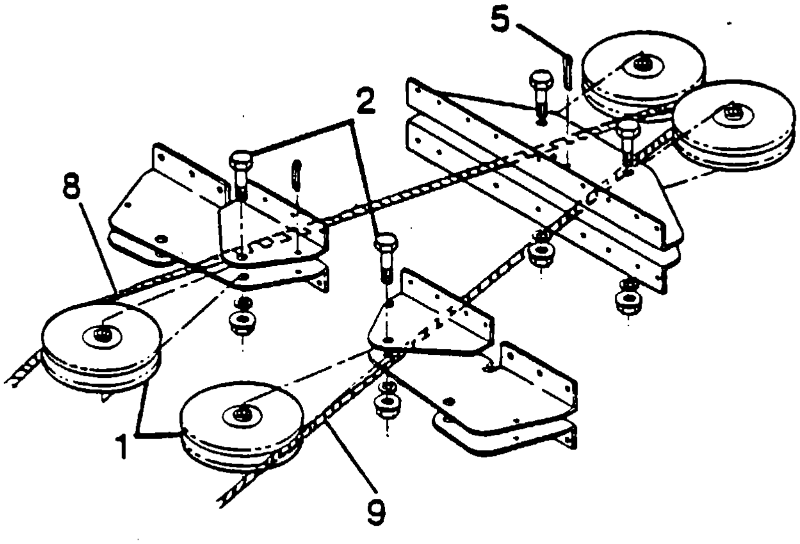
Due to remedy procedures in the following trouble shooting chart it may be necessary to rerig system, refer to paragraph 8-14.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.	Forward or aft end of push-pull tube disconnected.	Check visually and attach push-pull tube correctly.
	Cables disconnected.	Check visually, attach cables and rig system in accordance with paragraph 8-14.

8-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM.	Defective forward or rear bellcrank or bellcrank pivot bearing.	Move to check for play or binding. Replace bellcranks found defective.
	Cables slack.	Check tension and adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Nylon bearing on instrument panel binding.	Disconnect universal joint and check for binding. Replace bearing if binding is felt.
	Defective control "U" pivot bearing.	Disconnect elevator push-pull tube at lower end of "U" and check that control moves freely. Replace bearing if defective.
	Defective elevator hinges.	Move elevators by hand, checking hinges. Replace hinges found defective.
	Lubrication needed.	Lubricate in accordance with Section 2.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Defective pulleys or cable guards.	Open access plates and check visually. Replace defective parts and install guards properly.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	Check elevator travel with inclinometer. Rig in accordance with paragraph 8-14.
	Cables tightened unevenly.	Rig in accordance with paragraph 8-14. .
	Interference at instrument panel.	Rig in accordance with paragraph 8-14.





Detail A

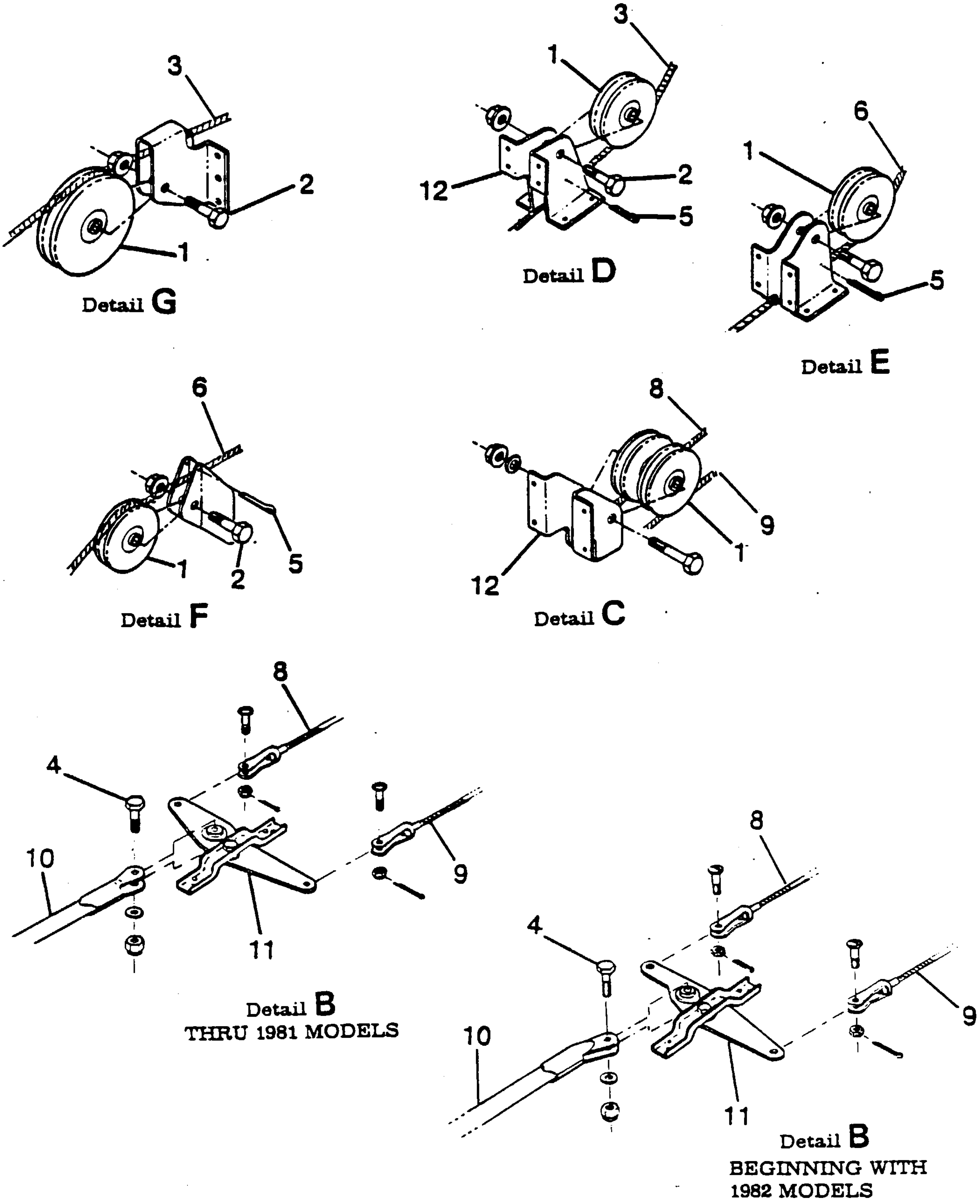
CAUTION

MAINTAIN SPECIFIED CABLE TENSION

CABLE TENSION:
30 LBS ± 10 LBS AT AVERAGE TEMPERATURE FOR THE AREA.
See Figure 1-1 for Travel.

1. Pulley
2. Bolt
3. Rear Up Cable
4. Bolt
5. Cable Guard
6. Rear Down Cable
7. Rear Bellcrank
8. Forward Up Cable
9. Forward Down Cable
10. Push-Pull Tube
11. Forward Bellcrank
12. Bracket
13. Turnbuckle

Figure 8-1. Elevator Control System (Sheet 1 of 2)



Detail G

Detail D

Detail E

Detail F

Detail C

Detail B
THRU 1981 MODELS

Detail B
BEGINNING WITH
1982 MODELS

Figure 8-1. Elevator Control System (Sheet 2 of 2)

8-4. ELEVATORS. (See figure 8-2.)

8-5. REMOVAL AND INSTALLATION.

NOTE

This procedure is written primarily for the right elevator since the trim tab is attached to this elevator.

a. Disconnect trim tab push-pull channel (3) at tab actuator.
b. Remove bolts (6) securing elevators to bellcrank (9).

NOTE

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

c. Remove bolts (16) from elevator hinges.
d. Using care, remove elevator.
e. To remove left elevator use same procedure, omitting step "a".
f. Reverse the preceding steps for installation. Rig system in accordance with paragraph 8-14 if necessary.

8-6. REPAIR. Repair may be accomplished as outlined in Section 18. If repair has affected static balance, check and rebalance as required.

8-7.. BELLCRANKS.

8-8. FORWARD. (See figure 8-1.)

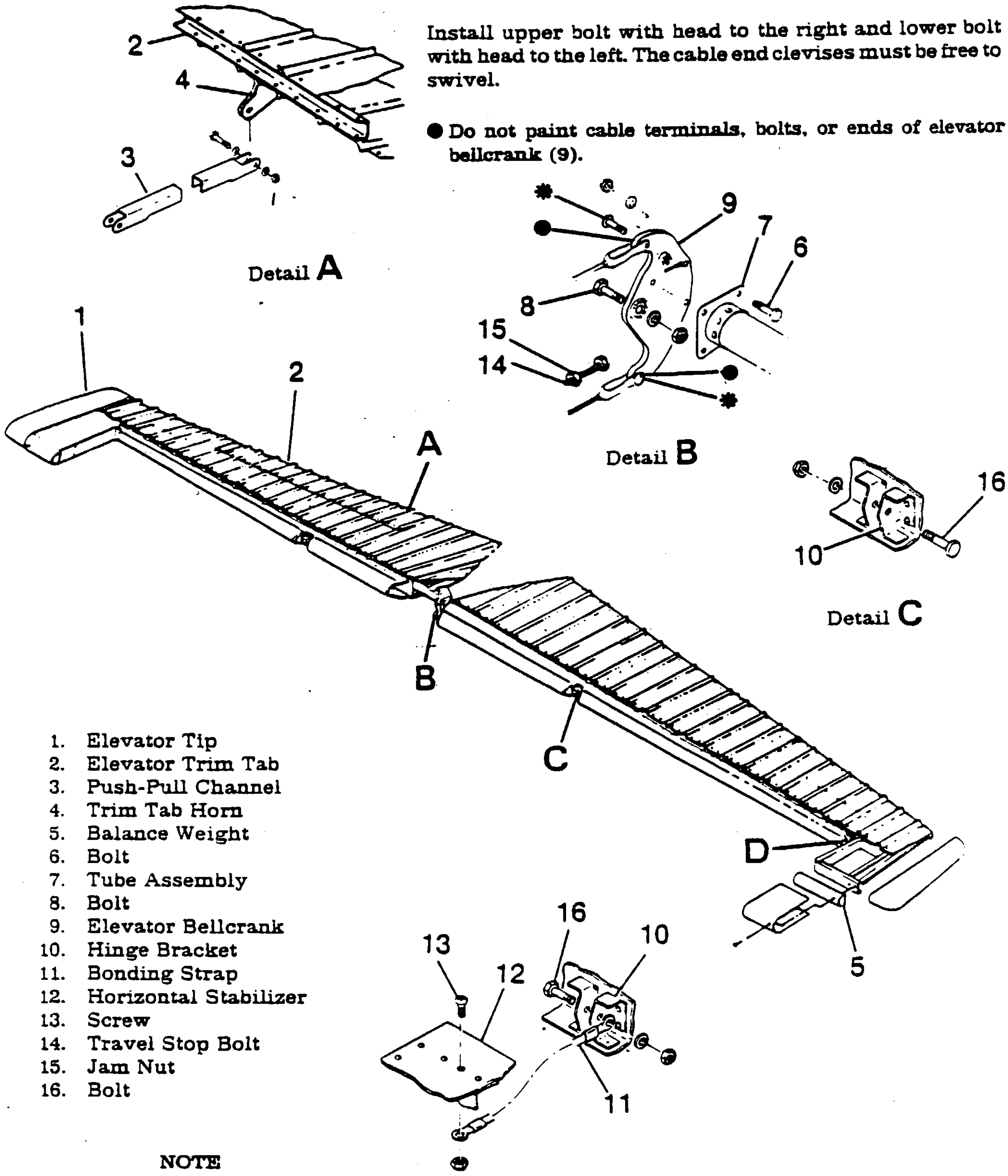
8-9. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.
b. Relieve cable tension at turnbuckles (13) and disconnect cables from bellcrank (11).
c. Disconnect push-pull tube (10) from bellcrank (11).
d. Remove pivot bolt and remove bellcrank.
e. Reverse preceding steps for installation. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed in step "a".

8-10. REAR. (See figure 8-2.)

8-11. REMOVAL AND INSTALLATION.

a. Remove rudder. (Refer to Section 10.)
b. Relieve cable tension at turnbuckles (index 13, figure 8-1) and disconnect cables from rear bellcrank (9).
c. Remove bolts (6) securing elevators to bellcrank.
d. Remove bellcrank pivot bolt (8) and slide bellcrank from between tube assemblies (7).



✱ NOTE

Install upper bolt with head to the right and lower bolt with head to the left. The cable end clevises must be free to swivel.

● Do not paint cable terminals, bolts, or ends of elevator bellcrank (9).

1. Elevator Tip
2. Elevator Trim Tab
3. Push-Pull Channel
4. Trim Tab Horn
5. Balance Weight
6. Bolt
7. Tube Assembly
8. Bolt
9. Elevator Bellcrank
10. Hinge Bracket
11. Bonding Strap
12. Horizontal Stabilizer
13. Screw
14. Travel Stop Bolt
15. Jam Nut
16. Bolt

NOTE

Install push-pull channel (3) with sides up - thru 172RG1164, and sides down - 172RG1165 and ON.

Figure 8-2. Elevator Installation

NOTE

It may be necessary to remove one of the stabilizer attaching bolts for clearance when removing the bellcrank pivot bolt.

e. Reverse preceding steps for installation. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed for access.

8-12. CABLES AND PULLEYS. (See figure 8-1.)

8-13. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.
b. Relieve cable tension at turnbuckles (13).
c. Disconnect cables at forward bellcrank (11).
d. Disconnect cables at rear bellcrank (7).
e. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

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

f. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards.
g. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed in step "a".

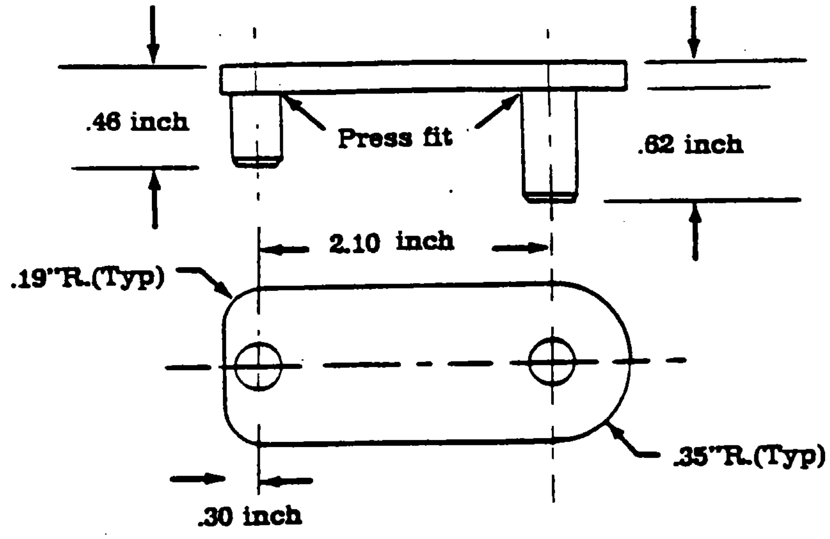
8-14. RIGGING. (See figure 8-1.)

a. Lock control column in neutral position by installing neutral rigging tool (index 2, figure 8-3).
b. Streamline elevators to neutral with horizontal stabilizer.

NOTE

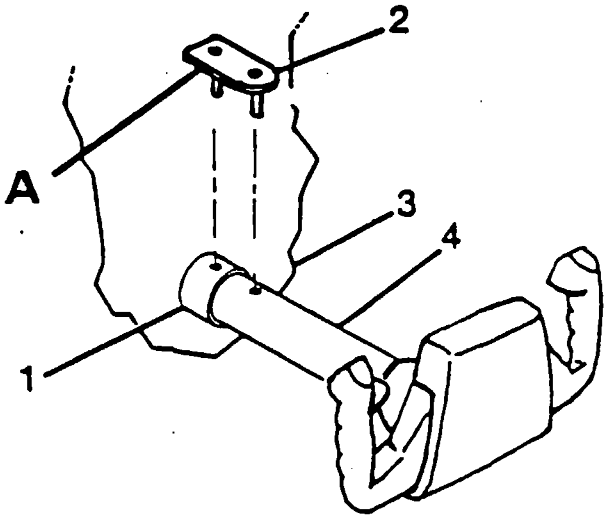
Neutral position measured with the bottom of the balance area flush with the bottom of the stabilizer.

c. Holding elevators in neutral position, adjust turnbuckles (13) equally to obtain 30 ± 10 lbs. cable tension.
d. Mount an inclinometer on elevator and, keeping elevator streamlined with stabilizer, set inclinometer to 0°.



Detail **A**

Fabricate from .125 inch steel plate and .209 inch dia. drill rod according to dimensions shown.



1. Support
2. Neutral Rigging Tool
3. Instrument Panel
4. Pilot's Control Column

Figure 8-3. Control Column Neutral Position Rigging Tool

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

e. Remove control column neutral rigging tool and adjust travel stop bolts (index 14. figure 8-2) to range of travel specified in figure 1-1.
f. Check that control "U" does NOT contact instrument panel in full UP position or firewall in the full DOWN position.
g. Safety turnbuckles (13) and travel stop bolts; check remainder of elevator control system for security and reinstall all items removed for access.

WARNING

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

SECTION 9

ELEVATOR TRIM CONTROL SYSTEM

TABLE OF CONTENTS

9-1. ELEVATOR TRIM CONTROL SYSTEM. (See figure 9-1.)

9-2. DESCRIPTION. The elevator trim tab, located on the right elevator, is controlled by a trim wheel mounted in the pedestal. Power to operate the tab is transmitted from the trim control wheel by means of chains, cables and an actuator. A mechanical pointer, adjacent to the trim wheel indicates tab position. A "nose-up" setting results in a tab-down position.

9-3. TROUBLE SHOOTING.

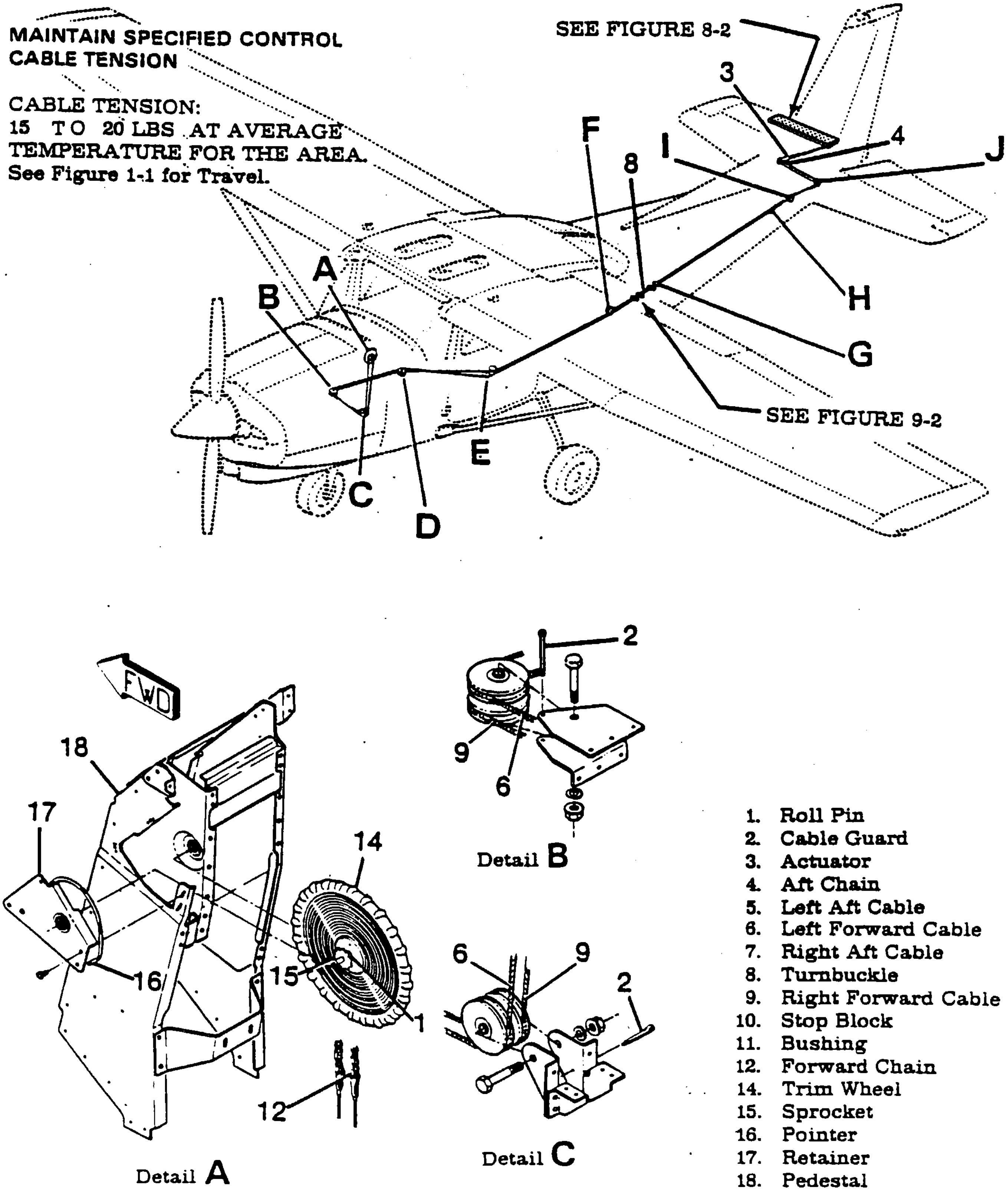
NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to rerig system, refer to paragraph 9-18.

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE.	Cable tension too high.	Check and adjust tension as specified in figure 9-1.
	Pulleys binding or rubbing.	Open access plates and check visually. Repair or replace as necessary.
	Cables not in place on pulleys.	Open access plates and check visually. Install cables correctly.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE (Cont).	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.
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. See figure 9-3.



CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

CABLE TENSION:
15 TO 20 LBS AT AVERAGE
TEMPERATURE FOR THE AREA.
See Figure 1-1 for Travel.

1. Roll Pin
2. Cable Guard
3. Actuator
4. Aft Chain
5. Left Aft Cable
6. Left Forward Cable
7. Right Aft Cable
8. Turnbuckle
9. Right Forward Cable
10. Stop Block
11. Bushing
12. Forward Chain
14. Trim Wheel
15. Sprocket
16. Pointer
17. Retainer
18. Pedestal

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

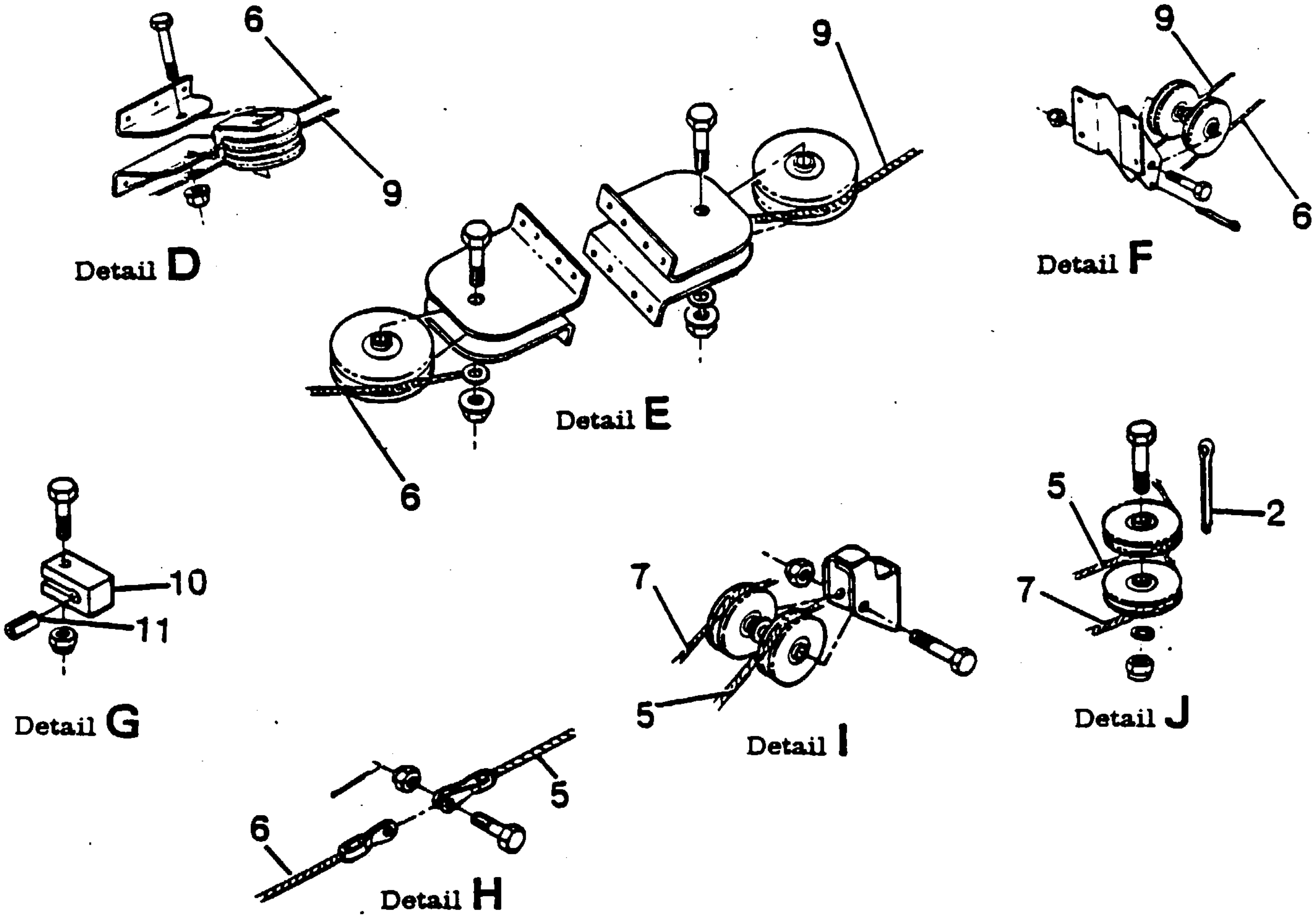


Figure 9-1. Elevator Trim Tab Control System (Sheet 2 of 2)

9-4. TRIM TAB. (See figure 8-2.)

9-5. REMOVAL AND INSTALLATION.

a. Disconnect push-pull channel (3) from horn assembly (4). (Torque nut to 12-19 inch pound on installation.)

b. Drill out rivets attaching hinge to elevator.

NOTE

After tab has been removed and if hinge pin is to be removed, it is necessary to spread the crimped ends of the hinge before driving out pin. When a pin has been installed, crimp ends of hinge to prevent pin from working out.

c. Reverse preceding steps for installation.

9-6. TRIM TAB ACTUATOR.

9-7. REMOVAL AND INSTALLATION. (See figure 9-1.)

CAUTION

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

a. Remove baggage compartment aft wall for access.
b. Remove safety wire and relieve cable tension at turnbuckle (8).
c. Disconnect push-pull tube from actuator (3).
d. Remove access plate from underside of right hand stabilizer beneath actuator.
e. Remove chain guard and disengage chain (4) from actuator sprocket.
f. Remove screws attaching clamps to bracket and carefully work actuator out through access opening.
g. Reverse the preceding steps for reinstallation. Rig trim system in accordance with paragraph 9-18, safety turnbuckle (8) and reinstall all items removed for access.

9-8. DISASSEMBLY. (See figure 9-4.)

a. Remove actuator in accordance with paragraph 9-7.
b. Disassemble actuator assembly (1) as illustrated in Detail A as follows:
    1. Remove chain guard (3) if not previously removed in step "e" of paragraph 9-7.
    2. Using suitable punch and hammer, remove groov-pins (8) securing sprocket (5) to screw (9) and remove sprocket from screw.
    3. Unscrew threaded rod end (15) and remove rod end from actuator.
    4. Remove groov-pins (10) securing bearings (6) and (14) at the housing ends.
    5. Lightly tap screw (9) toward the sprocket end of housing, remove bearing (6) and collar (7).
    6. Lightly tap screw (9) in the opposite direction from sprocket end, remove bearing (14), O-ring (13) and collar (7).
    7. It is not necessary to remove retaining rings (11).

9-9. CLEANING, INSPECTION AND REPAIR. (See figure 9-4.)

a. DO NOT remove bearing (16) from threaded rod end (15) unless replacement of bearing is necessary.
b. Clean all component parts, except bearing (16), by washing in Stoddard solvent or equivalent. Do not clean sealed bearing (16).
c. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.
d. Check bearings (6) and (14), screw (9) and threaded rod end (15) for excessive wear and scoring.

Dimensions of the parts are as follows:

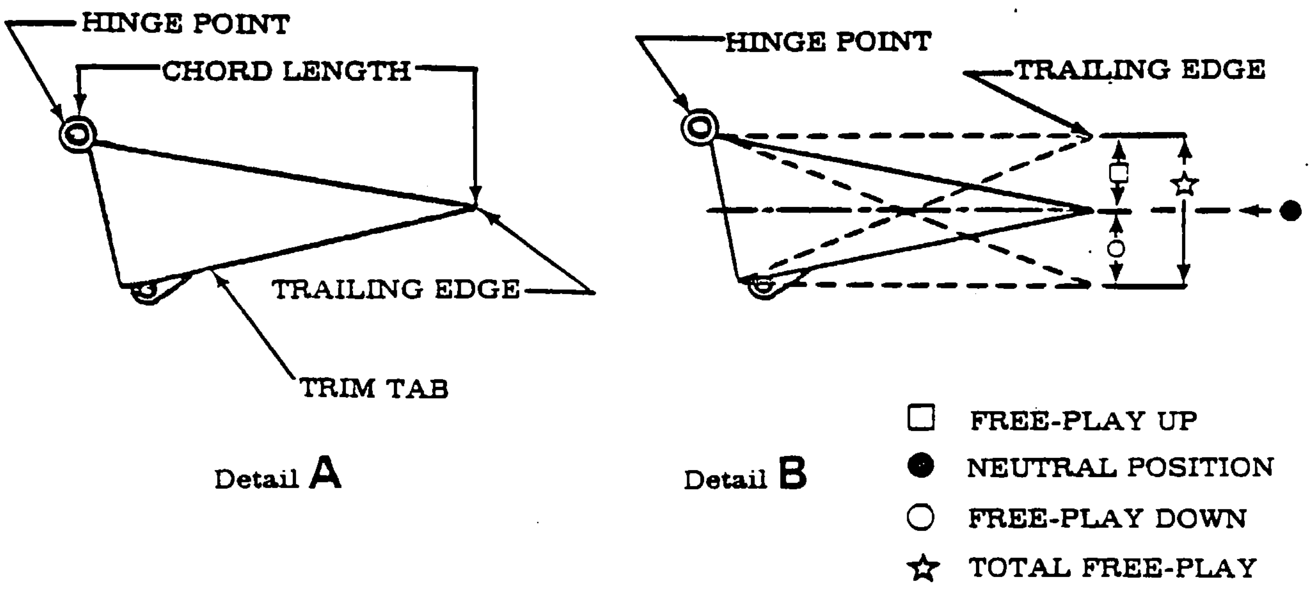
BEARING (6)	
INSIDE DIAMETER	0.373" MIN.
INSIDE DIAMETER	0.374" MAX.
BEARING (14)	
INSIDE DIAMETER	
SMALL HOLE	0.248" MIN.
SMALL HOLE	0.249" MAX.
LARGE HOLE	0.373" MIN.
LARGE HOLE	0.374" MAX.

THREADED ROD END (15) OUTSIDE DIAMETER (SHANK)	0.245" MIN. 0.246" MAX.
SCREW (9) OUTSIDE DIAMETER	0.369" 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.



Detail A

Detail B

1. Measure chord length at extreme inboard end of trim tab as shown in detail A.
2. Multiply chord length by 0.025 to obtain maximum allowable free-play.
3. Measure free-play at same point on trim tab that chord length was measured.
4. Total free-play must not exceed maximum allowable. Refer to detail B.

Figure 9-2. Trim Tab Free-Play Inspection

9-10. REASSEMBLY. (See figure 9-4.)

a. Always discard the following items and install new parts during reassembly.
   1. Groove-Pins (8) and (10).
   2. O-Ring (13).
   3. Nuts (2).

b. During reassembly, lubricate collars (7), screw (9) and threaded rod end (15) in accordance with procedures outlined in Section 2.

c. Install collar (7) and bearing (6) on screw (9).

d. Press sprocket (5) into the end of screw (9), align groov-pin holes and install new groov-pins (8).

e. Insert screw (9), with assembled parts, into housing (12) until bearing (6) is flush with end of housing.

NOTE

When inserting screw (9) into housing (12), locate the sprocket (5) at the end of housing which is farther away from the groove for retaining ring (11).

The bearings (6) and (14) are not pre-drilled and must be drilled on assembly. The groove-pins (10) are 1/16 inch in diameter, therefore, requiring a 1/16 (0.0625) inch drill.

f. With bearing (6) flush with end of housing (12), carefully drill bearing so the drill will emerge from the hole on the opposite side of housing (12). DO NOT ENLARGE HOLES IN HOUSING.

g. Press new groov-pins (10) into pin holes.

h. Insert collar (7), new O-ring (13) and bearing (14) into opposite end of housing (12).

i. Complete steps "f" and "g" for bearing (14).

j. If a new bearing (16) is required, a new bearing may be pressed into the boss. Be sure force bears against the outer race of bearing.

k. Screw the threaded rod end (15) into screw (9).

l. Install retaining rings (11), if they were removed.

m. Test actuator assembly by rotating sprocket (5) with fingers while holding threaded rod end (15). The threaded rod end should travel in and out smoothly, with no indication of binding.

n. Reinstall actuator assembly in accordance with paragraph 9-7.

9-11. TRIM TAB FREE-PLAY INSPECTION.

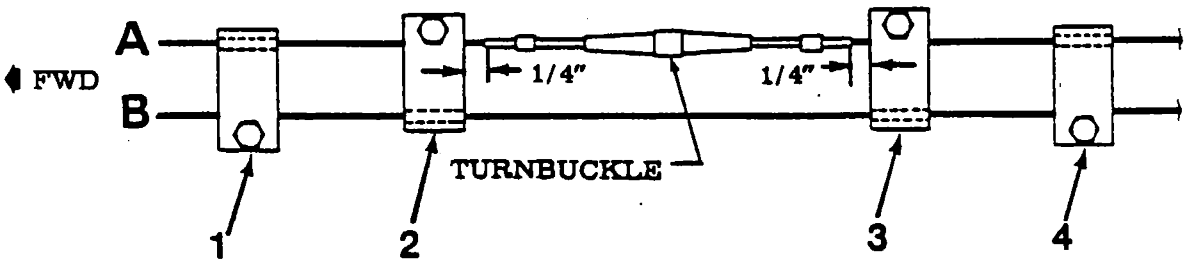
a. Place elevator and trim tab in the neutral position and secure elevator from movement.

b. Determine maximum amount of allowable free-play using formula shown in figure 9-2.

c. Using moderate hand pressure (up and down), measure free-play at trailing edge of trim tab.

d. If the trim tab free-play is less than the maximum allowable, the system is within prescribed limits.

e. If trim tab free-play is more than maximum allowable, check the following items for looseness while moving trim tab up and down.
   1. Check push-pull channel to trim tab horn assembly attachment for looseness.
   2. Check push-pull channel to actuator assembly threaded rod end attachment for looseness.



1. **With elevators in neutral, set trim tab to neutral (streamlined).**
2. **Position stop blocks (2) and (3) approximately 1/4" fore-and-aft of turnbuckle respectively, and secure to cable A.**
3. **Place inclinometer on trim tab and run tab to DOWN TRAVEL limit listed in Section 1.**
4. **Position stop block (4) against stop block (3) and secure to cable B.**
5. **Run trim tab to UP TRAVEL limit listed in Section 1, place stop block (1) against stop block (2) and secure to cable B.**

Figure 9-3. Elevator Trim Tab Travel Adjustment

3. **Check actuator assembly threaded rod end for looseness in the actuator assembly.**

f. **If looseness is apparent while checking steps e-1 and e-2, repair by installing new parts.**
g. **If looseness is apparent while checking step e-3, refer to paragraphs 9-6 through 9-10.**

9-12. TRIM TAB CONTROL WHEEL. (See figure 9-1.)

9-13. REMOVAL AND INSTALLATION.

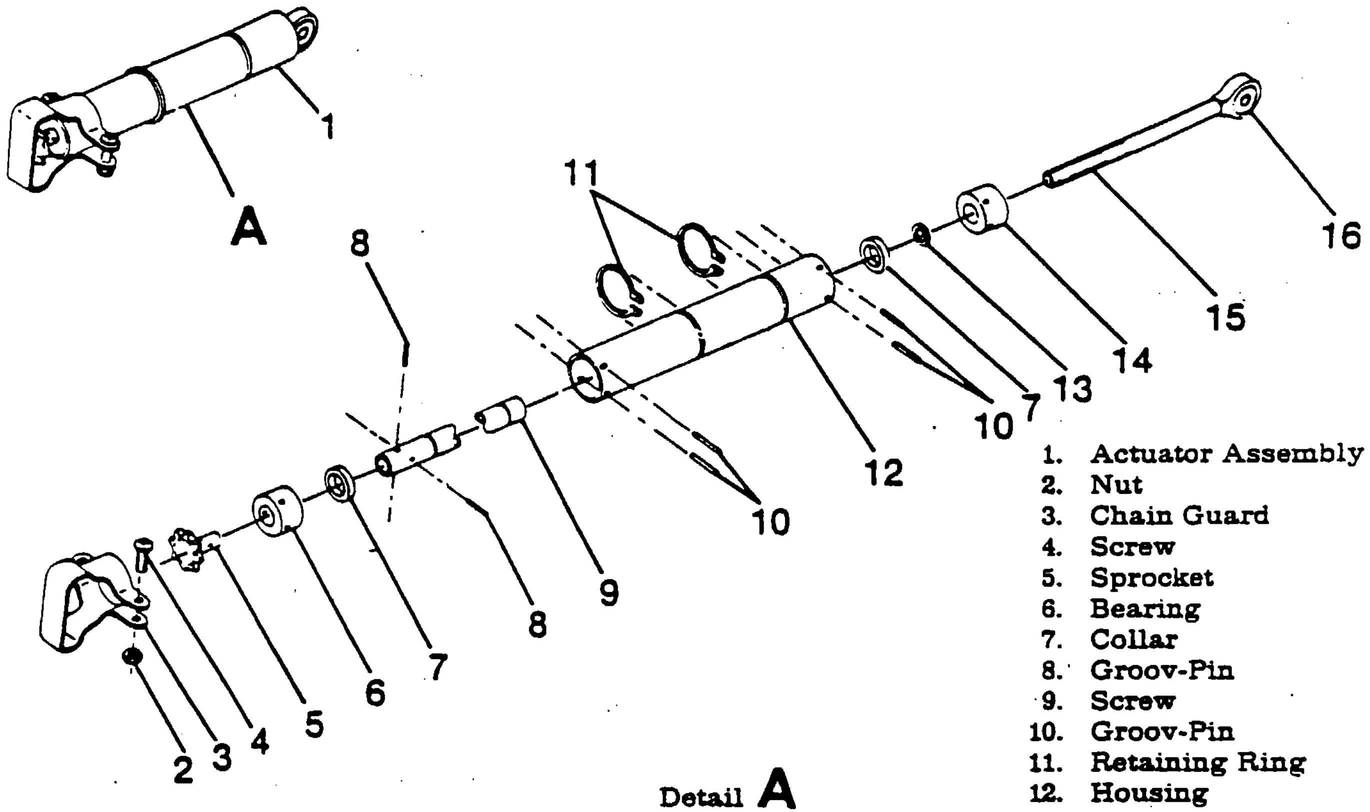
a. Relieve cable tension at turnbuckle (8).

CAUTION

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

b. Remove pedestal cover (12). (Refer to paragraph 9-18.)
c. Remove screws attaching control wheel retainer (17).
d. Remove retainer and pointer (16), using care not to drop control wheel (14).
e. Disenengage roller chain (12) from sprocket (15) and remove control wheel.
f. Reverse preceding steps for installation. Rig system in accordance with paragraph 9-18, safety turnbuckle and reinstall all items removed for access.

9-14. CABLES AND PULLEYS. (See figure 9-1.)



1. Actuator Assembly
2. Nut
3. Chain Guard
4. Screw
5. Sprocket
6. Bearing
7. Collar
8. Groov-Pin
9. Screw
10. Groov-Pin
11. Retaining Ring
12. Housing
13. O-Ring
14. Bearing
15. Threaded Rod End
16. Bearing

Figure 9-4. Elevator Trim Tab Actuator Assembly

9-15. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery, and access plates as necessary.
b. Disconnect cables at turnbuckles (8) and at cable ends (5) and (6).
c. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

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

d. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards.
e. Rig system in accordance with paragraph 9-18, safety turnbuckle and reinstall all items removed in step "a".

9-16. PEDESTAL COVER.(See figure 9-1.)

9-17. REMOVAL AND INSTALLATION.

a. Remove fuel selector valve handle and placard.
b. Remove mike and remove mike jack mounting nut.
c. Remove screws attaching pedestal cover to structure and remove cover.

9-18. RIGGING. (See figure 9-1.)

CAUTION

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

a. Remove rear baggage compartment panel and access plates as necessary.
b. Loosen travel stop blocks (10) on cables.
c. Disconnect actuator (3) from trim tab push-pull channel.
d. Check cable tension and readjust turnbuckle (8) if necessary.

NOTE

If chains and/or cables are being installed, permit actuator screw to rotate freely as chains and cables are connected. Set cable tension.

e. Rotate trim wheel (14) full forward (nose down). Ensure pointer (16) does not restrict wheel movement. If necessary, reposition pointer using thin screwdriver to pry trailing leg of pointer out of groove.

NOTE

Full forward (nose down) position of trim wheel is where further movement is prevented by chain or cable ends contacting sprockets or pulleys.

f. With elevator and trim tab both in neutral (streamlined), place an inclinometer on tab and set to zero.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. See figure 6-4.

g. Rotate actuator screw in or out as required to place tab up with a maximum of 2° overtravel, with actuator screw connected to push-pull channel.
h. Rotate trim wheel to position tab up and down, readjusting actuator screw as required to obtain overtravel in both directions.
i. Position stop blocks (10) and adjust as illustrated in figure 9-3 to limit travel as outlined in Section 1.
j. Check that trim wheel pointer travels the same distance from ends of slot in cover. Reposition trailing leg of pointer if necessary (refer to step "e").
k. Safety turnbuckle and reinstall all items removed in step "a".

WARNING

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

SECTION 10

RUDDER AND RUDDER TRIM CONTROL SYSTEM

10-1. RUDDER CONTROL SYSTEM. (See figure 10-1.)

10-2. DESCRIPTION. Rudder control is maintained through use of conventional type rudder pedals, which also control nose wheel steering. Rudder control cables are attached to the rudder bars in the pedal assembly and are attached to the rudder bellcrank through cables and pulleys. These same cables are used in control of the rudder trim system. Cable tension is 30 ± 10 lbs. on the rudder cables.

10-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to rerig system. refer to paragraph 10-12.

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.

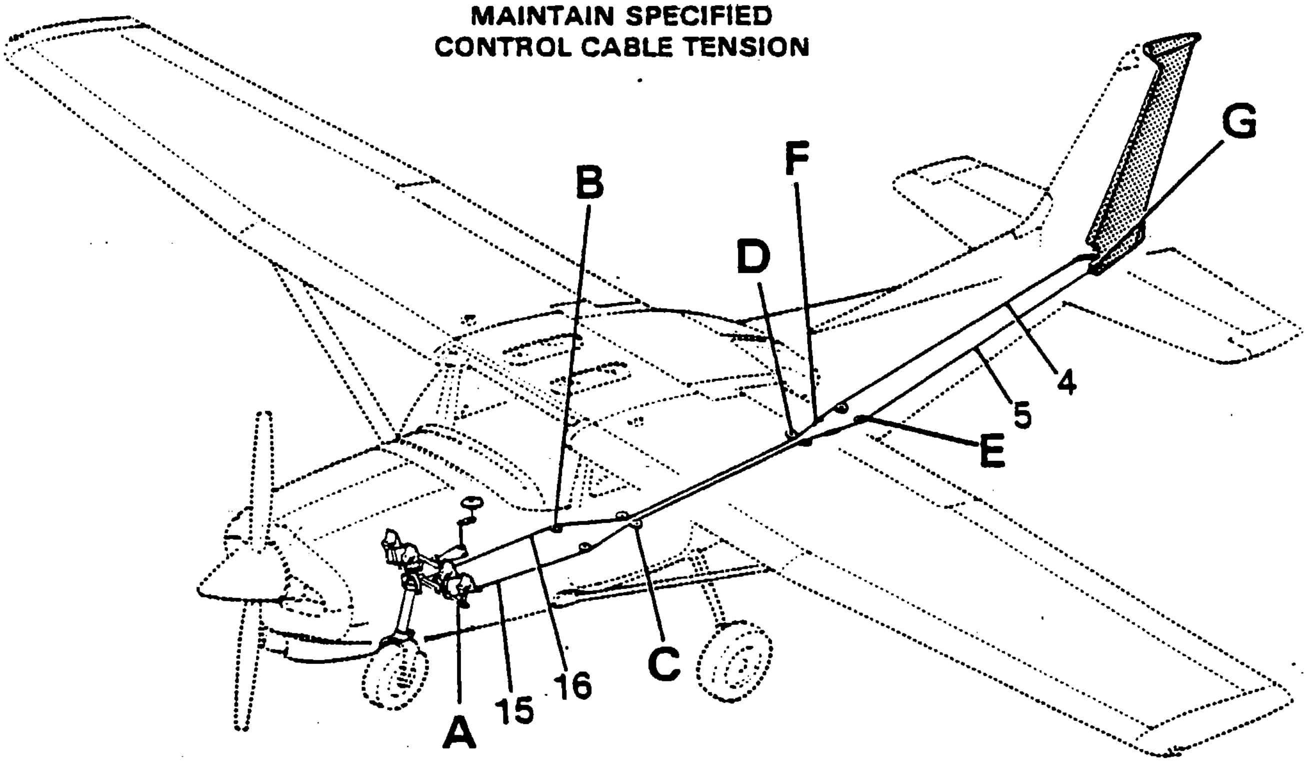
10-3. TROUBLE SHOOTING (Cont).

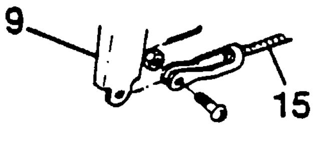
TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Rig system in accordance with paragraph 10-12.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable 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.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Rig system in accordance with paragraph 10-12.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-12.

10-4. RUDDER PEDAL ASSEMBLY. (See figure 10-2.)

10-5. DESCRIPTION. The rudder pedal assembly is involved in four functions, rudder control, rudder trim control, nose wheel steering and brake application. Rudder control and nose wheel steering are accomplished by application of pressure to the pedals. Application of pressure to the top of the rudder pedals operates the brakes. The rudder trim system is provided by linkage attached from the right foot rudder bar to the rudder trim control wheel.

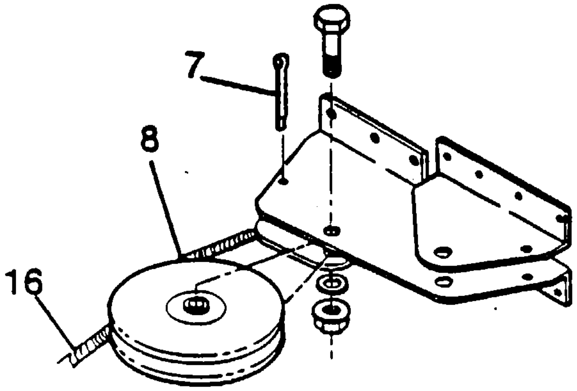
CAUTION
MAINTAIN SPECIFIED
CONTROL CABLE TENSION





Detail A

CABLE TENSION:
30 ± 10 LBS. AT AVERAGE AIR TEMPERATURE FOR AREA. REFER TO FIGURE 1-1 FOR TRAVEL.



Detail B

1. Shackle
2. Bellcrank
3. Travel Stop
4. RH Aft Cable
5. LH Aft Cable
6. Turnbuckle
7. Cable Guard
8. Pulley
9. Arm, Right Foot Rudder Bars
10. Rudder Cable
11. Clevis
12. Washer
13. Bolt
14. Stop Nut
15. LH Forward Cable
16. RH Forward Cable

Figure 10-1. Rudder Control System (Sheet 1 of 2)

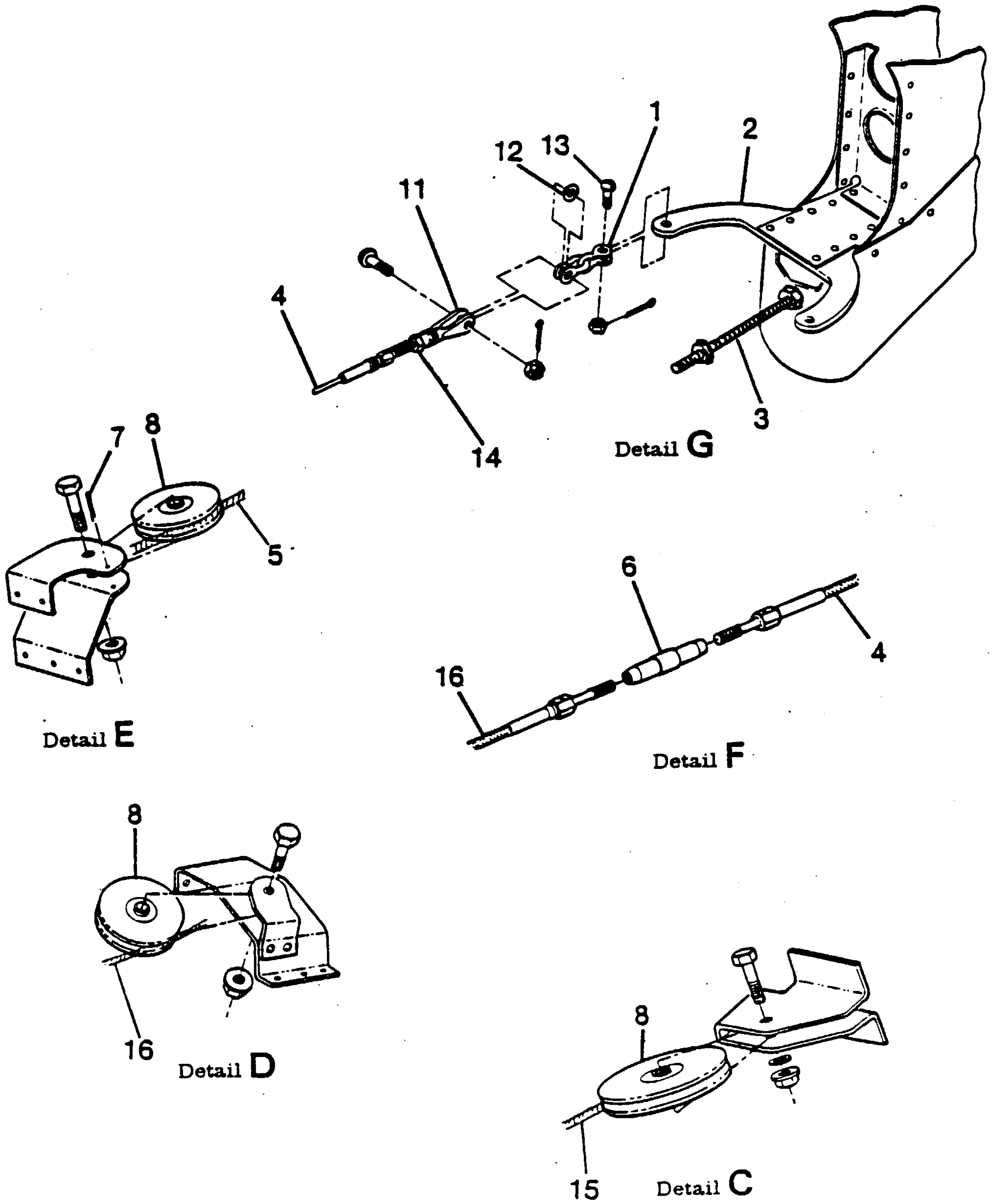
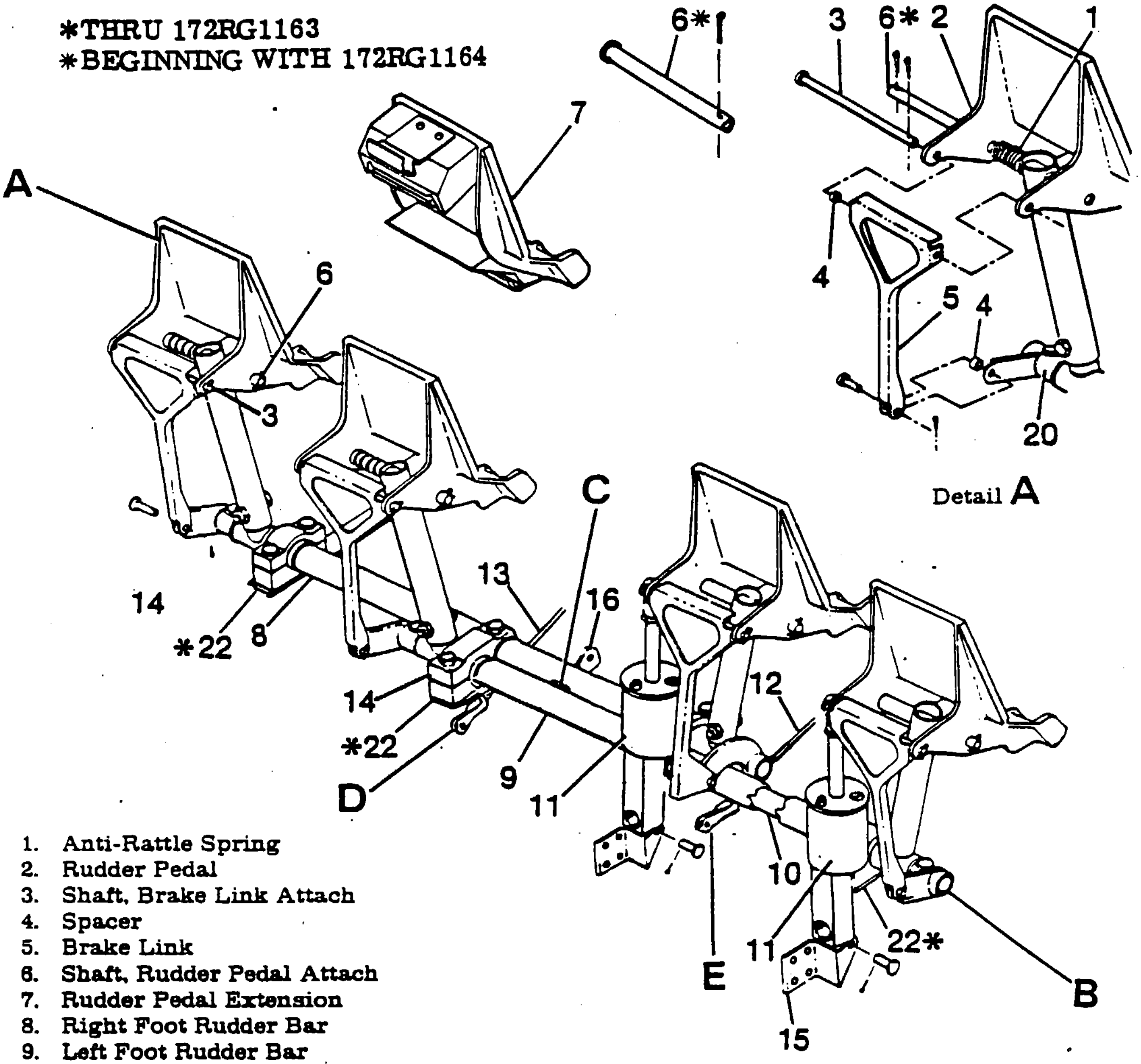


Figure 10-1. Rudder Control System (Sheet 2 of 2)



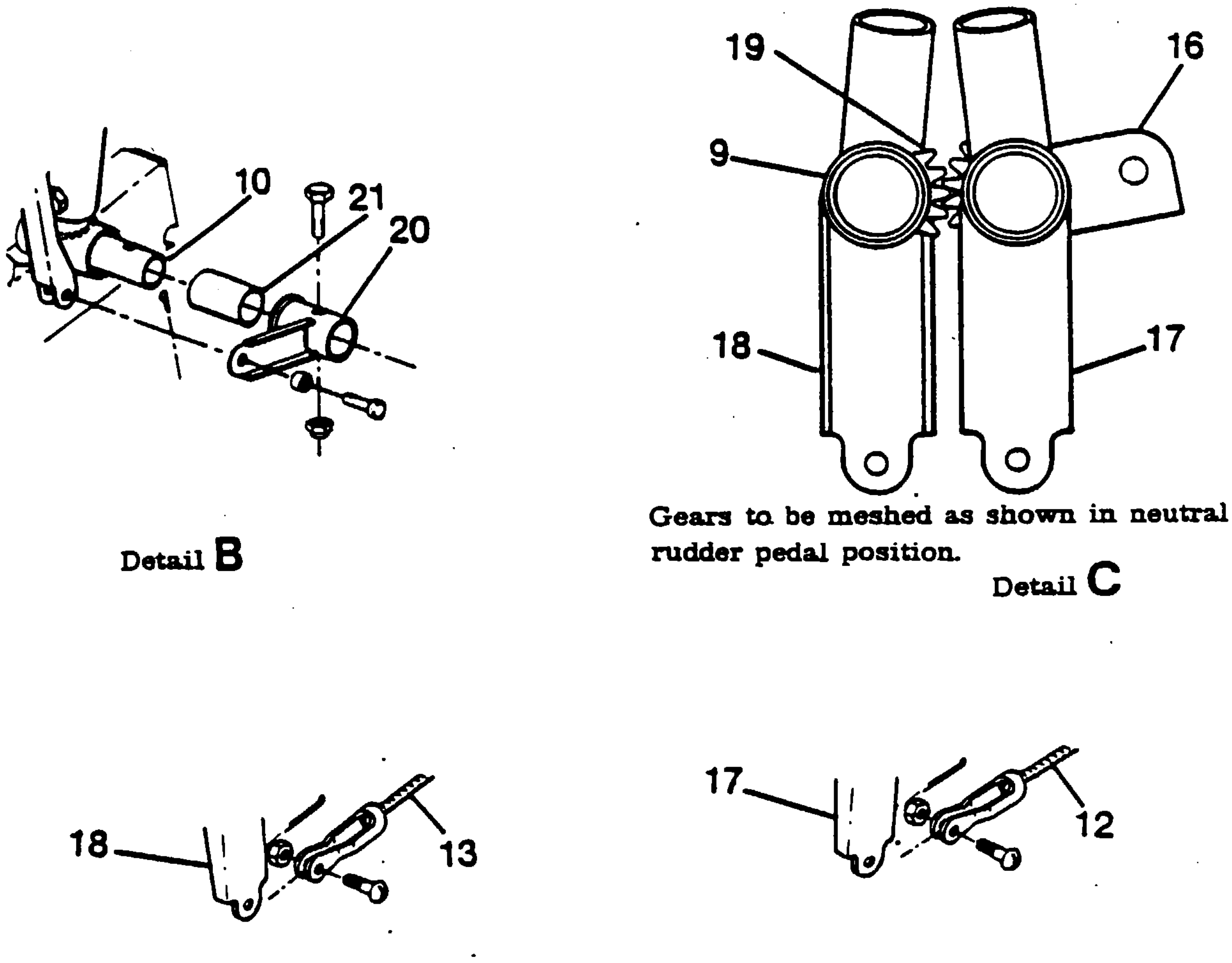
1. Anti-Rattle Spring
2. Rudder Pedal
3. Shaft, Brake Link Attach
4. Spacer
5. Brake Link
6. Shaft, Rudder Pedal Attach
7. Rudder Pedal Extension
8. Right Foot Rudder Bar
9. Left Foot Rudder Bar
10. Brake Torque Tube
11. Master Cylinder
12. LH Rudder Cable
13. RH Rudder Cable
14. Bearing Block
15. Bracket
16. Arm, Bungee Attach
17. Arm, Right Foot Rudder Bar
18. Arm, Left Foot Rudder Bar
19. Gear
20. Bellcrank
21. Bearing
22. Shim

NOTE

Hubs replace brake links (5), bellcranks (20) and pedals on the RH ends of the rudder bars when dual controls are not installed.

* BEGINNING WITH 172RG0829

Figure 10-2. Rudder Pedal Installation (Sheet 1 of 2)



Detail **B**

Gears to be meshed as shown in neutral rudder pedal position.

Detail **C**

Detail **D**

Detail **E**

Figure 10-2. Rudder Pedal Installation (Sheet 2 of 2)

10-6. REMOVAL AND INSTALLATION.

a. Remove carpeting, shields and soundproofing from the pedal and tunnel area as necessary.
b. Disconnect master cylinders (11) just forward of pilot's control pedals.
c. Disconnect parking brake cables at master cylinders.
d. Remove rudder pedals (2) and brake links (5).
e. Relieve cable tension at turnbuckles (index 6, figure 10-1).
f. Disconnect cables (12) (13) and steering bungee (index 2, figure 10-6).
g. Disconnect bungee (index 2, figure 10-6) by removing pin (6).
h. Remove bolts securing bearing blocks (14) and shims (22) beginning with 172RG0829, then remove. Work rudder bars out of tunnel area.

NOTE

Rudder bar assemblies should be checked for excessive wear before reinstallation. The bearing blocks are nylon and require no lubrication unless binding occurs. A few drops of all purpose oil should eliminate such binding.

i. Reverse preceding steps for reinstallation, installing rudder bars with gears meshed as shown in figure 10-2, Detail C. Rig system in accordance with paragraph 10-12. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

10-7. CABLES AND PULLEYS. (See figure 10-1.)

10-8. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.
b. Relieve cable tension at turnbuckles (6).
c. Disconnect cable at rudder bar (9) and bellcrank (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 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.

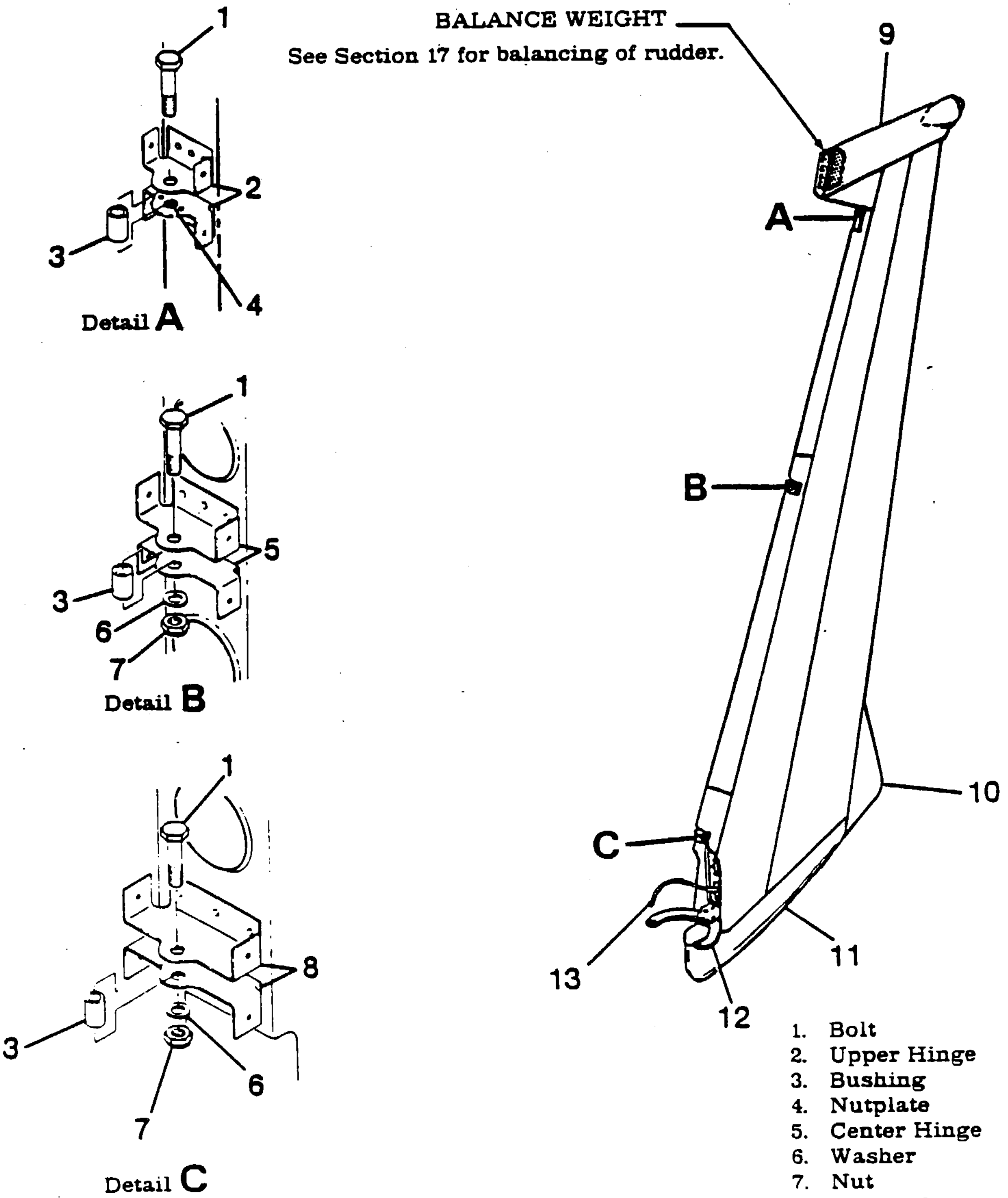
e. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
f. Rig system in accordance with paragraph 10-12. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

10-9. RUDDER. (See figure 10-3.)

10-10. REMOVAL AND INSTALLATION.

a. Disconnect tail navigation light quick-disconnect (13).
b. Relieve cable tension at clevises (index 11, figure 10-1) and disconnect clevises from rudder bellcrank (12).
c. With rudder supported, remove hinge bolts (1) and lift rudder free of vertical fin.
d. Reverse preceding steps for installation. Rig system in accordance with paragraph 10-12 and safety turnbuckles or clevises, as applicable.

10-11. REPAIR. Repair may be accomplished as outlined in Section 17. Hinge bushings may be replaced as necessary. Upon making repair or painting of rudder, a balancing check and/or rebalancing is required as described in Section 17.



1. Bolt
2. Upper Hinge
3. Bushing
4. Nutplate
5. Center Hinge
6. Washer
7. Nut
8. Lower Hinge
9. Upper Tip
10. Trim Tab
11. Lower Tip
12. Bellcrank
13. Quick Disconnect

Figure 10-3. Rudder Assembly

10-12. RIGGING. (See figure 10-1).

NOTE

The rudder and rudder trim system is correctly rigged when dimensions and specification are as follows:
With the nose wheel centered, rudder in neutral and rudder trim wheel and trim indicator in neutral.

1. Rudder bar gears are as shown in figure 10-2, Detail C (neutral position).
2. Steering and rudder trim bungee is as shown in figure 10-6, (neutral position).
3. Rudder cable tension is 30 ± 10 lbs.
4. Rudder travel stops are correctly set to specifications given in figure 1-1 or figure 10-4.

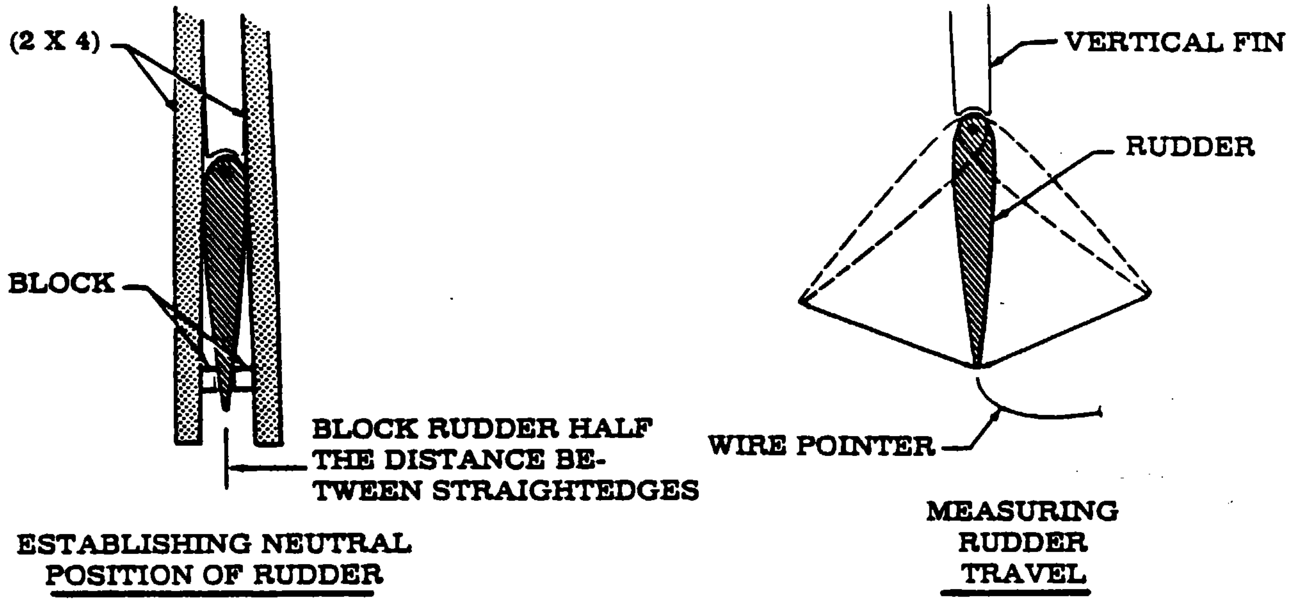
a. Tie down or weight tail of airplane just far enough to raise nose wheel clear of ground.
b. Center nose gear against external stops.
c. Establish neutral positions of the rudder (see figure 10-4), rudder trim wheel and trim indicator.
   1. Disconnect rudder cables and/or trim wheel chain if not previously disconnected or if necessary to establish neutral positions.
d. Check the nose wheel steering and trim bungee for the dimensions given in figure 10-6 (27/32" or .85" and 1-5/16" or 1.32"). Assure that the pin in the slotted hole of the bungee is seated at the top of the slot.
e. Note the position of the rudder bar gears (figure 10-2, Detail C), if the rudder bar has been properly installed, the adjustment of the bungee should correctly mesh the gears as shown (neutral position).
f. Attach chain from trim wheel linkage to the bungee sprocket (index 3, figure 10-6). See figure 10-5 for rudder trim wheel and trim indicator installation. Ensure that neutral positions are maintained and the bungee sprocket is not rotated.
g. Attach rudder cables to rudder bars and/or rudder bellcrank and adjust to 30 ± 10 lbs at the turnbuckles (6). Maintain neutral rudder position and rudder pedal position while establishing cable tension.
h. Set rudder travel as described in figure 10-4 or see figure 1-1 and set rudder travel stops to the dimensions given.

WARNING

Check rudder for correct direction of movement when operated by controls prior to flight.

10-13. RUDDER TRIM CONTROL SYSTEM. (See figure 10-5.)

10-14. DESCRIPTION. The trim wheel, actuated by the pilot, is linked by chains, shafts and sprockets to the trim and steering bungee which is attached to the right foot rudder bar and hence the rudder itself. Rotation of the trim wheel rotates the bungee sprocket which screws in and out of the bungee to initiate movement of the rudder.
A fixed trim tab (index 10, figure 10-3) is located at the bottom of the rudder itself and may be adjusted manually.



ESTABLISHING NEUTRAL POSITION OF RUDDER

MEASURING RUDDER TRAVEL

1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 x 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to one elevator in such a manner that it can be bent to index with a point on rudder trailing edge just above the lower rudder tip (disregard fixed trim tab).
3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges.
5. Hold rudder against right, then left, rudder stop. Measure the distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 5.29" and 5.91".

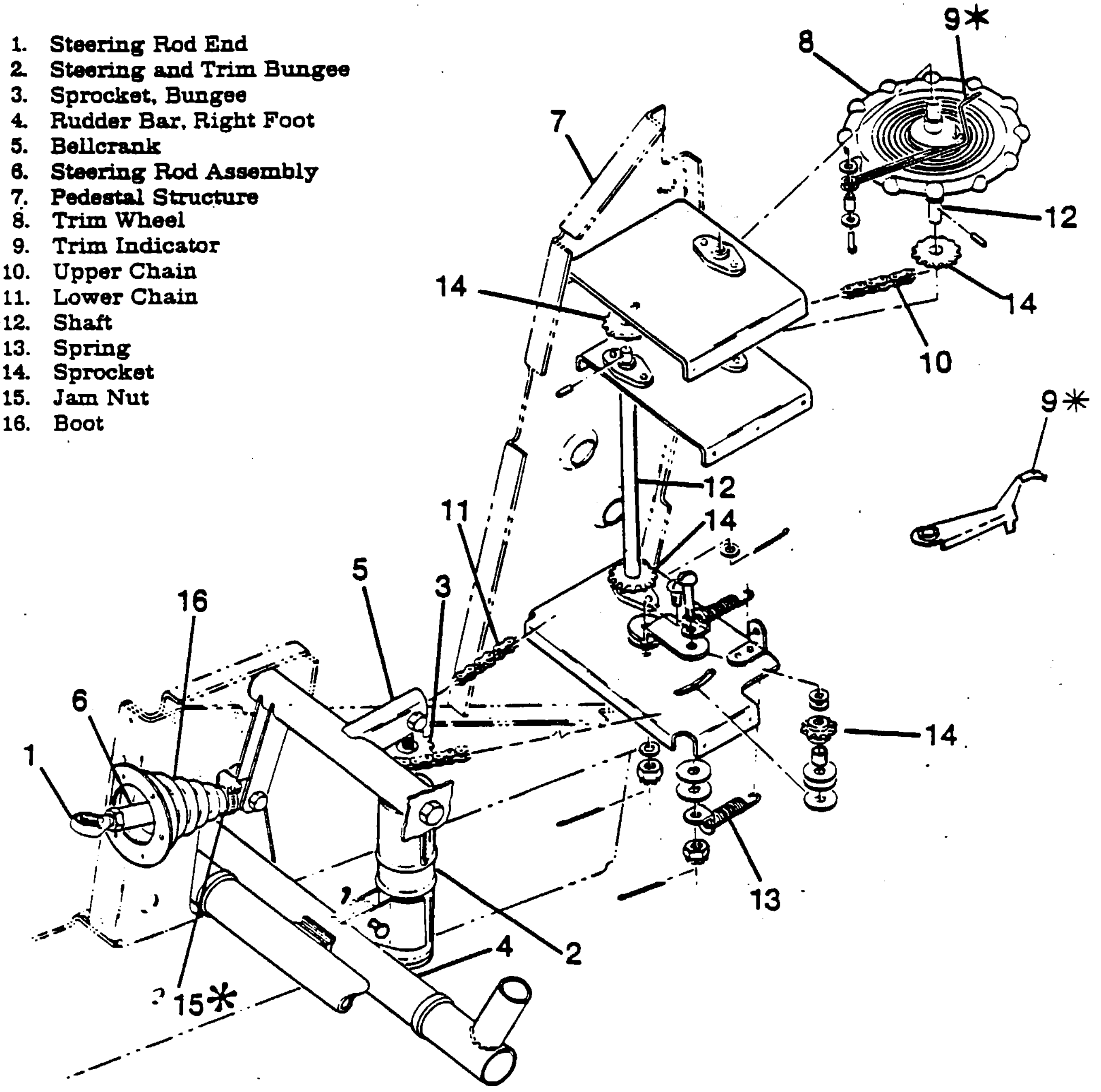
Figure 10-4. Checking Rudder Travel

10-15. RIGGING RUDDER TRIM. (See figure 10-5.) Rudder and rudder trim are a closed system and are rigged together as described in paragraph 10-12. The fixed trim tab is adjusted by flight testing the airplane and bending trim tab (index 10, figure 10-3) as necessary to provide adequate corrections. Do not rig rudder "off-center" unless trim tab does not provide adequate correction.

WARNING

Be sure that rudder trim wheel moves the rudder in correct direction prior to flight.

1. Steering Rod End
2. Steering and Trim Bungee
3. Sprocket, Bungee
4. Rudder Bar, Right Foot
5. Bellcrank
6. Steering Rod Assembly
7. Pedestal Structure
8. Trim Wheel
9. Trim Indicator
10. Upper Chain
11. Lower Chain
12. Shaft
13. Spring
14. Sprocket
15. Jam Nut
16. Boot



NOTE

Compliance with Service Letter SE80-99 Rev #1 is manditory.

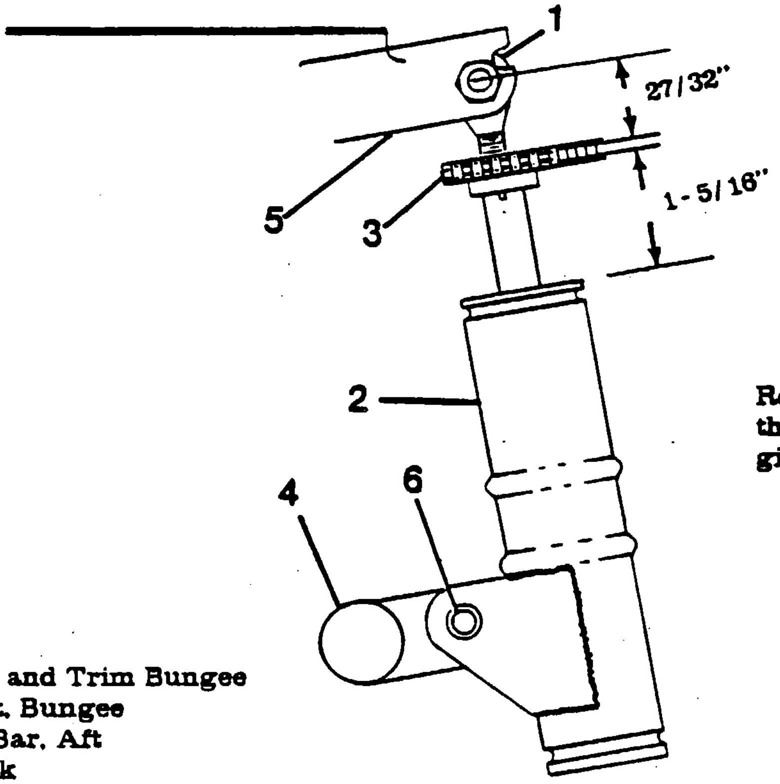
✳NOTE

Install jam nut (15) at aft end of boot.

✱ THRU 172RG1002

✳ BEGINNING WITH 172RG1003

Figure 10-5. Rudder Trim Control System



NOTE

Refer to paragraph 10-18 in the event that dimensions given cannot be obtained.

1. Rod End
2. Steering and Trim Bungee
3. Sprocket, Bungee
4. Rudder Bar, Aft
5. Bellcrank

Figure 10-6. Steering and Trim Bungee (Neutral Position)

10-16. NOSE GEAR STEERING. The nose gear is described and illustrated in Section 5.

10-17. DESCRIPTION. As applicable to this Section: The rudder pedals control nose gear steering through the nose wheel steering and trim bungee (2, figure 10-6), which engages a bellcrank (5, figure 10-5), which is connected to the nose gear steering bellcrank by a rod assembly (6, figure 10-5).

10-18. RIGGING. (See figure 10-5.)

a. Refer to paragraph 10-12 and rig nose gear steering at same time rudder and rudder trim system is rigged. This is a closed system and adjustments should be made at the same time.

NOTE

In the event that the steering and trim bungee (2) cannot be adjusted as shown in figure 10-6 with the nose gear centered, remove rod assembly (6) from the nose gear steering bellcrank. Adjust bungee (2) per paragraph 10-12 and adjust nose gear steering bellcrank rod (6) to allow nose wheel to center and reinstall rod (6) to bellcrank. It may be necessary to support rudder pedals in neutral position when the nose gear steering bellcrank rod is disconnected.

SECTION 11

ENGINE

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

TABLE OF CONTENTS

11-1. ENGINE COWLING.

11-2. DESCRIPTION. The engine cowling is divided into four major removable segments. A door located in the right upper segment provides access to the engine oil dipstick, oil filler neck and the fuel strainer drain control. The right and left upper cowl segments are secured with quick-release fasteners and either may be removed individually. The upper middle cowl segment also comprises the upper portion of the nose cap and is secured to the fuselage and lower nose cap by machine screws. The lower portion of the nose cap is secured to the lower engine nacelle by machine screws. The lower engine nacelle is an extension of the fuselage and provides fairing for the nose gear in its retracted position.

11-3. REMOVAL AND INSTALLATION.

a. Release the quick-release fasteners securing the right and left upper cowl segments to the fuselage and upper middle cowl segments and remove right and left upper segments.
b. Remove machine screws securing upper middle cowl segment to fuselage and lower nose cap and remove segment.
c. Remove machine screws attaching lower nose cap to lower engine nacelle and remove nose cap.
d. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct airflow around the engine. The vertically installed seals must fold forward or inward and the side seals must fold upward.

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.

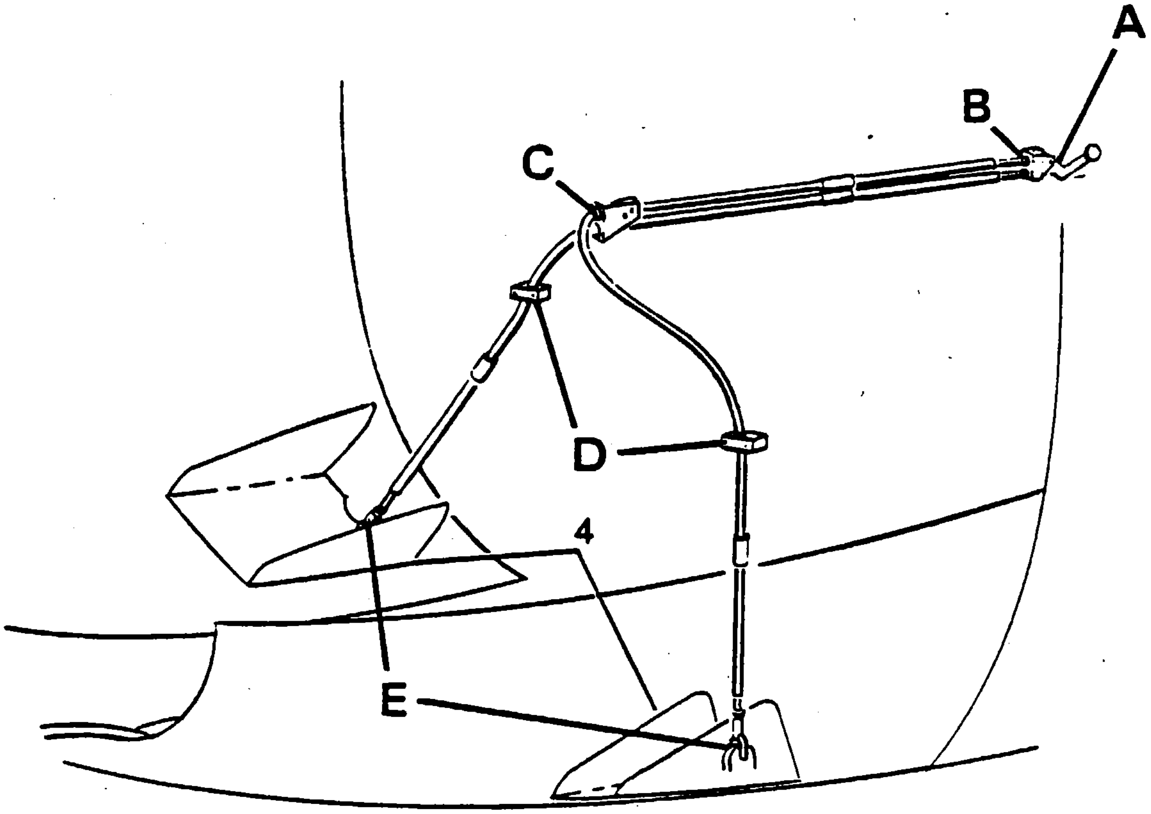
11-5. REPAIR. If cowling skins are extensively damaged, new complete sections of the cowling should be installed. Standard insert-type patches may be used for repair if repair parts are formed to fit contour of cowling. Small cracks may be stop-drilled and small dents straightened if they are reinforced 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.

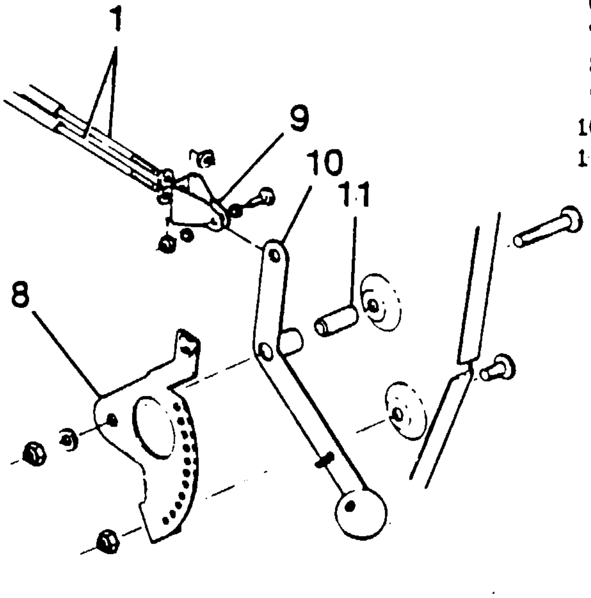
11-7. DESCRIPTION. Cowl flaps are provided to aid in controlling the engine temperature. Two cowl flaps, operated by a single control in the cabin, are located in the lower aft end of the engine nacelle. The engine exhaust protrudes through a cutout in the aft portion of the right cowl flap.

11-8. REMOVAL AND INSTALLATION. (See figure 11-1.)

a. Place cowl flap control lever (10) in the OPEN position.
b. Disconnect cowl flap control clevises (5) from cowl flap shock-mounts (6).
c. Remove safety wire securing hinge pins to cowl flaps, pull pins and remove flaps.
d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 11-9.



1. Cowl Flap Control
2. Clamp
3. Clamp
4. Cowl Flaps
5. Clevis
6. Shock-Mount
7. Bracket
8. Position Bracket
9. Clevis
10. Control Lever
11. Bushing



Detail **A**

Figure 11-1. Cowl Flap Installation (Sheet 1 of 2)

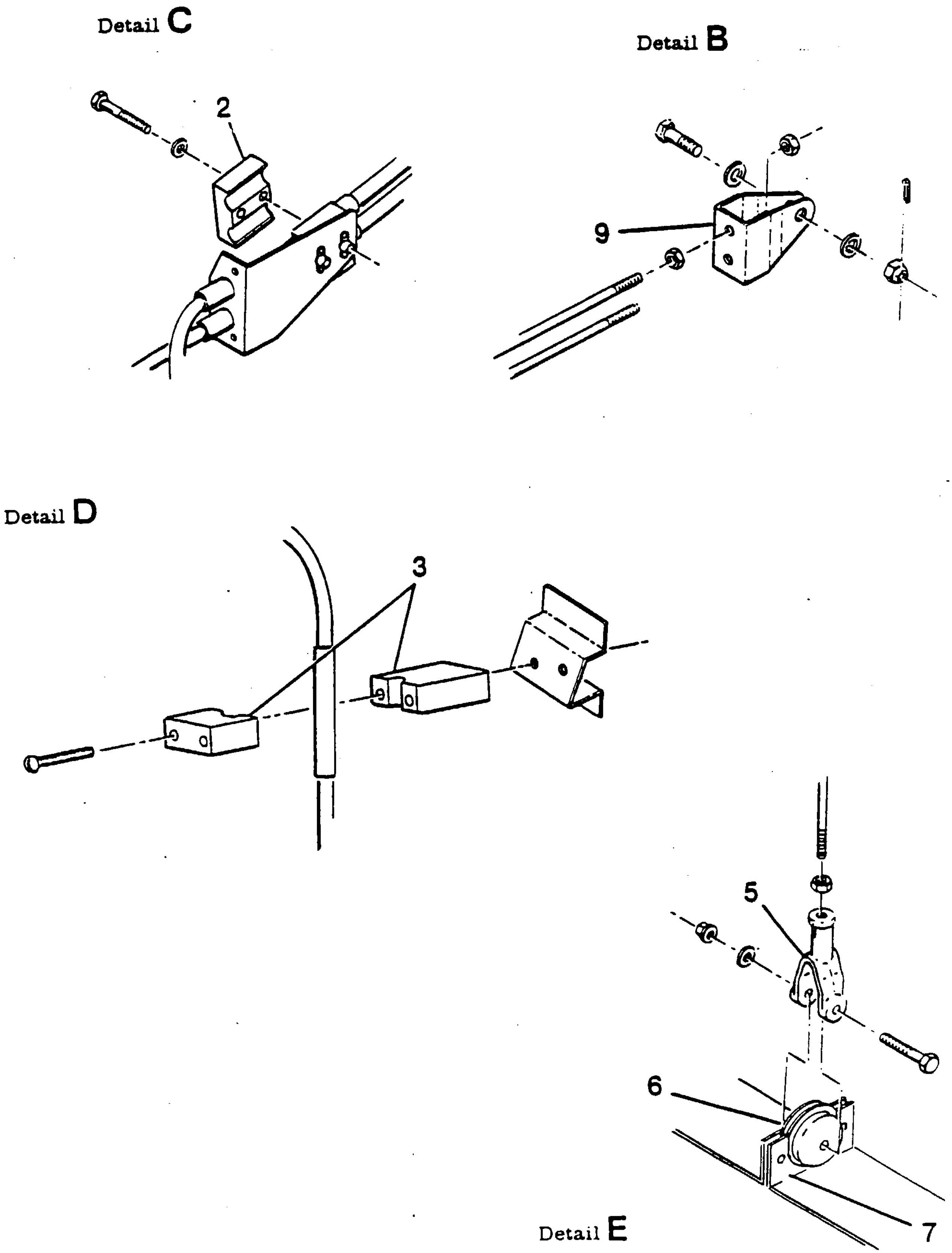


Figure 11-1. Cowl Flap Installation (Sheet 2 of 2)

11-9. RIGGING. (See figure 11-1.)

a. Disconnect cowl flap control clevises (5) from cowl flap shock-mounts (6).

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 (10) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (2) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (9) to position control lever in bottom hole of position bracket (8).

d. With the control lever in CLOSED position, hold one cowl flap trailing edge .27 ±.06 inches below the cowl contour. Loosen jam nut and adjust clevis (5) on the control to hold cowl flap in this position and install bolt.

NOTE

If lower control clevis (5) cannot be adjusted far enough to obtain the above adjustment and still maintain sufficient thread engagement, loosen the lower control housing clamp (3) 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. Check that all clamps and jam nuts are tight.

11-10. ENGINE.

11-11. DESCRIPTION. An air cooled, wet-sump four-cylinder, horizontally-opposed, direct-drive carbureted Lycoming 0-360-Series engine is used to power the aircraft. The cylinders, numbered from front to rear, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right front cylinder is number 1 and cylinders on the right side are identified by odd numbers 1 and 3. The left front cylinder is number 2 and the cylinders on the left side are identified as numbers 2 and 4. Refer to paragraph 11-14 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturers. These publications are available from the Cessna Supply Division.

11-12. TIME BETWEEN OVERHAUL (TBO). Refer to the latest Revision of Lycoming Service Instruction No. 1009, and all applicable Service Letters or Service Bulletins, for recommendations applicable to 0-360-Series engines. At the time of overhaul engine accessories should be overhauled.

11-13. OVERSPEED LIMITATIONS. The engine must not be operated above specified maximum continuous RPM. However, should inadvertant overspeed occur refer to the latest issue of Avco Lycoming Service Bulletin No. 369 and all applicable Service Letters and Service Instructions for obligatory recommendations.

11-14. ENGINE DATA.

AIRCRAFT Series	172RG
MODEL (Lycoming)	O-360-F1A6
Rated Horsepower at RPM	180 at 2700

11-14. ENGINE DATA (Cont).

Number of Cylinders	4 Horizontally-Opposed	
Displacement	361 Cubic Inches	
Bore	5.125 Inches	
Stroke	4.375 Inches	
Compression Ratio	8.5:1	
Magnetos	Slick 4191	
Right Magneto	Fires 25° BTC, Upper Left, Lower Right	
Left Magneto	Fires 25° BTC, Lower Left, Upper Right	
Magnetos	Slick 4251	
Installed on 172RG00017, 172RG00031, 172RG00033, 172RG00034, 172RG00038, 172RG00044, 172RG00054, and Beginning with 172RG00056 & On		
Right Magneto	Fires 25° BTC, Upper Left, Lower Right	
Left Magneto	Fires 25° BTC, Lower Left, Upper Right	
Firing Order	1-3-2-4	
Spark Plugs	18mm (Refer to Avco Lycoming Service Instruction No. 1042 for factory approved spark plugs and required gap.)	
Torque	390 ± 30 LB-IN.	
Carburetor (Marvel-Schebler)	HA-6	
Tachometer	Mechanical Drive	
Oil Sump Capacity	8 U.S. Quarts	
With External Filter	9 U.S. Quarts	
Oil Pressure (PSI)		
Normal	60-90	*50-90
Minimum Idling	25	20
Maximum	100 (Thru 1980)	115
Maximum	115 (1981 and ON)	
Oil Temperature		
Normal Operating	Within Green Arc	
Maximum	Red Line (245°F)	
Probe Location	Accessory Housing	
Cylinder Head Temperature		
Normal Operating	Within Green Arc	
Maximum	Red Line (500°F)	
Probe Location	Lower Side of Number 4 Cylinder	

*1984 and ON and all aircraft equipped with SK172-84 Kit.

11-14. ENGINE DATA. (Cont).

Direction of Crankshaft Rotation (Viewed from Rear)	Clockwise
Dry Weight-With Accessories	300 LB (Weight is approximate and will vary with optional accessories installed.)

11-15. TROUBLE SHOOTING -- ENGINE.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE WILL NOT START.	Improper use of starting procedure.	Refer to Pilot's Operating Handbook
	Fuel bays empty.	Visually inspect bays. 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 bay known to contain gasoline.
	Defective carburetor.	Repair or replace carburetor. Refer to Section 12 for fuel strainer
	Carburetor screen or fuel strainer plugged.	Remove carburetor and clean thoroughly. Refer to paragraph 11-47.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.)	Refer to Pilot's Operating Handbook.
	Engine flooded.	Refer to Pilot's Operating Handbook.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective magneto switch or grounded magneto leads.	Check continuity. Repair or replace switch or leads.
	Spark plugs fouled.	Remove, clean and regap plugs. Test harness cables to persistently fouled plugs. Replace if defective.

11-15. TROUBLE SHOOTING -- ENGINE (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE.	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 11-48.
	Carburetor idling jet plugged.	Clean carburetor and fuel strainer. Refer to paragraph 11-46.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-58.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.	Refer to Pilot's Operating Handbook.
	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 engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY.	Restriction in aircraft fuel system.	Refer to Section 12.
	Worn or improperly rigged throttle or mixture control.	Check visually. Replace worn Linkage. Rig properly.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.

11-15. TROUBLE SHOOTING -- ENGINE (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY. (Cont).	Defective ignition system.	Refer to paragraph 11-58.
	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.	Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Restricted induction air filter.	Check visually. Clean in accordance with Section 2.
	Cracked engine mount.	Inspect and repair or replace mount as required.
	Defective mounting bushings.	Inspect and install new bushings as required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Check that idle cut-off stop on carburetor is contacted. Replace worn linkage. Rig properly.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, it is defective. Repair or replace primer.
	Defective carburetor.	Repair or replace carburetor.
	Fuel contamination.	Check all screens in fuel system. Drain all fuel and flush out system. Clean all screens, lines, strainer and carburetor.

11-16. **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 procedures. 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 still attached.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Place fuel selector valve in the OFF position.
c. Remove engine cowling in accordance with paragraph 11-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine mount or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 13.
i. Disconnect throttle and mixture controls at carburetor. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Loosen clamps and remove flexible duct from engine baffle and oil cooler.
k. Loosen clamps and remove flexible duct from muffler shroud and heater valve.
l. Disconnect carburetor heat control at airbox and remove clamp attaching control to bracket. Pull control aft to clear engine.
m. Disconnect wires and cables as follows:
   1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

   2. Disconnect starter electrical cable at starter.
   3. Disconnect cylinder head temperature wire at probe.
   4. Disconnect electrical wires and wire shielding ground at alternator.
   5. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.

n. Disconnect lines and hoses as follows:
   1. Disconnect vacuum hose at firewall fitting.
   2. Disconnect engine breather hose at top of accessory case.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

   3. Disconnect oil temperature bulb at adapter.
   4. Disconnect primer line at firewall fitting.
   5. Disconnect fuel supply hose at carburetor.
   6. Disconnect oil pressure line at firewall fitting.
   7. Disconnect oil cooler hoses at cooler.

o. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.
p. Attach a hoist to the lifting eye at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mount.

CAUTION

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

q. Remove bolts attaching engine mount to firewall and slowly hoist engine and mount pulling forward. Check any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.

11-17. CLEANING. Refer to Section 2 for cleaning of the engine.

11-18. 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.

11-19. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.

a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.
b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.
c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.
d. Inspect for color bleaching of the end fittings or severe discoloration of the hoses.

NOTE

Avoid excessive flexing and sharp bends when examining hoses for stiffness.

e. Refer to Section 2 for replacement intervals for flexible fluid carrying hoses.
f. For major engine repairs, refer to the manufacturer's overhaul and repair manual.

11-20. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lockwashers, nuts, gaskets and rubber connections should be new parts.

11-21. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

a. Hoist the engine to a point near the engine mount.
b. Install engine shock-mount pads as illustrated in figure 11-2.
c. Carefully lower engine slowly into place on the engine mount. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mount.

NOTE

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

d. Install engine shock mount bolts, washers and nuts, torque bolts to 450-500 in-lbs. then remove the hoist and tail support stand.
e. Route throttle, mixture, propeller and carburetor heat controls to the carburetor, airbox, propeller governor and connect. Secure controls in position with clamps.

NOTE

Throughout the aircraft fuel system, from the tanks to the carburetor, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

f. Connect lines and hoses as follows:
    1. Connect oil cooler hoses at cooler.
    2. Connect oil pressure line at firewall fitting.
    3. Connect fuel supply hose at carburetor.
    4. Connect primer line at firewall fitting.
    5. Connect oil temperature bulb at adapter.
    6. Connect engine breather hose at top of accessory case.
    7. Connect vacuum hose at firewall fitting.
    8. Install clamps and lacings attaching lines and hoses to engine, engine mount and brackets.
g. Connect wires and cables as follows:
    1. Connect electrical wires and wire shielding ground at alternator.
    2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

    3. Connect starter electrical cable at starter.
    4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Hand tighten, then torque 1/4 turn.
    5. Install clamps and lacings securing wires and cables to engine, engine mount, and brackets.
h. Install flexible duct to heater valve and engine baffle and install clamps.
i. Install flexible duct to engine baffle and oil cooler and install clamps.

j. Install propeller and spinner in accordance with instructions outlined in Section 13.
k. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

l. Clean and install induction air filter.
m. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.
n. Check all switches are in the OFF position, and connect battery cables.
o. Rig engine controls in accordance with paragraphs 11-77 thru 11-80.
p. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
q. Install engine cowling in accordance with paragraph 11-3.
r. Perform an engine run-up and make final adjustments on the engine controls.

11-22. FLEXIBLE FLUID HOSES.

11-23. 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 11-19 for detailed inspection procedures for flexible hoses.

11-24. 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 Advisory Circular 43.13-1, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.**

11-25. 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 takeoff power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.
b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the RPM values obtained in step b. The resulting RPM figure should be within 50 RPM of 2650 RPM.

d. If the resulting average RPM figure is lower than stated above, the following checks are recommended to determine a possible deficiency.
   1. Check carburetor heat control for proper rigging. If partially open it would cause a slight power loss.
   2. Check magneto timing, spark plugs and ignition harness for settings and conditions.
   3. Check condition of induction air filter. Clean if necessary.
   4. Perform an engine compression check. (Refer to engine Manufacturer's Manual.)

11-26. ENGINE BAFFLES.

11-27. DESCRIPTION. The sheet metal baffles installed on the engine directs the flow of air around the cylinders and other engine components to provide optimum cooling. These baffles incorporate rubber-asbestos composition seals at points of contact with the engine cowling and other engine components to help confine and direct the airflow to the desired area. It is very important to engine cooling that the baffles and seals are in good condition and installed correctly. The vertical seals must fold forward and the side seals must fold upwards. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any new baffle seals properly.

11-28. CLEANING AND INSPECTION. The engine baffles should be cleaned with a suitable solvent to remove oil and dirt.

NOTE

The rubber-asbestos seals are oil and grease resistant but should not be soaked in solvent for long periods.

Inspect baffles for cracks in the metal and for loose and/or torn seals. Repair or replace any defective parts.

11-29. 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.

11-30. 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.

11-31. ENGINE MOUNT. (See figure 11-2.)

11-32. DESCRIPTION. The engine mount is composed of sections of steel tubing welded together and reinforced with gussets. The mount is fastened to the fuselage at four points. The engine is attached to the engine mount with shock-mount assemblies which absorb engine vibrations.

11-33. REMOVAL AND INSTALLATION. Removal of the engine mount is accomplished by removing the engine as outlined in paragraph 11-11, then removing the engine mount from the firewall. On reinstallation torque the mount-to-fuselage bolts to 160-190 in-lb. Torque the engine-to-mount bolts to 450-500 in-lb.

11-34. REPAIR. Refer to Section 18.

11-35. PAINTING. Refer to Section 19.

11-36. ENGINE SHOCK MOUNT PADS. (See 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.

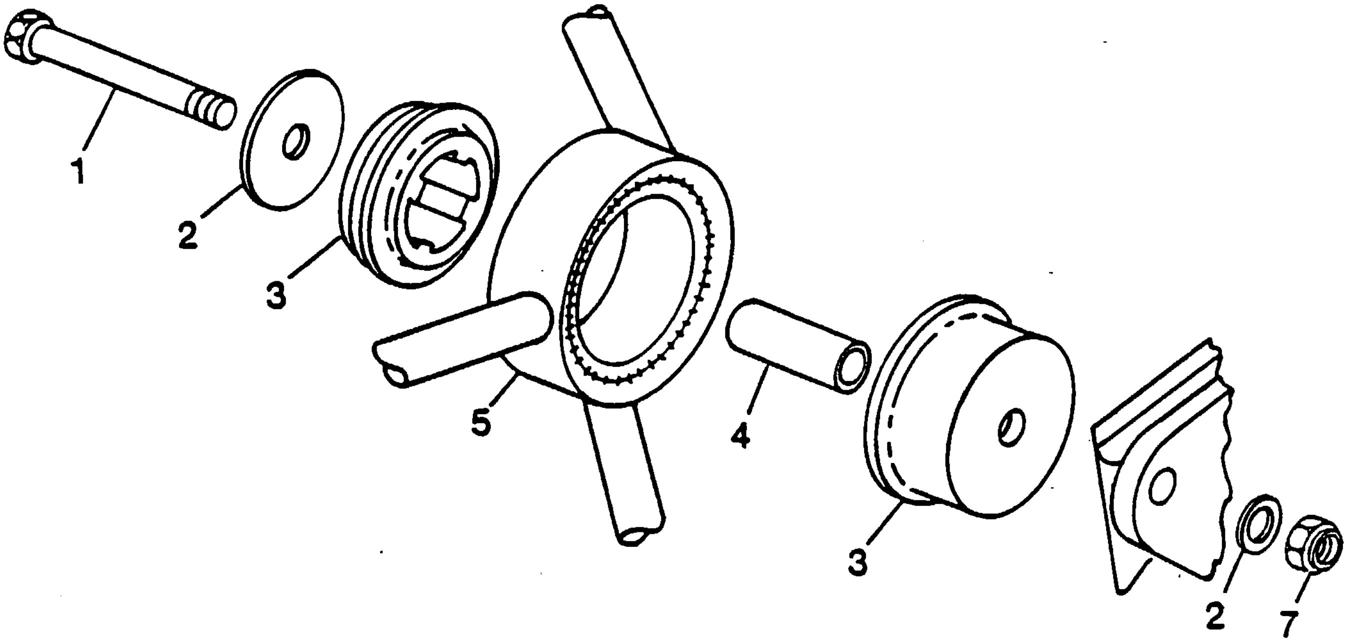
11-37. OIL SYSTEM.

11-38. DESCRIPTION. The lubricating system is of the full pressure, wet sump type. Refer to applicable Engine Manufacturer's Overhaul Manual for specific details and descriptions.

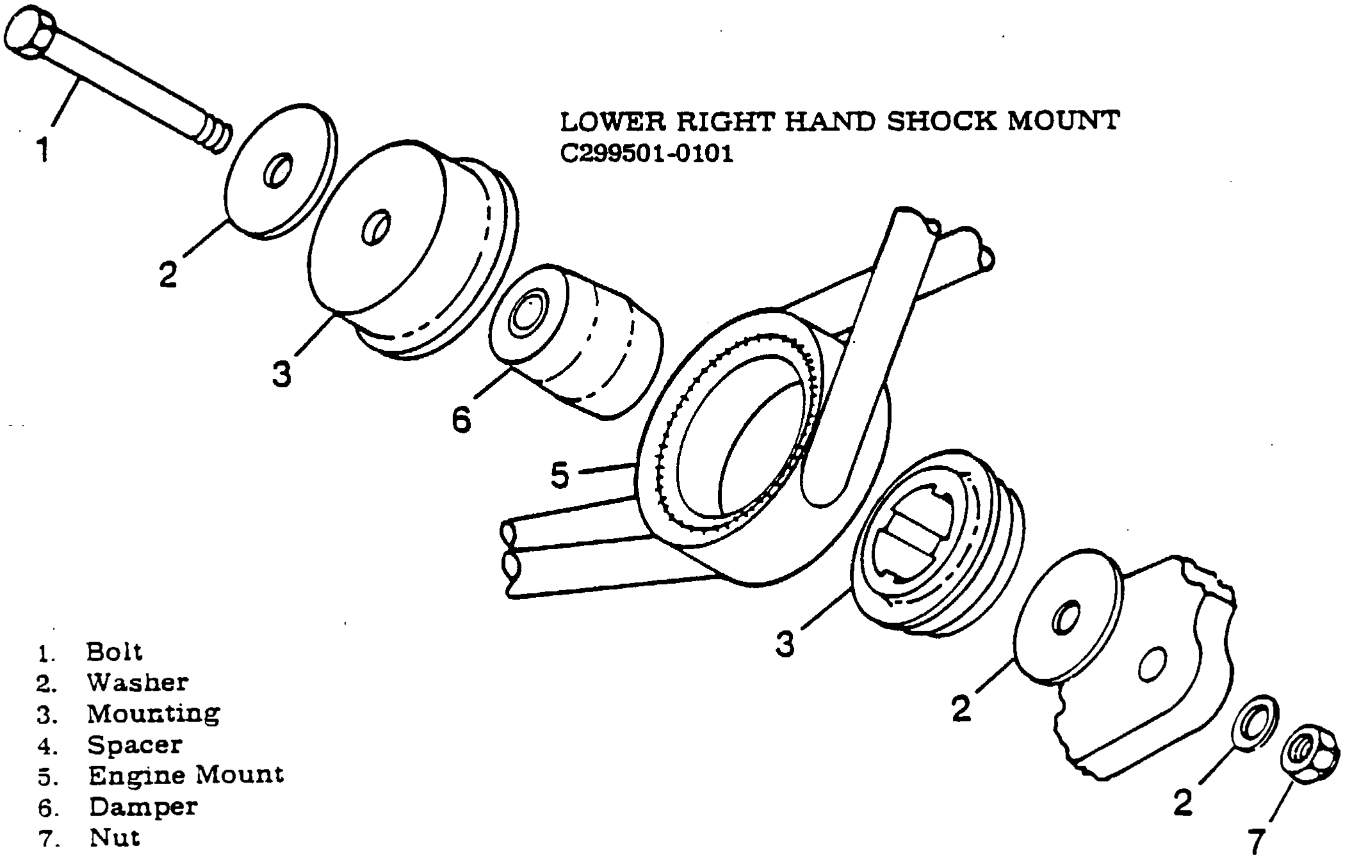
WARNING

The U.S. Environmental Protection Agency advises that mechanics and other workers who handle engine oil are advised to minimize skin contact with used oil and promptly remove used oil from the skin. In a laboratory study, mice developed skin cancer after skin was exposed to used engine oil twice a week without being washed off, for most of their life span. Substances found to cause cancer in laboratory animals may also cause cancer in humans.

UPPER RIGHT HAND SHOCK MOUNT
C299501-0106



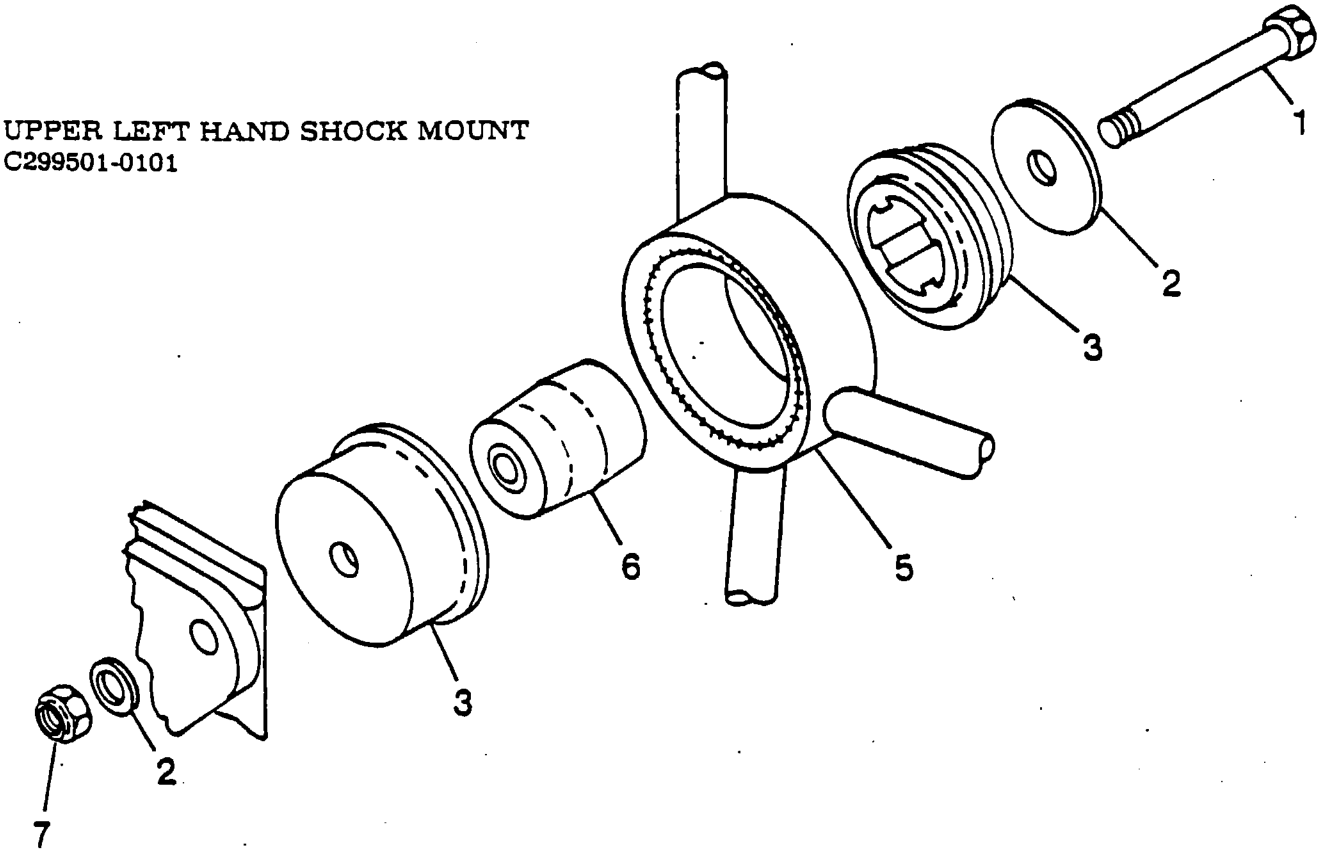
LOWER RIGHT HAND SHOCK MOUNT
C299501-0101



1. Bolt
2. Washer
3. Mounting
4. Spacer
5. Engine Mount
6. Damper
7. Nut

Figure 11-2. Shock Mount Details (Sheet 1 of 2)

UPPER LEFT HAND SHOCK MOUNT
C299501-0101



LOWER LEFT HAND SHOCK MOUNT
C299501-0106

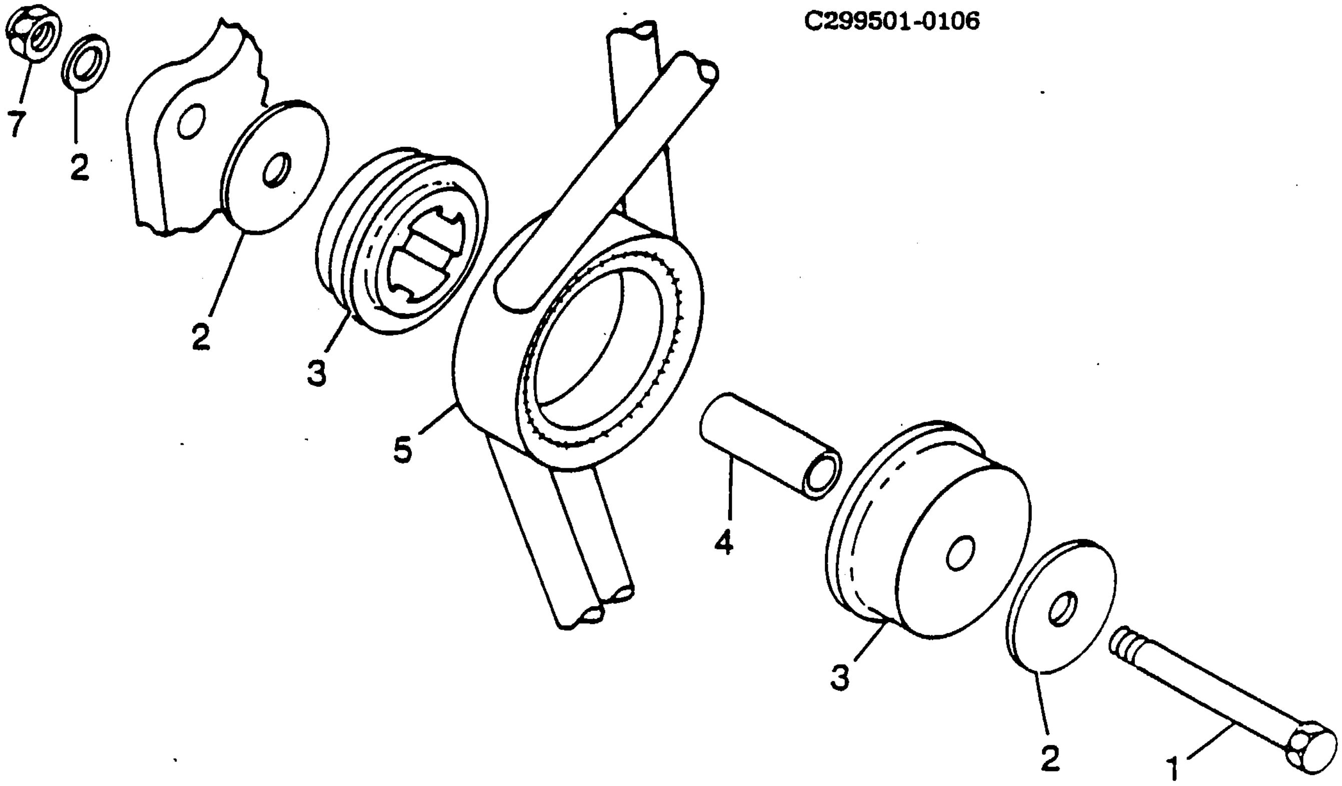


Figure 11-2. Shock Mount Details (Sheet 2 of 2)

11-39. TROUBLE SHOOTING -- OIL SYSTEM.

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.

11-39. TROUBLE SHOOTING -- OIL SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OIL PRESSURE (Cont).	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Leak in pressure or suction line.	Inspect gasket between accessory housing and crankcase. Repair engine as required.
	Dirty oil screens.	Remove and clean oil screens.
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 known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective. Replace bulb.
	Oil cooler thermostatic valve/bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.

11-39. TROUBLE SHOOTING -- OIL SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Drain oil cooler and inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic valve or bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold. oil is bypassing cooler. Remove and clean valve and seat. If still inoperative. replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 RPM to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure. oil level and cylinder head temperature. If they are correct. check oil temperature gage for being defective: if similar reading is observed. bulb is defective. Replace bulb.
	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.

11-40. FULL-FLOW OIL FILTER.

11-41. DESCRIPTION. An external full-flow oil filter is installed on the engine. If the filter should become clogged, a bypass valve allows engine oil to flow directly to the engine oil passages.

11-42. REMOVAL AND INSTALLATION.

NOTE

Replacement filters are available from the Cessna Supply Division.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove safety wire from filter.
c. Unscrew filter from adapter.
d. Lightly lubricate gasket with engine oil or Dow Corning DC4 prior to installation.
e. Install spin-on filter on the stud and torque to 18-20 ft.-lbs.
f. Safety wire filter to adapter.
g. After first engine run check for oil leaks.

11-43. OIL COOLER.

11-44. DESCRIPTION. An external oil cooler is provided. Flexible hoses carry the oil to and from the cooler. Cooling air is ducted to the oil cooler. A bypass valve causes oil to bypass the cooler in the event of congealed oil or an obstruction in the cooler.

11-45. ENGINE FUEL SYSTEM.

11-46. DESCRIPTION. A carburetor is installed on the engine (refer to paragraph 11-14). The carburetor is equipped with a manual mixture control and an idle cut-off. For repair and overhaul of the carburetor refer to the manufacturer's overhaul and repair manual.

11-46A. CARBURETOR.

11-47. 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 bolts attaching airbox to carburetor, and remove airbox.
e. Disconnect throttle and mixture controls at the carburetor. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
f. Disconnect and cap or plug fuel lines at carburetor.
g. Remove safety wire, nuts and washers attaching carburetor to engine, 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 11-77 thru 11-78. (Check carburetor throttle arm to idle stop arm attachment for security and proper safetying at each normal engine inspection in accordance with figure 11-3.)

11-48. 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. **At 1000 RPM, adjust the idle mixture screw so there is no RPM rise as the 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 may be rough at idle and will balk when advancing the throttle for taxi, thus requiring a richer mixture. Turn adjusting screw OUT (counterclockwise) for a richer mixture.**

f. **If mixture is set too RICH, an RPM increase will be noted when leaning at 1000 RPM, thus requiring a leaner mixture. Turn adjusting screw IN (clockwise) for a leaner mixture.**

NOTE

> After each adjustment to the idle mixture, run engine up to approximately 2000 RPM to clear engine of excess fuel to obtain a correct idle speed.

11-49. INDUCTION AIR SYSTEM.

11-50. DESCRIPTION. Air enters the system through an induction airbox and filter on the left side of the engine. From the induction airbox the filtered air is ducted to the inlet of the carburetor mounted on the lower aft end of the engine, through the carburetor, where the fuel is mixed with the air to the intake manifold. From the intake manifold, the fuel-air mixture is distributed to each cylinder by separate intake pipes. The intake pipes are attached to the manifold with hoses and clamps and to the cylinder with a four bolt flange sealed with a gasket. A butterfly valve, located in the airbox, may be operated manually from the cabin to permit the selection of either cold or heated air. When the induction air door is closed, heated air is drawn from a shroud on the left exhaust stack assembly.

11-50A. **INSTALLATION OF INDUCTION AIR SYSTEM DUCTS.** When cutting induction air system ducts to length, the support wire should be cut back far enough to bend back (minimum bend radius 1/8 inch) under the clamp and protrude 1/4 inch. Do not break the bond between the wire and the fabric. Before tightening the clamps, make sure there is no twist or torque on the duct. If the duct is supported with MIL-Y-1140 cord in place of wire, the same installation procedure applies except MIL-Y-1140 has no minimum bend radius requirements.

The minimum installed bend radii for wire-supported ducts in plane of bend, measured from the duct wall, are as follows:

1. Neoprene, one ply - 1/4 diameter of the maximum duct dimension.
2. Neoprene, two ply, and silicone, one ply - 1/3 diameter of the maximum duct dimension.
3. Silicone, two ply - 1/2 diameter of the maximum duct dimension.

NOTE

One-ply, wire-supported, silicone ducts and ducts carrying filtered induction air shall not have local areas hand-formed to a different cross section.

11-51. AIRBOX.

11-52. REMOVAL AND INSTALLATION.

a. Remove upper left engine cowl in accordance with paragraph 11-3.
b. Disconnect carburetor heat control and bracket from the airbox.
c. Disconnect throttle control bracket from the airbox.
d. Disconnect coupling in the air duct.
e. Cut safety wire and remove the four bolts that bolt the airbox to the carburetor. Carefully remove the airbox.
f. Reverse the preceding steps for reinstallation, using the appropriate safety wire. Rerig the carburetor heat control in accordance with paragraph 11-74.

11-53. CLEANING AND INSPECTION. Clean metal parts of the induction airbox with Stoddard solvent or equivalent. Inspect for cracks, dents, loose rivets, etc. Minor cracks may be stop-drilled. In case of continued or severe cracking, replace airbox. Inspect gaskets and install new gaskets, if damaged. Check manually-operated air door for ease of operation and proper rigging.

11-54. INDUCTION AIR FILTER.

11-55. DESCRIPTION. An induction air filter is housed in the induction air ducting on the left aft side of the engine compartment.

11-56. REMOVAL AND INSTALLATION.

a. Remove the upper left engine cowl in accordance with paragraph 11-3.
b. Loosen the coupling in the air duct.
c. Remove the four bolts securing the air filter in the filter housing.
d. Rotate the filter housing as necessary to remove the filter.
e. Remove and replace the filter, making certain the airflow arrows correspond to the airflow path.
f. Reverse the preceding steps for reinstallation.

NOTE

When installing induction air filter, apply only enough torque to compress air filter seal a maximum of 60% from free state.

11-57. CLEANING AND INSPECTION. Clean and inspect filter in accordance with instructions in Section 2.

NOTE

If air filter gasket becomes loose, bond with EC-1300L or equivalent.

11-58. IGNITION SYSTEM.

11-59. DESCRIPTION. The ignition system is comprised of two magnetos mounted on rear of engine, two spark plugs in each cylinder, an ignition wiring harness, an ignition switch mounted on the instrument panel and required wiring between the ignition switch and magnetos.

11-60. TROUBLE SHOOTING -- IGNITION SYSTEM.

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.

11-60. TROUBLE SHOOTING -- IGNITION SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START (Cont).	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 11-61 or 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 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 11-61 or 11-67.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Relace defective magneto.
	Spark plugs loose.	Check and install properly.

11-61. MAGNETOS (SLICK 4191).

11-62. DESCRIPTION. Sealed, lightweight, Slick 4191 (impulse coupling) magnetos are used. These magnetos **MUST NOT BE DISASSEMBLED**. Internal Timing is fixed and the breaker points are not adjustable. These magnetos have a mandatory service life of 800 hours, after which they **MUST** be replaced with the appropriate 4300 Series magneto.

11-63. REMOVAL AND INSTALLATION.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Therefore, ground the breaker contact points or disconnect the high-tension wires from the magneto or the spark plugs.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove high-tension outlet plate and disconnect magneto "P" lead.
c. Remove nuts and washers securing magneto to the engine. Note the approximate angular position at which the magneto is installed, then remove the magneto.
d. Reverse the preceding steps for reinstallation and time magneto-to-engine in accordance with paragraph 11-65.

11-64. INTERNAL TIMING. Internal timing is accomplished during manufacture of the magneto. Since these magnetos are **NOT TO BE DISASSEMBLED**, there is no internal timing.

11-65. MAGNETO-TO-ENGINE TIMING. The magneto must be installed with its timing marks correctly aligned, with number one cylinder on its compression stroke and with the number one piston at its advanced firing position. Refer to paragraph 11-14 for the advanced firing position of number one piston. To locate the compression stroke of the number one cylinder, remove the lower spark plugs from number 2, 3 and 4 cylinders. Remove the upper spark plug from number one cylinder. Place the thumb of one hand over the spark plug hole of the number one cylinder 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 attained, locate the number one piston at its advanced firing position. Locating the advanced firing position of the number one piston may be obtained by rotating the crankshaft opposite to its normal direction of rotation until the piston is approximately 30 degrees before top dead center (BTC) on the compression stroke of number one cylinder. Then rotate the crankshaft in its normal direction of rotation to align the timing mark on the FORWARD face of the starter ring gear support with the drilled hole in the forward end of the starter, making sure the final motion of the ring gear is in the direction of normal rotation.

NOTE

The starter ring gear must always be in this position when either magneto is locked in position.

When the cylinder is 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 chamfered edges toward the operator when looking into the magneto mount pad on the engine.

a. Remove the ventilating plug from the bottom of the magneto. The ventilating plug in the top of the magneto need not be removed.
b. Rotate the magneto shaft until the timing marks are visible through the ventilation plug hole.
c. Establish that the magneto is at the number one firing position. It is possible for the timing mark to be visible while the firing position is 180 degrees from the number one firing position.

NOTE

It is necessary to "spark" the magneto to establish the correct firing position. The outlet plate with the spark plug leads must be installed. Hold the number one spark plug lead close to the magneto case, or ground the magneto and hold the number one spark plug lead close to a good ground. Rotate the impulse coupling in the normal direction of rotation until a spark occurs at this lead. (Impulse coupling pawls must be depressed to turn magneto shaft in normal direction of rotation.) Turn impulse coupling backwards a few degrees, until timing mark is centered in ventilating plug hole and install timing pin (or 0.093 inch 6-penny nail) through hole in bottom of magneto next to flange and into mating hole in the rotor shaft. This locks the magneto approximately in firing position while installing on the engine.

d. If timing pin is not used, keep timing mark centered in ventilating plug hole during magneto installation.
e. Be sure magneto adapter and gaskets are in place and that the engine is in the correct firing position, then install magneto approximately at the angle noted during removal, tighten mounting nuts finger tight.

NOTE

Remove timing pin (or nail) from magneto, if installed.
Be sure to remove this pin before rotating propeller.

f. Connect a timing light to the capacitor (primary lead) terminal at the rear of the magneto and to a good ground.

g. Rotate propeller opposite to normal direction of rotation a few degrees (approximately 5 degrees) to close magneto contact points.

NOTE

Do not rotate propeller back far enough to engage impulse coupling, or propeller will have to be rotated in normal direction of rotation until impulse coupling releases, then again back-up to a few degrees before the firing position.

h. Slowly advance the propeller (tap forward with minute movements as firing position is approached) in normal direction of rotation until timing light indicates position at which contacts break. The contacts should break at the advanced firing position of number one cylinder. Loosen mounting nuts slightly and rotate magneto case to cause the contacts to break at the correct position. Tighten mounting nuts.
i. After tightening magneto mounting nuts, recheck timing. Make sure that both magnetos are set to fire at the same time. Remove timing equipment, install spark plugs and connect spark plug leads and ignition switch leads.

11-66. MAINTENANCE. Magneto-to-engine timing should be checked at the first 50 hours, first 100 hours and thereafter at each 100 hours. If timing to the engine is not within plus zero degrees and minus two degrees, the magneto should be retimed to the engine.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble appears definitely to be associated with a magneto, the following may be used to help disclose the source of trouble.

a. Remove high-tension outlet plate and check distributor block for moisture.
b. If any moisture is evident, lightly wipe with a soft, dry, clean, lint-free cloth. Install outlet plate.

NOTE

Since these magnetos **MUST NOT BE DISASSEMBLED**, a new magneto should be installed if the moisture check does not remedy the trouble.

11-67. MAGNETOS (SLICK 4251).

11-68. DESCRIPTION. Installed on aircraft 172RG0017, 172RG0031, 172RG0033, 172RG0034, 172RG0038, 172RG0044, 172RG0054, and beginning with 172RG0056 & ON, a lightweight Slick 4251 magneto is used on the engine. This magneto is designed for use with light aircraft engines and is a completely self-contained assembly. The rotor revolves on two ball bearings positioned on either side of the rotating magnet. The rotor and bearing assembly is contained within the drive end frame, with bearing preloading determined by a loading spring, eliminating the need for selective shimming. Other components contained within the drive end frame are a high tension coil, retained by wedge-shaped keys, and the contact breaker assembly, secured with two screws to the inboard bearing plate. A two-lobe replaceable cam is fitted to the anti-drive end of the rotor shaft, and a two-pole magnet turns at crankshaft speed, producing four sparks through 720 degrees of engine crankshaft rotation. The distributor housing contains the distributor gear and electrode assembly, distributor block, bearing bar, and condenser. Spark retarding, to assist engine starting, is provided by an impulse coupling mounted on the drive shaft. At engine cranking speed, counterweighted spring-loaded pawls engage a stop pin located in the drive end frame mounting flange. Pawl engagement with the pin retards rotor rotation through 90 degrees, at which point the pawl is released by a cam on the impulse shell. Once the engine starts and accelerates beyond cranking speed, the pawl counterweights move outward, preventing any further engagement between the pin and pawls. The magnetos can be disassembled for inspection and maintenance in the field.

11-69. REMOVAL AND INSTALLATION.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Therefore, ground the breaker contact points, or disconnect the high-tension wires from the magneto or the spark plugs.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove high-tension outlet plate and disconnect magneto "P" lead.
c. Remove nuts and washers securing magneto to the engine. Note the approximate angular position at which the magneto is installed, then remove the magneto.
d. Reverse the preceding steps for reinstallation and time magneto to engine in accordance with paragraph 11-70.

NOTE

Magneto (primary) lead nut torque range is 13-15 in.-lbs. Exceeding this torque range could result in possible condenser damage.

11-70. MAINTENANCE PROCEDURES.

NOTE

For internal timing procedures, refer to Slick 4200/6200 Series Aircraft Magnetos Maintenance and Overhaul Instructions.

11-71. MAGNETO-TO-ENGINE TIMING. After 100 hours of operation and every 100 hours thereafter, or at annual inspection, whichever comes first, the magneto-to-engine timing should be checked. This is accomplished in the following manner:

WARNING

Be sure switch is in "OFF" position and the "P" lead is grounded.

a. Turn the engine crankshaft in the normal direction of rotation until the No. 1 cylinder is in the full-advance firing position.
b. Loosen the magneto mounting bolts, and connect a standard timing light between engine ground and the magneto condenser terminal.

NOTE

Switch must be "ON".

c. Rotate the complete magneto opposite normal rotation of the magneto on the engine mounting, until the timing light indicates the contact breaker points are just opening. Secure the magneto in this position.

WARNING

During all magneto maintenance, always take proper precautions to make sure the engine can not fire or start if the propeller is moved. TURN SWITCH "OFF".

11-71A. DISASSEMBLY. Refer to Slick 4200/6200 Series Aircraft Magnetos Maintenance and Overhaul Instructions Bulletin, and all revisions and supplements thereto, for disassembly instructions.

11-71B. CHECKING CONTACT ASSEMBLIES. At 500 hour intervals, the contact assemblies should be checked for burning or wear.

11-71C. POINTS. If the points are not discolored and have a white frosty surface around the edges, the points are functioning properly and should not be touched. Apply M-1827 cam grease sparingly to each lobe of the cam before reassembly. If the points are blue (indicating excessive arcing) or pitted, they should be discarded. Replace both condenser and damaged points.

11-71D. CARBON BRUSH. At 500 hour inspections, it is necessary to check the carbon brush in the distributor gear for wear, cracks and chipping. Measure carbon brush length from distributor gear shaft to end of brush. Minimum acceptable length is 1/32 inch. If worn, cracked or chipped, the distributor gear must be replaced. Put a drop of SAE S20 non-detergent machine oil in each oilite bearing in the distributor block and bearing bar.

11-71E. HIGH TENSION LEAD. Inspect the high tension lead from the coil to make sure it makes contact with the carbon brush on the distributor gear shaft.

11-71F. IMPULSE COUPLING SHELL & HUB. At 500 hour inspection, visually inspect the impulse coupling shell and hub for cracks, loose rivets or rounded pawls that may slip when latching up on the pin. If any of these conditions are evident, the coupling should be replaced.

11-71G. CLEANING AND INSPECTION.

a. Inspect internal and external threads of all threaded hardware. Damaged or worn parts must be replaced.
b. Inspect the bearing plate for excessive wear and damage. (Maximum bearing bore I.D. to be 1.5752 inch.)
c. Check the rotor for damaged or worn keyway. Check the rotor bearing surfaces for wear. (Minimum O.D. to be 0.6690 inch.)
d. Inspect the magneto frame and distributor housing for cracks or other damage. Check the bearing bore in the drive end frame for wear. (Maximum I.D. to be 1.5741 inch.)
e. Clean all parts thoroughly with a grease solvent before reassembly.

NOTE

No structural repairs are permissable. Replace all items showing wear or damage, or that are not within the tolerances specified.

11-71H. REASSEMBLY. Refer to Slick 4200/6200 Series Aircraft Magnetos Maintenance and Overhaul Instructions Bulletin, and all revisions and supplements thereto, for reassembly instructions.

11-72. MAGNETO CHECK.

a. Start and run engine until the oil and cylinder head temperatures are in the normal operating ranges.

b. Advance engine speed to 1700 RPM.

c. Turn the ignition switch to the "R" position and note the RPM drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

d. Turn the switch to the "L" position and note the RPM drop, then return the switch to the "BOTH" position.

e. The RPM drop should not exceed 150 RPM on either magneto setting or show greater than 50 RPM differential between magneto settings. A smooth RPM drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp RPM drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or a higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

11-73. SPARK PLUGS. Two 18-mm spark plugs are installed in each cylinder. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

Refer to Section 2 for inspection interval. Remove, clean, inspect and regap all spark plugs at each inspection. Install lower spark plugs in upper portion of cylinders and install upper spark plugs in lower portion of cylinders. Since deterioration of lower spark plugs is usually more rapid than that of the upper spark plugs, rotating helps prolong spark plug life.

11-74. ENGINE CONTROLS.

11-75. DESCRIPTION. The throttle, mixture propeller and carburetor heat controls are of the push-pull type. The mixture control is equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The mixture control also has a vernier adjustment. Turning the knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. The carburetor heat control has no locking device.

11-76. RIGGING. When adjusting any engine control it is important to check that the control slides smoothly throughout its full range of travel, that it locks securely if equipped with a locking device and the arm or lever it operates moves through its full arc of travel.

CAUTION

> Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

NOTE

> Refer to the inspection chart in Section 2 for inspection, replacement and/or lubrication interval for the throttle control.

11-77. THROTTLE CONTROL.

NOTE

> Before rigging throttle control, check that control end (13) is secure. If any indication of looseness or breakage is apparent, replace throttle control.

a. Screw friction lock nut (2) into threads of barrel (7).
b. Ensure washer (5) and nut (6) on forward side of panel are secure.
c. Push knob assembly (1) full in against friction lock nut (2), then pull knob assembly out approximately 1/8-inch to obtain "cushion."
d. Tighten friction lock nut (2) against barrel (7).
e. At the carburetor, attach throttle arm hardware to rod end (16).

NOTE

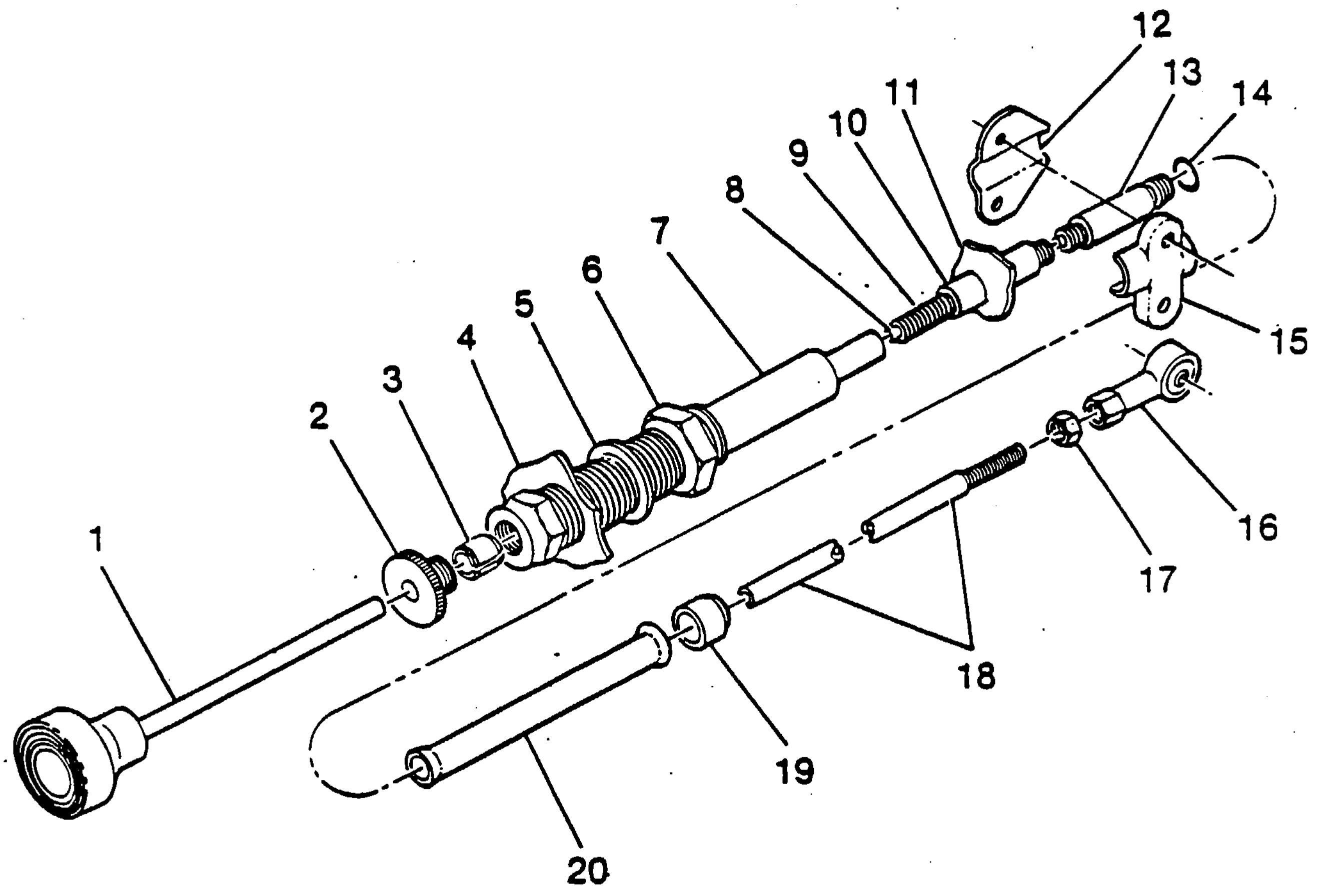
> Ensure palnut (17) is on threads of plunger (18) before installing rod end (16).

f. Screw rod end (16) up threads of plunger (18) until throttle arm contacts full power stop; secure rod end with palnut (17).

NOTE

> Ensure that rod end (16) is threaded on to plunger (18) so that .020-inch safety wire cannot be installed through drilled hole in rod end.

g. Check control end (13) clamping in bracket (12) and clamp (15).
h. Pull knob assembly full out and check that idle stop on carburetor is contacted.
i. Work throttle control in and out several times to check for binding.



1. Knob Assembly
2. Friction Lock Nut
3. Locking Collet
4. Instrument Panel
5. Washer
6. Nut
7. Barrel
8. Core
9. Casing
10. Clamping Sleeve
11. Firewall
12. Bracket
13. Control End
14. Packing
15. Clamp
16. Rod End
17. Palnut
18. Plunger
19. Plunger Seal
20. Plunger Guide

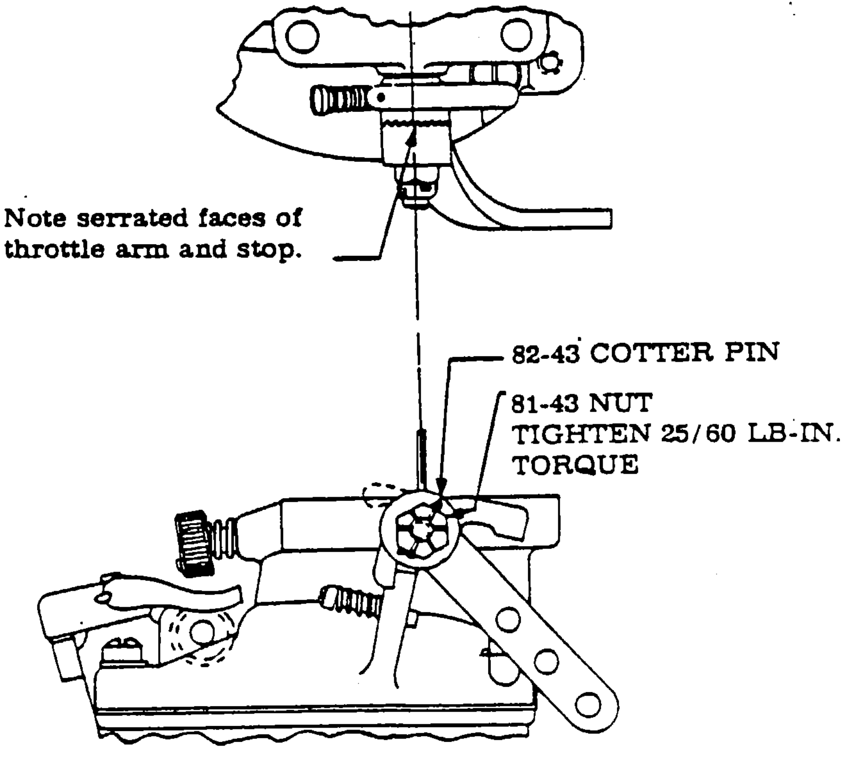


Figure 11-3. Throttle Control and Throttle Arm to Idle Stop Adjustment

11-78. 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 and nut will swivel in the arm. Torque nut to 15 in.-lbs minimum.
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, replacment and/or lubrication interval for the mixture control.

11-79. CARBURETOR HEAT CONTROL.

a. Loosen clamp securing the control to the bracket on engine.
b. Push control full in, then pull it out approximately 1/8 inch from panel for cushion.
c. Shift control housing in its clamp so that the valve in the airbox is seated in the full open position. Tighten clamp in this position.
d. Pull out on the control and check that the air valve inside the airbox seats in the opposite direction.
e. Check that bolt and nut on the air valve lever secures the control wire and that the bolt will swivel in the lever.
f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.

NOTE

Refer to the inspection chart in Section 2 for inspection, replacement and/or lubrication interval for the carburetor heat control.

11-80. PROPELLER CONTROL. (Refer to Section 13).

11-81. STARTING SYSTEM.

11-82. DESCRIPTION. The starting system employs an electrical starter motor mounted at the front (propeller end) lower left side of the engine. A starter solenoid is activated by the ignition key on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the starter motor. Initial rotation of the starter armature shaft, engaged with the reduction gear, drives the Bendix shaft and pinion. When the armature turns the reduction gear, the Bendix drive pinion meshes with the crankshaft ring gear assembly by inertia and action of the screw threads within the Bendix sleeve. A detent pin engages in a notch in the screw threads which prevents demeshing if the engine fails to start when the starting circuit is de-energized. When the engine reaches a predetermined speed, centrifugal action forces the detent pin out of the notch in the screw shaft and allows the pinion to demesh from the ring gear.

11-83. TROUBLE SHOOTING -- STARTING SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity of master switch and circuit. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity of switch and circuit. Install new switch or wires.
	Defective starter motor.	Check voltage to starter. If voltage is present, remove, repair or install new starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective Bendix drive.	Remove starter and inspect Bendix drive. Replace defective parts.
	Damaged starter pinion gear or ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Inspect cable. Install new cable.
	Loose or dirty connections.	Inspect connections. Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Inspect commutator. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion gear or broken teeth on ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.

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.

11-84. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new ones). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding.

11-85. STARTER MOTOR.

11-86. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

CAUTION

When disconnecting or connecting the starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between terminal and field coils causing the starter to be inoperative.

b. Disconnect electrical cable at starter motor. Insulate the disconnected cable terminal as a safety precaution.
c. Loosen the lower engine mount bolts and hoist the engine so that the starter will clear the nose gear cover assembly.
d. Remove three nuts and washers and one bolt securing starter to crankcase. Work starter from engine.
e. To install starter, position starter on mounting pad, aligning dowel pins in starter mounting pad with holes in mounting pad on engine.
f. Secure starter with washer, lockwasher and nut in three places and install bolt and washers.
g. Tighten nuts and bolt evenly to a torque value of 150 lb-in.
h. Connect electrical cable to starter terminal and install engine cowling.

11-87. EXHAUST SYSTEM. (See figure 11-4.)

11-88. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, one for the left and one for the right bank of cylinders. The left exhaust stack assembly joins the right exhaust stack assembly by means of a crossover pipe and slip joint at the front of the engine. Exhaust from all four cylinders is routed through a muffler located on the right side of the engine compartment. From the muffler, exhaust gas is routed overboard by a tailpipe through the lower fuselage. A shroud fitted to the muffler captures heat which is used to heat the aircraft cabin. Heated air for carburetor heat is supplied by a shroud on the number four exhaust pipe.

11-89. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Disconnect flexible ducts from shrouds on muffler assembly.
c. Remove nuts, bolts, washers and clamps attaching exhaust pipes to muffler assembly and remove muffler assembly.
d. Remove nuts and washers attaching exhaust pipes to the cylinders and remove pipes and gaskets.
e. Reverse the preceding steps for reinstallation. Install a new copper-asbestos gasket between each exhaust pipe and its mounting pad. When installing the attaching nuts, install a plain washer, an internal tooth washer and nut. Make sure all clamps attaching muffler to exhaust pipes are tight and all air ducts are installed.

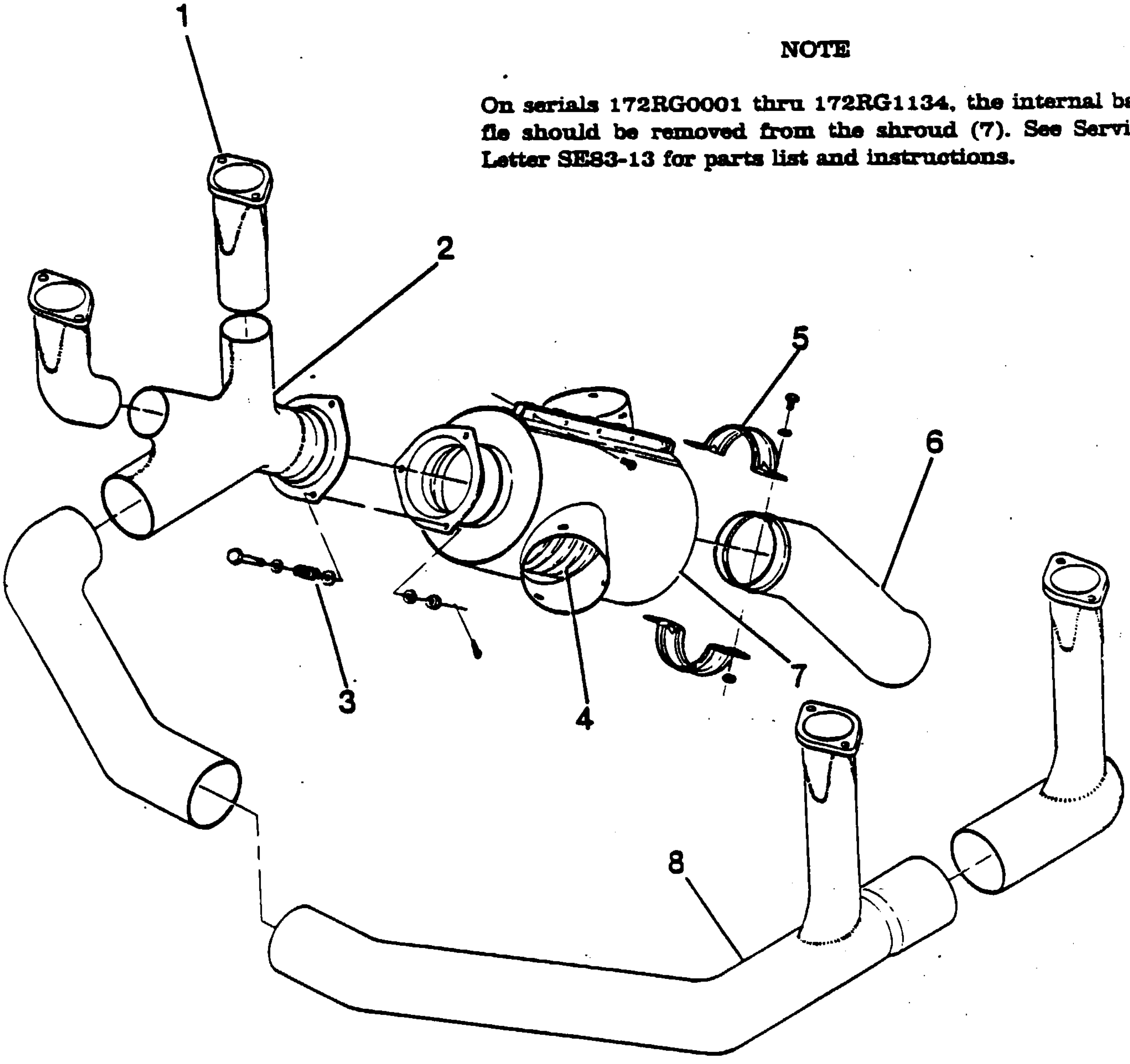
11-90. INSPECTION.

WARNING

Any time exhaust fumes are detected in the cabin, an immediate inspection must be performed.

The exhaust system must be thoroughly inspected every 100 hours of operation. The heat exchange section and the muffler must be inspected every 50 hours of operation. All components that show cracks and general deterioration must be replaced with new parts. Using a flashlight and mirror inspect diffuser tubes through the tailpipe. Replace muffler if defective.

a. **Remove engine cowling in accordance with paragraph 11-3.**
b. **Loosen or remove shrouds so that ALL surfaces of the exhaust system are visible.**
c. **Check for holes, cracks and burned spots. Especially check the areas adjacent to welds. Look for exhaust gas deposits in surrounding areas which indicate an exhaust leak.**
d. Where a surface is not accessible for visual inspection or for a positive test, proceed as follows;
   1. Remove exhaust pipes and muffler.
   2. Remove shrouds.
   3. Seal openings with expansion rubber plugs.
   4. Using a manometer or gage, apply approximately 3 ± 1/2 psi (6 inches of mercury) air pressure while the unit is submerged in water. Any leaks will appear as bubbles and can be readily detected.
   5. It is recommended that any components found defective be replaced with new parts before the next flight.
   6. If no defects are found, remove plugs and dry components with compressed air.
e. Install the exhaust system and engine cowling.



NOTE

On serials 172RG0001 thru 172RG1134, the internal baffle should be removed from the shroud (7). See Service Letter SE83-13 for parts list and instructions.

1. Riser
2. Exhaust Stack Assembly
3. Spring
4. Muffler
5. Clamp Half
6. Tailpipe
7. Shroud
8. Tailpipe

Figure 11-3. Exhaust System

11-91. EXTREME WEATHER MAINTENANCE.

11-92. COLD WEATHER. Cold weather starting is made easier by the installation of the manually-operated engine primer system. Fuel is supplied by a line from the fuel strainer to the plunger type primer. Operating the primer forces fuel to the intake valve port of the cylinder. Primer lines should be replaced when crushed or broken and should be properly clamped to prevent vibration and chafing. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 11-91 for use of the ground service 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 run-up after these conditions have been followed, preheat the drained oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the oil, fuel may be mixed with the heated oil in a ratio of 1 part fuel to 12 parts oil before pouring into the engine oil sump. If the free air temperature is below -29°C (-20°F), the engine compartment should be preheated by a ground heater. Pre-heating the engine compartment is accomplished by inducing heated air up through the engine cowl flaps, thus heating up both the cylinders and oil. After the engine compartment has been pre-heated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull the propeller through several revolutions by hand before starting engine.

CAUTION

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

11-93. DUSTY CONDITIONS. Dust inducted into the intake system of the engine is probably the greatest single cause of early engine wear. When operating under high dust conditions, service the induction air filter daily as outlined in Section 2. Also, change engine oil and lubricate the airframe more often than specified.

11-94. SEACOAST AND HUMID AREAS. In salt water areas, special care should be taken to keep the engine and accessories clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensed moisture.

SECTION 12

FUEL SYSTEM

12-1. FUEL SYSTEM.

12-2. DESCRIPTION. Fuel flows by gravity from two integral fuel bays (one per wing) through finger strainers, selector valve, fuel strainer to the engine-driven fuel pump and the auxiliary electric fuel pump. Fuel under pressure is then delivered to the carburetor. Positive ventilation is provided by an interconnecting bay vent line and check valve, this line exits through the left hand lower wing skin and terminates behind the left wing strut, the right hand bay has a vented fuel cap. An electric fuel quantity indicating system consisting of two float type transmitters (one in each bay) and two fuel quantity indicators mounted in the instrument panel, indicate the fuel quantity. A manual primer is available, the primer takes fuel from the fuel strainer and directs it to cylinders 2, 3 and 4 only.

12-3. PRECAUTIONS. Because fuels are volatile, certain safety precuations should be observed when performing maintenance on the system, or some related systems. The most common precautions are listed below, however good judgement and common sense should also be used during such maintenance actions.

a. Make sure aircraft is **GROUNDED** to a proper grounding stake before fueling, defueling, purging, or performing other maintenance on the fuel system.

b. Residual fuel draining from disconnected lines also constitute a fire hazard. Allowing this drainage to accumulate increases the hazard accordingly, therefore drip pans should be used.

c. Damage to the fuel system can occur from foreign material in the system from unprotected lines and fittings when disconnected. Caps or covers should always be used.

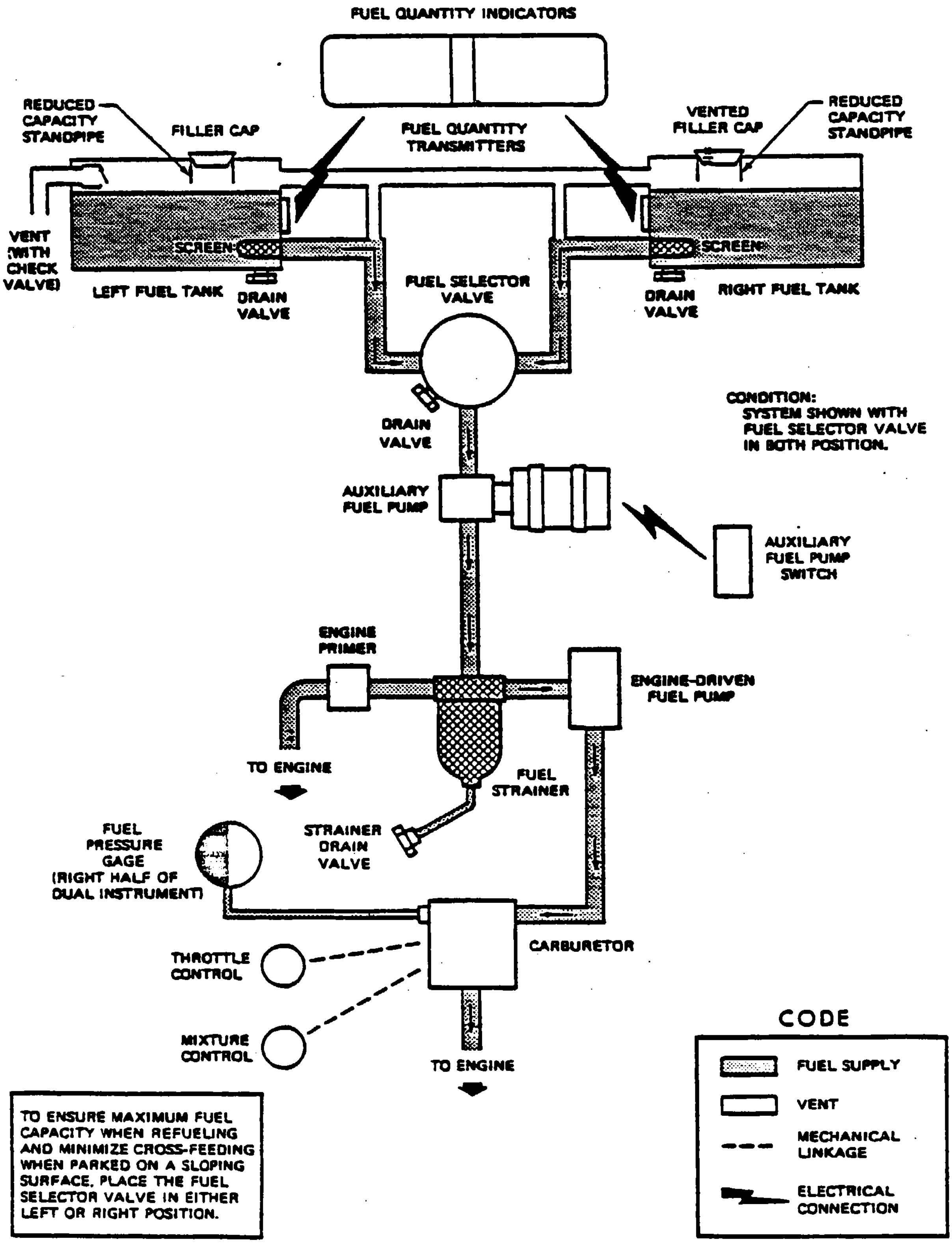
12-4. TROUBLE SHOOTING -- FUEL SYSTEM.

This table to be used in conjunction with trouble shooting chart in Section 11.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FUEL QUANTITY INDICATION.	Fuel bays empty.	Service with proper fuel
	Open or defective circuit breaker.	Reset, or replace if defective.
	Open circuit due to wiring or connections.	Tighten connections or replace defective wiring.
	Defective indicator, transmitter.	Refer to Section 15.
NO FUEL FLOW TO ENGINE DRIVEN PUMP.	Fuel selector valve turned off.	Select bay with most fuel.
	Fuel strainer plugged.	Turn fuel selector valve OFF, and clean strainer.
	Fuel bay outlet screen plugged.	CAUTION DRAIN BAY. Remove and clean screens, and flush bay.
	Defective fuel selector valve.	CAUTION DRAIN BAYS. Repair or replace selector valve.
	Fuel line plugged.	CAUTION DRAIN BAY. Remove, repair, and reinstall line.
NO FUEL FLOW WHEN ELECTRIC PUMP OPERATED.	Defective fuel pump switch.	Replace defective switch.
	Open circuit due to broken wiring or loose connections.	Repair circuit or tighten connections.
	Defective electric fuel pump.	Replace pump.

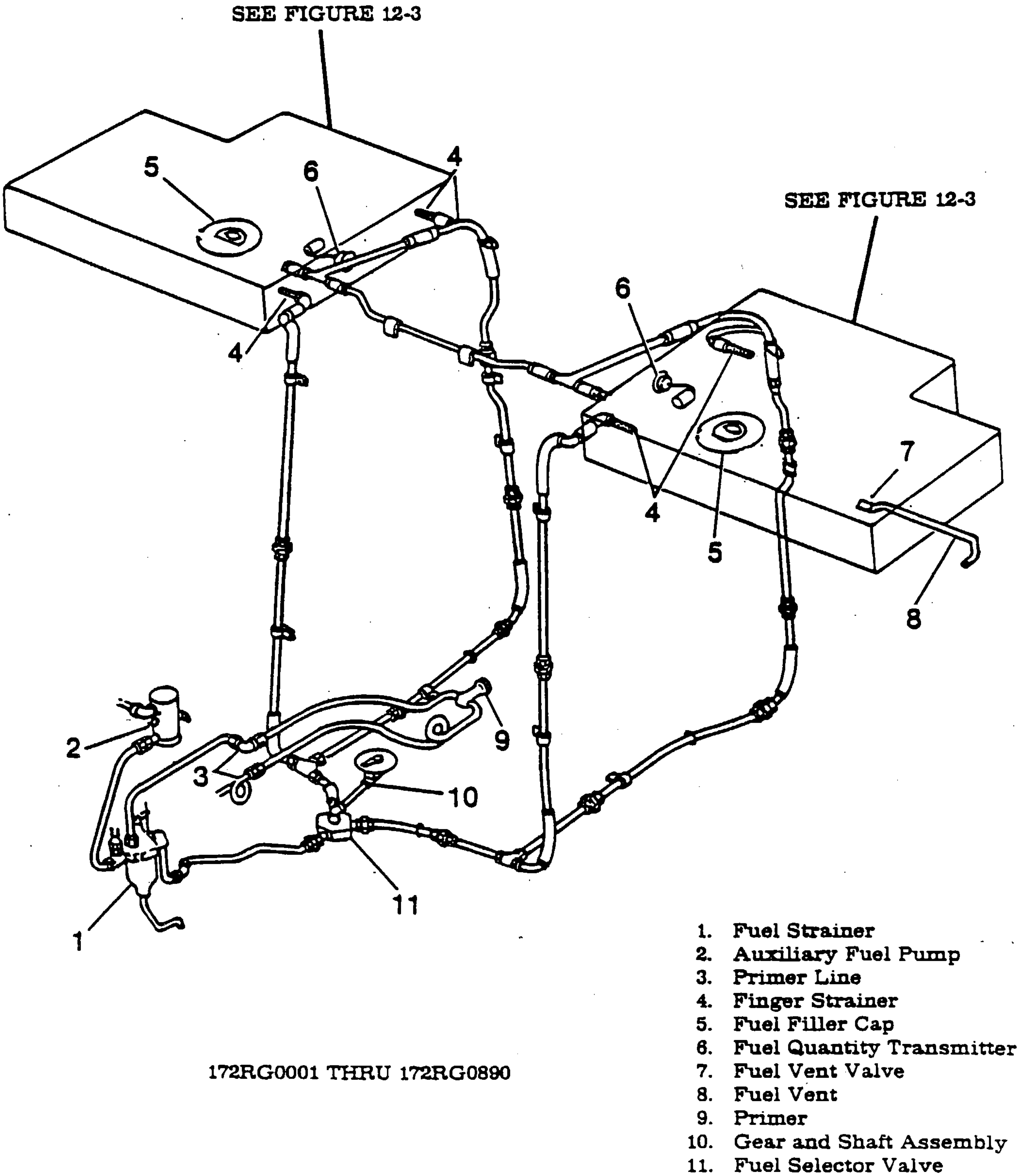
12-4. TROUBLE SHOOTING -- FUEL SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FUEL STARVATION AFTER STARTING.	Plugged fuel bay vent.	Refer to paragraph 12-19.
	Water in fuel.	Drain fuel bay sumps, selector valve, lines, and strainer
	Malfunction of engine driven fuel pump.	Refer to Section 12.
FLUCTUATING FUEL PRESSURE INDICATION.	Obstructed filters or screens.	Remove, check, and clean, proceding from most accessable to least.
	Fuel flow indicator defective.	Replace defective indicator.



TO ENSURE MAXIMUM FUEL CAPACITY WHEN REFUELING AND MINIMIZE CROSS-FEEDING WHEN PARKED ON A SLOPING SURFACE, PLACE THE FUEL SELECTOR VALVE IN EITHER LEFT OR RIGHT POSITION.

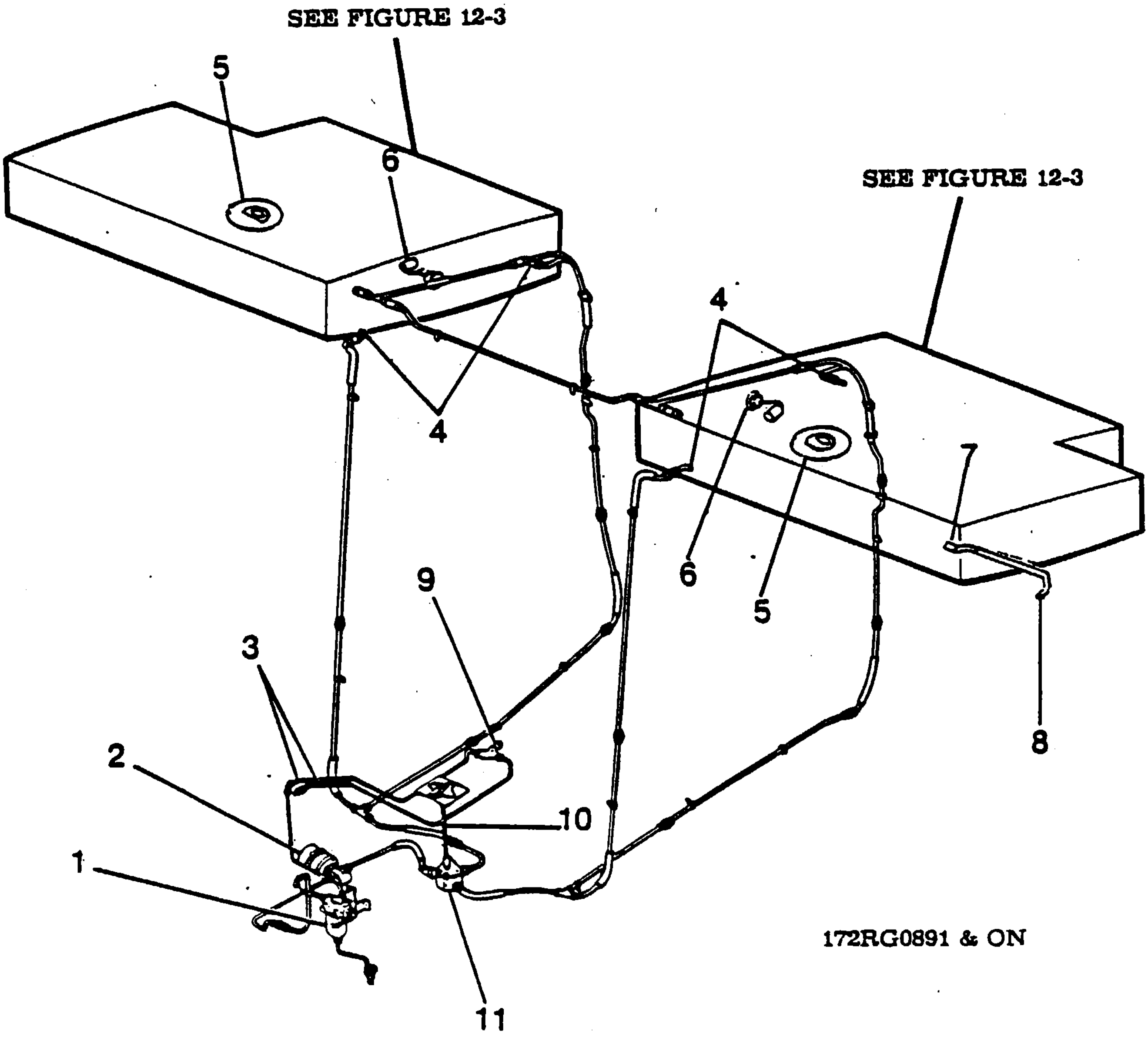
Figure 12-1. Fuel System Schematic



172RG0001 THRU 172RG0890

1. Fuel Strainer
2. Auxiliary Fuel Pump
3. Primer Line
4. Finger Strainer
5. Fuel Filler Cap
6. Fuel Quantity Transmitter
7. Fuel Vent Valve
8. Fuel Vent
9. Primer
10. Gear and Shaft Assembly
11. Fuel Selector Valve

Figure 12-2. Fuel System Installation (Sheet 1 of 2)



1. Fuel Strainer
2. Auxiliary Fuel Pump
3. Primer Line
4. Finger Strainer
5. Fuel Filler Cap
6. Fuel Quantity Transmitter
7. Fuel Vent Valve
8. Fuel Vent
9. Primer
10. Gear and Shaft Assembly
11. Fuel Selector Valve

Figure 12-2. Fuel System Installation (Sheet 2 of 2)

NOTE

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 thread lubricant or seal through the complete system. Apply sparingly to male fittings, omitting first threads to prevent stringing across fittings. Do not use any other form of thread compound on the injector system.

12-5. INTEGRAL FUEL BAYS.

12-6. DESCRIPTION. The bays consist of a front and rear fuel spar, inboard, outboard and intermediate ribs and stringers. Sump drain valves (one in each bay) are provided for draining water and sediment. In addition, airplanes 172RG0001 thru 172RG1191 incorporating SK182-100 have four additional quick drain fuel sump valves installed in each fuel bay.

12-7. FUEL BAY LEAKS.

12-8. CLASSIFICATION OF FUEL LEAKS. Fuel leaks which do not constitute a flight hazard are stains, seeps and heavy seeps NOT in an enclosed area. However, they should be repaired when the aircraft is grounded for other maintenance. Fuel leaks which constitute a flight hazard are running leaks in any area, seeps, heavy seeps or stains in an enclosed area, such as the wing leading edge, the sections of wing inboard and outboard of the fuel bay and the area between the rear fuel spar and the main spar. These leaks must be repaired before that bay is used for another flight. The wet or stained spot on the wing in the area of the bay is an indication of the intensity of the leak. Fuel leak classifications are shown in figure 12-4.

NOTE

Stains and seeps that are not considered a flight hazard must be inspected after each flight to ensure that they have not grown in intensity to the point of causing a flight hazard.

Should a flight hazard leak occur in an area where there are no adequate repair facilities, then the affected bay should be drained, the leak temporarily repaired, and the aircraft flown immediately to an adequate repair facility by using the opposite fuel supply.

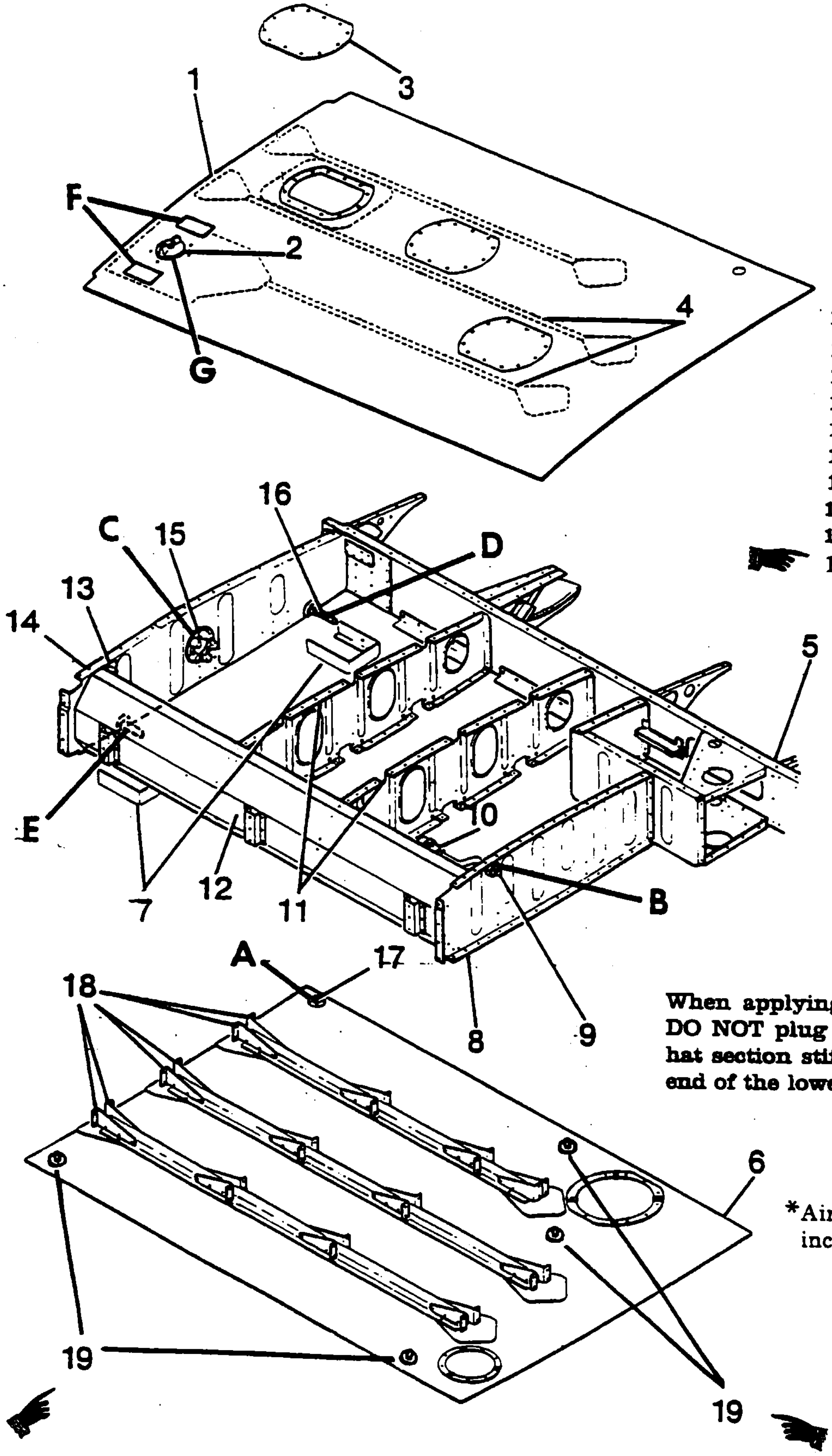
12-9. FUEL BAY PURGING.

WARNING

Purge fuel bays with an inert gas prior to repairing fuel leaks, to preclude the possibility of an explosion.

The following procedure may be used to purge the bay with argon or carbon dioxide.

a. **GROUND** the aircraft to a suitable grounding stake.
b. Set the fuel selector valve handle in the off position.
c. Drain all fuel from bay being repaired. Observe the precautions in paragraph 12-3.
d. Remove access door and insert hose into bay.
e. Allow inert gas to flow into bay for several minutes (time dependent upon hose size, rate of flow, etc.) to remove all fuel vapors.



1. Upper Wing Skin
2. Filler Cap
3. Access Cover
4. Stiffeners
5. Main Spar
6. Lower Wing Skin
7. Outlet Baffles
8. Wing Rib
9. Fuel Vent
10. Vent Valve
11. Interior Ribs (Baffles)
12. Front Spar
13. Interior Vent
14. Root Rib
15. Quantity Transmitter
16. Finger Filters
17. Bay Drain Valve
18. Hat Section Stiffener
19. Quick Drain Fuel Valve *

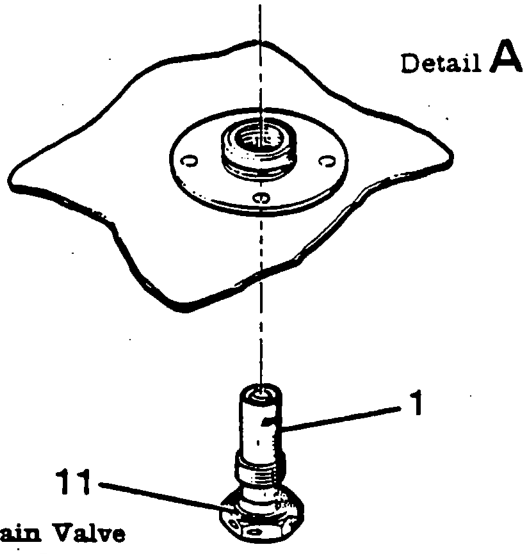
NOTE

When applying sealant in the fuel bay, DO NOT plug fuel drain path below the hat section stiffeners (18) at the inboard end of the lower skin assembly (6).

NOTE

*Airplanes 172RG0001 and On incorporating SK182-100.

Figure 12-3. Fuel Bay Installation (Sheet 1 of 5)



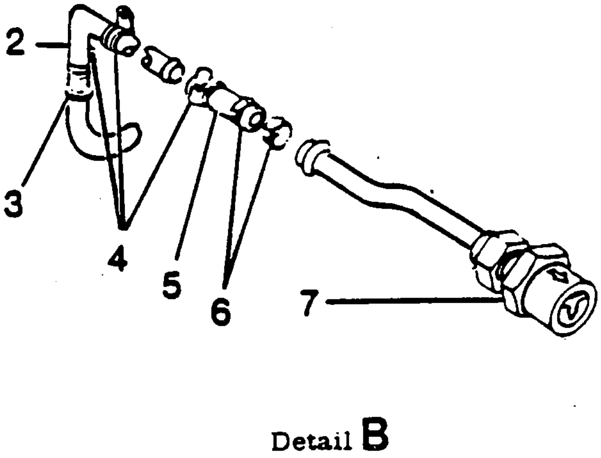
NOTE

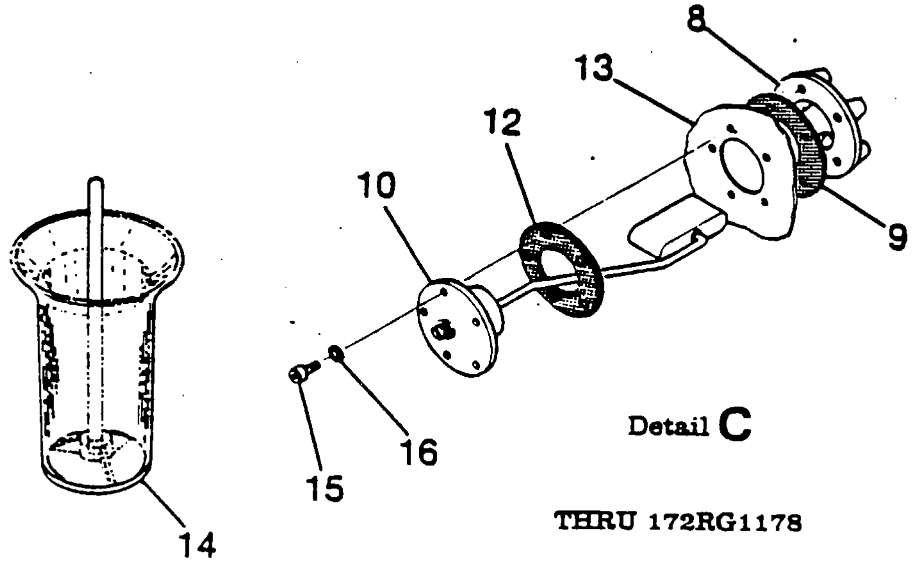
Torque screws (15) to 20 in/lbs (once only), using a cross-pattern sequence.

NOTE

Torque drain valve (1) 15 to 35 in.-lbs. Drain valve gasket (11) should be lightly oiled and installed with asbestos side against head of valve. Use fuel sampler cup (14) to collect fuel samples from drain valve (11).

1. Drain Valve
2. Vent Line
3. Grommet
4. Clamp
5. Hose
6. Clamp
7. Vent Valve
8. Nutring
9. Gasket-Root Rib
10. Fuel Quantity Transmitter
11. O-Ring
12. Gasket-Transmitter
13. Root Rib
14. Fuel Sampler Cup
15. Washer

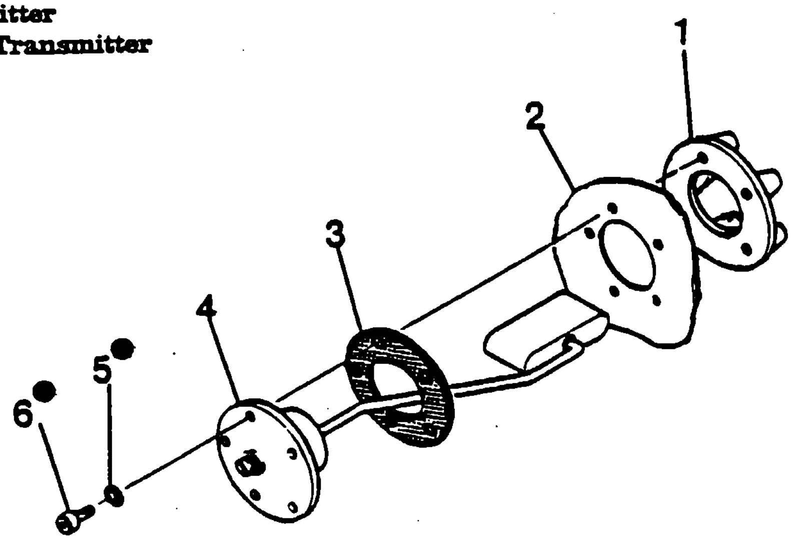




THRU 172RG1178

Figure 12-3. Fuel Bay Installation (Sheet 2 of 5)

1. Nutring
2. Root Rib
3. Gasket-Transmitter
4. Fuel Quantity Transmitter
5. Washer
6. Screw



Detail C

172RG1179 & ON

NOTE

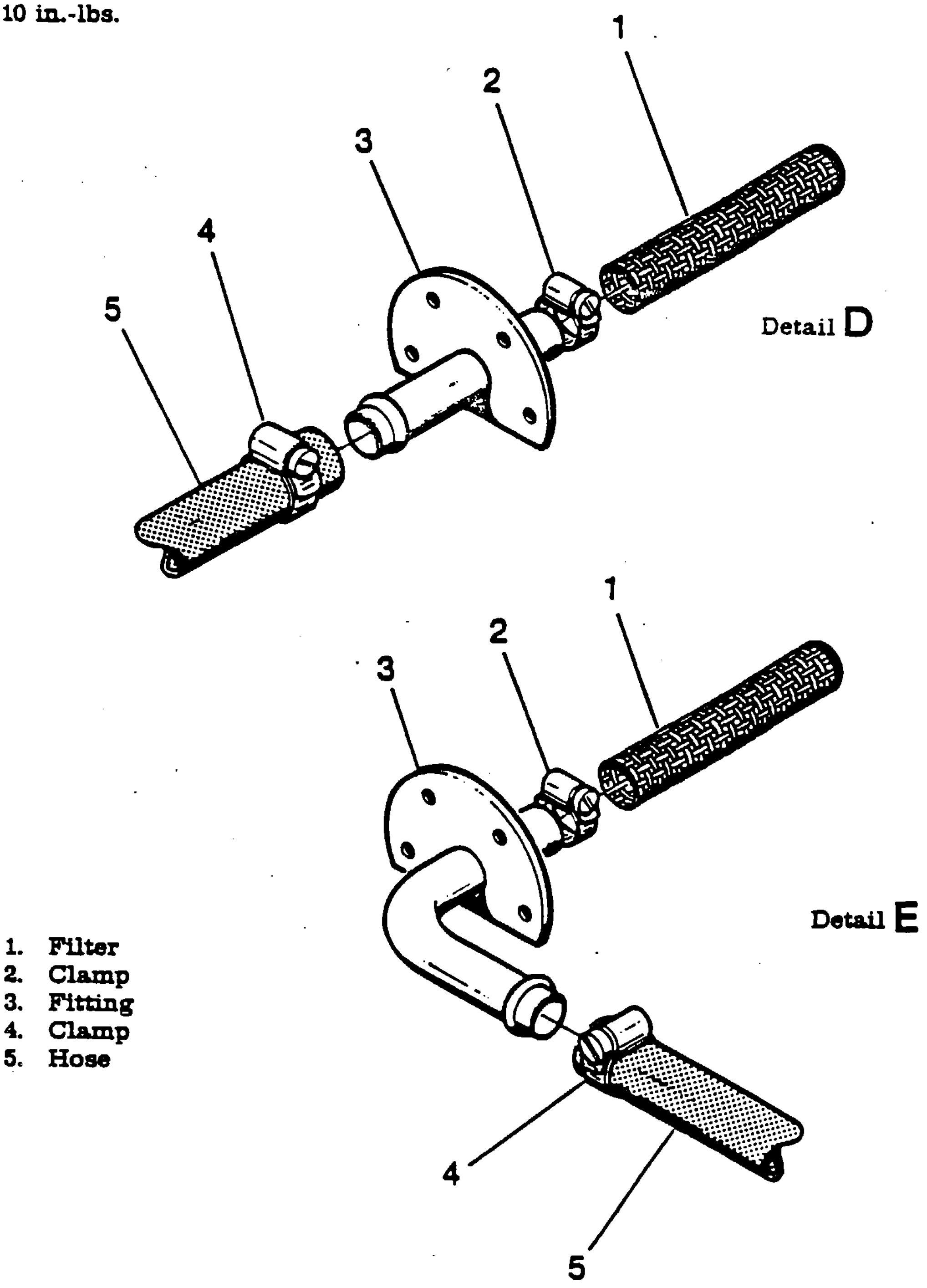
Beginning with serial 172RG1179, nutring (1) is bonded to root rib (2) with fuel tank sealant. Sealant, SK210-56 or SK210-101, may be ordered from Cessna Supply Division.

● After installing washers (5) and screws (6), torque screws to 20 in./lbs. (once only) using a cross-pattern sequence.

Figure 12-3. Fuel Bay Installation (Sheet 3 of 5)

NOTE

When tightening screw clamp (4), do not exceed 8-10 in.-lbs.



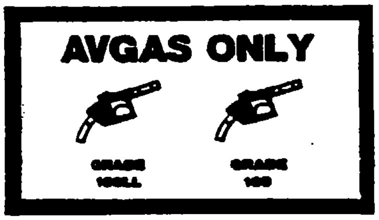
1. Filter
2. Clamp
3. Fitting
4. Clamp
5. Hose

Figure 12-3. Fuel Bay Installation (Sheet 4 of 5)

FUEL

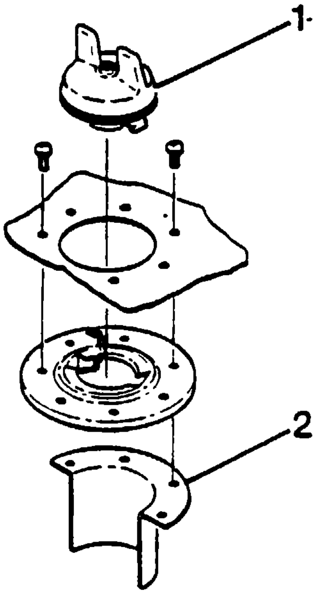
100LL/100 MIN GRADE AVIATION GASOLINE
CAP. 33.0 U.S. GAL.
CAP. 24.0 U.S. GAL. TO BOTTOM OF FILLER COLLAR

Fuel Quantity Placard



Fuel Grade Placard

1. **Fuel Cap (see figure 12-7)**
2. **Fuel Filler Collar**



Detail G

Figure 12-3. Fuel Bay Installation (Sheet 5 of 5)

Since argon and carbon dioxide are heavier than air, these gases will remain in the bay during the repair. The repair shall be made using nonsparking tools (air motors, plastic scrappers, etc.).

NOTE

Portable vapor detectors are available to determine presence of explosive mixtures and are calibrated for leaded fuel. These detectors can be used to determine when it is safe to make repairs.

12-10. **INTEGRAL FUEL BAY SEALANT. Two kinds of sealants are used, one to seal the fuel bay area and the other to seal the access doors. The access door sealant is more pliable and will not adhere to metal as firmly as the bay sealant does. This permits the access doors to be removed without damage to them. Service Kits, SK210-56 (6 ounce tube), or SK210-101 (2.5 ounce tube), are available from the Cessna Supply Division, contain these sealants with the proper quantity of accelerator for each sealant. The sealants and accelerators can be identified by the color of the material.**

WARNING

Keep sealants away from heat and flame. Use only in a well ventilated area. Avoid skin and eye contact. WEAR EYE SHIELDS. In case of eye contact, flush with generous amounts of water and get prompt medical attention.

12-11. MIXING SEALANT. Mix sealant in accordance with instructions supplied with Service Kit SK210-56.

12-12. **SEALING DURING AND AFTER STRUCTURAL REPAIR.**

CAUTION

Protect drain holes and fuel outlet screens when applying sealants. DO NOT plug drain channels at inboard end of stringers (see figure 12-3).

Any repair that breaks the fuel bay seal will necessitate resealing of that area of the bay. Repair parts that need sealing must be installed and riveted during the sealing operation. All joints within the boundary of the bay, but which do not provide a direct fuel path out of the bay, such as stringers and rib flanges within the bay, must be fay surface sealed only. Joints which provide a direct fuel path out of the bay area, such as fuel spar flanges and inboard and outboard rib flanges, must be fay surface sealed and fillet sealed on the fuel side. Fay surface sealing is applying sealant to one mating part before assembly. Enough sealant must be applied so it will squeeze out completely around the joint when the parts are riveted or fastened together. The fillet seal is applied after the joint is fay surface sealed and riveted or fastened together. Fillet sealing is applying sealant to the edge of all riveted joints, joggles, bend reliefs, voids, rivets or fasteners through the boundary of the bay and any place that could produce a fuel leak. The fay sealant need not be cured before the fillet seal is applied, but the squeezed out sealant, to which the fillet sealant is applied, must be free of dirt and contamination. Fillets laid on intersecting joints shall be joined together to produce a continuous fillet. Filler sealant must be pressed into the joint, working out all entrapped air. The best method of applying sealant is with an extrusion gun. Then work the sealant into the joint with a small paddle, being careful to eliminate all air bubbles.

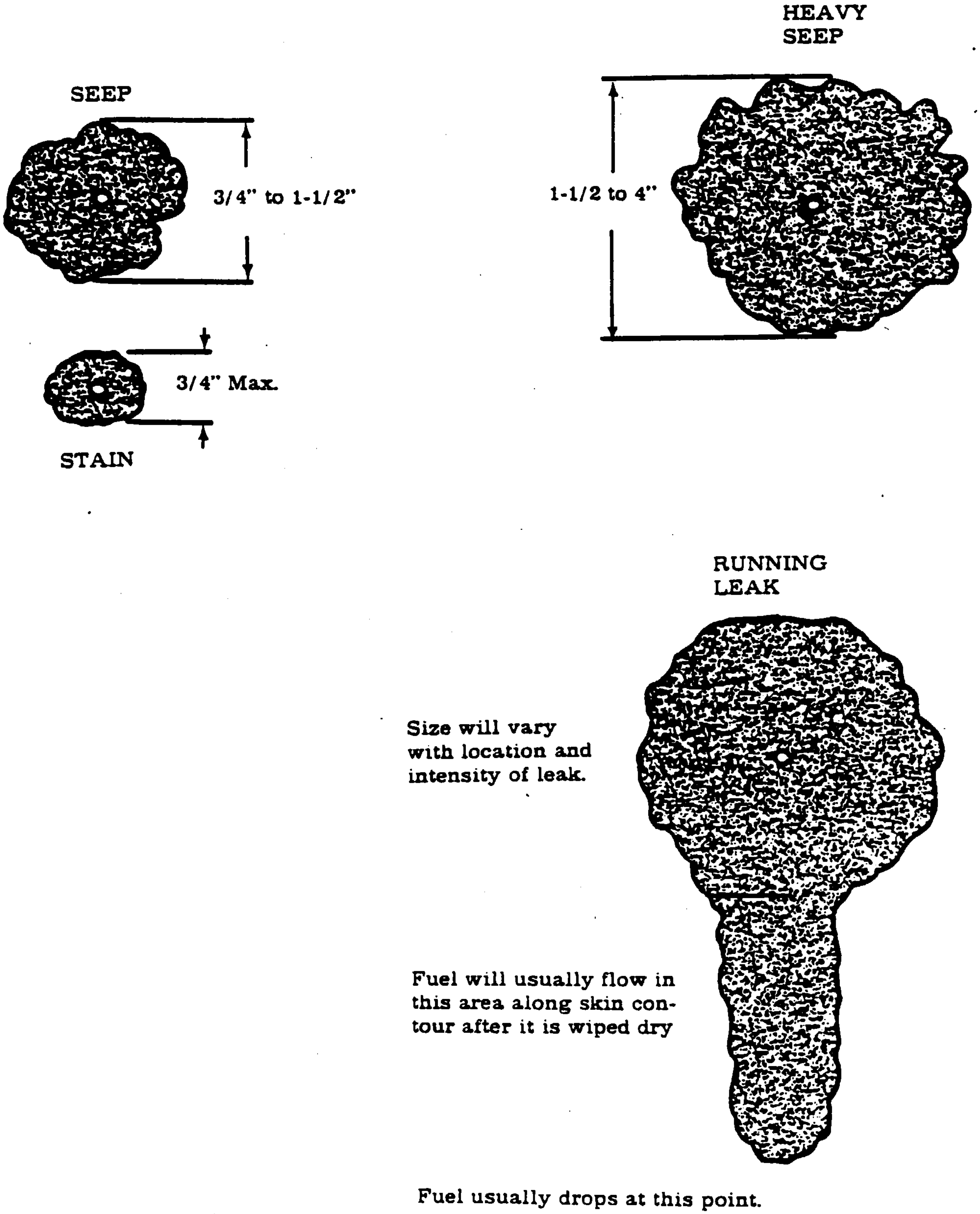
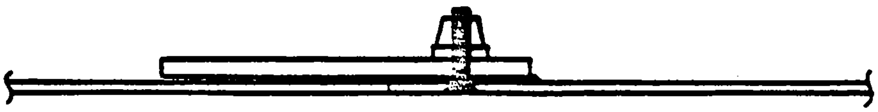


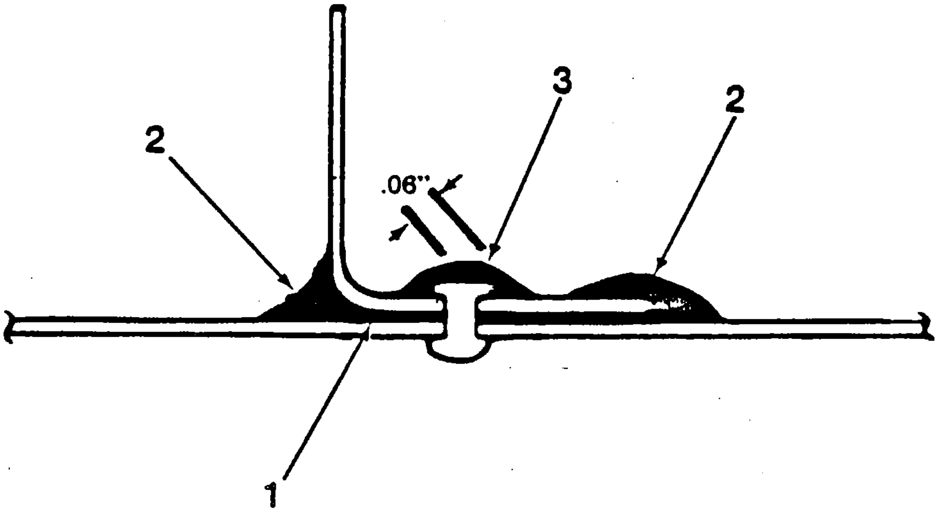
Figure 12-4. Classification of Fuel Leaks

NOTE

Refer to paragraph 12-12.

TYPICAL
INSPECTION PLATE

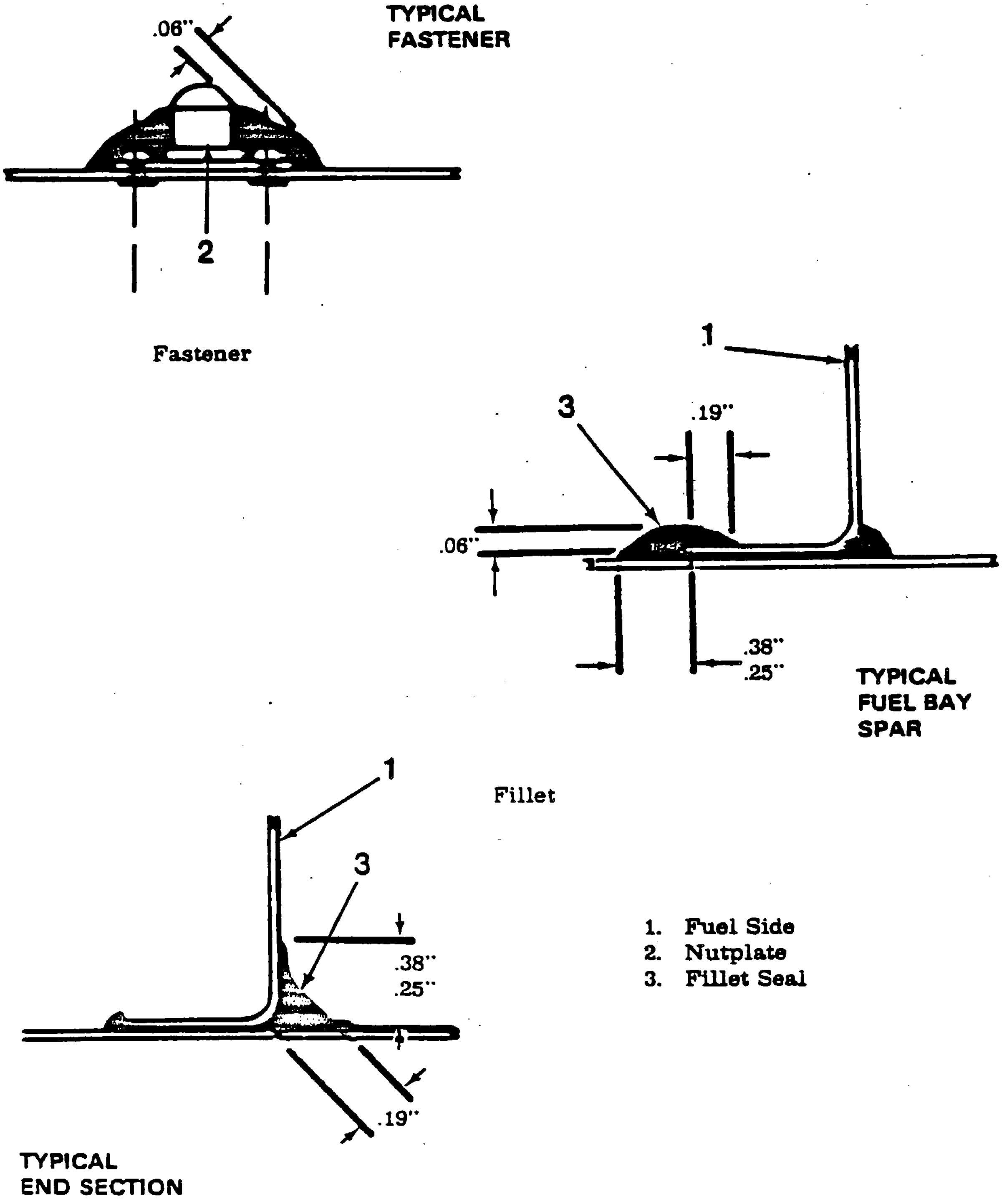




TYPICAL
RIB SECTION

1. Faying
2. Fillet Seal
3. Rivet and Fastener Seal

Figure 12-5. Typical Fuel Bay Sealing (Sheet 1 of 2)



1. Fuel Side
2. Nutplate
3. Fillet Seal

Figure 12-5. Typical Fuel Bay Sealing (Sheet 2 of 2)

NOTE

During structural repair, parts must be predrilled, countersunk or dimpled and cleaned before being sealed and positioned for final installation.

a. Remove all existing sealant from area to be sealed, leaving a taper on the remaining sealant. The taper will allow a scarf bond and a continuous seal when the new sealant is applied.

NOTE

The best method of removing sealant is with a chisel-type tool made of hard fiber. Remaining sealant may then be removed with aluminum wool. Steel wool or sandpaper must not be used.

b. Vacuum thoroughly to remove all chips, filings, dirt, etc., from the bay area.
c. All surfaces and areas to be sealed shall be thoroughly cleaned by wiping with a clean cloth dampened with Methyl Ethyl Ketone (MEK), acetone or similar solvent and dried with a clean cloth before the solvent evaporates.

Always pour the solvent on the cloth. Never use contaminated solvent. The cloth shall not be so saturated that dripping occurs.

NOTE

Allowable work life of Tank Area Sealant is two hours from the starting time of mixing. Allowable work life of Access Cover Sealant is two hours. These apply to standard conditions of 77° Fahrenheit and 50% relative humidity. An increase in temperature or a decrease in humidity will shorten the work life of the sealant.

d. Apply fay surface sealant to one mating part and install rivets or fasteners while sealant is still within its allowable work life.

NOTE

During the sealing operation, sealant must be checked at various times to determine that it has not exceeded its allowable work life. Use a small wood paddle., such as a tongue depressor to gather some sealant. Touch the sealant to a piece of clean sheet metal. If the sealant adheres to the sheet metal, it is still within its allowable work life. If the sealant does not adhere to the sheet metal, it is beyond its allowable work life and must not be used.

e. Apply a fillet seal to the repaired area on the inside of the bay.
f. Apply fay surface door sealant to access doors and adapter plate, if removed, and install the doors and adapter.
g. Allow the sealant to cure. Refer to paragraph 12-14 for curing time.
h. Clean stains from outside of bay area.
i. Test fuel bay for leaks as described in paragraph 12-15.

12-13. SEALING FUEL LEAKS. First determine the source of the fuel leak. Fuel can flow along a seam or structure of the wing for several inches, making the leak source difficult to find. A stained area is an indication of the leak source. Fuel leaks can be found by testing the complete bay as described in paragraph 12-15. Another method of detecting the source of a fuel leak is to remove access doors and blow with an air nozzle from the inside of the bay in the area of the leak while soap bubble solution is applied to the outside of the bay. After the leak source has been found, proceed as follows:

a. Remove existing sealant in the area of the leak as described in paragraph 12-12.
b. Clean the area and apply a fillet seal. Press sealant into leaking area with a small paddle, working out all air bubbles.
c. If leakage occurs around a rivet or bolt, restrike the rivet or loosen bolt, retorque, and reseal around nut plate.
d. Apply fay surface door sealant to access doors, fuel quantity transmitters, etc., if removed, and install.
e. Test fuel bay for leakage as outlined in paragraph 12-15.

12-14. CURING TIME. Service Kit SK210-56 contains SP654706B2 Access Door Sealant Kit and SP654890B2 Fuel Bay Sealant Kit. Normal curing time for each seal is 24 hours. These values are based on a standard condition of 77°F (25°C) and 50% relative humidity. Curing time may be accelerated as shown in the following chart.

NOTE

Temperature shall not exceed 160°F (71°C). Bay must be vented to relieve pressure during accelerated curing.

ACCELERATED CURING TIME
SK210-56 AND SK210-101 KITS

°F of Sealant	Time in Hours
160	3
140	4
*130	*5 1/2
120	7

*Applicable to Service Kit SK210-101 only.

Service Kit SK210-101 contains PR1321B 1/2 Access Cover Sealant Kit and PR1422B 1/2 Fuel Bay Sealant Kit. Normal curing time for PR1321B 1/2 seal based on a standard condition of 75°F (23.9°C) and 50% relative humidity is 18 hours. Normal curing time for PR1422B 1/2 seal based on a standard condition of 77°F (25.9°C) and 50% relative humidity is 45 hours. Curing time may be accelerated by applying heat up to 120°F on the PR1321B 1/2, and by applying heat up to 130°F on the PR1422B 1/2. Refer to Accelerated Curing Time Chart above.

12-15. Testing Integral Fuel Bay.

a. Remove vent line from vent fitting and cap fitting.
b. Disconnect fuel lines from bay.
c. To one of the bay fittings, attach a water manometer capable of measuring twenty inches of water.
d. To the other bay fitting, connect a well regulated supply of air (1/2 PSI MAXIMUM, or 13.8 INCHES of water). Nitrogen may be used where the bay might be exposed to temperature changes while testing.
e. Make sure filler cap is installed and sealed.

CAUTION

Do not attempt to apply pressure to the bay without a good regulator, and a positive shutoff in the supply line. Do not inflate the fuel bay to more than 1/2 PSI or damage may occur.

f. Apply pressure slowly until 1/2 PSI is obtained.
g. Apply a soap solution as required.
h. Allow 15 to 30 minutes for pressure to stabilize.
i. If bay holds for 15 minutes, without pressure loss, bay is acceptable.
j. Reseal and retest if any leaks are found.

12-16. FUEL QUANTITY INDICATING SYSTEM.

12-16A. DESCRIPTION. The system includes one float-type transmitter in each fuel bay, two quantity indicators on the left side of the instrument panel, and associated wiring. The gages are magnetic type; the float transmitters are variable resistive type. Refer to Section 15 for calibration, removal, and installation procedures.

12-17. FUEL VENTS.

12-18. DESCRIPTION. A vent line is installed in the outboard end of the left fuel bay and extends overboard down through the lower wing skin. The inboard end of the vent line extends into the fuel bay, then forward and slightly downward. A vent valve is installed on the inboard end of the vent line inside the fuel bay. A crossover line connects the two bays together. A tee is installed on each end of the crossover line. A separate vent line is attached to the tees, connecting the crossover line to each of the aft fuel supply lines from each fuel bay. See figure 12-2. In addition, the right hand fuel tank cap includes a safety vent valve to ensure positive fuel tank venting.

12-19. CHECKING. If stoppage of either the fuel vent or vent bleed hole occurs, with the engine running, it can lose power, and eventually stop due to fuel starvation. If the above stoppage occurs during a non-run period, fuel expansion can pressurize the fuel bays, causing fuel spillage.

a. Attach a rubber tube to the end of vent line beneath the wing.
b. Blow into tube to slightly pressurize bay. If air can be blown into bay, vent line is open.
c. After bay 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 slightly pressurize the bay, and loosen, but do not remove filler cap on opposite wing to check bay crossover line is open.

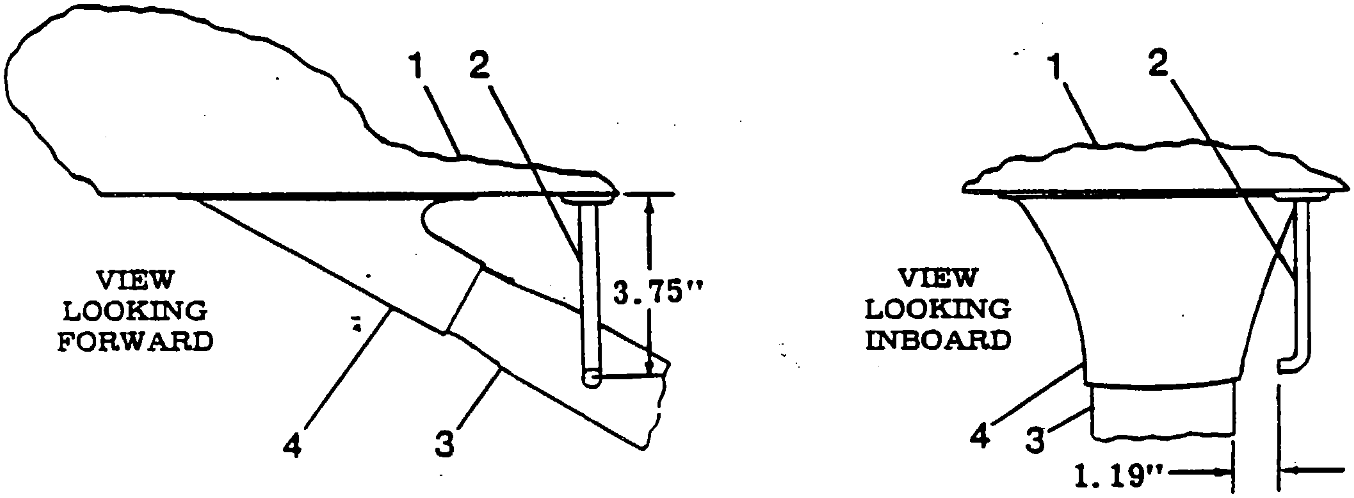
NOTE

Remember that a plugged vent line or bleed hole can cause either fuel starvation or the pressurization of bays 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. See figure 12-6.



1. Wing
2. Vent
3. Strut
4. Fairing

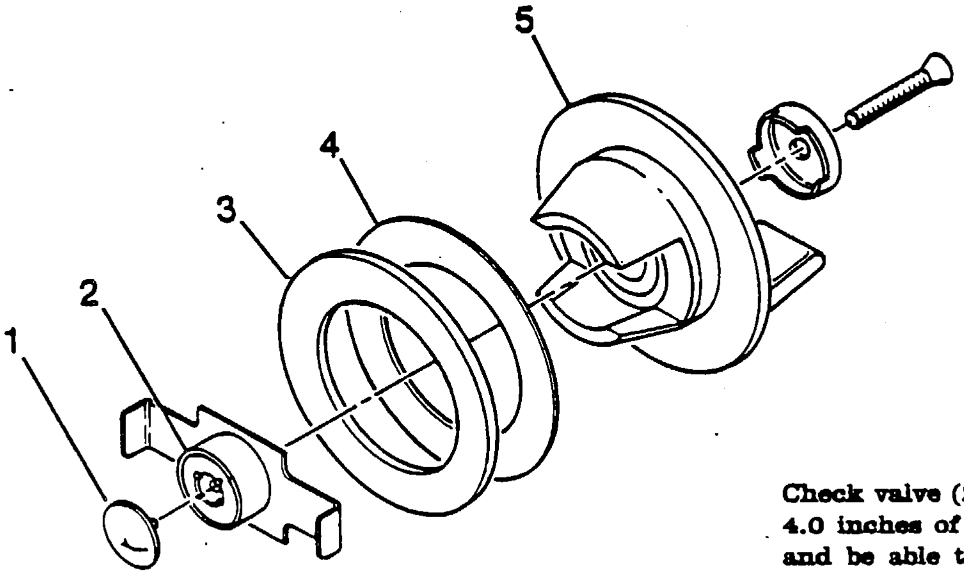
Figure 12-6. Fuel Vent Location

12-20. VENTED FUEL FILLER CAP. (See figure 12-7.)

12-21. DESCRIPTION. The RIGHT-HAND fuel filler cap incorporates a vent and safety valve that provides both vacuum and positive pressure relief.

12-22. CLEANING, INSPECTION AND REPAIR.

a. Remove RIGHT-HAND fuel filler cap from the adapter assembly.
b. Disconnect the safety chain from the cap and cover or plug the tank opening to keep out foreign matter.
c. Check condition of gasket and frictionless washer, replace as required.
d. Using cotton swabs and Stoddard solvent or equivalent, gently lift edges of rubber umbrella and clean seat and umbrella removing all contaminates. Using a second swab wipe seat and umbrella thoroughly, removing all cotton fibers. Repeat until swabs show no discoloration.
e. If the umbrella continues to leak or is deteriorated, remove and replace. To remove the umbrella, lubricate the umbrella stem with (MIL-H-5606) hydraulic fluid to prevent tearing the stem. When installing the new umbrella, lubricate the stem with (MIL-H-5606) hydraulic fluid and use a small blunt tool to insert the retaining knob on the umbrella, into the check valve body.
f. Connect fuel cap to safety chain and reinstall cap in the adapter assembly.



NOTE

Check valve (2) shall open at or before 4.0 inches of water vacuum pressure, and be able to withstand .5 PSI positive pressure without leakage.

1. Umbrella
2. Check Valve (Vent)
3. Gasket
4. Frictionless Washer
5. Fuel Cap Body

Figure 12-7. Vented Fuel Filler Cap

12-23. FUEL SELECTOR VALVE. (See figure 12-8.)

12-24. DESCRIPTION. A four position fuel selector valve is located beneath the floorboard just aft and slightly to the left of the pedestal structure. A shaft incorporating two universal joints links the valve to a handle and shaft assembly mounted on the pedestal structure. The positions of the handle are labeled "OFF, LEFT, BOTH ON AND RIGHT". Valve repair is limited to replacement of component parts only. Beginning with serial 172RG0891, a drain valve assembly is located in the bottom of the selector valve body, for sampling and draining of fuel.

12-25. REMOVAL AND INSTALLATION. (See figures 12-2 and 12-8.)

a. Drain all fuel from bays, strainer, lines and selector valve, observing precautions outlined in paragraph 12-3.
b. Peel back carpet as required to gain access to inspection plates aft of pedestal structure.

The Following Steps Apply to Valves Used Thru Serial 172RG0890:

a. Remove plug button (1), screws (2) and (5), and washer (3). Detach handle (4) and cover placard (6) from gear assembly (8).
b. Remove roll pin (11), screw (7), and nut (9). Detach gear assembly (8), drive shaft (10), and universal joint (15) from system.
c. Disconnect, plug and cap fuel lines, inlets, and outlet of fuel selector valve (14).
d. Remove bolts (18) and washers (17), detach fuel selector valve (14) from system.

The Following Steps Apply to Valves Used on 172RG0891 Thru Serial 172RG1176:

a. Remove plug button (1), screws (2) and (5), and washer (3). Detach handle (4) from shaft assembly (11).
b. Remove cotter pin (8) and roll pin (11), detach guide (7) and shaft assembly (11) from system.
c. Disconnect, plug and cap fuel lines, inlets, and outlet of fuel selector valve (13).
d. Remove bolts (14) and washers (15), detach fuel selector valve (13) from system.

The Following Steps Apply to Valves Used on 172RG1177 And ON:

a. Remove plug button (1), screws (2) and (5), and washer (3). Detach handle (4) from shaft assembly (12) and cover placard (6) from bracket (10).
b. Remove snap ring (8), roll pin (13), clevis pin (14) and cotter pin (15). Detach guide (7) and shaft assembly (12) from system.
c. Disconnect, plug and cap fuel lines, inlets, and outlet of fuel selector valve (18).
d. Remove bolts (16) and washers (17), detach fuel selector valve (18) from system.
c. Reverse preceding steps for installation. Service airplane in accordance with Section 2.
d. Turn fuel selector valve to BOTH ON position and check for fuel leaks.
e. Replace items removed for access to system.

12-26. DISASSEMBLY. (See figure 12-8, sheet 4.)

a. Remove fuel selector valve(s) in accordance with paragraph 12-25.

b. Remove screws (1) securing cover (2) to valve body (8) and carefully remove cover. Discard "O" rings (3), (10) and (16), but retain ball (4) and spring (5) for reinstallation.

c. Slowly withdraw rotor (6) from valve body.

NOTE

Removal of rotor (6) will allow seal (9), O-ring (10), washer (11) and spring (12) (one each typical, both inlet ports), to pop free.

d. Remove washer (7), plug (14), drain valve (17), and O-ring (13).

12-27. CLEANING, INSPECTION AND REPAIR.

NOTE

Repair of damaged or worn parts of the selector valve assembly is NOT authorized and therefore, is limited to replacement of component parts only.

a. Clean disassembled parts by washing in Stoddard solvent or equivalent. Blow parts dry using clean compressed air.

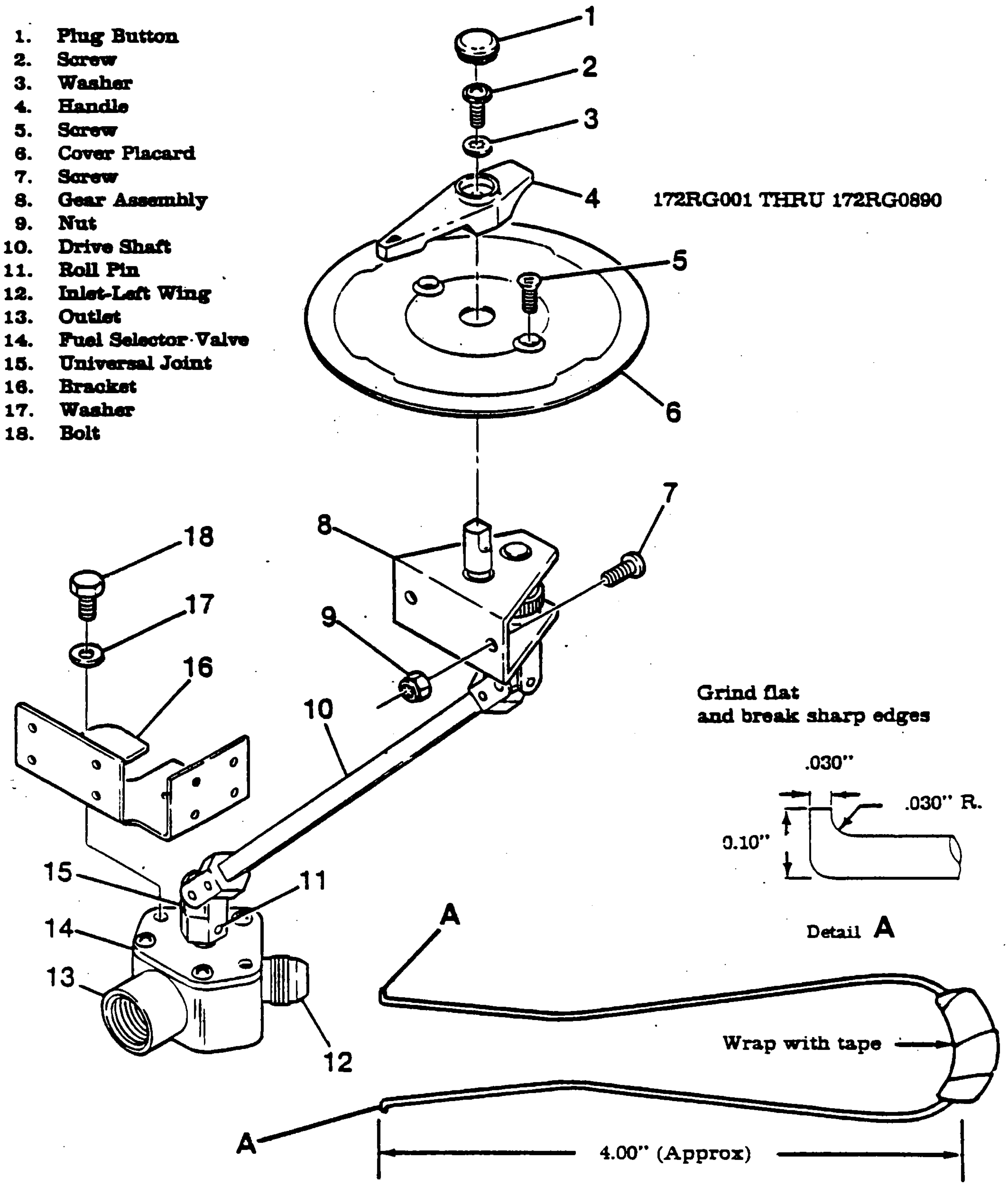
b. Inspect all parts for obvious wear or damage as follows:

1. Check detent holes in cover (2) for excessive wear and examine bearing surfaces with rotor (6).
2. Inspect shaft and bearing surfaces of rotor (6) for removal of black anodized finish indicating wear. Check for internal corrosion of drilled passages.
3. Examine valve body (8) for wear, cracks, distortion and internal corrosion. Any damage to thread surfaces at inlet and outlet ports or cover attach screw holes is cause for rejection.

NOTE

Reassembly of selector valve is facilitated by mounting in a bench vise or equivalent bench support, making sure valve body (8) is protected from damage. Fabricate two spring compressors to relieve pressure on seals during installation of rotor. See figure 12-8 (sheet 1) for spring compressor dimensions.

1. **Plug Button**
2. **Screw**
3. **Washer**
4. **Handle**
5. **Screw**
6. **Cover Placard**
7. **Screw**
8. **Gear Assembly**
9. **Nut**
10. **Drive Shaft**
11. **Roll Pin**
12. **Inlet-Left Wing**
13. **Outlet**
14. **Fuel Selector Valve**
15. **Universal Joint**
16. **Bracket**
17. **Washer**
18. **Bolt**



SPRING COMPRESSOR

Figure 12-8. Fuel Selector Valve and Spring Compressor (Sheet 1 of 4)

1. **Plug Button**
2. **Screw**
3. **Washer**
4. **Handle**
5. **Screw**
6. **Cover Placard**
7. **Guide**
8. **Cotter Pin**
9. **Bracket**
10. **Nut**
11. **Shaft Assembly**
12. **Roll Pin**
13. **Fuel Selector Valve**
14. **Bolt**
15. **Washer**
16. **Inlet-Right Wing**
17. **Inlet-Left Wing**
18. **Outlet**

172RG0891 THRU 172RG1177

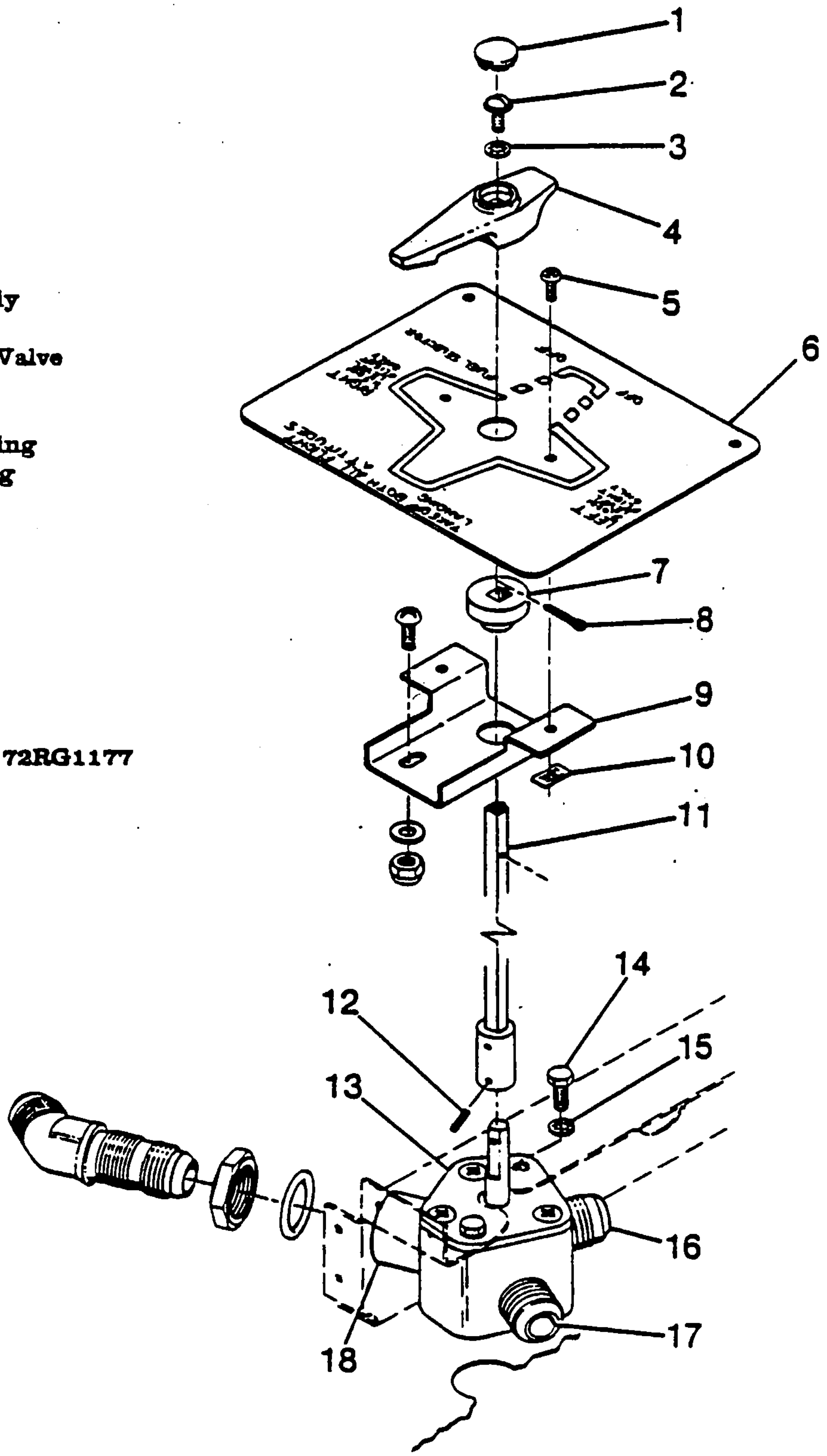
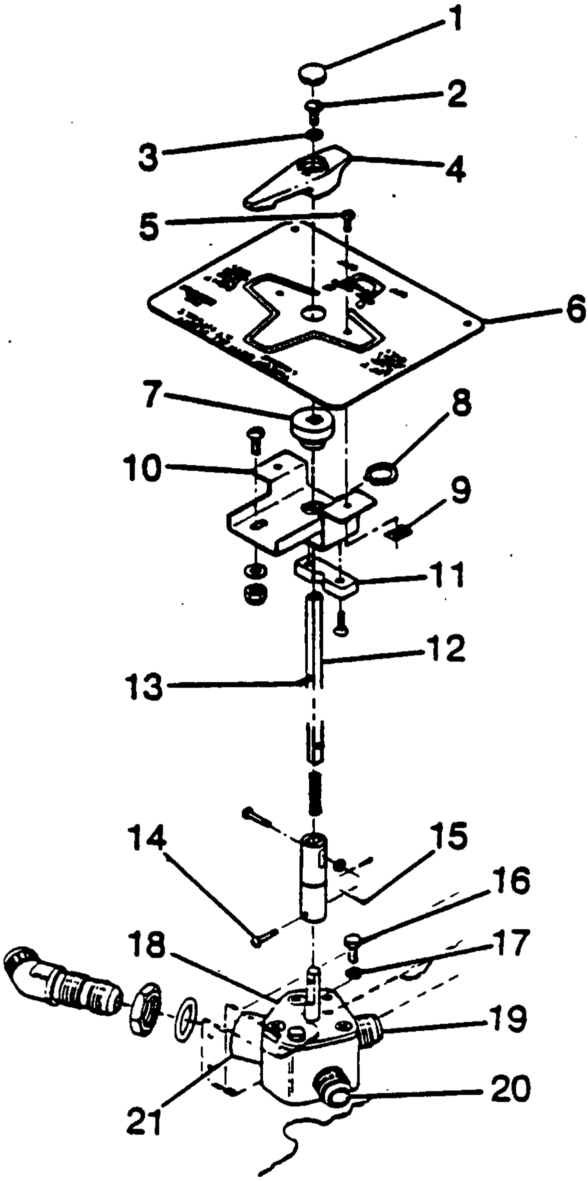


Figure 12-8. Fuel Selector Valve and Spring Compressor (Sheet 2 of 4)

1. **Plug Button**
2. **Screw**
3. **Washer**
4. **Handle**
5. **Screw**
6. **Cover Placard**
7. **Guide**
8. **Snap Ring**
9. **Nut**
10. **Bracket**
11. **Stop Block**
12. **Shaft Assembly**
13. **Roll Pin**
14. **Clevis Pin**
15. **Cotter Pin**
16. **Bolt**
17. **Washer**
18. **Fuel Selector Valve**
19. **Inlet-Right Wing**
20. **Inlet-Left Wing**
21. **Outlet**



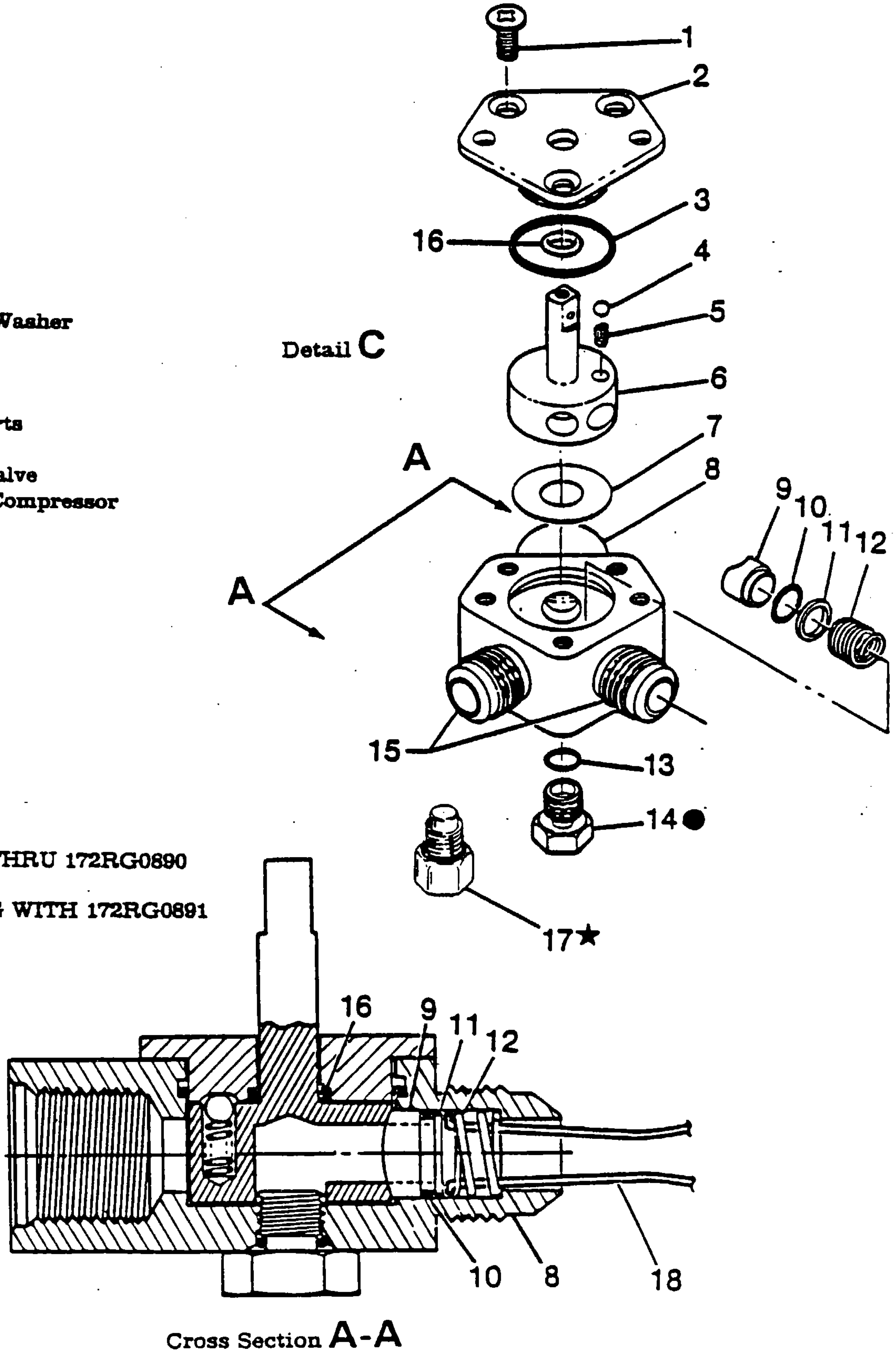
NOTE

Roll pin (13) must be bonded to drive shaft (12) with EA-9316, EA-9309, or EA-9314. These products may be purchased from: Hystol Div. Dexter Corp; Willow Pass Rd, Pittsberg, CA 94565. Equivalent product: EC-2216 (3M Co., St. Paul, MN 55119). Clean roll pin (13) and drive shaft (12) with MEK. Thoroughly dry parts before applying bonding agent. At 75°F, bond cures to 80% ultimate tensile strength within 24 hours. Accelerated cure:
(a) Five minutes at 250°F.
(b) Ten minutes at 200°F.

172RG1178 & ON

Figure 12-8. Fuel Selector Valve and Spring Compressor (Sheet 3 of 4)

1. Screw
2. Cover
3. O-Ring
4. Ball
5. Spring
6. Rotor
7. Washer
8. Body
9. Seal
10. O-Ring
11. Spring Washer
12. Spring
13. O-Ring
14. Plug
15. Inlet Ports
16. O-Ring
17. Drain Valve
18. Spring Compressor



● 172RG0001 THRU 172RG0890

★ BEGINNING WITH 172RG0891

Figure 12-8. Fuel Selector Valve and Spring Compressor (Sheet 4 of 4)

12-28. REASSEMBLY.

a. Ensure all component parts are clean, then coat sparingly with lightweight engine oil.
b. Insert springs (12) into body (8).
c. With spring compressors (18) in place as shown in Section A-A on figure 12-8, compress springs (12) and install spring washers (11), new O-rings (10) and seals (9) into inlet ports.
d. Holding springs compressed, carefully insert washer (7) and rotor (6) into valve body (8). Release spring compressors and check for proper seating of seals to rotor.
e. Insert new O-ring (3) into recess at top of valve body (8).
f. Place new O-ring (16) over shaft of rotor.
g. Lubricate spring (5) and ball (4) with lubricant conforming to Military Specification VV-P-236 (USP Petrolatum or equivalent), inserting spring into hole in top of rotor.
h. Place ball on spring and turn rotor as required to index one of the detent holes in cover (2).
i. Attach cover (2) and test rotation of rotor shaft for ease of operation and positive detent engagement.
j. Replace plug (14) using new O-ring (13).
k. Reinstall selector valve in accordance with paragraph 12-25.

12-29. FUEL STRAINER. (See figure 12-9.)

12-30. DESCRIPTION. The fuel strainer is mounted on the right side of the nose gear tunnel near the firewall. The strainer is equipped with a quick-drain valve which provides a means of draining trapped water and sediment from the fuel system.

NOTE

The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft.

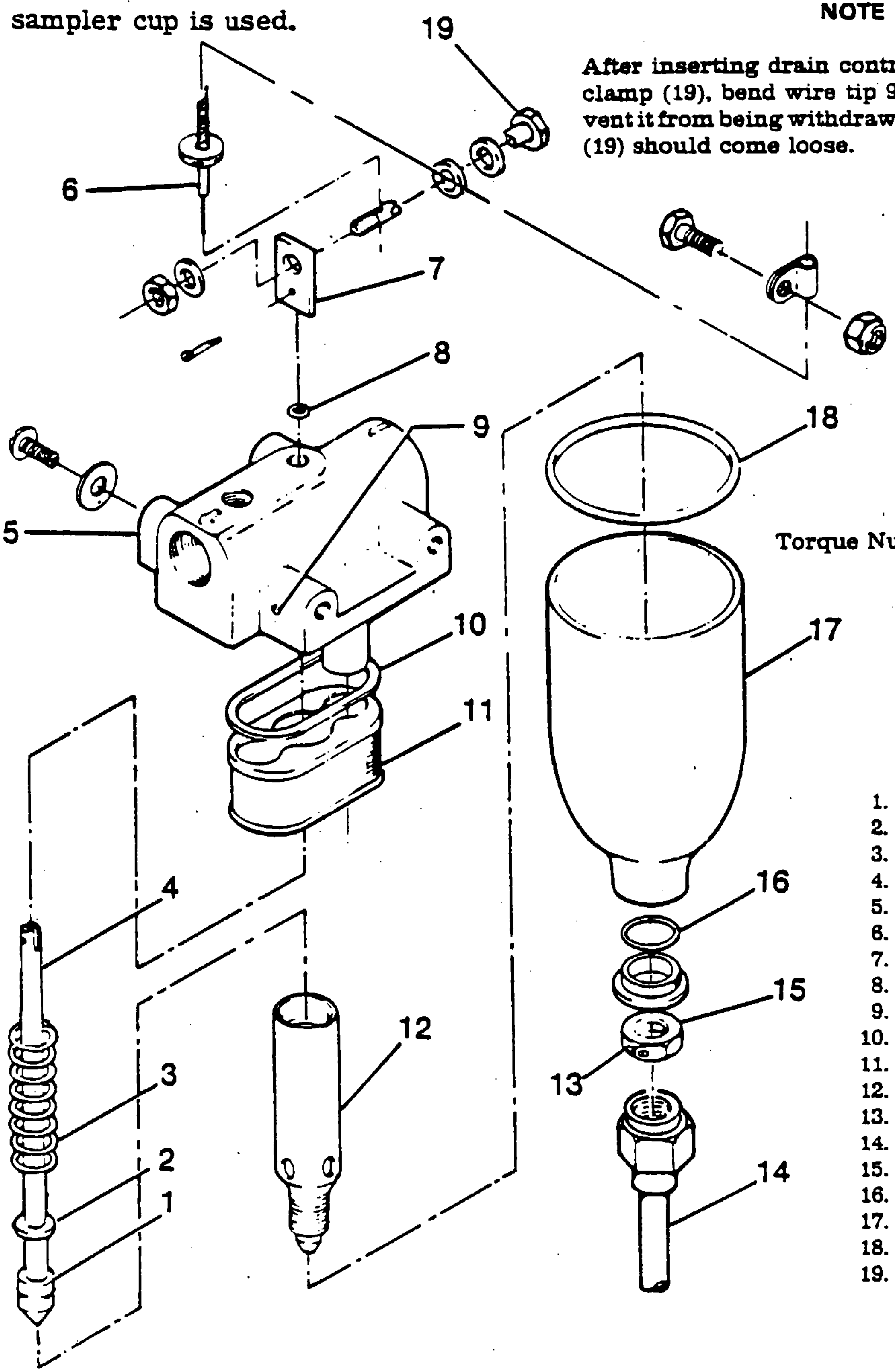
12-31. REMOVAL AND INSTALLATION.

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 nose gear tunnel 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.
f. Safety wire the two bolts attaching the assembly to the nose gear tunnel together.

Beginning with the 1982 models the cable control is deleted and a sampler cup is used.

NOTE

After inserting drain control (6) wire through clamp (19), bend wire tip 90° (degrees) to prevent it from being withdrawn if attaching clamp (19) should come loose.



Note

Torque Nut (15) to 25-30 lb. in.

1. Collar
2. Washer
3. Spring
4. Plunger
5. Top
6. Drain Control
7. Plate
8. O-Ring
9. Safety Wire Hole
10. Gasket
11. Filter
12. Standpipe
13. Safety Wire Hole
14. Drain Line
15. Nut
16. O-Ring
17. Bowl
18. O-Ring
19. Clamp

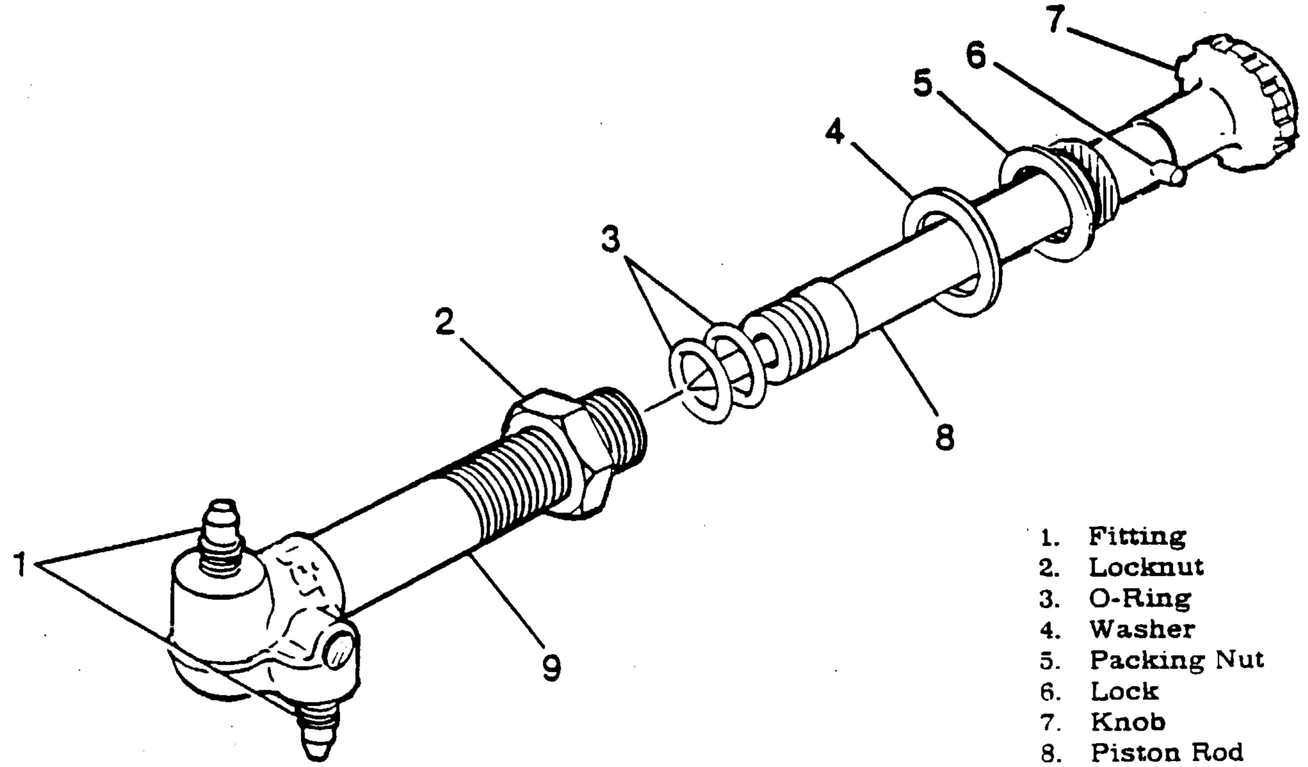
Figure 12-9. Fuel Strainer

12-32. DISASSEMBLY AND ASSEMBLY.

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 bow. Note that step-washer at bottom of bowl is installed so that step seats against O-ring. Connect drain tube.
g. With selector valve in "ON" position, check for leaks and proper operation of quick-drain valve.
h. Safety wire bottom nut to top assembly. Wire must have right hand wrap, at least 45 degrees.

12-33. PRIMING SYSTEM. (See figure 12-2.)

12-34. DESCRIPTION. The Model 172RG-Series, equipped with a "Blue Streak" (Lycoming) engine, employs a standard manually-operated priming system which primes three cylinders. Fuel is supplied by a line from the strainer to the plunger-type primer. Operating the primer delivers fuel to the intake port of the cylinders. Operating the primer system delivers fuel to the intake port of each individual cylinder except No. 1.



1. Fitting
2. Locknut
3. O-Ring
4. Washer
5. Packing Nut
6. Lock
7. Knob
8. Piston Rod
9. Barrel

Figure 12-10. Primer Assembly

12-35. REMOVAL. (See figure 12-10.)

NOTE

Removal of primer from instrument panel entails disassembly of primer.

a. Place fuel selector valve in the OFF position.
b. Spread drip cloth under left-hand instrument panel.
c. Disconnect and cap or plug primer lines at primer.
d. Unlock primer knob and pull aft to clear packing nut (5).
e. Unscrew packing nut (5).
f. Withdraw primer knob and piston rod from instrument panel.
g. The primer barrel can now be worked free from the instrument panel on the firewall side of the panel.

12-36. INSPECTION. Visually inspect primer lines for crushed, kinked or broken condition. Ensure proper clamping to prevent fatigue due to vibration or chafing. Ensure barrel's (9) cylinder wall is free of signs of pitting, corrosion, or scoring and that O-rings (3) are in good condition.

NOTE

To remove O-rings (3) from piston rod (8), squeeze O-rings in grooves of piston rod with thumb and index finger. Work O-rings over end of piston rod. O-rings can be refitted to their grooves on piston rod (8) in a like manner.

CAUTION

Do not damage O-rings (3).

12-37. INSTALLATION. (See figure 12-10.)

a. From the firewall side of the instrument panel, insert barrel assembly (9) through hole in panel. Ensure that washer (4) is installed on barrel between locknut (2) and the firewall side of the panel.

CAUTION

Do not damage O-rings (3) during step "b".

b. While holding barrel assembly (9) firmly in place, insert piston rod assembly (8) into barrel.
c. The distance the barrel protrudes through hole in panel can be adjusted by turning locknut (2).
d. Tighten packing nut (5) against panel.
e. Unplug or uncap fittings on primer lines and attach to primer fittings (1).
f. Turn fuel selector valve to the ON position.
g. Check primer for proper pumping action and positive fuel shutoff in the locked position.

12-38. AUXILIARY ELECTRIC FUEL PUMP. (See figure 12-11.)

12-39. DESCRIPTION. An electrically driven auxiliary fuel pump is mounted on the firewall. and is connected in parallel with the fuel flow of the primary pump. This pump is designed to be used if the primary pump should fail. It is controlled by the Auxiliary Fuel Pump Switch located adjacent to the Master Switch. As the fuel pressure and plunger spring tension become equal, the pumping action is automatically reduced due to limited plunger movement which maintains low tolerance output pressure.

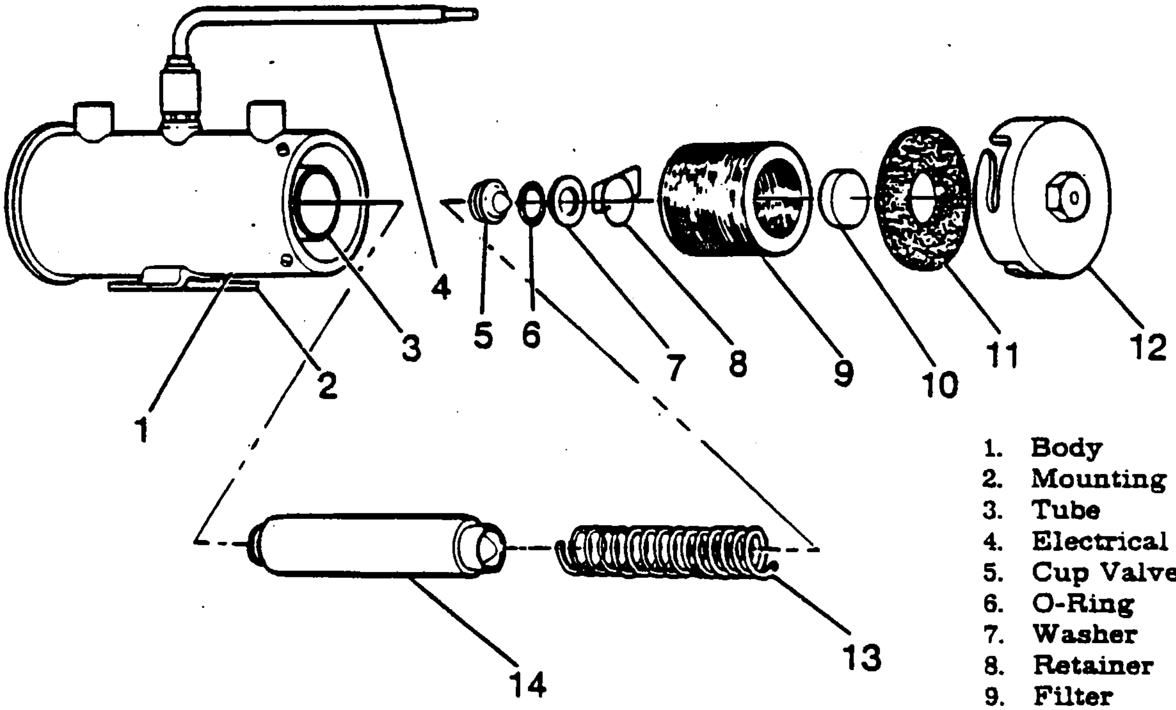
12-40. REMOVAL AND INSTALLATION.

a. Place fuel selector valve in OFF position.
b. Make sure that Master Switch and Auxiliary Fuel Pump Switch are OFF.

NOTE

On aircraft 172RG0818 thru 172RG0890 it will be necessary to remove the auxiliary fuel pump cooling shroud.

c. Remove fuel lines from pump, observing precautions in paragraph 12-3.
d. Disconnect wire at connector.
e. Remove two mount bolts, retaining hardware for installation.
f. Reverse preceding steps for installation, and check pump operation when repair is completed.



1. Body
2. Mounting Bracket
3. Tube
4. Electrical Lead
5. Cup Valve
6. O-Ring
7. Washer
8. Retainer
9. Filter
10. Magnet
11. Gasket
12. Cover
13. Spring
14. Plunger

Figure 12-11. Auxiliary Fuel Pump (Electric)

SECTION 13

PROPELLER AND GOVERNOR

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

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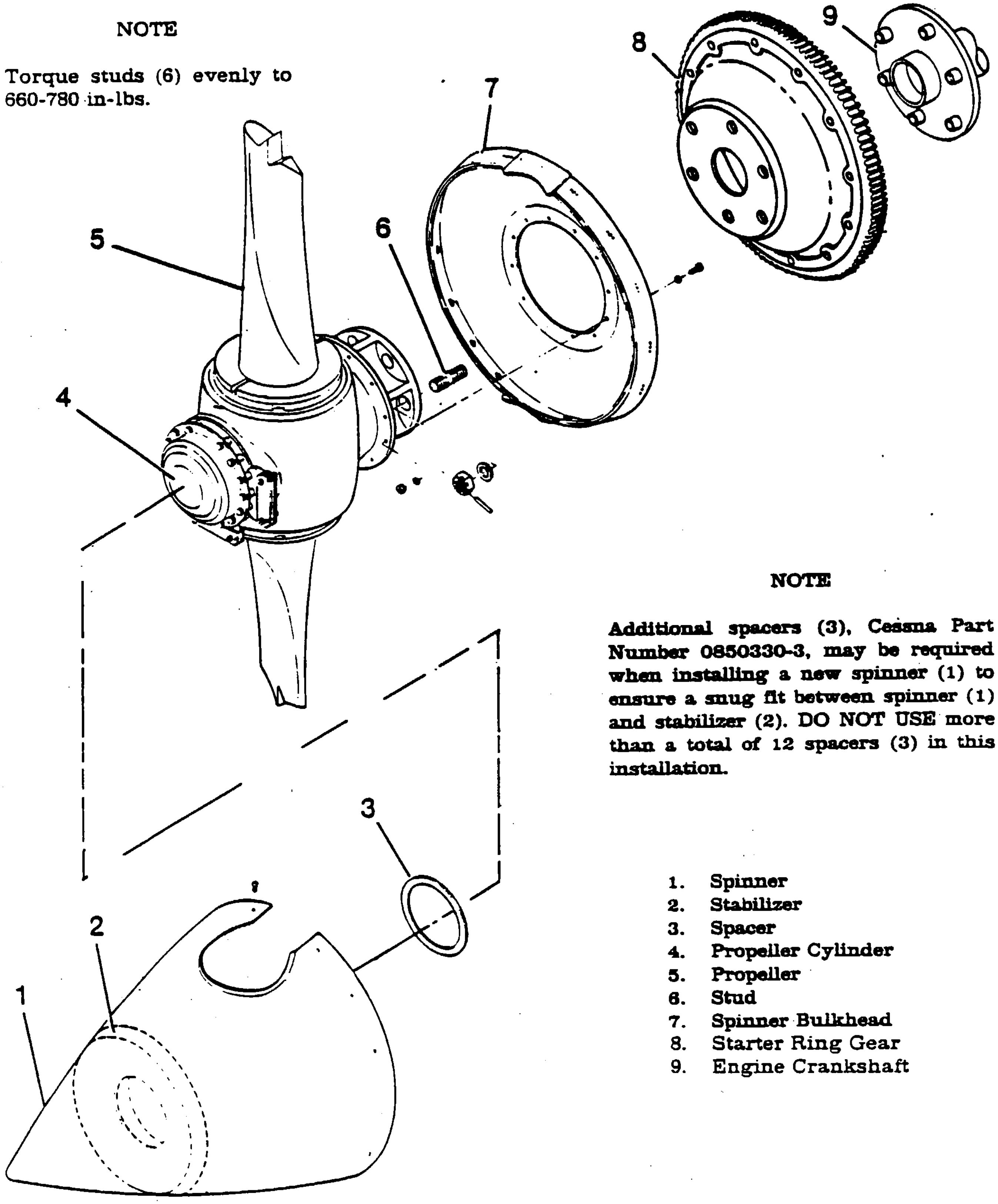
13-1. PROPELLER DESCRIPTION. The constant-speed propeller is a single acting unit, where governor regulated oil pressure opposes the centrifugal twisting moment of the rotating blades and spring force to obtain the correct blade pitch for engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the engine crankshaft. The amount and pressure of the engine oil used is controlled by the propeller governor. An increase or decrease in throttle setting or a change in aircraft attitude will affect the balance to maintain the most efficient and economical RPM, which the pilot has previously selected. If the throttle is opened more, or the aircraft speed is increased, the engine RPM will also begin to increase. This change is sensed by the propeller governor, and it directs oil pressure to the forward side of the piston. The blades will move to a higher pitch to load the engine, thereby maintaining constant RPM. Conversely, if the throttle is closed somewhat, or aircraft speed is decreased, the engine RPM will try to decrease. The governor senses this, and it allows oil to drain from the forward side of the piston. Spring tension and centrifugal twisting moment will move the propeller blades to a lower pitch to maintain selected engine speed.

NOTE

Torque studs (6) evenly to 660-780 in-lbs.



NOTE

Additional spacers (3), Cessna Part Number 0850330-3, may be required when installing a new spinner (1) to ensure a snug fit between spinner (1) and stabilizer (2). DO NOT USE more than a total of 12 spacers (3) in this installation.

1. **Spinner**
2. **Stabilizer**
3. **Spacer**
4. **Propeller Cylinder**
5. **Propeller**
6. **Stud**
7. **Spinner Bulkhead**
8. Starter Ring Gear
9. Engine Crankshaft

Figure 13-1. Propeller Installation

13-2. TROUBLE SHOOTING -- PROPELLER AND GOVERNOR.

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 13-8.
	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 13-8.
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 13-8.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to takeoff 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 13-8.
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.

13-2. TROUBLE SHOOTING -- PROPELLER AND GOVERNOR (CONT.)

TROUBLE	PROBABLE CAUSE	REMEDY
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	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.

13-3. REPAIR. Metal propeller repair is a two step operation. First, the damage must be evaluated. Second, a determination of degree of the damage must be made under criteria contained in Federal Aviation Regulations, Part 43 (FAR 43) and Federal Aviation Agency Advisory Circular No 43.14 (FAA AC 43.13). These instructions must be observed anytime repairs or alterations are being made, because they authorize the level of repair for each action.

NOTE

For information not covered in this section, refer to the applicable McCauley Service Manual and Supplements thereto.

13-4. REMOVAL. (See figure 13-1.)

WARNING

Be sure magneto is grounded before turning propeller.

a. Remove spinner dome.
b. Remove safety wire, back off studs attaching propeller to engine crankshaft about one-fourth inch, and pull propeller forward.

NOTE

Studs will have to be backed out evenly so propeller can be pulled forward (approximately 1/4 inch each time) until all studs are disengaged from engine crankshaft flange. As the propeller is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

c. Pull propeller from engine crankshaft.
d. If necessary to remove the aft spinner bulkhead, remove bolts, washers, and nuts attaching bulkhead to propeller hub.

NOTE

After removing the propeller, loosen alternator adjusting arm and disengage drive belt from pulley on aft face of starter ring gear support assembly.

13-5. INSTALLATION. (See figure 13-1.)

WARNING

Be sure magneto is grounded before turning propeller.

a. If aft spinner bulkhead was removed, reinstall.
b. If starter ring gear support was removed, clean mating surfaces of support assembly and engine crankshaft flange.
c. Place alternator drive belt in pulley groove of starter ring gear support. Fit starter ring gear over propeller flange bushings on crankshaft.

NOTE

Make sure bushing hole in ring gear support, marked O, is assembled adjacent to O mark on crankshaft flange bushing. The starter ring gear must be located correctly to assure proper alignment of the timing mark on the ring gear.

d. Clean propeller hub cavity and mating surfaces of propeller hub and ring gear support.
e. Lightly lubricate new O-ring and crankshaft pilot with clean engine oil, and install O-ring in the propeller hub.
f. Align propeller mounting studs with proper holes in engine crankshaft flange, and slide propeller carefully over crankshaft pilot until bolts can be started in crankshaft flange bushing. Position propeller blades to extend through aft spinner bulkhead with ample clearance.
g. Tighten studs evenly, and work propeller aft on crankshaft flange. Torque studs to 660-780 in. lb.
h. Install .040 inch diameter corrosion resistant safety wire through studs in pairs.
i. Adjust alternator drive belt tension as outlined in Section 16.
j. Install spacers (3) and stabilizer (2) on propeller cylinder (4). If spacers are not centered mechanically (piloted), visually center and hold them until stabilizer is forced firmly in place.
k. Hold spinner (1) snug against stabilizer (2) and check alignment of holes in spinner with holes in spinner bulkhead (7). Add or remove spacers (3) from propeller cylinder (4) until holes are within .050 of alignment.
l. Push hard on spinner (1) to align holes and install screws and washers (if required) in 3 or more equal spaces around the spinner bulkhead (7). Relax pressure on the spinner (1) and install the remaining screws and washers (if required).
m. Tighten all screws uniformly around the spinner.

13-6. TIME BETWEEN OVERHAUL (TBO). Propeller overhaul shall coincide with engine overhaul, but shall not exceed limits specified in McCauley Service Bulletin 137 and all revisions and supplements thereto. Refer to Sectioh 11 for engine overhaul periods.

13-7. GOVERNOR DESCRIPTION. The engine mounted, centrifugal, single-acting propeller governor is mounted on the upper left side of engine just forward of number two cylinder. The term "single-acting" refers to the way engine oil is directed to the propeller to effect pitch change. This governor directs oil pressure to increase blade-pitch. Decreased blade pitch is caused by centrifugal twisting moment of rotating propeller blades and the force of an internal spring, as oil pressure is relieved. When oil is relieved by the governor, it returns to the oil sump through governor pilot spool valve action. Basically the governor consists of an engine driven gear pump, pressure relief valve, rotating flyweights, a pilot spool valve, and a control lever to vary spring load on flyweights, which presets engine load through blade pitch.

NOTE

Outward physical appearance of specific governors is the same, but internal parts determine the action of oil pressure output: i.e., oil pressure to increase or decrease blade pitch. Always be sure the correct governor is used with the propeller.

13-8. TROUBLE SHOOTING. Since governor action is directly related to propeller pitch, very few governor troubles can be isolated with governor installed and operated on the aircraft. Failure of propeller to change pitch correctly may be caused by the governor or propeller. Except for locating obvious troubles, it is best to install a governor known to be in good condition to check whether the propeller or the governor is at fault when trouble occurs in the propeller pitch change mechanism. If the trouble disappears the governor was at fault. If the trouble persists, the propeller may be at fault. Removal, installation, rigging of control, high-speed stop adjustment, desludging, and installation of governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classified as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

13-9. REMOVAL.

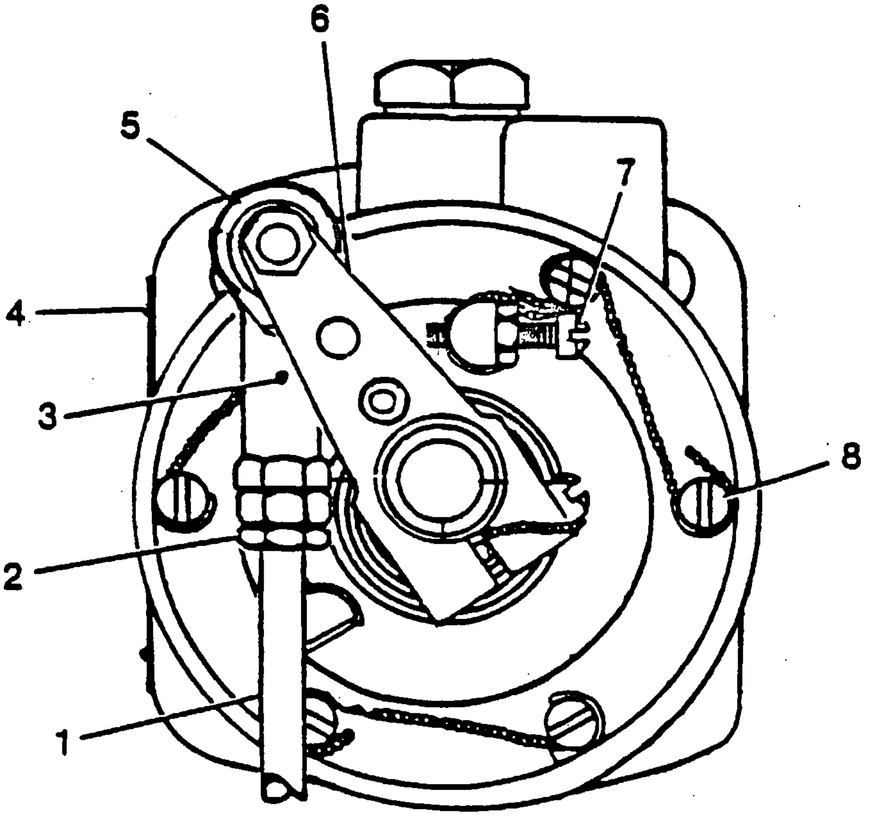
a. Remove engine cowling as required for access.
b. Disconnect control from arm or governor and from bracket.
c. Remove nuts and washers securing governor to engine crankcase.
d. Remove governor and mount gasket.

13-10. INSTALLATION.

WARNING

Be sure magneto is grounded before turning propeller.

a. Wipe governor and adapter mounting pad clean.
b. Install new gasket with screen facing governor (outward).
c. Position governor on mount studs, aligning governor pump drive splines with engine drive splines, and install nuts and washers. Do not force spline engagement. Rotate crankshaft slightly, and splines will mesh smoothly when properly aligned.
d. Install mount washers and nuts in removal sequence.
e. Connect control bracket to engine, and control end to governor arm. Rig per paragraph 13-11.
f. Install engine cowling previously removed for access in removal sequence.



1. Governor Control
2. Jam Nut
3. Thread Gage Hole
4. Governor
5. Rod End
6. Governor Arm
7. High RPM Stop Screw
8. Governor Ring Screws

Figure 13-2. Propeller Governor

13-11. HIGH RPM STOP ADJUSTMENT. (See figure 13-2.)

a. Remove engine cowling as necessary for access.
b. Loosen high-speed stop screw lock nut.
c. Turn stop screw IN for decrease in maximum RPM, and OUT to increase maximum RPM. One complete turn will cause a change of approximately 25 RPM.
d. Tighten lock nut, safety, and adjust linkage as necessary to maintain full travel. Ensure that governor arm contacts stop screw in both maximum and minimum settings, and that a cushion exists on control in both positions.
e. Install cowling and test-operate governor-propeller combination.

NOTE

It is possible for either the propeller low pitch stop or the governor high RPM stop to be the limiting factor. It is desirable for the governor high RPM stop to limit the engine speed at the maximum rated RPM for a particular aircraft. Due to climate conditions, field elevation, low pitch propeller blade angle, and other factors, 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.

13-12. RIGGING.

NOTE

The result of rigging of the governor control is full travel of the governor control arm (bottomed out against both high and low pitch stops) with some "cushion" at both ends of the control travel.

a. Disconnect control from governor arm.
b. Place propeller 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 with governor high RPM stop screw.
c. Place governor arm against high RPM stop screw.
d. Loosen jam nuts on control rod end, and adjust rod end to align with arm. Be sure sufficient thread engagement is maintained, it may be necessary to adjust control in mount bracket, to achieve proper alignment and thread engagement.
e. Attach control rod end to governor arm, tighten previously loosened jam nuts, and safety wire.
f. Operate the propeller control to see that governor arm has full travel, and contacts stops in both directions with proper "cushion".

13-13. TIME BETWEEN OVERHAUL (TBO). Propeller governor overhaul shall coincide with engine overhaul, but interval between governor overhauls shall not exceed 1800 hours. Refer to Section 11 for engine overhaul frequency requirements. The McCauley Service Manual is available from Cessna Supply Division.

SECTION 14

UTILITY SYSTEMS

TABLE OF CONTENTS

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 shutoff valve, mounted on the right forward side of the firewall, a push-pull control on the instrument panel, outlets and flexible ducting connecting the system.

14-4. SYSTEM OPERATION. Ram air is ducted through an engine baffle inlet and heat exchange section of the exhaust muffler, to the shut-off valve at the firewall. The heated air flows from the shut-off valve into a duct across the aft side of the firewall, where it is distributed into the cabin. The shut-off valve, operated by a push-pull control marked "CABIN HT", located on the instrument panel, regulates the volume of heated air entering the system. Pulling the control full out supplies maximum flow, and pushing control in gradually decreases flow, shutting off flow completely when the control is pushed full in.

14-5. TROUBLE SHOOTING. Most of the operational troubles in the heating, defrosting and ventilating systems are caused by sticking or binding air valves and their controls, damaged air ducting or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. (Refer to Section 2 of this manual for lubrication information.) Damaged or broken parts must be repaired or replaced. When checking controls, ensure that valves respond freely to control movement, that they move in the correct direction, and that they move through their full range of travel and seal properly. Check that hoses are properly secured and replace hoses that are burned, frayed or crushed. If fumes are detected in the cabin, a thorough inspection of the exhaust system should be accomplished. Refer to applicable paragraph in Section 11 of this manual 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 shutoff valves at the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound or equivalent compound.

14-6. REMOVAL, REPAIR AND INSTALLATION. The heating and defrosting systems are illustrated in figure 14-1. The figure may be used as a guide for removal, repair or installation of system components. Burned, frayed or crushed hose must be replaced with new hose, cut to correct length and installed in the original routing. Trim hose windings shorter than complete hose length to allow clamps to be installed. Defective air valves should be repaired or replaced. Check for correct operation of valves and their controls after repair and/or installation.

14-7. DEFROSTER SYSTEM.

14-8. DESCRIPTION. The defrosting system is comprised of a duct across the aft side of the firewall, defroster outlets, mounted on the cowl deck, immediately aft of the windshield, and flexible ducting connecting the system.

14-9. SYSTEM OPERATION. Air from the duct across the aft side of the firewall flows through the flexible ducting to the defroster outlet. Temperature and volume of this air is controlled by settings of the heater system control.

14-10. TROUBLE SHOOTING. Since the defrosting system depends on proper operation of the heating system, trouble shooting procedures outlined in paragraph 14-5 should be followed for checking the defroster system.

14-11. REMOVAL, REPAIR AND INSTALLATION. The defroster system is illustrated in figure 14-1 in conjunction with the heating system. The figure may be used as a guide for removal, repair or installation of system components. Burned, frayed or crushed hose must be replaced with new hose, cut to correct length and installed in the original routing. Trim hose windings shorter than complete hose length to allow clamps to be installed. A defective defroster outlet should be repaired or replaced. Check for correct operation of control after repair and/or installation.

14-12. VENTILATING SYSTEMS.

14-13. DESCRIPTION. Three separate systems are installed for cabin ventilation. One system is comprised of an air scoop, located in each wing root fillet, with flexible ducting connecting each air scoop to an adjustable air vent silencer unit, located on each side of the rear cabin area. Another system is comprised of an air scoop, located in the leading edge of each wing, just outboard of the air scoop in the wing root fillets. These air scoops are connected to cabin outlets, installed on each side of the cabin, near the upper corners of the windshield. These outlets are manually-adjustable with knobs on the outlet assemblies. A third system is comprised of a fresh air scoop door on the right side of the fuselage, just forward of the copilot seat. Flexible ducting connects this air scoop to the duct across the aft side of the firewall. This system is controlled by a push-pull control on the instrument panel.

14-14. SYSTEMS OPERATION. Heating, defrosting and ventilating systems work together to provide the conditions desired by the pilot. The heating system, defrosting system and one ventilating system receive air from the duct across the aft side of the firewall. As long as the "CABIN HT" control is pushed in, no heated air can enter the firewall duct; therefore, if the "CABIN AIR" control (to the scoop door on the right forward fuselage) is pulled out, only fresh air from the scoop will flow through the duct into the cabin. As the "CABIN HT" control is gradually pulled out, more and more heated air will blend with the fresh air from the scoop, and be distributed into the cabin. Either one, or both of the controls may be set at any position from full open to full closed. Rear seat ventilation is provided by air vent silencer assemblies, mounted in the left and right rear cabin wing root areas. These units receive ram air from the airscoops in the wing root fillets. Each silencer assembly is equipped with a valve which meters incoming cabin ventilating air, which greatly reduces inlet air noise. The outlet assemblies, installed near the upper corners of the windshield are manually operated, increasing or decreasing flow of ram air into the cabin.

14-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating systems are caused by sticking or binding of the inlet scoop door or its control. Check air scoop 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

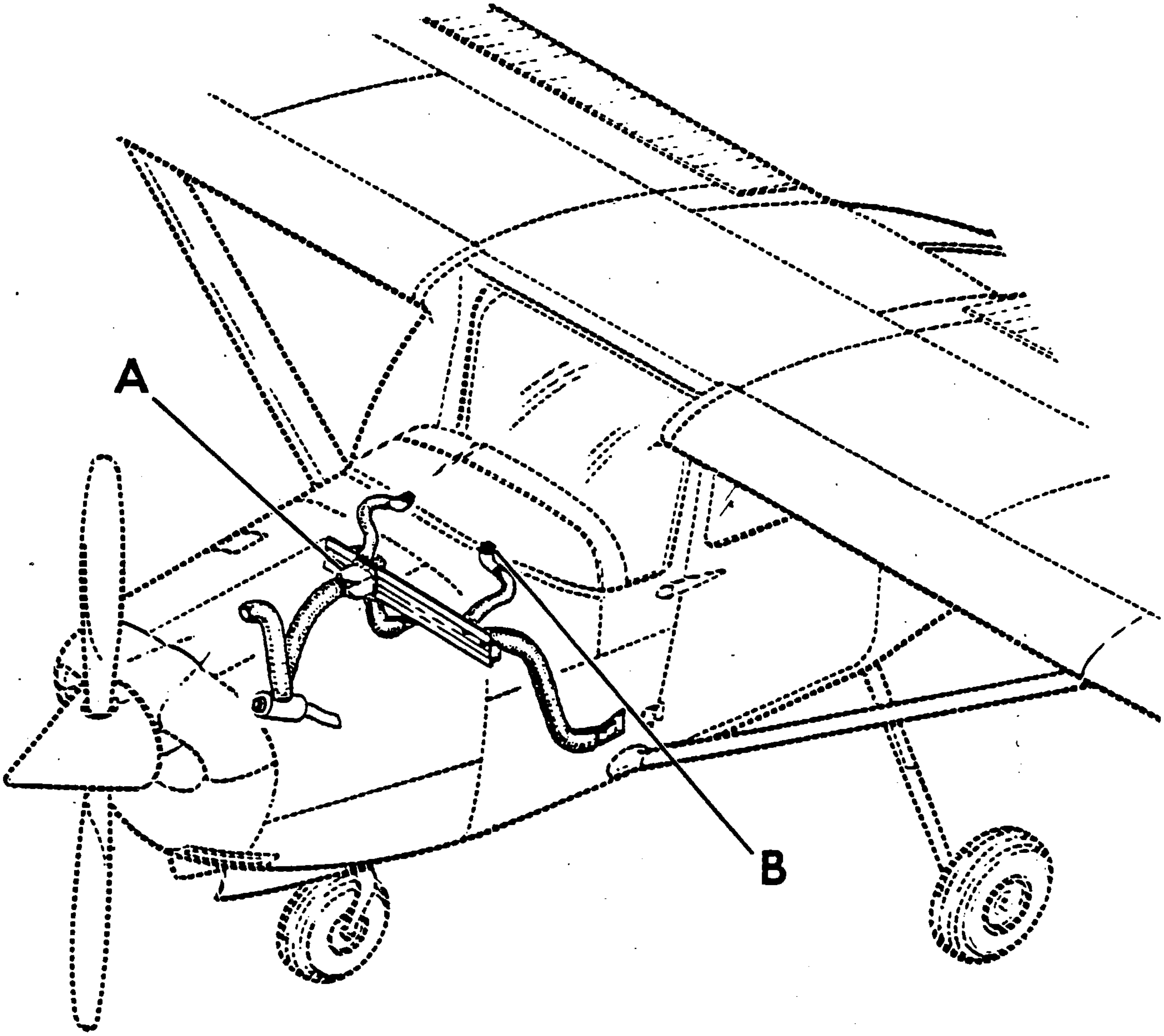
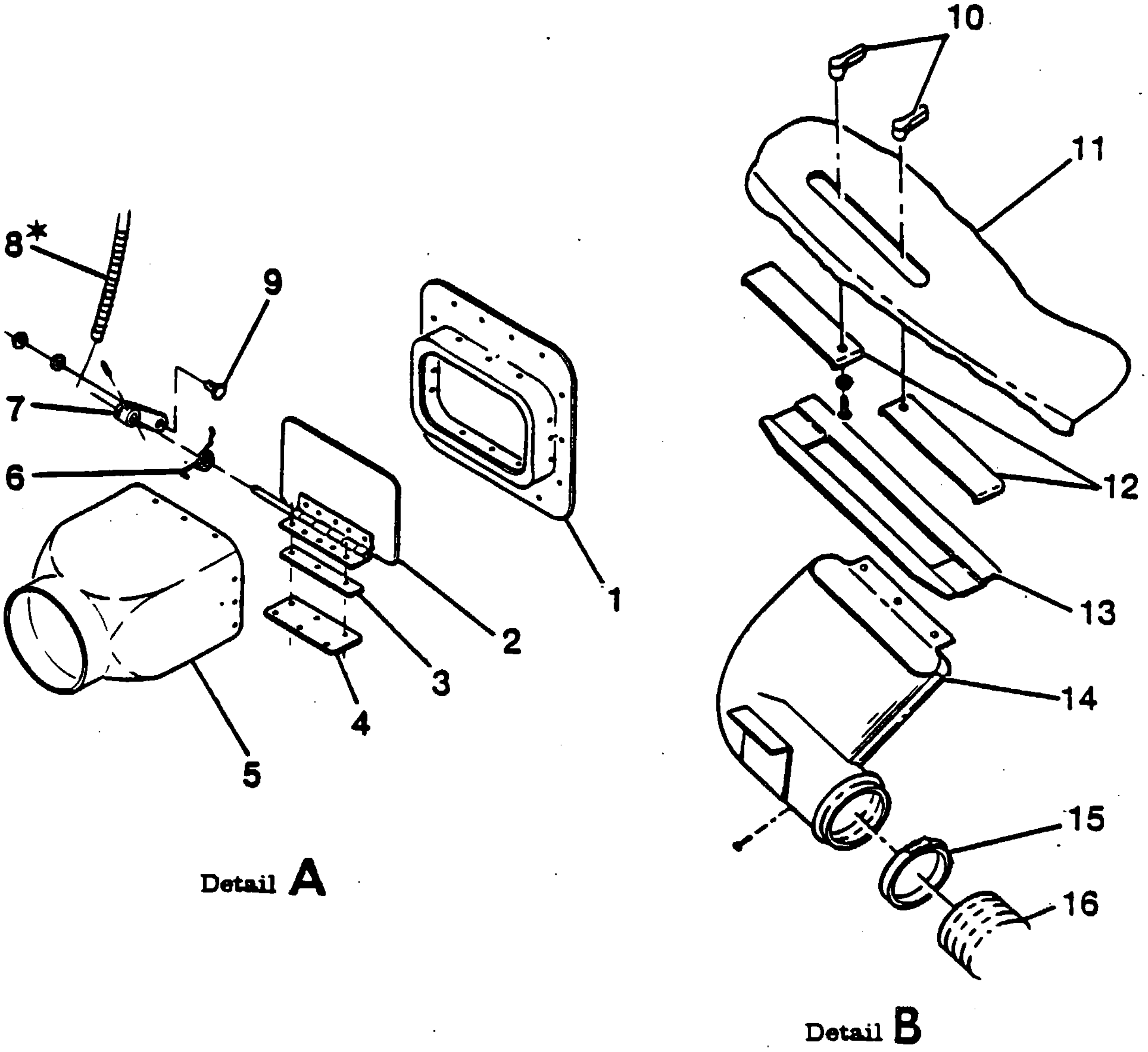


Figure 14-1. Heating and Defrosting Systems (Sheet 1 of 2)

a cleaning solution which would contaminate the air. The filters may be removed to increase air flow. However, their removal will cause a slight increase in noise level.

14-16. REMOVAL, REPAIR AND INSTALLATION. The ventilating system is illustrated in figure 14-2. The figure may be used as a guide for removal, repair or installation of system components. A defective ventilator or scoop must be repaired or replaced. Check for proper operation of controls after repair and/or installation.



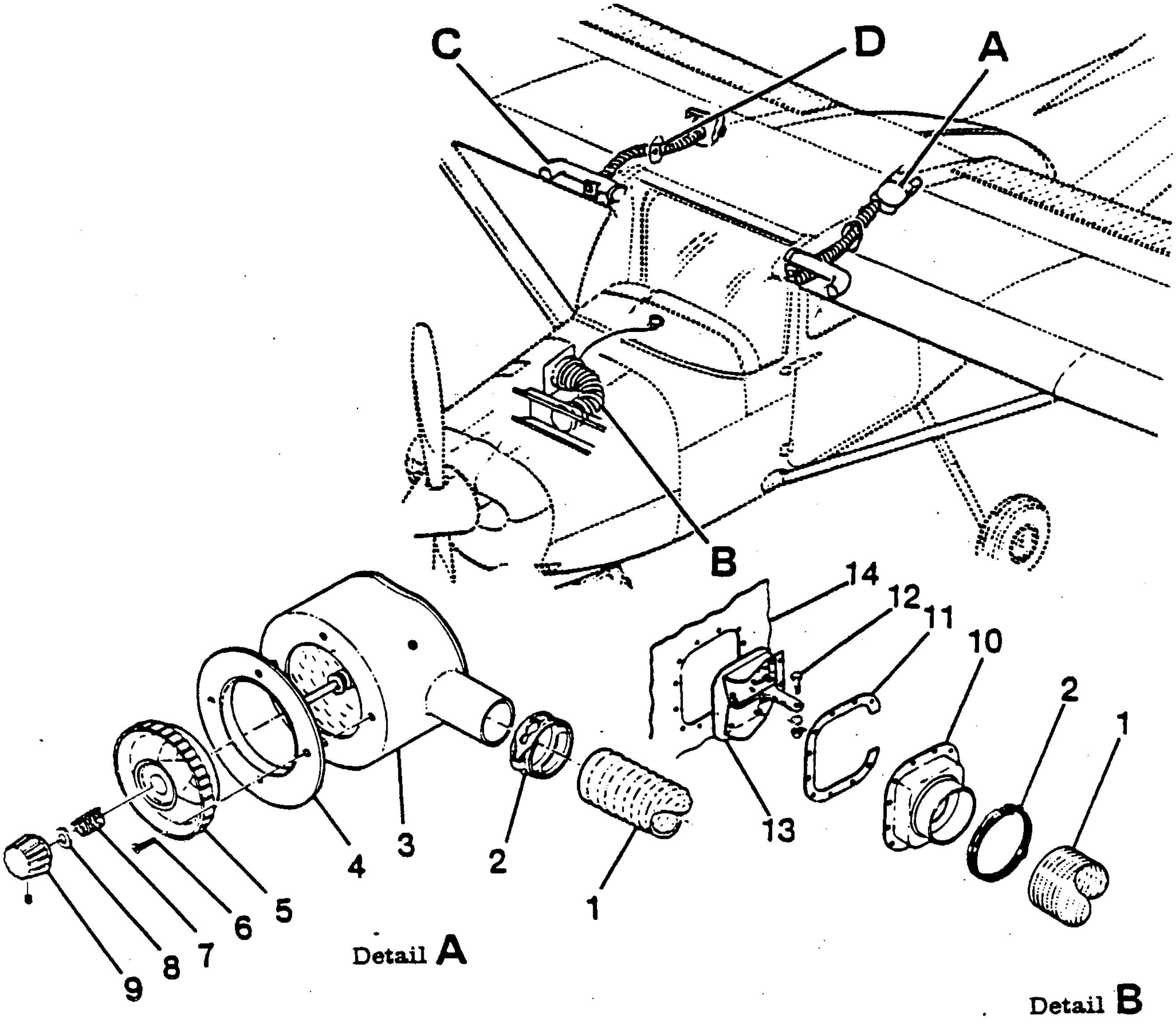
Detail A

Detail B

1.	Seat	5.	Valve Body	9.	Clamp Bolt	13.	Valve Guide
2.	Valve Plate	6.	Spring	10.	Knob	14.	Nozzle
3.	Shim	7.	Arm Assembly	11.	Cowl Deck	15.	Clamp
4.	Retainer	8.	Defroster Control	12.	Valve	16.	Hose

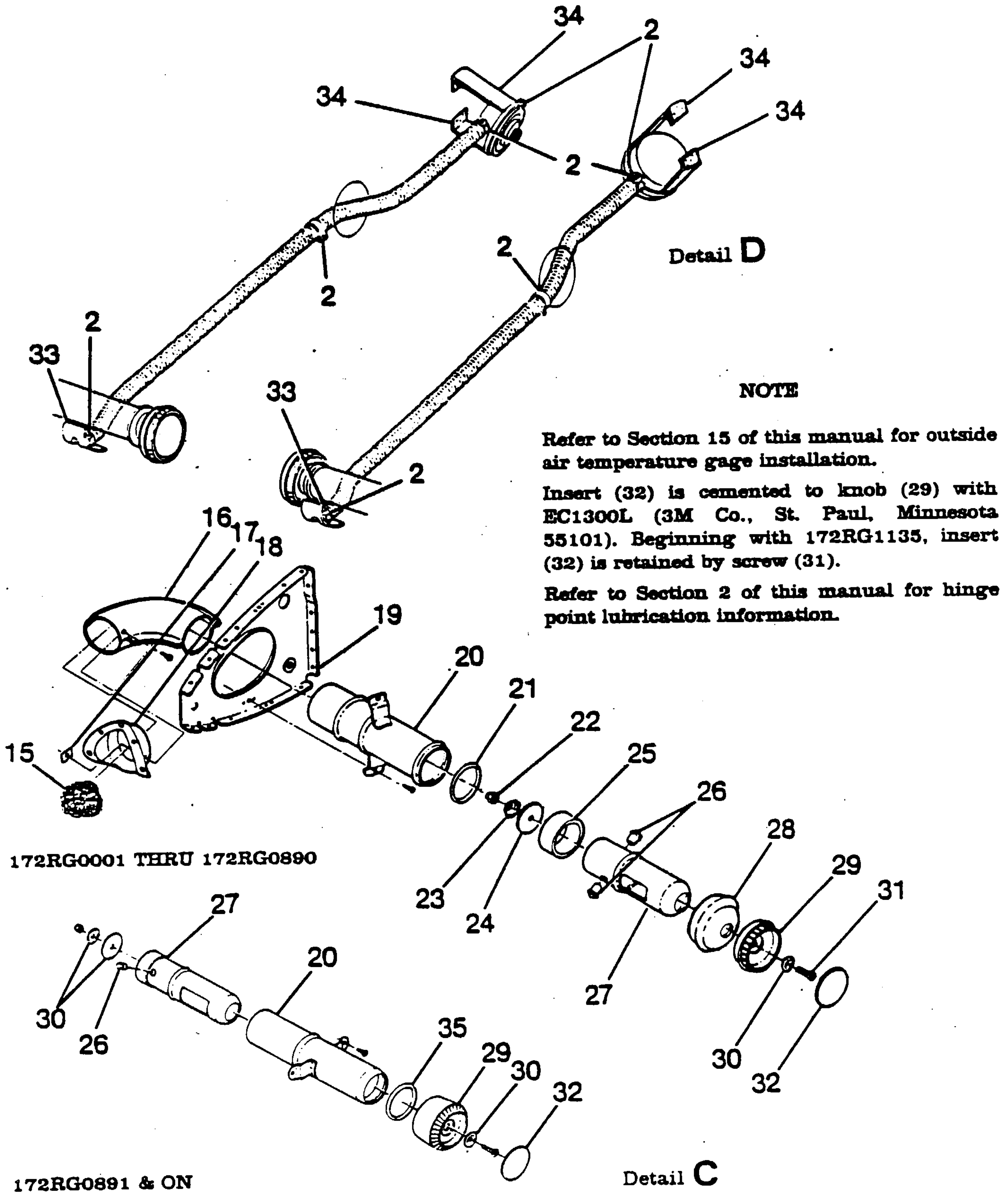
*** See figure 14-2 for heating, defrosting and ventilating system controls.**

Figure 14-1. Heating and Defrosting Systems (Sheet 2 of 2)



1. Hose
2. Clamp
3. Air Vent Silencer
4. Escutcheon
5. Knob
6. Screw
7. Spring
8. Washer
9. Knob
10. Inlet
11. Seal
12. Clamp Bolt
13. Air Vent Door
14. Fuselage Skin
15. Filter
16. Elbow
17. Nutplate
18. Air Scoop
19. Rib
20. Tube Assembly
21. Felt Washer
22. Nut
23. Washer
24. Washer
25. Seal
26. Bullet Catch
27. Outlet Assembly
28. Cap
29. Knob
30. Washer
31. Screw
32. Insert
33. Adapter
34. Bracket

Figure 14-2. Ventilating System (Sheet 1 of 3)



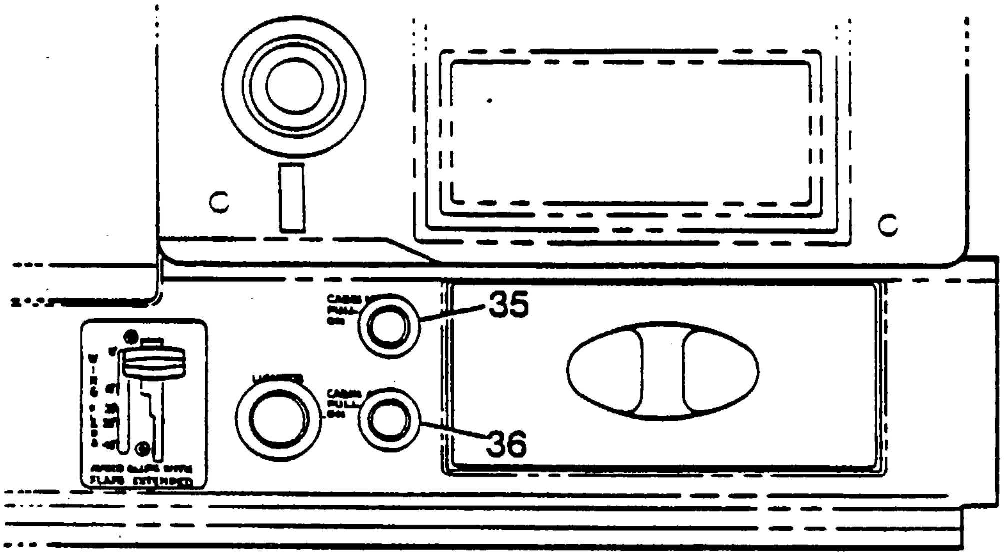
NOTE

Refer to Section 15 of this manual for outside air temperature gage installation.

Insert (32) is cemented to knob (29) with EC1300L (3M Co., St. Paul, Minnesota 55101). Beginning with 172RG1135, insert (32) is retained by screw (31).

Refer to Section 2 of this manual for hinge point lubrication information.

Figure 14-2. Ventilating System (Sheet 2 of 3)



35. Cabin Heat and Defrosting System Control
36. Cabin Ventilating System Control

NOTE

Beginning with 1985 models, the heating, defrosting and ventilating system controls (35) and (36) are changed to locking type. The center button must be pushed in and held before moving the knob in either direction.

Figure 14-2. Ventilating System (Sheet 3 of 3)

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 trouble shooting and corrective measures only. It does not deal with specific instrument repairs since this usually requires special equipment and data. Instrument repairs should be handled by instrument specialists. Federal Aviation Regulations require malfunctioning instruments to be sent to an approved instrument overhaul and repair station or returned to manufacturer for servicing. Our concern here is with preventive maintenance and correction of system faults which result in instrument malfunctions. The descriptive material, maintenance and trouble shooting information is intended to help the mechanic determine malfunctions and correct them, up to the defective instrument itself. At this point an instrument technican 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 the 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.

15-3. INSTRUMENT PANEL.

15-4. DESCRIPTION. The instrument panel assembly consist of a stationary and shock-mounted panel. The stationary panel contains instruments which are NOT sensitive to vibration. The shock-mounted panel contains major flight instruments such as horizontal and directional gyros which are affected by vibration. Most of the instruments are screw-mounted on the panel backs.

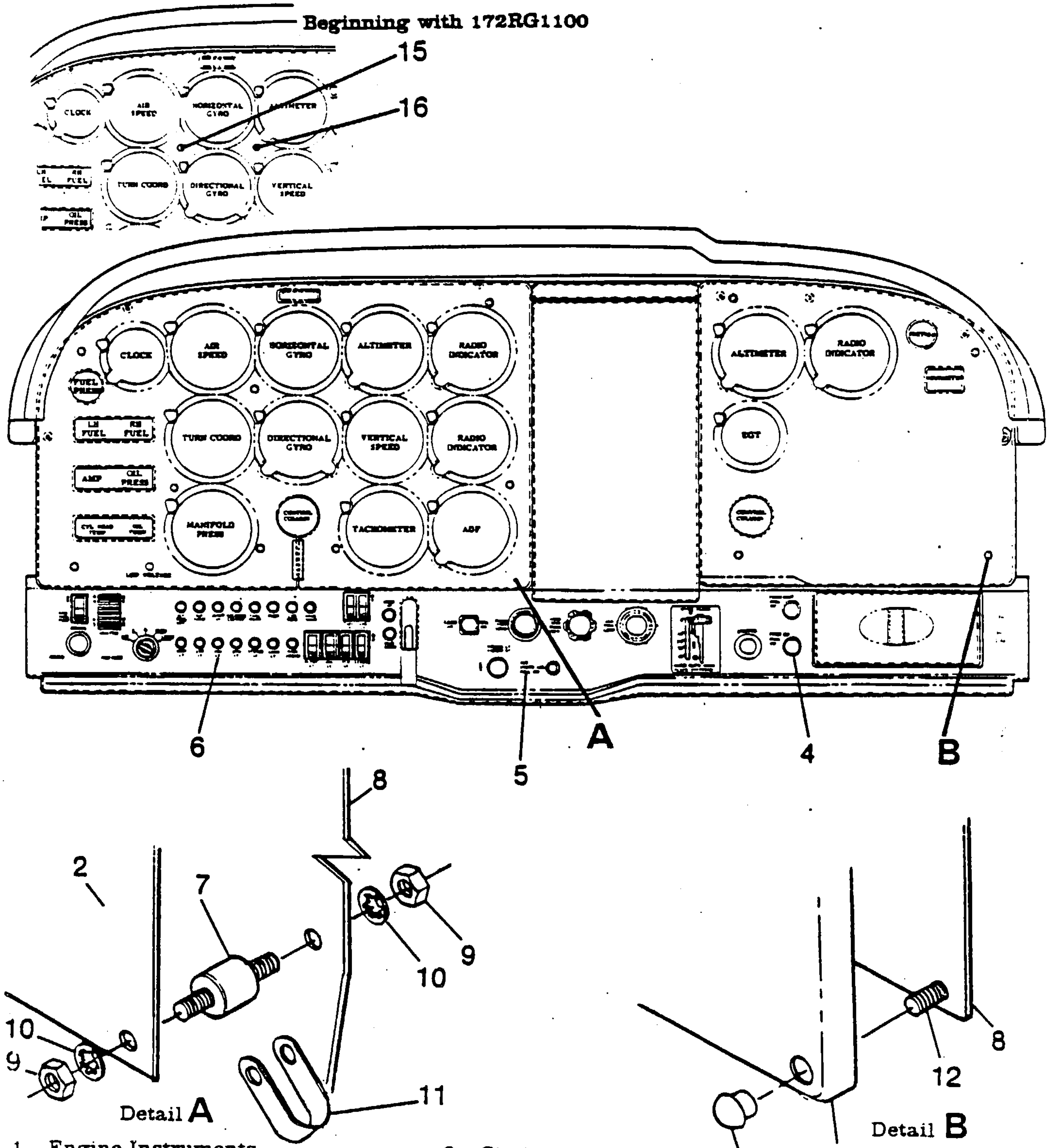
15-5. REMOVAL AND INSTALLATION. (See figure 15-1.) The stationary panel is secured to engine mount stringers and a forward fuselage bulkhead and ordinarily is not considered removable. The shock-mounted panel is secured to the stationary panel with rubber shock-mounted assemblies. To remove shock-mounted panel proceed as follows:

a. Unscrew threaded buttons securing decorative cover and remove cover.
b. Remove nuts and washers from shock-mounts.
c. Tag and disconnect instrument wiring.
d. Disconnect plumbing and cap all open fittings and lines.
e. Pull panel straight back to remove.
f. For installation reverse the preceding procedure. Ensure ground strap is properly installed.

15-6. SHOCK MOUNTS. Service life of instruments is directly related to adequate shock-mounting of panel. If removal of panel is necessary, check mounts for deterioration.

15-7. INSTRUMENTS.

15-8. REMOVAL. (See figure 15-1.) Most instruments are secured to panel with screws inserted through panel face. To remove an instrument, remove decorative cover, disconnect wiring or plumbing to the instrument, remove mounting screws and take instrument out from behind, or in some cases, from front of panel. Instrument clusters are installed as units and are secured by a screw at each end. A cluster must be removed from panel to replace an individual gage. In all cases when an instrument is removed, disconnect lines or wires should be protected. Cap open lines and cover pressure connections on instrument to prevent thread damage and entrance of foreign matter. Wire terminals should be insulated or tied up to prevent accidental grounding or short-circuiting.



1. Engine Instruments
2. Shock-Mounted Panel
3. Radio Panel
4. Heating and Ventilating Controls
5. Engine Controls
6. Switch and Circuit Breaker Panel
7. Shock-Mount
8. Stationary Panel
9. Nut
10. Lockwasher
11. Ground Strap
12. Stud
13. Decorative Cover
14. Threaded Button
15. Low-Voltage Light
16. Low-Vacuum Light

Figure 15-1. Instrument Panel (Typical)

15-9. INSTALLATION. Generally, installation procedure is the reverse of removal procedure. Ensure mounting screw nuts are tightened firmly, but do not over-tighten, particularly on instruments having plastic cases. The same rule applies to connecting plumbing and wiring.

NOTE

All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through Cessna Supply Division.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change calibration of gages.

15-10. PITOT AND STATIC SYSTEMS. (See 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 source buttons to collect condensation in static system. A pitot tube heater may be installed. The heating element is controlled by a switch at instrument panel and powered by the electrical system. An alternate static source valve may be installed in the static system for use when the external static source is malfunctioning. Refer to the Pilot's Operating Handbook for flight operation using the alternate static source.

15-12. MAINTENANCE. Proper maintenance of pitot and static system is essential for proper operation of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in pitot system will result in false airspeed indications, while static system malfunctions will affect readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the principal rules for system maintenance. The pitot tube and static ports MUST be kept clean and unobstructed.

15-13. STATIC PRESSURE SYSTEM INSPECTION AND LEAKAGE TEST. The following procedure outlines inspection and testing of static pressure system, assuming altimeter has been tested and inspected in accordance with current Federal Aviation Regulations.

a. Ensure static system is free from entrapped moisture and restrictions.
b. Ensure no alternations or deformations of airframe surface have been made which would affect the relationship between air pressure in static pressure system and true ambient static pressure for any flight configuration.
c. Close static pressure alternate source control, if installed.
d. Attach a source of suction to static pressure source opening, place a piece of tape over other opening. Figure 15-4 shows method of obtaining suction.
e. Slowly apply suction until altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed range of vertical speed indicator or airspeed indicator.

f. Cut off suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on altimeter.
g. If leakage rate is within tolerance, slowly release suction source.

NOTE

If leakage rate exceed maximum allowable, first tighten all connections, then repeat leakage test. if leakage rate still exceeds maximum allowable, use following procedure.

h. Disconnect static pressure lines from airspeed indicator and vertical speed indicator. Use suitable fittings to connect lines together so altimeter is the only instrument still connected into static pressure system.
i. Repeat leakage test to check whether static pressure system or the bypassed instruments are cause of leakage. If instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If static pressure system is at fault, use following procedure to locate leakage.
j. Attach a source of positive pressure to static source opening. Figure 15-4 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.

k. Slowly apply positive pressure until altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections and static source flange with solution of mild soap and water, watching for bubbles to locate leaks.
l. Tighten leaking connections. Repair or replace parts found defective.
m. Reconnect airspeed and vertical speed indicators into static pressure system and repeat leakage test per steps "c" thru "g".

15-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check pitot system for leaks, place a piece of 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 leak in system, check all connections for tightness.

15-15. BLOWING OUT LINES. Although pitot system is designed to drain down to pitot tube opening, condensation may collect at other points in system and produce a partial obstruction. To clear line, disconnect at airspeed indicator. Using low pressure air, blow from indicator end of line toward pitot tube.

CAUTION

Never blow through pitot or static lines toward instruments.

Like pitot lines, static pressure lines must be kept clear and connections tight. All models have a static source sump which collects moisture and keeps system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow line clear with low-pressure air. Check all static pressure line connections for tightness. If hose or hose connections are used, check for general condition and clamps for security. Replace hose which cracked, hardened or show other signs of deterioration.

15-16. REMOVAL AND INSTALLATION OF COMPONENTS. (See figure 15-2.) To remove pitot mast remove four mounting screws on side of connector (20) and pull mast out of connector far enough to disconnect pitot line (9). Electrical connections to heater assembly (if installed) may be disconnected through wing access opening just inboard of mast. Pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Installation of tubing will be simpler if a guide wire is drawn in as tubing is removed from wing. The tubing may be removed from wing. The tubing may be removed intact by drawing it out through cabin and right door. Tighten connections firmly but avoid overtightening and distorting fittings. It twisting of plastic tubing is encountered when tightening fittings, VV-P-236 (USP Petrolatum), may be applied sparingly between tubing and fittings.

15-17. ENCODING ALTIMETER.

15-18. DESCRIPTION. An encoding altimeter may be installed which is also connected to static system pressure. The encoding altimeter supplies coded altitude signals to the aircraft's transponder for transmission to ground based interrogating radar. The encoding altimeter installation requires the use of a fully operational secondary altimeter as backup.

15-19. REMOVAL AND INSTALLATION. Figure 15-3 may be used as a guide for removal and installation of the encoding altimeter.

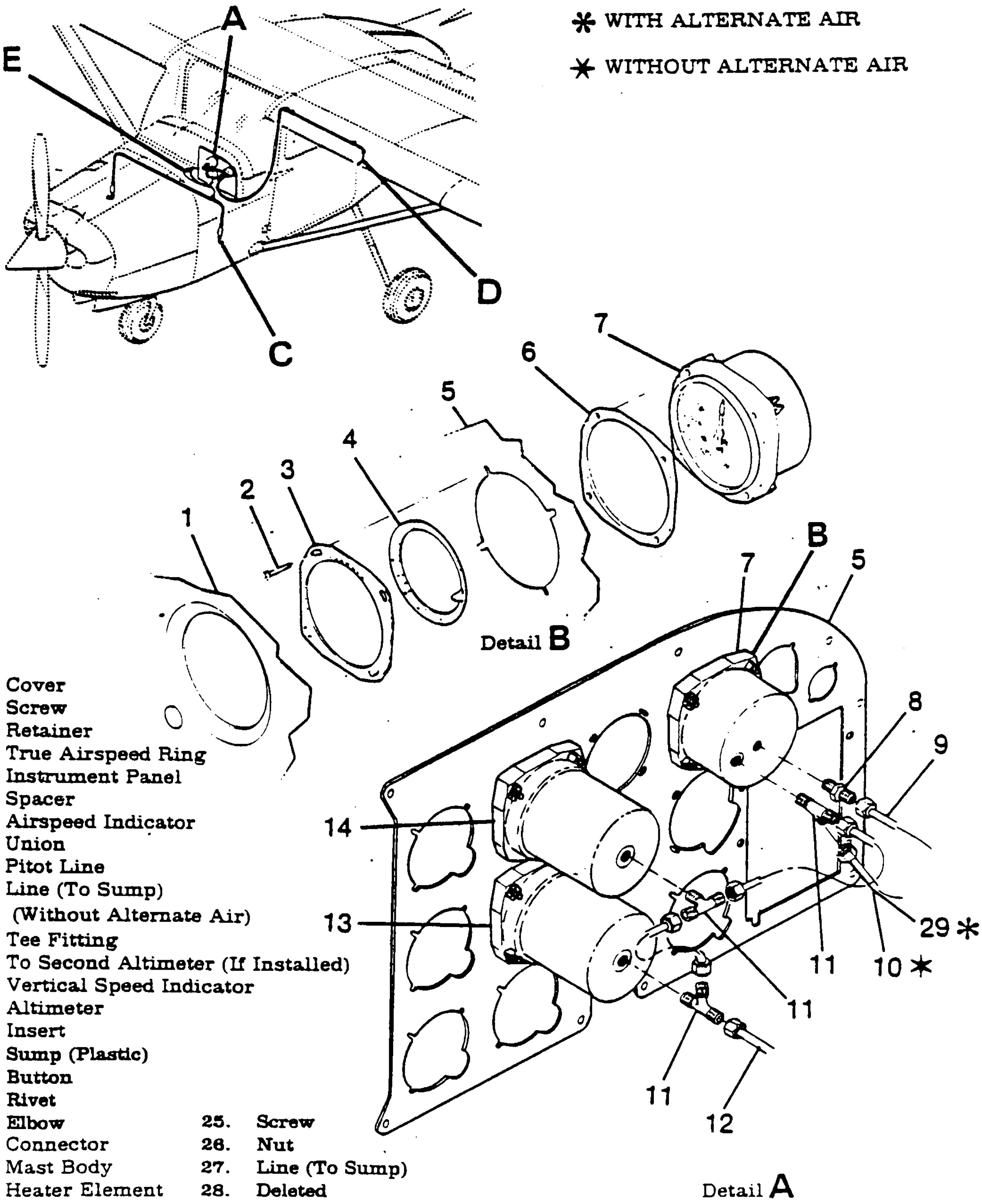
15-20. TROUBLE SHOOTING -- PITOT STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIR-SPEED INDICATION. (Normal altimeter and vertical speed.)	Pitot tube obstructed, leak or obstruction in pitot line.	Test pitot tube and line for leaks or obstructions. Blow out tube and line, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE. (all three instruments.)	Leaks or obstruction in static line.	Test line for leaks and obstructions. Repair or replace line, blow out obstructed line.

15-21. TRUE AIRSPEED INDICATOR.

15-22. DESCRIPTION. The true airspeed indicator is equipped with a conversion ring, which may be rotated until pressure altitude is aligned with outside air temperature, then airspeed indicated on the instrument is read as true airspeed on the adjustable ring.

15-23. REMOVAL AND INSTALLATION. (See figure 15-2.) Upon installation, before tightening mounting screws (2), calibrate instrument as follows: Rotate ring (4) until 105 knots on the adjustment ring aligns with 105 knots on the indicator. Holding this setting, move retainer (3) until 60°F aligns with zero pressure altitude, then tighten mounting screws (2) and replace decorative cover (1).



1. Cover
2. Screw
3. Retainer
4. True Airspeed Ring
5. Instrument Panel
6. Spacer
7. Airspeed Indicator
8. Union
9. Pitot Line
10. Line (To Sump) (Without Alternate Air)
11. Tee Fitting
12. To Second Altimeter (If Installed)
13. Vertical Speed Indicator
14. Altimeter
15. Insert
16. Sump (Plastic)
17. Button
18. Rivet
19. Elbow
20. Connector
21. Mast Body
22. Heater Element
23. Valve
24. Knob
25. Screw
26. Nut
27. Line (To Sump)
28. Deleted
29. Line (To Airspeed)
30. Sump (Metal)

Figure 15-2. Pitot Static System (Sheet 1 of 2)

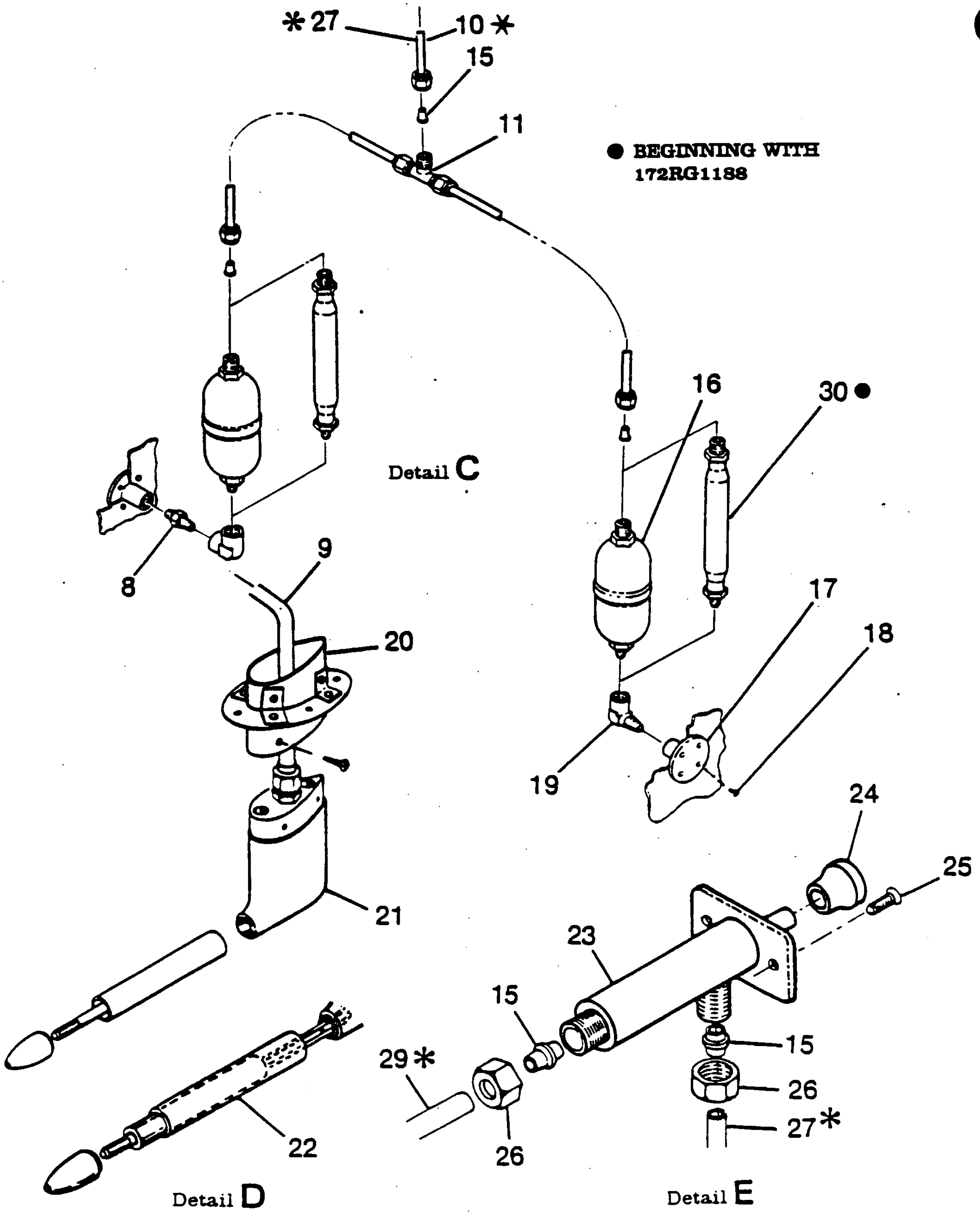
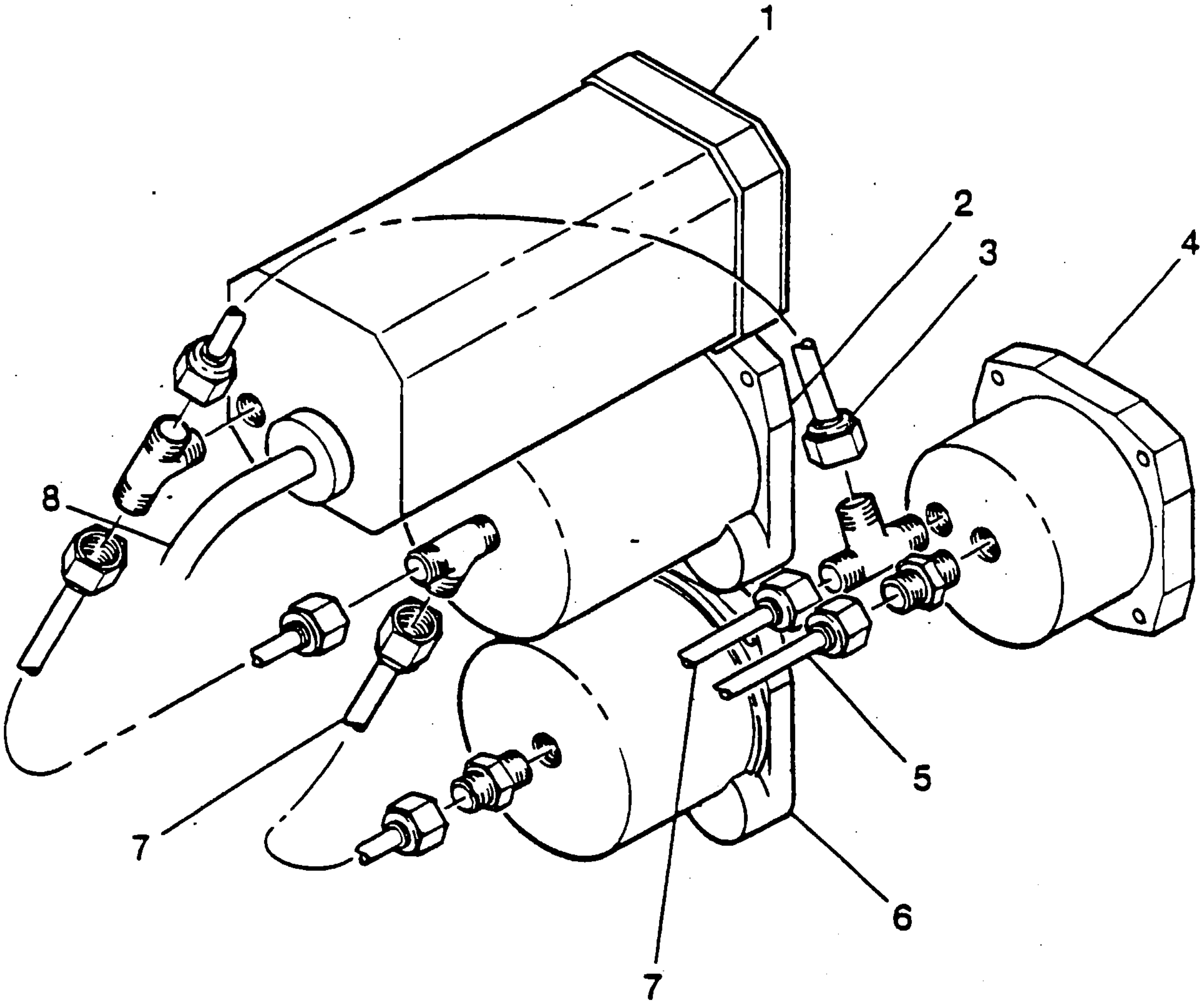


Figure 15-2. Pitot Static System (Sheet 2 of 2)



1. Encoding Altimeter
2. Vertical Speed Indicator
3. Static Line
4. Airspeed Indicator
5. Pitot Line
6. Backup Altimeter
7. Static Line
8. Cable (To Transponder)

Figure 15-3. Encoding Altimeter Installation

15-24. TROUBLE SHOOTING -- AIRSPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Test line and connection for leaks. Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Check line for obstructions. Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Defective mechanism or leaking diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check panel shock mounts. Replace defective shock mounts.
	Excessive tubing vibration.	Check clamps and line connections for security. Tighten clamps and connections, replace tubing with flexible hose.

15-25. TROUBLE SHOOTING -- ALTIMETER.

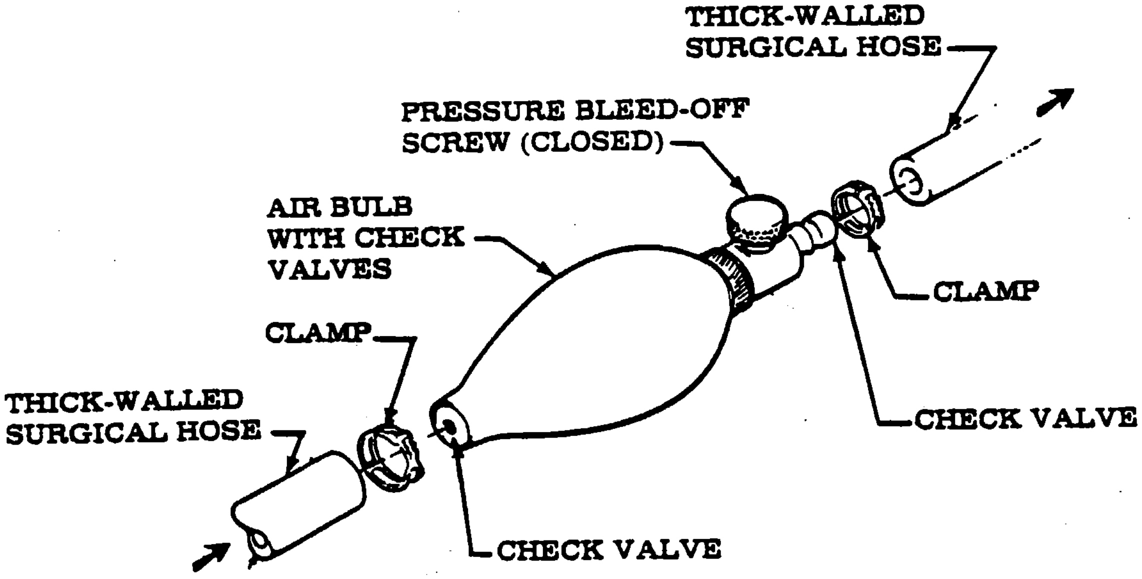
TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines.
	Defective mechanism.	Substitute known-good altimeter and check reading. Replace instrument.

15-25. TROUBLE SHOOTING -- ALTIMETER. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Substitute known-good altimeter and check reading. Replace instrument.
	Pointers out of calibration.	Compare reading with known-good altimeter. Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Check lines for obstruction or leaks. Blow out lines. tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Check other instruments and system plumbing for leaks. Blow out lines. tighten connections.

15-26. TROUBLE SHOOTING -- VERTICAL SPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines.
	Static line broken.	Check line for damage. connections for security. Repair or replace damaged line. tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Check line for obstructions. Blow out lines.
	Ruptured diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
	Pointer off zero.	Reset pointer to zero.



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

15-26. TROUBLE SHOOTING - VERTICAL SPEED INDICATOR (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
POINTER OSCILLATES.	Partially plugged static line.	Check line for obstructions. Blow out lines.
	Leak in static line.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check shock mounts. Replace defective shock mounts.
	Defective diaphragm.	Substitute known indicator and check for vibration. Replace instrument.

15-27. TROUBLE SHOOTING -- PITOT TUBE HEATER.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF".	Turn switch "ON".
	Open circuit breaker.	Reset circuit breaker.
	Break in wiring.	Test for open circuit. Repair wiring.
	Heating element burned out.	Check resistance of heating element. Replace element.

15-28. VACUUM SYSTEM.

15-29. DESCRIPTION. Suction to operate the gyros is provided by a dry-type engine-driven vacuum pump, gear-driven through a spline-type coupling. A suction relief valve, to control system pressure, is connected between the pump inlet and instruments. In the cabin, the vacuum line is routed from gyro instruments to the relief valve at the firewall. A throw away type central air filtering unit is installed. The reading of the suction gage indicates net difference in suction before and after air passes through a gyro. This differential pressure will gradually decrease as the central air filter becomes dirty, causing a lower reading on the suction gage.

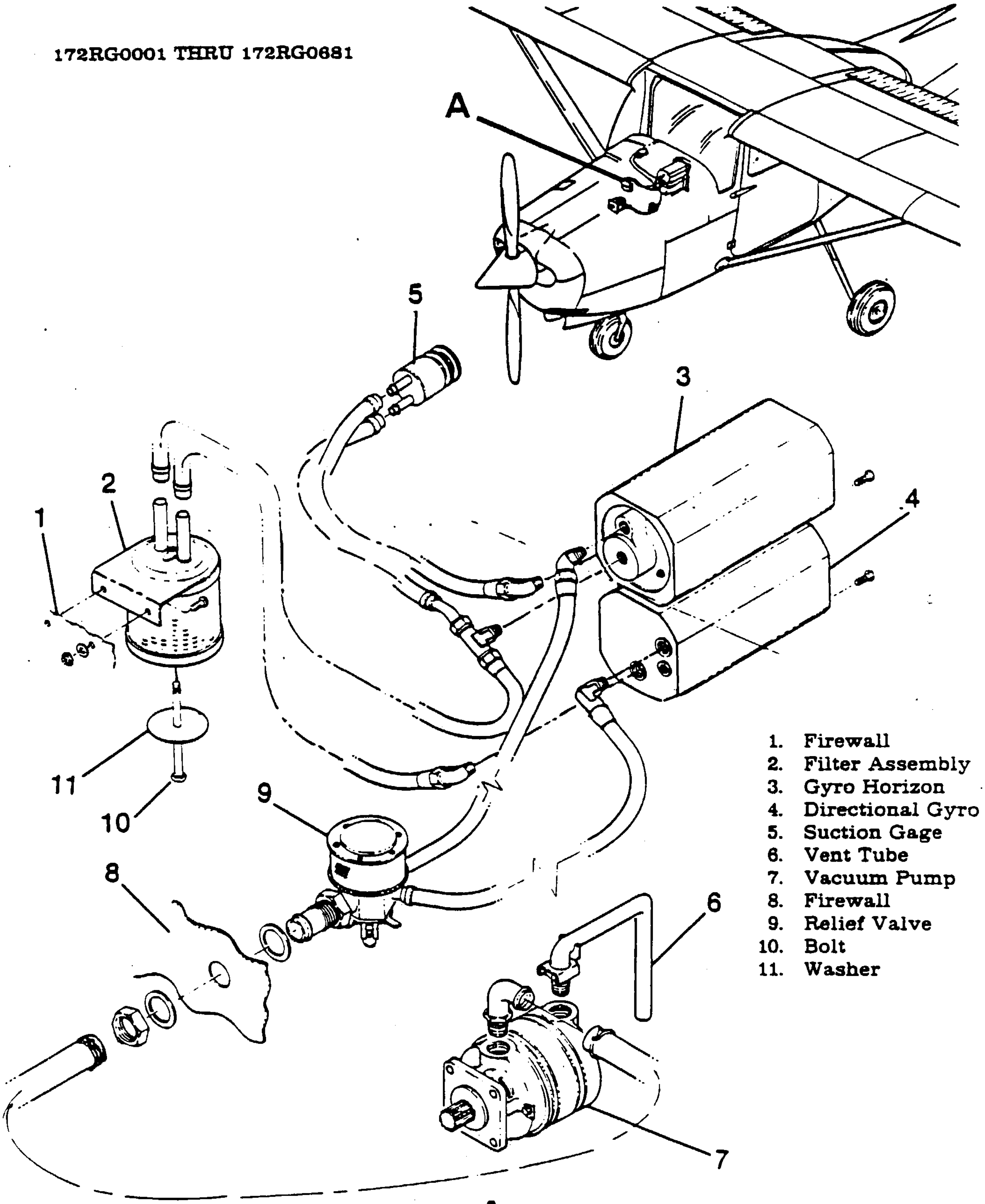
NOTE

Excessive smoking will cause premature filter clogging.

15-30. TROUBLE SHOOTING -- VACUUM SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS.	Gyros function normally-relief valve screen clogged, relief valve malfunction.	Check screen than valve. Compare gage readings with new gage. Clean screen, reset valve. Replace gage.
NORMAL SUCTION GAGE READING, SLUGGISH OR ERRATIC GYRO RESPONSE.	Instrument air filters clogged.	Check filter. Replace if required.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Check lines for leaks, disconnect and test pump. Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Central air filter dirty.	Check filter. Replace if required.
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Check suction with test gage. Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace valve.

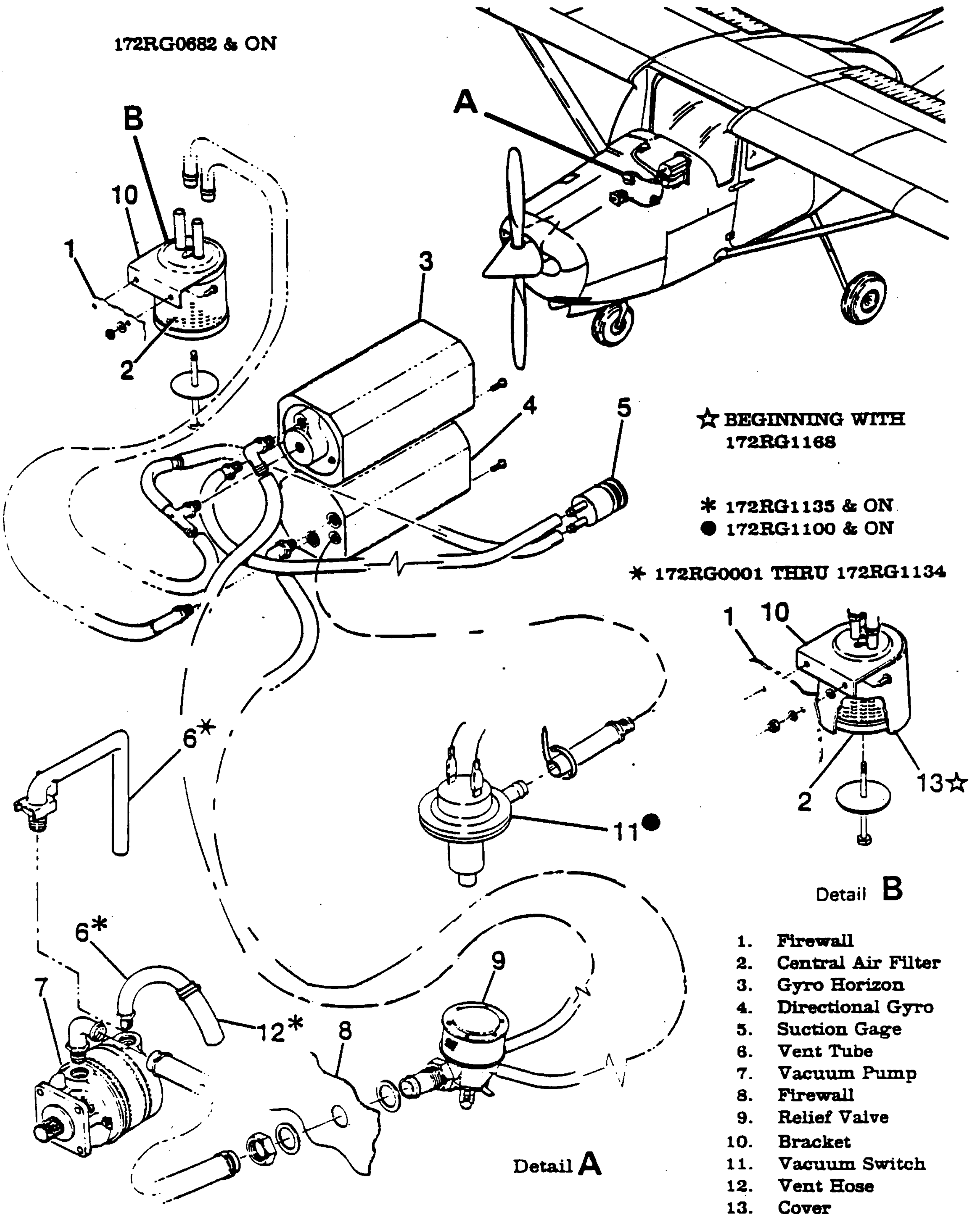
172RG0001 THRU 172RG0681



1. Firewall
2. Filter Assembly
3. Gyro Horizon
4. Directional Gyro
5. Suction Gage
6. Vent Tube
7. Vacuum Pump
8. Firewall
9. Relief Valve
10. Bolt
11. Washer

Detail A

Figure 15-5. Vacuum System (Sheet 1 of 2)



☆ BEGINNING WITH 172RG1168

✱ 172RG1135 & ON
● 172RG1100 & ON

✱ 172RG0001 THRU 172RG1134

1. Firewall
2. Central Air Filter
3. Gyro Horizon
4. Directional Gyro
5. Suction Gage
6. Vent Tube
7. Vacuum Pump
8. Firewall
9. Relief Valve
10. Bracket
11. Vacuum Switch
12. Vent Hose
13. Cover

Figure 15-5. Vacuum System (Sheet 2 of 2)

15-31. TROUBLE SHOOTING -- GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central air filter dirty.	Check filter. Replace if required.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro response. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central air filter dirty.	Check filter. Replace if required.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.

15-31. TROUBLE SHOOTING -- GYROS. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Check filter. Replace if required.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.

15-32. TROUBLE SHOOTING -- VACUUM PUMP.

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve filter clogged.	Check filter. Replace if required.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Substitute known-good pump and check pump suction. Replace vacuum pump.
LOW PRESSURE.	Safety valve leaking.	Replace safety valve.
	Vacuum pump failure.	Substitute known-good pump and check pump pressure. Replace vacuum pump.

15-33. MAINTENANCE PRACTICES.

NOTE

When replacing a vacuum system component, ensure all connections are made correctly to avoid damage to gyro system. When a component is removed, cap off and identify all open lines, hoses, and fittings to prevent dirt from entering system, and to ensure proper reinstallation. Upon component replacement, check all hoses carefully to be sure they are clean and free of debris, oil, solvent, collapsed inner liners, and external damage. Replace old, hard, cracked, or brittle hoses, particularly on pump inlet, to avoid possible pump damage. On vacuum pump, where hose clearance is tight, making it difficult to reinstall hoses, apply a light film of petrolatum to the fitting. Install hoses by pushing them straight on, and do not wiggle hoses from side to side as this could cause particles to be cut from inside of hose, allowing particles to enter system.

CAUTION

Do not use teflon tape, pipe dope, or thread lubricants of any type on fitting threads, and avoid over-tightening of connections. All filters in vacuum system must be changed when installing a new pump. Failure to do so will void pump warranty. DO NOT CONNECT A PUMP BACKWARDS. Since the manifold check valve provides no pressure relief, the pump will be destroyed within a matter of seconds after starting the engine.

15-33A. REMOVAL OF VACUUM PUMP.

a. Remove upper engine cowling in accordance with procedures in Section 11.
b. Disconnect, cap off and identify hose on inlet side of vacuum pump.
c. Identify and disconnect hose on oulet side of vacuum pump.
d. Remove nuts, lockwashers, and flat washers securing vacuum pump to engine.
e. Remove vacuum pump from mounting studs on engine.
f. Remove elbow from pump and retain if it is reusable.

NOTE

Discard any twisted fittings or nuts with rounded corners.

15-33B. MOUNTING PAD INSPECTION.

a. Check condition of the AND 20000 pad seal. If the seal shows any signs of oil leakage, replace the seal.

15-33C. INSTALLATION OF VACUUM PUMP.

a. Before installing a new vacuum pump, purge all lines in system to remove carbon particles or other pump components that may have been deposited in lines by previous pump.

NOTE

Before installing vacuum pump on engine, ensure that mating surfaces are clean and free of any old gasket material.

b. Consult the applicable Parts Catalog, the pump vendor's application list, or the PMA label on the pump box to verify that the pump is the correct model for the engine and/or system.

c. Position vacuum pump in a jaw-protected vise, with drive coupling downward.

CAUTION

Pump housing should never be placed directly in a vise, since clamping across center housing will cause an internal failure of carbon rotor. Protect pump mounting flange with soft metal or wood. NEVER install a vacuum pump that has been dropped.

d. Install elbow in pump; hand-tighten only.

NOTE

Do not use teflon tape, pipe dope, or thread lubricants of any type, and avoid over-tightening of connections.

NOTE

Use only a box wrench to tighten fittings to desired position. Do not make more than one and one half (1-1/2) turns beyond hand-tighten position.

e. Position new mounting studs.

f. Position vacuum pump on mounting studs.

g. Secure pump to engine with flat washers, new lockwashers, and nuts.

CAUTION

Always replace all lockwashers with new ones when installing a new vacuum pump. Tighten all four mounting nuts (4) to 50 to 70 pound-inches.

h. Connect hose to inlet side of vacuum pump.
i. Install upper engine cowling in accordance with procedures in Section 11.

15-33D. LOW-VACUUM WARNING LIGHT. A red low-vacuum warning light is installed on the instrument panel. The light is controlled by a vacuum switch mounted on the back of the gyro horizon. The switch contacts are normally closed. The light may be checked by turning ON the master switch. With the engine running the light should illuminate when the vacuum drops below 3 ± .5 inches Hg.

15-34. CLEANING. In general, low-pressure, dry compressed air should be used in cleaning vacuum system components. Suction relief valve, exposed to engine oil and dirt, should be washed with Stoddard solvent and dried with low-pressure air; replace suction relief valve 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.

15-35. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches of mercury is desirable for gyro instruments. However, a range of 4.6 to 5.4 inches of mercury is acceptable. To adjust the relief valve, remove central air filter, run engine to 2200 rpm on the ground and adjust relief valve to 5.3 ± .1 inches of mercury.

CAUTION

Do not exceed maximum engine temperature.

Be sure central air filter is clean before installing. If reading drops noticeably, install new filter.

15-35A. STANDBY VACUUM SYSTEM.

15-35B. DESCRIPTION. A standby vacuum system may be installed in the airplane. The system consists of a vacuum pump, driven by an electric motor, mounted on the aft side of the firewall and associated hoses. One hose is the vacuum pump vent hose and the other connects to a manifold with the engine driven vacuum pump, just prior to the system relief valve. A two position circuit breaker switch, mounted adjacent to the cabin air control on the instrument panel, controls and protect the system.

15-35C. TROUBLE SHOOTING - STANDBY VACUUM SYSTEM.

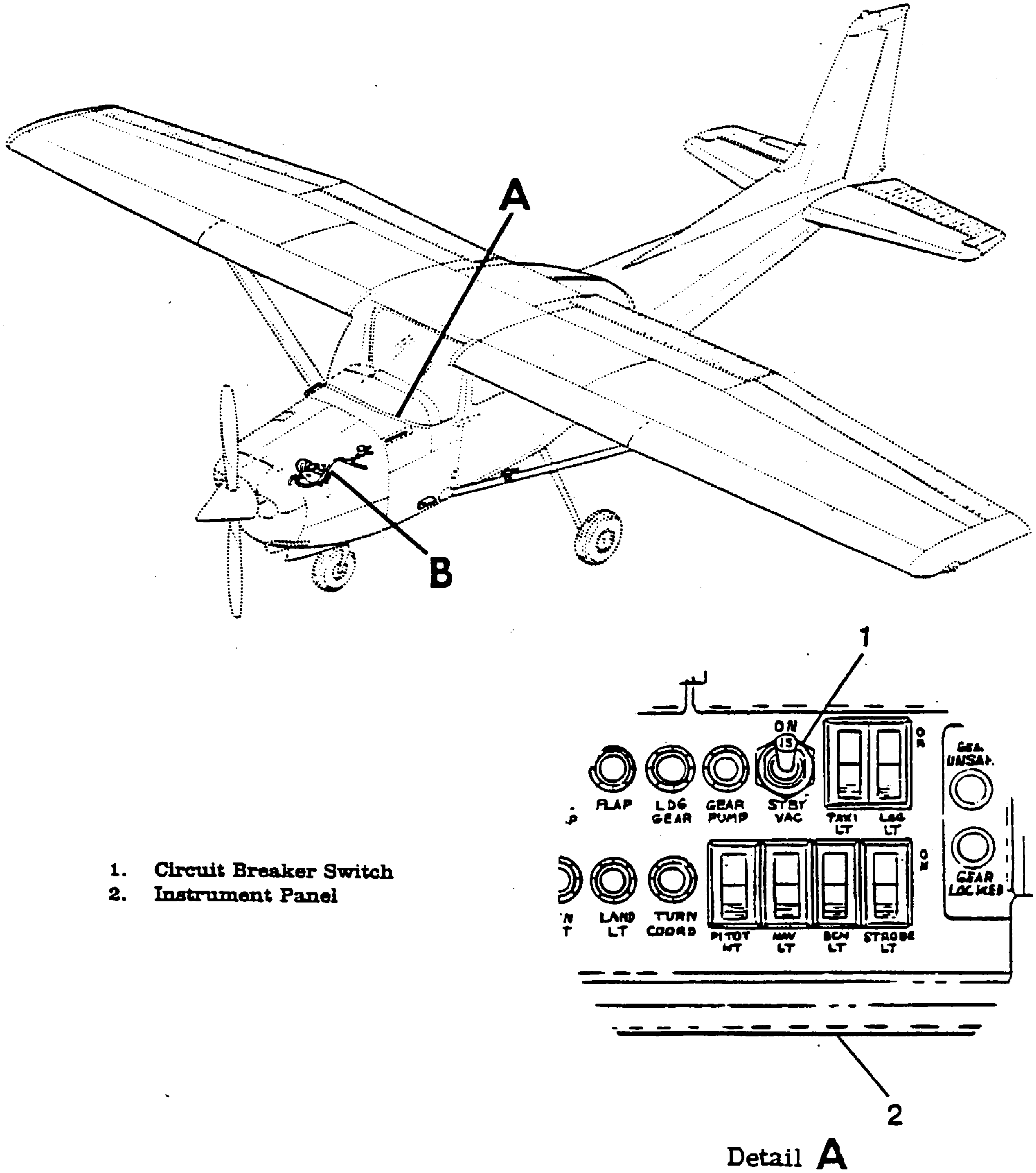
TROUBLE	PROBABLE CAUSE	REMEDY
NO SUCTION GAGE READING.	Circuit breaker switch has opened.	Reset circuit breaker switch. If switch reopens, check wire from switch to bus bar for short. Repair or replace wire.
	Defective motor.	Check voltage input wire and ground wire. Repair or replace wires.
	Defective pump.	Check pump operation. Replace pump.
LOW SUCTION GAGE READING.	Leak or restriction between pump and suction gage.	Check hoses and connections for leaks and obstructions. Install new clamps at connection, clear or replace hoses.
	Relief valve not properly adjusted.	Adjust relief valve.
	Defective pump.	Check pump. Replace pump.
	Central air filter dirty.	Replace central air filter.

15-35D. REMOVAL. (See figure 15-5A.)

a. Release clamps securing hoses (7) and (15) to pump (4).
b. Cap hoses (7), (15) and pump fittings (8) so dirt cannot enter system.
c. Make sure circuit breaker switch (1) and battery switch are off.
d. Disconnect motor voltage input wire and ground wire (18).
e. Remove safety from bolts (20).
f. Release clamp (16) from motor (17).
g. Support pump and motor assembly and remove bolts (20) and washers (19).
h. If pump is to be removed from motor, remove nuts (6) and washers (5).

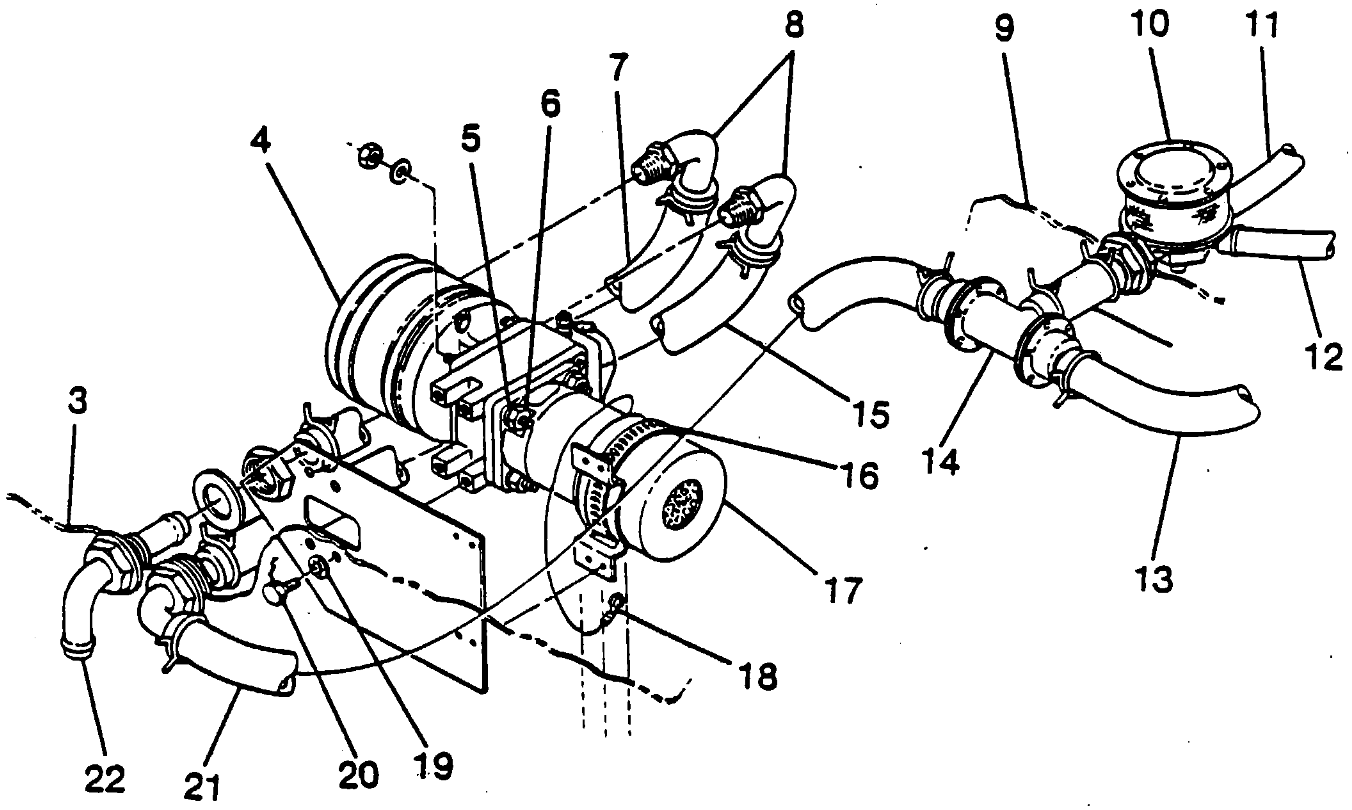
15-35E. INSTALLATION. (See figure 15-5A.)

a. If removed, install pump (4) on motor (17) drive studs and install washers (5) and nuts (6).
b. Position pump and motor assembly up against firewall (3) and install washers (18) and bolts (20).
c. Safety-wire bolts (20).
d. Secure clamp 916) around motor (17).
e. Connect motor voltage input wire and ground wire (18).
f. Remove caps from hoses (7), (15), and fittings (8) then install hoses and clamps.
g. Turn on battery switch and circuit breaker switch (1) then check suction gage to see that system is operating properly. Then turn off switches.



1. Circuit Breaker Switch
2. Instrument Panel

Figure 15-5A. Standby Vacuum System (Sheet 1 of 2)



Detail **B**

3. Firewall
4. Vacuum Pump
5. Washer
6. Nut
7. Vent Hose
8. Fittings
9. Firewall
10. Relief Valve
11. Hose (to Gyro Horizon)
12. Hose (to Directional Gyro)
13. Hose (to Engine-Driven Pump)
14. Manifold
15. Hose (to Firewall)
16. Clamp
17. Electric Motor
18. Ground Wire
19. Washer
20. Bolt
21. Hose (to Manifold)
22. Fitting (Vent)

Figure 15-5A. Standby Vacuum System (Sheet 2 of 2)

15-36. ENGINE INDICATORS.

15-37. TACHOMETER.

15-38. DESCRIPTION. The tachometer used on Cessna single-engine aircraft is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the drive-shaft. To function properly, shaft housing must be free of kinks, dents and sharp bends. There should be no bend within three inches of either terminal. If a tachometer is noisy or pointer oscillates, check cable housing for kinks, sharp bends and damage. Disconnect cable at tachometer and pull it out of housing. Check cable for worn spots, breaks and kinks.

NOTE

Before replacing a tachometer cable in housing, coat lower two thirds with AC Type ST-640 speedometer cable grease or Lubriplate No. 110. Insert cable in housing as far as possible, then slowly rotate to make sure it is seated in engine fitting. Insert cable in tachometer, making sure it is seated in drive shaft, then reconnect housing and hand-tighten, then torque 1/4 turn.

15-39. MANIFOLD PRESSURE/FUEL PRESSURE INDICATOR.

15-40. DESCRIPTION. The manifold pressure and fuel pressure indicators are in one instrument case. However, each instrument operates independently. The manifold pressure gage is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury. A dampening screw, labeled MANIFOLD, is located below the fuel pressure port. Proper adjustment of this screw may eliminate sluggish needle or excessive needle vibration. DO NOT OVERTIGHTEN this screw against the seat or the orifice may be damaged. The fuel pressure indicator is a pressure instrument calibrated in gallons per hour, indicating approximate gallons of fuel metered per hour to the engine. Pressure for operating the indicator is obtained through a hose from the fuel manifold valve. Beginning with aircraft serial 172RG0891, a filter assembly has been installed in the manifold pressure line. Located in the engine compartment on the aft right-hand baffle assembly, the filter is used to filter air to the manifold pressure gage.

15-41. TROUBLE SHOOTING -- MANIFOLD PRESSURE GAGE.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Check line for obstructions. Blow out line.
JERKY MOVEMENT OF POINTER.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	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.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.

15-41. TROUBLE SHOOTING -- MANIFOLD PRESSURE GAGE (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
SLUGGISH OPERATION OF POINTER.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	Foreign matter in line.	Check line for obstructions. Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.
	Dampening screw incorrectly adjusted.	Open 3/4 to 1 turn counterclockwise from seated position. If still sluggish, turn screw further counterclockwise.
EXCESSIVE POINTER VIBRATION.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	Tight rocker pivot bearings.	Replace instrument.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.
	Dampening screw incorrectly adjusted.	Open 3/4 to 1 turn counterclockwise from seated position. If pointer still vibrates, turn screw clockwise.
IMPROPER CALIBRATION.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	Faulty mechanism.	Replace instrument.
NO POINTER MOVEMENT.	Manifold pressure line filter. (172RG0891 & ON)	Check filter. Replace if required.
	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Check line and connections for breaks. Repair or replace damaged line.

15-42. TROUBLE SHOOTING -- FUEL PRESSURE INDICATOR

TROUBLE	PROBABLE CAUSE	REMEDY
DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Blow out line.
	Pressure line broken.	Check line for damage or leaks. Repair or replace damaged line.
	Fractured bellows or damaged mechanism.	Replace instrument.
	Clogged snubber orifice.	Replace instrument.
	Pointer loose on shaft.	Replace instrument.
POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Check line for obstructions. Blow out line.
	Clogged snubber orifice.	Replace instrument.
	Damaged bellows or mechanism.	Replace instrument.
INCORRECT OR ERRATIC READING.	Damaged or dirty mechanism.	Replace instrument.
	Pointer bent, rubbing on dial or glass.	Replace instrument.
	Leak or partial obstruction in pressure or vent line.	Check line for obstructions or leaks. Blow out dirty line, repair or tighten loose connections.

15-43. CYLINDER HEAD TEMPERATURE GAGE.

15-44. 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. Rochester gages are connected the same as the Stewart - Warner gages, but the Rochester gages do not have the calibration pot and are not adjustable. Refer to Table 1 on page 15-34A when trouble shooting the cylinder head temperature gage.

15-45. TROUBLE SHOOTING - CYLINDER HEAD TEMPERATURE GAGE.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	No current to circuit.	Check circuit breaker and electrical circuit to gage.
		Repair electrical circuit.
	Defective gage, bulb or circuit.	Isolate with ohmeter check of circuits.
		Repair or replace defective items.
GAGE FLUCTUATES RAPIDLY.	Loose or broken wire permitting alternate make and break of gage circuit.	Inspect circuit wiring.
		Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE.	High voltage.	Check voltage supply.
	Gage off calibration.	Replace gage.
GAGE READS TOO LOW ON SCALE.	Low voltage.	Check voltage supply.
	Gage off calibration.	Replace gage.

15-45. TROUBLE SHOOTING. -- CYLINDER HEAD TEMP. GAGE (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE READS OFF SCALE AT HIGH END.	Break in bulb.	Replace bulb.
	Break in bulb lead.	Replace bulb.
	Internal break in gage.	Replace gage.
OBVIOUSLY INCORRECT READING.	Defective gage mechanism.	Replace gage.
	Incorrect calibration.	Replace gage.

15-46. OIL PRESSURE GAGE.

15-47. DESCRIPTION. The Bourdon tube-type oil pressure gage is a direct-reading instrument, operated by a pressure pickup line connected to the engine main oil gallery. The oil pressure line from the instrument to the engine should be filled with kerosene, especially during cold weather operation, to attain an immediate oil indication.

15-48. TROUBLE SHOOTING. -- OIL PRESSURE GAGE.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Clean line.
	Pressure line broken.	Check line for leaks and damage. Repair or replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on shaft.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Check line for obstructions. Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.

15-48. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Check line for leaks and damage. Repair or replace damaged line.

15-49. OIL TEMPERATURE GAGE.

15-50. DESCRIPTION. The oil temperature gage is an electrically operated indicator mounted in the instrument cluster with the oil pressure gage. One electrical lead is routed from the indicator to the sending unit installed in the engine. The other lead supplies power from the bus bar to the indicator. Refer to Table 2 on page 15-34B when trouble shooting the oil temperature gage.

15-51. FUEL QUANTITY INDICATING SYSTEM.

15-52. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float - operated variable - resistance transmitter in each fuel tank. The full position of float produces a minimum resistance though 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.

15-53. REMOVAL AND INSTALLATION OF FUEL QUANTITY TRANSMITTERS.

a. Drain fuel from tank. (Observe precautions in Section 12.)
b. Remove access plate above fuel tank for access to transmitter.
c. Disconnect electrical lead and ground strap from transmitter.
d. Remove safety wire and screws attaching transmitter and carefully work transmitter from tank . DO NOT BEND FLOAT ARM. Refer to paragraph 15-55 for calibration procedures.
e. Install transmitter by reversing preceding steps, using new gaskets on root rib (see figure 12-3). Be sure to tighten screws evenly.

NOTE

Make sure the transmitter is grounded.

f. Service fuel tanks. Check for leaks and correct quantity indication.

15-54. TROUBLE SHOOTING. -- FUEL QUANTITY INDICATING SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO INDICATE.	No power to indicator or transmitter. (Pointer stays below E.)	Check fuse and inspect for open circuit. Replace fuse, repair or replace defective wire.
	Grounded wire. (Pointer stays above F.)	Check for partial ground between transmitter and gage. Repair or replace defective wire.
	Low voltage.	Check voltage at indicator. Correct voltage.
	Defective indicator.	Substitute known-good indicator. Replace indicator.
OFF CALIBRATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Defective transmitter.	Substitute known-good transmitter. Recalibrate or replace.
	Low or high voltage.	Check voltage at indicator. Correct voltage.
STICKY OR SLUGGISH INDICATOR OPERATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Low voltage.	Check voltage at indicator. Correct voltage.
ERRATIC READINGS.	Loose or broken wiring on indicator or transmitter.	Inspect circuit wiring. Repair or replace defective wire.
	Defective indicator or transmitter.	Substitute known-good component. Replace indicator or transmitter.
	Defective master switch.	Replace switch.

15-55. TRANSMITTER CALIBRATION.
(Refer to page 15-34A.)

15-56. HOURMETER. (See figure 15-6.)

15-57. DESCRIPTION. The hourmeter is electrically operated and is actuated by a pressure switch in the oil pressure system. Electrical power is supplied through a one-amp fuse from the electrical clock circuit, and therefore, will operate independent of the master switch. If no clock is installed, a line direct from the battery contactor provides power independent of the master switch through a one-amp fuse located adjacent to the battery box. An indicator on the dial face rotates when the meter is actuated. If the meter is inoperative and the clock is operating, the meter or its wiring is faulty and must be replaced.

NOTE

When installing the hourmeter, the positive (red) wire must be connected to the white (+) terminal. Connecting wires incorrectly will damage the meter.

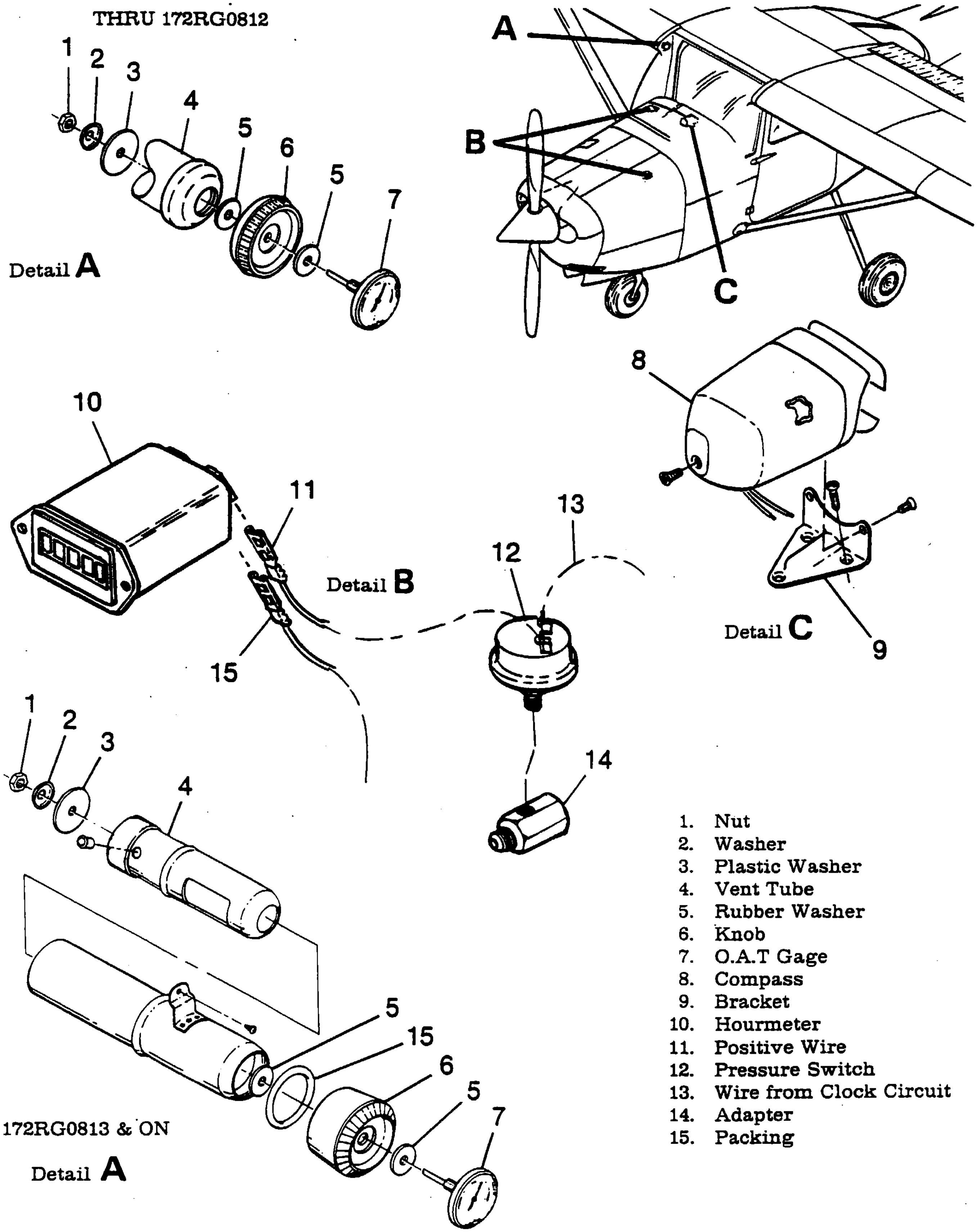
15-58. MAGNETIC COMPASS.

15-59. 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 panel lights rheostat. No maintenance is required on the compass except for an occasional check on a compass rose for adjustment of compensation and replacement of the lamp.

15-60. REMOVAL AND INSTALLATION. See figure 15-6 for removal and installation.

15-61. TURN COORDINATOR.

15-62. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-rate turn indicator. Its gyro simultaneously senses rate of motion roll and yaw axes which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an a. e. brushless spin motor with a solid state inverter.



1. Nut
2. Washer
3. Plastic Washer
4. Vent Tube
5. Rubber Washer
6. Knob
7. O.A.T Gage
8. Compass
9. Bracket
10. Hourmeter
11. Positive Wire
12. Pressure Switch
13. Wire from Clock Circuit
14. Adapter
15. Packing

Figure 15-6. Miscellaneous Instruments

15-55. TRANSMITTER CALIBRATION.

WARNING

Using the following fuel transmitter calibration procedure on components other than the originally installed (Stewart - Warner) components will result in a faulty fuel quantity reading.

15-55A. STEWART - WARNER GAGE TRANSMITTER CALIBRATION. Chances of transmitter calibration changing in normal service is remote; however, it is possible that float arm or float arm stops may become bent if transmitter is removed from cell. Transmitter calibration is obtained by adjusting float travel. Float travel is limited by 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 master switch in "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 lower stop so pointer indicator is on E. Raise float until arm is against upper stop and adjust upper stop to permit indicator pointer to be on F (full). Install transmitter in accordance with paragraph 15-49.

15-55B. ROCHESTER GAGE TRANSMITTER. Do not attempt to adjust float arm or stop. No adjustment is allowed.

Table 1

NOTE

Select the cylinder head temperature sending unit part number that is used in your aircraft 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	34.8	
S1372-2	CHT		310.0	34.8	
S1372-3	CHT			113.0	
S1372-4	CHT			113.0	
S2334-3	CHT	745.0			38.0
S2334-4	CHT	745.0			38.0

Table 2

NOTE

Select the oil temperature sending unit part number 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				46.4	
S1630-3	Oil Temp		620.0			52.4
S1630-4	Oil Temp		620.0			52.4
S1630-5	Oil Temp			192.0		
S2335-1	Oil Temp	990.0				34.0

15-55C. 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, ELECTRICAL 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. Refer to Section 2, Ground Handling, Servicing, Cleaning, Lubrication, And Inspection as required.

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.

   NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to paragraph 15-55A for instructions to adjust 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.

   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.

5. With the fuel selector valve in the "OFF" position, add unusable fuel quantity 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 15-55A for instructions to adjust 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.

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 15-55A for instructions to adjust 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 the Fuel Quantity Indicating System Operational Test. Remove maintenance warning tags and connect the airplane battery.

15-63. TROUBLE SHOOTING. -- TURN COORDINATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator damping.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Measure voltage at instrument. Correct voltage.
	Inverter frequency changed.	Replace instrument.
NOISY MOTOR.	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	Check continuity and voltage. Correct voltage or replace faulty wire.
	Inverter malfunctioning.	Replace instrument.
	Motor shorted.	Replace instrument.
	Bearings frozen.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at instrument. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage at instrument. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

15-64. TURN-AND-SLIP INDICATOR.

15-65. DESCRIPTION. The turn-and-slip indicator is an electrically operated instrument powered by the aircraft electrical system, therefore, operating only when the master switch is ON.

15-66. TROUBLE SHOOTING. -- TURN-AND-SLIP INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Internal fuse blown.	Check wiring for continuity. check voltage at indicator. Replace fuse. if fuse still blows. replace instrument.
	Master switch "OFF" or switch defective.	Check switch "ON". Replace defective switch.
	Broken or grounded lead to indicator.	Check circuit wiring. Repair or replace defective wiring.
	Indicator not grounded.	Check ground wire. Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES. HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage at indicator. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

15-67. OUTSIDE AIR TEMPERATURE GAGE (See figure 15-6.)

15-68. ECONOMY MIXTURE INDICATOR (EGT)

15-69. 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 Pilot's Operating Handbook for operating procedures.

15-70. 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 the mixture to peak EGT. After the pointer has peaked using the adjustment screw, position pointer over reference increment line (4/5 scale).

NOTE

> This setting will provide selective 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.

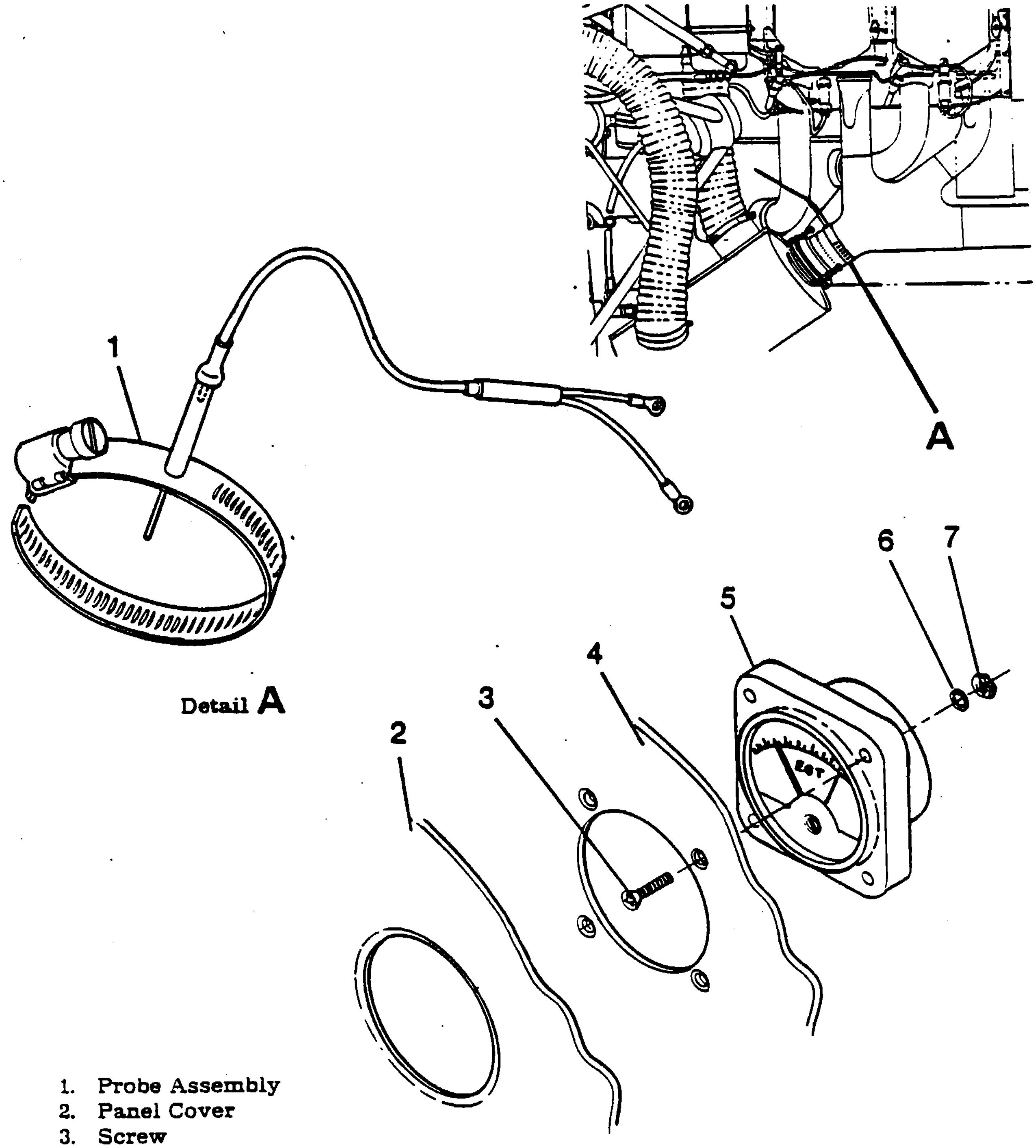
15-71. REMOVAL AND INSTALLATION. (See figure 15-7.)

a. Indicator.
   1. Remove instrument panel decorative cover.
   2. Disconnect EGT indicator leads.
   3. Remove screws, nuts and washers securing indicator and remove indicator.
   4. To install reverse the preceding steps.

b. Probe.
   1. Disconnect probe leads.
   2. Remove clamp and probe assembly.
   3. When installing probe, tighten clamp to 30-35 lb-in.
   4. Coil or fold excess lead and tie in a convenient out of the way location.

15-72. TROUBLE SHOOTING. -- (EGT).

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 15-70.
FLUCTUTATING READING.	Loose, frayed or broken lead, permitting alternate make and break of circuit.	Tighten connections and repair or replace defective leads.



1. Probe Assembly
2. Panel Cover
3. Screw
4. Instrument Panel
5. Indicator
6. Lockwasher
7. Nut

Figure 15-7. Economy Mixture Indicating System E.G.T.

SECTION 16

ELECTRICAL SYSTEMS

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

TABLE OF CONTENTS

16-1. ELECTRICAL SYSTEMS.

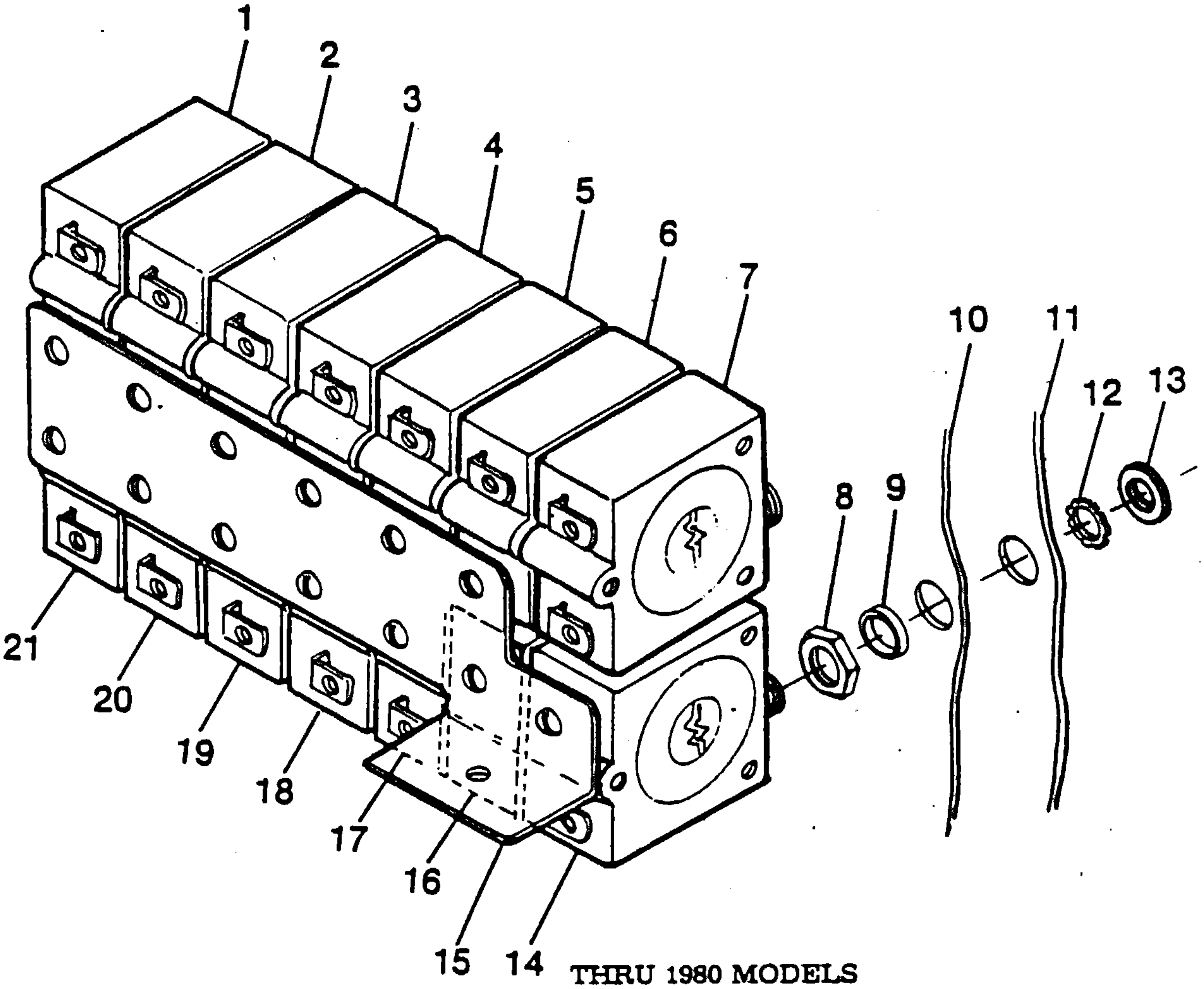
16-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Aircraft Lighting System, Pitot and Stall Warning Heaters, Cigar Lighter, Emergency Locator Transmitter and Electrical Load Analysis Chart.

16-3. ELECTRICAL POWER SUPPLY SYSTEM.

16-4. DESCRIPTION. Electrical energy for the aircraft is supplied by a 28-volt, direct-current, single wire, negative ground electrical system. A single 24-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. An engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by an alternator control unit. An external power receptacle is offered as optional equipment to supplement the battery system for starting and ground operation.

16-5. BUS BAR.

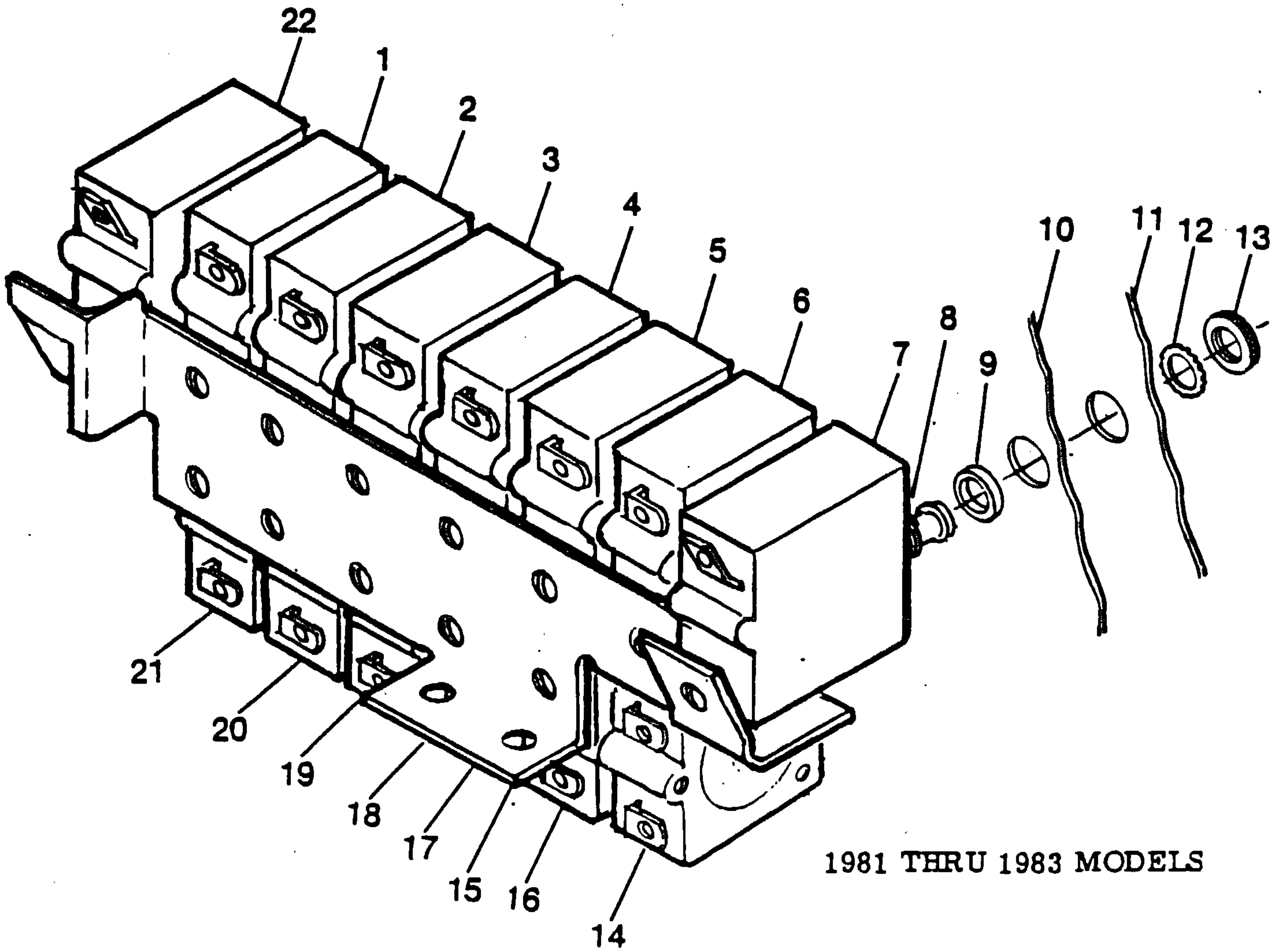
16-6. DESCRIPTION. Electrical power is supplied through a bus bar mounted on the circuit breakers on the instrument panel. This bus bar supplies power to the electrical equipment. A second bus bar is mounted on the left hand side of the fuselage. When the master switch is closed, the battery contactor engages and the battery power is supplied to the electrical bus. Power is then supplied through the avionics master switch to electronic bus bar.



THRU 1980 MODELS

1. Landing Gear
2. Flap
3. Fuel Pump
4. Air Condition Fan
5. Pitot Heat
6. Alternator Field
7. Alternator
8. Nut
9. Spacer
10. Instrument Panel
11. Decorative Cover
12. Washer
13. Decorative Nut
14. Instrument Lights
15. Bus Bar
16. Int Light
17. Navigation Lights
18. Beacon Light
19. Strobe Lights
20. Landing Lights
21. Turn Coordinator
22. Landing Gear Pump

Figure 16-1. Circuit Breaker and Bus Bar Installation (Sheet 1 of 2)



1981 THRU 1983 MODELS

1. Landing Gear
2. Flap
3. Fuel Pump
4. Air Condition Fan
5. Pitot Heat
6. Alternator Field
7. Alternator
8. Nut
9. Spacer
10. Instrument Panel
11. Decorative Cover
12. Washer
13. Decorative Nut
14. Instrument Lights
15. Bus Bar
16. Int Light
17. Navigation Lights
18. Beacon Light
19. Strobe Lights
20. Landing Lights
21. Turn Coordinator
22. Landing Gear Pump

Figure 16-1. Circuit Breaker and Bus Bar Installation (Sheet 2 of 2)

16-7. MASTER SWITCH.

16-8. DESCRIPTION. The operation of the battery and alternator systems is controlled by a master switch. The switch is an interlocking split rocker with battery mode on the right-hand side and alternator mode on the left-hand side. This arrangement allows the battery to be on the line without the alternator, however, operation of the alternator without the battery on the line is not possible.

16-9. AMMETER.

16-10. DESCRIPTION. The ammeter is connected between the battery and the electrical bus. The meter indicates the amount of flow either to or from the battery. With a low battery and the engine operating at cruise RPM, the ammeter will show the full alternator output. When the battery is fully charged and cruise RPM is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

16-11. BATTERY POWER SYSTEM.

16-12. BATTERY.

16-13. DESCRIPTION. The standard battery is 24-volts and is approximately 12.75 ampere-hour capacity. An optional battery with an approximate 15.5 ampere-hour rating may be installed. The battery is mounted on the right hand side of the tailcone aft of the baggage compartment.

16-14. TROUBLE SHOOTING -- BATTERY POWER SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE.	Battery discharged.	1. Measure voltage at "BAT" terminal of battery contactor with master switch and a suitable load such as a taxi light turned on. Normal battery will indicate 23 volts or more. If voltage is low, proceed to step 2. If voltage is normal, proceed to step 3.
	Battery faulty.	2. Check fluid level in cells and charge battery at 28 volts for approximately 30 minutes or until battery voltage rises to 28 volts. If tester indicates a good battery, the malfunction may be assumed to be a discharged battery. If the tester indicates a faulty battery, replace the battery.
	Faulty contactor or wiring between contactor or master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained, check wiring between contactor and master switch. Also check master switch.

16-14. TROUBLE SHOOTING -- BATTERY POWER SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE. (CONT.)	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 50-70 ohms. If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil, proceed to step 5.
	Faulty contactor contacts.	5. Check voltage on "bus" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittent, replace contactor. If voltage is normal, proceed to step 6.
	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

16-15. REMOVAL AND INSTALLATION. (See figure 16-2.)

a. Remove access door on right hand side of tailcone.
b. 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), reverse 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.

c. Remove cover from positive terminal.
d. Disconnect positive cable.
e. Disconnect battery drain tube from the battery.
f. Remove battery hold down bolts and battery cover.
g. Remove battery from aircraft.
h. To install battery, reverse this procedure using a new sta-strap on the positive terminal cover.

16-16. CLEANING THE BATTERY. For maximum efficiency, the battery and connections should be kept clean at all times.

a. Remove the battery 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 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 with the preceding paragraph.
g. Coat the battery terminals with petroleum jelly or an ignition spray product to reduce corosion.

16-17. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed, hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water, however will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level with the horizontal baffle plate or the split ring on the filler neck inside the battery. When "dry charged" batteries are put into service, fill as directed with electrolyte. However, as the electrolyte level falls below normal with use add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

16-18. TESTING THE BATTERY. The specific gravity of the battery may be measured with a hydrometer to determine the state of battery charge. If the hydrometer reading is low, slow-charge the battery and retest. Hydrometer readings of the electrolyte must be compensated for the temperature of the electrolyte. Some hydrometers have a built-in thermometer and conversion chart. The following chart shows the battery conditions for various hydrometer readings with an electrolyte temperature of 80° Fahrenheit.

BATTERY HYDROMETER READINGS

READINGS	BATTERY CONDITION
1.280 Specific Gravity	100% Charged
1.250 Specific Gravity	75% Charged
1.220 Specific Gravity	50% Charged
1.190 Specific Gravity	25% Charged
1.160 Specific Gravity	Practically Dead

NOTE

All readings shown are for an electrolyte temperature of 80° Fahrenheit. For higher temperatures the readings will be slightly lower. For cooler temperatures the readings will be slightly higher. Some hydrometers have a built-in temperature compensation chart and a thermometer. If this type tester is used, disregard this chart.

16-19. CHARGING THE BATTERY. When the battery is to be charged, the level of 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.

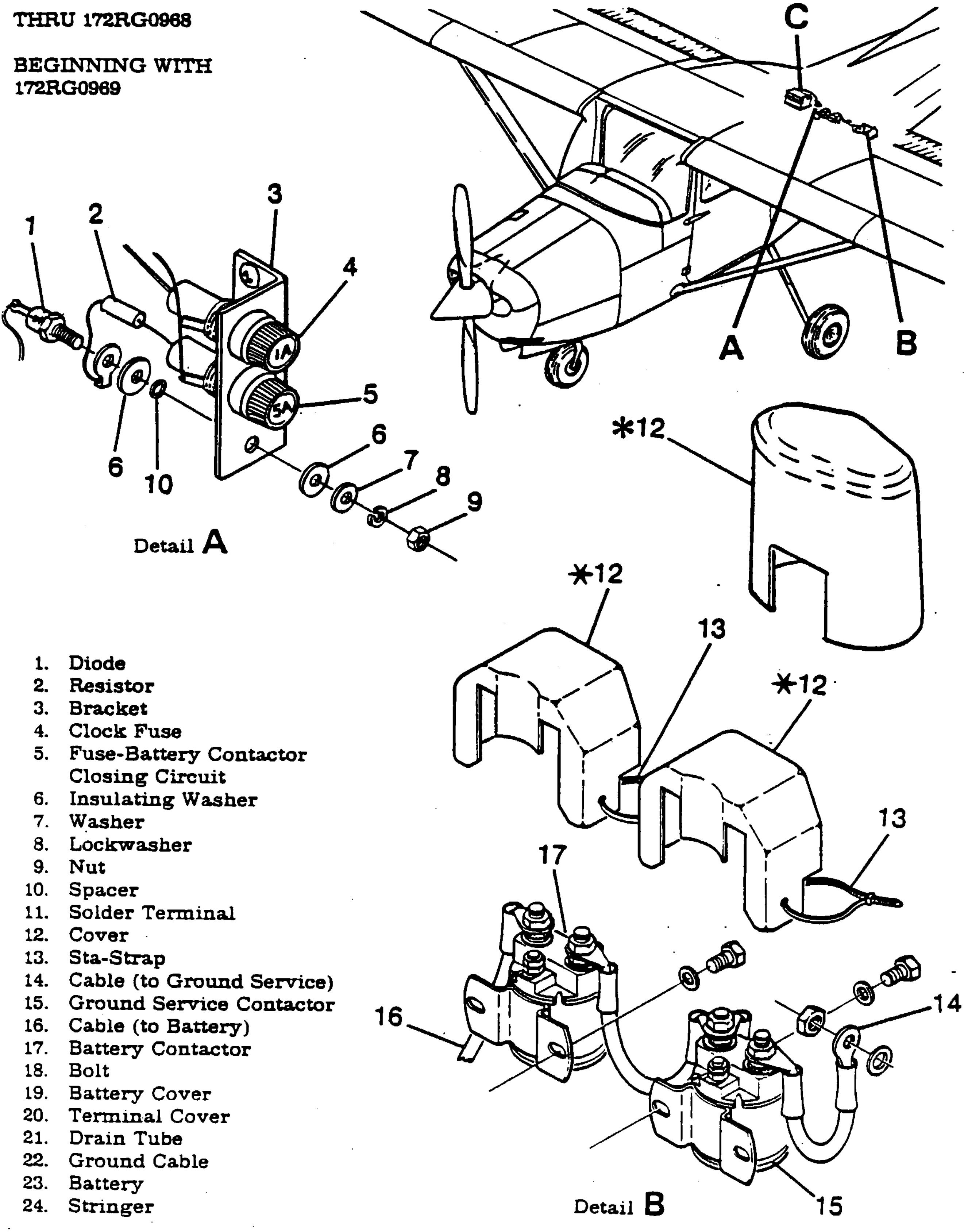
The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Test the battery with a hydrometer to determine the amount of charge. Decrease the charging rate or stop charging temporarily if the battery temperature exceeds 125°F.

16-20. BATTERY CONTACTOR.

16-21. DESCRIPTION. The battery contactor is bolted to the baggage compartment aft bulkhead. The contactor is plunger type. When the master switch is closed the contactor closes connecting the battery to the electrical system. A silicon diode is installed between master switch wire terminal and minus terminal of the contactor to eliminate spiking of transistorized radio equipment. A nylon cover is installed over the contactor to prevent short circuits.

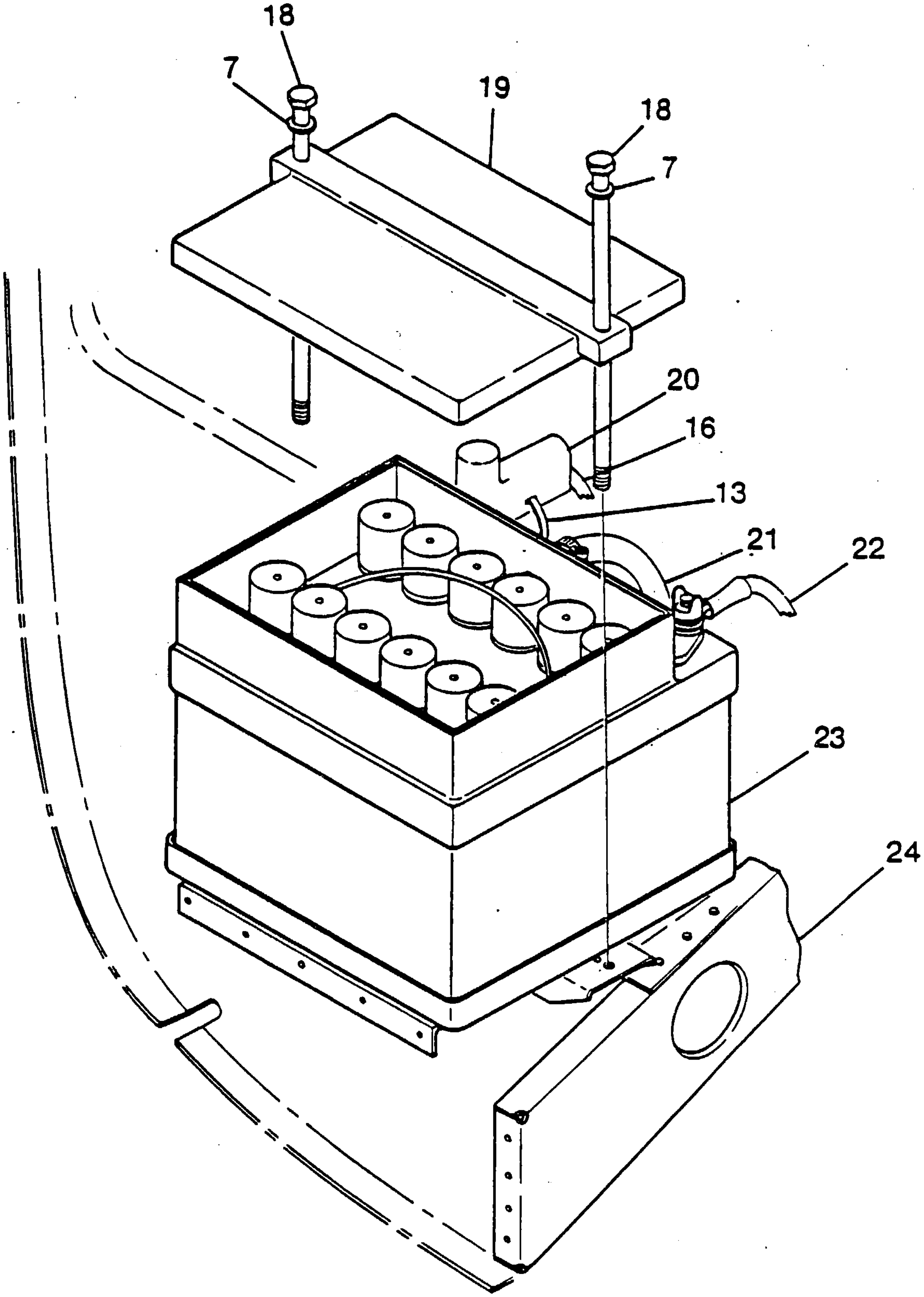
✱ THRU 172RG0968

✳ BEGINNING WITH 172RG0969



1. Diode
2. Resistor
3. Bracket
4. Clock Fuse
5. Fuse-Battery Contactor Closing Circuit
6. Insulating Washer
7. Washer
8. Lockwasher
9. Nut
10. Spacer
11. Solder Terminal
12. Cover
13. Sta-Strap
14. Cable (to Ground Service)
15. Ground Service Contactor
16. Cable (to Battery)
17. Battery Contactor
18. Bolt
19. Battery Cover
20. Terminal Cover
21. Drain Tube
22. Ground Cable
23. Battery
24. Stringer

Figure 16-2. Battery and Electrical Equipment Installation (Sheet 1 of 2)



Detail **C**

Figure 16-2. Battery and Electrical Equipment Installation (Sheet 2 of 2)

16-22. REMOVAL AND INSTALLATION. (See figure 16-2.)

a. Remove access panel on right hand side of tailcone.
b. Disconnect ground cable from negative terminal of battery.
c. Cut sta-straps and remove cover from contactor.
d. Remove nuts and washers securing cables to top terminals on contactor.
e. Remove nut, washer securing ignition switch wire.
f. Remove bolt and washer securing each side of contactor.
g. To install battery contactor, reverse the preceding steps, be sure to install diode assembly if removed.

16-23. BATTERY CONTACTOR CLOSING CIRCUIT.

16-24. DESCRIPTION. The battery contactor closing circuit consists of a 5 amp fuse, a resistor and a diode assembly mounted on a bracket adjacent to the battery. This serves to shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself.

16-25. GROUND SERVICE RECEPTACLE.

16-26. 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 thorugh an external power contactor to be connnected 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 reversed polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semi-conductor devices used in the aircraft from possible reverse polarity damage.

NOTE

The avionics master switch must be OFF when external power is applied.

NOTE

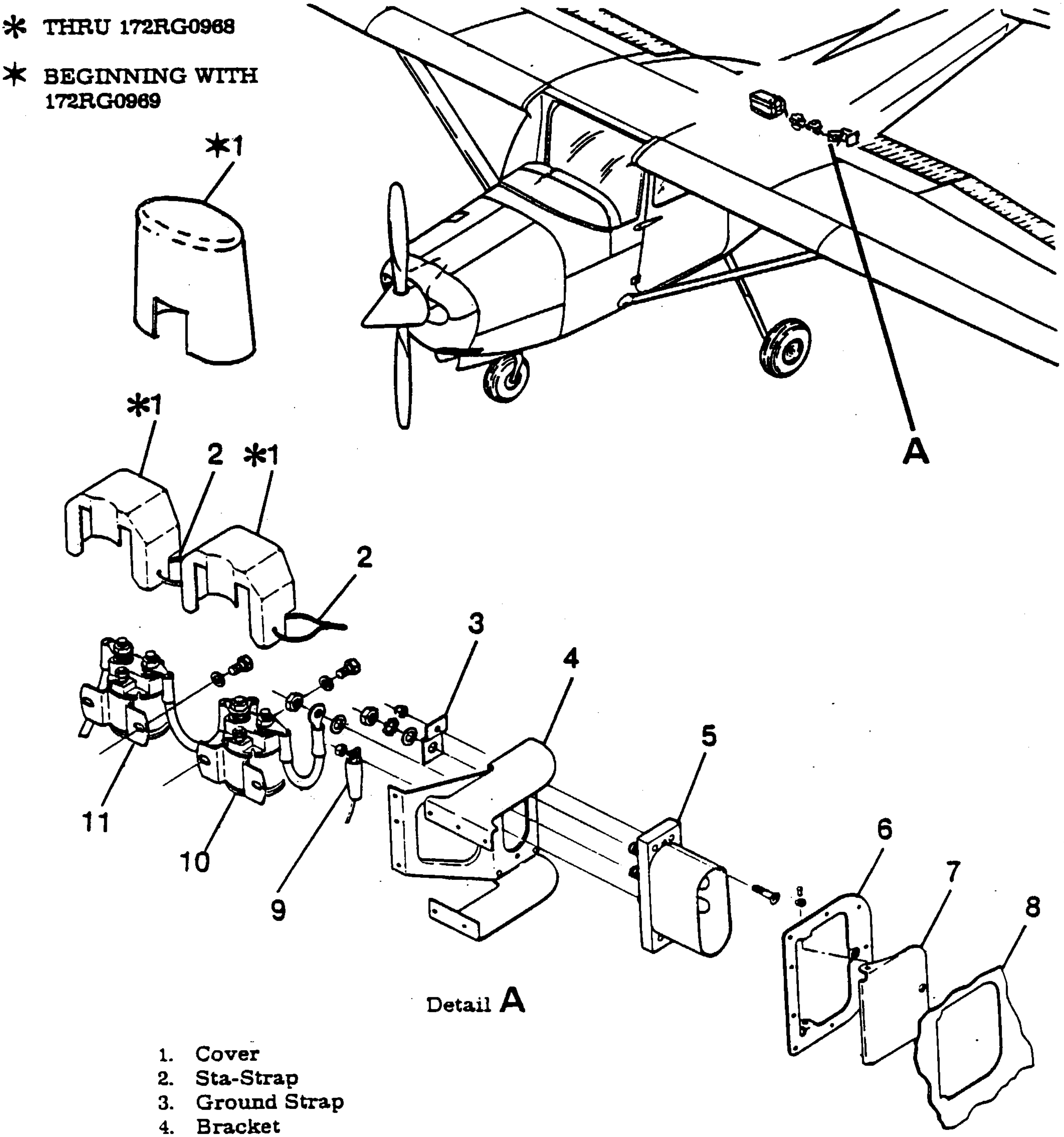
When using ground power to start the aircraft, close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field

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.

16-27. TROUBLE SHOOTING -- GROUND SERVICE RECEPTACLE.

TROUBLE	PROBABLE CAUSE	REMEDY
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 3. 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.
	Faulty external power contactor.	3. Check resistance from small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged.) Normal indication is 50-70 ohms. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 4.



1. Cover
2. Sta-Strap
3. Ground Strap
4. Bracket
5. Receptacle
6. Doubler
7. Door
8. Tailcone Skin
9. Diode Board
10. Ground Service Contactor
11. Battery Contactor

Figure 16-3. Ground Service Receptacle Installation

16-27. TROUBLE SHOOTING -- GROUND SERVICE RECEPTACLE.

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE (Cont.)	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

16-28. REMOVAL AND INSTALLATION. (See figure 16-3.)

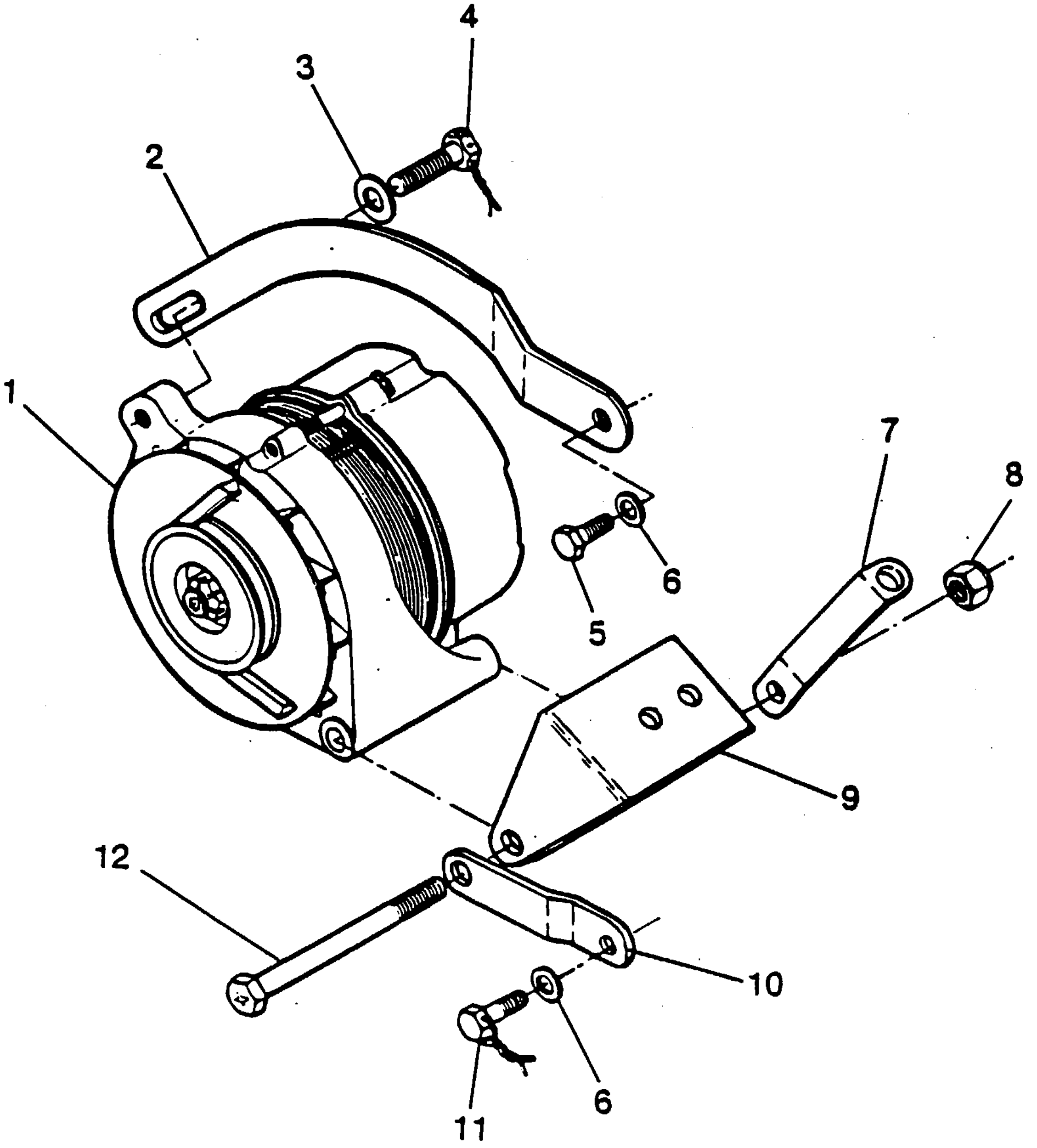
a. Remove access panel on right hand side of tailcone.
b. Disconnect negative cable from battery.
c. Remove nut, washer and ground service contactor cable from receptacle.
d. Remove nut and washer and holding diode board.
e. Remove nut and washers from ground strap.
f. Remove screws and nuts from receptacle, and remove receptacle.
g. To install, reverse preceding steps.

16-29. ALTERNATOR POWER SYSTEM.

16-30. DESCRIPTION. The alternator system consists of an engine driven alternator, alternator control unit and a circuit breaker mounted on the instrument panel. The system is controlled by the left hand portion of the split rocker, master switch labeled "ALT". Over and under voltage sensors are contained within the alternator control unit. A red warning light labeled "LOW VOLTAGE" is located on the instrument panel. The aircraft battery supplies the source of power for excitation of the alternator.

16-31. ALTERNATOR.

16-32. DESCRIPTION. The alternator is 28-volts 60 amperes, three phase, delta conntected with integral silicon diode rectifiers. The alternator is belt-driven. Refer to the Cessna Alternator Chargng Systems Service/Parts Manual.



1. Alternator
2. Adjustment Arm
3. Washer
4. Bolt
5. Safety Wire
6. Bracket
7. Nut

Figure 16-4. Alternator Installation

16-33. TROUBLE SHOOTING -- ALTERNATOR SYSTEM.

a. ENGINE NOT RUNNING.

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE OR ALTERNATOR CIRCUIT BREAKER OPENS. (Battery Switch ON, Alternator Switch OFF, all other electrical switches OFF.)	Shorted diode in alternator.	Turn off Battery Switch and remove "B" Lead from alternator. Check resistance from "B" Terminal of alternator to alternator case. Reverse leads and check again. Resistance reading may show continuity in one direction but should show an infinite reading in the other direction. If an infinite reading is not obtained in at least one direction, repair or replace alternator.
ALTERNATOR REGULATOR CIRCUIT BREAKER OPENS WHEN BATTERY AND ALTERNATOR SWITCHES ARE TURNED ON.	Short in alternator control unit.	Disconnect Over-Voltage Sensor plug and recheck. If circuit breaker stays in replace Over-Voltage Sensor. Disconnect control unit plug and recheck. If circuit breaker stays in, replace alternator control unit.
	Short in alternator field.	Disconnect "F" terminal wire and recheck. If circuit breaker stays in, replace alternator.

b. ENGINE RUNNING.

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR CIRCUIT BREAKER OPENS WHEN BATTERY AND ALTERNATOR SWITCHES ARE TURNED ON, LOW-VOLTAGE LIGHT DOES NOT COME ON.	Defective circuit breaker.	Replace circuit breaker.

16-33. TROUBLE SHOOTING -- ALTERNATOR SYSTEM (Cont).

b. ENGINE RUNNING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR REGULATOR CIRCUIT BREAKER OPENS WHEN BATTERY AND ALTERNATOR SWITCHES ARE TURNED ON, LOW-VOLTAGE LIGHT MAY OR MAY NOT COME ON.	Shorted field in alternator.	Check resistance from "F" terminal of alternator to alternator case, if resistance is less than 5 ohms repair/replace.

CAUTION

This malfunction may cause a shorted alternator control unit which will result in an over-voltage condition when system is again operated.

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR MAKES ABNORMAL WHINING NOISE.	Shorted diode in alternator.	Turn off Battery Switch and remove "B" Lead from alternator. Check resistance from "B" 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 one direction, repair or replace alternator.
LOW-VOLTAGE LIGHT DOES NOT GO OUT WHEN ALTERNATOR AND BATTERY SWITCHES ARE TURNED ON.	Shorted alternator control unit.	Replace alternator control unit.
	Defective low-voltage sensor.	Replace alternator control unit.

16-33. TROUBLE SHOOTING -- ALTERNATOR SYSTEM (Cont).

b. ENGINE RUNNING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
AFTER ENGINE START WITH ALL ELECTRICAL EQUIPMENT TURNED OFF CHARGE RATE DOES NOT TAPER OFF IN 1-3 MINUTES.	Alternator control unit faulty or high resistance in field circuit.	With engine not running turn off all electrical loads and turn on battery and alternator switches. Measure bus voltage to ground, then measure voltage from terminal of alternator to ground. If there is more than 2 volts difference check field circuit wiring shown on alternator system wiring diagram in Section 19. Clean all contacts. Replace components until there is less than 2 volts difference between bus voltage and field voltage.

NOTE

Also refer to battery power system trouble shooting chart.

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.	Alternator output voltage insufficient.	1. Connect voltmeter between D.C. Bus and ground. Turn off all electrical loads. Turn on Battery Switch, start engine and adjust for 1500 RPM, voltage should read approximately 24 volts. Turn on alternator switch, voltage should read between 28.4 and 28.9 volts. Ammeter should indicate a heavy charge rate which should taper off in 1-3 minutes. 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 does not rise when alternator switch is turned on proceed to Step 2.

16-33. TROUBLE SHOOTING -- ALTERNATOR SYSTEM (Cont).

b. ENGINE RUNNING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED. (Cont.)	Alternator output voltage insufficient (cont).	2. Stop engine, turn off all switches. Connect voltmeter between "F" terminal of alternator and ground. Do NOT start engine. Turn on battery switch and alternator switch. Battery voltage should be present at "F" terminal, less 1 volt drop thru regulator, if not refer to Step 3.
		3. Starting at "F" terminal of alternator, trace circuit to alternator control unit at Pin 1 (Blue Wire). Trace circuit from Pin 3 (Red Wire) to master switch, to Bus Bar. Trace circuit from alternator control unit Pin 2 (Orange Wire) to alternator "BAT" terminal. Check connections and replace component which does not have voltage present at output. Refer to alternator system. wiring diagram in Section 19.
	Alternator field winding open.	1. If voltage is present turn off alternator and battery switches. Check resistance from "F" terminal of alternator to alternator case, turning alternator shaft during measurement. Normal indication is 12-20 ohms. If resistance is high or low, repair or replace alternator. If ok refer to Step 2.
		2. 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.

16-34. REMOVAL AND INSTALLATION. (See figure 16-4.)

a. Ensure that the master switch is off and the negative lead is disconnected from the battery.
b. Remove wiring from the alternator and label.
c. Remove safety wire from the upper adjusting bolt and loosen bolt.
d. Remove safety wire from lower adjusting bolt and remove bolt.
e. Remove the locknut from the alternator mounting bolt.
f. Remove the alternator drive belt and the alternator mounting bolt, the alternator will then be free for removal.
g. To replace the alternator, reverse this procedure.
h. Apply a torque wrench to the nut on alternator pulley and adjust the belt tension so the belt slips when the following torque value is applied.

i. Tighten and safety wire upper and lower adjusting bolts.
j. Tighten alternator mounting bolt.

TORQUE VALVES
FOR
CHECKING ALTERNATOR BELT TENSION

Used Belt	New Belt
Slips At 7 to 9 Ft. Lbs.	Slips At 11 to 13 Ft. Lbs.

NOTE

On new aircraft of whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

16-35. OVER-VOLTAGE WARNING SYSTEM.

16-36. DESCRIPTION. The over-voltage sensor is contained within the alternator control unit. The unit also contains a low-voltage sensor. A red warning light labeled "LOW VOLTAGE" is installed on the instrument panel. When an over-voltage condition occurs the over-voltage sensor turns off the alternator and the voltage in the system drops. When system voltage drops below 24.5 volts the low-voltage sensor turns on the low-voltage light indicating a drain on the battery and the ammeter will show a discharge. Turn off bolt sections of the master switch to recycle the over-voltage sensor. If the over-voltage condition was transient, the normal alternator charging will resume and no further action is necessary. If the over-voltage tripoff recurs, then a generating system malfunction has occurred such that the electrical accessories must be operated from the aircraft battery only. Conservation of electrical energy must be practiced until the flight can be terminated. The over-voltage light filament may be tested at any time by turning off the "Alternator" portion of the master switch and leaving the battery portion on. This test does not induce an over-voltage condition on the electrical system.

16-37. ALTERNATOR CONTROL UNIT.

16-38. DESCRIPTION. The alternator control unit is a solid state voltage regulator with an over-voltage sensor and low-voltage sensor incorporated in the unit. The control unit is not adjustable and is a remove and replace item. A Cessna Alternator Charging System Test

Box Assembly (PN9870005) is available through the Cessna Service/Parts Center for use in isolating failures in the 28-volt alternator control units (C611005-0101 and C611005-0102) and the 28-volt alternator. Refer to the Cessna Alternator Chargng Systems Service/Parts Manual.

If the alternator low voltage light comes on when a COM radio transmitter is keyed the following corrective action should be followed.

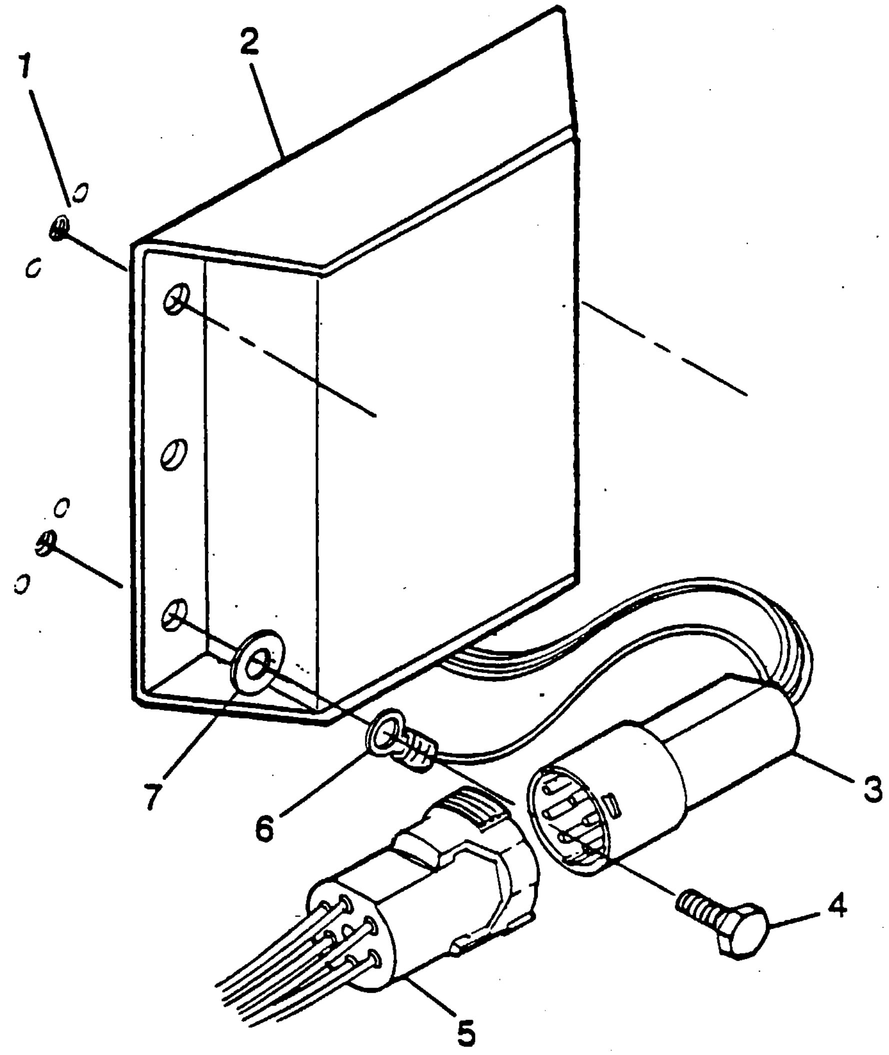
a. Inspect COM coax connectors at the radios and antennas for security and proper installation. Replace as required.
b. Ensure the COM coax shielding is properly grounded.
c. Inspect routing of COM coax and reroute as required to provide separation from the alternator wiring.
d. Inspect alternator control unit connector for loose or improperly installed contacts and replace or repair as required.
e. Inspect COM coax cables for damage where secured with ty-wraps. Cables that have been crushed or deformed should be replaced.

If the above inspection does not correct the problem a new alternator control unit may be installed.

16-39. REMOVAL AND INSTALLATION. (See figure 16-5.)

a. Remove upper half of engine cowl.
b. Place master switch in the "OFF" position.
c. Disconnect negative lead from the battery and pull lead free of the battery box.
d. Disconnect housing plug from the regulator/alternator control unit.
e. Remove screws securing the regulator/alternator control unit to the firewall.
f. To install regulator/alternator control unit, reverse the preceding steps. Be sure the connections for grounding are clean and bright before assembly. Otherwise faulty voltage regulator and/or excessive radio noise may result.

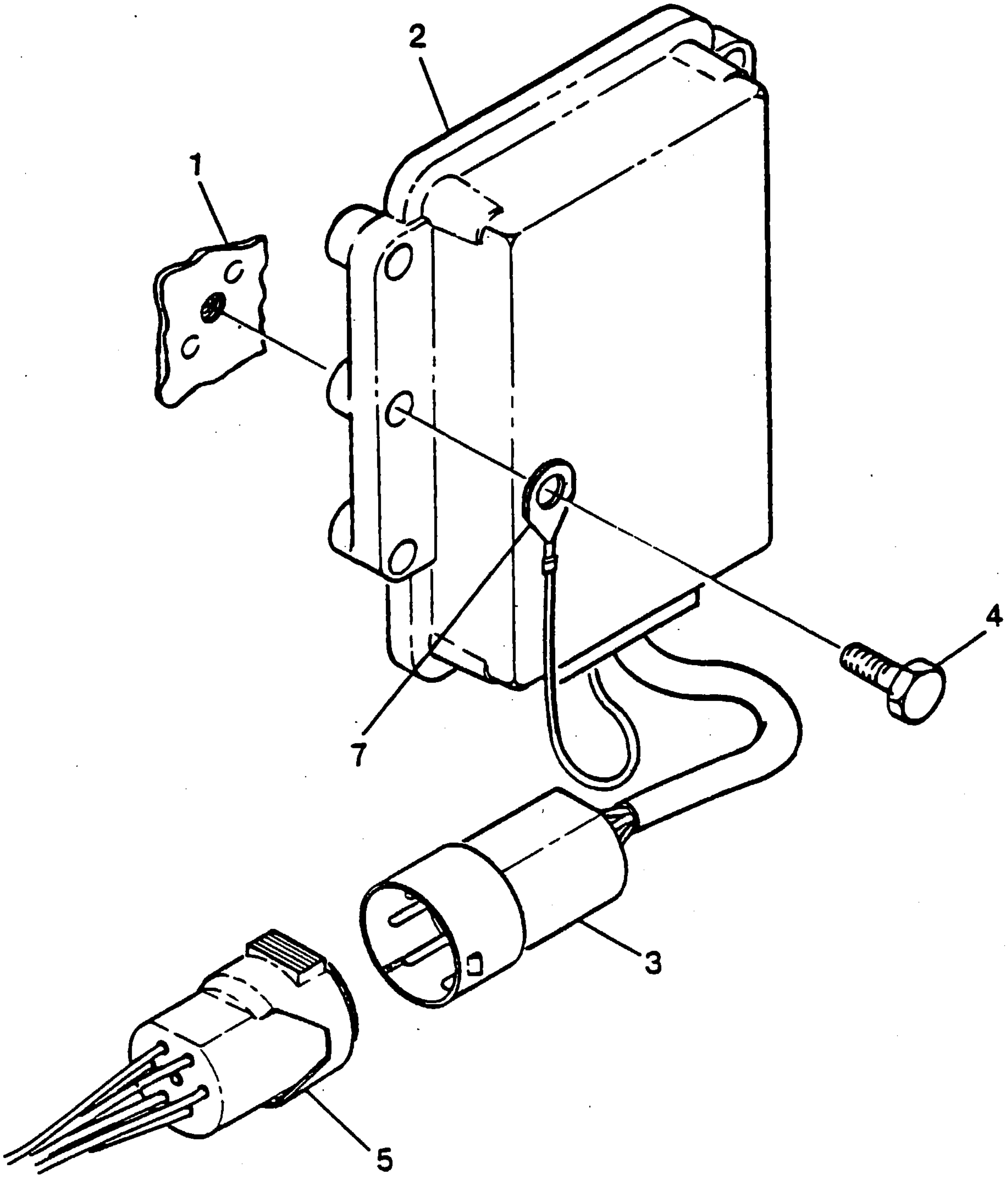
16-40. RIGGING THROTTLE-OPERATED MICRO SWITCHES. Refer to Section 5.



THRU 172RG1167

1. Firewall
2. Alternator Control Unit
3. Housing Plug
4. Bolt
5. Housing Cap
6. Ground Wire
7. Washer

Figure 16-5. Alternator Control Unit (Sheet 2 of 2)



BEGINNING WITH 172RG1168

Figure 16-5. Alternator Control Unit (Sheet 1 of 2)

16-41. AIRCRAFT LIGHTING SYSTEM.

16-42. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, anti-collision strobe lights, flashing beacon light, dome, instrument flood lights and courtesy light, control wheel map light, compass and radio dial lights.

16-43. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHT(S) OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is 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 AND/OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.

16-43. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLASHING BEACON DOES NOT LIGHT. (Cont.)	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or 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.	Install new flasher.
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is 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.

16-43. TROUBLE SHOOTING (Cont).

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.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT.	Open circuit breaker.	1. Check. if open reset. If circuit breaker continues to open proceed to step 2. 2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies. one at a time. If circuit breaker opens on one strobe power supply. If circuit breaker supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not, open proceed to step 4. 3. Check aircraft wiring. Repair or replace as necessary. 4. Inspect strobe power supply ground wire for contact with wing structure.

CAUTION

Extreme care should be taken when exchanging flash tube. The tube is fragile and can easily be cracked in a place where it will not be obvious visually. Make sure the tube is seated properly on the base of the nav light assembly and is centered in the dome.

NOTE

When checking defective power supply and flash tube. units from opposite wing may be used. Be sure power leads are protected properly when unit is removed to prevent short circuit.

16-43. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT.	Defective Strobe Power Supply, or flash tube.	1. Connect voltmeter to red lead between aircraft power supply (battery/external power) and strobe power supply connecting negative lead to wing structure. Check for 24 volts. If OK, proceed to step 2. If not, check aircraft power supply (battery/external power).
		2. Replace flash tube with known good flash tube. If system still does not work, replace strobe power supply.
DOME LIGHT TROUBLE.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with 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.	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.

16-43. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT. (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.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in position. Replace potentiometer.
	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.
INSTRUMENT LIGHTS WILL NOT DIM.	Open resistor or wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replace defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is 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.

16-44. LANDING AND TAXI LIGHTS.

16-45. DESCRIPTION. Thru 1981 Models the landing and taxi lights are cowl mounted. Beginning with 1982 Models, the landing and taxi lights are wing-mounted. The left hand light is used for taxi and the right hand for landing. Tow rocker type switches on the pilot's switch panel control the lights. A 20 amp circuit breaker is installed to protect the system.

16-46. REMOVAL AND INSTALLATION. (See figure 16-6.)

a. THRU 1981 MODELS.
   1. Remove screws (1) from bracket (2).
   2. Pull bracket (2), lamps (4) and gasket (5) forward to gain access to electrical leads.
   3. Disconnect electrical leads from lamps making sure switches are off and leads do not short out.
   4. When installing lamp, be sure to put gasket (5) over electrical leads before connecting leads.

b. BEGINNING WITH 1982 MODELS.
   1. Remove screws (2) and remove lens assembly (1).
   2. Remove screws (3) and remove brackets (4) and (5).
   3. Pull lamp (6) forward and disconnect electrical leads.
   4. If plates (8) are to be removed, remove screws (7), plates (8), and spacers (9), (10), (11), (12), (13), and (14). Note position of spacers for reinstallation.

5. To install reverse the preceding procedures.

16-47. ADJUSTMENT OF LANDING AND TAXI LIGHTS. (THRU 1981 MODELS) To adjust the lights, park the aircraft 3 feet from a wall or any suitable light reflecting surface (distance is measured between landing light and wall). With the nose gear shock strut extended 2 inches, the center of the landing light beam (right hand on the wall should be 27 inches above the floor. The center of the taxi light beam (left hand) on the wall should be 29 inches above the floor.

16-48. NAVIGATION LIGHTS.

16-49. DESCRIPTION. The navigation lights are mounted on each wing tip and the aft end of the vertical fin tip. The lights are controlled by a rocker type switch located on the instrument panel. A circuit breaker is installed on the panel to protect the system.

16-50. REMOVAL AND INSTALLATION. For removal and installation of the navigation lights see figure 16-7.

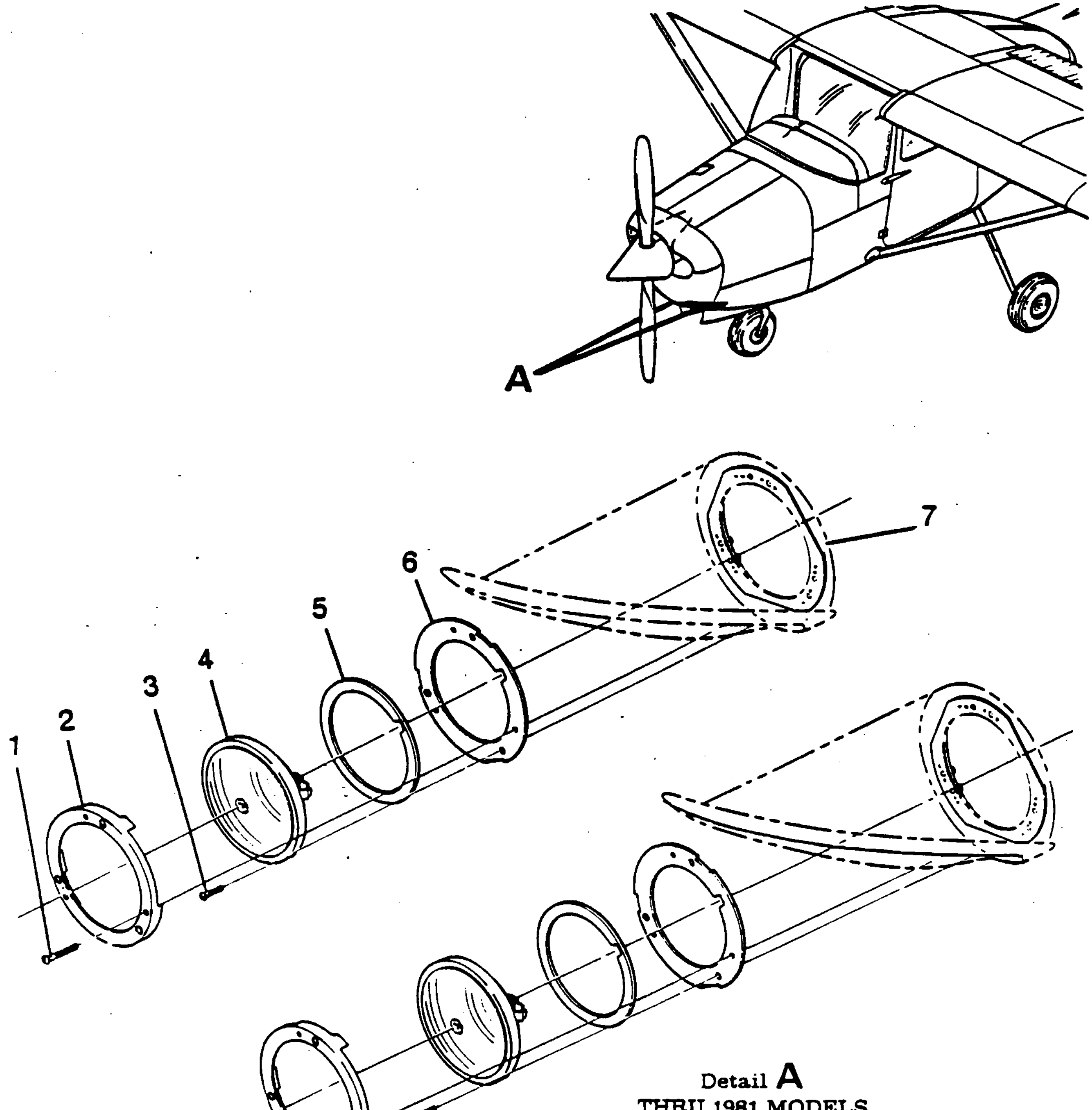
16-51. ANTI-COLLISION STROBE LIGHTS.

16-52. DESCRIPTION. A white strobe light may be installed on each wing tip with the navigation lights. Strobe lights are vibration resistant and operate on the principle of a capacitor discharge into a xenon tube, producing an extremely high intensity flash. Energy is supplied to the lights from individual power supplies mounted on each wing tip rib.

16-53. REMOVAL AND INSTALLATION. For removal and installation of strobe light and power supply, see figure 16-7.

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.

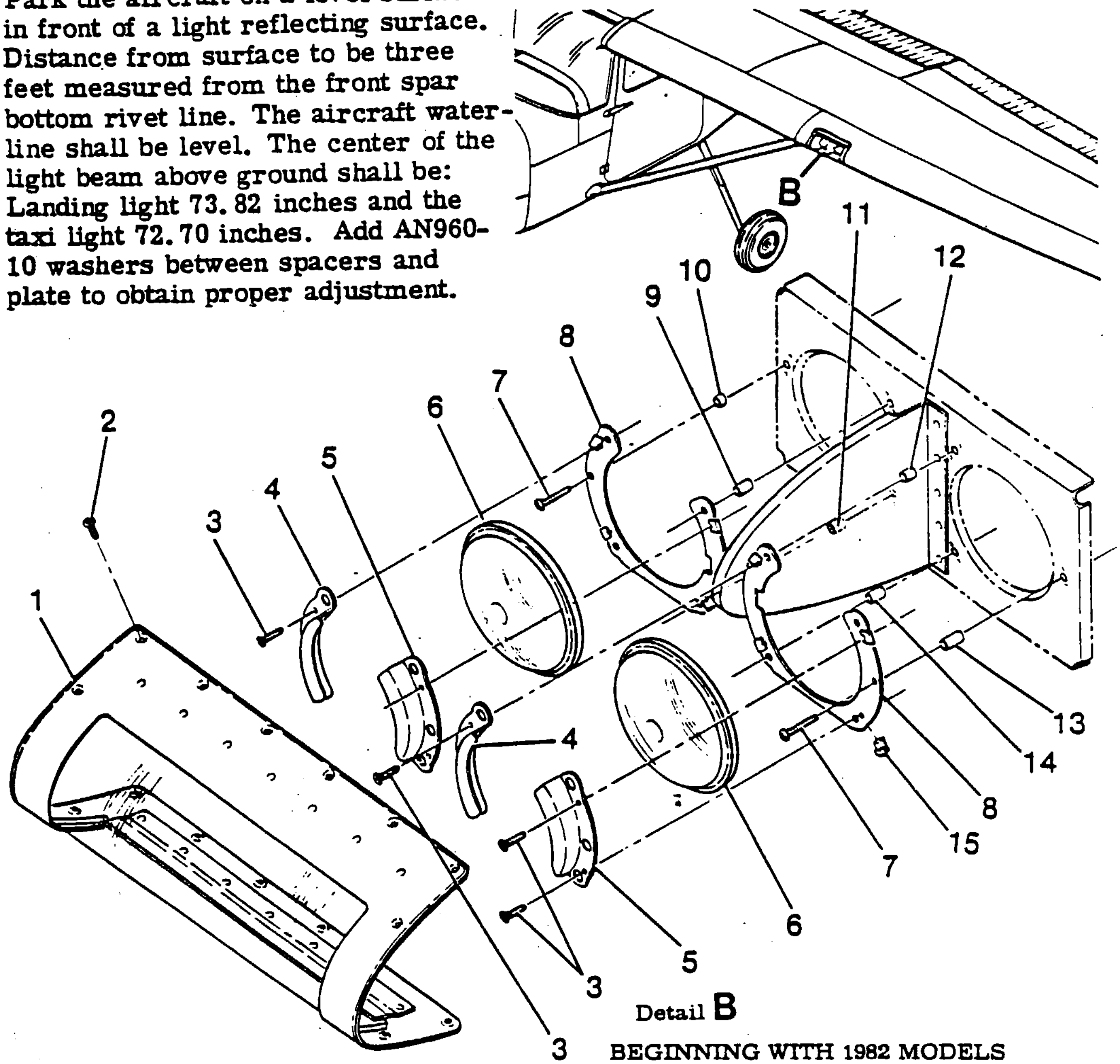


Detail **A**
THRU 1981 MODELS

1. Screw
2. Bracket
3. Screw
4. Lamp
5. Gasket
6. Plate
7. Receptacle

Figure 16-6. Landing and Taxi Lights Installation (Sheet 1 of 2)

Park the aircraft on a level surface in front of a light reflecting surface. Distance from surface to be three feet measured from the front spar bottom rivet line. The aircraft waterline shall be level. The center of the light beam above ground shall be: Landing light 73.82 inches and the taxi light 72.70 inches. Add AN960-10 washers between spacers and plate to obtain proper adjustment.

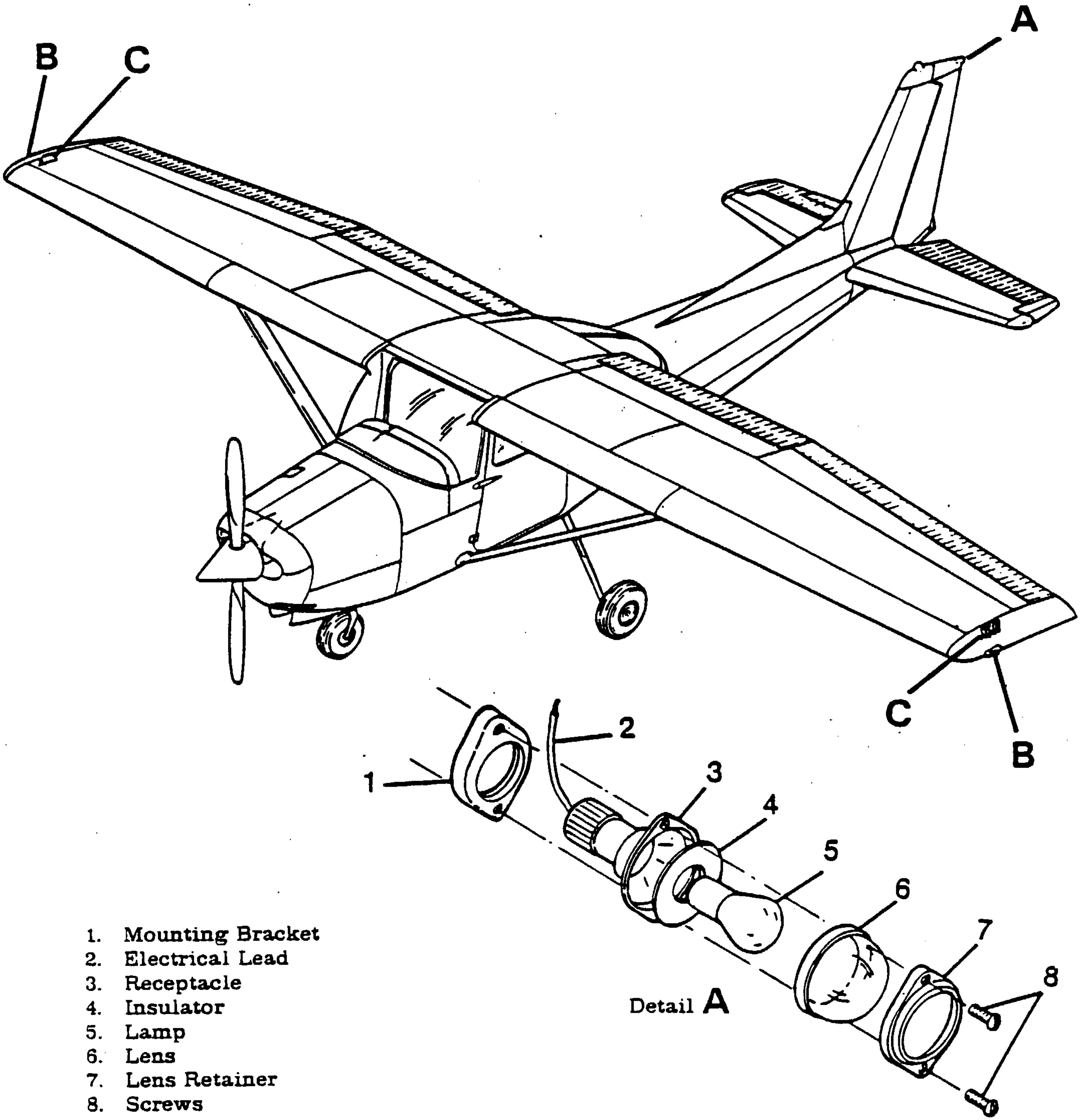


Detail B

BEGINNING WITH 1982 MODELS

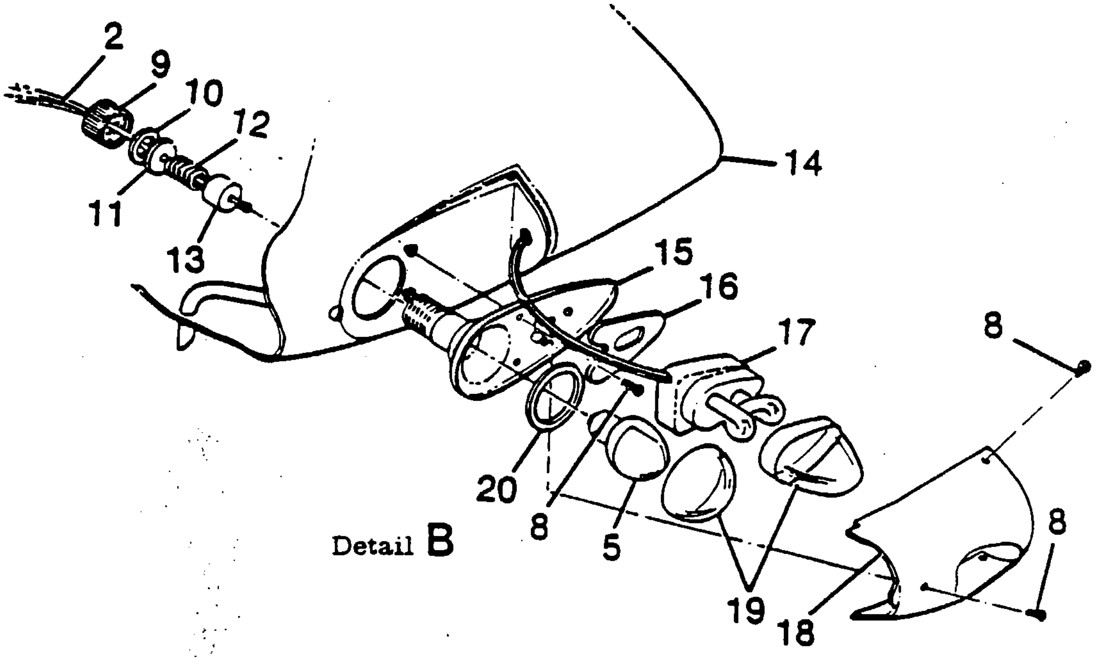
1.	Lens Assembly
2.	Screw
3.	Screw
4.	Bracket
5.	Bracket
6.	Lamp
7.	Screw
8.	Plate
9.	Spacer
10.	Spacer
11.	Spacer
12.	Spacer
13.	Spacer
14.	Spacer
15.	Nutplate

Figure 16-6. Landing and Taxi Lights Installation (Sheet 2 of 2)

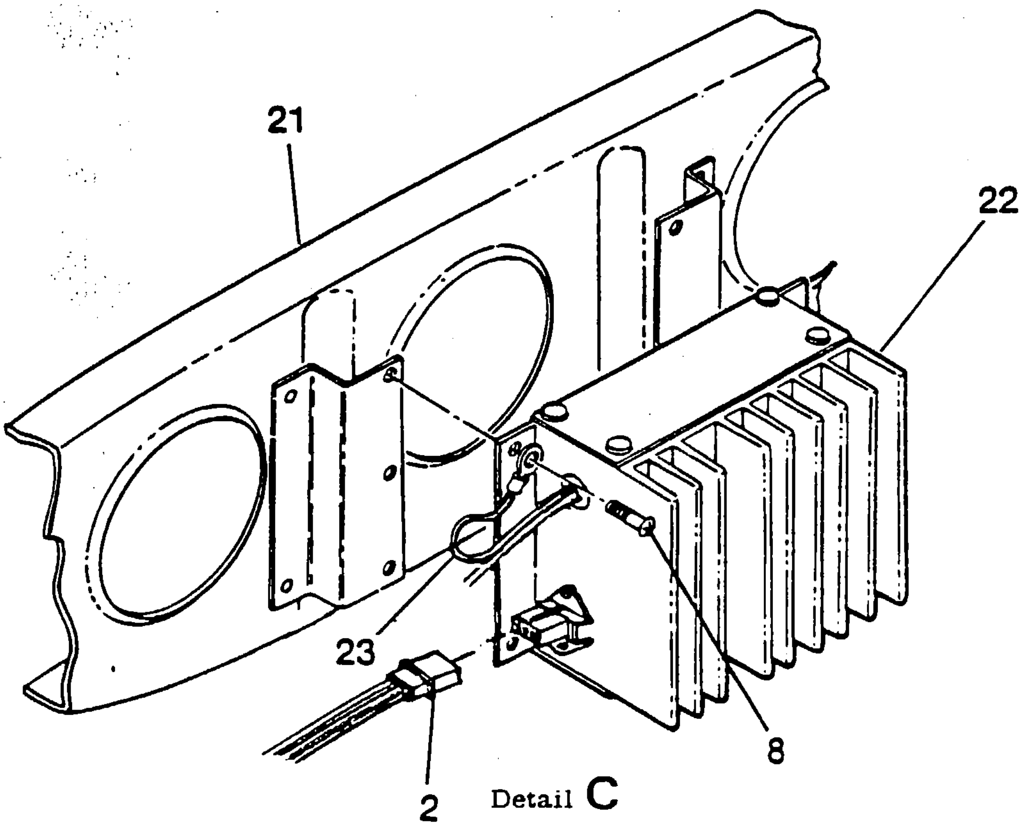


1. Mounting Bracket
2. Electrical Lead
3. Receptacle
4. Insulator
5. Lamp
6. Lens
7. Lens Retainer
8. Screws
9. Cap
10. Washer
11. Insulated Washer
12. Spring
13. Insulator
14. Wing Tip
15. Receptacle
16. Gasket
17. Flash Tube Assembly
18. Lens Retainer
19. Lens
20. Seal
21. Wing Tip Rib
22. Power Supply
23. Ground Wire

Figure 16-7. Navigation and Anti-Collision Strobe Light Installation (Sheet 1 of 2)



Detail B



Detail C

Figure 16-7. Navigation and Anti-Collision Strobe Light Installation (Sheet 2 of 2)

16-54. FLASHING BEACON.

16-55. DESCRIPTION. The flashing beacon light is attached to the vertical fin tip. The lamp is iodine-vapor, electrically switched by a solid-state flasher assembly. The flasher assembly is mounted in the aft section of the tailcone. The switching frequency of the flasher assembly operates the beacon at approximately 45 flashes per minute. A 6 ohm resistor is installed to eliminate a pulsing effect on the cabin lighting and ammeter.

16-56. REMOVAL AND INSTALLATION. For removal and installation of flashing beacon see figure 16-8.

16-57. INSTRUMENT AND DOME LIGHT.

16-58. DESCRIPTION. The instrument flood light and dome light are installed in the overhead console. The dome light consists of a frosted lens and a single bulb controlled by a switch mounted forward of the light. The instrument flood light consists of a red lens and a single bulb controlled by an off/on switch mounted aft of the light. Intensisty of the lamp is controlled by a rheostat switch located on the instrument panel.

16-59. REMOVAL AND INSTALLATION. For removal and installation of instrument and dome light, see figure 16-9.

16-60. COURTESY LIGHTS.

16-61. DESCRIPTION. The courtesy lights are mounted in the underside of each wing, inboard of the upper wing strut attach. The light consists of a lens socket and a single bulb. The lights are controlled by the dome light switch.

16-62. REMOVAL AND INSTALLATION. For removal and installation of the courtesy lights, see figure 16-9.

16-63. COMPASS AND RADIO DIAL LIGHTING.

16-64. DESCRIPTION. The compass and radio dial lights are contained within the individual units. The lights are controlled by the instrument flood light switch on the overhead console. Intensity is controlled by a rheostat located on the instrument panel.

16-65. INSTRUMENT POST LIGHTING.

16-66. DESCRIPTION. Individual postlighting may be installed to provide non-glare instrument lighting. The post light consists of a cap and a clear lamp assembly with a tinted lens bonded to the decorative covers. The intensity of the post lights is controlled by the radio light dimming rheostat located on the instrument panel.

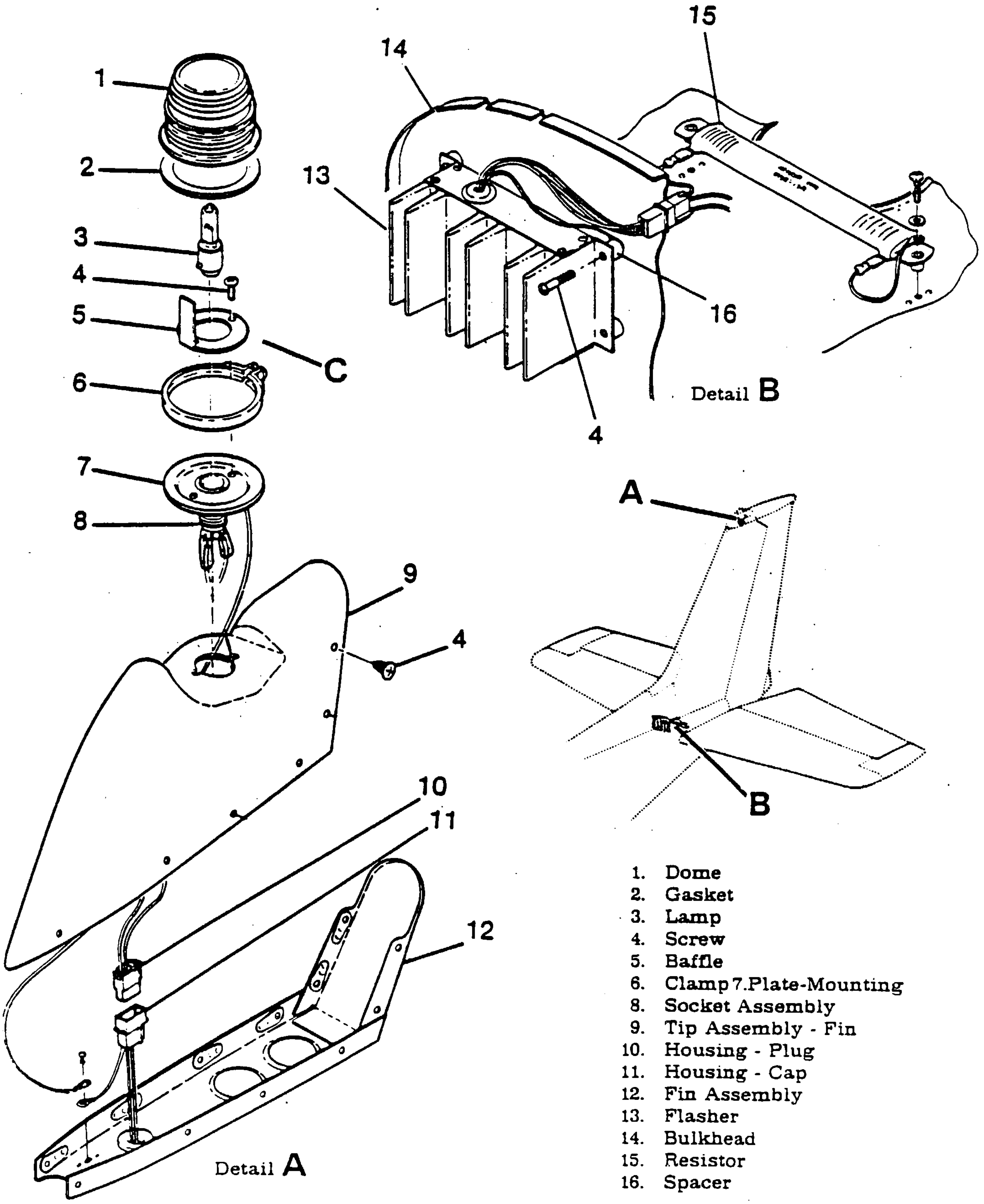
NOTE

When installing postlight assemblies, assemblies shall be coated with RTV-102, General Electric, Waterford, New York, on forward side of panel where postlight could come in contact with sheet metal subpanel. This coating shall insulate postlight assembly from contact with airplane structure. Maximum coating thickness to be .03.

16-67. REMOVAL AND INSTALLATION. For removal and installation of post lamp, slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

16-67A. TROUBLE SHOOTING - POSTLIGHTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LAMP WILL NOT LIGHT.	Defective lamp.	1. Test lamp with ohmmeter or replace with a new lamp. If lamp is OK, proceed to step 2.
	Defective socket or open circuit.	2. With switch on, test socket. If defective, replace socket or wiring.
ONE SECTION OF LAMPS WILL NOT LIGHT.	Defective connector.	1. Test for voltage on lamp side of connector. If voltage is not present, check opposite side of connector. If voltage is present, replace pins and sockets as necessary. If voltage is not present, check connections at terminal block.
	Defective circuit in dimming assembly.	2. Refer to paragraph 16-67B.
	Defective rheostat.	3. Check voltage at output side of rheostat with battery switch on. Should read battery voltage with rheostat turned full clockwise. 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.
ALL LAMPS OUT.	Open circuit breaker.	1. With battery switch on, check circuit breaker. Reset if open. If circuit breaker is set, check voltage at output side of breaker. If no voltage is present, replace circuit breaker.
LAMPS WILL NOT DIM.	Defective resistor or rheostat.	1. Check resistor and rheostat for continuity and resistance value. Also, check transistors for partial short. Refer to paragraph 16-67B. Replace rheostat and transistor.

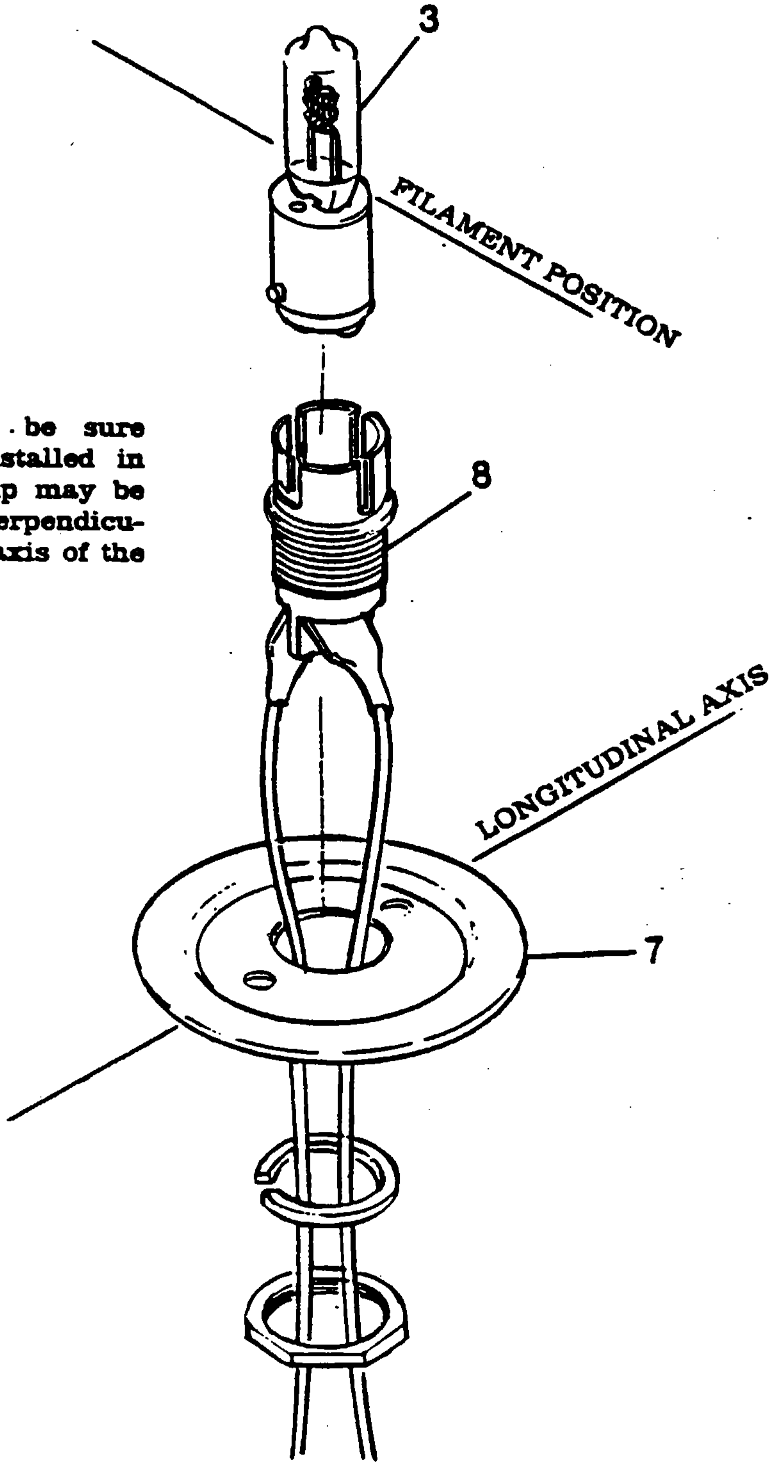


1. Dome
2. Gasket
3. Lamp
4. Screw
5. Baffle
6. Clamp7.Plate-Mounting
8. Socket Assembly
9. Tip Assembly - Fin
10. Housing - Plug
11. Housing - Cap
12. Fin Assembly
13. Flasher
14. Bulkhead
15. Resistor
16. Spacer

Figure 16-8. Flashing Beacon Light Installation (Sheet 1 of 2)

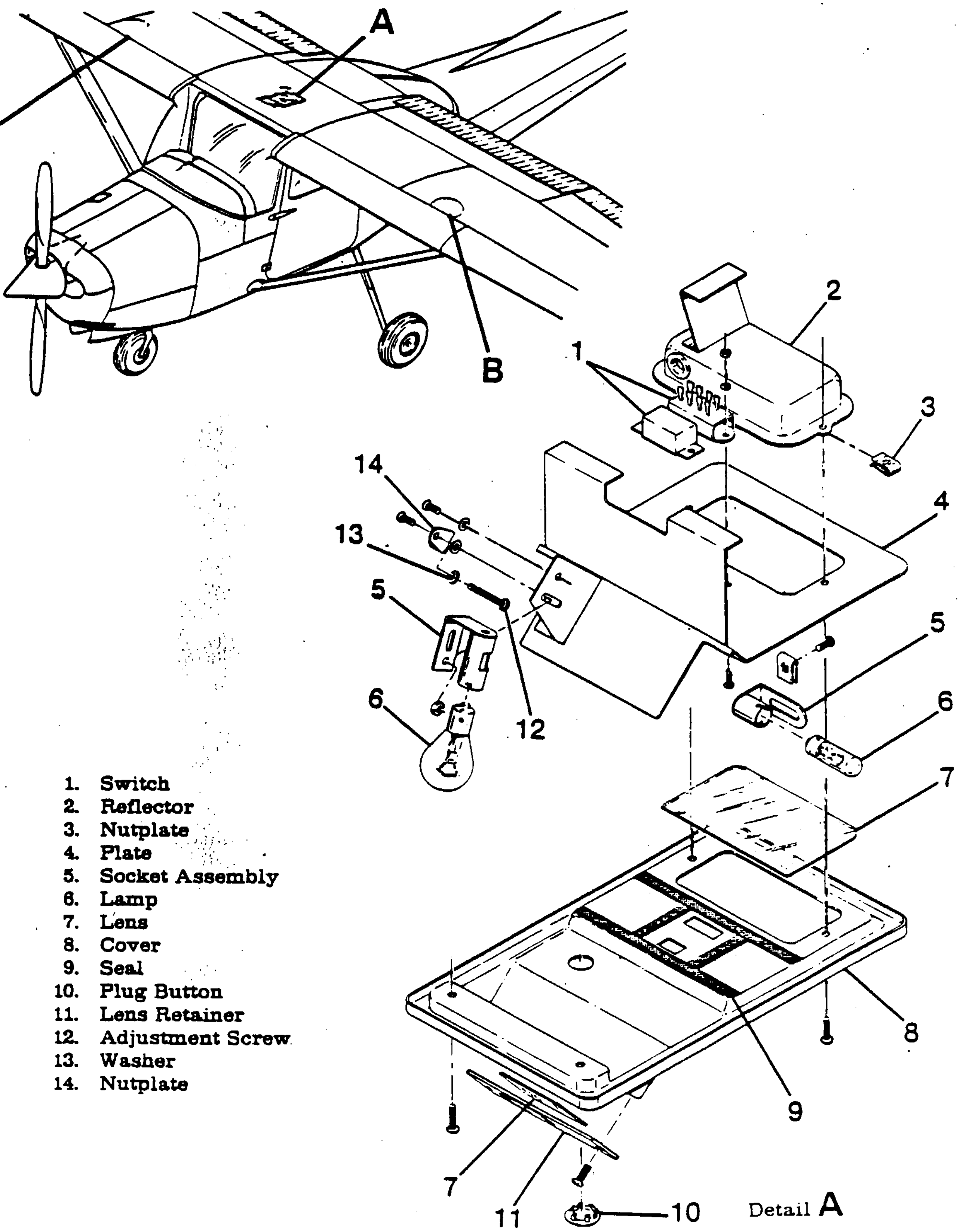
NOTE

When installing lamp be sure socket assembly is installed in mounting plate so lamp may be installed with filament perpendicular to the longitudinal axis of the aircraft.



Detail **C**
BEGINNING WITH 172RG246

Figure 16-8. Flashing Beacon Light Installation (Sheet 2 of 2)



1. Switch
2. Reflector
3. Nutplate
4. Plate
5. Socket Assembly
6. Lamp
7. Lens
8. Cover
9. Seal
10. Plug Button
11. Lens Retainer
12. Adjustment Screw
13. Washer
14. Nutplate

Figure 16-9. Instrument, Dome and Courtesy Light Installation (Sheet 1 of 2)

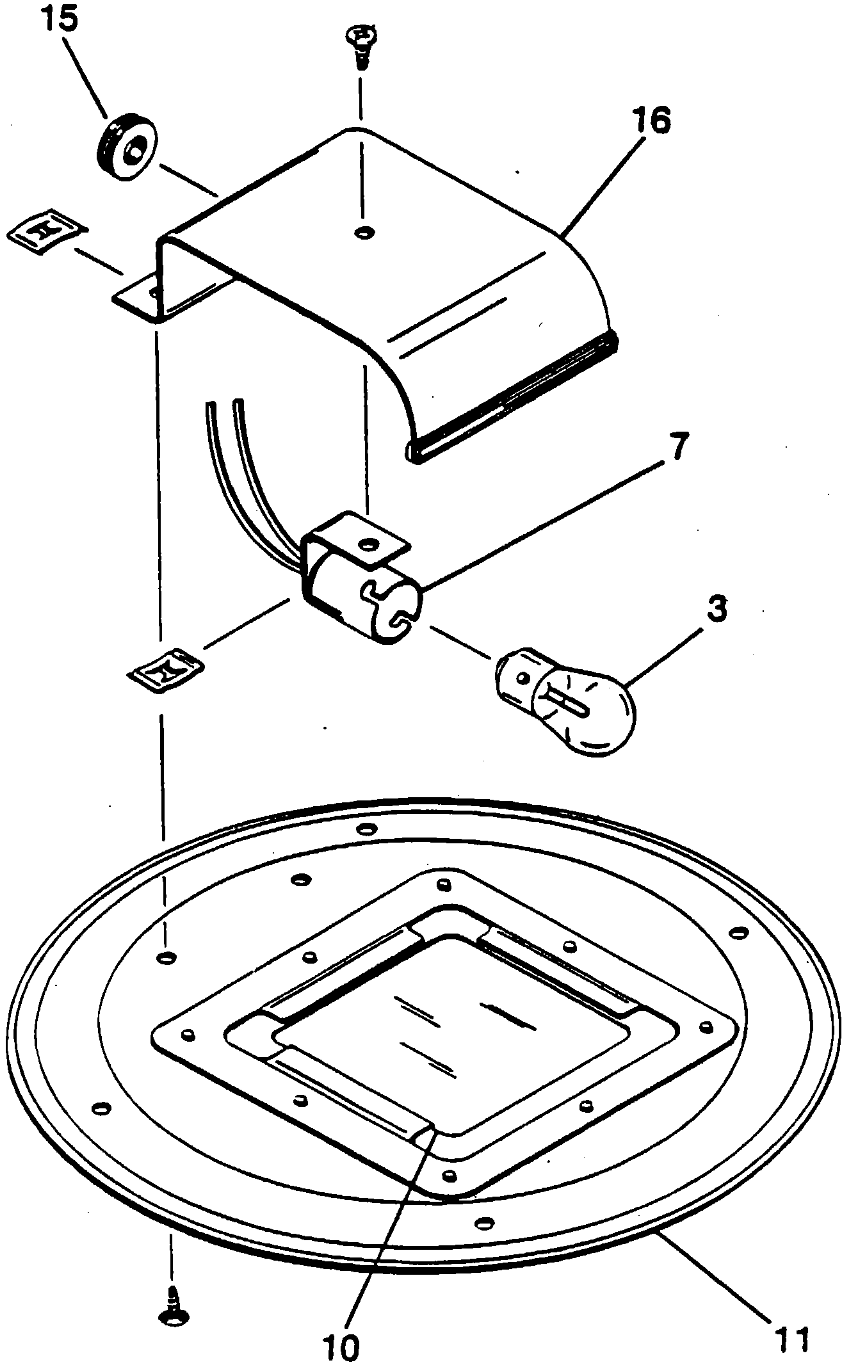


Figure 16-9. Instrument, Dome and Courtesy Light Installation (Sheet 2 of 2)

16-67B. TROUBLE SHOOTING - TRANSISTOR HEAT SINK. Remove heat sink from airplane. Check transistors for opens and shorts, check transistor sockets for evidence of shorting out against heat sink, especially on the bottom side. Check that legs of transistor socket have not been bent up against heat sink. If this has happened, you may see burned spot on the socket leg. If the transistor sockets and wiring appear to be in good condition, install transistor back in heat sink and make a continuity check. Attach one lead of an ohmmeter to the heat sink then check every pin of the pigtail plug with the other lead for continuity. (These should not be continuity). If continuity is found, this will burn out transistors immediately.

16-68. TRANSISTORIZED LIGHT DIMMING.

16-69. DESCRIPTION. A remotely located, two-circuit transistorized dimming assembly is installed to control instrument lighting. One circuit controls the compass light, map light and instrument flood lights. The other circuit controls radio light. A concentric knob arrangement on a dual rheostat assembly mounted on the instrument panel.

16-70. REMOVAL AND INSTALLATION. For removal and installation of transistorized dimming assembly, see figure 16-10.

16-70A. TROUBLE SHOOTING - HEAT SINK. Refer to paragraph 16-67B.

16-71. MAP LIGHTING.

16-72. DESCRIPTION. White map lighting and red non-glare instrument lighting are provided by an adjustable light mounted on the upper forward part of the left door post. The switch is a three position type with red, white and off positions. The map light contains a white bulb for general purpose lighting and a red bulb for adjustable instrument lighting. The intensity of the red bulb is controlled by the center portion of a concentric knob arrangement thru a dual rheostat assembly located on the pilot's switch panel.

16-73. REMOVAL AND INSTALLATION. (See figure 16-11.)

a. For replacement of defective lamp slide the hood and lens from the map light assembly and remove the bayonet type bulb.
b. For removal of the map light assembly, remove the screws from the front door post shield. Remove the washer and nut attaching the map light. Remove the ground wire from the map light screw. Detach the wires at the quick disconnect fasteners and remove the map light assembly.

16-74. CONTROL WHEEL MAP LIGHT.

16-75. DESCRIPTION. The control wheel map light is mounted on the lower side of control wheel. Light intensity is controlled by a rheostat. For dimming, rheostat should be turned clockwise.

16-76. REMOVAL AND INSTALLATION. (See figure 16-12, sheet 1.) (THRU 172RG1076.)

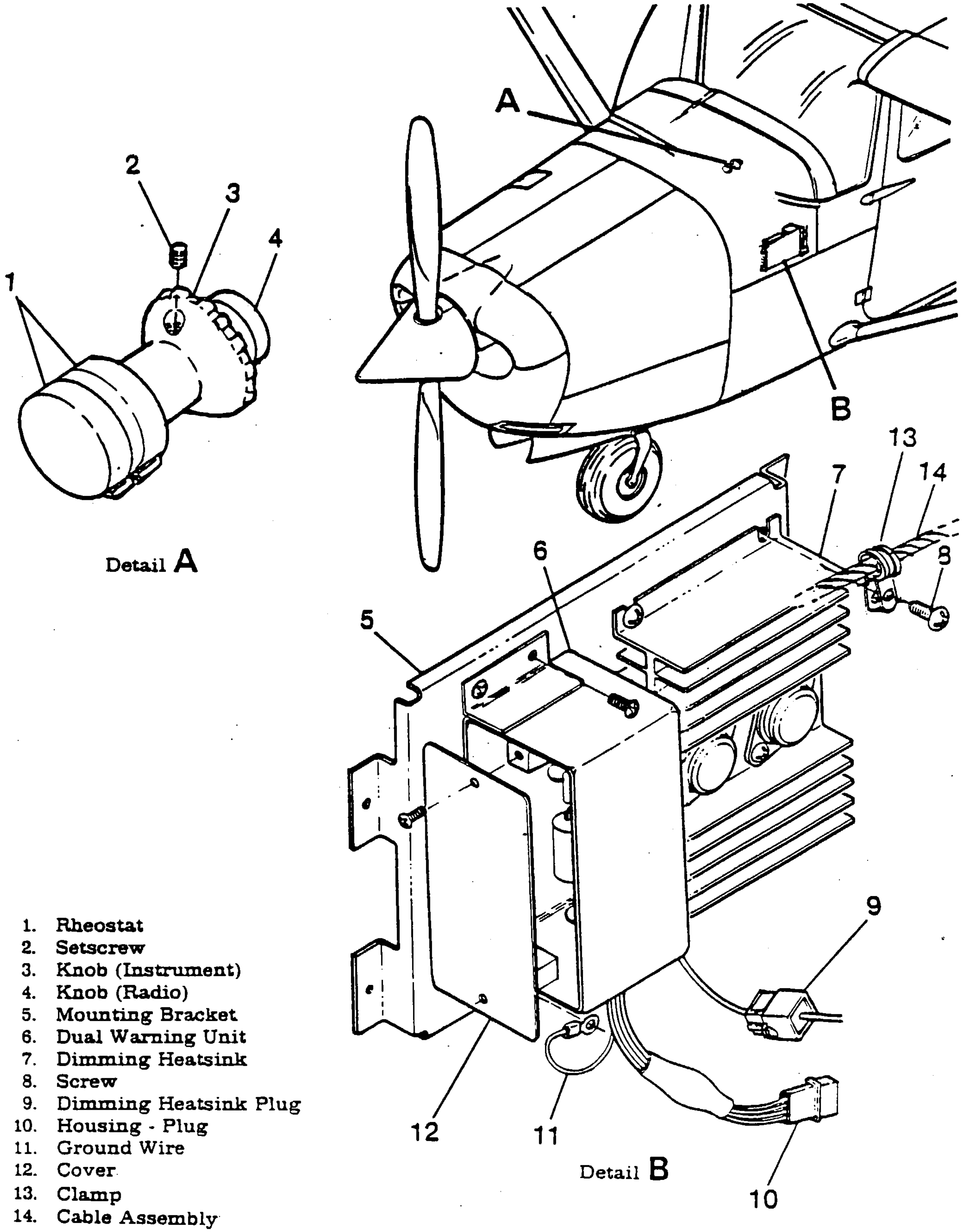
a. For easy access to map light assembly, rotate control wheel 90°.
b. Label wires connecting to map light assembly (terminal block) and remove screws securing wires to terminal block.
c. The assembly is now free for removal. Remove two screws securing map light to control wheel and remove map light assembly.
d. For reassembly reverse this procedure.

16-76A. REMOVAL AND INSTALLATION. (See figure 16-12, sheet 2.) (BEGINNING WITH 172RG1077 THRU 172RG1099.)

a. For easy access to map light assembly, rotate control wheel 90°.
b. To remove lamp, press in and rotate counterclockwise.
c. To remove rheostat, remove screws securing bracket (11).
d. Disconnect electrical leads from rheostat (10).
e. For reassembly reverse this procedure.

16-76B. REMOVAL AND INSTALLATION. (See figure 16-12, sheet 3.) (BEGINNING WITH 172RG1100.)

a. For easy access to map light assembly, rotate control wheel 90°.
b. To remove lamp, press in and rotate counterclockwise.
c. To remove rheostat, remove setscrew securing knob (11) and remove.
d. Disconnect electrical leads from rheostat (5).
e. Remove nut securing rheostat to control wheel (6) and remove rheostat (and washer beginning with 172RG1162).
f. For reassembly reverse this procedure making sure to install washer between rheostat and control wheel beginning with 172RG1162.

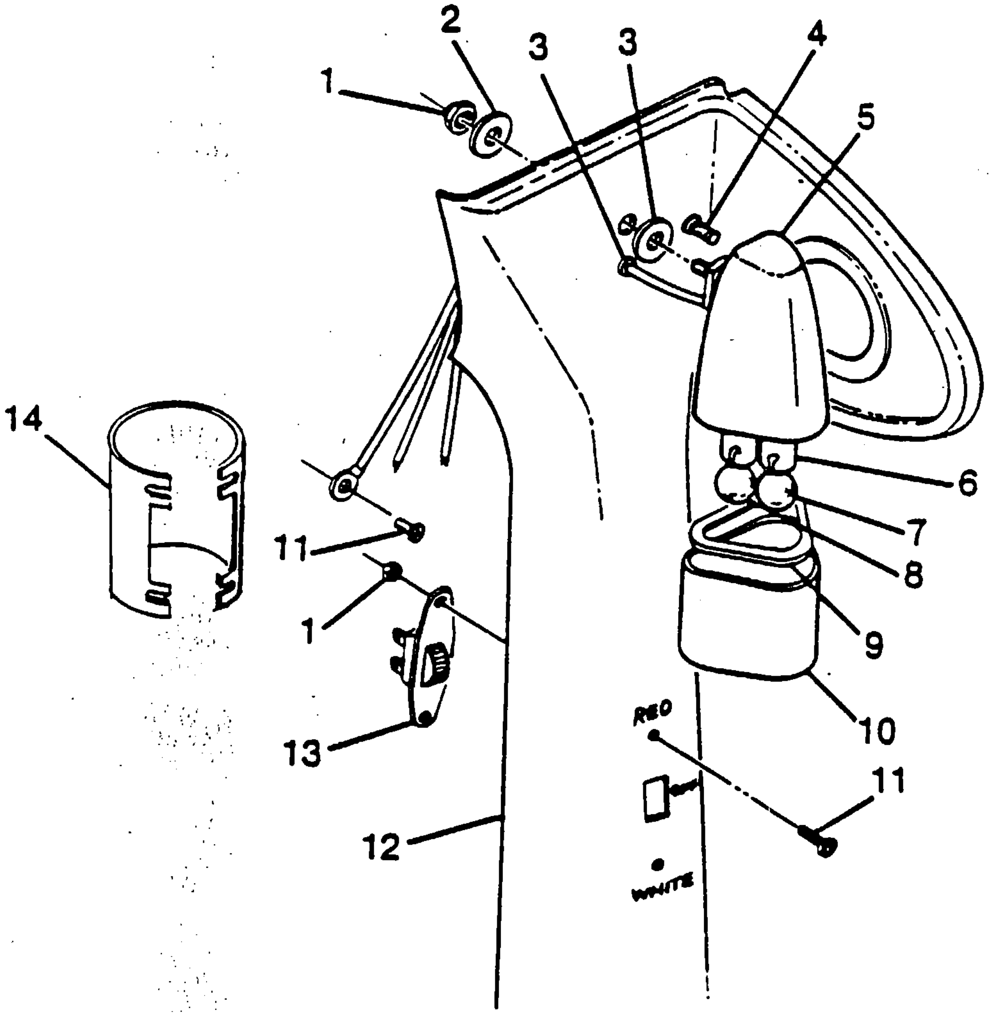


Detail A

Detail B

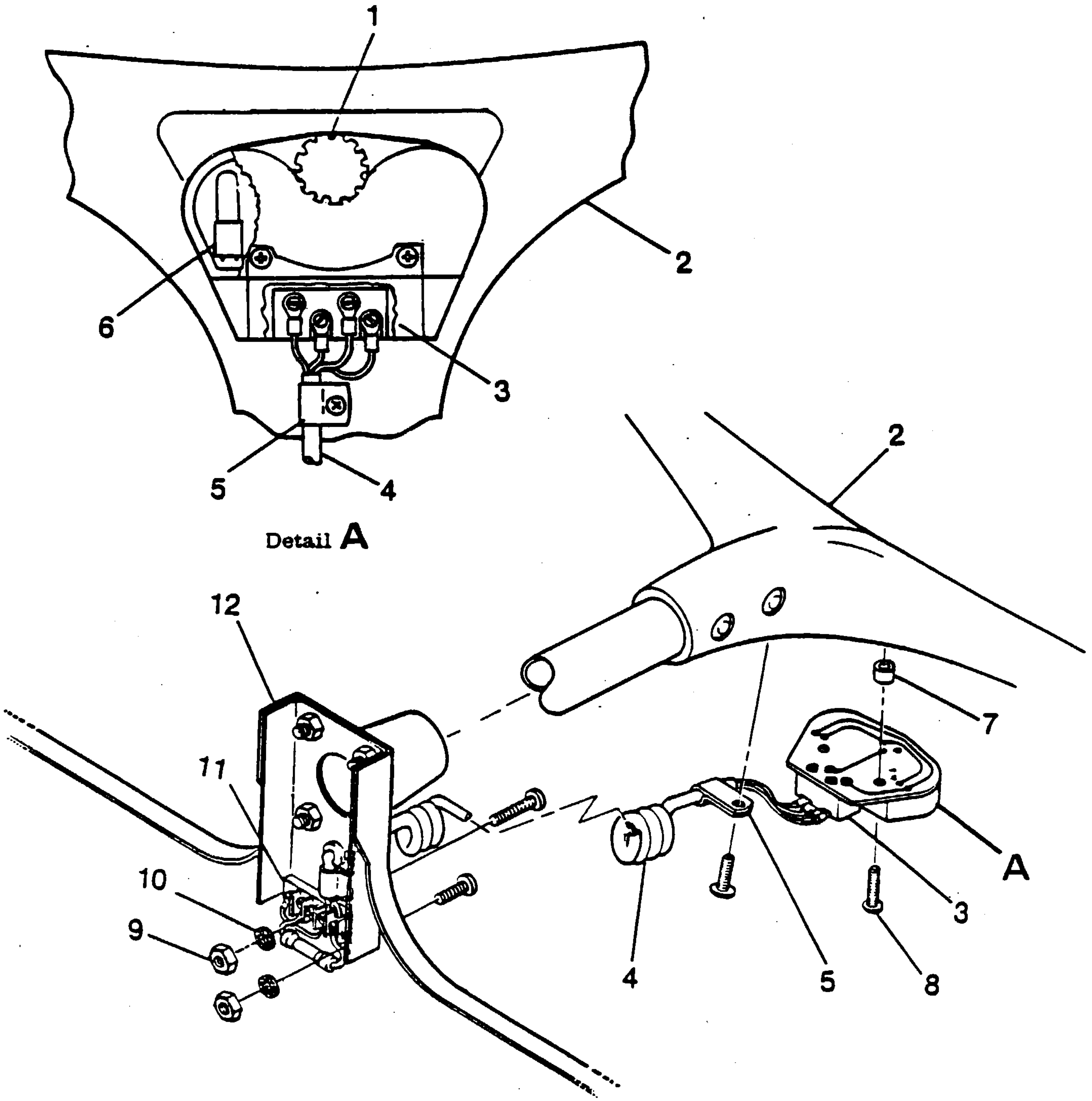
1. Rheostat
2. Setscrew
3. Knob (Instrument)
4. Knob (Radio)
5. Mounting Bracket
6. Dual Warning Unit
7. Dimming Heatsink
8. Screw
9. Dimming Heatsink Plug
10. Housing - Plug
11. Ground Wire
12. Cover
13. Clamp
14. Cable Assembly

Figure 16-10. Transistorized Light Dimming



1. Nut
2. Washer
3. Grommet
4. Adjustment Screw
5. Maplight Assembly
6. Socket Assembly
7. Lamp
8. Red Lamp
9. Lens
10. Hood
11. Screw
12. Front Doorpost Shield
13. Maplight Switch
14. Insulator

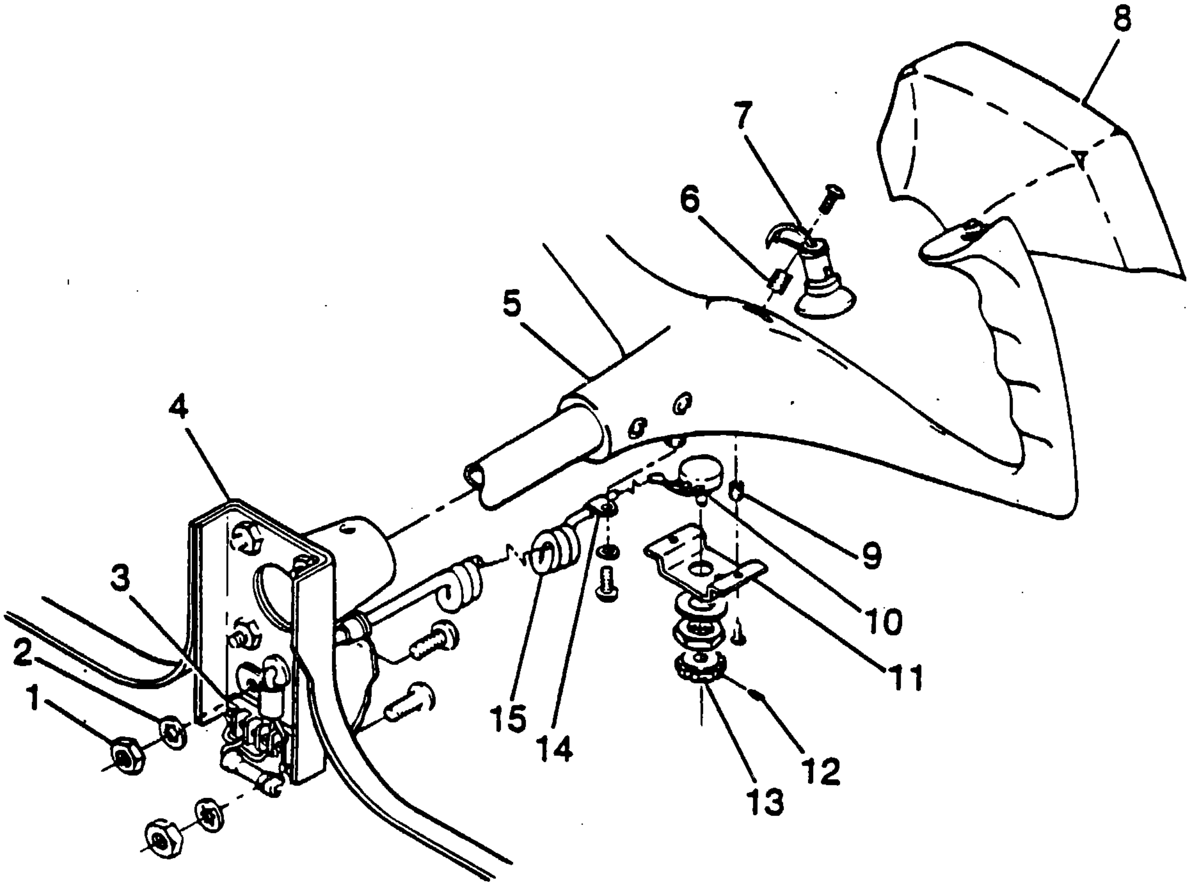
Figure 16-11. Map Light Installation



THRU 172RG1076

1. Knob
2. Control Wheel
3. Cover
4. Cable Assembly
5. Clamp
6. Lamp
7. Spacer
8. Screw
9. Nut
10. Washer
11. Terminal Board
12. Stationary Panel

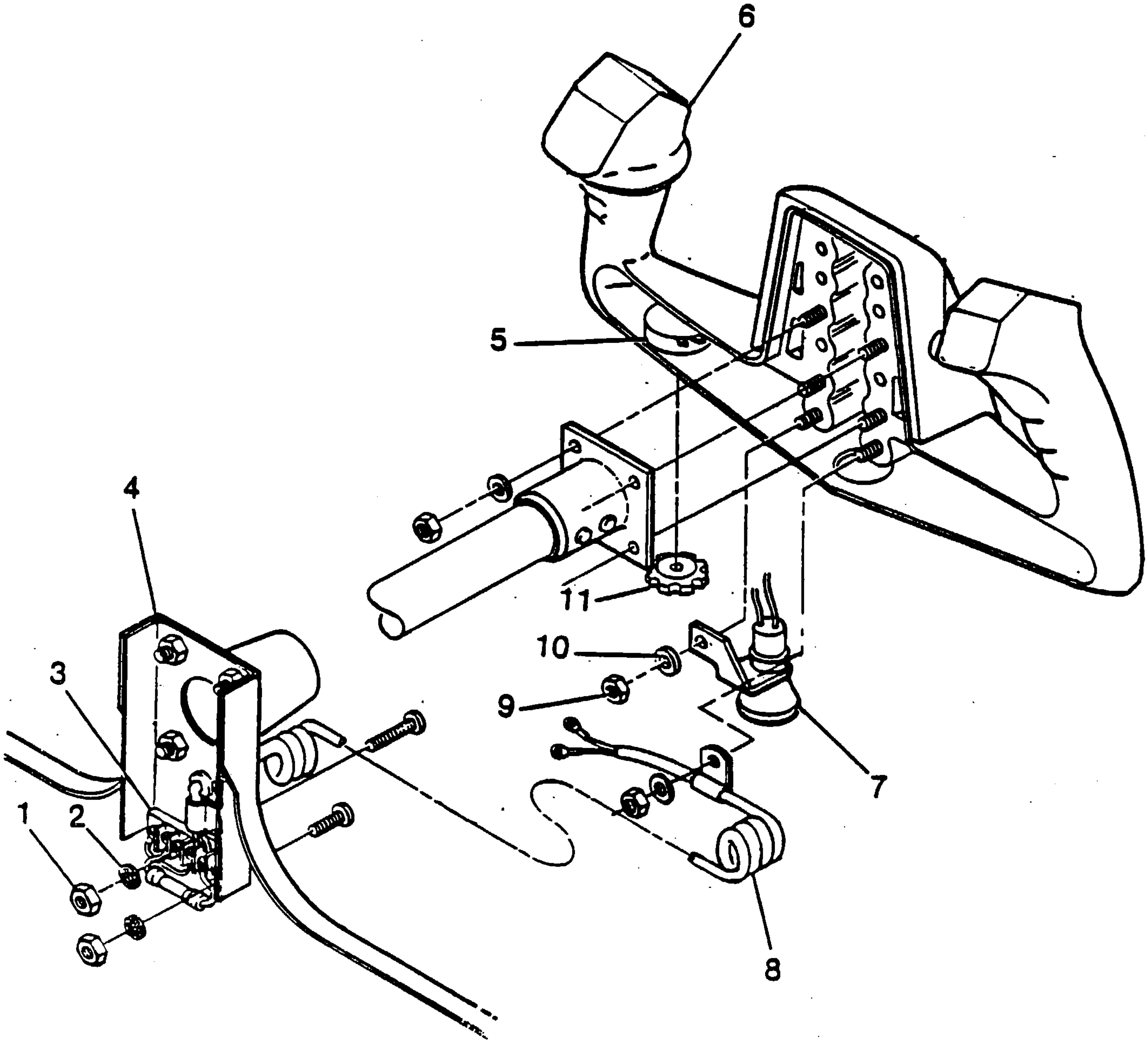
Figure 16-12. Control Wheel Map Light Installation (Sheet 1 of 3)



BEGINNING WITH 172RG1077

1. Nut
2. Washer
3. Terminal Board
4. Stationary Panel
5. Control Wheel
6. Insert
7. Map Light
8. Pad
9. Insert
10. Rheostat
11. Bracket
12. Set Screw
13. Knob
14. Clamp
15. Cable Assembly

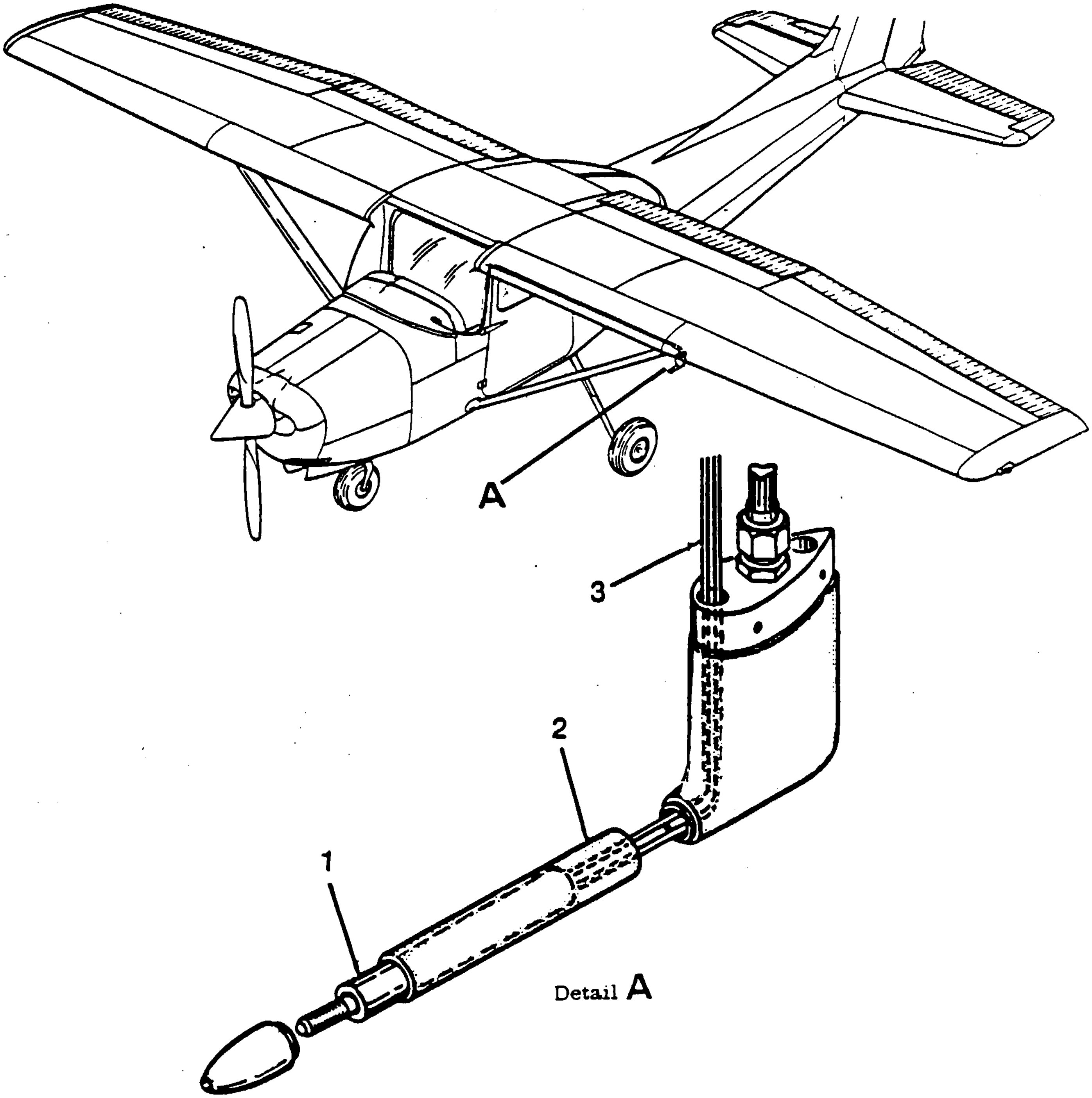
Figure 16-12. Control Wheel Map Light Installation (Sheet 2 of 3)



BEGINNING WITH 172RG1100

1. Nut
2. Washer
3. Terminal Board
4. Stationary Panel
5. Rheostat
6. Control Wheel
7. Map Light
8. Cable Assembly
9. Nut
10. Washer
11. Knob

Figure 16-12. Control Wheel Map Light Installation (Sheet 3 of 3)



1. Heating Element
2. Pitot Tube
3. Electrical Leads

Figure 16-13. Heated Pitot Installation

16-77. PITOT HEATER.

16-78. DESCRIPTION. An electrical heater unit is installed in some pitot tubes. The heater offsets the possibility of ice formations on the pitot tube. The heater is integrally mounted in the pitot tube and is operated by a switch on the instrument panel. (See figure 16-13.)

16-79. CIGAR LIGHTER. (THRU 172RG0891)

16-80. 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 unitl a click is heard.

CAUTION

Make sure master switch is "OFF" before inserting probe into circuit breaker on cigar lighter to reset.

16-81. STALL WARNING SWITCH.

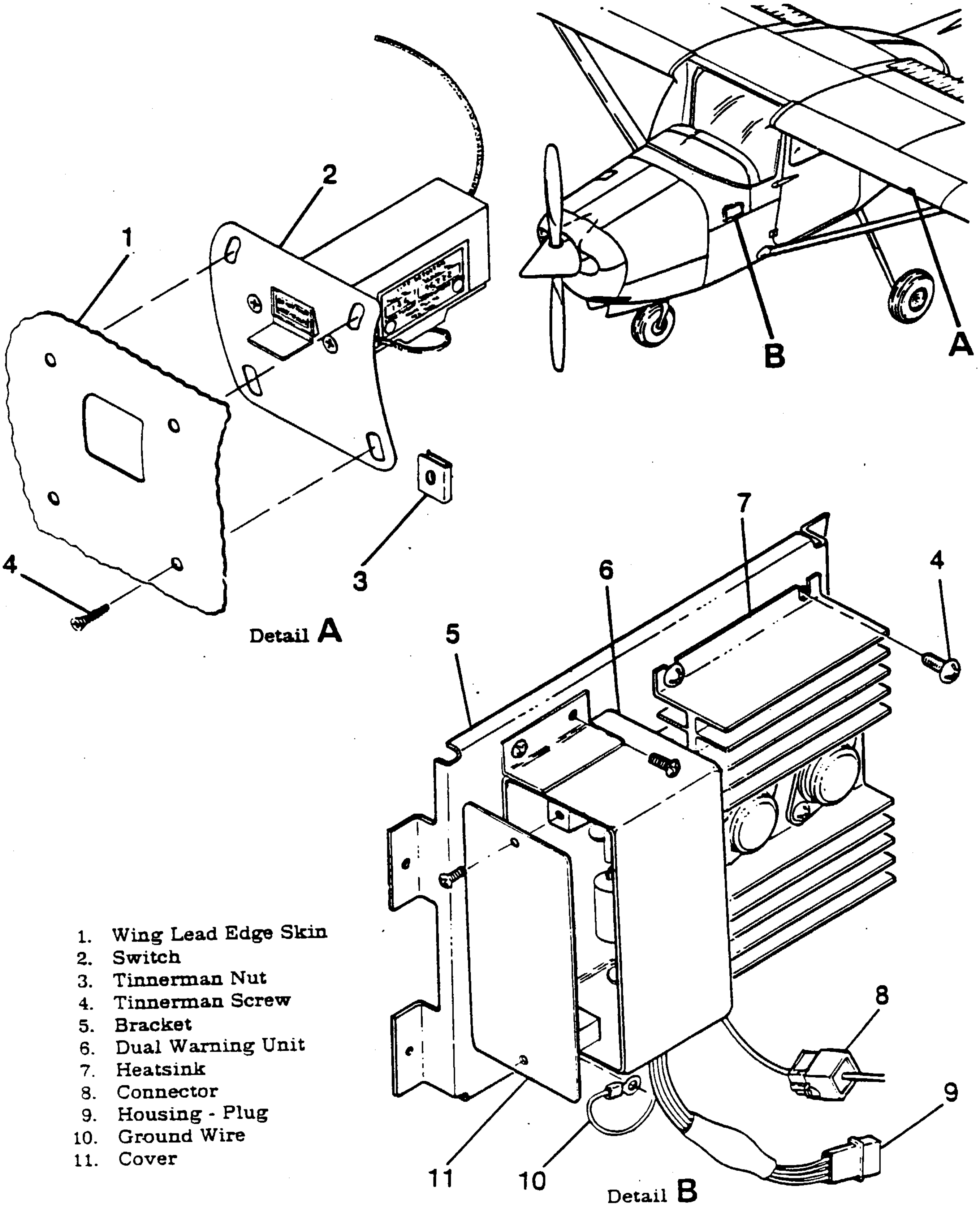
16-82. DESCRIPTION. The stall warning switch is installed in the leading edge of the left wing and is actuated by airflow over the surface of the wing. The switch will close as a stall condition is approached, actuating the stall warning horn. The horn should sound approximately five to ten miles per hour above actual stall speed. Initial installation of the switch should be with the lip of the warning switch approximately one sixteenth of an inch below the center line of the wing skin cutout. Test-fly the aircraft to determine if the horn sounds at the desired speed. If the horn sounds too soon, move the unit down slightly; if too late, move the unit up slighty.

16-83. REMOVAL AND INSTALLATION. (See figure 16-14.)

16-84. STALL WARNING UNIT.

16-85. DESCRIPTION. A solid state warning unit is mounted on a bracket, forward of the instrument panel on the left hand side. The warning signal initiated at the switch is transmitted by the warning unit through the radio speaker in the overhead console.

16-86. REMOVAL AND INSTALLATION. (See figure 16-14.)



1. Wing Lead Edge Skin
2. Switch
3. Tinnerman Nut
4. Tinnerman Screw
5. Bracket
6. Dual Warning Unit
7. Heatsink
8. Connector
9. Housing - Plug
10. Ground Wire
11. Cover

Figure 16-14. Stall Warning Installation

16-87. EMERGENCY LOCATOR TRANSMITTER.

16-88. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply with an externally mounted antenna. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a distinct, easily recognizable distress signal for reception by search and rescue personnel and others monitoring the emergency frequencies. The ELT exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet. The C589511-0117 transmitter, and the C589511-0113 transmitter on aircraft with Canadian registry, are used thru 172RG1150. Beginning with 172RG1151 the C589512-0103 transmitter is used on all aircraft.

The C589511-0113 transmits on 121.5 MHz at 25 mw rated power output for continuous hours in the temperature range of -4°F to + 131°F (-20°C to + 55°C). The C589511-0117 and C589512-0103 transmits on 121.5 and 343.0 MHz at 75 mw rated power output for 48 continuous hours in the temperature range of -4°F to + 131°F (-20°C to + 55°C).

Power is supplied to the transmitter by a battery-pack. The C589511-0114 alkaline battery-packs have the service life of the battery-pack stamped on the battery-pack, on the end of the transmitter below the switch and on top of the transmitter. The C589512-0107 alkaline battery-packs have the replacement date and date of installation on the battery-pack and the replacement date on the top of the transmitter.

16-89. 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 1 second (3 sweeps of the warble tone) or you may activate downed aircraft procedures by C.A.P., D.O.T. or F.A.A. personnel.

16-90. CHECK OUT INTERVAL:

100 HOURS OR THREE MONTHS, WHICHEVER COMES FIRST.

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. The FAA/DOT allows free space transmission tests from the aircraft any time within five minutes after each hour. The test time allowes is generally three sweeps of the warble tone, or approximately a one-second test. The control tower should be notified that a test is about to be performed.

NOTE

Without its antenna connected, the ELT will produce sufficient signal to reach your receiver, yet it will not disturb other communications or damage output circuitry.

NOTE

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

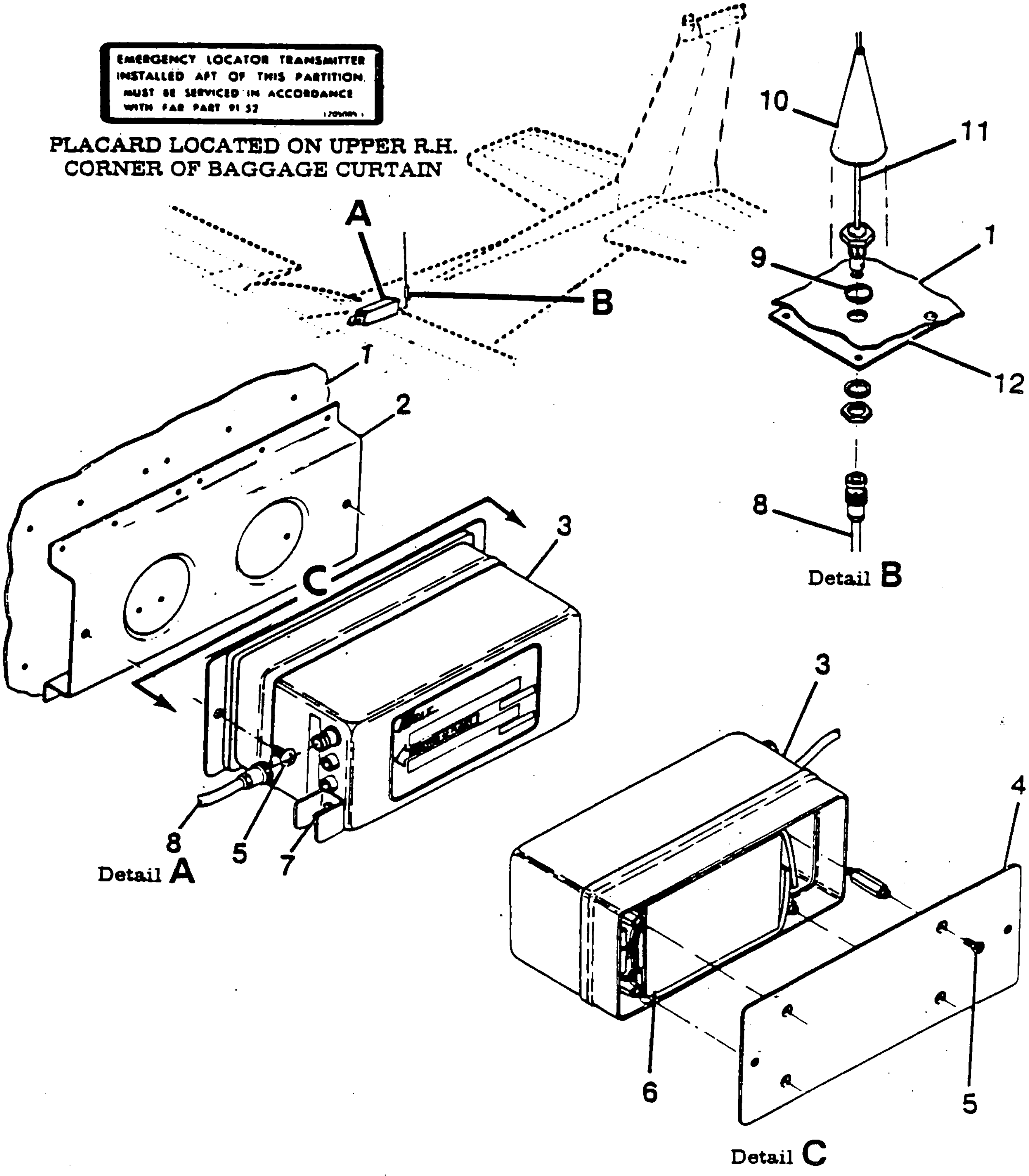
f. Check calendar date for replacement of battery-pack. This date is supplied on a sticker attached to the outside of the ELT case and to each battery.

16-91. REMOVAL AND INSTALLATION OF TRANSMITTER. (See figure 16-15.)
a. Remove cover to gain access to the transmitter and antenna.
b. Disconnect co-axial cable from end of transmitter.
c. Remove the two #10 screws from the baseplate of the ELT and remove ELT.
d. To reinstall transmitter, reverse preceding steps.

CAUTION

Ensure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

16-92. REMOVAL AND INSTALLATION OF ANTENNA. (See figure 16-15.)
a. Remove access cover from the right hand side of the tailcone.
b. Disconnect co-axial cable from base of antenna.
c. Remove the nut and lockwasher attaching the antenna base to the fuselage and the antenna will be free for removal.
d. To reinstall the antenna, reverse the preceding steps.



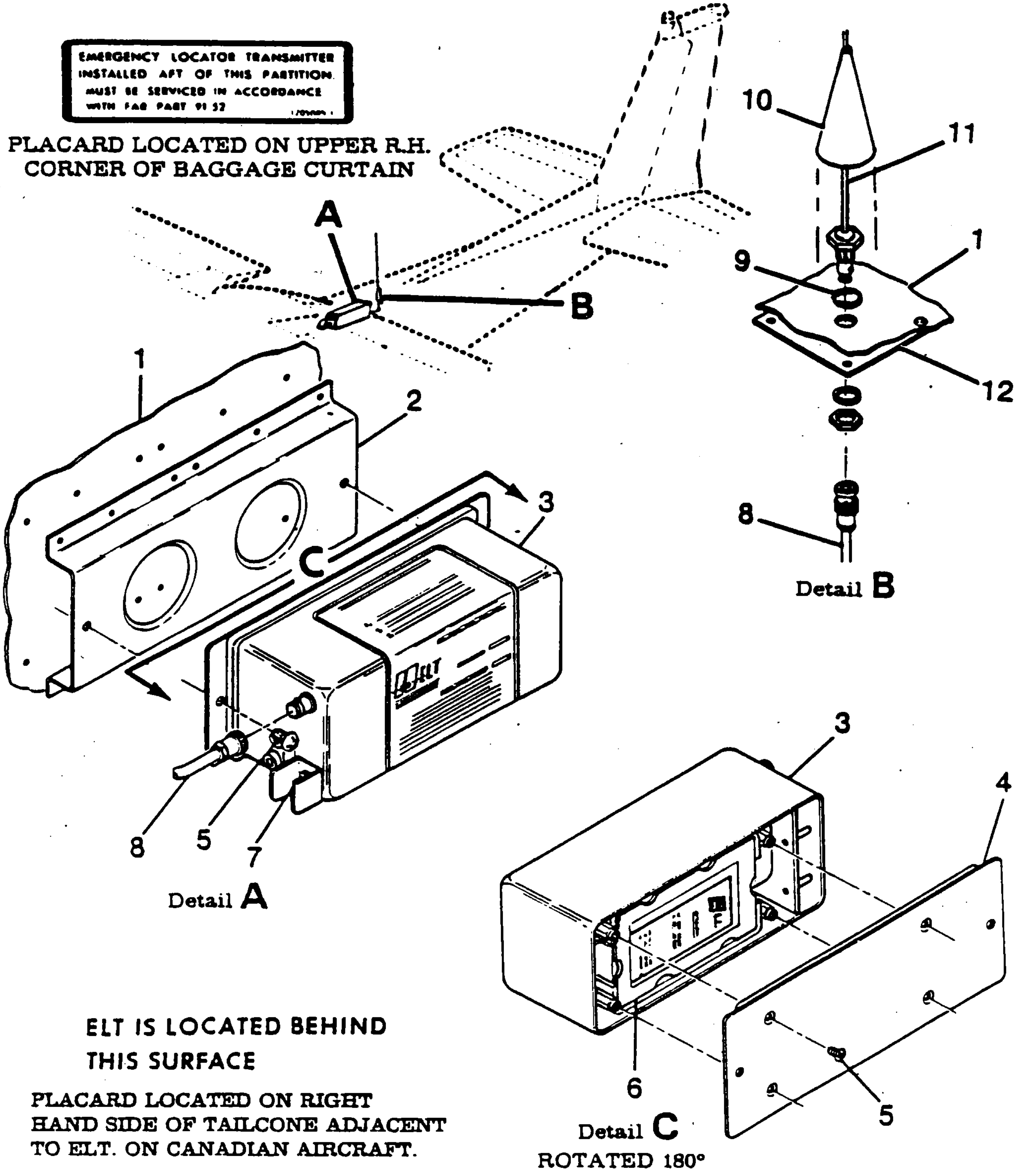
PLACARD LOCATED ON UPPER R.H. CORNER OF BAGGAGE CURTAIN

ROTATED 180°

THRU 172RG1099

1. Cabin Skin
2. Bracket
3. Transmitter
4. Cover
5. Screw
6. Battery Pack
7. Arm Switch
8. Co-axial Cable
9. Rubber Washer
10. Rubber Boot
11. Antenna
12. Doubler

Figure 16-15. Emergency Locator Transmitter Installation (Sheet 1 of 2)



EMERGENCY LOCATOR TRANSMITTER INSTALLED AFT OF THIS PARTITION. MUST BE SERVICED IN ACCORDANCE WITH FAR PART 91 52

PLACARD LOCATED ON UPPER R.H. CORNER OF BAGGAGE CURTAIN

ELT IS LOCATED BEHIND THIS SURFACE

PLACARD LOCATED ON RIGHT HAND SIDE OF TAILCONE ADJACENT TO ELT. ON CANADIAN AIRCRAFT.

BEGINNING WITH 172RG1100

1. Cabin Skin
2. Bracket
3. Transmitter
4. Cover
5. Screw
6. Battery Pack
7. Arm Switch
8. Co-axial Cable
9. Rubber Washer
10. Rubber Boot
11. Antenna
12. Doubler

Figure 16-15. Emergency Locator Transmitter Installation (Sheet 2 of 2)

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

The C589511-0111 and C589511-0119 co-axial cable must be installed as indicated on the cable sleeve. Cable end marked "TO ANT" must be connected to the ELT antenna, and the end marked "TO ELT" must be connected to the C589511-0113/-0117 and C589511-0103/-0104 transmitters.

16-92. REMOVAL AND INSTALLATION OF BATTERY PACK. (See figure 16-16.)

a. After the transmitter has been removed from aircraft in accordance with para. 16-91, place the transmitter switch in the OFF position.
b. Remove the four screws attaching the cover to the case and then remove the cover to gain access to the battery-pack.
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 16-16.
e. Connect the electrical connector as shown in figure 16-16.

NOTE

Before installing the C589511-0114 pack, check to ensure that its voltage is 7.5 volts or greater.

f. Replace the transmitter baseplate on the unit and pressing the baseplate and unit together attach baseplate with four nylok patch screws.
g. Stamp the new replacement date on the outside of the ELT. The date should be noted on the switching nameplate on the end of the unit as well as on the instruction nameplate on top of the unit.

WARNING

The battery-pack has pressurized contents. Do not recharge, short circuit or dispose of in fire.

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.

16-94. 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.

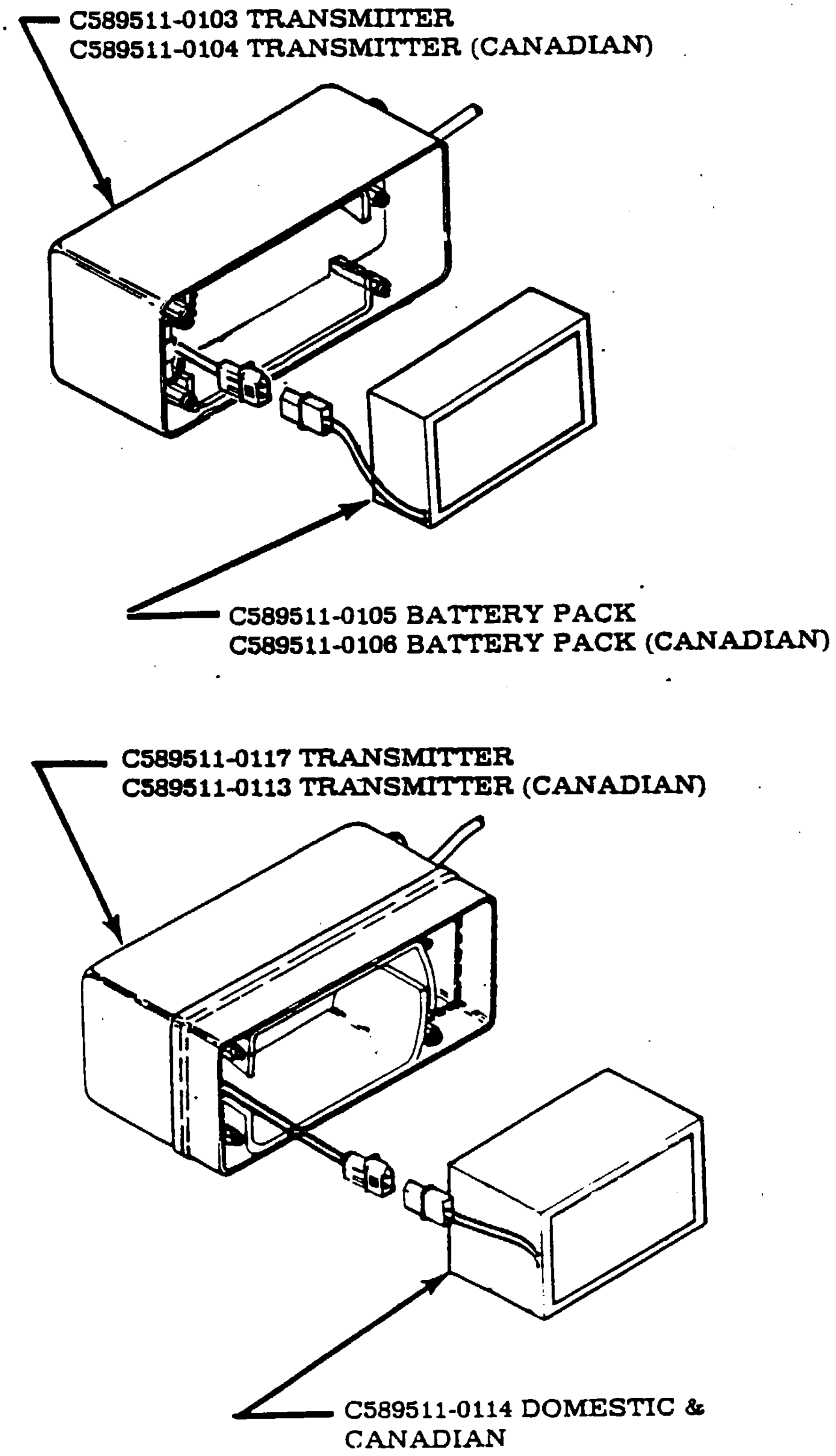


Figure 16-16. Battery Pack Installation

16-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
★POWER LOW.	Low battery voltage.	1. Set toggle switch to off. 2. Disconnect the battery-pack from the transmitter and connect a Simpson 260 model voltmeter and measure voltage. If the battery pack is 7.5 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 OK. If the battery is OK, check the transmitter as follows: a. Reconnect battery pack to the transmitter. b. By means of E.F. Johnson 105-0303-001 jackplugs and 3 inch maximum long leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to AUTO and observe the ammeter current drain. If the current-drain is in the 15-25 ma range, the transmitter or the co-axial cable is faulty.
	Faulty co-axial antenna cable.	4. Check co-axial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced.

★This test should be carried out with the co-axial cable provided with your unit.

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD					
	1980	1981	1982	1983	1984	1985
Battery Contactor	0.5	0.5	0.5	0.5	0.5	0.5
Fuel Indicators	0.1	0.1	0.1	0.1	0.1	0.1
Flashing Beacon Light	6.0	6.0	6.0	6.0	6.0	6.0
Instrument Lights	0.7	0.7	0.7	0.7	0.7	0.7
Position Lights	2.5	2.5	2.5	2.5	2.5	2.5
Turn Coordinator	0.3	0.3	0.3	0.3	0.3	0.3
OPTIONAL EQUIPMENT (RUNNING LOAD)						
Altitude Encoder (Blind)	0.1	0.1	0.1	0.1	0.1	0.1
Strobe Lights	3.0	3.0	3.0	3.0	3.0	2.0
Cessna 300 ADF (Type R-546E)	1.0	1.0	1.0	1.0	1.0	1.0
Cessna 300 Nav/Com (Type RT-385A)	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Cessna 300 HF Transceiver (PT10-A)	1.0***					
Cessna 300 Transponder (RT-359A)	2.0	2.0	2.0	2.0	2.0	2.0
Cessna 400 Glide Slope (Type R-443B) (40 Channel)	0.5	0.5	0.5	0.5	0.5	0.5
Cessna 400 Marker Beacon (Type R-402A)	0.1	0.1	0.1	0.1	0.1	0.1
Sunair SS Band HF Transceiver (Type ASB-125)	2.5**	2.5**	2.5**	2.5**	2.5**	2.5**
Cessna 300A Navomatic (Type AF-395A)	2.5	2.5	2.5	2.5	2.5	2.5
Cessna 200 Navomatic (Type AF-295B)	2.5	2.5	2.5	2.5	2.5	2.5
Cessna EA-401A Encoding Altimeter	0.1	0.1	0.1	0.1	0.1	
Narco 190 DME 2.9	2.9	2.9				
Cessna 400 XPDR (ARC Type RT-459A)	2.0	2.0	2.0	2.0	2.0	2.0
Pitot & Stall Warning Heat	5.25	5.8	5.8	5.8	5.8	5.8
Post Light	.64	0.6	0.6	0.6	0.6	0.6
RNAV 511	1.0	1.0				
Avionics Cooling Fan		1.0	1.0	0.6	0.6	1.0
DME-451 (450C)			1.2	1.2	1.2	
RNAV ANS5-351C			0.65	0.65	0.65	
Interphone System			†	†	†	†
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD						
Cigarette Lighter	7.0	7.0				
Clock	†	†	†	†	†	†
Control Wheel Map Light	0.1	0.1	0.1	0.1	0.1	0.1
Courtesy & Dome Lights	1.2	1.2	1.2	1.2	1.2	1.2
Flap Motor	10.0	8.5	8.5	8.5	8.5	1.8
Landing and Taxi Lights (Dual)	3.6 ea.	3.6 ea.				
Taxi Light			9.0	9.0	9.0	9.0
Landing Light			9.0	9.0	9.0	9.0
Map Light (Door Post)	0.2	0.2	0.2	0.2	0.2	0.2
Auxiliary Fuel Pump	0.2	0.3	0.3	0.3	0.3	0.3
Electrohydraulic Power Pack (LDG GEAR)	17.5	17.5	17.5	17.5	17.5	17.5
Standby Vacuum System						13.0

† Negligible
* 2.25 Transmitting
** 7.50 Transmitting
*** 9.00 Transmitting

SECTION 17

STRUCTURAL REPAIR

17-1. STRUCTURAL REPAIR.

17-2. 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.

17-3. EQUIPMENT AND TOOLS.

17-4. 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 17-1. 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.

17-5. 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 points, such as fuselage, firewall, wing and landing gear. These fuselage repair jigs are obtainable from the factory.

17-6. 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.

17-7. WING TWIST AND STABILIZER ANGLE-OF-INCIDENCE. Wing twist (washout) and horizontal stabilizer angle-of-incidence are shown in the following table. Stabilizers do not have twist. Wings have no twist from the root to wing station 100.00. All twist in the wing panel occurs between this station and the tip rib. See figure 17-2 for wing twist measurement.

WING	Twist (Washout)	3°
STABILIZER	Angle-of-Incidence	-30° 30'

17-8. REPAIR MATERIALS. Thickness of a material on which a repair is to be made can easily be determined by measuring with a micrometer. In general, material used in Cessna aircraft covered in this manual is made from 2024 aluminum alloy, heat treated to a -T3, -T4, or -T42 condition. If the type of material cannot readily be determined, 2024-T3 may be used in making repairs, since the strength of -T3 is greater than -T4 or -T42 (-T4 and -T42 may be used interchangeably, but they may not be substituted for -T3). When necessary to form a part with a smaller bend radius than the standard cold bending radius for 2024-T4, use 2024-0 and heat treat to 2024-T42 after forming. The repair material used in making a repair must equal the gauge of the material being replaced, unless otherwise noted. It is often practical to cut repair pieces from service parts listed in the aircraft Parts Catalog. A few components (empennage tips, for example) are fabricated from glass-fiber constructed material.

17-9. WING.

17-10. DESCRIPTION. The wing assemblies are a semicantilever type employing semimoncoque type of structure. Basically, the internal structure consists of built-up front and rear spar assemblies, a formed auxiliary spar assembly and formed sheet metal nose, intermediate, and trailing edge ribs. Stressed skin, riveted to the rib and spar structures, completes the rigid structure. Access openings (hand holes with removable cover plates) are located in the underside of the wing between the wing root and tip section. These openings afford access to aileron bellcranks, flap bellcranks, electrical wiring, strut attach fittings, control cables and pulleys, and control disconnect points.

17-11. WING SKIN.

17-12. 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 damage 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.

17-13. REPAIRABLE DAMAGE. Figure 17-4 outlines typical repair to be employed in patching skin. Before installing a patch, trim the damaged area to form a retangular pattern, leaving at least a one-half inch radius at each corner, and de-burr. The sides of the hole should lie span-wise or chord-wise. A circular patch may also be used. If the patch is in an area where flush rivets are used, make a flush patch type of repair; if in an area where flush rivets are not used, make an overlapping type of repair. Where optimum appearance and airflow are desired, the flush patch may be used. Careful workmanship will eliminate gaps at butt-joints; however, an epoxy type filler may be used at such joints.

17-14. 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.

17-15. WING STRINGERS.

17-16. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-13.)

17-17. REPAIRABLE DAMAGE. Figure 17-5 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.

17-18. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a stringer is so badly damaged that more than one section must be spliced, replacement is recommended.

17-19. WING AUXILIARY SPARS.

17-20. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-13.)

17-21. REPAIRABLE DAMAGE. Figure 17-8 illustrates a typical auxiliary spar repair.

17-22. 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.

17-23. WING RIBS.

17-24. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-13.)

17-25. REPAIRABLE DAMAGE. Figure 17-6 illustrates a typical wing rib repair.

17-26. 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.

17-27. WING SPARS.

17-28. 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.

17-29. REPAIRABLE DAMAGE. Figure 17-7, 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.

17-30. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Damage so extensive that repair is not practicable requires replacement of a complete wing spar. Also refer to paragraph 17-2.

17-31. WING LEADING EDGES.

17-32. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-12.)

17-33. REPAIRABLE DAMAGE. Wing skin repairs, outlined in paragraph 17-13, 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 fugure 17-13. If the damage would require a repair which could not be made between adjacent ribs, refer to the following paragraph.

17-34. 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 17-13) to facilitate replacement.

17-35. BONDED LEADING EDGES .

17-36. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-12.)

17-37. REPAIRABLE DAMAGE. (Refer to figure 17-11.) 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.

17-38. AILERONS.

17-39. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-12.)

17-40. REPAIRABLE DAMAGE. The repair shown in figure 17-9 may be used to repair damage to aileron leading edge skins. Figure 17-4 may be used as a guide to repair damage to flat surface between corrugations, when damaged area includes corrugations, see figure 17-12. It is recommended that material used for repair be cut from spare parts of the same guage and corrugation spacing. Following repair, the aileron must be balanced. Refer to paragraph 17-43 for balancing. If damage would require a repair which could not be made between adjacent ribs, refer to paragraph 17-41.

17-41. 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 17-42 and figure 17-3.

17-42. **AILERON BALANCING. Following repair, replacement or painting, the aileron must be balanced. A flight control surface balancing fixture kit is available (P/N5180002-1). See figure 17-3 for procedures pertaining to the use of this kit.**

17-43. WING FLAPS.

17-44. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-12.)

17-45. REPAIRABLE DAMAGE. Flap repairs should be similar to aileron repairs discussed in paragraph 17-41. Since the flap is not considered a movable control surface, no balancing is required.

17-46. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Flap repairs which require replacment of parts should be similar to aileron repairs discussed in paragraph 17-41. Since the flap is not considered a movable control surface, no balancing is required.

17-47. ELEVATORS AND RUDDER.

17-48. NEGLIGIBLE DAMAGE. Refer to paragraph 17-12. 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.

17-49. REPAIRABLE DAMAGE. Skin patches illustrated in figure 17-4 may be used to repair skin damage between corrugations. For skin damage which includes corrugations refer to figure 17-12. Following repair the elevator/rudder must be balanced. Refer to figure 17-3 for balancing. If damage would require a repair which could not be made between adjacent ribs, see paragraph 17-50.

17-50. 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 17-51 and figure 17-3.

17-51. **ELEVATOR AND RUDDER BALANCING. Following repair, replacement or painting, the elevators and rudder must be balanced. A flight control surface balancing fixture kit is available (P/N5180002-1). See figure 17-3 for procedures pertaining to the use of this kit.**

17-52. FIN AND STABILIZER.

17-53. NEGLIGIBLE DAMAGE. (Refer to paragraph 17-12.)

17-54. REPAIRABLE DAMAGE. Skin patches illustrated in figure 17-4 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.

17-55. 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.

17-56. FUSELAGE.

17-57. DESCRIPTION. The fuselage is of semimonocoque construction, consisting of formed bulkheads, longitudinal stringer, reinforcing channels, and skin panels.

17-58. NEGLIGIBLE DAMAGE. Refer to paragraph 17-12. 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 thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

17-39A. CRACKS IN CORRUGATED AILERON SKINS (Continued from page 17-5)

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 17-39, -40, and -41 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 or a trailing edge rivet.
   - C. Cracks in more than six trailing edge rivet locations per skin.

   Refer to paragraphs 17-39, -40, and -41 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.

17-44A. CRACKS IN CORRUGATED FLAP SKINS (Continued from page 17-5)

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 17-44, -45, and -46 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 or a trailing edge rivet.
   - C. Cracks in more than six trailing edge rivet locations per skin.

   Refer to paragraphs 17-44, -45, and -46 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.

17-48A. CRACKS IN CORRUGATED ELEVATOR SKINS (Continued from page 17-5)

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 17-48, -49, and -50 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 or a trailing edge rivet.

   C. Cracks in more than six trailing edge rivet locations per skin.

   Refer to paragraphs 17-48, -49, and -50 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.

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 × 1/2 × .060 inch 2024-T4 extruded angle, riveted over the wrinkle and extended to within 1/16 to 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 17-12.

17-59. REPAIRABLE DAMAGE. Fuselage skin repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 17-13. Stringers, formed skin flanges, bulkhead channels and similar parts may be repaired as shown in figure 17-5.

17-60. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Fuselage skin major repairs may be accomplished in the same manner as the wing repairs outlined in paragraph 17-13. Damaged fittings must be replaced. Seat rails serve as structural parts of the fuselage and must be replaced if damaged.

17-61. BONDED DOORS.

17-62. REPAIRABLE DAMAGE. Bonded doors may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in doors may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43.13-1 are also applicable to bonded doors.

17-63. BULKHEADS.

17-64. 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.

17-65. 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.

17-66. FIREWALL DAMAGE. Firewall sheets may be repaired by removing the damaged material (MIL-S-5059) corrosion-resistant (18-8) steel, 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 steel (MS20450C) rivets. The heater valve, located in the right-hand side of the firewall, is secured with steel rivets. The remainder of the firewall, attaching structure and bracketry is attached with aluminum (MS20470AD) rivets.

17-67. **FASTENERS.** Fasteners used in the aircraft are generally solid aluminum rivets, blind rivets, and steel-threaded fasteners. Usage of each is primarily a function of the loads to be carried, accessibility, and frequency of removal. Rivets used in aircraft construction are usually fabricated from aluminum alloys. In special cases, monel, corrosion-resistant steel and mild steel, copper, and iron rivets are used.

17-67A. **RIVETS.** Standard solid-shank MS rivets are those generally used in aircraft construction. They are fabricated in the following head types: roundhead, flathead, countersunk head, and brazier head. Flathead rivets are generally used in the aircraft interior where head clearance is required. MS20426 countersunk head rivets are used on the exterior surfaces of the aircraft to minimize turbulent airflow. MS20470 brazier head rivets are used on the exterior surfaces of the aircraft where strength requirements necessitate a stronger rivet head than that of the countersunk head rivet. Both the brazier head and the countersunk head rivets are used on the exterior of the aircraft where head clearance is required. Hi-shear rivets are special, patented rivets having a hi-shear strength equivalent to that of standard AN bolts. They are used in special cases in locations where hi-shear loads are present, such as in spars, wings, and in heavy bulkhead ribs. This rivet consists of a cadmium-plated pin of alloy steel. Some have a collar of aluminum alloy. Some of these rivets can be readily identified by the presence of the attached collar in place of the formed head on standard rivets. Blind rivets are used, where strength requirements permit, where one side of the structure is inaccessible, making it impossible or impractical to drive standard solid-shank rivets.

17-67B. **REPLACEMENT OF HI-SHEAR RIVETS.** Replacement of hi-shear rivets 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 the following fasteners.

a. NAS464P-* bolt, MS21042-* nut and AN960-* washer in place of Hi-shear rivets for forgings with machined flat surfaces around attachment holes.
b. NAS464P-* bolt, ESNA2935-* mating base washer and ESNA RM52LH2935-* self-aligning nut for forgings (with draft angle of up to a maximum of 8°) without machined flat surfaces around attachment holes.

*Dash numbers to be determined according to the size of the holes and the grip lengths required. Bolt grip length should be chosen so that no threads remain in the bearing area.

17-67C. **SUBSTITUTION OF RIVETS.**

a. Solid-shank rivets (MS20426AD and MS20470AD). When placing rivets in installations which require raised head rivets, it is desirable to use rivets identical to the type of rivet removed. Countersunk-head rivets (MS20426) are to be replaced by rivets of the same type and degree of countersink. When rivet holes become enlarged, deformed, or otherwise damaged, use the next larger size rivet as a replacment. Replacement shall not be made with rivets of lower strength material.
b. Hi-shear Rivets. When hi-shear rivets are not available, replacement of sizes 3/16-inch or greater rivets shall be made with bolts of equal or greater strength than the rivet being replaced, and with self-locking nuts of the same diameter
c. The following pages contain approved solid-shank and hi-shear rivet substitutions.

Replace	In thickness (or thicker)	With
MS20470AD3	.025	NAS1398B4, NAS1398D4
	.020	NAS1738B4, NAS1738D4, NAS1768D4, CR3213-4, CR3243-4
MS20470AD4	.050	NAS1398B4, NAS1398D4
	.040	NAS1398B5, NAS1398D5, NAS1738B4, NAS1738E4, NAS1768D4, CR3213-4
	.032	NAS1738B5, NAS1738E5, NAS1768D5, CR3213-5, CR3243-4
	.025	CR3243-5
MS20470AD5	.063	NAS1398B5, NAS1398D5
	.050	NAS1398B6, NAS1398D6, NAS1398B5, NAS1738E5, CR3213-5
	.040	NAS1738B6, NAS1738E6, NAS1768D5, CR3213-6, CR3243-5
	.032	CR3243-6
MS20470AD6	.080	NAS1398B6
	.071	NAS1398D6
	.063	NAS1738B6, NAS1738D6, NAS1768D6, CR3213-6
	.050	CR3243-6
MS20426AD3 (Countersunk) (See Note 1)	.063	NAS1399B4, NAS1399D4
	.040	NAS1769D4, CR3212-4
	.025	NAS1769B4, NAS1739E4, CR3242-4
MS20426AD4 (Countersunk)	.080	NAS1399B4, NAS1399D4
	.063	NAS1739B4, NAS1739D4, CR3212-4
	.050	NAS1769D4
	.040	CR3242-4
(See Note 1)	.050	CR3212-5
	.040	NAS1739B5, NAS1739D5, NAS1769D4
	.032	CR3242-5
MS20426AD4 (Dimpled)	.063	NAS1739B4, NAS1739D4

Replace	In thickness (or thicker)	With
MS20426AD5 (Countersunk)	.090	NAS1399B5, NAS1399D5
	.080	CR3212-5
	.071	NAS1739B5, NAS1739E5
	.063	NAS1769D5
	.050	CR3242-5
(See Note 1)	.063	NAS1739B6, NAS1739D6, NAS1769D6, CR3212-6
	.040	CR3242-6
	.032	AN509-10 Screw with MS20365 Nut
MS20426AD5 (Dimpled)	.071	NAS1739B5, NAS1739D5
	.090	NAS1739B6, NAS1739D6, CR3212-6
MS20426AD6 (Countersunk)	.071	NAS1769D6
	.063	CR3242-6
	.032	AN509-10 Screw with MS20365 Nut
MS20426AD6 (Dimpled)	.090	NAS1739B6, NAS1739D6
	.032	AN509-10 Screw with MS20365 Nut

NOTE 1: Rework required. Countersink oversize to accommodate oversize rivet.

NOTE 2: Do not use blind rivets in high-vibration areas or to pull heavy sheets or extrusions together. High-vibration areas include the nacelle or engine compartment including the firewall. Heavy sheets or extrusions include spar caps.

REPLACE		DIAMETER	WITH	
Fastener	Collar		Fastener	Collar
● NAS178	NAS179	(See Note 1)	● NAS1054	NAS179, NAS528
		(See Note 1)	● NAS14XX	NAS1080C, NAS1080E, NAS1080G
		(See Note 1)	● NAS529	NAS524A
		(See Notes 1 and 2)	★ NAS1446	NAS1080C, NAS1080A6
		(See Note 1)	★ NAS7034	NAS1080K
		(See Note 1)	□ NAS464	AN364, MS20364, MS21042
			□ NAS1103	
			□ NAS1303	
			□ NAS6203	
			□ AN173	AN305, MS20305, MS21044, MS21045
● NAS1054	NAS179, NAS528		● NAS14XX	NAS1080C, NAS1080E
			● NAS529	NAS524A
		(See Note 2)	★ NAS1446	NAS1080C, NAS1080A6
			★ NAS7034	NAS1080K
			□ NAS464	AN364, MS20304, MS21042
			□ NAS1103	
			□ NAS1305	
			□ NAS6203	
● NAS14XX	NAS1080C NAS1080E NAS1080G		● NAS529	NAS524A
			★ NAS1446	NAS1080C, NAS1080A6
			★ NAS7034	NAS1080K
			□ NAS464	AN364, MS20364, MS21042
			□ NAS1103	
			□ NAS1303	
			□ NAS6203	
● NAS529	NAS524A	(See Note 3)	□ NAS1446	NAS1080C, NAS1080A6

NOTE 1: See appropriate tables for nominal diameters available.

NOTE 2: Available in oversize for repair of elongated holes. Ream holes to provide a .001 inch interference fit.

NOTE 3: NAS1446 oversize only permitted as a replacement for NAS529.

● Steel shank fastener designed for drive-on collars.

★ Steel shank fastener designed for squeeze-on collars. Installation requires sufficient space for the tool and extended shank of the fastener.

□ Threaded fastener.

17-68. ENGINE MOUNT.

17-69. DESCRIPTION. The engine mount is constructed of 4130 chrome molybdenum steel tubing. The mount is composed of sections of steel tubing, welded together and reinforced with gussets. The mount is fastened to the fuselage at four points. Refer to Section 11.

17-70. 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.

17-71. ENGINE MOUNT RADIAL SUPPORT DAMAGE. Minor damage such as a crack adjacent to an engine attaching lug may be repaired by rewelding the support tube and extending a gusset past the damaged area. Extensively damaged parts must be replaced.

17-72. 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. Refer to Section 18 for painting engine mount.

17-73. 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.

17-74. ENGINE COWLING.

17-75. 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.

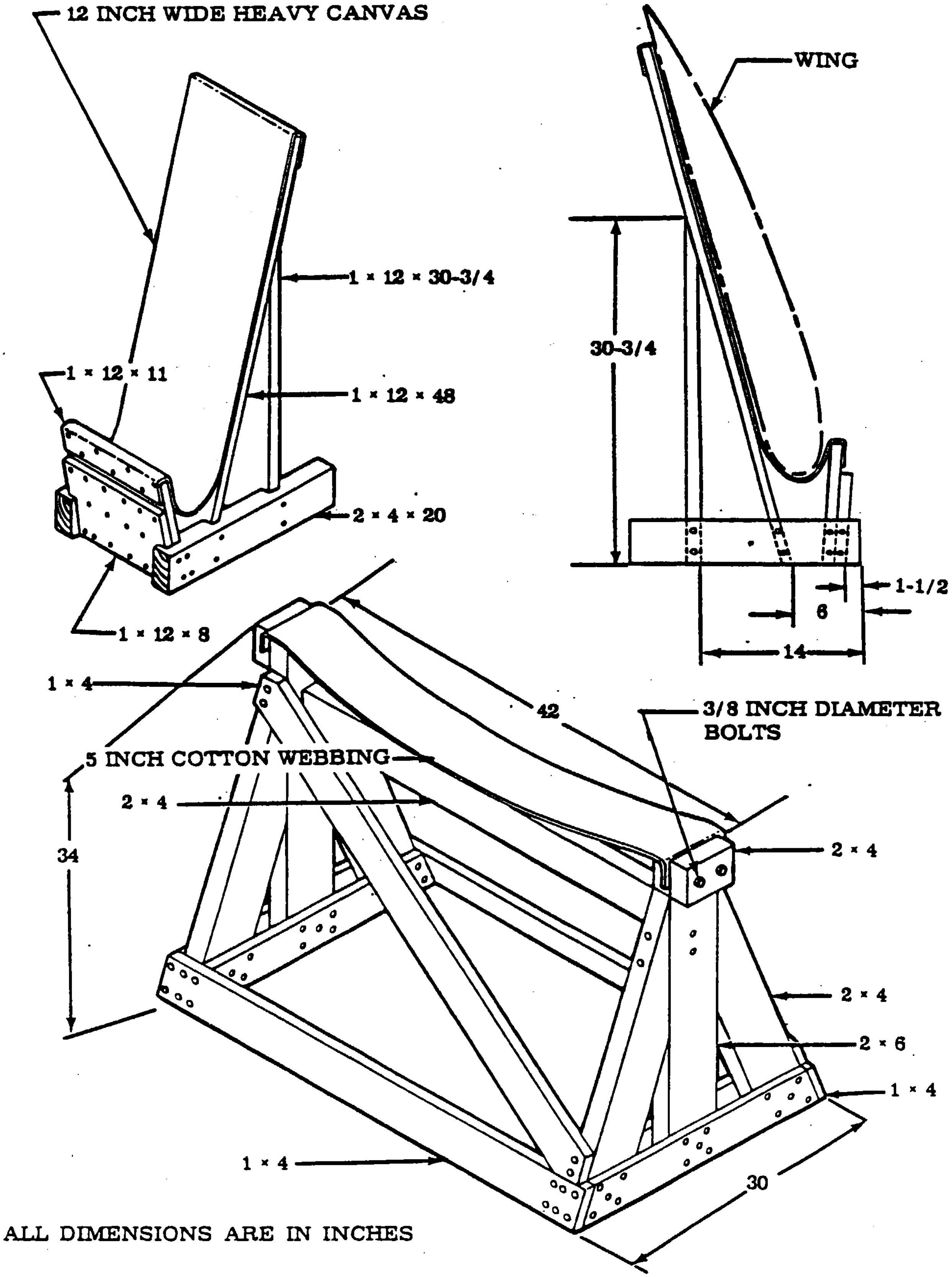
17-76. REPAIR OF REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to their small size they are easier to replace than to repair.

17-77. 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 resin. Epoxy resins are preferable for making repairs, since epoxy compounds are usually more stable and predictable than polyester and, in addition, give better adhesion. In addition, repair kits are also available for the repair of cracks in ABS, PBC, PVPC, graphite and fiberglass material. These kits P/N's 51543 thru 51548 are available from Cessna Supply Division.

17-78. CORROSION AND CORROSION CONTROL.

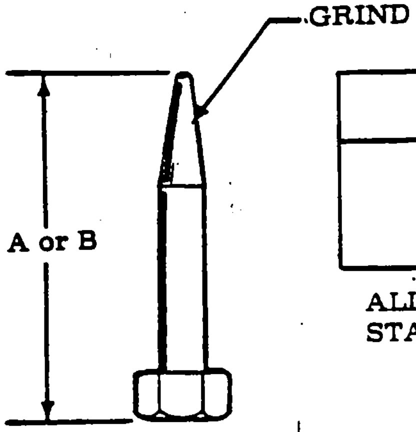
NOTE

For information on corrosion and corrosion control for aircraft, refer to FAA Advisory Circular AC43-4.



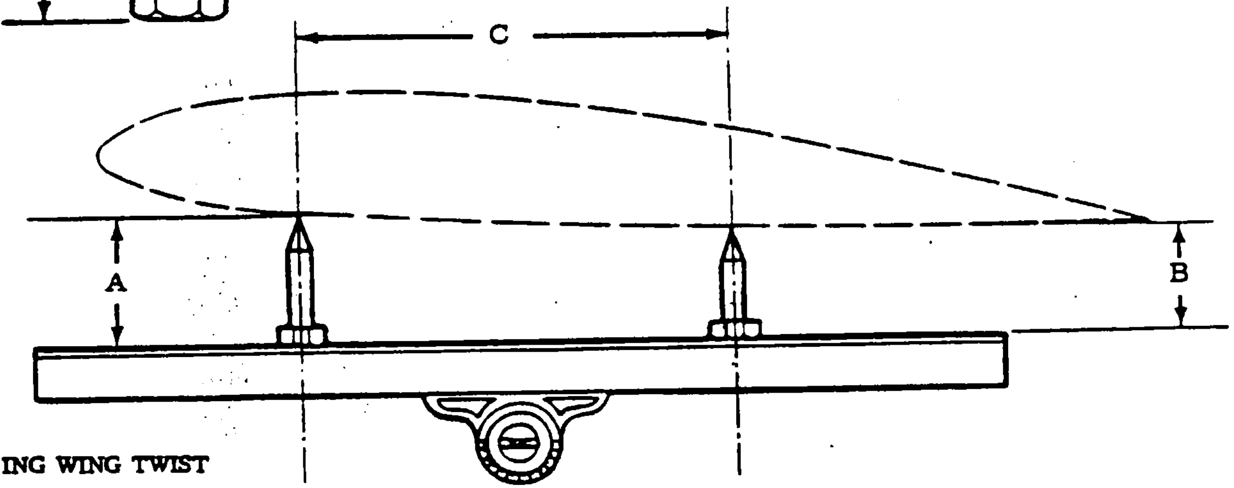
ALL DIMENSIONS ARE IN INCHES

Figure 17-1.Wing and Fuselage Support Stands



A	B	C	WING STATION
2.00	1.00	29.50	39.00
2.00	1.00	29.50	100.00
.45	1.00	24.00	208.00

ALL WING TWIST OCCURS BETWEEN STA. 100.00 AND STA. 208.00 (Refer to paragraph 17-7.)



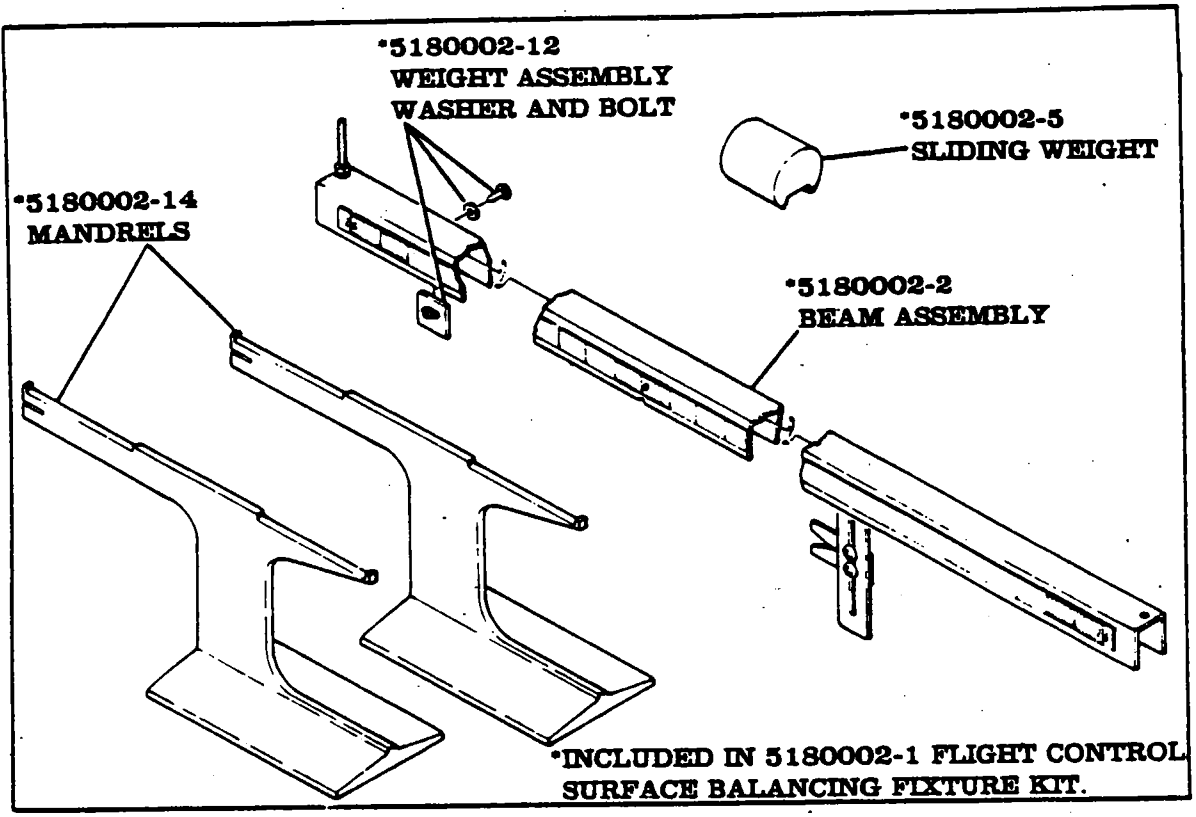
MEASURING WING TWIST

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" 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 .10 inch maximum to attain parallelism.

Figure 17-2. Checking Wing Twist

FLIGHT CONTROL SURFACE BALANCING FIXTURE KIT
(PART NUMBER 5180002-1)



GENERAL NOTES

1. Balance control surfaces in a draft-free area.

2. Place hinge bolts through control surface hinges and position on knife edge balancing mandrels. Be sure hinge bolt shank rests on knife edge.

3. Make sure all control surfaces are in their approved flight configurations: painted (if applicable), trim tabs installed, all foreign matter removed from inside of control surface, elevator trim tab push-pull rod installed and all tips installed.

4. Place balancing mandrels on a table or other suitable flat surface.

5. Adjust trailing edge support to fit control surface being balanced while center of balancing beam is directly over hinge line. Remove balancing beam and balance the beam itself by moving the adjustable weight (fastened by bolt and washer). Fine balance may be accomplished by use of washers at long screw on end of beam.

6. When positioning balancing beam on control surface, avoid rivets to provide a smooth surface for the beam and keep the beam 90° to the hinge line of the control surface.

Figure 17-3. Control Surface Balancing (Sheet 1 of 6)

7. Paint is a considerable weight factor. In order to keep balance weight to a minimum, it is recommended that existing paint be removed before adding paint to a control surface. Increase in balance weight will also be limited by the amount of space available and clearance with adjacent parts. Good workmanship and standard repair practices should not result in unreasonable balance weight.

8. The approximate amount of weight needed may be determined by taping loose weight at the balance weight area.

9. Lighten balance weight by drilling off part of weight.

10. Make balance weight heavier by fusing bar stock solder to weight after removal from control surface. The ailerons should have balance weight increased by ordering additional weight and gang channel, listed in applicable Parts Catalog and installing next to existing inboard weight the minimum length necesary for correct balance, except that a length which contains at least two attaching screws must be used. If necessary, lighten new weight or existing weights for correct balance.

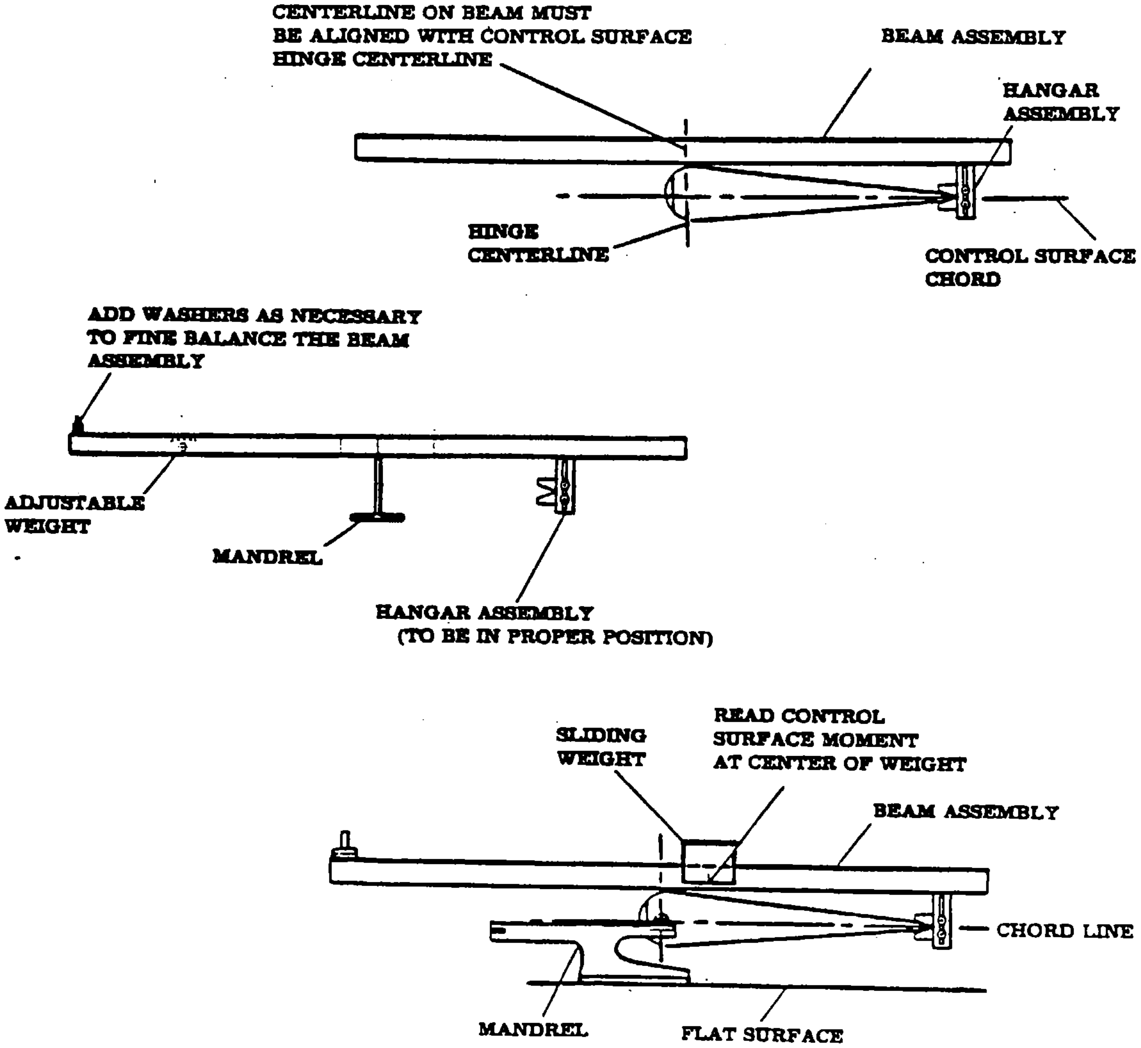


Figure 17-3. Control Surface Balancing (Sheet 2 of 6)

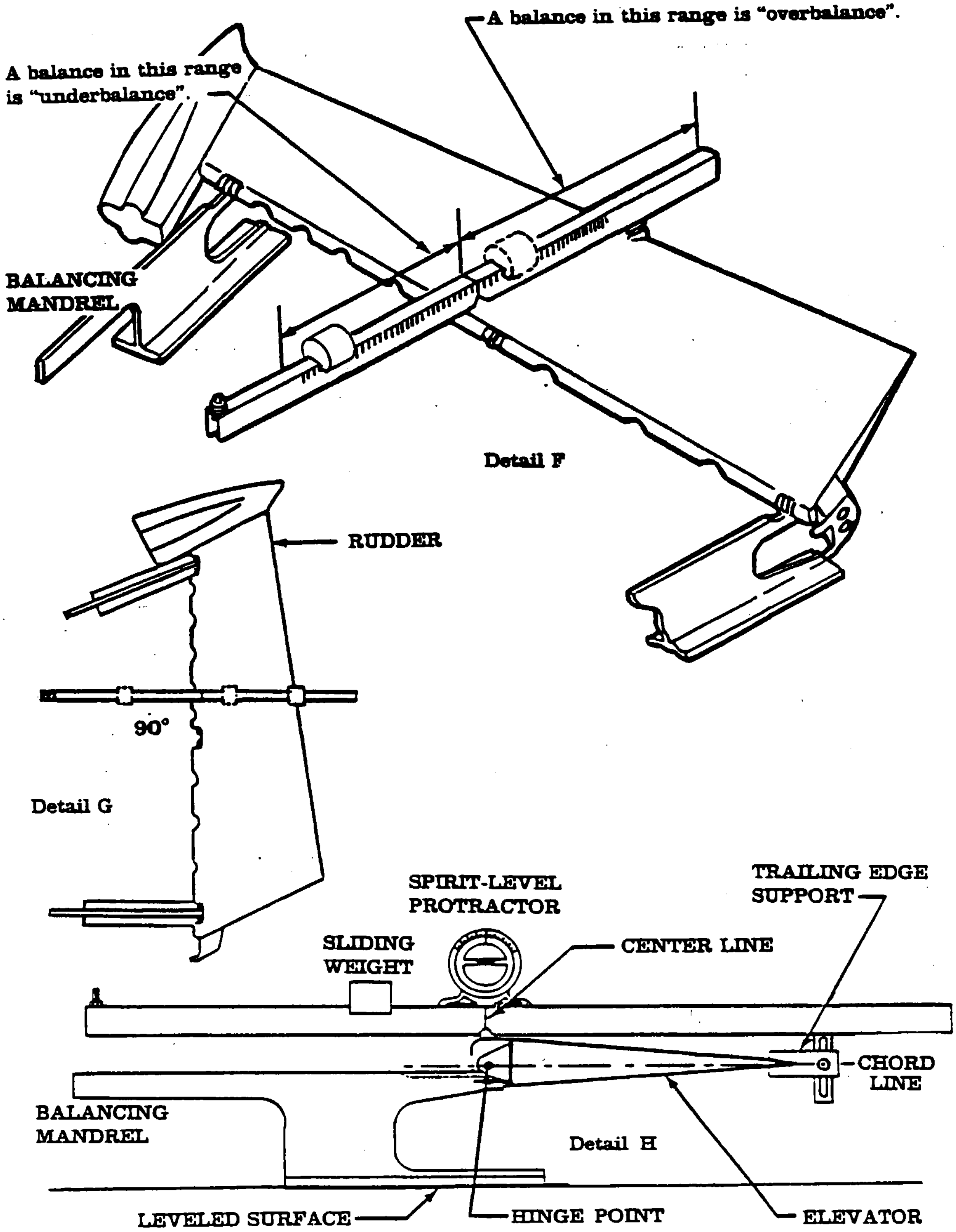
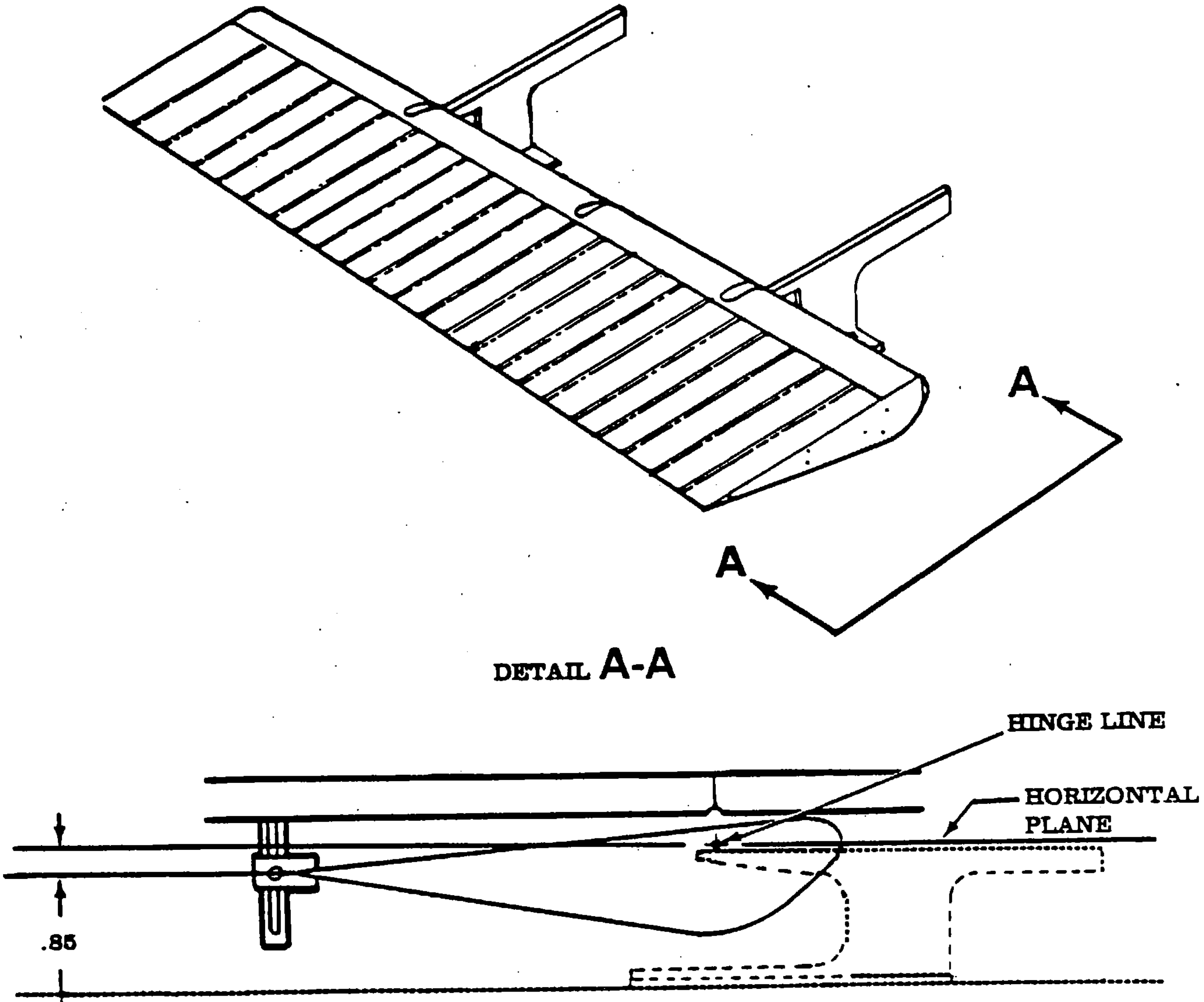


Figure 17-3. Control Surface Balancing (Sheet 3 of 6)

AILERONS



Balance aileron inverted, with trailing edge at point opposite cut-out for middle hinge .85" below hinge line horizontal plane.

Figure 17-3. Control Surface Balancing (Sheet 4 of 6)

CONTROL SURFACE BALANCE REQUIREMENTS

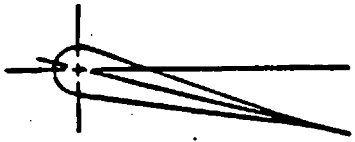
NOTE

Balance limits for control surfaces are expressed for "Approved Flight" configuration. "Approved Flight" configuration is that condition of the control surface as prepared for flight of the airplane whether it be painted or unpainted.

"Approved Flight" limits must never be exceeded when the surface is in its final configuration for flight.

DEFINITIONS:

UNDERBALANCE is defined as the condition that exists when surface is trailing edge heavy and is defined by a symbol (+). If the balance beam sliding weight must be on the leading edge side of the hinge line (to balance the control surface), the control surface is considered to be underbalanced.



OVERBALANCE is defined as the condition that exists when surface is leading edge heavy and is defined by a symbol (–). If the balance beam sliding weight must be on the trailing edge side of the hinge line (to balance the control surface), the control surface is considered to be overbalanced.

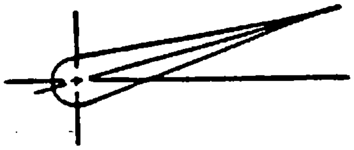


Figure 17-3. Control Surface Balancing (Sheet 5 of 6)

CONTROL SURFACE	APPROVED FLIGHT CONFIGURATION BALANCE LIMITS (Inch-Pounds)
AILERON	0.0 to +11.31
RUDDER	0.0 to +9.0
RIGHT ELEVATOR	0.0 to +24.5
LEFT ELEVATOR	0.0 to +18.5

Figure 17-3. Control Surface Balancing (Sheet 6 of 6)

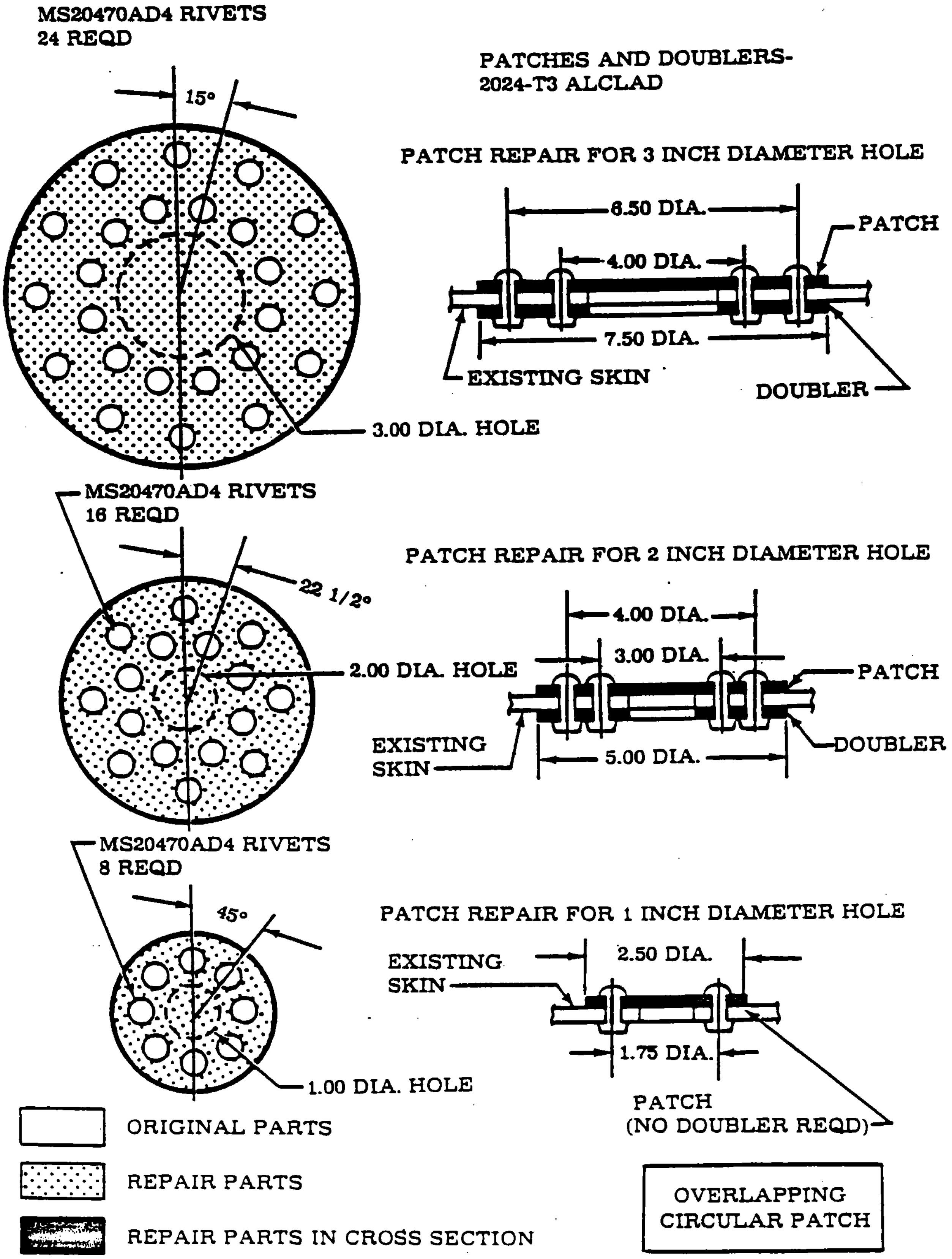
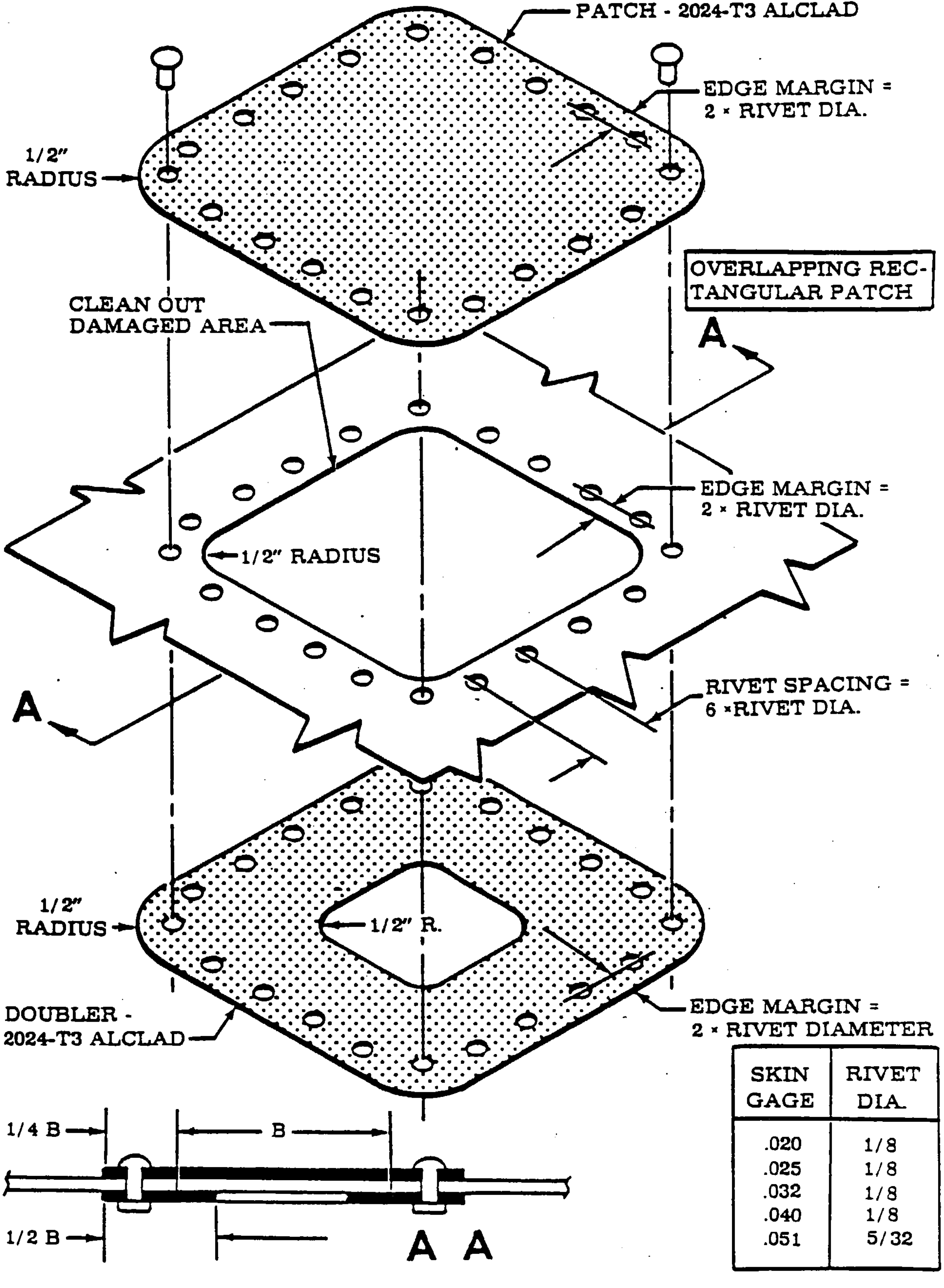
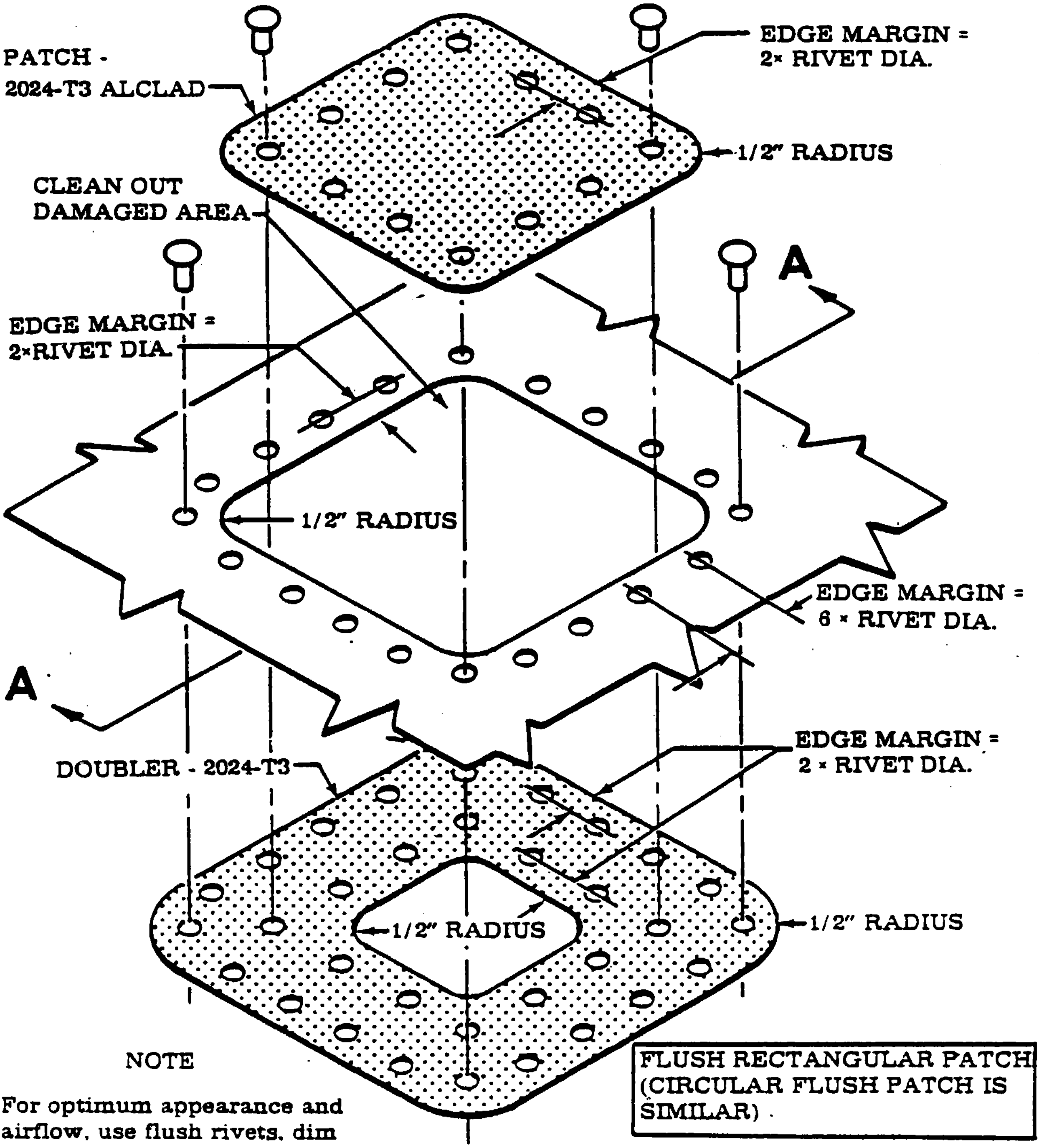


Figure 17-4. Skin Repair (Sheet 1 of 6)



SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

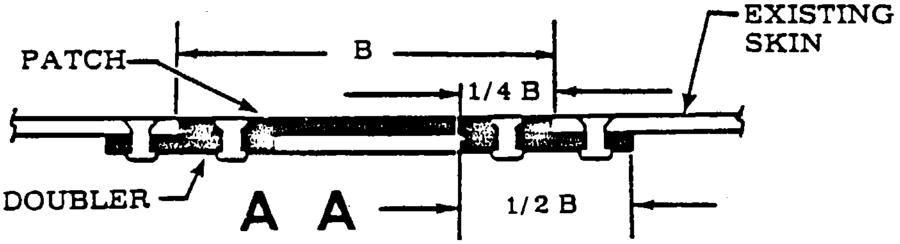
Figure 17-4. Skin Repair (Sheet 2 of 6)



FLUSH RECTANGULAR PATCH (CIRCULAR FLUSH PATCH IS SIMILAR)

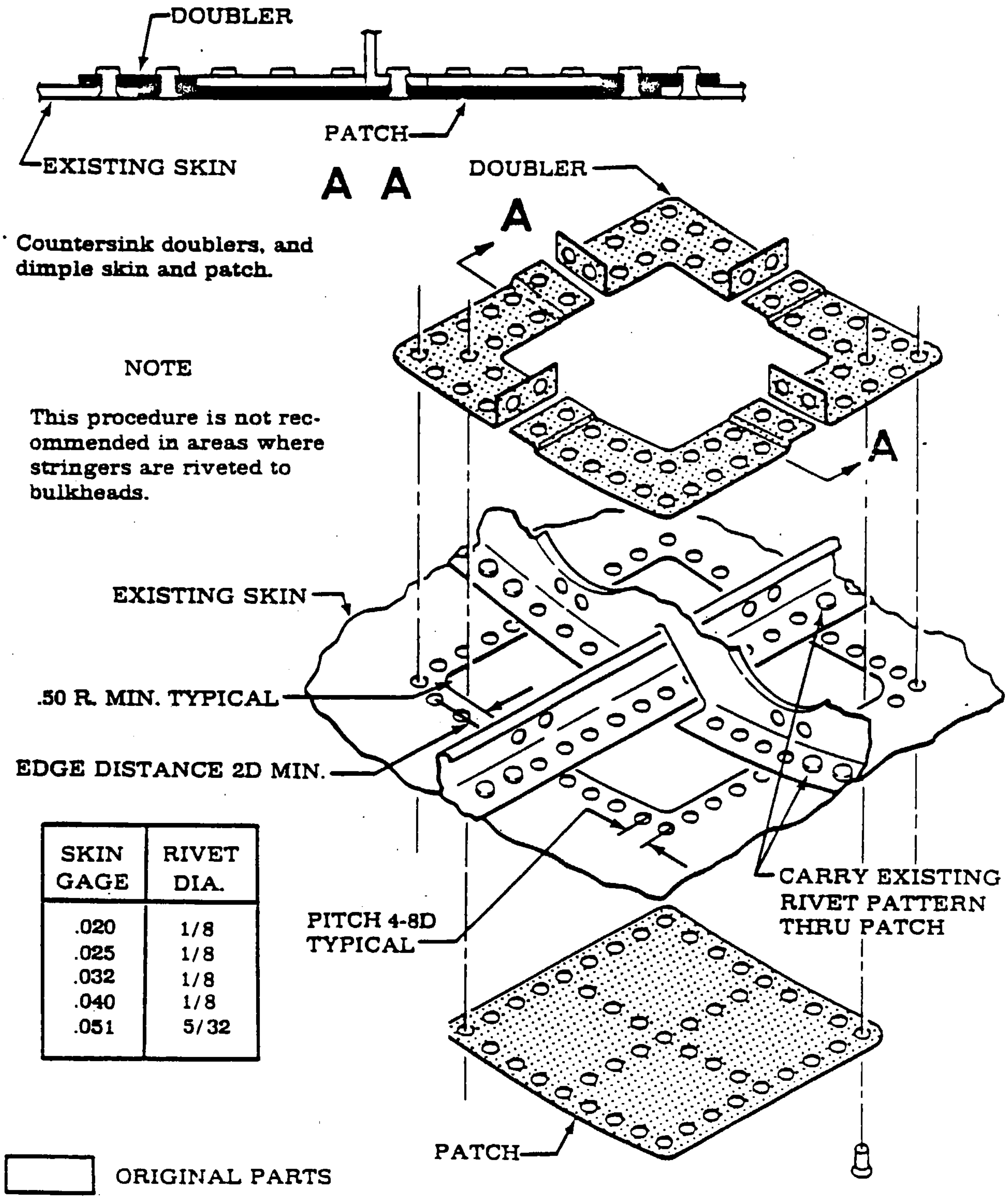
NOTE

For optimum appearance and airflow, use flush rivets, dimpled skin and patch, and countersunk doubler.



SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 17-4. Skin Repair (Sheet 3 of 6)



Countersink doublers, and dimple skin and patch.

NOTE

This procedure is not recommended in areas where stringers are riveted to bulkheads.

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

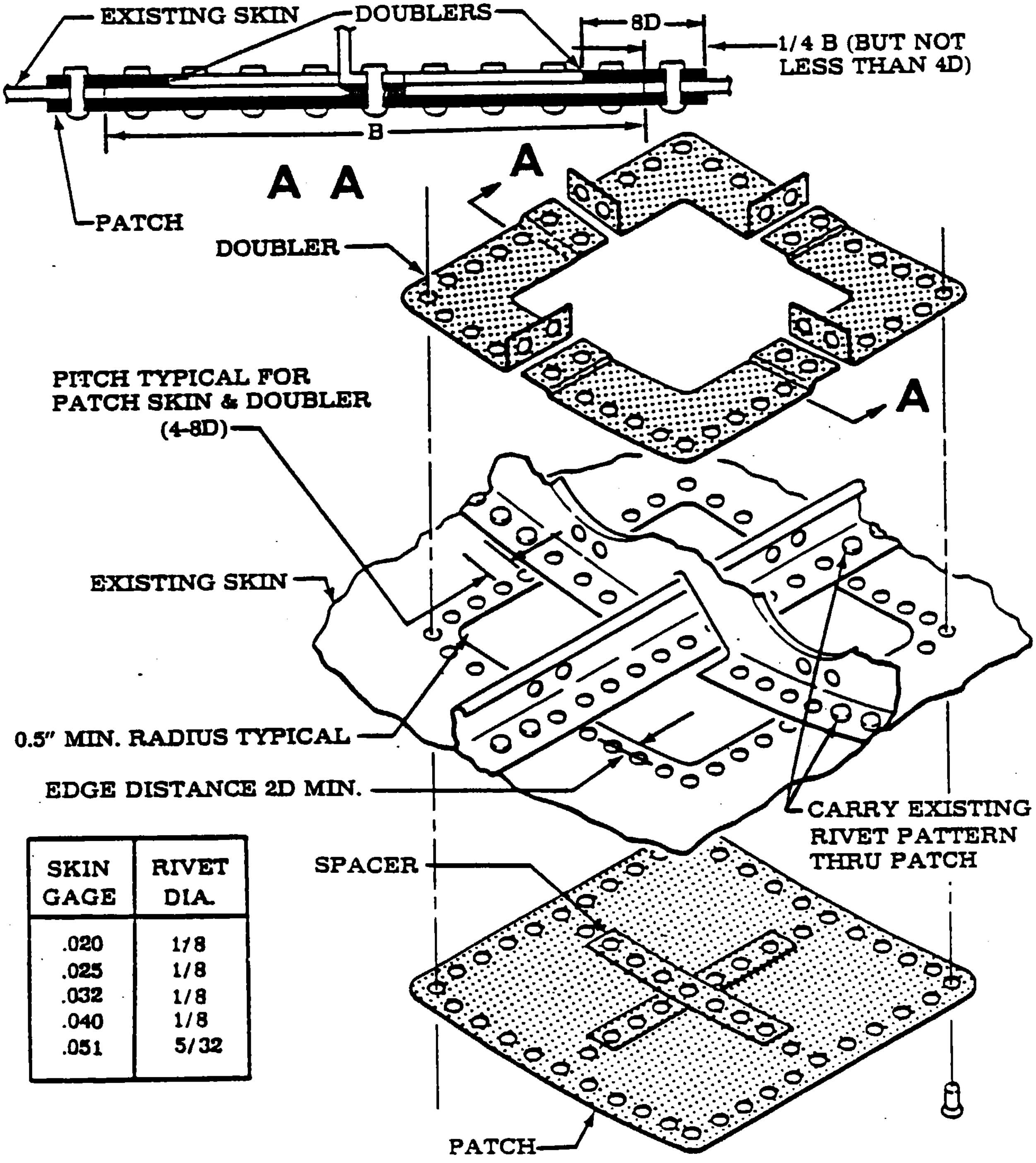
☐ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

FLUSH PATCH AT
STRINGER/BULKHEAD
INTERSECTION

Figure 17-4. Skin Repair (Sheet 4 of 6)



SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

☐ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

OVERLAPPING PATCH AT STRINGER/BULKHEAD INTERSECTION

Figure 17-4.Skin Repair (Sheet 5 of 6)

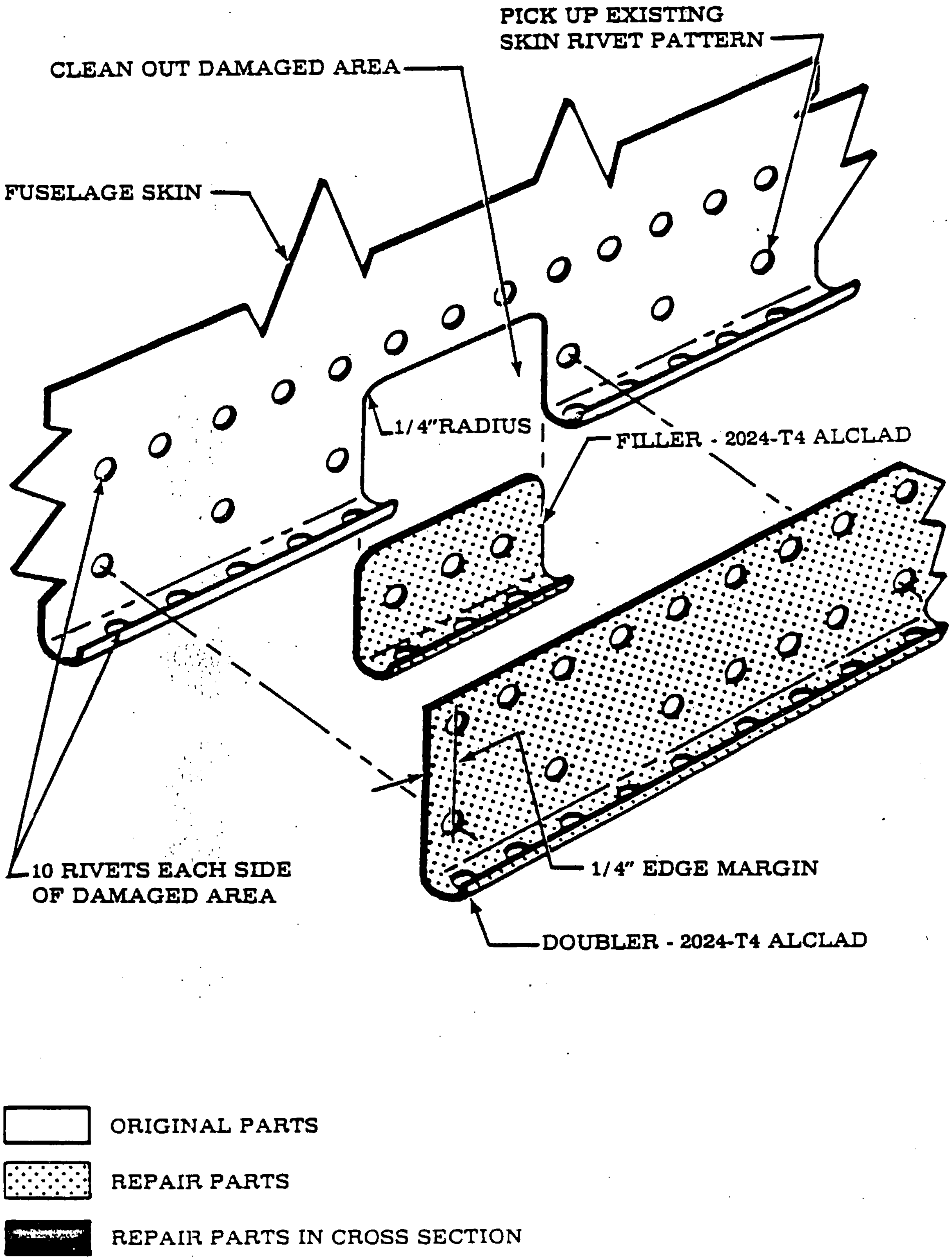


Figure 17-4. Skin Repair (Sheet 6 of 6)

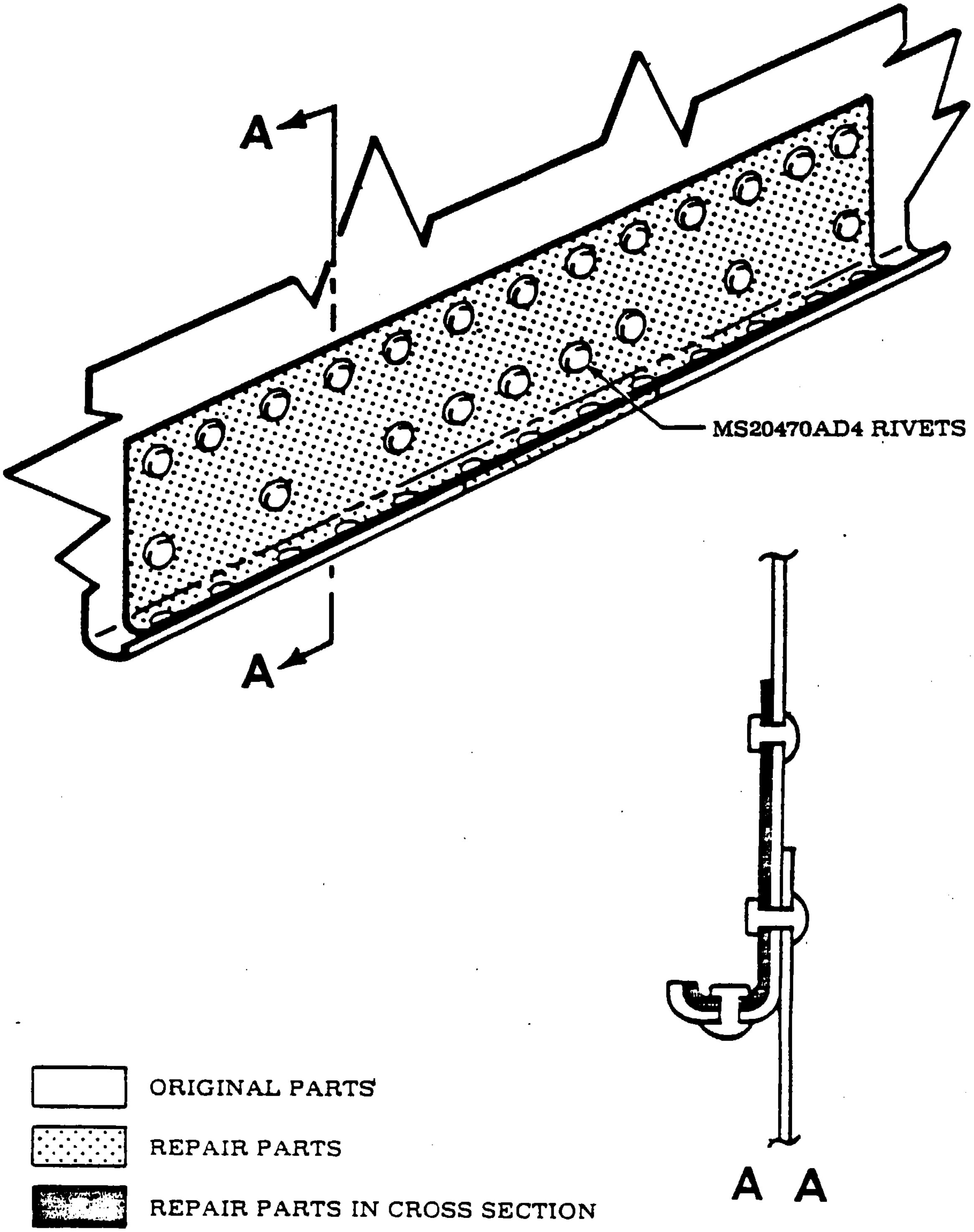


Figure 17-4. Skin Repair (Sheet 6 of 6 continued)

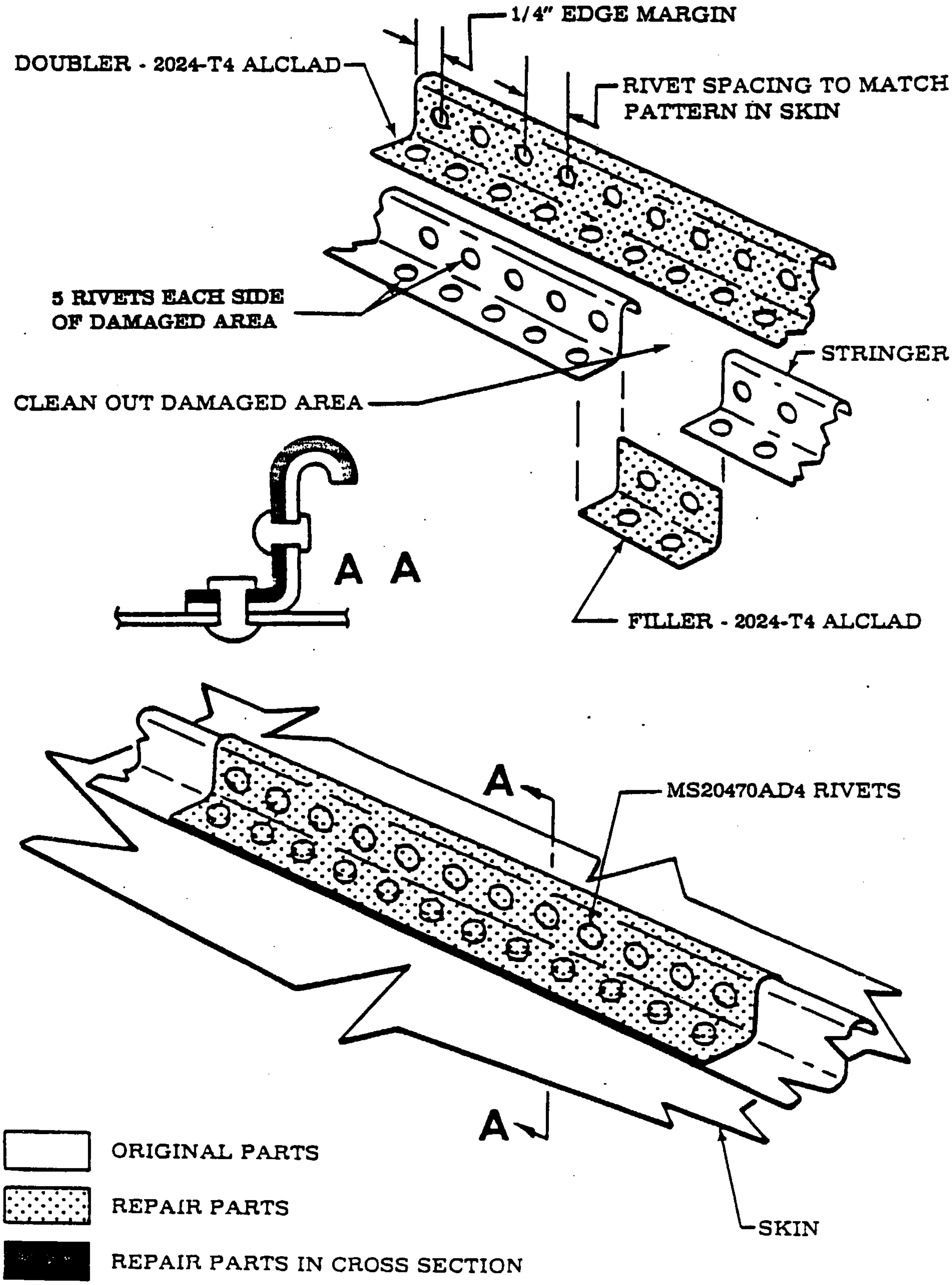


Figure 17-5.Stringer and Channel Repair (Sheet 1 of 4)

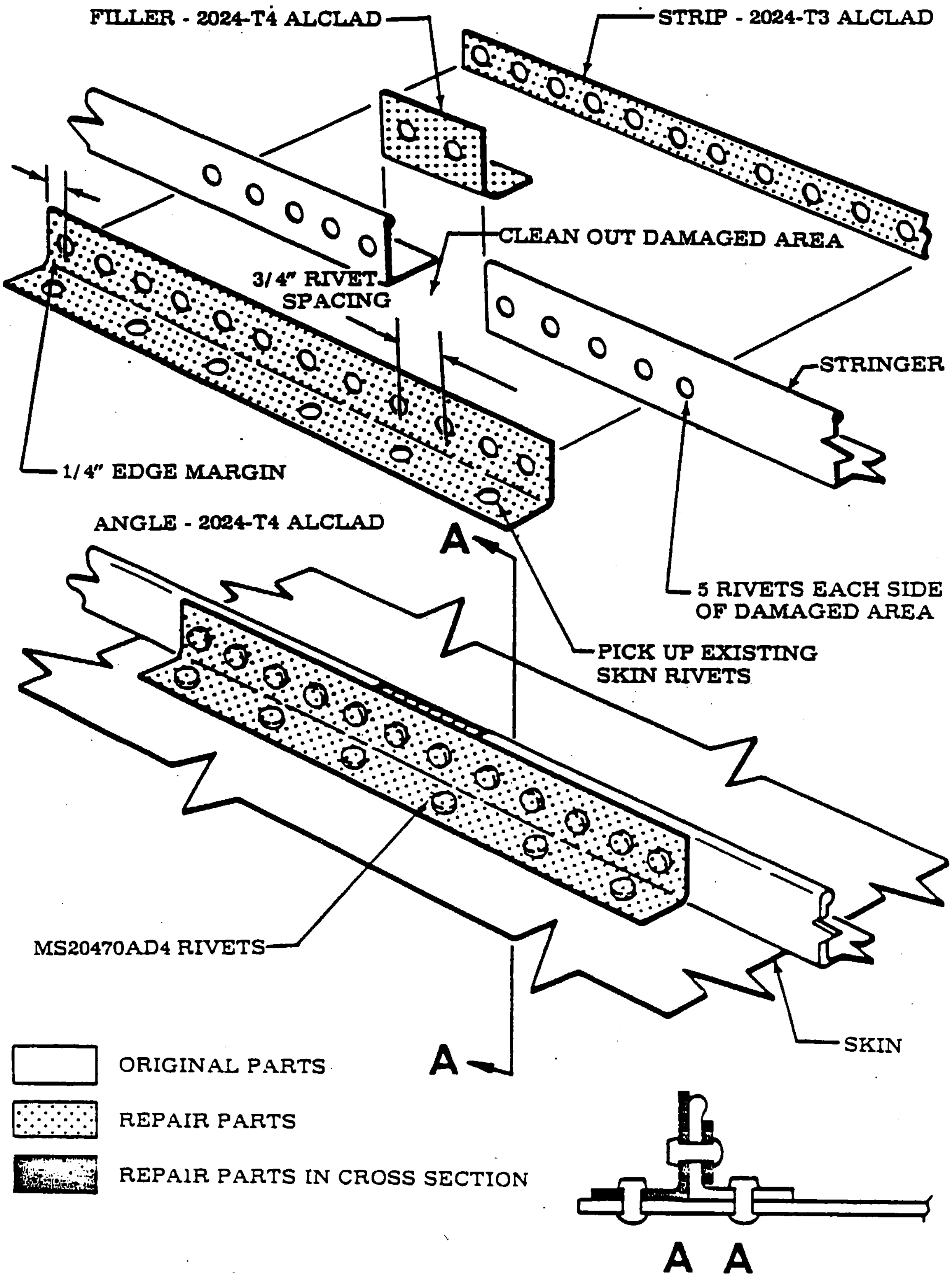


Figure 17-5. Stringer and Channel Repair (Sheet 2 of 4)

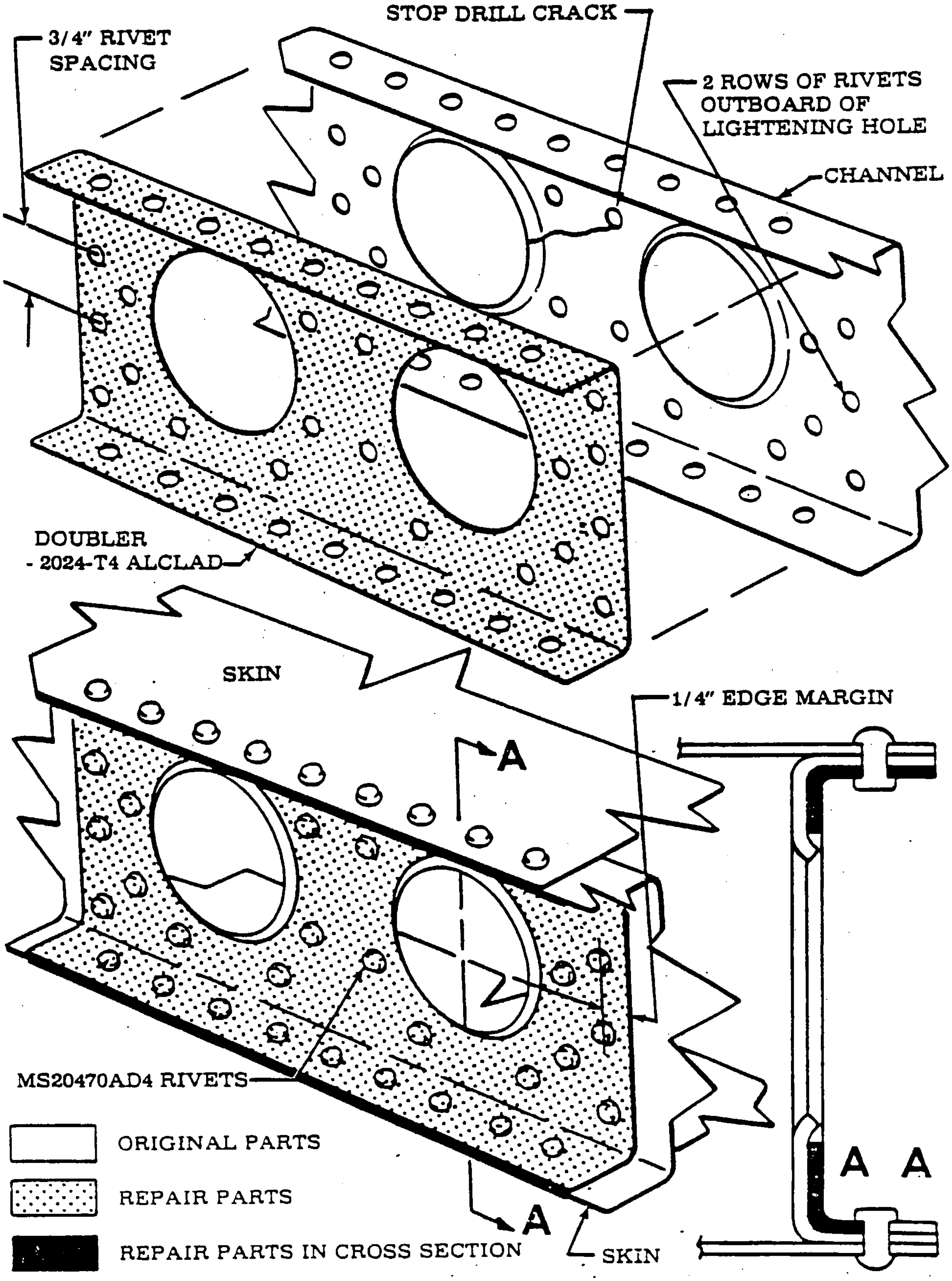


Figure 17-5. Stringer and Channel Repair (Sheet 3 of 4)

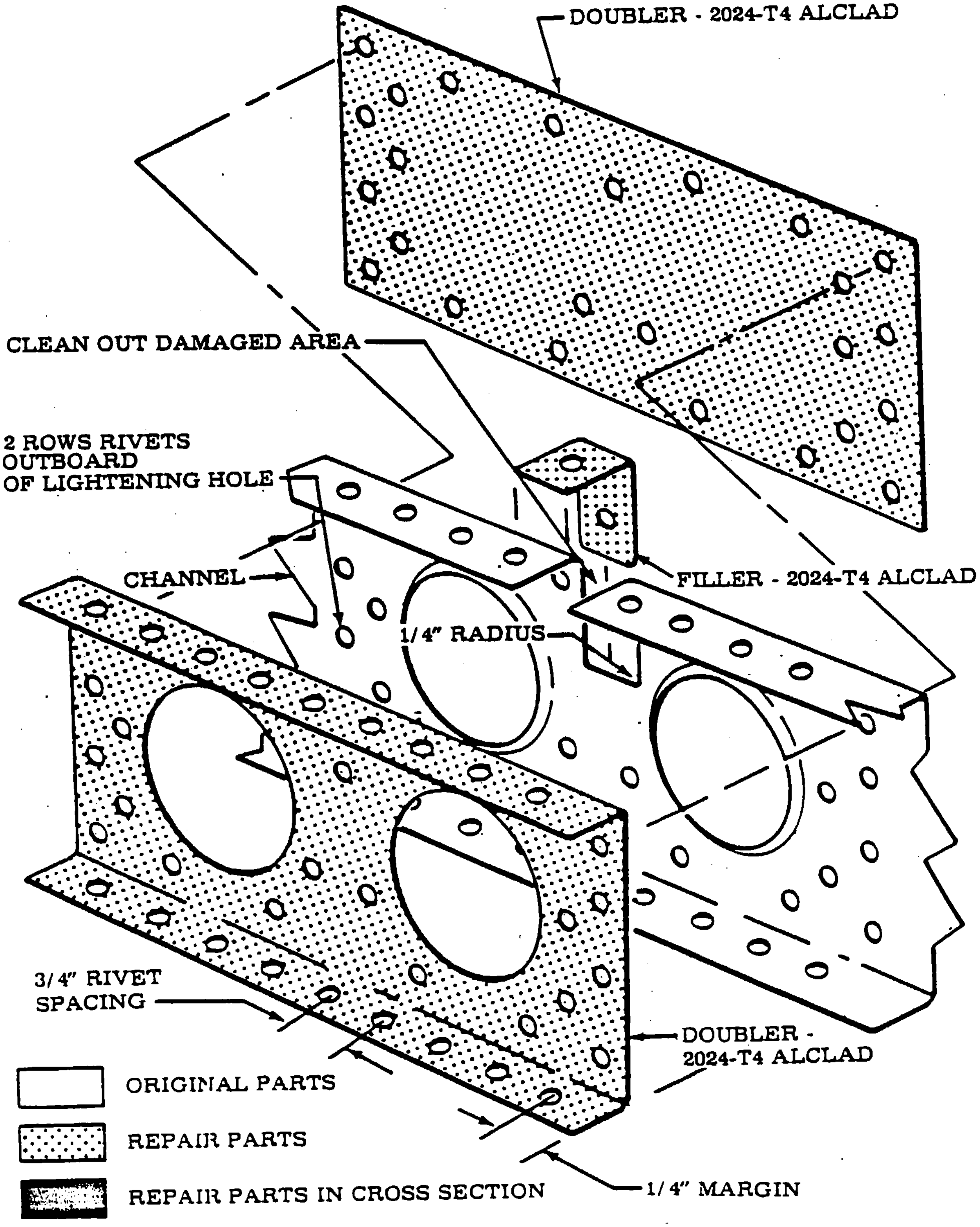


Figure 17-5.Stringer and Channel Repair (Sheet 4 of 4)

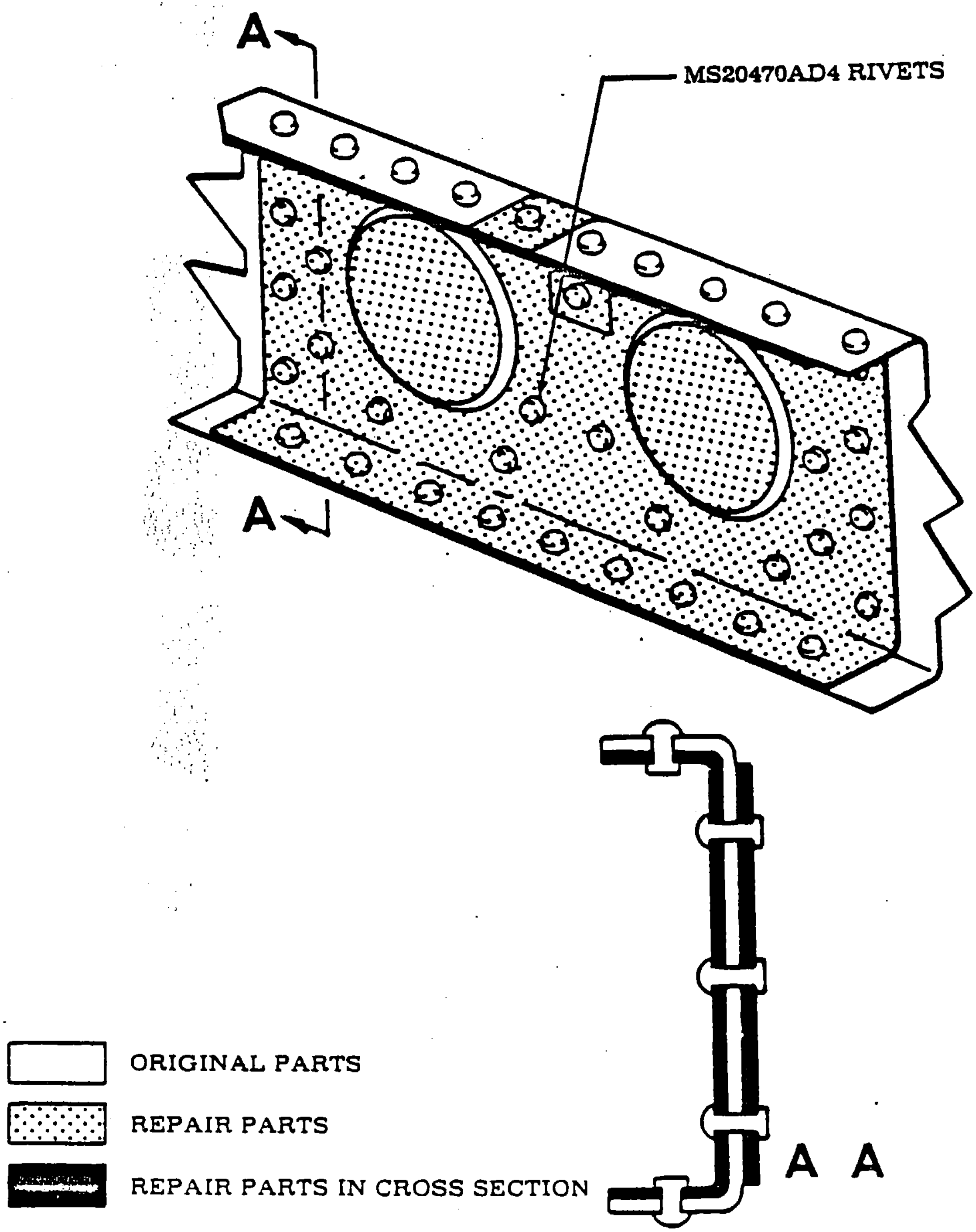


Figure 17-5. Stringer and Channel Repair (Sheet 4 of 4 continued)

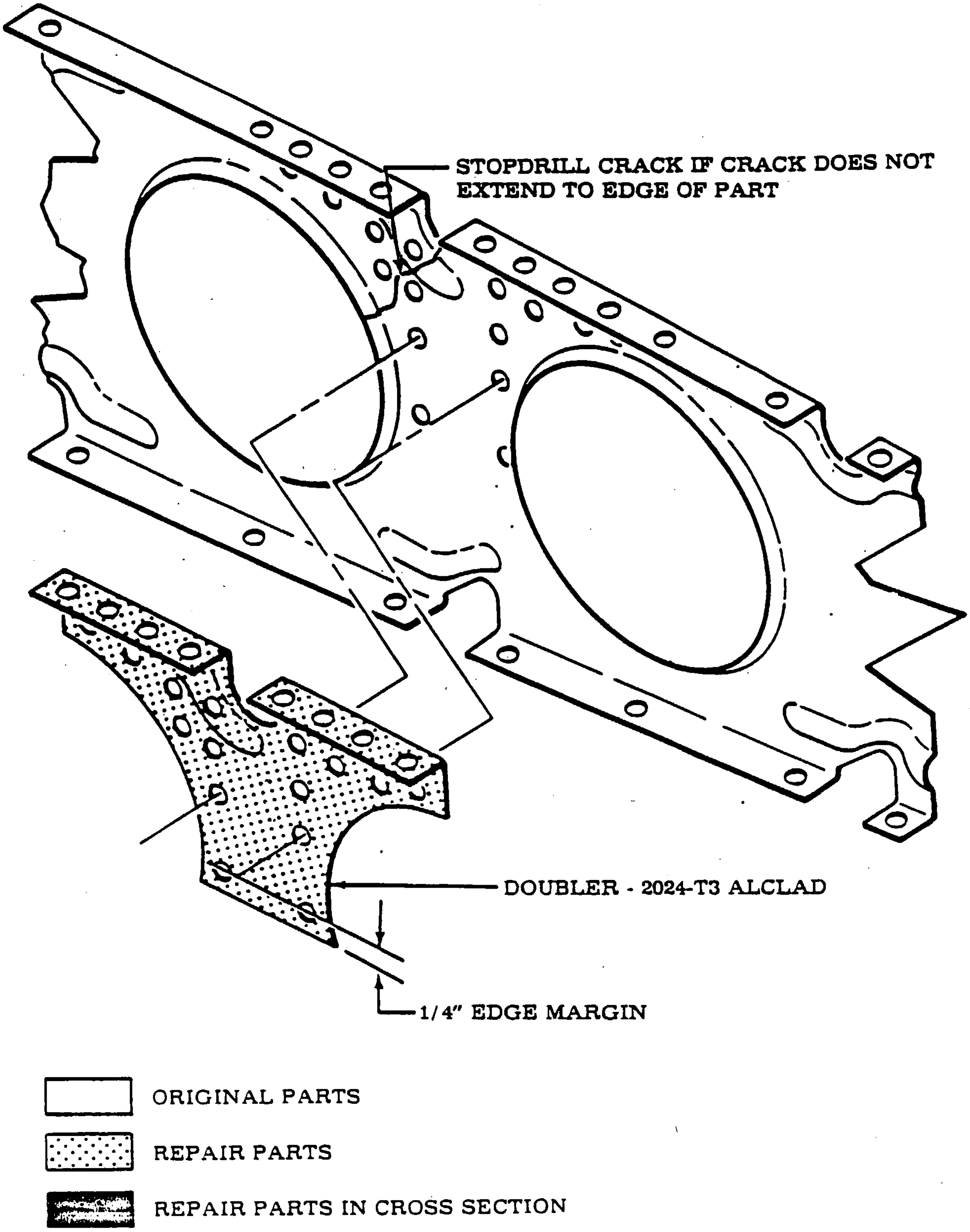


Figure 17-6. Rib Repair (Sheet 1 of 2)

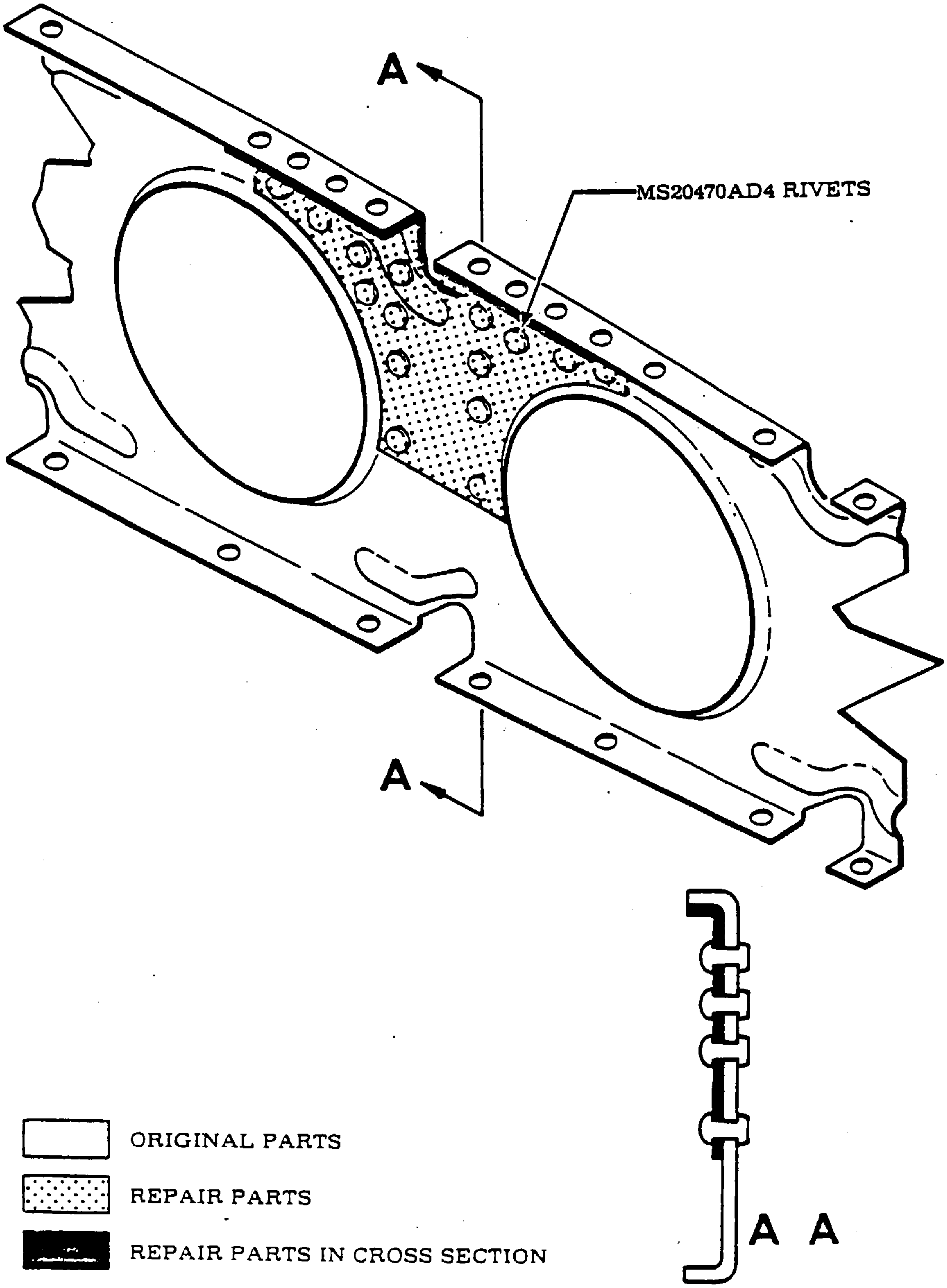
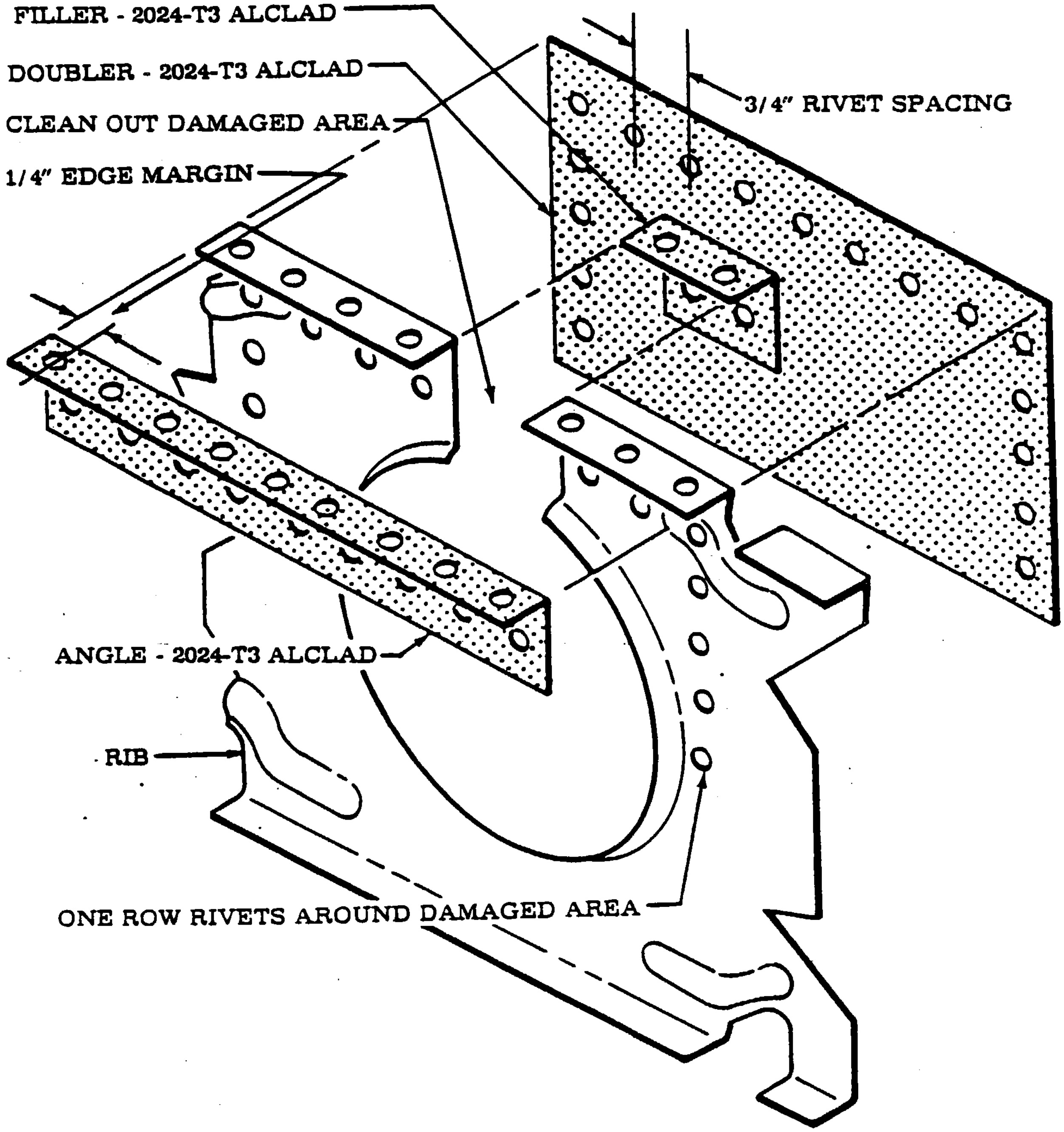


Figure 17-6. Rib Repair (Sheet 1 of 2 continued)



☐ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

Figure 17-6.Rib Repair (Sheet 2 of 2)

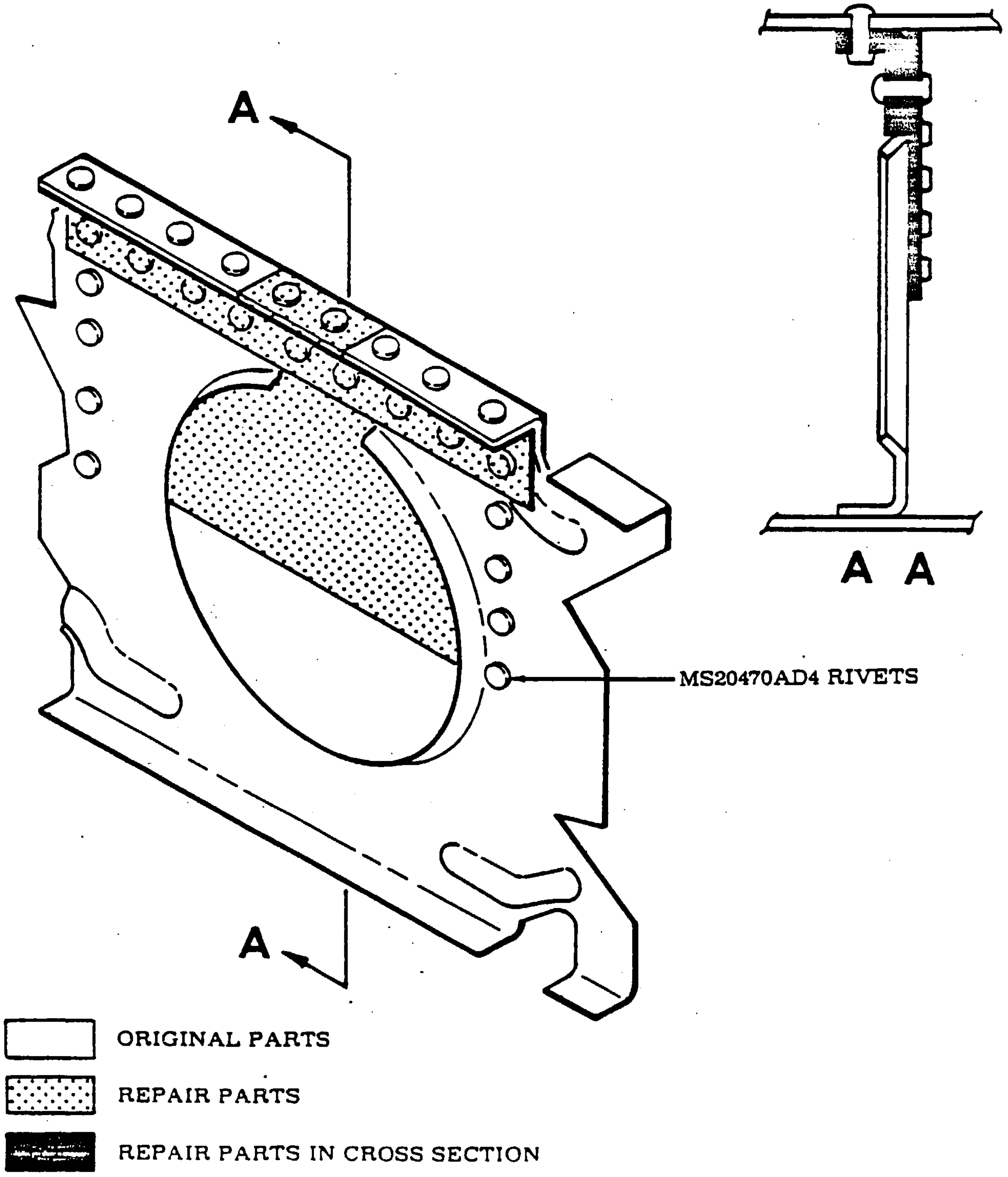


Figure 17-6. Rib Repair (Sheet 2 of 2 continued)

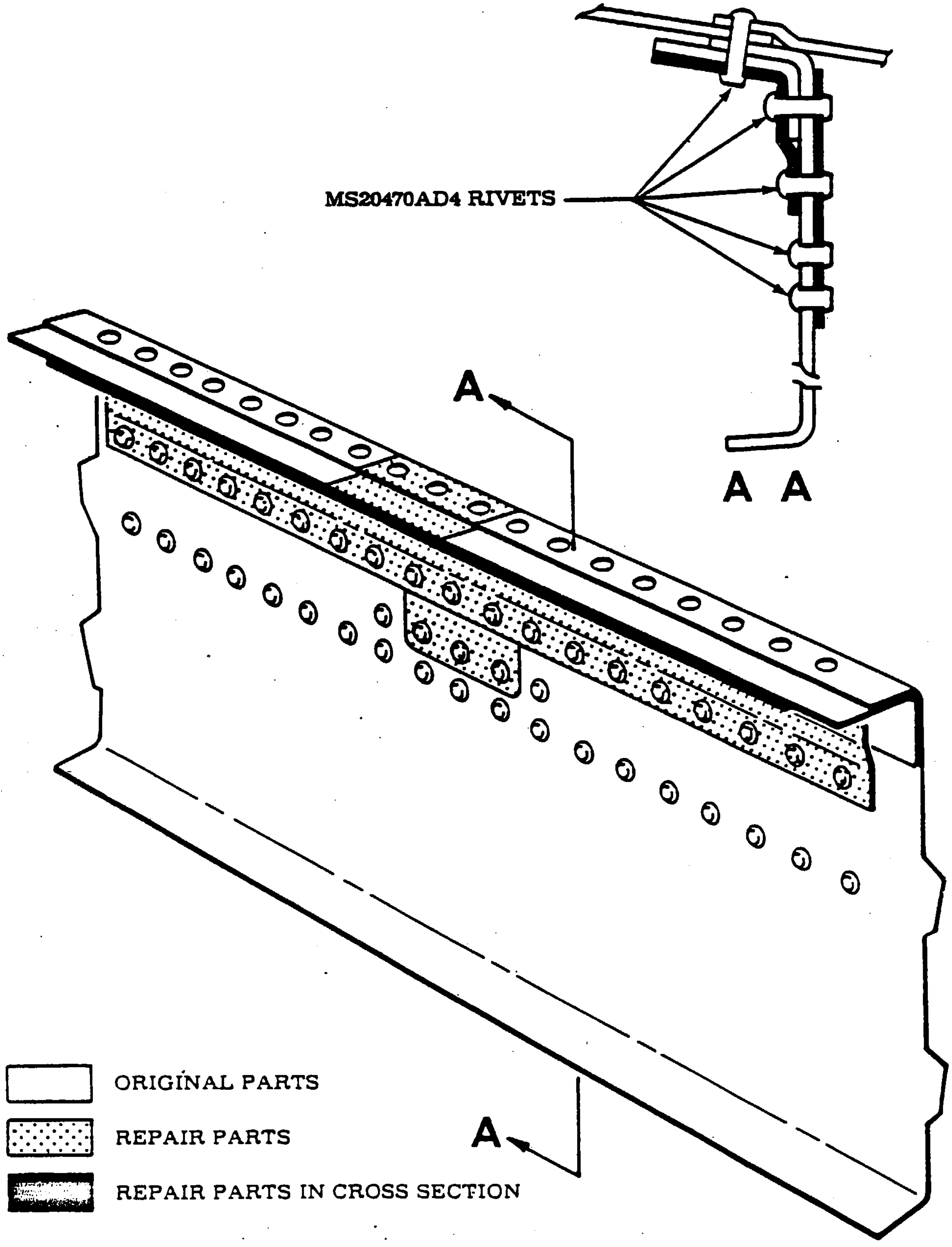
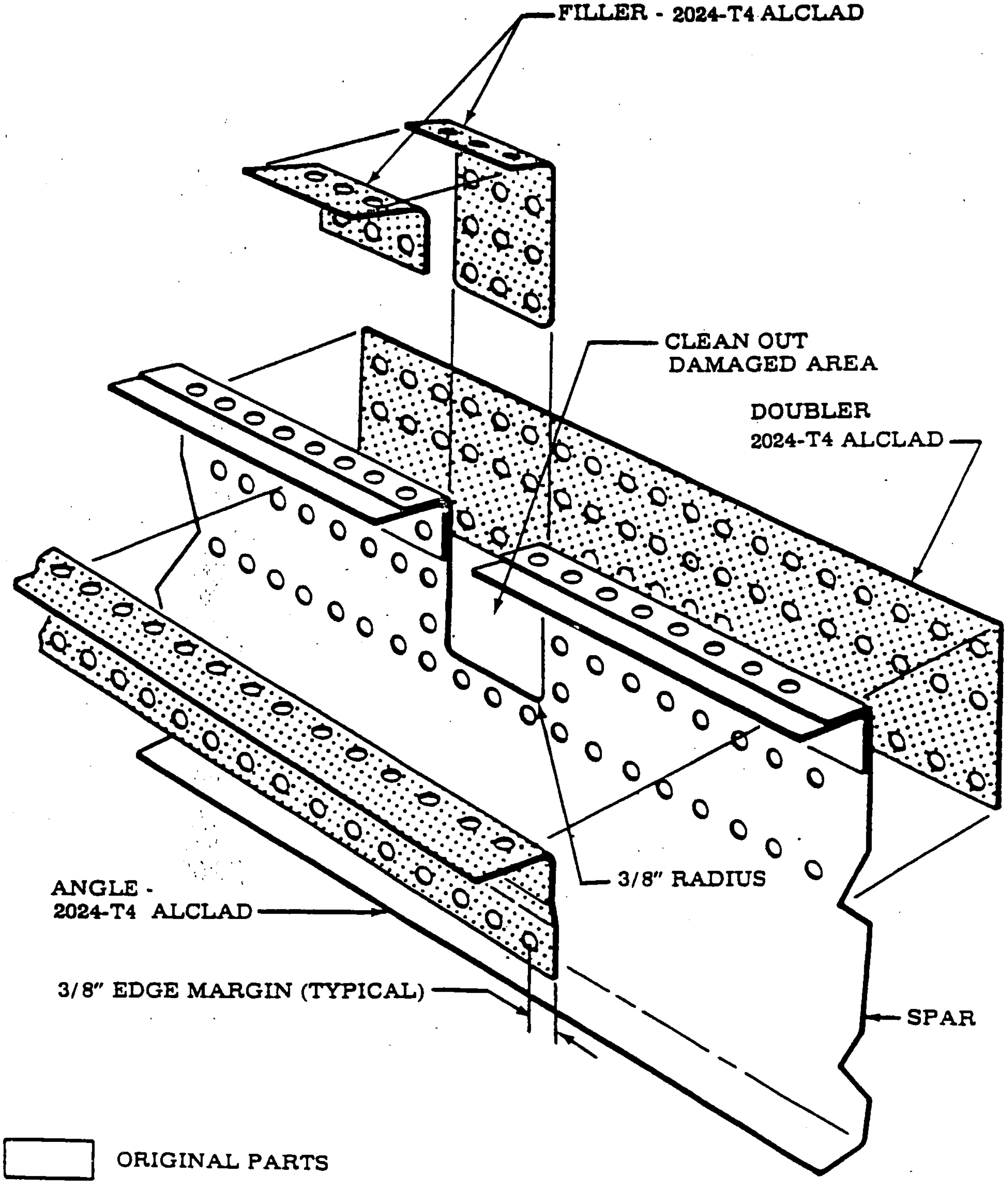


Figure 17-7.Wing Spar Repair (Sheet 1 of 4)

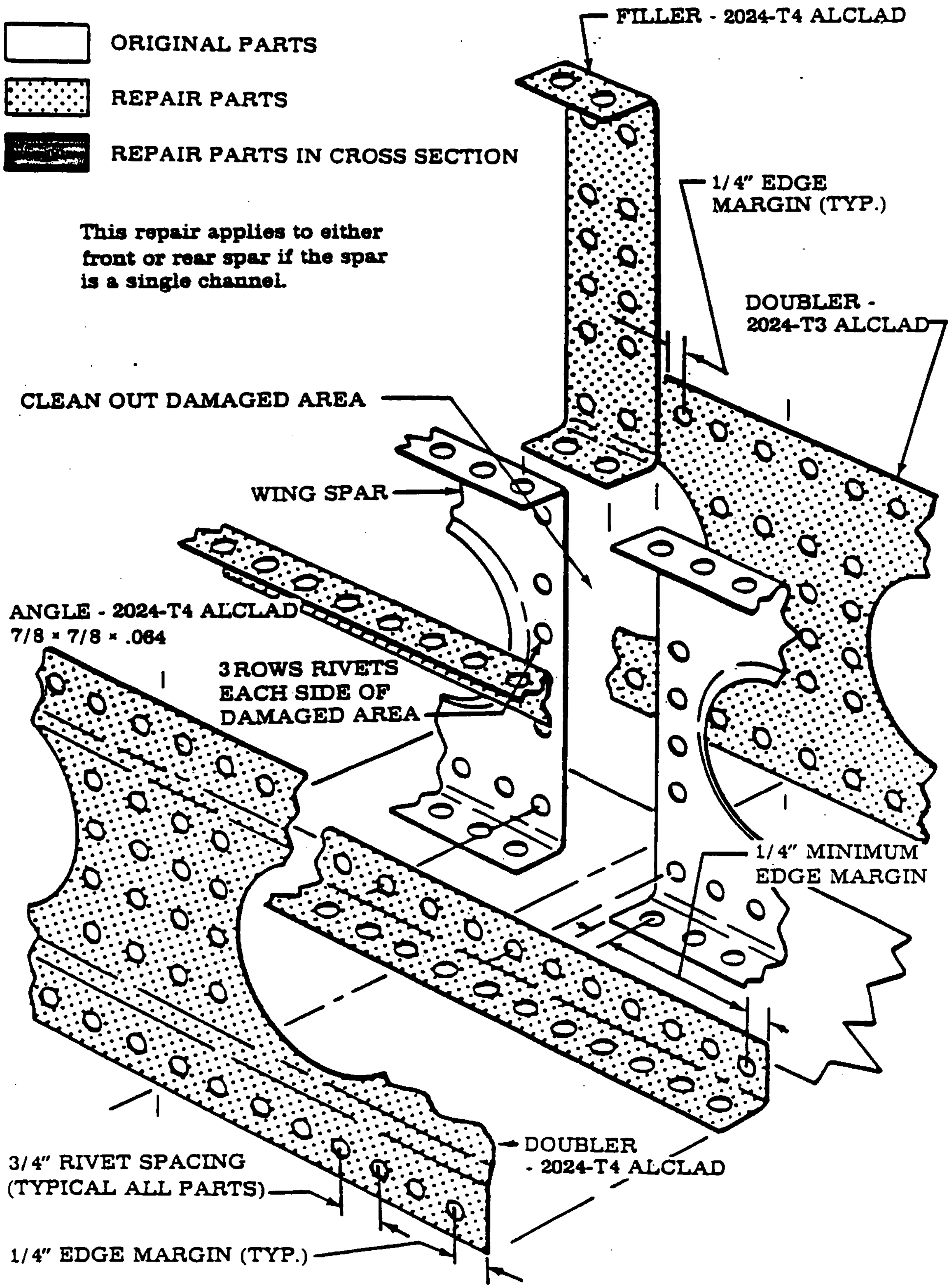


☐ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

Figure 17-7. Wing Spar Repair (Sheet 1 of 4 continued)



This repair applies to either front or rear spar if the spar is a single channel.

Figure 17-7. Wing Spar Repair (Sheet 2 of 4)

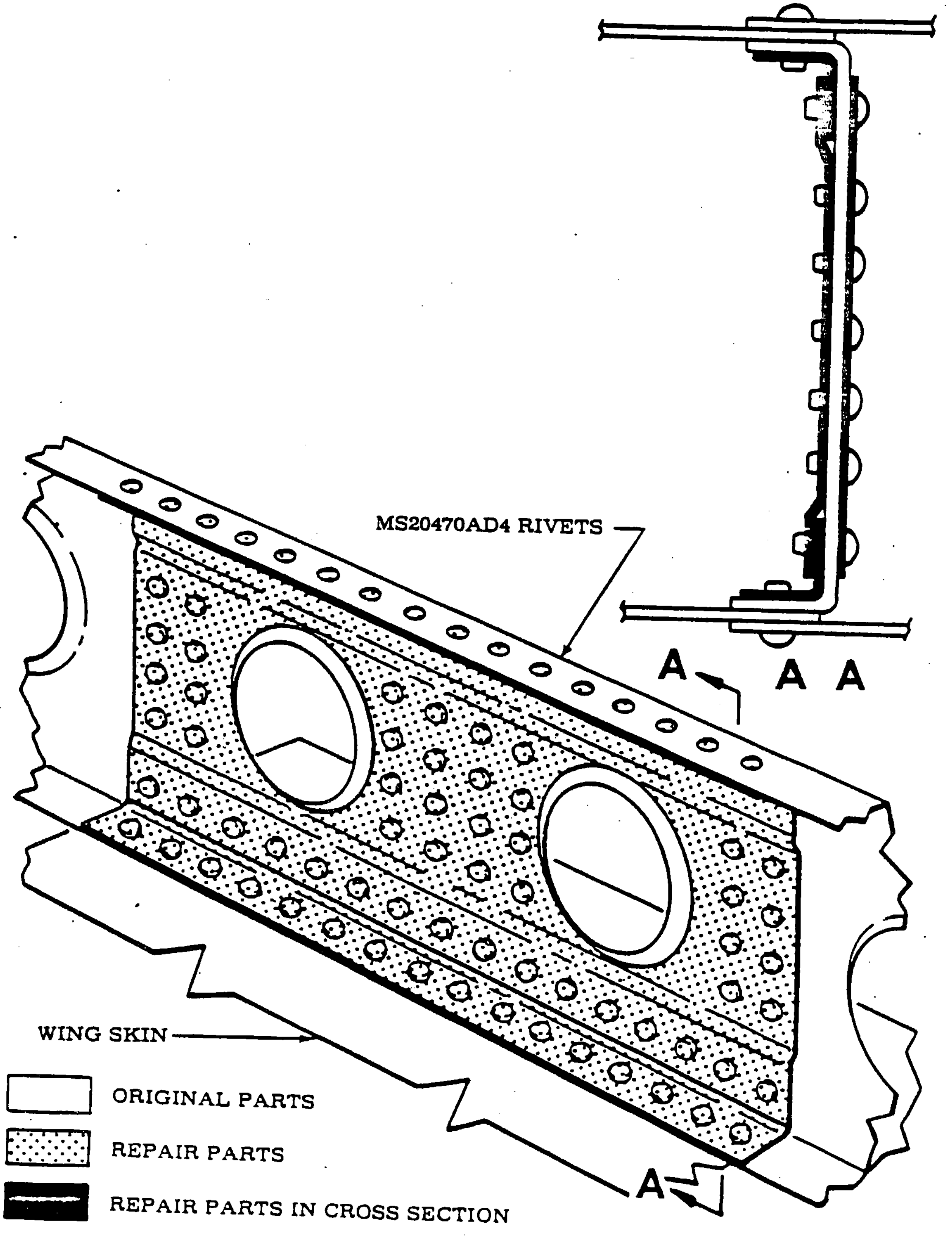


Figure 17-7. Wing Spar Repair (Sheet 2 of 4 continued)

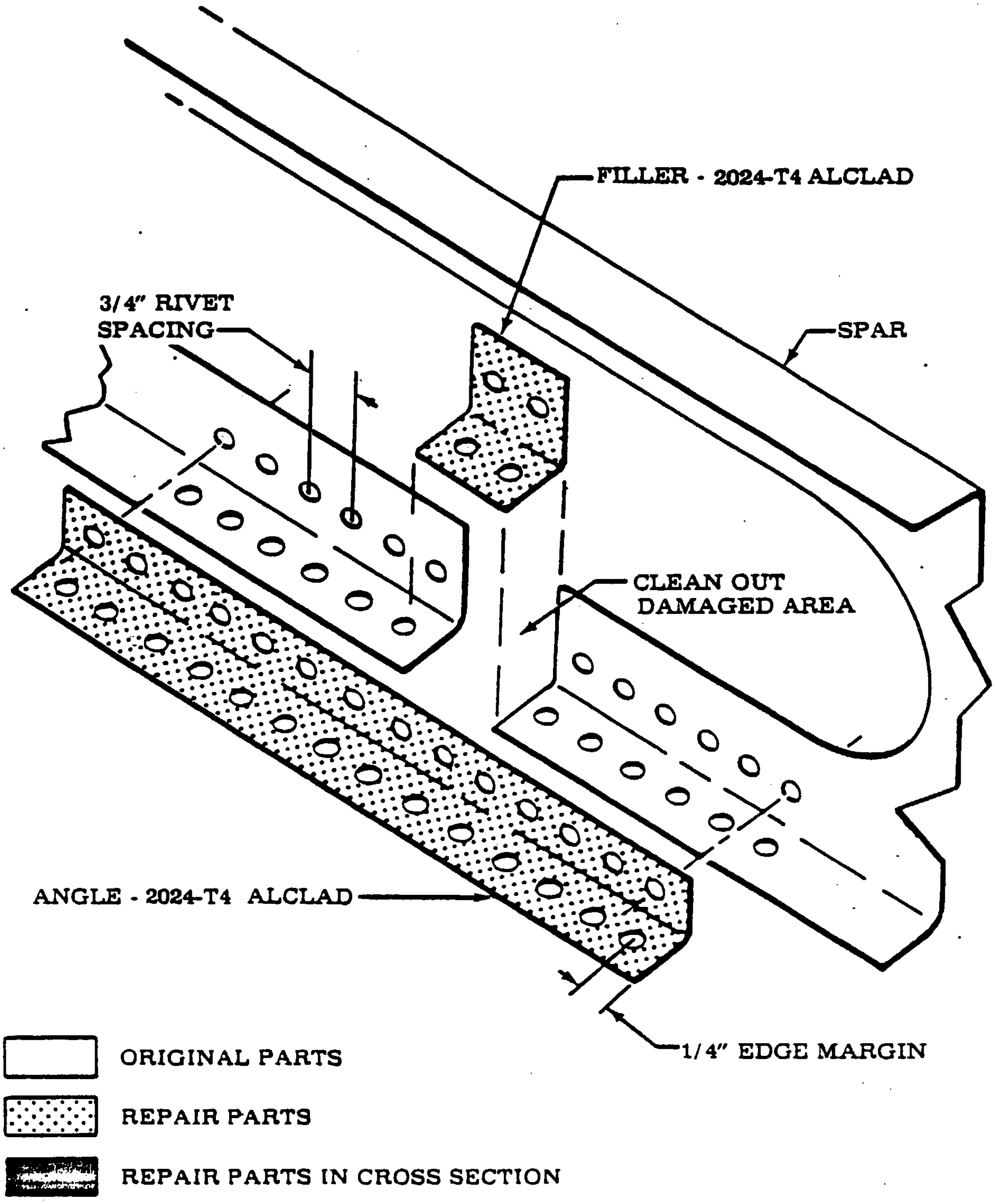


Figure 17-7.Wing Spar Repair (Sheet 3 of 4)

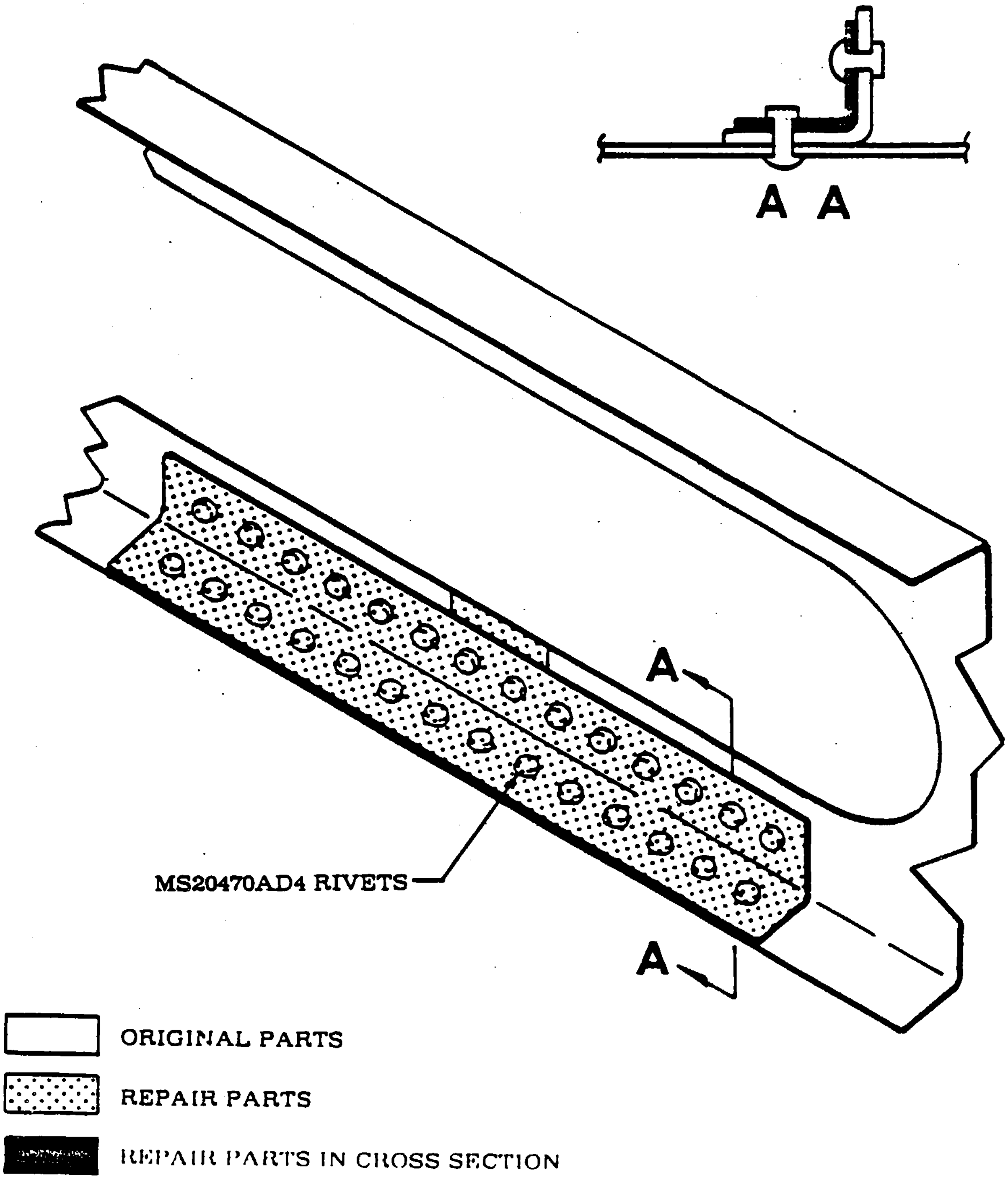
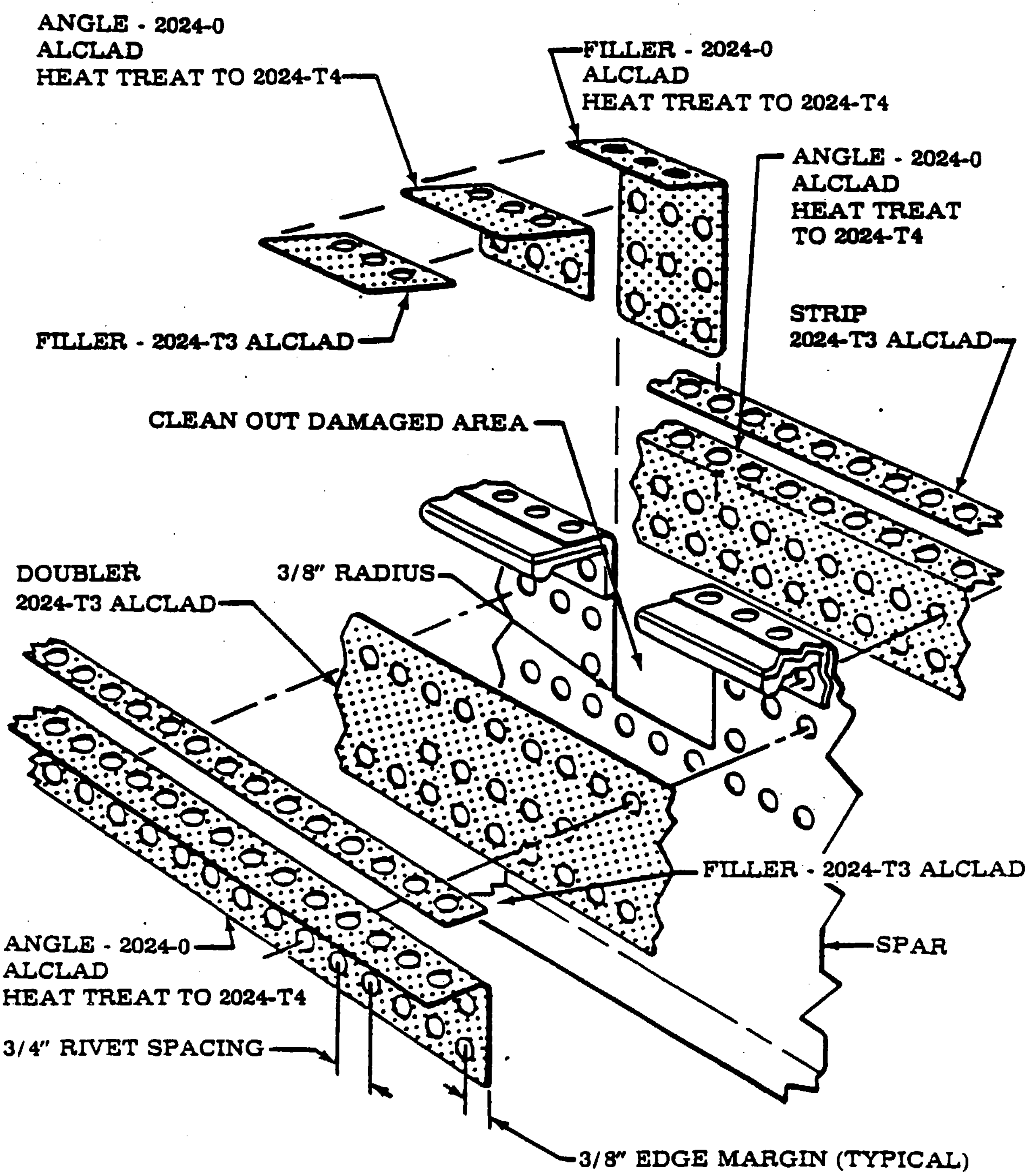


Figure 17-7. Wing Spar Repair (Sheet 3 of 4 continued)



☐ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

Figure 17-7. Wing Spar Repair (Sheet 4 of 4)

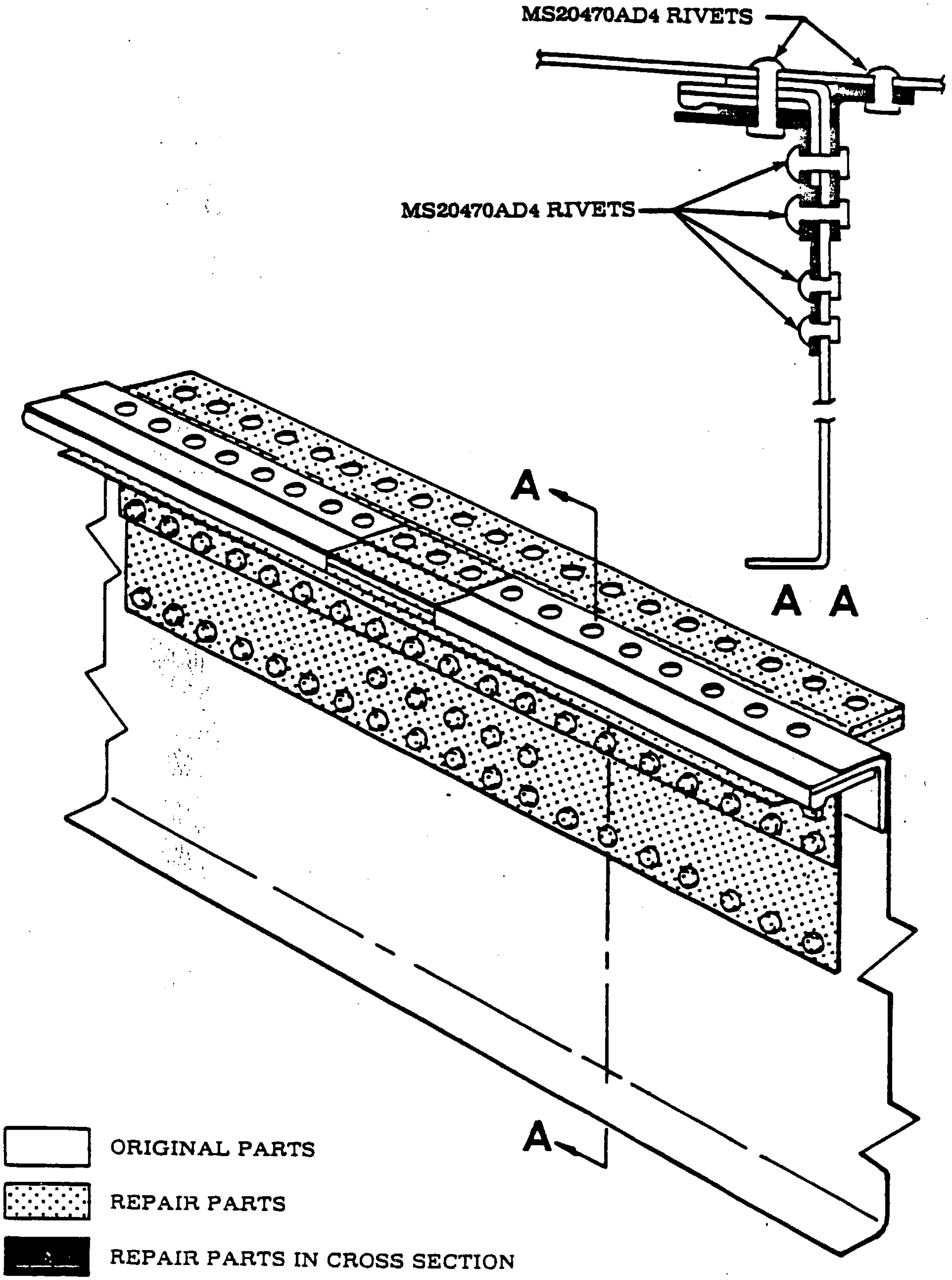


Figure 17-7. Wing Spar Repair (Sheet 4 of 4 continued)

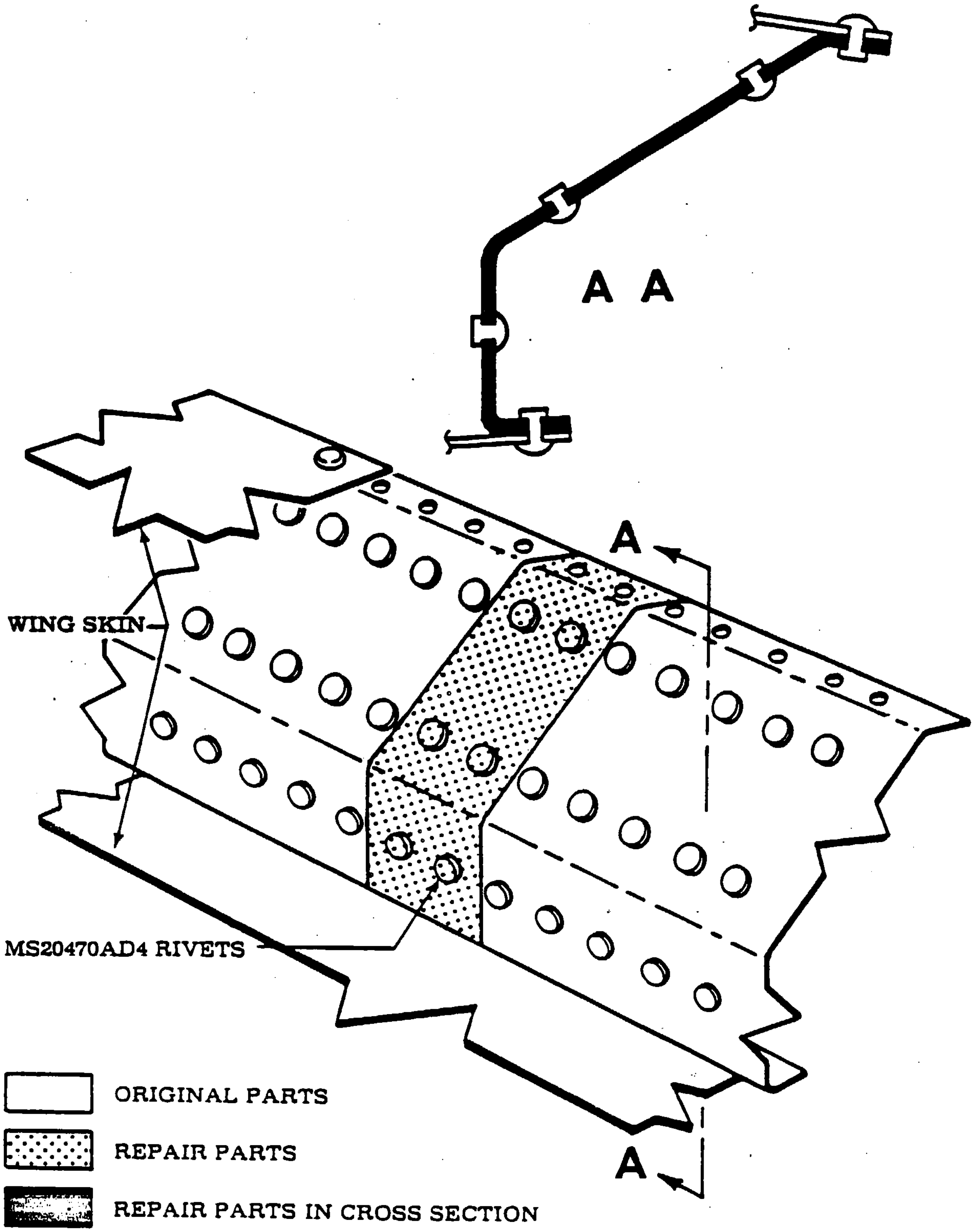


Figure 17-8.Auxiliary Spar Repair

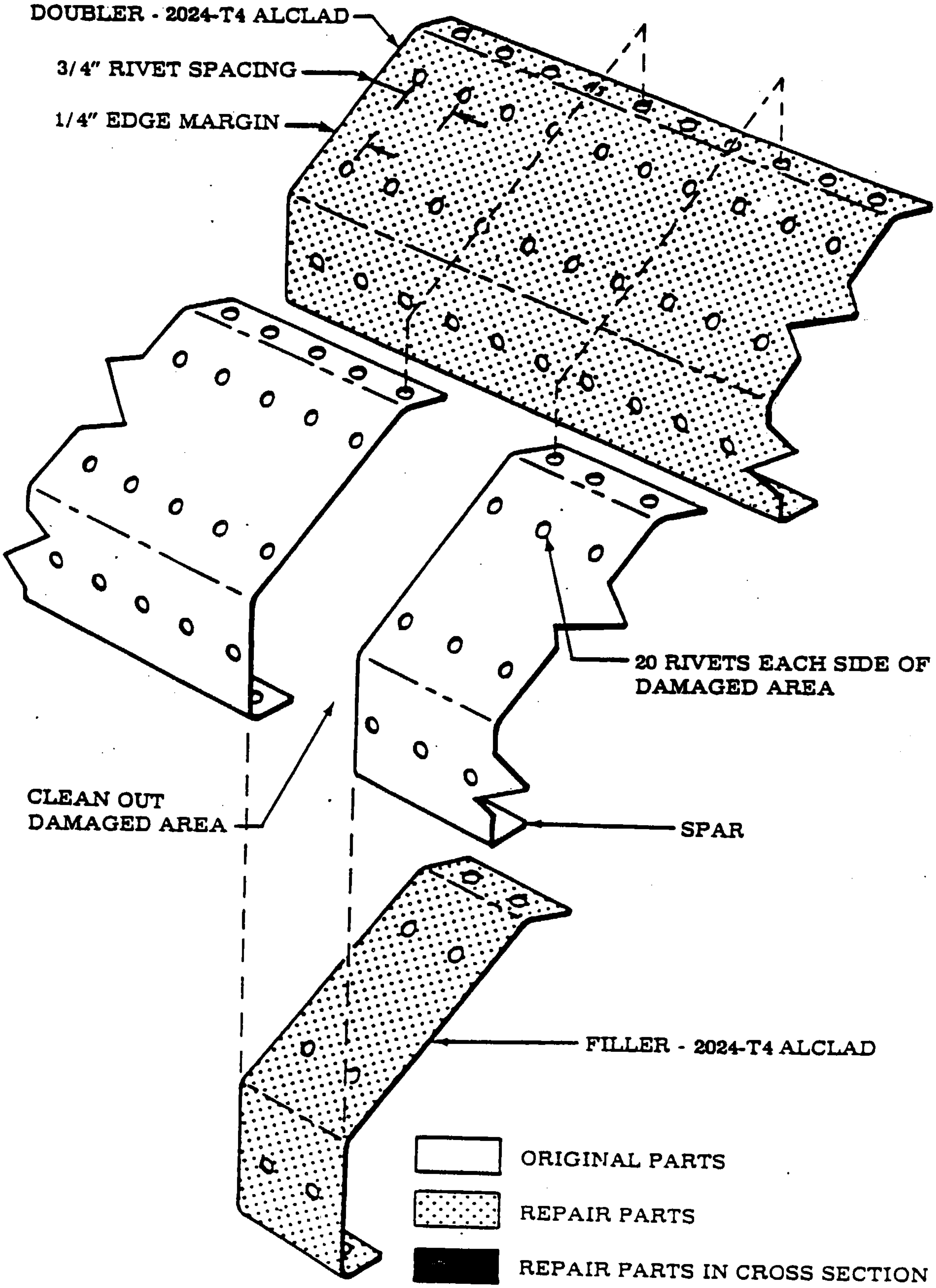


Figure 17-8. Auxiliary Spar Repair (continued)

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.

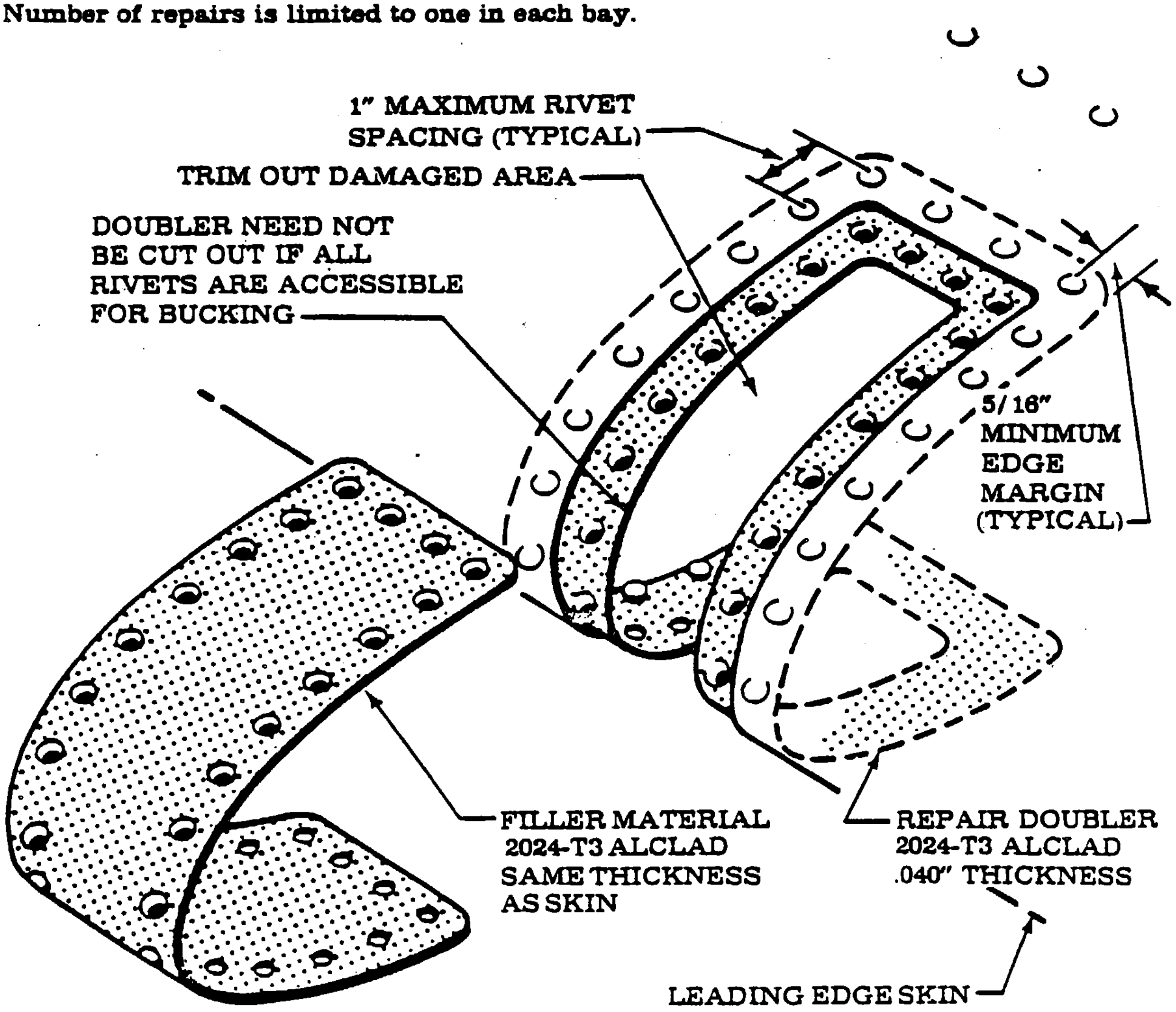


Figure 17-9.Leading Edge Repair

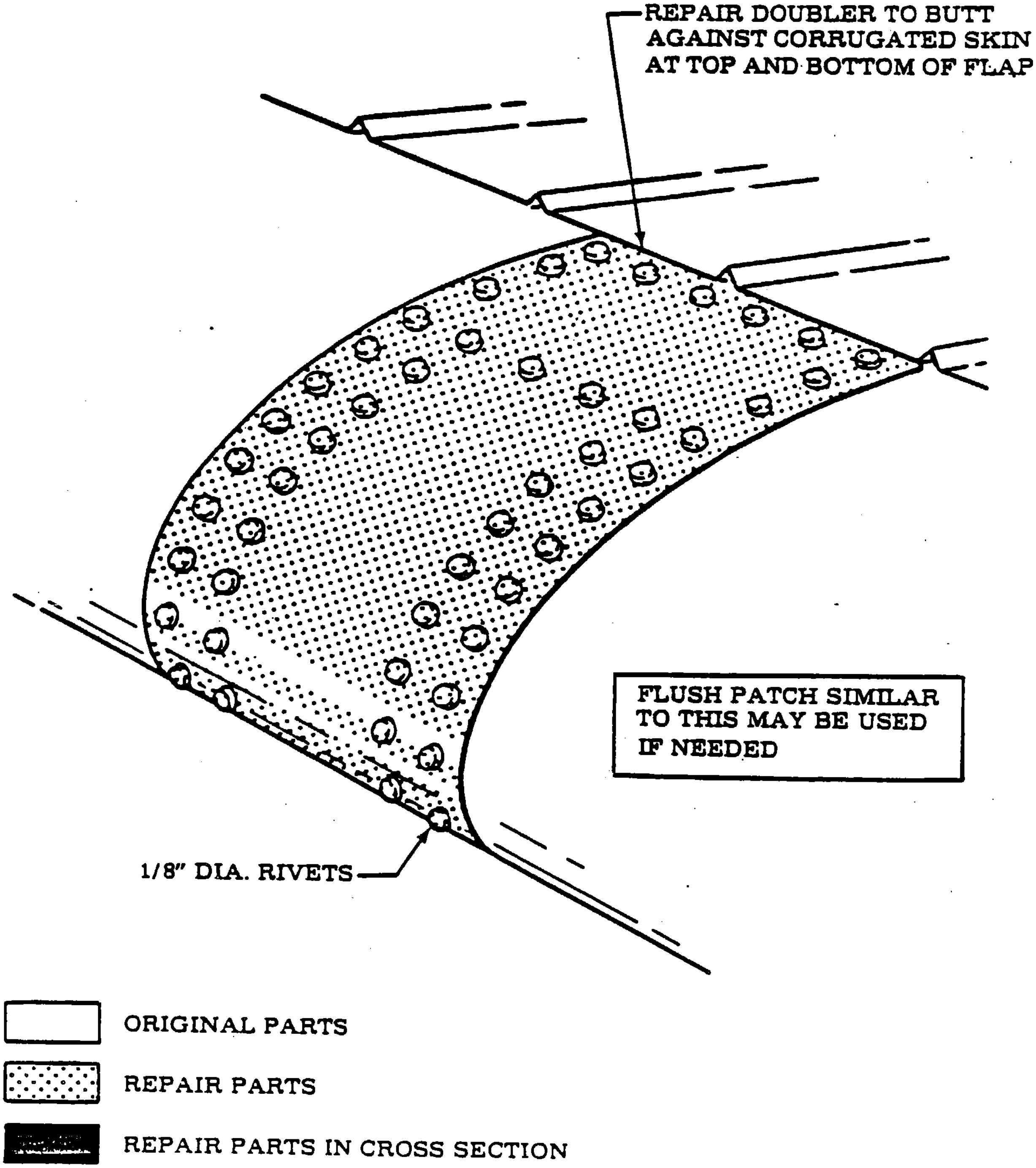


Figure 17-10.Flap Leading Edge Repair

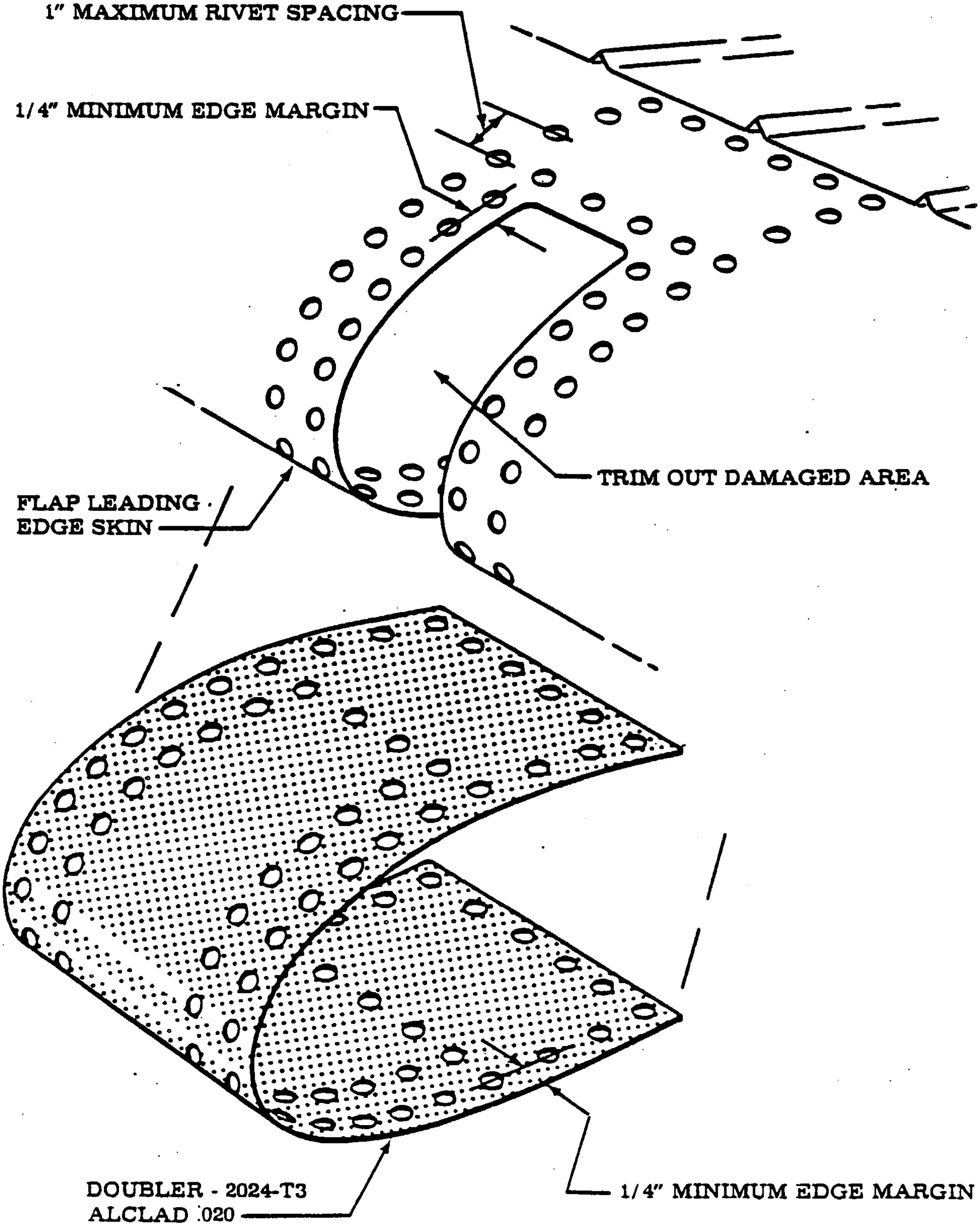


Figure 17-10. Flap Leading Edge Repair (continued)

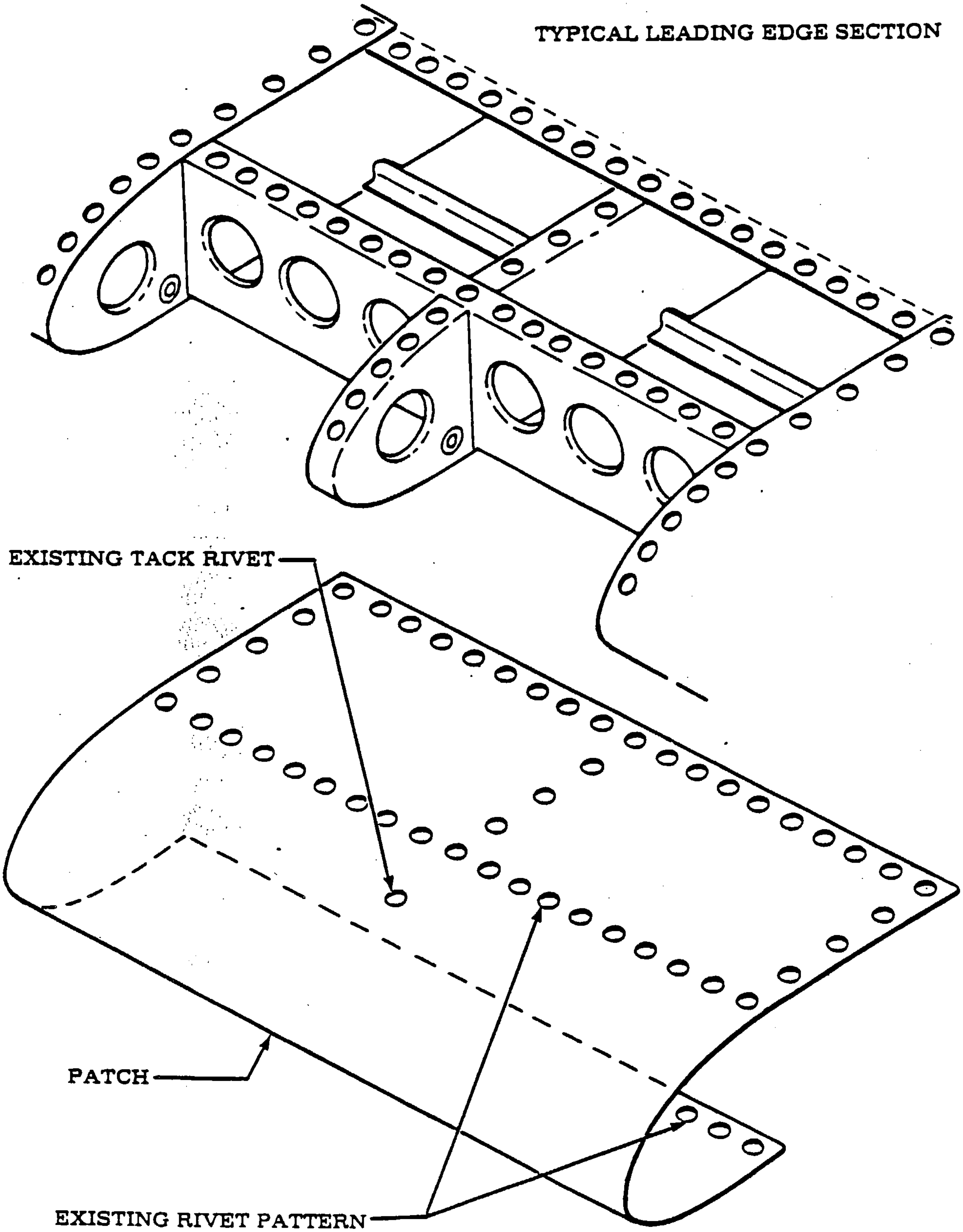
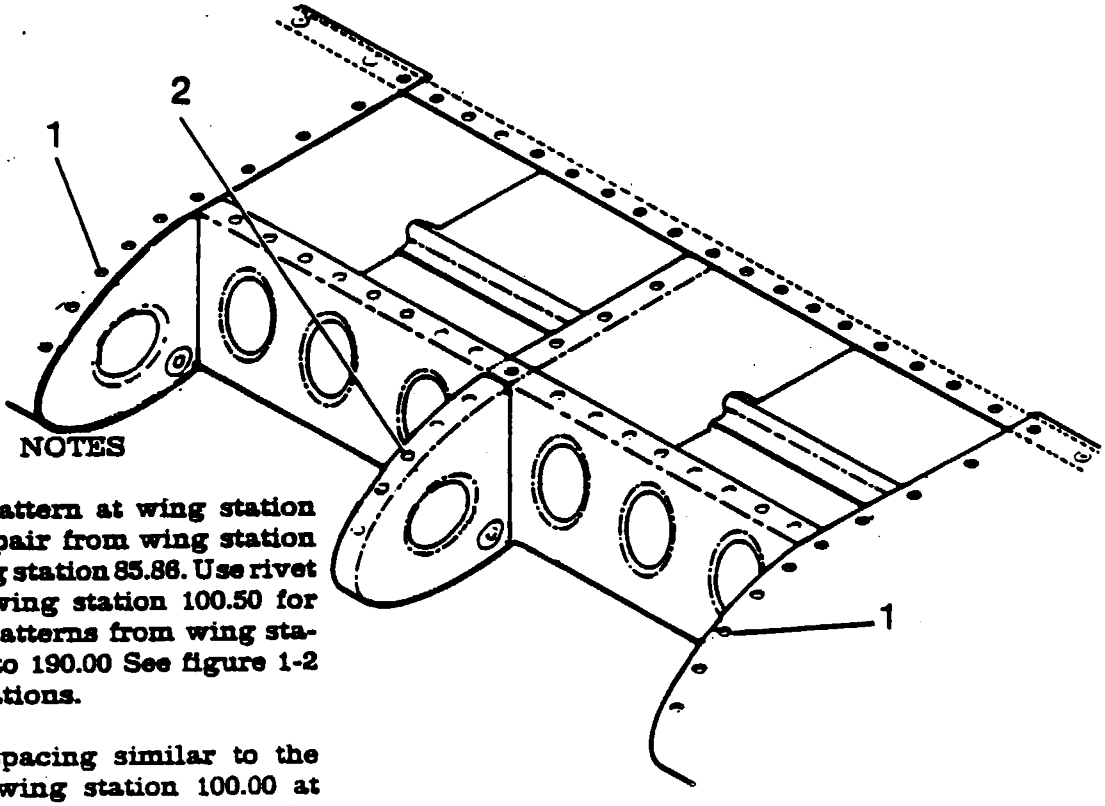


Figure 17-11. Bonded Leading Edge Repair



NOTES

1 **Use rivet pattern at wing station 23.62 for repair from wing station 23.62 to wing station 85.86. Use rivet pattern at wing station 100.50 for lap splice patterns from wing station 100.00 to 190.00 See figure 1-2 for wing stations.**

2 **Use rivet spacing similar to the pattern at wing station 100.00 at leading edge ribs between lap splices.**

Select number of flush rivets to be used at each wing station leading edge rib from table.

NUMBER OF FLUSH RIVETS IN DIMPLED SKIN REQUIRED IN REPLACEMENT LEADING EDGE SKIN

WING STATION RIB	SOLID MS20426-4	BLIND CR2248-4
118	18	22
136	15	18
154	11	13
172	10	12
190	10	12

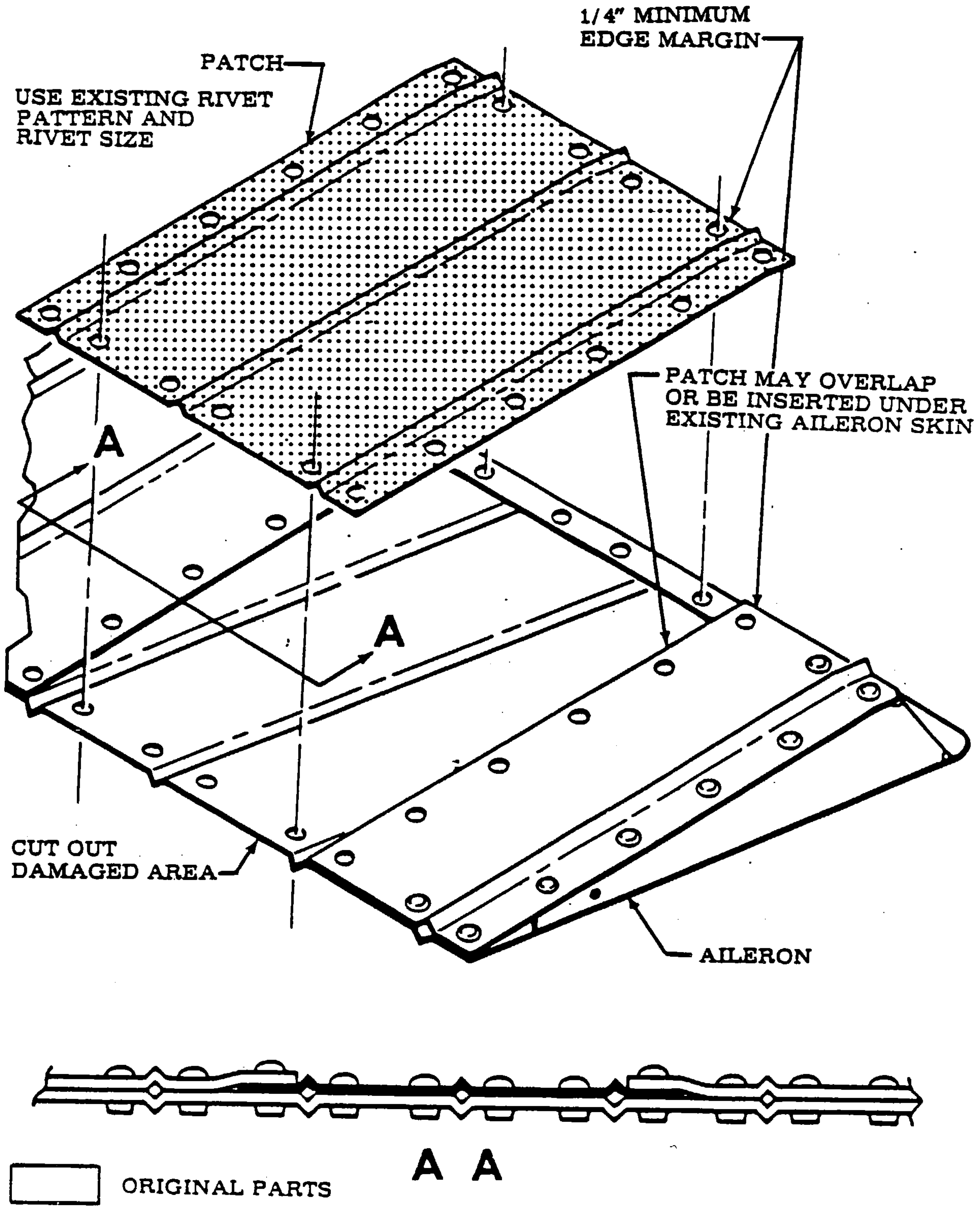
RIBS:

Blind rivets may be substituted for solid rivets in proportionally increased numbers in accordance with the above table.

SPARS:

Blind rivets may be installed in wing spars only in those locations where blind rivets were used during original manufacture, ie fuel bay area of front spars on aircraft with integral fuel bays.

Figure 17-11. Bonded Leading Edge Repair (continued)

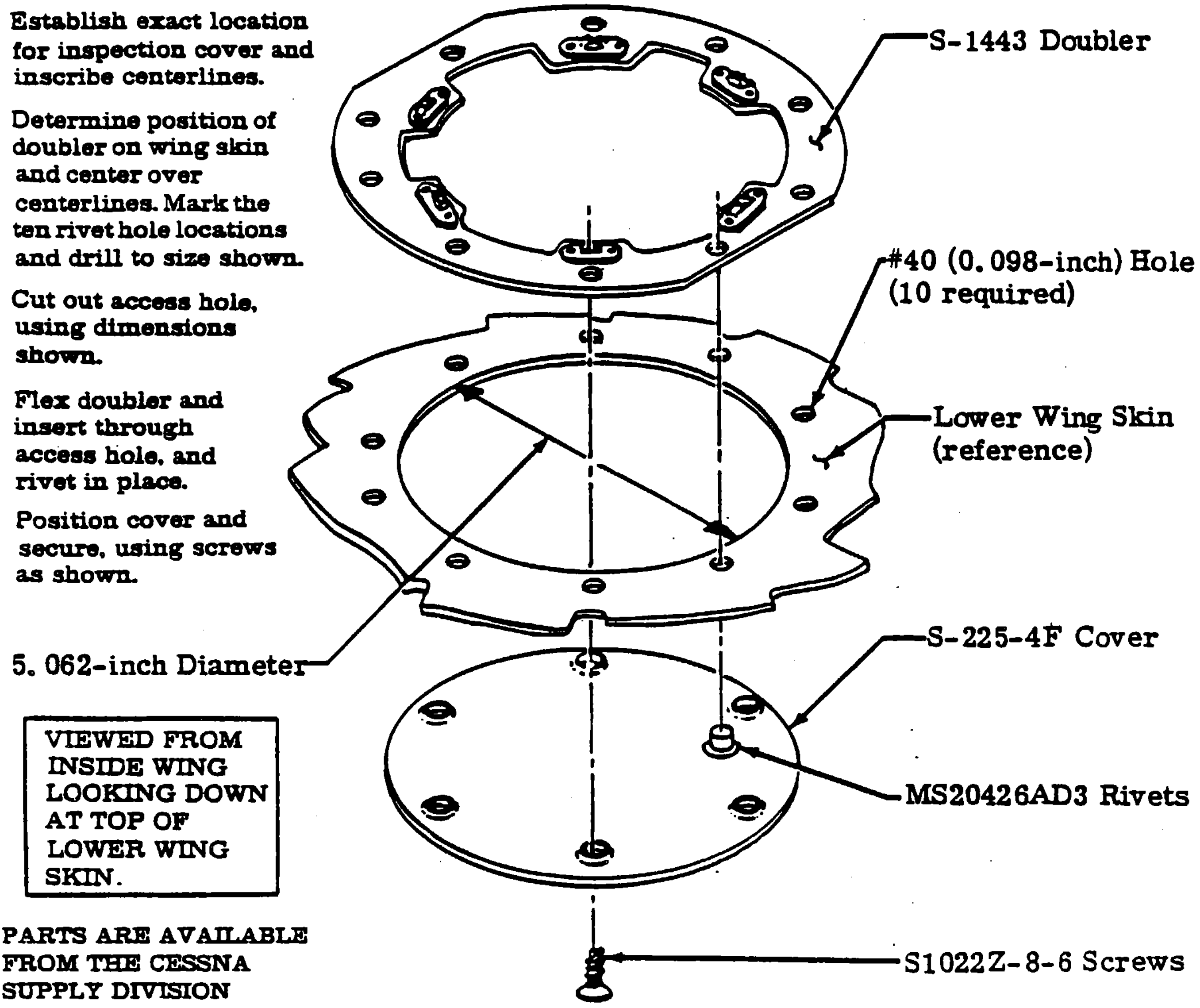


□ ORIGINAL PARTS

▨ REPAIR PARTS

■ REPAIR PARTS IN CROSS SECTION

Figure 17-12. Corrugated Skin Repair



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 is 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.

Figure 17-13. Access Hole Installation

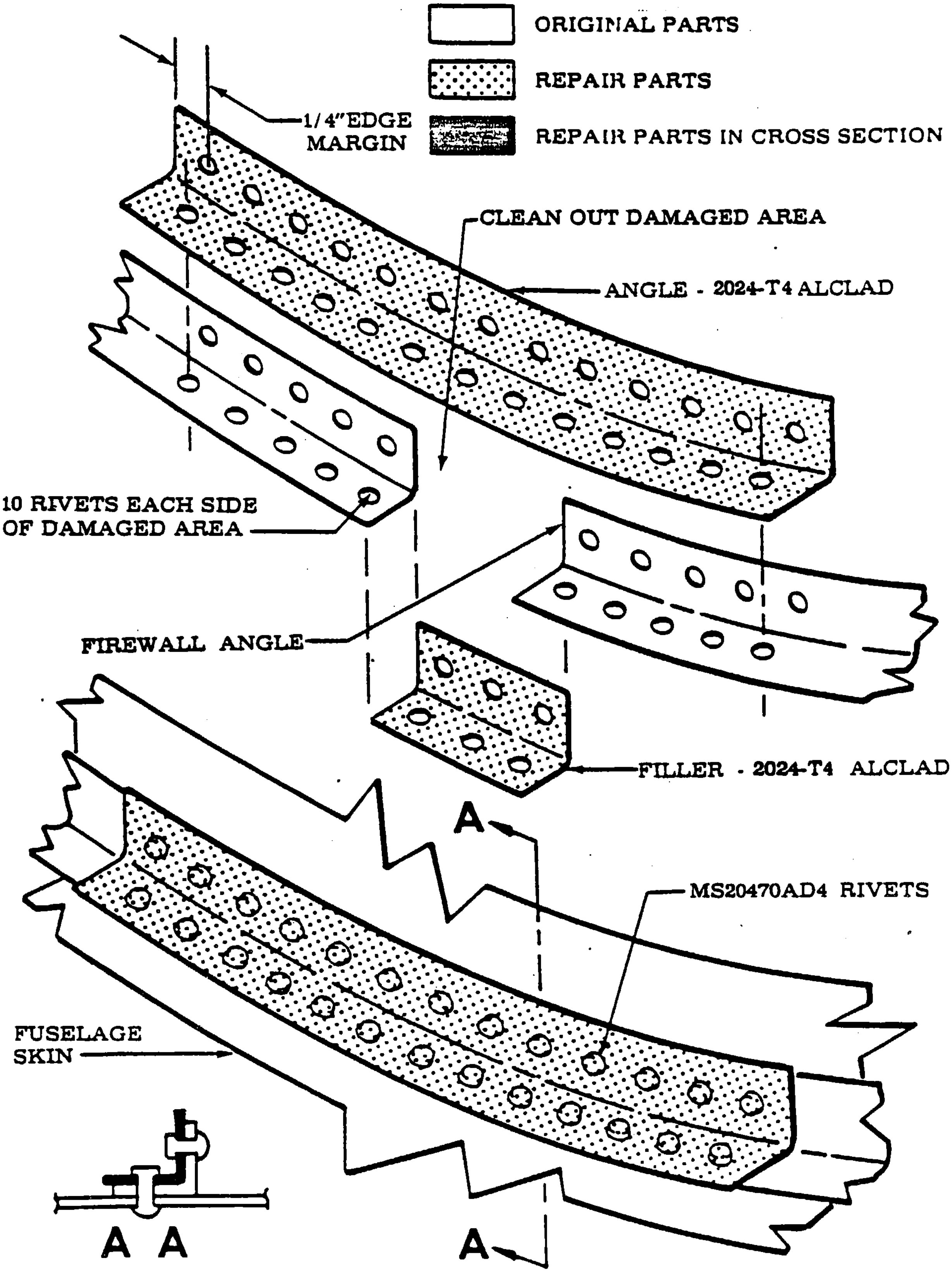


Figure 17-14. Firewall Angle Repair

SECTION 18

PAINTING

18-1. EXTERIOR FINISH. The airplane has an exterior finish consisting of a base color, which covers the entire applicable exterior. Two additional colors are applied to the base color, one being a major color the other an accent color. These two colors will be referred to herein as "stripe" areas. Applicable placards and decals are then installed on the exterior of the airplane in their appropriate places.

For paint numbers, color, decals or placards refer to the Airplane Trim Plate and Parts Catalog. In all cases, determine the type of paint on the aircraft as some types of material are not compatible. Material may be obtained from the Cessna Supply Division.

NOTE

Control surfaces, except for wing flaps, require balancing after painting. Refer to Section 17 for balancing procedures.

18-2. DENT REPAIR.

NOTE

Refer to Section 17 for repair of damaged area(s). Dent repair as described in this Section is applicable only to smooth dents in the skin that are free from cracks, sharp corners, are not stress wrinkles and do not interfere with any internal structure or mechanism.

a. Sand area of dent down to the metal, to include roughing the aluminum surface lightly to increase adhesion.
b. Mix filler to be used per the instructions listed on the container. White Streak filler is recommended.
c. Apply the mixed filler to the dent area with a smooth applicator, leaving the filler thickness just above the surrounding skin.
d. Allow the filler to dry hard enough to sand, approximately 20 minutes. Use a medium grit sand paper and sand the filler down until it is getting close to the skin surface then use a fine grit sand paper. Final sanding of the area should be done with #400 or #600 sand paper using care to feather the edges. Hand sanding should be used.

IMRON MODIFIED URETHANE

MATERIAL	NO/TYPE	AREA OF APPLICATION
PAINT	IMRON ENAMEL	Used as corrosion proof topcoat
	IMRON 192S Activator	Catalyst for Imron Enamel
THINNER	IMRON Y8485S Reducer	Used to thin Imron Enamel
PRIMER	WASH PRIMER P60G2	Used to prime aircraft for Imron Enamel
REDUCER	Catalyst Reducer R7K44	Used to reduce P60G2

NOTE

Do not paint pitot tube, gas caps, or aileron gap seals. Also do not paint antenna covers which were not painted at the factory.

REQUIRED MATERIALS

MATERIAL	NO/TYPE	AREA OF APPLICATION
STRIPPER	Strypeeze Stripper	Used to strip primer overspray
CLEANER	DX440 Wax and Grease Remover	Used to clean aircraft exterior
	Imperial Cleaner	Used to remove grease, bug stains, etc.
	Klad Polish	Used to clean aluminum finish
	606 Polishing Compound	Used to rub out overspray
SOLVENT	(MEK) Methyl Ethyl Ketone	Used to clean aircraft prior to topcoat
CLOTH	HEX Wiping Cloth	Used with solvent to clean aircraft exterior
FILLER	White Streak	Used to fill small dents
MASKING	Class A Solvent Proof Paper	Used to mask areas not to be painted
	Tape Y218	Used for masking small areas
	Tape Y231	Used for masking small areas

18-3. FACILITY. Painting facilities must include the ability to maintain environmental control to a minimum temperature of 65°F., and a positive pressure inside to preclude the possibility of foreign material damage. All paint equipment must be clean, and accurate measuring containers available for mixing protective coatings. Modified Urethane has a pot life of four to eight hours, depending on ambient temperature and relative humidity. Use of approved respirators while painting is a must, for personal safety. All solvent containers should be grounded to prevent static build-up. Catalyst materials are toxic, therefore, breathing fumes or allowing contact with skin can cause serious irritation. Material stock should be rotated to allow use of older materials first, because its useful life is limited. All supplies should be stored in an area where temperature is higher than 50°F., but lower than 90°F. Storage at 90°F. is allowable for no more than sixty days providing it is returned to room temperature for mixing and use.

18-4. EQUIPMENT. The facility should contain the following equipment:

a. Accurate measuring containers for mixing (stainless steel or lined containers).
b. Solvent containers which are grounded to prevent static build-up.

WARNING

Use explosion proof containers for storing wash solvent and flammable materials.

c. Approved respirators for painting is a must for personal safety.
d. A source of dry compressed air and spray equipment capable of delivering 50 to 60 psi at the gun.

18-5. SURFACE PREPARATION. The area to be painted should consist of, at minimum, sections extending to skin laps or stripe lines. Urethane finishes cannot be adequately "spotted in".

a. Sand the area to be painted with #400 and followed with #600 sand paper to remove the finish paint. Avoid, if possible, sanding through the primer.
b. If the primer is penetrated over an area 1/2 inch square or larger, repriming is required.

NOTE

Where paint or primer removal is required, Strypeeze Paint Remover may be used. All traces of stripper must be removed before refinishing. Use care to avoid stripper from running into faying surfaces on corrosion proofed airplanes.

c. Using dry compressed air, blow clean the area to be painted.
d. Mask the surrounding area as necessary to protect from overspray. Masking with 3M Tape Y231 or Y238 and Class A solvent paper is recommended. Ensure that all windows, ABS plastic parts and all mechanical parts not to be painted are securely covered. Double masking tape is recommended at all skin laps to prevent blow by, if applicable.
e. Cover the flap tracks, nose gear strut tube, wheels, shimmy dampener rod ends, gas caps, PITOT TUBE and static air hole as applicable.

NOTE

The hole in the static source button must be open and free from paint and foreign matter. The adjacent surface must be smooth and free from all paint imperfections.

f. Methyl Ethyl Ketone (MEK) solvent should be used for final cleaning of airplanes prior to painting. The wiping cloths shall be contaminant and lint free Hex. Saturate the cloth in solvent and wring out so it does not drip. Wipe the airplane surface with the solvent saturated cloth in one hand and immediately dry with a clean cloth in the other hand. It is important to wipe dry solvent before it evaporates.

18-6. PRIMING.

a. Mix P60G2 primer with R7K44 catalyst using one part primer to one and one half parts catalyst. After mixing, allow primer to set for thirty minutes before spraying.

NOTE

Pot life of the mixed primer is six hours. All mixed primer material should be discarded if not used within this time.

b. Check spray equipment for approximately 10 ± 1 psi pot pressure and approximately 50 psi air pressure at the gun.

WARNING

The airplane should be grounded prior to spraying to prevent static electricity build-up and discharge.

d. Apply primer in one wet even coat to allow for a dry film thickness of .0003 to .0005 inch.

NOTE

The top coat should be applied after primer has cured sufficiently but no later than four hours after application. The primer can be considered cured when scratching with firm pressure of the fingernail does not penetrate the coating.

e. Scuff sand the primer only where runs or dirt particles are evident. Minor roughness or grit may be removed by rubbing the surface with brown Kraft paper which has been thoroughly wrinkled.

18-7. PAINTING.

WARNING

The airplane should be grounded prior to spraying to prevent static electricity build-up and discharge.

a. Mix the polyurethane enamel (see paragraph 18-1) with Imron 192S Activator three parts enamel to one part activator. Mix thoroughly (no induction time required before spraying). Pot life is from 6 to 8 hours at 75°F.

b. Check spraying viscosity for 18 to 20 seconds on a No. 2 Zahn Cup (viscosity should be checked after 4 hours and adjusted if necessary). Use Y8485S Imron Reducer as required. Air pressure at the gun should be approximately 50 psi and pot pressure should be 12 psi during application.

WARNING

When applying modified urethane finishes, the painter should wear an approved respirator, which has a dust filter and organic vapor cartridge, or an air supplied respirator. All modified urethane finishes contain some isocyanate, which may cause irritation to the respiratory tract or an allergic reaction. Individuals may become sensitized to isocyanates.

c. Painting of the airplane should be done with the application of 2 wet even coats, but no more than 3 wet even coats, to allow for a dry film thickness of approximately 2.0 mils. Finish film thickness in excess of 3.0 mils is not desirable.

NOTE

Application of paint over dry coats will not allow for reflow, and will leave a grainy appearance.

d. Allow the airplane to sit for a 5 minute period for the finish to "flash off" before moving.

18-8. CURING. For best results it is desirable to force dry the airplane, after the "flash off" period, for 1-1/2 hours at 120°F to 140°F. Modified urethane paint requires a minimum of seven days to cure under normal conditions, if humidity and temperature is lower, curing time should be extended a maximum of 14 days. During the curing period, indiscriminate use of masking tape, abrasive polishes, or cleaners can cause damage to the finish. The most desirable curing temperature is 60°F. Modified urethane finishes are also sensitive to moisture, therefore, should be stored out of rain until cured.

18-9. STRIPE AREAS. Stripe areas, as defined in paragraph 18-1, should be applied over the base coat after the base coat has been forced dried 1-1/2 hours as described in paragraph 18-8, and has then cooled to room temperature.

a. Mask stripe area using 3M Tape Y231 or Y218 and Class A solvent proof paper. Double tape all skin laps to prevent blow by.

b. Airplanes which will have a stripe only configuration shall be masked, cleaned, and primed, in stripe area only.

c. If the base coat is not over 72 hours old, the stripe area does not require sanding. If sanding is necessary because of age or to remove surface defects, use #400 or #600 sand paper. Course paper will leave sand marks which will decrease gloss and depth of gloss of the finish. The use of power sanders should be held to a minimum: however if used, exercise care to preclude sanding through the white base coat. Wipe surface to be striped with a tack cloth and check all tapes.

d. Stripe colors on Imron base coat will be Imron Enamel. Mix as outlined in paragraph 17-7.

e. Painting of the stripe should be done with 2 or 3 wet-even coats. Dry coats will not reflow, and will leave a grainy appearance. Stripes may be force dried or air dried. Film thickness of a stripe is approximately 1.5 mil to 2.0 mils.

f. Do not remove masking tape and paper until the paint has dried to a "dry to touch" condition. Care should be exercised in removal of the masking to prevent damage to the finish.

18-10. TOUCH-UP.

a. To remove overspray or smooth rough areas in the paint, use DuPont #606 rubbing compound.

b. Grease, bug stains, etc., may be removed from painted surfaces with DX440 Wax and Grease Remover or Imperial Cleaner. Klad Polish may be used on bare aluminum to remove stains, oxides, etc.

c. If defects exist in the paint, the area of the defect should be reworked as outlined in paragraphs 18-5 through 18-8.

18-11. PAINTING OF ABS PLASTIC PARTS.

a. Painting of Spare Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.
2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned with appropriate thinner and applied as a wet coat to ensure adhesion.

b. Touch Up of Previously Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.
2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a compatible primer - surfacer and sealer.
4. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned and applied as a wet coat to ensure adhesion.

18-12. REFINISHING ENGINE MOUNTS. After completing a repair as directed in Section 17, refinish with Heat Resistant Enamel, Black. Degrease and scuff sand of grit blast entire area to bare metal. Spray enamel to a dry film thickness of 0.001" to 0.0013", and cure at 250°F for 15 minutes. Part can be handled as soon as it cools to touch.

SECTION 19

WIRING DIAGRAMS

TABLE OF CONTENTS

CIRCUIT FUNCTION AND SPECIFIC CIRCUIT CODE LETTERS

- A - Armament
- B - Photographic
- C - Control Surface
  - CA - Automatic Pilot
  - CC - Wing Flaps
  - CD - Elevator Trim
- D - Instrument (Other Than Flight or Engine Instrument)
  - DA - Ammeter
  - DB - Flap Position Indicator
  - DC - Clock
  - DD - Voltmeter
  - DE - Outside Air Temperature
  - DF - Flight Hour Meter
- E - Engine Instrument
  - EA - Carburetor Air Temperature
  - EB - Fuel Quantity Gage and Transmitter
  - EC - Cylinder Head Temperature
  - ED - Oil Pressure
  - EE - Oil Temperature
  - EF - Fuel Pressure
  - EG - Tachometer
  - EH - Torque Indicator
  - EJ - Instrument Cluster
- F - Flight Instrument
  - FA - Bank and Turn
  - FB - Pitot Static Tube Heater and Stall Warning Heater
  - FC - Stall Warning
  - FD - Speed Control System
  - FE - Indicator Lights
- G - Landing Gear
  - GA - Actuator
  - GB - Retraction
  - GC - Warning Device (Horn)
  - GD - Light Switches
  - GE - Indicator Lights
- H - Heating, Ventilating and De-Icing
  - HA - Anti-icing
  - HB - Cabin Heater
  - HC - Cigar Lighter
  - HD - De-ice
  - HE - Air Conditioners
  - HF - Cabin Ventilation
- J - Ignition
  - JA - Magneto
- K - Engine Control
  - KA - Starter Control
  - KB - Propeller Synchronizer
- L - Lighting
  - LA - Cabin
  - LB - Instrument
  - LC - Landing
  - LD - Navigation
  - LE - Taxi
  - LF - Rotating Beacon
  - LG - Radio
  - LH - De-ice
  - LJ - Fuel Selector
  - LK - Tail Floodlight
- M - Miscellaneous
  - MA - Cowl Flaps
  - MB - Electrically Operated Seats
  - MC - Smoke Generator
  - MD - Spray Equipment
  - ME - Cabin Pressurization Equipment
  - MF - Chem O_2 - Indicator
- P - D.C. Power
  - PA - Battery Circuit
  - PB - Generator Circuits
  - PC - External Power Source
- Q - Fuel and Oil
  - QA - Auxiliary Fuel Pump
  - QB - Oil Dilution
  - QC - Engine Primer
  - QD - Main Fuel Pumps
  - QE - Fuel Valves
- R - Radio (Navigation and Communication)
  - RA - Instrument Landing
  - RB - Command
  - RC - Radio Direction Finding
  - RD - VHF
  - RE - Homing
  - RF - Marker Beacon
  - RG - Navigation
  - RH - High Frequency
  - RJ - Interphone
  - RK - UHF
  - RL - Low Frequency
  - RM - Frequency Modulation
  - RP - Audio System and Audio Amplifier
  - RR - Distance Measuring Equipment (DME)
  - RS - Airborne Public Address System
- S - Radar
- U - Miscellaneous Electronic
  - UA - Identification - Friend or Foe
- W - Warning and Emergency
  - WA - Flare Release
  - WB - Chip Detector
  - WC - Fire Detection System
- X - A.C. Power

FUNCTION CIRCUITS	GAUGE	BASE COLOR (or solid)	STRIPE COLOR
A + Power	16	Red	None
	18	Red	Black
A + Power		Red	White
	20	Red	Green
	22	Red	Yellow
Ground	16	Black	None
	18	Black	White
Mike Ground	22	Black	None
Radio Lights Dim	18	Yellow	None
Mike Audio	22	Tan	None
		Tan (Shielded)	None
Mike Key	22	White	Black
Radio Speaker	20	Green	None
Headphones	22	Blue	None
Dev + •	22	Gray	Red
Dev - •	22	Gray	Green

- "Dev+" and "Dev-" circuits are for use in Nav-o-matic 300 autopilots and any associated omni indicator circuit to which it connects.

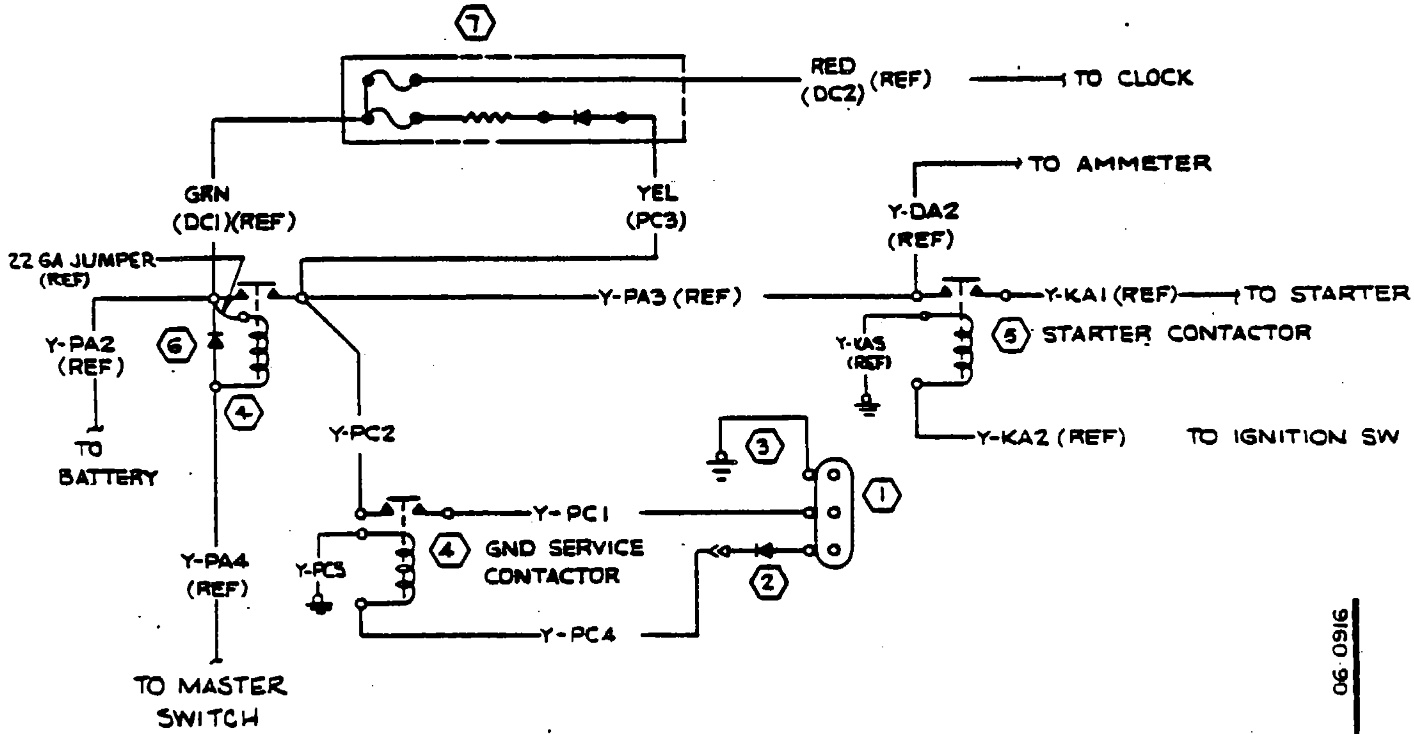
NOTE

All other color coded wires are for general use in multi-conductor radio and autopilot harness assemblies.

CROSS REFERENCE LISTING OF SERIAL REQUEST NUMBERS LISTED ON DIAGRAMS VS. AIRCRAFT SERIAL NUMBERS.

SR No.	AIRCRAFT SERIAL NO.	SR. No.	AIRCRAFT SERIAL NO.
SR9106	172RG0001	SR10034	172RG0891
SR9583	172RG0013	SR10056	172RG0891
SR9626	172RG0571	SR10093	172RG1141
SR9657	172RG0056	SR10122	172RG0891
SR9738	172RG0357	SR10185	172RG1077
SR9785	172RG0670	SR10254	172RG1003
SR9945	172RG0891	SR10254	172RG1145
		SR10413	172RG1178

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-2475-1 WAS S-2443-1 (SR 9106)	RLK 5-22-79	



06-0916

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-PC5	22	-22-4		S-1367-1-10	S-1367-1-12		
Y-PC4	22			S-1493-1	S-1367-1-10		
YEL (PC3)	22	-22-4		S-1367-1-13	SOLDER		
Y-PC2	4	S-1562-4-9		S-2447-4	S-2447-4		
Y-PC1	4	S-1562-4-9		S-1367-6-14	S-2447-4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
7	0712031	FUSE & DIODE ASSY	
6	0770728	DIODE ASSY	
5	S-2443-1	CONTACTOR	
4	S-2475-1	CONTACTOR	
3	0553010	GROUND STRAP	
2	1570043	DIODE BD ASSY	
1	MS3506-1	RECEPTACLE	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	D. J. Harden	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-29-78
STRESS		
PROJ	R. FIFE	12-1-78
APPD		
OTHER		

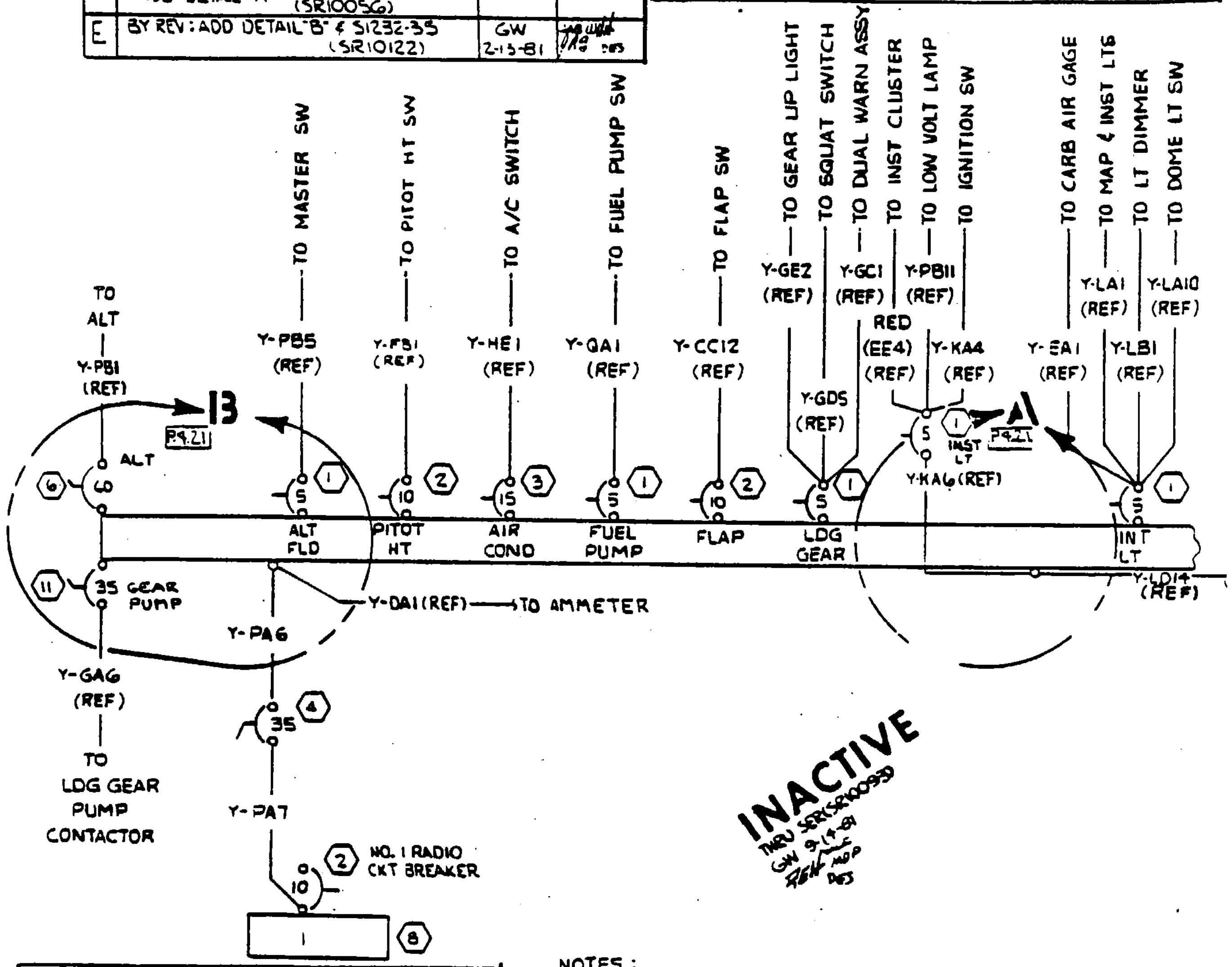
Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
GROUND SERVICE
RECEPTACLE (OPT)

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 4 . 1

C	BY REV: DELETE DC7 FROM DIGITAL CLOCK TO PITOT HEAT CKT BKR ADD DETAIL "C" PG 4.2.1 MER G172ED858	TLW 4-17-80	DES
D	BY REV: ADD DETAIL D, S-1360-20L (SR10034) ADD DETAIL "A" (SR10056)	DFS 12-2-80	JAB DES
E	BY REV: ADD DETAIL "B" & S1232-35 (SR10122)	GW 2-13-81	DES

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: "FLAP" WAS 15 (SR9106)	GW 7-31-79	RF
B	BY REV: ADD DETAILS A, B, C, & SER PG 4.2.1. S1232-5 (SR9626)	NTL 1-18-80	RF



INACTIVE THRU SER(SR10099) GW 9-14-81 DES

NOTES :

1. INSTALL S-1071-3-18.0 TUBING OVER PA6 BEFORE INSTALLING TERMINALS

ITEM NO.	PART NO.	DESCRIPTION	
11	S-1232-35	CIRCUIT BREAKER	
10	S-1360-20L	CKT BKR	
9	S-1232-5	CKT BKR	
8	2470002	BUS BAR - ELECTRONICS	
7	2470002	BUS BAR - PRIMARY	
6	S-1707-60	CKT BKR	
5	S-1232-30	CKT BKR	
4	S-2281-1	SWITCH	
3	S-1360-15L	CKT BKR	
2	S-1360-10L	CKT BKR	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-PA7	10	S-1562-10-9		S-1367-3-8	S-1367-3-6		
Y-PA6	10	S-1562-10-9		S-1367-3-10	S-1367-3-8	1	

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-5-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-11-78
APPD		
OTHER		

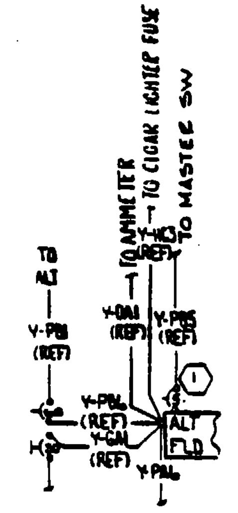
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
BUS BAR &
AVIONICS MASTER SWITCH

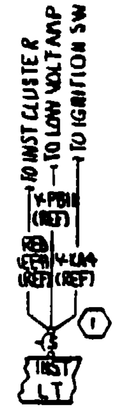
SIZE C | CODE IDENT. NO. 71379 | DWG NO 2471000

SCALE: NONE | (SR9106) | PAGE: 4.2.0

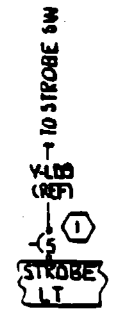
REVISION			
LET	DESCRIPTION	DATE	APPD
E	SEE PG 4.2.0 FOR REVISION		



DETAIL B PG 4.2.0
THRU SER (SR9626)

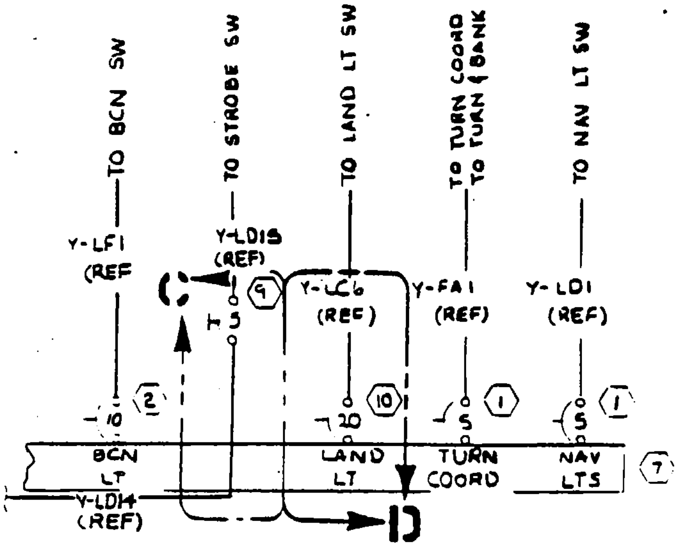


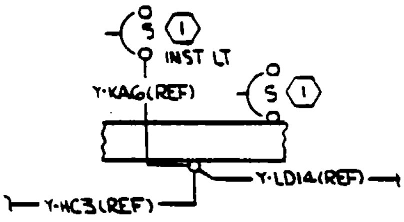
DETAIL A PG 4.2.0
THRU SER (SR9626)



DETAIL C
THRU SER (SR9626)

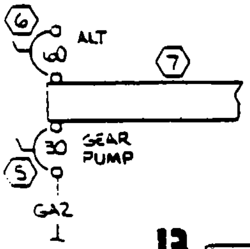
DETAIL D
THRU SER (SR10034)





DETAIL A PG 4.2.0
THRU SER (SR10056)

INACTIVE
THRU SER (SR10093)
GW 9-19-81



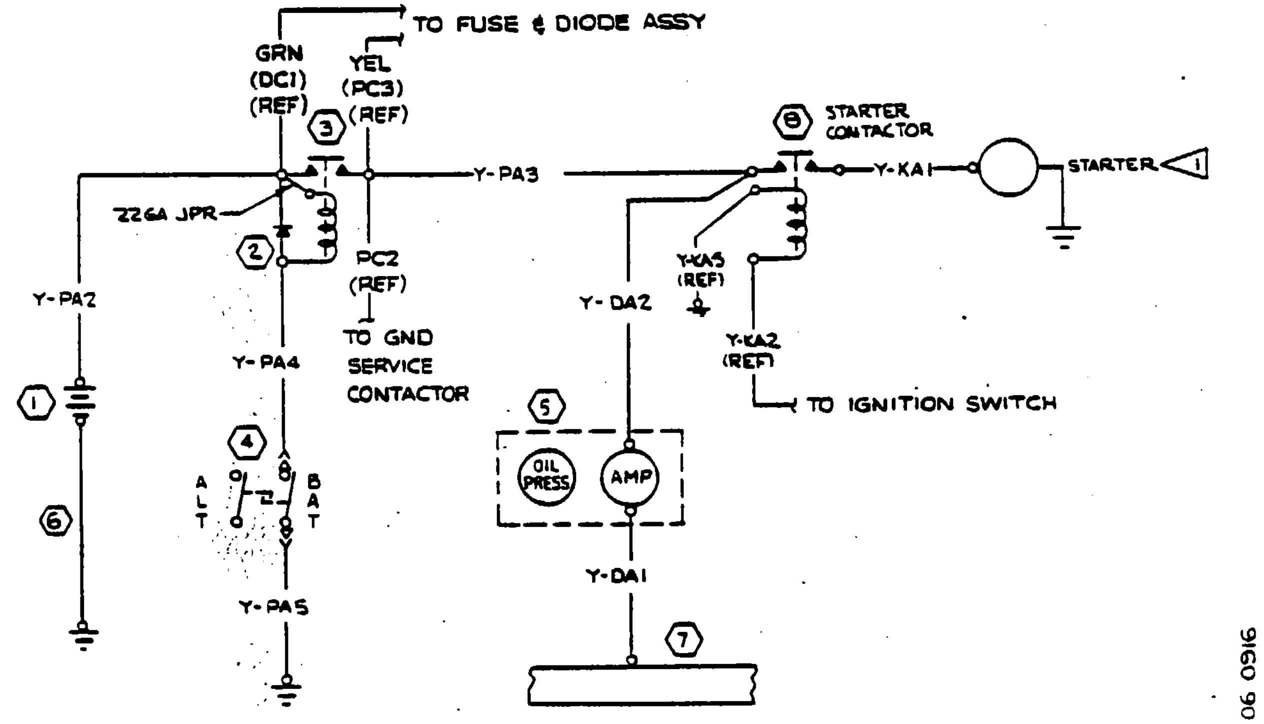
DETAIL B PG 4.2.0
SER (SR9626) THRU SER (SR10122)

CONTRACT NO:			Cessna AIRCRAFT CO.	PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS	
	NAME	DATE	TITLE WIRING DIAGRAM BUS BAR & AVIONICS MASTER SWITCH		
DESIGN	WHITSON	1-25-80			
GROUP					
DRAWN	LANCASTER	1-18-80			
CHECK	BOCLESKE	1-22-80			
STRESS					
PROJ	R. FIFE	1-29-80	SIZE C	CODE IDENT. NO. 71379	DWG NO. 2471000
APPD	RS				
OTHER			SCALE: NONE	SR9626)	PAGE: 4.2.1

NOTES -

1. STARTER SUPPLIED WITH ENGINE

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE Y-PA1; ADD 0412007: S2447-8/DA2 WAS S2447-4 (SR9106)	RLY 3-8-79	ZF
B	BY REV: S-2475-1 WAS S-2443-1 (SR9106)	RLK 5-22-79	JAB ZF



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-KA1	4	S-1562-4-9		S-2447-4	S-1367-6-13		
Y-DA2	8	S-1562-8-9		S-1367-4-10	S-2447-8		
Y-DA1	8	S-1562-8-9		S-1367-4-10	S-1367-4-10		
Y-PA5	22			S-1493-1	S-1367-1-8		
Y-PA4	22			S-1367-1-10	S-1493-1		
Y-PA3	4	S-1562-4-9		S-2447-4	S-2447-4		
Y-PA2	4	S-1562-4-9		S-2447-4	S-2447-4		

WIRE TABLE

8	S-2443-1	CONTACTOR	
7	2470002	BUS BAR	
6	0412007	GND STRAP	
5	C669560-0101	INST CLUSTER	
4	S-1994-1-1	MASTER SWITCH	
3	S-2475-1	CONTACTOR	
2	0770728	DIODE ASSY	
1	C614002-0101	BATTERY ASSY	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

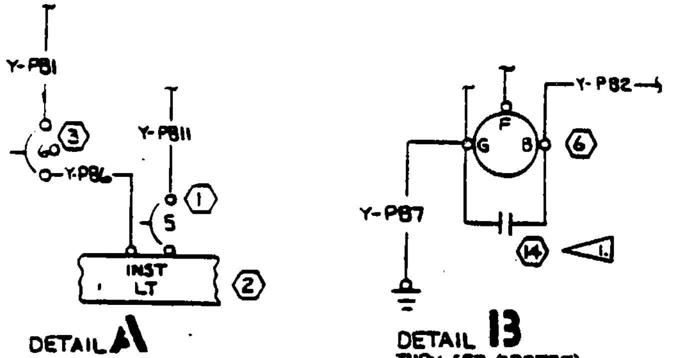
	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	WW Harding	[illegible]
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-11-78
APPD	JRG	
OTHER	/	

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

SIZE	CODE IDENT NO.	DWG NO
C	71379	2471000

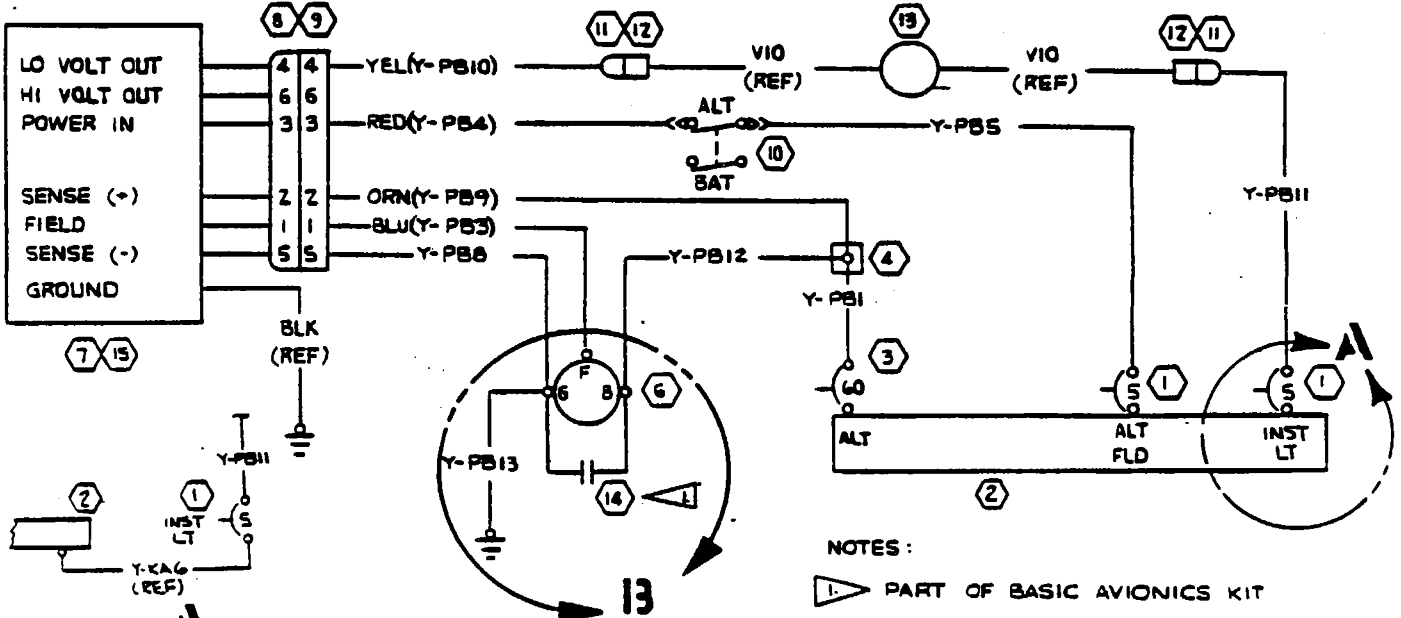
SCALE: NONE (SR9106) PAGE: 4 . 3



DETAIL A
THRU SER (SR9626)

DETAIL B
THRU SER (SR9785)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 20GA WAS 22GA/PB4, PB8, PB10 16GA WAS 20GA/PB3; S-2099-8 WAS S-2099-6; S-1367-2-10 WAS S-1367-1-10 (NOW SHOP PRACTICE) YEL(Y-PB10) WAS Y-PB10, RED(Y-PB4) WAS Y-PB4, ORN(Y-PB9) WAS Y-PB9, BLU(Y-PB3) WAS Y-PB3 (USE EXISTING STOCK)	RLK HHG 9-5-79	
B	BY REV: ADD DETAIL "A". SER OUT PB6 WIRE (SR9626) BY REV: ADD C611005-0102 (NOW SHOP PRACTICE)	NTL 1-18-80 SEB	
C	BY REV: ADD DETAIL "B", Y-PB12, & Y-PB13; 0570315 WAS 0570314 (SR 9786)	SEB 3-31-80	
D	BY REV: ADD DETAIL "A" & SER'S. (SR10093)	GW 9-22-81	



DETAIL A
SER(SR9626) THRU SER(SR10093)

NOTES:

1. PART OF BASIC AVIONICS KIT

15	C611005-0102	ALT CONT UNIT	(ALT)
14	S-1915-1	CAPACITOR	
13	S-2135-2	LAMP ASSY	
12	S-1637-2	HOUSING	
11	S-1637-1	HOUSING	
10	S-1994-1	MASTER SWITCH	
9	S-2373-2	CONNECTOR	
8	S-2373-1	CONNECTOR	
7	C611005-0101	ALT CONT UNIT	
6	C611503-0102	ALTERNATOR	
5			
4	0570315	TERM. BLOCK	
3	S-1232-60	CKT BKR	
2	2470002	BUS BAR	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

Y-PB 13	8	S-1562-8-9		S-1943-1	S-1943-3		SER(SR 9785) & ON
Y-PB 12	8	S-1562-8-9		S-1943-2	S-1943-1		SER(SR 9785) & ON
Y-PB11	22			S-1635-1	S-1367-1-6		
YEL(Y-PB10)	20	-20-4		S-2099-6	S-1635-1		
ORN(Y-PB9)	20	-20-3		S-2099-6	S-1367-1-12		
Y-PB8	20			S-2099-6	S-1367-1-10		
Y-PB7	8	S-1562-8-9		S-1943-3	S-1943-2		THRU SER(SR 9785)
Y-PB6	8	S-1562-8-9		S-1367-4-10	S-1367-4-8		THRU SER(SR9626)
Y-PB5	22			S-1493-1	S-1367-1-6		
RED(Y-PB4)	20	-20-2		S-2099-6	S-1493-1		
BLU(Y-PB3)	16	-16-6		S-1367-2-10	S-2099-8		
Y-PB2	8	S-1562-8-9		S-1943-2	S-1943-2		THRU SER (SR 9785)
Y-PB1	8	S-1562-8-9		S-1367-4-8	S-1943-2		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CONTRACT NO:

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	D. Hardin	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-11-78
APPD	JRB	
OTHER		

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM

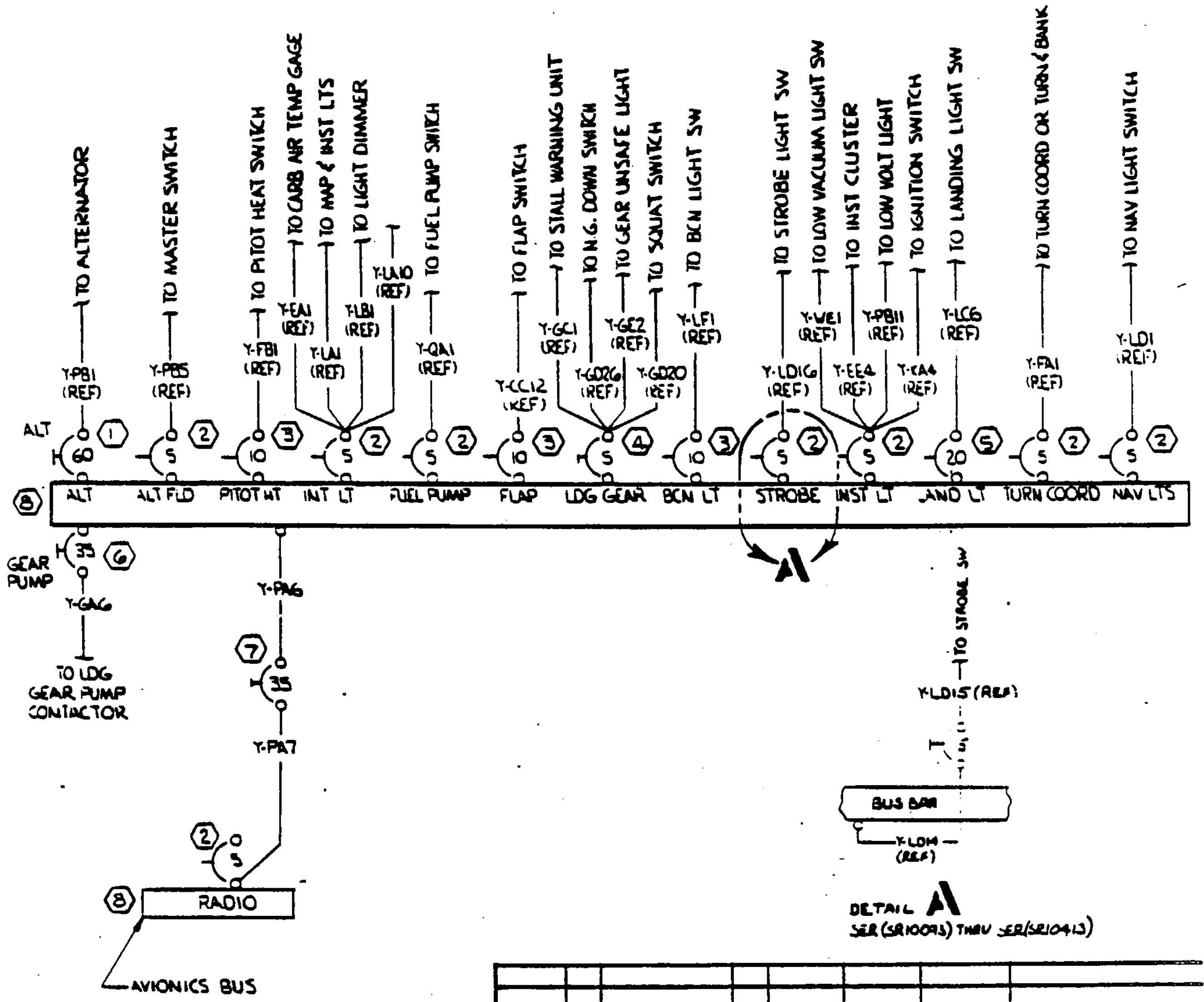
CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDED:

SUPERSEDED BY:

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 4.4

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: Y-WE1 (REF) WAS Y-VA1 (REF) (SR10093)	REK 3-16-92	
B	BY REV: ADD DETAIL A & SER (SR10413)	REK 6-17-92	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-PA7	10	S-1562-10-9		S1367-3-8	S1367-3-6		
Y-PA6	10	S-1562-10-9		S1367-3-10	S1367-3-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
8	2470002	BUS BAR	
7	S2281-1	SWITCH	
6	S1232-35	CIRCUIT BREAKER	
5	S1360-20L	CIRCUIT BREAKER	
4	S1232-5	CIRCUIT BREAKER	
3	S1360-10L	CIRCUIT BREAKER	
2	S1360-5L	CIRCUIT BREAKER	
.	S1707-60	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:
2471000 PG 4.20 & 4.21

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	6-6-81
GROUP	M PAINE	10-6-81
DRAWN	WHITSON	9-18-81
CHECK	RB HAIR	9-22-81
STRESS		
PROJ	D.E SIPES	10-6-81
APPD		
OTHER		

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA. KANSAS

TITLE
WIRING DIAGRAM —
BUS BAR & AVIONICS
MASTER SWITCH

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

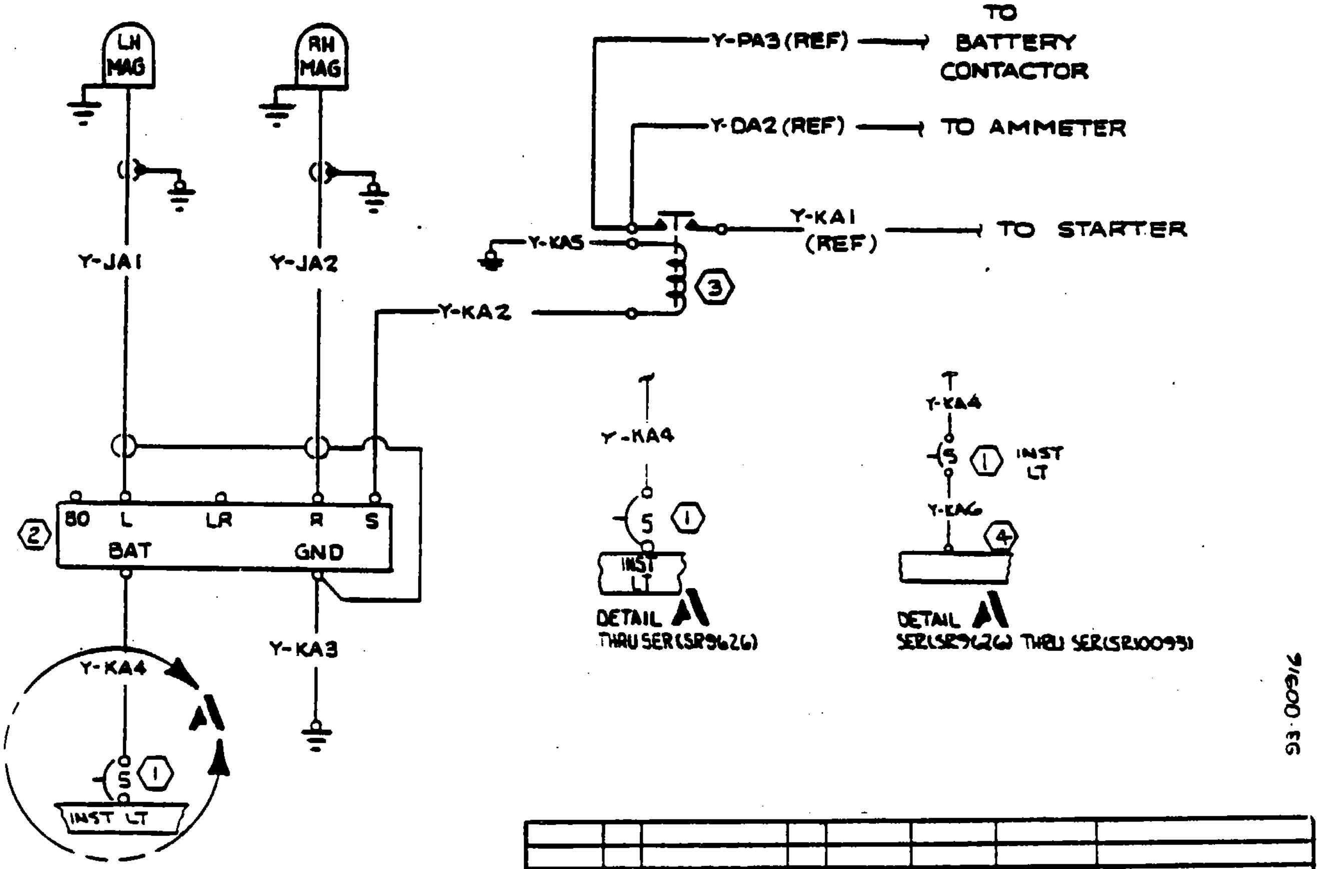
SCALE NONE (SR10093) PAGE: 4.5

NOTES:

▷1. AT IGNITION SWITCH: TERMINATE CENTER CONDUCTOR WITH S-1367-1-6. TERMINATE SHIELDS WITH S-1367-2-8

▷2. AT MAG: TERMINATE CENTER CONDUCTOR WITH S-1367-1-10, TERMINATE SHIELDS WITH S-1367-2-10

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A" & SER IN KA6 WIRE (SR9626)	NTL 1-22-80	[illegible]
B	BY REV: S-1367-1-10 WAS S-1367-1-8, S-1367-2-10 WAS S-1367-2-8/NOTE 2 (SR9626)	FAS 4-1-80	[illegible]
C	BY REV: ADD DETAIL "A" & SER'S. SER OUT KA6 (SR10093)	GW 9-18-81	[illegible]



Y-KA6	20		3/4	S-1367-1-10	S-1367-1-6		(SR9626) THRU (SR10093)
Y-KA5	22			S-1367-1-10	S-1367-1-10		
Y-KA4	22			S-1367-1-6	S-1367-1-6		
Y-KA3	22			S-1367-1-6	S-1367-1-8		
Y-KA2	22			S-1367-1-6	S-1367-1-10		
Y-JA2	18S			◁1.	◁2.		
Y-JA1	18S			◁1.	◁2.		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

4	2470002	BUS BAR	
3	S-2443-1	STARTER CONTACTOR	
2	C292501-0105	IGNITION SWITCH	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

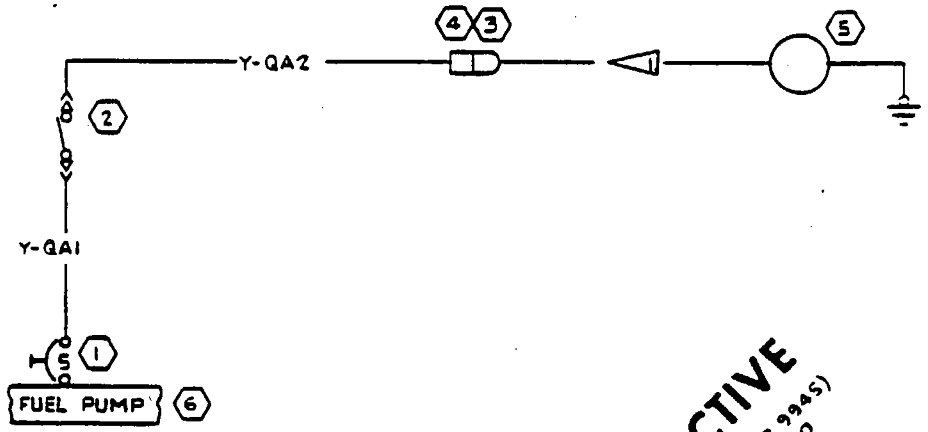
TITLE
WIRING DIAGRAM—
MAGNETO SYSTEM

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 5.1

NOTES:

1 TERMINATE CONDUCTOR WITH S-1635-1 TERMINAL

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C291506-0102 WAS C291506-0101 REVISE NOTE 1 (SR9106)	GW 7-31-79	JAB RF



INACTIVE
THRU SER (SR 9945)
AKI 10-30-80

06 0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-QA2	22			S-1636-1	S-1493-1		
Y-QA1	22			S-1493-1	S-1367-1-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	2470002	BUS BAR	
5	C291506-0102	FUEL PUMP	
4	S-1637-2	HOUSING	
3	S-1637-1	HOUSING	
2	S-2160-1	SWITCH	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: 2471000 PG 7.2

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	D H Harden	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-11-78
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

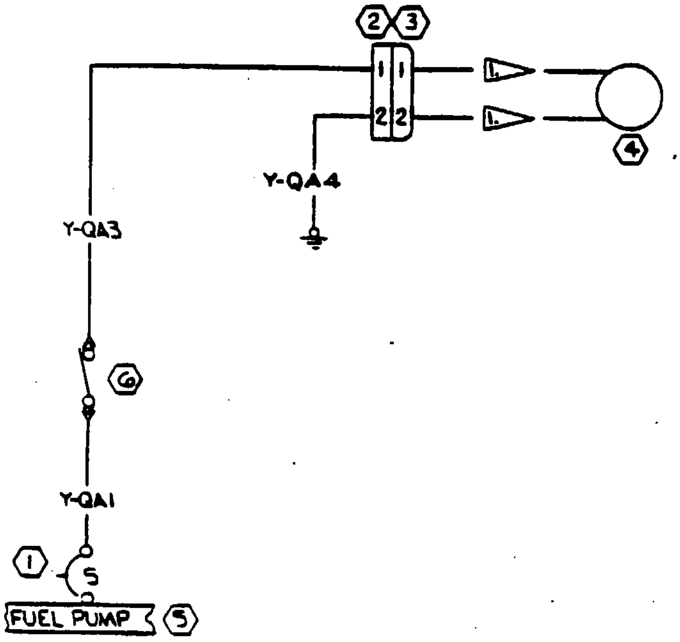
TITLE
WIRING DIAGRAM — FUEL PUMP

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 7.1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD Y-QA1, S2160-1, & NOTE 1 (SR9945)	GW 3-31-81	

NOTES:

1. TERMINATE VENDOR LEADS WITH S-1635-1 TERMINALS



45-0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-QA1	22			S-1367-1-6	S-1493-1		
Y-QA4	20			S-1636-1	S-1367-1-8		
Y-QA 3	20			S1493-1	S-1636-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	S-2160-1	SWITCH	
5	2470002	BUS BAR	
4	C291504	FUEL PUMP	
3	S-2035-1	HOUSING	
2	S-2035-2	HOUSING	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 2471000-7.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	12-18-70
GROUP	W.H. Hes Lud	1-12-81
DRAWN	A K JANUS	12-0-80
CHECK	RE	12-10-80
STRESS		
PROJ	D.E. SIPES	1-13-81
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM —
FUEL PUMP

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9945) PAGE: 7.2

NOTES ·

▷1 MATL IS ALPHA 5857-6 OR BELDEN. 83009-6

▷2 MATL IS ALPHA 5857-7 OR BELDEN 83009·001

▷3 ~~CRIMP S·1636-5 TERM. AROUND WIRE INSULATION USING MOLEX HT-1921 CRIMPING TOOL. BEND BACK .25 OF STRIPPED WIRE OVER CRIMP & SOLDER PER CES 1040~~

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD EB8, EB9, S-1640-6, S-1641-6, S-1640-9, & S-1641-9: EB6 & EB7 WERE YEL (SR9106)	GW 7-31-79	JAB RF
B	BY REV: S1367-1-4 WAS S1636-5/ (BLU)EC2 DELETE NOTE ▷3 (NOW SHOP PRACT)	MKM 9-24-80	JAB 285

INACTIVE
EFF THRU SER (SR9657)
GW 9-18-79 RF
JAB

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
YEL(EB9)	20	-20-4		S-1635-1	S-1367-1-10		
YEL(EB8)	20	-20-4		S-1635-1	S-1367-1-10		
RED(EB1)	22	-22-2		S-1367-1-10	S-1367-1-10		
Y-EB2	20			S-1367-1-10	S-1635-1		
Y-EB3	↑			S-1367-1-10	S-1635-1		
Y-EB4	│			S-1367-1-10	S-1367-1-8		
Y-EB5	│			S-1367-1-10	S-1367-1-8		
EB6	│			S-1636-1	S-1636-1		
EB7	↓			S-1636-1	S-1636-1		
BLU(EC1)	20	-20-6		S-1367-1-10	S-1635-1		
BLU(EC2)	18	◁1		S-1636-1	S-1367-1-4		
BRN(EE1)	20	-20-1		S-1367-1-10	S-1635-1		
BRN(EE3)	18	◁2		S-1636-1	S-1367-1-10		
RED(EE2)	20	-20-2		S-1367-1-10	S-1635-1		
RED(EE4)	22	-22-2		S-1636-1	S-1367-1-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
16	S-1640-9	HOUSING	
15	S-1641-9	HOUSING	
14	S-2443-1	STARTER CONTACTOR	
13	C669562-0101	INST CLUSTER	
12	C669561-0101	INST CLUSTER	
11	C669560-0101	INST CLUSTER	
10			
9			
8	S-1640-6	HOUSING	
7	S-1641-6	HOUSING	
6	C668050-0502	FUEL XMTR-RH	
5	C668050-0501	FUEL XMTR-LH	
4	S-2334-1	SENDING UNIT	
3	S-2335-1	SENDING UNIT	
2	S-1360-5L	CKT BKR .	
1	2470002	BUS BAR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:
2471000 PG 8.4 & PG 8.4.1

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.W.	12-6-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-76
APPD		
OTHER /		

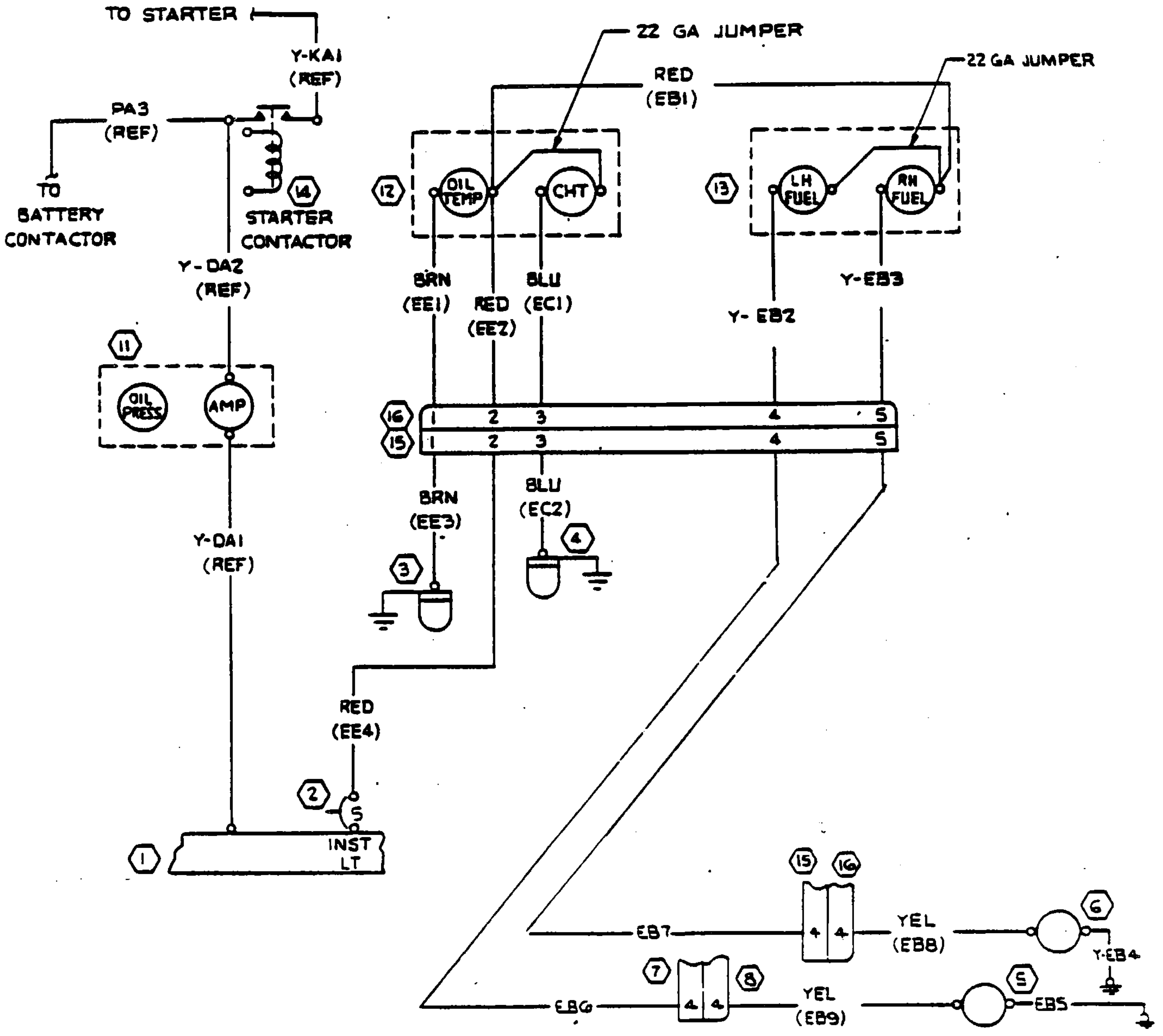
Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
INSTRUMENT CLUSTERS
& TRANSMITTERS

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 8.1

06 0916

Instrument Clusters & Transmitters (Sheet 1 of 2)



CONTRACT NO:		
	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.H. Hardin	12-6-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R.FIFE	12-12-78
APPD		
OTHER /		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM —
INSTRUMENT CLUSTERS
& TRANSMITTERS

SIZE C

CODE IDENT. NO. 71379

DWG NO 2471000

SCALE: NONE

(SR9106)

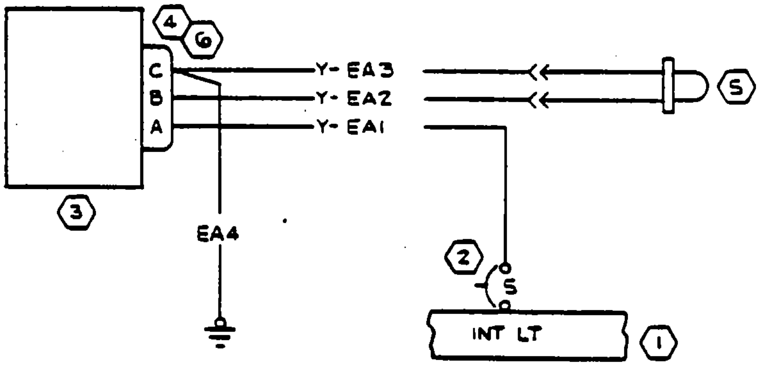
PAGE: 2.1

Instrument Clusters & Transmitters (Sheet 2 of 2)

NOTES:

1 TERMINALS ARE Y214-H FURNISHED BY VENDOR (09922)

REVISION			
LET	DESCRIPTION	DATE	APPD



06 0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-EA4	22			SOLDER	S-1367-1-8		
Y-EA3	22			SOLDER	1		
Y-EA2	22			SOLDER	1		
Y-EA1	22			SOLDER	S-1367-1-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	MS3057-6A	CLAMP	
5	0550209	PROBE	
4	MS3106A-14S-7S	CONNECTOR	
3	S-1311-4	INDICATOR	
2	S-1360-5L	CKT BKR	
1	2470002	BUS BAR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.H. Harder	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD	JKS	
OTHER		

Cessna. AIRCRAFT CO.

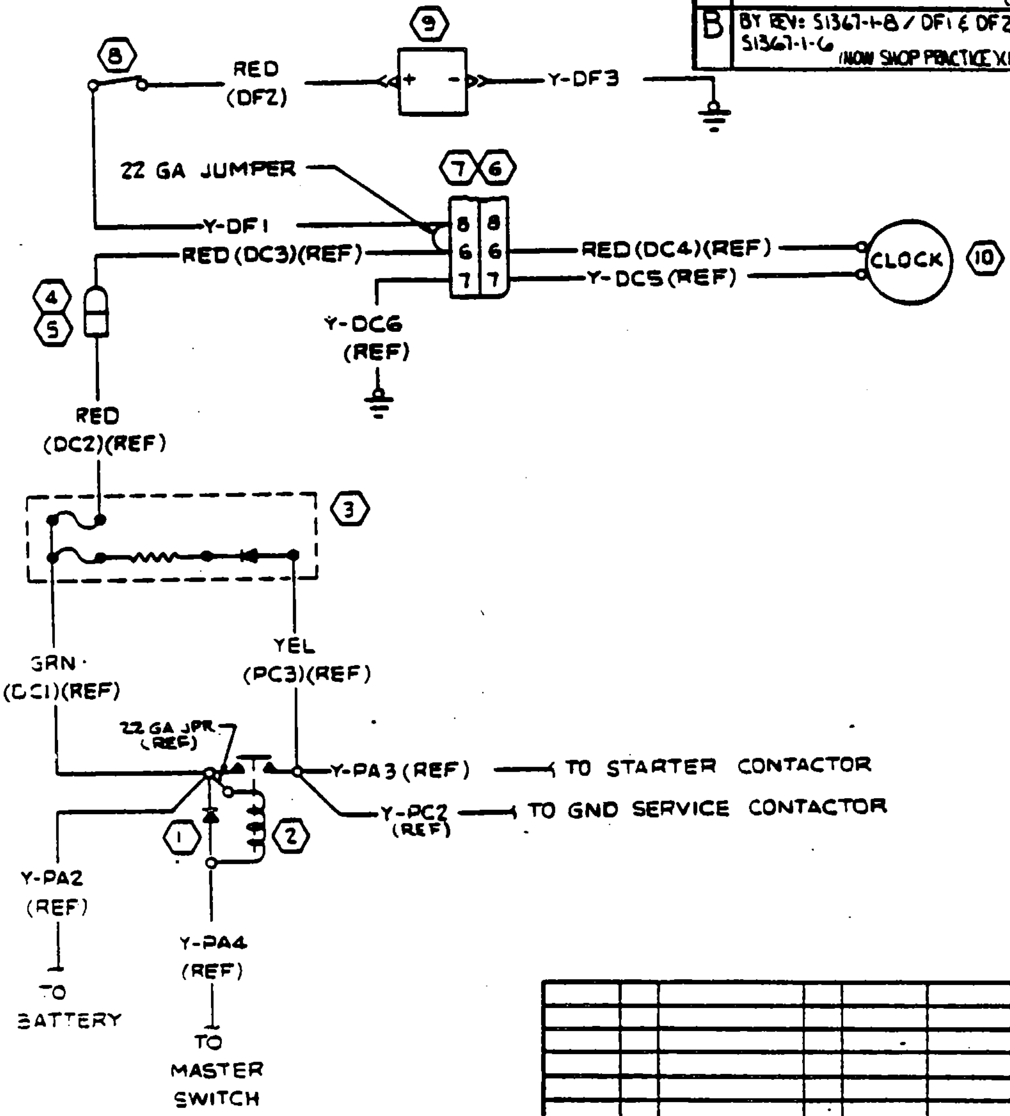
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CARB AIR TEMP GAGE

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 8.2

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-2475-1 WAS S-2445-1 (SR9106)	RLK 5-22-79	
B	BY REV: S1367-1-8 / DF1 & DF2 WAS S1367-1-6 (NOW SHOP PRACTICE X WER 15260967)	GW 7-8-82	



10	C664508-0102	CLOCK	
9	C664503-0101	HOURMETER	
8	S-1711-1	PRESSURE SWITCH	
7	S-1641-9	HOUSING	
6	S-1640-9	HOUSING	
5	S-1637-2	HOUSING	
4	S-1637-1	HOUSING	
3	0712031	FUSE & DIODE ASSY	
2	S-2475-1	BATTERY CONTACTOR	
1	0770728	DIODE ASSY	
ITEM NO.	PART NO.	DESCRIPTION	
	EQUIPMENT TABLE		

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

Y-DF3	22			S-1493-1	S-1367-1-8		
RED(DFZ)	22	-22-2		S-1367-1-8	S-1493-1		
Y-DF1	22			S-1636-1	S-1367-1-8		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
WIRE TABLE							

CONTRACT NO:

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	WHITSON	10-13-78
GROUP		12-6-76
DRAWN	PAPE	9-22-78
CHECK	OCRLESKE	9-23-78
STRESS		
PROJ	R.FIFE	12-12-78
APPD		
OTHER		

TITLE
WIRING DIAGRAM—
HOURMETER
(CPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 3.3

NOTES:

▷1 MATL IS ALPHA 5857-6 OR BELDEN 83009-6

▷2 MATL IS ALPHA 5857-7 OR BELDEN 83009-1

▷3 ~~CRIMP S-1636-5 TERM. AROUND WIRE INSULATION USING MOLEX HT-1921 CRIMPING TOOL. BEND BACK .25 OF STRIPPED WIRE OVER CRIMP & SOLDER PER CES1040~~

▷4 MATL IS ALPHA 5857-2 OR BELDEN 83009-10

▷5 GROUND AT ENGINE CRANKCASE WITH ENGINE TO MOTOR MOUNT GROUND STRAP

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A & SER (SR9626)	NTL 1-18-80	JAB JRS RF
B	BY REV: S1367-1-4 WAS S1636-5/(BLU)EC2 DELETE NOTE ◁3; S-2335 WAS S-2335-1 S-2334 WAS S-2334-1 C668050 WAS C668050-0501 & 502 C669560 WAS C669560-0101 C669561 WAS C669561-0101 C669562 WAS C669562-0101 NOW SHOP PRACTICE	MKM 9-24-80	JAB DJH JRS DES
C	BY REV: ADD DETAIL 'A' & SER'S (SR10093)	GW 9-22-81	MDP DES
D	BY REV: S1493-1/EB4 & EB5 WAS S1367-1-8 (MERG172E0968XSR9657XREF)	GW 6-29-82	DJH JRS

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(EE6)	18	◁4		S-1636-1	S-1367-1-12		
BLK(EE5)	20	-20-0		S-1367-1-8	S-1635-1		
YEL(EB9)	20	-20-4		S-1635-1	S-1367-1-10		
YEL(EB8)	20	-20-4		S-1635-1	S-1367-1-10		
RED(EB1)	22	-22-2		S-1367-1-10	S-1367-1-10		
EB2	20			S-1367-1-10	S-1635-1		
EB3				S-1367-1-10	S-1635-1		
EB4				S-1367-1-10	S1493-1		
EB5				S-1367-1-10	S1493-1		
EB6				S-1636-1	S-1636-1		
EB7				S-1636-1	S-1636-1		
BLU(EC1)	20	-20-6		S-1367-1-10	S-1635-1		
BLU(EC2)	18	◁1		S-1636-1	S-1367-1-4		
BRN(EE1)	20	-20-1		S-1367-1-10	S-1635-1		
BRN(EE3)	18	◁2		S-1636-1	S-1367-1-10		
RED(EE2)	20	-20-2		S-1635-1	S-1367-1-10		
RED(EE4)	22	-22-2		S-1367-1-6	S-1636-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
14	S-1640-9	HOUSING	
13	S-1641-9	HOUSING	
12	S-2443-1	STARTER CONTACTOR	
11	C669562	INST CLUSTER	
10	C669561	INST CLUSTER	
9	C669560	INST CLUSTER	
8	S-1640-6	HOUSING	
7	S-1641-6	HOUSING	
6	C668050	FUEL XMTR-RH	
5	C668050	FUEL XMTR-LH	
4	S-2334	SENDING UNIT	
3	S-2335	SENDING UNIT	
2	S-1360-5L	CIRCUIT BREAKER	
1	2470002	BUS BAR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 2471000 PG 5.1

SUPERSEDED BY:

CONTRACT NO:

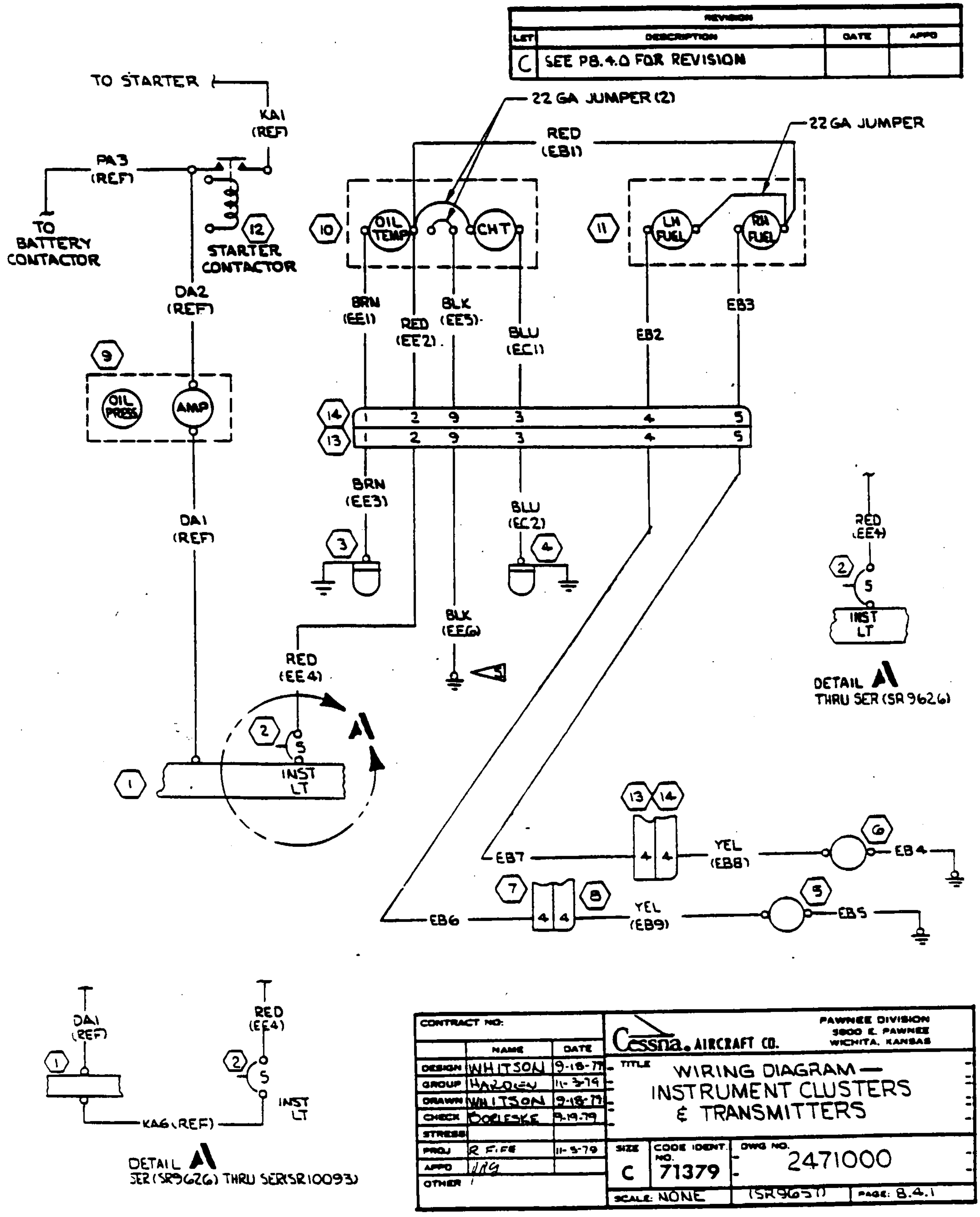
	NAME	DATE
DESIGN	WHITSON	9-18-79
GROUP	HARDEN	11-3-79
DRAWN	WHITSON	9-18-79
CHECK	BORLESKE	9-19-79
STRESS		
PROJ	R FIFE	11-5-79
APPD	JRS	
OTHER		

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

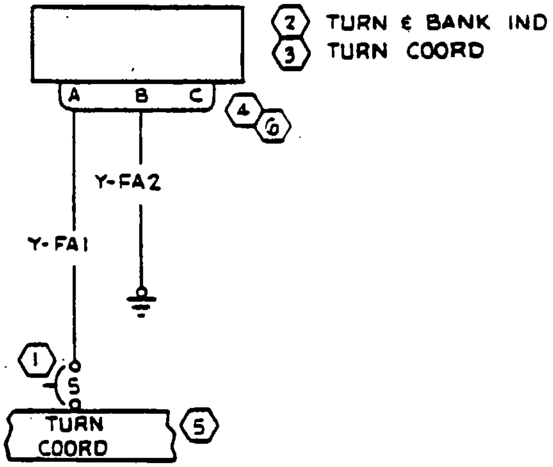
TITLE
WIRING DIAGRAM —
INSTRUMENT CLUSTERS
& TRANSMITTERS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9657) PAGE: 5.4.3


REVISION
LET
DESCRIPTION
DATE
APPD
C
SEE PG. 4.0 FOR REVISION
TO STARTER
KA1 (REF)
PA3 (REF)
TO BATTERY CONTACTOR
12
STARTER CONTACTOR
DA2 (REF)
9
OIL PRESS.
AMP
DA1 (REF)
1
22 GA JUMPER (2)
RED (EB1)
22 GA JUMPER
10
OIL TEMP
CHT
11
LH FUEL
RH FUEL
BRN (EE1)
RED (EE2)
BLK (EE5)
BLU (EC1)
EB2
EB3
14
13
1 2 9 3 4 5
1 2 9 3 4 5
BRN (EE3)
3
BLU (EC2)
4
BLK (EE6)
5
RED (EE4)
2
S
INST LT
A
RED (EE4)
2
S
INST LT
DETAIL A
THRU SER (SR 9626)
13
14
EB7
4 4
YEL (EB8)
6
EB4
7
8
EB6
4 4
YEL (EB9)
5
EB5
DA1 (REF)
1
RED (EE4)
2
S
INST LT
KA6 (REF)
DETAIL A
SER (SR9626) THRU SER (SR10093)
CONTRACT NO:
NAME
DATE
DESIGN WHITSON 9-18-79
GROUP HAROLSEN 11-3-79
DRAWN WHITSON 9-18-79
CHECK DOBLESKE 9-19-79
STRESS
PROJ R FIFE 11-5-79
APPD JRG
OTHER
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS
TITLE
WIRING DIAGRAM —
INSTRUMENT CLUSTERS & TRANSMITTERS
SIZE C
CODE IDENT. NO. 71379
DWG NO. 2471000
SCALE: NONE
(SR9651)
PAGE: 8.4.1

REVISION			
LET	DESCRIPTION	DATE	APPD



06 0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-FA2	22			SOLDER	S-1367-1-8		
Y-FA1	22			S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	MS3057-4A	CLAMP	
5	2470002	BUS BAR	
4	MS3106A10SL-3S	CONNECTOR	
3	C661003-0505	TURN COORD	
2	S-1303-2	TURN & BANK IND	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W H Hardin	12-6-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
TURN COORDINATOR &
TURN & BANK IND

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000

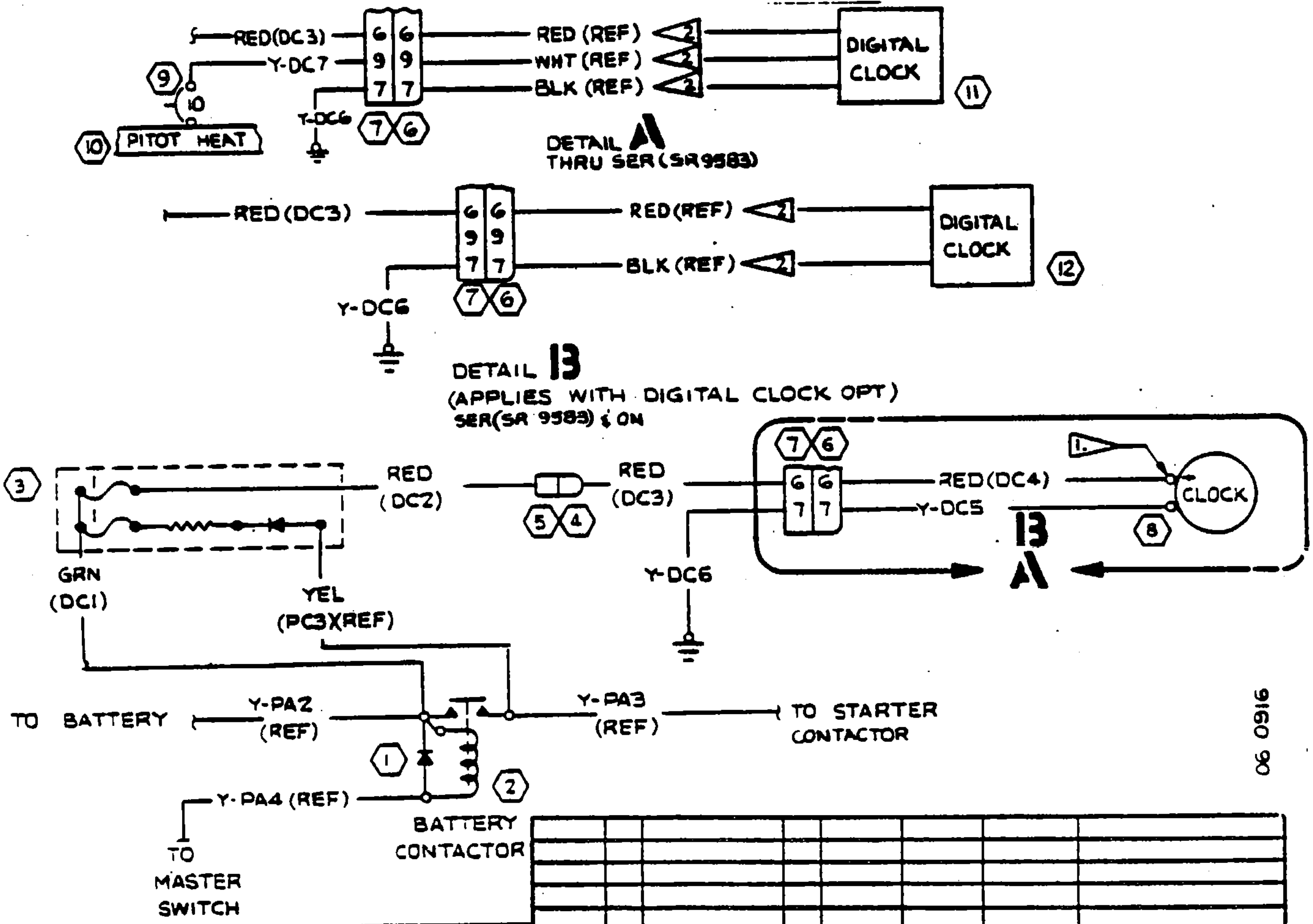
SCALE: NONE
(SR9106)
PAGE: 9.1

NOTES

1. POWER WIRE MUST BE CONNECTED TO "+" TERM. OF CLOCK OR INTERNAL DAMAGE TO UNIT WILL RESULT

2. INSTALL S-1635-1 TERM. ON VENDOR WIRE

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-2475-1 WAS S-2443-1, S-1367-1-6 WAS S-1367-1-10 (SR9106)	RLK 5-22-79	ZF
B	BY REV: WHT(REF) WAS RED(REF). RED(REF) WAS BLU(REF) (SR9106)	GN 6-27-79	ZF
C	BY REV: ADD DETAIL "B" (C664511-0102 SER OUT DETAIL "A" (SR9583)	HHG 2-13-80	DB



12	C664511-0102	DIGITAL CLOCK	
11	C664511-0101	DIGITAL CLOCK	
10	2470002	BUS BAR	
9	S-1360-10L	CKT BKR	
8	C664508-0102	CLOCK	
7	S-1641-9	HOUSING	
6	S-1640-9	HOUSING	
5	S-1637-2	HOUSING	
4	S-1637-1	HOUSING	
3	0712031	FUSE & DIODE ASSY	
2	S-2475-1	BATTERY CONTACTOR	
1	0770728	DIODE ASSY	
ITEM NO	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

Y-DC7	18			S-1367-1-6	S-1636-1		THRU SER(SR 9583)
Y-DC6	22			S-1636-1	S-1367-1-8		
Y-DC5				S-1367-1-6	S-1635-1		
RED(DC4)		-22-2		S-1367-1-6	S-1635-1		
RED(DC3)		-22-2		S-1635-1	S-1636-1		
RED(DC2)		-22-2		SOLDER	S-1636-1		
GRN(DC1)	22	-22-5		S-1367-1-13	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD		
OTHER		

Cessna. AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
CLOCK &
OPT DIGITAL CLOCK

SIZE C | CODE IDENT. NO. 71379 | DWG NO 2471000

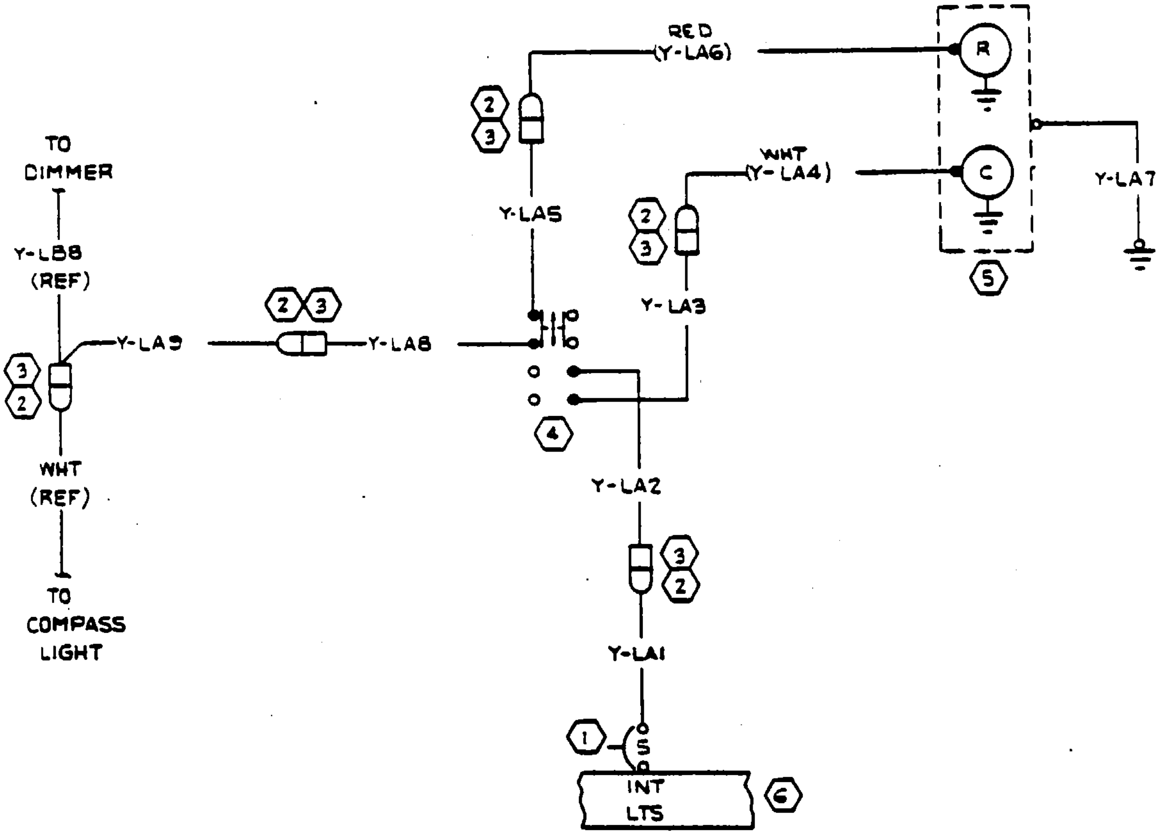
SCALE: NONE | (SR9106) | PAGE: 10.1

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE "OPT" IN TITLE (SR9106)	RLY 3-8-79	QLY CA ZF



06 0916

Y-LA9	22			S-1635-1	S-1636-1		
Y-LA8	22			SOLDER	S-1636-1		
Y-LA7	|			S-1367-1-14	S-1367-1-14		
RED(LA6)	|	-22-2		S-1635-1	SOLDER		
Y-LA5	|			SOLDER	S-1636-1		
WHT(LA4)	|	-22-9		SOLDER	S-1635-1		
Y-LA3	|			SOLDER	S-1636-1		
Y-LA2	|			S-1636-1	SOLDER		
Y-LA1	22			S-1367-1-6	S-1635-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

6	2470002	BUS BAR	
5	1470089	LIGHT ASSY	
4	S-1501-1	SWITCH	
3	S-1637-2	HOUSING	
2	S-1637-1	HOUSING	
1	S-1360-5L	CKT BKR	
	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	PAPE	9-27-78
CHECK	CORLESKE	9-23-78
STRESS		
PROJ	E.FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
1000 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
MAP & AUX INSTRUMENT LIGHT

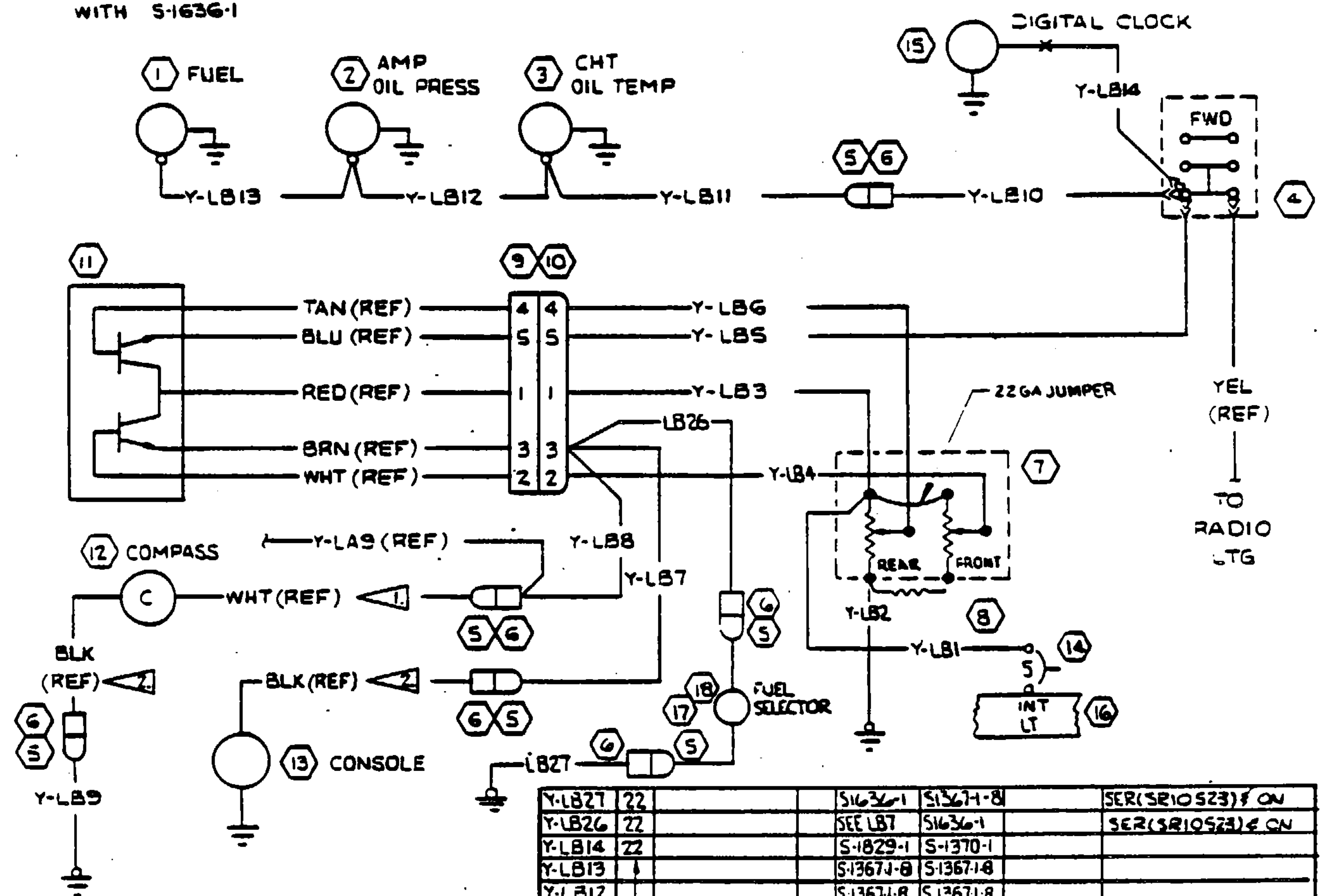
SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 11.1

B	BY REV: ADD LB26.LB27.S2524-1 & MS25231-1829 (SR10523)	GW 6-29-82	

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV DELETE 22 GA JUMPER S200C[illegible] S-1367-1-8 WAS S-1367-1-6. LB11, LB12 LB13 34003-917 WAS 34003-55-3910 (NOW SHOP PRACTICE)	VTL 10-15-79	RF

NOTES:

1. TERMINATE VENDOR FURNISHED WIRE WITH S-1635-1
2. TERMINATE VENDOR FURNISHED WIRE WITH S-1636-1



Y-LB27	22			S1636-1	S1367-1-8		SER(SR10523) & ON
Y-LB26	22			SEE LB7	S1636-1		SER(SR10523) & ON
Y-LB14	22			S-1829-1	S-1370-1		
Y-LB13	↓			S-1367-1-8	S-1367-1-8		
Y-LB12				S-1367-1-8	S 1367-1-8		
Y-LB11				S-1635-1	S1367-1-8		
Y-LB10				S-1829-1	S-1636-1		
Y-LB9				S-1635-1	S-1367-1-8		
Y-LB8				SEE LB7	S-1636-1		
Y-LB7				S-1635-2	S-1635-1		
Y-LB6				SOLDER	S-1635-1		
Y-LB5				S-1635-1	S 1829-1		
Y-LB4				SOLDER	S-1635-1		
Y-LB3				SOLDER	S-1635-1		
Y-LB2	↓			SOLDER	S-1367-1-8		
Y-LB1	22			S-1367-1-6	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

8	MS25231-829	LAMP	
17	S2524-1	SOCKET ASSY	
16	2470002	BUS BAR	
15	MS25231-1819	LAMP	
14	S-1360-5L	CKT BKR	
13	MS15584-15	LAMP	
12	MS25237-327	LAMP	
11	1570166	DIMMING ASSY	
10	S-1640-6	HOUSING	
9	S-1641-6	HOUSING	
8	S-2000C201J	RESISTOR	
7	S-2091-7	POT. ASSY	
6	S-1637-2	HOUSING	
5	S-1637-1	HOUSING	
4	34003-917	TERM. BLOCK	
3	C669561-0101	INST CLUSTER	
2	C669560-0101	INST CLUSTER	
1	C669562-0101	INST CLUSTER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CXXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-8-78
GROUP	W H Hardin	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

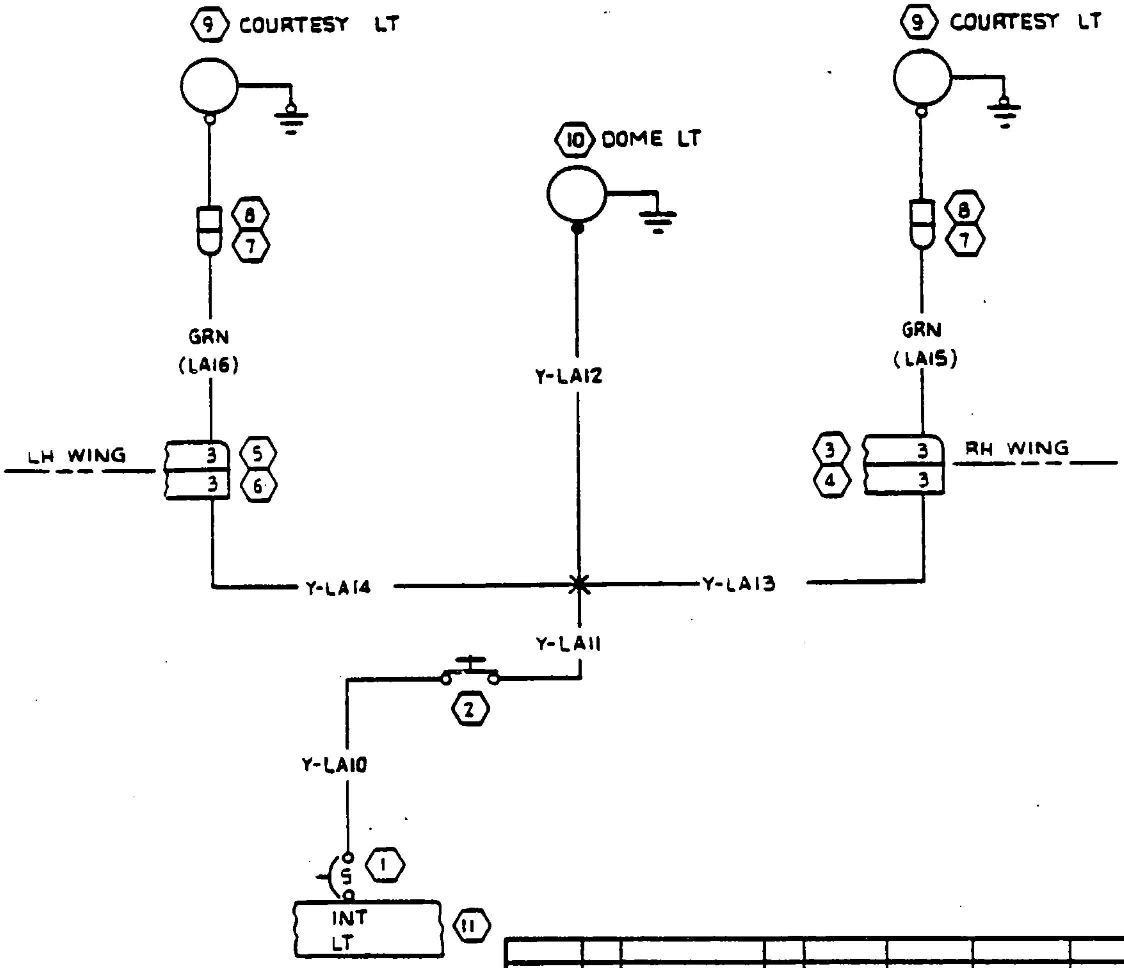
TITLE

WIRING DIAGRAM —
COMPASS & INSTRUMENT
LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 11 .2

REVISION			
LET	DESCRIPTION	DATE	APPD



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GRN(LA16)	22	-22-5		S-1635-1	S-1635-1	(STD)	
GRN(LA15)	↑	-22-5		S-1635-1	S-1635-1	(STD)	
Y-LA14	|			SEE LA11	S-1636-1	(STD)	
Y-LA13	|			SEE LA11	S-1636-1	(STD)	
Y-LA12	|			SEE LA11	SOLDER		
Y-LA11	↓			S-1830-1	S-1370-2		
Y-LA10	22			S-13671-6	S-1830-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

11	2470002	BUS BAR	
10	MS25231-313	LAMP	
9	MS15584-15	LAMP	
8	S-1637-2	HOUSING	
7	S-1637-1	HOUSING	
6	S-1641-6	HOUSING	
5	S-1640-6	HOUSING	
4	S-1641-9	HOUSING	
3	S-1640-9	HOUSING	
2	S-1831-1	SWITCH	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

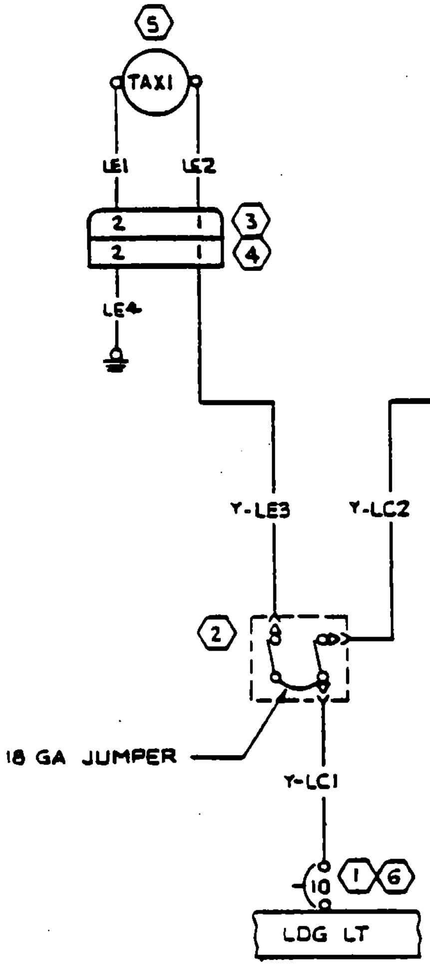
	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.H. Harden	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER	/	

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
DOME & OPT COURTESY
LIGHTS

SIZE	CODE IDENT. NO.	DWG NO	
C	71379	2471000	
SCALE: NONE		(SR9106)	PAGE: 11 . 3

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 4594 WAS 4591 (SR9106)	RLY 3-8-79	



INACTIVE
EFF THRU SER (SR10034)
OFS 12-2-80

06 0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-LE4	18			S-1636-1	S-1367-1-12		
Y-LE3				S-1636-1	S-1493-1		
Y-LE2				S-1367-1-8	S-1635-1		
Y-LE1				S-1635-1	S-1367-1-8		
Y-LC5				S-1636-1	S-1367-1-12		
Y-LC4				S-1635-1	S-1367-1-8		
Y-LC3				S-1635-1	S-1367-1-8		
Y-LC2				S-1493-1	S-1636-1		
Y-LC1	18			S-1367-1-6	S-1493-2		

WIRE TABLE

6	2470002	BUS BAR	
5	4594	LAMP	
4	S-2035-2	HOUSING	
3	S 2035-1	HOUSING	
2	S-2160-4	SWITCH	
1	S-1360-10L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY: 2471000 PG 11.10

CONTRACT NO:

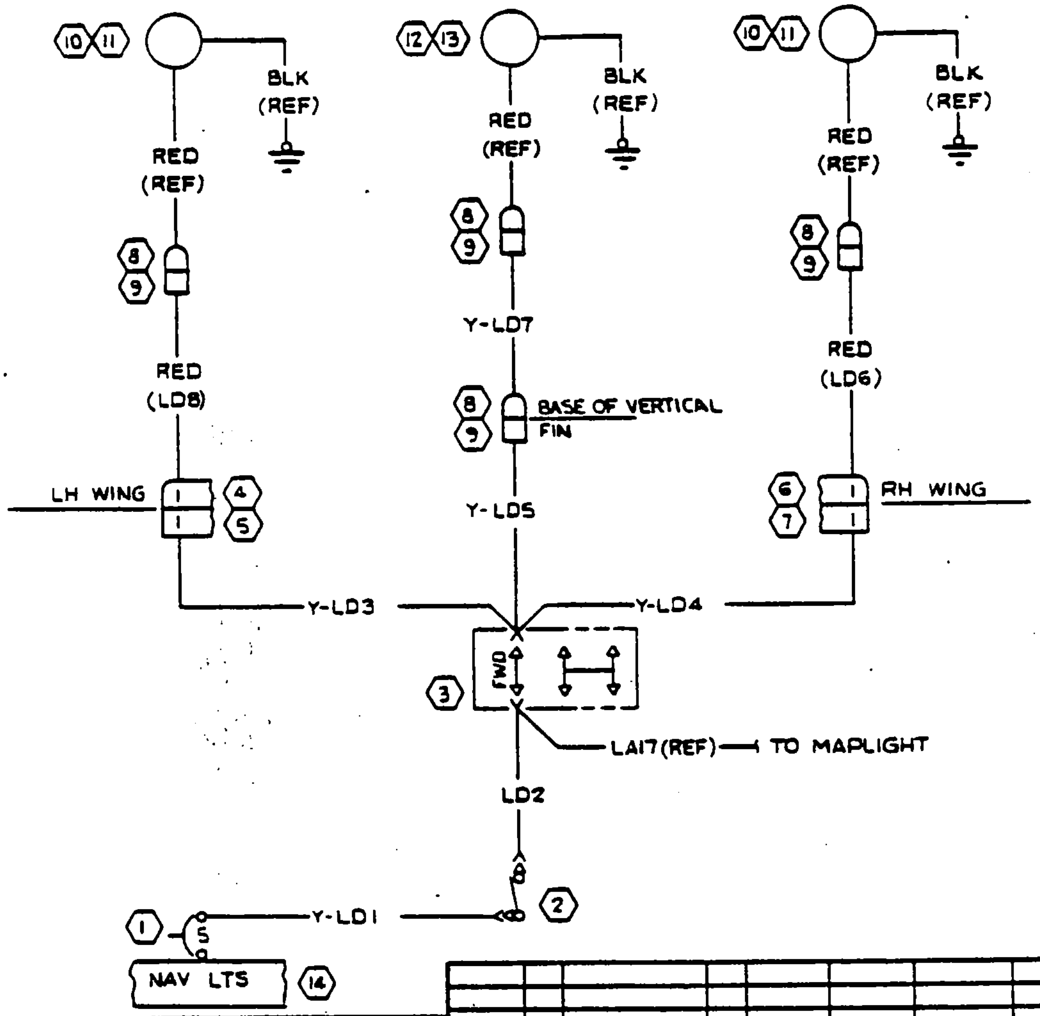
	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.H. Harden	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER		

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
LANDING & TAXI LIGHTS
(OPT)

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 11.4

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: LD7 WAS LD8. LD8 WAS LD7 (SR9106)	GW 6-27-79	



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14	2470002	BUS BAR	
13	MS35478-307	LAMP	
12	C622001-0102	LIGHT ASSY	
11	MS25309-7512	LAMP	
10	C622001-0202	LIGHT ASSY	
9	S-1637-2	HOUSING	
8	S-1637-1	HOUSING	
7	S-1641-9	HOUSING	
6	S-1640-9	HOUSING	
5	S-1641-6	HOUSING	
4	S-1640-6	HOUSING	
3	34003-55-3410	TERM. BLOCK	
2	S-2160-1	SWITCH	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

Y-LD7	20			S-1635-1	S-1636-1		
RED(LD8)	20	-20-2		S-1635-1	S-1636-1		
RED(LD6)	20	-20-2		S-1635-1	S-1636-1		
Y-LD5	20			S-1829-1	S-1636-1		
Y-LD4	22			S-1829-1	S-1636-1		
Y-LD3	22			S-1829-1	S-1636-1		
Y-LD2	22			S-1493-1	S-1829-1		
Y-LD1	22			S-1367-16	S-1493-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
NAV LIGHTS

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

SIZE C

CODE IDENT. NO. 71379

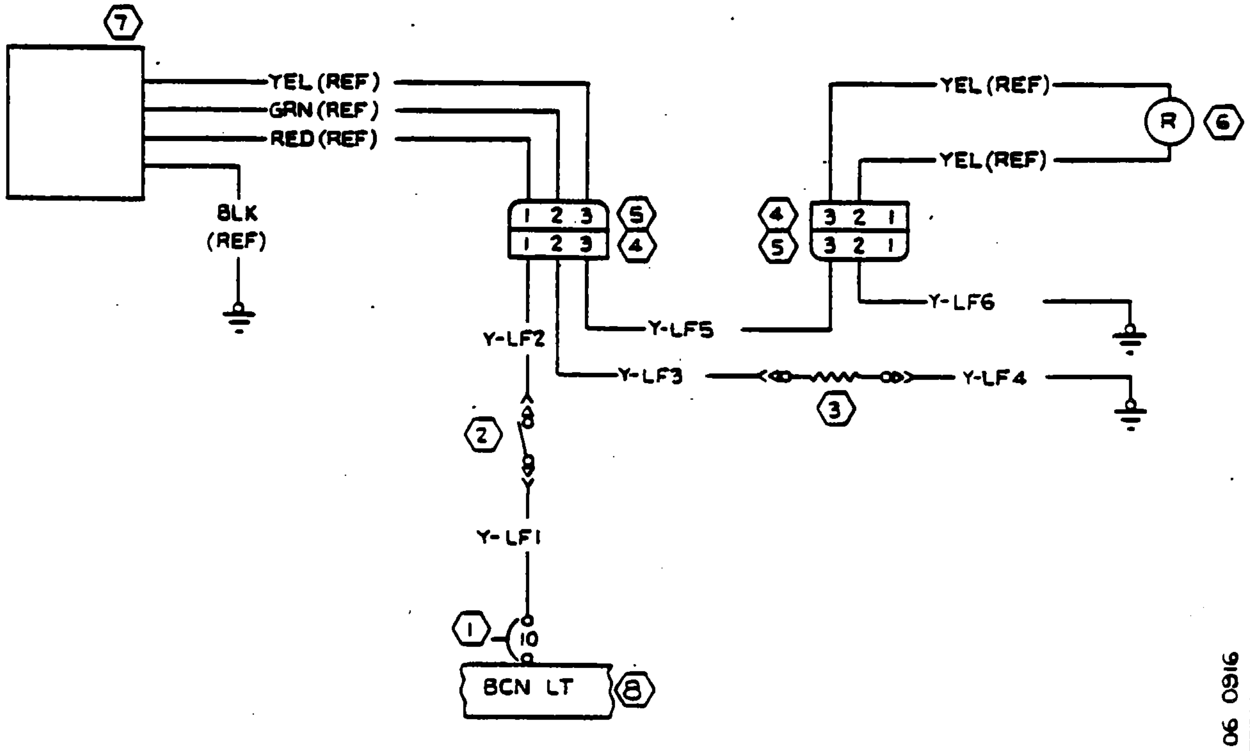
DWG NO 2471000

SCALE: NONE

(SR9106)

PAGE: 11.5

REVISION			
LET	DESCRIPTION	DATE	APPD



Y-LF6	18			S-1635-1	S-1367-1-8		
Y-LF5	↓			S-1636-1	S-1635-1		
Y-LF4	|			S-1493-1	S-1367-1-8		
Y-LF3	|			S-1636-1	S-1493-1		
Y-LF2	↓			S-1493-1	S-1636-1		
Y-LF1	18			S-1367-1-6	S-1493-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

8	2470002	BUS BAR	
7	C594502-0102	FLASHER ASSY	
6	C621001-0102	LIGHT ASSY	
5	S-1638-2	HOUSING	
4	S-1638-1	HOUSING	
3	OR95-6	RESISTOR	
2	S-2160-1	SWITCH	
1	S-1360-10L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W.H. Hardin	12-9-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD	JRB	
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
FLASHING BEACON
(CPT)

SIZE C

CODE IDENT. NO. 71379

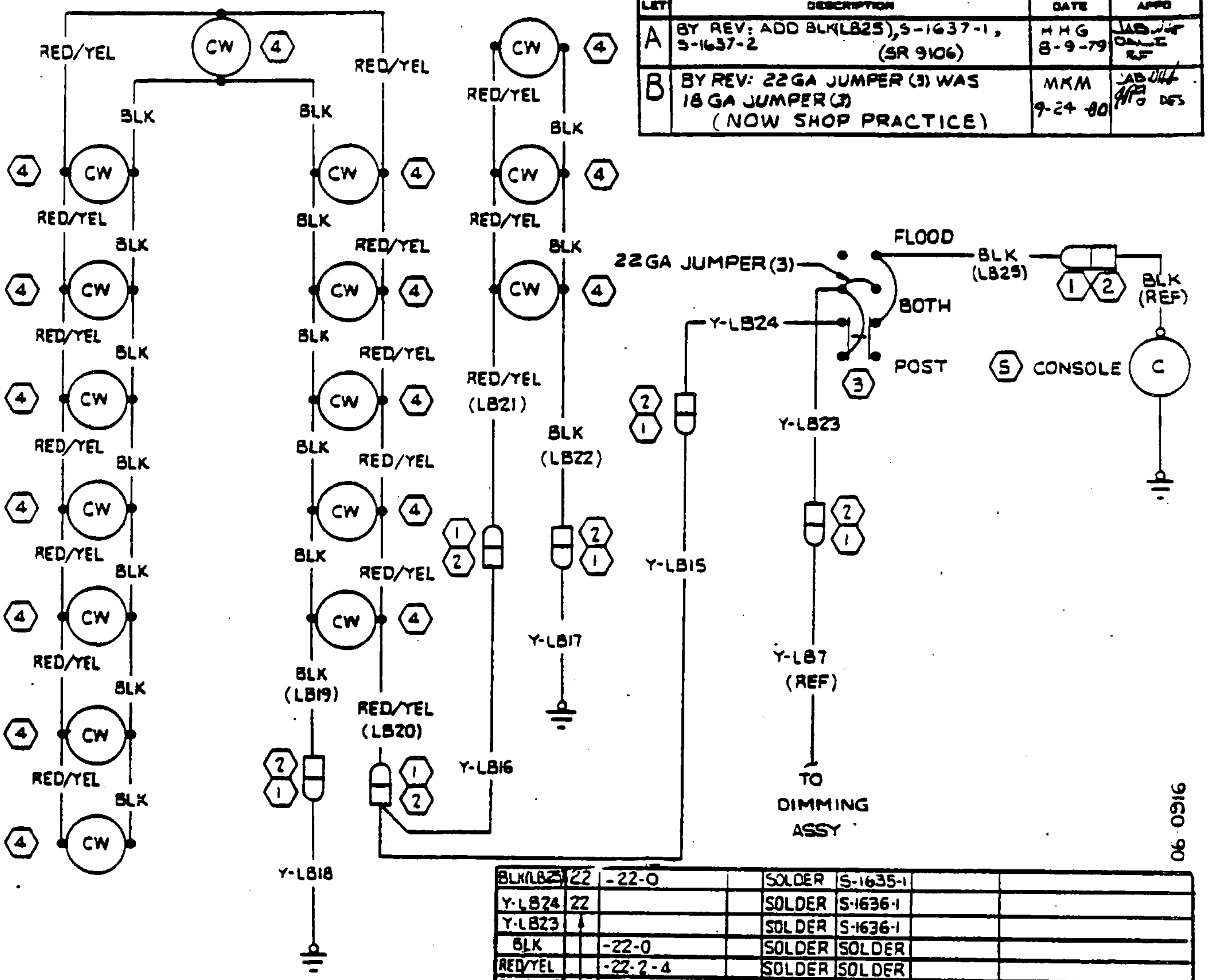
DWG NO 2471000

SCALE: NONE

(SR9106)

PAGE: 11.6

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD BLK(LB25), S-1637-1, S-1637-2 (SR 9106)	HHG 8-9-79	JAB DALE RF
B	BY REV: 22GA JUMPER (3) WAS 18 GA JUMPER (3) (NOW SHOP PRACTICE)	MKM 9-24-80	JAB DES



06 0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(LB25)	22	-22-0		SOLDER	S-1635-1		
Y-LB24	22			SOLDER	S-1636-1		
Y-LB23	↓			SOLDER	S-1636-1		
BLK		-22-0		SOLDER	SOLDER		
RED/YEL		-22-2-4		SOLDER	SOLDER		
BLK(LB22)		-22-0		SOLDER	S-1636-1		
RED/YEL (LB21)		-22-2-4		SOLDER	S-1635-1		
RED/YEL (LB20)		-22-2-4		SOLDER	S-1635-1		
BLK(LB19)		-22-0		SOLDER	S-1636-1		
Y-LB18				S-1635-1	S-1367-1-8		
Y-LB17				S-1635-1	S-1367-1-8		
Y-LB16	↑			S-1636-2	S-1636-1		
Y-LB15	22			S-1635-1	SEE LB16		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
5	MS15584-15	LAMP	
4	MS25237-327	LAMP	
3	S-1501-1	SWITCH	
2	S-1637-2	HOUSING	
1	S-1637-1	HOUSING	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON.	10-18-76
GROUP	DJ Harding	12-8-78
DRAWN	PAPE	9-22-78
CHECK	BCRLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD	JAB	
OTHER		

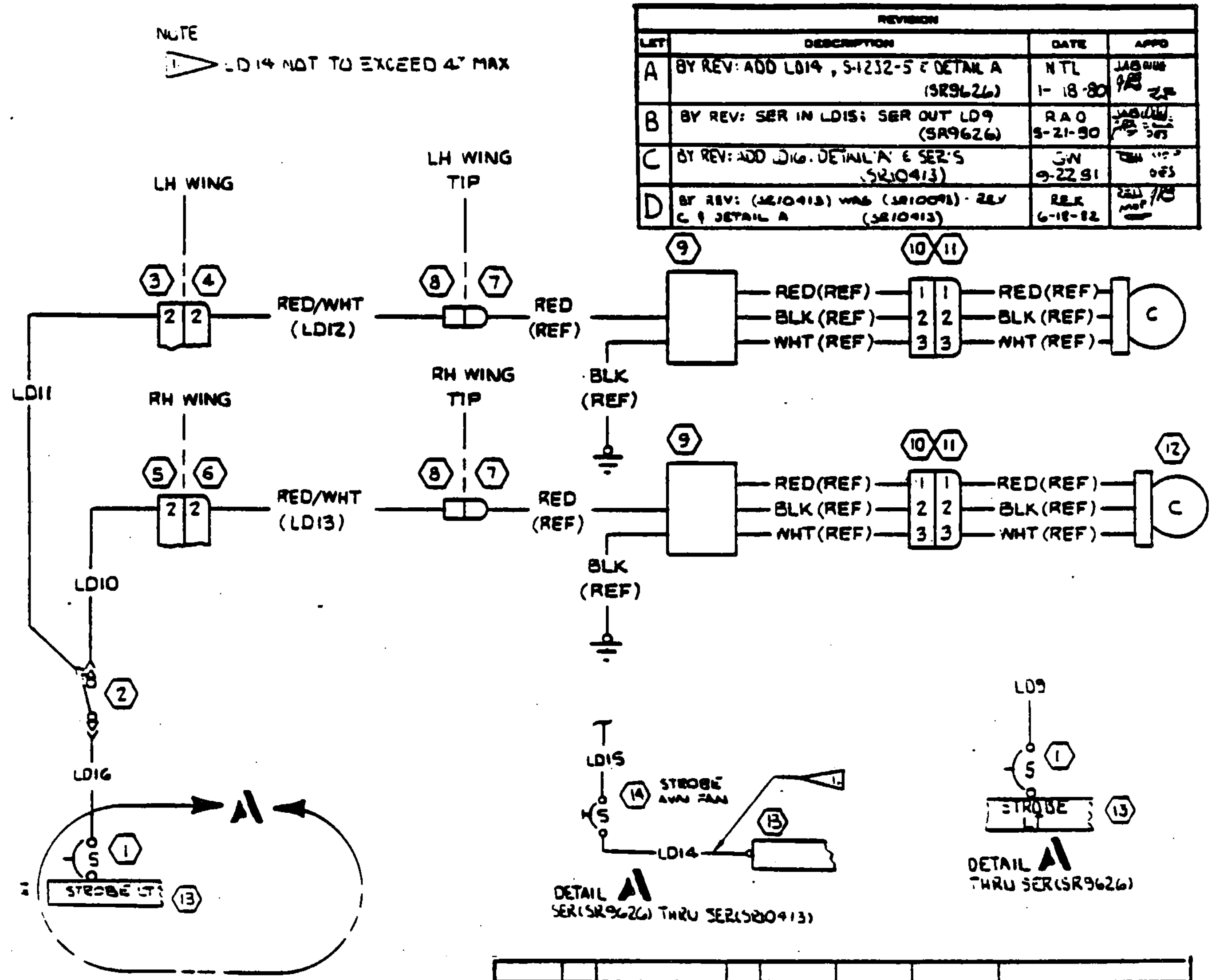
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
INSTRUMENT PANEL
POST LIGHTING (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 11 . 8

REVISION			
LTR	DESCRIPTION	DATE	APPD
A	BY REV: ADD LD14, S-1232-5 & DETAIL A (SR9626)	NTL 1-18-80	
B	BY REV: SER IN LD15; SER OUT LD9 (SR9626)	RAO 5-21-80	
C	BY REV: ADD LD16. DETAIL 'A' & SER'S (SR10413)	GW 9-22-81	
D	BY REV: (SR10413) WAS (SR10093) - REV C & DETAIL A (SR10413)	REK 6-18-82	



14	S-1232-5	CKT BKR	
13	2470002	BUS BAR	
12	C622006-0101	LAMP ASSY	
11	S-1638-2	HOUSING	
10	S-1638-1	HOUSING	
9	C622008-0102	STROBE PWR SUPPLY	
8	S-1637-2	HOUSING	
7	S-1637-1	HOUSING	
6	S-1640-9	HOUSING	
5	S-1641-9	HOUSING	
4	S-1640-6	HOUSING	
3	S-1641-6	HOUSING	
2	S-2160-1	SWITCH	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

Y-LD16	22			S-1367-1-6	S-1493-1		SER (SR10093) & ON
Y-LD15	22			S-1367-1-8	S-1493-1		(SR9626) THRU (SR10413)
Y-LD14	20			S-1367-1-8	S-1367-1-10	1	(SR9626) THRU (SR10413)
RED/WHT	20	-20-4-9		S-1635-1	S-1636-1	(STD)	
(LD13)							
RED/WHT	20	-20-4-9		S-1635-1	S-1636-1	(STD)	
(LD12)							
Y-LD11	22			SEE LD10	S-1636-1		
Y-LD10	22			S-1493-2	S-1636-1		
Y-LD9	22			S-1367-1-6	S-1493-1		THRU SER (SR9626)
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-4-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R. FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

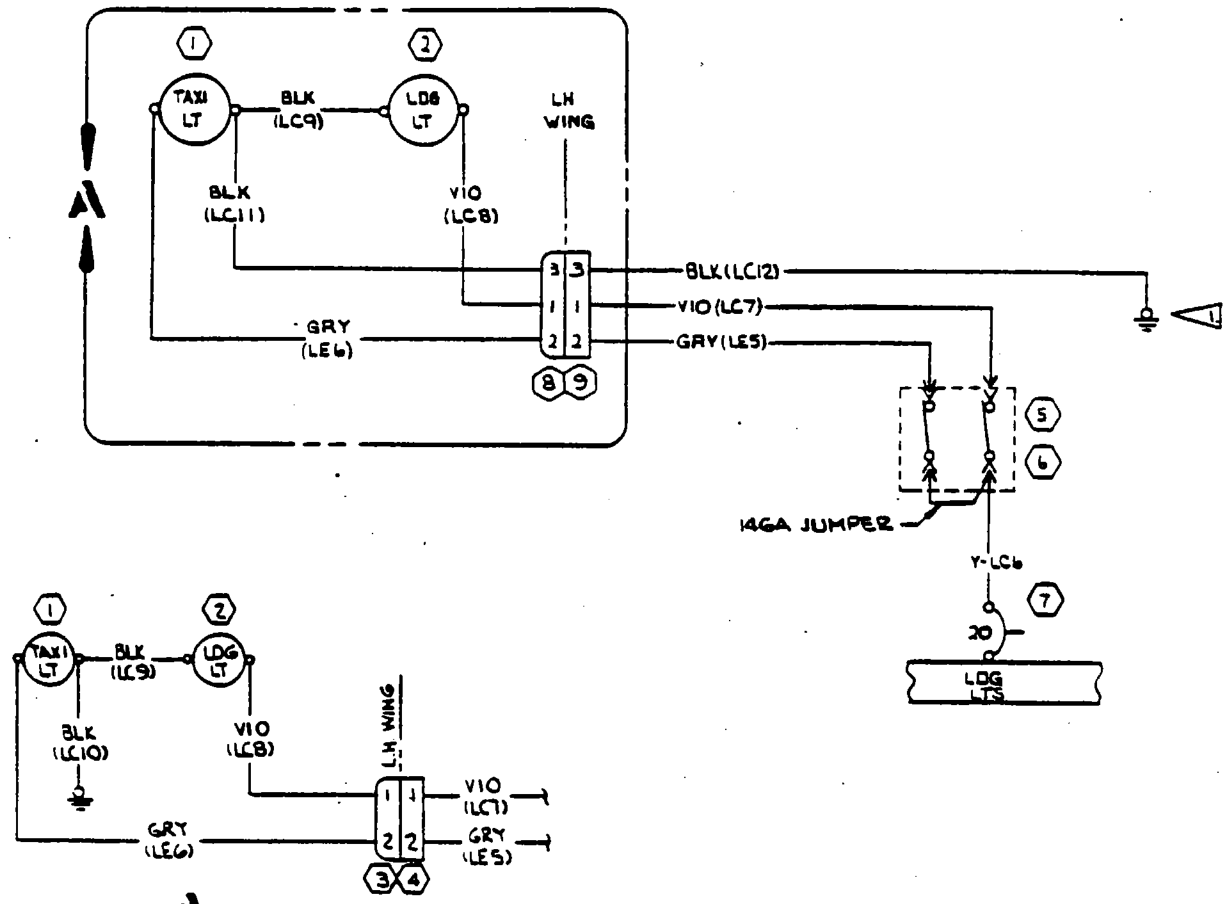
TITLE
WIRING DIAGRAM —
WING TIP STROBE LIGHT
(OPT)

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9IC6)
PAGE: 11.9

NOTES:

1. GROUND AT LOWER L.H. A.C.U. MOUNTING BOLT

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL 'A' (SR10248)	GW 7-23-81	JAB JRG



DETAIL A
THRU SER (SR10248)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(LC12)	14	-14-0		S-1636-2	S-1367-2-12		SER(SR10248) & ON
BLK(LC11)	14	-14-0		S-1367-2-8	S-1635-2		SER(SR10248) & ON
BLK(LC10)	14	-14-0		S-1367-2-8	S-1367-2-10		THRU SER(SR10248)
BLK(LC9)		-14-0		S-1367-2-8	S-1367-2-8		
VIO(LC8)		-14-7		S-1635-2	S-1367-2-8		
VIO(LC7)		-14-7		S-1493-2	S-1636-2		
Y-LC6				S-1367-2-6	S-1493-2		
GRY(LE6)		-14-8		S-1635-2	S-1367-2-8		
GRY(LE5)	14	-14-8		S-1493-2	S-1636-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	S-1638-1	HOUSING	
8	S-1638-2	HOUSING	
7	S-1360-20L	CIRCUIT BKR	
6	S-2023-1	ADAPTER	
5	S-2160-4	SWITCH	
4	S-2035-2	HOUSING	
3	S-2035-1	HOUSING	
2	4596	LDG LT	
1	4587	TAXI LT	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 2471000 PG 11.4
SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	12-5-80
GROUP	W.J. Nader	1-12-81
DRAWN	SPRINGER	12-2-80
CHECK	BORLESKE	12-3-80
STRESS		
PROJ	D. E. SIPES	1-13-81
APPD	JRG	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

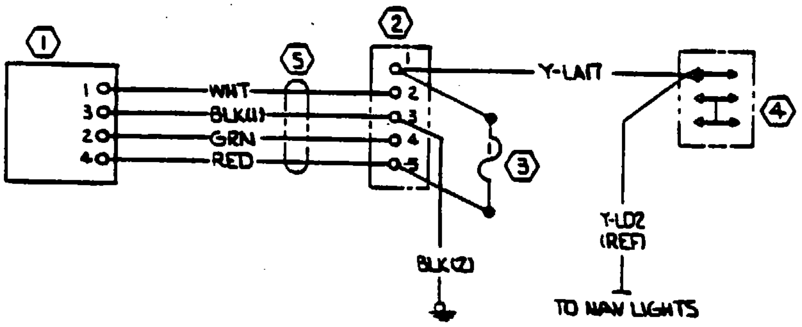
TITLE
WIRING DIAGRAM — LANDING & TAXI LIGHTS WING MOUNTED

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE NONE
(SR10034)
PAGE: 11.10

REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:

1. MATERIAL IS 8409 CABLE (70903)
2. VENDOR FOR 320733 & 329636 IS (00779)



INACTIVE
THRU SER (SR10185)
GW 9-25-81
MDP

Y-LA17	22			329636	S1829-1		
BLK(2)	22	-22-0		329636	S1367-1-8		
RED		◁1		320733	320733		
GRN		◁1		320733	320733		
BLK(1)		◁1		320733	320733		
WHT		◁1		320733	320733		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

5	8409	CABLE ASSY	
4	34003-55-3410	TERMINAL STRIP	
3	1570141	FUSE ASSY	
2	351-11-05-001	TERMINAL STRIP	
1	0570088	MAP LIGHT ASSY	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX-CESSNA SPEC. NO.
S-XXX OR CMXXXX-CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY: 3920299

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	9-25-81
GROUP		
DRAWN	WHITSON	9-25-81
CHECK	BORLESKE	9-25-81
STRESS		
PROJ	D.E. SIPES	10-1-81
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
1800 E. PAWNEE
WICHITA, KANSAS

TITLE WIRING DIAGRAM — MAPLIGHT-CONTROL WHEEL (OPT)

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(3291061 REF)
PAGE: 1.1

NOTES:

1. SYSTEM SHOWN WITH ACFT ON GND. GEAR DOWN & LOCKED. POWER OFF

2. INSTALL 1270717 DIODE ASSY WITH MARKING BAND ON DIODE TO POSITIVE TERMINAL ON PUMP MOTOR

3. INSTALL S-1636-1 TERMINAL ON VENDOR WIRE

4. INSTALL S-1635-1 TERMINAL ON VENDOR WIRE

5. USE S-1694-5-0.8 SHRINKABLE TUBING OVER S-1830-1 TERMINAL

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD BLU/YEL (REF) & WHT (REF) (SR9106)	NTL 2-22-79	
B	BY REV: ADD S-1640-6, S-1641-6 (SR9106)	RLK 3-29-79	
C	BY REV: ADD TERMINAL IDENTIFICATION TO NOSE GEAR SWITCH; H11-1287 (SR9106)	GW NTL 7-12-79	
D	BY REV: ADD DETAIL "A" (SR9626) S1635-1 WAS S1636-1/GE4 & GD6 (NON SHOP PRACT) (SR9626) ADD 9880710. SER IN GD8, GD9, GA5, GE6 WIRES & ADD NOTE 5 (SR9738)	NTL 12-19-79	
E	BY REV: S-1636-1 WAS S-1635-1 / GD8, GD9, GA5, & GE6 (MER 6172-E0843)	NAL 5-27-80	
F	BY REV: 9881141 WAS 9881128 (SR9828)	MKM 9-10-80	

INACTIVE
EFF THRU SER (SR9945)
AKJ 11-6-80

26-0916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-GE6	22			S-1636-1	S-1830-1	5	SER (SR9738) & ON
BLU/YEL (Y-GA5)	22	-22-6-4		S-1636-1	S-1830-1	5	SER (SR9738) & ON
BLU/YEL (Y-GD9)	22	-22-6-4		S-1636-1	S-1830-1	5	SER (SR9738) & ON
Y-GD8	22			S-1636-1	S-1830-1	5	SER (SR9738) & ON
Y-GD7	22			S-1636-1	S-1635-1		
Y-GD6	22			S-1636-1	S-1635-1		
Y-GE5	22			SOLDER	SOLDER		
Y-GE4				SOLDER	S-1635-1		
Y-GE3				SOLDER	SOLDER		
Y-GE2				SOLDER	S-1367-1-6		
Y-GE1				SOLDER	S-1367-1-8		
Y-GD5				SEE GD4	S-1367-1-6		
Y-GD4				S-1635-1	S-1635-2		
Y-GD3				S-1636-1	S-1636-1		
Y-GD2				S-1636-1	S-1635-1		
Y-GD1				SOLDER	S-1635-1		
Y-GA4	22			S-1367-1-10	S-1635-1		
Y-GA3	12			S-1367-3-13	S-1367-3-12		
Y-GA2	12			S-1367-3-8	S-1367-3-13		
Y-GA1	12			S-1367-3-10	S-1367-3-8		THRU SER (SR9626)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
18	9880710	SWITCH	
17	H11-1287	SWITCH	(ALT)
16	S-1641-6	HOUSING	
15	S-1640-6	HOUSING	
14	MS25041-4	LIGHT ASSY	
13	VM920M-3	LIGHT ASSY	
12	2470002	BUS BAR	
11	S-1360-5L	CKT BKR	
10	S-1232-30	CKT BKR	
9	9881141	MOTOR ASSY	
8	1270717	DIODE ASSY	
7	S-1577-1	CONTACTOR	
6	9880700-4	SWITCH	
5	602EN67-6B	SWITCH	
4	S-1377-2	SWITCH	
3	S-2088-1	SWITCH	
2	S-1637-2	HOUSING	
1	S-1637-1	HOUSING	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: 2471000.12.1.2 & 12.1.3

CONTRACT NO:

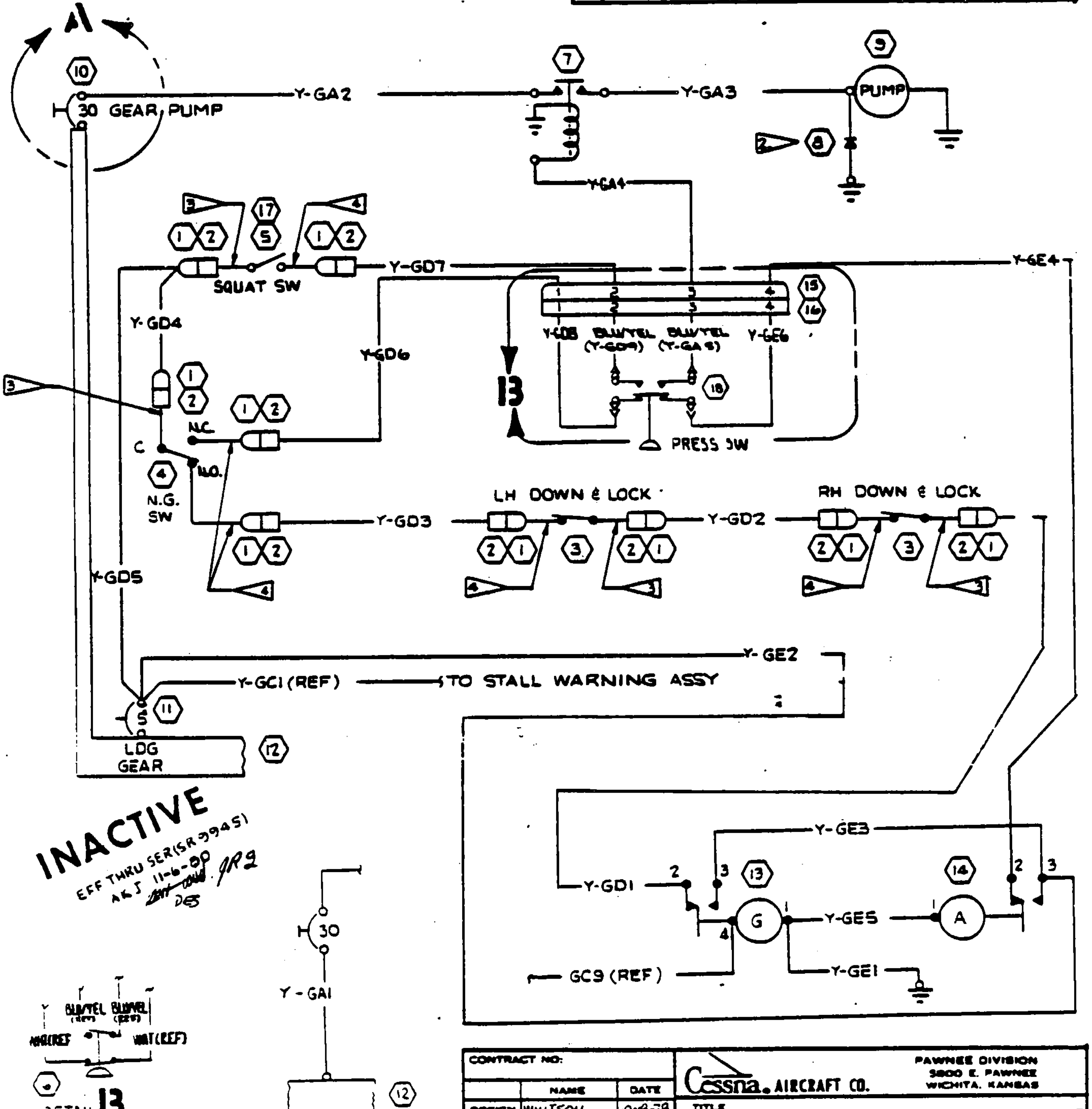
	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	PAPE	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD	JRG	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
LANDING GEAR SYSTEM

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 12.1.0

REVISION			
LET	DESCRIPTION	DATE	APPD
D	SEE SHT 12.1.0 FOR NOTES & REVISION		



DETAIL B
THRU SER (SR9738)

DETAIL A
THRU SER (SR9626)

INACTIVE
EFF THRU SER (SR 9945)
AKJ 11-6-80 JRS
DES

CONTRACT NO:			Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	TITLE WIRING DIAGRAM - LANDING GEAR SYSTEM
DESIGN	WHITSON	10-8-78	
GROUP		12-8-78	
DRAWN	PAPE	9-22-78	
CHECK	BORLESKE	9-23-78	
STRESS			
PROJ	R. FIFE	12-12-78	SIZE C · CODE IDENT NO. 71379 · DWG NO. 2471000
APPD			
OTHER			SCALE: NONE · (SR9106) · PAGE: 12.1.1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL 'A' & PG 12.1.4 (SR10122)	GW 2-13-81	AB JRS DES
B	BY REV: ADD DETAIL "B" & GA8 & INACTIVATE DWG (SR10254)(SR10093)	TMS 10-20-81	JAB JRS DES
C	BY REV: S1830-1/GD12 WAS S1635-1 (SR9945)(REF)(MER G172EC968)	GW 6-29-82	

NOTES:

1. SYSTEM SHOWN WITH ACFT ON GND, GEAR DOWN & LOCKED, POWER OFF.

2. INSTALL 1270717 DIODE ASSY WITH MARKING BAND TO POSITIVE TERMINAL ON PUMP MOTOR

3. INSTALL S-1636-1 TERMINAL ON VENDOR WIRE

4. INSTALL S-1635-1 TERMINAL ON VENDOR WIRE

5. INSTALL S-1694-5-0.8 SHRINKABLE TUBING OVER S-1830-1 TERMINAL

INACTIVE THRU SER (SR10093) GW 10-20-81 AB MDP JRS DES

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
GA8	10	S-1562-10-9		S-1367-3-12	S-1367-3-8		SER(SR10254) & ON
GA7	10	S-1562-10-9		S-1367-3-13	S-1367-3-12		SER(SR10122) & ON
GA6	10	S-1562-10-9		S-1367-3-8	S-1367-3-13		SER(SR10122) & ON
Y-GE5	22			SOLDER	SOLDER		
Y-GE3	22			SOLDER	SOLDER		
Y-GE2	22			SOLDER	S-1367-1-6		
Y-GE1	22			SOLDER	S-1367-1-8		
Y-GD19	22			S-1367-1-6	S-1367-1-6		
Y-GD15	22			S-1635-1	S-1635-1		
Y-GD14	22			SOLDER	S-1830-1	5	
Y-GD13	22			S-1830-1	S-1830-1	5	
Y-GD12	22			S-1367-1-6	S-1830-1		
Y-GD11	22			S-1635-1	S-1367-1-6		
Y-GD10	22			S-1636-1	S-1635-1		
BLU/YEL Y-GA5	22	-22-6-4		S-1636-1	S-1830-1	5	
BLU/YEL Y-GD9	22	-22-6-4		S-1636-1	S-1830-1	5	
Y-GD5	22			S-1635-1	S-1367-1-6		
Y-GD2	22			S-1636-1	S-1635-1		
Y-GD1	22			SOLDER	S-1635-1		
Y-GA4	22			S-1367-1-10	S-1635-1		
Y-GA3	12			S-1367-3-13	S-1367-3-12		THRU SER (SR10122)
Y-GA2	12			S-1367-3-8	S-1367-3-13		THRU SER (SR10122)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
19	S-1232-35	CIRCUIT BREAKER
18	H11-1287	SWITCH (ALT)
17	S-2088-1	SWITCH
16	S-1377-1	SWITCH
15	MS25041-4	LIGHT ASSY
14	VM920M-3	LIGHT ASSY
13	16-430007	SWITCH (LICON)
12	YZ-2RN7T	SWITCH
11	602EN67-6B	SWITCH
10	9880710	SWITCH
9	S-1577-1	CONTACTOR
8	9881128	MOTOR ASSY
7	1270717	DIODE ASSY
6	S-1637-1	HOUSING
5	S-1637-2	HOUSING
4	S-2035-1	HOUSING
3	S-2035-2	HOUSING
2	S-1232-30	CKT BKR
1	S-1360-5L	CKT BKR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 2471000-12.1.0,12.1.1

SUPERSEDED BY: 2471000 - 12.0.12.2.1

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	12-17-80
GROUP		
DRAWN	A K JANUS	12-5-80
CHECK	RE	12-10-80
STRESS		
PROJ	J.E SIPES	-13-81
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING GEAR SYSTEM

SIZE C

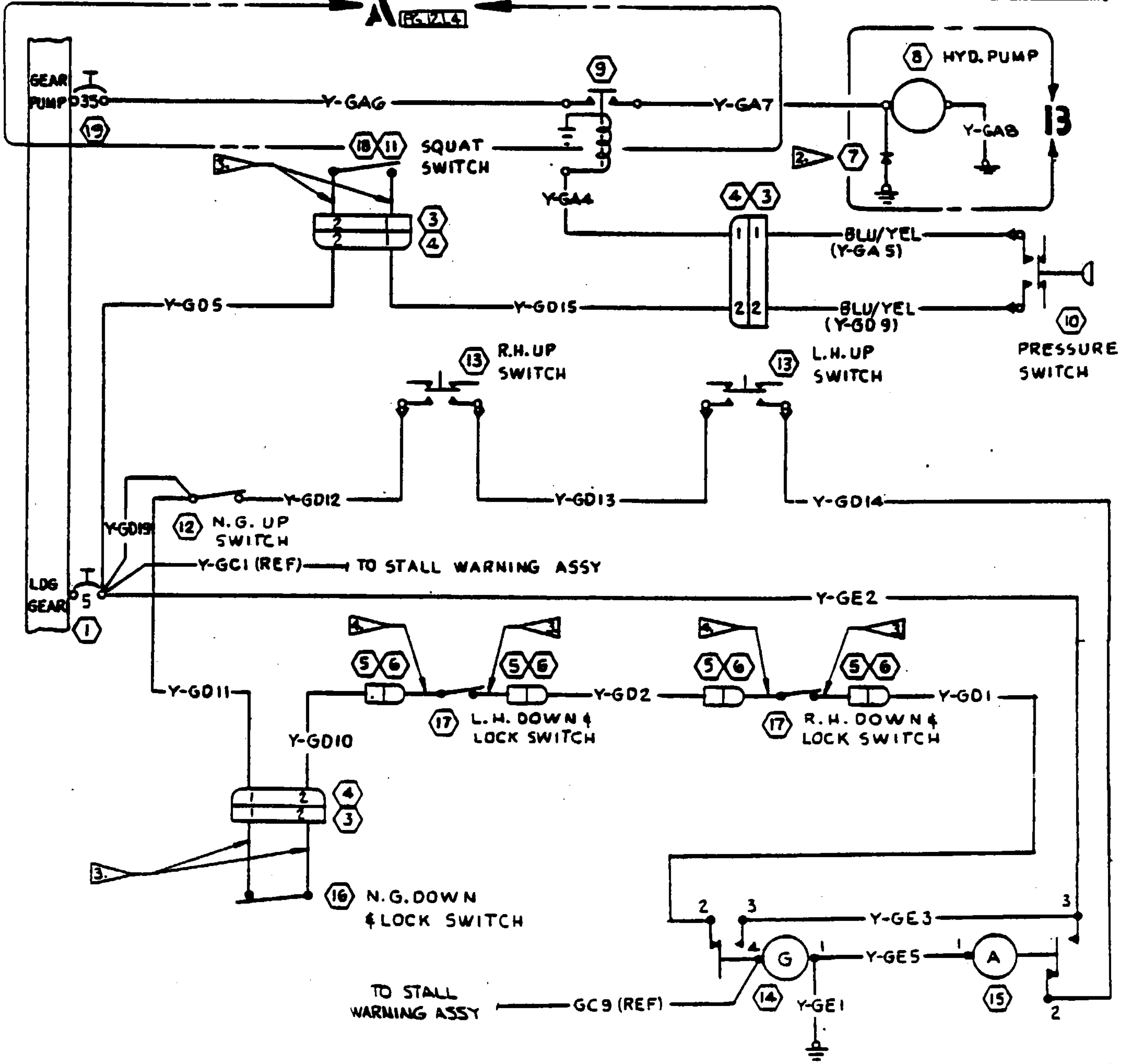
CODE IDENT. NO. 71379

DWG NO 2471000

SCALE NONE

(SR9945) PAGE: 12.1.2

REVISION			
LET	DESCRIPTION	DATE	APPD
B	SEE SHT 12.1.2 FOR NOTES & REVISION		



INACTIVE
THRU SER(SR10093)
GW 10-20-31
AB MDP JRG
DES

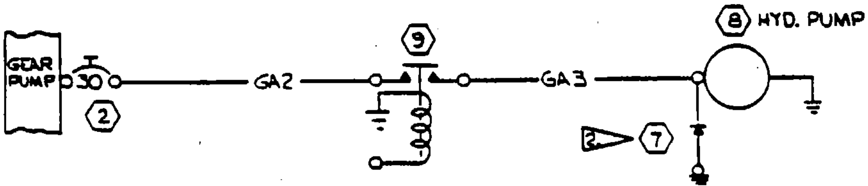
CONTRACT NO:		
	NAME	DATE
DESIGN	WITSON	12-17-80
GROUP	D.H.Wanden	1-12-81
DRAWN	AK JANUS	11-5-80
CHECK	RE Hame	12-10-80
STRESS		
PROJ	D.E. SIPES	1-13-81
APPD	ARE	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

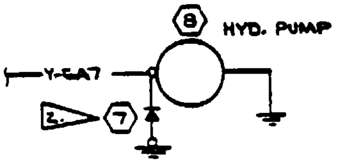
TITLE
WIRING DIAGRAM
LANDING GEAR SYSTEM

SIZE C
CODE IDENT NO. 71379
DWG NO. 2471000
SCALE: NONE
(SR9945)
PAGE: 12.1.3

REVISION			
LET	DESCRIPTION	DATE	APPD
B	SEE PG. 12.1.2 FOR NOTES & REVISION		



DETAIL A
THRU SER (SR10122)



DETAIL B
EFF THRU SER(SR10254)

INACTIVE
THRU SER(SR10093)
GW 10-20-81
JAB MDP
DES

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		3-2-81
DRAWN	WHITSON	2-3-81
CHECK	BORLESKE	2-13-81
STRESS		
PROJ	D. SIPES	3-6-81
APPD		7-3-81
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE WIRING DIAGRAM — LANDING GEAR SYSTEM

SIZE	CODE IDENT NO.	DWG NO.
C	71379	2471000
SCALE: NONE	(SR10122)	PAGE: 12.1.4

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: GAB WAS 22 GA (SR10093)	GW 11-20-81	JRG
B	BY REV: L.H. WAS R.H., R.H. WAS L.H., SHEET 12.2.1 (SR10093)	REK 3-18-82	

NOTES:

1. SYSTEM SHOWN WITH ACFT ON GROUND. GEAR DOWN & LOCKED. HYDRAULIC SYSTEM PRESSURIZED. POWER OFF.

2 TERMINATE VENDOR LEADS WITH S1635-1 TERMINALS

3 INSTALL S1694-5-0.8 SHRINKABLE TUBING OVER S1830-1 TERMINAL

4 INSTALL 1270717 DIODE ASSY WITH MARKING BAND TO POSITIVE TERMINAL ON PUMP MOTOR

Y-GA8	10			S1367-3-12	S1367-3-12		
Y-GD38	22			SEE GD29	SEE GD31	<3	
Y-GD37	22			SEE GD34	SOLDER	<3	
Y-GD36	22			SEE GD28	SEE GD29		
Y-GA7	10	S1562-10-9		S1367-3-13	S1367-3-12		
Y-GA6	10	S1562-10-9		S1367-3-8	S1367-3-13		
Y-GE5	22			SOLDER	SOLDER		
Y-GE3				SOLDER	SOLDER		
Y-GE6				S1367-1-8	SOLDER		
Y-GE1				SOLDER	S1367-1-8		
Y-GD35				S1367-1-6	SOLDER		
Y-GD34				SEE GD33	S1830-1	<3	
Y-GD33				S1367-1-6	S1830-1	<3	
Y-GD32				S1636-1	SOLDER		
Y-GD31				S1636-1	S1830-1	<3	
Y-GD30				S1636-1	S1636-1		
Y-GD29				S1636-1	S1830-1	<3	
Y-GD28				S1636-1	S1367-1-6		
Y-GD27				S1636-1	S1636-1		
Y-GD26				S1367-1-8	S1636-1		
Y-GD25				S1493-1	SOLDER		
Y-GD24				S1636-1	S1367-1-10		
BLU/YEL (Y-GD23)		-22-6-4		S1635-1	S1830-1	<3	
BLU/YEL (Y-GD22)		-22-6-4		S1635-1	S1830-1	<3	
Y-GD21				S1636-1	S1636-1		
Y-GD20	22			S1367-1-9	S1636-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

9	MS25041-2	LIGHT ASSY	
8	9881128	MOTOR ASSY	
17	1270717	DIODE ASSY	
6	S1577-1	CONTACTOR	
15	1570043	DIODE ASSY	
4	VM920M-3	LIGHT ASSY	
13	16-430007	SWITCH	
2	S2586-1	SWITCH	
1	S1638-1	HOUSING	
0	S1638-2	HOUSING	
9	S2088-3	SWITCH	
8	S1377-2	SWITCH	
7	9880710	PRESSURE SWITCH	
6	S2035-2	HOUSING	
5	S2035-1	HOUSING	
4	H11-1287	SWITCH (ALT)	
3	G02EN67-GB	SWITCH	
2	S1232-35	CIRCUIT BREAKER	
1	S1232-5	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:
2471000 PG 12.1.2, 12.1.3,
12.1.4

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-20-81
GROUP	M PAINE	10-20-81
DRAWN	WHITSON	10-19-81
CHECK	BORLESKE	10-19-81
STRESS		
PROJ	D. SIPES	10-20-81
APPD	JRG	
OTHER		

Cessna. AIRCRAFT CO.

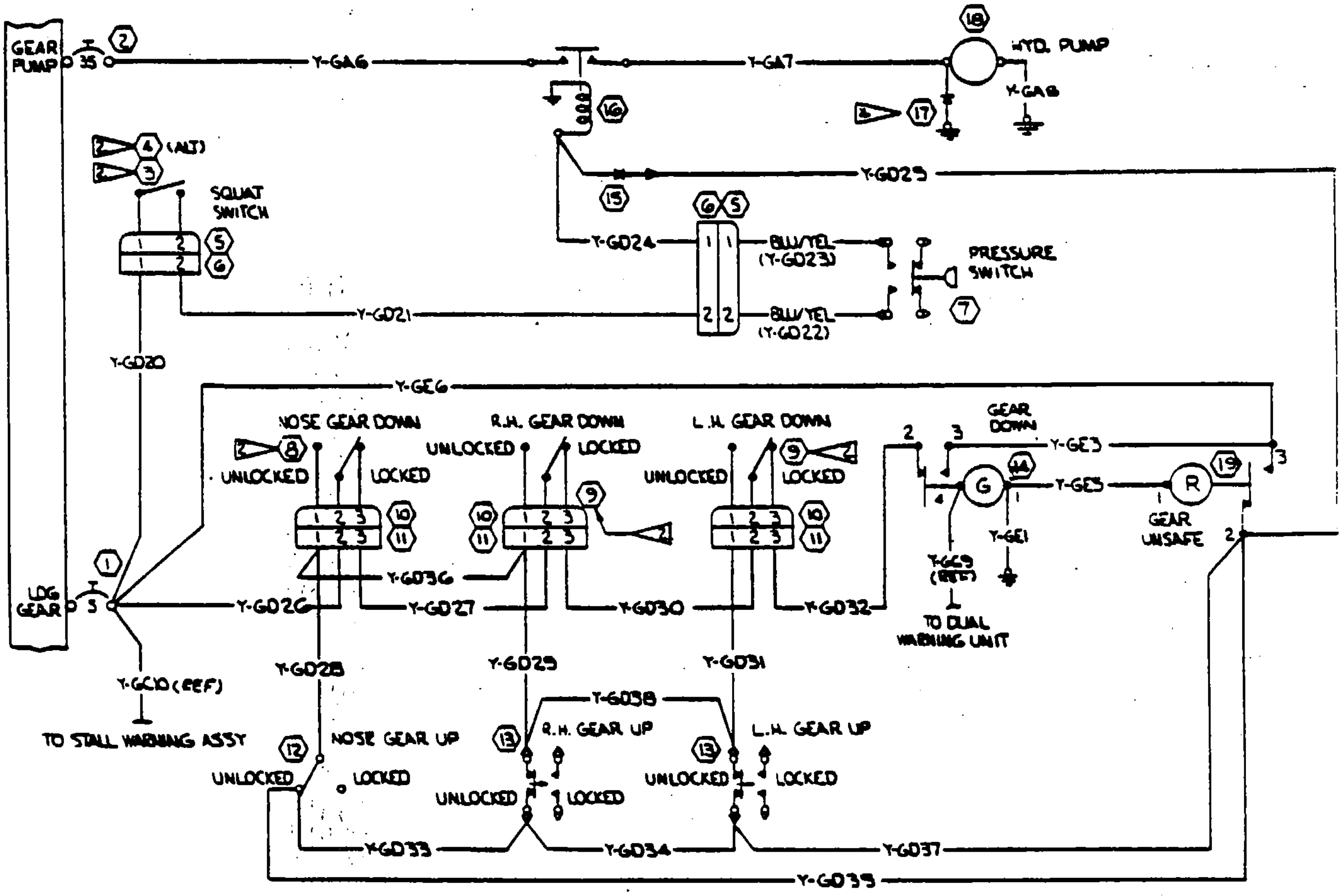
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
LANDING GEAR SYSTEM

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000

SCALE: NONE (SR10093) PAGE: 2.2.0

REVISION			
LET	DESCRIPTION	DATE	APPD
B	SEE PAGE 12.2.0 FOR REVISION		



CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-20-81
GROUP	M PAINE	10-20-81
DRAWN	WHITSON	10-19-81
CHECK	BORLESKE	10-19-81
STRESS		
PROJ	D.E.SIPES	10-20-81
APPD	JR/DS	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE WIRING DIAGRAM— LANDING GEAR SYSTEM

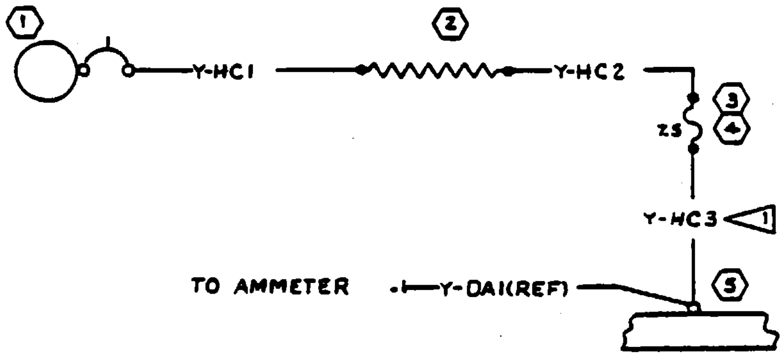
SIZE	CODE IDENT NO.	DWG NO.
C	71379	2471000

SCALE: NONE (SR10093) PAGE: 12.2.1

REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:

1. MAXIMUM LENGTH OF HC3 WIRE TO BE 6 INCHES



06-0916

INACTIVE
THRU SER (SR10056)
GW 1-12-81

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-HC3	18			SOLDER	S-1367-1-6		
Y-HC2	18			SOLDER	SOLDER		
Y-HC1	18			S-1367-1-8	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
5	2470002	BUS BAR	
4	S-2375-7.5	FUSE	
3	S-2374-7.5	FUSE HOLDER	
2	S-2041-50-1.6	RESISTOR	
1	0513052	LIGHTER ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	[illegible]
GROUP	[illegible]	12-5-78
DRAWN	SHAVER	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	E.FIFE	12-12-78
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.

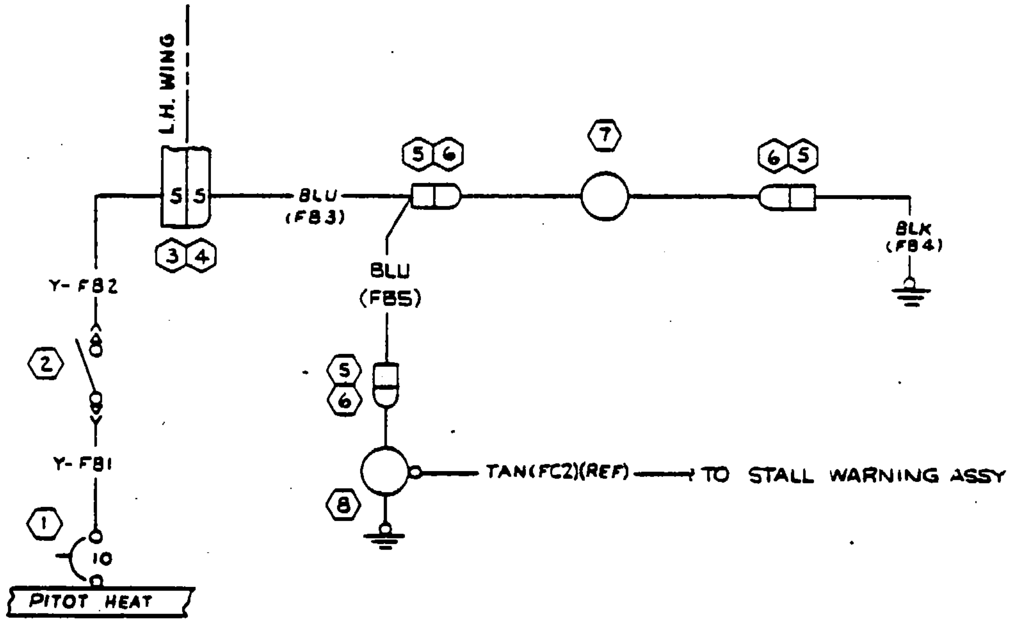
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIGAR LIGHTER

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 13.1

REVISION			
LET	DESCRIPTION	DATE	APPD



06-0916

BLU(FB5	18	-18-6		SEE FB3	S-1636-1	(STD).	
BLK(FB4	18	-18-0		S-1636-1	S-1367-1-8		
BLU(FB3	18	-18-6		S-1635-1	S-1636-2	(STD)	
Y-FB2	18			S-1493-1	S-1636-1		
Y-FB1	18			S-1367-1-6	S-1493-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

8	S-1672-9	STALL DETECTOR (HTD)	
7	0721105	PITOT HEATER	
6	S-1637-1	HOUSING	
5	S-1637-2	HOUSING	
4	S-1640-6	HOUSING	
3	S-1641-6	HOUSING	
2	S-2160-1	SWITCH	
1	S-1360-10L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	W. Wheeler	12-8-78
DRAWN	SHAVER	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	Z ElFE	12-12-78
APPD	JRB	
OTHER		

Cessna. AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
HEATED PITOT &
STALL WARNING (OPT)

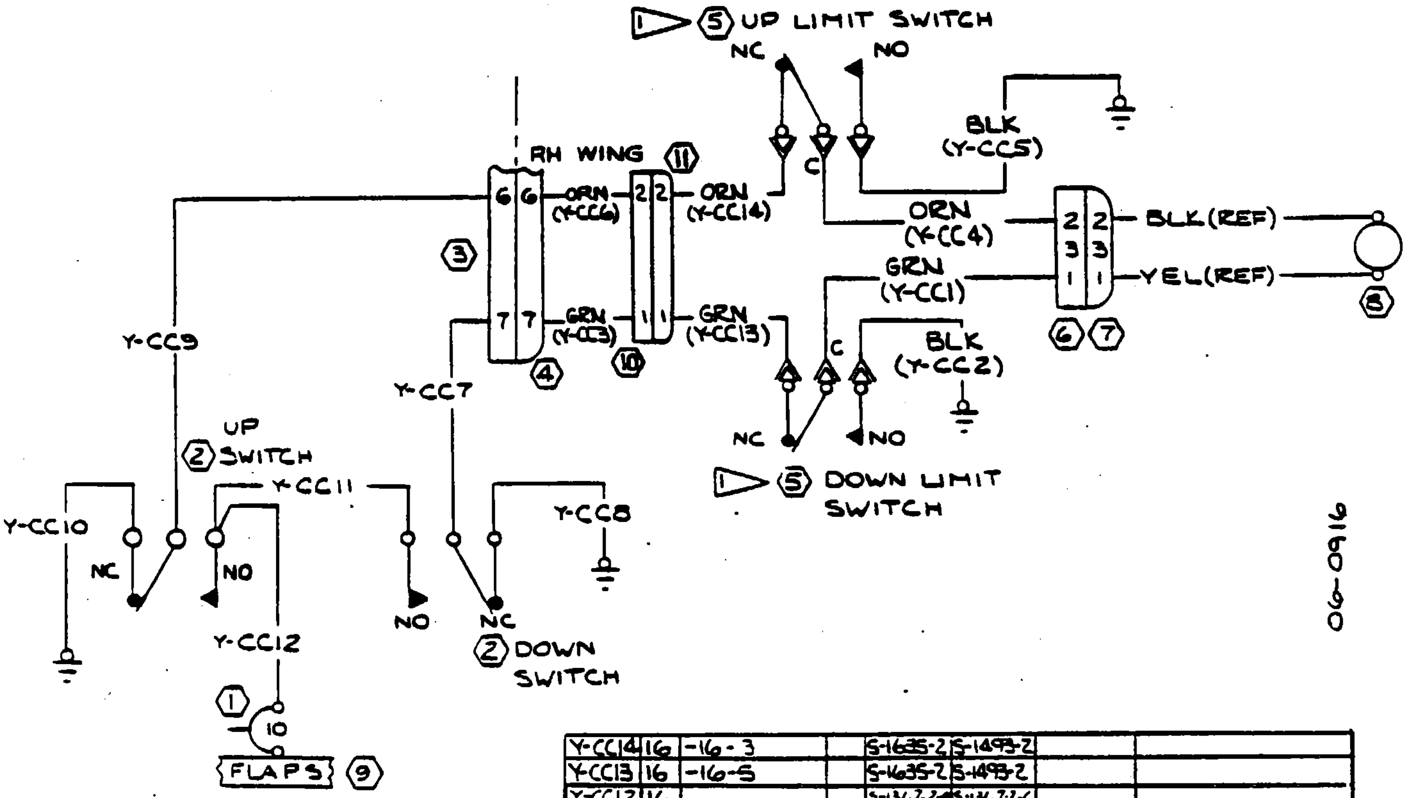
SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 13.2

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD Y-CC13, Y-CC14; Y-CC1 Y-CC2, Y-CC3, Y-CC4, Y-CC5, Y-CC6 WAS WHITE WIRE; S-1635-2 WAS S-1493-2/Y-CC3 & Y-CC5; S-1636-2 WAS S-1635-2/Y-CC3; S-1636-2 WAS S-1367-2-8/Y-CC5 (SR9106)	RLY 3-8-79	RF
B	BY REV: PIN 6 WAS PIN 7/S-1640-9 & S-1641-9 (NOW SHOP PRACTICE)	GW 9-5-79	RF

NOTES:

1 > PART OF C301002 ACTUATOR ASSY



Y-CC14	16	-16-3		S-1635-2	S-1493-2		
Y-CC13	16	-16-5		S-1635-2	S-1493-2		
Y-CC12	16			S-1367-2-4	S-1367-2-6		
Y-CC11	16			S-1367-2-4	S-1367-2-4		
Y-CC10	16			S-1367-2-4	S-1367-2-8		
Y-CC9	16			S-1636-2	S-1367-2-4		
Y-CC8	16			S-1367-2-4	S-1367-2-8		
Y-CC7	16			S-1636-2	S-1367-2-4		
Y-CC6	16	-16-3		S-1493-2	S-1635-2		
Y-CC5	16	-16-0		S-1635-2	S-1636-2		
Y-CC4	16	-16-3		S-1636-2	S-1493-2		
Y-CC3	16	-16-5		S-1635-2	S-1636-2		
Y-CC2	16	-16-0		S-1493-2	S-1367-2-8		
Y-CC1	16	-16-5		S-1636-2	S-1493-2		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

11	S-2035-1	HOUSING	
10	S-2035-2	HOUSING	
9	2470002	BUS BAR	
8	C301002-0108	ACTUATOR ASSY	
7	S-1638-2	HOUSING	
6	S-1638-1	HOUSING	
5	S-1906-2	SWITCH	
4	S-1640-9	HOUSING	
3	S-1641-9	HOUSING	
2	S-1906-1	SWITCH	
1	S-1360-10L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP	D. Wardlow	12-8-78
DRAWN	S. LINGSBURY	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — ELECTRIC WING FLAPS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE: NONE SR9106 PAGE: 14.1

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S-1377-2 (SR9106)	RLY 3-8-79	RF
B	BY REV: ADD "FLAP" & THROTTLE NOMENCLATURE: DELETE GC10: S-1367-1-4/GC6 WAS S-1635-1: S-1367-1-4/GC8 WAS S-1493-1; H11-1287 (SR9106)	GW NTL 7-12-79	RF
C	BY REV: INACT PG 15.1.1. ADD PG 15.1.2 (SR9945)	GW 5-15-81	DES
D	BY REV: SER OUT GC1. SER IN GC10: GD52(REF) WAS GD1(REF): GD20(REF) WAS GD5(REF): GD26(REF) WAS GD19(REF): GE6(REF) WAS GE2(REF): S1232-5 WAS S1360-5L (SR10093)	GW 10-19-81	JAB MOD DES

NOTES:

1. SYSTEM SHOWN WITH LDG GEAR DOWN & LOCKED, ACFT ON GROUND & POWER OFF

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-GC10	22			S1367-1-8	S1636-1		SER(SR10093) & ON
Y-GC9	↓			S-1636-1	SOLDER		
BLK (GC8)		-22-0		S-1367-1-4	S-1367-1-4		
Y-GC7				SEE GC4	S-1367-1-4		
BLK (GC6)		-22-0		SOLDER	S-1367-1-4		
Y-GC5				S-1636-1	SOLDER		
Y-GC4				S-1636-2	S-1635-1		
BLK (GC3)		-22-0		S-1370-1	S-1367-1-8		
BLU (GC2)	↓	-22-6		S-1636-1	S-1830-1		
Y-GC1	22			S-1636-1	S-1367-1-6		THRU SER(SR10093)
BLK (FC3)	20	-20-0		S-1367-1-6	S-1367-1-8		
TAN (FC2)	20	-20-10		S-1635-1	S-1367-1-6		
Y-FC1	20			S-1636-1	S-1636-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
17	S1232-5	CIRCUIT BREAKER	
16	H11-1287	SWITCH	(ALT)
15	S-1360-5L	CIRCUIT BREAKER	
14	602EN67-6B	SQUAT SWITCH	
13	VM920M-3	LIGHT ASSY	
12	S-1637-2	HOUSING	
11	S-1637-1	HOUSING	
10	S-1906-1	SWITCH-FLAP WARNING	
9	S-2327-1	SWITCH-THROTTLE	
8	S-2088-1	SWITCH	
7	S-1377-2	SWITCH	
6	S-1641-6	HOUSING	
5	S-1640-6	HOUSING	
4	S-1672-9	STALL DETECTOR (HTD)	
3	S-1672-5	STALL DETECTOR	
2	C596510-0101	SPEAKER	
1	1270733	DUAL WARNING ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-18-78
GROUP		12-8-78
DRAWN	SHAVER	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	R FIFE	12-12-78
APPD		
OTHER	/	

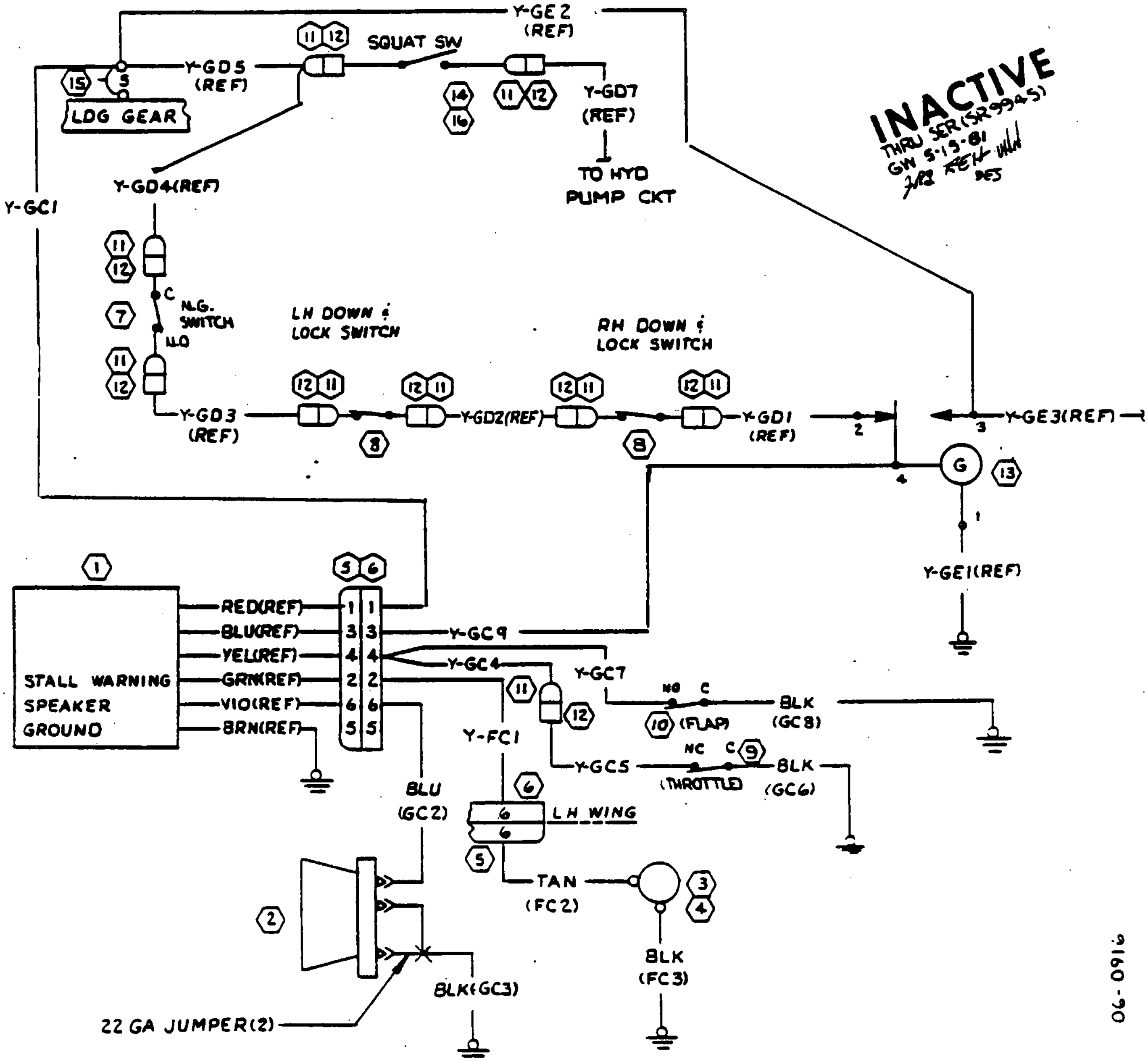
Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
LANDING GEAR AND
WARNING SYSTEM

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR9106)
PAGE: 15.1.0

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PG. 15.1.0 FOR REVISION		



INACTIVE
THRU SER (SR9945)
GW 5-13-81
JRB REH WH
DES

CONTRACT NO:		
	NAME	DATE
DESIGN	WHITSON	10-19-78
GROUP	O.H.Hardin	12-5-78
DRAWN	SHAVER	9-22-78
CHECK	BORLESKE	9-23-78
STRESS		
PROJ	Z FIBE	12-12-78
APPD	JRB	
OTHER	/	

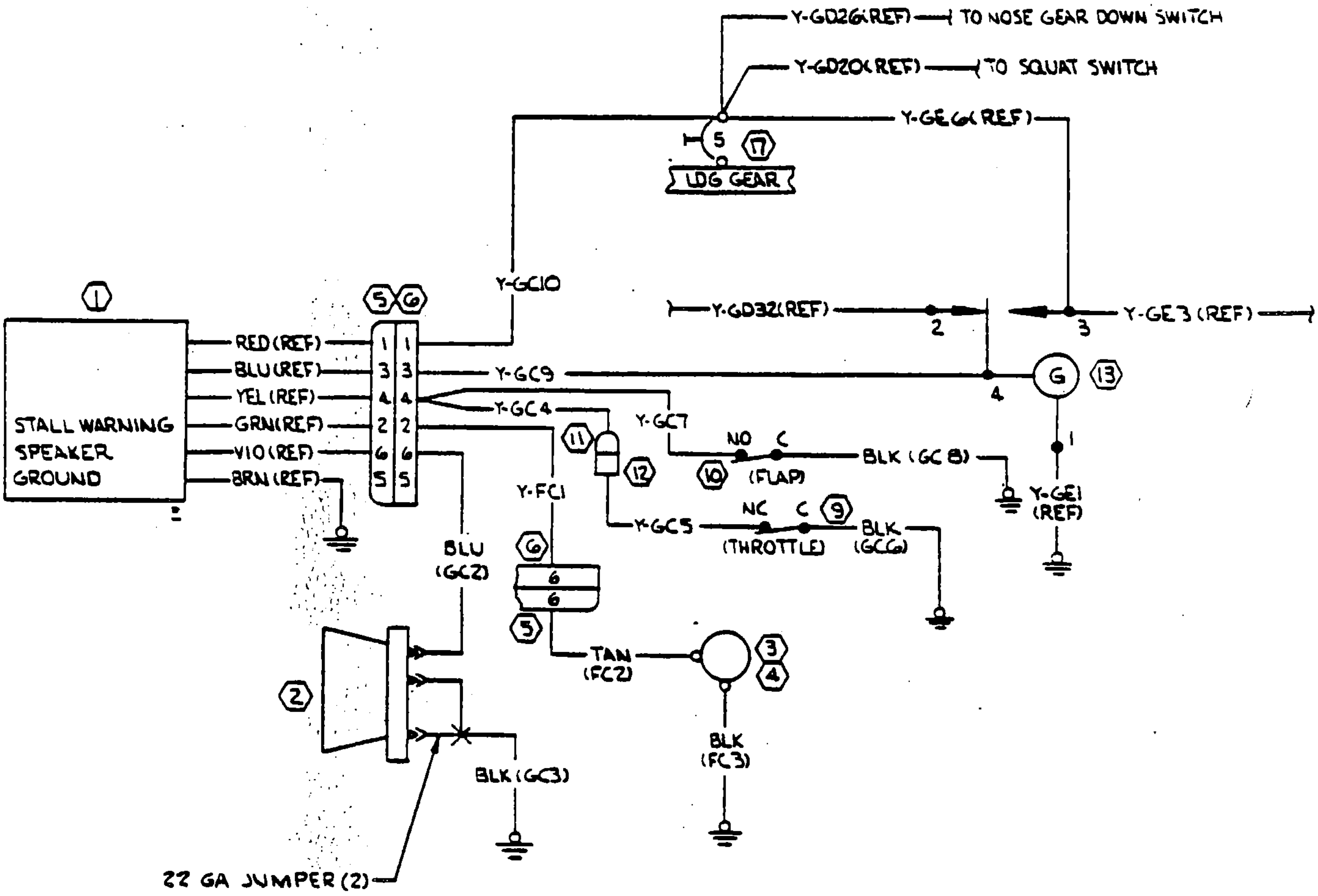
Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM
LANDING GEAR AND
WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	2471000

SCALE: NONE (SR9106) PAGE: 151.1

REVISION			
LET	DESCRIPTION	DATE	APPD
D	SEE PG 15.1.0 FOR REVISION		



93-00916

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP		5-21-81
DRAWN	WHITSON	5-15-81
CHECK	R.E. Hair	5-18-81
STRESS		
PROJ		5-21-81
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM
LANDING GEAR AND
WARNING SYSTEM

SIZE	CODE IDENT NO.	DWG NO.
C	71379	2471000

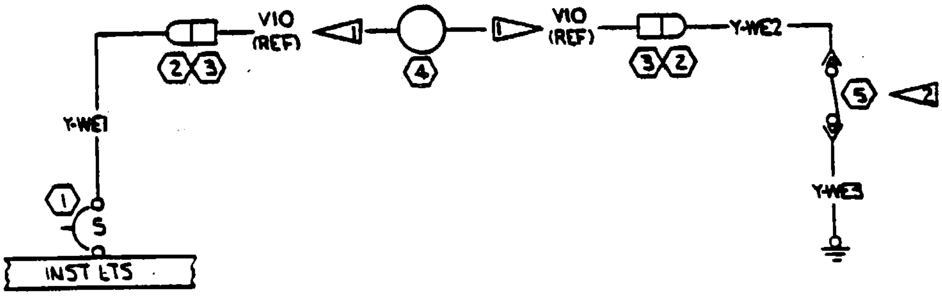
SCALE: NONE (SR9945) PAGE: 15.1.2

REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:

1. TERMINATE VENDOR SUPPLIED LEAD WITH S1636-1 TERMINAL

2. VACUUM SWITCH CONTACTS ARE NORMALLY CLOSED. CONTACTS OPEN AT 3.5±1 INCHES OF MERCURY VACUUM



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
Y-WE3	22	-22-0		S1493-1	S1367-8		
Y-WE2	22	-22-0		S1635-1	S1493-1		
Y-WE1	22	-22-0		S1367-1-6	S1635-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
5	S2571-1	VACUUM SWITCH	
4	S2519-2	LAMP ASSY	
3	S1637-2	HOUSING	
2	S1637-1	HOUSING	
1	S1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-1000-CESSNA SPEC. NO.
S-1XXX OR CM1000-CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	10-20-81
GROUP	M PAINE	10-20-81
DRAWN	WHITSON	10-14-81
CHECK	RE...2	10-14-81
STRESS		
PROJ	D. SIPES	10-20-81
APPD	JRG	
OTHER		

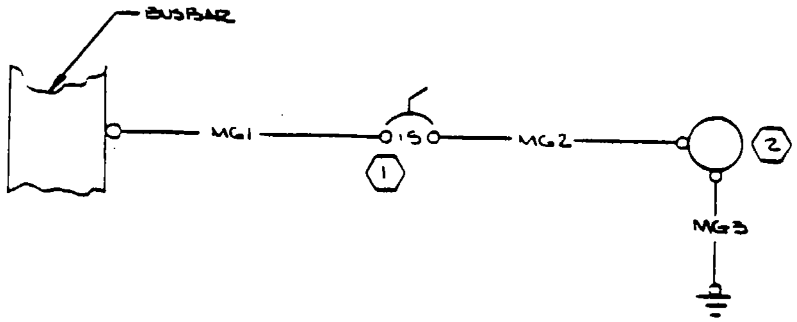
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
VACUUM OUT WARNING
SYSTEM

SIZE C
CODE IDENT. NO. 71379
DWG NO 2471000
SCALE: NONE
(SR10093)
PAGE: 15.2

N/A: 2406001

REVISION			
LET	DESCRIPTION	DATE	APPD



13-00916

MG3	16	S-2589		S1367-2-8	S1367-2-6		
MG2	16	S-2589		S1367-2-8	S1367-2-8		
MG1	16	S-2589		S1367-2-8	S1367-2-8		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

2	CK5008-0101	VACUUM PUMP	
1	CM3389-15	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	HARDEN	2-19-85
GROUP	HARDEN	2-19-85
DRAWN	HARDEN	2-19-85
CHECK	Z.E HAIR	2-19-85
STRESS		
PROJ		
APPD	MOP	2-19-85
OTHER		

Cessna. AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
STANDBY VACUUM PUMP

SIZE	CODE IDENT. NO.	DWG NO
C	71379	2471000

SCALE NONE (SR10413) PAGE: 16.1