Cessna
A Textron Company

Service Manual

1985 Thru 1986

MODEL 210 & T210 SERIES

Member of GAMA

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

REVISION 2 TO THE BASIC MANUAL IS BEING SUPPLIED TO PROVIDE ADDITIONAL INFORMATION NECESSARY TO MAINTAIN THE AIRPLANE AND INCORPORATES TEMPORARY REVISIONS NUMBER 1, DATED 1 DECEMBER 1992, AND NUMBER 2, DATED 3 OCTOBER 1994.

D2073-2-13
(RGI-50-8/00)

26 NOVEMBER 1985

REVISION 2 3 JUNE 1996

Cessna
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TEMPORARY REVISION NUMBER 6

DATE 5 April 2004

MANUAL TITLE	1985 thru 1986 Model 210 & T210 Series Service Manual
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This Temporary Revision consists of the following pages, which affect and replace existing pages in the paper copy manual and supersede aerofiche information.

SECTION	PAGE	AEROFICHE FICHE/FRAME	SECTION	PAGE	AEROFICHE FICHE/FRAME
2	35	1/C17			
2	36	1/C18			
2	39	1/C21			
2	39A	Added			
2	39B	Added			

REASON FOR TEMPORARY REVISION

1. To revise the cleaning interval of the engine fuel injection nozzles.

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 Insert the new pages into the publication at the appropriate locations and remove and discard the superseded pages.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 5

DATE 7 October 2002

MANUAL TITLE	1985 Thru 1986 Model 210 & T210 Service Manual
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MANUAL NUMBER - AEROFICHE	D2073-2-13AF
TEMPORARY REVISION NUMBER	D2073-2TR5

MANUAL DATE 26 November 1985 **REVISION NUMBER** 2 **DATE** 3 June 1996

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SECTION	PAGE	AEROFICHE FICHE/FRAME	SECTION	PAGE	AEROFICHE FICHE/FRAME
2	40	1/C22			
2	40A	Added			
2	40B	Added			
2	41	1/C23			
16	24C	Added			
16	24D	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

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TEMPORARY REVISION NUMBER 4

DATED 2 February 1998

MANUAL TITLE MODEL 210/T210 1985 THRU 1986 SERVICE MANUAL

MANUAL NUMBER - PAPER COPY D2073-2-13 **AEROFICHE** D2073-2-13AF

TEMPORARY REVISION NUMBER - PAPER COPY D2073-2TR4-13 **AEROFICHE** N/A

MANUAL DATE 26 November, 1985 **REVISION NUMBER** 2 **DATE** 3 June, 1996

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

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REASON FOR TEMPORARY REVISION

To add Parker Hannifin Vacuum Manifold Check Valve inspection/replacement times to inspection section.

FILING INSTRUCTIONS FOR THIS TEMPORARY REVISION

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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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TEMPORARY REVISION NUMBER 3

DATED October 1, 1997

MANUAL TITLE Model 210, And T210 Series
1985 Thru 1986 Service Manual

MANUAL NUMBER - PAPER COPY D2073-2-13 **AEROFICHE** D2073-2-13AF

TEMPORARY REVISION NUMBER - PAPER COPY D2073-2TR3-13 **AEROFICHE** N/A

MANUAL DATE 26 November 1985 **REVISION NUMBER** 2 **DATE** 3 June 1996

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
14	3	2F17			
14	4	2F18			

REASON FOR TEMPORARY REVISION

1. To add wet torque values for McCauley propeller hub bolts.

FILING INSTRUCTIONS FOR THIS TEMPORARY REVISION

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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 REVISED PAGES. DESTORY SUPERSEDED PAGES.

NOTE

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

* The asteric indicates pages revised, added or deleted by the current revision.

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Revision	2	3 June 1996

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 670

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14-1 thru 14-9	0
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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.

POPULAR NAME	MODEL YEAR	MODEL	SERIAL BEGINNING	SERIAL ENDING
CENTURION	1985	210R	21064898	21064949
TURBO CENTURION	1985	T210R	21064898	21064949
CENTURION WITH VALUE GROUP A (& B)	1985	210R	21064898	21064949
TURBO CENTURION WITH VALUE GROUP A (& B)	1985	T210R	21064898	21064949
CENTURION	1986	210R	21064950	21065009
TURBO CENTURION	1986	T210R	21064950	21065009
CENTURION WITH VALUE GROUP A (& B)	1986	210R	21064950	21065009
TURBO CENTURION WITH VALUE GROUP A (& B)	1986	T210R	21064950	21065009

INTRODUCTION

This manual contains factory-recommended procedures and instructions for ground handling, servicing, and maintaining the airplane. Besides serving as a reference for the experienced mechanic, this book also covers step-by-step procedures for the less experienced.

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

IMPORTANT INFORMATION CONCERNING 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, 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 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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REVISIONS.

1. Revisions/changes are issued as required and include only pages that require updating.

REISSUE.

1. A reissued manual is a complete manual incorporating all the latest information and outstanding revisions. It supersedes and replaces previous issue(s) of the manual.

CHANGES / REVISIONS and REISSUES.

1. Can be purchased from your Cessna Service Station or directly from Cessna Parts Distribution (CPD 2), Dept. 701, Cessna Airplane Company, P.O. Box 949, Wichita, Kansas 67201 (walk-in address: 5800 East Pawnee, Wichita, Kansas 67218).

TEMPORARY REVISIONS.

1. Additional information which becomes available may be provided by temporary revisions. This service is used to provide, without delay, new information which will assist in maintaining safe flight/ground operations. Temporary revisions are designed to replace existing pages in the manual and are numbered to match pages in the manual. Temporary revisions are normally incorporated into this manual at the next scheduled change, revision or reissue.

REVISION BARS.

1. Additions, or revisions to text in an existing section will be identified by a revision bar on the page adjacent to the change.
2. When technical changes cause unchanged text to appear on a different page/pages, a revision bar will be placed in the margin opposite the page number of all affected pages providing no other revision bar appears on the page.
3. When extensive technical changes are made to text in an existing section that requires complete retype of copy, revision bars will appear full length of the page
4. When art in an existing illustration is revised, a pointing hand will appear in the illustration, and will point to the area of the art revision.
5. New art added to an existing section will be identified by a single pointing hand adjacent to the figure title and figure number.
6. Revision bars are not shown for:
   a. Introductory material, indexes and tabular data.
   b. Blank spaces which are the result of text, illustration or table deletion:
   c. Correction of minor inaccuracies, such as punctuation, etc., unless such a correction changes the meaning of instructive information and procedures.

CUSTOMER CARE SUPPLIES AND PUBLICATIONS CATALOG

A Customer Care Supplies and Publications Catalog is available from your Cessna Service Station or directly from Cessna Parts Distribution (CPD 2), Dept. 701, Cessna Airplane Company, P.O. Box 949, Wichita, Kansas 67201 (walk-in address: 5800 East Pawnee, Wichita, Kansas 67218. This catalog lists all publications and Customer Care Supplies available from Cessna for prior year models as well as new products. To maintain this catalog in a current status, it is revised yearly and issued on Aerofiche.

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 Airplane 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 general comments you wish to make.

SECTION 1

GENERAL DESCRIPTION

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1-1. GENERAL DESCRIPTION.

1-2. MODEL 210 SERIES.

1-3 DESCRIPTION. The Cessna Centurion, Centurion - With Value Group A (&B), Turbo Centurion, and Turbo Centurion - With Value Group A (&B) (Model 210 Series) airplanes, described in this manual, are single-engine, high-wing monoplanes of all metal, semimonocoque construction.. Wings are full cantilever, with sealed sections forming fuel bays. The fully-retractable tricycle landing gear consists of tublar spring-steel main gear struts and a steerable nose gear with an air-hydraulic fluid shock strut. The six place seating arrangement is of conventional, forward facing type. Powering the Model 210 Series is a Continental, horizontally-opposed, air-cooled, six-cylinder, fuel-injected engine driving an all-metal, constant-speed propeller. A more desirable higher performance airplane, is offered in the turbocharged version of the Model 210 Series.

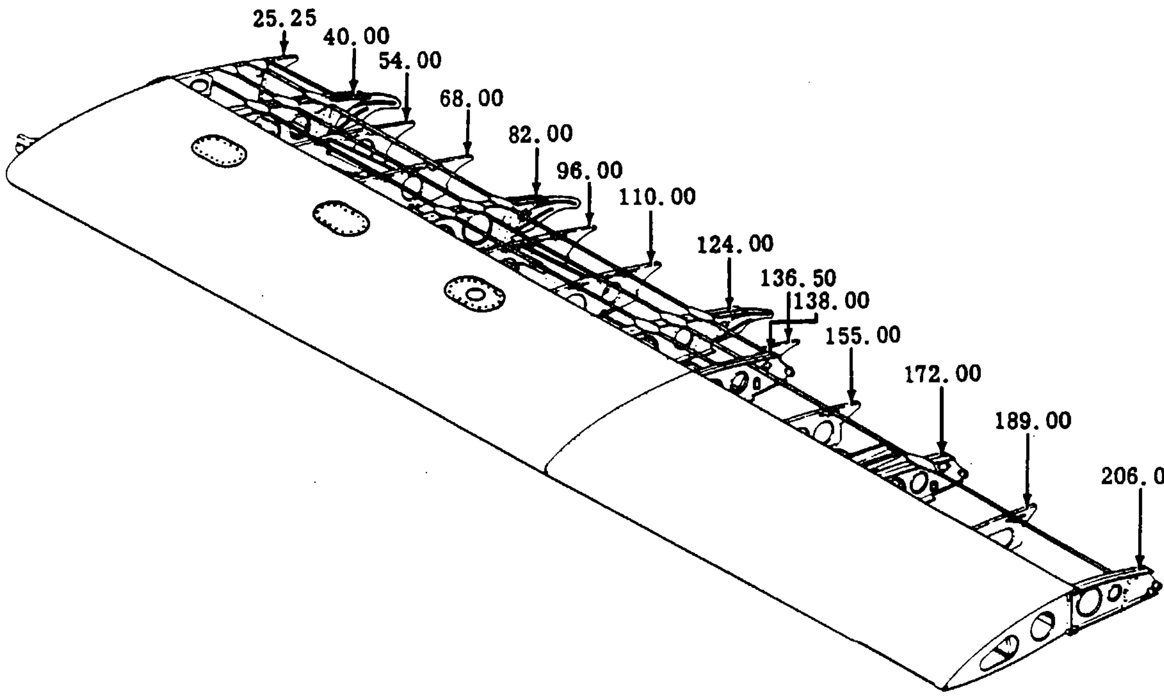
1-4. AIRCRAFT SPECIFICATIONS. Leading particulars of these airplanes, with dimensions based on gross weight, are given in figure 1-1. If these dimensions are used for constructing a hangar or computing clearances, remember that such factors as nose gear strut inflation, tire pressure, tire sizes and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

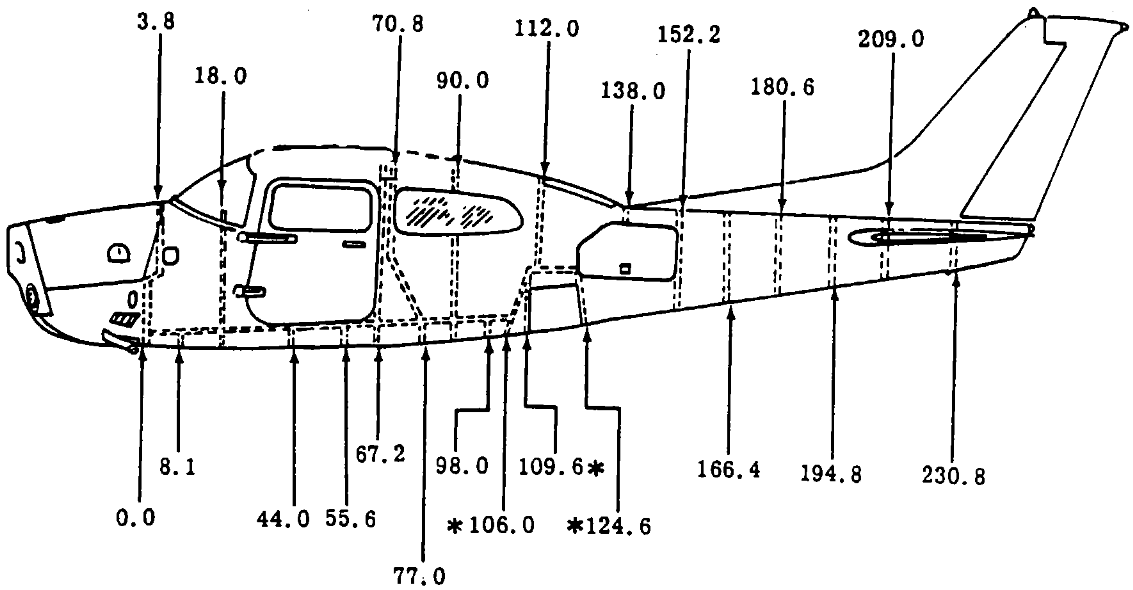
1-5. STATIONS. A station diagram is shown in figure 1-2 to assist in locating equipment when a written description is inadequate or impractical.

MAXIMUM WEIGHT - 210	
Ramp	3812 lbs
Takeoff or Landing	3800 lbs
STANDARD EMPTY WEIGHT - 210	
Centurion	2220 lbs
Centurion - With Value Group A (& B)	2269 lbs
MAXIMUM USEFUL LOAD - 210	
Centurion	1592 lbs
Centurion - With Value Group A (& B)	1543 lbs
MAXIMUM WEIGHT - T210	
Ramp	4118 lbs
Takeoff	4100 lbs
Landing	3900 lbs
STANDARD EMPTY WEIGHT - T210	
Turbo Centurion	2320 lbs
Turbo Centurion - With Value Group A (& B)	2369 lbs
MAXIMUM USEFUL LOAD - T210	
Turbo Centurion	1798 lbs
Turbo Centurion - With Value Group A (& B)	1749 lbs
FUEL CAPACITY	
Total	90 gal.
Usable	87 gal.
OIL CAPACITY	10 qt.
With External Oil Filter and All Turbocharged Engines	11 qt.
ENGINE MODEL	
210 (Refer to Section 12 for Engine Data)	CONTINENTAL IO-520
T210 (Refer to Section 12A for Engine Data)	CONTINENTAL TSIO-520-CE
PROPELLER (Constant-Speed)	
(Three Blades)	80" McCauley
LANDING GEAR (Retractable, Hydraulically-Actuated	Tricycle
MAIN WHEEL TIRES	6.00 x 6
Pressure	55 psi
NOSE WHEEL TIRE	
210	5.00 x 5, 6 Ply
Pressure	50 psi
T210	5.00 x 5, 10 Ply
Pressure	88 psi
NOSE GEAR STRUT PRESSURE (Strut Extended)	90 psi
WHEEL ALIGNMENT	
Camber	4° ± 1° 30'
Toe-In	0" to .06"
AILERON TRAVEL	
Up	20° ± 2°
Down	15° ±2°
WING FLAP TRAVEL (Electrically-Actuated)	0° ± 0° to 30°, +1° -2°
RUDDER TRAVEL (Measured parallel to water line)	
Right	24° ± 1°
Left	24° ± 1°
RUDDER TRAVEL (Measured perpendicular to hinge line)	
Right	27° 13' ± 1°
Left	27° 13' ± 1°
ELEVATOR TRAVEL	
Up	25° ± 1°
Down	20° ± 1°
ELEVATOR TRIM TAB TRAVEL	
Up	20° ± 1°
Down	15° ± 1°
PRINCIPAL DIMENSIONS	
Wing Span	441.75"
Tail Span	156.32"
Length	337.96"
Fin Height (Maximum with Nose Gear Depressed and Flashing Beacon installed on Fin)	112.92"
Track Width	104.20"
BATTERY LOCATION	Left Side of Firewall

Figure 1-1. Aircraft Specifications

MODEL 210 SERIES





* INDICATES CANTED BULKHEAD

Figure 1-2. Reference Stations

1-6. GENERAL. This chapter deals with general torque and safetying practices used to ensure security of installation and prevent overstressing of components. Special torque values, when required, are specified with the specific component maintenance and installation instructions.

1-7. TORQUEING PROCEDURES. 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 fatigue. Overtorque can be equally damaging because of failure of a bolt or nut from overstressing threaded areas.

a. Calculating Torque. There are a few simple, but very important, procedures that should be followed to assure that correct torque is applied:

1. Calibrate torque wrench periodically to assure accuracy; and recheck frequently.

2. When using a torque wrench adapter which changes distance from torque wrench drive to adapter drive, the indicated reading must be adjusted for desired torque reading. (See Figure 1-2.)

3. Be sure that bolt and nut threads are clean and dry unless otherwise specified.

4. Determine friction drag torque and add to specified dry torque value to ensure proper bolt utilization.

(a) Hand-turn nut onto bolt until it stops.

(b) Using a torque wrench, measure running torque (torque required to turn nut on bolt).

(c) This running torque must be added to specified dry torque value to ensure proper bolt utilization.

EXAMPLE

Average running torque for a nut	= 15 in.-lbs.
Dry torque required	= 125 ±5 in.-lbs.
Final torque wrench reading	= 140 ±5 in.-lbs.

(d) Since running torque will become less due to nut/bolt re-use (in accepted applications), this procedure must be repeated each time.

(e) When necessary to tighten from bolt head, increase torque value by an amount equal to shank torque (torque required to turn bolt when installed). Measure with a torque wrench.

EXAMPLE

Average running torque for a nut	= 15 in.-lbs.
Average running shank torque for installed bolt	= 10 in.-lbs.
Dry torque required	= 125 ±5 in.-lbs.
Final torque wrench reading	= 150 ±5 in.-lbs.

b. Torque Values - Bolts and Nuts. (See Table 1-1.)

1. Tables included in this section do not apply to the following exceptions:

(a) Sheet metal screws should be tightened firmly, but with no specific torque value.

(b) Screws attached to nutplates should be tightened firmly, but with no specific torque value.

(c) Bolts, nuts, and screws used in control systems and installations where required torque would cause binding or interfere with proper operation of parts.

(d) Screws used with dimpled washers should not be drawn tight enough to eliminate washer crown.

(e) Fasteners that have a specified torque in a specific installation.

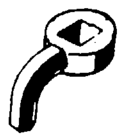
2. The values shown in Table 1-1 are based on parts being clean and dry with no lubricants added.

3. Castellated nuts requiring cotter pins should be tightened to low torque value. Torque can be increased to install cotter pin, but should never exceed maximum torque value.

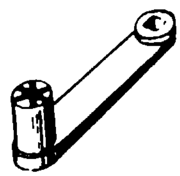
NOTE

Self-locking castellated nuts, MS17825 and MS17826, require a separate torque range. These values are shown separately in torque value tables.

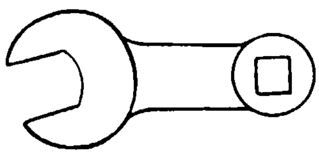
SHORT OPEN END ADAPTER



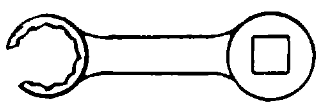
SETSCREW ADAPTER



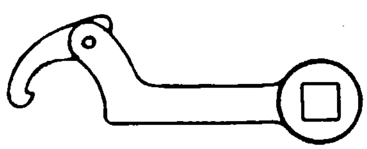
HOSE CLAMP ADAPTER



OPEN-END WRENCH ADAPTER



FLARE NUT WRENCH ADAPTER



SPANNER WRENCH ADAPTER

NOTE

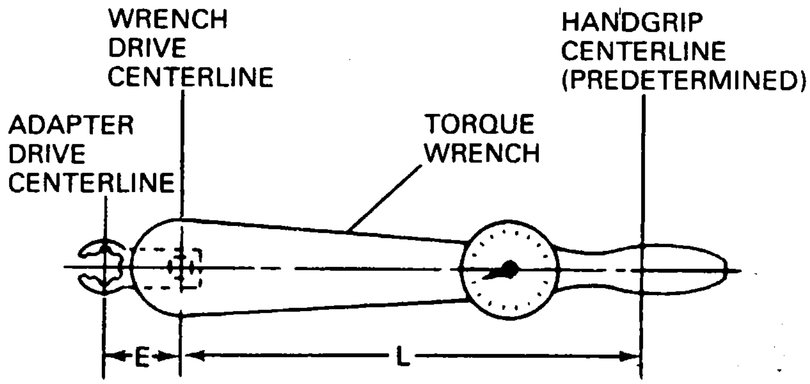
When using a torque wrench adapter which changes the distance from torque wrench drive to adapter drive, apply following formula to obtain corrected torque reading.

FORMULA

$$\frac{T \times L}{L + E} = Y$$

LEGEND

T = Desired Torque
Y = Indicated Torque
L = Effective Length Lever
E = Effective Length of Extension

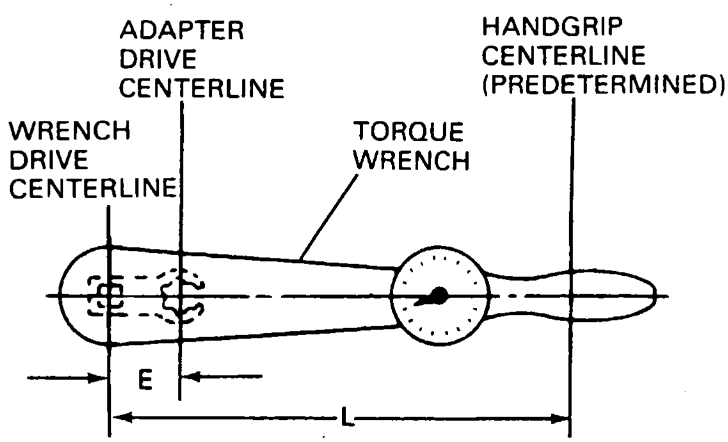


EXAMPLE

T = 135 In.-Lbs
Y = Unknown
L = 10.0 In.-Lbs
E = 1.5 In.

$$Y = \frac{135 \times 10}{10 + 1.5} = \frac{1350}{11.5} = 117.39$$

Y = 117 In.-Lbs



EXAMPLE

T = 135 In.-Lbs
Y = Unknown
L = 10.0 In.-Lbs
E = −1.5 In.

$$Y = \frac{135 \times 10}{10 - 1.5} = \frac{1350}{8.5} = 158.82$$

Y = 159 In.-Lbs

Figure 1-3. Torque Wrench Adapter Adjustment

BOLT TORQUE VALUES

BOLTS — Tension	BOLTS — Shear
AN3 thru AN20 AN42 thru AN49 AN73 thru AN81 AN173 thru AN186 AN509NK9 AN525NK525 MS20033 thru MS20046 MS20073 MS20074 MS24694 MS27039	NOTE: Bolts in tension column may be used with shear nuts. Bolts in shear column should not be used unless a minimum of two threads extend beyond nut after installation.

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

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

NUTS — Tension	NUTS — Shear
AN310 AN315 NA363 AN365 MS20365 MS21045 NAS679 NAS1021 NAS1291	AN320 AN364 NAS1022 MS20364

Nut-bolt size	FINE THREAD SERIES Torque Limits in.-lbs. MIN.	MAX.	Torque Limits in.-lbs. 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

Nut-bolt size	COURSE THREAD SERIES Torque Limits in.-lbs. MIN.	MAX.	Torque Limits in.-lbs. 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

Nut-bolt size	FINE THREAD SERIES Torque Limits in.-lbs. MIN.	MAX.	Torque Limits in.-lbs. 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

Nut-bolt size	MS17825 Torque Limits in.-lbs. MIN.	MAX.	MS17826 Torque Limits in.-lbs. MIN.	MAX.
10-32	28	35	16	20
1/4-28	65	80	35	45
5/16-24	180	225	70	90
3/8-24	260	325	100	125
7/16-20	460	575	180	225
1/2-20	720	900	240	300
9/16-18	880	1100	320	400
5/8-18	1300	1600	480	600
3/4-16	2200	2800	880	1100
7/8-14	3700	4600	1500	1900
1-14	5400	6800	2400	3000
1-1/8-12	8000	10000	4000	5000
1-1/4-12	11000	14000	5600	7000

Table 1-1. Torque Values - Bolts and Nuts

c. Torque Value - Threaded Straight Fittings.

NOTE

Tables in this section are for general applications. Refer to specific installations for special torque values and procedures.

1. Connectors installed in bosses with no required orientation should be installed using torque values given in Table 1-2.

THREADED CONNECTOR					
TUBE OUTSIDE DIAMETER (Inches)	THREAD	JAM-NUT Torque-Limits (in.-lbs.)		CONNECTOR w/ PACKING w/o JAM-NUT Torque-Limits (in.-lbs.)	
		MIN.	MAX.	MIN.	MAX.
1/8	5/16-24	35	50	50	55
3/16	3/8-24	65	80	65	75
1/4	7/16-20	85	105	95	105
5/16	1/2-20	105	125	125	135
3/8	9/16-18	120	150	155	165
1/2	3/4-16	240	280	280	305
5/8	7/7-14	320	380	380	405
3/4	1/16-12	500	600	550	600
1	1-5/16-12	720	880	800	900
1-1/4	1-5/8-12	960	1200	900	1000
1-1/2	1-7/8-12	1200	1440	900	1000
2	2-1/2-12	1400	1500	900	1000

Table 1-2. Torque Values
Jam-Nuts and Threaded Connector

2. Connectors installed in bosses requiring a specific orientation do not use a torque value, but use the following steps:

(a) Place jam-nut on fitting along with retainer and packing.

(b) Turn nut down until packing is firmly against lower threaded section of fitting.

(c) Install fitting into boss and tighten until there is a sudden increase in torque.

(d) Tighten fitting 1-1/2 turns.

(e) Orientation is accomplished by tightening fitting, but not exceeding one turn.

(f) Tighten jam-nut to torque values in Table 1-2.

3. Bulkhead fittings are installed with jam-nuts and should be torqued to values in Table 1-2.

4. Torque values for hose end fittings (nipple or nut) are given in Table 1-3.

TORQUE VALUE - HOSE ASSEMBLIES				
HOSE INSIDE DIAMETER	Nipple or Nut			
	ALUMINUM Torque-Limits in.-lbs.		STEEL Torque-Limits in.-lbs	
	MIN.	MAX.	MIN.	MAX.
1/8	20	30	75	85
3/16	25	35	95	105
1/4	50	65	135	150
5/16	70	90	170	200
3/8	110	130	270	300
1/2	230	260	450	500
5/8	330	360	650	700
3/4	460	500	900	1000
1	500	700	1200	1400
1-1/4	800	900	1520	1680
1-1/2	800	900	1900	2100
1-3/4	—	—	—	—
2	1800	2000	2660	2940

Table 1-3. Torque Values
Hose Assemblies

5. Torque values for straight threaded fittings used with rigid lines are given in Table 1-4.

THREADED STRAIGHT FITTING TORQUE VALUE (RIGID TUBE)													
	FLARED END						STRAIGHT END						
TUBE OUTSIDE DIAMETER	ALUMINUM Torque-Limits in-lbs.		ALUMINUM On Oxygen Lines Torque-Limits in-lbs.		STEEL Torque-Limits in-lbs.		6061-0 ALUMINUM 5052-0 ALUMINUM Torque-Limits in-lbs.		STEEL Torque-Limits in-lbs.		6061-T(X) ALUMINUM w/ steel sleeve Torque-Limits in-lbs.		
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TUBE WALL	MIN.	MAX.
1/8							20	30	45	55			
3/16					90	100	30	40	90	100	0.028	45	55
1/4	40	65			135	150	40	65	135	150	0.022	80	105
											0.028	80	105
											0.035	80	105
											0.049	90	115
5/16	60	80	100	125	180	200	60	80	180	200	0.028	80	105
											0.035	80	105
											0.042	125	175
3/8	75	125			270	300	75	125	270	300	0.028	125	175
											0.035	125	175
											0.049	125	175
1/2	150	250			450	500	150	250	450	500	0.028	135	180
											0.035	200	300
											0.049	400	500
											0.058	400	500
											0.065	400	500
5/8	200	350			700	800	200	350	700	800	All	500	600
3/4	300	500			1100	1150	300	500	1100	1150	All	600	700
1	500	700			1200	1400	500	700	1200	1400	All	1000	1300
1-1/4	600	900			1300	1450	600	900	1300	1450	All	1300	1500
1-1/2	600	900			1350	1500	600	900	1350	1500	All	1400	1700
2							600	900	1500	1700			

Table 1-4. Torque Values - Straight Threaded Fittings (Line)

1-8. SAFETYING PROCEDURES. The use of safety wire, cotter pins, lockwashers, and self-locking nuts is to prevent relative movement of critical components subject to vibration, torque, tension, etc., which could cause attaching parts to be broken, loosened, and/or detached.

1-9. SAFETY WIRE PROCEDURES.

a. Identification. Lockwire comes in three types which are identified by size and color. The three types are classified by use.

1. Inconel and Monel wire is used for general lockwiring and is identified by a natural wire color.

(a) Inconel can withstand temperatures up to 1500°F.

(b) Monel can withstand temperatures up to 800°F.

2. Copper that is cadium-plated and dyed yellow is used for shear and seal wiring applications.

(a) Shear applications are those where it is necessary to break or shear wire to permit operation or actuation of emergency devices.

(b) Seal applications are where wire is used with a lead seal to prevent tampering or use of a device without indication.

3. Aluminum Alloy (Alclad 5056) is dyed blue and is used exclusively for safety-wiring magnesium parts.

4. Size of wire is dependent on material and purpose of installation.

(a) 0.020-inch diameter copper wire should be used for shear and seal application.

(b) 0.020-inch diameter wire may be used to lockwire parts with tie holes smaller than 0.045 inches; or, on parts with tie hole diameters between 0.045 and 0.062 when spacing between ports is less than two inches; or, when bolts and screws of 0.25-inch diameter or less are closely spaced.

(c) 0.032-inch minimum diameter wire is used for general purpose lockwiring.

NOTE

When using single-wire method of locking, the largest wire that will fit tie holes should be used.

b. Lockwire Installation. There are two basic forms of lockwiring. The single-wire method has limited application; the double-twist method is the common method of lockwiring.

1. Use new wire for each application; do not try to re-use old wire.

2. Single-wire method is accomplished by passing a single wire through tie holes and back with ends then twisted together. (See Figure 1-4.)

(a) Single-wire method is used for shear and seal wiring applications.

(b) Single-wire method can be used in closely spaced, closed geometric patterns. Closely spaced is defined as spacing two inches or less between centers of parts.

CAUTION

Screws in closely spaced geometric patterns which secure hydraulic or air seals, hold hydraulic pressure, or are used in critical areas should use double-twist method of lockwiring.

3. Lockwiring by the double-twist method is really one wire twisted on itself several times and is accomplished by the following steps (see Figure 1-4).

(a) Insert one end of wire through tie holes of bolt head and firmly loop around bolt head.

NOTE

This does not necessarily apply to castellated nuts when slot is close to top of nut. The wire will be more secure if it is made to pass along side of stud.

(b) While taut, twist strands to within 1/8 inch of next part. The twisting keeps wire taut without overstressing and prevents wire from becoming nicked, kinked, or mutilated.

(c) Lockwiring multiple groups by double-twist method is accomplished in a similar manner except twists between parts are alternated between clockwise and counterclockwise.

(d) After last tie hole, wire is twisted three to five times to form a pigtail.

(e) Cut off any excess wire and bend pigtail towards part.

4. When lockwiring widely spaced multiple groups by double-twist method, three units shall be the maximum number in a series.

NOTE

Widely spaced multiple groups shall mean those in which fasteners are from four to six inches apart. Lockwiring shall not be used to secure fasteners or fittings which are spaced more than six inches apart, unless tie points are provided on adjacent parts to shorten span of lockwire to less than six inches.

5. When lockwiring closely spaced multiple groups, the number of units that can be lockwired by a 24-inch length of wire shall be the maximum number in a series.

6. Parts should be lockwired so that wire is placed in tension (pulled on) if a part attempts to loosen.

c. Required Lockwire Installation Applications.

1. Bolts and other fasteners securing critical parts that affect airplane safety and operation.

(a) In blind-tapped hole applications or bolts or castellated nuts on studs, lockwiring is installed in same manner as described for bolt heads.

(b) Hollow head bolts are safetied in manner prescribed for regular bolts.

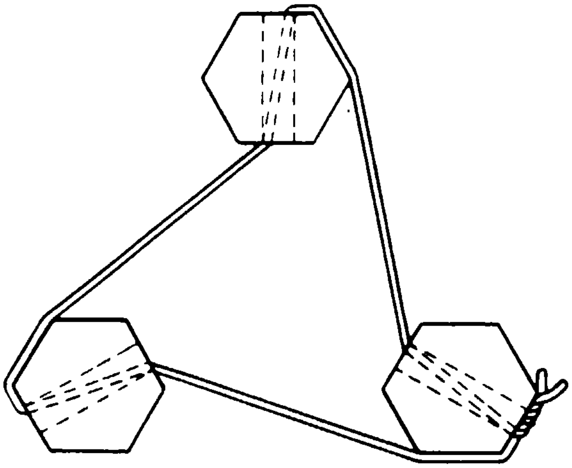
(c) Drain plugs and cocks may be safetied to a bolt, nut, or other part having a free tie hole in accordance with instructions described.

(d) External snap rings may be locked if necessary using general locking principles as described and illustrated. Internal snap rings should not be lockwired.

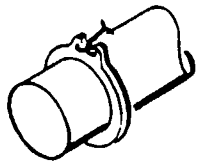
(e) When locking is required on electrical connectors which use threaded coupling rings, or on plugs which employ screws or rings to fasten individual parts of plug together, they shall be lockwired with 0.020-inch diameter wire in accordance with locking principles as described and illustrated. It is preferable to lockwire all electrical connectors individually. Do not lockwire one connector to another unless it is necessary to do so.

(f) Drilled head bolts and screws need not be lockwired if installed into self-locking nuts or installed with lockwashers. Castellated nuts with cotter pins or lockwire are preferred on bolts or studs with drilled shanks, but self-locking nuts are permissible within limitations described in Paragraph 1-13.

2. For new design, lockwire shall not be used to secure nor shall lockwire be dependent upon fracture as basis for operation of emergency devices such as handles, switches, and guard-covering handles that operate emergency mechanisms such as emergency exits, fire extingushers, emergency cabin pressure release, emergency landing gear release, and the like. However, where existing structural equipment or safety of flight emergency devices requires shear wire to secure equipment while not in use, but which are dependent upon shearing or breaking of lockwire for successful emergency operation of equipment, particular care exercised to assure that wiring under these circumstances shall not prevent emergency operations of these devices.



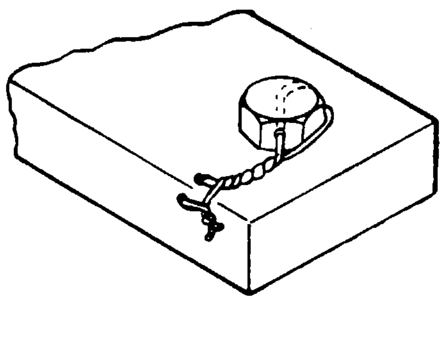
BOLTS IN CLOSELY SPACED, CLOSED
GEOMETRICAL PATTERN. SINGLE- WIRE METHOD.



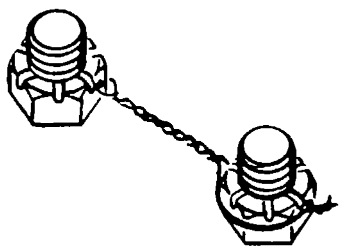
EXTERNAL SNAP RING
SINGLE-WIRE METHOD

NOTE

RIGHT-HAND THREADED PARTS
SHOWN. REVERSE DIRECTION
FOR LEFT-HAND THREADS.



SINGLE FASTENER APPLICATION
DOUBLE-TWIST METHOD



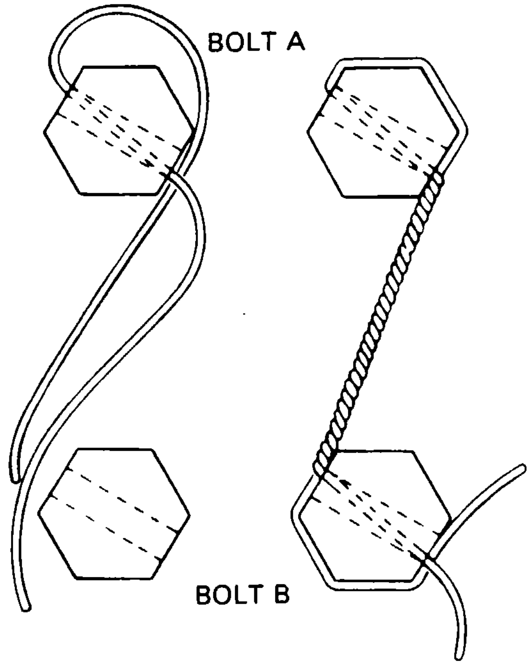
CASTELLATED NUTS ON DRILLED STUDS
DOUBLE-TWIST METHOD

Figure 1-4. Lockwire Safetying (Sheet 1 of 2)

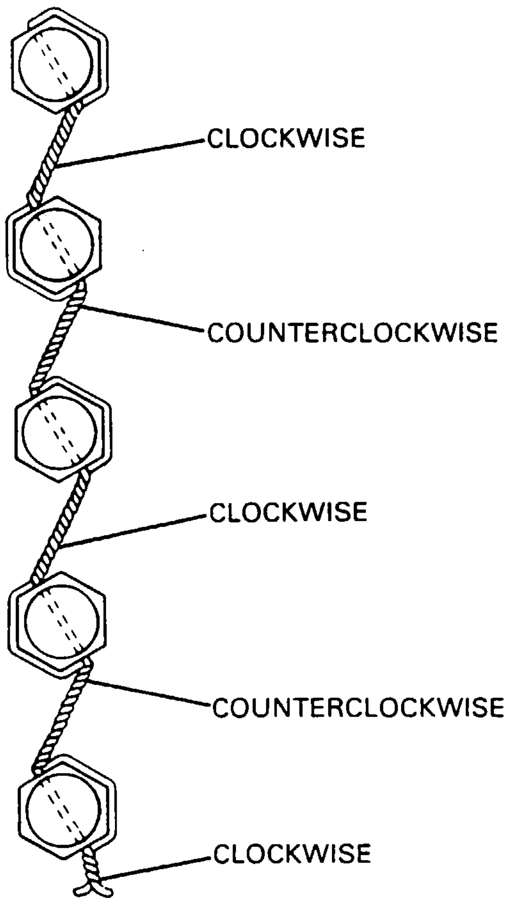
DOUBLE-TWIST METHOD

STEP 1. Insert wire through bolt A and bend around bolt (if necessary, bend wire across bolt head). Twist wires clockwise until they reach bolt B.

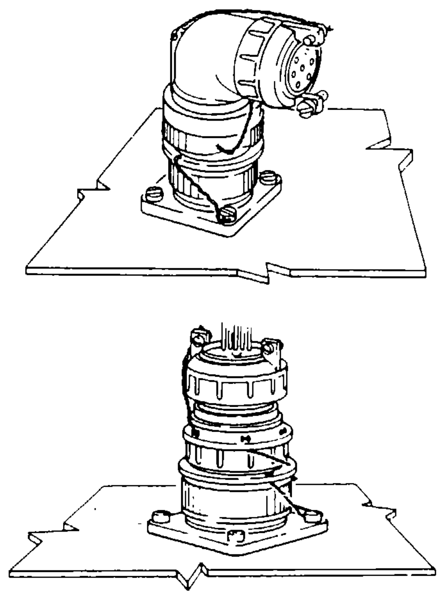
STEP 2. Insert one end of wire through bolt B. Bend other end around bolt (if necessary, bend wire across head of bolt). Twist wires counterclockwise 1/2 inch or six twists. Clip ends. Bend pigtail back againt part.



DOUBLE-TWIST METHOD



MULTIPLE FASTENER APPLICATION
DOUBLE-TWIST METHOD



ELECTRICAL CONNECTION

Figure 1-4. Lockwire Safetying (Sheet 2 of 2)

1-10. USE OF COTTER PINS.

a. Cotter Pin Installation. Castellated nuts and pins may be safetied with cotter pins or lockwire. The preferred method is to use cotter pins.

1. Select cotter pin material in accordance with temperature, atmosphere, and service limitations (see Table 1-5).

COTTER PINS (MS24665)		
MATERIAL	TEMP	USE
Carbon Steel	Up to 450°F	Pins that contact cadmium-plated surfaces. General Applications Normal Atmospheres
Corrosion-Resistant	Up to 800°F	Pins that contact corrosion-resistant steel. Corrosive atmospheres

Table 1-5. Cotter Pin Temperature and Use

2. Cotter pins shall be new upon each application.

3. When nuts are to be secured to fastener with cotter pins, tighten nut to low side (minimum) of applicable specified or selected torque range, unless otherwise specified, and if necessary, continue tightening until slot aligns with hole. In no case shall you exceed high side (maximum) torque range.

4. If more than 50 percent of cotter pin diameter is above nut castellation, a washer should be used under nut or a shorter fastener should be used. A maximum of two washers may be permitted under a nut.

5. The largest diameter cotter pin which hole and slots will accommodate should be used, but in no application to a nut, bolt, or screw shall pin size be less than sizes described in Table 1-6.

(6) Install cotter pin with head firmly in slot of nut with axis of eye at right angles to bolt shank. Bend prongs so that head and upper prong are firmly seated against bolt (see figure 1-5).

COTTER PIN - MINIMUM SIZE	
THREAD SIZE	MINIMUM PIN SIZE
6	0.028
8	0.044
10	0.044
1/4	0.044
5/16	0.044
3/8	0.072
7/16	0.072
1/2	0.072
9/16	0.086
5/8	0.086
3/4	0.086
7/8	0.086
1	0.086
1-1/8	0.116
1-1/4	0.116
1-3/8	0.116
1-1/2	0.116

Table 1-6. Cotter Pin Minimum Size

(7) In pin applications, install cotter pin with axis of eye parallel to shank of clevis pin or rod end. Bend prongs around shank of pin or rod end (see Figure 1-5).

CAUTION

Cadium-plated cotter pins should not be used in applications bringing them in contact with fuel, hydraulic fluid, or synthetic lubricants.

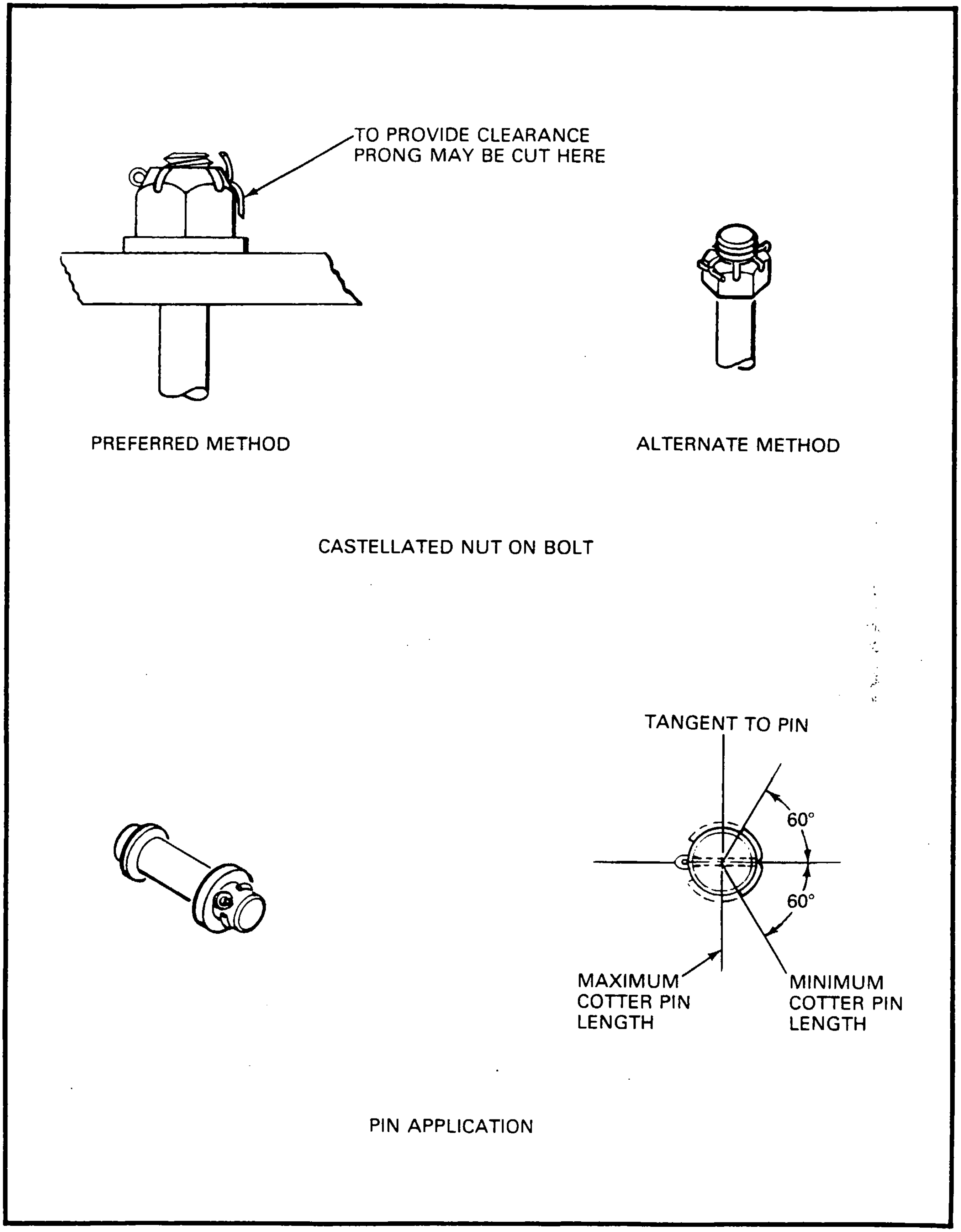


Figure 1-5. Installation of Cotter Pins

1-11. USE OF LOCKING CLIPS.

a. Safetying Turnbuckles. (See Figure 1-6.)

1. Prior to safetying, both threaded terminals shall be screwed an equal distance into turnbuckle body and shall be screwed in at least so far that not more than three threads of any terminal are exposed outside body.

2. After turnbuckle has been adjusted to its locking position, with slot indicator groove on terminals and slot indicator notch on body aligned, insert end of locking clip into terminal and body (refer to Figure 1-6) until U-curved end of locking clip is over hole in center of body.

(a) Press locking clip into hold to its full extent.

(b) Curved end of locking clip will expand and latch in body slot.

(c) To check proper seating of locking clip, attempt to remove pressed "U" end from body hole with fingers only.

NOTE

Do not use tool as locking clip could be distorted.

3. Locking clips are for one time use only and shall not be re-used.

4. Both locking clips may be inserted in same hole of turnbuckle body or in opposite holes of turnbuckle body.

1-12. USE OF LOCKWASHERS.

a. Lockwashers can be used only under the following conditions.

1. When self-locking feature cannot be provided in externally or internally threaded part.

2. When a cotter pin cannot be used to prevent rotation of internal threads with respect to external threads.

3. When lockwire cannot be used to prevent loosening of threaded parts.

4. When fastening is not used for fabrication of primary structure.

5. When loosening of threaded parts would not endanger safety of airplane or people.

6. When corrosion encouraged by gouging aluminum or magnesium alloys by edges of teeth on tooth-locked washers would not cause malfunctioning of parts being fastened together.

1-13. USE OF SELF-LOCKING NUTS.

a. Restrictions.

1. Self-locking nuts cannot be used under certain conditions.

(a) Used, reworked, or reprocessed nuts should not be installed for any application.

(b) Do not use if at joints in control systems for singular attach points.

(c) Do not use on externally threaded parts that serve as an axle of rotation for another part where tensional (torque) loads can cause nut to loosen and/or become separated. Examples are pulleys, levers, linkages, and cam followers.

NOTE

Self-locking nuts can be used when threaded parts are held by a positive locking device that requires shearing or rupture before torsional loads can act on threaded parts.

(d) Do not use where a loose nut, bolt, or screw could fall or be drawn into an area that would impede or damage or otherwise distort operation.

(e) Do not use to attach access panels and doors or to assemble components that are routinely disassembled or removed for access and servicing.

(f) In general, do not use self-locking nuts where loss of bolt affects safety of flight.

2. Bolts, studs, or screws, excluding Hi-Locks, must extend through self-locking nut for a length equivalent of two threaded pitches. This length includes chamfer.

3. Self-locking nuts which are attached to structure shall be attached in a positive manner to eliminate possibility of their rotation or misalignment when tightening is to be accomplished by rotating bolts to structure, and permit replacement of nuts.

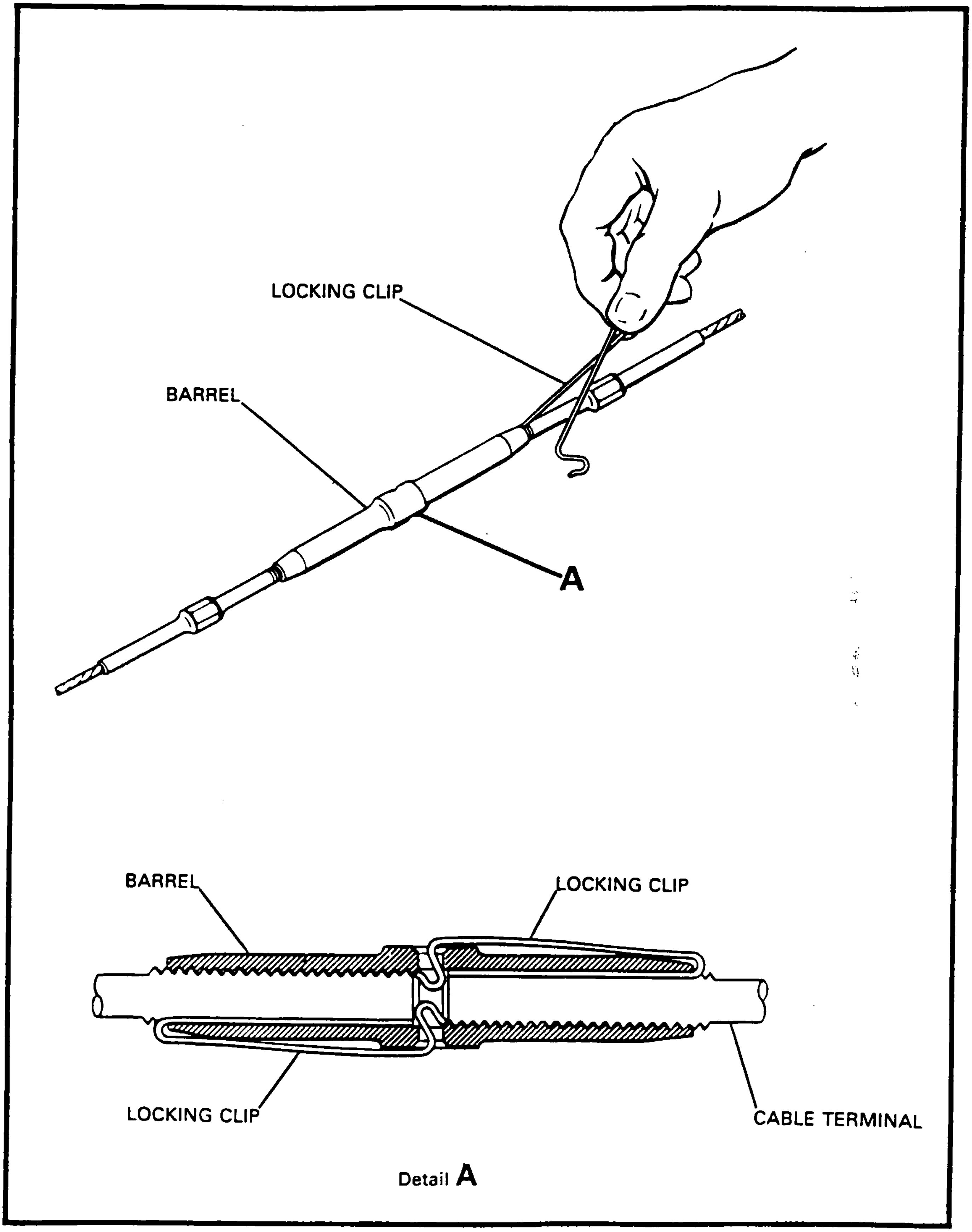


Figure 1-6. Safetying Turnbuckle Assemblies

1-14. CONTROL CABLE WIRE BREAKAGE AND CORROSION LIMITATIONS.

a. Inspection of Control Cables.

1. Control cable assemblies are subject to a variety of environmental conditions and forms of deterioration that ultimately may be easy to recognize such as wire/strand breakage, or the not so readily visible types ofdeterioration including corrosion and/or distortion. Thefollowing information will aid in detecting these cable conditions.

2. Broken Wire.

(a) Examine cables for broken wires by passing a cloth along length of cable. This will detect broken wires, if cloth snags on cable. Critical areas for wire breakage are those sections of cable which pass through fairleads, across rob blocks, and around pulleys.If no snags are found, then no further inspection is required. If snags are found or broken wires are suspected, then a more detailed inspection is necessary which requires that the cables be bent in a loop to confirm broken wires (refer to figure 1-7). Loosen or remove cable to allow it to be bent in a loop as shown. While rotating cable, inspect bent area for broken wires.

(b) Wire breakage criteria for cables in flap, aileron, rudder, and elevator systems are as follows:

(1) Individual broken wires are acceptable in primary and secondary control cables at random locations when there are no more than six broken wires in any given ten-inch cable length.

3. Corrosion.

(a) Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear-producing airframe components such as pulleys, fairleads, rub blocks, etc. It may be necessary to remove and bend cable to properly inspect it for internal strand corrosion as this condition is usually not evident on outer surface of cable. Replace cable if internal corrosion is found. If a cable has been wiped clean of its corrosion-preventive lubricant and metal-brightened, the cable shall be examined closely for corrosion. For description of control cable corrosion, refer to Chapter 51, Corrosion and Corrosion Control.

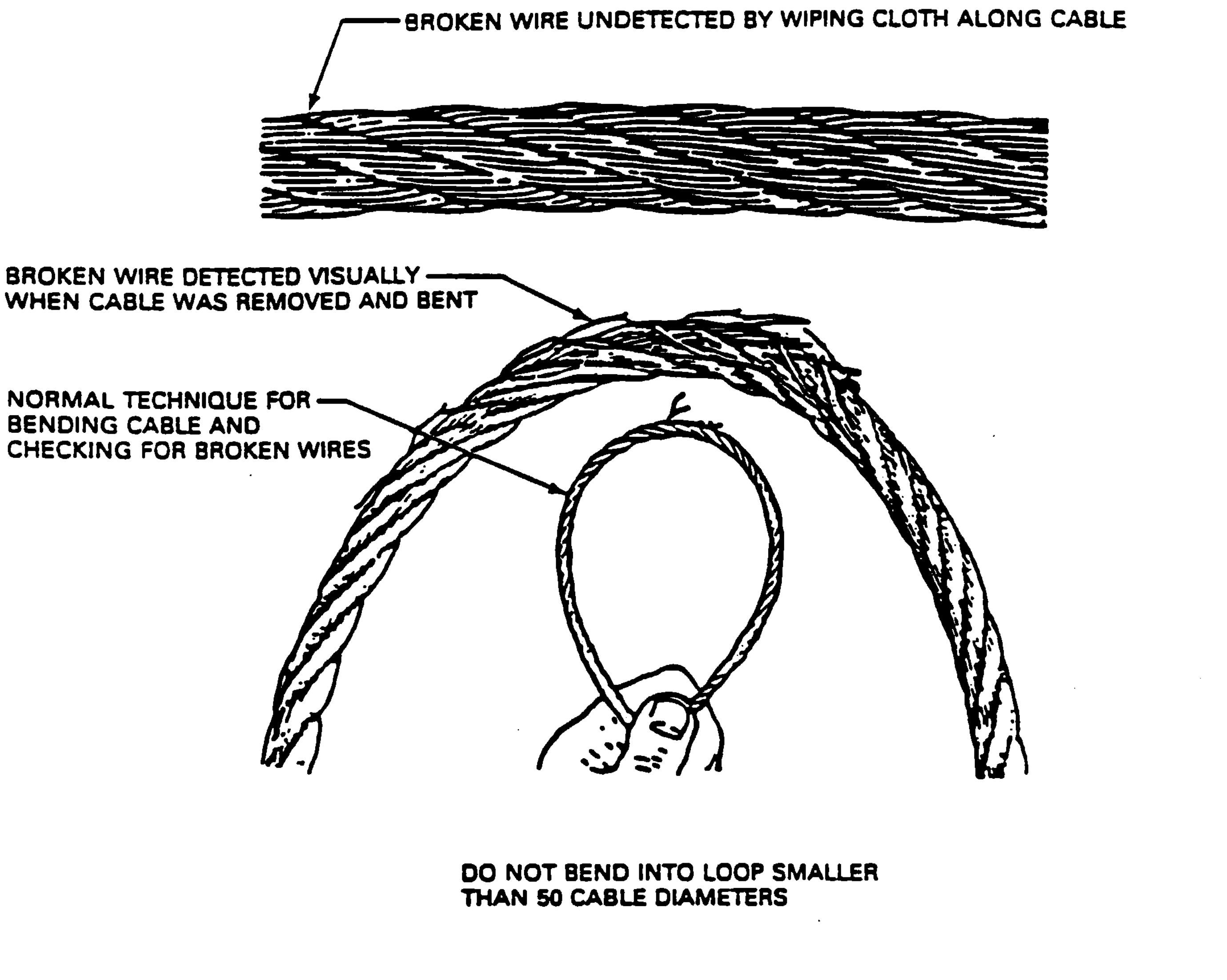


Figure 1-7. Cable Broken Wire Inspection

1-15. ADHESIVES, CEMENTS AND SEALANTS - SHELF LIFE AND STORAGE.

a. General.

1. This section provides information which defines the proper storage and usable life (shelf life) of adhesives, cements and sealents which are used for maintenance and/or repair of the airplane. Also included in this section is the criteria used for testing these materials after the normal shelf life has expired, to determine if an extension to the shelf life is possible.

2. Shelf life refers to a specified period of time usually from the date of manufacture (normally stamped or printed on the product container) to the expiration date (which should be determined using limits specified in Table 1-7 or if applicable, the manufacturer's expiration date printed or stamped on the product container). The specified shelf life is dependent on proper storage in accordance with the limits specified in this section and/or the manufacturer's instructions.

b. Storage Criteria.

1.Storage of Adhesives and Cements. All adhesives and cements shall be stored under controlled temperature conditions. . If open shop storage becomes necessary, these products shall in no case be stored in an area which will subject them to temperatures in excess of 95°F. Containers shall be tightly closed prior to being placing them into the proper storage environment. For proper storage environment, refer to Table 1-7 and the following paragraphs.

(a) Class I - These adhesives are epoxy base materials and have one year storage at room temperature. 0°F storage will extend the storage life. Refer to the product container instructions for storage temperature and life.

(b) Class II, III and IV - These adhesives are rubber and resin base and are good for six months at room temperature storage. 40°F storage will extend the storage life. Refer to the product container instructions for limits of each adhesive.

(c)Class V - These are silicone rubber adhesives. If stored in their original containers at a temperature below 80°F, have a shelf life of one year or as indicated on the storage container.

(d) Class VI - These are solvent bonding solvents. They should be stored in their original containers and tightly closed, and stored at 40°F temperature.

(e)ClassVII - Cyanoacrylate base materials must be stored in the original containers at 40°F or as specified on the container instructions.

(f) Class VIII - These are pressure sensitive materials. The shelf life is two years when stored at 75°F and 50 percent relative humidity.

(g) Class IX - These are polyurethane products. Store in original container, between 70 and 100°F. Urethanes are moisture sensitive and precautions should be taken to ensure complete protection from moisture contamination. Container must be tightly closed at all times.

(h) Class X - These are acrylic base materials. They require storage at 40°F or per instructions on product container.

c. Storage of Sealants.

1. All sealants shall be stored under controlled temperature conditions. If open shop storage becomes necessary, these products shall in no case be stored in an area which will subject them to temperatures in excess of 95°F or below 40°F. Containers shall be tightly closed prior to placing them in the proper storage environment. For proper storage environment, refer to Table 1-7 and the following paragraphs.

(a) Premixed and frozen sealants shall be stored at -40°F or colder and shall not be used more than six weeks after the date of mixing even if all storage is at -40°F or colder. If storage temperatures rise above 40°F, but not warmer than -30°F, the material may be stored for a maximum of two weeks warmer than -40°F plus time at -40°F or colder for a combined total not to exceed five weeks beyond the date of mixing. If storage temperatures rise above -40°F but are not warmer than -20°F, the materials may be stored for a maximum of one week above -30°F plus time at -40°F or colder for a combined total not to exceed four weeks beyond the date of mixing.

(b) Unmixed sealants shall be stored at a controlled temperature of between 40 and 80°F and have a shelf life of approximately six months when stored within this temperature range. Unmixed sealants stored at temperatures exceeding 80°F shall be used within five weeks.

2. All materials should be used on a "first in-first out" basis. The adhesives, cements and sealants should be rotated so this requirement can be accomplished. All material containers should be clearly marked with a "use by" date, consisting of the year and month. All materials not used by this date must be tested prior to use. Refer to Testing criteria and Table 1-7.

d. Testing Criteria.

1. Any material (adhesive, cement or sealant) not used within its shelf life will be tested and the results reviewed to determine if the material is usable. If there is doubt about the material being usable, it must be properly disposed of. Material that has exceeded its original shelf life may be retested to determine if the material meets its requirements. Materials meeting their requirements will have their shelf life extended as specified in Table 1-7. Materials with shelf life extensions must be retested after a specified period of time. Refer to Table 1-7.

2. Testing of Overaged Adhesives and Cements.

NOTE

Overaged adhesives and cements are those that have exceeded their original shelf life and must be tested prior to use and/or given extended shelf life.

(a) Class I Epoxy Adhesive - Examine both components to ensure that they are still workable. Check for gelling and/or contamination. Stir components and mix a small amount of adhesive. Verify that adhesive sets up and hardens.

(b) Class II, III and IV Rubber and Resin Base Adhesives - Open containers and check for gelling and/or contamination. Check for spreading and drying.

(c)Class V Silicone Rubber Adhesives - Examine adhesive for hardness. If adhesive is still soft and can be spread, it is acceptable. Verify that adhesive will harden.

(d) Class VI Solvent Bonding Solvents - Check for signs of apparent contamination. Solvents should be clean and clear with no signs of cloudiness.

(e)Class VII Cyanoacrylic Base Adhesives - Verify that product is still liquid with no visible signs of contamination.

(f) Class VIII Pressure Sensitive Materials - Open containers and inspect for hardening, gelling and contamination. Stir components and mix a small amount of adhesive. Verify that adhesive sets up properly.

(g) Class X Acrylic Adhesives - Inspect base material to ensure that it is still liquid. Mix a small amount of the components and verify that it sets up properly.

3. In general, if these materials exhibit normal physical properties, with no signs of hardening, gelling or contamination and set up and/or harden properly as applicable, the shelf life may be extended as specified in Table 1-7.

e. Testing of Overaged Sealants.

NOTE

Overaged sealants are those that have exceeded their original shelf life and must be tested prior to use and/or given extended shelf life.

1. For identification of sealants Classification, refer to Fuel, Weather, Pressure and High-Temperature Sealing - Maintenance Practices.

2. Overaged sealants to be tested for possible shelf life extension shall be properly mixed using the correct materials, procedures and equipment.

3. Overaged premixed frozen sealants, along with unmixed sealants should be visually inspected. Sealants whic show conclusive evidence of separation, discoloration and/or gelling prior to the addition of a thinner or curing agent shall be discarded. When in doubt of the sealant quality, the overaged sealant should be compared with the same type of sealant, under six months old, which is known to be satisfactory.

4. The mixed sealants may be tested by placing a small amount of sealant (smaple buttons) on a sheet of paper. After the sample buttons have cured, they should be cut in half and examined. The sealant should show no signs of spots or streaks of unmixed base compound or curing agent. However, sample buttons containing spots, streaks, discoloration and/or variations in uniformity of color are acceptable if these spots, streaks, etc., are tack free upon inspection. All mixed sealant should be as void free as possible.

5. Contaminated sealant, premixed sealant that have been thawed and refrozen shall be discarded.

6. Type I, Class A sealants should be checked for appearance, application time, tack-free time, cure time and adhesion.

7. Type I, Class B sealants should be checked for appearance, applicatiion time, cure time, tack-free time and adhesion. In addition, Class B-2 and B-4 sealants should be checked for initial flow.

8. Type I, Class C sealants should be checked for appearance, application time, cure time and adhesion. In addition, Class C sealants should be tested to determine that they ARE NOT at a tackfree condition at the end of their rated work life (squeeze out life).

9. Type II sealants should be checked for appearance, application time, tack-free time and cure time.

10. Type III sealants should be easily thinned with MEK, when difficulty is encountered in thinning the sealant, it should be discarded.

11. Type IV sealants should be checked for appearance, application time, tack-free time and cure time.

12. Type V and VI sealants should be checked for appearance, tack-free time and cure time.

13. Type VII sealants should be checked for appearance, application time, tack-free time and cure time.

14. Type VIII sealants should be checked for appearance, application time, tack-free time, cure time and adhesion. Adhesion to aluminum should be (peel) less than two-pounds per inch of width.

PRODUCT	STORAGE CONDITION (TEMPERATURE IN DEGREES FAHENHEIT)	SHELF LIFE IN MONTHS	EXTEND SHELF LIFE IN MONTHS	RETEST IN MONTHS
ADHESIVES AND CEMENTS				
EA9309.3NA	40 TO 80°F	12 Months	6 Months	6 Months
EA9339	40 TO 80°F	12 Months	6 Months	6 Months
EA9314	40 TO 80°F	12 Months	6 Months	6 Months
EA9330	40 TO 80°F	12 Months	6 Months	6 Months
EA907	40 TO 80°F	12 Months	6 Months	6 Months
Devcon F	40 TO 80°F	12 Months	6 Months	6 Months
EA934NA	40 TO 80°F	12 Months	6 Months	6 Months
380/6	40 TO 80°F	12 Months	6 Months	6 Months
A1186B	40 TO 80°F	12 Months	6 Months	6 Months
EC2216	40 TO 80°F	12 Months	6 Months	6 Months
#10 Fastset	40 TO 80°F	12 Months	6 Months	6 Months
608 Quickset	40 TO 80°F	12 Months	6 Months	6 Months
EC880	40 TO 80°F	8 Months	3 Months	3 Months
EC847	40 TO 80°F	8 Months	3 Months	3 Months
EC1300L	40 TO 80°F	*6 Months	*3 Months	*3 Months
5452	40 TO 80°F	12 Months	6 Months	6 Months
56431	40 TO 80°F	12 Months	6 Months	6 Months
1636	40 TO 80°F	12 Months	6 Months	6 Months
RTV - 157	40 TO 80°F	12 Months	6 Months	6 Months
RTV - 158	40 TO 80°F	12 Months	6 Months	6 Months
RTV - 159	40 TO 80°F	12 Months	6 Months	6 Months
RTV732	40 TO 80°F	12 Months	6 Months	6 Months
RTV102	40 TO 80°F	12 Months	6 Months	6 Months
RTV103	40 TO 80°F	12 Months	6 Months	6 Months
RTV106	40 TO 80°F	12 Months	6 Months	6 Months
RTV108	40 TO 80°F	12 Months	6 Months	6 Months
RTV109	40 TO 80°F	12 Months	6 Months	6 Months
RTV94034	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 222	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 242	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 271	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 277	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 290	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 416	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 495	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 515	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 569	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 592	40 TO 80°F	12 Months	6 Months	6 Months
Loctite 595	40 TO 80°F	12 Months	6 Months	6 Months

* Do not use after three months of storage in the 81°F to 90°F range
Do not use after five days of storage above 90°F.

Table 1-7. (Sheet 1 of 2)

PRODUCT	STORAGE CONDITION (TEMPERATURE IN DEGREES FAHENHEIT)	SHELF LIFE IN MONTHS	EXTEND SHELF LIFE IN MONTHS	RETEST IN MONTHS
ADHESIVES AND CEMENTS (CONTINUED)				
Loctite	40 TO 80°F	12 Months	6 Months	6 Months
Loctite	40 TO 80°F	12 Months	6 Months	6 Months
Loctite	40 TO 80°F	12 Months	6 Months	6 Months
Loctite	40 TO 80°F	12 Months	6 Months	6 Months
Loctite	40 TO 80°F	12 Months	6 Months	6 Months
DA-5521	40 TO 80°F	12 Months	6 Months	6 Months
PS-18	40 TO 80°F	12 Months	6 Months	6 Months
PS-30	40 TO 80°F	12 Months	6 Months	6 Months
XA-3678	40 TO 80°F	12 Months	6 Months	6 Months
XF-3585	40 TO 80°F	12 Months	6 Months	6 Months
LR-100-226	40 TO 80°F	12 Months	6 Months	6 Months
EC776	40 TO 80°F	* 8 Months	* 3 Months	*3 Months
SB and P2	40 TO 80°F	12 Months	6 Months	6 Months
SEALANTS				
Pro-Seal 890	40 TO 80°F	6 Months	2 Months	2 Months
GC-408	40 TO 80°F	6 Months	2 Months	2 Months
PR1422	40 TO 80°F	6 Months	2 Months	2 Months
PR1440	40 TO 80°F	6 Months	2 Months	2 Months
GC435	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 567	40 TO 80°F	6 Months	2 Months	2 Months
PR810	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 700	40 TO 80°F	6 Months	2 Months	2 Months
GC1900	40 TO 80°F	6 Months	2 Months	2 Months
PR366	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 735	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 895	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 706B	40 TO 80°F	6 Months	2 Months	2 Months
PR1321	40 TO 80°F	6 Months	2 Months	2 Months
GC200	40 TO 80°F	6 Months	2 Months	2 Months
RTV-730	40 TO 80°F	6 Months	2 Months	2 Months
Pro-Seal 815	40 TO 80°F	6 Months	2 Months	2 Months
GC402	40 TO 80°F	6 Months	2 Months	2 Months
PR-1005L	40 TO 80°F	*8 Months	*3 Months	*3 Months
GC-3001	40 TO 80°F	*8 Months	*3 Months	*3 Months
444R	40 TO 80°F	*8 Months	*3Months	*3 Months

* Do not use after three months of storage in the 81°F to 90°F range
Do not use after five days of storage above 90°F.

Table 1-7. (Sheet 2 of 2)

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.

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2-1. GROUND HANDLING.

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

CAUTION

When towing the aircraft, never turn the nose wheel more than 35 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.

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

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

CAUTION

When using the landing gear strut jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must then be lowered for a second jacking operation. Jacking both wheels simultaneously with landing gear strut jack pad is not recommended.

2-4A. LEVELING. Longitudinally leveling of the aircraft is accomplished by backing out the two screws on the left side of the fuselage and then placing a level across the screws. Corresponding points on either the upper or lower main door sills may be used to level the aircraft laterally.

2-4B. WEIGHING AIRCRAFT. Refer to Pilot's Operating Handbook.

SHOP NOTES:

TOW BAR: PART NUMBER 0501019-1, IS AVAILABLE FROM THE CESSNA SUPPLY DIVISION.

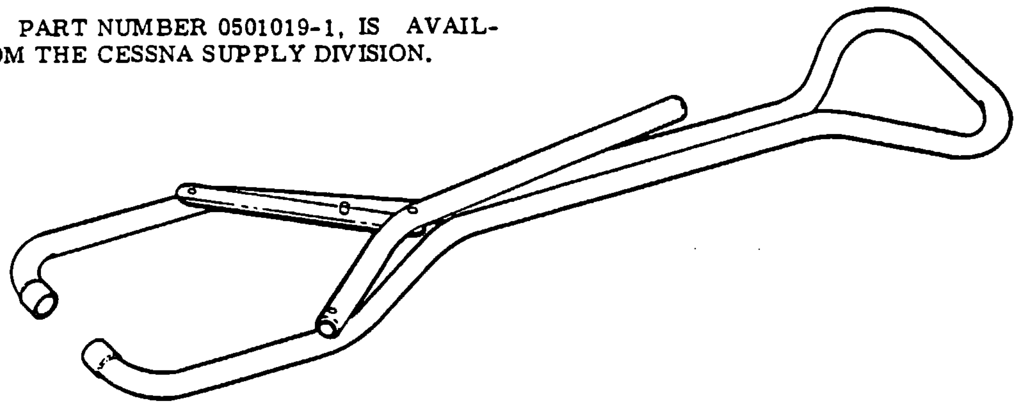


Figure 2-1. Typical Tow Bar

2-5. PARKING. Parking precautions depend principally on local conditions. As a general precaution, it is wise to set the parking brake or chock the wheels, and install the control lock. In severe weather, and high wind conditions, tie down the aircraft as outlined in paragraph 2-6 if a hangar is not available.

2-6. 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 mid-wing in line with the outboard edge of the flaps. Secure the opposite ends of ropes cables or chains to ground anchors.
b. Secure a tie-down rope (no chains or cables) to upper trunnion of the nose gear, 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 locks may be installed.

2-7. FLYABLE STORAGE.

NOTES

Preservation date should be written on propeller tag.

Maintain complete and accurate engine preservation records to ensure proper preservation of the engine cylinders can be documented and confirmed at a later date if necessary.

The airplane is delivered from Cessna with a Corrosion Preventive Aircraft Engine Oil mixture. This engine oil is a blend of aviation grade straight mineral oil and corrosion preventive compound. This oil should be used for the first 25 hours of engine operation. In the event it is necessary to add oil during the first 25 hours of operation, use MIL-L-6082 aviation grade straight mineral oil of the correct viscosity.

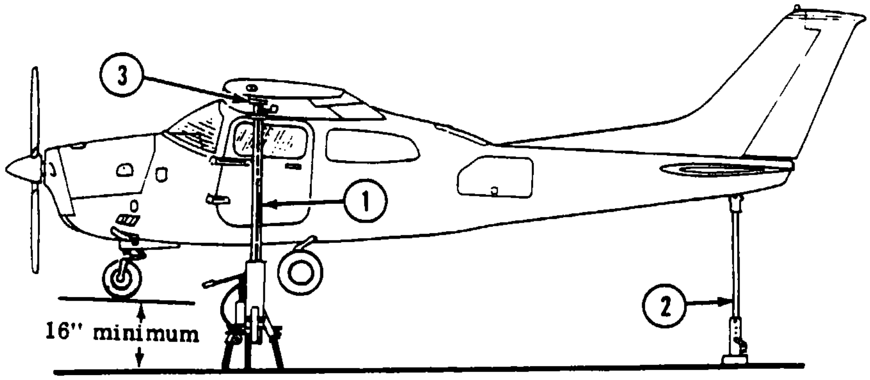
Flyable storage is defined as a maximum of 30 days non-operational storage and can be broken down into the following two programs.

a. Program 1 - engines or cylinders with less than 50 operating hours.
   1. Propeller pull-thru every five days. (See step c.)
   2. Fly airplane every 30 days. (See step d.)
b. Program 2 - engines or cylinders with more than 50 operating hours to TBO if not flown weekly.
   1. Propeller pull-thru every seven days. (See step c.)
   2. Fly airplane every 30 days. (See step d.)
c. The propeller should be rotated by hand without running the engine. For four and six cylinder straight drive engines, rotate engine six revolutions, stop propeller 45°to 90° from original position. For six cylinder geared engines, rotate propeller four revolutions and stop propeller 30° to 60° from original position.

CAUTION

For maximum safety, accomplish engine rotation as follows:

1. Verify magneto switches are OFF.
2. Place throttle in CLOSED position.
3. Place mixture control in IDLE CUT-OFF position.
4. Set brakes and block airplane wheels.
5. Leave airplane tie-downs installed and verify that cabin door latch is open.



ITEM NUMBER	TYPE AND PART NUMBER	REMARKS
1	#2-170 Basic jack #2-109 Leg Extension #2-70 Slide tube extension	Closed height: 69-1/2 inches; extended height: 92" (Insert slide tube extension into basic jack)
2	Cessna #2-168	Universal tail stand (SEE NOTE 2)
3	Block Cessna #1200028-1	1 x 4 x 4 padded with 1/4" rubber Jack point (SEE NOTE 1)

1. Provisions are furnished on the bottom of each wing for installation of optional 1200028-1 jack points.
2. Weighted adjustable stand attaches to tie-down ring.

   Wing jack points are aft of the aircraft center-of-gravity. This causes the aircraft to be nose heavy when on jacks. Place additional weights (shot bags or sand bags) on the weighted tail stand to hold the tail down. In addition, the base of adjustable tail stand (2-168) is to be filled with concrete for additional weight as a safety factor.

3. Items (1), (2) and (3) are available from the Cessna Supply Division.

Figure 2-2. Jacking Details (Sheet 1 of 2)

JACKING AIRCRAFT

1. Lower the aircraft tail so that wing jack and stands can be placed at wing jack points.
2. Raise aircraft tail and attach tail stand to tail tie-down ring. BE SURE the tail stand weighs enough to keep the tail down under all conditions and that it is strong enough to support any weight that may be placed upon it.
3. Raise jacks evenly until desired height is reached. When jacking the aircraft, the main landing gear wheels must be a minimum of 16" above shop floor for landing gear retraction.
4. The jack point on the bottom of the step may be used to raise only one main wheel. Do not use brake casting as a jack point.
5. The nose may be raised by weighting down the tail. Place weight on each side of stabilizer, next to fuselage.
6. Whenever the landing gear is to be operated in the shop, use the wing jack and tail jack points to raise the aircraft.
7. The aircraft may be hoisted as outlined in paragraph 2-3.

REMOVING AIRCRAFT FROM JACKS

1. Place landing gear control handle in gear down position.
2. Operate ground hydraulic power source or aircraft emergency hydraulic hand pump until landing gear is down and locked and the green indicator light is observed.
3. Disconnect ground hydraulic power source and/or stow emergency hydraulic hand pump handle.
4. Ascertain that green (DOWN) light is illuminated; then place master switch in OFF position.
5. Lower jacks evenly until aircraft rests on the landing gear and remove wing jacks and tail stand.
6. Compress nose landing gear shock strut to static position.

SHOP NOTES:

Figure 2-2. Jacking Details (Sheet 2 of 2)

6. DO NOT stand within arc of propeller blades while turning propeller.

d. The airplane should be flown for thirty (30) minutes, reaching, but not exceeding, normal oil and cylinder temperatures. If the aircraft cannot be flown it should be represerved in accordance with paragraph 2-11. (Temporary Storage) or paragraph 2-14. (Idefinite Storage). Ground running is not an acceptable substitute for flying.

NOTE

If step 2 in each program cannot be accomplished on schedule due to weather, maintenance, etc., pull the propeller through daily and accomplish as soon as possible.

e. If airplane is stored outside, tie it down in accordance with paragraph 2-6. 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.

2-8. RETURNING AIRCRAFT TO SERVICE. After flyable storage, returning the aircraft to service is accomplished by performing a thorough pre-flight inspection. At the end of the first 25 hours of engine operation, drain engine oil and clean oil pressure screen (or change external oil filter element). Service engine with correct grade and quantity of oil. Refer to figure 2-4 and paragraph 2-20 for correct grade of engine oil.

2-9. TEMPORARY STORAGE. Temporary storage is defined as aircraft in a non-operational status for a maximum of 90 days. The aircraft is constructed of corrosion-resistant alclad aluminum, which will last indefinitely under normal conditions if kept clean. However, these alloys are subject to oxidation. The first indication of corrosion on unpainted surfaces is in the form of white deposits or spots. On painted surfaces, the paint is discolored or blistered. Storage in a dry hangar is essential to good preservation and should be procured, if possible. Varying conditions will alter the measures of preservation, but under normal conditions in a dry hangar, and for storage periods not to exceed 90 days, the following methods of treatment are suggested.

a. Fill fuel bays with correct grade of gasoline.

b. Clean and wax aircraft thoroughly.

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

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

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

NOTE

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

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

NOTE

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

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

NOTE

The preservative oil must be MIL-L-46002, grade 1, at room temperature. Two preservative oils recommended for use in Teledyne Continental engines for temporary and indefinite storage are NOX RUST VCI-105 (Daubert Chemical Co., 4700 S. Central Avenue Chicago, IL.) and PETROTECT, VA (Pennsylvania Refining Company, Butler, PA).

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

i. After completing step "h," rotate crankshaft so that no piston is at a top position.

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

k. Install spark plugs and connect spark plug leads.

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

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

n. If the aircraft is to be stored outside, perform the procedures outlined in paragraph 2-6. 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.

2-10. 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 2-9.

2-11. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedure 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 values listed in Section 12 or 12A of this manual.

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 pre-flight inspection, then start and warm-up engine.

2-12. INDEFINITE STORAGE. Indefinite storage is defined as aircraft in a non-operational status for an indefinite period of time. Engines treated in accordance with the following may be considered protected against normal atmosphere corrosion, provided procedures outlined in paragraph 2-13 are performed at intervals specified.

a. Drain engine oil and refill with MIL-C-6529 Type II. The aircraft should be flown for thirty (30) minutes, reaching, but not exceeding normal oil and cylinder temperatures. Allow engine to cool to ambient temperature.

b. Remove top spark plug and spray preservative oil (Lubrication Oil - Contact and Volatile Corrosion - Inhibited, MIL-L-46002, Grade 1) at room temperature, through upper spark plug hole of each cylinder with piston in approximately bottom dead center position. Rotate crankshaft as each pair of opposite cylinders is sprayed. Stop crankshaft with no piston at top dead center. A pressure pot or pump-up type garden pressure sprayer may be used. The spray head should have ports around circumference to allow complete coverage of cylinder walls.

c. Respray each cylinder without rotating crank. To thoroughly cover all surfaces of cylinder interior, move nozzle or spray gun from top to bottom of cylinder.

NOTE

MIL-C-6529 Type II may be formulated by thoroughly mixing one part compound MIL-C-6529 Type I (Esso Rust-Ban 628, Cosmoline No. 1223 or equivalent) with three parts new lubricating oil of the grade recommended for service (all at room temperature). Single grade oil is recommended.

d. Apply preservative to engine interior by spraying MIL-L-46002, Grade 1 oil (approximately two ounces) through oil filler tube.

e. Install dehydrator plugs MS27215-1 or-2, in each of the top spark plug holes, making sure that each plug is blue in color when installed. Protect and support spark plug leads with AN-4060 protectors.

f. DO NOT rotate propeller after completing step "e".

g. If engine is equipped with a pressure type carburetor, preserve this component by the following method. Drain carburetor by removing the drain and vapor vent plugs from regulator and fuel control unit. With mixture control in "Rich" position, inject lubricating oil, grade 1010, into fuel inlet at a pressure not to exceed 10 psi until oil flows from vapor vent opening. Allow excess oil to drain, plug inlet and tighten and safety the drain and vapor vent plugs. Wire throttle in open position, place bags of desiccant in the intake and seal opening with moisture resistant paper and tape or a cover plate.

h. If carburetor is removed from engine, place a bag of desiccant in throat of carburetor air adapter. Seal adapter with moisture-resistant paper and tape or a cover plate.

i. The TCM fuel-injection system does not require any special preservation preparation. For preservation of the Bendix RSA-7DA1 fuel-injection system, refer to the Bendix Operation and Service Manual.

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

k. Seal cold air inlet to heater muff with moisture-resistant tape to exclude moisture and foreign objects.

l. Seal engine breather by inserting a dehydrator MS27215-2 plug in breather hose and clamping in place.

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

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

o. Drain corrosion-preventive mixture from engine sump and reinstall drain plug or close drain valve.

NOTE

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

p. 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.

q. Prepare airframe for storage as outlined in paragraph 2-11 thru step "e".

2-13. INSPECTION DURING STORAGE. Aircraft in indefinite storage shall be inspected as follows:

a. Aircraft prepared for indefinite storage should have cylinder dehydrator plugs visually inspected every 15 days. The plugs should be changed as soon as their color indicates unsafe conditions of storage.

If the dehydrator plugs have changed color in one-half or more of the cylinders, all desiccant material on the engine should be replaced.

b. The cylinder bores of all engines prepared for indefinite storage should be resprayed with corrosion-preventive mixture every six months, or more frequently if bore inspection indicates corrosion has started earlier than six months. Replace all desiccant and dehydrator plugs. Before spraying, engine should be inspected for corrosion as follows: Inspect interior of at least one cylinder on each engine through the spark plug hole. If cylinder shows start of rust, spray cylinder corrosion-preventive oil and turn prop over six times, then respray all cylinders. Remove at least one rocker box cover from each engine and inspect valve mechanism.

2-14. RETURNING AIRPLANE TO SERVICE. After indefinite storage, use the following procedure to return the airplane to service.

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

b. Check battery and install.

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

d. Remove warning placards posted at throttle and propeller.

e. Remove and clean engine oil screen, then reinstall and safety. on airplanes that are equipped with an external oil filter, install new filter elements.

f. Remove oil sump drain plug and drain sump. Install and safety drain plug and fill engine with oil.

NOTE

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

WARNING

When returning the airplane to service do not use the corrosion-preventive oil referenced in paragraph 2-12, step "a".

g. Service and install the induction air filter.

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

i. Clean, gap, and install spark plugs. Torque plugs to value listed in Section 12 or 12A.

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

k. If the carburetor has been preserved with oil, drain it by removing the drain and vapor vent plugs from the regulator and fuel control unit. With mixture control in "Rich" position, inject service-type gasoline into fuel inlet at a pressure not to exceed 10 psi until all of the oil is flushed from the carburetor. Reinstall carburetor plugs and attach fuel line.

l. Perform a thorough preflight inspection, then start and warm up engine.

m. Thoroughly clean and test-fly airplane.

2-15. SERVICING.

2-16. DESCRIPTION. Servicing requirements are shown in figure 2-4. The following paragraphs supplement this figure by adding details not included in the figure.

2-17. FUEL BAYS. An area of each wing is sealed to form an integral fuel bay. Recommended fuel grades are listed in figure 2-4. Fuel bays should be filled immediately after flight to lessen condensation in bays and lines.

NOTE

Before refueling or when airplane is parked on a slope, place the fuel selector handle in the LEFT ON or RIGHT ON position, whichever corresponds to the low wing. This will minimize cross-feeding from the fuller bay and reduce fuel seepage from the wing vents. This note applies only to 1985 models.

WARNING

DURING ALL FUELING PROCEDURES, FIREFIGHTING EQUIPMENT MUST BE AVAILABLE. TWO GROUND WIRES FROM DIFFERENT POINTS ON THE AIRPLANE TO SEPARATE APPROVED GROUND STAKES SHALL BE USED TO PREVENT ACCIDENTAL DISCONNECTION OF ONE GROUND WIRE. ENSURE THAT FUELING NOZZLE IS GROUNDED TO THE AIRPLANE.

NOTE

Tie-down rings should be used as grounding points for all grounding wires during refueling procedures.

2-18. 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 occurring under these unusual conditions it is permissible to add isopropyl alcohol or ethyelene glycol monomethyl ether (EGME) compound to the fuel supply. See Figure 2-3 for fuel additive mixing ratio.

CAUTION

Diethylene glycol monomethyl ether (DiEGME) has NOT been approved by engine manufacturer for use with propeller single engine aircraft.

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 fuel 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 glycolmonomethyl 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.

SHOP NOTES:

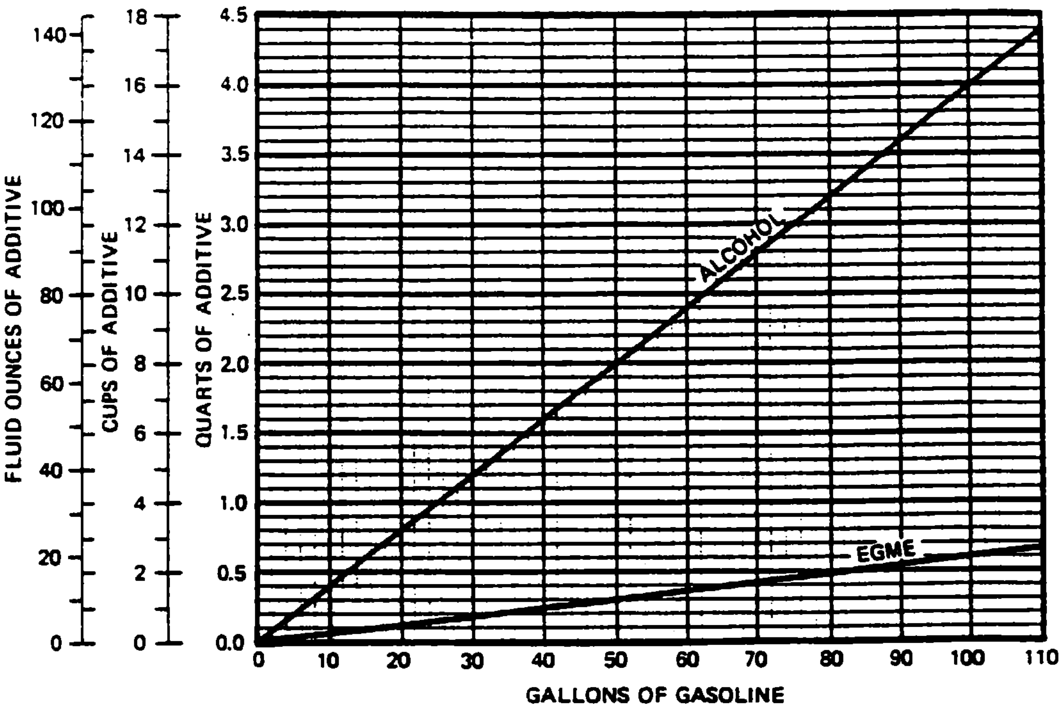


Figure 2-3. Fuel Additive Mixing Ratio Chart

Prolonged storage of the airplane will result in a water buildup 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.

2-19. FUEL DRAINS. Drains are located at various places throughout the fuel system. Refer to Section 13 for locations of the various drains in the system. Remove drain plugs and open drain valves at the intervals specified in figure 2-4. To use drain cup for sampling, place cup to valve and depress valve with rod protruding from cup. If water is found during daily inspection, open all drain valves and remove all fuel drain plugs to drain all water from the fuel system.

2-20. 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 and 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 clean oil pressure screen (or change external filter element) whenever oil on the dipstick appears dirty. Aviation grade ashless dispersant oil conforming to Continental Motors Specification MHS-24, and all revisions or supplements thereto, and conforming with current Continental Aircraft Engine Service Bulletins shall be used.

NOTE

The aircraft is delivered from Cessna with a corrosion preventive aircraft engine oil (MIL-C-6250, Type I). If oil must be added during the first 25 hours of operation, use only aviation grade straight mineral oil conforming to Specification MIL-L-6082. After the first 25 hours of operation, drain engine oil sump and clean the oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with correct quantity and grade of dispersant oil conforming to Continental Motors Specification MHS-24 and with current Continental Aircraft Engine Service Bulletins. Newly overhauled engines should also be operated on aviation grade straight mineral oil conforming to Specification MIL-L-6082 until a total of 25 hours have accumulated.

When changing engine oil, remove and clean oil pressure screen or install a new filter element on aircraft equipped with an external oil filter. To drain oil, proceed as follows:

a. Operate engine until oil temperature is at normal operating temperature.
b. Remove oil drain plug from engine sump and allow oil to drain into a container.
c. After engine oil has drained, install and safety drain plug.
d. Remove and clean oil pressure screen or change external oil filter element.
e. Service engine with correct quantity and viscosity of aviation grade engine oil.

NOTE

Refer to inspection charts for intervals for changing engine oil and external filter elements. Refer to figure 2-4 for correct viscosities and capacities of aviation grade engine oil.

2-21. 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 over-stressed. 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 filter, proceed as follows:**

a. Remove filter from aircraft.

NOTE

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

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

CAUTION

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

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

NOTE

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

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

NOTE

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

e. Be sure airbox is clean, and inspect filter. If filter is damaged, a new filter should be installed.
f. Install filter at entrance to airbox with gasket on aft face of filter frame and with flow arrows on filter frame pointed in the correct direction.

2-22. VACUUM SYSTEM AIR FILTER. The vacuum system central air filter keeps dust and dirt from entering the vacuum-operated instruments. Inspect filter every 100 hours for damage. Replace filter when damaged, every 500 hours of operation, or whenever it becomes sufficiently clogged to cause suction gage readings to drop below 4.6 Hg. Do not operate the vacuum system with the filter removed or a vacuum line disconnected because 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.

2-23. BATTERY. Battery servicing involves adding distilled water to maintain the electrolyte even with the horizontal baffle plate or split ring at the bottom of the filler holes, checking cable connections, and neutralizing and cleaning off any spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and clean water to neutralize electrolyte or corrosion. Follow with a thorough flushing with clean water. Do not allow bicarbonate of soda to enter battery. Brighten cable and terminal connection with a wire brush, then coat with petroleum jelly before connecting. **Check the battery every 100 hours (or at least every 90 days), oftener in hot weather. Add only distilled water, not acid or "rejuvenators," to maintain electrolyte level in the battery. Inspect the battery** box and clean and remove any evidence of corrosion.

2-24. TIRES. Maintain tire pressure at the value specified in Section 1. When checking pressure, examine tire for wear, cuts, bruises and slippage.

NOTE

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

2-25. NOSE GEAR STRUT. The nose gear strut requires periodic checking to ascertain that the strut is filled with hydraulic fluid and is inflated to the correct air pressure. To fill the nose gear strut with hydraulic fluid and air, proceed as follows:

a. Remove valve cap and release all air.
b. Remove valve housing assembly.
c. Compress strut completely (stops in contact with outer barrel hub).
d. Oil level.
   1. Fluid used should comply with Specification MIL-H-5606.
   2. Fill strut to bottom of valve installation hole.
   3. Maintain oil level at bottom of valve installation hole.
e. Fully extend strut.
f. Replace valve housing assembly.
g. With strut fully extended and nose wheel clear of ground, inflate strut to 90 PSI.

NOTE

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

2-26. NOSE GEAR SHIMMY DAMPER. The shimmy damper should be serviced at least every 100 hours. The damper must be filled completely with hydraulic fluid, free of entrapped air with the compensating piston bottomed in the rod. Check that piston is comletely bottomed as follows:

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

NOTE

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

Service the shimmy damper as follows:

a. Remove fillter plug from damper.
b. Move piston completely to opposite end from filler plug.
c. Fill damper with clean hydraulic fluid.
d. Reinstall filler plug and safety.
e. Wash damper in solvent and wipe dry with a cloth.
f. Reinstall shimmy damper in airplane.

NOTE

Keep shimmy damper, especially the exposed portions of the damper piston shaft, clean to prevent collection of dust and grit which could cut the seals in the damper 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.

2-27. HYDRAULIC BRAKE SYSTEMS. Check brake master cylinders and refill with hydraulic fluid as specified in the inspection charts. Bleed the brake system of entrapped air whenever there is a spongy response to the brake pedals. Refer to Section 5 for filling and bleeding the brake system.

2-28. LANDING GEAR HYDRAULIC RETRACTION SYSTEM. Draining, filling and bleeding of the landing gear hydraulic system can be accomplished by the following method.

a. Place airplane master switch in off position and place airplane on jacks as shown in figure 2-2. Bleed pressure from system by moving landing gear selector valve to gear UP 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 from elbow on right side of power pack (behind access cover) and attaching a drain hose to the elbow. Place end of hose in a container of at least one gallon capacity and using emergency hand pump, pump fluid into container. When power pack reservoir is empty, replace cap.
c. Fill power pack reservoir with MIL-H-5606 hydraulic fluid by inserting a 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.

2-29. 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 replace aircraft on jacks as shown in figure 2-2. Bleed pressure from system by moving landing gear selector valve to gear UP 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 from elbow on right side of power pack (behind access cover) and place a nonmetal container below opening.
c. Place landing gear selector valve in DOWN position and operate emergency hand pump to pump fluid into container.
d. If the drain fluid is clear and not appreciably darker in color than new fluid, continue to use the present fluid.
e. If the fluid color is doubtful, place a fluid sample in a nonmetallic 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.

2-30. OXYGEN SYSTEM. Refer to Section 15.

2-31. FACE MASKS. Refer to Section 15.

2-32. CLEANING.

2-33. GENERAL DESCRIPTION. Keeping the aircraft clean is important. Besides maintaining the trim appearance of the aircraft, cleaning lessens the possibility of corrosion and makes inspection and maintenance easier.

2-34. UPHOLSTERY AND INTERIOR. Cleaning prolongs the life of upholstery fabrics and interior trim. To clean the interior, proceed as follows:
a. Empty all the ashtrays.
b. Brush out or vacuum clean the upholstery and carpeting to remove dirt.
c. Wipe leather and plastic surfaces with a damp cloth.
d. Soiled upholstery fabrics and carpet may be cleaned with a foam-type detergent, used according to the manufacturer's instructions.
e. Oily 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 a volatile solvent; it may damage the packing and backing material.
f. Scrape off sticky materials 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.)

2-35. PLASTIC TRIM. The instrument panel, plastic trim and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent.

SHOP NOTES:

2-36. CLEANING WINDSHIELD AND WINDOWS.

2-36A. MATERIALS REQUIRED.

NAME	MANUFACTURER	USE
Mild soap or detergent (hand dishwashing type without abrasives).	Commercially available.	Cleaning windshields and windows.
Aliphatic Naphtha Type II conforming to Federal Specification TT-N-95.	Commercially available.	Removing deposits which cannot be removed with mild soap solution on acrylic windshields and windows.
*Polishing wax.		Waxing acrylic windshields and windows
Turtle Wax (paste).	Turtle Wax, Inc. Chicago, IL. 60638	
Great Reflections Paste Wax	E.I. duPont de Nemours and Co. (Inc.) Wilmington, DE 19898	
Slip-Stream Wax (paste)	Classic Chemical Grand Prairie, TX 75050	
Acrylic polish conforming to Federal Specification P-P-560 such as:		Cleaning and polishing acrylic windshields and windows.
Permatex plastic cleaner No. 403D	Permatex Company, Inc. Kansas City, KS 66115	
Cotton flannel or cotton terry cloth material.	Commercially available.	

* These are the only polishing waxes tested and approved for use by Cessna Aircraft Company.

CAUTION

Windshields and windows are easily damaged by improper handling and cleaning techniques.

a. Place airplane inside hangar or in shaded area and allow to cool from heat of sun's direct rays.

b. Using clean (preferably running) water, flood surface. Use bare hands with no jewelry to feel and dislodge any dirt or abrasive materials.

c. Using a mild soap or detergent (such as dish-washing liquid) in water, wash surface. Again use only bare hands to provide rubbing force. (A clean cloth may be used to transfer soap solution to surface, but extreme care must be exercised to prevent scratching surface.)

d. On acrylic windshields and windows only, if soils which cannot be removed by a mild detergent remain, Type II aliphatic naphtha applied with a soft clean cloth may be used as a cleaning solvent. Be sure to frequently refold cloth to avoid redepositing soil and/or scratching windshield with any abrasive particles.

e. Rinse surface thoroughly with clean fresh water and dry with a clean cloth.

CAUTION

DO NOT use any of the following on or for cleaning windshields and windows: methanol, denatured alcohol, gasoline, benzene, xylene, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays.

2-36B. WAXING.

a. Hand polishing wax should be applied to acrylic surfaces. (The wax has an index of refraction nearly the same as transparent acrylic and tend to mask any shallow scratches on windshield surface).

b. Acrylic surfaces may be polished using a polish meeting Federal Specification P-P-560 applied per manufacturer's instructions.

CAUTION

DO NOT use rain repellent on acrylic surfaces.

NOTE

When applying and removing wax and polish, use a clean soft cloth.

2-36C. PREVENTIVE MAINTENANCE.

NOTE

Utilization of the following techniques will help minimize windshield and window crazing.

a. Keep all surfaces of windshields and windows clean.
b. If desired, wax acrylic surfaces.
c. Carefully cover all surfaces during any painting, powerplant cleaning or other procedure that calls for use of any type of solvents or chemicals. The following coatings are approved for use in protecting surfaces from solvent attack.
   1. White Spary Lab, MIL-C-6799, Type I, Class II.
   2. WPL-3 Masking Paper - St. Regis, Newton, MA.
   3. 5 X N - Poly-Spotstick - St. Regis, Newton, MA.
   4. Protex 40 - Mask Off Company, Monrovia, CA, and Southwest Paper Co., Wichita, KS.
   5. Protex 10VS - Mask Off Company, Monrovia, CA, and Southwest Paper Co., Wichita, KS.
   6. Scotch 344 Black Tape - 3M Company.
d. Do not park or store airplane where it might be subjected to direct contact with or vapors from: methanol, denatured alcohol, gasoline, benzene, xylene, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
e. Do not use solar screens or shields installed on inside of airplane or leave sun visors up against windshield. The reflected heat from these items causes elevated temperatures which accelerate crazing and may cause formation of bubbles in the inner ply of multiple ply windshields.
f. Do not use a power drill motor or other powered device to clean, polish, or wax surfaces.

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

2-37. ALUMINUM SURFACES. The aluminum surfaces require a minimum of care, but should never be neglected. The aircraft may be washed with non-alkaline grease solvents to remove oil and/or grease. Household-type detergent soap powders are effective cleaners, but should be used cautiously since some of them are strongly alkaline. Many good aluminum cleaners, polishes and waxes are available from commercial suppliers of aircraft products.

2-38. 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. 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 washdown.

Perform all cleaning operations in well ventilated work areas and ensure that adequate firefighting 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 in accordance with Paragraph 12-3.
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, vacuum pump or turbocharger relief valve.

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.

2-40. 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.

2-41. 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.

2-42. LUBRICATION.

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.

2-43. GENERAL DESCRIPTION. Lubrication requirements are outlined in figure 2-5. Before adding lubricant to a fitting, wipe the fitting free of dirt. Lubricate until grease appears around part being lubricated and wipe excess grease from parts. The following paragraphs supplement figure 2-5 by adding details not shown in the figure.

2-44. NOSE GEAR TORQUE LINKS. Lubricate torque links every 50 hours. When operating in dusty conditions, more frequent lubrication is recommended.

2-45. TACHOMETER DRIVE SHAFT. Refer to Section 16.

2-46. WHEEL BEARING LUBRICATION. Clean and repack wheel bearings at the first 100-hour inspection and at each 500-hour inspection thereafter. If more than the usual number of take-off and landings are made, extensive taxiing is required or the aircraft is operated in dusty areas or under seacoast conditions, clean and lubricate wheel bearings at each 100-hour inspection.

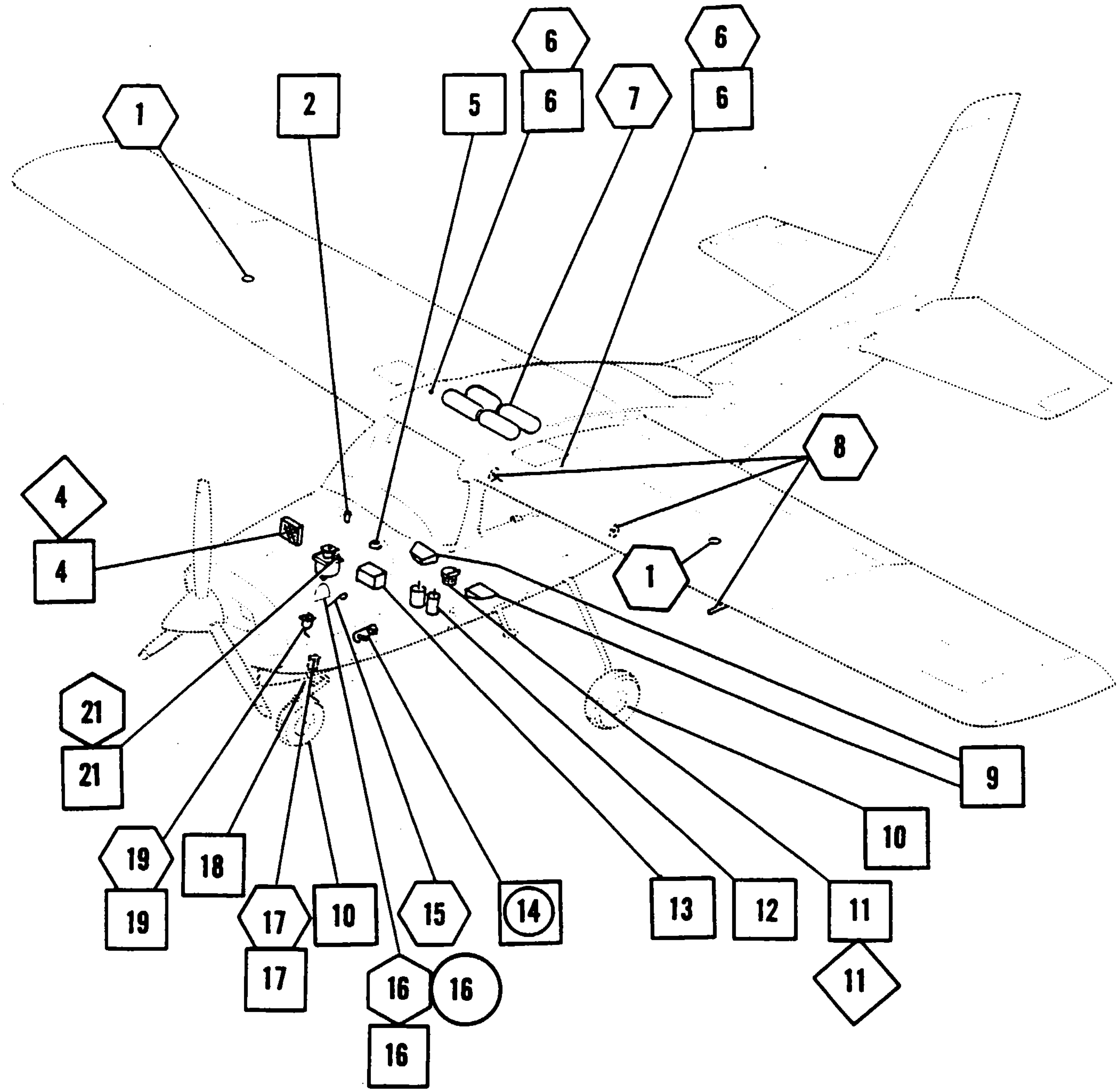
2-47. WING FLAP ACTUATOR. Clean and lubricate wing flap actuator jack screw each 100 hours as follows:
a. Expose jack screw by operating flaps to full-down position.
b. Clean jack screw threads with solvent rag and dry with compressed air.

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.

2-48. ROD END BEARINGS. Periodic inspection and lubrication is required to prevent corrosion of the bearing in the rod end. At each 100-hour inspection, disconnect the control rods at the aileron and 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 the aileron. If corrosion is detected during inspection, install new rod ends.



(REFER TO SHEET 2 FOR CAPACITIES AND SPECIFICATIONS)

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

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

OXYGEN:
SPEC. NO. MIL-O-27210

SPECIFIED AVIATION GRADE FUELS:

WARNING

ONLY AVIATION GRADE FUELS ARE APPROVED FOR USE.

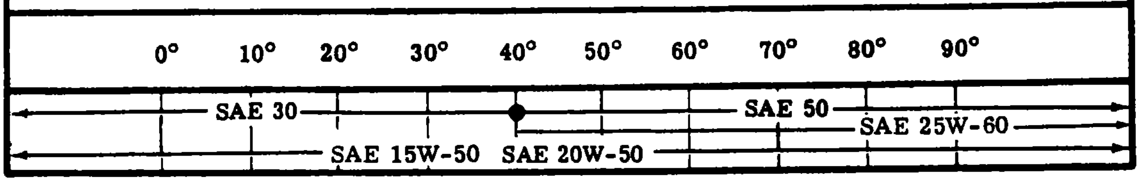
ENGINE MODEL	APPROVED FUEL GRADES	NOTE
Continental IO-520-L & TSIO-520-CE	100LL (blue)	1
	100 (green) (formerly 100/130)	1

NOTE

1. Compliance with Continental Aircraft Engine Service Bulletin M82-8 and all supplements or revisions thereto, must be accomplished.

SPECIFIED AVIATION GRADE OIL:

AVERAGE AMBIENT TEMPERATURE (°F) / OIL GRADE



Aviation grade ashless dispersant oil, conforming to Continental Motors Specification MHS-24, and all revisions or supplements thereto, must be used except as noted in paragraph 2-20, herein. Refer to Continental Aircraft Engine Service Bulletin M82-8, and any superseding bulletins, revisions or supplements thereto, for further recommendations.

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

CAPACITY (TOTAL)	CAPACITY (TOTAL WITH FILTER)	NORMAL OPERATION	MINIMUM FOR FLIGHT
10	11	8	7

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

DAILY

1 FUEL BAYS:
Service after each flight. Keep full to retard condensation. Refer to paragraph 2-18 for details.

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

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

15 OIL DIPSTICK:
Check on preflight. Add oil as necessary. Refer to paragraph 2-20 for details. Check that filler cap is tight and oil filler is secure.

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

7 OXYGEN CYLINDERS:
Check for anticipated requirements before each flight. Refer to Section 15 for details.

17 NOSE GEAR SHOCK STRUT:
Check on preflight. Check inner barrel showing below outer barrel to be 1.00-2.00 (approximately 1.20) inches after bouncing. Deviation from these dimensions is cause to check and service strut per paragraph 2-25.

25 HOURS

16 ENGINE OIL SYSTEM: FIRST 25 HOURS
Drain engine oil and change external oil filter (if equipped). Refill engine with ashless dispersant oil.

21 HYDRAULIC POWER PACK
Check fluid level each 25 hours and after a gear extension which utilizes the emergency hand pump.

50 HOURS

16 ENGINE OIL SYSTEM:
Change short oil filter (approximately 4.8 inches long) each 50 hours. Add recommended grade aviation oil to replace oil lost in existing filter. Drain and refill oil sump at least every 100 hours regardless of filter size.

21 HYDRAULIC POWER PACK FLUID SAMPLE AND CONTAMINATION CHECK:
Refer to Paragraph 2-29 for details.

100 HOURS

2 FUEL AIR CONTROL UNIT SCREEN:
Remove and clean screen.

4 INDUCTION AIR FILTER:
Clean filter per paragraph 2-21. Replace as required.

5 VACUUM RELIEF VALVE FILTER:
Replace each 100 hours.

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

100 HOURS

11 **VACUUM SYSTEM CENTRAL AIR FILTER:**
Inspect filter element for damage. Refer to paragraph 2-22.

6 **FUEL BAY SUMP DRAINS:**
Drain off any water or sediment.

9 **FUEL RESERVOIR DRAIN:**
Open drain valve(s) and drain off water and sediment.

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

13 **BATTERY:**
Check electrolyte level and clean battery compartment each 100 hours or each 90 days.

18 **SHIMMY DAMPER:**
Check fluid level and refill as required in accordance with paragraph 2-26.

10 **TIRES:**
Maintain correct tire inflation as listed in Section 1. Refer to paragraph 2-24.

17 **NOSE GEAR SHOCK STRUT:**
Keep strut filled and inflated to correct pressure. Refer to paragraph 2-25.

16 **ENGINE OIL SYSTEM:**
Change oil and long filter (approximately 5.8 inches long) each 100 hours or every six months, whichever occurs first.

19 **FUEL STRAINER:**
Disassemble and clean strainer bowl and screen.

21 HYDRAULIC POWER PACK FLUID SAMPLE AND CONTAMINATION CHECK:
Refer to Paragraph 2-29 for details.

200 HOURS

14 **GROUND SERVICE RECEPTACLE:**
Connect to 24-volt, D.C. negative-ground power unit for cold weather starting and lengthy ground maintenance of the aircraft electrical equipment with the exception of electronic equipment. Master switch should be turned on before connecting a generator-type or battery-type power source. Refer to Section 17.

500 HOURS

11 **VACUUM SYSTEM CENTRAL AIR FILTER:**
Replace every 500 hours or annually. Refer to paragraph 2-22.

4 **INDUCTION AIR FILTER:**
Replace every 500 hours or annually. Refer to paragraph 2-21.

21 HYDRAULIC POWER PACK FLUID SAMPLE AND CONTAMINATION CHECK:
Check sample of hydraulic fluid for sediment and discoloration.
Refer to Paragraph 2-29 for details.

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

FREQUENCY (HOURS)

50 | 100 | 500 | 1000

METHOD OF APPLICATION

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

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

NOTE

The military specifications listed below 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
GT	. . . .	NO. 10WT NON-DETERGENT OIL
OL	VV-L-800A	LIGHT OIL

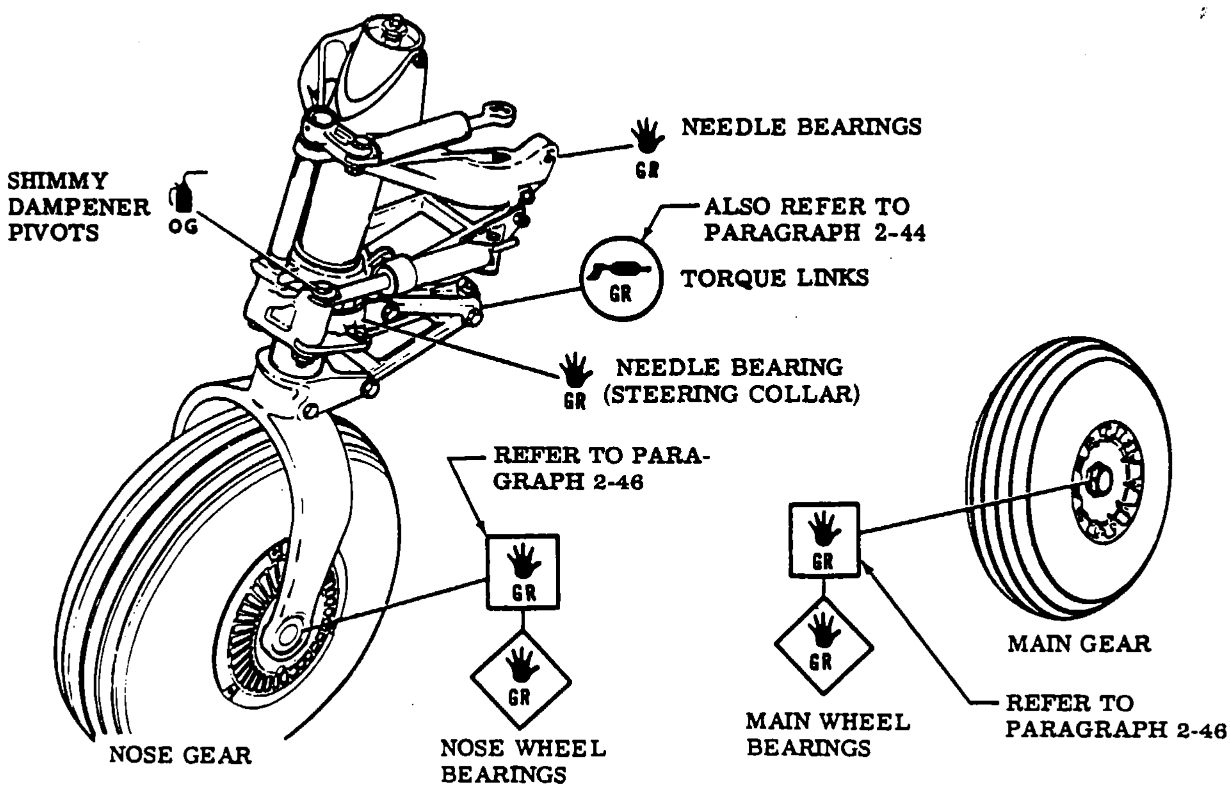


Figure 2-5. Lubrication (Sheet 1 of 4)

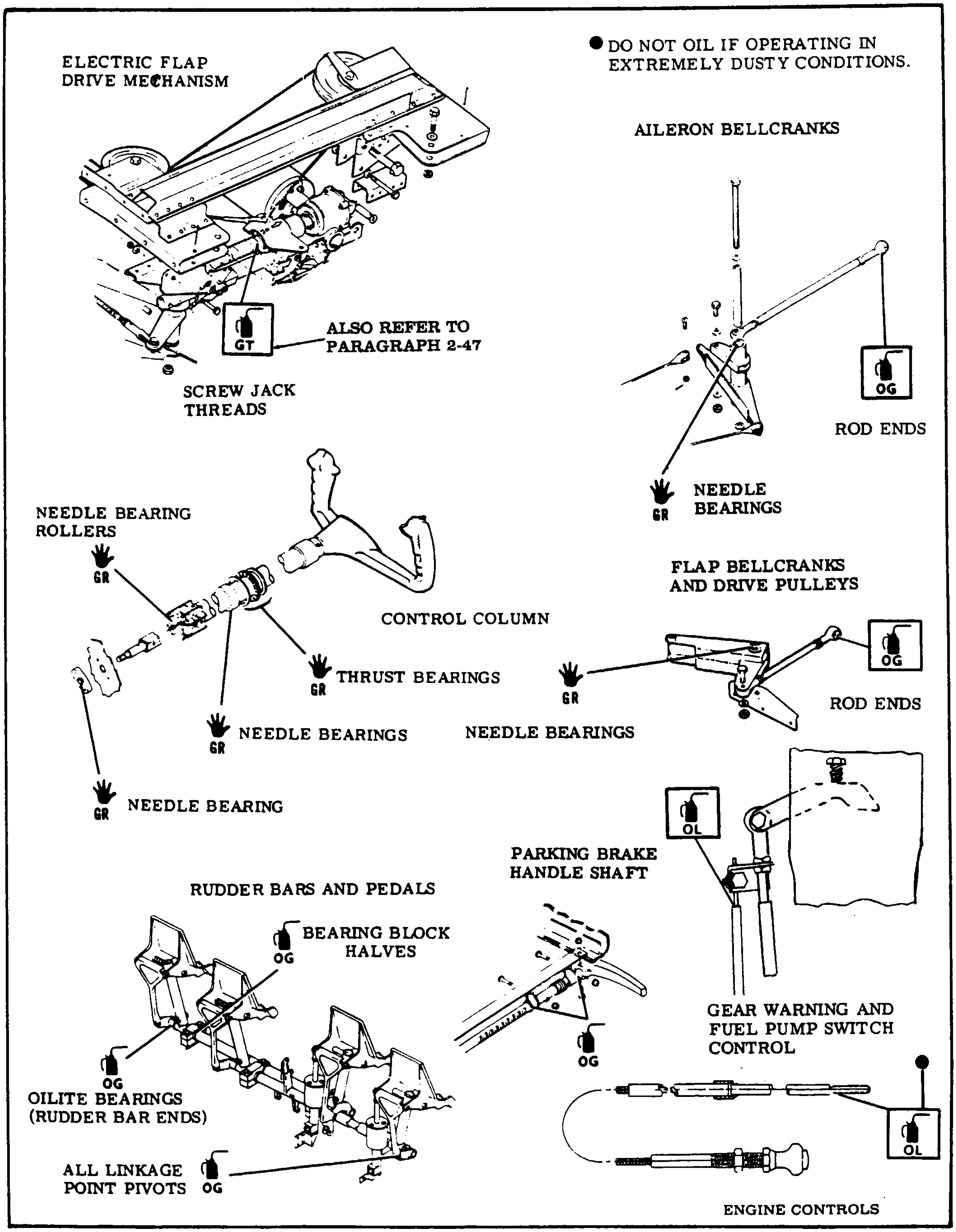


Figure 2-5. Lubrication (Sheet 2 of 4)

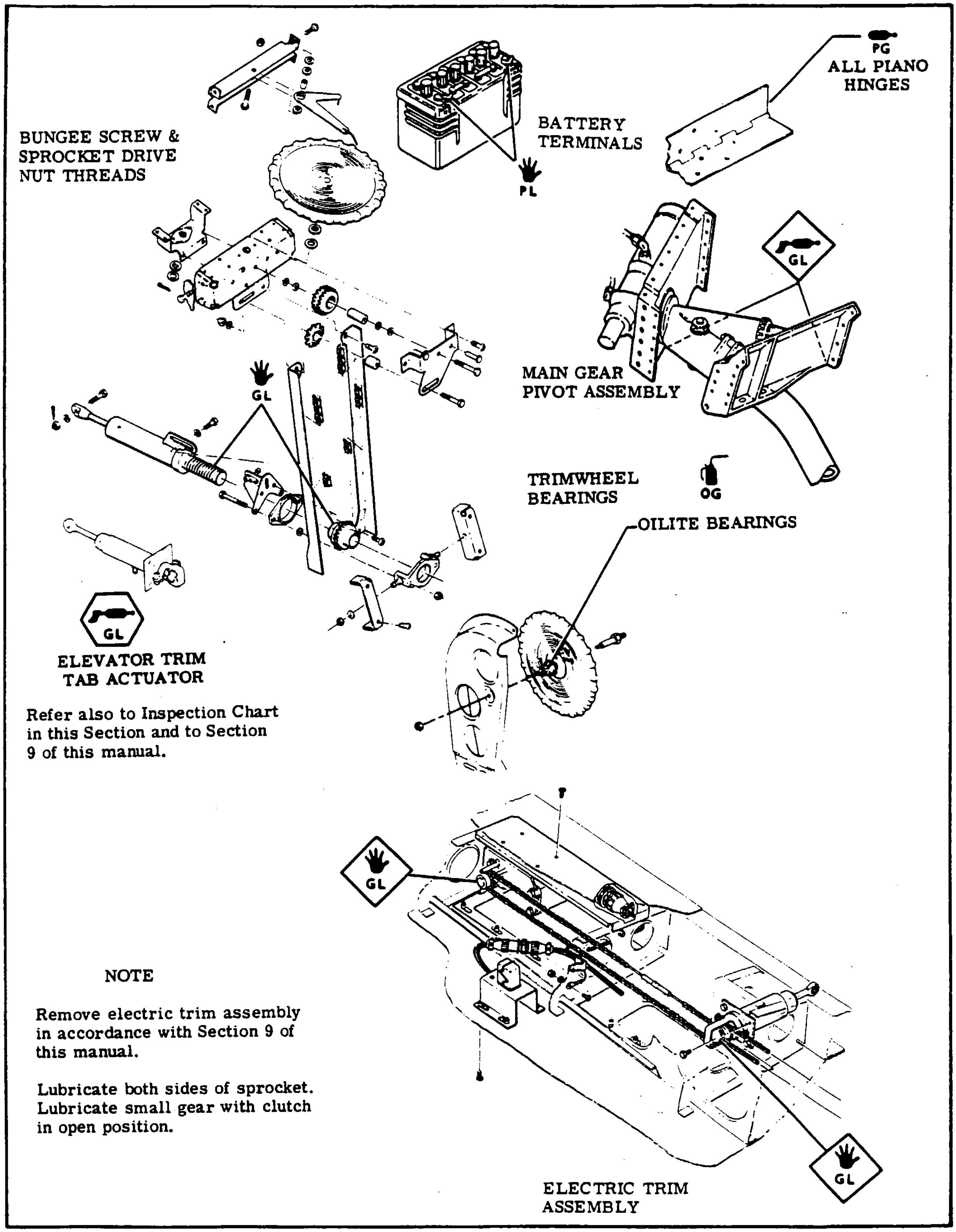
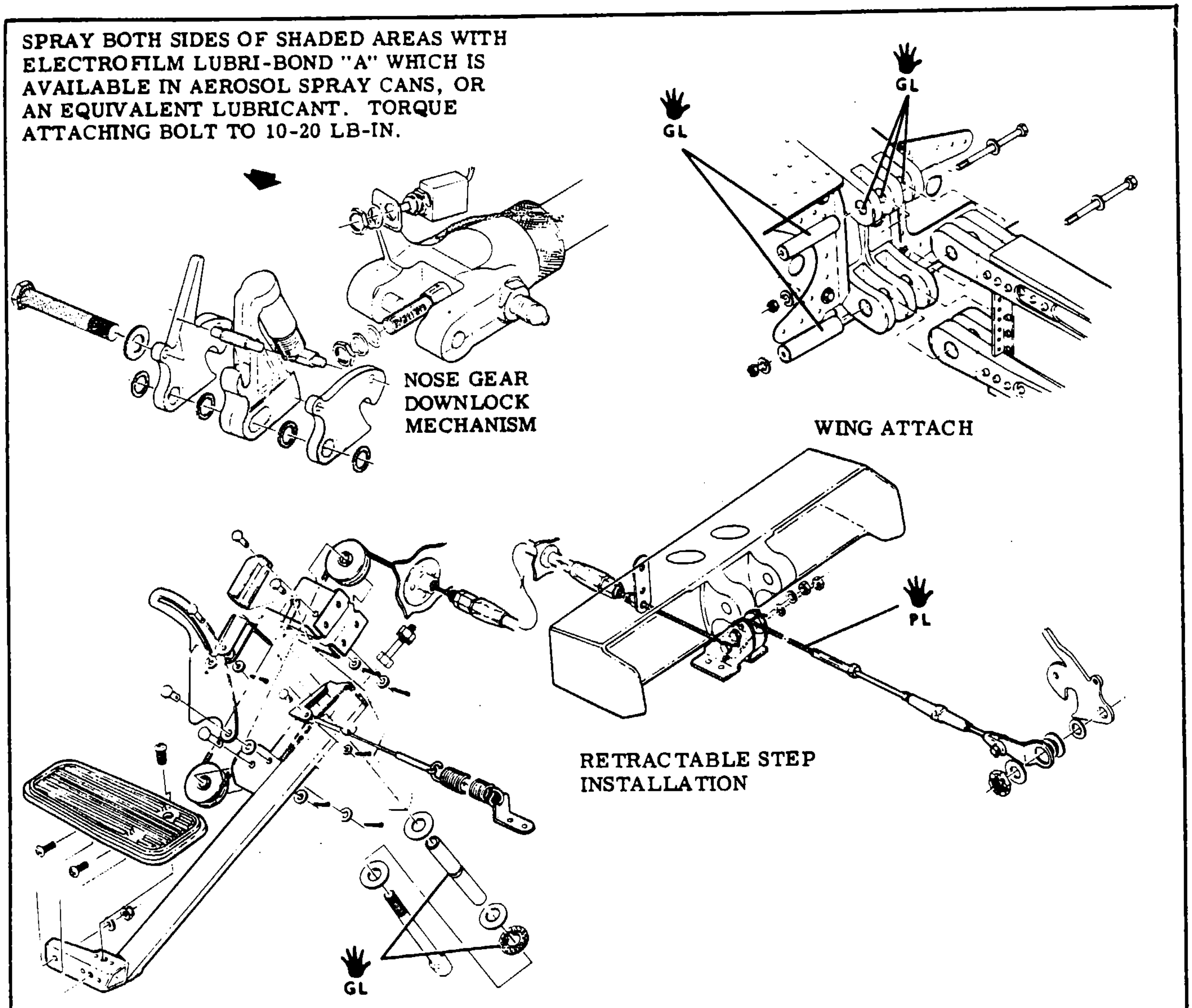


Figure 2-5. Lubrication (Sheet 3 of 4)



NOTES

Sealed bearings require no lubrication.

McCauley propellers are lubricated at overhaul and require no other lubrication.

Lubricate unsealed pulley bearings, Oilite bearings, pivot and hinge points, and any other friction point obviously needing lubriction, with general purpose oil every 1000 hours or oftener, if required.

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

Lubricate door latching mechanism with MIL-S-8660 silicone compound or equivalent lubricant, applied sparingly to friction points, every 1000 hours or oftener if binding occurs. No lubrication is recommended for the rotary clutch.

Apply DOOR-EZE lubricant to latch bolt.

LUBRICATION OF WASTEGATE ACTUATOR - If wastegate movement is sluggish, apply either Kano Aero Kroil (Kano Laboratories, 1000 S. Thompson Lane, Nashville, Tenn. 37211) or Mouse Milk Penetrating Oil (Worldwide Aircraft Filter Corporation, 1685 Abram Court, San Leandro, Cal. 94577) to both EXTERNAL ends of wastegate shaft. Actuate until smooth operation is obtained. Remove residue.

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

2-49. GENERAL INSPECTION (MODEL 210 AND T210 AIRPLANES).

NOTE

Cessna Aircraft Company recommends PROGRESSIVE CARE for airplanes flown 200 hours or more per year, and 100-HOUR INSPECTION for airplanes flown less than 200 hours per year.

A. Inspection Requirements.

(1)Two basic types of inspections are available as defined below:

(a) As required by Federal Aviation Regulation Part 91.409(a), all civil airplanes of U.S. registry must undergo an annual inspection each 12 calendar months. In addition an annual 100 hour inspection, airplanes operated commercially (for hire) must also have a complete inspection each 100 hours of operation as required by Federal Aviation Regulation Part 91.409(b).

(b) In lieu of the above requirements, an airplane may be inspected in accordance with a progressive inspection program in accordance with Federal Aviation Regulation Part 91.409(d), which allows the work load to be divided into smaller operations that can be accomplished in a shorter time period. The CESSNA PROGRESSIVE CARE PROGRAM has been developed to satisfy the requirements of Part 91 409 (d).

B. Inspection Program Selection.

(1) As a guide for selecting the inspection program that best suits the operation of the airplane, the following is provided:

(a) If the airplane is flown less than 200 hours annually, the following conditions apply:

1. If flown for hire.

a. An airplane operating in this category must be inspected each 100 hours of operation (100-HOUR) and each 12 calendar months of operation (ANNUAL).

2. If not flown for hire.

a. An airplane operating in this category must be inspected each 12 calendar months of operation (ANNUAL). It is recommended that between annual inspections, all items be inspected at the intervals specified in the Inspection Time Limits Charts and Component Time Limits Charts.

(b) If the airplane is flown more than 200 hours annually, the following condition applies:

1. Whether flown for hire or not, it is recommended that airplanes operating in this category be placed on the CESSNA PROGRESSIVE CARE PROGRAM. However, if not placed on the CESSNA PROGRESSIVE CARE PROGRAM, the inspection requirements for airplanes in this category are the same as those defined under Paragraph B. (1)(a)1.a. or 2.a. CESSNA PROGRESSIVE CARE PROGRAM may be utilized as a total concept program which ensures that the inspection intervals in the inspection charts are not exceeded. Manuals and forms which are required for conducting the CESSNA PROGRESSIVE CARE PROGRAM inspections are available from the Cessna Supply Division.

C. Inspection Charts.

NOTE

Cessna has prepared these Inspection Charts to assist the owner or operator in meeting the foregoing responsibilities and to meet the intent of Federal Aviation Regulation Part 91.409(d). The Inspection Charts are not intended to be all-inclusive, for no such charts can replace the good judgment of a certified airframe and powerplant mechanic in performance of his duties. As the one primarily responsible for this airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

(1) The following Inspection Charts (Inspection Time Limits, Component Time Limits, Progressive Care Inspection, and Expanded Inspection) show the recommended intervals at which items are to be inspected based on normal usage under average environmental conditions. Airplanes operated in extremely humid tropics, or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, and lubrication. Under these adverse conditions, perform periodic inspections in compliance with this chart at more frequent intervals until the operator can set his own inspection periods based on field experience. The operator's inspection intervals shall not deviate from the inspection time limits shown in this manual except as provided below:

(a) Each inspection interval can be exceeded by 10 hours or can be performed early at any time prior to the regular interval as provided below:

1. In the event of late compliance of any operation scheduled, the next operation in sequence retains a due point from the time the late operation was originally scheduled.
2. In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next phase due point may remain where originally set.
3. In the event of early compliance of any operation scheduled, that occurs more than 10 hours ahead of schedule, the next phase due point must be rescheduled to establish a new due point from the time of early accomplishment.

(2) As shown in the charts, there are items to be checked at 50 hours, 100 hours, 200 hours, or at Special of Yearly inspection. Special or Yearly inspection items require servicing or inspection at intervals other than 50, 100, or 200 hours. If two inspection time requirements are listed for one inspection item, one hourly and the yearly, both apply and whichever requirement occurs first determines the time limit.

(a) When conducting a 50-hour inspection, check all items listed under EACH 50 HOURS. A 100-hour inspection includes all items listed under EACH 50 HOURS and EACH 100 HOURS. The 200-hour inspection includes all items listed under EACH 50 HOURS, EACH 100 HOURS, and EACH 200 HOURS. All of the items listed would be inspected, serviced, or otherwise performed as necessary to ensure compliance with the inspection requirements.

(b) A COMPLETE AIRPLANE INSPECTION includes all 50-, 100-, and 200-hour items plus those Special and Yearly Inspection Items which are due at the specified time.

(c) Component Time Limits Charts should be checked at each inspection interval to ensure proper overhaul and replacement requirements are accomplished at the specified times.

D. Inspection Guidelines.

(1) The Inspection Charts are to be used as a recommended inspection outline. Detailed information of systems and components in the airplane will be found in various chapters of this Maintenance Manual and the pertinent vendor publications. It is recommended that reference be made to the applicable portion of this manual for service instructions, installation instructions, and to the vendor's data or publications specifications for torque values, clearances, settings, tolerances, and other requirements.

(2) For the purpose of this inspection, the term on condition is defined as follows: The necessary inspections and/or checks to determine that a malfunction or failure will not occur prior to the next scheduled inspection.

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

(4) FLUID LINES AND HOSES: Inspect for leaks, cracks, bulging, collapsed, twisted, dents, kinks, chafing, proper radius, security, discoloration, bleaching, deterioration, and proper routing; rubber hoses for stiffness and metal lines for corrosion.

(5) METAL PARTS: Inspect for security of attachment, cracks, metal distortion, broken spotwelds, condition of paint (especially chips at seams and around fasteners for onset of corrosion) and any other apparent damage.

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

(7) STRUCTURAL FASTENERS: Inspect for correct torque in accordance with applicable torque values. Refer to Bolt Torque Data during installation or when visual inspection indicates the need for a torque check.

NOTE

Torque values listed are not to be used for checking tightness of installed parts during service.

(8) FILTERS, SCREENS, AND FLUIDS: Inspect for cleanliness and the need for replacement at specified intervals.

(9) System check (operation or function) requiring electrical power must be performed using 28.5 ±0.25 volts bus voltage. This will ensure all components are operating at their designed requirements.

(a) Airplane file.

1. Miscellaneous data, information, and licenses are a part of the airplane 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 Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of exported airplanes should check with their own aviation officials to determine their individual requirements.

a. To be displayed in the airplane at all times:

1) Standard Airworthiness Certificate (FAA Form 8100-2).
2) Aircraft Registration Certificate (FAA Form 8050-3).
3) Aircraft Radio Station License (Federal Communication Commission Form 556 if transmitter is installed).
4) Radio Telephone Station License (Federal Communication Commission Form 409 if Flitefone Radio Telephone is installed).

b. To be carried in the airplane at all times:

1) Weight and Balance Data Sheets and associated papers (all copies of the Repair and Alteration Form, FAA Form 337, are applicable).
2) Equipment List.
3) Pilot's Operating Handbook and FAA-Approved Airplane Flight Manual.

c. To be made available upon request:

1) Airframe, Engine, Propeller, and Avionics Maintenance Records.

2-50. PRE-INSPECTION CHECKS. (MODEL 210 AND T210 AIRPLANES.)

A. Pre-inspection Operational Checks.

(1) Before beginning the step-by-step inspection, start and run up the engine and upon completion, shut down the engine in accordance with instructions in the Pilot's Operating Handbook and FAA-Approved Airplane Flight Manual. During the run-up, observe the following, making note of any discrepancies or abnormalities:
  (a) Engine temperatures and pressures.
  (b) Static RPM. (Also refer to Section 12 of this manual.)
  (c) Magneto drop. (Also refer to Section 12 of this manual.)
  (d) Engine response to changes in power.
  (e) Any unusual engine noises.
  (f) Fuel selector and/or shutoff valve; operate engine on each tank (or cell) position and OFF position long enough to ensure shutoff and/or selector valve functions properly.
  (g) Idling speed and mixture; proper idle cut-off.
  (h) Alternator and ammeter.
  (i) Suction gage.
  (j) Fuel flow indicator.

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

(3) Some of the items in the Inspection Time Limits paragraph are optional, therefore not applicable to all airplanes.

Mechanic's Pre-inspection Discrepancies or Abnormalities to be Checked:

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Mechanic's Post-inspection Corrective Action Taken:

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____

		2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
A		**Placards (Refer to Pilot's Operating Handbook)**					
A	1	Placards and Decals - Inspect presence, legibility, and security. Consult Pilot's Operating Handbook and FAA-Approved Airplane Flight Manual for required placards.			●		
B		**Fuselage (Section 3)**					
B	1	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.		●			
B	2	Internal Fuselage Structure - Inspect bulkheads, doorposts, stringers, doublers, and skins for corrosion, cracks, buckles, and loose rivets, bolts and nuts.			●		
B	3	Control Wheel Lock - Check general condition and operation.			●		
B	4	Fuselage Mounted Equipment - Check for general condition and security of attachment.			●		
B	5	Antennas and Cables - Inspect for security of attachment, connection, and condition.			●		
B	6	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with FAR Part 91.52. Refer to Section 17 - Operational Test of Emergency Locator Transmitter.		●			
B	7	Instrument Panel Shock Mounts, Ground Straps, and Covers - Inspect for deterioration, cracks, and security of attachment.			●		
B	8	Pilot's and Copilot's Inertia Reels - Inspect for security of installation, proper operation, and evidence of damage.		●			
B	9	Seats, Seat Belts, and Shoulder Harnesses - Check general condition and security. Check operation of seat stops and adjustment mechanism. Inspect belts for condition and security of fasteners.		●			
B	10	Windows, Windshield, Doors, and Seals - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.		●			
B	11	Upholstery, Headliner, Trim, and Carpeting - Check condition and clean as required.				EACH 400	EACH 1
B	12	Flight Controls - Check freedom of movement and proper operation through full travel with and without flaps extended. Check electric trim controls for operation (as applicable.)		●			
B	13	Aileron, Elevator, and Rudder Stops - Check for damage and security.		●			
B	14	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.		●			
B	15	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Ensure inspection of seat rails for cracks EACH 50 HOURS. Refer to Section 3.	●				

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)		EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
B	16 Control Column - Inspect pulleys, cables, sprockets, bearings, chains, bungees, and turnbuckles for condition and security.			•		
B	17 Fuel Line and Selector Valve Drain(s) - Remove plug and drain.		•			
C	**Wings and Empennage (Section 4).**					
C	1 Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.		•			
C	2 Wing Spar and Wing Strut Fittings - Check for evidence of wear. Check attach bolts for indications of looseness and retorque as required.			•		
C	3 Wing Structure - Inspect spars, ribs, skins, and stringers for cracks, wrinkles, loose rivets, corrosion, or other damage.			•		
C	4 Metal Lines, Hoses, Clamps, and Fittings - Check for leaks, condition, and security. Check for proper routing and support.			•		
C	5 Wing Access Plates - Check for damage and security of installation.			•		
C	6 Vertical and Horizontal Stabilizers, Tips and Tailcone - Inspect externally for skin damage and condition of paint.		•			
C	7 Vertical and Horizontal Stabilizers and Tailcone structure - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical and horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tips.		•			
D	**Landing Gear and Brakes (Section 5).**					
D	1 Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake.		•			
D	2 Main Gear Tubular Struts - Inspect for cracks, dents, corrosion, condition of paint or other damage. Check axles for condition and security.		•			
D	3 Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support. (See Cessna SEB 92-8)				EACH 400	EACH 1
D	4 Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.		•			
D	5 Tires - Check tread wear and general condition. Check for proper inflation.		•			
D	6 Main Landing Gear Strut-to-Pivot Attachment - Check for damage, cracks, loose rivets, bolts and nuts and security of attachment.			•		
D	7 Nose Gear Steering Mechanism - Check for wear, security, and proper rigging.			•		

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)		EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
D	8 Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.		•			
D	9 Nose Gear Fork - Inspect for cracks, general condition, and security of attachment.			•		
D	10 Wheel Bearings - Clean, inspect and lube.				A	
D	11 Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.		•			
D	12 Landing Gear - Perform five fault-free cycles.		•			
D	13 Main Landing Gear - Check downlock engagement.		•			
D	14 Landing Gear System - Check adjustment of main and nose gear up and down switches, and operation of gear position indicator.		•			
D	15 Throttle-Operated Gear Warning System - Check condition of wiring and security of components. Perform rigging check (refer to Figure 5-8).			•		
D	16 Nose Gear Doors and Linkage - Check for .25 inch minimum clearance throughout up and down cycles, and proper fit when closed. Check linkage for wear, damaged bearings, distortion, and superficial damage.		•			
D	17 Hydraulic System - Check all components for leaks and external damage to components or mounting structure.		•			
D	18 Emergency Hand Pump - Check operation, check lines and components for damage and leaks.			•		
D	19 Powerpack - Clean self-relieving check valve filter.		•			
D	20 Powerpack - Hydraulic fluid contamination check.				B	
D	21 Powerpack - Check condition and wear of brushes in servomotor.				C	
D	22 Powerpack - Perform hydraulic pressure checks of primary relief valve, thermal relief valve, and pressure switch. Can be operationally pressure checked in the aircraft without power pack removal from aircraft (refer to paragraph 5-6A). To determine if relief valve disassembly or adjustment is necessary, relief valves can be bench checked after removal from power pack (refer to paragraph 5-12A).		•			
D	23 Landing Gear System - Overhaul main gear downlock actuators, main and nose gear actuators, landing gear selector valve, emergency hand pump, and pressure switch. Replace all rubber goods.					D
D	24 Brake System - Overhaul brake discs, parking brake system, wheel cylinders, and master cylinders. Replace brake pads and all rubber goods.					D
E	**Aileron Control System (Section 6).**					
E	1 Ailerons, Hinges - Check condition, security and operation.		•			
E	2 Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.		•			

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)		EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
E	3 Ailerons and Cables - Check operation and security of stops. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment or if stops are damaged. Check fairleads and rub strips for condition.			•		
E	4 Autopilot Rigging - Check per Avionics Installation Manual.				E	EACH 1
E	5 Aileron Controls - Check freedom of movement and proper operation through full travel with and without flaps extended		•			
F	**Wing Flap Control System (Section 7).**					
F	1 Flaps - Check tracks, rollers, and control rods for security of attachment. Check operation.		•			
F	2 Flap Actuator Threads - Clean and lubricate. Refer to paragraph 2-52 for detailed instructions.		•			
F	3 Flap Structure,, Linkage, Bellcranks, Pulleys, and Pulley Brackets - Check for condition, operation and security.			•		
F	4 Wing Flap Control - Check operation through full travel and observe Flap Position indicator for proper indication.			•		
F	5 Flaps and Cables - Check cables for proper tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment.			•		
F	6 Flap Motor, Actuator, and Limit Switches (electric flaps) - Check wiring and terminals for condition and security. Check actuator for condition and security.			•		
G	**Elevator Control System (Section 8).**					
G	1 Elevator Control - Check freedom of movement and proper operation through full travel with and without flaps extended.		•			
G	2 Elevator, Hinges, and Cable Attachment - Check condition, security, and operation.		•			
G	3 Elevator Control System - Inspect pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition, security, and operation.			•		
G	4 Elevator/Rudder Downspring - Check structure, bolts, linkage, bellcrank, and push-pull tube for condition, operation, and security. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travels if cables require tension adjustment or if stops are damaged.		•			
H	**Elevator Trim Tab Control System (Section 9).**					
H	1 Elevator Trim Tab and Hinges - Check condition, security, and operation.		•			
H	2 Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.		•			

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)		EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
H	3 Trim Controls and Indicators - Check freedom of movement and proper operation through full travel. Check pulleys, cables, sprockets, bearings, chains, bungees, and turnbuckles for condition and security. Check electric trim controls for operation as applicable.			●		
H	4 Elevator Trim Tab Stop Blocks - Inspect for damage and security.			●		
H	5 Elevator Trim Tab Actuator - Clean, lubricate, and check free-play.				F	
H	6 Elevator Trim Tab Actuator - Free-Play limits inspection. Refer to Section 9-12.			●		
I	**Rudder Control System. (Section 10).**					
I	1 Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect the rudder hinge bolts for proper safetying of nuts with cotter pins. Inspect balance weight for looseness and the supporting structure for damage.		●			
I	2 Rudder Pedals and Linkage - Check for general condition, proper rigging, and operation. Check for security of attachment.			●		
I	3 Rudder, Tips, Hinges, and Cable Attachment - Check condition, security, and operation.		●			
I	4 Rudder - Check internal surfaces for corrosion, condition of fasteners, and balance weight attachment.			●		
J	**Normally Aspirated and Turbocharged Engines (Sections 1 2and 12A).**					
J	1 Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	●				
J	2 Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	●				
J	3 Cowl Flap Controls - Check freedom of movement through full travel.	●				
J	4 Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	●			G	
J	5 Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.		●			
J	6 Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.			●		
J	7 Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.			●		
J	8 Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	●				

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)

		EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
J	9 Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation. Clean and inspect air filter and re-oil if flock-coated.		•			
J	10 Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-24.		•		H	
J	11 Alternate Induction Air System - Check for obstructions, operation, and security.	•				
J	12 Alternator and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment.	•			I	
J	13 Alternator - Check brushes, leads, commutator or slip ring for wear.				J	
J	14 Starter, Starter Solenoid, and Electrical Connections - Check for condition of starter brushes, brush leads, and commutator.		•			
J	15 Oil Cooler - Check for obstructions, leaks, and security of attachment.	•				
J	16 Exhaust System (normally aspirated engine) - Inspect for cracks and security. Air leak check exhaust system. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	•				
J	17 Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust stem and security. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	•				
J	18 Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		•			U
J	19 Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.		•			
J	20 Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.		•		K	
J	21 Magnetos - Timing Procedures and intervals, lubrication. and overhaul procedures.				L	
J	22 Ignition Harness and Insulators - Check for proper routing, deterioration. and condition of terminals.		•			
J	23 Spark Plugs - Remove. clean analyze, test, gap, and rotate top plugs-to-bottom and bottom plugs-to-top.		•			
J	24 Cylinder Compression - Perform differential compression test.			•		
J	25 Fuel Injection System - Check security of fuel-air control unit, manifold valve, nozzles, screws and pump. Check fuel lines for leaks, interference, and proper routing.		•			
J	26 Engine Primer - Check for leakage, operation, and security.		•			
J	27 Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	•				M
J	28 Cold and Hot Air Hoses - Check condition, routing, and security.		•			

2-51	INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS	
					HOURS	YEARS
J 29	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.		•			
J 30	Engine Baffles and Seats - Check condition and security of attachment.	•				
J 31	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary. Check crankcase breather lines for obstructions, security, and general condition.		•			
J 32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, over boost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	•			N	
J 33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.			•		
J 34	Heater Components - Inspect all components for condition and security.		•			
J 35	Engine Oil Change -Turbocharged and Normally Aspirated Engines With Oil Filter: a. Remove and replace short oil filter. (Approximately 4.8 inches long) b. Add recommended grade aviation oil to replace oil lost in existing filter.	•				O
J 36	Engine Oil Change -Turbocharged and Normally Aspirated Engines With Oil Fitter: Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). Drain oil sump, remove and replace long oil fitter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	•				O
J 37	Engine Oil Change - Normally Aspirated Engines With Oil Filter: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.		•		O	
J 38	Fuel Manifold Valves, Valve Covers, and Fuel System.				V	
J 39	Engine fuel injection nozzles.				X	
K	**Fuel System (Section 13).**					
K 1	Integral Fuel Tanks - Check for evidence of leakage and condition of fuel caps, adapters, and placards.		•		P	
K 2	Integral Fuel Tanks - Drain fuel and check tank interior and outlet screens.				P	
K 3	Fuel System - Inspect plumbing and components for mounting and security.		•			

2-51	INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
K 4	Fuel Tank or Bladder Drains - Drain water and sediment.	•				
K 5	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.		•			
K 6	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.		•			
K 7	Throttle-Operated Auxiliary Fuel Pump Switch - Check condition of wiring and security of components. Perform rigging check (refer to 13-35).		•			
K 8	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.		•			
K 9	Fuel Quantity Indicators - Check for damage, security of installation, and perform accuracy test.					Each 1
L	**Propeller and Propeller Governor (Section 14).**					
L 1	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	•				
L 2	Propeller Mounting - Check for security of installation.	•				
L 3	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage	•				
L 4	Spinner - Check general condition and attachment.	•				
L 5	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.		•			
L 6	Propeller Mounting Bolts - Inspect mounting bolts and safety wire for signs of looseness. Retorque mounting bolts as required.			•		
L 7	Propeller Hub - Check general condition.			•		
L 8	Propeller Governor and Control - Check for security and operation of controls.			•		
L 9	Propeller Assembly - Overhaul.				Q	
M	**Utility Systems (Section 15).**					
M 1	Ventilation System - Inspect clamps, hoses, and valves for condition and security.				400	Each 1
M 2	Heater Components, Inlets, and Outlets - Inspect all lines, connections, ducts, clamps, seals, and gaskets for condition, restriction, and security.		•			
M 3	Cabin Heat and Ventilation Controls - Check freedom of movement through full travel. Check friction locks for proper operation.			•		
M 4	Pitot Tube and Stall Warning Vane - Check for condition and obstructions.	•				
M 5	Pitot Tube Heater Element - Perform operational check.	•				
M 6	Propeller Anti-ice Slip Rings, Brushes and Boots - Inspect for condition and security. Perform operational check.	•				
M 7	Heated Windshield Panel - Check operation, security of installation, electrical wiring, and condition of storage bag			•		
M 8	Oxygen System - Inspect masks, hoses, lines, and fittings for condition, routing, and support. Test operation and check for leaks.			•		

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)

			EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
M	9	Oxygen Cylinder - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.					EACH 5
N		Instruments and Instrument Systems (Section 16).					
N	1	Vacuum System - Inspect for condition and security.		•			
N	2	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.		•			
N	3	Vacuum Pump - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.		•			
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.		•		R	
N	5	Vacuum System relief Valve - Inspect for condition and security.		•		S	
N	6	Instruments - Check general condition and markings for legibility.		•			
N	7	Instrument Lines, Fittings, Ducting, and Instrument Panel Wiring - Check for proper routing, support, and security of attachment.			•		
N	8	Static System - Inspect for security of installation, cleanliness, and evidence of damage.			•		
N	9	Navigation Indicators, Controls, and Components - Inspect for condition and security.			•		
N	10	Airspeed Indicator, Vertical Speed Indicator, and Magnetic Compass - Calibrate.					EACH 2
N	11	Altimeter and Static System - Inspect in accordance with FAR Part 91.411.					EACH 2
N	12	Instrument Panel Mounted Avionics Units (Including Audio Panel, VHF Nav/Com(s), ADF, Transponder, DME, and Compass System - Inspect for deterioration, cracks, and security of instrument panel mounts. Inspect for security of electrical connections, condition, and security of wire routing.			•		
N	13	Avionics Operating Controls - Inspect for security and proper operation of controls and switches and ensure that all digital segments will illuminate properly.			•		
N	14	Remote Mounted Avionics - Inspect for security of units and electrical connectors, condition and security of wire routing. Also check for evidence of damage and cleanliness.			•		
N	15	Microphones, Headsets, and Jacks - Inspect for cleanliness, security, and evidence of damage.			•		
N	16	Magnetic Compass - Inspect for security of installation, cleanliness, and evidence of damage.			•		
N	17	Vacuum Manifold Check Valve. (If so equipped)				W	

2-51 INSPECTION TIME LIMITS. (MODEL 210 & T210 AIRPLANES.)

			EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
O		Electrical Systems (Section 17).					
O	1	General Airplane and System Wiring - Inspect for proper routing, chafing, broken or loose terminals, general condition, broken or inadequate clamps, and sharp bends in wiring.			•		
O	2	Instrument, Cabin, Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.		•			
O	3	Circuit Breakers and Fuses - Check operation and condition. Check for required number of spare fuses.		•			
O	4	Battery - Check general condition and security. Check level of electrolyte.		•		T	
O	5	Battery Box and Cables - Clean and remove any corrosion. Check cables for routing, support, and security of connections.		•			
O	6	Switch and Circuit Breaker Panel, Terminal Blocks, and Junction Boxes - Inspect wiring and terminals for condition and security.			•		
O	7	Alternator Control Unit - Inspect wiring, mounting, condition, and wire routing.			•		
O	8	Switches - Check operation, terminals, wiring, and mounting for conditions, security, and interference.			•		
O	9	Instrument Panel and Control Pedestal - Inspect wiring, mounting, and terminals for condition and security. Check resistance between stationary panel and instrument panel for proper ground.			•		
O	10	External Power Receptacle and Power Cables - Inspect for condition and security.			•		
P		Post Inspection.					
P	1	Replace all fairings, doors, and access hole covers. Ground check engine, alternator charging rate, oil pressure, tachometer, oil temperature and pressure gages, and general operation of components.					
Q		Perform the Following Operational Checks:					
Q	1	Brakes - Test toe brakes and parking brake for proper operation.		•			
R		Service Bulletins/Airworthiness Directives.					
R	1	Check that all applicable Cessna Service Bulletins and Supplier Service Bulletins are complied with.					
R	2	Check that all applicable Airworthiness Directives and Federal Aviation Regulations are complied with.					
R	3	Ensure all Maintenance Record Entries required by Federal Aviation Regulations are completed before returning the airplane to service.					

Special Inspection Legends:

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

B. At the first 50 hours, first 100 hours, and each 500 hours thereafter, or one year, whichever comes first.

C. Each 500 hours, and whenever improper operation is suspected. Replace brushes when worn to .25 inch or less.

D. Overhaul components and replace rubber goods on condition basis.

E. Each 600 hours or 1 year, whichever comes first.

F. Lubrication of the actuator is required each 1000 hours or 3 years, whichever comes first. See figure 2-5 for grease specification.

G. Lubricate each 100 hours (except in extreme dusty conditions). These controls are not repairable and should be replaced every 1500 hours or sooner if required.

H. Clean filter per paragraph 2-25. Replace paper filters at least each 500 hours.

I. Check belt tension after 10 to 25 hours of operation. Refer to Section 17.

J. Inspect each 500 hours.

K. At the first 25 hours, first 50 hours, first 100 hours, and each 100 hours thereafter, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. If magneto-to-engine timing is correct within plus zero to minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto from engine. Detailed maintenance and overhaul information covering Slick magnetos is available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations. Order 1037C1-13 for 4200/6200 series magnetos.

L. Every 500 hours of operation, perform the following items:

   a. Inspect contact points for condition and adjust or replace as required.

   b. Inspect carbon brush, high-tension lead, and distributive block for condition. Clean or replace parts as required.

   c. Inspect impulse coupling and pawls for condition and replace as required. Use light pressure only. Do not force when checking pawls.

   d. Inspect and lubricate bearings; replace as required.

   e. Lubricate contact point cam.

   The magnetos must be overhauled or replaced with new or rebuilt magnetos at every engine overhaul.

M. Replace engine compartment rubber hoses (Cessna-installed only) every 5 years, or at engine overhaul, whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then be replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. For engine flexible hoses (Continental Motors-installed), refer to Continental Motors Maintenance Manual and Continental Motor Engine Service Bulletins.

N. Replace check valves in turbocharger oil lines each 1000 hours.

O. First 25 hours: Refill with straight grade mineral oil and use until a total of 50 hours have accumulated, or oil consumption has stabilized. Change oil, replace filter, and refill sump with recommended grade of ashless dispersant oil. Change oil and replace filter at least every six months, regardless of accumulated hours.

P. Each 1000 hours.

Q. See McCauley Service Manual; refer to list of publications.

R. Replace every 500 hours.

S. Replace filter each 100 hours.

T. Check electrolyte level and clean battery box each 100 hours or 90 days.

U. Overhaul or replace Dukes Electrical Fuel Boost Pump at 10 years. Refer to Dukes Mandatory Service Bulletin No. 0003.

V. Each 100 hours or whenever fuel flow fluctuation is encountered, inspect fuel manifold valves, valve covers, and fuel system components and lines for signs of leaks. Refer to Teledyne Continental Motors Service Bulletin SB95-7.

W. Check condition and operation of check valve manifold, beginning five years from the date of manufacture, and every twelve months thereafter. Replace check valve manifold ten years from date of manufacture. Refer to Airborne Product Memo #39 for manufacture date information

X. At the first 100-hour inspection on new, rebuilt or overhauled engines, remove and clean the fuel injection nozzles. Thereafter, the fuel injection nozzles must be cleaned at 300-hour intervals or more frequently if fuel stains are found.

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2-52. COMPONENT TIME LIMITS

1. General

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

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

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

   Replacement - Item must be replaced with a new item or a serviceable item that is within its service life and time limits or has been rebuilt as defined in 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 comes 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 comes 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 comes first (Note 1)	NO
Engine Air Filter	500 hours or 36 months, whichever comes first (Note 9)	NO
Engine Mixture, Throttle, and Propeller Controls	At engine TBO	NO
Check Valve (Turbocharger Oil Line Check Valve)	Every 1,000 hours of operation (Note 10)	NO
Oxygen Bottle - Lightweight Steel (ICC-3HT, DOT-3HT)	Every 24 years or 4380 cycles, whichever occurs first	NO
Oxygen Bottle -Composite (DOT-E8162)	Every 15 years	NO
Engine Driven Dry Vacuum Pump Drive Coupling (Not lubricated with engine oil)	6 years or at vacuum pump replacement, whichever occurs first	NO
Engine Driven Dry Vacuum Pump (Not lubricated with engine oil)	500 hours (Note 11)	NO
Standby Dry Vacuum Pump	500 hours or 10 years, whichever occurs first (Note 11)	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

COMPONENT	REPLACEMENT TIME	OVERHAUL
Engine Flexible Hoses (TCM 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 in a serviceable condition, must be placed on order immediately and then be replaced within 120 days after receiving the new hose from Cessna.

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

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

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

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

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

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

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

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

Note 9: The air filter may be cleaned, refer to Section 2 of this service manual for servicing instructions. 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 the turbocharger oil line check valve every 1,000 hours of operation (Refer to Cessna Service Bulletin SEB91-7 Revision 1, or latest revision).

Note 11: 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.

2-53. SCHEDULED MAINTENANCE CHECKS. (MODEL 210 & T210 AIRPLANES)

2-54. PROGRESSIVE CARE PROGRAM. (MODEL 210 & T210 AIRPLANES)

A. Progressive Inspection Program.

(1) Purpose and Use.

(a) As detailed in Federal Aviation Regulation Part 91.409. paragraph (d), airplanes that desire to use a Progressive Inspection Program must be inspected in accordance with an authorized progressive inspection program. This chapter presents the current progressive inspection program for the Cessna Model 210 and T210, recommended by the Cessna Aircraft Company.

B. Introduction.

(1) Following is the recommended Progressive Care Program for Model 210 and T210 airplanes.

(2) This program is divided into four separate operations which are to be accomplished initially after 50 hours of operation and each 50 hours of operation thereafter. Additional special requirements indicated as Special Inspection, which are required at other intervals are specified separately.

(3) Recommended progressive care inspection may be accomplished by one of the following.

NOTE: Some 100 HOUR items are covered in Operations 1 and 3. also some 200 HOUR items are covered in Operations 1, 2, 3, and 4. These items are placed here for convenience and expediency of the total inspection. Alter the first completion of all four Operations, these items will be at the proper intervals.

(a) NEW DELIVERED AIRCRAFT - A new delivered aircraft must have less than 50 hours total time in service and enough calendar time remaining since the issuance date of the original Airworthiness Certificate to allow the owner/operator to complete a cycle of all four Operations before the first annual inspection becomes due. Operation 1 will be due at 50 hours time in service. Operation 2 will be due at 100 hours. Operation 3 will be due at 150 hours and Operation 4 will be due at 200 hours. There are additional inspection requirements for new aircraft at the FIRST 50 HOUR inspection point. In addition to performing Operation 1, the FIRST 50 HOUR ITEMS listed in the inspection Time Limits Charts in 2-54 must also be performed. After these FIRST 50 HOUR items have been accomplished, they have permanent inspection time limits which are covered in the Operations Schedules.

(b) ALL OTHER AIRCRAFT - To qualify other aircraft which have more than 50 hours time in service for the Progressive Inspection Program, conduct a COMPLETE AIRPLANE INSPECTION. Operation 1 will become due 50 hours from the time the COMPLETE AIRPLANE INSPECTION was accomplished.

(4) Performance of the inspections as listed herein at the specified points will assure compliance with the Inspection Time Limits detailed in 2-54. Special inspections shall be complied with at prescribed intervals and/or intervals coinciding with operations 1 through 4 as outlined in 2-57.

(5) An operator may elect to perform the recommended inspections on a schedule other than that specified. Any inspection schedule requiring the various inspection items detailed in this chapter be performed at a frequency equal to that specified herein or more frequently is acceptable. Any inspection item performed at a time period in excess of that specified herein must be approved by the appropriate regulating agency.

(6) As defined in Federal Aviation Regulations Part 91.409. (d) the frequency and detail of the Progressive Inspection Program shall provide for the complete inspection of the airplane within each 12-calendar months. If the airplane is approaching the end of a 12-calendar month period, but the complete cycle of 4 operations has not been accomplished, it will be necessary to complete the remaining operations, regardless of airplane hours before the end of the 12-calendar month period. If the Progressive inspection Program is to be discontinued, an annual inspection becomes due at the time when any item reaches a maximum of 12-calendar months from the last time it was inspected under the Progressive Inspection Program. Refer to Federal Aviation Regulation Part 91.409 (d) for detailed information.

C. **Inspection Time Limitations.**

(1) Each inspection interval may be exceeded by 10 hours or can be performed early at any time prior to the regular interval as provided below:

(a) In the event of late compliance of any operation scheduled, the next operation in sequence retains a due point from the time the late operation was originally scheduled.

(b) In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next phase due point may remain where originally set.

(c) In the event of early compliance of any operation scheduled, that occurs more than 10 hours ahead of schedule, the next phase due point must be rescheduled to establish a new due point from the time of early accomplishment.

D. **Procedures.**

(1) The following instructions are provided to aid in implementation of the Model 210 & T210 Series Progressive Care Program Schedule.

(a) Use the Progressive Care Program Inspection Chart, provided herein, for each airplane. The chart is to be placed in the airplane flight log book for use as a quick reference for pilots and maintenance personnel in determining when inspections are due and that they are performed within prescribed flight time intervals.

(b) Use the Progressive Care Program Component Overhaul and Replacement Log, provided herein, for each airplane. This log is to be kept with the airplane maintenance records and serves as a periodic reminder to maintenance personnel when various components are due for overhaul or replacement.

(c) To start the Progressive Care Program, begin conducting the inspections defined herein and refer to Federal Aviation Regulations Part 91.409(d) for procedures to notify the Federal Aviation Administration of the intent to begin a progressive inspection program.

(d) Accomplish each inspection and maintenance item per the checklists on the operation sheets of the Progressive Care and Maintenance Schedule. Spaces have been provided for the mechanics and inspectors signatures as required, as well as any remarks These are to become part of the maintenance records for each airplane. Each inspection is to be logged in the airplane and or engine log books. Refer to Federal Aviation Regulation Part 43.for the recommended entry statement.

PROGRESSIVE CARE PROGRAM
(MODEL 210 & T210 AIRPLANES)

COMPONENT OVERHAUL AND REPLACEMENT RECORD

COMPONENT	DATE	REASON FOR REPLACEMENT	REPLACEMENT PART NUMBER SERIAL NUMBER	NEXT OVERHAUL AIRPLANE HOURS DATE
	X			
	X			
	X			
	X			
	X			
	X			
	X			
	X			
	X			
	X			
	X			

PROGRESSIVE CARE PROGRAM
INSPECTION CHART

AIRPLANE MODEL: 210/T210 **REGISTRATION NUMBER:**

INSPECTION POINTS	TIME		TIME	
	INSPECTION DUE	INSPECTION ACCOMPLISHED	INSPECTION DUE	INSPECTION ACCOMPLISHED
OPERATION 1				
OPERATION 2				
OPERATION 3				
OPERATION 4				

EXAMPLE:

The airplane in this example was placed on the Progressive Care Program after flying a total of 110 hours. At that point, a complete initial inspection of the airplane was performed. The following steps indicate what will have taken place up through an hourmeter reading of 261 hours.

1. After the initial inspection at 110 hours, the first Inspection Due Column was filled out to show the total flying time at which each of the four (4) operation inspections would be due.
2. As each inspection was performed, the total flying time was recorded in the Inspection Accomplished column. The next Inspection Due space for that particular operation is also filled in at this time. These times will always be 200 hours from the last due point providing the operation was actually accomplished within the ten (10) hours limit.
3. The sample airplane now has a total flying time of 261 hours and the inspection chart shows that a Phase 4 will be due at 310 hours.

INSPECTION POINTS	TIME		TIME	
	INSPECTION DUE	INSPECTION ACCOMPLISHED	INSPECTION DUE	INSPECTION ACCOMPLISHED
OPERATION 1	160	162	360	
OPERATION 2	210	209	409	
OPERATION 3	260	261	460	
OPERATION 4	310			

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

Registration No. _______ Airplane Model and SN _________ AirplaneTime _______

INSPECTION COMPLETED BY

B	13	Aileron, Elevator, and Rudder Stops - Check for damage and security.	
B	15	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Ensure inspection of seat rails for cracks EACH 50 HOURS. Refer to Section 3.	
C	1	Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.	
C	6	Vertical and Horizontal Stabilizers, Tips and Tailcone - Inspect externally for skin damage and condition of paint.	
C	7	Vertical and Horizontal Stabilizers and Tailcone structure - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical and horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check security of inspection covers, fairings, and tips.	
E	1	Ailerons, Hinges - Check condition, security and operation.	
E	2	Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.	
E	5	Aileron Controls - Check freedom of movement and proper operation through full travel with and without flaps extended	
F	1	Flaps - Check tracks, rollers, and control rods for security of attachment. Check rod end bearings for corrosion and lubricate. Check operation.	
F	2	Flap Actuator Threads - Clean and lubricate. Refer to paragraph 2-47 for detailed instructions.	
G	1	Elevator Control - Check freedom of movement and proper operation through full travel with and without flaps extended.	
G	2	Elevator, Hinges, and Cable Attachment - Check condition, security, and operation.	
G	4	ElevatorArm - Check bolts, linkage, and push-pull tube for condition, operation, and security. Check travels if cables require tension adjustment or if stops are damaged.	
H	1	Elevator Trim Tab and Hinges - Check condition, security, and operation.	
H	2	Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.	
I	1	Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect the rudder hinge bolts for proper safetying of nuts with cotter pins. Inspect balance weight for looseness and the supporting structure for damage.	
I	3	Rudder, Tips, Hinges, and Cable Attachment - Check condition, security, and operation.	
J	1	Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

Registration No. _______ Airplane Model and SN __________ AirplaneTime_______

INSPECTION COMPLETED BY

J	2	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	
J	3	Cowl Flap Controls - Check freedom of movement through full travel.	
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	
J	5	Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.	
J	6	Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.	
J	7	Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.	
J	8	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	
J	9	Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation. Clean and inspect air filter and re-oil if flock-coated.	
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	
J	11	Alternate Induction Air System - Check for obstructions, operation, and security.	
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	
J	14	Starter, Starter Solenoid, and Electrical Connections - Check for condition of starter brushes, brush leads, and commutator.	
J	15	Oil Cooler - Check for obstructions, leaks, and security of attachment.	
J	16	Exhaust System (normally aspirated engine) - Inspect for cracks and security. Air leak check exhaust system. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	17	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust stem and security. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).	
J	19	Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	
J	22	Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.	
J	23	Spark Plugs - Remove, clean analyze, test, gap, and rotate top plugs-to-bottom and bottom plugs-to-top.	

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

Registration No. _______ **Airplane Model and SN** __________ **AirplaneTime**_______

			INSPECTION COMPLETED BY
J	24	Cylinder Compression - Perform differential compression test.	
J	25	Fuel Injection System - Check security of fuel-air control unit, manifold valve, nozzles, screws and pump. Check fuel lines for leaks, interference, and proper routing	
J	26	Engine Primer - Check for leakage, operation, and security.	
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	
J	28	Cold and Hot Air Hoses - Check condition, routing, and security.	
J	29	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.	
J	30	Engine Baffles and Seals - Check condition and security of attachment.	
J	31	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary. Check crankcase breather lines for obstructions, security, and general condition.	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	
J	33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	
J	34	Heater Components - Inspect all components for condition and security.	
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

Registration No. ______ **Airplane Model and SN** __________ **AirplaneTime**_______

INSPECTION COMPLETED BY

J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.	
K	1	Integral Fuel Tanks - Check for evidence of leakage and condition of fuel caps, adapters, and placards.	
K	3	Fuel System - Inspect plumbing and components for mounting and security.	
K	4	Fuel Tank Drains - Drain water and sediment.	
K	5	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.	
K	7	Throttle-Operated Auxiliary Fuel Pump Switch. Check condition of wiring and security of components. Perform rigging check (refer to Paragraph 13-35).	
K	8	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.	
L	1	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	
L	2	Propeller Mounting - Check for security of installation.	
L	3	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	
L	4	Spinner - Check general condition and attachment.	
L	5	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.	
L	6	Propeller Mounting Bolts - Inspect mounting bolts and safety-wire for signs of looseness. Retorque mounting bolts as required.	
L	7	Propeller Hub - Check general condition.	
L	8	Propeller Governor and Control - Check for security and operation of controls.	
M	2	Heater Components, Inlets, and Outlets - Inspect all lines, connections, ducts, clamps, seals, and gaskets for condition, restriction, and security.	
M	4	Pitot Tube and Stall Warning Vane - Check for condition and obstructions.	
M	5	Pitot Tube Heater Element - Perform operational check.	
M	6	Propeller Anti-ice Slip Rings, Brushes and Boots - Inspect for condition, and security. Perform operational check.	
N	3	Vacuum Pump - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.	
O	5	Battery Box and Cables - Clean and remove any corrosion. Check cables for routing, support, and security of connections.	
O	7	Alternator Control Unit - Inspect wiring, mounting, condition, and wire routing.	
O	10	External Power Receptacle and Power Cables - Inspect for condition and security.	

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
B	11	Upholstery, Headliner, Trim, and Carpeting - Check condition and clean as required.	EACH 400	EACH 1	
D	3	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support. (See Cessna SEB92-8)	EACH 400	EACH 1	
D	10	Wheel Bearings - Clean, inspect and lube.	A		
D	20	Powerpack - Hydraulic fluid contamination check.	B		
D	21	Powerpack - Check condition and wear of brushes in servomotor.	C		
D	23	Landing Gear System - Overhaul main gear downlock actuators, main and nose gear actuators, landing gear selector valve, emergency hand pump, and pressure switch. Replace all rubber goods.		D	
D	24	Brake System - Overhaul brake discs, parking brake system, wheel cylinders, and master cylinders. Replace brake pads and all rubber goods.		D	
E	4	Autopilot Rigging - Check per Avionics Installation Manual.	E	EACH 1	
H	5	Elevator Trim Tab Actuator - Clean, lubricate, and check free-play.	F		
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	G		
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	H		
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	I		
J	13	Alternator - Check brushes, leads, commutator or slip ring for wear.	J		
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		U	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	K		
J	21	Magnetos - Timing Procedures and intervals, lubrication, and overhaul procedures.	L		
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.		M	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	N		

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

SPECIAL INSPECTION AND YEARLY ITEMS
Please review each of these items for required compliance

			HOURS	YEARS	INSPECTION COMPLETED BY
J	33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	N		
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	O		
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	O		
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	O		
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.	V		
K	2	Integral Fuel Tanks - Drain fuel and check tank interior and outlet screens.	P		
K	9	Fuel Quantity Indicators - Check for damage, security of installation, and perform accuracy test.		EACH 1	
L	9	Propeller Assembly - Overhaul	Q		
M	1	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	400	EACH 1	
M	9	Oxygen Cylinder - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.		EACH 5	
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	R		
N	5	Vacuum System relief Valve - Inspect for condition and security.	S		
N	10	Airspeed Indicator, Vertical Speed Indicator, and Magnetic Compass - Calibrate.		EACH 2	
N	11	Altimeter and Static System - Inspect in accordance with FAR Part 91.411.		EACH 2	
N	17	Vacuum Manifold Check Valve (if so equipped)	W		
O	4	Battery - Check general condition and security. Check level of electrolyte.	T		

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
P	1	Replace all fairings, doors, and access hole covers. Ground check engine, alternator charging rate, oil pressure, tachometer, oil temperature and pressure gages, and general operation of components.			
R	1	Check that all applicable Cessna Service Bulletins and Supplier Service Bulletins are complied with.			
R	2	Check that all applicable Airworthiness Directives and Federal Aviation Regulations are complied with.			
R	3	Ensure all Maintenance Record Entries required by Federal Aviation Regulations are completed before returning the airplane to service.			

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 1

Special Inspections Legends:

A. First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.
B. At the first 50 hours, first 100 hours, and each 500 hours thereafter, or one year, whichever comes first.
C. Each 500 hours, and whenever improper operation is suspected. Replace brushes when worn to .25 inch or less.
D. Overhaul components and replace rubber goods on-condition basis.
E. Each 600 hours or 1 year, whichever comes first.
F. Lubrication of the actuator is required each 1000 hours or 3 years, whichever comes first. See figure 2-5 for grease specification.
G. Lubricate each 100 hours (except in extreme dusty conditions). These controls are not repairable and should be replaced every 1500 hours or sooner if required.
H. Clean filter per paragraph 2-25. Replace paper filters at least each 500 hours.
I. Check belt tension after 10 to 25 hours of operation. Refer to Section 17.
J. Inspect each 500 hours.
K. At the first 25 hours, first 50 hours, first 100 hours, and each 100 hours thereafter, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. if magneto-to-engine timing is correct within plus zero to minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto from engine, Detailed Maintenance and Overhaul Information covering Slick magnetos is available from Cessna Parts Deisribution (CPD2) through Cessna Service Stations. Oder 1037-C1-13 for 4200/6200 series magnetos.
L. Every 500 hours of operation, perform the following items:
    a. Inspect contact points for condition and adjust or replace as required.
    b. Inspect carbon brush, high-tension lead, and distributive block for condition. Clean or replace parts as required.
    c. Inspect impulse coupling and pawls for condition and replace as required. Use **light** pressure only. **Do not force** when checking pawls.
    d. Inspect and lubricate bearings; replace as required.
    e. Lubricate contact point cam.

    The magnetos **must** be overhauled or replaced with new or rebuilt magnetos at every engine overhaul.
M. Replace engine compartment rubber hoses (Cessna installed only) every 5 years or at engine overhaul whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. Engine flexible hoses (Continental installed), (Refer to Continental Maintenance Manual and Continental Engine Service Bulletins).
N. Replace check valves in turbocharger oil lines each 1000 hours.
O. First 25 hours: Refill with straight grade mineral oil and use until a total of 50 hours have accumulated, or oil consumption has stabilized. Change oil, replace filter, and refill sump with recommended grade of ashless dispersant oil. Change oil and replace filter at least every six months, regardless of accumulated hours.
P. Each 1000 hours.
Q. See McCauley Service Manual; refer to list of publication.
R. Replace every 500 hours.
S. Replace filter each 100 hours.
T. Check electrolyte level and clean battery box each 100 hours or 90 days.
U. Overhaul or replace Dukes Electrical Fuel Boost Pump at 10 years. Refer to Dukes Mandatory Service Bulletin No. 0003.
V. Each 100 hours or whenever fuel flow fluctuation is encountered, inspect fuel manifold valves, valve covers, and fuel system components and lines or signs of leaks. Refer to Teledyne Continental Motors Service Bulletin SB95-7.
W. Check condition and operation of check valve manifold beginning five years from date of manufacture, and every twelve months thereafter: replace check valve manifold ten years from date of manufacture. Refer to Airborne Product Memo #39 for manufacture date information.

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B	1	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.
B	6	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with FAR Part 91.52. Refer to Section 17 - Operation Test of Emergency Locator Transmitter.
B	8	Pilot's and Copilot's Inertia Reels - Inspect for security of installation, proper operation, and evidence of damage.
B	9	Seats, Seat Belts, and Shoulder Harnesses - Check general condition and security. Check operation of seat stops and adjustment mechanism. Inspect belts for condition and security of fasteners.
B	10	Windows, Windshield, Doors, and Seals - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.
B	12	Flight Controls - Check freedom of movement and proper operation through full travel with and without flaps extended. Check electric trim controls for operation (as applicable.)
B	14	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.
B	15	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Ensure inspection of seat rails for cracks EACH 50 HOURS. Refer to Section 3.
B	17	Fuel Line and Selector Valve Drain(s) - Remove plug and drain.
D	1	Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake.
D	2	Main Gear Tubular Struts - Inspect for cracks, dents, corrosion, condition of paint or other damage. Check axles for condition and security.
D	4	Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.
D	5	Tires - Check tread wear and general condition. Check for proper inflation.
D	6	Main Landing Gear Strut-to-Pivot Attachment - Check for damage, cracks, loose rivets, bolts and nuts and security of attachment.
D	7	Nose Gear Steering Mechanism - Check for wear, security, and proper rigging.
D	8	Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.

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D	9	Nose Gear Fork - Inspect for cracks, general condition, and security of attachment.	
D	11	Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.	
D	12	Landing Gear - Perform five fault-free cycles.	
D	13	Main Landing Gear - Check downlock engagement.	
D	14	Landing Gear System - Check adjustment of main and nose gear up and down switches, and operation of gear position indicator.	
D	15	Throttle-Operated Gear Warning System - Check condition of wiring and security of components. Perform rigging check (refer to Figure 5-8).	
D	16	Nose Gear Doors and Linkage - Check for .25 inch minimum clearance throughout up and down cycles, and proper fit when closed. Check linkage for wear, damaged bearings, distortion, and superficial damage.	
D	17	Hydraulic System - Check all components for leaks and external damage to components or mounting structure.	
D	19	Powerpack - Clean self-relieving check valve filter.	
D	22	Powerpack - Perform hydraulic pressure checks of primary relief valve, thermal relief valve, and pressure switch. Can be operationally pressure checked in the aircraft without power pack removal from aircraft (refer to paragraph 5-6A). To determine if relief valve disassembly or adjustment is necessary, relief valves can be bench checked after removal from power pack (refer to paragraph 5-12A).	
J	1	Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	
J	2	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	
J	3	Cowl Flap Controls - Check freedom of movement through full travel.	
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	
J	8	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	
J	11	Alternate Induction Air System - Check for obstructions, operation, and security.	
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	
J	15	Oil Cooler - Check for obstructions, leaks, and security of attachment.	
J	16	Exhaust System (normally aspirated engine) - Inspect for cracks and security. Air leak check exhaust system. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	

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J	17	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust stem and security. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.
J	30	Engine Baffles and Seals - Check condition and security of attachment.
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.
K	4	Fuel Tank Drains - Drain water and sediment.
K	6	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.
L	1	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.
L	2	Propeller Mounting - Check for security of installation.
L	3	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.
L	4	Spinner - Check general condition and attachment.
M	4	Pitot Tube and Stall Warning Vane - Check for condition and obstructions.
M	5	Pitot Tube Heater Element - Perform operational check.
M	6	Propeller Anti-ice Slip Rings, Brushes and Boots - Inspect for condition, and security. Perform operational check.
N	1	Vacuum System - Inspect for condition and security.
N	2	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.

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N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	
N	5	Vacuum System relief Valve - Inspect for condition and security.	
N	6	Instruments - Check general condition and markings for legibility.	
O	2	Instrument, Cabin, Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.	
O	3	Circuit Breakers and Fuses - Check operation and condition. Check for required number of spare fuses.	
Q	1	Brakes - Test toe brakes and parking brake for proper operation.	

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
B	11	Upholstery, Headliner, Trim, and Carpeting - Check condition and clean as required.	EACH 400	EACH 1	
D	3	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support. (See Cessna SEB92-8)	EACH 400	EACH 1	
D	10	Wheel Bearings - Clean, inspect and lube.	A		
D	20	Powerpack - Hydraulic fluid contamination check.	B		
D	21	Powerpack - Check condition and wear of brushes in servomotor.	C		
D	23	Landing Gear System - Overhaul main gear downlock actuators, main and nose gear actuators, landing gear selector valve, emergency hand pump, and pressure switch. Replace all rubber goods.		D	
D	24	Brake System - Overhaul brake discs, parking brake system, wheel cylinders, and master cylinders. Replace brake pads and all rubber goods.		D	
E	4	Autopilot Rigging - Check per Avionics Installation Manual.	E	EACH 1	
H	5	Elevator Trim Tab Actuator - Clean, lubricate, and check free-play.	F		
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	G		
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	H		
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	I		
J	13	Alternator - Check brushes, leads, commutator or slip ring for wear.	J		
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		U	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	K		
J	21	Magnetos - Timing Procedures and intervals, lubrication, and overhaul procedures.	L		
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.		M	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	N		

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SPECIAL INSPECTION AND YEARLY ITEMS
Please review each of these items for required compliance

			HOURS	YEARS	INSPECTION COMPLETED BY
J	33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	N		
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	O		
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	O		
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	O		
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.	V		
K	2	Integral Fuel Tanks - Drain fuel and check tank interior and outlet screens.	P		
K	9	Fuel Quantity Indicators - Check for damage, security of installation, and perform accuracy test.		EACH 1	
L	9	Propeller Assembly - Overhaul	Q		
M	1	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	400	EACH 1	
M	9	Oxygen Cylinder - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.		EACH 5	
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	R		
N	5	Vacuum System relief Valve - Inspect for condition and security.	S		
N	10	Airspeed Indicator, Vertical Speed Indicator, and Magnetic Compass - Calibrate.		EACH 2	
N	11	Altimeter and Static System - Inspect in accordance with FAR Part 91.411.		EACH 2	
N	17	Vacuum Manifold Check Valve. (If so equipped)	W		
O	4	Battery - Check general condition and security. Check level of electrolyte.	T		

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
P	1	Replace all fairings, doors, and access hole covers. Ground check engine, alternator charging rate, oil pressure, tachometer, oil temperature and pressure gages, and general operation of components.			
R	1	Check that all applicable Cessna Service Bulletins and Supplier Service Bulletins are complied with.			
R	2	Check that all applicable Airworthiness Directives and Federal Aviation Regulations are complied with.			
R	3	Ensure all Maintenance Record Entries required by Federal Aviation Regulations are completed before returning the airplane to service.			

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Special Inspections Legends:

A. First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.
B. At the first 50 hours, first 100 hours, and each 500 hours thereafter, or one year, whichever comes first.
C. Each 500 hours, and whenever improper operation is suspected. Replace brushes when worn to .25 inch or less.
D. Overhaul components and replace rubber goods on-condition basis.
E. Each 600 hours or 1 year, whichever comes first.
F. Lubrication of the actuator is required each 1000 hours or 3 years, whichever comes first. See figure 2-5 for grease specification.
G. Lubricate each 100 hours (except in extreme dusty conditions). These controls are not repairable and should be replaced every 1500 hours or sooner if required.
H. Clean filter per paragraph 2-25. Replace paper filters at least each 500 hours.
I. Check belt tension after 10 to 25 hours of operation. Refer to Section 17.
J. Inspect each 500 hours.
K. At the first 25 hours, first 50 hours, first 100 hours, and each 100 hours thereafter, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. if magneto-to-engine timing is correct within plus zero to minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto from engine, Detailed Maintenance and Overhaul Information covering Slick magnetos is available from Cessna Parts Deisribution (CPD2) through Cessna Service Stations. Oder 1037-C1-13 for 4200/6200 series magnetos.
L. Every 500 hours of operation, perform the following items:
   a. Inspect contact points for condition and adjust or replace as required.
   b. Inspect carbon brush, high-tension lead, and distributive block for condition. Clean or replace parts as required.
   c. Inspect impulse coupling and pawls for condition and replace as required. Use **light** pressure only. **Do not force** when checking pawls.
   d. Inspect and lubricate bearings; replace as required.
   e. Lubricate contact point cam.

   The magnetos **must** be overhauled or replaced with new or rebuilt magnetos at every engine overhaul.
M. Replace engine compartment rubber hoses (Cessna installed only) every 5 years or at engine overhaul whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. Engine flexible hoses (Continental installed), (Refer to Continental Maintenance Manual and Continental Engine Service Bulletins).
N. Replace check valves in turbocharger oil lines each 1000 hours.
O. First 25 hours: Refill with straight grade mineral oil and use until a total of 50 hours have accumulated, or oil consumption has stabilized. Change oil, replace filter, and refill sump with recommended grade of ashless dispersant oil. Change oil and replace filter at least every six months, regardless of accumulated hours.
P. Each 1000 hours.
Q. See McCauley Service Manual; refer to list of publication.
R. Replace every 500 hours.
S. Replace filter each 100 hours.
T. Check electrolyte level and clean battery box each 100 hours or 90 days.
U. Overhaul or replace Dukes Electrical Fuel Boost Pump at 10 years. Refer to Dukes Mandatory Service Bulletin No. 0003.
V. Each 100 hours or whenever fuel flow fluctuation is encountered, inspect fuel manifold valves, valve covers, and fuel system components and lines or signs of leaks. Refer to Teledyne Continental Motors Service Bulletin SB95-7.
W. Check condition and operation of check valve manifold beginning five years from date of manufacture, and every twelve months thereafter: replace check valve manifold ten years from date of manufacture. Refer to Airborne Product Memo #39 for manufacture date information

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INSPECTION COMPLETED BY

B	13	Aileron, Elevator, and Rudder Stops - Check for damage and security.	
B	15	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Ensure inspection of seat rails for cracks EACH 50 HOURS. Refer to Section 3.	
C	1	Wing Surfaces and Tips - Inspect for skin damage, loose rivets, and condition of paint.	
C	2	Wing Spar Fittings - Check for evidence of wear. Check attach bolts for of looseness, retorque as required.	
C	3	Wing Structure - Inspect spars, ribs, skins, and stringers for cracks, wrinkles, loose rivets, corrosion, or other damage.	
C	4	Metal Lines, Hoses, Clamps, and Fittings - Check for leaks, condition, and security.	
C	5	Wing Access Plates - Check for damage and security of installation.	
C	6	Vertical and Horizontal Stabilizers, Tips and Tailcone - Inspect externally for skin damage and condition of paint.	
C	7	Vertical and Horizontal Stabilizers and Tailcone structure - Inspect bulkheads, spars, ribs, and skins for cracks, wrinkles, loose rivets, corrosion, or other damage. Inspect vertical and horizontal stabilizer attach bolts for looseness. Retorque as necessary. Check covers, fairings, and tips.	
E	1	Ailerons, Hinges - Check condition, security and operation.	
E	2	Aileron Structure, Control Rods, Hinges, Balance Weights, Bellcranks, Linkage, Bolts, Pulleys, and Pulley Brackets - Check condition, operation, and security of attachment.	
E	3	Ailerons and Cables - Check operation and security of stops. Check cables for tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment or if stops are damaged. Check fairleads and rub strips for condition.	
E	5	Aileron Controls - Check freedom of movement and proper operation through full travel with and without flaps extended	
F	1	Flaps - Check tracks, rollers, and control rods for security of attachment. Check rod end bearings for corrosion and lubricate. Check operation.	
F	2	Flap Actuator Threads - Clean and lubricate. Refer to paragraph 2-47 for detailed instructions.	
F	3	Flap Structure,, Linkage, Bellcranks, Pulleys, and Pulley Brackets - Check for condition, operation and security.	
F	4	Wing Flap Control - Check operation through full travel and observe Flap Position indicator for proper indication.	
F	5	Flaps and Cables - Check cables for proper tension, routing, fraying, corrosion, and turnbuckle safety. Check travel if cable tension requires adjustment.	
F	6	Flap Motor, Actuator, and Limit Switches (electric flaps) - Check wiring and terminals for condition and security. Check actuator for condition and security.	
G	1	Elevator Control - Check freedom of movement and proper operation through full travel with and without flaps extended.	

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			INSPECTION COMPLETED BY
G	1	Elevator Control - Check freedom of movement and proper operation through full travel with and without flaps extended.	
G	2	Elevator, Hinges, and Cable Attachment - Check condition, security, and operation.	
G	4	ElevatorArm - Check bolts, linkage, and push-pull tube for condition, operation, and security. Check travels if cables require tension adjustment or if stops are damaged.	
H	1	Elevator Trim Tab and Hinges - Check condition, security, and operation.	
H	2	Elevator Trim System - Check cables, push-pull rods, bellcranks, pulleys, turnbuckles, fairleads, rub strips, etc. for proper routing, condition, and security.	
H	4	Elevator Trim Tab Stop Blocks - Inspect for damage and security.	
H	6	Elevator Trim Tab Actuator - Free-Play limits inspection. Refer to Section 9-12.	
I	1	Rudder - Inspect the rudder skins for cracks and loose rivets, rudder hinges for condition, cracks and security; hinge bolts, hinge bearings, hinge attach fittings, and bonding jumper for evidence of damage and wear, failed fasteners, and security. Inspect the rudder hinge bolts for proper safetying of nuts with cotter pins. Inspect balance weight for looseness and the supporting structure for damage.	
I	3	Rudder, Tips, Hinges, and Cable Attachment - Check condition, security, and operation.	
I	4	Rudder - Check internal surfaces for corrosion, condition of fasteners, and balance weight attachment.	
J	1	Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	
J	2	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	
J	3	Cowl Flap Controls - Check freedom of movement through full travel	
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation	
J	5	Ignition Switch and Electrical Harness - Inspect for damage, condition, and security	
J	8	Induction System - Check security of clamps, tubes, and ducting Inspect for evidence of leakage	
J	9	Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation. Clean and inspect air filter and re-oil if flock-coated.	
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	
J	11	Alternate Induction Air System - Check for obstructions, operation, and security.	

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			INSPECTION COMPLETED BY
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	
J	14	Starter, Starter Solenoid, and Electrical Connections - Check for condition of starter brushes, brush leads, and commutator.	
J	15	Oil Cooler - Check for obstructions, leaks, and security of attachment.	
J	16	Exhaust System (normally aspirated engine) - Inspect for cracks and security. Air leak check exhaust system. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	17	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust stem and security. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).	
J	19	Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	
J	22	Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.	
J	23	Spark Plugs - Remove, clean analyze, test, gap, and rotate top plugs-to-bottom and bottom plugs-to-top.	
J	25	Fuel Injection System - Check security of fuel-air control unit,manifold valve, nozzles, screws and pump. Check fuel lines for leaks, interference, and proper routing	
J	26	Engine Primer - Check for leakage, operation, and security.	
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	
J	28	Cold and Hot Air Hoses - Check condition, routing, and security.	
J	29	Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.	
J	30	Engine Baffles and Seals - Check condition and security of attachment.	
J	31	Crankcase, Oil Sump, and Accessory Section - Inspect for cracks and evidence of oil leakage. Check bolts and nuts for looseness and retorque as necessary. Check crankcase breather lines for obstructions, security, and general condition.	

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INSPECTION COMPLETED BY

J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.
J	34	Heater Components - Inspect all components for condition and security.
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.
K	3	Fuel System - Inspect plumbing and components for mounting and security.
K	4	Fuel Tank Drains - Drain water and sediment.
K	5	Fuel Tank Vent Lines and Vent Valves - Check vents for obstruction and proper positioning. Check valves for operation.
K	7	Throttle-Operated Auxiliary Fuel Pump Switch. Check condition of wiring and security of components. Perform rigging check (refer to Paragraph 13-35).
K	8	Fuel Strainer, Drain Valve, and Controls - Check freedom of movement, security, and proper operation. Disassemble, flush, and clean screen and bowl.
L	1	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.
L	2	Propeller Mounting - Check for security of installation.
L	3	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.
L	4	Spinner - Check general condition and attachment.

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OPERATION NO. 3

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			INSPECTION COMPLETED BY
L	5	Spinner and Spinner Bulkhead - Remove spinner, wash, and inspect for cracks and fractures.	
M	2	Heater Components, Inlets, and Outlets - Inspect all lines, connections, ducts, clamps, seals, and gaskets for condition, restriction, and security.	
M	4	Pitot Tube and Stall Warning Vane - Check for condition and obstructions.	
M	5	Pitot Tube Heater Element - Perform operational check.	
M	6	Propeller Anti-ice Slip Rings, Brushes and Boots - Inspect for condition, and security. Perform operational check.	
N	3	Vacuum Pump - Check for condition and security. Check vacuum system breather line for obstructions, condition, and security.	
O	5	Battery Box and Cables - Clean and remove any corrosion. Check cables for routing, support, and security of connections.	

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MODEL 210 &T210

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
B	11	Upholstery, Headliner, Trim, and Carpeting - Check condition and clean as required.	EACH 400	EACH 1	
D	3	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support. (See Cessna SEB92-8)	EACH 400	EACH 1	
D	10	Wheel Bearings - Clean, inspect and lube.	A		
D	20	Powerpack - Hydraulic fluid contamination check.	B		
D	21	Powerpack - Check condition and wear of brushes in servomotor.	C		
D	23	Landing Gear System - Overhaul main gear downlock actuators, main and nose gear actuators, landing gear selector valve, emergency hand pump, and pressure switch. Replace all rubber goods.		D	
D	24	Brake System - Overhaul brake discs, parking brake system, wheel cylinders, and master cylinders. Replace brake pads and all rubber goods.		D	
E	4	Autopilot Rigging - Check per Avionics Installation Manual.	E	EACH 1	
H	5	Elevator Trim Tab Actuator - Clean, lubricate, and check free-play.	F		
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	G		
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	H		
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	I		
J	13	Alternator - Check brushes, leads, commutator or slip ring for wear.	J		
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		U	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	K		
J	21	Magnetos - Timing Procedures and intervals, lubrication, and overhaul procedures.	L		
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.		M	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	N		

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
J	33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	N		
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	O		
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	O		
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	O		
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.	V		
K	2	Integral Fuel Tanks - Drain fuel and check tank interior and outlet screens.	P		
K	9	Fuel Quantity Indicators - Check for damage, security of installation, and perform accuracy test.		EACH 1	
L	9	Propeller Assembly - Overhaul	Q		
M	1	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	400	EACH 1	
M	9	Oxygen Cylinder - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.		EACH 5	
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	R		
N	5	Vacuum System relief Valve - Inspect for condition and security.	S		
N	10	Airspeed Indicator, Vertical Speed Indicator, and Magnetic Compass - Calibrate.		EACH 2	
N	11	Altimeter and Static System - Inspect in accordance with FAR Part 91.411.		EACH 2	
N	17	Vacuum Manifold Check Valve. (If so equipped)	W		
O	4	Battery - Check general condition and security. Check level of electrolyte.	T		
P	1	Replace all fairings, doors, and access hole covers. Ground check engine, alternator charging rate, oil pressure, tachometer, oil temperature and pressure gages, and general operation of components.			
R	1	Check that all applicable Cessna Service Bulletins and Supplier Service Bulletins are complied with.			

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
R	2	Check that all applicable Airworthiness Directives and Federal Aviation Regulations are complied with.			
R	3	Ensure all Maintenance Record Entries required by Federal Aviation Regulations are completed before returning the airplane to service.			

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MODEL 210 &T210

OPERATION NO. 3

SPECIAL INSPECTION AND YEARLY ITEMS	HOURS	YEARS	INSPECTION COMPLETED BY

Please review each of these items for required compliance

Special Inspections Legends:

A. First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.
B. At the first 50 hours, first 100 hours, and each 500 hours thereafter, or one year, whichever comes first.
C. Each 500 hours, and whenever improper operation is suspected. Replace brushes when worn to .25 inch or less.
D. Overhaul components and replace rubber goods on-condition basis.
E. Each 600 hours or 1 year, whichever comes first.
F. Lubrication of the actuator is required each 1000 hours or 3 years, whichever comes first. See figure 2-5 for grease specification.
G. Lubricate each 100 hours (except in extreme dusty conditions). These controls are not repairable and should be replaced every 1500 hours or sooner if required.
H. Clean filter per paragraph 2-25. Replace paper filters at least each 500 hours.
I. Check belt tension after 10 to 25 hours of operation. Refer to Section 17.
J. Inspect each 500 hours.
K. At the first 25 hours, first 50 hours, first 100 hours, and each 100 hours thereafter, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. if magneto-to-engine timing is correct within plus zero to minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto from engine, Detailed Maintenance and Overhaul Information covering Slick magnetos is available from Cessna Parts Deisribution (CPD2) through Cessna Service Stations. Oder 1037-C1-13 for 4200/6200 series magnetos.
L. Every 500 hours of operation, perform the following items:
   a. Inspect contact points for condition and adjust or replace as required.
   b. Inspect carbon brush, high-tension lead, and distributive block for condition. Clean or replace parts as required.
   c. Inspect impulse coupling and pawls for condition and replace as required. Use **light** pressure only. **Do not force** when checking pawls.
   d. Inspect and lubricate bearings; replace as required.
   e. Lubricate contact point cam.

   The magnetos **must** be overhauled or replaced with new or rebuilt magnetos at every engine overhaul.
M. Replace engine compartment rubber hoses (Cessna installed only) every 5 years or at engine overhaul whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. Engine flexible hoses (Continental installed), (Refer to Continental Maintenance Manual and Continental Engine Service Bulletins).
N. Replace check valves in turbocharger oil lines each 1000 hours.
O. First 25 hours: Refill with straight grade mineral oil and use until a total of 50 hours have accumulated, or oil consumption has stabilized. Change oil, replace filter, and refill sump with recommended grade of ashless dispersant oil. Change oil and replace filter at least every six months, regardless of accumulated hours.
P. Each 1000 hours.
Q. See McCauley Service Manual; refer to list of publication.
R. Replace every 500 hours.
S. Replace filter each 100 hours.
T. Check electrolyte level and clean battery box each 100 hours or 90 days.
U. Overhaul or replace Dukes Electrical Fuel Boost Pump at 10 years. Refer to Dukes Mandatory Service Bulletin No. 0003.
V. Each 100 hours or whenever fuel flow fluctuation is encountered, inspect fuel manifold valves, valve covers, and fuel system components and lines or signs of leaks. Refer to Teledyne Continental Motors Service Bulletin SB95-7.
W. Check condition and operation of check valve manifold beginning five years from date of manufacture, and every twelve months thereafter: replace check valve manifold ten years from date of manufacture. Refer to Airborne Product Memo #39 for manufacture date information.

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OPERATION NO. 4

Registration No. ______ **Airplane Model and SN** __________ **AirplaneTime**______

INSPECTION COMPLETED BY

A	1	Placards and Decals - Inspect presence, legibility, and security. Consult Pilot's Operating Handbook and FAA-Approved Airplane Flight Manual for required placards.	
B	1	Fuselage Surface - Inspect for skin damage, loose rivets, condition of paint, and check pitot-static ports and drain holes for obstruction. Inspect covers and fairings for security.	
B	2	Internal Fuselage Structure - Inspect bulkheads, doorposts, stringers, doublers, and skins for corrosion, cracks, buckles, and loose rivets, bolts and nuts.	
B	3	Control Wheel Lock - Check general condition and operation.	
B	4	Fuselage Mounted Equipment - Check for general condition and security of attachment.	
B	5	Antennas and Cables - Inspect for security of attachment, connection, and condition.	
B	6	Emergency Locator Transmitter - Inspect for security of attachment and check operation by verifying transmitter output. Check cumulative time and useful life of batteries in accordance with FAR Part 91.52. Refer to Section 17 - Emergency Locator Transmitter - Checkout Interval.	
B	7	Instrument Panel Shock Mounts, Ground Straps, and Covers - Inspect for deterioration, cracks, and security of attachment.	
B	8	Pilot's and Copilot's Inertia Reels - Inspect for security of installation, proper operation, and evidence of damage.	
B	9	Seats, Seat Belts, and Shoulder Harnesses - Check general condition and security. Check operation of seat stops and adjustment mechanism. Inspect belts for condition and security of fasteners.	
B	10	Windows, Windshield, Doors, and Seals - Inspect general condition. Check latches, hinges, and seals for condition, operation, and security of attachment.	
B	12	Flight Controls - Check freedom of movement and proper operation through full travel with and without flaps extended. Check electric trim controls for operation (as applicable.)	
B	14	Portable Hand Fire Extinguisher - Inspect for proper operating pressure, condition, security of installation, and servicing date.	
B	15	Seat Tracks and Stops - Inspect seat tracks for condition and security of installation. Check seat track stops for damage and correct location. Ensure inspection of seat rails for cracks EACH 50 HOURS. Refer to Section 3.	
B	16	Control Column - Inspect pulleys, cables, sprockets, bearings, chains, bungees, and turnbuckles for condition and security.	
B	17	Fuel Line and Selector Valve Drain(s) - Remove plug and drain.	
D	1	Brakes, Master Cylinders, and Parking Brake - Check master cylinders and parking brake mechanism for condition and security. Check fluid level and test operation of toe and parking brake.	

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INSPECTION COMPLETED BY

D	2	Main Gear Tubular Struts - Inspect for cracks, dents, corrosion, condition of paint or other damage. Check axles for condition and security.	
D	4	Wheels, Brake Discs, and Linings - Inspect for wear, cracks, warps, dents, or other damage. Check wheel through-bolts and nuts for looseness.	
D	5	Tires - Check tread wear and general condition. Check for proper inflation.	
D	8	Nose Gear - Inspect torque links, steering rods, and boots for condition and security of attachment. Check strut for evidence of leakage and proper extension. Check strut barrel for corrosion, pitting, and cleanliness. Check shimmy damper and/or bungees for operation, leakage, and attach points for wear and security.	
D	11	Nose Gear Attachment Structure - Inspect for cracks, corrosion, or other damage and security of attachment.	
D	12	Landing Gear - Perform five fault-free cycles.	
D	13	Main Landing Gear - Check downlock engagement.	
D	14	Landing Gear System - Check adjustment of main and nose gear up and down switches, and operation of gear position indicator.	
D	16	Nose Gear Doors and Linkage - Check for .25 inch minimum clearance throughout up and down cycles, and proper fit when closed. Check linkage for wear, damaged bearings, distortion, and superficial damage.	
D	17	Hydraulic System - Check all components for leaks and external damage to components or mounting structure.	
D	18	Emergency Hand Pump - Check operation, check lines and components for damage and leaks.	
D	19	Powerpack - Clean self-relieving check valve filter.	
D	22	Powerpack - Perform hydraulic pressure checks of primary relief valve, thermal relief valve, and pressure switch. Can be operationally pressure checked in the aircraft without power pack removal from aircraft (refer to paragraph 5-6A). To determine if relief valve disassembly or adjustment is necessary, relief valves can be bench checked after removal from power pack (refer to paragraph 5-12A).	
G	3	Elevator Control System - Inspect pulleys, cables, sprockets, bearings, chains, and turnbuckles for condition, security, and operation.	
H	3	Trim Controls and Indicators - Check freedom of movement and proper operation through full travel. Check pulleys, cables, sprockets, bearings, chains, bungees, and turnbuckles for condition and security. Check electric trim controls for operation as applicable.	
I	2	Rudder Pedals and Linkage - Check for general condition, proper rigging, and operation. Check for security of attachment.	
J	1	Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	
J	2	Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	

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INSPECTION COMPLETED BY

J	3	Cowl Flap Controls - Check freedom of movement through full travel.	
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	
J	8	Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	
J	11	Alternate Induction Air System - Check for obstructions, operation, and security.	
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	
J	15	Oil Cooler - Check for obstructions, leaks, and security of attachment.	
J	16	Exhaust System (normally aspirated engine) - Inspect for cracks and security. Air leak check exhaust system. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	17	Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust stem and security. Refer to Sections 12 and 12A, Paragraphs 12-98 and 12A-102, for inspection procedures.	
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	
J	30	Engine Baffles and Seals - Check condition and security of attachment.	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	
K	4	Fuel Tank Drains - Drain water and sediment.	
K	6	Fuel Selector Valve - Check controls for detent in each position, security of attachment, and for proper placarding.	

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INSPECTION COMPLETED BY

L	1	Propeller Governor and Control - Inspect for oil and grease leaks. If leakage is evident, refer to McCauley Service Manual.	
L	2	Propeller Mounting - Check for security of installation.	
L	3	Propeller Blades - Inspect for cracks, dents, nicks, scratches, erosion, corrosion, or other damage.	
L	4	Spinner - Check general condition and attachment.	
M	3	Cabin Heat and Ventilation Controls - Check freedom of movement through full travel. Check friction locks for proper operation.	
M	4	Pitot Tube and Stall Warning Vane - Check for condition and obstructions.	
M	5	Pitot Tube Heater Element - Perform operational check.	
M	6	Propeller Anti-ice Slip Rings, Brushes and Boots - Inspect for condition, and security. Perform operational check.	
M	7	Heated Windshield Panel - Check operation, security of installation, electrical wiring, and condition of storage bag.	
M	8	Oxygen System - Inspect masks, hoses, lines, and fittings for condition, routing, and support. Test operation and check for leaks.	
N	1	Vacuum System - Inspect for condition and security.	
N	2	Vacuum System Hoses - Inspect for hardness, deterioration, looseness, or collapsed hoses.	
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	
N	5	Vacuum System relief Valve - Inspect for condition and security.	
N	6	Instruments - Check general condition and markings for legibility.	
N	7	Instrument Lines, Fittings, Ducting, and Instrument Panel Wiring - Check for proper routing, support, and security of attachment.	
N	8	Static System - Inspect for security of installation, cleanliness, and evidence of damage.	
N	9	Navigation Indicators, Controls, and Components - Inspect for condition and security.	
N	12	Instrument Panel Mounted Avionics Units (Including Audio Panel, VHF Nav/Com(s), ADF, Transponder, DME, and Compass System - Inspect for deterioration, cracks, and security of instrument panel mounts. Inspect for security of electrical connections, condition, and security of wire routing.	
N	13	Avionics Operating Controls - Inspect for security and proper operation of controls and switches and ensure that all digital segments will illuminate properly.	
N	14	Remote Mounted Avionics - Inspect for security of units and electrical connectors, condition and security of wire routing. Also check for evidence of damage and cleanliness.	

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			INSPECTION COMPLETED BY
N	15	Microphones, Headsets, and Jacks - Inspect for cleanliness, security, and evidence of damage.	
N	16	Magnetic Compass - Inspect for security of installation, cleanliness, and evidence of damage.	
O	1	General Airplane and System Wiring - Inspect for proper routing, chafing, broken or loose terminals, general condition, broken or inadequate clamps, and sharp bends in wiring.	
O	2	Instrument, Cabin, Navigation, Beacon, Strobe, and Landing Lights - Check operation, condition of lens, and security of attachment.	
O	3	Circuit Breakers and Fuses - Check operation and condition. Check for required number of spare fuses.	
O	6	Switch and Circuit Breaker Panel, Terminal Blocks, and Junction Boxes - Inspect wiring and terminals for condition and security.	
O	8	Switches - Check operation, terminals, wiring, and mounting for conditions, security, and interference.	
O	9	Instrument Panel and Control Pedestal - Inspect wiring, mounting, and terminals for condition and security. Check resistance between stationary panel and instrument panel for proper ground.	
Q	1	Brakes - Test toe brakes and parking brake for proper operation.	

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SPECIAL INSPECTION AND YEARLY ITEMS
Please review each of these items for required compliance

			HOURS	YEARS	INSPECTION COMPLETED BY
B	11	Upholstery, Headliner, Trim, and Carpeting - Check condition and clean as required.	EACH 400	EACH 1	
D	3	Brake Lines, Wheel Cylinders, Hoses, Clamps, and Fittings - Check for leaks, condition, and security and hoses for bulges and deterioration. Check brake lines and hoses for proper routing and support. (See Cessna SEB92-8)	EACH 400	EACH 1	
D	10	Wheel Bearings - Clean, inspect and lube.	A		
D	20	Powerpack - Hydraulic fluid contamination check.	B		
D	21	Powerpack - Check condition and wear of brushes in servomotor.	C		
D	23	Landing Gear System - Overhaul main gear downlock actuators, main and nose gear actuators, landing gear selector valve, emergency hand pump, and pressure switch. Replace all rubber goods.		D	
D	24	Brake System - Overhaul brake discs, parking brake system, wheel cylinders, and master cylinders. Replace brake pads and all rubber goods.		D	
E	4	Autopilot Rigging - Check per Avionics Installation Manual.	E	EACH 1	
H	5	Elevator Trim Tab Actuator - Clean, lubricate, and check free-play.	F		
J	4	Engine, Propeller Controls, and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	G		
J	10	Induction Air Filter - Remove and clean. inspect for damage, and service per paragraph 2-21.	H		
J	12	Alternator and Electrical Connections - Check condition and security of alternator and support brackets. Check alternator belts for condition and proper adjustment.	I		
J	13	Alternator - Check brushes, leads, commutator or slip ring for wear.	J		
J	18	Auxiliary (Electric) Fuel Pump - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		U	
J	20	Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.	K		
J	21	Magnetos - Timing Procedures and intervals, lubrication, and overhaul procedures.	L		
J	27	Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.		M	
J	32	Turbocharger (if applicable) - a. Inspect turbocharger mounting brackets, ducting, linkage, and attaching parts for general condition, leakage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressor housing for leakage, apparent damage, security of attachment, and evidence of wear. Check waste gate return spring for condition and security.	N		

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SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
J	33	Turbocharger (if applicable) - a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.	N		
J	35	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: a. Remove and replace short oil filter (approximately 4.8 inches long). b. Add recommended grade aviation oil to replace oil lost in existing filter.	O		
J	36	Engine Oil Change - Turbocharged and Normally Aspirated Engines With Oil Filters: c. Drain oil sump and refill with recommended grade aviation oil (when system is equipped with short oil filter). d. Drain oil sump, remove and replace long oil filter (approximately 5.8 inches long), and refill with recommended grade aviation oil.	O		
J	37	Engine Oil Change - Normally Aspirated Engines Without Oil Filters: a. Engine Oils Without Oil Filter - Drain oil sump and oil cooler, clean and inspect screens, and refill with recommended grade aviation oil.	O		
J	38	Fuel Manifold Valves, Valve Covers, and Fuel System.	V		
K	2	Integral Fuel Tanks - Drain fuel and check tank interior and outlet screens.	P		
K	9	Fuel Quantity Indicators - Check for damage, security of installation, and perform accuracy test.		EACH 1	
L	9	Propeller Assembly - Overhaul	Q		
M	1	Ventilation System - Inspect clamps, hoses, and valves for condition and security.	400	EACH 1	
M	9	Oxygen Cylinder - Inspect for condition, check hydrostatic test date and perform hydrostatic test, if due.		EACH 5	
N	4	Vacuum System Air Filter - Inspect for damage, deterioration and contamination. Clean or replace, if required. NOTE Smoking will cause premature filter clogging.	R		
N	5	Vacuum System relief Valve - Inspect for condition and security.	S		
N	10	Airspeed Indicator, Vertical Speed Indicator, and Magnetic Compass - Calibrate.		EACH 2	
N	11	Altimeter and Static System - Inspect in accordance with FAR Part 91.411.		EACH 2	
N	17	Vacuum Manifold Check Valve (If so equipped)	W		
O	4	Battery - Check general condition and security. Check level of electrolyte.	T		
P	1	Replace all fairings, doors, and access hole covers. Ground check engine, alternator charging rate, oil pressure, tachometer, oil temperature and pressure gages, and general operation of components.			

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 4

SPECIAL INSPECTION AND YEARLY ITEMS Please review each of these items for required compliance			HOURS	YEARS	INSPECTION COMPLETED BY
R	1	Check that all applicable Cessna Service Bulletins and Supplier Service Bulletins are complied with.			
R	2	Check that all applicable Airworthiness Directives and Federal Aviation Regulations are complied with.			
R	3	Ensure all Maintenance Record Entries required by Federal Aviation Regulations are completed before returning the airplane to service.			

CESSNA PROGRESSIVE CARE
MODEL 210 &T210

OPERATION NO. 3

Special Inspections Legends:

A. First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.
B. At the first 50 hours, first 100 hours, and each 500 hours thereafter, or one year, whichever comes first.
C. Each 500 hours, and whenever improper operation is suspected. Replace brushes when worn to .25 inch or less.
D. Overhaul components and replace rubber goods on-condition basis.
E. Each 600 hours or 1 year, whichever comes first.
F. Lubrication of the actuator is required each 1000 hours or 3 years, whichever comes first. See figure 2-5 for grease specification.
G. Lubricate each 100 hours (except in extreme dusty conditions). These controls are not repairable and should be replaced every 1500 hours or sooner if required.
H. Clean filter per paragraph 2-25. Replace paper filters at least each 500 hours.
I. Check belt tension after 10 to 25 hours of operation. Refer to Section 17.
J. Inspect each 500 hours.
K. At the first 25 hours, first 50 hours, first 100 hours, and each 100 hours thereafter, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. if magneto-to-engine timing is correct within plus zero to minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto from engine, Detailed Maintenance and Overhaul Information covering Slick magnetos is available from Cessna Parts Deisribution (CPD2) through Cessna Service Stations. Oder 1037-C1-13 for 4200/6200 series magnetos.
L. Every 500 hours of operation, perform the following items:
   a. Inspect contact points for condition and adjust or replace as required.
   b. Inspect carbon brush, high-tension lead, and distributive block for condition. Clean or replace parts as required.
   c. Inspect impulse coupling and pawls for condition and replace as required. Use **light** pressure only. **Do not force** when checking pawls.
   d. Inspect and lubricate bearings; replace as required.
   e. Lubricate contact point cam.

   The magnetos **must** be overhauled or replaced with new or rebuilt magnetos at every engine overhaul.
M. Replace engine compartment rubber hoses (Cessna installed only) every 5 years or at engine overhaul whichever occurs first. This does not include drain hoses. Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then replaced within 120 days after receiving the new hose(s) from Cessna. Replace drain hoses on condition. Engine flexible hoses (Continental installed), (Refer to Continental Maintenance Manual and Continental Engine Service Bulletins).
N. Replace check valves in turbocharger oil lines each 1000 hours.
O. First 25 hours: Refill with straight grade mineral oil and use until a total of 50 hours have accumulated, or oil consumption has stabilized. Change oil, replace filter, and refill sump with recommended grade of ashless dispersant oil. Change oil and replace filter at least every six months, regardless of accumulated hours.
P. Each 1000 hours.
Q. See McCauley Service Manual; refer to list of publication.
R. Replace every 500 hours.
S. Replace filter each 100 hours.
T. Check electrolyte level and clean battery box each 100 hours or 90 days.
U. Overhaul or replace Dukes Electrical Fuel Boost Pump at 10 years. Refer to Dukes Mandatory Service Bulletin No. 0003.
V. Each 100 hours or whenever fuel flow fluctuation is encountered, inspect fuel manifold valves, valve covers, and fuel system components and lines or signs of leaks. Refer to Teledyne Continental Motors Service Bulletin SB95-7.
W. Check condition and operation of check valve manifold beginning five years from date of manufacture, and every twelve months thereafter: replace check valve manifold ten years from date of manufacture. Refer to Airborne Product Memo #39 for manufacture date information.

SECTION 3

FUSELAGE

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3-1. FUSELAGE.

3-2. WINDSHIELD AND WINDOWS.

3-3. DESCRIPTION. The windshield and windows are single-piece, acrylic panels, set in sealing strips strips and held by formed retaining strips, secured to fuselage with screws and rivets. FS-4291 sealer (TMK01 Kit, Cessna Supply Division, SPA Dept 703, Cessna Aircraft Company, 5800 E. Pawnee, Wichita, KS 67218, sealing compound used in conjunction with a felt seal is applied to all edges of the windshield and windows, with exception of wing root area. The wing root fairing has a heavy felt strip that completes the windshield sealing.

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

3-5. WINDSHIELD AND WINDOW INSTALLATION TECHNIQUES:

Special drills must be used when drilling holes in acrylic. Standard drills will cause the hole to be oversized, distorted, or excessively chipped.

Whenever possible, a coolant such as a plastic drilling wax should be used to lubricate the drill bit. Cessna recommends "Reliance" drill wax or Johnson No. 140 Stick Wax.

Drilled holes should be smooth with a finish of 125 rhr.

The feed and speed of the drill is critical. The following chart indicates drill speed for various thicknesses of acrylic.

Material Thickness	Drill Speed
1/16" to 3/16"	1500 to 4500 rpm
1/4" to 3/8"	1500 to 2000 rpm
7/16"	1000 to 1500 rpm
1/2"	500 to 1000 rpm
3/4"	500 to 800 rpm
1"	500 rpm

Specifications for the twist drill used to drill acrylics is as follows:

Shallow holes - when hole depth to hole diameter ratio is less than 1.5 to 1, the drill shall have an included tip angle of 55 degrees to 60 degrees and a lip clearance angle of 15 degrees to 20 degrees.

Medium deep holes - when hole depth ot hole diameter ratio is from 1.5 to 1 up to 3 to 1, the drill shall have an included tip angle of 60 degrees to 140 degrees and a lip clearance angle of 15 degrees to 20 degrees.

Deep holes - when hole depth ot hole diameter ratio is greater than 3.0 to 1, the drill shall have an included tip angle of 140 degrees and a lip clearance of 12 degrees to 15 degrees.

Parts which must have holes drilled shall be backed up with a drill fixture. Holes may be drilled through the part from one side. However, less chipping around holes will occur if holes are drilled by drilling the holes from both sides. This is accomplished by using a drill with an acrylic backup piece on the opposite side. Remove the drill from the hole and switch the backup plate and finish drilling from the opposite side.

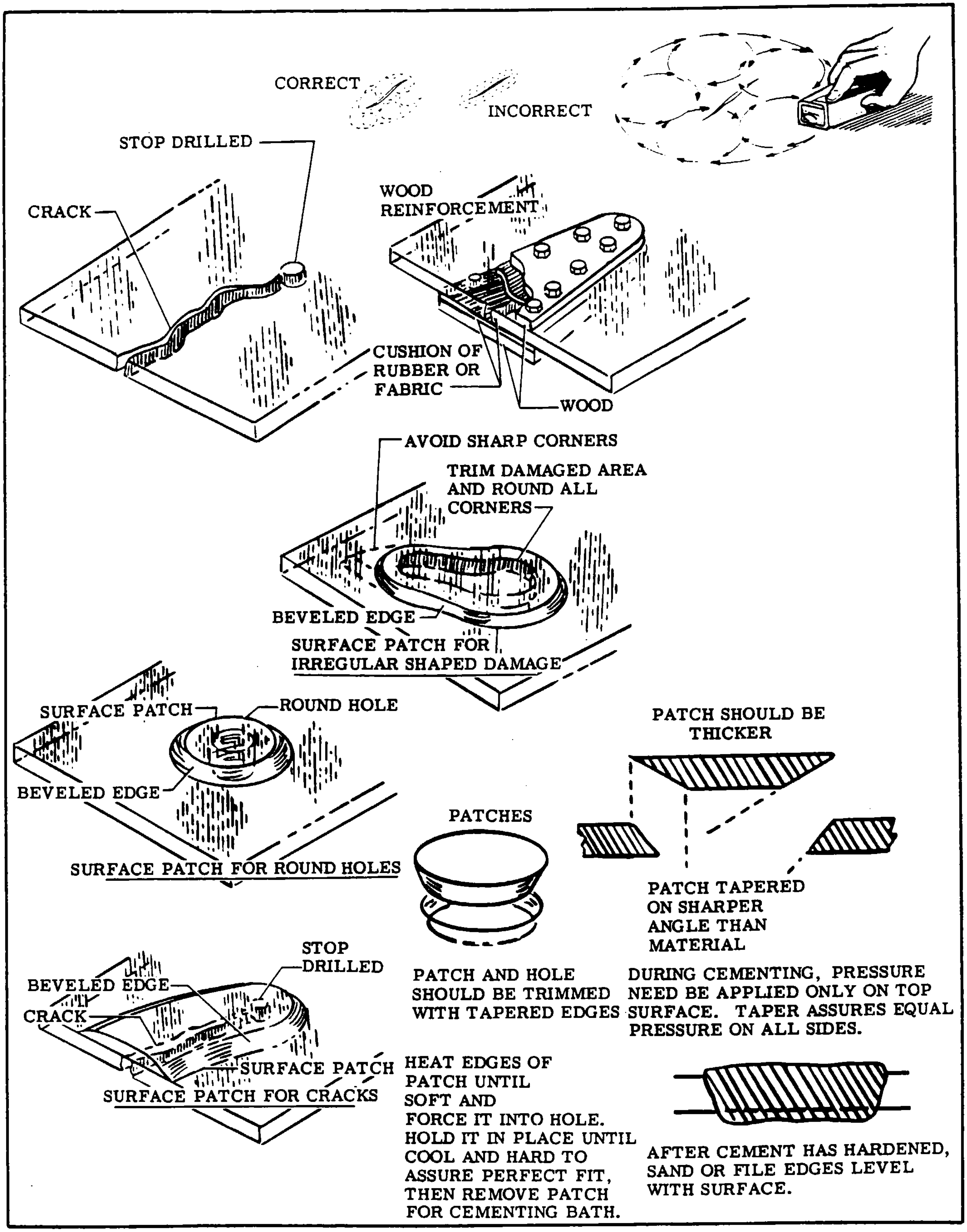


Figure 3-1. Repair of Windshields and Windows

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 three 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 the scratch with a circular motion, keeping abrasive constantly wet with clean water to prevent scratching the surface further. Use minimum pressure and cover an area large enough to prevent the formation of "bull's-eyes" or other optical distortions.

CAUTION

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

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

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

d. Apply fresh tallow or buffing compound to a motor-driven buffing wheel. Hold wheel against plastic surface, moving it constantly over the 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 considerabley longer period of time to attain the same result as produced by a buffing wheel.

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

NOTE

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

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

3-8. CRACKS. (See figure 3-1.)

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

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

c. A temporary repair can be made on a curved surface by placing fabric patches over the affected areas. Secure the patches with aircraft dope, Specification No. MIL-D-5549: or lacquer, Specification No. MIL-L-7178. Lacquer thinner, Specification No. Mil-T-6094 can also be used to secure the patch.

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

3-10. WINDSHIELD. (See figure 3-2.)

3-11. REMOVAL.
a. Remove wing fairings.
b. Remove air vent tubes.

NOTE

Remove and tape compass and outside air temperature gage clear of work area. Do not disconnect electrical wiring. (See Section 16.)

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.

3-12. 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 bottom edge of windshield into lower retainer.
f. Using a piece of bent sheet metal (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.

3-13. WINDOWS.

3-14. MOVABLE. (See figure 3-3.) A movable window, hinged at the top, is installed in the left cabin door on all aircraft and may also be installed in the right door as a customer option.

3-15. REMOVAL AND INSTALLATION.
a. Disconnect window stop (5).
b. Remove pins from window hinges (6).
c. Reverse preceding steps for reinstallation. To remove frame from plastic panel, drill out blind rivets at frame splice. When replacing plastic panel in frame, ensure sealing strip and an adequate coating of Presstite No. 579.6 sealing compound is used around all edges of panel.

3-16. WRAP-AROUND REAR. (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.

3-17. REMOVAL AND INSTALLATION.
a. Remove upholstery as necessary to expose retainer strips inside cabin.
b. Drill out rivets as necessary to remove the retainers on both sides and the lower edge of window.
c. Remove window by starting at aft edge and pulling window into the cabin area.
d. Reverse preceding steps for reinstallation. Apply sealing strips and an adequate coating of sealing compound to prevent leaks. When installing a new window, check fit and carefully file or grind away excess plastic.
e. Use care not to crack the window when installing.

3-18. FIXED. (See Figure 3-2.) Fixed windows, mounted in sealing strips and sealing compound, are held in place by various retainer strips. To replace the side windows, remove upholstery and trim panels as necessary and drill out the rivets securing retainers. Except for the left door, rear window and windshield, the aircraft is equipped with double windows. Apply felt strip and sealing compound to all edges of the window to prevent leaks. Check fit and carefully file or grind away excess plastic. Use care not to crack the window when installing.

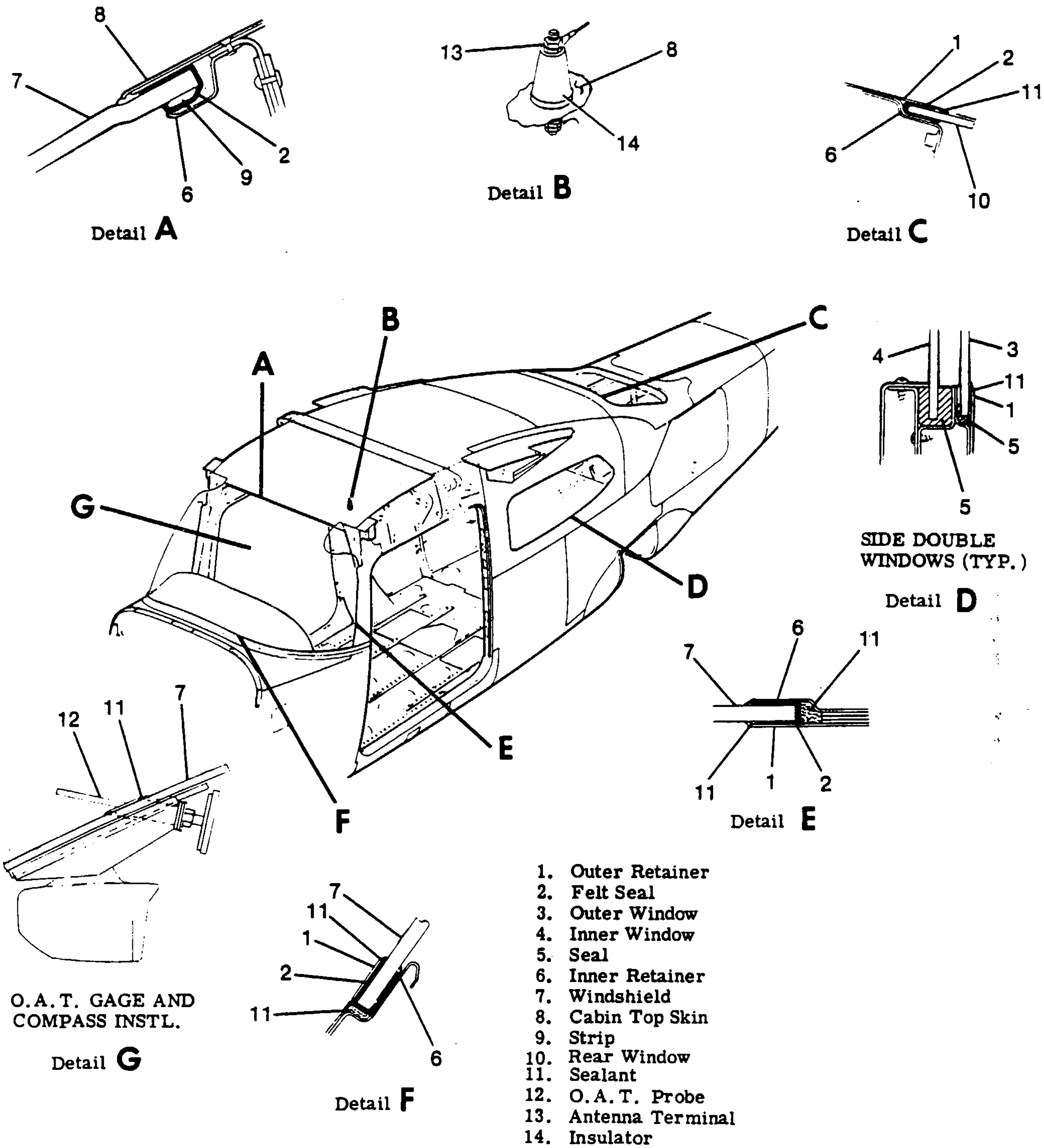
3-19. CABIN STRUCTURE. (See figure 3-2.)

3-20. SEALING. (See figure 3-2.)

WARNING

Following any structural repairs to the fuselage, it is very important to restore the following provisions to factory standards.

When the airplane was manufactured, provisions were incorporated into the fuselage structure to ensure airflow (Carbon Monoxide) beneath the fuselage cannot enter the cabin. These provisions include:
a. SEALANT AND TAPE. Sealant has been applied around wire bundles entering the cabin, around fuel lines entering the belly beneath the floorboards, in stringers and around aft baggage compartment bulkhead, and between belly skin and floorboards in and around landing gear forgings, tunnels and wheel well. Tape and sealant have been applied beneath floorboard at sta. 67.25, and in vertical stabilizer at sta. 200.45. All cover plates in floorboards have been sealed with tape.
b. PLUGS. Plugs have been installed in hat section stringers at sta 152.20 to prevent airflow from entering cabin from tail cone.
c. PRESSURIZATION. To equalize the air pressure in the lower fuselage and tail cone, air scoops have been installed in the following (4) four locations: (1) fwd of the RH doorpost, (2) at sta. 23.00 of the LH belly, (3) at sta. 77.00 of LH belly, and (4) at sta. 200.45 RH side of vertical stabilizer.



1. Outer Retainer
2. Felt Seal
3. Outer Window
4. Inner Window
5. Seal
6. Inner Retainer
7. Windshield
8. Cabin Top Skin
9. Strip
10. Rear Window
11. Sealant
12. O.A.T. Probe
13. Antenna Terminal
14. Insulator

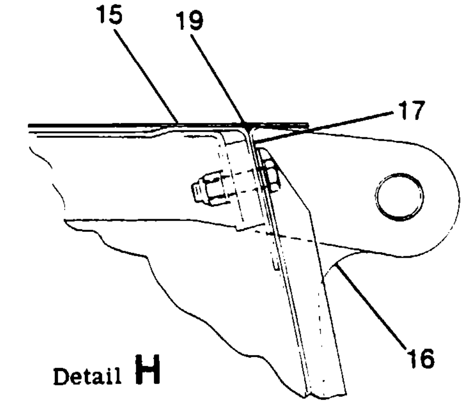
NOTE

Apply H.B. Fuller FS-4291 to all edges of windshield and windows under outer retainer (1).

NOTE

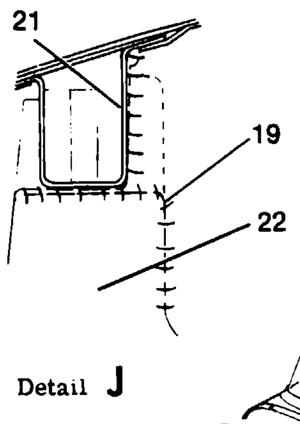
Seal between antenna insulator (14) and skin (8) with RTV 102 (General Electric Co.) or equivalent.

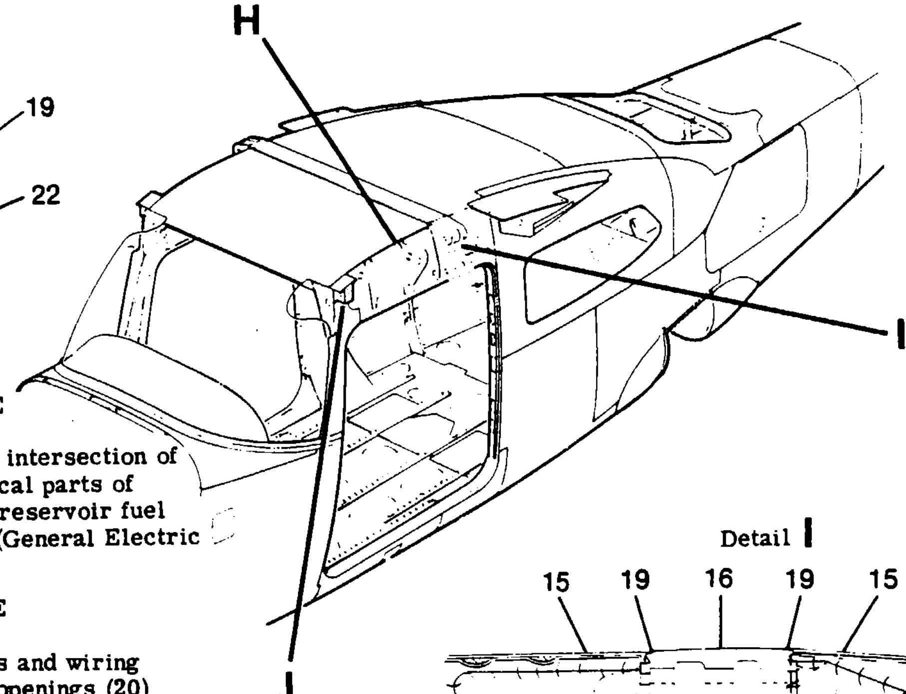
Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 1 of 7)



NOTE

- When cabin top skin has been removed. seal between skin (15) and radius formed by two flanges of root rib (17) with Inmont Corp. No. 576.1 sealant
- Krylon Ignition sealer No. 1304 may be used on inside of cabin top skin around rivets that are found to be leaking.
- Seal openings and joints at all intersections of carry-thru spars (16) and (21), root rib (17), doublers (18) and door post (22) with RTV 102 (General Electric Co.) sealant.





NOTE

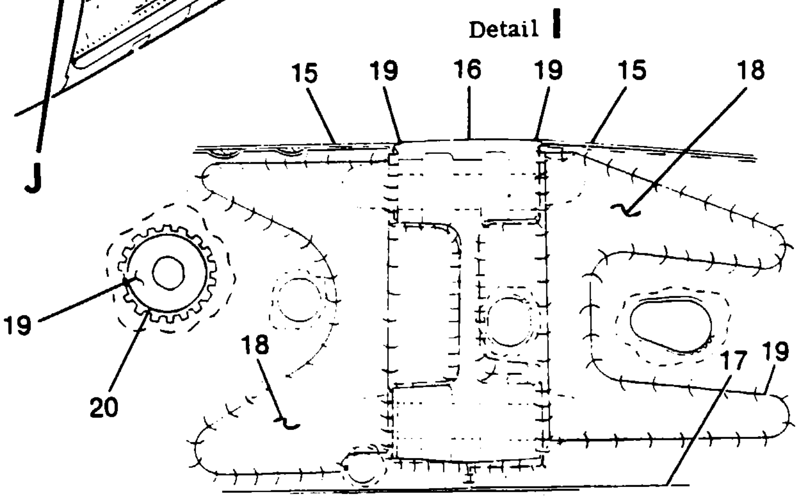
Seal any openings at intersection of floorboard and vertical parts of cabin structure and reservoir fuel lines with RTV 102 (General Electric Co.) sealant.

NOTE

Seal all hoses, lines and wiring protruding through openings (20) in root rib with Inmont Corp. No. 579.6 sealant.

NOTE

Seal radius formed by cabin top skin (15) and carry-thru spar (16) with Acryl-R 5504 (Schnee-Morehead Chemical Inc.) sealant per Detail I.



NOTE

·Seal all openings in structure with cloth backed pressure sensitive tape; 230 or 231 Polyken, Polyken Kendall Division, Chicago, Ill; Tuck 92T, Technical Tape Corp., Shawnee Mission, Ks; or P69, P670, or P672 Permacel, New Brunswick, N.J.; or any equivalent.

15. Cabin Top Skin
16. Carry-Thru Spar
17. Root Rib
18. Doubler
19. Sealant
20. Root Rib Opening (Typical)
21. Front Carry-Thru Spar
22. Door Post

Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 2 of 7)

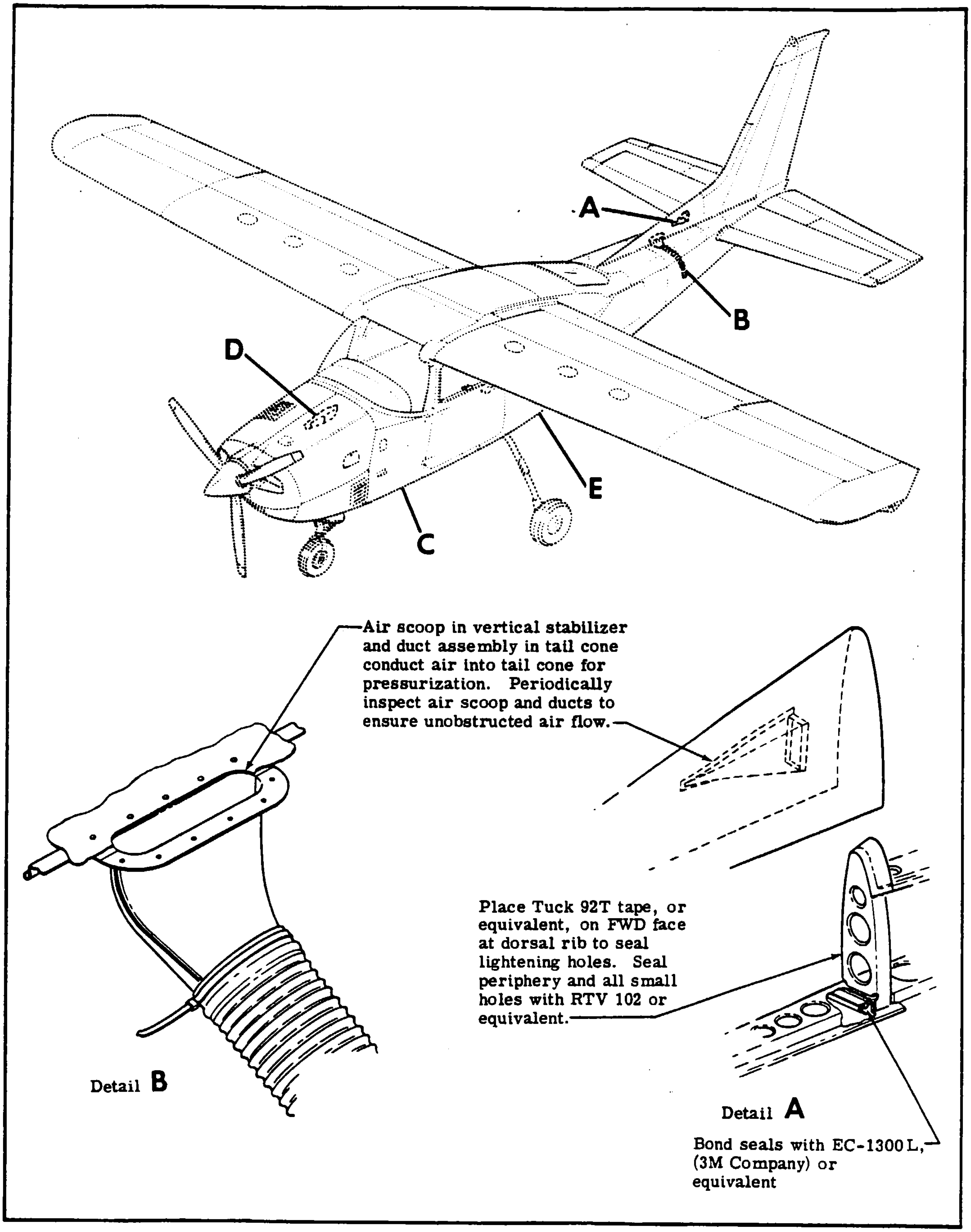


Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 3 of 7)

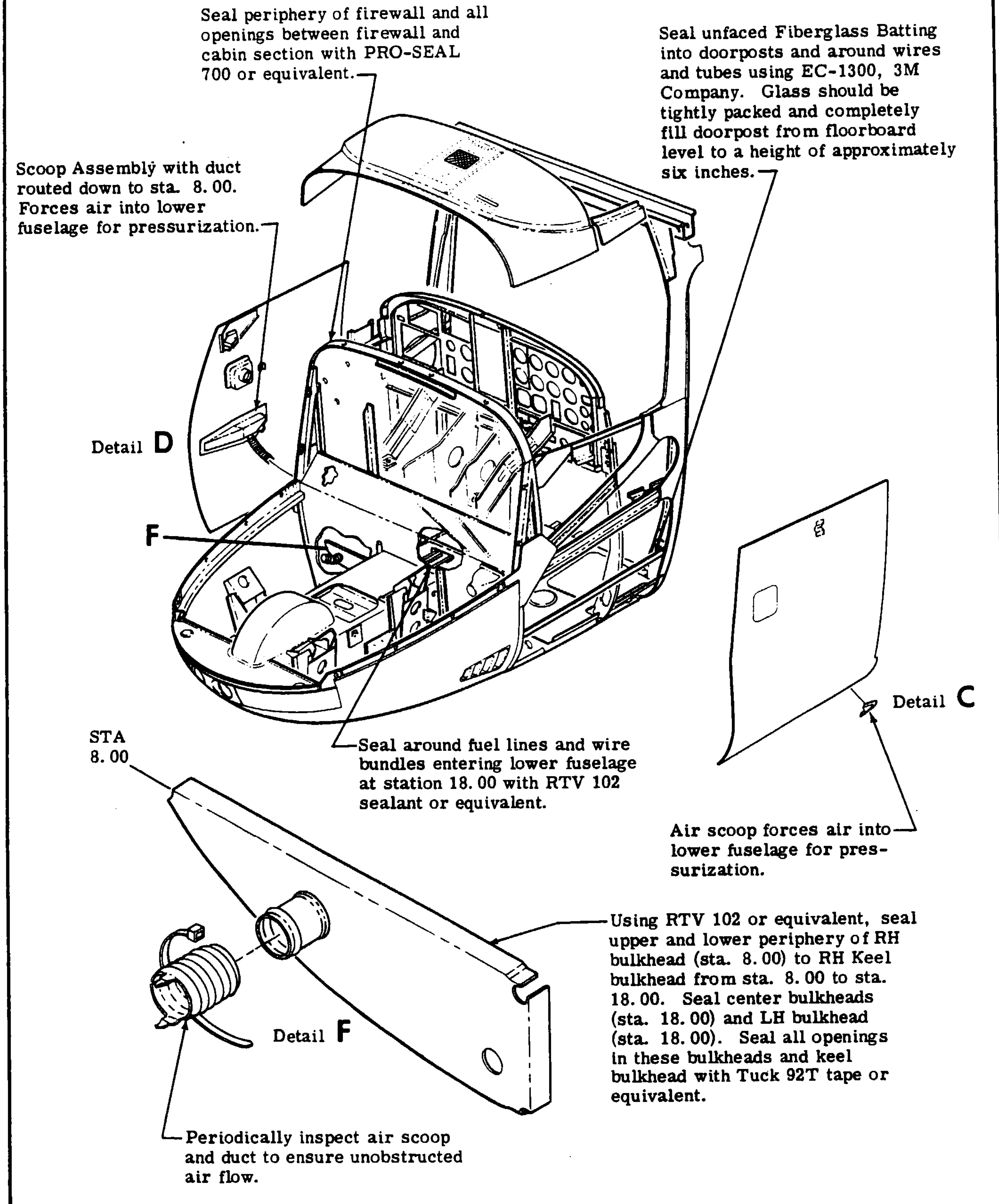


Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 4 of 7)

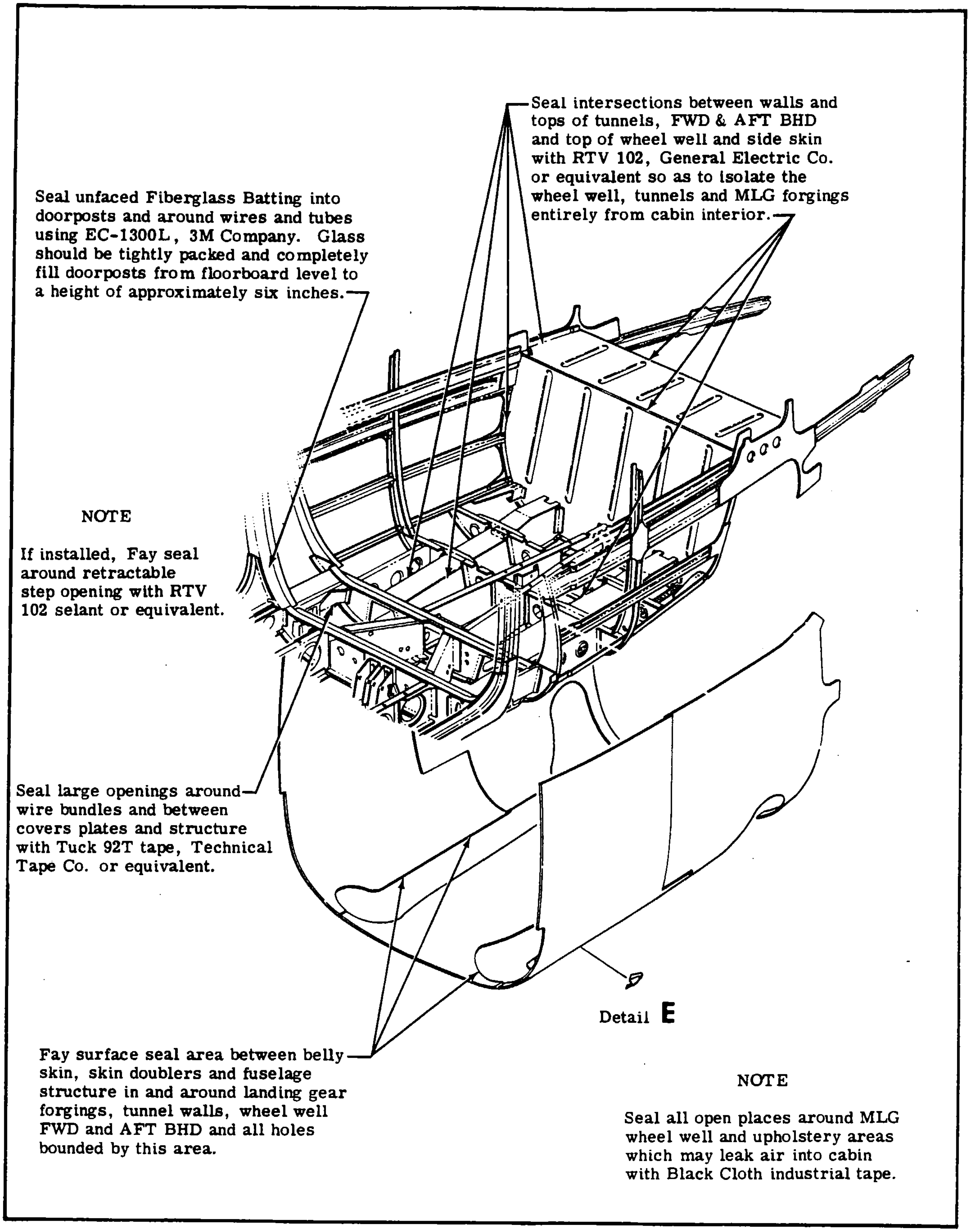
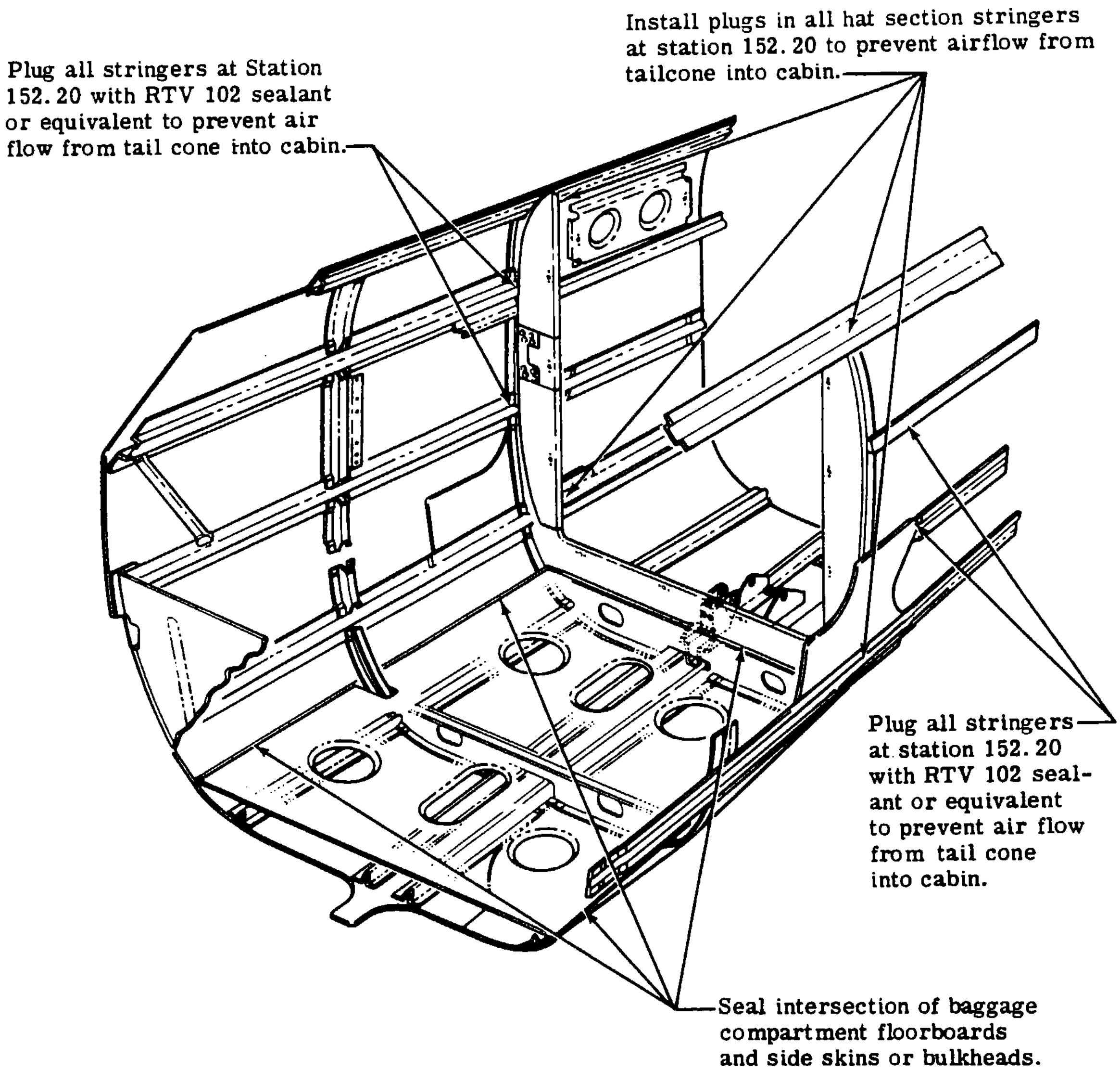


Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 5 of 7)

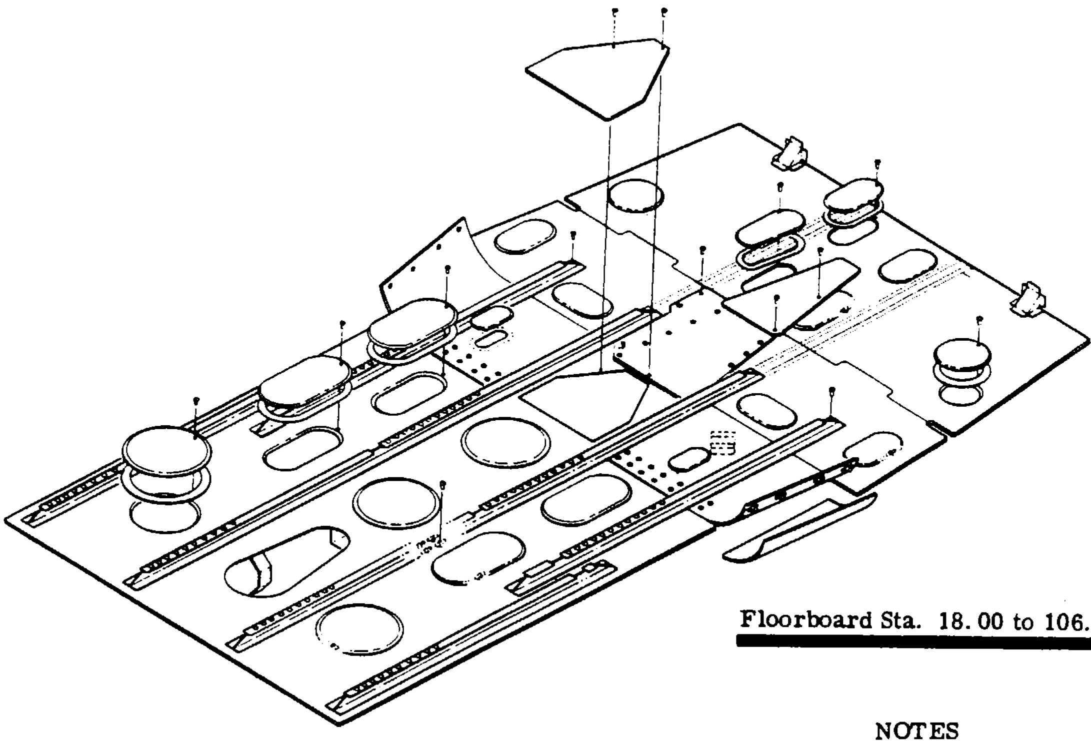


NOTES

Fay surface seal intersections of bulkhead at station 152.20 to fuselage skin with RTV 102 sealant or equivalent.

Seal cover plates on baggage compartment floorboard with Tuck 92T tape, Technical Tape Company, or equivalent.

Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 6 of 7)



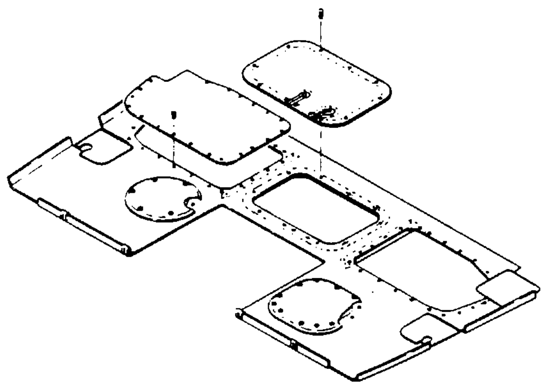
Floorboard Sta. 18.00 to 106.00

NOTES

Seal intersection of floorboard and side skin from LH sta, 1800 and RH sta. 8.00 to canted sta. 106 BHD.

Seal all covers to floorboards with Tuck 92T tape or equivalent and seal remaining gaps around wires and tubes with RTV 102 sealant or equivalent.

Fay surface seal lower surface of floorboards, floorboard doublers, and covers to fuselage structure in and around landing gear forgings, tunnel top and all holes bounded by this area.



Floorboard Sta. 0.00 to 18.00

Figure 3-2. Windshield and Fixed Window Installation and Cabin Sealing (Sheet 7 of 7)

3-21. CABIN DOORS. (See figure 3-3 and 3-4.)

3-22. REMOVAL AND INSTALLATION. Removal of cabin doors is accomplished by removing the screws attaching the hinges and door stop, or by removing the hinge pins attaching the door and door stop. If permanent hinge pins are removed from the door hinges, they may be replaced by clevis pins secured with cotter pins, or new hinge pins may be installed by inserting pin through both hinge halves and chucking a rivet set in a hand drill, hold one end of pin and form head on opposite end. Reverse pin and repeat process.

3-23. WEDGE ADJUSTMENT. Wedges, at upper forward edge of the door aid in preventing air leaks at this point. They engage as the door is closed. Several attaching holes are located in the wedges and the set of holes giving best results should be selected.

3-24. WEATHERSTRIP. Weatherstrip is bonded around the edges of the cabin door and the movable window opening. A hollow center, fluted type seal is used. When replacing door seals, ensure mating surfaces are clean, dry and free of oil and grease. Position butt ends of seal at door low point and cut a small notch in seal at this point for drainage. Apply a thin, even coat of EC-1300L adhesive (3M Co.) or equivalent to each surface and allow to dry until tacky before pressing into place.

3-25. SEALING. (See figure 3-3.)

3-26. LATCHES. (See figure 3-4.)

3-27. DESCRIPTION. (See figure 3-4.)
The cabin door latch is a spring-loaded latch pin type. As the door is closed, (see figure 3-4), push rod (14) rides up on actuator (45), causing bolt (13) to disengage from catch (20), driving bolt into slot. As the door is opened, by pulling outboard on handle (21), bolt (13) is pulled out of slot, engaging spring-loaded catch (20).

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

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

3-29. INSTALLATION OF LOCK ASSEMBLY ON LATCH ASSEMBLY. (See figure 3-4.)

a. Assemble locking arm (3) with pin assembly (5).
b. Place pin (5) in 1/8-inch hole of base assembly (23).
c. Align .099-inch hole of locking arm (3) with .094-inch hole in latch base (23), and install pin (4).
d. Assemble cam assembly (1) to locking arm (3). Cam should be on latch side of locking arm (3).
e. Use washers between cam and cotter pin, and install cotter pin on clevis bolt.

3-30. INSTALLATION OF LATCH ASSEMBLY. (See figure 3-4.)

NOTE

Install with latch in CLOSED position.

a. Install latch assembly between door pan and door skin.
b. Cable assembly 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 (13) and push rod (14) extend through their respective holes.
e. Trip push rod (14) so that bolt (13) is fully extended and handle (21) is flush.
f. Secure latch to door pan with four NAS220-5 screws through base assembly (23) and two AN525-10R6 screws through aft flange of door pan.
g. Drill eleven .128-inch holes to align with latch base (23).

NOTE

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

3-31. INSTALLING CABLE ASSEMBLY. (See figure 3-4.)

NOTE

Remove cover assembly (41).

a. On pin end of cable assembly (25), attach clamp (26) and nut (34), one-inch from end of casing, as shown in Detail A.
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 (29) and align pin on cable with pin guide (31), and insert pin through guide. Access is gained through .875-inch hole (33).
d. Align clamp on cable casing with hole located one-inch below .875-inch hole (33), and install screw.
e. Check operation of cable. If sluggish operation of cable is encountered, add S-1450-24A-062 washers (27) to clip-on nut (34) to facilitate smoother cable operation.

NOTE

Washers are to be bonded to clip-on nut with 579.6 sealer (Inmont Corp., St. Louis, Missouri), or equivalent.

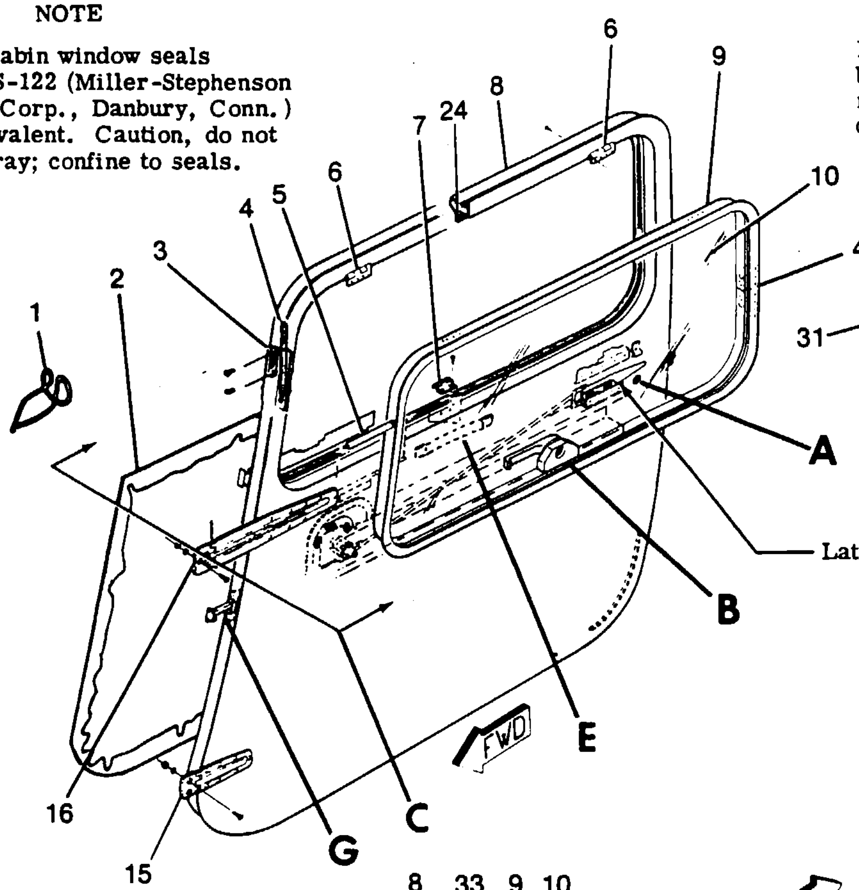
3-32. RIGGING CABLE ASSEMBLY. (See figure 3-4.)

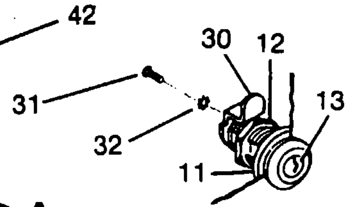
NOTE

Spray cabin window seals with MS-122 (Miller-Stephenson Chem. Corp., Danbury, Conn.) or equivalent. Caution, do not overspray; confine to seals.

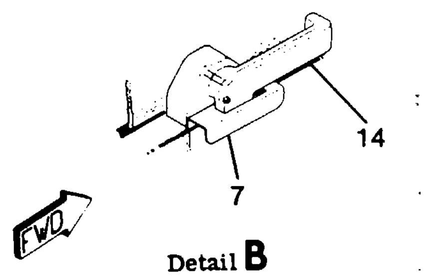
NOTE

Forming the flange of a bonded door is not permissable as it could cause material separation.

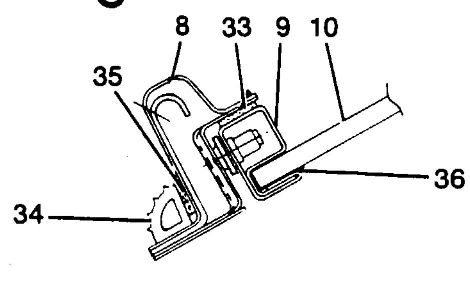




Detail **A**



Detail **B**



Detail **C**

1. Upholstery Clip
2. Upholstery Panel
3. Wedge
4. Spring
5. Window Stop
6. Window Hinge
7. Latch Plate
8. Cabin Door
9. Window Frame
10. Window
11. Washer
12. Nut
13. Lock Assembly
14. Latch Handle
15. Lower Hinge
16. Upper Hinge
24. Window Seal
30. Cam
31. Screw
32. Washer
33. Window Seal
34. Door Seal
35. Rubber Shim
36. Tape
42. Splice Gap

NOTE

After installing cam (30) on lock assembly (13), seal over head of screw (31) and washer (32) with RTV 103 (General Electric Co.) sealant.

NOTE

Seal openable window frame splice gap (42) with Inmont Corp. 576.1 sealant.

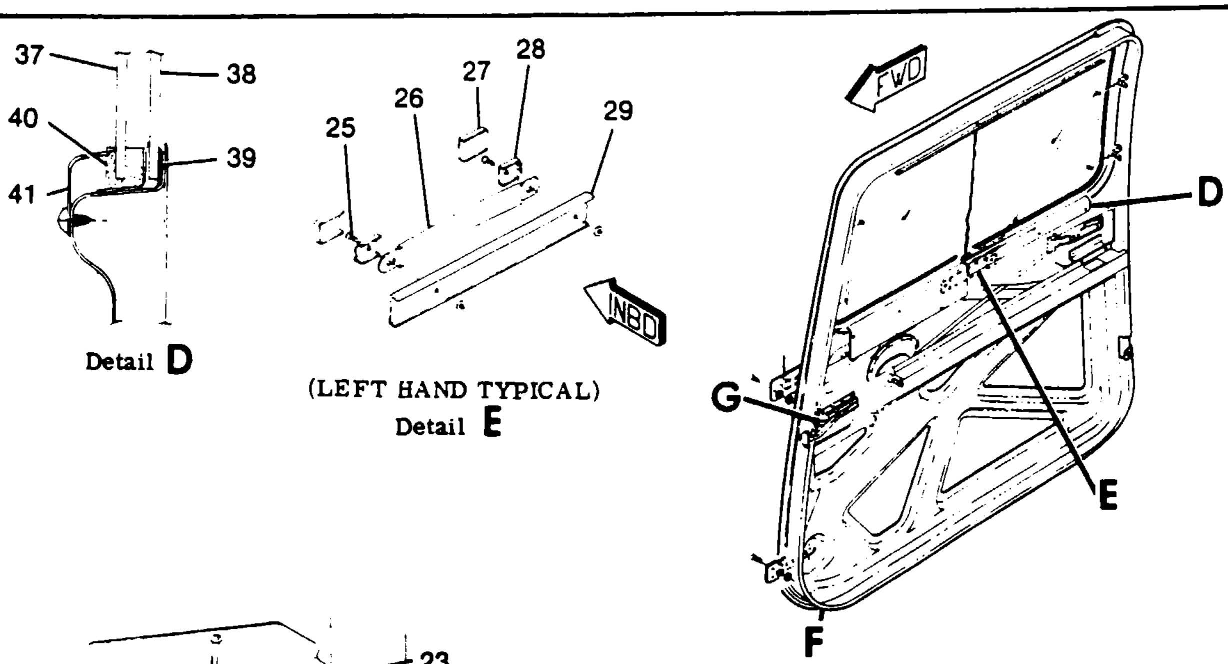
NOTE

Cover edge of window (10) around perimeter with No. 33 electrical tape (36) 1.00 inch wide.

NOTE

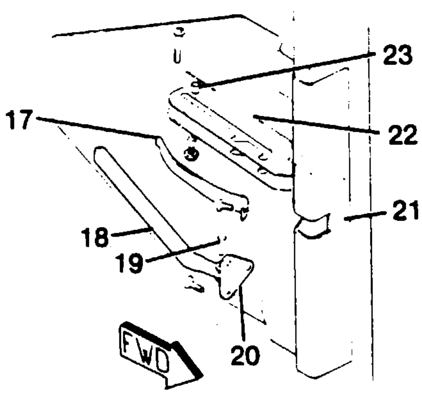
Use rubber shim (35) as required to obtain proper fit of seal (34).

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



Detail D

(LEFT HAND TYPICAL)
Detail E



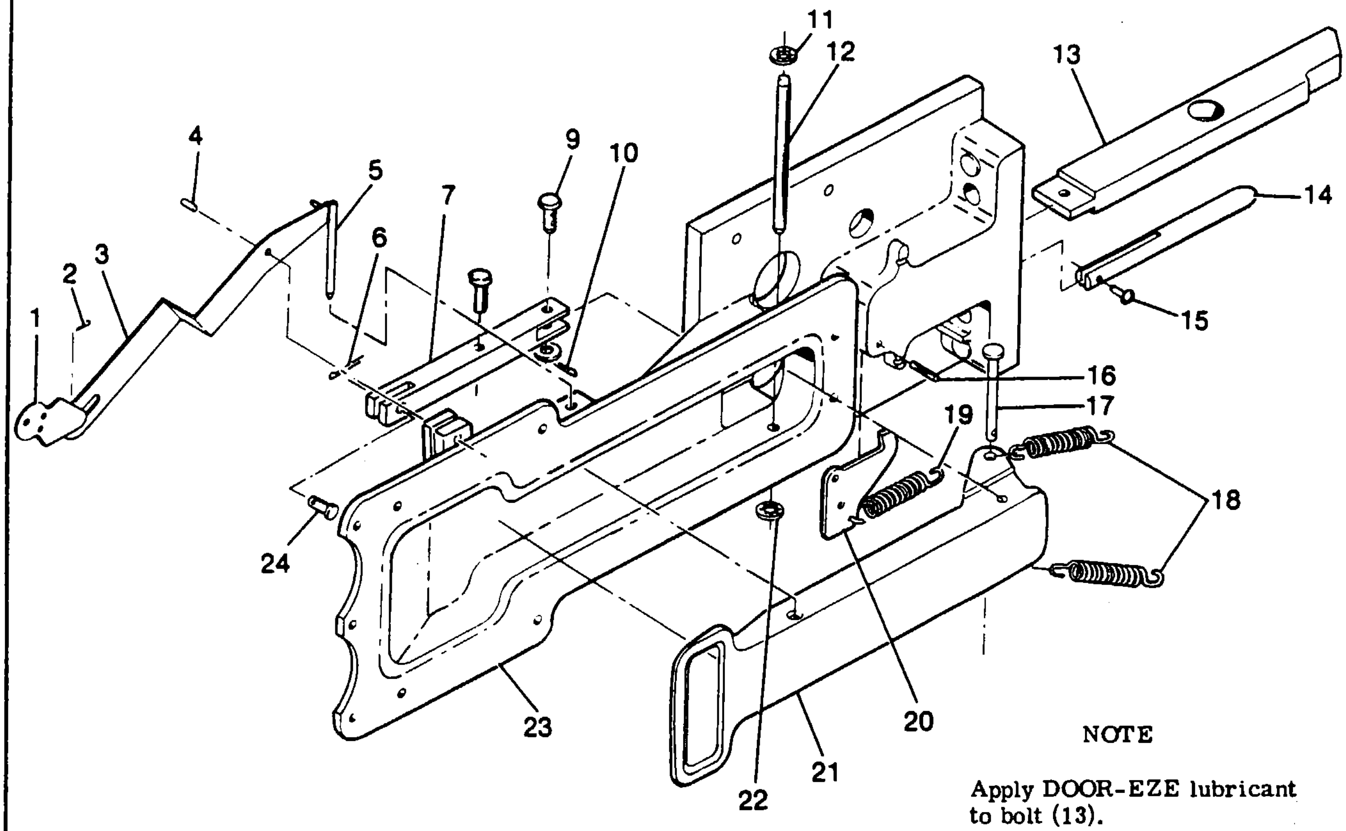
(LEFT HAND TYPICAL)
Detail G

17. Spring
18. Door Stop Arm
19. Pin
20. Hinge
21. Reinforcement
22. Stop Assembly
23. Spacer
25. Screw
26. Pull Handle
27. Clamp Cover
28. Clamp
29. Window Molding
37. Inboard Window
38. Outboard Window
39. Sealant
40. Inboard Window Seal
41. Inboard Window Seal Retainer

NOTES

The cutout in the inner door pan may be trimmed to maintain a .10" minimum clearance with the door stop arm. After tightening, spacers (23) must roll freely. Lubricate surface of spring (17) in contact with spacers (23) with hi-lo temp grease (MIL-G-21164C).
A fixed double paned window is installed in the right hand door as standard equipment.
As an option the openable type window may have been installed.
Seal outboard edge of outboard window with Inmont Corp. 579.6 sealant.
Drain Extension (43) and bonding agent used for this installation are available through Cessna Supply Division.
To install drain hole, loosen door seal enough to allow access to hole location on lower forward corner of cabin door.
Locate hole approximately 1 inch aft of intersection of door corner radius tangent.
Drill .193 (#10) hole in door inner skin pan (44), taking care not to allow drill to protrude into door outer skin.
Trim 1217060-1 drain extension (43) as required to fit door pan lip radius and bond in place over drain hole with Hexcelite 6109 A/B, insuring adhesive does not obstruct drain.
Reinstall door seal where loosened per paragraph 3-24, ensuring that drain hole remains clear.

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



NOTE

Apply DOOR-EZE lubricant to bolt (13).

1. Cam Assembly
2. Cotter Pin
3. Locking Arm
4. Pin
5. Pin
6. Cotter Pin
7. Pull Bar
8. Deleted
9. Pin
10. Cotter Pin
11. Lock Washer
12. Pin
13. Bolt
14. Push Rod
15. Rivet
16. Pin
17. Pin
18. Spring
19. Spring
20. Catch
21. Outside Handle
22. Lock Washer
23. Latch Base Assembly
24. Pin

Figure 3-4. Cabin Door and Latch Assembly (Sheet 1 of 3)

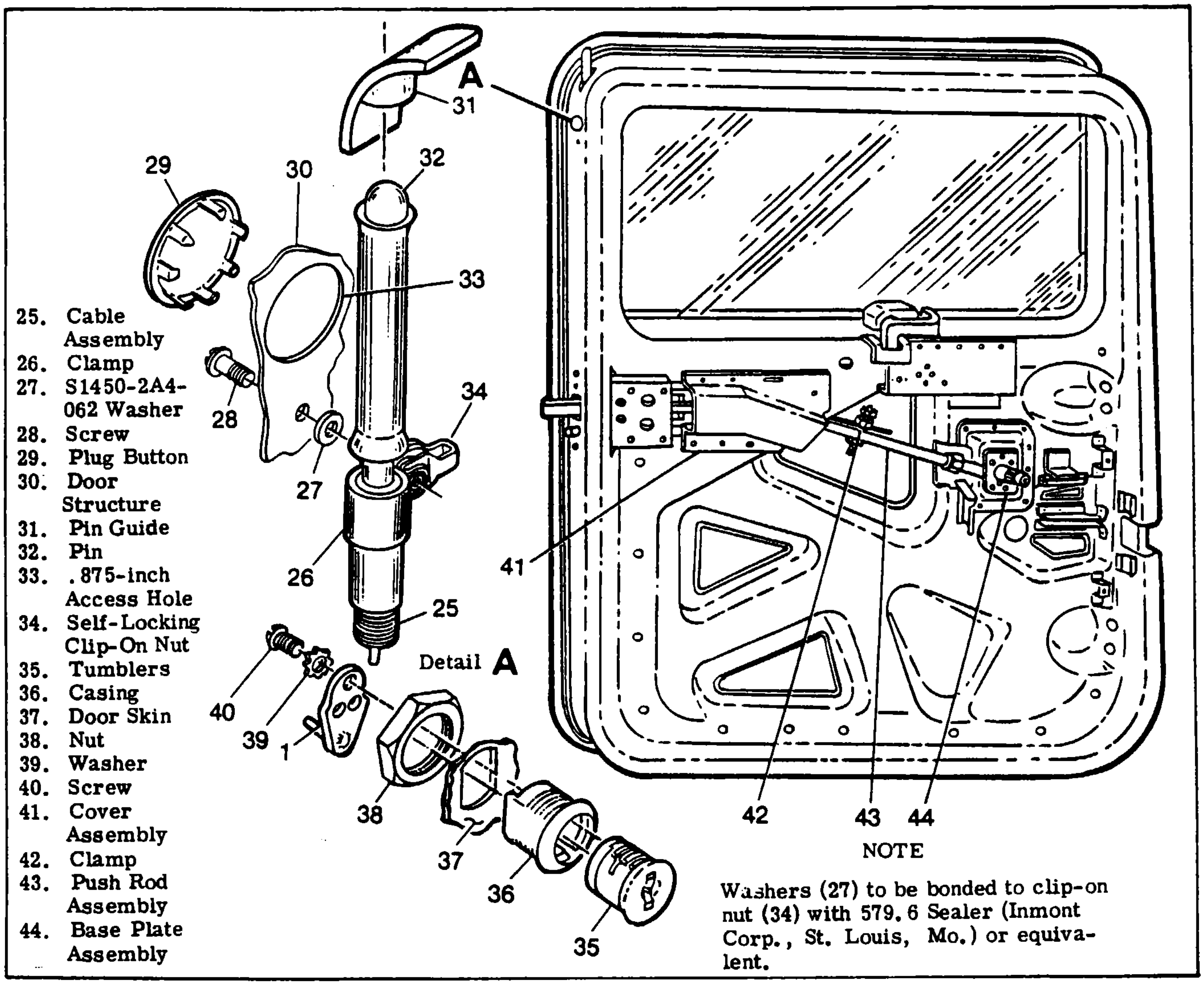


Figure 3-4. Cabin Door and Latch Assembly (Sheet 2 of 3)

NOTE

Make sure door latch is in OPEN position before proceeding.

a. Cut casing of cable assembly approximately two inches from clamp (42) on push rod assembly (43).
b. Insert core of cable through clamp (42).
c. Pull core through clamp so that pin (32) extends approximately 1/8-inch from door pan contour.
d. Cut core approximately one-inch forward of push rod clamp (42).
e. Secure two nuts to push rod clamp.
f. Operate latch several times to ensure latch works freely. If latch binds up and will not work freely, remove cable core from clamp (42) and operate latch. If latch operates easily without cable attachment, check cable for possible adjustments to facilitate ease of operation.
g. After cable operates freely, install cover assembly (41) and recheck cable for operation.

3-33. RIGGING INSIDE DOOR HANDLE. (See figure 3-4.)

a. With latch secured to door pan, attach push rod assembly (43) to pull bar (7), and secure with pin (9).

NOTE

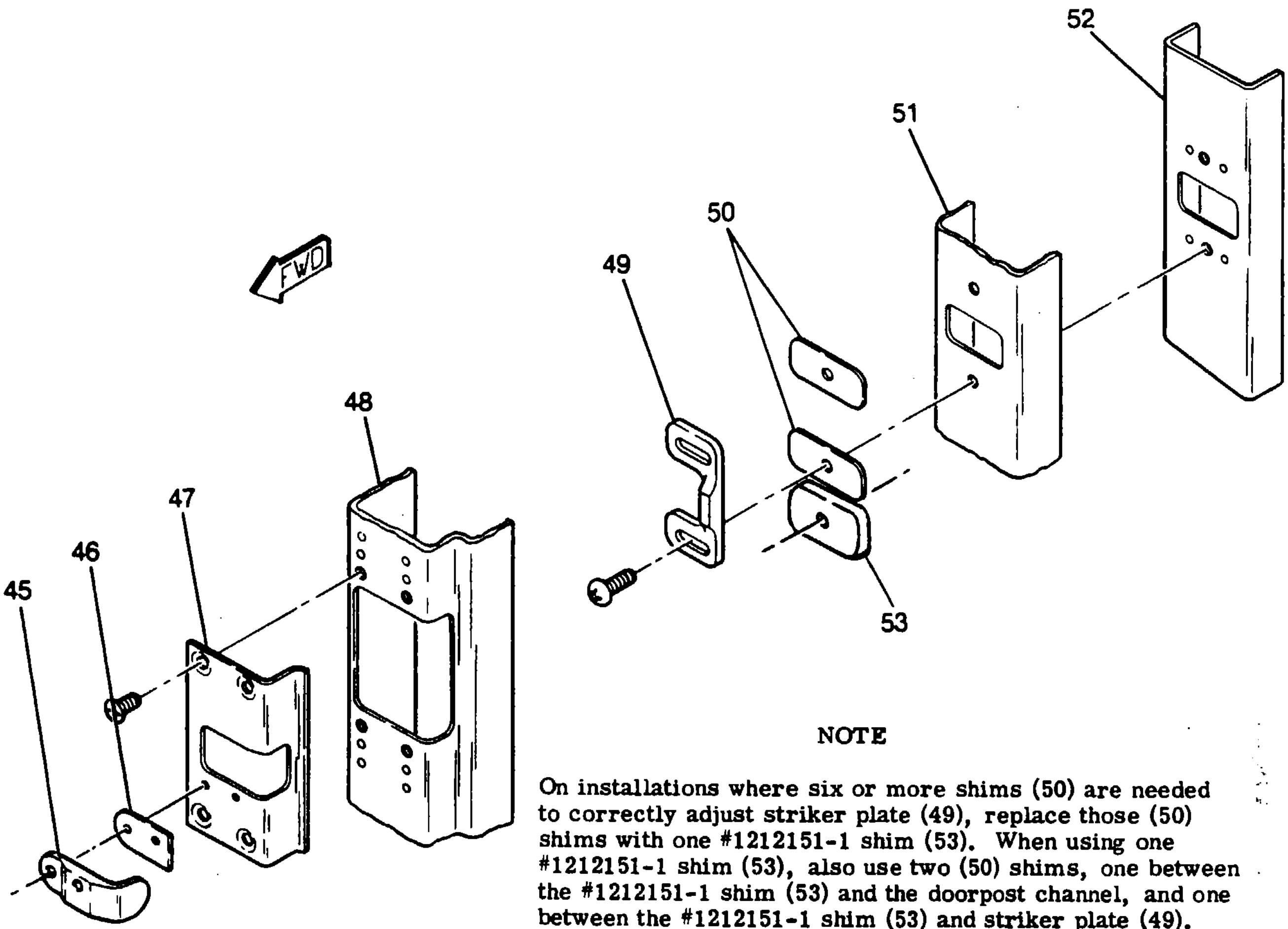
Do not install cotter pin (10).

b. Ensure that latch is in CLOSED position.
c. By removing pin (9) that connects push 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:



NOTE

On installations where six or more shims (50) are needed to correctly adjust striker plate (49), replace those (50) shims with one #1212151-1 shim (53). When using one #1212151-1 shim (53), also use two (50) shims, one between the #1212151-1 shim (53) and the doorpost channel, and one between the #1212151-1 shim (53) and striker plate (49). Where two or more #1212151-1 shims (53) are needed, use shims (50) as described above, plus, add one shim (50) between each #1212151-1 shim (53) used. In all cases, when shimming striker plate (49), be sure to retain minimal distance between striker plate (49) and cabin door latch bolt. Never grind the end of latch bolt to clear striker plate. Always remove shims as required to maintain minimal clearance.

NOTE

If cabin door is located forward such that the door latch will not operate, this will not allow the latch assembly push rod to ride up on the actuator and trigger the latch bolt. Install 1212150 shims as required beneath the actuator, located on the cover assembly.

45. Actuator
46. #1212150-1 Shim
47. Doorpost Jamb
48. Striker Plate Cover
49. Striker Plate
50. #1212147-1 Shim
51. Channel
52. Channel
53. #1212151-1 Shim

Figure 3-4. Cabin Door and Latch Assembly (Sheet 3 of 3)

NOTE

Cabin door latch must be in OPEN position. Latch must operate smoothly and freely.

1. Adjust striker plate (49) forward by installing 1212147-1 shims (50) as required, so that there is a minimal clearance between bolt (13) and striker (49).

NOTE

This adjustment will ensure that when the door is opened from the outside, the bolt 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 (14) to ride up on actuator (45) and trigger the latch bolt (13), install 1212150-1 shims (46) as required beneath actuator (45), located on cover assembly (48).

2. 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 rod from the door latch to the inside handle assembly should be lengthened, adjusted "out".

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.

3. To make 1/2 turn adjustment, remove smaller end of pushrod (43) and turn it over (180°). Then reinstall base plate assembly.

4. When closing cabin door from outside, by using a large, sharp force on outside handle, it is possible to overcenter inside handle, thus locking one's self out. To prevent this from occuring, when adjusting pushrod in step "2", adjust pushrod so there is a sufficient force (6 to 12 pounds) against inside handle to prevent it from overcentering when closing door from outside. (Refer to paragraph 3-35.)

5. Do not file, grind or sand any portion of the bolt.

6. Recheck clamps that secure cable. There must not be any slippage between cable casing and clamp.

7. After overcenter adjustment has been made, install cotter pin (10) in clevis pin (9).

e. Rivet latch base (23) to door skin with MS20426A4-3 rivets.

f. Attach lock assembly casing (36) to door skin (37) with nut (38) provided.

g. Install tumblers (35) and attach cam (1) to tumblers with screw and lock washer provided (40) and (39).

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

NOTE

Steps "f", "g" and "h" apply to left-hand doors only.

3-34. DOOR PULL HANDLE. (See figure 3-3.)

3-35. REMOVAL AND INSTALLATION. (See figure 3-3, sheet 2.) The figure may be used as a guide for removal and installation of the door pull handle.

3-36. BAGGAGE DOOR. (See figure 3-5.)

3-37. REMOVAL AND INSTALLATION.

a. Disconnect door stop.
b. Remove hinge pin.
c. Reverse preceding steps for reinstallation.

3-38. SEALING. (See figure 3-5.)

3-39. SCRUPPER DRAIN INSTALLATION. (See figure 3-5.)

a. Parts and materials required may be obtained from the Cessna Supply Division.
b. Installation is accomplished with trim panel under baggage door removed and carpet loosened along left side of floor.
c. Remove sealant from intersection of bulkhead (44), floor (45), and at lower left forward corner of compartment for drain to lower fuselage.
d. Drill .250" drain hole (46) in lower left forward corner of baggage compartment per detail F.
e. Install scupper (47) in lower left side of baggage compartment by bonding scupper to floor and at both ends with General Electric RTV-102 sealant.
f. Drill four number 40 holes through scupper (47) and floor (45), equally spaced, starting 2.5" from forward end. Install four sheetmetal screws (48).
g. Reinstall trim panel and carpet.

3-40. SEATS. (See figure 3-6.)

3-41. PILOT. (See figure 3-6, sheet 1.)

a. Articulating recline/vertical adjust.

3-42. COPILOT. (See figure 3-6, sheet 1.)

a. Articulating recline.
b. Articulating recline/vertical adjust.

3-43. 3RD AND 4TH.

a. Articulating recline.

3-44. DESCRIPTION. These seats are manually-operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-45. REMOVAL AND INSTALLATION.

a. Remove seat stops. (Refer to figure 3-6.)
b. Disengage the seat adjustment pin.
c. Slide seat fore-and-aft to disengage seat rollers from rails.
d. Lift seat out.

e. Reverse preceding steps for reinstallation. Ensure all seat stops are reinstalled.

WARNING

It is extremely important that the pilot's seat stops are installed. Acceleration and deceleration could possibly permit seat to become disengaged from the seat rails and create a hazardous situation, especially during take-off and landing.

3-46. BENCH. (See figure 3-6, sheet 3 and figure 3-6A.)

3-47. DESCRIPTION. These seats incorporate no adjustment provisions and are bolted to the cabin structure. The seat back folds down to provide addition storage space on top of the main gear wheel well and on top of the seat back. The seat bottom may be removed from the frame by removing two bolts.

3-48. REMOVAL AND INSTALLATION.

a. Pull up on knob (1) to unlatch seat back.

b. Remove pin (10) from guide (8) on each side of seat back.

c. Remove bolts (14) from the three seat legs.

d. Remove bolts (9) from both sides of seat bottom.

NOTE

Bolts (9) are located inside the main gear wheel well.

e. With the seat back folded down, use care and slide the two inside seat belts out from between the seat back and bottom. Remove seat from aircraft.

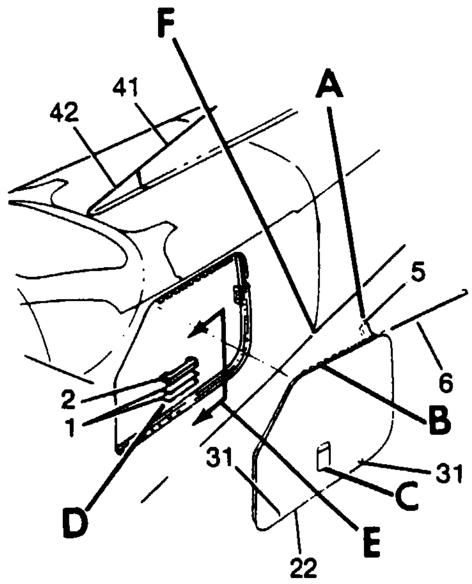
f. Reverse preceding steps for reinstallation.

3-49. REPAIR. Replacement of defective parts is recommended in repair of seats.

3-50. CABIN UPHOLSTERY. Due to the wide selection of fabrics, styles and colors, it is impossible to depict each particular type of upholstery. The following paragraphs describe general procedures which will serve as a guide in removal and replacement of upholstery. Major work, if possible, should be done

SHOP NOTES:

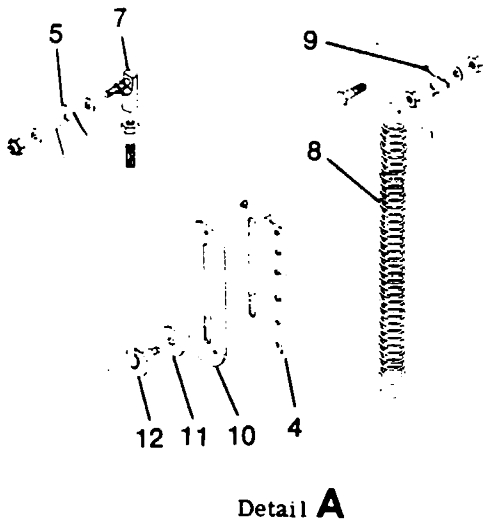
1. Shim
2. Striker
3. Hinge Half
4. Rod Support Bracket
5. Bracket
6. Hinge Pin
7. Ball Joint
8. Balance Spring
9. Bulkhead
10. Escutcheon
11. Washer
12. Door Stop
13. Nut
14. Latch Assembly
15. Spacer
16. Outer Skin
17. Seal
19. Handle
20. Lock Assembly
21. Cam
22. Baggage Door
23. Latch Bolt
24. Bearing Assembly
25. Latch Pan Assembly
26. Link Bolt
27. Handle Shaft
28. Lock Cover
29. Washer
30. Lock Screw
31. Drain Hole
33. Sealant
34. Bulkhead
35. Skin
36. Floor
37. Stringer
39. Circular Seal
40. Inner seal Pan
41. Dorsal Fin
42. Fin Fairing
43. Door Jam

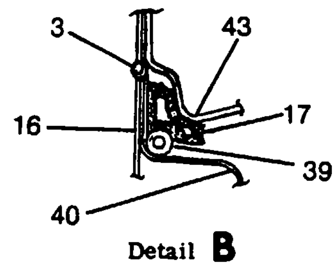


NOTES

- Check that all attaching screws in dorsal fin (41) are tight. Seal fin fairing (42) and three attaching screws with Inmont 576.1.
- Install hinge pin (6) from aft end of door assembly (22) with end bend inboard of hinge.
- Check that loop on aft end of baggage door hinge pin (6) does not interfere with seal (17) when door is closed. Reform loop as necessary to prevent hinge pin (6) from rotating and compressing seal (17).
- Ensure baggage door inner seal pan (40), provides a smooth mating surface for door seal (17). Fill any low areas with White Streak filler, sand until smooth and repaint.
- Install shims (1) as required to obtain engagement shown in Detail D between striker plate (2) and baggage door latch bolt (23).
- Install washers (29) as required to align link (26) perpendicular to handle shaft (27). At least one washer must be installed between link and cotter pin.
- Bond seal (17) around baggage door with EC-880 (3M Co.) or equivalent. Locate butt ends of seal at door low point, no closer than 2.00 inches to latch assembly.
- Cut small notch in one end of hollow seal (17) to allow for drainage. Do not cement butt ends together.
- Seal lock screw (30) to cap (28) and area where cam (21) passes thru cap with RTV-102 (General Electric Co.) or equivalent.
- Ensure drain holes (31) are clear.
- The baggage door is of bonded construction. Reforming of this door is not permissible as material separation may occur in the flange area.
- Apply Inmont Corp. 576.1 sealant (33) to open areas between striker and jamb per detail D.
- Seal baggage compartment structure for water tight seal by applying RTV 102 (General Electric Co.) sealant at openings and intersections of bulkhead, skin, floor and stringers per detail F.
- Seal intersection of door jam (43) and outer skin (16) with Inmont Corp. 576.1 sealant.
- If baggage door continues to leak around seal in hinge area after all sealing procedures have been used, a length of S-1453-1 circular cross section seal may be used as a back-up to reinforce the door seal (17). Cement S-1453-1 seal (39) with 3-M Co. EC-880 adhesive to door inner skin pan (40) per detail B along the full length of hinge area and down the forward and aft sides approximately three inches. Readjust baggage door as necessary.

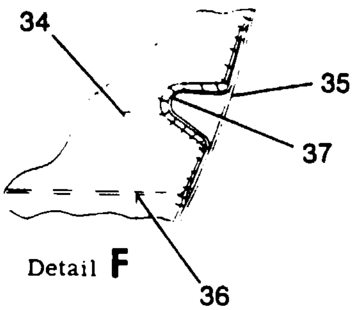
Figure 3-5. Baggage Door Installation and Compartment Sealing (Sheet 1 of 3)

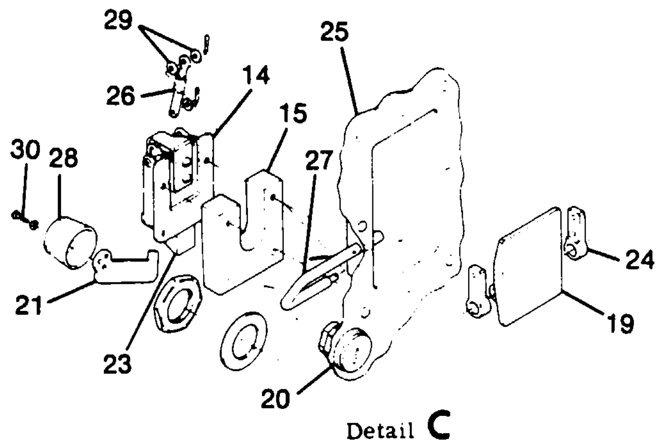


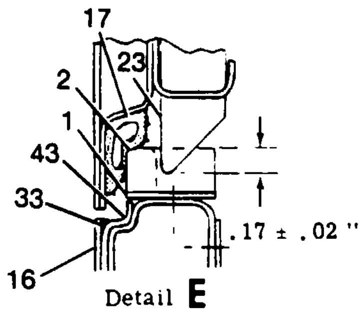


NOTE

Locate edge of seal (17) 1/8 inch or less from edge of outer perifery of baggage door.







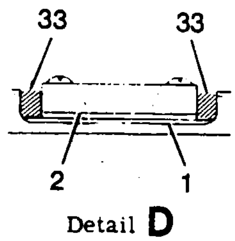
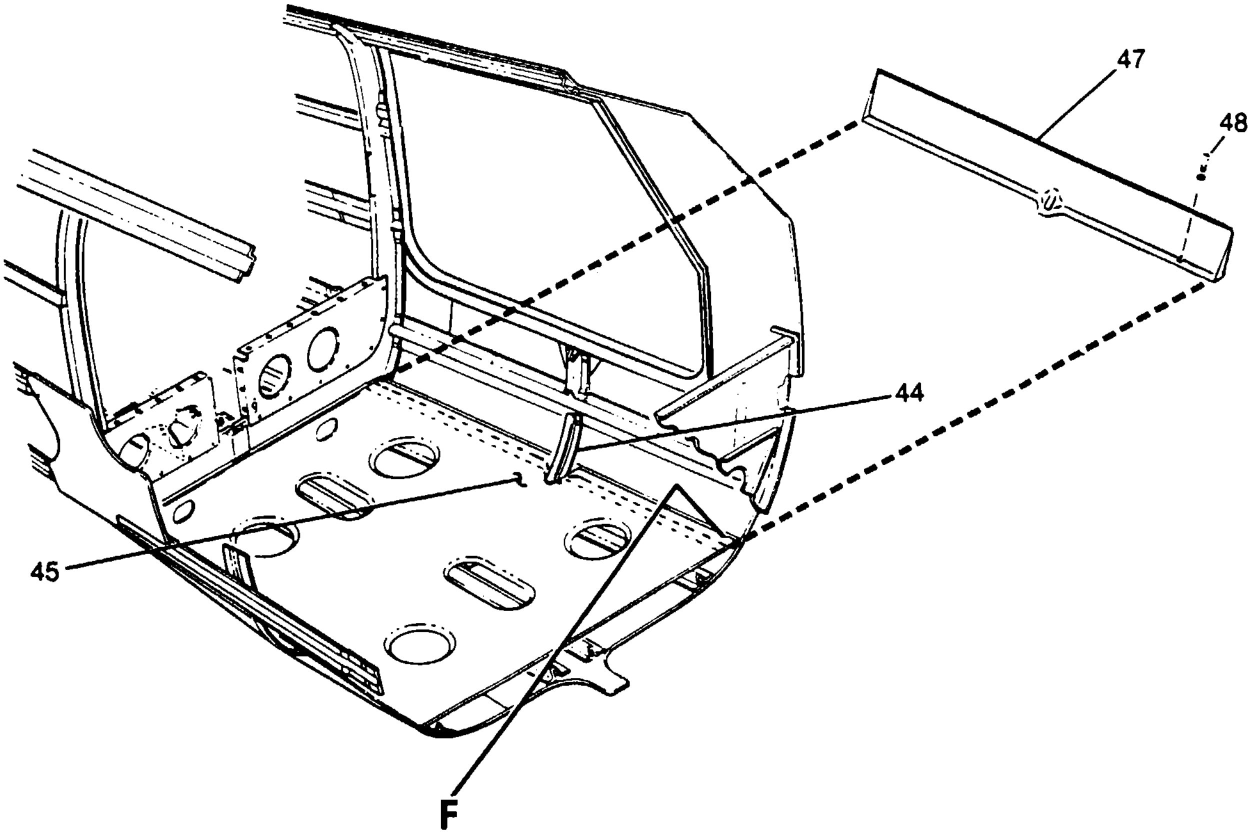
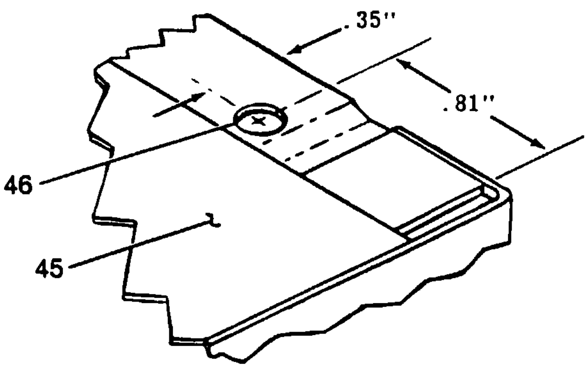


Figure 3-5. Baggage Door Installation and Compartment Sealing (Sheet 2 of 3)



BAGGAGE COMPARTMENT

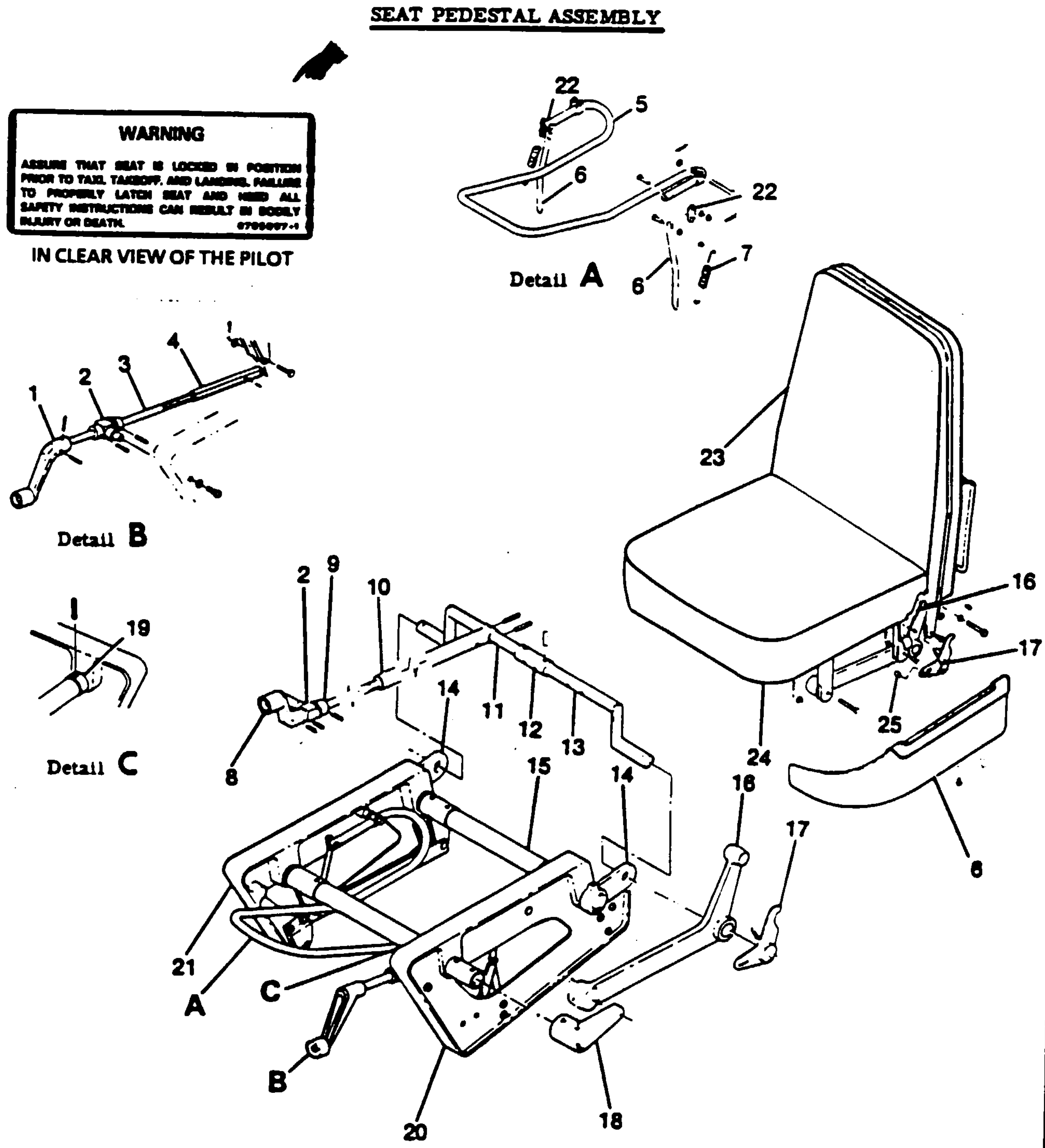


Detail F

44. Bulkhead
45. Floor
46. Drain Hole
47. Scupper
48. Screw

SCUPPER DRAIN INSTALLATION

Figure 3-5. Baggage Door Installation and Compartment Sealing (Sheet 3 of 3)

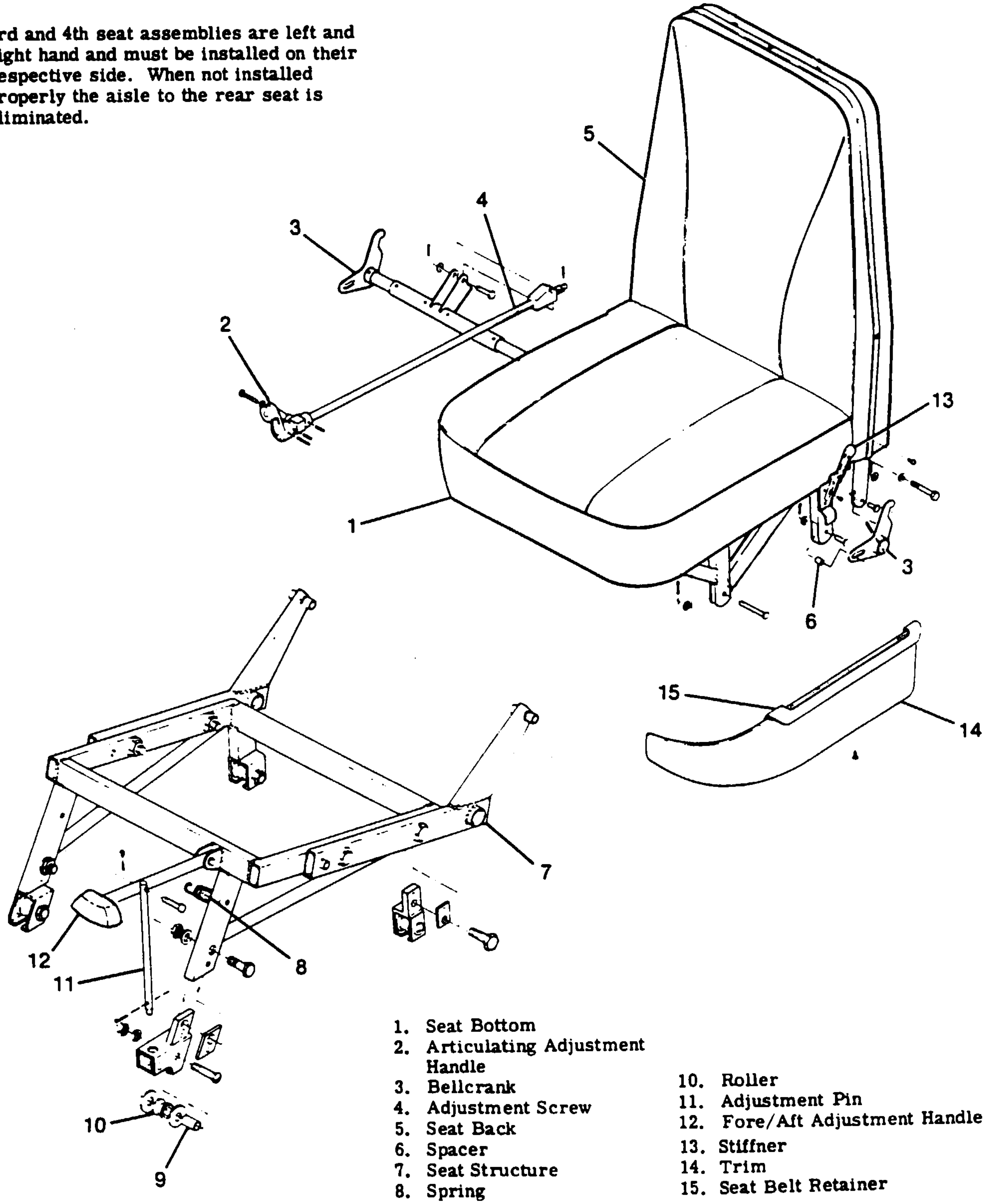


1. Vertical Adjust Handle
2. Bearing Block
3. Vertical Adjust Screw
4. Vertical Adjust Nut
5. Seat Adjust Handle
6. Seat Adjust Pin
7. Spring
8. Seat Back Adjust Handle
9. Bearing
10. Jack Screw
11. RH Crank
12. Splice
13. LH Crank
14. Torque Tube Bellcrank
15. Rear Torque Tube
16. Seat Pivot Bracket
17. Seat Back Adjust Bellcrank
18. Forward Torque Tube Bellcrank
19. Collar
20. LH Pedestal
21. RH Pedestal
22. Link-Seat Lock
23. Seat Back
24. Seat Bottom
25. Spacer
26. Trim

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

NOTE

3rd and 4th seat assemblies are left and right hand and must be installed on their respective side. When not installed properly the aisle to the rear seat is eliminated.



1. Seat Bottom
2. Articulating Adjustment Handle
3. Bellcrank
4. Adjustment Screw
5. Seat Back
6. Spacer
7. Seat Structure
8. Spring
9. Bushing
10. Roller
11. Adjustment Pin
12. Fore/Aft Adjustment Handle
13. Stiffner
14. Trim
15. Seat Belt Retainer

ARTICULATING RECLINE
3RD AND 4TH

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

PILOT'S AND COPILOT'S SEAT STOP INSTALLATIONS

WARNING

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

1. Seat Rail (INBD)
2. Anchor Pin
3. Cotter Pin
4. Seat Stop

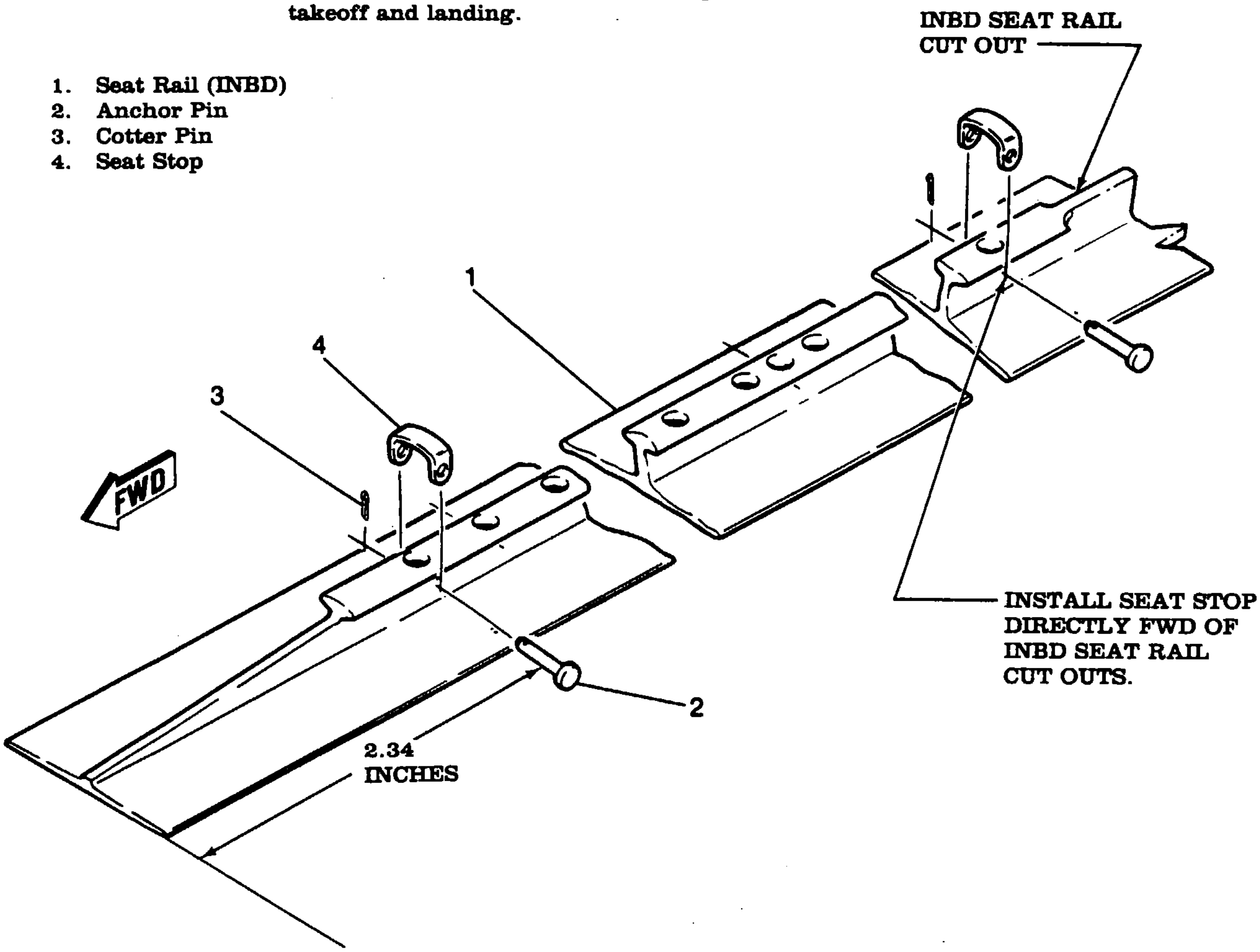
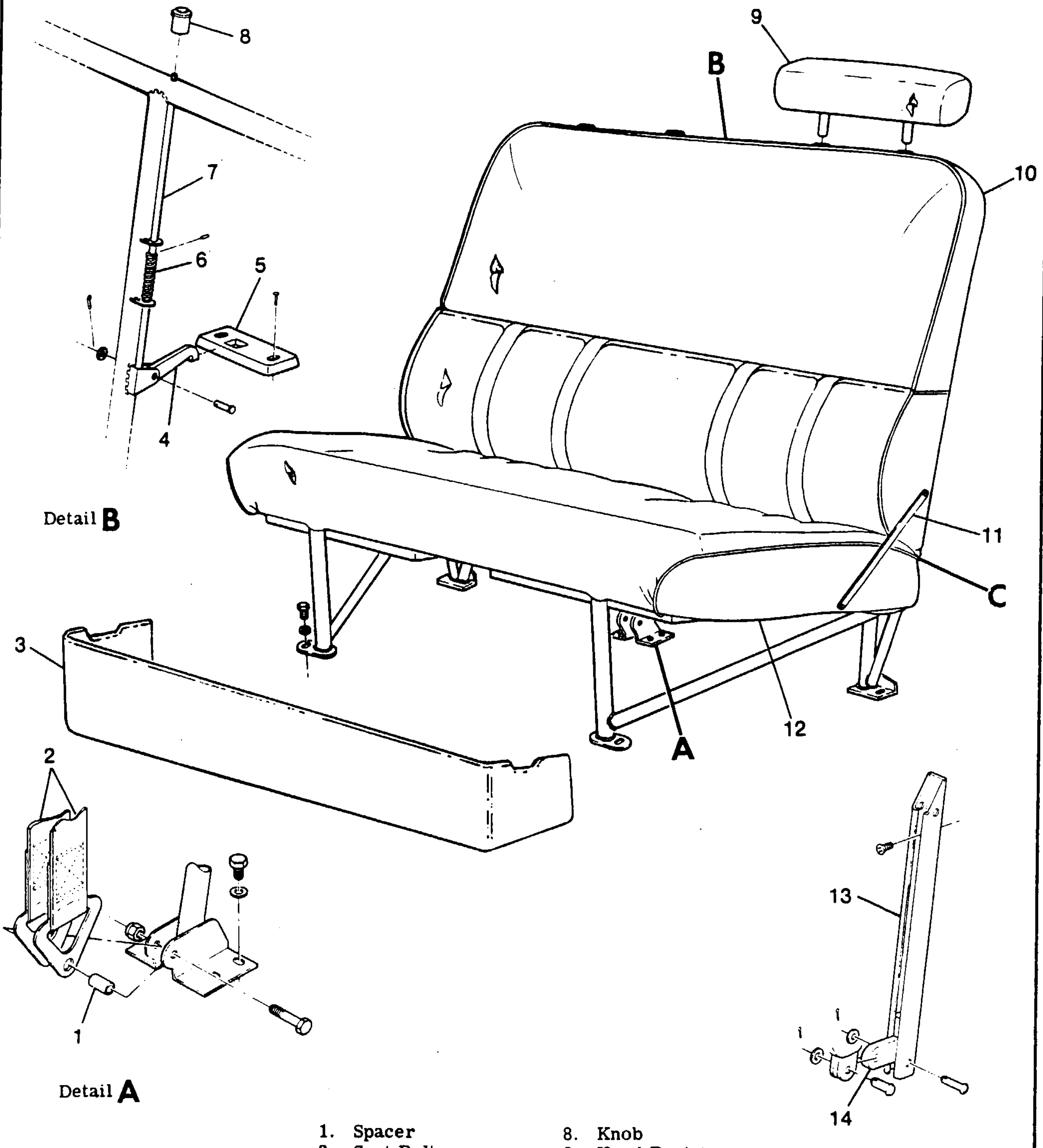


Figure 3-6. Seat Installation (Sheet 3 of 3)



1. Spacer
2. Seat Belt
3. Seat Skirt
4. Latch
5. Striker
6. Spring
7. Release Pin
8. Knob
9. Head Rest
10. Seat Back
11. Pivot Arm
12. Seat Bottom
13. Track
14. Guide

Figure 3-6A. Rear Bench Seat

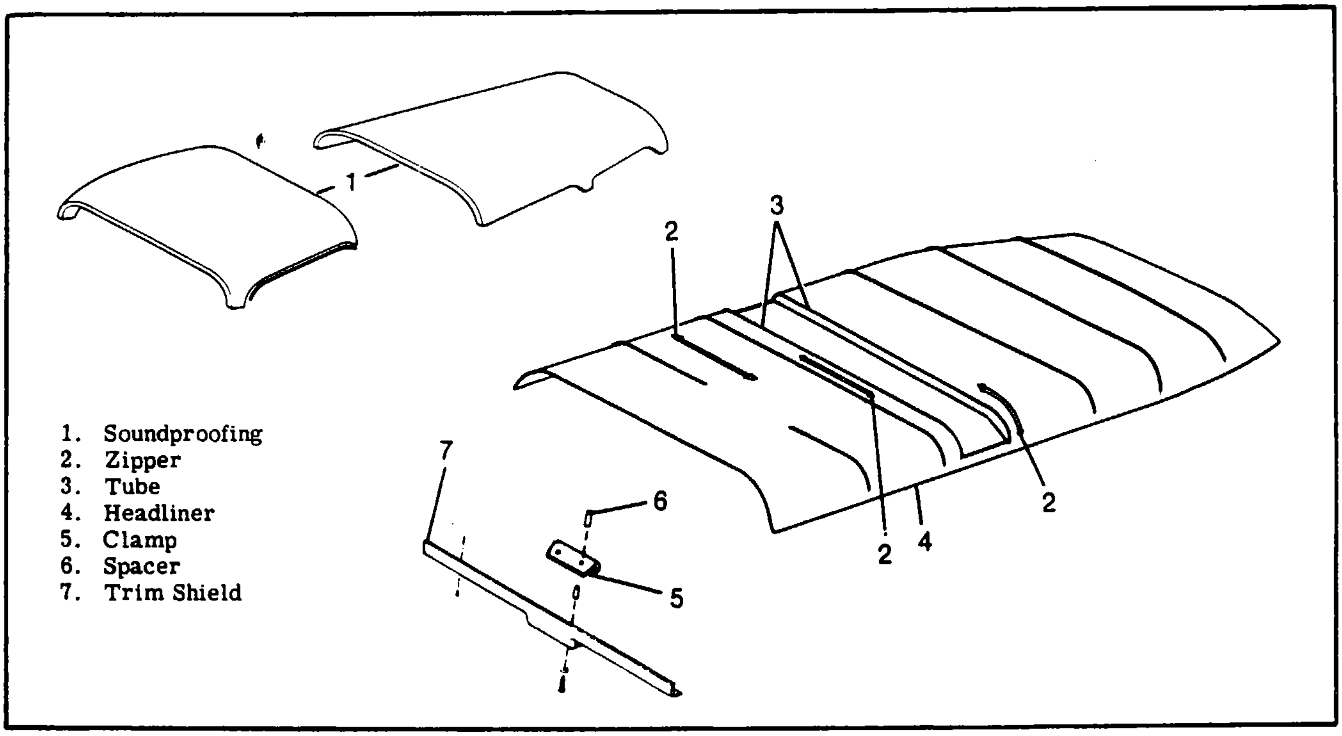


Figure 3-7. Cabin Headliner Installation

by an experienced mechanic. If the work must be done by a mechanic unfamiliar with upholstery practices, the mechanic should make careful notes during removal of each item to facilitate replacement later.

3-51. MATERIALS AND TOOLS. Materials and tools will vary with the job. Scissors for trimming upholstery to size and a dull-bladed putty knife for wedging material beneath retainer strips are the only tools required for most trim work. Use industrial rubber cement to hold soundproofing mats and fabric edges in place. Refer to Section 18 for thermoplastic repairs.

3-52. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound deadener compound applied to inner surfaces of the skin in most areas of the cabin and baggage compartment. All soundproofing material should be replaced in its original position any time it is removed. A soundproofing panel is placed in the gap between wing and fuselage and held in place by the wing root fairings.

3-53. CABIN HEADLINER. (See figure 3-7.)

3-54. REMOVAL.

a. Remove all overhead oxygen, ventilating and light consoles, sun visors, dome lights, all inside finish strips and plates and any other visable retainers securing headliner.

b. Work edges of headliner free from metal teeth which hold fabric.

c. Starting at the front of headliner and working toward the rear, work headliner down, removing screws through the metal tabs which hold the wire bows to cabin top. Pry loose outer ends of the bows from retainers above doors. Detach each wire bow in succession.

d. Remove headliner assembly and bows from the aircraft.

NOTE

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

e. Remove the spun glass soundproofing panels.

NOTE

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

3-55. INSTALLATION.

a. Before installation, check all items concealed by headliner for security. Use wide cloth tape to secure loose wires to the fuselage and to seal any openings in the wing roots. Straighten tabs bent during removal of headliner.

b. Apply cement to inside of skin in the areas where soundproofing panels are not supported by wire bows and press soundproofing in place.

c. Insert wire bows into headliner seams and secure the two bows at rear of headliner. Stretch the material along edges to properly center, but do not stretch it tight enough to destroy ceiling contours or distort wire bows. Secure edges of headliner with the metal teeth.

d. Work headliner forward, installing each wire bow in place with the metal tabs. Wedge ends of wire bows into the retainer strips. Stretch headliner just taut enough to avoid wrinkles and maintain a smooth contour.

e. When all bows are in place and fabric edges are secured, trim off excess fabric and reinstall all items removed.

3-56. UPHOLSTERY PANELS.

3-57. REMOVAL AND INSTALLATION. Removal of the upholstery side panels is accomplished by removing the seats for access and removing screws, retaining strips and ash trays as required to free the panels. When reinstalling side panels, do not overtighten screws. Larger screws may be used in enlarged holes as long as the area behind the hole is checked for wiring, fuel lines and other components which might be damaged by using a longer screw. Automotive type spring clips attach the door panels and a dull putty knife makes an excellent tool for prying the clips loose. The rear baggage panel is secured to the aft cabin wall with cloth retaining strips for easy removal.

3-58. CARPETING.

3-59. REMOVAL AND INSTALLATION. Cabin area and baggage compartment carpeting is held in place by rubber cement, small sheet metal screws and retaining strips. Cloth retaining strips are also installed on some aircraft near access plate locations for quick-removal of the carpeting and inspection in these areas. When fitting a new carpet, use the old one as a pattern for trimming and marking screw holes.

3-60. SAFETY PROVISIONS.

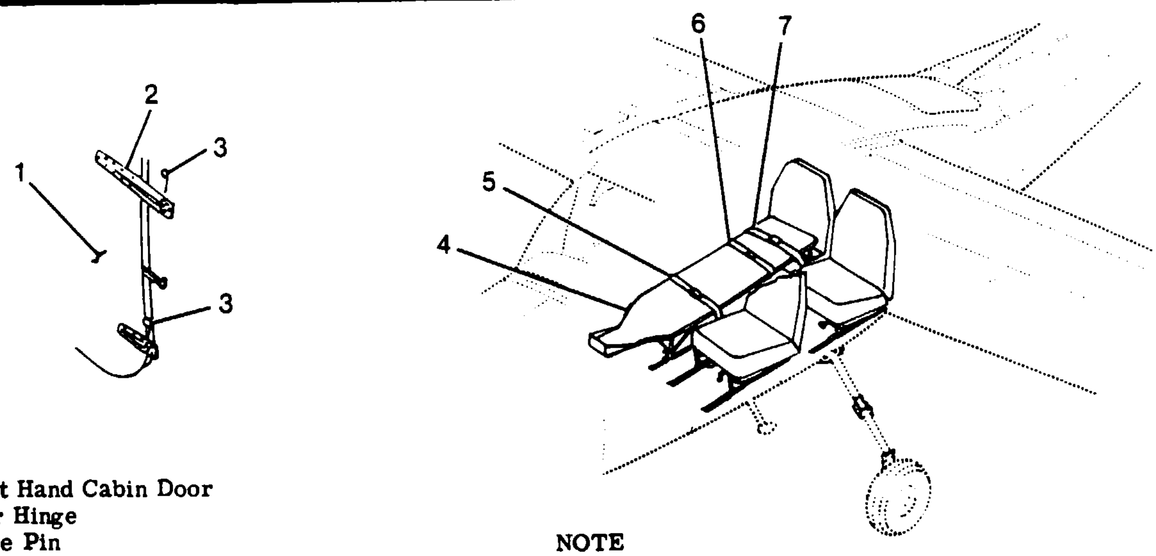
3-61. BAGGAGE RETAINING NET.

3-62. DESCRIPTION. A nylon baggage net having six tie-down straps is provided to secure baggage in the area aft of the wheel well and on the backs of the fifth and sixth seats when they are used for stowing baggage. When using the baggage net to secure baggage stowed aft of the wheel well, only four of the net tie-down straps are usually used. They are fastened to the two tie-down rings located on the forward edge of the wheel well and two rings at the bottom edge of the rear cabin window. If the fifth and sixth seats are not occupied, the seat backs may be folded forward to create more baggage area. If this area is used, all six tie-down straps must be used. Tie the front straps of the net to the front legs of the fifth and sixth seats and the remaining four straps to the tie-down rings provided.

3-63. SAFETY BELTS. (See figures 3-6 and 3-10.)

3-64. DESCRIPTION. Safety belts should be replaced if frayed or cut, latches are defective or stitching is broken. Attaching parts should be replaced if excessively worn or defective. The pilot and copilot seat safety belts are attached to brackets

Figure 3-8. DELETED - NOT USED



1. Right Hand Cabin Door
2. Door Hinge
3. Hinge Pin
4. Stretcher
5. Copilot Seat Belt
6. Stretcher Belt
7. Right Hand Center Seat Belt

NOTE

Removable door hinge pins are used when stretcher is installed for easy access to the stretcher.

Figure 3-9. Stretcher Installation

bolted to the cabin floor. The 3rd and 4th seat belts are attached to brackets bolted to the cabin floor and fuselage structure. The bench seat belts are attached to a bracket bolted to the cabin floor and to the seats themselves.

NOTE

The belt half with the buckle should be installed on the outboard side of the seat to ensure proper operation of the shoulder harness.

3-65. SHOULDER HARNESS. (See figure 3-10.)

3-66. DESCRIPTION. Individual shoulder harnesses are installed for each seat. The pilot and copilot harnesses are bolted to the upper rear doorposts and the 3rd, 4th and bench seat harnesses are bolted to the aft cabin structure.

3-67. INERTIA REEL HARNESS. (See figure 3-10.)

3-68. DESCRIPTION. An inertia reel harness assembly may be installed for the pilot and copilot positions. The inertia reels are installed in a mounting base located in the aft center overhead console. The shoulder and lap belt are one assembly with an adjuster to position the shoulder harness. The reel is designed to lock and hold when a 2 to 3 "g" force is applied and 12 inches of webbing remain on the reel. The reel can be checked for proper operation by giving webbing a quick tug, the reel should lock and hold.

3-69. REMOVAL AND INSTALLATION.

a. Remove the screws retaining the escutcheon on aft center console and remove the oxygen outlet covers by rotating counter-clockwise if installed.

b. Remove screws in mounting bracket and remove (2) screws in each reel assembly and pull belt through bracket.

c. Re-install by reversing the procedure.

3-70. GLIDER TOW-HOOK.

3-71. DESCRIPTION. A glider tow-hook, which is mounted in place of the tail tie-down ring, is available thru 21062954.

3-72. Deleted - Not Used.

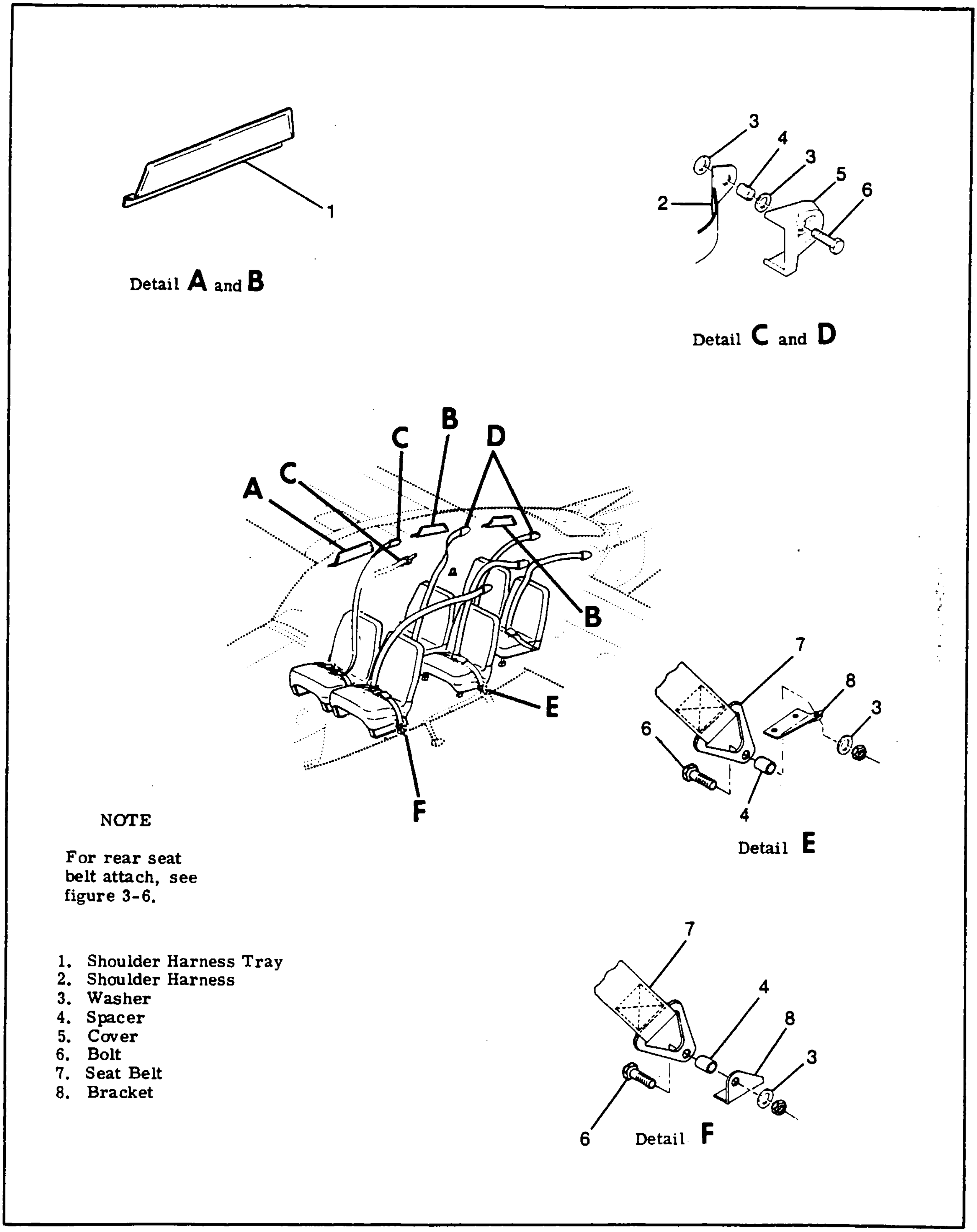
3-73. Deleted - Not Used.

3-74. STRETCHER INSTALLATION. (See figure 3-9.)

3-75. DESCRIPTION. A portable stretcher may be installed in the aircraft. The stretcher is installed by removing the copilot seat and utilizing the copilot's seat belt and the right hand center seat and seat belt.

3-76. REMOVAL AND INSTALLATION.

a. Remove copilot's seat and store in baggage com-



NOTE

For rear seat belt attach, see figure 3-6.

1. Shoulder Harness Tray
2. Shoulder Harness
3. Washer
4. Spacer
5. Cover
6. Bolt
7. Seat Belt
8. Bracket

Figure 3-10. Seat Belt and Shoulder Harness Installation (Sheet 1 of 2).

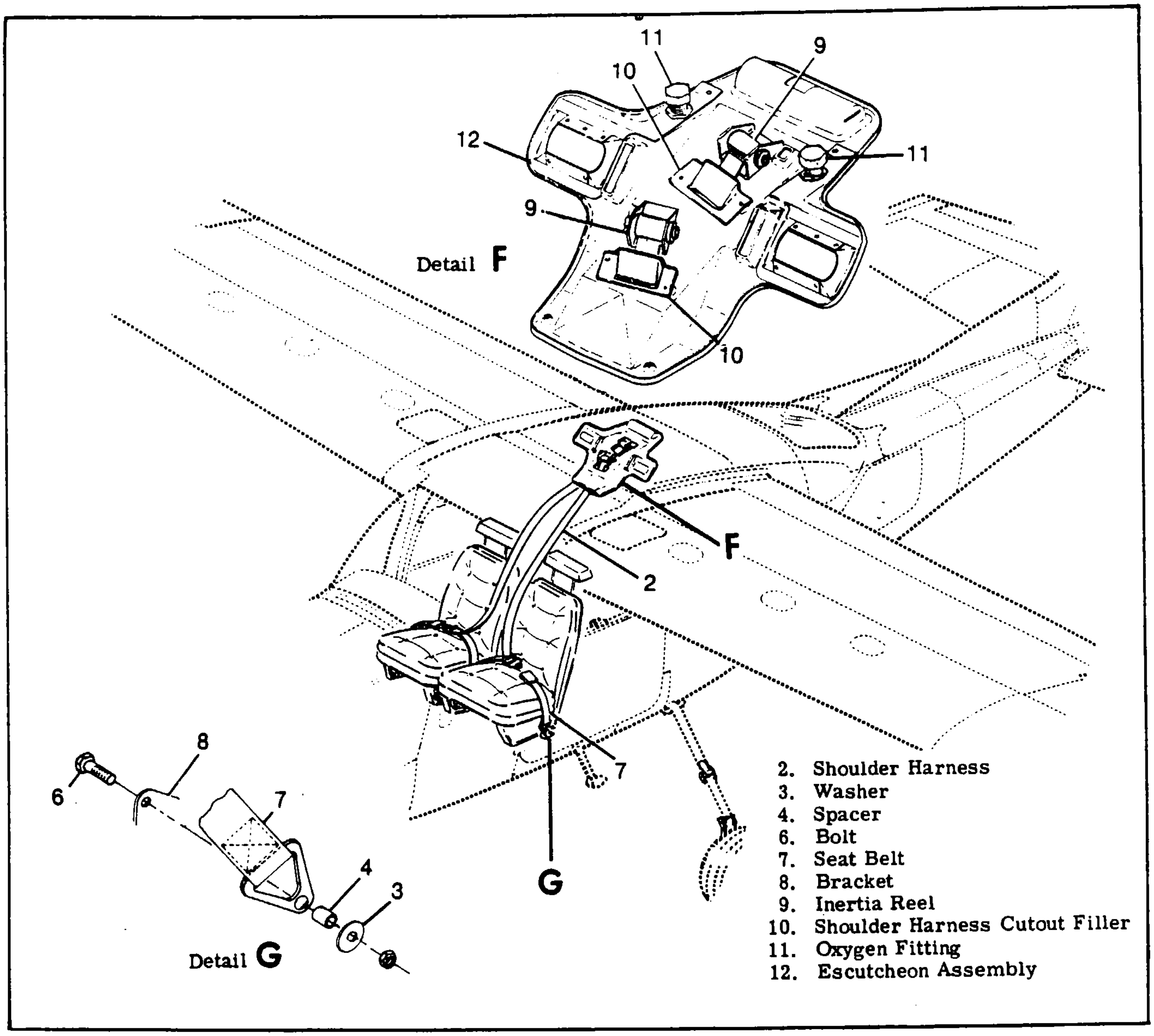


Figure 3-10. Seat Belt and Shoulder Harness Installation (Sheet 2 of 2).

partment.

b. Replace right hand cabin door hinge pins with removable hinge pins.

c. Replace right hand cabin door stop hinge rivet with a pin, washer and cotter pin.

d. Pass stretcher through cabin door, head-end first. Rotate stretcher until head end rests on right hand center seat. Engage legs at the foot of the stretcher with copilot seat rails and secure locking pin on inboard leg.

e. Secure head end of stretcher with right hand center seat belt.

3-77. CABIN STEP INSTALLATION. (See figure 3-11.)

3-78. DESCRIPTION. To facilitate entry and exit from the aircraft, a retractable step is installed. The step is operated by a cable assembly attached to the nose gear actuator and is extended and retracted with the nose gear.

3-79. REMOVAL AND INSTALLATION. (See figure 3-11.)

a. Remove the co-pilot seat, carpeting, inspection covers and step cover as required to gain access to the step assembly.

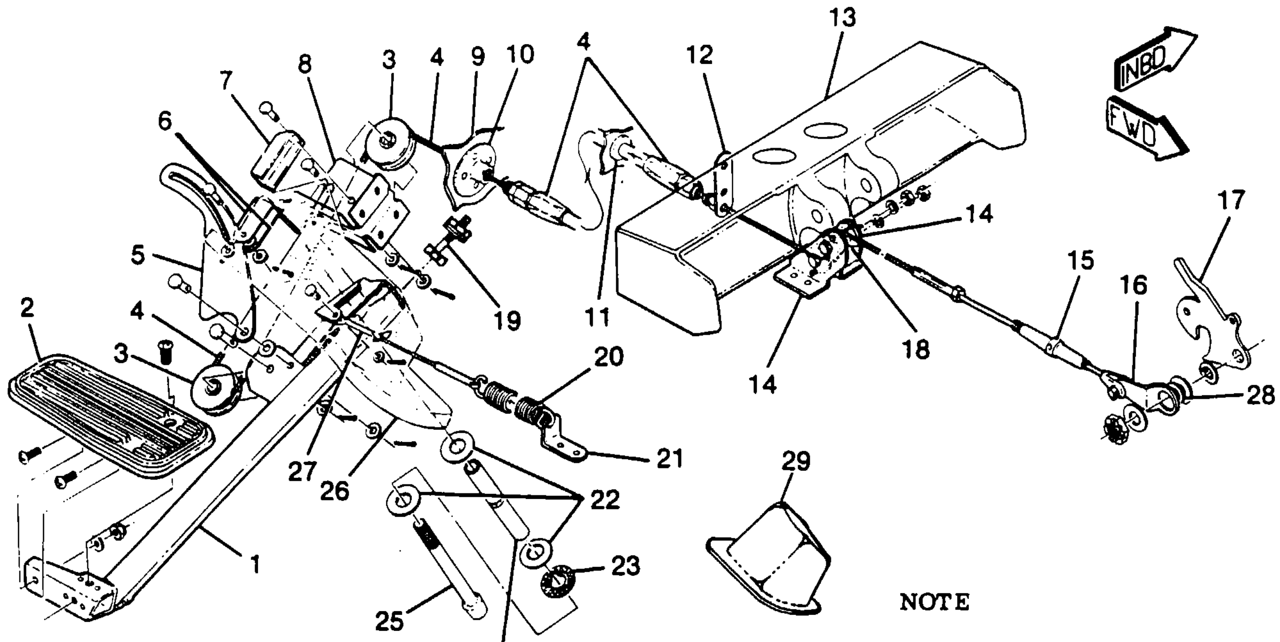
b. Disconnect cable (27) by removing the cotter pin and the attaching pin located at the end of the cable.

c. Disconnect cable (4) by removing pulley (3) from the step assembly. Retain the pulley for reinstallation.

d. Remove the attaching pin from the cable cover (5) and bracket (6).

e. Remove bolt (25) and remove the step assembly from the aircraft.

f. To install cabin step, reverse the preceding steps.



NOTE

Step tread is bonded to step assembly (2) with EC-1300L (3M Company, St. Paul, Minnesota 55101) or equivalent.

Cover seal (7) is bonded to pulley bracket (8) with EC-1300L or EC-880 (3M Company, St. Paul, Minn. 55101) or equivalent adhesive and sealed with RTV102 white adhesive sealant (General Electric, Waterford, New York) or equivalent sealant.

NOTE

Lubricate bushing (24) and bearing (23) with MIL-G-21164 grease. Cable assemblies (4) and (27) may be lubricated with Petrolatum VV-P-236.

Washers may be added or deleted from stop bolt (19) to adjust travel of step attach assembly (1). No specific measurement is required; only to facilitate entry and exit from aircraft.

1. Step Attach Assembly
2. Step Assembly
3. Pulley
4. Cable Assembly
5. Cable Cover
6. Bracket
7. Cover Seal
8. Pulley Bracket
9. Bulkhead Station 44.0
10. Boss
11. Grommet
12. Fitting Assembly
13. Nose Gear Drag Fitting
14. Pulley Bracket
15. Turnbuckle
16. Spring Clip
17. Nose Gear Attach Hook
18. Pulley
19. Stop Bolt
20. Spring
21. Bracket
22. Race
23. Bearing
24. Bushing
25. Internal Wrenching Bolt
26. Support
27. Cable Assembly
28. Spacer
29. Step Support Cover

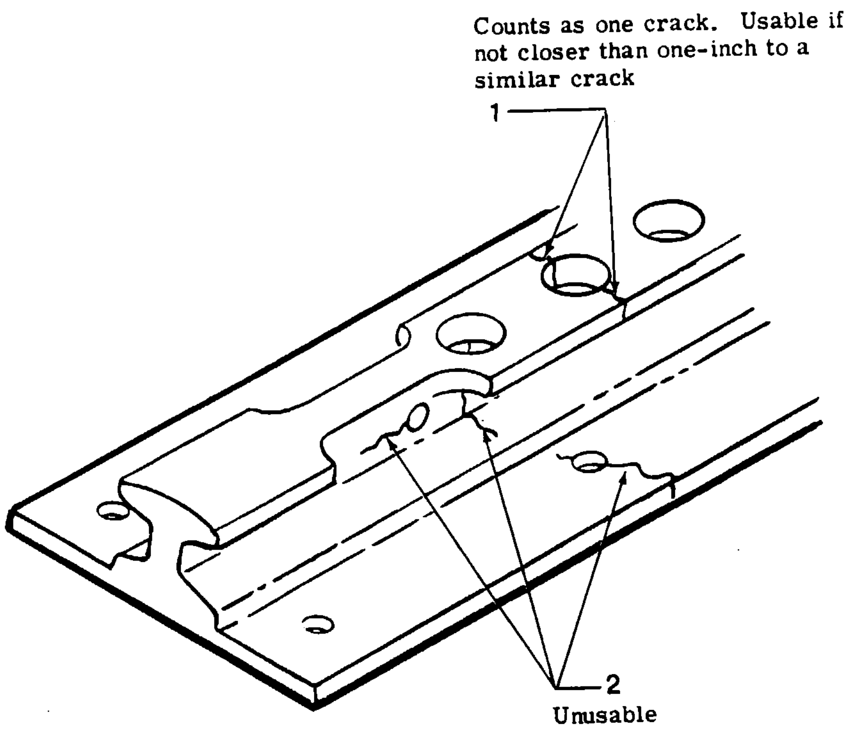
Figure 3-11. Cabin Step Installation

NOTE

For cable rigging instructions refer to Section 5. When rigging procedure is complete, safety wire turnbuckle (15).

g. Refer to Section 5 for removal and installation of components not specifically called out in the preceding steps.

3-80. SEAT RAIL INSPECTION. A special inspection of the seat rails should be conducted each 50 hours. See figure 3-12 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 in any direction other than right angle to length of crack.
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 3-12. Seat Rail Inspection

SECTION 4

WINGS AND EMPENNAGE

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4-1. WINGS AND EMPENNAGE.

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

4-3. DESCRIPTION. Each all-metal wing panel is a full cantilever type, with a single main spar, two fuel spars, formed ribs and stringers. The front fuel spar also serves as an auxiliary spar and provides the forward attachment point for the wing. An inboard section of the wing, forward of the main spar, is sealed to form an integral fuel bay area. Stressed skin is riveted to the spars, ribs and stringers to complete the structure. An all-metal, balanced aileron, flap, and a detachable wing tip are part of each wing assembly. A navigation light is mounted in each wing tip.

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

a. Remove wing gap fairings and fillets.

b. Drain fuel from wing being removed. (Observe precautions outlined in Section 13.)

c. Remove cabin headliner in accordance with procedures outlined in Section 3.

WARNING

Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

d. (Refer to Section 15.) Rotate valves on three cylinders clockwise to shut off filler line pressure; the quick-release adapter on the cylinder-regulator assembly will retain pressure within the cylinder. Disconnect oxygen filler line at first tee upstream from filler valve.

e. Disconnect:
1. Electrical wires at wing root disconnects.
2. Fuel lines at wing root.
3. Pitot line (left wing only) at wing root.
4. Cabin ventilator hose at wing root.
5. Aileron carry-thru cable and aileron direct cables of wing being removed, at turnbuckles behind headliner front shield and doorpost shield.

NOTE

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

f. If right wing is being removed, disconnect flap cables from right flap drive pulley, and remove cable guards and/or pulleys as required to pull flap cables into right wing root area.

g. If left wing is being removed, relieve tension on right flap cables at right flap drive pulley. Disconnect right flap cables at flap actuator in left wing and remove pulleys to pull flap cables into left wing root area.

NOTE

Rigging of flap actuator and components in left wing need not be disturbed to remove either wing. It is recommended that flap be secured in streamlined position with tape during wing removal to prevent damage, since flap will swing freely.

h. Remove nut, washer and bolt attaching front fuel spar to fuselage.

i. Remove bolts, washers and retainers holding main spar dowel pins in position.

j. Support wing at inboard and outboard ends, and remove dowel pins that attach main wing spar to fuselage. It is recommended to remove the top dowel pin first, then lower outboard end of wing before removing bottom dowel pin.

NOTE

It may be necessary to use a long punch to drive out main wing spar attaching dowel pins, or to rock wing slightly while removing pins. Care must be taken not to damage dowel pins, spar fittings or spar carry-thru fittings as these are reamed holes and close tolerance dowel pins.

k. Remove wing and lay on padded stand.

4-5. REPAIR. A damaged wing panel may be repaired in accordance with instructions outlined in Section 18. Extensive repairs of wing skin or structure are best accomplished by using the wing repair jig, which may be obtained from Cessna. The 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.

NOTE

Refer to figure 4-1 for lubrication of dowel pins prior to installation.

a. Hold wing in position with wing tip low.
b. Install:
   1. Dowel pins attaching main spar to fuselage. (Install bottom pin first, then rotate wing tip up, and install top pin.)
   2. Bolts, washers and nuts that hold main spar attach dowel pins in position.
   3. Front fuel spar attach bolt, washer and nut.
c. Route flap and aileron cables and make proper connections.
d. Connect:
   1. Electric wires at wing root disconnects.
   2. Fuel lines at wing root.
   3. Pitot line (if left wing is being installed.)
   4. Cabin ventilator hose at wing root.
   5. Oxygen filler line at tee in cabin top area.

CAUTION

Be sure to turn valves counterclockwise on three oxygen cylinders to turn on filler line pressure. Refer to Section 15 for a complete oxygen system leak test prior to installing headliner.

e. Rig aileron system (Section 6).
f. Rig flap system (Section 7).
g. Refill wing fuel bays and check all connections for leaks.

NOTE

If a new wing is being installed, it will be necessary to calibrate the fuel control monitor in the cabin ceiling area. Refer to Section 16 for calibration procedure.

h. Check operation of navigation, courtesy and landing lights.
i. Check operation of fuel quantity indicator.
j. Install wing gap fairings and fillets.

NOTE

Be sure to install soundproofing panel in wing gap before replacing fairing.

k. Install headliner, interior panels, upholstery and inspection plates.
l. Test operation of flap and aileron systems.

4-7. ADJUSTMENT (CORRECTING "WING-HEAVY" CONDITION). If considerable control wheel pressure is required to keep the wings level in normal flight, a wing-heavy condition exists. Refer to Section 6 for adjustment of aileron tabs.

4-8. VERTICAL FIN. (See figure 4-2.)

4-9. DESCRIPTION. The fin is primarily of metal construction, consisting of ribs and spars covered with skin. Fin tips are glass fiber/ABS construction. Hinge brackets at the rear spar attach the rudder.

4-10. REMOVAL. The fin may be removed without first removing the rudder. However, for access and ease of handling, the rudder may be removed if desired, following the procedures outlined in Section 10.
a. Remove fairings on both sides of fin.
b. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads and rudder cables if rudder has not been removed.
c. Remove screws attaching dorsal fin to fuselage.
d. Remove bolts attaching fin front and rear spars to fuselage.
e. Remove fin.

4-11. REPAIR. A damaged fin may be repaired in accordance with applicable instructions outlined in Section 18.

4-12. INSTALLATION. Reverse procedures outlined in paragraph 4-10 to install the fin. Be sure to check and reset rudder and elevator travel if any stop bolts were removed or settings distrubed. Refer to Sections 8 and 10 respectively for setting elevator and rudder travel. Refer to figure 1-1 for control surface travels.

4-13. HORIZONTAL STABILIZER. (See figure 4-3.)

4-14. DESCRIPTION. The horizontal stabilizer is primarily of metal construction, consisting of ribs and a front and rear spar which extends throughout the full span of the stabilizer. The skin is riveted to both spars and ribs. Stabilizer tips are constructed of ABS. The elevator tab actuator screw is contained within the horizontal stabilizer assembly, and is supported by a bracket riveted to the rear spar. The underside of the stabilizer contains an opening which provides access to the elevator tab actuator screw. Hinges on the rear spar support the elevator.

4-15. REMOVAL.

a. Remove elevators and rudder in accordance with procedures outlined in Sections 8 and 10.
b. Remove vertical fin in accordance with procedures outlined in paragraph 4-10.
c. Disconnect elevator trim control cables at clevis, turnbuckle and clamps 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.

4-16. REPAIR. A damaged horizontal stabilizer may be repaired in accordance with applicable instructions outlined in Section 18.

4-17. INSTALLATION. Reverse the procedures outlined in paragraph 4-15 to install the horizontal stabilizer. Rig the control systems as necessary, following instructions outlined in applicable sections. Set control surface travels to values listed in figure 1-1.

4-18. 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.

4-19. 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.

4-20. 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-Keytone.

4-21. 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 one-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 wipe down with MEK on a cloth will leave surface suitable for bonding to the aluminum.

NOTE

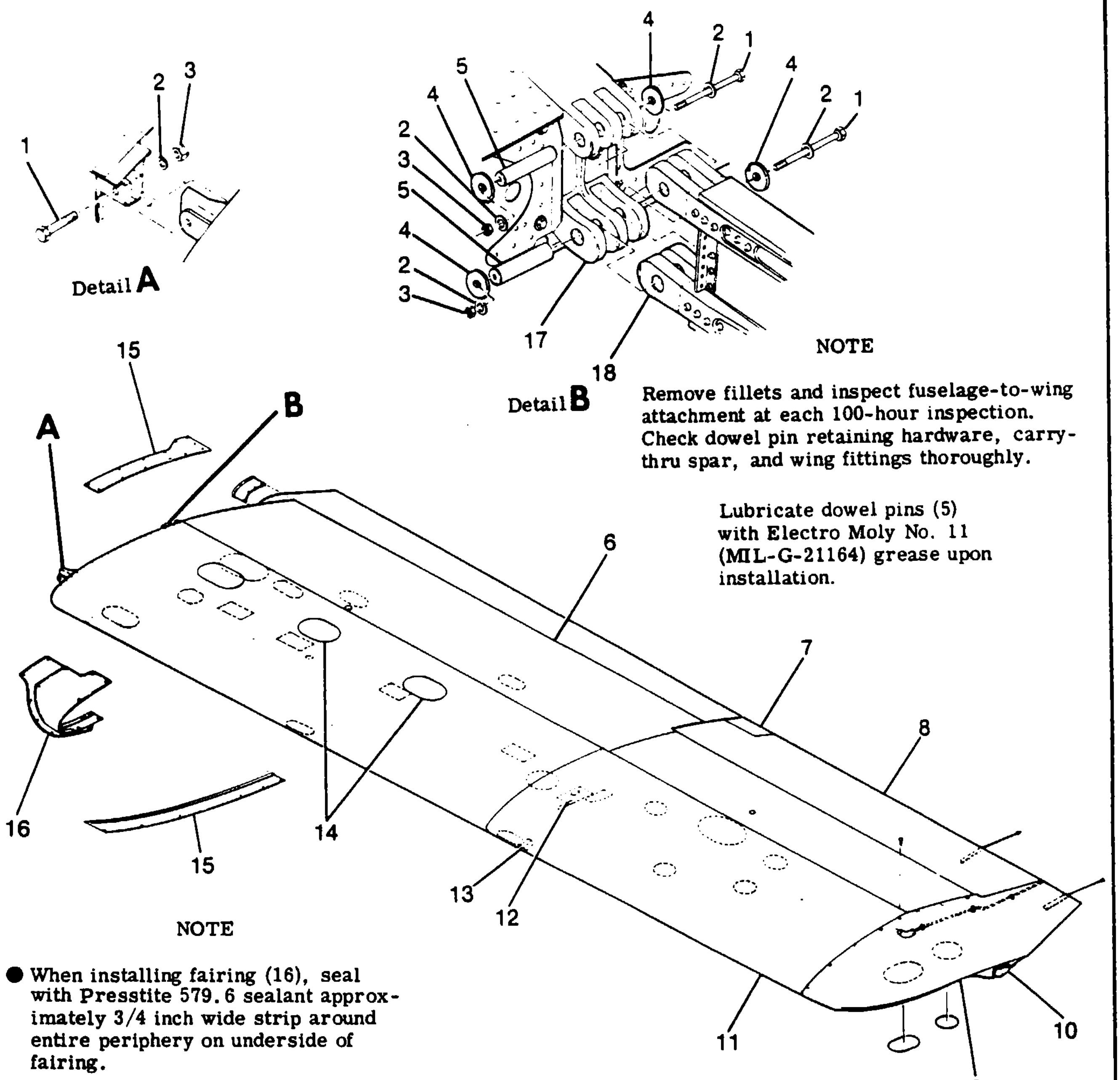
Boots may be applied over epoxy primer, but if the surface has been painted, the paint shall be removed from the bond area. This shall be done by wiping the surfaces with a clean, lint-free rag, soaked with solvent, and then wiping the surfaces dry, before the solvent has time to evaporate, with a clean,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

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 the 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 it properly.

i. Press 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 tailing edges of the boot 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 the boot for painting stabilizer.



NOTE

Remove fillets and inspect fuselage-to-wing attachment at each 100-hour inspection. Check dowel pin retaining hardware, carry-thru spar, and wing fittings thoroughly.

Lubricate dowel pins (5) with Electro Moly No. 11 (MIL-G-21164) grease upon installation.

NOTE

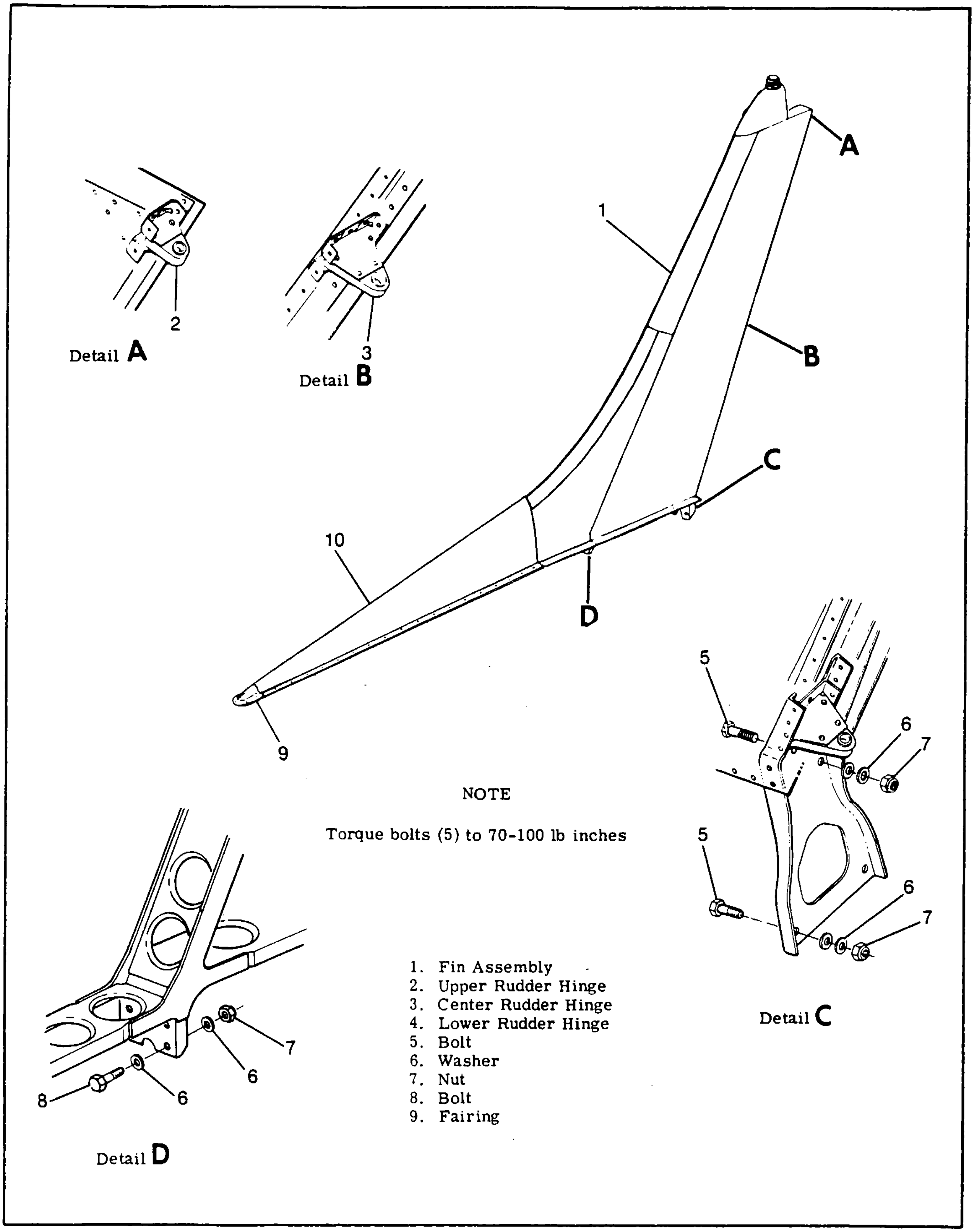
- When installing fairing (16), seal with Presstite 579.6 sealant approximately 3/4 inch wide strip around entire periphery on underside of fairing.
- When installing fillets (15), apply Permacel 672 tape 5/8 inch wide 3/16 inch from edge, around entire periphery on underside of fillet and seal with Inmont Corp. 576.1 sealant between tape and edge of fillet.

NOTE

If there is damage to bushings in fittings (17) or (18), notify factory before anticipating replacement, as these are critical areas.

1. Bolt
2. Washer
3. Nut
4. Retainer
5. Dowel Pin
6. Flap
7. Trim Tab
8. Aileron
9. Tip Assembly
10. Navigation Light
11. Bonded Leading Edge
12. Pitot Tube
13. Stall Warning Unit
14. Access Plate
15. Fillet
16. Fairing
17. Fuselage Fitting
18. Wing Fitting

Figure 4-1. Wing Installation

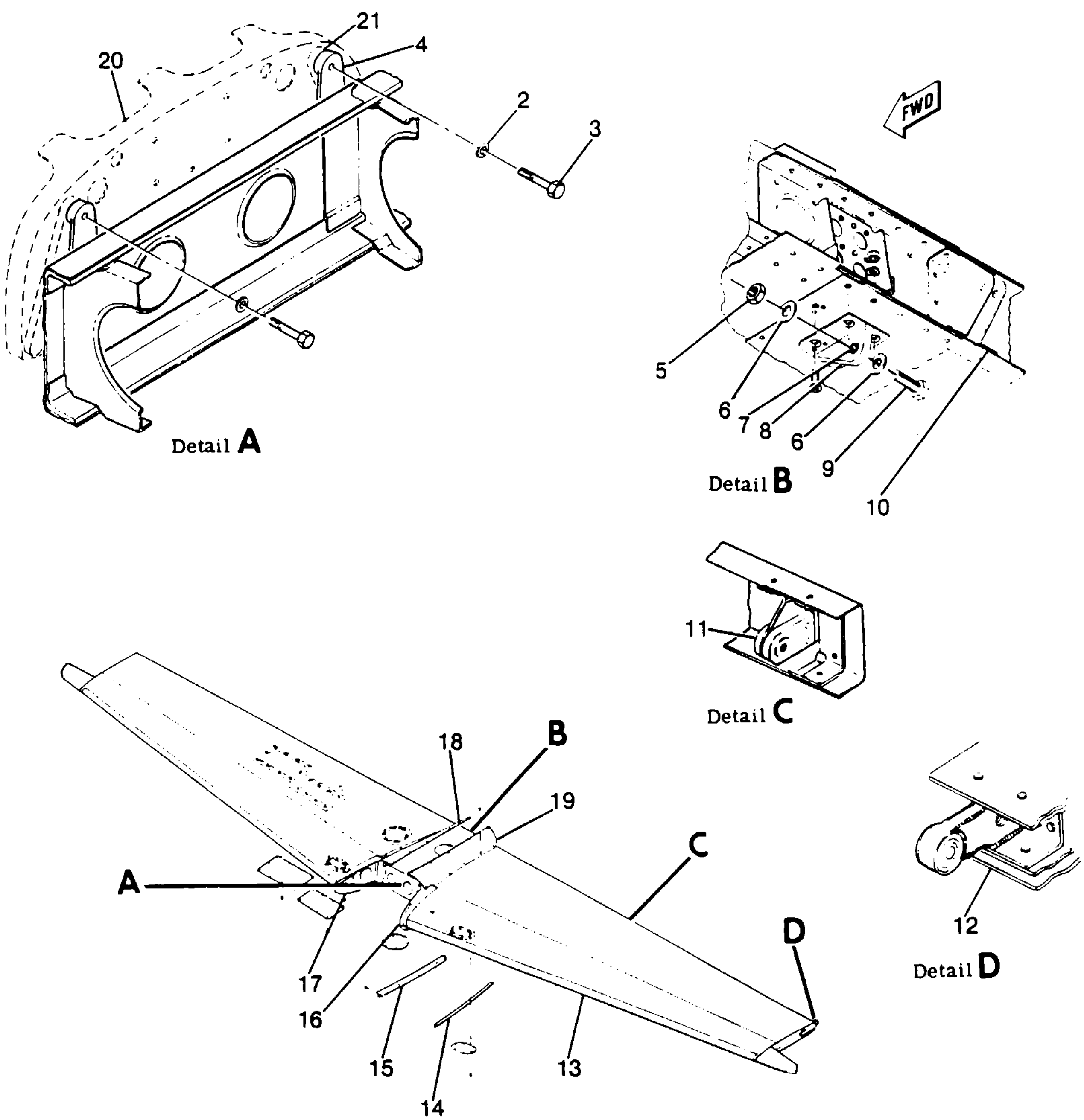


NOTE

Torque bolts (5) to 70-100 lb inches

1. Fin Assembly
2. Upper Rudder Hinge
3. Center Rudder Hinge
4. Lower Rudder Hinge
5. Bolt
6. Washer
7. Nut
8. Bolt
9. Fairing

Figure 4-2. Vertical Fin Installation



1. Nut
2. Washer
3. Bolt
4. Bracket
5. Nut
6. Washer
7. Bushing
8. Bracket
9. Bolt
10. Elevator Pylon Bracket
11. Elevator Inboard Hinge
12. Elevator Outboard Hinge
13. Stabilizer Assembly
14. Lower Left Fairing
15. Lower Right Fairing
16. Forward Left Fairing
17. Forward Right Fairing
18. Upper Right Fairing
19. Upper Left Fairing
20. Bulkhead
21. Nutplate

Figure 4-3. Horizontal Stabilizer Installation

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.

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5-1 LANDING GEAR SYSTEM.

5-2 **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. The main gear actuators 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 inside the center console. The hydraulic reservoir is an inte-gral 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 pump body. 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 weather 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 gear DOWN indicator (green) light. The GEAR UNSAFE (red) light is on anytime the gear is in transit (retract or extend), or whenever system pressure drops below 1000 psi with the safety (squat) switch closed. The nose gear squat switch, activated by the nose gear, electrically averts inadvertent retraction when ever the nose gear strut is compressed by weight of the airplane.

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 6 to 8 seconds during the retract cycle, a malfunction has occurred.

5-3. TROUBLE SHOOTING.

Just because this chart lists a probable cause, proper checkout procedures cannot be deleted and the replacement of a part is not necessarily the proper solution to the problem. The mechanic should always look for obvious problems such as loose or broken parts, external leaks, broken wiring, etc. To find the exact cause of a problem, a mechanic should use a hand pump, pressure gage and a voltmeter to isolate each item in the system. Hydraulic fluid will foam if air is pumped into system, causing fluid to be blown overboard thru pack vent line.
The problems listed are all with the systems controls in their normal operating position: Master switch ON, hydraulic pump breaker IN and landing gear breaker IN. During landing gear system servicing, a power supply capable of maintaining 27.5 volts throughout the gear cycle must be used to augment the ship's battery.

CAUTION

Prior to using Hydro-Test unit with power pack, remove and dry off filler plug and dipstick. Adjust cap tension so that no movement of cap is apparent. Failure to accomplish these procedures could result in filler cap coming loose from power pack.

TROUBLE	PROBABLE CAUSE	REMEDY
MOTOR PUMP WILL NOT OPERATE GEAR BUT EMERGENCY HAND PUMP WILL OPERATE GEAR.	Low voltage (in flight).	Check alternator and wiring.
	Fluid level low in reservoir.	Refill reservoir.
	Motor pump failure.	Replace pump.
	Faulty check valve	Replace valve
	NOTE Motor and pump are not repairable and must be replaced.	
	Pump frozen.	Remove motor and coupling from top of power pack and replace pump.
	Broken pump or motor drive shaft or coupling.	Remove motor and pump from top of power pack and replace motor, pump and coupling.
	If motor was not turning, check wiring and motor.	Check motor for loose or broken connections; check for frozen pump or coupling. Check circuit breaker in pedestal.
	Bad pump shaft seal.	Replace pump.
	External leakage around top of pump assembly.	Remove motor and pump assemblies from top of power pack and replace upper packing and/or back-up rings.
	Air lock in pump (new pack installation or pump replacement).	Remove filter and intermittently bump start switch until fluid flows. Replace filter.
PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM	No fluid in reservoir.	Refill reservoir.

5-3. TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM. (Cont).	Broken hydraulic line.	Check for evidence of leakage and repair or replace line. Flush out system and refill reservoir.
	Bad O-ring actuator piston; O-ring left out after repair.	Disconnect line upstream from actuator and check for pressure. Perform this check for all actuators in system.
	Bad O-ring on gear control valve.	Replace O-ring.
	Thermal relief valve stuck open.	Replace valve.
HAND PUMP DOES NOT BUILD PRESSURE, BUT ELECTRIC PUMP OPERATES PROPERLY.	Check valve in hand pump sticking.	Inspect check valve.
	Defective hand pump outlet check valve.	Replace valve.
	Main gear or downlock actuator O-ring leaking.	Disassemble actuator and replace O-rings.
	Filter in outlet check valve improperly positioned in filter body, or seal between filter and check valve improperly positioned.	Replace seal and position filter in retainer with Petrolatum.
LANDING GEAR OPERATION EXTREMELY SLOW.	Downlock rod adjustment incorrect (mainly LH rod).	Adjust rod end to lengthen actuator one turn.
	Pump failure.	Replace pump.
	Low voltage in electrical system.	Check alternator and wiring.
	Pump motor brushes worn.	Replace pump motor.
	Fluid leak in gear line.	Locate and repair or replace broken line or fitting.
	Excessive internal power pack leakage.	Remove and repair or replace power pack.
POWER PACK EXTERNAL LEAKAGE.	Static seals (all fittings).	Remove and replace O-rings and/or back-up rings as required. Check tubing flares for leaks.
	Reservoir cover.	Remove power pack and remove cover: replace seals.
GEAR DOWN-LOCK WILL NOT RETURN TO FULL-LOCK POSITION.	Binding in spring and tube assemblies.	Check operation to locate binding and eliminate.

5-3. TROUBLE SHOOTING. (Cont).

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.
	Instrument panel gear indicator circuit breaker open.	Reset breaker. Determine cause for tripped breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Instrument panel gear indicator circuit wires disconnected or open.	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.
	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.
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. Determine cause of tripped 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 restriction.
PUMP MOTOR STOPS BEFORE GEAR IS EXTENDED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. Determine cause of tripped circuit breaker.

5-3. TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP MOTOR CONTINUES TO RUN AFTER GEAR IS FULLY RETRACTED OR EXTENDED.	Pressure switch defective.	Install new switch.
	Pressure switch out of adjust.	Remove, adjust or install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Internal leakage in system.	Check 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 adjust-ment.	Remove, adjust or install new switch.
	Internal leakage in system.	Check actuators for internal leakage. Repair or install new actuators.
	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 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.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. De-termine cause of tripped circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Hydraulic pump motor solenoid defective.	Install new solenoid.

5-3. TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR FAILS TO EXTEND(cont).	Hydraulic pump motor ground.	Check ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid (Refer to Section 2.)
	Nose gear contacts stop bolts.	Adjust stop bolts to obtain proper clearance. (Refer to paragraph 5A-87).
RH GEAR UNLOCKS BUT LH GEAR WILL NOT UNLOCK.	Improper setting of RH downlock actuator rod.	Check rigging procedures outline in this Section.
BOTH RH AND LH MAIN GEAR UNLOCK BUT ONLY NOSE GEAR WILL RETRACT.	Improper setting of LH downlock actuator rod.	Check rigging procedures outlined in this Section.
MOTOR PUMP WILL NOT TURN ON BY WORKING SELECTOR SWITCH. HAND PUMP WILL PUT GEAR DOWN.	Defective pressure switch circuit.	Check circuit continuity.
		Check switch adjustment.
SET SCREW ON CAM NOT EX-TENDED ENOUGH FOR GEAR TO MOVE CAM OVER CENTER.	Check washers under bolt on downlock arm assembly.	Add AN960-10 washer under bolt downlock arm assembly.
MAIN GEAR WILL NOT LOCK OVER CENTER.	Main gear not centered in support.	Rerig saddle per rigging instructions.
MALFUNCTION OF GEAR INDICATOR LIGHTS.	1. Both lights on at same time. 2. Light will change from green to amber or in reverse when gear control switch is moved.	Check ground wire for proper connection.

5-4. **HYDRAULIC SYSTEM LEAK CHECK.** (Refer to figure 5-2.)

a. Jack airplane in accordance with procedures outlined in Section 2 of this Manual.
b. To relieve system pressure, pull the GEAR PUMP circuit braker to OFF and move the gear selector handle to UP and back to the DOWN position.
c. Install a O-2000 SI gage at the service tee (Index 29, figure 5-3) on the left-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 is found, it can be assumed there is an internal leak in the power pack. If leak ia 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. The only way to isolate part that is leaking is to systematically replace the check valve O-ring, check valve, and then thermal relief valve.

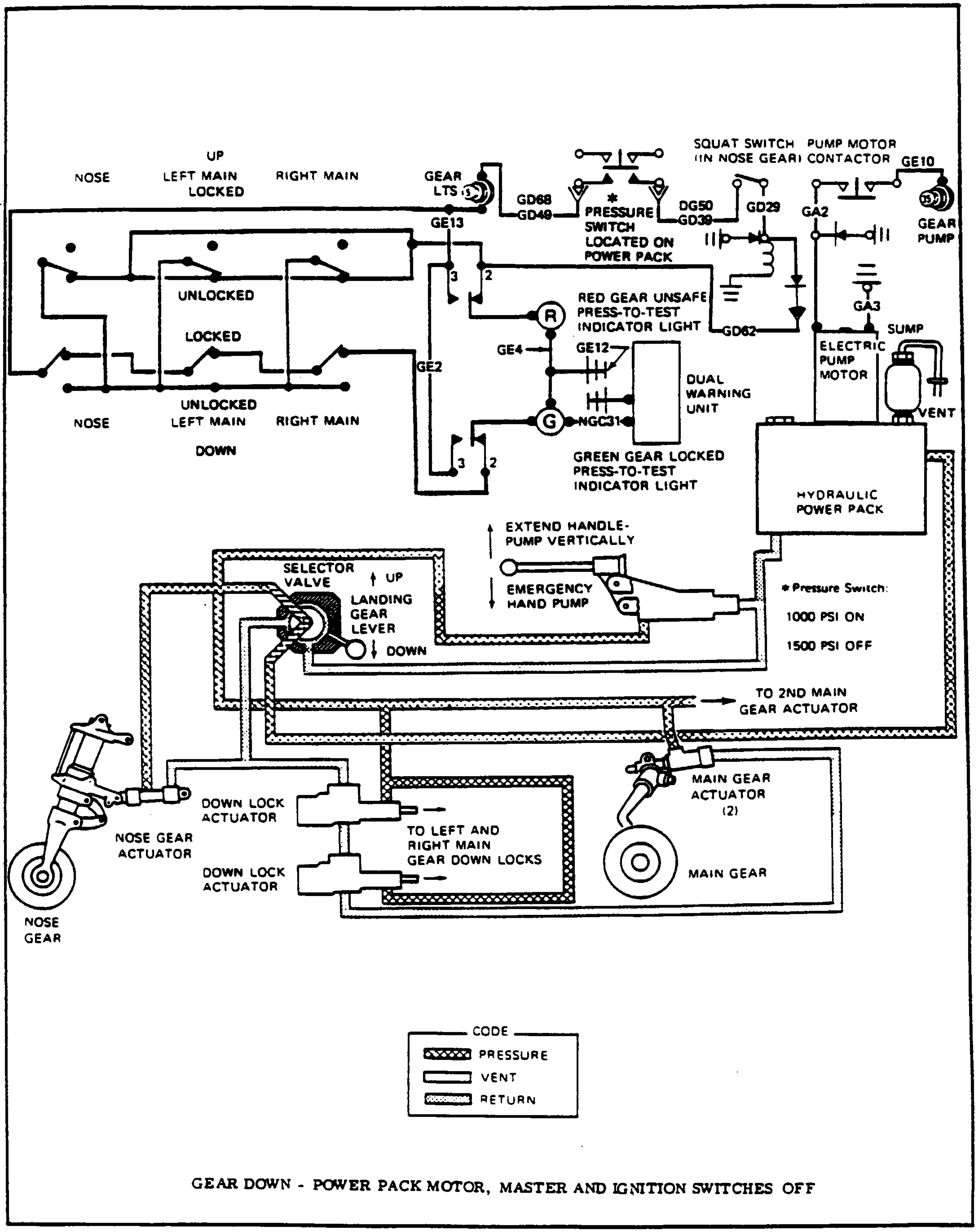
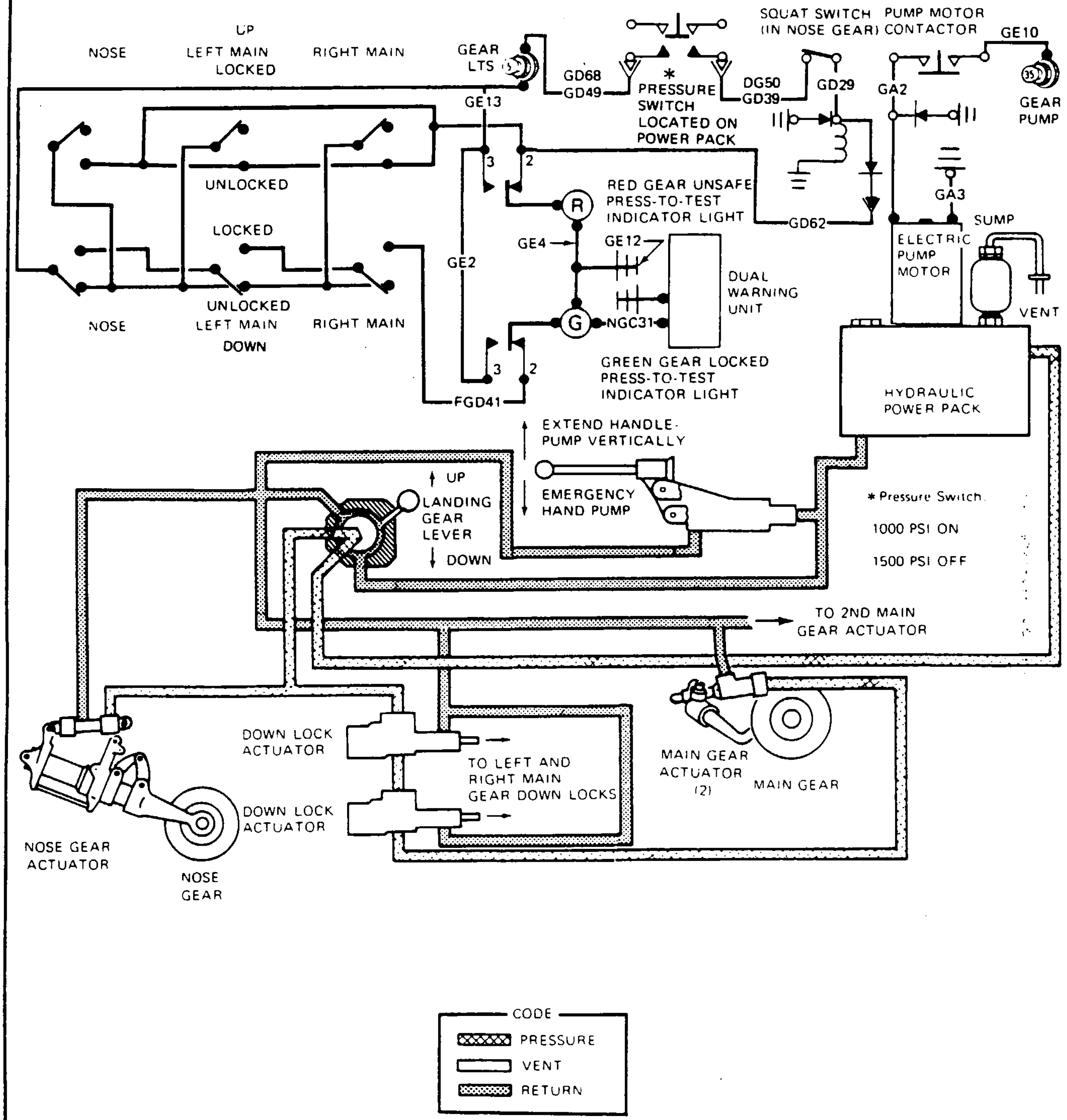


Figure 5-1. Landing Gear Schematic (Sheet 1 of 2)



GEAR UP - POWER PACK MOTOR OFF, MASTER AND IGNITION SWITCHES ON

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

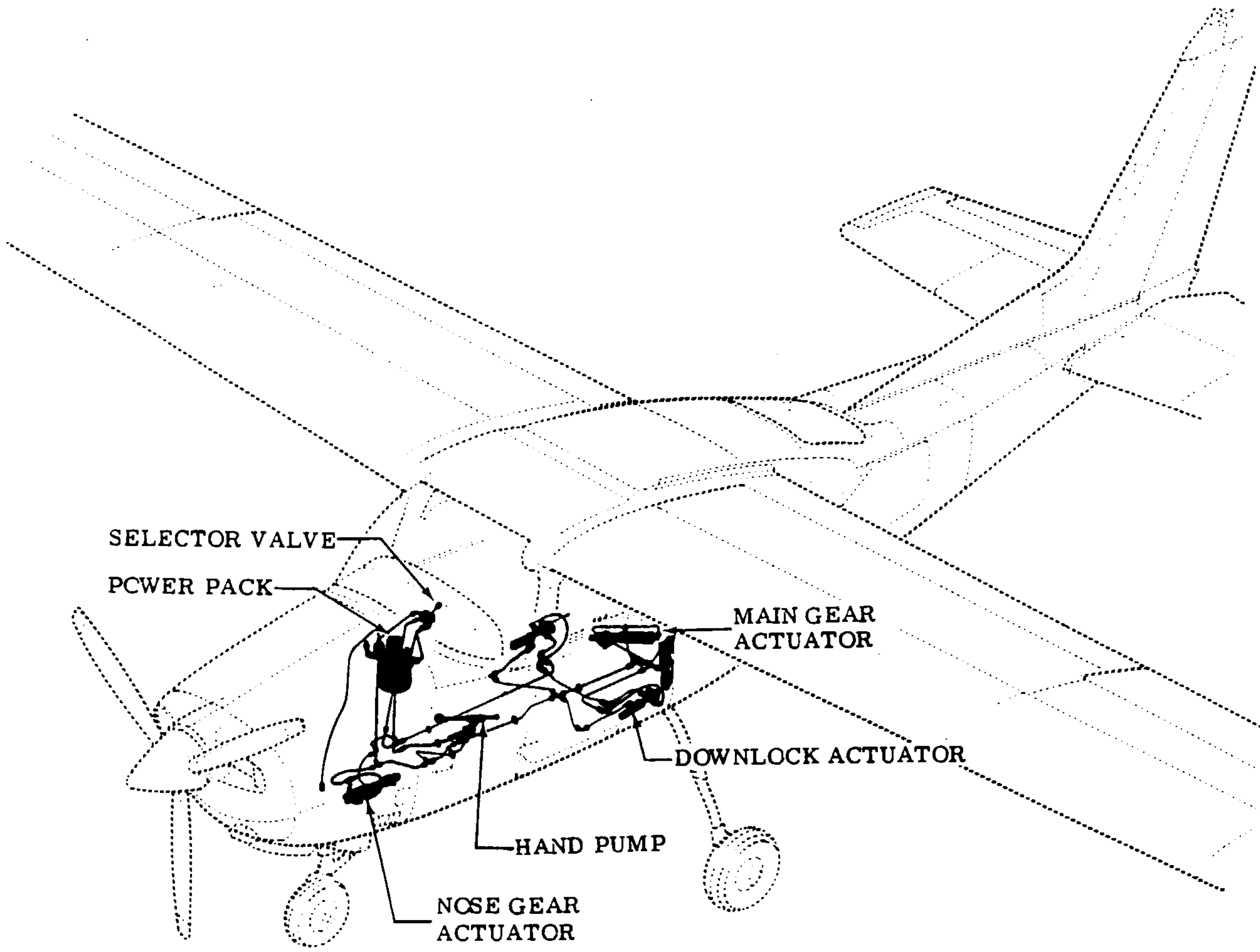


Figure 5-2. Landing Gear System Component Locator

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.

5-5. POWER PACK. (Refer to figure 5-3)

5-6. DESCRIPTION. The hydraulic power pack located in the pedestal, is a multi-purpose unit. It contains a hydraulic reservoir, valves, an electrically driven motor, and the pump. An emergency hand pump, located between the pilot's and copilot's seats. Uses reservoir fluid to permit extension of the landing gear.

NOTE

The hydraulic power pack primary relief valve, thermal relief valve, and pressure switch can be operationally checked on the aircraft without power pack removal from the aircraft or disassembly. Refer to paragraph 5-6A. for specific instructions. Refer to paragraph 5A-12A for primary and thermal relief valve bench check instructions if the power pack is removed from aircraft.

5-6A. ON-AIRCRAFT HYDRAULIC POWER PACK OPERATIONAL CHECKS. (Refer to figure 5-3.) The primary and thermal relief valves and pressure switch should be pressure checked each 100 hours. They can be operationally checked without removal from aircraft. For bench check instructions after removal from power pack, refer to paragraph 5A-12A.

NOTE

Checks are to be performed with external power set at 28.5 volts.

a. Primary Relief Valve.
(1) Jack aircraft in accordance with procedures outlined in Section 2.
(2) Remove cap and install pressure gage at tee (29) fitting on left side of power pack.
(3) Pull landing gear circuit breaker.
(4) Select landing gear handle to DOWN position.
(5) Install 18 gage (minimum) jumper wire between buss side of contactor and small terminal on pump motor contactor (to energize coil).
(6) Push landing gear circuit breaker in: power pack should run: monitor pressure.
(7) Primary relief valve should open at 1800 PSI. +0 or -50 PSI.
(8) After check is complete, remove pressure from system, remove pressure gage, install cap on tee (29) pull landing gear circuit breaker, remove jumper wire, push landing gear circuit breaker back in, and return system to original configuration.

b. Thermal Relief Valve.
(1) With aircraft on jacks and pressure gage installed at tee (29) fitting on left side of power pack, pull landing gear circuit breaker.
(2) Select landing gear to DOWN position.
(3) Extend emergency gear pump handle.
(4) Pump emergency gear pump handle and monitor pressure. Thermal relief valve should open at 2200 PSI, -0 or +50 PSI.
(5) After check is complete, remove pressure from system, remove pressure gage, and install cap on tee (29).
(6) Push in landing gear circuit breaker, and return system to original configuration.

c. Pressure Switch.
(1) With aircraft on jacks and pressure gage installed at tee (29) fitting on left side of power pack, pull landing gear circuit breaker.
(2) Select landing gear UP and DOWN several times to relieve pressure in landing gear system.
(3) Select landing gear UP, and push in landing gear circuit breaker.
(4) After gear raising cycle is complete, check pressure. Pressure should be 1500 PSI.
(5) Select gear DOWN. After gear lowering cycle is complete, pressure should be 1500 PSI.
(6) After check is complete, remove pressure from system, remove pressure gage, install cap on tee, and return system to original configuration.

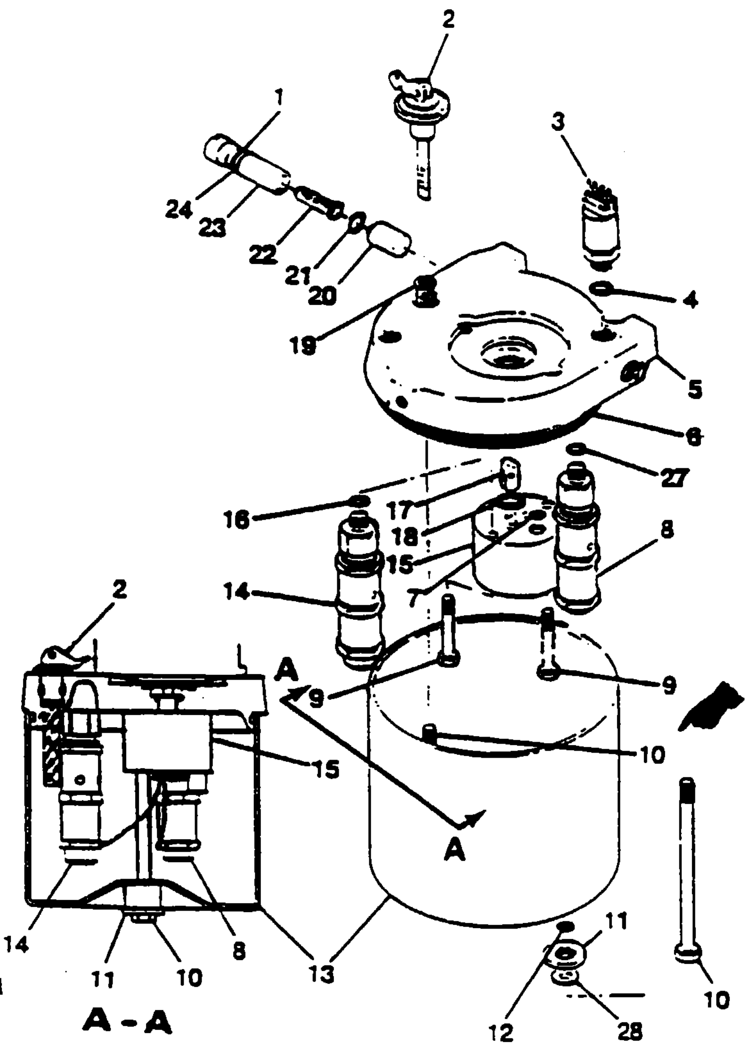
5-7. REMOVAL. (Refer to figure 5-3.)
a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Turn master switch OFF and place gear selector handle in a neutral position to relieve system pressure. After 15 seconds, return gear selector handle to DOWN position

NOTE

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

c. Remove front seats and spread drip cloth over front carpet.
d. Remove decorative cover from pedestal as outlined in Section 9 of this manual.
e. Remove upper panel assembly from aft face of pedestal.
f. Remove screws attaching indicator assembly at top of pedestal; remove indicator assembly.
g. Remove four bolts attaching wheel and gear box assembly; remove wheel and gear box assembly.
h. Loosen idler sprocket assembly by loosening bolt and sliding sprocket inboard in slot.
i. Disconnect chin at connecting link.
j. Remove left-hand and right-hand chain guards.
k. Allow chain to remain on gimbal assembly in lower pedestal area.
l. Position gallon container under drain elbow at right-hand side of pedestal.
m. Remove cap from elbow and attach drain hose bracket to sides of pedestal.
n. Using hand pump, drain reservoir fluid into container.
o. Disconnect and cap or plug all hydraulic lines at power pack.
p. Disconnect wiring at pressure switch.

1. Packing
2. Dipstick
3. Pressure Switch
4. Packing
5. Body Assembly
6. Packing
7. Packing
8. Thermal Relief Valve
9. Bolt
10. Bolt
11. Washer
12. Packing
13. Reservoir
14. Primary Relief Valve
15. Hydraulic Pump
16. Packing
17. Coupling
18. Packing
19. Fluid Filter Screen
20. Self Relieving Check Valve
21. Packing
22. Filter Assembly Self-Relieving Check Valve lve
23. Retainer
24. Back-Up Ring
25. Motor Assembly
26. Bolt
27. Packing
28. Washer
29. Tee



NOTE

Install 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.

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

q. Remove three mounting bolts, one at the forward side of power pack, and two, attaching power pack bracket to sides of pedestal.

r. Remove power pack and bracket from pedestal.

NOTE

It should not be necessary to disturb studs on left and right sides of pedestal to remove power pack.

5-8. DISASSEMBLY. (Refer to figure 5-3.)

a. Remove bolts (10), washers (11), and packing (12) from reservoir (13).

b. Remove reservoir (13) from body assembly (5).

NOTE

If reservoir will not disengage from body, assembly (5), 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 (5). Apply air pressure (not to exceed 15 PSI, reservoir proof pressure), and remove reservoir (1). A strap clamp is not recommended as clamp may damage reservoir.

c. Remove packing (6) from body assembly (5).

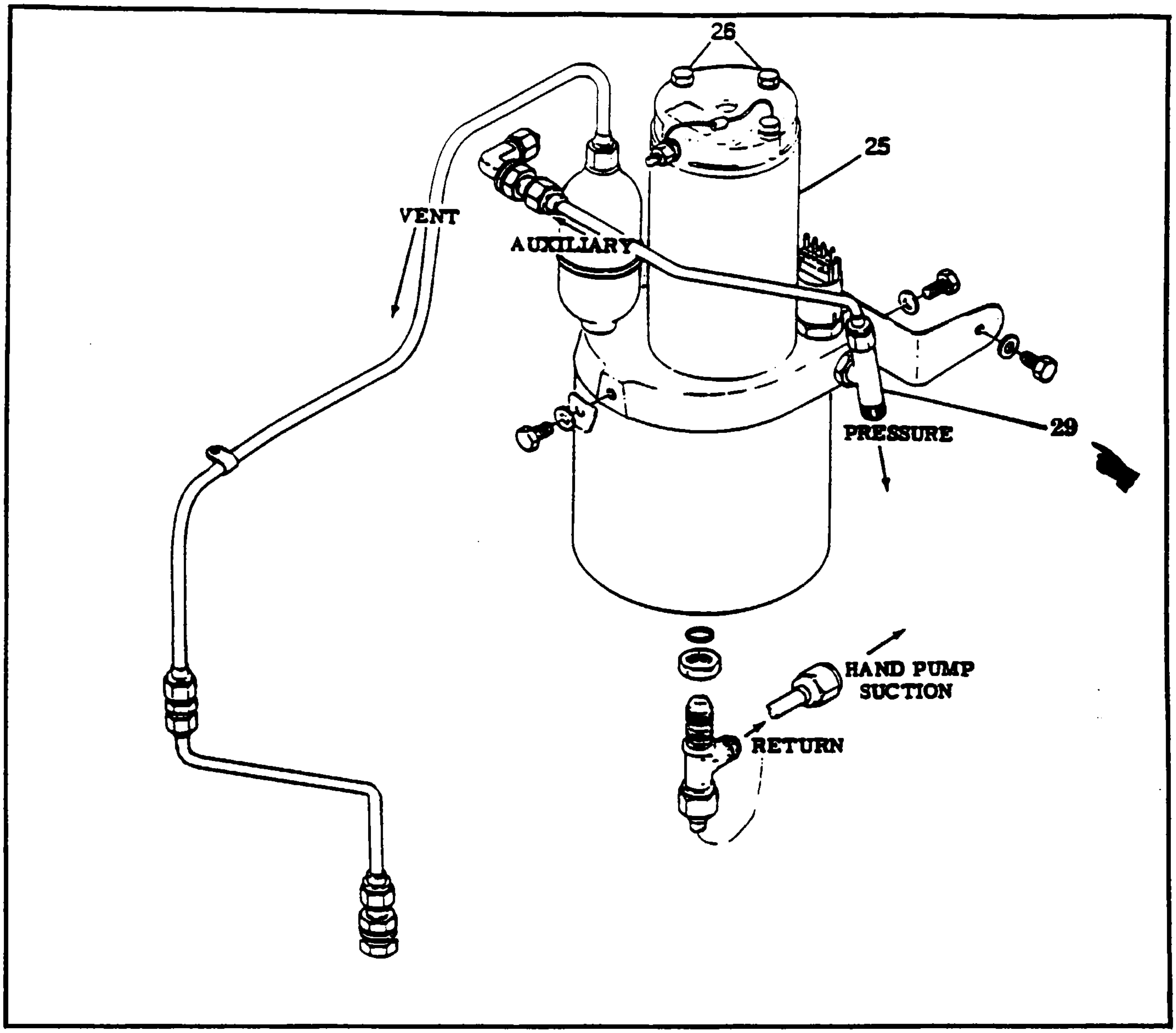
NOTE

Disassembly of relief valves (14) and (8) 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 and remove relief valve assemblies (14), and (8) from body assembly (5).

e. Remove dipstick (2), and fluid filter screen (19) from body assembly (5).

f. Remove retainer (23), filter assembly self-relieving check valve (22), back-up ring (24), packing (1), packing (21), and self-relieving check valve (20) from body assembly (5).



NOTE

If self-relieving check valve (20) will not fall from hole in body assembly (5), place a drift or punch made of soft material into the pressure opening of body assembly and tap spacer from body assembly.

g. Remove pressure switch (3) and packing (4) from body assembly (5).
h. Remove bolts (9) attaching hydraulic pump (15) to body assembly (5), and remove pump (15) and coupling (17) from body assembly. Remove packings (18) and (7)
i. Remove motor assembly (25) from body assembly (5) by removing attaching bolts (26).

5-9 INSPECTION. (Refer to 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. (Refer to figure 5-3).

NOTE

Install 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. Using new packings (7) and (18), install hydraulic pump (15) and coupling (17) into body assembly (5) with bolts (9).
b. Install motor assembly (25) on top of body assembly (5) after aligning coupling (17) to match mating connection in motor. Secure motor to body with bolts (26), safety-wire bolts as shown in View A-A.
c. Using new packing (4), install and tighten pressure switch (3) onto body assembly (5).
d. Using new back-up ring (24) and packings (1) and (21), install and tighten self-relieving check valve (20), filler assembly self-relieving check valve (22) and retainer (23) into body assembly (5).
e. Install primary relief valve (14) and thermal relief valve (8) assemblies along with packings (27) and (16) onto body assembly (5).

CAUTION

Ensure that relief valves are installed in their correct location. Refer to View A-A.

f. Install fluid filter screen (19) and dipstick (2) into body assembly (5).

NOTE

Safety-wire relief valves (14) and (8) to hydraulic pump mounting bolts (9) as shown in view A-A.

g. Using new packing (6), washers (11) and (28), and packing (12), install and tighten reservoir (13) onto body assembly (5).
h. Torque bolts (10) to 30-35 inch-pounds.

5-11 INSTALLATION. (Refer to figure 5-3.)
a. Work power pack and bracket assembly into position and install three bolts, securing power pack to pedestal.
b. Connect all hydraulic lines to power pack fittings. Ensure that all fittings are properly installed, with jamnuts tight, after lines are tightened.
c. Install wheel and gear box assembly and indicator assembly in top of pedestal.
d. Install left-hand and right-hand chain guards for rubber trim chain.
e. Connect chain at connecting link after stringing chain over idler sprocket.
f. Tighten idler sprocket assembly by sliding sprocket outboard in slot and tightening bolt.
g. Connect ground wire to pressure switch (3), and wire to motor.
h. Connect power pack wiring to plug.
i. Install upper panel assembly on pedestal.
j. Fill reservoir (13) on right-hand side of power pack with clean hydraulic fluid in accordance with procedures outlined in Section 2 of this manual.
k. Operate gear through several cycles to bleed system. Check for correct operation and signs of fluid leakage. A 28 volt power supply should be used to augment the aircraft's battery.

5-12 PRIMARY AND THERMAL RELIEF VALVE ASSEMBLIES. (REFER TO FIGURE 5A-3)
The primary relief valve (14), located between the self-relieving check valve (20) and hydraulic pump (15), serves to limit that amount of pressure which can be generated by the hydraulic pump. The thermal relief valve (8), located on the system side of the self-relieving check valve (20), serves to limit the system pressure. System pressure can increase due to thermal expansion. Both valves are identical except for differing pressure relief settings (refer to figure 5-4).

5-12A BENCH CHECK OF PRIMARY AND THERMAL RELIEF VALVES. (Refer to figure 5-4).

NOTE

The hydraulic power pack primary relief valve, thermal relief valve, and pressure switch can be operationally checked on the aircraft without power pack removal from the aircraft or disassembly. Refer to paragraph 5-6A for specific instructions.

If on-aircraft pressure checking of the power pack reveals out-of-tolerance relief valve opening, it may be necessary to determine if relief valve disassembly or adjustment is necessary. Once removed from power pack, individual relief valves can be bench checked.

NOTE

Adequate precautions should be taken to recover hydraulic fluid which will be expelled from the primary relief valve while under pressure.

CAUTION

As primary and thermal relief valves are identical except for differing pressure relief settings, special care should be exercised to ensure relief valves are reinstalled in their correct locations. (Refer to figure 5-3, view A-A).

a. Primary Relief Valve.
(1) Using a hydraulic pump with a flow rate of 0.5 to 0.7 gallons per minute connected to a hydraulic reservoir, a pressure gage with 2500 PSI capacity, and a hose with appropriate fittings, connect hydraulic pump to adapter (2) of the primary relief valve.
(2) Apply pressure slowly to ensure that relief valve assembly opens at correct pressure reading. Primary relief valve should open at 1800 PSI, +0 or -50 PSI. Refer to paragraph 5A-15 for adjustment instructions.
b. Thermal Relief Valve.
(1) Using a hand pump connected to a hydraulic reservoir, a pressure gage with 2500 PSI capacity, and a hose with appropriate fittings, connect hand pump to adapter (2) of the thermal relief valve.
(2) Manually pump pressure up slowly to ensure that relief valve assembly opens at correct pressure reading. Thermal relief valve should open at 2200 PSI, -0 or +50 PSI. Refer to paragraph 5A-15 for adjustment instructions.

5-13 REMOVAL. (Refer to figure 5-3).
a. Cut safety wire and remove primary relief valve (14) and thermal relief valve (8) from body assembly (5).

5-14 DISASSEMBLY. (Refer to figure 5A-4.)

NOTE

Relief valve assemblies (5) and (23) are preset by the factory and normally will not require disassembly.

a. Remove jamnut (13) and adjustment screw (12) from housing (8).
b. Remove spring (11), guide (10), balls (6), and piston (9) from housing (8).
c. Loosen jamnut (7) and remove adapter (2) from housing (8).
d. Remove poppet (4) and orifice (3) from adapter (2).

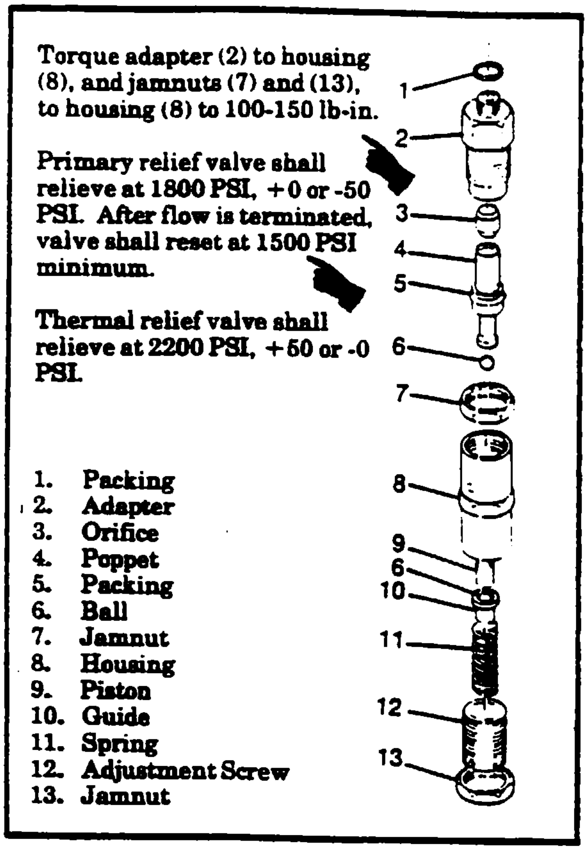


Figure 5-4. Relief Valve Assembly

5A-15 INSPECTION. (Refer tofigure 5A-4).

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.

5A-16 ASSEMBLY AND ADJUSTMENT. (Refer to figure 5A-4).

NOTE

Use new packings during reassembly. Lubricate all packings with MIL-H-5606 hydralic fluid. Lubricate threads with Petrolatum.

a. Install orifice (3) and poppet (4) into adapter (20). (New packing [5] must be installed on poppet [4]).

b. Install jamnut (7) and housing (8) on adapter (2).

c. Tighten adapter (2) into housing (8) and torque to 100-150 lb-in.

d. Tighten jamnut (7) against housing (8), and torque to 100-150 lb-in.

e. Install one ball (6) into housing (8), so that it rests on poppet (4). Install piston (9) into housing (8), then install remaining ball (6) into end of piston (9).

f. Insert guide (10) and spring (11) into housing (8), making sure that balls (6) and piston (9) remain in correct position.

g. Turn adjustment screw (12) into housing (8) until it just contacts spring (11), then turn in one additional turn. Start jamnut (13) onto adjustment screw (12) and snug against housing (8).

h. Connect hydraulic pump with a flow rate of 0.5 to 0.7 gallons-per-minute and a pressure gage with 2500 PSI capacity to relief valve. Apply pressure slowly to ensure that relief valve assembly opens at correct pressure reading. Primary relief valve opens at 1800 PSI, +0 or -50 PSI and reset at 1500 PSI MINIMUM (no leakage). Thermal relief valve opens at 2200 PSI, +50 or -0 PSI.

i. If adjustment of either relief valve is necessary, loosen jamnut (13) and turn adjustment screw (12) in to increase pressure or back adjustment screw (12) out to decrease pressure. Tighten jamnut (13) against housing (8) and torque to 100-150 lb-in. Recheck pressure adjustments.

5-17. INSTALLATION. (Refer to figure 5A-3).

a. Install relief valve assemblies (8) and (14) along with new packings onto body assembly (5).

CAUTION

Ensure that relief valves are installed in their correct locations. (Refer to View A-A).
Safety wire relief valves as shown in View A-A.

5-18. PRESSURE SWITCH. (Refer to figure 5-5).

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 the 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, at which time, the pump will again operate to build up pressure to approximately 1500 PSI, regardless of gear selector handle position.

NOTE

The hydraulic power pack primary relief valve, thermal relief valve, and pressure switch can be operationally checked on the aircraft without power pack removal from the aircraft or disassembly. Refer to paragraph 5-6A for specific instructions.

5-20. REMOVAL AND INSTALLATION. (Refer to figures 5-3 and 5-5.

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.

5-21. DISASSEMBLY. (Refer to figure 5-5).

a. Remove bolt pin (10).

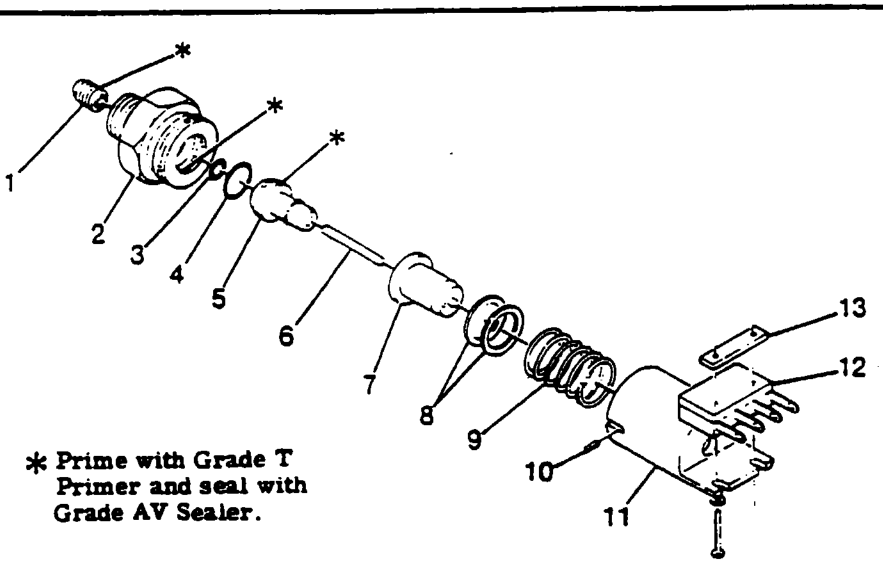
b. Unscrew housing (11) from fitting (2).

c. Remove spring (9).

d. Remove washers (8) from flange of stop (7).

NOTE

Chart in figure 5-5 lists washers by part number, thickness and effect on operating pressure PSI.



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

WASHER APPLICABILITY

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

Figure 5-5. Pressure Switch

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

NOTE

Do not damage lip of guide (5). Threads of guide (5), snubber (1), and internal threads of fitting (2) are primed with Loctite grade T primer and sealed with Loctite grade AV sealer.

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

5-22. INSPECTION AND REPAIR. (Refer to figure 5-5.)

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.
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).

5-23. REASSEMBLY. (Refer to figure 5-5).

NOTE

Threads of snubber (1), guide (5). and internal threads of fitting (2) are to be primed with Loctite grade T primer and sealed with Loctite grade AV sealant. Allow primer to cure for a minimum of three minutes before sealant application. Allow sealant to set from five to 40 minutes after assembling parts.

NOTE

Install new seal (3) and packing (4) and existing piston (6), stop (7) and spring (9). lubricated with a film of Petrolatum VV-P-236. hydraulic fluid MIL-H-5606. or Dow-Corning DC-7. Lubricate guide (5). however. keep lubricant away from threaded end of part.

a. Install snubber (1) into fitting (2) and tighten with slotted screwdriver.
b. Install packing (4) in fitting (2).
c. Install seal (3) in guide (5).
d. Install guide (5) into fitting (2) 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. Insert piston (6) into hole in guide (5).
h. Install stop (7) over guide (5).
i. Install exact number and thickness of washers removed.
j. Install spring (9) over washers (8).
k. Screw housing (11) on fitting (2).

NOTE

If same number of washers (8) are installed as were removed, pressure should not require readjustment. If readjustment is necessary, the washer applicability table lists washer part numbers, thickness, and effect in pressure. Washers are available from the Cessna Supply Division.

l. Check fluid level in power pack reservoir. (Refer to Section 2 of this Manual.)

5-24. ADJUSTMENT. (See figure 5-5.)
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).
c. Adjust switch (12) to bottom out plunger against stop (7).
d. Turn housing (11) back from full thread engagement one to one-fourth turn to locate hole in fitting (2) in slot in skirt of housing assembly (11).
e. Attach electrical connections to pressure switch and attach external power source.
f. Turn master switch ON.
g. Pump emergency hand pump to obtain 1500 ± 50 psi.
h. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 ± 50 psi.
i. If switch opens electrical circuit prematurely, disassemble pressure switch down to washers (8) and add washers (8) as necessary to obtain desired pressure; repeat steps "b" and "d" only if switch (12) was loosened during this step. (But not "c".)
j. If switch opens electrical circuit later than 1500 ± 50 psi, disassemble pressure switch down to washers (8) and remove washers (8) as necessary to obtain desired pressure; repeat steps "b" and "d" only if switch was loosened with this step.
k. After final pressure adjustment, install pin (10) in slot of housing (11).
l. Turn master switch OFF.

5-25. EMERGENCY HAND PUMP. (Refer to figure 5-6.)

5-26. DESCRIPTION. The emergency hand pump is mounted below the floor between the pilot and copilot seats. The pump handle extends to the cabin. The pump supplies a flow of pressurized hydraulic fluid to extend the landing gear in the event of normal hydraulic pump failure.

5-27. REMOVAL AND INSTALLATION.
a. Remove seats as required for access.
b. Remove screws attaching cover over hand pump and 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 the preceding steps, bleeding lines and pump as lines are connected.
h. Fill reservoir as required.

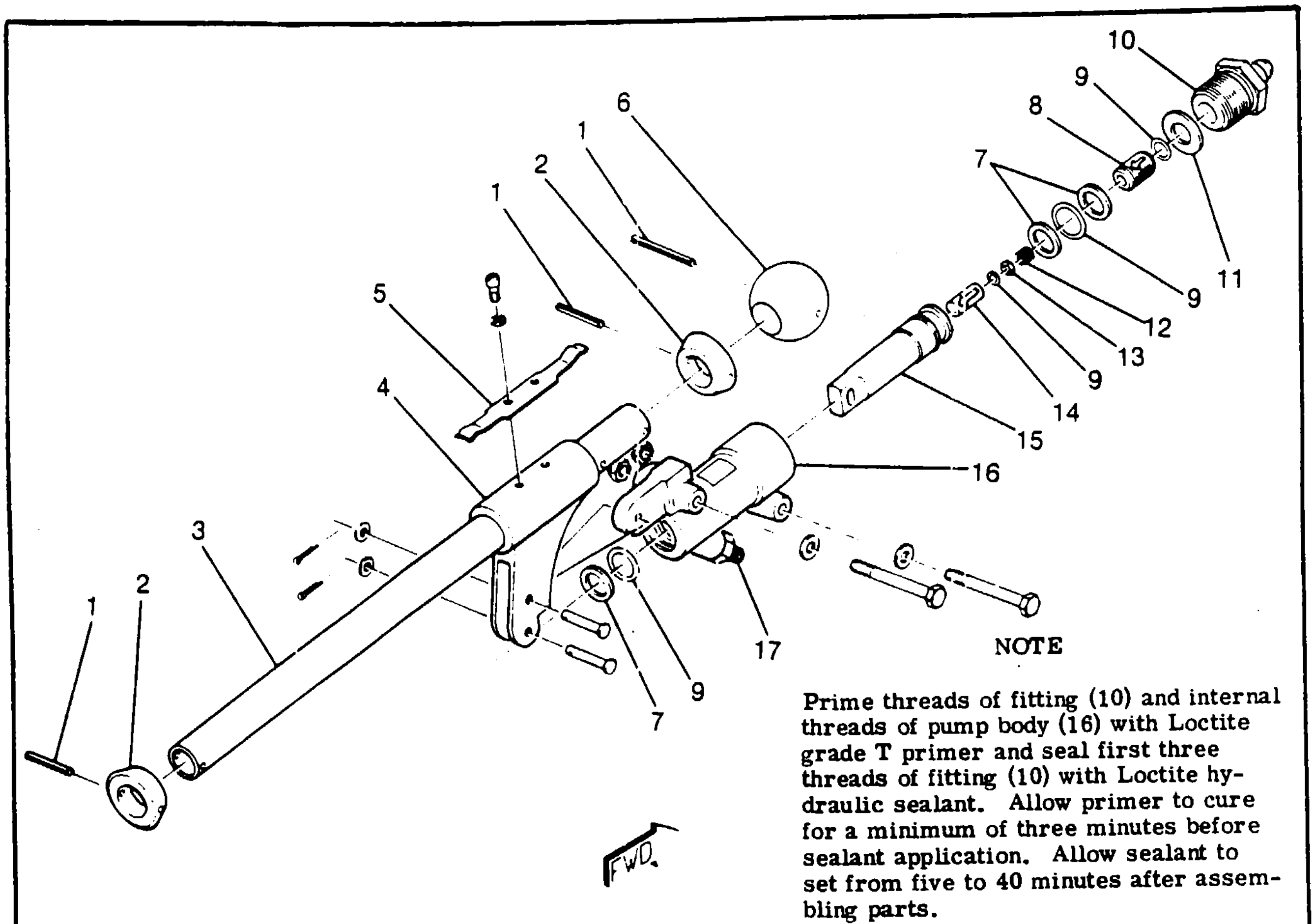
5-28. DISASSEMBLY. (Refer to figure 5-6.)

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 hand pump handle by removing pivot and linkage pins after removing cotter pins.
b. Remove end fitting from body assembly.
c. Push piston from body assembly.
d. Remove retaining ring from end fitting to remove valve assemblies.
e. Remove and discard all O-rings and back-up rings.

5-29. INSPECTION AND REPAIR.
a. Inspect seating surfaces of valves.



NOTE

Prime threads of fitting (10) and internal threads of pump body (16) with Loctite grade T primer and seal first three threads of fitting (10) with Loctite hydraulic sealant. Allow primer to cure for a minimum of three minutes before sealant application. Allow sealant to set from five to 40 minutes after assembling parts.

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

Figure 5-6. emergency Hand Pump

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

Install new packing (9), (17) and back-up rings (7), lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606 or Dow-Corning DC-7.

5-30. REASSEMBLY. (Refer to figure 5-6.) Assemble the emergency hand pump, using the figure as a guide. Also, for detailed instructions, reverse the procedures outlined in paragraph 5-28.

5-31. LANDING GEAR SELECTOR VALVE. (Refer to figure 5-7.)

5-32. DESCRIPTION. A mechanical gear position selector valve is located on 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 gear.

5-33. REMOVAL AND INSTALLATION. (Refer to figure 5-7.)

a. **Remove knob (5) from rod (14).**

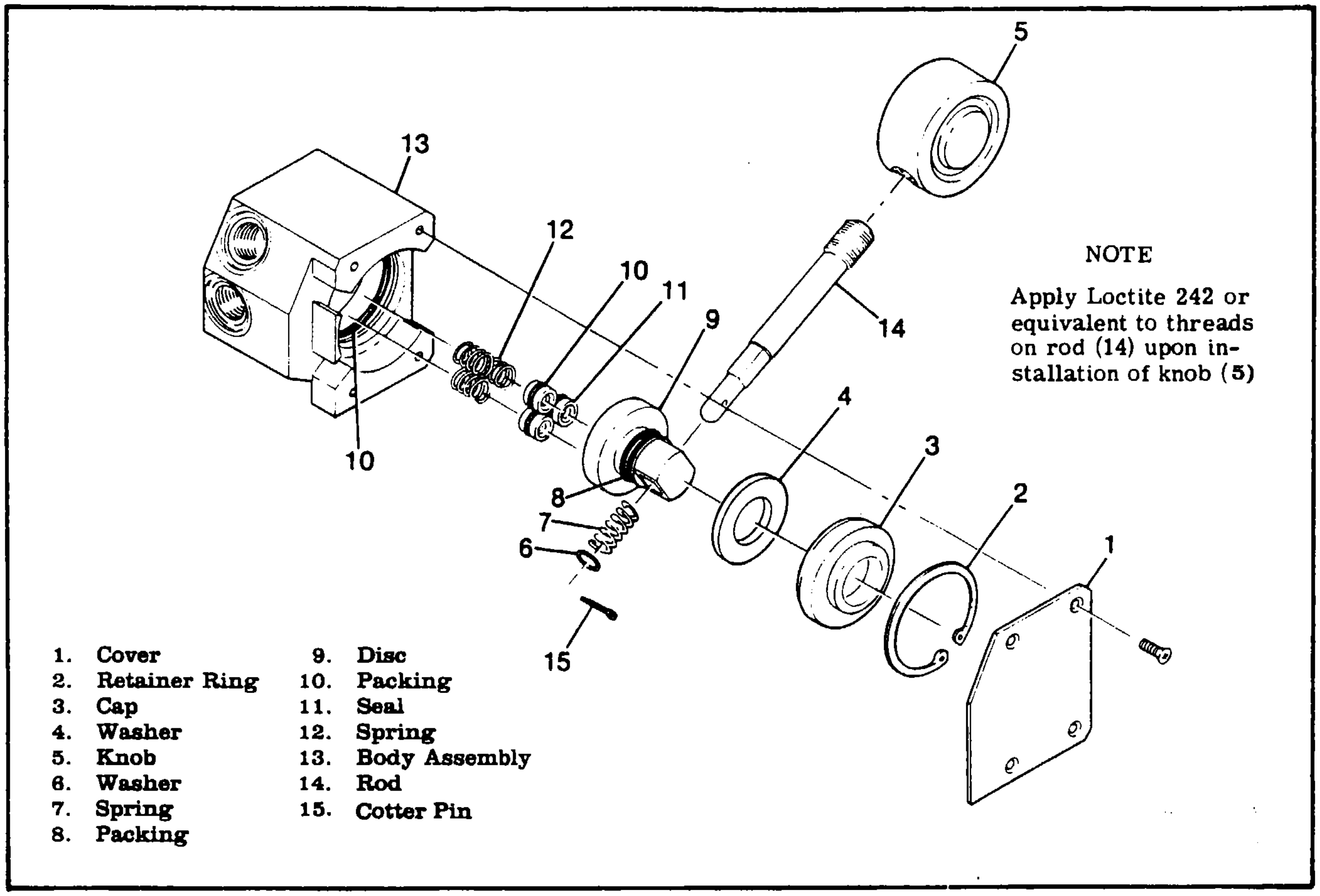


Figure 5-7. Gear Selector Valve

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.

5-34. DISASSEMBLY AND REASSEMBLY. (Refer to figure 5-7.)
a. Remove cover (1), retaining ring (2) and cap (3).
b. **Remove cotter pin (15), washer (6) and spring (7).**
c. Pull rod (14) from disc (9); remove disc.
d. Remove seals (11) and springs (12).
e. Reverse preceding steps for reassembly.

5-35. INSPECTION AND REPAIR. (Refer to figure 5-7.) Replace packings (8) and (10). Check valve for wear, foreign or abrasive materials. Disc (9) may be refaced (lapped) if worn or abraded.

5-36. RIGGING THROTTLE-OPERATED GEAR WARNING HORN MICRO-SWITCH. (Refer to figure 5-8.) Rigging procedures for sea level or turbocharged aircraft are outlined in figure 5-8.

5-37. MAIN LANDING GEAR. (Refer to figure 5-9.)

5-38. 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 in turn are bolted through a splined shaft, to the hydraulic main gear rotary actuators.

CAUTION

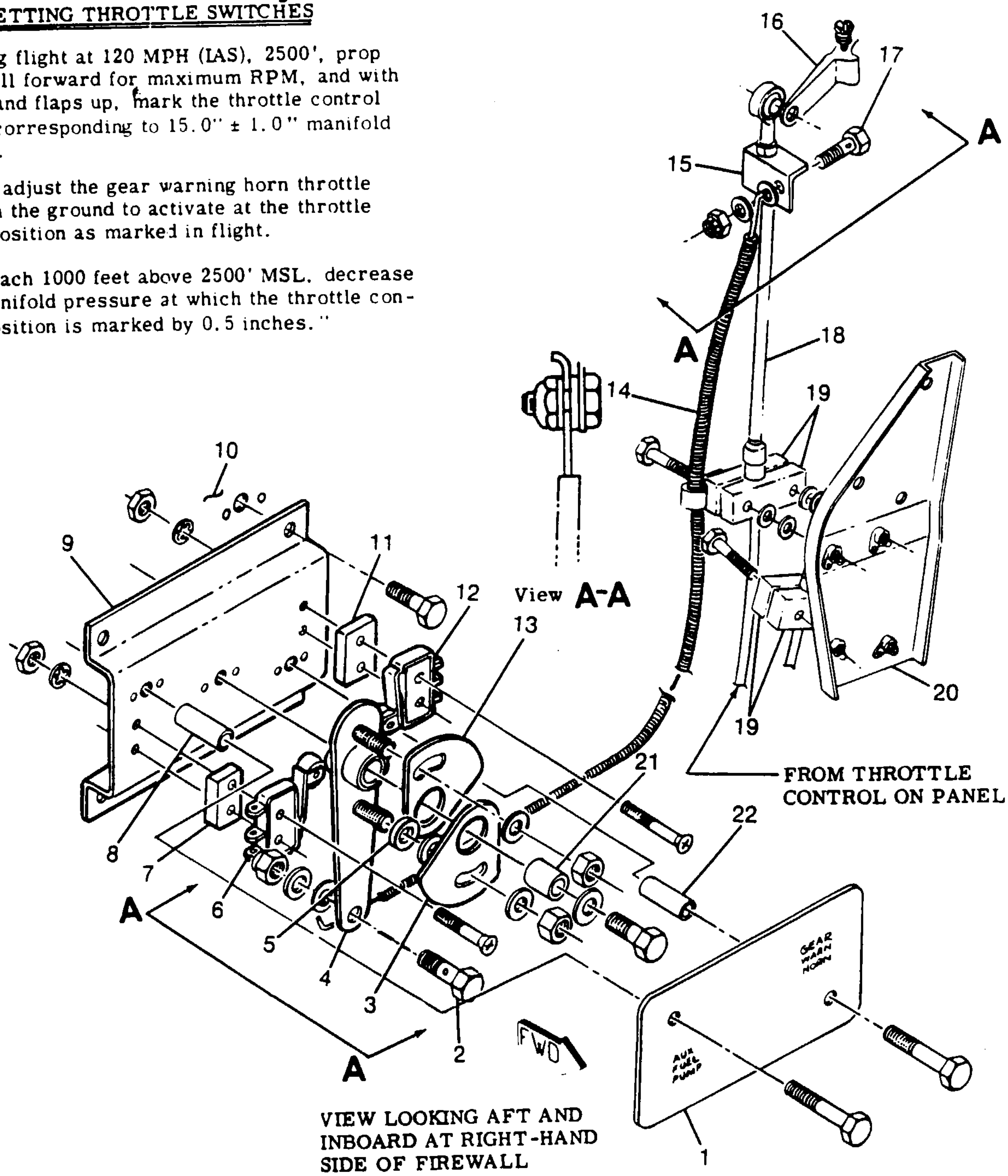
Use of recapped tires or new tires not listed on the aircraft equipment list are not recommended due to possible interference between the tire and structure when landing gear is in the retracted position.

SETTING THROTTLE SWITCHES

1. During flight at 120 MPH (IAS), 2500', prop control full forward for maximum RPM, and with the gear and flaps up, mark the throttle control position corresponding to 15.0" ± 1.0" manifold pressure.

2. Then adjust the gear warning horn throttle switch on the ground to activate at the throttle control position as marked in flight.

"For each 1000 feet above 2500' MSL, decrease the manifold pressure at which the throttle control position is marked by 0.5 inches."



1. Cover
2. Clamp Bolt
3. Fuel Pump Switch Cam
4. Arm Assembly
5. Thick Washer
6. Fuel Pump Switch
7. Spacer
8. Spacer
9. Mounting Bracket
10. Lower RH Firewall
11. Spacer
12. Gear Warning Switch
13. Gear Warning Cam
14. Throttle Control (Secondary)
15. Cable Clamp Mount
16. Throttle Lever
17. Clamp Bolt
18. Cabin Throttle Control
19. Clamp Half
20. Clamp Assembly
21. Bushing
22. Spacer

Figure 5-8. Rigging Throttle-Operated Gear Warning Horn Switch

5-39. TROUBLE SHOOTING.

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.
	Wheel out of alignment.	Align wheels.
	Wheels out of balance.	Balance wheels
	Sprung main gear strut.	Replace strut.
	Bent axle.	Install new axle.
	Dragging brakes.	Jack wheel and check brake.
	Wheel bearings not adjusted properly.	Tighten axle nut properly.

5-40. REMOVAL. (Refer to figure 5-9.)

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 to up position, 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 position 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 has 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 pump motor circuit breaker pulled.

d. Remove strut attach bolt (26) and work strut (29) and plug (25) from pivot assembly (14).

e. Disconnect brake line from union (23) and plug union and brake line.

f. Remove O-rings (24) from plug (25) and clean plug and strut (29).

5-41. INSTALLATION. (Refer to figure 5-9.)

NOTE

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

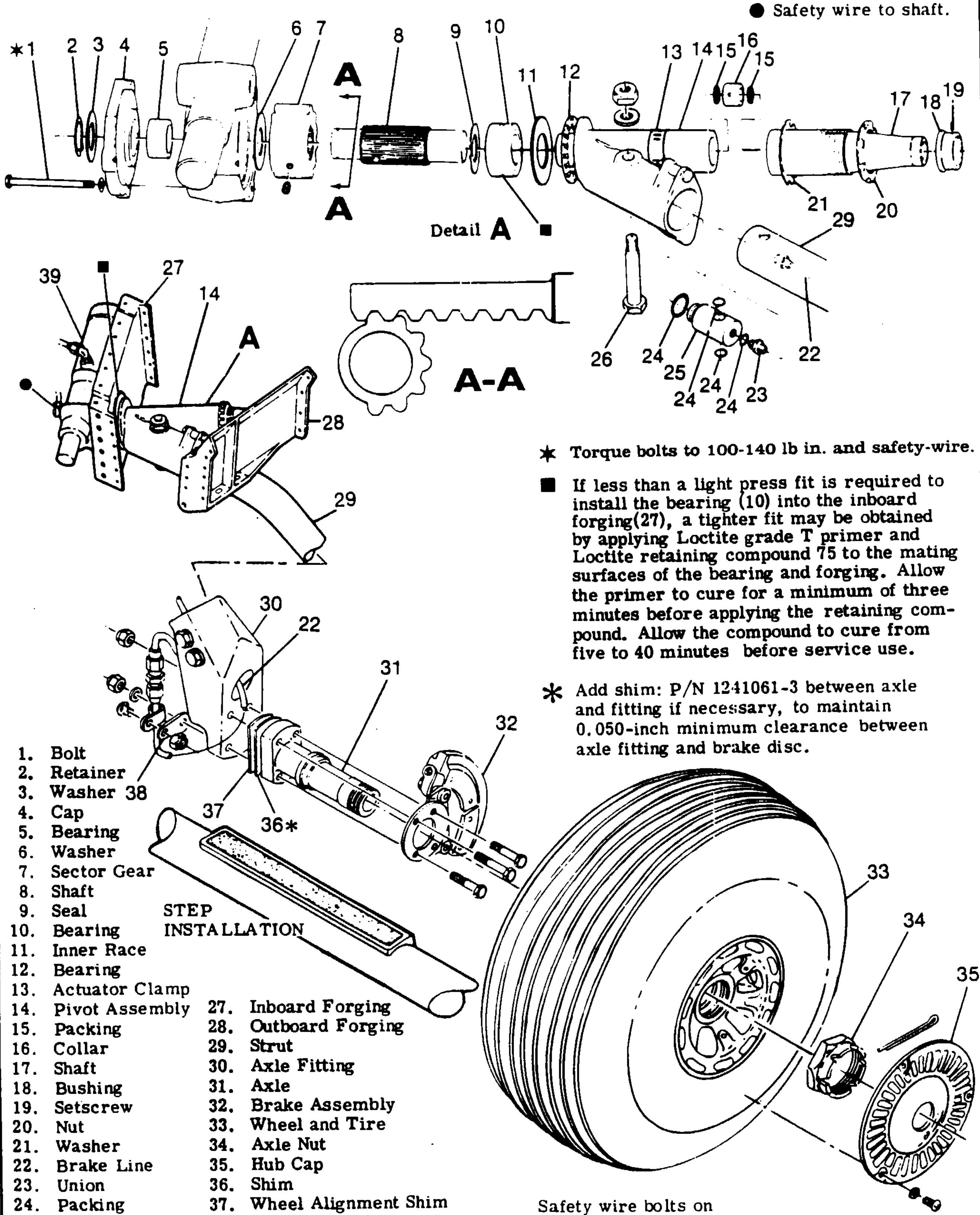
a. Lubricate new O-rings (24) and end of strut (29) with Petrolatum VV-P-236, hydraulic fluid MIL-L-5606, or Corning DC-7 (keep DC-7 away from areas to be painted before installation. Install O-rings (24) on plug (25).

b. Remove caps from union (23) and brake line, attach brake line to union (23), and work plug (25) and strut (29) into pivot (14).

NOTE

When installing a new pivot assembly (14), burnishing the 2.100 I.D. bore may be required to facilitate assembly of landing gear strut (29).

c. Align hole in plug (25) with holes in pivot assembly (14) using special tool No. SE934.



● Safety wire to shaft.

✱ Torque bolts to 100-140 lb in. and safety-wire.

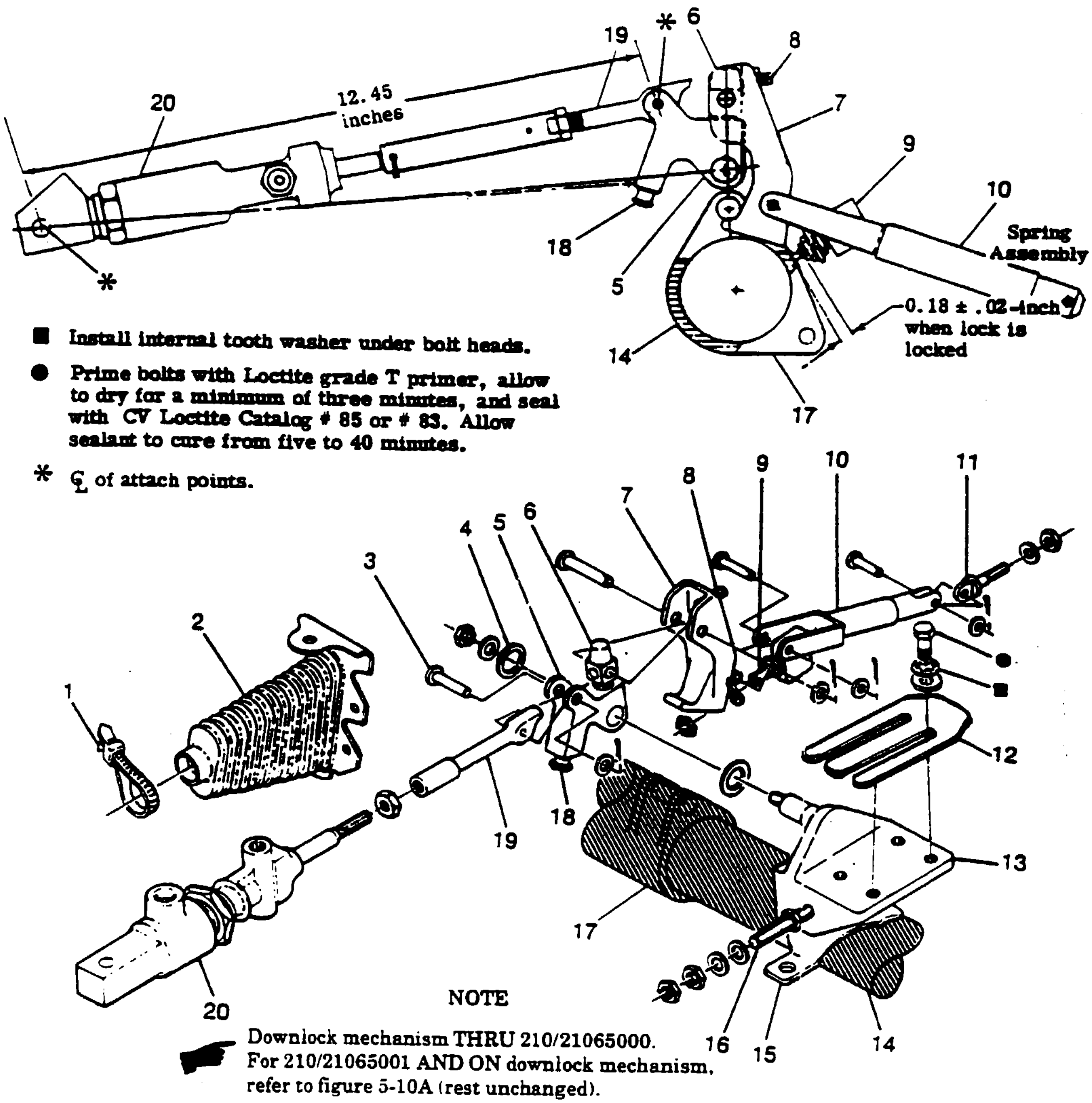
■ If less than a light press fit is required to install the bearing (10) into the inboard forging(27), a tighter fit may be obtained by applying Loctite grade T primer and Loctite retaining compound 75 to the mating surfaces of the bearing and forging. Allow the primer to cure for a minimum of three minutes before applying the retaining compound. Allow the compound to cure from five to 40 minutes before service use.

✱ Add shim: P/N 1241061-3 between axle and fitting if necessary, to maintain 0.050-inch minimum clearance between axle fitting and brake disc.

1. Bolt
2. Retainer
3. Washer
4. Cap
5. Bearing
6. Washer
7. Sector Gear
8. Shaft
9. Seal
10. Bearing
11. Inner Race
12. Bearing
13. Actuator Clamp
14. Pivot Assembly
15. Packing
16. Collar
17. Shaft
18. Bushing
19. Setscrew
20. Nut
21. Washer
22. Brake Line
23. Union
24. Packing
25. Plug
26. Bolt
27. Inboard Forging
28. Outboard Forging
29. Strut
30. Axle Fitting
31. Axle
32. Brake Assembly
33. Wheel and Tire
34. Axle Nut
35. Hub Cap
36. Shim
37. Wheel Alignment Shim
38. Bracket
39. Actuator

Safety wire bolts on installation.

Figure 5-9. Main Landing Gear

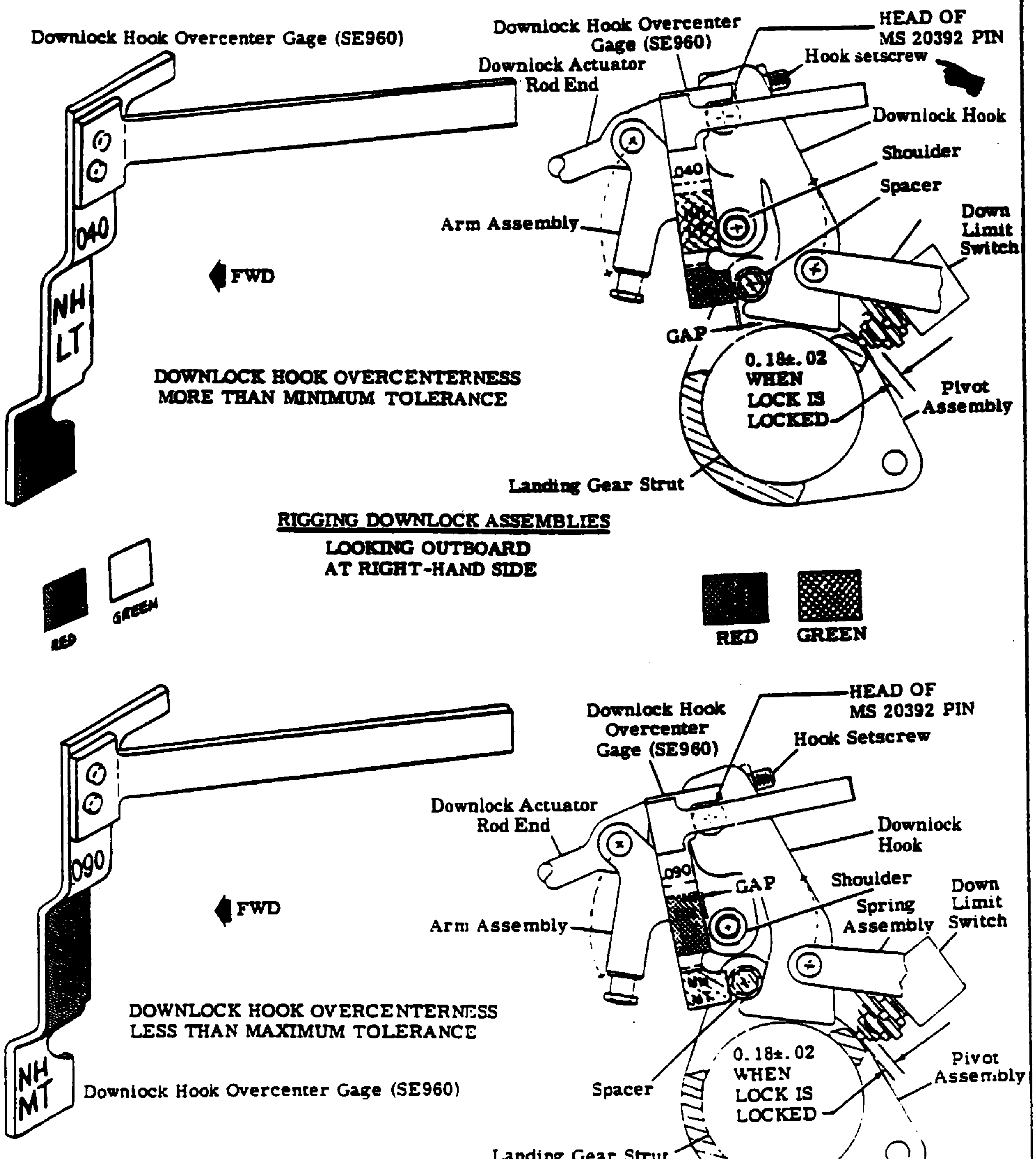


1. Tie
2. Boot
3. Pin
4. Spacer
5. Arm Assembly
6. Downlock Adjustment Screw
7. Downlock Hook
8. Hook setscrew
9. Downlock Switch
10. Spring Assembly
11. Eyebolt
12. Shim
13. Support Assembly
14. Landing Gear Strut
15. Shell Assembly
16. Stud
17. Pivot Assembly
18. Bolt
19. Rod End
20. Actuator

NOTE

Stud (16) and downlock support shell (15) attaching screws shall be sealed with grade AV Loctite 271, or Loctite Catalog # 87. Allow sealant to cure for 12 hours before service use.

Figure 5-10. Rigging Main Landing Gear (Sheet 1 of 3)



ABBREVIATIONS ON GAGES:

NHLT - NOT HITTING. LESS THAN DIMENSION STAMPED ON GAGE

NHMT - NOT HITTING. MORE THAN DIMENSION STAMPED ON GAGE

THRU 210/21065000.

Figure 5-10. Rigging Main Landing Gear (Sheet 2 of 3)

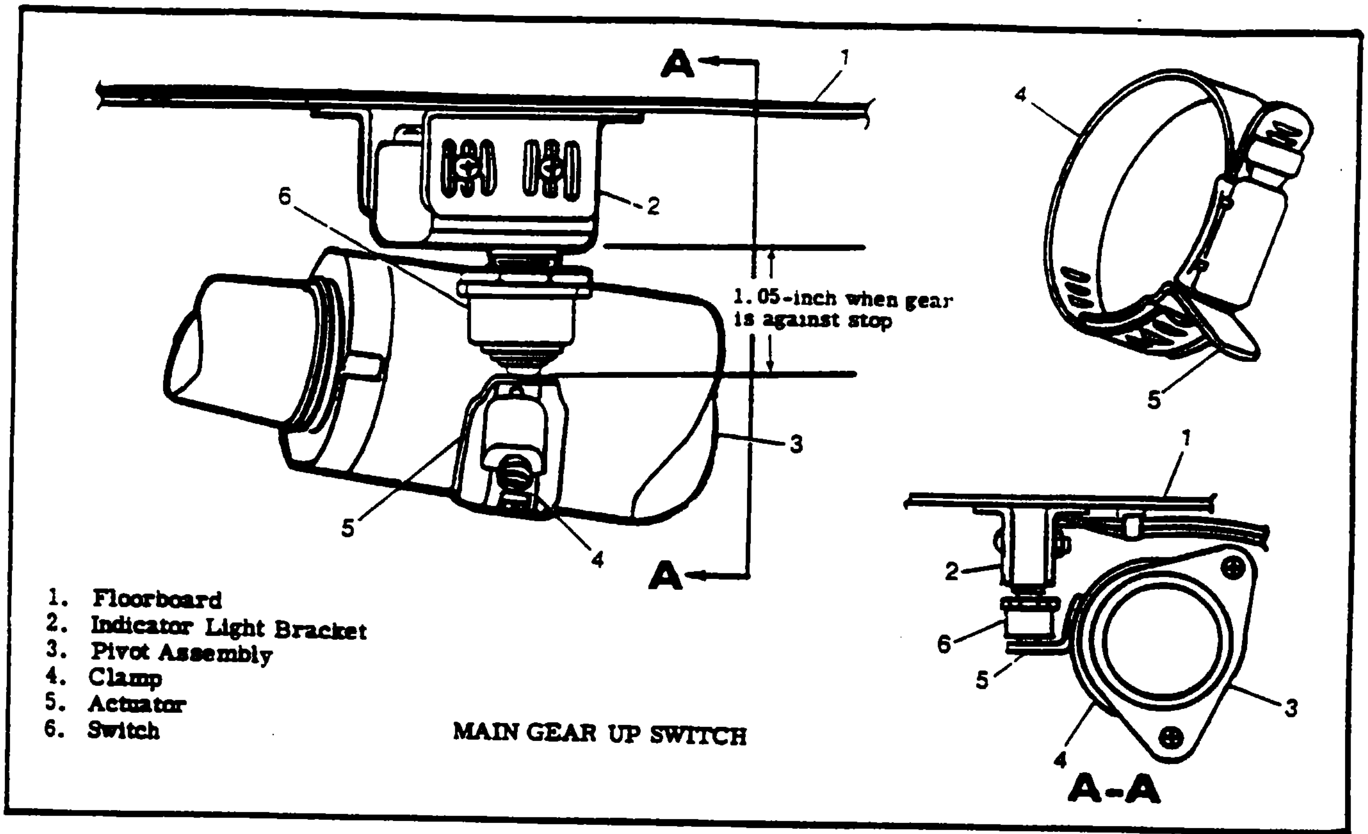


Figure 5-10. Rigging Main Landing Gear (Sheet 3 of 3)

NOTE

Special tool No. SE934 is available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations. This tool is designed to install strut attaching bolt without damaging the O-rings in the plug.

d. Install the strut attaching bolt (26) by pushing the SE934 tool through the aligned holes of the pivot (14), strut (29),and plug (25), with the threaded end of the bolt (26). install and tighten nut and washer on the bolt (26).

e. Fill and bleed brake system in accordance with paragraph 5-156 in this Manual.

f. Rig landing gear in accordance with procedures outlined in this Section.

5-42A. RIGGING MAIN LANDING GEAR (210/21065001 and ON). (Refer to figure 5-10A.)

WARNING

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

NOTE

All of the following rigging adjustments shall be accomplished with the aircraft on jacks and in a level condition, using the ship's power pack to supply pressure. A ground power source should augment the ship's battery.

a. (Refer to figure 5-10.) With main gear unlocked and main landing gear support forging assembled loose to the outboard support assembly (13), bring main landing gear strut (14) into DOWN position and adjust as follows:

1. Center and shim simultaneously main landing gear support assembly (13), using shims (P/N 1241629) between outboard forging (Index 28, figure 5-9), and landing gear support assembly (13), as shown in sheet 1, to level wings and assure that end points of main landing gear wheel axles are within ±.25-inch of water line plane. Total of shims to be within .025-inch to .075-inch.

2. Check landing gear spring-to-support pad surface contact, and maintain surface contact at 75% or better.

NOTE

The following shims are available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations:

1241629-1	.016-inch
1241629-2	.025-inch
1241629-3	.050-inch
1241629-4	.071-inch

b. Adjust hook setscrew (8) to stop hook assembly .040 to .090-inch over center as shown on sheet 2.

NOTE

The downlock hook (7) shall have positive clearance with both inboard and outboard ears of the gear pivot, in all conditions of hook operation, locked, normal operation and malfunction operation. Adjust downlock hook (7) inboard and outboard as required, by locating spacers, installed on the required side of the hook. In some cases, all of the spacers will be installed on one side of the downlock hook to achieve the required clearance.

c. A new downlock actuator assembly is received with a preassembled length of 12.45-inches, and the three hydraulic ports in the same plane. Install actuator assembly, attaching it to fuselage structure and arm assembly (5).

d. With landing gear free, hydraulic pressure off, and downlock systems in position shown on sheet 1,swing landing gear into the DOWN position and adjust downlock adjustment screw (6) as follows:

NOTE

To relieve hydraulic pressure, pull hydraulic pump circuit breaker off, and move gear selector handle up and down two or three times.

1. If downlock locks, turn downlock adjustment screw (6) 1/4 turn out at a time until lock will not lock; then turn back in 1/4 turn and secure pin.
2. If downlock does not lock, turn downlock adjustment screw (6) 1/4 turn in at a time until lock will lock, then secure pin.

e. Readjust hook setscrew (8) to stop hook assembly .040 to .090-inch overcenter. When checking overcenter measurement of arm assembly (5), landing gear should be as shown on sheet 2, with nut, washer and spacer removed, which retains the arm assembly (5). Use downlock overcenter gages (P/N SE960) to determine if downlock hook assembly is still within tolerances shown on sheet 2. Use gages as follows:

NOTE

Overcenter gages, P/N SE960 are available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations.

1. Remove nut, washer and spacer which retain arm assembly to support assembly.
2. Install .090-inch downlock gage (SE960) on inboard side of downlock hook (7) as shown on sheet 2. Upper portion of gage should rest against head of pin attaching downlock adjustment screw (6). If downlock hook (7) is under maximum overcenter tolerance, green area of gage will contact spacer on gear pivot, while red area will not make contact with .50-inch diameter shoulder, as shown in the figure. When downlock hook (7) is in maximum overcenter tolerance, both green and red areas will make contact. If red area makes contact and green area does not, the hook setscrew (8) should be adjusted INWARD to bring overcenter dimension within tolerance.
3. Install.040-inch downlock gage (SE960) on inboard side of downlock hook (7) as shown on sheet 2. If downlock hook (7) is over minimum overcenter tolerance, green area of gage will contact shoulder, while red area will not make contact with spacer.
4. When downlock hook (7) is in minimum overcenter tolerance, both red and green areas will make contact.
5. If overcenter tolerance is less than .040-inch, the red area will make contact, while the green area will not. If this condition exists, the next step is to determine if the downlock adjustment screw (6) is making contact with the hook setscrew (8). This is accomplished by lifting the landing gear spring upward off the hook assembly and checking for possible rotation of the hook assembly, by hand, with hydraulic pressure off.
6. If a slight rotation is possible, hook setscrew (8) is not contacting downlock adjustment screw (6). If contact is not being made, downlock actuator will have to be re-adjusted by backing off actuators rod end (19) one-half turn at a time (one and one half turn maximum adjustment) until hook assembly is .040-inch or more overcenter, and contact is being made between hook setscrew (8) and adjustment screw (6). If contact is being made, hook setscrew (8) should be adjusted outward to increase overcenter measurement to within tolerance.

NOTE

For correct rigging, hook setscrew (8) must make contact with downlock adjustment green areas of both gages must contact as shown on sheet 2.

f. Now that downlock adjustment screw (6) has been adjusted following procedures outlined in step "e", check actuator rod end (19) adjustment as follows:

1. Connect all hydraulic lines, fill system with MIL-H-5606 hydraulic fluid and purge system of air by cycling gear through several cycles.

NOTE

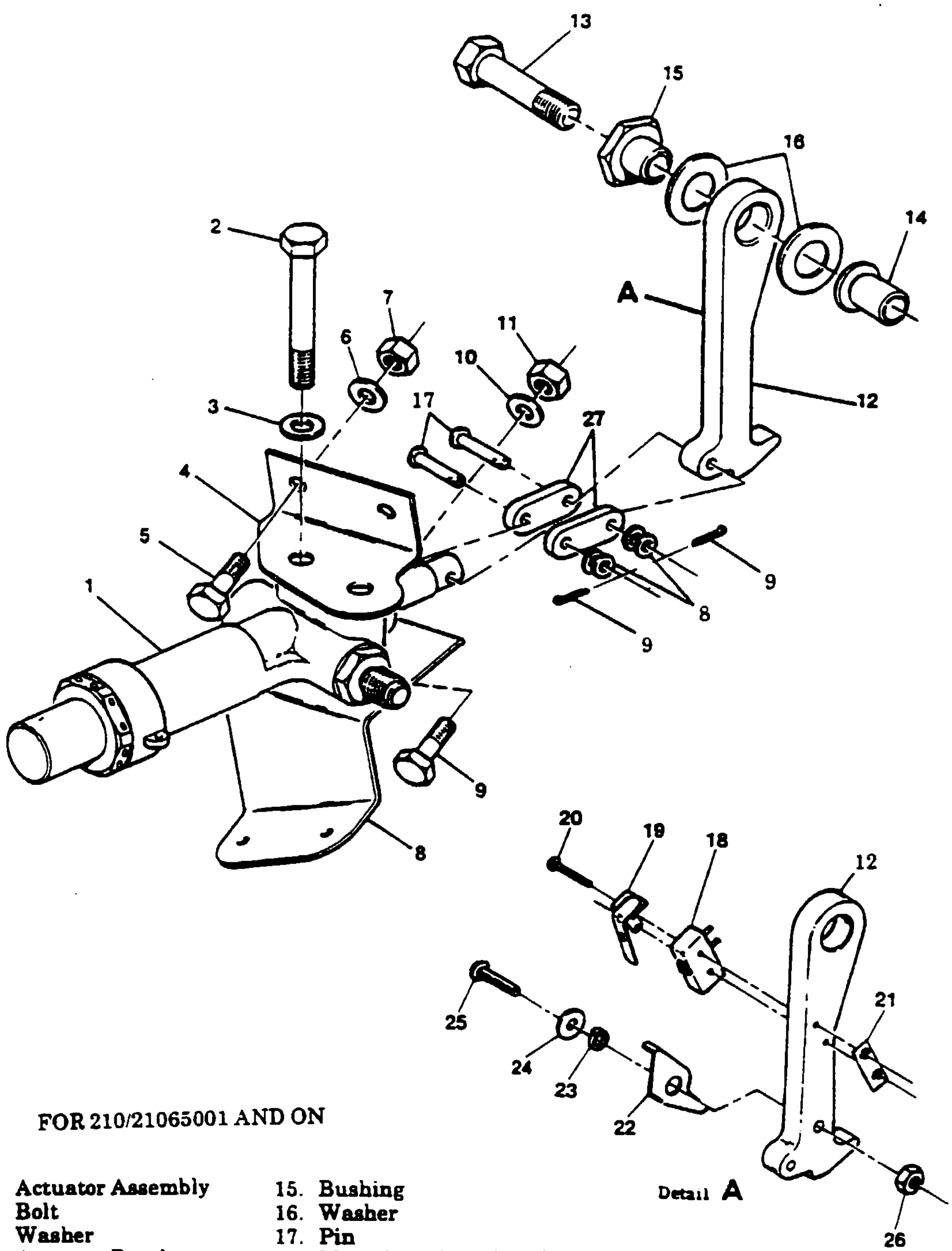
Check fluid level in power pack reservoir frequently during purging and rigging procedures.

2. Reset hydraulic pump circuit breaker to ON.
3. With gear in down and locked position, move gear selector handle to GEAR UP position and note actuation of main gear downlock hooks.
4. As soon as left downlock hook (7) is actuated to unlock the left gear, move gear selector handle back to GEAR DOWN position to simulate what would occur if the pilot were to select gear down before the gear was fully retracted. If downlock hooks (7) do not lock the gear in the down position, check downlock system for misalignment.

g. Place gear selector handle in GEAR UP position and allow gear to retract to UP position.

h. Check that gear up indicator switches are closed (light out) and some free travel exists on switch plunger (plunger not bottomed out). Adjust position as necessary.

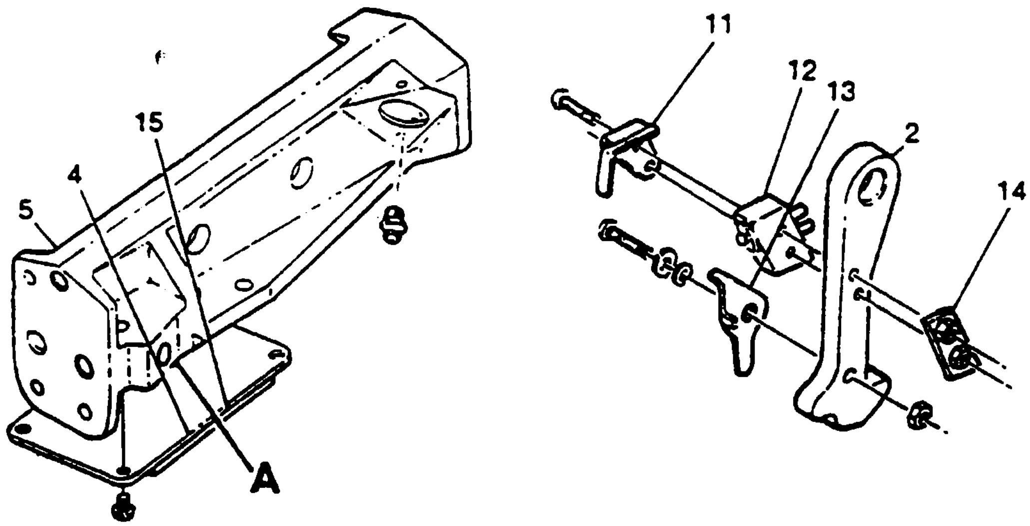
i. Lower gear, turn master switch OFF, and replace panels, carpeting, and items removed for access. Remove aircraft from jacks.

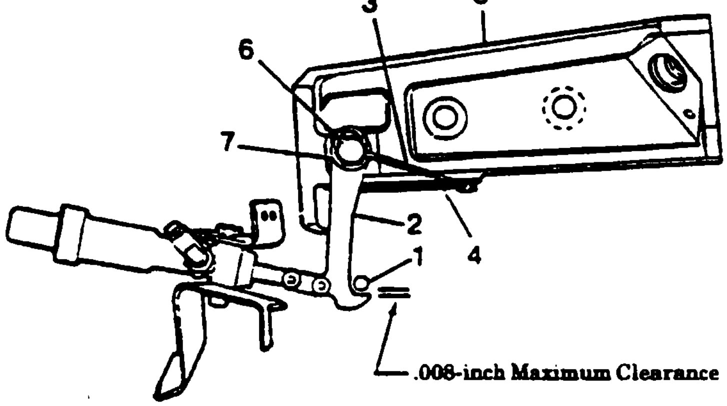


FOR 210/21065001 AND ON

1. Actuator Assembly
2. Bolt
3. Washer
4. Actuator Bracket
5. Bolt
6. Washer
7. Nut
8. Screw
9. Cotter Pin
10. Washer
11. Nut
12. Downlock Hook
13. Bolt
14. Bushing
15. Bushing
16. Washer
17. Pin
18. Main Gear Downlock Switch
19. Limit Switch Attachment
20. Screw
21. Plate Assembly Limit Switch Attachment
22. Actuator
23. Lock Washer
24. Washer
25. Screw
26. Nut
27. Hook Link

Figure 5-10A. Rigging Main Landing Gear (Sheet 1 of 2)





1. Pivot Lock Pin
2. Downlock Hook
3. Safety Wire
4. Downstop Backing Plate
5. Bulkhead Forging
6. Pivot Bolt
7. Adjustment Cam
11. Actuator
12. Switch
13. Actuator
14. Switch Plate
15. Downstop Pad

FOR 210/21065001 AND ON

Figure 5-10A. Rigging Main Landing Gear (Sheet 2 of 2)

5-42. RIGGING MAIN LANDING GEAR (210/T21065001 and On). (Refer to figure 5-10A.)

WARNING

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

NOTE

A new main landing gear downlock mechanism has been incorporated on serials 210/21065001 and ON. A single acting downlock sequence actuator and downlock hook replaces the double acting actuator, arm assembly, and downlock hook. Figure 5-10A illustrates the replacement downlock mechanism while figure 5-10 illustrates the unchanged associated parts and structure and may also be used as a guide for determining relationship of parts.

a. (Refer to figure 5-10.) With main gear unlocked and main landing gear support forging assembled loose to the outboard support assembly (13), bring main landing gear strut (14) into DOWN position and adjust as follows:

1. Center and shim simultaneously main landing gear support assembly (13), using shims (P/N 1241629) between outboard forging (Index 28, figure 5-9), and landing gear support assembly (13), as shown in sheet 1, to level wings and assure that end points of main landing gear wheel axles are within ±.25-inch of water line plane. Total of shims to be within .025-inch to .075-inch.

NOTE

The following shims are available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations:

1241629-1	.016-inch
1241629-2	.025-inch
1241629-3	.050-inch
1241629-4	.071-inch

2. Check landing gear spring-to-support pad surface contact, and maintain surface contact at 75% or better.

NOTE

For 21065001 and On the downlock mechanism does not have an arm assembly (Index 5, figure 5-10, sheet 1) with downlock adjustment screw (Index 6, figure 5-10, sheet 1) and thus does not require downlock hook overcenter measurement and adjustment.

b. (Refer to figure 5-10A, sheet 1.) Install actuator assembly, attaching it to fuselage structure and downlock hook (12) using hook links (27).

c. With landing gear free, hydraulic pressure off, and downlock systems in position shown on sheet 2, check clearance between downlock hook (2) and pivot lock pin (1) with gear in down and locked position. Clearance must not exceed .008-inch. If adjustment of downlock hook is necessary, work through access opening (access panels in cabin, under carpet, above main gear pivot assemblies) and remove safety wire (3). Loosen pivot bolt (6) and turn cam (7) until clearance is within tolerance; tighten pivot bolt (6).

d. Check rigging of downlock hook and main gear down limit switches as follows:

1. Temporarily insert a .025-inch shim (P/N SE997-1 or -2) between pivot assembly (Index 14, figure 5-9) and downstop pad (15, figure 5-10A, sheet 2).

WARNING

Stay clear of main landing gear when making this check.

2. Please gear selector handle in DOWN position and reset gear pump circuit breaker. Turn master switch ON and allow gear to rotate to full down position, leaving the master switch ON.

3. With SE997-1 or -2 shim in place, downlock hook (2) should not engage pivot lock pin (1), and light should be OFF.

4. Recycle gear UP, remove shim SE997-1 or -2, and then gear DOWN. Light should be ON. Refer to paragraph 5-43. for rigging and adjustment of main gear downlimit switches.

e. Refer to figure 5-10, sheet 1. Check actuator rod end (19) adjustment as follows:

1. Connect all hydraulic lines, fill system with MIL-H-5606 hydraulic fluid, and purge system of air by cycling gear through several cycles.

NOTE

Check fluid level in power pack reservoir frequently during purging and rigging procedures.

2. Reset hydraulic pump circuit breaker to ON.

3. With gear in down and locked position, move gear selector handle to GEAR UP position and note actuation of main gear downlock hooks.

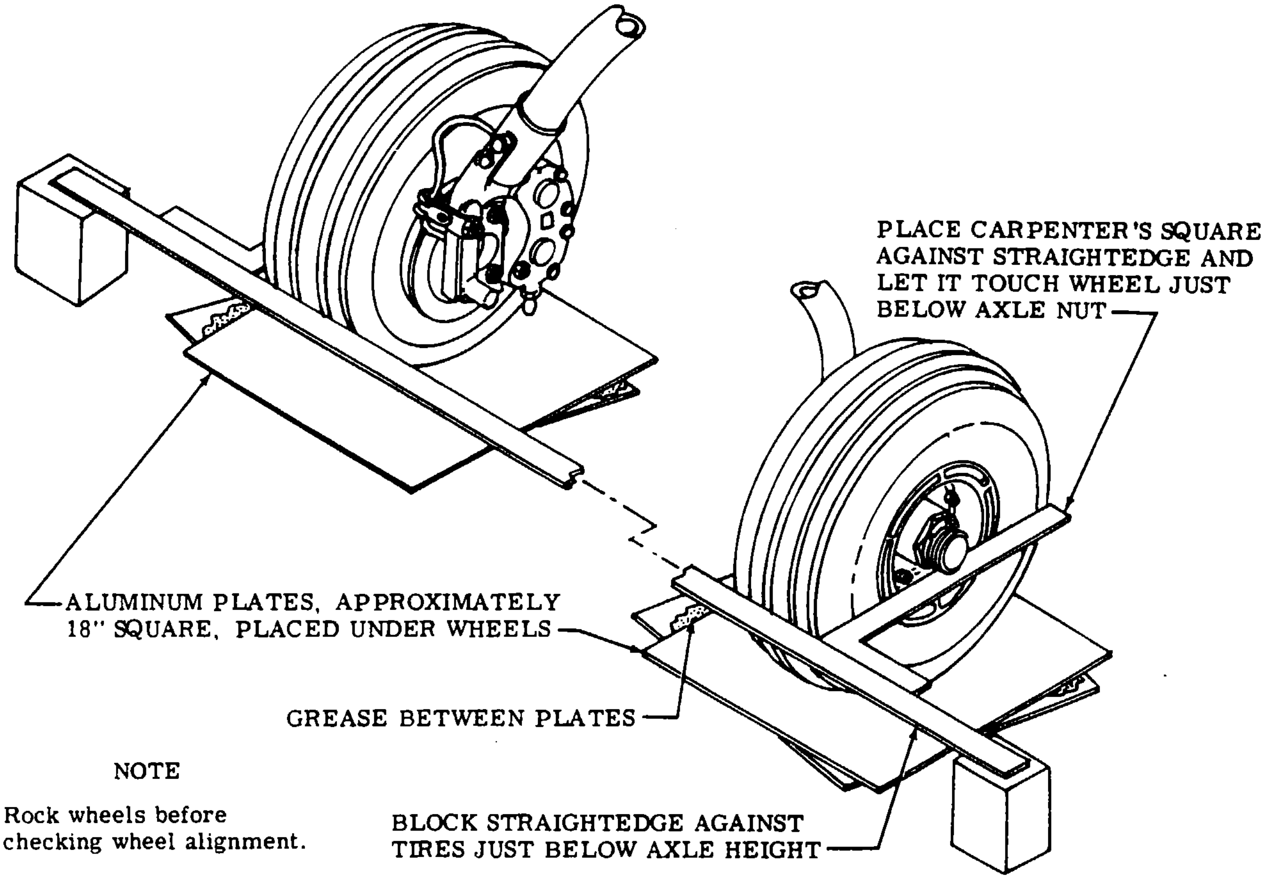
4. As soon as left downlock hook (7) is actuated to unlock the left gear, move gear selector handle back to GEAR DOWN position to simulate what would occur if the pilot were to select gear down before the gear was fully retracted. If downlock hooks (7) do not lock the gear in the down position, check downlock system for misalignment.

f. Place gear selector handle in GEAR UP position and allow gear to retract to UP position.

g. Check that gear up indicator switches are closed (light out) and some free travel exists on switch plunger (plunger not bottomed out). Adjust position as necessary.

h. Lower gear, turn master switch OFF, and replace panels, carpeting, and items removed for access. Remove aircraft from jacks.

5-43. RIGGING MAIN GEAR DOWN LIMIT SWITCHES. (Refer to figure 5-10, sheet 2.) The main gear down limit switches are attached to brackets which are welded to the downlock hooks. Adjustment is accomplished by loosening the lock nut and either tightening or loosening the adjustment nut and retightening the lock nut against the bracket behind the adjustment nut. Down limit switches are to be adjusted to the dimension stipulated in the figure.

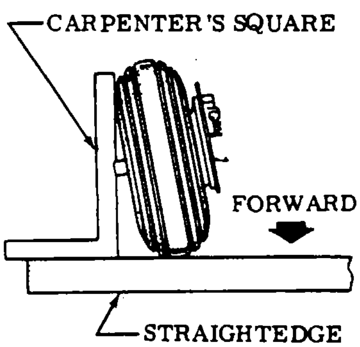


NOTE

Rock wheels before checking wheel alignment.

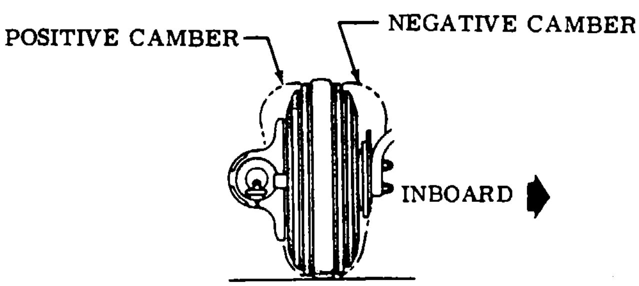
TOP VIEW OF TOE-IN CHECK

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



FRONT VIEW OF CAMBER CHECK

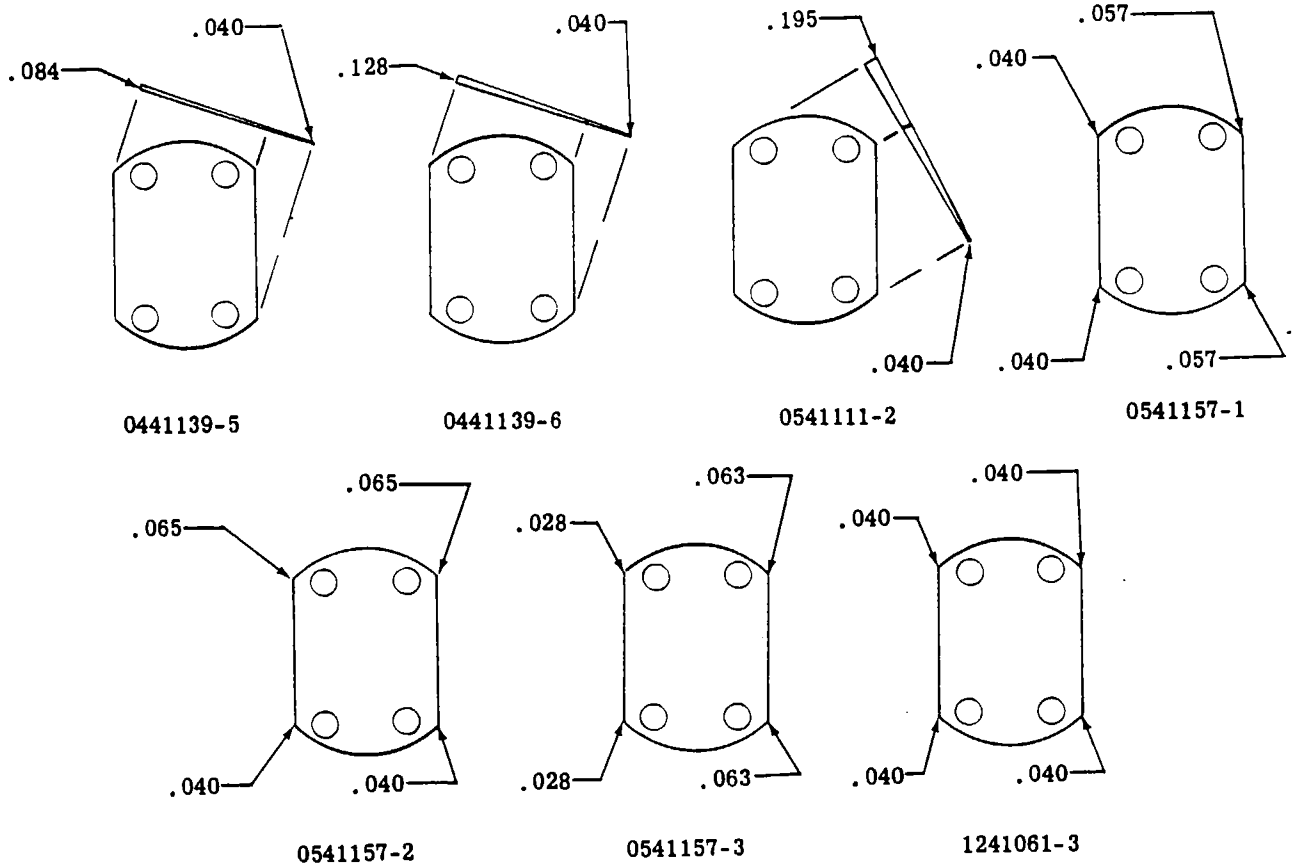
Measure camber by reading protractor level held vertically against outboard flanges of wheel.



NOTE

See Section 1, figure 1-1 for toe-in and camber tolerances. Setting toe-in and camber within these tolerances while the cabin and fuel tanks are empty will give approximately zero toe-in and zero camber at gross weight. Therefore, if normal operation is at less than gross weight and abnormal tire wear occurs, realign the wheels to attain the ideal setting for the load conditions. Refer to sheet 2 of this figure for shims availability. Always use the least number of shims possible to obtain the desired result.

Figure 5-11. Wheel Alignment (Sheet 1 of 2)



NOTE

To assure adequate thread engagement of the mounting bolts, use 0541111-2 or 0441139-6 shim alone and/or 0541157-1, -2, -3 or 0441139-5 shims in and combinition as required to get zero toe-in and zero camber at normal operating weight. Total thickness of shims at upper bolts must not exceed .195. If any tapered shims are used, all AN960 washers must be removed from the upper bolts.

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

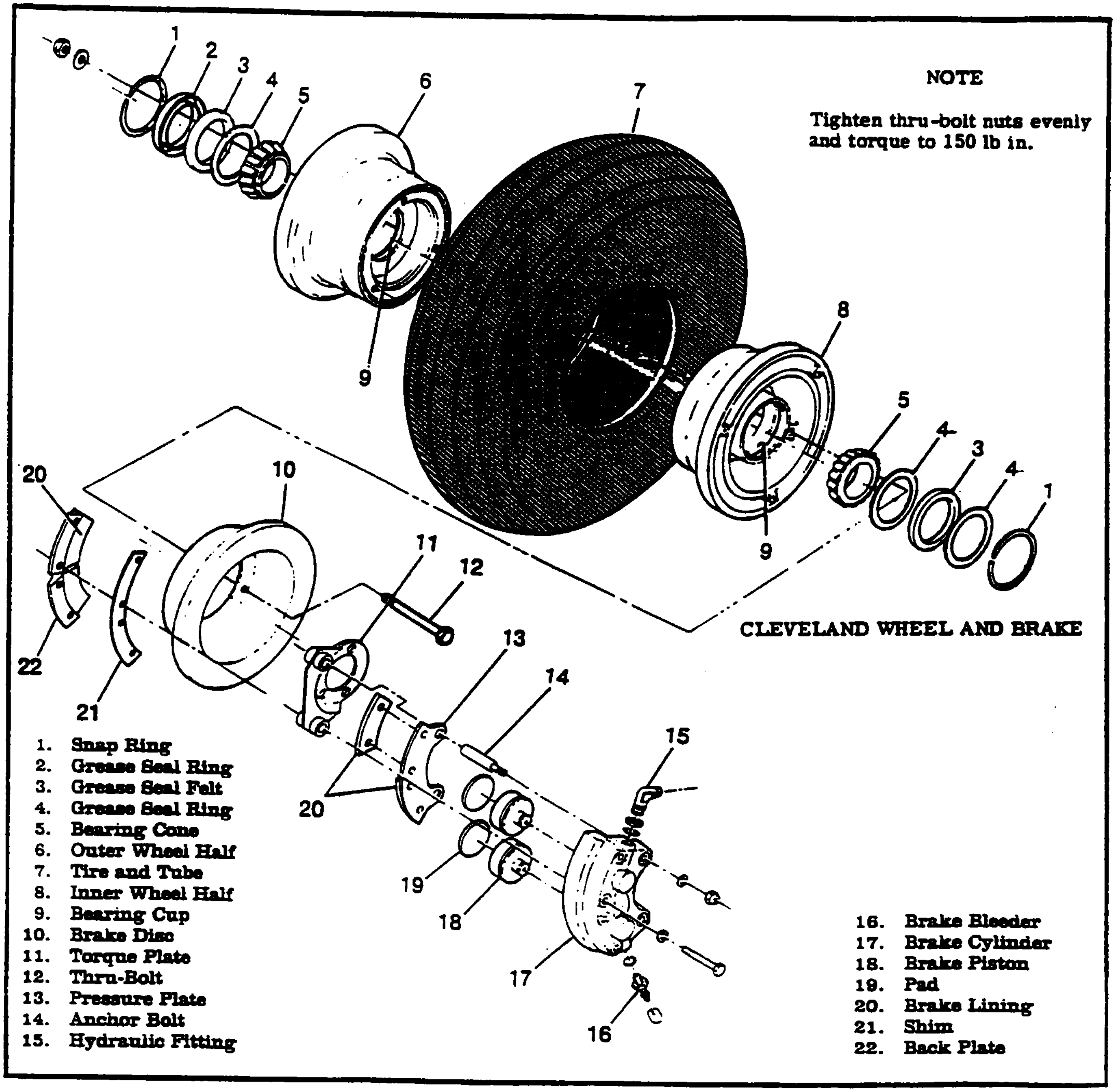


Figure 5-12. Main Landing Gear Wheel. Tire and Brake Assembly

5-44. RIGGING MAIN GEAR UP LIMIT SWITCHES. (Refer to figure 5-10, sheet 3.) The main gear up limit switches are mounted in brackets which are attached to the underside of the removable floorboards. immediately above the main landing gear pivot assemblies. The switches are contacted by actuators. bonded to clamps, which are attached to the aft leg of the landing gear strut pivot assembly. When replacing a clamp/actuator assembly. adjust the actuator tab prior to bonding, so that it actuates the gear-up indicator light switch. Bond the actuator to the clamp with HYSOL EA-9309 or 3M EC-2216 adhesive. Trim off excess end tab of clamp and position clamp helix approximately as shown in the figure. to avoid interference with gear-up switch wiring. Additional switch adjustment is provided by slotted holes in the switch mounting brackets. Adjust actuator tab-to-switch clearance to dimension stipulated in the figure. With landing gear full up and clearance as specified in Figure 5-10., check that GEAR UNSAFE light is out.

5-45. MAIN WHEEL AND TIRE ASSEMBLY.

5-46. DESCRIPTION. The aircraft is equipped with Cleveland wheel and tire assemblies.

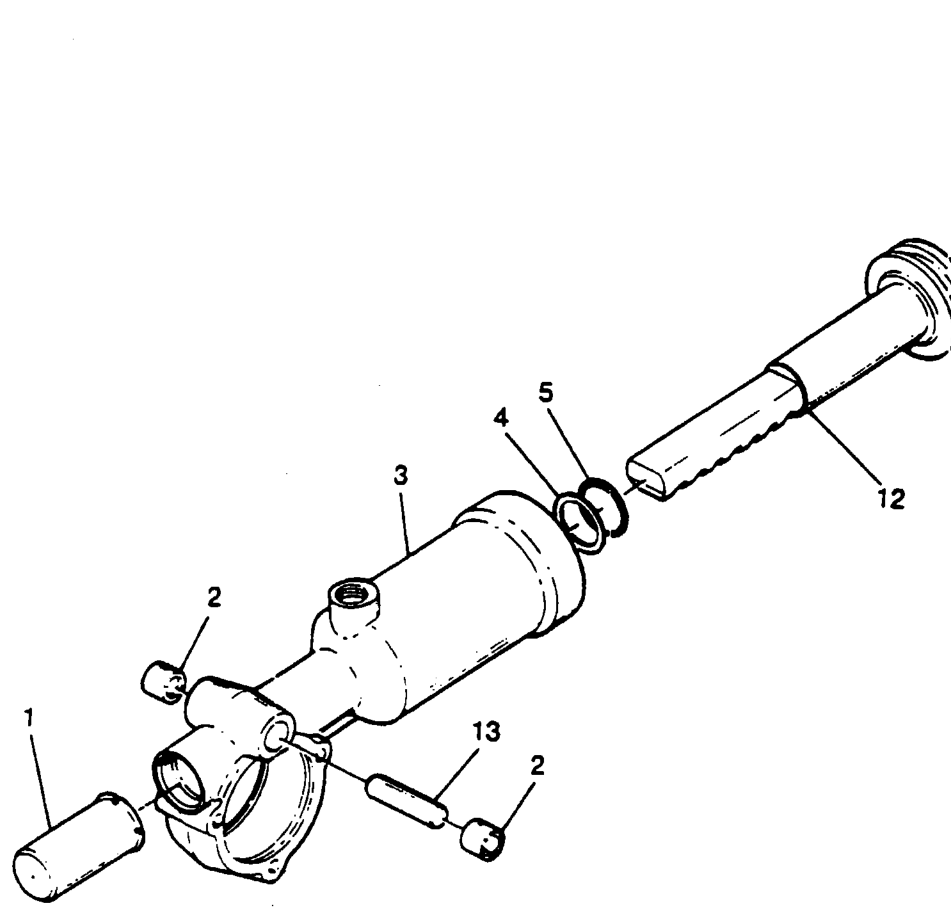


Figure 5-13. Main Landing Gear Actuator

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.

5-47. REMOVAL OF MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-12.)

NOTE

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

a. Using the jack point under step on main gear strut, jack-up wheel being removed.
b. Remove hub caps.
c. Remove cotter pin and axle nut.
d. Remove bolts and washers attaching back plate and remove back plate.
e. Pull wheel from axle.

5-48. DISASSEMBLY OF MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-12.)
a. Deflate tire and break tire beads loose.

CAUTION

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

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

NOTE

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

5-49. INSPECTION AND REPAIR OF MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-12.)

a. Clean all metal parts and the grease seal felts in solvent and dry thoroughly.

b. Inspect wheel halves for cracks. Cracked wheel halves should be replaced. 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 repainted with aluminum lacquer.

c. Brake disc should be replaced if excessively scored or warped. Small nicks and scratches should be sanded smooth.

d. Bearing cups and cones should be inspected carefully for damage and discoloration. After cleaning, repack cones with clean aircraft wheel bearing grease (Section 2) before installation in the wheel.

5-50. REASSEMBLY OF MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-12.)

a. Insert thru-bolts through brake disc and position in the inner wheel half, using the bolts to guide the disc. Assure the disc is bottomed in wheel half.

b. Position tire and tube with the inflation valve through hole in outboard wheel half. Place inner wheel half in position. Apply a light force to bring wheel halves together. Maintaining the light force, assemble a washer and nut on one thru-bolt and tighten snugly. Assemble remaining washers and nuts on thru-bolts and torque to 150 lb-in.

CAUTION

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

c. Clean and repack bearing cones with clean aircraft wheel bearing grease (refer to Section 2 of this Manual).

c. Assemble bearing cones, grease seal felts and rings into wheel halves.

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

5-51. MAIN WHEEL BALANCING AND ALIGNMENT. Wheel alignment procedures are outlined in figure 5-11.

5-52. MAIN WHEEL AND AXLE REMOVAL. (Refer to figure 5-9.)

a. Remove hub caps.

b. Remove wheel and tire in accordance with applicable paragraph of this Section.

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

d. Remove bolts, washers, nuts and stud securing axle and brake components to fitting at lower end of strut.

NOTE

When removing axle from strut fitting, note number and position of wheel alignment shim. Mark these shims or tape together carefully so they can be reinstalled in exactly the same position to ensure that wheel alignment is not disturbed. Also, note position of stud attaching axle to fitting so that the stud may be installed in the same position. Stud is the uplock for the main gear.

5-53. MAIN WHEEL AND AXLE INSTALLATION. (Refer to figure 5-9.)

a. Secure axle and brake components to strut fitting, making sure that wheel alignment shims and stud are reinstalled in their original position.

NOTE

Shim: P/N 1241061-3, available from the Cessna Parts Distribution (CPD 2) through Cessna Service Stations, can be installed between axle and fitting, if neecssary, to maintain .050 inch minimum clearance between axle fitting and brake disc.

b. Install wheel assembly on axle in accordance with applicable paragraph of this Section.

c. Connect hydraulic brake line to brake cylinder.

d. Fill and bleed affected brake system.

e. Install hub caps.

f. Check wheel alignment.

5-54. MAIN GEAR ACTUATOR. (Refer to figure 5-13.)

5-55. REMOVAL.

a. Remove seats and peel back carpet as necessary to gain access to plate above actuator; remove access plate.

b. Remove access plate from bulkhead forward of actuator.

c. Disconnect and drain hydraulic fluid at wheel brake cylinders.

d. Place landing gear control handle UP, with master switch OFF, and operate emergency hand pump until main gear downlocks release.

e. Disconnect and cap or plug all hydraulic lines at the actuator.

f. Remove bolts attaching actuator mounting flange to bulkhead forging.

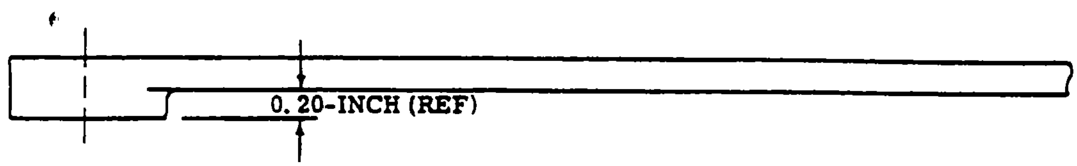
g. Work actuator free of forging and pivot assembly; remove actuator.

5-56. DISASSEMBLY. (Refer to figure 5-13.)

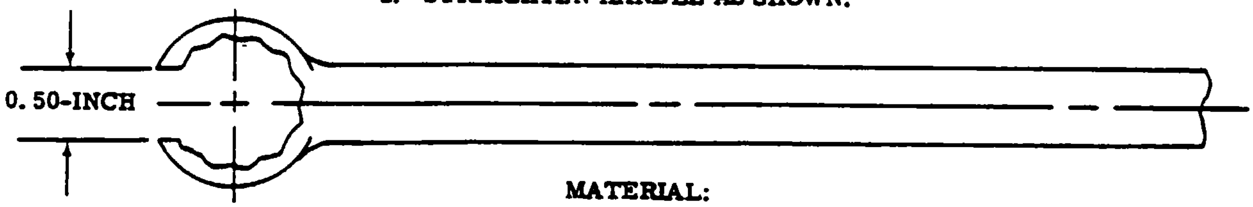
a. Remove setscrew (8) and remove end gland (7) by unscrewing from actuator body (3).

b. Remove cap (1) from end of actuator.

c. Using a small rod, push piston (12) from actuator body.

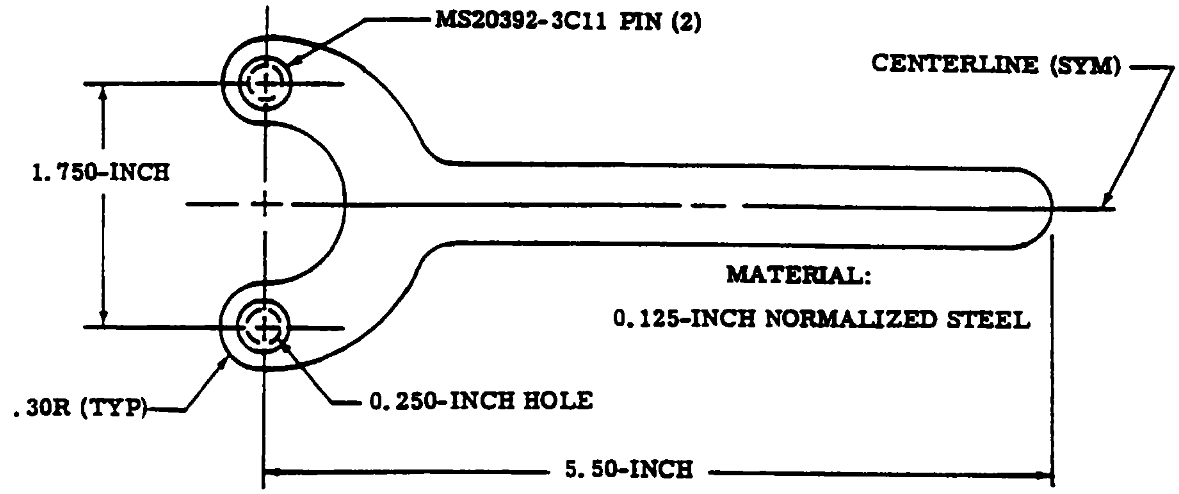


1. WRENCH USED TO TIGHTEN OR LOOSEN JAMNUT ON MAIN GEAR ACTUATOR.
2. STRAIGHTEN HANDLE AS SHOWN.



MATERIAL:

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



1. WRENCH USED TO INSTALL OR REMOVE END GLAND ON MAIN GEAR ACTUATOR.
2. 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-oxidizating 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 5-14. Fabrication of Main Landing Gear Actuator End Gland Removal Tool

NOTE

Unless defective. do not remove nameplate. bearings (2) or roller (13).

d. Remove packing (5) and back-up ring (4) from cylinder body (3). Discard packing (5).
e. Remove packing (10) and back-up ring (9) from end gland (7). Discard packing (10).
f. Remove and discard packing (11) from piston (12).

5-57. INSPECTION.
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 cap (1). piston (12). roller (13), if removed. and actuator body (3) 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.

5-58. PARTS REPAIR/REPLACEMENT. 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-458). providing their removal does not affect operation of the unit. During assembly. install all new packings.

5-59. REASSEMBLY. (Refer to figure 5-13.)

NOTE

Use MIL-G-2116C lubricant on roller (13) and bearings (2). if removed.

a. If bearings (2) and roller (13) 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 bearings or roller.
b. Install back-up ring (4) and new packing (5) in actuator body core. Install new packing (11) and back-up rings (6) on piston (12).

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.

c. Slide piston (12) into cylinder body (3).
d. Install back-up ring (9) and new packing (10) on end gland.
e. Install end gland in cylinder and tighten until end of gland is flush with end of cylinder body. Install and tighten setscrew (8).
f. Install cap (1) at end of actuator assembly.

5-60. INSTALLATION.
a. With main landing gear in the down and locked position. install actuator into bulkhead forging so that piston rack gear and sector gear engage as shown in figure 5-9, Section A-A.
b. Lubricate swivel fitting on actuator with MIL-G-21164 lubricant, install packing in fitting.
c. Install cap (4), washer (3). retainer (2) and swivel fitting on actuator as shown in figure 5-9.
d. Install bolts (1) and torque to 100-140 lb-in. and safety-wire. Safety-wire swivel fitting to shaft (8).
e. Connect all hydraulic lines to their source locations. Lubricate threads with Petrolatum.
f. Connect brake line at wheel cylinder. Fill and bleed brake system in accordance with procedures outlined in applicable paragraph in this Section.
g. Rig landing gear in accordance with procedures outlined in applicable paragraph in this Section.
h. Remove aircraft from jacks and install access covers, carpeting and seats removed for access.

5-61. MAIN GEAR PIVOT ASSEMBLY.

5-62. REMOVAL. (Refer to figure 5-9.)
a. Remove 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 from sector gear (7).
d. Bend tangs of washer (21) from notches in nut (20) and completely unscrew nut (20) from threaded area of shaft (17).
e. Push shaft (17) into pivot assembly (14) and pull pivot assembly free of shaft (8).

5-63. INSPECTION AND REPAIR. (Refer to figure 5-9.)
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 (10) (pressed into bulkhead forgings in aircraft) for damage and excessive wear. Replace bushing or bearing as required.

NOTE

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

5-64. INSTALLATION. (Refer to figure 5-9.)
a. Lubricate all bushings and bearings with MIL-G-21164 grease. Slide shaft (17) into pivot assembly (14).
b. Install pivot with bearing (12) and race (11) installed. into inboard bearing in bulkhead forging. Pull shaft from pivot and install washer (21) and nut (20) 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 (9) and sector gear (7) on inboard end of pivot assembly so that setscrew hole in sector gear lines up with setscrew hole in shaft (8); install setscrew into sector gear and shaft with Loctite 242 locking compound and tighten screw.

5-65. GEAR POSITION INDICATOR SWITCHES.

5-66. DESCRIPTION. The gear down indicator switches are attached to brackets which are welded to the downlock hooks. The main gear up limit switches are mounted in brackets which are attached to the underside of the removable floorboards immediately above the main landing gear pivot assemblies. Refer to the paragraphs in this section which outline procedures for rigging the main gear up and down switches.

5-67. DOWNLOCK MECHANISM. (Refer to figure 5-15.)

5-68. DESCRIPTION. The downlock mechanism is comprised of hydraulic actuators connected to arm assemblies, which trip downlock hooks, releasing the main landing gear struts. Figure 5-15 illustrates the downlock mechanism and may be used as a guide for determining relationship of parts. A locator illustration is also provided, which shows station numbers, bulkheads, ribs and parts of the downlock mechanism. To locate a specific fuselage station, refer to the station 1 of this manual.

NOTE

A new main landing gear downlock mechanism has been incorporated on serials 210/21065001 and ON. A single acting downlock sequence actuator and downlock hook replaces the double acting actuator, arm assembly, and downlock hook. Figure 5-10A illustrates the replacement downlock mechanism while figures 5-10 and 5-15 each illustrate the unchanged associated parts and structure and may also be used as a guide for determining relationship of parts.

5-69. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 5-15.) The downlock mechanism located just forward and aft of the rear door post under the floorboard. Access to the mechanism is gained by removing the seats, peeling back the carpet and removing the access plates immediately forward and aft of the rear door post on either side of the aircraft. Figure 5-15 may be used as a guide for removal and installation of components of the downlock mechanism. Upon complete reassembly of the downlock mechanism, rig the main landing gear in accordance with procedures outlined in the applicable paragraph in this section.

NOTE

A new main landing gear downlock mechanism has been incorporated on serials 210/21065001 and ON. Figure 5-10A illustrates the replacement downlock mechanism while figures 5-10 and 5-15 each illustrate the unchanged associated parts and structure and may also be used as a guide for removal and installation of components of the replacement downlock mechanism.

5-70. DOWNLOCK ACTUATOR.

5-71. DISASSEMBLY. (Refer to figure 5-16).
a. Loosen nut (1) and unscrew end fitting (2) from body (3). Spring (4) can also be removed.
b. Remove hose valve assembly (5), O-ring (14), spring guide (15), spring (6), ball (7) and ball (8) from body (3).
c. Remove piston/rod (9) from body.
d. Remove and discard all packings and back-up rings from end fitting (2), body (3) and piston/rod (9).

5-72. INSPECTION AND REPAIR.
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 piston spring (4) for evidence of breaks and distortion.
d. Inspect end fitting, piston/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 uplock 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.

5-73. REASSEMBLY.

NOTE

Install new O-rings and back-up rings lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dowcorning DC-7.

a. Assemble by reversing procedures outlined in paragraph 5-70.

5-74. MAIN GEAR STRUT STEP. (Refer to figure 5-9).

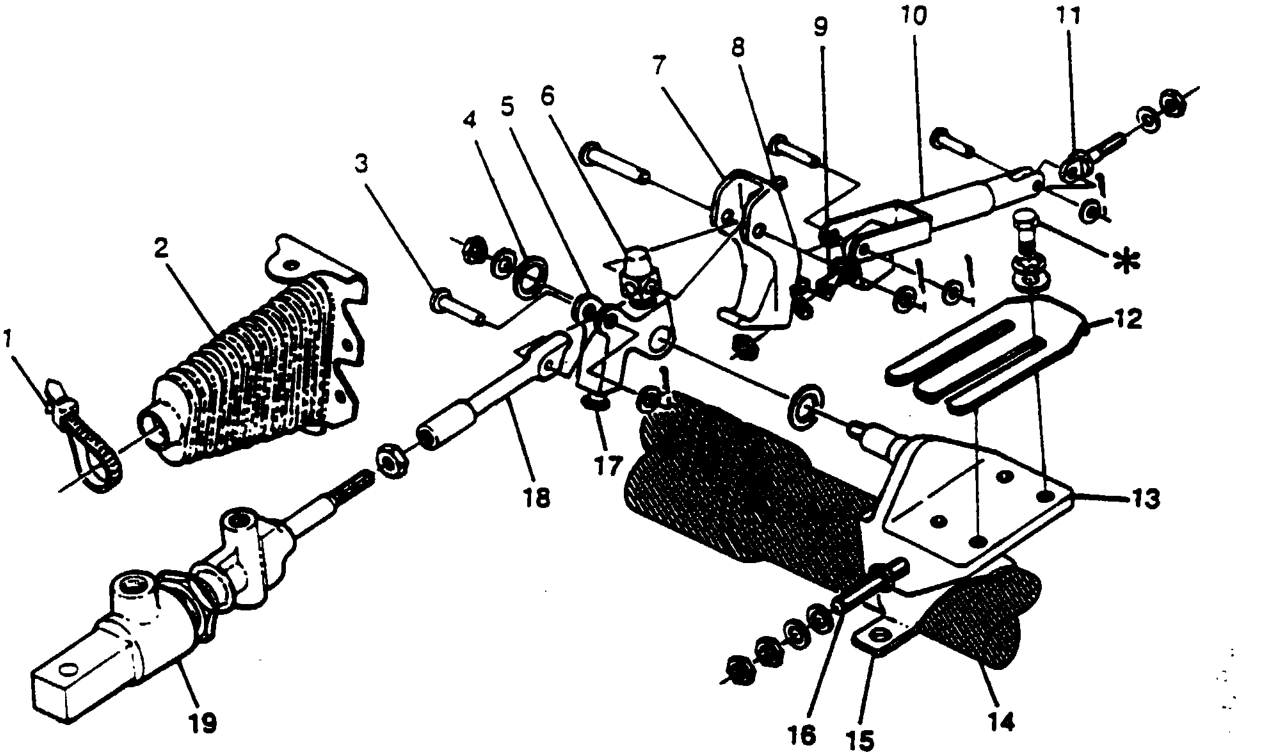
5-75. DESCRIPTION. The step is constructed of Uralite 3121 polyurethane casting, with a molded depression area, located in the top of the step. An adhesive-backed "Walkway" material with rough surface is pressed into the depressed area of the strut.

5-76. REMOVAL.

NOTE

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

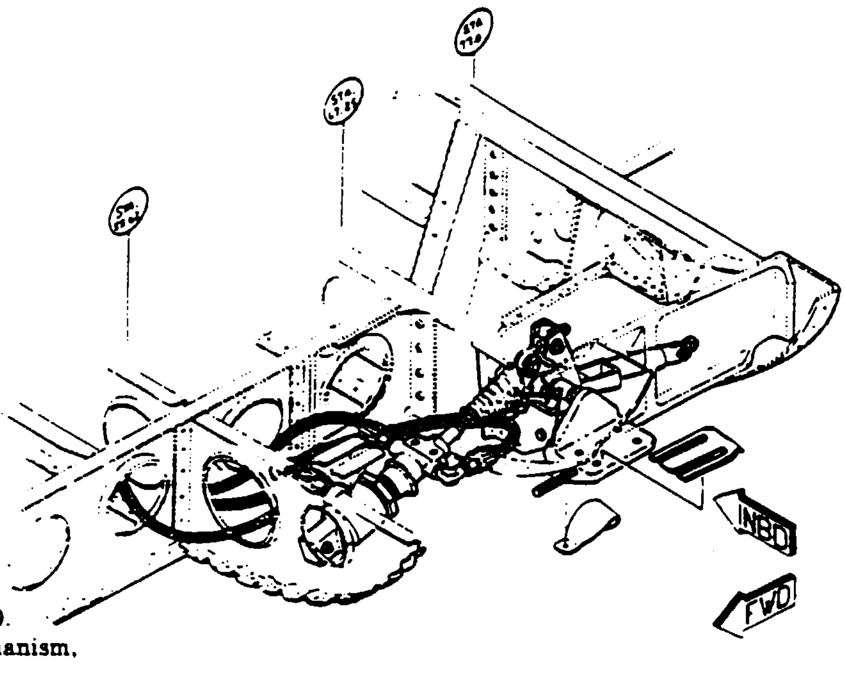
a. Using a heat gun, heat step mat a temperature of 200°-250° F, until step material becomes pliable.
b. Using a sharp knife, remove step material down to the metal strut.
c. Clean off remaining step material with a wire wheel and sandpaper. Leave surface slightly rough or abraded. Clean oil and grease from strut with solvent, wipe off excess solvent with dry cloth and let surface dry.
d. Apply zinc chromate primer-green or yellow, to clean area on strut. Dry film thickness to be .0003 to .0005 inch.



* Install internal tooth washer under bolt heads.

* Prime bolts with LOCTITE GRADE "T" PRIMER and seal with LOCTITE CV or CATALOG #85 or #83.

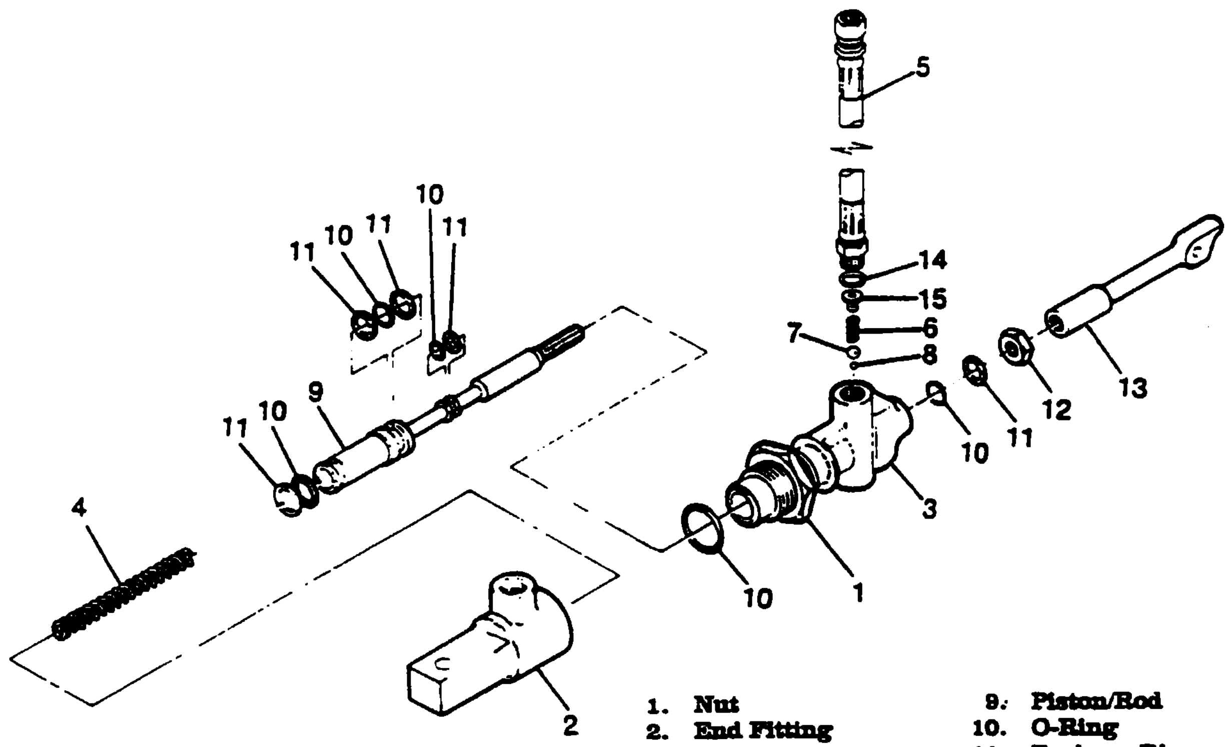
1. Tie
2. Boot
3. Pin
4. Spacer
5. Arm Assembly
6. Downlock Adjustment Screw
7. Downlock Hook
8. Hook Setscrew
9. Downlock Switch
10. Spring Assembly
11. Eyebolt
12. Shim
13. Support Assembly
14. Landing Gear Strut
15. Shell Assembly
16. Stud
17. Bolt
18. Rod End
19. Actuator



NOTE

Downlock mechanism THRU 210/21065000.
For 210/21065001 AND ON downlock mechanism, refer to figure 5-10A (rest unchanged).

Figure 5-15. Main Landing Gear Downlock Installation



1. Nut
2. End Fitting
3. Body
4. Spring
5. Hose Valve Assembly
6. Spring
7. Ball
8. Ball
9. Piston/Rod
10. O-Ring
11. Back-up Ring
12. Jamnut
13. Rod End
14. O-Ring
15. Spring Guide

Figure 5-16. Main Landing Gear Downlock Actuator

5-77. INSTALLATION.

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 strut 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 and step after curing is completed.

5-78. NOSE GEAR SYSTEM.

5-79. DESCRIPTION. The nose gear consists of a pneudraulic shock assembly, mounted in a trunnion assembly, a steering arm and bungee. shimmy dampener, nose wheel. tire and tube. hub cap. bearing, 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.

5-80. OPERATION. The nose gear shock strut is pivoted just forward of the firewall. Retraction and extension of the nose gear is accomplished by a double-acting hydraulic cylinder. the forward end of which contains the nose gear downlock. Initial action of the cylinder disengages the downlock before retraction begins. Nose gear doors are mechanically closed as the nose gear retracts. As the nose gear extends, the doors are mechanically opened.

5-81. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.	Defective strut seals and/or defects in lower strut.	Replace defective seals; stone out small defects in lower strut. Replace lower strut if badly scored or damaged.
NOSE STRUT WILL NOT HOLD AIR PRESSURE.	Defective filler valve or valve not tight.	Check gasket and tighten loose valve. Replace defective valve.
	Defective O-ring at top of strut.	Replace O-ring.
	Result of fluid leakage at bottom of strut.	Replace defective seals; stone out small defects in lower strut. Replace lower strut if badly scored or damaged.
NOSE WHEEL SHIMMY. (Also Refer to Service Letter SE84-21.)	Nose strut attachment loose.	Secure attaching parts.
	Shimmy dampener lacks fluid.	Service shimmy dampener.
	Defective shimmy dampener.	Repair or replace dampener.
	Loose or worn steering components.	Tighten loose parts; replace if defective.
	Loose torque links.	Add shim washers and replace parts as necessary.
	Loose wheel bearings.	Replace bearings if defective; tighten axle nut properly.
	Nose wheel out of balance.	Refer to applicable paragraph.

5-82. REMOVAL OF NOSE GEAR ASSEMBLY.

a. Jack aircraft or weight the tail of aircraft to raise nose wheel off the ground.

WARNING

Before working in landing gear wheel wells. PULL-OFF hydraulic pump circuit breaker. The pump circuit breaker is located in the circuit breaker panel, located immediately forward of the left forward doorpost.

b. Open landing gear doors and disconnect nose wheel door push-pull rods.

c. Tag for identification and disconnect electrical wires at gear-down microswitch located on forward end of nose gear safety switch on torque links. and remove clamps attaching wires to nose strut.

d. Tag for identification and disconnect electrical wires at nose gear safety switch on torque links, and remove clamps attaching wires to nose gear strut.

e. Disconnect steering bungee from steering bellcrank.

f. Disconnect nose gear actuator from strut by removing cotter pin, castellated nut, washers and bolt.

NOTE

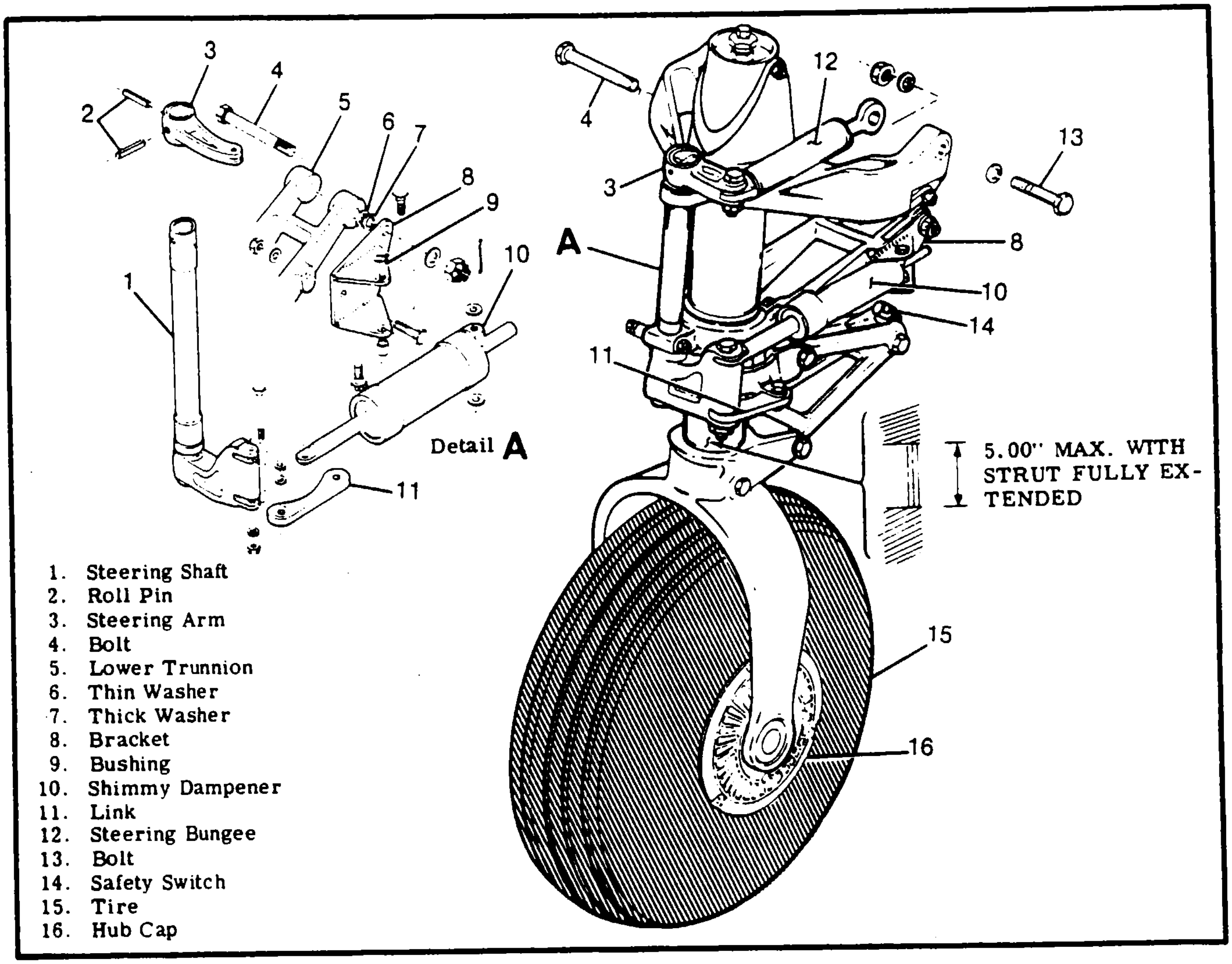
Retain spacer washers between downlock hooks on end of actuator.

g. Disconnect nose gear strut door tie rods from nose gear. Remove trunnion bolts.

NOTE

Trunnion bolts are accessible from inside the cabin. at the very forward end of the tunnel cover at the firewall. Two men will be required to remove these bolts, one working inside the cabin, the other working in the nose wheel well.

h. Work entire nose gear assembly free of the aircraft.



1. Steering Shaft
2. Roll Pin
3. Steering Arm
4. Bolt
5. Lower Trunnion
6. Thin Washer
7. Thick Washer
8. Bracket
9. Bushing
10. Shimmy Dampener
11. Link
12. Steering Bungee
13. Bolt
14. Safety Switch
15. Tire
16. Hub Cap

Figure 5-17. Nose Gear Installation

5-83. DISASSEMBLY OF NOSE GEAR STRUT. (Refer to figure 5-18.)

NOTE

The following procedure applies to the nose gear shock strut after it has been removed from the aircraft, and the nose wheel has been removed. In many cases, separating the upper and lower struts will permit inspection and parts replacement without removal or complete strut disassembly.

WARNING

Deflate strut completely before removing bolt (33), lock ring (31) or bolt (2). Also deflate strut before disconnecting torque links.

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

NOTE

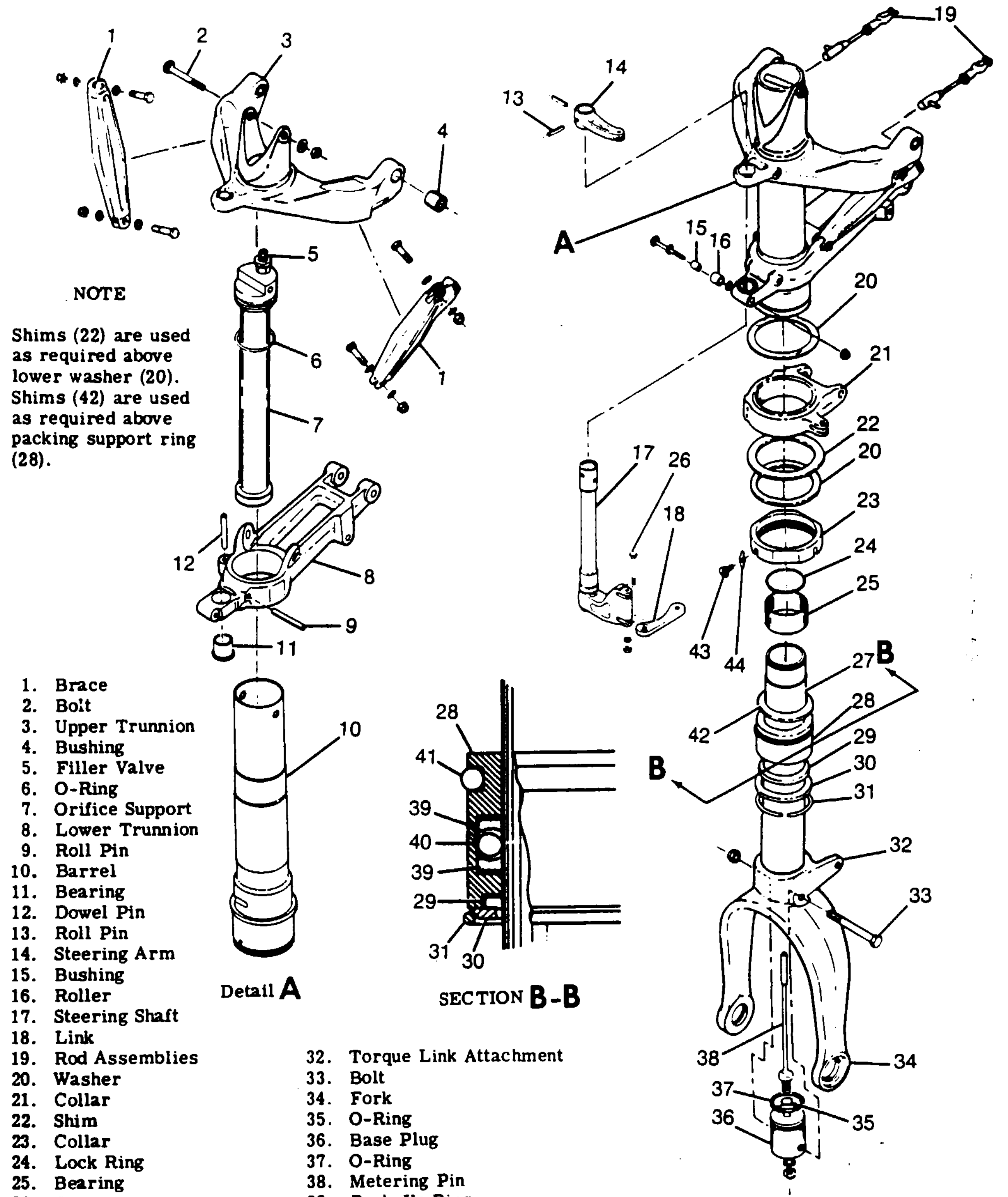
Hydraulic fluid will drain from strut as lower strut is pulled from upper strut.

e. Using a straight, sharp pull, remove lower strut from upper strut. Invert lower strut and drain hydraulic fluid from strut.
f. Remove lock ring and bearing from lower strut.
g. Slide shims, if used, packing support ring, scraper ring, retaining ring and lock ring from lower strut.

NOTE

Note number of shims, relative position and top side of each ring and bearing to aid in reassembly.

h. Remove and discard O-rings and back-up rings



NOTE

Shims (22) are used as required above lower washer (20). Shims (42) are used as required above packing support ring (28).

1. Brace
2. Bolt
3. Upper Trunnion
4. Bushing
5. Filler Valve
6. O-Ring
7. Orifice Support
8. Lower Trunnion
9. Roll Pin
10. Barrel
11. Bearing
12. Dowel Pin
13. Roll Pin
14. Steering Arm
15. Bushing
16. Roller
17. Steering Shaft
18. Link
19. Rod Assemblies
20. Washer
21. Collar
22. Shim
23. Collar
24. Lock Ring
25. Bearing
26. Bolt
27. Lower Strut
28. Packing Support Ring
29. Scraper Ring
30. Retaining Ring
31. Lock Ring
32. Torque Link Attachment
33. Bolt
34. Fork
35. O-Ring
36. Base Plug
37. O-Ring
38. Metering Pin
39. Back-Up Ring
40. O-Ring
41. O-Ring
42. Shim
43. Bolt
44. Tab Washer

Figure 5-18. Nose Gear Shock Strut Assembly from packing support ring.

i. Remove metering pin and base plug by removing bolt from lower strut and fork assembly.

NOTE

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

j. Remove and discard O-rings from metering pin and base plug.

k. Remove orifice support by removing bolt at top of strut. Remove and discard O-ring from orifice support.

l. Remove collar from upper strut. To remove collar, remove bolt and tab washer. Remove washers, shims, if installed, and steering collar.

NOTE

Upper and lower trunnions are press fitted to the upper strut with braces installed during assembly. Pin is also press fitted to the lower trunnion.

5-84. INSPECTION AND REPAIR OF SHOCK STRUT COMPONENTS. (Refer to figure 5-18.)

a. Bushings and bearings in upper trunnion and lower trunnion may be replaced as required. Needle bearing in collar should not be replaced. Replace entire steering collar if needle bearing is defective.

b. Thoroughly clean all parts in solvent and inspect them carefully. Replace all worn or defective parts and all O-rings, seals and back-up rings with new parts.

c. Sharp metal edges should be smoothed with No. 400 emery paper, then cleaned with solvent.

5-85. REASSEMBLY OF NOSE GEAR STRUT. (Refer to figure 5-17.)

NOTE

Install new seals and existing lock ring, lubricated with a film of Petrolatum VV-P-236, hydraulic fluid MIL-H-5606, or Dow-Corning DC-7.

a. Install top washer (20), steering collar (21), shims (22) (as many as were removed), and collar (23). Screw collar (23) up threads on lower end of upper strut (10) until it is flush with the lower end of the strut, to the nearest one-third turn. Use shims as required above lower washer, to fill gap between collars. Shims are available from the Cessna Supply Division, as follows:

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

NOTE

When correct number of shims are installed, secure collar (23) with bolt (43) and secure bolt with tab washer (44) by bending tabs of washer.

b. Install O-ring (37) on base plug (36).

c. Install O-ring (35) on metering pin (38), and install in base plug (36).

d. Install bolt (33) through holes in fork (34) and base plug (36). Install nut on bolt.

e. Install lock ring (31), retaining ring (30) and scraper ring (29) down over lower strut (27). Ensure they are installed in same positions as they were when removed.

f. Install O-rings (40) and (41) and back-up rings (39) in packing support ring (28).

NOTE

Install contoured back-up rings (39), one on each side of O-ring (40) with concave surface of back-up rings next to O-ring.

g. Install bearing (25) and lock ring (24) at upper end of lower strut assembly.

NOTE

Ensure that beveled edge of bearing is installed up next to lock ring.

h. Install upper strut assembly over lower strut assembly.

i. Install lock ring (31) in groove in lower end of barrel (10). Position lock ring so that one of its ends covers the small access hole in the lock ring groove.

j. Install steering shaft (17) up through hole in lower trunnion (8) and hole in upper trunnion (3).

k. Install steering arm (14) over steering shaft (17) and secure with roll pins.

l. Install link (18) to bottom of steering shaft (17) and attach opposite end to steering collar (21).

m. If braces (1) were removed, they should be installed, connecting at upper trunnion (3) and lower trunnion (8).

n. Attach lower torque link to torque link fitting (32) and upper torque link to steering collar (21).

o. Install O-ring (6) and filler valve (5) on orifice support (7).

p. Install orifice support in barrel (10), install bolt (2).

q. Service shock strut as outlined in Section 2 of this manual.

5-85. INSTALLATION OF NOSE GEAR STRUT.

WARNING

Before working in landing gear wheel wells, PULL-OFF hydraulic pump circuit breaker. The pump circuit breaker is located in the circuit breaker panel, located immediately forward of the left forward doorpost.

a. Work entire nose gear assembly into nose gear wheel well.

NOTE

Trunnion bolts are accessible from inside the cabin, at the very forward end of the tunnel cover at the firewall. Two men will be required to install these bolts, one inside the cabin, the other in the nose wheel well.

b. Install trunnion bolts.
c. Install nose gear strut door tie rods.

NOTE

On aircraft equipped with retractable step, install right-hand tie rod on outboard side of eyebolt only, when connecting nose gear strut doors. Left-hand tie rod should be installed in normal manner.

d. Install nose gear actuator and install castellated nut and cotter pin. On aircraft equipped with retractable step, rig step in accordance with applicable paragraph, after nose strut is installed and rigged.

NOTE

When connecting nose gear actuator to strut, lubricate and torque bolt as outlined in Section 2 of this manual.

e. Install steering bungee to steering bellcrank.
f. Identifying tagged applicable electrical wires, connect wires at safety switch on torque links and install clamps attaching wires to nose strut.
g. Identifying tagged applicable electrical wires, connect wires at gear-down microswitch located on forward end of nose gear actuator at bracket on bearing end.
h. Connect nose wheel door push-pull rods.
i. Rig nose gear and nose gear doors in accordance with procedures outlined in applicable paragraph in this Section.

5-86. SHIMMY DAMPER. (Refer to figure 5-19.)

5-87. 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.

5-88. REMOVAL. (Refer to figure 5-17.)
a. Remove bolt securing shimmy damper to steering shaft.
b. Remove bolt attaching damper to bracket, attached to lower trunnion.
c. Remove shimmy damper from aircraft.

5-89. DISASSEMBLY. (Refer to figure 5-19.)
a. Remove outer retaining ring (7).
b. Remove bearing head (6).
c. Remove O-rings (15) and (17) and back-up rings (16) and (18) from bearing head (6).
d. Remove internal retaining ring (5).
e. Remove rod assembly (8).
f. Remove O-ring (19), and back-up ring (9).
g. Remove setscrew (14), spring (13), floating piston (12) and O-ring (3).
h. Remove bolt (1) and Stat-O-Seal (2).
i. Remove O-ring (20).

5-90. INSPECTION AND REPAIR OF SHIMMY DAMPER. (Refer to figure 5-19.)
a. Thoroughly clean all parts in solvent and inspect carefully.
b. Sharp metal edges should be smoothed with No. 400 emery paper, then thoroughly cleaned with solvent.
c. Replace all worn or defective parts.

5-91. REASSEMBLY OF SHIMMY DAMPER. (Refer to figure 5-19.)

NOTE

Install new seals, 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. If piston (10) was removed, install piston and install roll pin (11).

NOTE

Orifice in piston (10) connects to passage in rod (8).

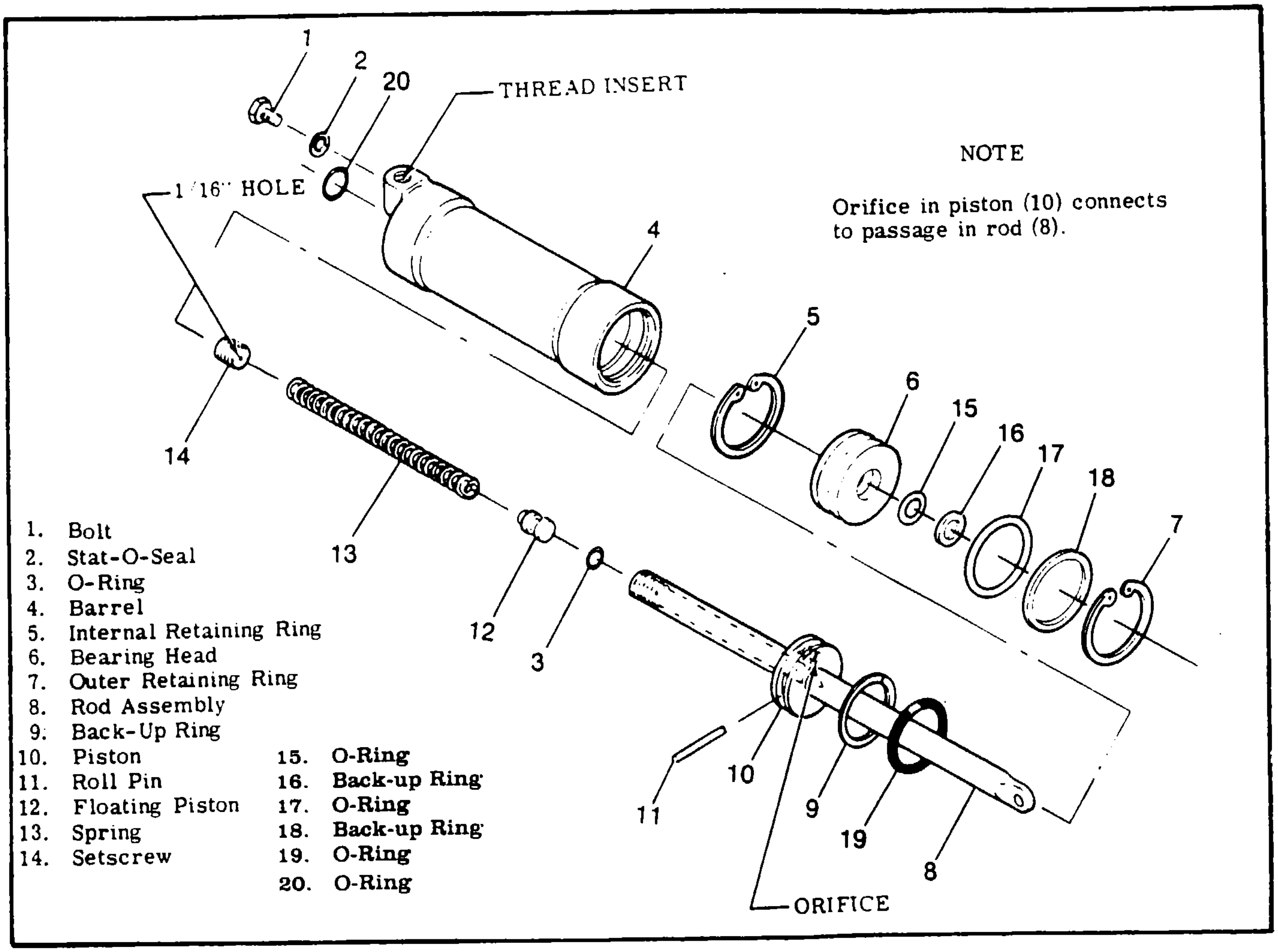


Figure 5-19. Shimmy Dampener

b. Install O-ring (3), floating piston (12), spring (13) and setscrew (14) in rod assembly (8).
c. Install O-ring (20) in barrel (4).
d. Install rod assembly (8) in barrel (4).
e. Install back-up ring (9) and O-ring (19).
f. Install internal retaining ring (5).
g. Install O-rings (15) and (17) and back-up rings (16) and (18) on bearing head (6).
h. Install bearing head (6) over shaft assembly (8) in barrel (4).
i. Install outer retaining ring (7).
j. Install Stat-O-Seal (2) on bolt (1).
k. Install bolt (1) in barrel (4).
l. Service shimmy damper in accordance with procedures outlined in Section 2 of this manual.

5-92. TORQUE LINKS. (Refer to figure 5-20.)

5-93. DESCRIPTION. The torque links align the lower strut with the nose gear steering system, but permit shock strut action.

5-94. REMOVAL OF TORQUE LINKS. (Refer to figure 5-20.)

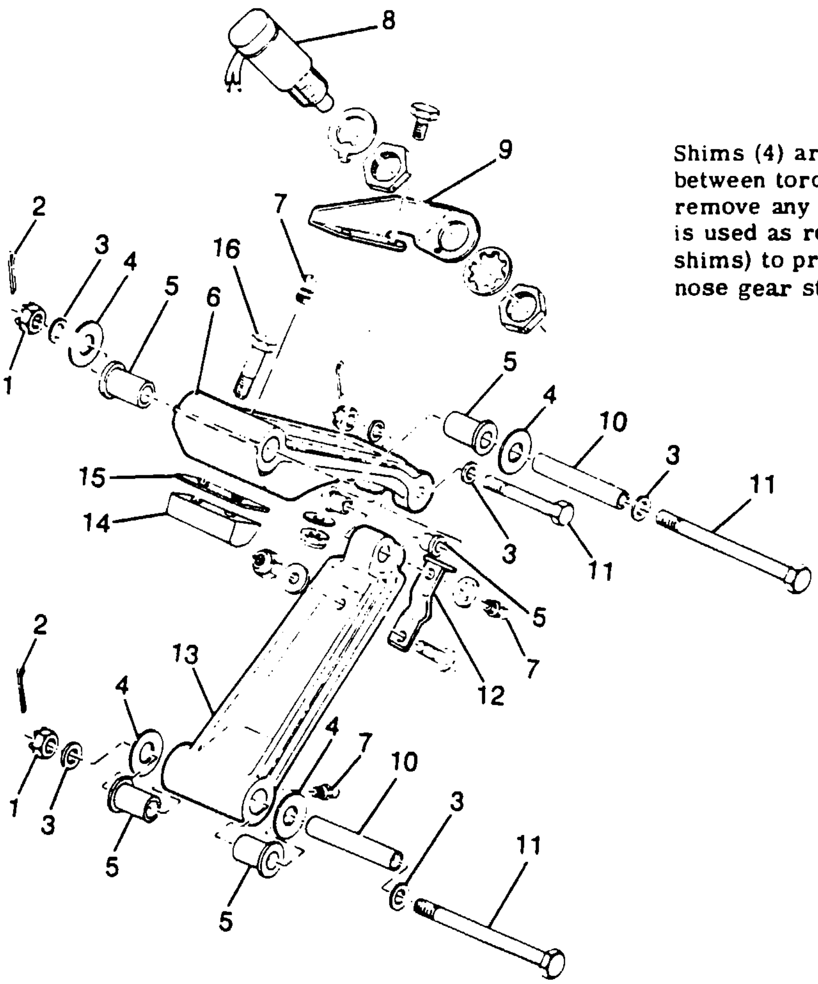
NOTE

DEFLATE NOSE GEAR SHOCK STRUT COMPLETELY BEFORE REMOVING TORQUE LINKS.

a. Remove nuts and washers attaching safety switch (8) to bracket (9); remove switch from bracket.
b. Remove washers, shims, spacers, bolts and nuts. Note position of attaching hardware for reinstallation.

5-95. DISASSEMBLY AND REASSEMBLY. (Refer to figure 5-20.) The figure may be used as a guide for disassembly and reassemblying the torque links. Bushings should not be removed except for replacement of parts. Replace any parts if excessively worn.

5-96. INSTALLATION OF TORQUE LINKS.
a. With shock strut completely deflated, install upper torque link to collar on nose gear strut.



NOTE

Shims (4) are available to use as required between torque link and nose gear fork to remove any looseness. Also, shim (15) is used as required (maximum of three shims) to prevent over extension of the nose gear strut. Refer to figure 5-17.

1. Nut
2. Cotter Pin
3. Washer
4. Shim
5. Bushing
6. Upper Torque Link
7. Grease Fitting
8. Safety Switch
9. Bracket
10. Spacer
11. Bolt
12. Switch Actuator
13. Lower Torque Link
14. Centering Lug
15. Shim
16. Bolt

Figure 5-20. Nose Gear Torque Links

b. Install lower torque link to torque link attach point on nose gear fork.

c. Install upper key washer and nut on safety switch, install switch in bracket, and install star washer and nut on threads of switch.

d. Tighten attaching bolt nuts snugly, then tighten to align next castellation with cotter pin hole in bolt.

e. Check upper and lower torque links for looseness. If looseness is apparent, remove attaching nuts and install shims (4) as necessary to take up any looseness. This will assist in preventing nose wheel shimmy.

f. Retighten attaching nuts snugly, then tighten to align next castellation with cotter pin hole in bolt; install cotter pin.

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

5-97. DELETED.

5-98. DELETED.

5-99. DELETED.

5-100. DELETED.

5-101. NOSE GEAR DOWNLOCK MECHANISM. (Refer to figure 5-22.)

5-102. DESCRIPTION. The nose gear downlock mechanism is a hook at the piston rod end of the nose gear actuator.

5-103. REMOVAL AND INSTALLATION OF NOSE GEAR DOWNLOCK MECHANISM. (Refer to figure 5-22.) Refer to "Removal of Nose Gear Actuator" paragraph of this Section.

5-104. NOSE GEAR ACTUATOR. (Refer to figure 5-23.)

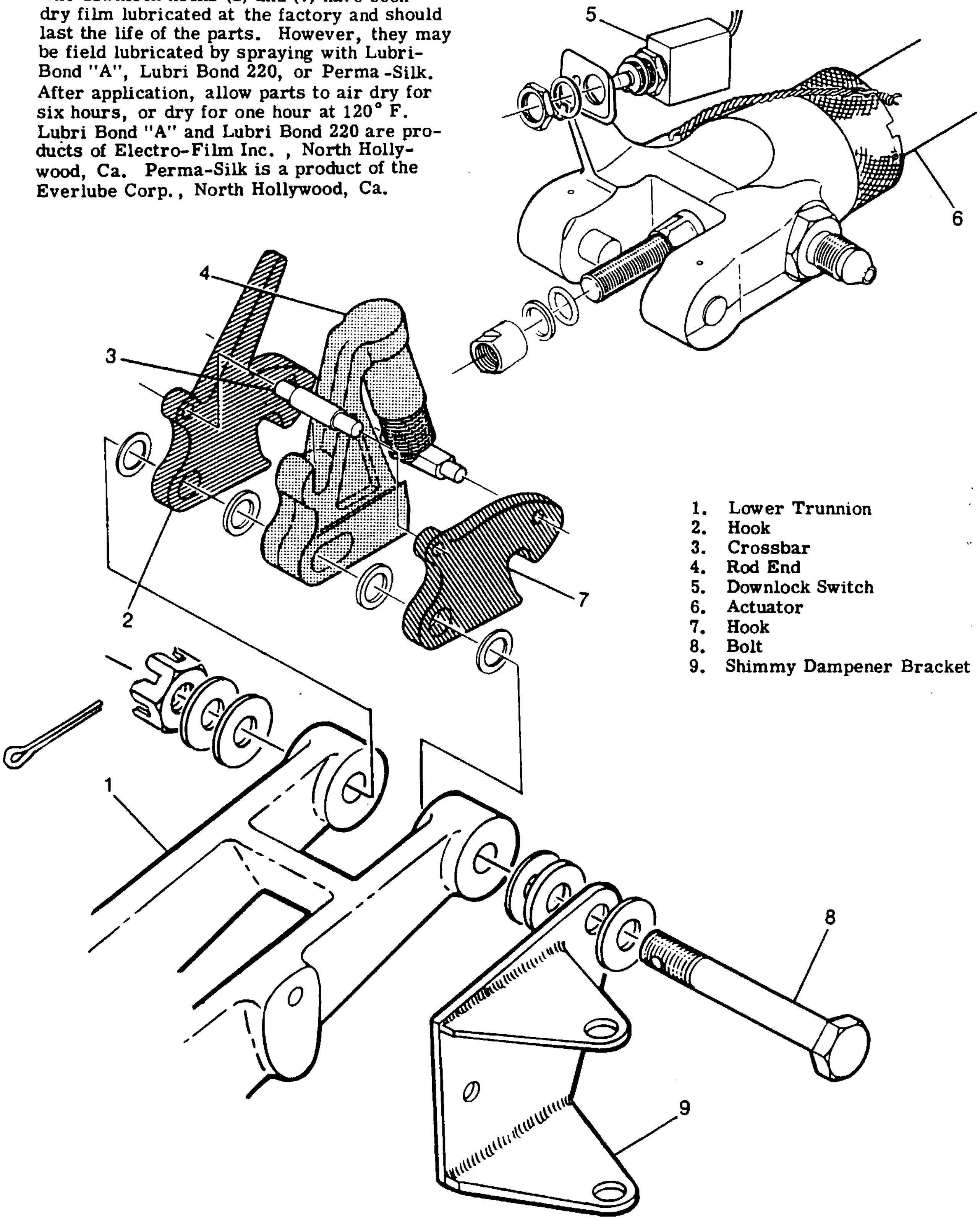
5-105. DESCRIPTION. The nose gear actuator extends and retracts the nose gear and serves as a rigid drag strut in the gear-down position. A spring clip attaches the retractable step cable turnbuckle to to the nose gear actuator.

5-106. REMOVAL OF NOSE GEAR ACTUATOR.
a. Open doors and jack aircraft or weight down tail to raise nose wheel off the ground.
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 lower trunnion by removing cotter pin, castellated nut, washers and bolt.
e. Retain components of downlock mechanism which will be freed by removing bolt.

5-107. DISASSEMBLY OF NOSE GEAR ACTUATOR. (Refer to figure 5-23.)
a. Loosen lock nut at end of piston rod and remove rod end assembly as a unit; remove lock nut from piston rod.

NOTE

The downlock hooks (2) and (7) have been dry film lubricated at the factory and should last the life of the parts. However, they may be field lubricated by spraying with Lubri-Bond "A", Lubri Bond 220, or Perma-Silk. After application, allow parts to air dry for six hours, or dry for one hour at 120° F. Lubri Bond "A" and Lubri Bond 220 are products of Electro-Film Inc., North Hollywood, Ca. Perma-Silk is a product of the Everlube Corp., North Hollywood, Ca.



1. Lower Trunnion
2. Hook
3. Crossbar
4. Rod End
5. Downlock Switch
6. Actuator
7. Hook
8. Bolt
9. Shimmy Dampener Bracket

Figure 5-22. Nose Gear Downlock Mechanism

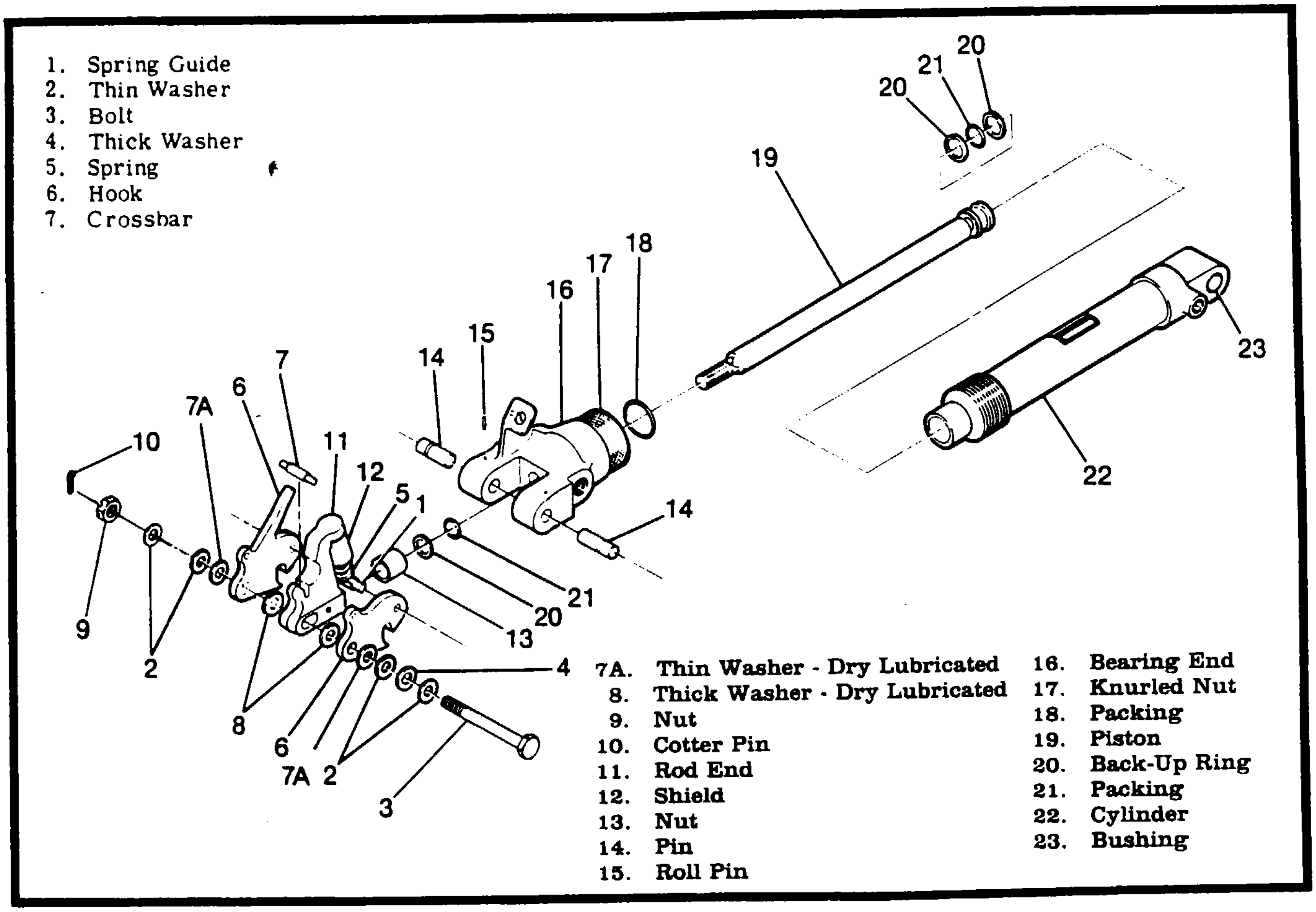


Figure 5-23. Nose Gear Actuator

b. Remove safety wire from knurled nut, and loosen knurled nut.
c. Remove bearing end from cylinder, and remove nut from cylinder.
d. Pull piston from cylinder.
e. Remove O-rings and back-up rings from bearing end and piston.
f. Disassemble hook assembly.

5-108. INSPECTION AND REPAIR OF PARTS OF NOSE GEAR ACTUATOR.
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 a 19.80 ± 2.0 pound load.
c. Inspect hooks, spring guide, bearing end, 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.

5-109. REASSEMBLY OF NOSE GEAR ACTUATOR. (Refer to figure 5-23.)

NOTE

Install 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. Install O-rings and back-up rings in bearing end.
b. Install O-rings and back-up rings on piston.
c. Insert piston into cylinder. Do not damage back-up rings and O-rings when inserting piston.
d. With knurled nut on cylinder, install bearing end of cylinder. Use care to avoid damage to O-rings and back-up rings when installing bearing end of cylinder.

NOTE

Centerline of hook pins and centerline of bushing hole must align within 0.005-inch with cylinder assembled at a length of 11.98 ± 0.03-inches, measured from centerline of hook pins to centerline of bushing in cylinder in cylinder anchor end.

e. Tighten and safety wire knurled nut.
f. Install lock nut on end of piston.
g. Assemble and install hook assembly on piston.

5-110. INSTALLATION OF NOSE GEAR ACTUATOR.

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 fuselage structure with bolt, washer and nut. Safety nut with cotter pin.
b. Assemble and attach nose gear downlock mechanism to lower trunnion as shown in figure 5-18.

NOTE

Upon completion of installation, safety wire bolts (*) to clips (23).

NOTE

Check nose gear door-to-cowling clearance to be 0.12-inch to 0.15-inch on the left and right sides of the nose gear doors each time the turbine access door on turbocharged models is re-installed.

5-111. REMOVAL AND INSTALLATION OF NOSE GEAR UPLOCK AND RELEASE ACTUATOR.
a. Disconnect uplock spring.
b. Disconnect and cap or plug hydraulic lines at actuator.
c. Disconnect and tag up-limit switch electrical wires.
d. Remove cotter pin and clevis pin attaching actuator link to bellcrank arm. Note position of spacer washers and direction of clevis pin.
e. Remove nuts, washers and bolts attaching actuator to wheel well tunnel wall. Note and retain shims between actuator and tunnel wall.
f. Remove bolt, washer and nut attaching bellcrank at top of nose wheel.

NOTE

Use care to avoid dropping bearings in bellcrank assembly. Retain washers used as shims at each end of bellcrank.

g. Install uplock mechanism and actuator by reversing the preceding steps. Install shims and washers as noted during removal.

5-112. NOSE GEAR DOOR SYSTEM. (Refer to figure 5-24.

5-113. DESCRIPTION. The nose gear door system consists of a right and left forward door, actuated by push-pull rods and a torque tube assembly. The aft doors are attached to the torque tube assembly with springs.

5-114. REMOVAL AND INSTALLATION. (Refer to figure 5-24.)
a. Remove hinge bolts, nuts, washers and bushings.
b. Remove nuts from push-pull rods and remove forward doors.
c. Disconnect spring from aft door eyebolt, and remove aft doors.
d. Reverse preceding steps to install nose gear doors.

5-115. NOSE WHEEL STEERING SYSTEM. (Refer to figure 5-25.)

5-116. DESCRIPTION. The nose wheel steering system links the rudder pedals to the nose wheel fork, affording steering control through use of the rudder pedals. The nose gear torque links straighten the nose wheel as the landing gear is retracted.

5-117. REMOVAL AND INSTALLATION OF NOSE WHEEL STEERING SYSTEM COMPONENTS. (Refer to figure 5-25.) Refer to the figure as a guide in determining relationship of steering system components. Also, the illustration may be used as a guide during removal and installation of system components.

5-118. RIGGING OF NOSE WHEEL STEERING SYSTEM. Since the nose wheel steering system is connected with the rudder control system, adjustment to one system would directly affect the other. Refer to Section 10 of this manual for rigging procedures for the rudder system and the nose wheel steering system.

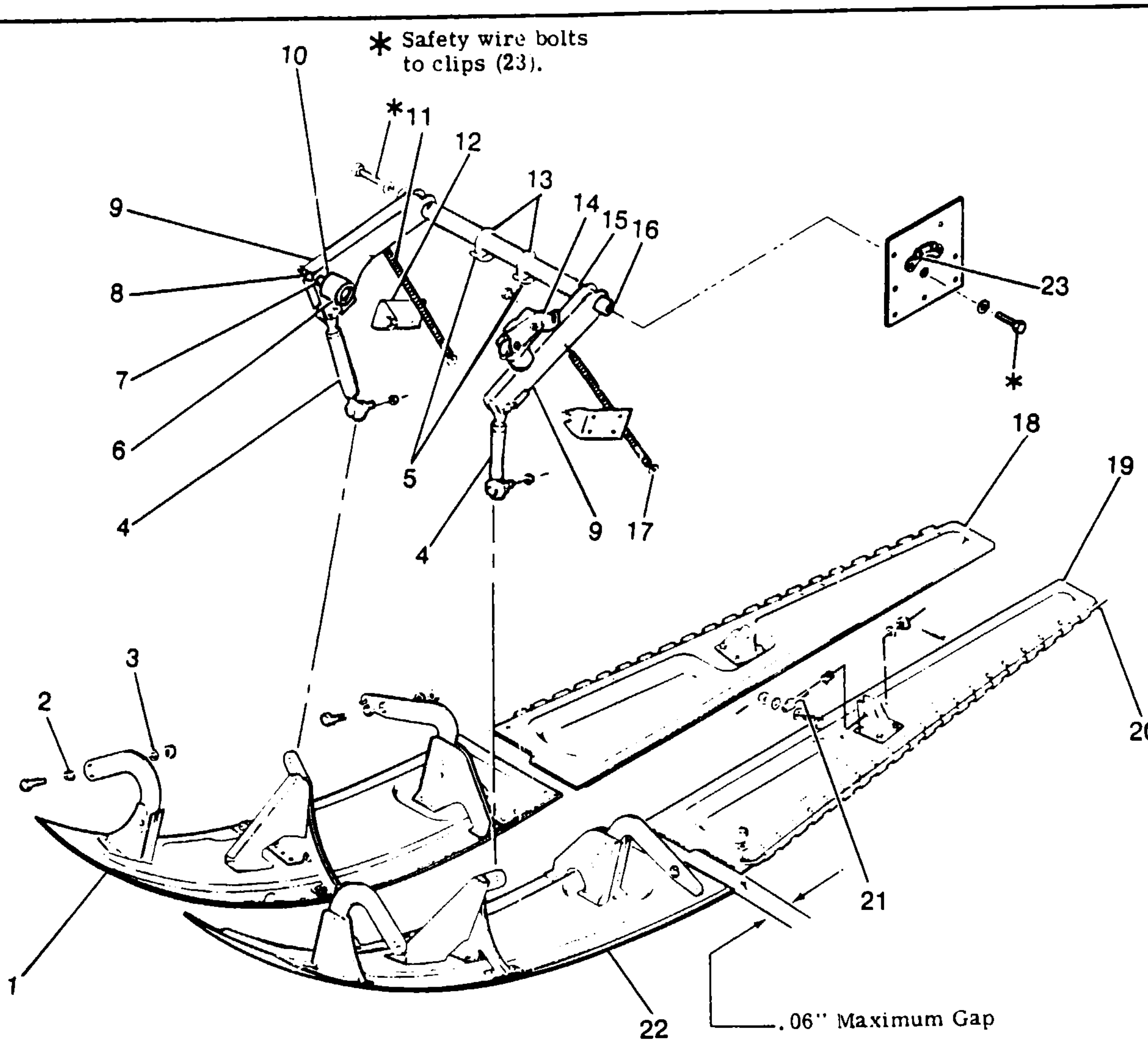
5-119. TROUBLE SHOOTING. (Refer to paragraph 5-81.)

5-120. RIGGING NOSE LANDING GEAR. (Refer to figure 5-26.)

NOTE

Nose gear shock strut must be correctly inflated prior to rigging the nose gear. Refer to Section 1 of this manual for correct nose gear shock strut inflation pressure.

a. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
b. Actuator locking hooks (1) on the nose gear actuator shall completely engage downlock pins (2) without drag, and cross bar (3) shall rotate freely to indicate it is not bearing on either side of slot in rod end (4). Adjust rod end of actuator as required.

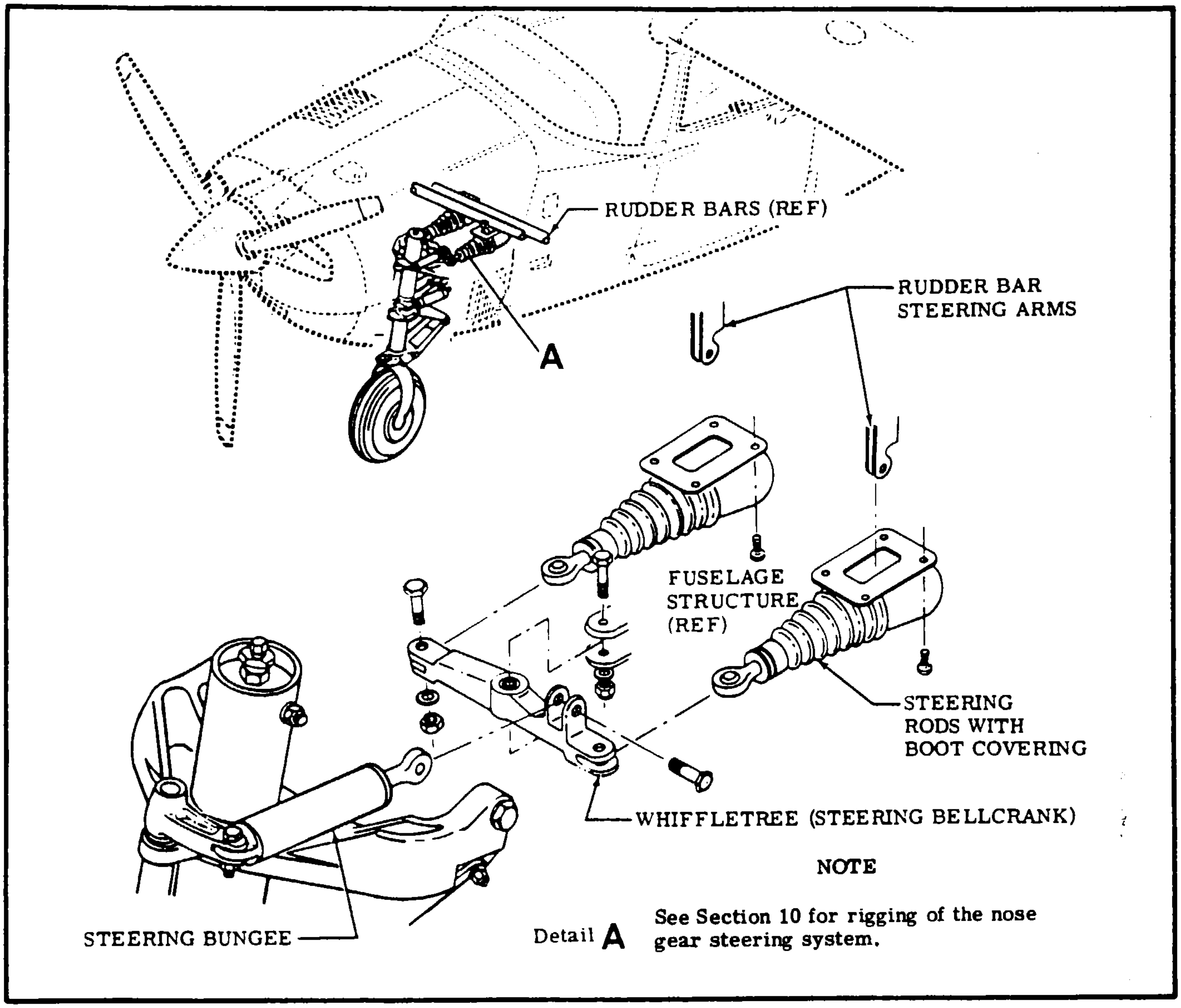


1. RH Fwd Door
2. Bushing
3. Washer
4. Barrel Assembly
5. Up-Stop
6. Bearing Assembly
7. Spacer
8. Spacer
9. Arm
10. Bolt
11. Spring
12. Stop Assembly
13. Up-Stop
14. Switch Assembly
15. Bellcrank Weld Assembly
16. Bearing
17. Washer
18. RH Aft Door
19. LH Aft Door
20. Hinge Pin
21. Eyebolt
22. LH Fwd Door
23. Clip

NOTE

REFER TO PARAGRAPH 5-124 FOR COMPLETE DOOR RIGGING PROCEDURES.

Figure 5-24. Nose Gear Doors



5-25. Nose Wheel Steering System

CAUTION

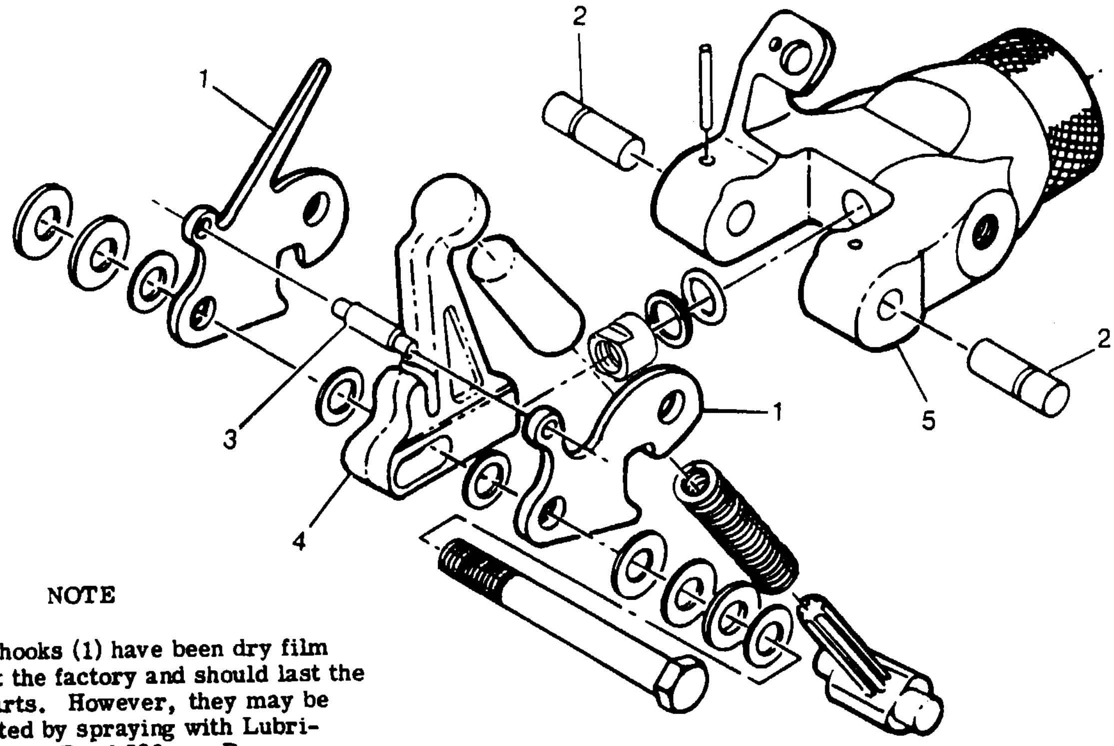
The piston rod is flattened near the threads to provide a wrench pad. Do not grip the piston rod with pliers, as tool marks will cut the O-ring seal in the actuator.

5-121. RIGGING NOSE GEAR DOWN LIMIT SWITCH. (Refer to figure 5-26.) The nose gear down limit switch is mounted on a tab which is a part of the bearing end (5) of the nose gear actuator. The switch is actuated by the right-hand actuator locking hook (1). Switch adjustment is accomplished by loosening the lock nut and either tightening or loosening the adjustment nut and re-tightening the lock nut against the tab behind the adjustment nut. Down limit switch is to be adjusted to the dimension stipulated in the figure.

5-122. RIGGING NOSE GEAR UP LIMIT SWITCH. (Refer to figure 5-26.) The nose gear up limit switch is mounted to a bracket, located in the left-hand forward area of the nose wheel well. The switch is activated by the left-hand arm of the bellcrank weld assembly. Switch adjustment is provided by slots in the switch mounting bracket. Up limit switch is to be adjusted to the dimension stipulated in the figure.

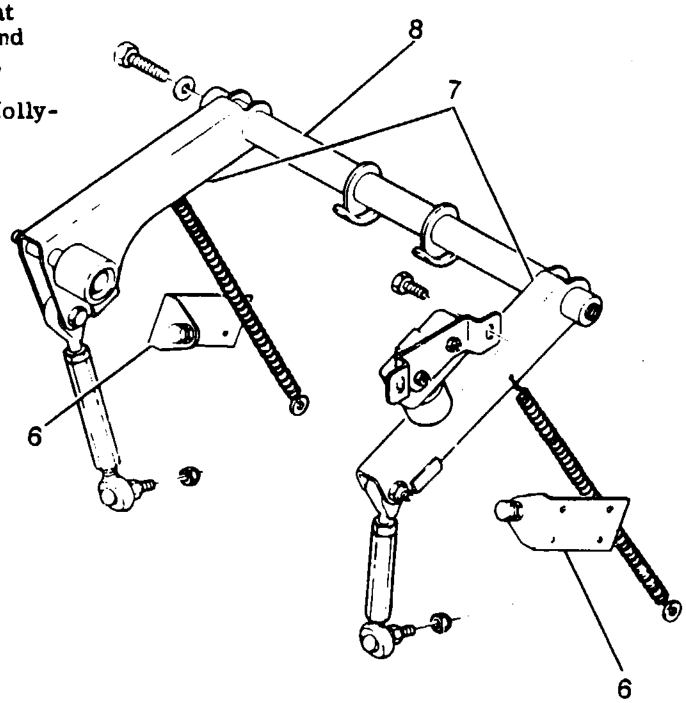
5-123. RIGGING OF NOSE GEAR SQUAT SWITCH. (Refer to figure 5-26.) The nose gear squat switch (safety) switch is mounted in a bracket, attached to the upper nose gear torque link. The switch is operated by an actuator, attached to the nose gear lower torque link. Adjust squat switch so that contacts close when nose gear strut is .12 to .25-inch from fully-extended position.

5-124. RIGGING OF NOSE GEAR DOORS. (See figure 5-24.) Nose gear door adjustments are accomplished by adjusting push-pull rod ends as required to cause the doors to close snugly. Doors must fair



NOTE

The locking hooks (1) have been dry film lubricated at the factory and should last the life of the parts. However, they may be field lubricated by spraying with Lubri-Bond "A", Lubri Bond 220, or Perma-Silk. After application, allow parts to air dry for six hours, or dry for one hour at 120° F. Lubri Bond "A" and Lubri Bond 220 are products of Electro-Film Inc., North Hollywood, Ca. Perma-Silk is a product of the Everlube Corp., North Hollywood, Ca.



1. Locking Hook
2. Downlock Pin
3. Cross Bar
4. Rod End
5. Bearing End
6. Stop Assembly
7. Arm
8. Bellcrank Weld Assembly

Figure 5-26. Rigging Nose Landing Gear (Sheet 1 of 2)

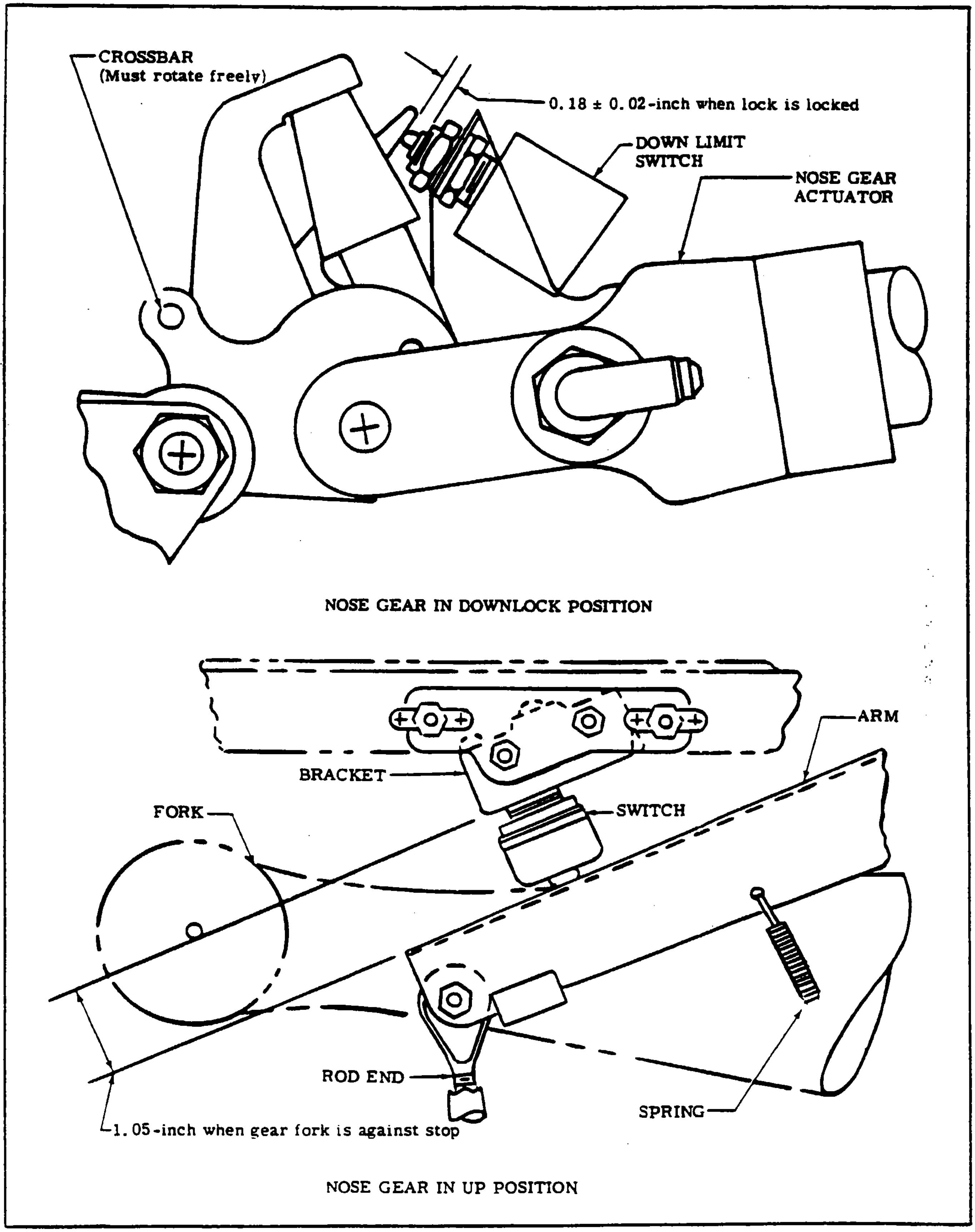


Figure 5-26. Rigging Nose Landing Gear (Sheet 2 of 2)

when the nose gear is fully retracted. Link rods are to be adjusted so that the doors, when in the open position, clear any part of the nose gear assembly by a minimum of 0.25-inch during retraction. Nose gear doors are designed to overlap the lower cowl skin. Adjust stop bolts on stop assemblies (12) as required to contact arms (9) on bellcrank weld assembly (15) when forward nose gear doors are in FULL-OPEN position. Adjust barrel assemblies (4) as required to fair forward nose gear doors in closed position. Pack bearings (16) with MIL-G-21164 grease. Safety wire bolts (*) to clips (23).

5-125. FINAL LANDING GEAR SYSTEMS CHECK. After landing gear systems have been installed and rigged, prior to removal from jacks, cycle landing gear through 25 cycles using the system's emergency hand pump.

NOTE

Check fluid level in power pack reservoir frequently during purging and system checks.

One of the 25 cycles shall consist of a downlock malfunction check, consisting of the following procedure, using a 28 volt DC, 60 amp electrical power supply.

a. Pull hydraulic circuit breaker off.

b. With gear in down and locked position, move gear selector handle GEAR UP position and note actuation of main gear downlock hooks.

c. As soon as left downlock hook is actuated to unlock the left gear, move gear selector handle back to GEAR DOWN position to simulate what would occur if the pilot were to select gear down before the gear was fully retracted. If downlock hooks do not lock the gear in the down position, check downlock system for misalignment.

NOTE

This malfunction check is in addition to the check used during the rigging procedure.

d. Remove aircraft from jacks.

5-126. NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-27.)

5-127. DESCRIPTION. The aircraft are equipped with McCauley wheel assemblies.

NOTE

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.

5-128. OPERATION. The nose gear wheel is free-rolling on an independent axle and is used to steer the aircraft while taxiing by means of the nose wheel steering system.

5-129. REMOVAL OF NOSE WHEEL AND TIRE ASSEMBLY.

a. Weight tail of aircraft to raise nose wheel off the ground.

b. Remove nose wheel axle bolt.

c. Use a rod or long punch inserted in ferrule to tap opposite ferrule out of nose wheel fork.

d. Remove spacers, axle tube and hub caps before disassembling nose wheel.

e. Reverse proceding steps to install nose wheel. Tighten axle bolt until a slight bearing drag is obvious when the wheel is turned. Back off nut to nearest castellation and install cotter pin.

5-130. DISASSEMBLY OF NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-27.)

WARNING

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

a. Remove valve core, completely deflate tire, and break tire beads loose.

b. Remove thru-bolts and separate wheel halves.

c. Remove tire and tube.

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 replacement is necessary. To remove, heat wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out bearing cup and press in the new one while the wheel is still hot.

5-131. INSPECTION AND REPAIR OF NOSE WHEEL AND TIRE ASSEMBLY. Procedures outlined in paragraphs regarding the main wheel and tire assemblies may be used as a guide for inspection and repair of the nose wheel and tire assembly.

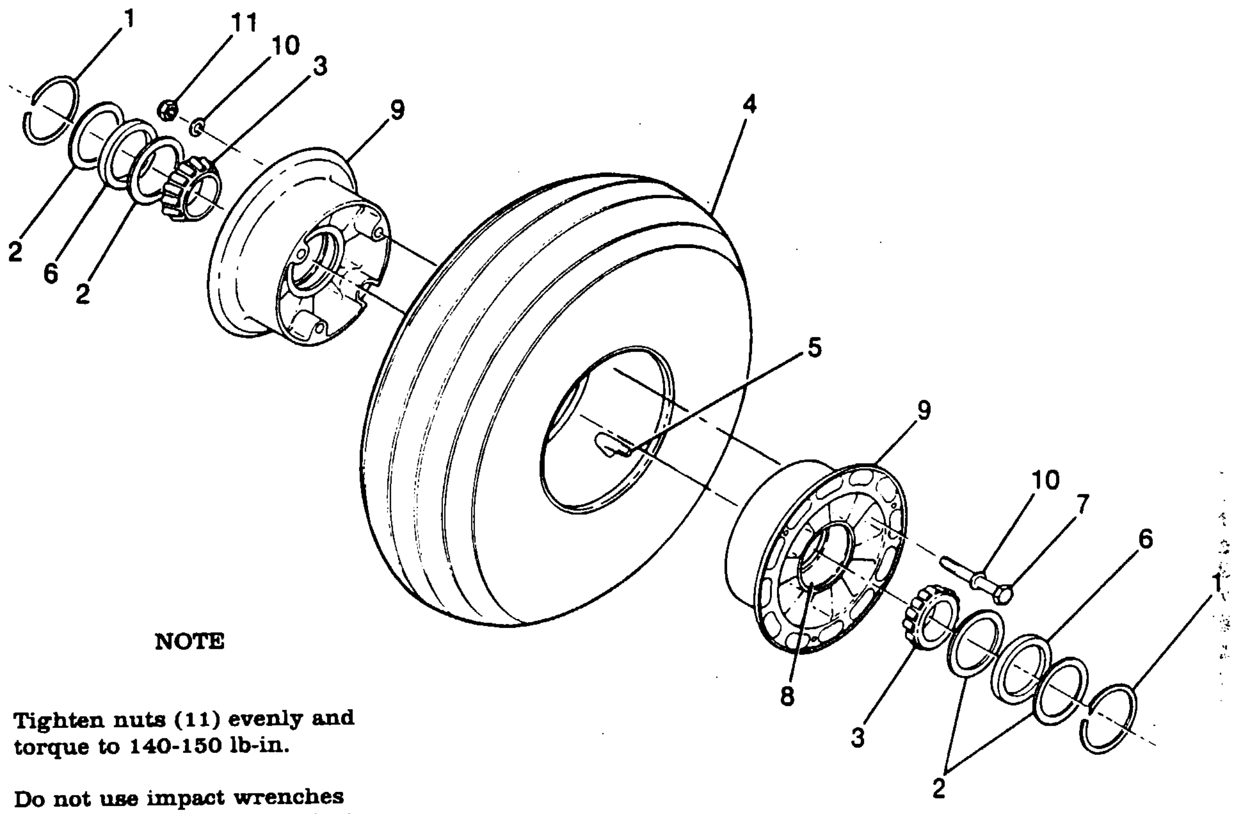
5-132. REASSEMBLY OF NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-27.)

a. Place tube inside tire and align balance marks on tire and tube.

b. Place tire and tube on wheel half with tube valve stem through hole in wheel half.

CAUTION

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



NOTE

Tighten nuts (11) evenly and torque to 140-150 lb-in.

Do not use impact wrenches on thru-bolts (7) or nuts (11).

1. Snap Ring
2. Grease Seal Ring
3. Bearing
4. Tire
5. Tube
6. Grease Seal Felt
7. Thru-Bolt
8. Bearing Cup
9. Wheel Half
10. Washer
11. Nut

Figure 5-27. Nose Gear Wheel and Tire Assembly

c. Insert thru-bolts, position other wheel half and secure with nuts and washers. Torque bolts to value stipulated in figure 5-27.
d. Clean and repack bearing cones with clean wheel bearing grease.
e. Assemble bearing cones, seals, and retainers into wheel half.
f. Inflate tire to seat tire beads, then adjust to correct pressure.

5-133. INSTALLATION OF NOSE WHEEL AND TIRE ASSEMBLY.
a. Install nose wheel in fork and install ferrules.
b. Install axle stud.
c. Tighten axle stud until a slight bearing drag is obvious when the wheel is turned. Back off nut to nearest castellation and install cotter pins.

5-134. BRAKE SYSTEM

5-135. DESCRIPTION. The hydraulic brake system consists of two master cylinders, brake lines, connecting each master cylinder to its corresponding wheel brake cylinder, and the single, disc-type brake assembly, located at each main landing gear wheel.

CAUTION

After connecting brake hose, ensure that hose does not contact or rub against brake disc, causing brake hose failure.

5-136. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Check and adjust properly.
	Parking brake linkage holding brake pedal down.	Check and adjust properly.
	Worn or broken piston return spring. (In master cylinder.)	Repair or replace master cylinder.
	Restriction in hydraulic lines of restriction in compensating port in master brake cylinder.	Drain brake lines and clear the inside of the brake line with filtered compressed air. Fill and bleed brakes. If cleaning the lines fail to give satisfactory results, the master cylinder may be faulty and should be repaired.
	Worn, scored, or warped brake discs.	Replace brake disc and linings.
	Damage or accumulated dirt restricting free movement of wheel brake parts.	Clean and repair or replace parts as necessary.
BRAKES FAIL TO OPERATE.	Leak in system.	Check entire system for leaks. If brake master cylinders or wheel assemblies are leaking, they should be repaired or replaced.
	Air in system.	Bleed system.
	Lack of fluid in master cylinders.	Fill and bleed systems.

5-137. BRAKE MASTER CYLINDER. (Refer to figure 5-28.)

5-138. 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.

5-139. REMOVAL.
a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
b. Remove front seats and rudder bar shield for access to brake master cylinders.
c. Disconnect parking brake linkage and disconnect brake master cylinders from rudder pedals.
d. Disconnect hydraulic hose from brake master cylinders and remove cylinders.
e. Plug or cap hydraulic fittings, hose and lines to prevent entry of foreign material.

5-140. DISASSEMBLY. (Refer to figure 5-28.)
a. Unscrew clevis (1) and nut (2).
b. Remove filler plug (3).

NOTE

A special tool, brake master cylinder wrench No. 34-101 is available from Watkins Supply 711 W 2nd Wichita, KS. 67203. Use to accomplish the following step.

c. Unscrew cover (4) and remove up over piston (5).
d. Remove piston (5) and spring (8).
e. Remove packing (7) and back-up ring (6) from piston (5).

5-141. INSPECTION AND REPAIR. (Refer to figure 5-28.) 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 packings and back-up rings. Filler plug (3) must be vented so pressure cannot build up during brake operation. Remove plug and drill 1/16-inch hole, 30° from vertical, if plug is not vented. Refer to View A-A for location of hole.

5-142. REASSEMBLY. (Refer to figure 5-28.)
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.

5-143. INSTALLATION.
a. Connect hydraulic hoses to brake master cylinders.
b. Connect brake master cylinders to rudder pedals and connect parking brake linkage.
c. Install rudder bar shield and install front seats.
d. Install bleeder screw at wheel brake assembly and fill and bleed brake system in accordance with applicable paragraph in Section 5.

5-144. HYDRAULIC BRAKE LINES.

5-145. DESCRIPTION. The 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.

WARNING

After connecting brake hose, ensure that hose does not contact or rub against brake disc, causing brake hose failure.

5-146. WHEEL BRAKE ASSEMBLIES. (Refer to figure 5-12.)

5-147. DESCRIPTION. The wheel brake assemblies employ a floating brake assembly and a disc which is attached to the main wheel.

5-148. WHEEL BRAKE REMOVAL. (Refer to figure 5-12.) Wheel brake assemblies can be removed by disconnecting the brake line (drain fluid when disconnecting the brake line) and removing the brake back plate. The brake disc is removed after the wheel is removed and disassembled. To remove the torque plate, remove wheel and axle.

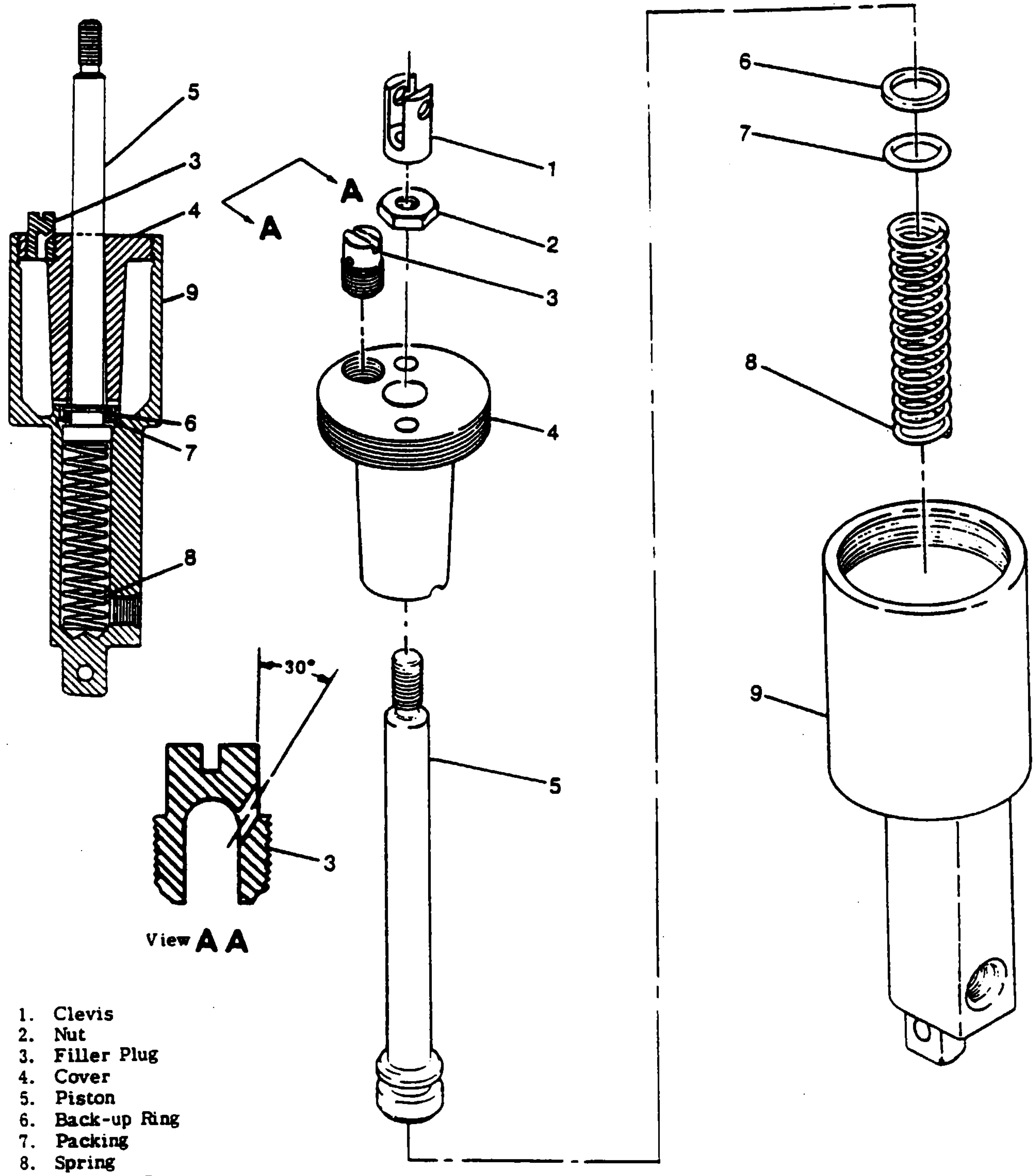
5-149. WHEEL BRAKE DISASSEMBLY. Refer to figure 5-12 for a breakdown of wheel brake parts. This figure may be used as a guide for disassembling the wheel brakes.

5-150. WHEEL BRAKE INSPECTION AND REPAIR.
a. Clean all parts except brake linings and O-rings in dry cleaning solvent and dry thoroughly.
b. Install all new O-rings. If O-ring reuse is necessary, wipe with a clean cloth saturated in hydraulic fluid and inspect for damage.

NOTE

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

c. Check brake lining for deterioration and maximum permissible wear. (Refer to applicable paragraph for maximum wear limit.)
d. Inspect brake cylinder bore for scoring. A scored cylinder will leak or cause rapid O-ring wear. Install a new-brake cylinder if the bore is scored.
e. If the anchor bolts of the brake assembly are nicked or gouged, they shall be sanded smooth to prevent binding with the pressure plate or torque plate. When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft mallet.
f. Inspect wheel brake disc for minimum thickness. If disc is below minimum thickness, install a new part. Minimum thickness of Cleveland disc No. 164-07800 is .450 inch.



1. Clevis
2. Nut
3. Filler Plug
4. Cover
5. Piston
6. Back-up Ring
7. Packing
8. Spring
9. Cylinder Body

Figure 5-28. Master Brake Cylinder

5-151. WHEEL BRAKE REASSEMBLY. (Refer to figure 5-12).

NOTE

Lubricate parts with a clean hydraulic fluid during brake reassembly.

a. Refer to figure 5-10 as a guide while reassembling wheel brakes.

5-152. WHEEL BRAKE INSTALLATION.
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.

5-153. BRAKE LINING. The brake lining pads used in this assembly are either non-asbestos organic composition or iron based metallic composition. Brake pads must be properly optimum service life. This is accomplished by a brake burn-in. Burn-in also wears off brake high spots prior to operational use. If brake use is required before burn-in, use brakes intermittently at LOW taxi speeds.

5-153A. BRAKE BURN-IN.

CAUTION

Brake burn-in must be performed by a qualified person familiar with acceleration and stop distances of the airplane.

a. Non-asbestos Organic Composition burn-in.
1. Taxi the airplane for 1500 feet, with engine at 1700 RPM, applying brake pedal force as needed to maintain 5 to 10 M.P.H. (5 to 9 Knots).
2. Allow brakes to cool for 10 to 15 minutes.
3. Apply brakes and check to see if a high throttle static engine run-up can be held with normal pedal force. If so, conditioning burn-in is complete.
4. If static run-up cannot be held, repeat Steps 1. thru 3. as needed.

b. Metallic Composition Burn-in.
1. Taxi the airplane at 34 to 40 M.P.H. (30 to 35 Knots) and perform full stop braking application.

CAUTION

Brake conditioning using successive stops at higher speeds could cause brakes to overheat resulting in warped discs and/or pressure plates.

2. Without allowing brake discs to cool substantially, repeat Step 1. for second full stop braking application.
3. Apply brakes and check to see if a high throttle static engine run-up can be held with normal pedal force. If so, conditioning burn-in is complete.
4. If static run-up cannot be held, repeat Steps 1. thru 3. as needed.

NOTE

Normal brake usage should generate enough heat to maintain the glaze throughout the life of the lining. Light brake usage can cause the glaze to wear off, resulting in reduced brake performance. Visual inspection of brake disc will indicate brake lining condition. A smooth, non-grooved surface indicates linings are properly glazed. Rough, grooved linings must be reglazed. In such cases, the lining may be conditioned again following the instructions set forth above.

NOTE

Do not set parking brakes while brake discs are hot.

5-154. 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 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.

5-155. BRAKE LINING INSTALLATION. (Refer to figure 5-12).
a. Remove bolts securing back plate, and remove back plate
b. Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.
c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller punch) in the rolled rivet, and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate in the same manner.

NOTE

A rivet setting kit, Part. No. 199-1, is available from Cessna Parts Distribution (CPD 2) through Cessna Service Stations. This kit contains a punch and an anvil.

d. Clamp the flat side of the anvil in a vise.
e. Align new lining on back plate and place brake rivet in hole with rivet head in the lining. Place the head against the anvil.
f. Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with a hammer to set rivet. Repeat blowes on punch until lining is firmly against back plate.
g. Realign the lining on the back plate and install and set rivets in the remaining holes.
h. Install a new lining on pressure plate in the same manner.
i. Position pressure plate on anchor bolts and place cylinder in position so that anchor bolts slide into the torque plate.
j Install back plate with bolts and washers.

WARNING

After reinstallation of the brake assembly, check brake line clearance to the disc in the area above the axle.

5-156. BRAKE SYSTEM BLEEDING.

NOTE

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

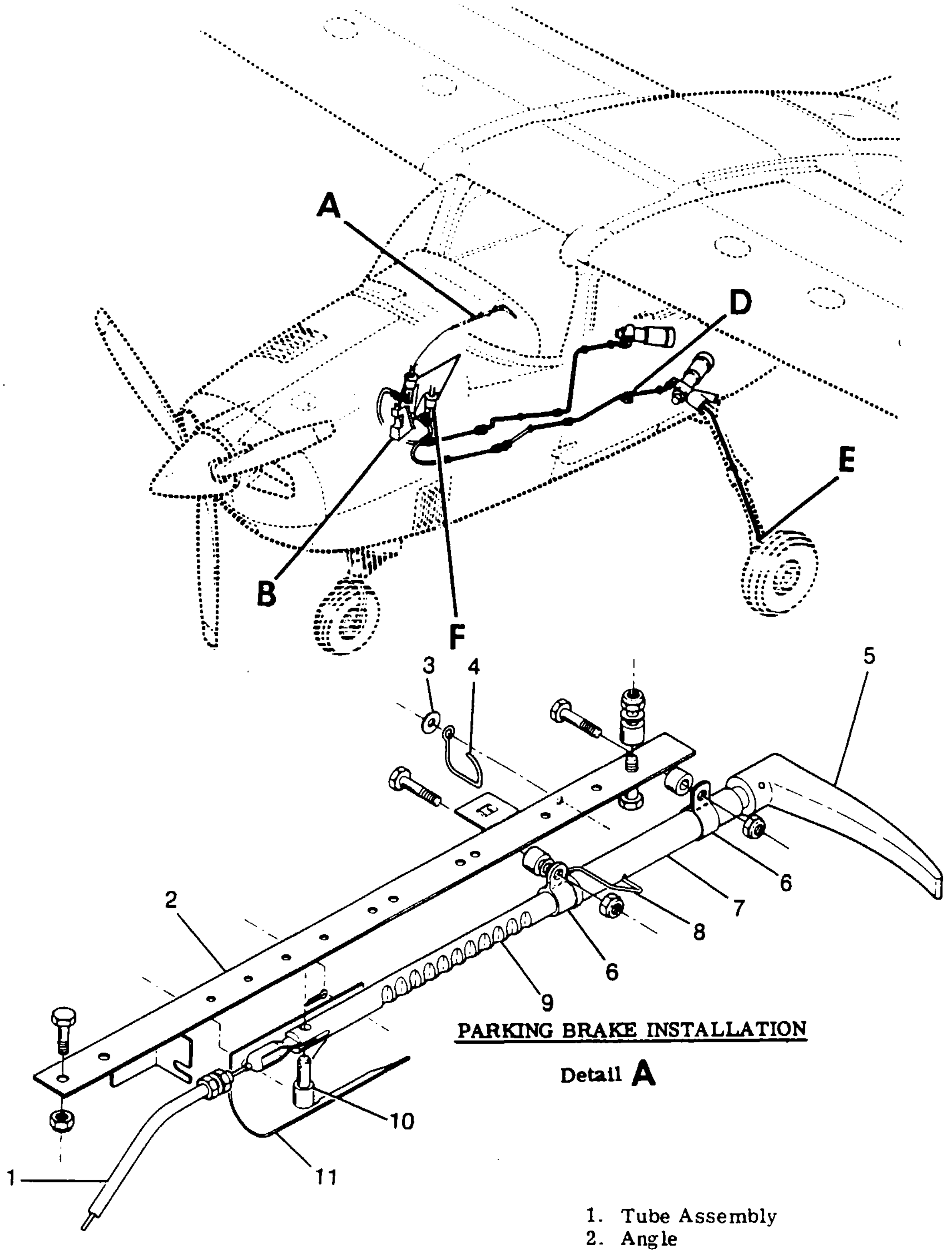
a. Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into the filler hole at top of the brake master cylinder.
b. Immerse opposite end of flexible hose into a container with enough hydraulic fluid to cover end of the hose.
c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit to the bleeder valve in the wheel cylinder.
d. As fluid is pumped into the system, observe the immersed end of the hose at the master 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.

5-157. PARKING BRAKE SYSTEM. (Refer to figure 5-29).

5-158. 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.

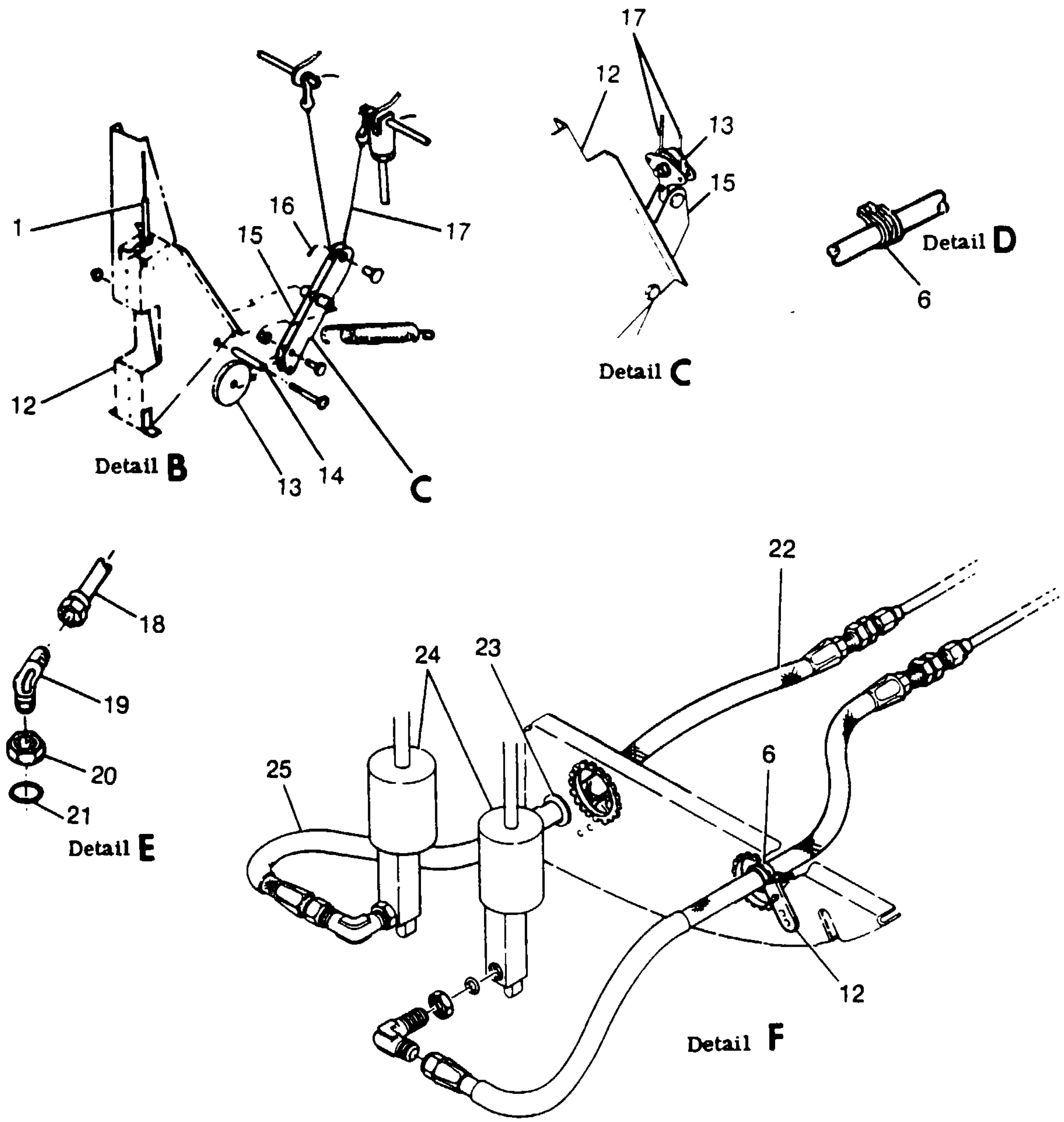
5-159. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 5-29). For relative location of system components. The illustration may be used as a guide during removal and installation of components.

5-160. 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 or replace as outlined in applicable paragraph in this Section. Check parking brake handle and ratchet for proper operation and release. Replace worn or damaged parts.



1. Tube Assembly
2. Angle
3. Washer
4. Catch
5. Handle
6. Clamp
7. Housing
8. Spring
9. Tube
10. Positioning Pin
11. Positioning Rack

Figure 5-29. Parking Brake System (Sheet 1 of 2)



12. Bracket
13. Pulley
14. Spacer
15. Bellcrank
16. Cotter Pin
17. Cable
18. Brake Line
19. Fitting
20. Nut
21. O-Ring
22. Hose
23. Grommet
24. Brake Master Cylinder
25. Sleeving

Figure 5-29. Parking Brake System (Sheet 2 of 2)

SECTION 6

AILERON CONTROL SYSTEM

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

6-2. DESCRIPTION. The aileron control system is comprised of push-pull rods, bellcranks, cables, pulleys, quadrants and components forward of the instrument panel, all of which link the control wheels to the ailerons.

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 6-21.

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

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of cables.	Refer to paragraph 6-17.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Cables improperly adjusted.	Refer to paragraph 6-17.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Refer to paragraph 6-17.
	Incorrect adjustment of travel stop bolts.	Refer to paragraph 6-17.

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

6-5. DESCRIPTION. Rotation of the control wheel rotates four bearing roller assemblies (2) on the end of the control wheel tube (12), which in turn rotates a square control tube assembly (17) inside and extending from the control wheel tube (12). Attached to this square tube (17) is a quadrant (32) which operates the aileron system. This same arrangement is provided for both control wheels. Synchronization of the control wheels is obtained by the interconnect cable (29), turnbuckle (37) and adjustable terminals (31). The forward end of the square control tube (17) is mounted in a bearing block (33) on firewall (36) and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies (2) on the end of the control wheel tube reduce friction as the control wheel is moved fore-and-aft for elevator system operation. A sleeve weld assembly (6), containing bearings which permit the control wheeltube to rotate within it, is secured to the control wheel tube by a sleeve and retaining ring in such a manner it moves fore-and-aft with the control wheel tube. This movement allows the push-pull tube (18) attached to the sleeve weld assembly (6) to operate an elevator arm assembly (19), to which one elevator cable (20) is attached. A torque tube (22) connects this arm assembly (19) to the one on the opposite end of the torque tube (22), to which the other elevator cable is attached. The copilot's control wheel is linked to the aileron and elevator control systems in the same manner as the pilot's control wheel.

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

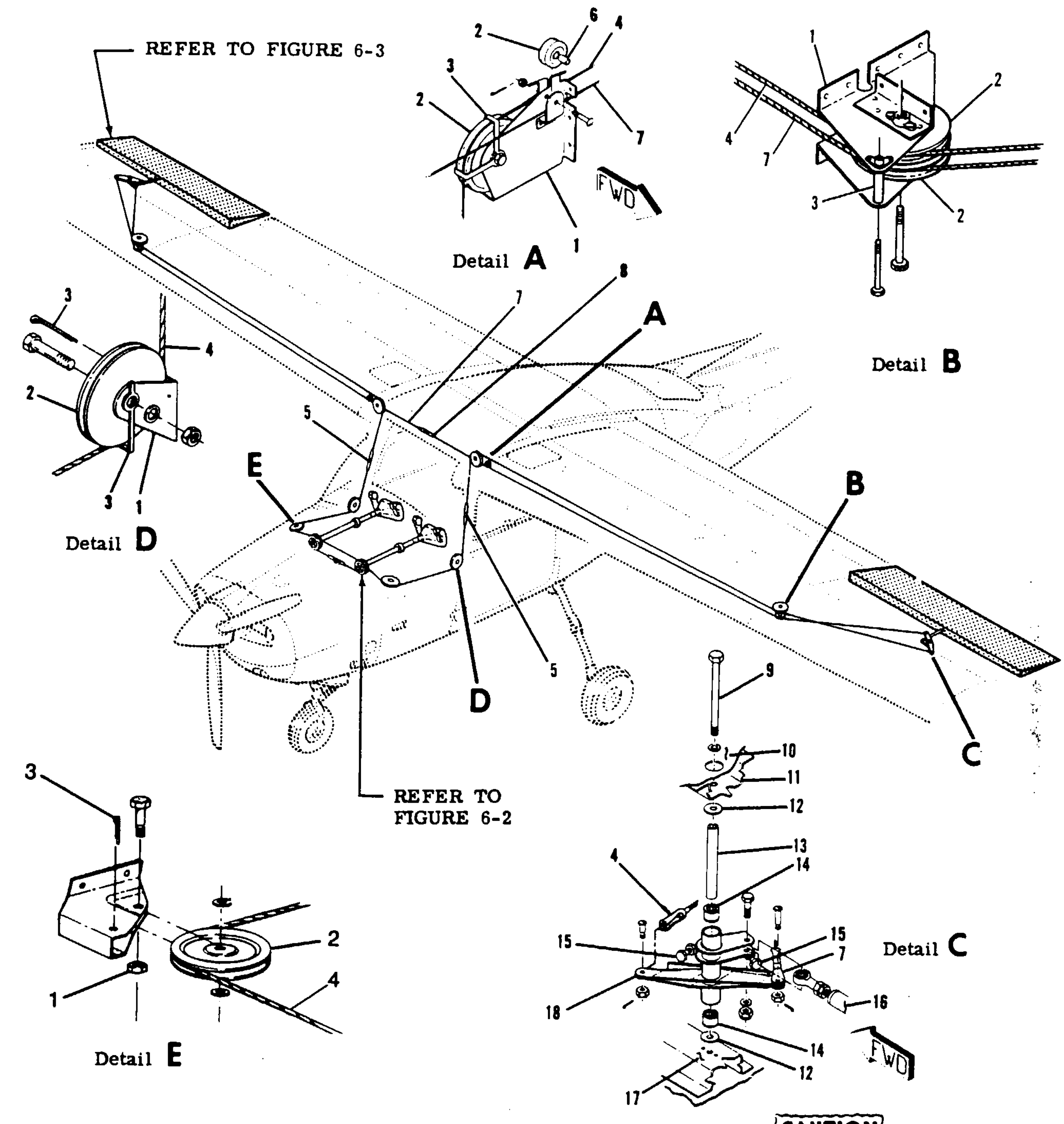
a. Remove bolts securing adapter to control wheel (41).
b. Disconnect electrical wiring to map light, mike switch and electric trim switch at connector.
c. Remove control column shield (24).
d. Remove decorative cover from instrument panel.
e. Remove screw securing adjustable glide plug (15) to control tube assembly (17) and remove plug (15) and glide (16).
f. Disconnect push-pull tube (18) at sleeve weld assembly (6).
g. Remove screws securing cover assembly (14) at instrument panel.
h. Using care, pull control wheel tube assembly (12) aft and work assembly out through instrument panel.

NOTES

To ease removal of control wheel tube assembly (12), snap rings (10) may be removed from their locking grooves to allow sleeve weld assembly (6) additional movement.

If removal of control tube assembly (17) or quadrant (32) is necessary, proceed to step "h."

i. Remove safety-wire and relieve direct cable tension at turnbuckles (5), figure 6-1.
j. Remove safety-wire, relieve interconnect cable tension at turnbuckle (37) and remove cables from quadrant (32).
k. Remove safety-wire and remove roll pin (30) through quadrant (32) and control tube assembly (17).
l. Remove pin, nut (34) and washer from control tube assembly (17) at bearing block (33) on forward side of firewall (36).
m. Using care, pull control tube assembly (17) aft and remove quadrant (31).
n. Reverse the preceding steps for reinstallation. Rig aileron, interconnect and elevator control sys-



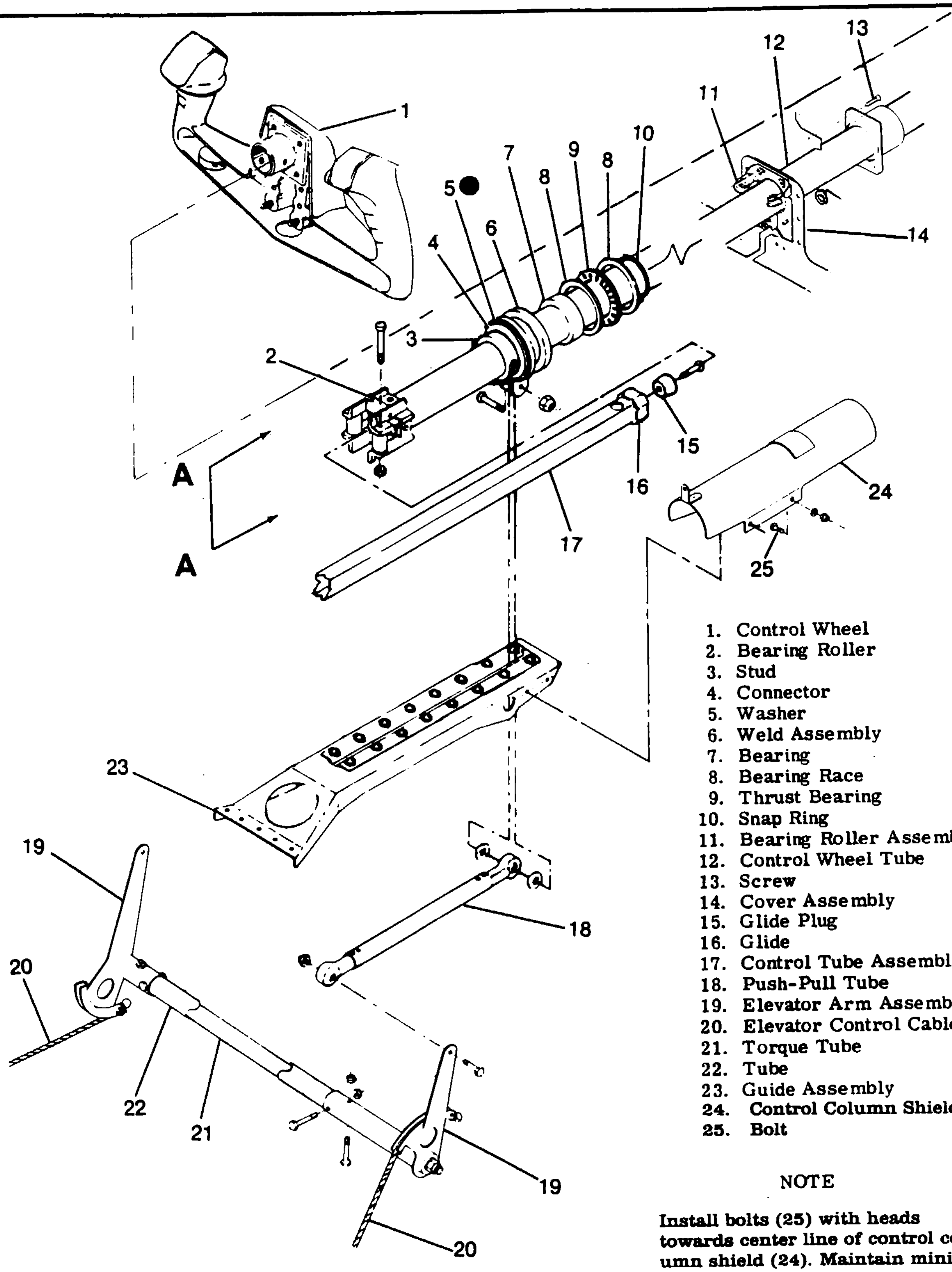
1. Bracket
2. Pulley
3. Cable Guard
4. Cable (Direct)
5. Turnbuckle (Direct Cable)
6. Bushing
7. Cable (Carry-Thru)
8. Turnbuckle (carry-Thru Cable)
9. Pivot Bolt
10. Upper Wing Skin
11. Upper Support
12. Brass Washer
13. Bushing
14. Needle Bearing
15. Travel Stop Bolt
16. Push-Pull Rod
17. Lower Support
18. Bellcrank

CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

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

Figure 6-1. Aileron Control System



1. Control Wheel
2. Bearing Roller
3. Stud
4. Connector
5. Washer
6. Weld Assembly
7. Bearing
8. Bearing Race
9. Thrust Bearing
10. Snap Ring
11. Bearing Roller Assembly
12. Control Wheel Tube
13. Screw
14. Cover Assembly
15. Glide Plug
16. Glide
17. Control Tube Assembly
18. Push-Pull Tube
19. Elevator Arm Assembly
20. Elevator Control Cable
21. Torque Tube
22. Tube
23. Guide Assembly
24. Control Column Shield
25. Bolt

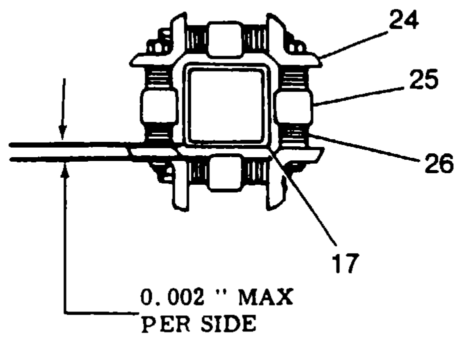
NOTE

Install bolts (25) with heads towards center line of control column shield (24). Maintain minimum clearance of 0.06 inch between shield (24) and moving components of control column.

●Use as required to adjust free play.
(Do not exceed 4 washers per assembly.)

Figure 6-2. Control Column Installation (Sheet 1 of 3)

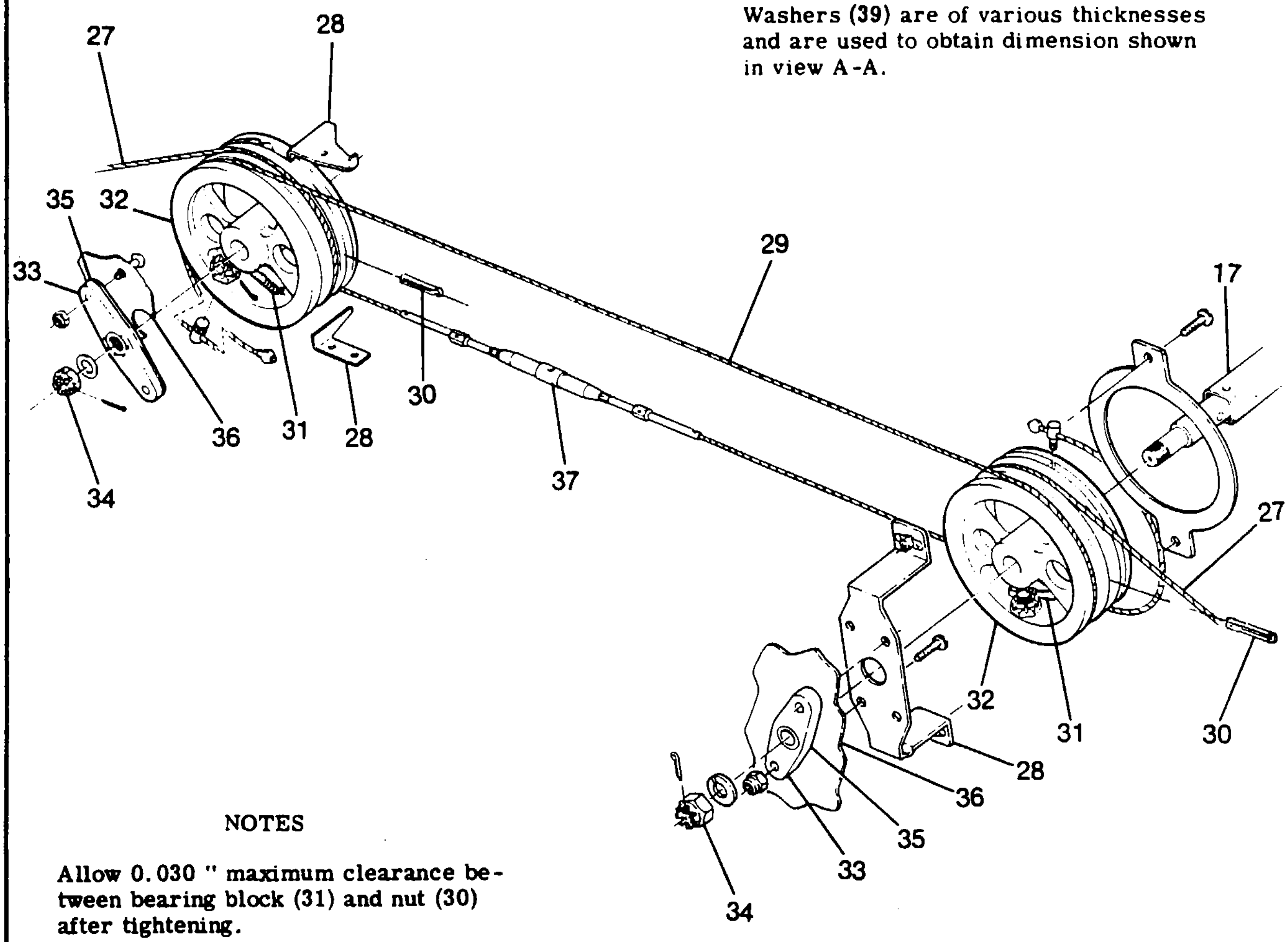
17. Control Tube Assembly
24. Retainer
25. Bearing Roller
26. Washer
27. Aileron Control Cable
28. Cable Guard
29. Interconnect Cable
30. Roll Pin
31. Interconnect Cable Adjustment Terminal
32. Quadrant
33. Bearing Block
34. Nut
35. Spacer
36. Firewall
37. Interconnect Cable Turnbuckle



VIEW **A-A**

NOTES

Washers (39) are of various thicknesses and are used to obtain dimension shown in view A-A.



NOTES

Allow 0.030 " maximum clearance between bearing block (31) and nut (30) after tightening.

Adjust interconnect cable (32) tension to 30 ± 10 lbs.

*Safety wire these items.

Figure 6-2. Control Column Installation (Sheet 2 of 3)

12. Control Wheel Tube
38. Map Light Rheostat
39. Transponder Identification
40. Pitch Sync
41. Control Wheel
42. Mike Switch
43. Go Around
44. Electric Trim Switch
45. Map Light Assembly
46. Knob
47. Trim Disengage
48. Autopilot Disengage
49. Cover

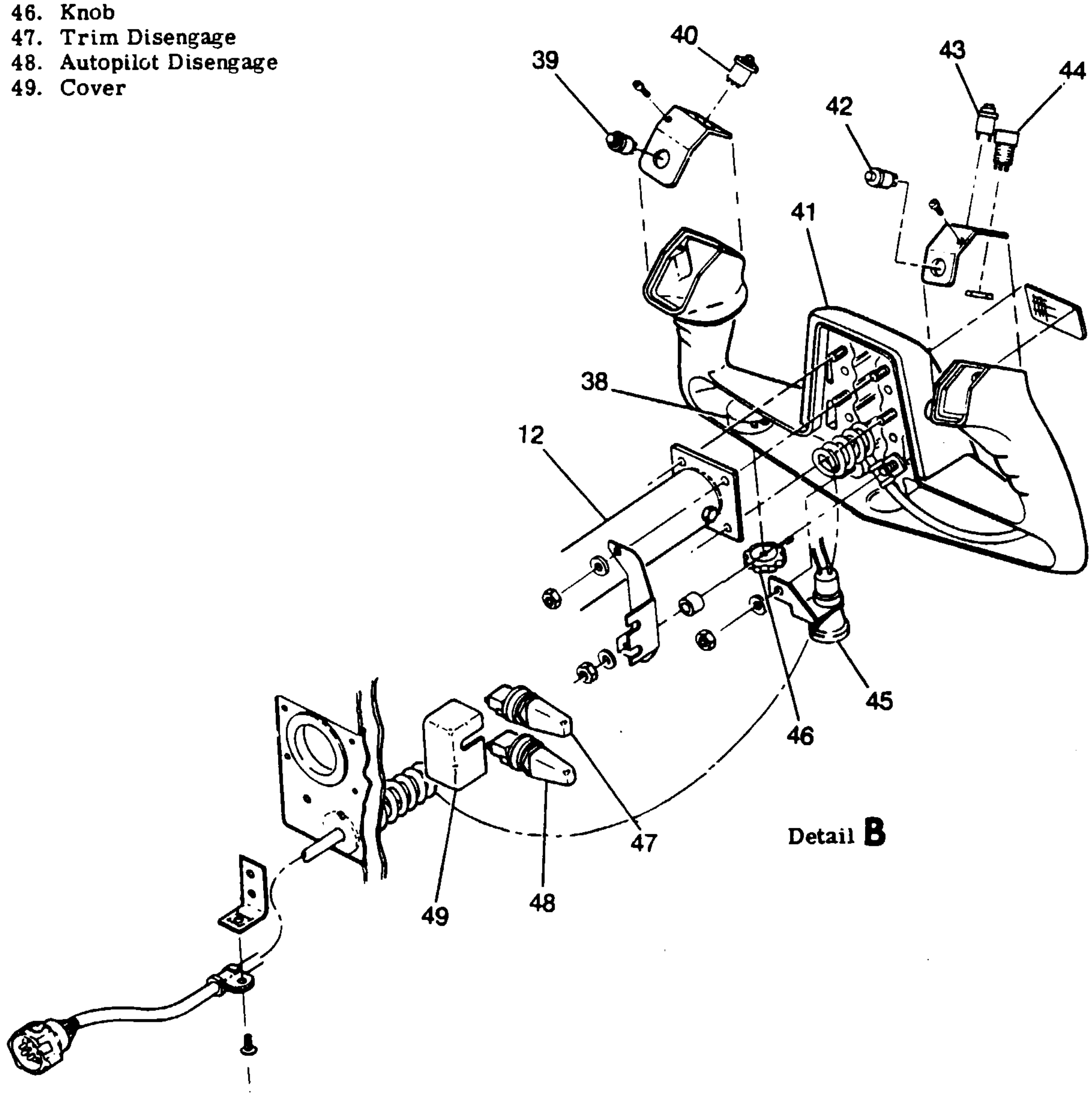


Figure 6-2. Control Column Installation (Sheet 3 of 3)

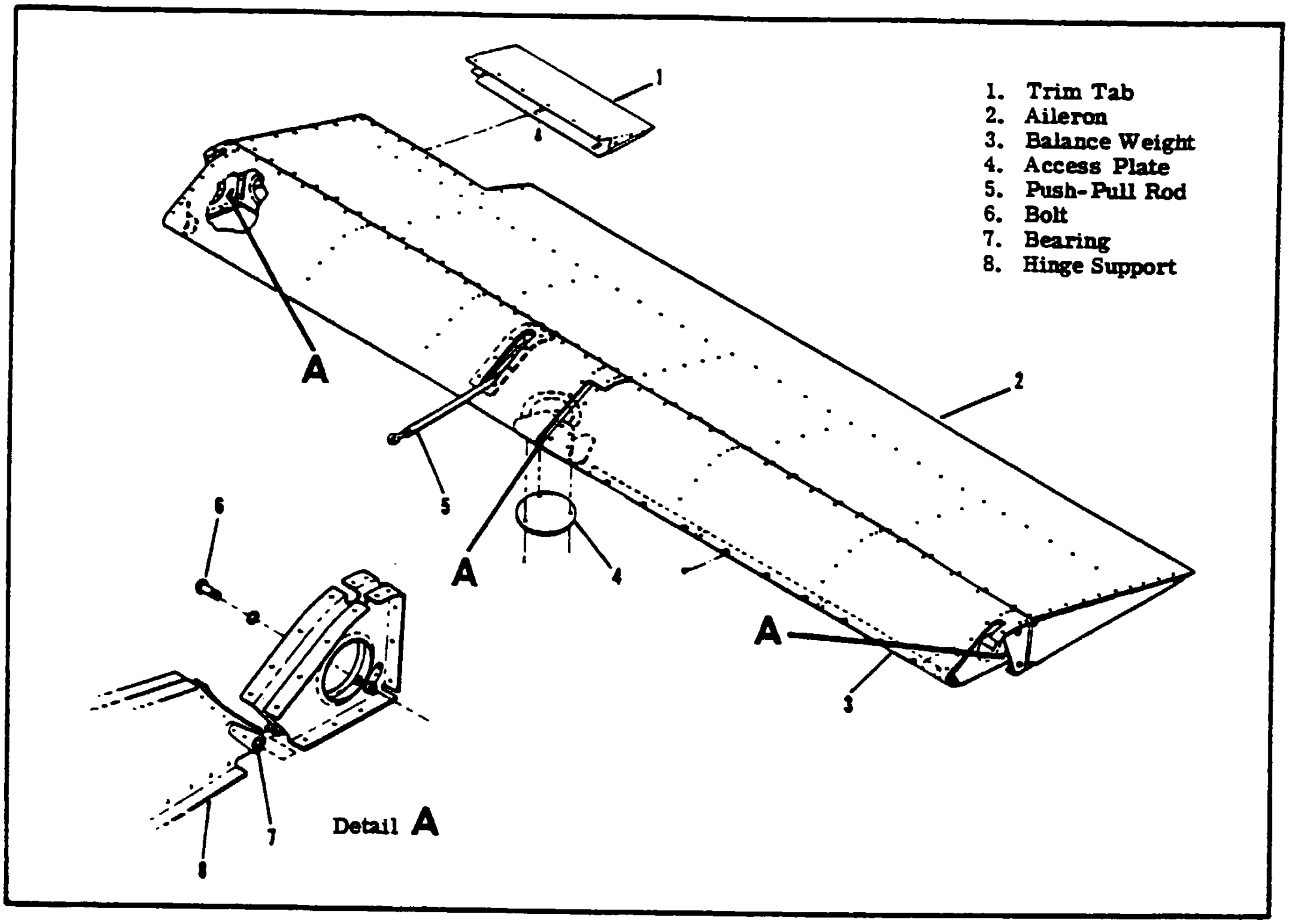


Figure 6-3. Aileron Installation

tems in accordance with paragraphs 6-17 and Section 8 respectively. Safety turnbuckles and other items previously safetied. Tighten nut (34) securing control tube assembly (17) to firewall snugly, then loosen nut to 0.030 inch maximum clearance between nut and bearing block, align cotter pin hole and install pin.

6-7. REPAIR. Worn, damaged or defective shafts, bearings, quadrants, cables or other components should be replaced. Refer to Section 2 for lubrication requirements.

6-8. BEARING ROLLER ADJUSTMENT. (Refer to figure 6-2.) Each bearing assembly (11) has an 0.062 inch eccentric adjustment when installed, for aligning the control tube weld assembly and push-pull tube (18) with the guide assembly (23). For alignment: proceed as follows:

a. Remove control wheel assembly in accordance with paragraph 6-6.
b. Install cover plate (14) backwards (bearing on aft side) and leave loose with instrument panel.
c. Align control wheel tube assembly (12) for free travel of push-pull tube (18) along full length of guide assembly (23).
d. Center cover plate (14) over tube and bearing assembly and secure plate to instrument panel.
e. Adjust each bearing (11) to control wheel tube assembly and tighten bearings in place.
f. Remove cover plate and reinstall with bearings facing forward.

6-9. AILERON BELLCRANK. (Refer to figure 6-1.)

6-10. REMOVAL.

a. Remove access plate inboard of each bellcrank (18) on underside of wing.
b. Remove safety-wire and relieve cable tension at turnbuckles (5).
c. Disconnect control cables from bellcrank (18).
d. Disconnect push-pull rod (16) at bellcrank (18).
e. Remove pivot bolts (9) securing bellcrank to wing structure.

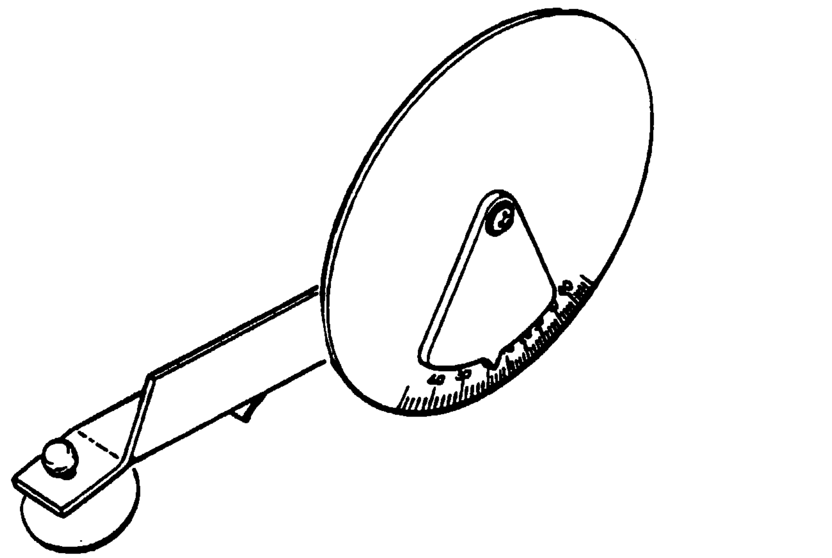


Figure 6-4. Inclinometer for Measuring Control Surface Travel

f. Remove bellcrank through access opening, using care that bushing (13) is not dropped from bellcrank.

NOTE

Brass washers (12) may be used as shims between each end of bellcrank and supports (11 and 17). Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (14).

6-11. INSTALLATION.
a. Connect control cables (4 and 7) to bellcrank (18) prior to installing bellcrank.
b. Place bushing (13) in bellcrank and position bellcrank in wing.
c. Install brass washers (12) as required between upper and lower end of bellcrank and wing supports to shim out excess clearance.
d. Install bellcrank pivot bolt (9).
e. Connect push-pull rod (16) to bellcrank.
f. Re-rig aileron system in accordance with paragraph 6-21. safety turnbuckles and reinstall all items removed for access.

6-12. 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.

6-13. AILERONS. (Refer to figure 6-3.)

6-14. REMOVAL AND INSTALLATION
a. Remove access plate (4) and disconnect push-pull rod (5) at aileron.
b. Remove wing tip for access to outboard hinge bolt.
c. Run flaps to full down position for access to inboard hinge bolt.
d. Remove hinge bolts (6) securing aileron and carefully remove aileron from wing.
e. Reverse the preceding steps for reinstallation. Rig system, if necessary, in accordance with paragraph 6-21 and reinstall all items removed for access.

NOTE

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

6-15. REPAIR. Aileron repair and static balance may be accomplished in accordance with instructions outlined in Section 18. Before installation. ensure balance weights and hinges are securely attached.

6-16. AILERON TRIM TAB. (Refer to figure 6-3.)

6-17. REMOVAL AND INSTALLATION.
a. Remove screws on lower side of tab.
b. Drill out rivets on upper side of tab and remove tab.
c. Reverse the preceding steps for reinstallation.

6-18. ADJUSTMENT. Adjustment is accomplished by loosening the screws, shifting tab trailing edge up to correct for a wing-heavy condition or down to correct for a wing-light condition. Divide correction equally on both tabs. When installing a new wing or aileron, set tab in neutral and adjust as necessary after flight test.

6-19. CABLES AND PULLEYS. (Refer to figure 6-1.)

6-20. REMOVAL AND INSTALLATION.

a. Remove access plates, wing root fairings and upholstery as required.

b. Remove safety wire and relieve cable tension at turnbuckles (5 and 8).

c. Disconnect cables from aileron bellcranks (18) and quadrants (index 29, figure 6-2).

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

NOTE

To ease routing of cables, a length of wire may be attached to end of the cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use 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 aileron system in accordance with paragraph 6-21, safety turnbuckles and install access plates, fairings and upholstery removed in step "a."

6-21. RIGGING.

a. (Refer to figure 6-1.) Remove access plates and upholstery as required.

b. Remove safety wire and relieve all cable tension at turnbuckles (5 and 8).

c. Disconnect push-pull rods (16) at bellcranks (18).

d. (Refer to figure 6-2.) Adjust turnbuckle (37) and adjustment nuts (31) on interconnect cable (29) to remove slack, acquire proper tension (30 ± 10 pounds) and position both control wheels level (synchronized).

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

f. (Refer to figure 6-1.) Adjust direct cable turnbuckles (5) and carry-thru cable turnbuckle (8) to position bellcranks (18) approximately in neutral while maintaining 40±10 pounds tension on carry-thru cable (7).

f. Streamline ailerons with reference to flaps (flaps full UP and disregarding aileron trim tabs), then adjust push-pull rods (16) to fit and install.

g. With ailerons streamlined, mount an inclinometer on trailing edge of aileron and set pointer to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. Refer to figure 6-4.

h. Remove bar from control wheels and adjust travel stop bolts (15) to degree of travel specified in figure 1-1.

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

WARNING

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

SHOP NOTES:

SECTION 7

WING FLAP CONTROL SYSTEM

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Trouble Shooting	1J22/7-2
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Repair	1J23/7-3
Flap Control Lever	1J23/7-3
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7-1. WING FLAP CONTROL SYSTEM. (Refer to figure 7-1.)

7-2. DESCRIPTION. The wing flap control system consists of an electric motor and transmission assembly, drive pulleys, synchronizing push-pull tubes, bellcranks, push-pull rods, cables, pulleys and a follow-up control. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys, cables and synchronizing tubes. Electrical power to the motor is controlled by two microswitches mounted on a "floating" arm, a control lever and a follow-up control. As the control lever is moved to the desired flap setting, a switch is tripped actuating the flap motor. As the flaps move, the floating arm is rotated by the follow-up control until the active switch clears the control lever cam, breaking the circuit. To reverse the direction of flap travel, the control lever is moved in the opposite direction. When the control lever cam contacts the second switch the flap motor is energized in the opposite direction. Likewise, the follow-up control moves the floating arm until the second switch is clear of the control lever cam.

7-3. OPERATIONAL CHECK.

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

b. Check for positive shut-off of motor at the flap travel extremes, FLAP MOTOR MUST STOP OR DAMAGE WILL RESULT.

c. Check wing flaps for sluggish in operation on the ground with engine running.

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

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. Refer to Section 6.

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

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

7-4. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 7-21.

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

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO EXTEND.	Disconnected or defective DOWN operating switch.	Check continuity of switch. Connect or replace switch.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-21.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.

7-5. FLAP MOTOR, TRANSMISSION AND ACTUATOR ASSEMBLY. (Refer to figure 7-1.)

7-6. REMOVAL AND INSTALLATION.

a. Run flaps to full DOWN position.
b. Disconnect battery cables at the battery and insulate cable terminals as a safety precaution.
c. Remove access plates from under actuator assembly on left wing and adjacent to the drive pulleys on both wings.
d. Relieve cable tension at turnbuckles (items 7, 8 and 9, sheet 1.)

NOTE

Remove motor (3), transmission (18), actuator assembly (17) and lower support as a unit.

e. Disconnect cables from actuator cable drive assembly (17).
f. Remove bolt (11) securing follow-up control bellcrank (10) to actuator assembly (17). Retain spacer (9).
g. Disconnect flap motor and microswitch wiring and tag for reference on reinstallation.
h. Remove bolts (12 and 20) securing lower support to upper support. Retain spacer (9), bushing (19) and washers.
i. Remove bolt (21) securing motor and transmission assembly to upper support (7).

NOTE

Although not required, nuts (2) securing motor (3) to transmission (18) may be removed to swing motor clear of working area for easier removal of bolt (21).

j. Using care, work assembly out of wing through access opening.
k. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed for access.

7-7. REPAIR. Repair consists of replacement of motor, transmission or coupling. Lubricate in accordance with Section 2.

7-8. FLAP CONTROL LEVER. (Refer to figure 7-1.) sheet 2.)

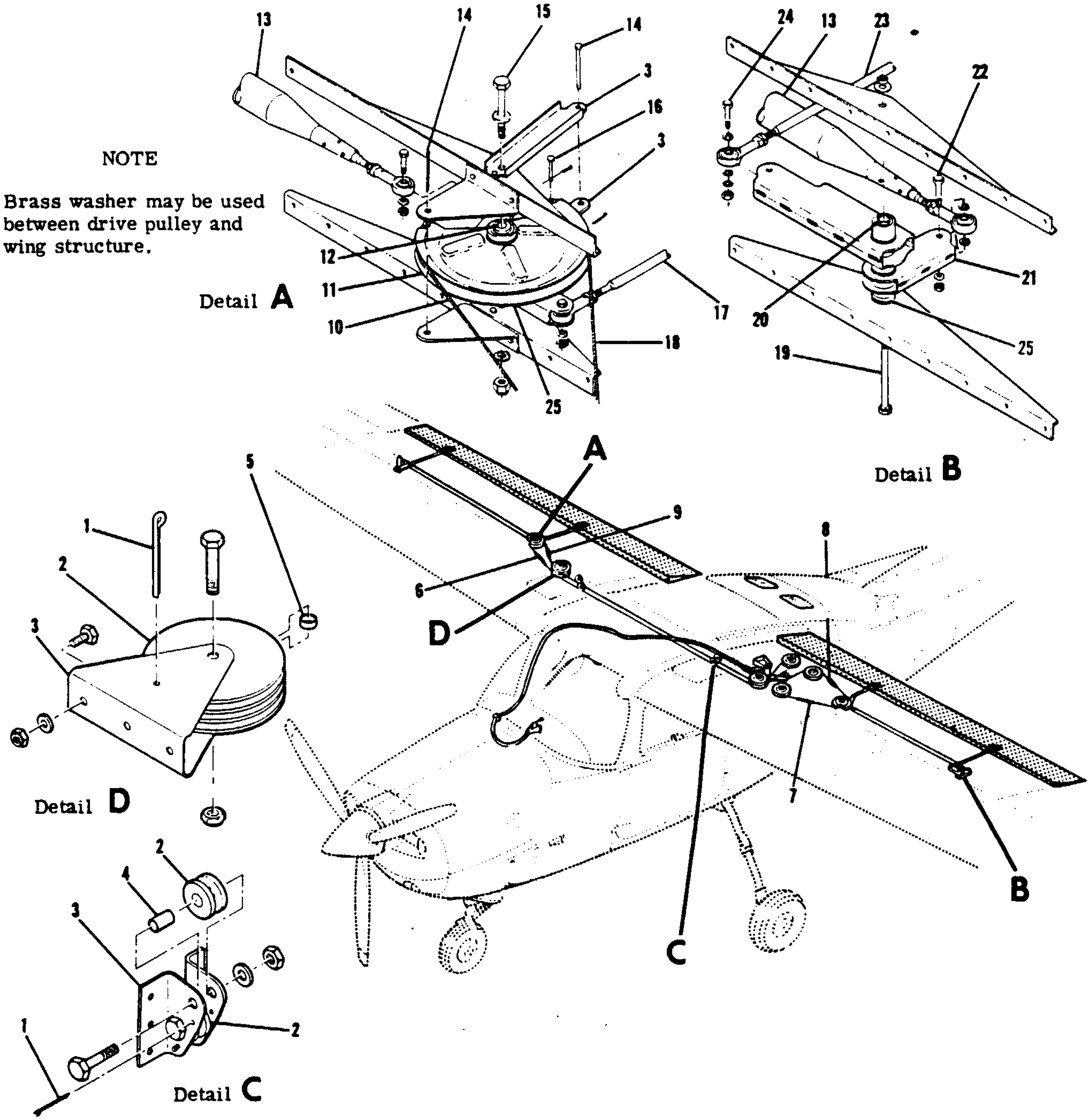
7-9. REMOVAL AND INSTALLATION.

a. Remove follow-up control (8) from switch mounting arm (30).
b. Remove flap operating switches (28 and 29) from switch mounting arm (30). DO NOT disconnect electrical wiring at switches.
c. Remove knob (27) from control lever (26).
d. Remove remaining items by removing bolt (32) and nut (35). Use care not to drop parts into tunnel area.
e. Reverse the preceding steps for reinstallation. Do not overtighten bolt (32) causing lever (26) to bind. Rig system in accordance with paragraph 7-21.

7-10. DRIVE PULLEYS. (Refer to figure 7-1, sheet 1.)

7-11. REMOVAL AND INSTALLATION.

a. Run flaps to full DOWN position.
b. Remove access plates adjacent to drive pulley (11).
c. Relieve cable tension at turnbuckles (7 and 8) for removal of left hand drive pulley and relieve cable tension at turnbuckles (6 and 9) for removal of right hand drive pulley.
d. Remove bolt securing flap push-pull rod (17) to drive pulley.
e. Remove bolt securing synchronizing push-pull tube (13) to drive pulley.
f. Remove cable guards (14).
g. Remove cable lock pins (16) and disconnect cables (10 and 18) from drive pulley. Tag cables for reference on reinstallation.
h. Remove pivot bolt (15) attaching drive pulley to wing structure.
i. Remove drive pulley (11) through access opening, using care not to drop bushing (12). Retain brass washer between drive pulley and wing structure. Tape open ends of pulley to protect bearings.
j. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed for access.



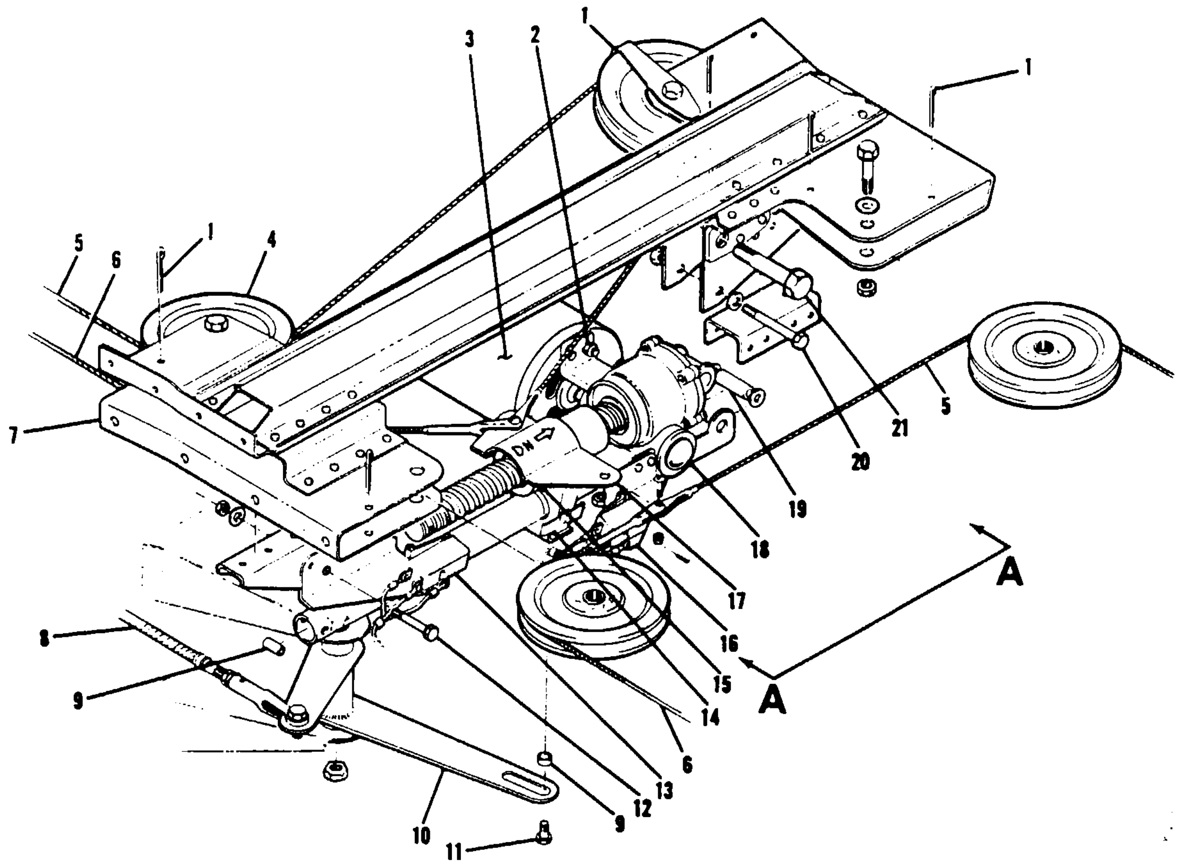
1. Cable Guard
2. Pulley
3. Bracket
4. Bushing
5. Spacer
6. Turnbuckle (Right Direct)
7. Turnbuckle (Left Direct)
8. Turnbuckle (Left Retract)
9. Turnbuckle (Right Retract)
10. Cable (Direct)
11. Drive Pulley
12. Bushing
13. Synchronizing Push-Pull Tube
14. Cable Guard
15. Pivot Bolt
16. Lock Pin
17. Inboard Push-Pull Rod
18. Cable (Retract)
19. Pivot Bolt
20. Bushing
21. Bellcrank
22. Bolt
23. Outboard Push-Pull Rod
24. Bolt
25. Brass Washer

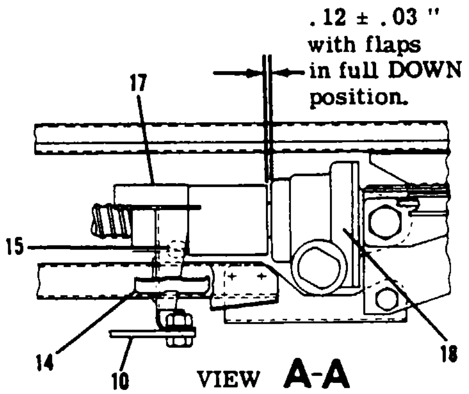
CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

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

Figure 7-1. Wing Flap Control System (Sheet 1 of 3)



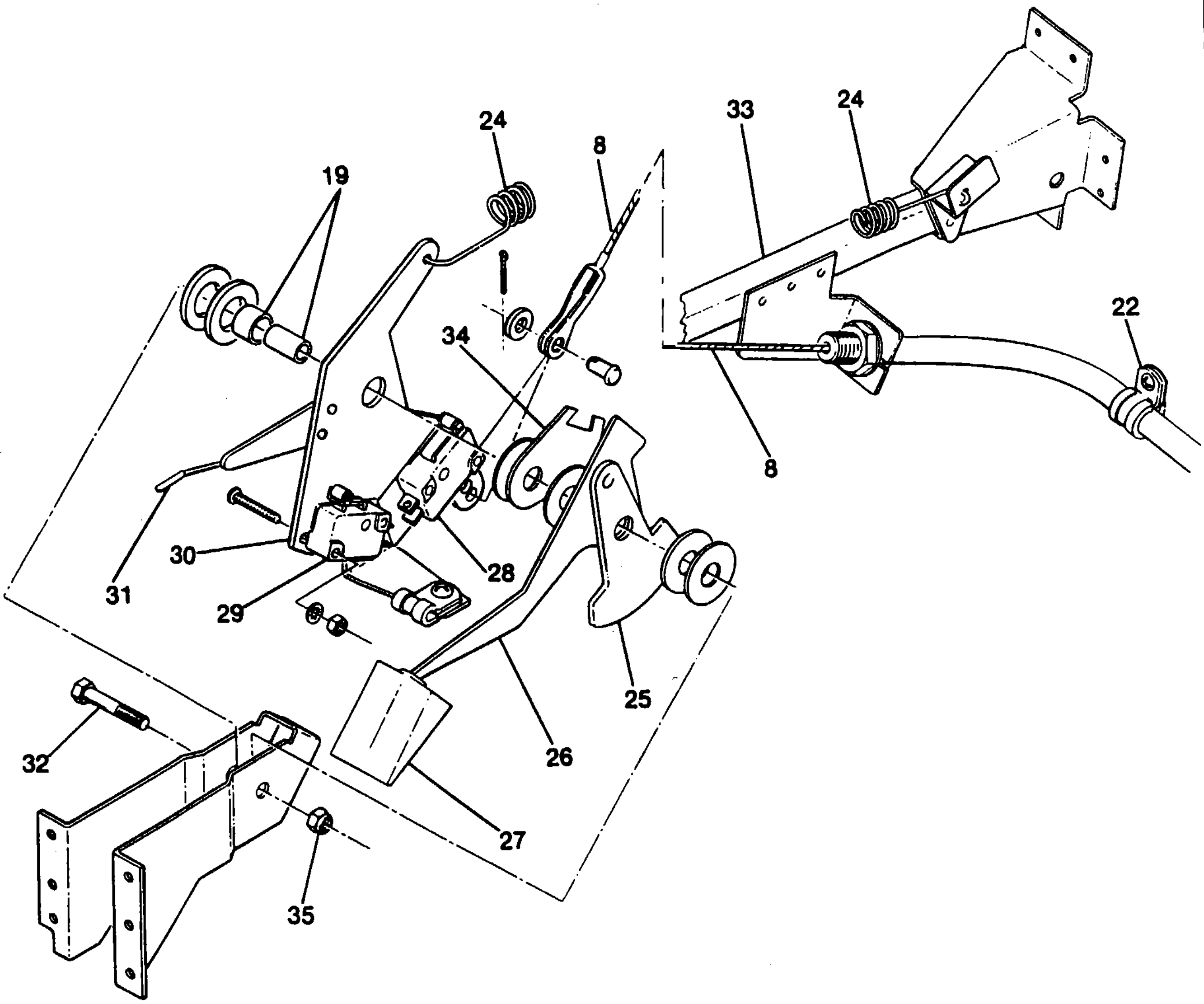


NOTE

Torque setscrew (15) to 40 inch-lbs. Apply Loctite Sealant, Grade CV to threads of setscrew (15) after final adjustment.

1. Cable Guard
2. Nut
3. Motor Assembly
4. Pulley
5. Cable (Retract)
6. Cable (Direct)
7. Upper Support Assembly
8. Follow-Up Control
9. Spacer
10. Bellcrank
11. Bolt
12. Bolt
13. Up-Limit Switch
14. Striker Plate (Cam)
15. Setscrew
16. Down-Limit Switch
17. Actuator Cable Drive Assembly
18. Actuator
19. Bushing
20. Bolt
21. Bolt
22. Clamp
23. Washer
24. Spring
25. Cam
26. Control Lever
27. Knob
28. Flaps Down Operating Switch
29. Flaps Up Operating Switch
30. Switch Mounting Arm
31. Position Indicator
32. Bolt
33. Stiffener
34. Bracket
35. Nut

Figure 7-1. Wing Flap Control System (Sheet 2 of 3)



NOTE

Insulators are installed between switches (13, 16, 28 and 29) and their mounting brackets. Install AN960-D4 washers (one per switch fastener) between the insulator and switches, 28 and 29 ONLY.

Apply Loctite Sealant, Grade CV, to threads of control lever (26) before installing knob (27).

Figure 7-1. Wing Flap Control System (Sheet 3 of 3)

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

7-13. BELLCRANKS. (Refer to figure 7-1, sheet 1.)

7-14. REMOVAL AND INSTALLATION.
a. Run flaps to full DOWN position.
b. Remove access plates adjacent to bellcrank (21).
c. Remove bolt (24) securing push-pull rod (23) to bellcrank (21).
d. Remove bellcrank pivot bolt (19) and position bellcrank as necessary to expose synchronizing push-pull tube attach point.
e. Remove bolt (22) securing synchronizing push-pull tube (13) to bellcrank (21) and work bellcrank out through access opening using care not to drop bushing (20). Tape open ends of bellcrank to protect needle bearings.

NOTE

To remove synchronizing push-pull tube (13), disconnect tube at bellcrank (21) and drive pulley (11). Position tube through lightening holes until removal is possible through access opening.

f. Reverse the preceding steps for reinstallation. If the push-pull rod and synchronizing tube adjustments are not disturbed, re-rigging of the system should not be necessary. Check flap travel and rig in accordance with paragraph 7-21, if necessary, and reinstall all items removed for access.

7-15. REPAIR. Repair is limited to replacement of bearings. Cracked, bent or excessively worn bellcranks must be replaced. Lubricate in accordance with Section 2.

7-16. FLAPS. (Refer to figure 7-2.)

7-17. REMOVAL AND INSTALLATION
a. Run flaps to full DOWN position.
b. Remove access plate (7) outboard of the inboard flap track.
c. Disconnect push-pull rod (3) at both flap attach points.
d. Remove bolt (6) at each aft flap track, pull flap aft and remove remaining bolts. As flap is removed from wing, all washers, rollers and bushings will fall free. Retain these for reinstallation.
f. If the push-pull rod adjustment is not disturbed, re-rigging of the system should not be necessary. Check flap travel and rig in accordance with paragraph 7-21, if necessary.

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

7-19. CABLES AND PULLEYS. (Refer to figure 7-1, sheet 1.)

7-20. REMOVAL AND INSTALLATION.
a. Remove access plates, fairings and upholstery as required for access.
b. Relieve cable tension at turnbuckles (6, 7, 8 and 9).
c. Disconnect cables at drive pulleys (11).
d. Disconnect cables at actuator cable drive assembly (item 17, sheet 2).
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 the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use wire to pull cable into position.

f. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards.
g. Re-rig flap system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed in step "a."

7-21. RIGGING.
a. (Refer to figure 7-1, sheet 1.) Using care, run flaps to full DOWN position.
b. Disconnect cables at turnbuckles (6, 7, 8 and 9).
c. Disconnect push-pull rods (17) at drive pulleys (11).
d. Disconnect push-pull rods (23) at bellcranks (21).
e. Disconnect synchronizing push-pull tubes (13) from drive pulleys (11) and bellcranks (21).
f. If cables are being replaced with drive pulleys (11) installed, rotate drive pulleys beyond their normal range of travel to permit cable attachment. If drive pulleys are not installed, it may be easier to attach the cables prior to installing the drive pulleys in the wings.
f. Attach the 1/8" direct cable to the forward side of drive pulleys and the 3/32" retract cable to the aft side of drive pulleys. (Refer to figure 7-3.)
h. Adjust synchronizing push-pull tubes (13) to 41.87" between centers of rod end holes, tighten jam nuts and install.
i. Adjust inboard push-pull rods (17) to 10.81" and outboard push-pull rods (23) to 10.39" between centers of rod end holes, tighten jam nuts and install. These dimensions may vary in order to obatin snug fitting of flap in "UP" position.
j. Ensure cables are properly routed and in pulley grooves and adjust turnbuckles to obtain specified cable tension.
k. (Refer to figure 7-1, sheet 2.)

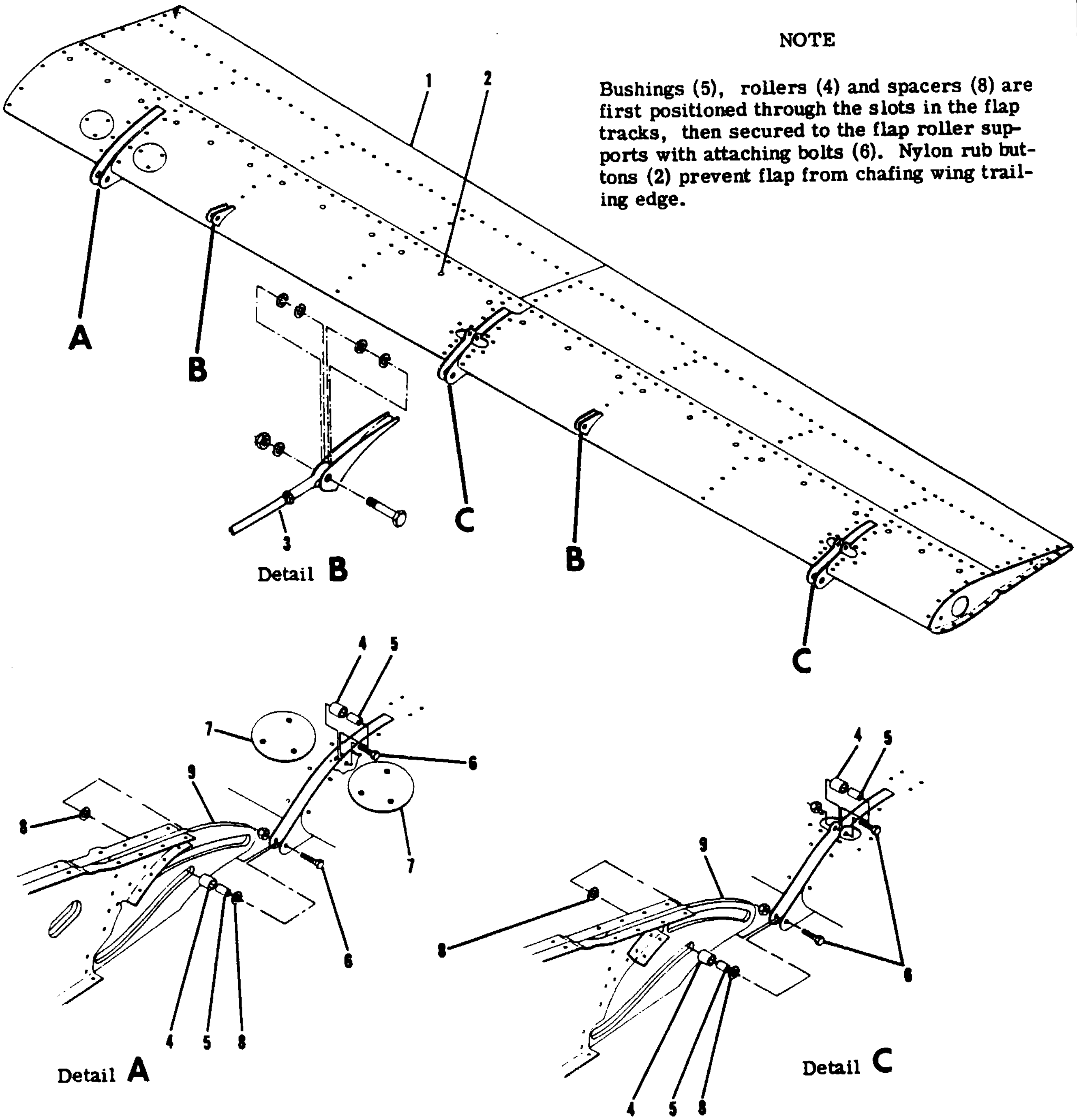
NOTE

The ball screw assembly does not have a free-wheeling feature. Therefore, the flap actuator motor MUST be shut-off at travel extremes or structural deformation will occur.

Carefully run flaps to full UP position and adjust

NOTE

Bushings (5), rollers (4) and spacers (8) are first positioned through the slots in the flap tracks, then secured to the flap roller supports with attaching bolts (6). Nylon rub buttons (2) prevent flap from chafing wing trailing edge.



1. Flap Assembly
2. Nylon Rub Button
3. Push-Pull Rod
4. Roller
5. Bushing
6. Bolt
7. Access Plate
8. Spacer
9. Flap Track

Figure 7-2. Flap Installation

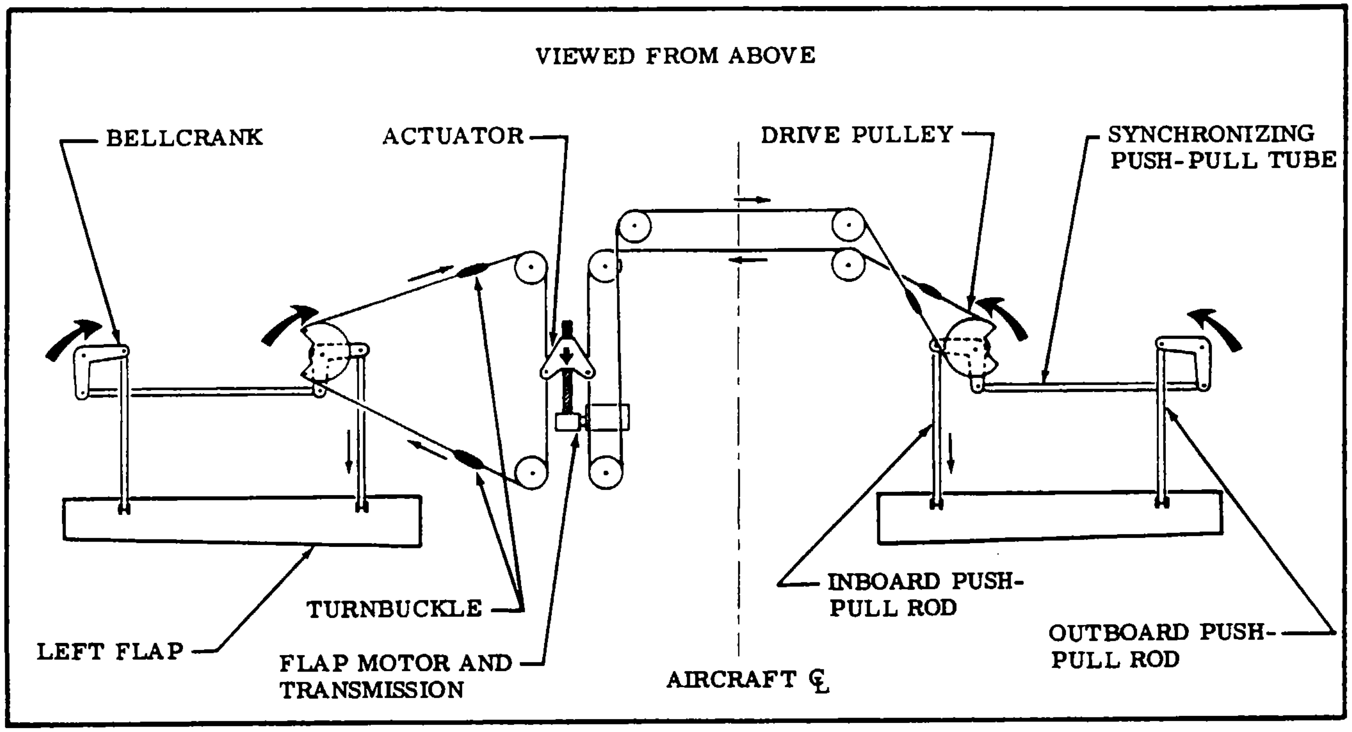


Figure 7-3. Flap System Schematic

UP-LIMIT switch to operate and shut-off motor at degree of travel specified in figure 1-1.

l. Mount an inclinometer on one flap and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. Refer to Section 6.

m. Carefully run flaps to DOWN position and adjust DOWN-LIMIT switch (16) to operate and shut-off motor to .12±.03 inches between cable drive assembly (17) and transmission (18) as illustrated in VIEW A-A.

n. Operate control lever (26) and run flaps to full UP position.

o. Disconnect follow-up control (8) at switch mounting arm (30).

p. Without moving control lever (26), move arm (30) until cam (25) is centered between switches (28 and 29). Ensure switches are centered in their respective adjustment slots prior to centering cam (25).

q. Adjust flaps DOWN operating switch (28) in slotted holes until roller just clears cam (25) and secure. This adjustment should provide flaps down operation to 10°+0°-2° and 20°±2°. If not, readjust switch (28) as necessary.

NOTE

The flaps must NEVER exceed 10° when the control lever (26) is moved from the 0° to 10° position.

r. Adjust flaps UP operating switch (29) in slotted holes to 0.062" clearance between switch roller and cam (25) when the DOWN operating switch has just opened in the 10°+0°-2° and 20°±2° position.

NOTE

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

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

NOTE

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

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

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

SECTION 8

ELEVATOR CONTROL SYSTEM

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

8-2. DESCRIPTION. The elevators are operated by power transmitted through fore-and-aft movement of the pilot or copilot control wheels. The system is comprised of control columns, an elevator torque tube, cables and pulleys. The elevator control cables, at their aft ends, are attached to a bellcrank mounted on a bulkhead in the tailcone. A push-pull tube connects this bellcrank to the elevator arm assembly, installed between the elevators. An elevator trim tab is installed in the trailing edge of the right elevator and is described in Section 9.

8-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 8-14.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.	Forward or aft end of push-pull tube disconnected.	Check visually. 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 bellcrank or arm assembly pivot bearings or push-pull tube attach bearings.	Move bellcrank or arm to check for play or binding. Disconnect push-pull tube and check that bearings rotate freely. Replace defective parts.
	Cables slack.	Check and adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Check visually. Route cables correctly over pulleys.
	Defective control column bearing rollers.	Check visually. Replace defective rollers.
	Defective control column torque tube bearings.	Disconnect necessary items and check that bearings rotate freely. Replace defective bearing.
	Control guide on aft end of control square tube adjusted too tightly.	Loosen screw and tapered plug in end of control tube enough to eliminate binding.
	Defective elevator hinges.	Disconnect push-pull tube and move elevators by hand. Replace defective hinges.
	Defective pulleys or cable guards.	Check visually. Replace defective parts and install guards properly.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	Rig in accordance with paragraph 8-14.
	Cables tightened unevenly.	Rig in accordance with paragraph 8-14.
	Interference at instrument panel.	Rig in accordance with paragraph 8-14.

8-4. CONTROL COLUMN.
Section 6 outlines removal, installation and repair of control column.

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

8-6. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Disconnect trim tab push-pull tube at tab actuator. (Refer to Section 9.)

c. Remove bolts (13) securing elevator torque tubes (7) to arm assembly (8).

NOTE

If adhesive has been applied to shanks of bolts (13) prior to installation, use a heat gun to soften epoxy before removing bolts from system.

d. Remove bolts (6) from elevator hinges (5).

e. Using care, remove elevator.

f. To remove left elevator use same procedure, omitting step "b".

g. Reverse the preceding steps for reinstallation.

h. Set right hand elevator maintaining 0.18" dimension specified in figure 8-2.

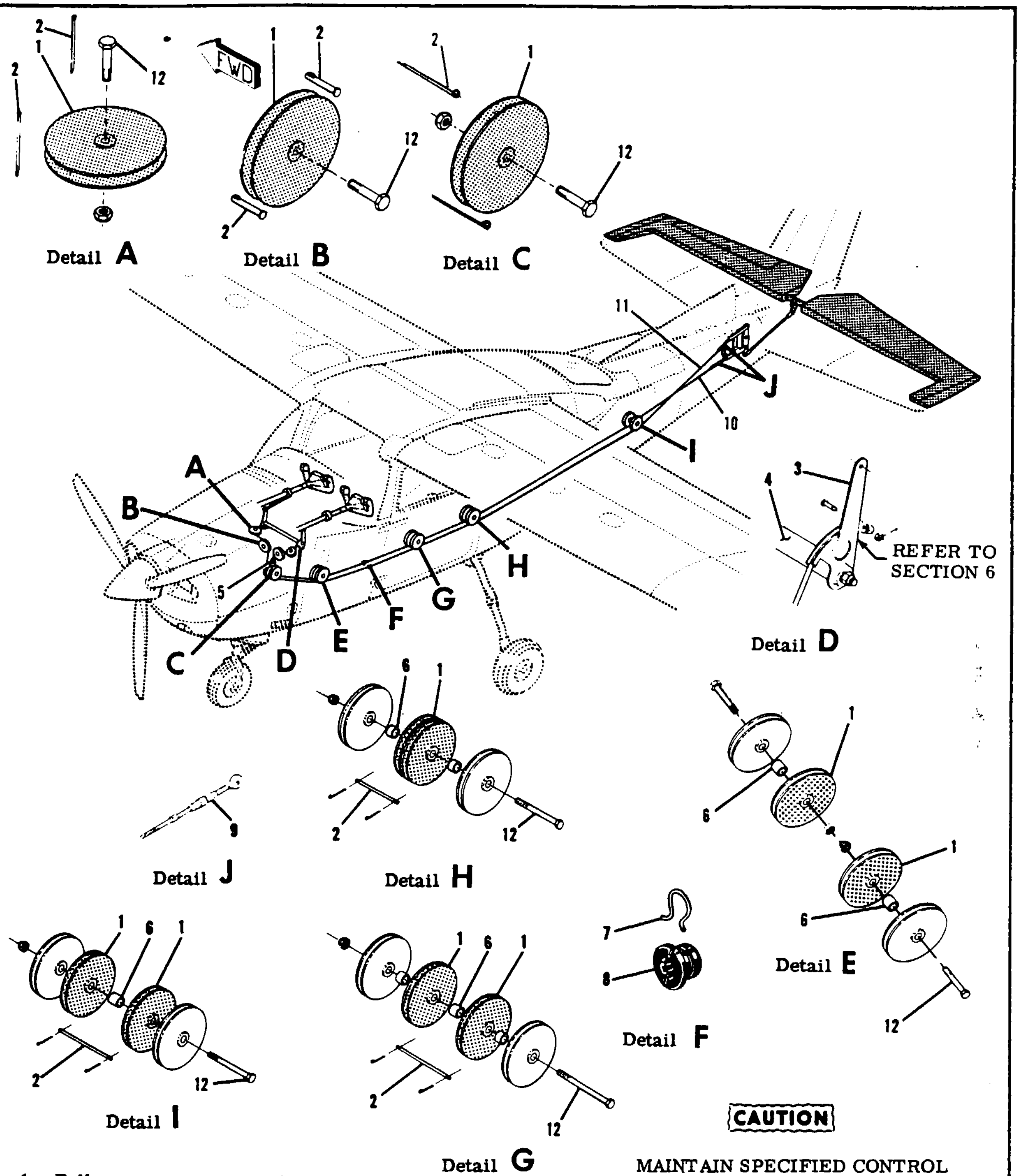
i. When reinstalling bolts (13) install a washer under the head of each bolt and under each nut.

NOTE

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

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

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



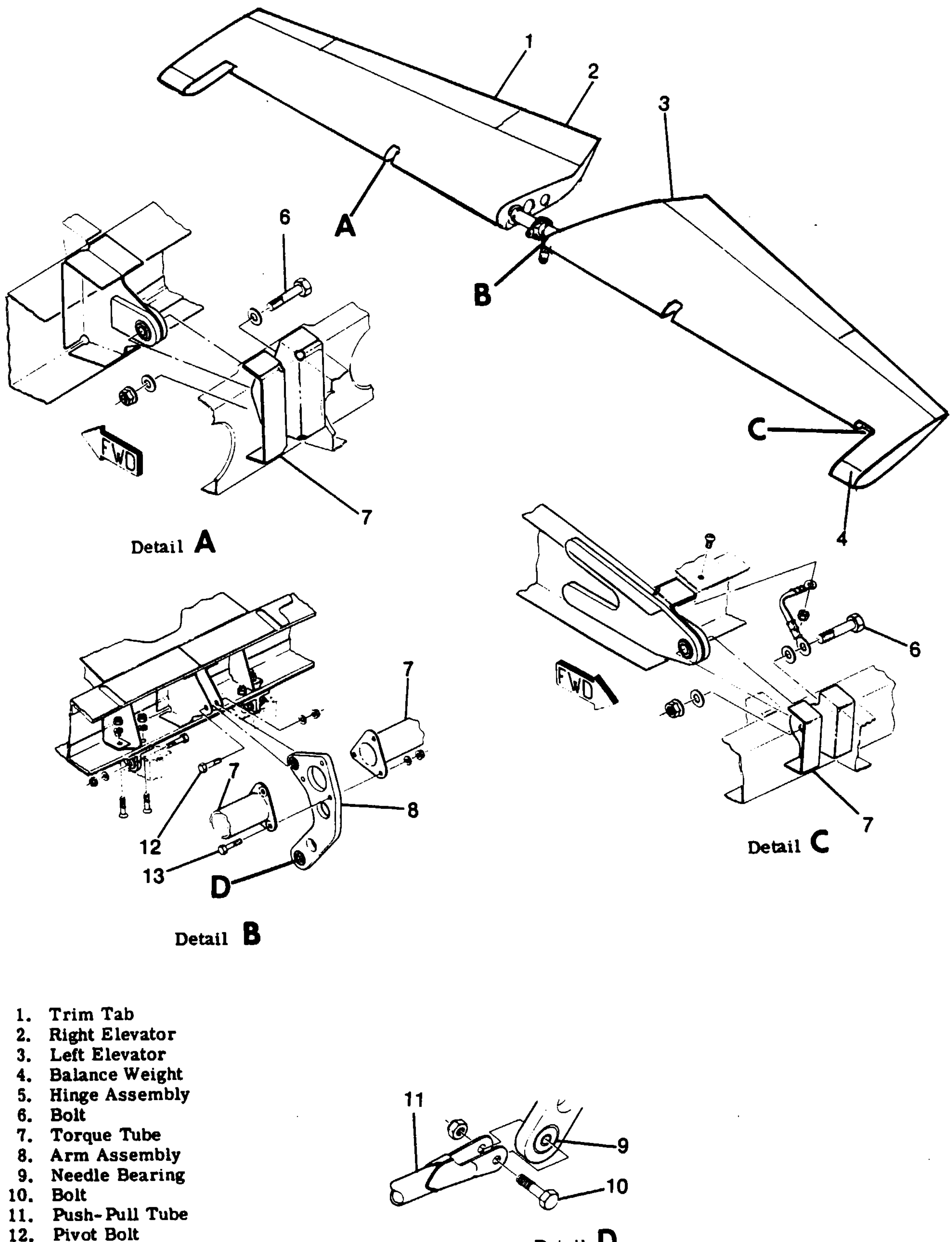
CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

1. Pulley
2. Cable Guard
3. Arm Assembly
4. Elevator Torque Tube
5. Balance Weight
6. Spacer
7. Clip
8. Fairlead
9. Turnbuckle
10. Elevator DOWN Cable
11. Elevator UP Cable
12. Bolt

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

Figure 8-1. Elevator Control System



1. Trim Tab
2. Right Elevator
3. Left Elevator
4. Balance Weight
5. Hinge Assembly
6. Bolt
7. Torque Tube
8. Arm Assembly
9. Needle Bearing
10. Bolt
11. Push-Pull Tube
12. Pivot Bolt
13. Bolt

Figure 8-2. Elevator Installation

1. Stop Block
2. Bracket
3. Pivot Bolt
4. Push-Pull Tube
5. Bolt
6. Spacer
7. Bearing
8. Bellcrank
9. Link
10. Turnbuckle
11. Elevator DOWN Cable
12. Elevator UP Cable

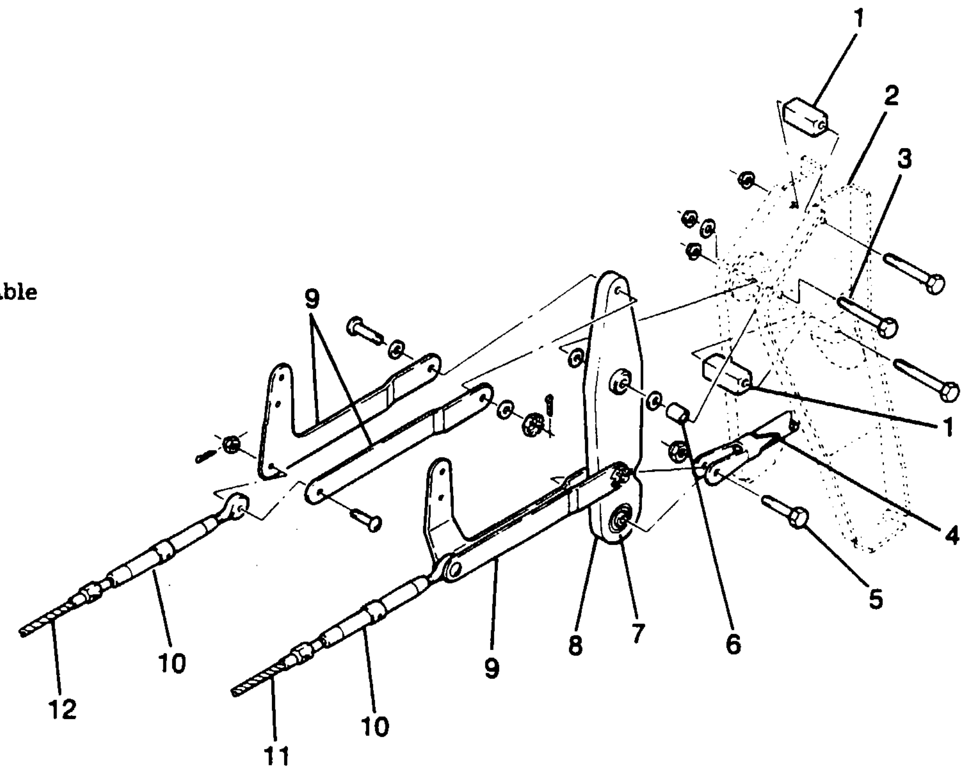


Figure 8-3. Elevator Bellcrank Installation

NOTE

Holes are drilled off center in bellcrank stops to provide elevator travel adjustments. 90° rotation of bellcrank stop provides approximately 1° of elevator travel.

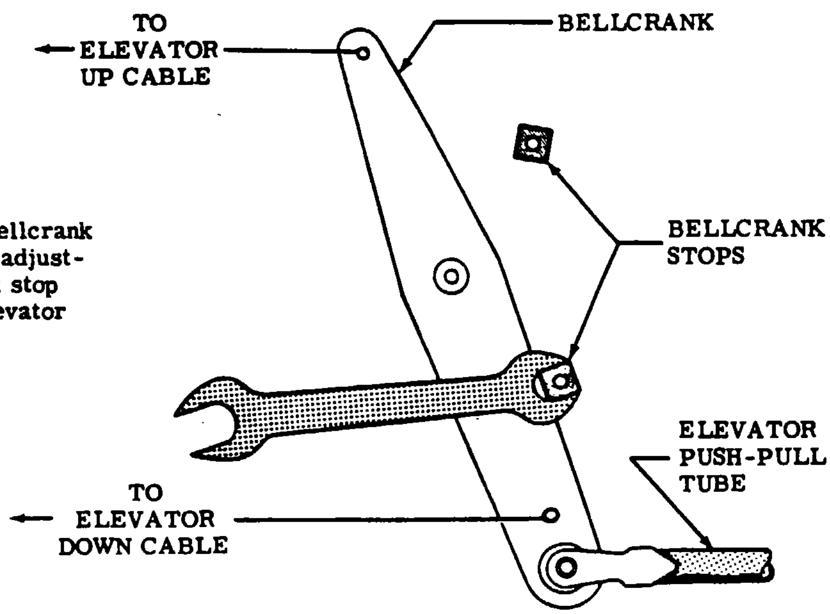
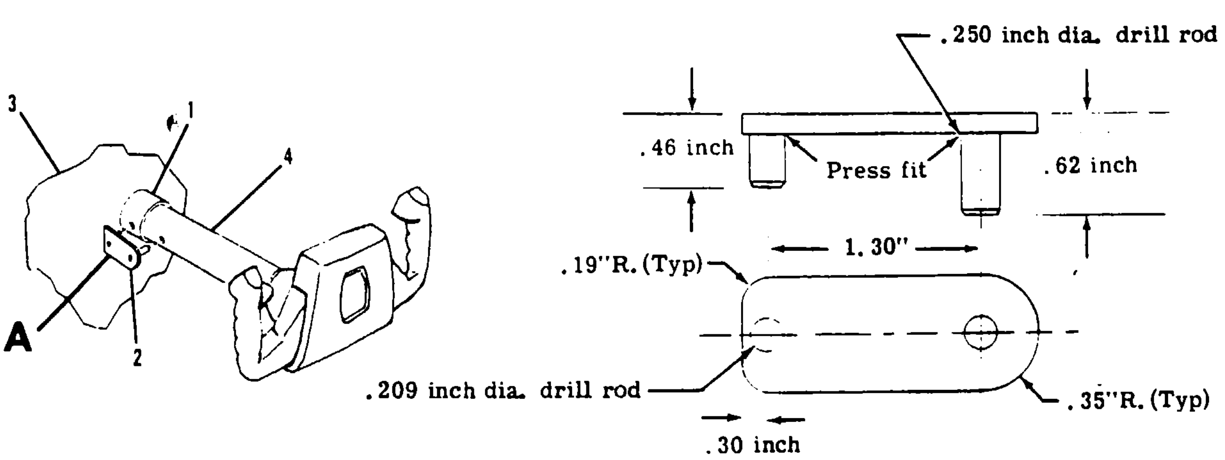


Figure 8-4. Elevator Bellcrank Travel Stop Adjustment



1. Support
2. Neutral Rigging Tool
3. Instrument Panel
4. Pilot's Control Column

Fabricate from 0.125 inch steel plate, 0.209 inch diameter and 0.250 inch diameter drill rod according to dimensions shown.

Figure 8-5. Control Column Neutral Position Rigging Tool

8-9. REMOVAL AND INSTALLATION.

a. Remove access plate below bellcrank on tailcone.

CAUTION

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

b. Remove safety-wire, relieve cable tension at turnbuckles (10) and disconnect turnbuckle eyes at bellcrank links (9).

c. Remove bolt (5) securing push-pull tube (4) to bellcrank (8).

d. Remove pivot bolt (3) attaching bellcrank (8) to brackets (2) and remove bellcrank.

e. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed for access.

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

8-11. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Remove bolt (10) securing push-pull tube (11) to arm assembly (8).

c. Remove bolts (13) securing elevator torque tubes (7) to arm assembly (8).

d. Remove pivot bolt (12) securing arm assembly (8) and slide assembly from between elevator torque tubes.

e. Reverse the preceding steps for reinstallation and reinstall all items removed for access.

f. When reinstalling bolts (13) install a washer under the head of each bolt and under each nut.

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

8-13. REMOVAL AND INSTALLATION.

CAUTION

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

a. Remove seats, upholstery and access plates as necessary.

b. Remove safety wire and relieve cable tension at turnbuckles (9).

c. Disconnect cables at control column arm assemblies (3) and disconnect balance weight (5).

d. Disconnect cables at bellcrank links (item 9, figure 8-3).

e. Remove fairleads, cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

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

f. Reverse the preceding steps for reinstallation.
g. After cables are routed in position, install fairleads, pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.
h. Re-rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed in step "a".

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

CAUTION

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

a. Lock control column in neutral position. (Refer to figure 8-5.)
b. Adjust turnbuckles (10) equally to streamline elevator with horizontal stabilizer.

NOTE

Disregard counterweight areas of elevators when streamlining.

c. With LEFT elevator streamlined, mount an inclinometer on elevator and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. Refer to Section 6.

d. Adjust bellcrank travel stop blocks to obtain degree of elevator travel as specified in figure 1-1.

NOTE

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

e. Move control wheel through full range of travel and check cable tension in various positions. Tension should not be less than 20 pounds or more than 40 pounds in any position.
f. Check all turnbuckles are safetied and all parts are secured, then reinstall all parts removed for access.

WARNING

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

SECTION 9

ELEVATOR TRIM TAB CONTROL SYSTEM

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9-1. ELEVATOR TRIM TAB CONTROL SYSTEM. (Refer to figure 9-1.)

9-2. DESCRIPTION. The elevator trim tab, located on the trailing edge of the right elevator, is controlled by a trim wheel mounted in the pedestal. Power to operate the tab is transmitted from the trim control wheel by means of roller chains, cables, an actuator and a push-pull tube. A mechanical pointer, adjacent to the trim wheel indicates nose attitude of the aircraft. Forward rotation of the wheel trims the nose down and aft rotation of the wheel trims the nose up. An electric trim assist may be installed and is described in paragraph 9-17. When de-energized the electric trim assist has no effect on manual operation.

9-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to appropriate rigging paragraphs.

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE.	Cable tension too high.	Check cable tension and adjust.
	Pulleys binding or rubbing.	Check pulleys visually. Repair or replace as necessary.
	Cables not in place on pulleys.	Check visually. Install cables correctly.
	Trim tab hinge binding.	Disconnect actuator and move tab up and down to check hinge resistance. Lubricate or replace hinge as necessary.
	Defective trim tab actuator.	Remove chain from actuator sprocket and operate actuator manually. Replace defective actuator.
	Rusty chain.	Check visually. Replace rusty chain.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE (CONT).	Damaged sprocket.	Check visually. Replace damaged sprockets.
	Bent sprocket shaft.	Observe motion of sprockets. Replace defective shafts.
LOST MOTION BETWEEN CONTROL WHEEL AND TRIM TAB.	Cable tension too low.	Check cable tension and adjust.
	Broken pulley.	Check visually. Replace defective pulley.
	Cables not in place on pulleys.	Check visually. Install cables correctly.
	Worn trim tab actuator.	Disconnect trim tab and check for play in actuator. Replace defective actuator.
	Actuator attachment loose.	Check actuator for security and tighten.
TRIM INDICATION INCORRECT.	Indicator incorrectly engaged on wheel track.	Check visually. Reset indicator.
INCORRECT TRIM TAB TRAVEL.	Stop blocks loose or incorrectly adjusted.	Adjust stop blocks on cables. Refer to figure 9-5.
	Incorrect rigging.	Refer to paragraph 9-15.

9-4. TRIM TAB. (Refer to figure 9-2.)

9-5. REMOVAL AND INSTALLATION.

a. Disconnect push-pull tube (9) from horn assembly (6).

NOTE

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

b. Remove screw (11) securing hinge pin (10), pull pin until free of tab and remove tab.

NOTE

It is not necessary to completely remove hinge pin.

c. Reverse the preceding steps for reinstallation. Rig system, if necessary, in accordance with paragraph 9-15.

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

9-7. REMOVAL AND INSTALLATION.

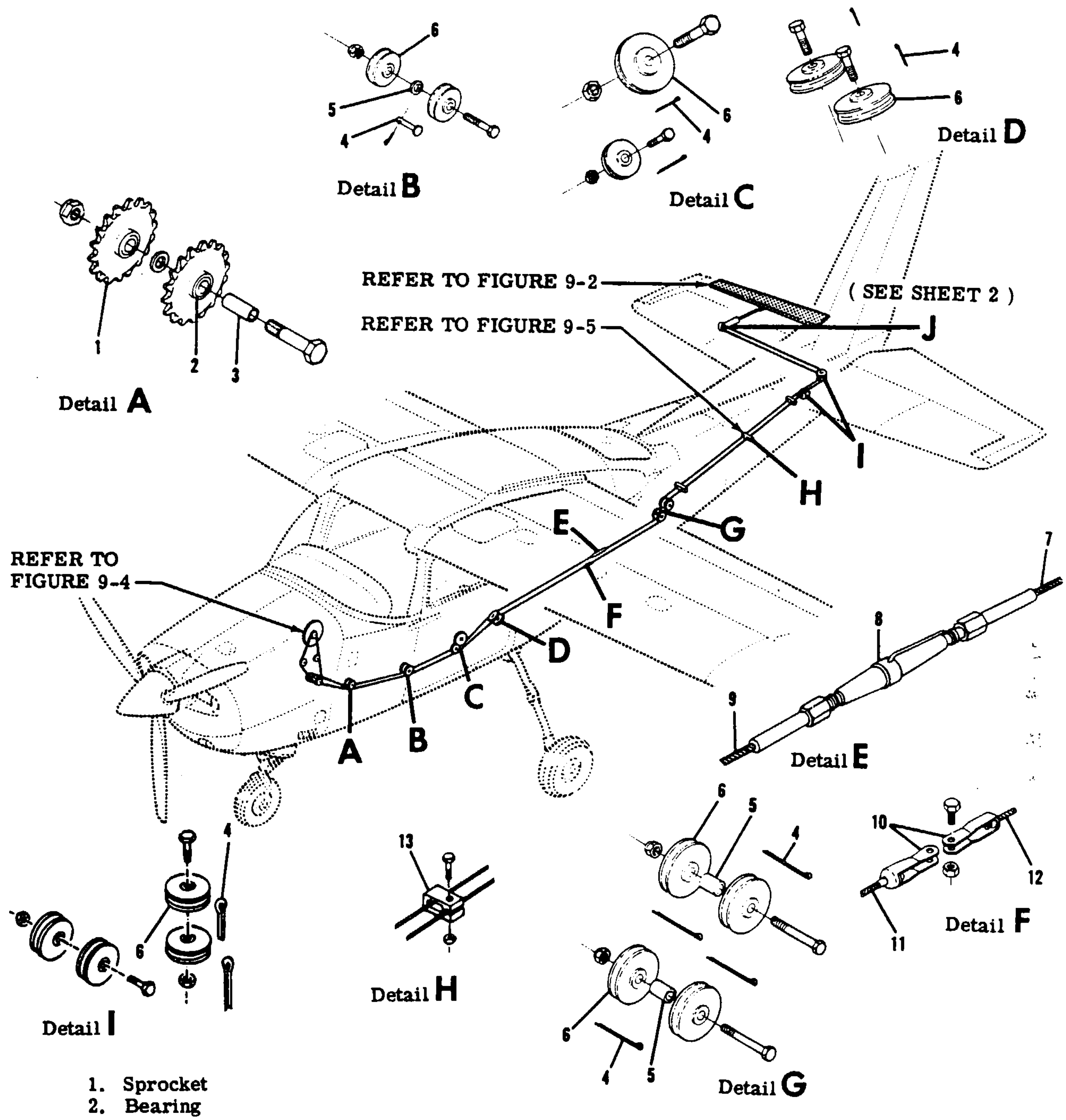
a. Relieve cable tension at turnbuckle (8).
b. Disconnect push-pull tube (15) at actuator (19).
c. Remove access plate beneath actuator.
d. Remove chain guard (21) and disengage roller chain (23) from actuator sprocket (20).
e. Remove screws attaching bracket (24) to bracket (18) and remove actuator (19) through access opening.

f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-15, safety turnbuckle and reinstall all items removed for access.

9-8. TRIM TAB CONTROL WHEEL. (Refer to figure 9-4.)

9-9. REMOVAL AND INSTALLATION.

a. Remove pedestal cover as outlined in paragraph 9-14.
b. Remove screws (13) and nuts (9) securing chain guard (10) to pedestal structure (6).
c. Remove bolt (1) securing indicator (3) to pedestal structure (6). Retain washers (2) and spacer (4) for reinstallation.
d. Loosen bolts (11) securing idler sprockets (16) to pedestal structure (6), slide idler sprockets in slotted holes and disengage chain (19) from sprockets.
e. Remove bolts (11), chain guard (10) and indicator (3), using care not to bend indicator or drop parts into tunnel area.
f. Remove roller chain (19) from trim wheel sprocket and carefully slide wheel (7) from pivot stud (8).
g. Reverse the preceding steps for reinstallation.



1. Sprocket
2. Bearing
3. Bushing
4. Cable Guard
5. Spacer
6. Pulley
7. Right Aft Cable
8. Turnbuckle
9. Right Forward Cable
10. Cable Ends
11. Left Forward Cable
12. Left Aft Cable
13. Travel Stop Block

CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION.

CABLE TENSION:
20 +0. -5 LBS. (AT AVERAGE TEMPERATURE FOR THE AREA)
REFER TO FIGURE 1-1 FOR TRAVEL.

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

Remove roller chain (19) slack by adjusting idler sprockets (16) in slotted holes and reinstall all items removed for access.

9-10. CABLES AND PULLEYS.

9-11. REMOVAL AND INSTALLATION.

a. FORWARD CABLE. (Refer to figure 9-1.)

1. Peel back carpeting as necessary to expose access plates in cabin and baggage areas and remove plates.
2. Remove safety wire, relieve cable tension and disconnect turnbuckle (8).
3. Disconnect cable ends (10).
4. (Refer to figure 9-4.) Remove pedestal cover as outlined in paragraph 9-14.
5. Remove lower pedestal panel (14) and disengage roller chain (21) from drive sprocket assembly (18).
6. Remove cable guards and pulleys as necessary to work cable free of aircraft.

NOTE

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

7. Reverse the preceding steps for reinstallation.
8. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards. Ensure roller chain (21) is positioned correctly over drive sprocket (18).
9. Re-rig system in accordance with paragraph 9-15, safety turnbuckle (index 8, figure 9-1) and reinstall all items removed for access.

b. AFT CABLE. (Refer to figure 9-1.)

1. Peel back carpeting as necessary to expose access plates in baggage area and remove plates.
2. Remove rear baggage compartment wall.
3. Remove safety wire, relieve cable tension and disconnect turnbuckle (8).

CAUTION

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

4. Disconnect cable ends (10).
5. Remove travel stop blocks (13).
6. Disconnect electric trim clamps and keepers, if installed.
7. Remove access plate beneath trim tab actuator (17) and remove chain guard (19).
8. Disengage roller chain (20) from actuator sprocket (18).
9. Remove cable guards and pulleys as necessary to work cable free of aircraft.

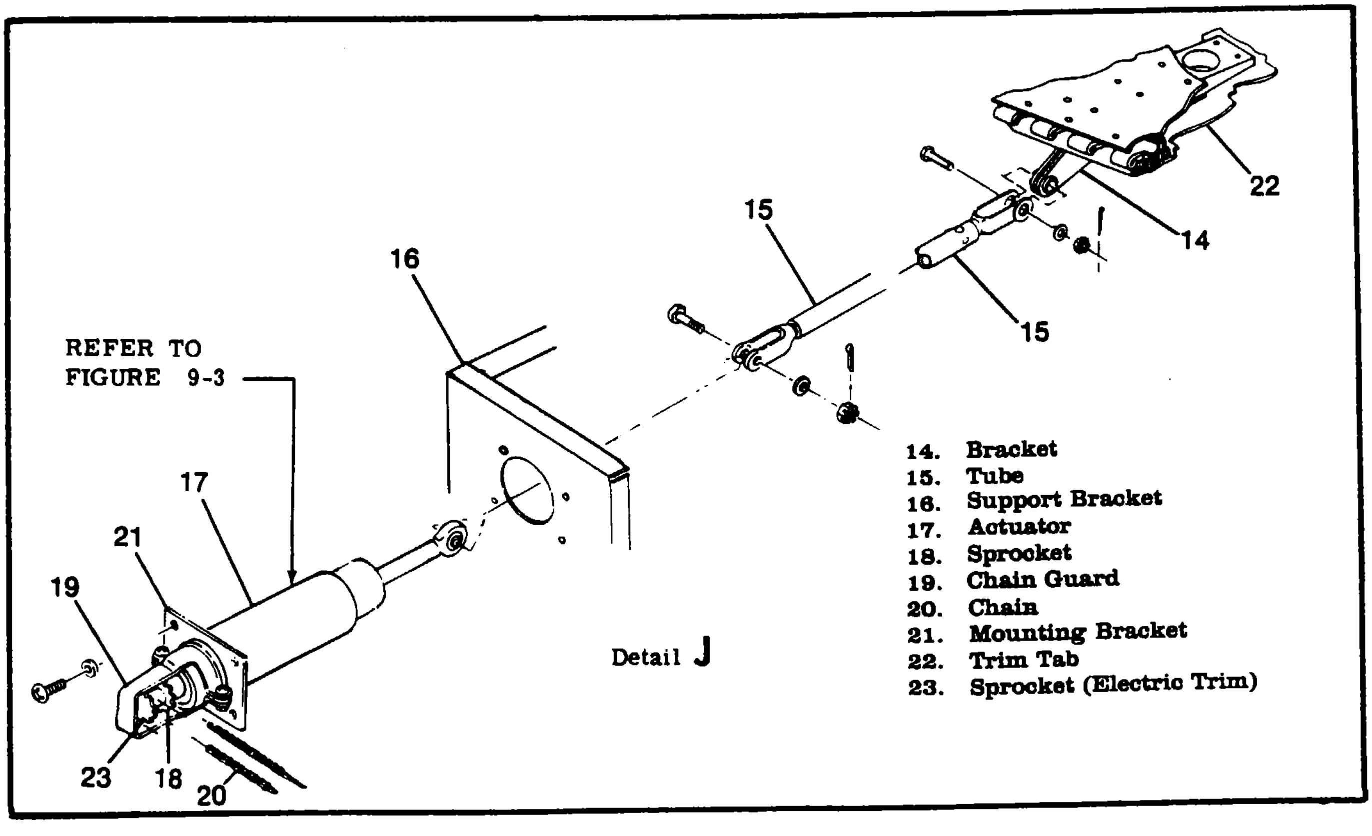


Figure 9-1. Elevator Trim Tab Control System (Sheet 2 of 2)

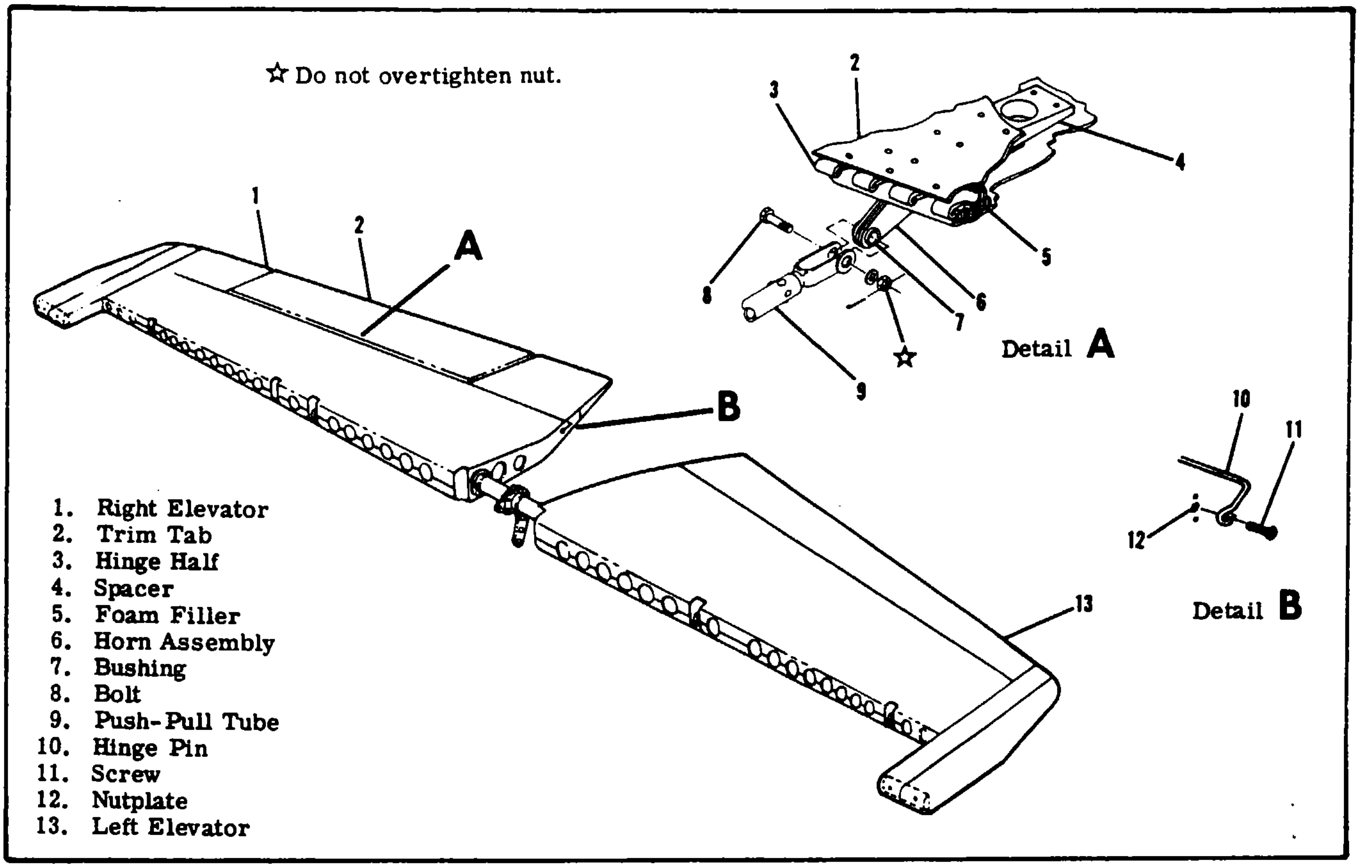


Figure 9-2. Elevator Trim Tab Installation

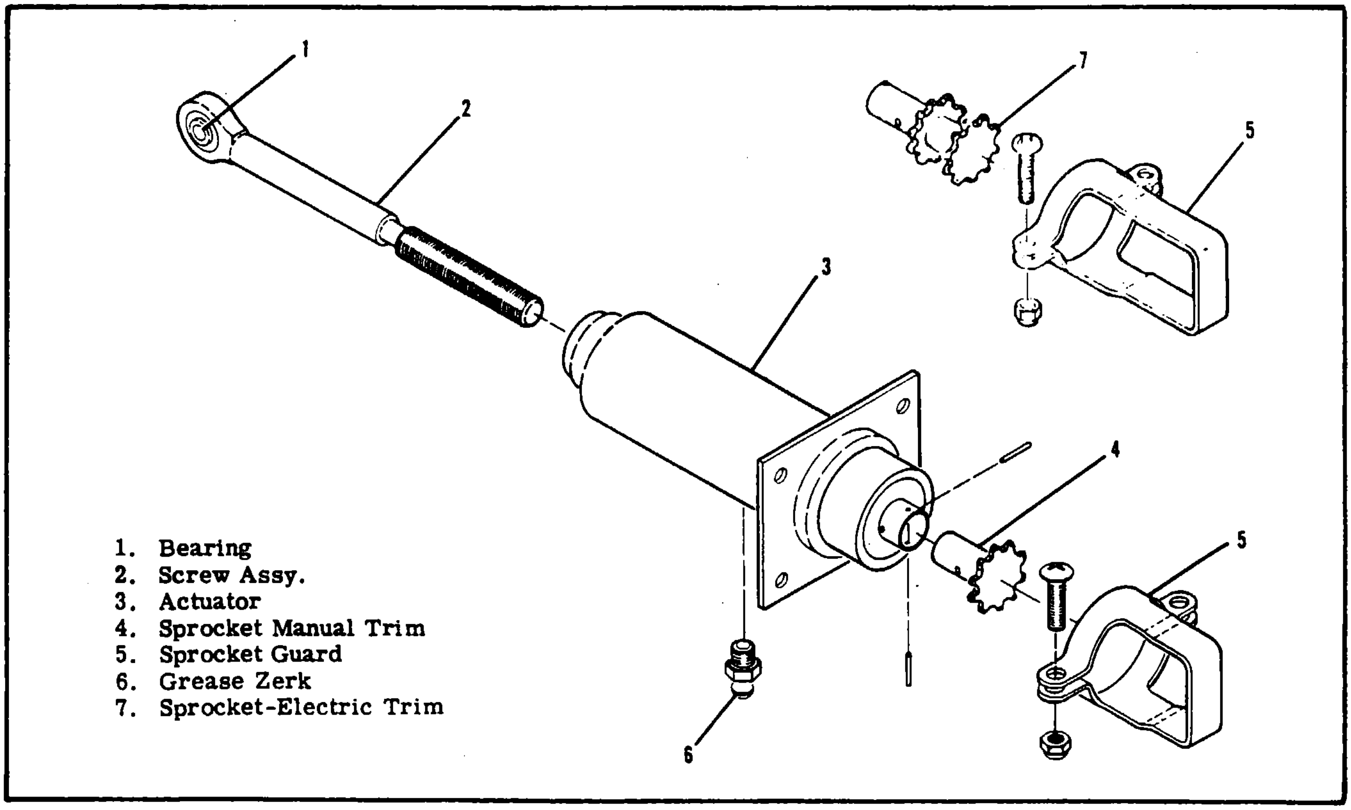
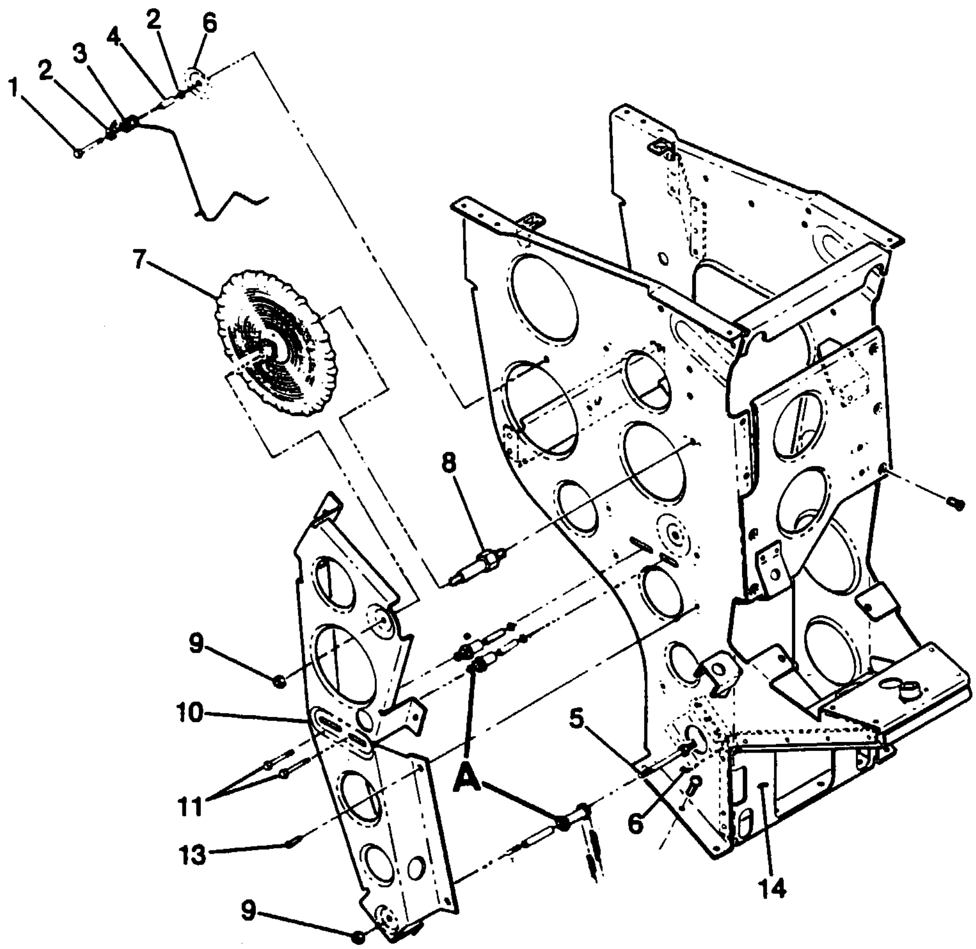
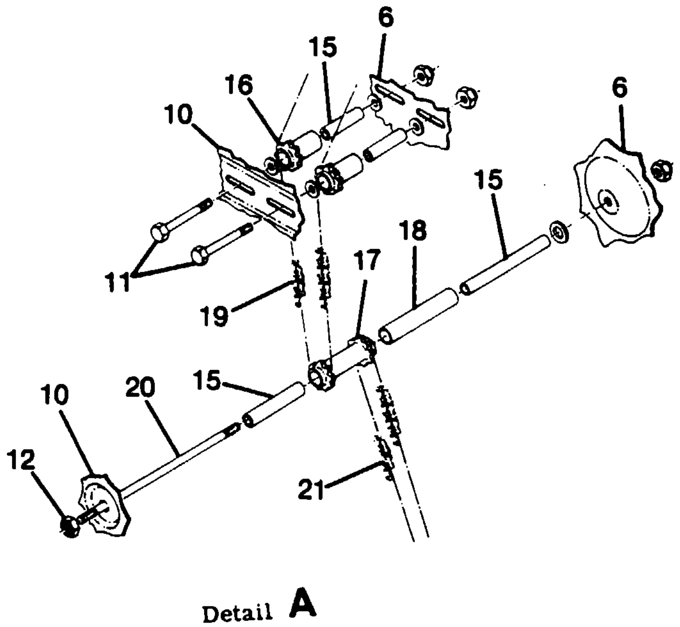


Figure 9-3. Elevator Trim Tab Actuator Assembly





1. Bolt
2. Washer
3. Position Indicator
4. Spacer
5. Shaft
6. Pedestal Structure
7. Trim Wheel
8. Pivot Stud
9. Nut
10. Chain Guard
11. Bolt
12. Nut
13. Screw
14. Lower Pedestal Panel
15. Bushing
16. Idler Sprocket
17. Spacer
18. Drive Sprocket
19. Roller Chain
20. Shaft
21. Roller Chain

Figure 9-4. Elevator Trim Wheel Installation

NOTE

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

10. Reverse the preceding steps for reinstallation.
11. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards. Ensure roller chain (20) is positioned correctly over actuator sprocket (18).
12. Re-rig system in accordance with paragraph 9-15, safety turnbuckle (8) and reinstall all items removed for access

9-12. TRIM TAB FREE-PLAY INSPECTION. (Refer to figure 9-5A.)

a. Place elevators and trim tab in neutral position and secure from movement.

b. Determine maximum allowable free-play using the following instructions.

1. Measure chord length of extreme inboard end of the trim tab as shown in detail A, figure 9-5A.
2. Multiply chord length by 0.025 to obtain maximum allowable free-play.

c. Using moderate pressure, move the trim tab trailing edge up and down by hand to check free-play.

NOTE

Measure free-play at the same point on trim tab that chord length was measured. Total free-play must not exceed maximum allowable. Refer to detail B, figure 9-5A.

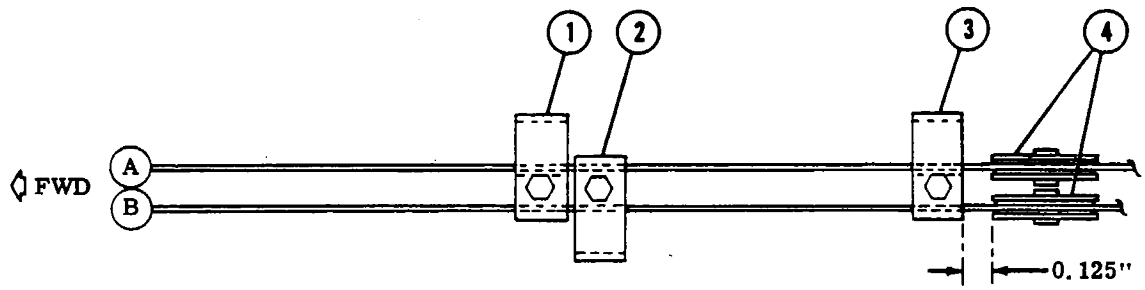
d. If the trim tab free-play is less than the maximum allowable the system is within the prescribed limits.

e. If the trim tab free-play is more than the maximum allowable, check the following items, for looseness while moving the trim tab up and down.

1. Check push-pull tube to trim tab horn assembly attachment for looseness.
2. Check push-pull tube to actuator assembly threaded rod end attachment for looseness.
3. Check actuator assembly threaded rod end for looseness in actuator assembly with push-pull tube disconnected.

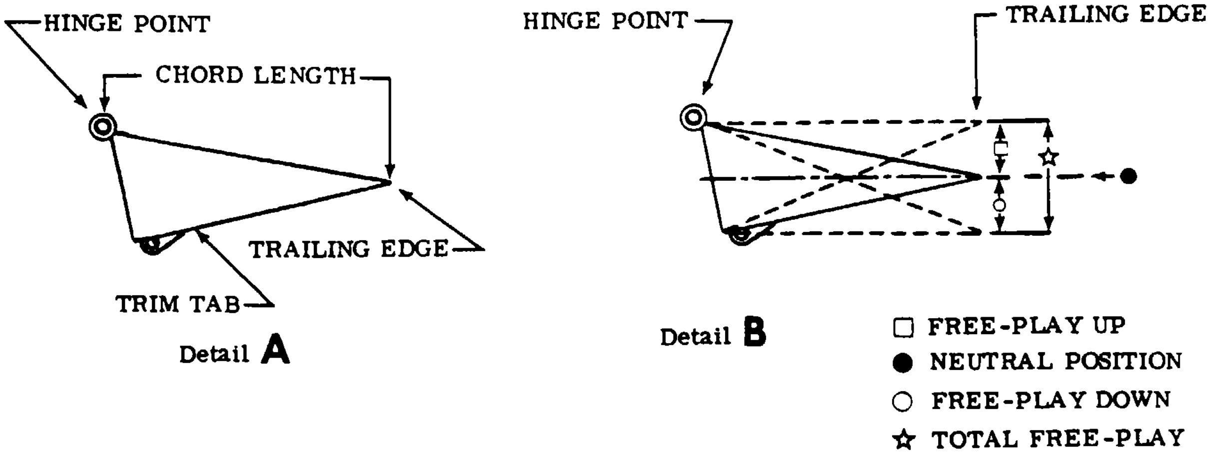
f. If looseness is apparent while checking steps e-1 and e-2, repair by installing new parts.

g. If looseness is apparent while checking step e-3, refer to paragraphs 9-7 through 9-8. Recheck trim tab free-play.



1. With elevators in neutral, set trim tab to neutral (split the non-faired difference between the inboard and outboard ends).
2. Place inclinometer on trim tab, adjust inclinometer to 0° and lower tab to degree of travel specified in figure 1-1.
3. Position stop block (3) on cable B, maintain 0.125 " between stop block (3) and pulleys (4) when elevator tab is in full down position and secure stop block (3) to cable B.
4. Raise trim tab to specified degree, place stop block (2) against stop block (3) and secure to cable A.
5. Place trim tab in full down position maintaining 0.125 " between stop block (3) and pulleys (4), place stop block (1) against stop block (2) and secure to cable B. (Recheck travel.)

Figure 9-5. Elevator Trim Tab Travel Stop Adjustment



1. Measure chord length at extreme inboard end of trim tab as shown in detail A.
2. Mulitiply 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 9-5A. Trim Tab Free-Play Inspection

9-13. PEDESTAL COVER.

9-14. REMOVAL AND INSTALLATION.

a. Turn fuel selector valve to OFF position and drain fuel from strainer and lines.
b. Remove knurled nut from engine primer if installed and pull plunger from primer body. Protect primer from dirt.
c. Remove fuel selector handle and placard.
d. Remove cowl flap handle knob.
e. Remove electric trim circuit breaker nut and microphone mounting bracket, if installed.
f. Fold carpet back as necessary and remove screws securing cover to floor and pedestal.
g. Disconnect electrical wiring to pedestal lights.
h. Carefully work cover from pedestal to prevent damage.
i. Reverse the preceding steps for reinstallation.

9-15. RIGGING MANUAL TRIM. (Refer to figure 9-1.)

CAUTION

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

a. Remove rear baggage compartment wall and access plates as necessary.
b. Loosen travel stop blocks (13) on trim tab cables (7 and 12).
c. Disconnect push-pull tube (15) from actuator (19).
d. Check cable tension for 20+0, -5 pounds and readjust turnbuckle (8) if necessary.

NOTE

If roller chains and/or cables are being installed, permit actuator screw to rotate freely as roller chains and cables are connected. Adjust cable tension and safety turnbuckle (8).

e. (Refer to figure 9-4.) Rotate trim control wheel (7) full forward (nose down). Ensure pointer (3) does not restrict wheel movement. If necessary to reposition pointer, proceed as follows:
   1. Remove pedestal cover as outlined in paragraph 9-14.
   2. Loosen nut (9) at trim wheel pivot stud (8).
   3. Loosen screws (13) securing chain guard (10) far enough that trim wheel (7) can be moved approximately 1/8 inch, then reposition pointer (3) using a thin screwdriver to pry trailing leg of pointer out of groove in trim wheel. Reposition pointer as required.
   4. Tighten nut (9) and screws (13) but do not reinstall pedestal cover until rigging is complete.

NOTE

Full forward (nose down) position of trim wheel is where further movement is prevented by the roller chain or cable ends contacting sprockets or pulleys.

f. With elevator and trim tab both in neutral (split the non-faired difference between the inboard and outboard ends), mount an inclinometer on trim tab and set to 0°. Disregard counterweight areas of elevators when streamlining. These areas are contoured so they will be approximately 3° down when the elevators are streamlined.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Supply Division. Refer to Section 6.

g. Rotate actuator screw in or out as required to place trim tab up with a maximum of 2° overtravel, with actuator screw connected to push-pull tube (index 15, figure 9-1).
h. Rotate trim wheel to position trim tab up and down, readjusting actuator screw as required to obtain overtravel in both directions.
i. Position stop blocks and adjust as illustrated in figure 9-5 to degree of trim tab travel specified in figure 1-1.
j. Install pedestal cover and adjust trim tab pointer (3) as follows:
   1. Rotate trim control wheel (7) top place tab at 10° up position.
   2. Locate the pointer (3) at the TAKE-OFF triangle as viewed from the pilot seat. (Refer to step "e," and reposition pointer if necessary.)
   3. Bend pointer (3) as required to clear pedestal cover. (Pointer must NOT rub against pedestal cover or clear cover more than .125 inch maximum.)
k. Safety turnbuckle and reinstall all items removed in step "a".

WARNING

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

9-16. ELECTRIC TRIM ASSIST INSTALLATION. (Refer to figure 9-6.)

9-17. DESCRIPTION. The electric elevator trim assist installation consists of two switches mounted on the pilot's control column, a circuit breaker mounted on the center pedestal cover, wiring running aft to the electric drive assembly and a chain connecting the drive assembly to an additional sprocket mounted on the standard manual elevator trim actuator. When the clutch (16) is not energized, the drive assembly "free wheels" and has no effect on manual trim operation.

9-18. TROUBLE SHOOTING.

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

9-19. REMOVAL AND INSTALLATION. (Refer to figure 9-6.)

a. Remove aft baggage compartment wall.

NOTE

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

b. Remove cover (7) below drive assembly (9).

c. Disconnect wiring at connectors (8).

d. Remove sprocket guard (index 5, figure 9-3) from trim tab actuator (3).

e. Remove mounting bolts from drive assembly and tab actuator and remove from aircraft.

f. Reverse preceding steps for reinstallation. Check system rigging in accordance with paragraph 9-23.

9-20. CLUTCH ADJUSTMENT. The actuator clutch torque setting is 20 ± 4 in. lbs. tension setting for the elevator. For step-by-step procedures, refer to the appropriate Autopilot Service/Parts Manual.

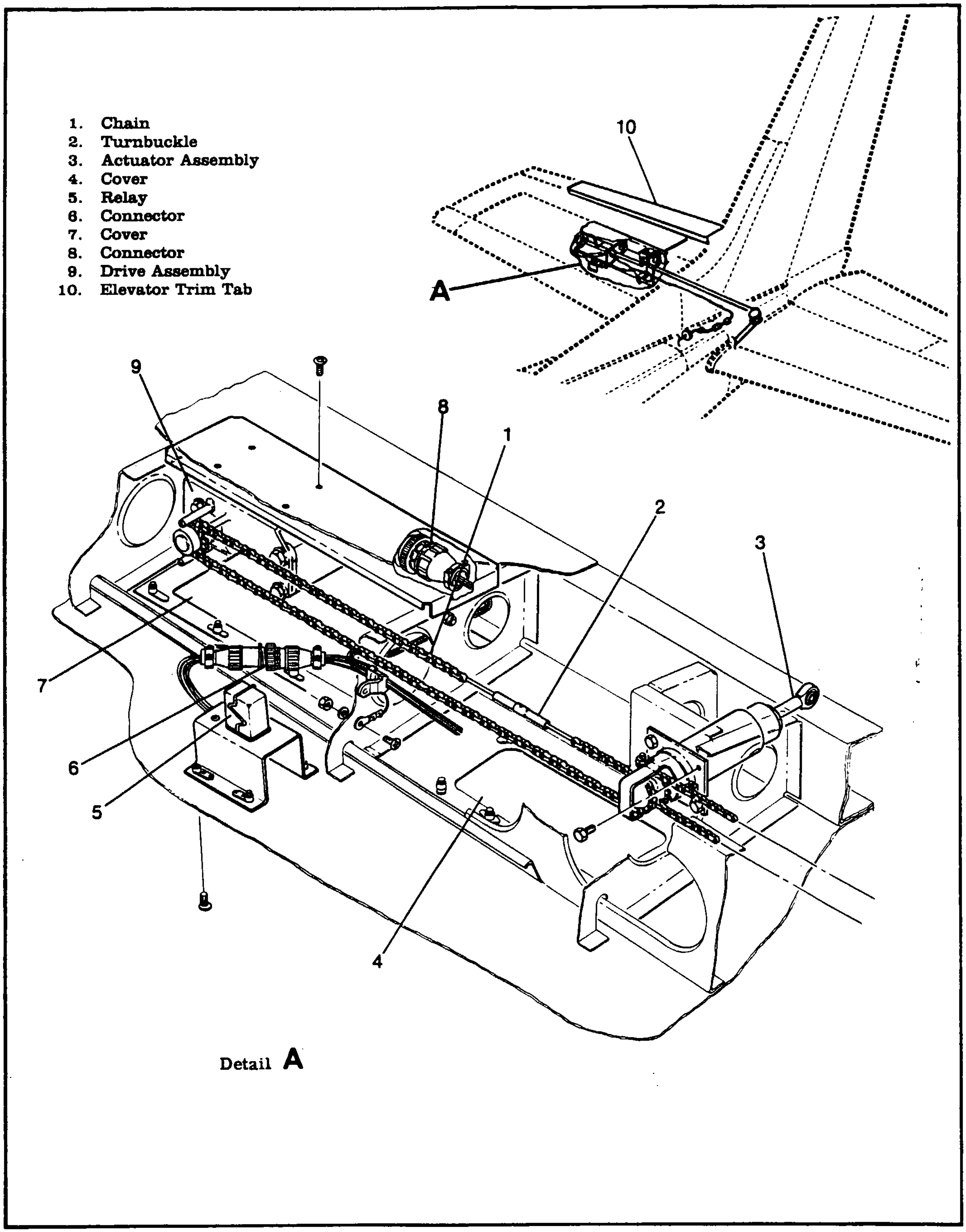


Figure 9-6. Electric Trim Assist Installation

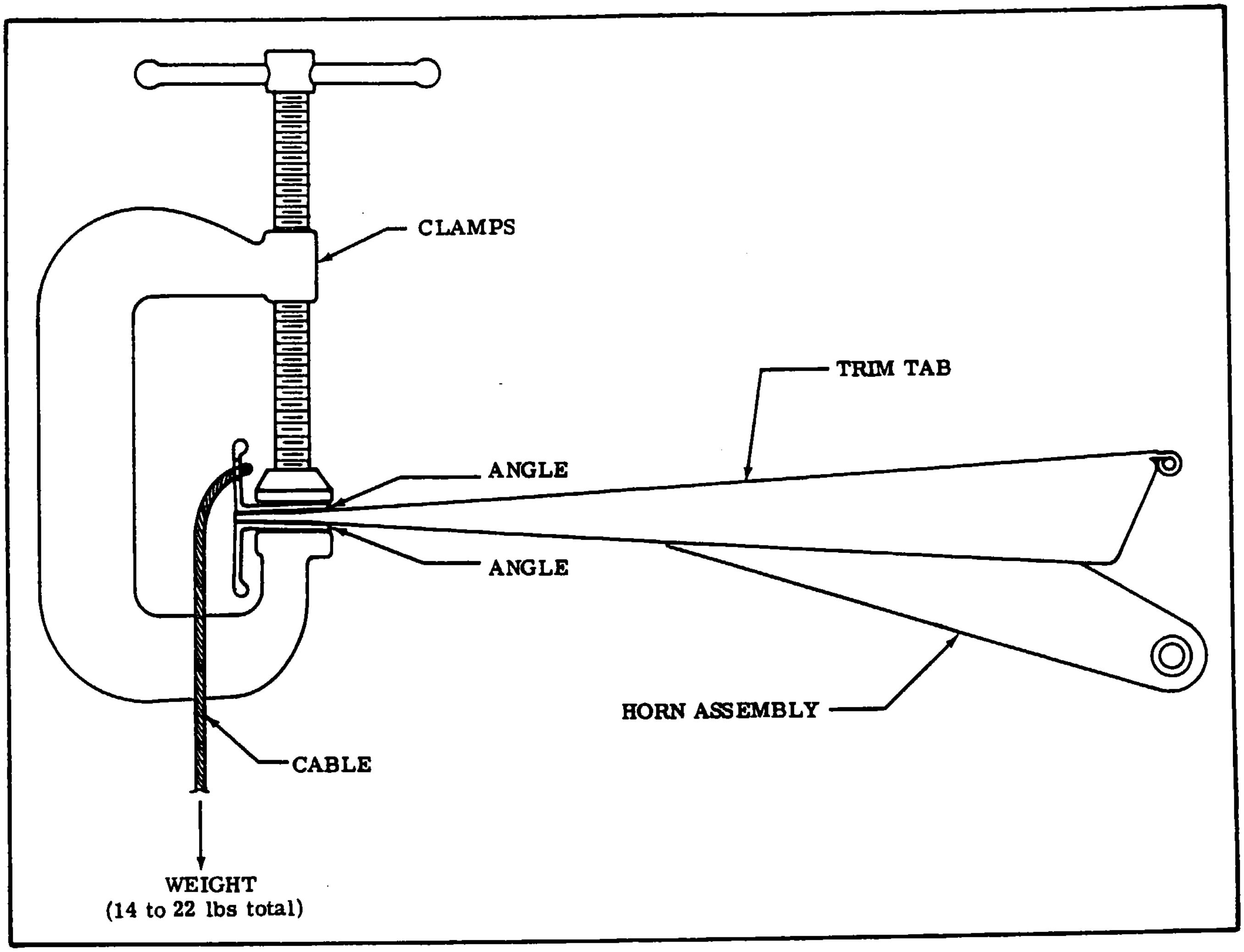


Figure 9-7. Trim Tab Simulated Air Load Test

9-21. TRIM TAB SIMULATED AIR LOAD TEST. (Refer to figure 9-7.)

NOTE

The manual elevator trim control system must be properly rigged, aircraft electrical operating voltage must be normal, electric trim assist clutch must be properly adjusted and elevator must be in neutral position prior to completing the following steps.

a. Attach two angles approximately 18 inches in length to the trailing edge of the trim tab with clamps as illustrated to prevent bending of tab trailing edge.
b. Attach a cable directly aft of the trim tab horn assembly.
c. Attach 14 pounds minimum to 22 pounds maximum of weight (including the angles, clamps and cable) to the cable and operate trim switch to place tab in the UP position. The clutch MUST lift 15 pounds weight to the FULL UP position but must slip at 18 pounds.

NOTE

If electric trim clutch slips prior to lifting required weight to full up position. DO NOT READJUST CLUTCH, refer to step "d" or step 5 to locate and remove reason for excessive friction in elevator trim control system.

d. Check trim tab hinge and linkage for binding, check trim system cables and chains for proper tension, check system pulleys and actuator for binding.
e. After trim system has been thoroughly checked and excessive friction removed, repeat step "c".

9-22. RIGGING - ELECTRIC TRIM ASSIST. (Refer to figure 9-6.)

a. The standard manual elevator trim control system MUST be rigged in accordance with paragraph 9-15 prior to rigging the electric trim assist.

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

c. Remove access cover (4) and (7) located in under side of right stabilizer.

d. Locate turnbuckle (2) terminal point 0.75 inches from drive assembly housing and adjust until chain deflection between sprockets is approximately 0.25 inches.

e. Resafety turnbuckle and reinstall all items removed for access.

SECTION 10

RUDDER CONTROL SYSTEM

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

10-2. DESCRIPTION. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is comprised of the rudder pedals installation, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering. When dual controls are installed, stowable rudder pedals are provided at the copilot's position through 1977 models.

10-3. TROUBLE SHOOTING.

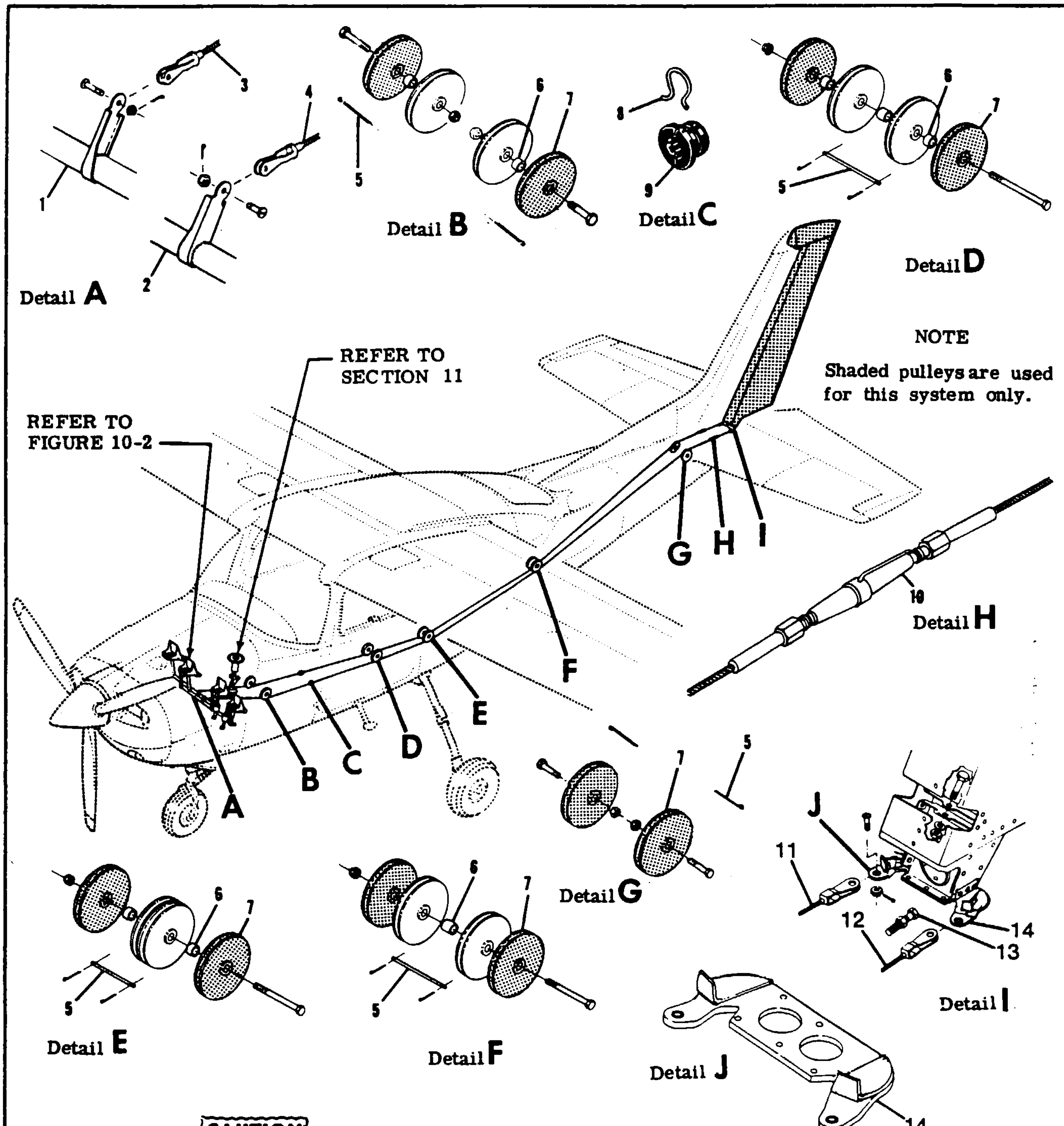
NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Open access plates and check visually. Connect or replace cables.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Open access plates and check visually. Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding. Replace bearing blocks.
	Defective rudder hinge bushings.	Check visually. Replace defective bushings.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Steering rods improperly adjusted.	Rig system in accordance with paragraph 10-11.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.
STOWABLE PEDALS DO NOT DISENGAGE.	Broken or defective control.	Disengage control and check manually. Replace control.
STOWABLE PEDALS DO NOT STOW.	Defective cover, catch or latch pin.	Check visually. Replace defective parts.
STOWABLE PEDALS DO NOT RE-ENGAGE.	Binding control.	Check control operation. Repair or replace control.
	Misaligned or bent mechanism.	Check visually. Repair or replace defective parts.



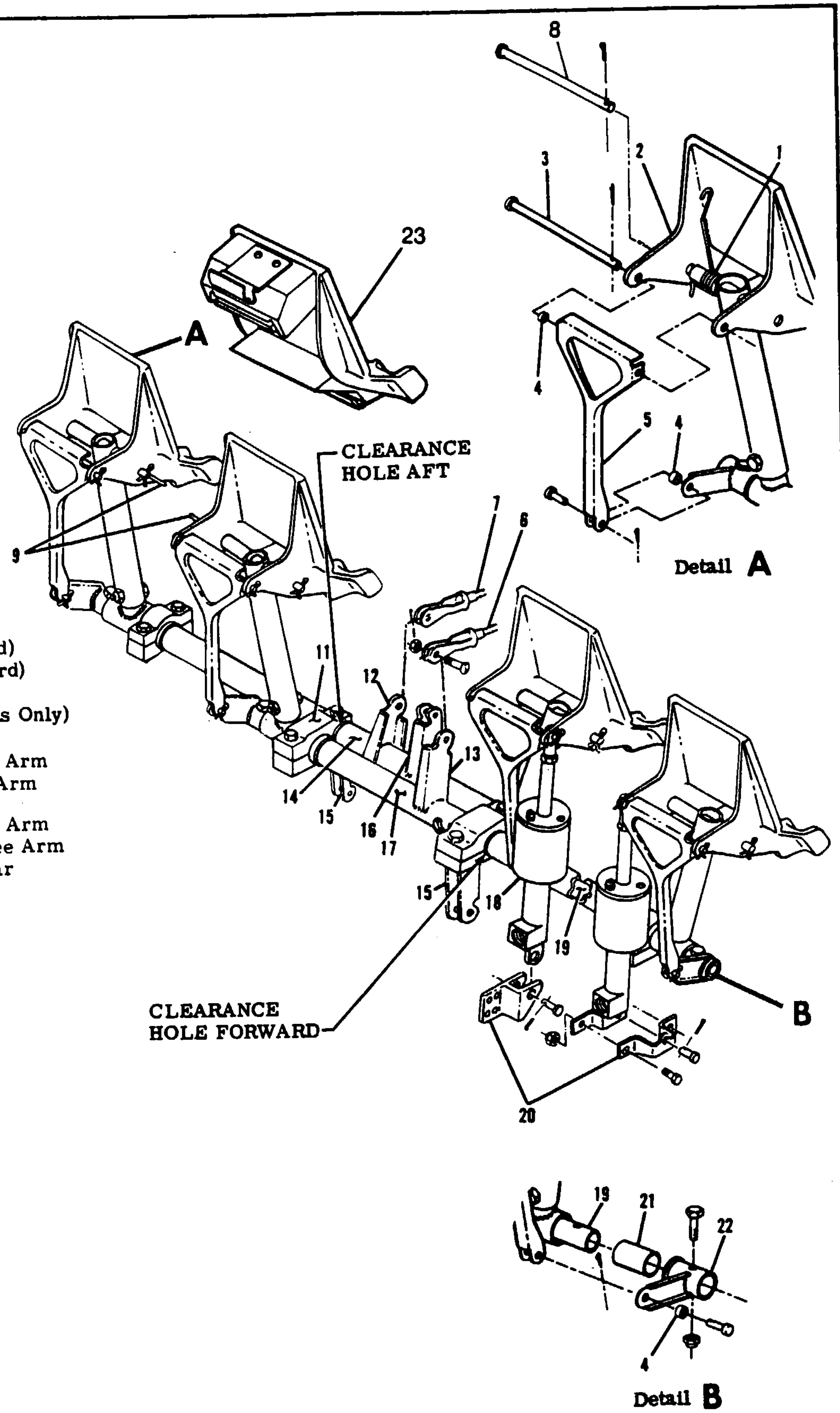
CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION

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

1. Right Rudder Bar
2. Left Rudder Bar
3. Right Forward Cable
4. Left Forward Cable
5. Cable Guard
6. Spacer
7. Pulley
8. Clip
9. Fairlead
10. Turnbuckle
11. Right Rear Cable
12. Left Rear Cable
13. Stop Bolt
14. Bellcrank

Figure 10-1. Rudder Control System



1. Anti-Rattle Spring
2. Pedal
3. Shaft
4. Spacer
5. Brake Link
6. Cable (Left Forward)
7. Cable (Right Forward)
8. Shaft
9. Pin (Stowable Pedals Only)
11. Bearing Block
12. Right Rudder Cable Arm
13. Left Rudder Cable Arm
14. Aft Rudder Bar
15. Nosewheel Steering Arm
16. Rudder Trim Bungee Arm
17. Forward Rudder Bar
18. Master Cylinder
19. Brake Torque Tube
20. Bracket
21. Bearing
22. Bellcrank
23. Pedal Extension

Figure 10-2. Rudder Pedal Installation

1. Steering Arm
2. Steering Bungee
3. Adjustable Rod End
4. Whiffletree (Steering Bellcrank)
5. Link Rod Assembly
6. Clamp
7. Boot
8. Boot Retainer
9. Right Rudder Bar Arm
10. Left Rudder Bar Arm

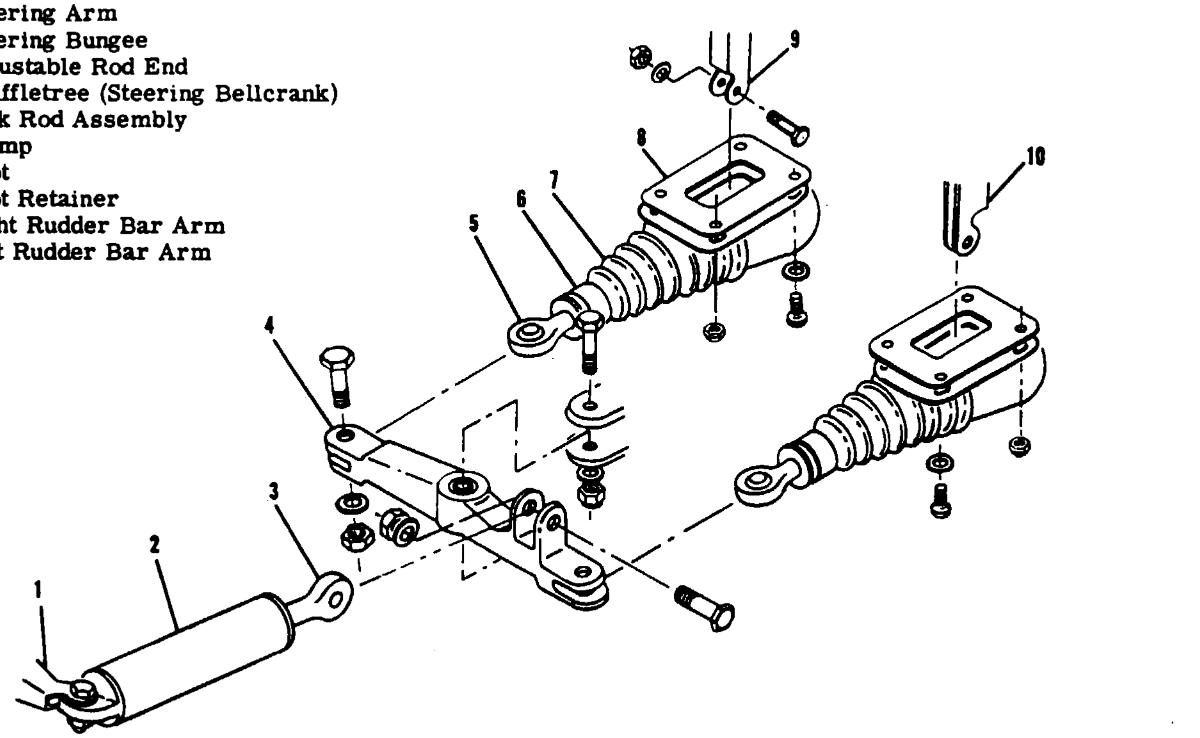


Figure 10-3. Nose Gear Steering Installation

10-4. RUDDER PEDAL ASSEMBLY.

10-5. REMOVAL AND INSTALLATION. (Refer to figure 10-2.)

a. Remove carpeting, shields and soundproofing from the rudder pedal and tunnel areas as necessary for access.
b. Disconnect brake master cylinders (18) and parking brake cables at pilot's rudder pedals.
c. Remove rudder pedals (2) and brake links (5).
d. Disconnect stowable rudder pedal controls (10).
e. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1).
f. Disconnect cables (6 and 7) from rudder bar arms (12 and 13).
g. Disconnect rudder trim bungee from rudder bar arm (16).
h. (Refer to figure 10-3.) Disconnect whiffletree link rod assemblies (5) at rudder bar arms (9 and 10).
i. (Refer to figure 10-2.) Remove bolts securing bearing blocks (11) and carefully work rudder bars out of tunnel area.

NOTE

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

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

10-6. RUDDER. (Refer to figure 10-4.)

10-7. REMOVAL AND INSTALLATION.

a. Remove stinger.
b. Disconnect tail navigation light wire.
c. Remove fairing from either side of vertical fin, remove turnbuckles (index 10, figure 10-1.)
d. Disconnect cables (4 and 6) from rudder bellcrank (3).
e. With rudder supported, remove all hinge bolts (2) and using care, lift rudder free of vertical fin.
f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

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

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

10-10. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.

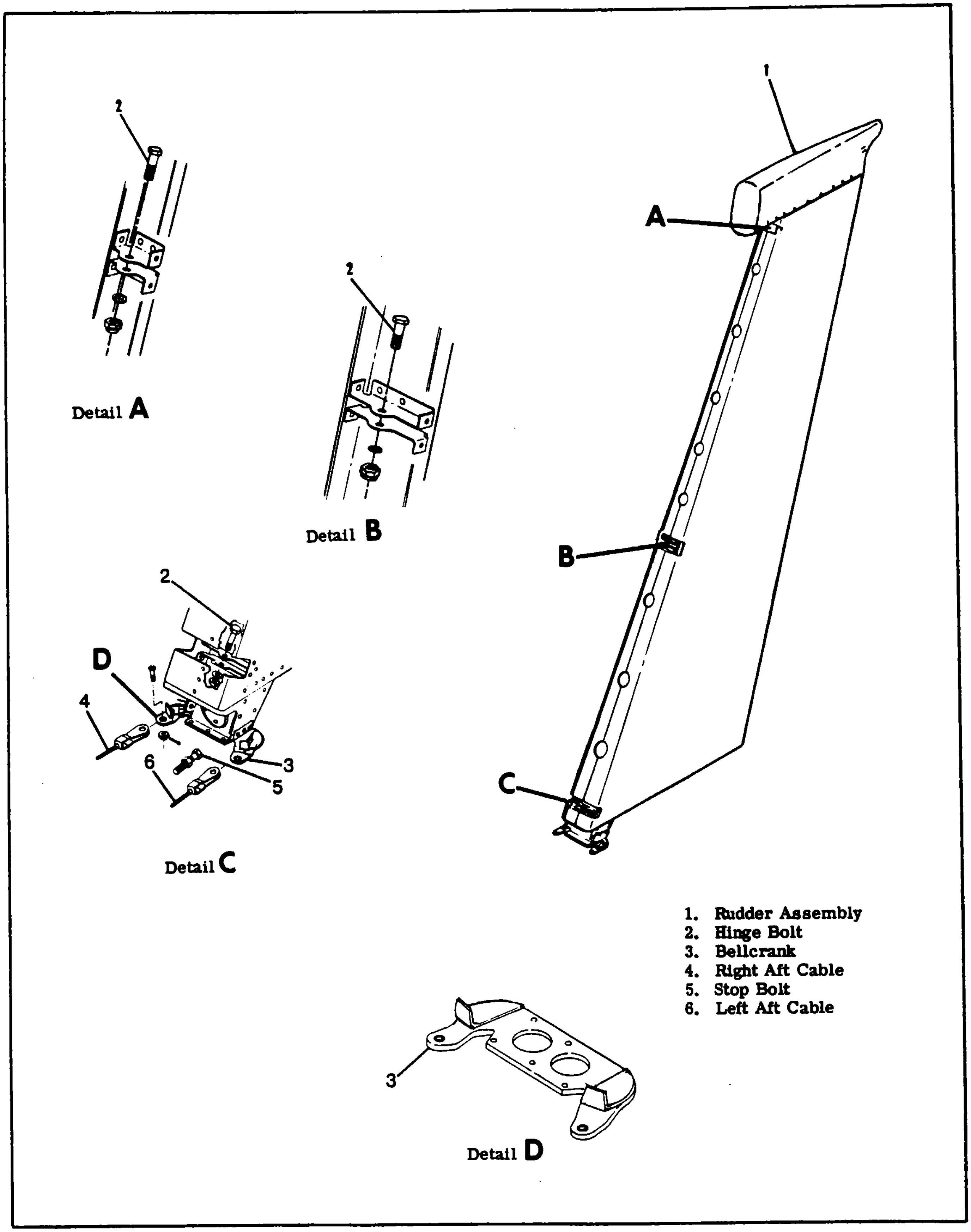
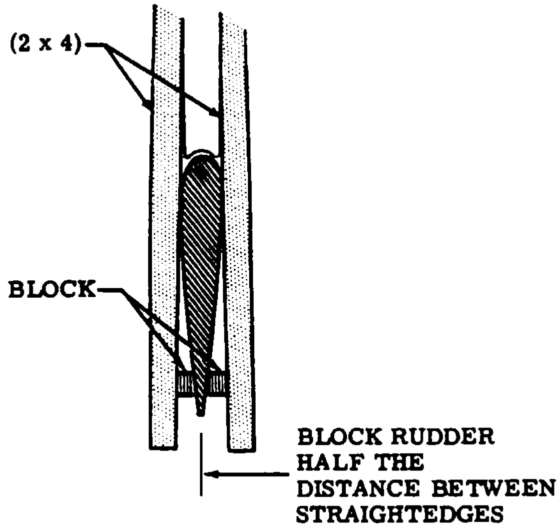
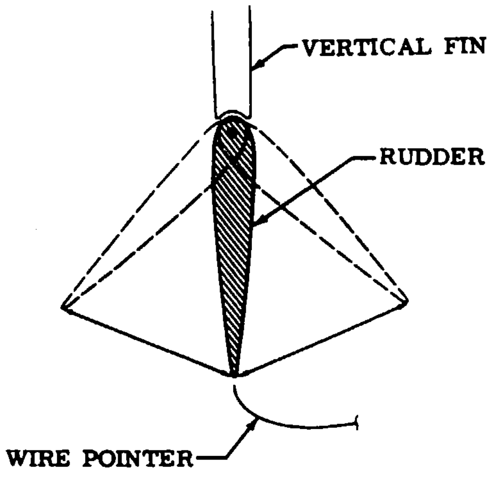


Figure 10-4. Rudder Installation



ESTABLISHING NEUTRAL POSITION OF RUDDER



MEASURING RUDDER TRAVEL

1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 × 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges and blocks.
5. Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 8.12" and 8.72".

Figure 10-5. Checking Rudder Travel

b. Remove safety wire, relieve cable tension and disconnect cables at turnbuckles (10).
c. Disconnect cables (3 and 4) at rudder bar arms.
d. Remove cable guards, pulleys and fairleads 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. Reverse the preceding steps for reinstallation.
f. After cable is routed in position, install pulleys, fairleads and cable guards. Ensure cable is positioned in pulley grooves before installing guards.
g. Re-rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed in step "a".

10-11. RIGGING.
a. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension at turnbuckles (index 10, figure 10-1).
b. Open landing gear doors. (Refer to Section 5.)
c. Tie down or weight tail to raise nosewheel free of ground.
d. Extend strut and ensure nose gear is centered against the external centering lug. (Neutral position.)
e. (Refer to figure 10-3.) Disconnect steering bungee adjustable rod end (3) from whiffletree (4).
f. Remove pedestal cover in accordance with Section 9.
g. Remove lower pedestal panel (index 14, figure 9-4).
h. Disconnect rudder trim bungee from rudder bar arm (index 16, figure 10-2).
i. Clamp rudder pedals in neutral position.
j. Adjust turnbuckles (index 10, figure 10-1) to streamline rudder with 30±10 lbs tension on cables.
k. Remove clamps from rudder pedals.
l. Adjust travel stop bolts (index 13, figure 10-1) to obtain degree of travel specified in figure 1-1. Figure 10-5 illustrates correct travel and one method of checking.
m. Adjust length of rod end (3) to align with whiffletree (4) and install bolt. DO NOT PRELOAD BUNGEE.
n. Connect rudder trim bungee and rig trim system as outlined in Section 11.
o. Operate rudder system, checking for ease of movement and full travel. Check cable tension with rudder in various positions. Cable tension should not be less than 20 pounds or more than 40 pounds in any position.
p. Check that all turnbuckles are safetied and reinstall all items removed for access.
q. Lower nosewheel to ground.

WARNING

Be sure rudder moves in the correct direction when operated by the rudder pedals.

SHOP NOTES:

SECTION 11

RUDDER TRIM CONTROL SYSTEM

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11-1. RUDDER TRIM CONTROL SYSTEM. (Refer to figure 11-1.)

11-2. DESCRIPTION. The rudder trim system is comprised of a trim control wheel and gear box assembly located in the upper control pedestal, which is connected by a chain assembly to a gimbal assembly in the lower pedestal. The gimbal assembly is attached to a stop bracket, which is attached to the rudder trim bungee. The bungee's push-rod assembly is attached to the right-hand rudder bar assembly. The rudder control system, rudder trim control system, and the nosewheel steering system are interconnected and adjustments to any one system will affect the others.

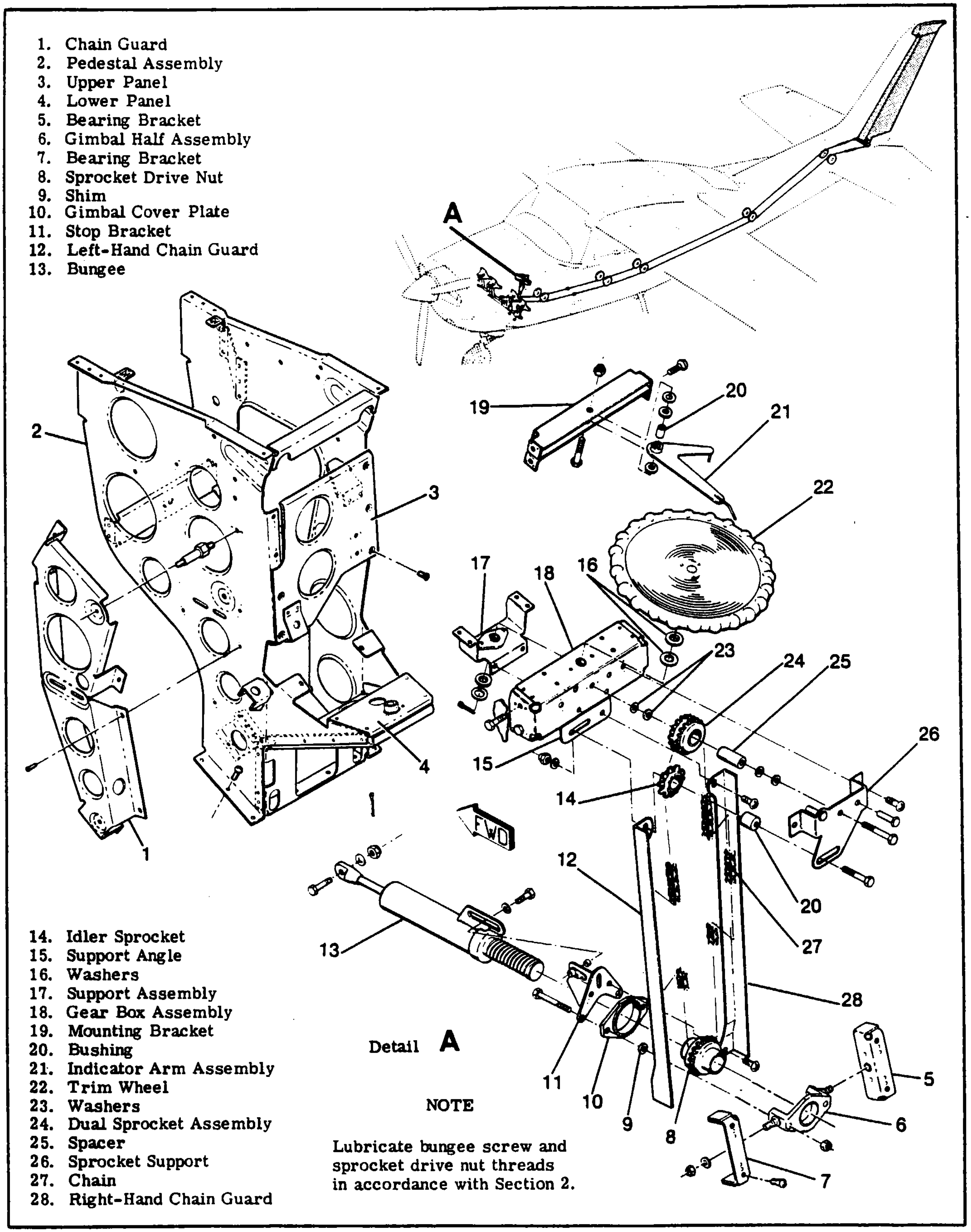
11-3. TROUBLE SHOOTING.

NOTES

This trouble shooting chart should be used in conjunction with the chart shown in Section 10.

Due to remedy procedures in the following chart, it may be necessary to re-rig the system. Refer to paragraph 11-5.

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



NOTE

Lubricate bungee screw and sprocket drive nut threads in accordance with Section 2.

Figure 11-1. Rudder Trim Control System

11-4. REMOVAL AND INSTALLATION OF SYSTEM COMPONENTS. (Refer to figure 11-1.)

a. INDICATOR ASSEMBLY.

1. Remove pedestal cover in accordance with procedures outlined in Section 9.
2. Remove four screws attaching mounting bracket assembly (19) to pedestal assembly (2).
3. Remove indicator assembly as a unit.
4. Reverse preceding steps for installation.

b. WHEEL AND GEAR BOX ASSEMBLY.

1. Remove pedestal cover as outlined in Section 9.
2. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).
3. Remove upper panel (3) and disconnect chain (27) at connecting link.
4. Remove four bolts attaching gear box assembly (18) to pedestal assembly (2).
5. Remove bolts attaching idler sprocket (14) and chain guards (12) and (28).
6. Remove wheel and gear box assembly as a unit.

NOTE

If wheel and gear box assembly is disassembled, install washers (16) and (23) as required to nest sprockets and prevent end play.

7. Reverse preceding steps for installation.

c. CHAIN ASSEMBLY.

1. Remove pedestal cover as outlined in Section 9.
2. Remove upper panel (3).
3. Remove access cover directly below and aft of pedestal in floor.
4. Remove fuel selector shaft, then remove lower panel (4).
5. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).
6. Disconnect chain at connecting link.
7. Remove bolt attaching bungee (13) to stop bracket (11).
8. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft away from bungee (13).
9. Remove chain (27) from sprocket drive nut (8).
10. Reverse preceding steps for installation.

d. GIMBAL ASSEMBLY.

1. Remove pedestal cover as outlined in Section 9.
2. Remove access cover directly below and aft of pedestal in floor.
3. Remove fuel selector shaft, then remove lower panel (4).
4. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).
5. Disconnect chain at connecting link.
6. Remove bolt attaching bungee (13) to stop bracket (11).
7. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft; remove from aircraft.

NOTE

If gimbal assembly is to be disassembled, upon reassembly, shims (9) should be installed between gimbal half assembly (6) and cover plate assembly (10) to maintain .002 to .004-inch end play on sprocket.

8. Reverse preceding steps for installation.

e. BUNGEE ASSEMBLY.

1. Remove pedestal cover as outlined in Section 9.
2. Remove upper panel (3).
3. Remove access cover directly below and aft of pedestal in floor.
4. Remove fuel selector shaft, then remove lower panel (4).
5. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).
6. Disconnect chain at connecting link.
7. Remove bolts attaching idler sprocket (14) and chain guards (12) and (28) to support angle (15).
8. Remove bolts attaching chain guard to stop bracket (11); remove chain guards.
9. Remove bolt attaching bungee (13) to stop bracket (11).
10. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft; remove from aircraft.
11. Disconnect bungee push-rod assembly from right-hand rudder bar assembly.
12. Using care, remove bungee from tunnel area, aft, through pedestal.
13. Reverse preceding steps for installation.

NOTE

Upon installation, lubricate bungee screw and sprocket drive nut threads per Section 2.

11-5. RIGGING RUDDER TRIM SYSTEM. (Refer to Figure 11-1.)

NOTE

Rudder control system and nose wheel steering system must be correctly rigged prior to rigging the rudder trim system.

a. Remove pedestal cover as outlined in Section 9.
b. Remove upper pedestal panel.
c. Remove access cover directly below and aft of pedestal in floor.
d. Remove fuel selector shaft, then remove lower pedestal panel.
e. Loosen chain by loosening bolt securing idler sprocket, and sliding sprocket inboard in slot in support angle; disconnect chain.
f. Remove bolt attaching bungee to stop bracket; unscrew gimbal assembly from actuator drive screw.
g. Disconnect bungee push-pull rod from right-hand rudder bar assembly.
h. Tie down or weight tail to raise nose wheel free of ground.
i. Ensure rudder pedals and rudder are in neutral position.

j. Attach bungee push-pull rod to right-hand rudder bar assembly.
k. Install lower panel assembly and bearing brackets.
l. Screw gimbal assembly onto bungee drive screw until studs on gimbal half assembly align with holes in bearing brackets and nutplate on stop bracket aligns with approximate center of slot in bungee stop arm.
m. Install and tighten bolts, washers and nuts.
n. String chain over idler sprocket and sprocket in wheel and gear box assembly; connect chain at connecting link.

NOTE

Indicator assembly should be installed with rudder pedals in neutral position. If indicator does not line up with centerline of aircraft, bend indicator left or right as required.

o. Tighten chain by moving idler sprocket outboard in slot in support angle.
p. Install full selector shaft.
q. Install upper panel.
r. Install floor access covers and pedestal cover.
s. Remove blocking from rudder and pedals.
t. Lower aircraft.

WARNING

Be sure rudder moves in correct direction when operated by the trim control wheel.

SHOP NOTES:

SECTION 12

ENGINE

(NORMALLY ASPIRATED)
REFER TO SECTION 12A FOR TURBOCHARGED

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 propellet 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 function, could cause the propeller to rotate.

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12-1. ENGINE COWLING.

12-2. DESCRIPTION. The engine cowling is divided into four major removable segments. The left upper cowling segment has two access doors, one at the upper front provides access to the oil filler neck and one at the left aft side provides access to the oil dipstick. The right and left nose caps are fastened to the lower engine nacelle and to each other with screws. The right and left upper cowl segments are secured with quick-release fasteners and either segment may be removed individually. The lower engine nacelle is an extension of the fuselage and provides fairing for the nose wheel in its retracted position.

12-3. REMOVAL AND INSTALLATION.

a. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the left and right segments.

b. Remove screws securing the left and right nose cap together and to the lower engine nacelle.

c. Disconnect air ducts from nose caps and remove caps.

d. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct air flow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards.

12-4. 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.

12-5. 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.

12-6. COWL FLAPS.

12-7. DESCRIPTION. Cowl flaps are provided to aid in controlling engine temperature. Two cowl flaps, operated by a single control in the cabin, are located at the lower aft end of the engine nacelle. The engine exhaust tailpipes extend through cutouts in the aft portion of each cowl flap.

12-8. REMOVAL AND INSTALLATION. (See figure 12-1.)

a. Place control lever (2) in the OPEN position.

b. Disconnect control clevises (12) from shock-mounts (13).

c. Remove safety wire securing hinge pins (9) to cowl flaps, pull pins from hinges and remove flaps.

d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 12-9.

12-9. RIGGING. (See figure 12-1.)

a. Disconnect control clevises (12) from shock-mounts (13).

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 control lever (2) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (5) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (4) to position control lever in bottom hole of position bracket (3).

d. With the control lever in CLOSED position, hold one cowl flap closed (against the rubber bumpers on the fuselage), loosen jam nut and adjust clevis (12) on the control to hold cowl flap in this position and install bolt.

NOTE

If the lower control clevis (12) cannot be adjusted far enough to streamline flap and still maintain sufficient thread engagement, loosen the lower control housing clamp (8) 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. Cowl flaps should open approximately 5.00 inches when measured in a straight line from the aft edge of door to firewall.

g. Check that all clamps and jam nuts are tight.

12-10. ENGINE.

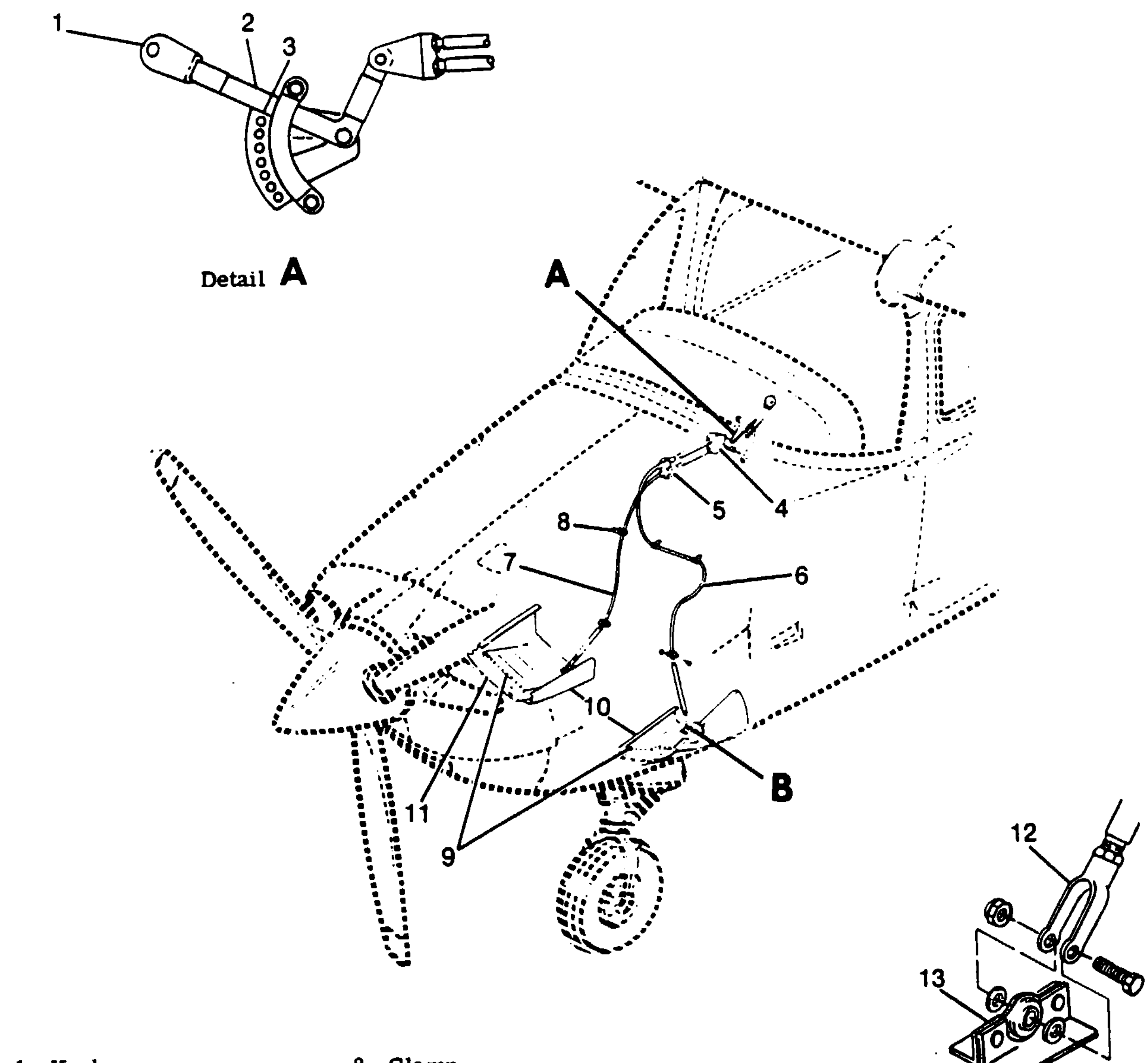
12-11. DESCRIPTION. An air cooled, wet-sump, six-cylinder, horizontally-opposed, direct-drive, fuel injected, Continental IO-520-L series engine driving a constant-speed propeller is used to power the aircraft. The cylinders, numbered from rear to front are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as numbers 2, 4 and 6. Refer to pargraph 12-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Supply Division.

12-12. ENGINE DATA.

Aircraft Series	21064898 AND ON
Model (Continental)	IO-520-L
BHP Maximum for Take-Off	300
(5 Minutes) at RPM	2850
BHP Maximum Except Take-Off	285
RPM (Max. Continuous)	2700
Number of Cylinders	6-Horizontally Opposed
Displacement	520 Cubic Inches
Bore	5.25 Inches
Stroke	4.00 Inches
Compression Ratio	8.5:1
Magnetos	Slick Model 6210
Right Magneto	Fires 22° BTC Upper Right and Lower Left
Left Magneto	Fires 22° BTC Upper Left and Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18mm (Refer to Continental Service Bulletin M77-10 for factory approved spark plugs and required gap)
Torque	330 ±30 LB-IN.
Fuel Metering System	Continental Fuel Injection
Unmetered Fuel Pressure	9.0 to 11.0 PSI at 600 RPM 31.0 to 33.0 PSI at 2850 RPM
Nozzle Pressure	3.5 to 4.0 PSI at 600 RPM 17.5 to 18.5 PSI at 2850 RPM
Oil Sump Capacity	10 U.S. Quarts
With External Filter	11 U.S. Quarts
Tachometer	Mechanical Drive
Oil Pressure (PSI)	
Minimum Idling	10
Normal	30 to 60
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cylinders
Oil Temperature	
Normal Operating	Within Green Arc
Maximum Permissible	Red Line (240°F)
Probe Location	Below Oil Cooler
Cylinder Head Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (460°F)
Probe Location	Lower Side of Number 4 Cylinder Without A/C Lower Side of Number 1 Cylinder With A/C
Economy Mixture Indicator (EGT) Probe Location	Exhaust Collector L.H. Side
Approximate Dry Weight	471 LB. (Weight is approximate and will vary with optional accessories installed.)

12-12A. TIME BETWEEN OVERHAUL (TBO). Teledyne Continental Motors recommends engine overhaul at 1700 hours operating time for the IO-520-L series engines. Refer to Continental Aircraft Engine Service Bulletin M81-22, and to any superseding bulletins, revisions or supplements thereto, for further recommendations. At the time of overhaul, engine accessories should be overhauled. Refer to Section 14 for propeller and governor overhaul periods.

12-12B. OVERSPEED LIMITATIONS. The engine must not be operated above specified maximum continuous RPM. However, should inadvertant overspeed occur, refer to Continental Aircraft Engine Service Bulletin M75-16, and to any superseding bulletins, revisions or supplements thereto, for further recommendations.



1. Knob
2. Control Lever
3. Position Bracket
4. Clevis
5. Clamp
6. Left Cowl Flap Control
7. Right Cowl Flap Control
8. Clamp
9. Hinge Pin
10. Cowl Flap
11. Hinge Half
12. Clevis
13. Shock Mount

Figure 12-1. Cowl Flaps Installation

12-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Improper use of starting procedure.	Refer to Pilot's Operating Handbook
	Defective aircraft fuel system.	Refer to Section 13.
	Spark plugs fouled.	Remove and clean. Check gaps and insulators. Use new gaskets. Check cables to persistently fouled plugs.
	Defective magneto switch or grounded magneto leads.	Check continuity, repair or replace switch or leads.
	Defective ignition system.	Refer to paragraph 12-79.
	Excessive induction air leaks.	Check visually. Correct cause of air leaks.
	Dirty screen in fuel control unit or defective fuel control unit.	Check screen visually. Check fuel flow through control unit. Replace defective fuel control unit.
	Defective electric fuel pump.	Refer to Section 13.
	Defective fuel manifold valve or dirty screen.	Check fuel flow through valve. Remove and clean. Replace if defective.
	Clogged fuel injection lines or discharge nozzles.	Check fuel through lines and nozzles. Clean lines and nozzles. Replace if defective.
	Fuel pump not permitting fuel from auxiliary pump to bypass.	Check fuel flow through engine-driven fuel pump. Replace engine-driven pump.
	Vaporized fuel in system.	Refer to Pilot's Operating Handbook
	Fuel tanks empty.	Visually inspect tanks. Fill with proper grade and quantity of gasoline.
	Fuel contamination or water in fuel system.	Open fuel strainer drain and check for water. Drain all fuel and flush out fuel system. Clean all screens, fuel lines, strainer, etc.
	Mixture control in the IDLE CUT-OFF position.	Move control to the full RICH position.
	Engine flooded.	Refer to Pilot's Operating Handbook
	Fuel ON-OFF valve in OFF position	Place valve in ON position.

12-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE.	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 12-46.
	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 and strainer.
	Defective ignition system.	Refer to paragraph 12-79.
	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.
	Dirty screen in fuel control unit or defective fuel control unit.	Check screen visually. Check fuel flow through control unit. Clean screen. Replace fuel control unit if defective.
	Defective manifold valve or clogged screen.	Check fuel flow through valve. Replace if defective. Clean screen.
	Defective engine-driven fuel pump.	If engine continues to run with electric pump turned on, but stops when it is turned off, the engine-driven pump is defective. Replace pump.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Propeller control set in high pitch position (low RPM).	Use low pitch (high RPM) position for all ground operation.
	Defective aircraft fuel system.	Refer to Section 13.
	Restricted fuel injection lines or discharge nozzles.	Check fuel flow through lines and nozzles. Clean lines and nozzles. Replace if defective.
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER.	Propeller control in high pitch (low RPM) position.	Use low pitch (high RPM) for all ground operations.
	Restriction in aircraft fuel system.	Refer to Section 13.
	Restriction in fuel injection system.	Clean system. Replace any defective units.

12-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER. (Cont.)	Engine-driven fuel pump pressure improperly adjusted.	Refer to paragraph 12-59.
	Worn or improperly rigged throttle or mixture control.	Check visually. Rig properly. Replace worn linkage.
	Spark plugs fouled or improperly gapped.	Clean and regap. Replace if defective.
	Defective ignition system.	Refer to paragraph 12-79.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Rig properly. Replace worn linkage.
	Defective or dirty manifold valve.	Operate electric fuel pump and check that no fuel flows through manifold valve with mixture control in IDLE CUT-OFF. Remove and clean. Replace if defective.
	Fuel leakage through primer.	Repair or replace primer.
	Auxiliary fuel pump ON.	Turn to OFF position.
	Defective fuel control unit.	If none of the preceding causes corrects the problem, the control unit is probably at fault. Replace control unit.

12-13A. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static RPM run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. It should be within 50 RPM of 2825 RPM.

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

1. Check governor control for proper rigging. It should be determined that the governor control arm travels to the high RPM stop on the governor and that the high RPM stop screw is adjusted properly. (Refer to Section 14 for procedures).

NOTE

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

2. Check operation of alternate air door spring or magnetic lock.

3. Check magneto timing, spark plugs and ignition harness for settings and conditions.

4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.

5. Check condition of induction air filter. Clean if required.

6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

12-14. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft with the lines and hoses being disconnected at the firewall.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Place fuel selector valve on fuel ON-OFF control in the OFF position.
c. Remove engine cowling in accordance with paragraph 12-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine nacelle 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 14. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
i. Disconnect throttle, mixture and propeller controls from their respective units. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect all hot and cold air flexible ducts and remove.
k. Remove exhaust system in accordance with paragraph 12-97.
l. 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 oil temperature wire at probe below oil cooler.
5. Disconnect electrical wires and wire shielding ground at alternator.
6. Disconnect exhaust gas temperature wires at quick-disconnects.
7. Disconnect electrical wires at throttle microswitches.
8. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.

m. Disconnect lines and hoses as follows:
1. Disconnect vacuum hose at firewall.
2. Disconnect oil breather and vacuum system oil separator vent lines where secured to the engine.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

3. Disconnect fuel supply and vapor return hoses at fuel pump.
4. Disconnect primer line at firewall fitting.
5. Disconnect fuel-flow gage hose at firewall.
6. Disconnect oil pressure line at firewall fitting.
7. Disconnect manifold pressure hose at firewall.
8. Disconnect manifold and balance tube drain lines.

n. 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.

CAUTION

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

o. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mounts.
p. Remove bolts, ground strap and heat deflectors.
q. Slowly hoist engine out of nacelle and clear of aircraft checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.
r. Remove engine shock-mounts and ground strap.

NOTE

If shock-mounts will be reused, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as illustrated in figure 12-2.

12-15. CLEANING. Clean engine in accordance with instructions in Section 2.

12-16. ACCESSORIES REMOVAL. Removal of engine accessories for overhaul or for engine replacement involves stripping the engine of parts, accessories and components to reduce it to the bare engine. During the removal process, removed items should be examined carefully and defective parts should be tagged for repair or replacement with new components.

NOTE

Items easily confused with similar items should be tagged to provide a means of identification when being installed on a new engine. All openings exposed by the removal of an item should be closed by installing a suitable cover or cap over the opening. This will prevent entry of foreign material. If suitable covers are not available, tape may be used to cover the openings.

12-17. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.
a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.
b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.
c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness, damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.
d. Inspect for color bleaching of the end fitting 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 in the engine compartment.
f. For major engine repairs, refer to the engine manufacturer's overhaul and repair manual.

12-18. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lockwashers, nuts, gaskets and rubber connections should be new parts.

12-19. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

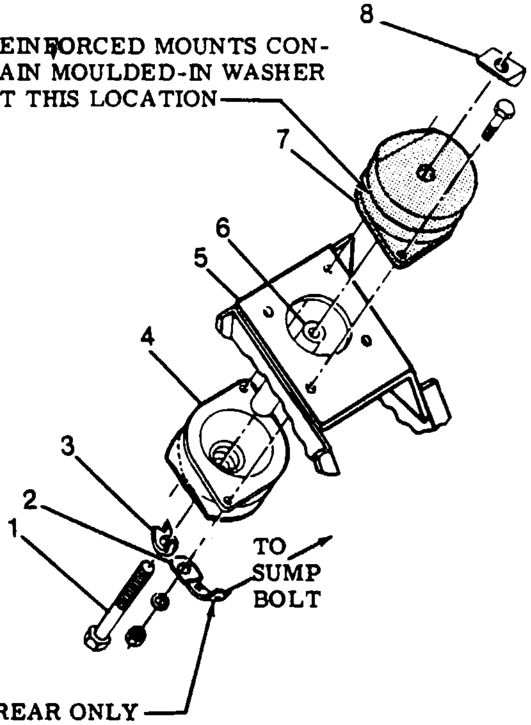
Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point just above the nacelle.
b. Install engine shock-mounts and ground strap as illustrated in figure 12-2.
c. Carefully lower engine slowly into place on the engine mounts. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mounts.

NOTE

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

d. Install engine-to-mount bolts, then remove the hoist and support stand placed under tail tie-down fitting. Torque bolts to 300+50-00 lb-in.
e. Route throttle, mixture and propeller controls to their respective units and connect. Secure controls in position with clamps.



Detail **A**

NOTES

ON ALL MODELS:

It is important that the correct engine mounts be installed in the correct positions. Install upper mounts with beveled edge at the top, except as noted below for turbocharged engines. Install lower mounts with beveled edge at the front, except as noted below for turbocharged engines. In addition, be sure that the two reinforced mounts are used at the upper, forward positions.

To determine which two of the eight mounts are the reinforced ones, use fingernail to feel whether moulded-in washer is present.

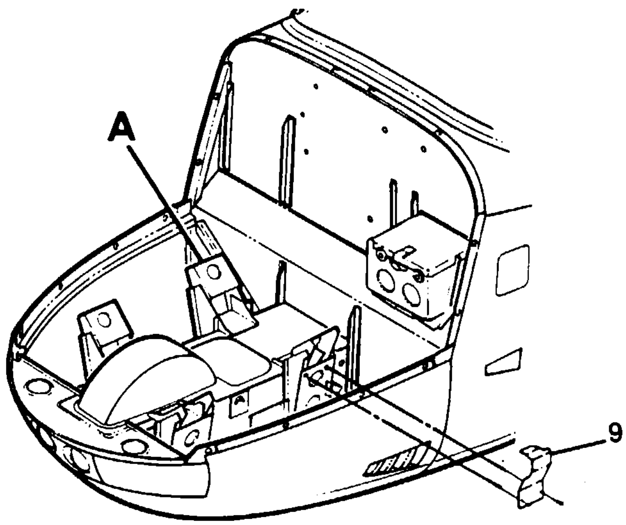
Torque bolts (1) to 300 +50 -00 lb-in.

ON TURBOCHARGED ENGINES:

Barrel nuts (8) are replaced with turbine support shafts at the right mounts of turbocharged engines.

Install left, forward, lower mount with beveled edges at the front and at the top on turbocharged engines.

If shock-mounts will be re-used, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as noted above.



1. Bolt
2. Ground Strap
3. Tab Lockwasher
4. Lower Mount
5. Engine Mount Support
6. Spacer
7. Upper Mount
8. Barrel Nut
9. Heat Shield

Figure 12-2. Engine Mount Installation

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, 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 lubricant or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel-soluble lubricant, such as engine oil, on fitting threads. Do not use any other form of thread compound on the injection system.

f. Connect lines and hoses as follows:
1. Connect manifold and balance tube drain lines.
2. Connect manifold pressure hose at firewall.
3. Connect oil pressure line at firewall fitting.
4. Connect fuel-flow gage hose at firewall.
5. Connect primer line at firewall fitting.
6. Connect fuel supply and vapor return hose at pump.
7. Connect oil breather and vacuum system oil separator vent lines where secured to the engine.
8. Connect vacuum hose at firewall.
9. Install clamps and lacings securing hoses and lines to the engine to prevent chafing.

g. Connect wires and cables as follows:
1. Connect electrical wires and wire shielding ground at alternator.
2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

3. Connect starter electrical cable at starter.
4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Torque housing attach nut to 100-lb.in.
5. Connect exhaust gas temperature wires at quick-disconnects.
6. Connect electrical wires at throttle micro-switches.
7. Connect oil temperature wire to probe below oil cooler.
8. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.

h. Install exhaust system in accordance with paragraph 12-97.
i. Connect all hot and cold air flexible ducts.
j. Install propeller and spinner in accordance with instructions outlined in Section 14.
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 in accordance with Section 2.
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 12-85, 12-86, 12-87 and 12-88.
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 12-3.
r. Perform an engine run-up and make final adjustments on the engine controls.

12-20. FLEXIBLE FLUID HOSES.

12-21. PRESSURE TEST. Refer to Section 2 for pressure test intervals. Perform pressure test as follows:
a. Place mixture control in the idle cut-off position.
b. Operate the auxiliary fuel pump in the high position.
c. Examine the exterior of hoses for evidence of leakage or wetness.
d. Hoses found leaking should be replaced.
e. After pressure testing fuel hoses, allow sufficient time for excess fuel to drain overboard from the engine manifold before attempting an engine start.
f. Refer to paragraph 12-17 for detailed inspection procedures for flexible hoses.

12-22. REPLACEMENT.
a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.
b. Provide as large a bend radius as possible.
c. Hoses should have a minimum of one-half inch clearance from other lines, ducts, hoses or surrounding objects or be butterfly clamped to them.
d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.
e. Refer to Advisory Circular 43.13, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

12-23. ENGINE BAFFLES.

12-24. DESCRIPTION. The sheet metal baffles installed on the engine direct the flow of air around the cylinders and other engine components to provide optimum cooling. These baffles incorporate rubber-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 baffles seal properly.

12-25. 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.

12-26. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any replaced baffles and seals are installed correctly and that they seal to direct the airflow in the correct direction. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

12-27. REPAIR. Repair of an individual segment of engine baffle is generally impractical, since, due to the small size and formed shape of the part, replacement is usually more economical. However, small cracks may be stop-drilled and a reinforcing doubler installed. Other repairs may be made as long as strength and cooling requirements are met. Replace sealing strips if they do not seal properly.

12-28. ENGINE OIL SYSTEM.

12-29. DESCRIPTION. The oil 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.

SHOP NOTES:

12-30. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken, disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Dirty oil screens.	Remove and clean oil screens.

12-30. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective.
	Oil cooler thermostatic bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Drain oil cooler and inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 rpm to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. Replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

12-30. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (Cont.)	Secondary effect of low oil pressure.	Observe oil pressure gage for low indication. Determine and correct reason for low oil pressure.
	Oil congealed in cooler.	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	Replace. Also refer to Service News Letter SNL85-8.
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

12-31. FULL-FLOW OIL FILTER.

12-32. DESCRIPTION. A disposable, spin-on oil filter attaches to an integral adapter on the oil pump casting. The filter contains an internal bypass valve.

12-33. REMOVAL.

a. Remove engine cowl in accordance with paragraph 12-3.

b. Cut safety-wire and turn filter counterclockwise to remove it from the adapter.

NOTE

Before discarding filter, cut the filter can open, remove the filter element and cut through the filter at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. If new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by imparting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

12-34. INSTALLATION.

a. Before installing the new spin-on filter the gasket should be lightly lubricated with engine oil or Dow Corning Compound (DC-4).

b. Torque oil filter to 18-20 ft-lbs and safety.

c. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.

d. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).

e. Check to make sure the filter can has not been making contact with any adjacent parts due to engine torque.

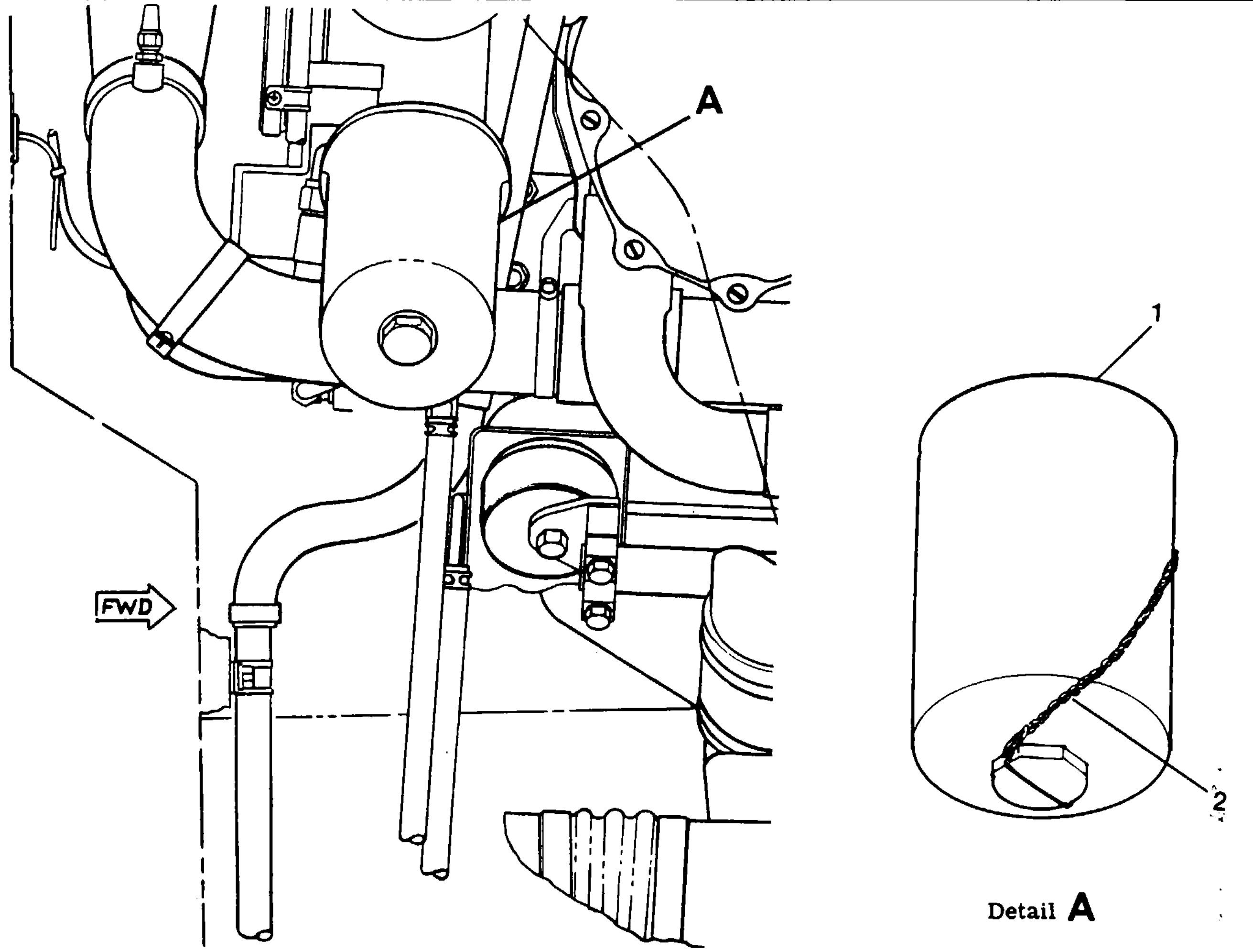
12-35. FILTER ADAPTER. The oil filter adapter is an integral part of the oil pump casting, located at rear of engine on right side.

12-36. OIL COOLER.

12-37. DESCRIPTION. A non-congealing oil cooler may be installed on the aircraft. Ram air passes through the oil cooler and is discharged into the engine compartment. Oil circulating through the engine is allowed to circulate continuously through warm-up passages to prevent the oil from congealing when operating in low temperatures. On the standard and non-congealing oil coolers, as the oil increases to a certain temperature, the thermostat valve closes, causing the oil to be routed to all of the cooler passages for cooling. Oil returning to the engine from the cooler is routed through the internally drilled oil passages.

12-38. ENGINE FUEL SYSTEM. (Refer to figure 12-5.)

12-39. DESCRIPTION. The fuel injection system is a low pressure system of injecting fuel into the intake valve port of each cylinder. It is a multi-nozzle, continuous-flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a fuel flow



1. Oil Filter
2. Safety Wire

Figure 12-4. Full-Flow Oil Filter

indicator are provided for leaning at any combination of altitude and power setting. The fuel flow indicator is calibrated in gallons per hour and indicates approximately the gallons of fuel consumed per hour. The continuous-flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine-driven fuel pump.

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven pump, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

12-40. FUEL-AIR CONTROL UNIT.

12-41. DESCRIPTION. This unit occupies the position ordinarily used for a carburetor, at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control

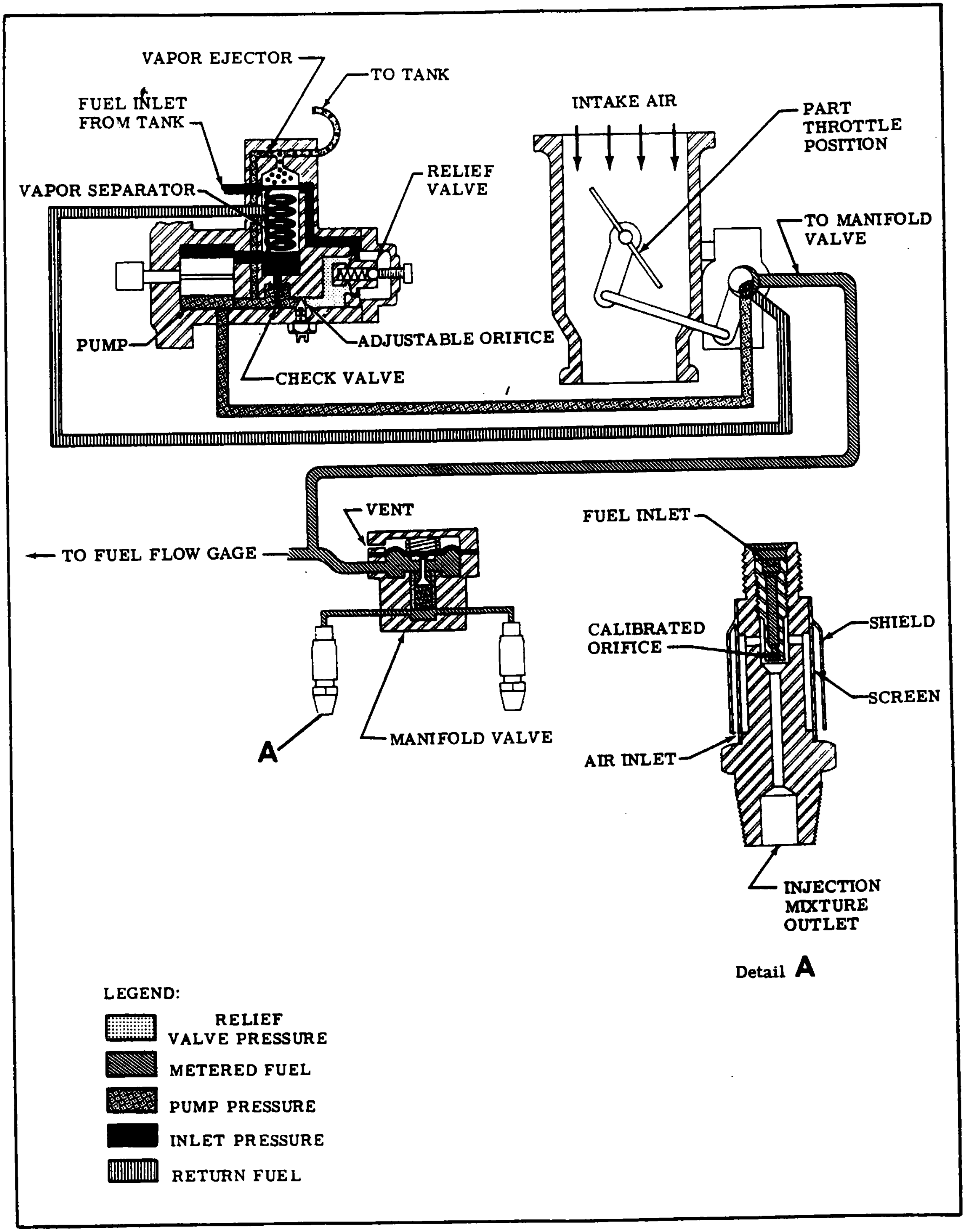


Figure 12-5. Fuel Injection Schematic

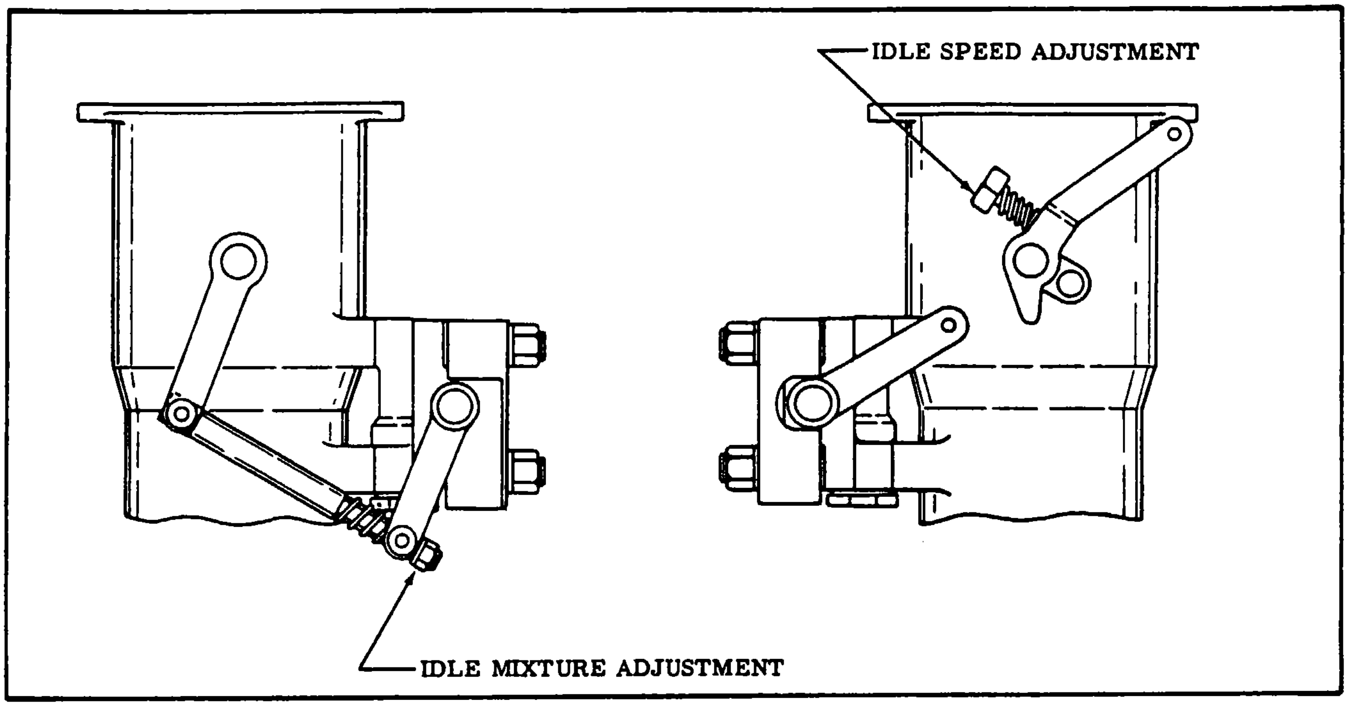


Figure 12-6. Idle Speed and Idle Mixture Adjustment

elements in this unit, one for air and two for fuel. One of the fuel control elements is for fuel mixture and the other is for fuel metering. Fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls this fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions airflow to fuel flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. The fuel control portion of the fuel-air control unit is enclosed in a shroud and is blast-air cooled to help prevent vapor lock.

12-42. REMOVAL AND INSTALLATION.

a. Place all cabin switches and fuel selector or fuel ON-OFF valve in the OFF position.
b. Remove cowling in accordance with paragraph 12-3.
c. Remove induction airbox in accordance with paragraph 12-63.
d. Disconnect engine controls at throttle and mixture control arms.

NOTE

Cap all disconnected hoses, lines and fittings.

e. The three fuel lines which attach to the fuel control unit are routed inside flexible tubing to help cool the fuel. Loosen tubing clamps at the control unit and slide tubing back to gain access to the fuel line fittings.
f. Disconnect fuel lines at control unit.
g. Loosen hose clamps which secure the control unit to the right and left intake manifolds.
h. Remove control unit.
i. Cover the open ends of the intake manifold piping to prevent entry of foreign matter.
j. Reverse the preceding steps for reinstallation. Use new gaskets when installing control unit. Rig throttle and mixture controls in accordance with paragraphs 12-84 and 12-85 respectively. Rig throttle-operated microswitch in accordance with Section 13.

12-43. CLEANING AND INSPECTION.

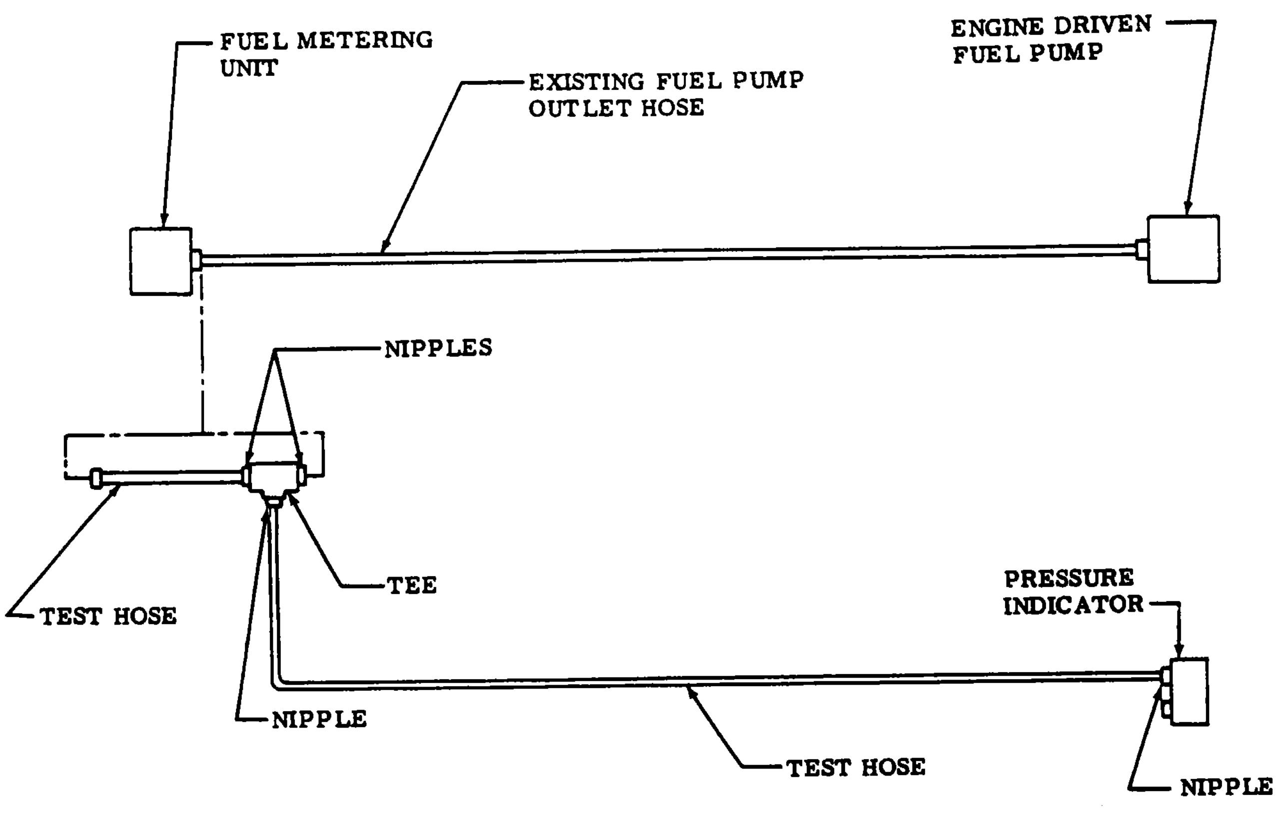
a. Check control connections, levers and linkage for security, safetying and for lost motion due to wear.
b. Remove the fuel screen assembly and clean in solvent (Stoddard or equivalent). Reinstall and safety.
c. Check the air control body for cracks and control unit for overall condition.

12-44. ADJUSTMENTS. (Refer to figure 12-6.) The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. The idle mixture adjustment is the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. 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 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



NOTE

WHEN ADJUSTING UNMETERED FUEL PRESSURE, TEST EQUIPMENT MAY BE "TEED" INTO THE ENGINE-DRIVEN FUEL PUMP OUTLET HOSE AT THE FUEL PUMP OR AT THE FUEL METERING UNIT.

Figure 12-7. Fuel Injection Pump Adjustment Test Harness

pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

b. Advance throttle to increase engine speed to 1000 rpm.

c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.

d. Adjust mixture adjusting nut to obtain a slight and momentary gain of 25 to 50 rpm at 1000 rpm engine speed as mixture control is moved from full IN (RICH) toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.

e. If mixture is set too LEAN, engine speed will drop immediately, thus requiring a richer mixture. Tighten adjusting nut (clockwise) for a richer mixture.

f. If mixture is set too RICH, engine speed will increase above 50 rpm. thus requiring a leaner mixture. Back off adjusting nut (counterclockwise) 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.

12-45. FUEL MANIFOLD VALVE (FUEL DISTRIBUTOR).

12-46. DESCRIPTION. Metered fuel flows to the fuel manifold valve, which provides a central point for distributing fuel to the individual cylinders. An internal diaphragm, operated by fuel pressure, raises or lowers a plunger to open and close the individual cylinder supply ports simultaneously. A needle valve in the plunger ensures that the plunger fully opens the outlet ports before fuel flow starts and closes the ports simultaneously for positive engine shut-down. A fine-mesh screen is included in the fuel manifold valve.

NOTE

The fuel manifold valves are supplied in two flow ranges. When replacing a valve assembly, be sure the replacement valve has the same suffix letter as the one stamped on the cover of the valve removed.

12-47. REMOVAL.

NOTE

Cap all disconnected lines, hoses and fittings.

a. Disconnect all fuel and fuel injection lines at the fuel manifold.
b. Remove bolts which secure fuel manifold and remove manifold.

12-48. CLEANING.
a. Remove manifold valve from engine in accordance with paragraph 12-47 and remove safety-wire from cover attaching screws.
b. Hold the top cover down against internal spring until all four cover attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below cover.
c. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

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

CAUTION

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

d. Using clean gasoline, flush out the chamber below the screen.
e. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.

CAUTION

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

f. Clean diaphragm, valve and top cover in the same manner. Be sure the vent hole in the top cover is open and clean.
g. Carefully replace diaphragm and valve. Check that valve works freely in body bore.
h. Position diaphragm so that horizontal hole in plunger valve is 90 degrees from the fuel inlet port in the valve body.
i. Place upper spring in position on diaphragm.
j. Place cover in position so that vent hole in cover is 90 degrees from inlet port in valve body. Install cover attaching screws and tighten to 20±1 lb-in. Install safety wire on cover screws.
k. Install fuel manifold valve assembly on engine in accordance with paragraph 12-49 and reconnect all lines and hoses to valve.
l. Inspect installation and install cowling.

12-49. INSTALLATION.
a. Secure the fuel manifold to the crankcase with the two crankcase bolts.
b. Connect the fuel lines and the six fuel injection lines. Inspect completed installation and install cowling.

12-50. FUEL DISCHARGE NOZZLES.

12-51. DESCRIPTION. From the fuel manifold valve, individual, identical size and length fuel lines carry metered fuel to the fuel discharge nozzles located in the cylinder heads. The outlet of each nozzle is directed into the intake port of each cylinder. The nozzle body contains a drilled central passage with a counterbore at each end. The lower end is used as a chamber for fuel-air mixture before the spray leaves the nozzle. The upper bore contains an orifice for calibrating the nozzles. Near the top, radial holes connect the upper counterbore with the outside of the nozzle body for air admission. These radial holes enter the counterbore above the orifice and draw outside air through a cylindrical screen fitted over the nozzle body. This screen prevents dirt and foreign material from entering the nozzle. A press-fit shield is mounted on the nozzle body and extends over the greater part of the filter screen, leaving a small opening at the bottom of the shield. This provides an air bleed into the nozzle which aids in vaporizing the fuel by breaking the high vacuum in the intake manifold at idle rpm and keeps the fuel lines filled. The nozzles are calibrated in several ranges. All nozzles furnished for one engine are the same range and are identified by a number and a suffix letter stamped on the flat portion of the nozzle body. When replacing a fuel discharge nozzle be sure it is of the same calibrated range as the rest of the nozzles in the engine. When a complete set of nozzles is being installed, the number must be the same as the one removed, but the suffix letters may be different, as long as they are the same for all nozzles being installed on a particular engine.

12-52. REMOVAL.

NOTE

Plug or cap all disconnected lines and fittings.

a. Disconnect the fuel injection lines at the fuel discharge nozzles. Remove nozzles with a 1/2 inch deep well socket wrench.

12-53. CLEANING AND INSPECTION. To clean nozzles, immerse in clean solvent and use compressed air to dry them. When cleaning, direct air through the nozzle in the direction opposite of normal fuel flow. Do not remove the nozzle shield or distort it in any way. Do not use a wire or other metal object to clean the orifice or metering jet. After cleaning, check the shield height from the hex portion of the nozzle. The bottom of the shield should be approximately 1/16 inch above the hex portion of the nozzle.

12-54. INSTALLATION.

a. Install nozzles in the cylinders and tighten to a torque value of 60 to 80 lb-in.

b. Connect the fuel lines at discharge nozzles.

c. Check installation for crimped lines, loose fittings, etc.

12-55. FUEL INJECTION PUMP.

12-56. DESCRIPTION. The fuel pump is a positive-displacement, rotating vane type, connected to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the pump vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line, where it is returned to the aircraft fuel system. Since the pump is engine-driven, changes in engine speed affects total pump flow proportionally. A check valve allows the auxiliary fuel pump pressure to bypass the engine-driven fuel pump for starting, or in the event of engine-driven fuel pump failure. The pump supplies more fuel than is required by the engine; therefore, a spring-loaded, diaphragm type relief valve is provided, with an adjustable orifice installed in the fuel passage to the relief valve to maintain desired fuel pressure for engine power setting. The adjustable orifice allows the exact desired pressure setting at full throttle. The fuel pump is equipped with a manual mixture control to provide positive mixture control throughout the range required by the injection system. This control limits output of the pump from full rich to idle cut-off. Non-adjustable mechanical stops are located at these positions. The fuel pump is ram-air cooled to help prevent high fuel temperatures. The ram air is picked up at the upper left engine baffle and directed through a flexible tube to the fuel pump shroud. The fuel supply and return lines from the fuel pump to the control unit are routed inside flexible tubes to help prevent vaporized fuel at these points.

12-57. REMOVAL.

a. Place fuel selector or fuel ON-OFF valve in OFF position and mixture control in IDLE CUT-OFF position.

b. Remove cowling in accordance with paragraph 12-3.

c. Loosen the clamps and slide the flexible tubes free of the horns on the fuel pump shroud to gain access to the fuel lines.

d. Remove the alternator drive belt.

e. Tag and disconnect all lines and fittings attached to the fuel pump.

NOTE

Plug or cap all disconnected lines, hoses and fittings.

f. Remove the shroud surrounding the fuel pump.

g. Remove the nuts and washers attaching the fuel pump to the engine.

h. Remove fuel pump and gasket.

WARNING

Residual fuel draining from lines and hose constitutes a fire hazard. Use caution to prevent accumulation of fuel when lines or hoses are disconnected.

i. If a replacement pump is not being installed immediately, a temporary cover should be installed on the fuel pump mount pad.

12-58. INSTALLATION.

a. Position a new gasket and fuel pump on the mounting studs with fuel pump inlet to the left. Be sure pump drive aligns with drive in the engine.

b. Secure pump to engine with plain washers, internal tooth lock washers and nuts. Tighten nuts evenly.

c. Install cooling shroud on fuel pump.

d. Install all fittings and connect all lines.

e. Install the flexible ram air tube on the air horn of the fuel pump shroud and install clamp

f. Replace the alternator drive belt and tighten the nuts on the adjusting arm so that the drive belt has proper tension. Refer to Section 17.

g. Inspect completed installation.

12-59. ADJUSTMENT. The full rich performance of the fuel injection system is controlled by manual adjustment of the air throttle, fuel mixture and pump pressure at idle and only by pump pressure at full throttle. To make full rich adjustments, proceed as follows:

a. Remove engine cowling in accordance with paragraph 12-3.

NOTE

Inspect the slot-headed adjustable orifice needle valve (located just below the fuel pump inlet fitting) to see if it is epoxy sealed or safety wired to the brass nut. If the needle valve is epoxy sealed, Continental Aircraft Engine Service Bulletin No. 70-10 must be complied with before calibration of the unit can be performed.

b. Disconnect the engine-driven fuel pump outlet fitting or the fuel metering unit inlet fitting and "tee" the test gage into the fuel injection system as illustrated in figure 12-7.

NOTE

Cessna Service Kit No. SK320-2J provides a test gage, line and fittings for connecting the test gage into the system to perform accurate calibration of the engine-driven fuel pump.

c. The test gage MUST be vented to atmosphere and

MUST be held as near to the level of the engine-driven fuel pump as possible. Bleed air from test gage line prior to taking readings.

NOTE

The test gage should be checked for accuracy at least every 90 days or anytime an error is suspected. The tachometer accuracy should also be determined prior to making any adjustments to the pump.

d. Start engine and warm-up thoroughly. Set mixture control to full rich position and propeller control full forward (low pitch, high rpm).
e. Adjust engine idle speed to 600 rpm and check test gage for 9-11 PSI. Refer to figure 12-7 for idle mixture adjustment.

NOTE

Do not adjust idle mixture until idle pump pressure is obtained.

WARNING

DO NOT make fuel pump pressure adjustments while engine is operating.

f. If the pump pressure is not 9 to 11 PSI, stop engine and turn the fuel pump relief valve adjustment, on the centerline of the fuel pump clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.
g. Maintaining idle pump pressure and idle RPM, obtain correct idle mixture in accordance with paragraph 12-44.
h. Completion of the preceding steps have provided:
1. Correct idle pump pressure.
2. Correct fuel flow.
3. Correct fuel metering cam to throttle plate orientation.
i. Advance to full throttle and maximum rated engine speed with the mixture control in full rich position and propeller control in full forward (low pitch, high rpm).
j. Check test gage for pressures specified in paragraph 12-12. If pressure is incorrect, stop engine and adjust pressure by loosening locknut and turning the slotheaded needle valve located just below the fuel pump inlet fitting clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

NOTE

If at static run-up, rated RPM cannot be achieved at full throttle, adjust pump pressure slightly below limits making certain the correct pressures are obtained when rated RPM is achieved during take-off roll.

k. After correct pressures are obtained, safety adjustable orifice and orifice locknut.
l. Remove test equipment, run engine to check for leaks and install cowling.

12-60. AUXILIARY ELECTRIC FUEL PUMP FLOW RATE ADJUSTMENT. Refer to Section 13.

12-61. INDUCTION AIR SYSTEM. (Refer to figure 12-8.)

12-62. DESCRIPTION. The engine air induction system receives ram air through an intake on the right front of the engine cowling. Aft of the engine cylinders is an air filter which removes dust and other foreign matter from the induction air. Air flow passing through the filter enters an airbox at the rear of the engine. The airbox has a spring-loaded alternate air door. If the air induction filter should become blocked, suction created by the engine will open the door and draw unfiltered air from inside the upper cowl area. An open alternate air door will result in an approximate 10% power loss at full throttle. After passing through the airbox, induction air enters a fuel/air control unit behind the engine, and is then ducted to the engine cylinders through intake manifold tubes.

12-63. REMOVAL AND INSTALLATION.
a. Remove cowling in accordance with paragraph 12-3.
b. Loosen inboard clamp (23) and remove duct (24) from coupler (22).
c. Remove screws (3) attaching forward air duct assembly (2) to air separator.
d. Remove rocker valve cover screws (29) from lower forward and aft mounting brackets (10) and (11).
e. Remove screws (4) attaching forward air duct assembly (2) to mounting bracket assemblies (7).
f. Remove bolt and washer (16) attaching center air duct assembly (14) to upper aft mounting bracket (12).
g. Reverse the preceding steps for reinstallation.

12-64. CLEANING AND INSPECTION. Clean metal parts of the induction air system with Stoddard solvent or equivalent. Inspect for cracks, dents, loose rivets, etc. Minor cracks may also be stop-drilled. In case of continued or severe cracking, replace appropriate ducts. Inspect spring-loaded alternate air door for freedom of operation and complete closing.

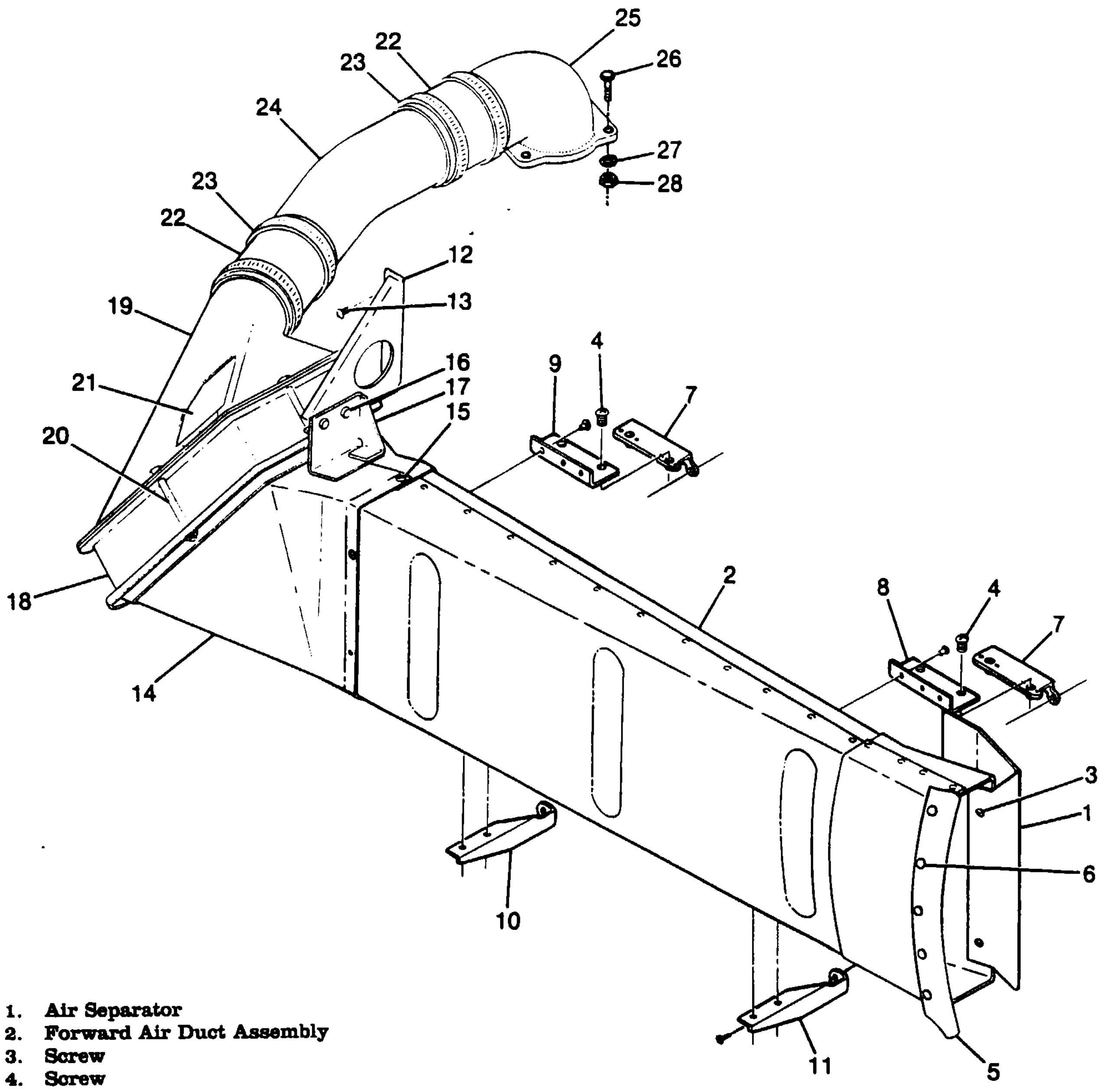
12-65. INDUCTION AIR FILTER.

12-66. DESCRIPTION. An induction air filter, mounted between the center air duct and the aft air duct, removes dust particles from the ram air entering the engine.

12-67. REMOVAL AND INSTALLATION.
a. Remove cowling in accordance with paraagraph 12-3.
b. Remove bolts, washers, and nuts (20) attaching filter (18) between aft air duct (19) and center air duct (14).
c. Remove air filter.

NOTE

When installing air filter, note direction of air flow and install filter accordingly.



1. Air Separator
2. Forward Air Duct Assembly
3. Screw
4. Screw
5. Seal
6. Washer
7. Mounting Bracket Assembly
8. Forward Mounting Bracket
9. Aft Mounting Bracket
10. Lower Aft Mounting Bracket
11. Lower Forward Mounting Bracket
12. Upper Aft Mounting Bracket
13. Screw
14. Center Air Duct Assembly
15. Screw
16. Bolt
    Washer
17. Upper Aft Mounting Bracket
18. Air Induction Filter
19. Aft Air Duct Assembly
20. Bolt
    Washer
    Nut
21. Alternate Air Door
22. Coupler
23. Clamp
24. Duct
25. Throttle Body Adapter Assembly
26. Bolt
27. Washer
28. Nut
29. Screw
30. Screw

Figure 12-8. Induction Air System

d. reverse the preceding steps for reinstallation.

12-68. CLEANING AND INSPECTION. Clean and inspect filter in accordance with Section 2.

12-69. DELETED.

12-70. DELETED.

12-71. IGNITION SYSTEM. (Refer to Figure 12-10.)

12-72. DESCRIPTION. The ignition system is comprised of two magnetos, 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.

12-73. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 12-79.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 12-79.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.

12-74. MAGNETOS.

12-75. DESCRIPTION. The airplane is equipped with 6200 series Slick magnetos. The magnetos contain a conventional two-pole rotating magnet (rotor), mounted ball bearings. Driven by the engine through an impulse coupling at one end, rotor shaft operates breaker points at other end of shaft. The nylon rotor gear drives a nylon distributor gear which transfers high tension current from wedge-mounted coil to proper outlet in the distributor block. A coaxial capacitor is mounted in distributor block housing to serve as the condenser as well as a radio nose suppressor. Both nylon gears are provided with timing marks for clockwise or counterclockwise rotation. The distributor gear and distributor block having timing marks, visible through air vent holes, for timing to the engine. A timing hole is located in the distributor block. A timing pin or 6-penny nail can be inserted through this timing hole into mating hole in rotor shaft to lock the magneto approximately in the proper firing position. The breaker assembly is accessible only after removing screws fastening magneto halves together and disconnecting capacitor slip terminal. Do not separate magneto halves while it is installed on the engine.

12-76. REMOVAL.
a. Remove engine cowling in accordance with paragraph 12-3.
b. Tag for identification and remove high tension wires from the magneto being removed.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Remove the high tension wires from magneto or disconnect spark plug leads from the spark plugs to prevent accidental firing.

c. Disconnect switch wire from condenser terminal at magneto. Tag wire for identification so it may be installed correctly.
d. Rotate propeller in direction of normal rotation until No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate the installation of a replacement magneto, it is good practice to position the crankshaft at the advanced firing angle for No. 1 cylinder during step "d." Any standard timing device or method can be used, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

e. Remove magneto retainer clamps, nuts and washers and pull magneto from crankcase mounting pad.

NOTE

As the magneto is removed from its mounting, be sure that the drive coupling rubber bushing and retainer do not become dislodged from the gear hub and fall into the engine.

12-77. INTERNAL TIMING.
a. Whenever the gear on the rotor shaft or the cam (which also serves as the key for the gear) has been removed, be sure that the gear and cam are installed so the timing mark on the gear aligns with the "O" etched on the rotor shaft.
b. When replacing breaker assembly or adjusting contact breaker points, place a timing pin (or 0.093 inch 6-penny nail) through the timing hole into the mating hole in the rotor shaft. Adjusting contact breaker points so they are just starting to open in this position will give the correct point setting. Temporarily assemble the magneto halves and capacitor slip terminal and use a timing light to check that the timing marks, visible through the ventilation plug holes are approximately aligned.

NOTE

The side of the magneto with the manufacturer's insignia has a red timing mark and the side opposite to the insignia has a black timing mark viewed through the vent plug holes. The distributor gear also has a red timing mark and a black timing mark. These marks are used for reference only when installing magneto on the engine. Do not place red and black lines together on the same side.

c. Whenever the large distributor gear and rotor gear have been disengaged, they must be engaged with their timing marks aligned for correct rotation. Align the timing mark on the rotor gear with the "RH" on the distributor gear. Care must be taken to keep these two gears meshed in this position until the magneto halves are assembled.

12-78. INSTALLATION AND TIMING TO ENGINE. The magneto MUST be installed with its timing marks correctly aligned, with the number one cylinder on its compression stroke and with number one piston at its advanced firing position. Refer to paragraph 12-12 for the advanced firing position of number one piston.

WARNING

The magneto is grounded through the ignition switch, therefore, any time the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, remove the high tension wires from the magneto or disconnect all spark plug leads to prevent accidental firing of the engine.

To locate the compression stroke of number one cylinder, remove the lower spark plugs from each cylinder except number one cylinder. Remove the top plug from number one cylinder. Place thumb of one hand over the number one cylinder spark plug hole and rotate the crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is obtained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one cylinder may be obtained by use of a timing disc and pointer, Timrite, protractor and piston locating gage or external engine timing marks alignment.

NOTE

External engine timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the crankshaft is turned in its normal direction of rotation. After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushings into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with the chamfered edges facing toward the front of the engine.

a. Turn the magneto shaft until timing marks, visible through ventilation plug holes are aligned, (red-to-red or black-to-black). Insert a timing pin or .093 inch diameter 6-penny nail in the distributor block (6200 series). Next, push timing pin through mating hole in rotor shaft. This locks magneto close to firing position during installation on engine.

NOTE

If the magneto drive gear was disengaged during magneto removal, hold the magneto in the horizontal position it will occupy when installed, make certain that the drive gear coupling slot is aligned with the magneto coupling lugs. If it is not aligned, pull the magneto drive gear out of mesh with its drive gear and rotate it to the aligned angle, then push it back into mesh. DO NOT WITHDRAW THE MAGNETO DRIVE GEAR FROM ITS OIL SEAL.

b. After magneto gasket is in place, position the magneto on the engine and secure, then remove the timing pin from the magneto. Be sure to remove this pin before turning the propeller.

c. Connect a timing light to the capacitor terminal at the front of the magneto and to a good ground.

d. Turn propeller back a few degrees (opposite of normal rotation) to close the contact points.

NOTE

Do not turn the propeller back far enough to engage the impulse coupling or the propeller will have to be turned in normal direction of rotation until the impulse coupling releases, then backed up to slightly before the firing position.

e. Slowly advance the propeller in the normal direction of rotation until the timing light indicates the contact points breaking. Magneto mounting clamps may be loosened so that the magneto may be shifted to break the points at the correct firing position.

f. Tighten magneto mounting nuts and recheck timing.

g. Repeat steps "a" through "f" for the other magneto.

h. After both magnetos have been timed, check synchronization of both magnetos. Magnetos must fire at the same time.

i. Remove timing devices from magneto and engine.

j. Connect spark plug leads to their correct magneto outlets.

NOTE

The No. 1 magneto outlet is the one closest to the ventilation plug on the side of the magneto having the manufacturer's insignia. The magneto fires at each successive outlet in clockwise direction. Connect No. 1 magneto outlet to No. 1 cylinder spark plug lead, No. 2 outlet to the next cylinder to fire, etc. Engine firing order is listed in paragraph 12-12.

k. Connect ignition switch (primary) leads to capacitor terminals on magnetos.

NOTE

Magneto (primary) lead nut torque range is 13-15 in.-lbs. Exceeding this torque range could result in possible condenser damage.

l. Inspect magneto installation and install engine cowling in accordance with paragraph 12-3.

12-79. MAINTENANCE. At the first 25-hour inspection and at each 100-hour inspection thereafter, the breaker compartment should be inspected. Magneto-to-engine timing should be checked at the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour

inspection. Refer to Slick 4200/6200 Series Aircraft Magneto Maintenance and Overhaul Instructions No. 1037C andd all revisions and supplements thereto. If timing is as specified in paragraph 12-12, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine. In the event magneto internal timing marks are off more than plus or minus five degrees when breaker points open to fire number one cylinder, remove magneto and check magneto internal timing. Whenever magneto halves are separated breaker point assembly should always be checked. As long as internal timing and magneto-to-engine timing are within the preceding tolerances, it is recommended that magneto be checked internally only at 500 hour intervals. It is normal for contact points to burn and cam to wear a comparable amount so magneto will remain in time within itself. This is accomplished by having a good area making contact on surface between points and correct amount of spring pressure on the cam. The area on the points should be twenty-five percent of area making contact. The spring pressure at the cam should be 10.5 to 12.5 ounces. When contact points burn, area becomes irregular, which is not detrimental to operation of points unless metal transfer is too great which will cause engine to misfire. Figure 12-9 illustrates good and bad contact points. A small dent will appear on nylon insulator between cam follower and breaker bar. This is normal and does not require replacement.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble definitely is associated with a magneto, use the following to help disclose the source of trouble without overhauling the magneto.

a. Moisture Check.

1. Remove magneto from engine and remove screws securing the magneto halves together, disconnect capacitor slip terminal and remove distributor. Inspect for moisture.

2. Check distributor gear finger and carbon brush for moisture.

3. Check breaker point assembly for moisture, especially on the surfaces of the breaker points.

4. If any moisture is evident in the preceding places, wipe with a soft, dry, clean, lint-free cloth.

b. Breaker Compartment Check.

1. Check all parts of the breaker point assembly for security.

2. Check breaker point surface for evidence of excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard-finish paper. If breaker point assembly is defective, install a new assembly. Make no attempt to stone or dress the breaker points. Clean new breaker points with clean, unleaded gasoline and hard-finish paper before installing.

3. Check capacitor mounting bracket for cracks or looseness.

4. Check the carbon brush on the distributor gear for excessive wear. The brush must extend a minimum of 1/32 inch beyond the end of the gear shaft. The spring which the carbon brush contacts should be bent our approximately 20 degrees from vertical, since spring pressure on the brush holds the distributor gear shaft against the thrust bearing in the distributor block.

5. Oil the bearings at each end of the distributor gear shaft with a drop of SAE 20 oil. Wipe excess oil from parts.

6. Make sure internal timing is correct and reassemble magneto. Install and properly time magneto to engine.

12-80. MAGNETO CHECK. Advanced timing settings in some cases, is the result of the erroneous practice of bumping magnetos up in timing in order to reduce RPM drop on single ignition. NEVER ADVANCE TIMING BEYOND SPECIFICATIONS IN ORDER TO REDUCE RPM DROP. Too much importance is being attached to RPM drop on single ignition. RPM drop on single ignition is a natural characteristic of dual ignition design. The purpose of the following magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, etc. In fact, absence of RPM drop should be cause for suspicion that the magneto timing has been bumped up and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

a. Start and run engine until the oil and cylinder head temperature is in the normal operating range.

b. Place the propeller control in the full low pitch (high RPM) position.

c. Advance engine speed to 1700 RPM.

d. Turn the ignition switch to the "R" position and note the RPM drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

e. Turn the switch to the "L" position and note the RPM drop, then return the switch to the "BOTH" position.

f. The RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. A smooth RPM drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp RPM drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

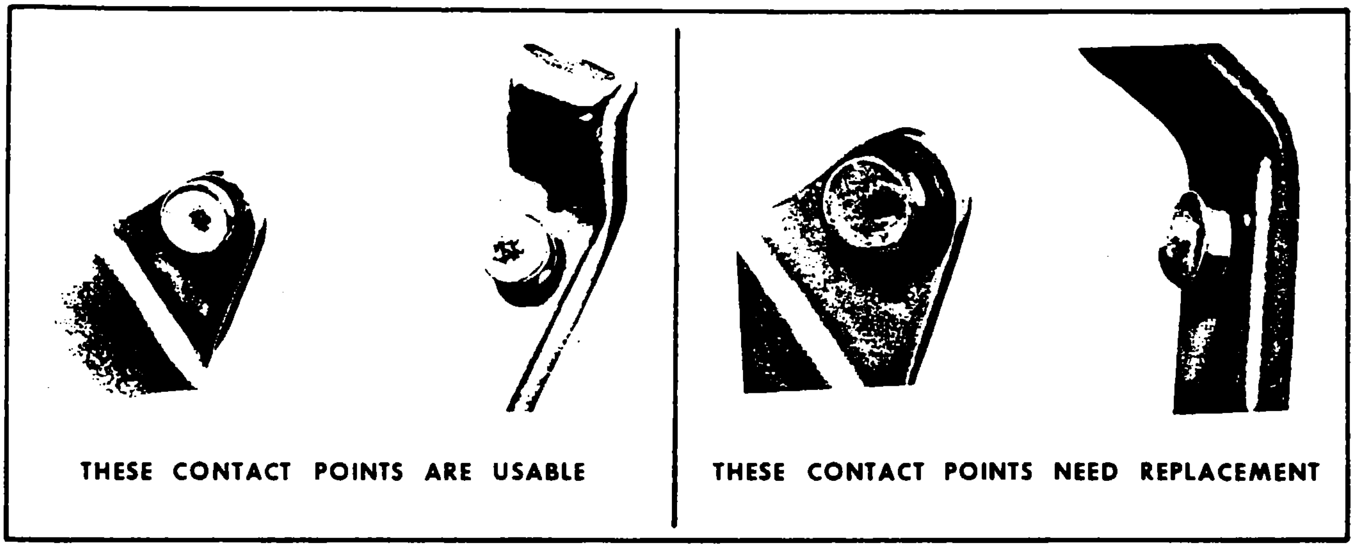


Figure 12-9. Magneto Contact Breaker Points

12-81. SPARK PLUGS. Two spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug service life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

Refer to Section 2 for inspection intervals. Remove, clean, inspect and regap all spark plugs at these intervals. At this time, 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.

12-82. ENGINE CONTROLS. (Refer to figure 12-10.)

12-83. DESCRIPTION. The throttle, mixture and propeller controls are of the push-pull type. The propeller and mixture controls are equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller and mixture controls also have a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. A "Palnut" type locknut is installed in back of the existing locknut at the engine end of the throttle, mixture and propeller controls.

12-84. RIGGING. When adjusting any engine control, it is important to check that the control slides smoothly throughout its full travel, that it locks securely if equipped with a locking device and the arm or lever which it operates moves through its full arc of travel.

CAUTION

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 inspection and lubrication charts in Section 2 of this manual for inspection, lubrication and/or replacement intervals for engine controls.

12-85. THROTTLE CONTROL.

a. Push throttle control full in, then pull control out approximately 1/8 inch for cushion.
b. Check that throttle control arm is against the mechanical stop. If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while throttle arm is against the mechanical stop.
c. Pull control full out and check that throttle arm contacts the idle stop.
d. The throttle arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

12-86. MIXTURE CONTROL.

a. Push mixture control full in, then pull control out approximately 1/8 inch for cushion.

b. Check that mixture control arm is in full rich position (against stop). If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while mixture arm is against the mechanical stop.

c. Pull control full out and check that mixture arm contacts the idle cut-off stop.

d. The mixture arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

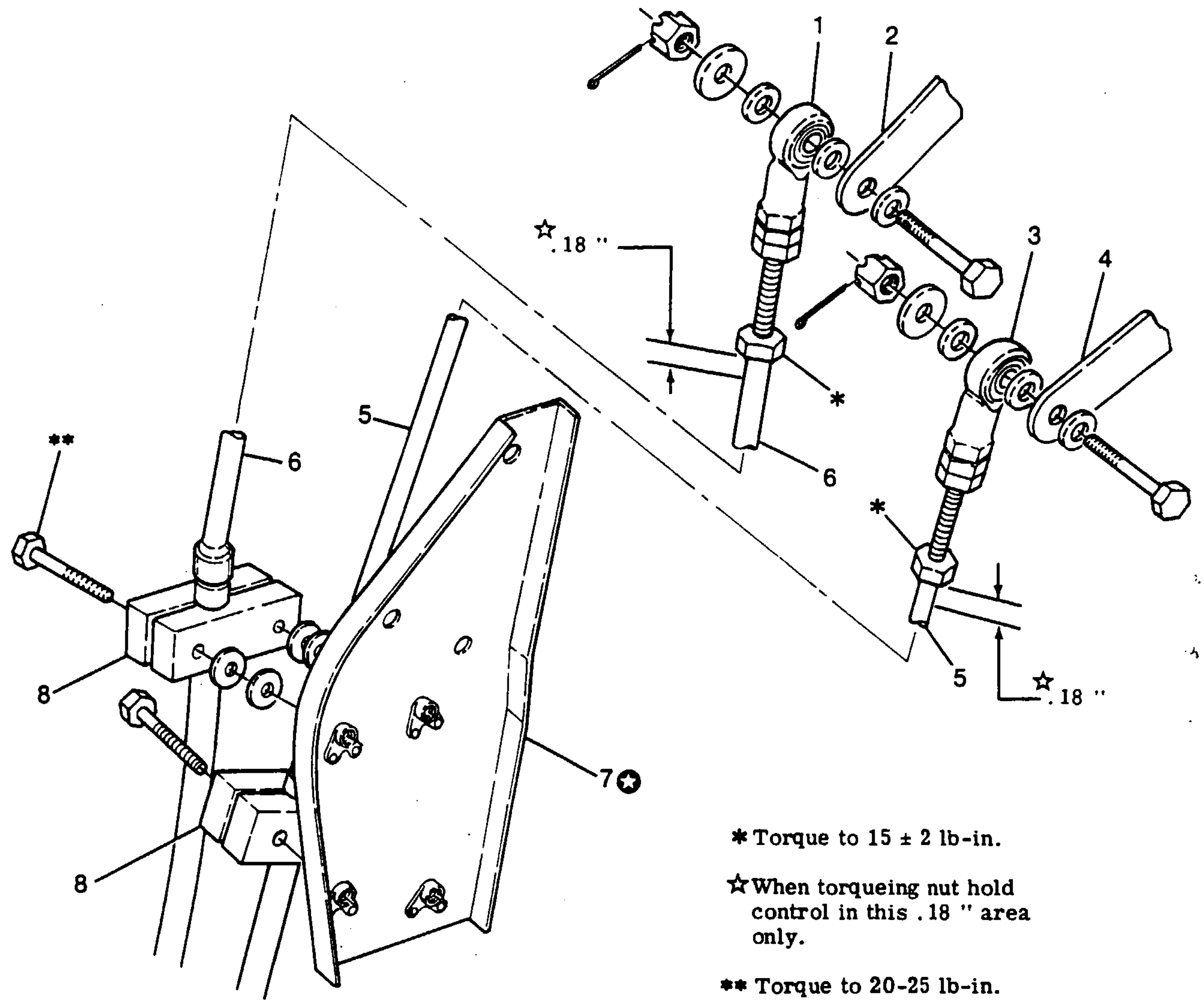
NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.

12-87. THROTTLE-OPERATED MICROSWITCH. Refer to Section 13.

12-87A. LANDING GEAR WARNING HORN. Refer to Section 5.

SHOP NOTES:



* Torque to 15 ± 2 lb-in.

☆ When torqueing nut hold control in this .18 " area only.

** Torque to 20-25 lb-in.

Safety wire bracket-to-engine mounting bolts to each other.

1. Rod End (Throttle Control)
2. Throttle Control Arm
3. Rod End (Mixture Control)
4. Mixture Control Arm
5. Mixture Control
6. Throttle Control
7. Bracket (Typical)
8. Clamp

✪ The turbocharged engine control bracket (7) is illustrated, the non-turbocharged bracket is shorter and does not use the washers between clamp (8) and bracket (7).

Figure 12-10. Engine Controls

12-88. PROPELLER CONTROL. Refer to Section 14.

12-89. STARTING SYSTEM.

12-90. DESCRIPTION. The automatically-engaged starting system employs an electrical starter motor mounted to a 90-degree adapter. A solenoid is activated by the ignition switch on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the motor. Initial rotation of the motor engages the starter through an overrunning clutch in the starter adapter, which incorporates worm reduction gears. The starter motor is located just aft of the right rear cylinder.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

12-91. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity. Install new switch or wires.
	Defective starter motor.	Check electrical power to motor. Repair or replace starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective overrunning clutch or drive.	Check visually. Install new starter adapter.
	Starter motor shaft broken.	Check visually. Install new starter motor.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Check visually. Install new cable.
	Loose or dirty connections.	Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Check visually. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion.	Remove and inspect. Replace starter drive.
	Worn or broken teeth on crankshaft gears.	Check visually. Replace crankshaft gear.

12-92. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new brushes). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal retation. Clean sanding dust from motor after sanding operations.

12-93. STARTER MOTOR.

12-94. REMOVAL AND INSTALLATION.
a. Remove engine cowling in accordance with paragraph 12-3.

CAUTION

When disconnecting starter electrical cable, do not permit terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

b. Disconnect battery cables and insulate as a safety precaution.
c. Disconnect electrical cable at starter motor.
d. Remove nuts and washers securing motor to starter adapter and remove motor. Refer to engine manufacturer's overhaul manual for adapter removal.
e. Reverse the preceding steps for reinstallation. Install a new O-ring seal on motor, then install motor. Be sure motor drive engages with the adapter drive when installing.

12-95. EXHAUST SYSTEM.

12-96. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, for the left and right bank of cylinders. Each cylinder has a riser pipe attached to the exhaust port. The three risers at each bank of cylinders are joined together into a collector pipe forming an exhaust stack assembly. The center riser on each bank is detachable, but the front and aft risers are welded to the collector pipe. The left muffler is enclosed in a shroud which captures exhaust heat which is used to heat the cabin.

12-96A. ECONOMY MIXTURE INDICATOR (EGT) Refer to Section 16.

12-97. REMOVAL AND INSTALLATION. (Refer to figure 12-11.)
a. Remove engine cowling in accordance with paragraph 12-3.
b. Disconnect ducts from heater shroud on left muffler assembly and EGT wires at quick-disconnects.
c. Disconnect tailpipe braces from shock-mounts at firewall brackets.
d. Remove nuts, springs and bolts attaching tailpipe and muffler to collector pipe and remove muffler and tailpipe assemblies.
e. Remove nuts attaching exhaust stack assemblies to the cylinders and remove exhaust stacks and gaskets.
f. Reverse the preceding steps for reinstallation Install a new copper-asbestos gasket between each riser and its mounting pad on each cylinder, regardless of apparent condition of those removed. Torque exhaust stack nuts at cylinders to 100-110 pound-inches.

12-98. INSPECTION. Refer to Section 2 for inspection intervals. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished as specified in the Inspection Charts in Section 2. A thorough inspection of the engine exhaust system is required to detect cracks which could cause leaks and result in loss of engine power. To inspect the engine exhaust system, proceed as follows:
a. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visually inspected.

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

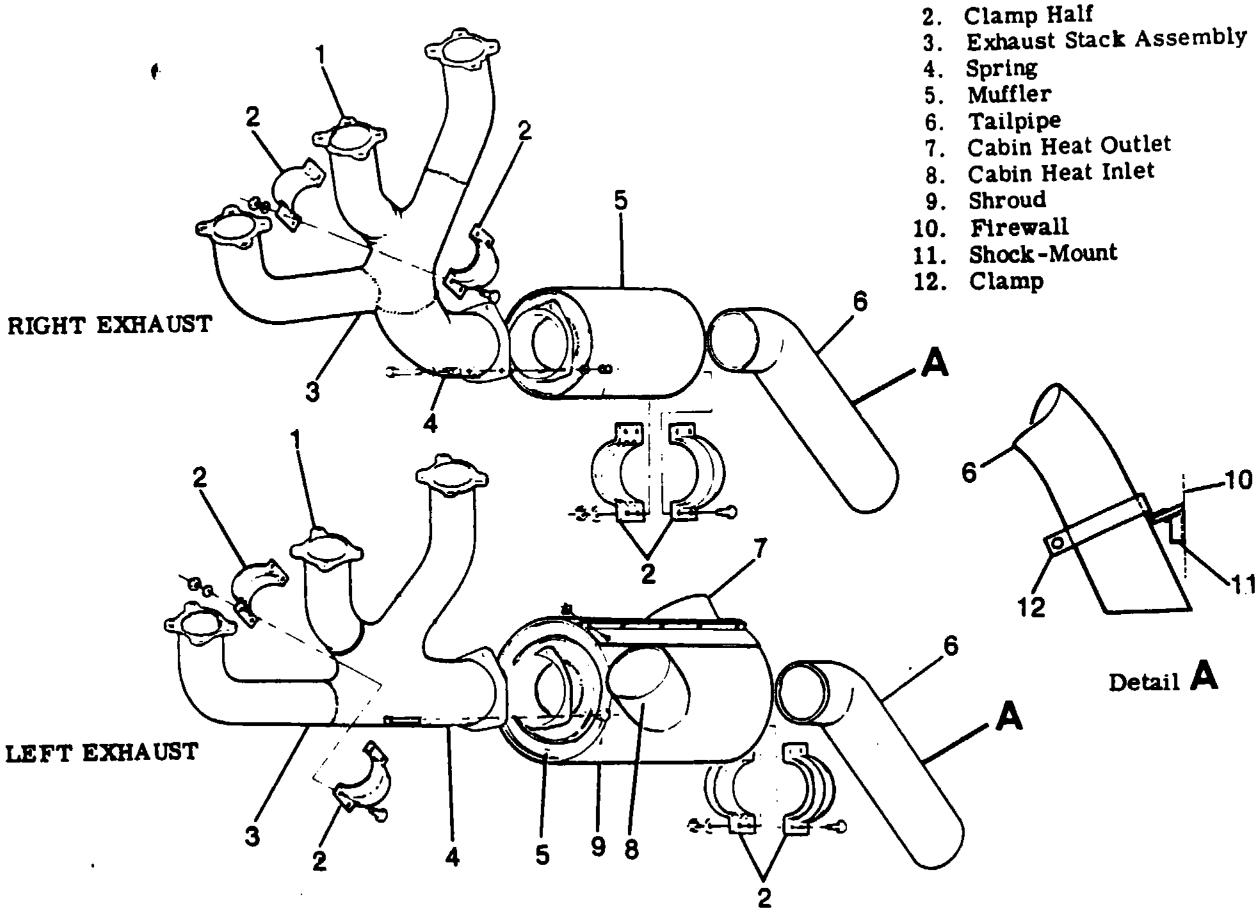
b. After visual inspection, an air leak check should be made on the exhaust system as follows:
1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

NOTE

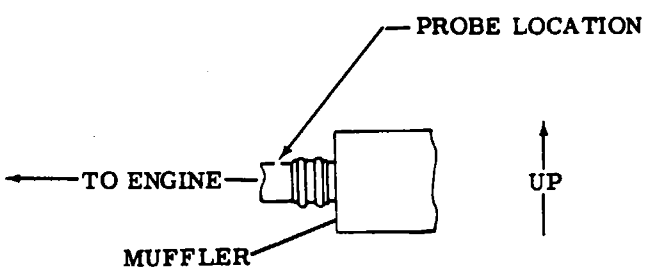
The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually by feel, or by using a soap and water solution and watching for bubbles. Forming of bubbles is considered acceptable, if bubbles are blown away system is not considered acceptable.
c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.
1. Remove exhaust stack assemblies.
2. Use rubber expansion plugs to seal openings.
3. Using a manometer or gage, apply approxi-

1. Riser
2. Clamp Half
3. Exhaust Stack Assembly
4. Spring
5. Muffler
6. Tailpipe
7. Cabin Heat Outlet
8. Cabin Heat Inlet
9. Shroud
10. Firewall
11. Shock-Mount
12. Clamp



ECONOMY MIXTURE INDICATOR (EGT) PROBE LOCATION



LEFT EXHAUST

Figure 12-11. Exhaust System

mately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.

4. It is recommended that exhaust stacks found defective be replaced before the next flight.

d. After installation of exhaust system components, perform the air leak check as specified in step "b" of this paragraph to make sure that the system is acceptable.

e. In addition to the above inspections, at 200 hours (after the mufflers have accumulated more than 1000 hours time in service) perform the following inspection:

1. Remove engine cowling in accordance with paragraph 12-3.
2. Remove the mufflers from the collector assemblies.
3. Remove the tailpipes from the mufflers.
4. Using a flashlight and a mirror, inspect the baffles and cones from both ends of the mufflers. Check for general deterioration and make sure the baffles are intact and not separated from the support rods.
5. If defects are found, replace the mufflers before further flight.
6. If no defects are found, reinstall the mufflers and tailpipes.

12-99. EXTREME WEATHER MAINTENANCE.

12-100. COLD WEATHER. Cold weather starting will be made easier by the installation of an engine primer system and a ground service receptacle. The primer system is manually operated from the cabin. Fuel is supplied by a line from the fuel strainer to the plunger. Operating the primer forces fuel to the engine. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 12-104 for use of the external power receptacle. The following may also be used to assist engine starting in extremely 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 engine oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the engine oil, gasoline may be mixed with the heated oil in a ratio of 1 part gasoline to 12 parts engine oil before pouring into the engine oil sump. If the free air temperature is below minus 29°C (-20°F), the engine compartment should be preheated by a ground heater. Pre-heating the engine compartment is accomplished by inducing heated air up through the cowl flap openings; thus heating both the oil and cylinders. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull propeller through several revolutions by hand before attempting to start the engine.

CAUTION

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

12-101. HOT WEATHER. Refer to Pilot's Operating Handbook.

12-102. SEACOAST AND HUMID AREAS. In salt water areas special care should be taken to keep the engine, accessories and airframe clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

12-103. DUSTY AREAS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating in high dust conditions, service the induction air filters daily as outlined in Section 2. Also change engine oil and lubricate airframe items more often than specified.

12-104. GROUND SERVICE RECEPTACLE. Refer to Section 17.

SECTION 12A

ENGINE
(TURBOCHARGED)

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 not 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.

NOTE

For additional information covering turbocharger and component maintenance. overhaul and trouble shooting refer to the Manufacturer's Overhaul Manual.

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12A-1. ENGINE COWLING.

12A-2. DESCRIPTION. The engine cowling is divided into four major removable segments. The left upper cowling segment has two access doors, one at upper front provides access to oil filler neck and one at left aft side provides access to oil dipstick and ground service receptacle, if installed. The right and left nosecaps are fastened to the lower engine nacelle and to each other with screws. The right and left upper cowl segments are secured with quick-release fasteners and either segment may be removed individually. The lower left engine nacelle contains a port on the aft end for venting the cabin heating system and may be removed. The opening in the lower right nacelle, which may be removed by removing screws, supplies ram air to the turbocharger.

12A-3. REMOVAL AND INSTALLATION.

a. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the left and right segments.
b. Remove screws securing the left and right nosecap together and to the lower engine nacelle, and remove caps.
c. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct air flow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards.

12A-4. CLEANING AND INSPECTION. Wipe 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.

12A-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.

12A-6. COWL FLAPS.

12A-7. DESCRIPTION. Cowl flaps are provided to aid in controlling engine temperature. Two cowl flaps, operated by a single control in the cabin, are located in the lower aft engine compartment. The engine exhaust tailpipe extends through a cutout, forward of the right-hand cowl flap.

12A-8. REMOVAL AND INSTALLATION. (See figure 12-1.)

a. Place control lever (2) in the OPEN position.
b. Disconnect clevis (10) from shock mount on right hand cowl flap.
c. Disconnect links (13) from arm (15) on left hand cowl flap.
d. Remove nuts, washers, and bolts at cowl flap attach points (11) and remove cowl flaps.
e. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 12A-9.

12A-9. RIGGING. (Refer to fiugre 12A-1.)

a. Disconnect control clevises (10) from shock-mount arm.
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 control lever (2) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (5) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (4) to position control lever in bottom hole of position bracket (3).
d. With control lever in CLOSED position, set LH, cowl flap flush to cowl skin. Set RH cowl flap trailing edge to a .62 ± .06 inch gap with lower fuselage skin.

NOTE

If lower control clevis (10) cannot be adjusted to attain desired setting, and still maintain sufficient thread engagement, loosen lower control housing clamp (8) and slide housing in clamp as necessary. Be sure threads are visible in clevis inspection holes.

e. Check that all clamps and jam nuts are tight.

12A-10. ENGINE.

12A-11. DESCRIPTION. An air-cooled, horizontally-opposed, direct-drive, fuel-injected, six-cylinder, turbocharged, Continental TSIO-520-CE series engine. driving a constant-speed propeller, is used to power the aircraft. The cylinders, numbered from rear to front, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and the cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as 2, 4 and 6. Refer to paragraph 12A-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Supply Division.

12A-12. ENGINE DATA.

	21064898 AND ON
Model (Continental)	TSIO-520-CE
BHP Maximum Including Take-Off	325
RPM (Maximum Continuous)	2700
Limiting Manifold Pressure (Sea Level)	37.0 Inches Hg.
Number of Cylinders	6-Horizontally Opposed
Displacement	520 Cubic Inches
Bore	5.25 Inches
Stroke	4.00 Inches
Compression Ratio	7.5:1
Magnetos	Slick Model No. 6220
Right Magneto	Fires 20° ±1° BTC Upper Right and Lower Left.
Left Magneto	Fires 20° ±1° BTC Upper Left and Lower Right.
Firing Order	1-6-3-2-5-4
Spark Plugs	18mm (Refer to Continental Service Bulletin M77-10 for factory approved spark plugs and required gap)
Torque	330 ±30 Lb-In.
Fuel Metering System	Continental Fuel Injection
Unmetered Fuel Pressure	5.5 to 6.5 PSI at 600 RPM 29 to 32 PSI at 2600 RPM
Nozzle Pressure	3.5 to 4.0 PSI at 600 RPM 16.9 PSI at 2700 RPM
Oil Sump Capacity	10 U.S. Quarts
With Filter Element Change	11 U.S. Quarts
Tachometer	Mechanical Drive
Oil Pressure (PSI)	
Minimum Idling	10
Normal	30 to 60
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cylinders
Oil Temperature	
Normal Operating	Within Green Arc (100° to 240°F)
Maximum Permissible	Red Line (240°F)
Probe Location	In front of No. 5 Cylinder Base
Cylinder Head Temperature	Red Line (460°F) Max.
Probe Location	Lower Side No. 1 Cylinder Head
Turbine Inlet Temperature	
Probe Location	Front Crossover Exhaust Runner

12A-13. TIME BETWEEN OVERHAUL (TBO). Teledyne Continental Motors recommended engine overhaul time is 1600 hours. Refer to Continental Aircraft Engine Service Bulletin M81-22, and to any superseding bulletins, revisions or supplements thereto, for further recommendations. At the time of overhaul, engine accessories should be overhauled. Refer to Section 14 for propeller and governor overhaul periods.

12A-14. OVERSPEED LIMITATIONS. The engine must not be operated above specified maximum continuous RPM. However, should inadvertent overspeed occur, refer to Continental Aircraft Engine Service Bulletin M75-16, and to any superseding bulletins, revisions or supplements thereto, for further recommendations.

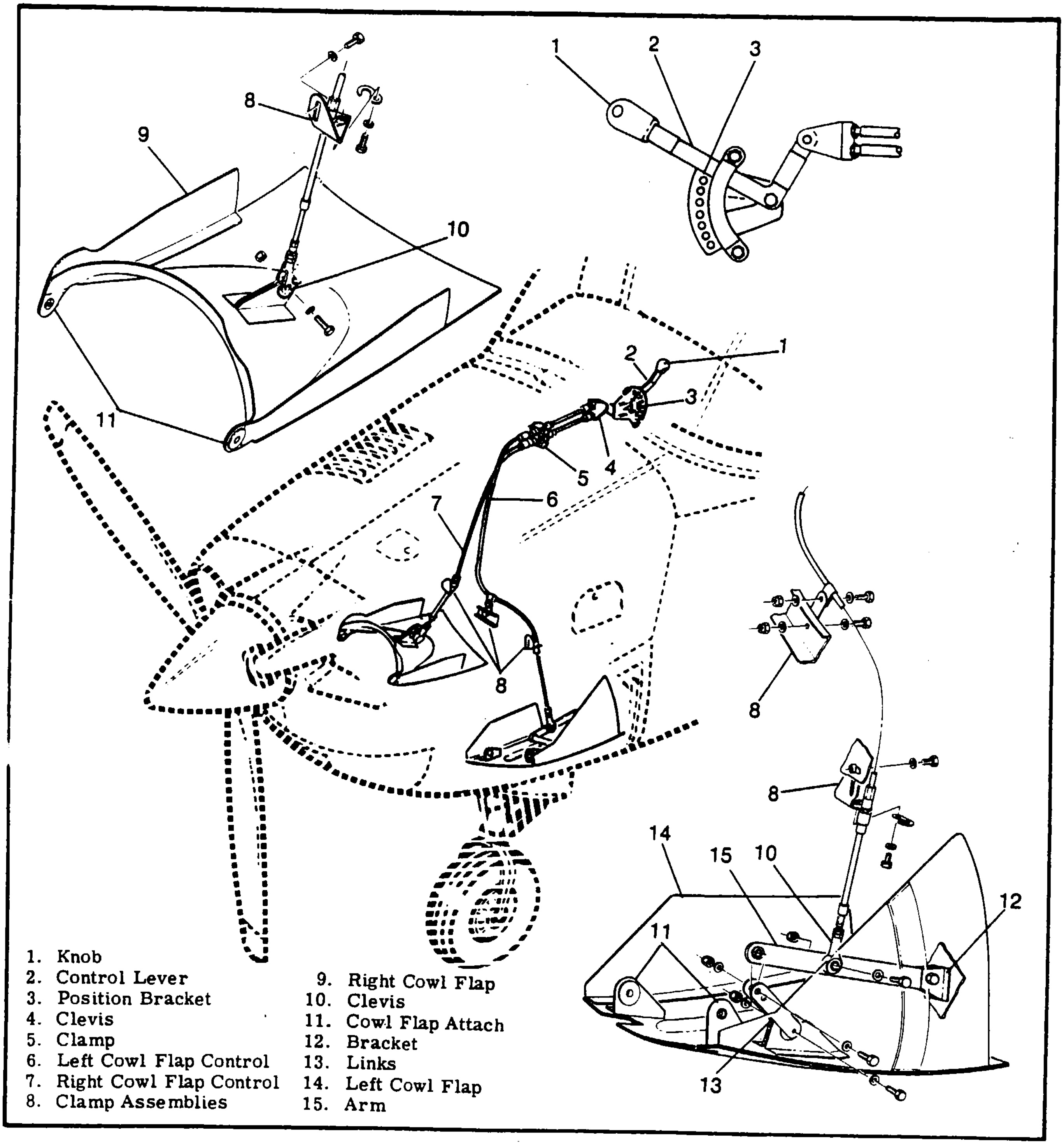


Figure 12A-1. Cowl Flaps Installation

12A-15. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Engine flooded or improper use of starting procedure.	Use proper starting procedure. Refer to Pilot's Operating Handbook.
	Defective aircraft fuel system.	Refer to Section 13.
	Fuel tanks empty.	Service fuel tanks.
	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to persistently fouled plugs. Replace if defective.
	Magneto impulse coupling failure.	Repair or install new coupling.
	Defective magneto switch or grounded magneto leads.	Repair or replace switch and leads.
	Defective ignition system.	Refer to paragraph 12-83.
	Induction air leakage.	Correct cause of air leakage.
	Clogged fuel screen in fuel control unit or defective unit.	Remove and clean. Replace defective unit.
	Clogged fuel screen in fuel manifold valve or defective valve.	Remove and clean screen. Replace defective valve.
	Clogged fuel injection lines or discharge nozzles.	Remove and clean lines and nozzles. Replace defective units.
	Defective auxiliary fuel pump.	Refer to Section 13.
	Engine-driven fuel pump not permitting fuel from auxiliary pump bypass.	Install new engine-driven fuel pump.
	Vaporized fuel in system. (Most likely to occur in hot weather with a hot engine.)	Refer to Pilot's Operating Handbook.
ENGINE STARTS BUT DIES, OR WILL NOT IDLE PROPERLY.	Propeller control in high pitch (low RPM) position.	Use low pitch (high RPM) position for all ground operations.
	Improper idle speed or idle mixture adjustment.	Refer to paragraph 12A-50.
	Defective aircraft fuel system.	Refer to Section 13.
	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to persistently fouled plugs. Replace if defective.
	Water in fuel system.	Drain fuel tank sumps, lines and fuel strainer.
	Defective ignition system.	Refer to paragraph 12-83.

12A-15. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE PROPERLY (CONT).	Inducation air leakage.	Correct cause of air leakage.
	Clogged fuel screen in fuel control unit or defective unit.	Remove and clean. Replace defective unit.
	Clogged fuel screen in fuel manifold valve or defective valve.	Remove and clean. Replace defective valve.
	Restricted fuel injection lines or discharge nozzles.	Remove, clean lines and nozzles. Replace defective units.
	Defective engine-driven fuel pump.	Install and calibrate new pump.
	Vaporized fuel in system. (Most likely to occur in hot weather with a hot engine.)	Refer to Pilot's Operating Handbook.
	Manual engine primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Obstructed air intake.	Remove obstruction; service air filter, if necessary.
	Discharge nozzle air vent manifolding restricted or defective.	Check for bent lines or loose connections. Tighten loose connections. Remove restrictions and replace defective components.
	Defective engine.	Check compression and listen for unusual engine noises. Check oil filter for excessive metal. Repair engine as required.
ENGINE HAS POOR ACCELERATION, RUNS ROUGHLY AT SPEEDS ABOVE IDLE OR LACKS POWER.	Idle mixture too lean.	**Refer to paragraph 12A-50.**
	Propeller control in high pitch (low RPM) position.	Use low pitch (high RPM) position for all ground operations.
	Incorrect fuel-air mixture, worn control linkage or restricted air filter.	Replace worn elements of control linkage. Service air filter.
	Defective ignition system.	**Refer to paragraph 12A-83.**
	Malfunctioning turbocharger.	Check operation, listen for unusual noise. Check operation of wastegate valve and for exhaust system defects. Tighten loose connections.
	Improper fuel-air mixture.	Check intake manifold connections for leaks. Tighten loose connections. Check fuel controls and linkage for setting and adjustment.

12A-15. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE HAS POOR ACCELERATION, RUNS ROUGHLY AT SPEEDS ABOVE IDLE OR LACKS POWER (CONT).	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to persistently fouled plugs. Replace if defective.
	Fuel pump pressure improperly adjusted.	**Refer to paragraph 12A-65.**
	Restriction in fuel injection system.	Clean out restriction. Replace defective items.
	Propeller out of balance.	Check and balance propeller.
	Defective engine.	Check compression, check oil filter for excessive metal. Listen for unusual noises. Repair engine as required.
	Exhaust system leakage.	**Refer to paragraph 12A-105.**
	Turbocharger wheels rubbing.	Replace turbocharger.
	Improperly adjusted or defective wastegate controller.	**Refer to paragraph 12A-115.**
	Leak in turbocharger discharge pressure system.	Correct cause of leaks. Repair or replace damaged parts.
	Manifold pressure overshoot. (Most likely to occur when engine is accelerated too rapidly.)	Move throttle about two-thirds open. Let engine accelerate and peak. Move throttle to full open.
	Engine oil viscosity too high for ambient air.	Refer to Section 2 for proper grade of oil.
POOR IDLE CUT-OFF.	Mixture control linkage improperly rigged.	**Refer to paragraph 12A-90.**
	Defective or dirty fuel manifold valve.	Remove and clean manifold valve.
	Fuel contamination.	Drain all fuel and flush out fuel system. Clean all screens, fuel strainers, fuel manifold valves, nozzles and fuel lines.
	Defective mixture control valve in fuel pump.	Replace fuel pump.
ENGINE LACKS POWER. REDUCTION IN MAXIMUM MANIFOLD PRESSURE OR CRITICAL ALTITUDE.	Incorrectly adjusted throttle control, "sticky" linkage or dirty air filter.	Check movement of linkage by moving control through range of travel. Make proper adjustments and replace worn components. Service air filter.

12A-15. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE LACKS POWER, REDUCTION IN MAXIMUM MANIFOLD PRESSURE OR CRITICAL ALTITUDE (CONT).	Defective ignition system.	Inspect spark plugs for fouled electrodes, heavy carbon deposits, erosion of electrodes, improperly adjusted electrode gaps and cracked porcelains. Test plugs for regular firing under pressure. Replace damaged or misfiring plugs.
	Improperly adjusted wastegate valve.	Refer to paragraph 12A-117.
	Loose or damaged exhaust system.	Inspect entire exhaust system to turbocharger for cracks and leaking connections. Tighten connections and replace damaged parts.
	Loose or damaged manifolding.	Inspect entire manifolding system for possible leakage at connections. Replace damaged components, tighten all connections and clamps.
	Fuel discharge nozzle defective.	Inspect fuel discharge nozzle vent manifolding for leaking connections. Tighten and repair as required. Check for restricted nozzles and lines and clean and replace as necessary.
	Malfunctioning turbocharger.	Check for unusual noise in turbocharger. If malfunction is suspected, remove exhaust and/or air inlet connections and check rotor assembly, for possible rubbing in housing, damaged rotor blades or defective bearings. Replace turbocharger if damage is noted.
BLACK SMOKE EXHAUST.	Turbo coking, oil forced through seal of turbine housing.	Clean or change turbocharger.
HIGH CYLINDER HEAD TEMPERATURE.	Defective cylinder head temperature indicating system.	Refer to Section 16.
	Improper use of cowl flaps.	Refer to Pilot's Operating Handbook.
	Engine baffles loose, bent or missing.	Install baffles properly. Repair or replace if defective.
	Dirt accumulated on cylinder cooling fins.	Clean thoroughly.
	Incorrect grade of fuel.	Drain and refill with proper fuel.

12A-15. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH CYLINDER HEAD TEMPERATURE (CONT).	Incorrect ignition timing.	**Refer to paragraph 12A-82.**
	Improper use of mixture control.	Refer to Pilot's Operating Handbook.
	Defective engine.	Repair as required.
HIGH OR LOW OIL TEMPERATURE OR PRESSURE.		**Refer to paragraph 12A-33.**

NOTE

Refer to paragraph 12A-112 for trouble shooting of controller and wastegate actuator.

12A-16. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. The minimum acceptable RPM is 2650 (or 2625 with prop de-ice boots). The average should fall between 2650 (or 2625 with prop de-ice boots) and 2700 RPM.

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

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

NOTE

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

2. Check operation of alternate air door spring or magnetic lock to make sure door will remain closed in normal operation.

3. Check magneto timing, spark plugs and ignition harness for settings and conditions.

4. Check fuel injection nozzles for restriction and check for correct unmetered fuel flow.

5. Check condition of induction air filter. Clean if required.

6. Perform an engine compression check. (Refer to engine Manufacturer's Manual).

12A-17. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for over-haul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft as a complete unit with the turbocharger and accessories installed.

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 or fuel ON-OFF valve in the OFF position.

c. Remove engine cowling in accordance with paragraph 12-3.

d. Disconnect battery cables and insulate terminals as a safety precaution. Remove battery and battery box for additional clearance, if desired.

e. Drain fuel strainer and lines.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine nacelle 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 14. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
i. Disconnect throttle, mixture and propeller controls from their respective units. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect 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 oil temperature wire at probe below oil cooler.
   5. Disconnect electrical wires and wire shielding ground at alternator.
   6. Disconnect exhaust gas temperatures or turbine inlet temperature wires at quick-disconnects.
   7. Disconnect electrical wires at throttle micro-switches.
   8. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.
k. Disconnect lines and hoses as follows:
   1. Disconnect vacuum hose at vacuum pump and remove oil separator vent line.

WARNING

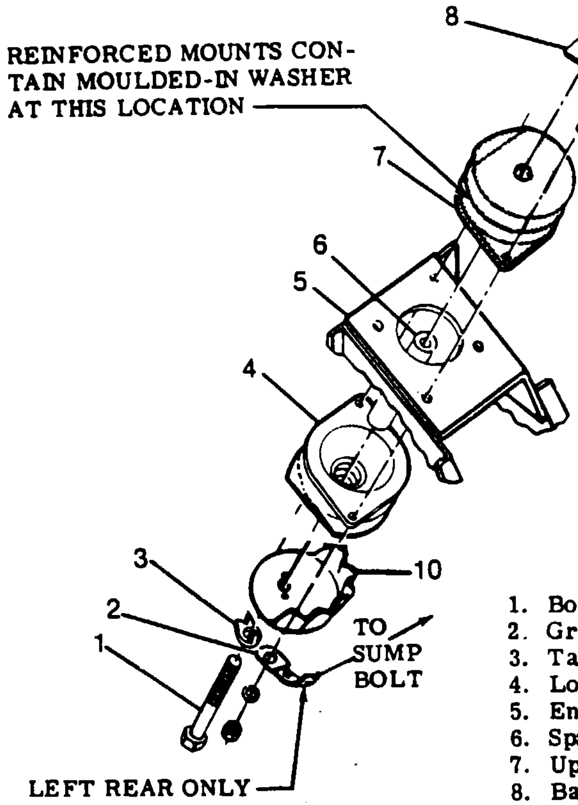
Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

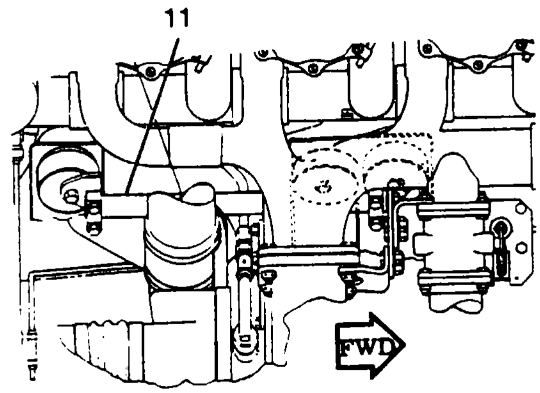
   2. Disconnect fuel supply and vapor return hoses at fuel pump. Disconnect and remove fuel pump drain line.
   3. Disconnect manifold pressure line at intake manifold.
   4. Disconnect the fuel-flow gage line at firewall.
   5. Disconnect the oil pressure line at the engine.
   6. Disconnect and remove the right and left manifold drain lines and the balance tube drain line.
   7. Disconnect duct from sonic venturi on intercooler.
   8. Disconnect turbine inlet duct from turbine.
   9. Disconnect the air vent line to fuel-flow gage, at firewall.
   10. Disconnect engine primer lines at right and left intake manifolds.
   11. Disconnect the oil drain line from oil deflector under external oil filter.
l. Disconnect cowl flap control from right hand cowl flap.
m. Remove screws securing lower right hand cowl and remove cowl.
n. Disconnect flexible ducting from heater shroud and cable valve.
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.

CAUTION

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

p. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mounts.
q. Remove mount bolts, ground strap and heat shields.
r. Slowly hoist engine out of nacelle and clear of aircraft checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.
s. Remove engine shock-mounts.

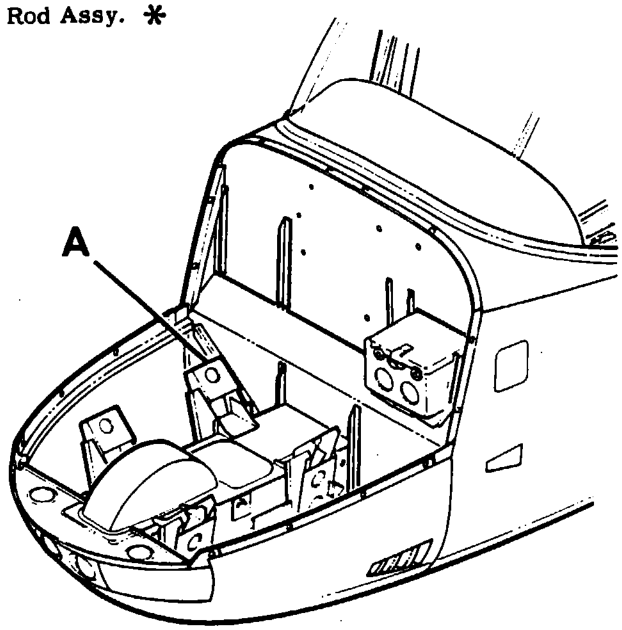




1. Bolt
2. Ground Strap
3. Tab Lockwasher
4. Lower Mount
5. Engine Mount Support
6. Spacer
7. Upper Mount
8. Barrel Nut
9. Bolt
10. Deflector *
11. Rod Assy. *

* Installed on R.H. Engine Mounts only.

Detail **A**



NOTES

It is important that the correct engine mounts be installed in the correct positions. Be sure that the four reinforced mounts are used at the upper, forward positions.

To determine which four of the twelve mounts are the reinforced ones, use fingernail to feel whether moulded-in washer is present.

If shock-mounts will be re-used, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as noted above.

Torque bolts (1) to 300 +50 -00 lb. in.

Figure 12A-2. Engine Mount Installation

NOTE

If shock-mounts will be reused, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as illustrated in figure 12A-2.

12A-18. CLEANING. Clean engine in accordance with instructions in Section 2.

12A-19. 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.

12A-20. 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 fitting 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 in the engine compartment.

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

12A-21. 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.

12A-22. INSTALLATION. Before installing the engine on the aircraft, install items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist engine to a point just above nacelle.

b. Install engine shock-mounts and ground strap as illustrated in figure 12A-2.

c. Carefully lower engine slowly into place on the engine mounts. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mounts.

NOTE

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

d. Attach ground strap under engine sump bolt and install engine mount bolts. Torque bolts to 300+50-00 lb-in. Bend tab washers to form lock for mount bolts. Install heat shields.

e. Remove support stand placed under tail tie-down fitting and remove hoist.

NOTE

If the exhaust system was loosened or removed, refer to paragraph 12A-105.

f. Connect flexible ducting on heater shroud and cabin valve.

g. Route propeller governor control along left side of engine and secure with clamps.

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, 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 lubricant or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the 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. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel-soluble lubricant, such as engine oil, on fitting threads. Do not use any other form of thread compound on the injection system.

h. Connect lines and hoses as follows:
1. Install and connect the left and right manifold drain lines and the balance tube drain line.
2. Connect the oil pressure line at its fitting.
3. Connect the fuel-flow gage line at firewall.
4. Connect the fuel supply and the vapor return lines at the fuel pump. Connect and install fuel pump drain line.
5. Connect manifold pressure line at intake manifold.
6. Connect vacuum line at the vacuum pump, and install oil separator vent line.
7. Connect air and oil lines at waste-gate controller on firewall.
8. Install lower right hand cowl.
9. Connect turbine inlet duct.
10. Connect cowl flap control to cowl flap.
11 Connect duct to sonic venturi on intercooler.
12. Connect engine primer lines at right and left intake manifolds.
13. Connect oil drain line to oil deflector under external oil filter.
14. Install all clamps securing lines and hoses to engine or structure.

i. Connect wires and cables as follows:
1. Connect oil temperature wire at probe below oil cooler.
2. Connect tachometer drive to adapter and torque to 100 lb-in.

WARNING

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break conductor between terminal and field coils causing starter to be inoperative.

3. Connect starter electrical lead.
4. Connect cylinder head temperature wire at probe.
5. Connect electrical wires and wire shielding ground to alternator.
6. Connect electrical wiring to throttle switches.
7. Connect exhaust gas temperature or turbine inlet temperature wires at quick-disconnects.
8. Install clamps that attach wires or cables, to engine or structure.

j. Connect engine controls and install block clamps.
k. Rig engine controls in accordance with paragraphs 12A-86, 12A-87, 12A-88, and 12A-89.
l. Install propeller and spinner in accordance with instructions outlined in Section 14.
m. 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.

n. Clean and install induction air filter in accordance with Section 2.
o. 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.
p. Check all switches are in the OFF position and connect battery cables.
q. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.

NOTE

When installing a new or newly overhauled engine, and prior to starting the engine, disconnect the oil inlet line at the controller and the oil outlet line at the controller. Connect these oil lines to a full-flow oil filter, allowing oil to bypass the controller. With filter connected, operate engine approximately 15 minutes to filter out any foreign particles from the oil. This is done to prevent foreign material from entering the controller.

r. Install engine cowling in accordance with paragraph 12A-3.
s. Perform an engine run-up and make final adjustments on the engine controls.

12A-23. FLEXIBLE FLUID HOSES.

12A-24. PRESSURE TEST. Refer to Section 2 for pressure test intervals. Perform pressure test as follows:

a. Place mixture control in the idle cut-off position.
b. Operate the auxiliary fuel pump in the high position.
c. Examine the exterior of hoses for evidence of leakage or wetness.
d. Hoses found leaking should be replaced.
e. After pressure testing fuel hoses, allow sufficient time for excess fuel to drain overboard from the engine manifold before attempting an engine start.
f. Refer to paragraph 12-20 for detailed inspection procedures for flexible hoses.

12A-25. REPLACEMENT.
a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.
b. Provide as large a bend radius as possible.
c. Hoses should have a minimum of one-half inch clearance from other lines, ducts hoses or surrounding objects or be butterfly clamped to them.
d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.
e. Refer to AC 43.13, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

12A-26. ENGINE BAFFLES.

12A-27. DESCRIPTION. The sheet metal baffles installed on the engine direct the flow of air around the cylinders and other components to provide optimum cooling. Rubber asbestos composition seals, attached to the engine cowling, align with the baffles to form a seal at points of contact to help confine and direct the airflow to the desired area. It is very important to engine cooling that the baffles and seals are in good condition and installed correctly. The vertical seals must fold forward and the side seals must fold upwards. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any new baffles seal properly. The baffle mounting bolts must be torqued to 180 - 210 inch lbs.

12A-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.

12A-29. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segment 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. Replace sealing strips if they do not seal properly. Other repairs may be made as long as strength and cooling requirements are met. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

12A-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 may be installed.

12A-31. ENGINE OIL SYSTEM

12A-32. DESCRIPTION. The engine lubrication system is a 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.

12A-33. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken. disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Dirty oil screens.	Remove and clean oil screens.

12A-33. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective.
	Oil cooler thermostatic bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Attempt to drain cooler. Inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 RPM to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal, replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

12A-33. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (Cont.)	Secondary effect of low oil pressure.	Observe oil pressure gage for low indication. Determine and correct reason for low oil pressure.
	Oil congealed in cooler	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	**Replace. Also refer to Service Newsletter SNL85-8.**
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

12A-34. FULL-FLOW OIL FILTER.

12A-35. DESCRIPTION. An external oil filter is installed on the engine. The filter is the throw away type and incorporates a bypass valve.

12A-36. REMOVAL AND INSTALLATION (Spin-On Filter). (See figure 12A-3.)

a. Remove engine cowling in accordance with paragraph 12A-3.

b. Remove safety wire from spin-on filter.

c. Unscrew spin-on filter from pump.

NOTE

Before discarding filter, cut the filter can open, remove the filter element and cut through the filter at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. If new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by imparting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

d. Before installing the new spin-on filter the gasket should be lightly lubricated with engine oil or Dow Corning Compound (DC-4).

e. Torque oil filter to 18-20 ft-lbs and safety.

f. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.

g. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).

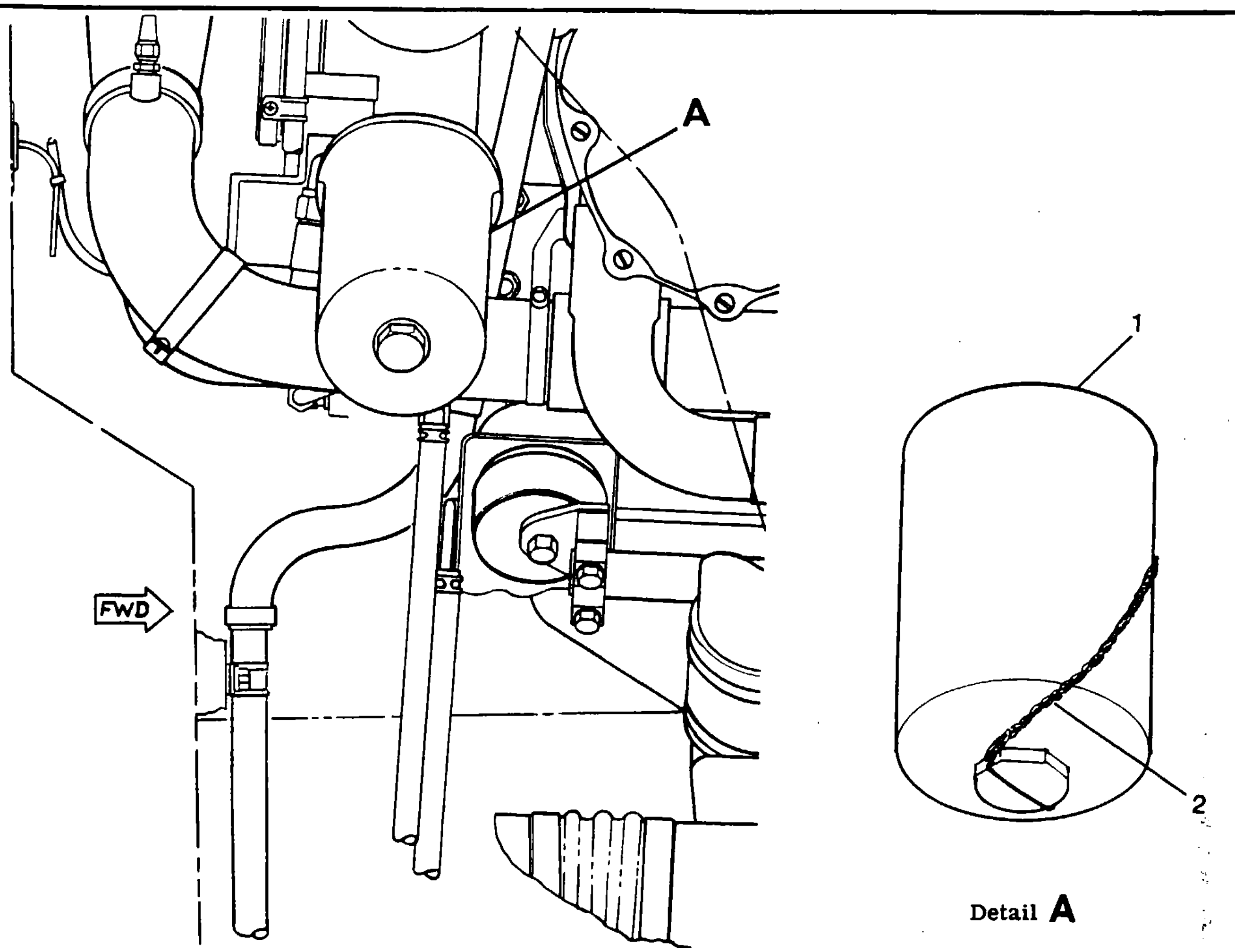
h. Check to make sure the filter can has not been making contact with any adjacent parts due to engine torque.

12A-37. OIL COOLER.

12A-38. DESCRIPTION. A non-congealing remote oil cooler is used. Ram air passes through oil cooler and is discharged into engine compartment.

12A-39. ENGINE FUEL SYSTEM. (Refer to figure 12A-6.)

12A-40. DESCRIPTION. The fuel injection system is a low pressure system of injecting fuel into intake port of each cylinder. It is a multi-nozzle continuous flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a fuel flow indicator are provided for leaning. The fuel flow indicator is calibrated in pounds per hour. The continuous-flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine driven fuel pump. The four major components of the system are: **fuel injection pump, fuel-air control unit, engine oil heated fuel manifold valve and fuel discharge nozzles. The fuel injection pump incorporates an adjustable aneroid sensing unit which is pressurized from dis charge side of turbocharger compressor. Turbo charger discharge air pressure is also used to vent the fuel discharge nozzles and vent port of fuel flow gage.**



1. Oil Filter
2. Safety Wire

Figure 12A-3. Full-Flow Oil Filter

NOTE

Throughout the aircraft fuel system. from the fuel bays to the engine-driven fuel pump. use NS-40 (RAS-4. Snap-On Tools Corp., Kenosha. Wisconsin), MIL-T-5544 (Thread Compound. Antiseize. Graphite-Petrolatum) or equivalent, as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only. omitting the first two threads. Always ensure that a compound, the residue from a previously used compound or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel soluble lubricant. such as engine lubricating oil. on the fitting threads. Do not use any other form of thread compound on the injection system fittings.

12A-41. FUEL-AIR CONTROL UNIT.

12A-42. DESCRIPTION. This unit occupies the position ordinarily used for a carburetor, at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control elements in this unit. one for air and two for fuel. One of the fuel control elements is for fuel mixture and the other is for fuel metering. Fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls this fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions airflow to fuel flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. The fuel control portion of the fuel-air control unit is enclosed in a shroud and is blast-air cooled to help prevent vapor lock.

12A-43. REMOVAL.

a. Place all cabin switches and fuel selector or fuel ON-OFF valve in the OFF position.
b. Remove cowling in accordance with paragraph 12-3.
c. Loosen clamp and disconnect flexible duct from elbow at top of air throttle.
d. Tag and disconnect electrical wires from electric fuel pump microswitch.
e. Disconnect throttle and mixture control rod ends at fuel-air control unit.

NOTE

Cap or plug all disconnected hoses, lines and fittings.

f. Disconnect and tag all fuel lines at the fuel control valve.
g. Remove nuts and washers securing triangular brace to fuel-air control unit and engine, at lower end of control unit. Remove brace.
h. Remove bolt attaching fuel-air control unit to brace at top of control unit.
i. Loosen hose clamps which secure fuel-air control unit to right and left intake manifold assemblies and slip hoses from fuel-air control unit.
j. Remove fuel-air control unit.

12A-44. CLEANING AND INSPECTION.

a. Check control connections, levers and linkage for security, safetying and for lost motion due to wear.
b. Remove the fuel screen assembly and clean in solvent (Stoddard or equivalent). Reinstall and safety.
c. Check the air control body for cracks and control unit for overall condition.

12A-45. INSTALLATION.

a. Place control unit in position at rear of engine.
b. Install bolt attaching control unit to brace at top of unit. Ascertain that shock-mount is in place and in good condition.
c. Install triangular brace at lower end of control unit.
d. Install hoses and clamps which secure control unit to right and left intake manifold assemblies. Tighten hose clamps.
e. Connect fuel lines to unit.
f. Connect throttle and mixture control rod ends to control unit.
g. Connect electrical wiring to throttle-operated microswitch. Check switch rigging in accordance with Section 13.
h. Install induction air duct to elbow at top of control unit.
i. Inspect installation and install cowling.

12A-46. ADJUSTMENTS. (Refer to figure 12A-7.) The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. The idle mixture adjustment is the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. Idle speed and mixture adjustment should be accomplished after the engine has been warmed up. Since idle rpm may be affected by the mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture correctly.

a. Set the throttle stop screw 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.

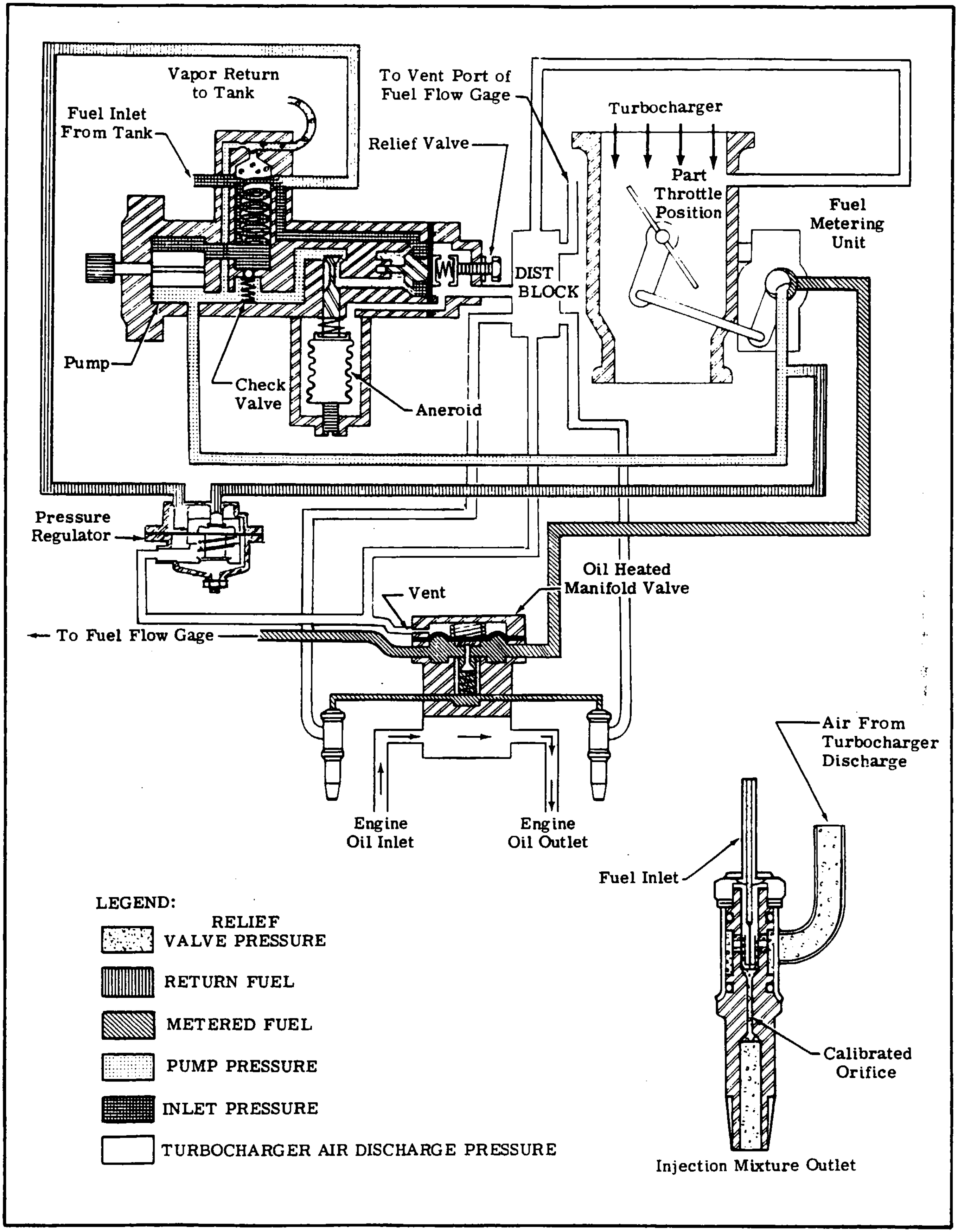


Figure 12A-4. Fuel System Schematic

b. Advance throttle to increase engine speed to 1000 rpm.

c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.

d. Adjust mixture adjusting nut to obtain a slight and momentary gain of 25 to 50 rpm at 1000 rpm engine speed as mixture control is moved from full IN (RICH)-toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.

e. If mixture is set too LEAN, engine speed will drop immediately, thus requiring a richer mixture. Tighten adjusting nut (clockwise) for a richer mixture.

f. If mixture is set too RICH, engine speed will increase above 5 rpm, thus requiring a leaner mixture. Back off adjusting nut (counterclockwise) 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.

12A-47. OIL HEATED FUEL MANIFOLD VALVE (FUEL DISTRIBUTOR).

12A-48. DESCRIPTION. Metered fuel flows to the oil heated fuel manifold valve, which provides a central point for distributing fuel to individual cylinders. An internal diaphragm, operated by fuel pressure, raises or lowers a plunger to open and close individual cylinder supply ports simultaneously. A needle valve in the plunger ensures that the plunger fully opens the outlet ports before fuel flow starts and closes the ports simultaneously for positive engine shutdown. A fine-mesh screen is included in the fuel manifold valve. To heat the fuel manifold valve, engine oil is directed from the LH forward engine oil galley to a lower chamber in manifold valve and routed back to engine through a fitting on oil filler neck.

NOTE

The fuel manifold valves are supplied in two flow ranges. When replacing a valve assembly, be sure the replacement valve has the same suffix letter as the one stamped on the cover of the valve removed.

12A-49. REMOVAL.

NOTE

Cap all disconnected lines, hoses and fittings.

a. Disconnect all fuel and fuel injection lines at fuel manifold.

b. Remove oil inlet and outlet lines at base of fuel manifold.

c. Remove bolts which secure fuel manifold and remove manifold.

12A-50. CLEANING.

a. Remove manifold valve from engine in accordance with paragraph 12A-49 and remove safety-wire from cover attaching screws.

b. Hold the top cover down against internal spring until all four cover attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below cover.

c. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

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

CAUTION

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

d. Using clean gasoline, flush out the chamber below the screen.

e. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.

CAUTION

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

f. Clean diaphragm, valve and top cover in the same manner. Be sure the vent hole in the top cover is open and clean.

g. Carefully replace diaphragm and valve. Check that valve works freely in body bore.

h. Position diaphragm so that horizontal hole in plunger valve is 90 degrees from the fuel inlet port in the valve body.

i. Place upper spring in position on diaphragm.

j. Place cover in position so that vent hole in cover is 90 degrees from inlet port in valve body. Install cover attaching screws and tighten to 20±1 lb-in. Install safety wire on cover screws.

k. Install fuel manifold valve assembly on engine in accordance with paragraph 12A-51 and reconnect all lines and hoses to valve.

l. Inspect installation and install cowling.

12A-51. INSTALLATION.

a. Secure fuel manifold to crankcase with two crankcase bolts.

b. Install oil inlet and outlet hoses at base of fuel manifold.

c. Connect the fuel lines and the six fuel injection lines. Inspect completed installation and install cowling.

12A-52. FUEL DISCHARGE NOZZLES.

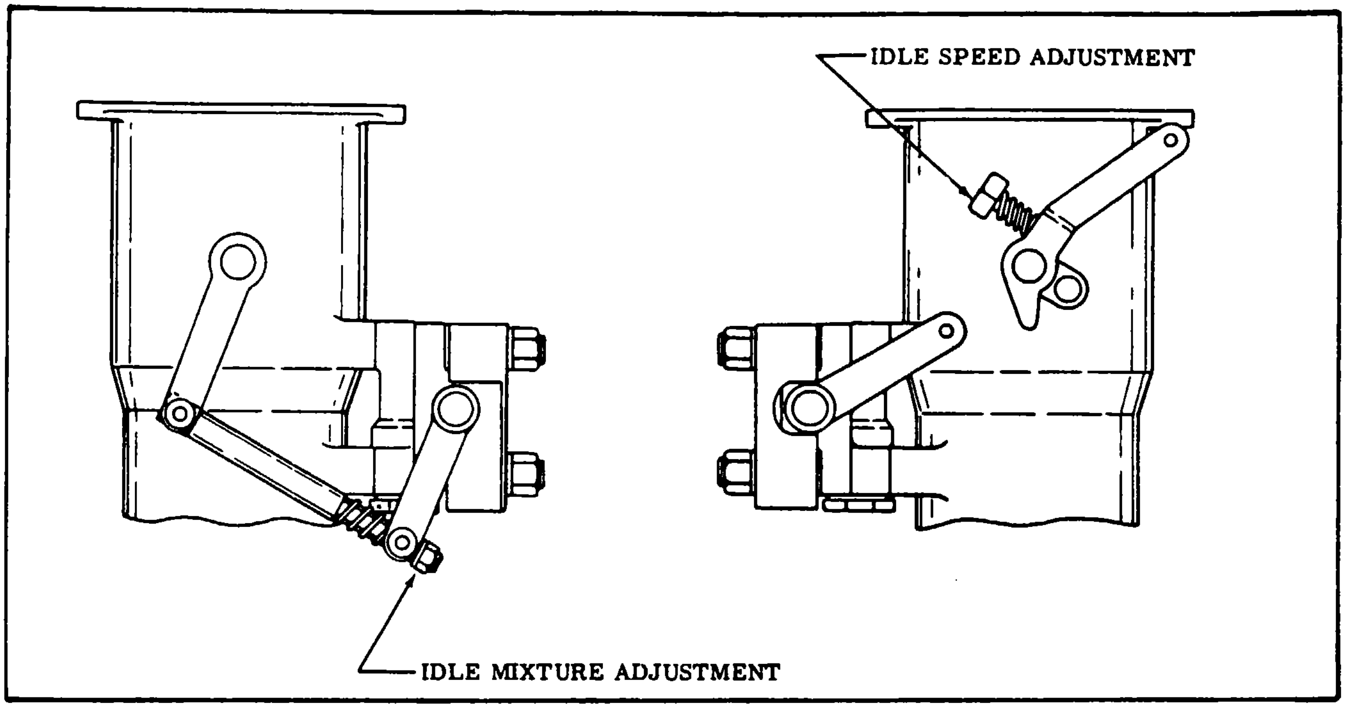


Figure 12A-5. Idle Speed and Idle Mixture Adjustment

12A-53. **DESCRIPTION. From the fuel manifold valve, individual, identical size and length fuel lines** carry metered fuel to the fuel discharge nozzles located in the cylinder heads. The outlet of each nozzle is directed into the intake port of each cylinder. An air bleed and nozzle pressurization arrangement is incorporated in each nozzle to aid in vaporization of the fuel. The nozzles are calibrated in several ranges. All nozzles furnished for one engine are of the same calibrated range and are identified by a number and suffix letter stamped on the flat portion of the nozzle body. When replacing a fuel discharge nozzle, be sure that it is of the same calibrated range as the rest of the nozzles in that engine. When a complete set of nozzles is being replaced, the number must be the same as the one removed but the suffix letter may be different, as long as they are the same for all nozzles being installed in a particular engine.

12A-54. **REMOVAL.**

a. **Remove engine cowling in accordance paragraph 12A-3.**

NOTE

Plug or cap all disconnected lines and fittings.

b. Disconnect nozzle pressurization line at nozzles and disconnect pressurization line at "tee" fitting so that pressurization line may be moved away from discharge nozzles.

c. Disconnect fuel injection line at fuel discharge nozzle.

d. Using care to prevent damage or loss of washers and O-rings, lift sleeve assembly from fuel discharge nozzle.

e. Using a standard 1/2-inch deep socket, remove fuel discharge nozzle from cylinder.

12A-55. **CLEANING AND INSPECTION. To clean nozzles, immerse in clean solvent and use compress**ed air to dry them. When cleaning, direct air through the nozzle in the direction opposite of normal fuel flow. Do not remove the nozzle shield or distort it in any way. Do not use a wire or other metal object to clean the orifice or metering jet. After cleaning, check the shield height from the hex portion of the nozzle. The bottom of the shield should be approximately 1/16 inch above the hex portion of the nozzle.

12A-56. **INSTALLATION.**

a. Using a standard 1/2-inch deep socket, install nozzle body in cylinder and tighten to a torque value of 60-80 lb-in.

b. Install O-rings, sleeve assembly and washers.

c. Align sleeve assembly and connect pressurization line to nozzles. Connect pressurization line to "tee" fitting.

d. Install O-ring and washer at top of discharge nozzle and connect fuel injection line to nozzle.

e. Inspect installation for crimped lines and loose fittings.

f. Inspect nozzle pressurization vent system for leakage. A tight system is required, since turbocharger discharge pressure is applied to various other components of the injection system.

g. Install cowling

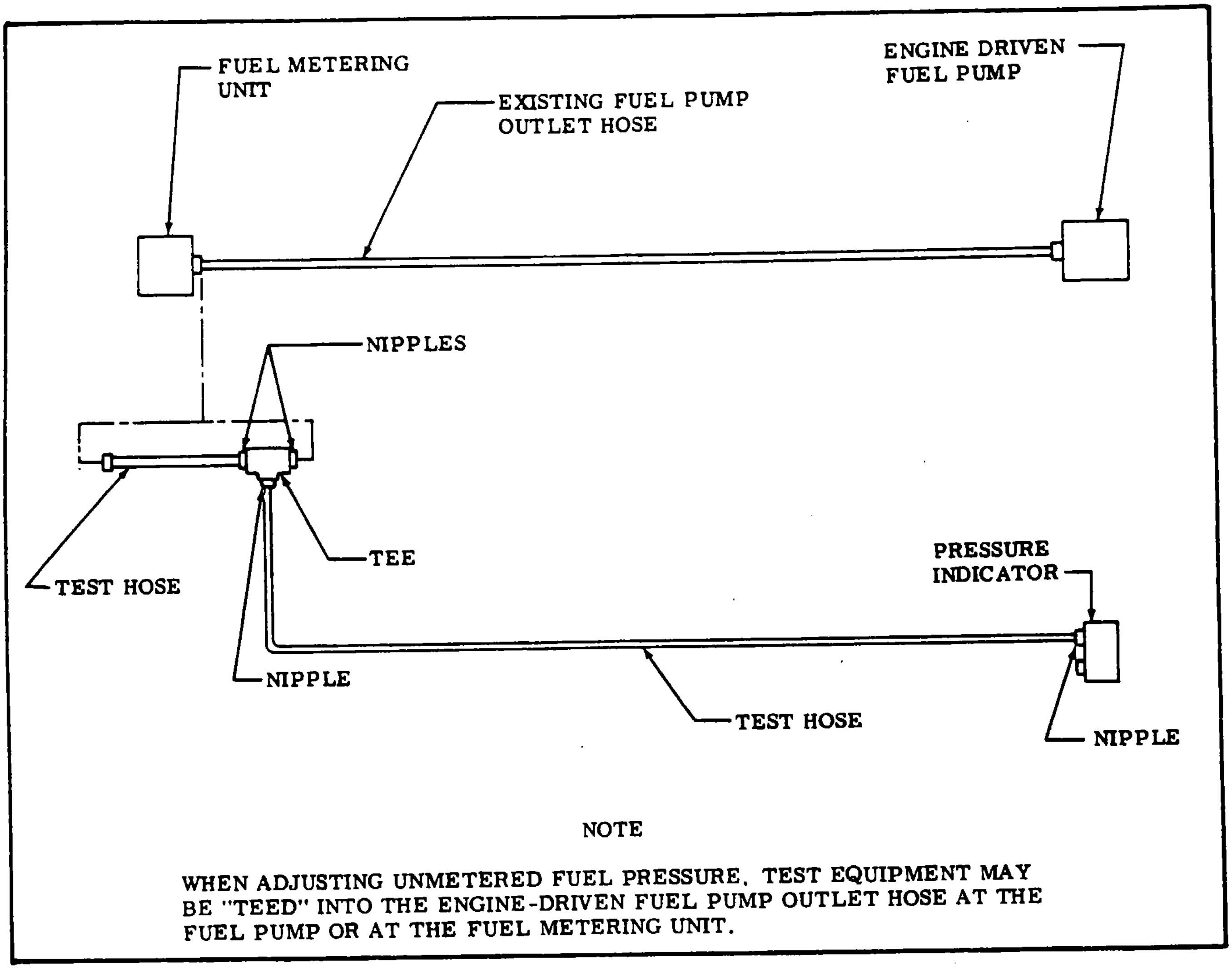


Figure 12A-6. Fuel Injection Pump Adjustment Test Harness

12A-57. FUEL INJECTION PUMP.

12A-58. DESCRIPTION. The fuel pump is a positive displacement, rotating vane type. It has a splined shaft for connection to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the pump vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line where it is returned to the fuel tank. Since the pump is engine-driven changes in engine speed affect total pump flow proportionally. A check valve allows the auxiliary fuel pump pressure to bypass the engine-driven pump for starting, or in the event of engine-driven fuel pump failure in flight. The pump supplies more fuel than is required by the engine; therefore, a relief valve is provided to maintain a constant fuel pump pressure. The engine-driven fuel pump is equipped with an aneroid. The aneroid and relief valve are pressurized from the discharge side of the turbocharger compressor to maintain a proper fuel/air ratio at altitude. The aneroid is adjustable for fuel pump outlet pressure at full throttle and the relief valve is adjustable for fuel pump outlet pressure at idle.

12A-59. REMOVAL.

a. Place fuel selector valve handle in OFF position.
b. Remove engine cowling in accordance with paragraph 12-3.
c. Remove alternator and left rear intake elbow.
d. Hoist engine far enough to remove weight from engine mount and remove left rear engine mount leg, shock-mount and alternator bracket.
e. Remove flexible duct and shroud, removing fuel lines and fittings as necessary. Tag each fitting and line for identification and cap or seal to prevent entry of foreign material. Flanges of shroud may be straightened to facilitate removal and installation, but must be re-formed after installation. Note angular position of fittings before removal.
f. Remove nuts and washers attaching fuel pump to engine and pull pump aft to remove. Remove thin gasket.
g. Place temporary cover on pump mounting pad.

12A-60. INSTALLATION.

a. Install and align any fittings removed after pump removal.

b. Using new thin gasket, install pump with aneroid chamber down.

c. Install cooling shroud and remainder of fittings, bending flanges of shroud to their original positions and aligning fittings as noted during removal.

d. Connect all fuel lines and shroud flexible duct.

e. Install alternator bracket, shock-mount and engine mount leg. Remove hoist, then adjust alternator drive belt tension. Refer to Section 17.

f. Install intake elbow.

g. Start engine and perform an operational check, adjusting fuel pump if required.

h. Install cowling.

12A-61. ADJUSTMENT. Adjustments of the fuel injection pump require special equipment and procedures. Adjustment to the aneroid applies only to the full throttle setting. Adjustment of the idle position is obtained through the relief valve. To adjust the pump to the pressures specified in paragraph 12-12, proceed as follows:

a. Remove engine cowling in accordance with paragraph 12A-3.

b. Disconnect the existing engine-driven fuel pump pressure hose at the fuel metering unit or fuel limiter unit and connect the test gage pressure hose and fittings into fuel injection system as shown in figure 12A-7. Gage MUST be vented to atmosphere.

NOTE

Cessna Service Kit No. SK320-2K provides a test gage, line and fittings for connecting the test gage into the system to perform accurate calibration of the engine-driven fuel pump.

c. The test gage MUST be held as near to the level of the engine driven fuel pump as possible. Bleed air from test gage line prior to taking readings.

NOTE

The test gage should be checked for accuracy at least every 90 days or anytime an error is suspected. The tachometer accuracy should also be determined prior to making any adjustments to the pump.

d. Disconnect line from the return (center) port of fuel flow limiter, plug line and cap port. See figure 12A-7.

CAUTION

Do not plug side port (inlet) of pressure limiter or limiter may be damaged during adjustment.

e. Start engine, warm up and run until oil temperature reads 40% to 70% in the green arc range. Oil cooler inlet may have to be partially blocked in cold weather. Set mixture control to full rich position and propeller control full forward (low pitch, high RPM).

f. Adjust engine idle speed to 600 ± 25 rpm and check test gage for 5.5 - 6.5 PSI. Refer to figure 12A-7.

NOTE

Do not adjust idle mixture until idle pump pressure is obtained.

DO NOT make fuel pump pressure adjustments while engine is operating.

g. If the pump pressure is not 5.5 - 6.5 PSI, stop engine and turn the pump relief valve adjustment, on the centerline of the fuel pump clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

h. Maintaining idle pump pressure and idle RPM, obtain correct idle mixture in accordance with paragraph 12A-46.

i. Completion of the preceding steps have provided:

1. Correct idle pump pressure.
2. Correct fuel flow.
3. Correct fuel metering cam to throttle plate orientation.

j. Advance to full throttle and maximum rated engine speed (propeller control full forward) with the mixture control in the full rich position and verify that maximum limit manifold pressure (37.0 +0-.5) is indicated. If manifold pressure is incorrect or static RPM is not at least 2650 RPM (or 2625 with prop de-ice boots), refer to paragraphs 12A-16.

k. Retard the propeller control to obtain 2600 ± 25 RPM stabilized.

l. Check ships fuel flow gage for 210 - 220 PPH. If fuel flow is incorrect, stop engine and adjust flow by loosening locknut and turning the adjusting screw located at the aneroid counterclockwise (CCW) to increase flow or clockwise (CW) to decrease flow. When fuel flow is correct, verify unmetered pressure is within the limits specified in paragraph 12A-12.

m. After correct pressures are obtained, shut down engine and tighten locknut on fuel pump adjustment screw.

n. Reconnect line to return (center) port of fuel flow limiter.

o. Start engine and advance to full throttle with mixture control full rich and the propeller control full forward. Check the ships fuel flow gage for 220 - 225 PPH. If fuel flow is incorrect, shut down the engine and adjust fuel flow setscrew on fuel flow limiter (clockwise (CW) to increase, counterclockwise (CCW) to decrease to obtain proper fuel flow.

p. Remove test equipment, run engine, check for leaks and install cowling.

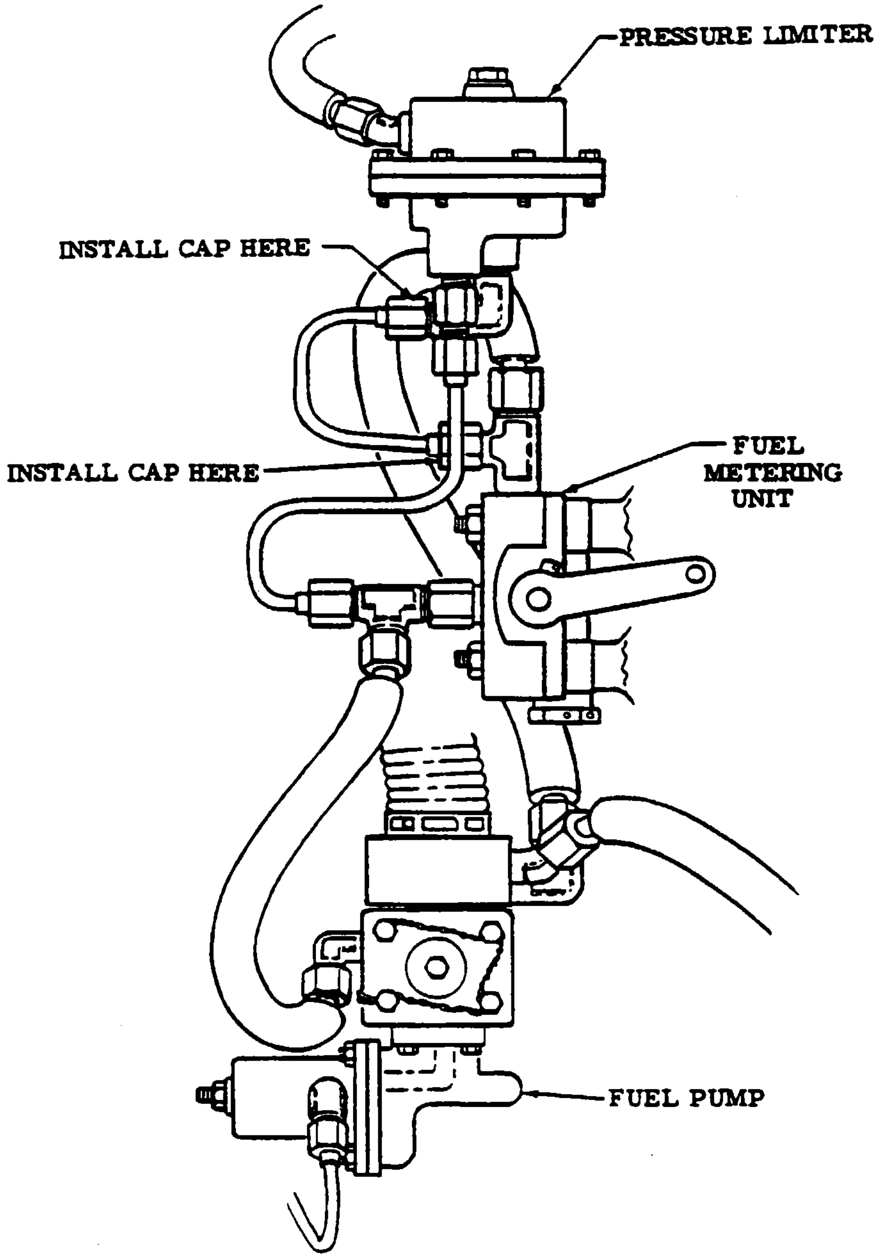


Figure 12A-7. Fuel Injection Pump Adjustment/Test

12A-62. INDUCTION AIR SYSTEM.

12A-63. DESCRIPTION. Ram air to the engine enters an induction air duct thru a port in lower right cowl. The air is filtered through a dry filter, located in the induction airbox. From the filter, the air passes through a flexible duct to the inlet of the turbocharger compressor. The pressurized air is then routed through a duct thru the intercooler to the fuel-air control unit mounted behind the engine and is then supplied to the cylinders through the intake manifold piping. The fuel-air control unit is connected to the cylinder intake manifold by elbows, hoses and clamps. The intake manifold is attached to each cylinder by four bolts through a welded flange, which is sealed by a gasket. A balance tube passes around the front side of the engine to complete the manifold assembly. An alternate air door, mounted in the duct between the filter and the turbocharger compressor, is held closed by a spring. If the induction air filter should become clogged, suction from the turbocharger compressor will open the door permitting the compressor to draw ambient air through the louvered opening immediately aft of the main induction air scoop. The alternate air door should be checked periodically for freedom of operation and complete closing. The induction air filter should be removed and cleaned at each 50-hour inspection, more often when opera ing under dusty conditions, refer to Section 2.

12A-64. AIRBOX. Refer to figure 12A-8.

12A-65. REMOVAL AND INSTALLATION.

a. Remove right hand upper cowl by releasing the quick-release fasteners attaching cowling to the fuselage and at the parting surfaces of the left and right segments.

b. Loosen clamp holding flex duct to turbocharger comperssor, and disconnect flex duct.

c. Disconnect control rods from cowl flaps.

d. Remove screws securing lower right cowl to fuselage and lower engine nacelle.

e. Remove lower left cowl and air box will come off as it is attached to the cowl.

f. Reverse the preceding steps for installation.

12A-66. CLEANING AND INSPECTION. Clean metal parts of 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 alternate spring-loaded door for freedom of operation and complete closing.

12A-67. INDUCTION AIR FILTER. Refer to figure 12A-8.

12A-68. DESCRIPTION. An induction air filter, located in the center of the airbox removes dust particles from the ram air entering the engine.

12A-69. REMOVAL AND INSTALLATION.

a. Remove right half of engine cowling in accordance with paragraph 12A-3.

b. Remove the two wing nuts securing the filter retainer in place.

c. Remove filter retainer and remove air filter.

d. Reverse the preceding steps for reinstallation.

12A-69A. INSTALLATION OF INLET DUCTS. When cutting duct assembly to length, 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 bond between wire and fabric. Before tightening clamps, make sure there is no twist or torque on hose. If hose is wrapped with MIL-Y-1140 cord in place of wire support, the same installation procedure applies except; MIL-Y-1140 has no minimum bend radius requirement.

The minimum installed bend radius for wire supported hose in the plane of bend is as follows:

1. Neoprene, one ply hose - 1/4 diameter of the maximum hose dimension.

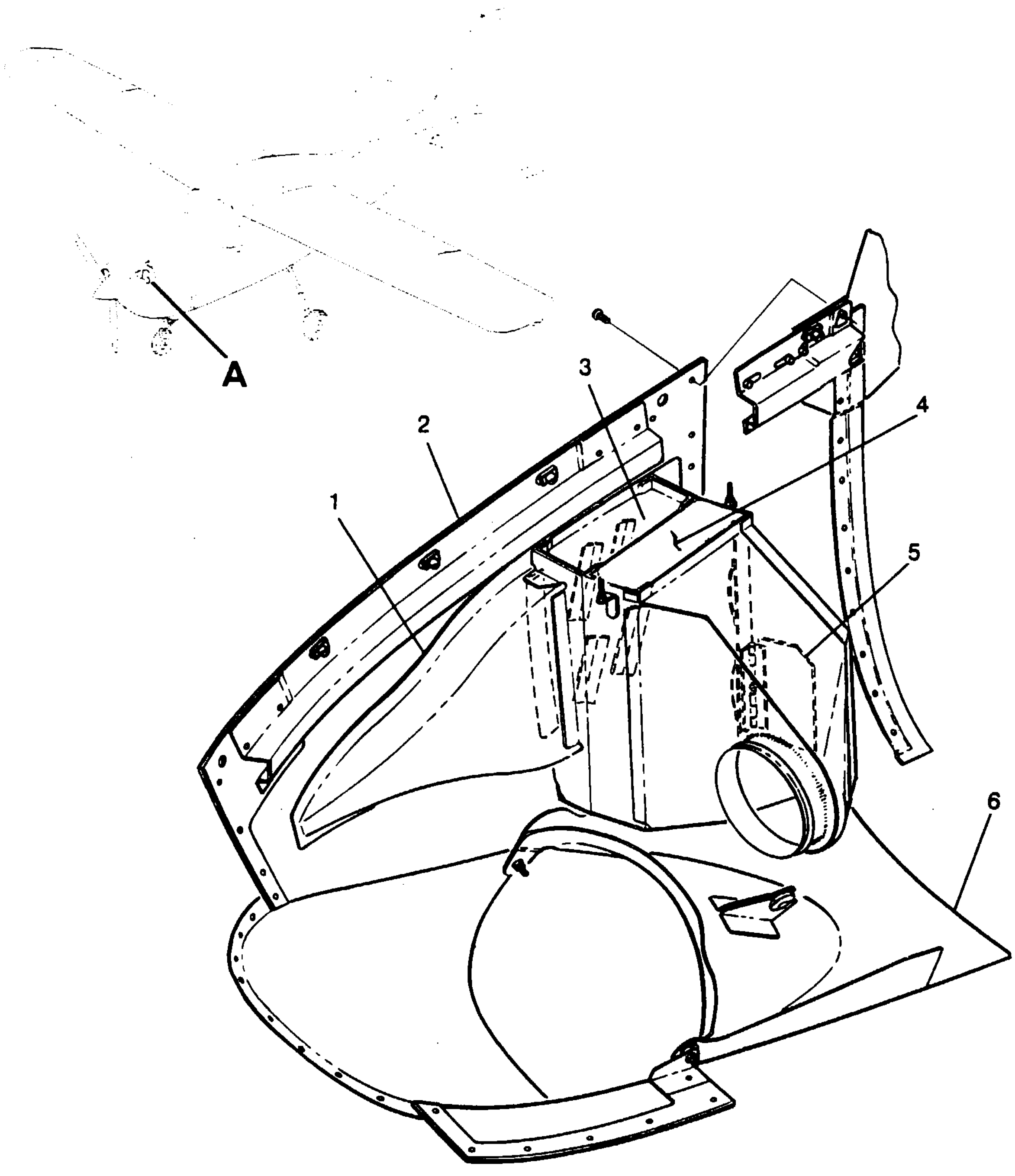
2. Neoprene, two ply hose and silicone, one ply hose - 1/3 diameter of the maximum hose dimension.

3. Silicone, two ply hose - 1/2 diameter of the maximum hose dimension.

12A-70. CLEANING AND INSPECTION. Clean and inspect filter in accordance with Section 2.

12A-71. IGNITION SYSTEM. Refer to figure 12A-10.

12A-72. DESCRIPTION. The ignition system is comprised of two magnetos, 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.



Detail **A**

1. Air Scoop
2. Lower Right Cowl
3. Airbox
4. Air Filter
5. Alternate Air Door
6. Cowl Flap

Figure 12A-8. Airbox Installation

12A-73. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 12A-80.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 12A-80.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.

12A-74. MAGNETOS.

12A-75. DESCRIPTION. The magnetos contain a conventional two-pole rotating magneto (rotor), mounted in ball bearings. Driven by engine through an impulse coupling at one, rotor shaft operates the breaker points at the other end of the shaft. The nylon rotor gear drives a nylon distributor gear which transfers high tension current from the wedge-mounted coil to the proper outlet in the distributor block. A coaxial capacitor is mounted in the distributor block housing to serve as the condenser as well as a radio noise suppressor. Both nylon gears are provided with timing marks for clockwise or counterclockwise rotation. The distributor gear and distributor block have timing marks, visible through the air vent holes, for timing to the engine. A timing hole is provided, located in the distributor block. A timing pin or 6-penny nail can be inserted through this timing hole into the mating hole in the rotor shaft to lock the magneto approximately in the proper firing position. The breaker assembly is accessible only after removing the screws fastening the magneto halves together and disconnecting the capacitor slip terminal. Do not separate magneto halves while it is installed on the engine.

12A-76. PRESSURIZED MAGNETOS. Pressurized air is taken from the throttle body adaptor assembly and directed by a hose, through a filter, to a tee and then to each magneto. The filter material is enclosed in a transparent case, with a flow arrow imprinted on it. The filter should be replaced when the filtering material is dirty.

12A-77. REMOVAL.

a. Remove engine cowling in accordance with paragraph 12A-3.

b. Tag for identification and remove high tension wires from magneto being removed.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Remove the high tension wires from magneto or disconnect spark plug leads from the spark plugs to prevent accidental firing.

c. Disconnect switch wire from condenser terminal at magneto. Tag wire for identification so it may be installed correctly.

d. Rotate propeller in direction of normal rotation until No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate the installation of a replacement magneto, it is good practice to position the crankshaft at the advanced firing angle for No. 1 cylinder during step "d." Any standard timing device or method can be used, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

e. Remove magneto retainer clamps, nuts and washers and pull magneto from crankcase mounting pad.

NOTE

As the magneto is removed from its mounting, be sure that the drive coupling rubber bushing and retainer do not become dislodged from the gear hub and fall into the engine.

12A-78. INTERNAL TIMING.

a. Whenever the gear on the rotor shaft or the cam (which also serves as the key for the gear) has been removed, be sure that the gear and cam are installed so the timing mark on the gear aligns with the "O" etched on the rotor shaft.

b. When replacing breaker assembly or adjusting contact breaker points, place a timing pin (or 0.093 inch 6-penny nail) through the timing hole located in the distributor block and into the mating hole in the rotor shaft. Adjusting contact breaker points so they are just starting to open in this position will give the correct point setting. Temporarily assemble the magneto halves and capacitor slip terminal and use a timing light to check that the timing marks, visibly through the ventilation plug holes are approximately aligned.

NOTE

The side of the magneto with the manufacturer's insignia has a red timing mark and the side opposite to the insignia has a black timing mark viewed through the vent plug holes. The distributor gear also has a red timing mark and a black timing mark. These marks are used for reference only when installing magneto on the engine. Do not place red and black lines together on the same side.

c. Whenever the large distributor gear and rotor gear have been disengaged, they must be engaged with their timing marks aligned for correct rotation. Align the timing mark on the rotor gear with the "RH" on the distributor gear. Care must be taken to keep these two gears meshed in this position until the magneto halves are assembled.

12A-79. INSTALLATION AND TIMING TO ENGINE. The magneto MUST be installed with its timing marks correctly aligned, with number one cylinder on its compression stroke and with number one piston at its advanced firing position. Refer to paragraph 12A-12 for the advanced firing position of number one piston.

WARNING

The magneto is grounded through the ignition switch, therefore, any time the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, remove the high tension wires from the magneto or disconnect all spark plug leads to prevent accidental firing of the engine.

To locate the compression stroke of number one cylinder, remove the lower spark plugs from each cylinder except number one cylinder. Remove the top plug from number one cylinder. Place thumb of one hand over the number one cylinder spark plug hole and rotate the crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is obtained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one cylinder may be obtained by use of a timing disc and pointer, Timrite, protractor and piston locating gage or external engine timing marks alignment.

NOTE

External engine timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the crankshaft is turned in its normal direction of rotation. After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushing into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with the chamfered edges facing toward the front of the engine.

a. Turn the magneto shaft until the timing marks visible through the ventilation plug holes are aligned (red-to-red or black-to-black) and insert a timing pin (or 0.093 inch 6-penny nail) through the timing hole located in the distributor block and into the mating hole in the rotor shaft. This locks the magneto approximately in the firing position while installing on the engine.

NOTE

If the magneto drive gear was disengaged during magneto removal, hold the magneto in the horizontal position it will occupy when installed, make certain that the drive gear coupling slot is aligned with the magneto coupling lugs. If it is not aligned, pull the magneto drive gear out of mesh with its drive gear and rotate it to the aligned angle, then push it back into mesh. DO NOT WITHDRAW THE MAGNETO DRIVE GEAR FROM ITS OIL SEAL.

b. After magneto gasket is in place, position the magneto on the engine and secure, then remove the timing pin from the magneto. Be sure to remove this pin before turning the propeller.
c. Connect a timing light to the capacitor terminal at the front of the magneto and to a good ground.
d. Turn propeller back a few degrees (opposite of normal rotation) to close the contact points.

NOTE

Do not turn the propeller back far enough to engage the impulse coupling or the propeller will have to be turned in normal direction of rotation until the impulse coupling releases, then backed up to slightly before the firing position.

e. Slowly advance the propeller in the normal direction of rotation until the timing light indicates the contact points breaking. Magneto mounting clamps may be loosened so that the magneto may be shifted to break the points at the correct firing position.
f. Tighten magneto mounting nuts and recheck timing.
g. Repeat steps "a" through "f" for the other magneto.
h. After both magnetos have been timed, check synchronization of both magnetos. Magnetos must fire at the same time.
i. Remove timing devices from magneto and engine.
j. Connect spark plug leads to their correct magneto outlets.

NOTE

The No. 1 magneto outlet is the one closest to the ventilation plug on the side of the magneto having the manufacturer's insignia. The magneto fires at each successive outlet in clockwise direction. Connect No. 1 magneto outlet to No. 1 cylinder spark plug lead, No. 2 outlet to the next cylinder to fire etc. Engine firing order is listed in paragraph 12A-12.

k. Connect ignition switch (primary leads to the capacitor terminals on the magnetos.

NOTE

Magneto (primary) lead nut torque range is 13-15 in.-lbs. Exceeding this torque range could result in possible condenser damage.

l. Inspect magneto installation and install engine cowling in accordance with paragraph 12-3.

12A-80. MAINTENANCE. At first 25-hour inspection and at each 100-hour inspection thereafter, the the breaker compartment should be inspected. Magneto-to-engine timing should be check at the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour inspection. Refer to Slick 4200/6200 Series Aircraft Magneto Maintenance and Overhaul Instructions No. 1037C andd all revisions and supplements thereto. If timing is as specified in paragraph 12A-12, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine. In the event magneto internal timing marks are off more than plus or minus five degrees when breaker points open to fire number one cylinder, remove magneto and check magneto internal timing. Whenever magneto halves are separated breaker point assembly should always be checked. As long as internal timing and magneto-to-engine timing are within the preceding tolerances, it is recommended that magneto be checked internally only at 500 hour intervals. It is normal for contact points to burn and cam to wear a comparable amount so magneto will remain in time within itself. This is accomplished by having a good area making contact on the surface between points and correct amount of spring pressure on the cam. The area on the points should be twenty-five percent of the area making contact. The spring pressure at cam should be 10.5 to 12.5 ounces. When contact points burn, area becomes irregular, which is not detrimental to the operation of the points unless metal transfer is too great which will cause the engine to misfire. Figure 12A-9 illustrates good and bad contact points. A small dent will appear on nylon insulator between cam follower and breaker bar. This is normal and does not require replacement.

NOTE

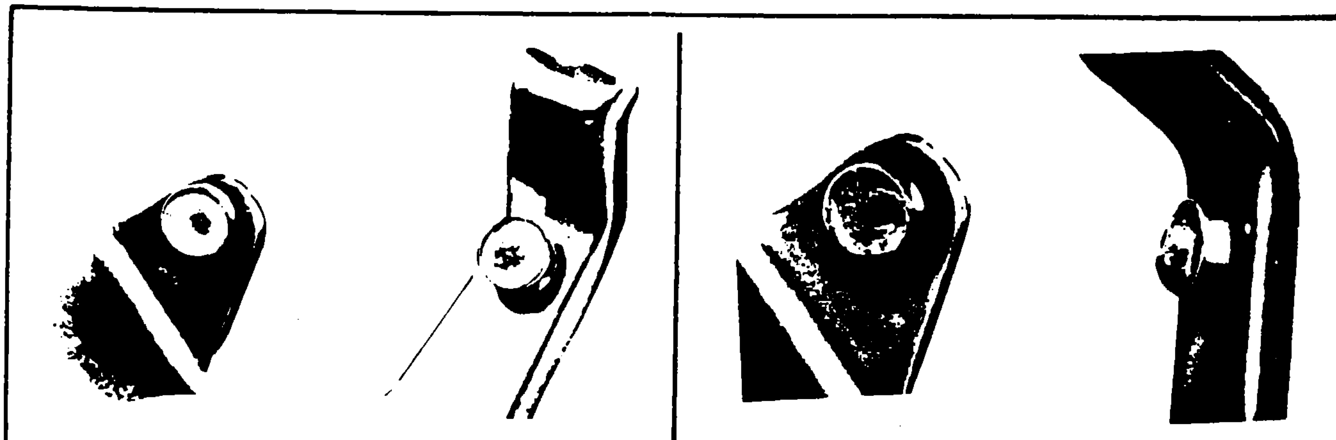
If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble definitely is associated with a magneto, use the following to help disclose the source of trouble without overhauling the magneto.

a. Moisture Check.
1. Remove magneto from engine and remove screws securing the magneto halves together, disconnect capacitor slip terminal and remove distributor. Inspect for moisture.
2. Check distributor gear finger and carbon brush for moisture.
3. Check breaker point assembly for moisture, especially on the surfaces of the breaker points.
4. If any moisture is evident in the preceding places. wipe with a soft. dry. clean, lint-free cloth.

b. Breaker Compartment Check.
1. Check all parts of the breaker point assembly for security.
2. Check breaker point surface for evidence of excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard-finish paper. If breaker point assembly is defective, install a new assembly. Make no attempt to stone or dress the breaker points. Clean new breaker points with clean, unleaded gasoline and hard-finish paper before installing.
3. Check capacitor mounting bracket for cracks or looseness.
4. Check the carbon brush on the distributor fear for excessive wear. The brush must extend a minimum of 1/32 inch beyond the end of the gear shaft. The spring which the carbon brush contacts should be bent out approximately 20 degrees from vertical, since spring pressure on the brush holds the distributor gear shaft against the thrust bearing in the distributor block.
5. Oil the bearings at each end of the distributor gear shaft with a drop of SAE 20 oil. Wipe excess oil from parts.
6. Make sure internal timing is correct and reassemble magneto. Install and properly time magneto to engine.

12-81. MAGNETO CHECK. Advanced timing settings in some cases, is the result of the erroneous practice of bumping magnetos up in timing in order to reduce RPM drop on single ignition. NEVER ADVANCE TIMING BEYOND SPECIFICATIONS IN ORDER TO REDUCE RPM DROP. Too much importance is being attached to RPM drop on single ignition. RPM drop on single ignition is a natural characteristic of dual ignition design. The purpose of the following magneto check is to determine that all the following magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, etc. In fact, absence of RPM drop should be cause for suspicion that the magneto timing has been bumped up and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

a. Start and run engine until the oil and cylinder head temperature is in the normal operating range.
b. Place the propeller control in the full low pitch (high RPM) position.
c. Advance engine speed to 1700 RPM.
d. Turn the ignition switch to the "R" position and note the RPM drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.
e. Turn the switch to the "L" position and note the RPM drop, then return the switch to the "BOTH" position.



THESE CONTACT POINTS ARE USABLE | THESE CONTACT POINTS NEED REPLACEMENT

Figure 12A-9. Magneto Contact Breaker Points

f. The RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. A smooth RPM drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp RPM drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

12A-82. SPARK PLUGS. Two spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug service life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

Refer to Section 2 for inspection intervals. Remove, clean, inspect and regap all spark plugs at these intervals. At this time, 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.

12A-83. ENGINE CONTROLS. (Refer to figure 12A-12.)

12A-84. DESCRIPTION. The throttle, mixture and propeller controls are of the push-pull type. The propeller and mixture controls are equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller and mixture controls also have a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. A "Palnut" type locknut is installed in back of the existing locknut at the engine end of the throttle, mixture and propeller controls.

12A-85. RIGGING. When adjusting any engine control, it is important to check that control slides smoothly throughout its full travel, that it locks securely if equipped with a locking device and arm or lever which it operates moves through its full arc of travel.

CAUTION

Some engine controls have a small retaining ring brazed (or attached with opoxy resin) in a groove .97 inch from the threaded end of the control. The purpose of this retaining ring is to prevent inadvertent withdrawal and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

12A-86. THROTTLE CONTROL.

a. Push throttle control full in, then pull control out approximately 1/8 inch for cushion.

b. Check that throttle control arm is against the mechanical stop. If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while throttle arm is against the mechanical stop.

c. Pull control full out and check that throttle arm contacts the idle stop.

d. The throttle arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

NOTE

Refer to the inspection chart in Section 2 for inspection, lubrication and/or inspection interval.

12A-87. MIXTURE CONTROL.

a. Push mixture control full in, then pull control out approximately 1/8 inch for cushion.

b. Check that mixture control arm is in full rich position (against stop). If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while mixture arm is against the mechanical stop.

c. Pull control full out and check that mixture arm contacts the idle cut-off stop.

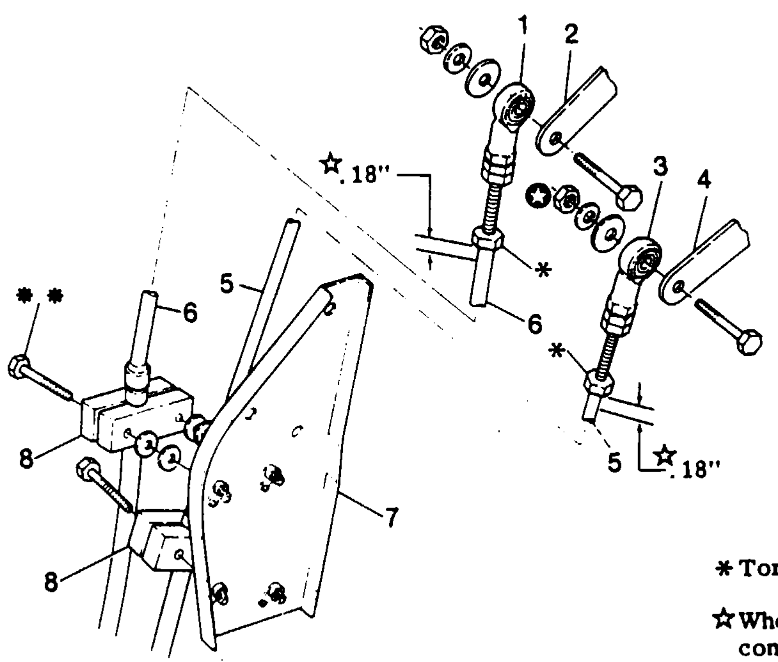
d. The mixture arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

NOTE

Refer to the inspection chart in Section 2 for inspection, lubrication and/or replacement interval.

12A-88. PROPELLER CONTROL. Refer to Section 14.

12A-89. RIGGING THROTTLE-OPERATED MICRO-SWITCH. Refer to Section 13.



* Torque to 15 ± 2 lb-in.

☆ When torqueing nut hold control in this .18 " area only.

* * Torque to 20-25 lb-in.

✪ Install AN356-1032 lock nut behind AN315-3R nuts.

1. Rod End (Throttle Control)
2. Throttle Control Arm
3. Rod End (Mixture Control)
4. Mixture Control Arm
5. Mixture Control
6. Throttle Control
7. Bracket (Typical)
8. Clamp

Safety wire bracket-to-engine mounting bolts to each other.

Figure 12A-10. Engine Controls

12A-90. AUXILIARY ELECTRIC FUEL PUMP, FLOW ADJUSTMENT. Refer to Section 13.

12A-91. LANDING GEAR WARNING HORN. Refer to Section 5.

12A-92. STARTING SYSTEM.

12A-93. DESCRIPTION. The automatically-engaged starting system employs an electrical starter motor mounted to a 90-degree adapter. A solenoid is activated by the ignition switch on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the motor. Initial rotation of the motor engages the starter through an overrunning clutch in the starter adapter, which incorporates worm reduction gears. The starter motor is located just aft of the right rear cylinder.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

12A-94. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity. Install new switch or wires.
	Defective starter motor.	Check electrical power to motor. Repair or replace starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective overrunning clutch or drive.	Check visually. Install new starter adapter.
	Starter motor shaft broken.	Check visually. Install new starter motor.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Check visually. Install new cable.
	Loose or dirty connections.	Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Check visually. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion.	Remove and inspect. Replace starter drive.
	Worn or broken teeth on crankshaft gears.	Check visually. Replace crankshaft gear.

12A-95. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new brushes). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding operations.

12A-96. STARTER MOTOR.

12A-97. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 12A-3.

CAUTION

When disconnecting starter electrical cable, do not permit terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

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

c. Disconnect electrical cable at starter motor.

d. Remove nuts and washers securing motor to starter adapter and remove motor. Refer to engine manufacturer's overhaul manual for adapter removal.

e. Reverse the preceding steps for reinstallation. Install a new O-ring seal on motor, then install motor. Be sure motor drive engages with the adapter drive when installing.

12A-98. EXHAUST SYSTEM. Refer to figure 12A-11.

12A-99. DESCRIPTION. The exhaust system is constructed of Inconel 601 stainless steel. The exhaust system consists of two exhaust stack assemblies, one for the left and one for the right bank of cylin ders. These exhaust stack assemblies are joined together to route the exhaust from all cylinders through the waste-gate or turbine. The three risers on the left bank of cylinders are joined together into a common pipe to form the left stack assembly. The risers on the cylinders are connected to a common pipe to form the right stack assembly. The right stack assembly connects to the left stack assembly at the front of the engine. Mounting pads for the waste-gate and turbine are provided on the right stack assembly. From the exhaust port of the turbine, a tailpipe routes the exhaust overboard through the lower fuselage. The exhaust port of the waste-gate is routed into the tailpipe so the exhaust gas can be expelled from the system when not needed at the turbine. The waste-gate is actuated by the waste-gate actuator which, in turn, is controlled by the waste-gate controller. Also, sleeving is installed on the fuel hose from the engine-driven pump to the fuel metering body and on the hose from the auxiliary fuel pump to the engine-driven pump. This is to prevent excessive heat on these fuel hoses as they route close to the exhaust stack.

12A-100. REMOVAL.

a. Remove engine cowling and right and left nose caps in accordance with paragraph 12-3.

b. Loosen clamp and disconnect flexible duct at aft end of cabin heater shroud on left exhaust stack.

c. Remove two screws securing shroud to support brackets.

d. Remove clamp attaching forward crossover assembly to left exhaust stack assembly.

e. Remove four nuts and washers attaching exhaust pipe to each cylinder and remove left exhaust stack assembly.

f. Remove bolts attaching waste-gate to right exhaust stack assembly.

g. Remove bolts and nuts attaching turbocharger to right exhaust assembly.

h. Remove EGT probe from exhaust collection.

i. Remove clamp attaching forward crossover assembly to right exhaust stack assembly.

j. Remove four nuts and washers attaching exhaust pipe to each cylinder and remove right exhaust stack assembly.

12A-101. INSTALLATION.

NOTE

It is important that the complete exhaust system, including the turbocharger and wastegate, be installed without preloading any section of the exhaust stack assembly.

Before reassembly of the slip joints, clean the mating surfaces with crocus cloth. The mating surfaces should then be lubricated with Fel-Pro, C5A or ON-OFF.

a. Use new gaskets between exhaust stacks and engine cylinders, at each end of waste-gate and between turbocharger and exhaust stack.

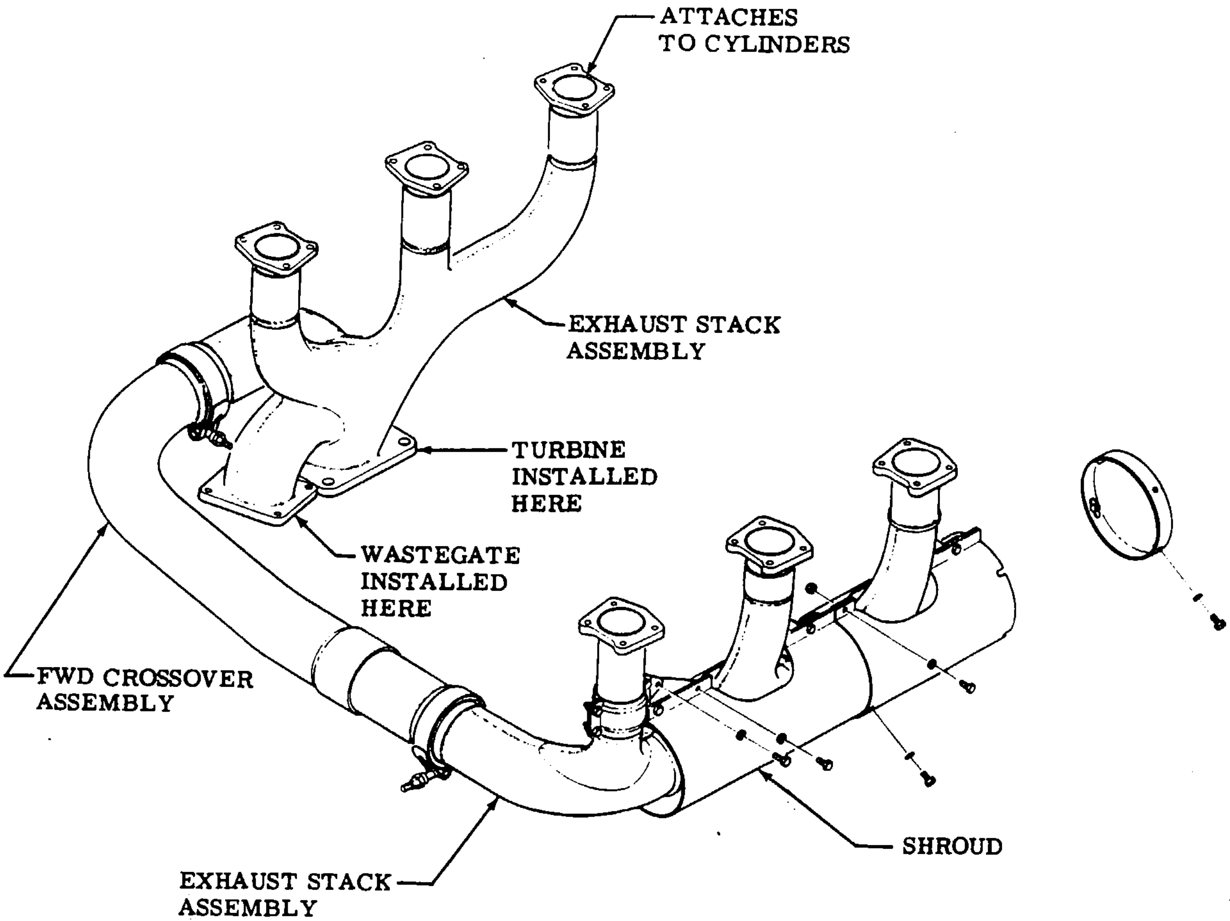


Figure 12A-11. Exhaust System

b. Loosen turbocharger supporting hardware as required to position the right exhaust stack assembly on cylinders.
c. Install washers and nuts securing exhaust stack assembly to cylinder, torque nuts evenly to 100-110 lb-in.
d. Position turbocharger and install bolts and nuts attaching turbocharger to right exhaust stack (figure 12-15). Tighten bolts securely.
e. Install bolts and nuts attaching waste-gate to right exhaust stack assembly and tighten securely.
f. Install forward crossover assembly on right exhaust stack assembly.
g. Install EGT probe in exhaust collector.
h. Position left exhaust stack assembly and secure with washers and nuts, torque evenly 100-110 lb-in.
i. Connect forward crossover assembly to left exhaust stack assembly with clamp.
j. Install two screws securing cabin heater shroud to support brackets.
k. Connect flexible duct to aft end of cabin heater shroud and tighten clamp.
l. Be sure all parts are secure and safetied as required, then perform step "b" of paragraph 12-105 to check for air leaks.
m. Reinstall any parts removed for access, then install nose caps and cowling.

12A-102. **INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general** deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 50 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of optimum turbocharger efficiency and engine power. To inspect the engine exhaust system proceed as follows:
a. Remove engine cowling as required and remove heater shroud so that ALL surfaces of the exhaust assemblies can be visually inspected.

WARNING

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

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

b. After visual inspection, an air pressure test should be made on the exhaust system as follows:
1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

NOTE

The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system and the heat exchanger area may be checked manually by feel, or by using a soap and water solution and watching for bubbles. The exhaust manifold in the heat exchanger area must be free of air leaks. In other areas, forming of bubbles is acceptable; however, if bubbles are blown away system is not acceptable. Also, some bubbles will appear at the joint of the turbocharger turbine and compressor bearing housing.
c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.
1. Remove exhaust stack assemblies.
2. Use rubber expansion plugs to seal openings.
3. Using a manometer or gage, apply approximately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.
d. It is recommended that any components of the exhaust system found defective be replaced before the next flight.
e. After installation of exhaust system components, recheck by performing the air pressure test to make sure that system is acceptable.

12A-103. **TURBOCHARGER.**

NOTE

For additional information covering turbocharger and component maintenance, overhaul and trouble shooting refer to the Manufacturer's Overhaul Manual.

12A-104. **DESCRIPTION. The turbocharger is an exhaust gas-driven compressor, or air pump, which** provides high velocity air to the engine intake manifold. The turbocharger is composed of a turbine wheel, compressor wheel, turbine housing and compressor housing. The turbine, compressor wheel and interconnecting drive shaft comprise one complete assembly and are the only moving parts in the turbocharger. Turbocharger bearings are lubricated with filtered oil supplied from the engine oil system. Engine exhaust gas enters the turbine housing to drive the turbine wheel. The turbine wheel, in turn, drives the compressor wheel, producing a high velocity of air entering the engine induction intake manifold. Exhaust gas is then dumped overboard through the exhaust outlet of the turbine housing and exhaust tailpipe. Air is drawn into the compressor through the induction air filter and is forced out of the compressor housing through a tangential outlet to the intake manifold. The degree of turbocharging is varied bv means of a waste-gate valve, which varies the amount of exhaust gas allowed to bypass the turbine.

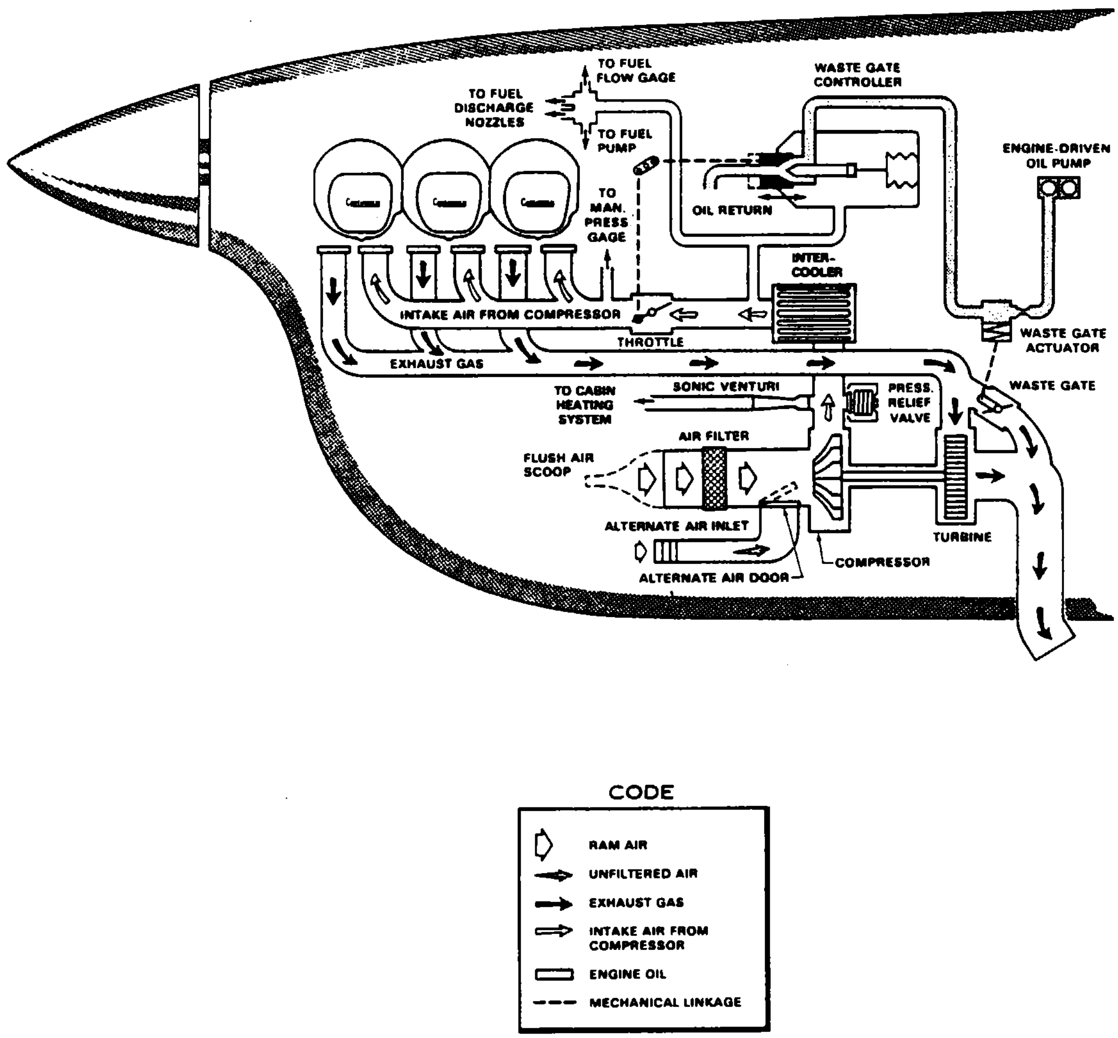


Figure 12A-12. Turbocharger System Schematic

12A-105. REMOVAL, REPLACEMENT AND INSTALLATION. Refer to figure 12A-14. The following procedures should be used in conjunction with the Manufacturer's Overhaul Manual.

a. Remove right-and upper and lower cowling.

CAUTION

Plug or tape all open lines and fittings, to, from, or on the turbocharger.

b. Disconnect drain line from wastegate actuator. Loosen the tailpipe clamp. Remove the tailpipe (7) from the turbine housing (8) and the wastegate assembly.

c. Remove shield (16) and disconnect line assemblies (2) and (10) from adapters (9) and (12).

d. Loosen clamps and remove air inlet and outlet ducts from the turbocharger compressor (11).

e. Remove four bolts (15) attaching turbocharger to exhaust collector (5).

f. Remove two bolts attaching mount bracket (4) to support (6) then remove bolts to remove turbocharger.

g. Remove oil inlet (12) and outlet (9) adapters from turbocharger, discard both gaskets, retain the bolts and washers.

h. Loosen turbine housing bolts (19, a, b, c, and d).

i. Remove bolts (19, a, b and c) and remove support (6).

NOTE

With turbocharger removed check exhaust collector flange for flatness. Flange is to be flat within .005", resurface the exhaust collector flange as required.

j. On the new turbocharger, loosen turbine housing bolts (19, a, b, c and d) and remove bolts (19, a, b and c).

CAUTION

Clamp plates must be installed between turbocharger and support (16). Lock plates (18) must be installed between support (16) and bolt heads (19).

k. Install support (6).

l. Snug bolts (19, a, b, c and d)..

NOTE

DO NOT LOOSEN bolts (19, e and f) so support may be adjusted as required.

DO NOT bend up lock tabs.

m. Remove tape from adapters (9 and 12) and install with new gaskets and retained bolts and washers. Torque bolts to 180-190 inch-pounds and safety.

n. Torque turbine housing bolts (19, a, b, c, d, e, and f) and 220-250 inch-pounds and bend up lock tabs.

o. Reinstall turbocharger by aligning holes in exhaust collector flange (5) with holes in turbine housing (8). Insert bolts (15) making sure two outboard nuts face up. Do not tighten.

p. Insert bolts (3) into clamp blocks and then align two bolt holes in support (6) to mount bracket (4) and insert bolts. Do not tighten.

q. Install tailpipe (7) onto turbine housing (8) and tighten V-band clamp loosely.

r. Torque mount bracket bolts and bolts (3) to 100-140 inch-pounds. Torque exhaust flange bolts (15) to 160-190 inch-pounds. Torque exhaust tailpipe V-band clamp nut to 40-60 inch-pounds.

s. Connect hose assemblies (2) and (10) and install shield (16).

t. Install inlet and outlet ducts and secure with clamps.

u. When installing discharge duct (1) loosen compressor housing V-band clamp enough to allow for proper fit. Secure clamp and torque nut to 40-60 inch-pounds.

NOTE

Be sure all clamps are installed with bolts on outboard side for easier access.

v. Connect drain line to wastegate actuator.

w. Reinstall right-hand upper and lower cowling.

12A-106. VARIABLE CONTROLLER AND WASTEGATE ACTUATOR.

12A-107. FUNCTIONS. The wastegate and variable controller use filtered engine oil for supply power to control turbocharger. The wastegate is used to control engine exhaust flow through the turbine and regulate its speed. Since the exhaust energy is the force that drives the turbocharger unit, the output of the compressor is controlled by bleeding or dumping of excess exhaust energy as needed. The wastegate actuator, which is physically connected to the waste gate by mechanical linkage, controls the position of the wastegate butterfly valve. The butterfly valve position is controlled by the variable controller. Engine oil is supplied to the wastegate actuator through the capillary tube where the pressure of oil determines the position of the valve. The variable controller cam arm is connected to the throttle linkage and controls the output of the compressor discharge pressure.

12A-108. OPERATION. The waste-gate actuator is spring-loaded to position the wastegate to the normally open position when there is not adequate oil pressure in the wastegate actuator power cylinder during engine shut down. When the engine is started. oil pressure is fed into the wastegate actuator power cylinder through the capillary tube. This automatically fills the wastegate actuator power cylinder and lines leading to the controllers, blocking the flow of oil by normally closed metering and/or poppet valves. As oil pressure builds up in the wastegate actuator power cylinder. it overcomes the force of the wastegate open spring. closing the wastegate. When the wastegate begins to close. the exhaust gases are routed through the turbocharger turbine. As the engine increases its power and speed, the increase of temperature and pressure of the exhaust gases causes the turbocharger to rotate faster, raising the turbocharger compressor outlet pressure. As the compressor outlet pressure rises, the aneroid bellows and the absolute pressure controller sense the increase in pressure. When at high engine speed and load and the proper absolute pressure is reached, the force on the aneroid bellows opens the normally closed metering valve. When the oil pressure in the wastegate actuator power cylinder is lowered sufficiently, the wastegate actuator open spring forces the mechanical linkage to open the wastegate. A portion of the exhaust gases then bypasses the turbocharger turbine, thus preventing further increase of turbocharger speed and holding the compressor discharge absolute pressure to the desired valve. Conversely. at engine idle, the turbocharger runs slowly with low compressor pressure output; therefore, the low pressure applied to aneroid bellows is not sufficient to affect the unseating of the normally closed metering valve. Consequently, engine oil pressure keeps the wastegate closed. The overboost control valve acts as a pressure relief valve and will open to prevent an excessive pressure increase to the throttle body.

NOTE

If wastegate movement is sluggish, apply either Kano Aero Kroil (Kano Laboratories, 1000 S. Thompson Lane, Nashville, Tennessee 37211) or Mouse Milk Penetrating Oil (Worldwide Aircraft Filter Corporation, 1685 Abram Court, San Leandro, California 94577) to both EXTERNAL ends of the wastegate shaft. Actuate until smooth operation is obtained. Remove residue.

CAUTION

The turbocharged engine installation is equipped with a controller system which automatically controls the engine within prescribed manifold pressure limits. Although these automatic controller systems are very reliable and eliminate the need for manual control through constant throttle manipulation, they are not infallible. For instance, such things as rapid throttle manipulation (especially with cold oil), momentary wastegate sticking, air in the oil system of the controller, etc, can cause overboosting.

Consequently, it is still necessary that the pilot observe and be prepared to control the manifold pressure, particularly during takeoff and power changes in flight.

The slight overboosting of manifold pressure beyond established maximums, which is occasionally experienced during initial takeoff roll or during a change to full throttle operation in flight. is not considered detrimental to the engine as long as it is momentary. Momentary overboost is generally in the area of 2 to 4 inches and can usually be controlled by slower throttle movement. No corrective action is required where momentary overboosting corrects itself and is followed by normal engine operation. However, if overboosting of this nature persists, or if the amount of overboost goes as high as 6 inches, the controller and overboost control should be checked for necessary adjustment or replacement of the malfunctioning component.

CAUTION

OVERBOOST EXCEEDING 6 INCHES beyond established maximums is excessive and can result in engine damage. It is recommended that overboosting of this nature be reported to your Cessna Dealer, who will be glad to determine what, if any, corrective action needs to be taken.

12A-109. VARIABLE CONTROLLER ADJUSTMENT. See figure 12A-13.

a. Remove engine cowling for access.

b. Advance throttle to full open position (throttle arm against full open stop, on aft side of throttle body.)

c. With throttle full open, the controller must be spring loaded against high setting stop (6).

d. Adjust linkage if required to obtain .020 to .040 gap and .52 to .57 compressed spring (11) length.

NOTE

Verify that the controller arm is attached firmly to the controller shaft and that the throttle arm is attached firmly to the throttle shaft.

e. HIGH PRESSURE SETTING.

1. For high pressure setting, start engine and warm-up, with oil temperature at the upper third of the green arc, accelerate the engine gradually to maximum power.

CAUTION

Discontinue acceleration if the manifold pressure exceeds 39 inch Hg or if maximum RPM is exceeded. Maximum manifold at full throttle should read 37±.5 inch Hg, if not proceed with the following steps.

WARNING

Engine must NOT be running while making adjustments, for safety.

2. Reduce power to idle, shut down engine.

3. Holding high pressure adjustment screw (2), to prevent change of setting, loosen locknut (1).

NOTE

During adjustment, the fork and pin (7) should move in the direction of the cam arm UP, marking (5), to increase manifold pressure and DN to decrease manifold pressure.

4. Rotate screw (2) counterclockwise to increase manifold pressure and clockwise to decrease manifold pressure. Approximately one complete turn of screw (2) should provide a 1 inch Hg variation of manifold pressure.

5. Repeat adjustments as required to obtain a setting within 37±.5 inch hg, and tighten locknut (1) taking care to hold screw (2) at the proper setting.

f. LOW PRESSURE SETTING AND CAM ANGLE VERIFICATION.

NOTE

Prior to adjusting the controller low pressure stop, install a calibrated manifold pressure gage to read compressor discharge pressure.

1. A tee fitting with one port capped, is installed at the fuel flow gage in the compressor discharge pressure line. Remove the cap and connect the calibrated manifold pressure gage to this tee. The pressure gage may also be connected where the discharge pressure line connects to the distribution block on the engine, located outboard of the left hand accessory pad.

g. ADJUSTMENT PROCEDURE.

1. Start engine and warm-up until oil temperature is at the upper third of green arc.

2. Adjust the propeller control to maintain a constant 2200 RPM.

3. Adjust throttle control to maintain manifold pressure at 29 inch Hg.

4. Compressor discharge pressure should read 32.2±.5.

5. Should adjustment be necessary, shut down engine before making adjustment.

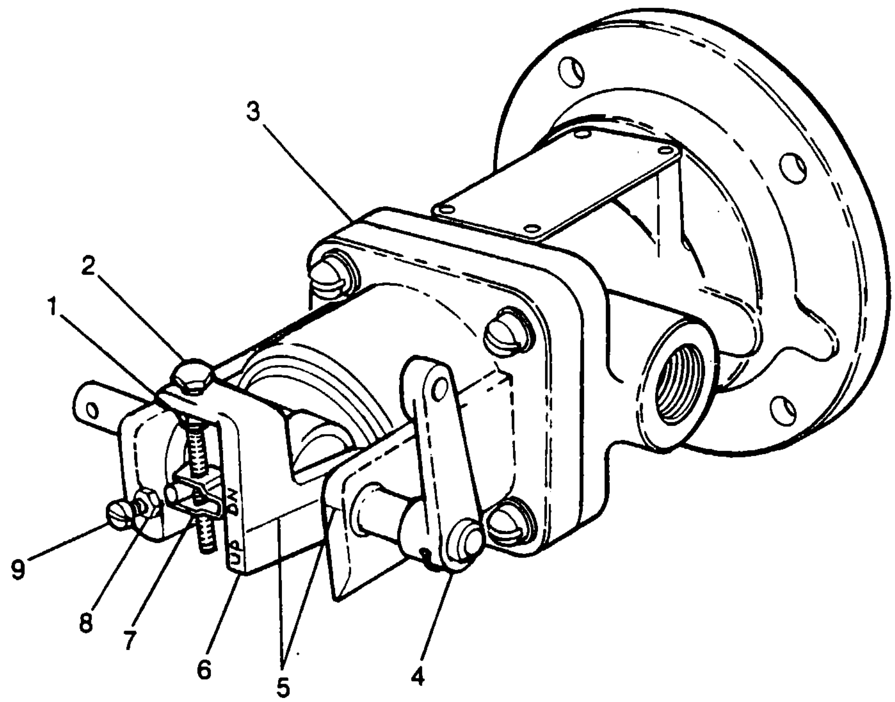
NOTE

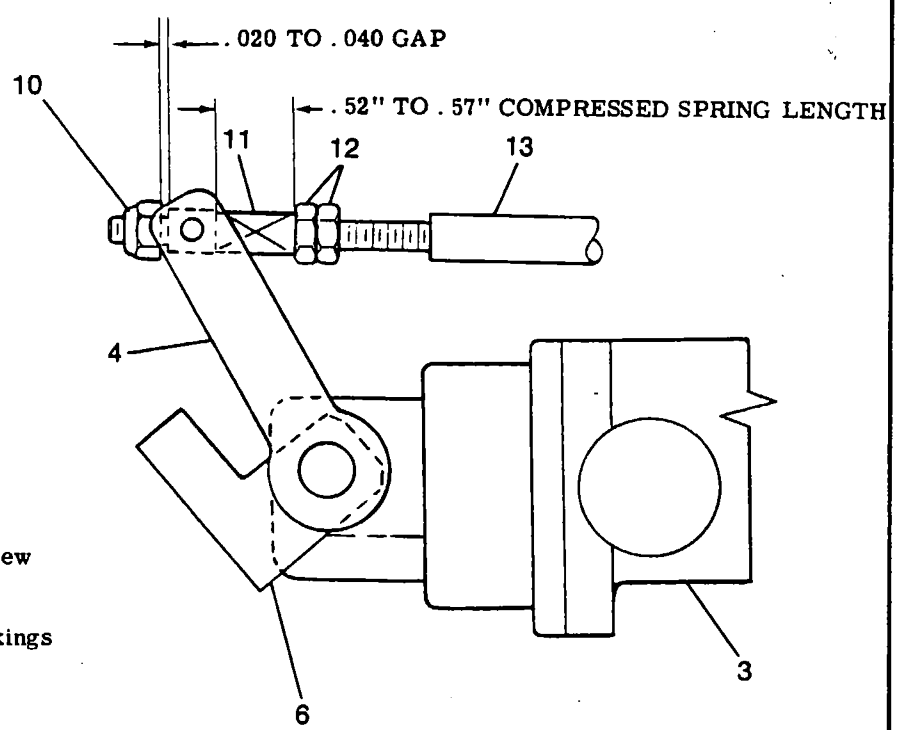
Approximately 1/4th turn of adjustment screw (9) should provide a 1 inch Hg variation of compressor discharge pressure.

6. If pressure is too high, loosen locknut (8) and turn low pressure adjustment screw (9) counterclockwise to decrease pressure. After adjustment tighten locknut (8).

7. If pressure is too low, loosen locknut (8) and turn low pressure adjustment screw (9) clockwise to increase pressure. After adjustment tighten locknut (8).

8. Start engine and repeat steps (1) thru (4).





1. Locknut
2. High Pressure Adjustment Screw
3. Variable Controller
4. Arm
5. Low Pressure Reference Markings
6. High Pressure Setting Stop
7. Fork and Pin Assembly
8. Locknut
9. Low Pressure Adjustment Screw
10. Nut
11. Spring
12. Jamnuts
13. Control

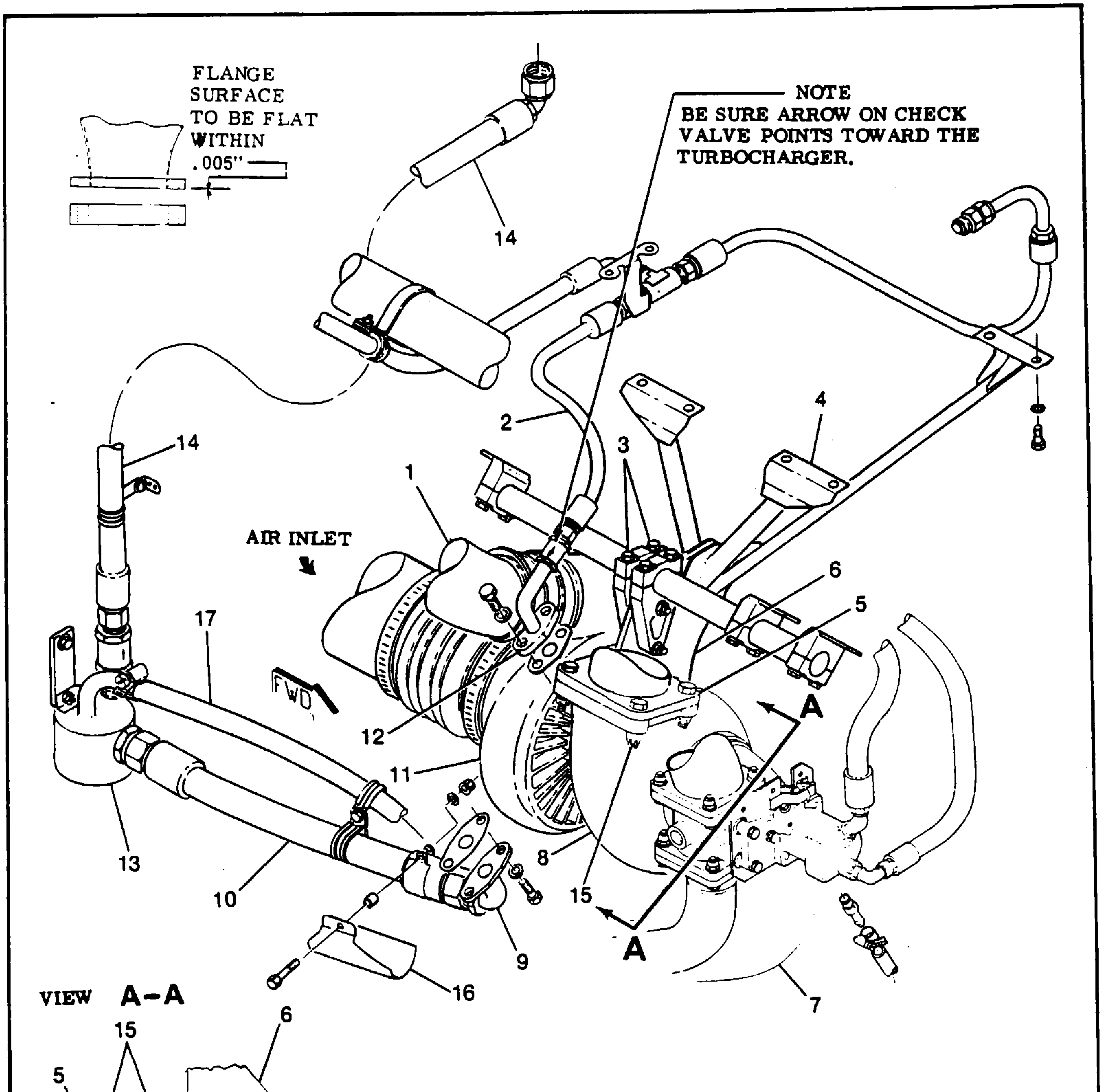
Figure 12A-13. Variable Controller Adjustment

12A-110. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
UNABLE TO GET RATED POWER BECAUSE MANIFOLD PRESSURE IS LOW.	Controller not getting enough oil pressure to close the wastegate.	Check oil pump outlet pressure, oil filter and external lines for obstructions. Clean lines and replace if defective. Replace oil filter.
	Controller out of adjustment or defective	**Refer to paragraph 12A-109. Replace controller if defective.**
	Defective actuator.	**Refer to paragraph 12A-114. Replace actuator if defective.**
	Leak in exhaust system.	Check for cracks and other obvious defects. Replace defective components. Tighten clamps and connections.
	Leak in intake system.	Check for cracks and loose connections. Replace defective components. Tighten all clamps and connections.
ENGINE SURGES OR SMOKES.	Defective controller.	**Refer to paragraph 12A-109. Replace if not adjustable.**
	Wastegate actuator linkage binding.	**Refer to paragraph 12A-114.**
	Wastegate actuator leaking oil.	Replace actuator.
TURBOCHARGER NOISY WITH PLENTY OF POWER.	Turbocharger overspeeding from defective or improperly adjusted controller.	**Refer to paragraph 12A-109. Replace if defective.**
	Wastegate sticking closed.	**Correct cause of sticking. Refer to paragraph 12A-114. Replace defective parts.**
	Controller drain line (oil return to engine sump) obstructed.	Clean line. Replace if defective.
ENGINE POWER INCREASES SLOWLY OR SEVERE MANIFOLD PRESSURE FLUCTUATIONS WHEN THROTTLE IS ADVANCED RAPIDLY.	Overboost control valve out of adjustment or defective.	Replace if defective.
	Wastegate operation is sluggish.	**Refer to paragraph 12A-114. Replace if defective. Correct cause of sluggish operation.**
ENGINE POWER INCREASES RAPIDLY AND MANIFOLD PRESSURE OVERBOOSTS WHEN THROTTLE IS ADVANCED RAPIDLY.	Overboost control valve out of adjustment or defective.	Replace if defective.
	Wastegate operation is sluggish.	**Refer to paragraph 12A-114. Replace if defective. Correct cause of sluggish operation.**

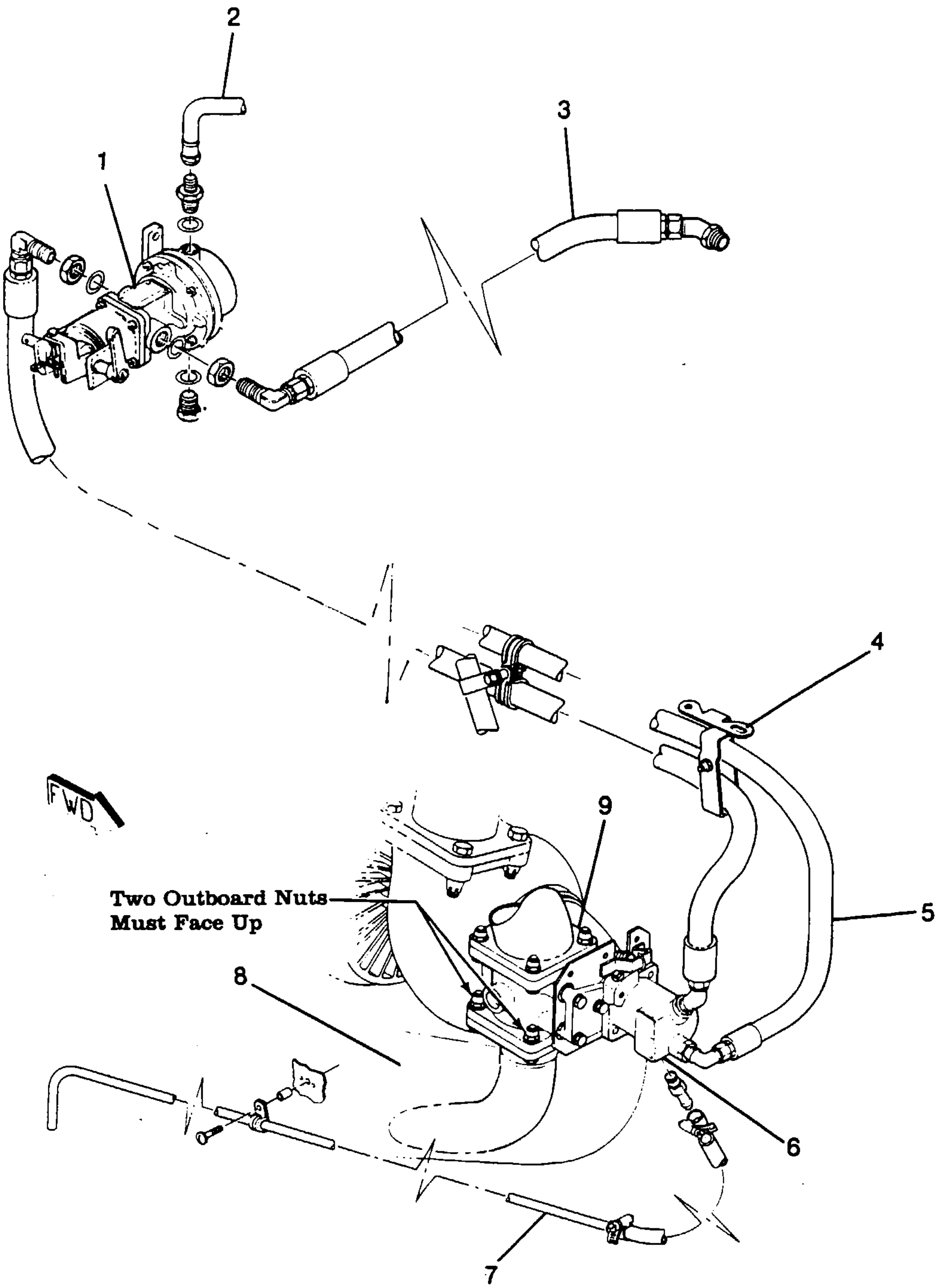
12A-110. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FUEL PRESSURE DECREASES DURING CLIMB, WHILE MANIFOLD PRESSURE REMAINS CONSTANT.	Compressor discharge pressure line to fuel pump aneroid restricted.	Check and clean out restrictions.
	Leaking or other wise defective engine-driven fuel pump aneroid.	Replace engine-driven fuel pump.
MANIFOLD PRESSURE DECREASES DURING CLIMB AT ALTITUDES BELOW NORMAL FULL THROTTLE CRITICAL ALTITUDE, OR POOR TURBOCHARGER PERFORMANCE INDICATED BY CRUISE RPM FOR CLOSED WASTEGATE. (Refer to paragraph 12A-108 and 12A-111.)	Leak in intake system.	Check for cracks and other obvious defects. Tighten all hose clamps and fittings. Replace defective components.
	Leak in exhaust system.	Check for cracks and other obvious defects. Tighten all clamps and fittings. Replace defective components.
	Leak in compressor discharge pressure line to controller.	Check for cracks and other obvious defects. Tighten all clamps and fittings. Replace defective components.
	Controller seal leaking.	Replace controller.
	Wastegate actuator leaking oil.	Replace actuator.
	Wastegate butterfly - closed gap is excessive.	**Refer to paragraph 12A-114.**
	Intake air filter obstructed.	Service air filter. Refer to Section 2 for servicing instructions.
FUEL FLOW DOES NOT DECREASE AS MANIFOLD PRESSURE DECREASES AT PART-THROTTLE CRITICAL ALTITUDE.	Defective engine-driven fuel pump aneroid mechanism.	Replace engine-driven fuel pump.
	Obstruction or leak in compressor discharge pressure line to engine-driven fuel pump.	Check for leaks or obstruction. Clean out lines and tighten all connections.
FUEL FLOW INDICATOR DOES NOT REGISTER CHANGE IN POWER SETTINGS AT HIGH ALTITUDES.	Moisture freezing in indicator line.	Disconnect lines, thaw ice and clean out lines.
SUDDEN POWER DECREASE ACCOMPANIED BY LOUD NOISE OF RUSHING AIR.	Intake system air leak from hose becoming detached.	Check hose condition. Install hose and hose clamp securely.
MANIFOLD PRESSURE GAGE INDICATION WILL NOT REMAIN STEADY AT CONSTANT POWER SETTINGS.	Defective controller.	Replace controller.
	Wastegate operation is sluggish.	**Refer to paragraph 12A-114. Replace if defective. Correct cause of sluggish operation.**



1. Compressor Discharge Duct
2. Oil Inlet Hose
3. Mount Bracket Bolts
4. Mount Bracket
5. Exhaust Collector Flange
6. Turbocharger Suppport
7. Tailpipe
8. Turbine Housing
9. Oil Outlet Adapter
10. Oil Outlet Hose
11. Compressor Housing
12. Oil Inlet Adapter
13. Oil Reservoir
14. Oil Return Hose
15. Bolts
16. Shield
17. Reservoir Vent Hose
18. Lockplate
19. Turbine Housing Bolts

Figure 12A-14. Turbocharger Installation



1. Controller
2. Line (to fuel injection air)
3. Line (return to engine sump)
4. Support Assembly
5. Line (from engine oil sump)
6. Wastegate Actuator
7. Drain Line
8. Tailpipe
9. Wastegate

12A-15. Controller and Wastegate Installation

12A-111. CONTROLLER, FUEL FLOW AND TURBOCHARGER OPERATIONAL FLIGHT CHECK. The following procedure details the method of the checking the operation of the variable controller, overboost valve and a performance check of the turbocharger.

(1) TAKE-OFF - VARIABLE CONTROLLER FULL THROTTLE CHECK.
- a. Cowl Flaps - Open.
- b. Airspeed - 110-120 KIAS.
- c. Oil Temperature - Middle of green arc.
- d. Engine Speed - 2700 ±25 RPM.
- e. Fuel Flow (Full Rich Mixture) 220 to 225 LBS/HR.
- f. Full Throttle M.P. - Controller should maintain 37.0 -0, +.5

Climb 2000 feet after take-off to be sure manifold pressure has stabilized.

(2) NORMAL POWER CLIMBS, FULL RICH FUEL FLOW CHECKS. (Conduct immediately after Item 1 check).
- a. Cowl Flaps - Open.
- b. Airspeed - 110-120 KIAS.
- c. Engine Speed - 2500 RPM.
- d. M. P. - 37 and 30 in. Hg.
- e. Fuel Flow (Full Rich Mixture - MINIMUM of 195 and 145 PPH, respectively.

(3) NORMAL CLIMB - VARIABLE CONTROLLER STABILITY CHECK.
- a. Cowl Flaps - Open.
- b. Airspeed - 110-120 KIAS.
- c. Engine Speed - 2500 RPM.
- d. Fuel Flow - Adjust mixture for 140 LBS/HR.
- e. Part-Throttle M. P. - 30.0 in. Hg.
- f. Climb to 10,000 feet - Check during climb.

Once the normal climb power setting is established after take-off, the controller should maintain a steady manifold pressure of no more than 0.75 in. Hg. M. P. rise up to 10,000 feet.

(4) CRUISE - VARIABLE CONTROLLER LOW SETTING CHECK.
- a. Cowl Flaps - Closed.
- b. Airspeed - Level Flight.
- c. Pressure Altitude - 10,000 Feet.
- d. Engine Speed - 2500 RPM.
- e. Part Throttle M. P. - 30 and 26 in. Hg.
- f. Fuel Flow - Lean to 140 and 115 PPH, respectively.
- g. Deck Pressure - 33.5 ±0.5 and 33.0 ±0.5 in. Hg. respectively.

NOTE

A calibrated manifold pressure gage will be required to be installed in the airplane to read turbocharger discharge (deck) pressure. The gage will be attached to the tee fitting on the back of the fuel flow gage.

(5) CRUISE-VARIABLE CONTROLLER AND TURBOCHARGER PERFORMANCE CHECK.
- a. Cowl Flaps - Closed.
- b. Airspeed - Level Flight.
- c. Pressure Altitude - 17,000 Feet.
- d. Engine Speed - 2700 RPM.
- e. Part-Throttle M. P. - 30 in. Hg.
- f. Fuel Flow - Lean to 164 LBS/Hr.
- g. Propeller Control -
  - (1) Slowly decrease RPM until manifold pressure starts to drop, indicating wastegate is closed.

NOTE

If the wastegate closes at engine speeds lower than shown on the chart in figure 12A-16, the turbocharger performance is normal. If the wastegate closes at engine speeds higher than shown in figure 12A-16, refer to the trouble shooting chart in paragraph 12A-110.

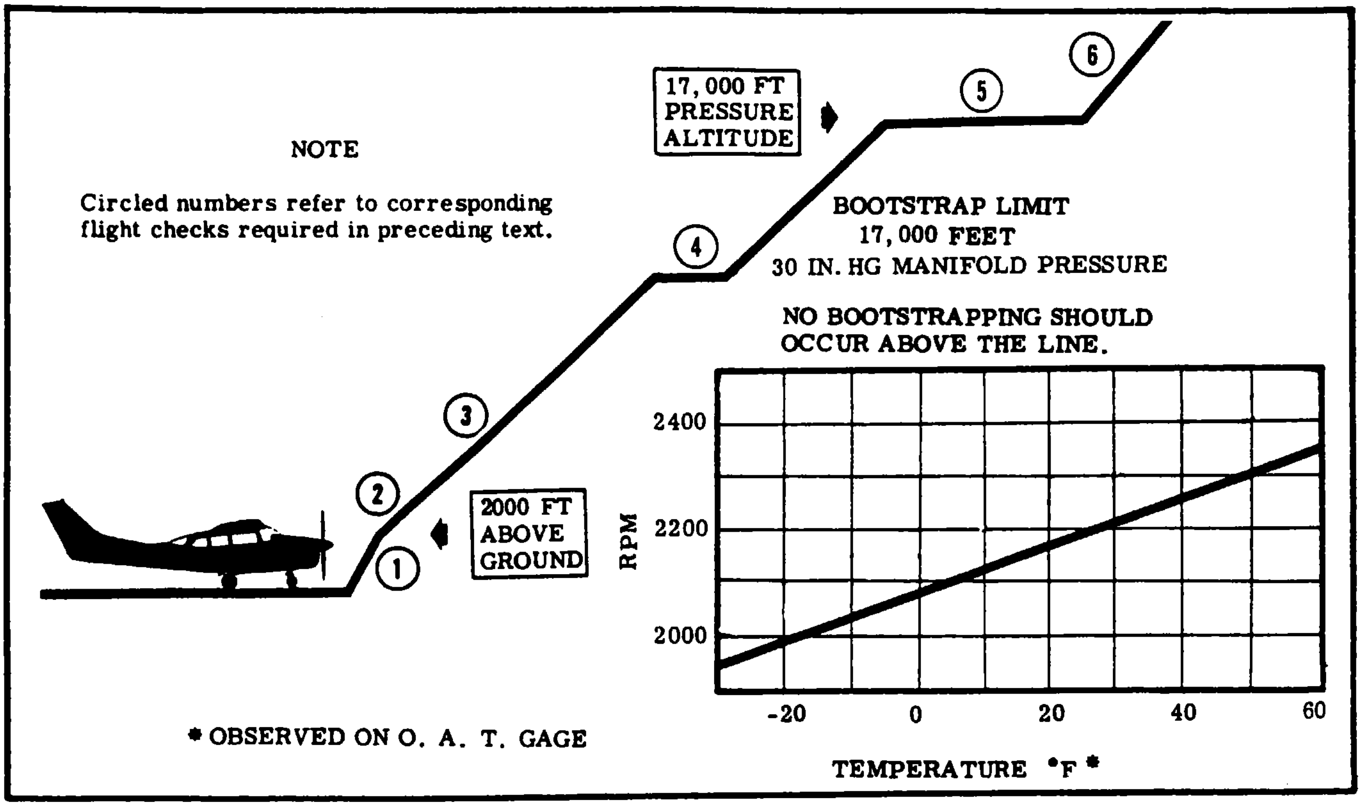


Figure 12A-16. Operational Flight Check

(2) Note outside air temperature and RPM as manifold pressure starts to drop, which should be in accordance with the chart in figure 12A-16.

(3) After noting temperature and RPM, increase engine speed 50 RPM to stabilize manifold pressure, with the wastegate modulating exhaust flow to control compressor output.

6 MCP CLIMB - VARIABLE CONTROLLER AND TURBOCHARGER PERFORMANCE CHECK.

a. Cowl Flaps - Open.
b. Airspeed - 110-120 KIAS.
c. Engine Speed - 2700 RPM.
d. Fuel Flow - 220 PPH. Above critical altitude, adjust for M. P. in accordance with climb schedule on fuel flow gage.
e. Throttle - As required to maintain 37 in. Hg M. P.
f. Climb to 23,000 feet - Check full throttle critical altitude during climb.

NOTE

The full throttle critical altitude is where manifold pressure starts decreasing below 37.0 in. Hg during the climb at a rate of approximately 1.0 in. Hg per 1000 feet. Note this altitude and the outside air temperature. If full throttle critical altitude has not been reached by 23,000 feet, discontinue check.

Outside Air Temperature	Full-Throttle Critical Altitude (MCP)
20°F Below Standard	21,000 feet
Standard Temperature	20,500 feet
20°F Above Standard	20,000 feet
40°F Above Standard	19,500 feet

Full-throttle critical altitudes lower than those listed indicate the turbocharger system is not operating properly (Refer to trouble shooting chart in paragraph 12A-110). Critical altitudes above those listed indicate turbocharger performance better than normal. However, critical altitudes beyond 2000 feet above those listed may indicate that the wastegate gap is too small. Also check that fuel flow decreases as manifold pressure decreases at critical altitude. Refer to trouble shooting chart if fuel flow does not decrease.

12A-112. REMOVAL AND INSTALLATION OF TURBOCHARGER CONTROLLER.

a. Disconnect and tag oil lines from controller and plug or cap open lines and fittings.

b. Disconnect compressor outlet pressure sensing line from controller and plug or cap open line and fitting.

c. Remove two bolts attaching controller to mounting bracket on firewall.

d. Remove controller from aircraft, being careful not to drop controller unit.

e. Installation of the controller may be accomplished by reversing the preceding steps. Resafety bolt attaching controller to bracket.

12A-113. REMOVAL AND INSTALLATION OF WASTEGATE AND ACTUATOR.

a. Disconnect and tag oil lines from actuator and plug or cap open lines and fittings.

b. Remove bolts, washers and nuts attaching wastegate and actuator assembly to tailpipe.

c. Loosen clamp attaching tailpipe to turbine exhaust outlet and work tailpipe from turbine.

d. Remove bolts, washers and nuts attaching the assembly to the exhaust manifold.

e. Remove the assembly from aircraft, being careful not to drop the unit.

f. Installation may be accomplished by reversing the preceding steps.

NOTE

When installing the assembly, be sure the gaskets at inlet and outlet of valve are installed and are in good condition. Replace gaskets if damaged.

12A-114. ADJUSTMENT OF WASTEGATE ACTUATOR. Refer to the Manufacturer's Overhaul manual.

12A-115. EXTREME WEATHER MAINTENANCE.

12A-116. COLD WEATHER. Cold weather starting will be made easier by the installation of an engine primer system and a ground service receptacle. The primer system is manually operated from the cabin. Fuel is supplied by a line from the fuel strainer to the plunger. Operating the primer forces fuel to the engine. With an external power receptacle installed an external power source may be connected to assist in cold weather or low battery starting. The following may also be used to assist engine starting in extremely 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 engine oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the engine oil, gasoline may be mixed with the heated oil in a ratio of 1 part gasoline to 12 parts engine oil before pouring into the engine oil sump. If the free air temperature is below minus 29°C (-20°F), the engine compartment should be preheated by a ground heater. Pre-heating the engine compartment is accomplished by inducing heated air up through the cowl flap openings; thus heating both the oil and the cylinders. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull propeller through several revolutions by hand before attempting to start the engine.

CAUTION

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

Refer to Average Ambient Temperature (°F) Oil Grade chart in Section 2, for the correct grade of engine oil for the ambient temperature.

12A-117. HOT WEATHER. Refer to Pilot's Operating Handbook.

12A-118. SEACOAST AND HUMID AREAS. In salt water areas special care should be taken to keep the engine, accessories and airframe clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

12A-119. DUSTY AREAS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating in high dust conditions, service the induction air filters daily as outlined in Section 2. Also change engine oil and lubricate airframe items more often than specified.

SECTION 13

FUEL SYSTEM

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13-1. FUEL SYSTEM. The fuel system as defined by this manual includes all components up to and including the fuel line connecting to the engine driven pump inlet. Engine mounted components are covered in Section 12 or 12A.

13-2. DESCRIPTION. The fuel system is a gravity-flow system from the bay outlets to the selector valve and a pump augmented system from the selector valve to the engine. A fuel supply line, a vapor return line and a vent line routed down each forward door post. A fuel supply line with a vent line are routed down each rear door post. The fuel bays are vented by a crossover vent line which is also connected to the vent lines in each forward door post, wing tip vents and vented fuel caps. The fuel lines from the firewall to the strainer and the strainer to the tunnel fitting are stainless steel with insulating sleeving. The fuel hose from the fuel pumps to the check valve, and from the check valve to the firewall, and fuel pump to tunnel fitting are fire sleeved hose. The standard and extended range fuel systems are the same except for the additional fuel bay in the outer end of each wing on the extended range fuel system.

The upper chamber of the three-position fuel selector valve labeled, LEFT ON, BOTH ON, and RIGHT ON, routes fuel from bays to fuel strainer and engine fuel system. The lower chamber of the selector valve routes vapor and excess fuel from engine injection system back to fuel bays.

The reservoir stores fuel from selector valve, bay drain and vent lines. Then fuel flows from reservoir through a by-pass in the auxiliary fuel pump (when the pump is not in operation) to fuel ON-OFF valve.

The fuel ON-OFF valve, mounted on left side of the pedestal, provides a means of stopping fuel flow to STRAINER and engine driven fuel pump.

The fuel STRAINER, mounted on firewall incorporates a remote drain valve. This valve is mounted on the lower, left engine cowling at the aft end of cowl flap. Since this is a low point in the system, fuel samples are taken at this location.

13-3. PRECAUTIONS. Observe the following general precautions and rules during fueling, defueling, tank or integral fuel bay purging, repairing, assembly or disassembly of system components, and electrical system checks and repairs on the airplane fuel system:

WARNING

DURING ALL FUELING PROCEDURES, FIRE-FIGHTING EQUIPMENT MUST BE AVAILABLE. TWO GROUND WIRES FROM DIFFERENT POINTS ON THE AIRPLANE TO SEPARATE APPROVED GROUND STAKES SHALL BE USED TO PREVENT ACCIDENTAL DISCONNECTION OF ONE GROUND WIRE. ENSURE THAT FUELING NOZZLE IS GROUNDED TO THE AIRPLANE.

a. Tie-down rings should be used as grounding points for all grounding wires during re-fueling procedures.
b. Plugs or caps should be placed on all disconnected hoses, lines, and fittings to prevent residual fuel drainage, thread damage, or entry of dirt or foreign material into fuel system.

NOTE

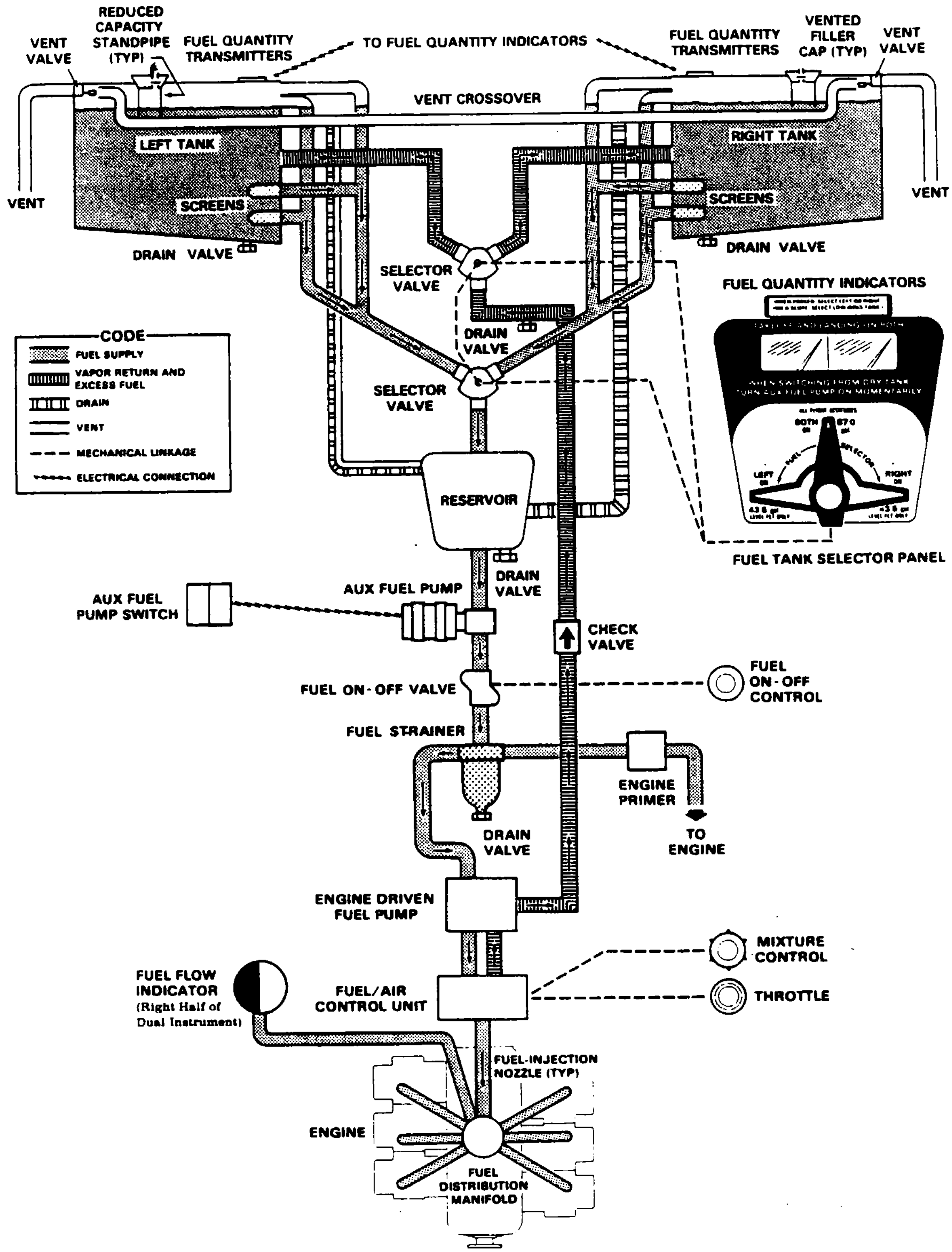
Use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, WI 53140) or MIL-T-5544 (Thread Compound, Antiseize, Graphite Petrolatum), USP Petrolatum, or engine oil as a thread lubricant or to seal leaking connections. Apply sparingly to male threads only, omitting first two to prevent entry into fuel system. Use only a fuel soluble lubricant on fitting threads. DO NOT use lubricants or compounds on injection system fittings or threads.

SHOP NOTES:

13-4. TROUBLE SHOOTING.

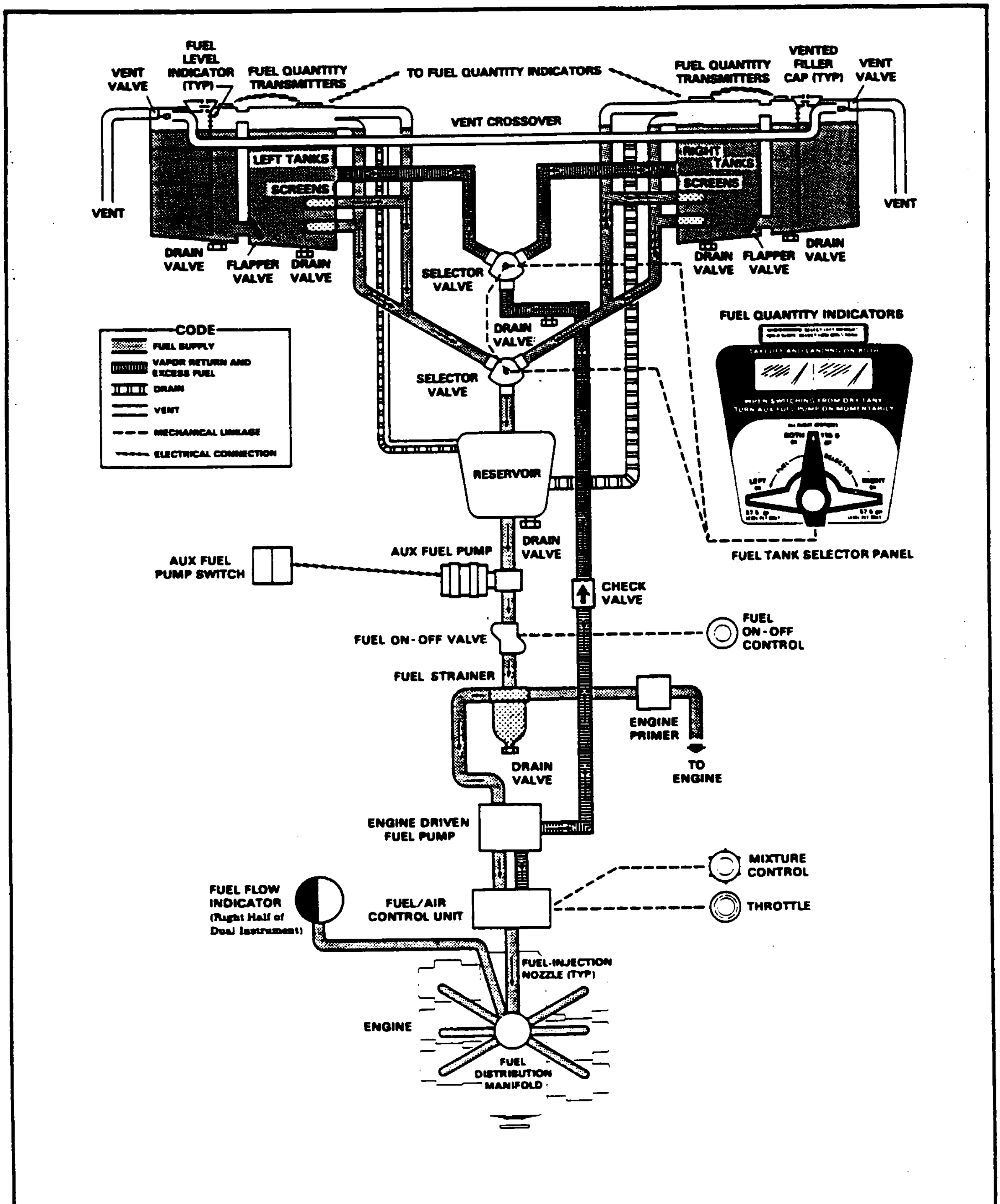
Use this trouble shooting chart in conjunction with the engine trouble shooting chart in Section 12 or 12A.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FLOW TO ENGINE-DRIVEN FUEL PUMP.	Fuel ON-OFF valve turned off.	Turn selector or fuel ON-OFF valve on.
	Fuel bays empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Fuel bay outlet screens plugged.	Remove and clean screens and flush out fuel bays.
	Defective fuel selector valve.	Repair or replace selector valve.
	Plugged fuel strainer.	Remove and clean strainer and screen.
	Defective check valve in electric fuel pump.	Repair or replace pump.
	Fuel line plugged.	Clean or replace fuel line.
FUEL STARVATION AFTER STARTING.	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Malfunction of engine-driven fuel pump or fuel injection system.	Refer to Section 12 or 12A.
	Plugged fuel vent.	Refer to paragraph 13-19.
	Water in fuel.	Drain fuel bays, lines and strainer.
NO FUEL FLOW WHEN ELECTRIC PUMP OPERATED.	Defective fuel pump switch.	Replace defective switch.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective electric fuel pump.	Replace defective pump.
	Defective engine-driven fuel pump bypass or defective fuel injection system.	Refer to Section 12 or 12A.
NO FUEL QUANTITY INDICATION.	Fuel bays empty.	Service with proper grade and amount of fuel.
	Open or defective circuit breaker.	Reset. Replace if defective.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective fuel quantity indicator or transmitter.	Refer to Section 16.
FLUCTUATING FUEL PRESSURE INDICATION. (T210 ONLY).	Obstructed filter in fuel inlet strainer of metering unit.	Remove and clean.
	Manifold valve.	Replace.
	Fuel flow indicator.	Replace.



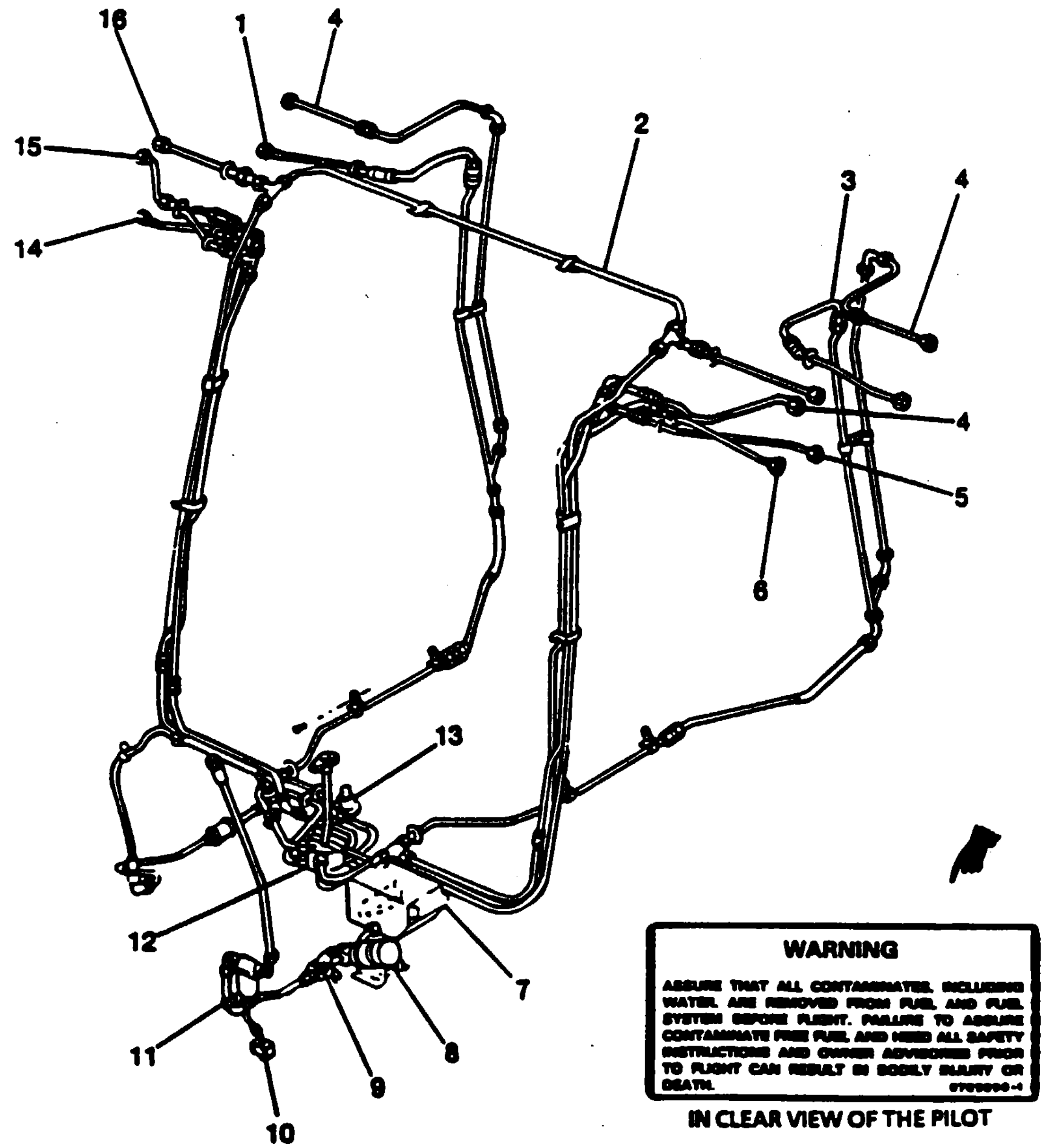
STANDARD RANGE

Figure 13-1. Fuel System Schematic (Sheet 1 of 2)



EXTENDED RANGE

Figure 13-1. Fuel System Schematic (Sheet 2 of 2)



1. Right-Hand Fuel Line
2. Crossvent Line
3. Left-Hand Fuel Line
4. Vent Line
5. Fuel Line
6. Drain Line
7. Reservoir
8. Auxiliary Fuel Pump
9. ON-OFF Valve
10. Strainer Drain Valve
11. Fuel Strainer
12. Fuel Selector Valve
13. Vent Line Drain Valve
14. Drain Line
15. Fuel Line
16. Vent Line

Figure 13-2. Fuel System

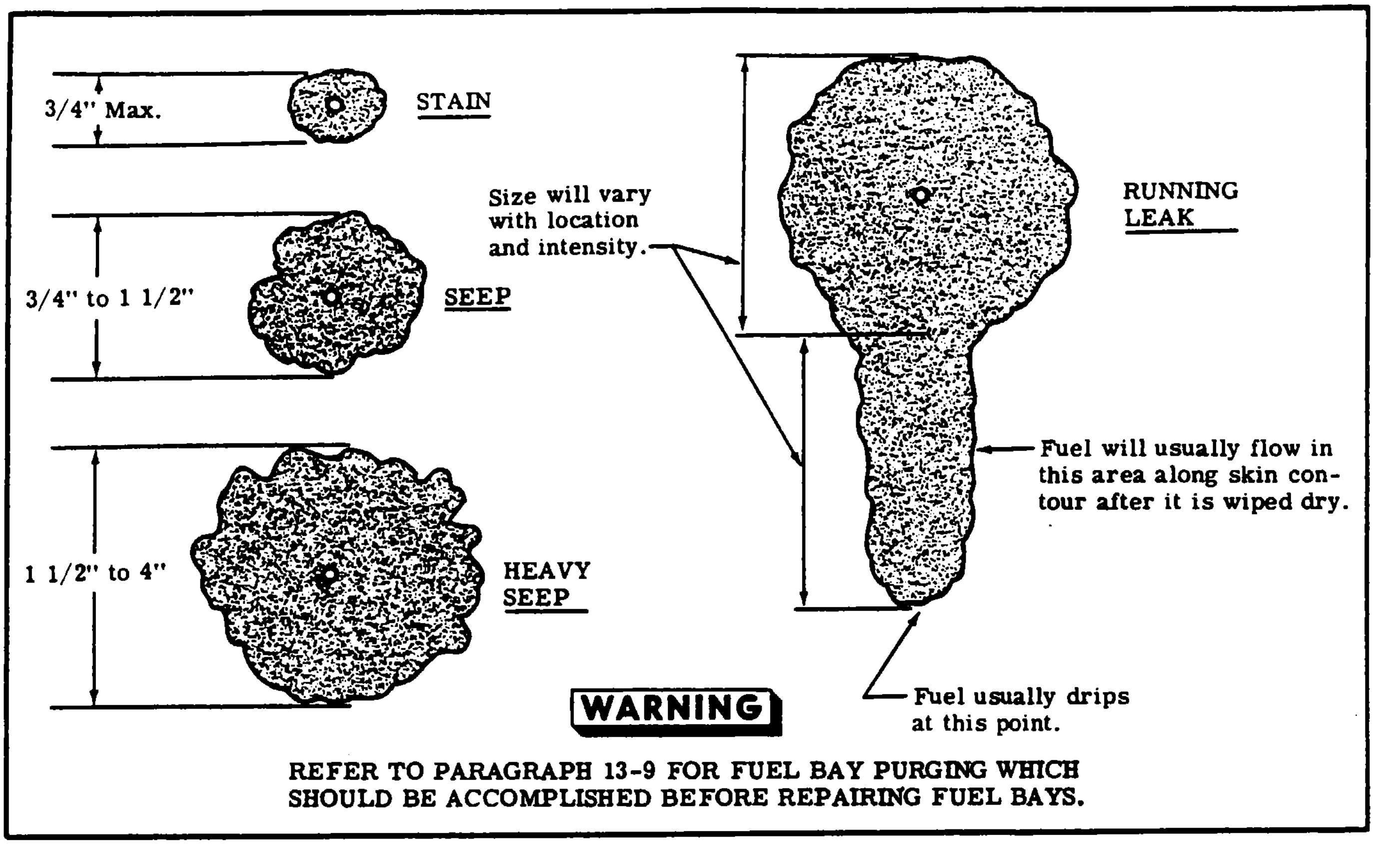


Figure 13-3. Classification of Fuel Leaks

13-5. **FUEL BAYS.**

13-6. **DESCRIPTION. Aircraft with cantilever wings have an inboard section of each wing forward of main spar sealed to form an integral fuel bay area. The bay consists of a front and rear fuel spar, inboard, outboard, and intermediate ribs and stringers. The extended range wing has fuel bay between station 172.00 and station 206.00. A fuel channel connects the outboard bay with the inboard bay. A flapper valve at the outboard bay end of the channel prevents fuel from flowing from the inboard bay to the outboard bay when aircraft is in a turn, or a low wing attitude.**

On the standard range a standpipe at the bay filler acts as a visual aid, when loading fuel, to indicate quantity of fuel on board. For a reduced load, fill to bottom edge of filler collar. On the extended range a graduated marker is installed just aft of filler, marked A, B, C.

13-7. FUEL BAY LEAKS.

13-8. 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 13-4.

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.

13-9. FUEL BAY PURGING.

WARNING

Prior to the repair of fuel bays, to reduce the possibility of an explosion, purge the bay with an inert gas, such as argon or carbon dioxide.

The following procedure may be used to purge the bay with argon or carbon dioxide.

a. Ground the aircraft to a suitable ground stake.

b. Set fuel valve handle in "OFF" position.

c. Drain all fuel from bay being repaired. (Observe the precautions in paragraph 13-3.)

d. Remove access doors and insert hose to each end of bay simultaneously.

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.

Since argon or carbon dioxide are heavier than air, these gases will remain in the bay during the repair. The repair shall be made using non-sparking tools (air motors, plastic scrapers, 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.

13-10. FUEL BAY SEALANT. Two kinds of sealants are used, one to seal fuel bay area and the other to seal access doors and fuel quantity transmitter adapter. The access door sealant is more pliable and will not adhere to metal as firmly as the bay sealant does. This permits access doors and fuel quantity-transmitter adapter to be removed without damage to them. Service Kits SK210-56 (6-ounce tube) and SK210-101 (2.5-ounce tube), which are available from the Cessna Supply Division, contain these sealants with proper quantity of accelerators for each sealant. The sealants can be identified by color. The bay sealant is white and its accelerator is a black paste. The access door sealant is grey and its accelerator is a clear liquid.

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 generously with clean water, and secure prompt medical attention.

13-11. MIXING SEALANT. Mix sealant according to service kit instructions.

13-12. SEALING. (Refer to Section 18 for repair procedures).

CAUTION

Protect drains and fuel outlet screens when applying sealants. DO NOT plug drain channels in hat section stiffeners.

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.

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.

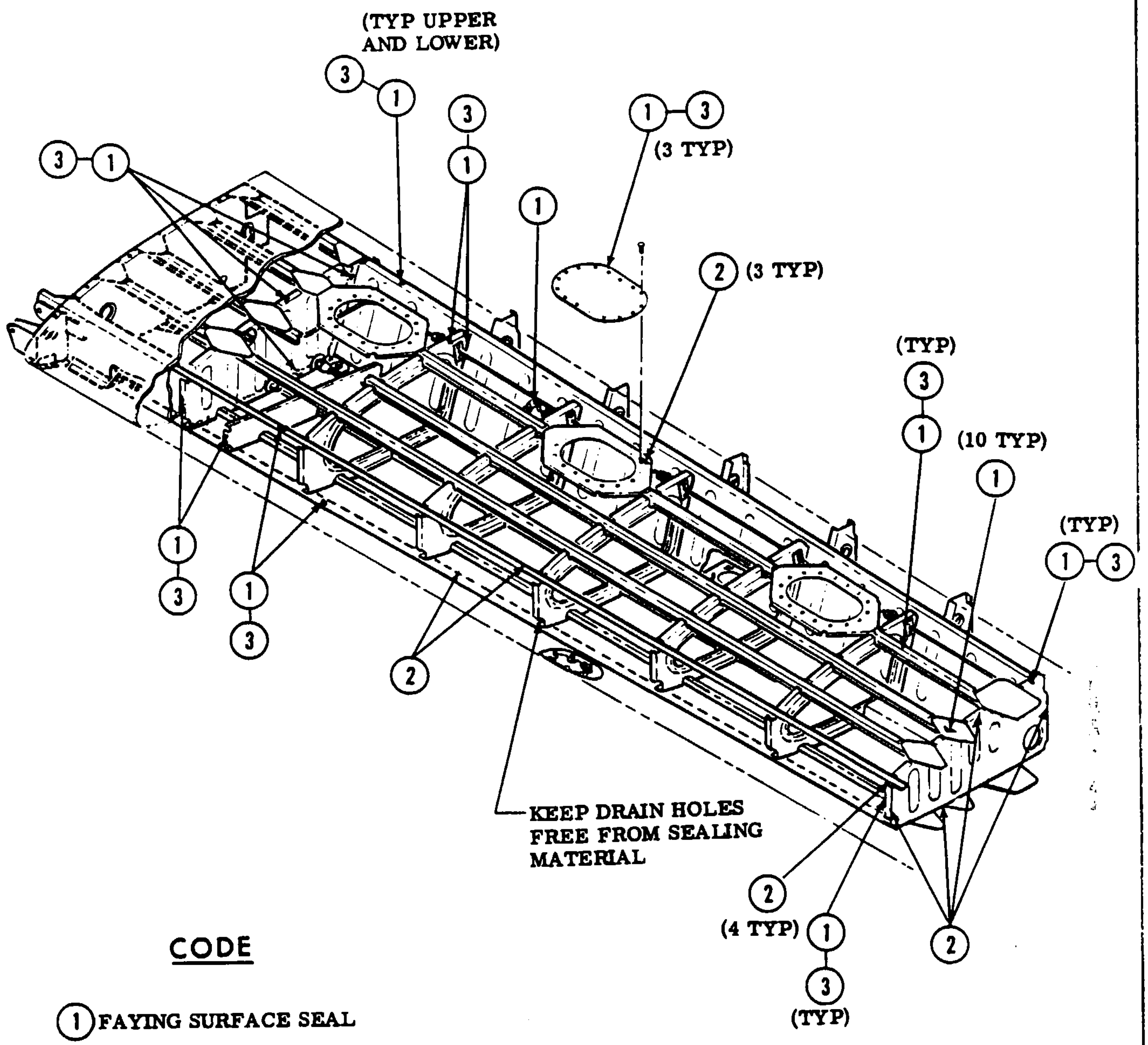
NOTE

The best method for removing sealant is with a chisel tool made of hard fiber. Remaining sealant is then removed with aluminum wool. Neither steelwool nor sandpaper can be used.

b. Vacuum thoroughly to remove all chips, filings, and other foreign material from bay areas.

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 prior to solvent evaporation. Always pour the solvent on the cloth. Never use contaminated solvent. The cloth shall not be so saturated that dripping occurs.

13-13. 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 13-15. 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 ap-



CODE

1 FAYING SURFACE SEAL

2 FILLET SEAL

3 RIVET AND FASTENER SEAL

NOTE

Types of sealing shown in this figure are used during manufacture of the fuel bay. The same types should be used when making a structural repair to the fuel bay area and when reinstalling the access doors or the fuel quantity sending unit.

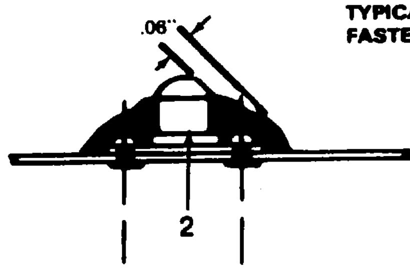
Figure 13-4. Fuel Bay Sealing (Typical) (Sheet 1 of 2)

NOTE

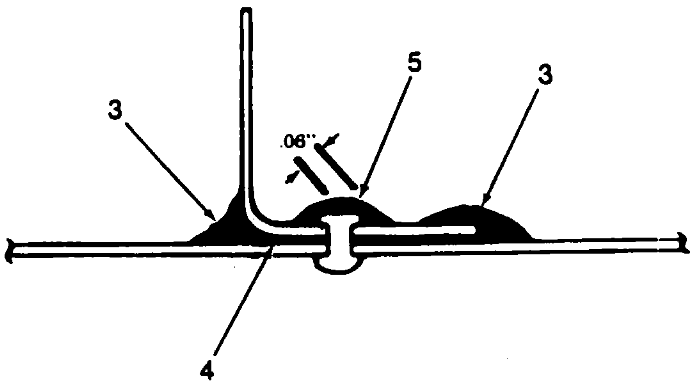
Refer to paragraph 13-12.

TYPICAL
INSPECTION PLATE

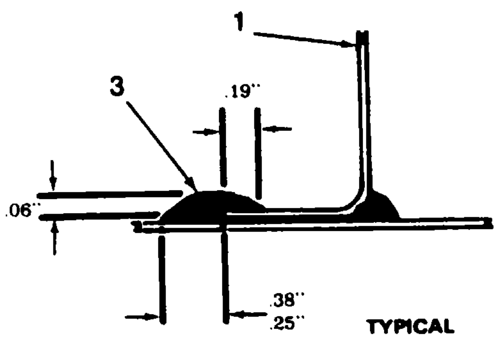
1. Fuel Side
2. Nutplate
3. Fillet Seal
4. Faying
5. Rivet and Fastener Seal



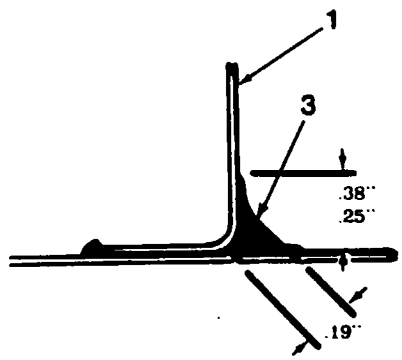
TYPICAL
FASTENER



TYPICAL
RIB SECTION



TYPICAL
FUEL BAY
SPAR



TYPICAL
END SECTION

Figure 13-4. Fuel Bay Sealing (Typical) (Sheet 2 of 2) plied 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.

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 nutplate.

d. Apply fay surface door sealant to access doors, fuel quantity transmitters, etc., if removed, and install.

e. Test fuel bay for leakage.

13-14. NORMAL CURE TIME. Access door sealant PR-1428 cure time is 24 hours for (B-1/2), and 72 hours for (B-2). Fuel bay sealant (P/S 890) cure time is 6 hours for (B-1/2) and 72 hours for (B-2).

13-14A. NORMAL WORK TIME. Normal work time for Access door PR-1428 is .05 hours for (B-1/2), and 2 hours for (B-2). Normal work time for Fuel bay P/S 890 is .5 hours for (B-1/2) and 2 hours for (B-2).

NOTE

Temperature shall not exceed 160°F (71°C). Bay must be vented to relieve pressure during accelerated curing.

ACCELERATED CURING TIME

°F of Sealant	Time in Hours
160	3
140	4
●130	5 1/2
120	7

●Applicable to SK210-101 only.

13-14B. INTEGRAL FUEL BAY QUICK REPAIR SEALANT. GC-435 is a quick-repair synthetic rubber sealant for use in fuel bays when it is necessary to refill bays as soon as the repair has been made; the sealant requires no cure time. The sealant is a two-part, medium viscosity polysulfide liquid polymer and is formulated for application by brush or extrusion. GC-435 may be purchased from: Goal Chemical Sealants Corp. 3137 East 26th. Street, Los Angeles, CA 90023.

13-14C. SURFACE PREPARATION. To ensure maximum adhesion of GC-435 integral bay surfaces should be free of oil, grease, wax, dirt, etc. Pour the cleaning solvent onto the cloth and wipe the surface, then use a clean, dry cloth to wipe the solvent from the surface prior to its evaporation. Be sure the surface to be sealed is clean and dry. Observe all warnings and cautions covering preparation and application of sealants as noted in this section and the instructions included with GC-435 sealant.

WARNING

The accelerators contain heavy metal peroxides; keep away from heat and flame. Use only in well-ventilated area, avoid skin and eye contact, and WEAR EYE SHIELDS. In case of eye contact, flush liberally with water, and get prompt medical attention.

13-14D. MIXING SEALANT. GC-435 comes in premeasured and proportioned kits ready for use. The base compound is cream-colored, and the catalyst is black. If the entire kit is not needed, the GC-435 may be proportioned by combining (10) parts of the base compound (cream colored), with (1) part of the catalyst (black by weight. Use an accurate scale and slowly mix the base and catalyst until a homogeneous blend of color and appearance is accomplished.

NOTE

Work life of GC-435 is approximately (15) minutes. Shelf life is at least (6) months when stored in an area where the ambient temperatures are 80° (26°C) or lower. Unless specifically noted all items relating to Integral Fuel Tank Sealants also apply to GC-435 quick-repair sealant.

SHOP NOTES:

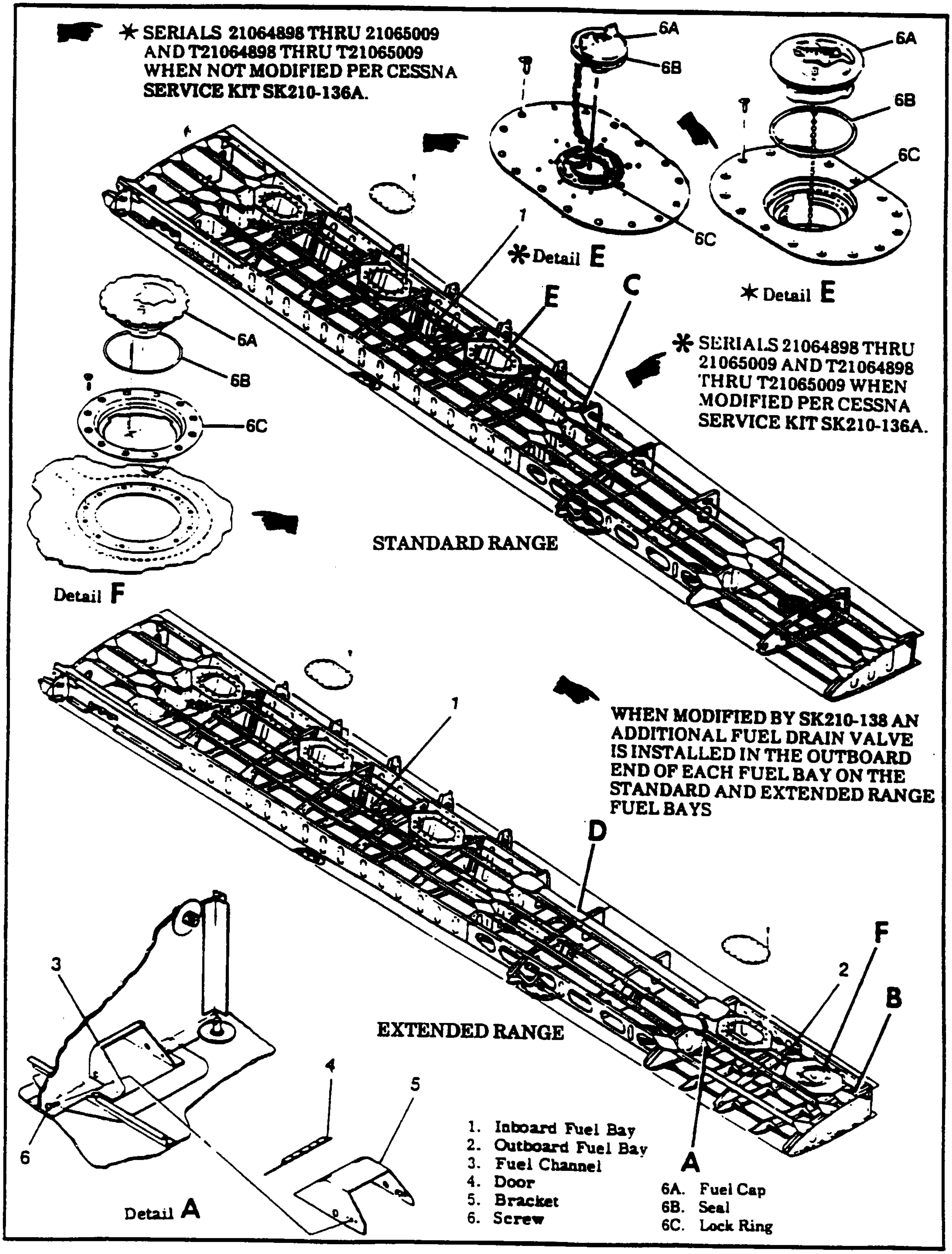
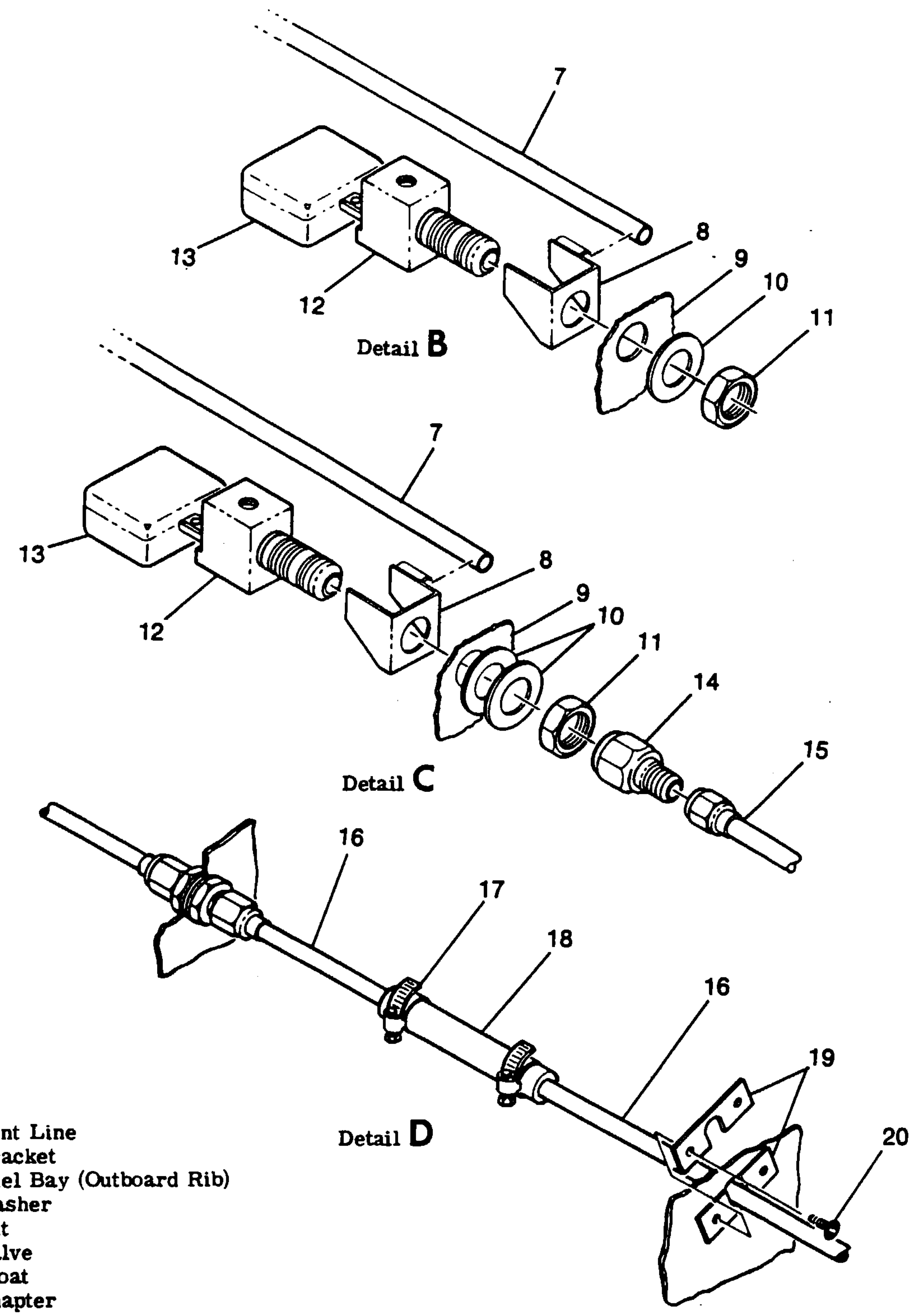


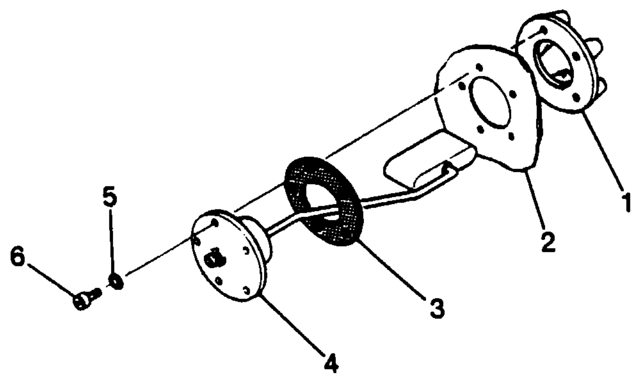
Figure 13-5. Fuel Bay Components (Sheet 1 of 3)



7. Vent Line
8. Bracket
9. Fuel Bay (Outboard Rib)
10. Washer
11. Nut
12. Valve
13. Float
14. Adapter
15. Vent Line
16. Bay Interconnect Vent Line
17. Clamp
18. Hose
19. Rub Strip
20. Screw

Figure 13-5. Fuel Bay Components (Sheet 2 of 3)

1. Nutring
2. Root Rib
3. Gasket
4. Fuel Quantity Transmitter
5. Washer
6. Screw



Detail **E**

NOTES

Nutring (1) is bonded to root rib (2). Order kit number SK210-56 or SK210-101, fuel tank sealant from Cessna Supply Division.

Torque screws (6) to 20 in.-lbs (once only), using a cross-pattern sequence.

Figure 13-5. Fuel Bay Components (Sheet 3 of 3)

13-15. 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 shut-off 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 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.

13-16. FUEL VENTS.

13-17. DESCRIPTION. The fuel bay vent line extends from each fuel bay to wing tip on standard range wing. The line is connected to a float-type vent valve in the fuel bay. On the extended range wing the vent valve is the outboard fuel bay and a vent line interconnects the bays. The vent valve prevents fuel drainage through vent line, but still allows positive pressure from expanding fuel to escape from the bays. Check all fittings and clamps for tightness and vent line for clearance to prevent chafing against inner wing structure. The fuel vent line at the trailing edge of the wing tip should be checked daily for evidence of foreign matter.

13-18. REMOVAL AND INSTALLATION. (See figure 13-5.)

a. Remove wing tip and access covers on underside of wing as necessary for access.
b. Disconnect vent line at valve in fuel bay and disconnect clamps attaching vent line to wing structure.
c. Remove vent line by carefully pulling it from outboard end of wing.
d. On the extended range the interconnect vent line may also be removed.
e. To remove vent valve, remove fuel bay access cover.
f. Remove nut and washer(s), then remove valve from inside of bay.
g. Remove sealer on valve and access cover, and reseal per paragraph 13-12 on installation.
h. Reverse the preceding steps for installation.

13-19. CHECKING. Field experience has demonstrated that the vents can become plugged, causing possible fuel starvation of the engine. Also, the bleed hole in the vent valve assembly could possibly become plugged, allowing pressure from expanding fuel to pressurize the bay areas. The following procedure may be used to check the vent and bleed hole in the vent valve assembly.

a. Cover .040 drilled holes approximately 6 inches from end of vent lines at trailing edges of wing tips.
b. Attach a rubber tube to the end of the vent line at the trailing edge of one wing tip.
c. Turn off fuel selector valve and check that both fuel filler caps are securely installed.
d. Blow into tube to slightly pressurize the fuel bay. If air can be blown into bay, the vent line is open.
e. After the fuel 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.
f. Repeat this procedure for fuel vent at opposite wing tip.

NOTE

Remember that a plugged vent line or bleed hole can cause either fuel starvation or the pressurizing of the bay by fuel expansion. Therefore, any fuel vent found plugged or restricted must be corrected before returning aircraft to service.

CAUTION

Be sure to uncover drilled holes in vent lines at wing tips after completion of check.

13-20. FUEL QUANTITY INDICATING SYSTEM.

13-21. DESCRIPTION. The system is comprised of one float type transmitter in each fuel bay, two quantity indicators located in fuel selector valve panel, and associated wiring. The gages are magnetic type, and the float transmitters are variable resistive type. Refer to Section 16 for operation, calibration, removal and installation procedures.

13-22. FUEL SELECTOR VALVE. (See figure 13-6.)

13-23. DESCRIPTION. A three-position, six port fuel selector valve is located beneath the floorboard. A shaft links the fuel selector valve to a handle mounted on the pedestal structure. The positions of the handle are labeled "BOTH ON, LEFT ON, RIGHT ON". Valve repair is limited to replacement of component parts only. Figure 13-6 illustrates the proper relationship of parts and may be used as a guide during disassembly and assembly.

13-24. REMOVAL AND INSTALLATION.

a. Drain all fuel from wing bays, reservoir, strainer and lines. (Observe precautions in paragraph 13-3.)
b. Remove selector valve handle.
c. Remove pedestal cover.
d. Remove center access plate.
e. Tag, and then disconnect or plug all six lines at valve.
f. Remove screws attaching elevator cable bracket to valve.
g. Remove nuts, washers, and bolts attaching valve to its bracket.
h. Remove valve.
i. Reverse preceding steps for installation. Prior to reinstalling equipment removed for access, secure fuel bays and check all lines and fittings for leaks in all selector valve positions.

13-25. DISASSEMBLY, REPAIR AND REASSEMBLY.

a. Remove pin (31) and shaft (30).
b. Remove spring retainer (24) spring (23) packing (22) and seal (21) from each part of lower body (20).
c. Remove screw (2) holding upper body (4) and lower body (20) together.
d. Remove lower body (20) with a twisting motion. Remove and tag washer(s) (16).
e. Cover upper body (4) and detent insert (17) with a clean shop cloth.

NOTE

The shop cloth will contain ball (15) and spring (14) when detent insert (17) is removed.

f. Carefully pry detent insert (17) from upper body (4).
g. Remove ball (15) and spring (14) from shop cloth.
h. Remove stop pin (3) from rotor (13).
i. Cover upper body (4) completely with a clean shop cloth.

NOTE

The shop cloth will contain seals (12), packings (11), washers (10) and springs (9) when the rotor is removed.

j. Push rotor (13) out of upper body (4).
k. Remove rotor (13), seals (12), packings (11), washers (10), and springs (9) from shop cloth.
l. Check detent holes in detent insert (17) for excessive wear.
m. Replace all seals and packings.
n. Insert rotor (13), in upper body (4), place detent insert (17), over rotor (13), place washer (16) in lower body (20), place lower body (20), over rotor (13) insert three screws (2) and torque to 30 lbs-in. check end play between rotor and valve bodies.
If end play is:
(1) .008 or greater, add S-1358-11 and/or S-1358-12 washers to decrease end play to .001 to .007.
(2) .007 to .004 add (1) S-1358-12 washer.
(3) .003 or less, disassemble valve land reassemble with different parts, recheck end play.
o. When end play is within tolerance disassemble, retain washers.

NOTE

Reassembly of selector valve is facilitated by mounting upper body (4) in a bench vise or equivalent bench support making certain upper body (4) is protected from damage. Fabrication of spring compressors (32), three are required.

p. Place upper body (4) upside down in bench vise or support.
q. Replace packing (6). Lubricate spring (14) with petrolatum and insert in rotor (13).
r. Insert spring (9) and compress with spring compressor (32) then insert washer (10), packing (11) and seal (12). The concave portion of the seal must fit the convex surface of the rotor (13). Complete this for each port.
s. While holding the three springs (9) with spring compressors (32), place washers (7) and/or (8) on shaft end of rotor (13) and insert rotor (13) into upper body (4). The seals (12) must fit flush against rotor (13). Release spring compressors (32).
t. Remove upper body (4) from bench vise or support.
u. Insert stop pin (3) into rotor shaft.
v. Place detent insert (17) on rotor (13) with slots for ball (15) toward upper body (4).
w. Place ball (15) on spring (14) align one of the slots, with the ball (15) and depress ball (15). While pushing the detent insert (17) toward upper body (4) as the ball (15) enters the slot the detent insert (17) may be pushed on to rotor (13) until it is flush with upper body (4). Rotate detent insert (17) until all four of its bolt holes align with four of the holes on the upper body (4).

1. Elevator Cable Bracket
2. Screws
3. Stop Pin
4. Upper Body
5. Packing
6. Packing
7. Washer, 1358-11
8. Washer, 1358-12
9. Spring
10. Washer
11. Packing
12. Seal
13. Rotor
14. Spring
15. Ball
16. Washer, 1358-10 or -11
17. Detent Insert
18. Packing
19. Packing
20. Lower Body
21. Seal
22. Packing
23. Spring
24. Spring Retainer
25. Plug
26. Screw
27. Washer
28. Handle
29. Screw
30. Shaft
31. Pin
32. Spring Compressor

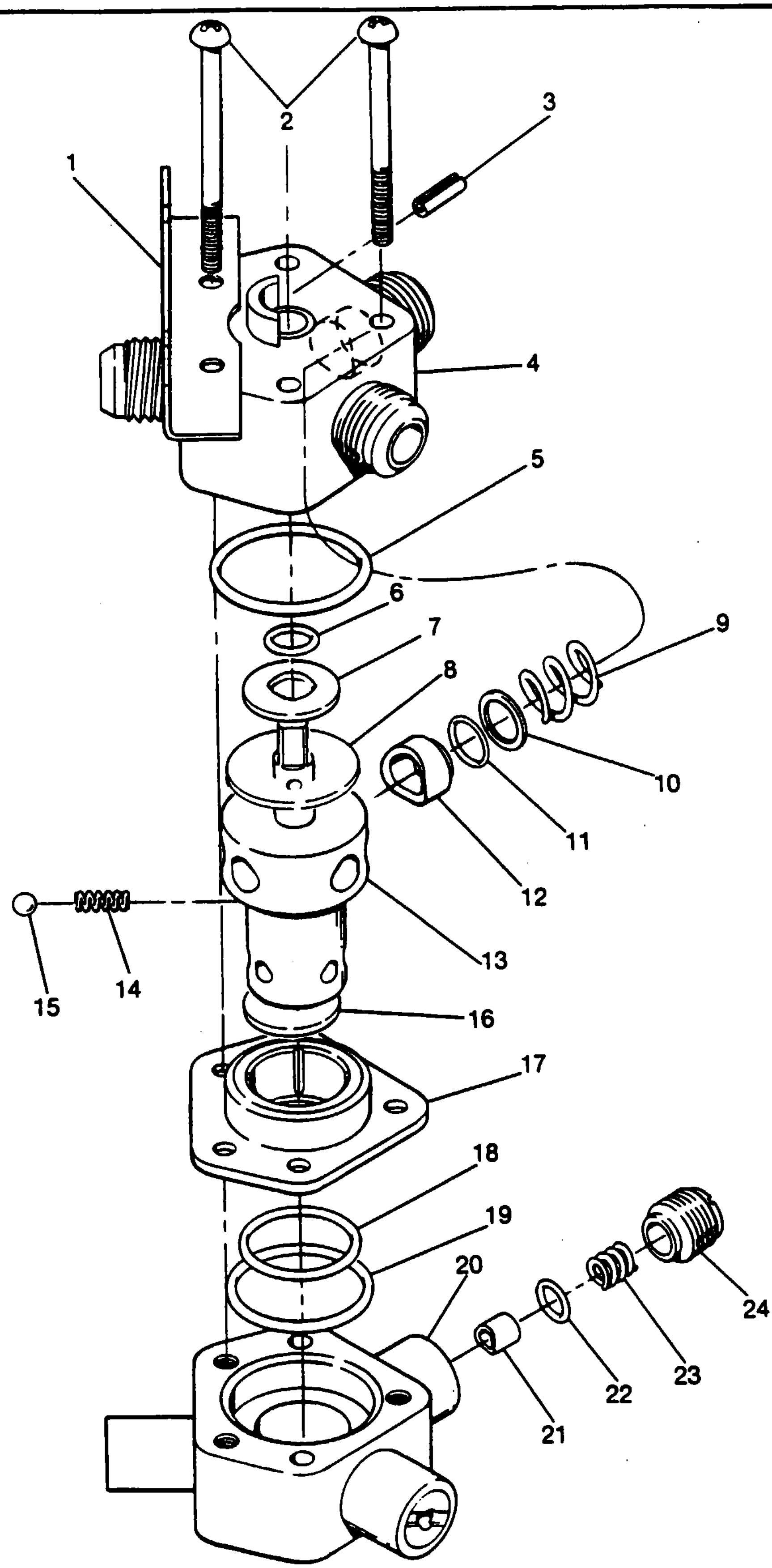


Figure 13-6. Fuel Selector Valve (Sheet 1 of 2)

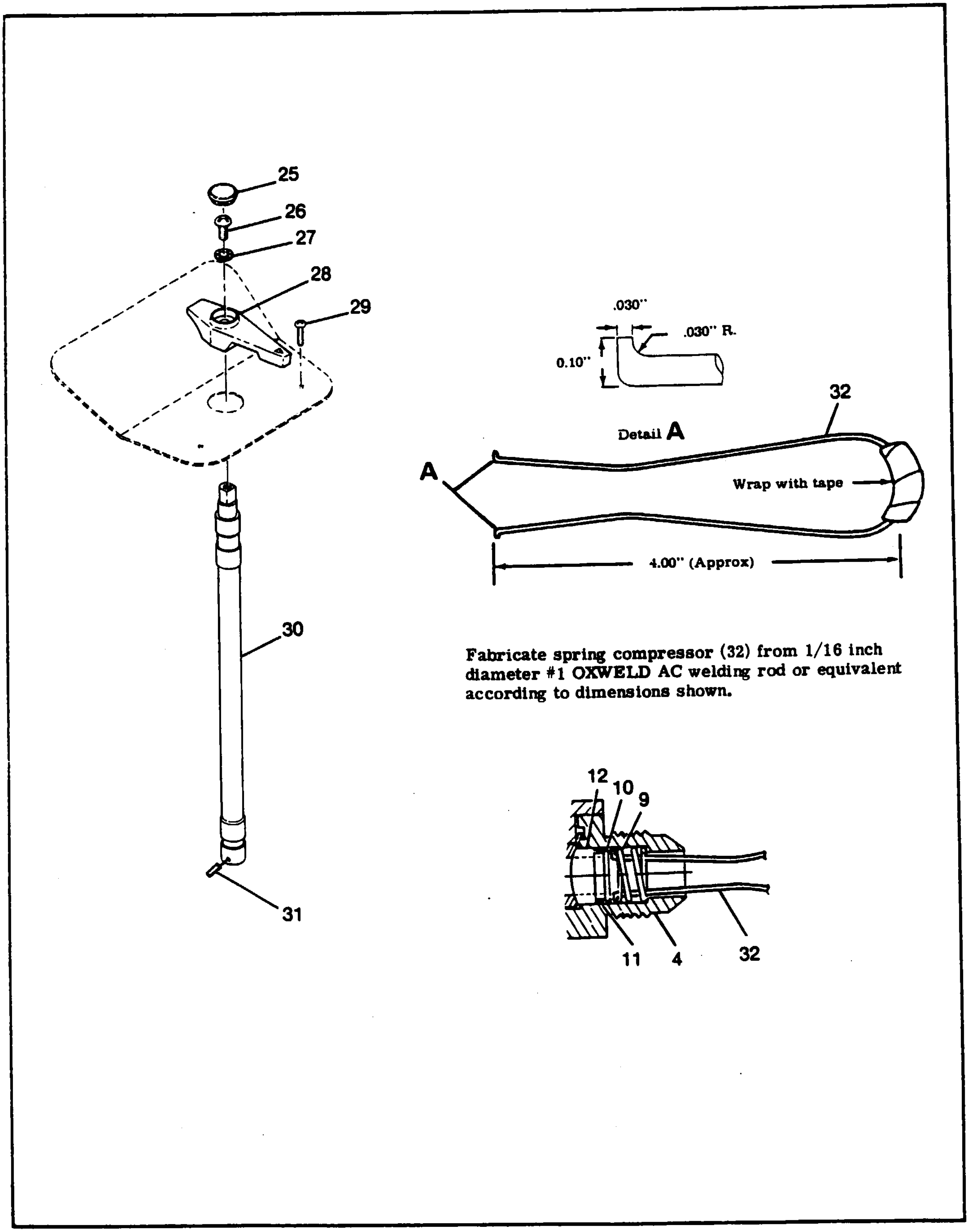


Figure 13-6. Fuel Selector Valve (Sheet 2 of 2)

x. Roll packing (18) over end of rotor (13) and push into cutout between rotor (13) and detent insert (17). Packing (18) must not protrude beyond lip of detent insert (17). Care must be exercised to avoid damage to packing.

y. Place packing (19) in groove on outer edge of detent insert (17).

z. Place lower body (20) over rotor (13). The five bolt holes in lower body (20) must align with five bolt holes in upper body (4).

13-26. LEAK TEST.

a. With valve assembled remove stop pin (3).

b. Set valve in a closed position.

c. Apply 6-10 psi Stoddard solvent to each port separately.

d. Maximum internal leakage 10 drops per minute. No external leakage allowed.

13-27. ALTERNATE METHOD.

a. With valve assembled remove stop pin (3).

b. Set valve in a closed position.

c. Apply 6-10 psi air to each port while valve is submerged in water.

d. Maximum internal leakage equivalent to 10 drops per minute Stoddard solvent. No external leakage allowed.

Add two drops of Loctite 242 to end of each spring retainer (24) after pressure test.

13-28. FUEL RESERVOIR. (See figure 13-7.)

13-29. DESCRIPTION. There is one reservoir installed in the lower fuselage, on the pilot's side outboard of fuel selector valve. The reservoir has four fuel line connections; one from fuel selector valve, one from lower right hand crossover drain line, one from left hand crossover drain line and one to engine by way of auxiliary fuel pump, ON-OFF valve and fuel strainer. A drain valve is installed in bottom of reservoir for draining.

13-30. REMOVAL AND INSTALLATION.

a. Drain all fuel from wing bays, reservoir, strainer and lines. Observe precautions in paragraph 13-3.

b. Remove carpeting and access plate.

c. Disconnect and cap or plug all fuel lines at the reservoir.

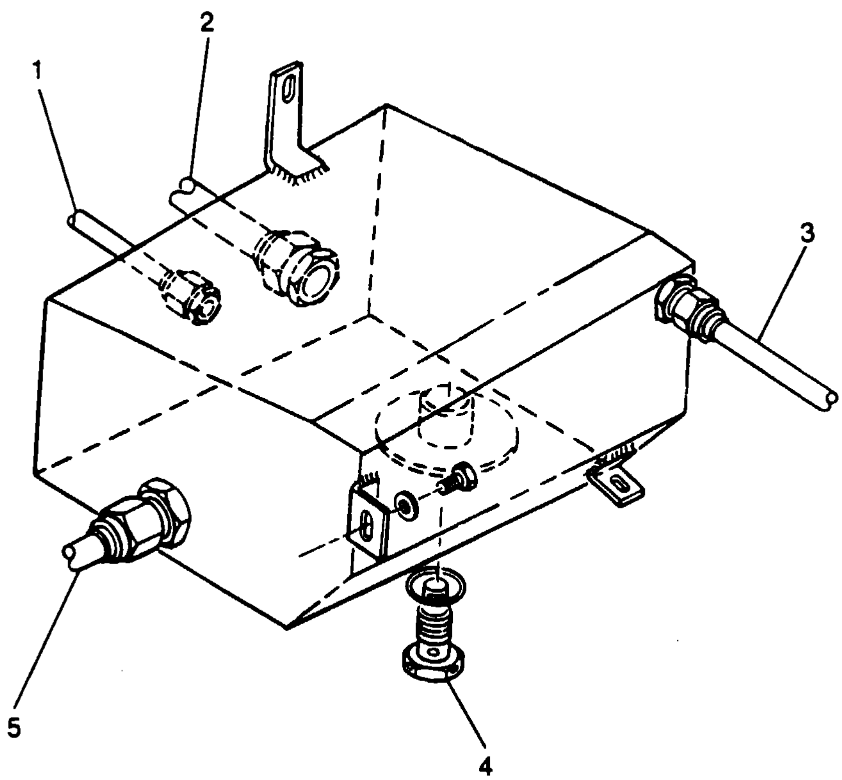
d. Remove screws securing mounting legs to fuselage.

e. Lift reservoir out.

f. Reverse preceding steps for installation. Prior to replacing access plate, secure fuel bays and check all connections for leaks.

NOTE

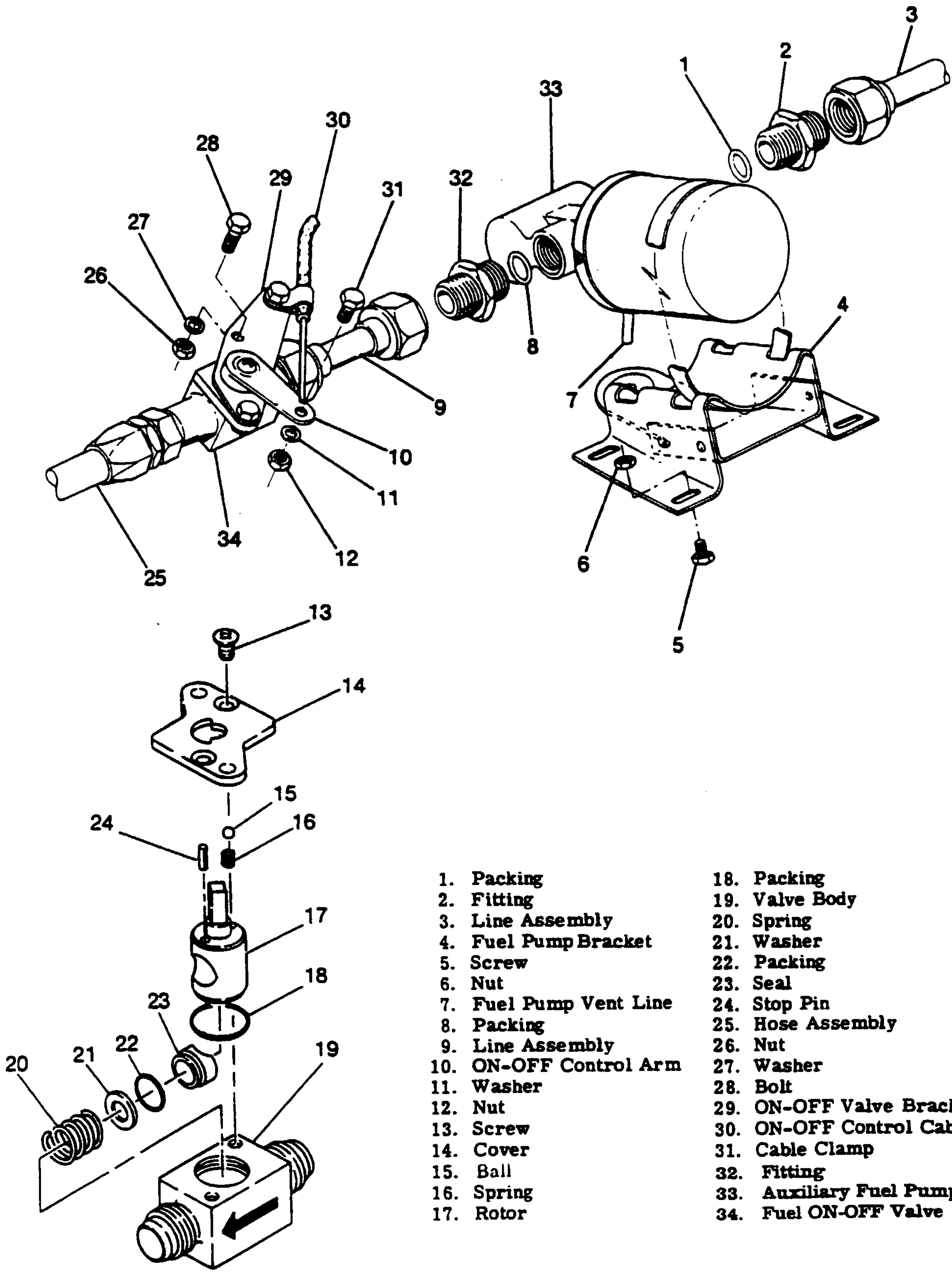
Maintain .37 to .50 inch clearance between lower RH crossover drain line (1), LH crossover line (3), and elevator cables.



1. Lower Right-Hand Crossover Drain Line
2. From Fuel Selector Valve
3. Drain Line Left-Hand Crossvent Line
4. Drain Valve
5. To Engine

Torque Drain Valve (4) to 15-35 in/lb.

Figure 13-7. Fuel Reservoir



1. Packing
2. Fitting
3. Line Assembly
4. Fuel Pump Bracket
5. Screw
6. Nut
7. Fuel Pump Vent Line
8. Packing
9. Line Assembly
10. ON-OFF Control Arm
11. Washer
12. Nut
13. Screw
14. Cover
15. Ball
16. Spring
17. Rotor
18. Packing
19. Valve Body
20. Spring
21. Washer
22. Packing
23. Seal
24. Stop Pin
25. Hose Assembly
26. Nut
27. Washer
28. Bolt
29. ON-OFF Valve Bracket
30. ON-OFF Control Cable
31. Cable Clamp
32. Fitting
33. Auxiliary Fuel Pump
34. Fuel ON-OFF Valve

Figure 13-8. Fuel System Components

13-31. AUXILIARY FUEL PUMP.

13-32. DESCRIPTION. An electric auxiliary fuel pump is located forward of reservoir. It is connected in line with engine driven pump, therefore, all fuel must flow through auxiliary pump internal by-pass valve. A fuel drain safety feature that prevents accumulation of fuel in auxiliary pump motor in case of leakage is incorporated. The auxiliary fuel pump is used for engine starting, and in place of engine driven pump if it should fail in flight.

13-33. REMOVAL AND INSTALLATION. (See figure 13-8.)

a. Turn fuel selector or fuel ON-OFF valve OFF.
b. Drain fuel from pump, lines, and strainer.
c. Be certain that master and pump switches are OFF.
d. Remove pilot's seat, carpeting, and plates at left side of pedestal as necessary for access to pump.
e. Disconnect and cap or plug all fuel lines and electrical connections at pump. (Observe safety precautions in paragraph 13-3.)
f. Loosen two securing clamps and lift pump out.
g. Reverse preceding steps for installation. Prior to reinstalling equipment removed for access, place selector or fuel ON-OFF valve ON, and check for leaks and proper pump operation.

13-34. AUXILIARY FUEL PUMP CIRCUIT. The auxiliary fuel pump switch is a yellow and red split-rocker type switch. The yellow right half of the switch is labeled "START," and its upper "ON" position, is used for normal starting and minor vapor purging during taxi. The red left half of the switch is labeled "EMERG," and its upper "HI" position is used in the event of an engine-driven fuel pump failure during take-off or high power operation. The "HI" position may also be used for extreme vapor purging. With the right half of the switch in the "ON" position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump operates at a high capacity to supply sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded "HI" position. In the "HI" position, an interlock within the switch automatically trips the right half of the switch to the "ON" position. When the spring-loaded left half of the switch is released, the right half will remain in the "ON" position until manually returned to the OFF position. When the engine-driven fuel pump is functioning and auxiliary fuel pump is placed in "ON" position, a fuel-to-air ratio considerably richer than best power is produced unless the mixture is leaned. If the auxiliary fuel pump switch is accidentally placed in the "ON" position with the master switch "ON" and the engine stopped, the intake manifolds will be flooded. A throttle shaft-operated microswitch adds a resistance to the high circuit to slow down the pump when the throttle is retarded to prevent an excessively rich mixture. Refer to paragraph 13-35 for rigging instructions.

13-35. RIGGING THROTTLE-OPERATED MICRO-SWITCHES. (Refer to figure 13-9.) These aircraft are equipped with a throttle-operated microswitch which slows down the electric fuel pump whenever the throttle is retarded while the electric pump is being used. The electric fuel pump microswitch should slow down the pump as the throttle is retarded to approximately 19 inches of mercury manifold pressure (sea level aircraft) and 23 inches of mercury manifold pressure (turbocharged aircraft).

NOTE

These settings must be established during ground run-up only. These values will not apply in flight.

a. Start engine and set throttle to obtain 19 inches of mercury manifold pressure (sea level aircraft) or 23 inches of mercury manifold pressure (turbocharged aircraft).
b. Mark position of throttle control at instrument panel and shut down engine.
c. Remove cover (16) and adjust fuel pump switch cam (2) to activate fuel pump switch (3) at throttle position marked in step "b".
d. With mixture control in "IDLE CUT-OFF," electrical fuel pump switch in "HI" and master switch in "ON" position, listen for change in sound of electric fuel pump as the throttle is retarded to the marked position.

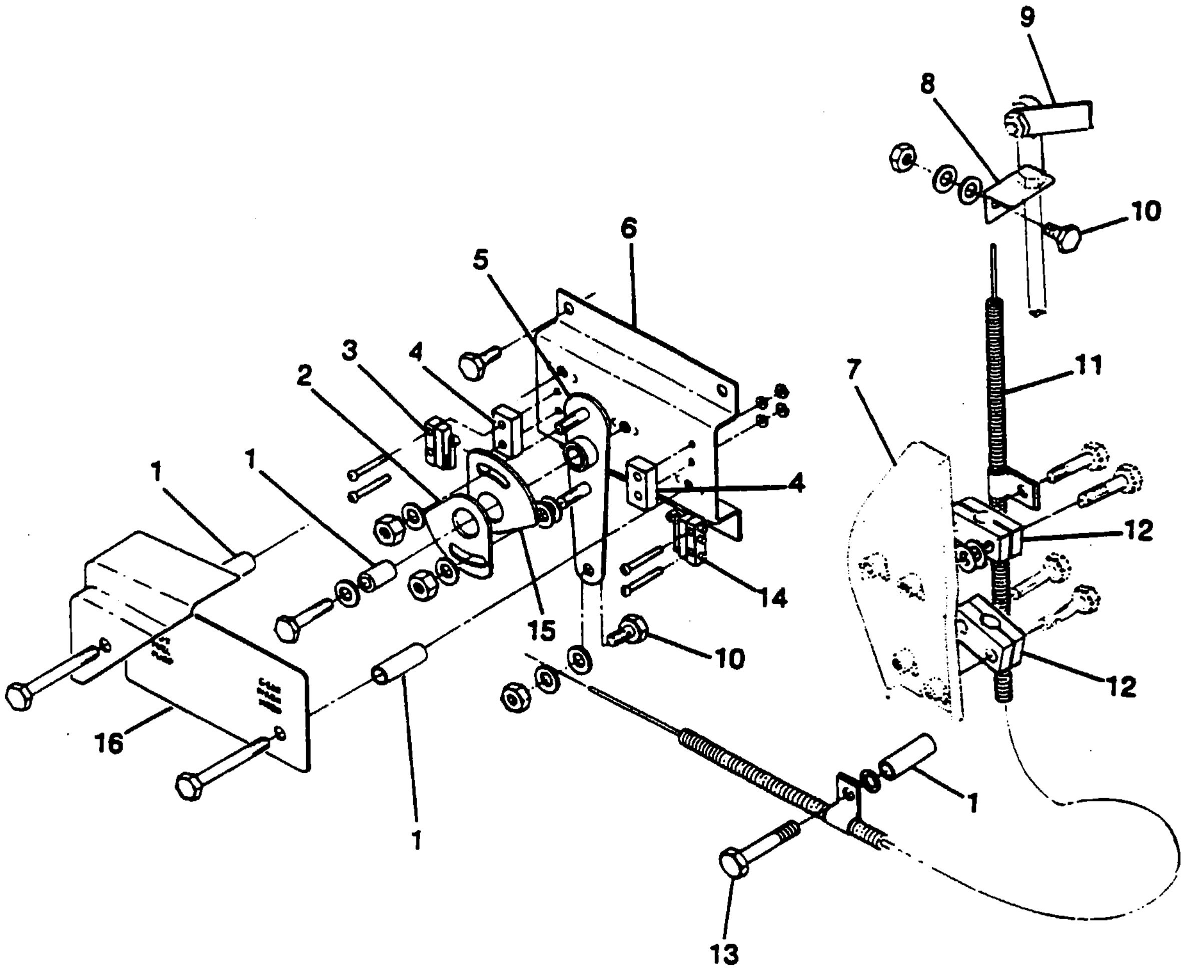
13-36. AUXILIARY ELECTRIC FUEL PUMP FLOW RATE ADJUSTMENT. (Refer to figure 13-10).

WARNING

During this adjustment, raw fuel will drain from the engine compartment; therefore, proper safety precautions should be taken. Conduct test in well ventilated area, use drip pans, insure airplane is properly grounded, and keep ignition source, (cigarettes, lighters, matches, etc.) away from area.

NOTE

These adjustment are to be conducted with the engine stopped and external power supplied to the airplane bus.



1. Spacer
2. Fuel Pump Switch Cam
3. Fuel Pump Switch
4. Spacer
5. Arm Assembly
6. Mounting Bracket
7. Clamp Assembly
8. Cable Clamp Mount
9. Throttle Lever
10. Clamp Bolt
11. Throttle Control (Secondary)
12. Clamp Half
13. Bolt
14. Gear Warning Switch
15. Gear Warning Cam
16. Cover

Figure 13-9. Throttle-Operated Microswitches

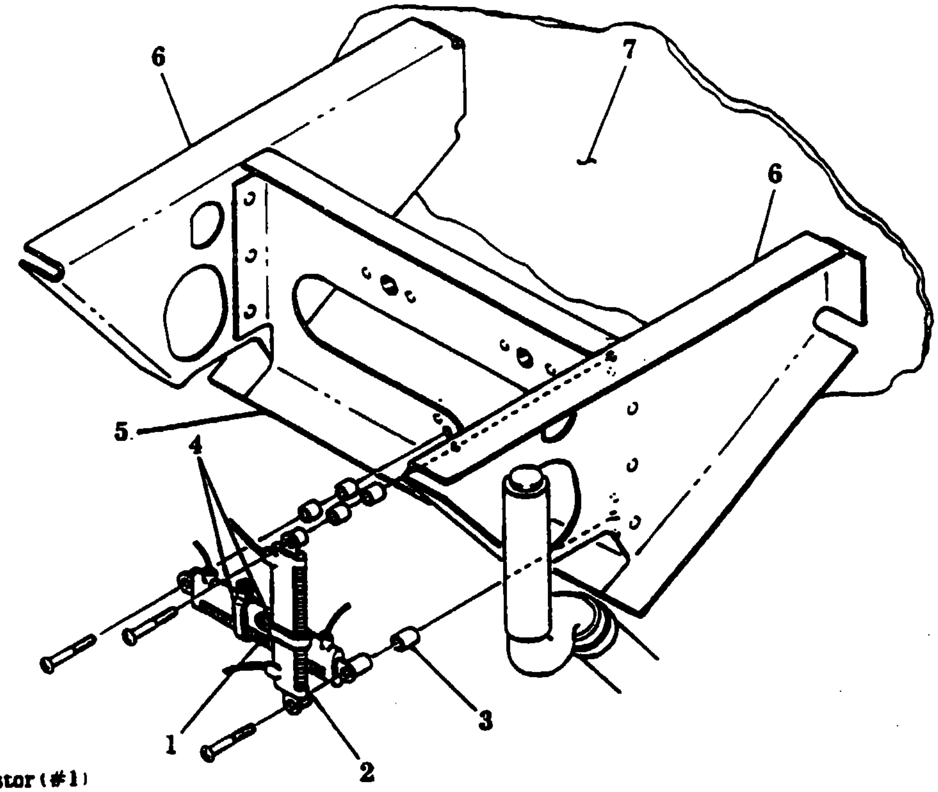


Figure 13-10. Auxiliary Fuel Pump Resistors (Sheet 1 of 2)

NOTE

Auxiliary electric (boost) fuel pump adjustment resistors were originally installed on the battery box support bracket (refer to figure 13-10, sheet 1). Dukes mandatory Service Bulletin No. 0003 directed replacement of fuel boost pump after 10 years service, and Cessna Service Kit SK210-154 provided parts and instructions to install new variable resistors for use with the replacement Dukes boost pump. In accordance with SK210-154, the adjustment resistors are mounted on the battery box (refer to figure 13-10, sheet 2).

a. Apply an external source of 27.75 VDC ± .25V to the airplane bus.
b. Set mixture control at "FULL RICH".
c. Turn master switch "ON" and fuel pump rocker switch "ON".
d. Advance throttle to full open position.
e. Check metered fuel pressure on ship's gauge. On 1985 and 1986 T210R airplanes (Serial 21064898 thru 21065009), fuel flow should be 100-110 pounds/hour. On all other airplanes, fuel flow should be 88-96 pounds/hour.
f. Adjust high-boost resistor (#1) as required to obtain 110-110 pounds/hour (16.7-18.3 gallons/hour).
g. Retard throttle slowly from the full "OPEN" position until the speed of the fuel pump can be audibly detected to change due to microswitch activation.
h. Wait momentarily for the fuel flow gage to respond.
i. The metered fuel pressure/flow on the airplane's gage should read on the low end red line to approximately one red line width above (approximately 4 PSI fuel pressure).
j. Adjust low-boost resistor (#2) as required to obtain fuel pressure at or above 4 PSI.

13-37. MAXIMUM HIGH BOOST CHECK. To verify high position function, momentarily depress spring-loaded red rocker switch to "HI" and verify a noticeable increase in indicated fuel flow on the fuel flow gage.

13-38. FUEL ON-OFF VALVE. (Refer to figure 13-8).

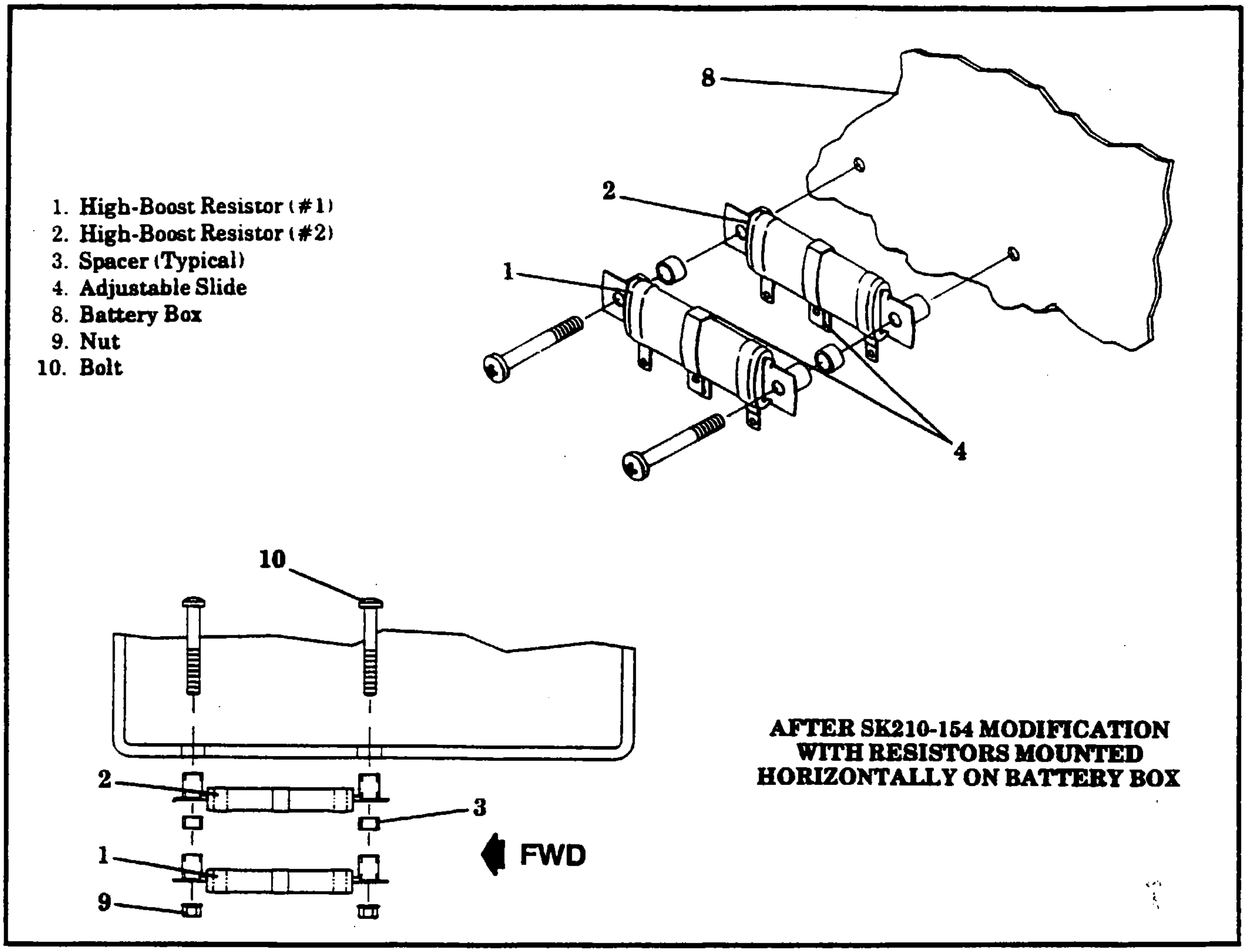
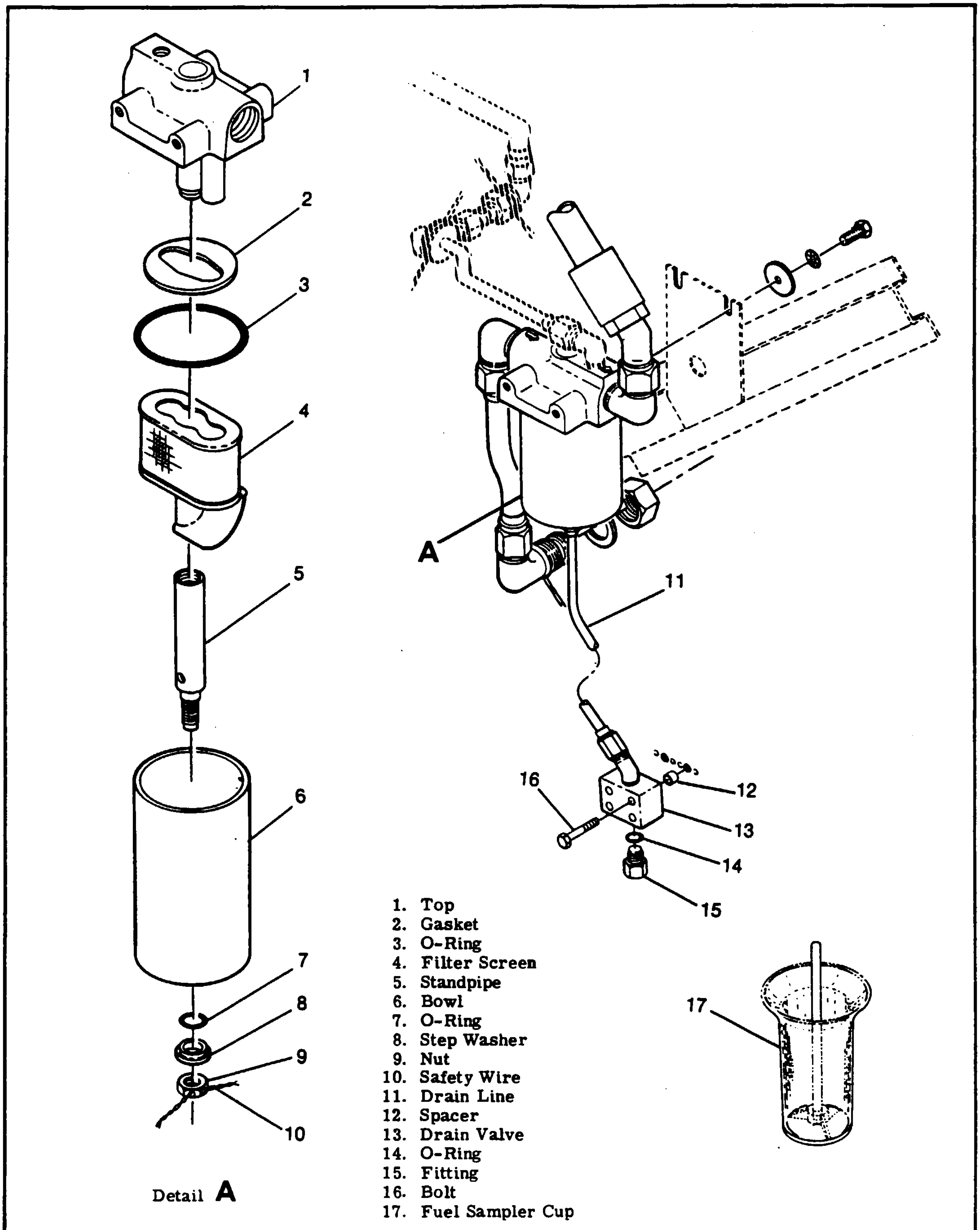


Figure 13-10. Auxiliary Fuel Pump Resistors (Sheet 2 of 2)

13-39. DESCRIPTION. The fuel ON-OFF valve is a two position valve located just forward of auxiliary fuel pump under the pilot's floorboard. The valve control knob is located on left lower area of pedestal. Valve repair consists of replacement of component parts.

13-40. REMOVAL AND INSTALLATION. (Refer to figure 13-8).

a. Drain all fuel from wing bays, reservoir, strainer and liner. (Observe precautions in paragraph 13-3).
b. Remove carpeting and access plate.
c. remove control cable from clamp on valve and control wire from valve arm.
d. Disconnect and cap or plug both inlet and outlet fuel lines.



1. Top
2. Gasket
3. O-Ring
4. Filter Screen
5. Standpipe
6. Bowl
7. O-Ring
8. Step Washer
9. Nut
10. Safety Wire
11. Drain Line
12. Spacer
13. Drain Valve
14. O-Ring
15. Fitting
16. Bolt
17. Fuel Sampler Cup

Figure 13-11. Fuel Strainer

e. Remove bolts from bracket and remove valve.
f. Reverse preceding steps for installation. Prior to replacing access plate, service fuel bays and check all connections for leaks. The valve must also be checked for positive on and off position.

NOTE

When installing valve, make certain arrow on the valve points with the direction of normal fuel flow. (Toward the engine).

13-41. DISASSEMBLY, REPAIR AND REASSEMBLY.
a. Remove screws (13) securing cover (14) to valve body (19); carefully remove cover.
b. Remove ball (15) and spring (16) from rotor (17).
c. Slowly withdraw rotor (17) from valve body (19).

NOTE

Removal of rotor (17) from valve body (19) will allow seal (23), packing (22), washer (21), and spring (20) to pop free.

d. Remove seal (23), packing (22), washer (21), and spring (20) from valve body (19).
e. Remove packing (18) from valve body (19).

NOTE

Reassembly of valve is facilitated by mounting in a bench vise or equivalent bench support, making sure valve body (19) is protected from damage. Fabrication of a spring compressor is recommended before reassembly. Replace packings (21) and (18) whenever rotor (17) is removed from valve body.

f. Ensure all component parts are clean, then coat sparingly with lightweight oil.
g. Install new packing (18) into recess at top of valve body (19).
h. Insert spring (20) into valve body (19).
i. With spring compressor, compress spring (20).
j. Install washer (21), new packing (22), and seal (23) into port.
k. Holding spring (20) compressed, carefully insert rotor (17) into valve body (19), release spring compressor, and visually inspect assembly for proper seating of seal (23) to rotor.
l. Lubricate spring (16) and ball (15) with Petrolatum.
m. Insert spring (16) into rotor (17).
n. Place ball (15) on top of spring (16).
o. Position cover (14) on valve body and turn rotor (17) as required to index one of detents in cover.
p. Secure cover (14) to valve body (19) with screws (13).
q. Test rotation of rotor (17) for each of operation and positive detent engagement.

13-42. FUEL STRAINER. (See figure 13-11.)

13-43. DESCRIPTION. The fuel strainer is located on the left forward side of the firewall. It is accessible through the left cowl flap opening or from above by removing the upper engine cowling. The fuel strainer incorporates a quick drain valve. The valve protrudes from the lower left side of engine cowling.

NOTE

The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft.

13-44. DISASSEMBLY, REASSEMBLY.
a. Place ON-OFF fuel control in OFF position.
b. Drain fuel from strainer and lines with drain valve (13).
c. Disconnect strainer drain line (11) from strainer bowl (6) and drain valve (13).
d. Remove nut (9), step washer (8) and O-ring (7) at bottom of bowl (6) and remove bowl (6) remove O-ring (3).
e. Carefully unscrew standpipe (5) and remove.
f. Remove filter screen (4) and gasket (2). Wash filter screen and bowl in solvent (P-S-661) and dry with compressed air.
g. Using a new gasket (2) install filter screen (4) and standpipe (5). Tighten standpipe finger tight.
h. Using new O-rings (3) and (7) install bowl (6). The step washer (8) must be installed so that the step seats against the O-ring (7), connect drain line (11).
i. Place ON-OFF fuel control in ON position.
j. Check for fuel leaks.
k. Check drain valve (13) for operation.

13-45. VENTED FUEL FILLER CAPS.

13-46. DESCRIPTION. The filler caps incorporate a vent safety valve that provides vacuum and positive pressure relief for the fuel bay. It is important that the cap is cleaned on an as required basis, if proper filler cap sealing is to be maintained. An improperly installed filler cap could cause a loss of fuel from the bays during flight. Repair of the metal cap is not recommended, except replacement of O-ring seal located on cap body. However, it is important that cap assembly be wiped off with Stoddard solvent or equivalent on an as required basis to help ensure proper filler cap sealing. The filler cap should be inspected and cleaned as indicated in paragraph 13-47 and 13-48.

13-47. INSPECTION. (See figure 13-12.)

NOTE

If fuel collects in handle well it could indicate stem O-ring leakage. Fuel collecting around perimeter of cap could indicate cap outer seal or check valve leakage.

a. Remove fuel cap from adapter (8), remove safety chain (10) from cap and cover or plug fuel opening to keep out foreign matter.
b. Rotate cap handle (1) to "OPEN" position, compress cap body (2) and lock plate (6) to expose .125 inch diameter handle pin (17).
c. Using a small wire push out handle pin (17).
d. Note resilience of O-ring (13) and outer seal (3) and condition of grooves. If O-ring (13) or outer seal (3) have deteriorated, install service kit SK210-136.
e. Note condition of tabs on lock plate (6) for signs of abnormal wear, if such wear is evident, replace complete cap assembly.

13-48. CLEANING.
a. Using a cotton swab and Stoddard solvent or equivalent, gently lift edges of rubber umbrella (5) and clean stainless steel 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.
b. If O-ring or outer seal grooves appear contaminated, clean with Stoddard solvent or equivalent and cotton swabs.
c. Ascertain that all vent holes in check valve are unobstructed.
d. Clean cap body and lock plate, check for defects.
e. If umbrella continues to leak or is deteriorated it must be replaced.
f. To remove umbrella, lubricate umbrella stem with (MIL-H-5606) hydraulic fluid to prevent tearing the stem.
g. To replace umbrella, lubricate umbrella stem with (MIL-H-5606) hydraulic fluid and use a small blunt tool to insert retaining knob on umbrella stem into check valve body to prevent damaging stem.

13-49. REASSEMBLY. (See figure 13-12.)

NOTE

If fuel was observed leaking around cap periphery prior to disassembly and leakage was not due to a bad O-ring or outer seal an additional split washer (16) may be added for a total of two, prior to reassemblying cap. To make sure that these washers are not installed upside down, check to see that edges of split parallel the respective sides of cap well. The addition of a washer under cap handle will increase effort required to uncap fuel tank.

a. Install spring (15) on stem (14).
b. Install fuel cap body (2) on stem (14).
c. Check that three metal plates (12) on top rim of lock plate (6) are aligned with three guide bosses on fuel cap body (2).

CAUTION

It is possible to install handle pin in pin hole 180 degree out of desired position, if alignment procedure in step "c" is not followed. If handle (1) is not installed properly FWD arrow on cap will not align with arrow on placard (9) when cap is reinstalled.

d. Compress cap body (2) and lock plate (6), install split washer(s) (16) as required.
e. Install cap handle (1) on stem (14) so that handle (1) will be in open position.
f. Insert handle pin (17) through handle (1) and stem (14).
g. Connect fuel cap assembly to safety chain (10) and reinstall fuel cap. Make certain that arrow on fuel cap body (2) and arrow on placard (9) align.

13-50. LEAK TESTING FILLER CAPS. The following procedure may be used to detect fuel filler cap leakage.
a. Service aircraft with approved fuel, filling each fuel bay.
b. Place fuel selector in OFF position.
c. Plug one of the fuel bay vent lines (where it protrudes beneath wing) with a small rubber plug or tape.
d. Connect a rubber hose to other vent. Then tee into this hose a pressure measuring device, such as a water manometer, manifold pressure gage or airspeed indicator.
e. Blow into open end of hose. The pressure must not exceed .7 psi which equals 20 inches of water on a water manometer or 1.43 inches Hg on a manifold pressure gage, or 174 kts on an airspeed indicator.

WARNING

Do not inhale fuel vapor while blowing into rubber hose.

f. It may take several applications of pressure to bring bay to desired pressure.

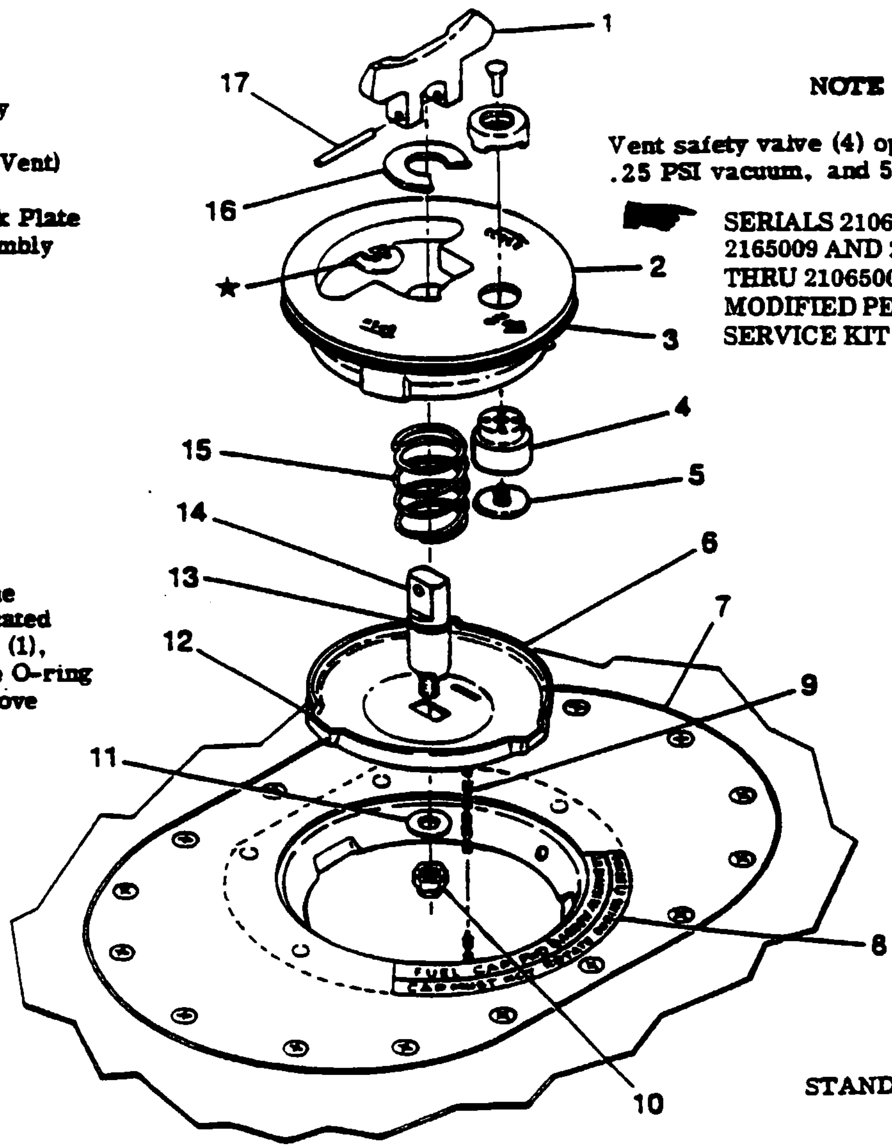
WARNING

Do not apply regulated or unregulated air pressure from an air compressor to fuel vent. Over inflation and major structural damage will occur if more than .7 psi is applied.

g. Pinch or close rubber hose to sustain pressure in fuel bay.
h. Apply a soap solution to fuel filler caps and inspect for leakage around rubber seal to filler neck junction, fuel cap vent, and fuel cap handle stem. Load cap sideways in all directions by pressing on fuel cap vent housing by hand.

1. Handle
2. Fuel Cap Body
3. O-Ring
4. Check Valve (Vent)
5. Umbrella
6. Fuel Cap Lock Plate
7. Adapter Assembly
8. Placard
9. Safety Chain
10. Nut
11. Washer
12. Lug
13. O-Ring
14. Stem
15. Spring
16. Split Washer
17. Handle Pin

★ A Letter M on the fuel cap body located under the handle (1), signifies that the O-ring (3) mounting groove is machined.



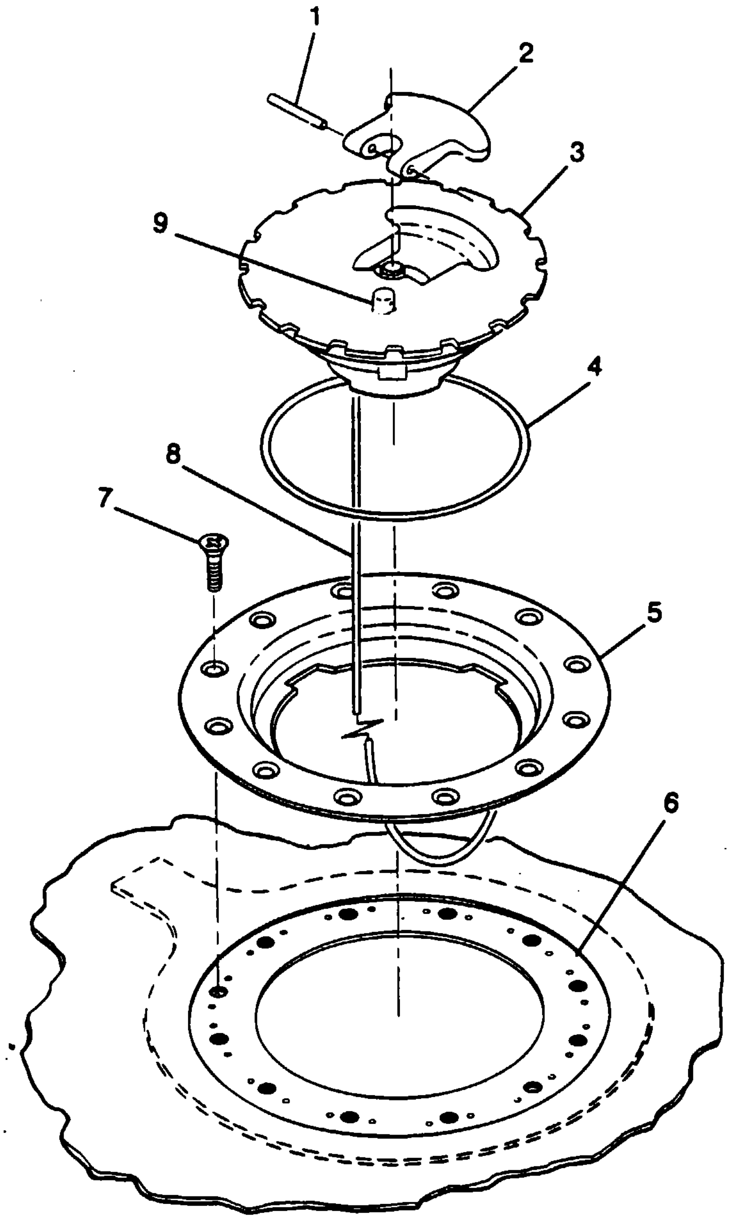
NOTE

Vent safety valve (4) opens at or before .25 PSI vacuum, and 5.0 PSI pressure.

SERIALS 21064898 THRU 2165009 AND 21064898 THRU 21065009 WHEN NOT MODIFIED PER CESSNA SERVICE KIT SK210-136A.

STANDARD RANGE

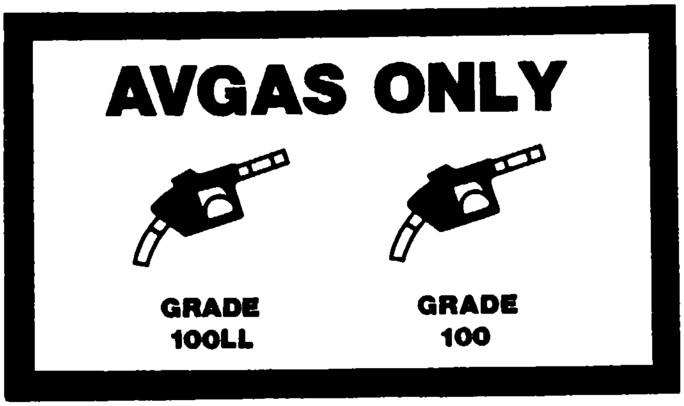
Figure 13-12. Fuel Filler Cap (Sheet 1 of 2)



EXTENDED RANGE

1. Pin
2. Handle
3. Fuel Cap Body
4. Seal
5. Lock Ring
6. Doubler
7. Screw
8. Lanyard
9. Vent

Figure 13-12. Fuel Filler Cap (Sheet 2 of 2)



Fuel Grade Placard

SERVICE THIS AIRPLANE WITH 100LL/100 MIN AVIATION GRADE GASOLINE. TOTAL CAPACITY 45.0 GAL.

SERVICE THIS AIRPLANE WITH 100LL/100 MIN AVIATION GRADE GASOLINE. TOTAL CAPACITY 60.0 GAL.

CAPACITY 33.5 GALLONS TO BOTTOM OF FILLER NECK EXTENSION.

Fuel Capacity Placards

Figure 13-13. Fuel System Placards

NOTE

No leakage is permissible. If leaks are present, replace cap with a new unit or repair in accordance with Cessna Service Information Letter SE80-59, Supplement No. 1 dated, June 23, 1980.

CAUTION

Care must be exercised in removing fuel filler caps until the system has been depressurized.

i. After replacement of either fuel filler cap, repeat inspection.
j. Remove rubber hose, unplug or remove tape from other fuel vent, and plate fuel selector in desired position.

13-51. PRIMING SYSTEM.

13-52. DESCRIPTION. The priming system is comprised of a plunger-type manually-operated primer, which draws fuel from strainer and forces it through a tee fitting to aft end of each intake manifold. Injecting fuel into each manifold primes both banks of cylinders.

13-53. REMOVAL AND INSTALLATION.
a. With fuel ON-OFF valve in OFF position, drain fuel from strainer and lines.
b. Disconnect and cap or plug all fuel lines at primer. (Observe precautions in paragraph 13-3.)
c. Unscrew knurled nut and remove plunger from pump body.
d. Remove pump body from instrument panel.

NOTE

Visually inspect primer lines for crushed, kinked or broken condition. Insure proper clamping to prevent fatigue due to vibration and chafing.

e. Reverse preceding steps for installation. With selector or fuel ON-OFF valve in ON position, check for leaks and proper pumping action.

SECTION 14

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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14-1. PROPELLER.

14-2. DESCRIPTION. The aircraft is equipped with an all-metal, constant-speed, governor-regulated propeller. The constant-speed propeller is single- acting, in which engine oil pressure, boosted and regulated by the governor is used to obtain the correct blade pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the crankshaft. The amount and pressure of the oil supplied is controlled by the engine-driven governor. An increase or decrease in throttle setting or a change in aircraft attitude will affect the balance which maintains a given RPM. If the throttle is opened further or if aircraft speed is increased, engine RPM will try to increase. The governor senses this and directs oil pressure to the forward side of the piston. The blades will be moved to a higher pitch and engine speed will remain constant. Conversely, if the throttle opening or the aircraft speed is decreased, the engine RPM will try to decrease. The governor senses this and allows oil to drain from the forward side of the piston. Spring tension and centrifugal twisting moment will move the blades to a lower pitch to maintain the selected engine speed.

14-3. REPAIR. Metal propeller repair first involves evaluating the damage and determining whether the repair will be a major or minor one. Federal Aviation Regulations, Part 43 (FAR 43), and Federal Aviation Agency, Advisory Circular No. 43.13 (FAA AC No. 43.13), define major and minor repairs, alterations and who may accomplish them. When making repairs or alterations to a propeller FAR 43, FAA AC No. 43.13 and the propeller manufacturer's instructions must be observed.

14-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO CHANGE PITCH.	Governor control disconnected or broken.	Check visually. Connect or replace control.
	Governor not correct for propeller. (Sensing wrong.)	Check that correct governor is installed. Replace governor.
	Defective governor.	Refer to paragraph 14-9.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 14-9.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
STATIC RPM TOO HIGH OR TOO LOW.	Improper propeller governor adjustments.	Perform static RPM check Refer to section 12 and 12A for procedures.
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 14-9.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to take-off after propeller has been reinstalled or has been idle for an extended period.
	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 14-9.
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	Damaged O-ring and seal between engine crankshaft flange and propeller.	Check visually. Remove propeller and install O-ring seal.
	Foreign material between engine crankshaft flange and propeller mating surfaces or mounting nuts not tight.	Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in para 14-6, e.
OIL LEAKAGE AT ANY OTHER PLACE.	Defective seals, gaskets, threads, etc., or incorrect assembly.	Propeller repair or replacement is required.

14-5. REMOVAL. Refer to figure 14-1.

a. Remove spinner attaching screws (2) and remove spinner (1), spinner support (3) and spacers (4). Retain spacers (4).

b. Remove cowling as required for access to mounting nuts (9).

c. loosen all mounting nuts (9) approximately 1/4 inch and pull propeller (15) forward until stopped by nuts.

WARNING

BE CERTAIN THAT MAGNETO IS GROUNDED BEFORE TURNING PROPELLER.

NOTE

As the propeller (15) is separated from the engine crankshaft flange, oil will drain from the propeller and engine cavities.

d. Remove all propeller mounting nuts (9) and pull propeller forward to remove from engine crankshaft (12).

e. If desired, the spinner bulkhead (11) can be removed by removing screws (10), which attach the spinner bulkhead to the propeller.

NOTE

If the optional propeller anti-ice system is installed, use caution when removing propeller. Removing the propeller without the anti-ice slip ring requires disconnecting nine wires at spinner bulkhead since the slip ring is mounted to the bulkhead. Wires should be identified according to wiring diagram to facilitate reassembly. During removal, installation, or other maintenance, use care to prevent damaging slip ring and brushes.

14-6. INSTALLATION.

a. If the spinner bulkhead was removed, position bulkhead so the propeller blades will protrude through the spinner with ample clearance. Install spinner bulkhead attaching screws (10), which attach the spinner to bulkhead.

CAUTION

Avoid scraping metal from bore of spinner bulkhead and wedging scrapings between engine flange and propeller. Trim the inside diameter of the bulkhead as necessary when installing a new spinner bulkhead.

b. Clean propeller hub cavity and mating surfaces of propeller and crankshaft.

c. Lightly lubricate new O-ring (13) and the crankshaft pilot with clean engine oil and install the O-ring in the propeller hub.

NOTE

If the airplane is configured with the optional propeller anti-ice system, the slip ring assembly must be installed with or prior to propeller. Use care to prevent damaging brushes and slip ring, and insure proper alignment. Reconnect slip ring wires according to the applicable wiring diagram.

WARNING

BE CERTAIN THAT MAGNETO IS GROUNDED BEFORE TURNING PROPELLER.

d. Lubricate the hub mounting studs with A-1637-16 (MIL-T-83483) grease.

ALL PROPELLER STUDS AND NUTS ARE REQUIRED TO BE INSTALLED WITH LUBRICATION ON THE HUB MOUNTING STUDS.

e. Align propeller mounting studs and dowel pins with proper holes in engine crankshaft flange and slide propeller carefully over crankshaft pilot until mating surfaces of propeller and crankshaft flange are approximately 1/4 inch apart.

f. Install propeller attaching washers and new nuts (9) and work propeller aft as far as possible, then tighten nuts evenly.

WARNING

DO NOT USE ALL STEEL LOCKNUTS. USE ONLY NEW ELASTIC ELEMENT LOCKNUTS WHEN INSTALLING PROPELLER.

g. Torque nuts 45 to 50 lb-ft. <u>LUBRICATED TORQUE ONLY.</u> Refer to McCauley Service Bulletin 227, or latest revision, as applicable for propeller stud and nut torque and lubrication requirements.

CAUTION

USE OF CROW FOOT OPEN-ENDED TORQUE WRENCHES CAN CAUSE SLIPPAGE AND LEAVE MARKS ON THE ENGINE OUTPUT FLANGE IF CARE IS NOT USED DURING THE TORQUE PROCESS.

USE PROPER CALCULATIONS WHEN USING TORQUE ADAPTERS TO ENSURE CORRECT INSTALLATION TORQUE.

TO PRODUCE CONSISTENT AND ACCURATE INSTALLATION TORQUE, MCCAULEY RECOMMENDS AN ADJUSTABLE "CLICK" TYPE WRENCH WITH NON RATCHETING, INTERCHANGEABLE, 12 POINT BOX-END WRENCH HEADS.

IT MAY BE NECESSARY TO USE VARIOUS ADAPTERS IN CERTAIN APPLICATIONS. HOWEVER, IT IS STRONGLY RECOMMENDED THAT EXTREME CAUTION BE EXERCISED TO ENSURE THAT ACCURATE TORQUE IS BEING APPLIED FOR MAXIMUM RETENTION.

ON MOST AIRPLANES, A TORQUE WRENCH CANNOT BE FITTED DIRECTLY ON THE PROPELLER MOUNTING NUT BECAUSE OF THE LACK OF CLEARANCE BETWEEN THE FLANGE AND ENGINE CASE. AN ADAPTER MUST BE USED ON THE TORQUE WRENCH.

THE USE OF A TORQUE WRENCH WITH ANY FORM OF EXTENSION REQUIRES THE TORQUE READING ON THE WRENCH TO BE CHANGED TO OBTAIN THE CORRECT TORQUE APPLIED AT THE NUT. TO OBTAIN CORRECT RESULTS REFER TO THE FORMULA IN SECTION 1.

h. Install spacers (4) and spinner support (3) on propeller cylinder (5). If spacers (4) are not centered mechanically (piloted), visually center and hold them until spinner support (3) is forced firmly in place.

i. Hold spinner (1) snug against spinner support (3) and check alignment of holes in spinner (1) with holes in spinner bulkhead(11). Add or remove spacers (4) from propeller cylinder (5) until holes are within .050 of alignment.

j. Push hard on spinner (1) to align holes and install screws and washers (if required) in three (3) or more equal spacers around the spinner bulkhead (11). Relax pressure on spinner and install remaining screws and washers (if required) in spinner.

k. Tighten all screws uniformly around the spinner.

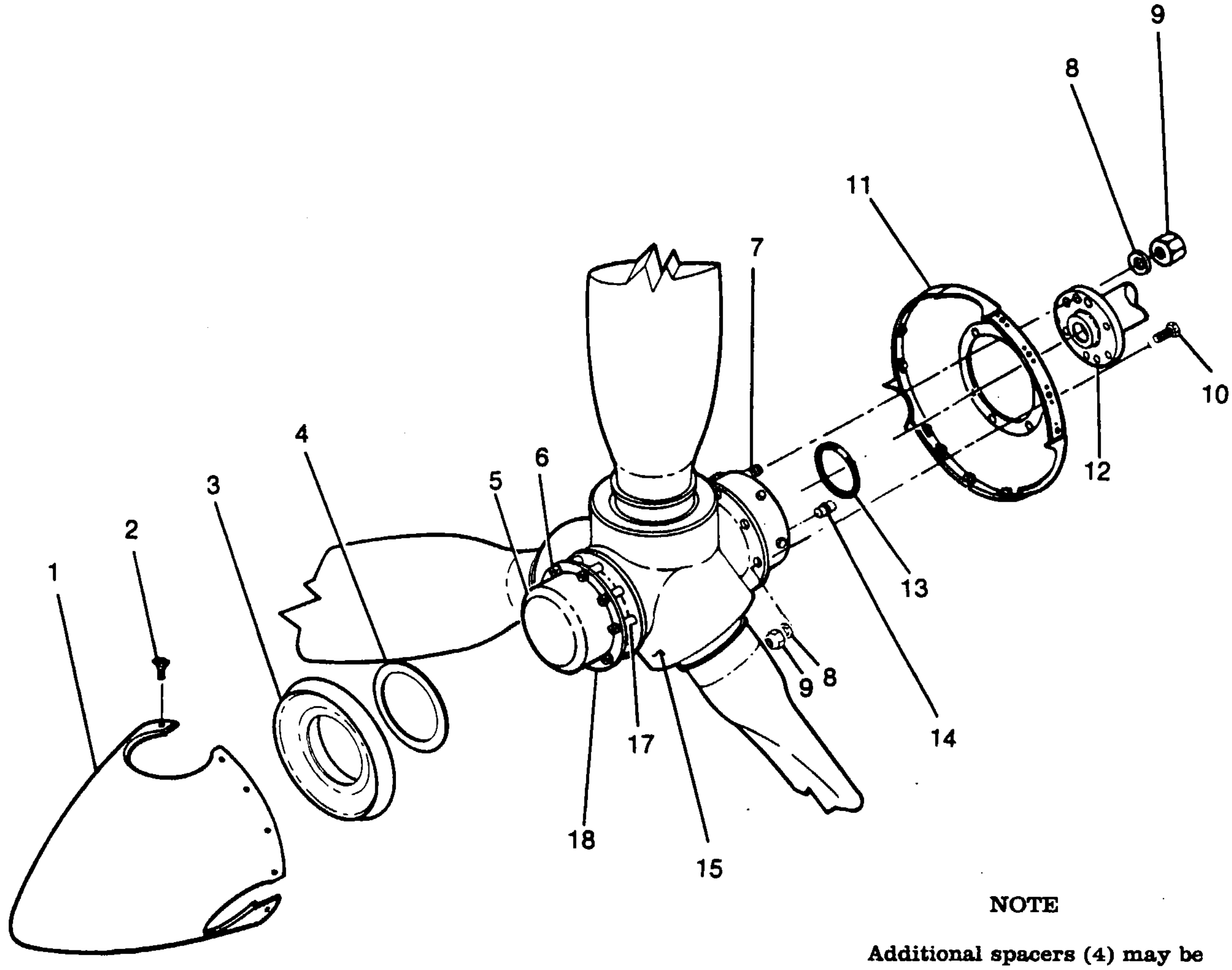
14-6A. TIME BETWEEN OVERHAUL (TBO). Propeller overhaul shall coincide with engine overhaul, but shall not exceed limits specified in McCauley Service Bulletin 137 and all revisions and supplements thereto. Refer to Sections 12 and 12A for engine overhaul periods.

14-7. GOVERNOR.

14-8. DESCRIPTION. The propeller governor is a single-acting, centrifugal type, which boosts oil pressure from the engine and directs it to the propeller where the oil is used to increase blade pitch. A single-acting governor uses oil pressure to effect a pitch change in one direction only; a pitch change in the opposite direction results from a combination of centrifugal twisting moment of rotating blades and compressed springs. Oil pressure is boosted in the governor by a gear type oil pump. A pilot valve, flyweight and speeder spring act together to open and close governor oil passages as required to maintain a constant engine speed.

NOTE

Outward physical appearance of specific governors is the same, but internal parts determine whether it uses oil pressure to increase or decrease blade pitch. The propellers used on these aircraft require governors which "sense" in a certain manner. "Sensing" is determined by the type pilot valve installed inside the governor. Since the basic governor may be sent to

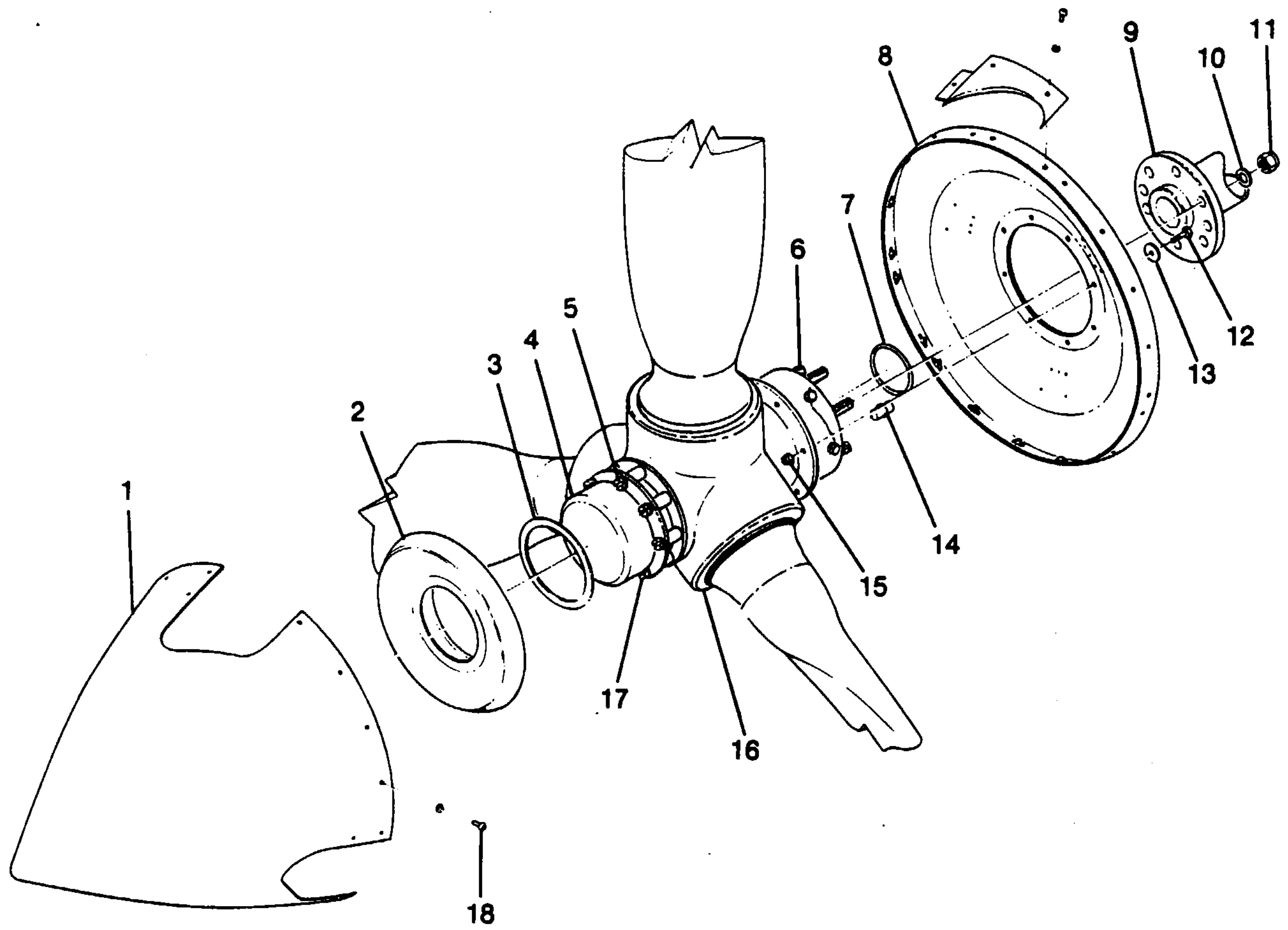


NOTE

Additional spacers (4) may be required when installing a new spinner (1) to ensure a snug fit between spinner (1) and support (3). Order Cessna Part Number 0752620-3. DO NOT USE more than 14 spacers in this installation.

1. Propeller Spinner
2. Screw
3. Spinner Support
4. Spacer
5. Cylinder
6. Screw
7. Stud
8. Washer
9. Nut
10. Screw
11. Spinner Bulkhead
12. Engine Crankshaft
13. O Ring
14. Dowel Pin
15. Propeller
17. Tube
18. Ring

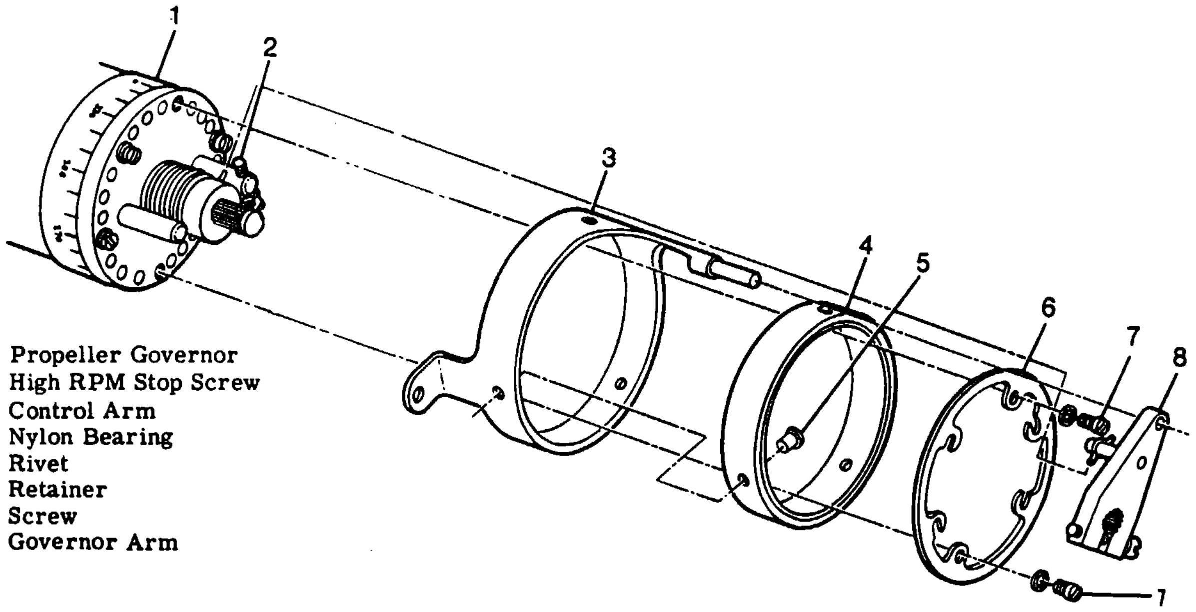
Figure 14-1. Propeller Installation (Sheet 1 of 2)



USED ON TURBOCHARGED ENGINES

1. Spinner
2. Support
3. Spacer
4. Cylinder
5. Screw
6. Stud
7. O-Ring
8. Spinner Bulkhead
9. Engine Crankshaft
10. Washer
11. Nut
12. Bolt
13. Washer
14. Dowl Pin
15. Nut
16. Propeller
17. Safety Wire
18. Screw

Figure 14-1. Propeller Installation (Sheet 2 of 2)



1. Propeller Governor
2. High RPM Stop Screw
3. Control Arm
4. Nylon Bearing
5. Rivet
6. Retainer
7. Screw
8. Governor Arm

Figure 14-2. Governor Control Arm and Bearing Assembly

"sense" oppositely, it is important to ascertain that the governor is correct for the propeller being used.

14-9. TROUBLE SHOOTING. When trouble shooting the propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault. Removal and replacement, rigging, high-speed stop adjustment, desludging and replacement of the governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classed as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

14-10. GOVERNOR REMOVAL.

a. Remove cowling, nose cap and engine baffles as required for access to governor.

b. Disconnect governor control from governor.

NOTE

Note EXACT position of all washers so that washers may be installed in the same position on reinstallation.

c. Disconnect intake manifold balance tube at front of engine and move as required for clearance.

d. Remove nuts and washers securing governor to engine and pull governor from mounting studs.

e. Remove gasket from between governor and engine mounting pad.

14-11. CONTROL ARM AND BEARING ASSEMBLY. Refer to figure 14-2.

14-12. REMOVAL AND INSTALLATION.

a. Using a scribe, make aligning index marks on governor arm (8) and end of governor serrated shaft.

NOTE

The governor arm (8) must be installed on the governor shaft in the same serration or the governor speed will be changed approximately 200 rpm.

b. Remove safety wire from governor arm screw and from screws attaching governor head to governor.

c. Remove the two screws (7) that pass through the non-notched holes in the retainer (6).

d. Loosen, but do not remove, the four remaining screws so that retainer (6) may be rotated.

e. Loosen screw in governor arm (8) so that arm may be slipped toward end of serrated shaft.

f. Slip governor arm toward end of serrated shaft and work retainer (6) and control arm (8) from governor (1).

NOTE

If governor arm (8) becomes disengaged from serrated shaft, align index marks and install arm on serrated shaft. The control arm spring has approximately 1-1/2 turns preload.

g. Reverse the preceding steps for reinstallation.

14-13. GOVERNOR INSTALLATION.

a. Wipe governor and engine mounting pad clean.

b. Install a new gasket on the mounting studs. Install gasket with raised surface of the gasket screen toward the governor.

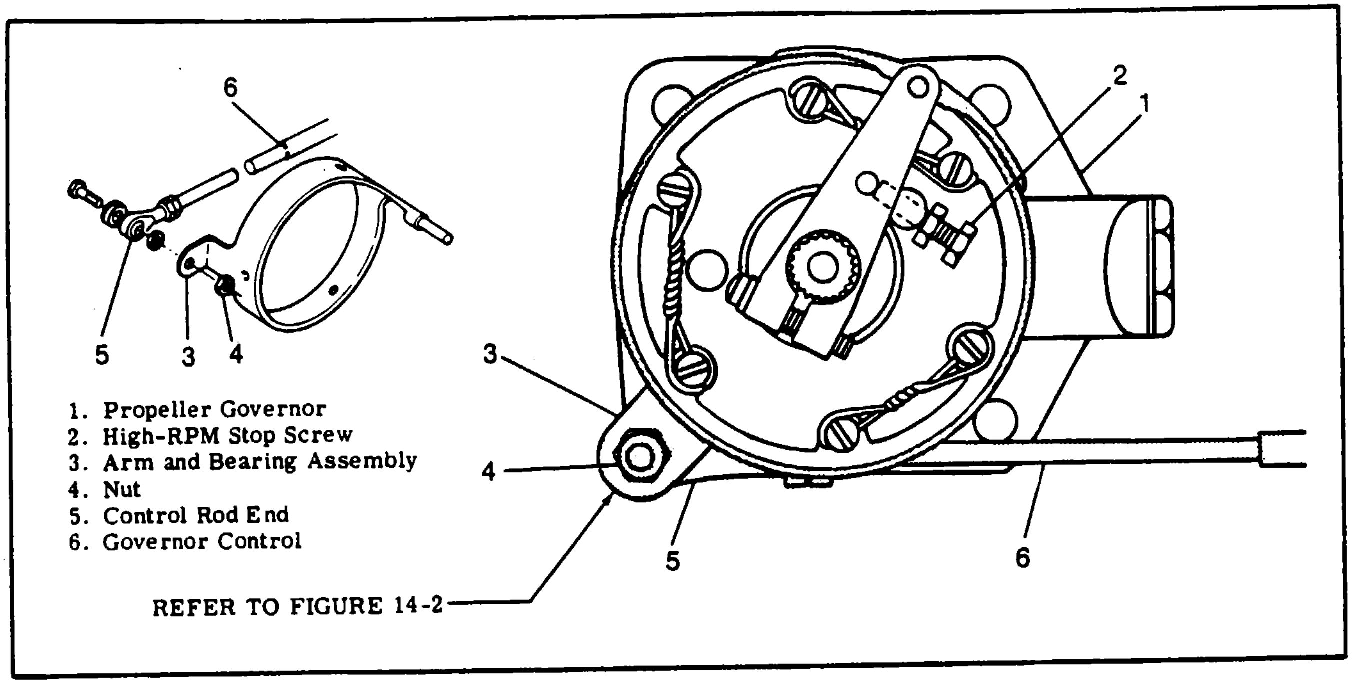


Figure 14-3. Governor and Control Adjustments

WARNING

Be certain that magneto is GROUNDED before turning propeller.

c. Position governor on mounting studs, aligning governor drive splines with splines in the engine and install mounting nuts and washers. Do not force spline engagement. Rotate engine crankshaft slightly so splines will engage smoothly as soon as properly aligned.
d. Connect governor control to governor, and rig as instructed in paragraph 14-15.
e. Connect intake manifold balance tube, if removed. Insure all clamps are tight.
f. Reinstall all items removed for access.

14-14. HIGH-RPM STOP ADJUSTMENT. figure 14-3.
a. Remove engine cowling.
b. Disconnect cabin heater inlet air duct from nose cap.
c. Remove plug button from left front baffle.

d. Remove safety wire and loosen the high-speed stop screw locknut.
e. Turn the stop screw IN to decrease maximum rpm and OUT to increase maximum rpm. One full turn of the stop screw causes a change of approximately 25 rpm.
f. Tighten stop screw locknut, safety wire stop screw and make propeller control linkage adjustment as necessary to maintain full travel.
g. Install cabin heater inlet air duct or plug button and install cowling.
h. Test operate propeller and governor.

NOTE

It is possible for either the propeller low pitch (high-rpm) stop or the governor high-rpm stop to be the high-rpm limiting factor. It is desirable for the governor stop to limit the high-rpm at the maximum rated rpm for a particular aircraft. Due to climatic conditions, field elevation, low-pitch blade angle and other considerations, an engine may not reach rated rpm on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated rpm when airborne.

14-15. RIGGING PROPELLER GOVERNOR CONTROL.
a. Disconnect control end (5) from governor (1).
b. Place propeller control in cabin, full forward, then pull it 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 and adjust control rod end until attaching holes align while governor arm is against high-rpm stop screw. Be sure to maintain sufficient thread engagement of the control and rod end. If necessary, shift control in the clamps to achieve this.
e. Attach rod end to the governor. Be sure all washers are installed correctly.
f. Operate the control to see that the governor arm bottoms out against the low pitch stop and bottoms out against the high pitch stop on the governor before reaching the end of control cable travel.

NOTE

The result of rigging is full travel of the governor arm (bottomed out against both high and low pitch stops) with some cushion at each end of control travel.

14-16. TIME BETWEEN OVERHAUL. (TBO). Propeller governor overhaul shall coincide with engine overhaul. Refer to Section 12 or 12A for engine time between overhaul (TBO) intervals. The governor and propeller overhaul manuals are available from the Cessna Supply Division.

SHOP NOTES:

SECTION 15

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15-1. UTILITY SYSTEMS.

15-2. HEATING AND DEFROSTING SYSTEM - 210. (See Figure 15-1.)

15-3. DESCRIPTION. On airplanes with non-turbocharged engines, ram air is directed through the nosecap and engine baffle to the muffler shroud assembly located on the left-hand exhaust stack. The heated air is then ducted to the heater valve located on the left-hand side of the firewall. When the valve is opened, the air is released into a duct assembly located across the aft side of the firewall; then it is ducted to the heating and defrosting outlets.

Temperature regulation is accomplished by blending the heated air with cool outside air from the ventialtion system (see paragraph 15-XX). The heater valve is operated by a push-pull control marked "CABIN HEAT," located on the instrument panel. It regulates the volume of heated air entering the system. Pulling the heater control full out supplies maximum flow, and pushing it in gradually decreases flow, shutting off flow completely when the control is pushed full in.

The defroster control operates a damper in the outlet to regulate the amount of air deflected across the inside surface of the windshield. The temperature and volume of this air is controlled by the settings of the cabin heating system control.

15-4. TROUBLE SHOOTING. Most of the operational troubles in the heating and defrosting system 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. Damaged or broken parts should be repaired or replaced. When checking controls, be sure valves respond freely to control movewment, 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 very thorough inspection of the exhaust muffler should be accomplished. Refer to the applicable paragraph in Section 12 for the non-turbocharged engine exhaust system inspection. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in heater ducts across the firewall with Pro-Seal No. 700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound.

15-5. REMOVAL AND INSTALLATION OF COMPONENTS. Figure 15-1 may be used as a guide for removal and installation of components of the heating and defrosting system. Cut replacement hoses to length and install in their original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. Defective heater valves and defroster outlets should be repaired or replaced. Check for proper operation after installation or repair.

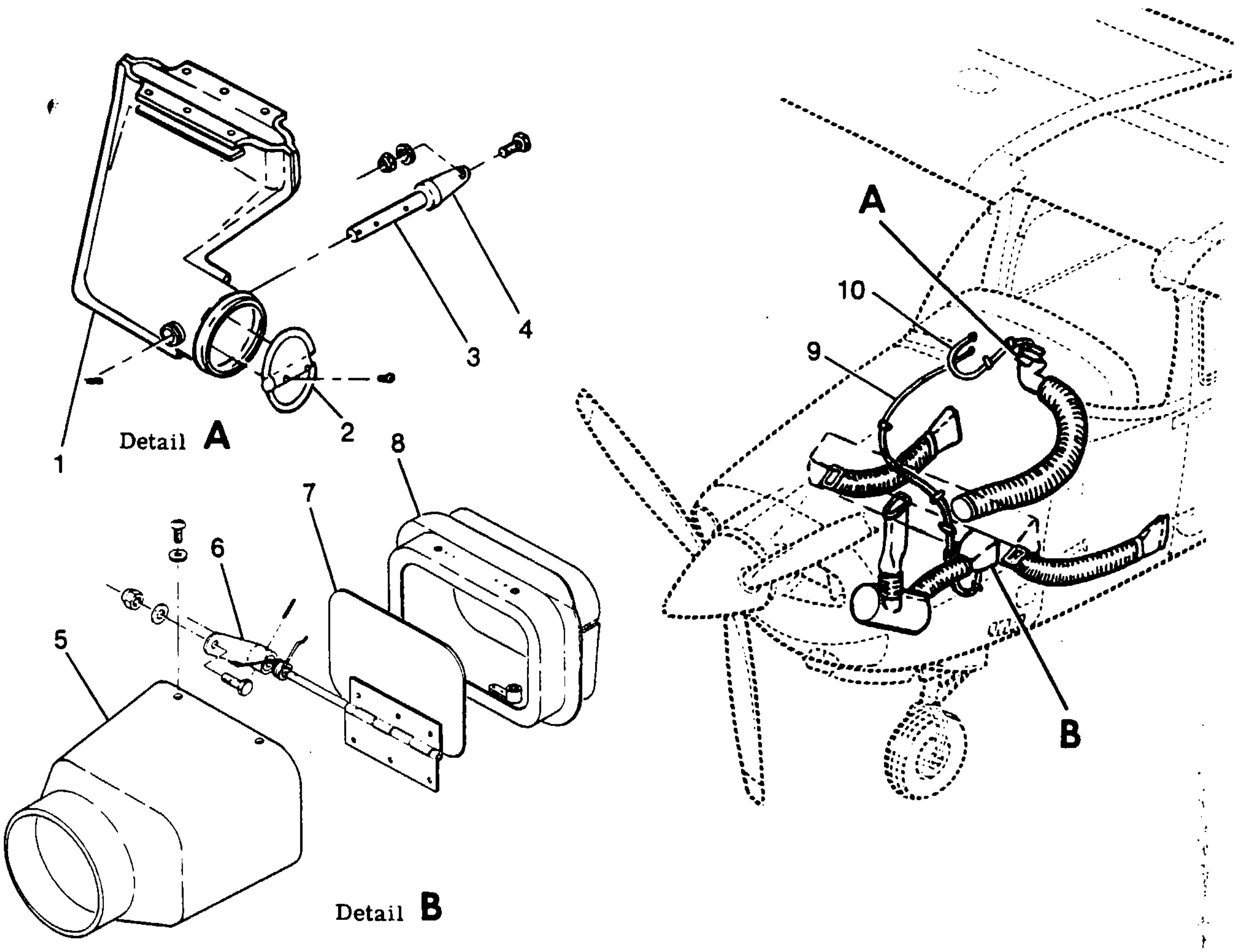
15-6. HEATING AND DEFROSTING SYSTEM - T210. (See Figure 15-2.)

15-7. DESCRIPTION. On airplanes with turbocharged engines, warm air is transferred from the compressor of the turbocharger to the heat exchanger, located on the lower left-hand cowl, where it is heated or cooled. The air is then ducted to the heater valve located on the left-hand side of the firewall. When the valve is opened, air is released into a duct assembly located across the aft side of the firewall; then, it is ducted to the heating and defrosting outlets. Temperature regulation is accomplished in two ways. To raise the temperature, a control, marked "CABIN TEMP," opens a valve forward of the heat exchanger; hot air is then drawn from the exhaust shroud, located on the left-hand exhaust stack, and used to heat the air drawn from the turbocharger. Lowering the temperature is accomplished by blending the heated air with cool outside air from the ventilation system (see paragraph 15-10). The heater valve is operated by a push-pull control, marked "CABIN HEAT," located on the instrument panel. It regulates the volume of heated air entering the system. Pulling the heater control full out supplies maximum flow, and pushing it in gradually decreases flow, shutting off flow when the control is pushed in fully.

Windshield defrost air is controlled by dual sliding gate valves at the outlet above the glareshield. The temperature and volume of this air is controlled by the settings of the cabin heating system controls.

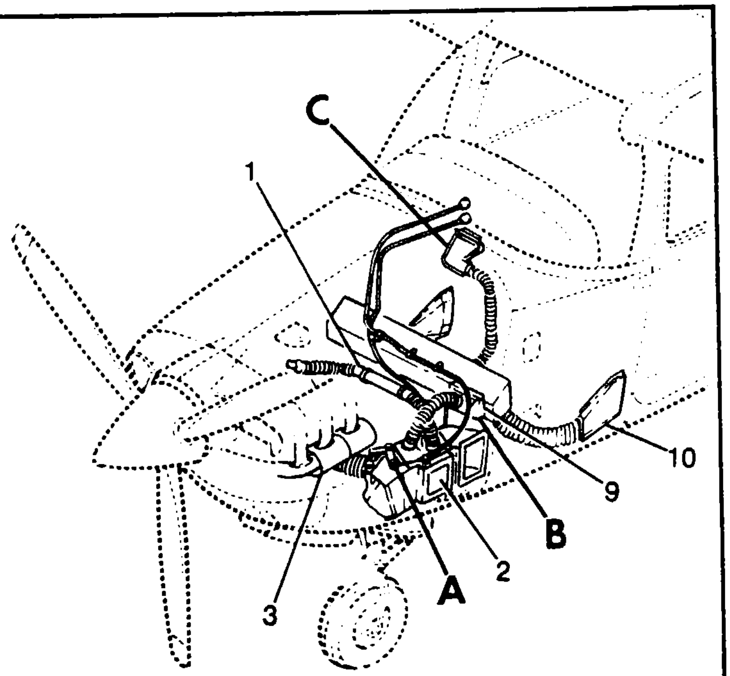
15-8. TROUBLE SHOOTING. Most of the operational troubles in the heating and defrosting system are caused by sticking or binding air valves and their controls, damaged air ducting, or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. Damaged or broken parts should be repaired or replaced. When checking controls, be sure valves respond freely to control movewment, 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 very thorough inspection of the exhaust muffler should be accomplished. Refer to the applicable paragraph in Section 12A for the turbocharged engine exhaust system inspection. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in heater ducts across the firewall with Pro-Seal No. 700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound.

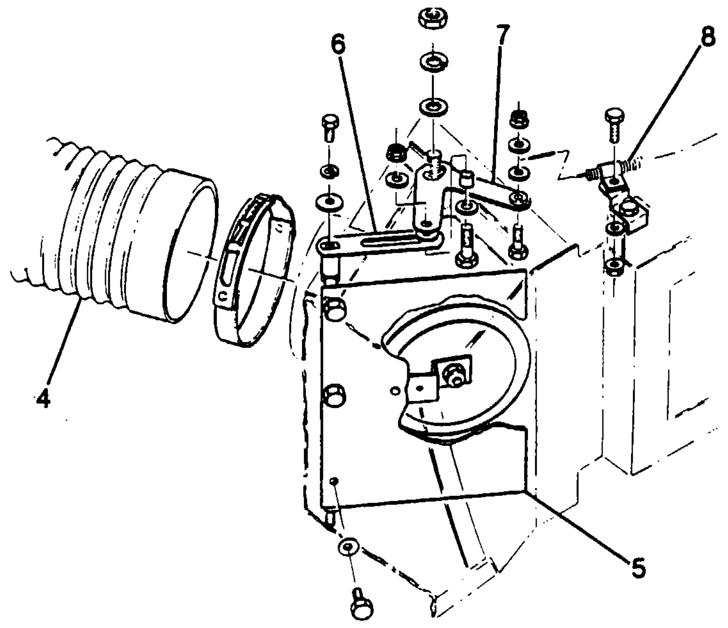
15-9. REMOVAL AND INSTALLATION OF COMPONENTS. Figure 15-2 may be used as a guide for removal and installation of components of the heating and defrosting system. Cut replacement hoses to length and install in their original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. Defective heater valves and defroster outlets should be repaired or replaced. Check for proper operation after installation or repair.



1. Defrost Nozzle
2. Valve Assembly
3. Shaft
4. Lever Assembly
5. Valve Body
6. Arm Assembly
7. Valve Plate Assembly
8. Valve Seat Assembly
9. Cabin Heat Control
10. Defrost Control

Figure 15-1. Model 210 Heating and Defrosting System

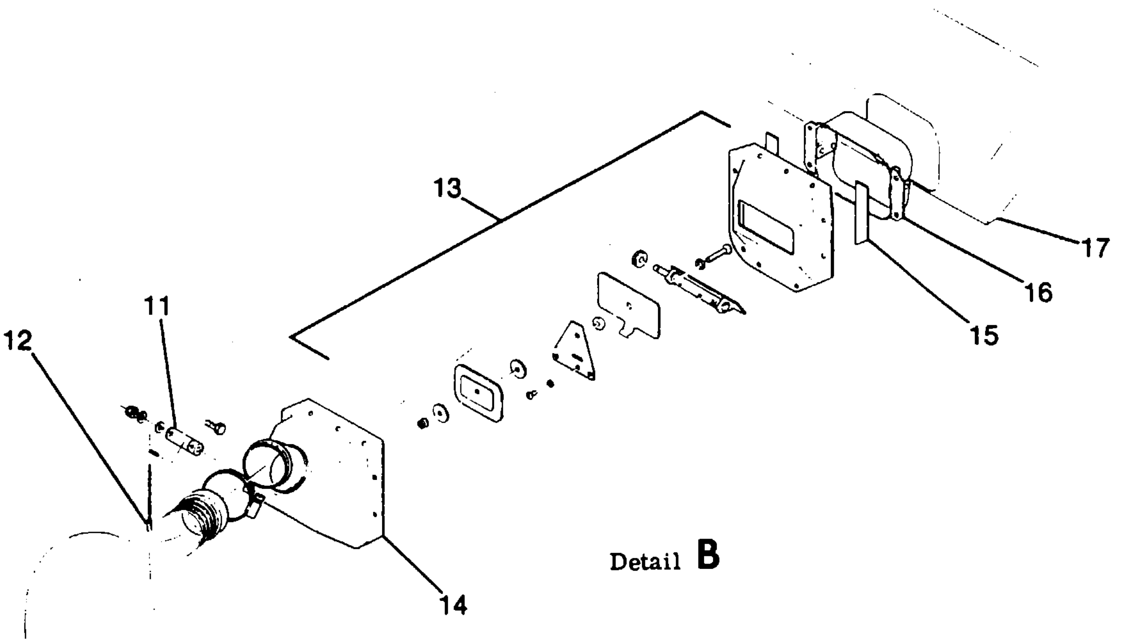




Detail A

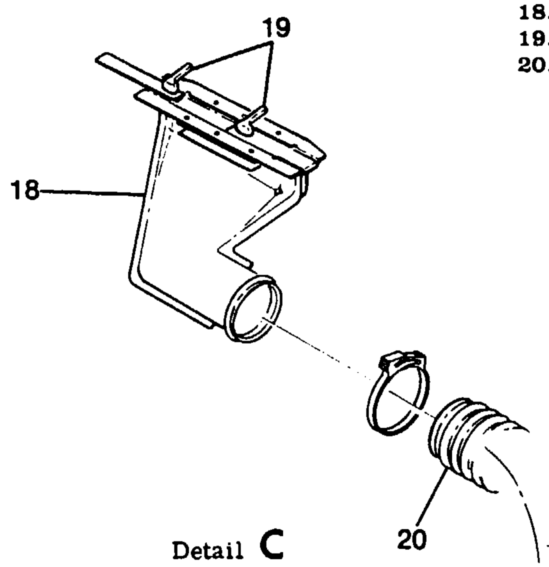
1. Venturi Crossover Tube
2. Heat Exchanger
3. Muffler Shroud
4. Duct
5. Valve Assembly - Temperature
6. Control Arm
7. Arm Assembly
8. Control Cable - Temperature
9. Firewall Shutoff Valve
10. Heater Outlet

Figure 15-2. Model T210 Heating and Defrosting System (Sheet 1 of 2)



Detail B

10. Duct
11. Control Arm
12. Control Cable - Shutoff
13. Valve Seat Assembly
14. Cover
15. Shim
16. Extension
17. Duct - Firewall
18. Defroster Outlet
19. Valve Assembly - Defroster
20. Duct - Defroster



Detail C

Figure 15-2. Model T210 Heating and Defrosting System (Sheet 2 of 2)

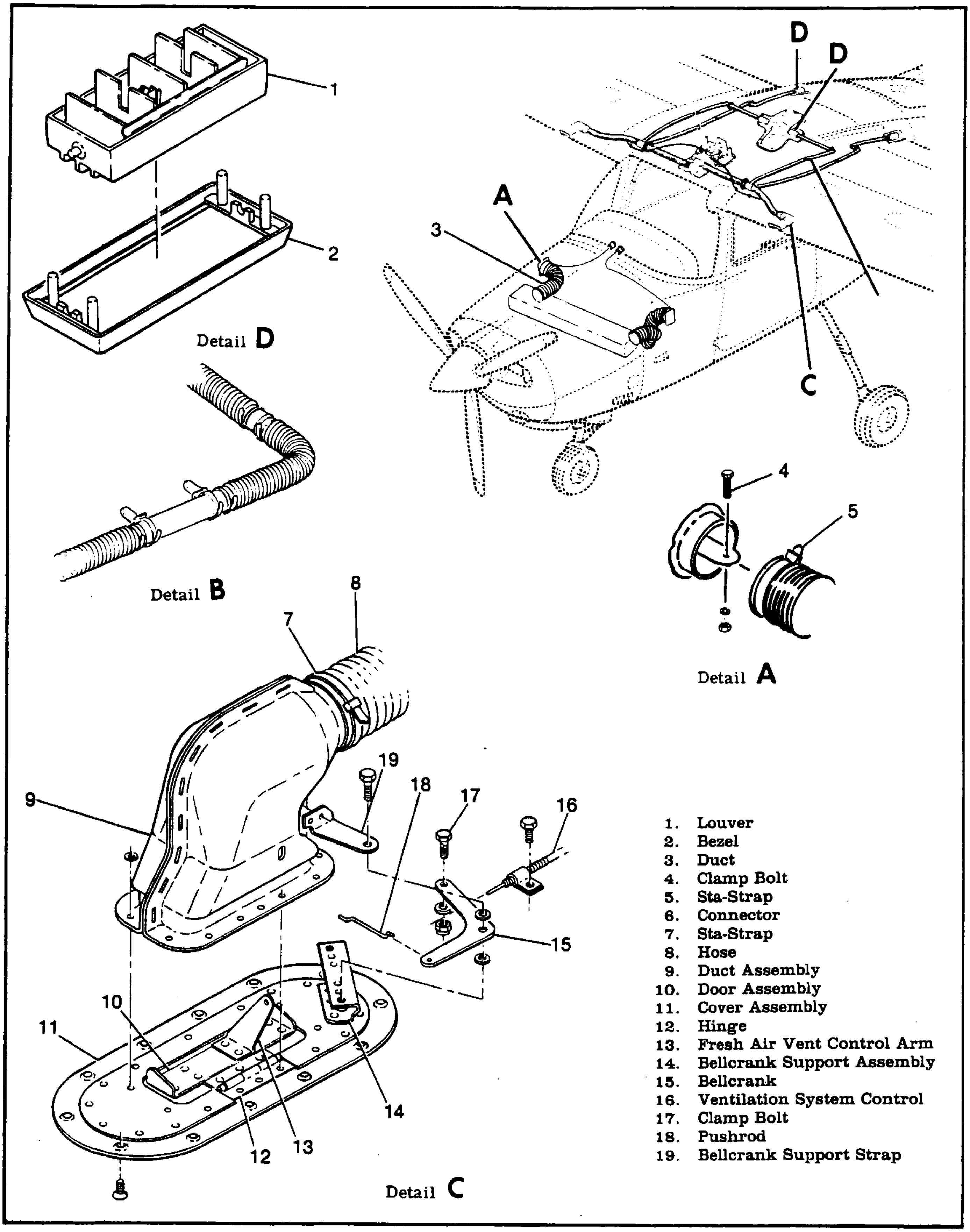
15-10. VENTILATING SYSTEM. (See Figure 14-3.)

15-11. DESCRIPTION. there are two fresh air ventilation systems incorporated into the airplane. Cabin ventilation is provided by two fresh air scoop doors, one on each side of the fuselage, just forward of the cabin doors. The left scoop door, labeled "CABIN AIR," is operated by a push-pull control on the instrument panel. The right scoop door, labeled "AUX CABIN AIR," is controlled by a push-pull control adjacent to the "CABIN AIR" control. Fresh air from the the scoops is routed to a duct located on the aft side of the firewall, where is is distributed to the cabin. As long as the "CABIN HEAT" control is pushed full in, no heated air can enter the firewall duct; however, as the "CABIN HEAT" control is gradually pulled out, more and more heated air will blend with fresh air from the scoops. Any of the controls may be set to any desired position to provide comfortable cabin temperatures.

Overhead air provides fresh air from adjustable doors located on the underside of the wings near the root. these two doors are controlled by two push-pull controls, labeled "OVERHEAD AIR, LEFT AND RIGHT." The controls are located on the instrument panel. Air is distributed through ducts, in the cabin top, to adjustable overhead ventilators.

15-12. TROUBLE SHOOTING. Most of the operational troubles in the ventilating system are caused by sticking or binding of the lever in the duct door or its control. The inner tube in the control valve could also bind or stick, requiring repair or replacement of the control valves.

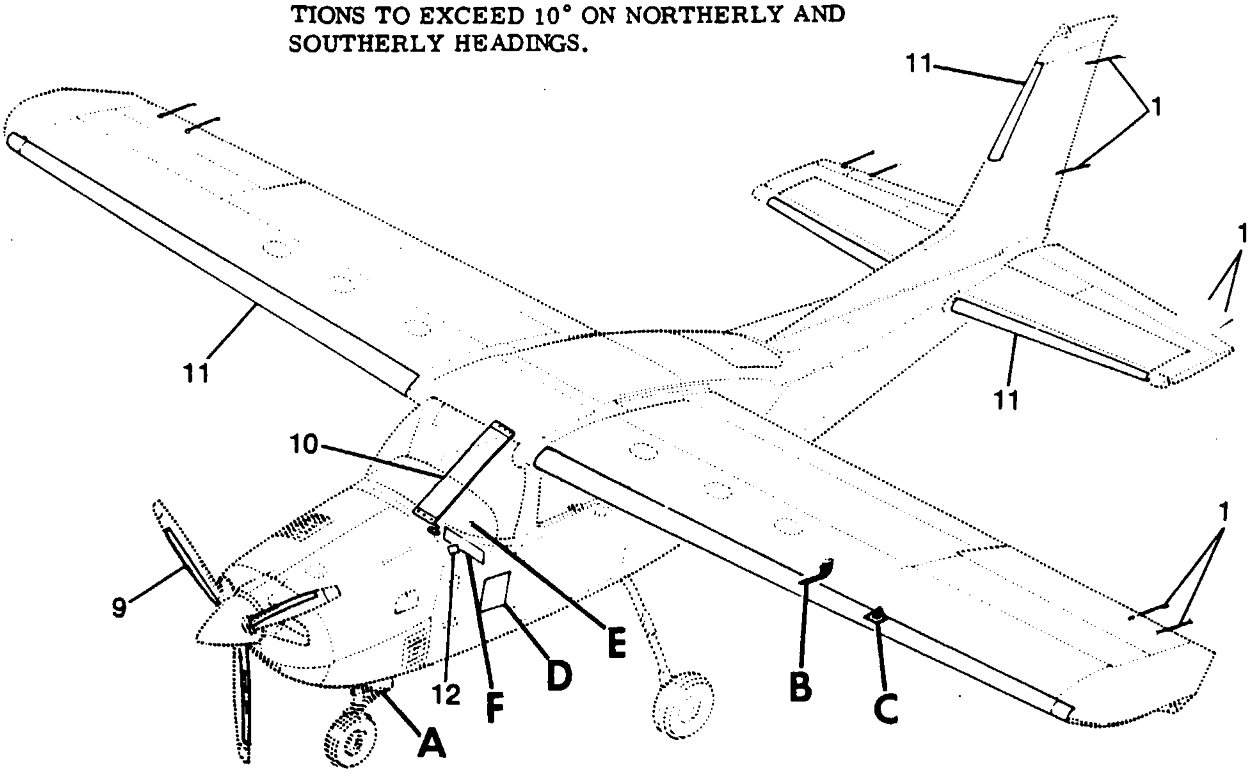
15-13. REMOVAL AND INSTALLATION OF COMPONENTS. Figure 15-3 may be used as a guide for removal and installation of components of the ventilation system. Cut replacement hoses to length and install in their original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. A defective control valve should be repaired or replaced. Check for proper operation of ventilating system controls after installation or repair.

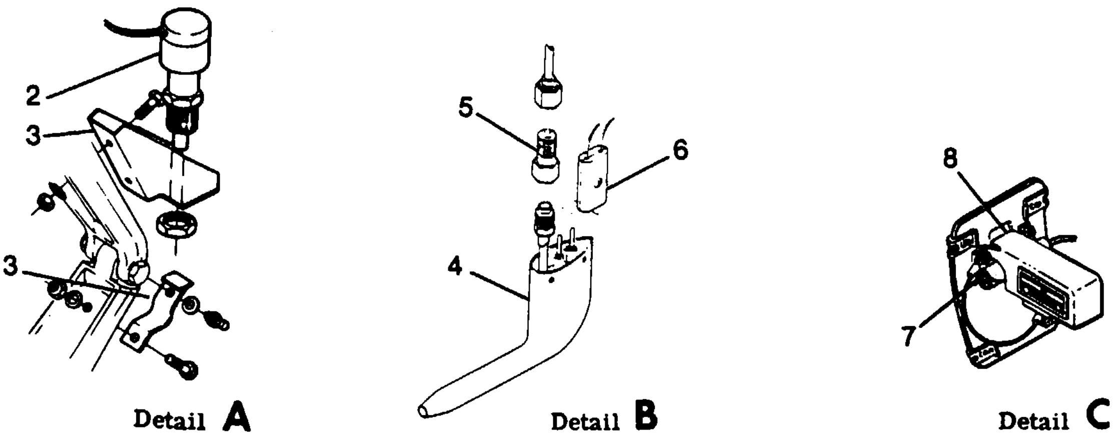


1. Louver
2. Bezel
3. Duct
4. Clamp Bolt
5. Sta-Strap
6. Connector
7. Sta-Strap
8. Hose
9. Duct Assembly
10. Door Assembly
11. Cover Assembly
12. Hinge
13. Fresh Air Vent Control Arm
14. Bellcrank Support Assembly
15. Bellcrank
16. Ventilation System Control
17. Clamp Bolt
18. Pushrod
19. Bellcrank Support Strap

Figure 15-3. Ventilating System

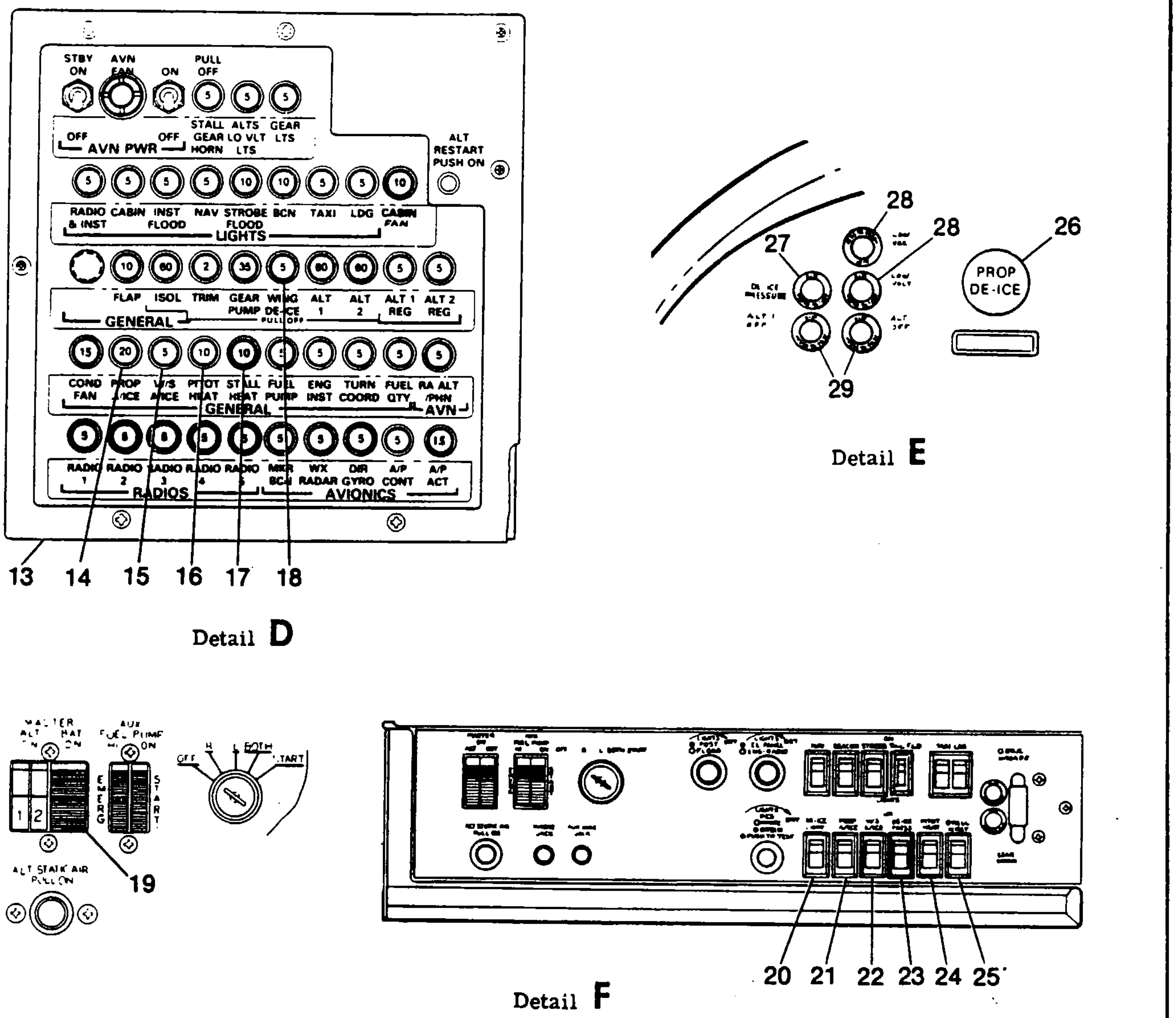
COMBINED OPERATION OF THE PITOT HEAT, WINDSHIELD AND PROPELLER ANTI-ICING SYSTEMS WILL CAUSE THE COMPASS DEVIATIONS TO EXCEED 10° ON NORTHERLY AND SOUTHERLY HEADINGS.





1. Control Surface Dischargers
2. Squat Switch
3. Bracket
4. Pitot Tube
5. Union
6. Receptacle
7. Heater Element
8. Stall Warning Unit
9. Propeller Anti-Ice
10. Windshield Anti-Ice
11. Pneumatic Boot
12. De-Ice Light

Figure 15-4. De-Ice and Anti-Ice System Components (Sheet 1 of 2)



13. Circuit Breaker Panel
14. Prop Anti-Ice Circuit Breaker
15. Windshield Anti-Ice Circuit Breaker
16. Pitot Heat Circuit Breaker
17. Stall Heat Circuit Breaker
18. Wing De-Ice Circuit Breaker
19. Master Switch Circuit Breaker
20. Ice Detector Light Switch
21. Propeller Anti-Ice Switch
22. Windshield Anti-Ice Switch
23. De-Ice Pressure Switch
24. Pitot Heat Switch
25. Stall Heat Switch
26. Propeller De-Ice Gage
27. De-Ice Pressure Light
28. Alt LO-VOLT Lights
29. Alt OFF Lights

Figure 15-4. De-Ice and Anti-Ice System Components (Sheet 2 of 2)

15-14. DE-ICE AND ANTI-ICE SYSTEMS. (See figure 15-4.)

15-15. DESCRIPTION. There are two methods of ice dispursement available on the 210 & T210 series airplanes. The first, known as de-ice, works to remove ice when it has formed. This method is used on the leading edges of the wings and empennage. The second method, known as anti-ice, works to prevent ice accumulation. The method is used on the propeller and windshield.

On the T210 series airplane, a de-ice/anti-ice package, called "flight into known icing" may be installed. Differences that are required for this system are noted in the subsequent paragraphs that detail the various subsystems.

15-16. FLIGHT INTO KNOWN ICING. An optional equipment package, called "flight into known icing", may be installed on the T210 series airplane. For operations in known icing conditions as defined by the Federal Aviation Agency, the following Cessna and FAA approved equipment must be installed and operational:

1. Wing, horizontal stabilizer and vertical fin leading edge pneumatic de-ice boots. (Refer to paragraph 15-17.)
2. Propeller anti-ice boots. (Refer to paragraph 15-34.)
3. Permanently mounted windshield anti-ice panel. (Refer to paragraph 15-42.)
4. Heated pitot tube (high capacity). (Refer to paragraph 15-49.)
5. Heated stall warning transducer (high capacity). (Refer to paragraph 15-49.)
6. Ice detector light. (Refer to paragraph 15-52.)
7. Dual 60-amp alternators. (Refer to Section 17.)
8. Control surface static dischargers. (Refer to paragraph 15-60.)
9. Dual vacuum pumps. (Refer to Section 16.)

For limitations of operation for this optional system, refer to the appropriate supplement in the Pilots Operating Handbook and FAA Approved Airplane Flight Manual.

15-17. WING, HORIZONTAL STABILIZER, AND VERTICAL FIN DE-ICE SYSTEM. (See figure 15-5.)

NOTE

The fin de-ice boot and its subsequent plumbing are installed only with the known icing package. Description and operation of the system is unchanged.

15-18. DESCRIPTION. The system consists of two engine-driven vacuum pumps, two pressure control valves, two vacuum relief valves, flow control valves, pressure switch, timer and a boot mounted on the leading edge of each wing, on the leading edge of each horizontal stabilizer and on the leading edge of the vertical fin. The dual vacuum pumps are utilized by the aircraft vacuum system, and the relief valve adjustment should be maintained in accordance with the procedures outlined in the applicable paragraph in Section 16 of this manual. A vacuum gage, located on the left side of the instrument panel is equipped with two plungers labeled L, R and source. In case of a vacuum pump failure, a red band will become visible on the plunger corresponding to the failed pump.

15-19. SYSTEM OPERATION. The boots expand and contract, utilizing pressure or vacuum from the engine-driven vacuum pumps. Normally, vacuum holds all the boots against the leading edge surfaces. When a de-icing cycle is initiated, the vacuum is removed and pressure is applied to expand the boots, thus cracking the ice which is removed by the inflight air moving over the leading edges and surfaces of the wings and stabilizers. Controls for the de-ice system consist of a two-position rocker-type de-ice switch located on the left switch panel, a pressure indicator light on the upper left side of the instrument panel, and a 5-amp circuit breaker on the left sidewall circuit breaker panel. The de-ice switch, labeled DE-ICE PRESS, is spring-loaded to the off position. When the switch is pushed to the ON (upper) position and released, it will activate one de-ice cycle. The system may be stopped at any point in the cycle (boots deflated) by pulling the WING DE-ICE circuit breaker to the off position. The boots inflate in the following sequence: Horizontal and vertical stabilizer boots inflate for approximately 6 seconds, inboard wing boots, 6 seconds and outboard wing boots, 6 seconds. The total time required for one de-ice cycle is approximately 18 seconds. The timing sequence is controlled by a timer located on the glove box (refer to paragraph 15-22). The pressure indicator light, labeled DE-ICE PRESSURE, should light when the tail section boots inflate. When ground-checking the system, it should light within one to two seconds after the cycle is initiated, and remain on for approximately 17 seconds. The system may be recycled within six seconds after the light goes off. An ice detector light is also included in the system. Refer to paragraph 15-52 for its location and operating instructions.

15-20. TROUBLE SHOOTING. The checks below are done with engine operating and electrical power applied.

TROUBLE	PROBABLE CAUSE	REMEDY
One or more boots do not inflate.	Timer does not work.	Replace timer.
	Flow valve not operating.	Replace flow valve.
	Air leaks.	Check plumbing and boots for leaks, repair or replace as required.
No boots inflate.	No voltage at red timer lead.	Check switch, circuit breaker and wiring for security and operation.
	Timer does not work.	Replace timer.
	Control valve(s).	Check and replace control valve.
	Vacuum pumps do not work.	Check and replace pump(s).
	Pressure regulator valve.	Check and replace regulator valve.
	Plumbing leaks.	Check, repair or replace as required.
Boots inflate slowly.	Plumbing leaks.	Check, repair or replace as required.
	Filter(s) clogged.	Replace filters.
	Control valve(s) do not work.	Replace control valve(s).
	Pressure regulator valve does not work.	Check and replace regulator valve.
Boot(s) do not deflate.	Flow valve(s) do not work.	Replace flow valve(s).
	Vacuum line(s) clogged or leak.	Check, repair or replace as required.
	Timer does not work.	Replace timer.
De-ice press light does not illuminate.	Bulb burned out	Replace bulb.
	Pressure switch(es) bad.	Replace switch(es).

15-21. REMOVAL INSTALLATION OF DE-ICE SYSTEM. (Refer to Figure 15-5.)

15-22. TIMER. (See figure 15-7.)

15-23. DESCRIPTION. The timer is located on glove box and controls length of time, in seconds, that de-ice boots are inflated during a de-icing cycle.

15-24, DE-ICE SYSTEM FUNCTIONAL CHECK.

a. Electrical Controls Check. (See figure 15-4.)

1. Check wing de-ice circuit breaker (18) closed.
2. Check de-ice pressure switch (23) off (spring-loaded to off position).
3. Turn master switch on.
4. Press de-ice pressure light (27) to check light circuit and bulb. Make sure dimming shutter is open.
5. Turn master switch off.

b. Vacuum Relief Valve(s) Adjustment.

1. Refer to Section 16 of this manual for vacuum relief valve(s) adjustment.

c. Preflight System Check:

1. With vacuum relief valve(s) adjusted and engine running from 2200 to 2500 rpm, check both buttons on the suction gage are retracted out of sight and vacuum is normal.
2. Press de-ice pressure light (23) on, and release.
3. Check that de-ice pressure light (27) comes on within one second, remains on for 18 seconds, then shuts off.
4. Check boots for inflation during 18-second cycle as follows: First six seconds tail section boots, then inboard wing boots inflate for six seconds completing one cycle.
5. The absence of or slow illumination of the de-ice pressure light during any of the three sequences of a cycle indicates insufficient pressure for proper system operation.

d. Timer Check (See figure 15-7):

1. Connect timer as shown in the wiring schematic.
2. Set voltage at 28 VDC, control switch to MOMON position and release to none position.
3. Record the time each light is on.
4. The recorded times shall match those shown in the timing chart ±10% at 28 VDC.
5. The timer output shall complete the cycle and then shut off all outputs.

NOTE

Reactivation of the control switch during a cycle will not interrupt that cycle or cause the unit to reset until the existing cycle is completed.

6. Vary the voltage from 22-31 VDC and repeat step 5. Timer must continue to operate at these voltages within the time frame shown in the chart.

NOTE

Do not check voltage levels without a load attached, since readings may be erroneous.

e. Air Pressure Check:

NOTE

This check may be performed in the engine compartment.

1. Disconnect both pressure hoses (1) and (6) from pressure control valves (10).
2. Connect a source of clean regulated dry air pressure (21 ±1 psig) fitted with a hand-operated valve or check valve and an in-line air pressure gauge to right pump pressure hose (1).

NOTE

A test kit (#343) for testing vacuum and pneumatic de-ice system is available from Airborne, 711 Taylor Street, Elyria, Ohio 44035, or the Cessna Supply Division. This kit contains the necessary equipment and supplemental instructions to perform this check.

3. Disconnect left and right vacuum inlet hoses from left and right vacuum pumps (8).
4. Disconnect electrical leads from pressure control valves (10).

CAUTION

Do not attempt air pressure check with de-ice timer module connected into the circuit.

5. Connect a vacuum source (5.6 in. Hg minimum) to right pump vacuum hose.
6. Connect a switched 28 VDC electrical source to right pressure control valve.
7. Insert pressure probe equipped with vacuum/pressure gage into the rubber hose connecting tail boots with tail boot flow valve.
8. Turn on pressure and vacuum sources. Verify that pressure flow is being vented overboard at right pressure control valve and no flow is present either in or out of disconnected hoses at left vacuum pump. Pressure gage on probe should read 4.5-4.6 in. Hg vacuum
9. Switch on electrical power to right pressure control valve and actuate tail boot flow control manually.

NOTE

Flow valves can be actuated mechanically by depressing the solenoid plunger inward using the fingers. This procedure eliminates the necessity of disconnecting and reconnecting electrical leads.

10. Overboard flow at pressure control valve should stop and pressure air should inflate tail boots. Pressure gage should show 18 ±.5 psi with audible venting or pressure air from pressure regulator valve (4) evident. Recheck for absence of airflow out of left pressure control valve.

11. With pressure control valve energized turn off pressure source using hand-operated valve. Pressure leak-down as shown by probe pressure gage should be 2 psi per minute or less. Use soap and water solution to locate leaks, turn off power to left pressure control valve, repair leaks and retest until leak-down rate is within tolerance.

12. Insert pressure probe into hose connecting outboard wing boots with outboard boot flow control valve and repeat steps 8 thru 11 noting leaks.

13. Insert pressure probe into hose connecting inboard wing boots with inboard boot flow control valve and repeat steps 8 thru 11 noting leaks.

14. Disconnect pressure and vacuum sources from right vacuum pump hoses and connect to left pump hoses.

15. Turn on pressure and vacuum sources. Verify that pressure flow is being vented overboard at left pressure control valve and no flow is present either in or out of disconnected hoses at right pump. Probe pressure gauge should read 4.5-5.6 in. Hg vacuum.

16. Switch on electrical power to left pressure control valve. Overboard flow at pressure control valve should stop. Check for no airflow from right pressure control valve and audible venting of pressure air from pressure regulator valve (40) is evident.

17. With probe air pressure gauge inserted into hose connecting any flow valve with its associated de-ice boot, actuate flow valve manually, and recheck probe air pressure gauge reads 18 ±.5 psi.

18. Disconnect test equipment and reconnect pressure and vacuum lines to vacuum pumps.

19. Reconnect wiring to pressure control valves.

15-25. ADHESION TEST.

a. Using excess material trimmed from ends of any wing or empennage de-ice boot, prepare one test specimen for each de-ice boot installed.

b. This specimen should be one-inch wide and four or more inches long.

c Cement specimen to installation surface adjacent to installed de-ice boot, following the identical procedure used for boot installation.

d. Leave one-inch of the strip uncemented to attach a clamp.

e. Four hours or more after de-ice boot installation, attach a spring scale to uncemented end of each strip and measure force required to remove the strip at a rate of one-inch per minute. The pull shall be applied 180° to the surface. (Strip doubled back on itself).

f. A minimum of five pounds tension (pull) shall be required to remove test strip.

NOTE

If less than five pounds is required acceptability of the de-ice boot adhesion shall be based on carefully lifting one corner of the de-ice boot in question sufficiently to attach a spring clamp and attaching a spring scale to this clamp. Pull with force 180° to the surface, and in such a direction that the de-ice boot tends to be removed on the diagonal. If a force of five pounds per inch of width can be exerted under these conditions, the installation shall be considered satisfactory. Width increases as corner peels back.

g. Re-cement corner following installation procedure.

CAUTION

Failure to achieve five pounds adhesion per inch of width requires reinstallation of the de-ice boot.

NOTE

Possible reasons for failure are: dirty surfaces, cement not mixed thoroughly. Corrosion of metal skin may occur if good adhesion is not attained, especially around rivet heads and metal skin splices. If these adhesion requirements are met, the aircraft may be flown immediately. Do not inflate de-ice boots within 48 hours of installation.

15-26. CLEANING DE-ICE BOOTS.

CAUTION

Use only the following instructions when cleaning de-ice/anti-ice boots. Disregard instructions which recommend petroleum base liquids (MEK, non-leaded gasoline, etc.) which can harm boot material.

a. Clean boots with mild soap and water, then rinse thoroughly with clean water.

NOTE

Isopropyl alcohol can be used to remove grime which cannot be removed using soap. If isopropyl alcohol is used for cleaning, wash area with mild soap and water, then rinse thoroughly with clean water.

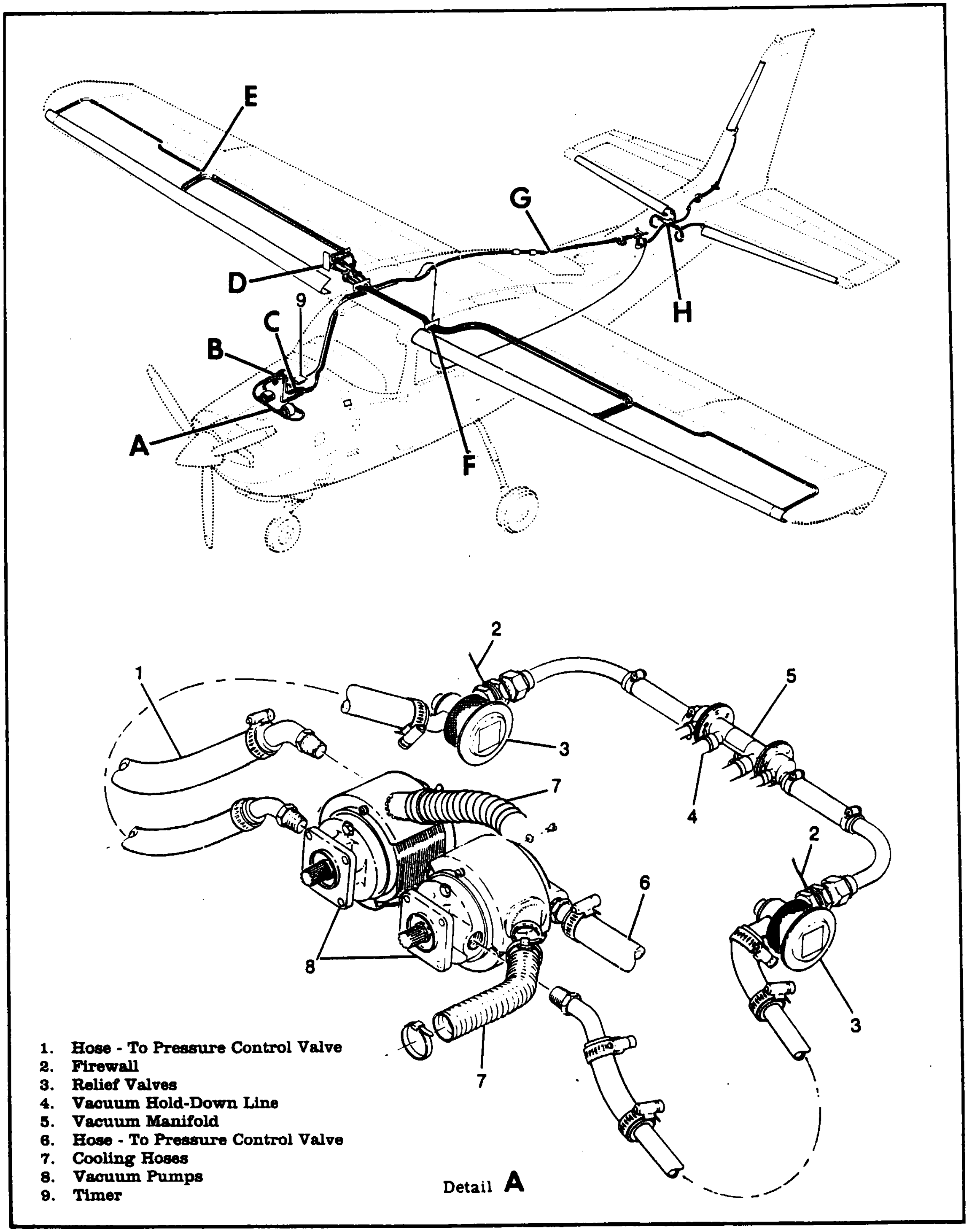
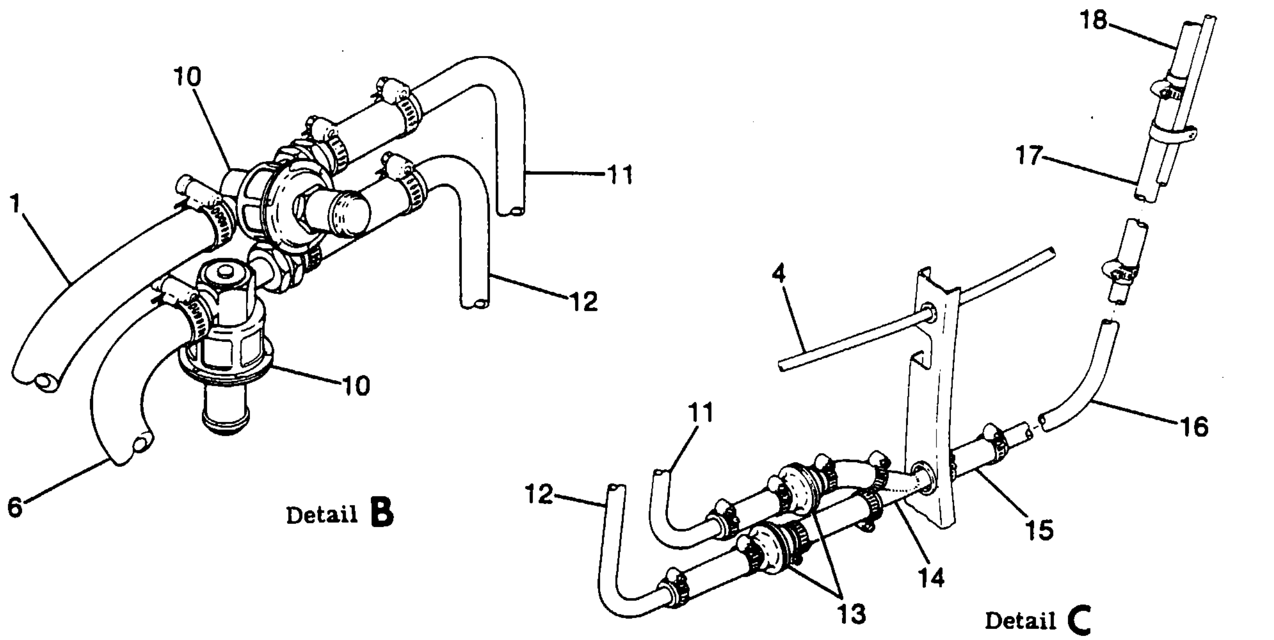
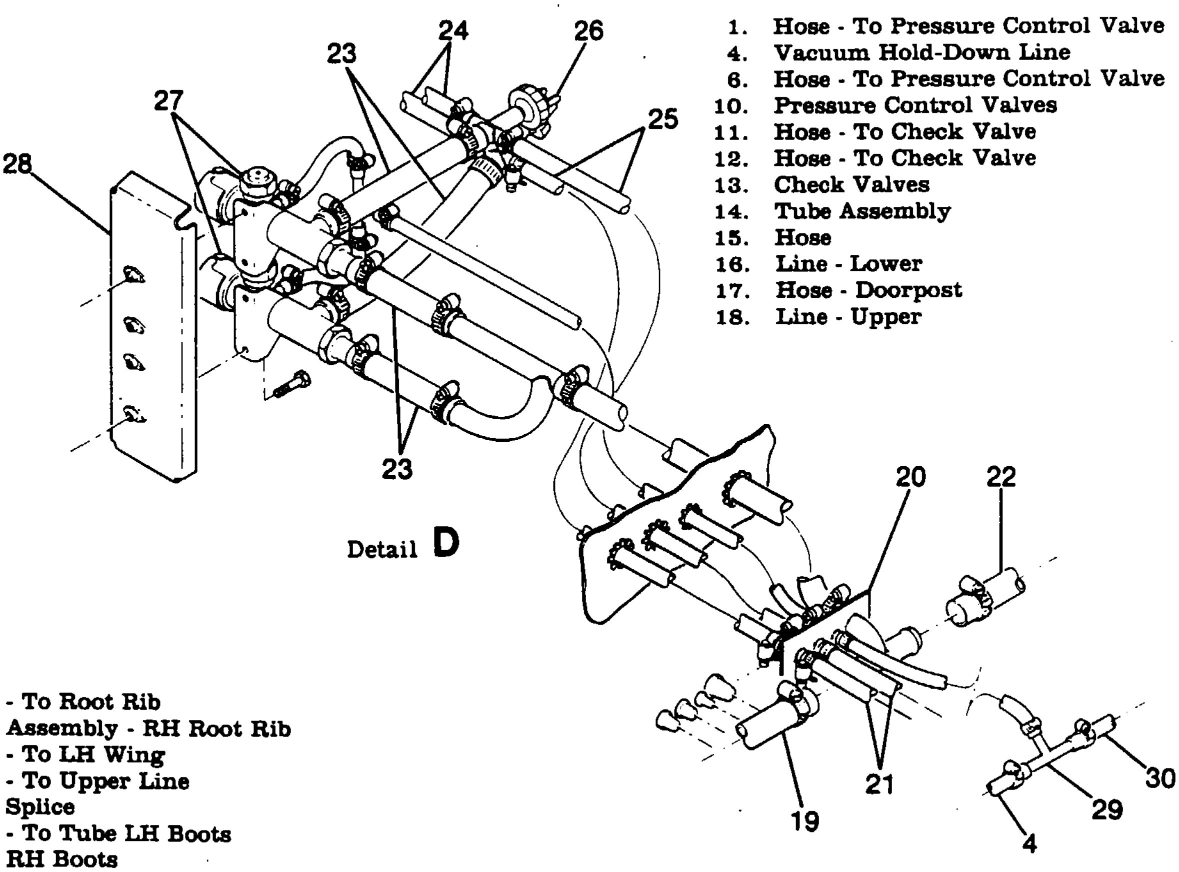


Figure 15-5. Wing, Horizontal Stabilizer, and Vertical Fin De-Icing System (Sheet 1 of 4)

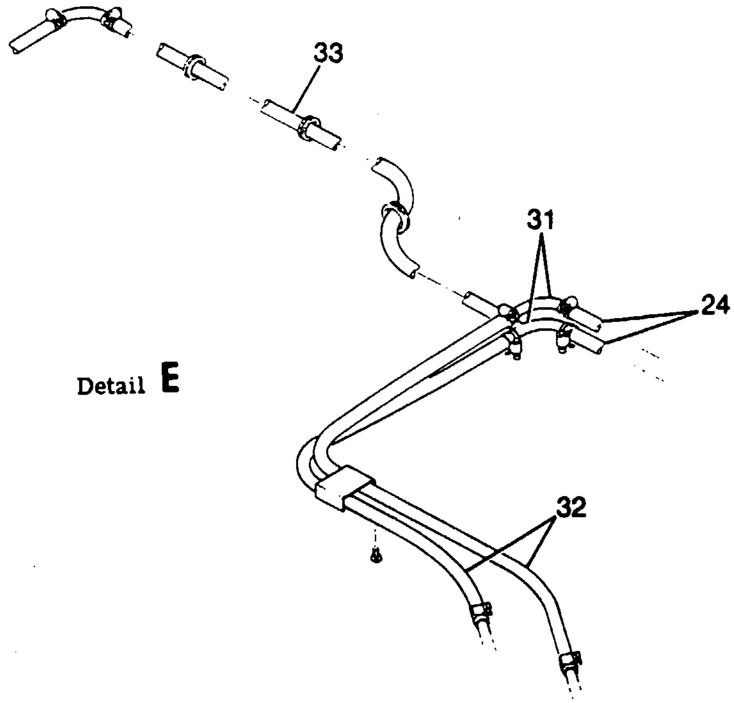


1. Hose - To Pressure Control Valve
4. Vacuum Hold-Down Line
6. Hose - To Pressure Control Valve
10. Pressure Control Valves
11. Hose - To Check Valve
12. Hose - To Check Valve
13. Check Valves
14. Tube Assembly
15. Hose
16. Line - Lower
17. Hose - Doorpost
18. Line - Upper

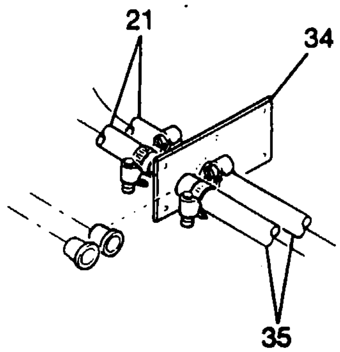


19. Hose - To Root Rib
20. Tube Assembly - RH Root Rib
21. Hose - To LH Wing
22. Hose - To Upper Line
23. Hose Splice
24. Hose - To Tube LH Boots
25. Hose RH Boots
26. Switch
27. Flow Valve
28. Bracket
29. Tube Assembly
30. Vacuum Hold-Down Line - Aft

Figure 15-5. Wing, Horizontal Stabilizer, and Vertical Fin De-Icing System (Sheet 2 of 4)

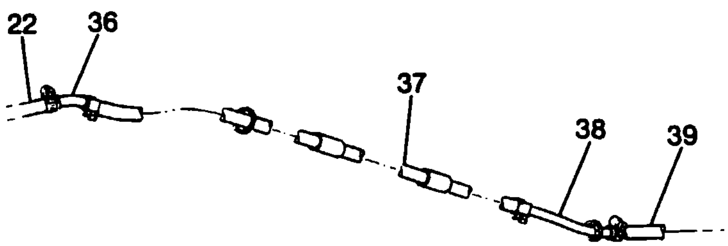


Detail **E**



Detail **F**

21. Hose - To LH Wing
22. Hose - To Upper Line
24. Hose - To Tube LH Boots
31. Line Assemblies
32. Hose - To Inboard Boots
33. Hose - To Outboard Boot
34. Tube Assembly - LH Root Rib
35. Hose - To Lines RH Boots
36. Line - Upper
37. Hose - To Lower Line
38. Line - Lower
39. Hose - To Pressure Regulator



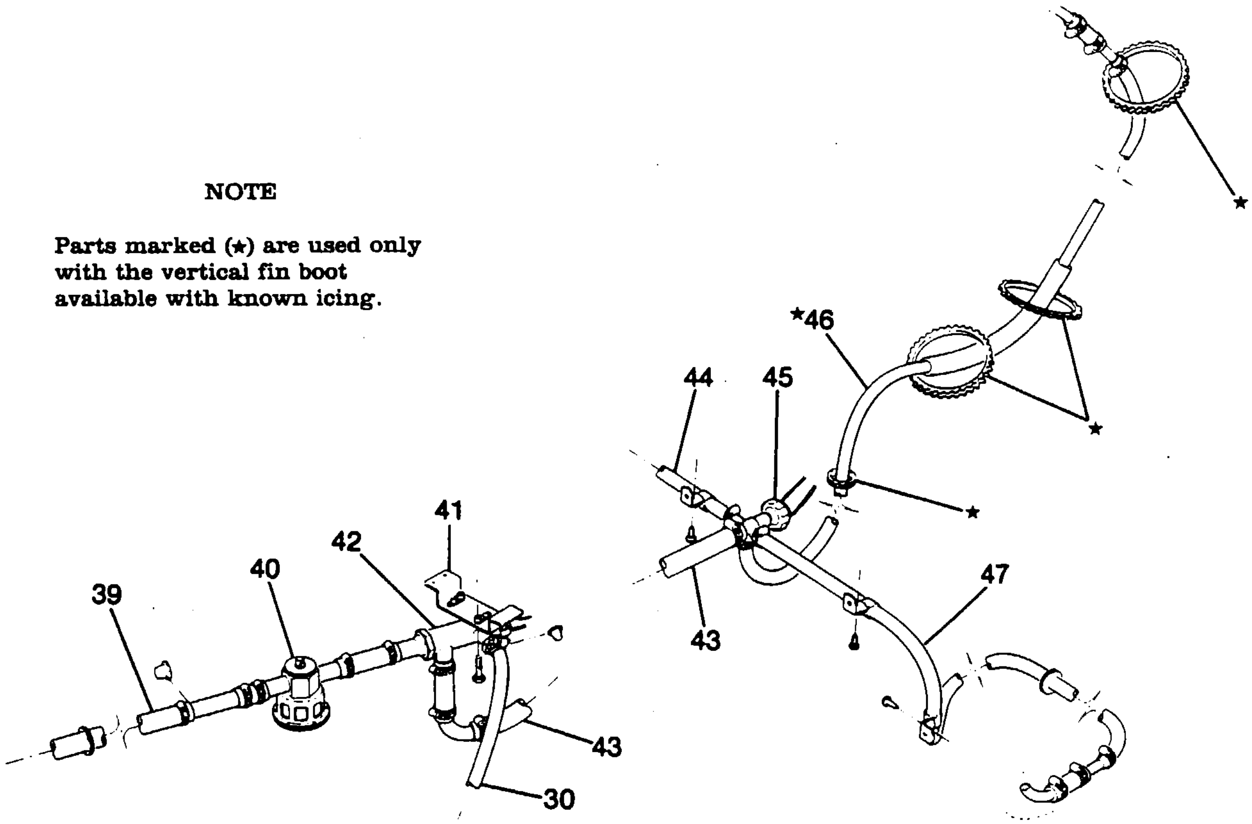
Detail **G**

Figure 15-5. Wing, Horizontal Stabilizer, and Vertical Fin De-Icing System (Sheet 3 of 4)

30. Vacuum Hold-Down Line - Aft
39. Hose - To Pressure Regulator Valve
40. Pressure Regulator Valve
41. Bracket
42. De-Ice Flow Valve
43. Hose - To Pressure Switch
44. Hose - To RH Stabilizer Boot
45. Pressure Switch
★46. Hose - To Vertical Fin Boot
47. Hose - To LH Stabilizer Boot

NOTE

Parts marked (★) are used only with the vertical fin boot available with known icing.



Detail **H**

Figure 15-5. Wing, Horizontal Stabilizer, and Vertical Fin De-Icing System (Sheet 4 of 4)

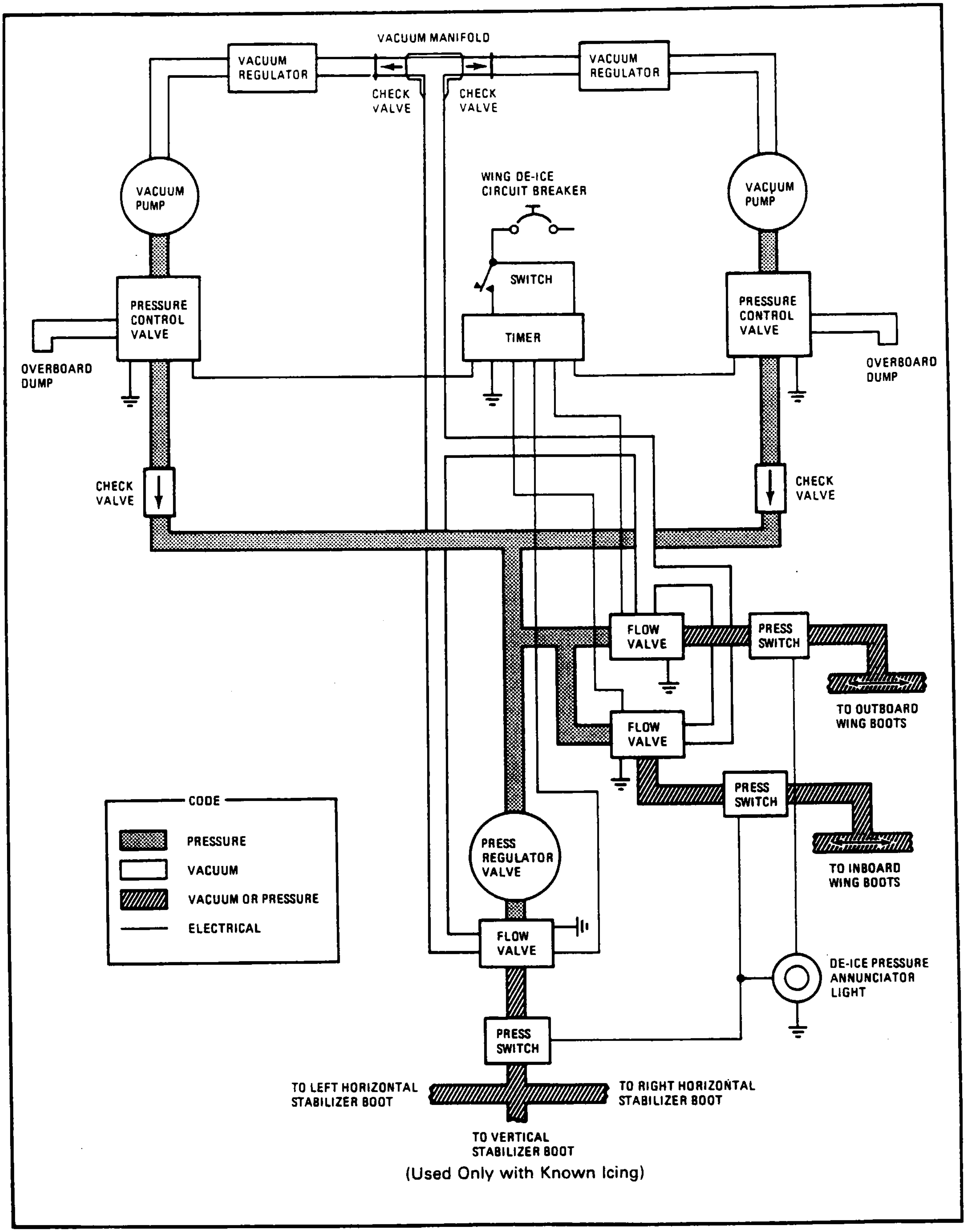


Figure 15-6. Wing, Horizontal Stabilizer, and Vertical Fin De-Icing System Schematic

15-27. CLEANING VACUUM SYSTEM AND COMPONENTS. Follow procedures as outlined in Section 16 of this manual for removal and installation. In general, low-pressure, dry compressed air should be used in cleaning vacuum system components. Suction relief valve should be washed with Stoddard solvent, then dried with low-pressure air blast.

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.

15-28. DE-ICE AND ANTI-ICE BOOT PROTECTIVE PRODUCTS. Two rubber treatment products, Age Master #1, and Icex are approved for use on de-ice boots and anti-ice boots of Cessna aircraft. Age Master #1 protects the rubber against deterioration from ozone, sunlight weathering, oxidation and polution. Icex helps retard ice adhesion and keeps the boots looking new longer; both products are produced and recommended by B. F. Goodrich. Age Master #1 (part #74-451-127) and Icex (part # ICEX) are available from the Cessna Supply Division.

a. Mask surrounding areas before applying Age Master #1 to clean, dry boot surfaces. Apply with a cheesecloth swab. DO NOT SPRAY this product; a rubbing or brushing action is required for the protective agent to penetrate the rubber surfaces. Apply three or more coats allowing a 5 to 10 minute drying period between applications. However, the total amount applied should not exceed 0. 3 to 0. 4 ounce per square foot of boot surface.

b. Mask surrounding areas before applying a light coat of Icex with a cheesecloth swab to clean, dry boot surfaces. A heavy coat of Icex will result in a sticky surface which collects dust and dirt. One quart of Icex will cover approximately 500 square feet. If boots have been treated with Age Master #1, allow it to dry for a minimum of 24 hours before applying the Icex. Apply Icex Spanwise in a single continuous back and forth motion.

CAUTION

Protect adjacent areas, clothing, and wear plastic or rubber gloves during application. Age Master stains clothing and Icex contains silicone which makes paint touch-up nearly impossible. Waterless hand cleaner is beneficial for cleaning hands, equipment and clothing.

Age Master #1 and Icex coatings last approximately 150 hours on wing and stabilizer boots and 15 hours on propeller boots.

15-29. APPROVED REPAIRS. (Cold Patch for Scuff or Surface Damage.)

NOTE

Surface coatings and surface refurbishing kits will not repair leaks. Use repair kit materials.

NOTE

When repairing de-ice boots and replacement layers are being installed, exercise care to prevent trapping air beneath the replacement layers. If air blisters appear after material is applied, they may be removed with a hypodermic needle. Should air blisters appear after boots have been installed for a length of time, it is permissible to cut a slit in the de-ice boot, apply adhesive and repair in accordance with the following cold patch repair procedures. An alternate method of repair is to peel the de-ice boot back using Toluol and reapply using 1300L cement.

a. Select a patch of ample size to cover damaged area.

b. Clean area to be repaired with a cloth slightly dampened with cleaner.

c. Buff area around damage with steel wool so that area is moderately but completely roughened.

d. Wipe buffed area clean with a cloth slightly dampened with cleaner to remove all loose particles.

e. Apply one even, thorough coat of 1300L cement to the patch and to the corresponding damaged area of the de-ice boot. Allow cement to set until it becomes tacky.

f. Apply patch to the de-ice boot with an edge or the center adhering first, then work remainder of patch down, being careful to avoid trapping air pockets.

g. Roll patch thoroughly with a stitcher roller, and allow to set for ten or fifteen minutes.

h. Wipe patch and surrounding area from center of patch outward with a cloth slightly dampened with MEK.

i. Apply one light coat of A-56-B conductive cement (B. F. Goodrich part number 74-451-11) to restore conductivity.

NOTE

Satisfactory adhesion should be obtained in four hours; however, if the patch is allowed to cure for a minimum of twenty minutes, the de-ice boots may be inflated to check the repair.

15-30. APPROVED REPAIRS. (Damage to Tube Area.)

NOTE

This type of damage consists of cuts, tears or ruptures to the inflatable tube area, and a fabric-reinforced patch must be used.

a. Select a patch of ample size to extend at least 5/8-inch beyond the damaged area.

NOTE

If the correct size patch cannot be obtained, one may be cut to the size desired from a larger patch. If this is done, the edges should be beveled by cutting with the shears at an angle. These patches are manufactured so they will stretch in one direction only. Be sure to cut the patch selected so that the stretch is in the width-wise direction of the inflatable tube.

b. Clean the area to be repaired with a cloth slightly dampened with cleaner.
c. Buff the area around damage with steel wool so that area is moderately but completely roughened.
d. Wipe buffed area clean with a cloth slightly dampened with cleaner to remove all loose particles.
e. Apply one even thorough coat of 1300L cement to the patch and to the corresponding damaged area of the de-ice boot. Allow cement to set until it becomes tacky.
f. Apply patch to de-ice boot with the stretch in the width-wise direction of the inflatable tubes, sticking edge of patch in place first, and working remainder down with a very slight pulling action so the rupture is closed. Use care not to trap air between patch and de-ice boot.
g. Roll patch thoroughly with a stitcher roller and allow to set for ten or fifteen minutes.
h. Wipe patch and surrounding area, from the center of patch outward with a cloth slightly dampened with cleaner.
i. Apply one light coat of A-56-B conductive cement (B. F. Goodrich part number 74-451-11) to restore conductivity.

NOTE

Satisfactory adhesion of patch to de-ice boot should be reached in four hours; however, if patch is allowed to cure for a minimum of twenty minutes, de-ice boots may be inflated to check the repair.

15-31. APPROVED REPAIRS. (Damage to Fillet Area.)

NOTE

This damage includes any tears or cuts to the tapered area aft of the inflatable tubes.

a. Trim damaged area square and remove excess material. Cut must be sharp and clean to permit a good butt joint of the inlay.
b. Cut inlay from tapered fillet B. F. Goodrich part number 74-451-21) to match cut out area.
c. Using Toluol, loosen edges of de-ice boot around area approximately one and one-half inches from all edges.
d. Clean area to be repaired with a cloth slightly dampened with cleaner.
e. Lift back edges of cutout and apply one coat of 1300L cement to underneath side of loosened portion of de-ice boot.
f. Apply one coat of 1300L cement to wing skin underneath loosened edges of de-ice boot and extending one and one-half inches beyond edges of de-ice boot into cutout area.
g. Apply second coat of 1300L cement to underneath side of de-ice boot as outlined in step (e).
h. Apply one coat of 1300L cement to one side of a two-inch wide neoprene-coated fabric tape (B. F. Goodrich part number 74-451-22), allow to dry and trim to size.
i. Reactivate cemented surfaces with Toluol and apply reinforcing tape to wing skin, exercising care to center tape under all edges of cutout.
j. Roll down tape on wing skin with stitcher roller to assure good adhesion, being careful to avoid creating air pockets.
k. Apply one coat of 1300L cement to top surface of tape and allow to dry approximately five to ten minutes.
l. Reactivate cemented surfaces with toluol. Working toward cutout, roll down edges of loosened de-ice boot, being careful to avoid creating air pockets. Edges should overlap on tape approximately one inch.
m. Roughen back surface of inlay repair material, previously cut to size, clean with cleaner and apply one coat of 1300L cement.
n. Apply one coat of 1300L cement to wing skin inside of cutout area and allow to dry.
o. Apply second coat of 1300L cement to back side of inlay material and allow to dry.
p. Reactivate cemented surfaces with Toluol and carefully insert inlay material with feathered edge aft. Working from wing leading edge aft, roll down inlay material carefully to avoid trapping air.
q. Roughen area on outer surface of de-ice boot and inlay with steel wool, one and one-half inches on each side of splice. Clean with cleaner and apply one coat of 1300L cement to this area.
r. Apply one coat of 1300L cement to one side of two-inch wide neoprene-coated fabric tape, trim to size and center tape over splice on all three sides.
s. Roll down tape on de-ice boot with stitcher roller to assure good adhesion, being careful to avoid creating air pockets.
t. Apply one light coat of A-56-B conductive cement (B. F. Goodrich part number 74-451-11) to restore conductivity.

15-32. APPROVED REPAIRS. (Damaged Veneer, loose from De-Ice Boot.)

a. Peel and trim loose veneer to the point where adhesion of veneer to de-ice boot is good.

b. Roughen area in which veneer is removed, with steel wool, rubbing parallel to cut edge of veneer ply to prevent loosening it.

c. Taper edges of veneer down to tan rubber ply by rubbing parallel to edges with steel wool and MEK.

d. Cut a piece of veneer Material (B. F. Goodrich part number 74-451-23) to cover damaged area and extend at least one-inch beyond, in all directions.

e. Mask off an area one-half inch larger in length and width than size of veneer patch.

f. Apply one coat of 1300L cement to damaged area, and one coat to veneer ply. Allow cement to set until it becomes tacky.

g. Roll veneer ply to de-ice boot with a two-inch rubber roller, applying a slight tension on veneer ply when applying, to prevent trapping air.

h. Wipe patch and surrounding area from center of patch outward with a cloth slightly dampened with cleaner.

i. Apply one light coat of A-56-B conductive cement (B. F. Goodrich part number 74-451-11) to restore conductivity.

NOTE

B. F. Goodrich Repair Kit No. 74-451-C for repairing de-ice boots is available from the Cessna Supply Division.

15-33. MATERIALS REQUIRED FOR INSTALLATION OF DE-ICE BOOTS.

1. No. EC-1300L (EC-1403) Cement, Minnesota Mining & Manufacturing Company.
2. Methyl-Isobutyl Ketone (MIBK).
3. Cleaning Solvent - Toluol.
4. Cleaning Solvent - Hexane.
5. Clean, lint-free cleaning cloths.
6. Four yards clean, heavy canvas duck fabric 48 inches wide.
7. Several empty tin cans.
8. Three-inch paint brushes.
9. Two-inch rubber hand rollers.
10. 1/4-inch metal hand stitcher roller. B. F. Goodrich Company (Part Number 3306-10).
11. Carpenters' chalk line.
12. One-inch masking tape.
13. Steel measuring tape.
14. Sharp knives.
15. Fine sharpening stone.
16. No. EC-539 Sealing Compound, Minnesota Mining & Manufacturing Company.
17. No. A-56-B Cement, B. F. Goodrich Company (Part Number 3306-15).
18. GACO-700-A Coating, Gates Engineering Co., Wilmington, Delaware 19889.

15-34. REPLACEMENT OF DE-ICE BOOTS. To remove or loosen installed de-ice boots, use toluol or toluene to soften the "cement" line. Apply a minimum amount of this solvent to the cement line as tension is applied to peel back the boot. Removal should be slow enough to allow the solvent to undercut the cement so that parts will not be damaged. To install a wing de-icer boot, proceed as follows:

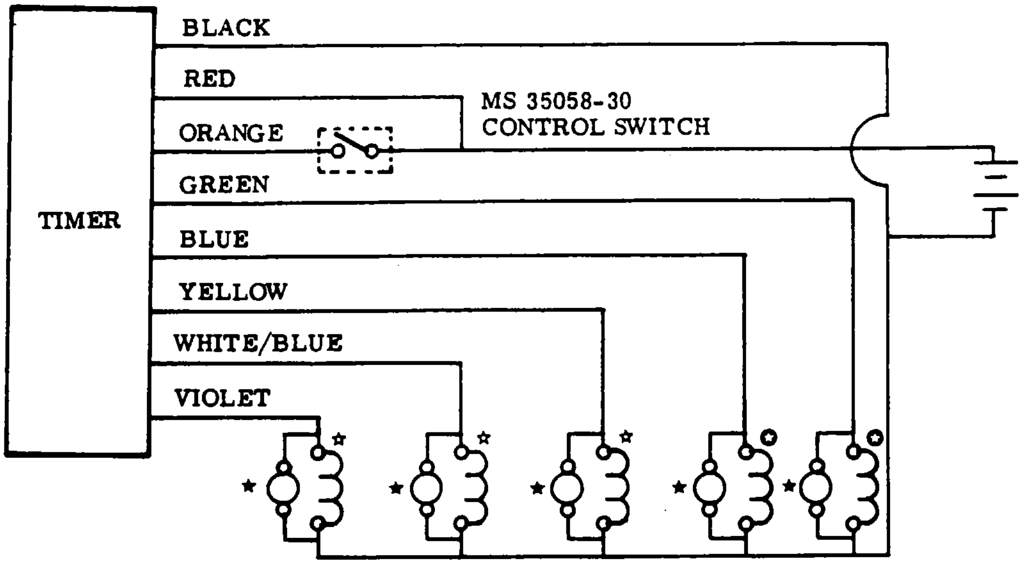
a. Clean the metal surfaces and the bottom side of the de-icer thoroughly with Methyl Ethyl Ketone or Methyl Isobutal Ketone. This shall be done by wiping the surfaces with a clean, lint-free rag soaked with the solvent and then wiping dry with a clean, dry, lint-free rag before the solvent has time to dry.

b. Place one inch masking tape on wing to mask off boot area allowing 1/2 inch margin. Take care to mask accurately so that clean-up time will be reduced.

c. Stir EC-1300L cement thoroughly before using. Brush one even, light coat onto leading edge and to rough side of boot, brushing well into rubber. Allow cement to air dry until cement does not transfer to fingers when touched. Then apply a second coat to each of the surfaces and allow to dry. Apply a vacuum to the boots when they are installed to help smooth out wrinkles.

d. Place a straight line along the leading edge line and a corresponding line on the inside of the de-icer boot if it does not have a centerline. Securely attach hoses to de-icer connections. Position centerline of boot with leading edge line, using a clean, lint-free cloth, heavily moistened with toluol, reactivate surface of cement on wing and the boot in small, spanwise areas approximately 6-inches wide. Avoid excessive rubbing of cement, which would remove it from the surface of the wing. Utilize enough help to hold boot steady during installation, and caution them against handling cemented surfaces. Roll boot firmly against leading edge, being careful not to trap any air between boot and leading edge surface. Always roll parallel to the inflatable tubes. Should the boot attach "off course", pull it up immediately with a quick motion, and reposition properly. Avoid twisting or sharp bending of boot. Finally, roll the entire surface of the boot parallel to tubes, applying pressure. Use the metal stitcher roller between tubes and around connections. Should an air pocket be encountered, carefully insert a hypodermic needle and allow air to escape. Do not puncture the inflatable tubes at any time. Fill any gaps between adjoining boots with GACO N-700-A Neoprene coating (Gates Engineering Co., Wilmington, Delaware 19899). Apply a coat of the Neoprene coating along trailing edge of boot to the surface of the skin to form a neat, straight filler.

e. Remove masking tape and clean surfaces with toluol.



TIMING CHART

WIRE COLOR	TIME ON (SECONDS)		
BLUE	18 SECONDS		
YELLOW	6 SEC.		
WHITE/BLUE		6 SEC.	
VIOLET			6 SEC.
GREEN	18 SECONDS		

★ .1 AMP LAMP, 28 VDC
☆ 20 OHM RESISTOR, 50 WATT OR 24-32 VDC SOLENOID (20 OHM)
○ 65 OHM RESISTOR, 10 WATT OR 24-32 VDC SOLENOID (65 OHM)

Figure 15-7. De-Ice System Timer Chart and Schematic

15-35. PROPELLER ANTI-ICE SYSTEM. (See figure 15-8.)

15-35A. DESCRIPTION. The system is of an electrothermal type, consisting of electrically-heated de-ice boots bonded to each propeller blade, a slip ring assembly for power distribution to the propeller de-ice boots, a brush block assembly to transfer electrical power to the rotating slip ring, and a timer to cycle electrical power to the de-ice boots in proper sequence. A rocker switch labeled PROP A/ICE, located on the pilot's lower left-hand panel, controls the propeller de-ice system. A circuit breaker labeled PROP A/ICE, located in the left circuit breaker panel, protects the propeller de-ice system. A propeller de-ice ammeter, located on the upper left instrument panel, indicates amperage for the propeller de-ice system.

The de-ice system applies heat to the surfaces of the propeller blades where ice would normally adhere. This heat, plus centrifugal force and the blast from the airstream, removes accumulated ice. Each de-ice boot has two separate electrothermal heating elements, and inboard and an outboard section. Each boot has three leads extending from a tab at the bottom of the boot. Each electrical lead is identified by a letter. The letter "G" stands for ground. The letter "I" stands for inboard, and the letter "O" stands for outboard. When the PROP A/ICE switch is turned on, the timer provides power through the brush block and slip ring to the outboard element of the propeller for approximately 20 seconds ±1 second. The timer then switches power to the inboard element of the propeller for approximately 20 seconds ±1 second. The complete cycle is then repeated. This outboard-inboard sequence is very important since the loosened ice, through centrifugal force, moves outboard. Heating may begin at any phase in the cycle, depending on timer position when the switch was turned off from previous use. Ground checkout of the system is permitted with engine not running. It is necessary to remove propeller before propeller de-ice system components, except for brush block assembly, timer, ammeter, circuit breaker and switch can be removed or installed.

15-36. TROUBLE SHOOTING - PROPELLER ANTI-ICE SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
ELEMENTS DO NOT HEAT.	Circuit breaker out or defective.	Reset circuit breaker. If it pops out again, determine cause and correct. Replace defective parts.
	Defective wiring.	Repair or replace wiring.
	Defective switch.	Replace switch.
	Detective timer.	Replace timer.
	Defective brush-to-slip ring. connection.	Check alignment. Replace defective parts.
SOME ELEMENTS DO NOT HEAT.	Incorrect wiring.	Correct wiring.
	Defective wiring.	Repair or replace wiring.
	Defective timer.	Replace timer.
	Defective brush-to-slip ring connection.	Check alignment. Replace defective parts.
	Defective element.	Replace element.
CYCLING SEQUENCE NOT CORRECT OR NO CYCLING.	Crossed connections.	Correct wiring.
	Defective timer.	Replace timer.
RAPID BRUSH WEAR, FREQUENT BREAKAGE, SCREECHING OR CHATTERING.	Brush block or slip ring out of alignment.	Align properly.

15-37. REMOVAL. (See figure 15-8.)

WARNING

Be certain magneto is grounded before turning propeller.

a. Remove spinner attaching screws (18) and remove spinner (19), spinner support (17) and spacers (16). Retain spacers (16).
b. Remove engine cowling and nose cap for access to propeller mounting nuts.
c. Loosen all propeller mounting nuts (26) approximately 1/4-inch and pull propeller forward until stopped by mounting nuts (26).

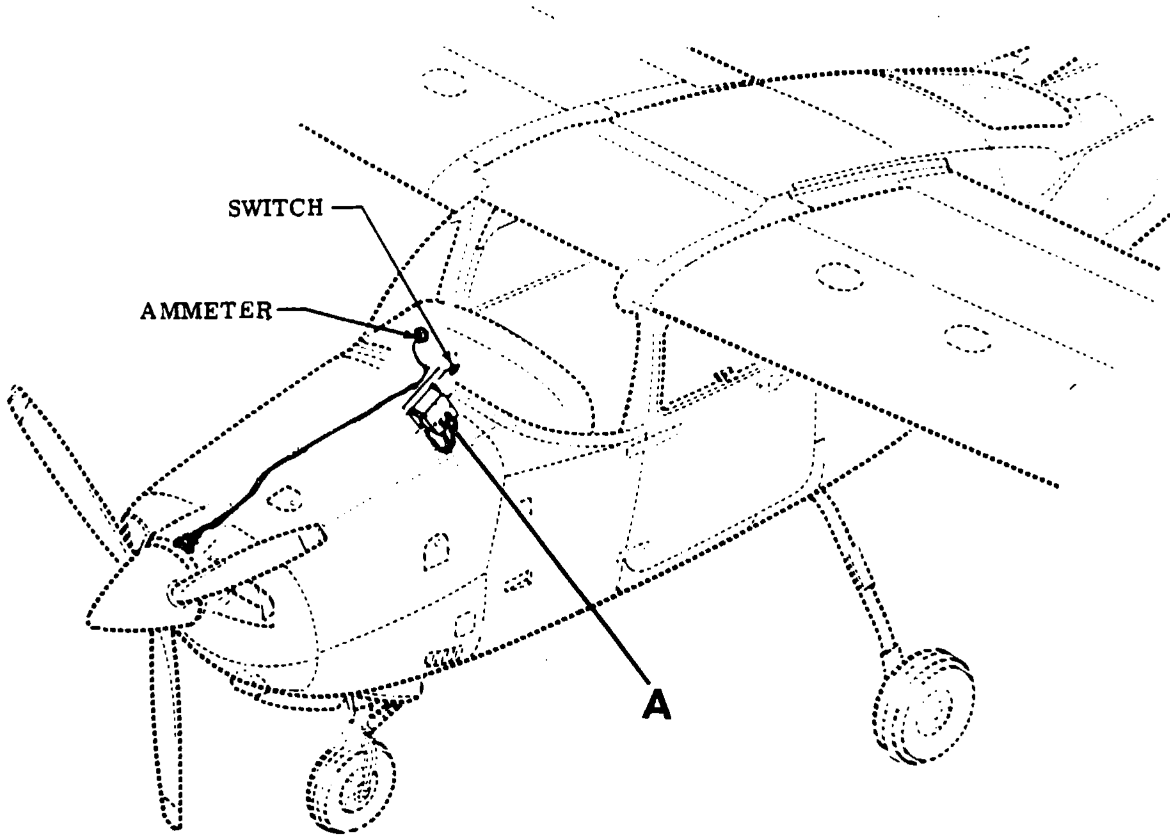
NOTE

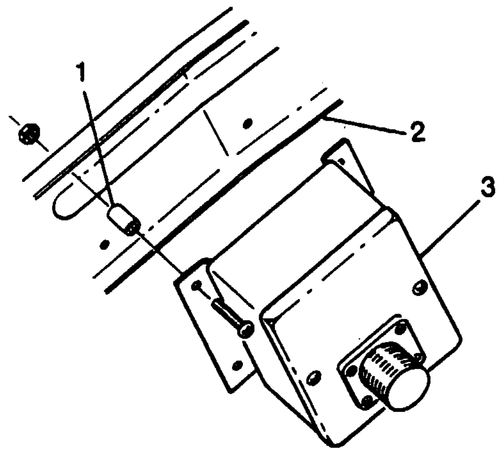
As propeller is separated from engine crankshaft flange. oil will drain from propeller and engine cavities.

CAUTION

Use caution when removing propeller. Removing propeller without the de-ice slip ring requires disconnecting nine wires at the spinner bulkhead, since the slip ring is mounted to the bulkhead. Wires should be identified according to wiring diagrams to facilitate reassembly. During removal, installation or other maintenance, use care to prevent damaging slip ring and brushes.

d. Remove sta-strap (21).
e. Remove nuts and washers securing electrical lead (11) to slip ring (8).
f. Remove all propeller mounting nuts (26) and washers (25) and pull propeller forward to remove from engine crankshaft (24).
g. Remove slip ring (8).





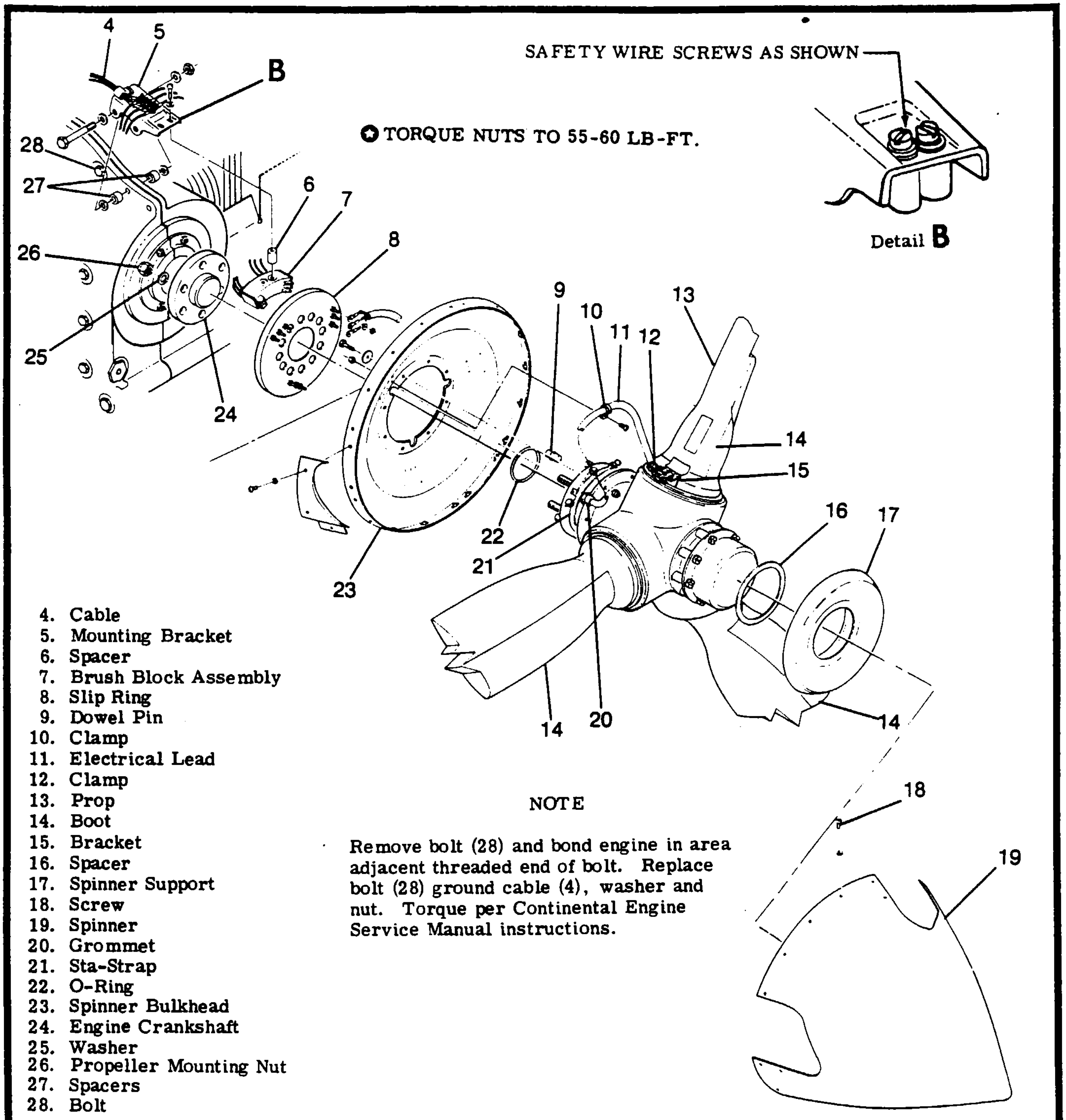
1. Spacer
2. Support
3. Timer

Detail **A**

Apply ice-repellant (MI-903) (Glidden Mfg. Co.) to leading edge surfaces, landing light covers and windshield to retard ice build-up.

KNOWN ICING REQUIRES A DUAL ALTERNATOR INSTALLATION WITH THIS INSTALLATION (Refer to Section 17)

Figure 15-8. Propeller De-Ice System (Sheet 1 of 2)



4. Cable
5. Mounting Bracket
6. Spacer
7. Brush Block Assembly
8. Slip Ring
9. Dowel Pin
10. Clamp
11. Electrical Lead
12. Clamp
13. Prop
14. Boot
15. Bracket
16. Spacer
17. Spinner Support
18. Screw
19. Spinner
20. Grommet
21. Sta-Strap
22. O-Ring
23. Spinner Bulkhead
24. Engine Crankshaft
25. Washer
26. Propeller Mounting Nut
27. Spacers
28. Bolt

NOTE

Remove bolt (28) and bond engine in area adjacent threaded end of bolt. Replace bolt (28) ground cable (4), washer and nut. Torque per Continental Engine Service Manual instructions.

Timer P/N	Power Input Pin & Socket	Ground Pin	Output Sequence, Time, Voltage	Time Repeat Cycle Time (sec)
C165020-0101	B (28VDC) (24-32)	G (28VDC)	C. D 20 seconds each	40

Figure 15-8. Propeller De-Ice System (Sheet 2 of 2)

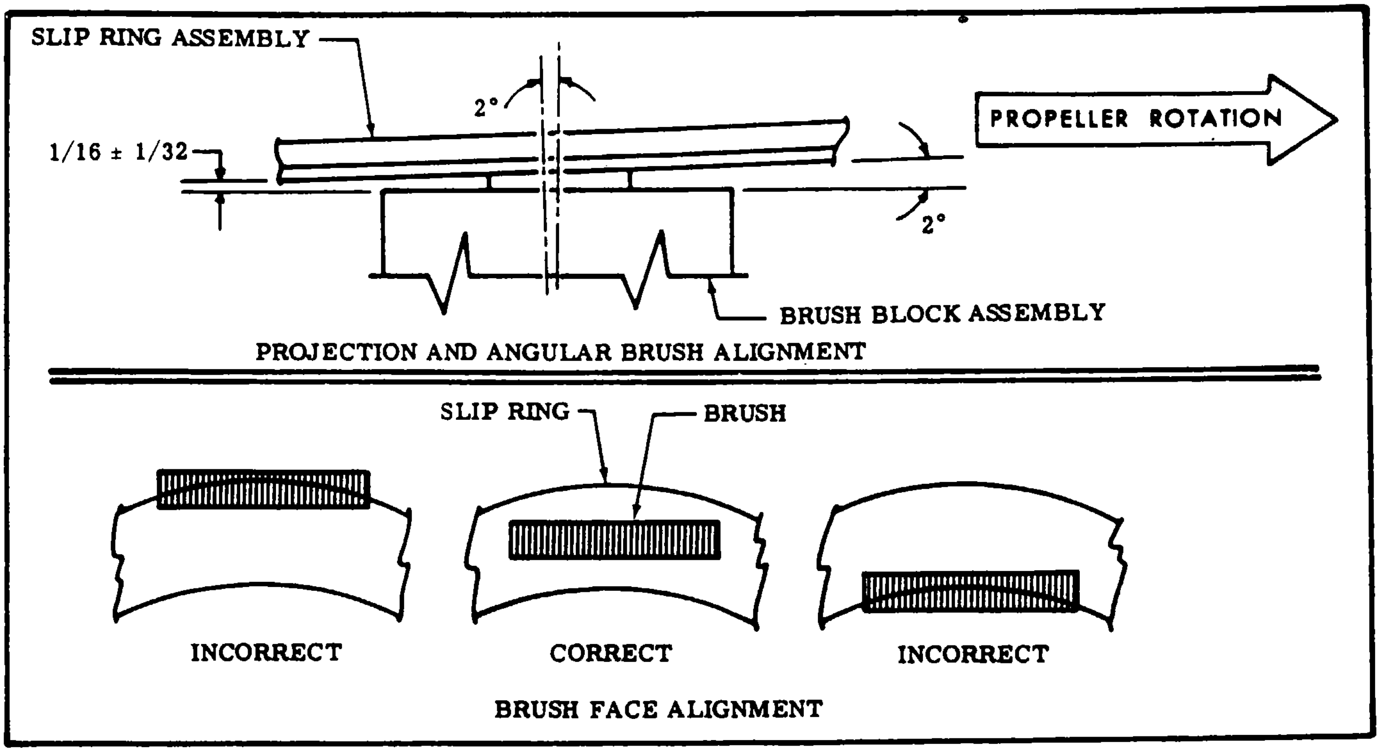


Figure 15-9. Brush Face Alignment and Projection and Angular Brush Alignment

h. Remove screw and nut securing clamp (10) to spinner bulkhead (23).
i. Remove bolts and washers securing spinner bulkhead (23) to propeller (13) and remove bulkhead.
j. Remove screws and nuts securing clamps (12) to brackets (15).
k. Remove nuts, washers, screws, and insulators securing electrical leads (11) to brackets (15).
l. Remove electrical leads (11) and grommets (20.

15-38. INSTALLATION. (See figure 15-8.)
a. Connect electrical leads (11) to brackets (15) using insulators, screws, washers, and nuts.
b. Install clamps (12) over electrical leads (11) and install on brackets (15) using screws, washers, and nuts.
c. Install grommets (20) over electrical leads (11) and install grommets in notches in propeller flange.
d. Position spinner bulkhead (23) on propeller (13) and secure with bolts, washers, and nuts.
e. Install clamps (10) over electrical leads (11) and secure to spinner bulkhead (23) with screws, washers, and nuts.
f. Install sta-strap (21) over electrical leads (11).
g. Lightly lubricate O-ring (22).
h. Position slip ring (8) and propeller (13) on engine crankshaft (24) and install washers (25) and nuts (26). Do not tighten.
i. Connect electrical leads (11) to slip ring (8) using washers and nuts.
j. Tighten propeller mounting nuts (26) to a torque of 55 to 60 lb-ft.
k. Install spacers (16), spinner support (17) and spinner (19) and install screws (18) securing spinner (19) to spinner bulkhead (23).

15-39. SLIP RING ALIGNMENT CHECK. After installation, slip ring must be checked for run-out.

NOTE

Excessive slip ring run-out will result in severe arcing between slip ring and brushes, and cause rapid brush wear. If allowed to continue, this condition will result in rapid deterioration of slip ring and brush contact surfaces, and lead to the eventual failure of the propeller de-icing system.

a. Securely attach a dial indicator gage to the engine and place the pointer on the slip ring.
b. Rotate the propeller slowly by hand. noting the deviation of the slip ring from a true plane as indicated on the gage.
c. Check that the total run-out does not exceed 0.010 inch (±0.005 inch), and that the total is not exceeded within any four inches of slip ring rotation.

NOTE

Care must be taken to exert a uniform push or pull on the propeller to avoid a considerable error in the readings caused by loose fitting thrust bearings.

d. If slip ring run-out is within the limits specified, no corrective action is required. If the run-out is not within limits specified, the slip ring will have to be removed and returned to the claims department of the Cessna Supply Division, and a new part ordered.

15-40. TIMER TEST.

a. Remove connector plug of wire harness from timer and jump power input socket of wire harness to timer input pins. (Refer to chart in figure 15-8 for pin identification.)

b. Jump timer ground pin to ground.

c. Turn on De-Icing System.

d. Check timer operation per the chart in figure 15-8. (use a voltmeter.)

e. Check volts to ground in each case. If engine is not running, and auxiliary power is not used, voltage will be battery voltage and cycle time may be slightly longer than indicated.

f. Hold voltmeter probe on the pin until the voltage drops to 0. Move the probe to the next pin in the sequence shown in the chart. Check voltage at each pin in sequence. When correctness of the cycling sequence is established, turn propeller De-Icing switch off at the beginning of one of the on-time periods, and record the letter of the pin at which the voltage supply is present.

NOTE

Timers do not home to pin "C" when turned off.

15-41. INSTALLATION AND ALIGNMENT OF BRUSH BLOCK ASSEMBLY. (See figure 15-9.)

NOTE

Installation of the brush block should be deferred. when possible. until after the slip ring, propeller, and related components are installed. However, the brush block assembly may be replaced without removing the propeller. To avoid breakage when installing the brush block assembly, keep brushes retracted in brush block until slip ring and propeller assemblies have been installed.

CAUTION

Make sure that slip ring run-out has been corrected before attempting to align brushes on slip ring.

a. In order to get smooth. efficient and quiet transfer of electric power from the brushes to the slip ring. brush alignment must be checked and adjusted, if necessary to meet the following requirements.

1. Projection must be such that the distance between the brush block and the slip ring is .06" ±.03".

2. The brushes must be lined up with the slip ring so that the entire face of each brush is in contact with the slip ring throughout the full 360° of slip ring rotation.

3. The brushes must contact the slip ring at an angle of approximately 2° from perpendicular to the slip ring surface. measured toward the direction of rotation of the slip ring.

b. Brush projection can normally be adjusted by loosening hardware attaching the brush block and holding the brushes in the desired location while re-tightening the hardware. Slotted holes are provided.

c. One method for face alignment is described in step "b". Another is to use shims between brush block and bracket. Laminated metal shims are generally provided. Layers of metal .003" are used to make up shims which are approximately 0.20" thick overall. Shims may be fabricated locally.

d. Loosen mounting bolts and twist block while tightening to attain proper angular adjustment.

CAUTION

Use care not to disturb other adjustments when adjusting angular alignment.

15-42. HEATED WINDSHIELD PANEL-FIXED. (See figure 15-10.)

NOTE

This installation is required for the known icing package.

15-43. DESCRIPTION. As optional heated panel is provided to prevent ice formation on the windshield. The system consists of an electrically heated panel attached to the windshield. a controller and a relay mounted on the glove box. The system is controlled by a rocker type switch on the pilot's switch panel. A circuit breaker on the circuit breaker panel protects the system.

15-44. REMOVAL AND INSTALLATION. (See figure 15-11.)

a. Panel Removal.

1. Ensure aircraft electrical power is "OFF".

2. Disconnect housing plug and cap, located forward of instrument panel on the left hand side.

3. Remove screws securing cover and gasket to deck skin. then pull housing plug up through skin.

4. Remove screws from retainers at top and bottom of heated panel.

5. Remove heated panel, retainers and shims at top and bottom of panel.

6. Remove any sealer that may have parted sticking to the windshield. A sharpened (Wood) spatula may be used, exercising care.

CAUTION

Do Not use any tool, abrasive or cleaner which may damage the windshield.

b. Panel Installation.

1. Apply a strip of masking tape on the LH windshield, from top to bottom, with outboard edge of tape located 6.60 inches to the left and parallel with the windshield centerline, as viewed looking forward.

2. Apply a strip of masking tape at the bottom of heated panel location with edge running parallel with, and .55 inch below the center of the three open fastener locations. However, this dimension may vary as lower edge of heated panel may be trimmed to match aircraft contours. A minimum of .35 inch edge margin must be maintained.

3. Locate heated panel with lower end and inboard side against edge of masking tape. Using a hole finder, locate and mark the four hole locations at the lower end of the panel.

4. Drill four .172 holes on the lower end of the panel where marked.

5. Place lower spacer in position and temporarily secure the lower end of heated panel with four screws.

6. Press the heated panel to the windshield contour working up from the bottom so that panel seal is compressed against windshield, firmly tape heated panel to windshield.

NOTE

The inner and outer lip of the heated panel seal should be in positive contact with the surface of the windshield over the full periphery of the panel. It is permissible to vary thickness of the spacers to facilitate proper sealing.

7. Using a hole finder. mark the center hole location at the upper end of panel.

CAUTION

Protect aircraft structure. Slip a thin metal shield between heated panel and windshield retainer to guard against drill bit thrust when penetrating heated panel.

8. Drill a (.172) hole located .10 inch down from the mark on the heated panel.

9. Remove drilling shield.

10. Use a pointed aligning tool (ice pick) through hole in heated panel and open hole in windshield retainer. pull panel up to align holes.

NOTE

Take precaution to prevent damage to windshield and/or doubler nutplates when tightening heated panel on windshield.

11. Using a hole finder. mark the remaining holes at the upper end of the panel.

12. Place the drilling shield between heated panel and windshield retainer and drill (.172) holes at the marked locations.

13. Place the upper spacer in position between heated panel and windshield and temporarily secure using four screws.

14. Check the temporary installation to ensure that heated panel is in proper relation to the windshield. Check to see if panel seal is in contact with windshield.

15. Remove the masking tape applied to windshield for locating heated panel. Apply new strips of masking tape on each side of the panel with edge aligned with and against outer lip of seal to facilitate final installation. Also apply strips of tape to upper and lower edge of heated panel.

16. Remove heated panel and deburr all parts.

17. Remove protective cover from the heated panel. Do not remove masking tape aligning guides. Clean thoroughly with a soft cloth or sponge. Wash with a mild soap and water. a 50/50 solution of isopropanol and water. or aliphatic naptha types. Do not use any abrasive materials. strong acid or base. methanol or methyl-ethyl-ketone. After cleaning. rince thoroughly and dry.

18. After cleaning. plastic surfaces may be polished by applying a thin coat of hard polishing wax. Rub lightly with a soft cloth using a circular motion.

19. Apply a bead of RTV108 sealer to the groove of heated panel.

NOTE

Do not allow the RTV108 sealer to be pressed out of the seal upon installation. If this happens, remove the heated panel, wipe the sealer off the windshield and the seal on the heated panel with isopropyl alcohol. Reapply RTV108 sealer in grooves, correcting the amount of bead, and reinstall the heated panel.

20. Install heated panel on windshield exercising care to prevent smearing of sealer.

21. Ensure proper location of spacers at upper and lower ends of heated panel. (See note after step 5).

22. Apply RTV-108 sealer to screws.

23. Install screws at top and bottom of heated panel.

24. Route heated panel electrical leads through the deck skin and gaskets then connect.

25. Install cover and apply a strip of tape around opening to keep sealer off of deck skin. Apply RTV 108 sealer, putting wire bundle in cover.

NOTE

Allow 24 hours for full cure of RTV108 sealer.

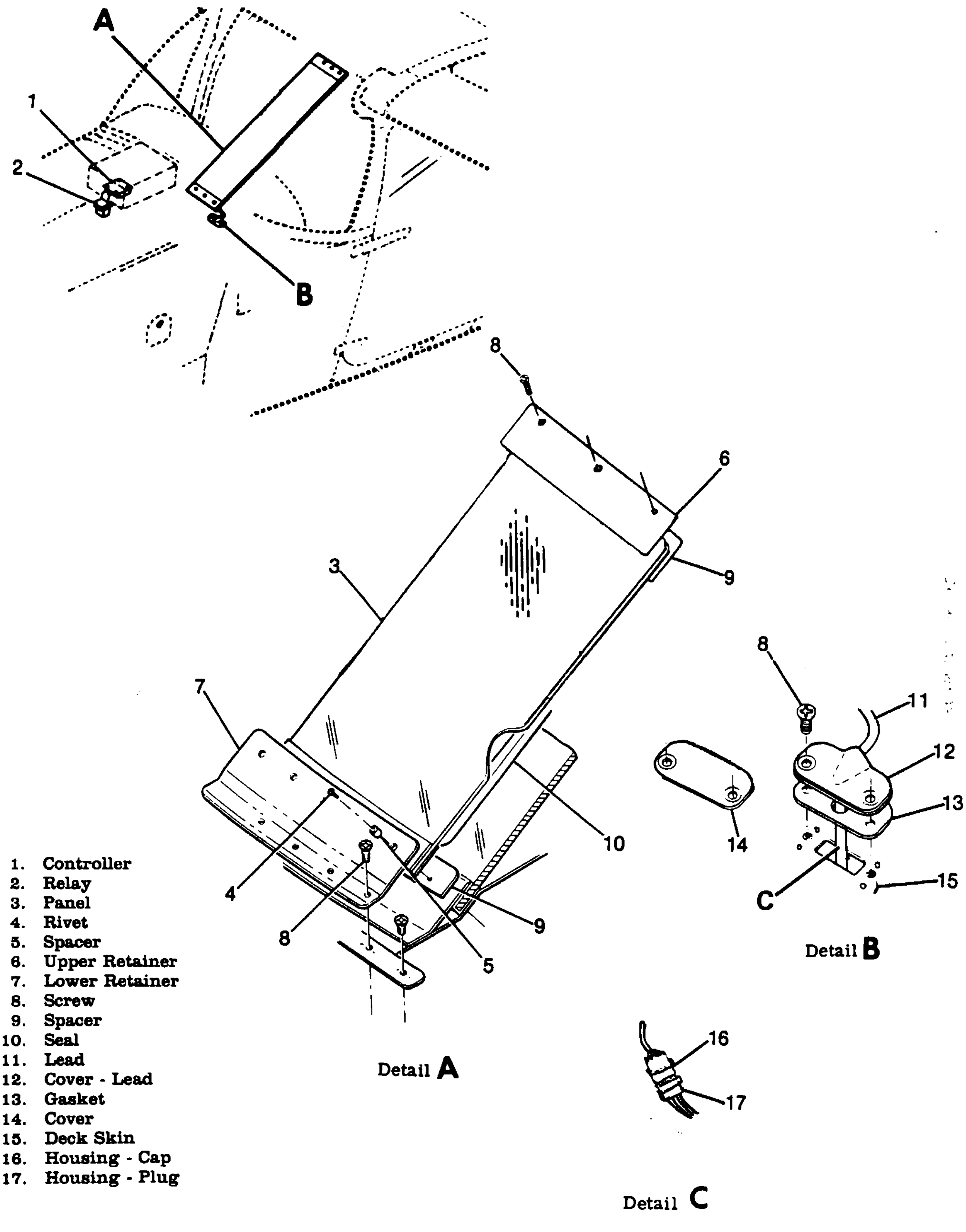
26. Remove all tape around heated panel and lead cover.

27. Operational check the heated panel as follows:

a. Turn windshield de-ice switch momentarily ON, check ammeter for discharge.

15-45. TRAPPED MOISTURE. To eliminate moisture trapped between the heated windshield panel and the windshield, proceed as follows:

a. Fabricate two probes from .125 diameter tube approximately three inches long. Cut one end of tubes off at approximately a 30° or less angle. File to a sharp edge.



1. Controller
2. Relay
3. Panel
4. Rivet
5. Spacer
6. Upper Retainer
7. Lower Retainer
8. Screw
9. Spacer
10. Seal
11. Lead
12. Cover - Lead
13. Gasket
14. Cover
15. Deck Skin
16. Housing - Cap
17. Housing - Plug

THIS INSTALLATION REQUIRED WITH KNOWN ICING

Figure 15-10. Windshield Anti-Ice Panel Installation (Fixed)

b. Insert one tube through the upper outboard corner of the heated panel and the other through the lower inboard corner. Move lower tube to the outboard corner as required to release all trapped water. Insert tubes through the rubber seal.

c. Connect upper tube to a source of low pressure dry air, or bottled nitrogen. Flow air between the heated panel and windshield until all visible moisture is gone. Activate heated panel for short periods to accelerate removal of moisture.

d. Apply soap and water mixture to edges of the heated panel. Restrict exit air, note and mark leakage from under panel. (Do not over pressure; use no more than 2.0 psi.)

e. Clean windshield and edge of heated panel with mild soap and water, a 50/50 solution of isopropl alcohol and water. Wipe dry and apply masking tape along leak area approximately .06 from seal. Lift edge of seal and insert RTV. Fill gap at upper and lower ends of heated panel between panel seal and the windshield retainer with RTV if leak is in this area. Remove tubes from windshield; fill holes with RTV and remove masking tape. Use clear RTV-108 sealer only.

15-46. HEATED WINDSHIELD PANEL (REMOVABLE). (See figure 15-11.)

NOTE

This installation is not used with known icing.

15-47. DESCRIPTION. The panel is constructed of two sheets of plate glass covering a layer of vinyl. Imbedded in the vinyl is a fine resistance wire which provides the heat for windshield de-icing. The lower edge of the panel is mounted on the deck skin just forward of the windshield. The upper end of the panel is supported by a rubber bumper which holds the panel off the windshield. The lower mounting bracket is hinged for easy cleaning between the panel and windshield. The hinge pins are spring loaded so the panel may be easily removed. Power to the windshield panel is provided through a plug located in a housing assembly just left of the lower support bracket. A drain tube is provided for the housing assembly also a plug button, painted the same color as the deck skin, to plug the connector hole when the anti-ice assembly is removed. A circuit breaker switch located on the instrument panel is a off-on switch and a circuit breaker to protect the system.

15-48. REMOVAL AND INSTALLATION. (See figure 15-11.) Use figure as a guide for removal and installation of components.

15-49. PITOT TUBE AND STALL WARNING.

15-50. DESCRIPTION. A special pitot tube with a larger inlet and higher capacity heating element and a higher capacity heated stall warning transducer are installed in the left wing to assure proper airspeed indications and stall warning in the event icing conditions are encountered. These systems are designed to prevent ice formation rather than remove it after it forms. Both systems are controlled by separate rocker switches labeled, PITOT HEAT and STALL HEAT. The pitot tube heater is protected by a 10-amp circuit breaker labeled, PITOT HEAT. The stall warning heater is protected by a 5-amp circuit breaker labeled, STALL HEAT. When the aircraft is on the ground, a resistor is introduced into the stall warning heater circuit by the nose wheel squat switch in order to prevent overheating. In addition, thinner static port buttons are used with the special pitot tube in order to maintain the standard airspeed calibrations.

15-51. REMOVAL AND INSTALLATION. (See figure 15-4.)

15-52. ICE DETECTOR LIGHT. (See figure 15-12.)

15-53. DESCRIPTION. An optional ice detector light may be installed on left hand side of fuselage, forward of cabin door. The ice detector light will illuminate leading edge of left wing so pilot can visually detect ice formation on wing. A pushbutton switch, located below master switch, controls ice detector light.

15-54. DUAL ALTERNATOR SYSTEM. See Section 17 of this manual.

15-55. DUAL VACUUM SYSTEM. See Section 16 of this manual.

15-56 thru 15-59. Deleted - Not Used.

15-60. CONTROL SURFACE DISCHARGERS.

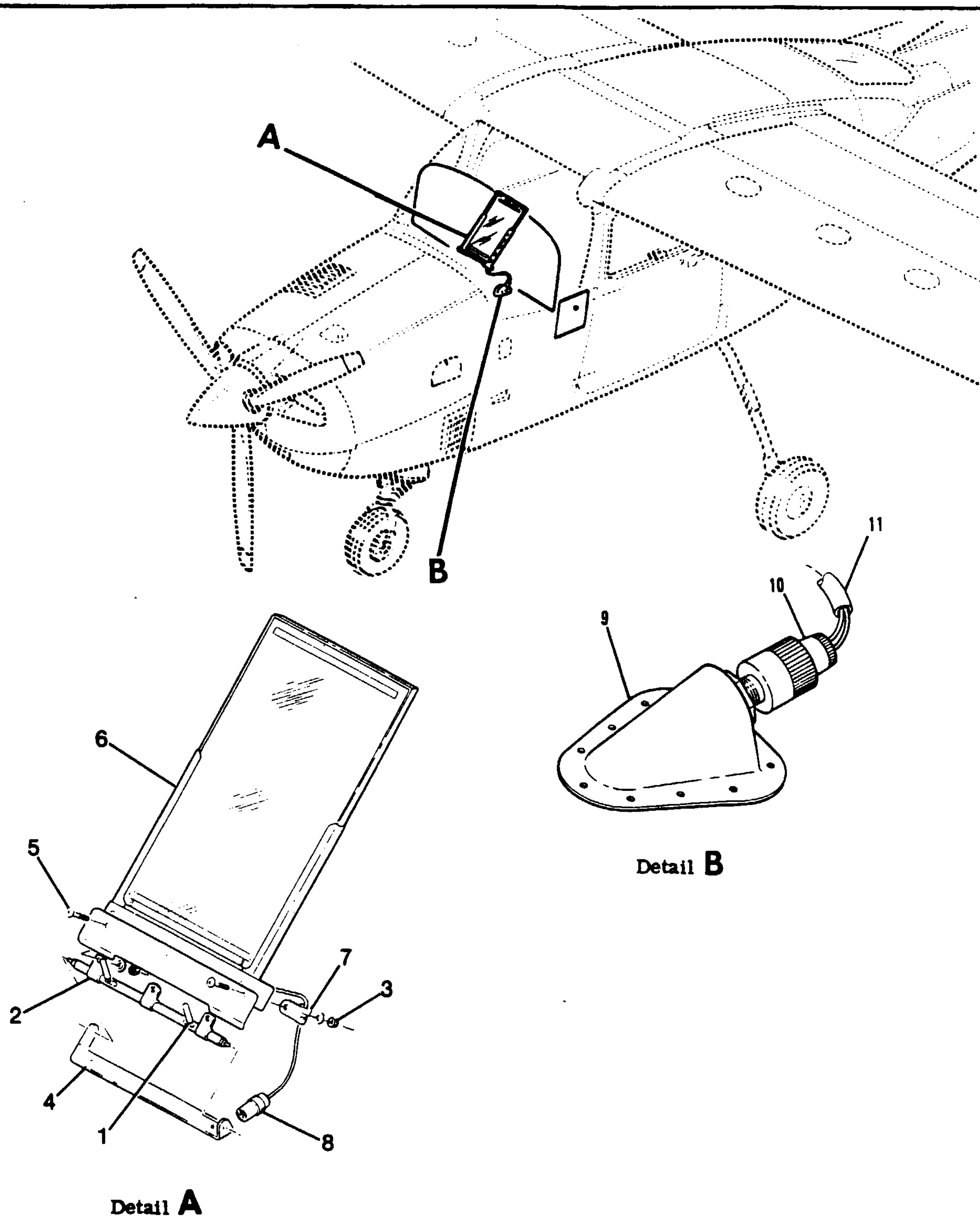
15-61. DESCRIPTION. Wick-type static dischargers are installed on the trailing edge surfaces of the ailerons, elevators and rudder of the airplane. These dischargers are used to reduce the stored voltage that is the result of electrostatic charging. The buildup of static electricity on the airframe is a consequence of flying through haze, dust, rain, snow or ice crystals.

Reduction of stored potential (voltage) is necessary to prevent undesirable electrostatic currents that could cause unacceptable radio noise or electrical insulation failures.

The wick is attached to the base by a threaded fitting, and may be replaced without removing the base from the airplane.

15-61A. INSPECTION. Static wicks and their bases should be check for physical condition. The majority of failures will be due to "hangar rash" or lightning damage, be certain to inspect the airframe itself for damage. Wick-type dischargers are functional as long as any material is present and their resistance is within the range given in paragraph 15-46. Static discahrgers lose their effectiveness with age and exposure to static electricity; therefore, they should have a resistance check when installed or every 500 hours or annually; whichever occurs first.

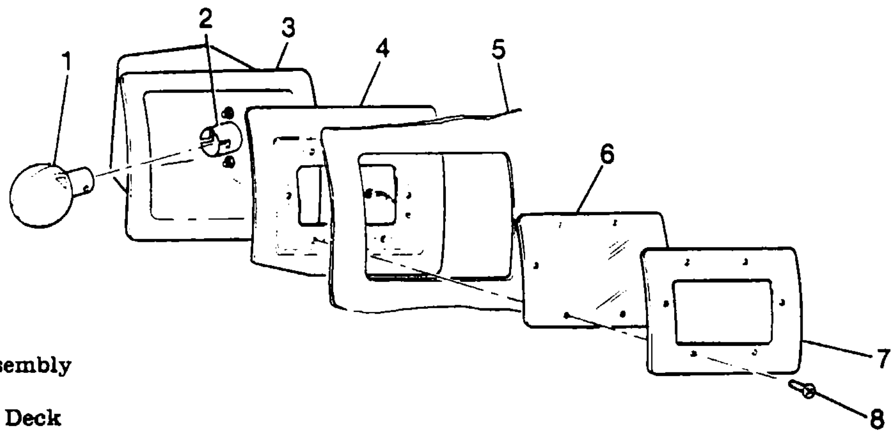
15-62. RESISTANCE CHECK. Perform the following resistance checks on each control surface discharger and replace those which do not conform to the resistance requirements.



1. Release Assembly
2. Stop Assembly
3. Nut
4. Bracket
5. Screw
6. Panel Assembly
7. Clamp
8. Connector
9. Housing Assembly
10. Connector
11. Anti-Ice Panel Lead

THIS INSTALLATION NOT USED WITH KNOWN ICING

Figure 15-11. Windshield Anti-Ice Panel Installation (Removable)



1. Lamp
2. Socket
3. Bracket Assembly
4. Doubler
5. Skin - Cowl Deck
6. Lens
7. Cover
8. Screw

THIS INSTALLATION REQUIRED WITH KNOWN ICING

Figure 15-12. Ice Detector Light Installation

NOTE

A GOOD airframe ground must be established in order to perform RELIABLE resistance checks on the control surface dischargers.

a. Check the resistance from the base to a good airframe ground using a low voltage ohmmeter. The resistance should not exceed 1.0 ohm maximum.

WARNING

Do not bend the wick during the following step since wicks have a higher resistance when bent.

b. Using a "megger", connect the EARTH terminal to the base of the discharger and check the resistance at the tip of the wick. The resistance should check between 1 to 100 megohms.

NOTE

A "megger" is a 500 to 1000 volt capacity megohmmeter and is available from the James G. Biddle Co., Plymouth Meeting, PA. 19462.

15-62A. REMOVAL/INSTALLATION.

a. Remove discharger wick from base. Discard lockwasher.

b. To remove base drill out rivets taking care not to distort holes in skin.

c. Installing the mounting base.

1. Use fine grit sandpaper and remove any paint that is around the attaching holes or under the mounting base footprint.

2. With a 500 or 600 grit emery cloth, break the aluminum oxide in the footprint (new oxide will form within minutes, do not delay performing steps 3. and 4.

3. Clean the mating surface of the airplane's skin with solvent.

4. Brush the cleaned skin with Aluma Prep 1201 alodine and wait until it is dry before proceeding.

5. Install the new base using an appropriate size blind rivet.

6. Primer and paint may be used as desired on the airplane skin (cover any attached discharger with paper or rag; do not use tape). Screw threads in the base should be protected with a lightly inserted wooden plug.

d. Installing the discharger wick.

1. Remove the plastic lockwasher retainer from the new discharger and discard (do not lose the new lockwasher).

2. Screw the new static discharger into the base only tight enough to compress the lockwasher; do not overtorque.

15-63. ELECTRICAL BONDING.

15-64. DESCRIPTION. Individual electrically conductive components and structures of the airplane must be electrically bonded together. This bonding is necessary to ensure that all conductive material on the airplane is at the same electric potential. If electrical bonding is not maintained, crew members or passengers may encounter electrical shocks, radio and other avionic system interference or even damage will result and corrosion between disimilar materials may occur.

Bond resistance between structures should not exceed 0.003 ohms unless otherwise specified in specific installations. After major repair and/or replacement of components or control surfaces an electrical bonding check is required.

15-65 thru 16-68. Deleted - Not Used.

15-69. OXYGEN SYSTEM.

WARNING

Under No circumstances, turn the ON-OFF control to the "ON" position with the outlet (low pressure) ports open to atmosphere. This action will induce serious damage to the regulator, with the following results:

1. Loss of outlet set pressure.
2. Loss of oxygen flow through the regulator which will result in inadequate oxygen being fed through the aircraft system.
3. Internal leakage of oxygen through regulator.

Opening of the control lever with the outlet ports open to atmosphere, results in an "overshoot" of the regulator metering device due to the extreme flow demand through the regulator. After overshooting, the metering poppet device goes into oscillation, creating serious damage to the poppet seat and diaphragm metering probe. This condition can occur even by turning the control lever on and then turning it quickly off.

A potential hazard exists to aircraft in the field where inexperienced personnel might remove the cylinder and regulator assembly from the aircraft and for some reason, attempt to turn the regulator to the "ON" position with the outlet ports open. Unfortunately, after the units have been improperly operated as noted, there is no outward appearance indicating that damage has occurred.

Testing these regulators should be accomplished only after installation in the aircraft. with the "downstream" low pressure line attached.

15-70. DESCRIPTION. The system is comprised of four oxygen cylinders. mounted in the cabin top area, in front of and behind the main carry-thru spar. Of the four cylinders, only one is a cylinder-regulator assembly or a 76.0 Cu. ft. cylinder mounted in the baggage compartment. Remaining components of the system include a filler valve, located in the lower inboard surface of the right wing thru 1985 and in the baggage compartment beginning with 1986 models, cabin outlets, mask assemblies, and a pressure gage at the pilot's position. The pilot's supply line is designed to receive a greater flow of oxygen than the passengers. The pilot's mask is equipped with a microphone, keyed by a switch button on the pilot's control wheel. An ON-OFF control is provided at the pilot's position.

WARNING

Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

15-71. Tools and Equipment.

NOTE

Equivalent substitues may be used instead of the following items.

NAME	NUMBER	MANUFACTURER	USE
Teflon Lubricating Tape	S1465	Commercially Available	To lubricate threads and fittings.
Trichloro-ethylene	MIL-T-7003	Commercially Available	To clean oxygen lines.
Naphtha	TT-N-95	Commercially Available	Flush oxygen lines.
Anti-Icing Fluid	MIL-F-5566	Commercially Available	Flush oxygen lines.
Sherlock Leak Detector	Type CG (MIL-L-25567A)	Puritan-Zep El Segundo, CA	For leak test fluid.
Flowrater (0 to 10 Liters per Minute LPM)		Commercially Available	Check pressure flow to passenger mask.
Pressure Gage (0-100 PSIG)		Commercially Available	To check oxygen flow.
Oxygen Outlet Adapter	C166005-0506	Cessna Aircraft Company	Used with pressure gage.

15-71A. MAINTENANCE PROCEDURES AND PRECAUTIONS. If maintenance is performed on the airplane oxygen system, or on any other system in the airplane requiring removal of an oxygen system component, strict adherence to the following procedures and precautions is required.

WARNING

Do Not permit smoking or open flame near airplane while maintenance is being performed on the oxygen system. Assure all electrical power is disconnected and that airplane is properly grounded. In addition, oils, grease and solvents may burn or explode spontaneously when contacted by oxygen under pressure.

CAUTION

Oxygen cylinders and regulators are furnished as assemblies by Cessna Parts Distribution (CPD 2). Attempting to remove, repair, and reinstall oxygen regulators in the field provides opportunity for contaminants to enter the system. Faulty regulators or regulators otherwise in need of disassembly should be exchanged for replacement oxygen bottle and regulator assemblies through CPD 2. Regulator and cylinder assembly shall be disassembled, repaired, inspected, cleaned, hydrostatically tested, reassembled, and serviced by manufacturer or other FAA-approved facility.

a. Working area, tools and hands must be clean.

b. Use extreme caution to assure every port in the system is kept thoroughly clean and free of water, oil, grease and solvent contamination.

c. Cap all openings immediately upon removal of any component. Do Not use tape or caps which will induce moisture.

d. Lines and fittings shall be clean and dry.

e. Use only teflon lubricating tape on threads of oxygen valves, tubing connectors, fittings and parts of assemblies. The teflon tape shall be used in accordance with the instructions listed following this step. Extreme care must be exercised to prevent contamination of teflon tape with oil, grease or other lubricants.

1. Lay tape on threads close to end of fitting: Clockwise on standard threads, opposite on left-hand threads.
2. Apply enough tension while winding so tape forms into thread grooves.
3. After wrap is complete, maintain tension and tear tape by pulling apart in direction it was applied. Resulted ragged end is the key to the tape staying in place. (If sheared or cut, tape may unwind.)
4. Press tape well into threads.
5. Make connections.

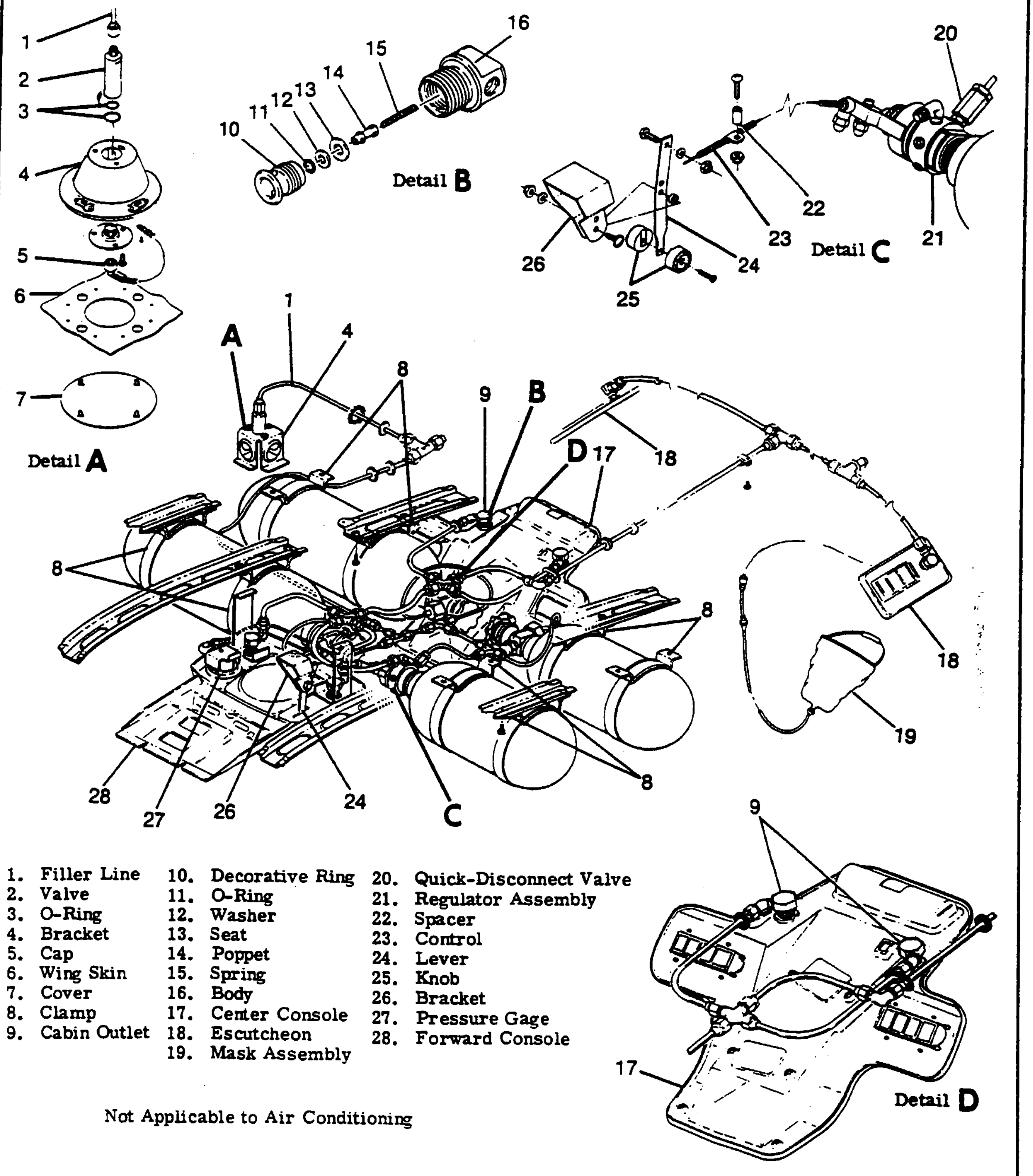
f. Fabrication of oxygen pressure lines is not recommended. Lines should be replaced by part numbers called out in the aircraft Parts Catalog.

g. Lines and fittings must be clean and dry. One of the following methods may be used.

1. Clean by degreasing with stabilized trichlorethylene, conforming to Federal Specifications O-T-634 or MIL-T-27602. These items can be obtained from American Mineral Spirits of Houston, TX.

NOTE

Most air compressors are oil lubricated, and a minute amount of oil may be carried by the airstream. If only an oil lubricated air compressor is available, drying must be accomplished by heating at a temperature of 250° to 300°F for a suitable period.



1. Filler Line
2. Valve
3. O-Ring
4. Bracket
5. Cap
6. Wing Skin
7. Cover
8. Clamp
9. Cabin Outlet
10. Decorative Ring
11. O-Ring
12. Washer
13. Seat
14. Poppet
15. Spring
16. Body
17. Center Console
18. Escutcheon
19. Mask Assembly
20. Quick-Disconnect Valve
21. Regulator Assembly
22. Spacer
23. Control
24. Lever
25. Knob
26. Bracket
27. Pressure Gage
28. Forward Console

Not Applicable to Air Conditioning

Figure 15-13. Oxygen System

2. Flush with naphtha, conforming to Specification TT-N-95 (aliphatic Naphtha). Blow clean and dry off all solvents with clean, dry, oil-free, filtered air. Flush with anti-icing fluid conforming to Specification TT-T-735 or Anhydrous ethyl alcohol. Rinse thoroughly with fresh water. Dry thoroughly with a stream of clean, dry, oil-free, filtered air.

3. Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with clean, dry, filtered air.

NOTE

Cap lines at both ends immediately after drying to prevent contamination.

15-72. REPLACEMENT OF COMPONENTS. Removal, disassembly, assembly and installation of system components may be accomplished while using figure 15-13A, 15-14 or 15-15 depending on which system is installed in the airplane.

CAUTION

Oxygen cylinders and regulators are furnished as assemblies by Cessna Parts Distribution (CPD 2). Attempting to remove, repair, and reinstall oxygen regulators in the field provides opportunity for contaminants to enter the system. Faulty regulators or regulators otherwise in need of disassembly should be exchanged for replacement oxygen bottle and regulator assemblies through CPD 2. Regulator and cylinder assembly shall be disassembled, repaired, inspected, cleaned, hydrostatically tested, reassembled, and serviced by manufacturer or other FAA-approved facility.

NOTE

The pressure gage, the line and filler valve should be removed and replaced only by personnel familiar with high-pressure fittings. Observe the maintenance precautions listed in the preceding paragraph.

NOTE

Oxygen cylinder and regulator assemblies may not always be installed in the field exactly as illustrated in figure 15-13A, which shows factory installation. Important points to remember are as follows.

a. Before removing cylinder, release low-pressure line by opening cabin outlets. Disconnect push-pull control cable, filler line, pressure gage line and outlet line from regulator. CAP ALL LINES IMMEDIATELY.

b. If it is necessary to replace filler valve O-rings, remove parts necessary for access to filler valve. Remove line from quick-disconnect valve at the regulator, then disconnect chain, but do not remove cap at filler valve. Remove screws securing valve and disconnect pressure line. Referring to applicable figure cap pressure line and seat. Disassemble valve, replace O-rings and reassemble valve. Install filler valve by reversing procedures outlined in this step.

c. To remove entire oxygen system, headliner must be lowered and soundproofing removed to expose lines. Refer to Section 3 for headliner removal.

15-73. OXYGEN CYLINDER GENERAL INFORMATION. The following information is permanently steel stamped on the shoulder, top head or neck of each oxygen cylinder and on a placard on the composit cylinders:

a. Cylinder specification, followed by service pressure (e. g. "ICC or DOT-3AA1800" and "ICC or DOT-3HT1850" for standard and light weight cylinders respectively and DOT-E8162-3000 on the composite cylinder.

NOTE

Effective 1 January 1970, all newly-manufactured cylinders are stamped "DOT" (Department of Transportation), rather than "ICC" (Interstate Commerce Commission). An example of the new designation would be: "DOT-3HT1850".

b. Cylinder serial number is stamped below or directly following cylinder specification. The symbol of the purchaser, user or maker, if registered with the Bureau of Explosives, may be located directly below or following the serial number. The cylinder serial number may be stamped in an alternate location on the cylinder top head.

c. Inspector's official mark near serial number.

d. Date of manufacture: This is the date of the first hydrostatic test (such as 4-69 for April 1969). The dash between the month and the year figures may be replaced with the mark of the testing or inspection agency (e. G. 4L69).

e. Hydrostatic test date: The dates of subsequent hydrostatic test shall be steel stamped (month and year) directly below the original manufacture date. The dash between the month and year figures can be replaced with the mark of the testing agency.

f. A Cessna identification placard is located near the center of the cylinder body.

g. Halogen test stamp: "Halogen Tested", date of test (month, day and year) and inspector's mark appears directly underneath the Cessna identification placard.

15-74. OXYGEN CYLINDER SERVICE REQUIREMENTS.

a. Hydrostatic test requirements:

1. Standard weight (ICC or DOT-3AA1800) cylinders must be hydrostatically tested to 5/3 their working pressure every five years commencing with the date of the last hydrostatic test.

2. Light weight (ICC or DOT-3HT1850) cylinders must be hydrostatically tested to 5/3 their working pressure every three years commencing with the date of the last hydrostatic test.

3. Composite (DOT-E8162) cylinders must be hydrostatically tested to 5/3 their working pressure every three years commencing with the date of the last hydrostatic test.

b. Service life requirements:

1. Standard weight (ICC or DOT-3AA1800) cylinders have no age life limitations and may continue to be used until they fail hydrostatic test.

2. Light weight (ICC or DOT-3HT 1850) cylinders must be retired from service after 24 years or 4,389 filling cycles after date of manufacture, which ever occurs first. If a cylinder is recharged more than average of once every other day, an accurate record of the number of rechargings must be maintained.

3 Composite (DOT-E8162) cylinders must be retired from service after 15 years.

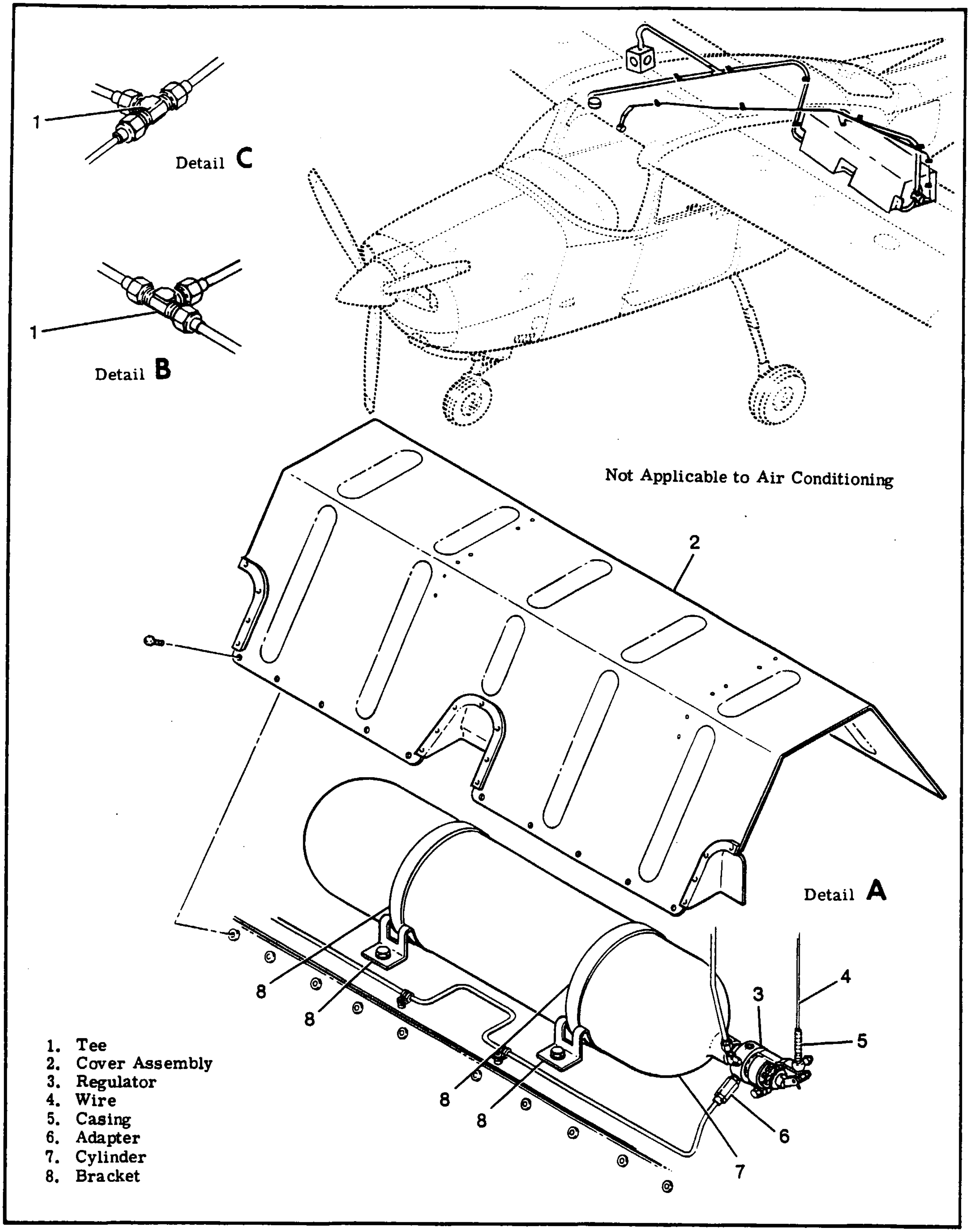


Figure 15-14. Aft Oxygen System

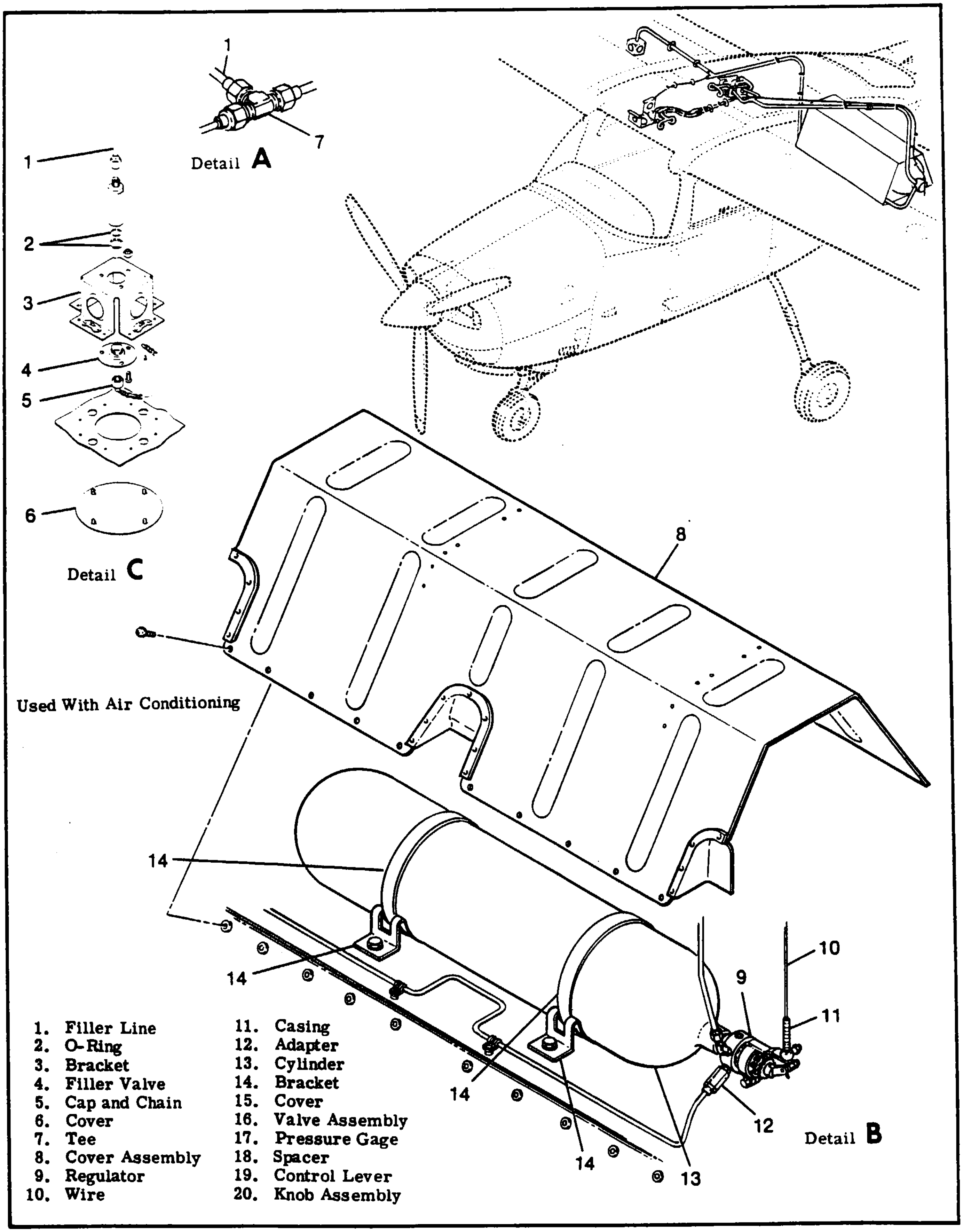


Figure 15-15. Oxygen System (Sheet 1 of 3)

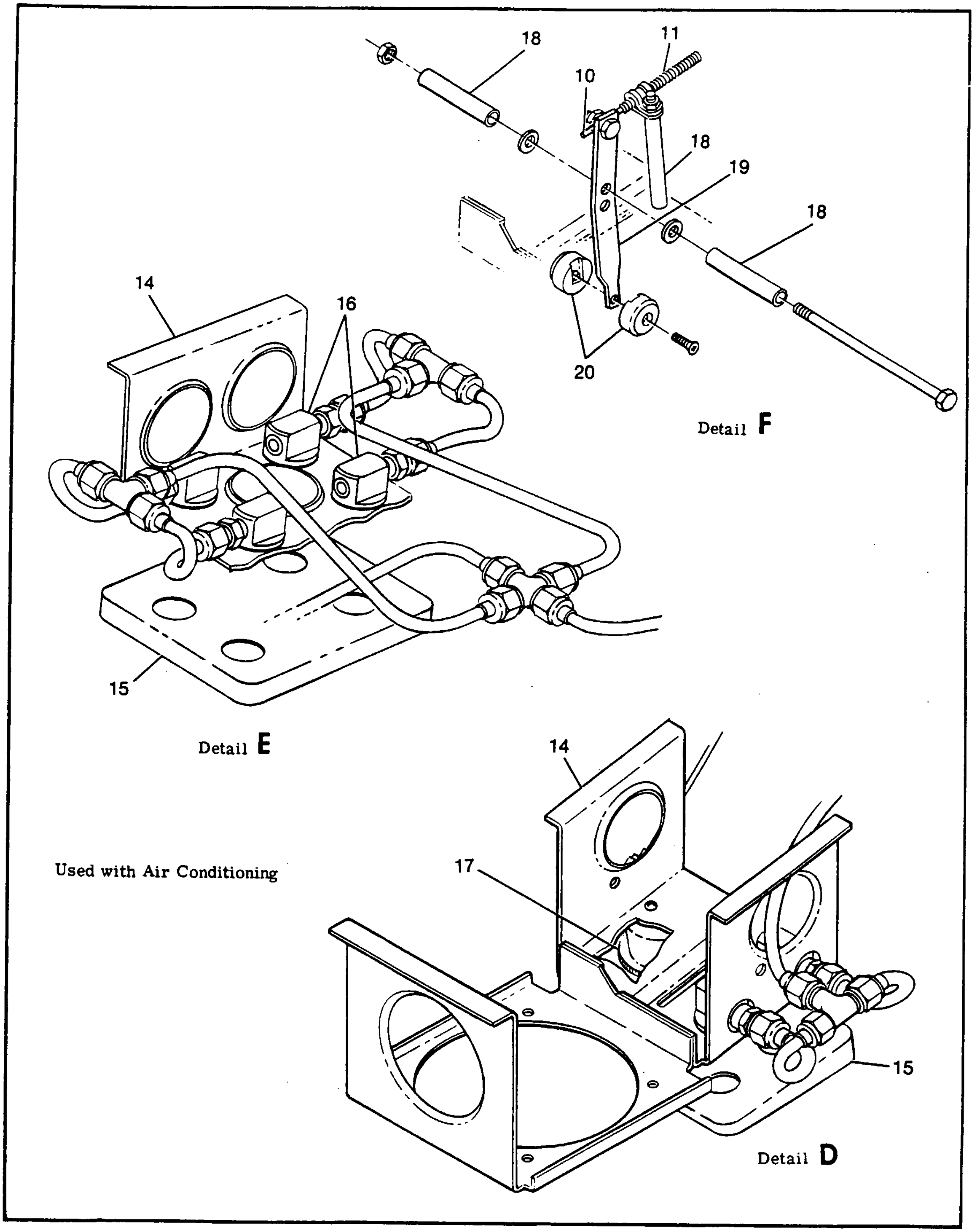


Figure 15-15. Oxygen System (Sheet 2 of 3)

1. Cover Assembly
2. Line to Valve Assemblies
3. Regulator
4. Wire
5. Casing
6. Cap
7. Bracket
8. Filler Valve
9. Line to Pressure Gage
10. Bracket
11. Strap
12. Cylinder

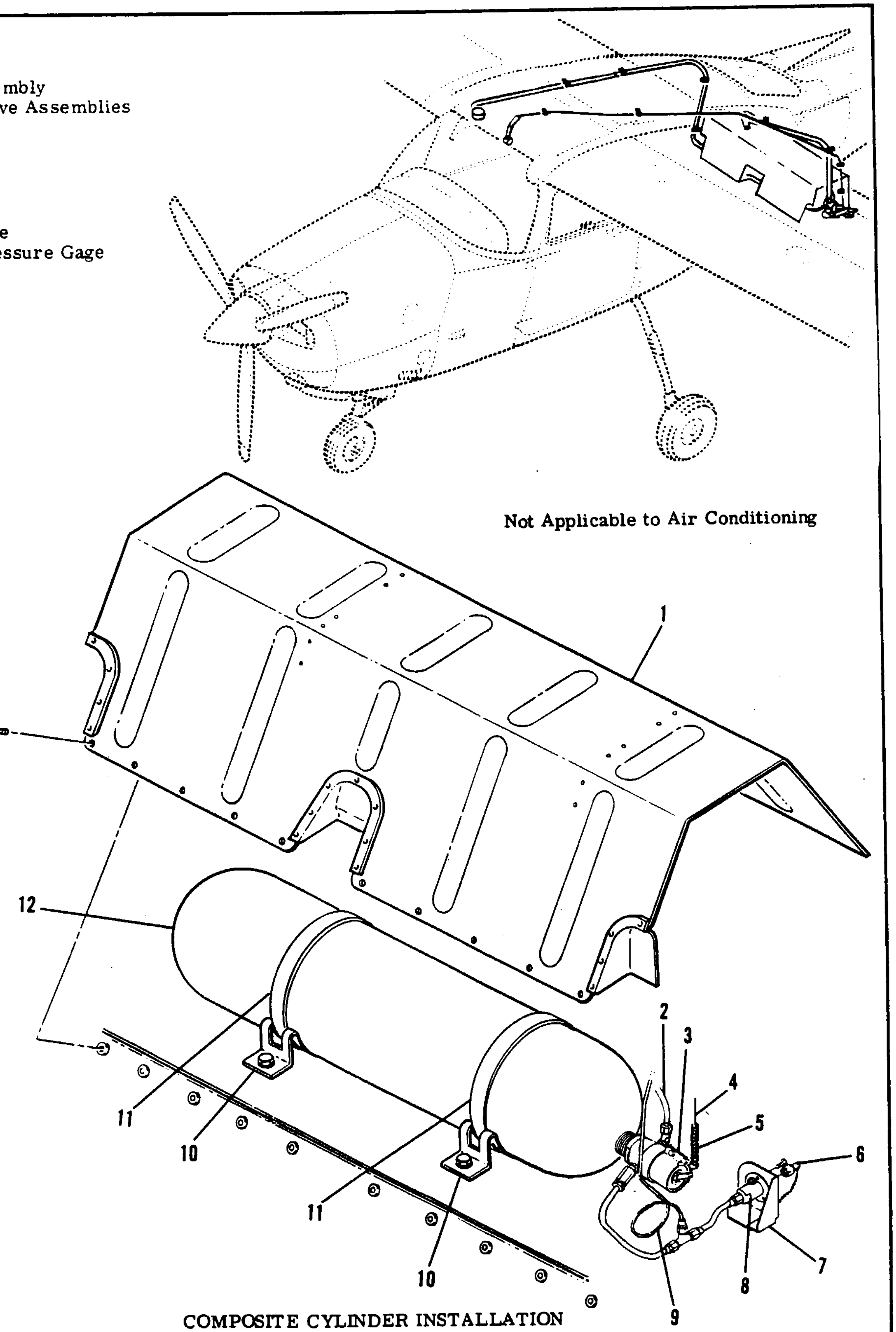


Figure 15-15. Oxygen System (Sheet 3 of 3)

NOTE

These test periods and life limitations are established by the Department of Transportation Code of Federal Regulations, Title 40, Chapter 1, Para. 73.34.

15-75. OXYGEN CYLINDER INSPECTION REQUIREMENTS. (ICC or DOT-3AA 1800).

a. Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges and strap chafing.

b. Examine the neck of cylinder for cracks, distortion or damaged threads.

c. Check the cylinders to determine if markings are legible.

d. Check date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.

e. Inspect the cylinder mounting bracket, bracket hold-down bolts and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.

15-75A. OXYGEN CYLINDER INSPECTION REQUIREMENTS. (ICC or DOT-3HT 1850).

f. In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing, deformation or deterioration.

g. A cylinder manufactured prior to January 17, 1978, and not yet marked with a rejection elastic expansion (REE), must be marked with that REE in cubic centimeters near the marked original elastic expansion prior to the next retest date. The REE for a cylinder ia 1.05 times its original elastic expansion.

h. Some cylinders manufactured to DOT special permit 5957 in the past, were incorrectly marked with "DOT 3HT" in addition to "SP5957". Cylinders made under SP5957 are not DOT 3HT cylinders, and the service life extension from 15 years to 24 years, effective January 17, 1978, does not apply to SP5957 cylinders, even if these cylinders are marked as 3HT cylinders. Such cylinders can be identified by the marking "SP5957", which will appear on the shoulder of the cylinder. Any cylinder so marked, regardless of any other markings that may also appear, is not a DOT 3HT cylinder, and the service life extension from 15 years to 24 years does not apply.

Discrepancies	Cylinder Classification DOT-3AA 1800	See Steps			See Steps	
Isolated Pitting or Corrosion (Depth)	0.020	1	2	0.010	1	2
Local Pitting or Corrosion or Line Corrosion (Depth)	0.010	2	3	0.005	2	3
General Corrosion	Not Allowed		4	Not Allowed		4
Cuts, Digs, Gauges (Depth)	0.010	5		0.005	5	
Dents (Depth)	0.062	6		0.031	6	
Fire Damage	Not Allowed		7	Not Allowed		7
Bulges	Not Allowed		8	Not Allowed		8

a. Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges and strap chafing. See chart and steps 1 thru 8.

1. Isolated pits of small cross section involving loss of wall thickness by corrosive media. Small isolated pits with a maximum depth as shown are acceptable.

2. If depth exceeds figure shown, cylinder must be returned to the manufacturer for disposition.

3. Local pitting or corrosion or line corrosion involving loss of wall thickness by corrosive media with a pattern of pits which are connected to others in a band or line. A small area with a minimum depth as shown is acceptable. Areas extending beyond 3 inches in diameter or 4 inches long shall be considered general corrosion.

4. General corrosion (sometimes accompanied by pitting) involving loss of wall thickness by corrosive media covering a considerable area. Cylinder must be returned to the manufacturer for hydrostatic testing.

5. Deformations caused by contact with a sharp object cutting or upsetting the material of the cylinder, decreasing the wall thickness. Maximum defect permissible without corrective action. If this depth is exceeded. the cylinder must be returned to the manufacturer for removal of defects and verification of cylinder strength by hydrostatic testing.

6. Deformations caused by contact with blunt objects in such manner that the thickness of the metal is not impaired. The major diameter of the dent must be equal to or greater than 32 times the depth

of the dent. Sharper dents (or deeper dents) than this are considered too abrupt and must be returned to the cylinder manufacturer for disposition.

7. Fire damage is indicated by charring or burning or sintering of the metal, charring or burning of the paint, distortion of the cylinder, functioned safety relief devices, melting of valve parts, etc. Cylinders must be returned to the cylinder manufacturer for disposition.

8. Bulged cylinders are not accpetable. Cylinders must be returned to the cylinder manufacturer for disposition.

NOTE

The above data may be used to determine that oxygen cylinders are acceptable for service. This criteria should be used prior to charging cylinders.

b. Examine the neck of cylinder for cracks, distortion or damaged threads.
c. Check the cylinders to determine if markings are legible.
d. Check date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.
e. Inspect the cylinder mounting bracket, bracket hold-down bolts and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.
f. In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing deformation or deterioration.

15-75B. INSPECTION OF OXYGEN CYLINDER-REGULATOR. (DOT-E8162)

a. A careful visual inspection of the oxygen cylinder should be performed during routine maintenance and periodic inspections. If the acceptability of the cylinder is questionable, return cylinder to manufacturer. Acceptable damage consists of such items as scratched paint or cuts and abrasions.

1. Scratches or Cuts. Cuts or scratches less than .005" (.125mm) deep are acceptable.

2. Abrasions. Minor abrasions such as scuffs, are acceptable unless the damage is deep enough to expost groups of fibers. Abrasions with isolated groups of fibers exposed or flat spots with depth less than .010" (.254 mm) must be epoxy coated to avoid water entrapment. A group of fibers is defined as .010" (.254mm) thick and .125" (3.175mm) wide.

3. Paint Removal. Paint removal is not recommended. In the event that paint removal for inspection or other reasons is required, the suitability of the paint removal procedure must be verified by the cylinder manufacturer. Some chemical paint removers may damage the composite. Abrasive or other mechanical means of paint removal, such as shot blast or wire brush are prohibited.

b. Regulator shall be removed and overhauled by manufacturer or an FAA-approved facility during hydrostatic testing.
c. Actuate regulator controls and valve to check for ease of operation.

CAUTION

Damage to regulator will occur if the control of a charged oxygen cylinder is turned ON with the low-pressure side of the regulator open to the atmosphere.

d. Pressurize the system and check for leaks.

15-76. OXYGEN SYSTEM COMPONENT SERVICE REQUIREMENTS.

a. PRESSURE REGULATOR. The regulator shall be removed and overhauled by manufacturer or an FAA approved facility during hydrostatic testing.
b. FILLER VALVE. The valve should be disassembled, inspected and the O-rings replaced, regardless of condition, every 3 years or 3000 flight hours, whichever occurs first.
c. QUICK-RELEASE COUPLING. The coupling shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.
d. PRESSURE GAGE. The gage shall be replaced when found to be faulty. No re-conditioning or overhaul of the gage is authorized.
e. INDIVIDUAL OUTLETS. The outlets shall be disassembled and inspected and the O-rings replaced, regardless of condition, every 3 years or 3000 flight hours, whichever occurs first.

NOTE

Each interconnected series of oxygen cylinders is equipped with a single gage. The trailer type cascade may also be equipped with a nitrogen cylinder (shown reversed) for filling landing gear struts, accumulators, etc. Cylinders are not available for direct purchase, but are usually leased and refilled by a local compressed gas supplier.

Service Kit SK310-32 (available from Cessna Supply Division) contains an adapter, a pressure gage, hose, lines, and fittings for equipping two oxygen cylinders to service oxygen systems. As noted in the Service Kit, a tee (Part No. 11844) and a pigtail (Part No. 1243-2) should be ordered for each additional cylinder to be used in the cascade of cylinders. Be sure to ground the airplane and ground servicing equipment before use.

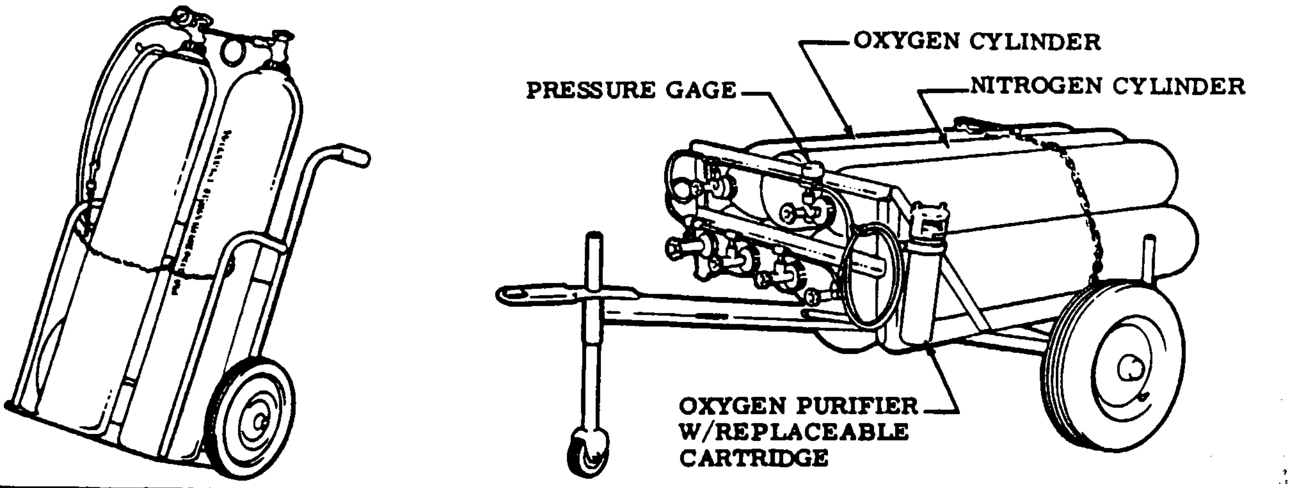


Figure 15-16. Typical Portable Oxygen Cascades

15-77. OXYGEN SYSTEM COMPONENT INSPECTION REQUIREMENTS.

a. Examine all parts for cracks, nicks, damaged threads or other apparent damage.

b. Actuate regulator controls and valve to check for ease of operation.

c. Determine if the gage is functioning properly by observing the pressure build-up and the return to zero when the system oxygen is bled off.

d. Replace any oxygen line that is chafed, rusted, corroded, dented, cracked or kinked.

e. Check fittings for corrosion around the threaded area where lines are joined together. Pressurize the system and check for leaks.

15-78. MASKS AND HOSE.

a. Check oxygen masks for fabric cracks and rough face seals. If the mask is a full-faced model, inspect glass or plastic for cleanliness and state of repair.

b. Flex the mask hose gently over its entirety and check for evidence of deterioration or dirt.

c. Examine mask and hose storage compartment for cleanliness and general condition.

15-79. MAINTENANCE AND CLEANING.

a. Clean and disinfect mask assemblies after use, as appropriate.

NOTE

Use care to avoid damaging micorphone assembly while cleaning and sterilizing.

b. Wash mask with a mild soap solution and rinse it with clear water.

c. To sterilize, swab mask thoroughly with a gauze or sponge soaked in a water/merthiolate solution. This solution should contain 1/5 teaspoon of merthiolate per one quart of water. Wipe the mask with a clean cloth and let air dry.

d. Observe that each mask breathing tube end is free of nicks and that the tube end will slip into the cabin oxygen receptacle with ease and will not leak.

e. If a mask assembly is defective (leaks, does not allow breathing or contains a defective microphone) it is advisable to return the mask assembly to the manufacturer or a repair station.

f. Replace hose if it shows evidence of deterioration.

g. Hose may be cleaned in the same manner as the mask.

15-80. OXYGEN SYSTEM PURGING.

a. A vapor degreasing solution of stabilized trichlorethylene conforming to MIL-T-7003, followed by blowing tubing clean and dry with a jet of nitrogen gas (BB-N411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

CAUTION

MOST AIR COMPRESSORS ARE OIL LUBRICATED, AND A MINIMUM AMOUNT OF OIL MAY BE CARRIED BY THE AIR STREAM. A WATER LUBRICATED COMPRESSOR SHOULD BE USED TO BLOW TUBING CLEAN WHEN NITROGEN OR ARGON ARE NOT AVAILABLE. THE AIR MUST BE CLEAN, DRY AND FILTERED.

b. Flush with naphtha conforming to Specification TT-N-95; then blow clean and dry with clean, dry, filtered air. Flush with anti-icing fluid conforming to MIL-F-5566 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water and dry with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

c. Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

NOTE

Cap all lines immediately after drying.

d. Fabrication of pressure lines is not recommended. Lines should be replaced from the factory by part number.

e. Use only S1465 Teflon lubricating tape on the threads of the male fittings. No lubricating tape is used on coupling sleeves or outside of the flares.

f. Maintenance personnel must assure that their hands are free of dirt and grease prior to installation of ocygen tubing or fittings.

CAUTION

USE NONSPARKING TOOLS.

WARNING

WITH OXYGEN BOTTLE CHARGED, DO NOT PULL CONTROL TO "ON" POSITION WITH OUTLET PORTS (LOW PRESSURE) OPEN TO ATMOSPHERE. DAMAGE TO REGULATOR METERING POPPET MAY OCCUR.

CAUTION

WHENEVER A COMPONENT OF THE OXYGEN SYSTEM HAS BEEN REMOVED, REINSTALLED, REPLACED OR SYSTEM HAS BEEN DISASSEMBLED IN ANY WAY, THE OXYGEN SYSTEM MUST BE LEAK CHECKED AND PURGED.

3. All tools used for installation of oxygen tubes or fittings must be free of dirt, grease and oils.

15-81. **FUNCTIONAL TESTING.** Whenever the regulator and cylinder assembly has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

a. Fully charge oxygen system in accordance with procedures outlined in paragraph 15-83.

b. Disconnect line and fitting assembly from pilot's mask and line assembly. Insert outlet end of line and fitting assembly into cabin outlet and attach opposite end of line to a pressure gage (gage should be calibrated in one-pound increments from 0 to 100 PSI). Place control lever in ON position. Gage pressure should read 70±10 PSI.

c. Insert mask and line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, test gage pressure should still be 70±10 PSI.

d. Place oxygen control lever in OFF position and allow test gage pressure to fall to 0 PSI. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE

If pressures specified in the foregoing procedures are not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

e. Connect mask and line assemblies to each cabin outlet and check each mask for proper operation.

f. Check pilot's mask microphone and control wheel switch for proper operation. After checking, return all masks to mask case.

g. Recharge oxygen system in accordance with procedures outlined in paragraph 15-83.

15-82. SYSTEM LEAK TEST. When oxygen is being lost from a system through leakage, a sequence of steps may be necessary to locate the opening. Leakage may often be detected by listening for the distinct hissing of escaping gas. If this check proves negative, it will be necessary to soap-test all lines and connections with a castile soap and water solution or specially compounded leak-test material. Make the solution thick enough to adhere to the contours of the fittings. At the completion of the leakage test, remove all traces of the leak detector or soap and water solution.

CAUTION

Do not attempt to tighten any connections while the system is charged.

15-83. SYSTEM CHARGING.

WARNING

BE SURE TO GROUND AIRCRAFT AND GROUND SERVICING EQUIPMENT BEFORE CHARGING OXYGEN SYSTEM.

a. Do not attempt to charge oxygen cylinders if servicing equipment fittings or filler valve are corroded or contaminated. If in doubt, clean with stabilized trichlorethylene and let air dry. Do not allow solvent to enter any internal parts.

b. If cylinder is completely empty, do not charge, as the cylinder must then be removed, inspected and cleaned.

CAUTION

A cylinder which is completely empty may well be contaminated. The regulator and cylinder assembly must then be disassembled, inspected and cleaned by an FAA approved facility, before filling. Contamination, as used here, means dirt, dust or any other foreign material, as well as ordinary air in large quantities. If a gage line or filler line is disconnected and the fittings capped immediately, the cylinder will not become contaminated unless temperature variation has created a suction within the cylinder. Ordinary air contains water vapor which could condense and freeze. Since there are very small orifices in the system, it is very important that this condition not be allowed to occur.

c. Connect cylinder valve outlet or outside filler valve to manifold or portable oxygen cascade.

d. Slowly open valve on cascade cylinder or manifold with lowest pressure, as noted on pressure gage, allow pressure to equalize, then close cascade cylinder valve.

e. Repeat this procedure, using a progressively higher pressure cascade cylinder, until system has been charged to the pressure indicated in the chart immediately following step "f" of this paragraph.

f. Ambient temperature listed in the chart is the air temperature in the area where the system is to be charged. Filling pressure refers to the pressure to which aircraft cylinders should be filled. This table gives approximations only and assumes a rise in temperature of approximately 25°F. due to heat of compression. This table also assumes the aircraft cylinders will be filled as quickly as possible and that they will only be cooled by ambient air; no water bath or other means of cooling be used.

Example: If ambient temperature is 70°F., fill aircraft cylinders to approximately 1,975 psi or as close to this pressure as the gage may read. Upon cooling, cylinders should have approximately 1,850 psi pressure.

TABLE OF FILLING PRESSURES

Ambient Temp. °F	Filling Press. psig	Ambient Temp. °F	Filling Press. psig
0	1650	70	1975
10	1700	80	2000
20	1725	90	2050
30	1775	100	2100
40	1825	110	2150
50	1875	120	2200
60	1925	130	2250

SECTION 16

INSTRUMENTS AND INSTRUMENT SYSTEMS

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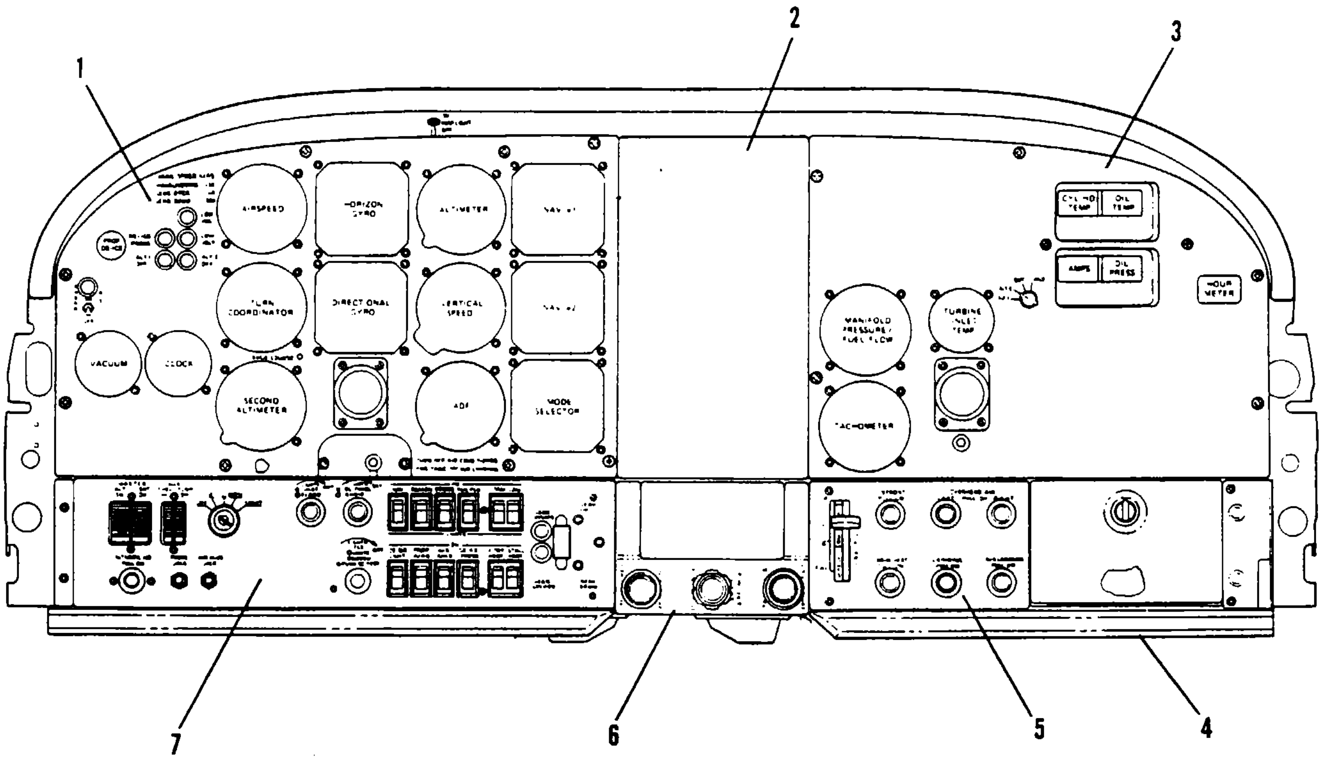
16-1. INSTRUMENTS AND INSTRUMENT SYSTEMS.

16-2. GENERAL. This section describes typical instrument installations and their respective operating systems. Emphasis is placed on trouble shooting and corrective measures only. It does NOT deal with specific instrument repairs since this usually requires special equipment and data and should be handled by instrument specialists. Federal Aviation Regulations require malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to manufacturer for servicing. Our concern here is with preventive maintenance on various instrument systems and correction of system faults which result in instrument malfunctions. The descriptive material, maintenance and trouble shooting information in this section is intended to help the mechanic



1. Removeable Flight Instrument Panel
2. Radio and Switch Panel
3. Fuel and Engine Instruments
4. Protection Pad
5. Heating and Ventilating Controls
6. Engine Controls
7. Ignition and Switch Panel

Figure 16-1. Instrument Panel (Typical)

determine malfunctions and correct them, up to the defective instrument itself, at which point an instrument technician should be called in. Some instruments, such as fuel quantity and oil pressure gages, are so simple and inexpensive, repairs usually will be more costly than a new instrument. On the other hand, aneroid and gyro instruments usually are well worth repairing. The words "replace instrument" in the text, therefore, should be taken only in the sense of physical replacement in the aircraft. Whether replacement is to be with a new instrument, an exchange one, or the original instrument is to be repaired must be decided on basis of individual circumstances.

16-3. INSTRUMENT PANEL. (Refer to figure 16-1).

16-4. DESCRIPTION. The instrument panel consists of a left and right removable instrument panel, a stationary radio panel and a lower switch and controls panel. The left hand removable panel contains the flight instruments. The right hand removable panel contains the engine cluster instruments and other related instruments with additional space for radio equipment. The center stationary panel is a compartmented panel for acceptance of radio equipment. The lower stationary panel contains the aircraft systems switches and controls.

16-5. REMOVAL AND INSTALLATION. LEFT REMOVABLE INSTRUMENT PANEL.

a. Tag and disconnect wiring and plumbing connections from instruments and panel.
b. Remove the screws through face of panel and screws from bottom support angle of panel.
c. Remove screws through panel and column support bearing and bearing doubler.
d. Panel may be moved aft to the control wheel for access behind panel. If panel is to be removed completely remove the control wheel per section 6.
e. To install panel reverse the steps of procedure.

16-6. REMOVAL AND INSTALLATION. RIGHT REMOVABLE INSTRUMENT PANEL.

a. Removal and Installation of right panel is similar to left panel. Radio equipment, if installed, must be removed.

16-7. INSTRUMENTS. (Refer to figure 16-1.)

16-8. REMOVAL. Most instruments are secured to the panel with screws inserted through the panel face, under the decorative cover. To remove an instrument, remove decorative cover, disconnect wiring or plumbing to instrument, remove mounting screws and take instrument out from behind, or in some cases, from front of panel. Instrument clusters are installed as units and are secured by a screw at each end. A cluster must be removed from the forward side of the stationary panel to replace an individual gage. In all cases when an instrument is removed, disconnected lines or wires should be protected. Cap open lines and cover pressure connections on instrument to prevent thread damage and entrance of foreign matter. Wire terminals should be insulated or tied up to prevent accidental grounding or short-circuiting.

16-9. INSTALLATION. Generally, installation procedure is the reverse of removal procedure. Ensure mounting screw nuts are tightened firmly, but do not over-tighten, particularly on instruments having plastic cases. The same rule applies to connecting plumbing and wiring.

NOTE

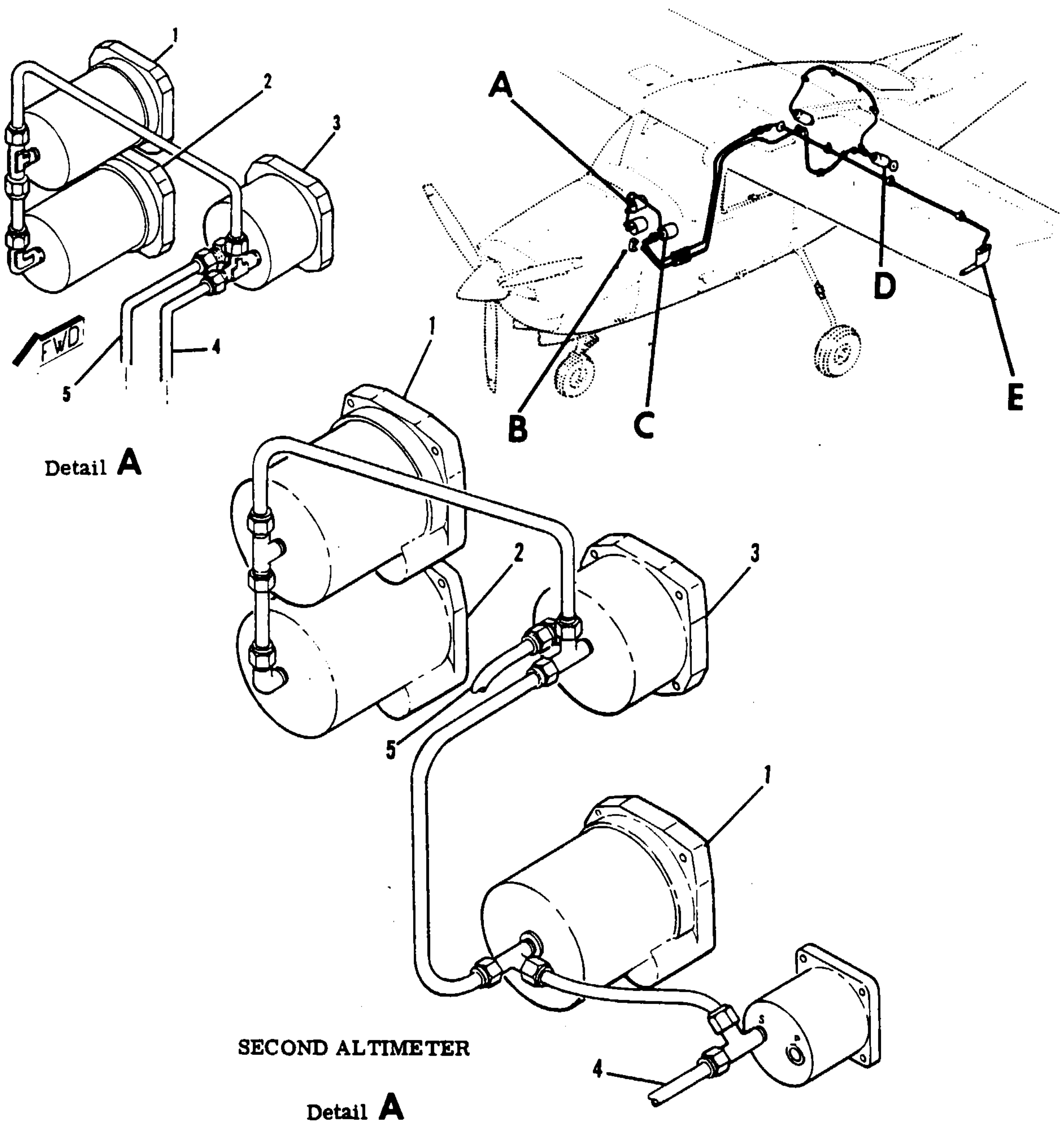
All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through the Cessna Supply Division.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change the calibration of gages.

16-10. PITOT AND STATIC SYSTEMS. (Refer to figure 16-2.)

16-11. 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 the static ports. A static line sump is installed at each source button to collect condensation in the static system. A pitot tube heater and stall warning heater may be installed. The heating elements are controlled by a switch at the instrument panel and powered by the electrical system. A static pressure alternate source valve may be installed in the static system for use when the external static source is malfunctioning. This source is to be used only in emergencies. When used as a static source, cabin pressure is substituted for atmospheric pressure, causing the instrument readings to vary from normal. This valve also permits draining condensate from the static lines. Refer to Pilot's Operating Handbook for flight operation using alternate static source pressure.

16-12. MAINTENANCE. Proper maintenance of the pitot and static system is essential for proper opera-



1. Altimeter
2. Vertical Speed Indicator
3. Airspeed Indicator
4. Static Line (To Sump)
5. Pitot Line (To Pitot Tube)
6. Alternate Static Source Valve
7. Line (To Airspeed)
8. Line (Alternate Air)
9. Bracket
10. Spacer
11. Instrument Panel
12. True Airspeed Ring
13. Retainer
14. Mounting Screw
15. Decorative Cover
16. Sump
17. Static Port
18. Heater Element (Heated Pitot Only)
19. Pitot Tube Mast Body
20. Connector

NOTE

Do not overtighten screws (14), and do not lubricate any parts.

Use spacers (10) as required for adequate friction on ring assembly (12).

Figure 16-2. Pitot-Static System (Sheet 1 of 2)

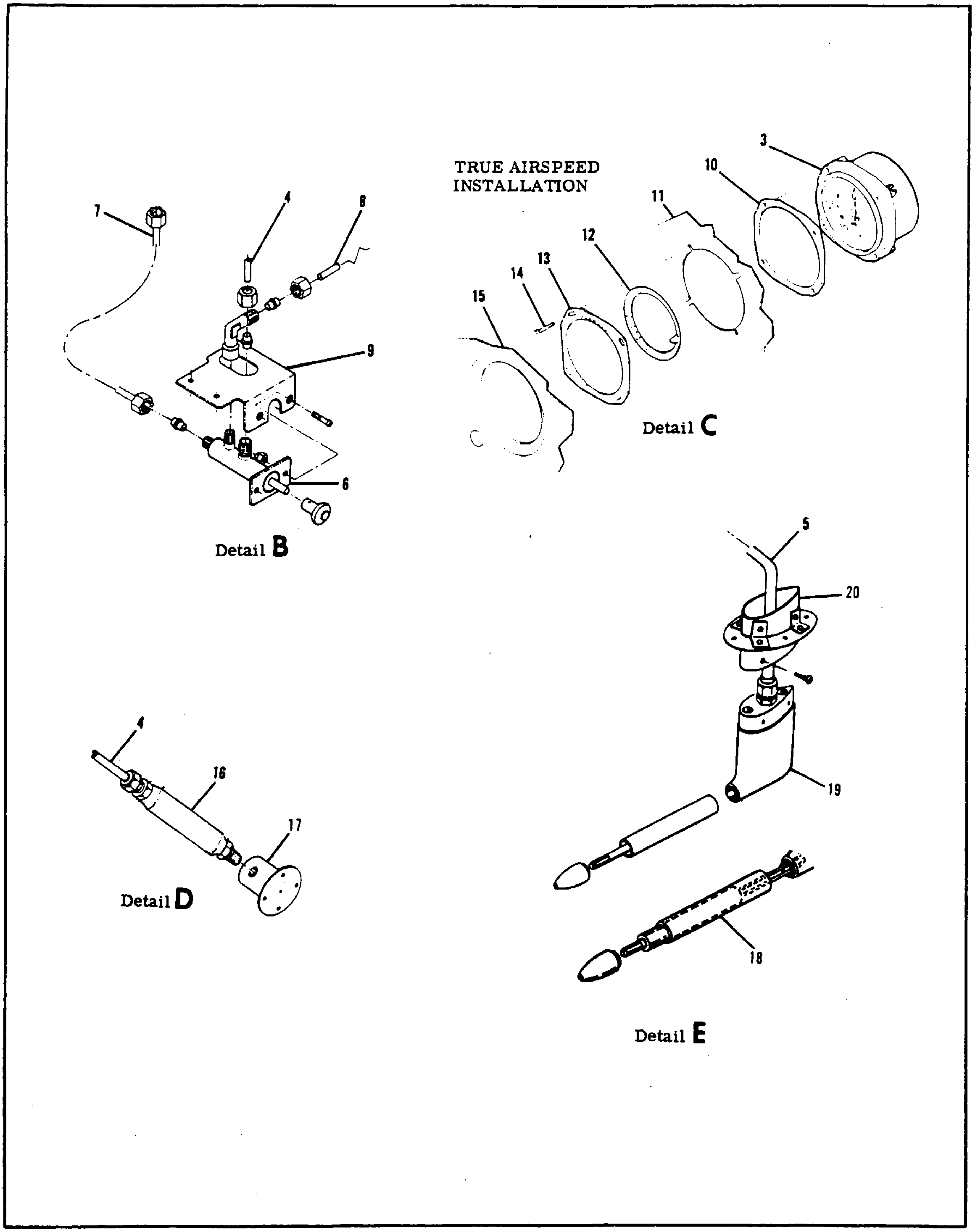


Figure 16-2. Pitot-Static System (Sheet 2 of 2)

tion of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in the pitot system will result in false airspeed indications, while static system malfunctions will affect the 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.

16-13. STATIC PRESSURE SYSTEM INSPECTION AND LEAKAGE TEST. The following procedure outlines inspection and testing of the static pressure system, assuming the altimeter has been tested and inspected in accordance with current Federal Aviation Regulations.

a. Ensure that the static system is free from entrapped moisture and restrictions.
b. Ensure that no alterations or deformations of the airframe surface have been made which would affect the relationship between air pressure in the static pressure system and true ambient static air pressure for any flight configuration.
c. Seal one static source port with pressure sensitive tape. This seal must be air tight.
d. Close the static pressure alternate source valve, if installed.
e. Attach a source of suction to the remaining static pressure source opening. Figure 16-3 shows one method of obtaining suction.
f. Slowly apply suction until the altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed the range of vertical speed indicator or airspeed indicator.

g. Cut off the suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on the altimeter.
h. If leakage rate is within tolerance, slowly release the suction source and remove the tape from static port.

NOTE

If leakage rate exceeds the maximum allowable, first tighten all connections, then repeat leakage test. If leakage rate still exceeds the maximum allowable, use the following procedure.

i. Disconnect the static pressure lines from airspeed indicator and vertical speed indicator. Use suitable fittings to connect the lines together so the altimeter is the only instrument still connected into the static pressure system.
j. Repeat the leakage test to check whether the static pressure system or the bypassed instruments are the cause of leakage. If the instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If the static pressure system is at fault, use the following procedure to locate leakage.
k. Attach a source of positive pressure to the static source opening. Figure 16-3 shows one method of obtaining positive pressure.

CAUTION

Do not apply positive pressure with the airspeed indicator or vertical speed indicator connected to the static pressure system.

l. Slowly apply positive pressure until the altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections and static source flange with LEAK-TEC or a solution of mild soap and water, watching for bubbles to locate leaks.
m. Tighten leaking connections. Repair or replace parts found defective.
n. Reconnect the airspeed and vertical speed indicators into the static pressure system and repeat leakage test per steps "c" thru "h".

16-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check the pitot system for leaks, place a piece of tape over the small hole in the lower aft end of pitot tube, fasten a piece of rubber or plastic tubing over pitot tube, close opposite end of tubing and slowly roll up tube until airspeed indicator registers in cruise range. Secure tube and after a few minutes recheck airspeed indicator. Any leakage will have reduced the pressure in system, resulting in a lower airspeed indication. Slowly unroll tubing before removing it, so pressure is reduced gradually. Otherwise instrument may be damaged. If test reveals a leak in system, check all connections for tightness.

16-15. BLOWING OUT LINES. Although the pitot system is designed to drain down to the pitot tube opening, condensation may collect at other points in the system and produce a partial obstruction. To clear the line, disconnect it at the airspeed indicator. Using low pressure air, blow from the indicator end of line toward the pitot tube.

Like the pitot lines, static pressure lines must be kept clear and connections tight. Static source sumps collect moisture and keeps system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow the line clear with low pressure air.

CAUTION

Never blow through pitot or static lines toward instruments. Insure that (avionics) altitude sensor line is disconnected from static lines before blowing out lines, or damage to sensor may occur.

NOTE

On aircraft equipped with an alternate static source, use the same procedure, opening the alternate static source valve momentarily to clear line, then close valve and clear the remainder of system.

Check all static pressure line connections for tightness. If hose or hose connections are used, check them for general condition and clamps for security.

Replace hose which have cracked, hardened or show other signs of deterioration.

16-16. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 16-2). To remove the pitot mast, remove the four mounting screws on the side of connector (19) and pull mast out of connector far enough to disconnect pitot line (5). Electrical connections to the heater assembly (if installed) may be disconnected through the wing access opening just inboard of mast. Pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Installation of tubing will be simpler if a guide wire is drawn in as tubing is removed from wing. The tubing may be removed intact by drawing it out through cabin and right door. When replacing components of pitot and static pressure systems, use anti-seize compound sparingly on male threads on both metal and plastic connections. Avoid excess compound which might enter lines. Tighten connections firmly, but avoid overtightening and distorting fittings. If twisting of plastic tubing is encountered when tightening fittings, VV-P-236 (USP Petrolatum), may be applied sparingly between tubing and fittings.

16-17. TROUBLE SHOOTING--PITOT-STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIRSPEED INDICATION. Normal altimeter and vertical speed.	Pitot tube deformed, leak or obstruction in pitot line.	Straighten tube, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE. All three instruments.	Leaks or obstruction in static line.	Repair or replace line.
	Alternate static source valve open.	Close for normal operation.

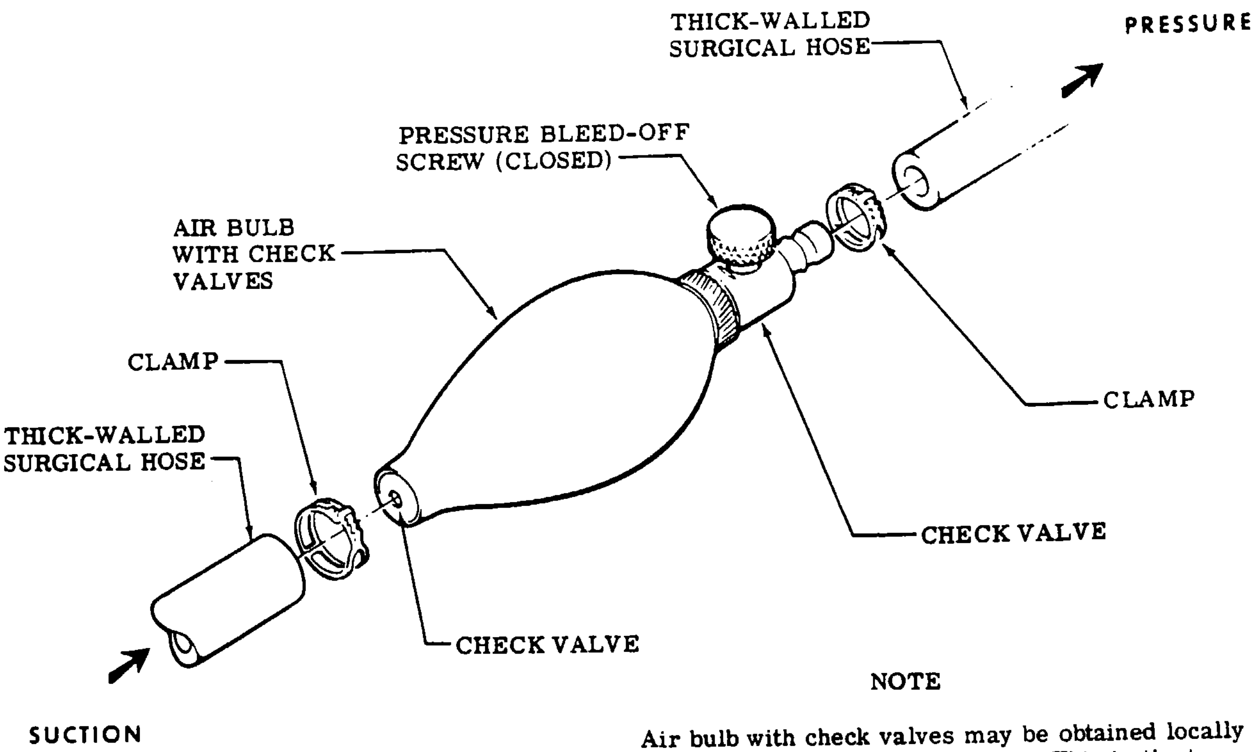
16-18. TRUE AIRSPEED INDICATOR. A true airspeed indicator may be installed. This indicator, equipped with a conversion ring, may be rotated until pressure altitude is aligned with outside air temperature, then airspeed indicated on the instrument is read as true airspeed on the adjustable ring. Refer to figure 16-2 for removal and installation. Upon installation, before tightening mounting screws (14), calibrate the instrument as follows: Rotate ring (12) until 105 knots on adjustable ring aligns with 105 knots on indicator. Holding this setting, move retainer (13) until 60°F aligns with zero pressure altitude, then tighten mounting screws (14) and replace decorative cover (15).

16-19. TROUBLE SHOOTING.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Repair or replace damaged lines, tighten connections.
	Defective mechanism.	Replace instrument.
	Leaking diaphragm.	Replace instrument.
	Alternate static source valve open.	Close for normal operation.



NOTE

Air bulb with check valves may be obtained locally from a surgical supply company. This is the type used in measuring blood pressure.

TO APPLY SUCTION:

1. Squeeze air bulb to expel as much air as possible.
2. Hold suction hose firmly against static pressure source opening.
3. Slowly release air bulb to obtain desired suction, then pinch hose shut tightly to trap suction in system.
4. After leak test, release suction slowly by intermittently allowing a small amount of air to enter static system. To do this, tilt end of suction hose away from opening, then immediately tilt it back against opening. Wait until vertical speed indicator approaches zero, then repeat. Continue to admit this small amount of air intermittently until all suction is released, then remove test equipment.

TO APPLY PRESSURE:

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected into static system.

1. Hold pressure hose firmly against static pressure source opening.
2. Slowly squeeze air bulb to apply desired pressure to static system. Desired pressure may be maintained by repeatedly squeezing bulb to replace any air escaping through leaks.
3. Release pressure by slowly opening pressure bleed-off screw, then remove test equipment.

Figure 16-3. Static System Test Equipment

16-19. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HAND VIBRATES.	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
	Excessive tubing vibration.	Tighten clamps and connections, replace tubing with flexible hose.

16-20. TROUBLE SHOOTING -- ALTIMETER.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Defective mechanism.	Replace instrument.
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Replace instrument.
	Pointers out of calibration.	Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Blow out lines, tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Blow out lines, tighten connections.

16-21. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Static line broken.	Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Blow out lines.
	Ruptured diaphragm.	Replace instrument.
	Pointer off zero.	Reset pointer to zero.

16-21. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
POINTER OSCILLATES.	Partially plugged static line.	Blow out lines.
	Leak in static line.	Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Replace instrument.

16-22. TROUBLE SHOOTING--PITOT TUBE HEATER.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF."	Turn switch "ON."
	Popped circuit breaker.	Reset breaker.
	Break in wiring.	Repair wiring.
	Heating element burned out.	Replace element.

16-23. VACUUM SYSTEM. (See figure 16-4.)

16-24. DESCRIPTION. A dry vacuum system is installed on the aircraft. The system utilizes a sealed bearing engine-driven vacuum pump. A discharge tube is connected to the pump to expell air from the pump overboard. A suction relief valve is used to control system vacuum and is connected between the pump inlet and the instruments. A central air filtering system is utilized. 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 central air filter becomes dirty, cause a lower reading on the suction gage. Barb type fittings are used in the vacuum system to eliminate use of hose clamps.

A dual pump system is available. The system plumbing and installation is illustrated in figure 16-4, sheets 2 and 3. With this system dual vacuum relief valves are utilized. Both are mounted at Station 3.85, and right or left buttock lines 8.35.

16-25. TROUBLE SHOOTING -- VACUUM SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS. (Gyros function normally.)	Relief valve filter clogged, relief valve malfunction.	Replace filter, reset valve. Replace gage.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Central air filter dirty.	Clean or replace filter.

16-25. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace it.

16-26. TROUBLE SHOOTING -- GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Replace defective shock panel mounts.
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Defective mechanism.	Replace instrument.
	Excessive vibration.	Replace defective shock panel mounts.
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Clean or replace filter.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.

16-26. TROUBLE SHOOTING GYRO'S (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Replace instrument.

16-27. TROUBLE SHOOTING -- VACUUM PUMP

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged pump drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve filter clogged.	Replace filter.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

16-28. 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 valves provide no pressure relief, the pump will be destroyed within a matter of seconds after starting the engine.

16-29. **REMOVAL OF VACUUM PUMP.**

a. Remove upper engine cowling in accordance with procedures in Sections 12 of 12A.

b. Disconnect, cap off and identify hose on inlet side of vacuum pump.

c. Identify and disconnect hose on outlet 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.

16-30. **MOUNTING PAD INSPECTION.**

a. Check condition of the AND 20000 pad seal. If the seal shows any signs of oil leakage, replace the seal. Replace seal if there is any doubt as to its

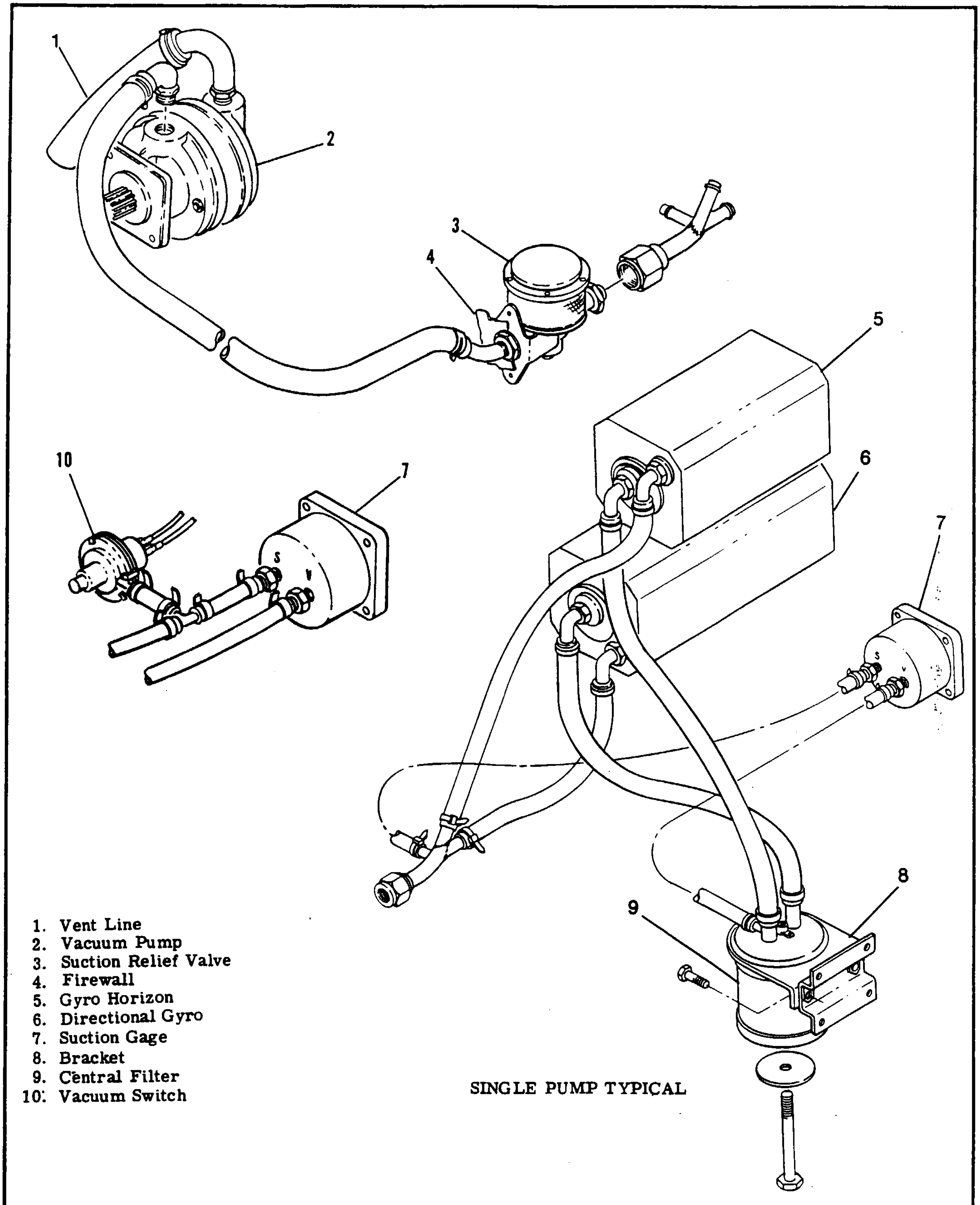
16-31. **INSTALLATION OF VACUUM PUMP.**

a. Before installing a new vacuum pump purge all lines in the system to remove carbon particles or pump components that may have been deposited in the lines by a previous pump.

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.

NOTE

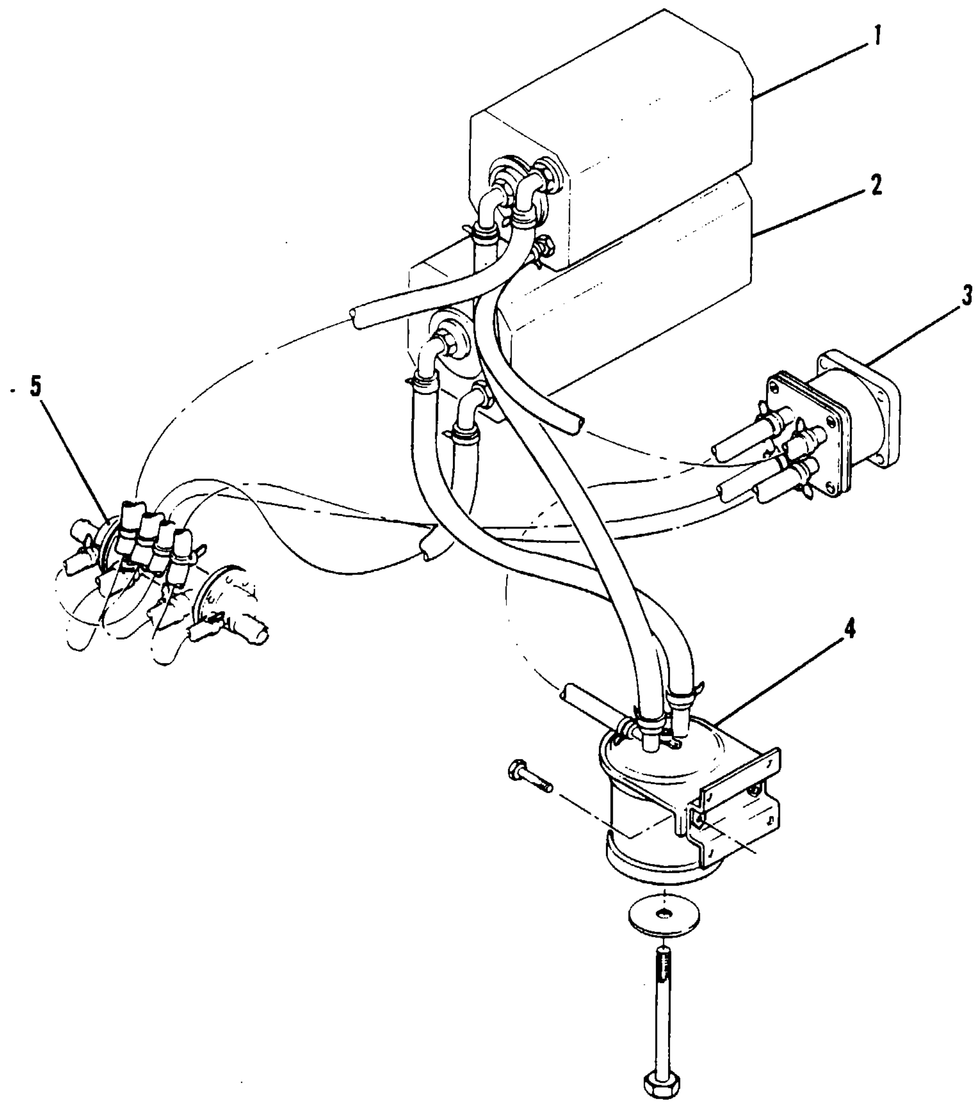
Before installing vacuum pump on engine,



1. Vent Line
2. Vacuum Pump
3. Suction Relief Valve
4. Firewall
5. Gyro Horizon
6. Directional Gyro
7. Suction Gage
8. Bracket
9. Central Filter
10. Vacuum Switch

SINGLE PUMP TYPICAL

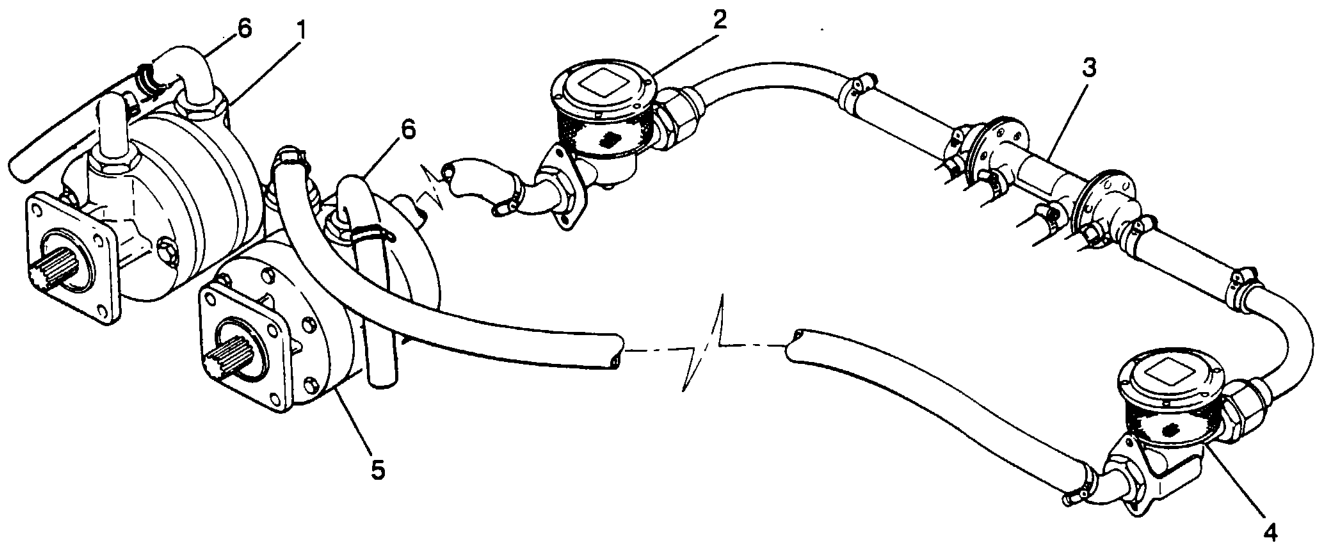
Figure 16-4. Vacuum System (Sheet 1 of 3)



DUAL VACUUM PUMP SYSTEM

1. Gyro Horizon
2. Directional Gyro
3. Suction Gage
4. Central Filter
5. Manifold Check Valve

Figure 16-4. Vacuum System (Sheet 2 of 3)



1. Right Hand Vacuum Pump
2. Relief Valve
3. Check Valve Manifold
4. Relief Valve
5. Left Hand Vacuum Pump
6. Tube
7. Hose

Figure 16-4. Vacuum System (Sheet 3 of 3)

ensure that mating surfaces are clean and free of any old gasket material.

c. Position the 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 pump that has been dropped.

NOTE

Do not use teflon tape, pipe dope, or thread lubricants of any type, and avoid overtightening of connections.

d. Install elbow in pump; hand-tighten only.

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.

NOTE

Before installing vacuum pump on engine, ensure that mating surfaces are clean and free of any old gasket material.

e. Position new mounting pad gasket on mounting studs on engine.

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 Sections 12 or 12A.

16-32. CLEANING. Remove and discard suction relief valve filter. Wash relief valve with Stoddard solvent and dry with low pressure, dry compressed air. Install new filter. Check hoses for external damage and collapsed inner liners.

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.

16-33. LOW-VACUUM WARNING LIGHT. (See figure 16-4, sheet 1.) A red low-vacuum warning light is installed on the instrument panel. This light is used in conjunction with the single pump system only. The light is controlled by a vacuum switch which is teed into the line between the suction gage and the directional gyro. 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.

16-34. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches Hg is desirable for gyro instruments. However a range of 4.6 to 5.4 inches Hg is acceptable.

Single pump adjustment. Remove central air filter, run engine at 2200 RPM, adjust relief valve to 5.3±.1 inches Hg.

Dual pump adjustment. Remove central air filter, with engine at 1900 set relief valves at lower end of green arc (4.8 inches Hg) with individual pump only on the line. Combined reading (both pumps on line) not to exceed 5.4 inches Hg at 1900 RPM.

CAUTION

Do not exceed maximum engine temperature.

NOTE

With either a single or dual vacuum pump, if vacuum drops noticeably after replacing central air filter, remove and replace existing filter with a new filter.

16-35. STANDBY VACUUM SYSTEM.

16-36. 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 aft side of 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 below the circuit breaker panel controls and protects the system.

16-37. 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.

16-38. REMOVAL. (See figure 15-5.)

a. Release clamps securing hose to pump (12).

b. Cap hoses and pump fittings so dirt cannot enter system.

c. Make sure circuit breaker switch (2) and battery switch are off.

d. Disconnect motor voltage input wire (9) and ground wire (8).

e. Remove safety from bolts (4).

f. Support pump and motor assembly and remove bolts (4) and washers (5).

g. If pump is to be removed from motor, remove nuts (13) and washers (14).

16-39. INSTALLATION. (See figure 15-5.)

a. If removed, install pump (12) on motor (7) drive studs and install washers (14) and nuts (13).

b. Position pump and motor assembly up against root rib (3) and install washers (5) and bolts (4).

c. Safety-wire bolts (4).

d. Connect motor voltage input wire and ground wire (9).

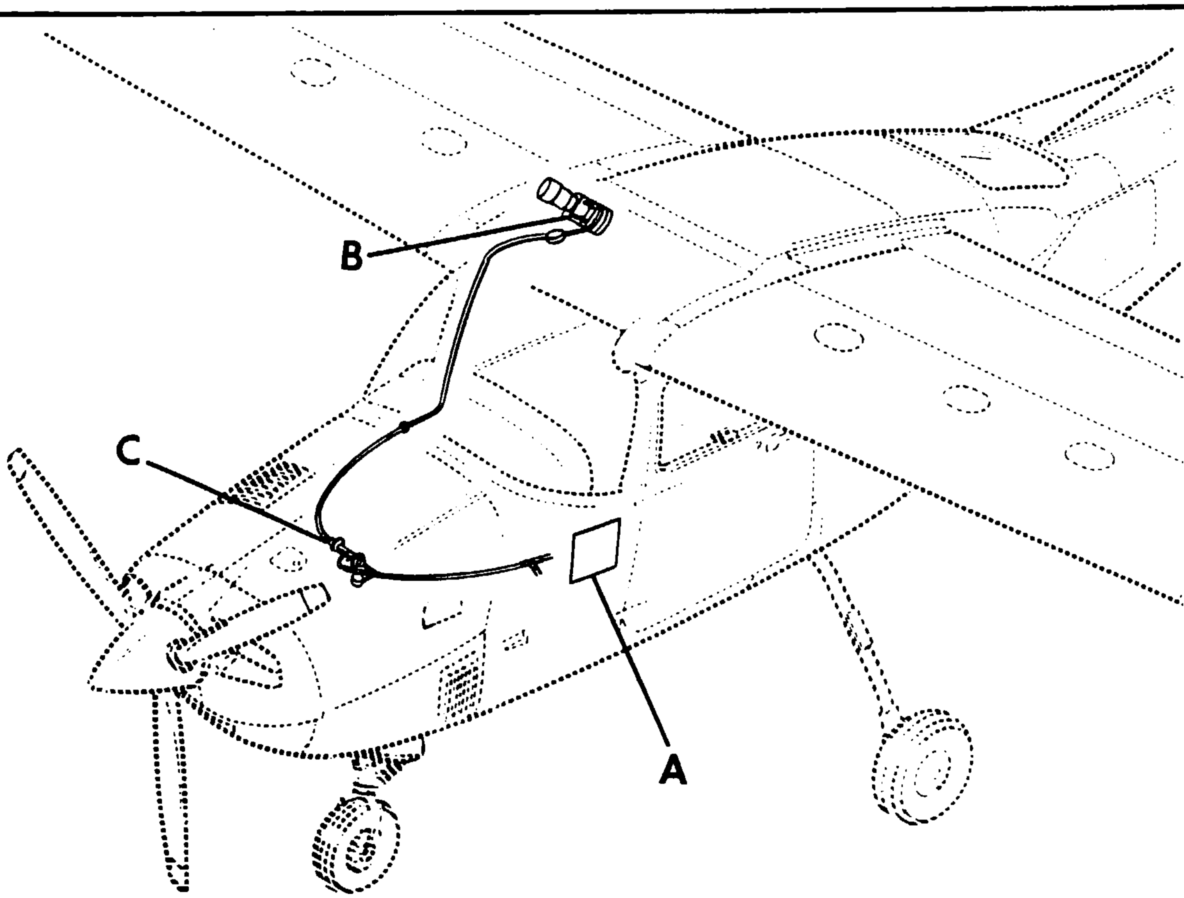
e. Remove caps from hose and fittings then install hose and clamps.

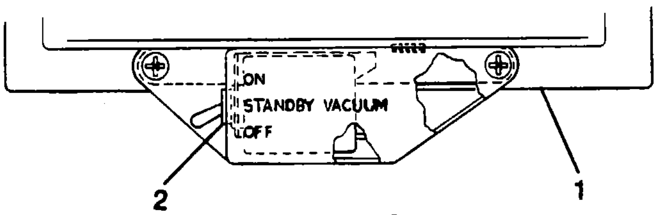
f. Turn on battery switch and circuit breaker switch (2) then check suction gage to see that system is operating properly. Then turn off switches.

16-40. ENGINE INDICATORS.

16-41. TACHOMETER.

16-42. DESCRIPTION. The tachometer is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the drive-shaft. To function properly, the shaft housing must be free of kinks, dents and sharp bends. There should be no bend on a radius shorter than six inches and no bend within three inches of either terminal. If a tachometer is noisy or the pointer oscillates, check the 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.

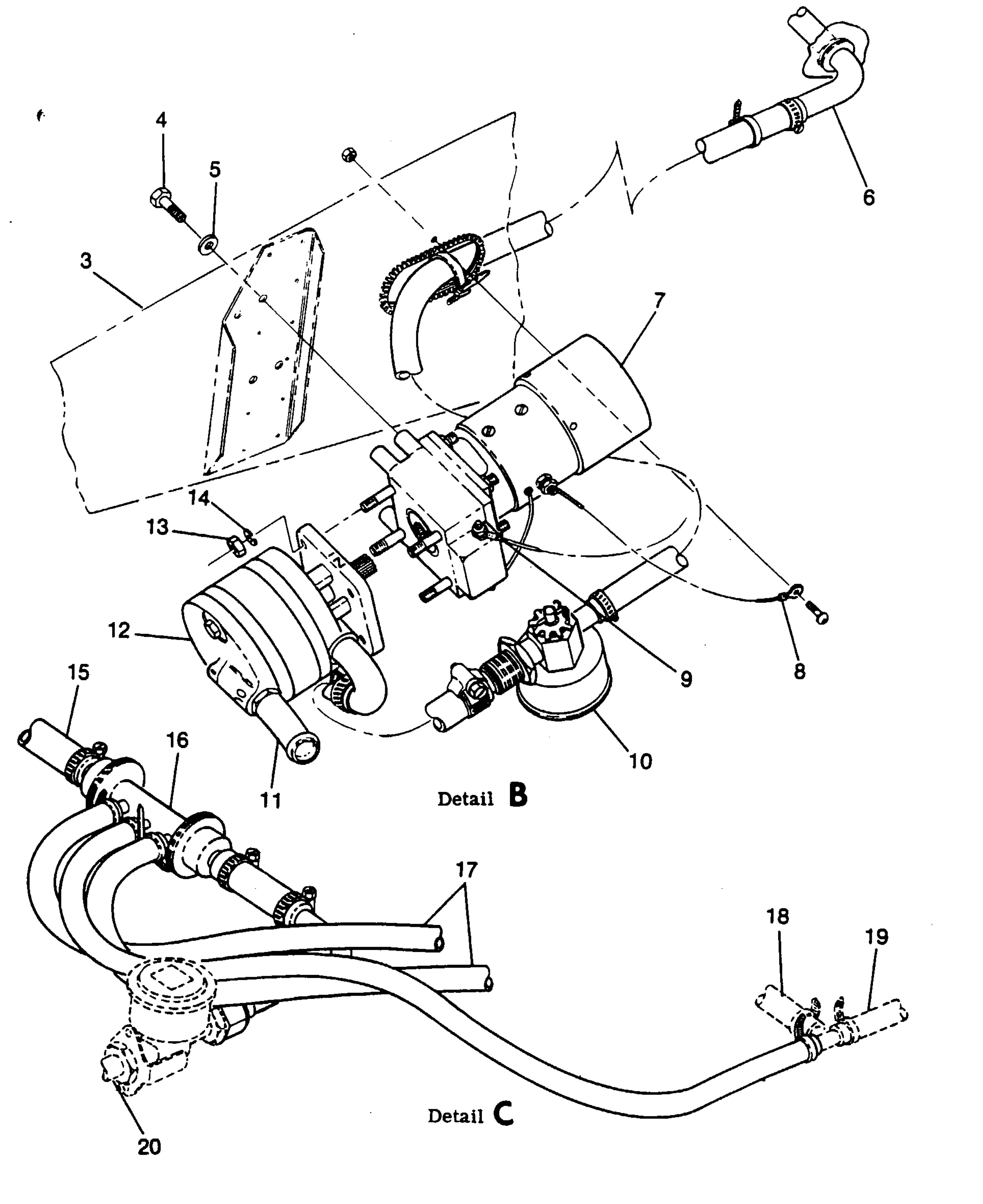




Detail A

1. Circuit Breaker Panes
2. Circuit Breaker Switch

Figure 16-5. Standby Vacuum System (Sheet 1 of 2)



3. Root Rib
4. Bolt
5. Washer
6. Hose (to Manifold)
7. Motor
8. Ground Wire
9. Voltage Input Wire
10. Regulator
11. Vent
12. Vacuum Pump
13. Nut
14. Washer
15. Hose (to Pump)
16. Manifold
17. Hoses (to Gyros)
18. Hose (to Vacuum Switch)
19. Hose (to Suction Gage)
20. Hose (to Engine Driven Pump)

Figure 16-5. Standby Vacuum System (Sheet 2 of 2)

NOTE

Before replacing a tachometer cable in the housing, coat the lower two thirds with AC Type ST-640 speedometer cable grease or Lubriplate No. 110. Insert the cable in housing as far as possible, then slowly rotate cable to make sure it is seated in the engine fitting. Insert cable in tachometer, making sure it is seated in drive shaft, then reconnect housing and torque to 50 pound-inches (at instrument).

16-43. MANIFOLD PRESSURE/FUEL FLOW INDICATOR.

16-44. DESCRIPTION. The manifold pressure and fuel flow 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. The fuel flow indicator is a pressure instrument calibrated in pounds per hour, indicating approximate pounds of fuel metered per hour to the engine. Pressure for operating the indicator is obtained through a hose from the fuel manifold valve. The fuel flow indicator is vented to atmospheric pressure on standard engine installations and to turbocharger outlet pressure on turbocharged engine installations.

16-45. TROUBLE SHOOTING -- MANIFOLD PRESSURE INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Blow out line.
JERKY MOVEMENT OF POINTER.	Excessive internal friction.	Replace instrument.
	Rocket shaft screws tight.	Replace instrument.
	Link springs too tight.	Replace instrument.
	Dirty pivot bearings.	Replace instrument.
	Defective mechanism.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
SLUGGISH OPERATION OF POINTER.	Foreign matter in line.	Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
EXCESSIVE POINTER VIBRATION.	Tight rocker pivot bearings.	Replace instrument.
IMPROPER CALIBRATION.	Faulty mechanism.	Replace instrument.
NO POINTER MOVEMENT.	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Repair or replace damaged line.

16-46. TROUBLE SHOOTING – FUEL FLOW INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
DOES NOT REGISTER.	Pressure line clogged.	Blow out line.
	Pressure line broken.	Repair or replace damaged line.
	Fractured bellows or damaged mechanism.	Replace instrument.
	Clogged snubber orifice.	Replace instrument.
	Pointer loose on staff.	Replace instrument.
POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	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.	Blow out dirty line, repair or tighten loose connections.

16-47. CYLINDER HEAD TEMPERATURE GAGE.

16-48. DESCRIPTION. The temperature sending unit regulates power through the cylinder head temperature gage. The gage and sending unit require little or no maintenance other than cleaning, making sure the lead is properly supported, and all connections are clean and properly insulated. The Rochester and Stewart Warner gages are connected the same, but the Rochester gage does not have a calibration pot and cannot be adjusted. Refer to Table 2 on page 16-24A when trouble shooting the cylinder head temperature gage.

NOTE

Torque used to tighten wire lead nut not to exceed 4 inch-pounds.

16-49. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	No current to circuit.	Repair electrical circuit.
	Defective gage or sender.	Repair or replace defective items.
GAGE FLUCTUATES RAPIDLY.	Loose or broken wire permitting alternate make and break of gage circuit.	Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE.	High voltage.	Check voltage supply.
	Gage off calibration.	Replace gage or sender. Check ground connection.

16-49. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE READS TOO LOW ON SCALE.	Low voltage.	Check voltage supply and "D" terminal.
	Gage off calibration.	Replace defective items.
	Defective gage or sender.	Replace defective items.
GAGE READS OFF SCALE AT HIGH END.	Defective gage or sender.	Replace defective items.
OBVIOUSLY INCORRECT READING.	Defective gage or sender.	Replace defective items.
	Incorrect calibration.	Replace defective items.
GAGE READS FULL SCALE WITH ENGINE COOL OR COLD.	Wire between sender and gage grounded.	Repair or replace wire as required.
	Defective gage or sender.	Replace defective items.
GAGE READS ZERO WHEN ENGINE IS HOT.	Wire between gage and sender is open or disconnected.	Repair or replace wire as required.
	Defective gage or sender.	Replace defective items.

16-50. OIL PRESSURE GAGE.

16-51. 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.

16-52. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Clean line.
	Pressure line broken.	Repair or replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on staff.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.

16-52. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line.

16-53. OIL TEMPERATURE GAGE.

16-54. DESCRIPTION. On some airplanes, the oil temperature gage is a Bourdon tube type pressure instrument connected by armored capillary tubing to a temperature bulb in the engine. The temperature bulb, capillary tube and gage are filled with fluid and sealed. Expansion and contraction of fluid in the bulb with temperature changes operates the gage. Checking capillary tube for damage and fittings for security is the only maintenance required. Since the tube's inside diameter is small, small dents and kinks, which would be acceptable in larger tubing, may partially or completely close off the capillary, making the gage inoperative. Some airplanes are equipped with gages that are electrically actuated and are not adjustable. Refer to Table 1 on page 16-24A when trouble shooting the oil temperature gage.

16-55. FUEL QUANTITY INDICATING SYSTEM.

16-56. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel tank. The full position of float produces a minimum resistance through transmitter, permitting maximum current flow through the fuel quantity indicator and maximum pointer deflection. As fuel level is lowered, resistance in transmitter is increased, producing a decreased current flow through fuel quantity indicator and a smaller pointer deflection.

16-57. REMOVAL AND INSTALLATION (Refer to figure 13-5).

a. Remove access plates on underside of wing forward of flap bellcrank.

b. Drain enough fuel from bay to lower fuel level below transmitter. (Observe precautions in paragraph 13-3).

c. Disconnect electrical lead and ground strap from transmitter.

d. Remove safety wire from transmitter attaching bolts, remove bolts and carefully remove transmitter from fuel spar. DO NOT BEND FLOAT ARM.

e. To install transmitter, reverse preceding steps, using a new gasket around opening in fuel bay and new sealing washers.

NOTE

Insure that transmitter is grounded per figure 16-6.

f. Service fuel bay. Check for leaks and correct fuel quantity indication.

16-58. 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.

16-58A. 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.

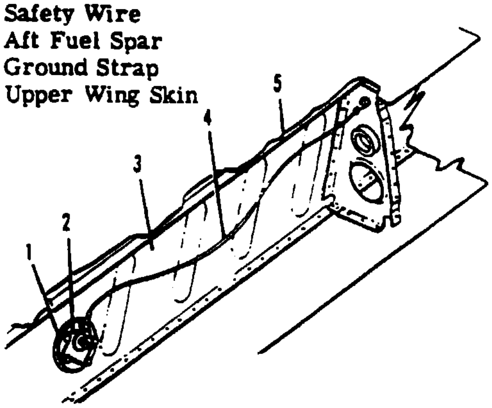


Figure 16-6. Ground Strap Installation

Before installing transmitter, attach electrical wires and place master switch "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 16-57.

16-58B. ROCHESTER GAGE TRANSMITTER. Do not attempt to adjust float arm or stop. No adjustment is allowed.

16-59. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO INDICATE.	No power to indicator or transmitter. (Pointer stays below E.)	Check fuse and inspect for open circuit. Replace fuse, repair or replace defective wire.
	Grounded wire. (Pointer stays above F.)	Check for partial ground between transmitter and gage. Repair or replace defective wire.
	Low voltage.	Check voltage at indicator. Correct voltage.
	Defective indicator.	Substitute known-good indicator. Replace indicator.
OFF CALIBRATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Defective transmitter	Substitute known-good transmitter. Recalibrate or replace.
	Low or high voltage.	Check voltage at indicator. Correct voltage.
STICKY OR SLUGGISH INDICATOR OPERATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Low voltage.	Check voltage at indicator. Correct voltag
ERRATIC READINGS.	Loose or broken wiring on indicator or transmitter.	Inspect circuit wiring. Repair or replace defective wire.
	Defective indicator or transmitter.	Substitute known-good component. Replace indicator or transmitter.
	Defective master switch.	Replace switch.

Table 1

NOTE

Select the oil 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	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

Table 2

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

16-59A. FUEL QUANTITY INDICATING SYSTEM OPERATIONAL TEST.

WARNING: REMOVE ALL IGNITION SOURCES FROM THE AIRPLANE AND VAPOR HAZARD AREA. SOME TYPICAL EXAMPLES OF IGNITION SOURCES ARE STATIC ELECTRICITY, ELECTRICALLY POWERED EQUIPMENT (TOOLS OR ELECTRONIC TEST EQUIPMENT - BOTH INSTALLED ON THE AIRPLANE AND GROUND SUPPORT EQUIPMENT), SMOKING AND SPARKS FROM METAL TOOLS.

WARNING: OBSERVE ALL STANDARD FUEL SYSTEM FIRE AND SAFETY PRACTICES.

1. Disconnect all electrical power from the airplane. Attach maintenance warning tags to the battery connector and external power receptacle stating:

   DO NOT CONNECT ELECTRICAL POWER, MAINTENANCE IN PROGRESS.

2. Electrically ground the airplane.

3. Level the airplane and drain all fuel from wing fuel tanks.

4. Gain access to each fuel transmitter float arm and actuate the arm through the transmitter's full range of travel.

   A. Ensure the transmitter float arm moves freely and consistently through this range of travel. Replace any transmitter that does not move freely or consistently.

WARNING: USE EXTREME CAUTION WHILE WORKING WITH ELECTRICAL COMPONENTS OF THE FUEL SYSTEM. THE POSSIBILITY OF ELECTRICAL SPARKS AROUND AN "EMPTY" FUEL CELL CREATES A HAZARDOUS SITUATION.

   B. While the transmitter float arm is being actuated, apply airplane battery electrical power as required to ensure that the fuel quantity indicator follows the movement of the transmitter float arm. If this does not occur, troubleshoot, repair and/or replace components as required until the results are achieved as stated.

   NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to this section for instructions for adjusting Stewart Warner fuel indicating systems.
   Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

5. With the fuel selector valve in the "OFF" position, add unusable fuel to each fuel tank.

6. Apply electrical power as required to verify the fuel quantity indicator indicates "EMPTY".

   A. If "EMPTY" is not indicated, adjust, troubleshoot, repair and/or replace fuel indicating components as required until the "EMPTY" indication is achieved.

   NOTE: Stewart Warner fuel quantity indicating systems can be adjusted. Refer to this section for instructions for adjusting Stewart Warner fuel indicating systems.
   Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

7. Fill tanks to capacity, apply electrical power as required and verify that the fuel quantity indicators indicate "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 this section for instructions for adjusting Stewart Warner fuel indicating systems.
      Rochester fuel quantity indicating system components are not adjustable, only component replacement or standard electrical wiring system maintenance practices are permitted.

8. Install any items and/or equipment removed to accomplish this procedure, remove maintenance warning tags and connect the airplane battery.

16-60. HOURMETER.

16-61. DESCRIPTION. The hourmeter is an electrically operated instrument, actuated by a pressure switch in the oil pressure gage line. Electrical power is supplied through a one-amp fuse from the electrical clock circuit, and therefore will operate independent of the master switch. A diode incorporated into the meter prevents interruption of avionics operation. This type hourmeter is identified by a white + above the positive terminal.

NOTE

When installing the hourmeter, the positive (red) wire must be connected to the white + terminal. Connecting wires incorrectly will damage the meter.

16-62. ECONOMY MIXTURE INDICATOR.

16-63. DESCRIPTION. The economy mixture indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 75% power. Exhaust gas temperature (EGT) varies with ratio of fuel-to-air mixture entering the engine cylinders. Refer to the Pilot's Operating Handbook for operating procedure of the system.

16-64. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE	Defective gage, probe or circuit.	Repair or replace defective part.
INCORRECT READING.	Indicator needs calibrating.	Calibrate indicator in accordance with paragraph 16-~~57~~.65
FLUCTUATING READING.	Loose, frayed or broken lead, permitting alternate make and break of circuit.	Tighten connections and repair or replace defective leads.

16-65. CALIBRATION. A potentiometer adjustment screw is provided either on the front or 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 of scale).

NOTE

This setting will provide relative temperature indications for normal cruise power settings within range of the instrument.

Turning the screw clockwise increases the meter reading and counterclockwise decreases the meter reading. There is a stop in each direction and damage can occur if too much torque is applied against stops. Approximately 600°F total adjustment is provided. The adjustable yellow pointer on the face of the instrument is a reference pointer only.

16-66. REMOVAL AND INSTALLATION. Removal of the indicator is accomplished by removing the mounting screws and disconnecting the leads. Tag leads to facilitate installation. The thermocouple probe is secured to the exhaust stack with a clamp. When installing probe, tighten clamp to 45 pound-inches and safety as required.

16-67. MAGNETIC COMPASS. (Refer to figure 16-7.)

16-68. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from the front of the case. The compass is internally lighted, controlled by the instrument lights rheostat switch. No maintenance is required on the compass except an occasional check on a compass rose and replacement of the lamp. The compass mount is attached by three screws to a base plate which is bonded to the windshield with methylene chloride. A tube containing the compass light wires is attached to the metal strip at the top of the windshield. Removal of the compass is accomplished by removing the screw at the forward end of the compass mount, unfastening the metal strip at the top of the windshield and cutting the two wire splices. Removal of the compass mount is accomplished by removing the outside air temperature probe and removing the three screws attaching mount to the base plate. Access to the inner screw is gained through a hole in the bottom of mount, through which a thin screwdriver may be inserted. When installing the compass, it will be necessary to splice the compass light wires.

16-69. STALL WARNING HORN AND TRANSMITTER.

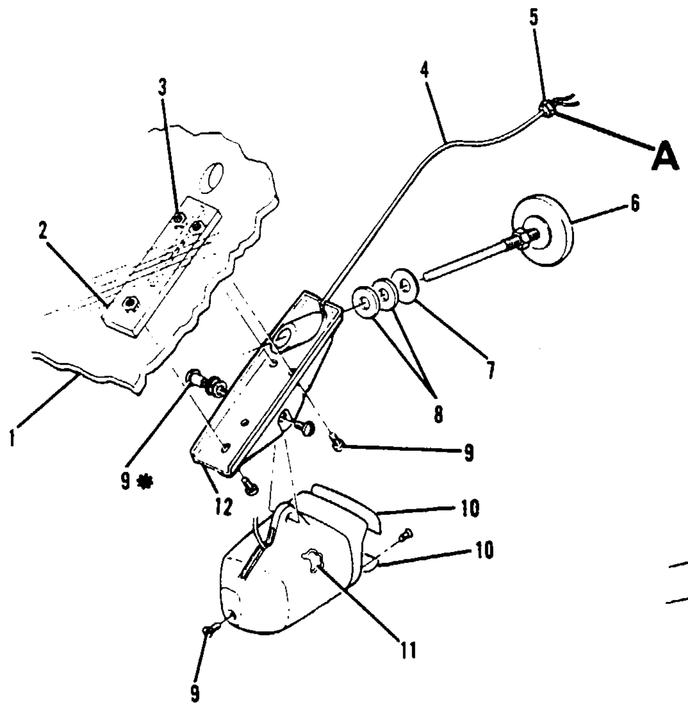
16-70. DESCRIPTION. The stall warning horn is contained in the dual warning unit mounted on the right hand wing root rib. It is electrically operated and controlled by a stall warning transmitter mounted on the leading edge of the left wing. For further information on the warning horn and transmitter, refer to Section 17.

16-71. TURN COORDINATOR.

16-72. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-turn rate indicator. Its gyro simultaneously senses rate of motion roll and yaw axis which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an ac brushless spin motor with a solid state inverter.

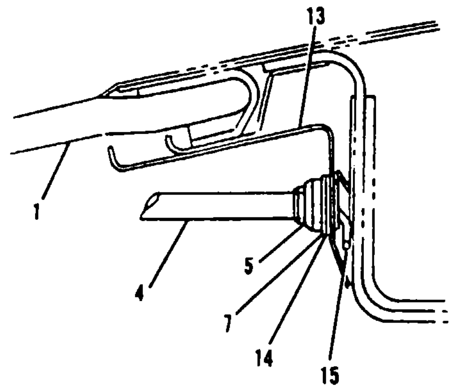
16-73. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator dampening.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Correct voltage.
	Inverter frequency changed.	Replace instrument.
NOISY MOTOR.	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	Correct voltage or replace faulty wire.
	Inverter malfunctioning.	Replace instrument.
	Motor shorted.	Replace instrument.
	Bearings frozen.	Replace instrument.



NOTE

✱ Torque to 10-15 lb inches to prevent compass rotation in flight.



Detail **A**

1. Windshield
2. Base Plate
3. Insert
4. Tube
5. Nut
6. Outside Air Temperature Gage
7. Washer
8. Rubber Washer
9. Screw
10. Compass Card
11. Compass
12. Compass Mount
13. Metal Strip
14. Lockwasher
15. Electrical Wire

NOTE

Seal temperature probe at windshield with General Electric RTV 103 sealant. All sealant must be between phenolic tube and windshield. Ensure no sealant touches shaft.

Figure 16-7. Magnetic Compass

16-73. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Correct voltage.

16-74. TURN-AND-SLIP INDICATOR.

16-75. DESCRIPTION. The turn-and-slip indicator isoperated by the aircraft electrical system and operates ONLY when the master switch is on. Its circuit is protected by an automatically-resetting circuit breaker.

16-76. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Automatic resetting circuit breaker defective.	Replace circuit breaker.
	Master switch "OFF" or switch defective.	Replace defective switch.
	Broken or grounded lead to indicator.	Repair or replace defective wiring.
	Indicator not grounded.	Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Correct voltage.

16-76. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLY CAUSE	REMEDY
NOISY GYRO.	High voltage.	Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

16-77. ELECTRIC CLOCK.

16-78. DESCRIPTION. The electric clock is connected to the battery through a one-ampere fuse mounted adjacent to the battery box. The electrical circuit is separate from the aircraft electrical system and will operate when the master switch is "OFF." Beginning with 21062955 a digital clock may be installed. Refer to Pilots Operating Handbook for operating instructions.

16-79. FUEL COMPUTER/DIGITAL CLOCK.

16-80. DESCRIPTION. The Astro Tech FT-2 is a dual function instrument providing a complete fuel management system and a multi-purpose time keeping device in a single instrument with each function sharing a common display panel. The instrument may be used as a replacement for the digital or electric clock, and may be mounted in the same location on the instrument panel.

The fuel computer portion of the instrument displays the following selections; fuel flow as measured by an engine mounted transducer, total fuel used, current fuel remaining and time remaining based on fuel remaining at the current flow rate. Fuel quantities are displayed in pounds with a gallon display available by utilizing a push button located below and to the right of the display. When time remaining at the currect flow rate reaches 45 minutes or less, the display will be blanked from one-tenth to three-tenths of a second per second in all of the selections.

The digital clock portion of the instrument displays the following selections; current time of day in either local (LCL) or Greenwich Mean Time (GMT) in hours and minutes, cummulative flight time in minutes and seconds (first hour) and hours and minutes (up to 100 hours) whenever fuel flow is greater than 25 to 30 pounds per hour (PPH) and elapsed time in minutes and seconds (first hour) and hours and minutes (up to 100 hours).

Fuel selections and time selections are made by utilizing a rotary-type selector switch common to both functions. Two pushbuttons, located below the display, are used to program the fuel computer digital clock.

16-81. FUEL COMPUTER OPERATION. The fuel computer contains five selections. They are selected by rotating the selector switch to the positions labeled ADD, FLOW, LB USD, LB REM, and TIME REM. These selections, when used in proper sequence with the programming buttons, will correctly program the computer.

The fuel quantity added during servicing of the airplane must be entered in the computer so that the LB REM position accurately represents the correct amount of usable fuel on board for each flight. The fuel quantity added is entered in the computer as follows:

To enter fill-up:

a. Rotate the selector switch to the ADD position.
b. Press left and right programming buttons together until display panel reads FULL.
c. Rotate the selector switch to LB REM position to display the usable fuel quantity in pounds on board.

NOTE

The usable fuel quantity for each airplane is programmed into the instrument at the factory. A battery disconnect or other power interruption will not alter this quantity.

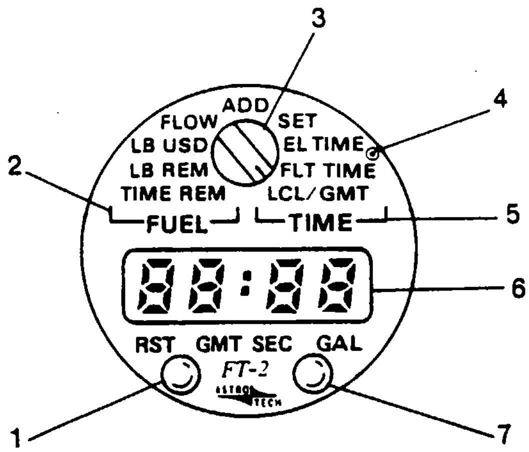
To enter less than fill-up:

a. Rotate the selector switch to the ADD position.
b. Press right programming button, labeled GAL, until the right digit represents the correct units of gallons of fuel added.
c. Press left programming button, labeled RST, until the left two digits represent the correct tens and hundreds of gallons of fuel added.
d. Rotate the selector switch to LB REM position to display the correct usable fuel quantity in pounds on board.

If an error has been made, resulting in an incorrect display of LB REM, the correct amount may be entered as follows:

a. Leave the selector switch in the ADD position.
b. Enter the corrected fuel quantity in gallons.
c. Rotate the selector switch to FLOW, then press and hold the left programming button.
d. While holding the left button pressed, slowly rotate the selector switch to the LB REM position. The set-in amount in gallons, multiplied by six, will now appear as LB REM.

When the selector switch is placed in the FLOW position, the display indicates the current fuel flow rate in pounds per hour (PPH). Press the GAL programming button to display the flow rate in gallons per hour (GPH).



1. Programming Button
2. Fuel Computer Selections
3. Selector Switch
4. Reset Switch
5. Digital Clock Selections
6. Display Panel
7. Programming Button

Figure 16-8. Fuel Computer/Digital Clock

Placing the selector switch in the LB USD position displays the current fuel quantity used (in pounds) since the last addition of fuel to the airplane. Press the GAL programming button to display the fuel used in gallons.

NOTE

Any entry of additional fuel to LB REM will reset the LB USD to zero.

The LB REM position displays the current total remaining fuel (in pounds) on board the airplane, based on the takeoff amount minus the fuel used as computed using fuel flow rates. Press the GAL programming button to display the remaining fuel in gallons.

NOTE

When the display is changed from pounds to gallons in the FLOW, LB USD, and LB REM positions, the gallons shown are computed on the ratio of 6 pounds per gallon and no volumetric correction for temperature change is made. Therefore maximum accuracy may be obtained by referring to the gallons functions.

The TIME REM position displays the flight time remaining in hours and minutes as computed using the current fuel flow rate and fuel remaining amounts. Since this displayed value is dependent upon flow rate, a reduction in engine power will show an increase in time remaining.

NOTE

With the selector switch in the TIME REM position, power settings of less than 25 to 30 PPH flow rate will cause the word OFF to be displayed.

If it is desired to test the display, rotate the selector switch to TIME REM position, then press the right programming button. This will cause all 8's to be shown, thereby testing each segment of each digit.

Any power interruption that might alter a memory value or activation of the reset switch will erase a line of dashes to be displayed in all selector switch positions. Pressing the right programming button will clear the dashes from the display and show the current selector switch position. All memory values will be erased and must be re-entered. However, the usable fuel quantity will not be altered, since it is permanently entered in the instrument.

NOTE

If an abnormally low voltage condition should occur, such as during a cold weather engine start or if power is interrupted during programming sequences, such as the reset sequence, it is possible for the instrument to enter a "locked up" condition in which the display will not change with selector switch selection. Should this occur, it will be necessary to clear the condition by pressing the reset switch with a pencil or similar small diameter tool. The reset switch is in a small diameter hole located between the words "EL TIME" and "FLT TIME" near the outer periphery of the instrument face. The instrument should now operate normally, but will have to be reprogrammed.

16-82. DIGITAL CLOCK OPERATION. The digital clock contains four selections. They are selected by rotating the selector switch to the positions labeled SET, EL TIME, FLT TIME, and LCL/GMT. These selections, when used in proper sequence with the programming buttons, will correctly program the digital clock.

NOTE

Some models may have an unmarked detent position between the ADD and SET positions. This position performs the same function as the SET position.

The digital clock may be set to the local (LCL) and Greenwich Mean Time (GMT) as follows:

a. Rotate the selector switch to the SET position.

b. Press the left programming button until local hours advance to the correct value.

c. Press both programming buttons together until Greenwich Mean Time hours advance to the correct value.

d. Press right programming button until minutes advance to correct value. This action sets and holds seconds to zero.

e. Rotate selector switch from SET to start seconds from zero hold.

To display the local time-of-day in hours and minutes, rotate the selector switch to LCL/GMT. If a minutes and seconds display is desired, press the right programming button, labeled SEC. If Greenwich Mean Time in hours and minutes is desired, press the left programming button, labeled GMT.

NOTE

Local or Greenwich Mean Time hours may be changed without resetting the minutes and seconds.

To display accumulated flight time, rotate the selector switch to FLT TIME. After the first hour, if a minutes and seconds display is desired in place of the hours and minutes display, press the right (SEC) programming button. Flight time may be reset to zero by pressing the left (RST) programming button.

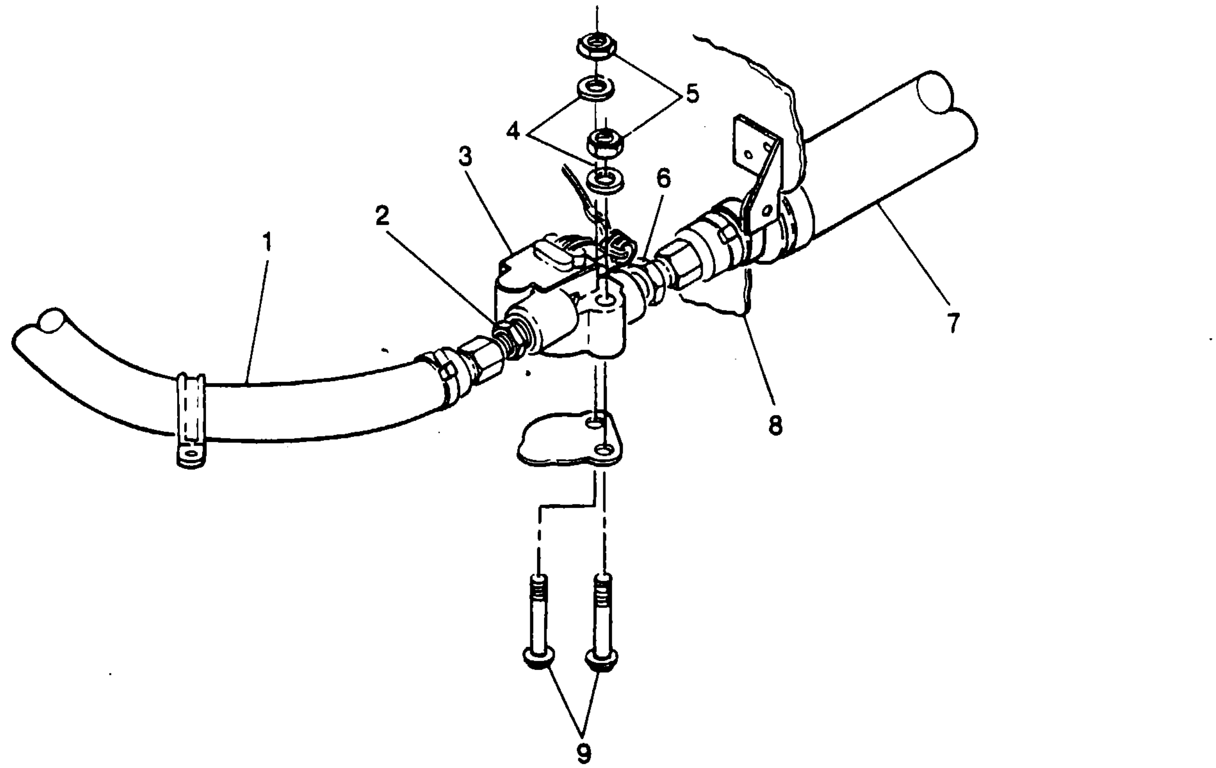
NOTE

Accumulated flight time may be zeroed only when the instrument is not counting (whenever fuel flow is less than 25-30 PPH) to prevent accidently zeroing flight time in the air.

Elapsed time (since pressing the RST button) is displayed by rotating the selector switch to the EL TIME position. After the first hour, if a minutes and seconds display is desired in place of the hours and minutes display, press the right (SEC) programming button. Elapsed time may be reset to zero by pressing the left (RST) programming button.

16-83. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FUEL COMPUTER FUNCTION INOPERATIVE	Faulty wiring from transducer to instrument.	Repair or replace wiring.
	Faulty transducer	Replace transducer
NO DISPLAY	Faulty wiring or open fuse.	Repair or replace wiring. Replace fuse.
DISPLAY WILL NOT CHANGE WITH SELECTOR SWITCH SELECTION	Low voltage or power interruption.	Correct low voltage condition. Connect power supply.
		Depress reset switch to reset instrument.



1. Line to Flow Divider
2. Adapter
3. Transducer
4. Washers
5. Nuts
6. Adapter
7. Line to Throttle Body Metering Unit
8. Vertical Baffle
9. Bolts

Figure 16-9. Fuel Flow Transducer

16-84. FUEL FLOW TRANSDUCER. The fuel flow transducer, located in the engine fuel line, measures the fuel flow rate (in pounds or gallons) to the throttle body metering unit. Fuel flow rate is measured by a turbine within the unit, mounted tangentially to the inlet port. Liquid fuel follows a helical flow path through the turbine and exits vertically to the outlet port, thereby venting any trapped vapor bubbles. The rotating turbine emits current pulse signals to the fuel computer section of the fuel computer/digital clock where they are displayed in pounds or gallons.

16-85. FUEL FLOW TRANSDUCER INSTALLATION. (See figure 16-9.) A filter should be located upstream of the inlet port to prevent dirt from entering the turbine bearings. There should be a reasonable length of straight line between the inlet port and a valve, elbow or other turbulence producing device. Since upstream turbulence affects the performance of the instrument, turbulence should be held to a minimum. Be sure to install the transducer in a horizontal position with the wire leads or tabs UP and the turbine totally immersed in fuel.

NOTE

Whenever a transducer is installed it must be calibrated. See paragraph 16-105 for calibration procedures.

16-86. TRANSDUCER REMOVAL AND REPLACEMENT (See figure 16-9.)

CAUTION

When performing any maintenance on the fuel system, the precautions in Section 13 must be observed.

a. Place the fuel selector in the OFF position.
b. Remove the fuse from the clock fuse holder mounted on the battery contactor bracket.
c. Disconnect the electrical connector, connecting the transducer to the instrument.
d. Disconnect and cap both fuel lines (1 and 7).
e. Remove nuts (5), washers (4), bolts (9) and remove transducer (3).
f. Reverse these steps for reinstallation.

NOTE

When replacing the inlet and outlet pipe fittings they are to be turned 3 times past hand tight or torqued to 25-30 lbs-ft whichever occurs first.

The transducer must be mounted horizontally with the electrical leads on top.

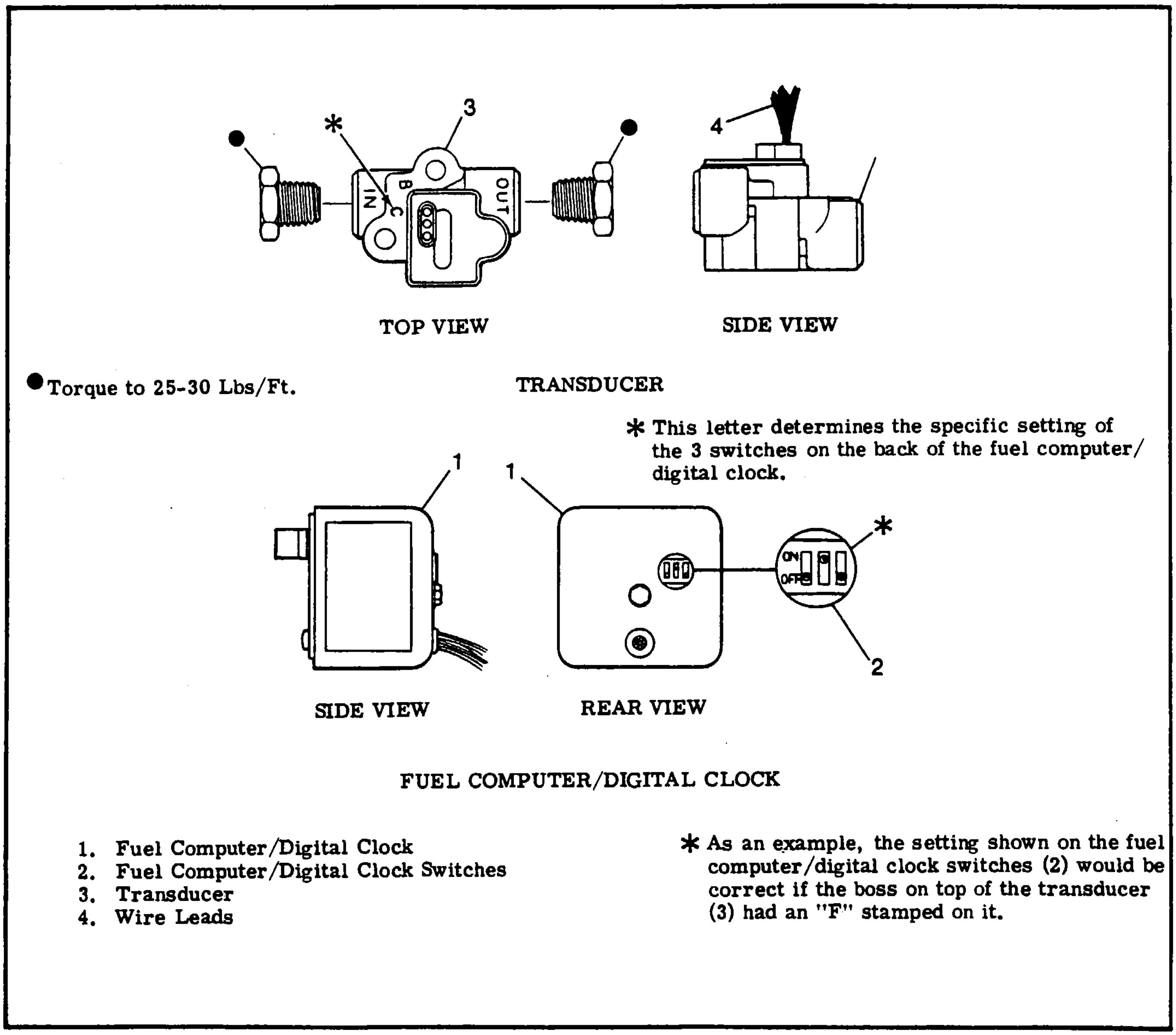


Figure 16-10. Transducer Markings and Fuel Computer/Digital Clock Switches

16.87. **FUEL TRANSDUCER CALIBRATION.** (See figures 16-10 and 16-11.) The fuel computer/digital clock (1) has a 3-section switch (2) located on the back of the unit under a tape cover. Remove the cover and set the switches as shown on the fuel transducer table, fiugure 16-11. The fuel transducer (3) may have one or two letters (stamped or raised), located on the boss adjacent to the inlet port. If the boss contains two letters, DISREGARD the first letter. The second letter, near the mounting bolt hole, is the calibration "K" factor letter and determines the switch setting on the fuel computer/digital clock. After setting the 3 switches to the transducer marking designation, replace the tape cover.

TRANSDUCER "K" FACTOR (PULSES PER GALLON)	SWITCH #1	SWITCH #2	SWITCH #3	TRANSDUCER MARKING DESIGNATION
81,500 - 82,375	ON	ON	ON	A
82,376 - 83,250	OFF	ON	ON	B
83,251 - 84,125	ON	OFF	ON	C
84,126 - 85,000	OFF	OFF	ON	D
85,001 - 85,875	ON	ON	OFF	E
85,876 - 86,750	OFF	ON	OFF	F
86,751 - 87,625	ON	OFF	OFF	G
87,626 - 88,500	OFF	OFF	OFF	H

Figure 16-11. Fuel Transducer Table

SECTION 17
ELECTRICAL SYSTEMS

WARNING

When performing any inspection or maintenance that required 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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17-1. ELECTRICAL SYSTEMS.

17-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Battery and External Power Supply System, Alternator Power System, Aircraft Lighting System, Pitot Heater, Stall Warning, and Electrical Load Analysis.

17-3. ELECTRICAL POWER SUPPLY SYSTEM.

17-4. DESCRIPTION. Energy for the aircraft is supplied by a 28- volt, direct-current, single wire, negative ground electrical system. A 24-volt battery supplies power for starting and furnishes a reserve in event of alternator failure. An alternator is the normal source of power during flight and maintains a battery charge controlled by a voltage regulator. An external power source receptacle may be installed to supplement the battery alternator system for starting and ground operation.

17-5. SPLIT BUS BAR.

17-6. DESCRIPTION. Electrical power is supplied through two bus bars located on cabin side forward of left hand door. An avionics master switch is installed on electronic bus bar to prevent transient voltages from damaging semiconductor circuitary in electronic installations.

17-7. REMOVAL AND INSTALLATION. (Refer to figure 17-1.)

17-8. MASTER SWITCH.

17-9. DESCRIPTION. The operation of the battery and alternator systems is controlled by a master switch. The switch is an interlocking split rocker with the battery mode on the right-hand side and the 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. The switch is labeled "BAT" and "ALT" below the switch and is located on the left-hand side of the switch panel.

17-10. AMMETER.

17-11. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed the ammeter will show the full alternator output when all electrical equipment is off. When the battery is fully charged and cruise RPM is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

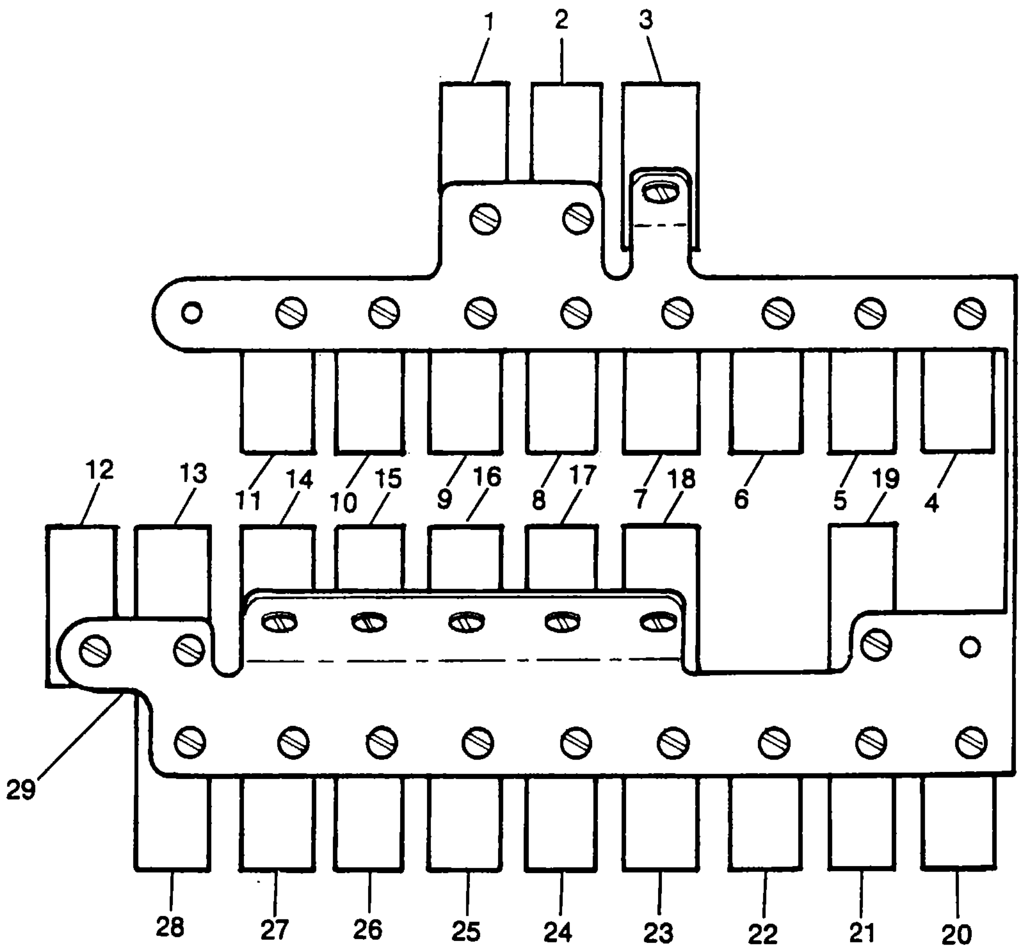
17-12. BATTERY POWER SYSTEM.

17-13. BATTERY.

17-14. DESCRIPTION. The battery is 24 volts with a 12.75 ampere-hour capacity as standard and a 15.5 ampere-hour capacity battery as optional. The battery is mounted on forward left side of firewall and is equipped with non-spill caps.

17-15. TROUBLE SHOOTING.

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. 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 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 tester indicates a faulty battery, replace the battery.
	Faulty contactor or wiring. between contactor and master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained, check wiring between contactor and master switch. Also check master switch.
	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 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.



VIEWED FROM THE BACK SIDE OF THE CIRCUIT BREAKER PANEL (TYPICAL INSTALLATION)

1. Gear Lights Circuit Breaker
2. Alternators Low Volt Lights Circuit Breaker
3. Stall/Gear Horn Circuit Breaker
4. Radio and Instrument Lights Circuit Breaker
5. Cabin Lights Circuit Breaker
6. Instrument Flood Lights Circuit Breaker
7. Navigation Light Circuit Breaker
8. Strobe Flood Circuit Breaker
9. Flashing Beacon Circuit Breaker
10. Taxi Light Circuit Breaker
11. Landing Light Circuit Breaker
12. Alternator 2 Regulator Circuit Breaker
13. Alternator 1 Regulator Circuit Breaker
14. Alternator 2 Circuit Breaker
15. Alternator 1 Circuit Breaker
16. Wing De-Ice Circuit Breaker
17. Gear Pump Circuit Breaker
18. Trim Circuit Breaker
19. Flap Circuit Breaker
20. Cond Fan Circuit Breaker
21. Prop Anti-Ice Circuit Breaker
22. Windshield Anti-Ice Circuit Breaker
23. Pitot Heat Circuit Breaker
24. Stall Heat Circuit Breaker
25. Fuel Pump Circuit Breaker
26. Engine Instrument Circuit Breaker
27. Turn Coordinator Circuit Breaker
28. Fuel Quantity Circuit Breaker
29. Bus Bar

Figure 17-1. Circuit Breaker Installation

17-16. REMOVAL AND INSTALLATION OF THE BATTERY. (Refer to figure 17-2).

a. To gain access to the battery, remove the upper left half of cowling.

b. Remove the battery box lid and disconnect the battery ground cable.

CAUTION

Always remove the ground cable first and connect it last to prevent accidentally shorting the battery to the airframe with tools.

c. Disconnect the positive cable from the battery and remove the battery from the aircraft.

d. To install a battery, reverse this procedure.

17-17. CLEANING THE BATTERY. For maximum efficiency, the battery and connections should be kept clean at all times.

a. Remove the battery in accordance with preceding paragraph.

b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.

c. Wipe 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 to the preceding paragraph.

g. Coat the battery terminals and the cable ends with petroleum jelly.

17-18. 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 will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain electrolyte level to bottom of split ring. When "dry charged" batteries are put into service, fill as directed with electrolyte. However as electrolyte level falls below normal with use add only distilled water to maintain proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper 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.

17-19. TESTING THE BATTERY. The specific gravity check method of testing the battery is preferred when the condition of the battery is in a questionable state-of-charge. However, when the aircraft has been operated for a period of time with an alternator output voltage which is known to be correct, the question of battery capability may be answered more correctly with a load type tester. If testing the battery is deemed necessary, the specific gravity should be checked first and compared with the following chart.

BATTERY HYDROMETER READINGS

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.

If the specific gravity reading indicates the battery is not fully charged the battery should be charged. The charging rate for the 12-GCAB-9 battery is 2 amps to start and finish at 1 amp, on the G-240 battery, 2 amps and on the G-242 battery, 3 amps.

17-20. 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. The battery cables and connections should be clean. Remove the battery from the aircraft and place in a well ventilated area for charging.

WARNING

When a battery is charging, 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. Under a reasonable rate of charge, see paragraph 17-19, the battery temperature should not rise over 115° F, nor should gassing be so violent that acid is blown from the vents.

17-21. BATTERY BOX.

17-22. DESCRIPTION. The battery is completely enclosed in a box which is painted with acid proof paint. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape. The battery box is riveted to the left forward side of the firewall.

17-23. REMOVAL AND INSTALLATION. (Refer to figure 17-2). The battery box is riveted to the firewall. The rivets must be drilled out to remove the box. When a battery box is installed and riveted into place, all rivets and scratches inside the box should be painted with acid-proof lacquer, Part No. CES1054-381, available from the Cessna Supply Division.

17-24. MAINTENANCE. The battery box should be inspected and cleaned periodically. The box and cover should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water. Hard deposits may be removed with a wire brush. When all corrosive deposits have been removed from the box, flush it thoroughly with clean water.

WARNING

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

Inspect the cleaned box and cover for physical damage and for areas lacking proper acid proofing. A badly damaged or corroded box should be replaced. If the box or lid require acid proofing, paint the area with acid-proof black lacquer, Part No. CES1054-381, available from the Cessna Supply Division.

17-25. BATTERY CONTACTOR.

17-26. DESCRIPTION. The battery contactor is bolted to the firewall below the battery box. The contactor is a solenoid plunger type, which is actuated by turning the master switch on. When the master switch is off, the battery is disconnected from the electrical system. A silicon diode is used to eliminate spiking of the transistorized radio equipment. The cathode (+) terminal of the diode connects to the battery terminal of the battery contactor. The anode (-) terminal of the diode connects to the same terminal of the diode connects to the same terminal on the contactor as the master switch wire. This places the diode directly across the contactor solenoid coil so that inductive spikes originating in the coil are clipped when the master switch is opened. (Refer to figure 17-2).

17-27. REMOVAL AND INSTALLATION. (Refer to figure 17-2).

a. Open battery box and disconnect ground cable from negative battery terminal. Pull cable clear of battery box.

b. Remove the nut, lockwasher and the two plain washers securing the battery cables to the battery contactor.

c. Remove the nut, lockwasher and the two plain washers securing the wire which is routed to the master switch.

d. Remove the bolt, washer and nut securing each side of the battery contactor. The Contactor will now be free for removal.

e. To replace the contactor, reverse this procedure.

17-28. BATTERY CONTACTOR CLOSING CIRCUIT. (Refer to figure 17-3). This circuit consists of a 5-amp fuse, a resistor and a diode mounted on the ground service receptacle bracket. 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 low to energize the contactor by itself.

17-29. GROUND SERVICE RECEPTACLE.

17-30. DESCRIPTION. A ground service receptacle is installed to permit the use of external power for cold weather starting or when performing lengthy electrical maintenance. A reverse polarity protection system is utilized whereby ground power must pass through an external power contactor to be connected to the bus. A silicon junction diode is connected in series with the coil on the external power contactor so that if the ground power source is inadvertently connected with a reversed polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices used in the aircraft, from possible reverse polarity damage.

NOTE

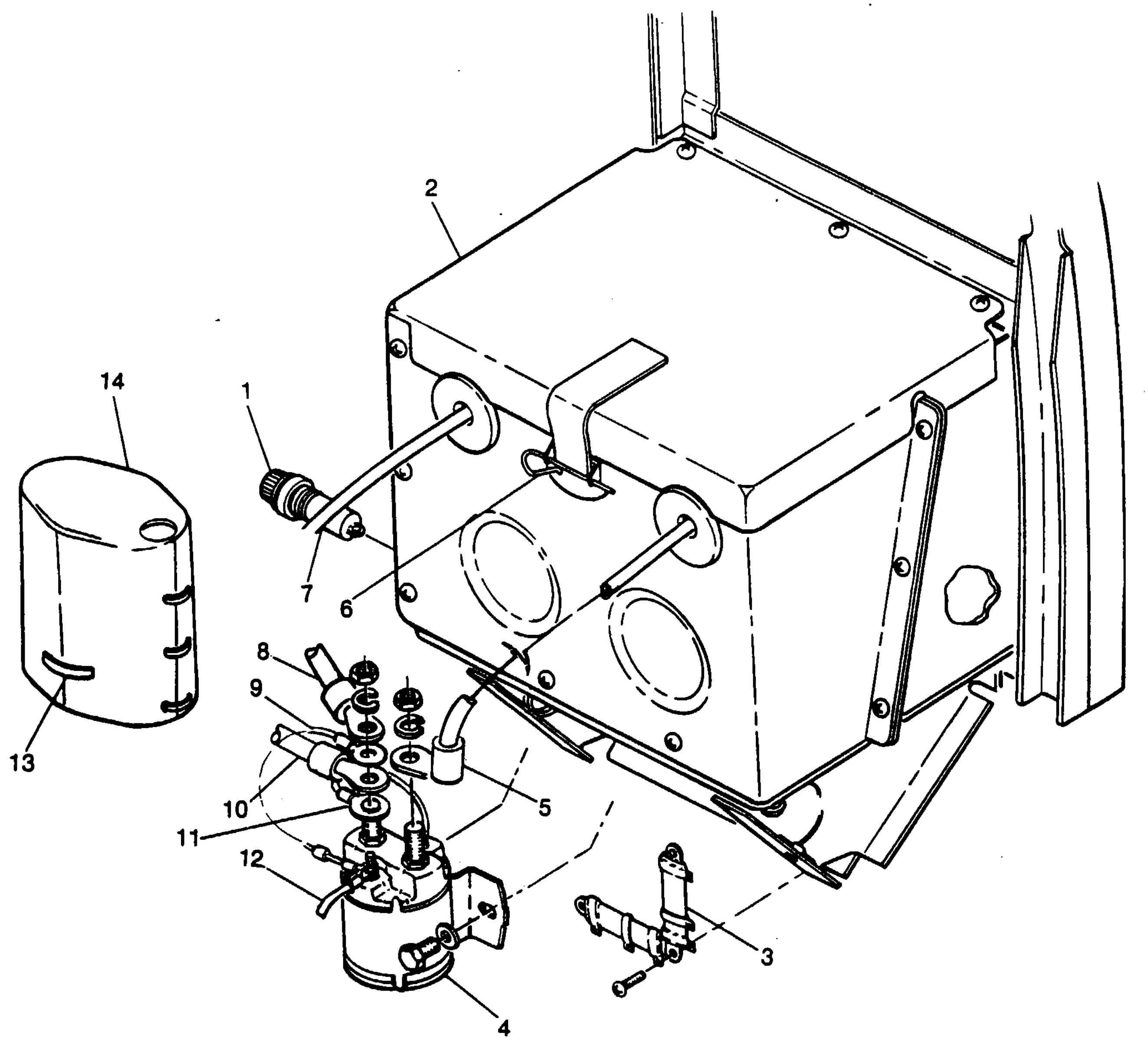
Maintenance of the electronic installations cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronics bus. For lengthy ground testing of electronic systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for 28 volts and close the master switch.

NOTE

When using ground power to start aircraft, close the master switch before removing ground power plug. This will ensure closure of 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.



1. Fuse
2. Battery Box
3. Resistor
4. Battery Contactor
5. Positive Cable
6. Clip
7. Ground Cable
8. Cable (to Ground Service Contactor)
9. Diode
10. Cable (to Starter Contactor)
11. Jumper Wire
12. Wire (to Master Switch)
13. Sta-Strap
14. Cover (Battery Contactor)

Detail **A**

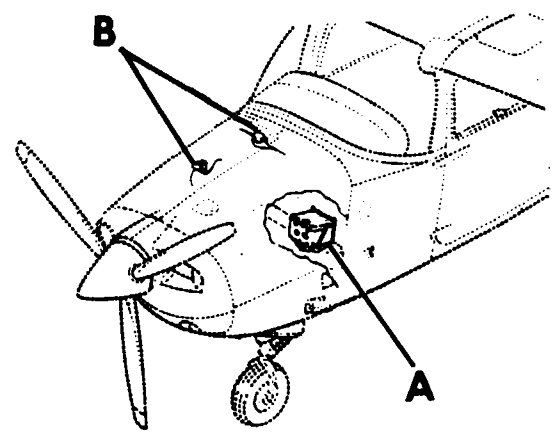
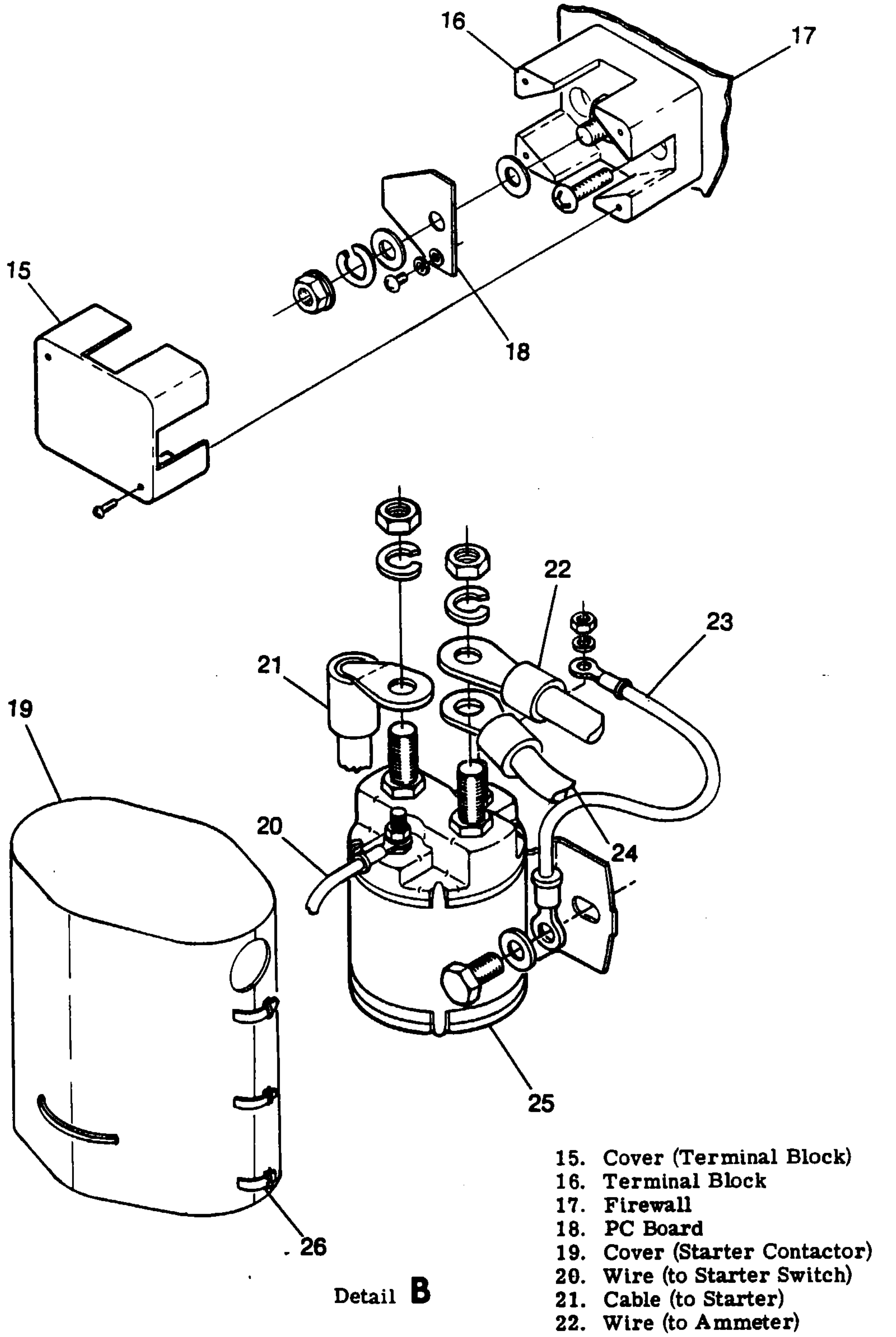
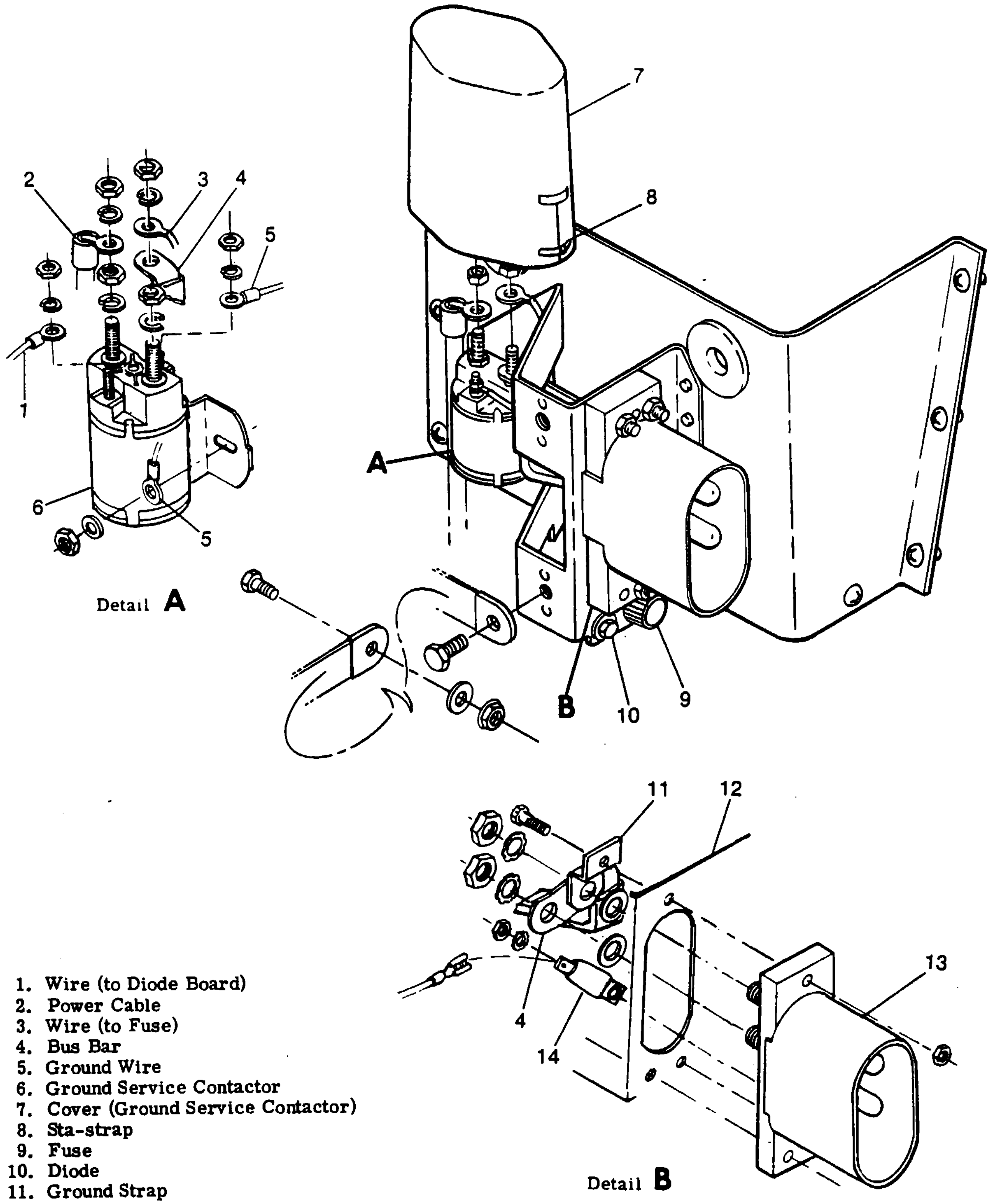


Figure 17-2. Battery and Electrical Equipment Installation (Sheet 1 of 2)



15. Cover (Terminal Block)
16. Terminal Block
17. Firewall
18. PC Board
19. Cover (Starter Contactor)
20. Wire (to Starter Switch)
21. Cable (to Starter)
22. Wire (to Ammeter)
23. Ground Wire
24. Cable (to Battery Contactor)
25. Starter Contactor
26. Sta-Strap

Figure 17-2. Battery and Electrical Equipment Installation (Sheet 2 of 2)



1. Wire (to Diode Board)
2. Power Cable
3. Wire (to Fuse)
4. Bus Bar
5. Ground Wire
6. Ground Service Contactor
7. Cover (Ground Service Contactor)
8. Sta-strap
9. Fuse
10. Diode
11. Ground Strap
12. Bracket
13. Receptacle
14. Diode Board

Figure 17-3. Ground Service Receptacle Installation

17-31. TROUBLE SHOOTING.

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 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals, check wiring between contactor and bus.
		2. Check for voltage at small terminal of ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.
	Open or mis-wired diode on ground service diode board assembly.	3. Check polarity and continuity of diode on diode board at rear of ground service receptacle. If diode is open or improperly wired, replace diode board assembly.
	Faulty external power contactor.	4. Check resistance from small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged). Normal indication is 50-70 ohms If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.
	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

17-32. REMOVAL AND INSTALLATION. (Refer to figure 17-3.)

a. Openthe battery box and disconnect the ground cable from the negative terminal of the battery and pull the cable free of the box.

b. Remove the nuts, washers, ground strap, bus bar and diode board from the studs of the receptacle and remove battery cable

c. Remove the screws and nuts holding the receptacle, ground strap will then be free from bracket.

d. To install a ground service receptacle, reverse this procedure.

17-33. ALTERNATOR POWER SYSTEM.

17-34. DESCRIPTION. The alternator system consists of an engine driven alternator, a voltage regulator and a circuit breaker located on the instrument panel. The system is controlled by the left hand portion of the split rocker, master switch labeled ALT. An over-voltage sensor switch and red warning light, labeled HIGH VOLTAGE are incorporated to protect the system. The aircraft battery supplies the source of power for excitation of the alternator.

17-35. ALTERNATOR.

17-36. DESCRIPTION. The 60-ampere alternator used on the aircraft is three-phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 28-volts at 60-amperes continuous output. Beginning with 1978 Models a 28-volt, 95 ampere alternator may be installed.

17-37. ALTERNATOR REVERSE VOLTAGE DAMAGE. The alternator is very susceptible to reverse polarity damage due to the very low resistance of the output windings and the low resistance of the silicon diodes in the output. If a high current source, such as a battery or heavy duty ground power cart is attached to the aircraft with the polarity inadvertently reversed, the current through the alternator will flow almost without limit and the alternator will be immediately damaged.

SHOP NOTES:

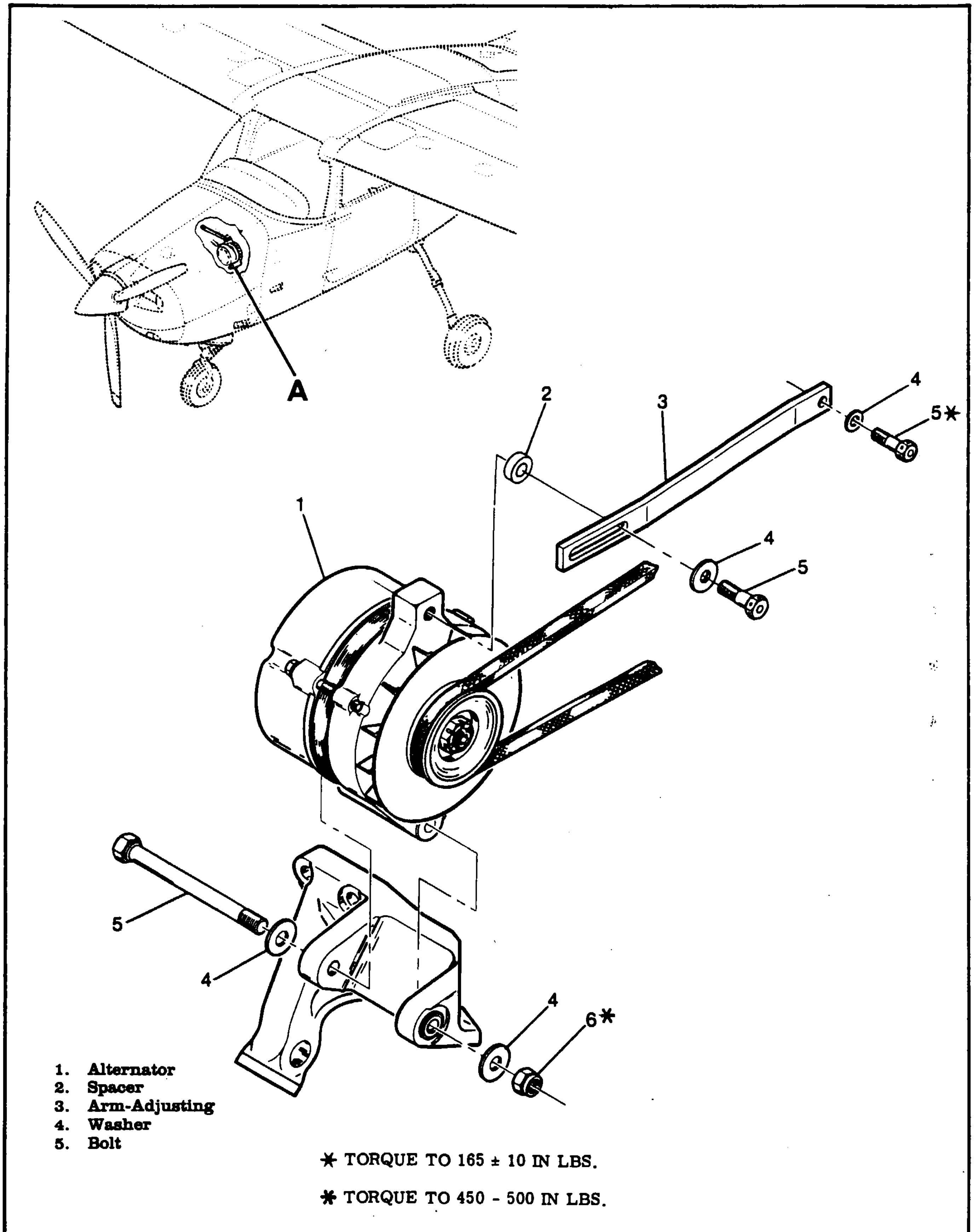
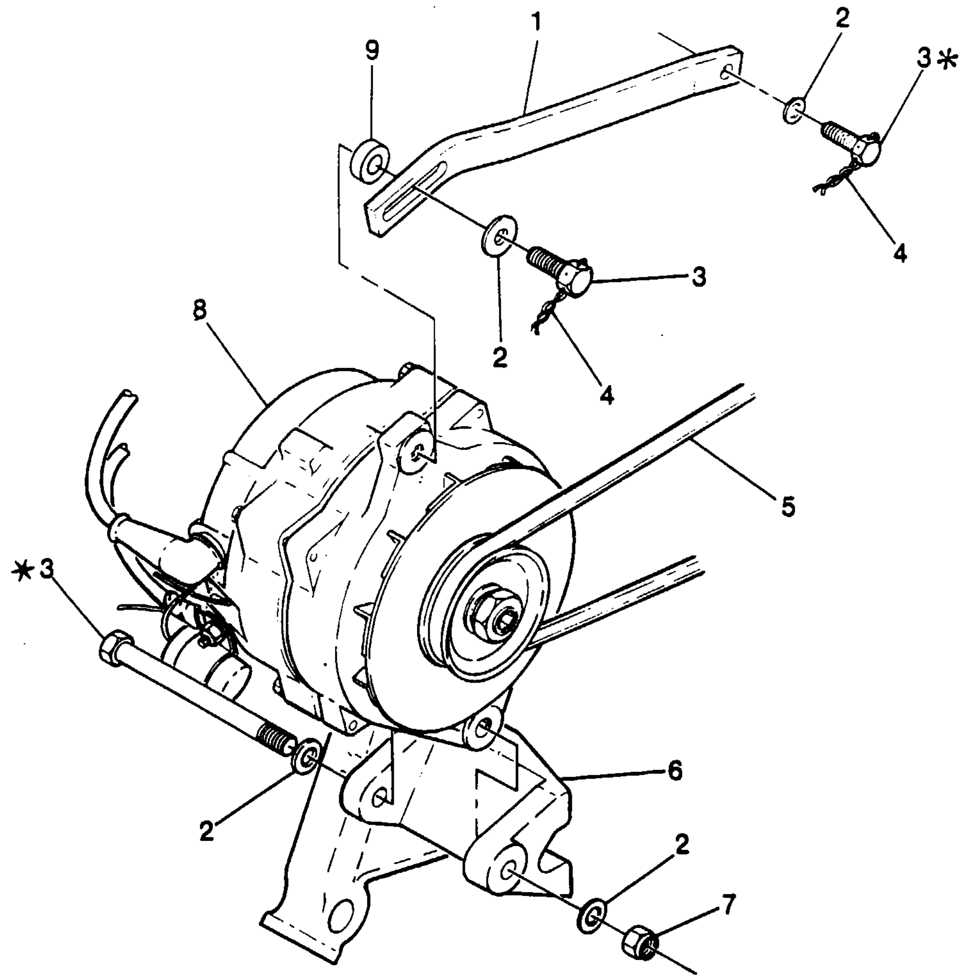


Figure 17-4. Alternator Installation (Sheet 1 of 2)



* TORQUE 165 ± 10 in. lb.

* TORQUE 450 to 500 in. lb.

NON-SHOCKMOUNTED

95 AMP ALTERNATOR

1. Arm-Adjusting
2. Washer
3. Bolt
4. Safety Wire
5. Drive Belt
6. Support
7. Nut
8. Alternator
9. Spacer

Figure 17-4. Alternator Installation (Sheet 2 of 2)

17-38. TROUBLE SHOOTING THE 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 alternator 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.		
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.
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.

17-38. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont.)
b. ENGINE RUNNING (Cont.)

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.
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 in 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.		
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.

17-38. TROUBLE SHOOTING THE 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.
	Alternator output voltage insufficient.	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.

17-39. REMOVAL AND INSTALLATION. (Refer to figure 17-4).

a. Make sure that master switch remains in the off position or disconnect negative lead from battery.
b. Disconnect the wiring from the alternator.
c. Remove the safety wire from the upper adjusting bolt and remove the bolt from the alternator.
d. Remove the nut and washer from the lower mounting bolt.
e. Remove the alternator drive belt and lower mounting bolt to remove the alternator.
f. To replace alternator, reverse this procedure.
g. Adjust belt tension to obtain 3/8" deflection at the center of the belt when applying 12 pounds of pressure to the belt. After the belt is adjusted and the the bolt is safety wired, tighten the bottom bolt to 100-140 lb.-in. torque on the 60 ampere alternator and 450-500 lb.-in. torque on the 95 amperee alternator to remove any play between the alternator mounting foot and the U-shaped support assembly.

CAUTION

On new aircraft or whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

NOTE

When tightening the alternator belt, apply pry bar pressure only to the end of the alternator nearest to the belt pulley.

17-40. ALTERNATOR CONTROL UNIT.

17-41. DESCRIPTION. The alternator control unit is a sold state voltage regualtor with an overvoltage sensor and a 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 (P/N 9870005) 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.

17-42. REMOVAL AND INSTALLATION. (Refer to figure 17-5.)

a. The control unit is mounted on aft side of battery box, under instrument panel.
b. Place master switch in the "OFF" position.
c. Disconnect negative lead from the battery.
d. Disconnect housing plug from the alternator control unit.
e. Remove screws securing the control unit to the firewall.
f. To install control unit reverse the preceding steps. Be sure the connections for grounding are clean and bright before assembly. Otherwise faulty voltage regulation and/or excessive radio noise may result.

17-43. RIGGING THROTTLE-OPERATED MICRO-SWITCH. Refer to Section 13.

17-44. AUXILIARY FUEL PUMP FLOW RATE ADJUSTMENT. Refer to Section 13.

17-45. DUAL ALTERNATOR SYSTEM.

17-46. DESCRIPTION. The dual alternator system consists of two belt-driven, 28 volt, 60 amp alternators, two alternator control units, two shunt and fuse assemblies, two line contactors, two alternator switches, two circuit breakers, a volt ammeter, a three light indicating system and a alternator restart system. An isolation circuit breaker is installed with the dual alternator system. Refer to the Pilots Operating Handbook for operational procedures.

17-47. ALTERNATORS.

17-48. DESCRIPTION. The alternators are belt-driven, 28 volt, 60 amp, three-phase, Delta connected stator windings with integral silicon diode rectifiers and a stator tap.

NOTE

Alternators are equal in function & capability, and normally operate under equal loads. Each may operate independently, but should not be thought of or operated as, a primary and secondary (or standby) system.

17-49. REMOVAL AND INSTALLATION. (See figure 17-6.)

17-50. ALTERNATOR CONTROL UNITS. The alternator control units are solid state voltage regulators with low voltage sensing internal paralleling circuitry in the alternator control units controls loads sharing between the alternators.

17-51. REMOVAL AND INSTALLATION. (See figure 17-6.)

17-52. ALTERNATOR CONTACTORS AND SHUNTS.

17-53. DESCRIPTION. Each alternators is equipped with a contactor and shunt. The shunt directs power through two fuses to the alternator control unit remote sensing and current sensing circuits. The shunt is also connected through fuses to the volt-ammeter selector switch which enables the pilot to monitor the electrical system operation.

17-54. REMOVAL AND INSTALLATION. (See figure 17-6.)

17-55. VOLT-AMMETER.

17-56. DESCRIPTION. The volt-ammeter is mounted on the left side of the instrument panel. A selector switch is provided for the pilot to monitor the electrical system operation. The selector switch allows the pilot to monitor the current supplied by each alternator, the battery charge or discharge current, or the system voltage.

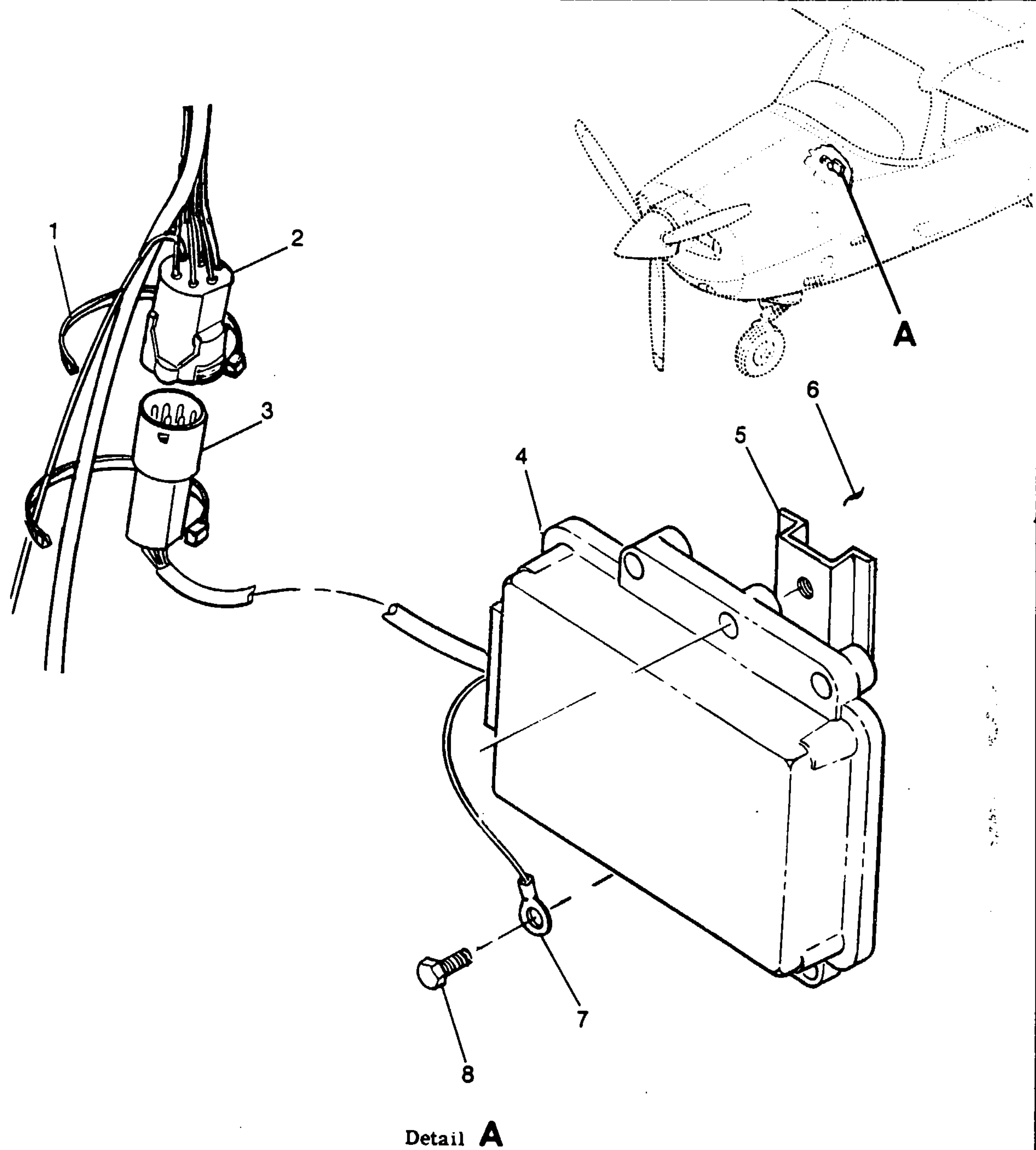
17-57. ALTERNATOR RESTART SYSTEM. The alternator restart system consists of a battery pack and a switch. When the restart switch, on the circuit breaker panel is actuated, power is directed from the battery pack through the restart switch to the alternator switch. With the alternator switch closed power is directed to the alternator control unit then to the alternator field for excitation of the alternator.

NOTE

Batteries should be changed at yearly intervals or sooner if function test shows need. Correct polarity must be observed when installing batteries. No. 814 Ray-O-Vac or No. MN1400 Mallory or equivalent to No. E-93 Everready Batteries are recommended.

WARNING

Do not rely on contact between battery holder (81) and plate (82) to maintain spring contact on batteries. If required, end plates of the battery holder may be reformed inward slightly to increase contact pressure on batteries. Check continuity of battery pack before installation with battery pack suspended from plate and with curvature of plate reversed as in normal installation.



1. Sta-strap
2. Housing Cap
3. Housing Plug
4. Alternator Control Unit
5. Bracket
6. Battery Box
7. Ground Wire
8. Bolt

Figure 17-5. Voltage Regulator/Alternator Control Unit Installation

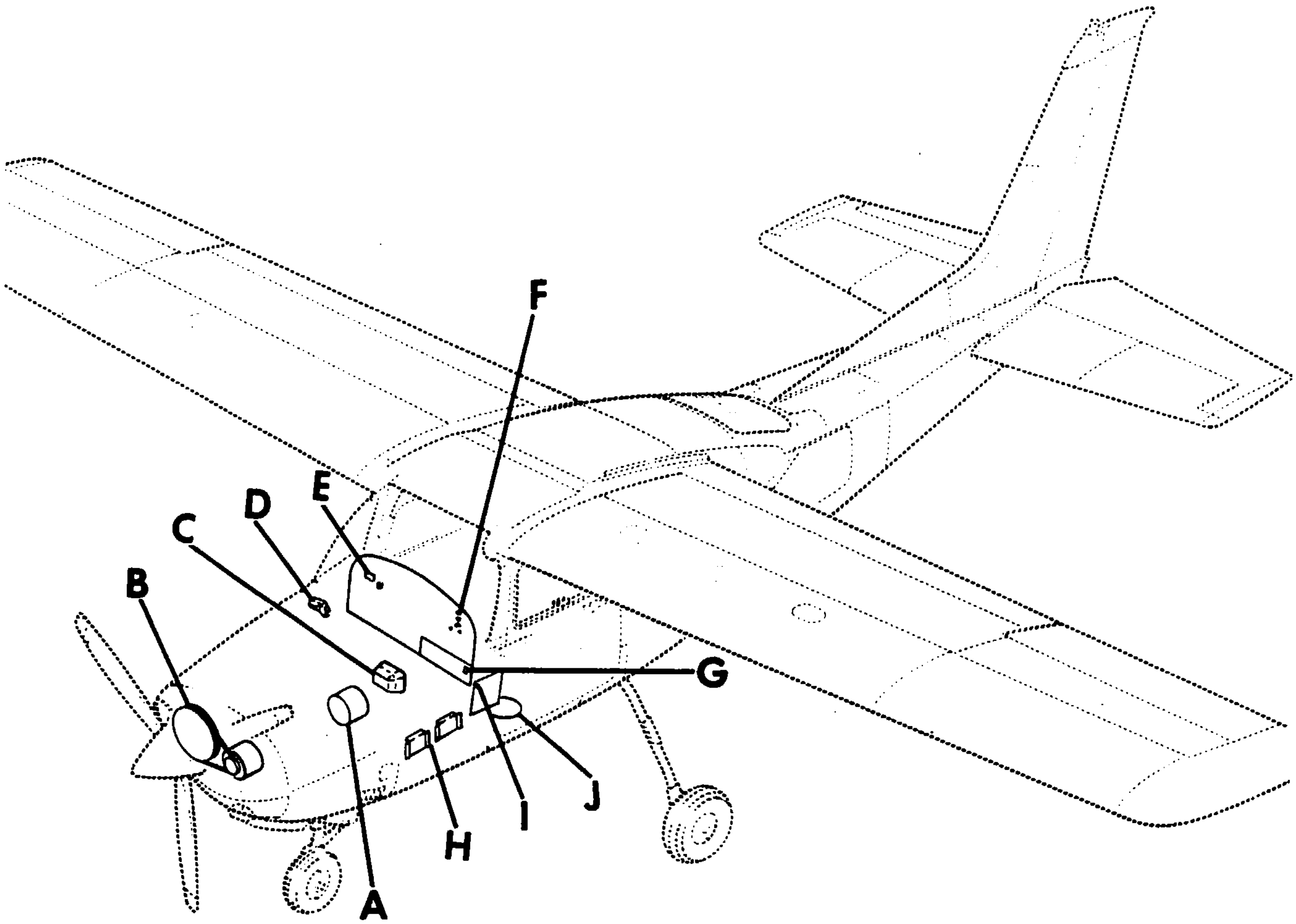
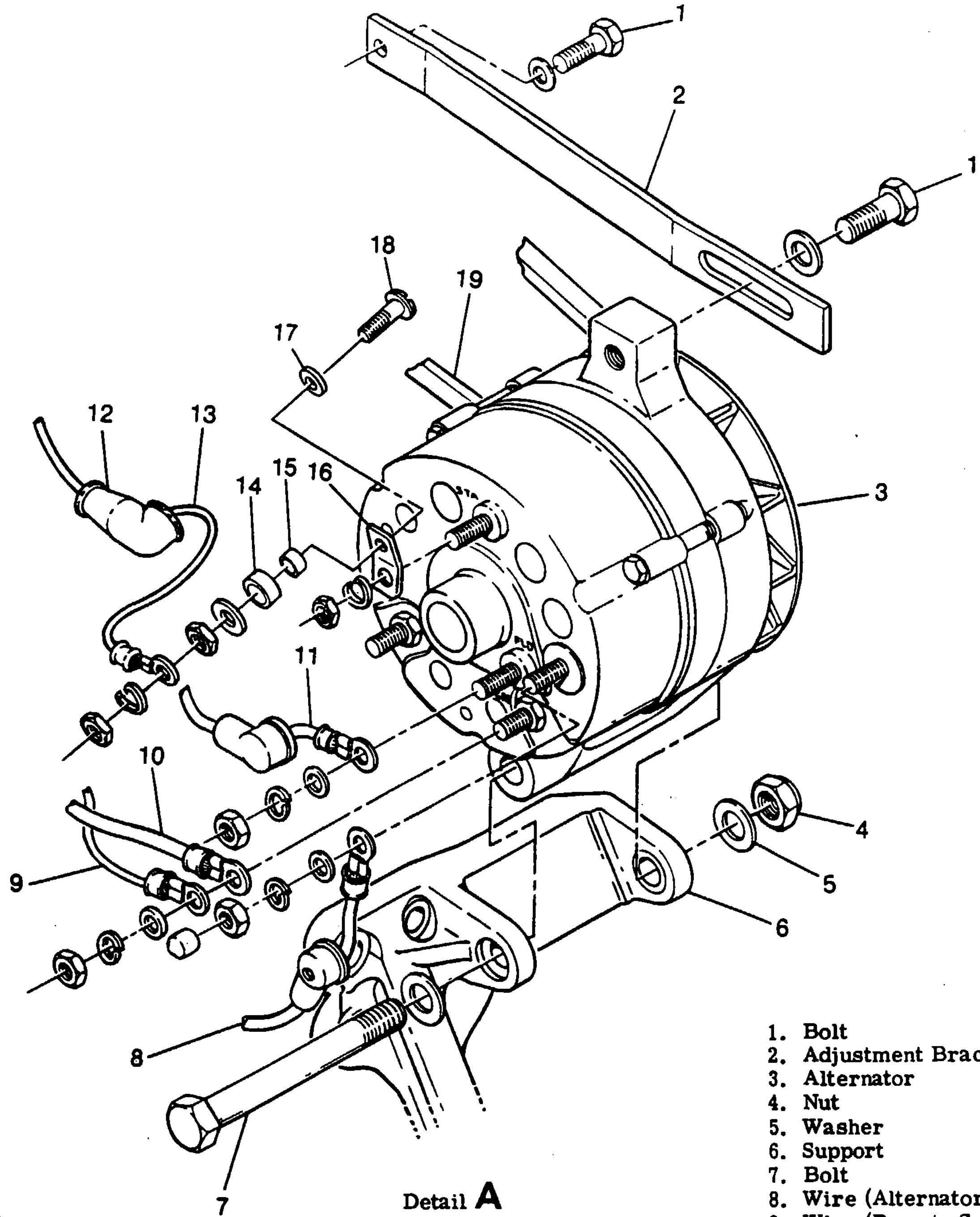
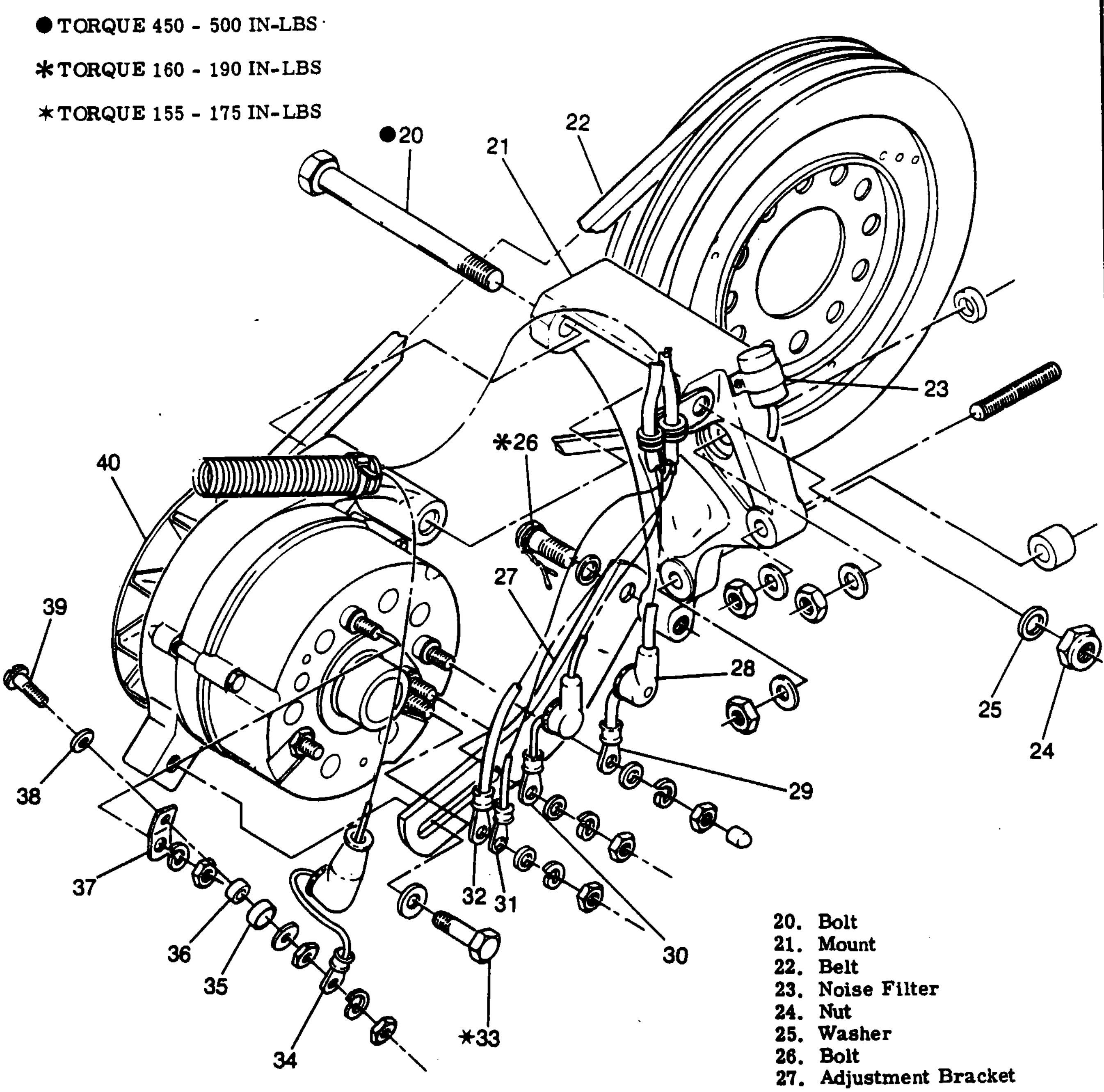


Figure 17-6. Dual Alternator System Installation (Sheet 1 of 7)



1. Bolt
2. Adjustment Bracket
3. Alternator
4. Nut
5. Washer
6. Support
7. Bolt
8. Wire (Alternator Shunt)
9. Wire (Remote Sense)
10. Wire (Ground)
11. Wire (Field)
12. Nipple
13. Wire (Alt OFF Sense)
14. Resistor
15. Insulator
16. Resistor
17. Washer
18. Screw
19. Belt

Figure 17-6. Dual Alternator System Installation (Sheet 2 of 7)

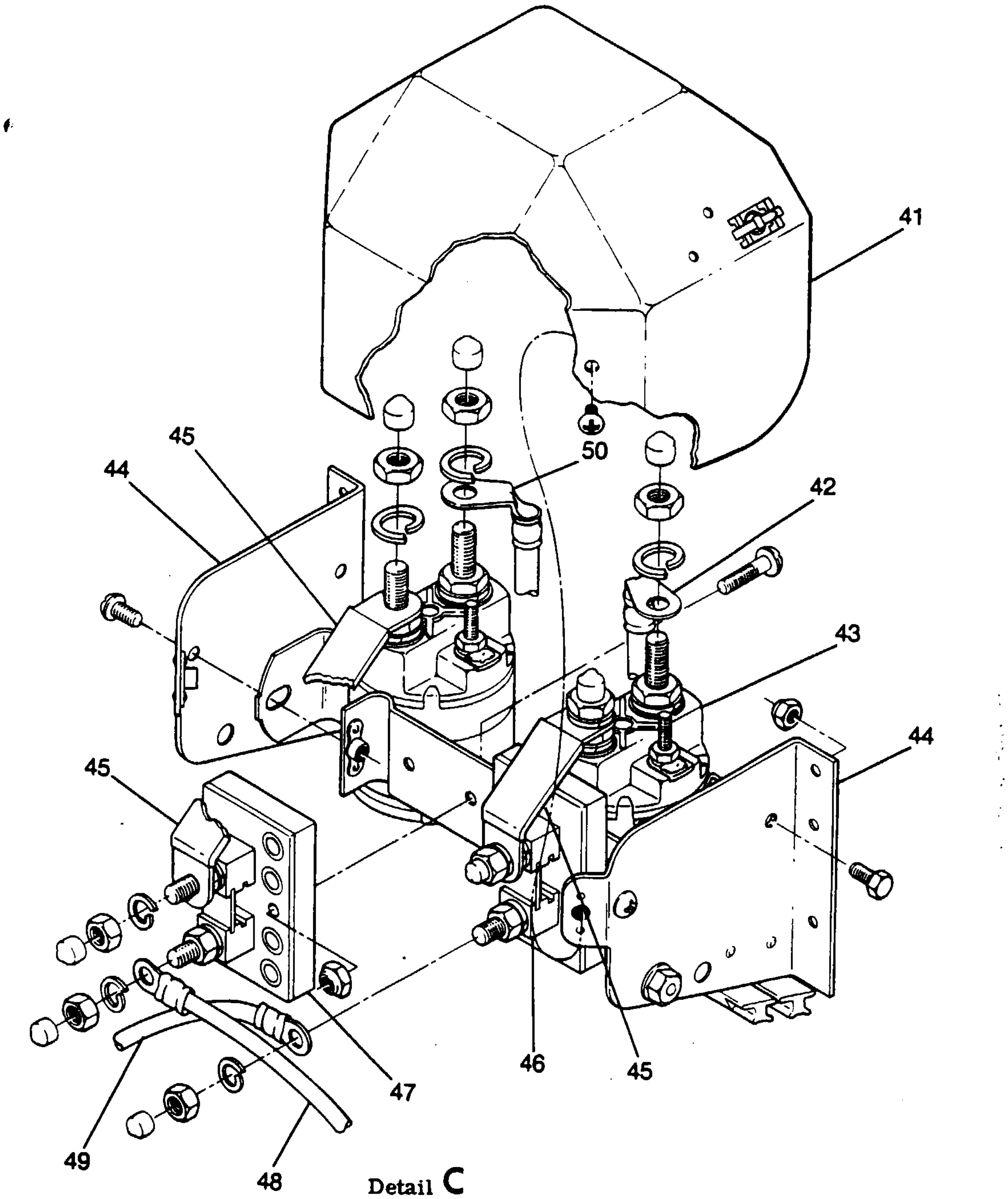


Detail **B**

BEGINNING WITH 21064570

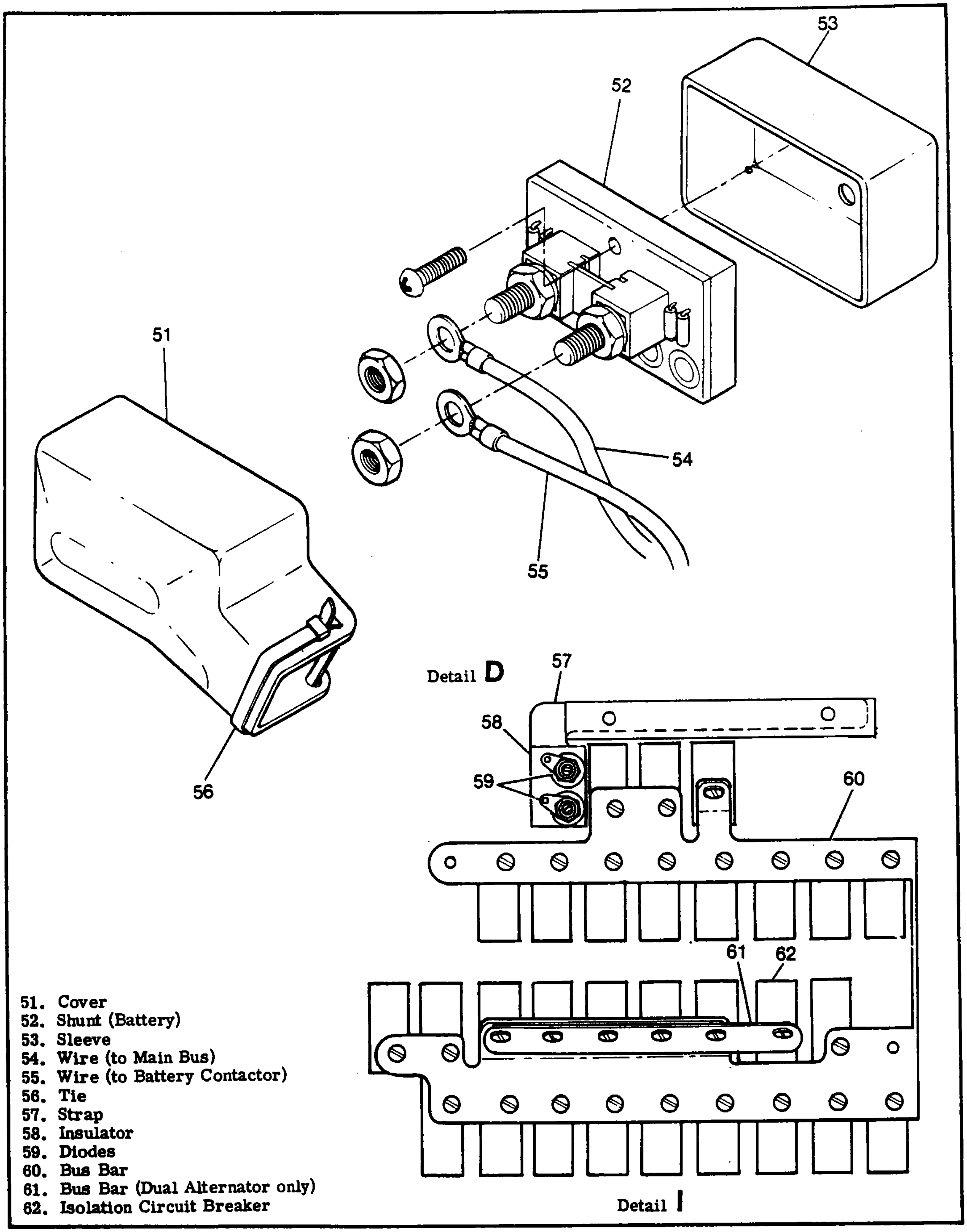
20. Bolt
21. Mount
22. Belt
23. Noise Filter
24. Nut
25. Washer
26. Bolt
27. Adjustment Bracket
28. Nipple
29. Wire (Alternator Shunt)
30. Wire (Field)
31. Wire (Remote Sense)
32. Wire (Ground)
33. Bolt
34. Wire (Alt OFF Sense)
35. Resistor
36. Insulator
37. Resistor
38. Washer
39. Screw
40. Alternator

Figure 17-6. Dual Alternator System Installation (Sheet 3 of 7)



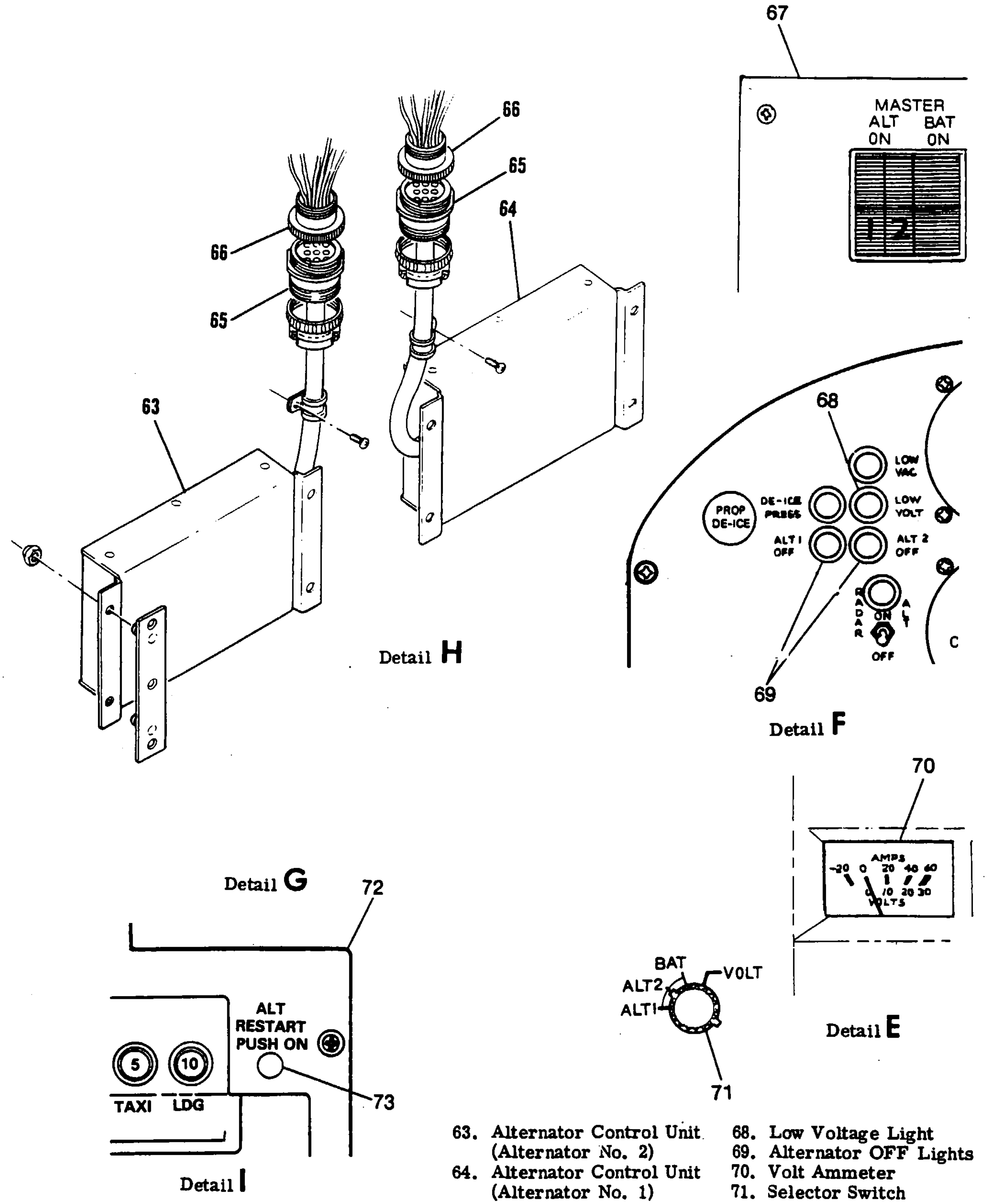
41. Cover
42. Wire (Circuit Breaker)
43. Contactor (Alternator No. 2)
44. Bracket
45. Bus Bar
46. Shunt (Alternator No. 2)
47. Shunt (Alternator No. 1)
48. Wire (to Alternator No. 1)
49. Wire (to Alternator No. 2)
50. Wire (Circuit Breaker)

Figure 17-6. Dual Alternator System Installation (Sheet 4 of 7)



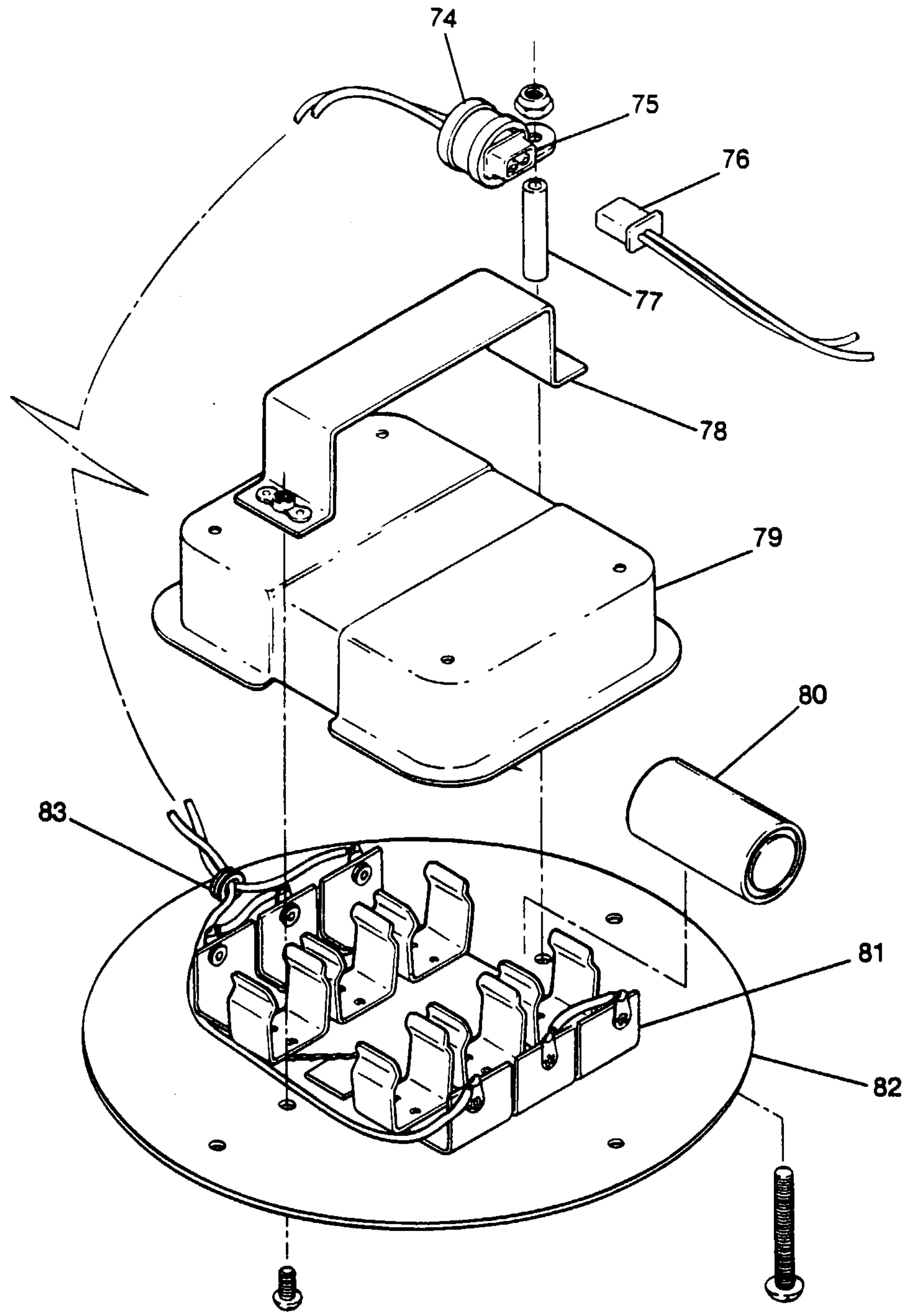
51. Cover
52. Shunt (Battery)
53. Sleeve
54. Wire (to Main Bus)
55. Wire (to Battery Contactor)
56. Tie
57. Strap
58. Insulator
59. Diodes
60. Bus Bar
61. Bus Bar (Dual Alternator only)
62. Isolation Circuit Breaker

Figure 17-6. Dual Alternator System Installation (Sheet 5 of 7)



63. Alternator Control Unit (Alternator No. 2)
64. Alternator Control Unit (Alternator No. 1)
65. Housing Plug
66. Housing Cap
67. Switch Panel
68. Low Voltage Light
69. Alternator OFF Lights
70. Volt Ammeter
71. Selector Switch
72. Circuit Breaker Panel
73. Alternator Restart Switch

Figure 17-6. Dual Alternator System Installation (Sheet 6 of 7)



74. Clamp
75. Housing Cap
76. Housing Plug
77. Spacer
78. Bracket
79. Cover
80. Battery
81. Battery Holder
82. Plate
83. Grommet

Detail J

Figure 17-6. Dual Alternator System Installation (Sheet 7 of 7)

17-58. AIRCRAFT LIGHTING SYSTEM.

17-59. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, flashing beacon light, anti-collision strobe lights, interior and instrument panel flood lights, electroluminescent panel lighting, instrument post lighting, pedestal lights, oxygen lights, courtesy lights, de-ice light, control wheel map light, baggage compartment light, compass and radio dial lights.

17-60. SWITCHES.

17-61. DESCRIPTION. The instrument panel switches used are snap-in type rocker switches. These switches have a design feature which permits them to snap into the panel from the panel side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

17-62. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	5. Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.

17-62. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
WARNING The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.		
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.
		2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies, one at a time. If circuit breaker opens on one strobe power supply, replace strobe power supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not open proceed to step 4.
		3. Check aircraft wiring. Repair or replace as necessary.
		4. Inspect strobe power supply ground wire for contact with wing structure.

17-62. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CAUTION Extreme care should be taken when exchanging flash tube. The tube is fragile and can easily be cracked in a place where it will not be obvious visually. Make sure the tube is seated properly on the base of the nav light assembly and is centered in the dome. NOTE: When checking defective power supply and flash tube, units from opposite wing may be used. Be sure power leads are protected properly when unit is removed to prevent short circuit.		
ONE ANTI-COLLISION STROBE LIGHT WILL	Defective Strobe Power Supply, or flash tube.	1. Connect voltmeter to red lead between aircraft power supply (battery/external power) and strobe power supply, connecting negative lead to wing structure. Check for 12/24 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.

17-62. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ELECTROLUMINESCENT PANELS WILL NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no open or short circuit is found, proceed to step 4.
	Defective resistor.	4. Check resistor for continuity. (Located in line between rheostat and inverta-pak.) Replace resistor.
	Defective rheostat.	5. Check input voltage at inverta-pak with master switch on. Voltmeter should give a smoothly varied reading over the entire control range of the rheostat. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Defective inverta-pak.	6. Check output voltage at inverta-pak with ac voltmeter. Should read about 125 volts ac with rheostat set for full bright. Replace inverta-pak.
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. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in brighter position. Replace potentiometer.
	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.

17-62. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
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.

17-63. LANDING AND TAXI LIGHTS.

17-64. DESCRIPTION. The landing and taxi lights are mounted in the lower nose cap. Both lamps are used for landing and only the right hand for taxi thru 1977 models and the left beginning with 1978 models. The lamps are controlled by two rocker switches with a diode assembly installed across the switches which enable the landing light switch to turn on both the landing and taxi lamps. The taxi light switch will turn on only the taxi lamp.

17-65. REMOVAL AND INSTALLATION. (Refer to figure 17-7.)

1. Remove screws (12) and remove cover (1).
2. Remove screws (2) and note position of washers (5) and or spacers (7) for installation.
3. Remove screws (11) then remove retainer (6) and gasket (8).
4. Pull lamp (9) from cover (10) and disconnect electrical leads.
5. Install new lamp and reassemble making sure washers (5) and or spacers (7) are in the proper position.

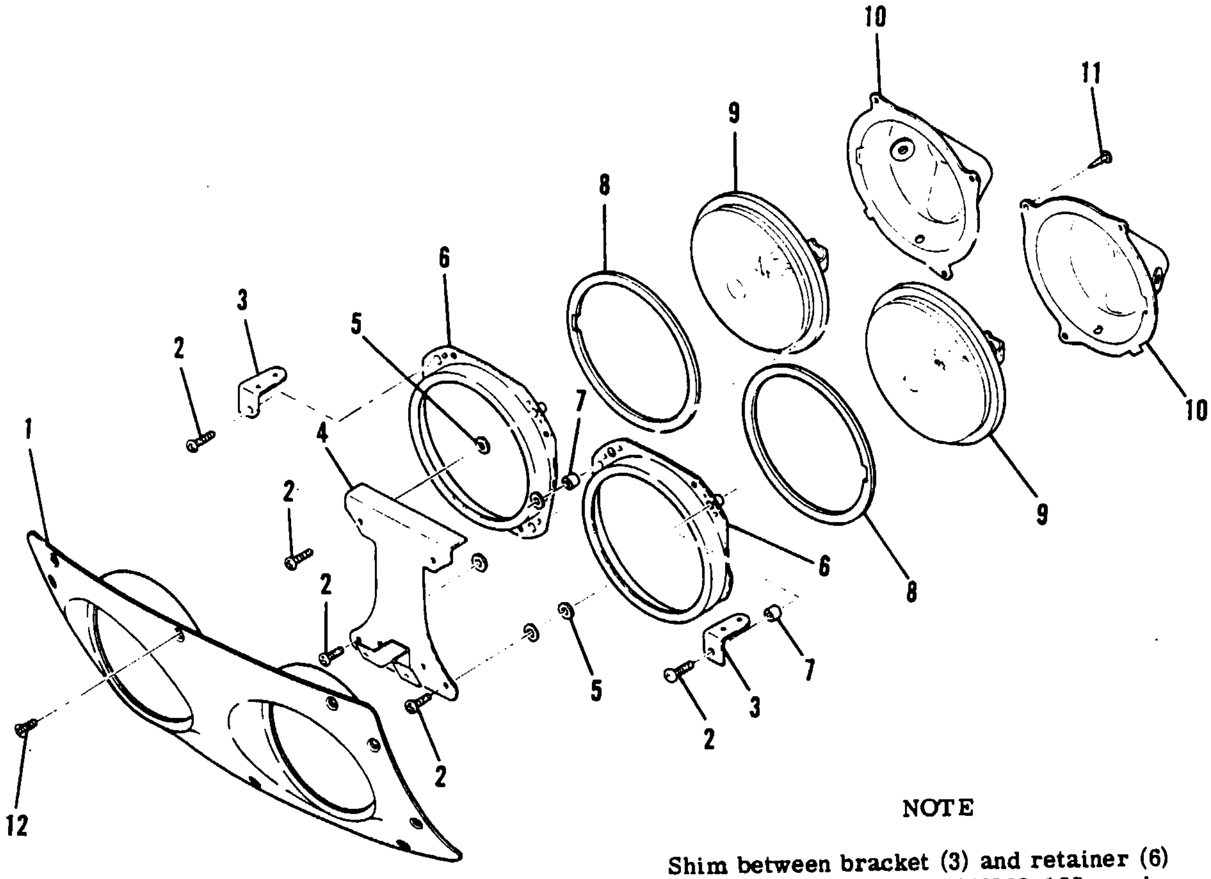
17-66. NAVIGATION LIGHTS.

17-67. DESCRIPTION. The navigation lights are located on each wing tip and the stinger. Operation of the lights is controlled by a single two position switch. A plastic light detector on each wing tip allows the pilot to determine if the lamps are working properly during flight.

17-68. REMOVAL AND INSTALLATION. Refer to figure 17-8 for removal and installation of navigation light components.

17-69. ANTI-COLLISION STROBE LIGHTS.

17-70. DESCRIPTION. A white strobe light may be installed on each wing tip with the navigation light. These lights are vibration resistant and operate on the principle of a capacitor discharge into a zenon tube, producing an extremely high intensity flash. Each strobe light has its own power supply mounted on the wing tip ribs.



NOTE

Shim between bracket (3) and retainer (6) with a equal number of AN960-10L washers (5) at all six locations as required so bottom of retainer (6) is 0.00 to 0.30 aft of cover (1).

1. Cover
2. Screw
3. Bracket
4. Bracket Assembly
5. Washer
6. Retainer
7. Spacer
8. Gasket
9. Lamp
10. Cover Assembly
11. Screw
12. Screw

Figure 17-7. Landing and Taxi Light Installation

17-71. REMOVAL AND INSTALLATION. Refer to figure 17-8 for removal and installation of strobe light components.

a. Remove wing tip disconnecting navigation and strobe light wires.
b. Disconnect power supply wires.
c. Remove the four mounting screws and remove power supply.
d. To reinstall reverse the preceding steps.

17-72. VERTICAL TAIL FLOOD LIGHTS.

17-73. DESCRIPTION. A flood light assembly is mounted on each end of the stabilizer, on the upper side. These lights are used to illuminate the vertical tail. A switch on the switch panel controls the lights and a circuit breaker on the breaker panel protects the circuit.

17-74. REMOVAL AND INSTALLATION. Refer to figure 17-8. for removal and installation.

NOTE

To properly secure the lens (4) to the fixture, 5 in-lbs (min) to 6 in-lbs (max) should be used. The screw should be tightened to the point that the lens is properly seated on the gasket and the "O" ring under the hold down screw washer is compressed without undue strain on the glass.

NOTE

Aircraft equipped with light assemblies using either 28 volt lamps or 14 volt lamps connected in series. 14 volt lamps assemblies are identified by rubber stamping "14V" on the lamp base. Refer to applicable wiring diagram if in doubt. It is imperative that 14 volt lamps are not installed in the 28 volt light assemblies as this will result in the immediate burn out of the lamp. Should 28 volt lamps be installed in the 14 volt light assemblies, there will be a considerable reduction of light output.

17-75. FLASHING BEACON.

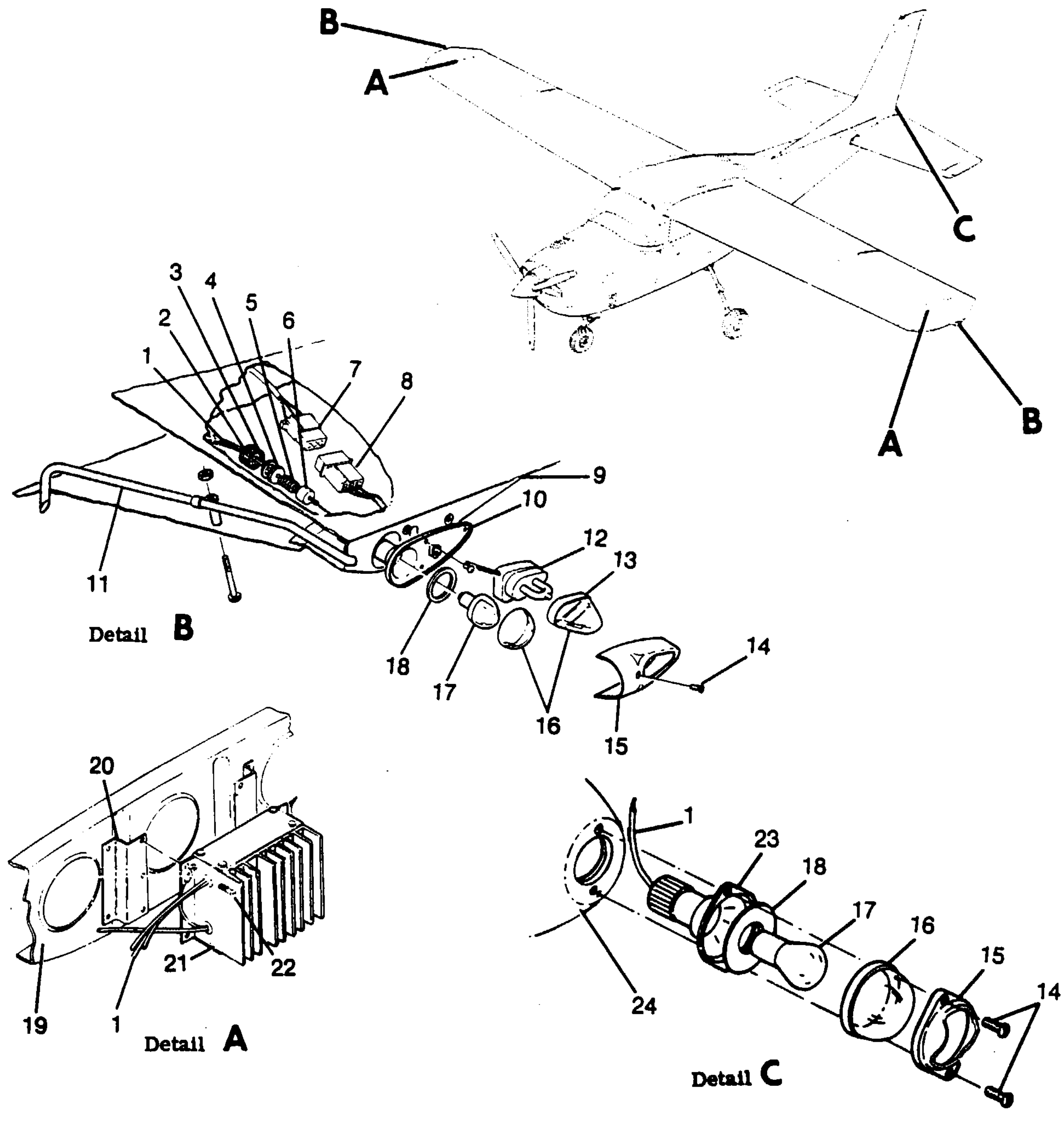
17-76. DESCRIPTION. The flashing beacon light is attached to the vertical fin tip. The flashing beacon has a iodine-vapor lamp electrically switched by a solid-state flasher assembly. The flasher assembly is mounted inside the fin tip. The switching frequency of the flasher assembly operates at approximately 45 flashes per minute. A resistor is installed and connected to the unused flasher lead to eliminate a pulsing effect on the cabin lighting and ammeter.

17-77. REMOVAL AND INSTALLATION. Refer to figure 17-9 for removal and installation of flashing beacon components.

17-78. INSTRUMENT LIGHTING.

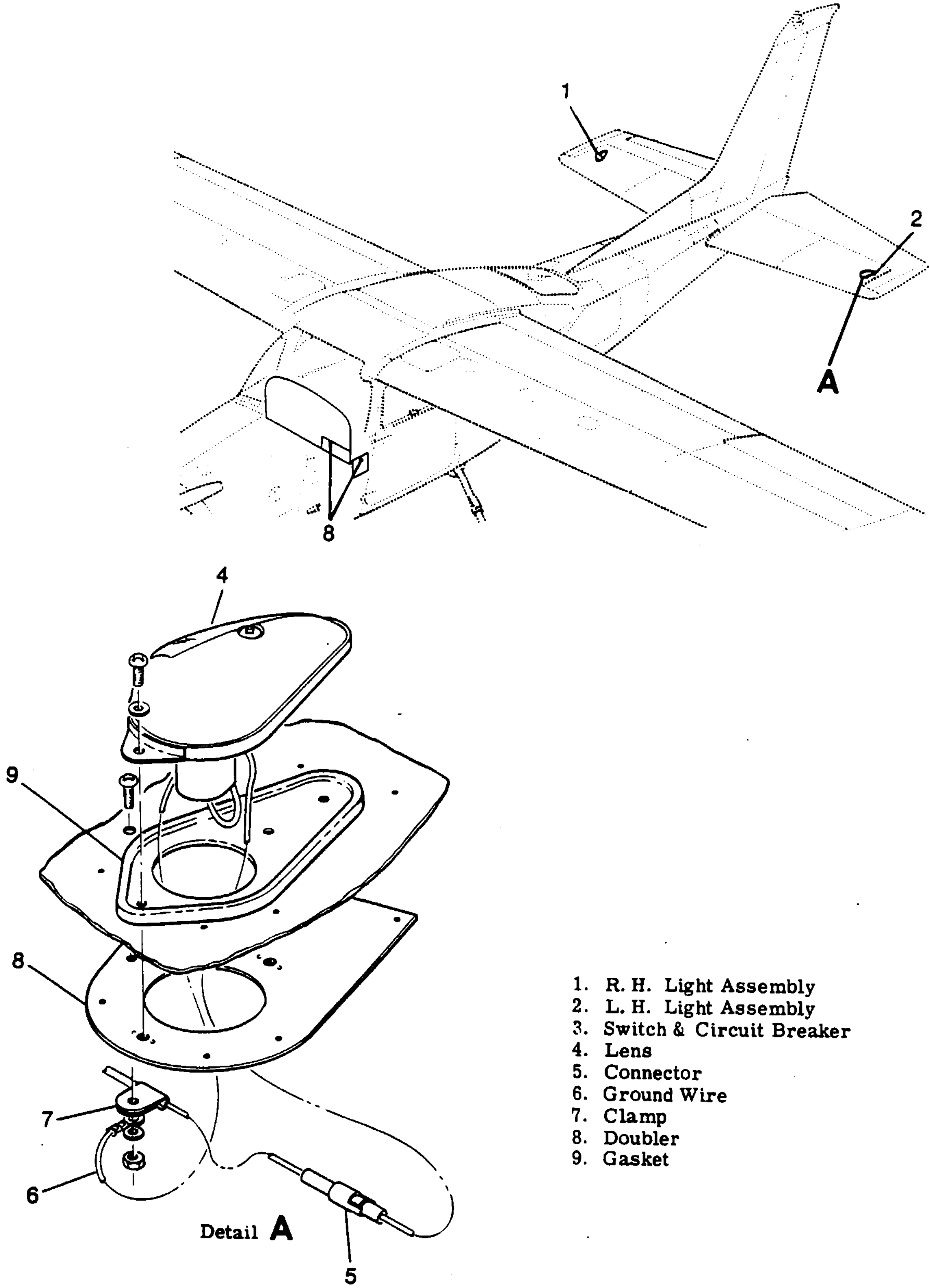
17-79. DESCRIPTION. The instrument panel lighting consists of two seperate sections. The lower two-thirds of the panel is illuminated by two lights mounted in the overhead console. The lighting for the upper one-third of the panel is provided by four lights mounted in the under side of the instrument glare shield. The intensity of the lighting is controled by the instrument light dimming rheostat located on the switch panel.

17-80. REMOVAL AND INSTALLATION. Refer to figure 17-10 for removal and installation of instrument brow lights.



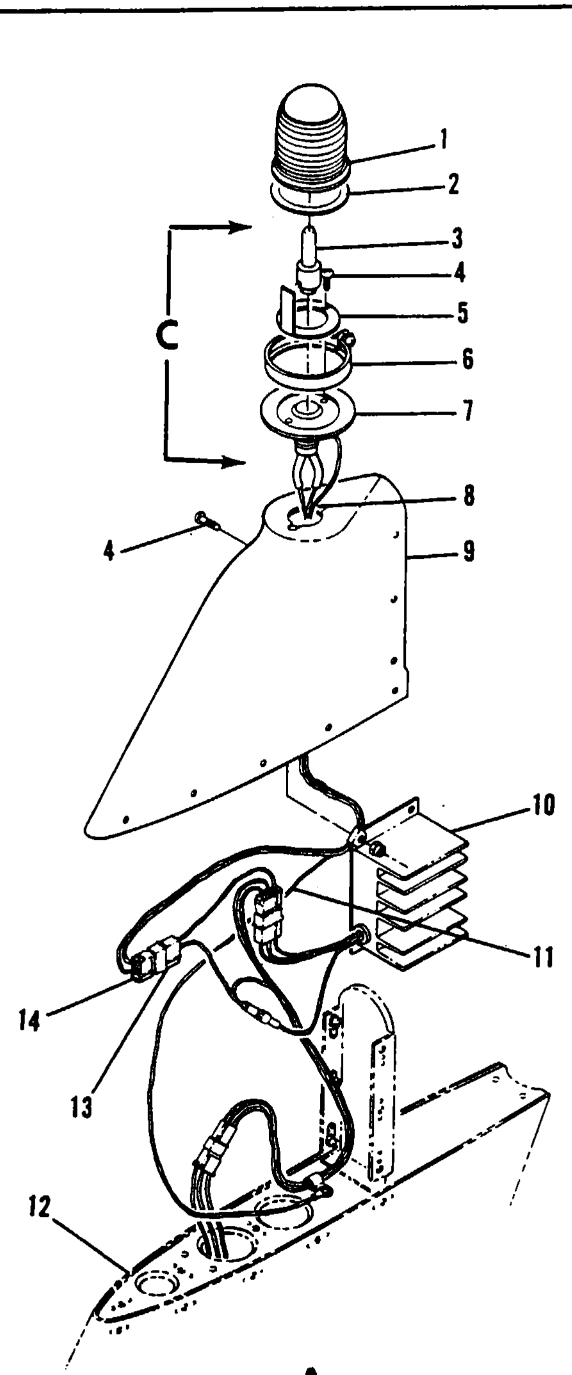
1. Electrical Leads	7. Housing - Plug	13. Gasket	19. Wing Tip Rib
2. Cap	8. Housing - Cap	14. Screw	20. Bracket
3. Washer	9. Wing Tip	15. Lens Retainer	21. Power Supply
4. Insulated Washer	10. Socket	16. Lens	22. Screw
5. Spring	11. Detector	17. Bulb	23. Socket - Tail
6. Insulator	12. Flash Tube	18. Seal	24. Stinger

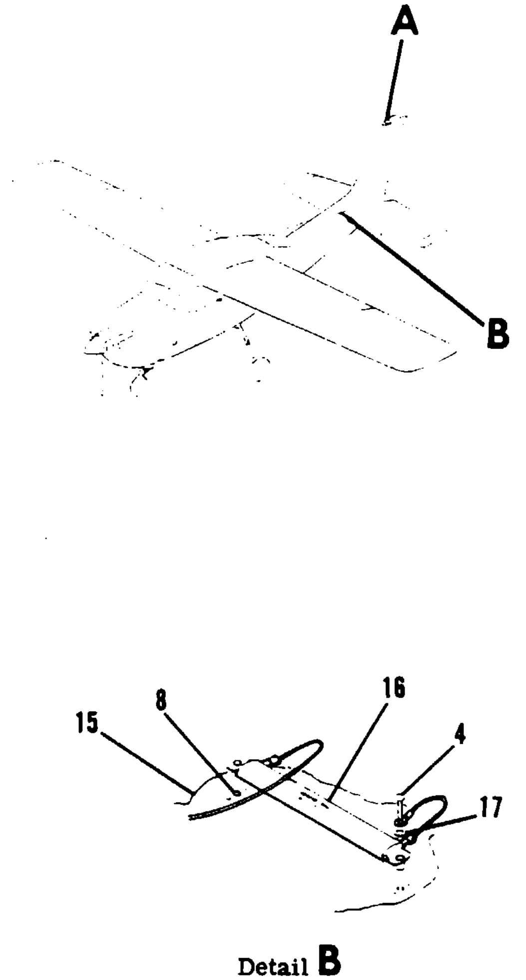
Figure 17-8. Navigation, Flood and Anti-Collision Strobe Lights Installation (Sheet 1 of 2)



1. R. H. Light Assembly
2. L. H. Light Assembly
3. Switch & Circuit Breaker
4. Lens
5. Connector
6. Ground Wire
7. Clamp
8. Doubler
9. Gasket

Figure 17-8. Navigation, Flood and Anti-Colission Strobe Lights Installation (Sheet 2 of 2)





CAUTION

When inserting lamp into socket always use a handkerchief or a tissue to prevent getting fingerprints on the lamp.

NOTE

Fingerprints on lamp may shorten the life of the lamp.

1. Dome
2. Gasket
3. Lamp
4. Screw
5. Baffle
6. Clamp Assembly
7. Mounting Plate
8. Socket
9. Tip Assembly - Fin
10. Flasher Assembly
11. Ground Wire
12. Fin Assembly
13. Housing - Cap
14. Housing - Plug
15. Stabilizer Skin - Upper
16. Resistor
17. Washer

Figure 17-9. 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.

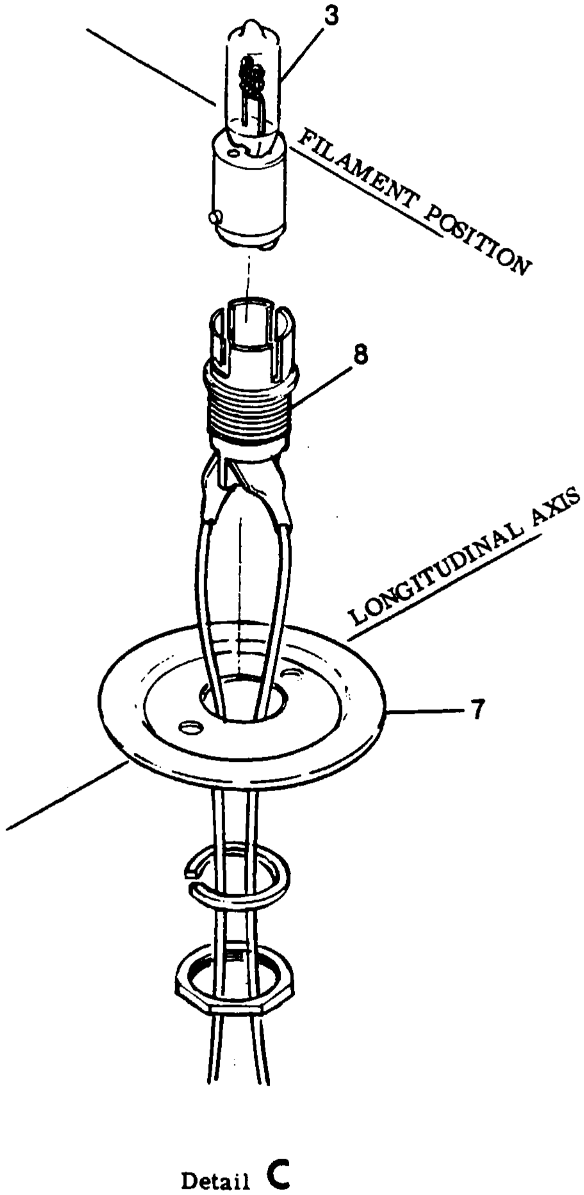
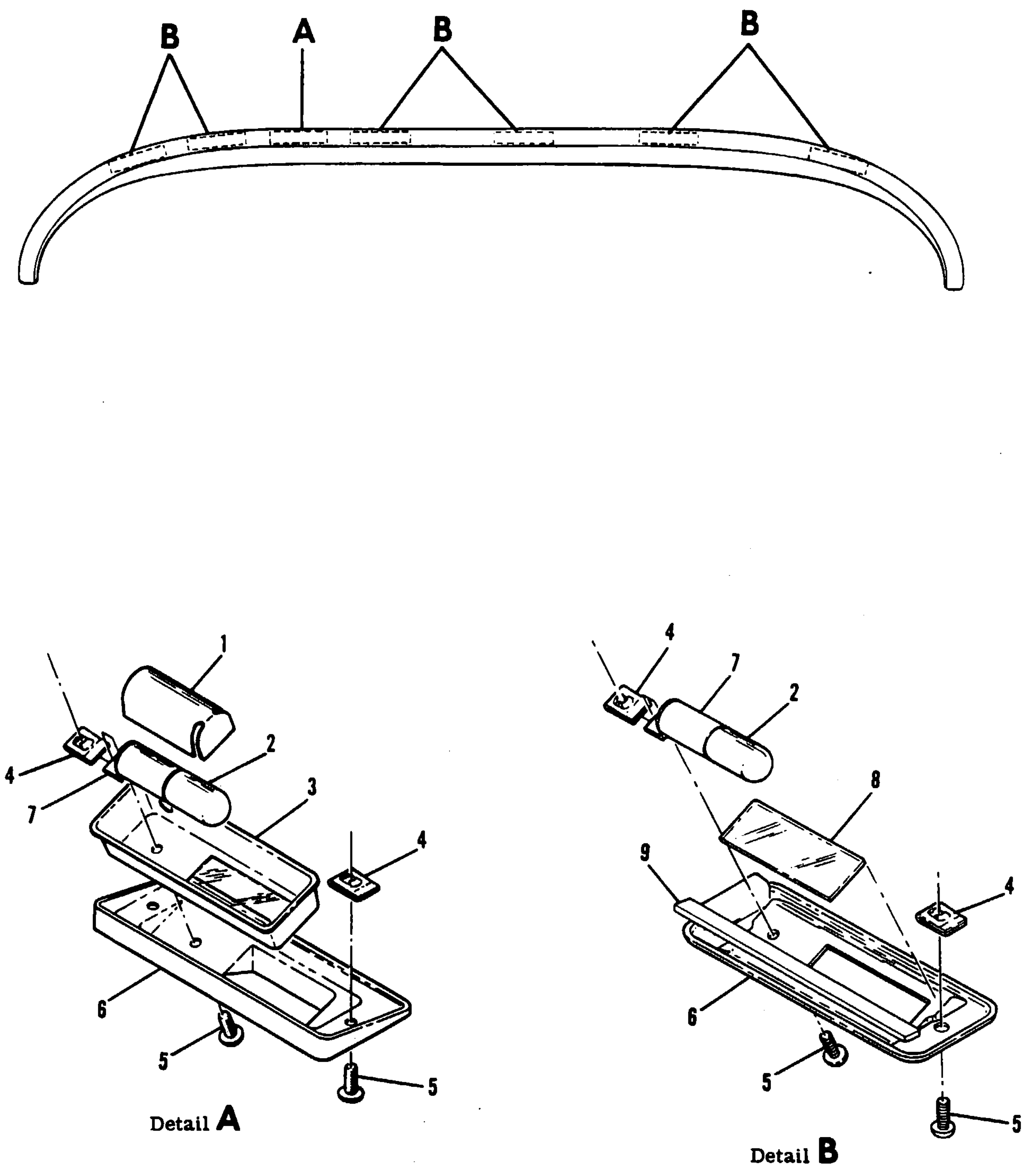


Figure 17-9. Flashing Beacon Light Installation (Sheet 2 of 2)



1. Reflector
2. Lamp
3. Housing
4. Nutplate
5. Screw
6. Housing
7. Socket Assembly
8. Lens
9. Seal

Figure 17-10. Instrument Panel Glare Shield Light Installation

17-81. REMOVAL AND INSTALLATION OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-11).

a. Unscrew metal oxzgen port covers, if installed.
b. Unscrew oxygen gage lens, if installed.
c. Remove screw from oxygen control knob and remove knob.
d. Remove the screws in the recess area of the fresh air vents.
e. Pull out the two oxygen post lights, if installed.
f. Remove remaining screws the over-head console cover and remove cover.
g. Twist lamp for removal from socket assembly.
h. For installation, reverse the preceeding steps.

17-82. VERTICAL ADJUSTMENT OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-11).

a. Pry the plug button from the overhead console cover to gain access to the adjustment screw.
b. Turn the screw clockwise to advance the light beam up the panel.
c. Turn the screw counterclockwise to advance the light down the panel.
d. Upon completing adjustment, reinstall plug button.

17-83. LATERAL ADJUSTMENT OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-11).

a. To gain access to the lights, remove the overhead console cover as outlined in paragraph 17-69.
b. Slide the light sockets inboard along the mounting bracket to advance the light beam outboard on the instrument panel. To advance the light beam inboard on the instrument, slide the light socket outboard along the mounting bracket.

NOTE

Should sliding the light sockets along the mounting bracket prove difficult, the screws attaching the light socket assembly to the mounting bracket may be loosened to permit the light socket assembly to slide along the mounting bracket. Once the adjustment is completed, ensure that the screws are tight enough to resist vibrating out of adjustment.

17-84. ELECTROLUMINESCENT PANEL LIGHTING.

17-85. DESCRIPTION. The electroluminescent lighting consists of two "EL" panels; the switch panel and the comfort control panel. The ac voltage required to drive the "EL" panels is supplied by a small inverta-pak (power supply) located behind the instrument panel. The intensity of the "EL" panel lighting is controlled by a rheostat located on the instrument panel. These "EL" panels have an expected life of over 16,000 hours and no replacement should be necessary during the life of the aircraft.

17-86. TROUBLE SHOOTING - (Refer to 17-62.)

17-87. TRANSISTORIZED LIGHT DIMMING.

17-88. DESCRIPTION. The light dimming circuit consists of a three-circuit transistorized dimming assembly. System is controlled by two controls on the lower left hand side of the panel. The right hand control is a dual rheostat with a concentric knob arrangement. A three-circuit transistorized dimming assembly is installed with post lighting. The controls go from three to four. The center portion of the left control controls the post lights, the outer portion controls flood lights, the center portion of the right hand control controls EL panel lighting and the outer portion controls engine and radio lighting.

17-89. REMOVAL AND INSTALLATION. For removal and installation of transistorized dimming, refer to figure 17-12.

17-90. PEDESTAL LIGHTS.

17-91. DESCRIPTION. The pedestal lights consist of three post type lights mounted on the pedestal to illuminate the fuel selector handle, rudder and elevator trim controls. The pedestal lights are controlled by the instrument light rheostat.

17-92. REMOVAL AND INSTALLATION. For removal and installation of pedestal lamps, slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

17-93. INSTRUMENT POST LIGHTING.

17-94. DESCRIPTION. Individual post lighting may be installed as optional equipment to provide for nonglare instrument lighting. The post light consists of a cap and a clear lamp assembly with a tinted lens. The intensity of the instrument post lights is controlled by the instrument light dimming rheostat located on the switch 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.

17-95. REMOVAL AND INSTALLATION. For removal and replacement of the instrument post lamps, slide the cap and the lens assembly from the base. Slide the lamp from the socket and replace.

17-96. TROUBLE SHOOTING - POSTLIGHTING.

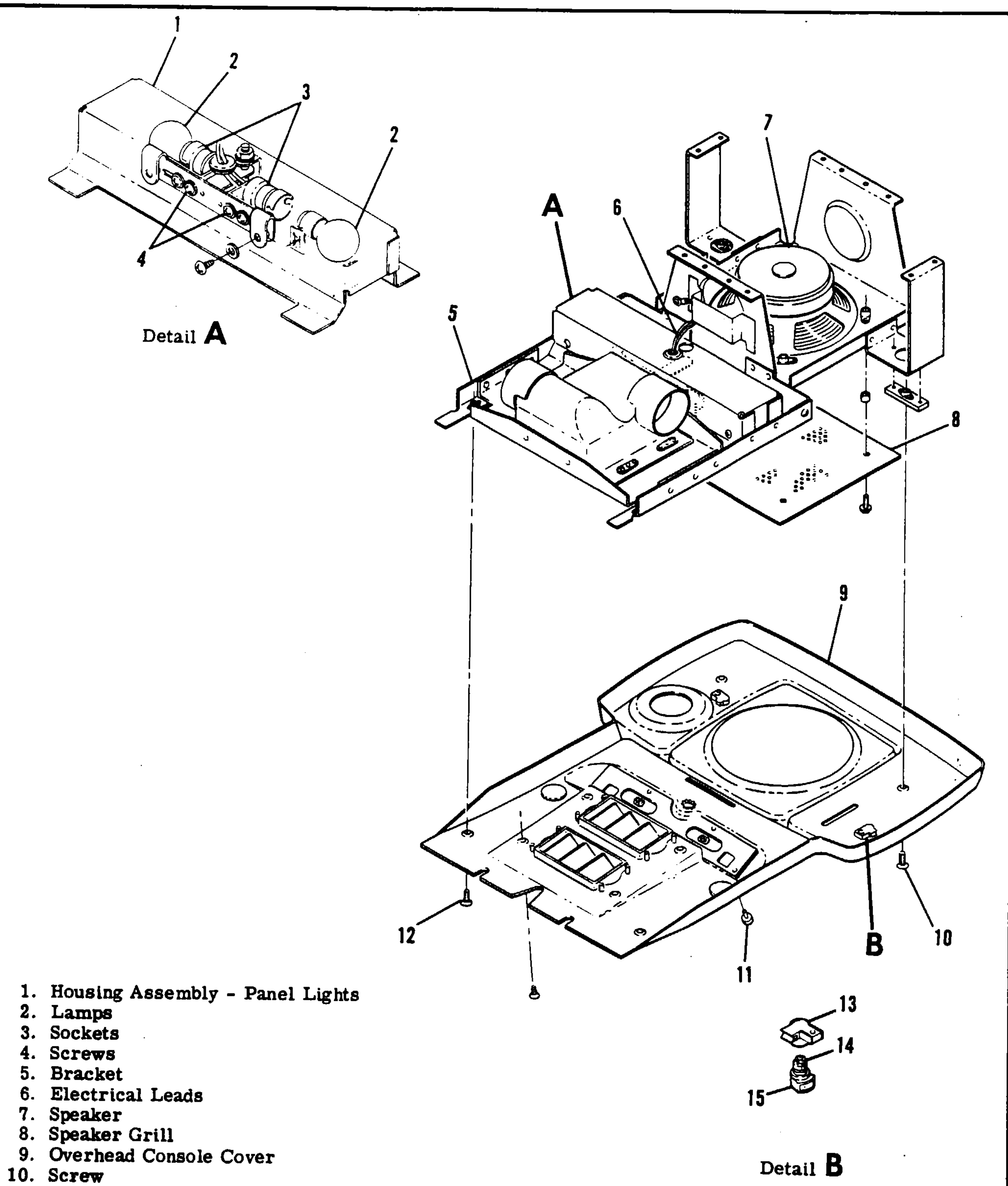
TROUBLE	PROBABLE CAUSE	REMEDY
LAMP WILL NOT LIGHT.	Defective lamp.	1. Test lamp with ohmmeter or replace with a new lamp. If lamp is OK, proceed to step 2.
	Defective socket or open circuit.	2. With switch on, test socket. If defective, replace socket or wiring.
ONE SECTION OF LAMPS WILL NOT LIGHT.	Defective 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 17-98.
	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 17-98. Replace rheostat and transistor.

17-97. 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.

17-98. OXYGEN LIGHTS.

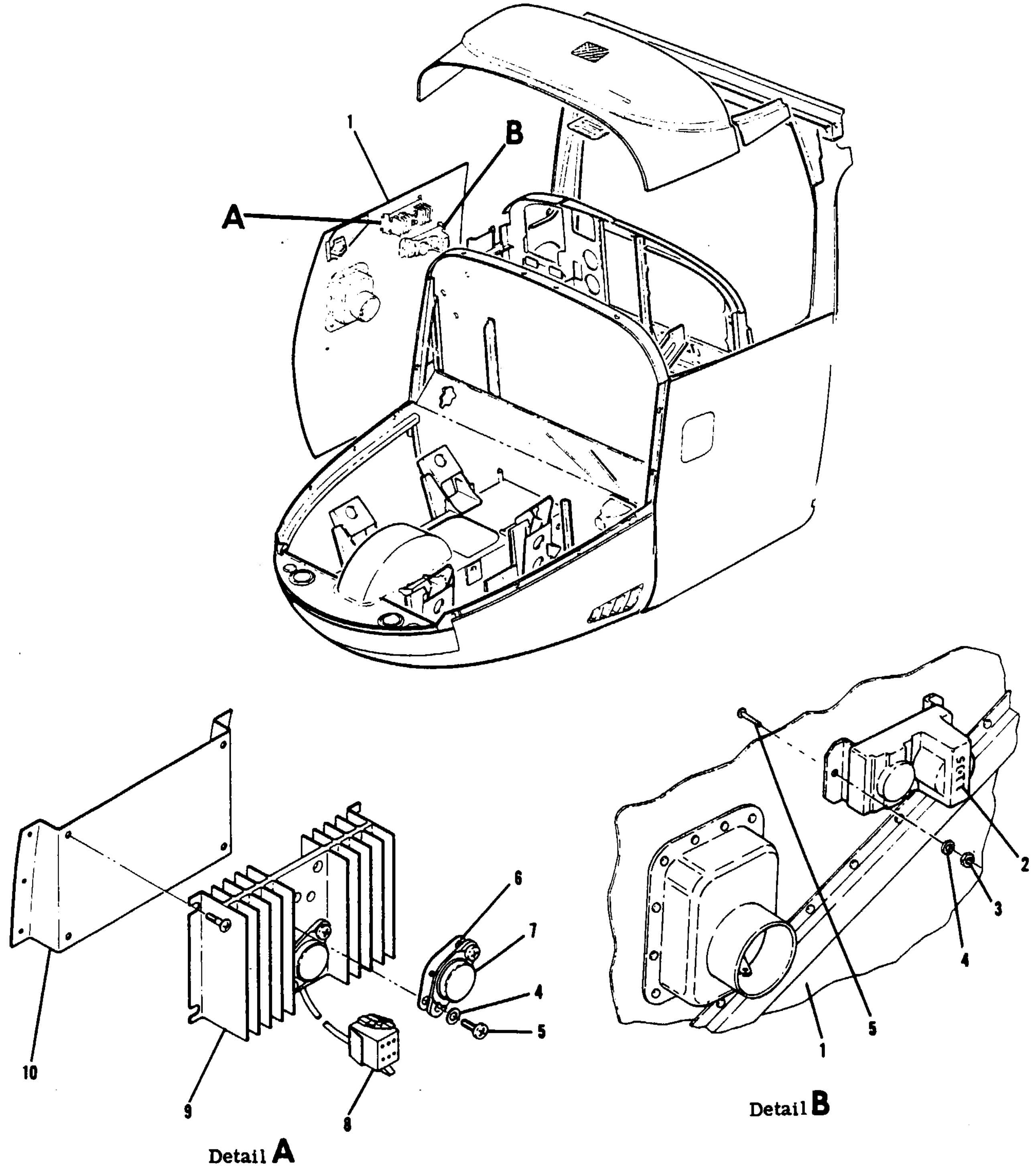
17-99. DESCRIPTION. The oxygen lights consist of two post type lights installed in the overhead oxygen console. The intensity of the oxygen lights is controlled by the radio light dimming rheostat located on the switch panel.

17-100. REMOVAL AND INSTALLATION. Refer to figure 17-11 and paragraph 17-94 for removal and installation of oxygen post lights.



1. Housing Assembly - Panel Lights
2. Lamps
3. Sockets
4. Screws
5. Bracket
6. Electrical Leads
7. Speaker
8. Speaker Grill
9. Overhead Console Cover
10. Screw
11. Slide Knob
12. Screw
13. Moutning Base
14. Lamp
15. Cap and Prism

Figure 17-11. Instrument Panel Light - Overhead Console



1. Left-hand Skin
2. Inverter
3. Nut
4. Washer
5. Screw
6. Mica Washer
7. Transistor
8. Housing - Socket
9. Heat Sink
10. Mounting Bracket

Figure 17-12. Transistorized Light Dimming and Electroluminescent Inverter Installations

17-101. COURTESY LIGHTS.

17-102. DESCRIPTION. The lights consist of one light located on the underside of each wing to provide ground lighting around the cabin area. The courtesy lights have clear lens and are controlled by a single slide switch labeled "Utility Lights," located on the left rear door post.

17-103. REMOVAL AND INSTALLATION. Refer to figure 17-13 for removal and installation of courtesy lights.

17-104. BAGGAGE COMPARTMENT LIGHT.

17-105. DESCRIPTION. The baggage compartment is illuminated by a lamp mounted in the top of the baggage compartment. The light is controlled by the "Utility Lights" switch located on the left door post.

17-106. REMOVAL AND INSTALLATION. (Refer to figure 17-16.)

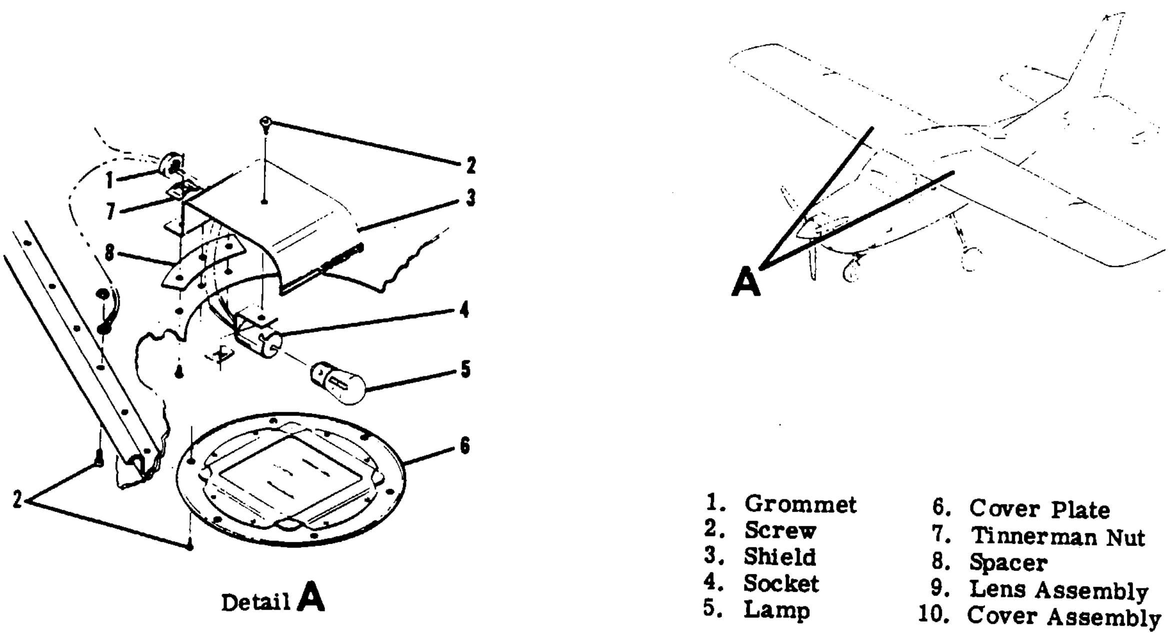
a. Ensure that the master switch is "OFF".
b. To gain access to the baggage compartment lamp, remove the screws attaching the retainer and lens to the reflector assembly.
c. Twist the lamp from the socket.
d. To replace the bulb, reverse this procedure.

17-107. INTERIOR LIGHTING

17-108. DESCRIPTION. Interior lighting consists of a dome light installed in the overhead console aft of rear wing spar. A slide switch located forward of the light controls the lamp.

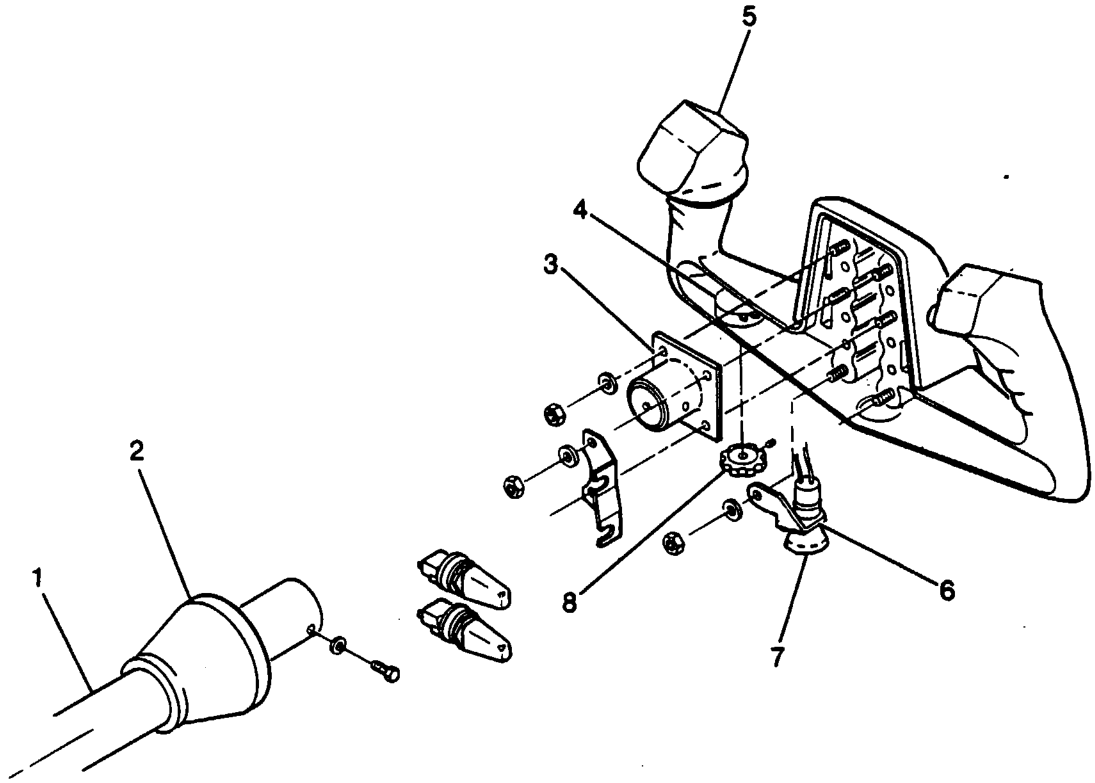
17-109. REMOVAL AND INSTALLATION.

a. Snap lens out of cover.
b. Remove lamp and replace with new lamp.
c. Reinstall lens.



1. Grommet
2. Screw
3. Shield
4. Socket
5. Lamp
6. Cover Plate
7. Tinnerman Nut
8. Spacer
9. Lens Assembly
10. Cover Assembly

Figure 17-13. Courtesy Light Installation



1. Control Tube Assembly
2. Cover
3. Adapter
4. Map Light Rheostat
5. Control Wheel
6. Map Light Assembly
7. Lamp
8. Knob (Map Light)

Figure 17-14. Control Wheel Map Light Installation

17-110. CONTROL WHEEL MAP LIGHT.

17-111. DESCRIPTION. The control wheel mwp light is internally mounted in the control wheel. A rheostat on the lower left hand side of the wheel controls the light.

17-112. **REMOVAL AND INSTALLATION. See figure 17-14.)**

a. For easy access to map light assembly, rotate control wheel 90 degrees.

b. To remove lamp, press in and rotate counterclockwise.

c. To remove rheostat, remove setscrew securing knob (8) and remove.

d. Disconnect electrical leads from rheostat (4).

e. Remove nut securing rheostat to control wheel (5) and remove rheostat and washer.

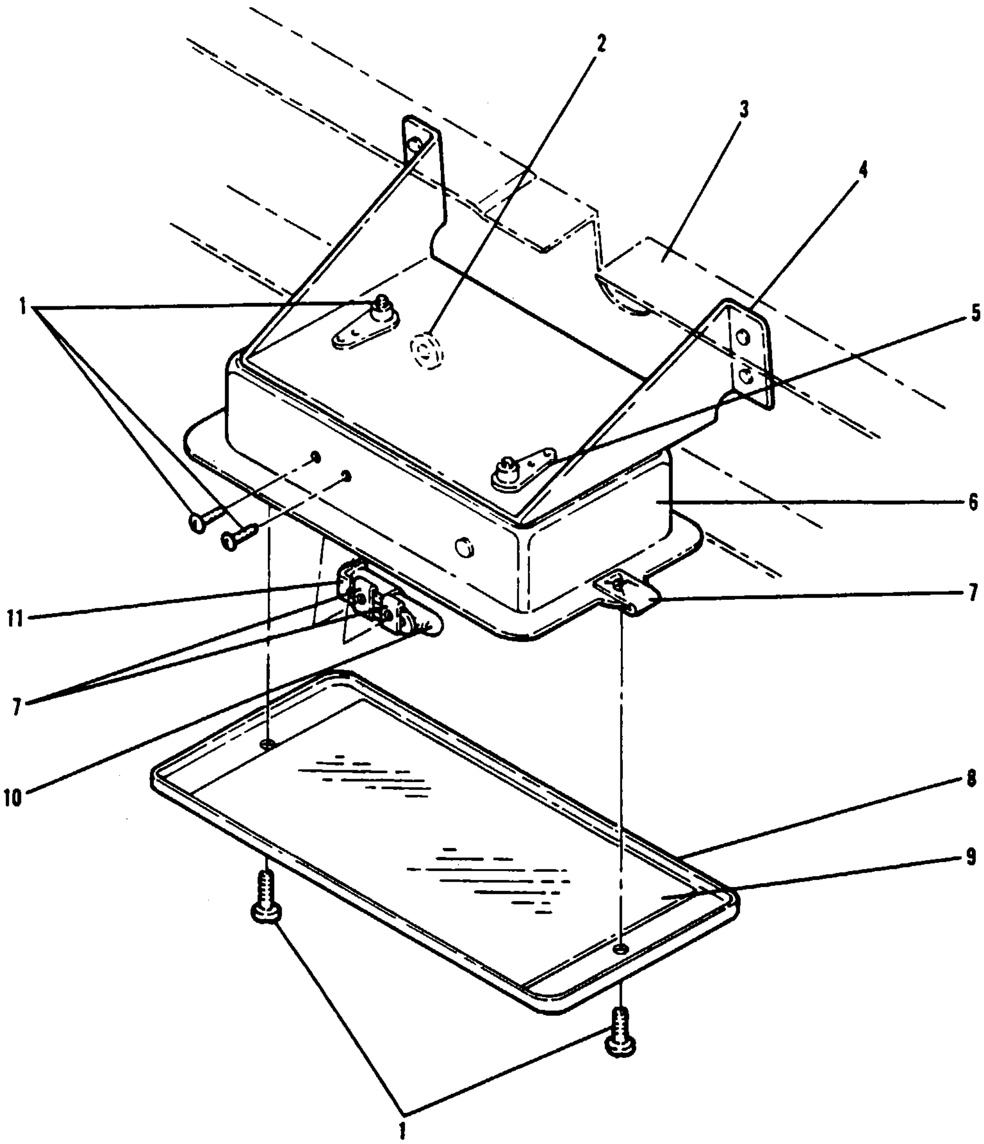
f. For reassembly reverse this procedure making sure to install washer between rheostat and control wheel.

17-113. **COMPASS AND RADIO DIAL LIGHTS.**

17-114. **DESCRIPTION. The compass and radio dial** lights are contained within the individual units. The light intensity is controlled by the instrument light dimming rheostat mounted on the lower left side of the instrument panel.

17-115. **STALL WARNING UNIT.**

17-116. **DESCRIPTION. A solid state warning unit is** installed on the right hand wing root rib. The warning siginal is transmitted through the radio speaker in the overhead console.



1. Screw
2. Grommet
3. Sta. 138 Bulkhead
4. Bracket
5. Nutplate
6. Reflector
7. Nut
8. Retainer
9. Lens
10. Lamp
11. Socket

Figure 17-15. Baggage Compartment Light Installation

17-117. REMOVAL AND INSTALLATION. Refer to figure 17-16 for removal and installation.

17-118. STALL WARNING SWITCH.

17-119. 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 at approximately five to ten miles per hour above the 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 slightly.

17-120. REMOVAL AND INSTALLATION. Refer to figure 17-16 for removal and installation.

17-121. PITOT AND STALL WARNING HEATERS.

17-122. DESCRIPTION. Electrical heater units are incorporated in some pitot tubes and stall warning switch units. The heaters offset the possibility of ice formation on the pitot tube and stall warning actuator switch. The heaters are integrally mounted in the pitot tube and stall warning actuator switch. Both heaters are controlled by the pitot heat switch.

17-123. REMOVAL AND INSTALLATION. Refer to figure 17-16 and 17-17 for removal and installation.

17-124. LANDING GEAR INDICATOR LIGHTS.

17-125. DESCRIPTION. The position of the landing gear is indicated by two press-to-test lamp assemblies mounted on the right side of the switch panel. The green light is on when all the wheels are down and locked; the amber is on when all the wheels are

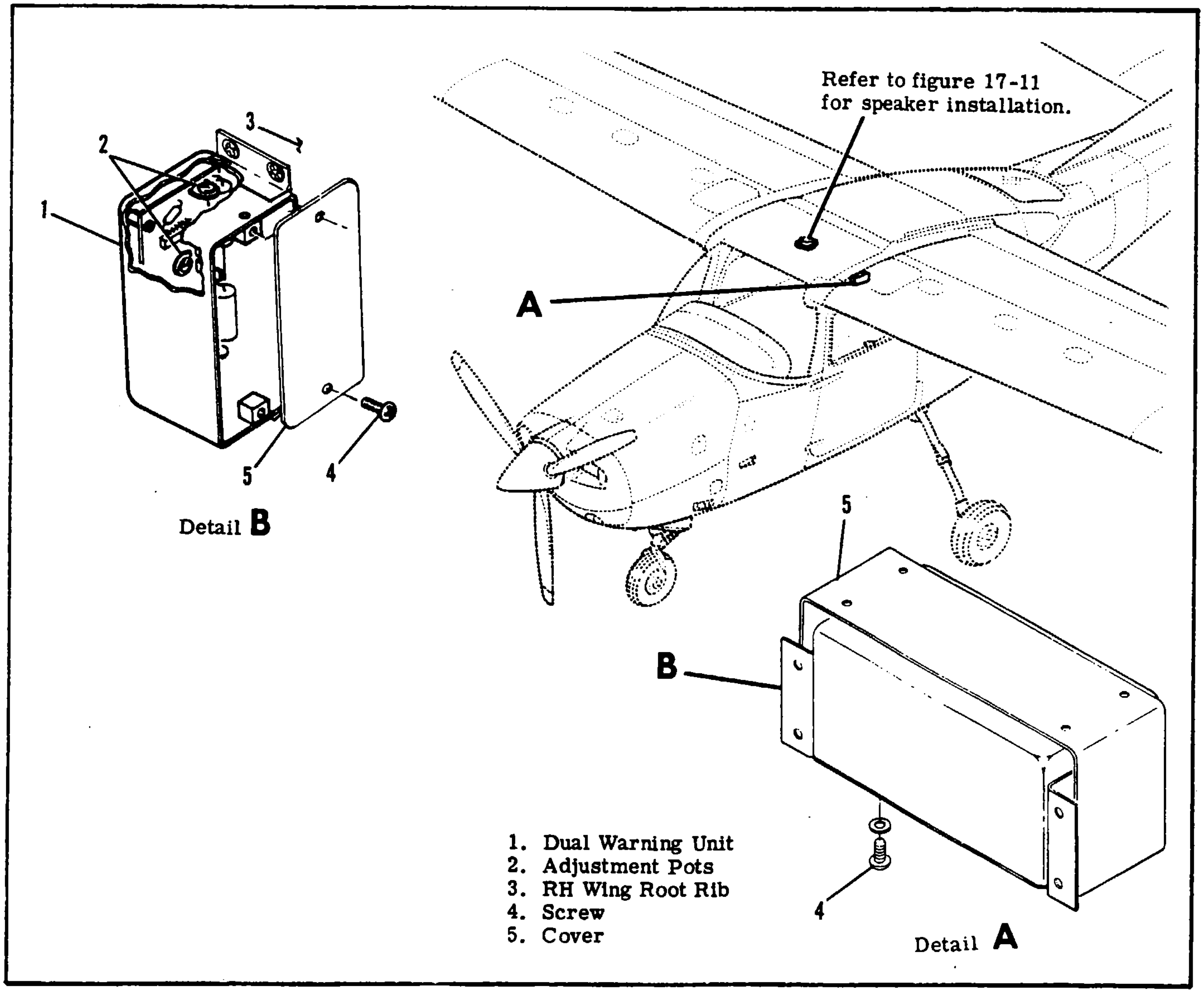


Figure 17-16. Stall Warning Unit

up and locked. If any wheel assumes an intermediate position of neither up and locked or down and locked, both lights will be dark. The hood of each light is removable for bulb replacement, and has a dimming shutter.

17-126. REMOVAL AND INSTALLATION.

a. Remove the hood on either light by unscrewing counterclockwise. The lamp bulb is in the hood and may be replaced by pulling it out and inserting a new lamp.

b. To remove the lamp socket assembly, remove the nut from the assembly on the front side of the panel.

c. Tag and unsolder the wires from the socket assembly.

d. To replace a lamp socket assembly, reverse the above procedure.

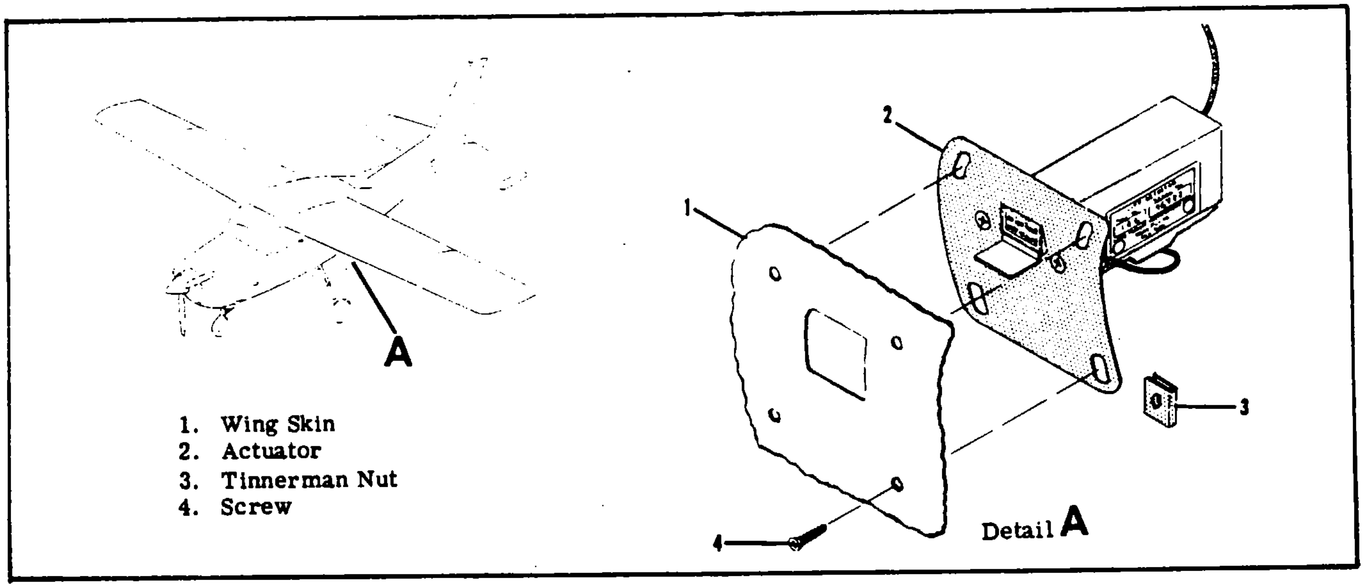


Figure 17-17. Stall Warning Switch

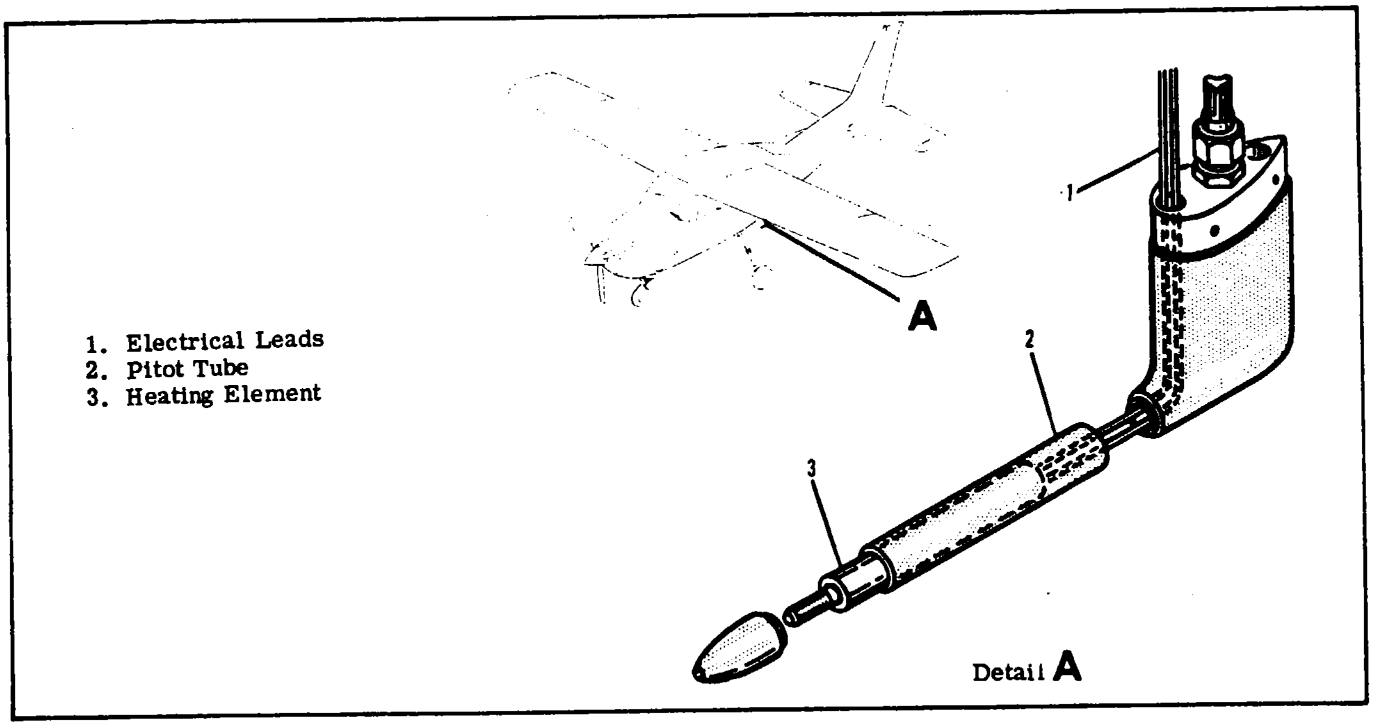


Figure 17-18. Pitot Heater

17-127. EMERGENCY LOCATOR TRANSMITTER.

17-128. 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 C589512-0103 transmitter is used on all aircraft.

The C589512-0103 transmits on 121.5 and 243.0 MHZ at 75 mw rated power output for 48 continuous hours in the temperature range of +131°F to -4°F (+55°C to -20°C).

Power is supplied to the transmitter by a battery-pack. The C589512-0107 alkaline battery-packs have the replacement date and date of installation on the top of the transmitter.

17-129. 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. or D.O.T. and or F.A.A. personnel.

17-130. OPERATIONAL TEST OF EMERGENCY LOCATOR TRANSMITTER. The ELT, its battery pack, and its antenna must be inspected and tested each 100 hours, or three months, which ever comes first. The operational test of the airplane's emergency locator system should check both radiated signal strength and the ELT G-switch. The airplane's VHF receiver is located very close to the ELT and is very sensitive. Consequently, using the airplane's VHF receiver to monitor ELT transmission does not provide same level of confidence in verifying ELT signal as using AM radio or performing control tower check.

CAUTION

Tests with the antenna connected should be approved by the nearest control tower. The FAA/DOT allows free space transmission tests from the airplane only within first five minutes after each hour. The test time allowed is limited to three sweeps of the warble tone or approximately one second. The control tower should be notified that a test is about to be conducted.

NOTE

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

a. Operational test of radiated signal with control tower monitoring.

(1) Turn airplane master switch ON.

(2) Verify that test is conducted within first five minutes of the hour.

(3) Turn airplane transceiver ON, request permission from nearest control tower and flight service station to conduct operational test of ELT, and request control tower monitoring.

(4) Place ELT function selector to the ON position for one second or less (no more than three sweeps of the audio signal). Immediately replace the ELT function selector to the ARM position after testing ELT.

(5) Contact control tower and confirm proper locator beacon operation.

(6) Restore switches to normal.

b. Operational test of radiated signal with handheld AM radio monitoring.

(1) Turn airplane master switch ON.

(2) Verify that test is conducted within first five minutes of the hour.

(3) Turn airplane transceiver ON and request permission from nearest control tower and flight service station to conduct operational test of ELT.

(4) Position a small hand held AM radio tuned to any frequency within six inches of the ELT antenna.

(5) Place ELT function selector to the ON position for one second or less (no more than three sweeps of the audio signal). Immediately replace the ELT function selector to the ARM position after testing ELT.

(6) Verify that ELT signal has been detected on hand held AM radio.

(7) Restore switches to normal.

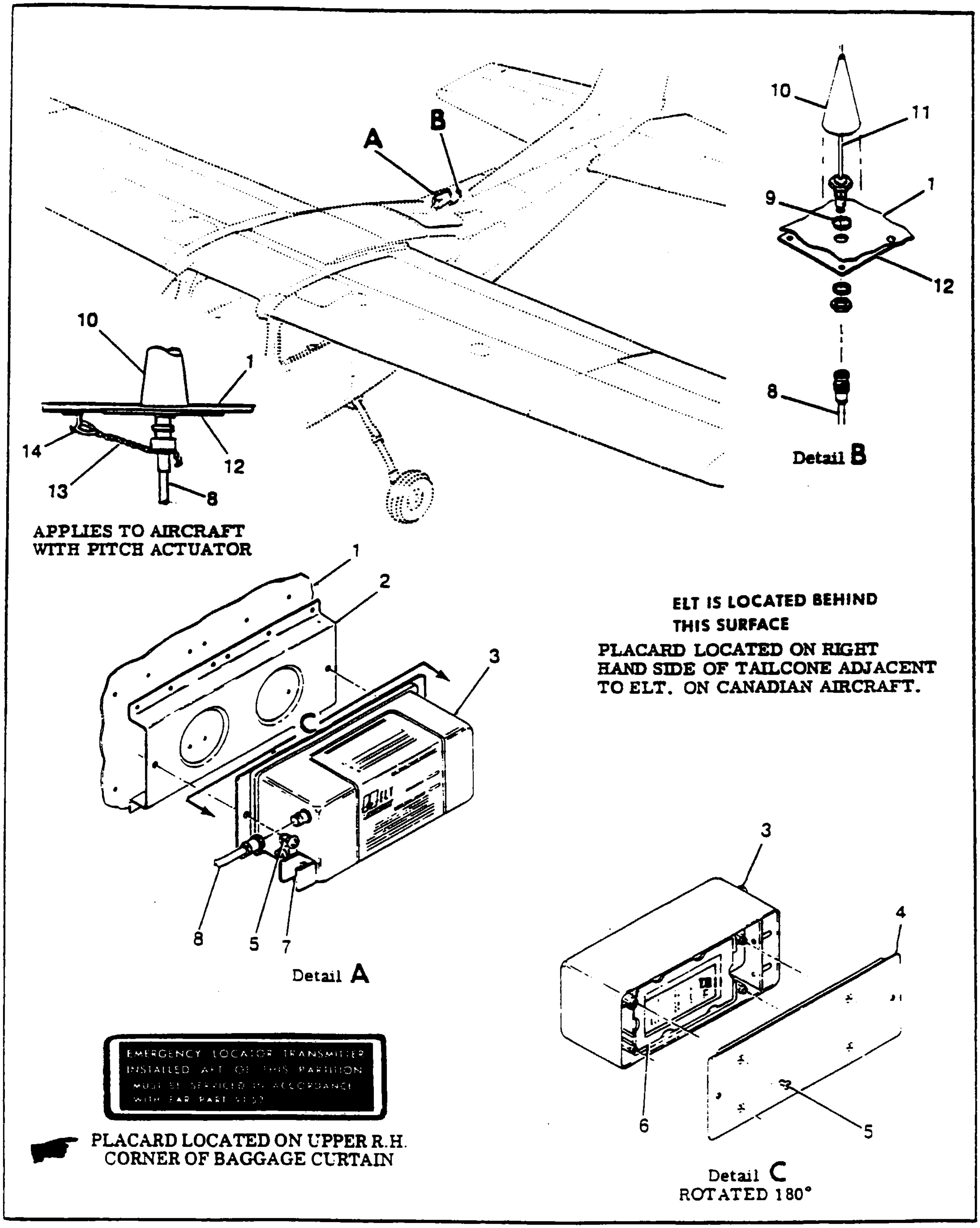


Figure 17-19. Emergency Locator Transmitter Installation

c. Operational test of the TSO-C91 ELT G-switch.
(1) Remove ELT from airplane.
(2) While holding ELT in one hand, sharply strike the end of the case in the direction of activation indicated on the case of the transmitter.
(3) Using either radiated signal test method described above, verify that the G-switch has been activated and ELT is transmitting.
(4) Reset the G-switch, and restore other disturbed switches to normal.
(5) Reinstall ELT in airplane.
d. Operational test of the TSO-C91a ELT G-switch.
(1) Remove ELT in airplane.
(2) While holding ELT firmly in one hand, make a throwing motion followed by a sudden reversal of the transmitter.
(3) Using either radiated signal test method described above, verify that the G-switch has been activated and ELT is transmitting.
(4) Reset the G-switch, and restore other disturbed switches to normal.
(5) Reinstall ELT in airplane.
e. 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.

17-131. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 17-19).
a. Remove baggage curtain to gain access to the transmitter and antenna.
b. Disconnect coaxial 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.

17-132. REMOVAL AND INSTALLATION OF ANTENNA. (See figure 17-19.)

a. Disconnect coaxial cable from base of antenna.

b. Remove the nut and lockwasher attaching the antenna base to the fuselage and the antenna will be free for removal.

c. To reinstall the antenna, reverse the preceding steps.

CAUTION

The C589511-0111 and C589511-0119 coaxial 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 C589512-0103 transmitters.

NOTE

Upon reinstallation of antenna, cement rubber boot (14) using RTV 102, General Electric Co. or equivalent, to antenna whip only; do not apply adhesive to fuselage skin or damage to paint may result.

17-133. REMOVAL AND INSTALLATION OF BATTERY PACK. (See figure 17-20.)

a. After transmitter has been removed from aircraft in accordance with para. 17-131, place 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 17-20.

e. Connect electrical connector as shown in figure 17-20.

NOTE

Before installing the C589511-0105 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 side 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. DO NOT use a substitute battery pack.

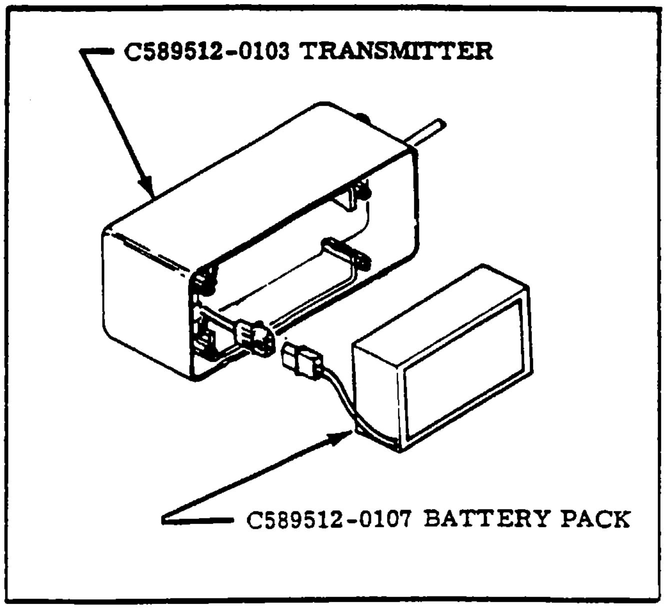


Figure 17-20. Battery Pack Installation.

17-134. **TROUBLE SHOOTING.** Should your Emergency Locating Transmitter fail the 100 Hours performance checks, it is possible to a limited degree to isolate the fault to a particular area of the equipment. In performing the following trouble shooting procedures to test peak effective radiated power, you will be able to determine if battery replacement is necessary or if your unit should be returned to your dealer for repair.

TROUBLE	PROBABLE CAUSE	REMEDY
*POWER LOW	Low battery voltage.	1. Set toggle switch to off. 2. Disconnect the battery pack from the transmitter and connect a Simpson 260 model voltmeter and measure voltage. If the battery pack transmitters 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 O.K. If the battery is O.K., chock 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 coaxial cable is faulty.
	Faulty coaxial antenna cable.	4. Check coaxial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced.

*This test should be carried out with the coaxial cable provided with your unit.

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS 1985	AMPS 1986
Battery Contactor	0.33	.33
Fuel Quantity Indicators	.05	.05
Engine Instruments	.10	.10
Flashing Beacon	7.0	7.0
Instrument Lights	2.2	1.0
EL Panels	0.3	.3
Lamp - Gear Up or Gear Down	0.04	.04
Position Lights	2.8	2.8
Turn Coordinator	0.30	.30
Turn & Bank Indicator (Optional)	0.24	.24
Alternator Control Unit	2.0	2.0
OPTIONAL EQUIPMENT (RUNNING LOAD)		
Heated Pitot and Stall Warning Heaters	5.8	5.8
Windshield Anti-Ice	4.4	4.4
Wing De-Ice	3.0	3.0
Propeller Anti-Ice	18.0 ●	18.0 ●
Strobe Lights	2.0	2.0
Post Lights	0.8	.8
Internal Instrument Lights		
Prop. De-Ice Ammeter	.02	.02
Encoding Altimeter	.08	.08
Radio Magnetic Indicator	.04	.04
T/EGT	.04	.04
Terrz TRA 2500 Radar Altimeter Indicator	.05	.05
ADF Indicator	.08	.08
Gyro Horizon (Autopilot)	.20	.20
Directional Gyro (Autopilot)	.20	.20
Air Speed	.05	.05
Vert Speed	.05	.05
Suction Gage	.05	.05
Man. Press/Fuel Flow	.05	.05
Tachometer	.05	.05
Digital Clock	.04	.04
Fuel Gage	.04	.04
Amp-Oil	.04	.04
Cyl Head-Oil Temp	.04	.04
Compass Lt	.04	.04
Cessna 200A Navomatic (Type AF-295B)	2.5	——
Cessna 300 ADF (Type R-546E)	1.0	1.0
Cessna 300 Transponder (Type RT-359A)	2.0	2.0
Cessna 300A Navomatic (Type AF-395A)	2.5	——
Cessna 300 Nav/Com (RT-385A)	1.0 ☆	1.0 ☆
Cessna 400 ADF (Type R-446A)	1.6	1.6
Cessna 400 Nav/Com (RT-485A, RT-485B)	1.6 ☆	1.6 ☆
Cessna 400 Transponder (RT-459A)	2.0	2.0
Cessna 400 Encoder Altimeter (EA-401A)	0.1	0.1
Cessna 400 Marker Beacon (Type R-402A, R-402B)	0.1	0.1
Sunair SSB Transceiver (Type ASB-125)	2.5 ☆	2.5 ☆
Altitude Alert/Select (AA-801A)	0.6	0.6
Cessna 400B IFCS (Type IF-550A) (Includes HSI & Course Datum)	6.0	6.0
Sperry RT-377A DME	0.3	0.3

OPTIONAL EQUIPMENT (RUNNING LOAD)	AMPS 1985	AMPS 1986
Cessna 400B Nav-O-Matic (Type AF-550A)	5.0	5.0
With Slaved Directional Gyro System (CS-504A)	5.2	5.2
With Unslaved HSI(IG-832C)	5.3	5.3
With Slaved HSI System (CS-832A)	5.8	5.8
With Slaved HSI & Course Datum (CS-832A)	6.0	6.0
Cessna 400 DME (RT-477A)	1.50	1.50
Cessna 400 R-Nav (RN-479A)	1.00	1.00
EC-100 Stereo	1.0	1.00
Bonzer Radar Altimeter (TERRA)	0.5	.50
Altitude Encoder (Blind)	0.10	.10
High Altitude Encoder (Blind)	0.10	.10
De-Ice System (Certified for Flight in Icing Conditions)	40.65	40.65
RDR-160 Weather Radar	3.5	3.50
Cessna 400 Glideslope (Type R-443B)	0.5	0.5
400 RMI	0.4	0.4
Avionics Cooling Fan	1.0	1.0
Interphone System	†	†
Primus 100 WX Radar	2.0	2.0
King KRA-10A Radar Altimeter	0.20	0.20
King KMA-24-03 Audio Panel W/MKR	0.1	0.16
King KX-165 Nav/Comm W/GS	0.4	0.40
King KY-196 Comm Transceiver	0.4	0.40
King KNS-81 RNAV/G.S.	.50	.50
King KN-63 DME	.60	.60
King KR-87 ADF	.43	.43
King KT-79 Transponder	.36	.36
King KI-229 RMI	1.00	1.00
King KT-96 Radio Telephone	0.50	0.50
King KWX-56 Color WX Radar	3.0	3.00
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD		
Cessna 300 Nav/Com (RT-385A)	2.3✪	2.3✪
Cessna 400 Nav/Com (RT-485A, RT-485B)	2.3✪	2.3✪
ASB-125 SSB HF Transceiver	7.5✪	7.5✪
Auxiliary Fuel Pump	3.0	3.0
Flap Motor	1.8	1.8
Landing Lights (Each)	3.6 EA	3.6 EA
Stall Warning Horn	.40	.40
Standby Vacuum System	13.0	13.0

ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD	AMPS 1985	AMPS 1986
Wing Courtesy Lights and Cabin Lights	1.5	1.5
Ice Detector Light	1.5	1.5
Hydraulic Power Pack	14.0	14.0
Electric Elevator Trim	.51	.51
Map Light (Glare Shield or Control Wheel)	0.1	0.10
Recognition Lights	3.6	3.6
Air Conditioning	22.8	22.8
King KX165	4.5	4.5
King KY196	5.0	5.0

†Negligible

● In flight running load ✪ Transmit ☆ Receive

SECTION 18

STRUCTURAL REPAIR

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Wing Ribs	3A5/18-3
Negligible Damage	3A5/18-3
Repairable Damage	3A5/18-3
Damage Necessitating Replacement of Parts	3A5/18-3
Wing Spars	3A5/18-3
Negligible Damage	3A5/18-3
Repairable Damage	3A5/18-3
Damage Necessitating Replacement of Parts	3A5/18-3
Wing Fuel Bay Spars/Ribs	3A5/18-3
Negligible Damage	3A5/18-3
Repairable Damage	3A5/18-3
Damage Necessitating Replacement of Parts	3A5/18-3
Ailerons	3A5/18-3
Negligible Damage	3A5/18-3
Repairable Damage	3A5/18-3
Damage Necessitating Replacement of Parts	3A5/18-3
Aileron Balancing	3A5/18-3
Wing Flaps	3A6/18-4
Negligible Damage	3A6/18-4
Repairable Damage	3A6/18-4
Damage Necessitating Replacement of Parts	3A6/18-4
Wing Leading Edges	3A6/18-4
Negligible Damage	3A6/18-4
Repairable Damage	3A6/18-4
Damage Necessitating Replacement of Parts	3A6/18-4
Elevators and Rudder	3A6/18-4
Negligible Damage	3A6/18-4
Repairable Damage	3A6/18-4
Damage Necessitating Replacement of Parts	3A6/18-4
Elevator/Rudder Balancing	3A6/18-4
Fin and Stabilizer	3A6/18-4
Negligible Damage	3A6/18-4
Repairable Damage	3A6/18-4
Damage Necessitating Replacement of Parts	3A6/18-4
Bonded Doors	3A6/18-4
Repairable Damage	3A6/18-4
Fuselage	3A6/18-4
Description	3A6/18-4
Negligible Damage	3A7/18-5
Repairable Damage	3A7/18-5
Damage Necessitating Replacement of Parts	3A7/18-5
Bulkheads	3A7/18-5
Landing Gear Bulkheads	3A7/18-5
Repair After Hard Landing	3A7/18-5
Firewall Damage	3A7/18-5
Fasteners	3A7/18-5
Rivets	3A7/18-5
Replacement of Hi-Shear Rivets	3A8/18-6
Substitution of Rivets	3A8/18-6
Baffles	3A11/18-9
Engine Cowling	3A11/18-9
Repair of Cowling Skins	3A11/18-9
Repair of Reinforcement Angles	3A12/18-10
Repair of Glass-Fiber Constructed Components	3A12/18-10
Corrosion and Corrosion Control	3A12/18-10

18-1. STRUCTURAL REPAIR.

18-2. REPAIR CRITERIA. Although this section outlines repair permissible on structure of the aircraft, the decision of whether to repair or replace a major unit of structure will be influenced by such factors as time and labor available and by a comparison of labor costs with the price of replacement assemblies. Past experience indicates that replacement, in many cases, is less costly than major repair. Certainly, when the aircraft must be restored to its airworthy condition in a limited length of time, replacement is preferable. Restoration of a damaged aircraft to its original design strength, shape and alignment involves careful evaluation of the damage, followed by exacting workmanship in performing the repairs. This section suggests the extent of structural repair practicable on the aircraft and supplements Federal Aviation Regulation, Part 43. Consult the factory when in doubt about a repair not specifically mentioned here.

18-3. EQUIPMENT AND TOOLS.

18-4. SUPPORT STANDS. Padded, reinforced sawhorse or tripod type support stands, sturdy enough to support any assembly placed upon them, must be used to store a removed wing or tailcone. Plans for local fabrication of support stands are contained in figure 18-1. The fuselage assembly, from the tailcone to the firewall, must NOT be supported from the underside, since the skin bulkheads are not designed for this purpose. Adapt support stands to fasten to the wing-attach points or landing gear attach-points when supporting a fuselage.

18-5. FUSELAGE REPAIR JIGS. Whenever a repair is to be made which could affect structural alignment, suitable jigs must be used to assure correct alignment of major attach points, such as fuselage, firewall, wing and landing gear. These fuselage repair jigs are obtainable from the factory.

18-6. WING JIGS. These jigs serve as a holding fixture during extensive repair of a damaged wing, and locates the root rib, leading edge and tip rib of the wing. These jigs are also obtainable from the factory.

18-7. 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 repaired unless otherwise noted. It is often practical to cut repair pieces from service parts listed in the Parts Catalog. A few components (empennage tips, for example) are fabricated from thermo-formed plastic or glass fiber constructed material.

18-8. WING TWIST AND STABILIZER ANGLE-OF-INCIDENCE. Wing twist (washout) and stabilizer angle of incidence are shown below. Stabilizers do not have twist. The cantilever wing has a uniform twist from the root rib to the tip rib. Refer to figure 18-2 for wing twist measurement.

WING	
Twist (Washout)	3°
STABILIZER	
Angle-of-incidence	-3° ± 15'

18-9. WING.

18-10. DESCRIPTION. The wing is sheet-metal constructed, with a single main spar, two fuel spars, formed ribs and stringers. The front fuel spar also serves as an auxiliary spar and is the forward wing attaching point. An inboard section forward of the main spar is sealed to form an integral fuel bay area. The main spar consists of milled spar caps and attaching fittings joined by a web section. The aft fuel spar is a formed channel. The front fuel spar is a built-up assembly consisting of a formed channel, doubler, attach strap and support angle. Stressed skin, riveted to the ribs, spars and stringers, completes the wing 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 the flap and aileron bellcranks, flap drive pulleys, flap actuator in left wing, flap and aileron control cable disconnect points, fuel adapter plate, air scoop connectors and electrical wiring.

18-11. WING SKIN.

18-12. 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 any area of the wing. Outboard of wing station 40.00 in areas of low stress intensity, cracks, deep scratches or sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines and material edges. The area on the lower surface of the wing between the two stringers adjacent to the main spar is not considered low stress intensity. Stop drilling is considered a temporary repair and a permanent repair should be made as soon as practicable.

18-13. REPAIRABLE DAMAGE. Repairs must not be made to the upper or lower wing skin inboard of station 40.00 without factory approval. However, an entire skin may be replaced without factory approval. Refer to Section 1 for wing station locations. Figure 18-4 outlines typical repairs to be employed in patching skin. Before installing a patch, trim the damaged area to form a rectangular pattern, leaving at least a one-half inch radius at each corner and deburr. 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 opoxy type filler may be used at such joints.

18-14. 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 existing structural members and each seam must be made exactly the same in regard to rivet size, spacing and pattern as the manufactured seams at the edges of the original sheet. If the manufactured seams are different, the stronger must be copied. If the repair ends at a structural member where no seam is used, enough repair panel must be used to allow an extra row of staggered rivets, with sufficient edge margin, to be installed.

18-15. WING STRINGERS.

18-16. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-17. REPAIRABLE DAMAGE. Figure 18-5 outlines a typical wing stringer repair. Two such repairs may be used to splice a new section of stringer material in position, without the filler material.

18-18. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a stringer is so badly damaged that more than one section must be spliced, replacement is recommended.

18-19. WING RIBS.

18-20. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-21. REPAIRABLE DAMAGE. Figure 18-6 illustrates typical wing rib repairs.

18-22. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Any wing rib damaged extensively should be replaced. However, due to the necessity of disassembling so much of the wing in order to replace a rib, especially in the fuel bay area which involves sealing, wing ribs should be repaired if practicable.

18-23. WING SPAR.

18-24. NEGLIGIBLE DAMAGE. Due to the stresses which the wing spar encounters, very little damage can be considered negligible. Smooth dents, light scratches and abrasions may be considered negligible.

18-25. REPAIRABLE DAMAGE. All cracks, stress wrinkles, deep scratches and sharp dents must be repaired. However, repairs must not be made to the main wing spar inboard of wing station 155.00 without factory approval. Refer to Section 1 for wing station locations. Figure 18-7 outlines a typical main wing spar repair.

18-26. DAMAGE NECESSITATING REPLACEMENT OF PARTS. An entire wing spar may be replaced without factory approval.

18-27. WING FUEL BAY SPARS AND RIBS.

18-28. NEGLIGIBLE DAMAGE. Any smooth dents in the fuel spars 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 any area of the spar.

18-29. REPAIRABLE DAMAGE. The type of repair outlined in figure 18-7 also applies to fuel bay spars outboard of wing station 124.0. Inboard of station 124.0, factory approval of proposed repairs is required. Refer to Section 13 for sealing procedures when working in fuel bay areas.

18-30. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Due to the amount of fuel bay sealant which must be removed from fuel bay components to facilitate repair, individual parts are not available to replace fuel bay spars or ribs. The entire fuel bay area must be replaced as a unit.

18-31. AILERONS.

18-32. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-33. REPAIRABLE DAMAGE. The repair shown in figure 18-8 may be used to repair damage to aileron leading edge skins. The flush-type skin patches shown in figure 18-4 may be used to repair damage to the remaining skins. Following repair, the aileron must be balanced. Refer to paragraph 18-35 and figure 18-3 for balancing the aileron.

18-34. 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 or replacement, balance aileron in accordance with paragraph 18-35 and figure 18-3.

18-35. AILERON BALANCING. Following repair, replacement or painting, the aileron must be balanced. A flight control surface balancing fixture kit is available (P/N 5180002-1). See figure 18-3 for procedures pertaining to the use of this kit.

18-36. WING FLAPS.

18-37. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-38. REPAIRABLE DAMAGE. Flap repairs should be similar to aileron repairs discussed in paragraph 18-33. A flap leading edge repair is shown in figure 18-9.

18-39. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Flap repairs which require replacement of parts should be similar to aileron repairs discussed in paragraph 18-34. Since the flap is not considered a movable control surface, no balancing is required.

18-40. WING LEADING EDGE.

18-41. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-42. REPAIRABLE DAMAGE. A typical leading edge skin repair is shown in figure 18-8. Also, wing skin repairs, outlined in paragraph 18-13, may be used to repair leading edge skins, although the flush-type patches should be used. Extra access holes, described in figure 18-10, must not be installed in the wing without factory approval. Where extreme damage has occured, replace complete skin panels.

18-43. DAMAGE NECESSITATING REPLACEMENT OF PARTS. An entire leading edge skin may be replaced without factory approval.

18-44. ELEVATORS AND RUDDER.

18-45. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12. 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.

18-46. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Following repair, the elevators and rudder must be balanced. Refer to paragraph 18-48 and figure 18-3 for balancing the elevators and rudder. If damage would require a repair which could not be made between adjacent ribs, see the following paragraph.

18-47. 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 occured, replacement of the entire assembly is recommended. After repair and/or replacement, balance elevators and rudder in accordance with paragraph 18-48 and figure 18-3.

18-48. 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/N 5180002-1). See figure 18-3 for procedures pertaining to the use of this kit.

18-49. FIN AND STABILIZER.

18-50. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-51. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Access to the dorsal area of the fin may be gained by removing the horizontal closing rib at the bottom of the fin. Access to the internal fin structure is best gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. Access to the stabilizer structure may be gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. If the damaged area would require a repair which could not be made between adjacent ribs, or a repair would be located in an area with compound curves, see the following paragraph.

18-52. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, or the repair would be located in an area with compound curves, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where damage is extensive, replacement of the entire assembly is recommended.

18-52A. BONDED DOORS.

18-52B. REPAIRABLE DAMAGE. Bonded doors may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in doors may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43.13-1 are also applicable to bonded doors.

18-53. FUSELAGE.

CAUTION

Repairs must not be made to the main wing spar carry-thru section of the cantilever wing without factory approval.

18-54. DESCRIPTION. The fuselage is of semi-monocoque construction consisting of formed bulkheads, longitudinal stringers, reinforcing channels and skin platings.

NOTE

When the airplane was manufactured, provisions were incorporated into the fuselage structure to ensure airflow beneath the fuselage cannot enter the cabin. These provisions include an airscoop in the vertical stabilizer and various scoops in the lower fuselage to equalize interior pressures, sealed floorboard inspection cover plates and tailcone hat section stringers, sealant applied to structure in main landing gear wheel well area and forward doorpost area bulkhead gaps, etc. Following any structural repairs to the fuselage, it is very important to restore these provisions to factory standards. See figure 3-2 for details.

18-55. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12. 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 area, wrinkles occuring 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 occuring in the skin of the main landing gear bulkhead areas must not be considered negligible. The skin panel must be opened sufficiently to permit a thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

Wrinkles occuring on open areas which disappear when the rivets at the edge of the sheet are removed, or a wrinkle which is hand removable, may often be repaired by the addition of a 1/2 x 1/2 x .060 inch 2024-T4 extruded angle, riveted over the wrinkle and extended to within 1/16 to 1/8 inch of the nearest structural members. Rivet pattern must be identical to the existing manufactured seam at the edge of the sheet.

18-56. REPAIRABLE DAMAGE. Fuselage skin repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 18-13. Stringers, formed skin flanges, bulkhead channels and similar parts may be repaired as shown in figure 18-5.

18-57. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Fuselage skin major repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 18-14. Damaged fittings must be replaced.

18-58. BULKHEADS.

18-59. LANDING GEAR BULKHEADS. Since these bulkheads are highly stressed members irregularly formed to provide clearance for control lines, actuators, fuel lines, etc., 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 such damage must be repaired by replacing the landing gear support assembly as an aligned unit.

18-60. 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 carefully examined and all support forgings must be checked for cracks, using a dye penetrant and proper magnification. Bulkheads in the area of possible damage must be checked for alignment and a straightedge must be used to determine deformation of the bulkhead webs. Damaged support structure, buckled floorboards and skins and damaged or questionable forgings must be replaced.

18-61. FIREWALL DAMAGE. Firewalls may be repaired by removing the damaged material and splicing in a new section. The new portion must be lapped over the old material, sealed with Pro-Seal #700 (Coast Pro-Seal Co., Chemical Division, 2235 Beverly Blvd., Los Angeles, California) compound, or equivalent and secured with MS16535 (steel) or MS-20613 (corrosion-resistant steel) rivets. The heater valve assembly is attached with MS16535 and MS-20613 rivets. Firewall plates, firewall doublers, and nutplates are attached to the firewall with MS-20470 (aluminum) rivets. Damaged or deformed angles and stiffeners may be repaired as shown in figure 18-11, or they may be replaced. A severely damaged firewall must be replaced as a unit.

18-62. 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.

18-63. 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 reaily 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.

18-64. 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.

18-65. 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 replacement. 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	.063	NAS1399B4, NAS1399D4
(Countersunk)	.040	NAS1769D4, CR3212-4
(See Note 1)	.025	NAS1769B4, NAS1739E4, CR3242-4

Replace	In thickness (or thicker)	With
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
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.

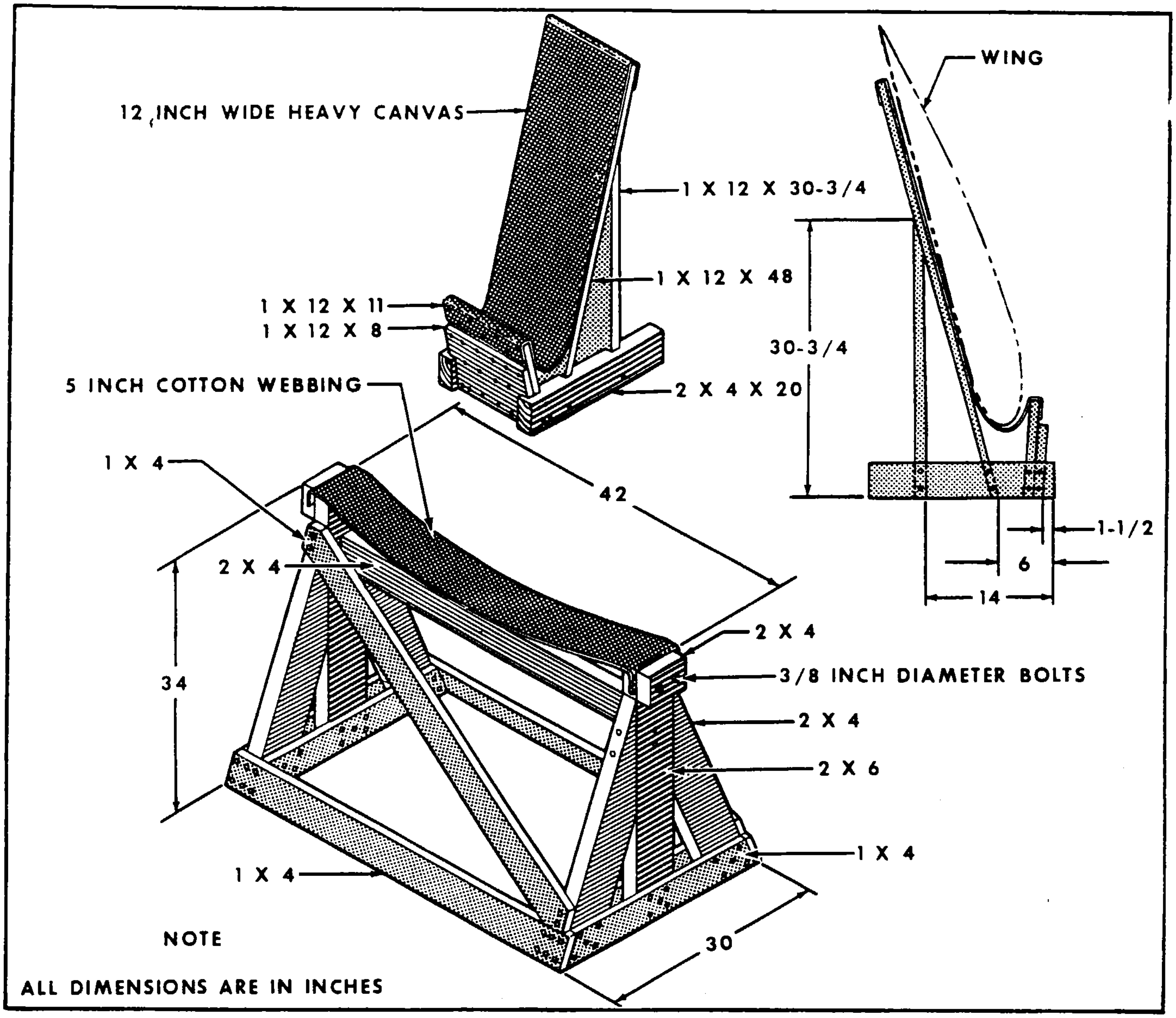
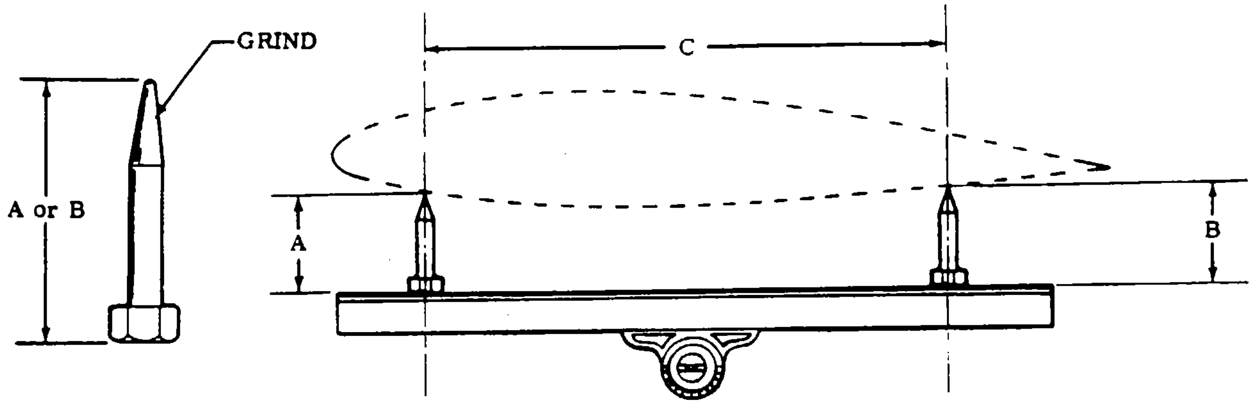


Figure 18-1. Wing and Fuselage Support Stands

18-66. BAFFLES. Baffles ordinarily require replacement if damaged or cracked. However, small plate reinforcements riveted to the baffle will often prove satisfactory both to the strength and cooling requirements of the unit.

18-67. ENGINE COWLING.

18-68. REPAIR OF COWLING SKINS. If extensively damaged, complete sections of cowling must be replaced. Standard insert-type 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. Bonded cowling may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in cowling may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in Advisory Circular 43.13-1 are also applicable to cowling.



A	B	C	WING STATION
2.00 .75	2.00 2.00	40.50 25.50	26.50 205.00

ALL WING TWIST OCCURS BETWEEN STA. 26.50 AND STA. 205.00.

CHECKING WING TWIST

If damage has occured 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 (42" minimum length of angle or equivalent), three modified bolts and a protractor head with level.

1. Check chart for applicable dimension for bolt length (A or B).
2. Grind bolt shanks to a rounded point as illustrated, checking length periodically.
3. Tape two bolts to straightedge according to dimension C.
4. Locate inboard wing station to be checked and make a pencil mark approximately one-half inch aft of first lateral row of rivets, aft of wing leading edge.
5. Holding straightedge parallel to wing station, (staying as clear as possible from "cans"), place 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 outboard 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 18-2. Checking Wing Twist

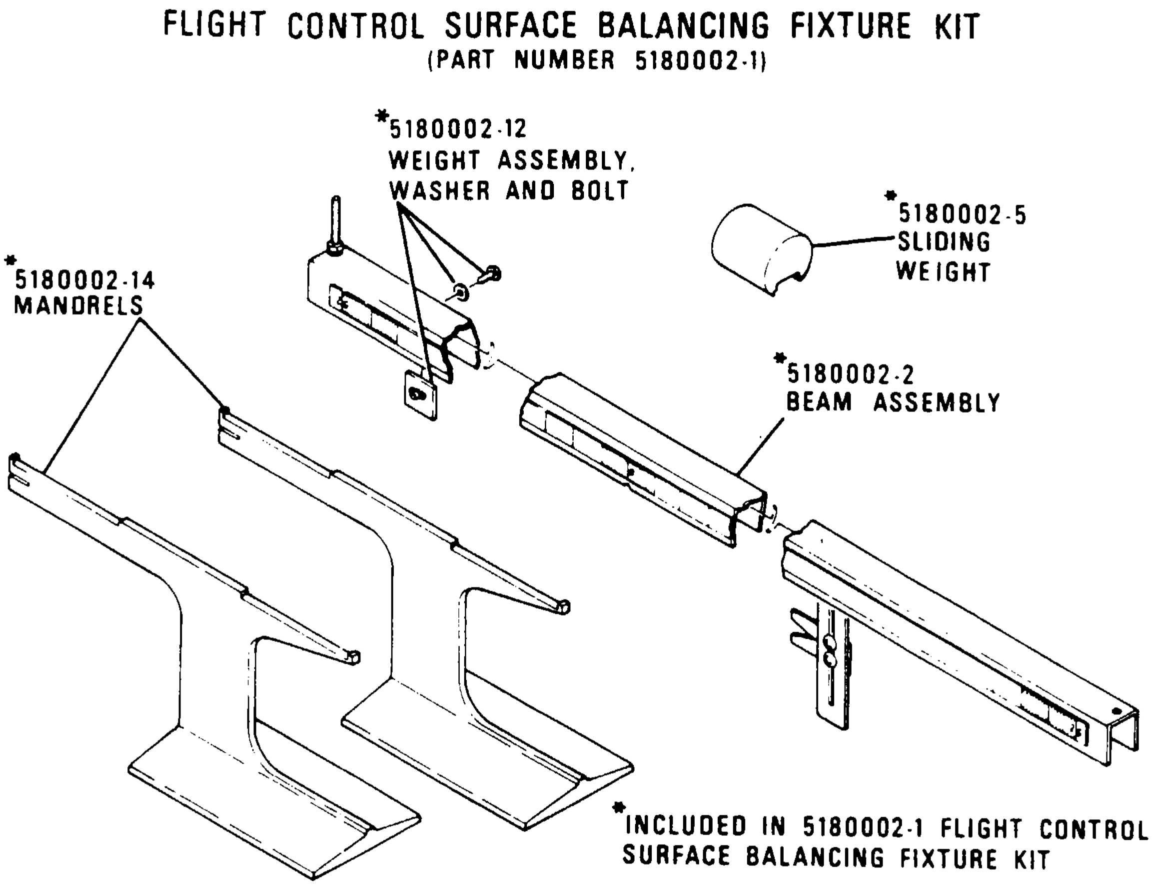
18-69. REPAIR OF REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to their small size they are easier to replace than to repair.

18-70. REPAIR OF GLASS-FIBER CONSTRUCTED COMPONENTS. Glass-fiber constructed components on the aircraft may be repaired as stipulated in instructions furnished in 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 give getter 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 the Cessna Supply Division.

18-71. CORROSION AND CORROSION CONTROL.

NOTE

For information on corrosion and corrosion control for aircraft, refer to FAA Advisory Circular AC43-4.



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 18-2. Control Surface Balancing (Sheet 1 of 5)

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 necessary 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.

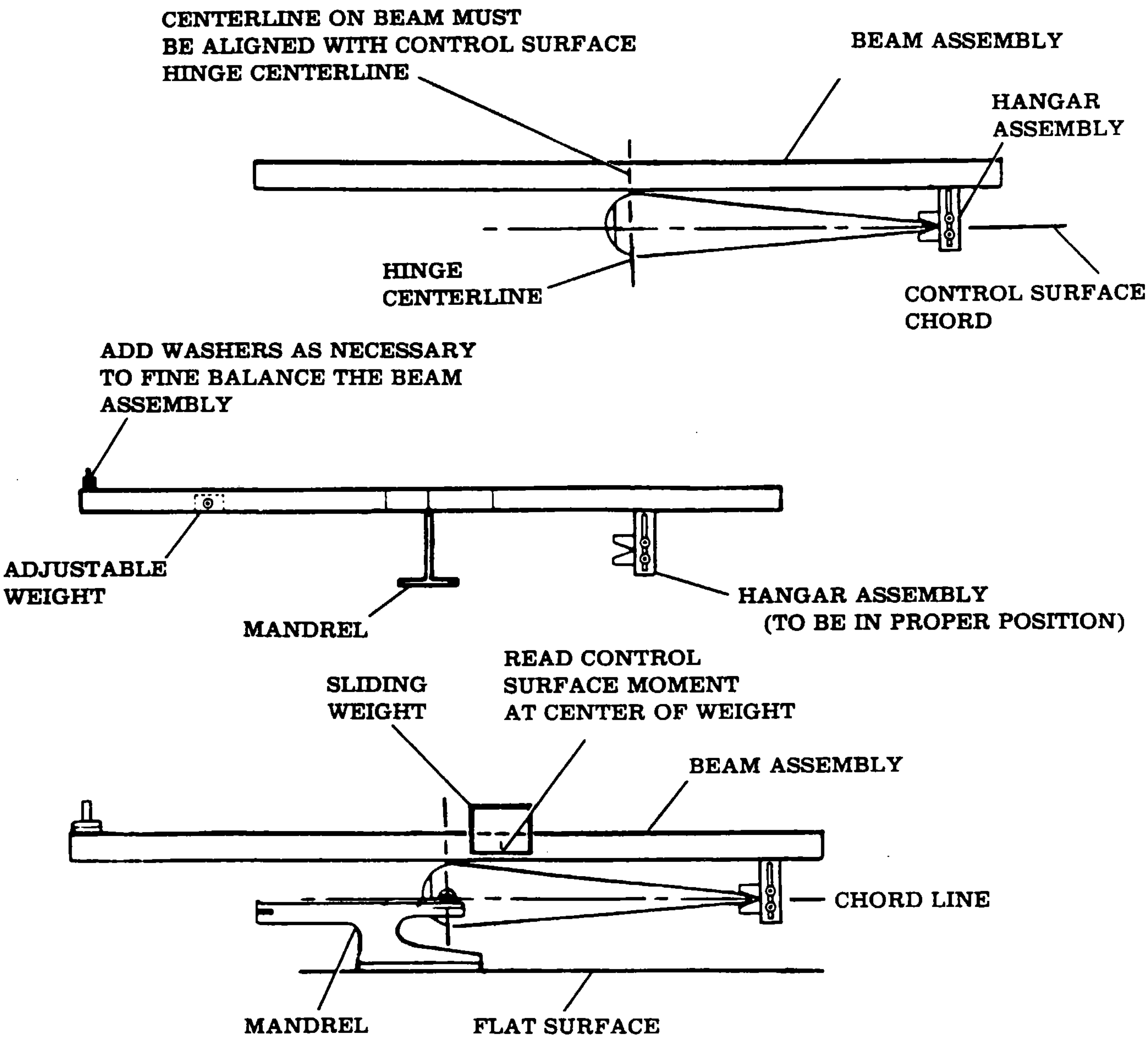


Figure 18-2. Control Surface Blaancing (Sheet 2 of 5)

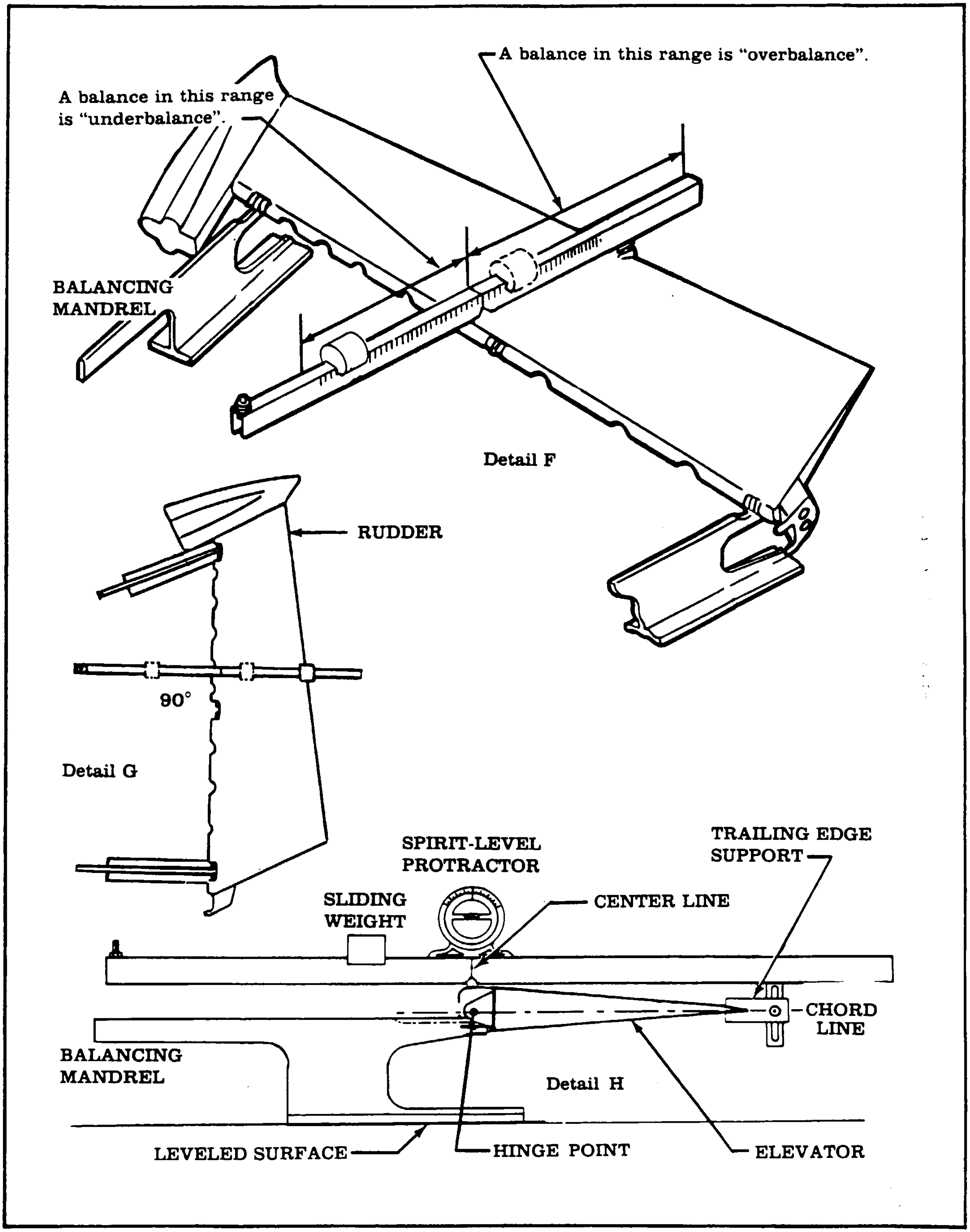
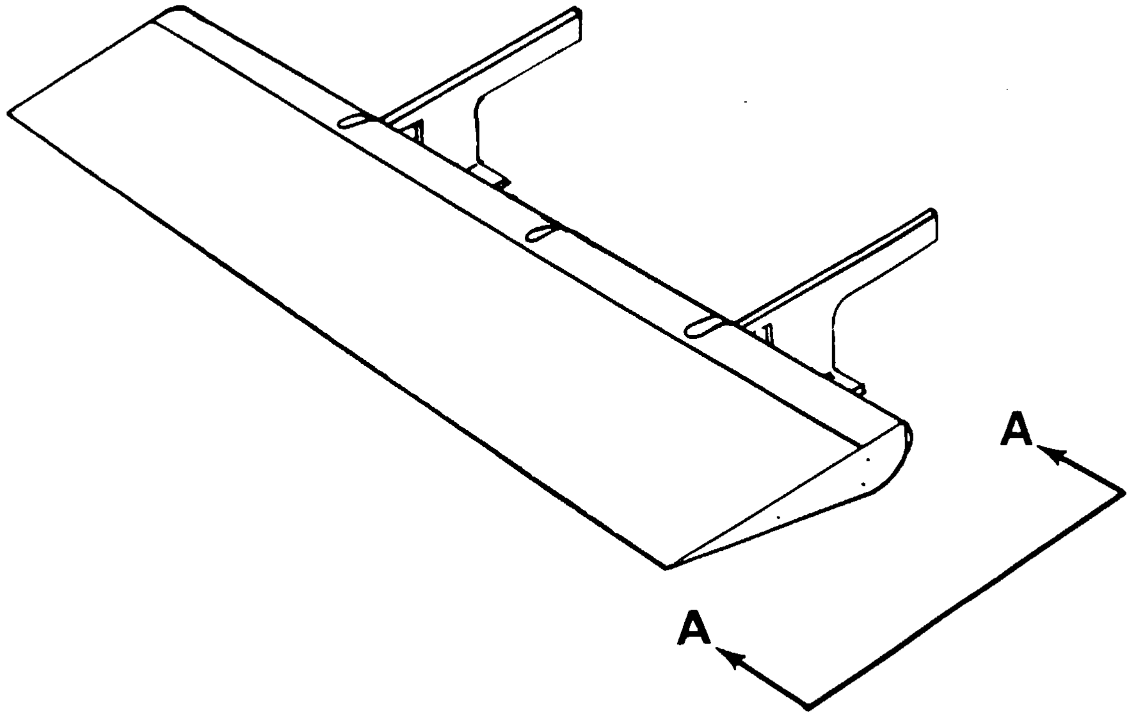
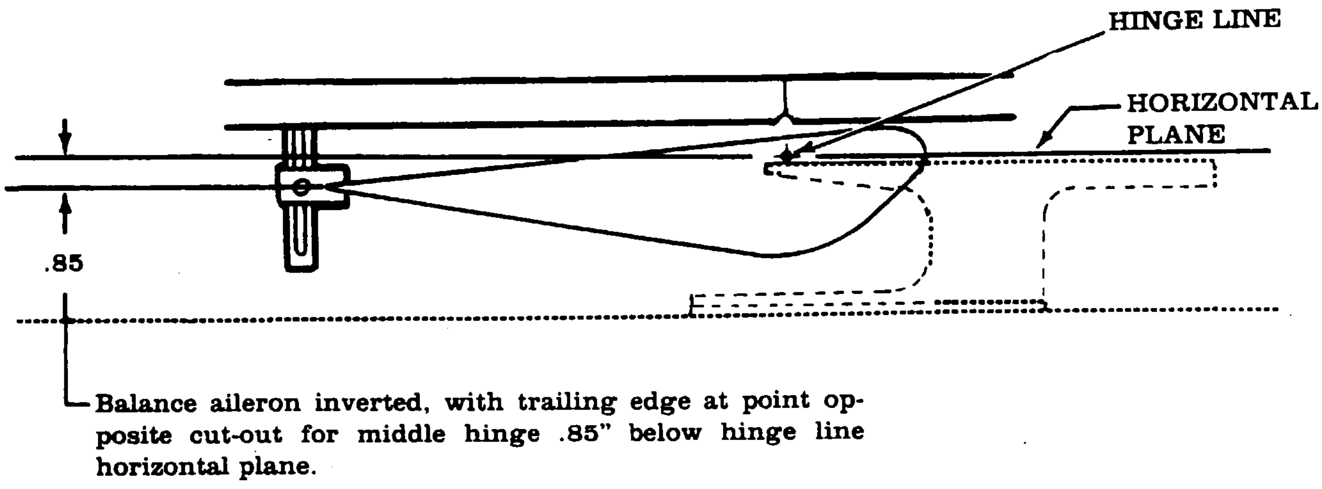


Figure 18-2. Control Surface Balancing (Sheet 3 of 5)

AILERONS





DETAIL A-A

Figure 18-2. Control Surface Blaancing (Sheet 4 of 5)

CONTROL SURFACE BALANCE REQUIREMENTS

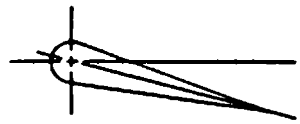
NOTE

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.

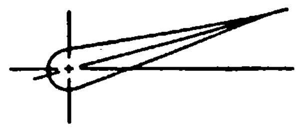
"Approved Flight" limits must never be exceeded when the surface is in its final configuration for flight.

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.



CONTROL SURFACE	APPROVED FLIGHT CONFIGURATION BALANCE LIMITS (Inch-Pounds)
AILERON (210)	-8.0 to -1.0
AILERON (T210)	-11.0 to 4.0
RUDDER	-4.0 to 3.0
RIGHT ELEVATOR	-6.0 to 1.0
LEFT ELEVATOR	-6.0 to 1.0

Figure 18-2. Control Surface Balancing (Sheet 5 of 5)

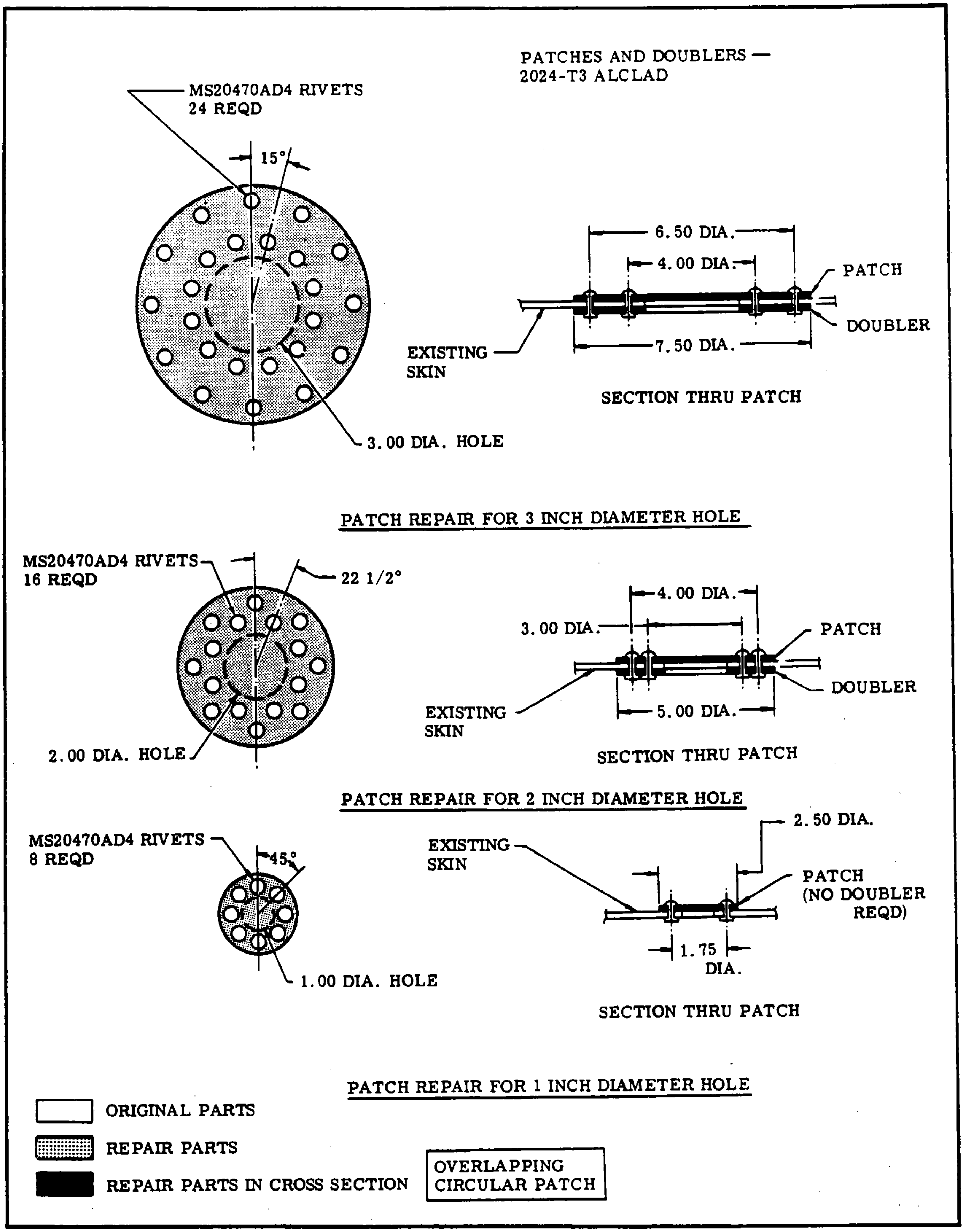
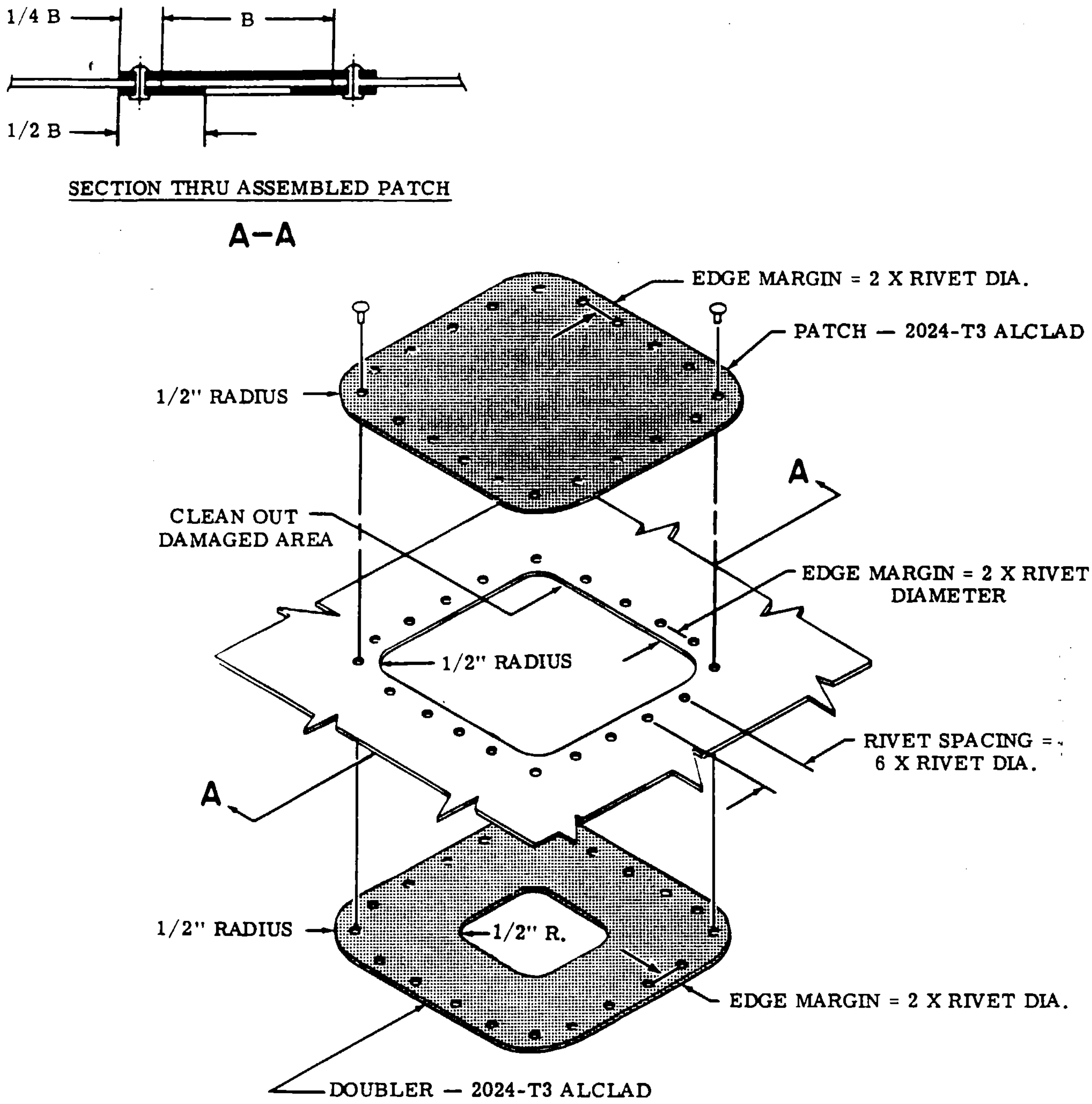


Figure 18-4. Skin Repair (Sheet 1 of 6)



ORIGINAL PARTS

REPAIR PARTS

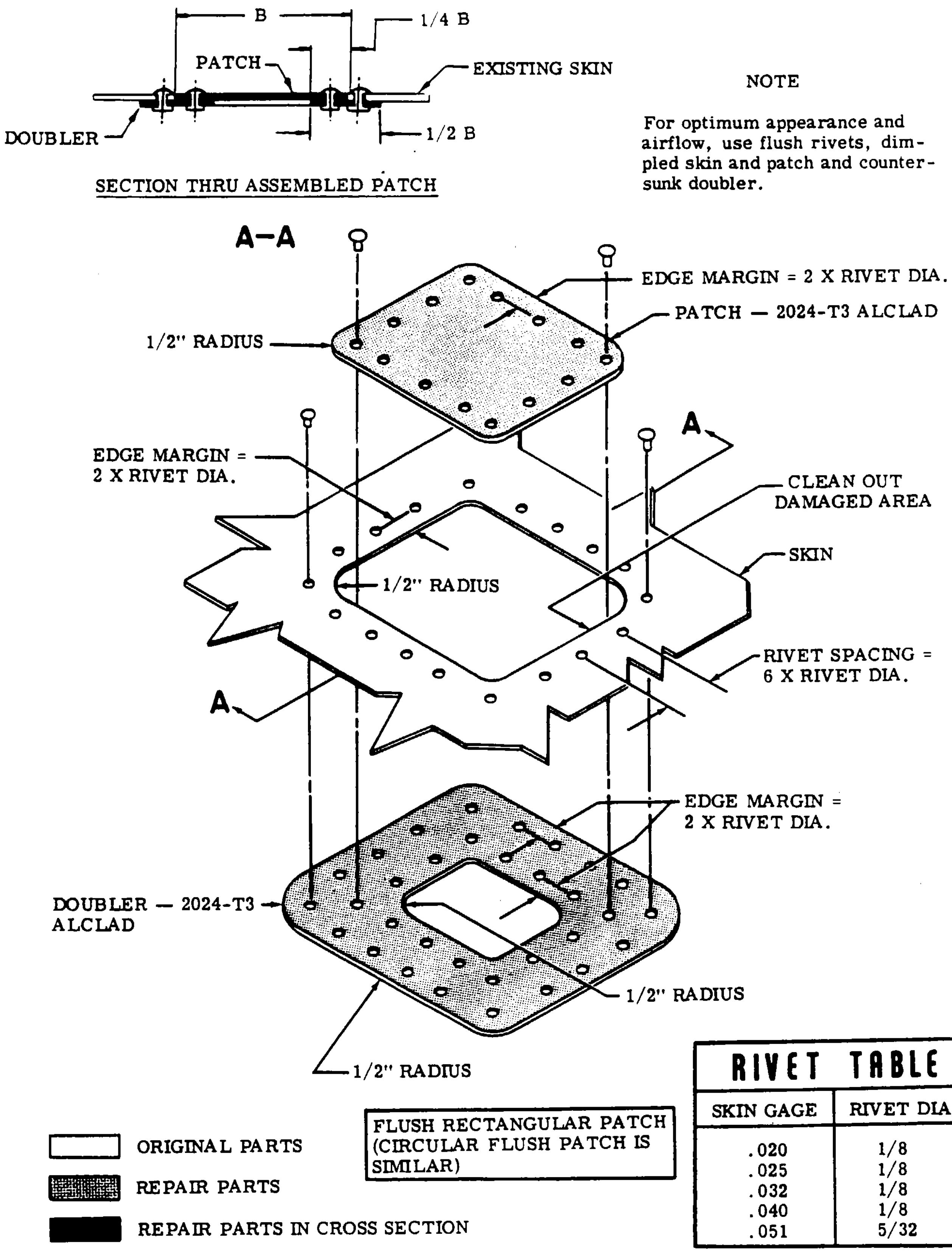
REPAIR PARTS IN CROSS SECTION

OVERLAPPING REC-
TANGULAR PATCH

RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 2 of 6)



NOTE

For optimum appearance and airflow, use flush rivets, dimpled skin and patch and countersunk doubler.

FLUSH RECTANGULAR PATCH (CIRCULAR FLUSH PATCH IS SIMILAR)

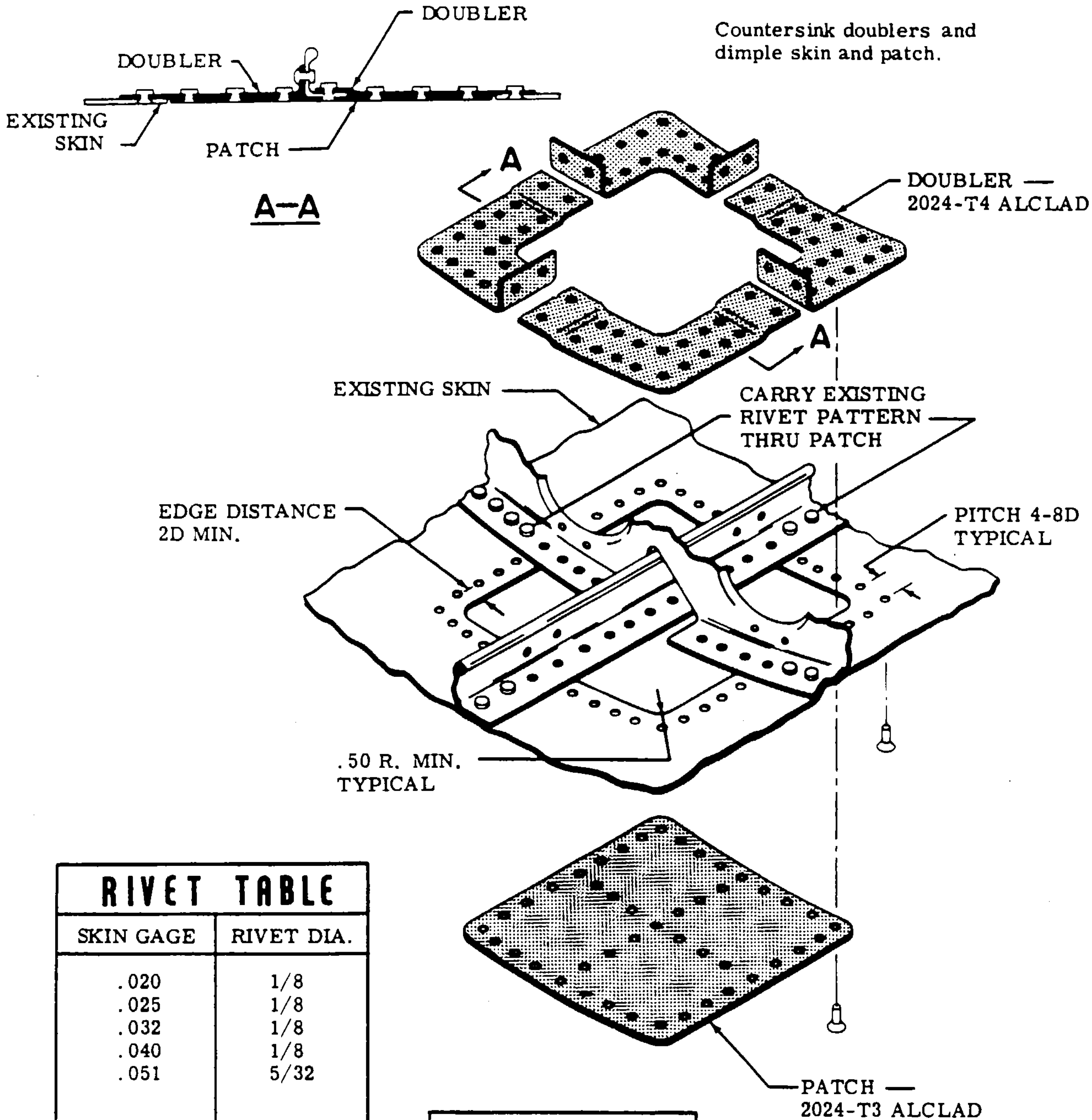
RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 3 of 6)

NOTE

Countersink doublers and dimple skin and patch.



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

ORIGINAL PARTS

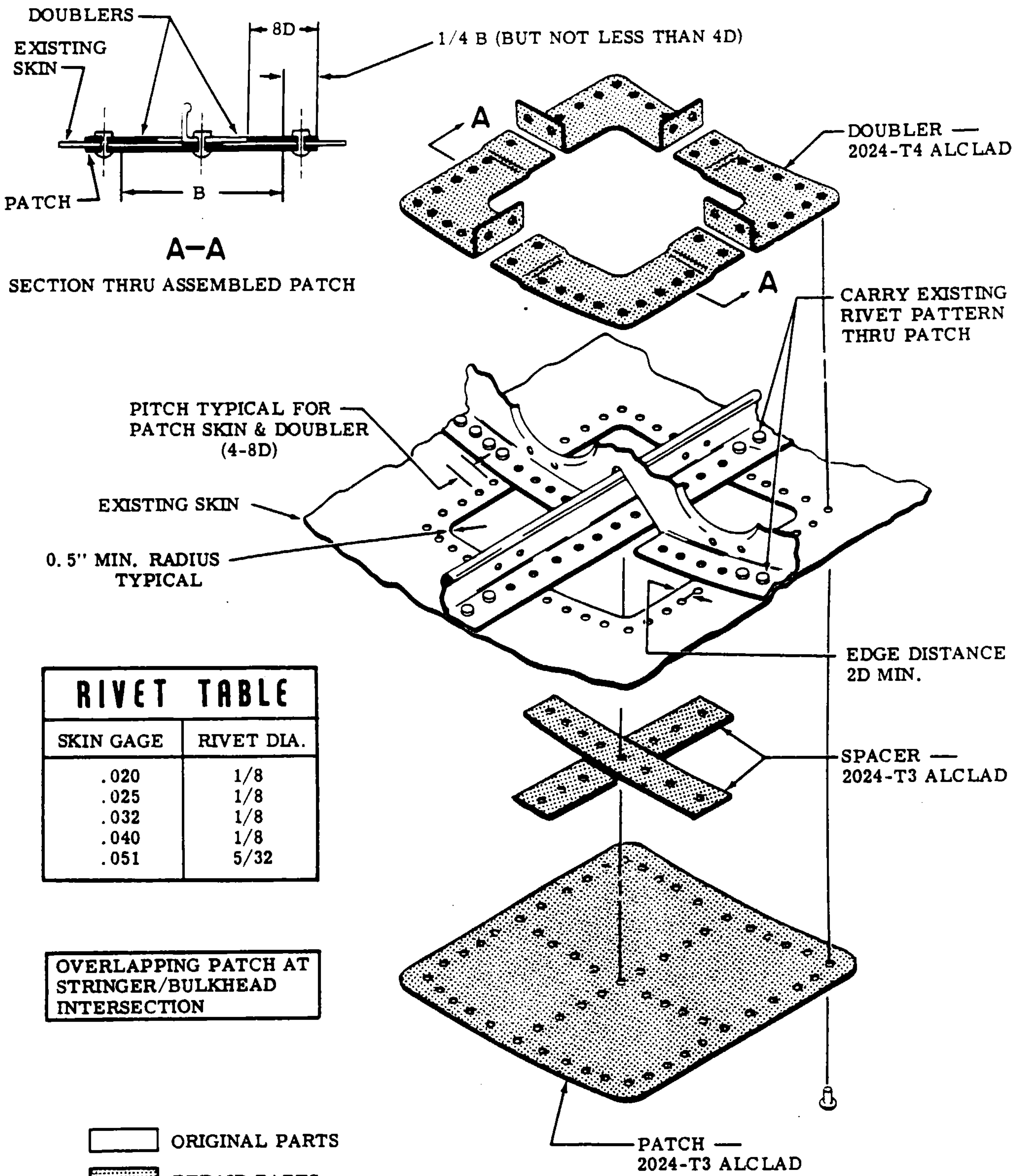
REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

NOTE

This procedure is not recommended in areas where stringers are riveted to bulkheads.

Figure 18-4. Skin Repair (Sheet 4 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

OVERLAPPING PATCH AT STRINGER/BULKHEAD INTERSECTION

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 18-4. Skin Repair (Sheet 5 of 6)

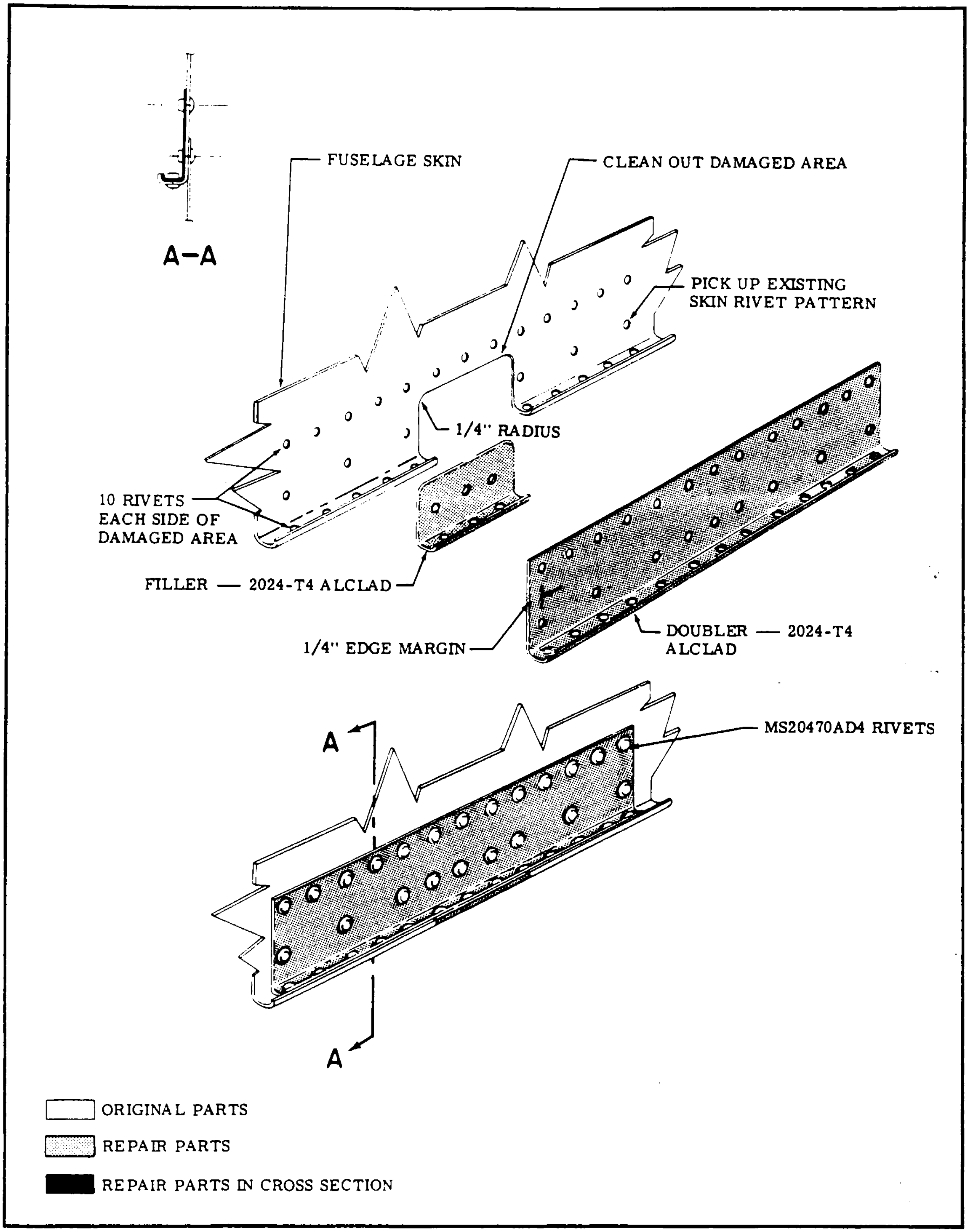


Figure 18-4. Skin Repair (Sheet 6 of 6)

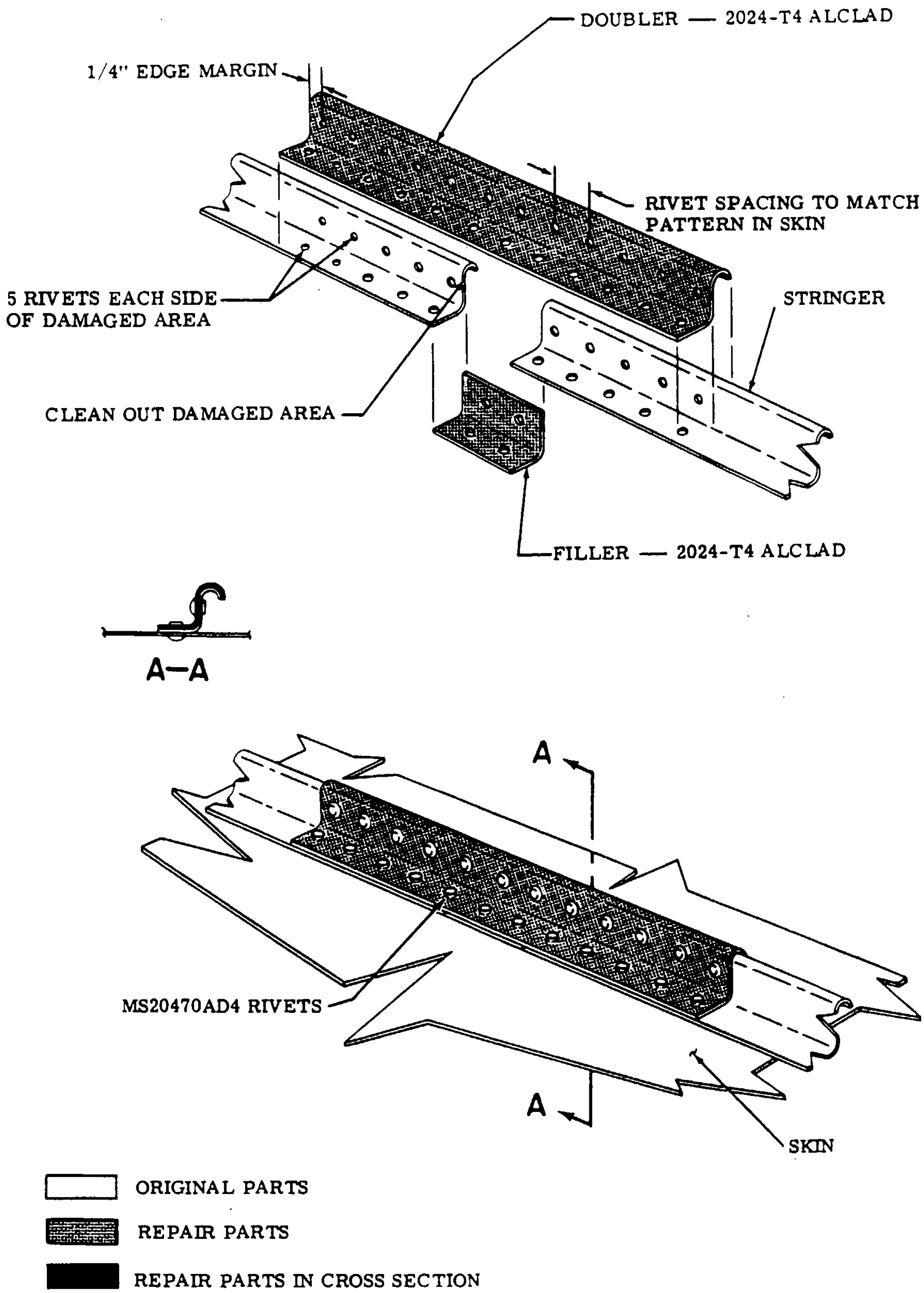


Figure 18-5. Stringer and Channel Repair (Sheet 1 of 4)

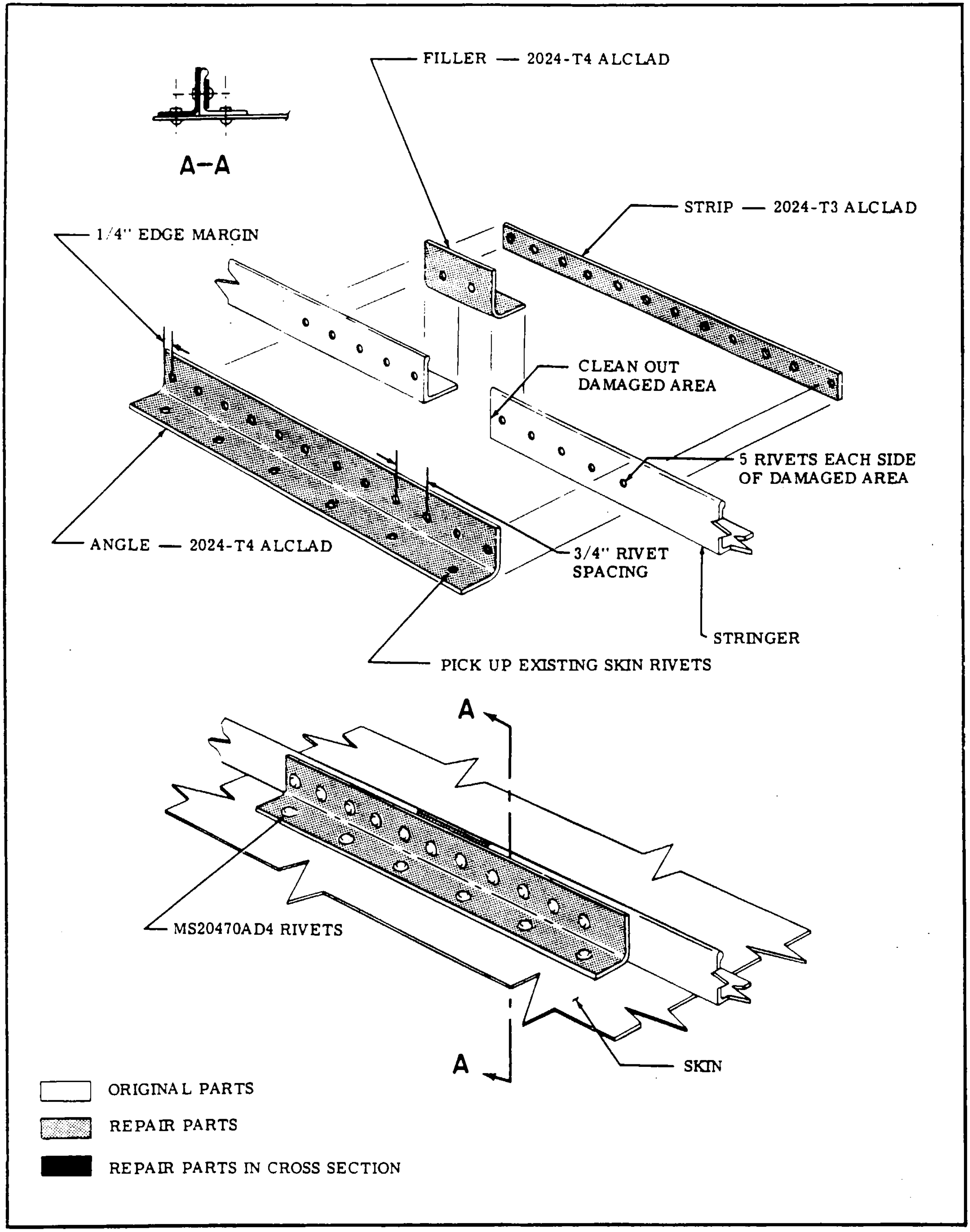


Figure 18-5. Stringer and Channel Repair (Sheet 2 of 4)

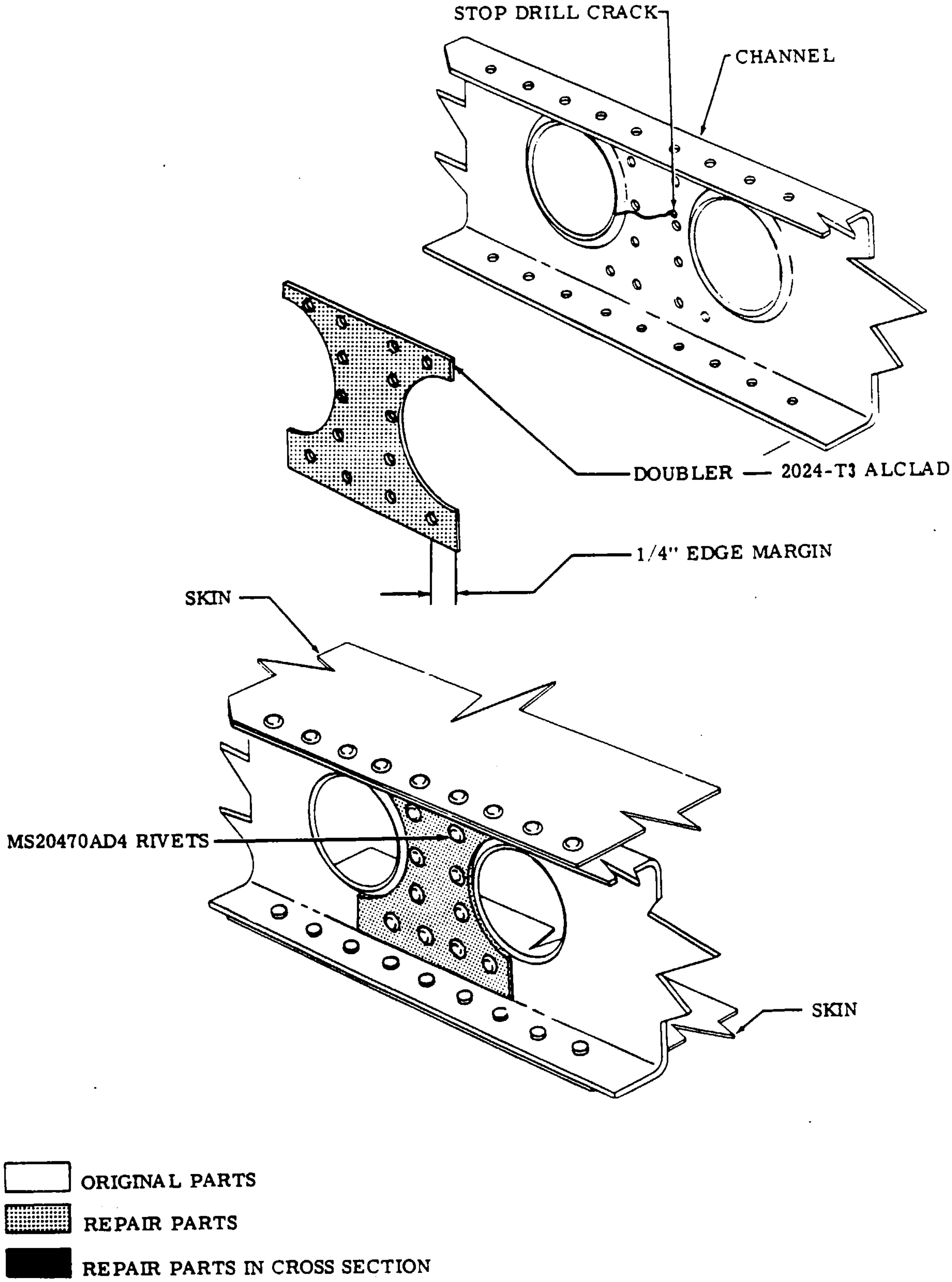


Figure 18-5. Stringer and Channel Repair (Sheet 3 of 4)

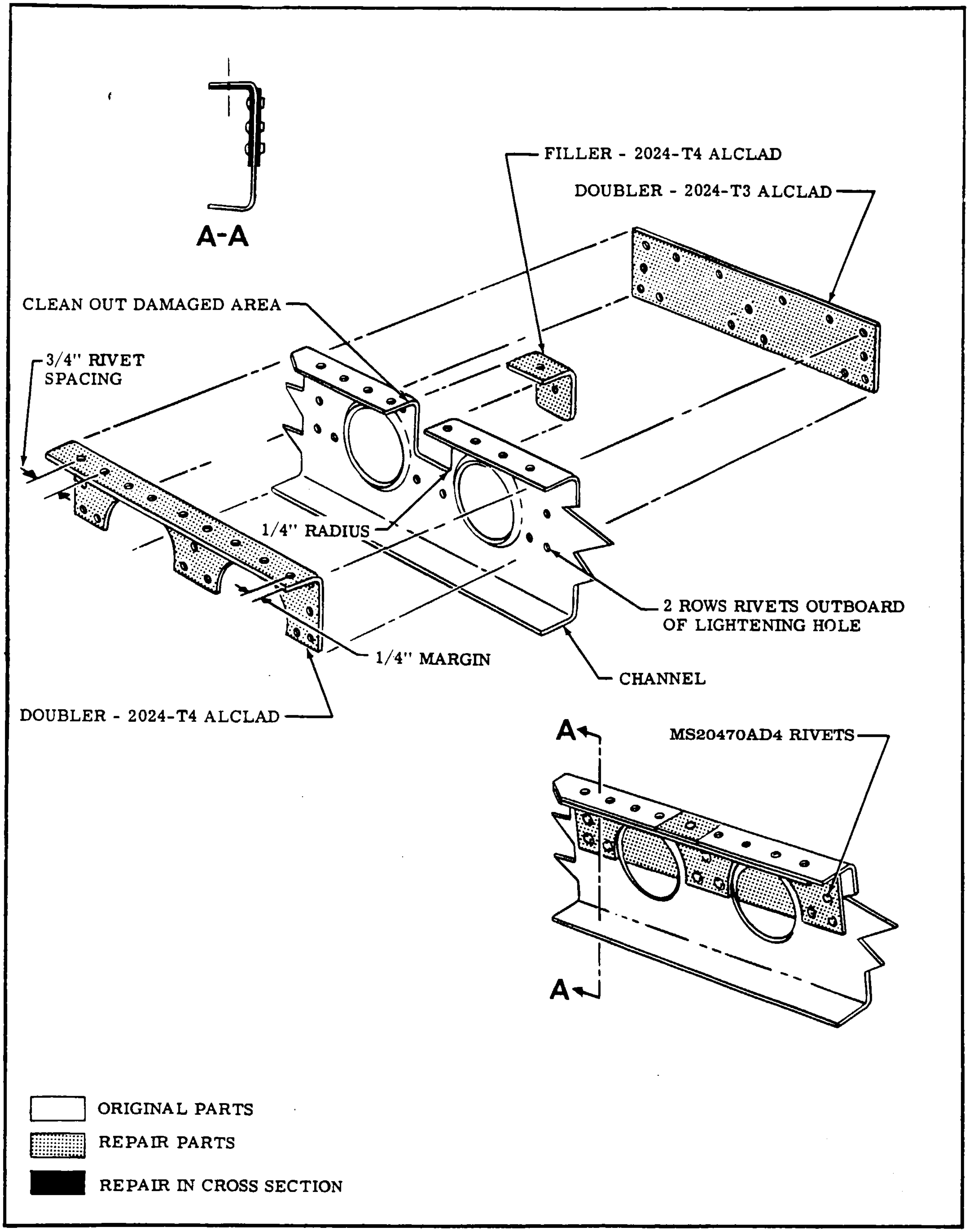


Figure 18-5. Stringer and Channel Repair (Sheet 4 of 4)

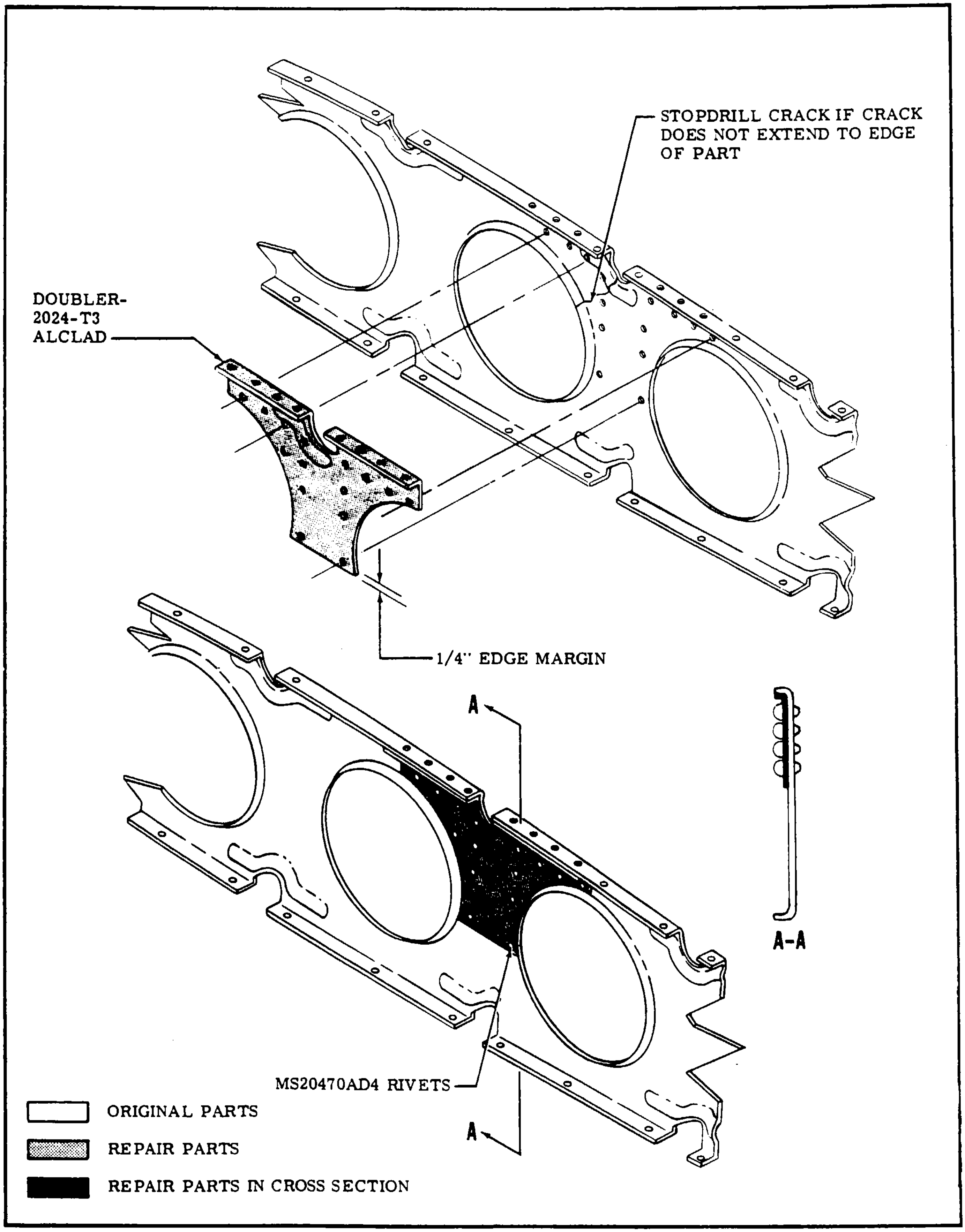


Figure 18-6. Rib Repair (Sheet 1 of 2)

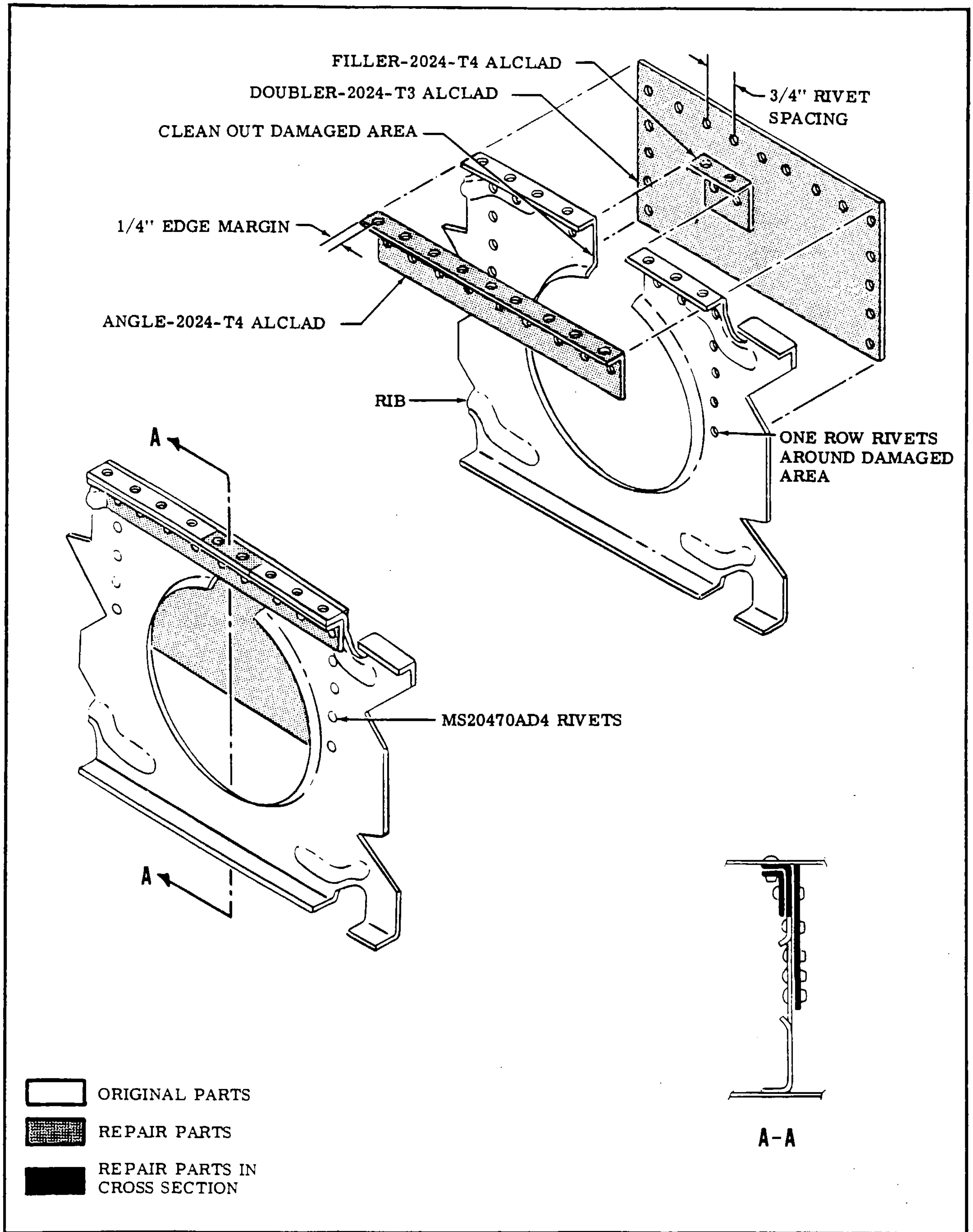
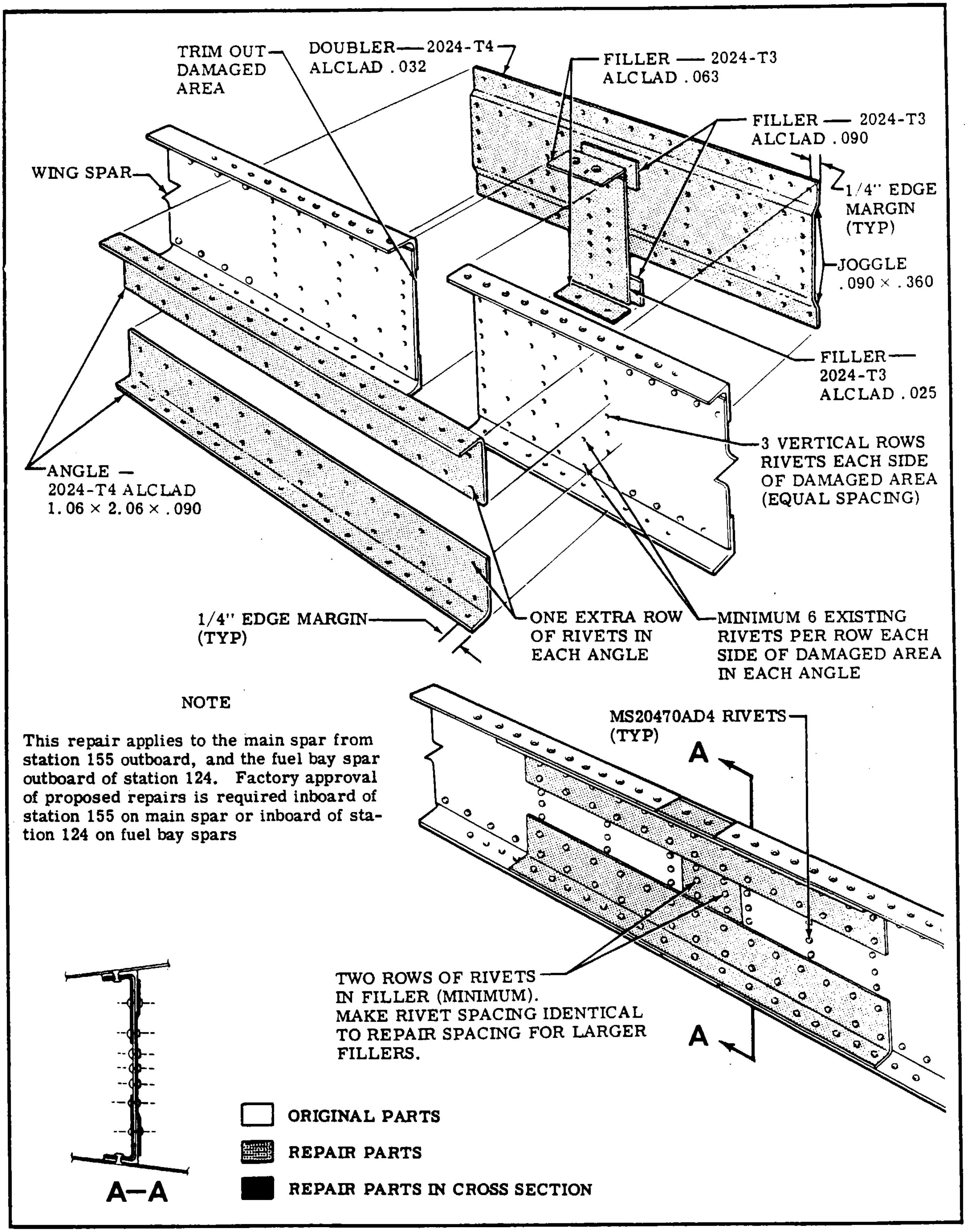


Figure 18-6. Rib Repair (Sheet 2 of 2)



NOTE

This repair applies to the main spar from station 155 outboard, and the fuel bay spar outboard of station 124. Factory approval of proposed repairs is required inboard of station 155 on main spar or inboard of station 124 on fuel bay spars

Figure 18-7. Wing Spar Repair

NOTES:

1. Dimple leading edge skin and filler material; countersink the doubler.
2. Use MS20426AD4 rivets to install doubler.
3. Use MS20426AD4 rivets to install filler, except where bucking is impossible. Use CR162-4 Cherry (blind) rivets where regular rivets cannot be bucked.
4. Contour must be maintained; after repair has been completed, use epoxy filler as necessary and sand smooth before painting.
5. On cantilever wing, vertical size is limited by ability to install doubler clear of front fuel spar or stringers outboard of spar. On flaps and ailerons, vertical size is limited by ability to install doubler clear of front spar. (Also refer to figure 18-9.)
6. Lateral size is limited to seven inches across trimmed out area.
7. Number of repairs is limited to one in each bay. On cantilever wings, consider a bay in the area forward of front fuel spar as if ribs extended to leading edge.

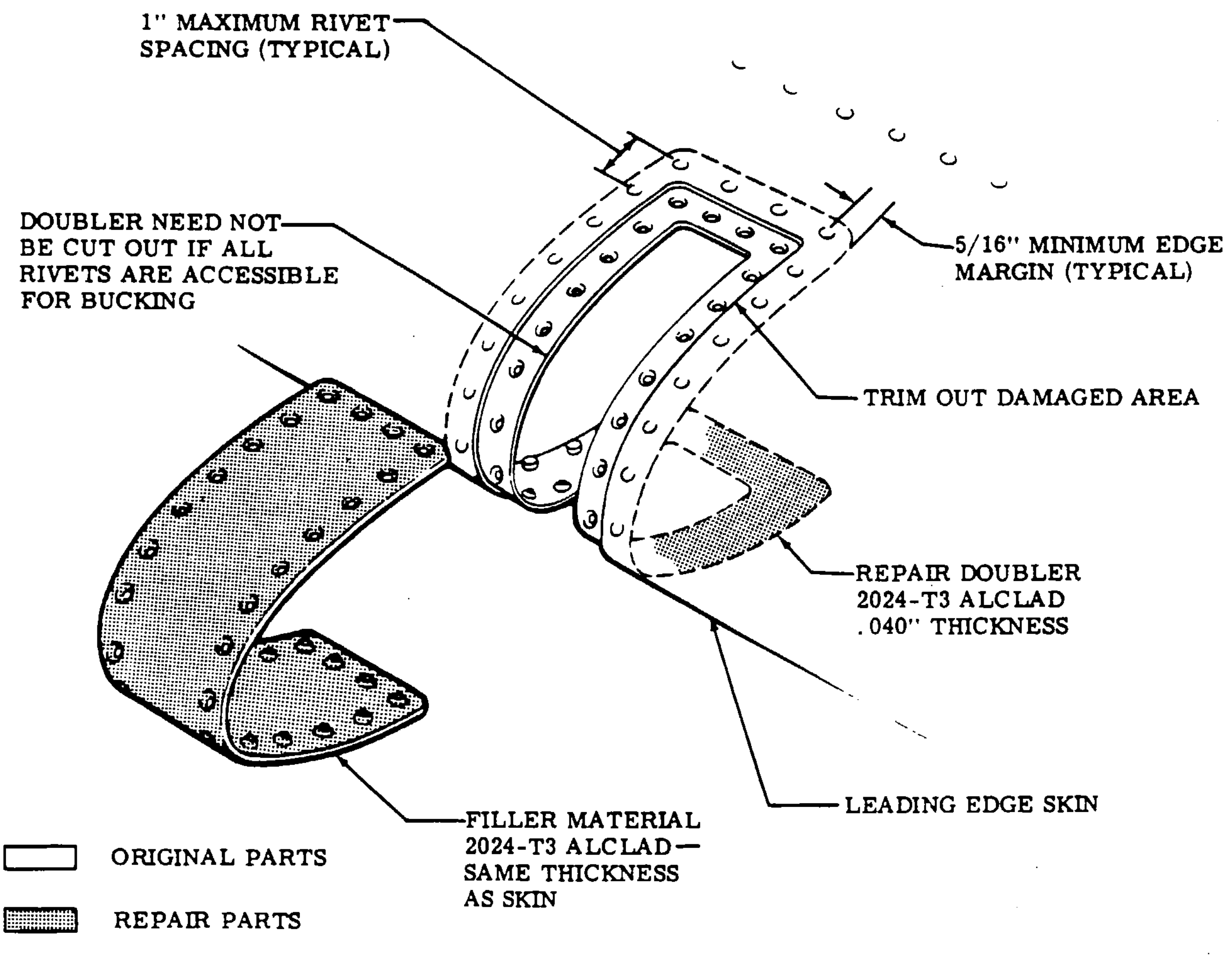


Figure 18-8. Leading Edge Repair

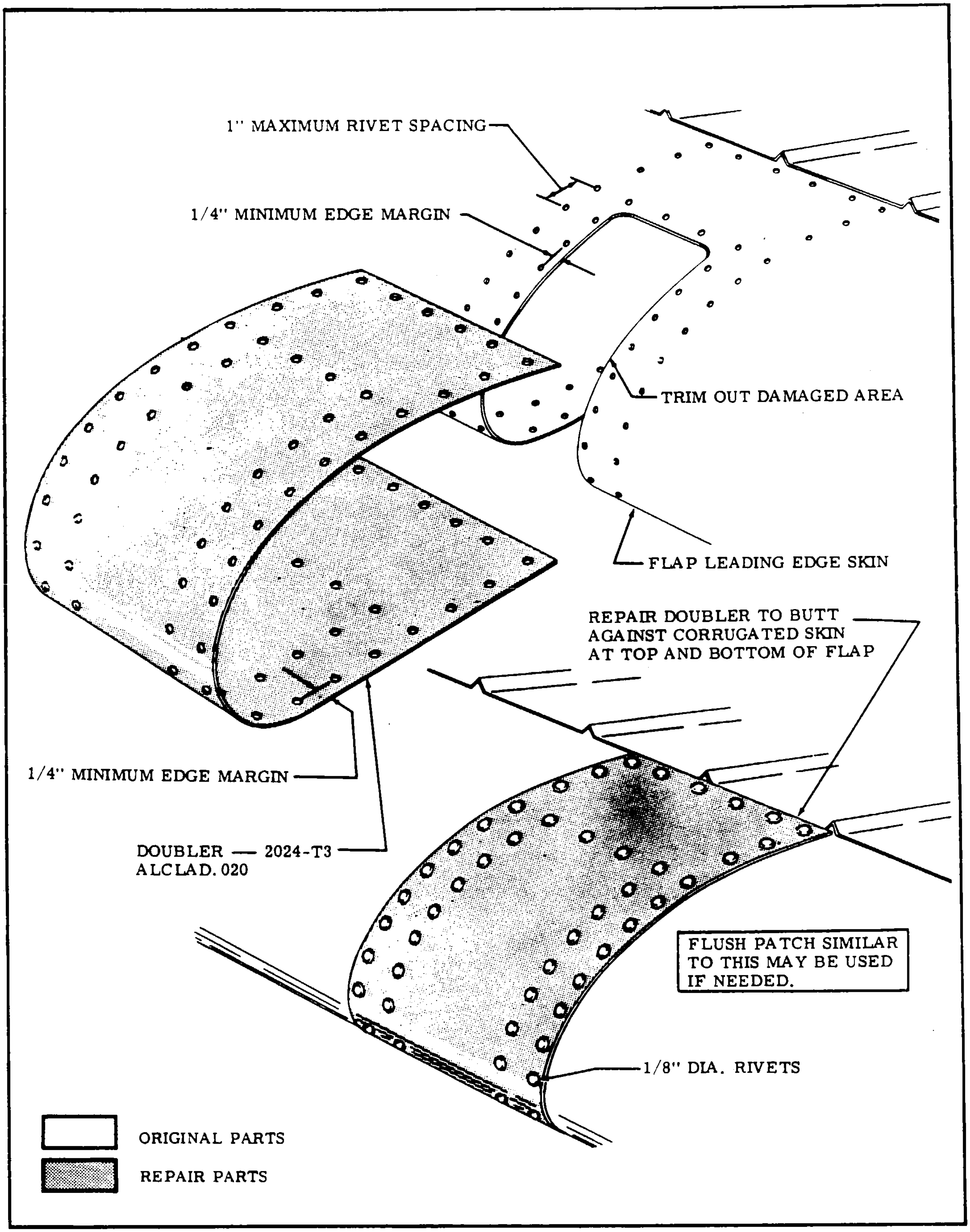
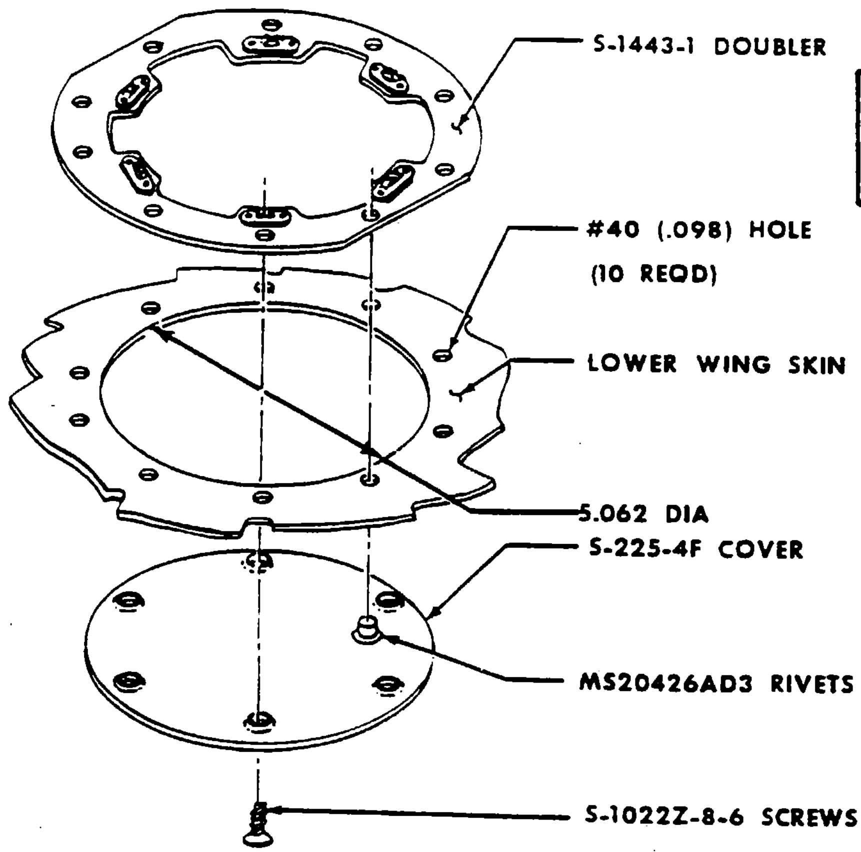


Figure 18-9. Flap Leading Edge Repair



VIEWED FROM INSIDE WING LOOKING DOWN AT TOP OF LOWER WING SKIN.

CAUTION

Do not install on cantilever wing without factory approval.

NOTE

PARTS ARE AVAILABLE FROM CESSNA PARTS DISTRIBUTION (CPD 2) THROUGH CESSNA SERVICE STATIONS.

PRECAUTIONS

1. Add the minimum number of access holes necessary.
2. Any circular or rectangular access hole which is used with approved optional equipment installations may be added in lieu of the access hole illustrated.
3. Use landing light installations instead of adding access holes where possible. Do not add access holes at outboard end of wing; remove wing tip instead.
4. Do not add an access hole in the same bay where one is already located.
5. Locate new access holes near the center of a bay (spanwise).
6. Locate new access holes forward of the front spars as close to the front spar as practicable.
7. Locate new access holes aft of the front spar between the first and second stringers aft of the spar. When installing the doubler, rotate it so the two straight edges are closest to the stringers.
8. Alternate bays, with new access holes staggered forward and aft of the front spar, are preferable.
9. A maximum of five new access holes in each wing is permissible; if more are required, contact the Cessna Technical Information Services Service Desk, at (316) 941-7550, for technical assistance.
10. When a complete leading edge skin is being replaced, the wing should be supported in such a manner so that wing alignment is maintained.

a. Establish exact location for inspection cover and inscribe centerlines.

b. Determine position of doubler on wing skin and center over centerlines. Mark the ten rivet hole locations and drill to size shown.

c. Cut out access hole, using dimension shown.

d. Flex doubler and insert through access hole and rivet in place.

e. Position cover and secure, using screws as shown.

Figure 18-10. Access Hole Installation

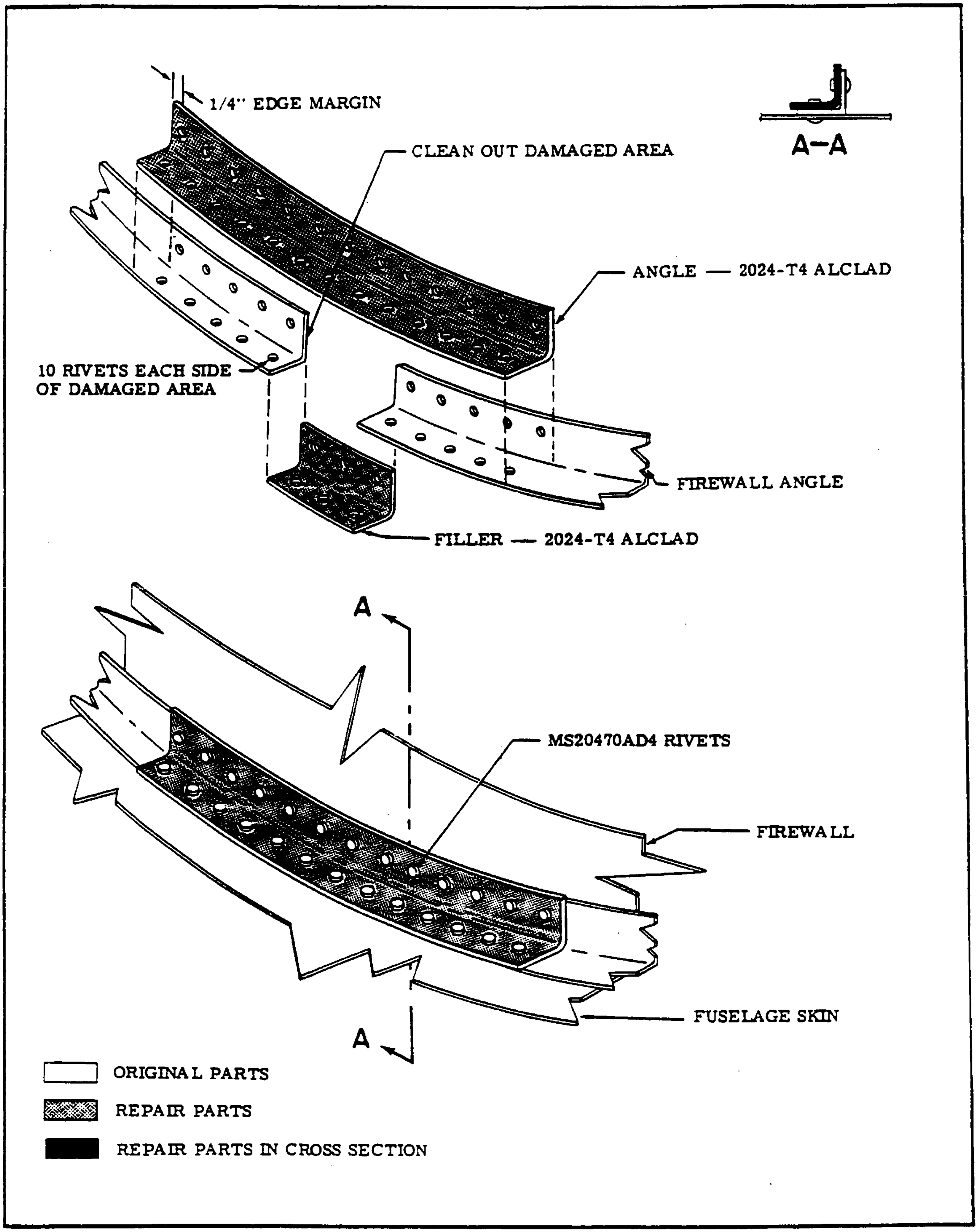


Figure 18-11. Firewall Angle Repair

SECTION 19

PAINT

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NOTE

This section contains a listing of standard factory materials, and shows the area of their application. To determine the paint number and color, refer to the aircraft trim plate and Parts Catalog. In all cases, determine the type of paint, because some types are not compatible with others. Materials can be obtained from the Cessna Supply Division.

19-1. MATERIALS LISTING.

IMRON MODIFIED URETHANE

MATERIAL	NO/TYPE	AREA OF APPLICATION
PAINT	IMRON ENAMEL	Used as corrosion proof topcoat
	IMRON 192S Activator	Catalyst for Imron Enamel
PRIMER	WASH PRIMER 2655 (Sterling)	Used to prime aircraft for Imron Enamel
REDUCER/ THINNER	IMRON Y8485S Reducer	Used to thin Imron Enamel
	Catalyst Reducer 2265 (Sterling)	Used to reduce 2655

SUPPORT MATERIALS

MATERIAL	NO/TYPE	AREA OF APPLICATION
STRIPPER	Strypeeze Stripper	Used to strip primer overspray
CLEANER	Form Tech AC	Used to clean aircraft exterior and to remove grease, bug stains, etc.
	Klad Polish	Used to clean aluminum finish
	808 Polishing Compound	Used to rub out overspray
SOLVENT	(MEK) Methyl Ethyl Ketone	Used to tack 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

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.

19-2. FACILITY. Painting facilities must include the ability to maintain environmental control; temperature at 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.

Modified urethane paint requires a minimum of seven days to cure under normal conditions, if humidity and temperature is lower, curing time will be extended a maximum of 14 days. During the curing period, indiscriminate use of masking tape, abrasive polishes, or cleaners can cause damage to finish. Desirable curing temperature for modified urethane is 60°F. for a resulting satisfactory finish.

19-3. APPLICATION.

19-4. CLEAN UP.

a. Inspect airplane for any surface defects, such as dents or unsatisfactory previous repairs, and correct according to Paragraph 19-11.

b. Wipe excess sealer from around windows and skin laps, using Form Tech AC. Mask windows, ABS parts and other areas not to be primed, with 3M tape and Class A Solvent-Proof Paper. Care must be exercised to avoid cuts, scratches or gouges by metal objects to all plexiglass surfaces, because cuts and scratches may contribute to crazing and failure of plexiglass windows.

c. 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 cloth in the 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.

NOTE

Do not use MEK on plexiglass as crazing will result.

When an airplane has paint or zinc chromate overspray on the exterior, stripper may be used to remove the overspray. The stripper may be applied by brush and will require a few minutes to soften the overspray. Heavy coatings may require more than one application of the stripper. Use extreme care to prevent stripper from running into faying surfaces on corrosion proofed airplanes. After removal of the overspray, clean the airplane with Methyl Ethyl Ketone (MEK) solvent in the prescribed manner.

NOTE

It is imperative that clean solvent be used in cleaning airplanes. Dispose of contaminated solvent immediately. Fresh solvent should be used on each airplane.

WARNING

Use explosion proof containers for storing wash solvents and other flammable materials.

19-5. PREPRIMING.

a. Corrosion proofed and standard aircraft will receive Sterling Wash Primer 2655, DuPont Imron Enamel for over all color, and for stripes.

b. Mix 1 part 2655 primer with 1 1/2 parts 2265 Catalyst Reducer, by volume. Mix in stainless steel or lined containers only. After mixing allow primer to set for 30 minutes before spraying. Pot life of the mixed primer is six (6) hours, all mixed materials should be discarded if not used within that time limit. Pot pressure during spraying should be approximately 10 ± 1 psi. Air pressure should be 40 to 50 psi at the gun. Blow loose contaminant off the airplane with clean, dry air. Check all tapes to make sure they adhere properly. Cover the flap tracks, nose gear strut tube, wheels, and shimmy dampener rod ends. ABS parts and other preprimed parts do not receive wash primer.

WARNING

AIRCRAFT SHOULD BE GROUNDED PRIOR TO PAINTING TO PREVENT STATIC ELECTRICITY BUILD-UP AND DISCHARGE.

19-6. PRIMING.

a. Apply primer in one wet even coat. Dry film thickness to be .0003 to .0005 inches. Do not topcoat until sufficiently cured. When scratching with firm pressure of the fingernail does not penetrate the coating, the primer is cured. Primer should be topcoated within four hours after application.

19-7. PREPAINTING.

a. On standard aircraft mix the required amount of Imron with Imron 192S Activator in a 3 to 1 ratio by volume. Mix thoroughly, and begin spraying immediately, because there is no induction time requirement. Imron can be thinned to spraying viscosity with Y8485S Imron Reducer. Viscosity should be checked and adjusted after four hours if necessary.

b. 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. The pot life of the mixture is approximately 6-8 hours at 75°F. Pot pressure should be approximately 12 psi during application. Air pressure at the gun should be 40 to 50 psi.

d. 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. Unmask ABS and other preprimed parts and check tapes. Clean surface with a jet of low pressure-dry air.

19-8. PAINTING OVERALL.

a. Complete painting of the plane should be done with 2 or 3 wet, even coats. Dry coats will not reflow, and will leave a grainy appearance.

b. Allow 5 minute period for the finish to flash off before moving aircraft to the oven.

c. Move to the force dry oven and dry for approximately 1 1/2 hours at 120°F to 140°F.

d. Dry film thickness of the overall color should be between 1.3 and 2.0 mils, over 5.0 mils requires Control Surface Balance Check. (Refer to Section 18).

19-9. MASKING FOR STRIPES.

a. Remove airplane from the oven. Allow airplane to cool to room temperature before masking.

b. Mask stripe area using 3M Tape Y231 or 3M Tape Y218 and Class A solvent proof paper. Double tape all skin laps to prevent blow by.

c. Airplanes which will have a stripe only configuration shall be masked, cleaned, and primed, in stripe area only.

d. 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 sandpaper. 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, 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.

e. Stripe colors on Imron base coat will be Imron Enamel. Mix as outlined in paragraph 19-6.

f. 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 1.0 mil.

g. 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.

h. Modified urethane finishes are sensitive to moisture, therefore, should be stored out of rain until cured.

19-10. TOUCH UP.

When necessary to touch up or refinish an area, the defect should be sanded with #400 and followed by #600 sandpaper. Avoid, if possible, sanding through the primer. If the primer is penetrated over an area 1/2 inch square or larger, repriming is ncesssary. Avoid spraying primer on the adjacent paint as much as possible. Since urethane finishes cannot be "spotted in" repairs should be in sections extending to skin laps or stripe lines.

a. Dry overspray and rough areas may be compounded out with DuPont #808 rubbing compound.

b. Grease, bug stains, etc. may be removed from painted surfaces with Form Tech AC. Klad Polish may be used on bare aluminum to remove stains, oxides, etc.

c. Rework areas, where paint or primer removal is required, may be stripped with Strypeeze Paint Removal. All traces of stipper must be removed before refinishing.

19-11. REPAIR OF DENTS.

a. To repair dents use White Streak Filler or equivalent. Mix White Streak in the correct proportion as recommended by the manufacturer.

b. Do not apply White Streak Filler over paint. All paint shall be removed in the repair area and the aluminum surface sanded lightly to increase adhesion. Apply the White Streak to a level slightly above the surrounding skin. After drying for 10 - 15 minutes, sand the filler flush with the skin surface, using care to feather the edges.

SECTION 20

WIRING DIAGRAMS

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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 - Auxilliary 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

CROSS REFERENCE LISTING OF SERIAL REQUEST NUMBERS
LISTED ON DIAGRAMS VS. AIRCRAFT SERIAL NUMBERS

SR No.	AIRCRAFT SERIAL No.
SR9361	P21000151
SR9427	21062969, *P21000120
SR9429	21063299, *P21000257
SR9556	21063953, T21067300 & *P21000405
SR9583	21063547, P21000344
SR9634	21064136
*SR9635	P21000591
SR9711	21064064, *!21000535
SR9785	21064136, *P21000591
SR9953	21064536
*SR9954	P21000761
SR10250	21064559, *P21000771
SR10101	21064773
*SR10102	P21000812
SR10148	21064340, *P21000692
SR10254	21064602, *P21000785
SR10396	21064773, *P21000812
SR10420	21064898
SR10421	*P21000835
SR10563	21064805, *P21000822

SR No.	AIRCRAFT SERIAL No.
SR10641	*P21000835
SR10659	21064898, *P21000835
SR10660	21064898, *P21000835
SR10662	21064898, *P21000835
SR10680	*P21000835
SR10713	21064904, *P21000835
SR10734	21064898, *P21000835
SR10790	21064898, *P21000835
SR6755	21059503
SR7038	21059720
SR7126	21059853
SR7381	21060090
SR7473	21059882
SR7486	21059852
SR7650	21060540
SR7913	21061040
SR7997	21060526, T21060544
SR8082	21060612
SR8143	21061574
SR8297	21061103

CROSS REFERENCE LISTING OF SERIAL REQUEST NUMBERS
LISTED ON DIAGRAMS VS. AIRCRAFT SERIAL NUMBERS.

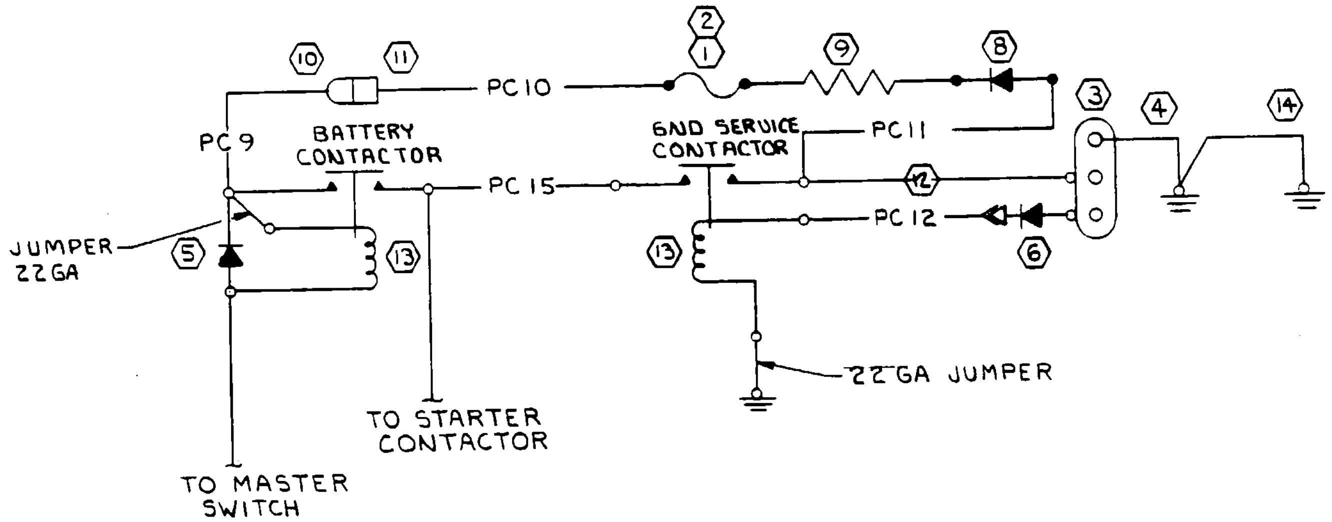
SR No.	AIRCRAFT SERIAL No.	SR No.	AIRCRAFT SERIAL No.
SR8426	21061296	SR9080	21062699, *P21000031
SR8464	21062274	SR9114	21063641
*SR8465	P21000001 thru P21000150	SR9115	*P21000386
SR8482	21061230	SR9187	21062955, *P21000151
SR8552	21061617	SR9195	21062942, *P21000122
SR8656	21061627	SR9221	21063477, *P21000345
SR8863	21062274 thru 21062953 *P21000001 thru P21000150	SR9310	T21063641, *P21000386

NOTE

Effectivity of diagrams are designated as follows: Eff thru (SRxxxx) denotes effectivity to the serial number prior to the (SRxxxx) serial. Ser (SRxxx) & on denotes effectivity for the (SRxxxx) serial and on. Diagrams and/or portions of, may be individually serialized and not designated by a (SRxxxx) number.

*Not Applicable to 210 and T210

REVISION			
LET	DESCRIPTION	DATE	APPD



35-0916
34-0916

ITEM NO.	PART NO.	DESCRIPTION	
14	0412007	GND SERV GND	
13	S-2475-1	CONTACTOR	
12	1270744	BUS BAR ASSY	
11	S-1637-2	HOUSING	
10	S-1637-1	HOUSING	
9	X26263	RESISTOR .75 Ω	
8	20H3P	DIODE	
7			
6	1570043	DIODE ASSY	
5	0770728	DIODE ASSY	
4	0312155	GROUND STRAP	
3	MS3506-1	RECEPTACLE	
2	S-1090-2	FUSEHOLDER	
1	S-1091-5	FUSE	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS	
PC11	22			S-1367-1-14	SOLDER		
PC15	2	S-1562-2-9		S-2447-2	S-1368-2-8		
PC12	22			S-1367-1-10	S-1493-1		
PC10	22			S-1636-1	SOLDER		
PC9	22			S-1367-1-13	S-1635-1		

WIRE TABLE

CONTRACT NO:

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

	NAME	DATE
DESIGN	TJADEN	1-22-80
GROUP	D.H.Harden	3-14-80
DRAWN	LEUERENZ	3-10-80
CHECK	BORLESKE	3-11-80
STRESS		
PROJ	J. MOORE	3-27-80
APPD		
OTHER		

TITLE WIRING DIAGRAM — GROUND SERVICE (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE NONE (SR9634) (SR9635) PAGE: 4.15

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

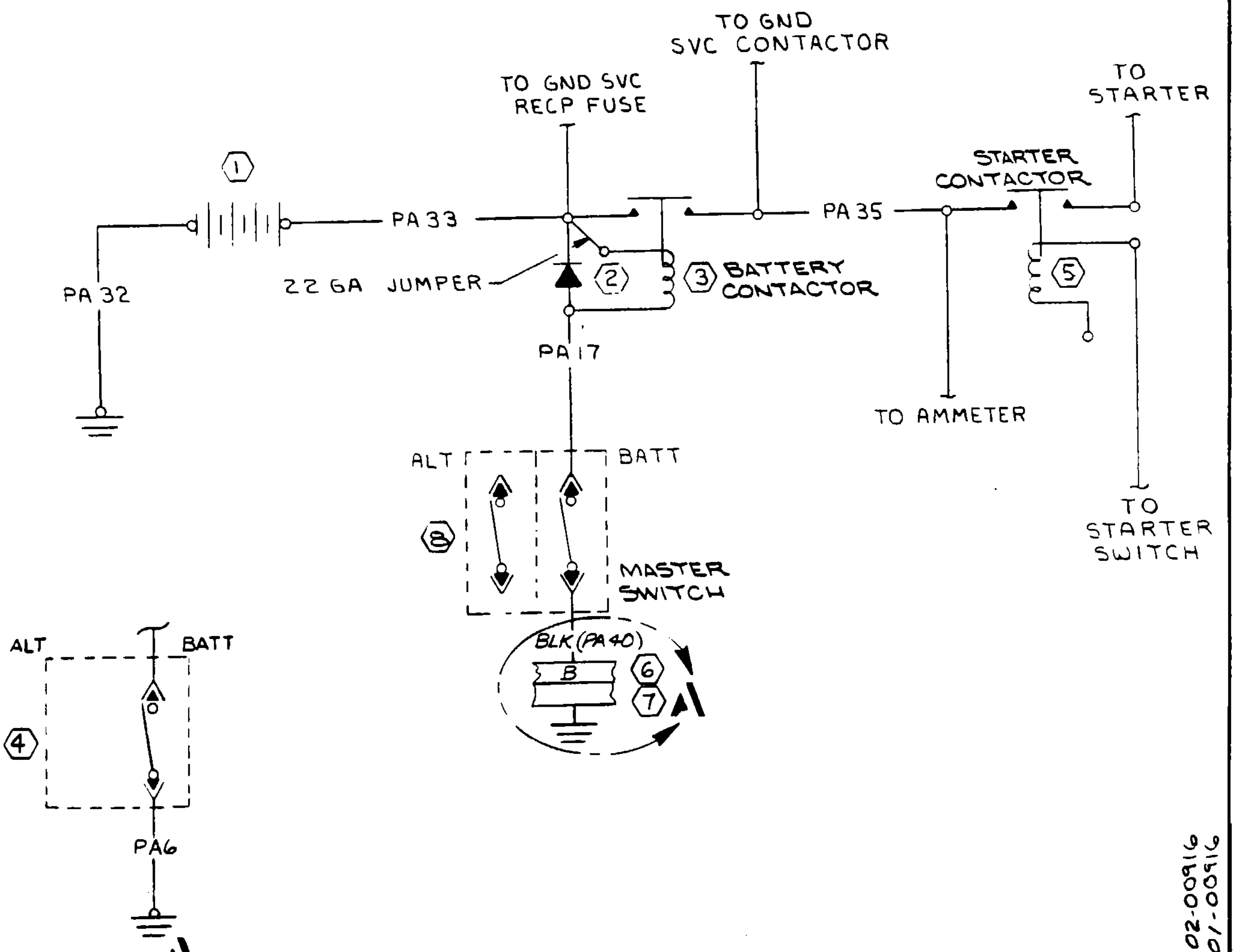
SUPERSEDES: 1270709 P. 4.2 4.21

SUPERSEDED BY:

NOTES:

1. PLACE 35.00 IN. LENGTH OF S-292-14 SLEEVING OVER WIRE BEFORE INSTALLING WIRE TERMINATION.

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A" BLK (PA 40), S-2527-1 & -2) (SR10101)(SR10102)	MKT 1-27-82	JAB WHH JRG
B	BY REV: ADD S-2593-2 SWITCH (SR10101)(SR10102)	WHH 4-22-82	REH JRG



DETAIL A
THRU SER (SR10101)(SR10102)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (PA40)	22	-22-0		S2099-4	S-1493-1		SER (SR10101)(SR10102) & ON
PA 35	2	S-1562-2-9	52.2	S-1367-7-13	S-1367-7-13	1	
PA 32	2	S-1562-2-9	21.7	S-1367-7-12	S-1367-7-13		
PA 33	2	S-1562-2-9	10.4	S-2447-2	S-1367-7-13		
PA 17	22			S-1367-1-10	S-1493-1		
PA6	22			S-1493-1	S-1367-1-8		THRU SER (SR10101)(SR10102)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
8	S-2593-2	MASTER SWITCH	
7	S-2527-2	GND CONNECTOR	
6	S-2527-1	LH GND BLOCK	
5	S-2443-1	CONTACTOR	
4	S-1994-1-1	SWITCH	
3	S-2475-1	CONTACTOR	
2	0770728	DIODE ASSY	
1	C614001-0105	BATTERY 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: 1270709 P 4.12

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	TJADEN	1-22-80
GROUP	D. Hilander	3-15-80
DRAWN	LEUERENZ	3-10-80
CHECK	BORLESKE	3-11-80
STRESS		
PROJ	J MOORE	3-27-80
APPD	JRG	
OTHER		

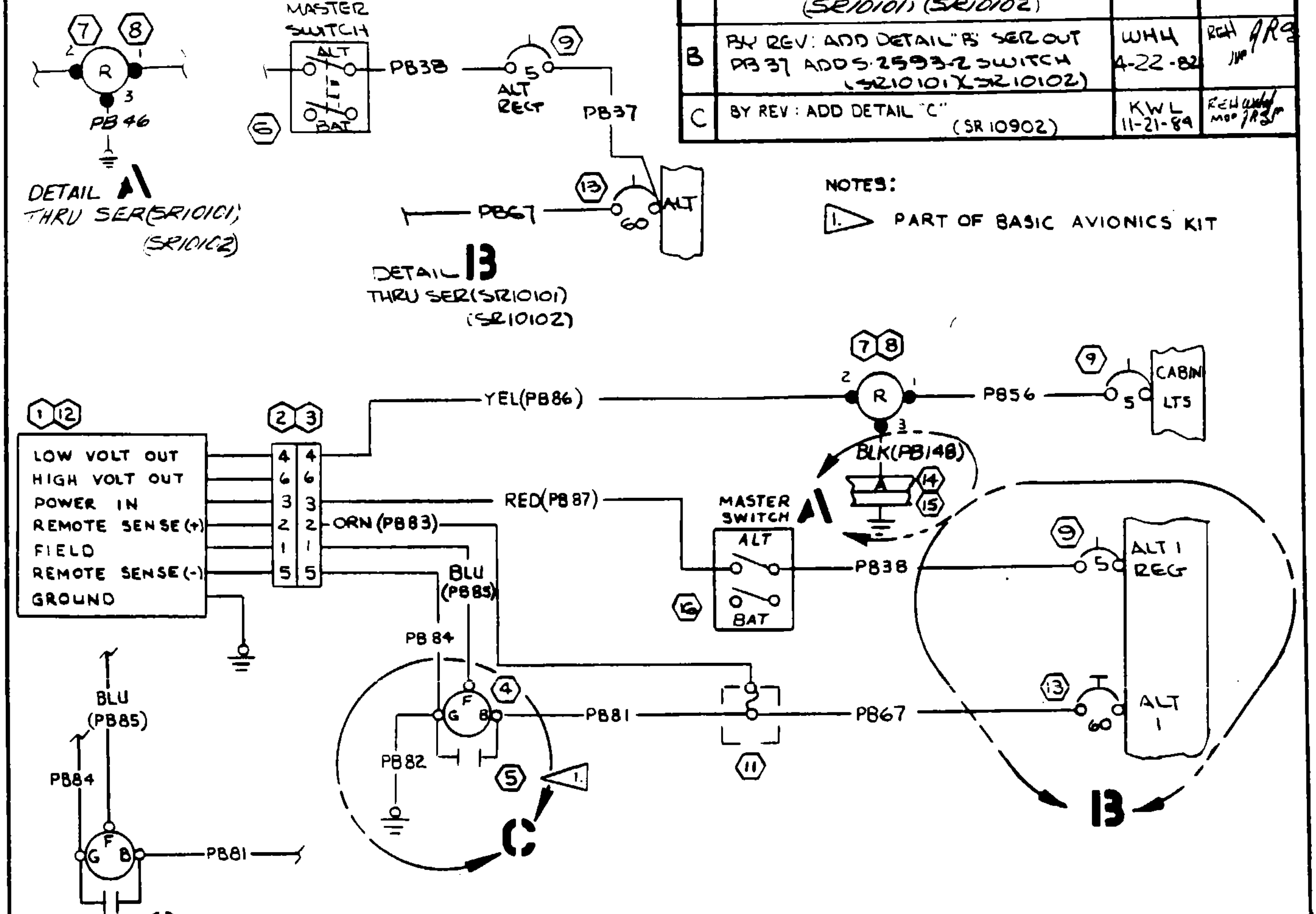
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

SIZE C
CODE IDENT. NO. 71379
DWG NO 1270709

SCALE NONE (SR 9634) (SR 9635) PAGE: 4.16

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV. ADD BLK(PB148) S-2527-1 & -2) & DETAIL "A" (SR10101) (SR10102)	MKT 1-27-82	JAB WHH
B	BY REV: ADD DETAIL "B" SER OUT PB37 ADD S-2593-2 SWITCH (SR10101)(SR10102)	WHH 4-22-82	RCH
C	BY REV: ADD DETAIL "C" (SR 10902)	KWL 11-21-84	RCH



DETAIL C
APPLIES TO P210 & T210
SER (SR10902) & ON

ITEM NO.	PART NO.	DESCRIPTION	
16	S2593-2	MASTER SWITCH	
15	S-2527-2	GND CONNECTOR	
14	S-2527-1	LH GND BLOCK	
13	S-1232-60	CIRCUIT BREAKER	
12	C611005-0102	ALT CONTROL UNIT (ALTERNATE)	
11	0570315	TERMINAL BOARD	
10	S-1707-60	CIRCUIT BREAKER	
9	S-1360-5L	CIRCUIT BREAKER	
8	MS25041-2	INDICATOR LIGHT	
7	MS25237-327	LAMP	
6	S-1994-1-1	MASTER SWITCH	
5	S-1915-1	CAPACITOR	1.
4	C611503-0102	ALTERNATOR ASSY	
3	S-2373-2	CONNECTOR	
2	S-2373-1	CONNECTOR	
1	C611005-0101	ALT CONTROL UNIT	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(PB148)	22	-22-0		SOLDER	S-2099-4	SER(SR10101)(SR10102) & ON	
RED(PB87)	20	-20-2		S-2099-6	S-1493-1		
YEL(PB86)	20	-20-4		SOLDER	S-2099-6		
BLU(PB85)	16	-16-6		S-2099-8	S-1367-2-10		
PB84	20			S-2099-6	S-1367-1-10		
ORN(PB83)	20	20-3		S-2099-6	S-1367-1-4		
PB82	8	S-1562-8-9		S-1943-1	S-2484-1		
PB81	8	S-1562-8-9		S-1943-2	S-1943-1		
PB67	8	S-1562-8-9		S-1943-2	S-1367-4-8		
PB56	22			S-1367-1-6	SOLDER		
PB46	22			SOLDER	S-1367-1-8	THRU SER(SR10101)(SR10102)	
PB38	22			S-1367-1-6	S-1493-1		
PB37	22			S-1367-1-10	S-1367-1-6	THRU SER	(SR10101)(SR10102)

WIRE TABLE

CONTRACT NO:

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	ABRAHAM	3-31-80
GROUP	D. Hauler	4-3-80
DRAWN	S. BURRIS	3-31-80
CHECK	RE HAIR	3-31-80
STRESS		
PROJ		
APPD		
OTHER		

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM 60 AMP

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR 9634)(SR 9635) | PAGE: 4.17

(SR 9785)

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:
1270709 PG. 4.9.0
SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
C	BY REV: ADD S2527-2, S2527-1, PB147, PB148, PB149, PB150, PB155, PB156, PB157, S2593-2 ADD PAGE 4.19.2 SER OUT PB112, PB113, PB128, PB129, PB141, PB142, PB143 (SR10101)(SR10102)	MKT 1-27-82 RNJ	JAB
D	BY REV: ADD DETAIL "C" (SR10101)(SR10102)	WHH 4.22.82	RGH JRG
E	BY REV: FN-DA24(REF) WAS FN-DA14(REF) FN-DA22(REF) WAS FN-DA15(REF) FN-DA25(REF) WAS FN-DA12(REF) FN-DA23(REF) WAS FN-DA13(REF) PG 4.19.1 (SR10734)	WHH 017.83	RGH JRG
G	SEE PAGE 4.19.2 FOR REVISIONS		

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: FN-DA15(REF) WAS FN-PB108 FN-DA14(REF) WAS FN-PB107 FN-DA12(REF) WAS FN-PB104 & FN-DA13(REF) WAS FN-PB105. DELETE FN-PB108, FN-PB104 FN-PB105 & FN-PB107 WIRES FROM WIRE TABLE. ON PB102 & PB103 WIRES SOLDER WAS S1495-1. ON PB112 & PB113 WIRES SOLDER WAS S1367-6, S1367-1-6 WAS S1495-1, ON PB128 & PB129 WIRES S1367-1-6 WAS S1495-1. ADD 20 GA JUMPERS AT ALT. RESTART SW. ON PB146 WIRE SOLDER WAS S1367-6 & S1367-1-10 DELETE 2170024 FROM EQUIPMENT TABLE (SR9953)(SR9954)	WHH 4-8-81	RGH JRG
B	BY REV: ADD NUMBERS ON TERMINALS/ MS25041-2 & MS25041-4. ADD MS25041-4; PB117/S1367-1-6 WAS S2099-4, PB135/S1367-1-6 WAS SOLDER (SR9953)(SR9954)	JPO 9-16-81 MKT 10-6-81	JAB JRG RGH

▷ TO AMMETER SEL. SW.

02-00916
01-00916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
PB124	20			S1367-1-12	S2099-4		
PB123	6			S1943-4	S1943-5		
PB122	20			S1367-1-8	S2099-4		
PB121	18			S1367-1-10	S2099-3		
PB120	20			S1367-1-10	S2099-4		
PB119	20			S1367-1-8	S2099-4		
PB118	18S			S1943-4	S2099-4		
PB117	20			S1367-1-6	S1367-1-6		
PB116	18			S1367-1-10	S2099-3		
PB115	20			S1367-1-8	S2099-4		
PB114	20			S1636-1	S1367-1-8		
PB113	20			SOLDER	S1367-1-6		THRU SER (SR10101)(SR10102)
PB112	20			SOLDER	S1367-1-6		THRU SER (SR10101)(SR10102)
PB111	20			SOLDER	S1636-1		
PB110	6			S2447-6	S1367-5-12		
PB109	6			S2447-6	S1367-5-12		
PB106	20			SOLDER	S1367-1-8		
PB103	20			S1367-1-6	SOLDER		
PB102	20			S1367-1-6	SOLDER		
PB101	18			S1367-1-10	S1367-1-10		
PB100	18			S1367-1-10	S1367-1-10		
PB98	6			S1367-5-8	S2447-6		
PB97	6			S2447-6	S1367-5-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
23	S1915-2	CAPACITOR	
22	S1915-1	CAPACITOR	
21	S2593-2	SWITCH	
20	S2527-2	GND CONNECTOR	
19	S2527-1	LH GND BLOCK	
18	MS25041-4	LIGHT ASSY	
17	2101055	BATTERY ASSY	
16	MS25237-327	LAMP	
15	MS25041-2	LIGHT ASSY	
14	S2349-1	CONNECTOR	
13	C611007-0101	ALT CONTROL UNIT	
12	S1790-2-1	SWITCH	
11	C611503-0104	ALTERNATOR	
10	S2035-2	PLUG	
9	83-0057	RESISTOR	
8	-		
7	S1890-1	SWITCH	
6	20H3P	DIODE	
5	S2558-1	SHUNT	
4	2170027	BUS BAR	
3	S1360-5L	CKT BREAKER	
2	S1232-60	CKT BREAKER	
1	S2475-1	CONTACTOR	

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		
GROUP	D. L. Hardin	3-24-81
DRAWN	ACKERSON	3-24-81
CHECK	BORLESKE	3-24-81
STRESS		
PROJ	J. H. Morrell	3-25-81
APPD		
OTHER		

Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — DUAL ALTERNATOR

SIZE	CODE IDENT NO.	DWG NO
C	71379	1270709

SCALE NONE (SR9953)(SR9954) PAGE: 4.19.0

Dual Alternator (Sheet 1 of 2)

PB165	20			S1367-1-12	S2099-4	SER(SR10680)(SR10420) & ON
PB164	20			S1367-1-10	S2099-4	SER(SR10680)(SR10420) & ON
PB163	18S			S1943-4	S2099-4	SER(SR10680)(SR10420) & ON
PB162	6			S2447-6	S1367-5-12	SER(SR10680)(SR10420) & ON
BLK(PB157)	22	-22-0		SOLDER	S2099-4	SER(SR10101)(SR10102) & ON
BLK(PB156)	22	-22-0		SOLDER	S2099-4	SER(SR10101)(SR10102) & ON
BLK(PB155)	22	-22-0		SOLDER	S2099-4	SER(SR10101)(SR10102) & ON
BLK(PB166)	20			S1367-1-10	S1367-1-12	SER(SR10680) & ON
PB150	20			S1493-1	S2099-4	SER(SR10101)(SR10102) & ON
PB149	20			S1493-1	S2099-4	SER(SR10101)(SR10102) & ON
PB148	20			SOLDER	S1493-1	SER(SR10101)(SR10102) & ON
PB147	20			SOLDER	S1493-1	SER(SR10101)(SR10102) & ON
PB146	6			S1943-4	S1943-5	
PB145	20			SOLDER	SOLDER	
PB144	20			S1367-1-8	SOLDER	
PB143	22			SOLDER	S1367-1-8	THRU SER(SR10101)(SR10102)
PB142	22			SOLDER	S1367-1-8	THRU SER(SR10101)(SR10102)
PB141	22			SOLDER	S1367-1-8	THRU SER(SR10101)(SR10102)
PB140	22			SOLDER	S2099-4	
PB139	22			SOLDER	SOLDER	
PB138	22			SOLDER	SOLDER	
PB137	22			S2099-4	SOLDER	
PB136	22			S2099-4	SOLDER	
PB135	22			S2099-4	S1367-1-6	
PB134	20			S2099-4	S1367-1-8	
PB133	20			S1367-1-8	S2099-4	
PB132	20			S2099-4	S2099-4	
PB131	20			S2099-4	S2099-4	
PB130	20			S2099-4	S2099-4	
PB129	20			S1367-1-6	S2099-4	THRU SER(SR10101)(SR10102)
PB128	20			S1367-1-6	S2099-4	THRU SER(SR10101)(SR10102)
PB127	18S			S1943-4	S2099-4	
PB126	20			S1367-1-8	S2099-4	
PB125	20			S1367-1-10	S2099-4	
CODE	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	W.H. Hoos...	3-24-81
DRAWN	ACKERSON	3-24-81
CHECK	BORLESKE	3-24-81
STRESS		
PROJ	[illegible]	3-2?-81
APPD	[illegible]	
OTHER		

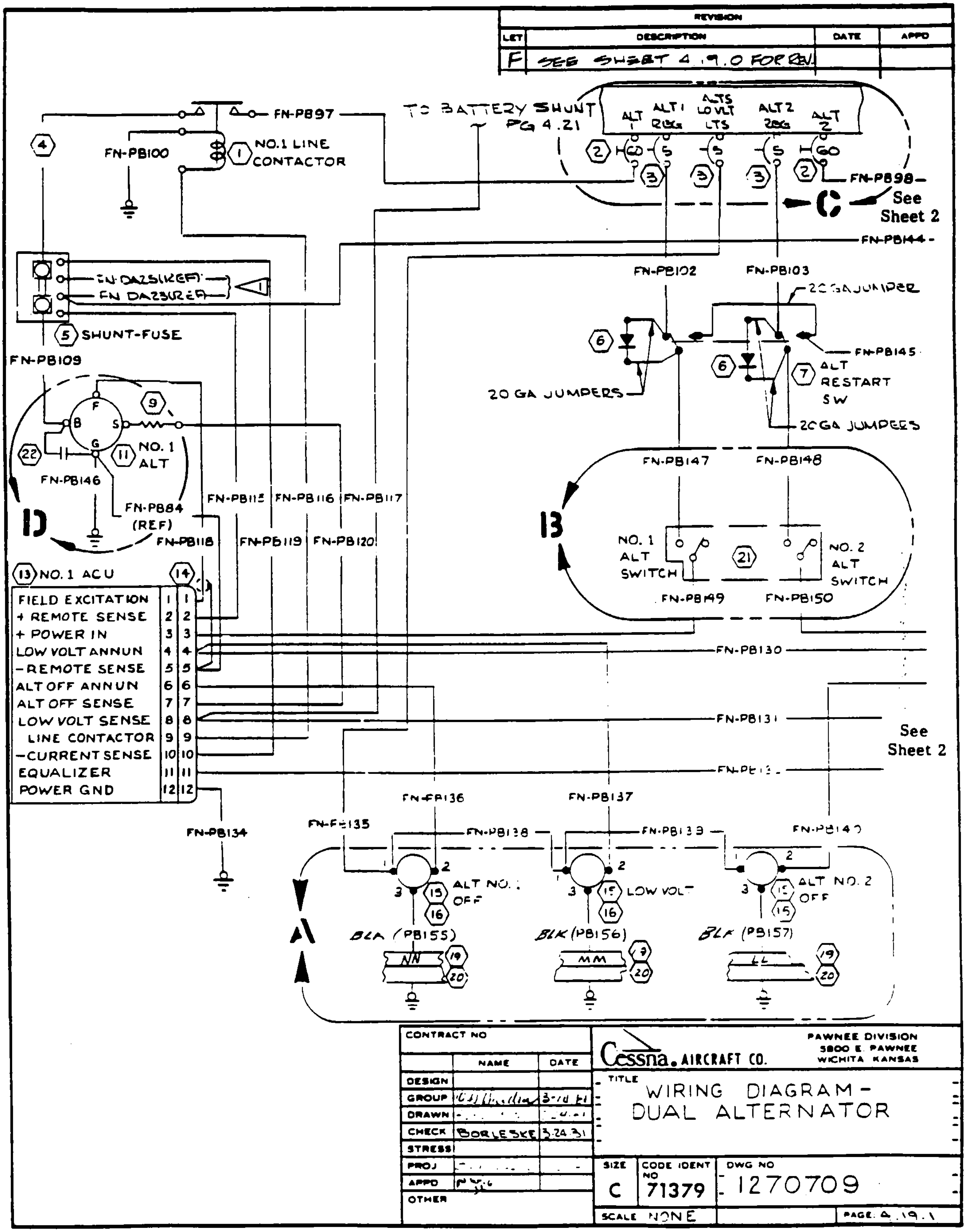
Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM— DUAL ALTERNATOR

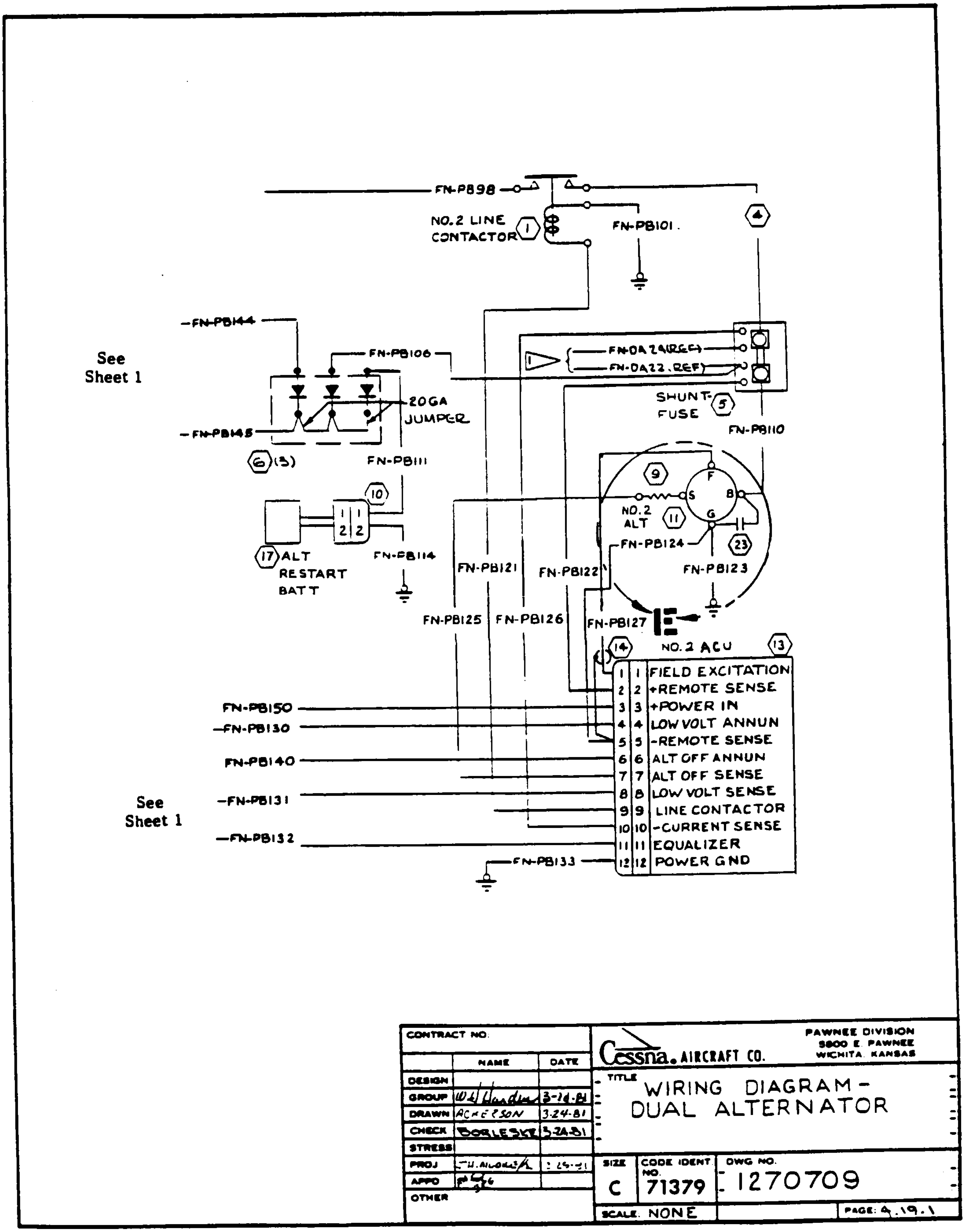
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

[illegible] - NONE (SR9953)(SR9964) PAGE: 4.19.0

Dual Alternator (Sheet 2 of 2)



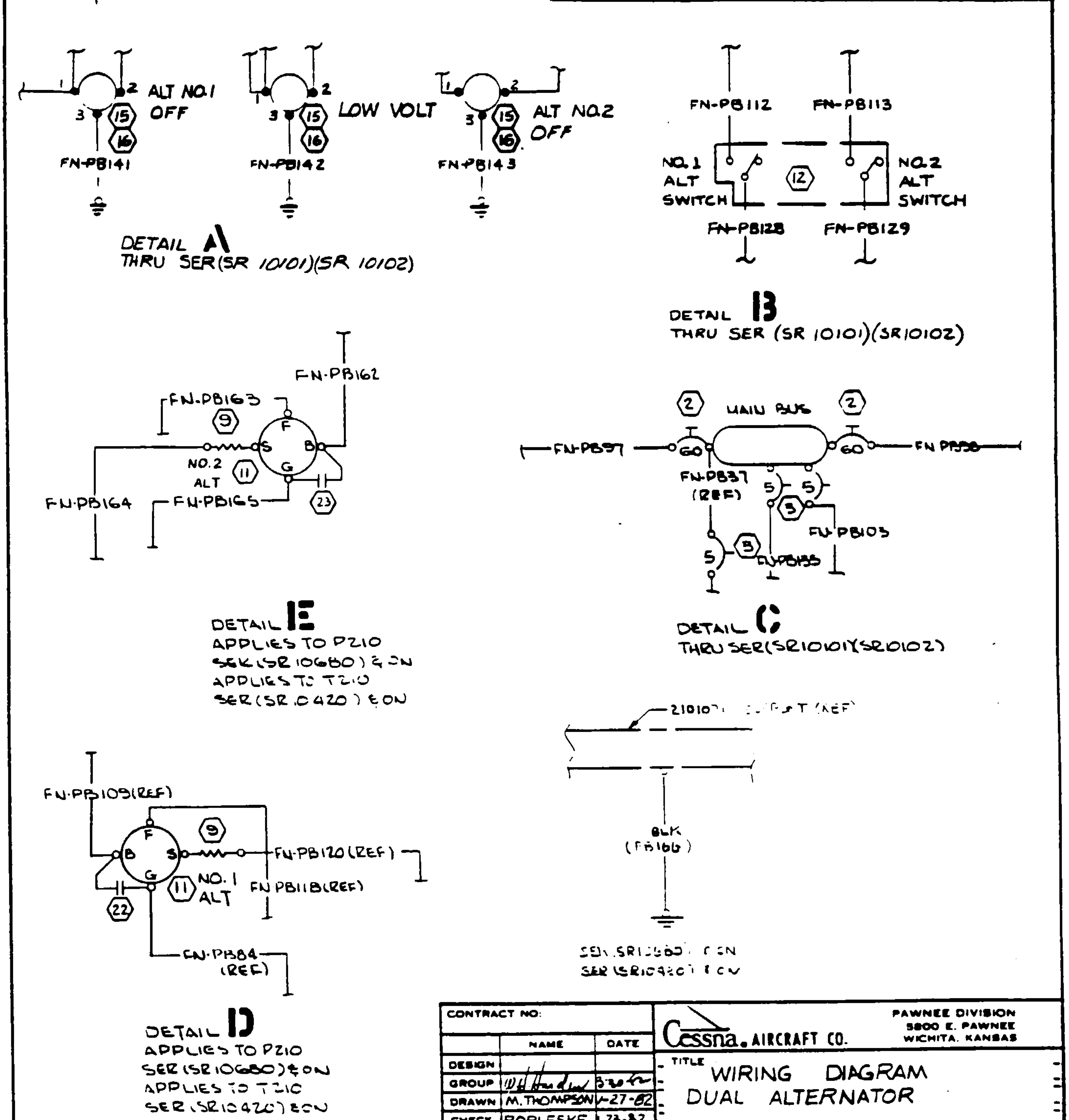
Dual Alternator (Sheet 1 of 2)



Dual Alternator (Sheet 2 of 2)

H	BY REV: ADD NOISE FILTER CAPACITORS S1915-1 & S1915-2 TO ALT NO. 1 & ALT NO. 2 RESPECTIVELY (EC 30419)	MLT 4-17-92	

REVISION			
LET	DESCRIPTION	DATE	APPD
F	BY REV: ADD DETAILS "D" & "E" (SR10420) & (SR10680)	10-1-84	
G	BY REV: ADD FB166 REF (SR10420)(SR10680)	TMS 2-26-85	



CONTRACT NO:	NAME	DATE
DESIGN		
GROUP		
DRAWN	M. THOMPSON	1-27-82
CHECK	BORLESKE	1-28-82
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM DUAL ALTERNATOR

SIZE	CODE IDENT NO.	DWG NO.
C	71379	1270709

SCALE NONE (SR10101)(SR10102) PAGE: 4.19.2

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: FN-PA38 WAS FN-PA17 (REF) FN-PA39 WAS FN-PA6 (REF) (SR9953)(SR9954)	WHH 4-8-81	REH
B	BY REV: S-2558-2 WAS S-2558-1 ADD FN-PB117 BATTERY-SHUNT (SR9953)(SR9954)	MKT 10-6-81	REH JRS
C	BY REV: ADD DETAIL 'A' S2527-2, S2527-1, BLK(FN-PA41); SER OUT FN-PA39, FN-PA38, S1790-1; ADD S2593-2, FN-PA17 (SR10101)(SR10102)	MKT 1-27-82 RNJ	
D	BY REV: CHANGE PICTURE OF S-2593-2 MASTER SWITCH TO SHOW PROPER LOCATION OF ALT 1 & ALT 2. (SR10101)(SR10102)	WHH 4-22-82	REH JRS
E	BY REV: ADD DETAIL "B" & 150 CIRCUIT BREAKER (SR10101)(SR10102)	WHH 5-26-82	REH
F	BY REV: DA17(REF) WAS DA16(REF), DA16(REF) WAS DA17(REF); FUSE WAS RESISTOR TO CONNECTION 2 OF S-2558-2 (SR9953)(REF)(SR9954)(REF)	GLS 7-14-82	JRS
G	BY REV: FN-DA20(REF) WAS FN-DA17(REF) FN-DA21(REF) WAS FN-DA16(REF) (SR10734)	WHH 10-17-83	REH JRS

02-00916

04-00916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
FN-PA17	22			S1367-1-10	S-1493-1		SER (SR10101)(SR10102) & ON
BLK(FN-PA41)	22	-22-0		S1367-1-6	S2099-4		SER (SR10101)(SR10102) & ON
FN-PA39	22			S1367-1-6	S1367-1-8		THRU SER (SR10101)(SR10102)
FN-PA38	22			S1367-1-10	S1367-1-6		THRU SER (SR10101)(SR10102)
FN-PA37	6	S-1562-6-9		S1367-5-12	S1367-5-8		
FN-PA36	6	S-1562-6-9		S1367-5-13	S1367-5-12		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	S-2593-2	MASTER SWITCH
9	S2527-2	GND CONNECTOR
8	S2527-1	LH GND BLOCK
7	S-2558-2	SHUNT-BATTERY
6	S-1232-60	CIRCUIT BREAKER
5	S-2443-1	CONTACTOR
4	S1790-1	MASTER SWITCH
3	S2475-1	CONTACTOR
2	0770728	DIODE ASSY
1	C614001-0105	BATTERY 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		
GROUP	W H Harden	3-26-81
DRAWN	HARDEN	3-24-81
CHECK	DORLESKE	3-24-81
STRESS		
PROJ	J H MCORE	
APPD		
OTHER		

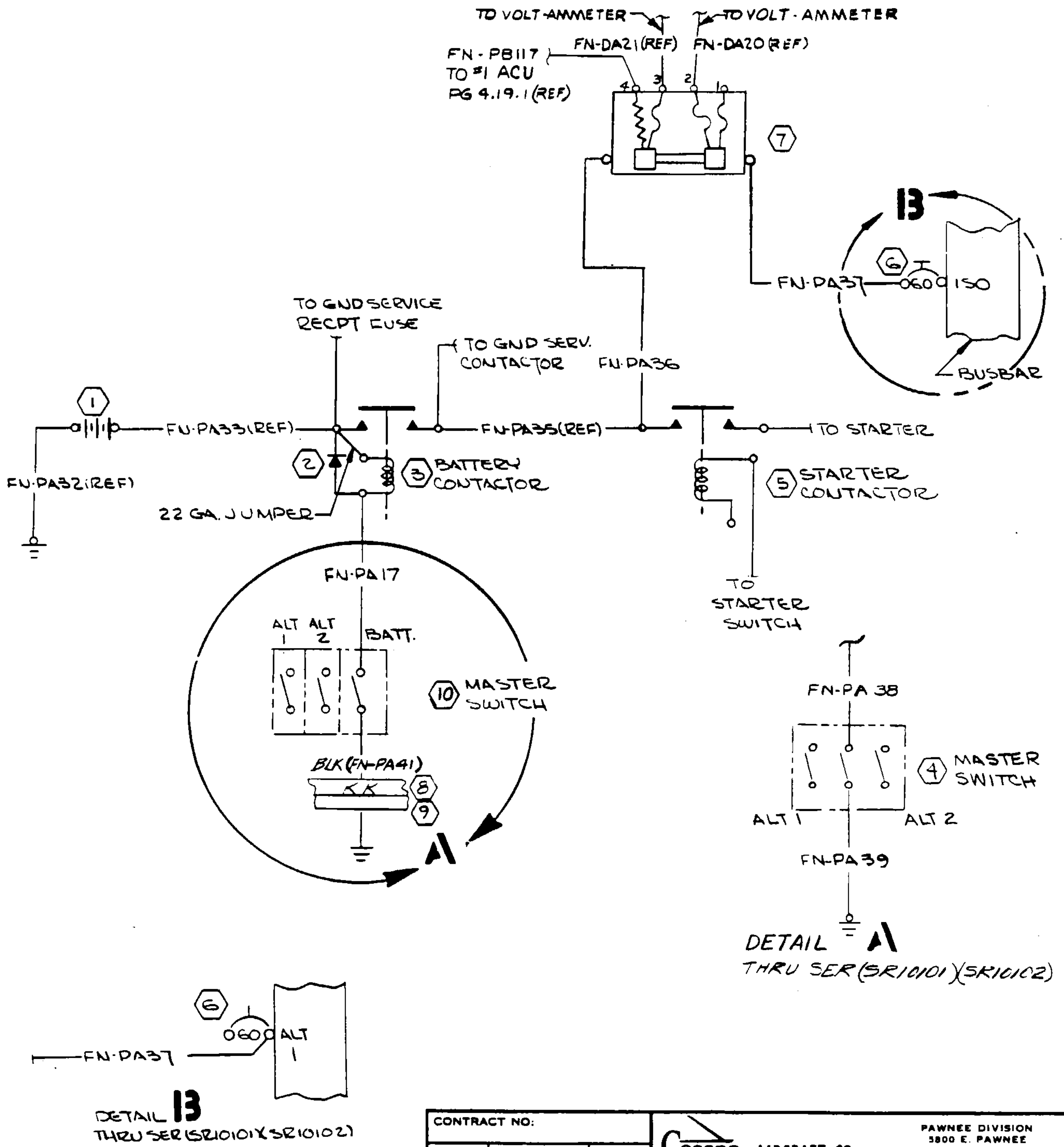
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT-OPT (WITH DUAL ALTERNATORS)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE (SR9953)(SR9954) PAGE: 4.21

Battery Circuit (OPT) (With Dual Alternators) (Sheet 1 of 2)



CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	W.H. Hardin	3-26-81
DRAWN	JARDEN	3-24-81
CHECK	DORLESKE	3-29-81
STRESS		
PROJ	J.H. MOORE	[illegible]
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — BATTERY CIRCUIT-OPT (WITH DUAL ALTERNATORS)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

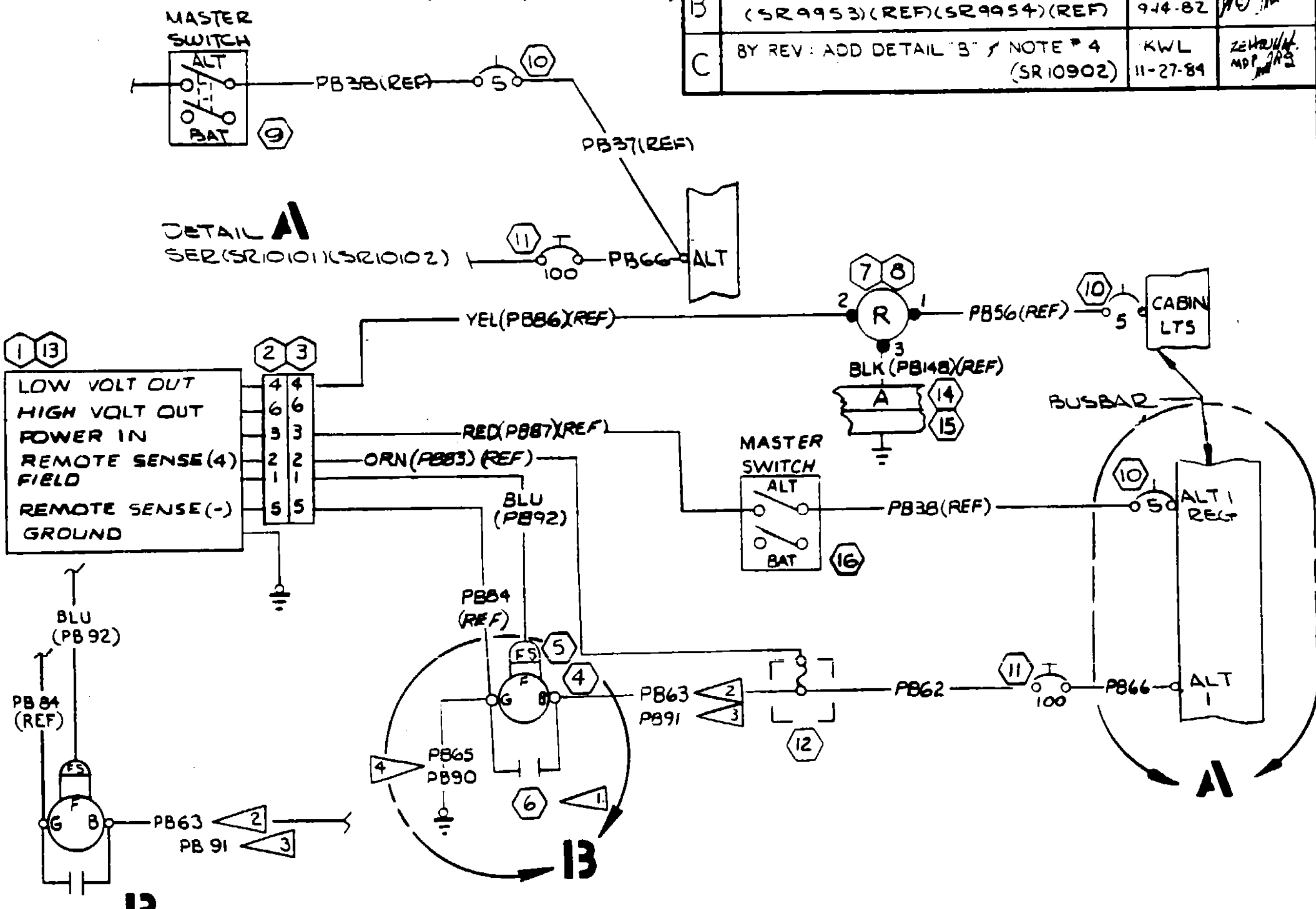
SCALE: NONE   629953 (629954)   PAGE: 4.21

Battery Circuit (OPT) (With Dual Alternators) (Sheet 2 of 2)

NOTES:

1. PART OF BASIC AVIONICS KIT
2. PB63 WIRE USED ON P210 ONLY AFTER SER (SR10061)
3. PB91 WIRE USED ON 210 & T210 SER (SR10061) & ON
4. PB65 WIRE USED ON 210. PB65 WIRE USED ON T210 THRU SER (SR 10902) PB90 WIRE USED ON P210 THRU SER (SR 10902)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A" & S-2533-2 SWITCH (SR10101) (SR10102)	WHH 4-22-82	RCH JRG
B	BY REV: BLU (PB92) WAS BLU (PB87) (SR9953) (REF) (SR9954) (REF)	GLS 9-14-82	ZEHJRG
C	BY REV: ADD DETAIL "B" & NOTE # 4 (SR 10902)	KWL 11-27-84	ZEHJRG MDP



DETAIL B
APPLIES TO P210 & T210
SER (SR10902) & ON

ITEM NO.	PART NO.	DESCRIPTION	
16	S-2533-2	MASTER SWITCH	
15	S-2527-2	GND CONNECTOR	
14	S-2527-1	LH GND BLOCK	
13	C611005	ALT CONTROL UNIT (ALTERNATE)	
12	0570315	TERMINAL BOARD	
11	S-2326-1	CIRCUIT BREAKER	
10	S-1360-5L	CIRCUIT BREAKER	
9	S-1994-1-1	MASTER SWITCH	
8	MS25041-2	INDICATOR LIGHT	
7	MS25237-327	LAMP	
6	S-1915-1	CAPACITOR	1.
5	D208-14489-KA	CONNECTOR	
4	C611505	ALTERNATOR ASSY	
3	S-2373-2	CONNECTOR	
2	S-2373-1	CONNECTOR	
1	C611005	ALT CONTROL UNIT	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
PB90	4	S-1562-4-9		S-2402-2	S-2402-1		THRU (SR 10902)
PB91	4	S-1562-4-9		S-2402-2	S-2402-2	3.	
BLU (PB92)	18	-18-6		S-2099-8	S-2376-1		
PB66	4	S-1562-4-9		S-1367-6-12	S-1367-6-10		
PB65	4	S-1562-4-9		S-2402-2	S2402-1		
PB63	4	S-1562-4-9		S-2402-2	S2402-2	2.	
PB62	4	S-1562-4-9		S-2402-2	S-1367-6-12		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	W.H. Harden	3-26-82
DRAWN	M THOMPSON	2-2-82
CHECK	BORLESKE	2-2-82
STRESS		
PROJ	J.H. MOORE	3-2-82
APPD	JRG	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM 95 AMP (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

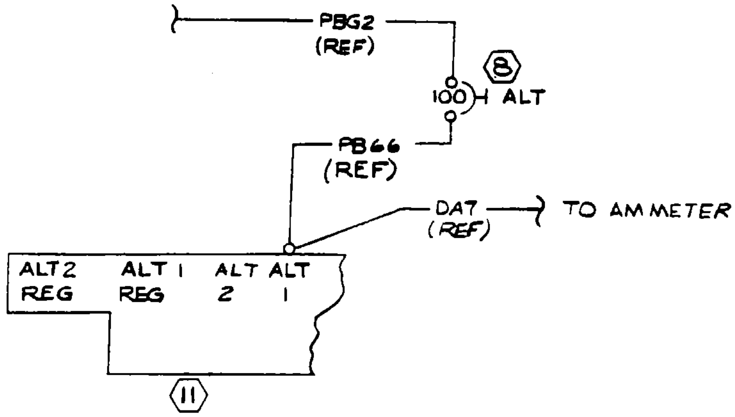
SCALE: NONE (SR10101) (SR10102) | PAGE: 4.22

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1270709 P. 4.10

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD



DETAIL A
APPLIES WITH 95 AMP. ALT SYSTEM (OPT)

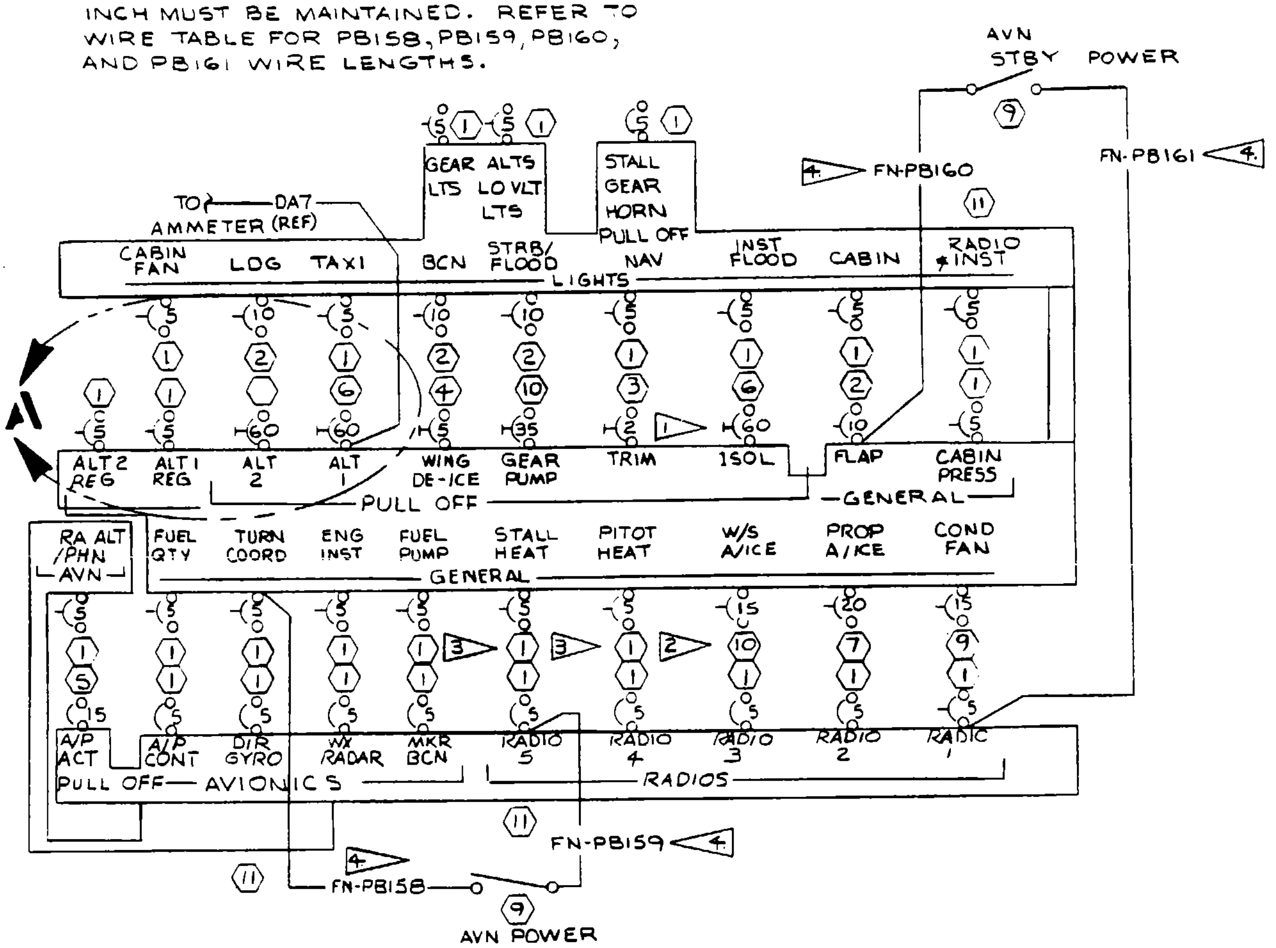
02-00916
01-00916

CONTRACT NO:			Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS		
	NAME	DATE			
DESIGN	HARDEN	4-23-82	TITLE WIRING DIAGRAM — CIRCUIT BREAKERS		
GROUP	W. H. Harden	4-23-82			
DRAWN	M.THOMPSON	4-28-82			
CHECK	R.YOUNGERS	4-28-82			
STRESS					
PROJ	[illegible]	[illegible]	SIZE	CODE IDENT. NO.	DWG NO.
APPD	JRS		C	71379	1270709
OTHER			SCALE: NONE	5R10101 (5R10102)	PAGE: 4.23.1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	SEE PG 4.23.0 FOR REV		

NOTES:

1. APPLIES TO P210 ONLY
2. S-1360-15L CKT BKR REQD WITH KNOWN ICING W/S A/ICE SYSTEM
3. S-1360-10L CKT BKR REQD WITH KNOWN ICING PITOT HEAT SYSTEM & STALL WARN HEAT SYSTEM.
4. WIRE CUT LENGTH TOLERANCE OF ± .10 INCH MUST BE MAINTAINED. REFER TO WIRE TABLE FOR PB158, PB159, PB160, AND PB161 WIRE LENGTHS.



ITEM NO.	PART NO.	DESCRIPTION
11	2170035	BUS BAR
10	S-1232-35	CIRCUIT BREAKER
9	MS25306-222	SWITCH
8	S-2326-1	CIRCUIT BREAKER
7	S-1360-20L	
6	S-1232-60	
5	S-1232-15	
4	S-1232-5	
3	S-1232-2	
2	S-1360-10L	
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
FN-PB161	10	S-1562-10-9	6.25	S-1367-3-6	S-1367-3-6	(OPT)
FN-PB160	10	S-1562-10-9	3.5	S-1367-3-6	S-1367-3-6	(OPT)
FN-PB159	10	S-1562-10-9	8.0	S-1367-3-6	S-1367-3-6	(OPT)
FN-PB158	10	S-1562-10-9	8.0	S-1367-3-6	S-1367-3-6	(OPT)

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		
GROUP	W.H. Harden	8-27-82
DRAWN	G. STAMM	8/20/82
CHECK	R. YOUNGERS	8-23-82
STRESS		
PROJ	[illegible]	[illegible]
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

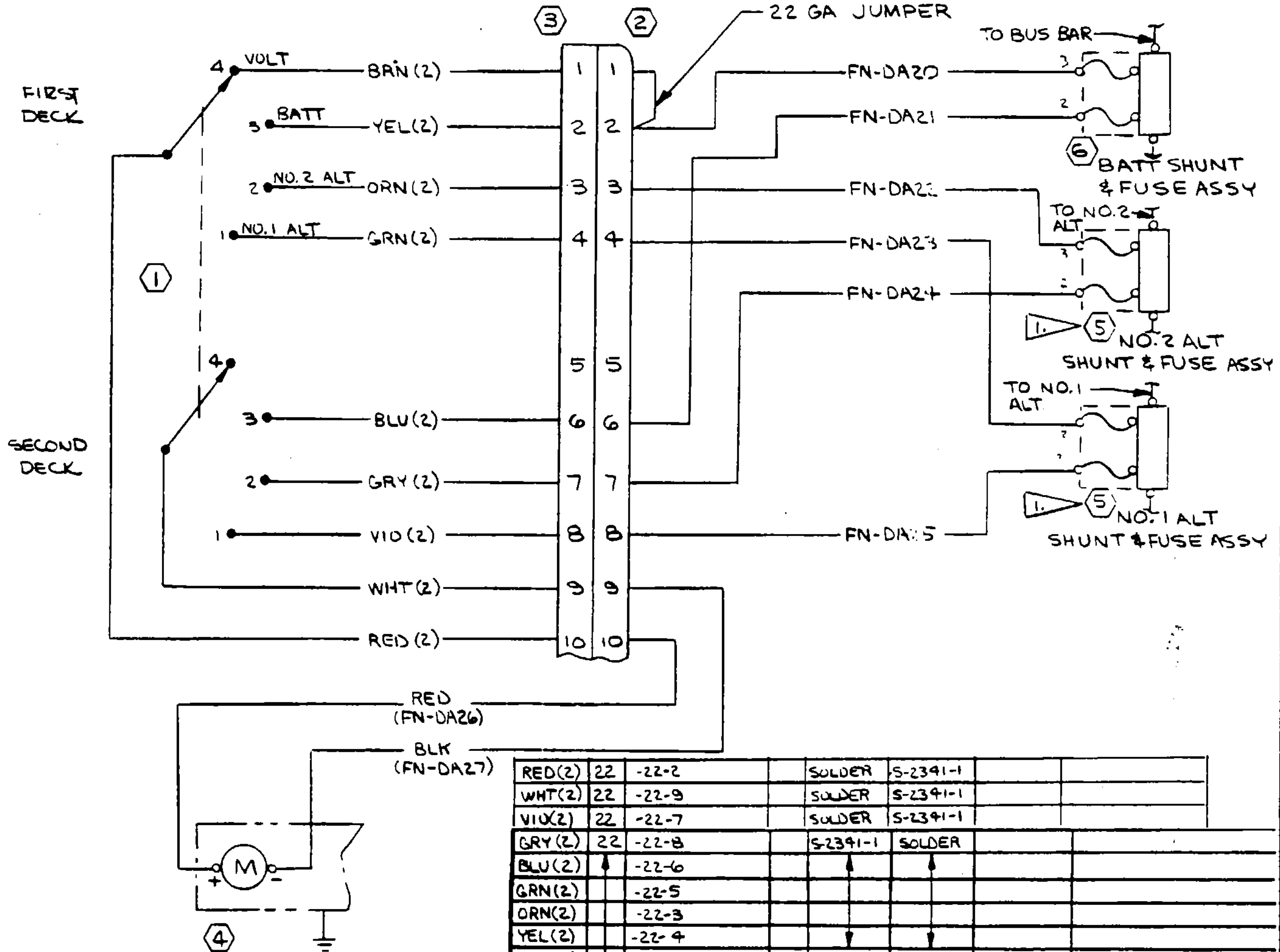
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE NONE (SR10563) PAGE: 4.23.2

NOTES:

1. ALTERNATOR SHUNT & FUSE ASSYS ARE PART OF 2170024 MODULE ASSY

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD SWITCH DECK DESIGNATIONS. ON FIRST DECK 1 THRU 4 WAS 6 THRU 9 (SR 10734)	WHH 12-1-83	REH 10HN ARS



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED(2)	22	-22-2		SOLDER	S-2341-1		
WHT(2)	22	-22-9		SOLDER	S-2341-1		
VIO(2)	22	-22-7		SOLDER	S-2341-1		
GRY(2)	22	-22-8		S-2341-1	SOLDER		
BLU(2)		-22-6					
GRN(2)		-22-5					
ORN(2)		-22-3					
YEL(2)		-22-4					
BRN(2)		-22-1		S-2341-1	SOLDER		
BLK (FN-DA27)		-22-0		S-2415-1	S-1367-1-10		
RED (FN-DA26)		-22-2			S-1367-1-10		
FN-DA25					S-1367-1-8		
FN-DA24							
FN-DA23							
FN-DA22							
FN-DA21							
FN-DA20	22			S-2415-1	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
6	S-2558-1	SHUNT-BATTERY
5	S-2558-1	SHUNT-ALTERNATOR
4	C669563	INSTR CLUSTER
3	S-2345-4	HOUSING
2	S-2350-6	HOUSING
1	2570100	SELECTOR SW 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: PG. 4.20

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	10-17-83
GROUP		
DRAWN	SPENCER	10-17-83
CHECK	REHAR	10-19-83
STRESS		
PROJ	[illegible]	[illegible]
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — VOLT-AMMETER (OPT)

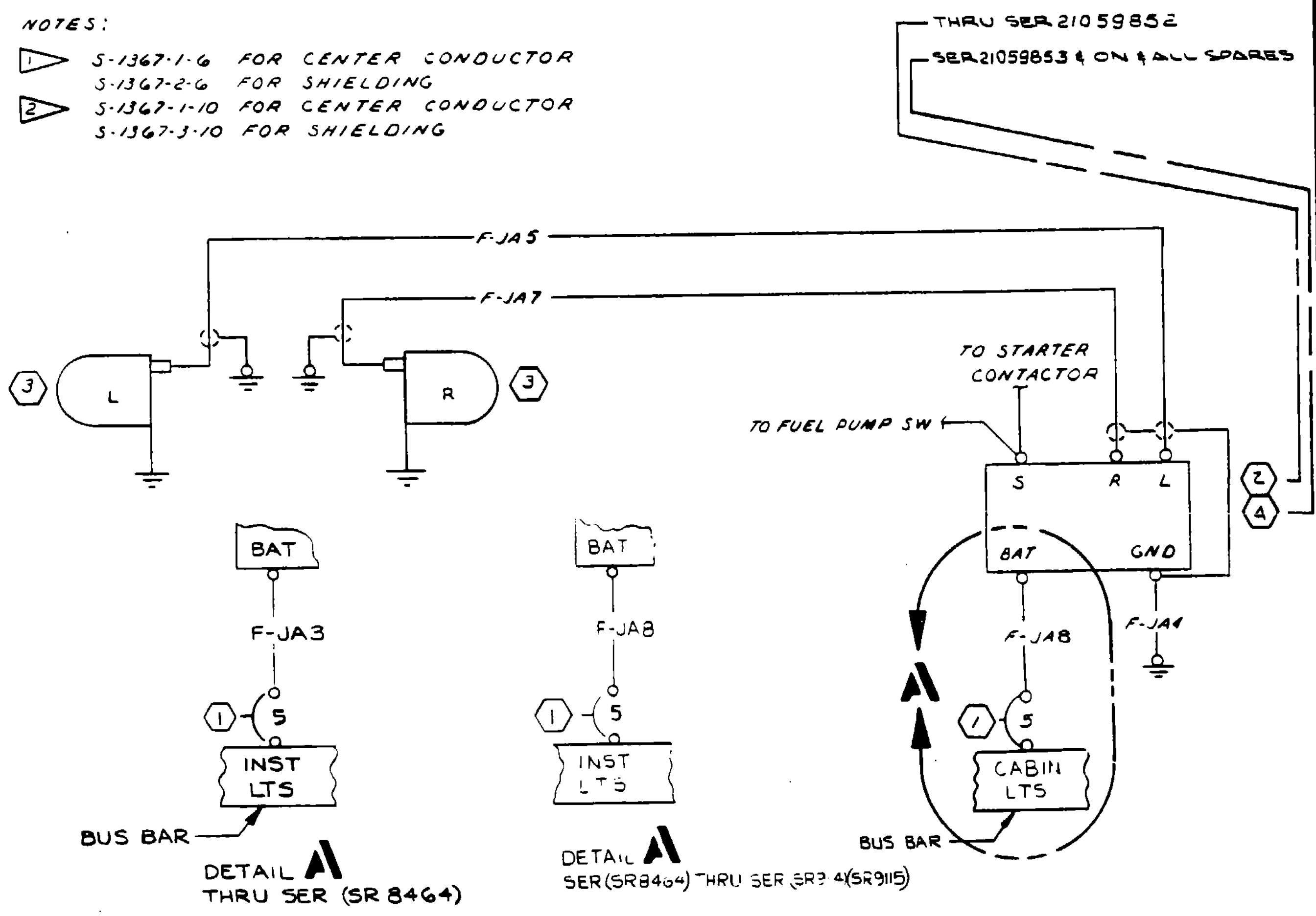
SIZE: C | CODE IDENT NO: 71379 | DWG NO: 1270709

SCALE: NONE | (SR10734)(SR10713) | PAGE: 4.24

LET	DESCRIPTION	DATE	APPD
E	BY REV: ADD DETAIL "A" & SER (SR9114) (SR 9115)	HHG 2-12-79	JAB
A	BY REV: SER OUT C292501-0101; SER IN C292501-0105 (SR7126)	RLY 2-29-72	LKW
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	
C	BY REV: S1360-5L WAS S1360-8L (SR8143)	GDS 5-12-76	
D	BY REV: ADD DETAIL "A" & SER & F-JA8 (SR 8464)	REG 4-28-77	

NOTES:

1. S-1367-1-6 FOR CENTER CONDUCTOR; S-1367-2-6 FOR SHIELDING
2. S-1367-1-10 FOR CENTER CONDUCTOR; S-1367-3-10 FOR SHIELDING



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
F-JA8	20			S-1367-1-6	S-1367-1-6	SER (SR8464) & ON
F-JA7	18S		66	1	2	
F-JA5	18S		65	1	2	
F-JA4	20		7	S-1367-1-8	S-1367-1-6	
F-JA3	20		13	S-1367-1-6	S-1367-1-6	THRU SER (SR8464)

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
4	C292501-0105	IGNITION SWITCH	
3	SLICK #662	MAGNETO	(09035)
2	C292501-0101	SWITCH	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP		2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	LK. WHITE	2-24-71
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

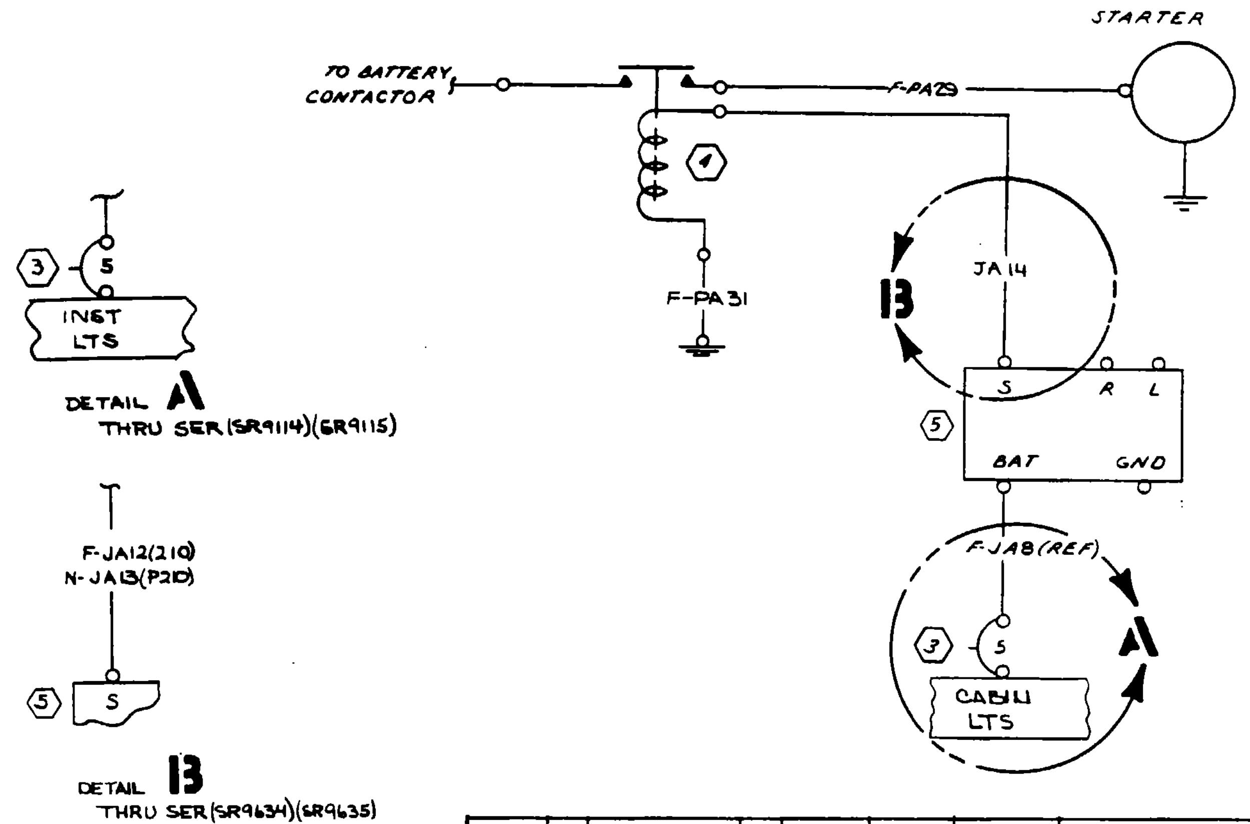
TITLE: WIRING DIAGRAM — MAGNETO SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 5.1

(SR 6755) IX
21059503

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A (SR9114)(SR9115)	DDH 12-9-78	JAB 12/4/78 JRS
B	BY REV: ADD JA12 & JA13; DELETE JA9 & JA11 (SR9221)	PSM 1-19-79	JAB 10/4/8 JRS
C	BY REV: S-1367-6-13 WAS S-1367-7-13/ PA29 (NOW SHOP PRACTICE)	HHG 8-1-79	JAB 10/4/8 JRS
D	BY REV: SER OUT JA12, JA13; ADD JA14, DETAIL B (MER P210 E0870) (SR9634)(SR9635)	DFS 7-14-80	JAB 10/4/8 JRS



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
JA-14	20			S-1367-1-6	S1367-1-10		SER(SR9634)(SR9635)&ON
N-JA13	20			S-1367-1-6	S-1367-1-10		THRU SER (SR9635)
F-JA12	20			S-1367-1-6	S-1367-1-10		THRU SER (SR9634)
F-PA31	22			S1367-1-10	S1367-1-10		
F-PA29	4	S-1562-4-9		S-2447-4	S-1367-6-13		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	C292501-0105	IGNITION SWITCH
4	S-2443-1	STARTER CONTACTOR
3	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1270709 P 6.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	12-14-78
GROUP	W.H. Harden	12-13-78
DRAWN	HAUN	12-9-78
CHECK	BORLESKE	12-12-78
STRESS		
PROJ	J. Oaks	2-26-78
APPD	JRS	
OTHER		

Cessna. AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — STARTER SYSTEM

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | SR9221 | PAGE: 6.2

REVISION (CON'T)			
LET	DESCRIPTION	DATE	APPD
L	BY REV: ADD DETAIL "C" & SER & F-QD33 (SR 8464)	REG 4-28-77	

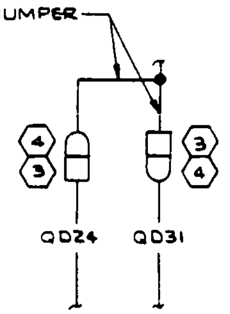
REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADDED NOTE 1	3-19-73	
B	BY REV: "F" PREFIX WAS "H", ADD F-GC21 (REF), F-GC13 (REF) & 1250706 (NOW SHOP PRACTICE)	DLO 6-20-73	PLH
C	BY REV: S-1370-1/QD31 WAS SEE QD24, SOLDER/QD24 WAS S-1370-1 (MER E0034) (NOW SHOP PRACTICE)	DEF 2-8-74	JRS
D	BY REV: S-1856-1 WAS 1250706-1 F-GC22 (REF) WAS F-GC13 (REF) (SR7597)	DLO 6-25-74	JRS
E	BY REV: DELETE NOTE 1; ADD NOTE 2 & 3; ADD JUMPERS AT RESISTOR AMOR-20-10 (SR 8082)	BLA 11-26-74	JRS
F	BY REV: ADD S-1637-1 & -2 TO QD24 & QD31, ALL WIRE LENGTHS; S-1635-1/QD31 & S-1636-1/QD24 WERE SOLDER NOW SHOP PRACTICE MER E0408	TMS 2-28-75	JRS
G	BY REV: REVISE NOTE 2 AND ADD DETAIL 'A' (SR8297)	GW 7-30-75	JRS
H	BY REV: 2LM-E WAS S-1856-1; ADD DETAIL B, QD32 & SER MER 207E0436 (SR8115) (SR8426)	JMS 1-14-76	JRS
J	BY REV. 20GA WAS 18GA/F-QD23 THRU F-QD32 & JUMPER WIRES (SR8143)	GDS 5-6-76	JRS
K	BY REV: S-2035-1 WAS S-1637-1; S-2035-2 WAS S-1637-2 (NOW SHOP PRACTICE) MER E0523	PH 8-27-76	

NOTES:

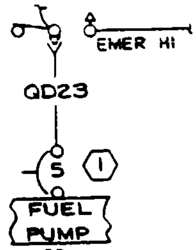
1. ~~PLACE YELLOW ROCKER SWITCH IN HIGH BOOST POSITION, ADJUST RESISTORS WITH ENGINE OFF & 27.5 VDC APPLIED TO BUS. OPEN TO FULL THROTTLE & ADJUST 1ST RESISTOR TO PRODUCE 125 LBS/HR INDICATION ON FUEL FLOW METER. ADJUST 2ND RESISTOR WITH THROTTLE CLOSED TO PRODUCE 40 LBS/HR INDICATION ON FUEL FLOW METER. RESISTORS ARE IN SERIES WHEN THROTTLE IS CLOSED.~~

2. ADJUST AMOR-20-10 TO 3.5 ± .5 OHMS PRIOR TO INSTALLATION

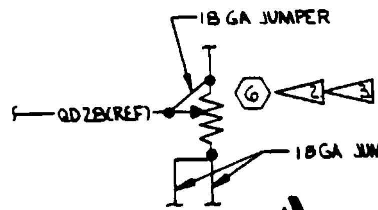
3. READJUST RESISTANCE AS REQUIRED AFTER INSTL TO COMPLY WITH FUEL FLOW REQUIREMENTS PER CES 1243



DETAIL B
THRU SER (SR8426)



DETAIL C
THRU SER (SR 8464)



DETAIL A
EFF THRU SER (SR8297)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-QD33	20			S-1367-1-6	S-1493-1		SER (SR8464) & ON
F-QD32	20		60	S-1493-1	S-1635-1		SER (SR8426) & ON
F-QD31	↑		54	S-1635-1	S-1370-1		
F-QD30			60	S-1635-1	SOLDER		
F-QD29			12	SOLDER	S-1636-1		
F-QD28			60	S-1635-1	SOLDER		
F-QD27			12	SOLDER	S-1636-1		
F-QD26			12	S-1635-1	SOLDER		
F-QD25			90	S-1493-1	S-1636-1		
F-QD24	↓		60	S-1493-1	S-1636-1		THRU SER (SR8426)
F-QD23	20		17	S-1367-1-6	S-1493-1		THRU SER (SR8464)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	S-2035-2	HOUSING	
8	S-2035-1	HOUSING	
7	C291504-0201	PUMP	
6	AMOR20-10	RESISTOR	
5	2-LM-E	SWITCH	
4	S-1637-1	HOUSING	
3	S-1637-2	HOUSING	
2	S-1846-3-2	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: P 7.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	11-30-72
GROUP	H Wise	1-3-73
DRAWN	PAPE	12-28-72
CHECK	R. YOUNGERS	12-30-72
STRESS		
PROJ		1-3-73
APPD	PLH	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

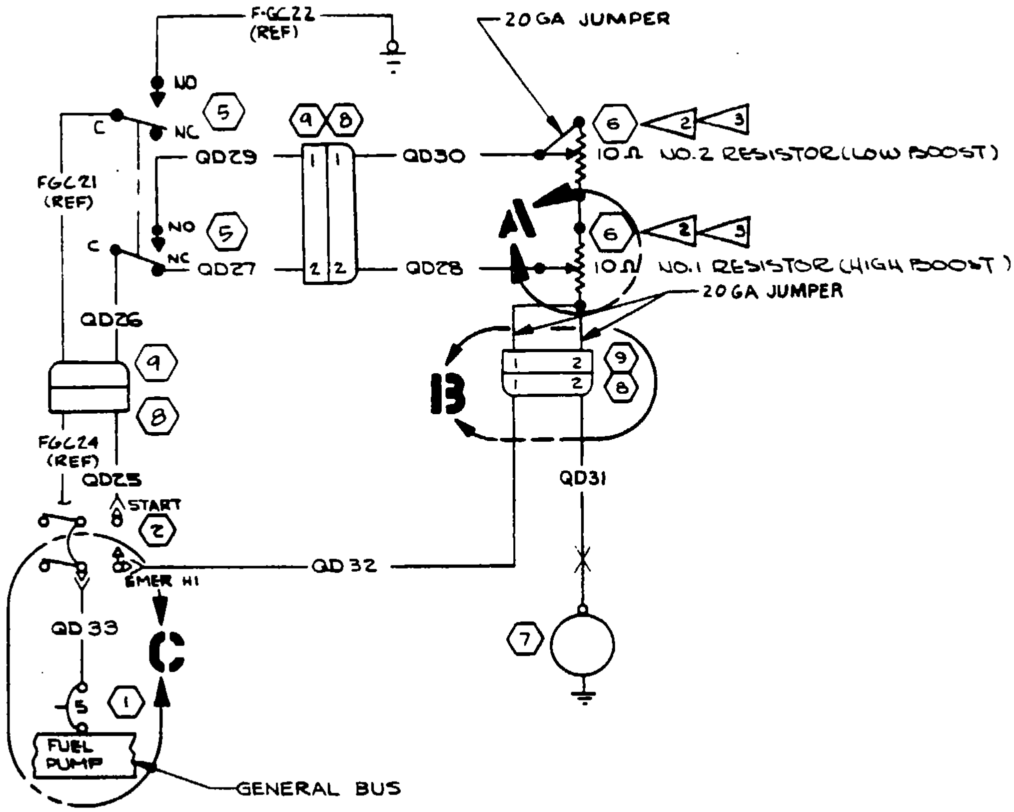
TITLE: WIRING DIAGRAM — FUEL PUMP SYSTEM

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 7.1.1

(SR7381) II (2/060090)

Fuel Pump System (Sheet 1 of 2)



CONTRACT NO:		
	NAME	DATE
DESIGN	VR SIPES	11-30-72
GROUP	H Wise	1-3-73
DRAWN	PAPE	12-28-72
CHECK	R. YOUNGERS	12-30-72
STRESS		
PROJ	N. McCarter	1-3-73
APPD	PLH	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — FUEL PUMP SYSTEM

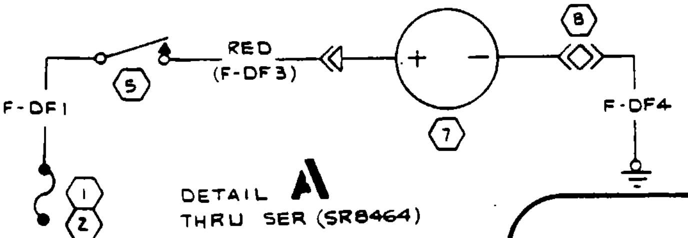
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 7.1.1

(SR7381) I (2/060090)

Fuel Pump System (Sheet 2 of 2)

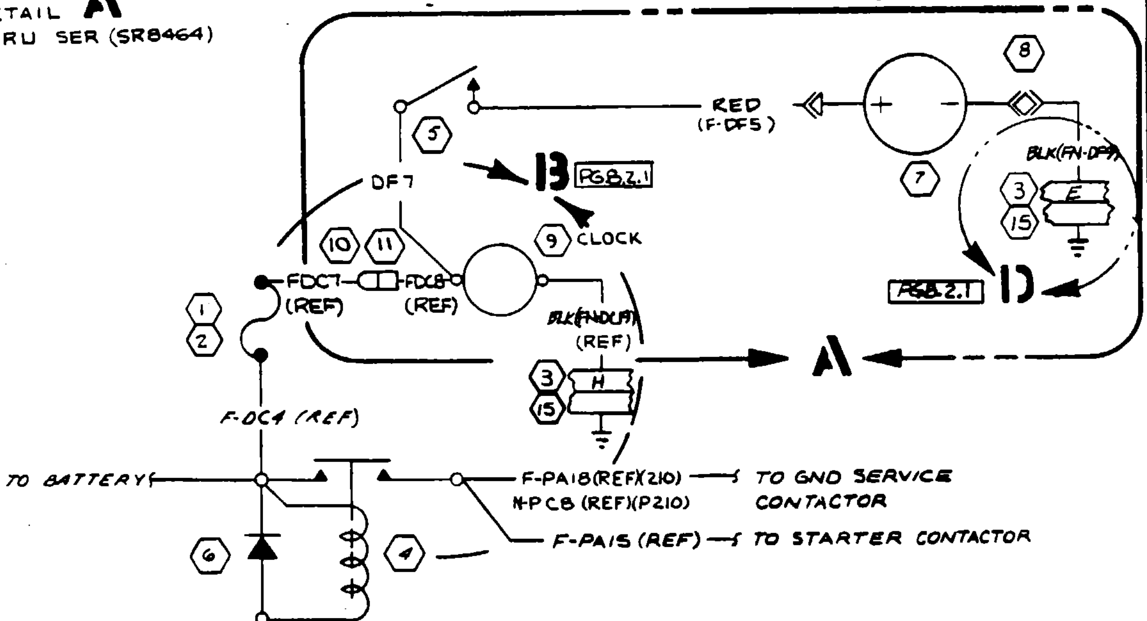
LET	DESCRIPTION	DATE	APPD
H	BY REV: C664503-0101 WAS C664502-0101; ADD DF8, NOTE 1, S1637-1,-2, C664511-0101, S1360-5L, DETAIL B & PG 8.2.1 (SR9080)(REF) (SR9187)	CMK 7-13-78	JAB
J	BY REV: ADD DETAIL "C" & C664511-0102 (SR9583)	HHG 2-13-80	JAB
K	BY REV: ADD DETAIL "D", S2527-2, S2527-1, BLK(FN-DF9), BLK(F-DC13)(REF) WAS BLK(F-DC11)(REF) BLK(F-DC19)(REF) WAS DC3(REF) (SR10101)(SR10102)	MKT 1-27-82	
L	BY REV: S1367-1-8 / DF1, DF3, DF5, DF7, & DF8 WAS S1367-1-6 (NOW SHOP PRACTICE)(MER 152E0967)	GW 7-8-82	

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: C664502-0101 WAS C664501-0103 ADD S-2023-1 (SR 7913)(REF)	2-10-76 GDS	
C	BY REV: 22 GA WAS 20GA/F-DF1, F-DF3 F-DF4 (SR8143)	GDS 5-6-76	
D	BY REV: RED (F-DF3) WAS F-DF3 (SR8656)	PH 9-21-76	
E	BY REV: ADD RED(F-DF5), F-DF6, & DETAIL A & SER (SR8464)	GLR 4-18-77	
F	BY REV: ADD PCB(REF) (SR8465)	GDS 6-6-77	JAB
G	BY REV: ADD DF7 & SER SER OUT DF1 (SR8464)(REF)(SR8465)(REF)	DLP 12-9-77	JAB



NOTES:

1. REQD ONLY WHEN OPT DIGITAL CLOCK C664511 IS INSTALLED



ITEM NO.	PART NO.	DESCRIPTION
15	S2527-2	GND CONNECTOR
14	C664511-0102	DIGITAL CLOCK
13	S-1360-5L	CIRCUIT BREAKER
12	C664511-0101	DIGITAL CLOCK
11	S-1637-2	HOUSING
10	S-1637-1	HOUSING
9	C664508-0101	CLOCK
8	S-2023-1	ADAPTOR
7	C664503-0101	HOURMETER
6	0770728-1	DIODE ASSY
5	S-1711-1	OIL PRESS. SWITCH
4	S-1580-1	BATTERY CONTACTOR
3	S-2527-1	LH GND BLOCK
2	S-1091-1	FUSE
1	S-1090-22	FUSEHOLDER

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(FN-DF9)	22	-22-0		S-1493-1	S2099-4		SER(SR10101)(SR10102) & ON
RED (DF8)	22	-22-2		S-1367-1-8	S-1635-2	1.	
F-DF7	22			S1367-1-6	S1367-1-8		SER(SR8464)(SR8465) & ON
F-DF6	22			S1493-1	S1367-1-8	SER(SR8464)	THRU(SR10101)(SR10102)
RED (F-DF5)	22	-22-2		S1367-1-8	S1493-1		SER(SR8464) & ON
F-DF4	22		15	S-1493-1	S-1367-1-6		THRU SER (SR8464)
RED (F-DF3)	22	-22-2	50	S-1367-1-8	S-1493-1		THRU SER (SR8464)
F-DF1	22		80	SOLDER	S-1367-1-8		THRU SER (SR8464)

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wiell	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. W. Carter	2-27-71
APPD		
OTHER		

Cessna. AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE **WIRING DIAGRAM — HOURMETER (OPT)**

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 8.2.0

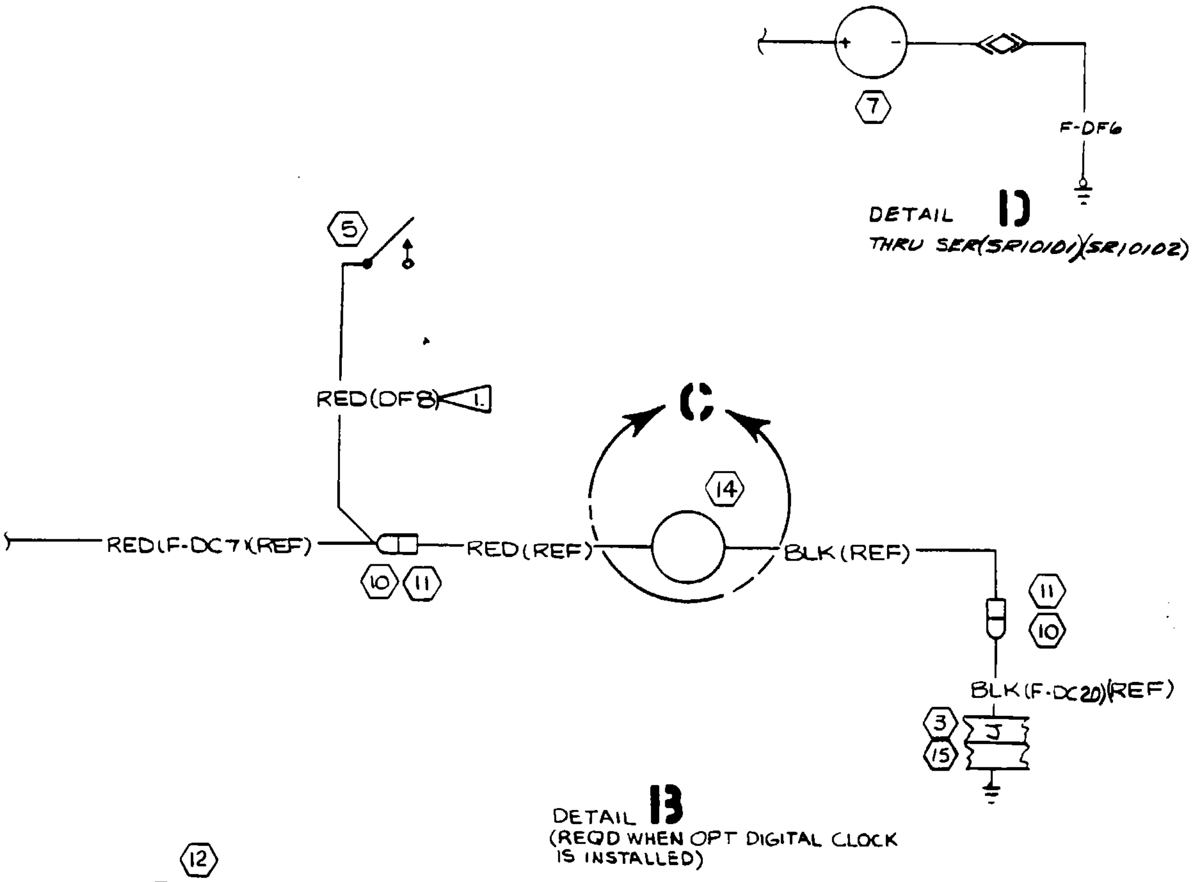
(SR 6755) II

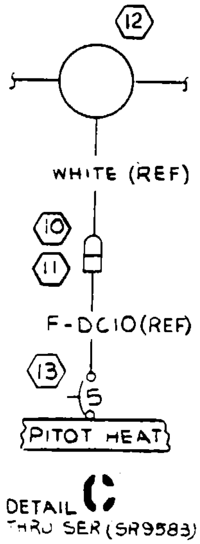
CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
K	SEE PG 8.2.0 FOR REVISION		





02-00916
01-00916

CONTRACT NO:			Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS		
	NAME	DATE			
DESIGN	G STAMM	7-21-78	TITLE WIRING DIAGRAM- HOURMETER (OPT)		
GROUP	[signature]	7-24-78			
DRAWN	C KING	7-13-78			
CHECK	BORLESKE	7-14-78			
STRESS					
PROJ	[signature]	8-1-78	SIZE	CODE IDENT. NO.	DWG NO.
APPD			C	71379	1270709
OTHER			SCALE: NONE	(SR9187)	PAGE: 8.2.1

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A", BLK (EB42), ADD S2527-1 & -2 (SR10101)(SR10102)	MKT 1-27-82	JAB WAH. JRS JA
B	BY REV: ADD PG 8.8.2, C668050(-0701 THRU -0704), EB44, EB45, EB46, & EB47, EB48, & EB49 (SR10662)	TMS 6-15-83	REH WAH JRQ
C	BY REV: ADD DETAIL "B" & "C" & SER (SR 10855)	KWL 9-24-84	REH WAH MDP JRS

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
EB 52	20			S-2099-7	S-1367-1-8		SER (SR 10855) & ON
EB 51	20			S-2099-7	S-1367-1-10		
EB 50	20			S-1367-1-10	S-2353-2		SER (SR 10855) & ON
EB49	20			S-1635-1	S-1367-1-8	(OPT)	
EB48	20			S-1635-1	S-1367-1-8	(OPT)	
EB47	20			S-1367-1-8	S-1367-1-8	(OPT)	
EB46	20			S-2341-1	S-1367-1-8	(OPT)	
EB45	20			S-1367-1-8	S-1367-1-8	(OPT)	
EB44	20			S-2099-7	S-1367-1-8	(OPT)	
BLK(EB42)	20	-20-0		S1367-1-6	S2099-4		SER (SR10101)(SR10102) & ON
EB41	20			S1367-1-10	S1367-1-10		
EB40	20			S1367-1-10	S1636-1		
EB39	20			S1367-1-10	S1636-1		
EB38	20			S1367-1-10	S2415-1		
EB37	20			S1367-1-10	S2353-2		
EB36	20			S1367-1-6	S1367-1-10		
BLK(EB30)	22	-22-0		S1367-1-8	S1367-1-10		
BLK(EB29)	22	-22-0		S1367-1-8	S1367-1-10		
YEL(EB27)	20	-20-4		S2341-1	S1367-1-10		
BLK(EB26)	22	-22-0		S1367-1-8	S1367-1-8		THRU SER (SR10101)(SR10102)
YEL(EB25)	20	-20-4		S2099-7	S1367-1-10		
YEL(EB21)	20	-20-4		S1635-1	S1367-1-10		
YEL(EB20)	20	-20-4		S1635-1	S1367-1-10		

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
18	S-2349-3	CONNECTOR	
17	S-2350-9	CONNECTOR	
16	C668050-0704	SENDING UNIT-RH OUTBD	
15	C668050-0703	SENDING UNIT-LH OUTBD	
14	C668050-0702	SENDING UNIT-RH INBD	
13	C668050-0701	SENDING UNIT-LH INBD	
12	S2527-2	GND CONNECTOR	
11	S2527-1	LH GND BLOCK	
10	S2349-1	CONNECTOR	
9	S2350-1	CONNECTOR	
8	205841-1	CONNECTOR	
7	205838-1	CONNECTOR	
6	C668050-0602	RH SENDING UNIT	
5	C668050-0601	LH SENDING UNIT	
4	S1641-6	CONNECTOR	
3	S1640-6	CONNECTOR	
2	C669562	INST CLUSTER	
1	S1360-5L	CIRCUIT BREAKER	

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1270709 PG.S 8.50 & 8.5.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	[illegible]	3-6-81
DRAWN	WHITSON	2-5-81
CHECK	BORLESKE	3-6-81
STRESS		
PROJ	[illegible]	3-6-81
APPD	[illegible]	
OTHER		

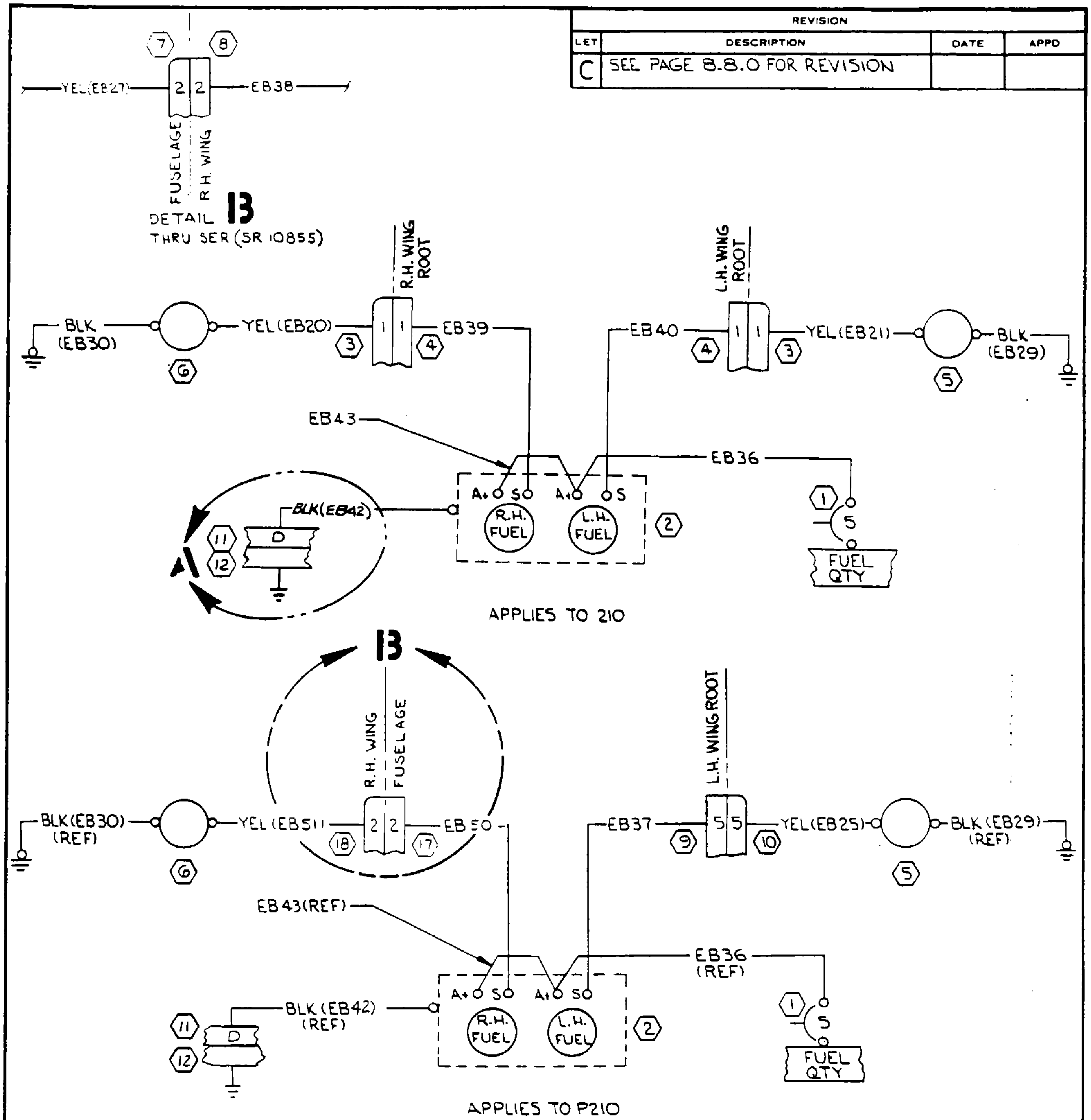
Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

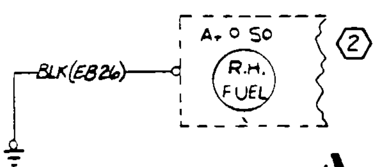
TITLE WIRING DIAGRAM — FUEL GAGES

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE (SR10148) PAGE: 8.8.0

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PAGE 8.8.0 FOR REVISION		

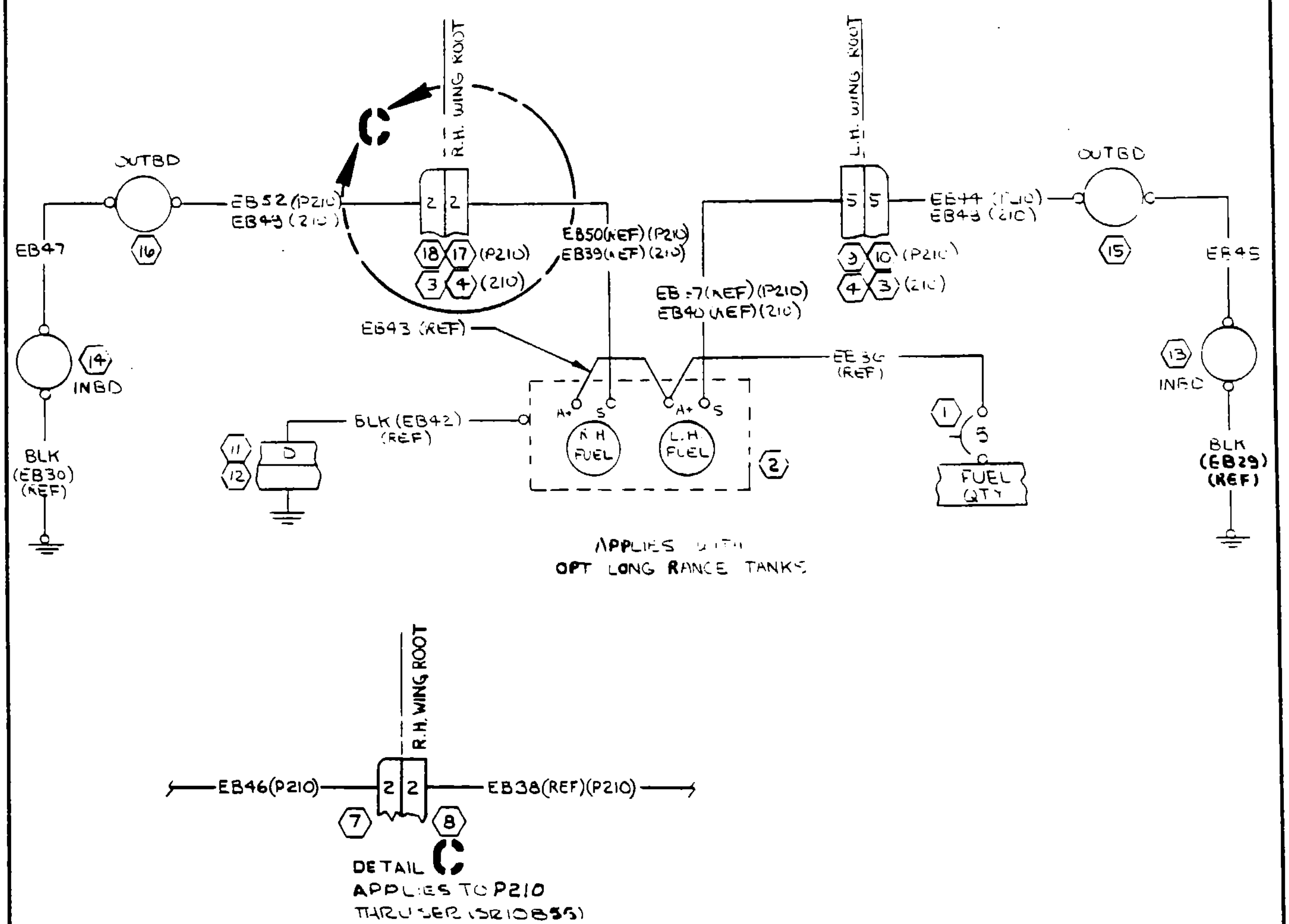




DETAIL A
THRU SER (SR10101)(SR10102)

CONTRACT NO:			Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	TITLE
DESIGN			WIRING DIAGRAM — FUEL GAGES
GROUP	[illegible]	3-6-81	
DRAWN	WHITSON	2-5-81	
CHECK	BORLESKE	3-6-81	
STRESS			
PROJ	[illegible]	3-6-81	SIZE C · CODE IDENT NO 71379 · DWG NO 1270709
APPD	[illegible]		
OTHER			SCALE: NONE · (SR10148) · PAGE: 8.8.1

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PG. 8.6.C FOR REVISION		



CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	6-15-83
GROUP	[illegible]	6-17-83
DRAWN	SPENCER	6-15-83
CHECK	EE HAIR	6-17-83
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO. — PAWNEE DIVISION, 5800 E. PAWNEE, WICHITA, KANSAS

TITLE: WIRING DIAGRAM - FUEL GAGES

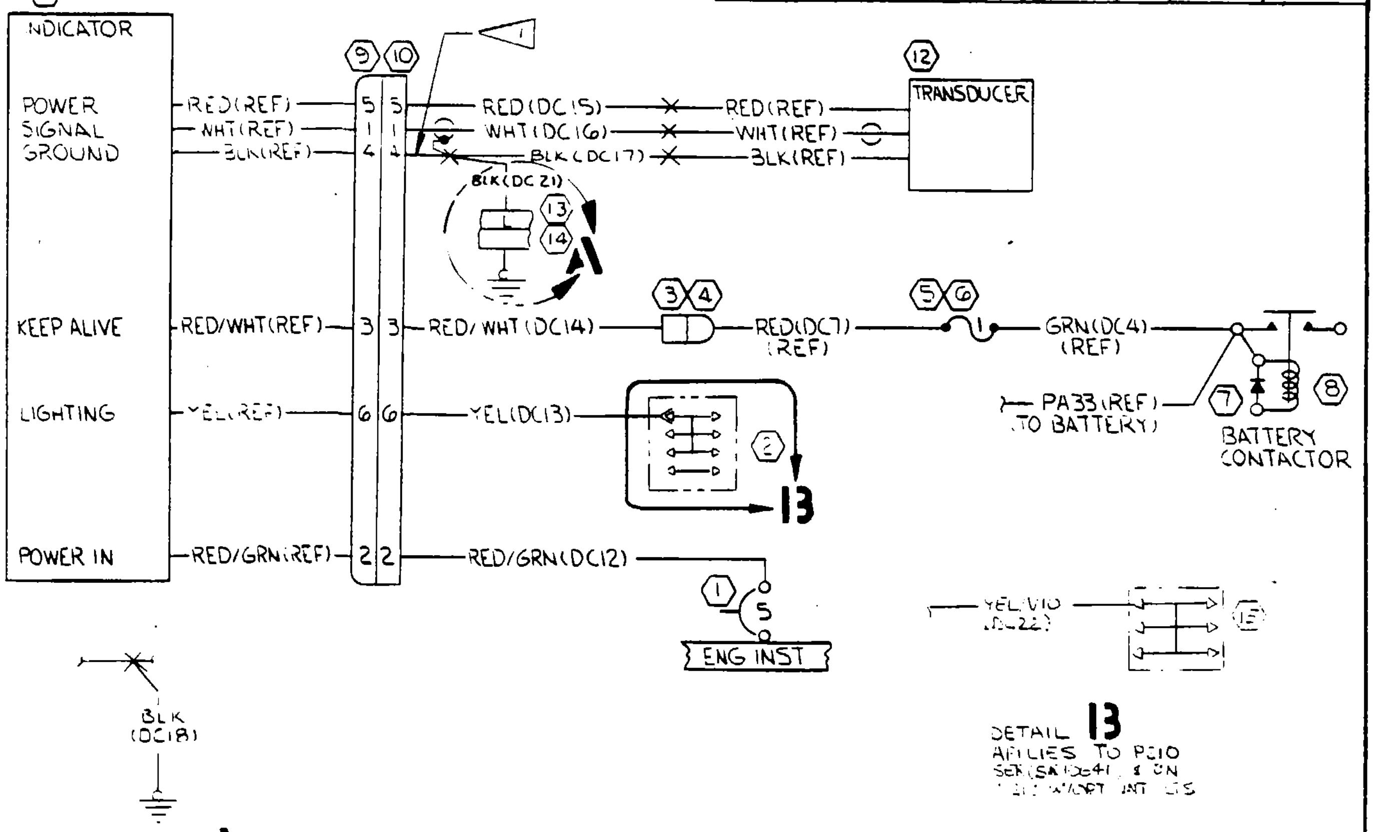
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE PAGE:

NOTES:

1. TERMINATE 22 GA JUMPER WITH S-1636-1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD JUMPER WIRE & NOTE 1; S-1370-1 WAS S-1636-1 / BLK (DC17) (SR9953)(REF)(SR9954)(REF)(MER210E0977) ADD S-2527-1 & S-2527-2; SER IN BLK (DC21) SER OUT BLK (DC18) (SR10101) (SR10102)	GLS 1-27-82	
B	BY REV: ADD DETAIL 'B' (SR10420) (SR10641)	TMS 2-8-84	



15	S-2567-3	TERMINAL BLOCK	
14	S-2527-2	GND CONNECTOR	
13	S-2527-1	LH GND BLOCK	
12	C913001	FLOW TRANSDUCER	
11	C662060	INDICATOR	
10	S1640-[illegible]	HOUSING	
9	S1640-[illegible]	HOUSING	
8	S2475-1	BATT. CONTACTOR	
7	0770726	DIODE ASSY	
6	S1090-[illegible]	FUSEHOLDER	
5	S1091-1	FUSE	
4	S1637-1	HOUSING	
3	S1637-2	HOUSING	
2	34004-815	TERMINAL BLOCK	
1	S1360-5L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
YEL/VIO (DC22)	22			S-1636-1	S-1529-1		SER (SR10641) & ON
BLK (DC21)	22	-22-0		SEE BLK (17)	S 2099-4		SER (SR10101)(SR10102) & ON
BLK (DC18)	22	-22-0		SEE BLK (17)	S1367-1-8		THRU SER (SR10101)(SR10102)
BLK (DC17)	22	-22-0		S1370-1	S1370-1		
WHT (DC16)	22S	S1461-22-9		S1636-1	S1370-1		
RED (DC15)	22	22-2		S1636-1	S1370-1		
RED/WHT (DC14)	22	-22-2-9		S1636-1	S1636-1		
YEL (DC13)	22	-22-4		S1636-1	S1529-1		
RED/GRN (DC12)	22	-22-2-5		S1367-1-6	S1636-1		

WIRE TABLE

CONTRACT NO:

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

	NAME	DATE
DESIGN		
GROUP	[illegible]	4-30-81
DRAWN	[illegible]	[illegible]
CHECK	[illegible]	[illegible]
STRESS		
PROJ	[illegible]	[illegible]
APPD		
OTHER		

TITLE WIRING DIAGRAM — FUEL TOTALIZER/CLOCK (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE NONE (SR9953)(SR9954) PAGE: 8.9

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

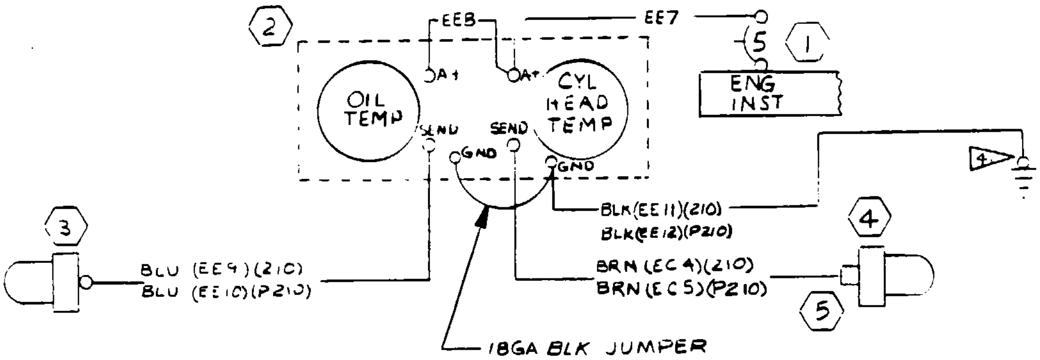
SUPERSEDES:

SUPERSEDED BY:

NOTES:

1. MATERIAL IS ALPHA 5857-7 OR BELDEN 83009-1
2. CRIMP S-1636-5 TERMINAL AROUND WIRE INSULATION. BEND .25 OF STRIPPED WIRE BACK OVER CRIMP & SOLDER PER CES1040. USE MOLEX HT-1921 CRIMPING TOOL ONLY
3. MATERIAL IS ALPHA 5857-6 (VENDOR CODE 92194) OR BELDEN 83009-6 (VENDOR CODE 70903)
4. GROUND AT ENGINE ACCESSORY COVER THRU (SR10420)(SR10421) GROUND AT ENGINE BOLT AT LH REAR OF PROP DE-ICE TERM BLOCK BKT (SR10420)(SR10421) THRU (SR10966) GROUND AT ENGINE BOLT AT RH REAR OF PROP DE-ICE TERM BLOCK BKT (SR10966) & ON.
5. MATERIAL IS ALPHA 5857-6 (VENDOR CODE 92194) OR BELDEN 83009-10 (VENDOR CODE 70903)

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD NOTE 6; BRN (EC6) WAS BRN (EC5) (SR9954)(REF)	GLS 11-12-81	
B	BY REV: DELETE NOTE 6; BRN (EC5) WAS BRN (EC6) (SR9954)(REF)	GLS 1-18/82	
C	BY REV: REVISE NOTE 4 (SR10420)(REF)(SR10421)(REF) (SR10966)	TMS 2-1-85	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (EE12)	18	5		S-1367-1-8	S-1367-1-12		
BLK (EE11)	18	5		S-1367-1-8	S-1367-1-12		
BLU (EE9)	18	3		S-1367-1-10	S-1367-1-10		
BLU (EE10)	18	3		S-1367-1-10	S-1367-1-10		
EE8	22			S-1367-1-10	S-1367-1-10		
EE7	22			S-1367-1-6	S-1367-1-10		
BRN (EC5)	18	1		S-1367-1-10	S-1636-5	2	
BRN (EC4)	18	1		S-1367-1-10	S-1636-5	2	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	S-1637-4	HOUSING
4	S-2334-4	XMTR
3	S-2335-1	XMTR
2	C669561-0102	INST CLUSTER
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG. 87

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	HARDEN	9-1-81
DRAWN	M. THOMPSON	9-2-81
CHECK	BORLESKE	9-4-81
STRESS		
PROJ		9-4-81
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

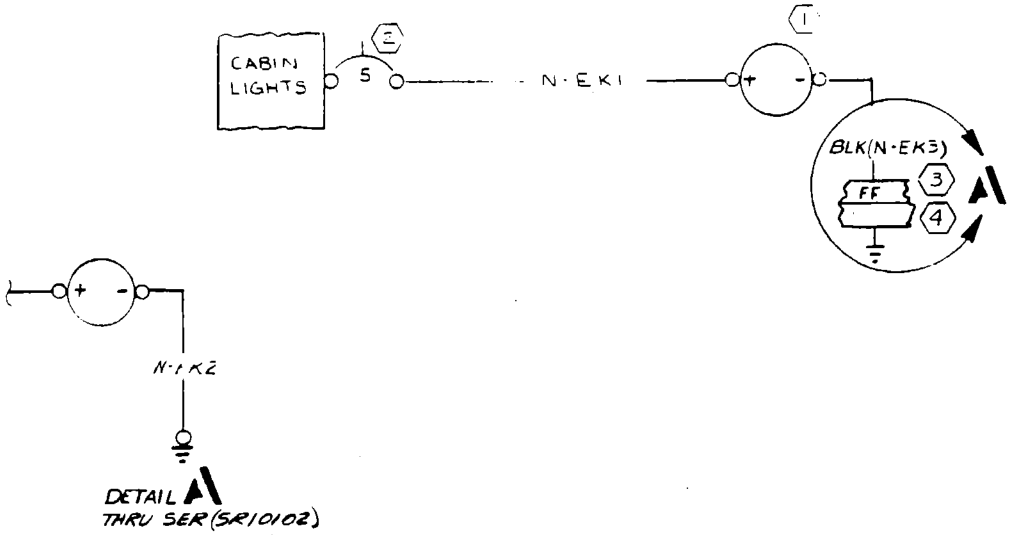
TITLE WIRING DIAGRAM — OIL TEMP & CYL HEAD TEMP

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE NONE | 210 P210 | PAGE: 8.10

(SR9953),(SR9954)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A", BLK(N-EK5), S2527-2 & -1; SER OUT N-EK2 (SR10102)	MKT 1-27-82	
B	BY REV: BLK(N-EK3) WAS BLK(N-EK5) (SR10102)	GLS 6-29-82	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(N-EK3)	22	-22-0		S-1367-1-8	S-2099-4		SER(SR10102) & ON
N-EK2	22			S-1367-1-8	S-1367-1-8		THRU SER (SR10102)
N-EK1	22			S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
4	S-2527-2	GND CONNECTOR	
3	S-2527-1	LH GND BLOCK	
2	S-1360-5L	CIRCUIT BREAKER	
1	C668501	T.I.T. GAGE	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP		10-3-81
DRAWN		10-9-81
CHECK	BORLESKE	
STRESS		
PROJ	GFICKEL	10-12-81
APPD		
OTHER		

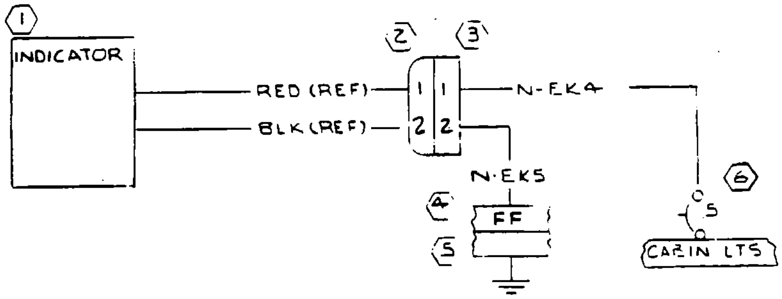
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — TURBINE INLET TEMP GAGE

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR4154) (REF) | PAGE: S.11

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
N-EK5	22	-22-9		S-1636-1	S-2[illegible]4	
BLK(REF)				X	S-163[illegible]-1	
RED(REF)				S-1635-1	X	
N-EK4	22	-22-9		S-1367-1-6	S-163[illegible]-1	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
6	S-1360-5L	CIRCUIT BREAKER
5	S-2527-2	GND CONNECTOR
4	S-2527-1	L H GND BLOCK
3	S-2035-2	CONNECTOR
2	S-2035-1	CONNECTOR
1	C668501	INDICATOR-EGT/TIT

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		
GROUP	[illegible]	4-20-82
DRAWN	G STAMM	4-20-82
CHECK	E YOUNGERS	4-20-82
STRESS		
PROJ	[illegible]	[illegible]
APPD	[illegible]	
OTHER		

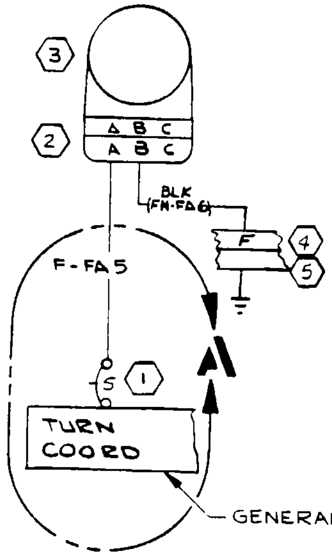
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

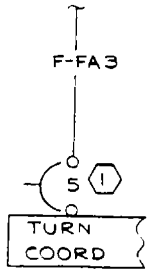
TITLE **WIRING DIAGRAM — INDICATOR-EGT & TURBINE INLET TEMP (OPT)**

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

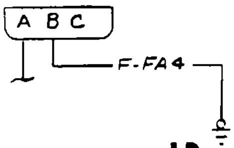
SCALE: NONE (S210102) PAGE: 3.12

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	H/W
B	BY REV: 22 GA WAS 20/ FA3, FA4 (SR 8143)	GDS 5-6-76	JRB
C	BY REV: ADD DETAIL A & SER & FA5 (SR 8464)	REG 4-28-77	
D	BY REV: ADD DETAIL "B" S2527-1/-2 BLK(FN-FA6), SER CUT FA4 (SR10101)(SR10102)	MKT 1-27-82	JRB





DETAIL A
THRU SER (SR 8464)



DETAIL B
THRU SER (SR10101)(SR10102)

9160020
9160010

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(FN-FA6)	22	-22-0		SOLDER	S2099-4		SER (SR10101)(SR10102) & ON
FA5	22			S1367-1-8	SOLDER		SER (SR8464) & ON
FA4	22		20	SOLDER	S-1367-1-10		THRU SER (SR10101)(SR10102)
FA3	22		16	S1367-1-8	SOLDER		THRU SER (SR 8464)

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
5	S2527-2	GND CONNECTOR	
4	S2527-1	LH GND BLOCK	
3	C661003-0505	TURN COORDINATOR	
2	MS3106A10SL3S	CONNECTOR	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES 1210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	2-18-71
GROUP	H. Wise	2-25-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — TURN COORDINATOR

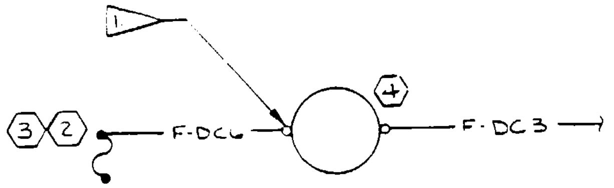
SIZE	CODE IDENT. NO.	DWG NO	
C	71379	1270709	
SCALE: NONE		210	PAGE: 9.2

(SR6755) IX (21059503)

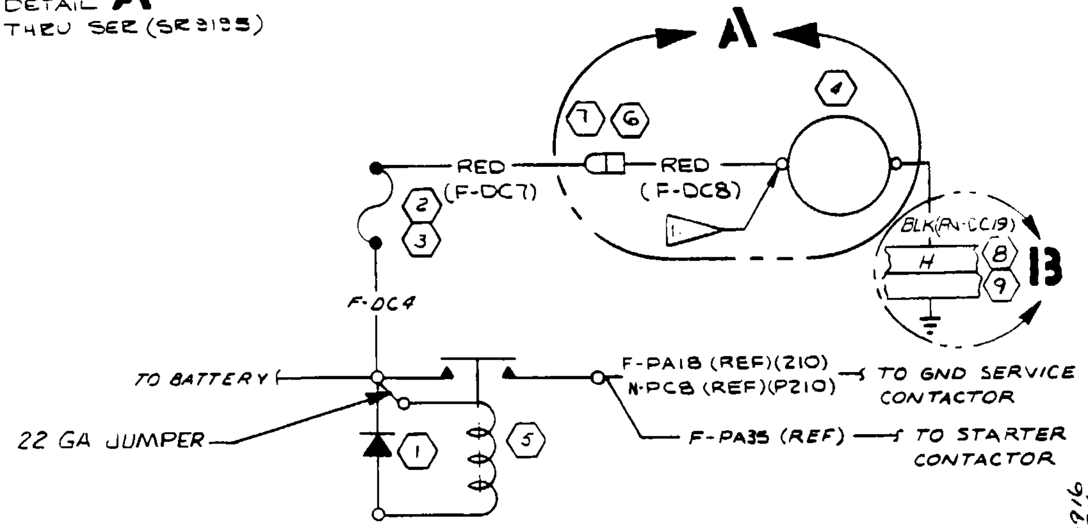
NOTES:

1. CAUTION: POWER WIRE MUST BE CONNECTED TO "BATT" TERMINAL OF CLOCK OTHERWISE INTERNAL DAMAGE TO UNIT WILL RESULT

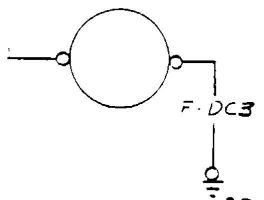
REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	
B	BY REV: 22 GA WAS 20/ F-DC3, F-DC4 F-DC5 (SR8143)	GDS 5-6-76	
C	BY REV: ADD P210 (SR8465)	DLP 6-6-77	JAB
D	BY REV: ADD NOTE 1, RED(F-DC7) RED F-DC8, S-1637-1,-2 & DETAIL A; SER OUT F-DC6; C664508-0102 WAS C664508-0101 (SR9195)	BGK CMK 7-13-78	JAB
E	BY REV: ADD DETAIL "B" BLK(FN-DC19), S2527(-1 & -2); SER OUT F-DC3, F-PA35(REF) WAS F-PA15(REF), S-2475-1 WAS S-1580-1, (NOW SHOP PRACT)(SR10101)(SR10102)	MKT 1-27-82	JAB



DETAIL A
THRU SER (SR9195)



02 00916
01-00916



DETAIL B
THRU SER(SR10101)(SR10102)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (FN-DC19)	22	-22-0		S-1367-1-6	S2099-4		SER (SR10101)(SR10102) & ON
RED F-DC8	22	-22-2		S-1636-1	S-1367-1-6		SER(SR9195) & ON
RED F-DC7	22	-22-2		SOLDER	S-1635-1		SER(SR9195) & ON
F-DC6	22		64	SOLDER	S-1367-1-6		THRU SER(SR9195)
BRN F-DC-4	22	-22-5	6	SOLDER	S-1367-1-3		
F-DC3	22		18	S-1367-1-6	S-1367-1-8		THRU SER(SR10101)(SR10102)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	S-2527-2	GND CONNECTOR	
8	S-2527-1	LH GND BLOCK	
7	S-1637-1	HOUSING	
6	S-1637-2	HOUSING	
5	S-2475-1	BATTERY CONTACTOR	
4	C664508-0102	CLOCK	
3	S-1091-1	FUSE	
2	S-1090-22	FUSEHOLDER	
1	0770728	DIODE 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: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K WHITE	2-24-71
STRESS		
PROJ	[illegible]	2-27-71
APPD		
OTHER		

TITLE
WIRING DIAGRAM — CLOCK

SIZE	CODE IDENT NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 10.1

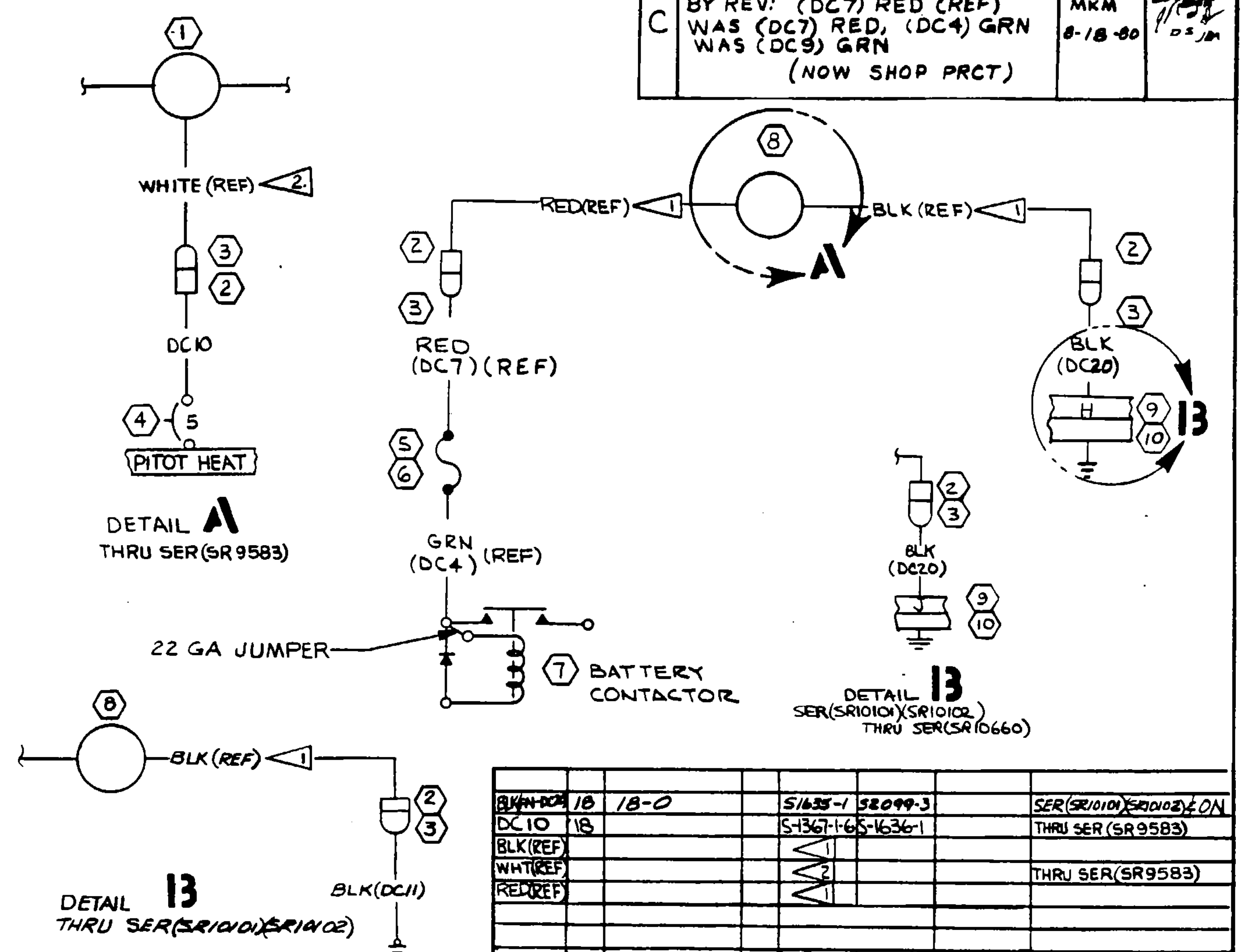
(SR6755) E

LET	DESCRIPTION	DATE	APPD
D	BY REV: ADD DETAIL B S2527(-2&-1), BLK(DC20; SER OUT BLK(DC11); S-2475-1 WAS S-1580-1 (NOW SHOP PRAC) (SR10101)(SR10102)	MKT 1-27-82	JAB WHH JRS
E	BY REV: PIN 'H' WAS 'J'/GND BLK; ADD DETAIL 'B' (SR10660)	TMS 8-2-83	JRS

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: WHITE (REF) WAS RED(REF) RED(REF) WAS BLU(REF), RED DC7 WAS BLU DC8; GRN(DC9) (REF) WAS GRN(DC9), DC11 WAS DC7 (SR9187)	CMK 7-13-78	JAB JRS
B	BY REV: ADD DETAIL 'A' & C664511-0102 (SR9583)	HHG 2-13-80	JAB JRS
C	BY REV: (DC7) RED (REF) WAS (DC7) RED, (DC4) GRN WAS (DC9) GRN (NOW SHOP PRCT)	MKM 8-18-80	DS

NOTES: 1 INSTALL S-1636-1 ON VENDOR WIRE
2 INSTALL S-1635-1 ON VENDOR WIRE



WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
BLK(DC20)	18	18-0		S1635-1	S2099-3	SER(SR10101)(SR10102)& ON
DC10	18			S-1367-1-6	S-1636-1	THRU SER (SR9583)
BLK(REF)				1		
WHT(REF)				2		THRU SER(SR9583)
RED(REF)				1		
BLK (DC11)	18	-18-0		S-1635-1	S-1367-1-8	THRU SER(SR10101)(SR10102)

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	S2527-2	GND CONNECTOR
9	S2527-1	LH GND BLOCK
8	C664511-0102	DIGITAL CLOCK
7	S-2475-1	CONTACTOR
6	S-1091-1	FUSE
5	S-1090-22	FUSEHOLDER
4	S-1360-5L	CIRCUIT BREAKER
3	S-1637-1	HOUSING
2	S-1637-2	HOUSING
1	C664511-0101	DIGITAL CLOCK

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAUM	4-12-78
GROUP	D H Harden	4-12-78
DRAWN	R. YOUNGERS	4-11-78
CHECK	BORLESKE	4-11-78
STRESS		
PROJ	P Hendrick	4-14-78
APPD	JRS	
OTHER		

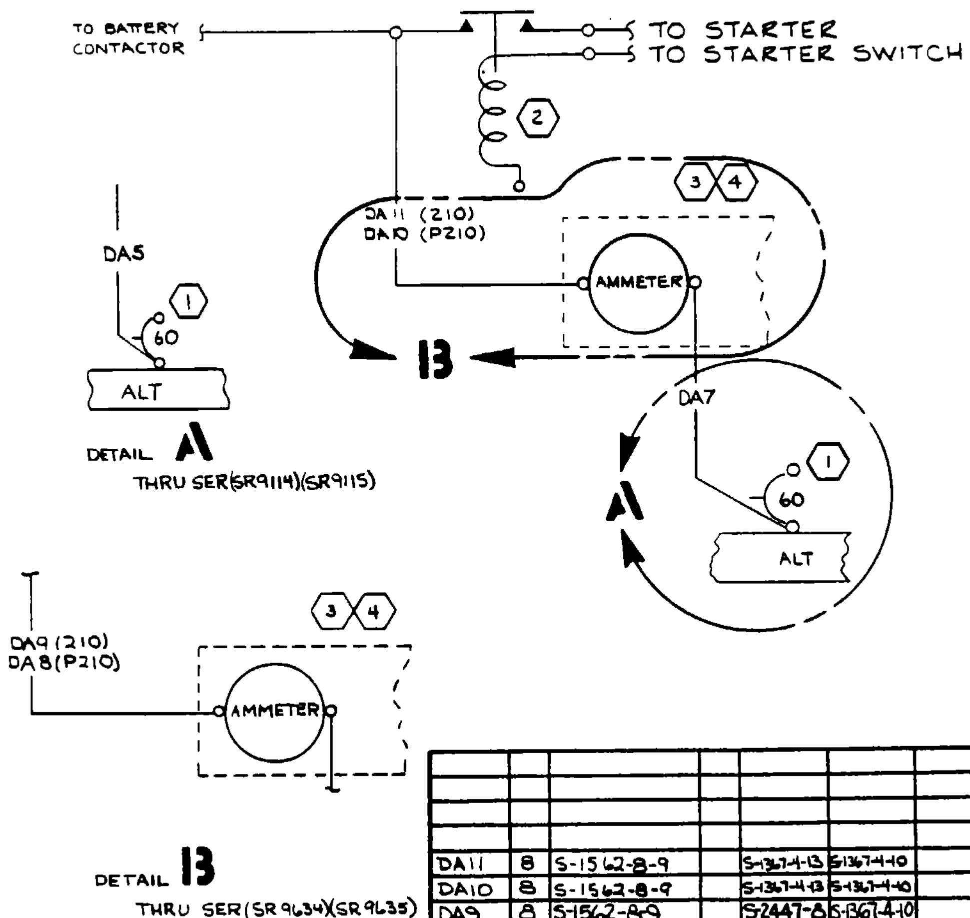
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — DIGITAL CLOCK (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR9187) | PAGE: 10.4

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A & DA7; SER OUT DA5 (SR9114)(SR9115)	HH6 12-12-78	
B	BY REV: ADD C669560-0102 (SR 9711)	SEB 11-1-79	
C	BY REV: SER OUT DA8, DA9; SER IN DA10, DA11; ADD DETAIL B (MER P210E0870) (SR9634)(SR9635)	DFS 7-14-80	



15-0916
14-0916

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
DA11	8	S-1562-8-9		S-1367-4-13	S1367-4-10		SER (SR9634) & ON
DA10	8	S-1562-8-9		S-1367-4-13	S-1367-4-10		SER (SR9635) & ON
DA9	8	S-1562-8-9		S-2447-8	S-1367-4-10		THRU SER (SR9634)
DA8	8	S-1562-8-9		S-2447-8	S-1367-4-10		THRU SER (SR9635)
DA7	8	S-1562-8-9		S-1367-4-10	S-1367-4-8		SER (SR9114)(SR9115) & ON
DA5	8	S-1562-8-9		S-1367-4-10	S-1367-4-10		THRU SER (SR9114)(SR9115)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	C669560-0102	INST CLUSTER	
3	C669527-0101	INST CLUSTER	
2	S-2443-1	STARTER CONTACTOR	
1	S-1707-60	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: 1210709 P 10.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	12-14-78
GROUP	D.H. Harden	12-13-78
DRAWN	HAUN	12-9-78
CHECK	BORLESKE	12-12-78
STRESS		
PROJ		12-20-78
APPD		
OTHER		

Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

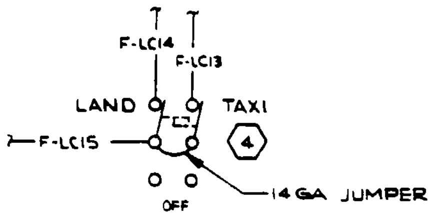
TITLE: WIRING DIAGRAM — AMMETER

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270709

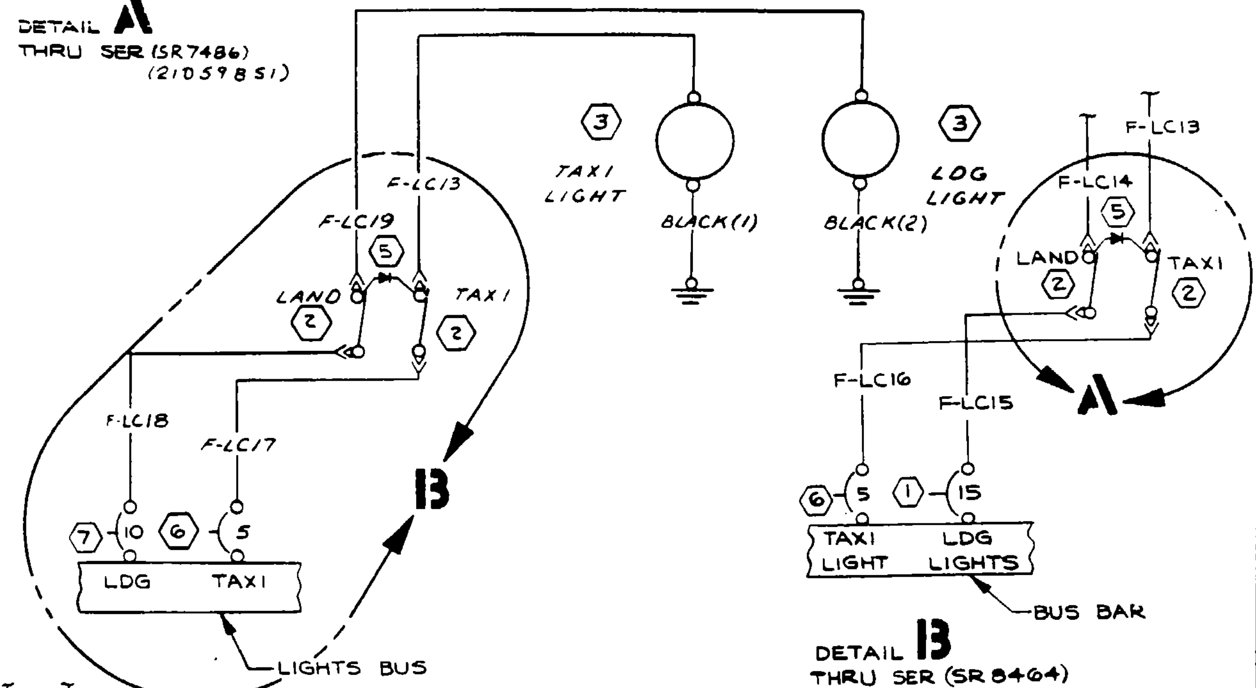
SCALE: NONE | SR 9221 | PAGE: 10.5

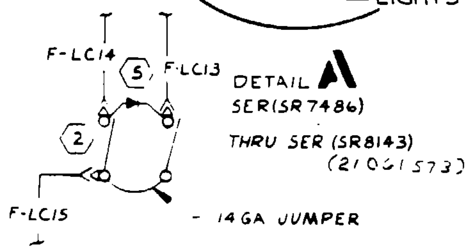
REVISION (CON'T)			
LET	DESCRIPTION	DATE	APPD
E	BY REV: ADD DETAIL "B" & SER, F-LC17, F-LC18 & F-LC19 (SR8464)	REG 4-28-77	
F	BY REV: 18GA. WAS 16GA./BLK(2); F-LC18 TO LDG WAS TAXI; F-LC17 TO TAXI WAS LDG (SR8464)(SR8465)	JJB 8-29-77	JAB

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE S-2094-1, GRAY, TAN, BLK(3) & BLK(4); 16GA WAS 18 GA /F-LC13 & F-LC14; 16GA WAS 14GA/F-LC15; S-1367-2-8 WAS S-1493-3 /F-LC13, F-LC14, BLK(1) & BLK(2) (SR6755) II	RLY 9-2-71	
B	BY REV: ADD S-2160-1, 1270082-1 & SER; SER OUT S-1846-1-3, SER(SR7486)	DLP 1-9-73	
C	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
D	BY REV: ADD F-LC16, S1360-5L; 20 GA. WAS 16GA/F-LC13, BLK(1); S-1493-1 WAS S-1493-2, 1367-1-8 WAS 1367-2-8/LC13; S-1367-1-8 WAS S-1367-2-8/BLK(1); SER OUT 14GA JUMPER WIRE (SR8143)	GDS 5-6-76	



DETAIL A
THRU SER (SR7486)
(21059851)





WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LC19	18			S-1493-1	S-1367-1-8		SER (SR8464) & ON
F-LC18	18			S-1493-1	S-1367-1-6		SER (SR8464) & ON
F-LC17	20			S-1493-1	S-1367-1-6		SER (SR8464) & ON
F-LC16	20			S-1493-1	S-1367-1-6		SER(SR8143) THRU SER(SR8464)
BLK(2)	18	-18-0	16	S-1367-2-8	S-1367-2-8		
BLK(1)	20	-20-0	16	S-1367-1-8	S-1367-1-8		
F-LC15	16		6	S-1493-2	S-1367-2-6		THRU SER (SR8464)
F-LC14	16		175	S-1493-2	S-1367-2-8		THRU SER (SR8464)
F-LC13	20		175	S-1493-1	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	S-1360-10L	CIRCUIT BREAKER
6	S-1360-5L	CIRCUIT BREAKER
5	1270082-1	DIODE ASSY
4	S-1846-1-3	SWITCH
3	GE 4591	LIGHT
2	S-2160-1	SWITCH
1	S-1360-15L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wiel	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ		2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING LIGHTS

SIZE	CODE IDENT NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 11.4

(SR6755) II
21059503

REVISIONS (CON'T)

LET	DESCRIPTION	DATE	APPD
F	BY REV: ADD DETAIL "C" & SER & F-LD52; S-1360-5L WAS S-1360-5 (SR 8464)	REG 4-28-77	[illegible]

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S-2160-1, 34002-55, LD41, LD42, LD43, LD44 & SER; SER OUT S-1844-1-2, LD23, LD25 & LD26 SER 21059720	DLP 1-9-73	[illegible]
B	BY REV: ADD WIRE LENGTHS & ORIENT TERM BOARD (NOW SHOP PRACTICE)	DLO 7-28-73	DLP H/W
C	BY REV: 34003-817 WAS 34002-55, ADD DETAIL "3" & SER'S & F-LD10 (SR 7913)	GW 9-17-75	[illegible]
D	BY REV: EFF OF DET "B" WAS THRU (SR7913) (SR8482)	JCS 3-15-76	[illegible]
E	BY REV: 22 GA WAS 18 GA/F-LD43, F-LD42, RED(2), RED(1), F-LD22; S-1635-1 WAS S-1635-2; S-1636-1 WAS S-1636-2 (SR8143)	TMS 5-21-76	[illegible]

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LD52	22			S-1367-1-6	S-1493-1		SER (SR 8464) & ON
F-LD44	22		6	S-1493-1	S-1829-1		SER 21059720 & ON
F-LD43	22		180	S-1829-1	S-1636-1		SER 21059720 & ON
F-LD42	22		200	S-1829-1	S-1636-1		SER 21059720 & ON
F-LD41	18		160	S-1829-1	S-1635-2		SER 21059720 THRU 21061229
RED(2)	22	-22-2	220	S-1635-1	S-1636-1		
RED(1)	22	-22-2	220	S-1635-1	S-1636-1		
F-LD34	18		100	S-1635-2	S-1636-2		THRU SER 21061229
F-LD10	22			S-1829-1	S-1636-1		SER 21061230 & ON
F-LD26	18		180	SEE F-LD25	S-1636-2		THRU SER 21059719
F-LD25	18		200	S-1493-2	S-1636-2		THRU SER 21059719
F-LD23	18		160	S-1493-1	S-1635-2		THRU SER 21059719
F-LD22	22		6	S-1367-1-6	S-1493-1		THRU SER (SR 8464)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
12	34003-817	TERM BLOCK	
11	S-1637-2	HOUSING-PLUG	
10	S-1637-1	HOUSING-CAP	
9	1270708-1	CABLE ASSY	
8	S-1360-5L	CIRCUIT BREAKER	
7	S-1844-1-2	SWITCH	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	S-1638-2	HOUSING-CAP	
3	S-2160-1	SWITCH	
2	C622001-0202	LIGHT ASSY	
1	C622001-0102	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-25-71
STRESS		
PROJ	V. McCarter	[illegible]-27-71
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

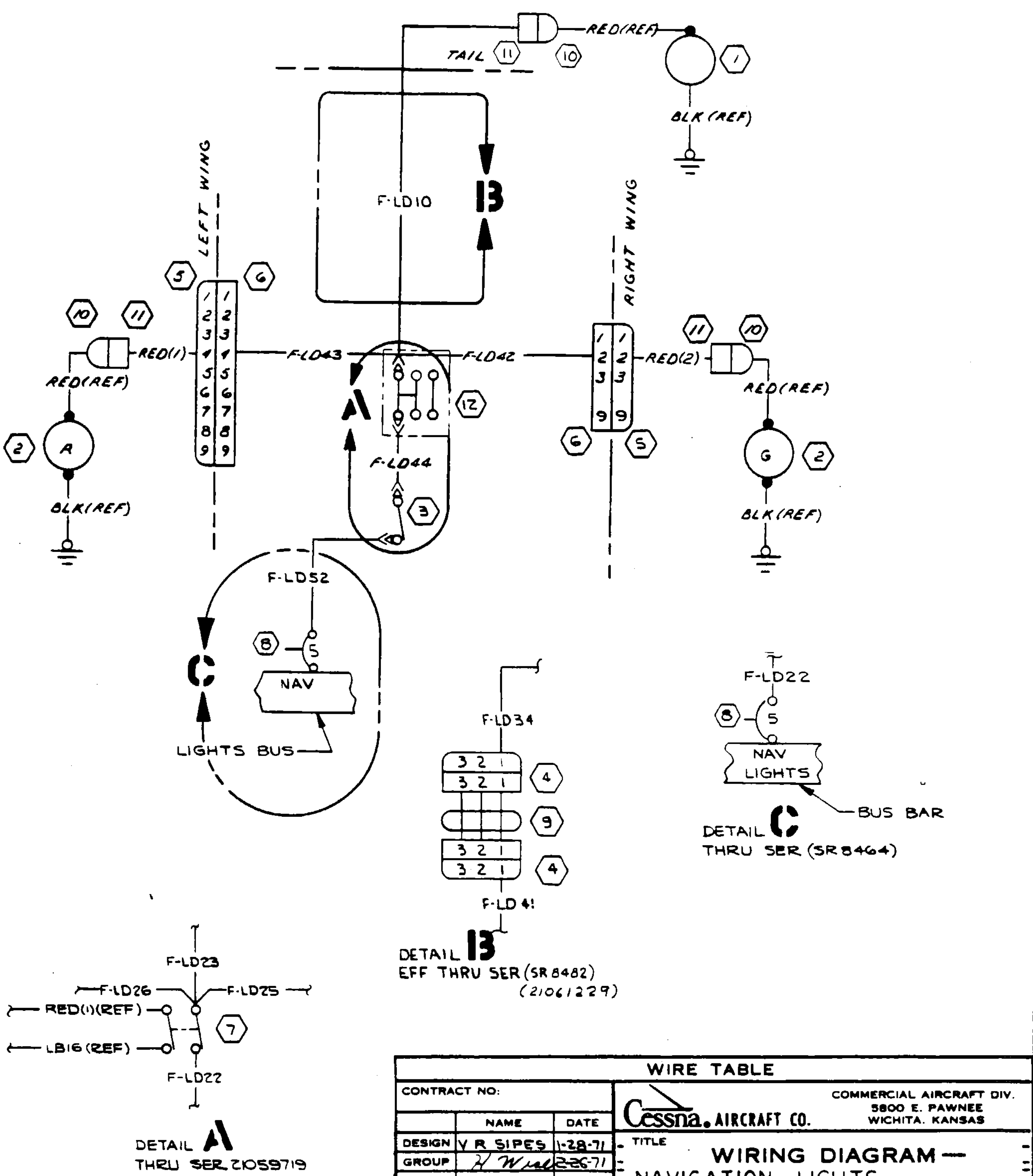
TITLE WIRING DIAGRAM — NAVIGATION LIGHTS

SIZE	CODE IDENT NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.5

(SR6755) IX (21059503)

Navigation Lights (Sheet 1 of 2)

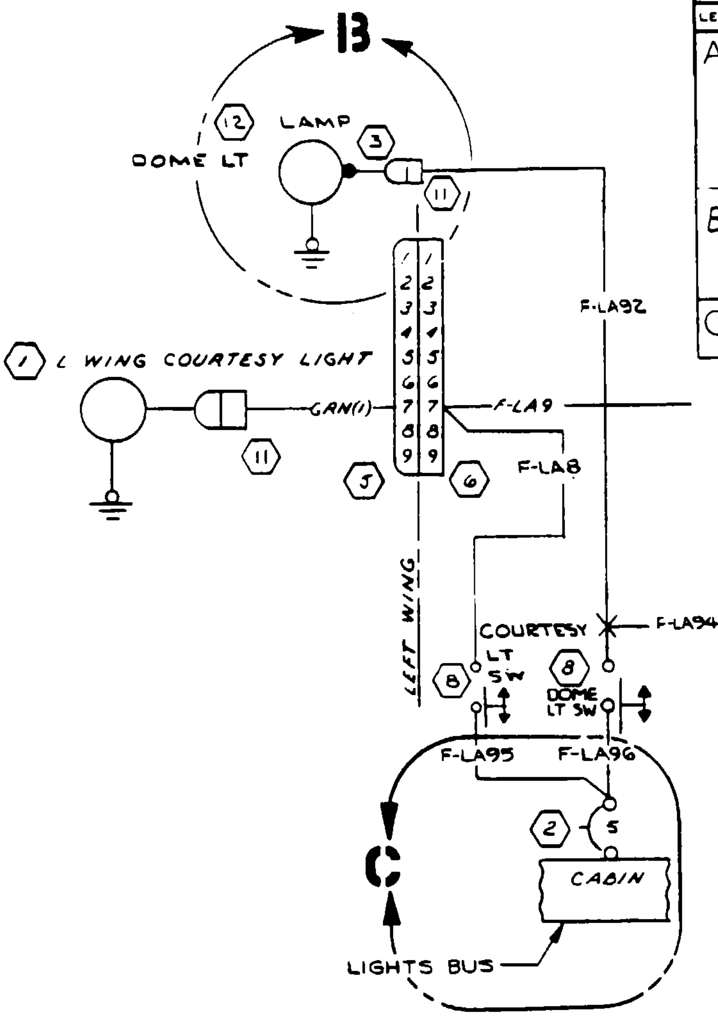


WIRE TABLE			
CONTRACT NO:			Cessna. AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	
DESIGN	V R SIPES	1-28-71	TITLE WIRING DIAGRAM — NAVIGATION LIGHTS
GROUP	H Wed	2-26-71	
DRAWN	V R SIPES	2-18-71	
CHECK	L.K. WHITE	2-25-71	
STRESS			
PROJ	N. McCarter	2-7-71	SIZE C — CODE IDENT. NO 71379 — DWG NO 1270709
APPD			
OTHER			SCALE: NONE — 210 — PAGE: 11.5

(SR6755) IX (21059503)

Navigation Lights (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S1637-2 TO FIELD & WIRE LENGTHS & S-1637-1; SER OUT F-LA3, F-LA10 & F-LA11, SER IN F-LA92, F-LA93 & F-LA94: 1221103-2 WAS 0700615-5 (NOW SHOP PRACTICE) (SR6755) (SR7381)	SLO 1-28-73	DLP HLW
B	BY REV: 22 GA WAS 18 GA / F-LA1 F-LA2 F-LA8, F-LA9, F-LA92, F-LA93, F-LA94, GRN(1) & GRN(2); S-1635-1 WAS S-1635-2, S-1636-1 WAS S-1636-2, S-1636-3 WAS S-1636-2 (SR8143)	GDS 5-6-76	JRB
C	BY REV: ADD DETAIL "C" & SER, F-LA95 & F-LA96 (SR8464)	REG 4-28-77	



See Sheet 2

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LA96	22			S-1830-1	S-1367-1-6		SER (SR8464) & ON
F-LA95	22			S-1830-1	S-1367-1-6		SER (SR8464) & ON
F-LA94	22		97	S-1830-1	S-1636-1		SER 21060090 & ON
F-LA93	22		8	S-1635-1	SOLDER		SER 21060090 & ON
F-LA92	22		43	S-1636-1	S-1370-1		SER 21060090 & ON
F-LA11	18		97	S-1830-1	S-341-1		THRU SER 21060089
GRN(2)	22	-22-5	20	S-1635-1	S-1636-1		
GRN(1)	22	-22-5	18	S-1635-1	S-1636-1		
F-LA10	18		8	S-341-1	SOLDER		THRU SER 21060089
F-LA9	22		88	S-1636-1	SEE F-LA8		
F-LA8	22		93	S-1830-1	S-1636-2		
F-LA3	18		43	S-341-2	S-1370-1		THRU SER 21060089
F-LA2	22		186	S-1830-1	S-1367-1-6		THRU SER (SR8464)
F-LA1	22		196	S-1367-1-6	S-1830-1		THRU SER (SR8464)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
12	GE313	LAMP	
11	S-1637-2	HOUSING-PLUG	
10	0413140-5	REFLECTOR	
9	0413138	SOCKET	
8	S-1831-1	SWITCH	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	S-1831-1	SWITCH	
3	S-1367-1	HOUSING-PIN	
2	S-1360-5L	CIRCUIT BREAKER	
1	1221103-2	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wiel	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-2-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

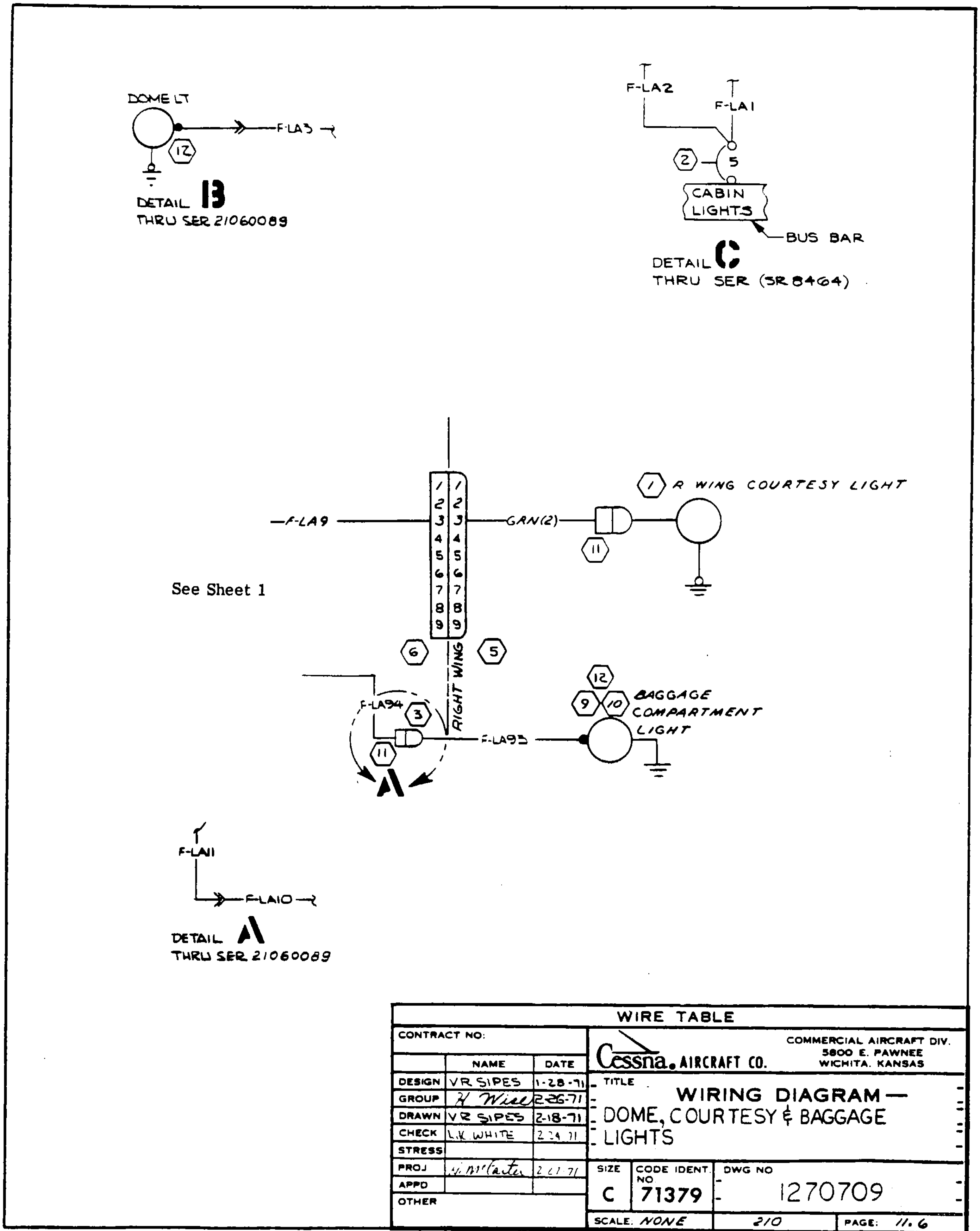
TITLE
WIRING DIAGRAM — DOME, COURTESY & BAGGAGE LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.6

(SR 6755) II
21059503

Dome, Courtesy & Baggage Lights (Sheet 1 of 2)



(SR 6755) II
21059503

Dome, Courtesy & Baggage Lights (Sheet 2 of 2)

LET	REVISION DESCRIPTION	DATE	APPD
J	BY REV: ADD DETAIL "C"; S2527-2 & -1), BLK (FN-LB163); SER OUT BLK (FN-LB88) (SR10101)(SR10102)	MKT 1-27-82	JAB JRS
A	BY REV: ADD WIRE LENGTHS & ORIENT TERM BOARD (NOW SHOP PRACTICE)	DLO 7-28-73	DLP
B	BY REV: ADD RH10-10, HF-10-10, S-1637-1, S-1637-2, F-LB111, F-LB108, F-LB109 & F-LB110 (SR7650)	MEM 5-17-74	DLO JRS
C	BY REV: 34003-55 WAS 34002-55; SER (SR 7913)	CJH 11-27-74	JRS
D	BY REV: 34003-817 WAS 34003-55, INBOARD TERM BLOCK / DETAIL 'A' WAS OUTBOARD TERM BLOCK; ADD SER'S TO LB8, LB9, LB10, LB11 (SR7650)(REF)(NOW SHOP PRACTICE) (SR7913)	GW 9-17-75	JRS
E	BY REV: 22 GA WAS 18 GA / F-LB88, F-LB111 F-LB108, F-LB109, F-LB110; S-1636-1 WAS S-1636-2 (SR 8143)	GDS 5-6-76	JRS
F	BY REV: ADD F-LB140, DETAIL 'B'; SER OUT F-LB108, F-LB109, F-LB110 & F-LB111, RH-10-10, HF-10-10, S-1637-1, S-1637-2 (SR8464)(SR8465)	JJB 8-29-77	JAB JRS
G	BY REV: 1213319(5) WAS (4) (SR8464)(REF)(SR8465)(REF)	DLP 2-9-77	JAB JRS
H	BY REV: ADD RED LB145; BLK FLB 88 WAS F-LB88, MER 21050667 (NOW SHOP PRACTICE)	HHG 2-21-79	JRS

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (FN-LB163)	22	-22-0		S-1370-1	S2099-4		SER (SR10101)(SR10102) & ON
RED F-LB145	22	-22-2		S-1370-1	SEE LB140		
F-LB140	22			S-1829-1	S-1370-1		(SR8464) & ON
F-LB110	22			S-1370-1	S-1635-1		(SR7650) THRU (SR8464)
F-LB109	22		6	SOLDER	S-1635-1		(SR7650) THRU (SR8464)
F-LB108	22		6	S-1636-1	SOLDER		(SR7650) THRU (SR8464)
F-LB111	22			S-1636-1	S-1829-1		(SR7650) THRU (SR8464)
BLK F-LB88	22	-22-0	90	S-1370-1	S-1367-1-8		THRU SER (SR10101)(SR10102)
F-LB87	18		90	S-1370-1	S-1829-1		THRU SER 21060539

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	S2527-2	GND CONNECTOR	
8	S2527-1	LH GND BLOCK	
7	34003-817	TERMINAL BLOCK	
6	S-1637-2	HOUSING-SOCKET	
5	S-1637-1	HOUSING	
4	HF-10-10	RESISTOR (OMNI)	ALTERNATE
3	RH-10-10	RESISTOR (DALE)	
2	34002-55	TERMINAL BLOCK	
1	1213319	LIGHT ASSY	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	J.K. WHITE	2-24-71
STRESS		
PROJ	[illegible]	2-27-71
APPD	JKB	
OTHER		

Cessna. AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

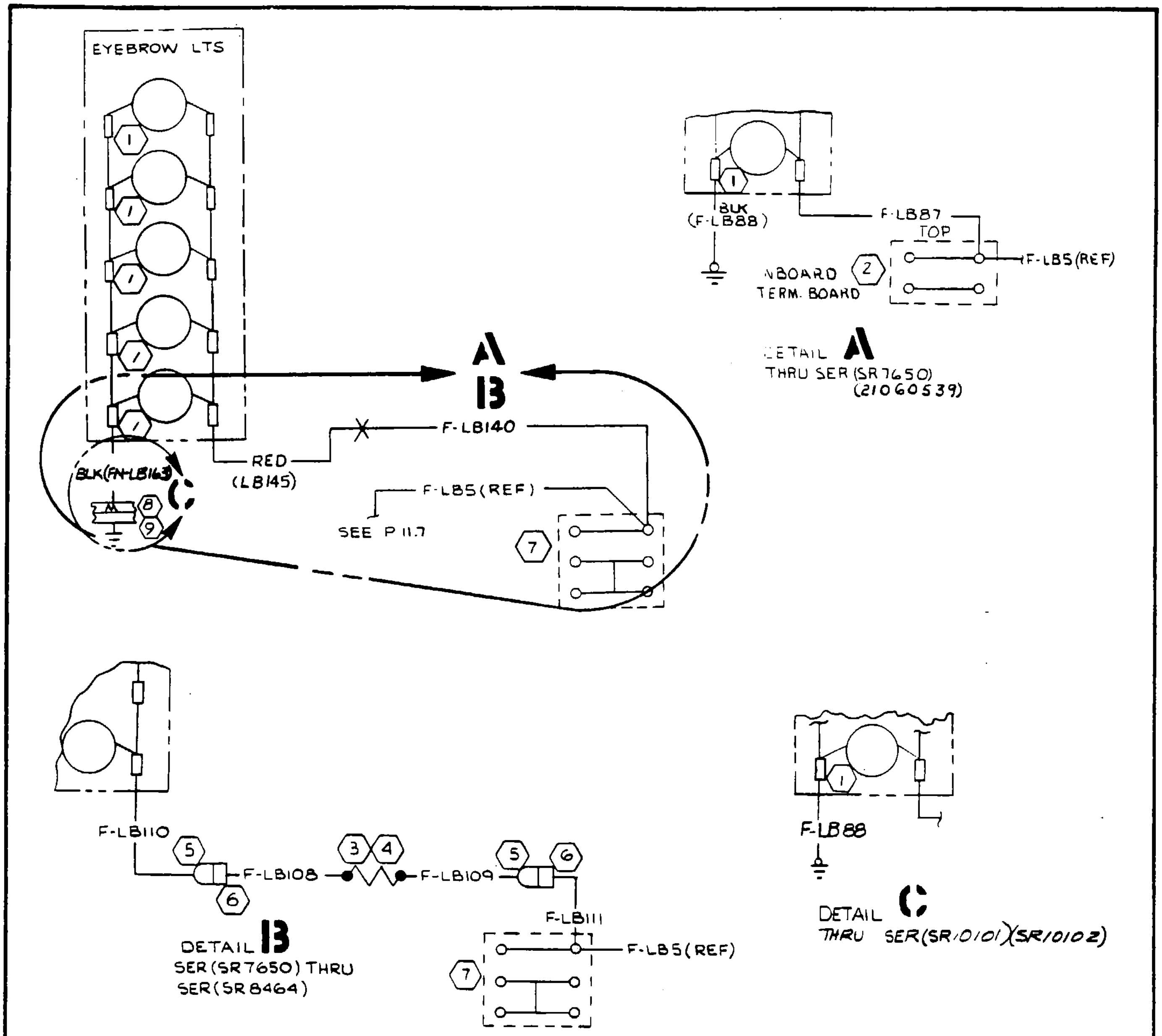
TITLE: WIRING DIAGRAM — EYEBROW LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 P210 PAGE: 11.8

(SR 6755) (21059503)

Eyebrow Lights (Sheet 1 of 2)



CONTRACT NO:		
	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	J.K. WHITE	2-24-71
STRESS		
PROJ		2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — EYEBROW LIGHTS

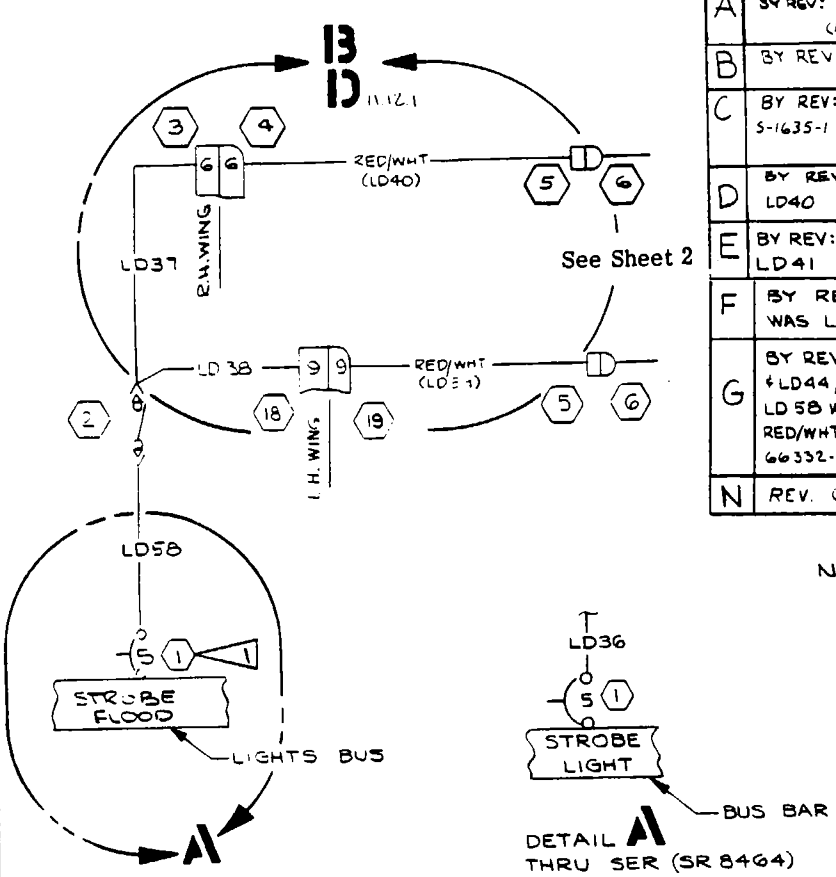
SIZE	CODE IDENT NO	DWG NO
C	71379	1270709

SCALE: NONE 210 P210 PAGE: 11.8

(SR 6755) IX (21059503)

Eyebrow Lights (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO	
B	BY REV: REACTIVATE DWG (SR7913)	GW 6-12-75	
C	BY REV: 22 GA WAS 18 GA/ LD 36 THRU LD40 S-1635-1 WAS S-1635-2, S-1636-1 WAS S-1636-2 (SR8143)	GDS 5-6-76	
D	BY REV: ADD (RED/WHT) TO LD39 & LD40 (NOW SHOP PRACTICE)	PH 8-25-76	
E	BY REV: ADD DETAIL "A" & SER & LD41 (SR8464)	REG 4-28-77	
F	BY REV: ADD DETAIL B; LD53 WAS LD41 (SR8464)(SR8465)	DLP 6-6-77	JAB
G	BY REV: RED/WHT LD62 & LD61 WAS LD45 & LD44, LD60 WAS LD43, LD59 WAS LD42, LD58 WAS LD53; S-2099-7 WAS 66331-5/ RED/WHT LD62 & LD61; S-2333-2 WAS 66332-5/ LD59 & LD60 (SR8464)(SR8465)	JJB 8-29-77	JAB
N	REV. CONT. ON P. 11.12.1		



NOTES:
1 S-1360-5L CKT. BKR. REPLACED WITH S-1360-10L CKT. BKR. WHEN TAIL FLOODLIGHT IS INSTALLED.

ITEM NO.	PART NO.	DESCRIPTION	
21	S-2350-9	CONNECTOR	
20	S-2349-3	CONNECTOR	
19	S-1640-9	HOUSING	
18	S-1641-9	HOUSING	
17	C622008-0104	CABLE ASSY	
16	C622009-0101	POWER SUPPLY	
15	S-1360-10L	CIRCUIT BREAKER	
14	205841-1	CONNECTOR	
13	205838-1	CONNECTOR	
12	S-2349-2	CONNECTOR	
11	S-2350-2	CONNECTOR	
10	S-2349-1	CONNECTOR	
9	S-2350-1	CONNECTOR	
8	C622006-0107	LAMP ASSY	
7	C622008-0102	POWER SUPPLY	
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-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED/WHT LD70	18	-18-2-9		S-2099-7	S-1636-1		
LD69	18			S-1493-1	S-2353-1		
RED/WHT LD64	18	-18-2-9		S-1636-1	S-2391-1		SER(SR9427) & ON
LD63	18			S-1493-1	S-2415-1		SER(SR9427) & ON
RED/WHT (LD62)	18	-18-2-9		S-2099-5	S-1636-1	STD	
RED/WHT (LD61)	20	-20-2-9		S-2099-7	S-1636-1	STD	THRU SER(SR9427)
LD60	18			S-1493-1	S-2353-1		
LD59	20			S-1493-1	S-2353-1		THRU SER(SR9427)
LD58	18			S-13674-6	S-1493-1		SER (SR 8464) & ON
RED/WHT (LD40)	18	-18-2-9		S-1636-1	S-1635-1	STD	
RED/WHT (LD39)	18	-18-2-9		S-1636-1	S-1635-1	STD	
LD38	18		180	S-1635-1	S-1493-1		
LD37	18		200	S-1635-1	S-1493-1		
LD36	22		18	S-1367-1-6	S-1493-1		THRU SER (SR8464)

WIRE TABLE

CONTRACT NO:		
	NAME	DATE
DESIGN	V R SIPES	3/25/72
GROUP		5-22-72
DRAWN	V R SIPES	5/22/72
CHECK	L K WHITE	
STRESS		
PROJ		
APPD		
OTHER		

Cessna. AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210 P210	PAGE: 11.12.0

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

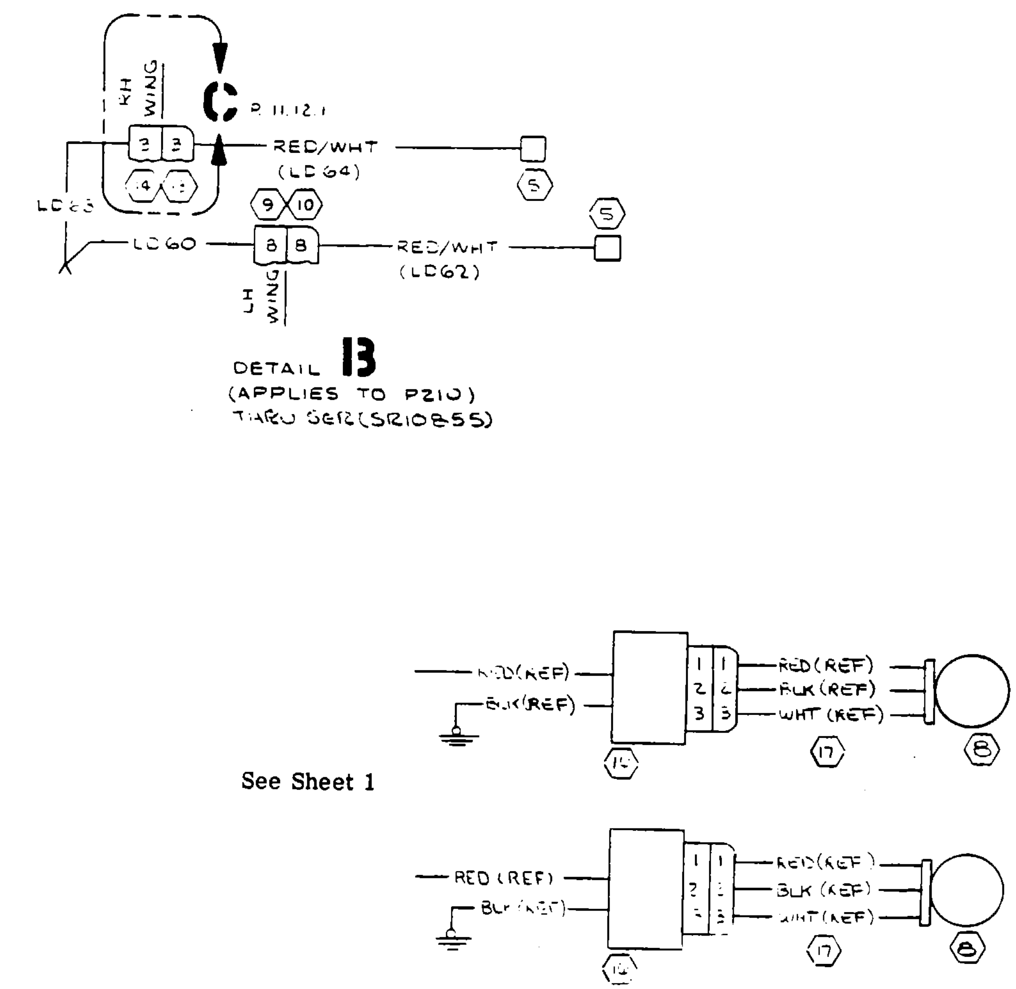
SUPERSEDES: PG 11.11

SUPERSEDED BY:

(SR 7038) IX (21059720)

Wing Tip Strobe Lights (OPT) (Sheet 1 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE TABLE

CONTRACT NO:		
	NAME	DATE
DESIGN	VR SIPES	3/25/72
GROUP	H. Wi...	5-22-72
DRAWN	VR SIPES	5/22/72
CHECK	L.K. WHITE	5-22-72
STRESS		
PROJ	J. McCarter	5-23-72
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPT)

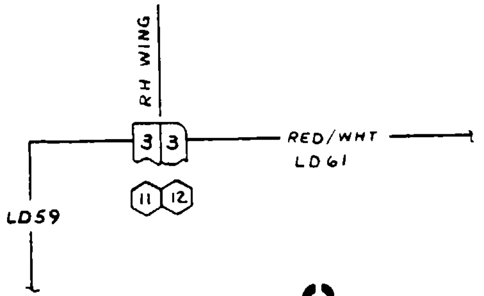
SIZE	CODE IDENT. NO	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 11.12.0

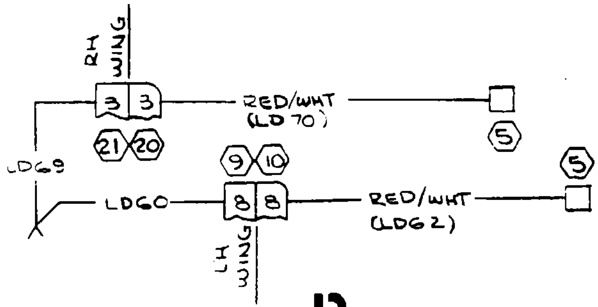
(SE 7038) IX (21059720)

Wing Tip Strobe Lights (OPT) (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
H	BY REV: C622006-0107 WAS -0102 C622008-0102 WAS C622007-0103; ADD DETAIL C & SER, ADD 205838-1, 205841-1, LD63, LD64, P 11.12.1 (SR9427)(SR8938)(REF) 20 GA WAS 22 GA/LD37, LD38, LD39, LD40, LD58, LD59, LD60, LD61, LD62, LD63, LD64	CS 4-10-78 DLP	
J	BY REV: (SR9427) WAS (SR8863)/REV H; DETAIL "C", LD59, LD61, LD63 & LD64 (SR9427)	GDA 10-4-78	RSP
K	BY REV: ADD FLAG NOTE 1 ON BUS BAR "STROBE FLOOD" WAS STROBE IN WIRE TABLE, 16 GA WAS 20 GA (SR10101)(SR10102)	WHH 5-26-82	REH
L	BY REV: ADD DETAIL "D", C622008-0104, C622009-0101 (SR10662)	TMS 5-15-83	
M	BY REV: ADD S-1641-9 & S-1640-9, L.H. WING (NOW SHOP PRACTICE) DELETE DETAIL D (SR10662) ADD NEW DETAIL "D" & SERIAL SEE OUT DETAIL "B" (SR10855)	KWL 8-21-84	REH
N	BY REV: LD69 WAS LD67, LD70 WAS LD68; S-1636-1 WAS S-2341-1 (NOW SHOP PRACTICE)	KWL 2-6-85	REH



DETAIL C P 11.12.0
THRU SER (SR9427)



DETAIL D
(APPLIES TO P210)
SER (SR10855) & ON

CONTRACT NO:			Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	
DESIGN	SPENCER	4-17-78	TITLE WIRING DIAGRAM— WING TIP STROBE LIGHTS (OPT)
GROUP			
DRAWN	C SHAVER	4-10-78	
CHECK	RE HAIR	5-27-82	
STRESS			
PROJ			SIZE C · CODE IDENT. NO. 71379 · DWG NO. 1270709
APPD			
OTHER			SCALE: NONE · (SR9427) · PAGE: 11.12.1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD RED,YEL,GRN,BLK & SER; SER OUT LF10,LF11,LF12,LF13 & LF14; ADD NOTE 1 (SR7473)	DLP 1-10-73	
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLD 5-3-73	
C	BY REV: ADD DETAIL 'A' & SER'S: SER OUT LF6 & LF7. SER IN LF15 (SR7913)	GW 9-17-75	
D	BY REV: EFF OF DET 'A' WAS THRU (SR7913) (SR8482)	JCS 3-15-76	
E	BY REV: 18 GA WAS 16GA/LF15, BLK(LF14), BLK(LF13), GRN(LF12), YEL(LF11), RED(LF10), LF5; S-1367-1-8 WAS S-1367-2-8, S-1493-1 WAS S-1493-2 (SR8143)	TMS 5-21-76	
F	BY REV: C594502-0102 WAS C594502-0101 (SR8552)	GDS 8-2-76	
G	BY REV: ADD DETAIL "B" & SER, LF16 & S-1360-10L (SR8464)	REG 4-28-77	
H	BY REV: ADD WIRE LF17/P210 (SR8465)	GDS 6-6-77	JAB
J	BY REV: ADD PAGE 11.13.1, 16 GA JUMPER S-1640-6, S-1641-6 & FLAG NOTE 2; SER OUT LF13 & LF14. SER IN LF18, LF19, LF20 & LF21 (SR9310	LWF 2-15-79	CMK
M	(CONTINUED ON PAGE 11.13.1)		

9160-59
9160-67

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (LF26)	18			S-1635-1	SEE LF1X	3.	SER(SR10659) & ON
GRN (LF25)	18			S-1635-2	S-1636-2	3.	SER(SR10659) & ON
LF24	18			S-1636-2	S-1493-1	3.	SER(SR10659) & ON
LF23	18			SEE LF21	S-1493-1	3.	SER(SR10659) & ON
BLK (LF22)	18	-18-0		S-1636-3	S-1367-1-8	3.	SER(SR9310 & ON
BLK (LF21)	18	-18-0		S-1636-3	S-1367-1-8	3.	SER (SR9310) & ON
BLK (LF20)	18	-18-0		SEE LF2	SEE LF19	3.	(SR9310) THRU (SR10659)
BLK (LF19)	18	-18-0		S-1635-1	S-1636-3	3.	SER(SR9310)& ON
BLK (LF18)	18	-18-0		S-1635-3	S-1493-1	3.	(SR9310) THRU (SR10659)
LF 17	18			S-1493-1	S-1636-2	3.	SER (SR8465) & ON
LF16	18			S-1367-2-6	S-1493-1		SER (SR8464) & ON
LF 15	18			S-1493-1	S-1636-2	3.	SER 21061230 & ON
BLK (LF14)	18	-18-0		S-1635-2	S-1367-1-8		SER 21059882 THRU (SR9310)
BLK (LF13)	18	-18-0		S-1493-1	S-1367-1-8		SER 21059882 THRU (SR9310)
GRN (LF12)	18	-18-5	75	S-1636-2	S-1493-1	3.	SER 21059882 THRU (SR10659)
YEL (LF11)	18	-18-4	75	S-1636-2	S-1635-2	3.	SER 21059882 & ON
RED (LF10)	18	-18-2	65	S-1635-2	S-1636-2	3.	SER 21059882 & ON
LF14	16			S-1635-2	S-1367-2-8		THRU SER 21059881
LF13	16			S-1493-2	S-1367-2-8		THRU SER 21059881
LF12	16		75	S-1636-2	S-1493-2		THRU SER 21059881
LF 11	16		75	S-1636-2	S-1635-2		THRU SER 21059881
LF10	16		65	S-1635-2	S-1636-2		THRU SER 21059881
LF 7	16		75	S-1635-2	S-1636-2		THRU SER 21061229
LF 6	16		125	S-1493-2	S-1635-2		THRU SER 21061229
LF 5	18		7	S-1367-2-6	S-1493-1		THRU SER (SR8464)

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
13	S-2035-1	HOUSING-PLUG	
12	S-2035-2	HOUSING-CAP	
11	S-1360-10L	CIRCUIT BREAKER	
10	C621001-0102	LIGHT ASSY	
9	C594502-0102	FLASHER ASSY	
8	OR95-6	RESISTOR	
7	S-1638-1	HOUSING-PLUG	
6	S-1637-1	HOUSING-CAP	
5	S-1637-2	HOUSING-PLUG	
4	1270705	CABLE ASSY	
3	S-1638-2	HOUSING-CAP	
2	S-2160-1	SWITCH	
1	S-1360-8L	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: PG 11.3
SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	3/25/72
GROUP	H. Wise	5-22-72
DRAWN	V R SIPES	5-22-72
CHECK	WHITE	5-22-72
STRESS		
PROJ		
APPD		
OTHER		

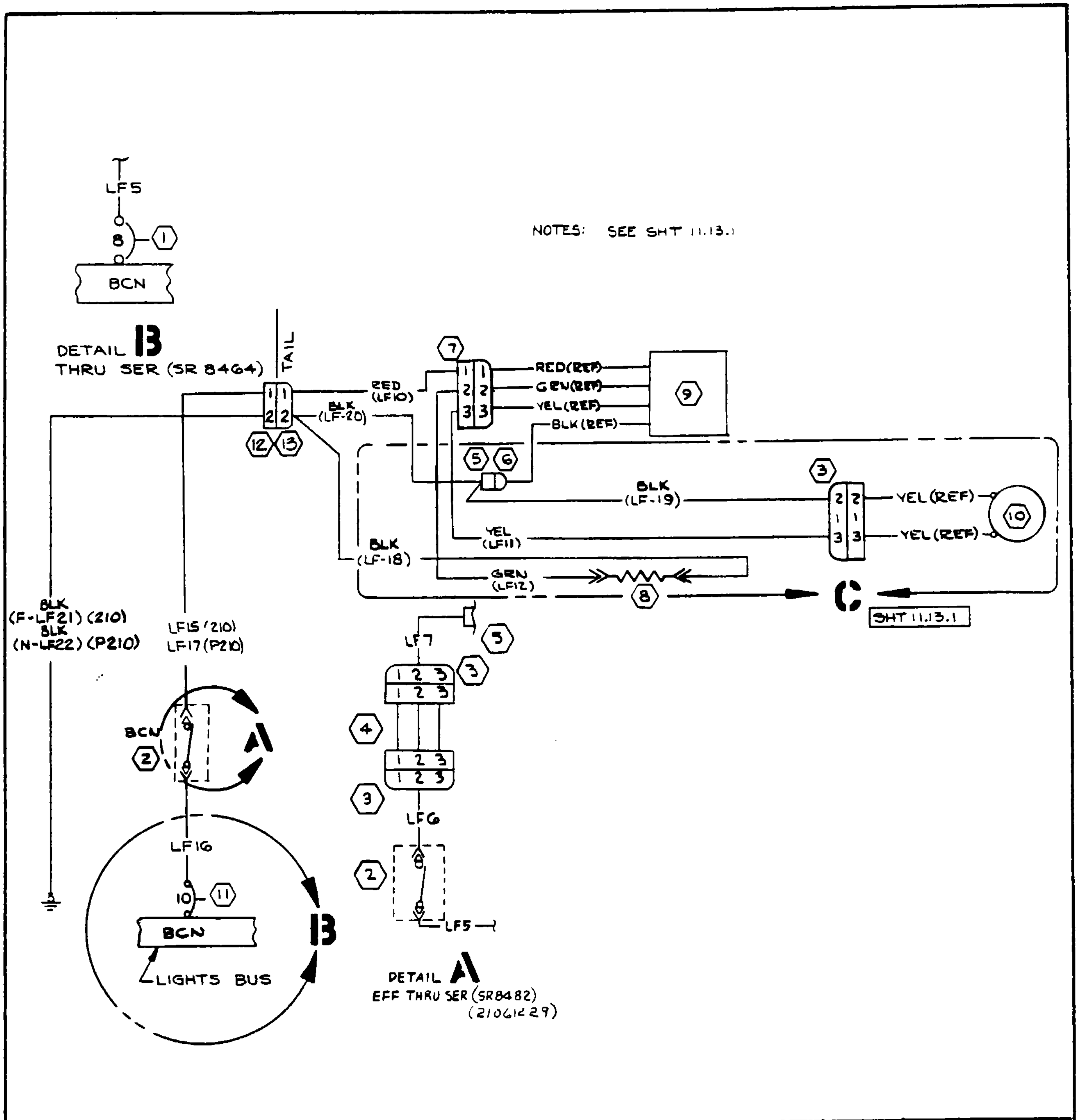
Cessna. AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON LIGHT

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210 P210	PAGE: 11.13.0

(SR7038) IX (21059720)

Flashing Beacon Light (Sheet 1 of 2)



WIRE TABLE			
CONTRACT NO:			COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS — Cessna AIRCRAFT CO.
	NAME	DATE	TITLE WIRING DIAGRAM — FLASHING BEACON LIGHT
DESIGN	V R SIPES	3/25/72	
GROUP	H. Wise	9-22-72	
DRAWN	V R SIPES	5-22-72	
CHECK	WHITE	5-22-72	
STRESS			SIZE C — CODE IDENT. NO. 71379 — DWG NO 1270709
PROJ	H. McCarter	5-23-72	
APPD			
OTHER			SCALE: NONE — 210 P210 — PAGE: 11.13.0

(SR7038)IX(21059720)

Flashing Beacon Light (Sheet 2 of 2)

NOTES:

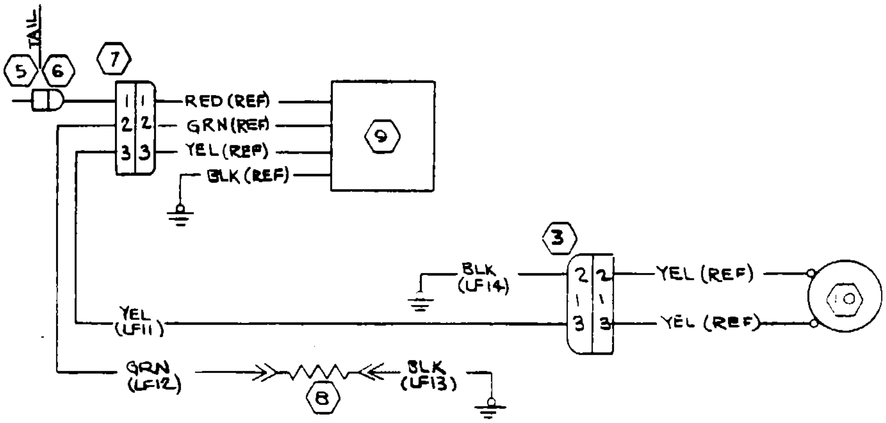
1. COLORED WIRES BEARING CES 1100 CODING IN PARENTHESIS SHALL NOT BE STAMPED. CES 1100 CODING ON THESE WIRES IS FOR PARTS LIST USE ONLY

~~2 INTERTWINE (LF19) WITH (LF11), (LF18) WITH (LF12) & (LF20) WITH (LF10) FROM COMPONENTS TO S-1641-6 HOUSING PLUG. INTERTWINE (LF21) WITH (LF15)/210 & (LF17)/P210~~

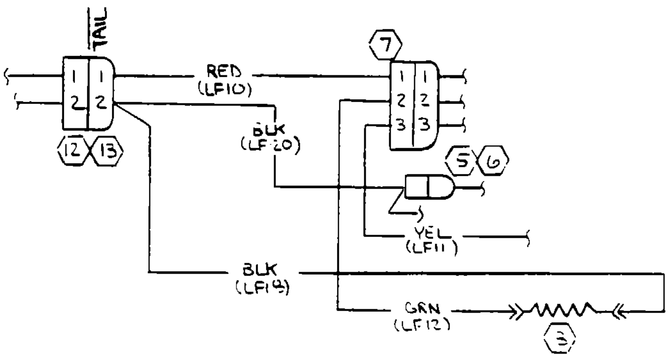
3 INTERTWINE (LF19) WITH (LF11), (LF18) WITH (LF12) & (LF20) W/(LF10); INTERTWINE (LF21)/210 & (LF22)/P210 WITH (LF15)/210 & (LF17)/P210. INTERTWINE (LF23) & (LF24) & (LF12) (LF25) (LF26)

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
K	BY REV: DELETE NOTE 2. ADD NOTE 3, BLK N-LF22 WIRE. S-2035-2 WAS S-1640-6 & S-2035-1 WAS S-1641-6. BLK WIRES (LF18), (LF19), (LF20), & (LF21) WERE WHT WIRES. (SR9310)	MDR 7-31-79	JAB JRS
L	BY REV: ADD DETAIL 'D'. REVISE NOTE 3 ADD LF23 & LF24 WIRES (SR10659)	WHH	TJP JRS
M	BY REV: REVISE DETAIL 'D'; S-1638-1 & -2 WAS S-2035-1 & -2/TAIL'; S-1636-3 WAS S-1635-1/LF21 & LF22; SEE LF21 WAS S-1636-3 /LF23; S-1636-2 WAS S-1635-2/LF24; ADD LF25 & LF26; REVISE NOTE 3 (SR10659)	TMS 2-13-81	TJP JRS



DETAIL C SHT 11.13.0
THRU SER (SR 9310)



DETAIL D
THRU SER (SR10659)

CONTRACT NO:		
	NAME	DATE
DESIGN	LWFINE	2-15-79
GROUP	[illegible]	2-[illegible]-79
DRAWN	L WFINE	2-15-79
CHECK	C KING	2-15-79
STRESS		
PROJECT	[illegible]	[illegible]
APPD		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — FLASHING BEACON LIGHT

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709
SCALE: NONE	210 P210	PAGE: 11.13.1

LET	DESCRIPTION	DATE	APPD
J	CONTINUED ON PAGE 11.17.1		

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: BLK(LB128) WAS BLK(REF) (SR8465) (SR8464)	GDS 6-20-77	JAB WWH JRG
B	BY REV: F-LB71 TO 34004-818 WAS 1270479-13; F-LB72 TO MS25231-1829 WAS 34004-818; RED/BLU (LA-116) WAS (LA-95), BLK(LA-117) WAS (LA-96); WHT(REF) WAS WHT/BLK (LB118); BLK(REF) WERE BLK(LB115), RED/BLU (LB116), RED(LB114); CHASSIS GND/MS25231-1829 WAS BLK(LB128) & BLK(LB117); ADD NOTE 1 (SR8464)(SR8465)	JJB 8-29-77	JAB WWH JRG
C	BY REV: ADDED F-LB100, F-LB101, N-LB130, BLK(N-LB142), C660501-0102 COMPASS ASSY, & NOTE 2; ADD LB143, NOTE 3, S2413-1 & MS25231-1819 (SR9167)	TFS CMK 7-13-78	JAB JRG
D	BY REV: DELETE NOTE 2, BLK(N-LB142) N-LB130, F-LB101, F-LB100, C660501-0102 COMPASS ASSY (SR8464)(REF)	LSS 8-10-78	JAB JR
E	BY REV: ADD RED(F-LA123), BLK(F-LA124), RED(F-LA116) WAS RED/BLU (LA116). ON F-LA90 NOTE: S-1370-1 WAS SOLDER; BLK(F-LA91) WAS LA91 & S-1370-1 WAS SOLDER. (NOW SHOP PRACTICE) ADD A/C (OPT): RED(F-LA121), BLK(F-LA122) (SR9114)(SR9115)	MDR 4-6-79	EJF WWH JRG

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
FN-LB151	22			S-1367-1-8	S-1367-1-3		SER(SR9711) & ON
FN-LB152	22			S-1367-1-8	S-1829-1		SER(SR9711) & ON
FN-LB153	22			S-1829-1	S-1370-1	(OPT)	<3
BLK (FN-LA122)	22	-22-0		SOLDER	SEE F-LA91	(OPT)	SER(SR9556) & ON
RED (FN-LA121)	22	-22-2		SOLDER	SEE F-LA90	(OPT)	
BLK (F-LA124)	22	-22-0		SOLDER	SEE F-LA91	(OPT)	
RED (F-LA123)	22	-22-2		SOLDER	SEE F-LA90	(OPT)	SER(SR9556) & ON
RED (FN-LE114)	22	-22-2		SEE LB112	S-1370-1		
RED (F-LA116)	22	-22-2		SOLDER	SOLDER	(OPT)	
BLK (F-LA117)	22	-22-0	25	SOLDER	SOLDER	(OPT)	
BLK (FN-LA91)	22	-22-0	10	S-1370-1	S-1367-1-8	(OPT)	
FN-LA90	22		190	S-1829-1	S-1370-1	(OPT)	
FN-LB112	22			S-1829-1	S-1370-2		
FN-LB72	22			SEE LB112	S-1829-1		THRU SER(SR10148)
FN-LE71	22			S-1829-1	SEE 1270479		THRU SER(SR9711)
FN-LB70	22			SEE 1270479	SEE 1270479		THRU SER(SR9711)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
14	S-2567-3	TERMINAL BOARD	
13	C669562	INST CLUSTER	
12	C669561-0102	INST CLUSTER	
11	C669560-0102	INST CLUSTER	
10	S-2413-1	SOCKET	<3
9	MS25231-1819	LIGHT	<3
8			
7	MS25231-1829	LAMP	
6	S-1899-7	LIGHT ASSY	
5	34004-818	TERMINAL BOARD	
4	C669525-0101	INST CLUSTER	
3	C669527-0101	INST CLUSTER	
2	C669526-0101	INST CLUSTER	
1	1270479-13	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 11.2 & 11.2.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	WHITSON	4-22-77
GROUP	W.H. Hardin	4-21-77
DRAWN	G.L. RYAN	4-21-77
CHECK	J. YOUEL	4-22-77
STRESS		
PROJ	PULLFORD	4-26-77
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — INSTRUMENT LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | PAGE: 11.17

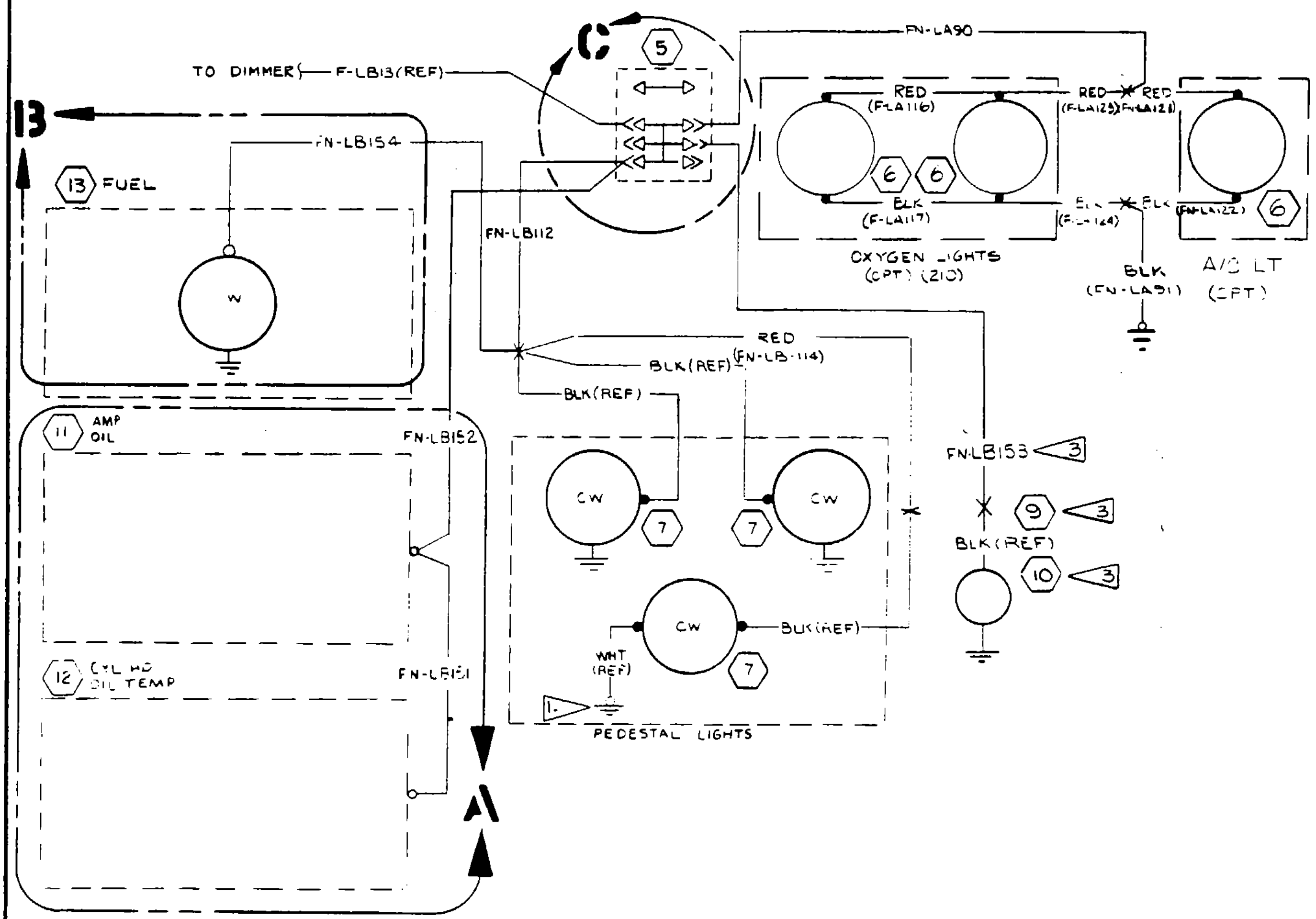
Instrument Lights (Sheet 1 of 2)

NOTES:

1. TERMINATE VENDOR FURNISHED WIRE WITH S-1367-1-8

2. ~~S1493-1 TERMINAL REPLACES S1829-1 WHEN OPT POST LIGHTS ARE INSTALLED~~

3. REQD ONLY WHEN OPT DIGITAL CLOCK C664511 IS INSTALLED

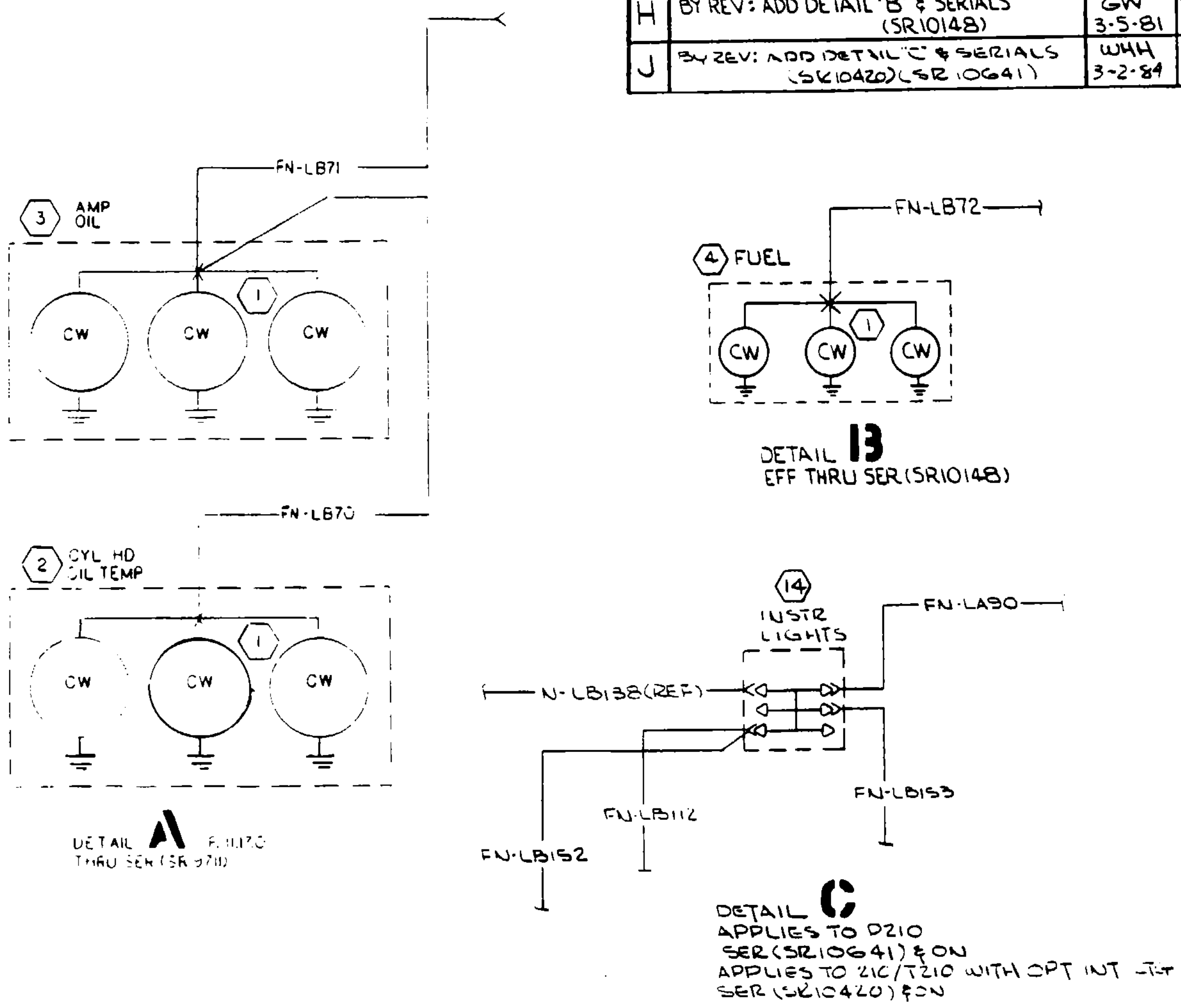


CONTRACT NO:			Cessna AIRCRAFT CO.	PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS	
	NAME	DATE	TITLE		
DESIGN	WHITSON	4-22-77	WIRING DIAGRAM — INSTRUMENT LIGHTS		
GROUP	W.H. Harden	4-21-77			
DRAWN	G.L. RYAN	4-21-77			
CHECK	J. YOUEL	4-22-77			
STRESS			SIZE	CODE IDENT. NO.	DWG NO
PROJ	PLHEDRICK	4-26-77	C	71379	1270709
APPD					
OTHER			SCALE: NONE	210 P210	PAGE: 11.17.C

(SK8464)

Instrument Lights (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
F	BY REV: FN-LB153 WAS LB143 (SR9187)(REF) ADD DETAIL A, C669560-0102 & C669561-0102 (SR9711) FN-LB70 WAS F-LB70, FN-LB71 WAS F-LB71, FN-LB72 WAS F-LB72, FN-LB112 WAS F-LB112, RED (FN-LB114) WAS RED(LB114) (NOW SHIP PRACTICE)	SA 11-21-79	
G	BY REV: ADD SER(SR9556) & ON TO LA123, LA124, LA121 & LA122 WIRES (SR9556)	WHH 1-28-80	
H	BY REV: ADD DETAIL 'B' & SERIALS (SR10148)	GW 3-5-81	
J	BY REV: ADD DETAIL 'C' & SERIALS (SR10420)(SR10641)	WHH 3-2-84	



LB154	22			SEE LB112	S1367-1-8		SER(SR10048) & ON
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	ABRAHAM	12-11-79	TITLE WIRING DIAGRAM — INSTRUMENT LIGHTS
GROUP			
DRAWN	ABRAHAM	11-21-79	
CHECK	BORLESKE	12-8-79	
STRESS			
PROJ			SIZE C · CODE IDENT. NO. 71379 · DWG NO. 1270709
APPD			
OTHER			SCALE: NONE · 210 P210 · PAGE: 11.17.1

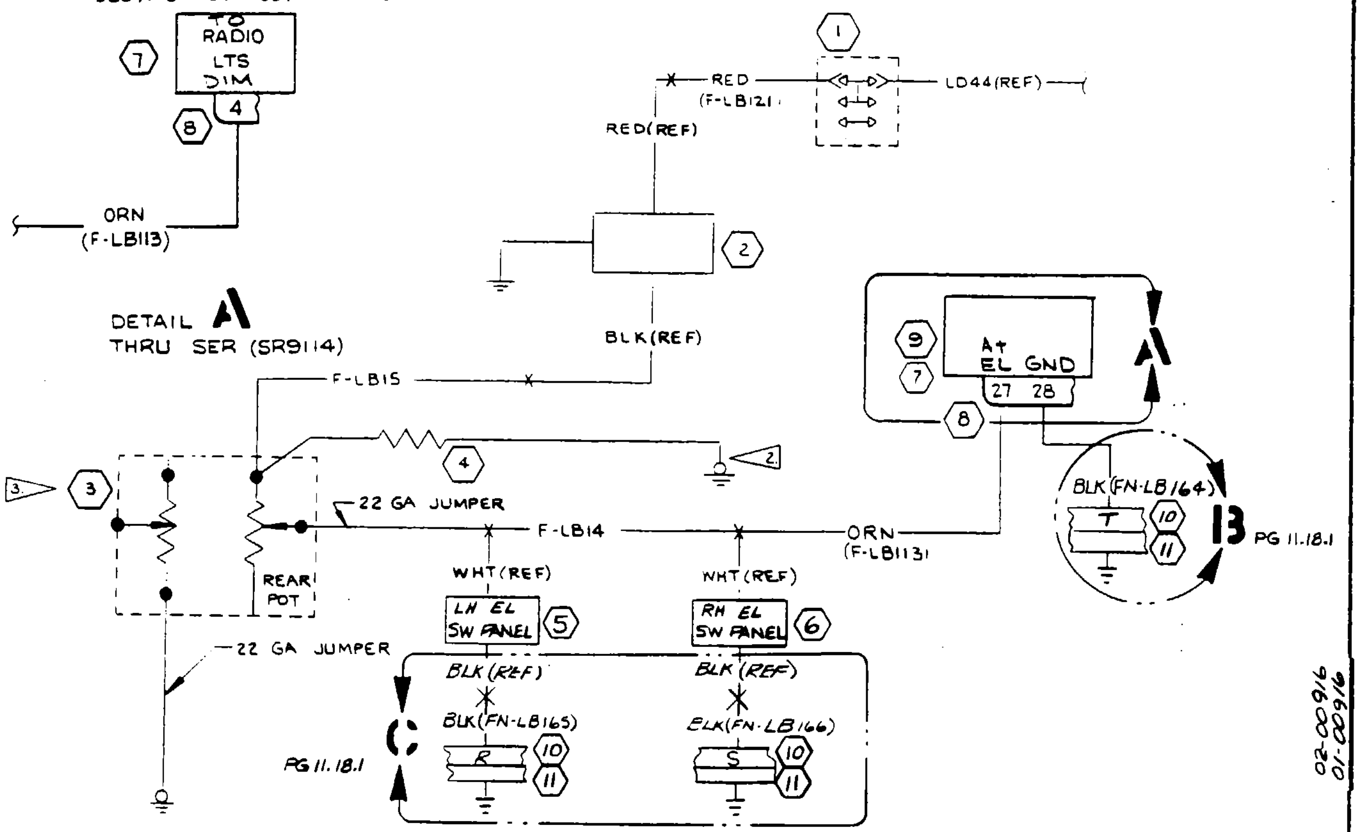
(SR9711)

C	BY REV: ADD DETAIL "B" & "C", PG 11.18.1, BLK(FN-LB164), BLK(FN-LB165), BLK(FN-LB166), S2527-2 & -1, SER OUT BLK(2) & BLK(1) (SR10101)(SR10102)	MKT 1-27-82	JAB 9RG

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A, LB144 & SER, 2470003 (SR9114)	DLP 2-20-79	
B	BY REV: BLK LB150 WAS BLK LB144 (SR9114)(SR9115)	HHG 5-21-79	JAB

NOTES:

1. THESE WIRES VENDOR FURNISHED
2. RESISTOR WIRE IS TERMINATED WITH S1367-1-14 TERMINAL & INSTALLED ON BUSHING OF THE TANDEM POT ASSY
3. WHEN ELECTROLUMINESCENT PANELS ARE INSTALLED, S2091-3 POT ASSY REPLACES S1904-2 POT ASSY



BLK (FN-LB166)	22	-22-0		S1370-1	S2099-4		SER(SR10101)(SR10102)&ON
BLK (FN-LB165)	22	-22-0		S1370-1	S2099-4		SER(SR10101)(SR10102)&ON
BLK (FN-LB164)	22	-22-0		85969-6	S2099-4		SER(SR10101)(SR10102)&ON
BLK(LB150)	22	-22-0		85969-6	S-1367-1-8		SER(SR9114) THRU (SR10101)(SR10102)
ORN F-LB113	22	-22-3		S1370-1	85965-6		
BLK(2)	22	-22-0		S1367-1-8	1.		THRU SER(SR10101)(SR10102)
BLK(1)	22	-22-0		S1367-1-8	1.		THRU SER(SR10101)(SR10102)
F-LB14	22		62	S1370-1	SEE ORN		
F-LB15	22		65	S1370-1	SOLDER		
RED F-LB121	22	-22-2	65	S1829-1	S1370-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
11	S2527-2	GND CONNECTOR
10	S2527-1	LH GND BLOCK
9	2470003	AUDIO CONTROL PNL
8	87149-1	CONNECTOR
7	0570442	AUDIO CONTROL PNL
6	1213782	PANEL ASSY
5	2113027	PANEL ASSY
4	VAL-5-6000	RESISTOR
3	S2091-3	POT ASSY
2	C613001-0101	POWER SUPPLY
1	34003-B17	TERM. BLOCK

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 11.1.0 & 11.1.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W H HARDEN	4-21-77
GROUP	W H Harden	4-21-77
DRAWN	GL RYAN	4-21-77
CHECK	J YOUEL	4-22-77
STRESS		
PROJ	PLANDRICK	4-26-77
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

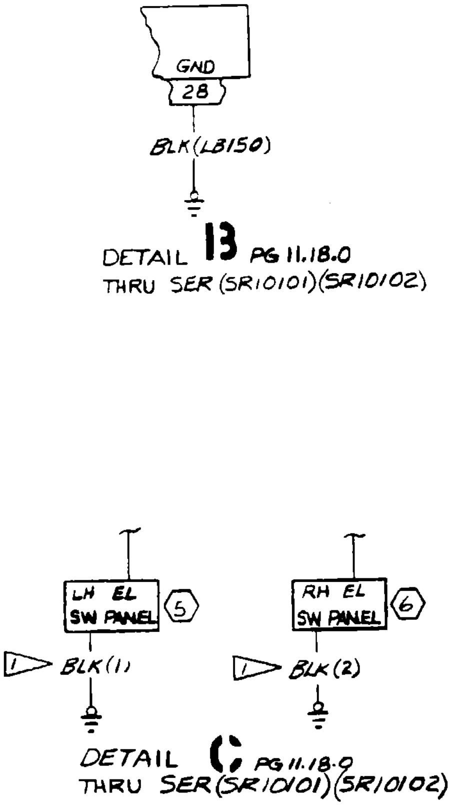
TITLE: WIRING DIAGRAM — ELECTROLUMINESCENT PANEL (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 11.18.0

(SR8464)

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PAGE 11.18.0 FOR REVISION		



02-00916
01-00916

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		
DRAWN	M THOMPSON	1-27-82
CHECK	BORLESKE	1-28-82
STRESS		
PROJ	J.H MOORE	3 26 82
APPD	JRS	
OTHER		

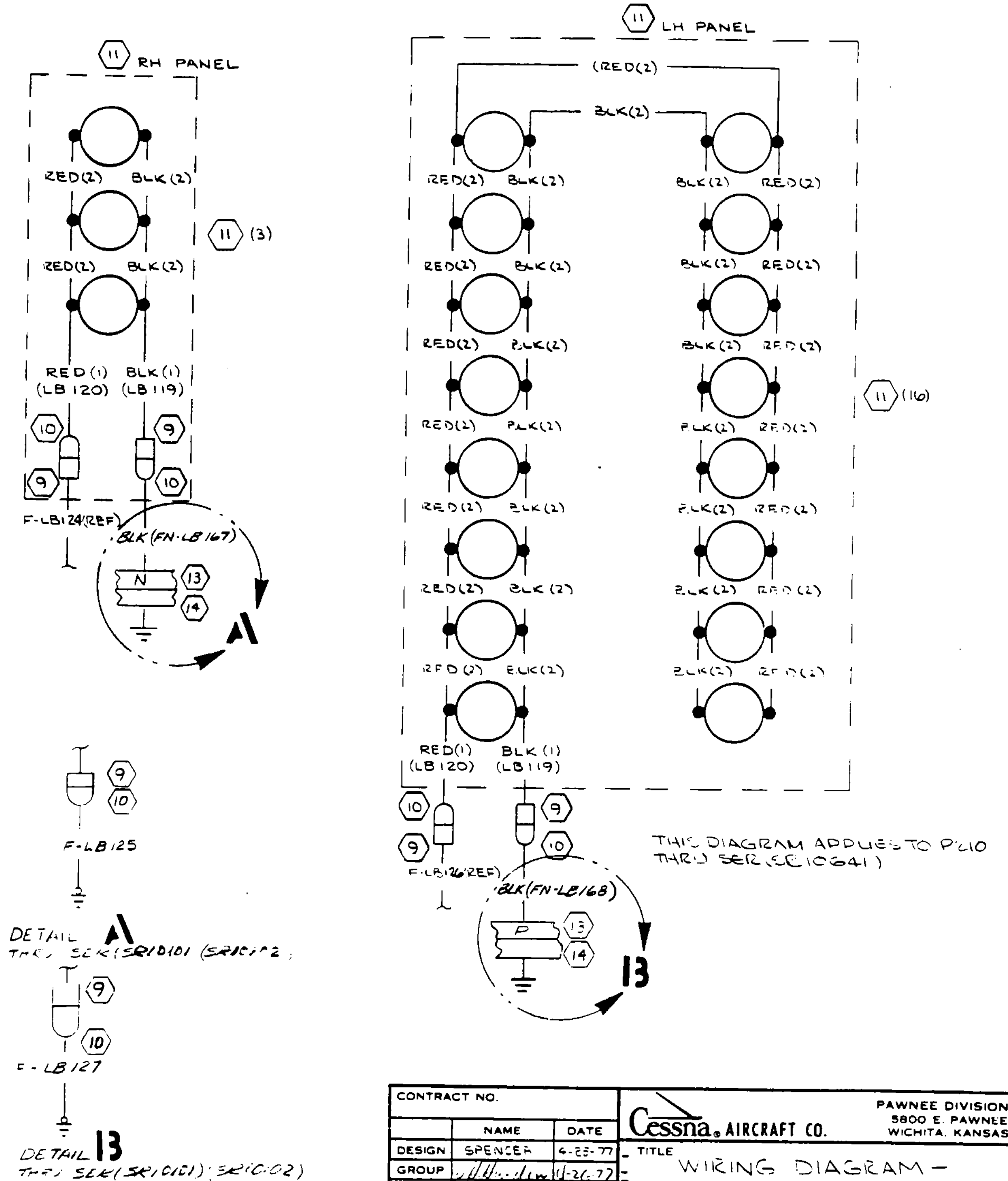
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM ELECTROLMINESCENT PANEL (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709
SCALE: NONE		PAGE: 11.18.1

(SR10101)(SR10102)

REVISION			
LET	DESCRIPTION	DATE	APPD
B	SEE PAGE 11.19.2 FOR REVISION		



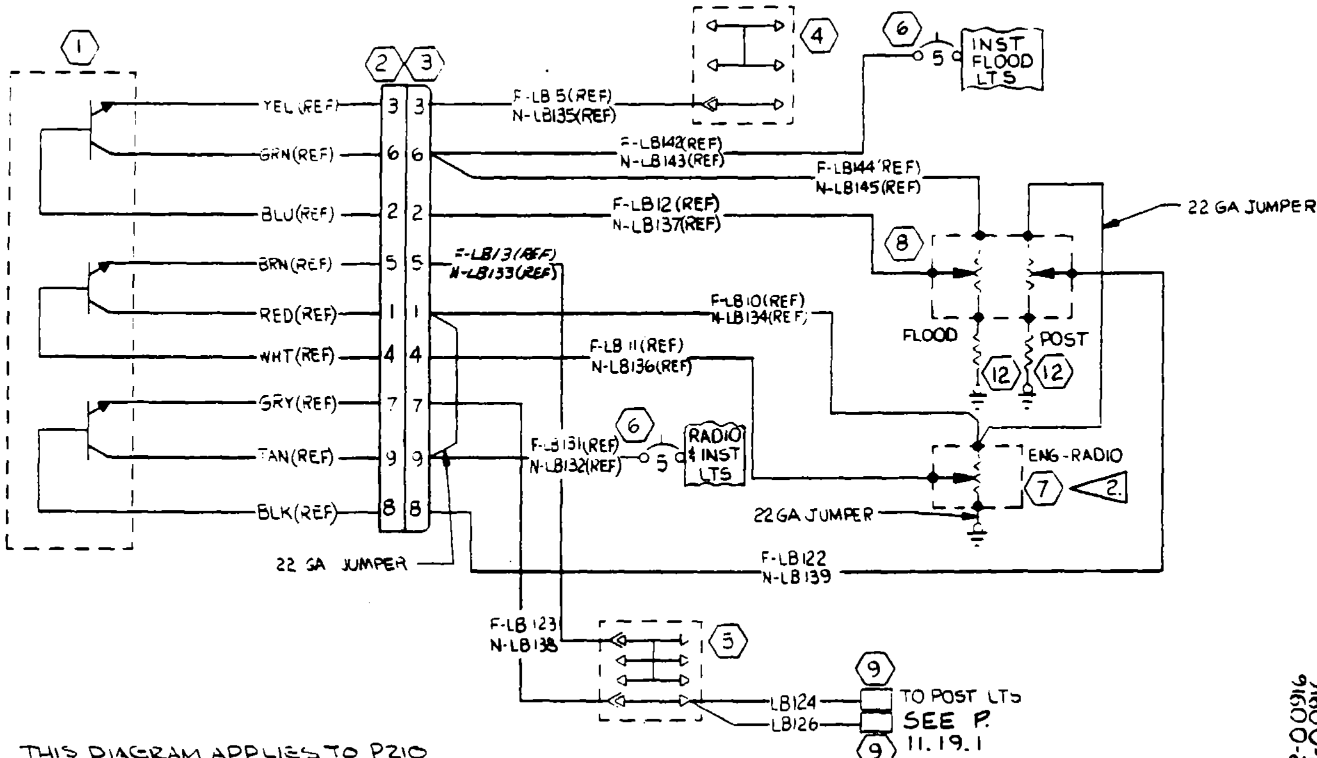
CONTRACT NO.			Cessna® AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	
DESIGN	SPENCER	6-23-77	TITLE WIRING DIAGRAM – POST LIGHTING (OPT)
GROUP		6-26-77	
DRAWN	Z. YOUNGERS	4-18-77	
CHECK	J YOUEL	4-19-77	
STRESS			
PROJ		3-26-77	SIZE C · CODE IDENT NO. 71379 · DWG NO. 1270709
APPD			
OTHER			SCALE NONE · PAGE 11.19.1

NOTES:

1. WHEN POST LT OPTION IS INSTALLED 1570301-1 DIMMING ASSY REPLACES 1570166 & S-2091-7 POT ASSY REPLACES S-1904-2

2. THIS POT IS PART OF S-2091-7 DUAL POT ASSY WHEN OPTIONAL EL LIGHTING IS INSTALLED

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV. ADD DETAIL "A" & "B", S2527(-1,-2) BLK(FN-LB167), BLK(FN-LB168); SER OUT LB125 & LB127 (SR10101)(SR10102)	MKT 1-27-82	JAB
B	BY REV ADD SER & MODEL APPL TO FACE OF DWG. (SR10641)	3-2-84	



THIS DIAGRAM APPLIES TO P210 THRU SER (SR10641)

02-00916
01-00916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
BLK (FN-LB167)	22	-22-0		S-1635-1	S2099-4		SER (SR10101)(SR10102) & ON
BLK (FN-LB168)	22	-22-0		S-1635-1	S2099-4		SER (SR10101)(SR10102) & ON
LB133	22			S-1635-1	SOLDER		
LB138	↑			S-1635-1	S-1829-1		
LB122				S-1635-1	SOLDER		
LB123				S-1635-1	S-1829-1		
LB125				S-1636-1	S-1367-1-8		THRU SER (SR10101)(SR10102)
LB127				S-1636-1	S-1367-1-8		THRU SER (SR10101)(SR10102)
BLK(2)		-22-0		SOLDER	SOLDER		
BLK(1)(LB119)		-22-0		SOLDER	S-1636-1		
RED(2)		-22-2		SOLDER	SOLDER		
RED(1)(LB120)		-22-2		SOLDER	S-1635-1		
LB126	↓			S-1829-1	S-1636-1		
LB124	22			S-1829-1	S-1636-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
14	S2527-2	GND CONNECTOR
13	S2527-1	LH GND BLOCK
12	S-2000C201J	RESISTOR
11	1513837	POST LT ASSY
10	S-1637-1	HOUSING
9	S-1637-2	HOUSING
8	S-2091-7	POT ASSY
7	S-1904-2	POT ASSY 2
6	S-1360-5L	CIRCUIT BREAKER
5	34004-818	TERMINAL BLOCK
4	34003-817	TERMINAL BLOCK
3	S-1640-9	HOUSING
2	S-1641-9	HOUSING
1	1570301	DIMMER 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: PAGE 11.19.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	2-14-79
GROUP		3-3-79
DRAWN	H. GIAZANIAN	2-12-79
CHECK	BORLESKE	2-13-79
STRESS		
PROJ		3-5-79
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE **WIRING DIAGRAM — POST LIGHTING (OPT)**

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE (SR 9114)(SR9115) PAGE: 11.19.2

1. TERMINATE VENDOR FURNISHED WIRES WITH S-1635-
2. TERMINATE VENDOR FURNISHED WIRES WITH S-1367-1-8
3. TERMINATE VENDOR FURNISHED WIRE W/S1636-1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD BLK TO(N-LB141) (SR8464)(REF)(SR8465)(REF)	LSS 8-10-78	JAB WHH JRS
B	BY REV: ADD BLK(LB88)(REF), WHT(REF) WAS BLK(REF), BLK(REF) WAS WHT(REF) LB103 WAS RED LB103, LB104 WAS RED LB104, S-1370-1 WAS S-1636-1 MER 210 E0667	HHG 3-21-79	JRS
	BY REV: ADD 2315-1, GE1495, F-LB146, N-LB147, BLK(FN-LB148), DETAIL A. (SR9114)(SR9115)	MDR 4-6-79	EJF
C	BY REV: ON DETAIL A: SER(SR9556)&ON WAS SER(SR9114)(SR9115) & ON (SR9556)	WHH 1-28-80	WHH JRS JAB
D	BY REV: ADD DETAIL B. ADD-LB155 THRU-LB162 WIRES. ADD RED(1) RED(2) BLK(1) & BLK(2) WIRES. ADD POST LTS FOR TACH, TWO RADIO IND. & SECOND ALT AS STANDARD (SR9953)(SR9954)	WHH 3-24-81	JAB FN for JRG
H	SEE PAGE 11.24.1 FOR REVISION		

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(2)	22	-22-0		SOLDER	SOLDER		SER(SR9953)(SR9954) & ON
BLK(1)		-22-0		S-1636-1	SOLDER		
RED(2)		-22-2		SOLDER	SOLDER		
RED(1)		-22-2		S-1636-1	SOLDER		SER(SR9953)(SR9954) & ON
N-LB162				S-1635-1	S-1367-1-8		SER(SR9554) THRU SER(SR10102)
F-LB161				S-1635-1	S-1367-1-8		SER(SR9553) THRU SER(SR10101)
N-LB160				S-1829-1	S-1635-1		SER(SR9554) & ON
F-LB159				S-1829-1	S-1635-1		SER(SR9553) & ON
N-LB158				S-1636-1	S-1367-1-8		SER (SR9554) THRU SER (SR10102)
F-LB157				S-1636-1	S-1367-1-8		SER (SR9553) THRU SER (SR10101)
N-LB156				S-1829-1	S-1635-1		SER(SR9554) & ON
F-LB155	22			S-1829-1	S-1635-1		SER(SR9553) & ON
BLK FN-LB148	22	-22-0		S-1636-1	S-1367-1-8	(OPT)	SER(SR9556) & ON
N-LB147	22			S-1636-1	S-1829-1	(OPT)	SER(SR9556) & ON
F-LB146	22			S-1636-1	S-1829-1	(OPT)	SER(SR9556) & ON
BLK (N-LB141)	22	-22-0		S-1635-1	S-1367-1-8		THRU SER(SR10101)(SR10102)
N-LB130				S-1636-1	S-1829-1		
N-LB129				S-1636-2	S-1829-1		
LB105				S-1829-1	S-1635-1		
LB104				SOLDER	S-1636-1		
LB103				SOLDER	S-1370-1		
F-LB102				S-1636-2	S-1829-1		
F-LB101				S-1635-1	S-1367-1-8		THRU SER(SR10101)(SR10102)
F-LB100	22			S-1829-1	S-1636-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
18	S2527-2	GND CONNECTOR
17	S2527-1	LH GND BLOCK
16	2113026	COVER ASSY-RH
15	1513837	POST LT. ASSY
14	2113025	COVER ASSY-LH
13	GE1495	BULB
12	2315-1	LIGHT ASSY
11	34004-818	TERMINAL BLOCK
10	1213319	LIGHT ASSY
9	S-1695-2	SWITCH
8	S-1637-2	HOUSING
7	S-1637-1	HOUSING
6	34003-817	TERMINAL BLOCK
5	S-2035-2	HOUSING - PLUG
4	S-2035-1	HOUSING - CAP
3	C660501	COMPASS ASSY
2	MS15584-16	MINIATURE LAMP
1	0513208	SOCKET

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PAGE 11.7.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	12-1-77
GROUP	D.J. Hardin	3-17-78
DRAWN	G. MOTYKO	11-28-77
CHECK	BORLESKE	11-29-77
STRESS		
PROJ	PLHEDRICK	3-21-78
APPD	JRS	
OTHER		

Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

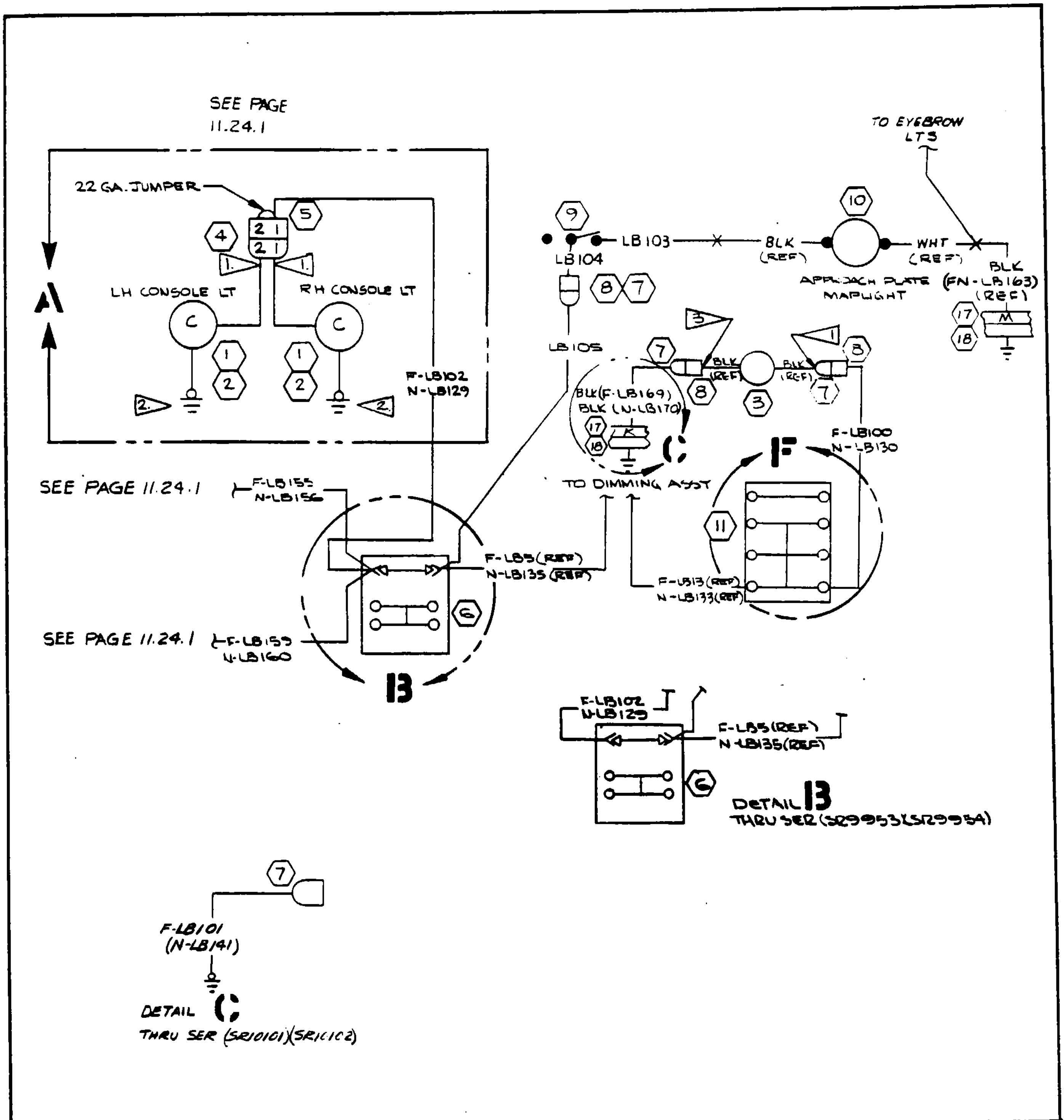
TITLE WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210. P210 | PAGE: 11.24.0

(SR8464)(SR8465)

Console & Compass Lights (Sheet 1 of 2)



CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	12-1-77
GROUP		3-17-78
DRAWN	G. MOTMKO	11-28-77
CHECK	BORLESKE	11-29-77
STRESS		
PROJ	PLHIEDRICK	3-21-78
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

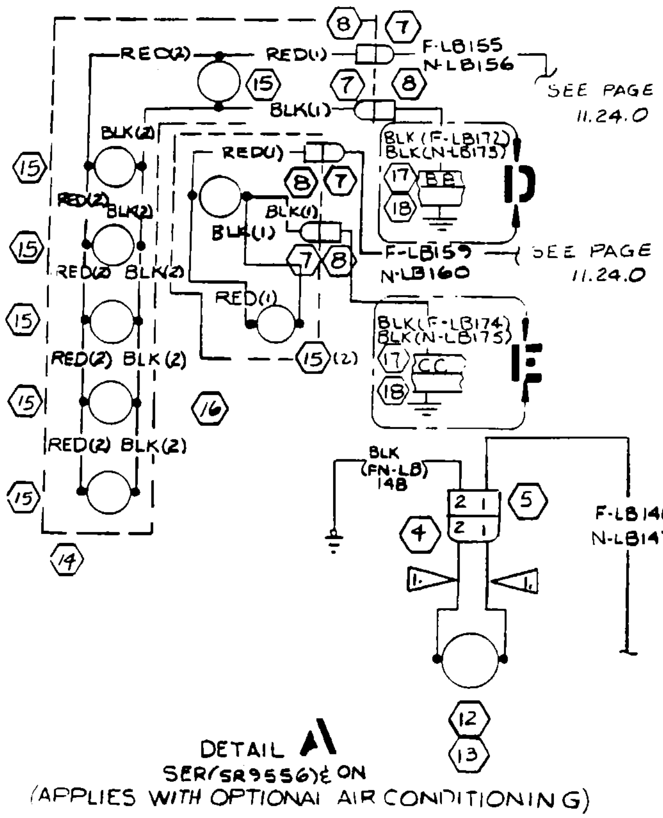
TITLE WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

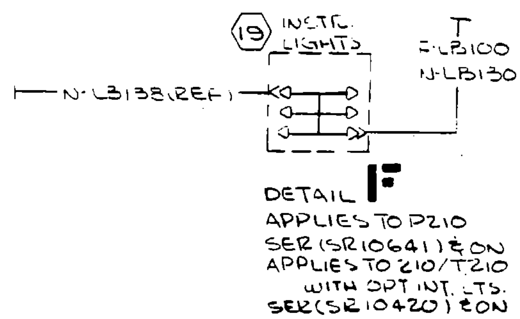
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210 P210	PAGE: 11.24.2

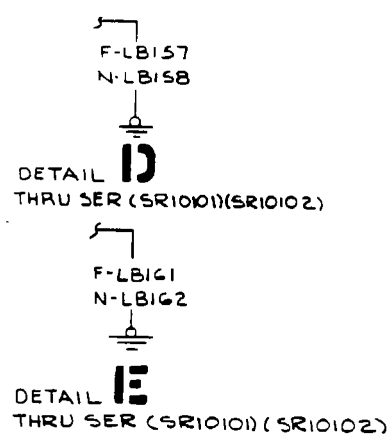
(SR8464)(SR8465)

Console & Compass Lights (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
E	BY REV: ADD 1513837(4) & PAGE 11.24.1 (SR9953)(SR9954)	MKT 8-18-81	JAB WHH
F	BY REV. ADD DETAIL "C", BLK(F-LB169), BLK(N-LB170), SER OUT BLK(N-LB141) F-LB101; ADD S2527(-1 & -2); C660501 WAS C660501-0102 (SR10101)(SR10102)	MKT 1-27-82	JAB WHH
G	BY REV: ADD DETAIL D & E (SR10101)(SR10102)	GLS 6-28-82	WHH
H	BY REV: SER OUT N-LB156, N-LB160, BLK(N-LB173) & BLK(N-LB175) WIRES. ADD DETAIL "F" & SERIALS. (SR10420)(SR10641)	WHH 3-2-84	REH WHH







WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
BLK (N-LB175)	22	-22-0		S-1636-1	S-2099-4	SER(SR10102) THRU SER(SR10641)
BLK (F-LB174)	22	-22-0		S-1636-1	S-2099-4	SER(SR10101) & ON
BLK (N-LB173)	22	-22-0		S-1636-1	S-2099-4	SER(SR10102) THRU SER(SR10641)
BLK (F-LB172)	22	-22-0		S-1636-1	S-2099-4	SER(SR10101) & ON
BLK (F-LB169)	22	-22-0		S-1635-1	S-2099-4	SER(SR10101) & ON
BLK (N-LB170)	22	-22-0		S-1635-1	S-2099-4	SER(SR10102) & ON

WIRE TABLE

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		
GROUP	[illegible]	8-24-81
DRAWN	M.THOMPSON	5-18-81
CHECK	BORLESKE	8-24-81
STRESS		
PROJ	[illegible]	[illegible]
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

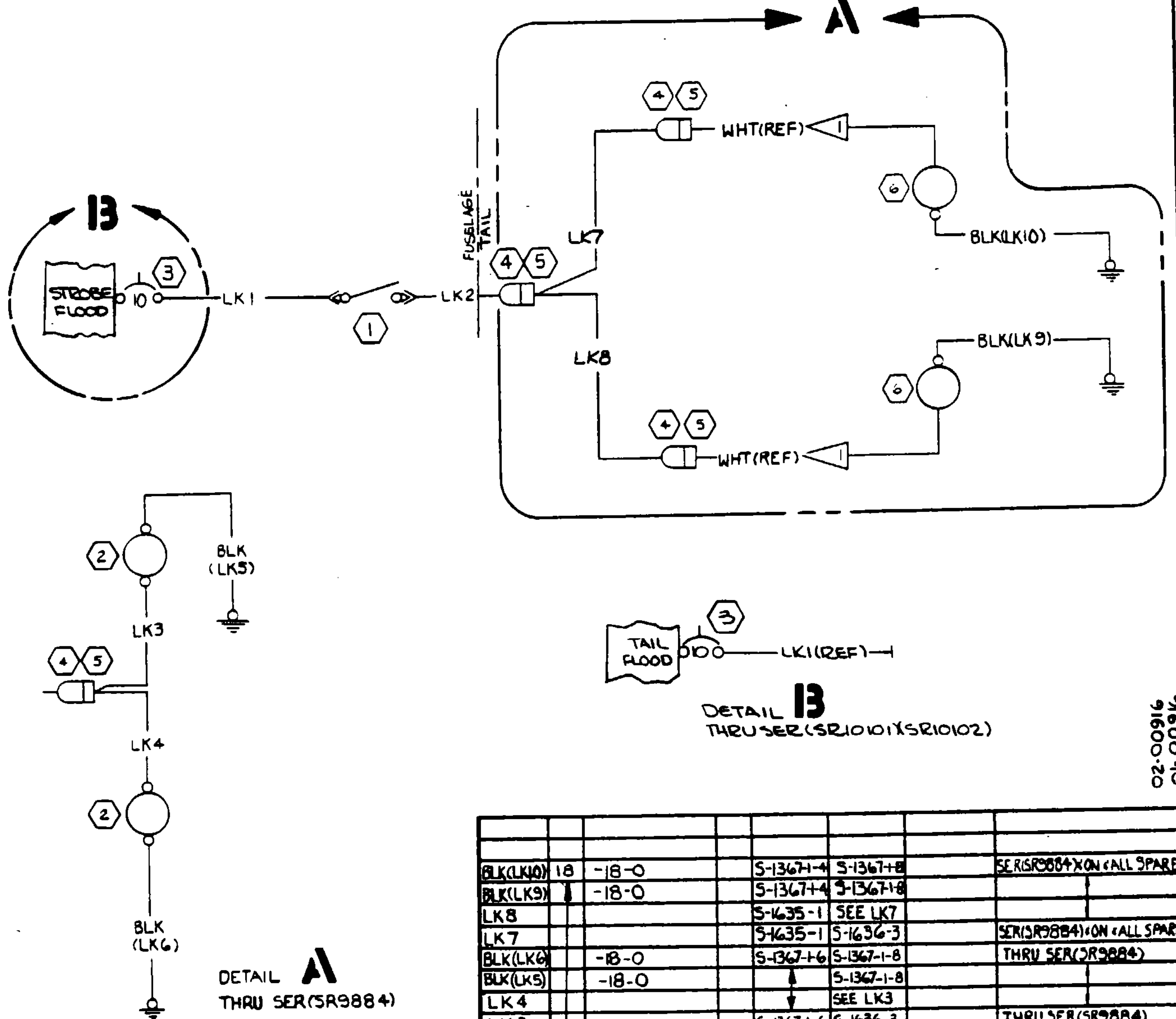
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 11.24

NOTES:

1. INSTALL S-1636-1 ON VENDOR WIRE

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD NOTE 1, DETAIL "A", LK7 & LK8, BLK(LK9) & BLK(LK10) (SR9884)	DCC 4-4-80	JAB
B	BY REV: ADD DETAIL "B" (SR10101)(SR10102)	WHH 5-26-82	REV



DETAIL A THRU SER(SR9884)

DETAIL B THRU SER(SR10101)(SR10102)

02-00916
01-00916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(LK10)	18	-18-0		S-1367-1-4	S-1367-1-8		SER(SR9884)(ON & ALL SPARES
BLK(LK9)		-18-0		S-1367-1-4	S-1367-1-8		
LK8				S-1635-1	SEE LK7		
LK7				S-1635-1	S-1636-3		SER(SR9884)(ON & ALL SPARES
BLK(LK6)		-18-0		S-1367-1-6	S-1367-1-8		THRU SER(SR9884)
BLK(LK5)		-18-0			S-1367-1-8		
LK4					SEE LK3		
LK3				S-1367-1-6	S-1636-3		THRU SER(SR9884)
LK2				S-1493-1	S-1635-1		
LK1	18			S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	00033092	LIGHT ASSY	
5	S-1637-2	HOUSING	
4	S-1637-1	HOUSING	
3	S-1360-10L	CKT BKR	
2	00033051	LIGHT ASSY	
1	S-2160-1	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	2-14-79
GROUP	W.J. Harder	3-3-79
DRAWN	H. GHAZARIAN	2-9-79
CHECK	BORLESKE	2-12-79
STRESS		
PROJ		3-1-79
APPD		
OTHER		

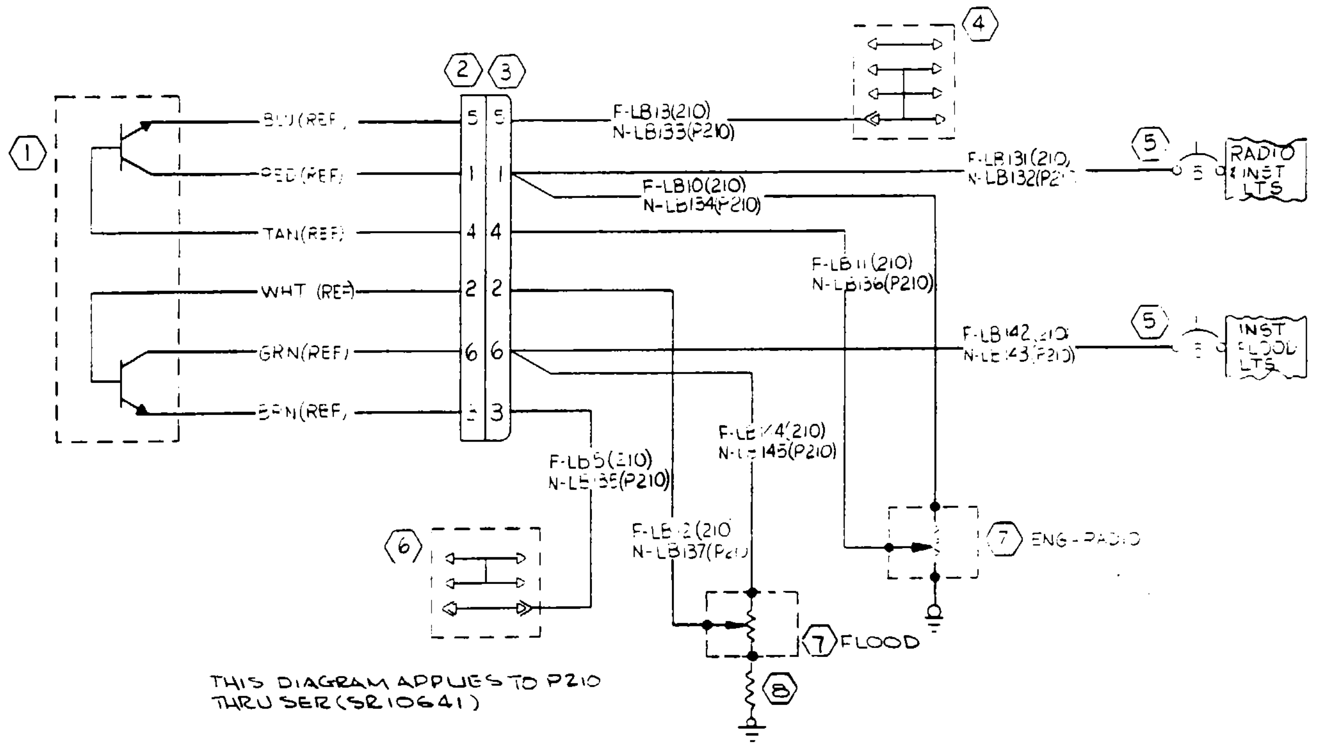
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — VERTICAL TAIL ILLUMINATION LIGHT (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR9114)(SR9115) | PAGE: 11.25

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD MODEL APPLICATION & SER TO FIELD OF DWG. ADD PG 11.26.1 (SR10641)	WHA 3-2-84	



THIS DIAGRAM APPLIES TO P210 THRU SER (SR10641)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
N-LB137	22			S-1635-1	SOLDER		
F-LB12	22			S-1635-1	SOLDER		
N-LB135	18			S-1829-1	S-1635-1		
F-LB5	18			S-1829-1	S-1635-1		
N-LB136	22			S-1635-1	SOLDER		
F-LB11	22			S-1635-1	SOLDER		
N-LB134	22			SEE N-LB132	SOLDER		
F-LB10	22			SEE F-LB131	SOLDER		
N-LB132	18			S-1635-3	S-1367-6		
F-LB131	18			S-1635-3	S-1367-6		
N-LB133	18			S-1635-1	S-1829-1		
F-LB13	18			S-1635-1	S-1829-1		
N-LB145	22			SEE N-LB143	SOLDER		
F-LB144	22			SEE F-LB142	SOLDER		
N-LB143	18			S-1635-3	S-1367-6		
F-LB142	18			S-1635-3	S-1367-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
11	S-2091-7	POT ASSY	
10	1570301	DIMMING ASSY	
9	S-2567-3	TERMINAL BLOCK	
8	S-2000020W	RESISTOR	
7	S-1394-2	POT ASSY	
6	34003-317	TERMINAL BLOCK	
5	S-1360-5L	CIRCUIT BREAKER	
4	34004-313	TERMINAL BLOCK	
3	S1640-6	HOUSING-PIN	
2	S-1641-6	HOUSING-SOCKET	
1	1570166	DIMMING 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: P 11 21

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	2-14-73
GROUP	V.H. Hauler	3-2-73
DRAWN	TOM ZAHNER	2-12-79
CHECK	BORLESKE	2-12-79
STRESS		
PROJ		3-5-73
APPD		
OTHER		

Cessna. AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — FLOOD, ENGINE INST & RADIO LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

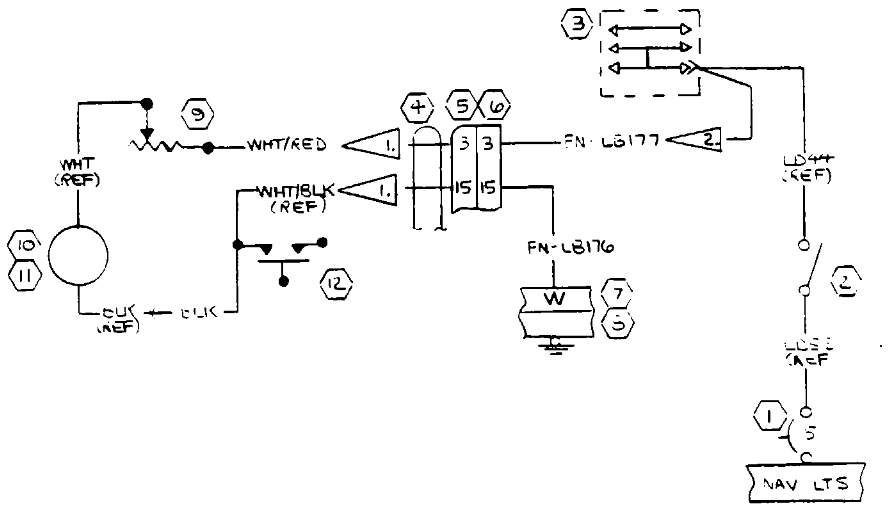
SCALE: NONE

PAGE: 11.26

NOTES:

1. MATERIAL IS RCF5130B COIL CORD VENDOR CODE (03630G)
2. NOT REQUIRED WHEN INSTALLED WITH OPT ELECTRIC TRIM. REFER TO PG 14.13.1

REVISION			
LET	DESCRIPTION	DATE	APPD



12	S-1365-1	MIKE SWITCH	
11	24RB	LAMP	
10	4157-001	SOCKET	
9	3859A161-152A	RHEOSTAT	
8	S-2527-2	GND CONNECTOR	
7	S-2527-1	GND BLOCK	
6	S-2349-1	HOUSING	
5	S-2350-3	HOUSING	
4	2270030	CABLE ASSY	
3	34003-817	TERMINAL BLOCK	
2	S-2160-1	SWITCH	
1	S-1360-5L	CKT BKR	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
FN LB176	22			S-2099-9	S-2099-4		
FN LB177	22			S-2099-9	S-1829-1		
BLK	22			S-1370-1	SOLDER		
WHT/RED	24	1.		SOLDER	S-2353-2		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	9-4-83
GROUP	[illegible]	9-22-83
DRAWN	SPENCER	9-8-83
CHECK	REHAIR	9-12-83
STRESS		
PROJ	[illegible]	[illegible]
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE **WIRING DIAGRAM — MAP LIGHT-CONTROL WHEEL**

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR10713) | PAGE: 11.28

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG. 11.27

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD LB207, LB208, LB209, LB210 LB211, LB212, LB213, LB214, LB215 ADD PAGE 11.23.2 (SR10420X SR10641)	KWL 1-7-85	

NOTES:

1. THIS IS THE ALTERNATE LOCATION FOR THE ALTIMETER WHEN THE ENCODING ALTIMETER IS INSTALLED. THE S-2035-2 HOUSING FOR INTERNAL INSTRUMENT LIGHTING IS TO BE INSTALLED AS STANDARD AT THIS LOCATION.

2. THE PROP DE-ICE AMMETER & RMI ARE OPTIONAL. HOWEVER THE S-2035-2 HOUSING FOR INTERNAL INSTRUMENT LIGHTING IS TO BE INSTALLED AS STANDARD AT THESE LOCATIONS.

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
FN-LB215	22			SEE LB208	S1636-2	
F-LB214				S-1829-1	SEE LB203	
F-LB213				S-1829-1	S-1636-2	
F-LB212				SEE LB195	S1636-2	
F-LB211				S1829-1	SEE LB183	
FN-LB210				SEE LB198	S-1636-2	
FN-LB209				SEE LB210	S-1636-2	
FN-LB208				SEE LB186	S-1636-2	
N-LB207				S1829-1	S-2099-4	
FN-LB206				SEE LB200	S-1636-1	
FN-LB205				SEE LB188	S-1636-1	
N-LB204				S1829-1	S1310-0	
FN-LB203				S1636-2	S1636-1	
FN-LB202				SEE LB203	SEE LB201	
FN-LB201				S1829-1	S1636-2	
FN-LB200				SEE LB199	S-1636-2	
199				SEE LB198	S-1636-2	
198				SEE LB197		
197				SEE LB196		
196				SEE LB195		
FN-LB195				S1636-2	S1636-2	
N-LB194				SEE LB193	SEE LB195	
N-LB193				SEE LB192	S1636-2	
N-LB192				S-1829-1	S-1636-2	
FN-LB191				S1636-2	S1636-1	
FN LB190				SEE LB189	SEE LB191	
FN LB189				S-1829-1	S-1636-2	
FN-LB188				SEE LB187	S1636-2	
187				SEE LB186	S-1636-2	
186				SEE LB185	S-1636-2	
185				SEE LB184		
184				SEE LB183		
FN-LB183				S1636-2	S1636-2	
N-LB182				SEE LB181	SEE LB183	
N-LB181				SEE LB180	S1636-2	
N-LB180	22			S-1829-1	S-1636-2	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
7	S-2527-2	GND. CONNECTOR	
6	S-2527-1	GND. BLOCK	
5	S-1638-1	HOUSING	
4	S-2035-2	HOUSING	
3	CM23-0031	LIGHT ASSY	
2	S-2567-3	TERMINAL BLOCK	
1	34004-818	TERMINAL BLOCK	

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:

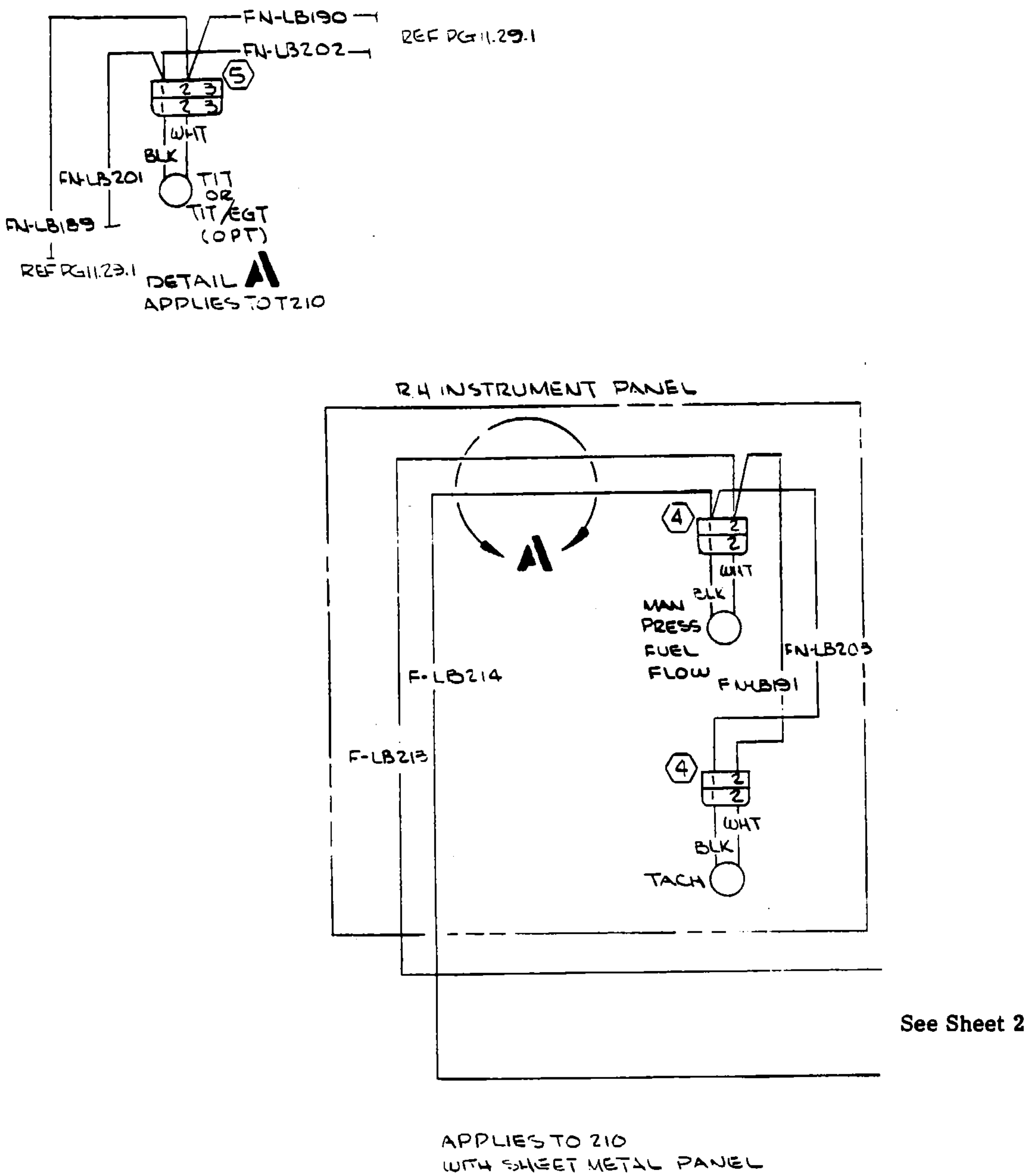
	NAME	DATE
DESIGN	HARDEN	3-3-84
GROUP		3-3-84
DRAWN	HARDEN	3-3-84
CHECK	REHAP	3-2-84
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — INTERNAL INSTRUMENT LIGHTING

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270708

SCALE: NONE PAGE: 11.23.1



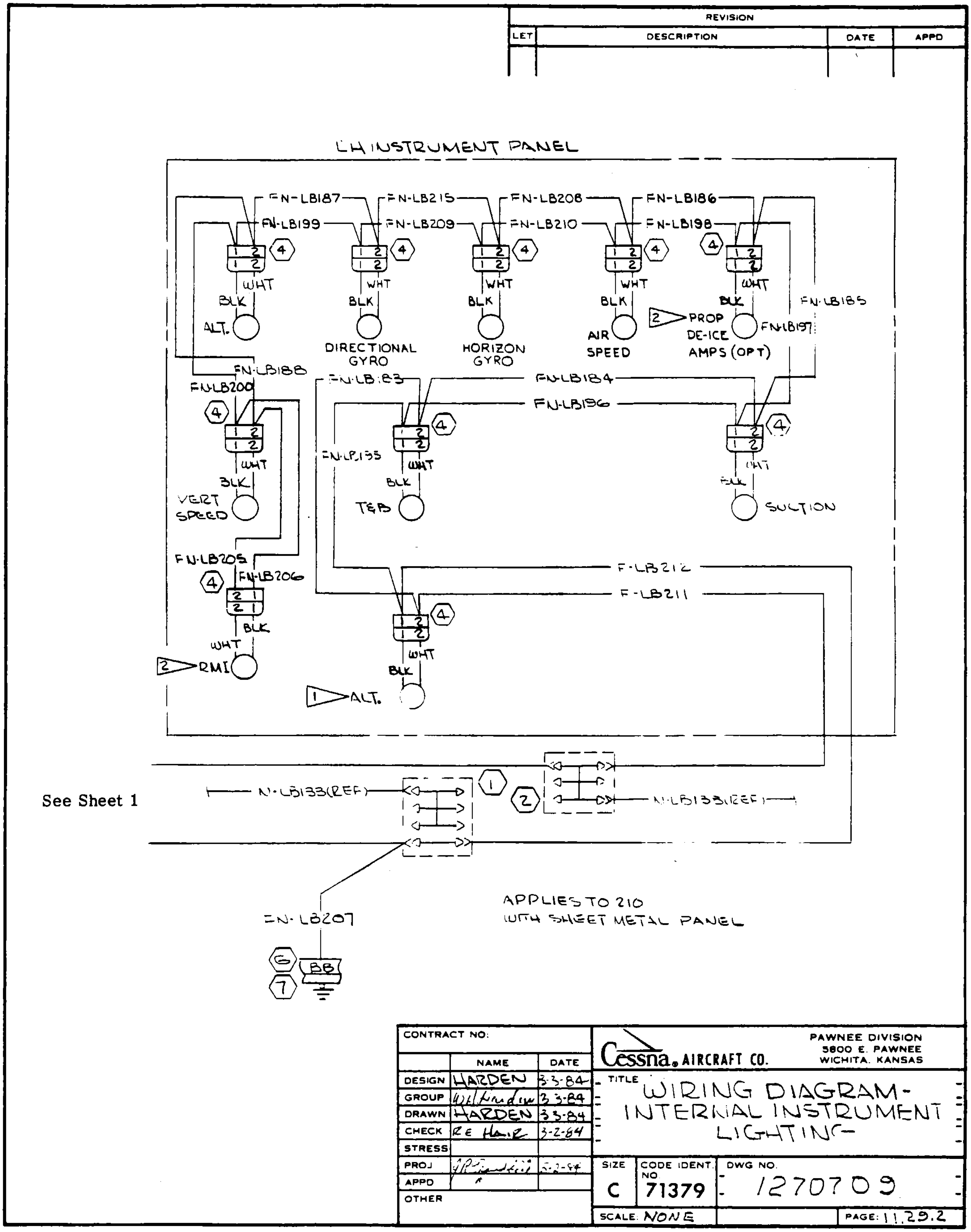
CONTRACT NO:		
	NAME	DATE
DESIGN	HARDEN	3-3-84
GROUP	[illegible]	3-3-84
DRAWN	HARDEN	3-3-84
CHECK	[illegible]	3-2-84
STRESS		
PROJ	[illegible]	5-2-84
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM - INTERNAL INSTRUMENT LIGHTING

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709
SCALE: NONE		PAGE: 11.29.2

Internal Instrument Lighting (Sheet 1 of 2)



Internal Instrument Lighting (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: GE13 WAS GE9, GD67 WAS GD26 & GD68 WAS GD38 (SR10101)(SR10102)	WHH 4-22-82	RAH
B	BY REV: MS27212-1-8 WAS MS27212-1-7 OBSOLETE GD64 & GD65 WIRES. REVISE DETAIL A, ON GD63 WIRE: S1367-1-6 WAS S-1370-1. ADD NOTE 5 AND N-GD69 WIRE. (SR10101)(SR10102)	GCS WHH 6-30-82	RLY

NOTES:

1. SYSTEM SHOWN WITH LANDING GEAR DOWN & LOCKED, ACFT ON GROUND, & POWER OFF
2. PRESSURE SWITCH OPENS WHEN GEAR IS UP & HYDRAULIC PRESSURE BUILDS UP TO PROPER LEVEL
3. INSTALL 1270717 DIODE ASSY WITH MARKING BAND ON DIODE TO POSITIVE TERMINAL ON PUMP MOTOR
4. USE S-1694-5-0.8 SHRINKABLE TUBING OVER S-1830-1 TERMINAL
5. TERMINATE VENDOR FURNISHED WIRE WITH S-1367-1-6 TERMINAL.

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
N-GD69	22			S1367-1-6	S1367-1-6		
GD68	22			S1367-1-6	S1635-1		
GD67	22			S1367-1-6	S1367-1-6		
GE13	22			S1367-1-6	SOLDER		
GA3	10	S1562-10-9		S1367-3-12	S1367-3-8		
N-GD66	22			S-1367-1-6	SOLDER		
N-GD63	22			S1367-1-6	S-1367-1-6		
GA2	10	S-1562-10-9		S1367-3-12	S1367-3-12		
GE10	10	S-1562-10-9		S-1367-3-12	S1367-3-8		
N-GD44	22			S-1367-1-6	S1367-1-6		
F-GD43				S-1367-1-6	S-1367-1-6		
N-GD42				SOLDER	S-1370-1		
F-GD41	22			S-1367-1-6	SOLDER		
GD62	22			S1493-1	SOLDER		
F-GD61				S-1367-1-6	S-1367-1-6		
F-GD60				S-1367-1-6	S-1367-1-6		
F-GD59				S-1367-1-6	S-1367-1-6		
F-GD58				S-1367-1-6	S-1367-1-6		
F-GD57				SOLDER	S-1367-1-6		
GD56				S-1367-1-6	S-1367-1-6		
GD55				S-1367-1-6	SOLDER		
BLU/YEL GD50	22	-22-6-4		S-1636-1	S-1830-1	4	
BLU/YEL GD49		-22-6-4		S-1636-1	S-1830-1	4	
GD48				S-1367-1-6	S1367-1-6		
GD47	22			S-1367-1-6	S-1367-1-6		
GD39				S-1635-1	S-1367-1-6		
N-GD35				S-1370-1	S-1370-1		
N-GD33				S-1367-1-6	S-1370-1		
GD29				S-1367-1-6	S-1367-1-10		
F-GD17				S-1367-1-6	S-1367-1-6		
GE4				SOLDER	SOLDER		
GE2				SOLDER	SOLDER		
BLK TE-E(2)	22	-22-0		SOLDER	S-2099-4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
19			
18	S2527-2	GND CONNECTOR	
17	S2527-1	LH GND BLOCK	
16	MS25041-2	LIGHT ASSY	
15	1570043	DIODE ASSY	
14	S-1232-35	CIRCUIT BREAKER	
13	9880710	PRESSURE SWITCH	2
12	S-2586-1	SWITCH-UP LOCK	
11	9881141	MOTOR	
10	1270717	DIODE ASSY	
9	S-1577-1	POWER PACK CONT	
8	VM920M-3	LIGHT	
7	MS27212-1-5	TERMINAL BOARD	
6	MS27212-1-8	TERMINAL BOARD	
5	S-1377-2	SWITCH	
4	1270034	SQUAT SWITCH	
3	S-1637-1	HOUSING	
2	S-1637-2	HOUSING	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1270709 P.12.4.0 P.12.4.1 P.12.4.2

SUPERSEDED BY:

CONTRACT NO:

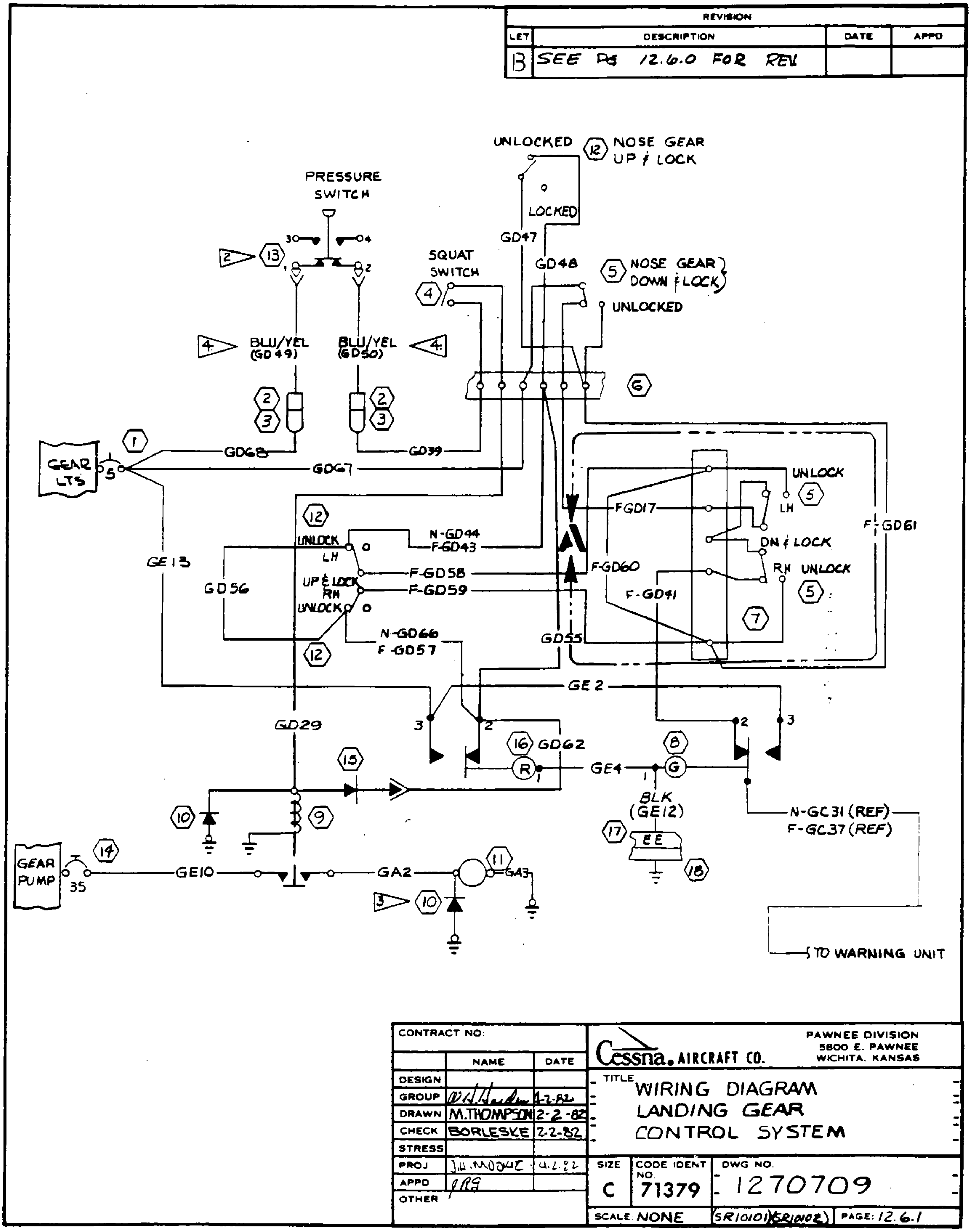
	NAME	DATE
DESIGN		
GROUP		2-2-82
DRAWN	M.THOMPSON	2-2-82
CHECK	BORLESKE	2-2-82
STRESS		
PROJ	J.W.MOORE	4-2-82
APPD	JRG/WHH	4-2-82
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

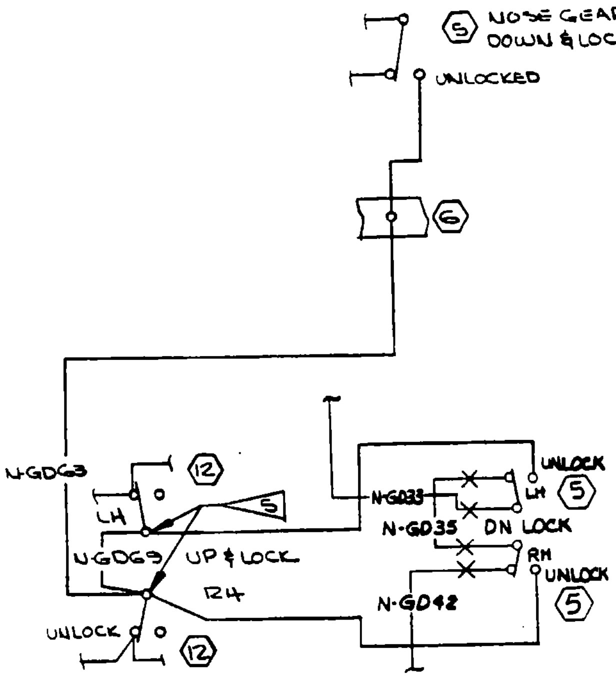
TITLE WIRING DIAGRAM — LANDING GEAR CONTROL SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE (SR10101)(SR10102) PAGE: 12.6.0



Landing Gear Control System (Sheet 1 of 2)



DETAIL A
(APPLIES TO P210 ONLY)

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	W.H. Harden	2-2-82
DRAWN	M.THOMPSON	2-2-82
CHECK	BORLESKE	2-2-82
STRESS		
PROJ	J.W. MOORE	4-2-82
APPD	JRG	
OTHER		

Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

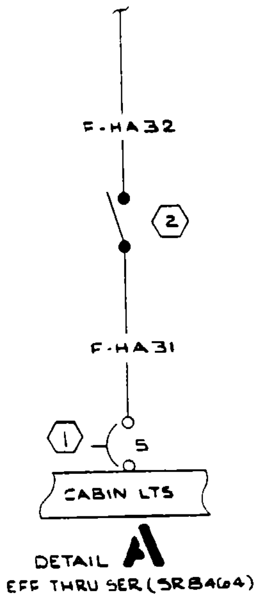
TITLE WIRING DIAGRAM LANDING GEAR CONTROL SYSTEM

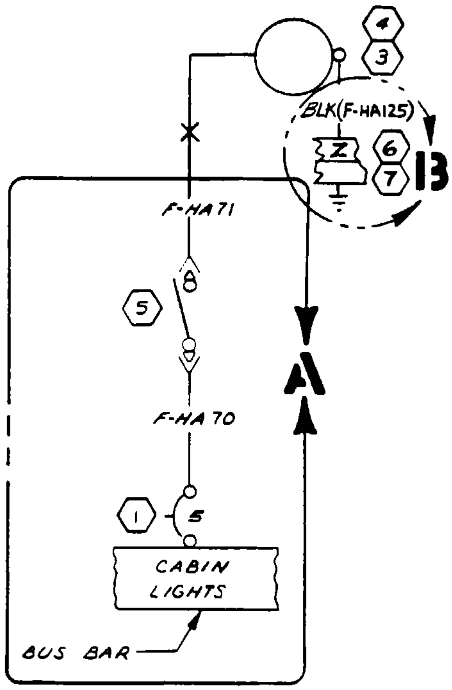
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

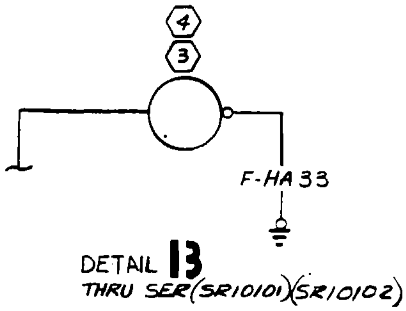
SCALE: NONE | SR10101 (SR10102) | PAGE: 12.6.1

Landing Gear Control System (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	
B	BY REV: 22 GA WAS 18 GA/ HA 31, HA 32, HA 33 (SR8143)	GDS 5-6-76	
C	BY REV: ADD DETAIL "A" & SER (8465)(SR8464)	LSS 6-6-77	JAB
D	BY REV: S-2160-3 WAS S-2160-1 (SR8464)(REF)(SR8465)(REF)	DLP 12-9-77	JAB
E	BY REV: ADD DETAIL "B", S2527-2(-1), BLK(F-NHA113); SEE OUT FN-HA33 (SR10101)(SR10102)	MKT 1-27-82	JAB
F	BY REV: BLK(FN-HA125) WAS BLK(FN-HA113) (SR10101)(SR10102)	RNJ 5-5-82	







BLK (FN-HA125)	22	-22-0		S-1367-1-6	S2099-4		SER(SR10101)(SR10102) & ON
HA 71	22			S-1370-1	S-1493-1		SER (SR8464) & ON
HA 70	22			S-1367-1-6	S-1493-1		SER (SR8464) & ON
F-HA33	22		12	S-1367-1-4	S-1367-1-4		THRU SER(SR10101)(SR10102)
F-HA32	22		29	SOLDER	S-1370-1		THRU SER(SR8464)
F-HA31	22		18	S-1367-1-6	SOLDER		THRU SER(SR8464)
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

7	S2527-2	GND CONNECTOR	
6	S2527-1	LH GND BLOCK	
5	S-2160-3	SWITCH	
4	MS25338-7079	LAMP	
3	#11-225	LAMPHOLDER	(95263)
2	S-1284-1	SWITCH	
1	S-1360-5L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wiese	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ		2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

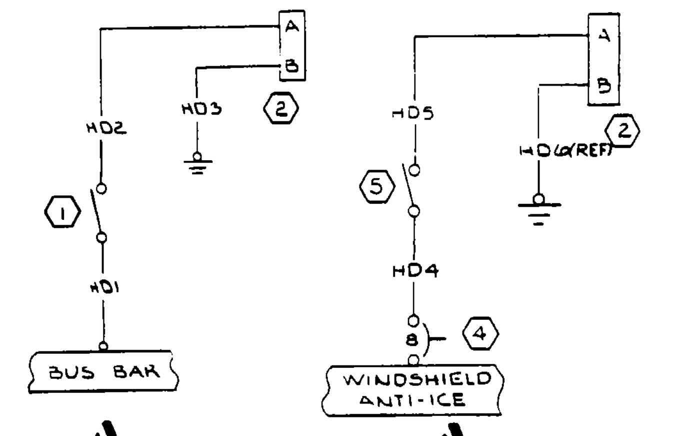
TITLE
WIRING DIAGRAM — LIGHT, ICE DETECTOR (OPT)

SIZE	CODE IDENT. NO	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 13.5

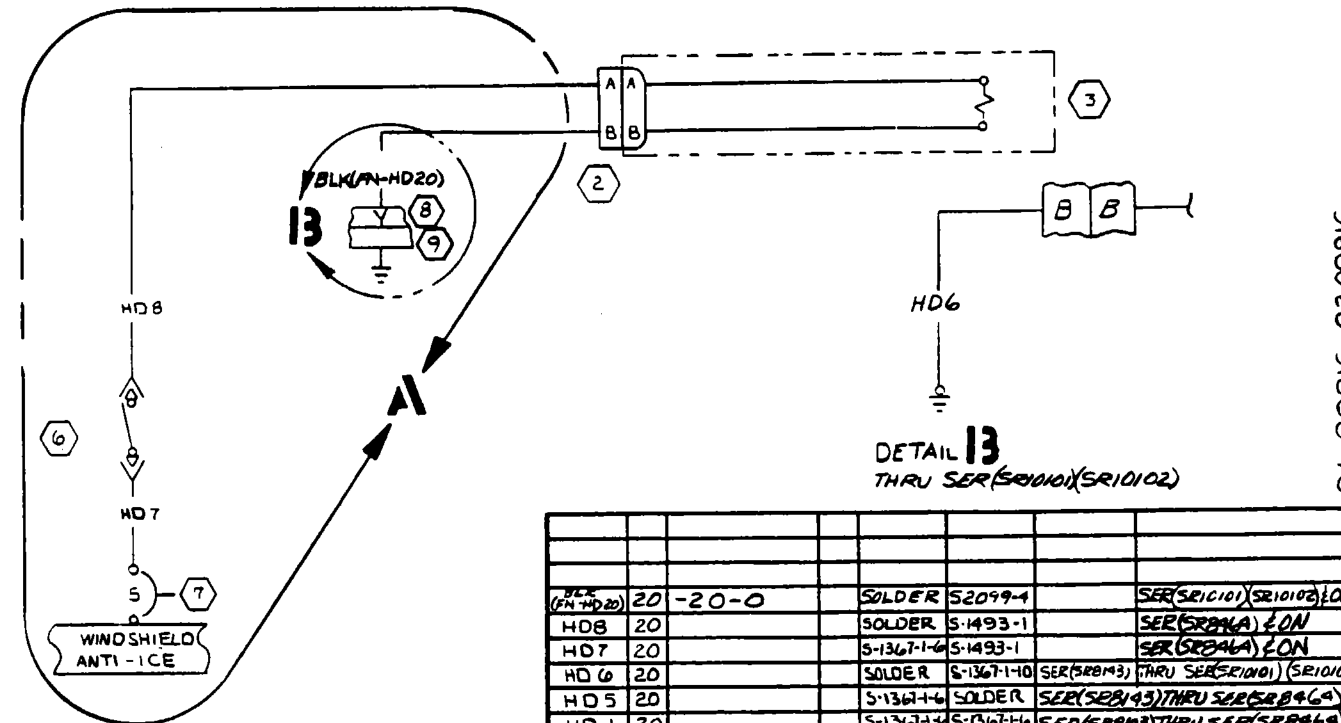
(SR6755) IX
2105 9503

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT HD1, HD2, HD3 & 112-507-101 SER IN S-382-2 ADD HD4, HD5, HD6, S-1360-8L & S-382-2 (SR8143)	RS 4-1-76	
B	BY REV: ADD DETAIL "A" & SER (SR8143) THRU SER (SR8464), HD7 & HD8 (SR8464) (SR8465)	LSS 6-6-77	JAB
C	BY REV: REACTIVATE DWG (SR8784)(SR8785)	CMK 7-6-78	JAB
D	BY REV: ADD DETAIL "B", S2527(-2 & -1) BLK (FN-HD20); SER OUT HD-6 (SR10101) (SR10102)	MKT 1-27-82	JAB



DETAIL A
THRU SER (SR8143)
(21061573)

DETAIL A
SER (SR8143) THRU SER (SR8464)



DETAIL B
THRU SER (SR10101)(SR10102)

01-00916 02-00916

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS	SERIALS	SERIALS
BLK (FN-HD20)	20	-20-0		SOLDER	S2099-4		SER(SR10101)(SR10102)&ON
HD8	20			SOLDER	S-1493-1		SER(SR8464)&ON
HD7	20			S-1367-1-6	S-1493-1		SER(SR8464)&ON
HD6	20			SOLDER	S-1367-1-10	SER(SR8143)	THRU SER(SR10101)(SR10102)
HD5	20			S-1367-1-6	SOLDER	SER(SR8143) THRU SER(SR8464)	
HD4	20			S-1367-1-6	S-1367-1-6	SER(SR8143) THRU SER(SR8464)	
HD3	18			SOLDER	S-1367-1-10		THRU SER (SR8143)
HD2	18			S-1367-1-6	SOLDER		THRU SER (SR8143)
HD1	18			S-1367-1-6	S-1367-1-6		THRU SER (SR8143)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	S2527-2	GND CONNECTOR	
8	S2527-1	LH GND BLOCK	
7	S-1360-5L	CIRCUIT BREAKER	
6	S-2160-1	SWITCH	
5	S-382-2	SWITCH	
4	S-1360-8L	CKT BREAKER	
3	1513460	HEATER	
2	KPT07E8-2S	RECEPTACLE	
1	S-382-2	CIRCUIT BREAKER SW	

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: PG. 13.12

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	12-[illegible]
GROUP	[illegible]	12-12-74
DRAWN	CJ HESSMAN	12-3-74
CHECK	J. YOUEL	12-10-74
STRESS		
PROJ	[illegible]	12-[illegible]-4
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — WINDSHIELD ANTI-ICE SYSTEM (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 (SR 7913) | PAGE: 13.7

P210 (21061040)

NOTES:

1. FOR COMPLETE INSTL (3) THREE EACH OF THESE WIRES ARE REQUIRED
2. THESE WIRES TO BE PER MIL-W-81044/12-18-9
3. THESE WIRES PART F 2170206 CABLE ASSY

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A", F-HA66, F-HA67, S-2160-1 & SER; C662503-0103 WAS C622503-0106 (SR8465)(SR8464)	LSS 6-6-77	JAB WHH JRS
B	BY REV: ADD F-HA79; ADD F-HA39, C662503-0103 & 22-370-20/DETAIL "B"; F-HA79 WAS F-HA39; SER OUT 1201080 (SR8464)(SR8465)	JJB 8-29-77	JAB WHH JRS
C	BY REV: S-1367-2-6 WAS S-1367-2-13/ HA41, HA42 & HA43 (NOW SHOP PRACTICE)	HHG 2-20-79	RLY WHH JRS
D	BY REV: ADD RED(F-HA106), BLK (F-HA107), S-1637-1, & S-1637-2. RED(F-HA66) WAS HA66 & BLK (F-HA67) WAS HA67. S-1367-2-8 & S-1636-2 WAS SOLDER/HA66 & HA67 (MER 206E0770) 14GA WAS 22 GA/HA66, HA67, HA107, HA106. (USE AS IS PARTS IN WORK, & FINISHED PARTS)	MDR 5-22-79	JAB WHH JRS RJS
E	BY REV: ADD DETAIL "B" (NOW SHOP PRACTICE)	RLY 8-7-80	RLY WHH JRS
F	BY REV: ADD DETAIL "C" & NOTE 3 (SR10680)	TMS 4-26-84	RLY WHH

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (F-HA107)	14	-14-0		SOLDER	S-1635-2		
RED (F-HA106)	14	-14-2		SOLDER	S-1635-2		
F-HA79	14			S-1367-2-12	SOLDER		
BLK (F-HA67)	14	-14-0		S-1367-2-8	S-1636-2		
RED (F-HA66)	14	-14-2		S-1367-2-8	S-1636-2		
F-HA73	14			S-1367-2-12	S-1493-2		
F-HA72	14			S-1367-2-14	S-1493-2		
F-HA36	18	2.		S-1367-1-6	S-1367-1-6		
F-HA35	18	2.		S-1367-1-6	S-1367-1-6		
F-HA34	18	2.		S-1367-1-6	S-1367-1-6		
F-HA43	14			S-1367-2-10	S-1367-2-6		
F-HA42	14		105	SOLDER	S-1367-2-6		
F-HA41	14		105	SOLDER	S-1367-2-6		
F-HA40	14		25	SOLDER	S-1367-2-8		
F-HA39	14		70	S-1367-2-12	SOLDER		
F-HA38	14		27	S-1367-2-10	S-1367-2-12		
F-HA37	14		32	S-1367-2-10	S-1367-2-10		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
15	C40055	BRUSH BLOCK	
14	C40057	BRACKET	
13	S-1637-2	CONNECTOR	
12	S-1637-1	CONNECTOR	
11	S-2160-1	SWITCH	
10	D40106	SLIP RING ASSY	
9	C40010	BRUSH BLOCK ASSY	
8	C165020-0101	TIMER	
7	MS3106AD20-15.5	PLUG	
6	MS3057-12A	CLAMP	
5	1201080	CABLE ASSY	
4	22-370-20	SHUNT	
3	C662503-0103	AMMETER	
2	S-382-2	SWITCH	
1	S-1360-20L	CKT 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: PG. 13.4

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	JRS	4-28-76
DRAWN	SWANSON	4-1-76
CHECK	YOUEL	4-7-76
STRESS		
PROJ	PLHMDRICK	4-28-76
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

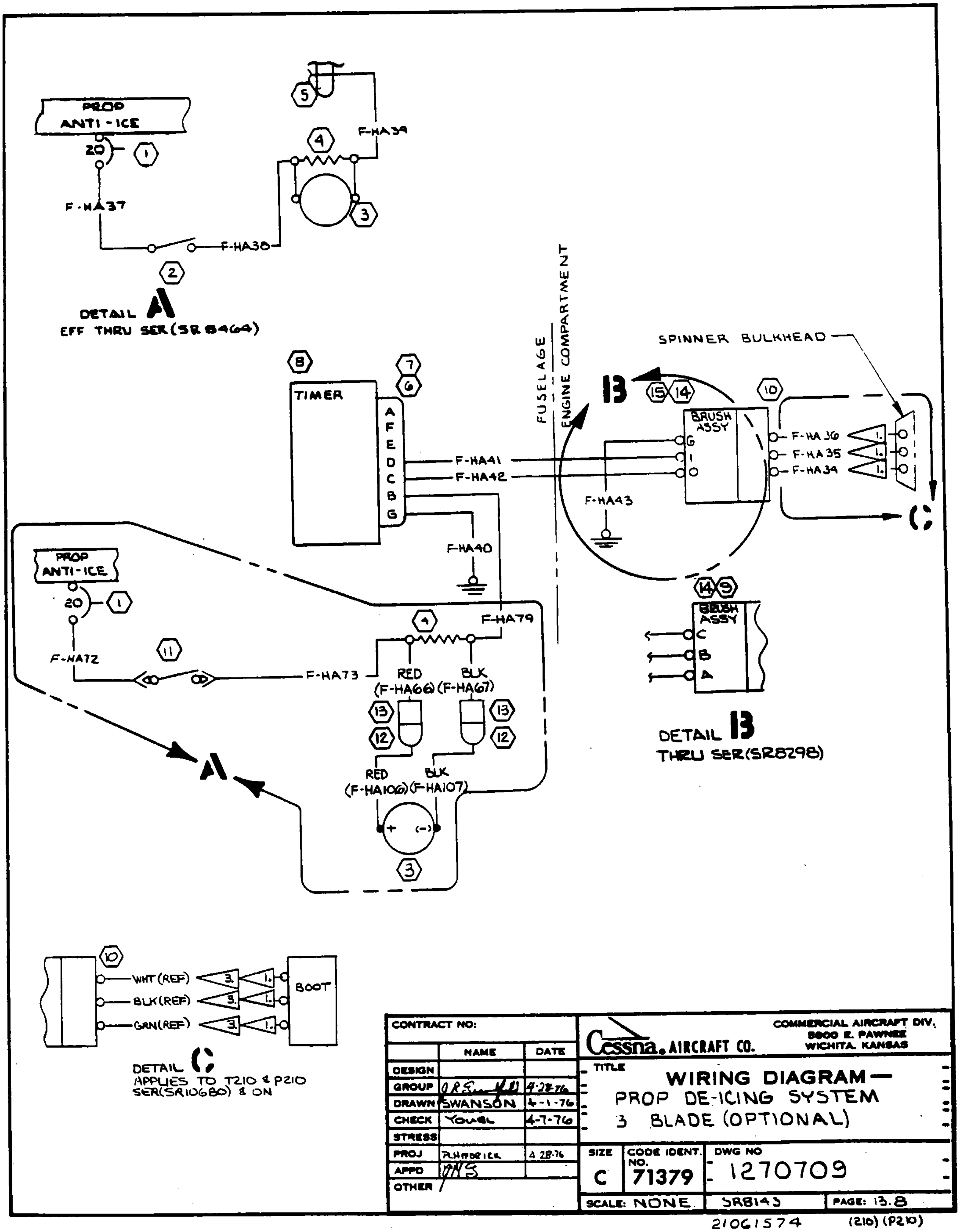
TITLE
WIRING DIAGRAM — PROP DE-ICING SYSTEM 3 BLADE (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE SR8143 PAGE: 13.8

21061574 (210) (P210)

Prop De-Icing System 3 Blade (OPT)(Sheet 1 of 2)



Prop De-Icing System 3 Blade (OPT) (Sheet 2 of 2)

NOTES:

1. HEATER CIRCUIT SHOWN ONLY. FOR STALL WARNING CIRCUIT SEE PAGE 15.5
2. TERMINATE VENDOR LEAD WITH S-1635-1
3. TERMINATE VENDOR LEAD WITH S-1367-1-6
4. S-1557-2 CAP UNUSED VENDOR LEADS FROM SWITCH
5. INTERTWINE HA108, HA109 & HA110 WITH HA53, HA54, HA59 & HA60 PER T210. INTERTWINE HA111, HA112 & HA110 WITH HA53, N-HA64 & NHA69 PER P210

01-00916, 02-00916

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-2099-5/ORN (N-HA74) WAS 66100-7, S-2353-1/N-HA68 WAS 66098-7 (SR8464)(SR8465)	JJB 8-29-77	JAB JRS
B	BY REV: 186-9 WAS S-1672-4 (NOW SHOP PRACTICE)	PSM 12-6-78	
C	BY REV: SER OUT DETAIL A, DETAIL B; SER IN DETAIL A, HA100, HA101, HA102 HA103, HA104; ADD FLAGNOTE 5 & PG 13.11.2 (SR9310)	LWF 2-15-79	CMK
D	BY REV: MS27212-1-7 WAS MS27212-1-6. REWIRE SQUAT SWITCH & RESISTOR. S-1367-2-6 WAS SOLDER/HA55. S-1367-2-6 WAS S-1370-2/HA56. S-1367-2-6 WAS S-1370-2/HA57. S-1367-2-6 WAS SOLDER/HA 58. S-1367-2-6 WAS SOLDER/HA68. S-1367-2-8 WAS SOLDER/HA103. REVISE PIN #'S/S-1640-9, S-1641-9, S-2349-1, S-2350-1 (SR8863)(REF)	MDR 6-22-79	JRS
E	BY REV: HA-108 WAS HA-100; HA109 WAS HA-101; HA110 WAS HA-102; HA-111 WAS HA-103; HA-112 WAS HA-104. (SR 9310)(REF)	MKM 8-1-80	
F	BY REV: ADD DETAIL 'C' & SERIALS. ADD HA113 WIRE & STALL WARN HEAT SWITCH & CIRCUIT BREAKER. (SR10356)	WHH 1-15-82	JRS
G	BY REV: MS27212-1-8 WAS MS27212-1-7/ITEM 12 (SR10101)(SR10102)	GLS 6/28/82	JRS

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
HA113	16			S-1367-2-6	S-1493-2		SER(SR10356) & ON
HA112	16			S1636-2	S2099-5	5	SER (SR9310) & ON
HA111	16			S-1367-2-8	S2983-1	5	SER (SR9310) & ON
HA110	16			S-1635-2	SOLDER	5	SER (SR9310) & ON
HA109	16			S-1635-2	S 1636-2	5	SER (SR9310) & ON
HA108	16			S-1367-2-8	S-1636-2	5	SER (SR9310) & ON
N-HA68	16			S-1367-2-6	S-2353-1		
ORN (N-HA74)	16	-16-3		S-1636-2	S-2099-5		
BLK (HA67)	20	-20-0		S-1636-2	S-1367-1-8		
BLU (HA62)	16	-16-6		S-1635-2	S-1636-2		
BLK (HA61)	20	-20-0		SOLDER	S-1367-1-8		THRU SER (SR9310)
HA60	16			S-1635-2	SOLDER	5	
HA59				S-1635-2	S-1636-2	5	
HA58				S-1367-2-6	S-1636-2		
HA57				SOLDER	S-1367-2-6		
HA56				SOLDER	S-1367-2-6		
HA55				SEE HA54	S-1367-2-6		
HA54				S-1493-2	S-1636-2	5	
HA53	16			S-1367-2-6	S-1493-2	5	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
17	S-1360-10L	CIRCUIT BREAKER	
16	S-2349-1	CONNECTOR	
15	S-2350-1	CONNECTOR	
14	S-1641-6	HOUSING - PIN	
13	S-1640-6	HOUSING - PIN	
12	MS27212-1-8	TERMINAL BOARD	
11	1CH1-6	SQUAT SWITCH	
10	S-2041-50-15	RESISTOR	
9	186-9	HEATED STALL DETECTOR	
8	AN5812-1	HEATED PITOT TUBE	
7	AN3115-1	RECEPTACLE	
6	S-1637-1	HOUSING - CAP	
5	S-1637-2	HOUSING - PLUG	
4	S-1640-9	HOUSING - PIN	
3	S-1641-9	HOUSING - SOCKET	
2	S-2160-1	SWITCH	
1	S-1360-15L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	6-20-77
GROUP	W.H. Harden	6-23-77
DRAWN	L. STOREY	6-6-77
CHECK	BORLESKE	6-7-77
STRESS		
PROJ	PLARDRICK	6-24-77
APPD	JRS	
OTHER		

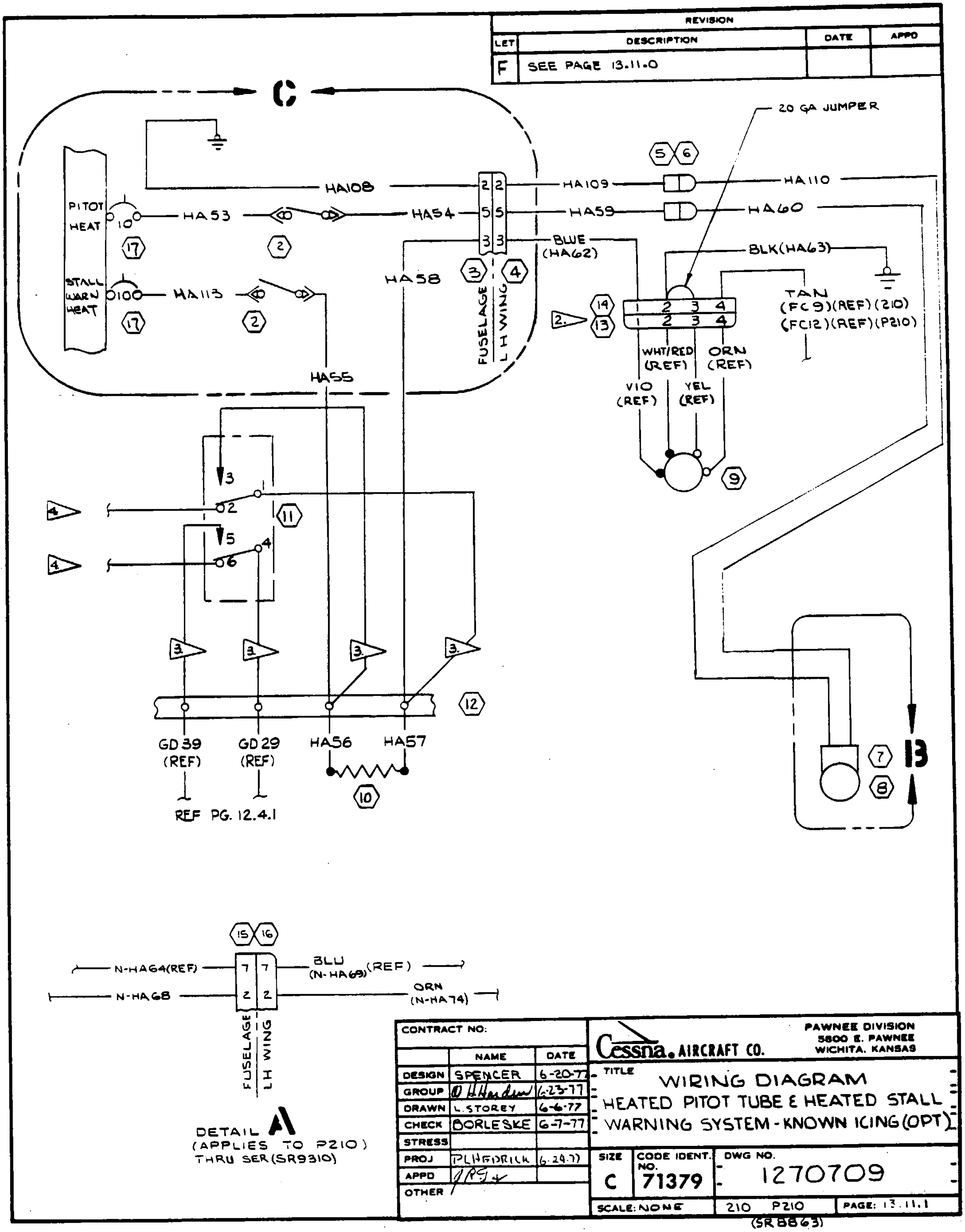
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — HEATED PITOT TUBE & HEATED STALL WARNING SYSTEM - KNOWN ICING (OPT)

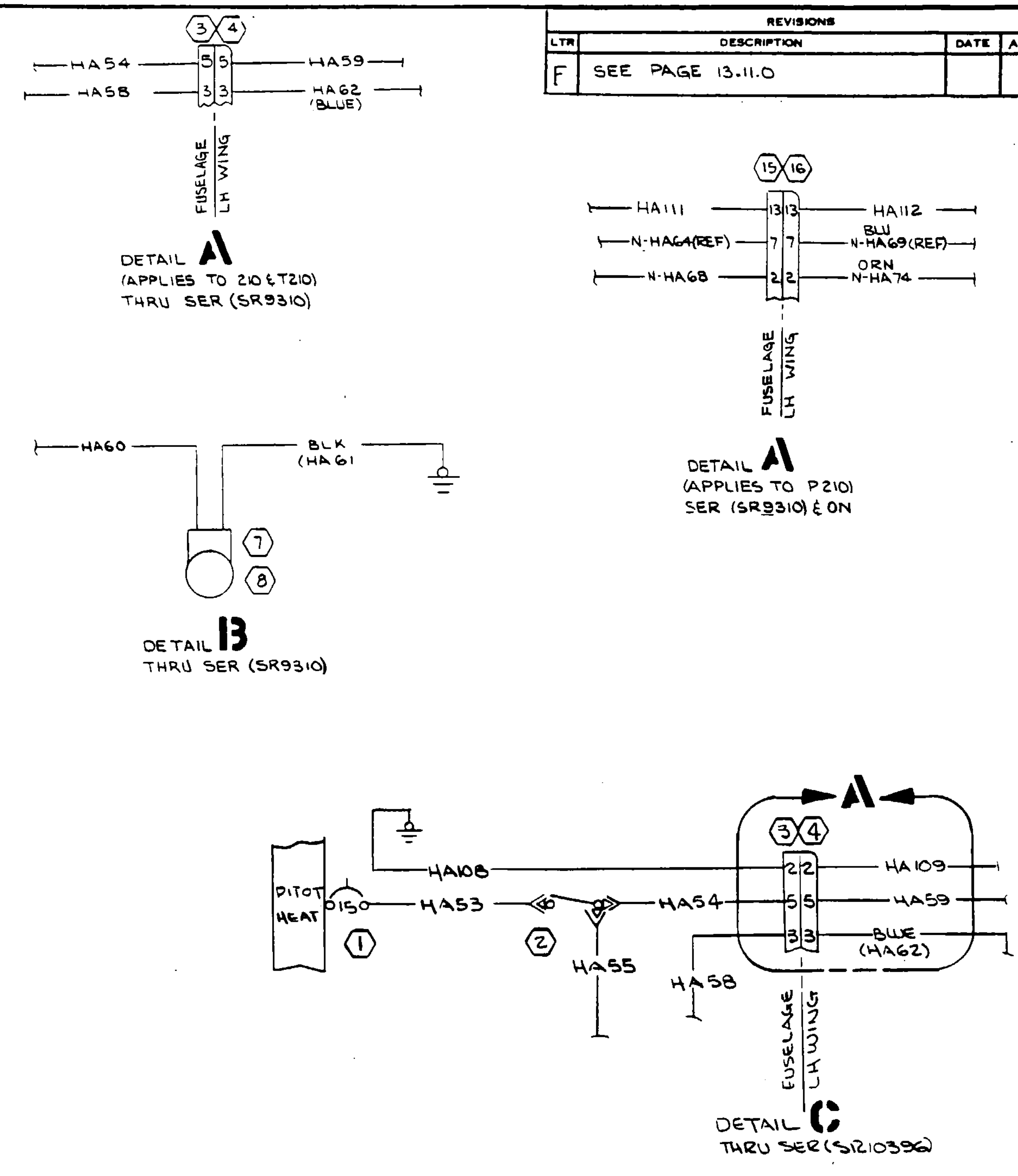
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 P210 PAGE: 13.11.0

(SR8863)


REVISION
LET
DESCRIPTION
DATE
APPD
F
SEE PAGE 13.11.0
C
20 GA JUMPER
HA108
HA109
HA110
HA53
HA54
HA59
HA60
PITOT HEAT
STALL WARN HEAT
BLUE (HA62)
BLK(HA63)
HA58
HA113
HA55
FUSELAGE
LH WING
TAN (FC9)(REF)(210) (FC12)(REF)(P210)
WHT/RED (REF)
ORN (REF)
VIO (REF)
YEL (REF)
GD 39 (REF)
GD 29 (REF)
HA56
HA57
REF PG. 12.4.1
B
N-HA64(REF)
N-HA68
BLU (N-HA69)(REF)
ORN (N-HA74)
DETAIL A
(APPLIES TO P210) THRU SER(SR9310)
CONTRACT NO:
NAME
DATE
DESIGN SPENCER 6-20-77
GROUP 6-23-77
DRAWN L.STOREY 6-6-77
CHECK BORLESKE 6-7-77
STRESS
PROJ 6-24-77
APPD
OTHER
Cessna. AIRCRAFT CO.
PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
TITLE
WIRING DIAGRAM
HEATED PITOT TUBE & HEATED STALL WARNING SYSTEM - KNOWN ICING (OPT)
SIZE C
CODE IDENT. NO. 71379
DWG NO. 1270709
SCALE: NONE
210 P210 (SR8863)
PAGE: 13.11.1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
F	SEE PAGE 13.11.0		



CONTRACT NO:		
	NAME	DATE
DESIGN	L W FINE	2-15-79
GROUP		2-22-77
DRAWN	L W FINE	2-15-79
CHECK	C KING	2-15-79
STRESS		
PROJECT		
APPD		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM HEATED PITOT & HEATED STALL WARNING SYSTEM-KNOWN ICING (OPT)

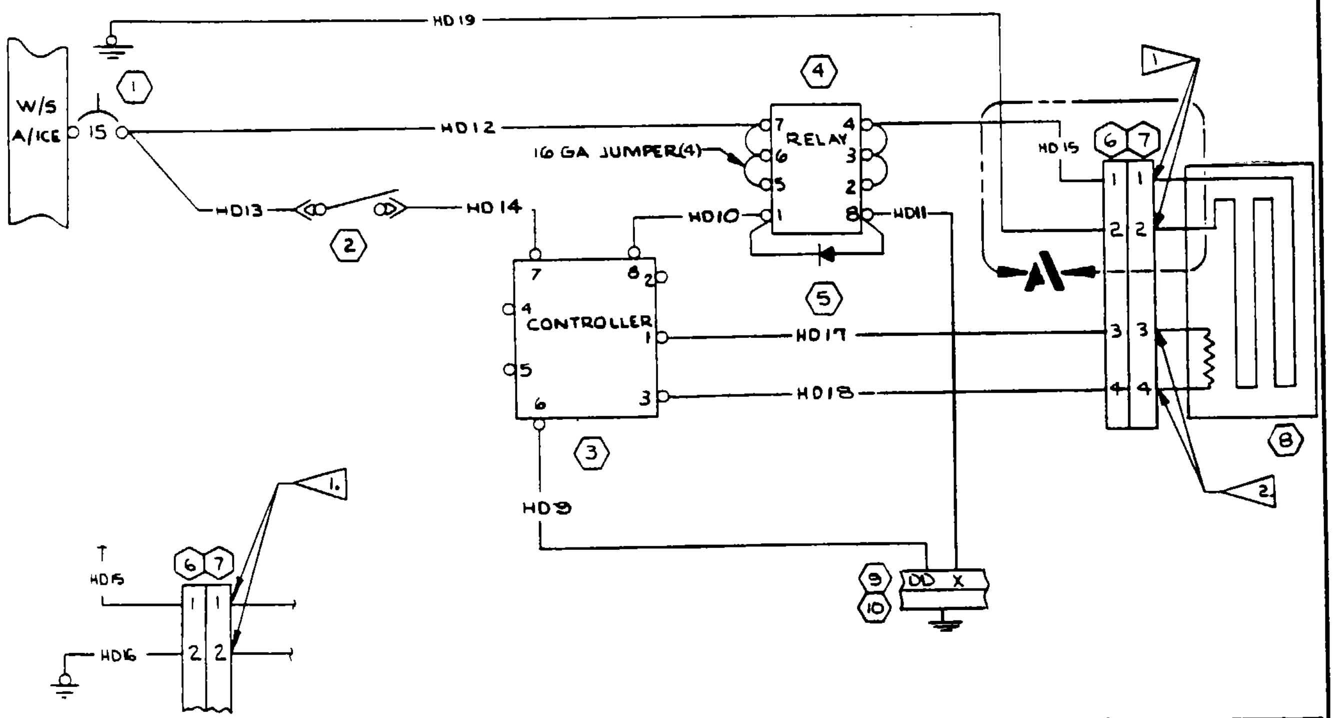
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE | T210 P210 | PAGE: 13.11.2

NOTES:

1. TERMINATE VENDOR FURNISHED WIRES WITH S-1635-2
2. TERMINATE VENDOR FURNISHED WIRES WITH S-1635-1
3. INTERTWINE HD19 WITH HD15 & HD12 FROM POINT OF ORIGIN TO TERMINATION POINT

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV & ADD S-1638-4, S-1638-5, NOTES 1 & 2, ADD HD15, HD16, HD17 & HD18; NP143501 WAS SK2567; IN TITLE BLOCK: "KNOWN ICING" WAS "SIERRACIN" (SR8863)	CRS 11-22-77	JAB
B	BY REV: ADD FLAGNOTE 3; SER OUT HD16; SER IN HD19 (SR9810)	LWF 2-15-79	CMK
C	BY REV: ADD DETAIL "B" & SER (SR 9808)	NRL 8-8-80	
D	BY REV: DELETE DETAIL "B" & THRU SER(SR9808) "NEW SHOP PRACTICE"	DES 7-21-81	
E	BY REV: ADD S-2527(-1 & -2), S-2099-4 WAS S-1367-2-10/HA9 & HA11 (SR10101)(REF)(SR10102)(REF) MER210ED 022	TMS 7-21-83	



DETAIL A
THRU SER(SF 9310)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
HD19	16			S-1636-2	S-1367-2-8	3	SER(SR9310) & ON
HD18	22			S-1367-2-8	S-1636-1		
HD17	22			S-1367-2-8	S-1636-1		
HD16	16			S-1636-2	S-1367-2-10		THRU SER(SR9310)
HD15				S-1367-2-8	S-1636-2		
HD14				S-1493-2	S-1367-2-8		
HD13				S-1367-2-6	S-1493-2		
HD12				S-1367-2-6	S-1367-2-8		
HD11				S-1367-2-8	S-2099-4		
HD10				S-1367-2-8	S-1367-2-8		
HD9	16			S-1367-2-8	S-2099-4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	S-2527-2	GND CONNECTOR
9	S-2527-1	LH GND BLOCK
8	NP143501	PANEL
7	S-1638-4	HOUSING - CAP
6	S-1638-5	HOUSING - PLUG
5	1N-2070	DIODE
4	KRP3DH	RELAY
3	9910216	CONTROLLER
2	S-2160-1	SWITCH
1	S-1360-15L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: PG 13.16

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	6-20-77
GROUP	W.H. Harden	6-23-77
DRAWN	L. STOREY	6-6-77
CHECK	BORLESKE	6-7-77
STRESS		
PROJ	PLHFDRICK	6-24-77
APPD	JRS	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — WINDSHIELD ANTI-ICE SYSTEM KNOWN ICING (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 P210 | PAGE: 13.12

B	BY REV: ADD DETAIL "A" S2527-2(-1), BLK(FN-HA126); SER OUT HA45 (SR10101)(SR10102) BY REV: ADD 2H48-22, DETAIL "B" & SECOND 2H48-22 PRESS CONT. VALVE (SR9954)(REF) (SR10396)	MKT 1-27-82 WHH 3-4-82	JAB WHH JRG
C	BY REV: BLK(FN-HA126) WAS BLK(FN-HA114) (SR10101)(SR10102)	RNJ 5-5-82	WHH BEH JRG
D	BY REV: ADD HA127 WIRE, GRN(REF) & C165022-0101. (SR10650)	WHH 3-22-83	BY WHH JRG
E	BY REV: HA126 WAS HA114/FIELD & REV "B" (NOW SHOP PRACTICE) ADD HA128, HA129; BLU(REF) & WHT(REF) WAS BLK(REF) (SR10396)(REF) THRU SER(SR9953)(SR9954) WAS THRU SER (SR10396)/DETAIL "B"; ADD DETAIL "B" & HA130 (SR9953)(REF) (SR9954)(REF) ADD GND BLOCK, S-2099-4 WAS S-1367-1-8/HA51 MER210E01022 (SR10101)(REF)(SR10102)(REF) MER P210E01046 MER210E0989	TMS 7-21-83	REH WHH JRG
F	BY REV: ADD DETAIL "C" & SER (SR10855)	KWL 9-29-89	REH WHH

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1370-1 WAS SEE HA50/HA52 YEL(REF) WAS BLU/WHT(REF); VIO(REF) WAS BLU(REF); WHT/BLU(REF) WAS YEL(REF); MOVED 3D2346-01 FROM S-2160-3 TO 3D2600-03; 3D2366-01 WAS 3D2346-01; (SR9427) WAS (SR8863)/13.13.0 & 13.13.1; S-2415-1 WAS 1-66504-3, S-2341-1 WAS 1-66506-3 (NOW SHOP PRACTICE)(SR9427)	BGK 10-4-78	RJP WHH JRG
		CS 7-7-78	

NOTES:

1. TERMINATE VENDOR FURNISHED WIRE WITH S-1367-1-8

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
N-HA136	20			S-2099-7	S-1370-1	SER (SR10855) & ON	
N-HA135				S-1370-1	S-2353-2		
N-HA134				S-2099-7	S-1370-1		
N-HA133	20			S-1370-1	S-2353-2		
N-HA132	22			S-2099-7	SEE HA103		
N-HA131	22			SOLDER	S-2353-2	SER (SR10855) & ON	
BLK (FN-HA130)	20	-20-0		S-1370-1	S-1367-1-43	(SR9953)(SR9954) THRU (SR10396)	
N-HA129	20			S-1367-1-10	S-1370-1		(SR10396) & ON
N-HA128	20			S-1367-1-10	S-1370-1		(SR10396) & ON
HA127	20			S-1370-1	S-1370-1		(SR10650) & ON
BLK (FN HA126)	22	-22-0		SOLDER	S-2099-4		(SR10101)(SR10102) & ON
F-HA105	22			S-1493-1	S-1367-1-8		
N-HA104				S-1493-1	S-1367-1-8		
F-HA103				S-1493-2	S-1493-1		
N-HA102				SOLDER	S-2415-1		THRU (SR10855)
F-HA101	22			SOLDER	S-1636-1		
N-HA100	20			S-1370-1	S-1367-1-8		
F-HA99					S-1367-1-8		
N-HA98					S-2341-1		THRU (SR10855)
F-HA97					S-1685-1		
N-HA96					S-2341-1		THRU (SR10855)
F-HA95					S-1635-1		
N-HA94					S-1370-1		
F-HA93					S-1370-1		
N-HA92					S-2415-1		THRU (SR10855)
F-HA91					S-1636-1		
N-HA90					S-2415-1		THRU (SR10855)
F-HA89	20			S-1370-1	S-1636-1		
N-HA88	20			S-1370-1	S-1367-1-8		
F-HA87	22			S-1493-1	S-1367-1-8		
N-HA86				S-1493-1	SOLDER		
F-HA85				SOLDER	S-1493-1		
N-HA84				S-2341-1	SEE N-HA103		THRU SER (SR10855)
F-HA83	22			S-1635-1	SEE F-HA103		
HA52	20			S-1370-1	S-1370-1		
HA51				S-2099-4	S-1370-1		
HA50				S-1493-2	S-1370-1		
HA49				SEE HA48	S-1370-1		
HA48	20			S-1367-1-8	S-1493-2		
HA45	22			SOLDER	S-1367-1-8		THRU SER (SR10101)(SR10102)
HA44	22			S-1367-1-8	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
18	S2349-3	CONNECTOR	P210
17	S2350-9	CONNECTOR	P210
16	C165022-0101	TIME MODULE	
15	2H48-22	PRESSURE CONT VALVE	
14	S2527-2	GND CONNECTOR	
13	S2527-1	LH GND BLOCK	
12	205838-1	CONNECTOR	P210
11	S-1640-9	CONNECTOR	210
10	S-1641-9	CONNECTOR	210
9	205841-1	CONNECTOR	P210
8	101174-1	PRESSURE SWITCH	
7	MS25041-3	INDICATOR LIGHT	
6	MS25237-327	LAMP	
5	3D2357-01	DE-ICE FLOW VALVE	
4	3D2366-01	PRESSURE CONT VALVE	
3	3D2600-03	TIME MODULE	
2	S-2160-3	SWITCH	
1	S-1232-5	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: 1270709 P 13.10

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	12-1-77
GROUP	WHH	1-14-78
DRAWN	C SHAVER	11-22-77
CHECK	BORLESKE	11-30-77
STRESS		
PROJ	P HEDRICK	1-17-78
APPD		
OTHER		

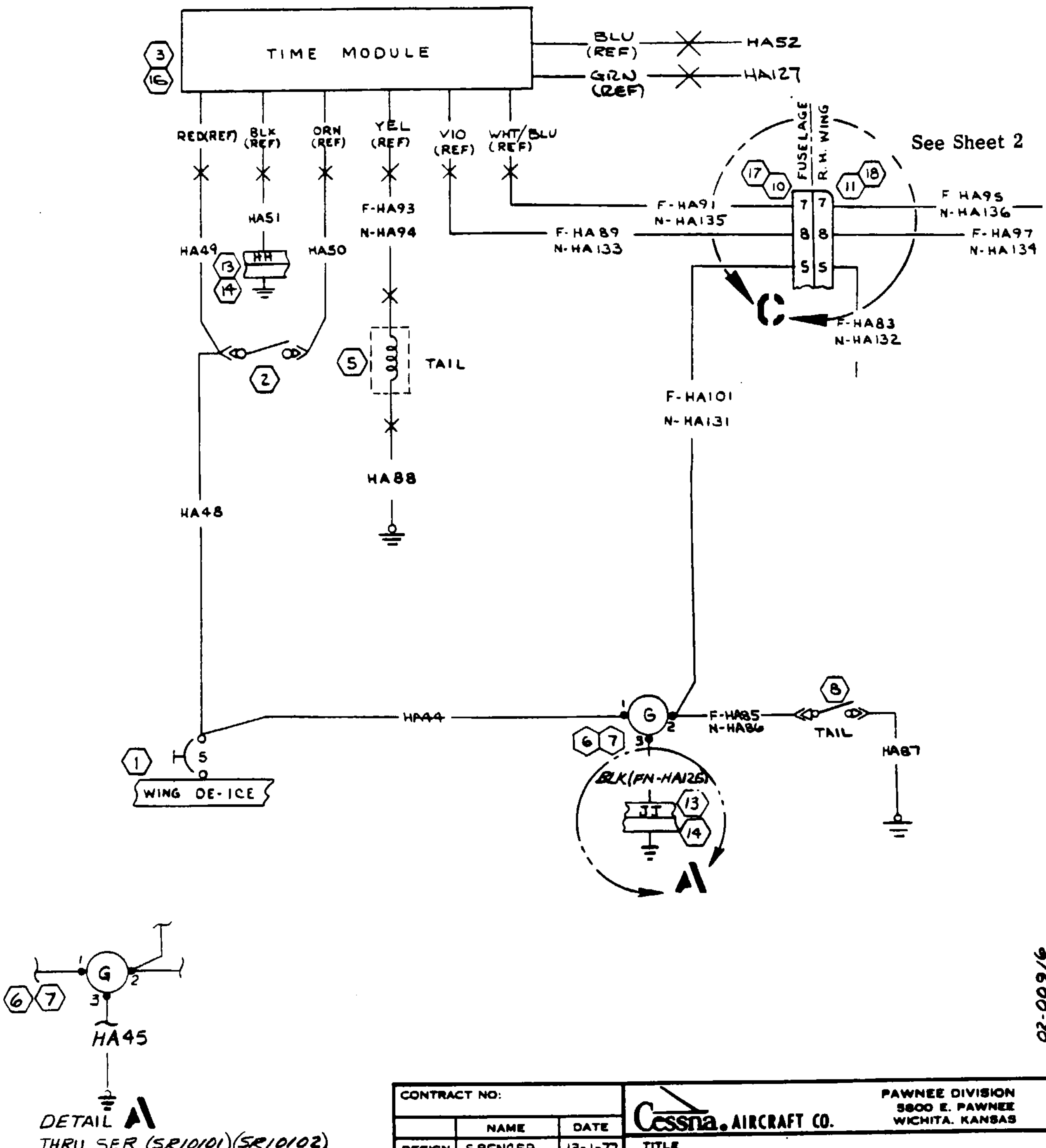
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — WING & STABILIZER DE-ICE SYSTEM - 3 CYCLE (OPT)

SIZE C CODE IDENT. NO. 71379 DWG NO 1270709

SCALE: NONE (SR9427) PAGE: 13.13.0

REVISION			
LET	DESCRIPTION	DATE	APPD
F	SEE SHT 13.13.0 FOR REV		



32-008/6

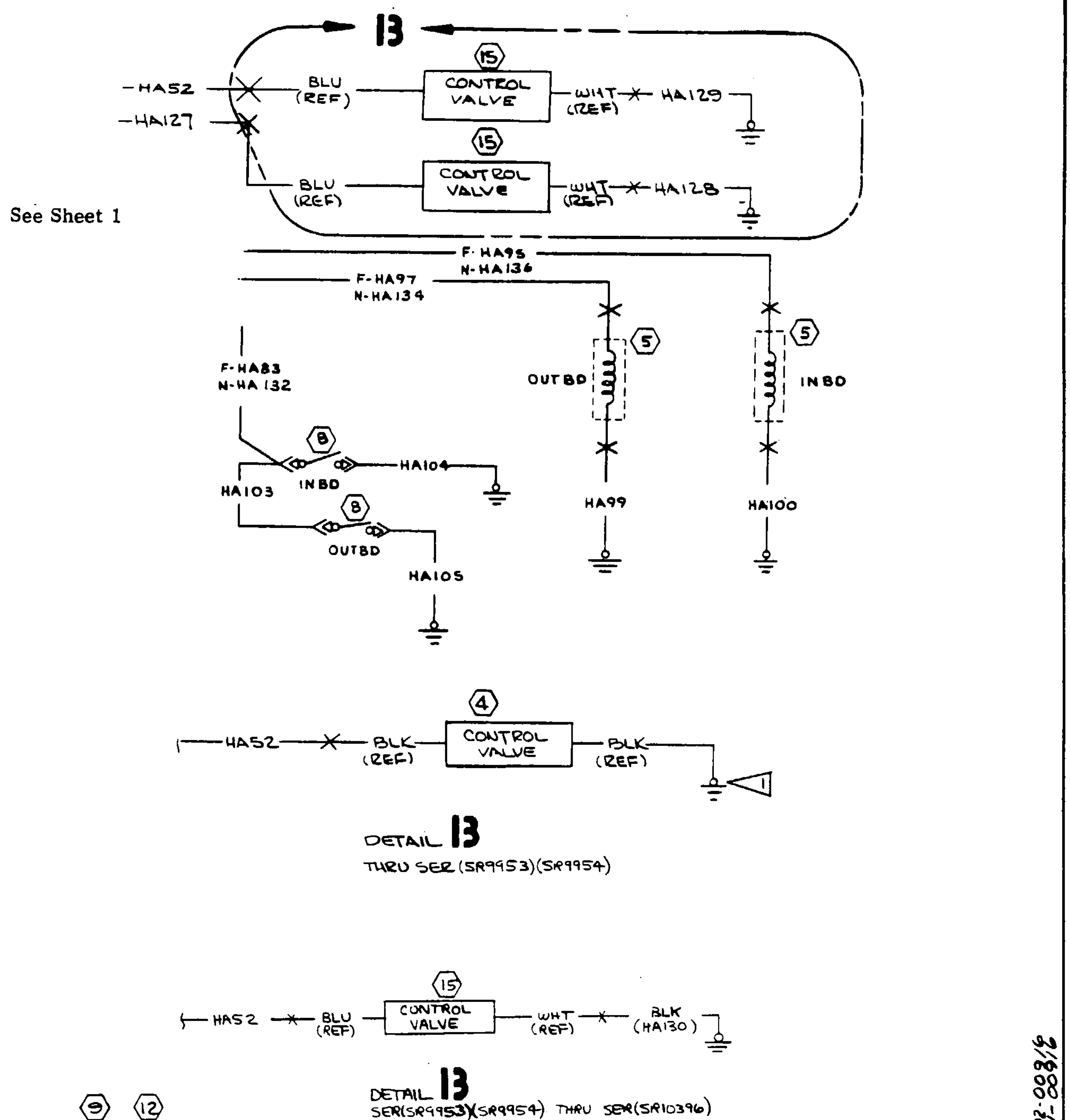
CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	12-1-77
GROUP	W. Whandan	1-14-78
DRAWN	C SHAVER	11-28-77
CHECK	BORLESKE	11-30-77
STRESS		
PROJ	P L HEDRICK	1-17-78
APPD	JRB	
OTHER		

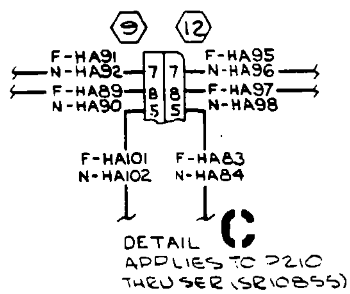
Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WING & STABILIZER DE-ICE SYSTEM - 3 CYCLE (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709
SCALE: NONE	(SR9427)	PAGE: 13.13.1

Wing & Stabilizer De-Ice System - 3 Cycle (OPT) (Sheet 1 of 2)





CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	12-1-77
GROUP	W. Wheeler	1-19-78
DRAWN	C SHAVER	11-22-77
CHECK	BORLESKE	11-30-77
STRESS		
PROJ	PLHEDRICK	1-17-78
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WING & STABILIZER DE-ICE SYSTEM - 3 CYCLE (OPT)

SIZE	CODE IDENT NO	DWG NO
C	71379	1270709
SCALE: NONE	(SR9427)	PAGE: 13.13.1

Wing & Stabilizer De-Ice System - 3 Cycle (OPT) (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: TITLE BLOCK SERIALS WERE (SR9114) & (SR9115) (SR9556)	HHG 8-9-79	JAB WHH
B	BY REV: HE 10 WAS CONN TO PIN 4/ S-1917-2, HE 6 & HE 19 WAS CONN TO PIN 1 / S-2035-1 ; S-1493-1 WAS SEE HE 10 / F-HE 6 & N-HE 19 NOW SHOP PRACTICE (MER 210 EC 911) (SR 9556)	SEB 1-25-80	JAB WHH JRG
C	BY REV: ADD DETAIL "A" (SK9954)	GW 6-30-81	WHH JRG

NOTES:

1. REMOVE & DISCARD VENDOR FURNISHED TERMINALS. TERMINATE WITH S-1636-2 TERMINALS.

2. TERMINATE VENDOR FURNISHED WIRE WITH S-1635-2 TERMINAL

3. TERMINATE VENDOR FURNISHED WIRE WITH S-1636-1 TERMINAL

4. INTERTWINE HE21 WITH HE9/210, HE22 WITH HE20/P210, HE16 WITH HE2, HE3, HE4, & HE1/210, HE17 WITH HE2, HE3, HE4, & HE18/P210, HE15 WITH HE12, HE13, & HE14

54 0091C

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK N-HE22	16	-16-0		S-1636-2	S-1367-2-8		
BLK F-HE21	16	-16-0		S-1636-2	S-1367-2-6		
N-HE20	16			S-1493-2	S-1635-2		
N-HE19	18			S-1493-1	S-1493-1		
N-HE18				S-1367-1-6	S-1493-1		
BLK N-HE17		-18-0		SEE HE15	S-1367-1-8		
BLK F-HE16		-18-0		SEE HE15	S-1367-1-8		
BLK HE15		-18-0		S-1635-1	S-1635-1		
HE14				S-1635-1	SEE HE4		
HE13				S-1635-1	SEE HE3		
HE12				S-1635-1	SEE HE2		
HE11				S-1493-1	S-1367-1-8		
HE10	18			S-1635-1	S-1493-1		
F-HE9	16			S-1493-2	S-1635-2		
HE8	16			S-1367-2-6	S-1493-2		
HE7	18			S-1635-1	S-1635-1		
F-HE6				S-1493-1	S-1493-1		
HE5				S-1433-1	S-1493-1		
HE4				S-1635-1	S-1493-1		
HE3				S-1635-1	S-1493-1		
HE2				S-1635-1	S-1493-1		
F-HE1	18			S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
15	S-1917-2	RELAY	
14	0882362	HIGH PRESSURE SW	
13	SD 5D-	COMPRESSOR	
12	S-2035-2	HOUSING	
11	S-2035-1	HOUSING	
10	6303-1	COOLING FAN	
9	S-1637-2	HOUSING	
8	S-1637-1	HOUSING	
7	S-1360-15L	CKT BKR	
6	S-1360-10L	CKT BKR	
5	1247200	THERMOSTAT SW (ARA)	
4	0882590	SWITCH (ARA)	
3	S-1638-4	HOUSING	
2	S-1638-5	HOUSING	
1	2101020	BLOWER	

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	SPENCER	3-2-79
GROUP	W.H.Header	3-3-79
DRAWN	H.GHAZARIAN	2-12-79
CHECK	BORLESKE	2-14-79
STRESS		
PROJ	[illegible]	3-5-79
APPD	JRG	
OTHER		

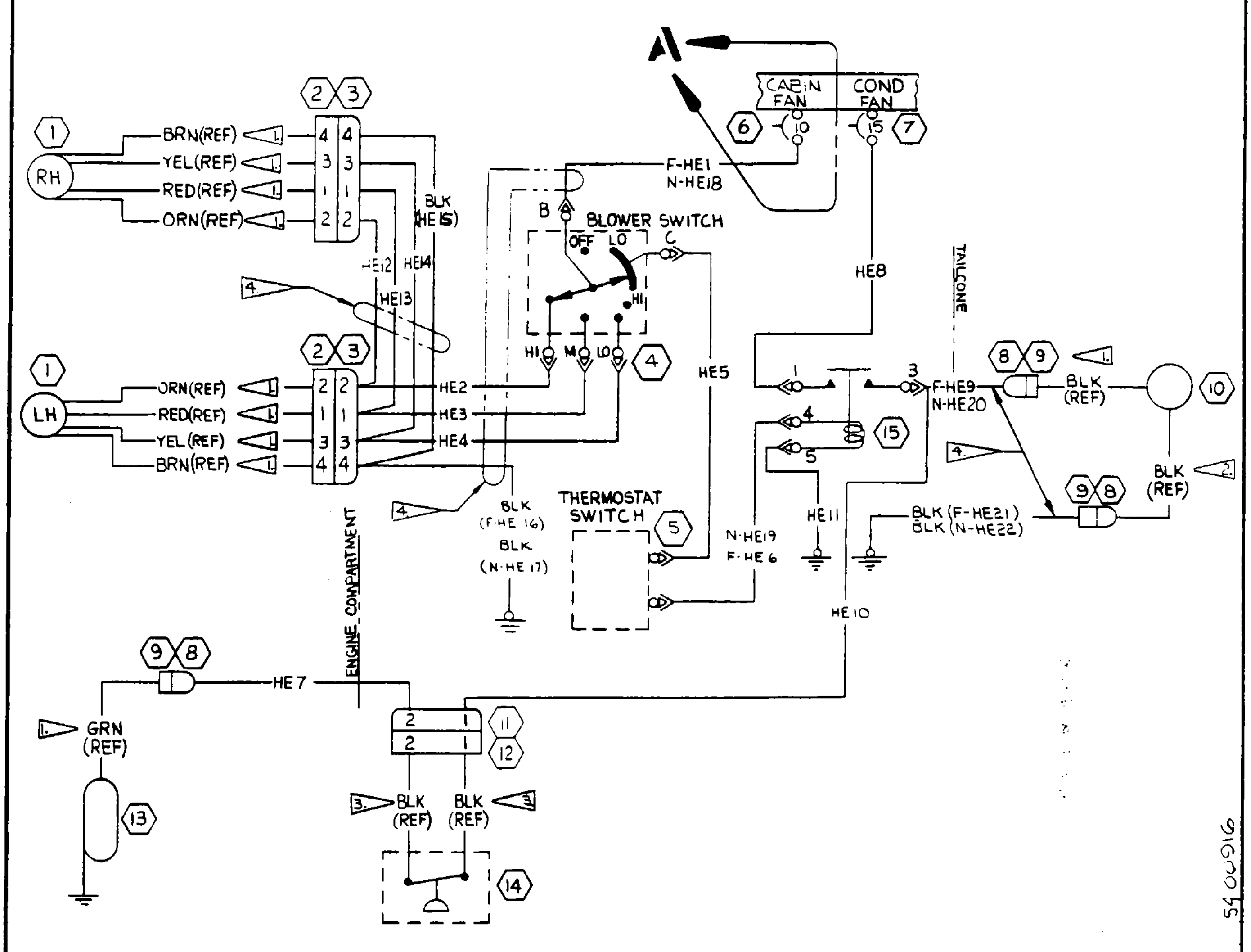
Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

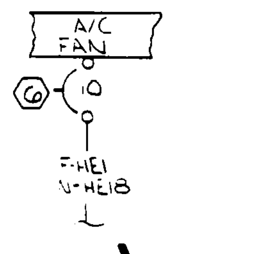
TITLE
WIRING DIAGRAM — AIR CONDITIONER (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE (SR 9556) PAGE: 13.15.C

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE SHT 13.15.0 FOR REVISION		





DETAIL A
EFF THRU SER(SK 9954)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	SERIALS

WIRE TABLE

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	SPENCER	3-2-79
GROUP	[illegible]	3-7-79
DRAWN	H.GHAZARIAN	2-12-79
CHECK	BORLESKE	2-14-79
STRESS		
PROJ	[illegible]	[illegible]
APPD	[illegible]	
OTHER		

Cessna. AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — AIR CONDITIONER (OF T)

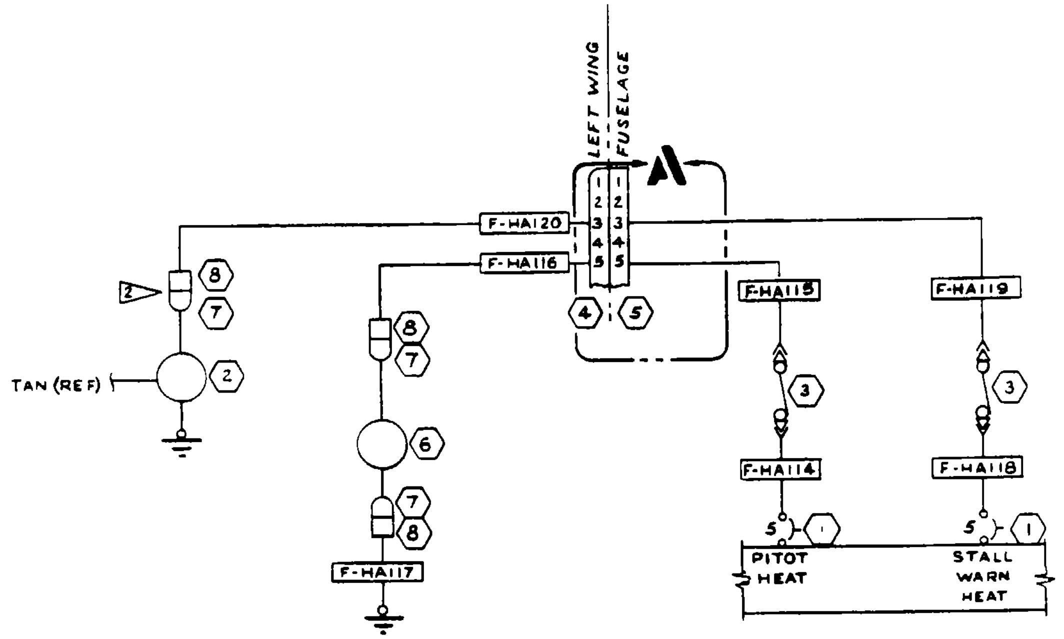
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE (SR 9556) PAGE: 13.15.1

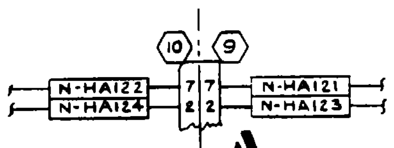
REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:
1. ONLY HEATER CIRCUITS ARE SHOWN. FOR STALL WARNING CIRCUIT SEE PAGE 15.5

2 S1637-1 HOUSING & S1635-1 PIN ADDED TO VENDOR SUPPLIED WIRE.



91600-10
91600-20



DETAIL A
APPLIES TO P210

N-HA124	18			S2099-7	S1636-1		
N-HA123				S1493-1	S2353-2		
N-HA122				S2099-7	S1636-1		
N-HA121				S1493-1	S2353-2		
F-HA120				S1635-1	S1636-1		
F-HA119				S1493-1	S1636-1		
F-HA118				S1367-1-6	S1493-1		
F-HA117				S1636-1	S1367-1-8		
F-HA116				S1635-1	S1636-1		
F-HA115				S1493-1	S1636-1		
F-HA114	18			S1367-1-6	S1493-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
10	S2349-1	CONNECTOR	
9	S2350-1	CONNECTOR	
8	S1637-2	HOUSING - PLUG	
7	S1637-1	HOUSING - CAP	
6	0721105	PITOT TUBE - HEATED	
5	S1641-9	HOUSING - SOCKET	
4	S1640-9	HOUSING - PIN	
3	S2160-1	SWITCH	
2	1221095	HEATED STALL DETECTOR	
1	S1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 13.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	HARDEN	2-5-82
GROUP	W. H. Harden	3-15-82
DRAWN	ACKERSON	2-9-82
CHECK	BORLESKE	3-12-82
STRESS		
PROJ	J.R. Smith	3-15-82
APPD		
OTHER		

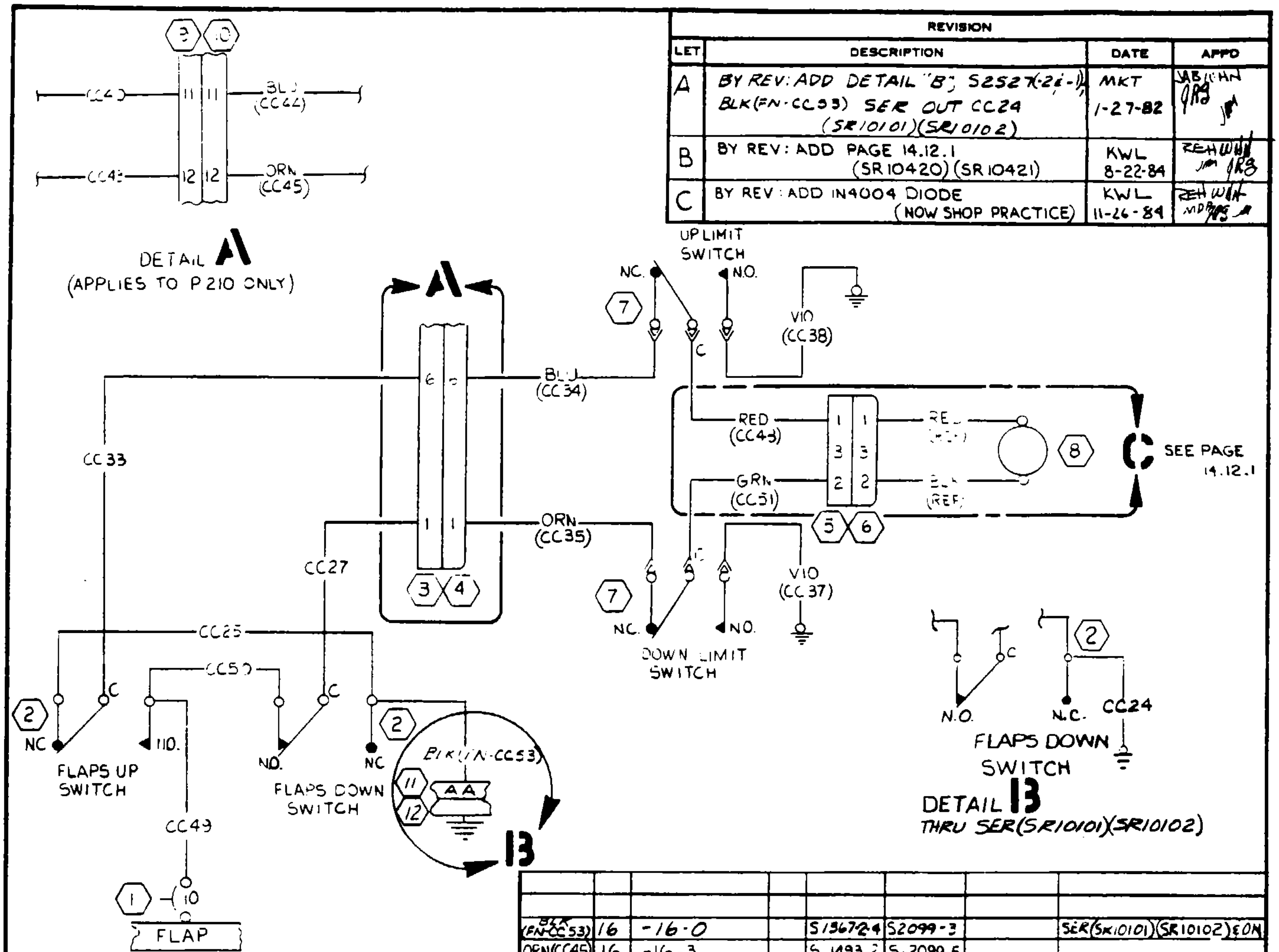
Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HEATED PITOT TUBE & HEATED STALL WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | SR10101 (SR10102) | PAGE: 13.16

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "B"; S2527-2 & -1 BLK (FN-CC53) SER OUT CC24 (SR10101)(SR10102)	MKT 1-27-82	
B	BY REV: ADD PAGE 14.12.1 (SR10420) (SR10421)	KWL 8-22-84	
C	BY REV: ADD IN4004 DIODE (NOW SHOP PRACTICE)	KWL 11-26-84	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (FN-CC53)	16	-16-0		S1367-2-4	S2099-3		SER (SR10101)(SR10102) & ON
ORN (CC45)	16	-16-3		S-1493-2	S-2099-5		
BLU (CC44)		-16-6		S-1493-2	S-2099-5		
CC43				S-1367-2-4	S-2353-1		
CC40				S-1367-2-4	S-2353-		
CC50				S-1367-2-4	S-1367-2-4		
VIO (CC37)		-16-7		S-1493-2	S-1367-2-8		
VIO (CC38)		-16-7			S-1367-2-8		
GRN (CC51)		-16-5			S-1636-2		
RED (CC48)		-16-2		S-1493-2	S-1636-2		
ORN (CC35)		-16-3		S-1635-2	S-1493-2		
BLU (CC34)		-16-6		S-1635-2	S-1493-2		
CC49				S-1367-2-8	S-1367-2-4		
CC33				S-1367-2.4	S-1636-2		
CC27					S-1636-2		
CC25					S-1361-2-4		
CC24	16			S-1367-2-4	S-1367-2-3		THRU SER (SR10101)(SR10102)

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
17	IN4004	DIODE	
16	6041H220	CONTACTOR	
15	53085	FLAP INTERRUPTER	
14	28326-0009	CONNECTOR	
13	S-1360-5L	CIRCUIT BREAKER	
12	S2527-2	GND CONNECTOR	
11	S2527-1	LH GND BLOCK	
10	S-2349-1	CONNECTOR	
9	S-2350-1	CONNECTOR	
8	C301002-0202	FLAP MOTOR	
7	S-1906-2	SWITCH	
6	S-1638-2	HOUSING	
5	S-1638-1		
4	S-1640-6		
3	S-1641-6	HOUSING	
2	S-1906-1	SWITCH	
1	S-1360-10L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1270709 PGS 14.14.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	2-14-79
GROUP		3-2-79
DRAWN	H GHAZARIAN	2-9-79
CHECK	BORLESKE	2-12-79
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

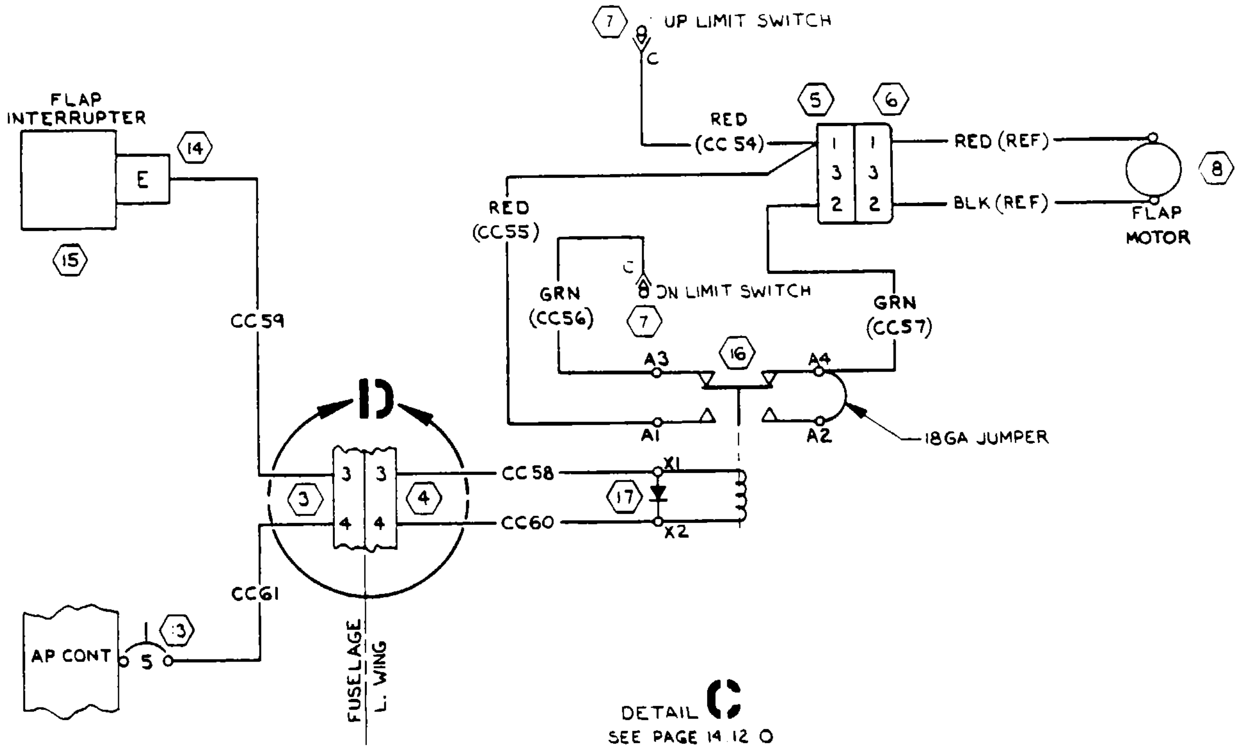
TITLE
WIRING DIAGRAM — WING FLAPS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

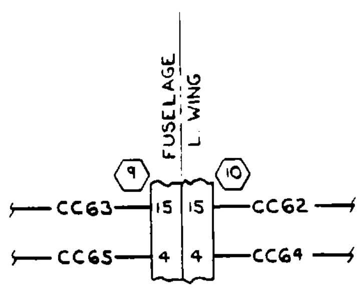
SCALE: NONE

PAGE:

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PG. 14.12.0 FOR REVISIONS		



DETAIL C
SEE PAGE 14.12.0



DETAIL D
(APPLIES TO P210)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS	
CC 65	20			S-1367-1-8	S-2353-1		(SR10420)	(SR10421)
CC 64				S-1493-2	S-1367-1-6			
CC 63				SOLDER	S-2353-1			
CC 62				S-1493-2	S-1367-1-6			
CC 61				S-1367-1-8	S-1636-2			
CC 60				S-1635-2	S-1367-1-6			
CC 59	20			SOLDER	S-1635-2			
CC 58	20			S-1635-2	S-1367-1-6			
GRN(CC57)	16	-16-5		S-1367-2-10	S-1636-2			
GRN(CC56)	16	-16-5		S-1493-2	S-1367-2-10			
RED(CC55)	18	-16-2		S-1367-2-10	S-1636-2			
RED(CC54)	16	-16-2		S-1493-2	S-1636-2		(SR10420)	(SR10421)

WIRE TABLE

CONTRACT NO:

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

	NAME	DATE
DESIGN		
GROUP	HALDEN	9-7-84
DRAWN	K. LUNDY	8-22-84
CHECK	R.E. HALL	9-7-84
STRESS		
PROJ	[illegible]	[illegible]
APPD		
OTHER		

TITLE
WIRING DIAGRAM — WING FLAPS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE (SR10420)(SR10421) PAGE: 14.12.1

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:

NOTES:

1. MATERIAL IS RCF5130B COIL CORD VENDOR CODE (096906)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A" (SR10420)(SR10680)	WHH 8-18-84	[illegible]

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED	24	1.		SOLDER	S-2353-2		
WHT/ORN							
VIO							
ORN							
WHT/YEL							
YEL							
BLK	24	1.		SOLDER	S-2353-2		
N-CD93	20			S-2099-9	S-1636-1		
N-CD92	20			S-2099-9	S-1636-1		
N-CD91	20			S-2099-9	S-1636-1		
N-CD90	20			S-2099-9	S-1636-1		
FN-CD89	18			SOLDER	S2099-3		
FN-CD88	18			S-2099-3	S-2099-3		
FN-CD87	18$			S-2099-8	S-1367-1-8		
FN-CD85	20			S-1367-1-8	S-2099-6		
FN-CD84				S-1635-1	S-2099-6		
FN-CD83				S-2099-6	S-2099-6		
FN-CD82				S-1635-1	S-2099-9		
FN-CD81				S-1635-1	S-2099-9		
FN-CD80				S-2099-6	S-2099-9		
FN-CD79				S-1635-1	S-2099-9		
F-CD78				S-2099-9	S-1636-1		
F-CD77				S-2099-9	S-1636-1		
F-CD76				S-2099-9	S-1636-1		
F-CD75	20			S-2099-9	S-1636-1		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
12	S-2527-1	CONNECTOR
11	2270035	RELAY ASSY
10	44430-3257	TRIM ACTUATOR
9	S-2349-2	HOUSING
8	S-1640-2	HOUSING
7	S-1641-2	HOUSING
6	S-1252-2	CKT BKR
5	S-2349-1	HOUSING
4	S-2350-3	HOUSING
3	[illegible]	CABLE ASSY
2	S-1965-3	SWITCH
1	72-[illegible]	SWITCH

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: [illegible] 14.11.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SPENCER	8-2-83
GROUP	[illegible]	8-4-83
DRAWN	SPENCER	8-2-83
CHECK	FEHA 2	8-1-83
STRESS		
PROJ	[illegible]	[illegible]
APPD		
OTHER		

Cessna AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

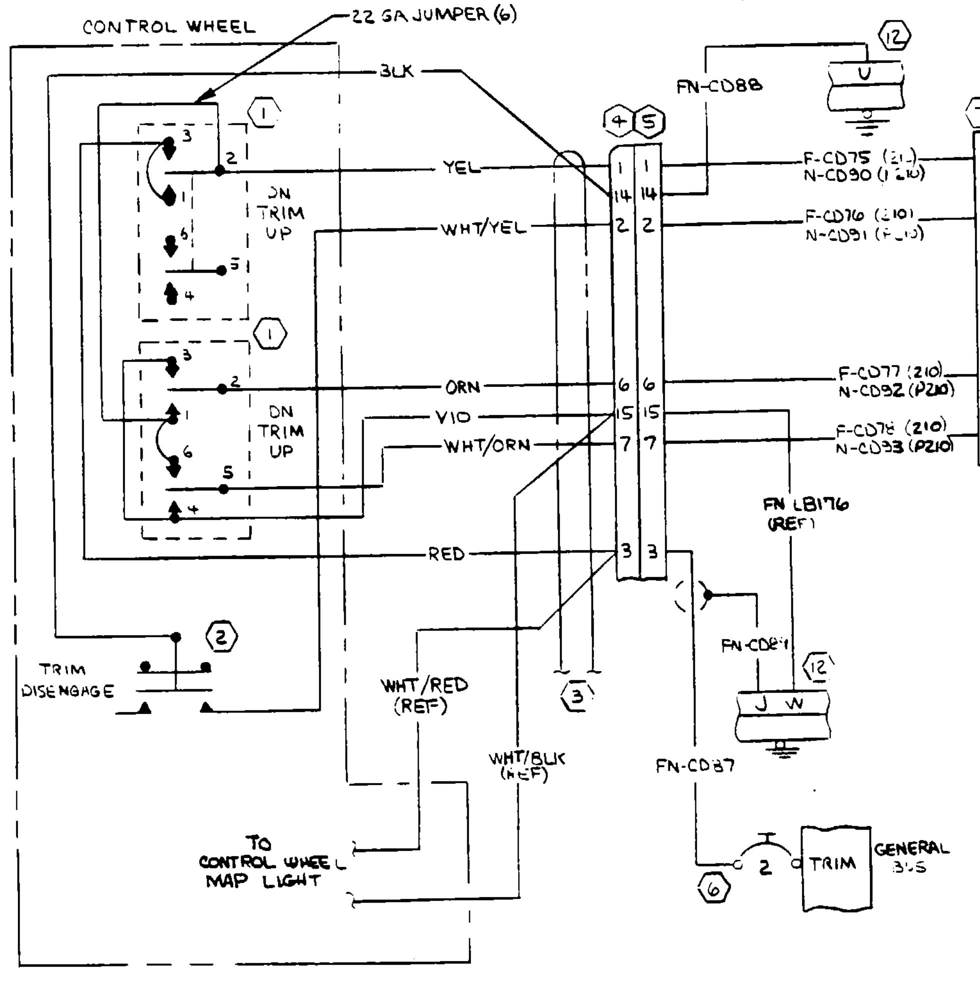
TITLE

WIRING DIAGRAM — ELECTRIC ELEVATOR TRIM (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | [illegible] | PAGE: 14.15.0

REVISION			
LET	DESCRIPTION	DATE	APPD
A	SEE PG. 14.13.0 FOR REVISION		



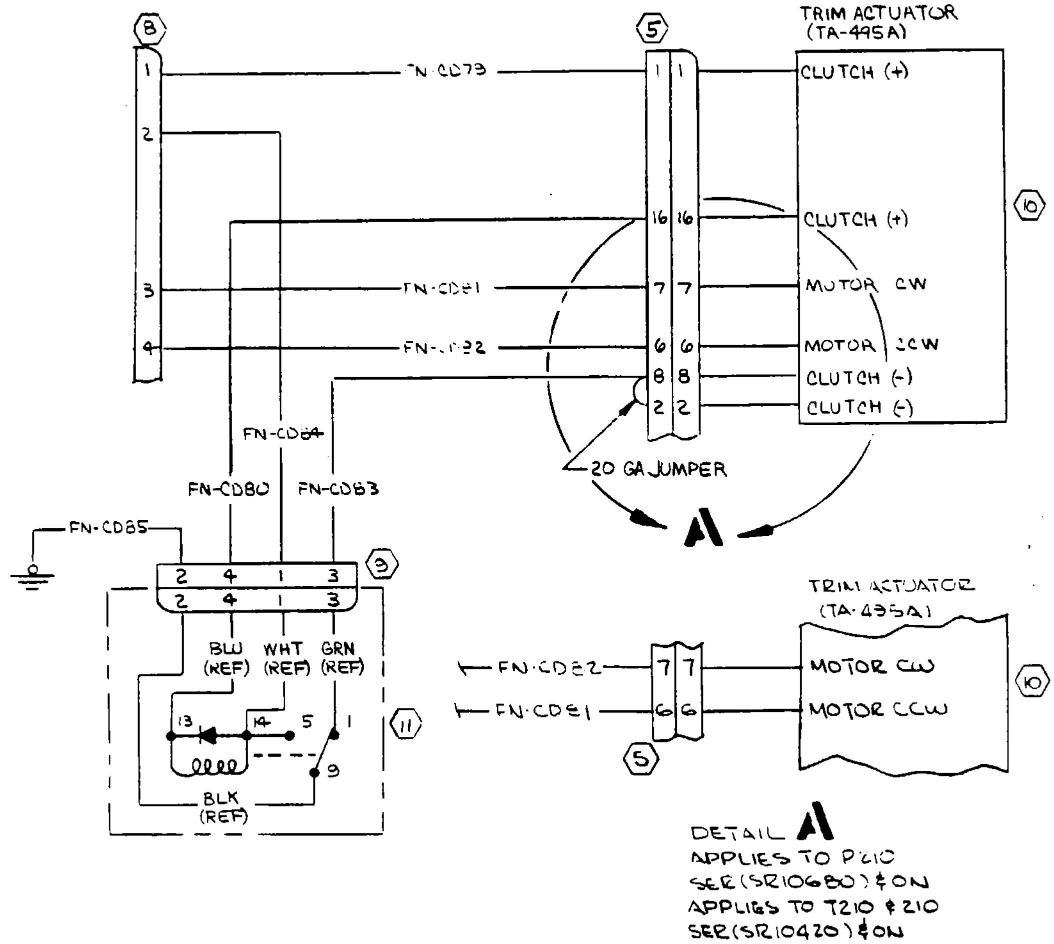
CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	8-2-83
GROUP		8-6-83
DRAWN	SPENCER	8-2-83
CHECK		8-2-83
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM - ELECTRIC ELEVATOR TRIM (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709
SCALE: NONE	SK10660	PAGE: 14.13.1

Electric Elevator Trim (Optional) (Sheet 1 of 2)



CONTRACT NO:			Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	TITLE WIRING DIAGRAM - ELECTRIC ELEVATOR TRIM (OPT)
DESIGN	SPENCER	8-2-63	
GROUP	W. L. Hawley	8-6-63	
DRAWN	SPENCER	8-2-63	
CHECK	R. E. Haiz	8-3-63	
STRESS			
PROJ			SIZE C · CODE IDENT. NO 71379 · DWG NO. 1270709
APPD			
OTHER			SCALE: NONE · PAGE: 14.13.1

Electric Elevator Trim (Optional) (Sheet 2 of 2)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 22 GA WAS 20GA/GC 21 THRU GC 25 BLUE (GC26), BLK (GC27), FC5, BLK (FC7) (SR 8143)	GDS 5-6-76	
B	BY REV: ADD S-2035-1 & S-2035-2; S-1830-1 WAS S-1493-1; S-1636-1 WAS S-1635-1/GC24; S-1635-1 WAS S-1636-1/GC24 (NOW SHOP PRACTICE) PER EO 523	PH 8-16-76	
C	BY REV: ADD DETAILS "A", "B", "C", "D"; P 15.5.1, S-2349-1, S-2350-1, WIRES TAN (FC9), TAN (FC10), FC11, TAN (FC12), GC 29, BLU (GC 30), GC 31 & GC 32; SER OUT GC 25; SER IN GC 28; GE 9(REF) WAS GE 6(REF), GE 10(REF) WAS GE 5(REF), GE 11(REF) WAS GE 3(REF) ADD S-1672-4 (SR 8464)(SR 8465)	LSS GDS 6-6-77	JAB
D	BY REV: S-2099-5 WAS 66100-7/TAN(FC12), TAN(FC10); S-2353-2 WAS 66332-5/N-FC11 (SR8464)(SR8465)	JJB 8-29-77	JAB
E	BY REV: 1270733 WAS 1270733-1 (NOW SHOP PRACTICE)	NTL 8-28-79	JAB
F	BY REV: ADD DETAIL "E & F", WIRES BLU (GC 33), BLU (GC 34), BLK (GC 35) & S-2035-1, S-2035-2. (SR 9860)	SEB 7-31-80	JAB
J	SEE PAGE 15.5.1 FOR REVISION		

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	TERMINALS	SERIALS
GC 40	22			S-1367-1-8	S-1636-1	SER (SR10102) & ON
GC 39	22			S-1367-1-8	S-1636-1	SER (SR10101) & ON
GC 37	22			S-1635-1	SOLDER	SER (SR 9953) & ON
FC 13	18	-18-10		S-1636-1	S-2099-5	SER (SR9953) & ON
GC 38	22			S-1636-1	S-1636-1	SER (SR 9953) & ON
GC 36	22			S-1367-1-6	S-1636-1	SER (SR9953) THRU SER (SR10101)
BLK (GC 35)	22	-22-0		S-1637-1	SOLDER	SER (SR 9860) & ON
BLU GC 34	22	-22-6		S-1636-1	SOLDER	SER (SR 9860) & ON
BLU GC 33	22	-22-6		S-1635-1	S-1636-1	SER (SR 9860) & ON
TAN (FC 12)	18	-18-10		S-1636-1	S-2099-5	
N-FC11	22			S-2353-2	S-1636-1	
TAN (FC 10)	18	-18-10		S-1367-1-6	S-2099-5	
N-GC32	22			S-1636-1	S-1636-1	
N-GC 31	22			S-1635-1	SOLDER	
BLU (GC 30)	22	-22-6		S-1636-1	S-1830-1	THRU SER (SR 9860)
N-GC29	22			S-1367-1-6	S-1636-1	THRU SER (SR10102)
F-GC-28	22			S-1367-1-6	S-1636-1	THRU SER (SR9953)
TAN (FC 9)	22	-22-10		S-1636-1	S-1635-1	
BLU GC 26	22	-22-6		S-1636-1	S-1830-1	THRU SER (SR9860)
BLK FC7	22	-22-0		S-1367-1-6	S-1367-1-8	
BLK GC27	22	-22-0		S-1637-1-8	S-1850-1	THRU SER (SR9860)
TAN FC6	18	-18-10	145	S-1635-1	S-1367-1-6	
FC 5	22			S-1636-1	S-1636-1	THRU SER (SR 9953)
GC 25	22			S-1637-1-6	S-1636-1	THRU SER (SR8464)
GC 24	22			S-1636-1	S-1636-1	THRU SER (SR7953)
GC 23	22			S-1635-1	SOLDER	THRU SER (SR7953)
GC 22	22			SOLDER	S-1367-1-10	
GC 21	22			S-1636-1	SOLDER	

WIRE TABLE

02-00916
01-00916

ITEM NO.	PART NO.	DESCRIPTION	
18	S2527-2	GND CONNECTOR	
17	S2527-1	LH GND BLOCK	
16	S-2349-1	PLUG	
15	S-2350-1	RECEPTACLE	
14	S-1672-4	STALL DETECTOR	
13	S-2035-2	HOUSING-PIN	
12	S-2035-1	HOUSING-PIN	
11	S-1232-5	CIRCUIT BREAKER	
10	S-1672-1	STALL DETECTOR	
9	S-1641-9	HOUSING-SOCKET	
8	S-1640-9	HOUSING-PIN	
7	VM920M-3	LIGHT ASSY	
6	S-1360-5L	CIRCUIT BREAKER	
5	S-1641-6	HOUSING-SOCKET	
4	S-1640-6	HOUSING-PLUG	
3			
2	S-1856-1	SWITCH	
1	1270733	WARNING UNIT 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	V R SIPES	11-15-74
GROUP	JRS	11-18-74
DRAWN	G. WHITSON	11-11-74
CHECK	J. YOUEL	11-12-74
STRESS		
PROJ	HMC/PLH	11-21-74
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

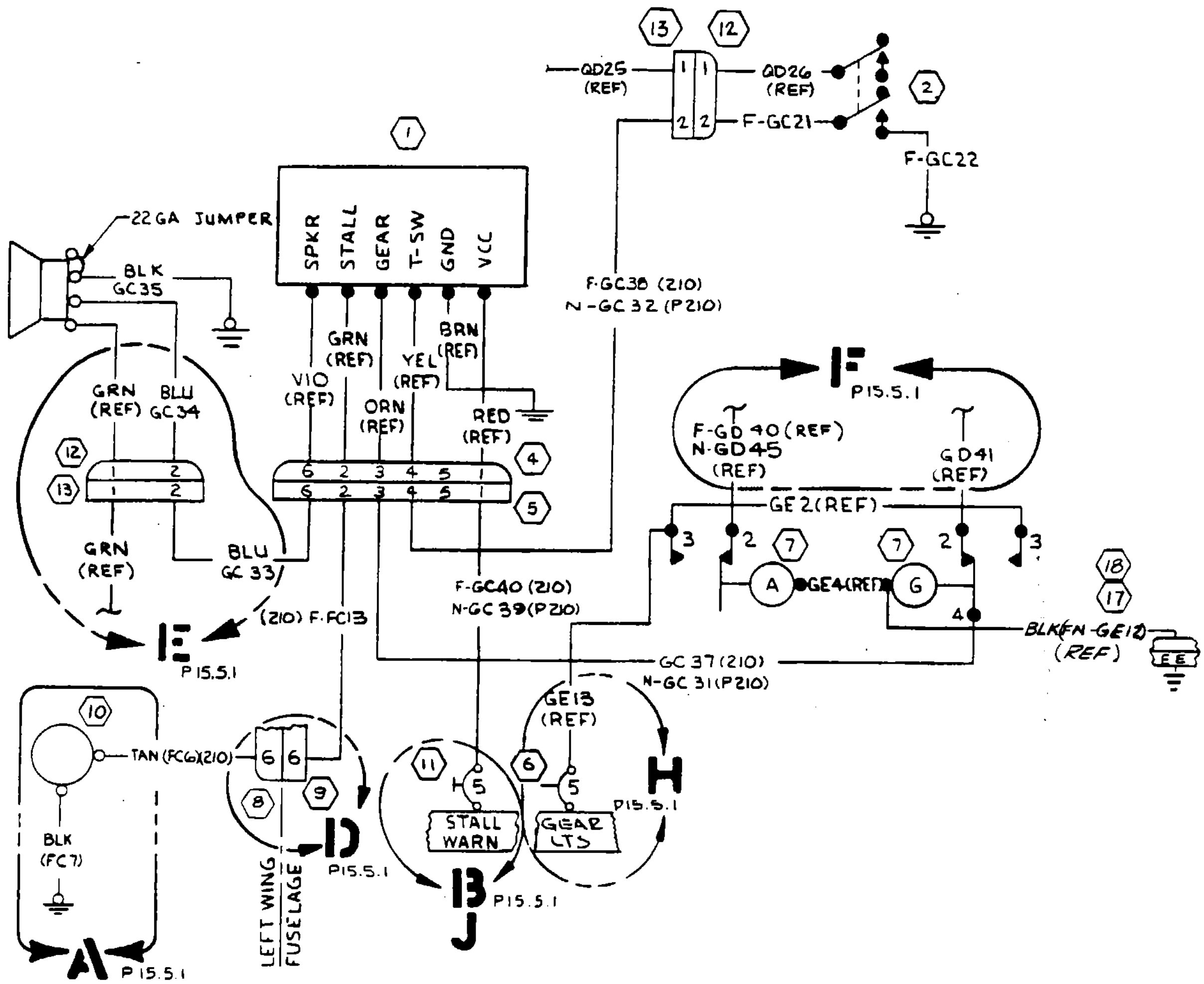
TITLE WIRING DIAGRAM — DUAL WARNING SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 P210 | PAGE: 15.5.0

(SR 7913)(2/06/040)

Dual Warning System (Sheet 1 of 2)



	NAME	DATE
CONTRACT NO:		
DESIGN	V R SIPES	11-15-74
GROUP	[illegible]	11-18-74
DRAWN	G. WHITSON	11-11-74
CHECK	J. YOUEL	11-12-74
STRESS		
PROJ	HMC/PLW	11-21-74
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

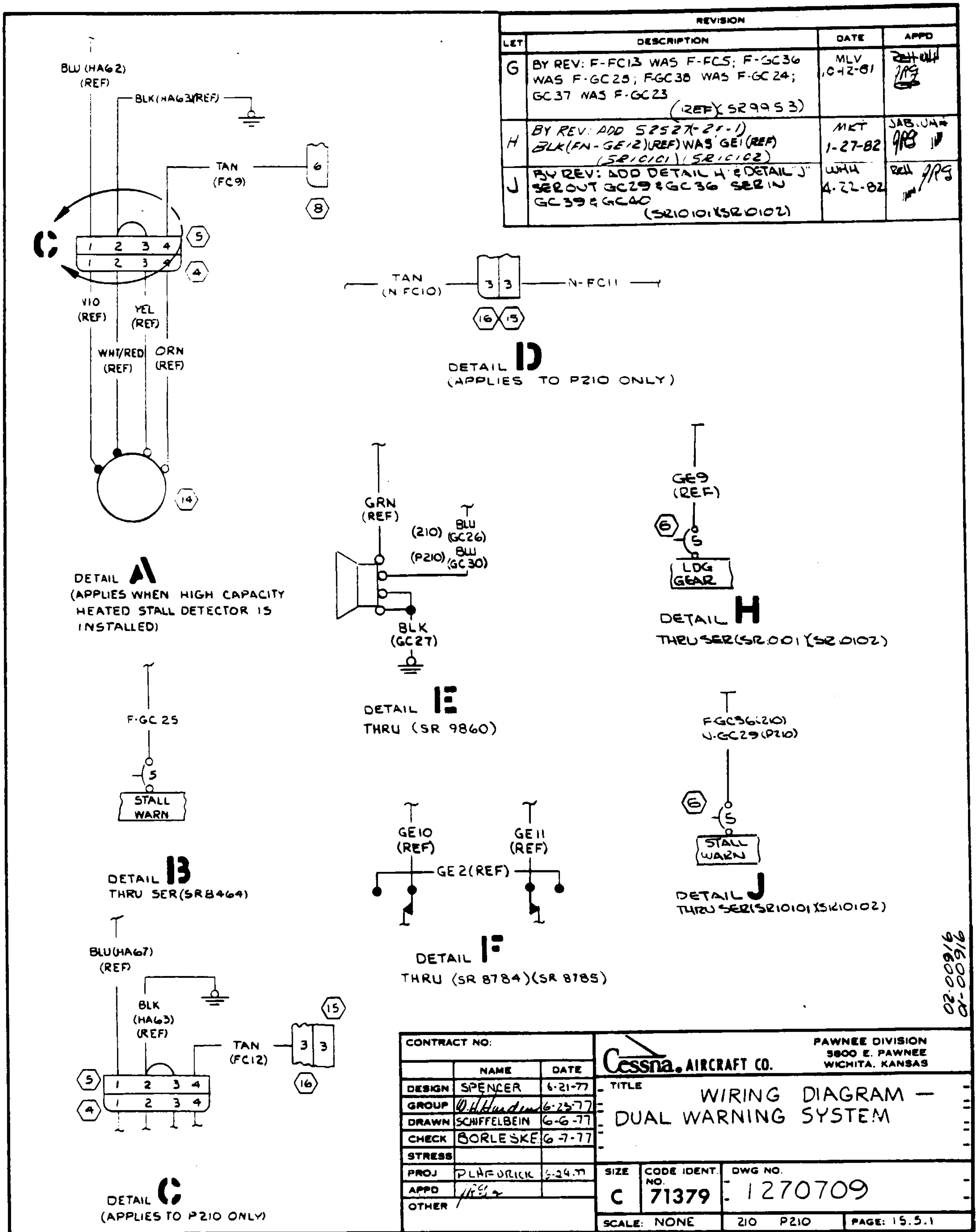
TITLE WIRING DIAGRAM — DUAL WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 15.5.0

(SR 7913)(2106040)

Dual Warning System (Sheet 2 of 2)



REVISION			
LET	DESCRIPTION	DATE	APPD
G	BY REV: F-FC13 WAS F-FC5; F-GC36 WAS F-GC25; F-GC38 WAS F-GC24; GC37 WAS F-GC23 (REF)(SR9953)	MLV 10-12-81	
H	BY REV: ADD S2527-25-1) BLK(FN-GE12)(REF) WAS GE1(REF) (SR10101)(SR10102)	MKT 1-27-82	JAB
J	BY REV: ADD DETAIL H & DETAIL J SEROUT GC29 & GC36 SER IN GC39 & GC40 (SR10101)(SR10102)	WHH 4-22-82	

CONTRACT NO:		
	NAME	DATE
DESIGN	SPENCER	6-21-77
GROUP	D.H. Harden	6-23-77
DRAWN	SCHIFFELBEIN	6-6-77
CHECK	BORLESKE	6-7-77
STRESS		
PROJ	PLAFORICK	6-24-77
APPD		
OTHER		

Cessna AIRCRAFT CO. — PAWNEE DIVISION, 5800 E. PAWNEE, WICHITA, KANSAS

TITLE: WIRING DIAGRAM — DUAL WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE | 210 P210 | PAGE: 15.5.1

(SR8464) (SR8465)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 2322-410-03306 WAS 2322-410-03303; ITEM 12 WAS IN2070 DIODE (SR10250)	8-6-81 JAB	JAB

ITEM NO.	PART NO.	DESCRIPTION	
29			
28	S2000A2R7J	RESISTOR	
27	S2000A103J	RESISTOR	
26	S2000A153J	RESISTOR	
25	2N3904	TRANSISTOR	
24	C315C103M5UICA	CAPACITOR	.01µf 50V
23	C321C104M5UICA	CAPACITOR	.1µf 50V
22			
21	S1640-6	HOUSING - PIN	
20	1270730	P.C. BOARD	
19	S2000A122J	RESISTOR	
18	S2000A242J	↑	
17	S2000A393J		
16	S2000A471J	↓	
15	S2000A102J	RESISTOR	
14	2322-410-03306	POT	
13	ET470X063A6	CAPACITOR	47µf 63V
12			
11	IN4001	DIODE	
10	2N4918	TRANSISTOR	
9	500D506G050DD7	CAPACITOR	50µf 50V
8	T3108225K035AS	↑	2.2µf 35V
7	CK05BX104K		.10µf 35V
6	T3308564K035AS		.56µf 35V
5	UK25-103	↓	.01µf 25V
4	T330C106K025AS	CAPACITOR	10µf 35V
3	LM350N	AUDIO AMP	
2	S2437-1	TIMER	
1	S2493-12	VOLTAGE REG	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
ORN	22	BELDEN 8568		SOLDER	SOLDER		
RED(1)	↑	↑		↑	SOLDER		
BRN(1)					SOLDER		
BRN					S-1367-24		
VIO					S-1635-1		
RED					↑		
YEL							
BLU	↓	↓		↓	↓		
GRN	22	BELDEN 8568		SOLDER	S1635-1		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP		
DRAWN		7-31-81
CHECK	ECRLESKE	7-31-81
STRESS		
PROJ		7-31-81
APPD		
OTHER		

Cessna. AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — DUAL WARNING UNIT

SIZE	CODE IDENT NO.	DWG NO
C	71379	1270709

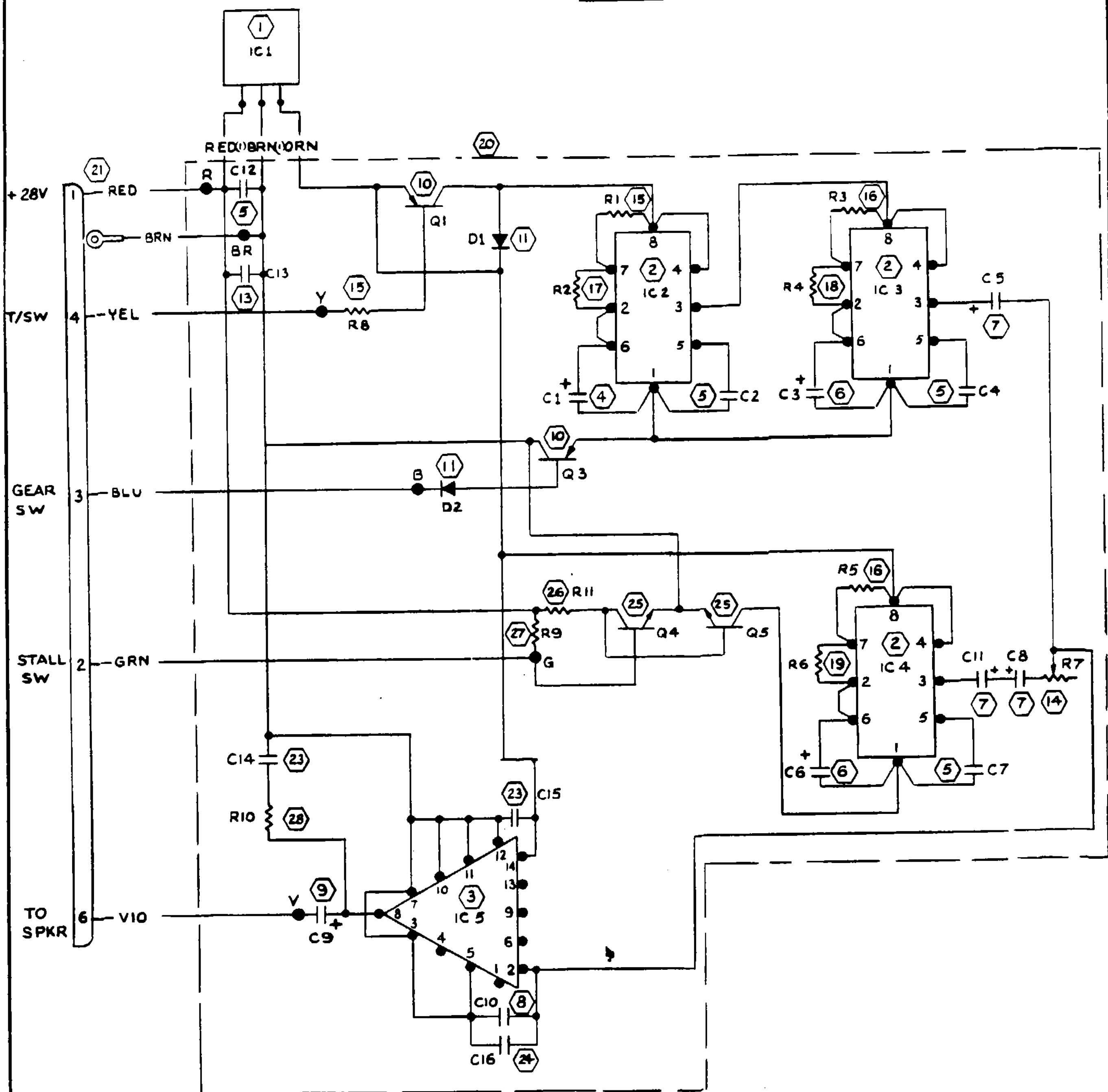
SCALE (SR10250) PAGE: 15.7.C

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 15.6

SUPERSEDED BY:

REVISION			
LET	DESCRIPTION	DATE	APPD
A	SEE PAGE 15.7.0 FOR REVISIONS		



CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		
DRAWN	ACKER J. N	7.21.81
CHECK	BORLESKE	7.31.81
STRESS		
PROJ	[illegible]	7.31.81
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION, 5800 E. PAWNEE, WICHITA, KANSAS

TITLE: SCHEMATIC - DUAL WARNING UNIT

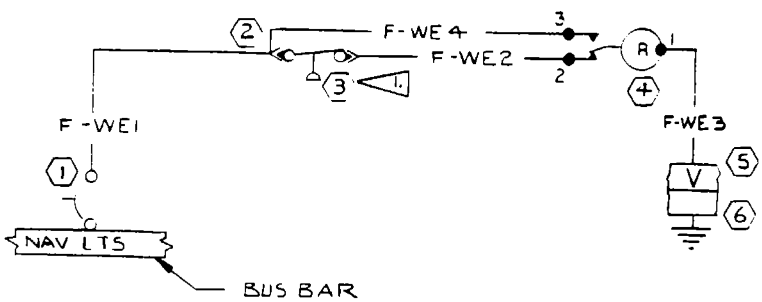
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: — (SR10250) PAGE: 15.7.1

NOTES:

1. VACUUM SWITCH CONTACTS ARE NORMALLY CLOSED.

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-WE4	22	-22-0		S-1493-1	SOLDER		
F-WE3	22	-22-0		SOLDER	S-2099-4		
F-WE2	22	-22-0		S-1493-1	SOLDER		
F-WE1	22	-22-0		S-1367-1-6	S-1493-1		

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION
6	S-2527-2	GND CONNECTOR
5	S-2527-1	LH GND BLOCK
4	MS25041-2-327	LAMP ASSY
3	S-2571-1	VACUUM SWITCH
2	S-2023-1	ADAPTER
1	S-1360-5L	CIRCUIT BREAKER

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G STAMM	3/15/82
GROUP	[illegible]	3-26-82
DRAWN	G STAMM	3/15/82
CHECK	[illegible]	3-15-82
STRESS		
PROJ	[illegible]	[illegible]
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO. PAWNEE DIVISION 5800 E. PAWNEE WICHITA, KANSAS

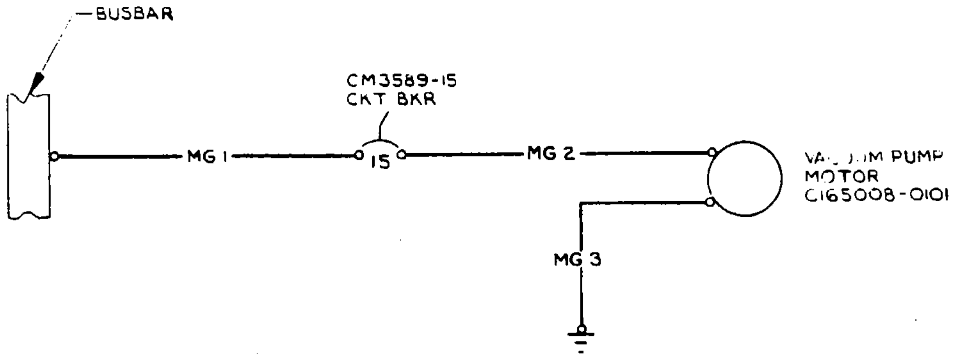
TITLE WIRING DIAGRAM — LOW VACUUM WARNING LIGHT (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE NONE 210 PAGE: 15 B

(SR10101)

REVISION			
LET	DESCRIPTION	DATE	APPD



MG 3	16	S-2589		S-1367-2-8	S-1367-2-6	
MG 2	16	S-2589		S-1367-2-8	S-1367-2-8	
MG 1	16	S-2589		S-1367-3-8	S-1367-3-8	
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	W H HAYDEN	1-7-85
DRAWN	KEN LUNDY	12-15-84
CHECK	R.E. HAIR	12-21-84
STRESS		
PROJ	[illegible]	1-28-85
APPD	MOR	1 8 85
OTHER		

Cessna. AIRCRAFT CO.

PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
STANDBY VACUUM PUMP
MODEL 210/P210

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE NONE (SR 10790) PAGE: 16.3

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: