CESSNA™ 177
1968 thru 1977 Service Manual
Table of Contents
Click on a link below

TOOLBAR HELP

The **Print** button allows you to print any specific page(s).

The **Show/Hide Navigation Pane** button opens or closes the lefthand column of bookmarks or thumbnails. Click on this button and the Actual Size or Fit Width button to enlarge text for reading.

The **Hand** tool enables you to move a single document page on the screen when the page does not fit within the main window. Drag the hand tool in the direction you want to move the page. A pointing hand indicates a hyperlink is present at that location.

The **Zoom** tool magnifies and reduces the page display. The "+" zooms in. To view the "-" and zoom out, choose the Zoom tool and hold down the Ctrl key. Click on the hand tool and the Actual Size button to exit and resize the page.

The **First Page** button moves the document to the first page.

Previous Page – moves you back one page in the document.

Next Page – moves you forward one page in the document.

The **Last Page** button moves the document to the last page.

The **Go Back** and **Go Forward** buttons retrace your steps through a document, moving to each view in the order visited.

The **Actual Size** button displays the page at 100%.

The **Fit Page** button scales the page to fit within the window.

The **Fit Width** button scales the page to fill the width of the window.

The lower toolbar (shown below) provides some of the same functions but provides some additional information. The page number matches the page number printed on the current document page (12-1). The zoom level is also shown (100%). The down arrow button to the right of the zoom level allows for zoom adjustment. The double arrow button on the far left will open/close the navigation pane. The buttons on both sides of the page number provide the same paging functions as the upper toolbar paging buttons.

For additional help, click on the **Help** command on the right side of the top command line. Click on the **Go Back** button to return to the manual.

177
AND
CARDINAL SERIES
1968 THRU 1977
SERVICE MANUAL

CHANGE NOTICE

LATEST CHANGED PAGES SUPERSEDE THE SAME PAGES OF PREVIOUS DATE

Insert changed pages into basic publication. Destroy superseded pages.

1 JULY 1970

D841C6-13—RAND—1300—7/76

CHANGE 6 1 JULY 1976

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

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

Dates of issue for original and changed pages are:

Original . . . . 0 . . . 1 July 1970
Change . . . . 1 . . . 1 July 1971
Change . . . . 2 . . . 1 July 1972
Change . . . . 3 . . . 1 July 1973
Change . . . . 4 . . . 1 July 1974
Change . . . . 5 . . . 15 June 1975
Change . . . . 6 . . . 1 July 1976

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 382, CONSISTING OF THE FOLLOWING:

Page No.	Change No.
*Title	6
*A	6
*i thru iii	6
*iv Blank	6
1-1	0
1-2 thru 1-3	3
1-4 thru 1-5	4
1-6 Blank	4
2-1	5
*2-2 thru 2-2A	6
*2-2B Blank	6
*2-3 thru 2-7	6
2-8	0
2-9 thru 2-10	5
2-10A	2
2-10B Blank	2
*2-11 thru 2-12	6
2-12A	5
2-12B Blank	5
*2-13	6
2-14	4
2-15	3
2-16	5
*2-17	6
2-18	3
2-19	4
*2-20	6
2-21	3
2-22	4
*2-23 thru 2-24	6
3-1	4
3-2 thru 3-3	0
3-4 thru 3-6	3
3-7	5
3-8	3
3-9	5
3-10 thru 3-11	2
3-12	5
3-13	2
3-14	3
3-15	5
3-16 thru 3-20	4
4-1	0
4-2 thru 4-4	5
*5-1 thru 5-2	6
*5-2A	6
*5-2B Blank	6
*5-3	6
5-4	5
*5-5 thru 5-6	6
*5-6A thru 5-6B	6
*5-7	6
5-8	2
*5-9 thru 5-11	6
5-12	5
*5-13 thru 5-14	6
*5-14A thru 5-14D	6
*5-15 thru 5-16	6
5-17	1
*5-18 thru 5-20	6
5-21	0
*5-22	6
5-23	3
5-24 Blank	3
6-1 thru 6-4	1

Page No.	Change No.
6-5	3
6-6 thru 6-8	1
7-1	2
7-2	1
7-3	5
7-4	2
7-5 thru 7-6	5
7-7 thru 7-9	3
7-10 Blank	3
8-1	5
8-2	2
8-3 thru 8-6	5
9-1	5
9-2	3
9-3	5
*9-4	6
9-5	3
9-6 thru 9-8	5
10-1	1
10-2 thru 10-3	5
10-4	1
10-5	5
10-6 thru 10-7	1
10-8	2
10-9	5
10-10 Blank	5
*11-1 thru 11-2	6
11-3 thru 11-4	2
11-5	5
*11-6	6
11-7 thru 11-8	5
11-9	2
*11-10	6
11-11	5
11-12 thru 11-13	2
11-14	5
11-15	2
11-16 thru 11-17	4
11-18	3
11-19	5
11-20 thru 11-25	2
11-26	4
*11-27 thru 11-28	6
*11-28A	6
*11-28B Blank	6
11-29	2
11-30 thru 11-31	5
11-32	2
12-1	1
12-2	5
12-3	2
12-4 thru 12-5	1
12-5A thru 12-5C	1
12-5D	5
12-6	4
12-7	3
12-8 thru 12-9	1
12-10 thru 12-11	0
12-12	5
12-13	1
*12-14	6
12-15 thru 12-16	0
*13-1	6
13-2	4
*13-3	6

Page No.	Change No.
13-4 thru 13-5	2
*13-6 thru 13-8	6
14-1	0
14-2 thru 14-4	2
14-5	1
14-6	0
*15-1	6
15-2	3
15-2A	5
15-2B Blank	5
15-3	4
15-4 thru 15-7	5
15-8	0
15-9 thru 15-10	2
15-11	0
*15-12	6
15-13	2
*15-14	6
*15-14A	6
*15-14B Blank	6
15-15	2
*15-15A thru 15-15B	6
*15-16	6
15-17	5
15-18 thru 15-19	2
*15-20	6
15-21	3
*15-22 thru 15-24	6
15-25	2
15-26 thru 15-27	4
15-28 Blank	4
*16-1 thru 16-2	6
*16-2A	6
*16-2B Blank	6
16-3	3
16-4 thru 16-5	2
16-6	3
16-7 thru 16-9	2
*16-10	6
16-11	2
*16-12 thru 16-13	6
16-14	4
16-15	3
*16-16	6
*16-16A	6
*16-16B Blank	6
*16-17	6
16-18	4
16-18A	4
16-18B Blank	4
16-19 thru 16-21	2
16-22	3
16-22A	3
16-22B	3
16-23	4
*16-24	6
16-25	5
16-26	4
16-26A	5
16-26B Blank	5
*16-27	6
16-28 thru 16-29	5
16-30	3
16-31	2
16-32 thru 16-36	5

Page No.	Change No.
*16-37 thru 16-38	6
17-1 Deleted	0
18-1	4
18-2	0
18-3	1
18-4	0
18-5 thru 18-6	4
18-7	0
18-8	5
18-9 thru 18-11	0
18-12	1
18-12A	5
18-12B Blank	5
18-13 thru 18-24	0
18-25	1
18-26 thru 18-29	0
18-30 Blank	0
*19-1	6
*19-2	6
*20-1	6
20-2	3
20-3 thru 20-4	0
*20-5	6
20-6	5
20-6A thru 20-6B	5
*20-7 thru 20-10	6
20-11	4
20-12	3
20-13	5
20-14	4
20-14A	4
*20-14B	6
20-14C	4
20-14D	5
20-15 thru 20-16	0
20-17 thru 20-18	3
20-19	5
*20-20	6
*20-20A thru 20-20B	6
20-21 thru 20-22	4
20-22A	4
20-22B Blank	4
20-23	0
20-24	4
20-24A thru 20-24B	4
20-25	4
*20-26	6
*20-26A	6
*20-26B Blank	6
20-27	3
20-28	5
20-29 thru 20-31	3
20-32	4
20-32A thru 20-32F	5
20-33	5
*20-34	6
20-35	3
*20-36	6
*20-37	6
*20-38 Blank	6

Upon receipt of the second and subsequent changes to this book, personnel responsible for maintaining this publication in current status should ascertain that all previous changes have been received and incorporated.

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

TABLE OF CONTENTS

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

All aircraft, regardless of manufacturer, are certificated under model number designations. However, popular names are often used for marketing purposes. To provide a consistent method of referring to 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	SERIALS BEGINNING	SERIALS ENDING
177 or CARDINAL	1968	177	17700001	17701164
177A or CARDINAL	1969	177A	17701165	17701370
177B or CARDINAL	1970	177B	17701371	17701530
177B or CARDINAL	1971	177B	17701531	17701633
177B or CARDINAL	1972	177B	17701634	17701773
177B or CARDINAL	1973	177B	17701774	17701973
177B or CARDINAL	1974	177B	17701974	17702203
177B, CARDINAL and CARDINAL II	1975	177B	17702204	17702313
CARDINAL or	1976	177B	17702314	17702539
CARDINAL II	1977	177B	17702540	

FOREWORD

This Service Manual contains factory-recommended procedures and instructions for ground handling, servicing, and maintaining Cessna Model 177-Series and Cardinal airplanes. Besides serving as a reference for the experienced mechanic, this Service Manual also covers step-by-step procedures for the less experienced man. This Service Manual should be kept in a handy place for ready reference. If properly used, it will better enable the mechanic to maintain these aircraft and thereby establish a reputation for reliable service.

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

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

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

This page intentionally left blank.

SECTION 1

GENERAL DESCRIPTION

TABLE OF CONTENTS Page

1-1. GENERAL DESCRIPTION.

1-2. MODEL 177 AND "CARDINAL" SERIES.

1-3. DESCRIPTION. The Cessna Models 177 and "Cardinal" Series aircraft, described in this manual, are single-engine, high-wing monoplanes of all-metal, semimonocoque construction. Wings are full cantilever, with a sealed section which forms an integral fuel bay area in each wing. The fixed tricycle landing gear consists of tubular spring-steel main gear struts and a steerable nose gear with an air/hydraulic fluid shock strut. Standard four-place seating consists of two individual front seats and one two/place rear seat. A two-place child's seat may be installed, aft of the rear seat, as optional equipment. These aircraft feature a horizontal stabilator, swept-back fin and rudder, large entry doors, and rear and side windows. These aircraft are powered by four-cylinder, horizontally opposed, air-cooled, "Blue Streak" (Lycoming) engines, driving all-metal, fixed-pitch or constant-speed propellers.

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

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

1-6. TORQUE VALUES. A chart of recommended nut torque values is shown in figure 1-3. These torque values are recommended for all installation procedures contained in this manual, except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

GROSS WEIGHT
(1968 Model 177 & Cardinal) . . . . 2350 lb
(1969 Model 177A & Cardinal and on) . . . . 2500 lb
FUEL CAPACITY
(thru 1969)
(Total) . . . . 49 gal.
(Usable). . . . . 48 gal.
(1970 thru 1972)
(Total) . . . . 50 gal.
(Usable). . . . . 49 gal.
(beginning with 1973)
STANDARD FUEL BAYS:
(Total) . . . . 50 gal.
(Usable). . . . . 49 gal.
OPTIONAL LONG/RANGE FUEL BAYS:
(Total) . . . . 61 gal.
(Usable). . . . . 60 gal.

NOTE

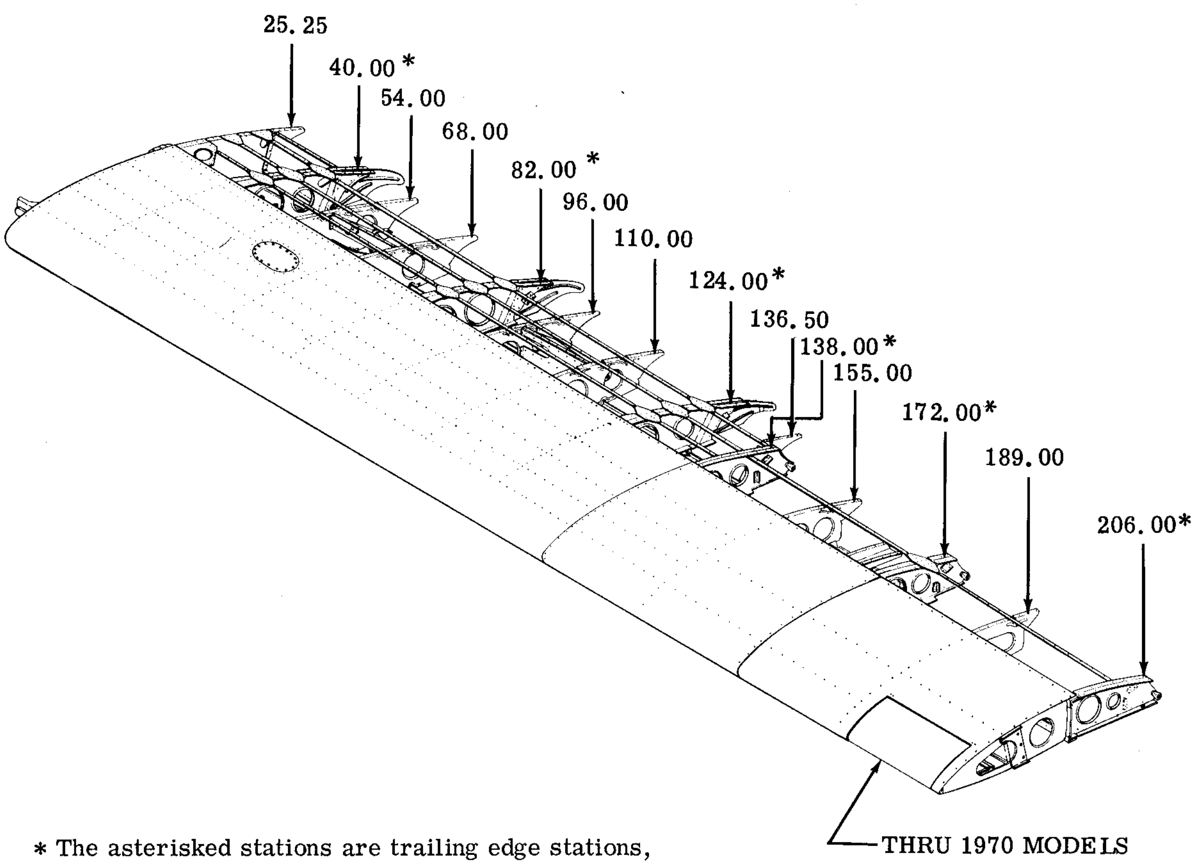
Fuel bay capacities to line of holes inside filler neck are as follows:
(thru 1969) . . . . 21 gal.
(beginning with 1970) . . . . 22 gal.
(Deduct 1 gallon to obtain usable fuel.)

OIL CAPACITY
(Without External Filter) . . . . 8 qt
(With External Filter). 9 qt
ENGINE MODEL (Refer to Section 11 for Engine Data)
(1968 Model 177 & Cardinal) . . . . LYCOMING O-320 Series
(1969 Model 177A & Cardinal and on) . . . . LYCOMING O-360 Series
PROPELLER
(1968 and 1969 Models 177, 177A & Cardinals). . . . . 76" McCauley (Fixed Pitch)
(1970 Model 177B & Cardinal and on) . . . . 76" McCauley (Constant Speed)
MAIN WHEEL TIRES
(1968 Models) . . . . 6.00x6, 4-ply rating
(1969 and on) . . . . 6.00x6, 6-ply rating
Pressure . . . . 30 psi
NOSE WHEEL TIRE (Standard) . . . . 5.00x5, 4-ply rating
Pressure
(Serial 17700001 thru 1700854) . . . . 30 psi
(Serial 17700855 and on). . . . . 35 psi
NOSE WHEEL TIRE (Optional) . . . . 6.00x6, 4-ply rating
Pressure (Thru Serial 17701164) . . . . 30 psi
NOSE GEAR STRUT PRESSURE (Strut Extended)
(Serial 17700001 thru 17700854) . . . . 50 psi
(Serial 17700855 and on). . . . . 40 psi
WHEEL ALIGNMENT
Camber . . . . 3° to 5°
Toe-in . . . . 0" to .06"

Figure 1-1. Aircraft Specifications (Sheet 1 of 2)

AILERON TRAVEL	
Up	20° ± 2°
Down	15° ± 2°
WING FLAP TRAVEL	0° to 30°, +2° -0°
RUDDER TRAVEL (Measured parallel to waterline)	
Right	21° 45' ± 1°
Left	21° 45' ± 1°
RUDDER TRAVEL (Measured perpendicular to hinge line)	
Right	24° ± 1°
Left	24° ± 1°
STABILATOR TRAVEL	
Up	20° ± 1°
Down	5° ± 1°
STABILATOR TRIM TAB TRAVEL	
(Serial 17700001 thru 17701164)	
Up	2° ± 1°
Down	7° ± 1°
(Serial 17701165 thru 17701370)	
Up	6°, +2° -0°
Down	12°, +0° -2°
(Serial 17701371 and on)	
Up	5° ± 1°
Down	13° ± 1°
PRINCIPAL DIMENSIONS	
Wing Span (Conventional Wing Tip)	35' 7-1/2"
Wing Span (Conical-Camber Wing Tip)	35' 6"
Wing Span (Conical-Camber with Strobe Lights)	35' 8"
Tail Span	11' 10"
Length	27' 3"
Fin Height (Maximum with Nose Gear Depressed and Flashing Beacon Installed on Fin)	8' 7"
Track Width	8' 3-1/2"
BATTERY LOCATION	Aft of Baggage Area

Figure 1-1. Aircraft Specifications (Sheet 2 of 2)



* The asterisked stations are trailing edge stations, which are canted outboard. The remainder of the stations, as well as the stations forward of the main spar corresponding to the asterisked trailing edge stations, are perpendicular to the leading edge.

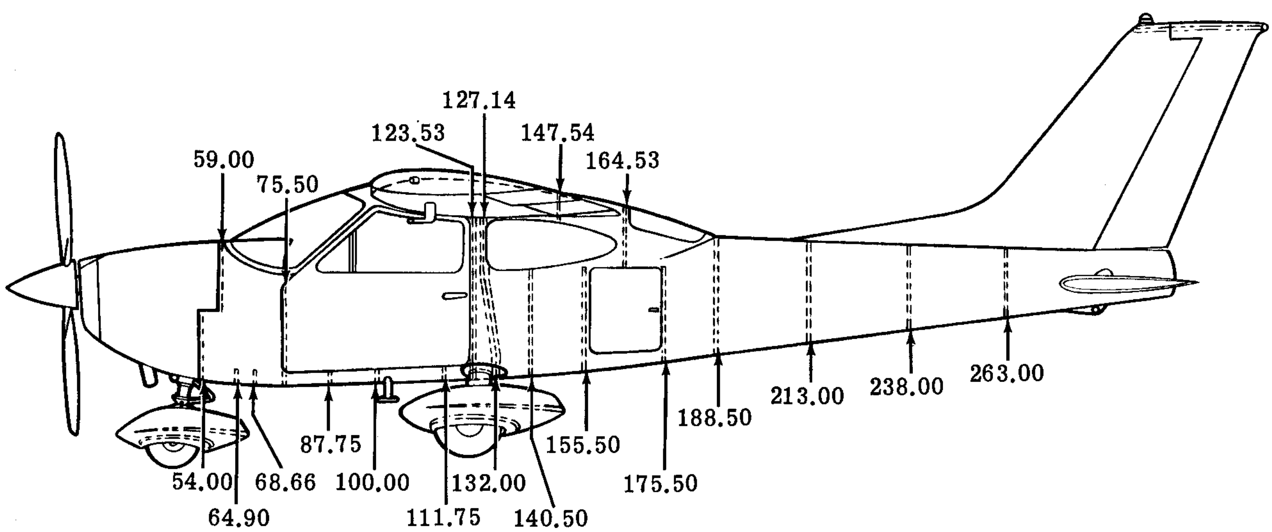


Figure 1-2. Reference Stations

RECOMMENDED NUT TORQUES

NOTE

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

TAP SIZE	TYPE OF NUT			
	TENSION		SHEAR	
	TORQUE		TORQUE	
	STD (NOTE 1)	ALT (NOTE 2)	STD (NOTE 3)	ALT (NOTE 2)
FINE THREAD SERIES				
8-36	12-15		7-9	
10-32	20-25	20-28	12-15	12-19
1/4-28	50-70	50-75	30-40	30-48
5/16-24	100-140	100-150	60-85	60-106
3/8-24	160-190	160-260	95-110	95-170
7/16-20	450-500	450-560	270-300	270-390
1/2-20	480-690	480-730	290-410	290-500
9/16-18	800-1000	800-1070	480-600	480-750
5/8-18	1100-1300	1100-1600	660-780	660-1060
3/4-16	2300-2500	2300-3350	1300-1500	1300-2200
7/8-14	2500-3000	2500-4650	1500-1800	1500-2900
1-14	3700-5500	3700-6650	2200-3300	2200-4400
1-1/8-12	5000-7000	5000-10000	3000-4200	3000-6300
1-1/4-12	9000-11000	9000-16700	5400-6600	5400-10000
COARSE THREAD SERIES				
	(NOTE 4)		(NOTE 5)	
8-32	12-15		7-9	
10-24	20-25		12-15	
1/4-20	40-50		25-30	
5/16-18	80-90		48-55	
3/8-16	160-185		95-100	
7/16-14	235-255		140-155	
1/2-13	400-480		240-290	
9/16-12	500-700		300-420	
5/8-11	700-900		420-540	
3/4-10	1150-1600		700-950	
7/8-9	2200-3000		1300-1800	
1-8	3700-5000		2200-3000	
1-1/8-8	5500-6500		3300-4000	
1-1/4-8	6500-8000		4000-5000	

NOTES

1. Covers AN310, AN315, AN345, AN362, AN363, AN366, MS20365, "1452", "EB", "UWN", "Z1200", NAS679, MS21044, MS21042, MS21045 and other self-locking nuts.
2. When using AN310 or AN320 castellated nuts where alignment between bolt and cotter pin is not reached using normal torque values, use alternate torque values or replace nut.
3. Covers AN316, AN320, AN7502 and MS20364.
4. Covers AN310, AN340, AN366, MS20365, and other self-locking anchor nuts.
5. Covers AN316, AN320 and MS20364.

The above values are recommended for all installation procedures contained in this book except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

Figure 1-3. Torque Values

This page intentionally left blank.

SECTION 2

GROUND HANDLING, SERVICING, CLEANING, LUBRICATION AND INSPECTION

TABLE OF CONTENTS

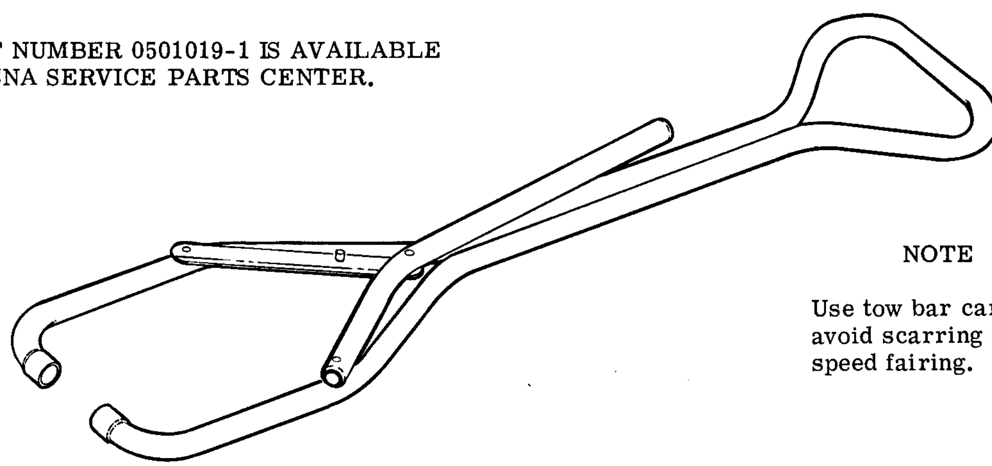
2-1. GROUND HANDLING.

2-2. TOWING. Moving the aircraft by hand is accomplished by pushing on the landing gear struts. A tow bar, illustrated in figure 2-1, should be attached to the nose gear to be used for steering and maneuvering the aircraft. When no tow bar is available, press down at tailcone bulkhead, just forward of stabilator, to raise nose wheel off the ground. With the nose wheel clear of the ground, the aircraft can be turned by pivoting about the main wheels.

CAUTION

When towing the aircraft, do NOT turn the nose wheel more than 45 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 tailcone, always apply pressure at a bulkhead to avoid buckling the skin.

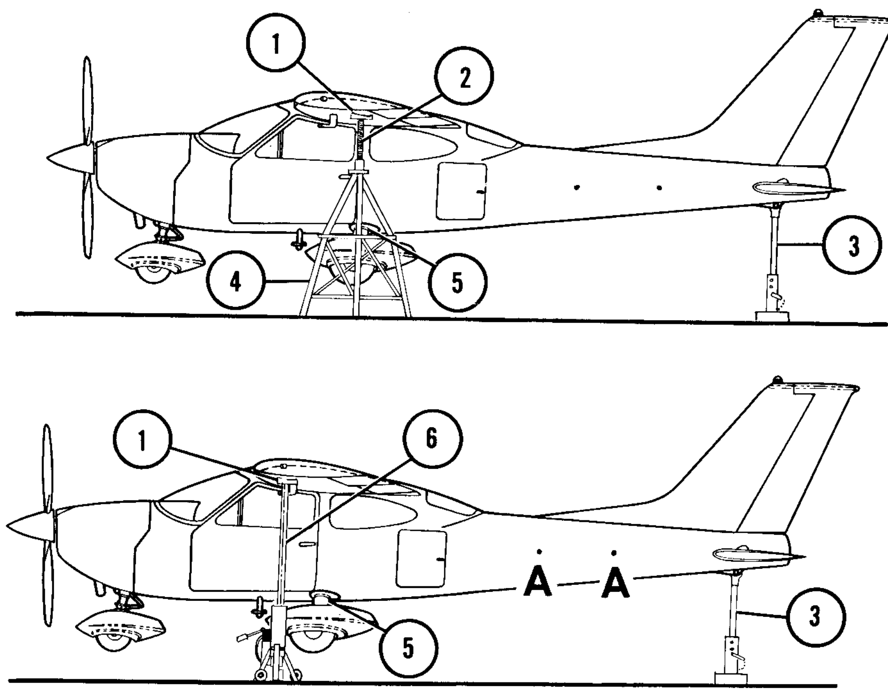
TOW BAR: PART NUMBER 0501019-1 IS AVAILABLE FROM THE CESSNA SERVICE PARTS CENTER.



NOTE

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

Figure 2-1. Tow Bar



ITEM NUMBER	TYPE AND PART-NUMBER	REMARKS
1	Block (Jack point not available)	1X4X4 padded with 1/4" rubber
2	Jack	Any short jack of capable capacity
3	Cessna #SE-767	Universal tail stand (SEE NOTE 1)
4	Cessna #SE-576 (41-1/2" high)	Universal jack stand (FOR USE WITH ITEM 2)
5	Cessna #1700129-1	Jack pad (SEE NOTE 2)
6	#2-170 Basic jack (includes #2-71 Slide tube: Liftstroke 22-1/2") #2-70 Slide tube: Liftstroke 22-1/2" #2-64 Extension cap #2-109 Leg extension	Min. closed height: 34" Max. extension height: 56-1/2" Min. closed height: 57-1/2' Max. extension height: 80" Adds 4" Adds 12"

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

NOTES

1 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 stand (SE-767) is to be filled with concrete for additional weight as a safety factor.

2 On tubular gear aircraft, the only fairing that requires removal is the one common to the fuselage and the tube gear fairing. This requires the removal of (7) screws. The jack pad is then inserted on the tube in the area between the fuselage and the upper end of the tube fairing, then jack the aircraft as required. The jack pad may be used only to raise one main wheel. Do not use brake castings as jack points.

3. Items (3), (4), (5) and (6) are available from the Cessna Service Parts Center.

JACKING INFORMATION

1. Place wing jack under main spar of the wing just outboard of main wheel. Pad at top of jack should be placed at junction of main wing spar and wing rib.
2. Raise aircraft tail and attach tail stand to tie-down fitting. 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. Operate jacks evenly until desired height is reached.
4. The individual strut jack pad may be used to raise only one main wheel at a time. Disconnect strut-to-fuselage fairing to attach strut jack pad to strut. DO NOT use brake casting as a jack point.
5. The nose may be raised by lowering and tying down the tail.
6. The aircraft may be hoisted as outlined in paragraph 2-3.

LEVELING THE AIRCRAFT

Longitudinal leveling of the aircraft is accomplished by removing the two screws in the tailcone (shown in figure 2-2 at "A") and installing bolts in the jig-located nutplates, then placing a level across the bolts. Also refer to paragraph 2-5.

A level placed across the front seat rails at corresponding points is used to level the aircraft laterally.

SHOP NOTES:

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

This page intentionally left blank.

2-3. HOISTING. The aircraft may be lifted with a hoist of two-ton capacity by using hoisting rings which are optional equipment, or by means of suitable slings. The front sling should be hooked to each upper engine mount at the firewall, and the aft sling should be positioned around the tailcone at the first bulkhead forward of the leading edge of the stabilator. If the hoisting rings are used, a minimum cable lenght 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 individual 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 individual jack pads is not recommended.

2-5. LEVELING. (Refer to figure 2-2.) Longitudinal leveling of the aircraft is accomplished by removing screws at stations 213.0 and 238.0 (on the tailcone) and installing bolts in the jig-located nutplates; then placing a level across the bolts. Raise, or lower, the nose as required to center the bubble in the level. A level placed across the front seat rails at corresponding points is used to level the aircraft laterally.

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

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

CAUTION

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

Moor the aircraft in accordance with the following procedures.

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

b. Secure a tie-down rope (no chains or cables) to the exposed portion of the engine mount and secure opposite end of rope to a ground anchor.

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

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

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

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

NOTE

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

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

CAUTION

Excessive ground operation shall be avoided.

2-9. RETURNING AIRCRAFT TO SERVICE. After flyable storage, returning the aircraft to service is accomplished by performing a thorough pre-flight inspection. At the end of the first 25 hours of engine operation, drain engine oil and clean oil pressure screen (or change external oil filter element). Service engine with correct grade and quantity of engine oil. Refer to figure 2-3 and paragraph 2-21 for correct grade of engine oil.

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

a. Fill fuel 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 and oil.
d. Either block up fuselage to relieve pressure on tires or rotate wheels every 30 days to prevent flat spotting of 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 the battery periodically, and charge as required.

NOTE

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

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

NOTE

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

h. Using a portable pressure sprayer, spray preservative oil through the upper spark plug hole of each cylinder with the piston in a down position. Rotate crankshaft as each pair of cylinders is sprayed.
i. After completing step "h," rotate crankshaft so that no piston is at a top position. If the aircraft is to be stored outside, stop two-bladed propeller so that blades are as near horizontal as possible to provide maximum clearance with passing aircraft.
j. Again, spray each cylinder without moving the crankshaft to thoroughly cover all interior surfaces of the cylinder above the piston.
k. Install spark plugs and connect spark plug leads.
l. Apply preservative oil to the engine interior by spraying approximately two ounces of the preservative oil through the oil filler tube.
m. Seal all engine openings exposed to the atmosphere, using suitable plugs or non-hygroscopic tape. Attach a red streamer at each point that a plug or tape is installed.
n. If the aircraft is to be stored outside, perform the procedures outlined in paragraph 2-7. In addition, the pitot tube, static source vents, air vents, openings in the engine cowling and similar openings should have protective covers installed to prevent entry of foreign material.
o. Attach a warning placard to the propeller to the effect that the propeller shall not be moved while the engine is in storage.

2-11. INSPECTION DURING STORAGE.
a. Inspect airframe for corrosion at least once a month and remove dust collections as frequently as possible. Clean and wax as required.
b. Inspect the interior of at least one cylinder through the spark plug hole for corrosion at least once a month.

NOTE

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

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

2-12. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedures to return the aircraft to service.
a. Remove aircraft from blocks and check tires for proper inflation. Check for proper nose gear strut inflation. (Refer to figure 1-1 for pressures.)
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. (Refer to Section 11.
g. While spark plugs are removed, rotate propeller several revolutions to clear excess rust preventive oil from cylinders.
h. Install spark plugs. Torque spark plugs to value specified in Section 11 and connect spark plug leads.
i. Check fuel strainer. Remove and clean filter screen if necessary. Check fuel bays and fuel lines for moisture and sediment. Drain enough fuel to eliminate moisture and sediment.
j. Perform a thorough preflight inspection, then start and warm-up engine.

2-13. INDEFINITE STORAGE. Indefinite storage is defined as aircraft in a non-operational status for an indefinite period of time. Engines treated in accordance with the following may be considered protected against normal atmosphere corrosion, provided the procedures outlined in paragraph 2-14 are performed at the intervals specified.
a. Operate engine until oil temperature reaches normal operating range. Drain engine oil sump and reinstall drain plug.
b. Fill oil sump to normal operating capacity with corrosion preventive mixture which has been thoroughly mixed and pre-heated to a minimum of 221°F at the time it is added to the engine.

NOTE

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

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

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

CAUTION

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

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

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

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

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

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

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

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

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

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

NOTE

Attach a red streamer to each place plugs or tape is installed. Either attach red streamers outside of the sealed area with tape or to the inside of the sealed area with safety wire to prevent wicking of moisture into the sealed area.

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

NOTE

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

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

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

NOTE

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

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

a. Inspect cylinder protex plugs each 7 days.

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

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

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

NOTE

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

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

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

b. Check battery and install.

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

d. Remove warning placards posted at throttle and propeller.

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

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

NOTE

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

g. Service and install the induction air filter.
h. Remove dehydrator plugs and spark plugs or plugs installed in spark plug holes and rotate propeller by hand several revolutions to clear corrosion-preventive mixture from cylinders.
i. Clean, gap, and install spark plugs. Torque plugs to the value listed in Section 11.
j. Check fuel strainer. Remove and clean filter screen. Check fuel tanks and fuel lines for moisture and sediment, and drain enough fuel to eliminate.
k. Perform a thorough pre-flight inspection, then start and warm-up engine.
l. Thoroughly clean aircraft and flight test aircraft.

2-16. SERVICING.

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

2-18. FUEL. Fuel bays should be filled immediately after flight to lessen condensation. Fuel bay capacities are listed in Section 1. The recommended fuel grade to be used is given in figure 2-3.

2-19. FUEL DRAINS. Drains and plugs are located in the fuel bays, selector valve, reservoir tank, lines and carburetor. The strainer drain valve is an integral part of the fuel strainer assembly. The strainer drain is equipped with a control which is operated from the upper right rear engine baffle, with access through the oil dipstick access door. Remove drain plugs and open strainer drain at the intervals specified in figure 2-3 to drain water and sediment from the fuel system.

2-20. CARBURETOR DRAIN PLUG INSPECTION. In order to prevent the possibility of thread sealant contamination in the carburetor float chamber, cleaning and inspection of the carburetor should be accomplished at each 100-hour inspection and anytime water in the fuel is suspected.
a. With the fuel valve OFF, remove carburetor drain plug and clean off any sealant present on the end of the plug or in the threads on the plug.
b. Inspect drain plug hole in the carburetor and remove any sealant remaining in the hole.
c. Turn fuel valve to ON to flush float chamber and drain plug chamber while probing drain plug hole to ascertain that all residue of sealant material is dislodged and washed out of the chamber. Flushing operation should last 15 to 30 seconds.
d. A second flushing should be then accomplished and the drained fuel retained for inspection to insure that no sealant particles are present.
e. Install drain plug as follows:
1. Install drain plug in carburetor 1-1/2 to 2 turns.
2. Apply NS-40 (RAS-4), MIL-T-5544 (Thread Compound, Antisieze, Graphite Petrolatum), or equivalent to plug threads.
3. Tighten and safety drain plug.
f. Turn fuel valve ON and inspect for evidence of fuel leakage.

2-21. ENGINE OIL. Check engine lubricating oil with the dipstick five to ten minutes after the engine has been stopped. The aircraft should be in as near a level position as possible when checking the engine oil, so that a true reading is obtained. Engine oil should be drained while the engine is still hot, and the nose of the aircraft should be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump. Engine oil should be changed every six months, even though less than the specified hours have accumulated. Reduce these intervals for prolonged operations in dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered, which cause sludging conditions. Always change oil, clean oil screens, and clean and/or change external filter element whenever oil on the dipstick appears dirty. When adding or changing oil, use aviation grade oil in accordance with figure 2-3.

NOTE

New or newly overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. If an ashless dispersant oil is used in a new or newly-overhauled engine, high oil consumption might possibly be experienced. The anti-friction additives in ashless dispersant oils will retard "break-in" of the piston, rings and cylinder walls. This condition can be avoided by the use of straight mineral oil. The aircraft is delivered from Cessna with a Corrosion Preventive Aircraft Engine Oil (MIL-C-6529, Type II, RUST BAN). If oil must be added during the first 25 hours of operation, use only aviation grade straight mineral oil (non-detergent) conforming to Specification No. MIL-L-6082. After the first 25 hours of operation, drain engine oil sump and clean both the oil suction strainer and oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with a straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

When changing engine oil, remove and clean oil screens, or install a new filter element on aircraft equipped with an external oil filter. An oil quick-drain valve may be installed. This valve provides a quick and cleaner method of draining the engine oil. This valve is installed in the oil drain port of the oil sump, and allows oil to be drained by attaching a hose over the fitting end and pushing up, causing the oil to drain through the hose into a container. To drain the engine oil, proceed as follows:
a. Operate engine until oil temperature is at normal operating temperature.
b. (With Quick-Drain Valve.) Attach a hose to the quick-drain valve in oil sump. Push up on quick-drain valve until it locks open, and allow oil to drain through hose into a container.

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

d. After engine oil has drained, close quick-drain valve and remove hose. Install and safety drain plug.

e. Remove and clean oil screen, or change external oil filter element.

f. Service engine with correct quantity and grade of engine oil.

NOTE

Refer to figure 2-3 for intervals for changing oil and filter elements.

NOTE

To minimize loss of oil through the breather, fill to specified oil level (7 quarts) on dipstick for normal operation (flight of less than three hours duration). For extended flight, fill to FULL mark (8 quarts) on dipstick. Do not operate with less than MINIMUM-FOR-FLIGHT quantity (6 quarts). If an external oil filter is installed, one additional quart is required when filter element is changed.

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

SHOP NOTES:

a. Remove filter by releasing the quick-release fasteners.
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.

NOTE

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

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

CAUTION

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

NOTE

The filter assembly may be cleaned with compressed air a maximum of 30 times or it may be washed a maximum of 20 times. A new filter should be installed after 500 hours of engine operating time or one year, whichever should occur first. However, at any time a filter is damaged, a new filter shall be installed. 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 should have a new filter installed.

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 induction air box and air inlet ducts to the engine are clean, inspect and replace filter if it is damaged.
f. Install filter. Be sure gasket on aft face of filter is in good condition.

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

2-24. BATTERY 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 connections with a wire brush, then coat with petroleum jelly before connecting. Check the battery every 50 hours (or at least every 30 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 area adjacent to battery box. Clean and remove any corrosion.

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

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.

2-26. NOSE GEAR SHOCK STRUT. The nose gear shock strut requires periodic checking to ensure that the strut is filled with hydraulic fluid and is inflated to the correct air pressure. To service shock strut, proceed as follows:
a. Remove valve core from air filler valve at lower end of strut and allow strut to fully compress (fork and outer barrel in contact).
b. With strut compressed, remove fluid filler plug at top of strut.
c. Extend strut one inch, and fill to overflow with hydraulic fluid. Replace fluid filler plug while strut is extended.
d. Compress strut.
e. If strut compresses fully, repeat steps "b" thru "d" until strut will not compress fully. This is done to ascertain that the floating piston is fully bottomed and that the strut is full of fluid.
f. After strut can not be fully compressed. remove fluid filler plug and compress strut fully allowing fluid to overflow from filler.
g. With strut fully compressed, install and tighten fluid filler plug.
h. Install valve core in air filler valve, and inflate strut with nose wheel off ground to the air pressure specified in figure 1-1.
i. Clean spilled fluid from strut and surrounding area.

NOTE

The nose landing gear shock strut will normally require only minimum amount of service. Maintain the strut extension pressure, as shown in figure 1-1. Lubricate landing gear as shown in figure 2-4. Check gear daily for general cleanliness, security of mounting and for hydraulic fluid leakage. Keep machined surfaces wiped free of dirt and dust, using a clean lint-free cloth saturated with MIL-H-5606 hydraulic fluid or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-27. NOSE GEAR SHIMMY DAMPENER. The shimmy dampener should be serviced at least every 50 hours. Since the shimmy dampener is subjected to heat from the engine, a small air space is needed for hydraulic fluid expansion. The shimmy dampener must be removed for filling, since it must be drained and filled with a specific amount of fluid.

a. Remove shimmy dampener from aircraft.

b. Remove fluid filler plug and drain all hydraulic fluid from dampener. Work dampener piston rod back and forth, and ascertain that all fluid has drained from dampener.

c. After all fluid is drained, move shimmy dampener piston to end of barrel opposite filler hole.

d. With dampener and hydraulic fluid at room temperature, fill dampener with 85cc (Thru 1971 Models) or 88cc (Beginning with 1972 Models and all Service Parts) of hydraulic fluid. Prior to filling, check placard on shimmy dampener for capacity. Do not overfill dampener.

e. Install filler plug and clean shimmy dampener with solvent, and dry dampener with a clean cloth.

NOTE

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

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

2-29. CLEANING.

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

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

CAUTION

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

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

2-32. INTERIOR TRIM. The instrument panel, 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. Volatile solvents, such as mentioned in paragraph 2-31, must never be used since they soften and craze the plastic.

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

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

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

CAUTION

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

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

a. Empty all ash trays.
b. Brush or vacuum clean the upholstery and carpet to remove dust and dirt.
c. Wipe leather and plastic 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 padding and the backing material.
f. Scrape off sticky materials with a dull knife, then spot clean the area.

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

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

2-39. LUBRICATION.

2-40. Lubrication requirements are shown in figure 2-5. Before adding grease to grease fittings, wipe dirt from fitting. Lubricate until grease appears around parts being lubricated, and wipe excess grease from parts. The following paragraphs supplement figure 2-4 by adding details.

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

2-42. WHEEL BEARINGS. Clean and repack the wheel bearings at the first 100-hour inspection and at each 500-hour inspection thereafter. If more than the usual number of take-offs and landings are made, extensive taxiing is required, or the aircraft is operated in dusty areas or under seacoast conditions, cleaning and lubrication of the wheel bearings shall be accomplished at each 100-hour inspection.

2-43. AILERON ROD END BEARING. The actuating rod attach point is exposed to the weather through a small opening in the upper leading edge of the aileron. Therefore, 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 ball for corrosion. If no corrosion is found, wipe the surface of the rod end balls with general purpose oil and rotate the ball freely to distribute the oil over its entire surface and connect the control rods. If corrosion is detected during inspection, install new rod end.

2-44. WING FLAP ACTUATOR.

a. On aircraft prior to Serial 17701634 which have not been modified by Service Kits SK177-17 or SK177-18B, proceed as follows:

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

a. Gain access to actuator by removing appropriate inspection plates on lower surface of wing.
b. Expose jack screw by operating flaps to full-down position.
c. Wipe a small amount of lubricant from jack screw with a rag and examine for condition. Lubricant should not be dirty, sticky, gummy or frothy in appearance.
d. Inspect wiped area on jack screw for presence of hard scale deposit. Previous wiping action will have exposed bare metal if no deposit is present.
e. If any of the preceding conditions exist, clean and relubricate jack screw as outlined in steps "f" thru "r".
f. Remove actuator from aircraft in accordance with procedures outlined in Section 7.
g. Remove all existing lubricant from jack screw and torque tube by running the nut assembly to the end of the jack screw away from the gearbox, and soaking the nut assembly and jack screw in Stoddard solvent.

NOTE

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

h. After soaking, clean entire length of jack screw with compressed air.

NOTE

Do not disassemble nut and ball retainer assembly.

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

j. Rotate nut down screw toward the motor.

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

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

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

n. Remove excess grease.

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

b. On aircraft prior to Serial 17701634 which have been modified by Service Kits SK177-17B or SK177-18B, proceed as follows:

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

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

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

c. On aircraft beginning with Serial 17701634, clean and lubricate wing flap actuator jack screw each 100 hours as follows:

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

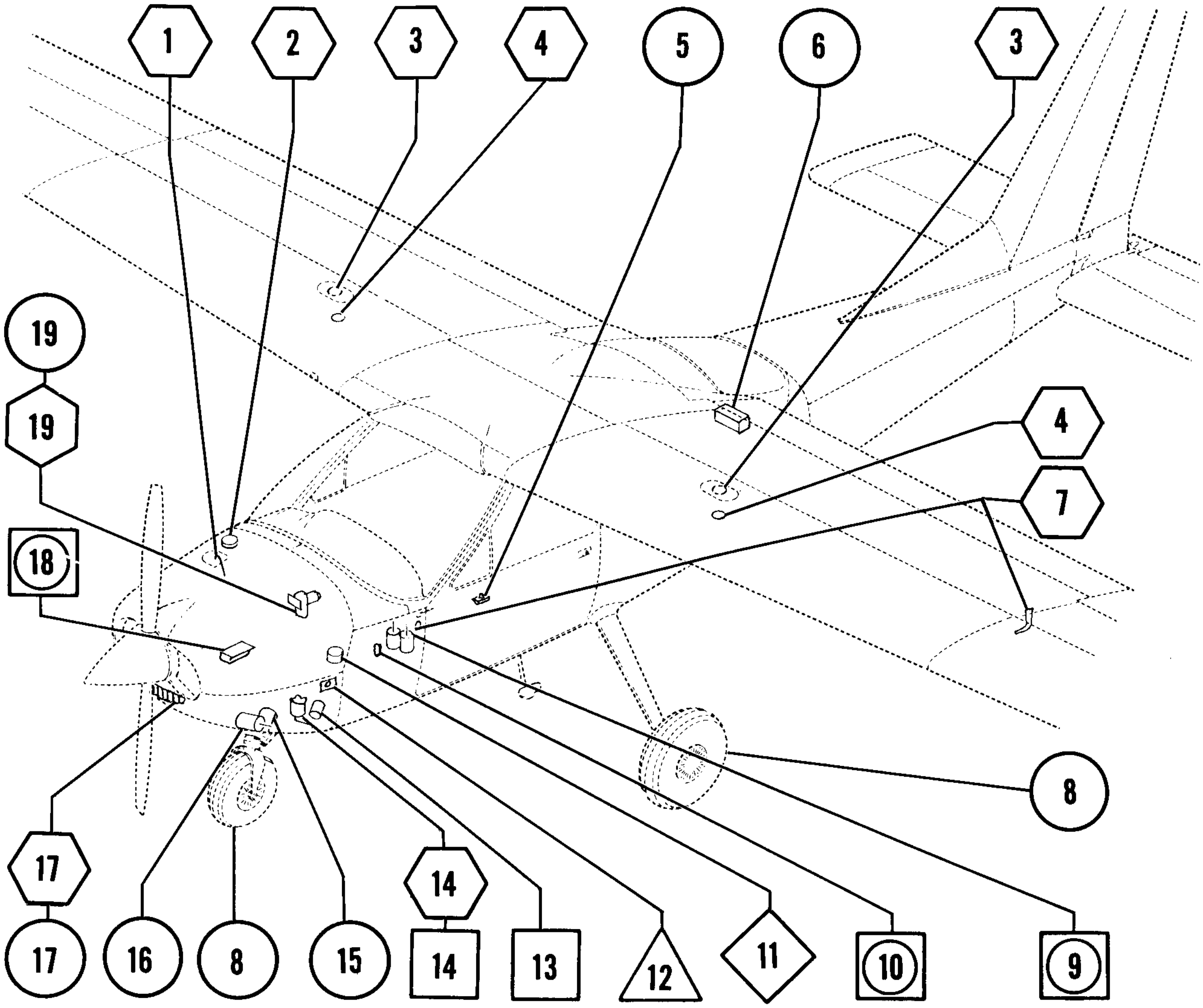
2. Clean jack screw threads with solvent rag and dry with compressed air.

NOTE

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

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

This page intentionally left blank.



NOTE

Refer to Sheet 2 for Specified Hydraulic Fluid, Fuel and Oil.

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

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

SPECIFIED AVIATION GRADE FUELS:

WARNING

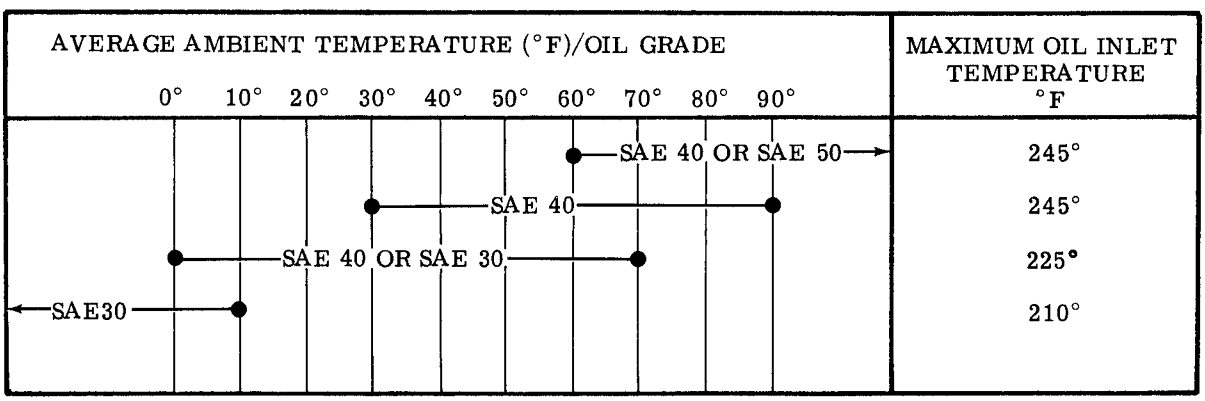
ONLY AVIATION GRADE FUELS ARE APPROVED FOR USE.

ENGINE MODEL	APPROVED FUEL GRADES	NOTE
LYCOMING O-320-E (1968)	80 (red) (formerly 80/87)	1
	100LL (blue)	1
	100 (green) (formerly 100/130)	1
LYCOMING O-360-A (1969 and on)	100LL (blue)	1
	100 (green) (formerly 100/130)	1

NOTE

1. Compliance with Avco Lycoming Service Instruction No. 1070J, and all revisions thereto, must be accomplished. Refer also to Avco Lycoming Service Letters L169 and L185, and any other applicable Service Letters or Service Bulletins, for further information.

SPECIFIED AVIATION GRADE OIL:



NOTE

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

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

DAILY

3 FUEL BAYS:
Service after each flight. Refer to paragraph 2-18 for details.

4 FUEL BAY SUMP DRAINS:
If quick-drain valves are installed, drain off water and sediment before the first flight of the day.

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

1 OIL DIPSTICK:
Check on preflight. Add oil as necessary. Refer to paragraph 2-21 for details. Check that filler cap is tight and oil filler door is secure.

14 FUEL STRAINER:
Drain water and sediment before first flight of the day.

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

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

FIRST 25 HOURS

19 ENGINE OIL SYSTEM
Refill with straight mineral oil, non-detergent, and use until a total of 50 hours has accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

50 HOURS

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

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

19 ENGINE OIL SYSTEM
Change oil each 50 hours if engine is NOT equipped with external oil filter; if equipped with external oil filter, change filter element each 50 hours and oil at each 100 hours, or every 6 months.

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

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

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

This page intentionally left blank.

50 HOURS (Cont)

5 FUEL SELECTOR VALVE DRAIN
Remove plug and drain water or sediment. Reinstall and safety plug.

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

100 HOURS

13 ELECTRIC FUEL PUMP
Remove and clean filter.

14 FUEL STRAINER
Disassemble and clean strainer bowl and screen.

200 HOURS

10 VACUUM RELIEF VALVE FILTER
Change each 1000 hours or to coincide with engine overhauls.

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

18 FUEL RESERVOIR TANK
Remove plug and drain water and sediment. Reinstall plug and safety. Refer to paragraph 2-19 for details.

500 HOURS

11 VACUUM SYSTEM CENTRAL AIR FILTER
Replace every 500 hours.

AS REQUIRED

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

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

FREQUENCY (HOURS)

50 100 500 1000

METHOD OF APPLICATION

HAND GREASE GUN OIL CAN SYRINGE (FOR POWDERED GRAPHITE)

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

NOTE

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

LUBRICANTS

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

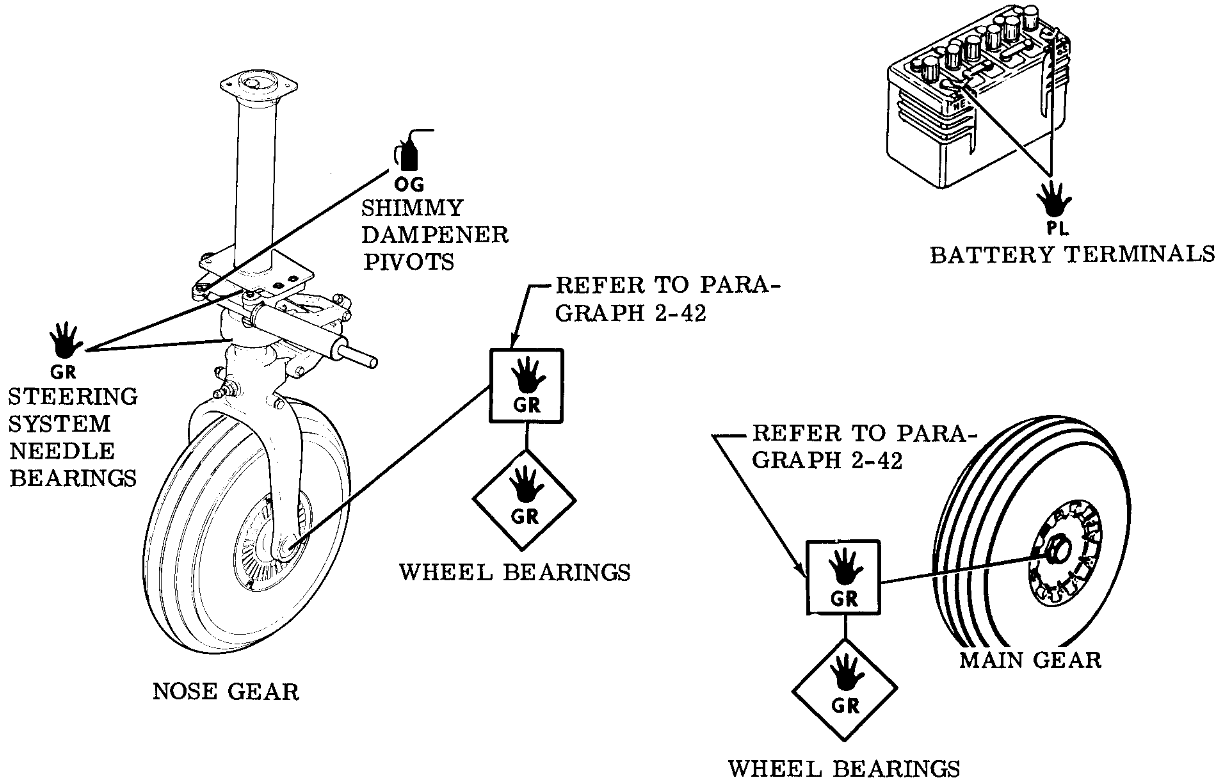


Figure 2-4. Lubrication (Sheet 1 of 3)

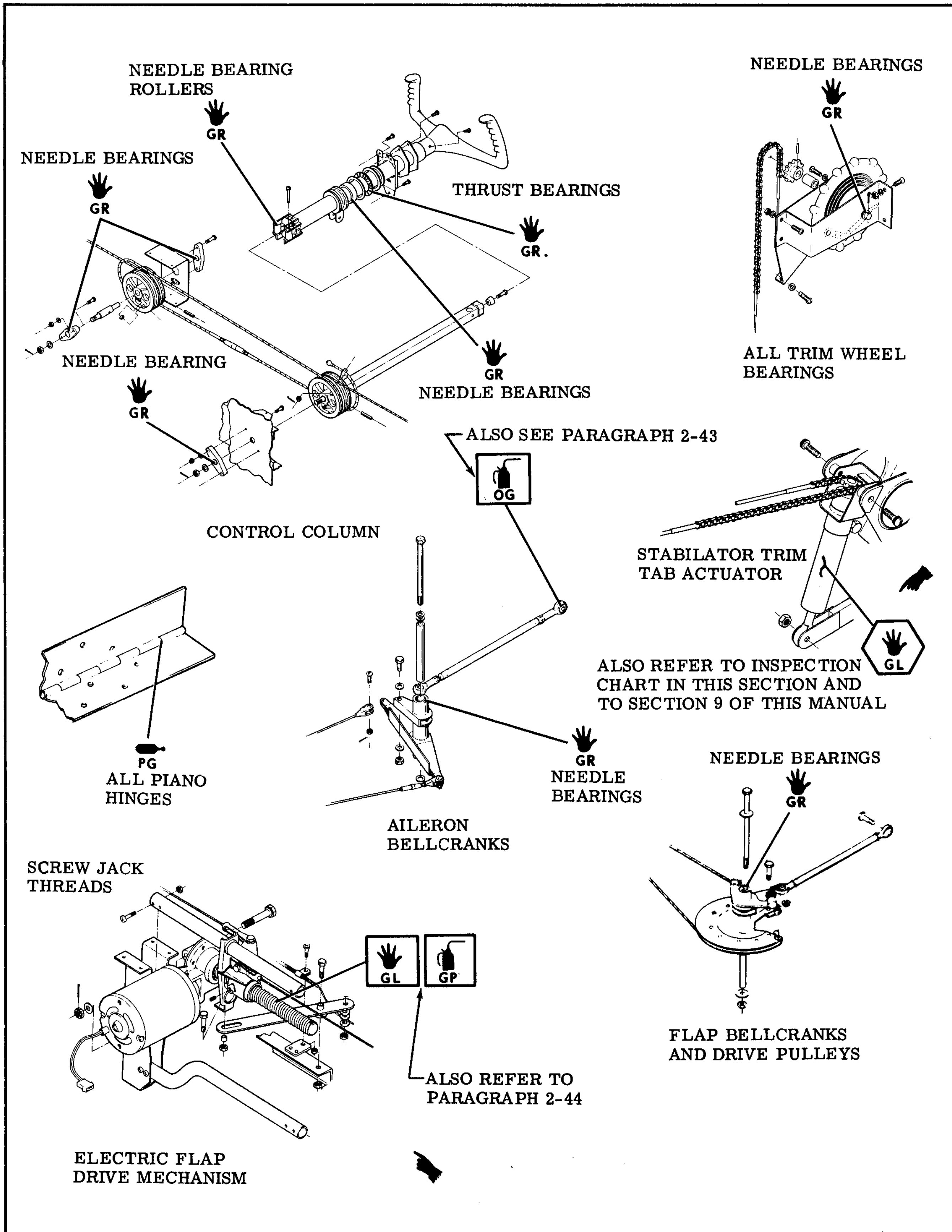
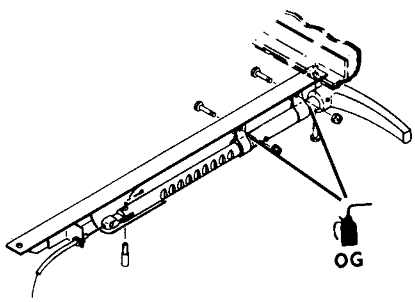
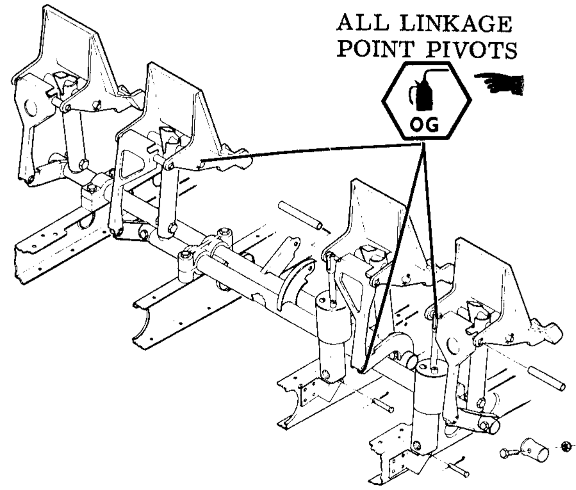


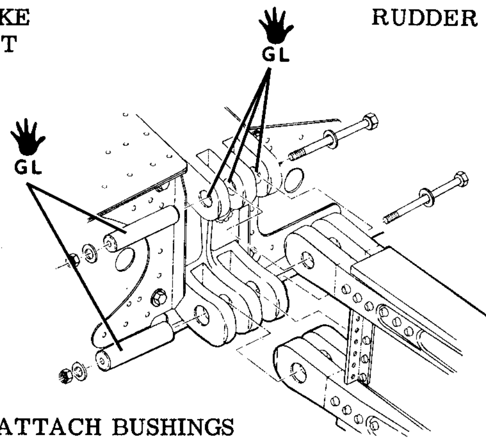
Figure 2-4. Lubrication (Sheet 2 of 3)



PARKING BRAKE HANDLE SHAFT



RUDDER BARS AND PEDALS



WING-ATTACH BUSHINGS

NOTES

Sealed bearings require no lubrication.

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

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

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

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

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

I INSPECTION REQUIREMENTS.

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

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

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

II INSPECTION CHARTS.

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

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

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

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

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

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

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

III INSPECTION PROGRAM SELECTION.

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

1. **IF THE AIRCRAFT IS FLOWN LESS THAN 200 HOURS ANNUALLY.**

a. IF FLOWN FOR HIRE

An aircraft operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 100 hours and each 12 calendar months of operation. A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above.

b. IF NOT FLOWN FOR HIRE

An aircraft operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 12 calendar months (ANNUAL). A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above. In addition, it is recommended that between annual inspections, all items be inspected at the intervals specified in the inspection charts.

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

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

IV INSPECTION GUIDE LINES.

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

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

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

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

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

NOTE

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

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

(g) AIRCRAFT FILE.

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

To be displayed in the aircraft at all times:
1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
2. Aircraft Registration Certificate (FAA Form 8050-3).
3. Aircraft Radio Station License, if transmitter is installed (FCC Form 556).

To be carried in the aircraft at all times:
1. Weight and Balance, and associated papers (Latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
2. Aircraft Equipment List.

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

(h) ENGINE RUN-UP.

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

1. Engine temperatures and pressures.
2. Static rpm. (Also refer to Section 11 of this Manual.)
3. Magneto drop. (Also refer to Section 11 of this Manual.)
4. Engine response to changes in power.
5. Any unusual engine noises.
6. Fuel selector and/or shut-off valve; operate engine(s) on each tank (or cell) position and OFF position long enough to ensure shut-off and/or selector valve functions properly.
7. Idling speed and mixture; proper idle cut-off.
8. Alternator and ammeter.
9. Suction gage.
10. Fuel flow indicator.

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

SHOP NOTES:

IMPORTANT

READ ALL INSPECTION REQUIREMENTS PARAGRAPHS PRIOR TO USING THESE CHARTS.

PROPELLER

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Spinner	●			
2. Spinner bulkhead			●	
3. Blades	●			
4. Bolts			●	
5. Hub			●	
6. Governor and Control			●	16

ENGINE COMPARTMENT

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

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Engine oil, screen, filler cap, dipstick, drain plug and external filter element	●			1
2. Oil cooler		●		
3. Induction air filter	●			2
4. Induction air box, air valves, doors and controls		●		
5. Cold and hot air hoses			●	
6. Engine baffles	●			
7. Cylinders, rocker box covers and push rod housings		●		
8. Crankcase, oil sump, accessory section and front crankshaft seal		●		
9. Hoses, metal lines and fittings	●			3
10. Ignition and exhaust systems	●			4
11. Ignition harness		●		
12. Spark plugs		●		
13. Compression check			●	
14. Crankcase and vacuum system breather lines			●	
15. Electrical wiring		●		
16. Vacuum pump and oil separator		●		
17. Vacuum relief valve filter (cabin area)			●	5
18. Engine controls and linkage	●			6
19. Engine shockmounts, mount structure and ground straps			●	
20. Cabin heat valves, doors and controls			●	

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
21. Starter, solenoid and electrical connections		●		
22. Starter brushes, brush leads and commutator			●	
23. Alternator and electrical connections		●		
24. Alternator brushes, brush leads, commutator or slip ring				7
25. Voltage regulator mounting and electrical leads		●		
26. Magnetos (externally) and electrical connections		●		
27. Magneto timing				8
28. Carburetor and drain plug		●		
29. Firewall			●	
30. Engine cowling	●			
FUEL SYSTEM				
1. Fuel strainer, drain valve and control, bay vents, caps and placards	●			
2. Fuel strainer screen and bowl		●		
3. Fuel reservoir			●	
4. Fuel bays, sump drains and fuel line drains			●	
5. Drain fuel and check bay interior, attachment and outlet screens				5
6. Fuel vent valves			●	
7. Fuel vent line drain			●	
8. Fuel selector valve and placards	●			
9. Fuel shut-off valve and placards	●			
10. Auxiliary fuel pump		●		
11. Engine-driven fuel pump		●		
12. Fuel vent line drain plug			●	
13. Engine primer		●		
LANDING GEAR				
1. Main gear wheels and fairings	●			
2. Nose gear wheel, torque links, steering rods, boots and fairings	●			
3. Wheel bearings				9
4. Nose gear strut and shimmy dampener (service as required)	●			

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

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
21. Antennas and cables			●	
22. Battery, battery box and battery cables	●			
23. Battery electrolyte				11
24. Emergency locater transmitter		●		12

CONTROL SYSTEMS

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

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

SPECIAL INSPECTION ITEMS

1 First 25 hours: refill with straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Change oil each 50 hours if the engine is NOT equipped with external oil filter; if equipped with external oil filter, change filter element each 50 hours and oil at each 100 hours; or every 6 months.

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

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

4 General inspection every 50 hours. Refer to Section 11 for 100 hour and 200 hour inspections.

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

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

7 Each 500 hours.

8 SLICK INTERNAL TIMING: These magnetos cannot be overhauled or timed in the field. The coil, capacitor and breaker assembly are non-repairable. As a good maintenance practice, and to have the benefit of good ignition at all times, it is recommended that the magnetos be removed at 900 hours of magneto time, and install new exchange magnetos.

SLICK MAGNETO-TO-ENGINE TIMING: First 50 hours, first 100 hours and thereafter at each 100 hours. If timing to the engine is not within plus zero degrees and minus two degrees, the magneto should be retimed to the engine.

BENDIX S-1200 and D-2000 INTERNAL TIMING AND MAGNETO-TO-ENGINE TIMING: First 25 hours, first 50 hours, first 100 hours and thereafter at each 100 hours, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. If magneto-to-engine timing is correct within plus zero degrees and minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine.

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

10 Replace each 500 hours.

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

12 Refer to Section 16 of this Manual for details.

13 Lubrication of the actuator is required each 1000 hours and/or 3 years, whichever comes first. Refer to figure 2-4 for grease specification.

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

14 Refer to paragraph 2-44 for detailed instructions for various serial ranges.

15 On aircraft 1770001 thru 17701908, each 100 hours, inspect vertical fin forward attachment bulkhead station 263.0 for cracks around vertical fin attachment bolt holes in accordance with Single Engine Service Letter SE73-40. Cracking around vertical fin attachment bolt holes will require that bulkhead assembly be replaced with improved configuration bulkhead by installing Service Kit SK177-28.

16 If leakage is evident, refer to McCauley Service Manual.

SECTION 3

FUSELAGE

TABLE OF CONTENTS Page

3-1. FUSELAGE.

3-2. WINDSHIELD AND WINDOWS.

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

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

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

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

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

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

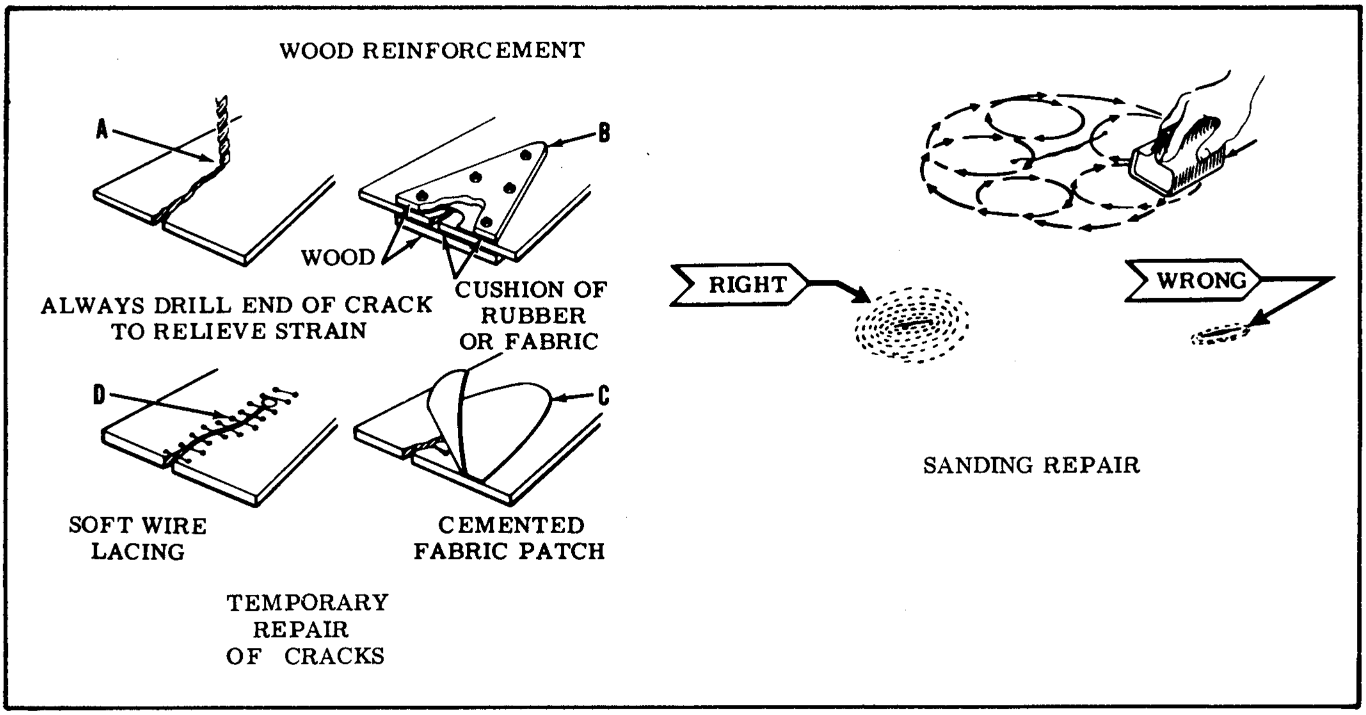


Figure 3-1. Repair of Windshield and Windows

CAUTION

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

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

c. When the scratches have been removed, wash area thoroughly with clean water to remove 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 the wheel against plastic surface, moving it constantly over the damaged area until the cloudy appearance disappears. A 2000-foot-per-minute surface speed is recommended to prevent overheating and distortion. (Example: 750 rpm polishing machine with a 10 inch buffing bonnet.)

NOTE

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

e. When the 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 eventually cause scratching of the 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.

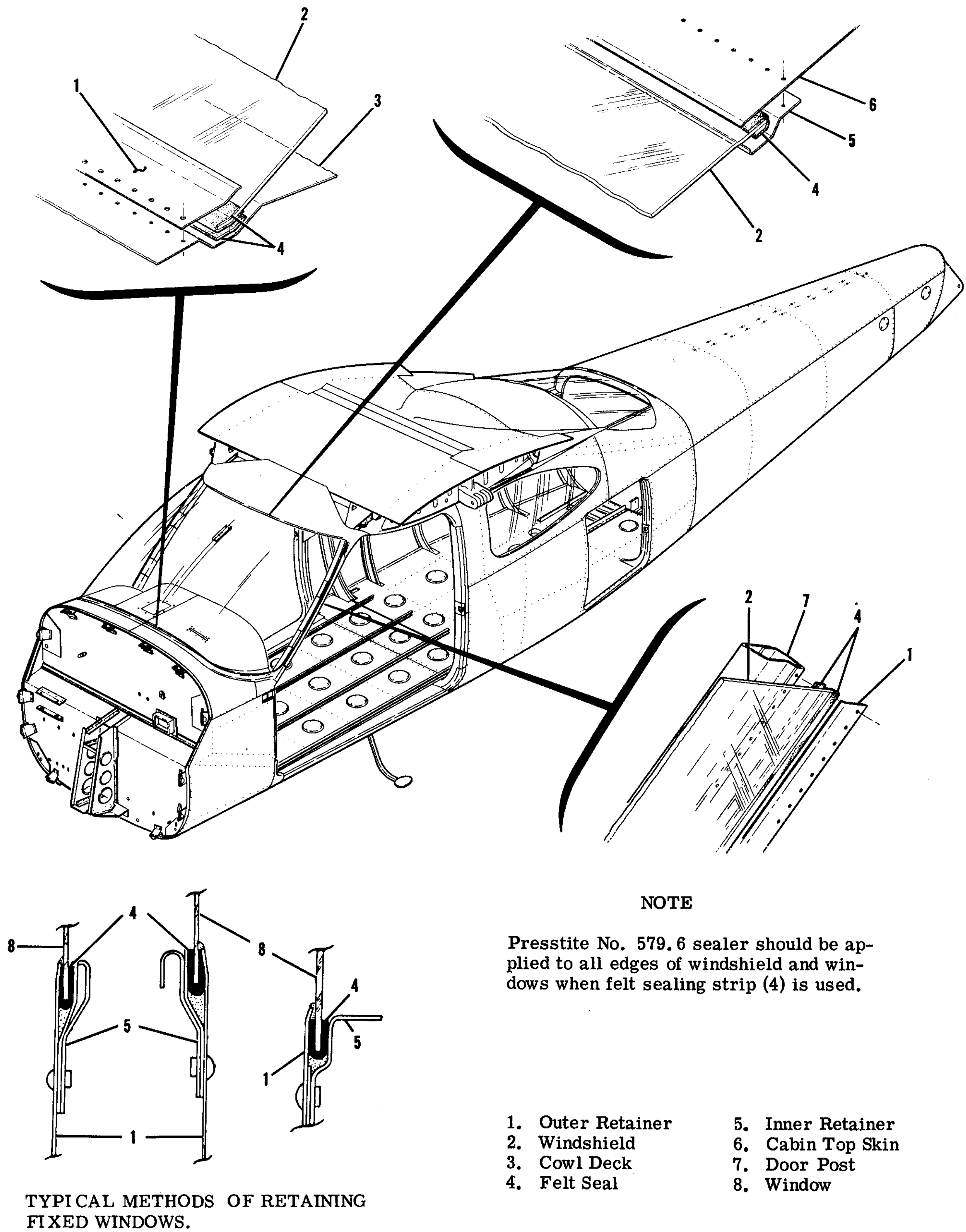
f. Minute hairline scratches can often be removed by rubbing with commercial automobile body cleaner or fine-grade rubbing compound. Apply with a soft, clean, dry cloth or imitation chamois.

3-8. CRACKS. (Refer to 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 of 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.



NOTE

Presstite No. 579.6 sealer should be applied to all edges of windshield and windows when felt sealing strip (4) is used.

1. Outer Retainer
2. Windshield
3. Cowl Deck
4. Felt Seal
5. Inner Retainer
6. Cabin Top Skin
7. Door Post
8. Window

Figure 3-2. Windshield and Fixed Window Installation

d. A temporary repair can be made by drilling small holes along both sides of crack 1/4 to 1/8 inch apart and lacing edges together with soft wire. Small-stranded antenna wire makes a good temporary lacing material. This type of repair is used as a temporary measure ONLY, and as soon as facilities are available, panel should be replaced.

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

3-10. REMOVAL.
a. Drill out rivets securing front retainer strip.
b. Remove wing fairings over windshield edges.
c. Remove outside air temperature gage.

NOTE

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

d. Pull windshield straight forward, out of side and top retainers. Remove top retainer if necessary.

3-11. INSTALLATION.
a. Apply felt strip and sealing compound or sealing tape to all edges of windshield to prevent leaks.
b. Reverse steps in preceding paragraph for installation.
c. When installing a new windshield, check fit and carefully file or grind away excess plastic.
d. Use care not to crack windshield when installing. If not previously removed, top retainer may be removed if necessary. Starting at upper corner and gradually working windshield into position is recommended.

NOTE

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

3-12. WINDOWS.

3-13. MOVABLE. (Refer to figure 3-3.) A movable window, hinged at the aft edge, is installed in the forward part of each cabin door. The window is operated by a crank on the inside of the door.

3-14. REMOVAL AND INSTALLATION.
a. Disconnect window arm (15).
b. Drill out rivets attaching window hinge to door.

NOTE

Since the hinge and retainers are sealed to the clear plastic, the window assembly must be replaced.

c. Reverse preceding steps for installation.

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

3-16. REMOVAL AND INSTALLATION.
a. Remove upholstery as necessary to expose retainer strips inside cabin.
b. Drill out rivets as necessary to remove retainers on both sides and lower edge of window.
c. Remove window by starting at aft edge and pulling window into cabin area.
d. Reverse preceding steps for installation. Apply sealing strips and an adequate coating of sealing compound to prevent leaks. When installing a new window, use care not to crack panel and file or grind away excess plastic.

3-17. FIXED. The fixed windows are one-piece acrylic plastic panels set in sealing strips and sealing compound and held in place by formed retainer strips.

3-18. REMOVAL AND INSTALLATION.
a. SIDE WINDOWS. (Refer to figure 3-2.)
1. Remove upholstery and trim panels as necessary.
2. Drill out rivets as necessary to remove retainer strips and remove window.
3. Reverse preceding steps for installation. Apply sealing strips and an adequate coating of sealing compound to all edges of window to prevent leaks. When installing a new window, use care not to crack panel and file or grind away excess plastic.
b. DOOR WINDOWS. (Refer to figure 3-3.)
1. Remove weatherstripping as necessary.
2. Drill out rivets around edge of door in the area of window.
3. Pull window out through top of door.
4. Reverse preceding steps for installation. Apply sealing strips and an adequate coating of sealing compound to all edges of window to prevent leaks. When installing a new window, use care not to crack panel and file or grind away excess plastic.

3-19. CABIN DOORS. (Refer to figure 3-3.)

3-20. REMOVAL AND INSTALLATION.
a. Disconnect door stop arm (18) at bracket (11).
b. Remove upholstery panels as necessary to gain access to hinge pins.
c. Remove upper hinge pin stop (20) and remove pin. Upper pin is installed with head down.
d. Remove pin from hinge (16).
e. Using care, remove door.
f. Reverse preceding steps for installation.

3-21. ADJUSTMENT. Cabin doors should be adjusted so skin fairs with fuselage skin. When fitting a new door, some trimming of door skin at edges and some reforming with a soft mallet may be necessary to achieve a good fit. Beginning with aircraft Serial 17701634 bonded doors are installed. It is not permissible to form the flange on these doors as it could cause material separation.

3-22. WEATHERSTRIP. Extruded seals are installed on the door frame to control leakage. Seals may be replaced by removing seals, throughly cleaning the surface and applying appropriate cemment for the material being used. Beginning with aircraft Serial 17701974 a nylon extruded seal is also installed on the door jamb.

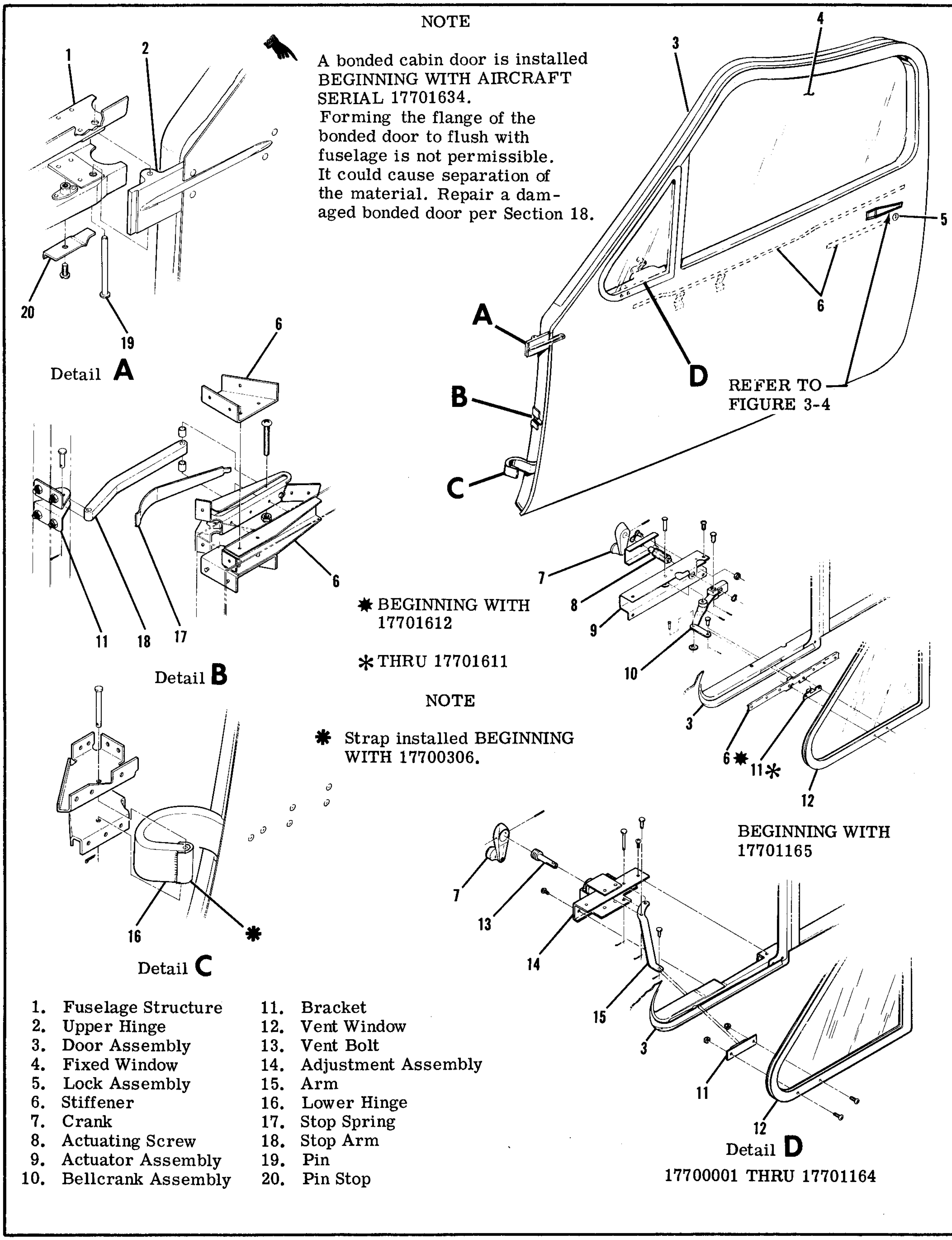


Figure 3-3. Cabin Door Installation

3-23. LATCHES. (Refer to figure 3-4.)

3-24. DESCRIPTION. The cabin door latch is a push-pull bolt type, utilizing a rotary clutch for positive bolt engagement. As door is closed, teeth on underside of bolt engage gear teeth on clutch. The clutch gear rotates in one direction only and holds door until handle is moved to LOCK position, driving bolt into slot. Beginning with Serial 17701774 and airplanes modified per SK177-26, a sliding bolt and stop have been added to the upper forward corner of the cabin to improve sealing. The bolt is actuated when the door handle is moved to the lock position.

NOTE

Do not close cabin door with the handle in the lock position, as damage to the forward bolt and or door jamb will result.

3-25. ADJUSTMENT. Vertical adjustment of the rotary clutch is afforded by slotted holes which ensures sufficient gear-to-bolt engagement and proper alignment.

NOTE

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

3-26. LOCK. In addition to interior locks, a cylinder and key type lock is installed on left door. If lock is to be replaced, the new one may be modified to accept the original key. This is desirable, as the same key is used for ignition switch and cabin door lock. After removing old lock from door, proceed as follows:
a. Remove lock cylinder from new housing.
b. Insert original key into new cylinder and file off any protruding tumblers flush with cylinder. Without removing key, check that cylinder rotates freely in housing.
c. Install lock assembly in door and check lock operation with door open.
d. Destroy new key and disregard code number on cylinder.

3-27. INDEXING INSIDE HANDLE. (Refer to figure 3-4.) When inside door handle is removed, reinstall in relation to position of bolt (4) which is spring-loaded to CLOSE position. The following procedure may be used:
a. Temporarily install handle (10) on shaft assembly (20) approximately vertical.
b. Move handle (10) back and forth until handle centers in spring-loaded position.
c. Without rotating shaft assembly (20), remove handle and install placard (15) with CLOSE index at top and press placard to seat prongs.
d. Install nylon washer (14).
e. Install handle (10) to align with CLOSE index on placard (15) and install clip (13).
f. Ensure bolt (4) clears doorpost and teeth engage clutch gear when handle (10) is in CLOSE position.

3-28. BAGGAGE DOOR. (Refer to figure 3-5.)

3-29. REMOVAL AND INSTALLATION.
a. Disconnect door-stop chain (9).
b. Remove screws securing upholstery panels and remove panels.
c. Remove bolts (11) securing door to hinges or remove clevis pins (10) securing hinges to brackets.
d. Reverse preceding steps for installation.

NOTE

When fitting a new door, trimming of door at edges and reforming with a soft mallet may be necessary to achieve a good fit.

3-30. SEATS. (Refer to figure 3-6.)

3-31. PILOT AND COPILOT.
a. RECLINING BACK.
b. VERTICAL ADJUST/RECLINING BACK.
c. ARTICULATING RECLINE/VERTICAL ADJUST.

3-32. DESCRIPTION. These seats are manually-operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-33. REMOVAL AND INSTALLATION.
a. Remove seat stops from rails.
b. Slide seat fore-and-aft to disengage seat rollers from rails.
c. Lift seat out.
d. Reverse preceding steps for installation. Ensure all seat stops are reinstalled.

WARNING

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

3-34. CENTER.
a. DOUBLE-WIDTH BOTTOM AND BACK/SINGLE RECLINING BACK.
b. DOUBLE-WIDTH BOTTOM AND BACK/INDIVIDUAL RECLINING BACKS.

3-35. DESCRIPTION. These seats are permanently bolted to the cabin structure and incorporate no adjustment provisions other than manually-adjustable three position backs.

3-36. REMOVAL AND INSTALLATION.
a. Remove bolts securing seat to cabin structure.
b. Lift seat out.
c. Reverse preceding steps for installation.

3-37. AUXILIARY.
a. FOLD-UP.

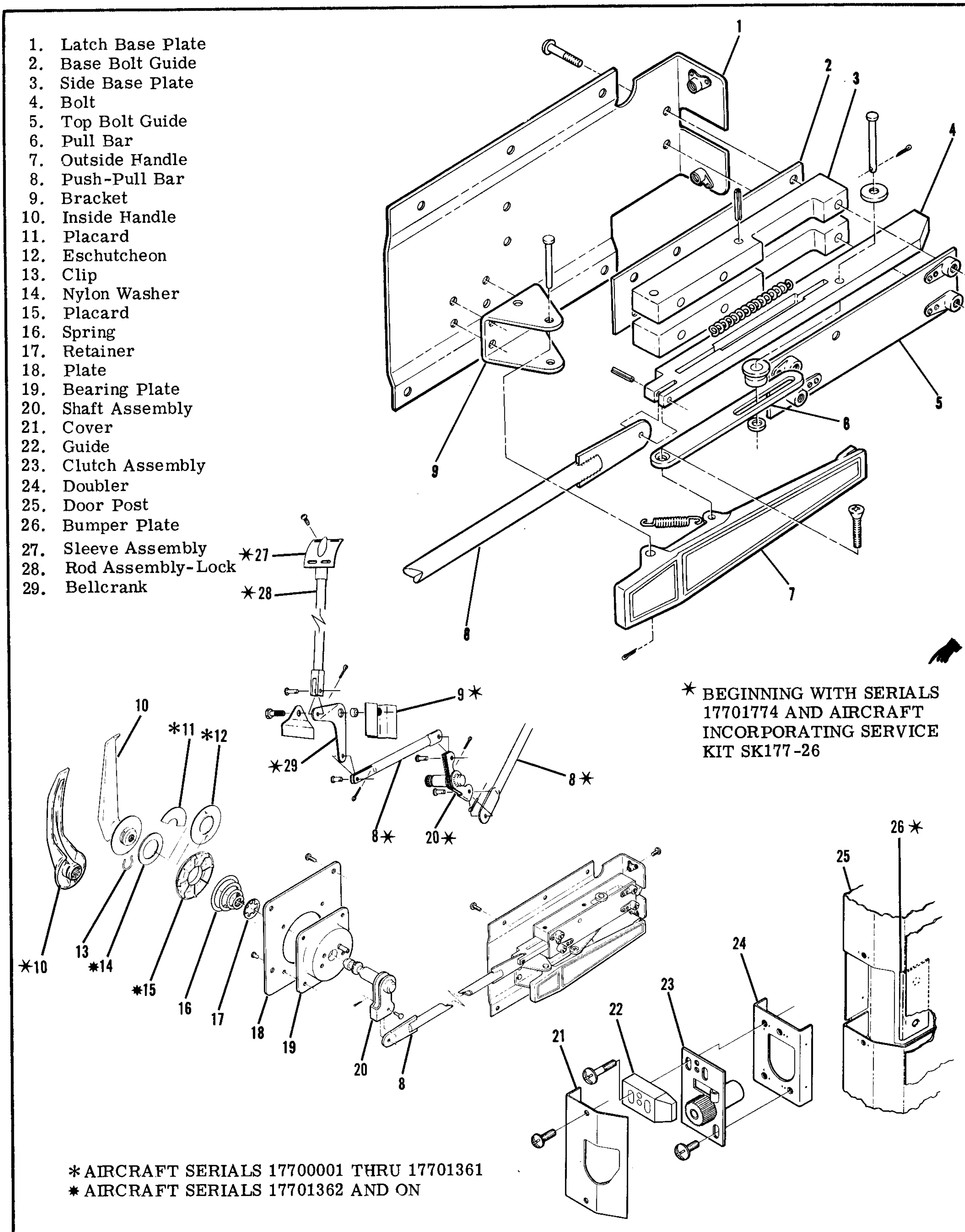
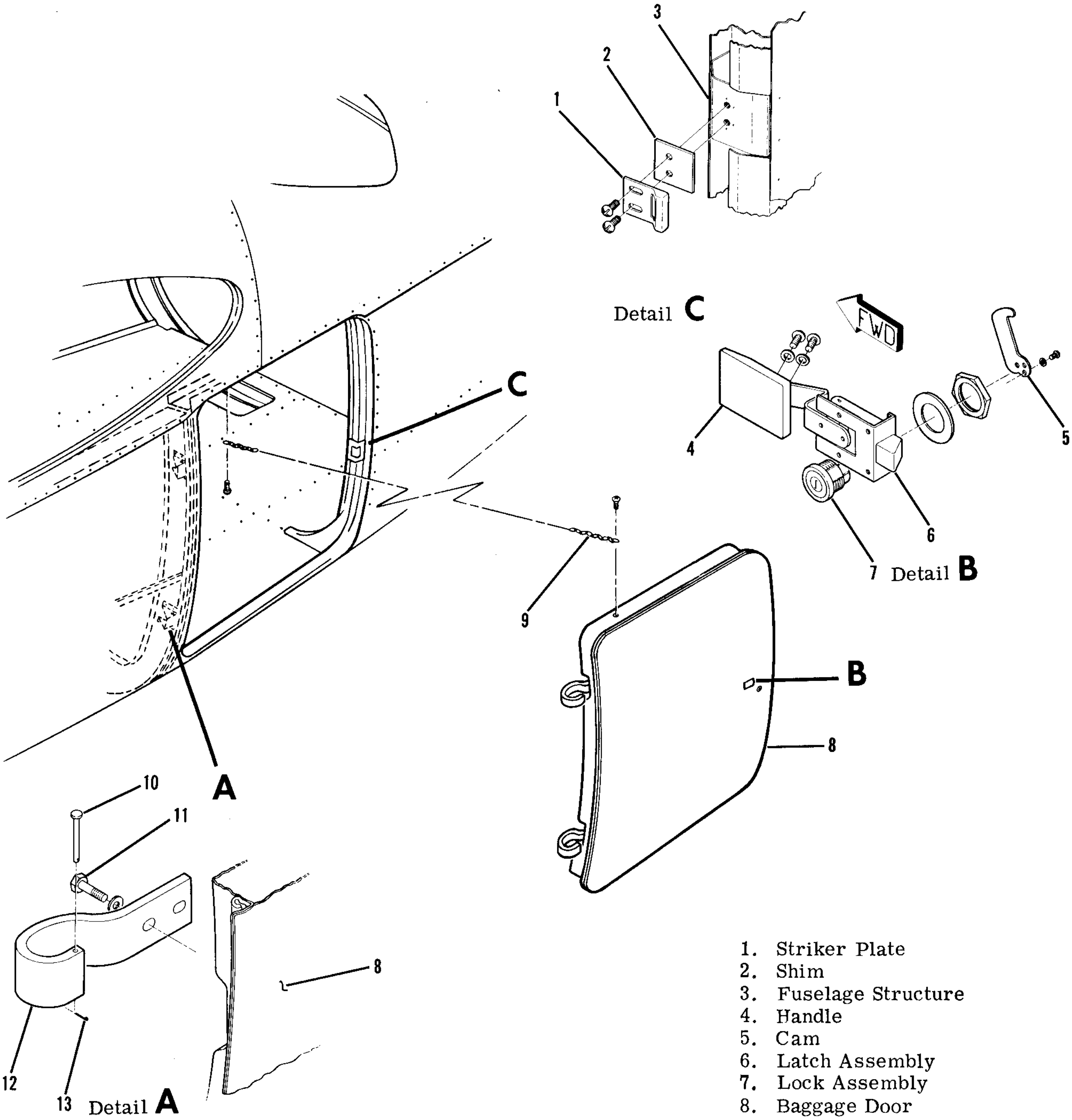


Figure 3-4. Cabin Door Latch

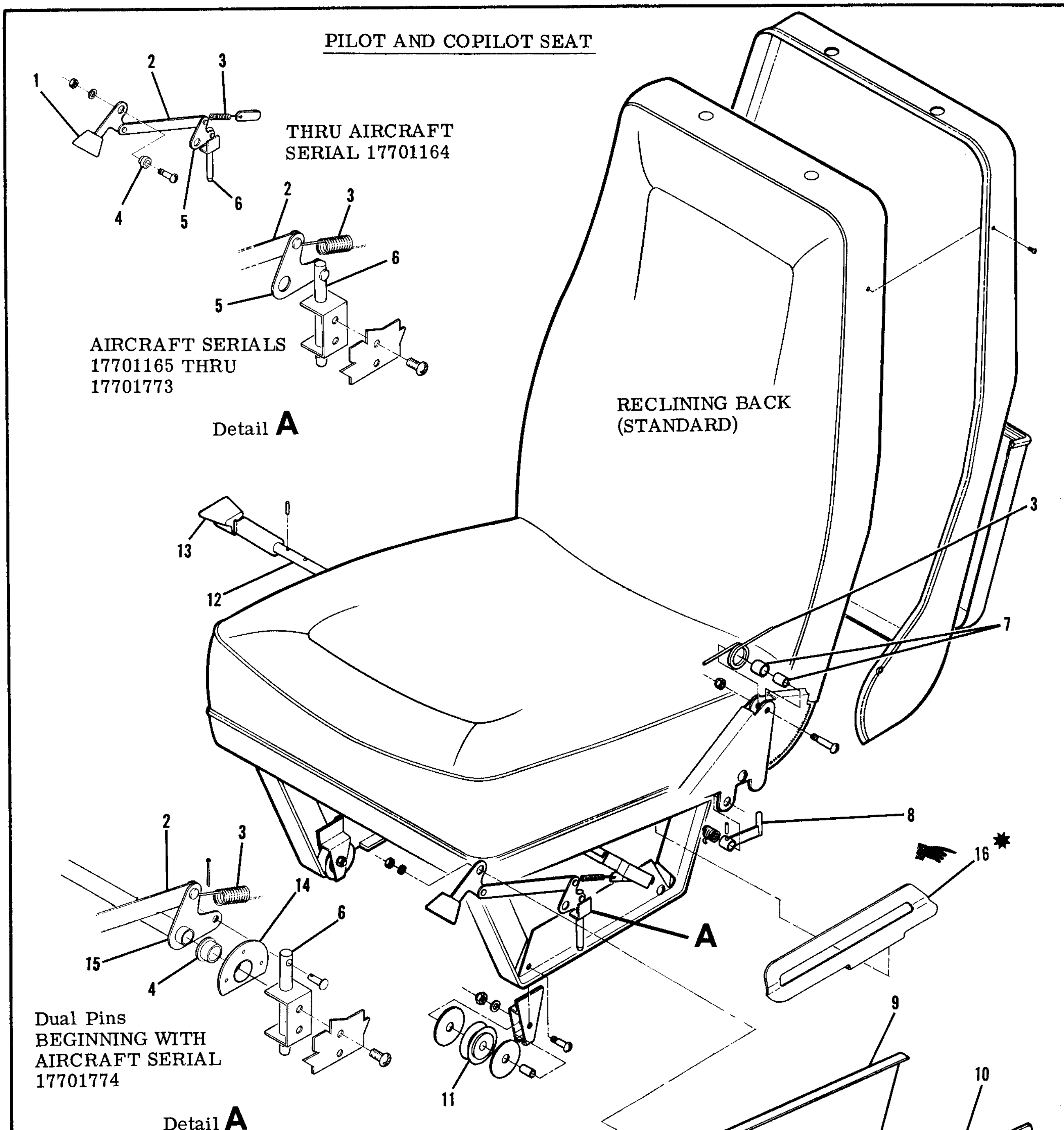


1. Striker Plate
2. Shim
3. Fuselage Structure
4. Handle
5. Cam
6. Latch Assembly
7. Lock Assembly
8. Baggage Door
9. Chain
10. Clevis Pin
11. Bolt
12. Hinge
13. Cotter Pin

NOTE

BEGINNING WITH AIRCRAFT SERIAL 17701531 a bonded baggage door is installed. When fitting a new door, it is not permissible to form the flange of the door as it could cause material separation. Repair bonded door per Section 18.

Figure 3-5. Baggage Door Installation

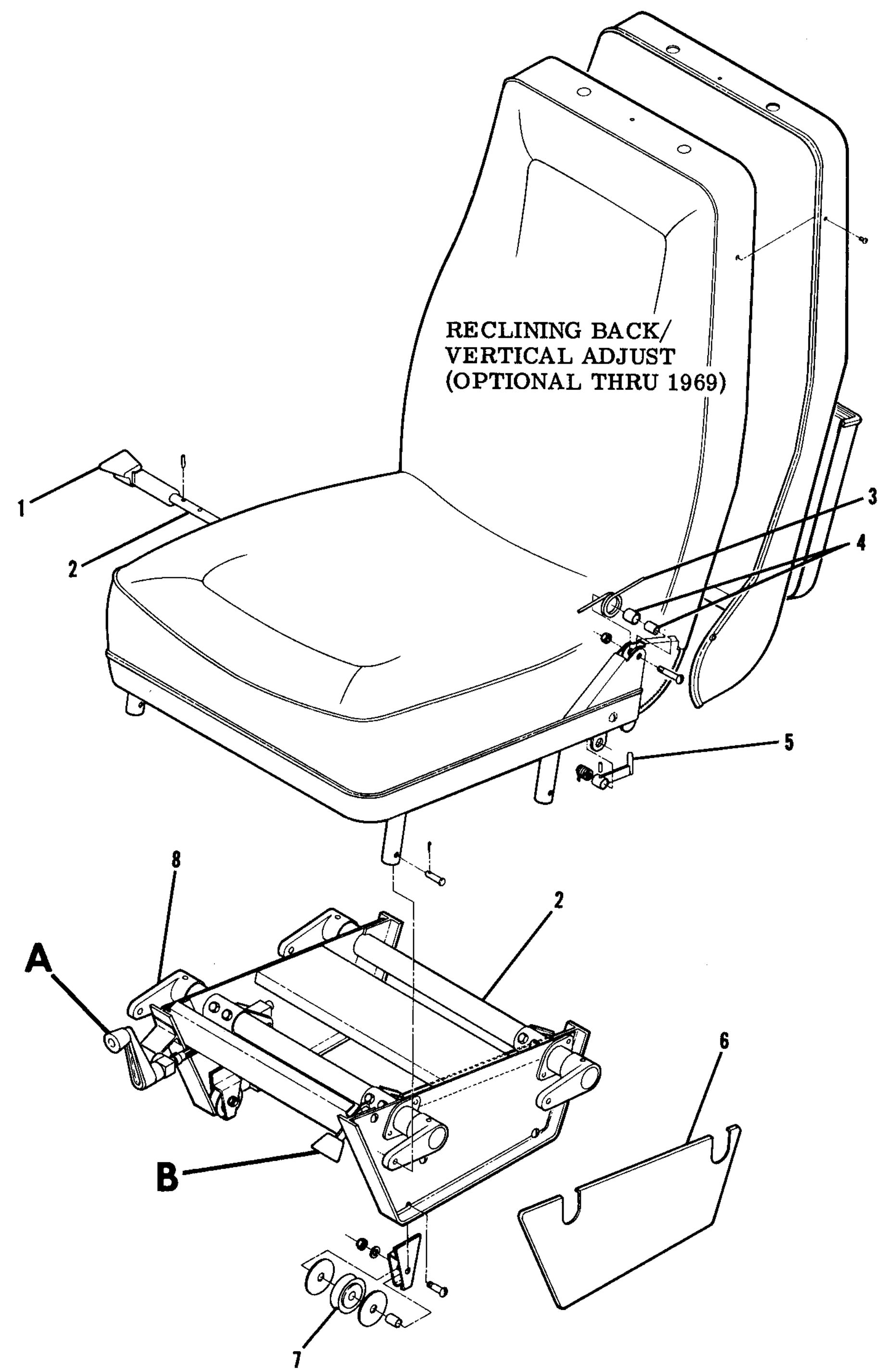


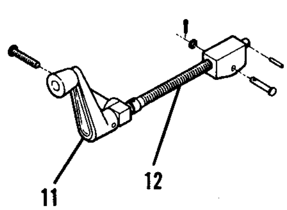
1. Fore/Aft Adjustment Handle
2. Link
3. Spring
4. Bushing
5. Bellcrank
6. Adjustment Pin
7. Bushing
8. Adjustment Pawl
9. Web
10. Cover
11. Roller
12. Torque Tube
13. Recline Handle
14. Housing
15. Bellcrank Assembly
16. Seat Belt Retainer

Figure 3-6. Seat Installation (Sheet 1 of 7)

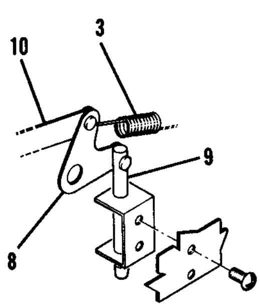
1. Recline Handle
2. Torque Tube
3. Spring
4. Bushing
5. Adjustment Pawl
6. Cover
7. Roller
8. Bellcrank
9. Adjustment Pin
10. Link
11. Vertical Adjustment Handle
12. Screw Assembly

PILOT AND COPILOT SEAT





Detail **A**

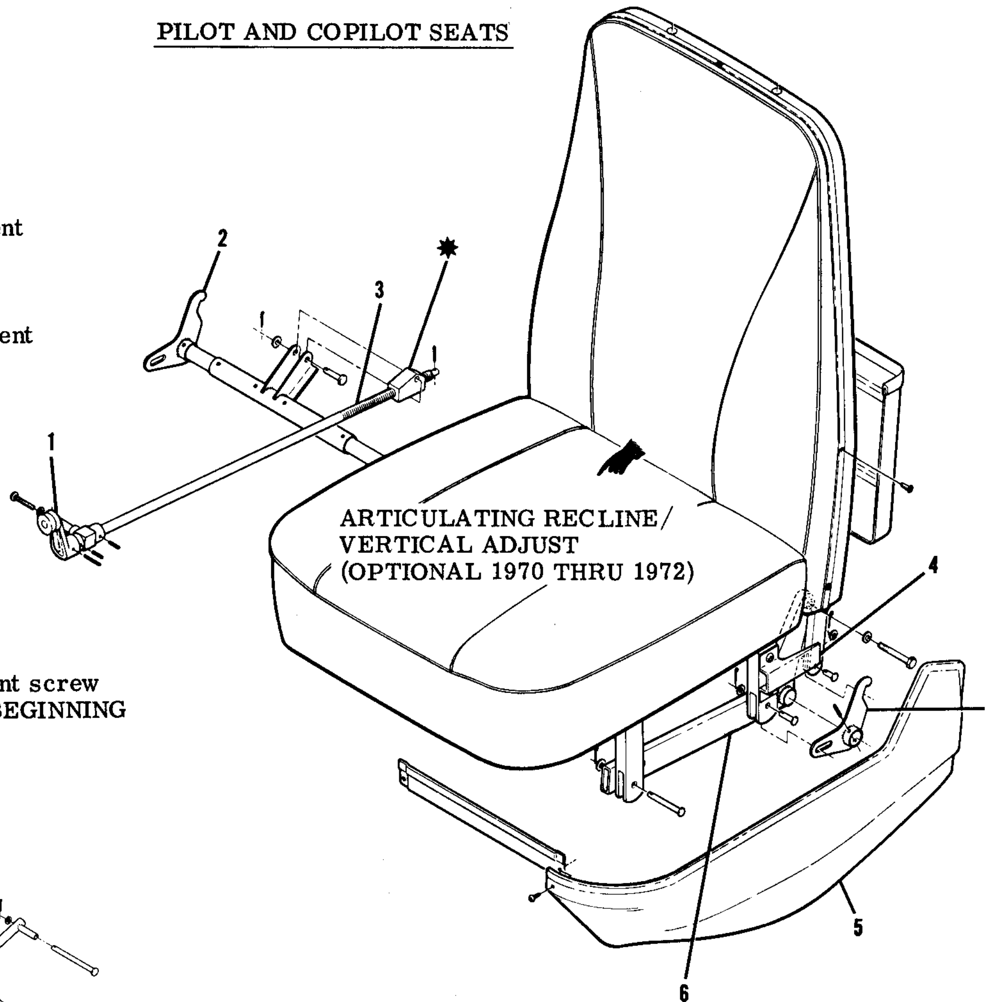


Detail **B**

Figure 3-6. Seat Installation (Sheet 2 of 7)

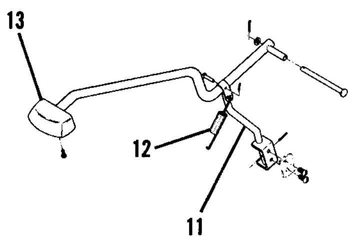
1. Articulating Adjustment Handle
2. Bellcrank
3. Adjustment Screw
4. Trim Bracket
5. Trim
6. Channel
7. Torque Tube
8. Seat Structure
9. Roller
10. Vertical Adjustment Handle
11. Adjustment Pin
12. Spring
13. Fore/Aft Adjustment Handle

PILOT AND COPILOT SEATS

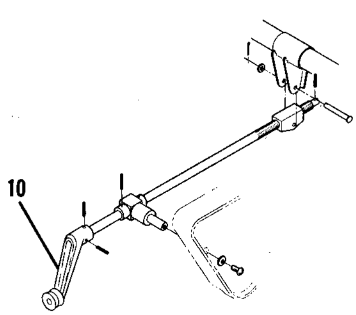


NOTE

✱ The nut on adjustment screw (3) is rotated 180° BEGINNING WITH 17701634.



Detail A



Detail B

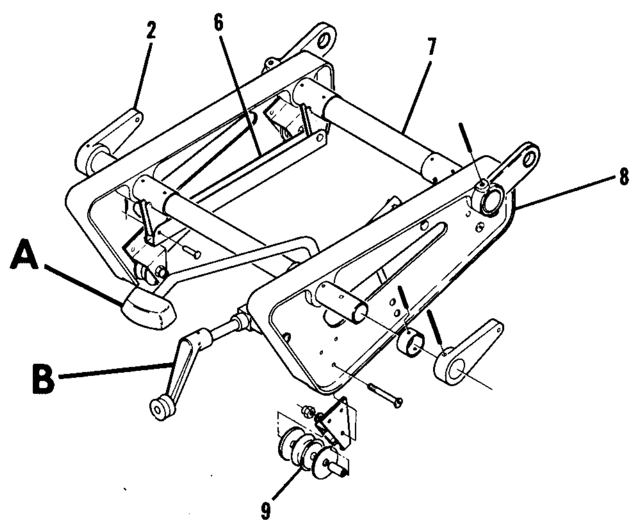
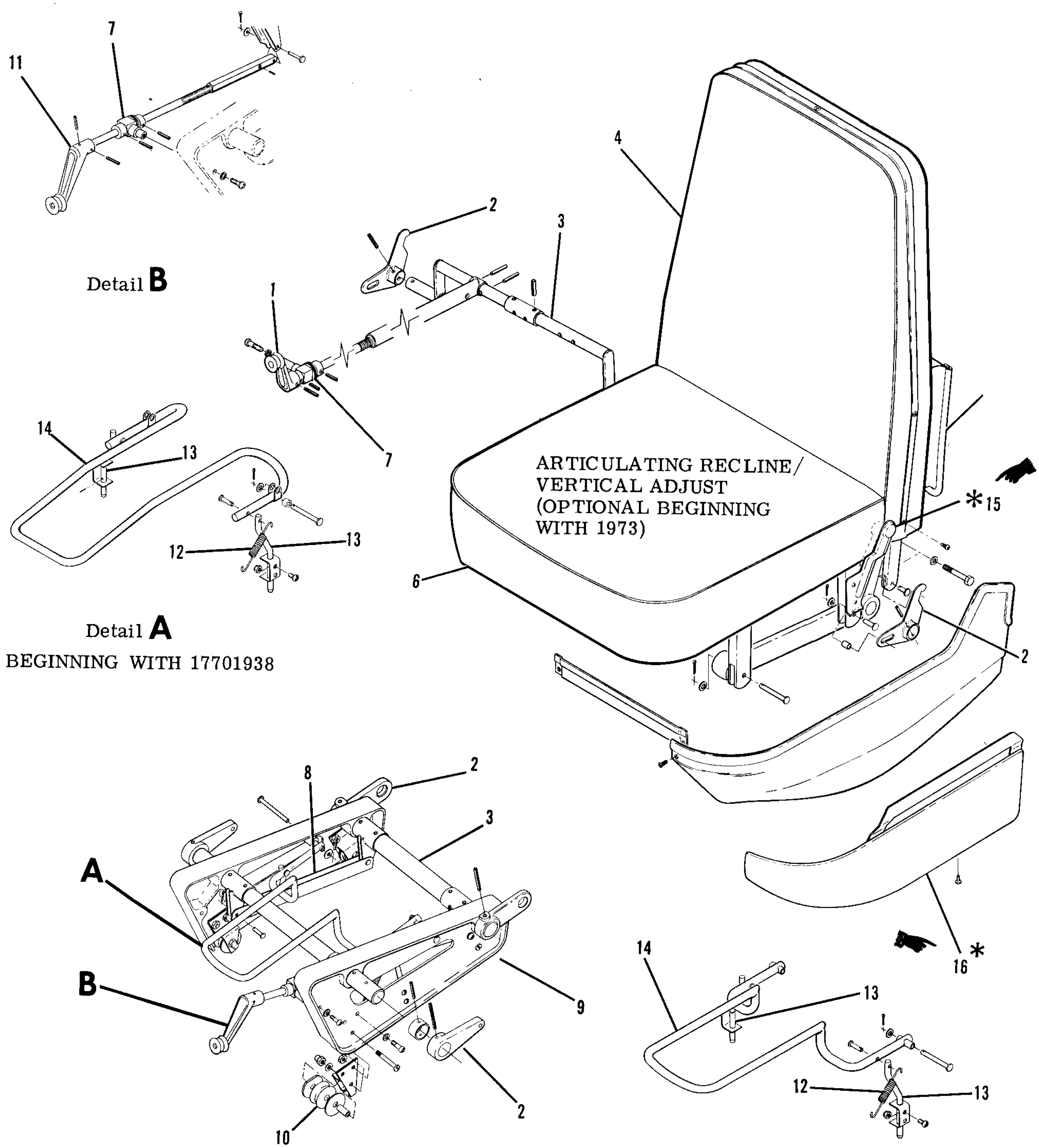


Figure 3-6. Seat Installation (Sheet 3 of 7)

PILOT AND COPILOT SEATS



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

Detail A

THRU 17701937

* SERIALS 17702113 THRU 17702313

* BEGINNING WITH SERIALS 17702314

Figure 3-6. Seat Installation (Sheet 4 of 7)

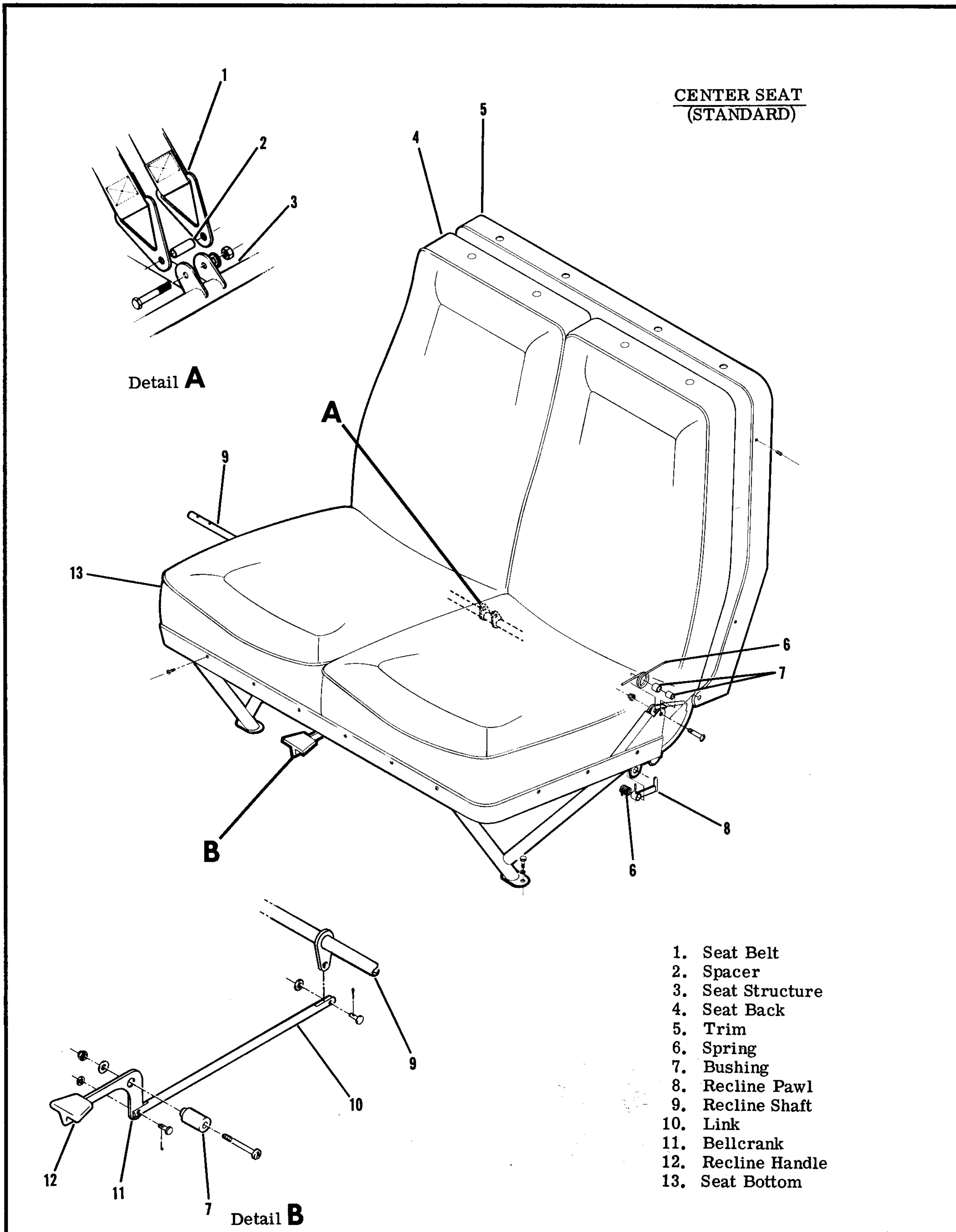


Figure 3-6. Seat Installation (Sheet 5 of 7)

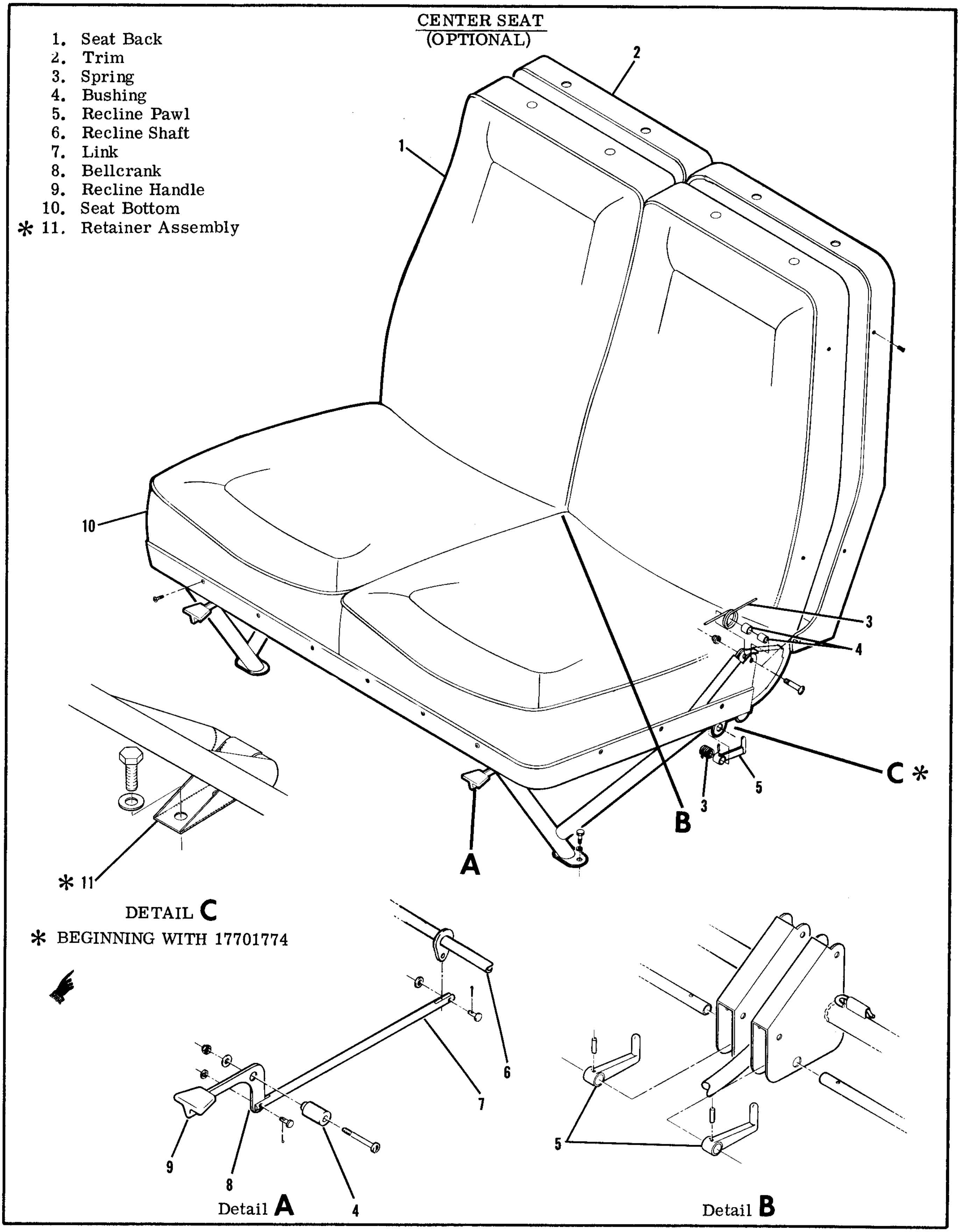
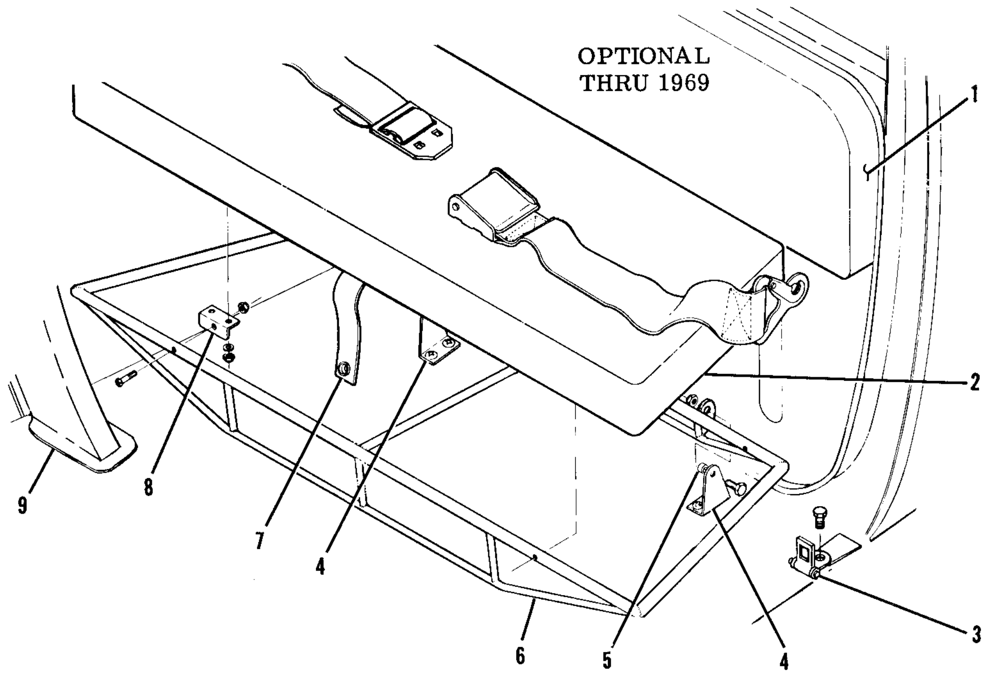
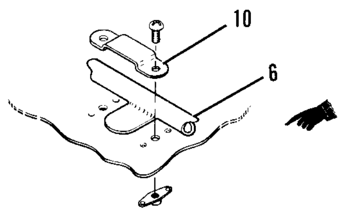


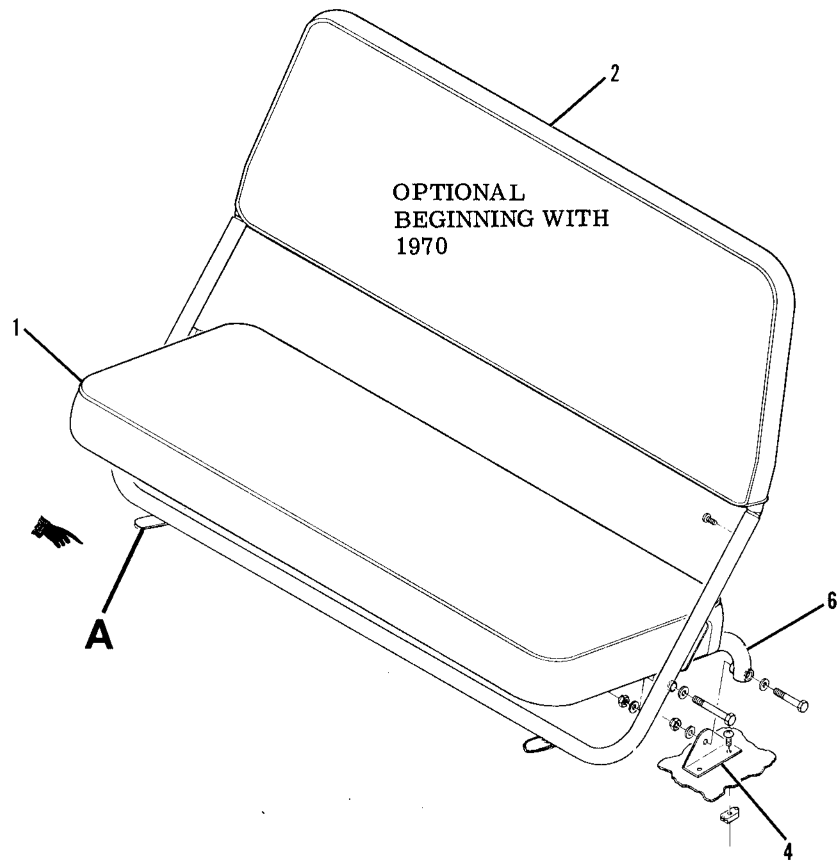
Figure 3-6. Seat Installation (Sheet 6 of 7)

AUXILIARY SEATS



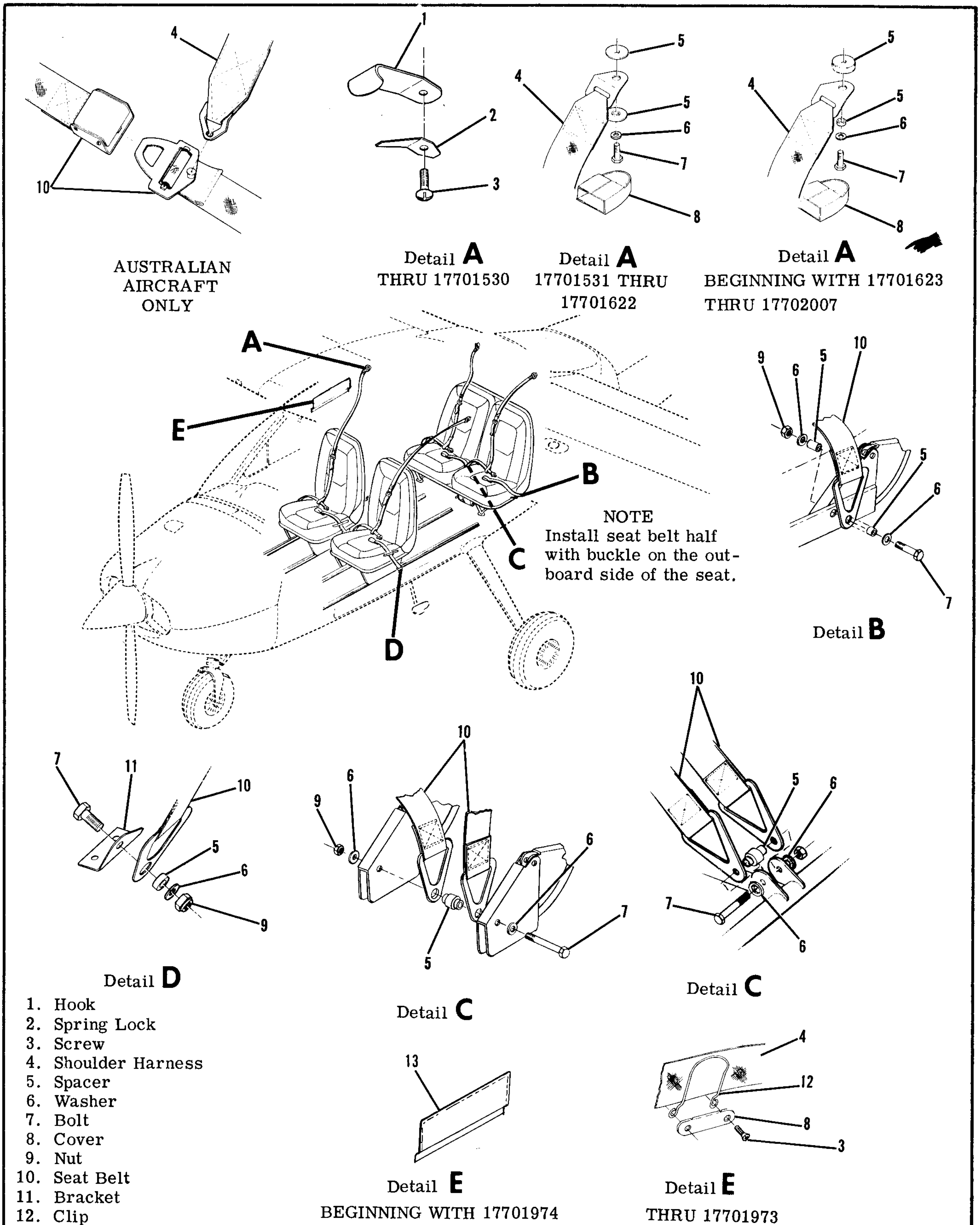


Detail **A**
BEGINNING WITH
SERIAL 17702124



1. Seat Back
2. Seat Bottom
3. Seat Belt Anchor
4. Hinge Bracket
5. Spacer
6. Seat Bottom Structure
7. Strap
8. Mounting Bracket
9. Fuselage Structure
10. Bracket

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



1. Hook
2. Spring Lock
3. Screw
4. Shoulder Harness
5. Spacer
6. Washer
7. Bolt
8. Cover
9. Nut
10. Seat Belt
11. Bracket
12. Clip
13. Tray (Shoulder Harness)

Figure 3-6A. Seat Belt and Shoulder Harness Installation(Sheet 1 of 2)

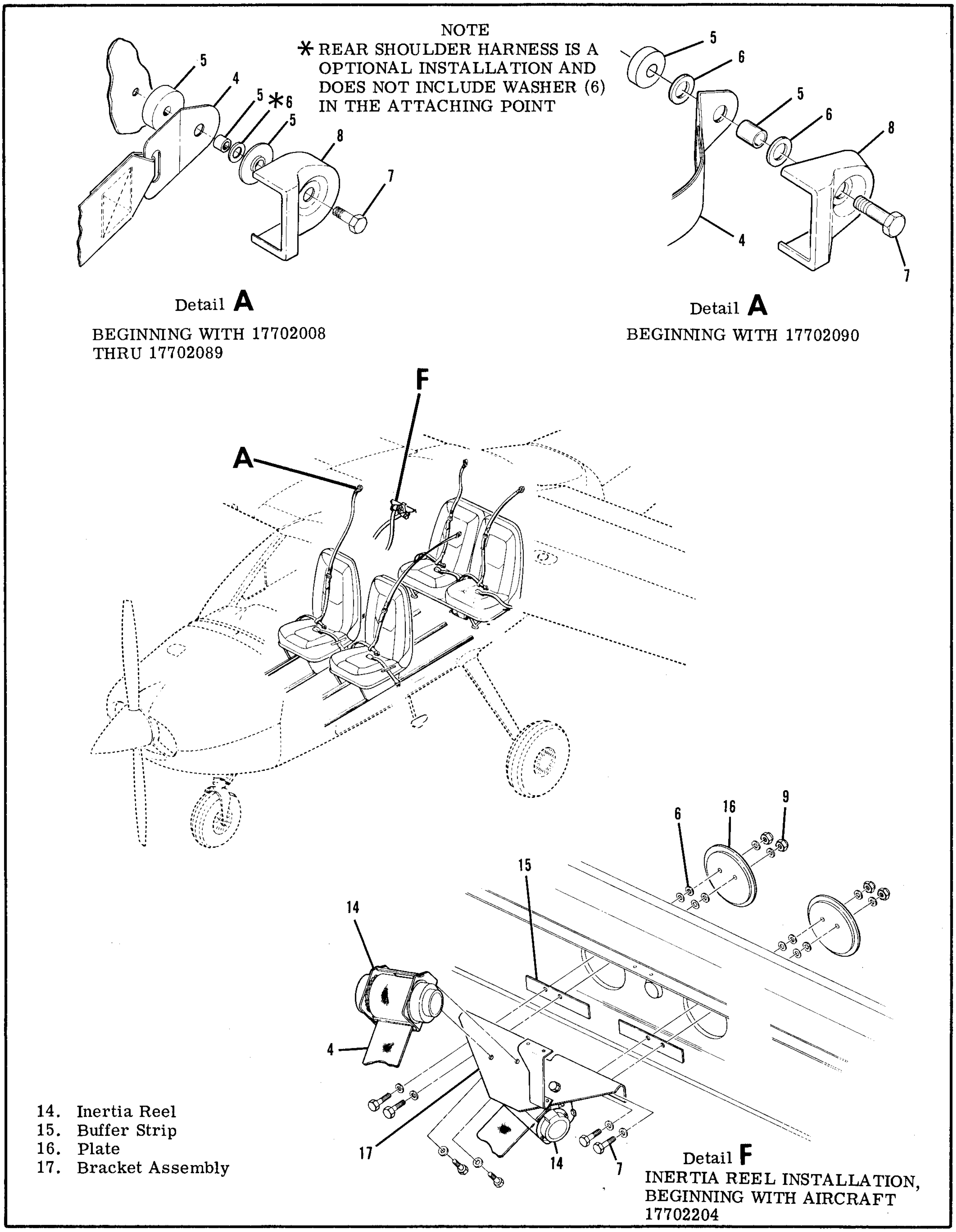


Figure 3-6A. Seat Belt and Shoulder Harness Installation(Sheet 2 of 2)

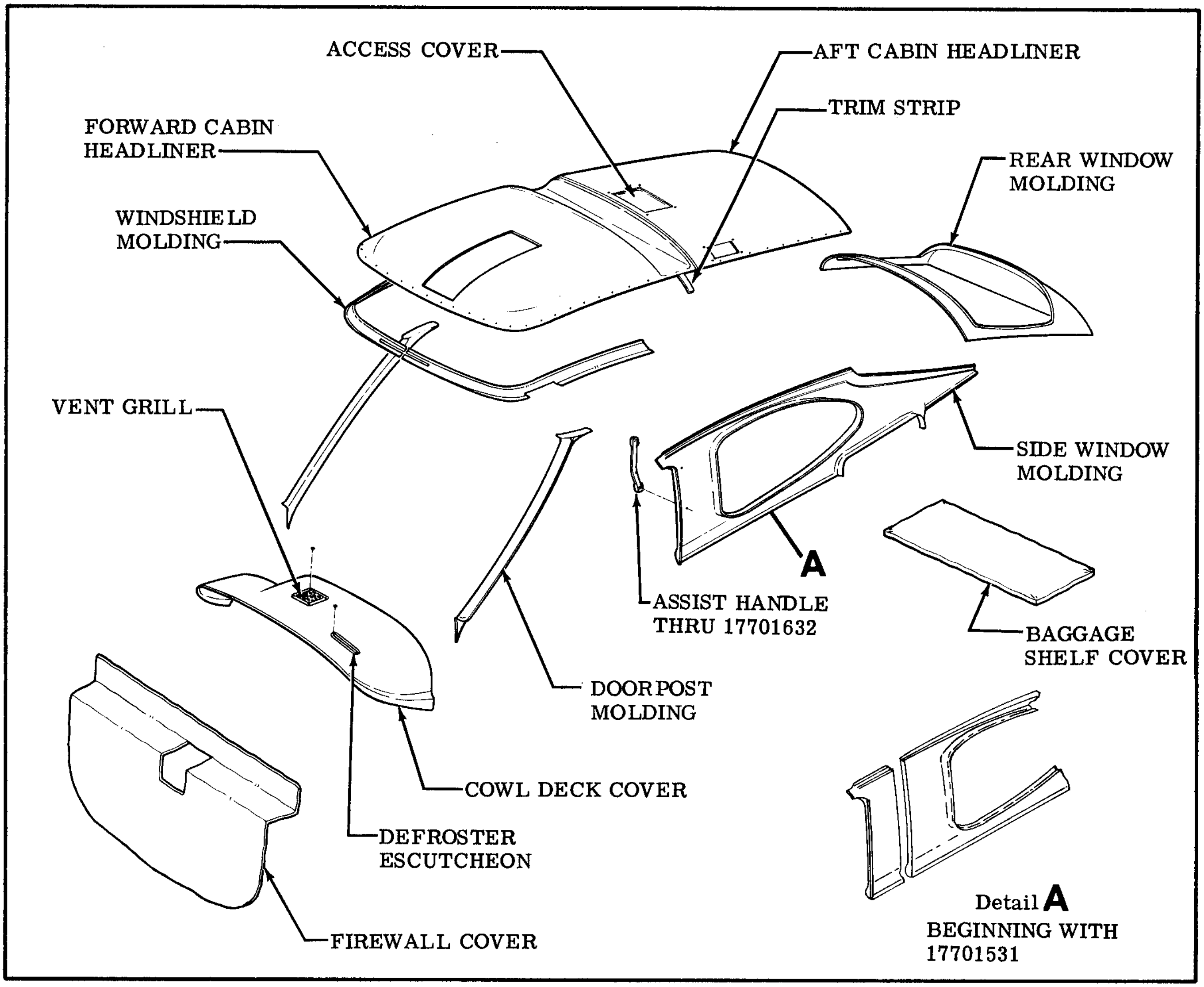


Figure 3-7. Cabin Upholstery

3-38. DESCRIPTION. These seats are permanently bolted to the cabin structure and have no adjustment provisions. The seat structure is mounted on hinge brackets with pivot bolts, thus allowing seat to be pivoted upward to acquire more baggage area.

3-39. REMOVAL AND INSTALLATION.

a. Remove bolts securing seat structure to hinge brackets.

b. Unsnap seat back from aft cabin wall. (1968 and 1969 Models).

c. Lift seat out.

d. Reverse preceding steps for installation.

3-40. REPAIR. Replacement of defective parts is recommended in repair of seats. However, a cracked framework may be welded, provided the crack is not in an area of stress concentration (close to a hinge or bearing point). The square-tube framework is 6061 aluminum, heat-treated to a T-6 condition. Use a heliarc weld on these seats, as torch welds will destroy heat-treatment of frame structure.

3-41. 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 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.

3-42. MATERIALS AND TOOLS. Materials and tools will vary with the job. Scissors for trimming upholstery to size and a dull-bladed putty knife for wedging material beneath retainer strips are the only tools required for most trim work. Use industrial rubber cement to hold soundproofing mats and fabric edges in place. Refer to Section 18 for thermo-plastic repairs.

3-43. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound dead-

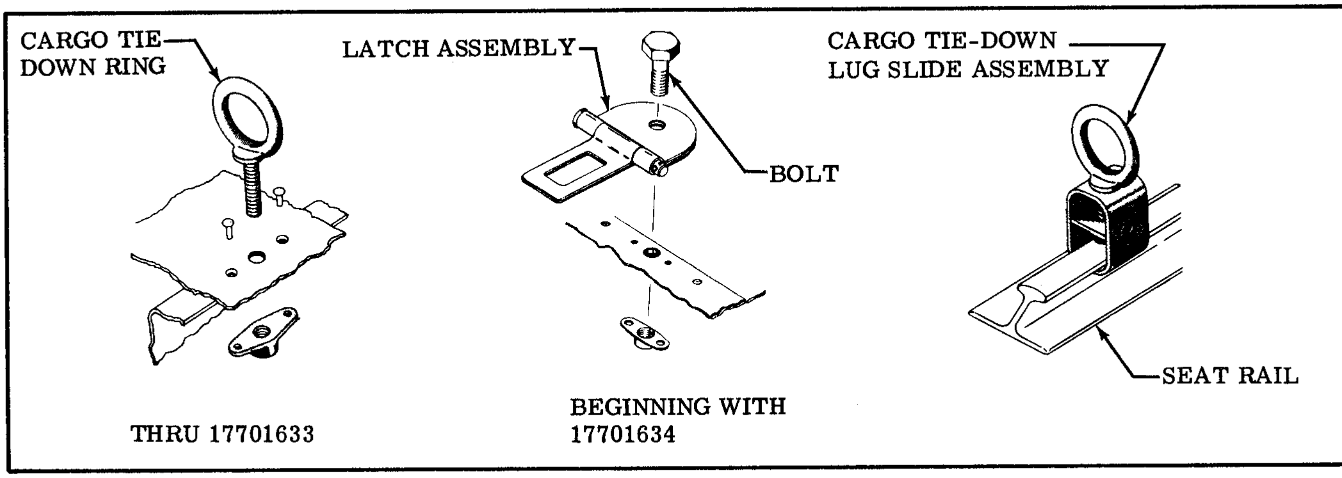


Figure 3-8. Cargo Tie-Downs

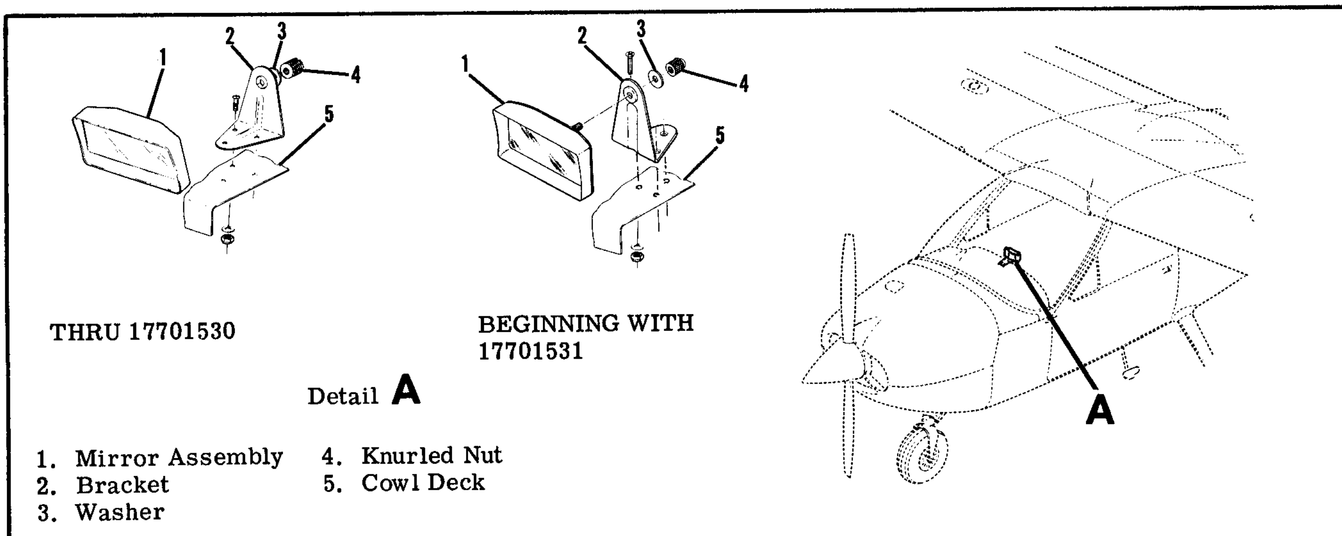


Figure 3-9. Rear View Mirror Installation

ener compound applied to inner surfaces of skin in most areas of cabin and baggage compartment. All soundproofing material should be replaced in its original position any time it is removed. A soundproofing panel is placed in gap between wing and fuselage and held in place by wing root fairings.

3-44. CABIN HEADLINER. (Refer to figure 3-7.)

3-45. DESCRIPTION. The cabin headliner is constructed of closed-cell thermoformed plastic, installed in two sections. One section extends from aft of the main spar forward and the other section from the main spar aft. The headliner is held in place with sheet metal screws.

3-46. REMOVAL AND INSTALLATION.

a. Remove forward air inlet controls and overhead console.
b. Remove rear air inlet controls and escutcheons.
c. Remove access cover aft of main spar.
d. Remove molding from fixed windows and trim strip above windshield.
e. Remove screws from the aft headliner section and carefully remove section.
f. Remove screws from the forward headliner section and carefully remove section.
g. Remove spun glass soundproofing panels.

NOTE

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

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

3-47. UPHOLSTERY SIDE PANELS. Removal of upholstery side panels is accomplished by removing seats for access, then removing parts attaching panels. Remove screws, retaining strips, arm rests and ash trays as required to free panels. Automotive type spring clips attach most door panels. A dull putty knife makes an excellent tool for prying clips loose. When installing side panels, do not over-tighten screws. Larger screws may be used in enlarged holes as long as area behind hole is checked for electrical wiring, fuel lines and other components which might be damaged by using a longer screw.

3-48. WINDLACE (DOOR SEAL). To furnish an ornamental edging for door opening and to provide additional sealing, a windlace is installed between upholstery panels or trim panels and doorpost structure. The windlace is held in place by sheet metal screws.

3-49. CARPETING. Cabin area and baggage compartment carpeting is held in place by rubber cement, small sheet metal screws and retaining strips. When fitting a new carpet, use old one as a pattern for trimming and marking screw holes. Some aircraft are equipped with a heavy-duty vinyl floor covering in the baggage compartment instead of carpeting. This covering is held in place by rubber cement, screws and retainers. Cargo tie-downs and/or safety belt brackets may be removed as necessary to aid in removal of carpeting.

3-50. SAFETY PROVISIONS.

3-51. CARGO TIE-DOWNS. Cargo tie-downs are used to ensure baggage cannot enter seating area during flight. Methods of attaching tie-downs are illustrated in figure 3-8. The eyebolt and nutplate can be located at various points. The sliding tie-down lug also utilizes the eyebolt and attaches to a seat rail. A baggage net may be installed using the cargo tie-downs.

3-52. SAFETY BELTS. Safety belts should be replaced if frayed or cut, latches are defective or stitching is broken. Attaching parts should be replaced if excessively worn or defective. The front seat safety belts are attached to clips bolted to the cabin floor and the center seat safety belts are attached to the seats themselves. The auxiliary seat is provided with only one safety belt and is snapped into clips bolted to the cabin floor. Refer to figure 3-6A for installation.

NOTE

On 1968 through 1970 model aircraft, when installing front and center seat safety belts be sure the belt half with the buckle is installed on the inboard side of the seat. Beginning with 1971 models the belt half with the buckle should be installed on the outboard side of the seat to ensure proper operation of the shoulder harness.

3-53. SHOULDER HARNESS. Individual shoulder harnesses may be installed for each seat except auxiliary. Each harness is connected to the upper fuselage structure and to the seat safety belt buckle. Component parts should be replaced as outlined in preceding paragraph. An inertia reel installation may be installed as optional equipment. Refer to figure 3-6A for installation.

3-54. REAR VIEW MIRROR. A rear view mirror may be installed on the cowl deck above instrument panel. Figure 3-9 shows details for rear view mirror installation.

SHOP NOTES:

SECTION 4

WINGS AND EMPENNAGE

TABLE OF CONTENTS Page

4-1. WINGS AND EMPENNAGE.

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

4-3. DESCRIPTION. Each wing is of all-metal construction 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 mounted on each wing assembly. The leading edge of the left wing is equipped with landing and taxi lights (thru 1970). Colored navigation lights are mounted at each wing tip.

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

a. Remove wing gap fairings and fillets.

b. Drain fuel from wing being removed.

c. Disconnect:

1. Electric wires at wing root disconnects.
2. Fuel lines at wing root.
3. Pitot line (left wing only) at wing root.
4. Cabin ventilator hoses at wing root.
5. Aileron carry-thru cable at turnbuckle in cabin area. Remove cable guards and/or pulleys as necessary to pull aileron cables into wing root area. Refer to figure 6-1 for aileron cable routing and turnbuckle location.

d. If right wing is being removed, disconnect flap cables at turnbuckles, and remove cable guards and/or pulleys as necessary to pull flap cables into right wing root area.

NOTE

To ease rerouting the cables, a guide wire may be attached to each cable before it is pulled free of the wing. 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.

e. If left wing is being removed, disconnect flap cables at turnbuckles, and remove cable guards and/ or pulleys as necessary to pull flap cables into left wing root area. Disconnect flap follow-up control from follow-up control arm and pull control out of wing area. Disconnect electrical lead at flap motor quick-disconnect. Refer to figure 7-1 for flap cable routing, turnbuckle location, and details of flap system.

NOTE

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

f. Remove nut, washer and bolt attaching front fuel spar to fuselage.
g. Remove bolts, washers, and retainers that hold main spar dowel pins in position.
h. Support wing at inboard and outboard end, and remove dowel pins that attach main wing spar to fuselage. It is best to remove the top dowel pin first, then lower outboard end of wing before removing the 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 the wings slightly while removing the pins. Care must be used not to damage dowel pins, spar fittings, or spar carry-thru fittings as these are reamed holes and close tolerance dowel pins.

i. 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 using the wing repair jig, which may be obtained from Cessna. The wing jig serves not only as a holding fixture, making work on the wing easier, but also assures absolute alignment of the repaired wing.

4-6. 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 up and install top pin.)

NOTE

Refer to figure 4-1 for lubrication of dowel pins prior to installation.

2. Bolts, retainers, 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. Electrical wires at wing root disconnects.
2. Fuel lines at wing root.
3. Pitot line (if left wing is being installed).
4. Cabin ventilator hoses at wing root.
e. Rig aileron system (Section 6).
f. Rig flap system (Section 7).
g. Refuel wing tank and check all connections for leaks.
h. Check operation of navigation, courtesy and landing lights. (Landing lights thru 1970 Models.)
i. Check operation of fuel gage.
j. Install wing gap fairings and fillets.

NOTE

Be sure to install soundproofing panel in wing gap before replacing fairings.

k. Install all inspection plates, interior panels and upholstery.
l. Test operate 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.

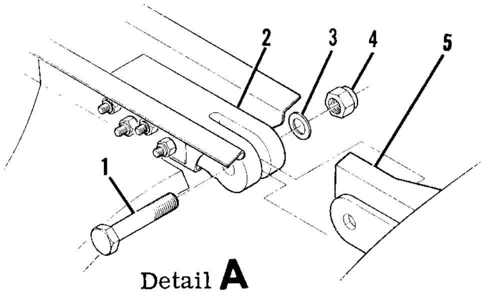
4-8. FIN. (Refer to figure 4-2).

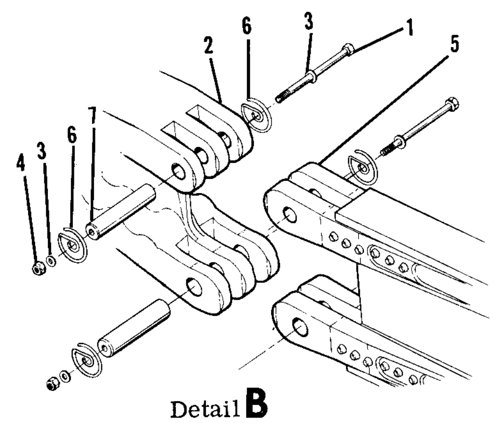
4-9. DESCRIPTION. The fin is primarily of metal construction, consisting of ribs and spars, covered with skin. Fin tips are of ABS construction. Hinge brackets at the rear spar attach the rudder. Brackets containing rudder stop bolts are attached at the rear spar.

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, following procedures outlined in Section 10.
a. Remove stabilator tab actuator arm and remove stinger.
b. Remove stabilator trim tab bellcrank.
c. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads, and rudder cables if rudder has not been removed.
d. Remove screws attaching dorsal to fuselage and fin and remove dorsal and dorsal fairing.
e. Remove bolts attaching fin rear spar to bulkhead and remove bolts attaching bracket at fin front spar to fuselage.
f. Remove the fin.

4-11. REPAIR. Fin repair should be accomplished in accordance with applicable instructions outlined in Section 18.

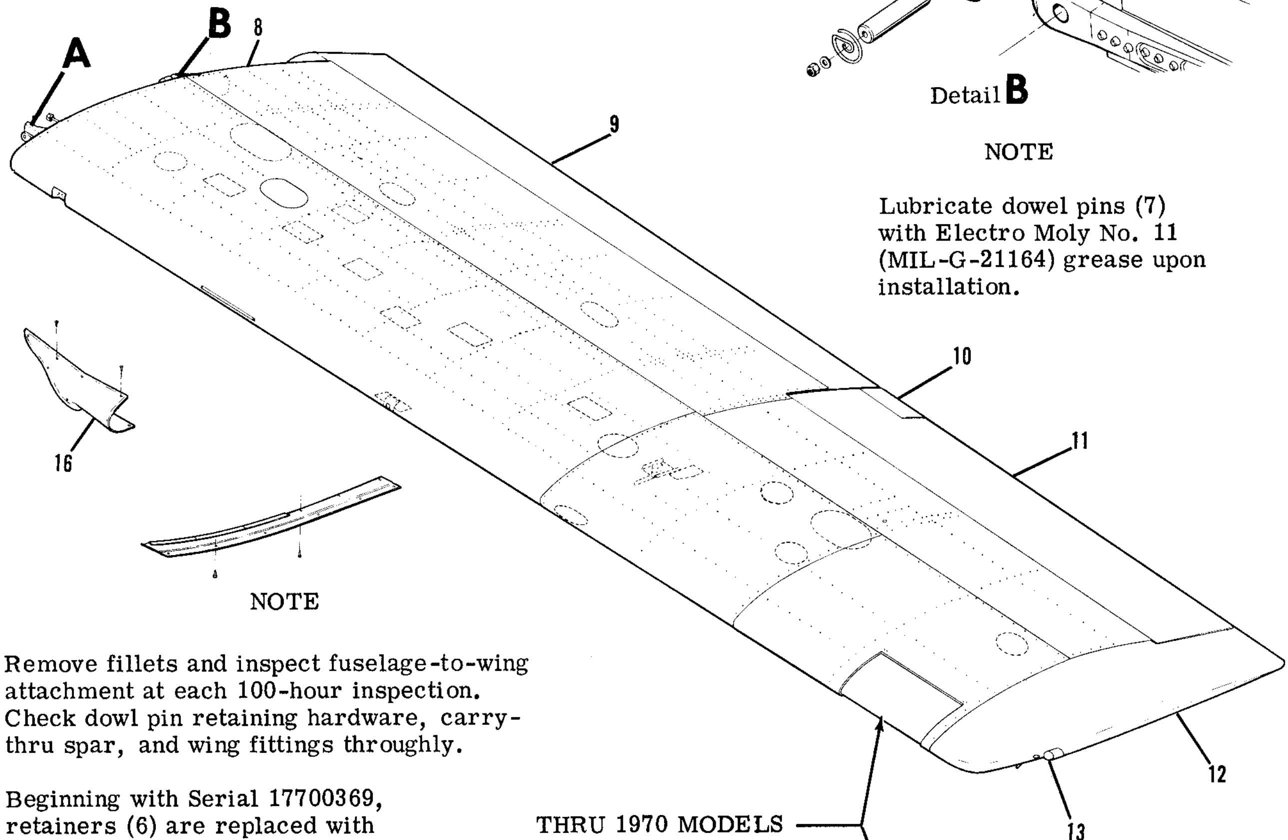
4-12. INSTALLATION. Reverse the steps outlined in paragraph 4-10 to install the fin. Check and reset rudder and stabilator travel if any stop bolts were removed or settings disturbed.





NOTE

Lubricate dowel pins (7) with Electro Moly No. 11 (MIL-G-21164) grease upon installation.



NOTE

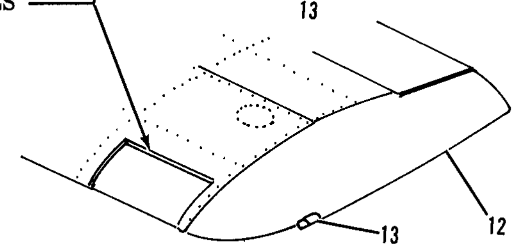
Remove fillets and inspect fuselage-to-wing attachment at each 100-hour inspection. Check dowl pin retaining hardware, carry-thru spar, and wing fittings throughly.

Beginning with Serial 17700369, retainers (6) are replaced with S1450-4H24-125 washers.

If there is damage to bushings in fittings (2) and (5), notify factory before anticipating replacement, as these are critical areas.

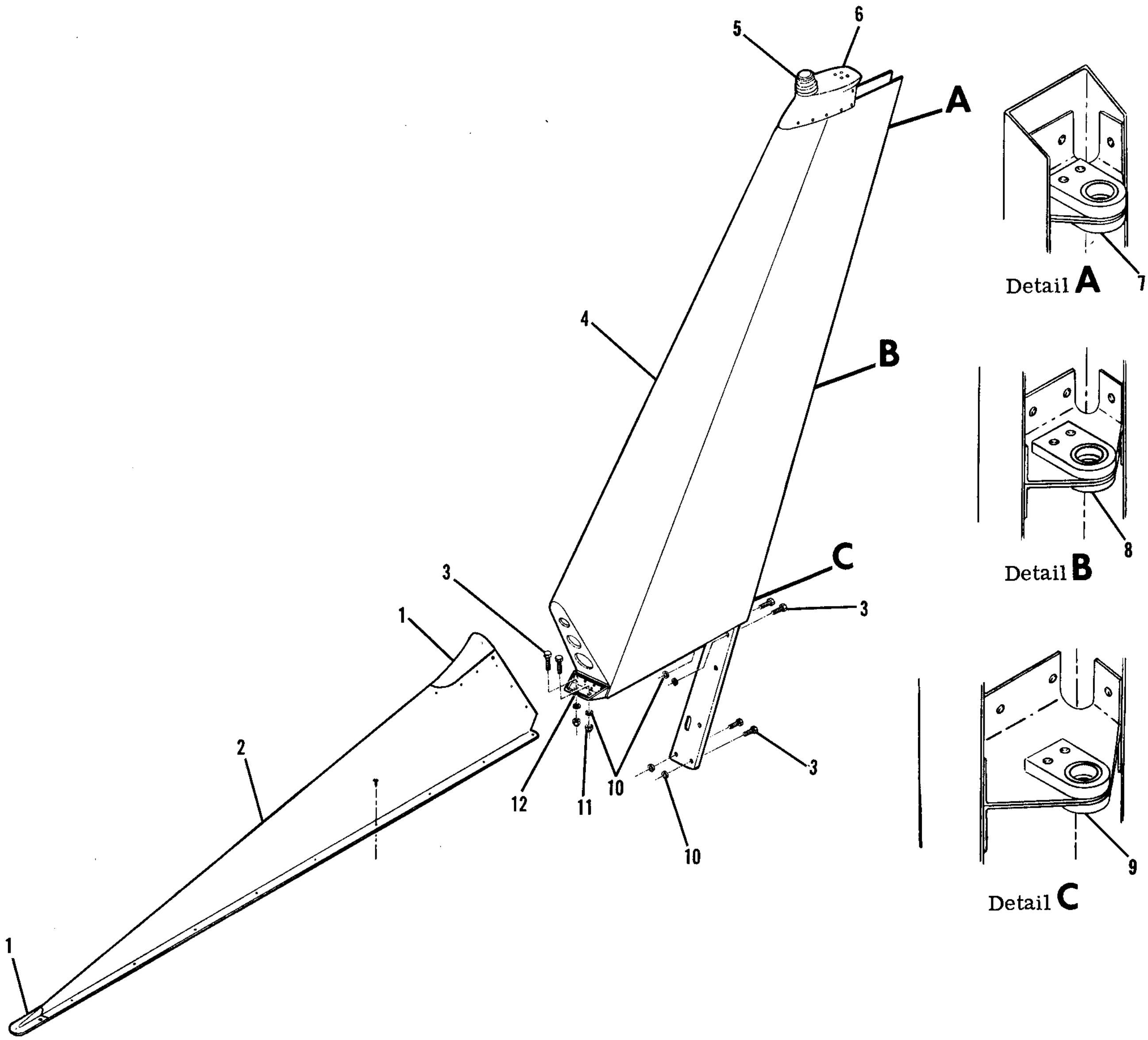
Beginning with the 1970 model, the wing leading edge is recontoured. Wing stations, removal and installation of the wings remain the same.

Beginning with the 1971 Models, the landing and taxi lights are located in the nose cowl.



1. Bolt
2. Fuselage Fitting
3. Washer
4. Nut
5. Wing Fitting
6. Retainer
7. Dowl Pin
8. Wing
9. Flap
10. Aileron Tab
11. Aileron
12. Wing Tip
13. Position Light
14. Landing and Taxi Light
15. Stall Strip
16. Fairing

Figure 4-1. Wing Installation



1. Fairing
2. Dorsal
3. Bolt
4. Fin Assembly
5. Flashing Beacon
6. Fin Tip
7. Upper Rudder Hinge
8. Center Rudder Hinge
9. Lower Rudder Hinge
10. Washer
11. Nut
12. Attach Bracket

Figure 4-2. Vertical Fin

SECTION 5
LANDING GEAR AND BRAKES

TABLE OF CONTENTS

5-1. LANDING GEAR.

5-2. DESCRIPTION. The fixed tricycle landing gear consists of tubular spring-steel main gear struts and a steerable nose gear with an air/hydraulic fluid shock strut. The main gear struts are enclosed by streamlined fairings. Wheel brake lines are routed through the fairings to the main wheels. Wheels are tube-type and are equipped with disc brakes. Speed fairings may be installed.

5-3. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to correct pressure.
	Landing gear attaching parts not tight.	Tighten loose parts and replace defective parts.
	Landing gear spring excessively sprung.	Remove and replace.
	Incorrect adjustment of bushing at outboard bulkhead (Thru 17701720)	Adjust as required. Refer to figure 5-3 for adjustment.
	Bent Axles.	Replace axles.
WHEEL BOUNCE EVIDENT EVEN ON SMOOTH SURFACE.	Out of balance condition.	Correct in accordance with paragraph 5-16.
TIRES WEAR EXCESSIVELY.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align in accordance with paragraph 5-15.
	Landing gear spring excessively sprung.	Remove and replace.
	Incorrect adjustment of bushing at outboard bulkhead (Thru 17701720)	Adjust as required. Refer to figure 5-3 for adjustment.
	Bent axles.	Replace axles.
	Dragging brakes.	Refer to paragraph 5-40.
	Wheel bearings too tight.	Adjust properly.

SHOP NOTES:

5-4. MAIN LANDING GEAR.

5-5. REMOVAL. (Refer to figure 5-1).
a. Jack or hoist aircraft as outlined in Section 2.
b. Remove brake bleeder screw at brake cylinder of gear to be removed.
c. Remove center seat and peel back carpet over strut-attach-bolt access plate; remove plate.
d. Disconnect and cap or plug brake line at bulkhead fitting in fuselage near inboard end of strut.
e. Remove screws attaching fairing (6) to fuselage. Slide fairing (6) down fairing (7).
f. Thru 17701720, remove screws and retainers. Rotate adjustment bushing to neutral position. (Refer to figure 5-3.)
g. Remove nut, washer and bolt attaching inboard end of strut (18) to inboard fitting (2).
h. Pull strut from fitting and bushing.

CAUTION

Use care when removing strut to prevent damage to hydraulic brake line.

5-6. INSTALLATION.

a. Reinstall all parts removed from strut.
b. Clean and polish machined surface on upper end of strut.
c. Apply Dow Corning Compound DC7 to approximately 13 inches on upper end of strut including machined surface.

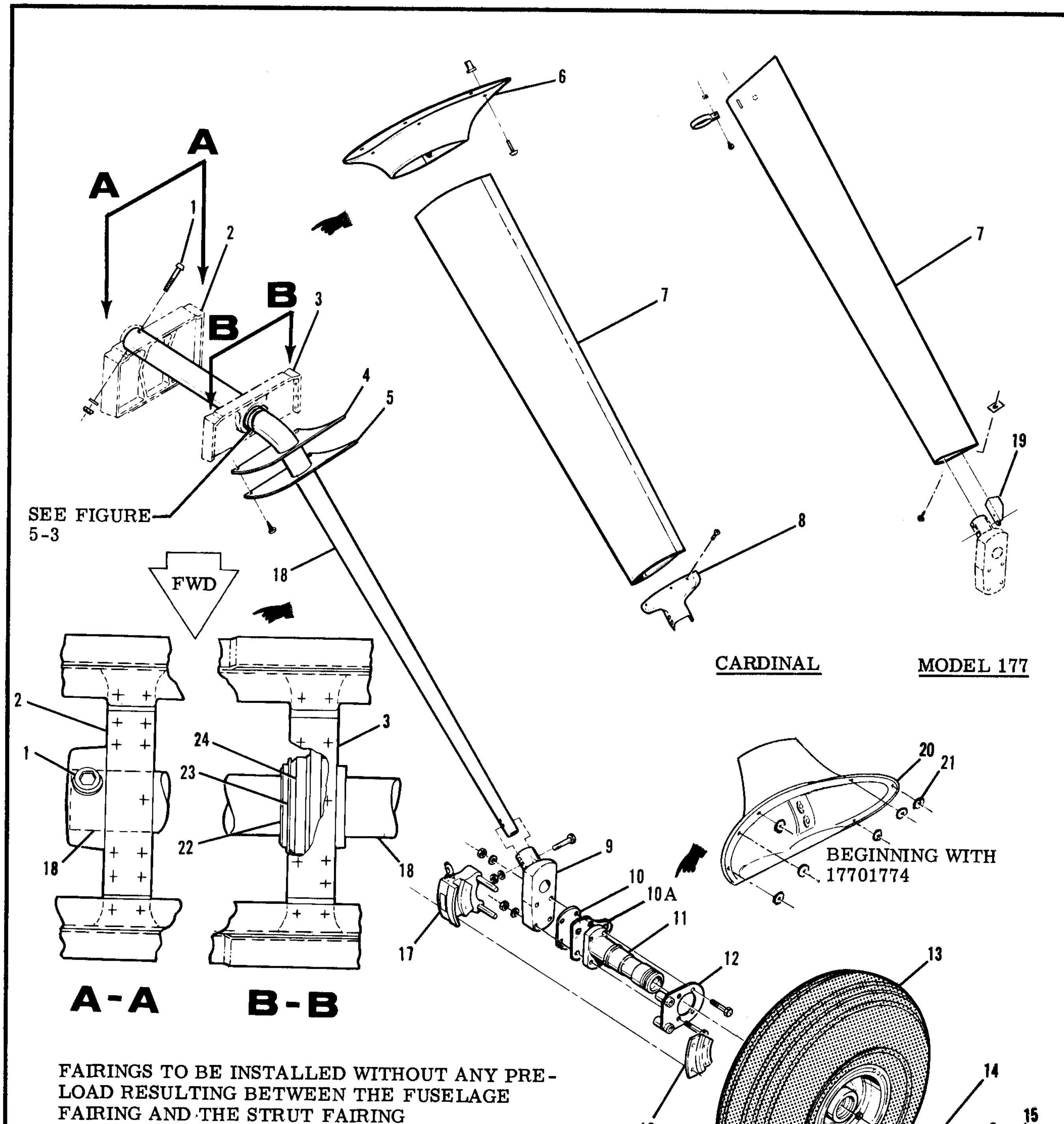
NOTE

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

d. Slide strut into place through outboard bushing and into strut inboard fitting.
e. Align strut in fitting and install bolt through fitting and strut. Install washer and nut on bolt and tighten to torque value listed in figure 1-3.
f. Lower aircraft to the ground.
g. Connect brake line. Fill and bleed brake system in accordance with paragraph 5-59.
h. Thru 17701720, rotate height adjustment bushing as required to level the wings within a total tolerance of three inches in accordance with figure 5-3.
i. Install parts removed for access.

SHOP NOTES:

This page intentionally left blank.



FAIRINGS TO BE INSTALLED WITHOUT ANY PRE-LOAD RESULTING BETWEEN THE FUSELAGE FAIRING AND THE STRUT FAIRING

1. Bolt
2. Inboard Fitting
3. Outboard Fitting
4. Seal
5. Cover
6. Fuselage Fairing
7. Strut Fairing
8. Cover Plate
9. Strut Fitting
10. Shim
10A. Brake Line Bracket
11. Axle
12. Torque Plate
13. Wheel Assembly
14. Nut
15. Hub Cap
16. Back Plate
17. Brake Cylinder
18. Spring Strut
19. Bracket
20. Brake Fairing
21. Spacer (Typical)
22. Bushing
23. Retainer
24. Spacer

Figure 5-1. Main Gear Installation

5-7. MAIN WHEEL SPEED FAIRING REMOVAL AND INSTALLATION. (Refer to figure 5-2.)

a. Prior to 1973 Models, remove screws attaching stiffener and inboard side of wheel speed fairing to attach plate, which is bolted to the axle.

NOTE

Beginning with 1973 Models, remove wheel brake fairing by removing screws around perimeter of fairing, then removing screws from nutplate holding two halves of brake fairing together, then, accomplish instructions outlined in step "a".

b. Remove bolt securing outboard side of fairing to axle nut.

c. Loosen scraper, if necessary, and work speed fairing from the wheel.

d. Reverse preceding steps to install wheel speed fairing.

e. After installation, check scraper-to-tire clearance for a minimum of 0.25 inch to a maximum of 0.38 inch. Elongated holes are provided in the scraper for clearance adjustment.

NOTE

Refer to Cessna Service Kit SK182-12 for repair of wheel speed fairings used on aircraft prior to 1971.

CAUTION

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

5-7A. REMOVAL AND INSTALLATION OF MAIN LANDING GEAR FAIRINGS. (Refer to figure 5-1.)

a. To remove brake fairing (20), proceed as follows:

1. Remove screws from perimeter of fairing.
2. Remove screws from nutplates holding two fairing halves.

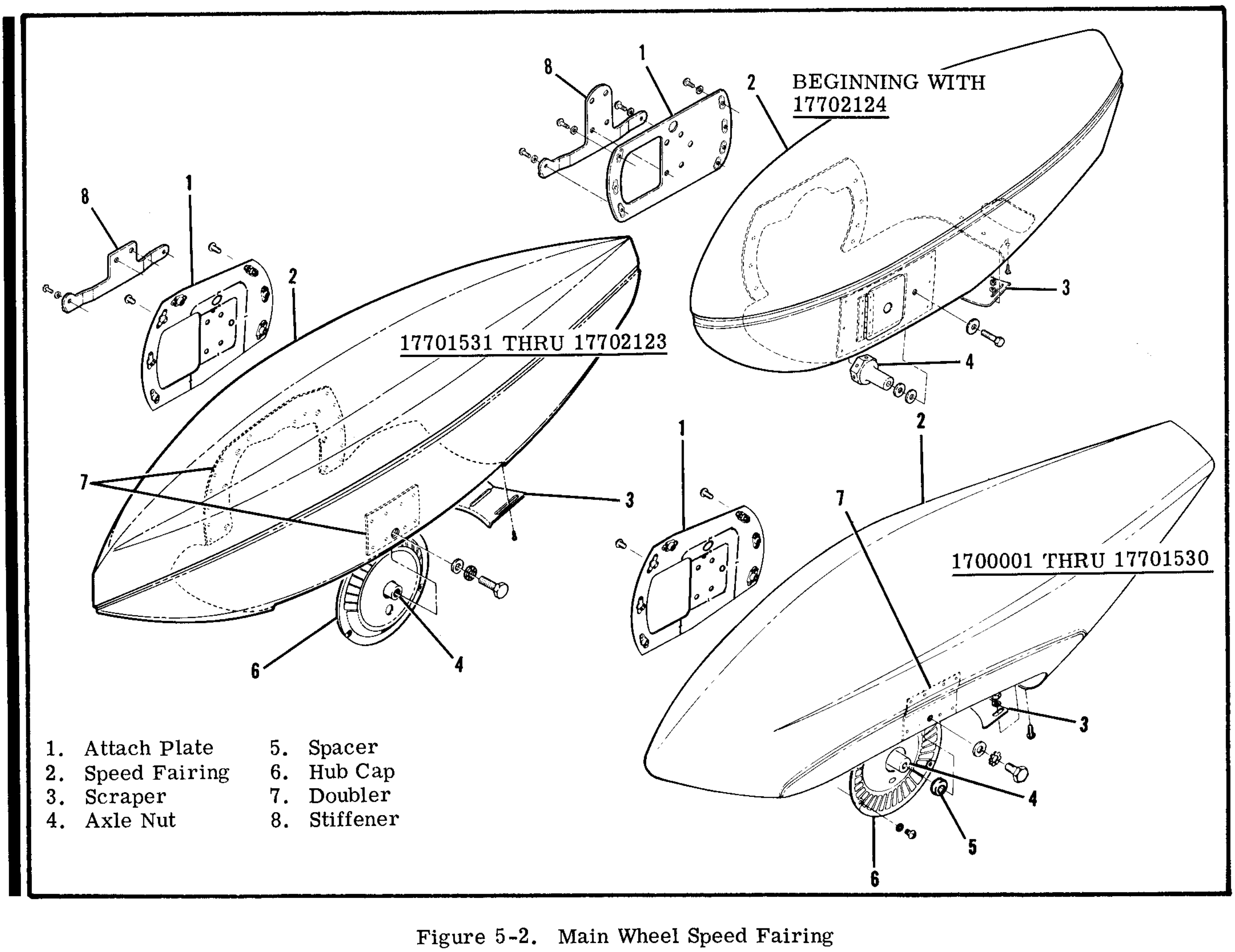


Figure 5-2. Main Wheel Speed Fairing

3. Reverse preceding steps to install brake fairing.

b. To remove cover plate (8), proceed as follows:

1. Remove screws attaching cover plate to strut fairing (7). Remove bolts attaching cover plate to strut fitting (9) and spring strut (18); remove cover plate.

2. Reverse procedures in step "1" to install cover plate.

c. To remove fuselage fairing, proceed as follows:

1. Remove screws attaching fairing (6) to fuselage.

2. Slide fairing down spring strut fairing (7).

3. Reverse preceding steps to install fuselage fairing.

d. To remove spring strut fairing (7), proceed as follows:

1. Remove brake fairing (if installed) as outlined in step "a".

2. Remove screws attaching cover plate (8) to spring strut fairing.

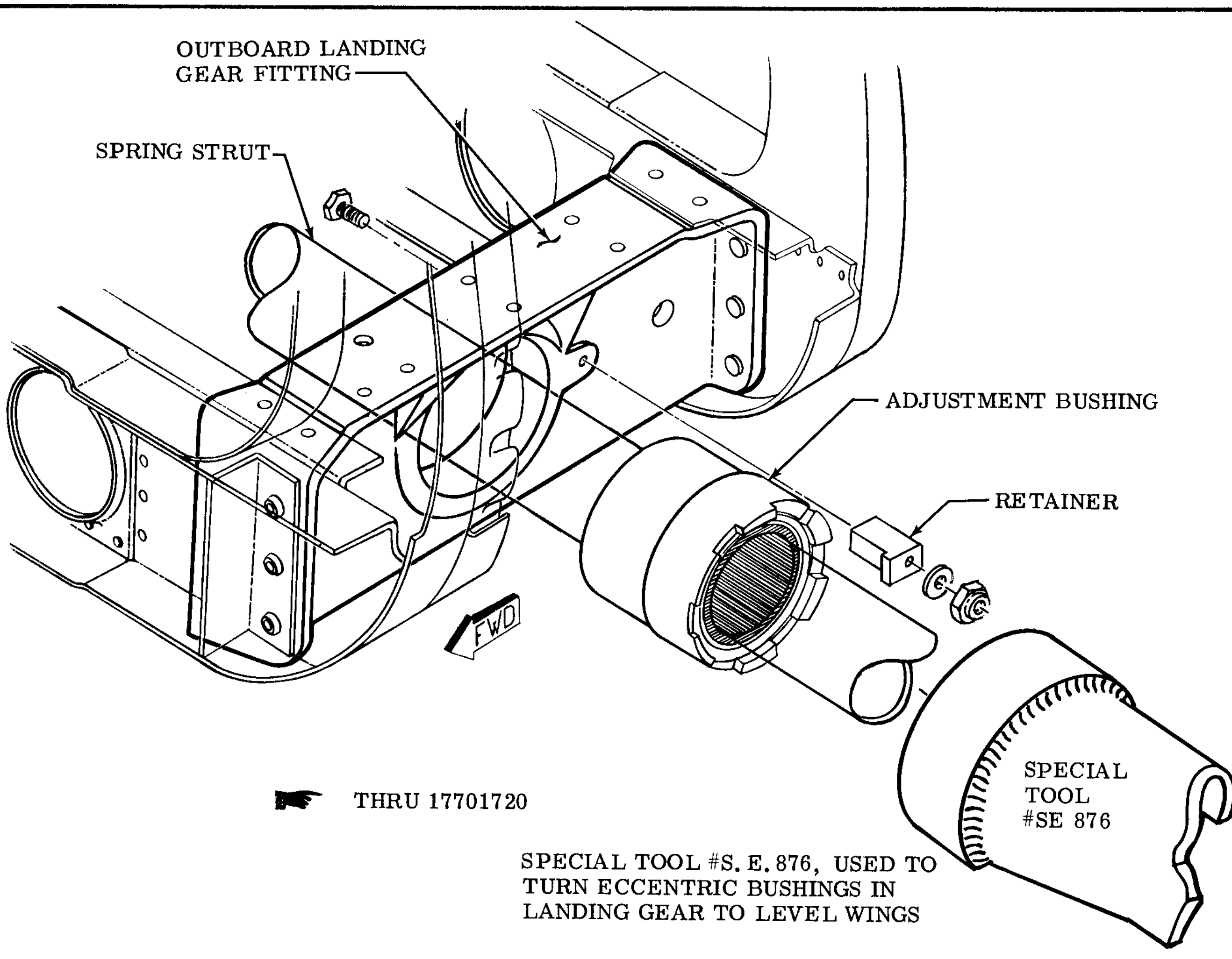
3. Remove fuselage fairing (6) as outlined in step "c".

4. Remove screws from nutplates along spring strut fairing.

5. Spring fairing over tubular spring strut.

6. Reverse preceding steps to install strut fairing.

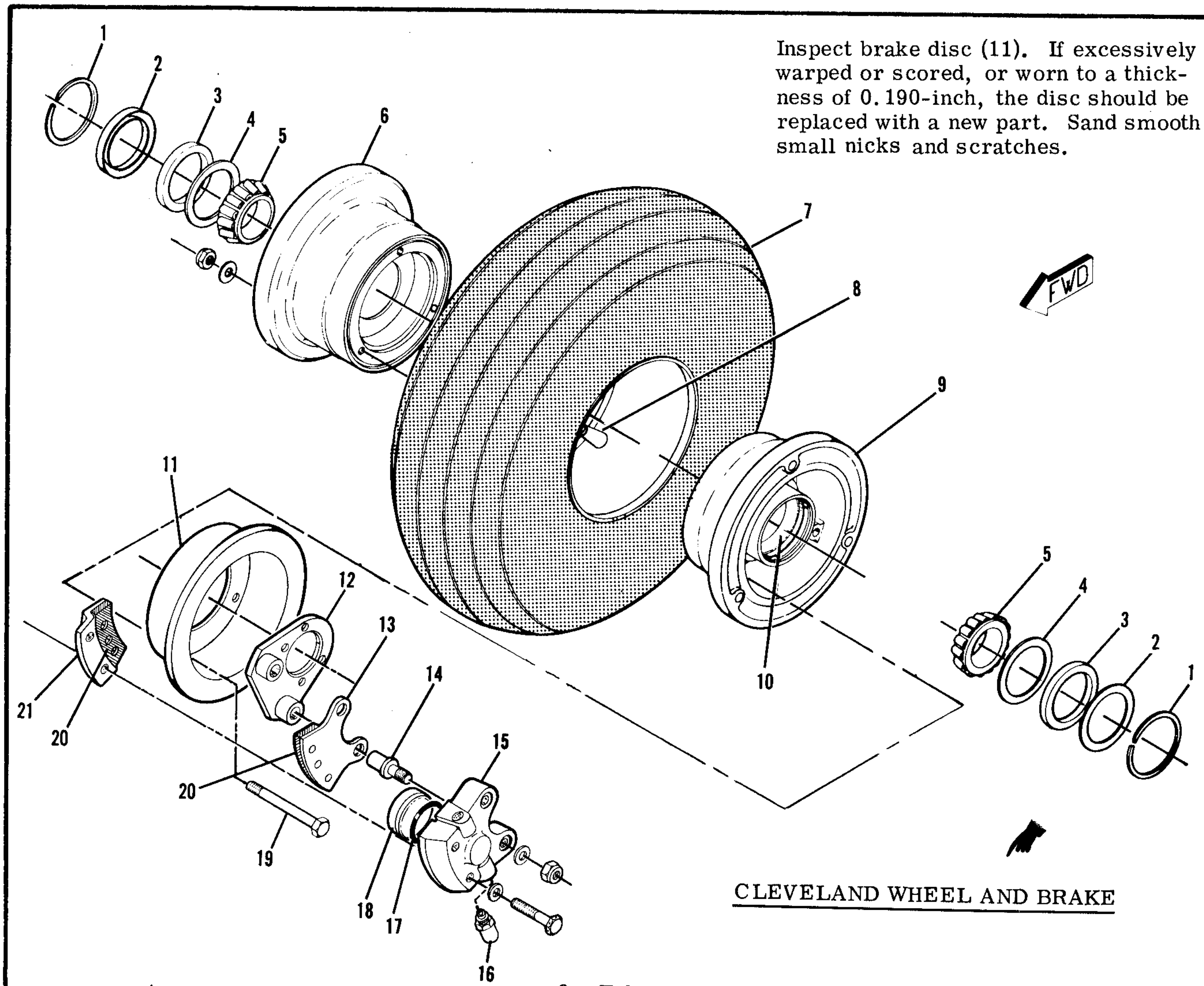
5-8. MAIN WHEEL REMOVAL. (Refer to figure 5-4.)



Height adjustment bushing shown in normal position. To raise right wing tip, rotate bushing one hole, 60 degrees counterclockwise. To lower the wing tip , rotate bushing one hole, 60 degrees clockwise.

For the right side adjusting bushing, rotate height adjustment bushing one hole, 60 degrees clockwise, to raise the wing tip. To lower the wing tip, rotate the bushing one hole, 60 degrees counterclockwise.

Figure 5-3. Wing Tip Height Adjustment



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

Figure 5-4. Cleveland Wheel and Brake Assembly

NOTE

It is not necessary to remove the main wheel to remove brake parts except the brake disc or torque plate. The brakes may be relined without removing the main wheel.

a. Hoist or jack the aircraft as outlined in Section 2.
b. Remove speed fairing, if installed, in accordance with paragraph 5-7.
c. Remove hub cap, cotter pin, and axle nut.
d. Remove bolts and washers attaching back plate and remove back plate.
e. Pull wheel from axle.

5-9. MAIN WHEEL DISASSEMBLY. (Cleveland Wheel.)

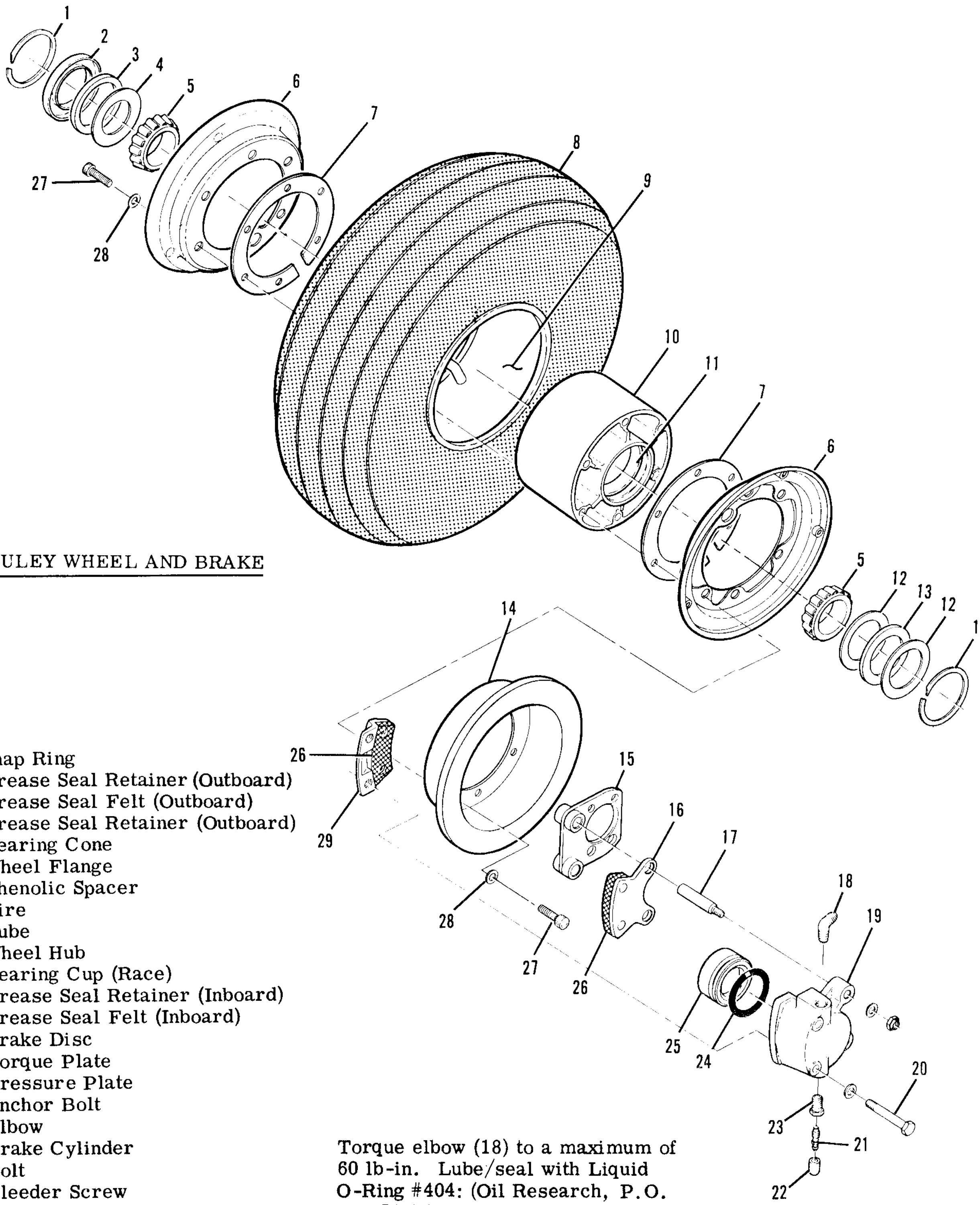
a. Deflate tire and break tire beads loose.

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 the grease seal ring, felts, and bearing cones from the wheel halves.

McCAULEY WHEEL AND BRAKE



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

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

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

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

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

Figure 5-4A. McCauley Wheel and Brake Assembly

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 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.

5-10. MAIN WHEEL INSPECTION AND REPAIR. (Cleveland Wheel.)

a. Clean all metal parts and the grease seal felts in solvent and dry throughly.

b. Inspect wheel halves for crakes. Cracked wheel halves must 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. Inspect brake disc. If excessively warped or scored, or worn to a thickness of 0.190-inch, the disc should be replaced with a new part. Sand smooth small nicks and scratches.

d. Bearing cups and cones must be inspected carefully for damage and discoloration. After cleaning, repack cones with clean aircraft wheel bearing grease (Section 2) before installation in the wheel.

5-11. MAIN WHEEL REASSEMBLY. (Cleveland Wheel.)

a. Insert thru-bolts through brake disc and position in the inner wheel half, using the bolts to guide the disc. Ascertain that the disc is bottomed in the wheel half.

b. Position the tire and tube with the inflation valve through hole in outboard wheel half.

c. Place the inner wheel half in position on outboard wheel half. Apply a light force to bring wheel halves together. Maintaining the light force, assemble a washer and nut on one thru-bolt and tighten snugly. Assemble the remaining nuts and washers on the thru-bolts and torque to the value specified in figure 5-4B.

CAUTION

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

d. Clean and repack bearing cones with clean aircraft wheel bearing grease (Refer to Section 2.).

e. Assemble the bearing cones, grease seal felts, and rings into wheel halves.

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

5-11A. MAIN WHEEL DISASSEMBLY. (Mc Cauley Wheel.)

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

WARNING

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

b. Remove capscrews and washers.

c. Separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.

d. Remove wheel hub from tire and tube.

e. Remove retainer rings, grease seal retainers, grease seal felts and bearing cones from wheel hub.

NOTE

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

5-11B. MAIN WHEEL INSPECTION AND REPAIR. (Mc Cauley Wheel.)

a. Clean all metal parts, grease seal felts and phenolic spacers in cleaning solvent and dry thoroughly.

b. Inspect wheel flanges and wheel hub for cracks. Discard cracked wheel flanges or hub and install new parts. Sand out nicks, gouges and corroded areas. When protective coating has been removed, clean the area thoroughly, prime with zonc chromate, and paint with aluminum lacquer.

c. If excessively warped or scored, or worn to a thickness of 0.190-inch, brake disc should be replaced with a new parts Sand smooth small nicks and scratches.

d. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease (refer to Section 2) before installing in the wheel hub.

5-11C. MAIN WHEEL REASSEMBLY. (Mc Cauley Wheel.)

a. Place wheel hub in tire and tube with tube inflation stem in cutout of wheel hub.

b. Place spacer and wheel flange on inboard side of wheel hub (opposite of tube inflation stem), then place washer under head of each capscrew and start capscrews into wheel hub threads.

c. Place spacer and wheel flange on outboard side and align valve stem in cutout in wheel flange.

d. Place washer under head of each capscrew and start capscrews into wheel hub threads.

MAIN GEAR	NOSE GEAR	WHEEL NUMBER	SIZE	MANUFACTURER	NUT/CAPSCREW TORQUE	WHEEL HALF/ FLANGE
X		C163001-0103	6.00 x 6	CLEVELAND	150 lb-in	MAGNESIUM
X		C163001-0104	6.00 x 6	CLEVELAND	90 lb-in	ALUMINUM
	X	1241156-12	5.00 x 5	CLEVELAND	90 lb-in	MAGNESIUM
	X	1241156-11	6.00 x 6	CLEVELAND	150 lb-in	MAGNESIUM
	X	C163002-0201	5.00 x 5	McCAULEY	90-100 lb-in	ALUMINUM
	X	C163003-0201	5.00 x 5	McCAULEY	90-100 lb-in	STEEL
	X	C163003-0401	5.00 x 5	McCAULEY	*190-200 lb-in	STEEL
	X	C163002-0301	6.00 x 6	McCAULEY	100-120 lb-in (mylar spacer)	ALUMINUM
					90-100 lb-in (phenolic spacer)	
	X	C163003-0301	6.00 x 6	McCAULEY	*190-200 lb-in	STEEL
X		C163003-0102	6.00 x 6	McCAULEY	*190-200 lb-in	STEEL
X		C163004-0104	6.00 x 6	McCAULEY	*190-200 lb-in	ALUMINUM
	X	C163005-0201	5.00 x 5	McCAULEY	140-150 lb-in	ALUMINUM

*Capscrew

Figure 5-4B. Main and Nose Wheel Thru-Bolt and Capscrew Torque Values

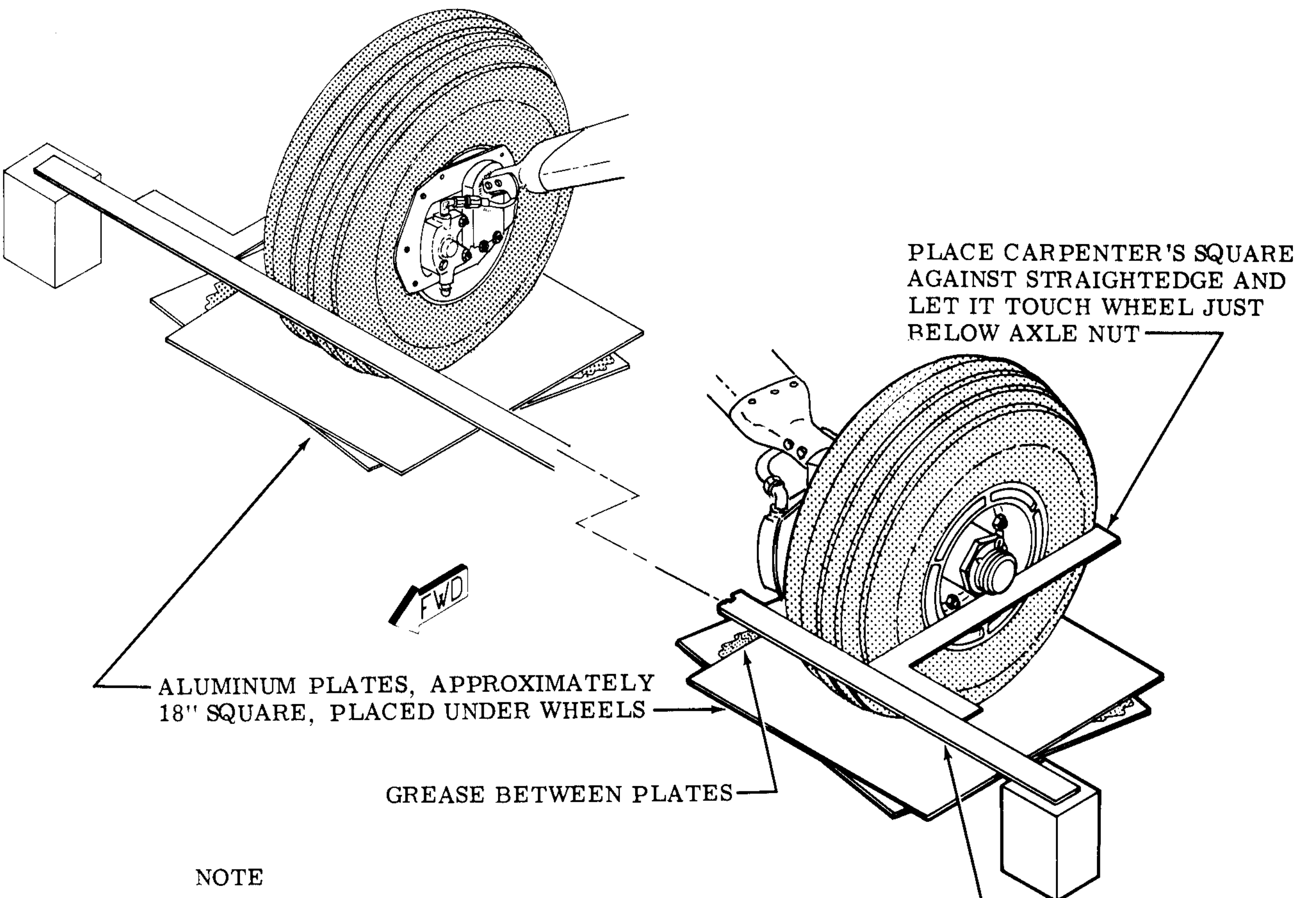
CAUTION

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

e. Tighten capscrews evenly and torque to the value specified in figure 5-4B.
f. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)
g. Assemble bearing cones, grease seal felts and retainer into wheel hub.
h. Inflate tire to seat tire beads, then adjust to correct tire pressure. Refer to figure 1-1 for correct tire pressure.

5-11D. MAIN AND NOSE WHEEL THRU-BOLT NUT AND CAPSCREW TORQUE VALUES. (Refer to figure 5-4B.) During assembly of the main and nose wheel, the thru-bolt nuts and capscrews should be tightened evenly and torqued to the value specified in figure 5-4B. The solid wheels having two wheel halves are manufactured by Cleveland Aircraft Products Co., and webbed wheels having two flanges and a hub, or two aluminum wheel halves are manufactured by McCauley Industrual Corporation. The Cleveland wheels are shown in figure 5-4 and figure 5-8 (Sheet 1 of 3). The McCauley Wheels have either aluminum flanges or steel flanges as shown in figure 5-4A and in figure 5-8 (Sheet 2 of 3). The aluminum flanges are attached to the wheel hub by thru-bolts and nuts, as shown in figure 5-8 (Sheet 2 of 3). The steel flanges are attached to the wheel hub by either thru-bolts or by capscrews as shown in figure 5-8 (Sheet 2 of 3). McCauley 2-piece aluminum nose wheels are attached by thru-bolts, as shown in figure 5-8 (Sheet 3 of 3).

SHOP NOTES:

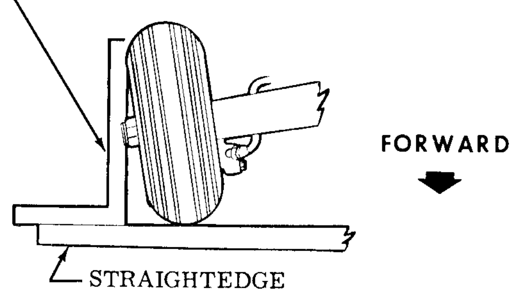


NOTE

Rock wheels before checking wheel alignment.

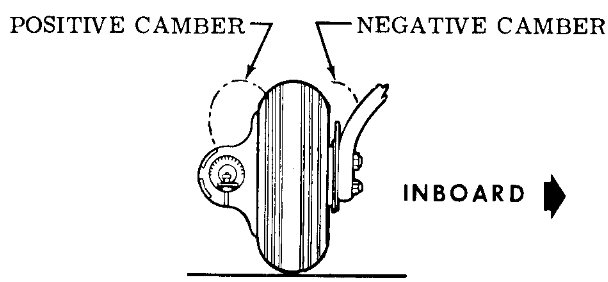
TOP VIEW OF TOE-IN CHECK

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



FRONT VIEW OF CAMBER CHECK

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



NOTE

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

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

SHIM PART NO.	POSITION OF THICKEST CORNER OR EDGE OF SHIM	CORRECTION IMPOSED ON WHEEL			
		TOE-IN	TOE-OUT	POS. CAMBER	NEG CAMBER
0541157-1	AFT FWD	.06" ----	---- .06"	---- 0°3'	0°3' ----
0541157-2	UP DOWN	.006" ----	---- .006"	0°30' ----	---- 0°30'
0541157-3	AFT FWD	.12" ----	---- .12"	---- 0°7'	0°7' ----
0541111-2	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .23" ---- .15"	.15" ---- .23" ----	2°50' 2°29' ---- ----	---- ---- 2°29' 2°50'
0441139-5	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .12" ---- .11"	.11" ---- .12" ----	0°25' 0°11' ---- ----	---- ---- 0°11' 0°25'
0441139-6	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .24" ---- .22"	.22" ---- .24" ----	0°50' 0°22' ---- ----	---- ---- 0°22' 0°50'
1241061-1	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	.03" .06" ---- ----	---- ---- .06" .03"	2°50' 2°49' ---- ----	---- ---- 2°49' 2°50'

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

5-12. MAIN WHEEL INSTALLATION.

a. Place wheel assembly on axle.

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

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

d. Install hub cap. Install speed fairing, if used, as outlined in paragraph 5-7.

CAUTION

Always check scraper-to-tire clearance after installing speed fairings, whenever a tire has been changed, and whenever scraper adjustment has been disturbed, If the aircraft is flown from surfaces with mud, snow, or ice, the fairings should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Refer to paragraph 5-7 for correct scraper-to-tire clearance.

5-13. MAIN WHEEL AND AXLE REMOVAL.

a. Remove speed fairing in accordance with paragraph 5-7.

b. Remove wheel in accordance with paragraph 5-8.

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

d. Remove four nuts, washers, and bolts securing axle and brake components to strut fitting.

NOTE

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

5-14. MAIN WHEEL AND AXLE INSTALLATION.

a. Secure axle and brake components to spring strut fitting, making sure that wheel alignment shims and speed fairing mounting plate (if used) are reinstalled in their original position.

b. Install wheel assembly on axle in accordance with paragraph 5-12.

c. Connect hydraulic brake line to brake cylinder.

d. Fill and bleed affected brake system in accordance with paragraph 5-59.

e. Install speed fairing (if used) in accordance with paragraph 5-7.

5-15. MAIN WHEEL ALIGNMENT. Correct main wheel alignment is obtained through the use of tapered shims between the flange of the strut fitting and the flange of the axle. See figure 5-5 for procedure to use in checking wheel alignment. Wheel shims and the correction imposed on the wheel by the various shims, are listed in the illustration.

NOTE

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

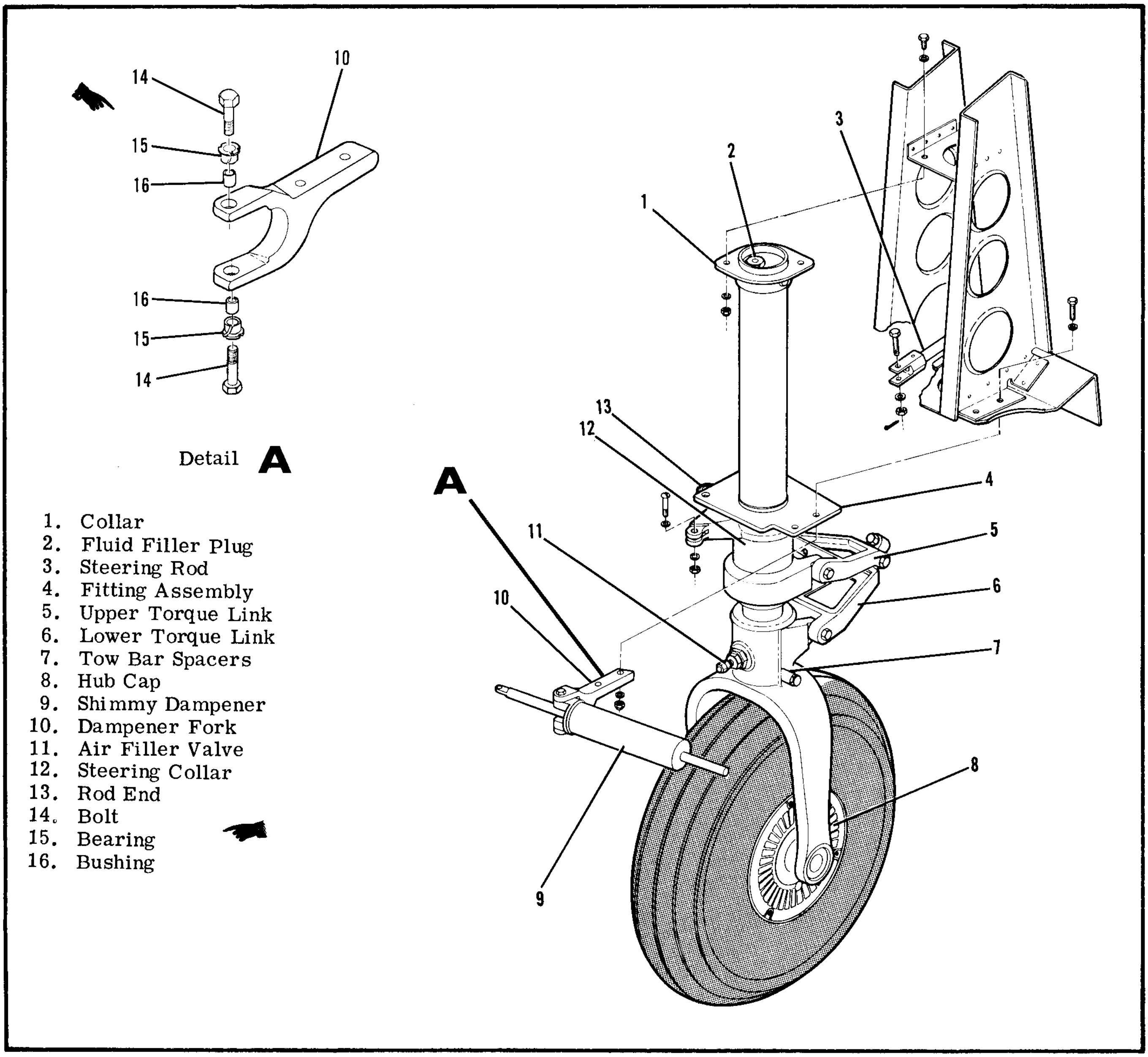
5-16. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, installing a new tire probably will correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light- weight point of the tire is marked with a red dot on the tire side-wall and the heavy-weight point of the tube is marked with a contrasting color line (usually near the valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel becomes unbalanced during service, it may be statically rebalanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

5-17. NOSE GEAR.

5-18. DESCRIPTION. The nose gear assembly includes a steerable nose wheel mounted on an air/hydraulic fluid shock strut. The shock strut is attached to brackets, riveted to the firewall and lower fuselage. Nose wheel steering is afforded by a spring-loaded steering rod assembly, linking the nose gear to the rudder pedal bars. A fluid-filled shimmy dampener is provided to minimize nose wheel shimmy. A nose wheel speed fairing may be installed.

5-18A. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NOSE WHEEL SHIMMY.	Nose strut loose in attaching clamps.	Tighten nose strut attaching clamps.
	Shimmy dampener lacks fluid.	Refer to Section 2.
	Defective shimmy dampener.	Repair or replace defective shimmy dampener.
	Loose or worn nose wheel steering linkage.	Tighten or replace defective linkage.
TIRES WEAR EXCESSIVLEY.	Loose or defective nose wheel bearings.	Tighten wheel bearings properly; replace if defective.
	Loose torque links.	Add washers or replace if necessary.
	Nose wheel out of balance.	Correct in accordance with paragraph 5-25.
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.	Defective strut seals.	Replace defective seals.
NOSE GEAR STRUT WILL NOT HOLD AIR PRESSURE.	Defective air filler valve or valve not tight.	Check gasket and tighten loose valve. Replace if defective.
	Defective strut seals.	Replace defective seals.



1. Collar
2. Fluid Filler Plug
3. Steering Rod
4. Fitting Assembly
5. Upper Torque Link
6. Lower Torque Link
7. Tow Bar Spacers
8. Hub Cap
9. Shimmy Dampener
10. Dampener Fork
11. Air Filler Valve
12. Steering Collar
13. Rod End
14. Bolt
15. Bearing
16. Bushing

Figure 5-6. Nose Gear Installation

5-19. NOSE GEAR REMOVAL AND INSTALLATION.

a. Remove engine cowling and tie-down the tail to raise nose wheel off the ground.

b. Disconnect steering rod assembly from nose gear.

c. Remove air filler valve core and deflate strut completely.

WARNING

Be sure strut is deflated completely before removing attaching bolts.

d. Remove bolts attaching collar at top of strut to bracket.

e. Remove two bolts attaching shimmy dampener support fork to fitting assembly and bracket. Disconnect shimmy dampener from steering collar and remove dampener and fork.

f. Remove two bolts attaching fitting assembly to bracket; remove nose gear.

g. Reverse the preceding steps to install the nose gear.

5-20. NOSE WHEEL SPEED FAIRING REMOVAL AND INSTALLATION. (Refer to figure 5-7.)

a. Weight or tie-down tail of aircraft to raise nose wheel off ground.

b. Remove nose wheel axle stud (6).

c. Remove air filler valve core and deflate strut completely.

WARNING

Be sure strut is deflated completely before disconnecting torque link or removing bolt that attaches speed fairing to strut.

d. Remove bolt (4) and cover plate (3). Retain tow-bar spacers (2).

e. Slide speed fairing up on strut and remove nose wheel in accordance with paragraph 5-21. Loosen scraper (5), if necessary.

f. Rotate speed fairing 90° and work it down over nose gear fork.

g. Reverse preceding steps to install speed fairing.

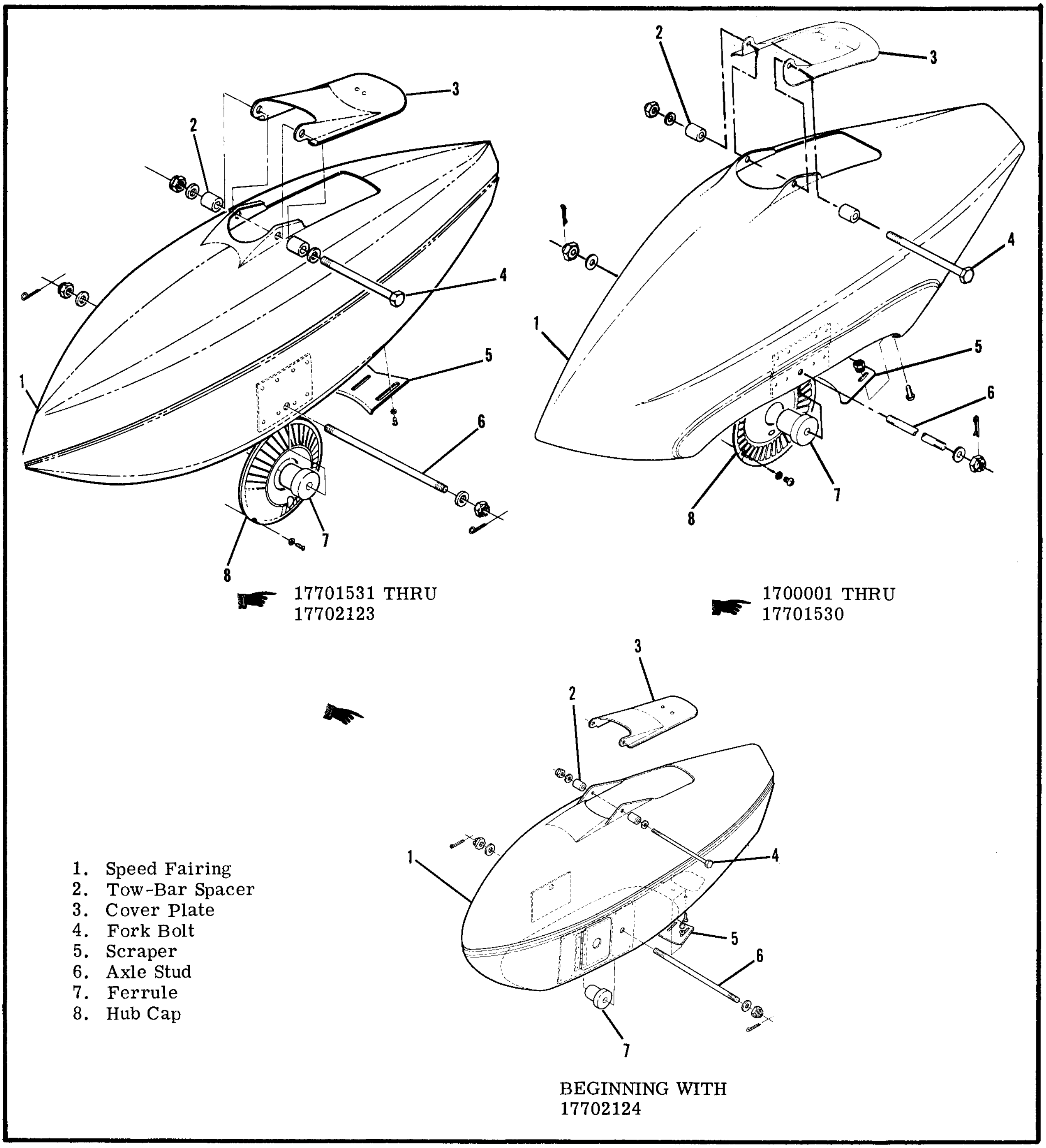


Figure 5-7. Nose Wheel Speed Fairing

h. Service shock strut in accordance with instructions outlined in Section 2.

CAUTION

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

5-21. NOSE WHEEL REMOVAL AND INSTALLATION.

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

b. Remove nose wheel axle bolt.

c. Use a rod or long punch inserted through one axle bolt ferrule to tap the opposite ferrule out of the fork. Remove both ferrules and pull the nose wheel from the fork.

d. Remove spacers and axle tube from nose wheel.

e. Reverse the preceding steps to install the nose wheel. Tighten axle bolt until a slight bearing drag is obvious when the wheel is turned. Back the nut off to the nearest castellation and install cotter pin.

CAUTION

On aircraft equipped with speed fairings, always check scraper-to-tire clearance after installing speed fairing, whenever a tire is changed, or whenever scraper adjustment has been disturbed. Set scraper clearance in accordance with paragraph 5-20.

5-22. NOSE WHEEL DISASSEMBLY. (Cleveland Wheel).

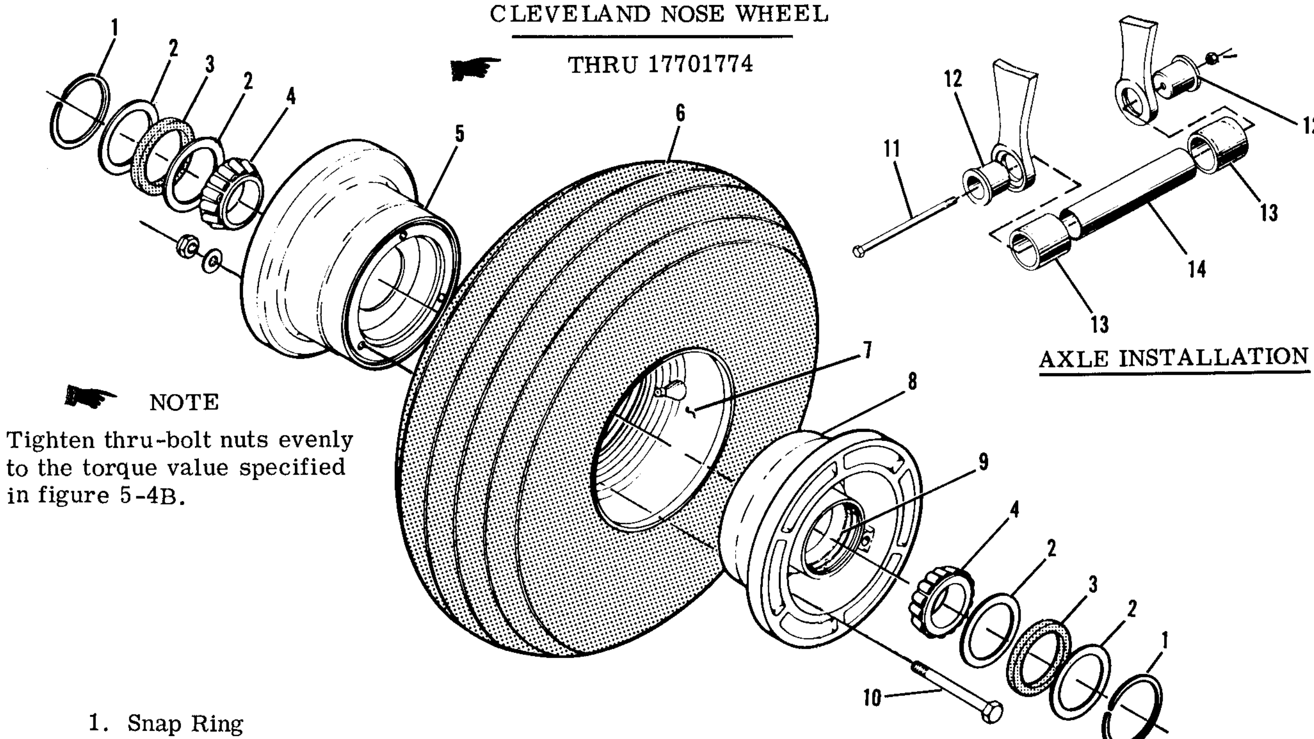
a. Remove hub cap, completely deflate tire and break tire beads loose.

WARNING

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

CLEVELAND NOSE WHEEL

THRU 17701774



NOTE
Tighten thru-bolt nuts evenly to the torque value specified in figure 5-4B.

1. Snap Ring
2. Grease Seal Ring
3. Grease Seal Felt
4. Bearing Cone
5. Male Wheel Half
6. Tire
7. Tube
8. Female Wheel Half
9. Bearing Cup
10. Thru-Bolt
11. Axle Bolt
12. Axle Bolt Bucket
13. Axle Spacer
14. Axle Tube

Figure 5-8. Nose Wheel (Sheet 1 of 3)

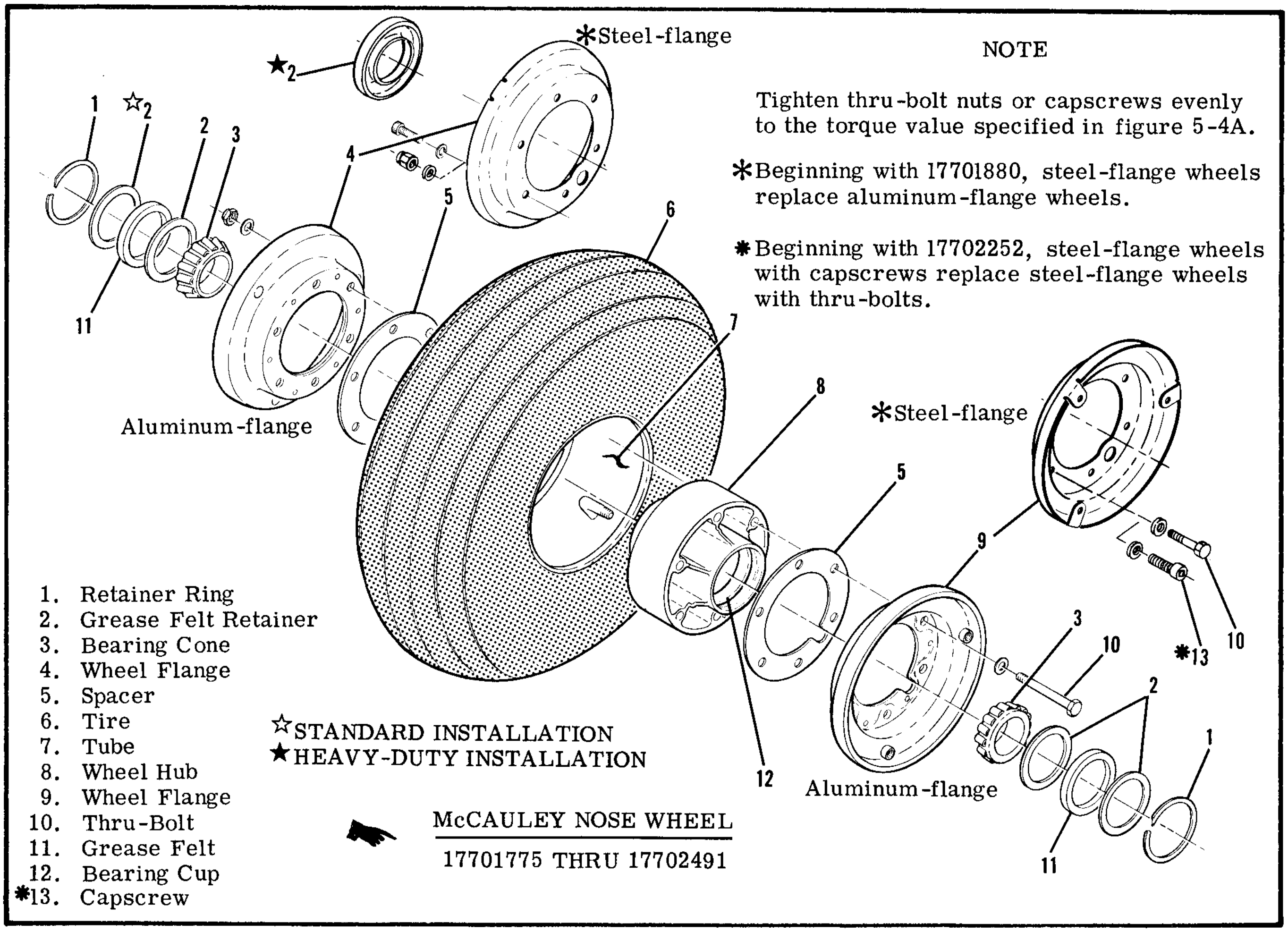


Figure 5-8. Nose Wheel (Sheet 2 of 3)

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 the bearing cup and press in the new one while the wheel is still hot.

5-23. NOSE WHEEL INSPECTION AND REPAIR. (Cleveland Wheel).
Instructions given in paragraph 5-10 for the main wheels may be used as a guide for inspection and repair of the nose wheel.

5-24. NOSE WHEEL REASSEMBLY. (Cleveland Wheel).
a. Insert tube in tire, aligning index marks on tire and tube.
b. Place tire and tube on wheel half and position valve stem through hole in wheel half.
c. Insert thru-bolts, position other wheel half, and secure with nuts and washers. Take care to avoid pinching tube between wheel halves. Torque bolts evenly to the value specified in figure 5-4B.

CAUTION

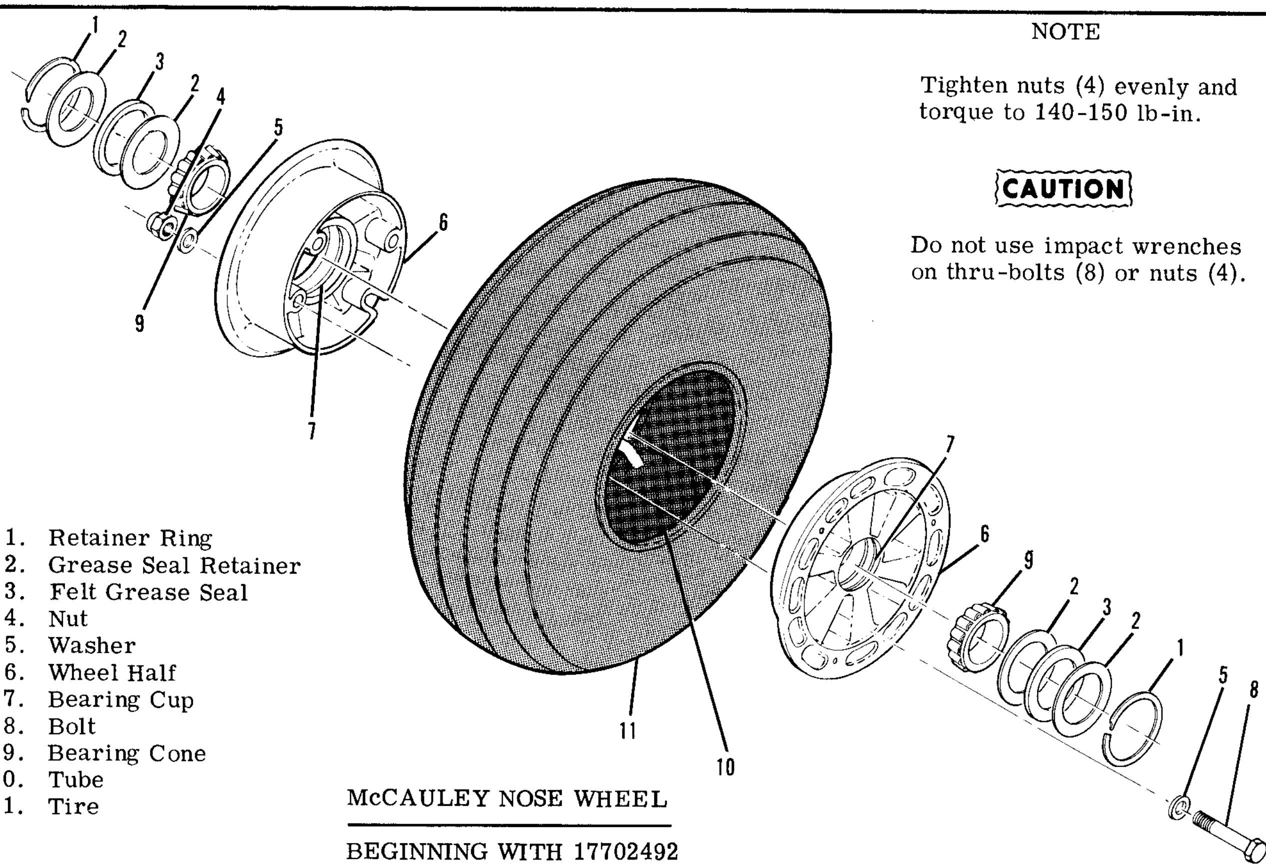
Uneven or improper torque on the thru-bolt nuts may cause bolt failure with resultant wheel failure.

d. Clean and repack bearing cones with clean aircraft wheel bearing grease (figure 2-5).
e. Assemble bearing cones, seals, and retainers into wheel halves.
f. Inflate tire to seat tire beads, then adjust to correct pressure.
g. Install hub caps and install wheel in accordance with paragraph 5-21.

5-24A. NOSE WHEEL DISASSEMBLY. (Mc Cauley Wheel with Thru-bolts) (Thru 17702251.)
a. Remove hub caps, completely deflate tire, and break tire beads loose at wheel flanges.

WARNING

Injury can result from attempting to remove wheel flanges with tire and tube inflated.



NOTE

Tighten nuts (4) evenly and torque to 140-150 lb-in.

CAUTION

Do not use impact wrenches on thru-bolts (8) or nuts (4).

1. Retainer Ring
2. Grease Seal Retainer
3. Felt Grease Seal
4. Nut
5. Washer
6. Wheel Half
7. Bearing Cup
8. Bolt
9. Bearing Cone
10. Tube
11. Tire

McCAULEY NOSE WHEEL

BEGINNING WITH 17702492

Figure 5-8. Nose Wheel (Sheet 3 of 3)

Avoid damaging wheel flanges when breaking tire beads loose.

b. Remove thru-bolt nuts and washers.
c. Remove thru-bolts and separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.
d. Remove wheel hub from tire and tube.
e. Remove retainer rings and remove grease seal retainers, grease seal felts, and bearing cones from wheel hub.

NOTE

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

5-24B. NOSE WHEEL INSPECTION AND REPAIR. (McCauley Wheel with Thru-bolts) (Thru 17702251.)
a. Clean all metal parts, grease seal felts, and spacers in cleaning solvent and dry thoroughly.
b. Inspect wheel flanges, and wheel hub for cracks. Cracked wheel flanges or hub shall be discarded and new parts installed. Sand out smooth nicks, gouges, and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.
c. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease (Section 2) before installing in wheel hub.

5-24C. NOSE WHEEL REASSEMBLY. (McCauley Wheel with Thru-bolts) (Thru 17702251.)
a. Insert tube in tire, aligning index marks on tire and tube.
b. Place wheel hub in tire with valve stem in cutout of wheel hub.
c. Place spacer and wheel flange on one side of wheel hub and with washer under head of thru-bolt insert bolt through wheel flange and wheel hub.
d. Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange.
e. Install washers and nuts on thru-bolts.

CAUTION

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

f. Tighten thru-bolt nuts evenly and torque to the value specified in figure 5-4B.

g. Clean and pack bearing cones with clean aircraft wheel bearing grease (Section 2).
h. Assemble bearing cones, grease seal felts and retainers into wheel hub.
i. Inflate tire to seat tire beads, then adjust to correct tire pressure. See figure 1-1 for correct tire pressure.

5-24D. NOSE WHEEL DISASSEMBLY. (McCauley Wheel with Capscrews) (17702252 thru 17702491.)
a. Remove hub caps, completely deflate tire, and break tire beads loose at wheel flanges.

WARNING

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

b. Remove capscrews and washers.
c. Separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.
d. Remove retainer rings and remove grease seal retainers, grease seal felts, and bearing cones from wheel hub.

NOTE

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

5-24E. NOSE WHEEL INSPECTION AND REPAIR. (McCauley Wheel with Capscrews)(17702252 thru 17702491.) Refer to paragraph 5-24B for inspection and repair of the McCauley nose wheel.

5-24F. NOSE WHEEL REASSEMBLY. (McCauley Wheel with Capscrews)(17702252 thru 17702491.)
a. Insert tube in tire, aligning index marks on tire and tube.
b. Place wheel hub in tire with valve stem in cutout of wheel hub.
c. Place spacer and wheel flange on one side of wheel hub.
d. Place washer under head of each capscrew, insert capscrews through wheel flange and spacer and start capscrews into wheel hub threads.

CAUTION

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

e. Tighten capscrews evenly and torque to the value specified in figure 5-4B.
f. Place spacer and wheel flange on other side of wheel hub and align valve stem in cutout in wheel flange.
g. Place washer under head of each capscrew, insert capscrew thru wheel flange and spacer and start capscrews into wheel hub threads.

CAUTION

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

h. Tighten capscrews evenly and torque to the value specified in figure 5-4B.
i. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)
j. Assemble bearing cones, grease seal felts and retainer into wheel hub.
k. Inflate tire to seat tire beads, then adjust to correct tire pressure (refer to Section 1).

5-24G. NOSE WHEEL DISASSEMBLY. (Beginning with 17702492.)

WARNING

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

a. Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves.
b. Remove nuts and washers.
c. Remove thru-bolts and washers.
d. Separate and remove wheel halves from tire and tube.
e. Remove retaining ring, grease seal retainer, felt grease seal, grease retainer and bearing cone from each wheel half.

NOTE

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

5-24H. NOSE WHEEL INSPECTION AND REPAIR. (Beginning with 17702492.)
a. Clean all metal parts and felt grease seals in Stoddard solvent, or equivalent, and dry thoroughly.

NOTE

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

b. Inspect wheel halves for cracks or damage.
c. Inspect bearing cones, cups, retaining rings and seals for wear or damage.
d. Inspect thru-bolts and nuts for cracks in threads or cracks in radius under bolt head.
e. Replace cracked or damaged wheel halves.
f. Replace damaged retaining rings and seals.
g. Replace any worn or cracked thru-bolts or nuts.
h. Replace any worn or damaged bearing cups or cones.
i. Remove any corrosion or small nicks.
j. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.
k. Pack bearings with grease specified in Section 2 of this manual.

5-24I. NOSE WHEEL REASSEMBLY. (Beginning with 17702492.)
a. Assemble bearing cone, grease seal retainer, felt grease seal, grease seal retainer and retaining ring into both wheel halves.
b. Insert tube in tire, aligning index marks on tire and tube.
c. Place wheel half into tire and tube (side opposite valve stem), aligning base of valve stem in valve slot. With washer under head of thru-bolt, insert bolt through wheel half.
d. Place wheel half into other side of tire and tube, aligning valve stem in valve slot.
e. Install washers and nuts on thru-bolts and pre-torque to 10-50 lb. in.

CAUTION

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

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

CAUTION

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

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

5-25. WHEEL BALANCING. Refer to paragraph 5-16 for wheel balancing.

5-26. STANDARD NOSE GEAR.

5-27. The standard nose gear shock strut is shown in figure 5-9. The optional heavy-duty nose gear, discussed later in this Section is shown in figure 5-10. Removal and installation of the nose gear may be accomplished as outlined in paragraph 5-19. Speed fairing and wheel removal and installation are outlined in paragraphs 5-20 and 5-21.

5-28. STANDARD NOSE GEAR DISASSEMBLY. (Refer to figure 5-9.) The following procedures apply when the shock strut, speed fairing and nose wheel have been removed. In many cases, separating the upper and lower struts will permit replacement of parts and inspection without removal or complete disassembly.

WARNING

Deflate strut completely before disconnecing torque links or removing bolt (7), lock ring (25) or bolt (30).

a. Remove filler plug (8). Invert strut and drain fluid into container.
b. Remove torque links from strut assembly, noting position of washers, spacers and bushing. (Refer to figure 5-9.)
c. Remove lock ring (25) from groove inside lower end of upper strut. A small hole is provided in lock ring groove to facilitate removal.

NOTE

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

d. Using a straight, sharp pull, separate lower strut from upper strut. Invert lower strut and drain fluid into a container.
e. Remove retainer ring (17) at upper end of lower strut (21). Remove piston head (19).
f. Remove bearing (22), scraper ring (23), back-up ring (24) and lock ring (25) from lower strut (21).
g. Remove air filler valve (35).
h. Remove bolt (30), tow bar spacers (29) and bushing (28).
i. Using a rod, through hole in piston rod at top of lower strut, push floating piston (33) and plug (31) from strut.

NOTE

Lower strut (21) and fork (27) area press fit, drilled on assembly. Separating these units is not recommended, except for replacement of parts.

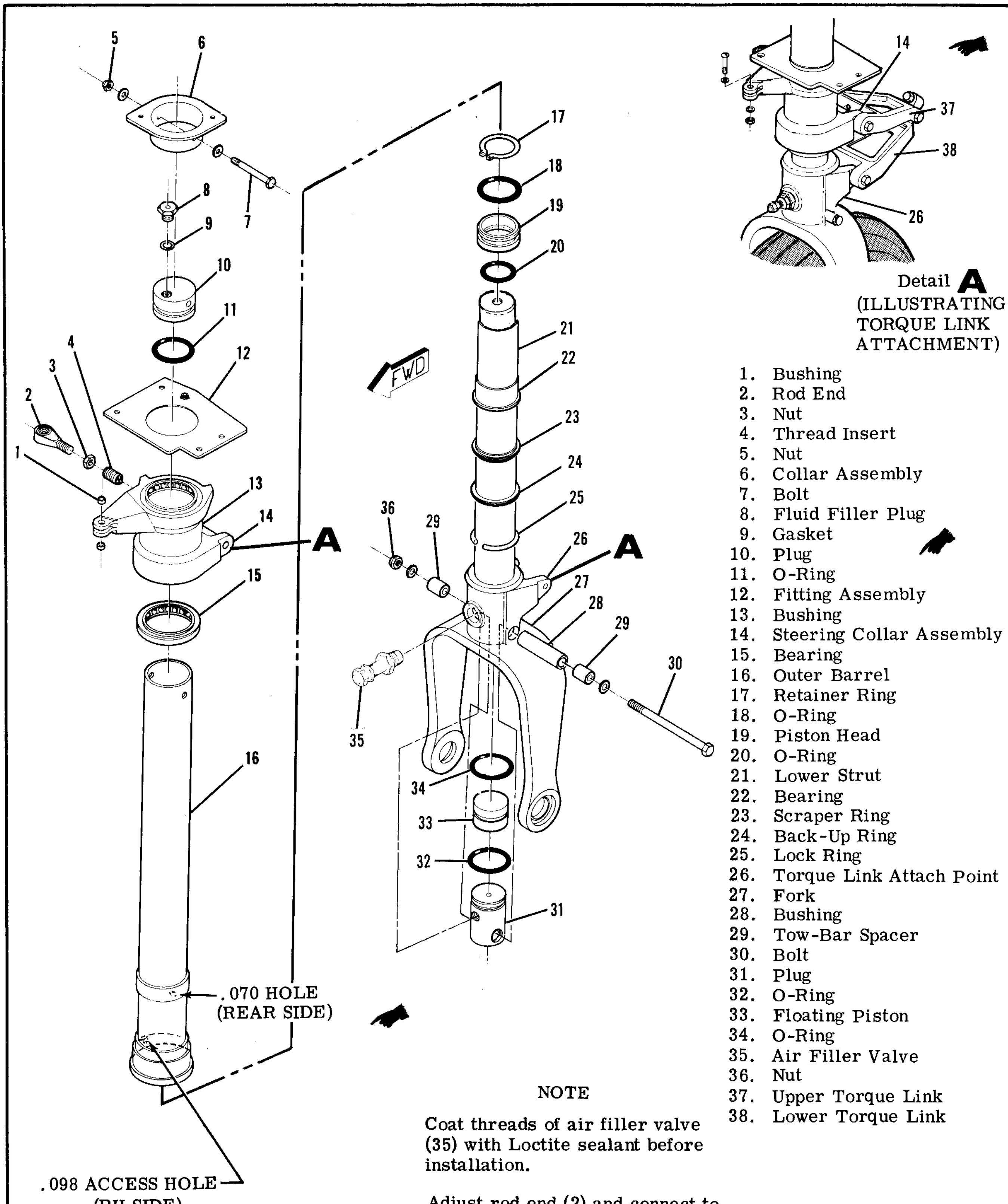
j. Remove bolt (7) at top of upper strut. Remove collar (6) and fitting assembly (12).

NOTE

Do not remove steering collar (14) unless bearing or collar replacement is required.

k. Using a rod, through lower end of upper strut, push plug (10) from strut.
l. Remove and discard all O-rings.

5-29. NOSE GEAR SHOCK STRUT INSPECTION AND REPAIR. (Refer to figure 5-9.)
a. Thoroughly clean all parts in cleaning solvent and inspect them carefully.
b. All worn or defective parts and all O-rings and back-up rings must be replaced with new parts.
c. Sharp metal edges should be smoothed with No. 400 emery paper, then cleaned with solvent.



1. Bushing
2. Rod End
3. Nut
4. Thread Insert
5. Nut
6. Collar Assembly
7. Bolt
8. Fluid Filler Plug
9. Gasket
10. Plug
11. O-Ring
12. Fitting Assembly
13. Bushing
14. Steering Collar Assembly
15. Bearing
16. Outer Barrel
17. Retainer Ring
18. O-Ring
19. Piston Head
20. O-Ring
21. Lower Strut
22. Bearing
23. Scraper Ring
24. Back-Up Ring
25. Lock Ring
26. Torque Link Attach Point
27. Fork
28. Bushing
29. Tow-Bar Spacer
30. Bolt
31. Plug
32. O-Ring
33. Floating Piston
34. O-Ring
35. Air Filler Valve
36. Nut
37. Upper Torque Link
38. Lower Torque Link

NOTE

Coat threads of air filler valve (35) with Loctite sealant before installation.

Adjust rod end (2) and connect to steering bungee clevis in accordance with procedures outlined in Section 10.

Figure 5-9. Nose Gear Shock Strut

5-29A. NOSE GEAR SHOCK STRUT REASSEMBLY. (Refer to figure 5-9.)

NOTE

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

a. If steering collar (14) was removed and disassembled, reassemble completely, and install collar on outer barrel (16).

NOTE

Collar is a slight press fit over barrel, and it might be required to tap collar gently with a rubber mallet while installing collar over barrel.

b. Install fitting assembly (12) over barrel and slide down to rest on collar assembly.
c. Install O-ring (11) in groove of plug (10) and insert plug in barrel (16) with filler plug hole to forward edge of strut and holes in plug aligned with holes in barrel.

NOTE

Do not install filler plug (8) or gasket (9) at this time.

d. Install collar assembly (6), lining up holes with holes in barrel (16) and plug (10). Install bolt (7), washers and nut (5).
e. Install O-ring (34) on floating piston (33) and insert piston through bottom of lower strut and fork assembly.
f. Install O-ring (32) on plug (31) and insert plug through bottom of lower strut and fork assembly, making sure that threaded hole in plug is to forward edge of strut and can be seen through hole in forward side of fork.

NOTE

If plug (31) is to be replaced, new part will need to be line-drilled to accept NAS-75-5 bushing.

g. Install bushing (28), bolt (30), washers, tow bar spacers (29) and nut (36).

NOTE

If wheel speed fairings are to be installed, do not torque nut (36) at this time.

h. Using a small rod, inserted through hole in top of lower strut (21), push floating piston (33) to rest on top of plug (31).

i. Coat threads of filler valve (35) with Loctite sealant, and insert filler valve through hole in front of fork, and screw into threaded hole in base plug (31); tighten.
j. Install lock ring (25), back-up ring (24), scraper ring (23) and bearing (22) on lower strut.
k. Install O-rings (18) and (20) on piston head (19) and install piston head with beveled edge of piston up next to retaining ring groove.
l. Install retaining ring (17) and snap into groove at top of lower strut.
m. Slide outer barrel assembly down over lower strut and fork assembly.
n. Rotate lock ring (25) until one of its ends just covers the small access hole in bottom of outer barrel; secure lock ring in groove inside bottom of barrel assembly.
o. If torque links were disassembled, assemble in accordance with paragraph 5-41.
p. Install torque links on nose gear as outlined in paragraph 5-31E.)

NOTE

If speed fairings are to be installed, remove bolt (30), washers, tow bar spacers (29) and nut (36).

q. Install speed fairings as outlined in paragraph 5-20.
r. Install nose wheel per paragraph 5-21.
s. Install gasket (9) on fluid filler plug (8). Install filler plug in plug (10).
t. Inflate strut in accordance with procedures outlined in Section 2 of this manual.

5-30. HEAVY-DUTY NOSE GEAR.

5-31. DESCRIPTION. The optional heavy-duty nose gear is shown in figure 5-10. Procedures outlined in paragraphs 5-19 and 5-28 thru 5-29A should be followed during removal, disassembly, inspection and repair and reassembly of the heavy-duty strut, with exceptions noted in figure 5-10.

5-31A. TORQUE LINKS.

5-31B. DESCRIPTION. Torque links keep the lower strut aligned with the nose gear steering system, but permit shock strut action.

5-31C. TORQUE LINK REMOVAL. (Refer to figure 5-11.)

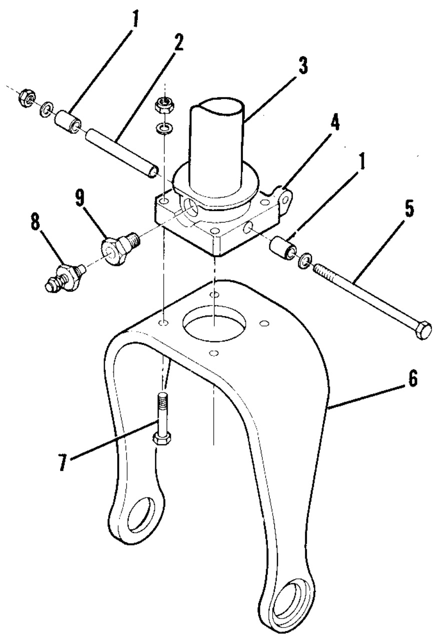
WARNING

Completely deflate strut before removing torque links.

a. Completely deflate shock strut.
b. Disconnect upper and lower attaching bolts, washers and nuts.

NOTE

Do not remove bearings (7) or bushings (3) except for replacement of parts.



1.	Tow-Bar Spacer	6.	Heavy-Duty Fork
2.	Bushing	7.	Bolt
3.	Lower Strut	8.	Air Filler Valve
4.	Torque Link Fitting	9.	Adapter
5.	Bolt		

Figure 5-10. Heavy-Duty Nose Gear Strut

5-31D. TORQUE LINK INSPECTION AND REPAIR. (Refer to figure 5-11.) Torque link bearings and/or bushings should not be removed except for replacement of parts; replace if excessively worn.

5-31E. TORQUE LINK INSTALLATION. (Refer to figure 5-11.)
a. With shock strut completely deflated, install upper and lower torque link assemblies.
b. Install bolt, washers and bushing attaching upper and lower assemblies.
c. Fill and inflate shock in accordance with procedures outlined in Section 2 of this manual.

5-31F. SHIMMY DAMPENER. (Refer to figure 5-12.)

5-31G. DESCRIPTION. The shimmy dampener offers resistance to shimmy by forcing hydraulic fluid through small orifices in a piston. Dampener barrel is attached to a dampener fork, secured to a stationary part of the aircraft structure. The piston rod is secured to the nose gear steering collar, which moves as the wheel is turned. This causes relative motion between barrel and piston rod.

5-31H. SHIMMY DAMPENER REMOVAL. (Refer to figure 5-6.)
a. Remove cotter pin, nut, washers and bolt attaching piston rod to steering collar (12).
b. Remove bolts attaching shimmy dampener to support fork (10); remove dampener.

5-31I. SHIMMY DAMPENER DISASSEMBLY. (Refer to figure 5-12.)
a. Remove screw (1) and stat-o-seal (2) and drain fluid.
b. Remove outer retainer (5), bearing head (6) and inner retainer (5).
c. Remove piston and rod assembly (9 and 8).
d. To remove piston (9) from rod (8), remove pin (10).
e. Remove all O-rings (7) and (11).

5-31J. SHIMMY DAMPENER INSPECTION AND REPAIR (Refer to figure 5-12.)
a. Inspect heli-coil inserts (3) for looseness or damaged threads.
b. Inspect piston (9) for fit on shaft (8); replace if loose.
c. Inspect retainer rings (5) and retainer ring grooves in barrel (4) for sharp edges.
d. Check retainer rings (5) for cracks or distortion.
e. Discard all O-rings.

5-32. SHIMMY DAMPENER REASSEMBLY. (Refer to figure 5-12.)

NOTE

Dow Corning DC-4 is recommended for O-ring lubrication. All other internal parts should be liberally coated with hydraulic fluid during assembly.

a. Install O-ring (11) in end of barrel (4).
b. Install rod and piston assembly (8 and 9).
c. Install inner retainer (5).
d. Install O-rings (7) on bearing head (6).
e. Install outer retainer (5).
f. Before installing filler screw (1) and stat-o-seal (2), service shimmy dampener as outlined in Section 2 of this manual.

5-33. SHIMMY DAMPENER INSTALLATION. (Refer to figure 5-6.)

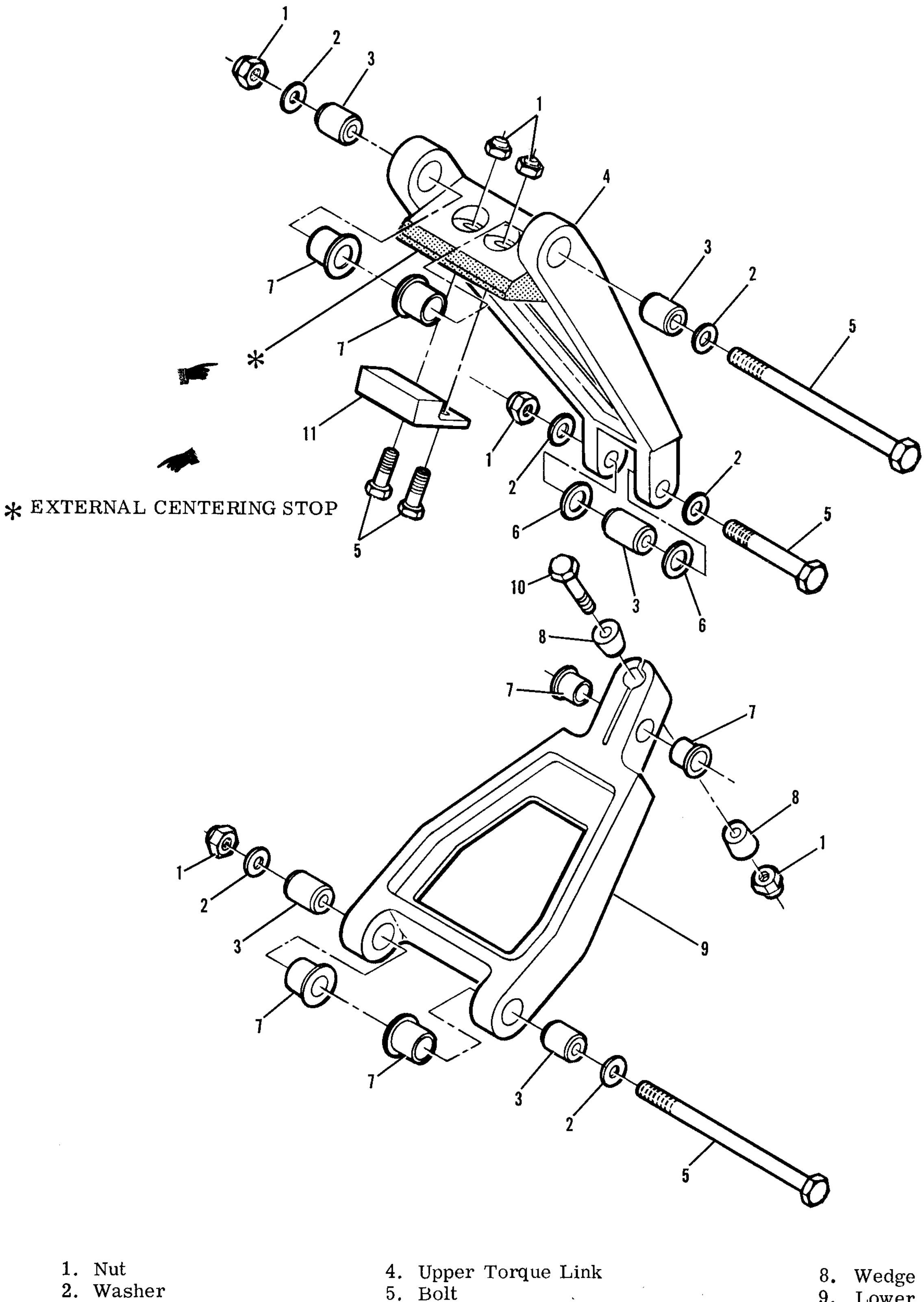
NOTE

Prior to installing shimmy dampener, check fit of bearings (15) and bushings (16) in fork (10). Make sure they are installed as shown.

a. Install bolts attaching shimmy dampener to support fork (10).
b. Install bolt, washers, nut and cotter pin attaching piston rod to steering collar (12)

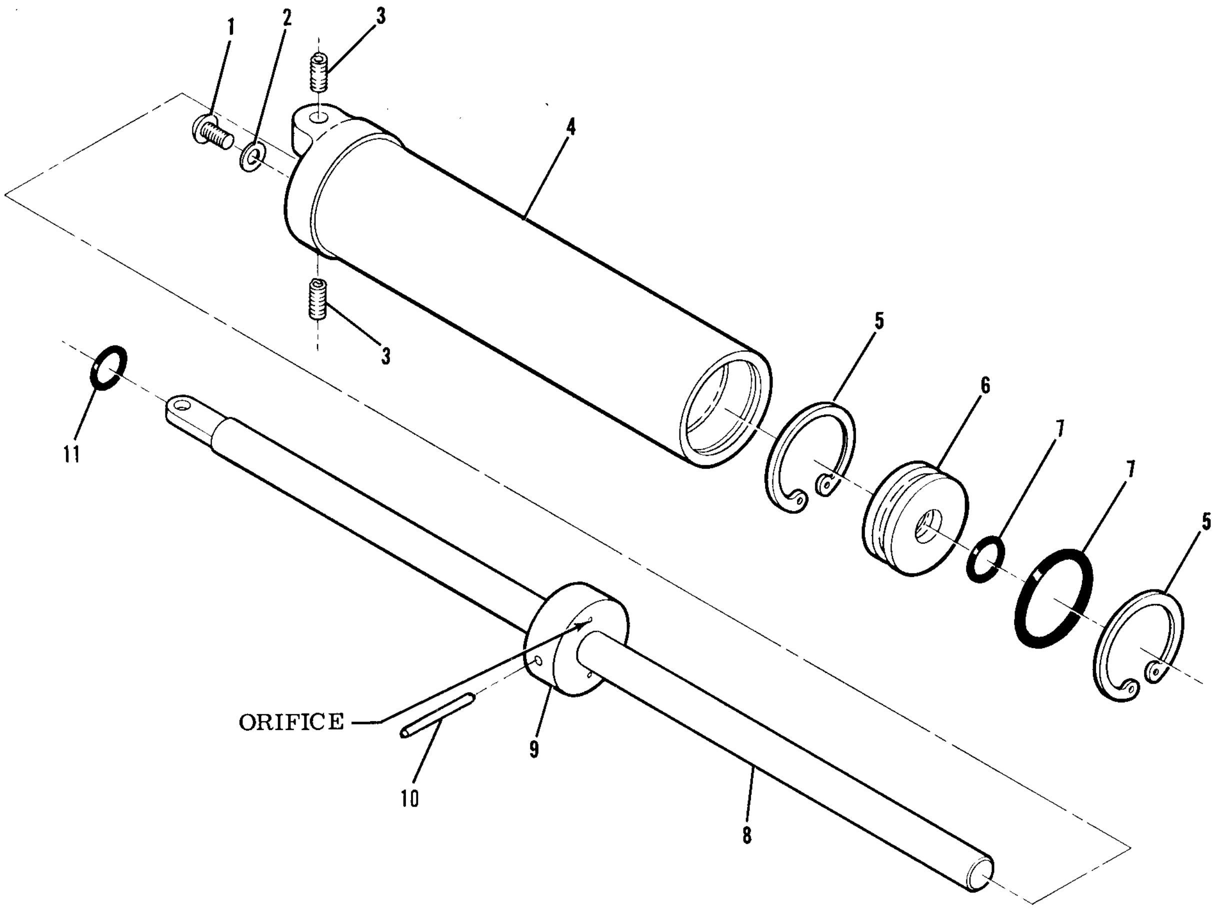
5-34. NOSE WHEEL STEERING SYSTEM.

5-35. DESCRIPTION. Nose gear steering is accomplished through the rudder pedal and rudder pedal bars. A nose gear steering bungee is attached to an arm located on one of the rudder pedal bars (thru 17701370) or through linkage to two arms located on one of the rudder pedal bars (beginning with 17701371). The opposite end of the bungee is attached to a rod end at the steering collar on the nose gear strut. The



1. Nut
2. Washer
3. Bushing
4. Upper Torque Link
5. Bolt
6. Washer
7. Bearing
8. Wedge
9. Lower Torque Link
10. Bolt
11. Stop Lug

Figure 5-11. Torque Links



1 Filler Plug
2. Stat-O-Seal
3. Heli-Coil Insert
4. Barrel
5. Retainer
6. Bearing Head
7. O-Ring
8. Rod
9. Piston
10. Pin
11. O-Ring

Figure 5-12. Shimmy Dampener

steering bungee contains a double-acting spring which provides nose gear steering through an arc of approximately 12-degrees each side of centerline and capability of free-swivel through 45-degrees each side of centerline. Nose gear steering is accomplished by transmission of steering forces through the bungee into the steering collar on the nose gear and then through the torque links to the lower fork. Refer to Section 10 for removal, installation and rigging of the steering system.

35A. STEERING BUNGEE ASSEMBLY.

36. DESCRIPTION. The bungee is comprised of a double-acting spring, rod and support assembly, a sleeve and a guide, inside the housing assembly. The bungee is spring-loaded, and should not be disassembled. Refer to the preceding paragraph for location and operation. Refer to Section 10 for removal, installation and rigging.

5-37. NOSE WHEEL STEERING ADJUSTMENT. Since the nose wheel steering and rudder system are interconnected, adjustments to one system may affect the other system. Section 10 contains rigging instructions for the nose wheel steering system as well as the rudder system.

5-38. BRAKE SYSTEM.

5-39. DESCRIPTION. The hydraulic system consists of two master cylinders, located just forward of the rudder pedals, brake lines connecting each master cylinder to its wheel brake cylinder, and the single-disc type brake assembly, located at each main landing gear wheel.

5-40. 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.
	Insufficient clearance at Lock-O-Seal in master cylinder.	Adjust as described in paragraph 5-46.
	Restriction in hydraulic lines or restriction in compensating port in master brake cylinders.	Drain brake lines and clear the inside of the brake line with filtered compressed air. Fill and bleed brakes. If cleaning the lines fails to give satisfactory results, the master cylinder may be faulty and should be repaired.
	Worn, scored or warped brake discs.	Replace brake discs 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.	If brake master cylinders or wheel brake assemblies are leaking, they should be repaired or replaced.
	Air in system.	Bleed system.
	Lack of fluid in master cylinders.	Fill and bleed if necessary.
	Master cylinder defective.	Repair or replace master cylinder.

SHOP NOTES:

5-41. BRAKE MASTER CYLINDERS.

5-42. 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.

5-43. BRAKE MASTER CYLINDER REMOVAL.
a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
b. Remove front seats and rudder bar shield for access to brake master cylinders.
c. Disconnect parking brake linkage and disconnect brake master cylinders from rudder pedals.
d. Disconnect brake master cylinders at bottom attach points.
e. Disconnect hydraulic hoses from brake master cylinders and remove cylinders.
f. Plug or cap hydraulic fittings lines and hoses to prevent entry of foreign materials.

5-44. BRAKE MASTER CYLINDER DISASSEMBLY. (Refer to figure 5-13.)
a. Unscrew clevis (1) and jamb nut (2).
b. Remove screw (18).
c. Remove filler plug (17) and setscrew (5).
d. Unscrew cover (4) and remove up over piston rod (3).
e. Remove piston rod (3) and compensating sleeve (16).
f. Slide sleeve (16) up over rod (3).
g. Unscrew nut (12) from threads of piston rod (3).
h. Remove spring (13) and O-ring (9) from piston (14).
i. Remove Lock-O-Seal (15).

5-45. BRAKE MASTER CYLINDER INSPECTION AND REPAIR. (Refer to figure 5-13.) Repair is limited to installation of new parts, cleaning and adjusting. (Refer to reassembly paragraph for adjustment.) Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinders. Inspect Lock-O-Seal (Parker Seal Co. P/N 800-001-6) and replace if damaged. Replace all O-rings. Filler plug (17) must be vented so pressure cannot build up in the reservoir during brake operation. If plug (17) is not vented, drill 1/16-inch hole, 30 degrees from vertical (as shown in the figure)

5-46. BRAKE MASTER CYLINDER REASSEMBLY. (Refer to figure 5-13.)
a. Install Lock-O-Seal (15) at bottom of piston rod (3).
b. Install O-ring (9) in groove in piston (14); insert piston spring (13) into piston, and slide assembly up on bottom threaded portion of piston rod (3).
c. Run nut (12) up threads to spring (13). Tighten nut (12) enough to obtain 0.040±0.005-inch clearance between top of piston and bottom of Lock-O-Seal, as shown in the figure.
d. Install piston return spring (11) into cylinder (10) portion of body (7).
e. Install piston rod (3) end through spring (11).
f. Slide compensating sleeve (16) over rod (3).
g. Install cover (4) and screw (18).
h. Install jamb nut (2) and clevis (1).
i. Install filler plug (17), making sure vent hole is open.
j. Install setscrew (5).

5-47. BRAKE MASTER CYLINDER INSTALLATION.
a. Connect hydraulic hoses to brake master cylinders and install cylinders.
b. Connect brake master cylinders to rudder pedals and connect parking brake linkage.
c. Install bleeder screw at wheel brake assembly and fill and bleed brake system in accordance with applicable paragraph in this section.
d. Install rudder bar shield and install front seats.

5-48. HYDRAULIC BRAKE LINES.

5-49. DESCRIPTION. The brake lines are rigid tubing, except for flexible hose used at the brake cylinder and at the master cylinder. A separate line is installed to connect each brake master cylinder to its corresponding wheel brake cylinder.

5-50. WHEEL BRAKE ASSEMBLIES. (Refer to figure 5-4.)

5-51. DESCRIPTION. The wheel brake assemblies employ a floating brake assembly and a disc which is attached to the main wheel with the wheel thru-bolts.

5-52. WHEEL BRAKE REMOVAL. (Refer to figure 5-4.) Wheel brake assemblies can be removed by disconnecting the brake line (drain hydraulic fluid when disconnecting line) and removing the brake backplate. The brake disc is removed after the wheel is removed and disassembled. To remove the torque plate, remove wheel and axle.

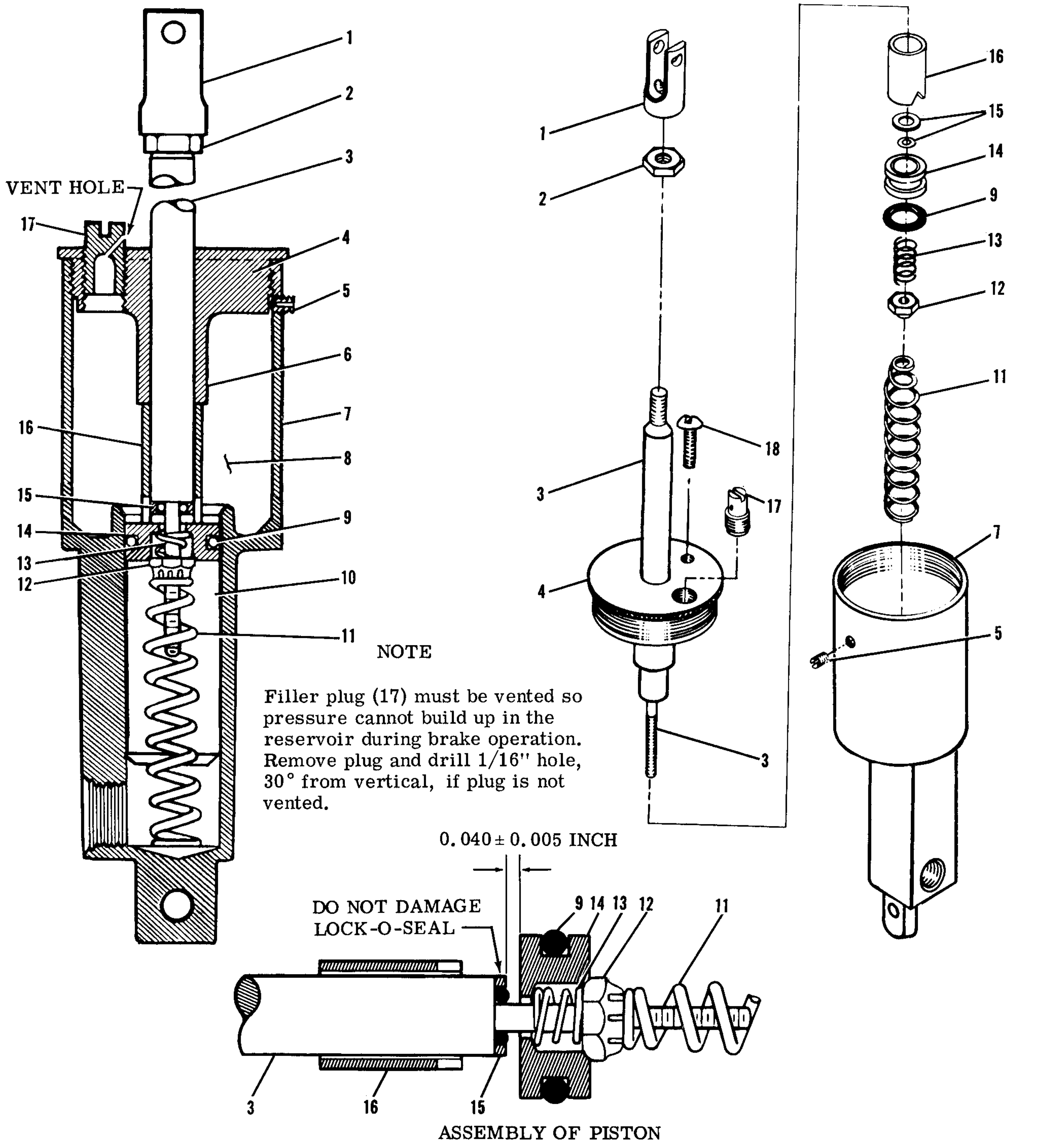
5-53. WHEEL BRAKE DISASSEMBLY. (Refer to figure 5-4 for a breakdown of wheel brake parts. This figure may be used as a guide for assembling the wheel brakes.

5-54. 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, dry cloth saturated in hydraulic fluid and inspect for damage.

NOTE

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

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



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

Figure 5-13. Brake Master Cylinder

When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft mallet.

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

5-55. WHEEL BRAKE REASSEMBLY. (Refer to figure 5-4.)

NOTE

Lubricate parts with clean hydraulic fluid during brake reassembly.

a. Refer to figure 5-4 as a guide while reassembling wheel brakes.

5-56. WHEEL BRAKE INSTALLATION.

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

b. Install back plate.

NOTE

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

5-57. CHECKING BRAKE LINING WEAR. New brake lining should be installed when the existing lining has worn to a minimum thickness of 3/32-inch. A 3/32-inch thick strip of material held adjacent to each lining can be used to determine amount of wear. The shank end of a drill bit of the correct size can also be used to determine wear of brake linings.

5-58. BRAKE LINING INSTALLATION. (Refer to figure 5-4.)

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 9/64-inch (or slightly smaller) punch in the rolled rivet, and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate and pressure plate in the same manner.

NOTE

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

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

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

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

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

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

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

j. Install back plate with bolts and washers.

5-59. BRAKE SYSTEM BLEEDING.

NOTE

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

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

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

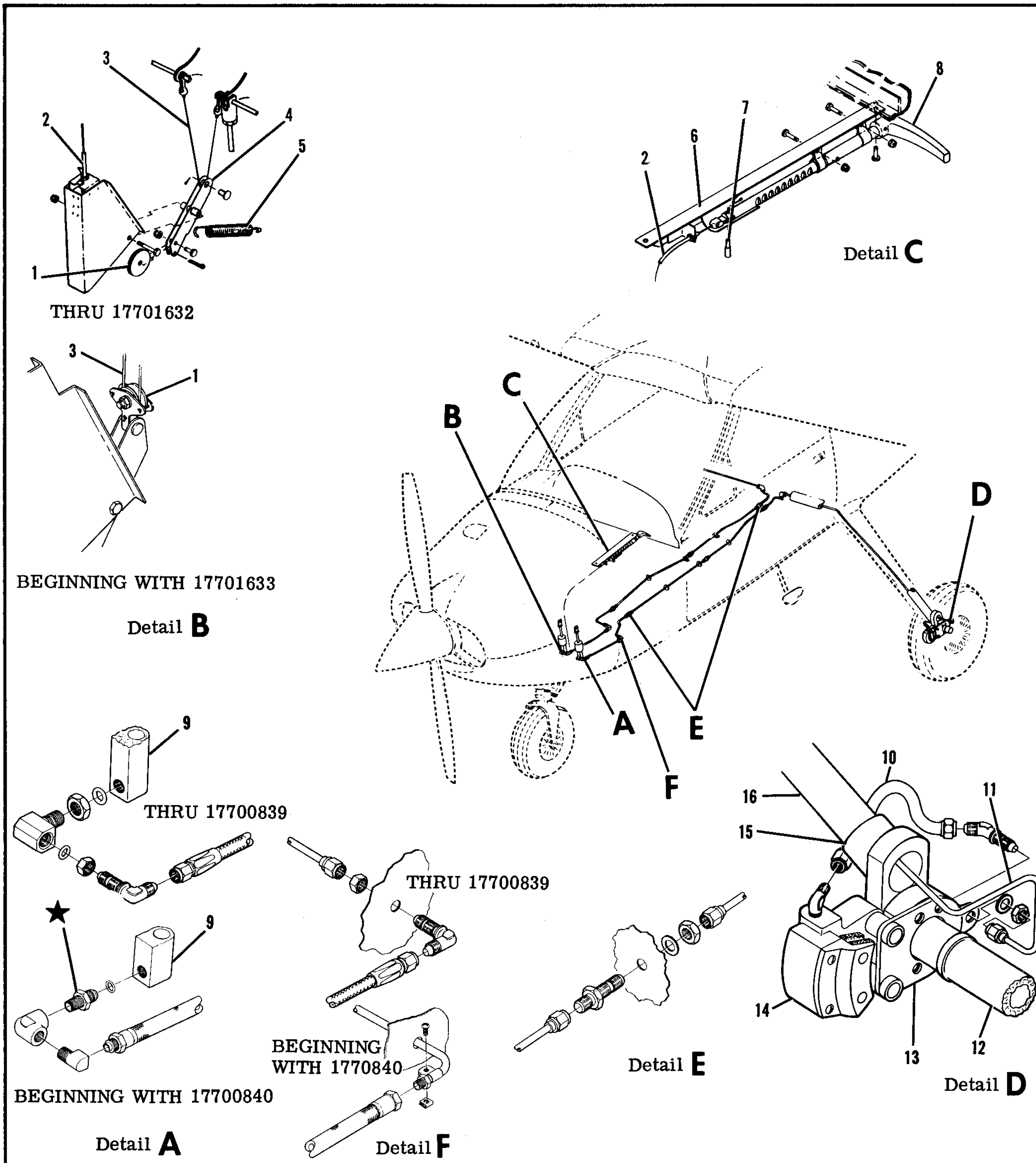
c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit, to the bleeder valve in the wheel cylinder.

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

5-60. PARKING BRAKE SYSTEM. (Refer to figure 5-14.)

5-61. DESCRIPTION. The parking brake system employs a handle and ratchet mechanism connected by a cable to linkage at the brake master cylinders. Pulling out on the handle depresses both master cylinder piston rods, and the handle ratchet locks the handle in this position until the handle is turned and released.

5-62. REMOVAL AND INSTALLATION OF COMPONENTS. Refer to the figure for relative location of system components. The figure may be used as a guide for removal and installation of parts of the system.



1. Pulley
2. Tube Assembly
3. Cable
4. Bellcrank Assembly
5. Spring
6. Stiffener Angle
7. Positioning Pin
8. Handle
9. Master Cylinder
10. Brake Hose
11. Brake Line
12. Axle
13. Torque Plate
14. Wheel Brake Assembly
15. Strut Fitting
16. Strut

★ Apply GRADE T primer and seal with LOCTITE #75 to nipple and brake cylinder upon installation.

Figure 5-14. Brake System

This page intentionally left blank.

SECTION 6

AILERON CONTROL SYSTEM

TABLE OF CONTENTS Page

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 re-rig system. Refer to paragraph 6-20.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION IN CONTROL WHEEL.	Loose control cables.	Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Replace worn or broken parts, install cables correctly.
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Adjust cables to proper tension.
	Pulleys binding or cable off.	Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Replace bellcrank.
	Quadrant binding.	Replace defective quadrant.
	Clevis bolts in system too tight.	Loosen, then tighten properly and safety.
	Defective bearing in control column sleeve.	Replace defective bearing.

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of cables.	Adjust in accordance with paragraph 6-20.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Transition cable improperly adjusted.	Adjust in accordance with paragraph 6-20.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Adjust in accordance with paragraph 6-20.
	Incorrect adjustment of travel stop bolts.	Adjust in accordance with paragraph 6-20.

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

6-5. DESCRIPTION. Rotation of the control wheel (6) rotates four bearing roller assemblies on the end of the tube and bearing assembly (19), which in turn, rotates a square control tube assembly (5) inside and extending from the tube and bearing assembly (19). Attached to this square tube (5) is a quadrant (34) which operates the aileron system. This same arrangement is provided for both control wheels and synchronization of the control wheels is obtained by the transition cable (36), turnbuckle (37) and adjustment terminals (35). The forward end of the square control tube (5) is mounted in a bearing block (28) on the firewall (38) and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies on the end of the tube and bearing assembly (19) reduce friction as the control wheel is moved fore-and-aft for stabilator system operation. A sleeve weld assembly (16), containing bearings which permit the tube and bearing assembly (19) to rotate within it, is secured to the tube by a sleeve and retaining ring in such a manner that it moves fore-and-aft with the tube and bearing assembly. This movement allows the link (20) attached to the sleeve weld assembly (16) to operate a lever arm (25) which transmits force to a quadrant (22). The stabilator control cables (23 and 24) are attached to these quadrants. When dual controls are installed, the copilot control wheel is linked to the aileron and stabilator control systems in the same manner as the pilot control wheel.

6-6. REMOVAL AND INSTALLATION.

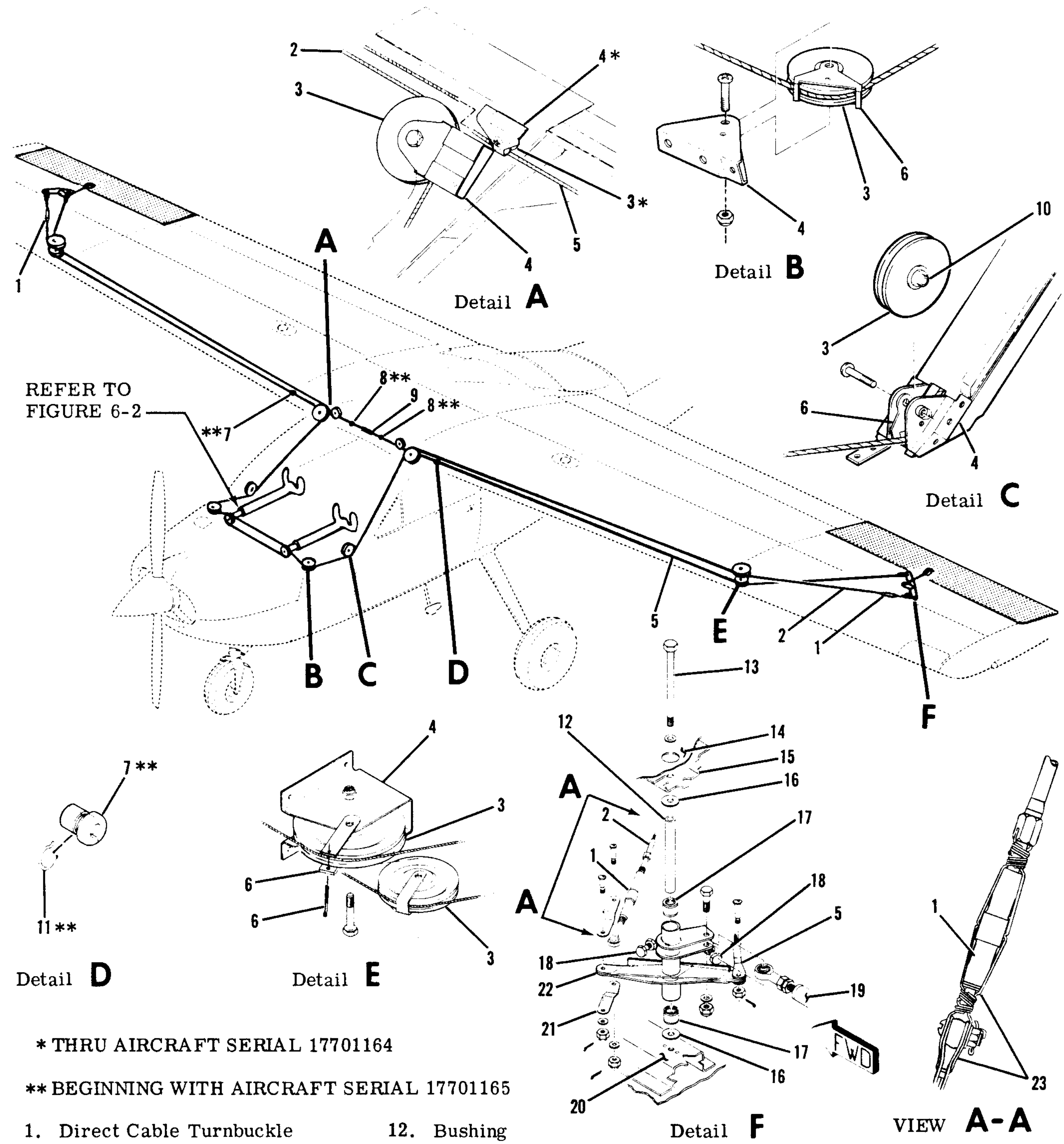
a. Remove screws attaching control wheel (6) to tube and bearing assembly (19) and remove control wheel. Disconnect electrical wiring if installed.
b. Remove decorative cover from instrument panel.
c. Relieve direct cable tension by loosening turnbuckles (index 1, figure 6-1).
d. Relieve transition cable tension by loosening turnbuckle (37).
e. Remove interconnect cable clamps (index 3, figure 6-3) if installed.
f. Remove cables from quadrants (34).
g. Remove roll pin (33) from quadrant (34).
h. Remove nut (39) and washer from tube assembly (5) protruding through bearing block (28) on forward side of firewall (38).
i. Disconnect link (20) from sleeve weld assembly (16).
j. Pull tube (5) aft and remove quadrant (34).
k. Remove screws securing collar (8) and bracket (10) to instrument panel.
l. Pull tube and bearing assembly (19) aft and remove tube assembly (5).
m. Work tube and bearing assembly (19) forward and down until free of collar (8) and bracket (10) at instrument panel.
n. Reverse preceding steps for reinstallation. Rig aileron and interconnect systems in accordance with paragraph 6-20, safety turnbuckles and all other items previously safetied. Tighten nut (39) securing tube assembly (5) to firewall snugly, then loosen the least amount required to eliminate binding and provide cotter pin alignment.

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. AILERON BELLCRANK. (Refer to figure 6-1.)

6-9. REMOVAL.

a. Remove access plate inboard of each bellcrank on underside of wing.
b. Relieve control cable tension by loosening turnbuckles (1).
c. Disconnect direct cable link (21) at bellcrank (22).
d. Disconnect carry-thru cable (5) at bellcrank.
e. Disconnect aileron push-pull rod (19) at bellcrank.



* THRU AIRCRAFT SERIAL 17701164

** BEGINNING WITH AIRCRAFT SERIAL 17701165

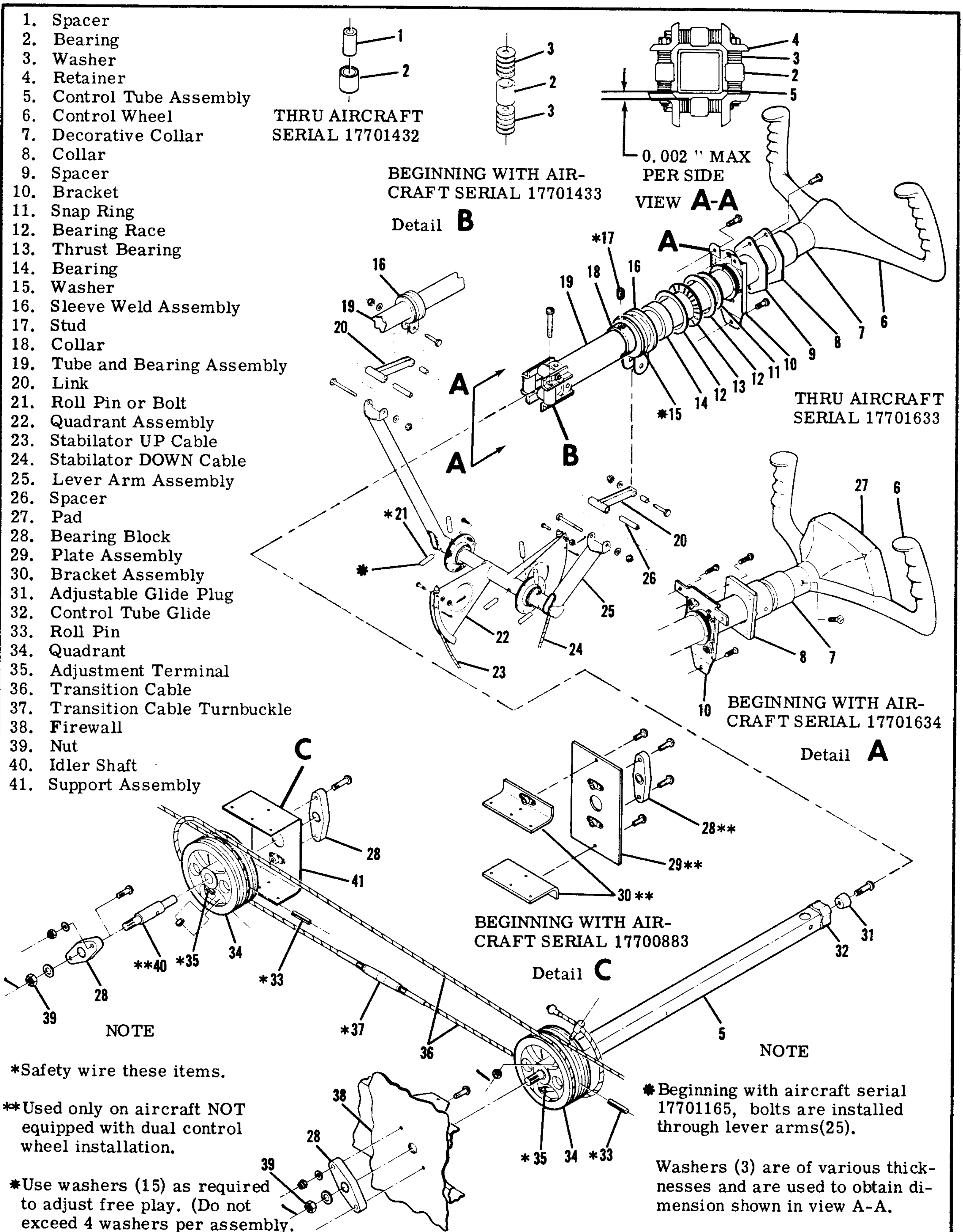
1. Direct Cable Turnbuckle
2. Direct Cable
3. Pulley
4. Bracket
5. Carry-Thru Cable
6. Cable Guard
7. Fairlead
8. Grommet
9. Carry-Thru Cable Turnbuckle
10. Bushing
11. Clip
12. Bushing
13. Pivot Bolt
14. Upper Wing Skin
15. Upper Support
16. Brass Washer
17. Needle Bearing
18. Stop Bolt
19. Push-Pull Rod
20. Lower Support
21. Link
22. Bellcrank
23. Safety Wire

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

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

Figure 6-1. Aileron Control System



1. Spacer
2. Bearing
3. Washer
4. Retainer
5. Control Tube Assembly
6. Control Wheel
7. Decorative Collar
8. Collar
9. Spacer
10. Bracket
11. Snap Ring
12. Bearing Race
13. Thrust Bearing
14. Bearing
15. Washer
16. Sleeve Weld Assembly
17. Stud
18. Collar
19. Tube and Bearing Assembly
20. Link
21. Roll Pin or Bolt
22. Quadrant Assembly
23. Stabilator UP Cable
24. Stabilator DOWN Cable
25. Lever Arm Assembly
26. Spacer
27. Pad
28. Bearing Block
29. Plate Assembly
30. Bracket Assembly
31. Adjustable Glide Plug
32. Control Tube Glide
33. Roll Pin
34. Quadrant
35. Adjustment Terminal
36. Transition Cable
37. Transition Cable Turnbuckle
38. Firewall
39. Nut
40. Idler Shaft
41. Support Assembly

NOTE

*Safety wire these items.

**Used only on aircraft NOT equipped with dual control wheel installation.

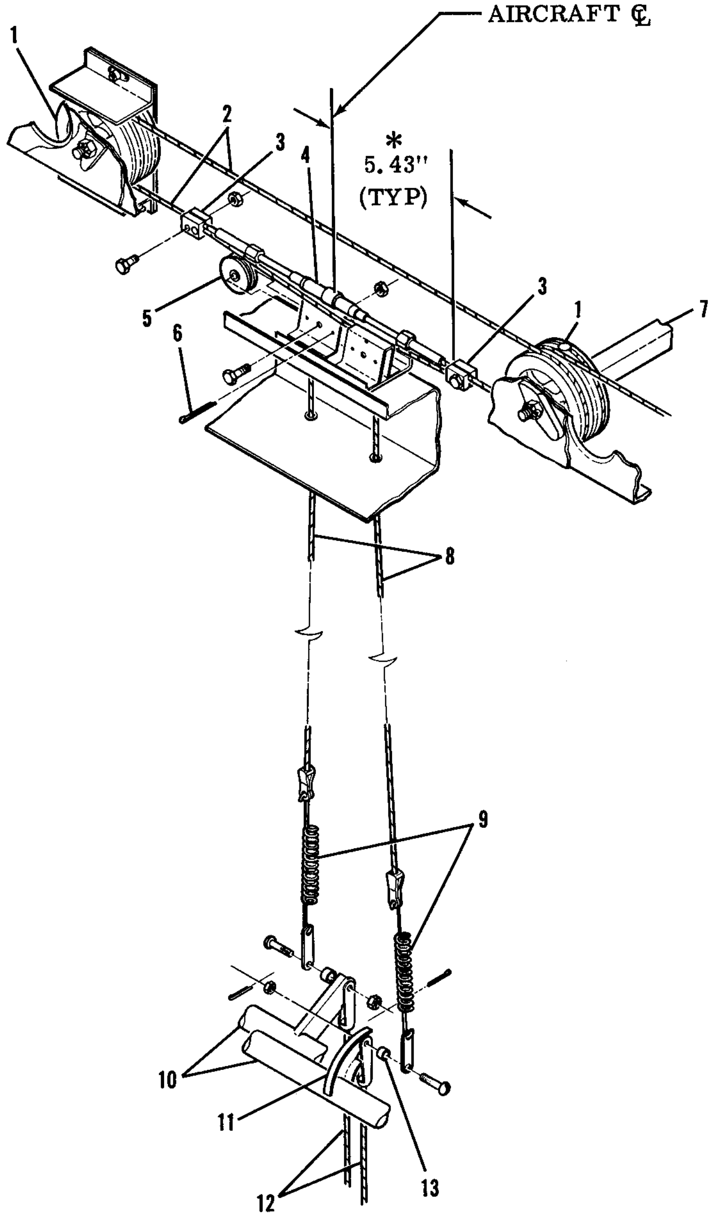
✱Use washers (15) as required to adjust free play. (Do not exceed 4 washers per assembly.

NOTE

✱Beginning with aircraft serial 17701165, bolts are installed through lever arms(25).

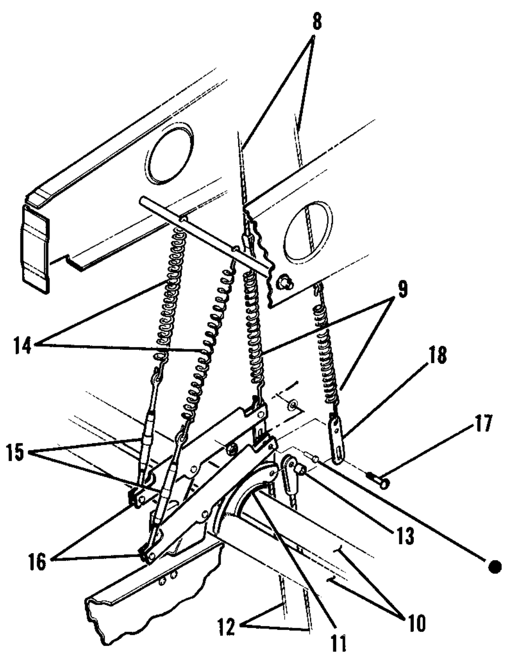
Washers (3) are of various thicknesses and are used to obtain dimension shown in view A-A.

Figure 6-2. Control Column Installation



AIRCRAFT SERIALS
17701165 THRU 17701370

1. Quadrant
2. Transition Cable
3. Cable Clamp
4. Transition Cable Turnbuckle
5. Pulley
6. Cable Guard
7. Control Tube Assembly
8. Rudder Interconnect Cables
9. Interconnect Springs
10. Rudder Bars
11. Rudder Bar Arm
12. Rudder Cables
13. Spacer
14. Forward Interconnect Springs
15. Turnbuckle
16. Arm
17. Bolt
18. Link



BEGINNING WITH AIRCRAFT SERIAL 17701371

* Dimension shown with ailerons and rudder in neutral position.

● Pins and washers are replaced by bolts and nuts beginning with aircraft serial 17701856

Figure 6-3. Aileron-Rudder Interconnect System

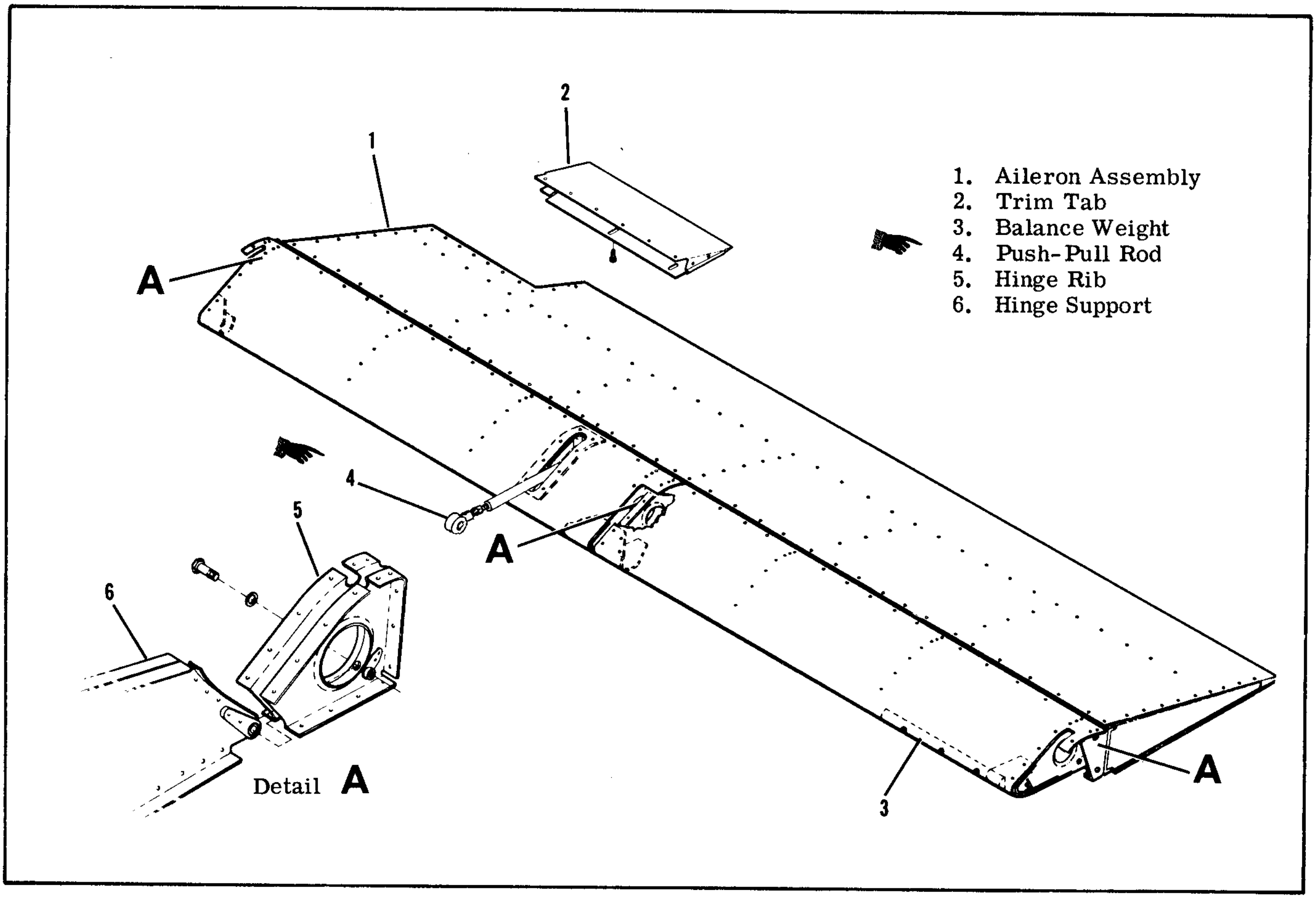


Figure 6-4. Aileron Installation

f. Remove bolt (13) securing bellcrank to wing structure.
g. Remove bellcrank through access opening, using care that bushing (12) is not dropped from bellcrank.

NOTE

Brass washers (16) may be used as shims between bellcrank and wing supports (15 and 20). Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (17).

6-10. INSTALLATION.
a. Connect control cables (2 and 5) to bellcrank (22) prior to positioning bellcrank in wing.
b. Place bushing (12) in bellcrank and position bellcrank in wing.
c. Install brass washers (16) as required between upper and lower end of bellcrank and wing supports to shim out excess clearance.
d. Install bellcrank pivot bolt (13).
e. Connect push-pull rod (19) to bellcrank.
f. Re-rig aileron system in accordance with paragraph 6-20, safety turnbuckles and reinstall all items removed for access.

6-11. 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.

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

6-13. REMOVAL AND INSTALLATION.
a. Remove access plates, wing root fairings and upholstery as required.
b. Disconnect cables from turnbuckles and bellcranks or quadrants depending on which cable is to be removed.
c. Remove cable guards, fairleads 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 before being withdrawn from the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use to pull cable into position.

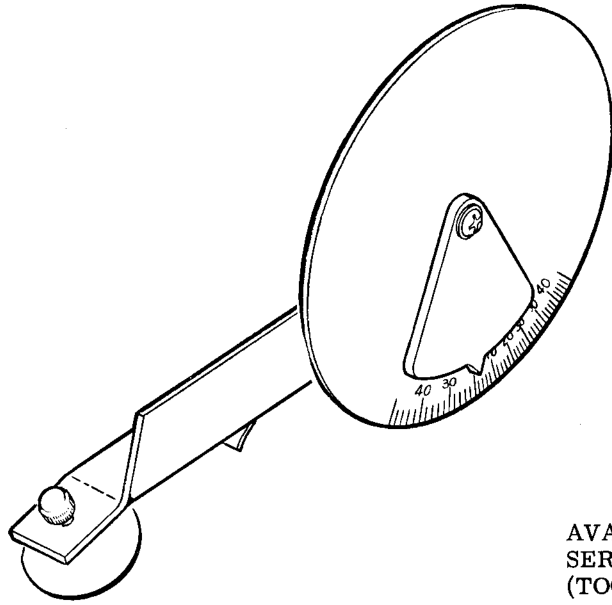


Figure 6-5. Inclinometer for Measuring Control Surface Travels

d. After cable is routed, install pulleys, fairleads and cable guards. Ensure cable is positioned in pulley groove before installing guard. Check grommets (8) for proper installation.
e. Re-rig aileron system in accordance with paragraph 6-20, safety turnbuckles, install access plates, fairings and upholstery removed in step "a."

6-14. AILERONS. (Refer to figure 6-4.)

6-15. REMOVAL AND INSTALLATION.
a. Remove access plate and disconnect push-pull rod (4) 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 securing aileron and carefully remove aileron from wing.
e. Reverse preceding steps for reinstallation. Rig system if necessary in accordance with paragraph 6-20 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.

6-16. 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.

6-17. AILERON TRIM TAB. (Refer to figure 6-4.)

6-18. 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 preceding steps for reinstallation.

6-19. 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.

6-20. RIGGING.
a. (Refer to figure 6-1.) Relieve all tension on aileron control system by loosening turnbuckles (1 and 9).
b. Disconnect push-pull rods (19) at bellcranks (22).
c. (Refer to figure 6-2.) Adjust transition cable turnbuckle (37) and adjustment terminals (35) to position control wheels (6) in neutral position (synchronized). While maintaining neutral position of control wheels, tighten transition cables until snug and safety turnbuckle (37) and adjustment terminals (35).
d. Tape a bar across both control wheels to hold them in neutral position.
e. (Refer to figure 6-1.) Adjust push-pull rods (19) at each aileron to 10.80" between centerlines of rod-

end bolt holes and connect push-pull rods to bellcranks (22).

f. Adjust direct cable turnbuckles (1) and carry-thru cable turnbuckle (9) equally to obtain 30 ± 10 pounds tension on carry-thru cable while maintaining ailerons in neutral with reference to trailing edge of wing flaps. Be sure wing flaps are full UP and disregard aileron trim tabs when making this adjustment.

f. With ailerons in neutral position (streamlined), mount an inclinometer on trailing edge of one aileron and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-5.

h. Remove bar from control wheels and adjust travel stops (18) to degree specified in figure 1-1.

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

WARNING

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

6-21. AILERON-RUDDER INTERCONNECT SYSTEM. (Refer to figure 6-3.)

a. (AIRCRAFT 17701165 THRU 17701370) With interconnect cable clamps (3) installed as illustrated, the centering force exerted on the control wheel due to the interconnect springs (9), should be 2.5+1-0 pounds. This force may be checked with a spring scale attached to the hand grip on the control wheel in its extreme position with controls fully crossed (full left rudder and full right aileron or full right rudder and full left aileron). If not within tolerance, do not move clamps (3), replace the springs (9).

b. (BEGINNING WITH AIRCRAFT 17701371)

1. Disconnect forward springs (14).
2. With interconnect cable clamps (3) installed and controls fully crossed, centering force should be 2.5+1-0 lbs. If not within tolerance, do not move clamps (3), replace the springs (9).
3. Reconnect forward springs (14). With rudder and ailerons centered, adjust turnbuckles (15) until bolts (17) in rudder bar arms are in middle of slots in links (18).

SHOP NOTES:

WING FLAP CONTROL SYSTEM

TABLE OF CONTENTS Page

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

7-3. OPERATIONAL CHECK.

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

NOTE

Due to the cable tension differential, the right flap will "lead" the opposite flap during extension when checked on the ground. In flight, the flaps will equalize due to the air pressure and cable stretch.

b. THRU AIRCRAFT SERIAL 17701633 WHEN NOT MODIFIED IN ACCORDANCE WITH SK177-17 AND SK177-18. Check for positive shut-off of motor at the flap travel extremes, motor should NOT continuously freewheel at travel extremes.

c. BEGINNING WITH AIRCRAFT SERIAL 17701634 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH SK177-17 AND SK177-18. Check for positive shut-off of motor at the flap travel extremes, FLAP MOTOR MUST STOP OR DAMAGE WILL RESULT.

d. Check wing flaps for sluggishness in operation. On the ground with engine running, the flaps should extend in approximately 5.5 seconds and retract in approximately 6.5 seconds.

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

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-5.

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

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

7-4. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 7-21.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO MOVE.	Defective circuit breaker.	Replace breaker.
	Popped circuit breaker.	Reset breaker.
	Defective microswitch.	Replace microswitch.
	Defective flap motor.	Replace flap motor.
	Broken or disconnected wires.	Connect or repair wiring.
	Defective or disconnected transmission and actuator assembly.	Connect or replace transmission and actuator assembly.
	Disconnected cables.	Connect cables.
	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.	Route cables correctly over pulleys.
	Bind in drive pulleys.	Replace drive pulley.
	Broken or binding pulleys.	Replace defective pulleys.
	Frayed cable.	Replace defective cable.
	Flaps binding on tracks.	Replace defective parts.
ONE FLAP FAILS TO MOVE.	Broken attachment to actuator.	Replace defective parts.
	Disconnected or broken cable.	Connect or replace cable.
	Disconnected push-pull rod.	Attach push-pull rod.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Rig per paragraph 7-21.
	Defective microswitch.	Replace microswitch.
	Follow-up control disconnected or slipping.	Secure control or replace if defective.
FLAPS FAIL TO EXTEND.	Defective, loose, or improperly adjusted forward operating switch.	Adjust and secure switch. Replace if defective.
	Follow-up control slipping, broken or disconnected.	Connect and secure control. Replace if defective.
	Defective down limit switch.	Replace defective switch.

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO RETRACT.	Defective, loose or improperly adjusted aft operating switch.	Adjust and secure switch. Replace if defective.
FLAP MOTOR CONTINUOUSLY FREEWHEELS.	Microswitches improperly adjusted.	Rig per paragraph 7-21.
FLAP POSITION INDICATOR FAILS TO RESPOND OR READINGS ERRONEOUS.	Follow-up control slipping, broken or disconnected.	Connect and secure control. Replace if defective.
	Pointer bent or broken.	Replace defective parts.

7-5. FLAP MOTOR, TRANSMISSION AND ACTUATOR ASSEMBLY.

7-6. REMOVAL AND INSTALLATION.

a. Place master switch in the ON position, run flaps to the full DOWN position then place master switch in the OFF position.

b. Remove aft baggage compartment wall, disconnect battery cables from battery and insulate terminals as a safety precaution.

c. Remove access plates from below actuator assembly.

d. (Refer to figure 7-1.) Remove headliner access cover, remove safety wire and relieve cable tension at turnbuckles (12 and 12A).

e. (Refer to figure 7-2.) Disconnect direct cables (3) from actuator guide assembly (7).

f. Remove bolt (14) securing follow-up control lever (11) to actuator guide assembly (7).

g. Remove screws securing lower support (22) to brackets (16 and 21).

h. Remove bolt (6) securing motor and transmission assembly to bracket (21). Move lower support (22) and motor and transmission assembly outboard to allow access to upper support screws.

i. Remove screws securing upper support (2) to brackets (16 and 21). Place switches (17 and 18) and all attaching hardware out of the working area.

j. Slide the lower support (22) out of grommet in the actuator guide assembly (7) and remove support from the wing.

k. Disconnect electrical quick-disconnect (15).

l. Using care, remove motor (1), transmission (4), actuator guide assembly (7) and upper support (2) from wing through access opening as a unit.

m. 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. For lubrication requirements refer to Section 2.

7-8. FLAP CONTROL LEVER.

7-9. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)

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

b. Remove follow-up control (19) from switch mounting arm (24).

c. Remove flap operating switches (26 and 28) from switch mounting arm (24). It is not necessary to disconnect electrical wiring at switches.

d. Remove knob (29) from control lever (21).

e. Remove remaining items by removing attaching bolt. Use care not to drop parts into tunnel area.

f. Reverse the preceding steps for reinstallation. Do not overtighten attaching bolt causing lever (21) to bind. Rig system in accordance with paragraph 7-21.

7-10. DRIVE PULLEYS.

7-11. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)

a. Run flaps to full DOWN position.

b. Remove headliner access cover, remove safety wire and relieve cable tension at turnbuckles (12 and 12A).

c. Remove access plates adjacent to drive pulley (2).

d. Remove bolt securing flap push-pull rod (9) to drive pulley (2).

e. Remove bolt securing synchronizing push-pull tube (1) to drive pulley (2).

f. Remove cable guards (6).

g. Remove cable lock pins (7) and disconnect cables (8 and 10) from drive pulley. Tag cables for reference on reinstallation.

h. Remove pivot bolt (5) attaching drive pulley to wing structure.

i. Remove drive pulley (2) through access opening, using care not to drop bushing (4). Retain brass washer between drive pulley and support bracket. Tape open ends of pulley to protect bearings (3).

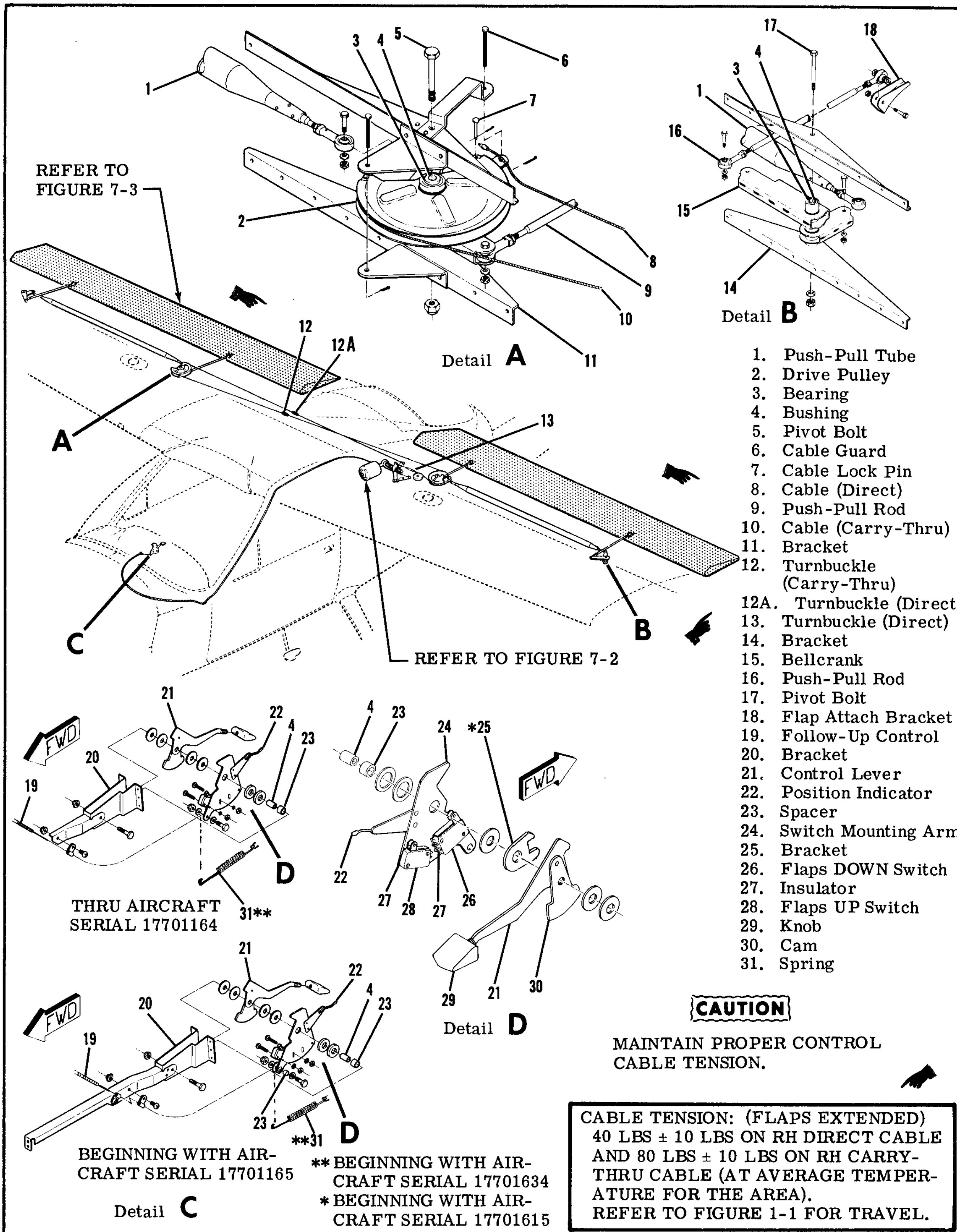


Figure 7-1. Flap Control System

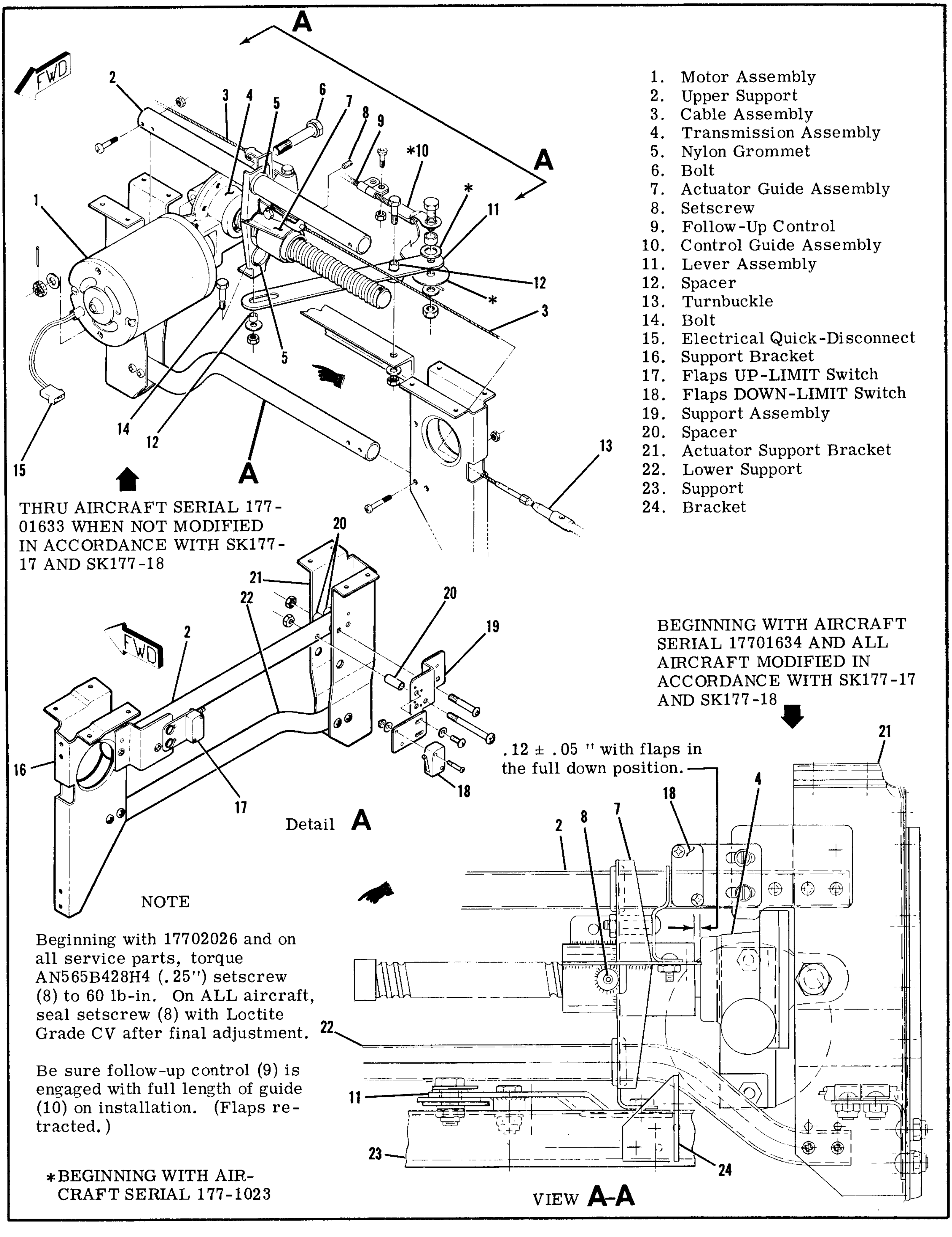


Figure 7-2. Flap Motor, Transmission and Actuator Installation

j. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed for access.

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

7-13. BELLCRANKS.

7-14. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)
a. Run flaps to full DOWN position.
b. Remove access plates adjacent to bellcrank (15).
c. Remove bolt securing push-pull rod (16) to bellcrank (15).
d. Remove bellcrank pivot bolt (17) and position bellcrank as necessary to expose synchronizing push-pull tube (1) attach point.
e. Remove bolt securing synchronizing push-pull tube (1) to bellcrank (15) and work bellcrank out through access opening using care not to drop bushing (4). Tape open ends of bellcrank to protect needle bearings (3).

NOTE

To remove synchronizing push-pull tube (1), disconnect tube at bellcrank (15) and drive pulley (2). Position tube through lightening holes until removal is possible through access opening.

f. Reverse the preceding steps for reinstallation. Brass washers may be used as required to shim out excess clearance between bellcrank and support brackets. 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 excessivly worn bellcranks must be replaced.

7-16. FLAPS.

7-17. REMOVAL AND INSTALLATION. (Refer to figure 7-3.)
a. Run flaps to full DOWN position.
b. Remove access plate (5) outboard of the inboard flap track.
c. Disconnect push-pull rod at both flap attach points (2).
d. Remove bolt (9) 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.
e. Reverse the preceding steps 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.

7-20. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)
a. Remove access plates, fairings and upholstery as required for access.
b. Relieve cable tension at turnbuckles (12 and 12A).
c. Disconnect cables at drive pulleys (2).
d. Disconnect cables at actuator guide assembly (index 7, figure 7-2).
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. Reverse the preceding steps for reinstallation. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
g. Re-rig flap system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed in step "a".

7-21. RIGGING.

NOTE

The following procedure outlines COMPLETE flap system rigging. All steps of this procedure should be noted, although individual circumstances may not require that all steps be completed.

a. THRU AIRCRAFT SERIAL 17701633 WHEN NOT MODIFIED IN ACCORDANCE WITH SK177-17 AND SK177-18.
1. (Refer to figure 7-2.) Run flaps to the FULL DOWN position.

NOTE

Loosen screws securing limit switches (17 and 18) and slide switches in their adjustment slots until they cannot be actuated by the guide assembly (7). This will ensure that the flaps are reaching their full travel before being stopped by the limit switches.

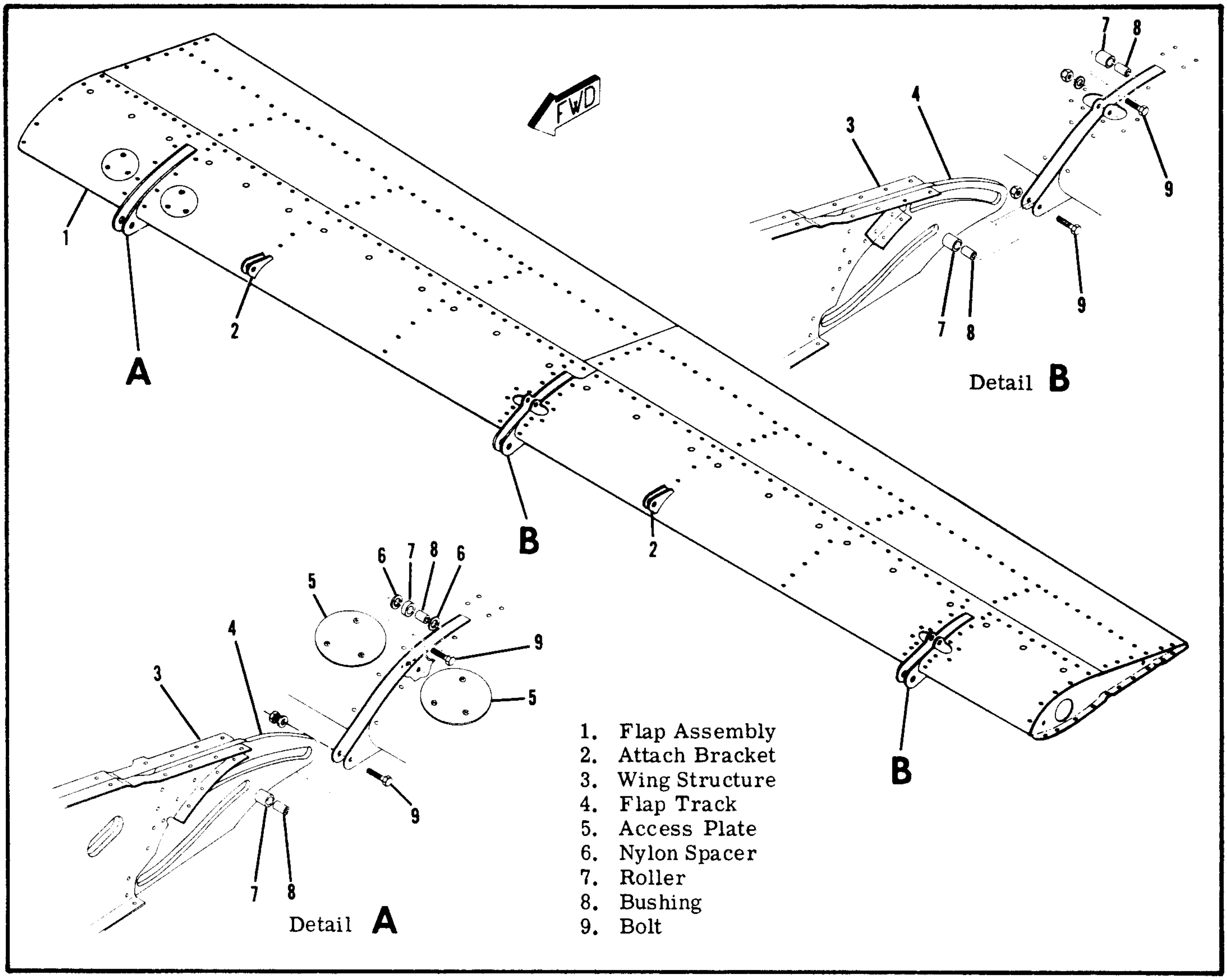


Figure 7-3. Flap Installation

2. (Refer to figure 7-1.) Remove headliner access cover, remove safety wire, relieve cable tension and disconnect turnbuckles (12 and 12A).

3. Disconnect push-pull rods (9) at both drive pulleys (2).

4. Disconnect push-pull rods (16) at both bellcranks (15).

5. Disconnect both synchronizing push-pull tubes (1) at the drive pulleys (2) and bellcranks (15).

6. If the cables are to be replaced, and the drive pulleys (2) ARE installed in the wings, rotate the drive pulleys beyond their normal range of travel to permit cable attachment. If the drive pulleys ARE NOT installed in the wings, it may be easier to attach the cables prior to installing the drive pulleys in the wings.

7. Attach the direct and carry-thru cables in accordance with schematic in figure 7-4.

8. Adjust the synchronizing push-pull tubes (1) to 41.94" between centers of rod end holes, tighten jam nuts and install push-pull tubes.

9. Adjust inboard push-pull rods (9) to 12.12" and outboard push-pull rods (16) to 11.57" between centers of rod end holes, tighten jam nuts and install push-pull rods.

10. Ensure all cables are properly routed and in their pulley grooves, then adjust turnbuckles (12 and 12A) to obtain specified cable tension with flaps in the FULL DOWN position.

11. (Refer to figure 7-2.) Run flaps FULL UP AND FORWARD and adjust UP-LIMIT switch (17) to operate and shut-off motor at this position.

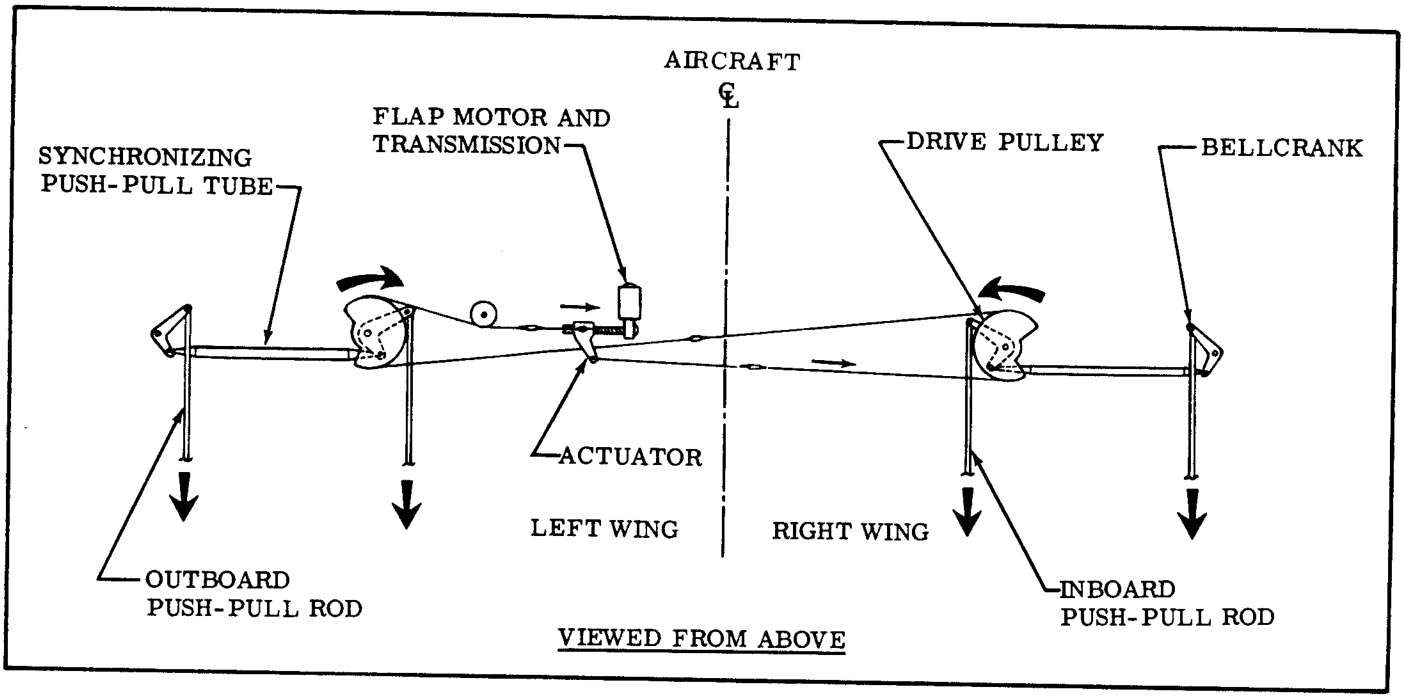


Figure 7-4. Flap System Schematic

12. Mount an inclinometer on one flap and adjust to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-5.

13. Run flaps DOWN and adjust DOWN-LIMIT switch (18) to operate and shut-off motor at the 30°+2°-0° position.
14. (Refer to figure 7-1.) Operate control lever (21) and run flaps to the full UP position.
15. Disconnect follow-up control (19) at switch mounting arm (24).
16. Without moving the control lever (21), move arm (24) until cam (30) is centered between switches (26 and 28). Ensure switches are centered in their respective adjustment slots prior to centering cam (30).
17. Adjust flaps DOWN operating switch (26) in the slotted holes until the roller just clears cam (30) and secure switch. This adjustment should provide flaps down operation to 10°±2° and 20°±2°. If not, readjust switch (26) as necessary.

NOTE

The flaps must NEVER exceed 10° when the control lever (21) is moved from the 0° to 10° position.

18. Adjust flaps UP operating switch (28) in the slotted holes to 0.062" clearance between switch roller and cam (30) when the DOWN operating switch has just opened in the 10° and 20° position.

NOTE

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

19. Complete an operational check as outlined in paragraph 7-3.
20. Check all rod ends and clevis ends for sufficient thread engagement, all jam nuts are tight, safety turnbuckles and reinstall all items removed for access.
21. 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 17 and 18.

b. BEGINNING WITH AIRCRAFT SERIAL 17701634 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH SK177-17 AND SK177-18. (Refer to figure 7-2.)

CAUTION

Do not use aircraft power to operate the flap motor until the limit-switches (17 and 18) have been adjusted or damage may occur due to overtravel. Separate the electrical quick-disconnect (15) at the flap motor and connect jumper wires from a 12-volt power source to operate the flap motor. The leads may be reversed to change motor direction or a 3-position switch (spring-loaded to center OFF position) may be used. Use caution when approaching travel extremes as there is no provision for freewheeling in the transmission.

1. Complete steps 2 thru 5 of subparagraph "a."
2. (Refer to figure 7-2.) Using the external power source and jumpers, run the actuator guide assembly (7) to .12±.05" between guide assembly (7) and transmission (4) as illustrated in VIEW A-A. Adjust the DOWN-LIMIT switch (18) to operate and shut-off motor at this position. DO NOT ALLOW GUIDE ASSEMBLY TO SEAT AGAINST TRANSMISSION.
3. Complete steps 6 thru 10 of subparagraph "a."
4. Mount an inclinometer on one flap and adjust to 30°+2°-0°.

NOTE

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

5. Using the external power supply and jumpers, run the flaps FULL UP AND FORWARD (0°) and adjust the UP-LIMIT switch (17) to operate and shut-off motor at this position. DO NOT ALLOW GUIDE ASSEMBLY TO REACH THE END OF THE SCREW ASSEMBLY.
6. Connect the electrical quick-disconnect (15) at the flap motor.
7. Complete steps 14 thru 21 of subparagraph "a."

This page intentionally left blank.

SECTION 8

STABILATOR CONTROL SYSTEM

TABLE OF CONTENTS

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

8-2. DESCRIPTION. The stabilator is operated by power transmitted through fore-and-aft movement of the pilot or copilot control wheel. The system is comprised of control columns, pulleys and cables which attach to the stabilator balance arm. As the stabilator moves through its range of travel, the trim tab changes angle in the opposite direction effecting control wheel forces and giving the pilot a positive "feel" at the control wheel. The trim tab 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 8-10.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.	Link disconnected at control column.	Check visually. Attach link and rig system in accordance with paragraph 8-10.
	Cables disconnected.	Check visually. Attach cables and rig system in accordance with paragraph 8-10.

8-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF STABILATOR SYSTEM.	Defective stabilator quadrant pivot bearings.	Check quadrant; move to check for play or binding. Replace defective bearings.
	Defective stabilator pivot bearings.	Disconnect cables at balance weight and move stabilator by hand to check for binding. Replace defective bearing.
	Cables slack.	Check cable tension. Adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Check visually. Route cables correctly on pulleys.
	Defective trim tab bellcrank bearings.	Disconnect actuator and push-pull tube from bellcrank and check for binding. Replace defective bearings.
	Defective control column bearing rollers.	Check visually. Replace defective rollers.
	Defective control column torque tube bearings.	Disconnect parts and check that torque tube rotates freely. Replace defective bearings.
	Control guide on aft end of control tube assembly adjusted too tight.	Loosen screw and tapered plug in end of control tube enough to eliminate binding.
	Defective pulleys or cable guards.	Check visually. Replace defective parts and install guards properly.
STABILATOR FAILS TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	Rig in accordance with paragraph 8-10.
	Cables tightened unevenly.	Rig in accordance with paragraph 8-10.
	Interference at instrument panel.	Rig in accordance with paragraph 8-10.

8-4. CONTROL COLUMN. (Refer to figure 6-2.) Section 6 outlines removal, installation and repair of control column.

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

8-6. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Remove stabilator trim tab push-pull tube (4) at tab (2).

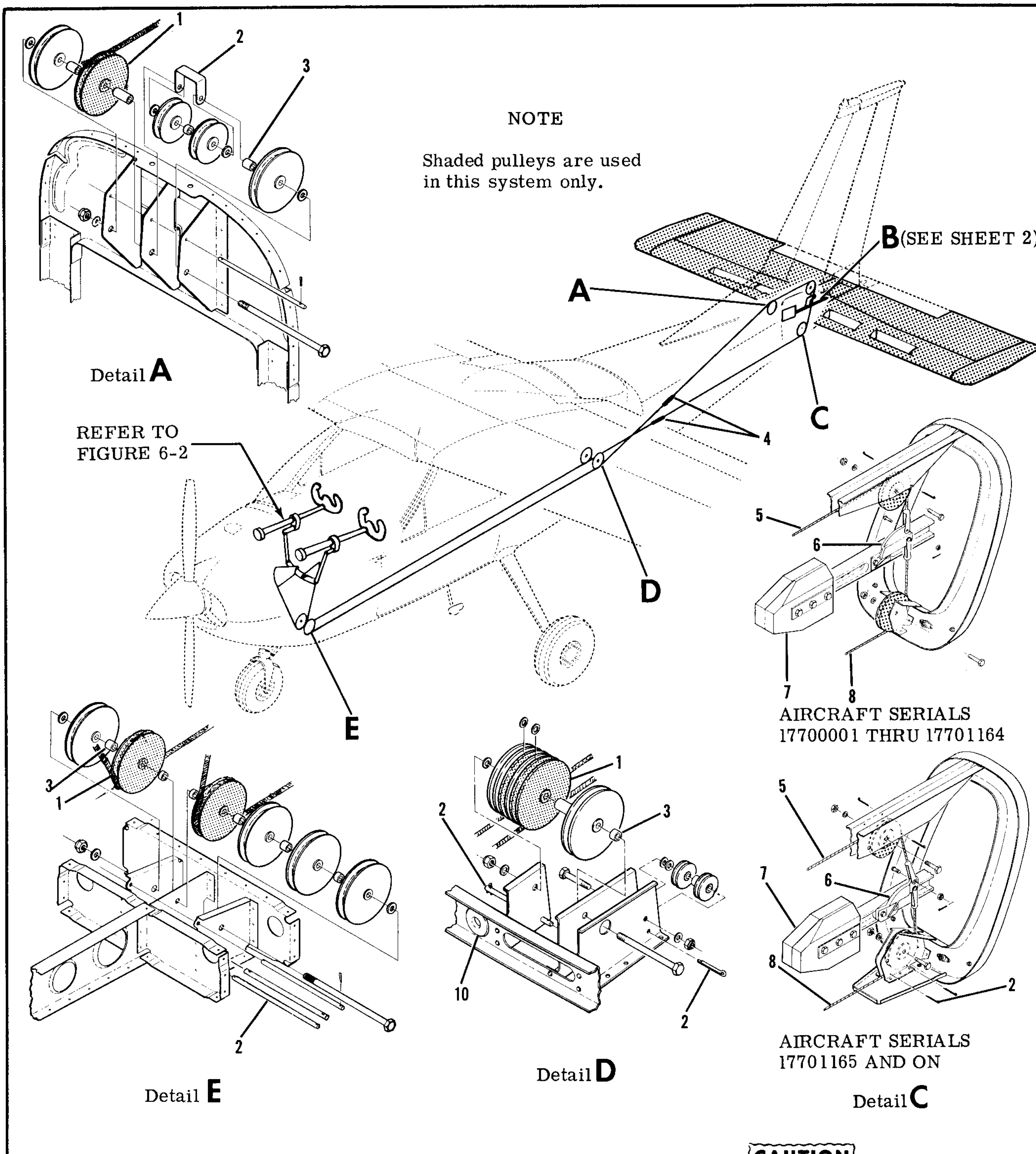
c. Remove bolts (12) securing balance weight arm (16) to stabilator (1).

NOTE

Rigging of stabilator and trim systems should not be affected by removal of stabilator. Cable tension need not be relieved if the balance weight arm is not to be removed from aircraft.

d. Remove stabilator pivot bolts (11) and remove stabilator (1) and trim tab (2) as a unit.

e. Reverse the preceding steps for reinstallation. Check stabilator and trim tab travels and rig if necessary.



1. Pulley
2. Cable Guard
3. Spacer
4. Turnbuckle
5. Stabilator Down Cable
6. Control Arm
7. Balance Weight
8. Stabilator Up Cable
9. Travel Stop Bolts
10. Grommet

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
30 LBS +10-0 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 8-1. Stabilator Control System (Sheet 1 of 2)

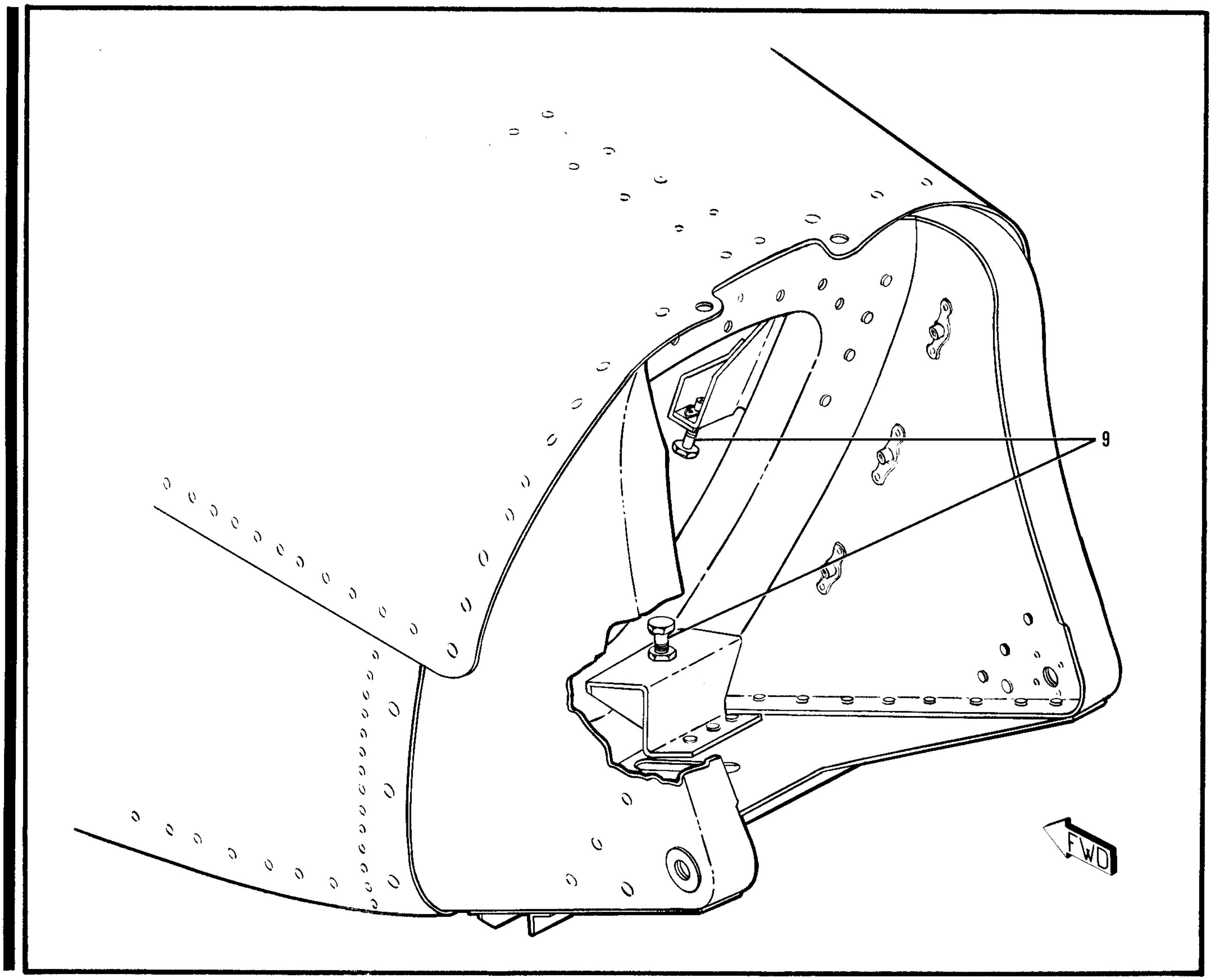


Figure 8-1. Stabilator Control System (Sheet 2 of 2)

SHOP NOTES:

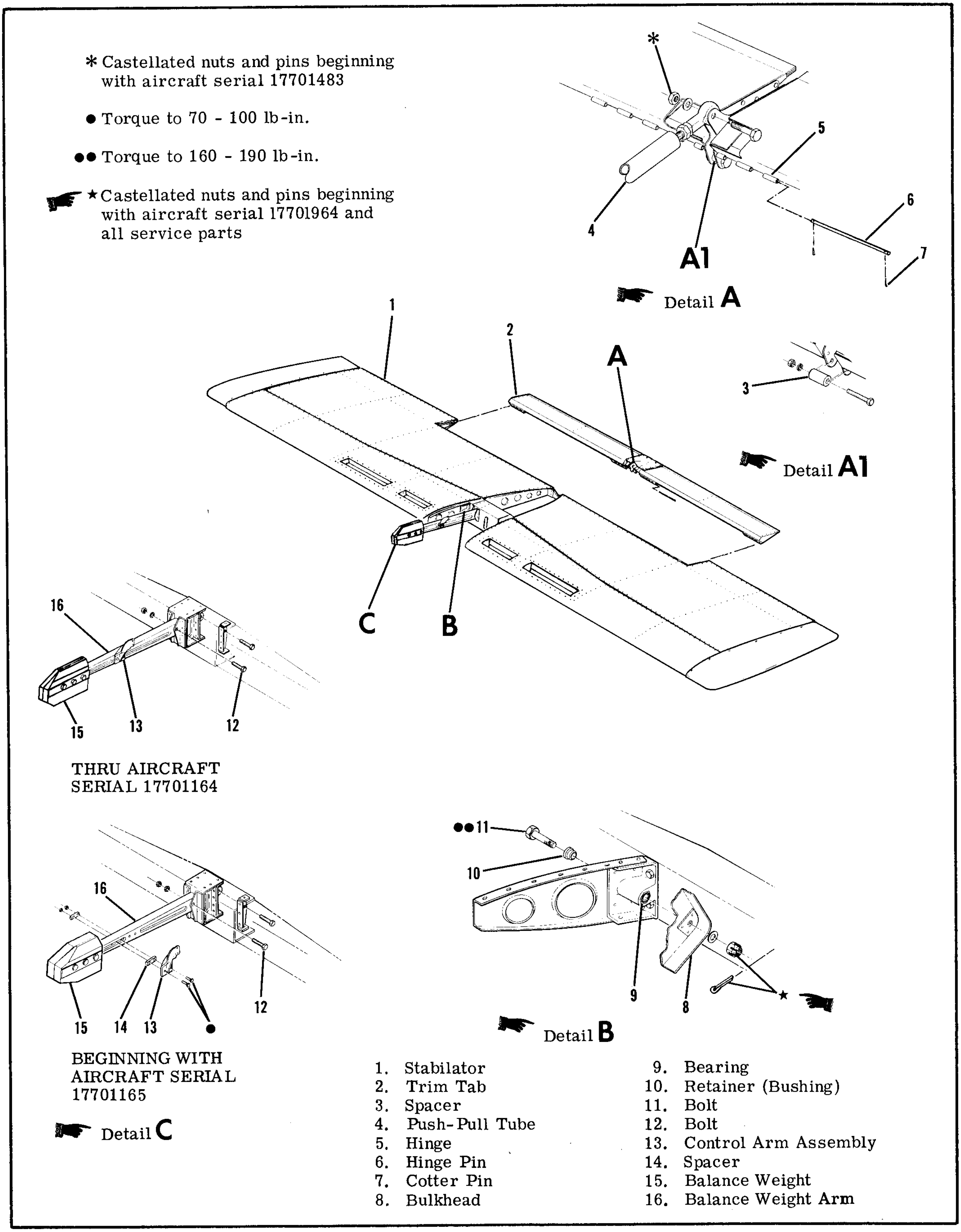
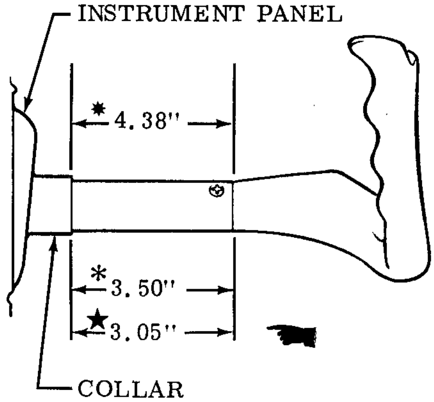


Figure 8-2. Stabilator Installation



✱ AIRCRAFT SERIALS 17700001 THRU 17701164
✻ AIRCRAFT SERIALS 17701165 THRU 17701633
★ BEGINNING WITH AIRCRAFT SERIAL 17701634

NOTE

Rig control column to dimension shown regardless of pin hole location.

Figure 8-3. Control Column Neutral Position

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

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

8-9. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.
b. Relieve cable tension at turnbuckles (4).
c. Disconnect cables at control column. (Refer to figure 6-2.)
d. Disconnect cables at control arm (6).
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 before being withdrawn from the 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. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards.
g. Rig system in accordance with paragraph 8-10, safety turnbuckles and reinstall all items removed in step "a."

8-10. RIGGING. (Refer to figure 8-1.)

a. Relieve cable tension at turnbuckles (4).
b. Block control wheel in neutral position illustrated in figure 8-3.
c. Adjust turnbuckles (4) as necessary to set stabilator to neutral while maintaining proper cable tension.

NOTE

Stabilator neutral position is determined by aligning the rivet in the inboard leading edge of stabilator with an adjacent No. 40 pilot hole in the left side of fuselage.

d. With stabilator in neutral, mount an inclinometer on trailing edge of stabilator and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-5.

e. Unblock control wheel and adjust travel stop bolts (9) to travel specified in figure 1-1.
f. Safety turnbuckles and reinstall all items removed for access.
g. After completion of steps "a" thru "f", the normal force required to operate the stabilator should be 8 lbs maximum measured at the center of the control wheel.

WARNING

Be sure stabilator moves in correct direction when operated by the control column.

SECTION 9

STABILATOR TRIM CONTROL SYSTEM

TABLE OF CONTENTS

9-1. STABILATOR TRIM CONTROL SYSTEM. (Refer to figure 9-1.)

9-2. DESCRIPTION. The stabilator trim tab serves a dual purpose. As a conventional trim tab, it is controlled by the trim wheel. Force to operate the tab is transmitted by cables and chains through a screw jack actuator, to a bellcrank and push-pull tube and finally to the trim tab. The trim tab also serves as an anti-servo tab. As the stabilator moves through its range of travel, the tab automatically trims opposite to afford a positive "feel" to the control wheel.

9-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 9-12.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION BETWEEN CONTROL WHEEL AND TRIM TAB.	Cable tension too low.	Check and adjust tension.
	Broken pulley.	Check visually. Replace broken pulley.
	Cables not in place on pulleys.	Check visually. Install cables correctly on pulleys.
	Worn trim tab actuator.	Disconnect actuator and turn sprocket by hand. Replace actuator if internally worn.
	Actuator attachment loose.	Check visually. Tighten actuator.
TRIM INDICATION INCORRECT.	Indicator incorrectly engaged on wheel track.	Check visually. Reset indicator.
INCORRECT TRIM TAB TRAVEL.	Stop blocks loose or incorrectly adjusted.	Rig system in accordance with paragraph 9-12.
	Incorrect rigging.	Rig system in accordance with paragraph 9-12.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE.	Cable tension too high.	Check and adjust tension.
	Pulleys binding or rubbing.	Check visually. Repair or replace pulleys as necessary.
	Cables not in place on pulleys.	Check visually. Install cables correctly on pulleys.
	Trim tab hinge binding.	Disconnect trim tab push-pull tube and check for binding. Lubricate or replace hinge as necessary.
	Defective trim tab actuator.	Disconnect actuator and turn sprocket by hand. Replace actuator if defective.
	Rusty chain.	Check visually. Replace rusty chain.
	Damaged sprocket.	Check visually. Replace damaged sprocket.
	Bent sprocket shaft.	Check visually. Replace bent shaft.
	Actuator pivot binding.	Disconnect bellcrank at lower end of actuator and check actuator for binding. Replace defective parts.
	Bellcrank binding.	Disconnect actuator and push-pull tube from bellcrank and check bellcrank for binding. Replace defective parts.

9-4. TRIM TAB. (Refer to figure 9-1.)

9-5. REMOVAL AND INSTALLATION.
a. Remove push-pull tube attach point cover and disconnect push-pull tube (21) at tab.

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 hinge pins from hinges and carefully remove tab.
c. Reverse preceding steps for reinstallation. Rig system if necessary in accordance with paragraph 9-12.

9-6. TRIM TAB ACTUATOR.

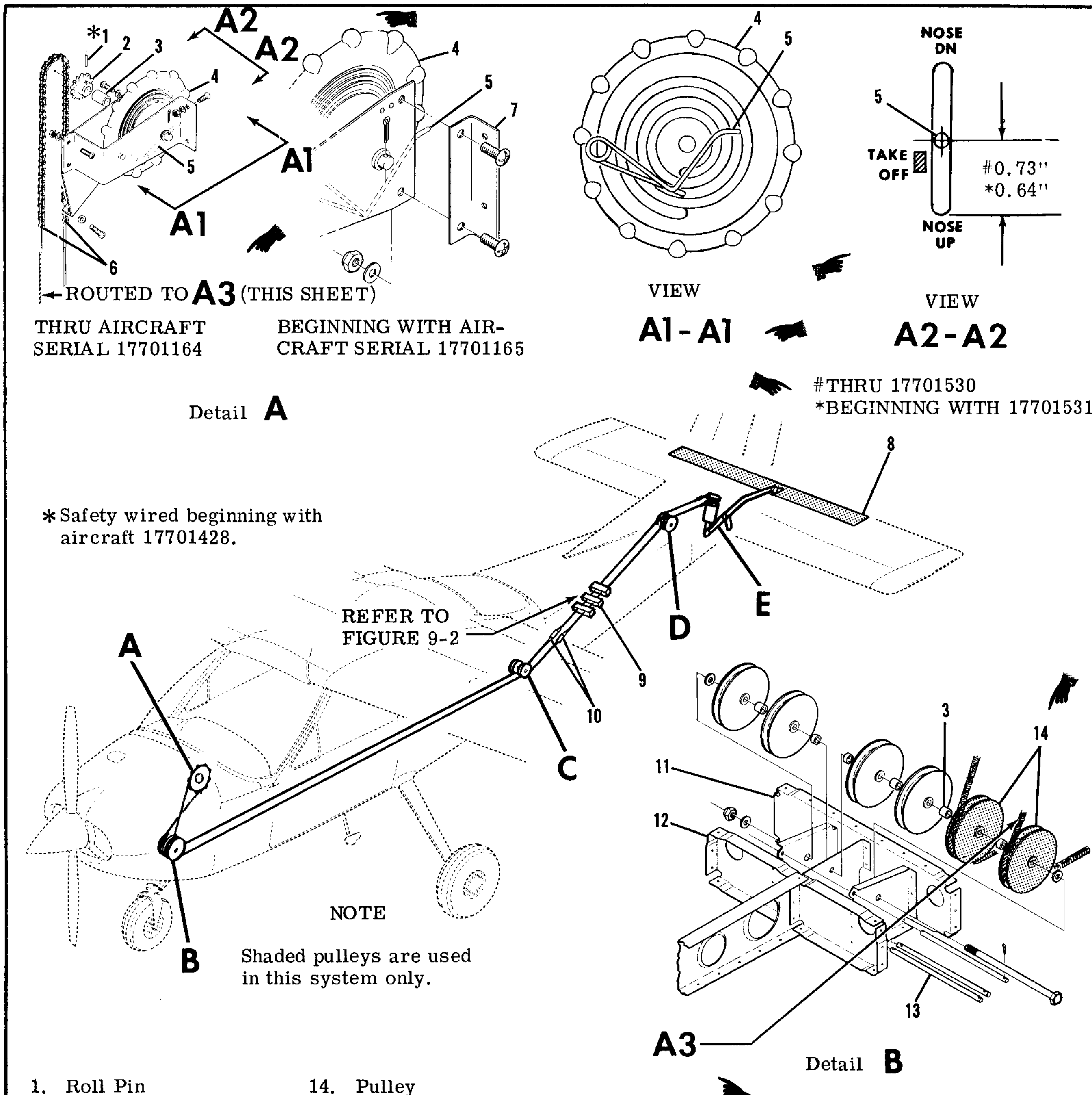
9-7. REMOVAL AND INSTALLATION. (Refer to figure 9-1.)
a. Remove rear baggage compartment wall and tailcone access plates.
b. Remove safety wire and relieve cable tension at turnbuckles (10).

CAUTION

Position a support stand under tailskid assembly to prevent tailcone from dropping while working inside.

c. Remove screws securing actuator bracket (20) to support bracket.
d. Remove chain guard (18) and disengage chain (6) from actuator sprocket (2).
e. Disconnect actuator (21) from bellcrank (23) and remove actuator from aircraft.
f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-12, safety turnbuckles and reinstall all items removed for access. For lubrication requirements refer to Section 2.

9-7A. DISASSEMBLY. (Refer to figure 9-3.)
a. Remove actuator in accordance with paragraph 9-7.



1. Roll Pin
2. Sprocket
3. Spacer
4. Trim Control Wheel
5. Position Indicator
6. Chain
7. Support
8. Trim Tab
9. Stop Block
10. Turnbuckle
11. Bulkhead (Sta. 68.66)
12. Bulkhead (Sta. 64.90)
13. Cable Guard
14. Pulley
15. Bulkhead (Sta. 188.50)
16. Grommet
17. Screw
18. Guard
19. Cover
20. Actuator Bracket
21. Actuator Assembly
22. Bolt
23. Bellcrank
24. Push-Pull Tube
25. Bulkhead (Sta. 263.00)
26. Bushing

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
15 LBS + 5 - 0 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 9-1. Stabilator Trim System (Sheet 1 of 2)

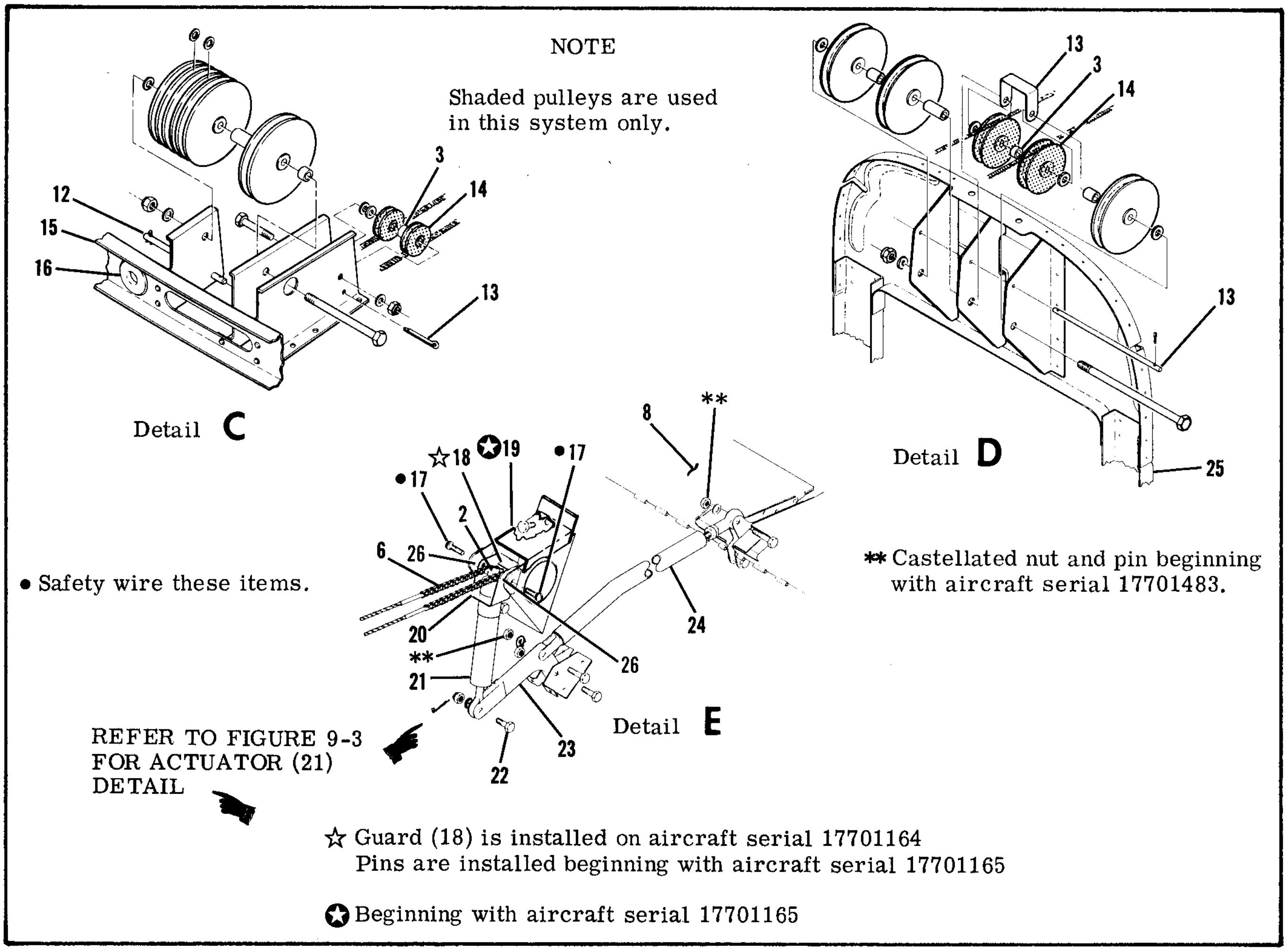


Figure 9-1. Stabilator Trim System (Sheet 2 of 2)

b. Disassemble actuator assembly as illustrated in figure 9-3 as follows:

1. Remove retaining rings (12) from actuator assembly and slide actuator bracket (index 20, figure 9-1) from housing (7).
2. Using suitable punch and hammer, remove groov pins (4) securing sprocket (1) to screw (5) and remove sprocket from screw.
3. Unscrew threaded rod end (10) and remove rod end from actuator.
4. Remove groov pins (6) securing bearings (2 and 9) at the housing ends.
5. Lightly tap screw (5) in the opposite direction from sprocket end, remove bearing (9), O-ring (8) and collar (3).
6. Lightly tap screw (5) toward the sprocket end of housing, remove bearing (2) and collar (3).

9-7B. CLEANING, INSPECTION AND REPAIR. (Refer to figure 9-3.)

a. DO NOT remove bearing (11) from threaded rod end (10) unless replacement of bearing is necessary.

b. Clean all component parts, except bearing (11), by washing in Stoddard solvent or equivalent. Do not clean sealed bearing (11).

c. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.

d. Check bearings (2 and 9), screw (5) and threaded rod end (10) for excessive wear and scoring. Dimensions of the parts are as follows:

BEARING (2)	
INSIDE DIAMETER	0.373" MIN.
INSIDE DIAMETER	0.380" MAX.
BEARING (9)	
INSIDE DIAMETER	
SMALL HOLE	0.248" MIN.
SMALL HOLE	0.253" MAX.
LARGE HOLE	0.373" MIN.
LARGE HOLE	0.380" MAX.
THREADED ROD END (10)	
OUTSIDE DIAMETER (SHANK)	0.242" MIN.
	0.246" MAX.
SCREW (5)	
OUTSIDE DIAMETER	0.367" MIN.
	0.370" MAX.

NOTE

Relative linear movement between internal threaded screw (5) and bearing (9) should be 0.004 to 0.010 inch at room temperature.

e. Examine threaded rod end (10) and screw (5) for damaged threads or dirt particles that may impair smooth operation.
f. Check sprocket (1) for broken, chipped and/or worn teeth.
g. Check bearing (11) for smoothness of operation.
h. DO NOT attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.

9-7C. REASSEMBLY. (Refer to figure 9-3.)
a. Always discard the following items and install new parts during reassemby.
1. Groov Pins (4 and 6)
2. O-Ring (8)
b. During reassembly, lubricate collars (3), screw (5) and threaded rod end (10) in accordance with Section 2.
c. Slip collar (3) and bearing (2) on screw (5),
d. Press sprocket (1) into the end of screw (5), align groov pin holes and install new groov pins (4).
e. Insert screw (5), with assembled parts, into housing (7) until bearing (2) is flush with the end of housing.

NOTE

When inserting screw (5) into housing (7), locate the sprocket (1) at the end of housing which is closer to the grooves for retaining rings (12).

- New bearings (2 and 9) are not pre-drilled and must be drilled on assembly. The groov pins (6) are 1/16 inch in diameter, therefore, requiring a 1/16 (0.0625) inch drill.

f. With bearing (2) flush with end of housing (7), carefully drill bearing so the drill will emerge from the hole on the opposite side of housing (7). DO NOT ENLARGE HOLES IN HOUSING.
g. Press new groov pins (6) into pin holes.
h. Insert collar (3), new O-ring (8) and bearing (9) into opposite end of housing (7).
i. Complete steps "f" and "g" for bearing (9).
j. If a new bearing (11) is required, a new bearing may be pressed into the boss. Be sure force bears against the outer race of bearing.
k. Screw the threaded rod end (10) into screw (5).
l. Slide actuator bracket (index 20, figure 9-1) onto housing (7) and install retaining rings (12).
m. Test actuator assembly by rotating sprocket (1) with fingers while holding threaded rod end (10). The threaded rod end should travel in and out smoothly, with no indication of binding.
n. Reinstall actuator assembly in accordance with paragraph 9-7.

9-7D. TRIM TAB FREE-PLAY INSPECTION.
a. Place stabilator and trim tab in the neutral position.
b. Using moderate pressure, move the trim tab trailing edge up and down by hand to check free-play.
c. A maximum of .137" (total motion up and down) measured at the trim tab trailing edge is permissible.
d. If the trim tab free-play is less than .137", the system is within prescribed limits.
e. If the trim tab free-play is more than .137", check the following items for looseness while moving the trim tab up and down.
1. Check push-pull tube (24) to trim tab horn assembly attachment for looseness.
2. Check push-pull tube (24) to bellcrank assembly (23) attachment for looseness.
3. Check bellcrank assembly (23) to actuator assembly (21) attachment for looseness.
4. Check actuator assembly threaded rod end for looseness in the actuator assembly (21).
f. If looseness is apparent while checking steps e-1 thru e-3, repair by installing new parts.
g. If looseness is apparent while checking step e-4, refer to paragraphs 9-6 through 9-7C.

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

9-9. REMOVAL AND INSTALLATION.
a. Relieve cable tension at turnbuckles (10).

CAUTION

Position a support stand under tailskid assembly to prevent tailcone from dropping while working inside.

b. Remove pedestal cover as outlined in paragraph 10-20.
c. Remove screws securing trim wheel supports (7) to pedestal structure. Lower trim wheel (4) and brackets to remove chain (6).

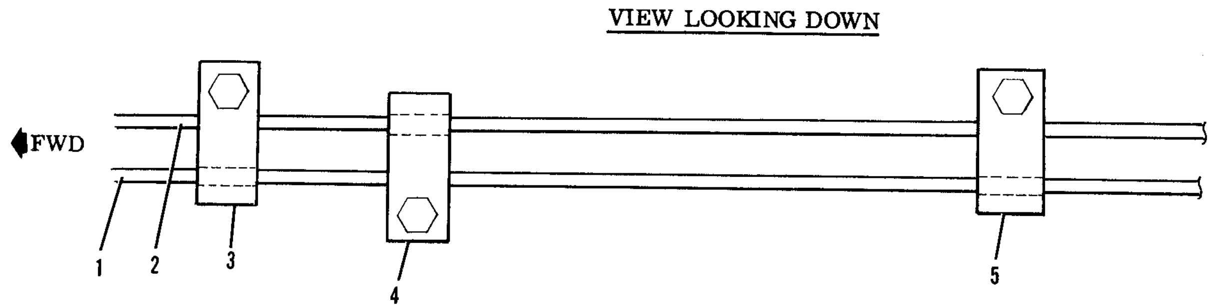
NOTE

Trim wheel (4) may be removed from brackets by driving out roll pin (1) in sprocket (2) and removing cotter pin on opposite end of shaft. This procedure is recommended for parts replacement only.

d. Reverse preceding steps for reinstallation. Rig system in accordance with paragraph 9-12, safety turnbuckles and reinstall all items removed for access.

9-10. CABLES AND PULLEYS.

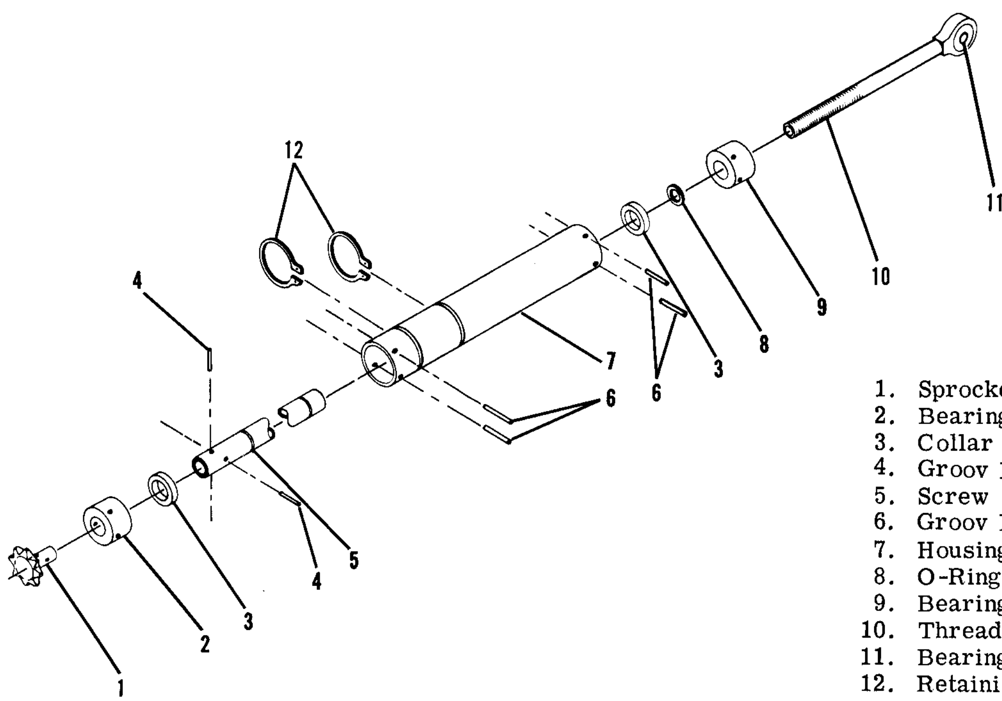
9-11. REMOVAL AND INSTALLATION.
a. FORWARD CABLE. (Refer to figure 9-1.)
1. Peel back carpeting as necessary to expose access plates in cabin and baggage areas and remove plates and rear baggage compartment wall.
2. Remove safety wire, relieve cable tension and disconnect forward cable ends from turnbuckles (10).



1. Left Cable
2. Right Cable
3. Forward Stop Block
4. Center Stop Block
5. Aft Stop Block

REFER TO FIGURE 9-1, THIS FIGURE AND EITHER PARAGRAPH 9-12 OR PARAGRAPH 9-13 FOR RIGGING PROCEDURES.

Figure 9-2. Stabilator Trim Travel Adjustment



1. Sprocket
2. Bearing
3. Collar
4. Groov Pin
5. Screw
6. Groov Pin
7. Housing
8. O-Ring
9. Bearing
10. Threaded Rod End
11. Bearing
12. Retaining Ring

Figure 9-3. Stabilator Trim Tab Actuator Assembly

CAUTION

Position a support stand under tailskid assembly to prevent tailcone from dropping while working inside.

3. Remove pedestal cover as outlined in paragraph 10-20.
4. Disengage roller chain (6) from trim control wheel sprocket (2). Refer to paragraph 9-9.
5. 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 the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and pull cable into position.

6. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards. Ensure roller chain (6) is positioned correctly over sprocket (2).
7. Re-rig system in accordance with paragraph 9-12, safety turnbuckles and reinstall all items removed for access.

b. AFT CABLE. (Refer to figure 9-1.)
1. Remove rear baggage compartment wall.
2. Remove safety wire, relieve cable tension and disconnect aft cable ends from turnbuckles (10).

CAUTION

Position a support stand under tailskid assembly to prevent tailcone from dropping while working inside.

3. Remove travel stop blocks (9).
4. Disengage roller chain (6) from actuator sprocket (2). Refer to paragraph 9-7.
5. 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 the aircraft. Leave wire in place, routed through structure, then attach the cable being installed and pull cable into position.

6. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guards. Ensure roller chain (6) is positioned correctly over actuator sprocket (2).
7. Re-rig system in accordance with paragraph 9-12, safety turnbuckles (10) and reinstall all items removed for access.

9-12. RIGGING. (Thru Serial 17701530.) (Refer to figures 9-1 and 9-2.)

CAUTION

Position a support stand under tailskid assembly or jack point (if installed) to prevent tailcone from dropping while working inside.

a. Remove rear baggage compartment wall and access plates as necessary.
b. Loosen travel stop blocks on trim tab cables.
c. Set and secure stabilator in neutral position. DO NOT USE CONTROL LOCK ON CONTROL COLUMN.

NOTE

Stabilator neutral position is determined by aligning rivet in inboard leading edge of stabilator with adjacent No. 40 (.098) hole at station 277.0 (refer to figure 1-2) on both sides of tailcone assembly.

d. Set and secure trim tab in neutral (streamlined) position.
e. Position indicator in slot adjacent to cabin trim wheel, so that centerline of indicator is located approximately .73-inch above bottom of slot to assure that wheel has approximately equal amounts of travel in both direction of rotation (center groove of trim wheel).
f. Disconnect actuator from bellcrank and run chain off actuator on right-hand side, except for one link left on sprocket.
g. Place an inclinometer on trim tab and run tab DOWN to 7°±1° (Serials 17700001 thru 17701164), 12°, +0° -2° (Serials 17701165 thru 17701370) or 13°±1° (Serials 17701371 thru 17701530). If indicator bottoms out at or before DOWN travel is reached, bend indicator up to clear bottom of slot.

NOTE

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

h. Attach actuator to bellcrank.
i. Run trim tab UP to 2°±1° (Serials 17700001 thru 17701164), 6°, +2° -0° (Serials 17701165 thru 17701370) or 5°±1° (Serials 17701371 thru 17701530).
j. Tighten center and aft stop blocks together at Station 238.0 (refer to figure 1-2.)
k. Run trim tab wheel in cabin to acquire DOWN travel limit specified in step "g".
l. Tighten forward stop block against center stop block.
m. Run trim control wheel to upper and lower travel limits and check system for operation.
n. If indicator cannot be adjusted, it may be necessary to proceed as follows:
1. Remove pedestal cover as outlined in Section 10.

2. Pry trailing leg of indicator out of groove in trim wheel, and using a thin screwdriver, reposition leg to groove indicated in View A-A and bend indicator so that centerline of indicator is approximately .73-inch above bottom of slot.

o. Remove inclinometer, install all items removed for access; remove tail stand.

WARNING

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

9-13. RIGGING. (Beginning with Serial 17701531.) (Refer to figures 9-1 and 9-2.)

CAUTION

Position a support stand under tailskid assembly or jack point (if installed) to prevent tailcone from dropping while working inside.

a. Remove rear baggage compartment wall and access plates as necessary.

b. Loosen travel stop blocks on trim tab cables.

c. Set and secure stabilator in neutral position. DO NOT USE CONTROL LOCK ON CONTROL COLUMN.

NOTE

Stabilator neutral position is determined by aligning rivet in inboard leading edge of stabilator with adjacent No. 40 (.098) hole at station 277.0 (refer to figure 1-2) on both sides of tailcone assembly.

d. Set and secure trim tab in neutral (streamlined) position.

e. Position indicator in slot adjacent to cabin trim wheel, so that centerline of indicator is located approximately .64-inch above bottom of slot to assure that wheel has approximately equal amounts of travel in both directions of rotation (center groove of trim wheel).

f. Disconnect actuator from bellcrank and run chain off actuator on right-hand side, except for one link left on sprocket.

g. Place an inclinometer on trim tab and run tab DOWN to 13°±1°. If indicator bottoms out at or before DOWN travel is reached, bend indicator up to clear bottom of slot.

NOTE

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

h. Attach actuator to bellcrank.

i. Run trim tab UP to 5°±1°.

j. Tighten center and aft stop blocks together at Station 238.0 (refer to figure 1-2.)

k. Run trim tab wheel in cabin to acquire DOWN travel limit specified in step "g".

l. Tighten forward stop block against center stop block.

m. Run trim control wheel to upper and lower travel limits and check system for operation.

n. If indicator cannot be adjusted, it may be necessary to proceed as follows:

1. Remove pedestal cover as outlined in Section 10.

2. Pry trailing leg of indicator out of groove in trim wheel, and using a thin screwdriver, reposition leg to groove indicated in View A-A and bend indicator so that centerline of indicator is approximately .64-inch above bottom of slot.

NOTE

Assure that trim tab is 5°±1° TAB DOWN with indicator at top of "TAKE OFF" mark and that trim tab is 8°±1° TAB DOWN with indicator at bottom of "TAKE OFF" mark.

o. Remove inclinometer, install all items removed for access; remove tail stand.

WARNING

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

SHOP NOTES:

SECTION 10

RUDDER AND RUDDER TRIM CONTROL SYSTEMS

TABLE OF CONTENTS

NOTE

This section is divided into two parts. The first part consists of paragraphs 10-1 thru 10-11 and covers the rudder control system. The second part consists of paragraphs 10-12 through 10-21 and covers the rudder trim control system.

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. Each rudder bar has two segments of welded gears that mesh and "close" the system, eliminating the need for return springs.

NOTE

The rudder control system, rudder trim control system and nosewheel steering system are interconnected and adjustments to any one system will affect the others.

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.	Connect or replace cables.
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Adjust cable tension.
	Cables not riding properly on pulleys.	Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	Replace bearing blocks.
	Defective rudder hinge bushings.	Replace defective bushings.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Adjust cable tension.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.

10-4. RUDDER PEDAL ASSEMBLY.

10-5. REMOVAL AND INSTALLATION.

a. Remove carpeting, shields and soundproofing from pedal and tunnel areas as required.

b. (Refer to figure 10-2.) Disconnect master cylinders (7) at the pilot rudder pedals.

c. Disconnect parking brake cables at master cylinders.

d. Remove all rudder pedals (1) and brake links (16).

e. Relieve cable tension at turnbuckles (index 10, figure 10-1).

f. Disconnect cables (19 and 21) from attachment arms. Beginning with aircraft serial 17701165 carefully relieve spring tension on aileron-rudder interconnect system. (Refer to Section 6.)

g. (Refer to figure 10-5.) Thru aircraft serial 17701370, remove bolt (18) securing steering bungee (20) to attachment arm (19).

h. Beginning with aircraft serial 17701371, remove bolt (27) securing actuator link (24) to attachment arms (26).

i. (Refer to figure 10-2.) Remove bolts securing bearing blocks (3) 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 the rudder bar assemblies as outlined in Section 2. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed in step "a."

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

10-7. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Disconnect tail navigation light quick-disconnect (10).

c. Relieve cable tension at turnbuckles (index 10, figure 10-1).

d. Disconnect cables from rudder horn assembly (9).

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

f. Reverse 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 and balance 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 carpeting, upholstery and access plates as necessary.

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

c. Disconnect cables (4 and 5) from rudder bar arms and rudder horn assembly (12).

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 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.

e. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.

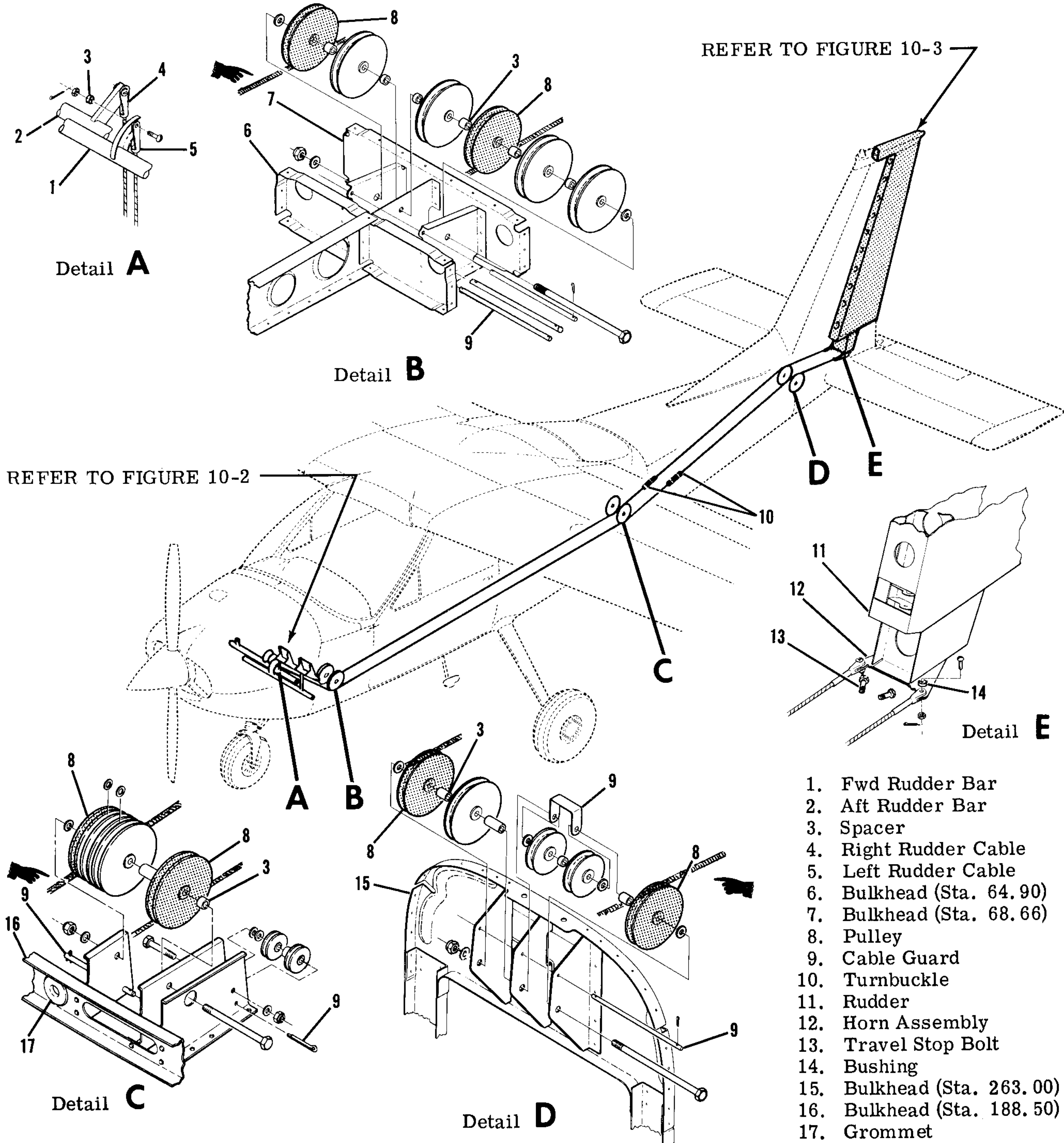
f. Re-rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed in step "a."

10-11. RIGGING.

NOTE

The rudder control system MUST be rigged correctly prior to rigging the rudder trim control system or the nosewheel steering system.

a. (Refer to figure 10-1.) Adjust the travel stop bolts (13) to degree of travel specified in figure 1-1.



1. Fwd Rudder Bar
2. Aft Rudder Bar
3. Spacer
4. Right Rudder Cable
5. Left Rudder Cable
6. Bulkhead (Sta. 64.90)
7. Bulkhead (Sta. 68.66)
8. Pulley
9. Cable Guard
10. Turnbuckle
11. Rudder
12. Horn Assembly
13. Travel Stop Bolt
14. Bushing
15. Bulkhead (Sta. 263.00)
16. Bulkhead (Sta. 188.50)
17. Grommet

NOTE

Refer to figure 6-2 for rudder-aileron interconnect rigging.

Shaded pulleys are used in this system only.

CAUTION

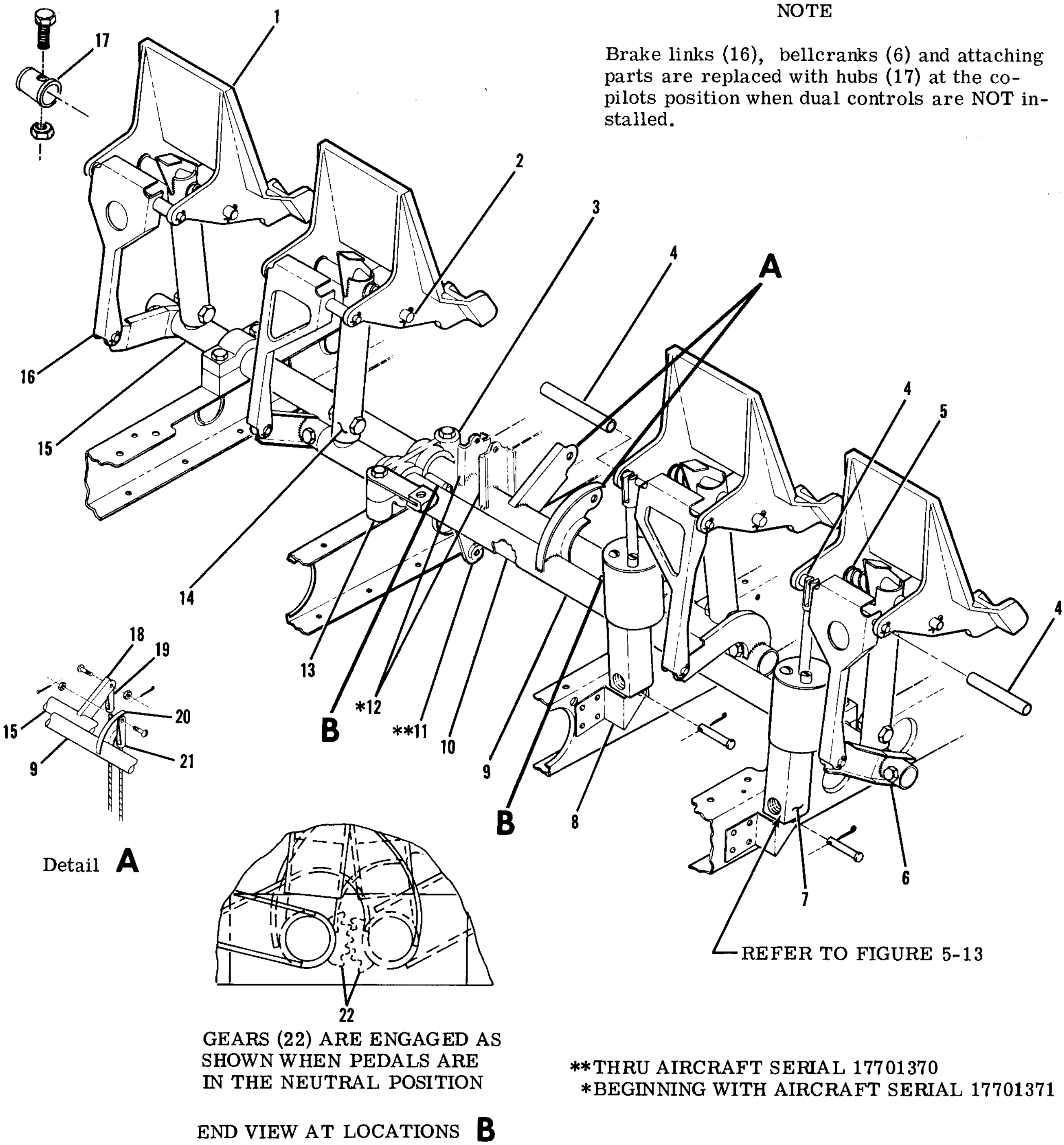
MAINTAIN PROPER CONTROL CABLE TENSION.

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

Figure 10-1. Rudder Control System

NOTE

Brake links (16), bellcranks (6) and attaching parts are replaced with hubs (17) at the copilots position when dual controls are NOT installed.



**THRU AIRCRAFT SERIAL 17701370
*BEGINNING WITH AIRCRAFT SERIAL 17701371

1. Rudder Pedal
2. Pivot Shaft
3. Bearing Block
4. Spacer
5. Anti-Rattle Spring
6. Bellcrank
7. Master Cylinder
8. Bracket
9. Forward Rudder Bar
10. Brake Torque Tube
11. Steering Bungee Attachment Arm
12. Rudder Trim Actuator Link Attachment Arm
13. Shim
14. Arm Assembly
15. Aft Rudder Bar
16. Brake Link
17. Single Controls Hub
18. Right Rudder Cable Arm
19. Right Rudder Cable
20. Left Rudder Cable Arm
21. Left Rudder Cable
22. Gears

Figure 10-2. Rudder Pedals Installation

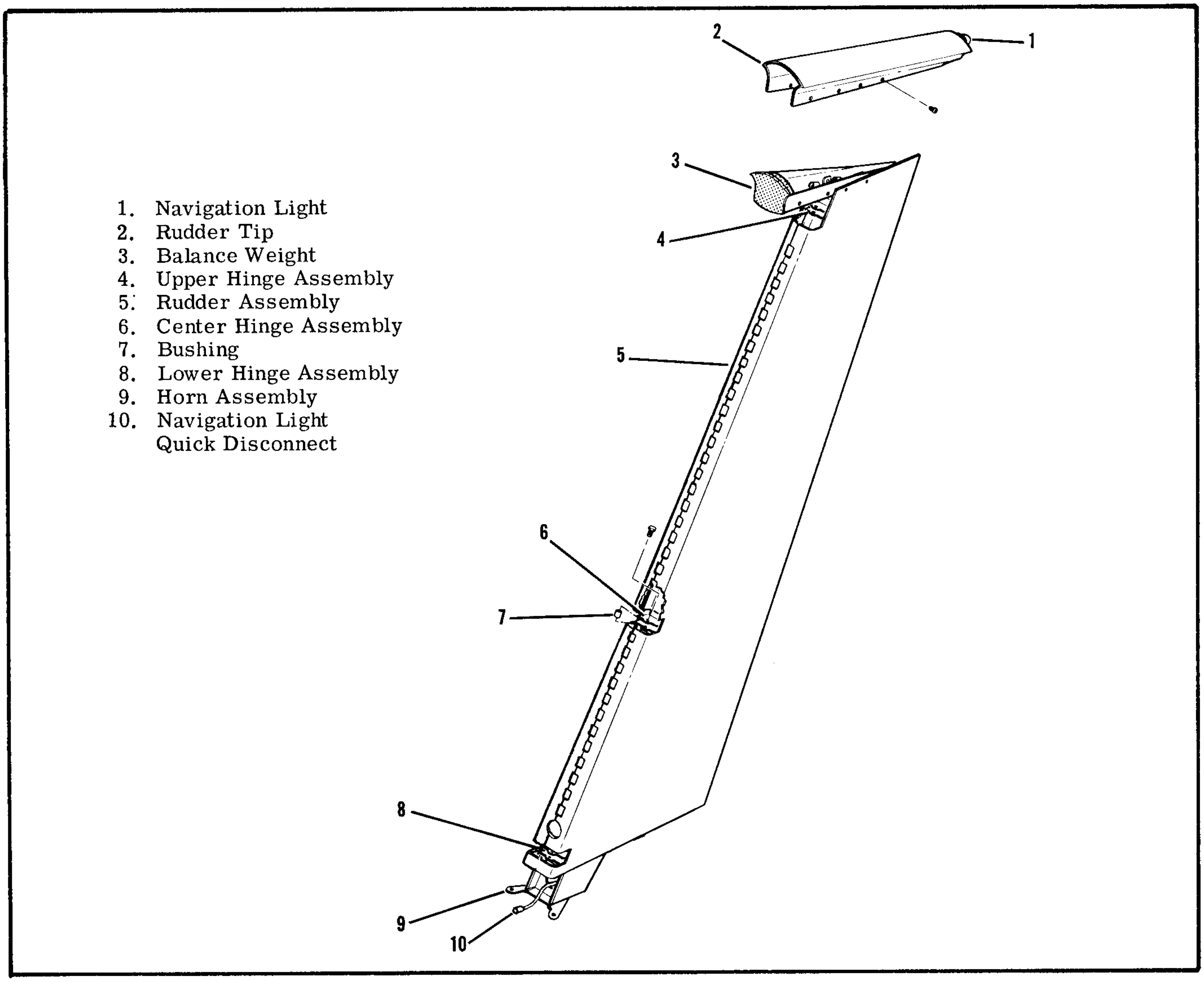


Figure 10-3. Rudder Assembly

Figure 10-4 illustrates the correct travel and one method of checking.

b. Relieve cable tension at turnbuckles (10).

c. Tie down or weight tail to raise nosewheel free of ground and ensure nose gear is centered against external stop. (Refer to Section 5.)

d. (Refer to figure 10-5.) Remove bolt (41) securing steering bungee rod clevis (39) to rod end (40) on nose gear.

e. Clamp rudder pedals in neutral position.

f. Adjust turnbuckles (index 10, figure 10-1) evenly to streamline rudder and obtain correct cable tension. Safety turnbuckles.

NOTE

After completing the preceding steps, the rudder control system is properly rigged. On aircraft serials prior to 17701371 proceed to step "g", beginning with aircraft serial 17701371 proceed to paragraph 10-21.

g. Adjust steering bungee rod clevis (39) to align with rod end (40).

NOTE

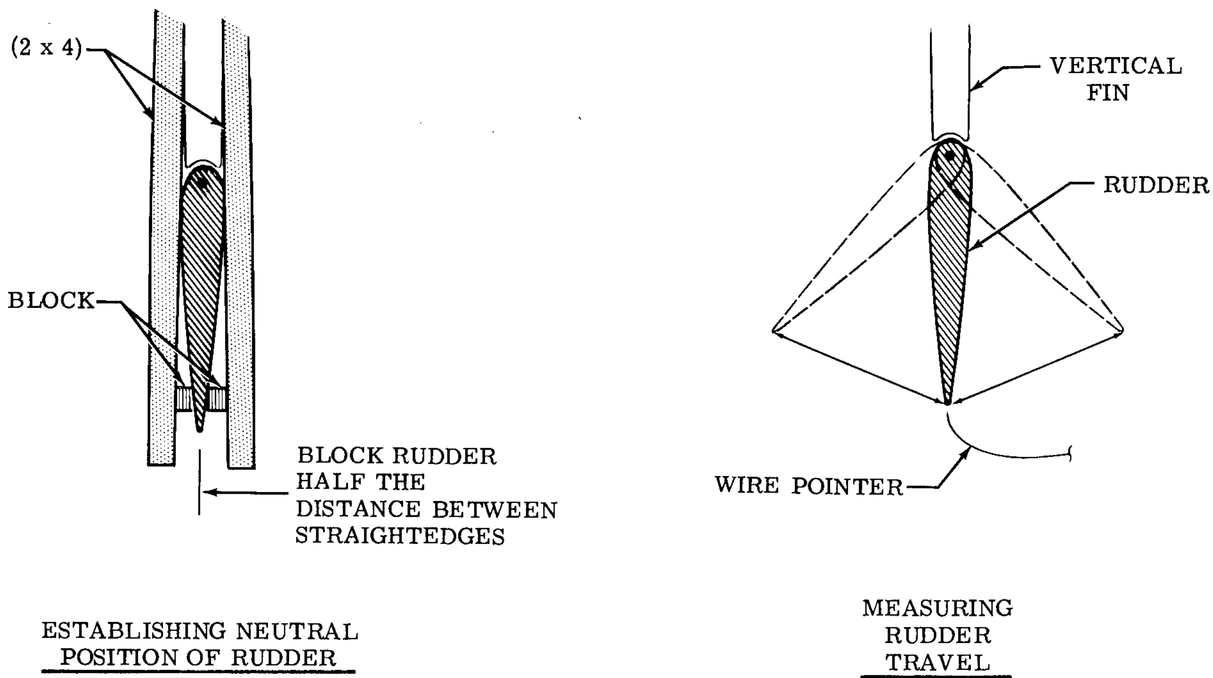
DO NOT attempt to preload the steering bungee internal springs by shortening the rod end clevis after alignment with the rod end. Preload is built into the steering bungee.

h. Install clevis (39) on rod end (40) and install bolt (41).

i. Safety turnbuckles, remove clamps from rudder pedals, lower nose wheel to ground and reinstall all items removed for access.

NOTE

Check aileron-rudder interconnect rigging in accordance with Section 6.



1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 x 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.
3. Using 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 6.25 and 6.78 inches.

Figure 10-4. Checking Rudder Travel

WARNING

Ensure rudder moves in correct direction when operated by the pedals.

SHOP NOTES:

10-12. RUDDER TRIM CONTROL SYSTEM. (BEGINNING WITH AIRCRAFT SERIAL 17701371.)

10-13. DESCRIPTION. The rudder trim control system is operated by a trim control wheel, mounted in the pedestal, which is connected by cables and chains to an actuator assembly attached to the aft rudder bar.

10-14. TROUBLE SHOOTING.

NOTE

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

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraphs 10-11 and 10-21.

TROUBLE	PROBABLE CAUSE	REMEDY
FALSE READING ON TRIM POSITION INDICATOR.	Improper rigging.	Rig in accordance with paragraphs 10-11 and 10-21.
	Worn, bent or disconnected linkage.	Repair or replace as necessary.
HARD OR SLUGGISH OPERATION OF TRIM WHEEL.	Worn, bent or binding linkage.	Repair or replace as necessary.
	Incorrect rudder cable tension.	Adjust rudder cable tension.
FULL TRIM TRAVEL NOT OBTAINED.	Rudder trim system improperly rigged.	Rig in accordance with paragraphs 10-11 and 10-21.

10-15. STEERING BUNGEE. (Refer to figure 10-5.)

10-16. REMOVAL AND INSTALLATION.
a. Remove rudder bars in accordance with paragraph 10-5.
b. Remove bolt (41) securing bungee rod clevis (39) to rod end (40).
c. Disconnect clamp (35) securing boot (36) to bungee (20).
d. Beginning with aircraft serial 17701371 remove bolt (28) securing actuator nut (23) to link assembly (25).
e. Remove nut (31) securing actuator assembly (22) to support (32) and remove actuator assembly.
f. Remove cotter pins securing shaft and link assembly (25) to supports (34).
g. Remove bolt (30) securing bungee assembly (20) to link assembly (25) and remove link and shaft assemblies.
h. Using care work bungee out of aircraft.
i. Reverse preceding steps for reinstallation. Rig system in accordance with paragraph 10-21.

10-17. TRIM CONTROL WHEEL. (Refer to figure 10-5.)

10-18. REMOVAL AND INSTALLATION.
a. Remove pedestal cover in accordance with paragraph 10-20.
b. Relieve cable tension at turnbuckles (10).
c. Remove chain guard from lower support (7) and disengage chain (9) from sprocket.
d. Remove screws securing lower support (7) to pedestal structure (8).
e. Remove screws securing indicator support bracket (3) to stringer assembly.
f. Remove bolts securing support tubes (2) to stringer assembly.
g. Using care work trim wheel (5) and attaching parts out of aircraft as a unit.
h. The unit may now be disassembled and parts replaced as necessary by removing the roll pin and sprocket.
i. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-21, safety turnbuckles and reinstall pedestal.

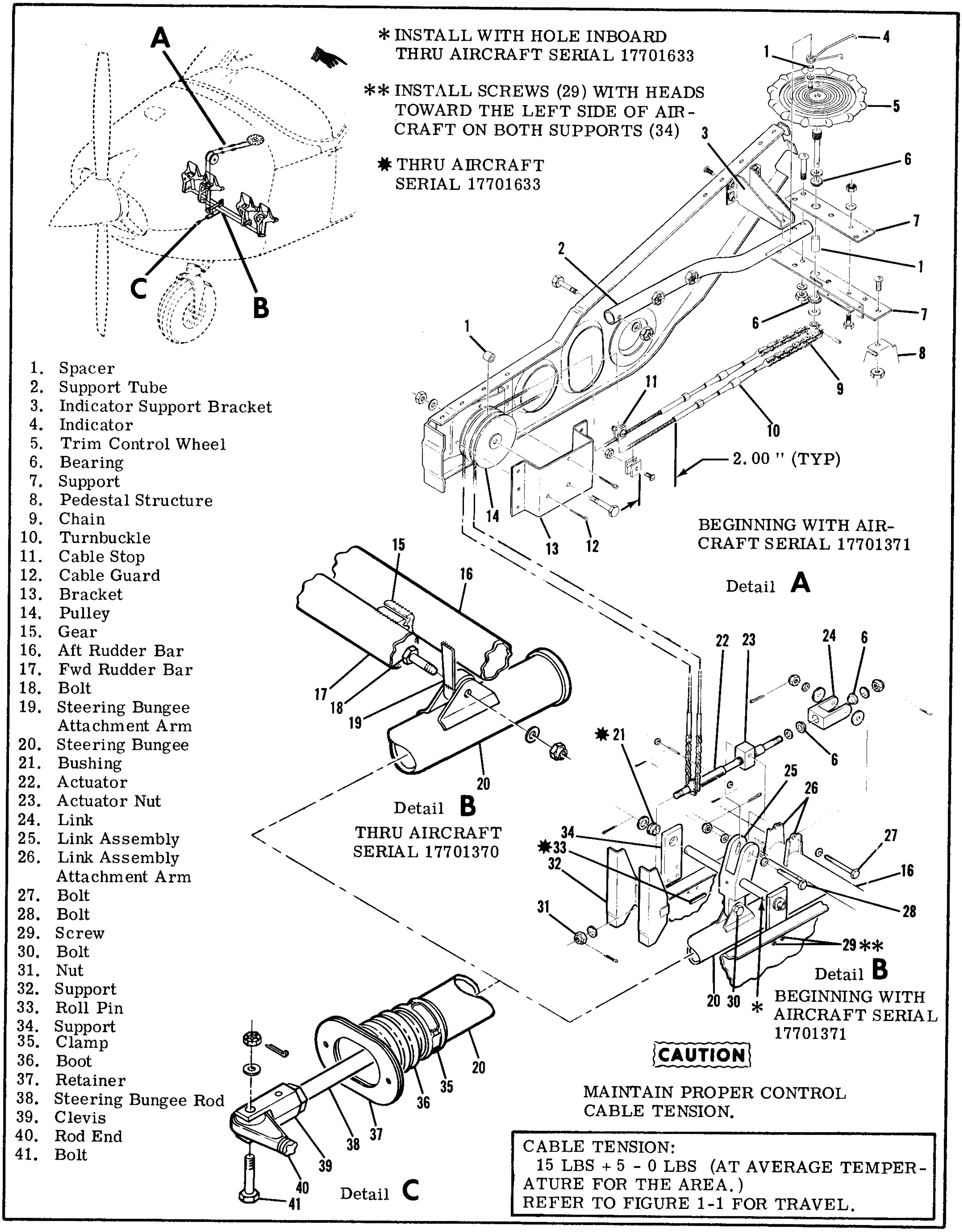


Figure 10-5. Rudder Trim Control System

10-19. PEDESTAL COVER.

10-20. REMOVAL AND INSTALLATION.

a. Remove cowl flap control knob (if installed).
b. Remove microphone mounting bracket and nut from microphone jack (if installed).
c. Remove ashtray and ashtray retainer.
d. Disconnect electrical wiring to pedestal cover.
e. Remove cigar lighter (if installed).
f. Remove courtesy light (if installed).
g. Remove screws securing pedestal cover to structure and carefully remove cover.
h. Reverse preceding steps for reinstallation.

10-21. RIGGING. (Refer to figure 10-5.)

NOTE

The rudder control system MUST be rigged correctly prior to rigging the rudder trim control system.

a. Check and/or complete rigging procedures outlined in paragraph 10-11, steps "a" thru "f".
b. Remove pedestal cover in accordance with paragraph 10-20.
c. Remove bolt (28) securing actuator nut (23) to link assembly (25).
d. Rotate trim control wheel (5) to position chains (9) as illustrated in DETAIL A, adjust turnbuckles (10) evenly to obtain specified tension and safety turnbuckles.
e. Adjust stop blocks (11) to dimension illustrated in DETAIL A.
f. Position indicator (4) trailing leg in the center groove of control wheel (5) and bend indicator pointer to the neutral position if necessary.
g. Adjust actuator nut (23) on the actuator assembly shaft threads to the mid-range position.
h. Align link assembly (25) with actuator nut (23) and install bolt (28).
i. Tie down or weight tail to raise nose wheel free of ground.
j. Adjust steering bungee rod clevis (39) to align with rod end (40).

NOTE

DO NOT attempt to preload the steering bungee internal springs by shortening the rod end clevis after alignment with the rod end. Preload is built into the steering bungee.

k. Install clevis (39) on rod end (40) and install bolt (41).
l. Remove clamps from rudder pedals.
m. Using trim control wheel (5) run pointer (4) through full travel, checking corresponding response of rudder.

NOTE

DO NOT attempt to adjust rudder trim by adjustment of the steering bungee rod. Degree of steering travel cannot be adjusted.

n. Make sure turnbuckles are safetied, reinstall pedestal cover and all items removed for access and lower nose wheel to ground.

NOTE

Check aileron-rudder interconnect rigging in accordance with Section 6.

WARNING

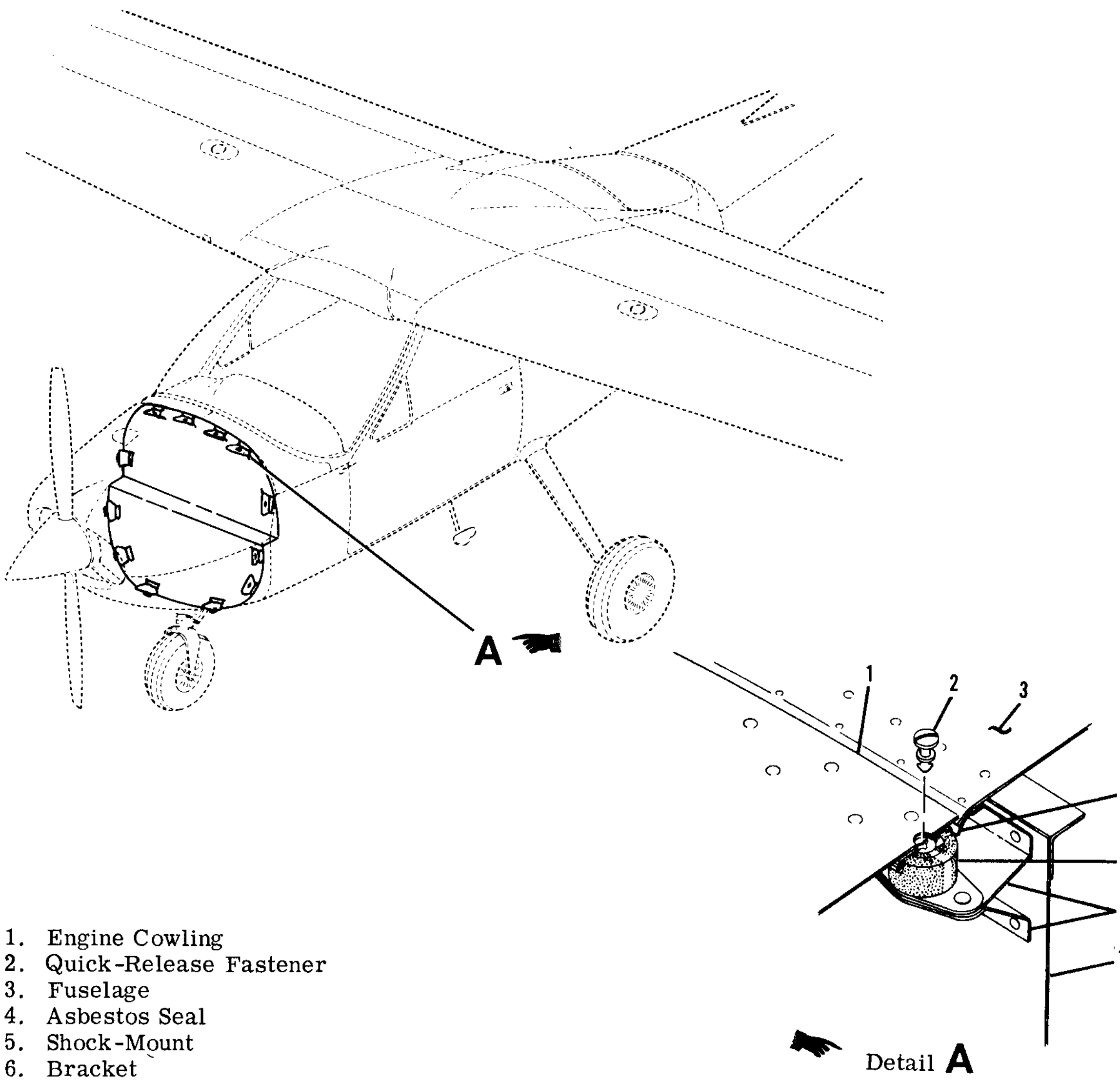
Ensure rudder moves in the correct direction when operated by the pedals and trim control wheel.

This page intentionally left blank.

SECTION 11

ENGINES

TABLE OF CONTENTS



1. Engine Cowling
2. Quick-Release Fastener
3. Fuselage
4. Asbestos Seal
5. Shock-Mount
6. Bracket
7. Firewall

Figure 11-1. Engine Cowling Shock-Mounts

11-1. ENGINE COWLING.

11-2. DESCRIPTION. The engine cowling is comprised of an upper and lower cowling segment. Instead of attaching directly to the fuselage, the cowling attaches to shock-mounts, which in turn, are fastened to the fuselage. Quick-release fasteners are used at the cowling-to-shock-mounts and at the parting surfaces of the upper and lower cowl attach points. Machine screws secure the cowling segments together at the nose caps. A door in the top cowl provides access to the engine oil dipstick, oil filler neck and strainer drain control. Beginning with aircraft serial 17701371 (1970 models) controllable cowl flaps are attached to the trailing edge of the lower cowl segment to aid in controlling the engine temperature. Beginning with aircraft serial 17701531 (1971 models), the landing light is installed in the lower cowling nose cap.

11-3. REMOVAL AND INSTALLATION

a. Release the quick-release fasteners attaching the cowling to the shock-mounts and at the parting surfaces of the upper and lower cowling segments.

b. Remove the machine screws securing the cowling nose caps together.

c. THRU AIRCRAFT SERIAL 17701164. Disconnect carburetor heat control, alternate air duct and carburetor air duct from the airbox.

d. BEGINNING WITH AIRCRAFT SERIAL 17701371 disconnect cowl flap controls at the cowl flaps.

e. BEGINNING WITH AIRCRAFT SERIAL 17701531 disconnect landing light electrical wiring.

f. Reverse the preceding steps for reinstallation. Be sure that the baffle seals are turned in the correct direction to confine and direct airflow around the engine. The vertical seals must fold forward and the side seals must fold upwards.

NOTE

When new shock-mounts or brackets are being installed, careful measurements should be made to position these parts correctly on the firewall. These service parts are not pre-drilled. Install shock-mounts on brackets so that cowling stud and shock-mount are correctly aligned. Sheet aluminum may be used as shims between bracket halves to provide proper cowling contour.

11-4. CLEANING AND INSPECTION. Wipe the inner surfaces of the cowling segments with a clean cloth saturated with cleaning solvent (Stoddard or equivalent). If the inside surface of the cowling is coated heavily with oil or dirt, allow solvent to soak until foreign material can be removed. Wash painted surfaces of the cowling with a solution of mild soap and water and rinse thoroughly. After washing, a coat of wax may be applied to the painted surfaces to prolong paint life. After cleaning, inspect cowling for dents, cracks, loose rivets and spot welds. Repair all defects to prevent spread of damage.

11-5. REPAIR. If cowling skins are extensively damaged, new complete sections of the cowling should be installed. Standard insert-type patches may be used for repair if repair parts are formed to fit contour of cowling. Small cracks may be stop-drilled and small dents straightened if they are reinforced on the inner surface with a doubler of the same material as the cowling skin. Damaged reinforcement angles should be replaced with new parts. Due to their small size, new reinforcement angles are easier to install than to repair the damaged part.

11-6. COWL FLAPS.

11-7. DESCRIPTION. Beginning with aircraft serial 17701371, cowl flaps are provided to aid in controlling engine temperature. Two cowl flaps, operated by a single control in the cabin, are located at the aft edge of the lower cowl segment.

11-8. REMOVAL AND INSTALLATION.

a. Place cowl flap control in the OPEN position.

b. Disconnect cowl flap control clevises from cowl flaps.

c. Remove safety wire securing hinge pins to cowl flaps, pull pins from hinges and remove flaps.

d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 11-9.

11-9. RIGGING.

a. Disconnect cowl flap control clevises from cowl flaps.

b. Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.

c. Place cowl flap control lever in the CLOSED position (bottom hole in the bracket). If the control lever cannot be placed in the bottom hole, loosen clamp at upper end of controls and slip housings in clamp or adjust controls at upper clevis to position control lever in bottom hole in the bracket.

d. With the control lever in CLOSED position, hold one cowl flap closed, streamlined with trailing edge of lower cowl. Adjust clevis on the control to hold cowl flap in this position and install bolt.

NOTE

If the lower control clevis cannot be adjusted far enough to streamline flap and still maintain sufficient thread engagement, loosen the lower control housing clamp and slide housing in clamp as necessary.

e. Repeat the preceding step for the opposite cowl flap.

11-10. ENGINE.

11-11. DESCRIPTION. An air cooled, wet-sump, four-cylinder, horizontally-opposed, direct-drive, carbureted "Blue Streak" (Lycoming) engine is used to power the aircraft. The cylinders, numbered from front to rear, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right front cylinder is number 1 and cylinders on the right side are identified by odd numbers 1 and 3. The left front cylinder is number 2 and the cylinders on the left side are identified as numbers 2 and 4. Refer to paragraph 11-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Service Parts Center.

11-12. ENGINE DATA.

Aircraft Series and Model Year	177 (1968)	177A (1969)	177B (1970 THRU 1972)	177B (1973 AND ON)
Lycoming Model ("Blue-Streak")	O-320-E2D	O-360-A2F	O-360-A1F6	O-360-A1F6D
BHP at RPM	150 BHP at 2700 RPM	180 BHP at 2700 RPM	Same	Same
Number of Cylinders	4-Horizontally-Opposed	Same	Same	Same
Displacement	319.8 Cubic Inches	361 Cubic Inches	Same	Same
Bore	5.125 Inches	5.125 Inches	Same	Same
Stroke	3.875 Inches	4.375 Inches	Same	Same
Compression Ratio	7.00:1	8.50:1	Same	Same
Magnetos				
Right Magneto	Slick No. 4050	Bendix No. S4LN-1209	Same	
	Fires 25° BTC	Same	Same	
	1-3 Upper and 2-4 Lower	Same	Same	
Left Magneto (Impulse)	Slick No. 4051	Bendix No. S4LN-1227	Same	
	Fires 25° BTC	Same	Same	
	2-4 Upper and 1-3 Lower	Same	Same	
Dual Magneto (Impulse)				Bendix No. D4LN-2021
Right Side				Fires 25° BTC
				1-3 Upper and 2-4 Lower
Left Side				Fires 25° BTC
				2-4 Upper and 1-3 Lower
Firing Order	1-3-2-4	Same	Same	Same
Spark Plugs	18MM (Refer to latest revision of Service Instruction No. 1042)	Same	Same	Same
Torque	390±30 Lb-In	Same	Same	Same
Carburetor (Marvel-Schebler)	MA-4SPA	MA-4-5	Same	Same
Tachometer	Mechanical	Same	Same	Same
Oil Sump Capacity	8 U.S. Quarts	Same	Same	Same
With External Filter Element Change	9 U.S. Quarts	Same	Same	Same

11-12. ENGINE DATA (Cont).

OIL PRESSURE				
Minimum Idling	25 PSI	Same	Same	Same
Normal	60-90 PSI	Same	Same	Same
Maximum (Cold Oil Starting)	100 PSI	Same	Same	Same
Oil Temperature				
Normal Operating	Within Green Arc	Same	Same	Same
Maximum Permissable	Red Line (245°F)	Same	Same	Same
Cylinder Head Temperature				
Normal Operating	Within Green Arc	Same	Same	Same
Maximum	Red Line (500°F)	Same	Same	Same
Probe Location			Lower side No. 3 Cylinder	Same
Approximate Dry Weight - With Standard Accessories	269 lbs (Weight will vary with optional equipment installed)	286 lbs (Weight will vary with optional equipment installed)	Same	279 lbs (Weight will vary with optional equipment installed)

11-12A. TIME BETWEEN OVERHAUL (TBO). Avco Lycoming recommends engine overhaul at 2000 hours for the O-320 Series and O-360 Series engines, except as stipulated in Avco Lycoming Service Instruction No. 1009 and revisions thereto. At the time of overhaul engine accessories should be overhauled. Refer to Section 13 for propeller and governor overhaul periods.

11-12B. OVERSPEED LIMITATIONS. The engine must not be operated above specified maximum continuous RPM. However, should inadvertant overspeed occur, refer to the latest issue of Avco Lycoming Service Bulletin No. 369 and all applicable Service Letters and Service Instructions for obligatory recommendations.

11-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE WILL NOT START.	Improper use of starting procedure.	Review starting procedure.
	Fuel tanks empty.	Visually inspect tanks. Fill with proper grade and quantity of gasoline.
	Mixture control in the IDLE CUT-OFF position.	Move control to the full RICH position.
	Fuel selector valve in OFF position.	Place selector valve in the ON position to a tank known to contain gasoline.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Carburetor screen or fuel strainer plugged.	Remove carburetor and clean thoroughly. Refer to paragraph 11-48.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.	Refer to paragraph 11-85.
	Engine flooded.	Refer to paragraph 11-85.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective magneto switch or grounded magneto leads.	Check continuity. Repair or replace switch or leads.
	Spark plugs fouled.	Remove, clean and regap plugs. Test harness cables to persistently fouled plugs. Replace if defective.

11-13. 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 11-49.
	Carburetor idling jet plugged.	Clean carburetor and fuel strainer. Refer to paragraph 11-48.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-63.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 11-85.
	Induction air leaks.	Check visually. Correct the cause of leaks.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Leaking float valve or float level set too high.	Perform an idle mixture check. Attempt to remove any rich indication with the idle mixture adjustment. If the rich indication cannot be removed, the float valve is leaking or the float level is set too high. Replace defective parts, reset float level.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY.	Restriction in aircraft fuel system.	Refer to Section 12.
	Worn or improperly rigged throttle or mixture control.	Check visually. Replace worn Linkage. Rig properly.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Defective ignition system.	Refer to paragraph 11-63.

11-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY OR WILL NOT ACCELERATE PROPERLY (Cont).	Defective or badly adjusted accelerating pump in carburetor.	Check setting of accelerating pump linkage and adjust as necessary.
	Float level set too low.	Check and reset float level.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Restricted carburetor air filter.	Check visually. Clean in accordance with Section 2.
	Cracked engine mount.	Inspect and repair or replace mount as required.
	Defective mounting bushings.	Inspect and install new bushings as required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Check that idle cut-off stop on carburetor is contacted. Replace worn linkage. Rig properly.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, it is defective. Repair or replace primer.
	Defective carburetor.	Repair or replace carburetor.
	Fuel contamination.	Check all screens in fuel system. Drain all fuel and flush out system. Clean all screens, lines, strainer and carburetor.

11-13A. 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 aircraft facing 90 degrees 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 RPM obtained.

c. Average the RPM values obtained in step b. The resulting RPM figure should be with-in 50 RPM of the following values:

MODEL	STATIC RPM
1968	2310
1969	2410
1970 and on	2670

d. If the resulting average RPM figure is lower than stated above, the following checks are recommended to determine a possible deficiency:

1. Check carburetor heat control for proper rigging. A partially open carburetor heat control will cause slight power loss.
2. Check ignition timing setting.
3. Check spark plugs and ignition harness for condition.
4. Check condition of induction air filter. Clean if necessary.
5. Perform engine compression check. (Refer to engine Manufacturer's Service Manual)

11-14. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft with the engine mount attached to the firewall.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Pull fuel shut-off valve control to the OFF position.
c. Remove engine cowling in accordance with paragraph 11-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine mount or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 13.
i. Disconnect throttle and mixture controls at carburetor. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect propeller governor control at governor and support bracket. Note EXACT position, size and number of attaching washers for reference on reinstallation.
k. Loosen clamps and remove flexible ducts from the engine baffle and oil cooler shroud, from the engine baffle and fuel strainer shroud, from the muffler shroud and heater valve and from the engine baffle and heater valve.
l. Disconnect the carburetor heat control at airbox and remove clamp attaching control to bracket. Pull control aft clear of engine.
m. Disconnect fuel strainer drain remote control.
n. Disconnect wires and cables as follows:
   1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

   2. Disconnect starter electrical cable at starter.
   3. Disconnect cylinder head temperature wire at probe.
   4. Disconnect electrical wires and wire shielding ground at alternator.
   5. Disconnect exhaust gas temperature wires at quick-disconnect.
   6. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.
o. Disconnect lines and hoses as follows:
   1. Disconnect vacuum hose at firewall fitting.
   2. Disconnect engine breather hose at top of accessory case.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

   3. Disconnect oil temperature bulb at adapter.
   4. Disconnect primer line at firewall fitting.
   5. Disconnect fuel supply hose at electric fuel pump on firewall.
   6. Disconnect oil pressure line at firewall fitting.
   7. Disconnect oil cooler hoses at cooler.
   8. Disconnect fuel pressure line at firewall.
   9. Disconnect engine-driven fuel pump drain line at pump.
p. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.

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

CAUTION

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

r. Remove bolts attaching engine to engine mount and slowly hoist engine and pull it forward. Checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.

11-15. CLEANING. Refer to Section 2 for cleaning of the engine.

11-16. ACCESSORIES REMOVAL. Removal of engine accessories for overhaul or for engine replacement involves stripping the engine of parts, accessories and components to reduce it to the bare engine. During the removal process, removed items should be examined carefully and defective parts should be tagged for repair or replacement with new components.

NOTE

Items easily confused with similar items should be tagged to provide a means of identification when being installed on a new engine. All openings exposed by the removal of an item should be closed by installing a suitable cover or cap over the opening. This will prevent entry of foreign material. If suitable covers are not available, tape may be used to cover the openings.

11-17. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.

a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.

b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.

c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.

d. Inspect for color bleaching of the end fittings or severe discoloration of the hoses.

NOTE

Avoid excessive flexing and sharp bends when examining hoses for stiffness.

e. Refer to Section 2 for replacement intervals for flexible fluid carrying hoses in the engine compartment.

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

11-18. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lock-washers, nuts, gaskets and rubber connections should be new parts.

11-19. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point near the engine mount.

b. Install engine shock-mount pads as illustrated in figure 11-2.

c. Carefully lower engine slowly into place on the engine mount. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mount.

NOTE

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

d. Install engine mount bolts, washers and nuts, then remove the hoist and tail support stand. Torque bolts to 450-500 lb-in.

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

NOTE

Throughout the aircraft fuel system, from the fuel bays to the carburetor, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

f. Connect lines and hoses as follows:
1. Connect oil cooler hoses at cooler.
2. Connect oil pressure line at firewall fitting.
3. Connect fuel supply hose at electric fuel pump.
4. Connect primer line at firewall fitting.
5. Connect oil temperature bulb at adapter.
6. Connect engine breather hose at top of accessory case.
7. Connect vacuum hose at firewall fitting.
8. Connect engine-driven fuel pump drain line.
9. Connect fuel pressure line at firewall.
10. Install clamps and lacings attaching lines and hoses to engine, engine mount and brackets.

g. Connect wires and cables as follows:
1. Connect electrical wires and wire shielding ground at alternator.
2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

3. Connect starter electrical cable at starter.
4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Torque housing attach nut to 100 lb-in.
5. Connect exhaust gas temperature wires at quick-disconnects.
6. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.

h. Connect fuel strainer drain remote control.
i. Install flexible ducts to the engine baffle and heater valve, to the muffler shroud and heater valve, to the engine baffle and fuel strainer shroud and to the engine baffle and oil cooler shroud. Install clamps and tighten.
j. Install propeller and spinner in accordance with instructions outlined in Section 13.
k. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

l. Clean and install induction air filter 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 11-69, 11-70, 11-71 and 11-72.
p. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
q. Install engine cowling in accordance with paragraph 11-3. Rig cowl flaps in accordance with paragraph 11-9.
r. Perform an engine run-up and make final adjustments on the engine controls.

11-20. FLEXIBLE FLUID HOSES.

11-21. PRESSURE TEST.
a. After each 50 hours of engine operation, all flexible fluid hoses in the engine compartment should be pressure tested as follows:
1. Place mixture control in the idle cut-off position.
2. Place the auxiliary fuel pump in the ON position.
3. Examine the exterior of hoses for evidence of leakage or wetness.
4. Hoses found leaking should be replaced.
5. Refer to paragraph 11-17 for detailed inspection procedures for flexible hoses.

11-22. REPLACEMENT.
a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.
b. Provide as large a bend radius as possible.
c. Hoses should have a minimum of one-half inch clearance from other lines, ducts, hoses or surrounding objects or be butterfly clamped to them.
d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.
e. Refer to AC 43.13-1, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

11-23. ENGINE BAFFLES.

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

11-25. 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.

11-26. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any replaced baffles and seals are installed correctly and that they seal to direct the airflow in the correct direction. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

11-27. REPAIR. Repair of an individual segment of engine baffle is generally impractical, since, due to the small size and formed shape of the part, replacement is usually more economical. However, small cracks may be stop-drilled and a reinforcing doubler installed. Other repairs may be made as long as strength and cooling requirements are met. Replace sealing strips if they do not seal properly.

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

11-29. DESCRIPTION. The engine mount is composed of sections of steel tubing welded together and reinforced with gussets. The mount is fastened to the fuselage at four points. The engine is attached to the engine mount with shock-mount assemblies which absorb engine vibrations.

11-30. REMOVAL AND INSTALLATION. Removal of the engine mount is accomplished by removing the engine as outlined in paragraph 11-14, then removing the engine mount from the firewall. On reinstallation torque the mount-to-fuselage bolts to 160-190 lb-in. Torque the engine-to-mount bolts to 450-500 lb-in.

11-31. REPAIR. Repair of the engine mount shall be performed carefully as outlined in Section 18. The mount shall be painted with heat-resistant black enamel after welding or whenever the original finish has been removed. This will prevent corrosion.

11-32. ENGINE SHOCK-MOUNT PADS. (Refer to figure 11-2.) The bonded rubber and metal shockmounts are designed to reduce transmission of engine vibrations to the airframe. The rubber pads should be wiped clean with a clean dry cloth.

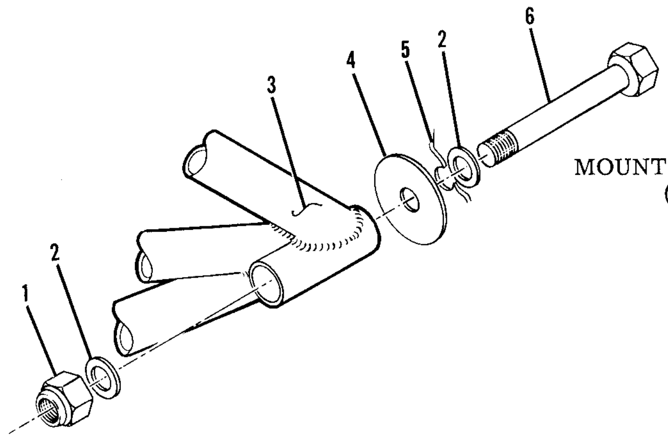
NOTE

Do not clean the rubber pads and dampener assembly with any type of cleaning solvent.

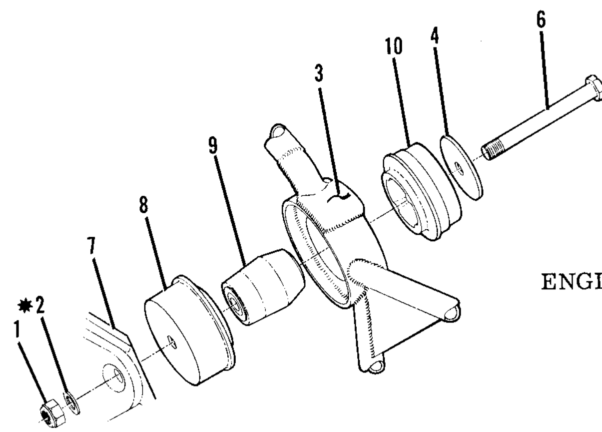
Inspect the metal parts for cracks and excessive wear due to aging and deterioration. Inspect the rubber pads for separation between the pad and metal backing, swelling, cracking or a pronounced set of the pad. Install new parts for all parts that show evidence of wear or damage.

11-33. ENGINE OIL SYSTEM.

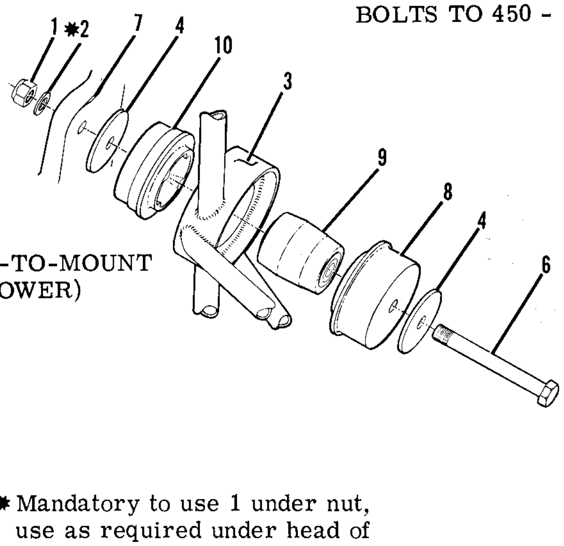
11-34. DESCRIPTION. The lubricating system is of the full pressure, wet sump type. The main bearings, connecting rod bearing, camshaft bearings, valve tappets and push rods, are lubricated by positive pressure. The pistons, piston pins, cams, cylinder walls, valve rockers, valve stems and other internal moving parts are lubricated by oil collectors and oil spray. The pump, which is located in the accessory housing, draws oil through a drilled passage leading from the suction screen located in the sump. From the pump, the oil enters a drilled passage to a threaded connection and through a flexible hose to the cooler. Pressure oil from the cooler returns through a flexible hose to a threaded connection on the accessory housing. From there the oil flows through a drilled passage to the pressure screen which is contained in a cast chamber mounted on the accessory housing. If cold oil or obstruction should restrict the flow through the cooler, a cooler bypass valve is provided to pass the pressure oil directly from the pump to the pressure screen. The oil is then filtered through the pressure screen chamber and fed through a drilled passage to the pressure relief valve which is located in the upper right side of the crankcase forward of the accessory housing. This relief valve regulates the engine oil pressure by allowing excessive oil to return to the sump, while the balance of the pressure oil is fed to the main oil gallery in the right half of the crankcase. The oil is distributed from the main gallery by means of a separate drilled passage to each main bearing of the crankshaft. The drilled passages to the bearings are located in such a manner as to form an inertia type filter, thus ensuring that only the cleanest oil will reach the bearings. Drilled passages from the rear main bearing supply pressure oil to the crankshaft idler gears. Angular holes are drilled through the main bearings to the rod journals where sludge removal tubes are located. Oil from the main gallery also flows to the cam and valve gear passages and then is conducted through branch passages to the hydraulic tappets and cam shaft bearings. Oil travels out through the hollow push rods to the valve rocker bearings and valve stems. Residual oil from the bearings, accessory drives and rocker boxes flows by gravity to the sump where it passes through the suction screen and is recirculated through the engine. The oil cooler is controlled by a thermostatically controlled valve. An external, replaceable element full-flow oil filter may be installed. This external filter replaces the pressure oil screen when installed.



1. Nut
2. Washer
3. Engine Mount
4. Washer
5. Firewall
6. Bolt
7. Engine Mount Foot
8. Shock-Mount Pad
9. Shock-Mount Dampener
10. Shock-Mount Pad



TORQUE ENGINE-TO-MOUNT
BOLTS TO 450 - 500 LB-IN



*Mandatory to use 1 under nut, use as required under head of bolt.

NOTE

When installing shock-mounts, install shock-mount pad (8) as shown for the upper and lower mounts. Also note on lower mount, washer (4) is installed between engine mount foot (7) and shock-mount (10). This is to prevent starter ring gear from coming in contact with lower cowling.

Beginning with aircraft serial 17701165, washer (4) is installed in upper engine-to-mount installation between engine foot (7) and shock-mount pad (8).

Figure 11-2. Engine Mount Details

11-35. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken, disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage/transducer; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Leak in pressure or suction line.	Inspect gasket between accessory housing and crankcase. Repair engine as required.
	Dirty oil screens.	Remove and clean oil screens.

11-35. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective. Replace bulb.
	Oil cooler thermostatic valve/bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Attempt to drain cooler. Inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic valve or bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 rpm to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. Replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

11-35. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (CONT).	Oil congealed in cooler.	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	Replace.
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

11-36. FULL-FLOW OIL FILTER. (Refer to figure 11-3.)

11-37. DESCRIPTION. An external oil filter may be installed on the engine. The filter and filter adapter replace the regular engine oil pressure screen and cast chamber on the accessory housing. The filter adapter incorporates mounting provisions for the oil cooler bypass valve and the oil temperature sensing bulb. If the filter element should become clogged, the bypass valve allows engine oil to flow to the engine oil passages.

11-38. REMOVAL AND INSTALLATION. (Refer to figure 11-3.)

NOTE

Filter element replacement kits are available from the Cessna Service Parts Center.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove both safety wires from filter can and unscrew hollow stud (12) to detach filter assembly from adapter (2) as a unit. Remove assembly from aircraft and discard gasket (5).
c. Deleted.
d. Lift lid (7) off filter can (10) and discard gasket (8).
e. Pull filter element (9) out of filter can (10).

NOTE

Before discarding removed filter element (9), remove the outer perforated paper cover; using a sharp knife, cut through the folds of the filter element at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. In new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by impacting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

f. Wash lid (7), hollow stud (12) and filter can (10) in solvent and dry with compressed air.

NOTES

When installing a new filter element (9), it is important that all gaskets are clean, lubricated and positioned properly, and that the correct amount of torque is applied to the hollow stud (12). If the stud is undertorqued, oil leakage will occur. If the stud is over-torqued, the filter can might possibly be deformed, again causing oil leakage.

- Lubricate all rubber grommets in the new filter element, lid gaskets and metal gasket with clean engine oil or general purpose grease before installation. Dry gaskets may cause false torque readings, again resulting in oil leakage.

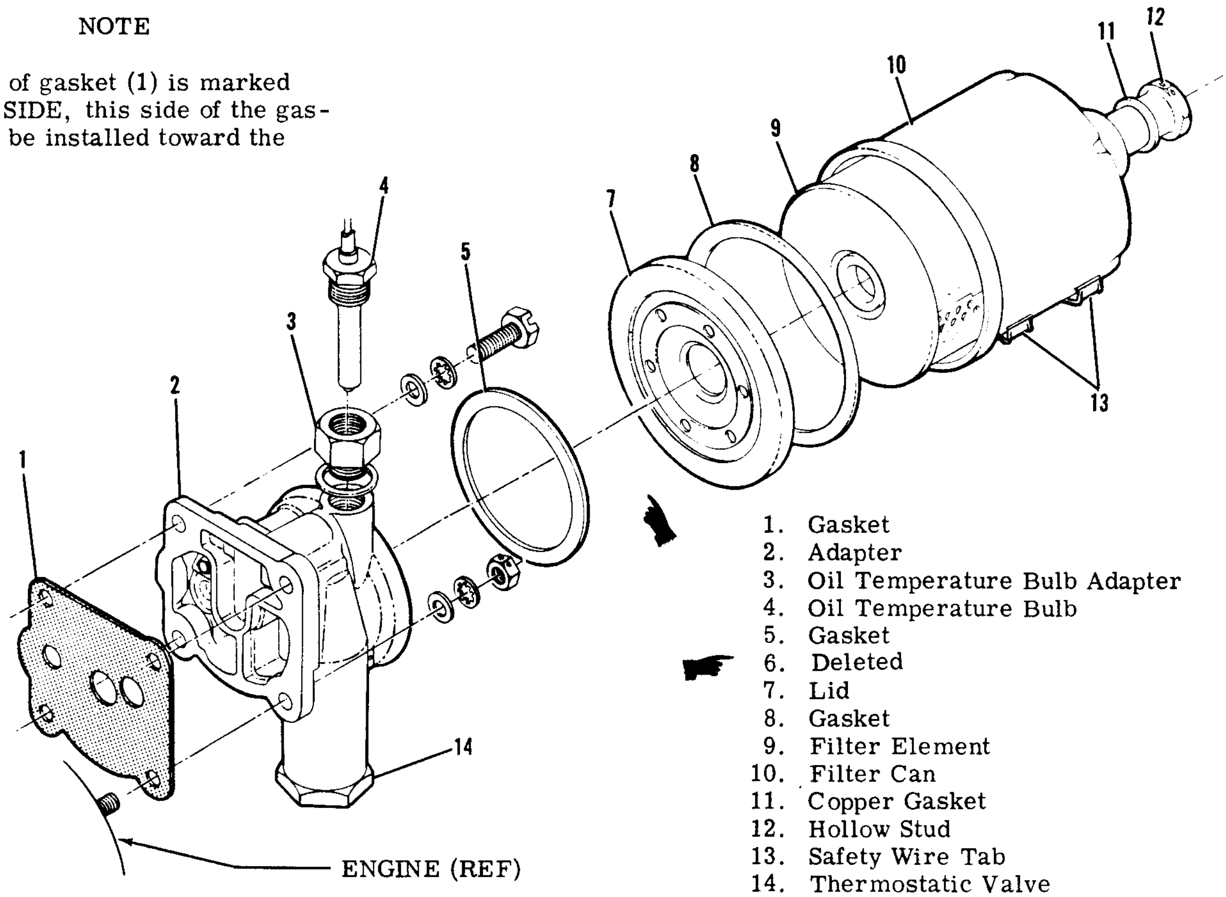
- Before assembly, place a straightedge across bottom of filter can. Check for distortion or out-of-flat condition greater than 0.010 inch. Install a new filter can if either of these conditions exist.

- After installing a new gasket on lid, turn lid over. If gaskets falls, try a different gasket and repeat test. If this gasket falls off, install a new lid.

g. Inspect the adapter gasket seat for gouges, deep scratches, wrench marks and mutilation. If any of these conditions are found, install a new adapter.
h. Place a new filter element (9) in can (10) and insert the hollow stud (12) with a new metal gasket (11) in place, through the filter can and element.

NOTE

One side of gasket (1) is marked ENGINE SIDE, this side of the gasket must be installed toward the engine.



1. Gasket
2. Adapter
3. Oil Temperature Bulb Adapter
4. Oil Temperature Bulb
5. Gasket
6. Deleted
7. Lid
8. Gasket
9. Filter Element
10. Filter Can
11. Copper Gasket
12. Hollow Stud
13. Safety Wire Tab
14. Thermostatic Valve

Figure 11-3. Full-Flow Oil Filter

i. Position a new gasket (8) inside flange of lid (7). Place lid in position on filter can.

j. With new gasket (5) on face of lid, install filter can assembly on adapter (2) with safety wire tabs (13) on filter can down. While holding filter can to prevent turning, tighten hollow stud (12) and torque to 20-25 lb-ft (240-300 lb-in), using a torque wrench.

k. Install all parts removed for access and service the engine with the proper grade and quantity of engine oil. One additional quart of oil is required each time the filter element is changed.

l. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.

m. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).

n. Check to make sure filter can has not been making contact with any adjacent parts due to engine torque.

o. While engine is still warm, recheck torque on hollow stud (12) then safety stud to tab (13) on filter can and safety thermostatic valve (14) to tab on filter can.

11-39. FILTER ADAPTER.

11-40. REMOVAL. (Refer to figure 11-3.)

a. Remove filter assembly in accordance with paragraph 11-38.

b. Remove oil temperature bulb (4) from adapter (2).

c. Remove the three bolts and washers attaching adapter to accessory housing.

d. Remove nut and washers attaching the lower left corner of adapter to accessory housing and remove adapter.

e. Remove gasket (1) from adapter mounting pad and discard.

11-41. DISASSEMBLY, INSPECTION AND REASSEMBLY. After removal of the adapter (2), remove thermostatic bypass valve (14) for cleaning. Do not disassemble the valve. Clean adapter and thermostatic valve in solvent and dry with compressed air. Ascertain that all passages in adapter are open. Remove any gasket material that may have adhered to the adapter. Inspect adapter for cracks, damaged threads, scratches or gouges to gasket seats. If any of these are found, install a new adapter. Using a new gasket install thermostatic bypass valve in adapter.

11-42. INSTALLATION.

a. Using a good grade of gasket sealant, install a new gasket on accessory housing adapter mount pad. Note that one side of the gasket is marked ENGINE SIDE; this side of the gasket must be installed toward the engine.
b. Install adapter on mounting pad and install bolts, washers and nut. Use lockwashers next to bolt heads and nut.
c. Tighten bolts and nut to 75 lb-in.
d. Install oil temperature bulb in adapter.
e. Install filter assembly in accordance with paragraph 11-38.
f. Install any components removed for access.

11-43. OIL COOLER.

11-44. DESCRIPTION. The external oil cooler is mounted on the firewall. Flexible hoses carry the oil to and from the cooler. Cooling air for the cooler is ducted from the upper right engine baffle to the shroud covered oil cooler. Exhaust air from the cooler is discharged into the engine compartment. At each engine oil change, drain the oil cooler.

11-45. ENGINE FUEL SYSTEM.

11-46. DESCRIPTION. A single barrel, float-type, up-draft carburetor is installed on the engine. The carburetor is equipped with a manual mixture control and an idle cut-off. For repair and overhaul of the carburetor refer to the manufacturer's overhaul and repair manual.

11-47. CARBURETOR.

11-48. REMOVAL AND INSTALLATION.

a. Pull fuel shut-off valve control to the OFF position.
b. Remove engine cowling in accordance with paragraph 11-3.
c. Drain fuel from strainer and lines with strainer drain control.
d. Disconnect throttle and mixture controls at carburetor. Note the EXACT position, size and number of washers and spacers for reference on reinstallation.
e. Disconnect and cap or plug the three fuel lines at carburetor.
f. Remove induction airbox in accordance with paragraph 11-53.
g. Remove nuts and washers attaching carburetor to intake manifold and remove carburetor.
h. Reverse the preceding steps for reinstallation. Use new gaskets between carburetor, intake manifold and induction airbox.
i. Rig throttle and mixture controls in accordance with paragraphs 11-69 and 11-70. Check carburetor throttle arm to idle stop arm attachment for security and proper safetying at each normal engine inspection in accordance with figure 11-5.

11-49. IDLE SPEED AND MIXTURE ADJUSTMENTS. Since idle rpm may be affected by idle mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture.

a. Start and run engine until the oil and cylinder head temperatures are in the normal operating range.
b. Check the magnetos for proper operation in accordance with paragraph 11-64.
c. Clear the engine by advancing the rpm to approximately 1000, then retard the throttle to the idle position. The engine rpm should stabilize at 600±25. If not, adjust the idle speed screw IN to increase and OUT to decrease rpm.

NOTE

An engine should idle smoothly, without excessive vibrations. The idle speed should be high enough to maintain idling oil pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

d. After the idle speed has stabilized (600±25 rpm), move the mixture control slowly toward the IDLE CUT-OFF position and observe the tachometer for any minute change during this manual leaning procedure.
e. Quickly return the mixture control to the FULL RICH position before the engine stops.
f. A momentary increase of approximately 25 rpm while slowly manually leaning the mixture is most desirable, an increase of more than 25 rpm indicates a rich idle mixture and an immediate decrease in rpm (if not preceded by a momentary increase) indicates a lean idle mixture.
g. If the idle mixture is too rich, turn the idle mixture adjustment center screw one or two notches in a clockwise direction as viewed from the aft end of the unit, then repeat steps "d" through "f."

NOTE

After each adjustment to the idle mixture, run engine up to approximately 1800 rpm to clear the engine of excess fuel and obtain a correct idle speed.

h. If the idle mixture is too lean, turn the idle mixture adjustment center screw one or two notches in a counterclockwise direction as viewed from the aft end of the unit, then repeat steps "d" thru "f."
i. This method of adjustment will give the desired idle rpm. If the adjustments do not remain stable, check the throttle and mixture linkage for evidence of wear and improper rigging. Any looseness of the throttle and mixture linkage will cause erratic idling. In all cases, allowance should be made for the effect of weather condition upon idling adjustment. The relation of the aircraft to the prevailing wind direction will have an effect on the propeller load and engine rpm. It is advisable to make idle adjustments with the aircraft crosswind.

11-50. INDUCTION AIR SYSTEM.

11-51. DESCRIPTION. Ram air to the engine enters the induction airbox through the induction air filter. From the induction airbox the air is directed to the inlet of the carburetor, mounted on the lower side of the engine oil sump, through the carburetor to the

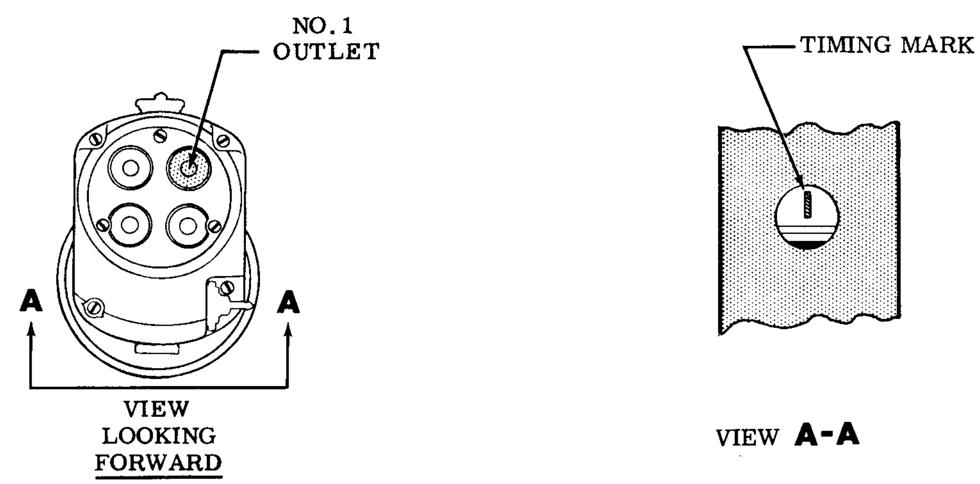


Figure 11-4. Magneto Outlet

center zone induction system, which is an integral part of the oil sump. From the center zone system, the fuel-air mixture is distributed to each cylinder by separate steel intake pipes. The intake pipes are attached to the center zone risers with hoses and clamps and to the cylinder with a two bolt flange which is sealed with a gasket. The induction airbox contains a valve, operated by the carburetor heat control in the cabin, which permits air from an exhaust heated source to be selected in the event carburetor icing or filter icing should be encountered.

11-52. AIRBOX.

11-53. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Disconnect alternate air control from arm at airbox and remove clamp securing control.

NOTE

On aircraft serials 17702040 thru 17702220 and on prior aircraft that have a P/N C294510-0601 filter installed, Cessna Single-engine Service Letter SE75-3 should be complied with.

c. THRU AIRCRAFT SERIAL 17701164. Removal of the complete airbox should not be necessary. The alternate air valve may be removed by removing the screws securing the valve and cover assembly to the remainder of the airbox and working the valve out of airbox.

d. AIRCRAFT SERIAL 17701165 THRU 17702313. Disconnect clamps securing flexible ducts to airbox assembly. BEGINNING WITH 17702314 a rigid aluminum tube is installed, remove clamps and remove tube.

e. Remove safety wire and remove bolts securing airbox to carburetor.

f. Reverse the preceding steps for reinstallation. Use a new gasket between carburetor and airbox.

11-54. IGNITION SYSTEM.

11-55. 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.

11-56. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 11-63.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 11-63.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.

11-57. MAGNETOS.

11-58. DESCRIPTION.

a. SLICK. A sealed lightweight Slick magneto, Model No. 4051 incorporating an impulse coupling is used as the left magneto, while magneto Model No. 4050 (direct drive) is used as the right magneto. These magnetos MUST NOT BE DISASSEMBLED. Internal timing is fixed and breaker points are not adjustable.

b. BENDIX S-1200 SERIES. The Bendix S-1200 series magneto is a completely self-contained unit. A two-pole rotating magnet provides the magnetic energy for the circuit. Suppression of breaker contact point arcing is accomplished by a feed-thru type capacitor mounted in the contact breaker point assembly cover. The left magneto incorporates an impulse coupling to rotate the magnet between impulse trips faster than engine cranking speed thus generating a better spark for starting, automatically retard the spark when starting the engine and act as a drive coupling for the magneto. The right magneto incorporates the standard drive.

c. BENDIX D-2000 SERIES. The Bendix D-2000 series magneto consists of two electrically independent ignition circuits in one housing. A single four pole rotor provides the magnetic energy for both circuits. The magneto uses an impulse coupling to provide reliable ignition at engine cranking speed. Suppression of breaker contact point arcing is accomplished by feed-thru type capacitors mounted in the magneto cover which forms a part of the magneto harness assembly.

11-59. REMOVAL AND INSTALLATION.

a. SLICK.

1. Remove engine cowling in accordance with paragraph 11-3.
2. Remove high-tension outlet plate and disconnect magneto "P" lead.
3. Remove nuts and washers securing magneto to the engine. Note the approximate angular position at which the magneto is installed, then remove the magneto.
4. Reverse the preceding steps for reinstallation and time magneto-to-engine in accordance with paragraph 11-62.

b. BENDIX S-1200 SERIES.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Therefore, ground the breaker contact points or disconnect the high-tension wires from magneto or spark plugs.

1. Remove engine cowling in accordance with paragraph 11-3.
2. Disconnect magneto "P" lead at the capacitor.
3. Remove nuts and washers attaching high-tension outlet plate to the magneto and remove plate.

NOTE

It is a good practice to position No. 1 cylinder at its approximate advanced firing position before removing the magneto.

4. Remove nuts, washers and clamps attaching magneto to the engine accessory housing.
5. Note the approximate angular position at which the magneto is installed, then remove the magneto.
6. Reverse the preceding steps for reinstallation and time magneto-to-engine in accordance with paragraph 11-62.

c. BENDIX D-2000 SERIES.

1. Remove engine cowling in accordance with paragraph 11-3.
2. Remove the eight screws securing the high-tension outlet cover to the magneto. The "P" leads may be disconnected for additional clearance if necessary.

NOTE

It is a good practice to position No. 1 cylinder at its approximate advanced firing position before removing the magneto.

3. Remove nuts, washers and clamps attaching the magneto to the engine accessory housing. Note the approximate angular position at which the magneto is installed, then remove the magneto.
4. Reverse the preceding steps for reinstallation and time magneto-to-engine in accordance with paragraph 11-62.

11-60. INTERNAL TIMING.

a. SLICK. Internal timing is accomplished during manufacture of the magneto. Since these magnetos are NOT TO BE DISASSEMBLED, there is no internal timing.

b. BENDIX S-1200 SERIES. (MAGNETO REMOVED FROM ENGINE.) The following procedures outline adjustment of the breaker contact points to open at the proper position. It is assumed that the magneto has not been disassembled and that the distributor gear and rotor shaft gear have been assembled for correct meshing of gears and direction of rotation. Magneto overhaul, including separation of the major sections, is not covered in this manual. Refer to the applicable Bendix publications for disassembly and overhaul.

1. Remove breaker contact point assembly cover.
2. Remove timing inspection plug from top of magneto and ventilator plug from bottom of magneto.
3. Turn rotating magnet in normal direction of rotation until the L ("E" gap) mark on distributor gear is approximately aligned with mark on block. Then turn rotating magnet in the opposite direction of rotation until the magnet locates in the neutral position.
4. Turn rotating magnet in normal direction of rotation until the first timing mark on the magnet is aligned with the divided casting line of the magneto

housing. There are four timing marks cast on the rotating magnet, two on each pole piece. When the rotating magnet is in its neutral position and then rotated in normal direction of rotation, the first timing mark on rotating magnet to appear in ventilator hole is the "E" gap mark for magnetos of this rotation. The other mark on magnet is the "E" gap for magnetos of opposite rotation.

5. While holding rotating magnet in this EXACT location, adjust the breaker contact points to just begin to open. Point opening shall be determined by the use of a timing light. (Bendix Part No. 11-9110 or equivalent.)

6. Turn rotating magnet in normal direction of rotation until cam follower of contact assembly is on the high point of cam lobe. Contact point clearance should be 0.016±0.003 inch. If dimension does not fall within limits, readjust contact points and recheck to be sure the points just begin to open when the applicable timing mark (refer to step 4) on magnet is aligned with divided casting line on housing ("E" gap).

NOTES

Wire feeler gages are recommended when checking contact point clearance.

- No attempt should be made to stone or dress contact points.

- If the above conditions are met and within tolerance, the magneto is timed internally and ready for installation. If the above conditions are not within tolerance, proceed to step 7.

7. Using a pair of padded jaw pliers or a vise, grip the drive member on the drive end of rotating magnet. While holding the rotating magnet, loosen the screw securing breaker contact cam to rotating magnet shaft and back screw out approximately half way. Place the end of a broad bladed screw driver between the bottom of the cam and housing. Strike the screw driver handle with a sharp downward blow to "pop" the cam loose from taper of shaft.

8. Rotate cam until breaker contact cam follower is on high point of cam lobe. Adjust breaker points to obtain a clearance of 0.016±0.003 inch. Tighten breaker contact securing screws to 20-25 lb-in.

9. Repeat steps 3 and 4.

10. While holding rotating magnet in this EXACT location, rotate the breaker contact cam in the opposite direction of rotation a few degrees BEYOND where the breaker contacts close, then rotate cam in the normal direction of rotation until the breaker contacts just begin to open. Point opening shall be determined by the use of a timing light. (Bendix Part No. 11-9110 or equivalent.)

11. While holding cam in this EXACT position, push cam on magnet shaft as far as possible with the fingers. Tighten cam securing screw thereby drawing the cam down evenly and tightly. Torque cam securing screw to 16-20 lb-in.

NOTE

Extreme care must be exercised in this operation. If cam adjustment is changed in the slightest degree, the timing of the magneto will be thrown off. Do not drive cam on shaft with a mallet or other instrument.

12. Repeat steps 3, 4, 5 and 6.

c. BENDIX D-2000 (DUAL) SERIES. (MAGNETO REMOVED FROM ENGINE.)

NOTE

A magneto, correctly timed internally, will have the red painted tooth of the large distributor gears approximately centered in the timing windows, the L ("E" gap) mark on the rotor shaft in alignment with the pointer and both sets of breaker contacts opening, all at the same time.

1. Remove breaker contact point assembly cover, if installed, by removing the cover screws, pulling cover directly aft away from housing and disconnecting both capacitor leads from breaker contact assemblies.

2. Remove timing inspection hole plugs from magneto.

3. Slowly turn the rotor shaft until the red painted tooth of the large distributor gear for each side is approximately centered in the inspection windows and the L ("E" gap) mark on the rotor is aligned with the pointer. Lock the rotor in this EXACT position using Bendix Rotor Holding Tool, Part No. 11-8465 or equivalent.

NOTE

Position the 11-8465 Rotor Holding Tool on drive end of rotor shaft in the 4 o'clock position so any shaft deflection caused by clamping action will be in a plane parallel to the breaker contacts.

4. Connect the timing light (Bendix Part No. 11-9110 or equivalent) black lead to any unpainted surface of the magneto. Connect the red light lead to the left breaker contact terminal and the green light lead to the right breaker contact terminal.

5. Carefully adjust the LEFT breaker contacts to just begin to open (light will go out) with the timing pointer within the width of the L ("E" gap) mark.

6. Repeat step 5 for the RIGHT breaker contacts.

7. Loosen the rotor holding tool and turn rotor shaft in normal direction of rotation until cam followers of contact assemblies are on the high point of cam lobes. Contact point clearance should be 0.016±0.002 inch and 0.016±0.004 inch on LEFT and RIGHT contacts respectively. If dimensions do not fall within limits, readjust contact points and recheck to be sure the points just begin to open when the timing pointer is within the width of the L ("E" gap) mark.

NOTES

Wire feeler gages are recommended when checking contact point clearance.

- No attempt should be made to stone or dress contact points.
- If the above conditions are met and within tolerance, the magneto is timed internally and ready for installation. If the above conditions are not within tolerance, proceed to step 8.

8. While holding the rotor shaft, loosen the screw securing breaker contact cam to rotor shaft and back screw out approximately half way. Place the end of a broad bladed screw driver between the bottom of the cam and housing. Strike the screw driver handle with a sharp downward blow to "pop" the cam loose from taper of shaft.

9. Rotate cam until breaker contact cam followers are on the high point of cam lobes. Adjust breaker points to obtain a clearance of 0.016±0.002 inch and 0.016±0.004 inch on LEFT and RIGHT contacts respectively. Tighten breaker contact securing screws to 20-25 lb-in.

10. Repeat step 3.

11. While holding rotor shaft in this EXACT position, rotate the breaker contact cam in the opposite direction of rotation a few degrees BEYOND where the breaker contacts close, then rotate cam in the normal direction of rotation until the breaker contacts just begin to open. Point opening should be determined by the use of a timing light. (Bendix Part No. 11-9110 or equivalent.)

12. While holding cam in this EXACT position, push cam on rotor shaft as far as possible with the fingers. Tighten cam securing screw thereby drawing the cam down evenly and tightly. Torque cam securing screw to 16-20 lb-in.

NOTE

Extreme care must be exercised in this operation. If cam adjustment is changed in the slightest degree, the timing of the magneto will be thrown off. Do not drive cam on rotor shaft with a mallet or other instrument.

13. Recheck timing to make sure both sets of breaker contacts begin to open within the width of the L ("E" gap) mark and that the contact point clearance is in accordance with dimensions in step 7.

NOTE

When reinstalling the inspection hole plugs, make sure the ventilated plugs are installed in the ends of the magneto. Torque plugs to 12-15 lb-in.

11-61. REPLACEMENT INTERVAL.

a. SLICK. These magnetos cannot be overhauled in the field. The coil, capacitor and breaker assembly are non-replaceable. As a good maintenance practice and to have the benefit of good ignition at all times, it is recommended that the magnetos be removed at 900 hours of magneto time and new exchange magnetos installed.

11-62. MAGNETO-TO-ENGINE TIMING.

a. SLICK. The magneto must be installed with its timing marks correctly aligned, with number one cylinder on its compression stroke and with the number one piston at its advanced firing position. Refer to paragraph 11-12 for the advanced firing position of number one piston. To locate the compression stroke of the number one cylinder, remove the lower spark plug from number 2, 3 and 4 cylinders. Remove the upper spark plug from number 1 cylinder. Place the thumb of one hand over the spark plug hole of number one cylinder and rotate crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is attained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one piston may be obtained by rotating the crankshaft opposite to its normal direction of rotation until the piston is approximately 30 degrees before top dead center (BTC) on the compression stroke of number one cylinder. Then rotate crankshaft in its normal direction of rotation to align the timing mark on the FORWARD face of the starter ring gear support with the drilled hole in the forward end of the starter, making sure the final motion of the ring gear is in the direction of normal rotation.

NOTE

The starter ring gear must always be in this position when either magneto is locked in position.

When the cylinder is in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushings into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with chamfered edges toward the operator when looking into the magneto mount pad on the engine.

1. Remove the ventilating plug from the bottom of the magneto. The ventilating plug in the top of the magneto need not be removed.

2. Rotate magneto shaft until timing marks are visible through the ventilation plug hole.

3. Establish that the magneto is at the number one firing position. It is possible for the timing mark to be visible while firing position is 180 degrees from number one firing position.

NOTE

It is necessary to "spark" the magneto to establish the correct firing position. The outlet plate with the spark plug leads must be installed. Hold number one spark plug lead (refer to figure 11-4) close to magneto case, or ground the magneto and hold the number one spark plug lead close to a good ground. Rotate impulse coupling (left magneto) or drive coupling (right magneto) in normal direction of rotation until a spark occurs at this lead. (Impulse coupling pawls must be depressed to turn magneto shaft in normal direction of rotation.) Turn coupling or drive coupling backwards a few degrees, until timing mark is centered in ventilating plug hole and install timing pin (or 0.093 inch 6-penny nail) through hole in bottom of magneto next to flange and into mating hole in the rotor shaft. This locks the magneto approximately in firing position while installing on the engine.

4. If timing pin is not used, keep timing mark centered in ventilating plug hole during magneto installation.

5. Be sure magneto gasket (right magneto), magneto adapter and gaskets (left magneto) are in place and that the engine is in the correct firing position, then install magneto approximately at the angle noted during removal, tighten mounting nuts finger tight.

NOTE

Remove timing pin (or nail) from magneto, if installed. Be sure to remove this pin before rotating propeller.

6. Connect a timing light to the capacitor (primary lead) terminal at the rear of the magneto and to a good ground.

7. Rotate propeller opposite to normal direction of rotation a few degrees (approximately 5 degrees) to close magneto contact points.

NOTE

Do not rotate propeller back far enough to engage impulse coupling, or propeller will have to be rotated in normal direction of rotation until impulse coupling releases on the left magneto, then again backed-up to a few degrees before the firing position.

8. Slowly advance propeller (tap forward with minute movements as firing position is approached) in normal direction of rotation until timing light indicates position at which contacts break. The contacts should break at the advanced firing position of number one cylinder. Loosen mounting nuts slightly and rotate magneto case to cause the contacts to break at the correct position. Tighten mounting nuts.

9. After tightening magneto mounting nuts, recheck timing. Make sure both magnetos are set to fire at the same time. Remove timing equipment, install spark plugs and connect spark plug leads and ignition switch leads.

NOTE

Beginning with the number one outlet, the magneto fires at each successive outlet in a counterclockwise direction, looking at the outlets. Connect number one magneto outlet to number one cylinder spark plug lead, number two outlet to the next cylinder to fire, etc. Engine firing order is listed in paragraph 11-12.

b. BENDIX S-1200 SERIES. The magneto must be installed with its timing marks correctly aligned, with number one cylinder on its compression stroke and with the number one piston at its advanced firing position. Refer to paragraph 11-12 for the advanced firing position of number one piston. To locate the compression stroke of number one cylinder, remove the lower spark plug from number 2, 3 and 4 cylinders. Place the thumb of one hand over the spark plug hole of number one cylinder and rotate crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is attained, locate number one piston at its advance firing position. Locating the advanced firing position of number one piston may be obtained by rotating the crankshaft opposite to its normal direction of rotation until the piston is approximately 30 degrees before top dead center (BTC) on the compression stroke of number one cylinder. Then rotate crankshaft slowly in normal direction of rotation to align the timing mark on the FORWARD face of the starter ring gear with the drilled hole in the forward end of the starter, making sure the final movement of the ring gear is in the direction of normal rotation.

NOTE

An accurate top center indicator which screws into a spark plug mounting hole, and a pendulum pointer mounted on a 360-degree timing disc may also be used to locate the advanced firing position. The timing disc should be adapted to fit over the end of the propeller spinner in such a manner that it may be rotated as necessary. In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the engine is turned in its normal direction of rotation.

After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner:

1. Remove timing inspection plug from top of magneto. Turn magneto drive shaft in direction of operating rotation until the applicable timing mark on the distributor gear is approximately aligned with the mark on the distributor block. Depress impulse coupling pawls on left magneto to rotate magneto shaft.

NOTE

The timing marks are for reference only. They should not be used to adjust contact breaker point opening or to determine proper timing of the magneto. (Refer to paragraph 11-60 for internal timing.)

2. Be sure magneto gasket (right magneto), magneto adapter and gaskets (left magneto) are in place and that engine is in the correct firing position, then install magneto approximately at the angle noted during removal, tighten mounting nuts finger tight.

NOTE

Be sure to keep timing marks in the magneto aligned as close as possible when installing on the engine.

3. Connect positive lead of the timing light (Bendix Part No. 11-9110 or equivalent) to the switch terminal (capacitor stud) of the magneto. Secure the common lead of timing light to good ground.

4. Rotate propeller opposite to normal direction of rotation a few degrees (approximately 5 degrees) to close the magneto breaker contact points.

NOTE

Do not rotate propeller backward enough to engage impulse coupling, or the propeller will have to be rotated in the normal direction of rotation until impulse coupling releases on the left magneto, then again backed-up to a few degrees before the firing position.

5. Slowly advance propeller (tap forward with minute movements as advanced firing position is approached) in normal direction of rotation until timing light indicates position at which contacts break. The contacts should break at the advanced firing position of number one cylinder. Loosen mounting nuts slightly and rotate magneto case as required to cause the contacts to break at the correct position. Tighten mounting nuts.

6. After tightening magneto mounting nuts, recheck timing. Make sure that both magnetos are set to fire at the same time. Remove timing equipment, install spark plugs and connect spark plug leads and ignition switch leads.

c. BENDIX D-2000 (DUAL) SERIES. The magneto must be installed with its timing marks carefully aligned, with number one cylinder on its compression stroke and with the number one piston at its advanced firing position. Refer to paragraph 11-12 for the advanced firing position of number one piston. To locate the compression stroke of the number one cylinder, remove the lower spark plug from number 2, 3 and 4 cylinders. Remove the upper spark plug from number 1 cylinder. Place the thumb of one hand over the spark plug hole of number one cylinder and rotate crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is attained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one piston may be obtained by rotating the crankshaft opposite to its normal direction of rotation until it is approximately 30 degrees before top dead center (BTC) on the compression stroke of number one cylinder. Rotate crankshaft in a normal direction to align the timing mark on the front face of the starter ring gear support with the drilled hole in the starter, making sure the final motion of the ring gear is in the direction of normal rotation.

NOTE

An accurate top center indicator which screws into a spark plug mounting hole, and a pendulum pointer mounted on a 360-degree timing disc may also be used to locate the advanced firing position. The timing disc should be adapted to fit over the end of the propeller spinner in such a manner that it may be rotated as necessary. In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the engine is turned in its normal direction of rotation.

After the engine has been placed in the correct firing position, install the magneto to the engine in the following manner:

1. Remove the timing window plug from the most convenient side of the magneto housing.

2. Remove the rotor viewing location plug from the top center of the housing.

3. Turn the rotating magnet drive shaft in the normal direction of magneto rotation until the red painted tooth of the large distributor gear is centered in the timing hole (hole at each side of magneto).

4. Also observe at this time that the built in pointer just ahead of the rotor viewing window aligns with the L ("E" gap) mark on the rotor.

5. Install the magneto-to-engine gasket on the magneto flange.

WARNING

Do not attach harness spark plug leads to the spark plugs until all magneto-to-engine timing procedures are completed and the switch leads ("P" leads) are connected.

6. Remove the engine-to-magneto drive gear train backlash by turning magneto drive opposite to normal rotation as far as possible.

7. With the no. 1 cylinder at its correct firing position and on the compression stroke, hold the magneto as close to its no. 1 firing position as possible (red tooth in center of window and pointer over L ("E" gap) mark on rotor) and install magneto to the engine. Loosely tighten magneto in position.

NOTE

To facilitate connection of a timing light to the switch lead ("P" lead) terminals, short adapter leads may be fabricated. These can be made by using two switch lead terminals and two short pieces of insulated wire. Install the fabricated adapter leads in the switch lead outlet terminals of the cover.

8. Attach the red lead of the timing light (Bendix Part No. 11-9110 or equivalent) to the left switch lead adapter, the green lead of the timing light to the right switch lead adpater and the black lead of the timing light to the magneto housing (common ground).

NOTE

An internal timing tolerance is allowed when adjusting the two main breakers. Therefore, one of the main breakers may open slightly before the other. Magneto-to-engine timing should be accomplished using the first main breaker to open as the reference point when the engine is in the firing position for No. 1 cylinder. This will insure that ignition created be either spark plug will not occur prior to the desired engine firing point.

9. Turn the entire magneto in direction of rotor rotation until the timing lights are on.

10. Turn magneto in direction of rotor rotation, right-hand rotation to right and left-hand rotation to left, until one of the timing lights just goes off. Then tighten the magneto mounting clamps evenly in this position.

11. Back the engine up approximately 10° and then carefully "bump" the engine forward while observing the timing lights.

12. At the No. 1 cylinder firing position, one of the timing lights should go off. Continue turning the engine in its normal direction of rotation until the other timing light goes off. This should be not more than 3 engine degrees later than the first light. If not, repeat steps 9 thru 11 until these conditions are obtained.

13. Make sure the magneto clamps are tightened securely, recheck timing once more and remove timing equipment.

14. Reinstall inspection plugs and torque plugs to 12-15 lb-in.

11-63. MAINTENANCE.

a. SLICK. Magneto-to-engine timing should be checked at the first 50 hours, first 100 hours and thereafter at each 100 hours. If timing to the engine is not within plus zero degrees and minus two degrees, the magneto should be retimed to the engine.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble appears definitely to be associated with a magneto, the following may be used to help disclose the source of trouble.

1. Remove high-tension outlet plate and check distributor block for moisture.

2. If any moisture is evident, lightly wipe with a soft, dry, clean, lint-free cloth. Install outlet plate.

NOTE

Since these magnetos MUST NOT BE DISASSEMBLED, a new magneto should be installed if the moisture check does not remedy the trouble.

b. BENDIX S-1200 AND D-2000 SERIES. At the first 25-hour inspection, first 50-hour inspection, each 100-hour inspection and thereafter at each 100-hour inspection, the contact breaker point compartment and magneto-to-engine timing should be inspected and checked. If magneto-to-engine timing is correct within plus zero and minus two degrees, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing (paragraph 11-60), then install and time to the engine.

NOTE

If engine operating troubles develop which appear to be caused by the ignition system, it is advisable to check the spark plugs and ignition harness first before working on the magnetos. If the trouble appears definitely associated with a magneto, the following may be used to help disclose the source of trouble without overhauling the magneto.

1. Moisture check.

a. Remove contact breaker point assembly cover and inspect cover, cables and capacitor for moisture in the area.

b. Inspect distributor block high tension outlets for moisture.

c. If any moisture is evident, lightly wipe with a soft, dry, clean, lint-free cloth.

CAUTION

Do not use gasoline or any other solvent, as these will remove the wax coating on some parts and cause an electrical leak.

2. Breaker contact compartment check.

a. Check all parts of the contact breaker assembly for security. Check distributor block high-tension outlet springs for evidence of spark erosion and proper height. The end of spring should not be more than 0.422 inch from top of tower.

b. Check breaker contact assembly points for excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard finish paper. If breaker points are found defective, install a new assembly. Make no attempts to stone or dress breaker points. Clean new breaker points with clean unleaded gasoline and hard finish paper before installing.

c. Check condition of the cam follower felt. Squeeze felt between thumb and finger. If fingers are not moistened with oil, re-oil using 2 or 3 drops of lubricant (Bendix Part No. 10-86527 or equivalent). Allow approximately 30 minutes for felt to absorb the lubricant. Blot off excess lubricant with a clean, lint-free cloth. Too much lubricant could foul breaker points and cause excessive burning.

d. BENDIX S-1200 SERIES. Check capacitor mounting bracket for cracks or loosening. If equipment is available, check the capacitor for leakage, series resistance and capacitance. The capacitance should be at least 0.30 microfarads.

e. BENDIX D-2000 (DUAL) SERIES. Check capacitors for looseness in the magneto cover of the harness assembly and for any physical damage. If equipment is available, check the capacitors for leakage, series resistance and capacitance. The capacitance should be 0.34 to 0.41 microfarads.

NOTE

Spring in capacitor outlet may cause an indication of a short to ground if an adapter lead is not used.

f. If the trouble has not been corrected after accomplishing the moisture and breaker contact compartment check, check magneto-to-engine timing in accordance with paragraph 11-62. If timing is incorrect, remove magneto and adjust internal timing in accordance with paragraph 11-60.

g. Reinstall magneto and time to engine in accordance with paragraph 11-62.

h. If the trouble has not been corrected, magneto overhaul or replacement is indicated.

11-64. MAGNETO CHECK.

a. Start and run engine until the oil and cylinder head temperatures are in the normal operating ranges.

b. Advance engine speed to 1800 rpm.

c. Turn the ignition switch to the "R" position and note the rpm drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

d. Turn the switch to the "L" position and note the rpm drop, then return the switch to the "BOTH" position.

e. The rpm drop should not exceed 150 rpm on either magneto or show greater than 50 rpm differential between magnetos. A smooth rpm drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp rpm drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, rpm checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of rpm drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

11-65. SPARK PLUGS. Two 18-mm spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

Refer to Section 2 for inspection interval. At each inspection, remove, clean, inspect and regap all plugs. Install lower spark plugs in upper portion of cylinders and install upper spark plugs in lower portion of cylinders. Since deterioration of lower spark plugs is usually more rapid than that of upper spark plugs, rotating helps prolong spark plug life.

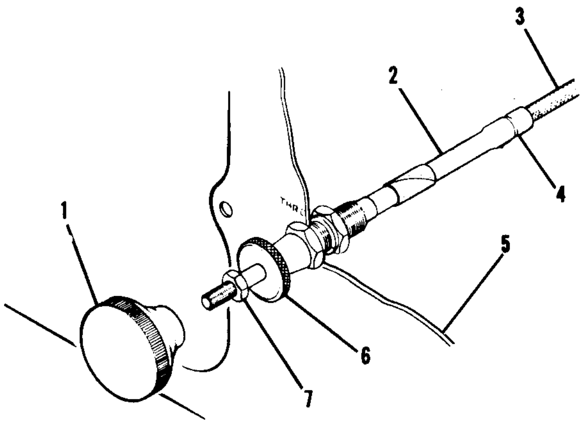
11-66. ENGINE CONTROLS.

11-67. DESCRIPTION. The throttle, mixture, propeller and carburetor heat controls are of the push-pull type. The propeller control is equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller control also has a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. The carburetor heat control has no locking device. The mixture control has no locking device thru aircraft serial 17702539. Beginning with aircraft serial 17702540 the mixture control is equipped with a lock and vernier adjustment as described for the propeller control.

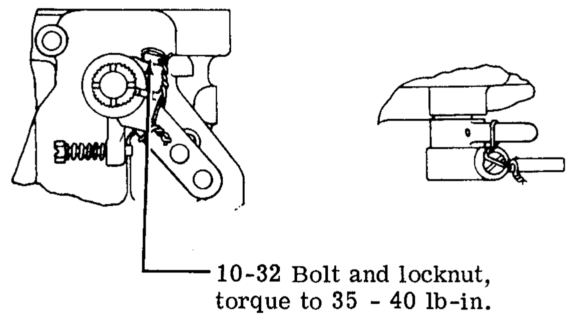
NOTE

Some controls have intricate parts that will fall out and possibly be lost if the control is pulled from the housing while it is disconnected.

11-68. 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.



1. Knob
2. Rigid Conduit
3. Flexible Conduit
4. Staked Connection
5. Instrument Panel
6. Friction Lock
7. Jam Nut



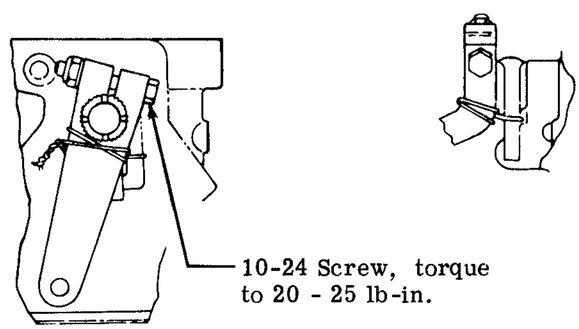
AIRCRAFT SERIALS 17700001 THRU 17701164

NOTE

As required or during carburetor overhaul, Avco Lycoming Service Instruction No. 1265 which consists of a new serrated throttle lever and shaft may be installed on the carburetor. The serrated feature of the new lever and shaft ensures positive locking and eliminates the safety wire and torque requirements specified in Service Bulletin No. 330A.

NOTE

Although sequence and direction of tying may vary, idle stop arm, throttle arm and clamping screw must all be tied together.



BEGINNING WITH AIRCRAFT SERIALS 17701165

Figure 11-5. Throttle Control

CAUTION

Some engine controls have a small retaining ring brazed (or attached with epoxy resin) near the threaded end (engine end) of the control. The purpose of these retaining rings is to prevent inadvertent withdrawal of and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

11-69. THROTTLE CONTROL.

NOTE

Before rigging throttle control shown in figure 11-5, check that staked connection (4) between rigid conduit (2) and flexible conduit (3) is secure. If any indication of looseness or breakage is apparent, replace the throttle control before continuing with the rigging procedure.

a. Pull throttle control out (idle position) and remove throttle control knob (1).
b. Screw jam nut (7) all the way down (clockwise) and install throttle knob. Screw the knob securely against the jam nut. Do not back jam nut out. This will prevent bottoming and possible damage to the staked connection.
c. Disconnect throttle control at the carburetor throttle arm, push throttle control in until jam nut hits friction lock (6) while the friction lock is loose, then pull control out approximately 1/8 inch for cushion. Note position of large washer at carburetor end of control. Install washer in same position when connecting control to arm.
d. Tighten friction lock (6), being careful not to change position of the throttle.
e. Move throttle arm on carburetor to full open, adjust rod end at end of throttle control to fit and connect to arm on carburetor.
f. Release friction lock and check full travel of arm on carburetor. If further adjustment is required, make all adjustment at the carburetor end of control. DO NOT change jam nut (7) setting.
g. Tighten rod end locknuts at carburetor end of control. Be sure to maintain sufficient thread engagement between rod end and control.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the throttle control.

11-70. MIXTURE CONTROL.
a. Push mixture control full in, then pull it out approximately 1/8 inch for cushion.
b. Loosen clamp securing the control to the carburetor.
c. Shift control housing in the clamp so that the mixture arm on the carburetor is in the full open position (RICH). Tighten the clamp in this position.
d. Pull mixture control full out. Check that idle mixture arm on carburetor is full closed (IDLE CUT-OFF).
e. Check that the bolt and nut at the mixture arm on carburetor secures the control wire and that the bolt will swivel in the arm.
f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.
g. When installing a new control, it may be necessary to shorten the wire and/or control housing.
h. The mixture arm on the carburetor must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed in.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.

11-71. CARBURETOR HEAT CONTROL.
a. THRU AIRCRAFT SERIAL 177-01164. With lower cowling segment in place and control connected to arm on airbox, loosen clamp securing the control to the bracket on the airbox.
b. BEGINNING WITH AIRCRAFT SERIAL 17701165. With control connected to arm on airbox, loosen clamp securing the control to the bracket on the airbox.
c. Push control full in, then pull it out approximately 1/8 inch from panel for cushion.
d. Shift control housing in its clamp so that the valve in the airbox is seated in the full open position. Tighten clamp in this position.
e. Pull out on the control and check that the air valve inside the airbox seats in the opposite direction.
f. Check that bolt and nut on the air valve lever secures the control wire and that the bolt will swivel in the lever.
g. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.
h. When installing a new control, it may be necessary to shorten the wire and/or control housing.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the carburetor heat control.

11-72. PROPELLER CONTROL. Refer to Section 13.

11-73. STARTING SYSTEM.

11-74. DESCRIPTION. The starting system employs an electrical starter motor mounted at the front (propeller end) lower left side of the engine. A starter solenoid is activated by the ignition key on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the starter motor. Initial rotation of the starter armature shaft, engaged with the reduction gear, drives the Bendix shaft and pinion. When the

This page intentionally left blank.

armature turns the reduction gear, the Bendix drive pinion meshes with the crankshaft ring gear assembly by inertia and action of the screw threads within the Bendix sleeve. A detent pin engages in a notch in the screw threads which prevents demeshing if the engine fails to start when the starting circuit is de-energized. When the engine reaches a predetermined speed, centrifugal action forces the detent pin out of the notch in the screw shaft and allows the pinion to demesh from the ring gear.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

11-75. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity of master switch and circuit. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity of switch and circuit. Install new switch or wires.
	Defective starter motor.	Check voltage to starter. If voltage is present. Remove, repair or install new starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective Bendix drive.	Remove starter and inspect Bendix drive. Replace defective parts.
	Damaged starter pinion gear or ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Inspect cable. Install new cable.
	Loose or dirty connections.	Inspect connections. Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Inspect commutator. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion gear or broken teeth on ring gear.	Inspect starter pinion gear and ring gear. Replace defective parts.

11-76. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new ones). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 of No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding.

11-77. STARTER MOTOR.

11-78. REMOVAL AND INSTALLATION

a. Remove engine cowling in accordance with paragraph 11-3.

CAUTION

When disconnecting or connecting the starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between terminal and field coils causing the starter to be inoperative.

b. Disconnect electrical cable at starter motor. Insulate the disconnected cable terminal as a safety precaution.

c. Remove three nuts and washers and one bolt securing starter to crankcase. Work starter from engine.

d. To install starter, position starter on mounting pad, aligning dowel pins in starter mounting pad with holes in mounting pad on engine.

e. Secure starter with washer, lockwasher and nut in three places and install bolt and washers.

f. Tighten nuts and bolt evenly to a torque value of 150 lb-in.

g. Connect electrical cable to starter terminal and install engine cowling.

11-79. EXHAUST SYSTEM.

11-80. DESCRIPTION. The exhaust system consists of an exhaust pipe from each cylinder to the muffler located beneath the engine. The muffler assembly is enclosed in a shroud which captures exhaust heat that is used to heat the aircraft cabin. A shroud on number three exhaust pipe is used to capture carburetor heat for the engine intake system. The tailpipe welded to the muffler routes the exhaust gases overboard.

11-81. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Disconnect flexible ducts from shrouds on muffler assembly and exhaust pipe.

c. Remove nuts, bolts, washers and clamps attaching exhaust pipes to muffler assembly.

d. Loosen nuts attaching exhaust pipes to the cylinders and remove muffler assembly.

e. Remove nuts and washers attaching exhaust pipes to the cylinders and remove pipes and gaskets.

f. Reverse the preceding steps for reinstallation. Install a new copper-asbestos gasket between each exhaust pipe and its mounting pad. When installing the attaching nuts, install a plain washer, an internal tooth washer and nut. Tighten nuts evenly to 100-110 lb-in. Make sure all clamps attaching muffler to exhaust pipes are tight and all air ducts are installed.

11-82. INSPECTION.

WARNING

Any time exhaust fumes are detected in the cabin, an immediate inspection must be preformed.

The exhaust system must be throughly inspected, especially the heat exchange section of the muffler. An inspection of the exhaust system must be preformed every 100 hours of operating time. All components that show cracks and general deterioration must be replaced with new parts. Using a flashlight and mirror inspect diffuser tubes through the tailpipe. Replace muffler if defective.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Loosen or remove shrouds so that ALL surfaces of the exhaust system are visible.

c. Check for holes, cracks and burned spots. Especially check the areas adjacent to welds. Look for exhaust gas deposits in surrounding areas which indicate an exhaust leak.

d. Where a surface is not accessible for a visual inspection or for a positive test, proceed as follows:

1. Remove exhaust pipes and muffler.
2. Remove shrouds.
3. Seal openings with expansion rubber plugs.
4. Using a manometer or gage, apply approximately 3 ± 1/2 psi (6 inches of mercury) air pressure while the unit is submerged in water. Any leaks will appear as bubbles and can be readily detected.
5. It is recommended that any components found defective be replaced with new parts before the next flight.
6. If no defects are found, remove plugs and dry components with compressed air.

e. Install the exhaust system and engine cowling.

11-83. EXTREME WEATHER MAINTENANCE.

11-84. COLD WEATHER. Cold weather starting is

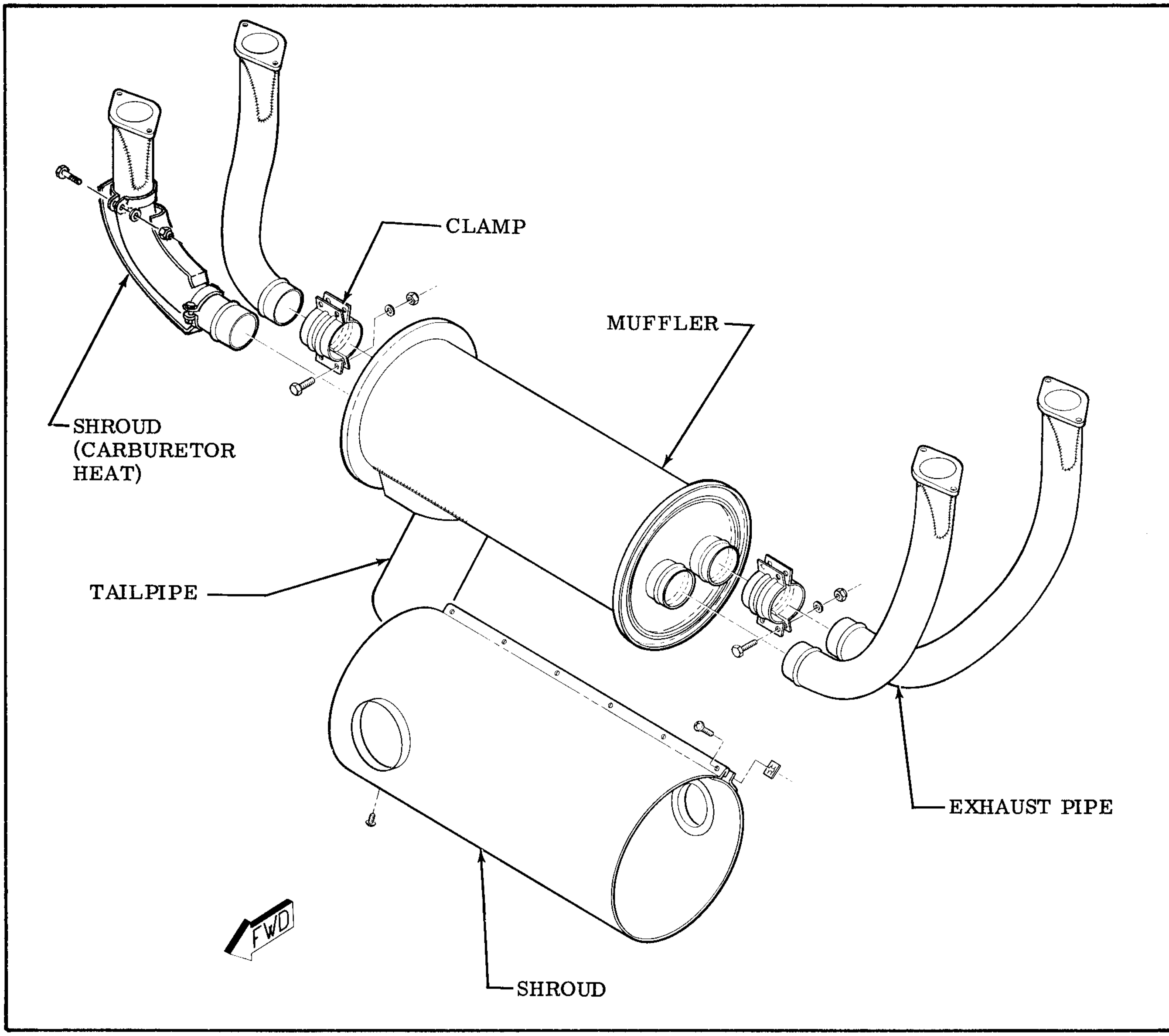


Figure 11-6. Exhaust System

made easier by the installation of the manually-operated engine primer system. Fuel is supplied by a line from the fuel strainer to the plunger type primer. Operating the primer forces fuel to the intake valve port of the cylinder. Primer lines should be replaced when crushed or broken and should be properly clamped to prevent vibration and chafing. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 11-88 for use of the external power receptacle.

The following may also be used to assist engine starting in extreme cold weather. After the last flight of the day, drain the engine oil into a clean container so the oil can be preheated. Cover the engine to prevent ice or snow from collecting inside the cowling. When preparing the aircraft for flight or engine run-up after these conditions have been followed, perheat the drained oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the oil, gasoline may be mixed with the heated oil in a ratio of 1 part fuel to 12 parts oil before pouring into the engine oil sump. If the free air temperature is below -29°C (-20°F), the engine compartment should be preheated by a ground heater. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull the propeller through several revolutions by hand before starting engine.

CAUTION

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

11-85. HOT WEATHER. Engine starting in hot weather or with a hot engine is sometimes hampered by vapor formation at certain points in the fuel system. To purge the vapor, remove the carburetor vent plug and purge the carburetor and lines by turning the fuel shut-off valve on. Purge the carburetor in this manner until fuel stands level with the vent plug opening. Replace the carburetor vent plug and operate the engine to make sure that the condition has been corrected.

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

Engine mis-starts characterized by sufficient power to disengage the starter but dying after three to five revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting procedure with additional priming.

CAUTION

Never operate the starting motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods will shorten the life of the starter motor.

11-86. DUSTY CONDITIONS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating under high dust conditions, service the induction air filter daily as outlined in Section 2. Also, change engine oil and lubricate the airframe more often than specified.

11-87. SEACOAST AND HUMID AREAS. In salt water areas, special care should be taken to keep the engine and accessories clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensed moisture.

11-88. GROUND SERVICE RECEPTACLE. With the ground service receptacle installed, the use of an external power source is recommended for cold weather starting and lengthy maintenance of the aircraft electrical system with the exception of electronic equipment.

NOTE

Electrical power is supplied through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. In the split bus system, both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the semiconductors in the electronic equipment.

The ground service plug receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is correctly connected to the aircraft. If the plug is accidentally connected backwards, no power will flow to the aircraft electrical system, thereby preventing any damage to electrical equipment.

The battery and external power circuits have been designed to completely eliminate the need to "jumper" across the battery contactors to close it. A special fused circuit in the external power system supplies the needed "jumper" across the contacts so that with a "dead" battery and an external power source applied, turning the master switch ON will close the battery contactor.

11-89. HAND CRANKING. A normal hand cranking procedure may be used to start the engine, if the starter is not engaged with the ring gear.

SECTION 12

FUEL SYSTEM

TABLE OF CONTENTS

12-1. FUEL SYSTEM.

12-2. DESCRIPTION. Fuel from the wing fuel bay areas is gravity-fed through a selector valve, small reservoir tank and shut-off valve to the fuel strainer. From the strainer, fuel is routed to an engine-driven pump which delivers fuel under pressure to the carburetor. An electric auxiliary fuel pump parallels the engine-driven pump and is used when the fuel pressure drops below 2 psi. Fuel bypasses the auxiliary pump when the pump is not in operation. Through 1971 Models, the fuel bays are individually vented overboard through vent lines extending to the wing tips with a check valve located just outside of each fuel bay. The reservoir tank is vented to the right fuel bay vent line and is teed into the line between the bay and the check valve. Beginning with 1972 Models, the fuel bays are individually vented outboard through vent lines extending to opposite wing tips. A drain plug for each vent line is located in the wing gap area of each wing. The reservoir tank is vented to the right fuel bay vent line and is teed into the line just outboard of the right wing fuel bay.

12-3. PRECAUTIONS.

NOTE

There are certain general precautions and rules concerning the fuel system which should be observed when performing the operations and procedures in this section. These are as follows:

a. During all fueling, defueling, purging, repairing or disassembly, ground the aircraft to a suitable ground stake.
b. Residual fuel draining from lines and hose constitutes a fire hazard. Use caution to prevent the accumulation of fuel when lines or hose are disconnected.
c. Cap open lines and cover connections to prevent thread damage and the entrance of foreign matter.

12-4. TROUBLE SHOOTING.

NOTE

This trouble shooting chart should be used in conjunction with the engine trouble shooting chart in Section 11.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FUEL FLOW TO ENGINE-DRIVEN FUEL PUMP.	Fuel shut-off valve not turned on.	Turn fuel shut-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.	Remove and repair or replace selector valve.
	Plugged fuel strainer.	Clean strainer and screen.
	Fuel line plugged.	Clean out or replace fuel line.
FUEL STARVATION AFTER STARTING.	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Malfunction of engine-driven fuel pump.	Refer to Section 11.
	Fuel vents plugged.	Refer to paragraph 12-7.
	Water in fuel.	Drain fuel bay sumps, fuel lines and strainer.
NO FUEL FLOW WHEN ELECTRIC PUMP IS TURNED ON.	Defective fuel pump switch.	Replace defective switch.
	Open or defective circuit breaker.	Reset. Replace if defective.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective electric fuel pump.	Replace defective pump.
NO FUEL QUANTITY INDICATION.	Fuel bays empty.	Service with proper grade and amount of fuel.
	Circuit breaker open or defective.	Reset. Replace if defective.
	Defective fuel quantity indicator or transmitter.	See Section 15.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.

NOTE

Throughout the aircraft fuel system, from the fuel bays to the carburetor, use 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.

12-5. FUEL VENTS.

12-6. DESCRIPTION. Thru 1971 Models, a fuel bay vent line extends from the upper aft corner of each fuel bay to the wing tip. This vent line contains a check valve, located just outboard of each fuel bay, to prevent fuel drainage, but still allow the positive pressure from expanding fuel to escape from the bays. A reservoir tank vent line is connected to the right fuel bay vent line, and contains a drain tee, located inboard and forward of the right forward door post. Removal and installation procedures for vent lines on aircraft thru 1971 Models are outlined in paragraph

12-8. Beginning with 1972 Models, a fuel bay vent line extends from the upper aft corner of each fuel bay to the opposite wing tip. This vent line contains a drain plug, located in the wing gap area of each wing. A reservoir tank vent line is connected to the right fuel bay vent line, and contains a drain tee, located inboard and forward of the right forward door post. Removal and installation procedures for vent lines on aircraft beginning with 1972 Models are outlined in paragraphs 12-8A thru 12-8I.

12-7. CHECKING VENTS. Field experience has demonstrated that the vents can become plugged, causing possible fuel starvation of the engine. On aircraft thru 1971 Models, the bleed hole in the vent valve assembly could possibly become plugged, allowing pressure from expanding fuel to pressurize the bay areas. The following procedures may be used to check the vent systems for proper operation. (THRU 1971 MODELS.)

a. Cover .040 drilled holes approximately 6 inches from end of vent lines at trailing edges of wing tips.

b. Attach a rubber hose to the end of vent line at trailing edge of one wing tip.

c. Turn fuel selector valve to opposite bay from vent line being checked, and check that both fuel

SHOP NOTES:

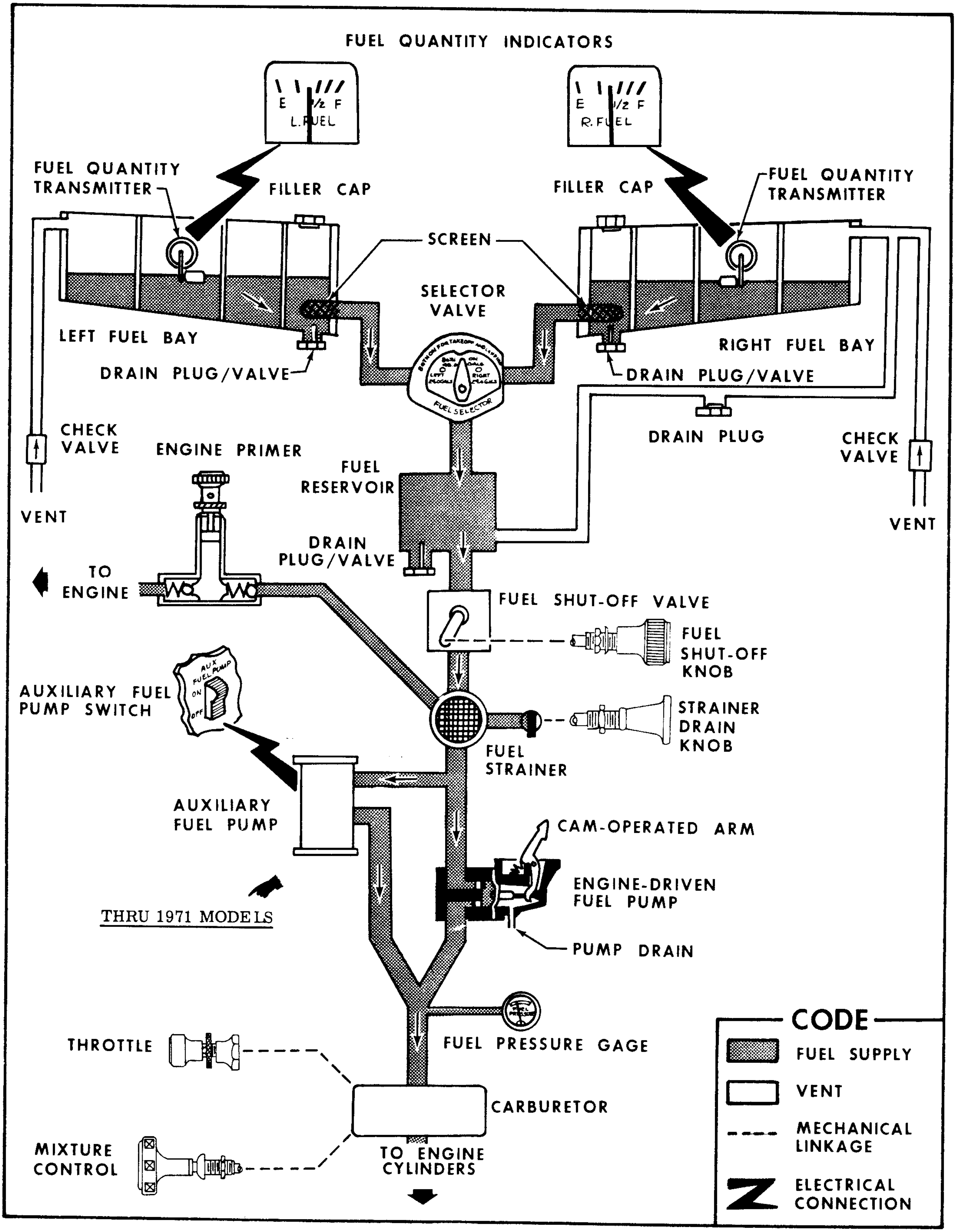


Figure 12-1. Fuel System Schematic

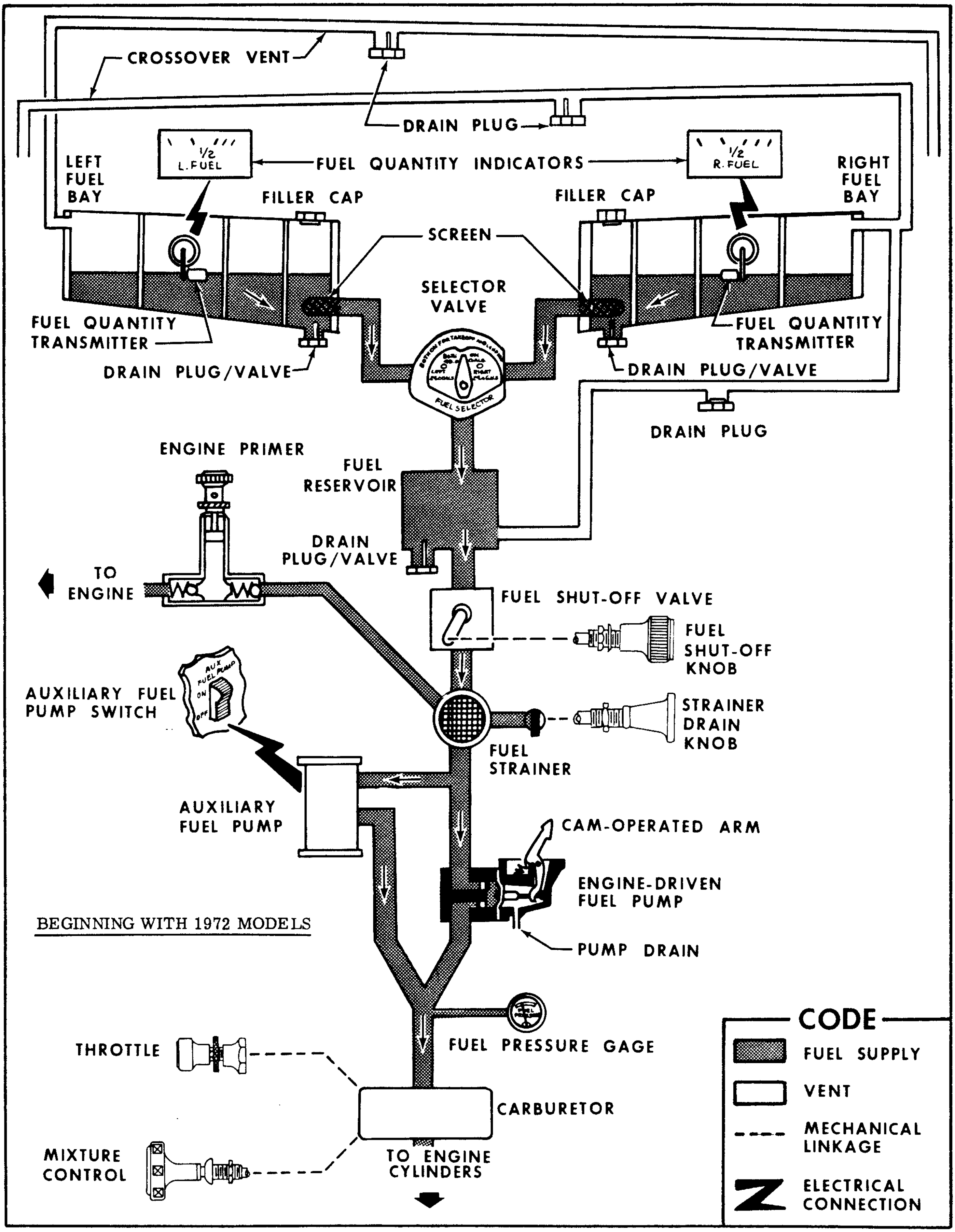
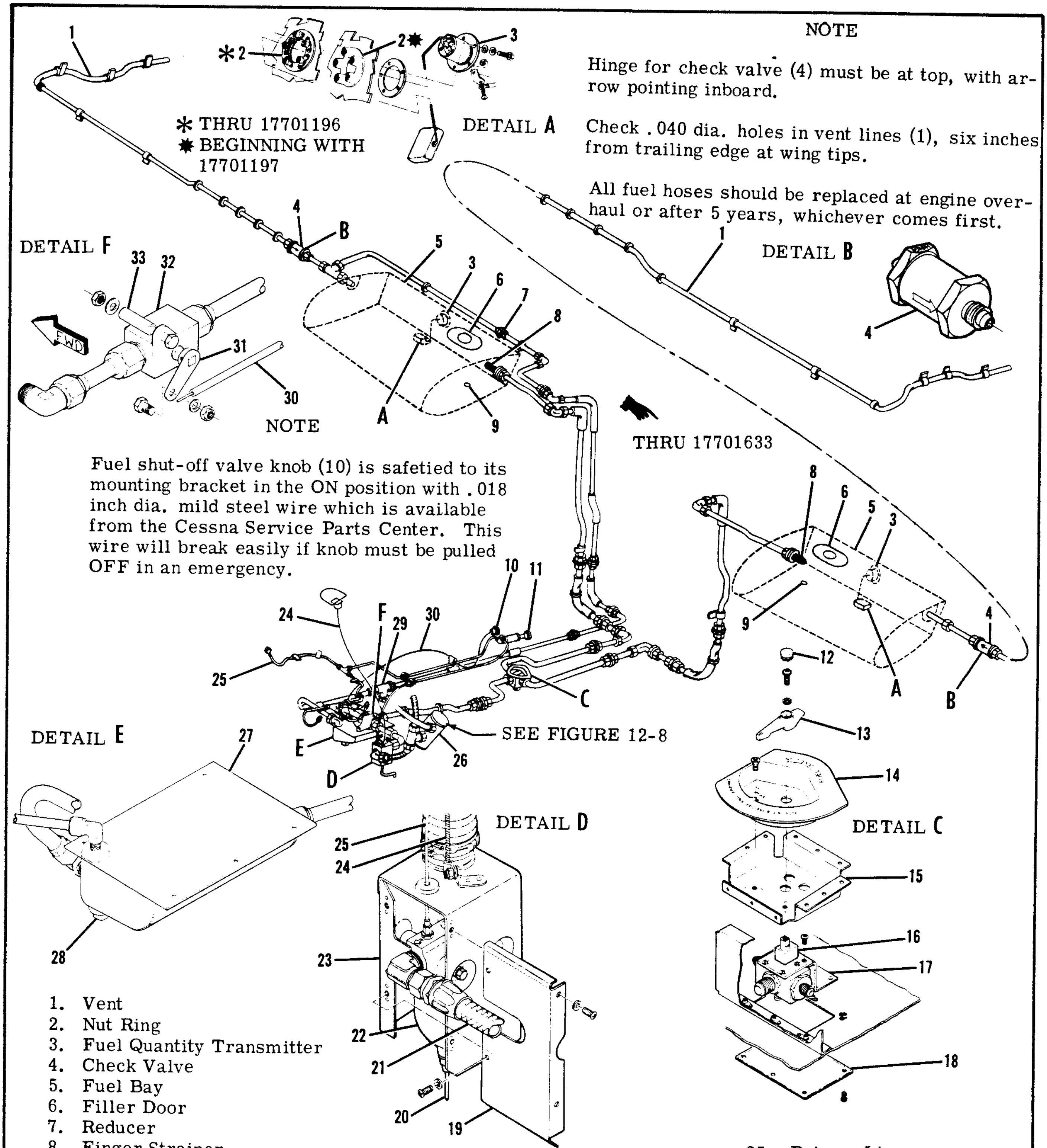


Figure 12-1A. Fuel System Schematic



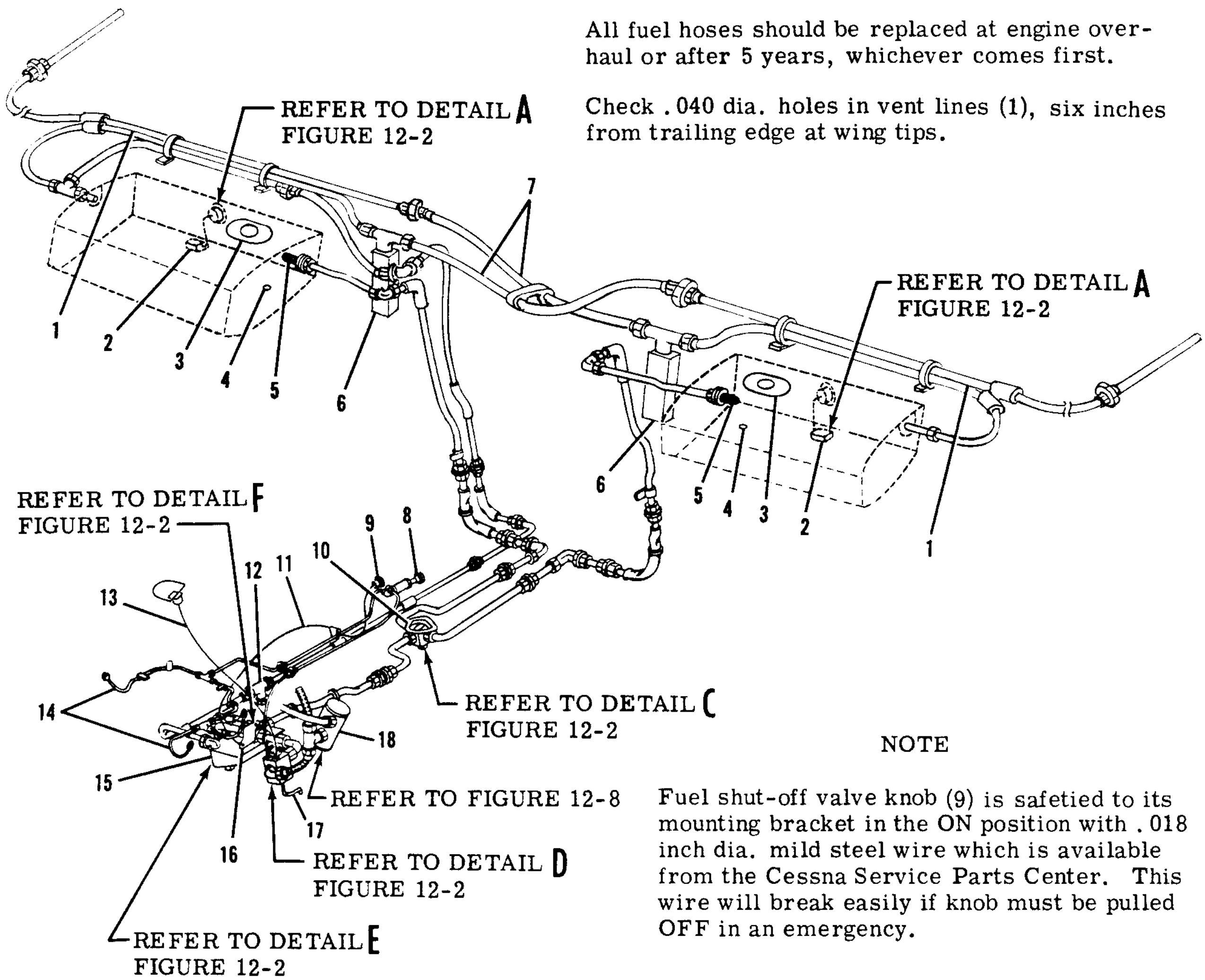
1. Vent
2. Nut Ring
3. Fuel Quantity Transmitter
4. Check Valve
5. Fuel Bay
6. Filler Door
7. Reducer
8. Finger Strainer
9. Drain Plug/Valve
10. Shut-Off Knob
11. Primer
12. Cap
13. Handle
14. Cover
15. Support
16. Selector Valve
17. Bracket
18. Access Door
19. Cover
20. Strainer Drain
21. Hose
22. Fuel Strainer
23. Shroud
24. Strainer Drain Control
25. Primer Line
26. Electric Fuel Pump
27. Reservoir Tank
28. Drain Plug/Valve
29. Vent Line Drain Tee
30. Shut-Off Control
31. Arm
32. Shut-Off Valve
33. Spacer

Figure 12-2. Fuel System

NOTE

All fuel hoses should be replaced at engine overhaul or after 5 years, whichever comes first.

Check .040 dia. holes in vent lines (1), six inches from trailing edge at wing tips.



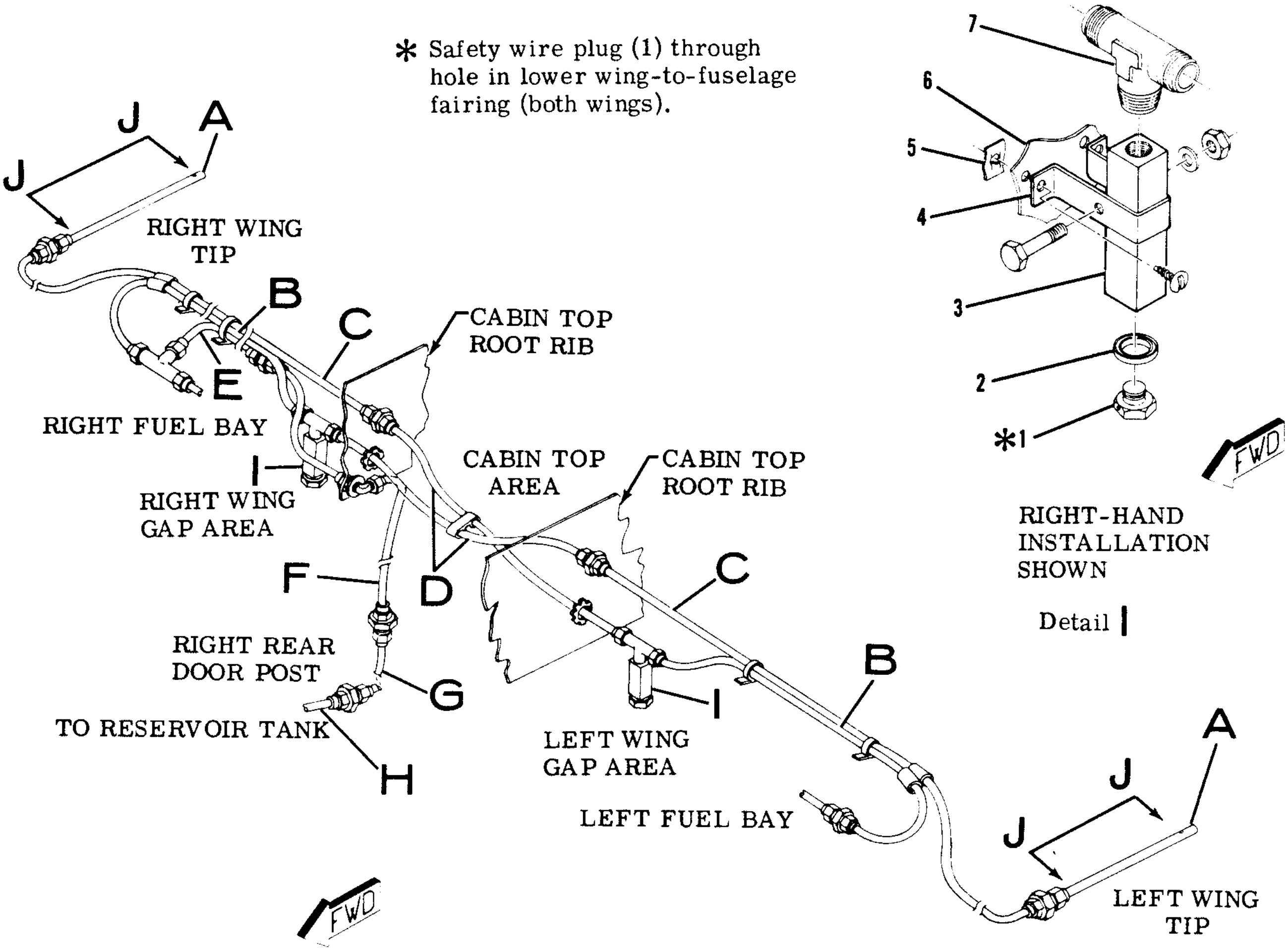
NOTE

Fuel shut-off valve knob (9) is safetied to its mounting bracket in the ON position with .018 inch dia. mild steel wire which is available from the Cessna Service Parts Center. This wire will break easily if knob must be pulled OFF in an emergency.

BEGINNING WITH 17701634

1. Vent Line
2. Fuel Quantity Transmitter
3. Fuel Filler Door
4. Drain Valve
5. Fuel Strainer
6. Drain Fitting
7. Crossover Vent Lines
8. Primer
9. Shut-Off Knob
10. Selector Valve
11. Shut-Off Control
12. Vent Line Drain Tee
13. Strainer Drain Control
14. Primer Line
15. Reservoir Tank
16. Shut-Off Valve
17. Fuel Strainer
18. Electric Fuel Pump

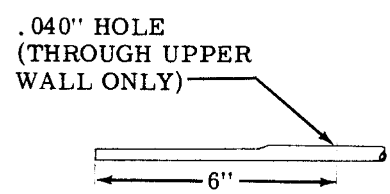
Figure 12-2A. Fuel System



BEGINNING WITH 17701634

NOTE

Removal and installation procedures are written for each area identified by the letters shown in this figure. Refer to paragraphs 12-8A thru 12-8I for procedures.



View J-J

1. Plug
2. Gasket
3. Drain Fitting
4. Bracket
5. Nut
6. Wing Root Rib
7. Tee

Figure 12-2B. Fuel Vent System

filler caps are securely installed.
d. Blow into tube to slightly pressurize the fuel bay. If air can be blown into fuel bay, the vent line is open.
e. After 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

A plugged vent line or bleed hole can cause either fuel starvation or the pressurization 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.

(BEGINNING WITH 1972 MODELS.)
a. Cover .040 drilled holes approximately 6 inches from end of vent lines at trailing edges of wing tips.
b. Turn fuel selector valve to opposite bay from vent line being checked, and check that both fuel filler caps are securely installed.
c. Blow into tube at wing tip to slightly pressurize the fuel bay. Plug or cap vent line at wing tip and remove fuel filler cap in opposite wing. If air can be blown into fuel bay, the vent line is open.
d. Repeat this procedure for fuel vent in opposite wing tip.

NOTE

A plugged vent line 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 and ends of lines at wing tips after completion of check.

12-8. REMOVAL AND INSTALLATION. (Thru 1971 Models.)
a. Remove wing tip and access plates on underside of wing as necessary for access.
b. Disconnect vent line from fuel bay and disconnect clamps attaching vent line to wing structure.
c. Remove vent line and check valve by carefully pulling line from the outboard end of the wing.
d. Reverse the preceding steps for installation.

CAUTION

The vent line check valve must be installed as shown in figure 12-2.

NOTE

Removal and installation procedures are written for each area identified by the letters shown in figure 12-2B, beginning with 1972 Models.

12-8A. REMOVAL AND INSTALLATION. (Area "A", figure 12-2B.)
a. Remove clamp from vent line inside wing tip.
b. Remove wing tip.
c. Disconnect vent line at union; remove vent line.
d. Reverse preceding steps for installation.

CAUTION

Ensure vent line is installed as shown in view J-J.

12-8B. REMOVAL AND INSTALLATION. (Area "B", figure 12-2B.)
a. Break safety wire at drain fitting in lower wing-to-fuselage fairing.
b. Remove fairing and drain fuel from fitting. (Observe precautions outlined in paragraph 12-3.)
c. Remove cover plates in lower wing skin as necessary for access.
d. Remove clamping along tube routing.
e. Disconnect vent line at outboard end of fuel bay in left wing or at outboard end of tee in right wing.
f. Disconnect vent line at hose fitting, and remove outboard tube through access hole in wing skin.
g. Disconnect inboard tube at drain fitting in wing gap area, and remove through wing root rib.
h. Reverse preceding steps for installation.

NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8C. REMOVAL AND INSTALLATION. (Area "C", figure 12-2B.)
a. Break safety wire at drain fitting in lower wing-to-fuselage fairing; remove fairing.
b. Remove cover plates in lower wing skin as necessary for access.
c. Remove clamp from vent line inside wing tip and remove tip.
d. Remove clamping along tube routing.
e. Disconnect inboard end of tube at cabin top root rib inside wing gap area.
f. Remove vent tube by pulling out through wing tip.
g. Reverse preceding steps for installation.

NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8D. REMOVAL AND INSTALLATION. (Area "D", figure 12-2B.)
a. Break safety wire at drain fitting in lower wing-to-fuselage fairing.
b. Remove fairing and drain fuel from fitting. (Observe precautions outlined in paragraph 12-3.)
c. Remove overhead console and forward headliner as outlined in Section 3.

(Figure 12-3 Deleted)

d. Remove clamping in cabin top.
e. Disconnect line at fitting in cabin top root rib.
f. Disconnect opposite end of line at drain fitting in wing gap area.
g. Remove vent line by pulling into cabin area.
h. Reverse preceding steps for installation.

NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8E. REMOVAL AND INSTALLATION. (Area "E", figure 12-2B.)
a. Break safety wire at drain fitting in right lower wing-to-fuselage fairing; remove fairing.
b. Remove cover plates in lower wing skin as necessary for access.
c. Remove clamping along tube routing.
d. Disconnect inboard end of inner vent tube at cabin top root rib in wing gap area.
e. Disconnect outboard end of inner vent tube at union inside wing.
f. Remove inner vent tube by pulling into wing gap area.
g. Disconnect inboard end of outer vent tube at union inside wing.
h. Disconnect opposite end of outer tube at aft end of tee at outboard end of fuel bay and remove tube through access hole in wing skin.
i. Reverse preceding steps for installation.

NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8F. REMOVAL AND INSTALLATION. (Area "F", figure 12-2B.)
a. Break safety wire at drain fittings in lower wing-to-fuselage fairings and remove fairings.
b. Drain fuel cells through drain valves. Drain reservoir tank and fuel lines by pulling drain control valve in cabin. (Observe precautions outlined in paragraph 12-3.)
c. Disconnect vent line fitting at cabin top root rib in right wing gap.
d. Remove upholstery along right rear door post as necessary to gain access.
e. Disconnect vent tube at union along door post.
f. Remove vent line by pulling down along door post.
g. Reverse preceding steps for installation.

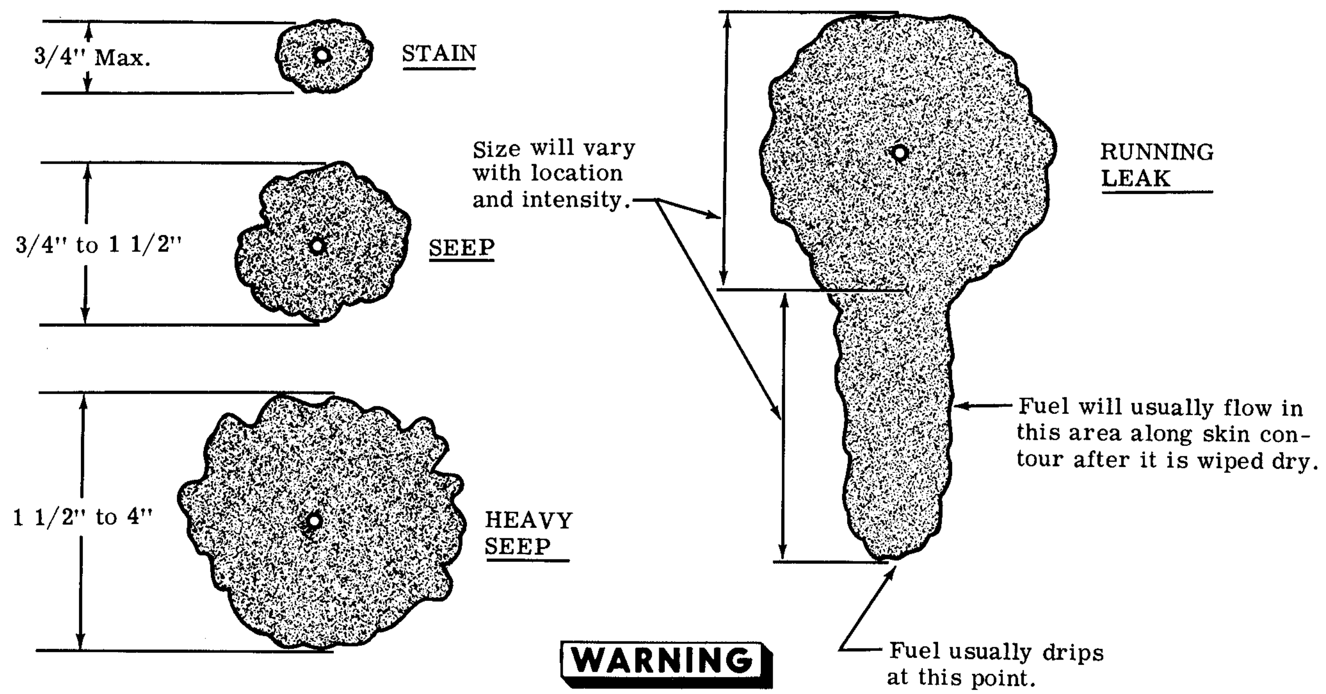
NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8G. REMOVAL AND INSTALLATION. (Area "C", figure 12-2B.)
a. Drain fuel cells through drain valves. Drain reversoir tank and fuel lines by pulling drain control knob in cabin. (Observe precautions outlined in figure 12-3.)
b. Remove upholstery along right rear door post as necessary to gain access to union.
c. Disconnect vent tube at union along door post.
d. Remove rear seat, carpeting and access plates as necessary for access to union.
e. Disconnect tube at union and remove tube by pulling up toward door post.

12-8H. REMOVAL AND INSTALLATION. (Area

SHOP NOTES:



WARNING

REFER TO PARAGRAPH 12-13 FOR FUEL BAY PURGING WHICH SHOULD BE ACCOMPLISHED BEFORE REPAIRING FUEL BAYS.

Figure 12-4. Classification of Fuel Leaks

"H", figure 12-2B.)

a. Drain fuel cells through drain valves. Drain reservoir tank and fuel lines by pulling drain control knob in cabin. (Observe precautions outlined in paragraph 12-3.)

b. Remove seats, carpeting and access plates as necessary for access to union and reservoir tank. (Refer to figure 12-2A.)

c. Disconnect tube at union and reservoir tank, and remove tube.

d. Reverse preceding steps for installation.

12-8I. REMOVAL AND INSTALLATION OF DRAIN FITTING. (Detail "I", figure 12-2B.)

a. Break safety wire at drain fitting in lower wing-to-fuselage fairing.

b. Remove fairing and drain fuel from fitting. (Observe precautions outlined in paragraph 12-3.)

c. Disconnect vent lines from tee (7).

d. Remove bolt, nut and washer from bracket (4).

e. Remove drain fitting.

f. Reverse preceding steps for installation.

NOTE

Be sure to safety wire drain fitting in lower wing-to-fuselage fairing.

12-8J. VENTED FUEL CAPS. Beginning with aircraft 17701598, vented fuel caps are installed on production aircraft to provide a secondary fuel vent system. The vent valve in the cap is designed to open in the event of a primary vent line obstruction. On aircraft 17701165 thru 17701597, these vented fuel caps are available from the Cessna Service Parts Center. On aircraft prior to 17701165, it is necessary to install a new filler door assembly when changing to the vented fuel cap, due to design differences in fuel cap adapters. If fuel servicing placards are installed on the original filler door, new placards must also be ordered. (Refer to Service Letter SE71-13.)

12-9. FUEL BAYS.

12-10. DESCRIPTION. Aircraft with cantilever wings have an inboard section of each wing, forward of the 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. Usable fuel in each bay configuration is shown in figure 1-1. A 22 gallon marker, in the form of a series of small holes just inside the filler neck, is provided to facilitate fueling to reduced fuel loads.

12-11. FUEL BAY LEAKS.

12-12. CLASSIFICATION OF FUEL LEAKS. Fuel leaks which do not constitute a flight hazard are stains, seeps and heavy seeps NOT in an enclosed area. However, they should be repaired when the aircraft is grounded for other maintenance. Fuel leaks which constitute a flight hazard are running leaks in any area, seeps, heavy seeps, or stains in an enclosed area, such as the wing leading edge, the sections of wing inboard and outboard of the fuel bay and the area between the rear fuel spar and the main spar. These leaks must be repaired before that bay is used for another flight. The wet or stained spot on the wing in the area of the bay is an indication of the intensity of the leak. Fuel leak classifications are shown in figure 12-4.

NOTE

Stains and seeps that are not considered a flight hazard must be inspected after each flight to insure that they have not grown in intensity to the point of causing a flight hazard.

If a leak causing a flight hazard should occur at a place where there are no facilities available to make an acceptable repair, it is recommended that the leaking bay be drained and some suitable material placed over the leak, if it is within an enclosed area of the wing, to eliminate escaping of fumes. By switching the fuel selector valve to the other bay, the aircraft can then be flown to a base where the fuel leak can be repaired.

12-13. FUEL BAY PURGING.

WARNING

To reduce the possibility of an explosion while repairing integral fuel bays which have been fueled, the bay may be purged with an inert gas.

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. Remove safety wire from shut-off valve control knob and pull control to "OFF" position. (Resafety control knob after completion of repair.)
c. Drain all fuel from bay being repaired. (Observe the precautions in paragraph 12-3.)
d. Remove access door and insert hose into bay.
e. Allow inert gas to flow into bay for several minutes (time dependent upon hose size, rate of flow, etc.) to remove all fuel vapors.

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.

12-14. INTEGRAL FUEL BAY SEALANT. Two kinds of sealants are used, one to seal the fuel bay and the other to seal the 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 the access doors and fuel quantity transmitter adapter to be removed without damage to them. Service Kit SK210-56, available from the Cessna Service Parts Center, contains these sealants with the proper quantity of accelerator 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 gray and its accelerator is a clear liquid.

WARNING

The accelerator, EC-1608B contains cumene hydroperoxide. Keep away from heat and flame. Use only in a well ventilated area. Avoid skin and eye contact. WEAR EYE SHIELDS. In case of eye contact, flush with copious amounts of water and get prompt medical attention.

12-15. MIXING SEALANT. Use all the accelerator and sealant in the container when mixing, to insure the proper ratio of accelerator to sealant. Stir the accelerator to absorb all floating liquid before it is mixed with the sealant. The accelerator can then be poured into the container of sealant for mixing; otherwise, a wax-free container must be used. Stir accelerator and sealant until it becomes a uniform mixture. Do not allow air bubbles to mix in. If this occurs, work air bubbles out.

12-16. SEALING DURING AND AFTER STRUCTURAL REPAIR.

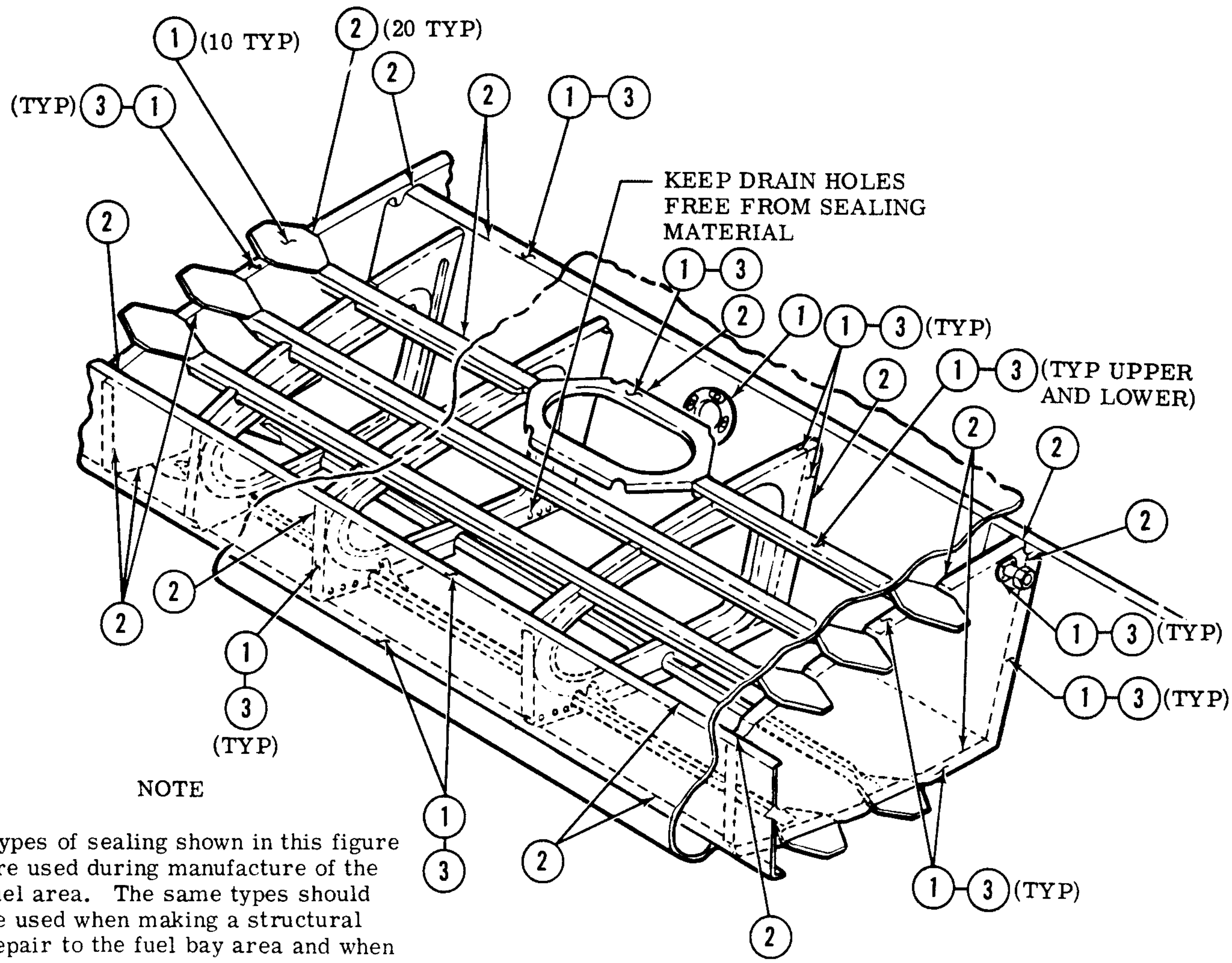
CAUTION

Protect drain holes and fuel outlet screens when applying sealants.

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 pre-



NOTE

Types of sealing shown in this figure are used during manufacture of the fuel area. 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 transmitter nutring.

CODE

1 FAYING SURFACE SEAL

2 FILLET SEAL

3 RIVET AND FASTENER SEAL

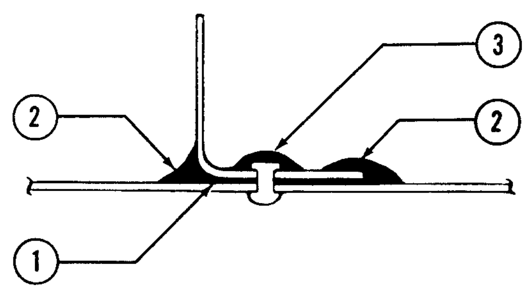


Figure 12-5. Fuel Bay Sealing (Sheet 1 of 2)

drilled, countersunk or dimpled and cleaned before being sealed and positioned for final installation.

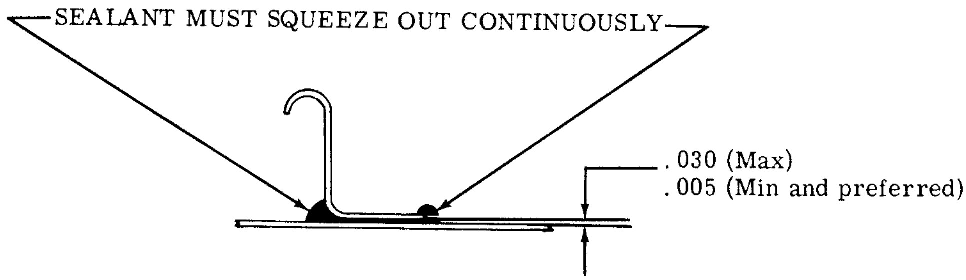
a. Remove all existing sealant from area to be sealed, leaving a taper on the remaining sealant. The taper will allow a scarf bond and a continuous seal when the new sealant is applied.

NOTE

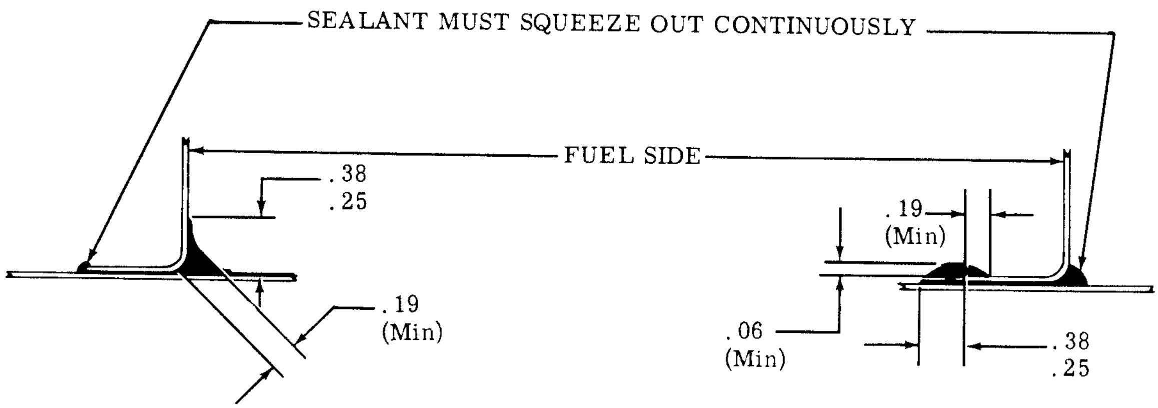
The best method of removing sealant is with a chisel-like tool made of hard fiber. Remaining sealant may then be removed with aluminum wool. Steel wool or sandpaper must not be used.

b. Vacuum thoroughly to remove all chips, filings, dirt, etc., from the bay area.

c. All surfaces and areas to be sealed shall be thoroughly cleaned by wiping with a clean cloth dampened with Methyl Ethyl Ketone (MEK), acetone or similar solvent and dried with a clean cloth before the solvent evaporates. Always pour the solvent on the cloth. Never use contaminated solvent. The cloth shall not be so saturated that dripping occurs.



FAY SURFACE SEALING



FILLET SEALING (With fay surfaces sealed)

FASTENER SEALING

Figure 12-5. Fuel Bay Sealing (Sheet 2 of 2)

NOTE

Allowable work life of EC-1675B/A sealant is four hours from the starting time of mixing. Allowable work life of EC-1608B/A sealant is one hour. These apply to standard conditions of 77° Fahrenheit and 50% relative humidity. An increase in temperature or a decrease in humidity will shorten the work life of the sealant.

d. Apply fay surface sealant to one mating part and install rivets or fasteners while sealant is still within its allowable work life.

NOTE

During the sealing operation, sealant must be checked at various times to determine that it has not exceeded its allowable work life. Use a small wood paddle, such as a tongue depressor, to gather some sealant. Touch the sealant to a piece of clean sheet metal. If the sealant adheres to the sheet metal, it is still within its allowable work life. If the sealant does not adhere to the sheet metal, it is beyond its allowable work life and must not be used.

e. Apply a fillet seal to the repaired area on the inside of the bay.
f. Apply fay surface door sealant to access doors and fuel quantity transmitter adapter, if removed, and install the doors and adapter.
g. Allow the sealant to cure. Refer to paragraph 12-18 for curing time.
h. Clean stains from outside of bay area.
i. Test fuel bay for leaks as described in paragraph 12-19.

12-17. SEALING FUEL LEAKS. First determine the source of the fuel leaks. Fuel can flow along a seam or the structure of the wing for several inches, making the leak source difficult to find. A stained area is an indication of the leak source. Fuel leaks can be found by testing the complete bay as described in paragraph 12-19. 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 a soap bubble solution is applied to the outside of the bay. After the leak source has been found, proceed as follows:
a. Remove existing sealant in the area of the leak as described in paragraph 12-16, step "a."
b. Clean the area and apply a fillet seal. Press sealant into leaking area with a small paddle, being sure to work out all entrapped air.
c. If a leak occurs around a rivet or bolt, restrike the rivet or torque the bolt to the maximum allowable torque, and repair any damaged sealant.
d. Apply fay surface door sealant to access doors or fuel quantity transmitter adapter, if removed, and install the doors and adapter.
e. Test fuel bay for leaks as described in paragraph 12-19.

12-18. CURING TIME. Service Kit SK210-56 contains SP654890B2 Fuel Tank Area Sealant Kit and SP654706B2 Access Door Sealant Kit. Normal curing time for SP654890B2 Sealant Kit is 72 hours. Normal curing time for SP654706B2 Sealant Kit is 24 hours. These values are based on a Standard condition of 77° Fahrenheit and 50% humidity. Curing time may be accelerated as shown in the following chart.

Temperature of Sealant °F.	Time in Hours
160	3
140	4
120	7

NOTE

Temperature shall not exceed 160°F. Bay must be vented to relieve pressure during accelerated curing.

WARNING

Access door sealant must not be heated above 90° until sealant is cured for 24 hours based on a standard condition of 77° Fahrenheit and 50% relative humidity. Harmful vapors are released if sealant is heated above 90°F.

12-19. TESTING INTEGRAL FUEL BAY.
a. Remove vent line from vent fitting and cap the fitting.
b. Remove forward and aft fuel lines from bay.
c. To one of the bay fittings, attach a water manometer capable of measuring 20 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.

12-20. FUEL QUANTITY TRANSMITTERS.

12-21. DESCRIPTION. Two fuel quantity indicators, located in a cluster on the instrument panel, are actuated individually by an electric fuel quantity transmitter installed on each aft fuel spar. The transmitters consist of a float attached to a pivoted rod, one end of which, is a rheostat wiper. The vertical motion of the fuel causes angular travel of the float which increases and/or decreases the amount of electrical resistance in the circuit. The resistance regulates the amount of needle deflection which indicates fuel level. Incorrect fuel quantity indication could result on some early aircraft, caused by contacting the transmitter float arm with the fuel nozzle. Single-Engine Service Letter SE69-25 describes a redesigned fuel quantity transmitter which is available from the Cessna Service Parts Center. This transmitter locates the float arm further inboard from the filler neck opening where it cannot be reached with a fuel nozzle. Later aircraft are equipped with a filler neck guard which extends further into the fuel bay to protect the float arm.

12-22. REMOVAL AND INSTALLATION. Refer to Section 15 for removal, installation and calibration of the fuel quantity transmitters.

12-23. FUEL RESERVOIR TANK.

12-24. DESCRIPTION. A fuel reservoir tank is installed in the lower right fuselage immediately aft of the firewall. The tank has three fuel line connections; one from the fuel selector valve, one to the fuel shut-off valve and one teed into the right fuel bay vent line. A drain plug/valve is installed in the bottom of the tank for draining trapped water and sediment from the fuel system.

12-25. REMOVAL AND INSTALLATION. (See figure 12-2.)

a. Completely drain all fuel from wing bays, fuel strainer, valves and reservoir tank. (Observe precautions in paragraph 12-3.)
b. Remove pedestal cover.
c. Remove rudder bar shields.
d. Slack off cable tension by loosening rudder cable turnbuckles and disconnect cables from rudder bars.
e. Remove the bolts through the rudder bar bearing blocks and pull the rudder bar assembly aft for access to reservoir.
f. Disconnect and cap or plug all fuel lines at reservoir.
g. Remove screws securing reservoir to floorboard and lift out reservoir.
h. Reverse the preceding steps for installation. Prior to reinstalling equipment removed for access, service fuel bays and check for leaks.
i. Refer to Section 10 to rig rudder system.

12-26. FUEL SELECTOR VALVE.

12-27. DESCRIPTION. A three position fuel selector valve is located in the floor area between the pilot and copilot positions. The positions on the valve are labeled "LEFT, BOTH ON and RIGHT." Valve repair consists of replacement of seals, springs, balls and other detail parts. Figure 12-6 illustrates the proper relationship of parts and may be used as a guide during disassembly and assembly.

12-28. REMOVAL AND INSTALLATION.

a. Completely drain all fuel from wing bays, fuel strainer, lines and valve. (Observe the precautions in paragraph 12-3.)
b. Remove access plates in floorboard and fuselage skin in area of selector valve.
c. Remove selector valve handle and cover.
d. Disconnect and cap or plug all fuel lines at selector valve.
e. Remove screws attaching valve to support bracket and remove valve through access hole.
f. Reverse the preceding steps for installation. Prior to reinstalling access plates, service fuel bays and check for leaks.

12-29. FUEL SHUT-OFF VALVE.

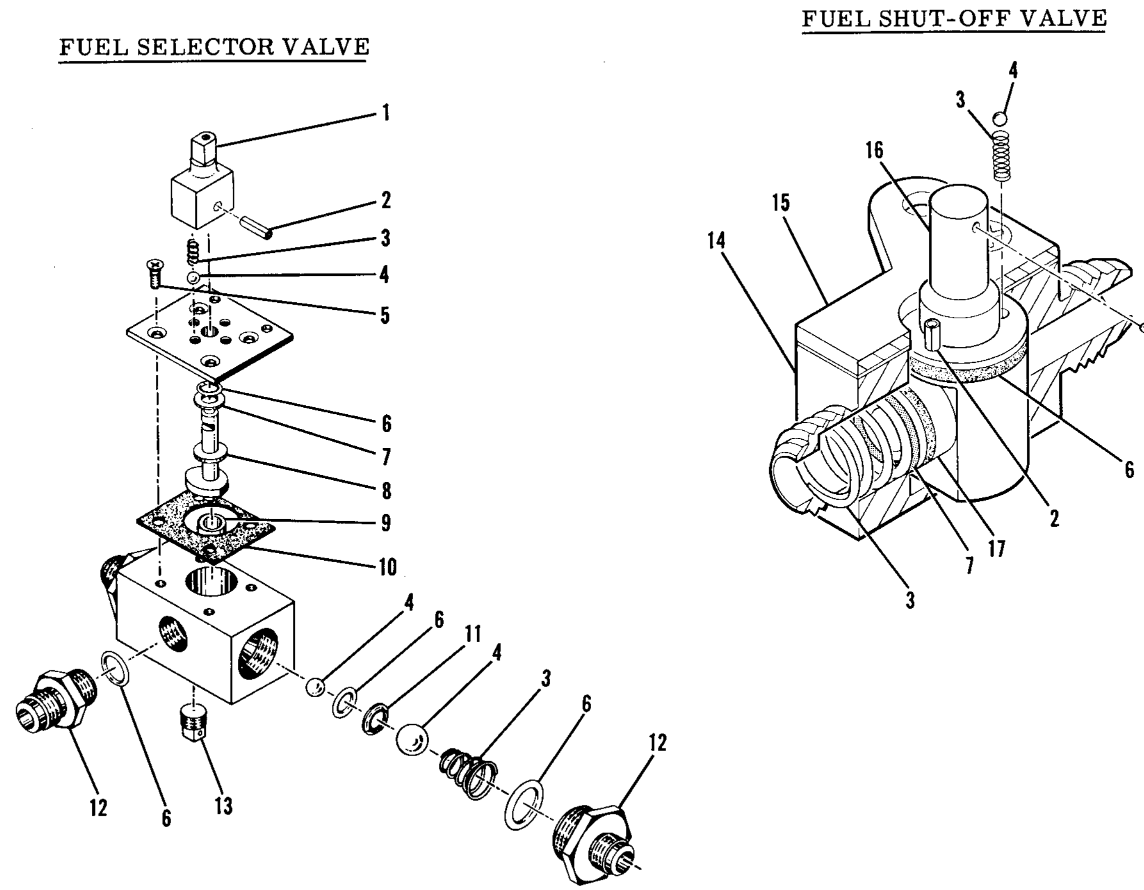
12-30. DESCRIPTION. The fuel shut-off valve is a two position ON-OFF valve located forward of the pedestal immediately aft of the firewall. The valve control knob is located at the top left of the pedestal directly below the instrument panel and is safetied to its mounting bracket in the "ON" position with .018 inch diameter mild steel safety wire which will break easily if knob must be pulled "OFF" in an emergency. Valve repair consists of replacement of seals, springs, balls and other detail parts. Figure 12-6 illustrates the proper relationship of parts and may be used as a guide during disassembly and assembly of these valves.

12-31. REMOVAL AND INSTALLATION.

a. Completely drain all fuel from wing bays, fuel strainer, lines and valve. (Observe the precautions in paragraph 12-3.)
b. Remove control from valve arm.
c. Disconnect and cap or plug fuel lines at valve.
d. Remove bolts attaching valve to firewall and remove valve.
e. Reverse the preceding steps for installation. Service fuel bays and check for leaks.

12-32. FUEL STRAINER.

12-33. DESCRIPTION. The fuel strainer is mounted on the firewall in the engine compartment and is enclosed by a cooling shroud. The strainer is equipped with a quick-drain valve which provides a means of draining trapped water and sediment from the fuel system. The quick-drain control is operated through an access door in the upper aft right cowl.



1. Housing	7. Washer	12. Nipple
2. Roll Pin	8. Cam	13. Plug
3. Spring	9. Bushing	14. Body
4. Ball	10. Gasket	15. Cover
5. Screw	11. Retainer	16. Rotor
6. O-Ring		17. Seal

Figure 12-6. Fuel Selector Valve and Shut-Off Valve

NOTE

The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft. (Refer to paragraph 12-34.)

12-34. DISASSEMBLY AND ASSEMBLY. (See figure 12-7.)

a. Remove safety wire from shut-off valve control knob and pull control to "OFF" position.

b. Drain fuel from strainer with quick-drain control. (Observe precautions in paragraph 12-3.)

c. Disconnect strainer drain tube and remove safety wire, nut and washer at bottom of filter bowl and remove bowl.

d. Carefully unscrew standpipe and remove.

e. Remove filter screen and gasket. Wash filter screen and bowl in solvent (Federal Specification P-S-661, or equivalent) and dry with compressed air.

f. Using a new gasket between filter screen and top assembly, install screen and standpipe. Tighten standpipe only finger tight.

g. Using all new O-rings, install bowl. Note that step-washer at bottom of bowl is installed so that step seats against O-ring. Connect strainer drain tube.

h. Push shut-off valve control knob to "ON" position, close strainer drain and check for leaks and proper operation. Torque bottom nut to 25-30 lb-in.

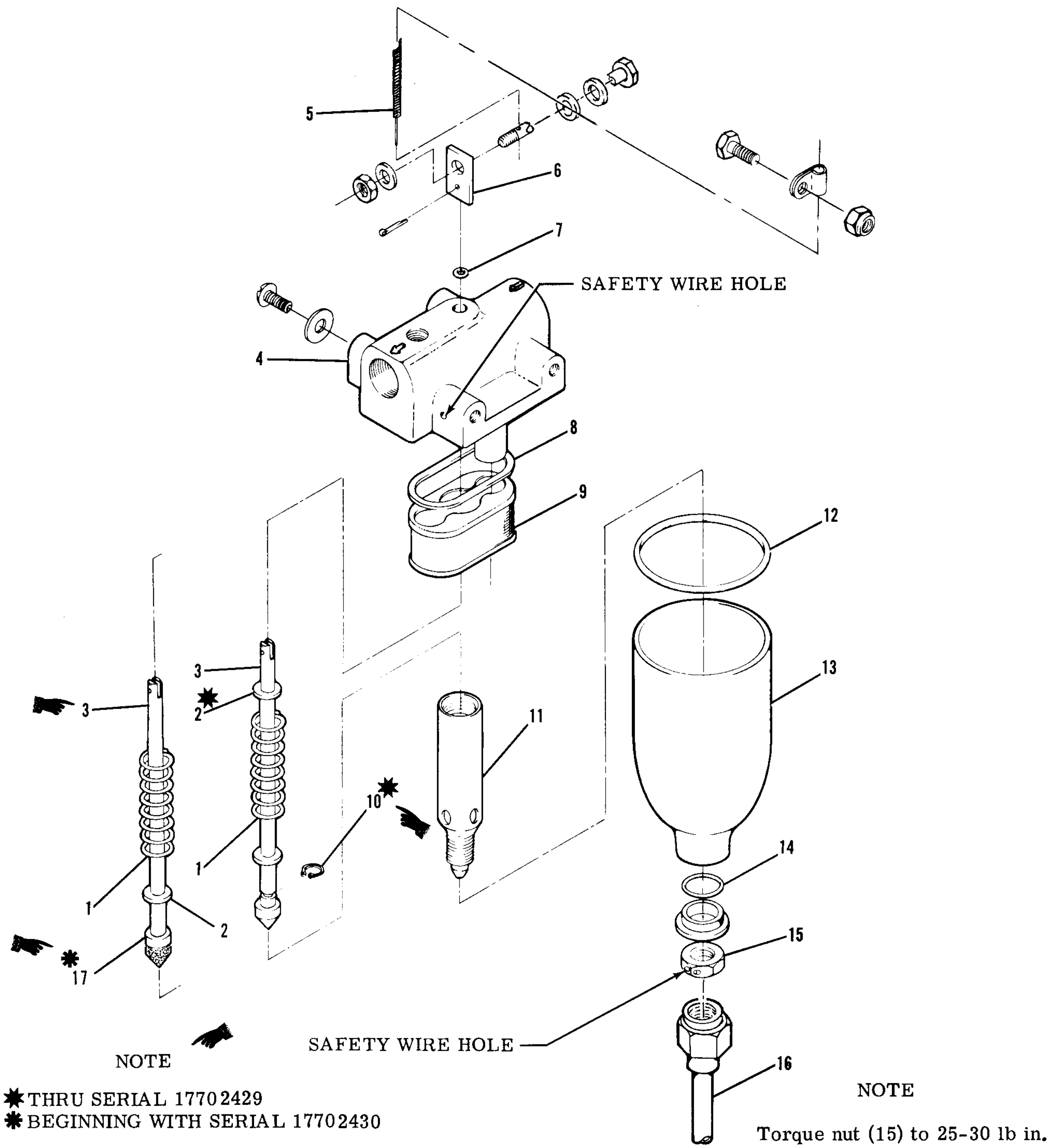
i. Safety wire bottom nut to top assembly. Wire must have right hand wrap, at least 45 degrees.

j. Safety wire shut-off valve knob to its mounting bracket with .018 inch diameter mild steel safety wire.

12-35. REMOVAL AND INSTALLATION.

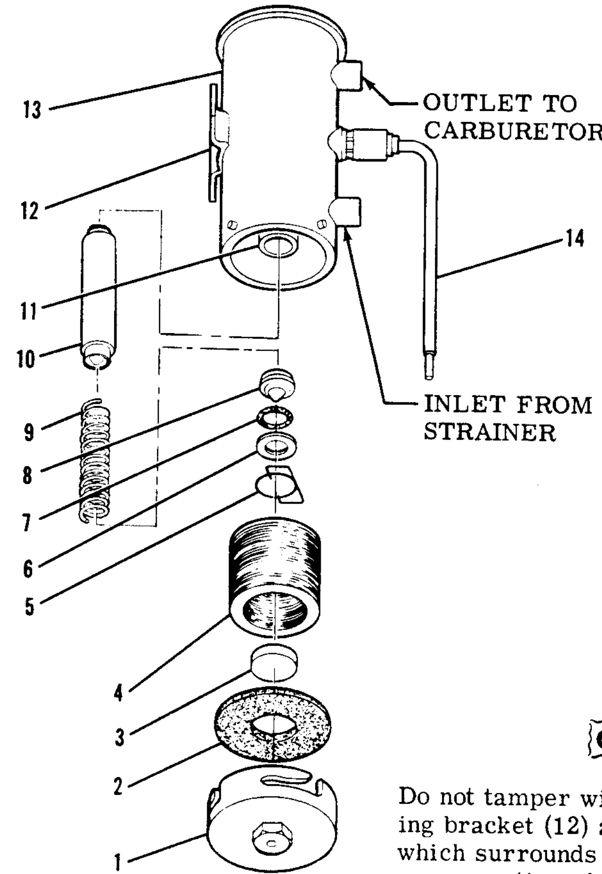
a. Remove safety wire from shut-off valve control knob and pull control to "OFF" position.

b. Drain fuel from strainer with quick-drain control.



1. Spring
2. Washer
3. Plunger
4. Top
5. Drain Control
6. Plate
7. O-Ring
8. Gasket
9. Filter
10. Retainer Ring
11. Standpipe
12. O-Ring
13. Bowl
14. O-Ring
15. Nut
16. Drain Line
17. Collar

Figure 12-7. Fuel Strainer



CAUTION

Do not tamper with seal at center of mounting bracket (12) as it retains the dry gas, which surrounds the electric system in the upper portion of the pump.

1. Cover
2. Gasket
3. Magnet
4. Filter
5. Retainer
6. Washer
7. O-Ring
8. Cup Valve
9. Spring
10. Plunger
11. Tube
12. Mounting Bracket
13. Body
14. Electrical Lead

Figure 12-8. Electric Fuel Pump

c. Disconnect and cap or plug all fuel lines at strainer. (Observe precautions in paragraph 12-3.)
d. Remove front cover of shroud.
e. Loosen clamp and clamp bolt attaching quick-drain control.
f. Disconnect primer line.
g. Remove screws attaching strainer to shroud.
h. Remove strainer.
i. Reverse the preceding steps for installation. Remember to install the insulation washer on the engine side of the firewall.
j. Push shut-off valve control knob to "ON" position, close strainer drain and check for leaks and proper operation.
k. Safety wire shut-off valve knob to its mounting bracket with .018 inch diameter mild steel safety wire.

12-36. PRIMING SYSTEM.

12-37. DESCRIPTION. The priming system is of the manually-operated type. Fuel is supplied by a line from the fuel strainer to the plunger-type primer. Operation of the plunger forces fuel to each individual cylinder except No. 3 cylinder.

12-38. REMOVAL AND INSTALLATION.
a. Disconnect and cap or plug all lines at primer. (Observe the precautions in paragraph 12-3.)
b. Unscrew knurled nut and remove plunger from pump body.
c. Remove pump body from instrument panel.

NOTE

Visually inspect primer lines for crushed, kinked, or broken condition. Ensure proper clamping to prevent fatigue due to vibration and chafing.

d. Prior to installing a primer, check for proper pumping action and positive fuel shut-off in the locked position.
e. Reverse the preceding steps for installation.

12-39. AUXILIARY FUEL PUMP.

12-40. DESCRIPTION. The electric auxiliary fuel pump, located on the forward side of the firewall, delivers fuel under pressure to the carburetor when the ON-OFF switch on the instrument panel is turned on. The pump parallels the engine-driven fuel pump and is used when fuel pressure drops below 2 psi. Fuel bypasses the auxiliary pump when the pump is not in operation. The auxiliary pump is used as a boost in starting and in the event of engine-driven pump failure.

12-41. REMOVAL AND INSTALLATION.

a. Remove cowling as necessary to gain access to pump.
b. Remove safety wire from shut-off valve control knob and pull control to "OFF" position.
c. Drain fuel from pump, lines and strainer with quick-drain control.
d. Ensure master switch and pump switch are in "OFF" position.
e. Disconnect and cap or plug all fuel lines at pump. (Observe the precautions in paragraph 12-3.)
f. Disconnect electrical lead from pump.
g. Remove attaching bolts and remove pump.
h. Reverse preceding steps for installation.
i. Push shut-off valve control knob to "ON" position and check for leaks.
j. Safety wire shut-off valve knob to its mounting bracket with .018 inch diameter mild steel safety wire.

12-42. DISASSEMBLY AND ASSEMBLY. (See figure 12-8.)

a. With 5/8" wrench, release cover (1). Twist cover by hand to remove from body (13).
b. Remove filter (4), magnet (3) and gasket (2).
c. Wash filter (4) in cleaning solvent and blow out dirt and solvent with air pressure. Check gasket (2) and replace if deteriorated. Clean cover (1).
d. Remove retainer (5) from tube (11) using thin nose pliers to spread and remove ends of retainer from tube.
e. Remove washer (6), O-ring (7), cup valve (8), spring (9) and plunger (10) from tube (11).
f. Wash parts in solvent and blow out with air pressure. If plunger does not wash clean or if there are any rough spots, gently clean surface with crocus cloth. Slosh pump assembly in solvent, being careful not to submerge electrical lead (14). Blow out tube with air pressure and swab inside of tube with a cloth wrapped around a stick.
g. Insert plunger (10) into tube (11), buffer spring end first. Check fit by slowly raising and lowering plunger in tube. If a click cannot be heard, interrupter assembly is not functioning properly and pump should be replaced.
h. Install spring (9), cup valve (8), O-ring (7) and washer (6). Compress spring (9) and install retainer (5) with ends of retainer in side holes of tube (11).
i. Place gasket (2) and magnet (3) in cover (1) and install filter (4) and cover assembly. Twist cover by hand to hold in position on pump body. Using 5/8" wrench, securely tighten cover (1).

CAUTION

Do not tamper with seal at center of mounting bracket (12) as it retains the dry gas, which surrounds the electrical system in the upper portion of the pump.

SHOP NOTES:

SECTION 13

PROPELLER AND GOVERNOR

TABLE OF CONTENTS Page

13-1. PROPELLER.

13-2. DESCRIPTION. An all-metal, fixed-pitch propeller, equipped with a spinner, is used on aircraft serial 17700001 thru 17701370. Beginning with aircraft serial 17701371, an all-metal, constant-speed, governor-regulated propeller, equipped with a spinner is used.

13-3. REPAIR. Repair of a metal propeller first involves evaluating the damage and determining whether the repair is to be a major or minor one. Federal Aviation Regulations, Part 43 (FAR 43) and Federal Aviation Agency Advisory Circular No. 43.13 (FAA AC No. 43.13), define major and minor repairs, alterations and who may accomplish them. When making alterations or repairs to a propeller, FAR 43, FAA AC 43.13 and the propeller manufacturer's instructions must be observed. The propeller manufacturer's Service Manual may be obtained from the Cessna Service Parts Center.

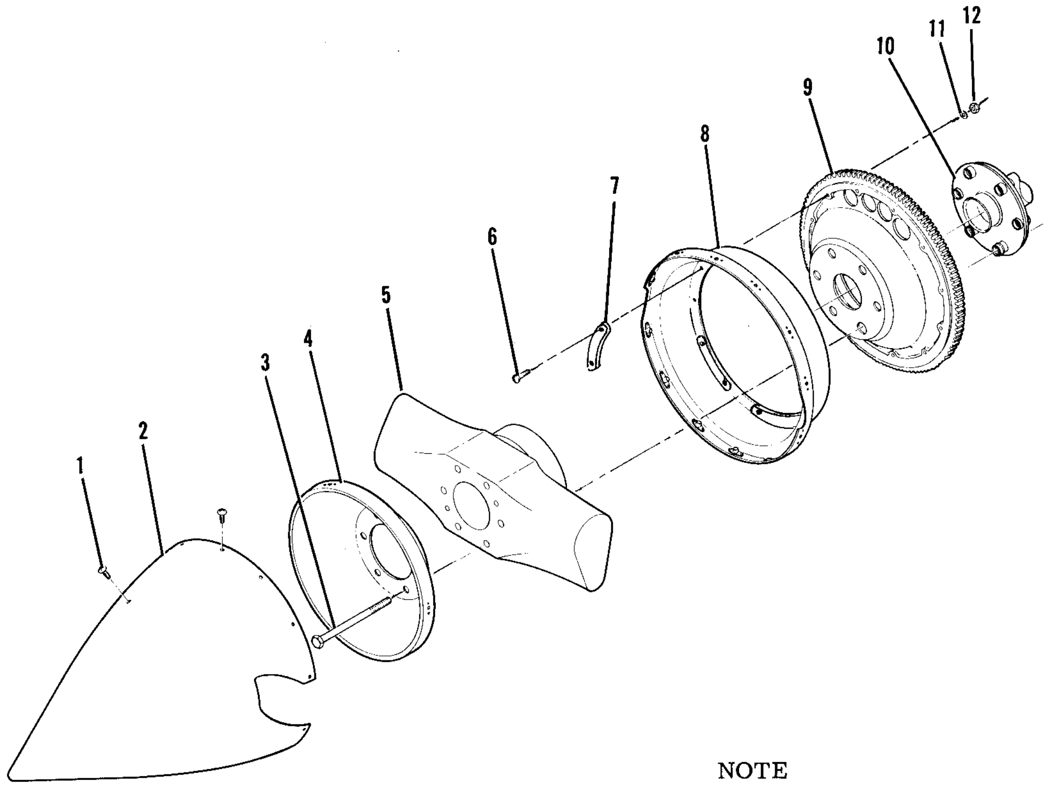
13-4. FIXED-PITCH PROPELLER.

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

WARNING

Be sure magneto switch is in OFF position before turning propeller.

a. Remove spinner (2).
b. Remove mounting bolts (3), remove forward spinner bulkhead (4) and pull propeller forward to remove.
c. If necessary to remove the rear spinner bulkhead (8), remove the bolts (6), washers (11) and nuts (12) attaching bulkhead (8) to starter ring gear support (9). Retain shims (7).
d. If removal of the ring gear support assembly (9) is necessary, loosen the alternator adjusting arm and disengage the drive pulley belt from pulley on the aft face of the starter ring gear support assembly.



NOTE

TORQUE PROPELLER MOUNTING BOLTS TO 45 LB-FT.

AIRCRAFT SERIAL 17700001 THRU 17701370

1. Screw
2. Spinner
3. Bolt
4. Forward Spinner Bulkhead
5. Propeller
6. Bolt
7. Shim
8. Rear Spinner Bulkhead
9. Ring Gear Support Assembly
10. Engine Crankshaft
11. Washer
12. Nut

Figure 13-1. Propeller Installation (Fixed-Pitch)

13-6. INSTALLATION. (Refer to figure 13-1.)

WARNING

Be sure magneto switch is in OFF position before turning propeller.

a. If the starter ring gear support assembly (9) was removed, clean the mating surface of support assembly and engine crankshaft.

b. Place alternator drive belt in the pulley groove of the starter ring gear support. Fit support assembly over propeller flange bushings of the crankshaft.

NOTE

Make sure the bushing hole in the ring gear support that bears the identification "O," is assembled at the "O" identified crankshaft flange bushing. This bushing is marked "O" by an etching on the crankshaft flange next to the bushing. The starter ring gear must be located correctly to assure proper alignment of the timing marks on the ring gear.

c. Clean mating surfaces of the propeller and starter ring gear support assembly.

d. Locate the top center (TC) mark on the aft face of the starter ring gear support. Locate one of the propeller blades over the TC mark, rotate the propeller clockwise (as viewed from front of engine) to the first bushing and install propeller and forward spinner bulkhead.

e. Tighten propeller mounting bolts evenly and torque bolts to 45 lb-ft.

f. Install bolts, washers, shims and nuts attaching the rear spinner bulkhead to the starter ring gear support. The bulkhead must be positioned so the propeller blades will emerge from the spinner with ample clearance.

g. Install spinner.

NOTE

Shims (7) must be installed with bevel edge next to aft spinner bulkhead.

h. Adjust alternator drive belt tension as outlined in Section 16.

13-7. CONSTANT-SPEED PROPELLER. The constant-speed propeller is a single-acting unit in which governor-regulated oil pressure opposed by the natural centrifugal twisting moment of the rotating blades and the force of an internal spring is used to obtain the correct pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the engine crankshaft. The amount and pressure of the 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 the aircraft speed is increased, the 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.

SHOP NOTES:

13-8. 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.)	Refer to paragraph 13-13. Replace governor.
	Defective governor.	Refer to paragraph 13-13. Replace defective governor.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Check manually. Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 13-13. Replace defective governor.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive propeller blade friction.	Check manually. Propeller repair or replacement is required.
STATIC RPM TOO HIGH.	Governor high-rpm stop set too high.	Refer to paragraph 13-16.
	Defective governor.	Refer to paragraph 13-13. Replace defective governor.
	Incorrect propeller or incorrect low pitch blade angle.	Check aircraft specification and install correct propeller with correct blade angle.
STATIC RPM TOO LOW.	Governor high-rpm stop set too low.	Refer to paragraph 13-16.
	Defective governor.	Refer to paragraph 13-13. Replace defective governor.
	Incorrect propeller or incorrect low pitch blade angle.	Check aircraft specification and install correct propeller with correct blade angle.
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 13-13.
	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 re-installed or has been idle for an extended period.

13-8. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE SPEED WILL NOT STABILIZE (Cont).	Excessive friction in pitch changing mechanism inside propeller or excessive propeller blade friction.	Check manually. Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 13-13. Replace defective governor.
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	Damaged O-ring 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.	Check visually. Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in figure 13-2.
OIL LEAKAGE BETWEEN PROPELLER HUB AND CYLINDER.	Defective cylinder gasket or cylinder mounting screws not tight.	Check visually. Remove cylinder, clean mating surfaces and install new gasket.
OIL LEAKAGE AT ANY OTHER PLACE.	Defective seals, gaskets, threads, etc., or incorrect assembly.	Check visually. Propeller repair or replacement is required.

13-9. REMOVAL. (Refer to figure 13-2.)

WARNING

Be sure magneto switch is in OFF position before turning propeller.

a. Remove spinner (1).
b. Remove safety wire and loosen bolts attaching propeller to engine crankshaft, about 1/4-inch and pull propeller forward.

NOTE

Bolts will have to be backed out evenly so that propeller may be pulled forward (approximately 1/4-inch at a time) until all bolts are disengaged from the engine crankshaft flange. As the propeller is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

c. Pull propeller (4) from engine crankshaft (10).
d. If necessary to remove the aft spinner bulkhead (8), remove bolts, washers and nuts attaching bulkhead to the starter ring gear support (9). Retain shims (7).

NOTE

After removal of the propeller, the starter ring gear support assembly (9) may be removed from the engine crankshaft to allow easier access of the aft spinner bulkhead attaching bolts. Loosen alternator adjusting arm and disengage alternator drive pulley belt from pulley on aft face of starter ring gear support assembly.

13-10. INSTALLATION. (Refer to figure 13-2.)

WARNING

Be sure magneto switch is in OFF position before turning propeller.

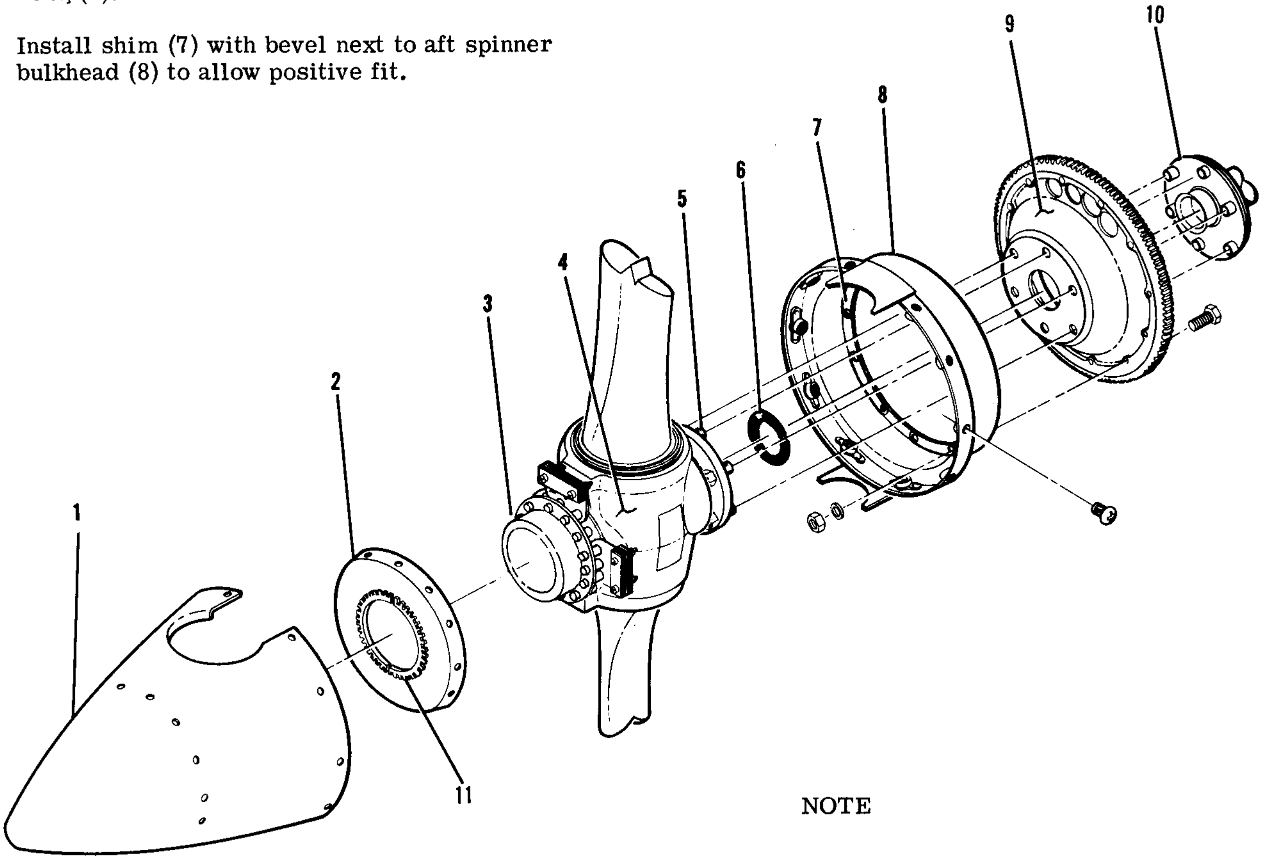
a. If aft spinner bulkhead was removed, install on ring gear support, using bolts, washers, nuts and shims as shown in figure 13-2.
b. If starter ring gear support and aft spinner bulkhead were removed, clean mating surfaces of support assembly and engine crankshaft flange.
c. Place alternator drive belt in pulley groove of the starter ring gear support. Fit starter ring gear support assembly over propeller flange bushings on the crankshaft.

NOTE

Torque studs (5) evenly to 55-65 lb-ft.

Bulkhead (2) is riveted to spinner dome (1). Be sure that grommet is installed in bulkhead (2).

Install shim (7) with bevel next to aft spinner bulkhead (8) to allow positive fit.



NOTE

AIRCRAFT SERIALS 17701371 THRU 17701701 AND 17701704

Index propeller blades in the first hole clockwise (CW) from the top center (TC) mark located on the aft side of the ring gear (as viewed from front of engine).

AIRCRAFT SERIALS 17701702 AND 17701703; 17701705 AND ON

Index propeller blades in line with top center (TC) mark located on the aft side of the ring gear (as viewed from front of engine).

1. Spinner
2. Spinner Bulkhead
3. Propeller Cylinder
4. Propeller
5. Stud
6. O-Ring
7. Shim
8. Aft Spinner Bulkhead
9. Starter Ring Gear Support
10. Engine Crankshaft
11. Grommet

BEGINNING WITH AIRCRAFT SERIAL 17701371

Figure 13-2. Propeller Installation (Constant-Speed)

NOTE

Make sure the bushing hole in the ring gear support that bears the identification "O", is assembled at the "O" identified crankshaft flange bushing. This bushing is marked "O" by an etching on the crankshaft flange next to the bushing. The starter ring gear must be located correctly to assure proper alignment of the timing marks on the ring gear.

d. Clean propeller hub cavity and mating surfaces of propeller hub and ring gear support.
e. Lightly lubricate a new O-ring and the crankshaft pilot with clean engine oil and install O-ring in propeller hub.
f. Align propeller mounting bolts with proper holes in engine crank flange and slide propeller carefully over crankshaft pilot until bolts can be started in crankshaft flange bushing. Position propeller blades to extend by the aft spinner bulkhead with ample clearance.
g. Tighten bolts evenly and work propeller aft. Tighten bolts to the torque value shown in figure 13-2.
h. Install safety wire through roll pins, safetying bolts in pairs.
i. Adjust alternator drive belt tension as outlined in Section 16.
j. Install spinner.

13-10A. TIME BETWEEN OVERHAUL (TBO). Propeller overhaul shall coincide with engine overhaul, but interval between overhauls of the propeller shall not exceed 1200 hours. Refer to Section 11 for engine time between overhaul (TBO) periods.

13-11. GOVERNOR.

13-12. DESCRIPTION. The base mounted, engine-driven, centrifugal, single-acting governor is mounted on the lower right side of the engine accessory drive housing. The term single-acting refers to the manner in which engine oil is directed to the propeller to affect changes in propeller blade pitch. This governor produces oil pressure to increase blade pitch. Decreased blade pitch is produced by centrifugal twisting moment of the rotating propeller blades and the force of an internal spring in the propeller, when governor oil pressure is relieved. Oil relieved by the governor is permitted to return from the propeller to the engine. Basically the governor consists of an engine-driven gear pump with a pressure relief valve, a pair of rotating fly weights pivoted on a fly weight head, a spring-loaded pilot valve operated by the fly weights under the influence of centrifugal force and a control lever which varies the spring load on the pilot valve.

NOTE

Outward physical appearance of specific governors is the same, but internal parts determine whether it uses oil pressure to increase or decrease propeller blade pitch. Always be sure the correct governor is used with the propeller.

13-13. TROUBLE SHOOTING. Since governor action is directly related to the propeller pitch changing mechanism, there are very few governor troubles that can be isolated with the governor installed and operating. Failure of the propeller to change pitch correctly might be caused either by the governor or propeller. Except for locating obvious troubles, it is best to install a governor known to be in good condition to check whether the propeller or the governor is at fault when trouble occurs in the propeller pitch change mechanism. If the trouble disappears, the governor was at fault, if the trouble persists, the propeller may be at fault. Removal and installation, rigging of control, high-speed stop adjustment, desludging and installation of governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governor are classed as propeller major repairs in Federal Aviation Regulations Part 43, which also define who may accomplish such repairs.

13-14. REMOVAL.
a. Remove engine cowling as required for access.
b. Disconnect heater duct and oil cooler ducts as required for access to governor.
c. Disconnect control from arm on governor and disconnect control from bracket.
d. Remove nuts and washers securing governor to adapter on engine accessory housing and work governor from mounting studs.
e. Remove governor mounting gasket.
f. Remove control bracket from governor.

13-15. INSTALLATION.
a. Install control bracket on governor and safety attaching screws.
b. Wipe governor and adapter mounting pad clean.
c. Install a new governor mounting gasket on the mounting studs. Install gasket with raised surface of the gasket screen toward the governor.
d. Position governor on mounting studs, aligning drive splines with drive splines in the engine and install washers and nuts. Do not force spline engagement. Rotate engine crankshaft slightly and splines will engage smoothly when properly aligned.
e. Tighten mounting nuts evenly to 100-150 pound-inches.
f. Connect governor control to bracket and control arm on the governor. Rig governor control as required for full travel. Refer to paragraph 13-17.
g. Install all parts removed for access.

13-16. HIGH RPM STOP ADJUSTMENT.
a. Remove engine cowling as required for access.
b. Loosen the high-speed screw lock nut.
c. Turn the stop screw in to decrease maximum RPM and out to increase maximum RPM. One full revolution of the stop screw causes a change of approximately 25 RPM.
d. Tighten stop screw lock nut and make propeller control linkage adjustment as necessary to maintain full travel of the control so that the propeller governor arm contacts stop screw.
e. Install cowling and test operate propeller and governor combination.

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 propeller blade angle and other considerations, an engine may not reach rated RPM on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated RPM when airborne.

13-17. RIGGING.

NOTE

The result of rigging the governor control is full travel of the governor control arm (bottomed out against both the high and low pitch stops) with some cushion at both ends of the control travel.

a. Disconnect control from governor control arm.

b Place control in the cabin full forward then pull control knob back approximately 1/8 inch and lock in this position. This will allow "cushion" to assure full contact with governor high RPM stop.

c. Place governor control arm against high RPM stop screw.

d. Loosen jam nuts on control and adjust rod end until attaching holes of rod end and governor arm align while governor control 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 its clamps to achieve this.

e. Attach control rod end to governor control arm, tighten control rod end jam nuts and install all safeties.

f. Operate the propeller control to see that the governor arm attains full travel in both directions.

13-18. TIME BETWEEN OVERHAUL (TBO). Propeller governor overhaul shall coincide with engine overhaul, but interval between overhauls shall not exceed 1800 hours. Refer to Section 11 for engine time between overhaul (TBO) periods. The McCauley Service Manual is available from the Cessna Service Parts Center.

SECTION 14

UTILITY SYSTEMS

TABLE OF CONTENTS Page

14-1. UTILITY SYSTEMS.

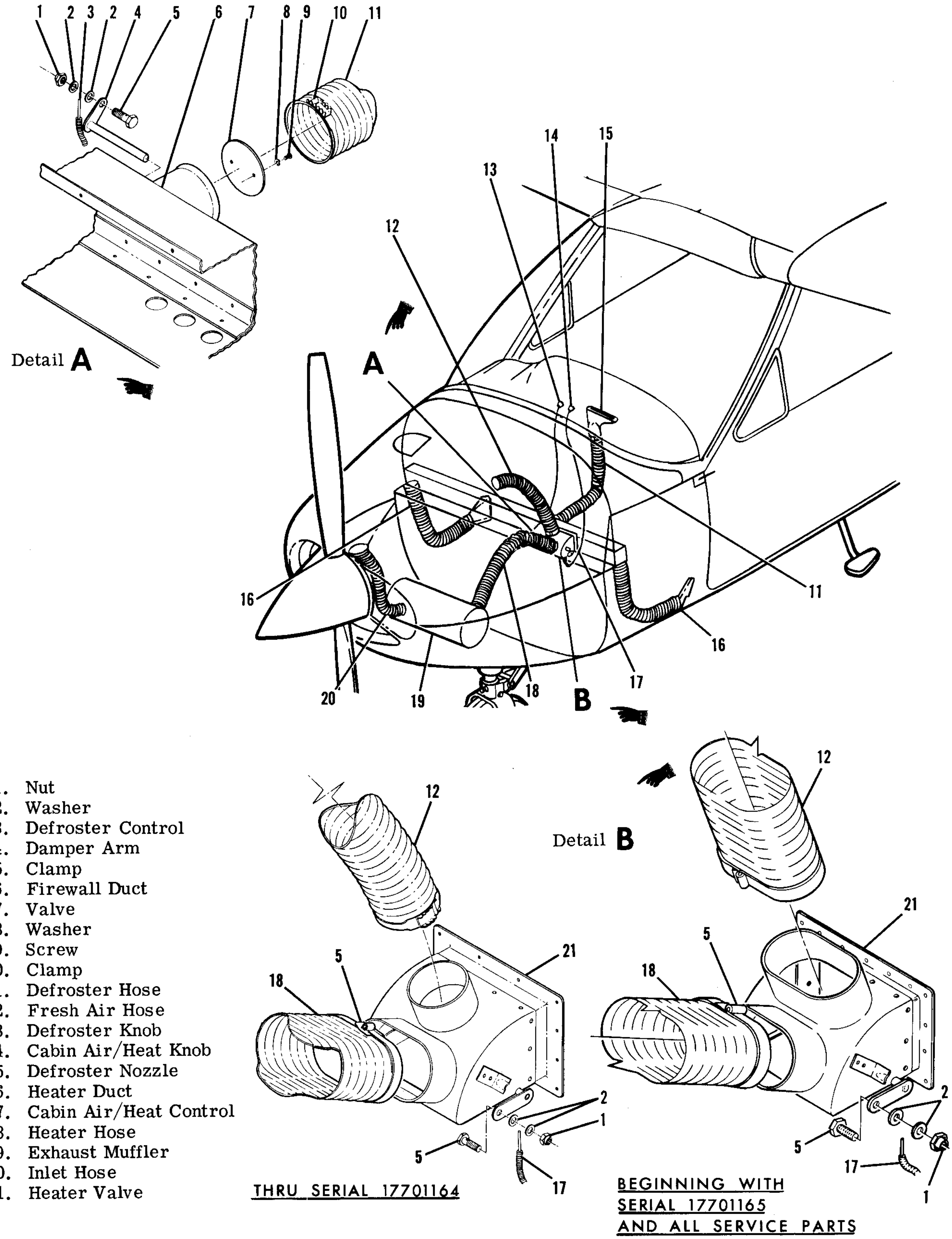
14-2. HEATING SYSTEM.

14-3. DESCRIPTION. The heating system is comprised of the heat exchange section of the exhaust muffler, a mixing airbox with shut-off valve on the forward side of the firewall, a push-pull control on the instrument panel, outlets and flexible ducting connecting the system.

14-4. OPERATION. Ram air is ducted through an engine baffle inlet and heat exchange section of the exhaust muffler, to a mixing airbox on the forward side of the firewall. Unheated ram air, routed through a duct connected to a vertical engine baffle, is also ducted to this airbox. The airbox valve provides an operation in which the first one inch of travel of the "CABIN AIR/HEAT" control results in varying degrees of fresh air flow. A detent is provided on the mixing valve at the full unheated fresh air position. As the control is pulled out past the detent position, further extension of the control results in mixing of increased quantities of heated air. Pulling the control full out provides maximum flow and heated air. From the mixing airbox, air flows into a duct across the aft side of the firewall where it is distributed into the cabin.

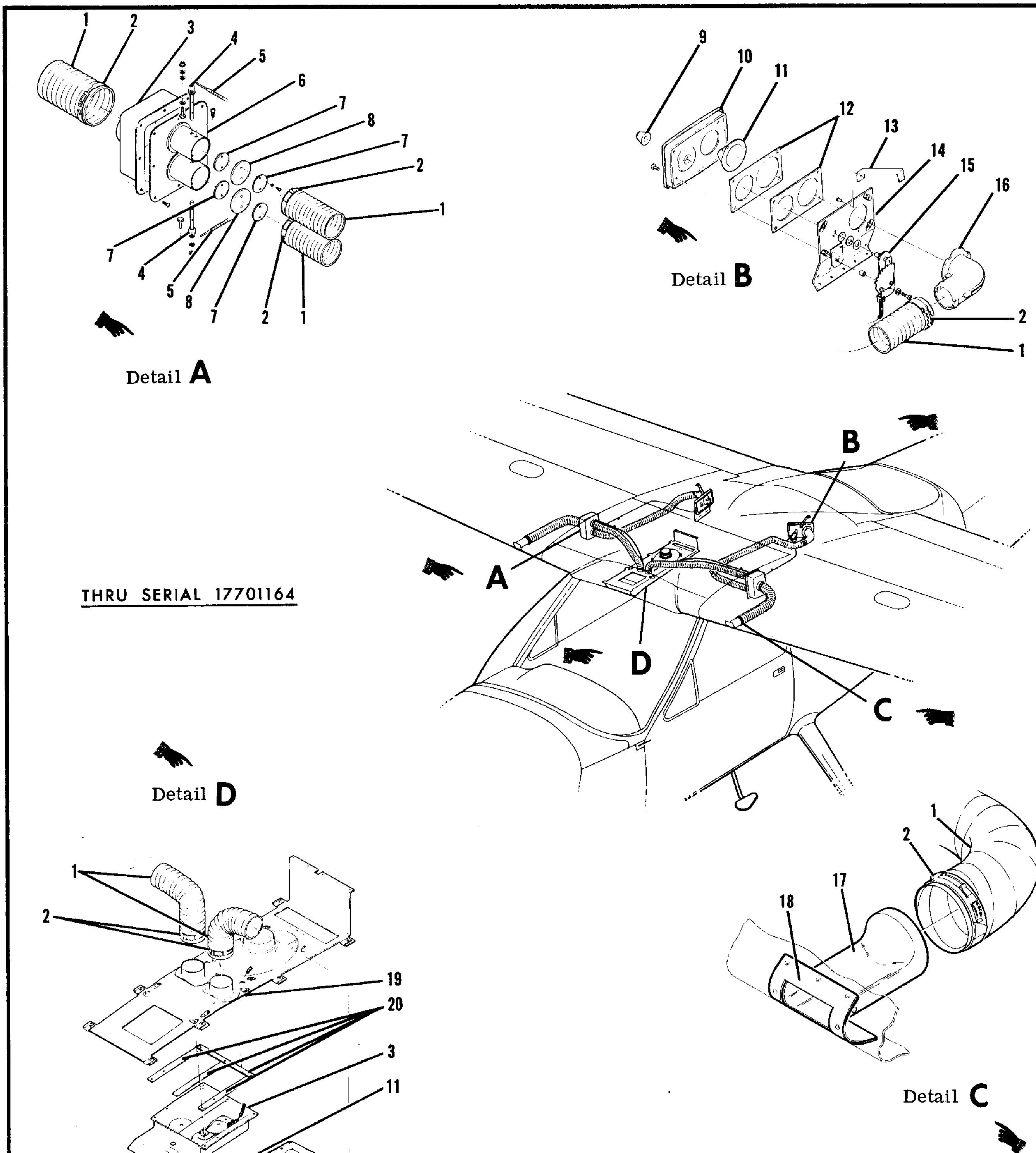
14-5. TROUBLE SHOOTING. Most of the operational troubles in the heating and defrosting systems are caused by sticking or binding valves or their controls, damaged air ducting, or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. Damaged or broken parts must be repaired or replaced. When checking controls, ensure valves respond freely to control movement, that they move in the correct direction and that they move through their full range of travel and seal properly. Check that hose are properly secured and replace hose that are burned, frayed, or crushed. If fumes are detected in the cabin, a thorough inspection of the exhaust system should be accomplished. Refer to applicable paragraph in Section 11 for this inspection. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in heater ducts across the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Chemical Division, Los Angeles, California) compound or equivalent compound.

14-6. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 illustrates the heating and defrosting systems and may be used as a guide during removal, installation and repair of heating system components. Burned, frayed or crushed hose should be replaced with new hose, cut to length and installed in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. Defective air valves must be repaired or replaced. Check for proper operation of valves and their controls after repair or replacement.



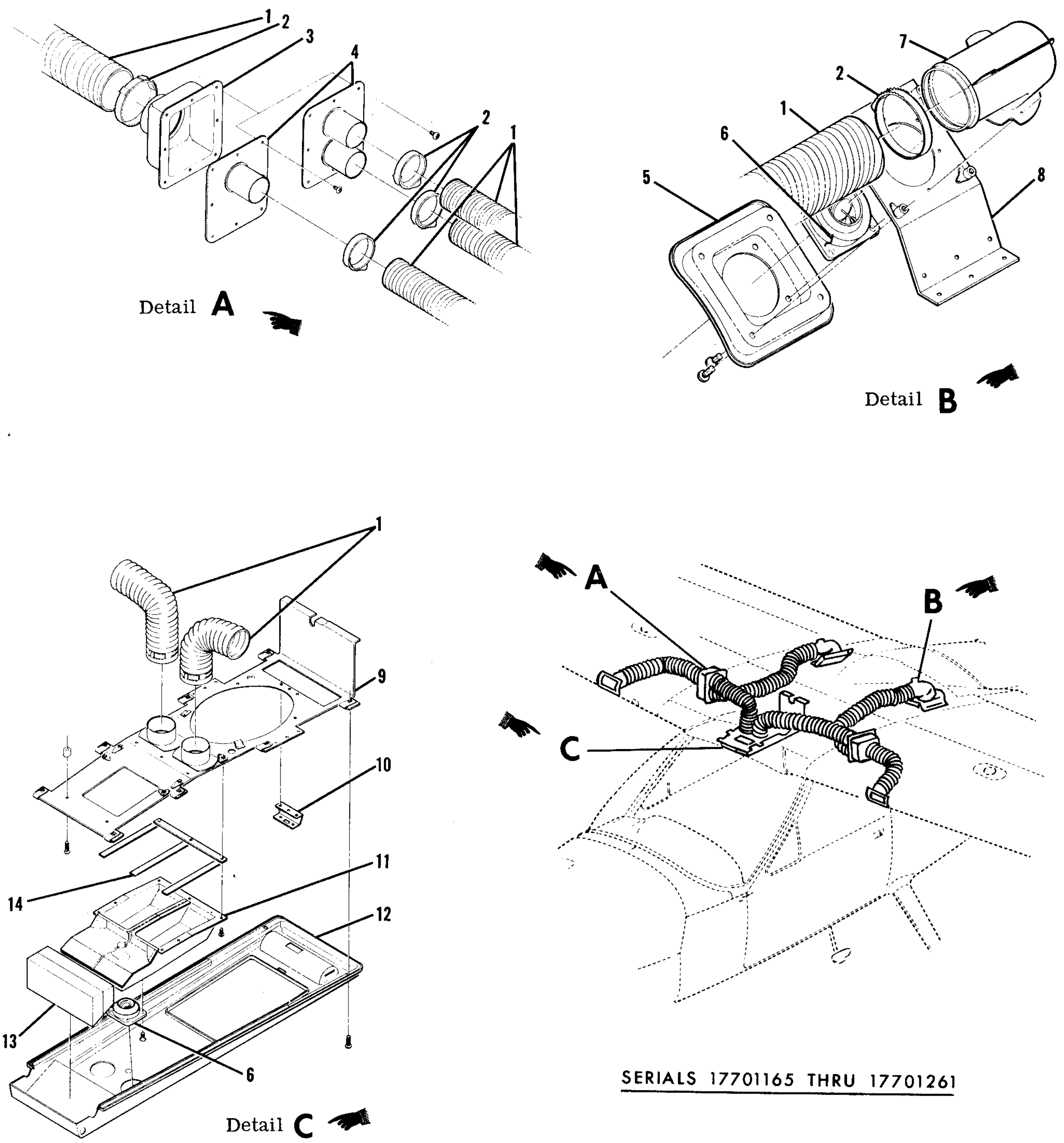
1. Nut
2. Washer
3. Defroster Control
4. Damper Arm
5. Clamp
6. Firewall Duct
7. Valve
8. Washer
9. Screw
10. Clamp
11. Defroster Hose
12. Fresh Air Hose
13. Defroster Knob
14. Cabin Air/Heat Knob
15. Defroster Nozzle
16. Heater Duct
17. Cabin Air/Heat Control
18. Heater Hose
19. Exhaust Muffler
20. Inlet Hose
21. Heater Valve

Figure 14-1. Heating and Defrosting Systems



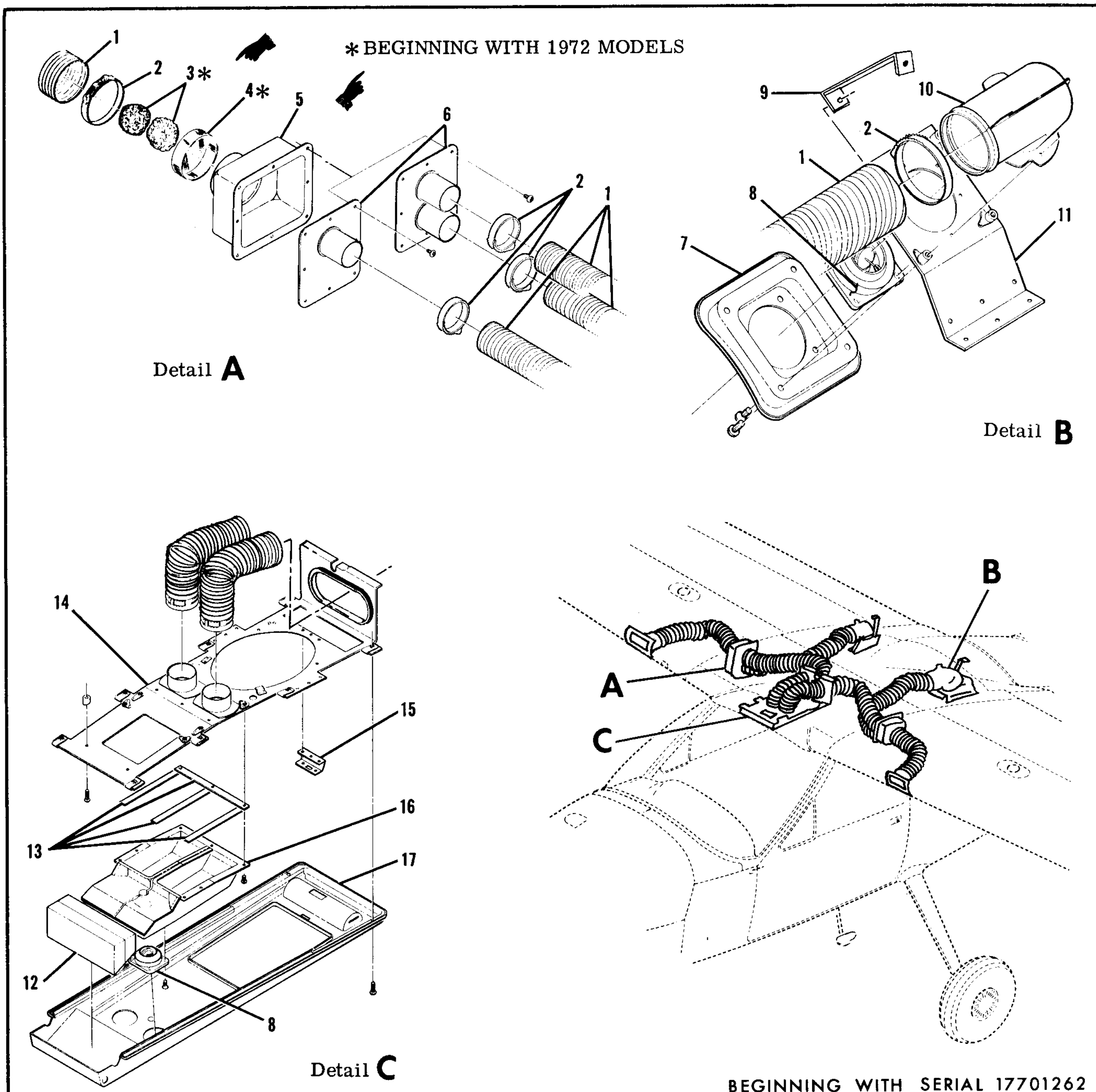
1. Duct
2. Clamp
3. Air Box
4. Damper Arm
5. Control Cable
6. Air Control Valve
7. Seal Cover
8. Valve Seal
9. Knob
10. Cover
11. Outlet
12. Spacer
13. Bracket
14. Brace
15. Control
16. Nozzle
17. Scoop
18. Flange
19. Console Support
20. Gasket
21. Console Cover
22. Retainer

Figure 14-2. Ventilating System (Sheet 1 of 3)



1. Duct
2. Clamp
3. Air Box Assembly
4. Divider
5. Cover
6. Air Valve
7. Nozzle
8. Brace
9. Console Support
10. Bracket
11. Cabin Vent Air Box
12. Console Cover
13. Glass-Fiber Shield
14. Gasket

Figure 14-2. Ventilating System (Sheet 2 of 3)



1. Duct
2. Clamp
3. Element
4. Retainer
5. Airbox Assembly
6. Divider
7. Cover
8. Air Valve
9. Bracket
10. Nozzle
11. Brace
12. Glass-Fiber Shield
13. Gasket
14. Console Support
15. Bracket
16. Cabin Vent Airbox
17. Console Cover

Figure 14-2. Ventilating System (Sheet 3 of 3)

14-7. DEFROSTER SYSTEM.

14-8. DESCRIPTION. The defrosting system is comprised of a duct across the aft side of the firewall, a defroster outlet, mounted on the left side of the cowl deck immediately aft of the windshield, a control knob on the instrument panel and flexible ducting connecting the system.

14-9. OPERATION. Air from the duct across the aft side of the firewall flows through a flexible duct to the defroster outlet. The defroster control operates a damper in the firewall duct 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.

14-10. TROUBLE SHOOTING. Since the defrosting system depends on proper operation of the heating systems, refer to paragraph 14-5 for trouble shooting the heating and defrosting systems.

14-11. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 illustrates the defrosting system and may be used as a guide for removal, installation and repair of defroster system components. Burned, frayed or crushed hose should be replaced with new hose, cut to length and installed in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. A defective defroster outlet must be repaired or replaced.

14-12. VENTILATING SYSTEM.

14-13. DESCRIPTION. The ventilating system is comprised of an airscoop mounted in the inboard leading edge of each wing, a small plenum chamber mounted at each wing root rib, two adjustable ventilators mounted in the overhead console, two adjustable ventilators mounted in the aft wing root areas and flexible ducting connecting the system.

14-14. OPERATION. Ram air received from scoops mounted in the inboard leading edges of the wings is ducted to small plenum chambers, located at each wing root rib. From the plenum chambers the air is routed to the pilot and copilot overhead console outlets and to the rear seat outlets. On some aircraft the quantity of air flowing through the outlets is controlled by means of a geared-type control, actuated by rotating a knob at each outlet position. (Refer to figure 14-2, sheet 1.) On other aircraft the quantity of air is controlled by means of a 360 degree manually-operated swiveling valve which can be turned to increase, decrease and direct the flow of air wherever desired. (Refer to figure 14-2, sheets 2 and 3.)

14-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating system are caused by sticking or binding air valves and their controls or damaged air ducting. In most cases, air valves or controls can be freed by proper lubrication. Damaged or broken parts should be repaired or replaced. When checking rigging of controls, ensure valves respond freely to control movement, that they move in the correct direction and that they move through their full range of travel and seal properly.

14-16. REMOVAL, INSTALLATION AND REPAIR. Figure 14-2 illustrates the ventilating system and may be used as a guide for removal, installation and repair of the ventilating system components. Frayed or crushed hose should be replaced with new hose, cut to length and installed in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. Defective air valves must be repaired or replaced. Check for proper operation of valves and controls after repair or replacement.

SHOP NOTES:

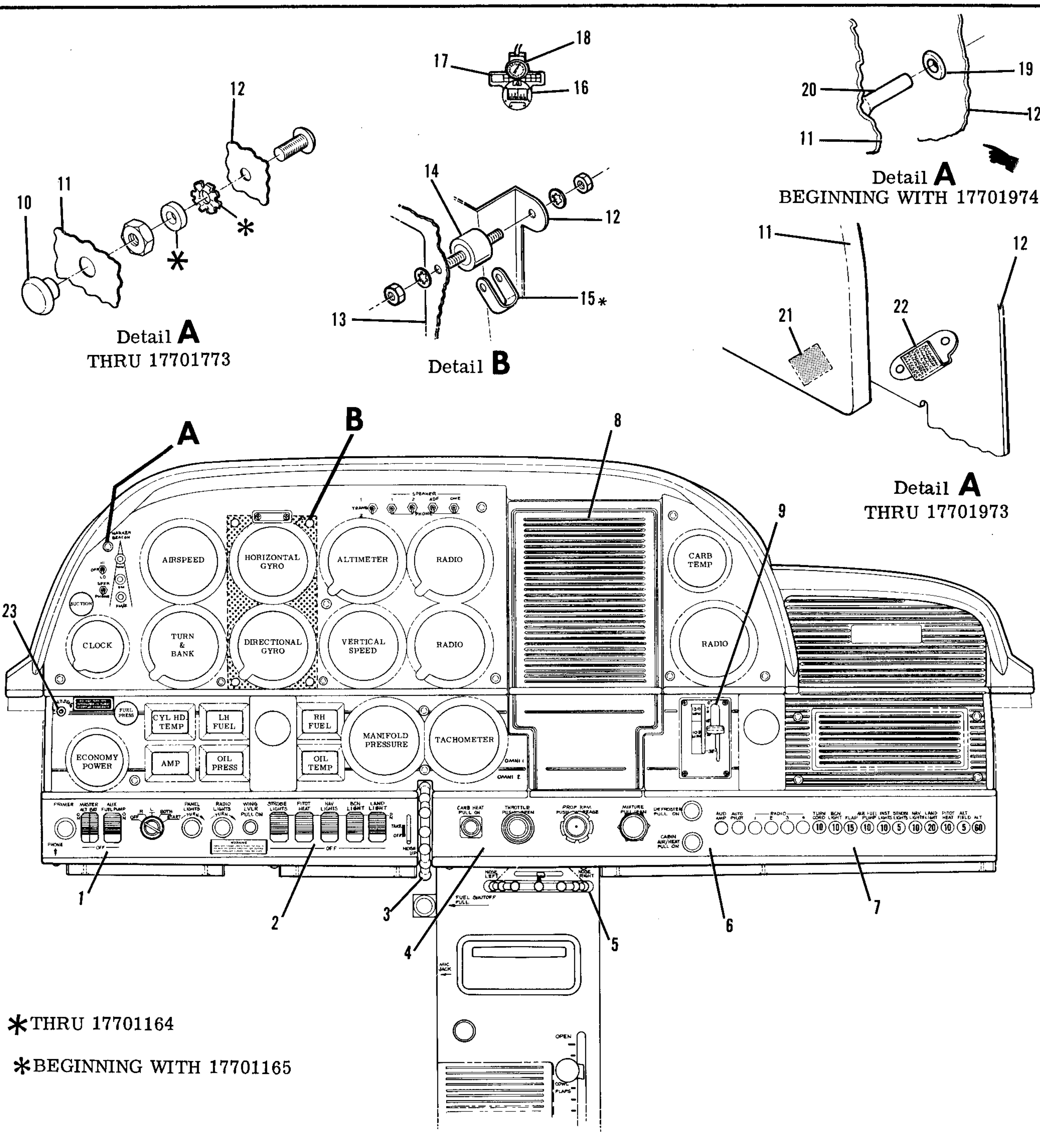
SECTION 15

INSTRUMENTS AND INSTRUMENT SYSTEMS

TABLE OF CONTENTS Page

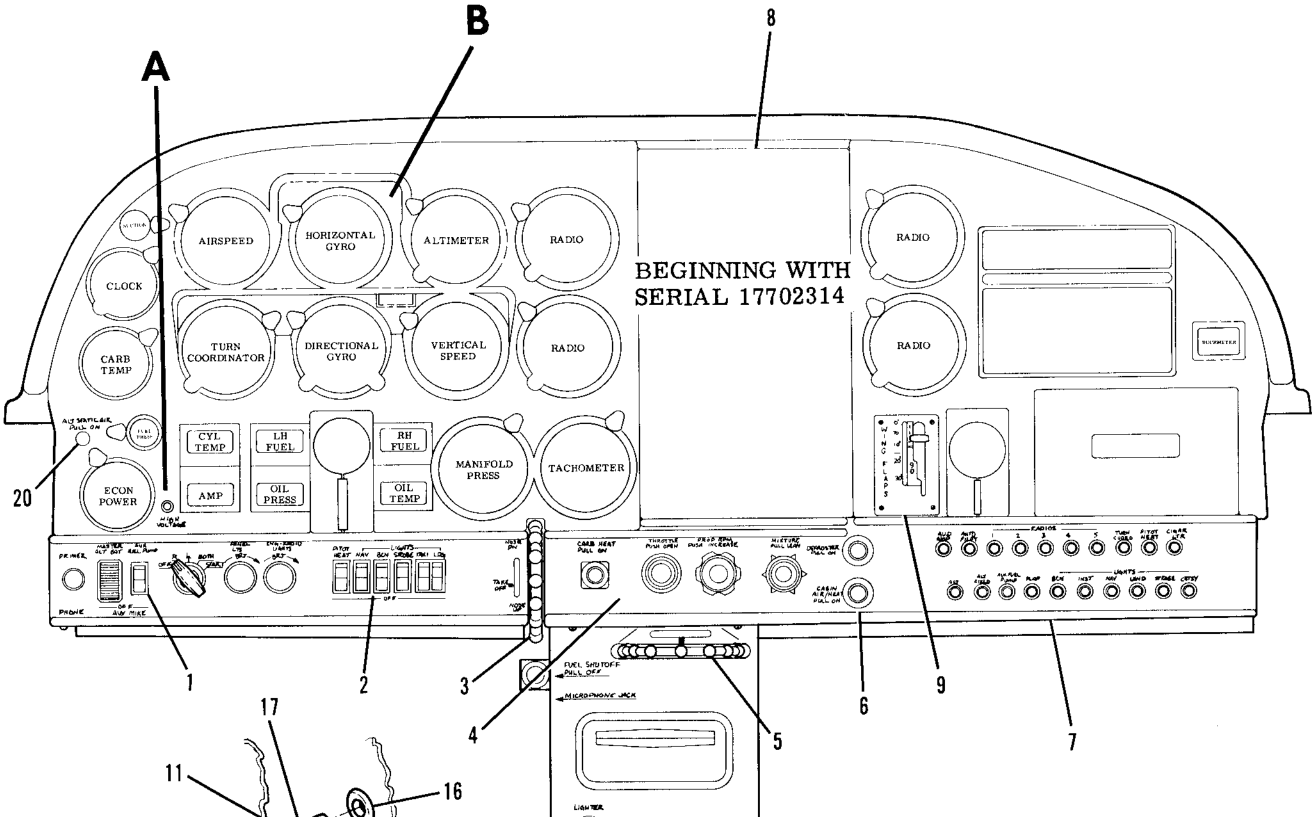
15-1. INSTRUMENTS AND INSTRUMENT SYSTEMS.

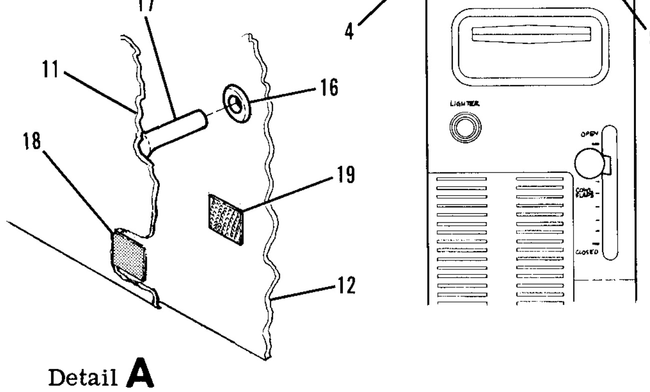
15-2. GENERAL. This section describes typical instrument installations and their respective operating systems. Emphasis is placed on trouble shooting and corrective measures only. It does NOT deal with specific instrument repairs since this usually requires special equipment and data and should be handled by instrument specialists. Federal Aviation Regulations require malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to manufacturer for servicing. Our concern here is with preventive maintenance on various instrument systems and correction of system faults which result in instrument malfunctions. The descriptive material, maintenance and trouble shooting information in this section is intended to help the mechanic determine malfunctions and correct them, up to the defective instrument itself, at which point an instrument technician should be called in. Some instruments, such as fuel quantity and oil pressure gages, are so simple and inexpensive, repairs usually will be more costly than a new instrument. On the other hand, aneroid and gyro instruments usually are well worth repairing. The words "replace instrument" in the text, therefore, should be taken only in the sense of physical replacement in aircraft. Whether replacement is to be with a new instrument, an exchange one, or original instrument is to be repaired must be decided on basis of individual circumstances.



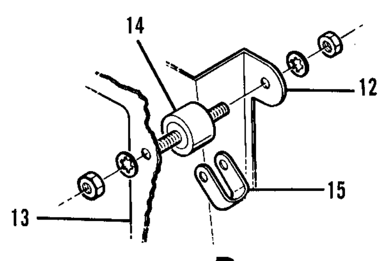
1. Fuel controls
2. Lighting controls
3. Stabilator trim control
4. Engine controls
5. Rudder trim control
6. Heating and vent controls
7. Circuit breaker panel
8. Radio panel
9. Flap control panel
10. Button
11. Decorative panel
12. Instrument panel
13. Shock-mounted (Gyro-panel)
14. Shock mount
15. Ground strap
    * (upper-locations only)
16. Magnetic compass
17. Correction card
18. Outside temp gage
19. Rubber grommet
20. Guide pin
21. Pile
22. Velcro hook
23. Alternate static source

Figure 15-1 Instrument Panel (Typical)





Detail **A**



Detail **B**

NOTE POSITION OF GROUND STRAP AND SEQUENCE OF ATTACHING PARTS WHEN REMOVING AND INSTALLING SHOCK PANEL

1. Fuel controls
2. Lighting controls
3. Stabilator trim control
4. Engine controls
5. Rudder trim control
6. Heating and vent controls
7. Circuit breaker panel
8. Radio panel
9. Flap control panel
10. Button
11. Decorative panel
12. Instrument panel
13. Shock-mounted (Gyro-panel)
14. Shock mount
15. Ground strap
16. Rubber grommet
17. Guide pin
18. Pile
19. Velcro hook
20. Alternate static source

Figure 15-1. Instrument Panel (Typical) (Sheet 2 of 2)

This page intentionally left blank.

15-3. INSTRUMENT PANEL. (Refer to figure 15-1.)

15-4. DESCRIPTION. The instrument panel assembly consists of shock-mounted and stationary panels. The stationary panel contains fuel and engine instruments, which are NOT sensitive to vibration. The shock-mounted panel contains major flight instruments such as horizontal and directional gyros which ARE affected by vibration. Most of the instruments are screw-mounted on the panel backs. The stabilator trim wheel is also secured to the instrument panel.

15-5. REMOVAL AND INSTALLATION. The stationary panel is secured to engine mount stringers and a forward fuselage bulkhead and ordinarily is not considered removable. The shock-mounted panel is secured to the main stationary panel with rubber shock-mounted assemblies. Beginning with 1969 Models the main panel may be removed for access after disconnecting plumbing, wiring, removing decorative cover and nuts securing panel to mounting studs. To remove shock-mounted panel proceed as follows:

a. Prior to 1972 models, remove decorative panel covers by unscrewing threaded buttons. On 1972 and 1973 models the covers are held on with Velcro fasteners and can be removed by pulling gently on cover. 1974 models utilize a guide pin and rubber grommet arrangement and can be removed by pulling evenly on the cover. Reinstall by reversing procedure.

b. Remove nuts from shock-mounts, tag and disconnect instrument wiring and plumbing and pull panel straight back.

c. Reverse preceding steps for installation. Ensure ground strap is properly installed.

15-6. SHOCK MOUNTS. Service life of instruments is directly related to adequate shock-mounting of panel. If removal of panel is necessary, check mounts for deterioration.

15-7. INSTRUMENTS. (Refer to figure 15-1.)

15-8. REMOVAL. Most instruments are secured to panel with screws inserted through panel face. To remove an instrument, remove decorative cover, disconnect wiring or plumbing to instrument, remove mounting screws and take instrument out from behind, or in some cases, from front of panel. Instrument clusters are installed as units and are secured by a screw at each end. A cluster must be removed from panel to replace an individual gage. In all cases when an instrument is removed, 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 so accidental grounding or short-circuiting will not occur.

15-9. INSTALLATION. Generally, installation procedure is the reverse of removal procedure. Ensure mounting screw nuts are tightened firmly, but do not over-tighten, particularly on instruments having plastic cases. The same rule applies to connecting plumbing and wiring.

NOTE

All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through Cessna Service Parts Center.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change calibration of gages.

15-10. PITOT AND STATIC SYSTEMS. (Refer to figure 15-2.)

15-11. DESCRIPTION. The pitot system conveys ram air pressure to the airspeed indicator. The static system vents vertical speed indicator, altimeter and airspeed indicator to atmospheric pressure through plastic tubing connected to static ports. A static line sump is installed at source button to collect condensation in static system. An alternate static source may be installed and is used only in emergencies. When used as a static source, cabin pressure is substituted for atmospheric pressure, causing instrument readings to vary from normal. Refer to Owner's Manual for flight operation using alternate static source pressure. A pitot tube heater may be installed. The heating element is controlled by a switch at the instrument panel and is powered by the electrical system. Beginning with aircraft 17702108, an encoding altimeter and a standby altimeter may be installed. The encoding altimeter supplies an altitude reading to the optional 300 or 400 transponder for signal transmission. The standby altimeter is connected to the static system by a tube to the vertical speed indicator.

15-12. MAINTENANCE. Proper maintenance of pitot and static system is essential for proper operation of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in the pitot system will result in false airspeed indications, while static system malfunctions will affect readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the principal rules for system maintenance. The pitot tube and static ports MUST be kept clean and unobstructed.

15-13. STATIC PRESSURE SYSTEM INSPECTION AND LEAKAGE TEST. The following procedure outlines inspection and testing of static pressure system, assuming altimeter has been tested and inspected in accordance with current Federal Aviation Regulations.

a. Ensure static system is free from entrapped moisture and restrictions.

b. Ensure no alterations or deformations of airframe surface have been made which would affect the relationship between air pressure in static pressure system and true ambient static air pressure for any flight configuration. If dual static ports are used, seal one opening with tape (air tight), then close

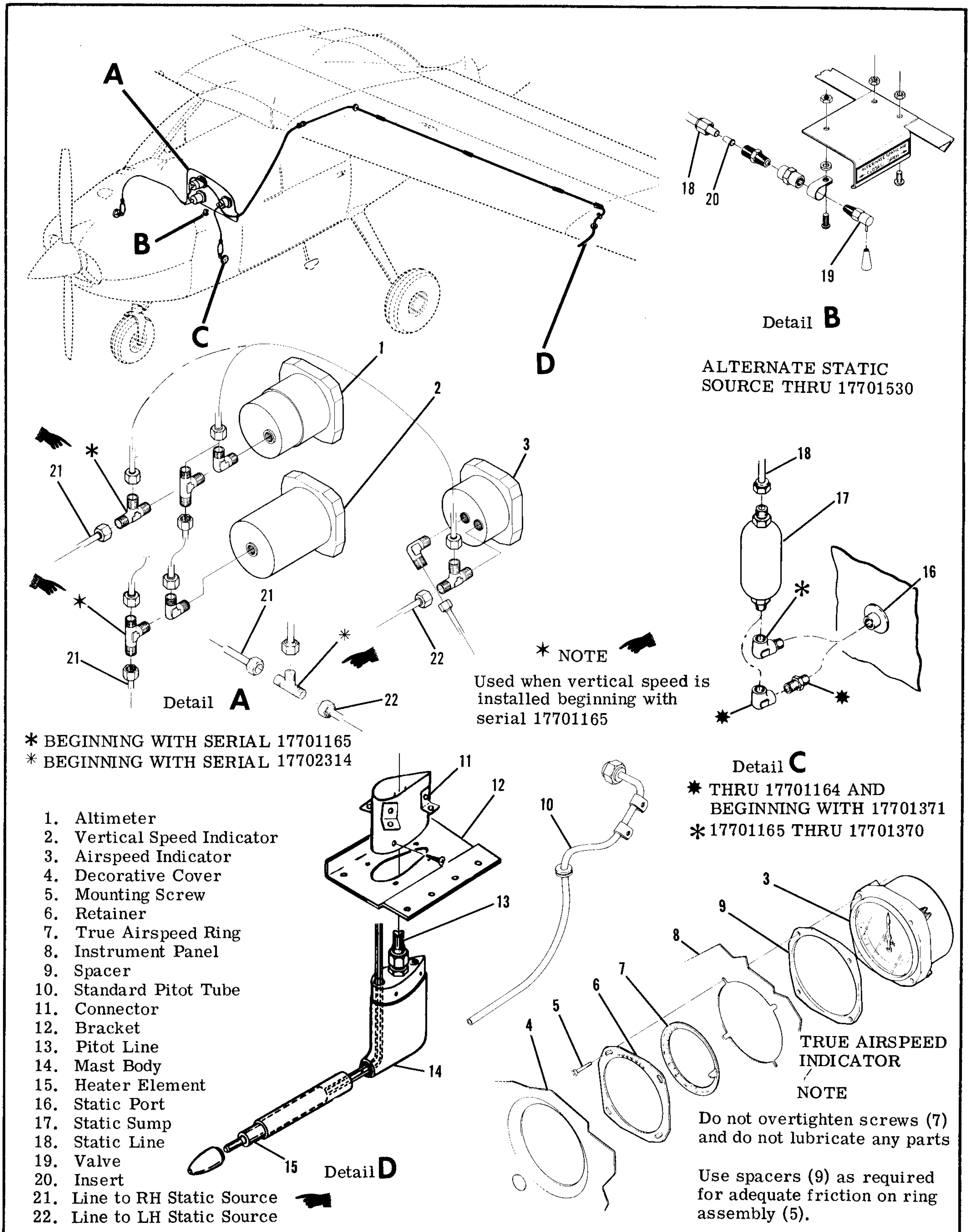
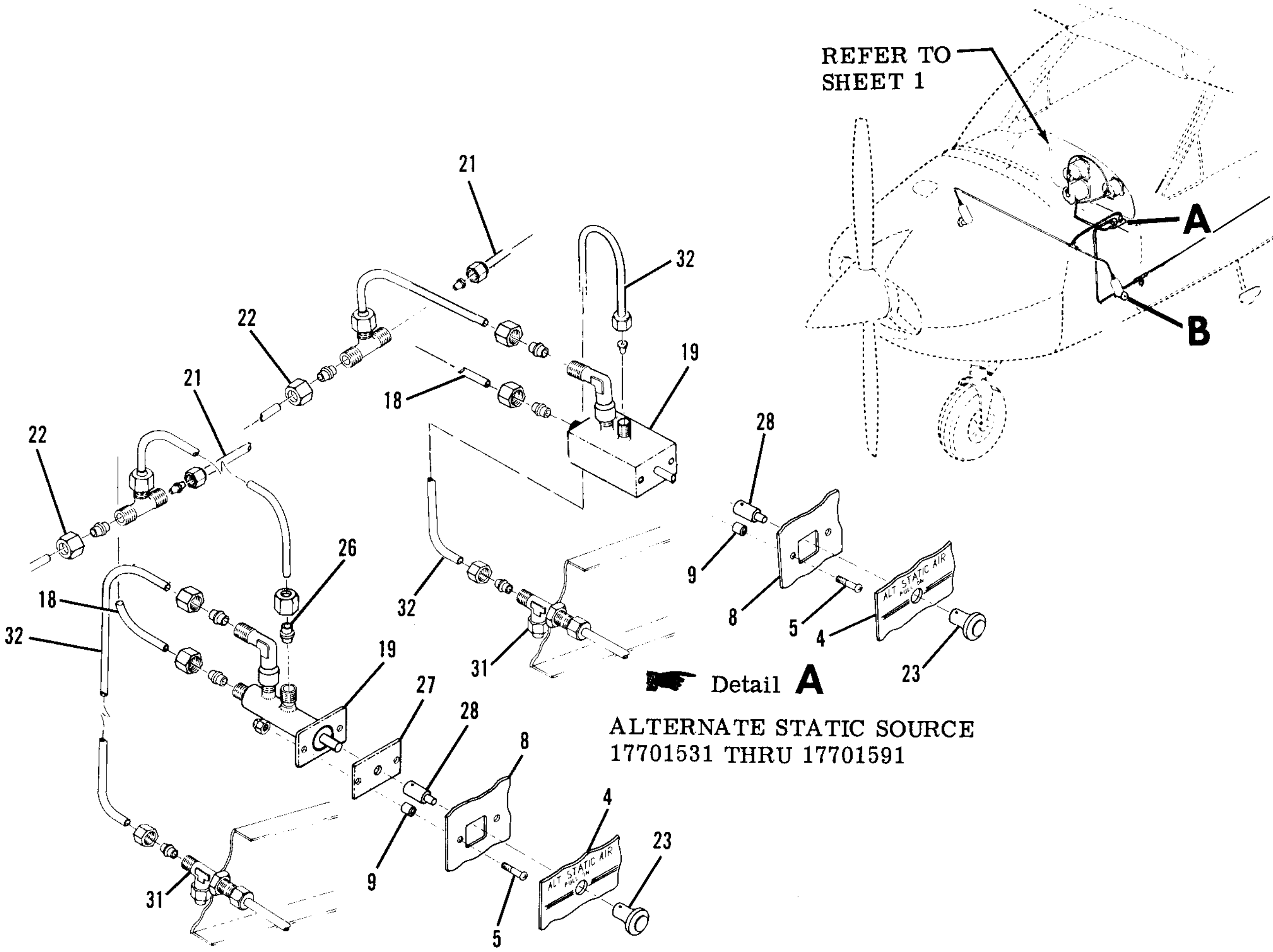


Figure 15-2. Pitot Static Systems (Sheet 1 of 2)

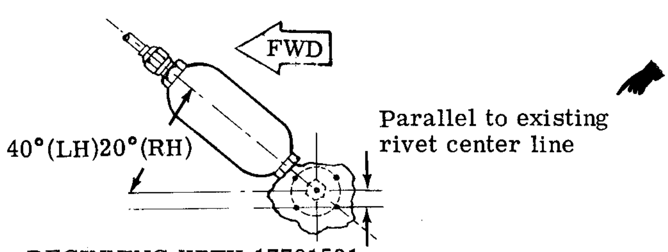


Detail A

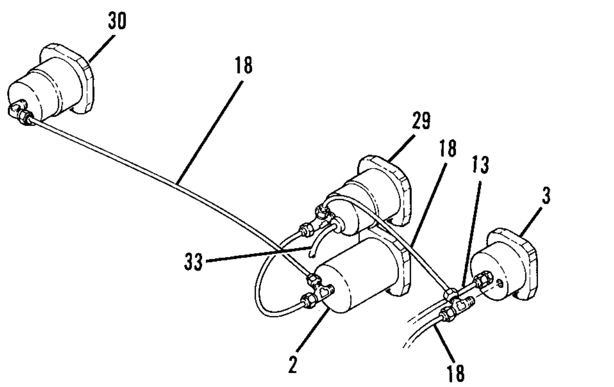
ALTERNATE STATIC SOURCE
17701531 THRU 17701591

Detail A

ALTERNATE STATIC SOURCE
BEGINNING WITH 17701592



BEGINNING WITH 17701531
Detail B



OPTIONAL ENCODING ALTIMETER
BEGINNING WITH 17702108

23. Valve Control Knob
24. Placard
25. Elbow
26. Insert
27. Plate
28. Extension
29. Encoding Altimeter
30. Standby Altimeter
31. Drain
32. Alternate Static Source Line
33. Cable to Transponder

NOTE

WHEN AN ENCODING ALTIMETER AND A STANDBY ALTIMETER ARE INSTALLED, STATIC LINE ROUTING WILL BE AS SHOWN

Figure 15-2. Pitot Static Systems (Sheet 2 of 2)

alternate static source valve (if installed).
c. Attach a source of suction to static pressure source opening. Figure 15-3 shows one method of obtaining suction.
d. Slowly apply suction until altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed range of vertical speed indicator or airspeed indicator.

e. Cut off suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on altimeter.
f. If leakage rate is within tolerance, slowly release suction source.

NOTE

If leakage rate exceeds maximum allowable, first tighten all connections, then repeat leakage test. If leakage rate still exceeds maximum allowable, use following procedure.

g. Disconnect static pressure lines from airspeed indicator and vertical speed indicator. Use suitable fittings to connect lines together so altimeter is the only instrument still connected into static pressure system.
h. Repeat leakage test to check whether static pressure system or the bypassed instruments are cause of leakage. If instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If static pressure system is at fault, use following procedure to locate leakage.
i. Attach a source of positive pressure to static source opening. Figure 15-3 shows one method of obtaining positive pressure.

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected to static pressure system.

j. Slowly apply positive pressure until altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections and static source flange with solution of mild soap and water, watching for bubbles to locate leaks.
k. Tighten leaking connections. Repair or replace parts found defective.
l. Reconnect airspeed and vertical speed indicators into static pressure system and repeat leakage test per steps "c" thru "f".

15-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check pitot system for leaks, place a piece of tape over small hole in lower aft end of pitot tube, fasten a piece of rubber or plastic tubing over pitot tube, close opposite end of tubing and slowly roll up tube until airspeed indicator registers in cruise range. Secure tube and after a few minutes recheck airspeed indicator. Any leakage will have reduced the pressure in system, resulting in a lower airspeed indication. Slowly unroll tubing before removing it, so pressure is reduced gradually. Otherwise instrument may be damaged. If test reveals a leak in system, check all connections for tightness.

15-15. BLOWING OUT LINES. Although pitot system is designed to drain down to pitot tube opening, condensation may collect at other points in system and produce a partial obstruction. To clear line, disconnect at airspeed indicator. Using low pressure air, blow from indicator end of line toward pitot tube.

CAUTION

Never blow through pitot or static lines toward instruments.

Like pitot lines, static pressure lines must be kept clear and connections tight. Static source sumps collect moisture and keep system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow line clear with low-pressure air. Check all static pressure line connections for tightness. If hose or hose connections are used, check for general condition and clamps for security. Replace hose which have cracked, hardened or show other signs of deterioration.

15-16. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 15-2.) To remove pitot mast remove four mounting screws on side of connector (11) and pull mast out of connector far enough to disconnect pitot line (13). Electrical connections to heater assembly (if installed) may be disconnected through wing access opening just inboard of mast. Pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Installation of tubing will be simpler if a guide wire is drawn in as tubing is removed from wing. The tubing may be removed intact by drawing it out through cabin and right door. 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.

15-17. TROUBLE SHOOTING--PITOT STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIRSPEED INDICATION. (Normal altimeter and vertical speed.)	Pitot tube obstructed, leak or obstruction in pitot line.	Test pitot tube and line for leaks or obstructions. Blow out tube and line, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE. (all three instruments.)	Leaks or obstruction in static line.	Test line for leaks and obstructions. Repair or replace line, blow out obstructed line.

15-18. TRUE AIRSPEED INDICATOR. A true airspeed indicator may be installed. This indicator, equipped with a conversion ring, may be rotated until pressure altitude is aligned with outside air temperature, then airspeed indicated on the instrument is read as true airspeed on the adjustable ring. Refer to figure 15-2 for removal and installation. Upon installation, before tightening mounting screws (5), calibrate instrument as follows: Rotate ring (7) until 120 mph on the adjustable ring aligns with 120 mph on the indicator. Holding this setting, move retainer (6) until 60°F aligns with zero pressure altitude, then tighten mounting screws (5) and replace decorative cover (4).

NOTE

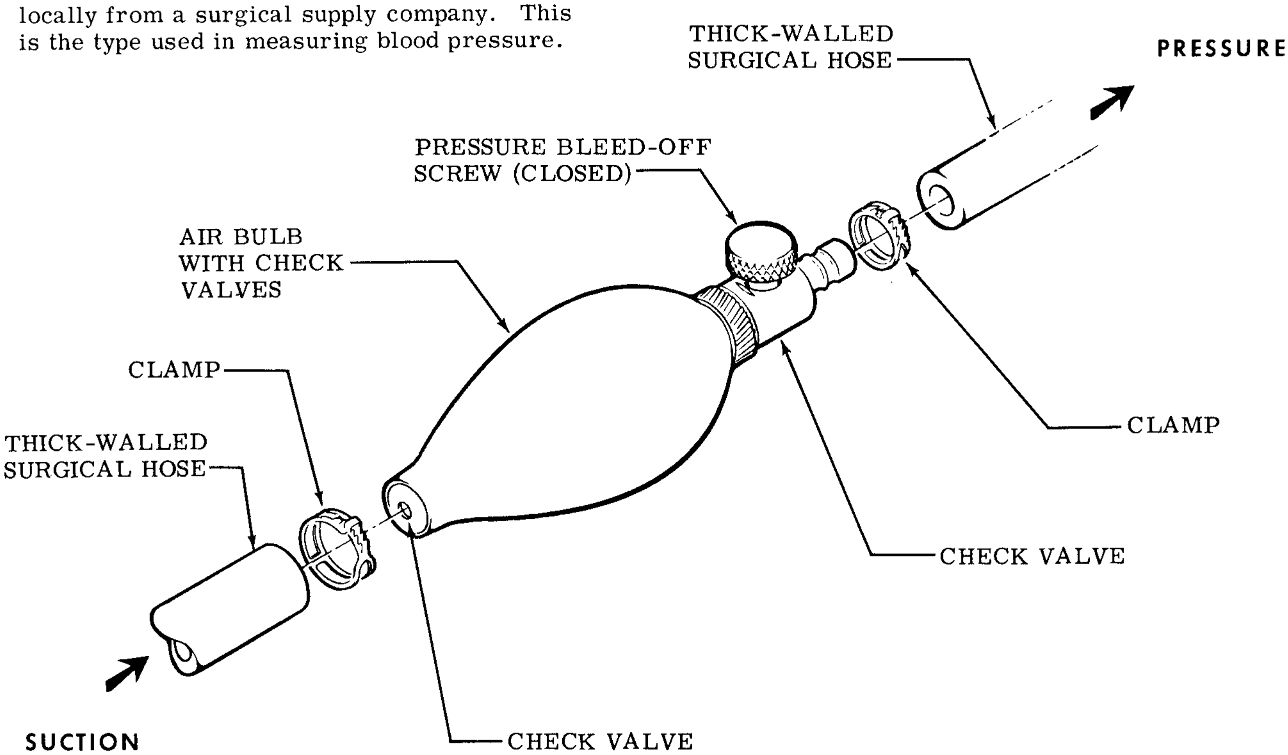
Beginning with serial 17702314, true airspeed indicators are graduated in knots. Therefore, use 105 knots instead of 120 miles per hour in the above calibration procedure.

15-19. TROUBLE SHOOTING--AIRSPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Test line and connection for leaks. Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Check line for obstructions. Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Defective mechanism or leaking diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check panel shock mounts. Replace defective shock mounts.
	Excessive tubing vibration.	Check clamps and line connections for security. Tighten clamps and connections, replace tubing with flexible hose.

NOTE

Air bulb with check valves may be obtained locally from a surgical supply company. This is the type used in measuring blood pressure.



TO APPLY SUCTION:

1. Squeeze air bulb to expel as much air as possible.
2. Hold suction hose firmly against static pressure source opening.
3. Slowly release air bulb to obtain desired suction, then pinch hose shut tightly to trap suction in system.
4. After leak test, release suction slowly by intermittently allowing a small amount of air to enter static system. To do this, tilt end of suction hose away from opening, then immediately tilt it back against opening. Wait until vertical speed indicator approaches zero, then repeat. Continue to admit this small amount of air intermittently until all suction is released, then remove test equipment.

TO APPLY PRESSURE:

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected into static system.

1. Hold pressure hose firmly against static pressure source opening.
2. Slowly squeeze air bulb to apply desired pressure to static system. Desired pressure may be maintained by repeatedly squeezing bulb to replace any air escaping through leaks.
3. Release pressure by slowly opening pressure bleed-off screw, then remove test equipment.

Figure 15-3. Static System Test Equipment

15-20. TROUBLE SHOOTING--ALTIMETER

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines.
	Defective mechanism.	Substitute known-good altimeter and check reading. Replace instrument.
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Substitute known-good altimeter and check reading. Replace instrument.
	Pointers out of calibration.	Compare reading with known-good altimeter. Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Check lines for obstruction or leaks. Blow out lines, tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Check other instruments and system plumbing for leaks. Blow out lines, tighten connections.

15-21. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Check line for obstructions. Blow out lines. Clean static sources.
	Static line broken.	Check line for damage, connections for security. Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Check line for obstructions. Blow out lines. Clean static sources
	Ruptured diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
	Pointer off zero.	Reset pointer to zero. Reset pointer to zero.
POINTER OSCILLATES.	Partially plugged static line.	Check line for obstructions. Blow out lines. Clean static sources.

15-21. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR. (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
POINTER OSCILLATES. (cont).	Leak in static line.	Test lines and connections for leaks. Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Substitute known-good indicator and check reading. Replace instrument.
HAND VIBRATES.	Excessive vibration.	Check shock mounts. Replace defective shock mounts.
	Defective diaphragm.	Substitute known-good indicator and check for vibration. Replace instrument.

15-22. TROUBLE SHOOTING--PITOT TUBE HEATER.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF."	Turn switch "ON."
	Popped circuit breaker.	Check visually. Reset breaker.
	Break in wiring.	Test for open circuit. Repair wiring.
	Heating element burned out.	Check resistance of heating element. Replace element.

15-23. PITOT TUBE ALIGNMENT. (Refer to figure 15-2.) For correct airspeed indication pitot tube (10) must be properly aligned. Open end of tube must be perpendicular to longitudinal axis of aircraft. A template like the one shown in figure 15-4 will prove the most convenient means of checking alignment. Prior to using template, check that pitot tube parallels row of rivets just outboard of tube. A straightedge may be placed along row of rivets to check the alignment. The template fits over the wing leading edge and should conform to the illustration. the illustration has been drawn carefully to actual size and may be traced directly on a piece of carbon paper between the printed page and the template material, then trace contours.

15-24. VACUUM SYSTEM. (Refer to figure 15-5.)

15-25. DESCRIPTION. Suction to operate the gyros is provided by a dry-type engine-driven vacuum pump, gear-driven through a spline-type coupling. A suction relief valve, to control system pressure, is connected between the pump inlet and the instruments. In the cabin, the vacuum line is routed from gyro instruments to the relief valve at the firewall. A 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 the central air filter becomes dirty, causing a lower reading on the suction gage.

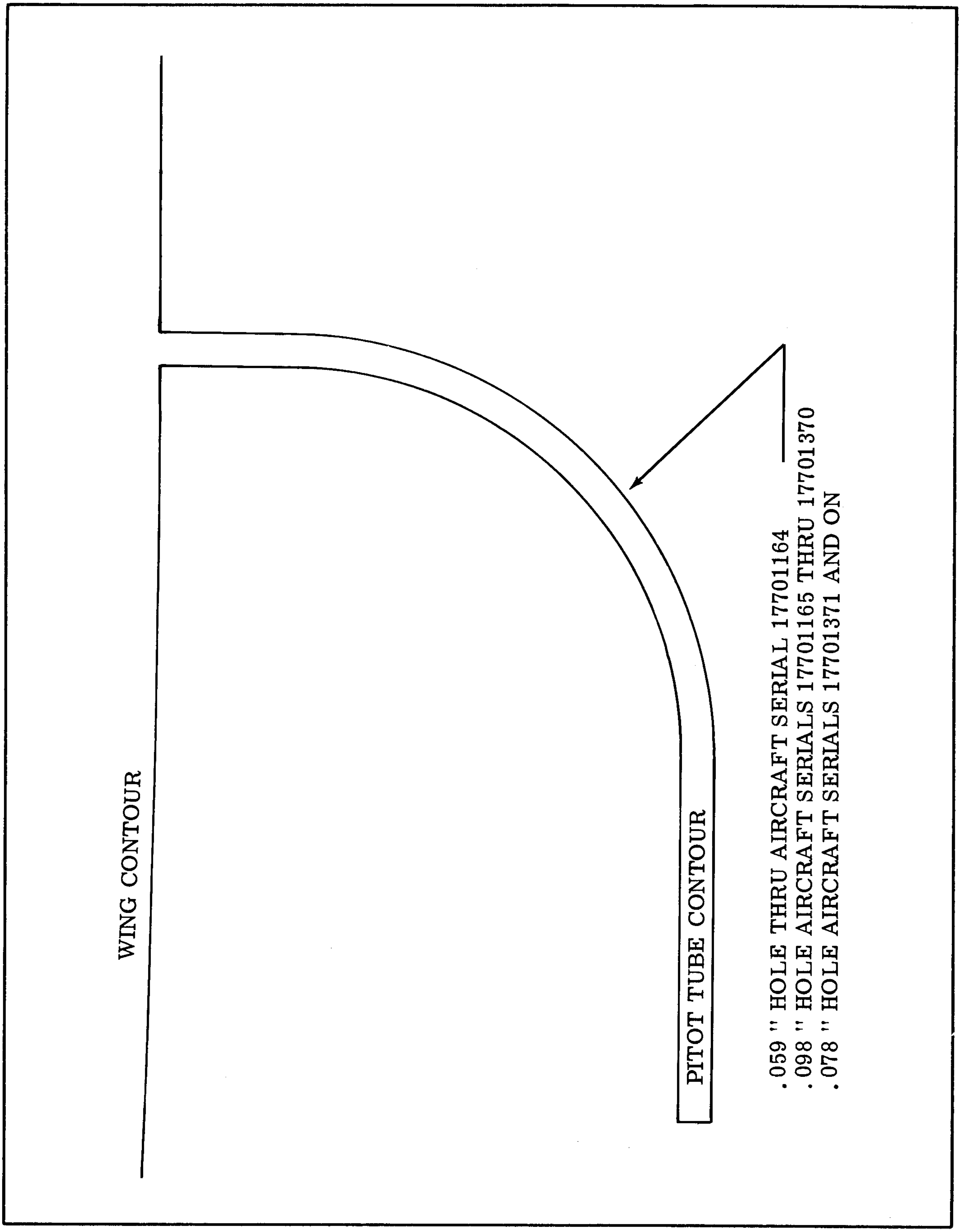


Figure 15-4. Pitot Tube Alignment Template

15-26. TROUBLE SHOOTING--VACUUM SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS.	Gyros function normally-relief valve screen clogged, relief valve malfunction.	Check screen, then valve. Compare gage readings with new gage. Clean screen, reset valve. Replace gage.
NORMAL SUCTION GAGE READING, SLUGGISH OR ERRATIC GYRO RESPONSE.	Instrument air filters clogged.	Check filter. Clean or replace filter.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump or restriction on pump discharge line.	Check lines for leaks, disconnect and test pump. Repair or replace lines, adjust or replace relief valve, repair or replace pump. Clean discharge lines.
	Central air filter dirty.	Check filter. Clean or replace filter.
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Check suction with test gage. Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace valve.

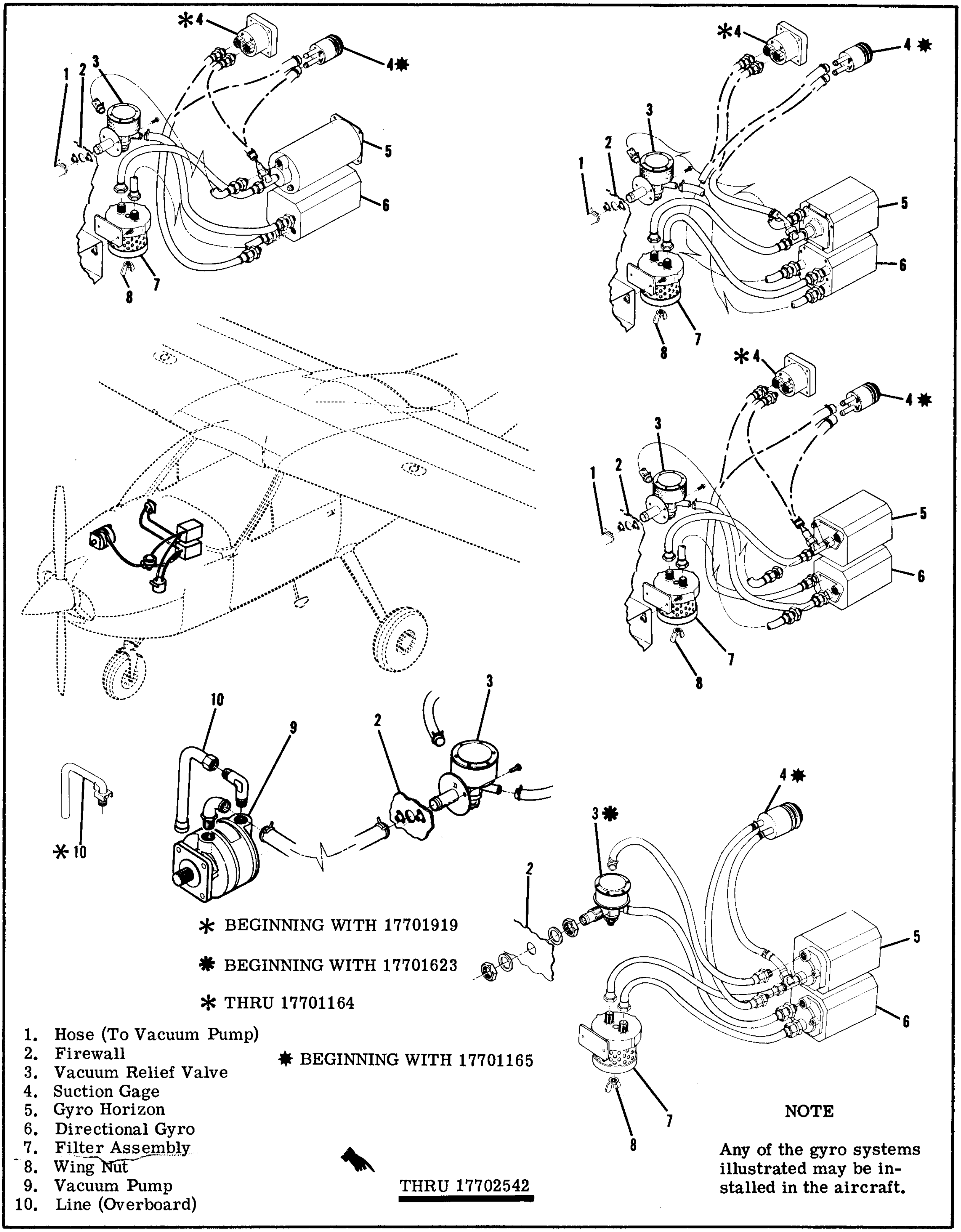
15-27. TROUBLE SHOOTING--GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central filter dirty.	Check filter. Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro response. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.

15-27. TROUBLE SHOOTING--GYROS. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central filter dirty.	Check filter. Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.
	Excessive vibration.	Check panel shock-mounts. Replace defective shock-mounts.
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Check filter. Clean or replace filter.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Substitute known-good suction gage and check gyro indication. Replace suction gage.
	Vacuum pump failure.	Check pump. Replace pump.
	Vacuum line kinked or leaking.	Check lines for damage and leaks. Repair or replace damaged lines, tighten connections.
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.

SHOP NOTES:

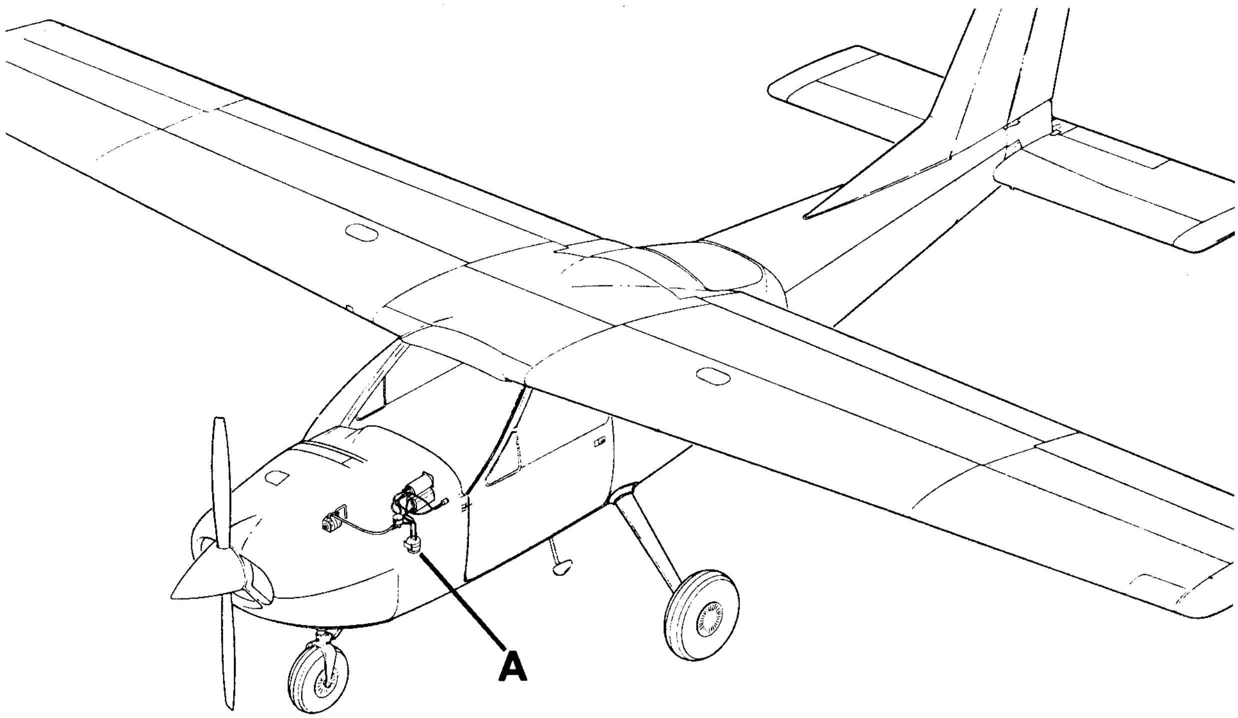


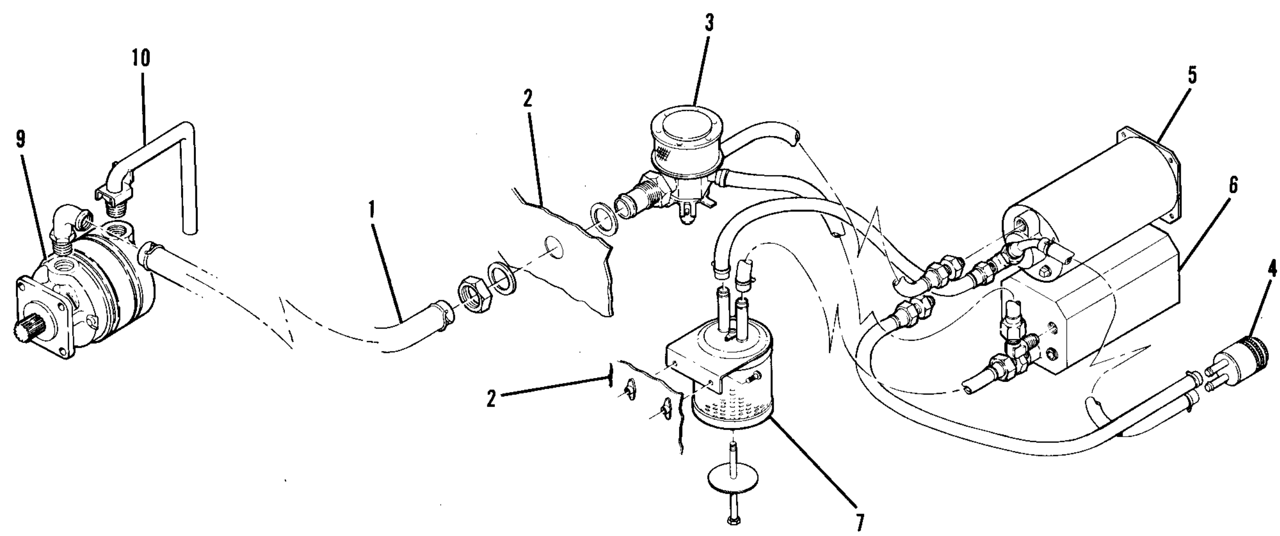
1. Hose (To Vacuum Pump)
2. Firewall
3. Vacuum Relief Valve
4. Suction Gage
5. Gyro Horizon
6. Directional Gyro
7. Filter Assembly
8. Wing Nut
9. Vacuum Pump
10. Line (Overboard)

NOTE

Any of the gyro systems illustrated may be installed in the aircraft.

Figure 15-5. Vacuum System (Typical) (Sheet 1 of 2)





Detail A

BEGINNING WITH 17702543

Figure 15-5. Vacuum System (Typical) (Sheet 2 of 2)

15-28. TROUBLE SHOOTING--VACUUM PUMP.

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve filter clogged.	Check filter for obstructions. Clean or replace filter.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Substitute known-good pump and check pump suction. Replace vacuum pump.
LOW PRESSURE.	Safety valve leaking.	Replace safety valve.
	Vacuum pump failure.	Substitute known-good pump and check pump pressure. Replace vacuum pump.

15-29. REMOVAL AND INSTALLATION OF COMPONENTS. The various components of vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. When replacing a vacuum system component, ensure connections are made correctly. Use thread lubricant sparingly and only on male threads. Avoid over-tightening connections. Before reinstalling a vacuum pump, place mounting pad gasket in position over studs. After installing pump, before connecting plumbing, start engine and check for evidence of oil in air discharge.

15-30. CLEANING. In general, low-pressure, dry compressed air should be used in cleaning vacuum system components. Components exposed to engine oil and dirt, should be washed with Stoddard solvent, then dried with a low-pressure air blast. Check hose for collapsed inner liners as well as external damage.

CAUTION

Never apply compressed air to lines or components installed in aircraft. The excessive pressures will damage gyros. If an obstructed line is to be blown out, disconnect at both ends and blow from instrument panel out.

15-31. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches of mercury is desirable for gyro instruments. However, a range of 4.6 to 5.4 inches of mercury is acceptable. To adjust the relief valve, remove control air filter, run engine to 1900 rpm on the ground and adjust relief valve to 5.3 ±.1 inches of mercury.

CAUTION

Do not exceed maximum engine temperature.

Be sure filter element is clean before installing. If reading drops noticeably, install new filter element.

15-32. ENGINE INDICATORS.

15-33. TACHOMETER.

15-34. 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, shaft housing must be free of kinks, dents and sharp bends. There should be no bend on a radius shorter than six inches and no bend within three inches of either terminal. If a tachometer is noisy or pointer oscillates, check cable housing for kinks, sharp bends and damage. Disconnect cable at tachometer and pull it out of housing. Check cable for worn spots, breaks and kinks.

NOTE

Before replacing a tachometer cable in housing, coat lower two thirds with AC Type ST-640 speedometer cable grease or Lubriplate No. 110. Insert cable in housing as far as possible, then slowly rotate to make sure it is seated in engine fitting. Insert cable in tachometer, making sure it is seated in drive shaft, then reconnect housing and torque to 50 pound-inches (at instrument).

15-35. OIL PRESSURE GAGE.

15-36. DESCRIPTION. Thru aircraft serial 17702123 a direct-reading, Bourdon tube-type oil pressure gage is installed. Pressure is transfered to the gage through a pressure line, filled with kerosene, connected to the engine main oil gallery. Beginning with aircraft serial 17702124 an electrical oil pressure gage is installed. The gage is mounted on a circuit board which compreses the back cover of the dual gage instrument cluster. The gage is electrically connected to the circuit board by the gage mounting screws. Power is supplied to the circuit board through the instrument light circuit breaker. A single wire connects the gage, through the circuit board, to a transducer mounted on the forward side of the firewall. Oil pressure is transmitted to the transducer through a pressure line connected to the engine main oil gallery.

15-37. TROUBLE SHOOTING.

a. THRU 17702123.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Check line.
	Pressure line broken.	Check line for leaks and damage. Replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on staff.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Check line for obstructions. Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Check line for leaks and damage. Repair or replace damaged line.

b. BEGINNING WITH 17702124.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER	Pressure line to transducer clogged.	Check line for obstructions. Clean line.
	Pressure line broken.	Check for leaks. Replace.
	No power to system.	Check circuit breaker. Reset. Check wiring. Replace.
	Transducer open.	Replace transducer.
GAGE READS INACCURATELY.	System out of calibration.	Apply 100 psi of regulated air pressure to transducer and adjust Trimpot to set pointer at max. red line on the gage.
	Trimpot faulty. Pointer moves erratically when Trimpot is rotated.	Replace cluster.

15-38. OIL TEMPERATURE GAGE.

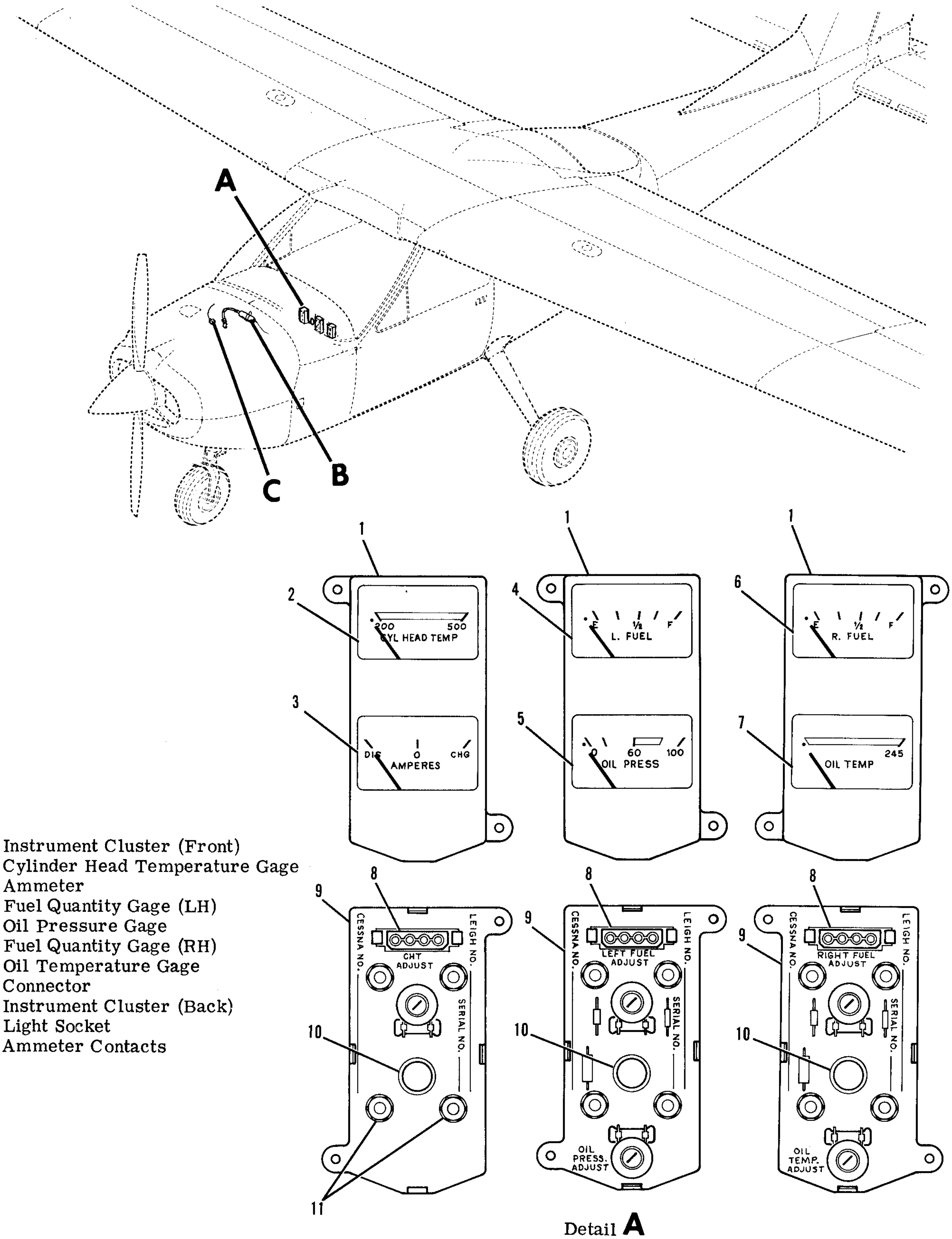
15-39. DESCRIPTION. Thru aircraft serial 17702123 the oil temperature gage is a Bourdon tube-type pres-instrument connected by armored capillary tubing to a temperature bulb in the engine. The temperature bulb, capillary tube and gage are filled with fluid and sealed. Expansion and contraction of fluid in the bulb with temperature changes operates gage. Checking capillary tube for damage and fittings for security is the only maintenance required. Since the tube's inside diameter is quite small, small dents and kinks which would be quite acceptable in larger tubing may partially or completely close off capillary, making gage inoperative. Beginning with aircraft serials 17702124 and electrical oil temperature gage is installed. The gage is mounted on a circuit board which comprises the back cover of the dual gage instrument cluster. The gage is electrically connected to the circuit board by the gage mounting screws. Power is supplied to the circuit board through the instrument lights circuit breaker. A single wire connects the gage, through the circuit board, to a transducer mounted on the aft, right hand side of the engine.

15-40. CARBURETOR AIR TEMPERATURE GAGE.

15-41. DESCRIPTION. The carburetor air temperature gage is of the resistance-bridge type. Changes in electrical resistance of the element are indicated by the gage, calibrated for temperature. The system requires power from the aircraft electrical system and operates only when the master switch is on. Although both instrument and sensing bulb are grounded, two leads are used to avoid possibility of instrument error induced by poor electrical bonds in the airframe.

15-42. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE POINTER STAYS OFF LOW END OF SCALE.	Circuit breaker out.	Check visually. Reset breaker.
	Master switch "OFF" or switch defective.	Check switch "ON." Replace defective switch.
	Broken or grounded leads between gage and sensing unit.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE POINTER GOES OFF HIGH END OF SCALE.	Broken or grounded lead.	Check circuit wiring. Repair or replace defective wiring.



1. Instrument Cluster (Front)
2. Cylinder Head Temperature Gage
3. Ammeter
4. Fuel Quantity Gage (LH)
5. Oil Pressure Gage
6. Fuel Quantity Gage (RH)
7. Oil Temperature Gage
8. Connector
9. Instrument Cluster (Back)
10. Light Socket
11. Ammeter Contacts

BEGINNING WITH 17702124

Figure 15-5A. Engine Instrument Installation (Leigh System) (Sheet 1 of 2)

17. Oil Pressure Line
18. Adapter (Used without Hourmeter)
19. Adapter (Used with Hourmeter)
20. Firewall
21. Pressure Switch (Hourmeter)
22. Washer
23. Bolt
24. Electrical Connector
25. Transducer (Oil Pressure)
26. Nut
27. Lockwasher
28. Wire (Oil Temperature)
29. Transducer (Oil Temperature)
30. Engine (Accessory Section)

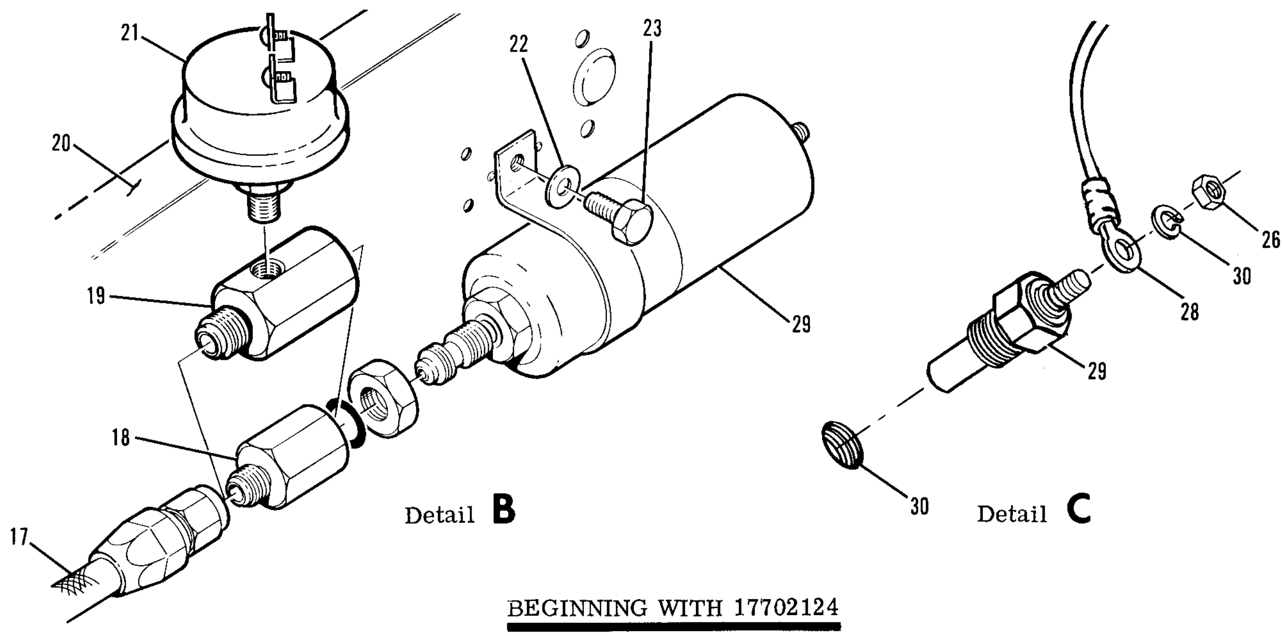


Figure 15-5A. Engine Instrument Installation (Leigh System) (Sheet 2 of 2)

15-42. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE POINTER GOES OFF HIGH END OF SCALE (cont.)	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE OPERATES INTERMITTENTLY.	Defective master switch, broken or grounded lead.	Check circuit wiring. Replace switch, repair or replace defective wiring.
	Defective gage or sensing unit.	Substiture known-good gage or sensing unit. Replace gage or sensing unit.
EXCESSIVE POINTER OSCILLATION.	Loose or broken lead.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
	Excessive vibration.	Check mounting screws. Tighten mounting screws.

15-42. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
OBVIOUSLY INCORRECT TEMPERATURE READING.	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
POINTER FAILS TO GO OFF SCALE WITH CURRENT OFF.	Defective master switch.	Replace switch.
	Defective gage.	Substitute known-good gage. Replace gage.

15-43. FUEL PRESSURE INDICATOR.

15-44. DESCRIPTION. The fuel pressure indicator is essentially a pressure gage calibrated in pounds-per-square-inch. Pressure for operating the indicator is obtained through a hose connected at the carburetor.

15-45. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Blow out line.
	Pressure line broken.	Check line for leaks and damage. 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.	Check line for obstruction. Blow out line.
	Clogged snubber orifice at carburetor fitting.	Replace fitting.
	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 line.	Check line for obstructions or leaks. Blow out dirty line, repair or tighten loose connections.

15-46. MANIFOLD PRESSURE GAGE.

15-47. DESCRIPTION. The manifold pressure gage is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury.

15-48. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Check line for obstructions. Blow out line.
JERKY MOVEMENT OF POINTER.	Excessive internal friction.	Replace instrument.
	Rocker shaft screws tight.	Replace instrument.
	Link springs too tight.	Replace instrument.
	Dirty pivot bearings.	Replace instrument.
	Defective mechanism.	Replace instrument.
	Leak in pressure line.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.
SLUGGISH OPERATION OF POINTER.	Foreign matter in line.	Check line for obstructions. Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Test line and connections for leaks. Repair or replace damaged line, tighten connections.
EXCESSIVE POINTER VIBRATION.	Tight rocker pivot bearings.	Replace instrument.
	Excessive vibration.	Check mounting screws. Tighten mounting screws.
IMPROPER CALIBRATION.	Faulty mechanism.	Replace instrument.

15-48. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
NO POINTER MOVEMENT.	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Check line and connections for breaks. Repair or replace damaged line.

15-49. CYLINDER HEAD TEMPERATURE GAGE.

15-50. DESCRIPTION. The cylinder head temperature gage is mounted in the dual instrument cluster on the pilots panel. A sending unit is installed in the lower side of No.3 cylinder. Thru 17702123 a potentiometer is externally mounted on the right hand gage mounting screw (contact), a single wire connects the potentiometer to the sending unit. A jumper wire connects the other mounting screw (contact) to the fuel quantity indicator lead from the instrument light circuit breaker. Beginning with 17702124 the back cover of the cluster is a circuit board. The gage is electrically connected through the circuit board to the board housing plug. One wire from the housing cap goes to the transducer, located in No. 3 engine cylinder, the other wire runs directly to the instrument light circuit breaker.

NOTE

A Cylinder Head Temperature Gage Calibration Unit, SK182-43 is available and may be ordered through the Cessna Service Parts Center.

15-51. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	No current to circuit.	Check circuit breaker and electrical circuit to gage. Repair electrical circuit.
	Defective gage, sending unit/ transducer or circuit	Isolate with ohmmeter check of circuits. Repair defective circuit. Replace sending unit/ transducer and gage.
GAGE FLUCTUATES RAPIDLY.	Loose or broken wire permitting alternate make and break of gage current.	Inspect circuit wiring. Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE.	High voltage. Gage off calibration.	Check voltage supply. Replace gage and sending unit/transducer.
GAGE READS TOO LOW ON SCALE.	Low voltage. Gage off calibration.	Check voltage supply. Replace gage and sending unit/transducer.
GAGE READS OFF SCALE AT HIGH END	Break in sending unit/transducer.	Replace sending unit/transducer and gage.
	Break in sending unit/transducer lead.	Replace sending unit/transducer and gage.
	Internal break in gage.	Replace gage and sending unit/transducer
OBVIOUSLY INCORRECT READING.	Defective gage mechanism.	Replace gage and sending unit/transducer
	Incorrect calibration.	Replace gage and sending unit/transducer

15-52. FUEL QUANTITY INDICATING SYSTEM.

15-53. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel tank. The full position of float produces a minimum resistance through transmitter, permitting maximum current flow through the fuel quantity indicator and maximum pointer deflection. As fuel level is lowered, resistance in transmitter is increased, producing a decreased current flow through fuel quantity indicator and a smaller pointer deflection.

15-53A. REMOVAL AND INSTALLATION.

a. Remove access plates on the underside of wing forward of the flap bellcrank.

b. Drain enough fuel from bay to lower fuel level below transmitter. (Observe precautions in paragraph 12-3.)

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.

f. Service fuel bay. Check for leaks and correct fuel quantity indication.

15-54. 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.

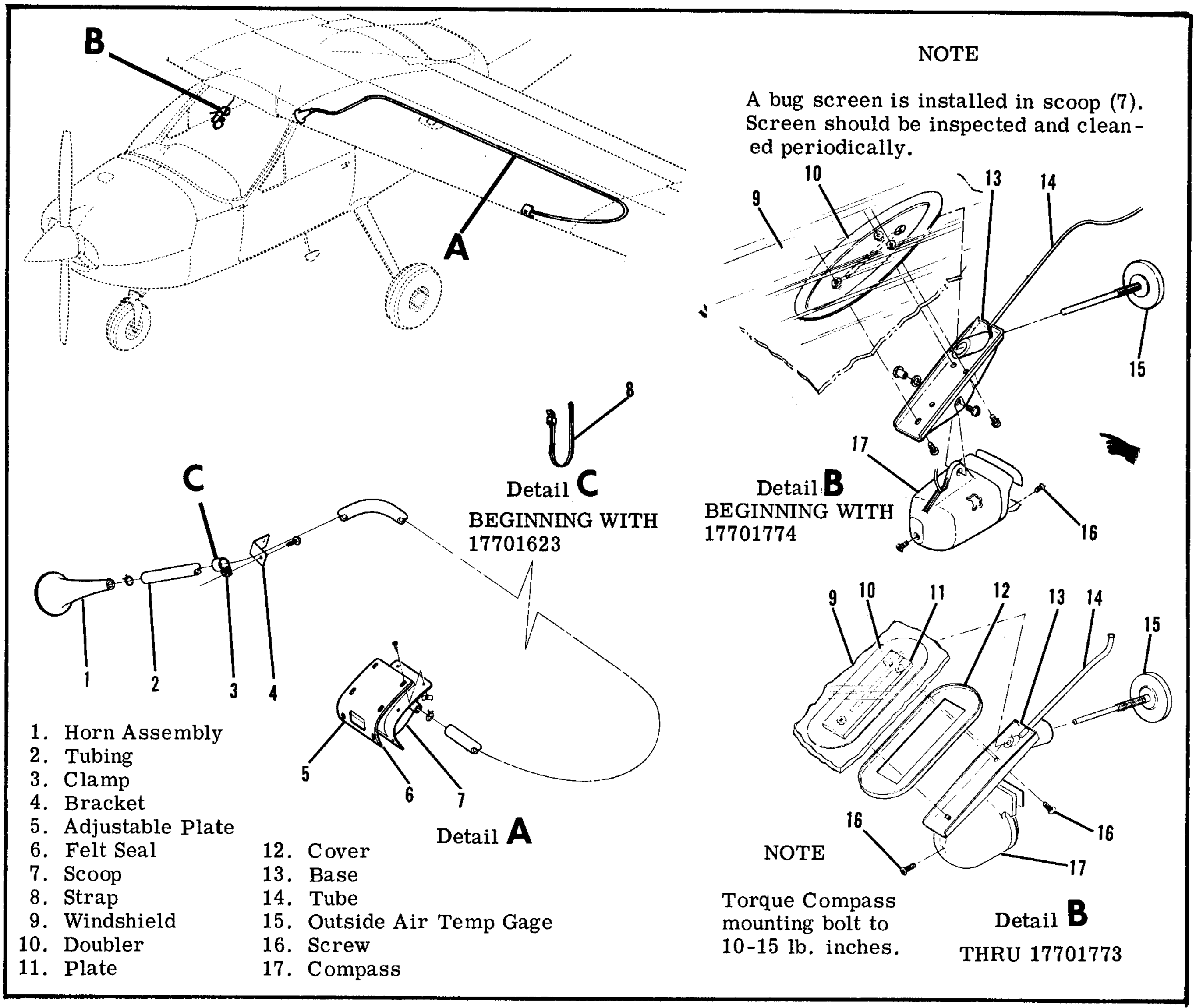


Figure 15-6. Stall Warning and Outside Air Temperature Gage Installation.

15-55. 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 bay. Transmitter calibration is obtained by adjusting float travel. Float travel is limited by float arm stops.

CAUTION

Use extreme caution while working with electrical components of fuel system. The possibility of electrical sparks around an "empty" fuel bay creates a hazardous situation.

Before installing transmitter, attach electrical wires and place master switch in "ON" position. Allow float arm to rest against lower float arm stop and read indicator. The pointer should be on E (empty) position. Adjust lower stop with float arm against stop so pointer indicator is on E. Raise float until arm is against upper stop and adjust stop to permit indicator pointer to be on F (full).

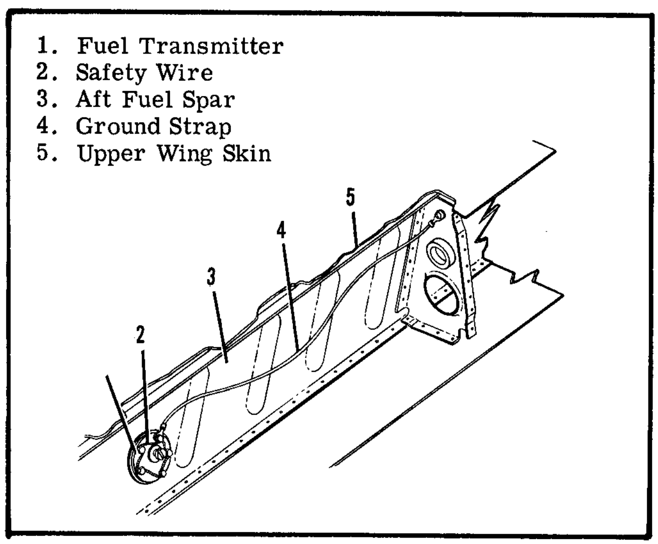


Figure 15-6A. Ground Strap Installation

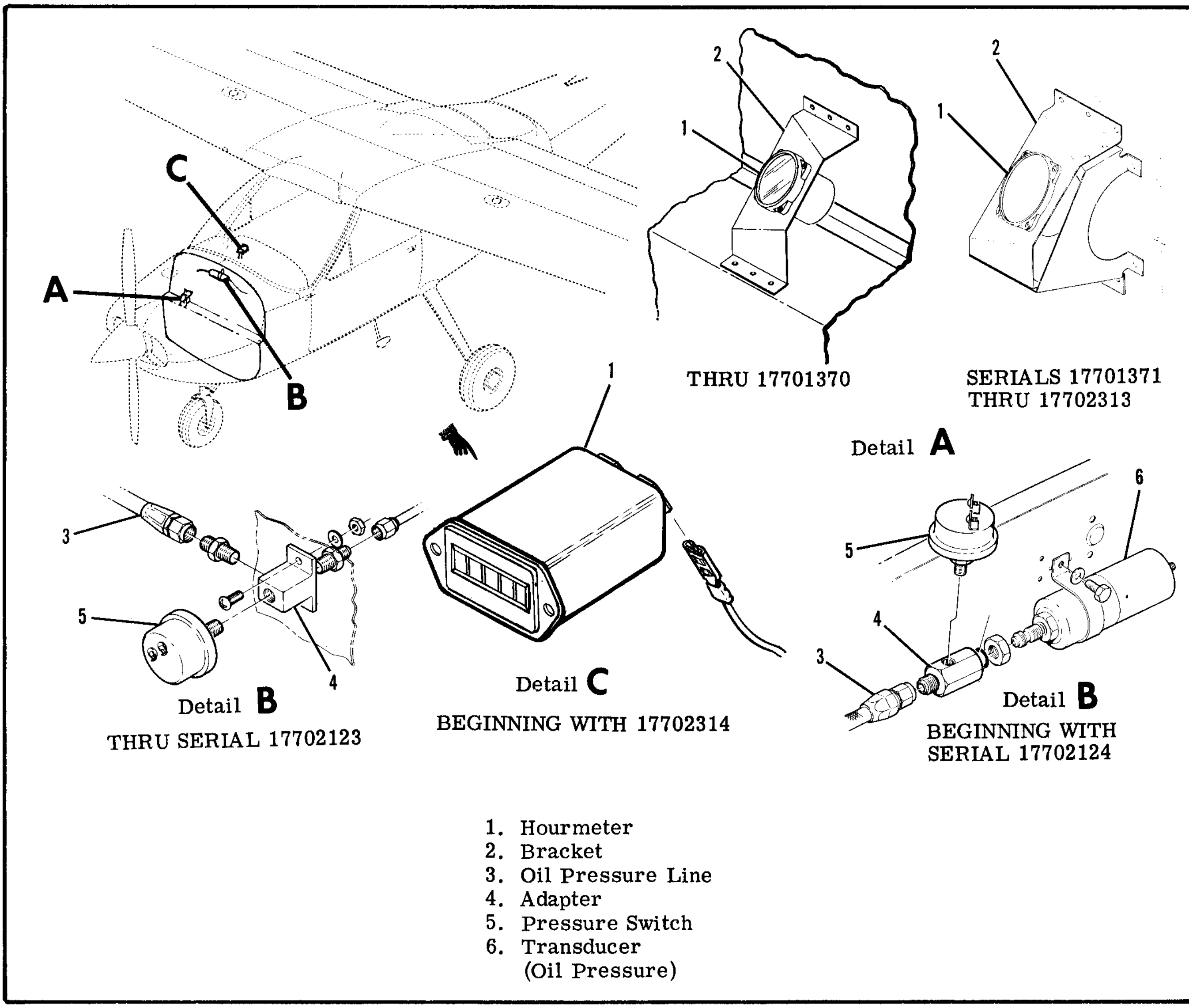


Figure 15-7. Hourmeter Installation

15-56. HOURMETER.

15-57. DESCRIPTION. The hourmeter is electrically operated and is actuated by a pressure switch in the oil pressure system. Electrical power is supplied through a one-amp fuse from the electrical clock circuit and therefore, will operate independent of the master switch. If no clock is installed, a line direct from the battery contactor provides power independent of the master switch through a one-amp fuse located adjacent to the battery box. An indicator on the dial face rotates when the meter is actuated. If the meter is inoperative and clock is operating, the meter or its wiring is faulty and must be replaced.

15-58. MAGNETIC COMPASS.

15-59. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from front of case. (See figure 15-6).

15-59A. OUTSIDE AIR TEMPERATURE GAGE. (See figure 15-6).
The compass is internally lighted, controlled by the panel lights rheostat. No maintenance is required on compass except an occasional check on a compass rose for adjustment of compensation and replacement of lamp.

15-60. ELECTRIC CLOCK.

15-61. DESCRIPTION. The electric clock is connected to the battery through a one-ampere fuse mounted adjacent to the battery box. The clock electrical circuit is separate from the aircraft electrical system and will operate when master switch is OFF.

15-62. STALL WARNING SYSTEM. (Refer to figure 15-6.)

15-63. DESCRIPTION. The system is composed of an adjustable plate on left wing leading edge, connected to a reed type horn by means of plastic tubing. The horn is actuated approximately 5 to 10 miles per hour above stalling speed as a negative air pressure area at wing leading edge causes a reverse flow of air through horn. By moving adjustable plate (5) up, actuation of horn will occur at a higher speed and moving plate down causes actuation to occur at a slower speed. Center adjustable plate opening in wing leading edge upon installation, then flight test aircraft, observing horn actuation during stall. Readjust plate to obtain desired results if necessary. Approximately 3/32 inch adjustment of plate will change speed at which horn actuation occurs by 5 miles per hour. To test horn operation, cover opening in plate (5) with a clean cloth, such as a handkerchief and apply a slight suction by mouth to draw air through horn.

15-64. TURN COORDINATOR.

15-65. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-rate turn indicator. Its gyro simultaneously senses rate of motion roll and yaw axes which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an a.c. brushless spin motor with a solid state inverter.

15-66. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator damping.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Measure voltage at instrument. Correct voltage.
	Inverter frequency changed.	Replace instrument.
NOISY MOTOR.	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	Check continuity and voltage. Correct voltage or replace faulty wire.
	Inverter malfunctioning.	Replace instrument.
	Motor shorted.	Replace instrument.
	Bearings frozen.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at instrument. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage to instrument. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

15-67. TURN-AND-SLIP INDICATOR.

15-68. DESCRIPTION. The turn-and-slip indicator is an electrically operated instrument powered by the aircraft electrical system, therefore, operating only when the master switch is ON.

15-69. TROUBLE SHOOTING.

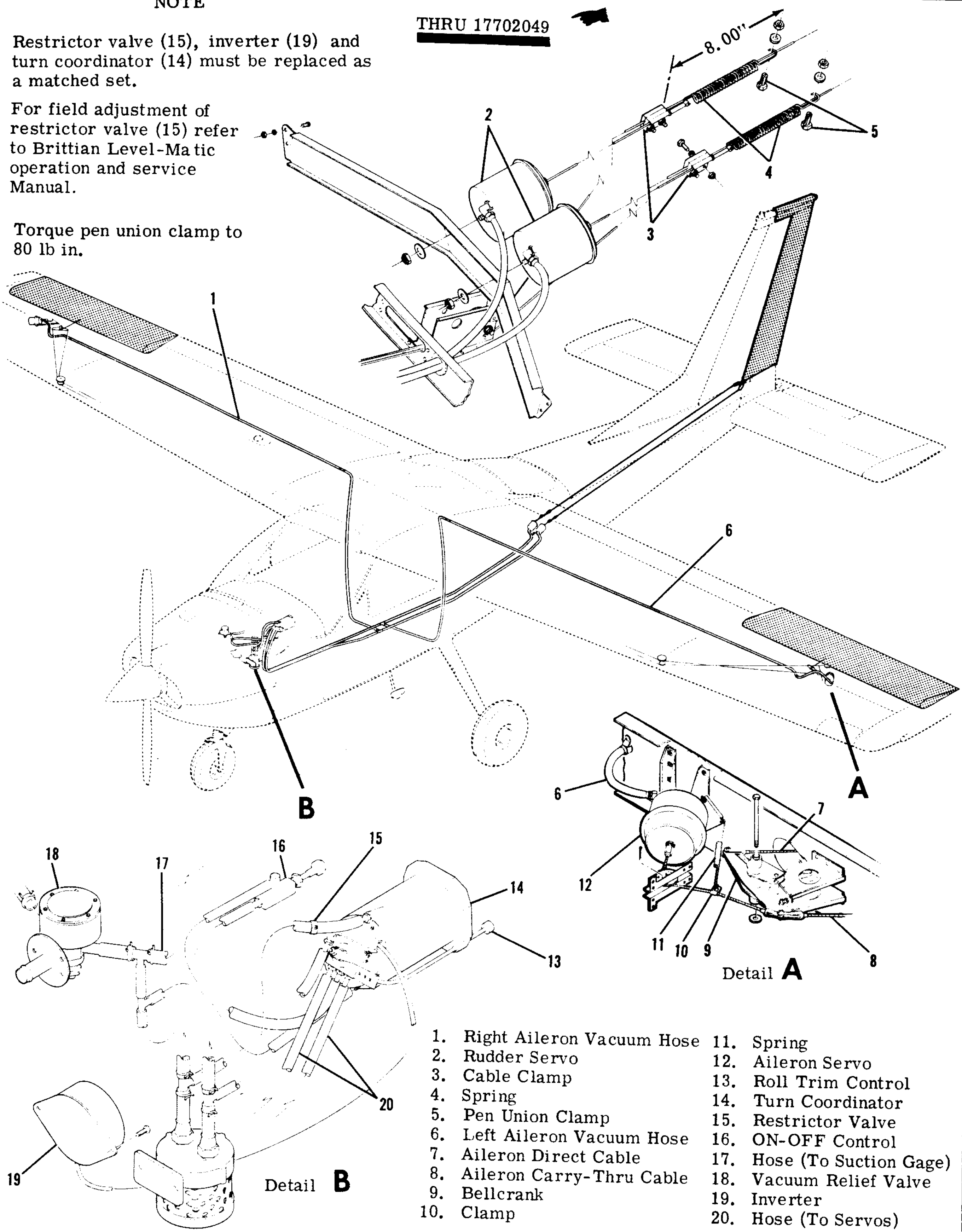
TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Internal fuse blown.	Check wiring for continuity, check voltage at indicator. Replace fuse, if fuse still blows, replace instrument.
	Master switch "OFF" or switch defective.	Check switch "ON." Replace defective switch.
	Broken or grounded lead to indicator.	Check circuit wiring. Repair or replace defective wiring.
	Indicator not grounded.	Check ground wire. Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage at indicator. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

NOTE

Restrictor valve (15), inverter (19) and turn coordinator (14) must be replaced as a matched set.

For field adjustment of restrictor valve (15) refer to Brittian Level-Matic operation and service Manual.

Torque pen union clamp to 80 lb in.



1. Right Aileron Vacuum Hose
2. Rudder Servo
3. Cable Clamp
4. Spring
5. Pen Union Clamp
6. Left Aileron Vacuum Hose
7. Aileron Direct Cable
8. Aileron Carry-Thru Cable
9. Bellcrank
10. Clamp
11. Spring
12. Aileron Servo
13. Roll Trim Control
14. Turn Coordinator
15. Restrictor Valve
16. ON-OFF Control
17. Hose (To Suction Gage)
18. Vacuum Relief Valve
19. Inverter
20. Hose (To Servos)

Figure 15-8. Wing Leveler Control System

15-70. WING LEVELER. THRU AIRCRAFT 17702049 (Refer to figure 15-8.)

15-71. DESCRIPTION. The wing leveler control system, consisting of a turn coordinator, pneumatic servos, connecting cables and hose may be installed. The turn coordinator gyro senses changes in roll attitude, then electrically meters vacuum power from the engine-driven vacuum pump to the cylinder-piston servos, operating ailerons for lateral stability. In addition to aileron servos, two servos are connected to the rudder cables and provide yaw stability that prevents excessive changes in heading in turbulent air. Manual control of system is afforded by the roll trim knob. Roll trim should not be used to correct faulty rigging or "wing heaviness." Manual override of system may be accomplished without damage to aircraft or system. The ON-OFF valve controls vacuum supply to distributor valve, but does not affect electrically operated turn coordinator gyro. Installation of wing leveler does not change vacuum relief valve settings. Refer to appropriate publication issued by the manufacturer for trouble shooting procedures.

15-72. RIGGING. (Refer to figure 15-8.)

a. Rudder controls and rudder must be in neutral position before clamps (3) are secured to cables.

b. While maintaining servos (2) in their neutral position, remove slack from servo cables by moving clamps (3) aft on rudder cables until servo cables become taut, then secure clamps (3) to cables.

c. Connect springs (4) to cable ends, then pull cables through clamps (3) until servos are fully extended but not stretched.

d. Position pen union clamps (5) on rudder cables 8.00 inches aft of clamp (3) and secure. Torque clamps to 80 pound-inches.

e. Aileron servos require no rigging if components are installed as illustrated in figure 15-8.

SHOP NOTES:

This page intentionally left blank.

SECTION 16

ELECTRICAL SYSTEMS

TABLE OF CONTENTS Page

16-1. ELECTRICAL SYSTEMS.

16-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Battery and External Power Supply System, Aircraft Lighting System, Pitot Heater, Cigar Lighter and Electrical Load Analysis.

16-3. ELECTRICAL POWER SUPPLY SYSTEM.

16-4. DESCRIPTION. Electrical energy for the aircraft is supplied by a 12-volt, direct-current, single-wire, negative ground electrical system. A single 12-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. An engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by a voltage regulator. An external power receptacle is offered as optional equipment to supplement the battery system for starting and ground operation.

16-5. SPLIT BUS BAR.

16-6. DESCRIPTION. Electrical power is supplied through a split bus bar. One side of the bus bar supplies power to the electrical equipment while the other side supplies the electronic installations. When the master switch is closed the battery contactor engages and the battery power is supplied to the electrical side of the split bus bar. The electrical bus feeds power to the electronic bus through a normally-closed relay; this relay opens when the starter switch is engaged or when an external power source is used, preventing transient voltages from damaging the semiconductor circuitry in the electronics installations.

16-7. SPLIT BUS POWER RELAY.

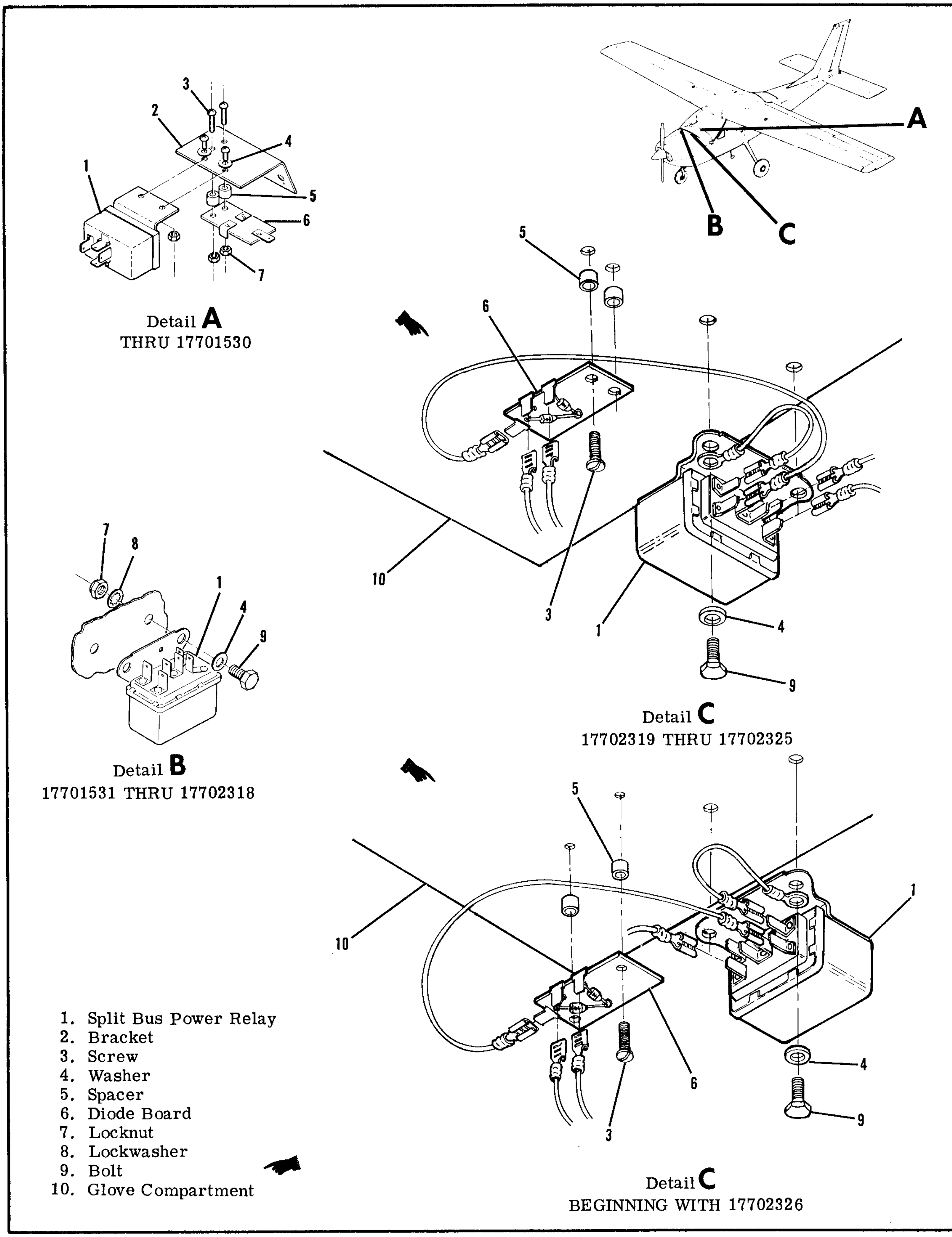
16-8. DESCRIPTION. A power relay is installed behind the instrument panel on all aircraft utilizing a split bus bar. The relay is a normally closed type, opening when external power is connected or when the starter is engaged, thus removing battery power from the electronic side of the split bus bar and preventing transient voltages from damaging the electronic installations. (See figure 16-1.)

16-9. MASTER SWITCH.

16-10. DESCRIPTION. The operation of the battery and alternator system is controlled by a master switch. On models prior to 1970 the switch is a rocker type with double-pole, single-throw contacts. The switch, when operated, connects the battery contactor coil to ground and the alternator field circuit to the battery, activating the power systems. On 1970 models and on, a new master switch is utilized. This switch is an inter-locking 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" above the switch and is located on the left hand side of the switch panel.

16-11. AMMETER.

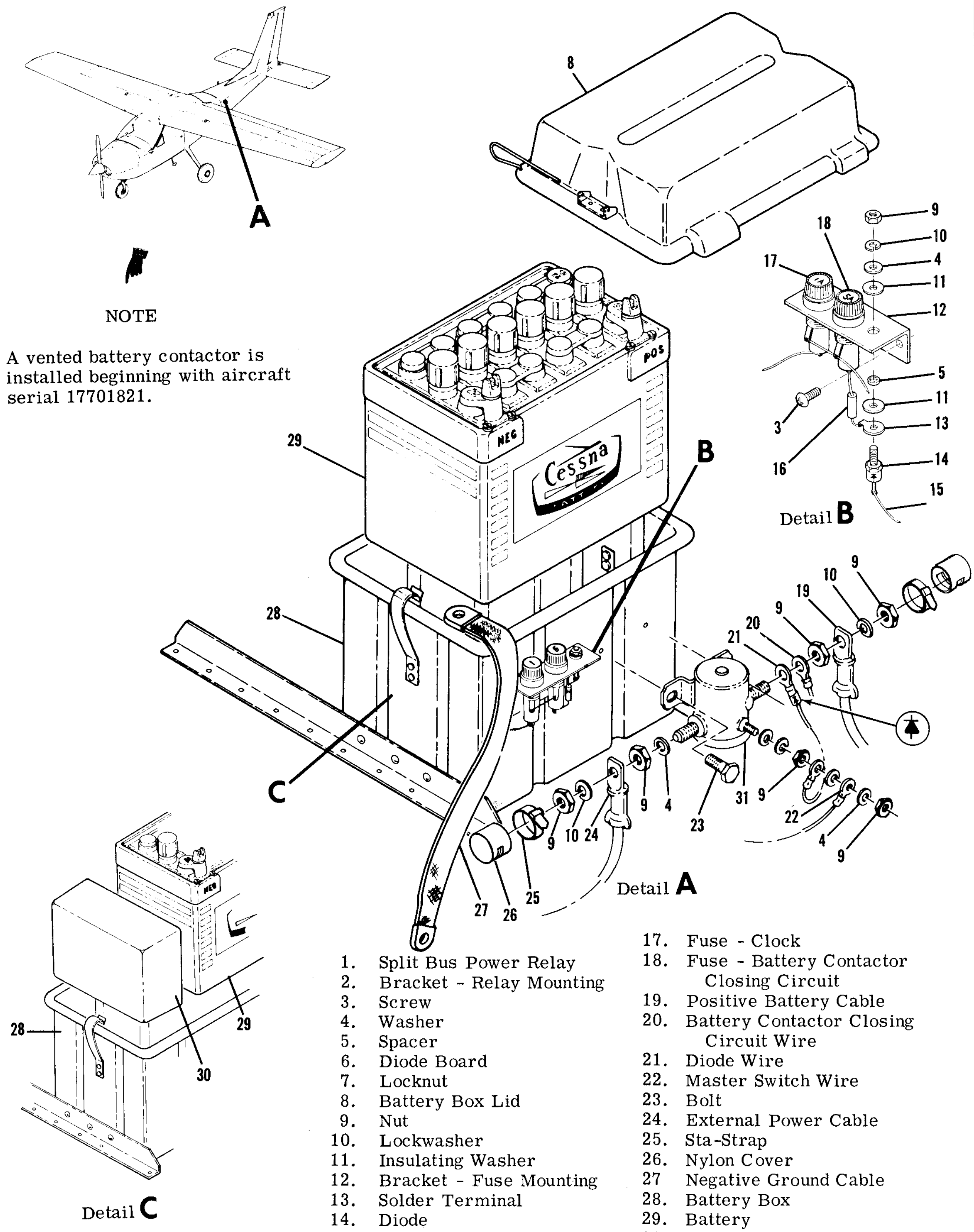
16-12. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed, the ammeter will show the full alternator output. When the battery is fully charged and cruise is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.



1. Split Bus Power Relay
2. Bracket
3. Screw
4. Washer
5. Spacer
6. Diode Board
7. Locknut
8. Lockwasher
9. Bolt
10. Glove Compartment

Figure 16-1. Split Bus Power Relay Installation

This page intentionally left blank.



1. Split Bus Power Relay
2. Bracket - Relay Mounting
3. Screw
4. Washer
5. Spacer
6. Diode Board
7. Locknut
8. Battery Box Lid
9. Nut
10. Lockwasher
11. Insulating Washer
12. Bracket - Fuse Mounting
13. Solder Terminal
14. Diode
15. Wire to Battery Contactor
16. Resistor
17. Fuse - Clock
18. Fuse - Battery Contactor Closing Circuit
19. Positive Battery Cable
20. Battery Contactor Closing Circuit Wire
21. Diode Wire
22. Master Switch Wire
23. Bolt
24. External Power Cable
25. Sta-Strap
26. Nylon Cover
27. Negative Ground Cable
28. Battery Box
29. Battery
30. Spacer
31. Contactor

Figure 16-2. Battery and Electrical Equipment Installation

16-13. BATTERY POWER SYSTEM.

16-14. BATTERY.

16-15. DESCRIPTION. The battery, furnished as standard equipment, is 12-volts and is approximately 25 ampere-hour capacity. A larger heavy duty battery is offered as optional equipment. The heavy duty battery is also 12-volts but is approximately 33 ampere hour capacity. The battery is mounted in the tailcone and is equipped with non-spill filler caps. Since the same battery box is used for both batteries, a spacer is utilized to fill the unused portion of the battery box when the smaller standard battery is installed. (See figure 16-2.)

16-16. 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 11.5 volts or more. If voltage is low, proceed to step 2. If voltage is normal, proceed to step 3.
	Battery faulty.	2. Check fluid level in cells and charge battery at 20 amps for approximately 30 minutes or until the battery voltage rises to 15 volts. Check battery with a load type tester. If tester indicates a good battery, the malfunction may be assumed to be a discharged battery. If the tester indicates a faulty battery, replace the battery.
	Faulty contactor or wiring between contactor or master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained check wiring between contactor and master switch. Also check master switch.
	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 16 to 24 ohms (Master switch open). If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil, proceed to step 5.
	Faulty contactor contacts.	5. Check voltage on "BUS" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittant, replace contactor. If voltage is normal, proceed to step 6.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE (cont).	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

16-17. REMOVAL AND INSTALLATION (Refer to figure 16-2.)

a. Remove aft baggage wall.
b. Remove the battery box cover.
c. Disconnect the ground cable from the negative battery terminal.

CAUTION

- When installing or removing battery always observe the proper polarity with the aircraft electrical system (negative to ground). Reversing the polarity, even momentarily, may result in failure of semiconductor devices (alternator diodes, radio protection diodes and radio transistors).
- Always remove the battery ground cable first and replace it last to prevent accidental short circuits.

d. Disconnect the cable from the positive terminal of the battery.
e. Lift the battery out of the battery box.
f. To replace the battery, reverse this procedure.

16-18. CLEANING THE BATTERY. For maximum efficiency the battery and connections should be kept clean at all times.

a. Remove the battery and connections in accordance with the preceding paragraph.
b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.
c. Wipe the battery cable ends, battery terminals and the entire surface of the battery with a clean cloth moistened with a solution of bicarbonate of soda (baking soda) and water.
d. Rinse with clear water, wipe off excess water and allow battery to dry.
e. Brighten up cable ends and battery terminals with emery cloth or a wire brush.
f. Install the battery according to the preceding paragraph.
g. Coat the battery terminals with petroleum jelly or an ignition spray product to reduce corrosion.

16-19. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water, however will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level with the horizontal baffle plate or the split ring on the filler neck inside the battery. When "dry charged" batteries are put into service fill as directed with electrolyte. When the electrolyte level falls below normal with use, add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

16-20. TESTING THE BATTERY. The specific gravity of the battery may be measured with a hydrometer to determine the state of battery charge. If the hydrometer reading is low, slow-charge the battery and retest. Hydrometer readings of the electrolyte must be compensated for the temperature of the electrolyte. Some hydrometers have a built-in thermometer and conversion chart. The following chart shows the battery condition for various hydrometer readings with an electrolyte temperature of 80° Fahrenheit.

SHOP NOTES:

BATTERY HYDROMETER READINGS

READINGS	BATTERY CONDITION
1.280 Specific Gravity	100% Charged
1.250 Specific Gravity	75% Charged
1.220 Specific Gravity	50% Charged
1.190 Specific Gravity	25% Charged
1.160 Specific Gravity	Practically Dead

NOTE

All readings shown are for an electrolyte temperature of 80° Fahrenheit. For higher temperatures the readings will be slightly lower. For cooler temperatures the readings will be slightly higher. Some hydrometers will have a built-in temperature compensation chart and a thermometer. If this type tester is used, disregard this chart.

16-21. CHARGING THE BATTERY. When the battery is to be charged, the level of the electrolyte should be checked and adjusted by adding distilled water to cover the tops of the internal battery plates. Remove the battery from the aircraft and place in a well ventilated area for charging.

WARNING

- When a battery is being charged, hydrogen and oxygen gases are generated. Accumulation of these gases can create a hazardous explosive condition. Always keep sparks and open flame away from the battery.
- Allow unrestricted ventilation of the battery area during charging.

The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Test the battery with a hydrometer to determine the amount of charge. Decrease the charging rate or stop charging temporarily if the battery temperature exceeds 125°F.

16-22. BATTERY BOX.

16-23. DESCRIPTION. The battery is completely enclosed in an acid resistant plastic box which is riveted to mounting brackets in the tailcone. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape.

16-24. REMOVAL AND INSTALLATION. (Refer to figure 16-2.) The battery box is riveted to the mounting brackets in the tailcone. The rivets must be drilled out to remove the box.

16-25. MAINTENANCE OF BATTERY BOX. The battery box should be inspected and cleaned periodically. The box and cover should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water. Hard deposits may be removed with a wire brush. When all corrosive deposits have been removed from the box, flush it thoroughly with clean water.

WARNING

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

Inspect the cleaned box and cover for physical damage and for areas lacking proper acid proofing. A badly damaged or corroded box should be replaced. If the box or lid require acid proofing, paint the area with acid proof paint Part No. CES 1054-529, available from the Cessna Service Parts Center.

16-26. BATTERY CONTACTOR.

16-27. DESCRIPTION. The battery contactor is bolted to the side of the battery box. The contactor is a plunger type contactor which is actuated by turning the master switch on. When the master switch is off, the battery is disconnected from the electrical system. A silicon diode is used to eliminate spiking of transistorized radio equipment. The large terminal of the diode connects to the battery terminal of the battery contactor. The small terminal of the diode and the master switch wire connect to the coil terminal of the battery contactor. Nylon covers are installed on the contactor terminals to prevent accidental shorts. (See figure 16-2.)

16-28. REMOVAL AND INSTALLATION. (Refer to figure 16-2.)

a. Remove the battery box cover and disconnect the ground cable from the negative battery terminal and 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 silicon diode which is connected to the battery terminal and the coil terminal.

e. Remove the bolt, washer and nut securing each side of the battery contactor to the battery box. The contactor will now be free for removal.

f. To replace the contactor, reverse this procedure.

16-29. BATTERY CONTACTOR CLOSING CIRCUIT.

16-30. DESCRIPTION. This circuit consists of a 5-amp fuse, a resistor and a diode mounted on a bracket on the side of the battery box. This serves to shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself.

16-31. GROUND SERVICE RECEPTACLE.

16-32. DESCRIPTION. A ground service receptacle is offered as optional equipment to permit use of external power for cold weather starting or when performing lengthy electrical maintenance. A reverse polarity protection system is utilized whereby ground power must pass through an external power contactor to be connected to the bus. A silicon junction diode is connected in series with the coil on the external power contactor so that if the ground power source is inadvertently connected with a reverse polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices, used in the aircraft from possible reverse polarity damage.

NOTE

Maintenance of the electronic installation cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronic bus. For lengthy ground testing of electronic systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for 14-volts and close the master switch.

NOTE

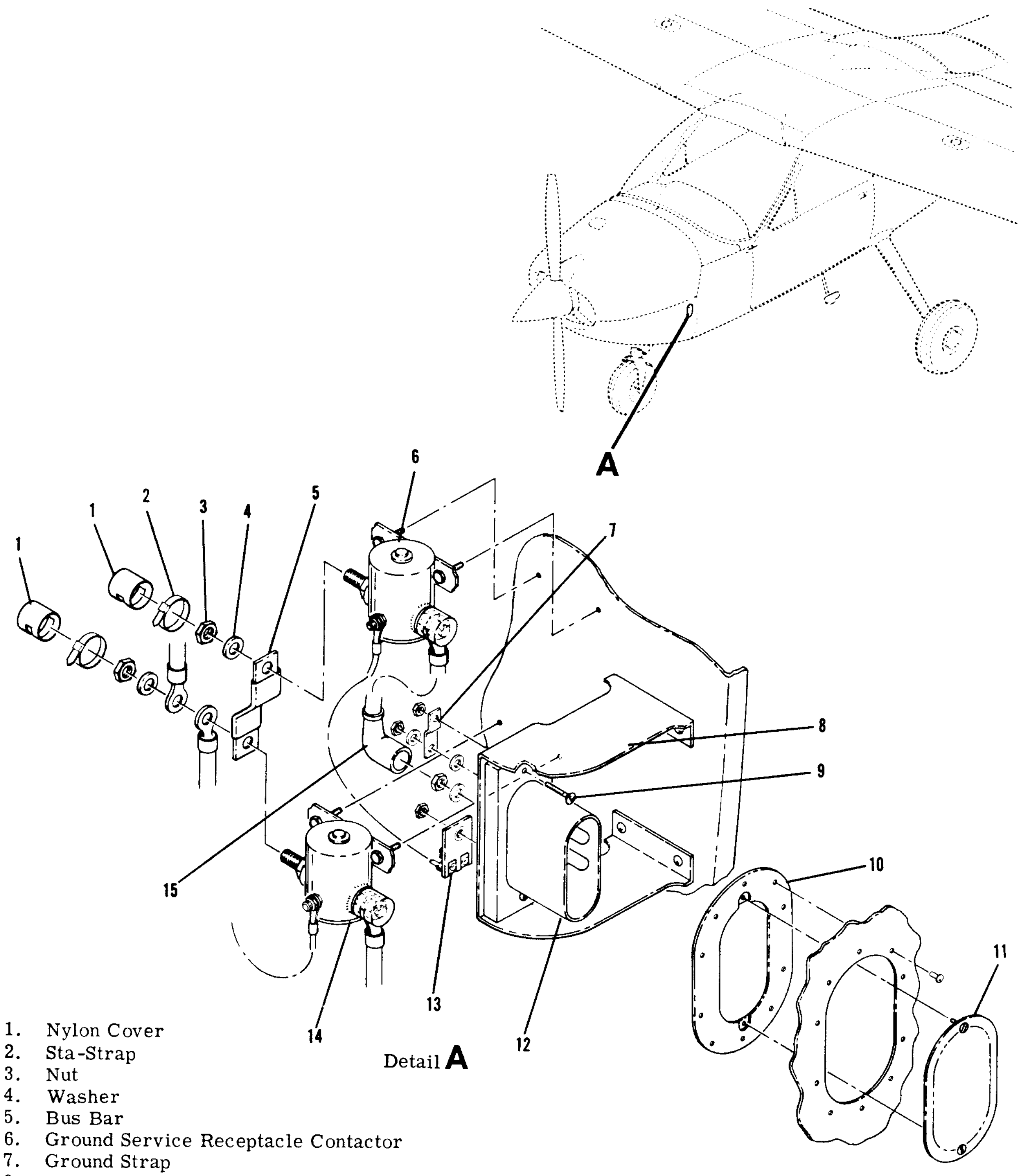
When using ground power to start the aircraft, close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field in the event that the battery is completely dead.

CAUTION

Failure to observe polarity when connecting an external power source directly to the battery or directly to the battery side of the battery contactor, will damage the diodes in the alternator and other semiconductor devices in the aircraft.

16-33. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	Check wiring to, and condition of diode mounted on the split bus relay bracket adjacent to the magneto switch. Correct wiring. Replace diode board assembly.
GROUND POWER WILL NOT CRANK ENGINE.	Ground service connector wired incorrectly.	1. Check for voltage at all three terminals of external power contactor with ground power connected and master switch off. If voltage is present on input and coil terminals but not on the output terminal, proceed to step 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals, check wiring between contactor and bus.
		2. Check for voltage at small terminal of ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.



1. Nylon Cover
2. Sta-Strap
3. Nut
4. Washer
5. Bus Bar
6. Ground Service Receptacle Contactor
7. Ground Strap
8. Bracket
9. Screw
10. Doubler
11. Cover Plate
12. Ground Service Receptacle
13. Diode Board
14. Starter Contactor
15. Nipple

Figure 16-3. Ground Service Receptacle Installation

16-33. TROUBLE SHOOTING. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE. (Cont).	Open or mis-wired diode on ground service diode board assembly.	3. Check polarity and continuity of diode on diode board at rear of ground service receptacle. If diode is open or improperly wired, replace diode board assembly.
	Faulty external power contactor.	4. Check resistance from small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged). Normal indication is 16-24 ohms. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.
	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

16-34. REMOVAL AND INSTALLATION. (Refer to figure 16-3.)

a. Open the battery box and diconnect the ground cable from the negative terminal of the battery and pull the cable from the battery box.

b. Remove the nuts, washers, ground strap and diode board from the studs of the receptacle and remove the battery cable.

c. Remove the screws and nuts holding the receptacle. The receptacle will then be free from the bracket.

d. To install a ground service receptacle, reverse this procedure. Be sure to place the ground strap on the negative stud of the receptacle.

16-35. ALTERNATOR POWER SYSTEM.

16-36. DESCRIPTION. The alternator system consists of an engine driven alternator, a voltage regulator mounted on the left hand side of the firewall and a circuit breaker located on the instrument panel. The system is controlled by the left hand portion of the split rocker, master switch labeled ALT. Beginning with 1972 models an over-voltage sensor switch and red warning light labeled HIGH VOLTAGE are incorporated to protect the system, (refer to paragraph 16-46). The aircraft battery supplies the source of power for excitation of the alternator.

16-37. ALTERNATOR.

16-38. DESCRIPTION. The 60-ampere alternators used on the 177 model are three-phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 14-volts at 60-amperes continuous output. The moving center part of the alternator (rotor) consists of an axial winding with radial interlocking poles which surround the winding. With excitation applied to the winding through slip rings, the pole pieces assume magnetic polarity. The rotor is mounted in bearings and rotates inside the stator which contains the windings in which the ac is generated. The stator windings are three-phase, delta connected, and are attached to two diode plates, each of which contain three silicon diodes.

The diode plates are connected to accomplish full-wave, rectification of the ac. The resulting dc output is applied to the aircraft bus and sensed by the voltage regulator. The regulator contorls the excitation applied to the alternator field, thus controlling the output voltage of the alternator.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON.	Shorted radio noise filter or shorted wire.	1. Remove cable from output terminal of alternator. Check resistance from end of cable to ground (MASTER SWITCH MUST BE OFF). If resistance does not indicate a direct short, proceed to step 4. If resistance indicates a direct short, proceed to step 2.
		2. Remove cable connections from radio noise filter. Check resistance from the filter input terminal to ground. Normal indication is infinite resistance. If reading indicates a direct short, replace filter. If no short is evident, proceed to step 3.
		3. Check resistance from ground to the free ends of the wires which were connected to the radio noise filter (or alternator if no noise filter is installed). Normal indication does not show a direct short. If a short exists in wires, repair or replace wiring.
	Shorted diodes in alternator.	4. Check resistance from output terminal of alternator to alternator case. Reverse leads and check again. Resistance reading may show continuity in one direction but should show an infinite reading in the other direction. If an infinite reading is not obtained in at least one direction, repair or replace alternator.
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.	Regulator faulty or improperly adjusted.	1. Start engine and adjust for 1500 RPM. Ammeter should indicate a heavy charge rate with all electrical equipment turned off. Rate should taper off in 1-3 minutes. A voltage check at the bus should indicate a reading consistant with the voltage vs temperature chart in the Cessna Alternator Charging Systems Service/Parts Manual. If charge rate tapers off very quickly and voltage is normal, check battery for malfunction. If ammeter shows a low charge rate or any discharge rate, and voltage is low, proceed to step 2.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED (Cont).	Regulator faulty or improperly adjusted. (Cont.)	2. Stop engine, remove cowl, and remove cover from voltage regulator. Turn master switch ON/OFF several times and observe field relay in regulator. Relay should open and close with master switch and small arc should be seen as contacts open. If relay is inoperative, proceed to step 3. If relay operates, proceed to step 4.
		3. Check voltage at "S" terminal of regulator with master switch closed. Meter should indicate bus voltage. If voltage is present, replace regulator. If voltage is not present, check wiring between regulator and bus.
		4. Remove plug from regulator and start engine. Momentarily jumper the "A+" and "F" terminals together on the plug. Ship's ammeter should show heavy rate of charge. If heavy charge rate is observed, replace regulator. If heavy charge rate is not observed, proceed to step 5.
	Faulty wiring between alternator and regulator, or faulty alternator.	5. Check resistance from "F" terminal of regulator to "F" terminal of alternator. Normal indication is a very low resistance. If reading indicates no, or poor continuity, repair or replace wiring from regulator to alternator.
		6. Check resistance from "F" terminal of alternator to alternator case. Normal indication is 6-7 ohms. If resistance is high or low, repair or replace alternator.
		7. Check resistance from case of alternator to airframe ground. Normal indication is very low resistance. If reading indicates no, or poor continuity, repair or replace alternator ground wiring.

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with voltage vs temperature chart in the Cessna Alternator Charging Systems Service/Parts Manual. Observe ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.
OVER-VOLTAGE WARNING LIGHT ON.	Regulator faulty or improperly adjusted. Faulty sensor switch.	1. With engine running turn off and on battery portion of the master switch. If the light stays on shut down engine then turn on the "BAT and "ALT" portions of the master switch. Check for voltage at the "S" terminal of the voltage regulator. If voltage is present adjust or replace regulator. If voltage is not present check master switch and wiring for short or open condition. If wiring and switch are normal replace sensor.

16-40. REMOVAL AND INSTALLATION. (Refer to figure 16-4.)

a. Ensure that master switch is off and the negative lead is disconnected from the battery.
b. Remove wiring from the alternator and label.
c. Remove safety wire from the upper adjusting bolt and loosen bolt.
d. Remove safety wire from lower adjusting bolt and remove bolt.
e. Remove the locknut from the alternator mounting bolt.
f. Remove the alternator drive belt and the alternator mounting bolt, the alternator will then be free for removal.
g. To replace the alternator, reverse this procedure.
h. Apply a torque wrench to the nut on alternator pulley and adjust the belt tension so the belt slips when the following torque value is applied.

TORQUE VALUES FOR CHECKING ALTERNATOR BELT TENSION

Used Belt	New Belt
Slips At 7 to 9 Ft. Lbs.	Slips At 11 to 13 Ft. Lbs

—NOTE—

Whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

i. Tighten and safety wire upper and lower adjusting bolts.
j. Tighten alternator mounting bolt.

16-41. ALTERNATOR FIELD CIRCUIT PROTECTION. On models prior to 1970, a 2-amp automatic resetting circuit breaker located on the back of the instrument panel is provided to protect the alternator field circuit. On 1970 models and on, a manually-resettable circuit breaker located on the switch panel is provided to protect the alternator field circuit.

16-42. ALTERNATOR VOLTAGE REGULATOR. THRU AIRCRAFT SERIAL 17702313.

16-43. DESCRIPTION. The alternator voltage regulator contains two relays. One relay is actuated by the aircraft master switch and connects the regulator to the battery. The second relay is a two-stage, voltage sensitive device, which is used to control the current applied to the field winding of the alternator. When the upper set of contacts on the voltage regulator relay are closed, full bus voltage is applied to the field. This condition will exist when the battery is being heavily charged or when a very heavy load is applied to the system. When the upper contacts open, as the voltage begins to rise toward normal bus voltage to the alternator field is reduced through a resistor network in the base of the regulator, thus reducing the output from the alternator. As the voltage continues to rise, assuming a very light load on the system, the lower contacts will close and ground the alternator field and shut the alternator completely off. Under lightly loaded conditions the voltage relay will vibrate between the intermediate charge rate and the lower (completely off) contacts. Under a moderate load, the relay will vibrate between the intermediate charge rate and the upper (full output) contacts.

The voltage relay is temperature compensated so that the battery is supplied with the proper charging voltage for all operating temperatures. With the battery fully charged (ship's ammeter indicating at or near zero) and a moderate load applied to the system (a taxi light turned on), the voltage at the bus bar should be within the range shown according to the voltage vs temperature chart in the Cessna Alternator Charging Systems Service/Parts Manual.

The voltage regulator is adjustable, but adjustment on the aircraft is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.

16-43A. ALTERNATOR VOLTAGE REGULATOR. BEGINNING WITH AIRCRAFT SERIAL 17702314.

16-43B. DESCRIPTION. The voltage regulator is semi-solid state. The mechanical relay in the regulator is actuated by the aircraft master switch and connects the regulator to the battery. The solid-state portion is voltage sensitive and controls the current applied to the field windings of the alternator. The regulator is a remove and replace item and not repairable. The regulator is adjustable, but adjustment on the aircraft is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.

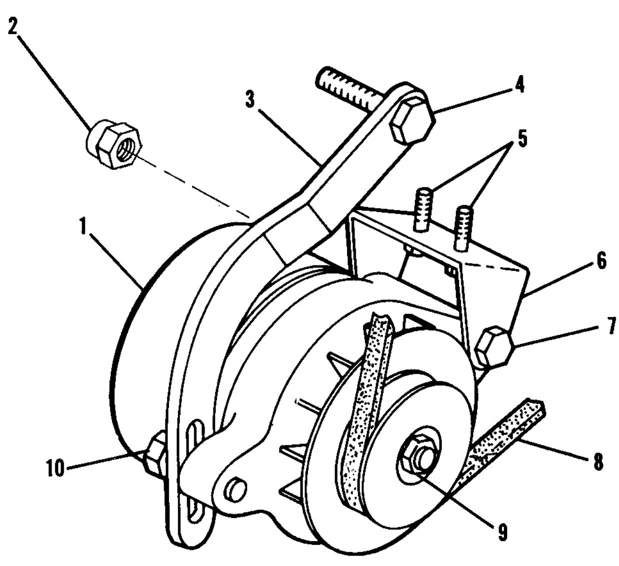
16-44. TROUBLE SHOOTING. For trouble shooting the voltage regulator, refer to paragraph 16-39.

16-45. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

a. Make sure that the master switch is off, or disconnect the negative lead from the battery.
b. Remove the connector plug from the regulator.
c. Remove two screws holding the regulator on the firewall.
d. To replace the regulator, reverse the procedure. Be sure that the connections for grounding the alternator, wiring shields and the base of the regulator are clean and bright before assembly. Otherwise, poor voltage regulation and/or excessive radio noise may result.

16-46. OVER-VOLTAGE WARNING SYSTEM.

16-47. DESCRIPTION. Beginning with 1972 Models, an over-voltage warning system is incorporated in the aircraft. The over-voltage warning system consists of an over-voltage sensor switch and a red warning light labeled, "HIGH VOLTAGE", on the instrument panel. When an over-voltage tripoff occurs the over-voltage sensor turns off the alternator system and the red warning light comes on. The ammeter will show a discharge. Turn off both sections of the Mas-Switch to recycle the over-voltage sensor. If the over-voltage condition was transient, the normal alternator charging will resume and no further action is necessary. If the over-voltage tripout recurs, then a generating system malfunction has occurred such that the electrical accessories must be operated from the aircraft battery only. Conservation of electrical energy must be practiced until the flight can be terminated. The over-voltage red warning light filament can be tested by turning off the Alternator portion of the Master Switch and leaving the Battery portion turned on. This test does not induce an over-voltage condition on the electrical system. On models prior to aircraft serial 17701690, should nuisance trip-outs occur caused by voltage spiks or transient voltage, Cessna Single-engine Service Letter SE72-15 dated April 21, 1972 should be complied with.

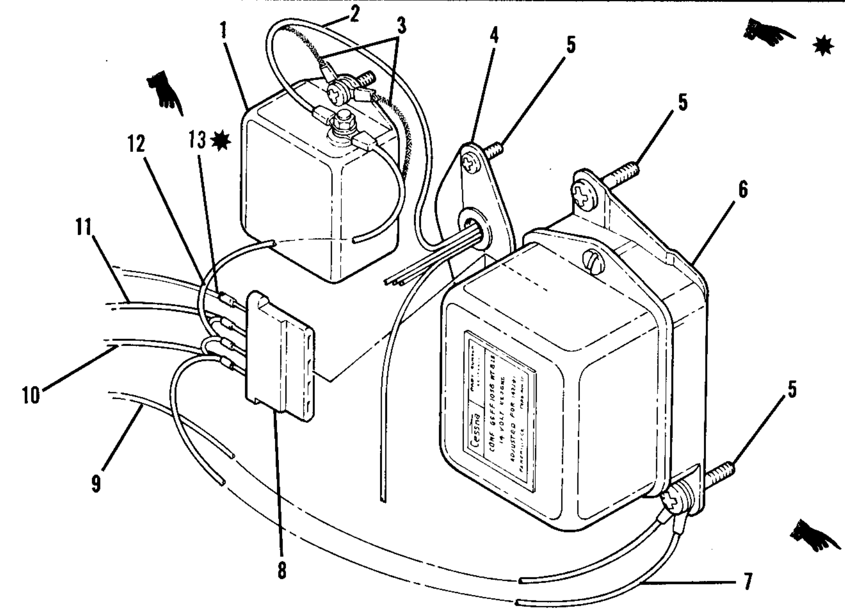


WARNING

On models manufactured prior to mid 1971 should alternator thru-bolt loosening or breaking occur, Cessna Service Letter SE71-40 dated November 24, 1971 should be complied with. On models manufactured after mid 1971 a new high strength thru-bolt and a K shaped retainer are installed. Torque bolts 45 to 55 pound-inches.

1. Alternator
2. Locknut
3. Adjusting Bracket
4. Upper Adjusting Bolt
5. Mounting Bracket Bolt
6. Mounting Bracket
7. Alternator Mounting Bolt
8. Drive Belt
9. Alternator Pulley Nut
10. Lower Adjusting Bolt

Figure 16-4. Alternator Installation



✱ BEGINNING WITH 17701634

1. Filter - Radio Noise
2. Wire to Master Switch
3. Shields - Ground
4. Firewall Shield
5. Screw
6. Voltage Regulator
7. Wire Shields to Ground
8. Housing
9. Wire to Alternator Ground
10. Wire to Alternator "F"
11. Wire to Alternator "A+"
12. Wire to Filter
13. Wire to Over-Voltage Light

Figure 16-5. Voltage Regulator Installation

16-48. AIRCRAFT LIGHTING SYSTEM.

16-49. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, flashing beacon light, anti-collision strobe lights, dome and instrument flood lights, courtesy lights, control wheel map light, compass and radio dial lights. On 1969 models & on, snap-in type rocker switches are introduced. These switches have a design feature which permits them to snap into the panel from the panel side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

16-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLASHING BEACON DOES NOT LIGHT (Cont).	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	5. Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. THRU 1972 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS.	Circuit breaker open.	Inspect. Reset.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS (Cont).	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.

WARNING

The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. (1973 MODELS & ON.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.
		2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies, one at a time. If circuit breaker opens on one strobe power supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not open proceed to step 4.
		3. Check aircraft wiring. Repair or replace as necessary.
		4. Inspect strobe power supply ground wire for contact with wing structure.

TROUBLE	PROBABLE CAUSE	REMEDY
CAUTION Extreme care should be taken when exchanging flash tube. The tube is fragile and can easily be cracked in a place where it will not be obvious visually. Make sure the tube is seated properly on the base of the nav light assembly and is centered in the dome. NOTE When checking defective power supply and flash tube, units from opposite wing may be used. Be sure power leads are protected properly when unit is removed to prevent short circuit.		
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. (1973 MODELS & ON.	Defective Strobe Power Supply, or flash tube.	1. Connect voltmeter to red lead between aircraft power supply (battery/external power) and strobe power supply, connecting negative lead to wing structure. Check for 12 volts. If OK proceed to step 2. If not, check aircraft power supply (battery/external power).
		2. Replace flash tube with known good flash tube. If system still does not work, replace strobe power supply.
DOME LIGHT TROUBLE.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with ohmeter or new lamp. Replace lamp.
	Defective switch.	5. Check for voltage at dome light with master and dome light switch on. Should read battery voltage. Replace switch.
INSTRUMENT LIGHTS WILL NOT LIGHT (THRU 1974 MODELS).	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.

This page intentionally left blank.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT (THRU 1974 MODELS). (Cont.)	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Defective rheostat.	4. Check voltage at instrument light with master switch on. Should read battery voltage with rheostat turned full clockwise and voltage should decrease as rheostat is turned counterclockwise. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Lamp burned out.	5. Test lamp with ohmmeter or new lamp. Replace lamp.
INSTRUMENT LIGHTS WILL NOT LIGHT (1975 MODELS & ON).	Short circuit wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in brighter position. Replace potentiometer.
	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.
INSTRUMENT LIGHTS WILL NOT DIM (1975 MODELS & ON).	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.

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT THRU 1970 AIRCRAFT ONLY.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is OK, proceed to step 4.
	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring. 4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.
CAUTION Failure to observe polarity shown on wiring diagrams 11.7.0, will result in immediate failure of the transistor on the map light circuit board assembly.		
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT 1971 AIRCRAFT & ON.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is OK, proceed to step 4.
	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring. 4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.

16-51. LANDING AND TAXI LIGHTS. (THRU 1970 MODELS.)

16-52. DESCRIPTION. The landing and taxi lights are mounted in the leading edge of the left wing. A clear plastic cover provides weather protection for the lamps and is shaped to maintain the leading edge curvature of the wing. The landing lamp is mounted on the inboard side and adjusted to throw its beam further forward than the taxi light. Both lights are controlled by a single switch.

16-53. REMOVAL AND INSTALLATION. (Refer to figure 16-6.)

a. Remove screws holding wing tip to wing , disconnect navigation light wire and remove wing tip.
b. Remove screws holding seal on rib to gain access to lights through lightening hole in rib.
c. Using a short screwdriver, reach in through the lightening hole and remove the four attaching screws (8) from the bracket assembly and remove the bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws (7). If readjustment is required, refer to figure 16-6.

d. Remove the two screws securing the wiring to the lamp contacts and remove the lamp.
e. Install new lamp and reassemble.
f. To replace plastic window, remove screws holding leading edge of rib to wing and remove leading edge of rib.
g. Slide the plastic window out of the retainers, install new window and reassemble.

16-54. LANDING AND TAXI LIGHTS. (BEGINNING WITH 1971 MODELS.)

16-55. DESCRIPTION. The landing and taxi light is mounted in the forward end of the engine cowling. This position facilitates the use of one lamp as both a landing and taxi light. The landing and taxi light is controlled by a rocker type switch located on the instrument panel.

NOTE

If excessive wearing or cracking of the landing light attachment bracket or lamp resulting in looseness of the light assembly, has been observed, it is recommended that Cessna Single-Engine Service Letter SE72-27, Dated October 6, 1972 be complied with.

16-56. REMOVAL AND INSTALLATION. (1971 AND 1972 MODELS.) Use figure 16-6 as a guide when removing or replacing lamp.

a. Remove the 4 screws securing bracket (1) to nose cap (3) and remove the bracket.
b. Pull the lamp away from the nose cap until the wire connections are exposed on the base of the lamp. Disconnect the wires and remove the lamp.
c. To reinstall the lamp reverse this procedure.

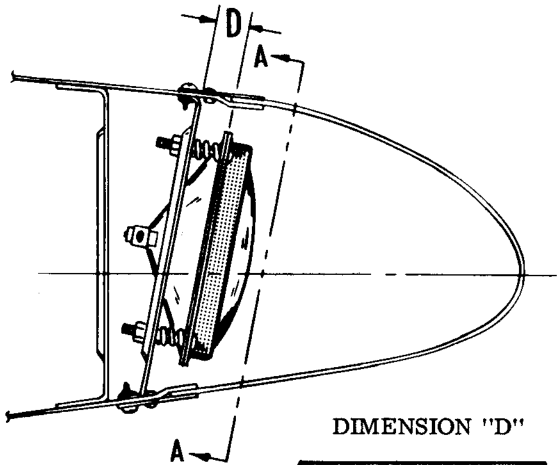
16-57. REMOVAL AND INSTALLATION. (BEGINNING WITH 1973 MODELS AND WHEN MODIFIED PER SK177-24. (Refer to figure 16-6 sheet 3 of 3).

a. Remove lower cowl and disconnect wire connections.
b. Remove screws (4) from landing light support (1) noting position and number of washers (2).
c. Remove screws (8) thru bracket (3) from bracket (7) and remove lamp.
d. To reinstall reverse this procedure.

16-58. ADJUSTMENT OF LANDING AND TAXI LIGHT (BEGINNING WITH 1971). Refer to figure 16-6. Adjustment of the landing and taxi light is pre-set at the factory with the adjustment screws bottomed out against the bracket. Should further adjustment be desired proceed as follows.

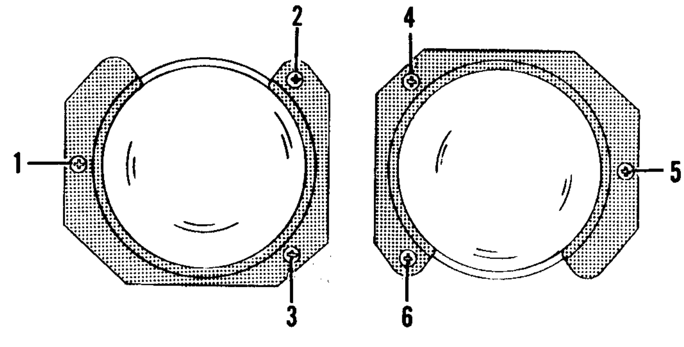
SHOP NOTES:

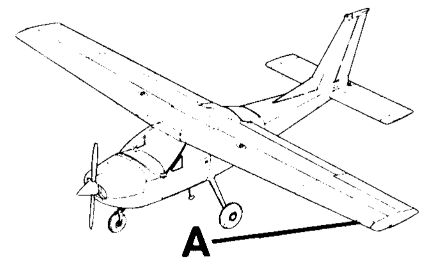
This page intentionally left blank.

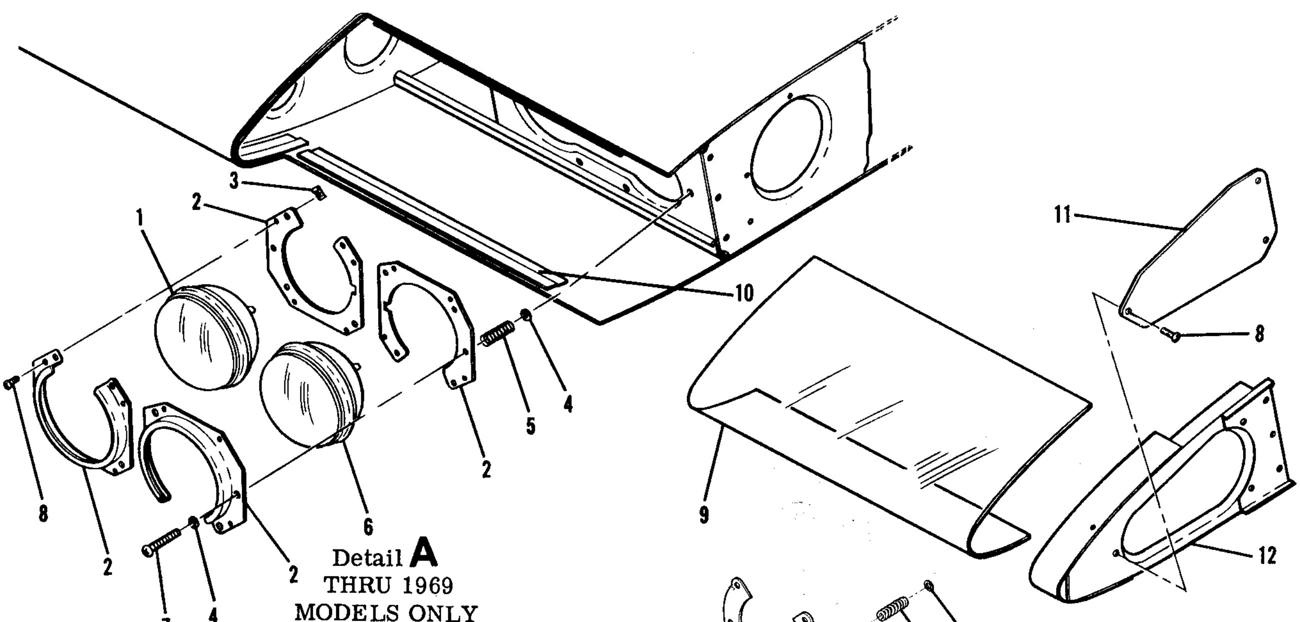


DIMENSION "D"

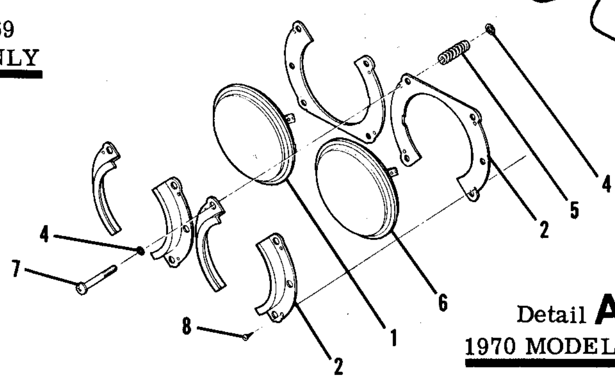
NO.	177
1	.40
2	1.34
3	1.20
4	.60
5	1.08
6	.76







Detail A
THRU 1969
MODELS ONLY



Detail A
1970 MODELS ONLY

1. Landing Lamp
2. Bracket
3. Tinnerman Nut
4. Washer
5. Spring
6. Taxi Lamp
7. Adjusting Screw
8. Screw
9. Window
10. Retainer
11. Seal
12. Rib

Figure 16-6. Landing and Taxi Light Installation (Sheet 1 of 3)

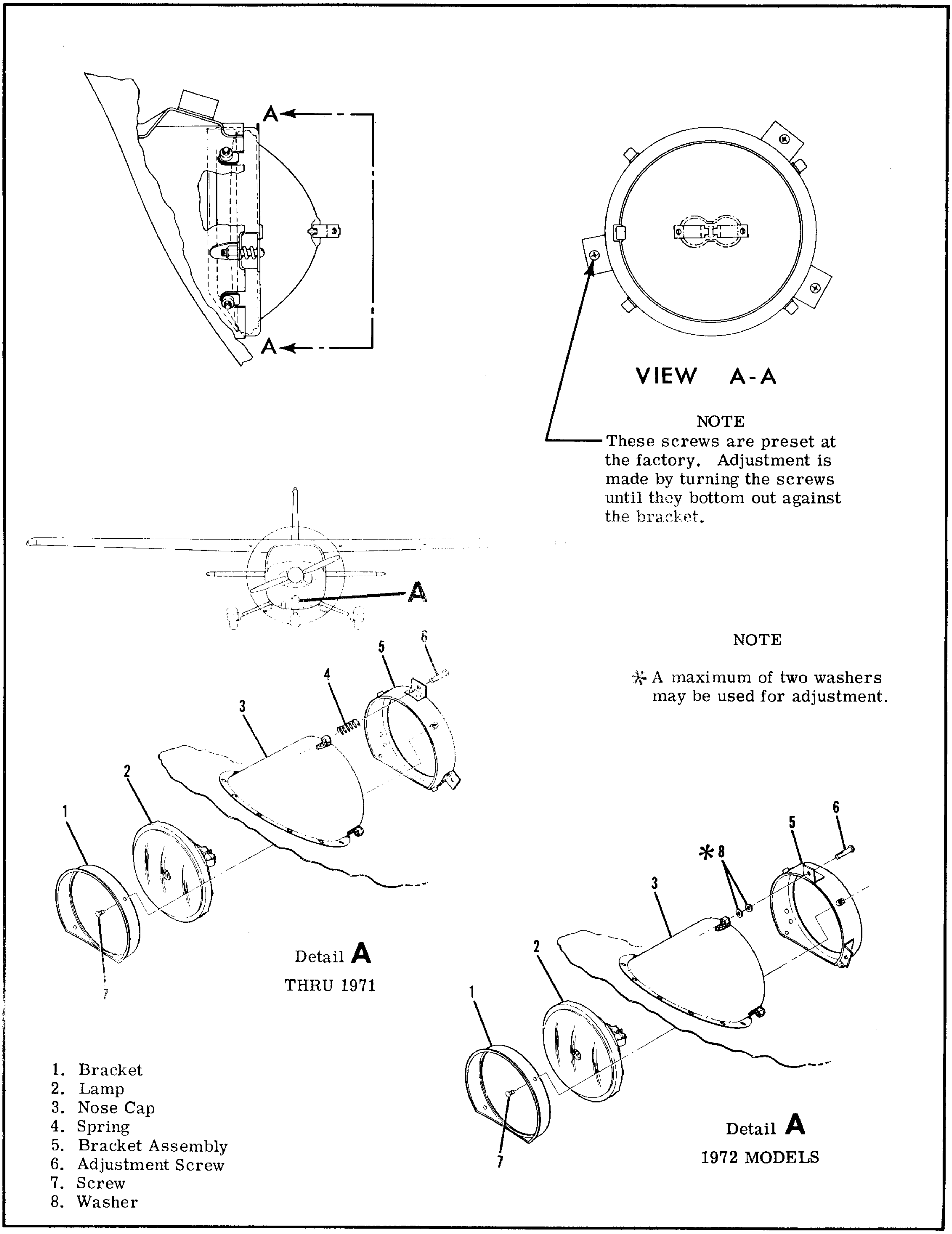
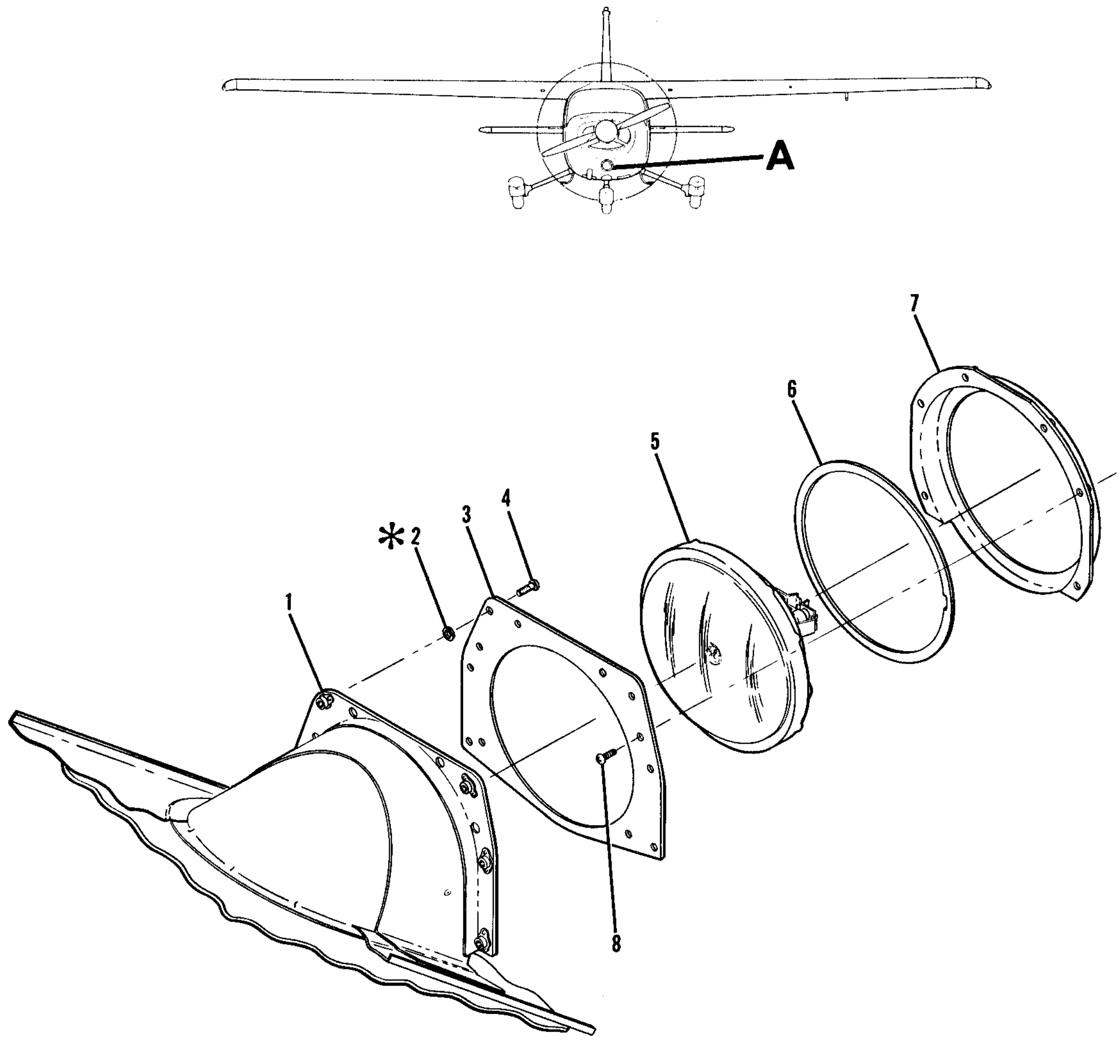


Figure 16-6. Landing and Taxi Light Installation (Sheet 2 of 3)



Detail A

BEGINNING WITH 1973 MODELS

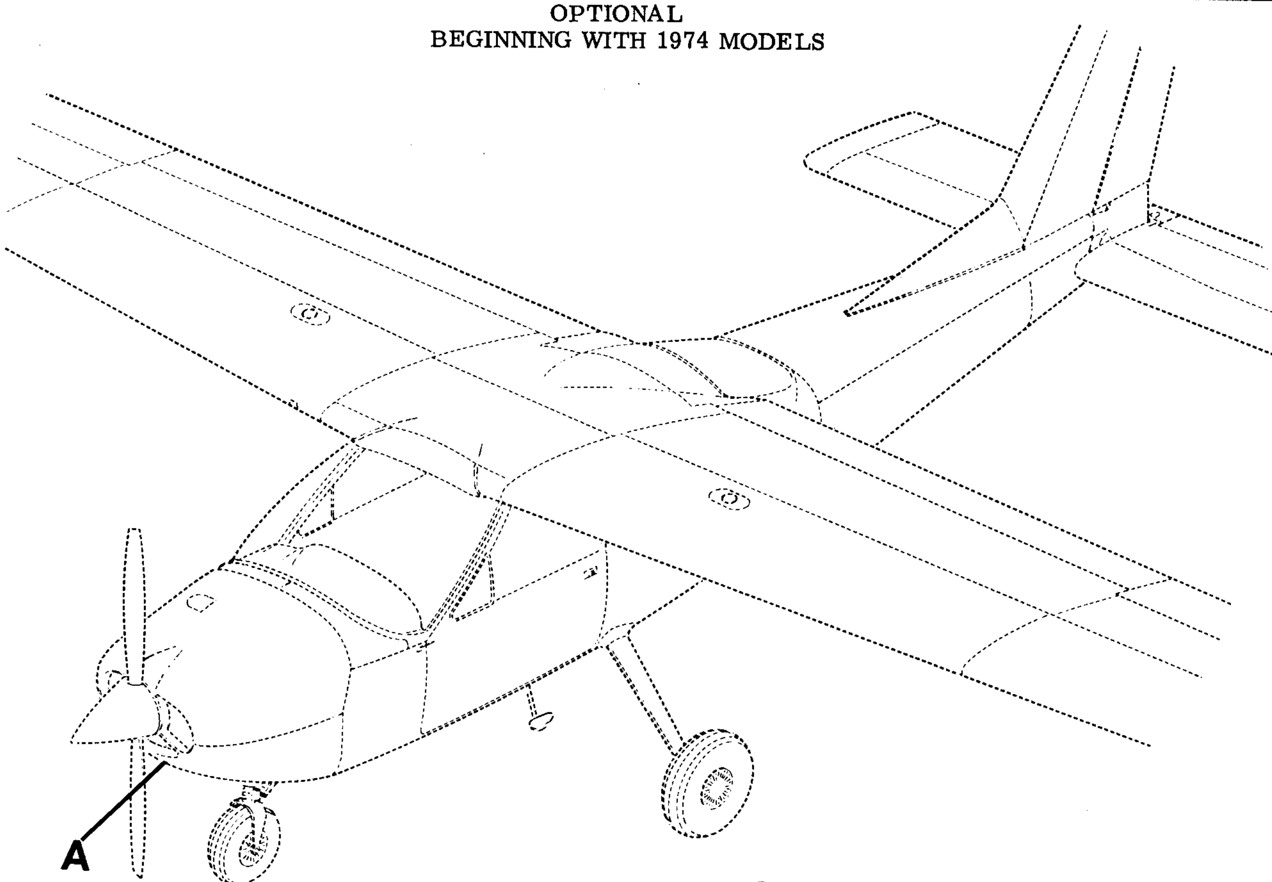
1. Landing Light Support
2. Washer
3. Bracket
4. Screw
5. Lamp
6. Gasket
7. Bracket
8. Screw

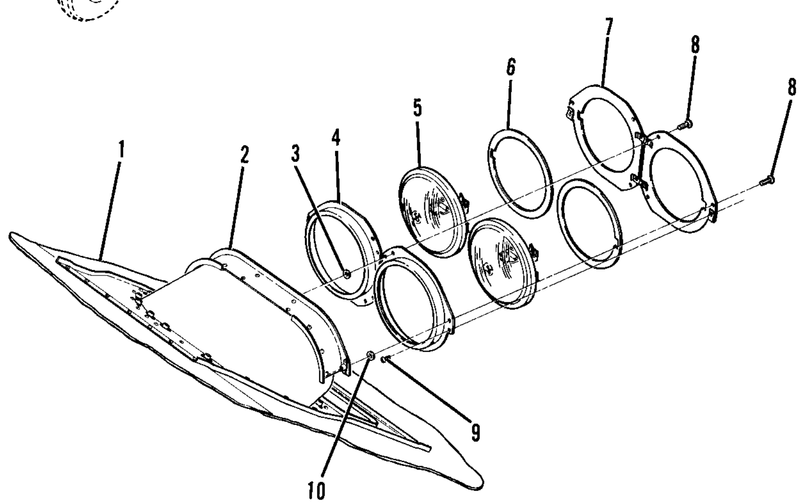
NOTE

* A maximum of two washers may be used for adjustment.

Figure 16-6. Landing and Taxi Light Installation (Sheet 3 of 3)

OPTIONAL
BEGINNING WITH 1974 MODELS

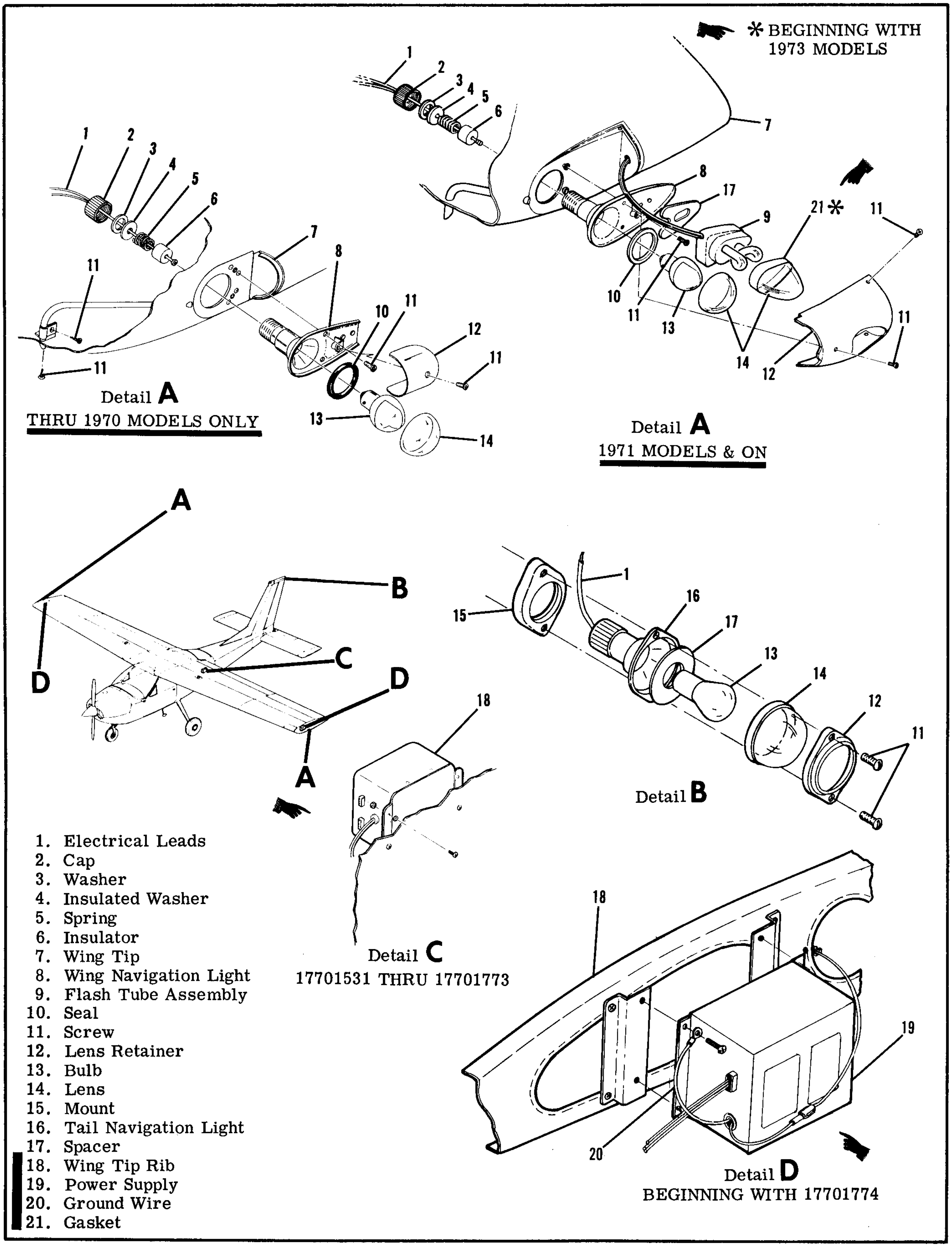




Detail **A**

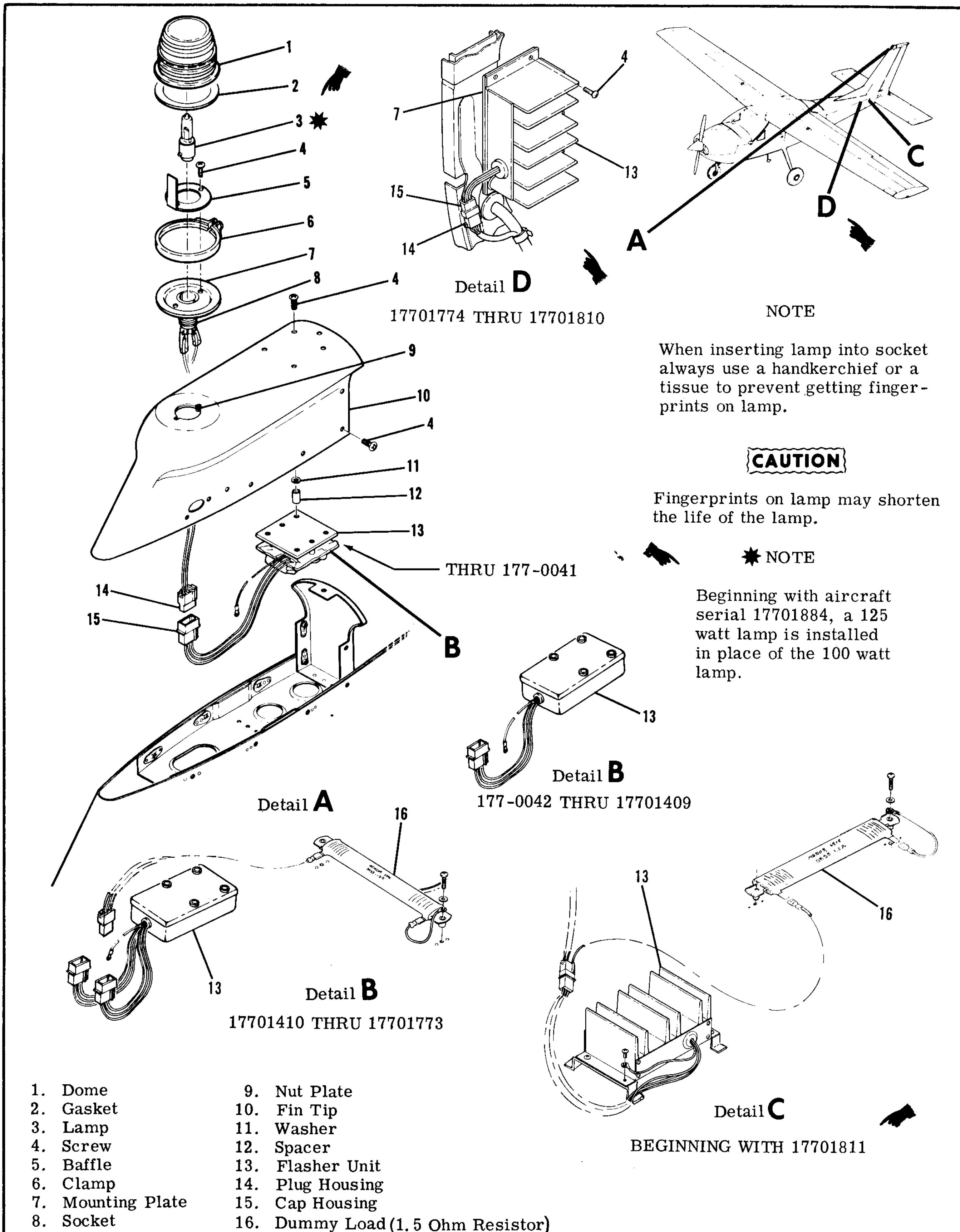
1. Nose Cap
2. Landing Light Support
3. Washer
4. Bracket
5. Lamp
6. Gasket
7. Plate
8. Screw
9. Screw
10. Washer

Figure 16-6A. Landing and Taxi light Installation (Dual)



1. Electrical Leads
2. Cap
3. Washer
4. Insulated Washer
5. Spring
6. Insulator
7. Wing Tip
8. Wing Navigation Light
9. Flash Tube Assembly
10. Seal
11. Screw
12. Lens Retainer
13. Bulb
14. Lens
15. Mount
16. Tail Navigation Light
17. Spacer
18. Wing Tip Rib
19. Power Supply
20. Ground Wire
21. Gasket

Figure 16-7. Navigation and Anti-Collision Strobe Lights Installation



NOTE

When inserting lamp into socket always use a handkerchief or a tissue to prevent getting finger-prints on lamp.

CAUTION

Fingerprints on lamp may shorten the life of the lamp.

* NOTE

Beginning with aircraft serial 17701884, a 125 watt lamp is installed in place of the 100 watt lamp.

1. Dome
2. Gasket
3. Lamp
4. Screw
5. Baffle
6. Clamp
7. Mounting Plate
8. Socket
9. Nut Plate
10. Fin Tip
11. Washer
12. Spacer
13. Flasher Unit
14. Plug Housing
15. Cap Housing
16. Dummy Load (1.5 Ohm Resistor)

Figure 16-8. Flashing Beacon Light Installation

a. Remove the lamp for access to adjustment screws. (See figure 16-6).
b. Thru 1971 Models adjustment is accomplished by turning the screws until desired setting is obtained. Beginning with 1972 Models washers must be added on adjustment screws to change the setting.

NOTE

A maximum of two washers may be used to adjust setting.

CAUTION

Should removal of the cowling be desired to make adjustments, ensure the landing and taxi light wiring is disconnected before removing the bottom cowling.

c. Remove cowling as outlined in Section 11.

16-58A. LANDING AND TAXI LIGHTS (DUAL COWL MOUNTED) (OPTIONAL BEGINNING WITH 1974 MODELS).

16-58B. DESCRIPTION. The landing and taxi lights are mounted in the lower nose cowl. The left hand lampis used for taxi and the right hand for landing. A split rocker switch mounted on the instrument panel controls the lights, one side for taxi and one or both for landing.

16-58C. REMOVAL AND INSTALLATION. (Refer to figure 16-6A).
a. Remove engine cowl (Refer to Section 11).
b. Remove screws (8) and remove light assembly. Note position of washers when removing taxi light for reinstallation.
c. Remove screws (9) and remove lamp.
d. Install new lamp and reverse the preceding steps for reinstallation.

16-59. NAVIGATION LIGHTS.

16-60. DESCRIPTION. The navigation lights are located on each wing tip and the top edge of the vertical fin. The lights are controlled by a single switch located on the instrument panel.

16-61. REMOVAL AND INSTALLATION. For removal and installation of navigation lights, refer to figure 16-7.

16-62. FLASHING BEACON LIGHT.

16-63. DESCRIPTION. The flashing beacon light is attached to a ABS plastic mounting on the vertical fin tip. The flashing beacon is an iodine vapor lamp electrically switched by a solid-state flasher assembly. Thru 17701773 the flasher assembly is mounted under the fin tip, 17701774 thru 17701810 the flasher assembly is located in the tailcone on the left hand side just forward of the stabilator, beginning with 17701811 the flasher assembly is located in the bottom of the tailcone at the aft end. The switching frequency of the flasher assembly operates the beacon at approximately 45 flashes per minute. Beginning with 17701410 a 1.5 ohm resistor is installed in the system to eliminate a pulsing effect on the cabin lighting and ammeter.

16-64. REMOVAL AND INSTALLATION. For removal and installation of the flashing beacon light and flasher assembly, refer to figure 16-8.

16-65. ANTI-COLLISION STROBE LIGHTS.

16-66. DESCRIPTION. A white strobe light is installed on each wing tip. Lights are vibration resistant and operate on the principle of a capacitor discharge into a xenon tube, producing an extremely high intensity flash. Energy is supplied to the strobe lights from a power supply. The power supply is mounted inside the left wing at station 175.50 thru serial 17701773. Beginning with serial 17701773 each strobe light is equipped with its own power supply mounted on the wing tip rib.

16-67. REMOVAL AND INSTALLATION. Refer to figure 16-7 as a guide for removal and installation of the anti-collision strobe light components.

WARNING

This anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

16-67A. OPERATIONAL REQUIREMENTS.

The capacitors in the strobe light power supplies must be reformed if not used for a period of six (6) months. The following procedure must be used.

Connect the power supply, red wire to plus, black to ground to 6 volt DC source. Do Not connect strobe tube. Turn on 6 volt supply. Note current draw after one minute. If less than 1 ampere, continue operation for 24 hours. Turn off DC power source. Then connect to the proper voltage, 12 volt. Connect tube to output of strobe power supply and allow to operate, flashing, for 15 minutes. Remove strobe tube. Operating power supply at 12 volts, note the current drain after one minute. If less than 0.5 amperes, operate for 6 hours. If current draw is greater than 0.5 amperes, reject the unit.

16-68. INSTRUMENT LIGHTING.

16-69. DESCRIPTION. The instrument panel lighting is fabricated in two separate sections. The lower two-thirds of the instrument panel is illuminated by an overhead light console mounted immediately forward of the cabin ventilation system. The lighting for the upper one-third of the instrument panel is provided by four small lights located in the instrument panel glare shield. The intensity of the instru-

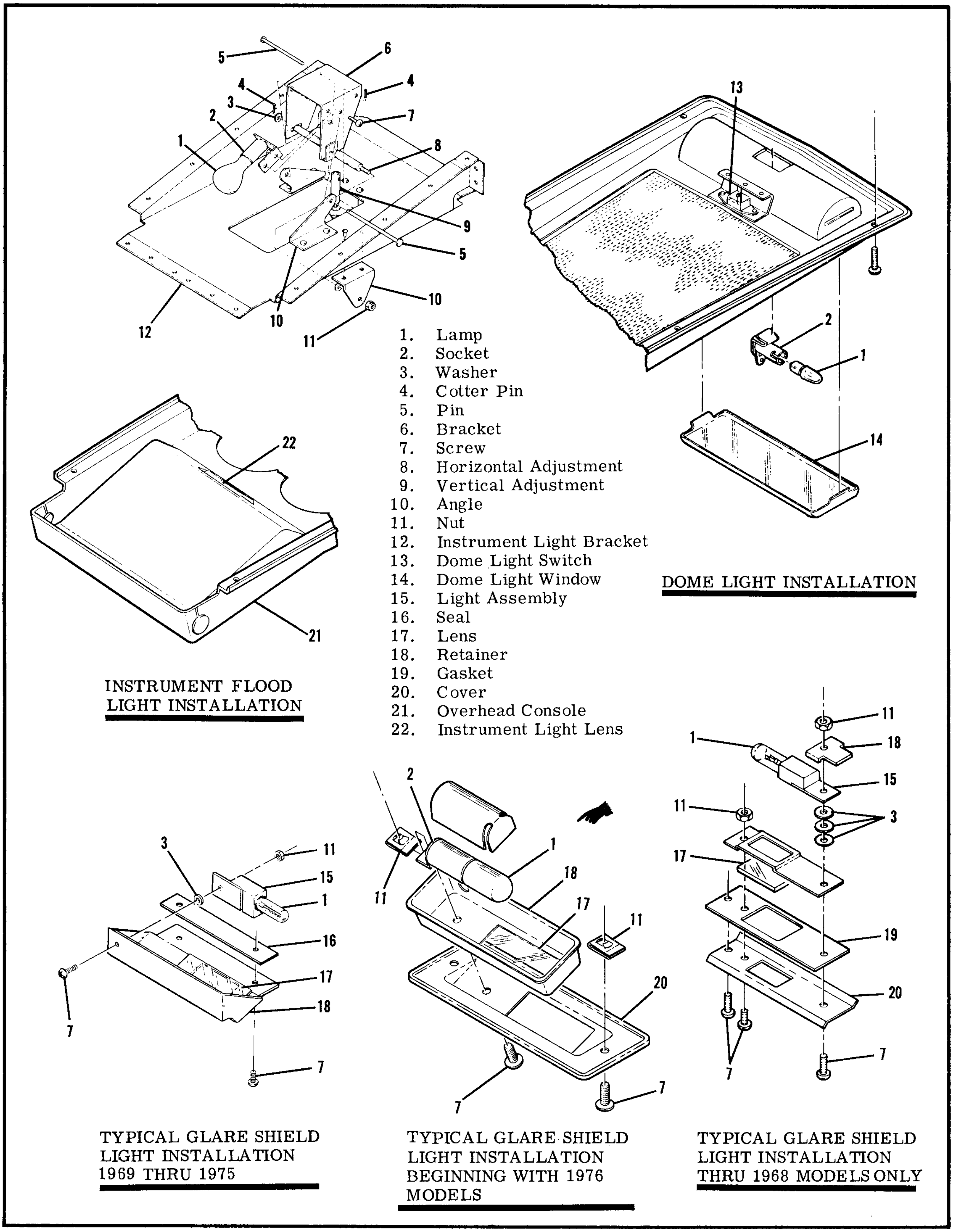
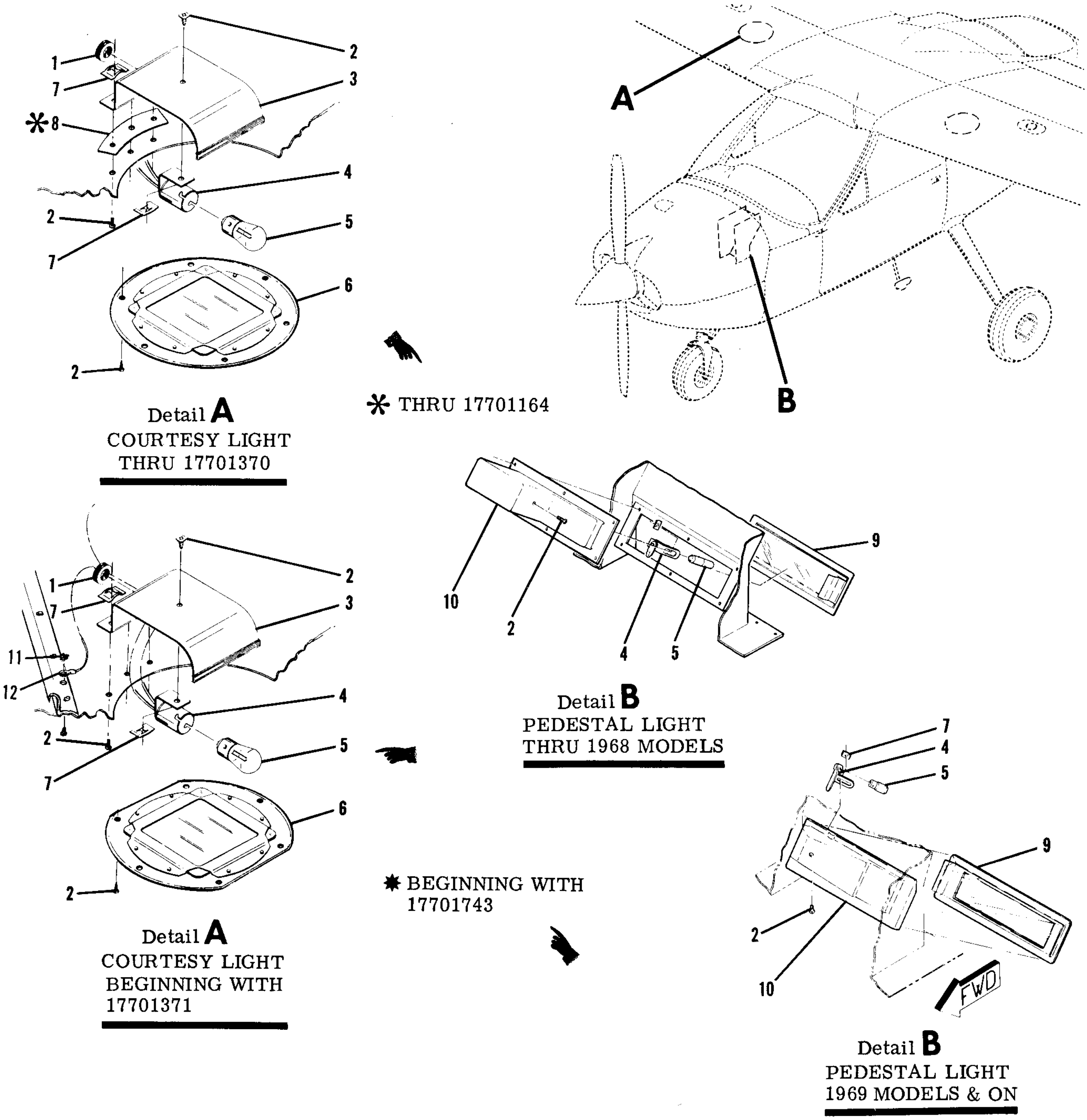
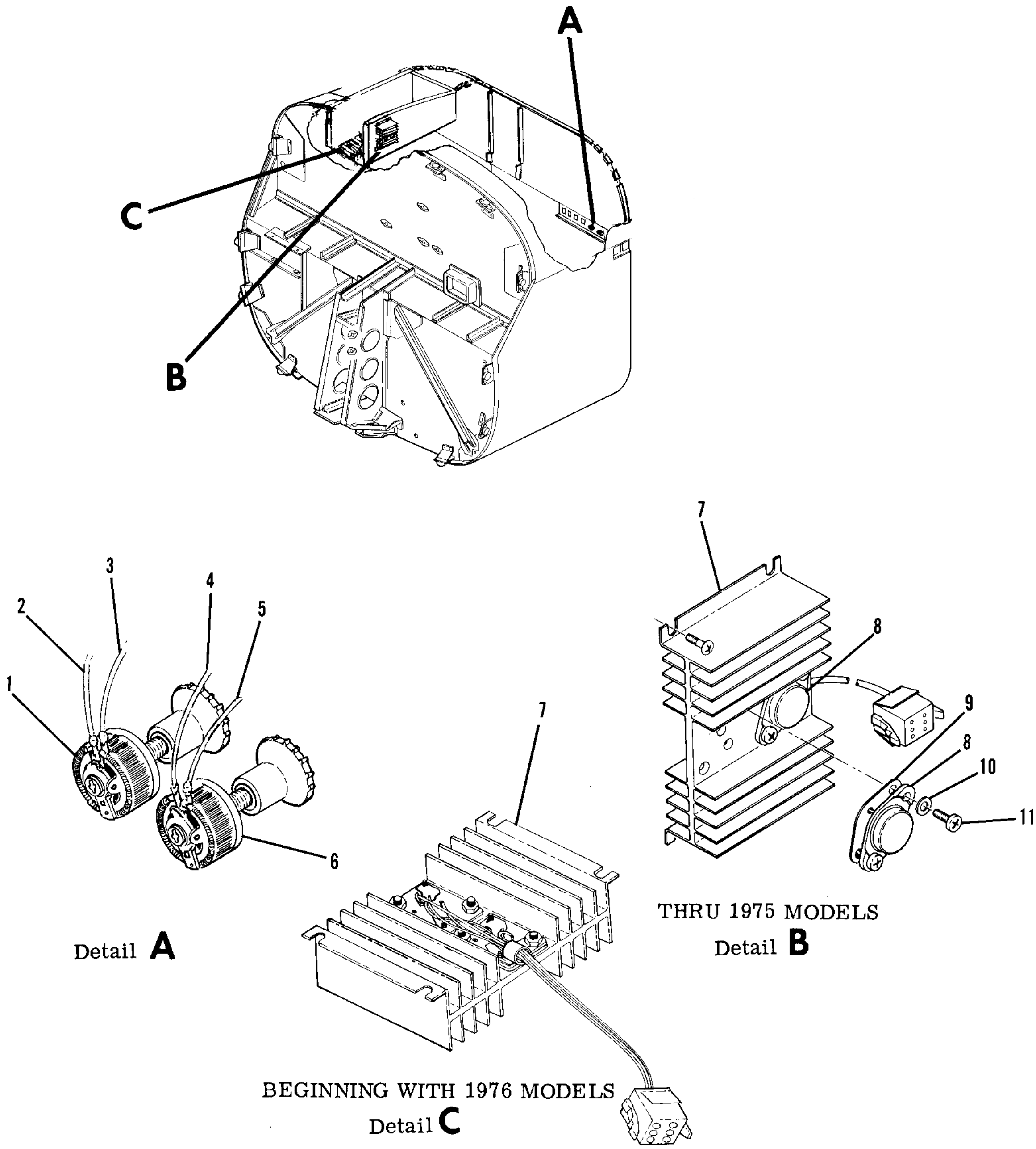


Figure 16-9. Dome and Instrument Lights Installation



1. Grommet
2. Screw
3. Shield
4. Socket
5. Lamp
6. Cover Plate
7. Tinnerman Nut
8. Spacer
9. Lens Assembly
10. Cover Assembly
11. Nut

Figure 16-10. Courtesy Lights Installation



1. Rheostat (Radio Lights)
2. Wire (To Circuit Breaker)
3. Wire (To Dimming Assembly)
4. Wire (To Circuit Breaker)
5. Wire (To Dimming Assembly)
6. Rheostat (Panel Lights)
7. Dimming Assembly
8. Transistor
9. Insulator
10. Washer
11. Screw

Figure 16-10A. Transistorized Light Dimming Installation

This page intentionally left blank.

ment panel lighting is controlled by a dimming rheostat located on the left side of the instrument panel.

16-70. REMOVAL AND INSTALLATION. For removal and installation of instrument panel lights, refer to figuer 16-9.

16-71. DOME LIGHT.

16-72. DESCRIPTION. The dome light is located in the aft end of the overhead console and provides for cabin lighting. The dome light consists of a frosted lens and a single bulb controlled by a switch located in the center of the overhead console.

16-73. REMOVAL AND INSTALLATION. For removal and installation of dome light, refer to figure 16-9.

16-74. COMPASS AND RADIO DIAL LIGHTING.

16-75. DESCRIPTION. The compass and radio dial lights are contained within the individual units. The compass light is controlled by the instrument light dimming rheostat and the radio lights are controlled by the radio light dimming rheostat. Both rheostats are located on the left side of the panel.

16-75A. TRANSISTORIZED LIGHT DIMMING.

16-75B. DESCRIPTION. Beginning with aircraft serial 17702124 a remotely located two-circuit transistorized dimming assembly is installed to control aircraft lighting. One circuit controls the eyebrow lights, compass light and console light, also post lighting if installed. The other circuit controls engine instrument and radio lighting. The dimming assembly is located on the inboard side of the glove box. Two dimming rheostats on the pilots switch panel control power through the dimming assembly. One rheostat is for panel lighting and the other for engine instrument and radio lighting.

16-75C. REMOVAL AND INSTALLATION. For removal and installation of the dimming assembly refer to figure 16-10A.

16-76. COURTESY LIGHTING.

16-77. DESCRIPTION. A courtesy light is located on the underside of each wing and in the lower portion of the pedestal. The switch operating all three courtesy lights is located on the left hand doorpost.

16-78. REMOVAL AND INSTALLATION. For removal and installation of courtesy lights, refer to figure 16-10.

16-79. CONTROL WHEEL MAP LIGHT.

16-80. DESCRIPTION. An optional control wheel map light is available on the 177 model. The map light is mounted on the underside of the control wheel and the light intensity is controlled by a thumb operated rheostat. For dimming, the rheostat should be turned clockwise.

CAUTION

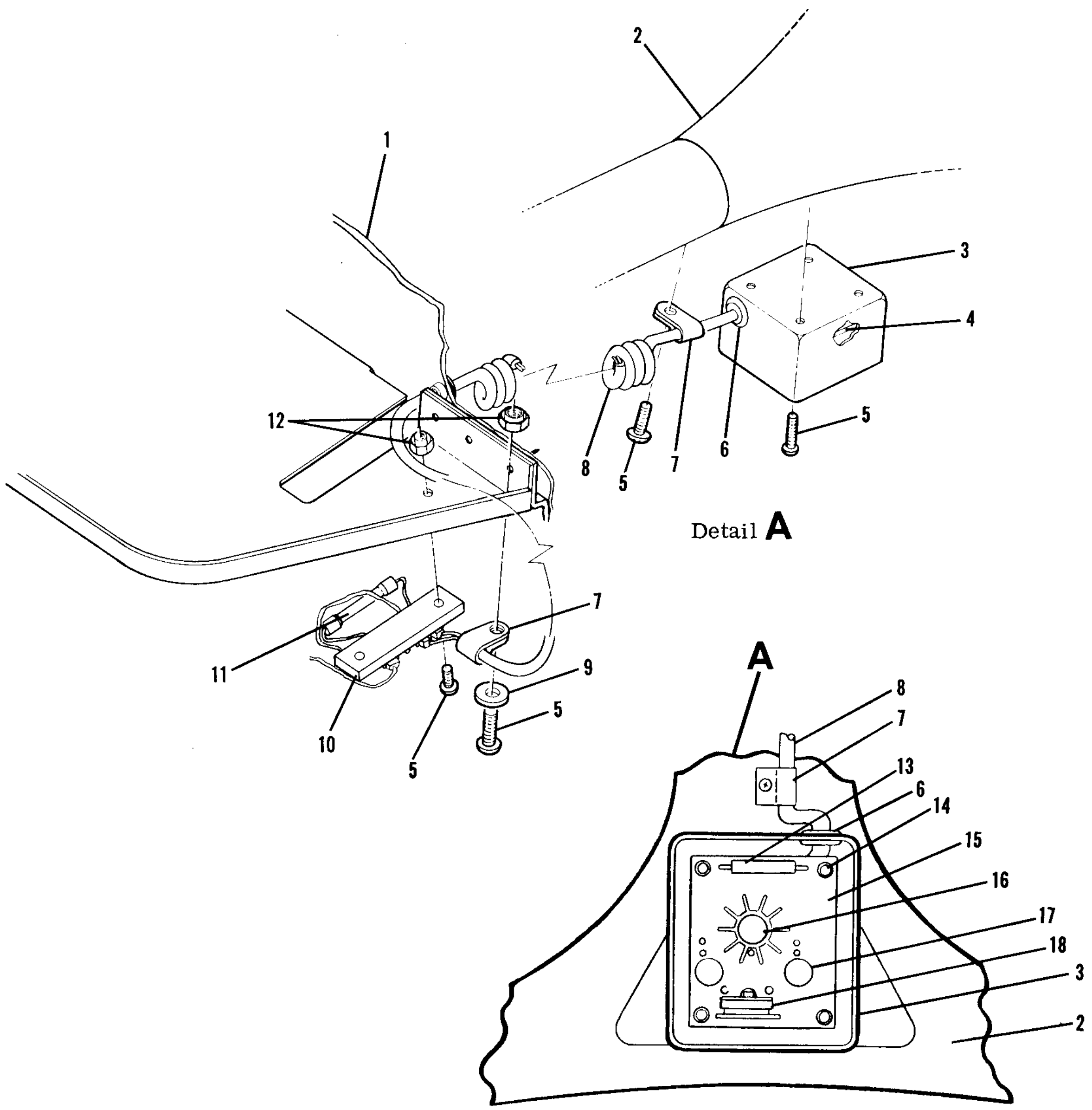
Thru 1970 aircraft only, failure to observe polarity shown on wiring diagram (Section 20), will result in immediate failure of the transistor on the map light circuit board assembly.

16-81. REMOVAL AND INSTALLATION. (Thru 1970 Aircraft Only) (See figure 16-11.)
a. For easy access to the map light assembly, rotate the control wheel 90°.
b. Remove the four screws from the map light circuit board. The map light assembly will then be free for removal from the control wheel.
c. Label the wires connecting to the map light circuit board assembly and remove the screws securing the wires to the circuit board assembly.
d. To install the map light assembly, reverse this procedure.

16-82. REMOVAL AND INSTALLATION. (BEGINNING WITH 1971) (See figure 16-11).
a. For easy access to the map light assembly rotate the control wheel 90°.
b. Beginning with 1972 Models, remove terminal block cover.
c. Label the wires connecting the map light assembly (terminal block) and remove screws securing the wires to the terminal block.
d. Remove screws securing map light to the control wheel and remove map light assembly.
e. For reassembly reverse this procedure.

16-83. PITOT HEATER.

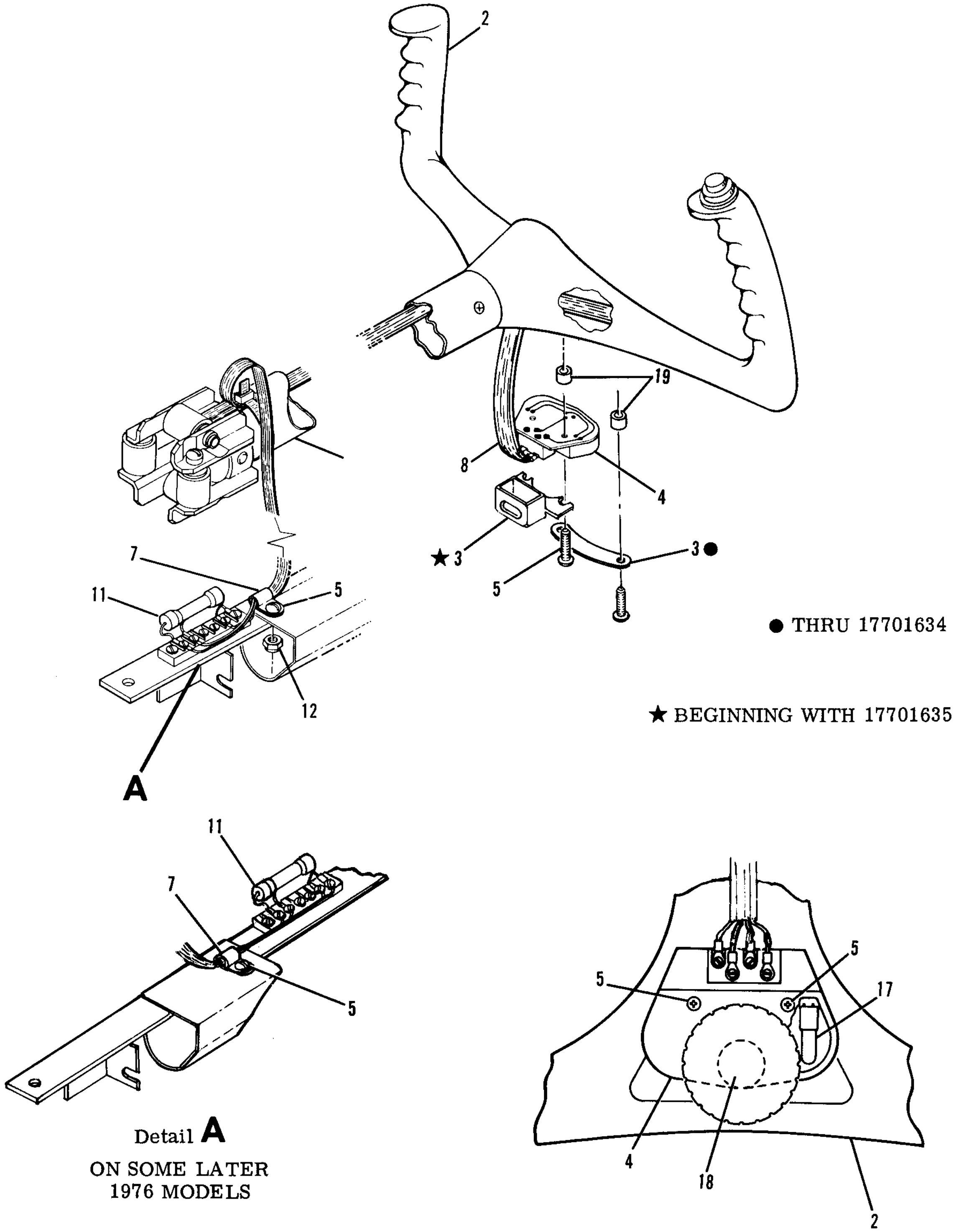
16-84. DESCRIPTION. An electrical heater unit is installed in some pitot tubes. The heater offsets the possibility of ice formation on the pitot tube. The heater is integrally mounted in the pitot tube and is controlled by the pitot heat switch. (See figure 16-12.) For Trouble Shooting refer to Section 15.



1.	Stationary Panel	7.	Clamp	13.	Resistor
2.	Control Wheel Assembly	8.	Cable Assembly	14.	Stand-Off
3.	Shield	9.	Washer	15.	Circuit Board
4.	Circuit Board	10.	Terminal Block	16.	Diode
5.	Screw	11.	1/2 Amp-Fuse Assembly	17.	Light
6.	Grommet	12.	Locknut	18.	Rheostat
				19.	Spacer

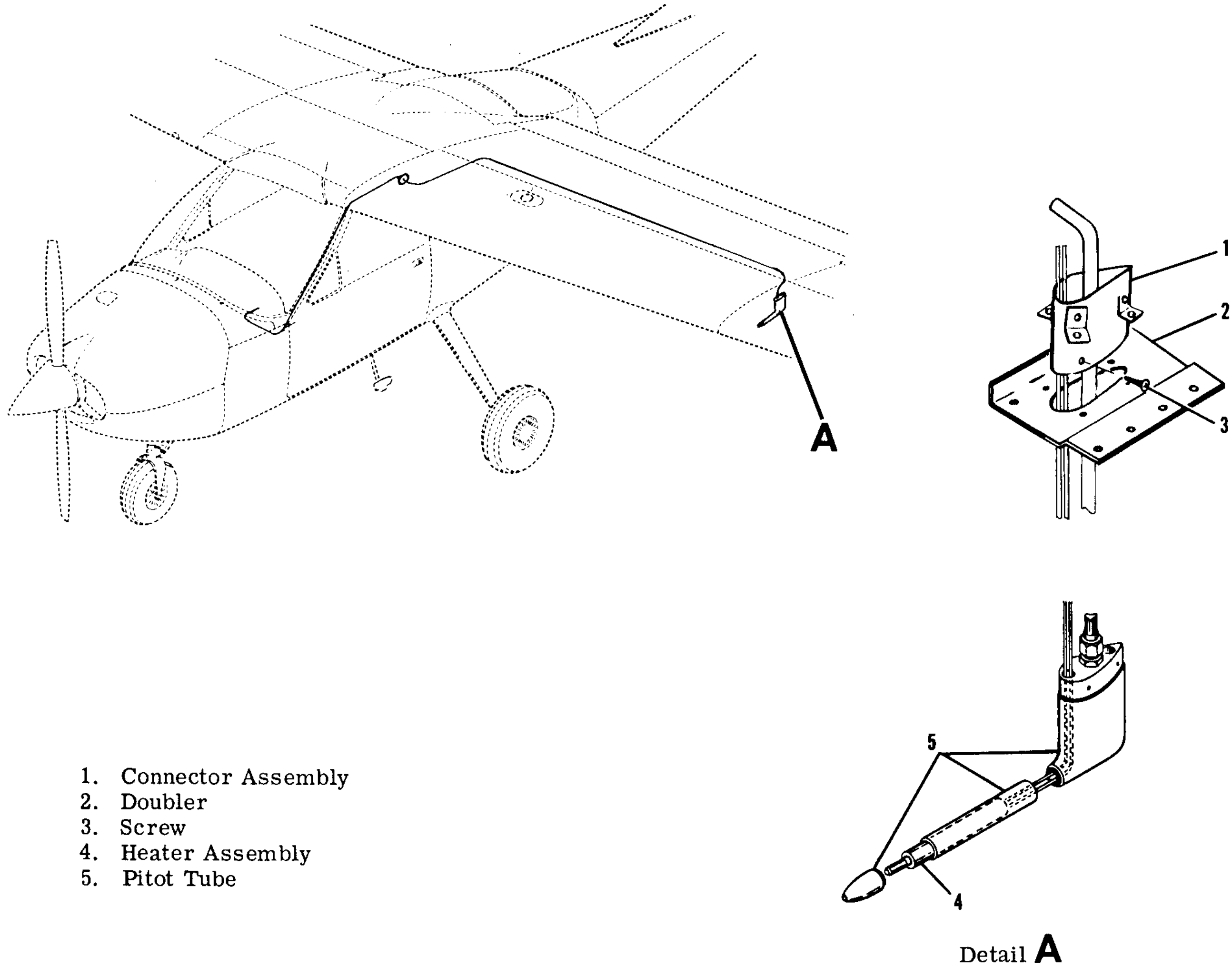
THRU 17701530

Figure 16-11. Control Wheel Map Light Installation (Sheet 1 of 2)



BEGINNING WITH 17701531

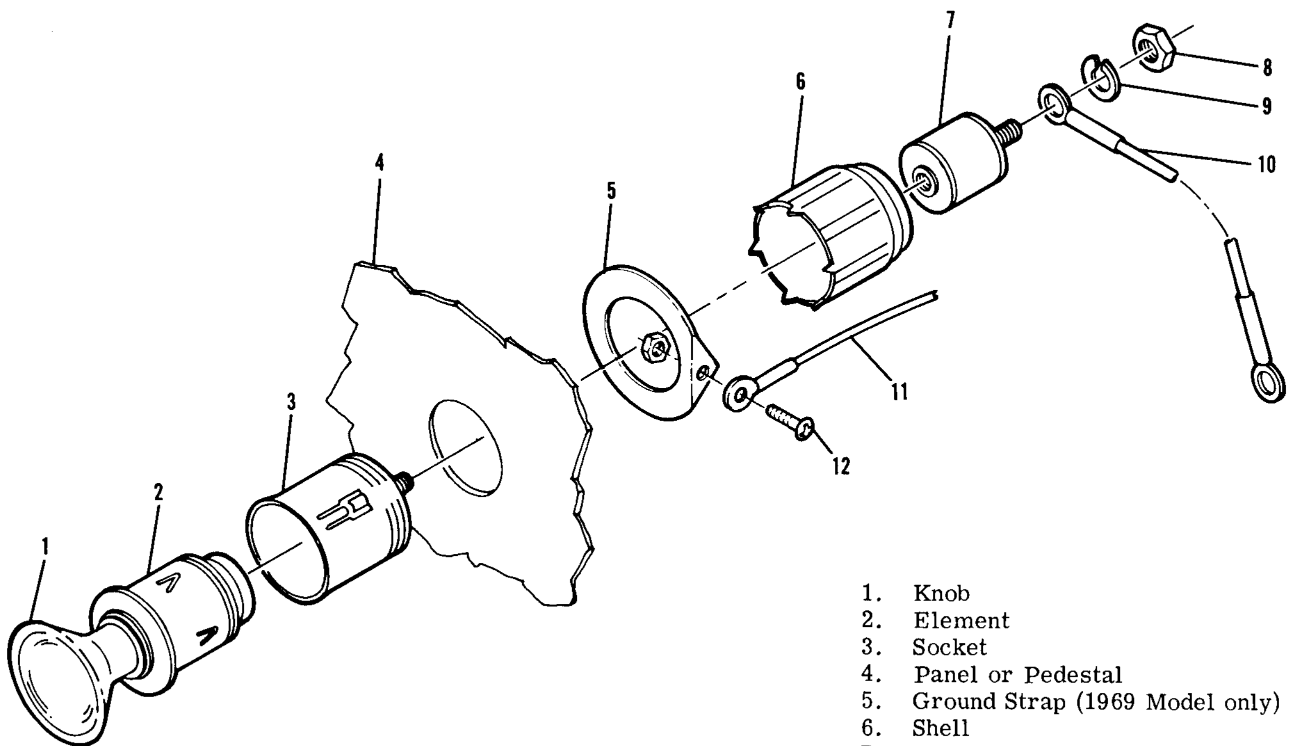
Figure 16-11. Control Wheel Map Light Installation (Sheet 2 of 2)



1. Connector Assembly
2. Doubler
3. Screw
4. Heater Assembly
5. Pitot Tube

Figure 16-12. Heated Pitot Installation

SHOP NOTES:



1. Knob
2. Element
3. Socket
4. Panel or Pedestal
5. Ground Strap (1969 Model only)
6. Shell
7. Circuit Breaker
8. Nut
9. Washer
10. Power Wire
11. Ground Wire (1969 Model only)
12. Screw

Figure 16-13. Cigar Lighter Installation

16-85. CIGAR LIGHTER.

16-86. DESCRIPTION. The cigar lighter (located on the instrument panel on 1968 models and on the pedestal on 1969 models) is equipped with a thermal-actuated circuit breaker which is attached to the rear of the cigar lighter. The circuit breaker will open if the lighter becomes jammed in the socket or held in position too long. The circuit breaker may be reset by inserting a small probe into the .078 diameter hole in the back of the circuit breaker and pushing lightly until a click is heard.

CAUTION

Make sure the master switch is "OFF" before inserting probe into the circuit breaker on cigar lighter to reset.

16-87. REMOVAL AND INSTALLATION. (Refer to figure 16-13.)

a. Ensure that the master switch is "OFF."
b. Remove cigar lighter element.
c. Disconnect wire on back of lighter.
d. Remove shell that screws on socket back of panel.
e. Remove cigar lighter ground strap. (1969 & on models only.)

NOTE

On 1969 & on models the cigar lighter is mounted in a royalite panel. In order for the lighter to be grounded and to operate, a ground strap must be installed.

f. The socket will then be free for removal.
b. To install a cigar lighter, reverse this procedure.

16-88. EMERGENCY LOCATOR TRANSMITTER.

16-89. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The C589510-0209 transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The C589510-0211 transmitter used for Canadian registry, operates on121.5 only. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a distant, easily recognizable distress signal for reception by search and rescue personnel and others monitoring the emergency frequencies. Power is supplied to the transmitter by a battery-pack which has the service life of the batteries placarded on the batteries and also on the outside end of the transmitter. ELT's thru early 1974 models, were equipped with a battery-pack containing six magnesium "D" size dry cell batteries wired in series. (See figure 16-15) Mid 1974 thru early 1975, ELT's are equipped with a battery pack containing four "in-line" lithium "D" batteries wired in series. Early 1975 and on ELT's are equipped with a battery-pack containing four lithium "D" size batteries which are stacked in two's (See figure 16-15). The ELT exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet. When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power (75 MW-minimum), for a continuous period of time as listed in the following table.

TRANSMITTER LIFE
TO 75 MILLIWATTS OUTPUT

Temperature	6 Cell Magnesium Battery Pack	4 Cell Lithium Battery Pack
+130°F	89 hrs	115 hrs
+ 70°F	95 hrs	115 hrs
- 4°F	49 hrs	95 hrs
- 40°F	23 hrs	70 hrs

Battery-packs have a normal shelf life of five to ten (5-10) years and must be replaced at 1/2 of normal shelf life in accordance with TSO-C91. Cessna specifies 3 years replacement of magnesium (6-cell) battery-packs and 5 years replacement of lithium (4-cell) battery packs.

16-90. OPERATION. A three position switch on the forward end of the unit controls operation. Placing the switch in the ON position will energize the unit to start transmitting emergency signals. In the OFF position, the unit is inoperative. Placing the switch in the ARM position will set the unit to start transmitting emergency signals only after the unit has received a 5g (tolerances are +2g and -0g) impact force, for a duration of 11-16 milliseconds.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 5 seconds or you may activate downed aircraft procedures by C. A. P., D. O. T. or F. A. A. personnel.

WARNING

Magnesium (6-cell) battery-packs (excluding 4 cell lithium battery-packs) after prolonged continuous use (1 hour) in a sealed environment give off explosive gas. If your ELT has operated for this time period or longer, as a precautionary measure, loosen the ELT cover screws, lift the cover to break air tight seal and let stand for 15 minutes before tightening screws. Keep sparks, flames and lighted cigarettes away from battery-pack.

NOTE

After relatively short periods of inactivation, the magnesium (6-cell) battery-pack develops a coating over its anode which drastically reduces self discharge and thereby gives the cell an extremely long storage life. This coating will exhibit a high resistance to the flow of electric current when the battery is first switched on. After a short while (less than 15 seconds), the battery current will completely dissolve this coating and enable the battery to operate normally. If this coating is present when your ELT is activated, there may be a few seconds delay before the transmitter reaches full power.

16-91. CHECKOUT INTERVAL:

100 HOURS.

a. Turn aircraft master switch ON.
b. Turn aircraft transceiver ON and set frequency on receiver to 121.5 MHz.
c. Remove the ELT's antenna cable from the ELT unit.
d. Place the ELT's function selector switch in the ON position for 5 seconds or less. Immediately replace the ELT function selector switch in the ARM position after testing ELT.
e. Test should be conducted only within the time period made up of the first five minutes after any hour.

CAUTION

Tests with the antenna connected should be approved and confirmed by the nearest control tower.

NOTE

Without its antenna connected, the ELT will produce sufficient signal to reach your receiver, yet it will not disturb other communications or damage output circuitry.

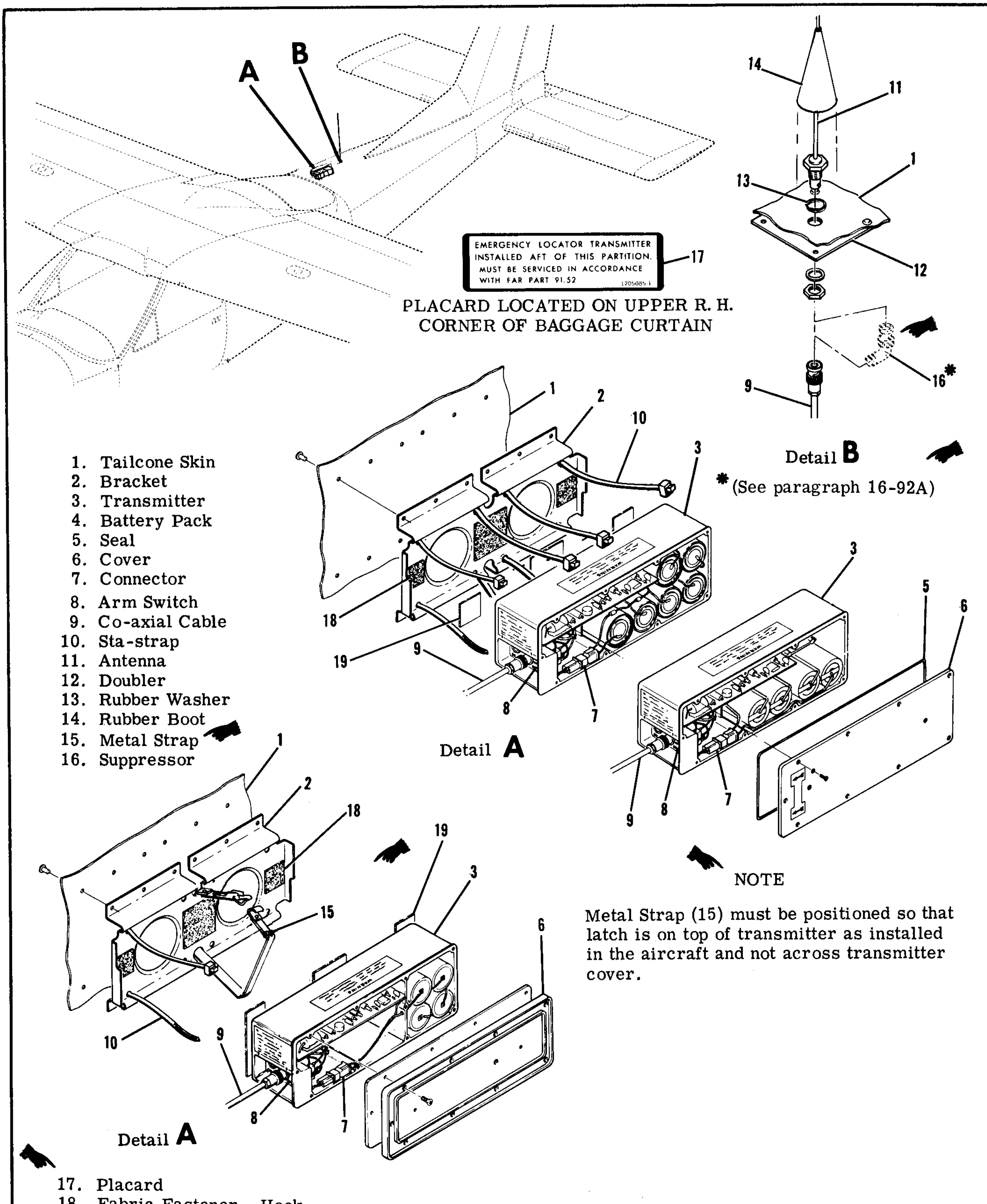


Figure 16-14. Emergency Locator Transmitter Installation

NOTE

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

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

16-92. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 16-14.)

a. Remove the baggage curtain to gain access to the transmitter and antenna.
b. Disconnect co-axial cable from end of transmitter.
c. Depending upon the particular installation, either cut four sta-straps and remove transmitter or cut sta-strap securing antenna cable and unlatch metal strap to remove transmitter.

NOTE

Transmitter is also attached to the mounting bracket by velcro strips; pull transmitter to free from mounting bracket and velcro.

NOTE

To replace velcro strips, clean surface thoroughly with clean cloth saturated in one of the following solvents: Trichloric thylene, Aliphatic Napthas, Methyl Ethyl Ketone or Enmar 6094 Lacquer Thinner. Cloth should be folded each time the surface is wiped to present a clean area and avoid redepositing of grease. Wipe surface immediately with clean dry cloth, do not allow solvent to dry on surface. Apply Velcro #40 adhesive to each surface in a thin even coat and allow to dry until quite tacky, but no longer transfers to the finger when touched (usually between 5 and 30 minutes). Porous surfaces may require two coats. Place the two surfaces in contact and press firmly together to insure intimate contact. Allow 24 hours for complete cure.

e. To reinstall transmitter, reverse preceding steps.

NOTE

An installation tool is required to properly secure sta-straps on units installed with sta-straps. This tool may be purchased locally or ordered from the Pandiut Corporation, Tinley Park, Ill., part number GS-2B (Conforms to MS90387-1).

CAUTION

Ensure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

16-92A. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 16-14.)

a. Disconnect co-axial cable from base of antenna.
b. Remove the nut and lockwasher attaching the antenna base ot the fuselage and the antenna will be free for removal.
c. To reinstall the antenna, reverse the preceding steps.

NOTE

Upon reinstallation of antenna, cement rubber boot (14) using RTV102, General Electric Co. or equivalent, to antenna whip only; do not apply adhesive to fuselage skin or damage to paint may result.

CAUTION

In-service 6 cell magnesium battery-pack powered ELT's require the installation of a static electricity suppressor in the antenna cable to prevent the possibility of damage to the case of the ELT. Refer to Cessna Avionics Service Letter AV74-16 and figure 16-14.

16-93. REMOVAL AND INSTALLATION OF MAGNESIUM SIX (6) CELL BATTERY-PACK. (Refer to figure 16-14.)

NOTE

Since replacement 6 cell magnesium battery-packs are no longer available, when in-service units require replacement, use the 4 cell lithium battery-pack. Refer to paragraph 16-94.

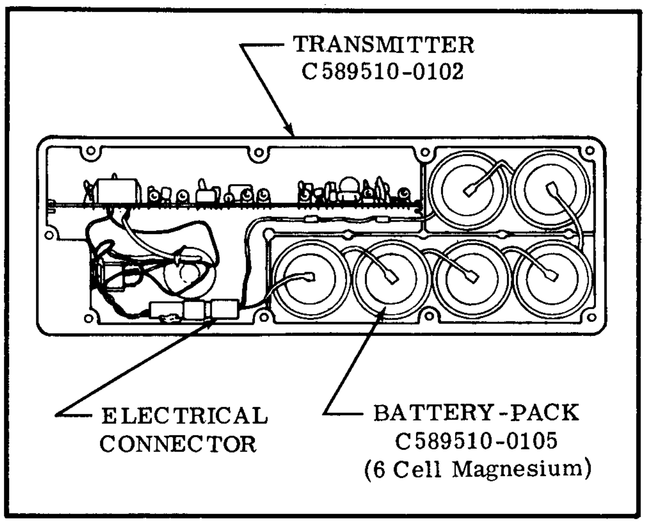


Figure 16-15. Magnesium 6 Cell Battery-Pack Installation

16-94. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 16-16.)

NOTE

Transmitters equipped with the 4 cell battery-pack can only be replaced with another 4 cell battery-pack.

a. After the transmitter has been removed from aircraft in accordance with para. 16-92, place the transmitter switch in the OFF position.
b. Remove the nine screws attaching the cover to the case and then remove the cover to gain access to the battery-pack.

NOTE

Retain the rubber "O" ring gasket, rubber washers and screws for reinstallation.

c. Disconnect the battery-pack electrical connector and remove battery-pack.
d. Place new battery-pack in the transmitter with four batteries as shown in the case in figure 16-16.
e. Connect the electrical connector as shown in figure 16-16.

NOTE

Before installing the new 4 cell battery-pack, check to ensure that its voltage is 11.2 volts or greater.

CAUTION

If it is desireable to replace adhesive material on the 4 cell battery-pack, use only 3M Jet Melt Adhesive #3738. Do not use other adhesive materials since other materials may corrode the printed circuit board assembly.

f. Replace the transmitter cover by positioning the rubber "O" ring gasket, if installed, on the cover and pressing the cover and case together. Attach cover with nine screws and rubber washers.
g. Remove the old battery-pack placard from the end of transmitter and replace with new battery-pack placard supplied with the new battery-pack.

CAUTION

Be sure to enter the new battery-pack expiration date in the aircraft records. It is also recommended this date be placed in your ELT Owner's Manual for quick reference.

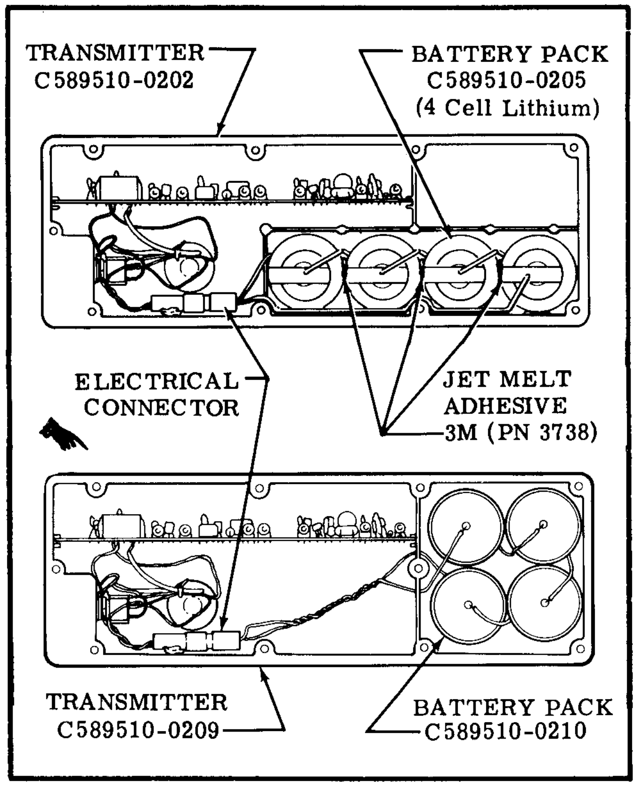


Figure 16-16. Lithium 4 Cell Battery Pack Installations

16-95. TROUBLE SHOOTING. Should your Emergency Locating Transmitter fail the 100 Hours performance checks, it is possible to a limited degree to isolate the fault to a particular area of the equipment. In performing the following trouble shooting procedures to test peak effective radiated power, you will be able to determine if battery replacement is necessary or if your unit should be returned to your dealer for repair.

SHOP NOTES:

TROUBLE	PROBABLE CAUSE	REMEDY
*POWER LOW	Low battery voltage.	1. Set toggle switch to off. 2. Remove plastic plug from the remote jack and by means of a Switchcraft #750 jackplug, connect a Simpson 260 model voltmeter and measure voltage. If the battery-pack voltage on the 6-cell magnesium battery pack transmitter is 10.8 volts or less, and on the 4-cell lithium battery pack transmitters is 11.2 volts or less, the battery pack is below specification.
	Faulty transmitter.	3. If the battery-pack voltage meets the specifications in step 2, the battery-pack is O.K. If the battery is O.K., check the transmitter as follows: a. Remove the voltmeter. b. By means of a switchcraft 750 jackplug and 3 inch maximum long leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to ON and observe the ammeter current drain. If the current-drain is in the 85-100 ma range, the transmitter or the co-axial cable is faulty.
	Faulty co-axial antenna cable.	4. Check co-axial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced.

*This test should be carried out with the co-axial cable provided with your unit.

SHOP NOTES:

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD 1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Battery Contactor	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fuel Indicator	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Instrument Lights	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.3
Position Lights	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Turn Coordinator	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Flashing Beacon	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
OPTIONAL EQUIPMENT (RUNNING LOAD)										
Heated-Pitot	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Strobe Lights	—	—	—	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Carburetor Air Temp	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cessna 300 ADF (Type R-521B)	1.6	1.6	1.6	1.6	—	—	—	—	—	—
Cessna 300 ADF (Type R-546A)	—	—	—	—	1.0	1.0	1.0	1.0	1.0	—
Cessna 300 ADF (Type R-546E)	—	—	—	—	1.0	1.0	1.0	1.0	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B)	.02	.02	.02	.02	.02	.02	.02	—	—	—
Cessna 300 Nav/Com (90 Channel-Type RT-517R)	4.5	4.5	4.5	4.5	—	—	—	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	4.5	4.5	4.5	4.5	—	—	—	—	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-508A)	—	—	—	—	1.9	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	—	—	—	—	1.9	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)	—	—	—	—	—	1.9	1.9	1.9	1.9	—
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	—	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-328C)	—	—	—	—	—	—	1.5	—	—	—
Cessna 300 Nav/Com (720 Channel-Type RT-328D)	—	—	—	—	—	—	—	1.5	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-308C)	—	—	—	—	—	—	1.5	1.5	1.5	1.5
Cessna 300 Transceiver (Type RT-524A)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	—
Cessna 300 HF Transceiver (Type PT10-A)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	—	—	—
Cessna 300 Transponder (Type KT-75R)	1.5	1.5	1.5	1.5	1.5	—	—	—	—	—
Cessna 300 Transponder (Type KT-76 & KT-78)	—	—	—	—	1.3	1.3	1.3	1.3	—	—
Cessna 300 Transponder (Type RT-359A)	—	—	—	—	—	—	1.0	1.0	1.0	2.0
Cessna 300 Navomatic (Type AF-512C)	2.0	2.0	2.0	2.0	—	—	—	—	—	—
Cessna 300 Navomatic (Type AF-512D)	—	—	—	—	2.0	—	—	—	—	—
Cessna 300 Navomatic (Type AF-394A)	—	—	—	—	—	2.0	2.0	—	—	—
Cessna 300A Navomatic (Type AF-395A)	—	—	—	—	—	—	—	2.0	2.0	2.5
Cessna 300 DME (Type KN-60B)	3.0	3.0	3.0	3.0	—	—	—	—	—	—
Cessna 300 DME (Type KN-60C)	—	—	—	—	3.0	3.0	2.9	—	—	—
Cessna 400 Glideslope (Type R-543B)	0.5	0.5	0.5	0.5	0.5	—	—	—	—	—
Cessna 400 Glideslope (Type R-443A)	—	—	—	—	—	0.4	—	—	—	—
Cessna 400 Glideslope (Type R-443B)	—	—	—	—	—	—	0.5	0.5	0.5	0.5
Cessna 400 Marker Beacon (Type R-402A)	—	—	—	—	—	—	—	0.3	.14	.10
Cessna 400 Transponder (Type RT-459A)										2.0
Cessna 200A Navomatic (Type AF-295A)	—	—	—	—	—	—	2.0	—	—	—
Cessna 200A Navomatic (Type AF-295B)	—	—	—	—	—	—	—	2.0	2.0	2.5
Cessna EA-401A Encoding Altimeter	—	—	—	—	—	—	—	.065	.065	.065
King KY-95E	4.0	4.0	4.0	—	—	—	—	—	—	—
King KX-160AE, -160E and -160FE (360 channel)	2.5	2.5	2.5	—	—	—	—	—	—	—
King KX-160-1 (100 channel)	2.5	2.5	2.5	—	—	—	—	—	—	—
Sunair SSB Transceiver (Type ASB-125)	—	—	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Narco Mark 12A Nav/Com	4.6	4.6	—	—	—	—	—	—	—	—
Narco Mark 12B Nav/Com with VOA-40 or VOR-50	—	4.6	4.6	4.6	—	—	—	—	—	—
King KN-60C DME	—	—	—	—	—	—	—	2.9	—	—
Pantronics PT10-A HF Transceiver	—	—	—	—	—	—	—	1.5	1.5	1.5
Cessna 300 Nav/Com (720 Channel-Type RT-328T	—	—	—	—	—	—	—	—	1.5	1.5
Narco 190 DME	—	—	—	—	—	—	—	—	3.0	2.9
Blind Encoder										.100
Bendix Marker Beacon (GM-247A)										.100

†Negligible

ELECTRICAL LOAD ANALYSIS CHART (CONT.)

ITEMS NOT CONSIDERED AS PART OF THE RUNNING LOAD	AMPS REQD 1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Cigarette Lighter	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Clock	†	†	†	†	†	†	†	†	†	†
Control Wheel Map Light	.33	.33	.33	.16	.16	.16	.33	.33	.33	.33
Courtesy and Dome Lights	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Flap Motor.	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Landing Lights (Single)	15.6	15.6	15.6	18.0	20.0	20.0	20.0	20.0	20.0	20.0
Auxiliary Fuel Pump	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Landing Lights (Dual	—	—	—	—	—	—	15.6	15.6	15.6	15.6
†Negligible										

SECTION 18

STRUCTURAL REPAIR

TABLE OF CONTENTS

18-1. STRUCTURAL REPAIR.

18-2. REPAIR CRITERIA. Although this section outlines repair permissible on structure of the aircraft, the decision of whether to repair or replace a major unit of structure will be influenced by such factors as time and labor available and by a comparison of labor costs with the price of replacement assemblies. Past experience indicates that replacement, in many cases, is less costly than major repair. Certainly, when the aircraft must be restored to its airworthy condition in a limited length of time, replacement is preferable. Restoration of a damaged aircraft to its original design strength, shape and alignment involves careful evaluation of the damage, followed by exacting workmanship in performing the repairs. This section suggests the extent of structural repair practicable on the aircraft and supplements Federal Aviation Regulation, Part 43. Consult the factory when in doubt about a repair not specifically mentioned here.

18-3. EQUIPMENT AND TOOLS.

18-4. SUPPORT STANDS. Padded, reinforced sawhorse or tripod type support stands, sturdy enough to support any assembly placed upon them, must be used to store a removed wing or tailcone. Plans for local fabrication of support stands are contained in figure 18-1. The fuselage assembly, from the tailcone to the firewall, must NOT be supported from the underside, since the skin bulkheads are not designed for this purpose. Adapt support stands to fasten to the wing-attach points or landing gear attach-points when supporting a fuselage.

18-5. FUSELAGE REPAIR JIGS. Whenever a repair is to be made which could affect structural alignment, suitable jigs must be used to assure correct alignment of major attach points, such as fuselage, firewall, wing and landing gear. These fuselage repair jigs are obtainable from the factory.

18-6. WING JIGS. These jigs serve as a holding fixture during extensive repair of a damaged wing, and locates the root rib, leading edge and tip rib of the wing. These jigs are also obtainable from the factory.

18-7. 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 ANGLE-OF-INCIDENCE. Angle-of-incidence and wing twist are listed in the following chart. The cantilever wing has a uniform twist from the root rib to the tip rib. The amount of twist between these two ribs is the difference between the angle-of-incidence at the root and the angle-of-incidence at the tip. See figure 18-2.

Angle-of-incidence, Root	+3°30'
Angle-of-incidence, Tip	+ 30'
Twist (Washout)	3°

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 transmitter, 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 146.00 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 84.0. Inboard of station 84.0, factory approval of proposed repairs is required. Refer to Section 12 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 should be used to repair damage to the remaining skins. Filler material must match existing corrugations. Doubler material may be flat. 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. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-36. WING FLAPS.

18-37. NEGLIGIBLE DAMAGE. See 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. However, repairs must not be made to the wing leading edge skin inboard of wing station 40.00 without factory approval. Refer to Section 1 for wing station locations. Extra access holes outlined in figure 18-10 must not be installed on the cantilever wing without factory approval.

18-43. DAMAGE NECESSITATING REPLACEMENT OF PARTS. An entire leading edge skin may be replaced without factory approval.

18-44. STABILATOR.

18-45. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-46. REPAIRABLE DAMAGE. Should damage occur to the skin in the area between the two outboard ribs, the entire skin in that area may be replaced or the skin in any bay may be replaced, depending on the extent of damage. Replacement skin must be the same gage as the original skin. Repair seams must be made to lie along existing structural members, and each seam must use the same rivet size and pattern as the original seam. Should damage occur to the stabilator tip, replacement of the tip is recommended. Following repair, the stabilator must be balanced. Refer to paragraph 18-48 and figure 18-3 for balancing the stabilator.

18-47. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Repairs must not be made to the stabilator inboard of the area between the two outboard ribs without factory approval. However, an entire skin, spar or rib may be replaced without factory approval. Following repair or replacement, the stabilator must be balanced. Refer to paragraph 18-48 and figure 18-3 for balancing the stabilator.

18-48. STABILATOR BALANCING. Following repair, replacement or painting, the stabilator must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-49. STABILATOR TRIM TAB. Repairs must not be made to the stabilator trim tab without factory approval.

18-50. RUDDER.

18-51. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-52. REPAIRABLE DAMAGE. Skin patches, illustrated in figure 18-4, may be used to repair skin damage. If the damaged area would require a repair which could not be made between adjacent ribs, see the following paragraph. Following repair, rudder must be balanced. Refer to paragraph 18-54 and figure 18-3 for balancing the rudder.

18-53. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the entire assembly is recommended. After repair or replacement, balance rudder in accordance with paragraph 18-54 and figure 18-3.

18-54. RUDDER BALANCING. Following repair, replacement or painting, the rudder must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-55. FIN.

18-56. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-57. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Access to the dorsal fin may be gained by removing the attaching screws, then remove the dorsal fin from the aircraft. Access to the fin is best 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.

18-58. 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.

18-59. FUSELAGE.

CAUTION

Repairs must not be made to the main wing spar carry-thru section of the cantilever wing without factory approval.

18-60. DESCRIPTION. The fuselage is of semi-monocoque construction consisting of formed bulkheads, longitudinal stringers, reinforcing channels and skin platings.

18-61. 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 occurring over stringers which disappear when the rivet pattern is removed may be considered negligible. However, the stringer rivet holes may not align perfectly with the skin holes because of a permanent "set" in the stringer. If this is apparent, replacement of the stringer will usually restore the original strength characteristics of the area.

NOTE

Wrinkles occurring in the skin of the main landing gear bulkhead areas must not be considered negligible. The skin panel must be opened sufficiently to permit a thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

Wrinkles occurring 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.

18-62. 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.

18-63. 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. Seat rails serve as structural parts of the fuselage and must be replaced if damaged.

18-63A. BONDED DOORS.

18-63B. 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.

18-64. BULKHEADS.

18-65. 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.

18-66. 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.

18-67. REPLACEMENT OF HI-SHEAR RIVETS. Hi-shear rivet replacement with close tolerance bolts or other commercial fasteners of equivalent strength properties is permissible. Holes must not be elongated, and the Hi shear substitute must be a smooth push fit. Field replacement of main landing gear forgings on bulkheads may be accomplished by using:

a. NAS464P* Bolt, MS21042-* Nut and AN960-* washer in place of Hi-Shear Rivets for forgings with machined flat surface around attachment holes.

b. NAS 464P* Bolt, ESNA 2935* Mating Base Ring, ESNA LH 2935* Nut for forgings (with draft angle of up to a maximum of 8°) without machined flat surface around attachment holes.

*Dash numbers to be determined according to the size of the holes and the grip lengths required. The bolts grip length should be chosen so that no threads remain in the bearing area.

18-68. FIREWALL DAMAGE. Firewalls may be repaired by removing the damaged material and splicing in a new section. The new portion must be lapped over the old material, sealed with Pro-Seal #700 (Coast Pro-Seal Co., Chemical Division, 2235 Beverly Blvd., Los Angeles, California) compound, or equivalent and secured with stainless steel rivets. Damaged or deformed angles and stiffeners may be repaired as shown in figure 18-11, or they may be replaced. A severely damaged firewall must be replaced as a unit.

18-69. ENGINE MOUNT.

18-70. DESCRIPTION. The mount for the aircraft engine is constructed of 4130 chrome-molybdenum steel tubing. A truss structure, fastened to the firewall at four points, supports a cradle arrangement.

this cradle arrangement, with its supporting lugs, forms the base for rubber shock mounted engine supports.

18-71. GENERAL CONSIDERATIONS. All welding on the engine mount must be of the highest quality since the tendency of vibration is to accentuate any minor defect present and cause fatigue cracks. Engine mount members are preferably repaired by using a large diameter replacement tube, telescoped over the stub of the original member, using fishmouth and rosette type welds. However, reinforced 30-degree scarf welds in place of the fishmouth welds are considered satisfactory for engine mount repair work.

18-72. ENGINE MOUNT SUPPORT CRADLE DAMAGE. Minor damage such as a crack adjacent to an engine attaching lug may be repaired by rewelding the cradle tube and extending a gusset past the damaged area. Extensively damaged parts must be replaced.

18-73. DAMAGE INVOLVING ENGINE MOUNTING LUGS AND ENGINE MOUNT-TO-FUSELAGE ATTACHING FITTINGS. Engine mounting lugs and engine mount-to-fuselage attaching fittings should not be repaired but must be replaced.

18-74. 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.

18-75. ENGINE COWLING.

18-76. 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 AC43.13-1 are also applicable to cowling.

18-77. REPAIR OF REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to their small size they are easier to replace than repair.

18-78. REPAIR OF ABS COMPONENTS. Rezolin Repair Kit Number 404 may be obtained from the Cessna Service Parts Center for repair of ABS components.

18-79. 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 better adhesion.

SHOP NOTES:

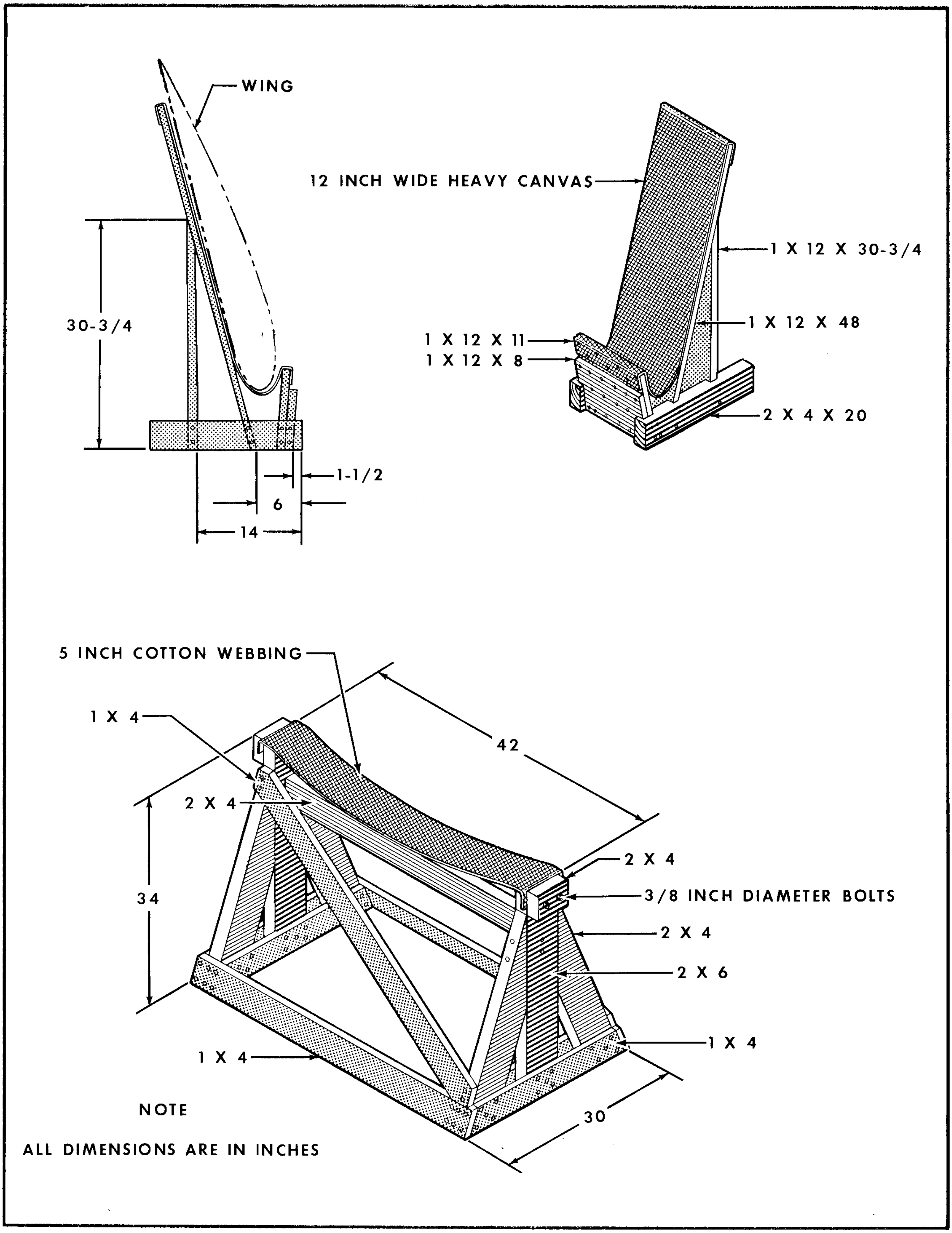
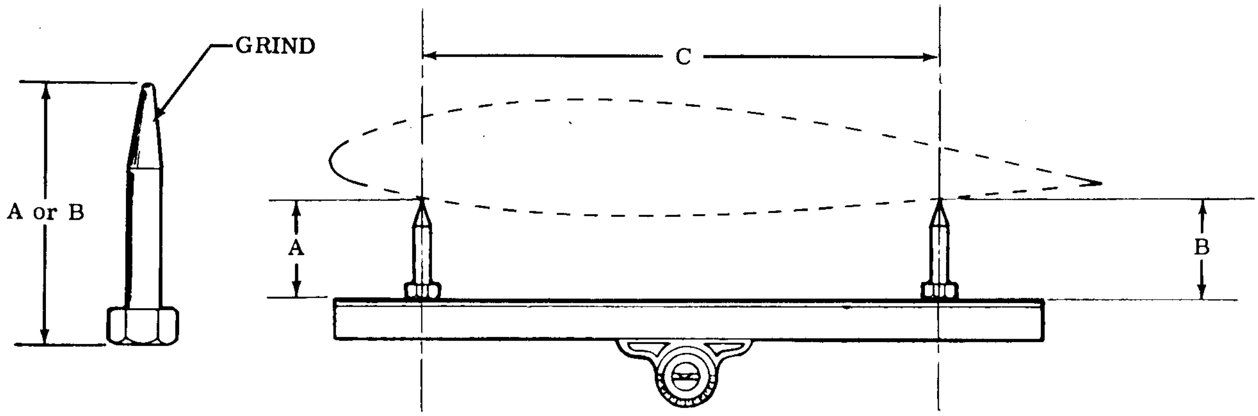
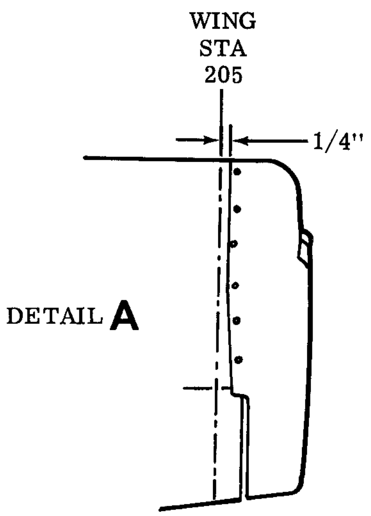


Figure 18-1. Support Stands





MODELS	A	B	C	WING STATION
177 AND 177A	2.00 .75	2.00 2.00	40.50 25.50	26.50 205.00

MODELS	A	B	C	WING STATION
177B	2.00 .25	2.00 2.00	40.50 25.50	26.50 205.00

(Refer to paragraph 18-8 for angle of incidence).

CHECKING WING TWIST

If damage has occurred to a wing, it is advisable to check the twist. The following method can be used with a minimum of equipment, which includes a straightedge (42" minimum length of angle, or equivalent), two 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 the lateral row of rivets in the wing leading edge spar flange. rivet
5. Locate outboard wing station to be checked in accordance with detail A. Make a pencil mark approximately one-half inch aft of first lateral row of rivets in the leading edge spar.
6. 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.
7. Set bubble in level to center and lock protractor to hold this reading.
8. Omitting step 7, repeat procedure for each wing station, using dimensions specified in the chart. Check to see that protractor bubble is still centered.
9. 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

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.

3. Make sure all control surfaces are in their final flight configuration: painted, trim tabs installed, balance weight installed, all foreign matter removed from inside of control surface, stabilator 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 adding washers or nuts as required at end opposite the trailing edge support.

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.

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 Catalogs 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 and/or existing weights for correct balance.

BALANCING BEAM

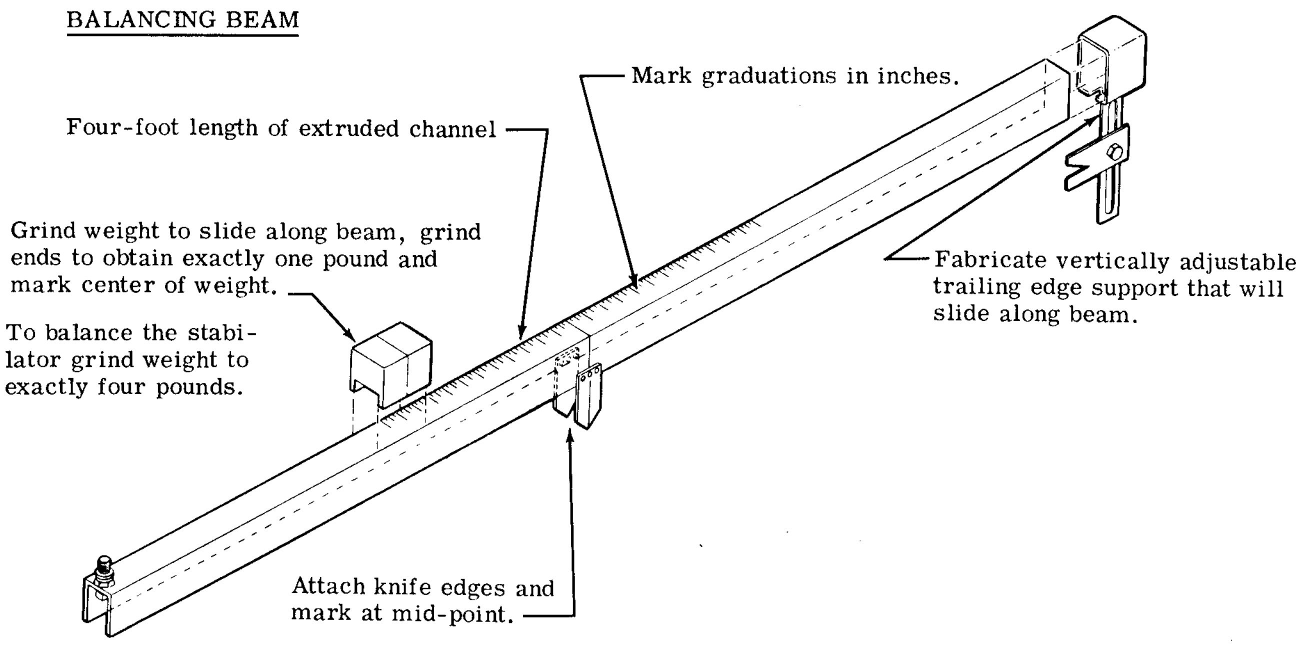


Figure 18-3. Control Surface Balancing (Sheet 1 of 4)

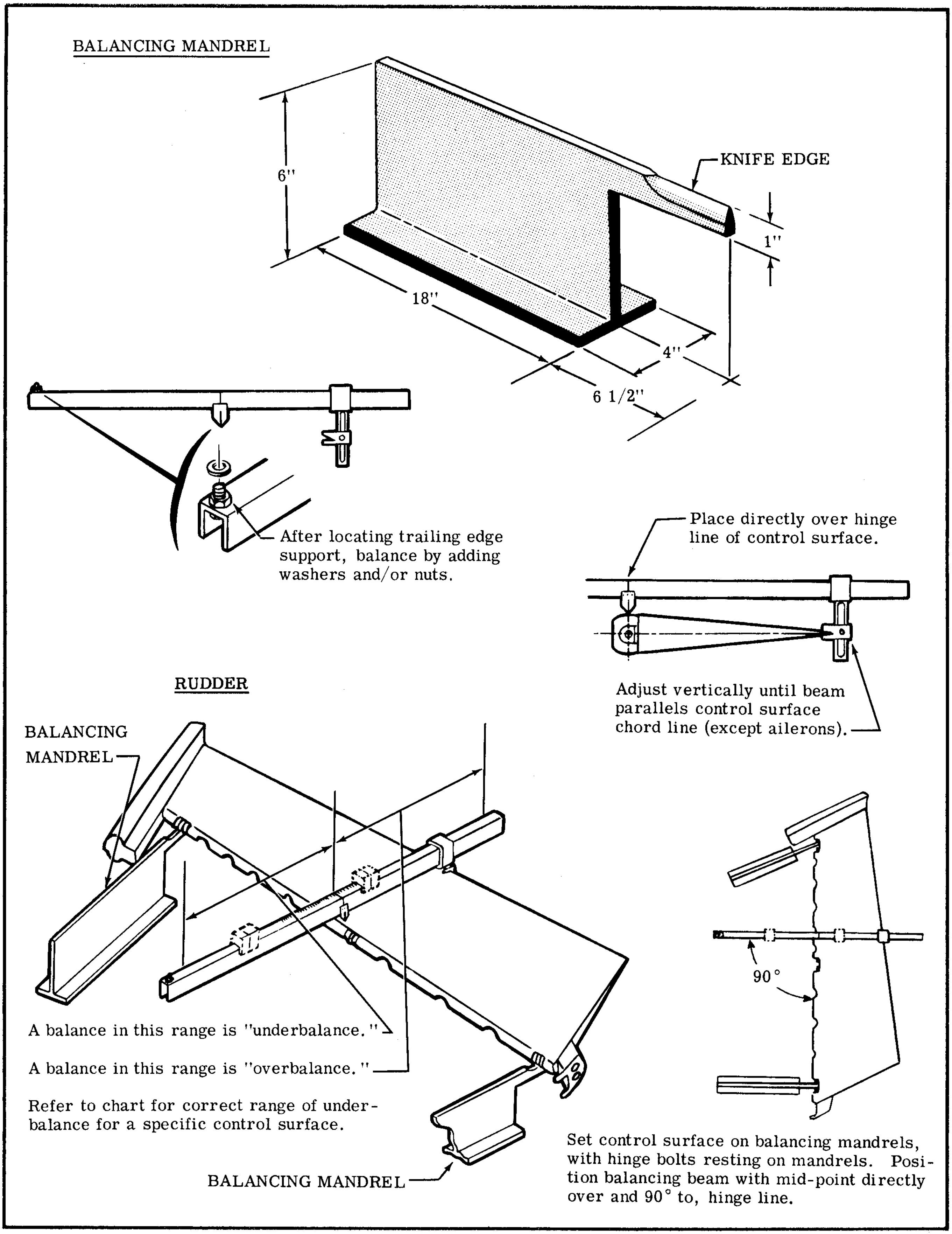
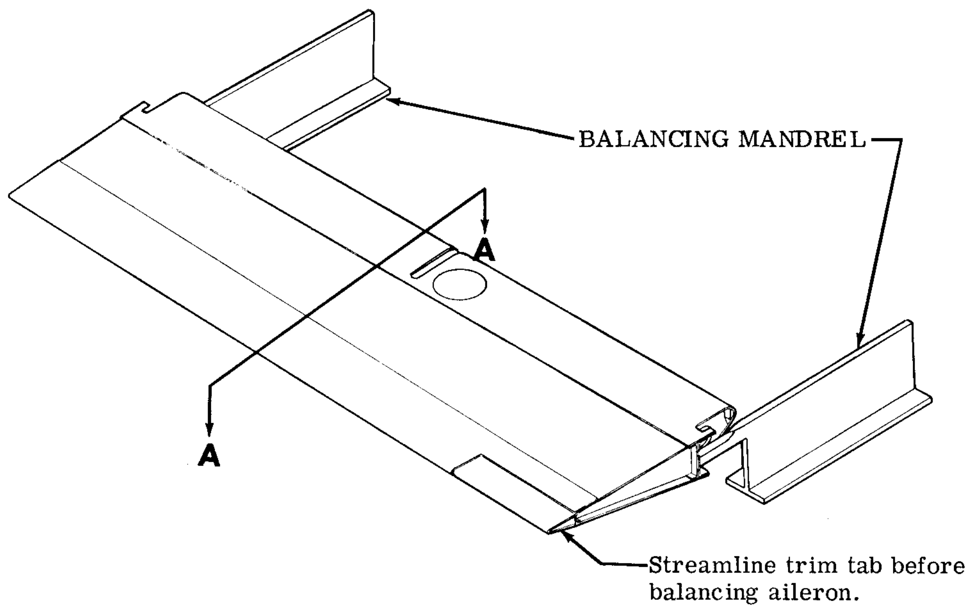
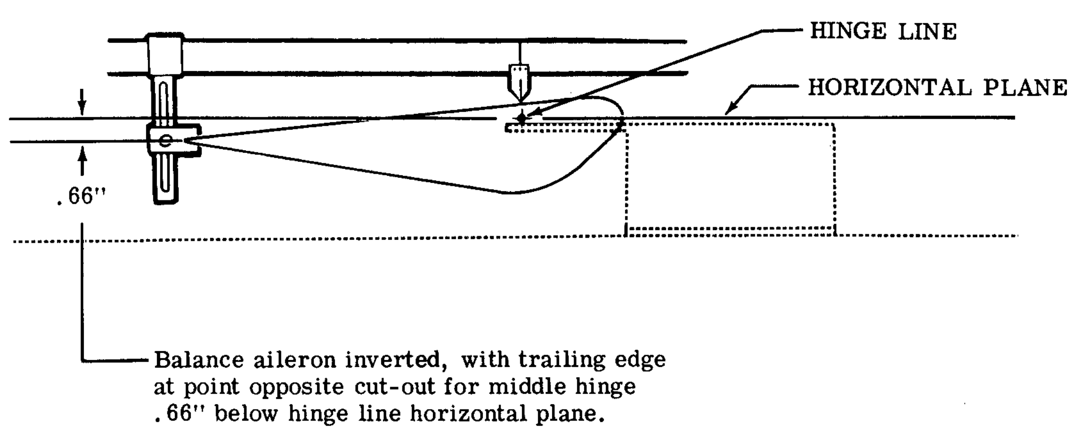


Figure 18-3. Control Surface Balancing (Sheet 2 of 4)

AILERONS



DETAIL A-A



Refer to chart for correct range of underbalance.

Figure 18-3. Control Surface Balancing (Sheet 3 of 4)

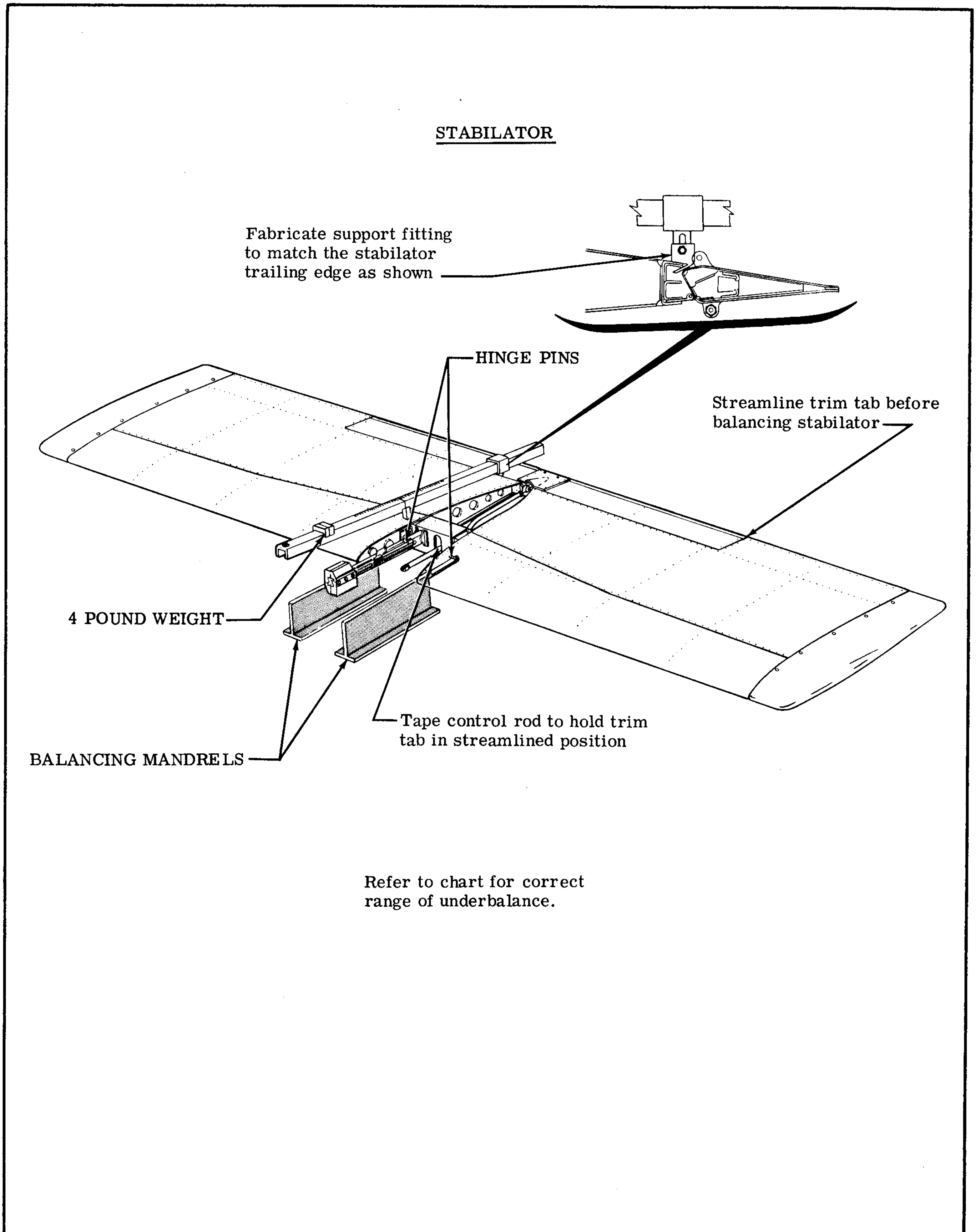


Figure 18-3. Control Surface Balancing (Sheet 4 of 4)

CONTROL SURFACE BALANCE REQUIREMENTS

NOTE

Unpainted values are not limits which must be met. They are given as guides, in order that the unbalance of the control surface in the final aircraft configuration may be predicted. If the control surface in the unpainted condition falls within the unpainted limit, the mechanic may feel confident that the control surface will be acceptable after painting. However, if the surface in the unpainted condition exceeds the unpainted limit, the balance must be checked again after final painting to assure that the control surface falls within the painted unbalance limit. Refer to GENERAL NOTES on sheet 3 for specific conditions.

DEFINITIONS:

UNDERBALANCE is defined as the condition that exists when the control surface is trailing edge heavy, and is symbolized by a plus (+).

OVERBALANCE is defined as the condition that exists when the control surface is leading edge heavy, and is symbolized by a minus (-).

NOTE

The "Balance Limits" columns list the moment tolerances within which the control surface must balance. These tolerances must never be exceeded in the final flight configuration.

CONTROL: AILERON

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
+18.97 to +23.59	+16.55 to +21.17
	Beginning with 17702317 and all spares. +15.55 to +17.55

CONTROL: RUDDER

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
+12.0 to +15.0	+10.0 to +12.5

CONTROL: STABILATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
*+60.77 to +67.00 ●/** 0.00 to +18.10 *** -27.0 to -8.9	●/** -5.00 to +1.23 *** -32.0 to -25.8

* APPLIES ONLY TO 17700001 THRU 17701134 WHICH HAVE NOT BEEN UPDATED TO CONFIGRATION OF CESSNA SERVICE LETTER SL68-14 (CESSNA CARDINAL RULE).

** AIRCRAFT WITH OR WITHOUT S-1938-1 ABRASION BOOT INSTALLED.

*** AIRCRAFT WITH S-1938-3 ABRASION BOOT INSTALLED.

● AIRCRAFT NOT COVERED BY CESSNA SERVICE LETTER SE68-14 AND WITHOUT ABRASION BOOTS INSTALLED.

Figure 18-3. Control Surface Balancing (Sheet 4A of 4)

This page intentionally left blank.

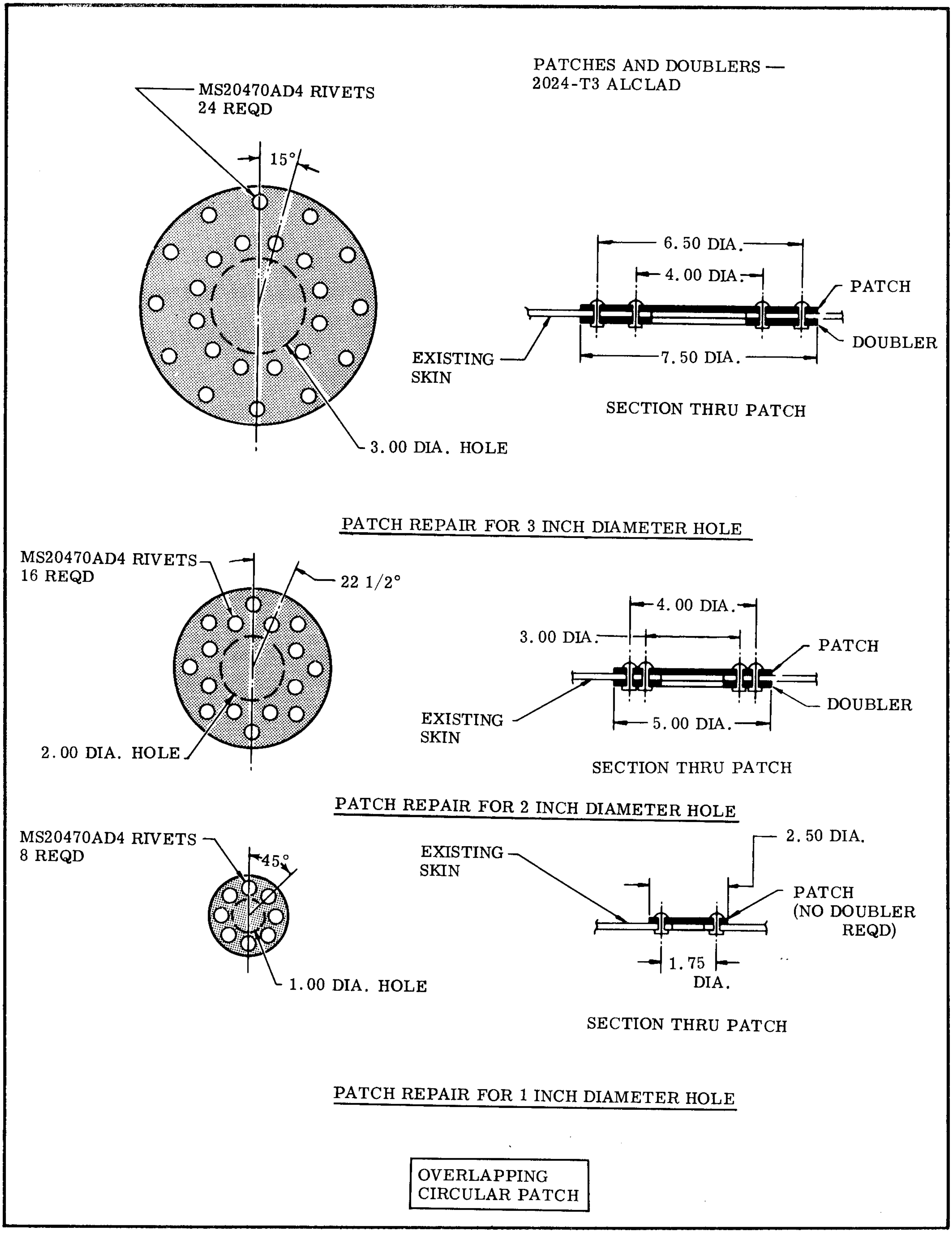
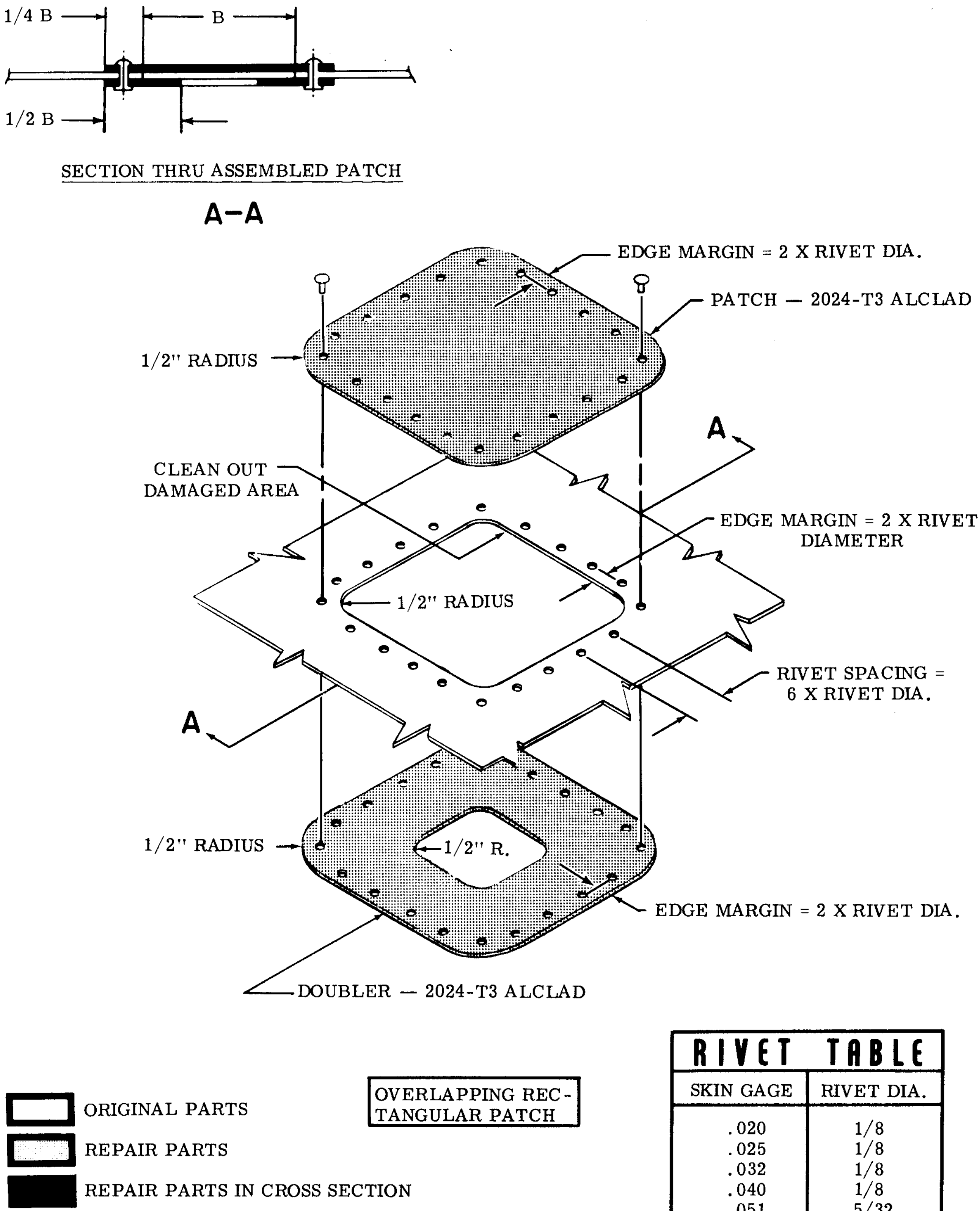


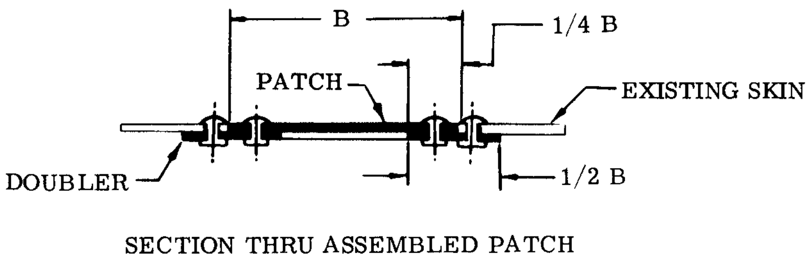
Figure 18-4. Skin Repair (Sheet 1 of 6)



RIVET TABLE

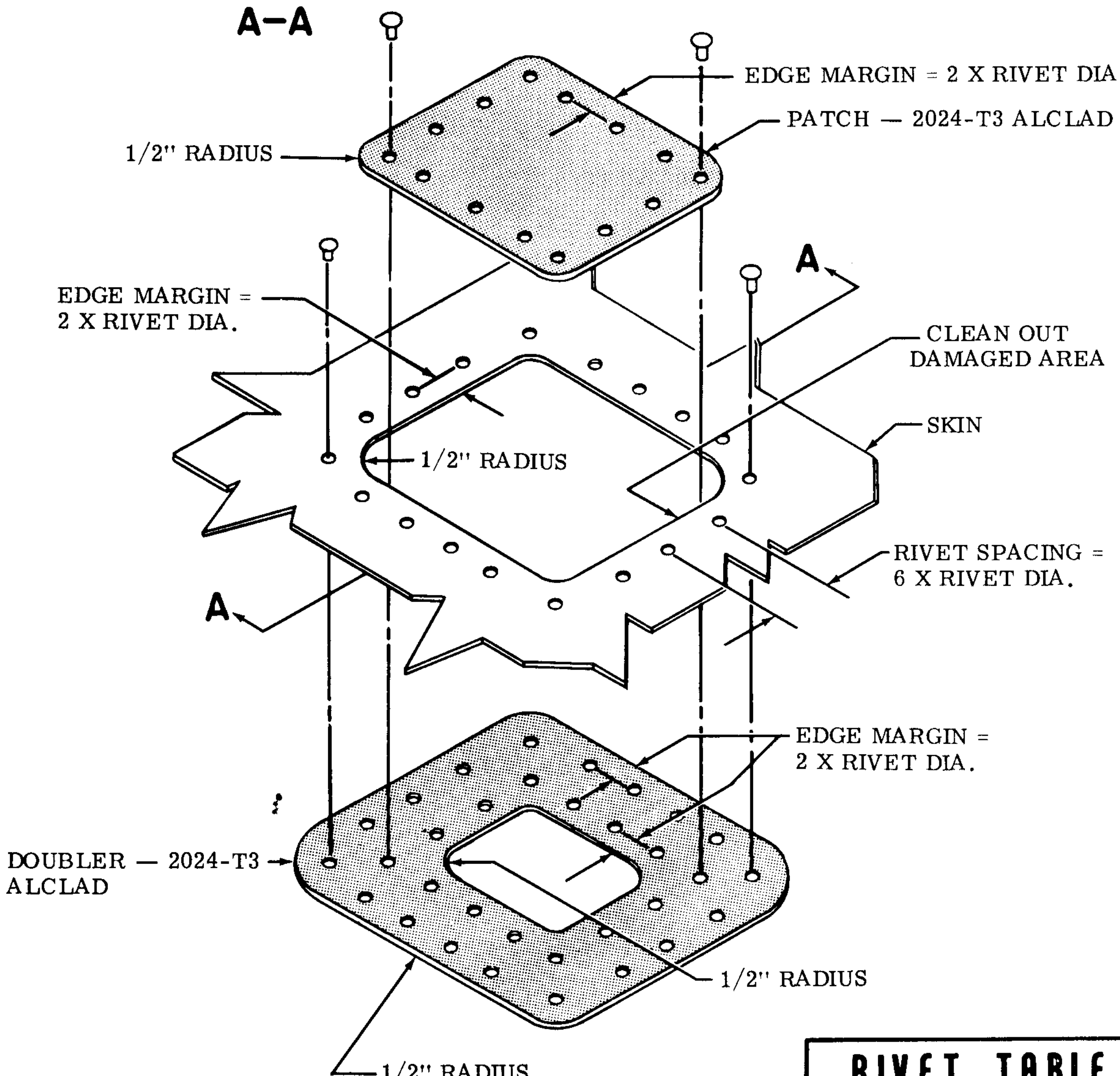
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 2 of 6)



NOTE

For optimum appearance and airflow, use flush rivets, dimpled skin and patch and countersunk doubler.



ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

FLUSH RECTANGULAR PATCH (CIRCULAR FLUSH PATCH IS SIMILAR)

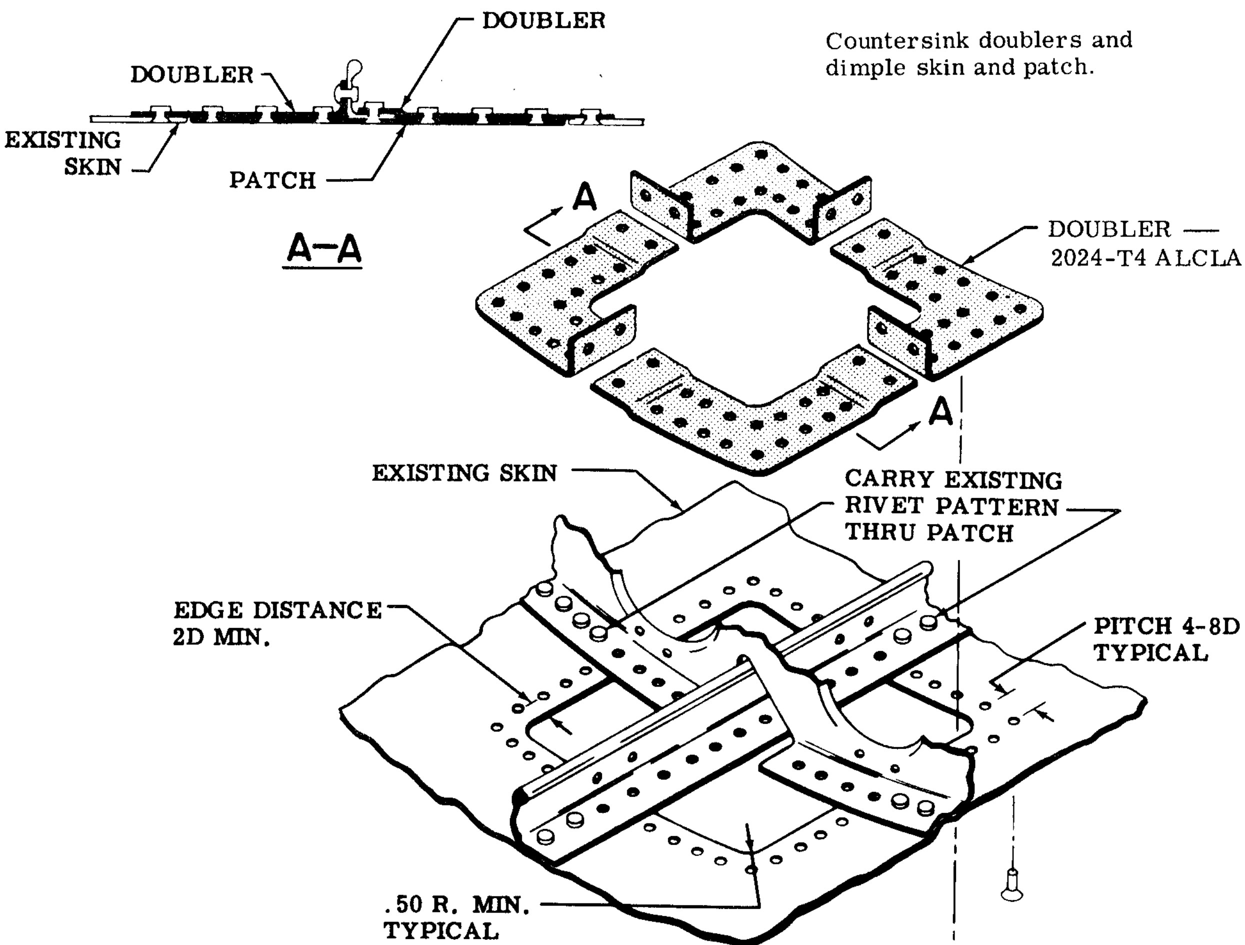
RIVET TABLE

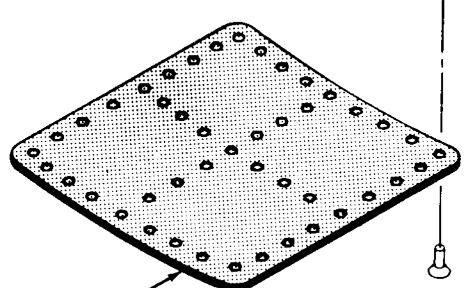
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 3 of 6)

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

FLUSH PATCH AT STRINGER/BULKHEAD INTERSECTION

ORIGINAL PARTS

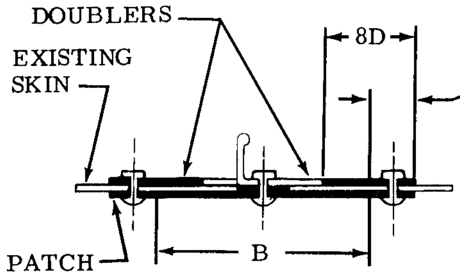
REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

NOTE

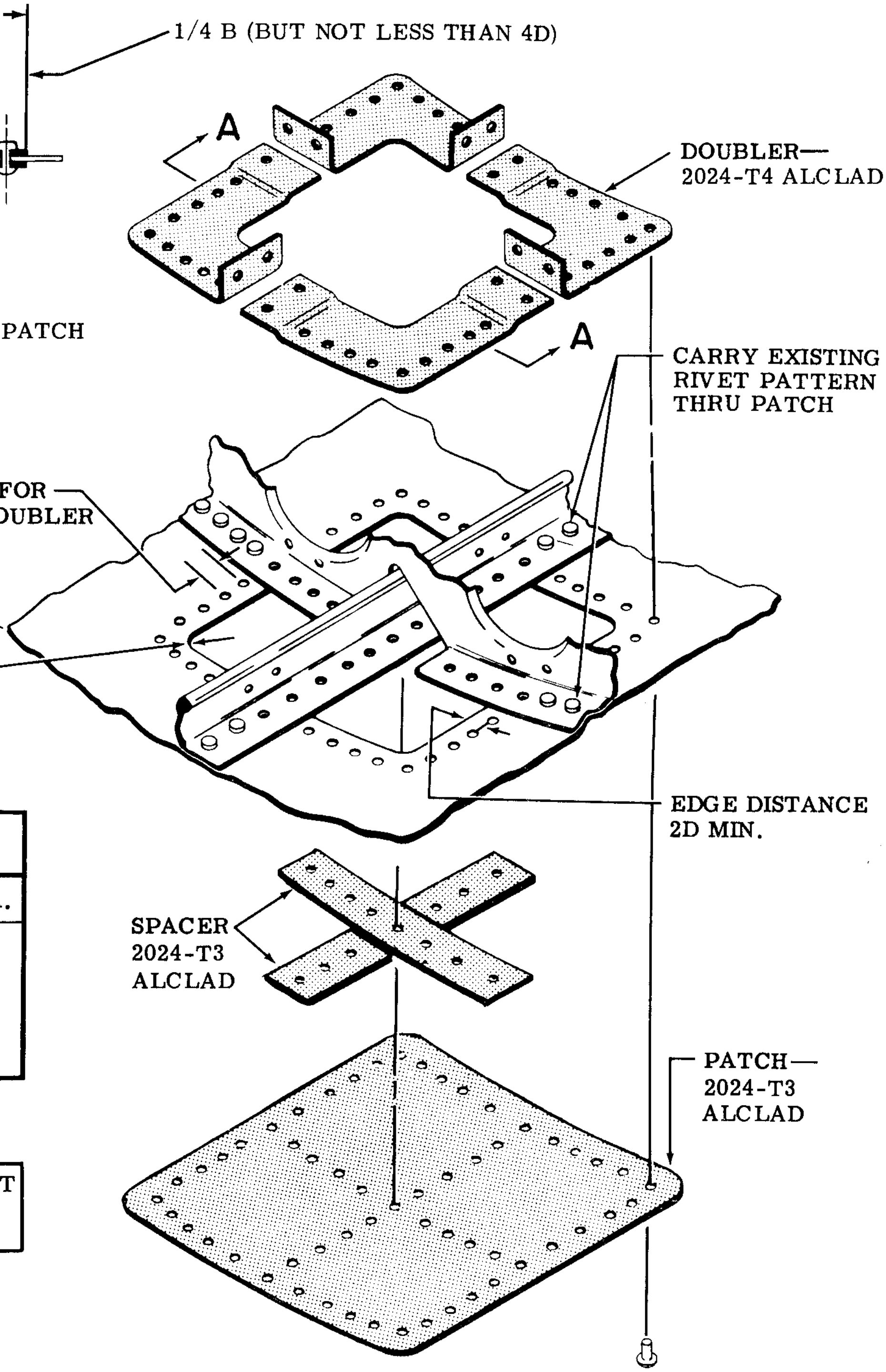
This procedure is not recommended in areas where stringers are riveted to bulkheads.

Figure 18-4. Skin Repair (Sheet 4 of 6)



A–A

SECTION THRU ASSEMBLED PATCH



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)

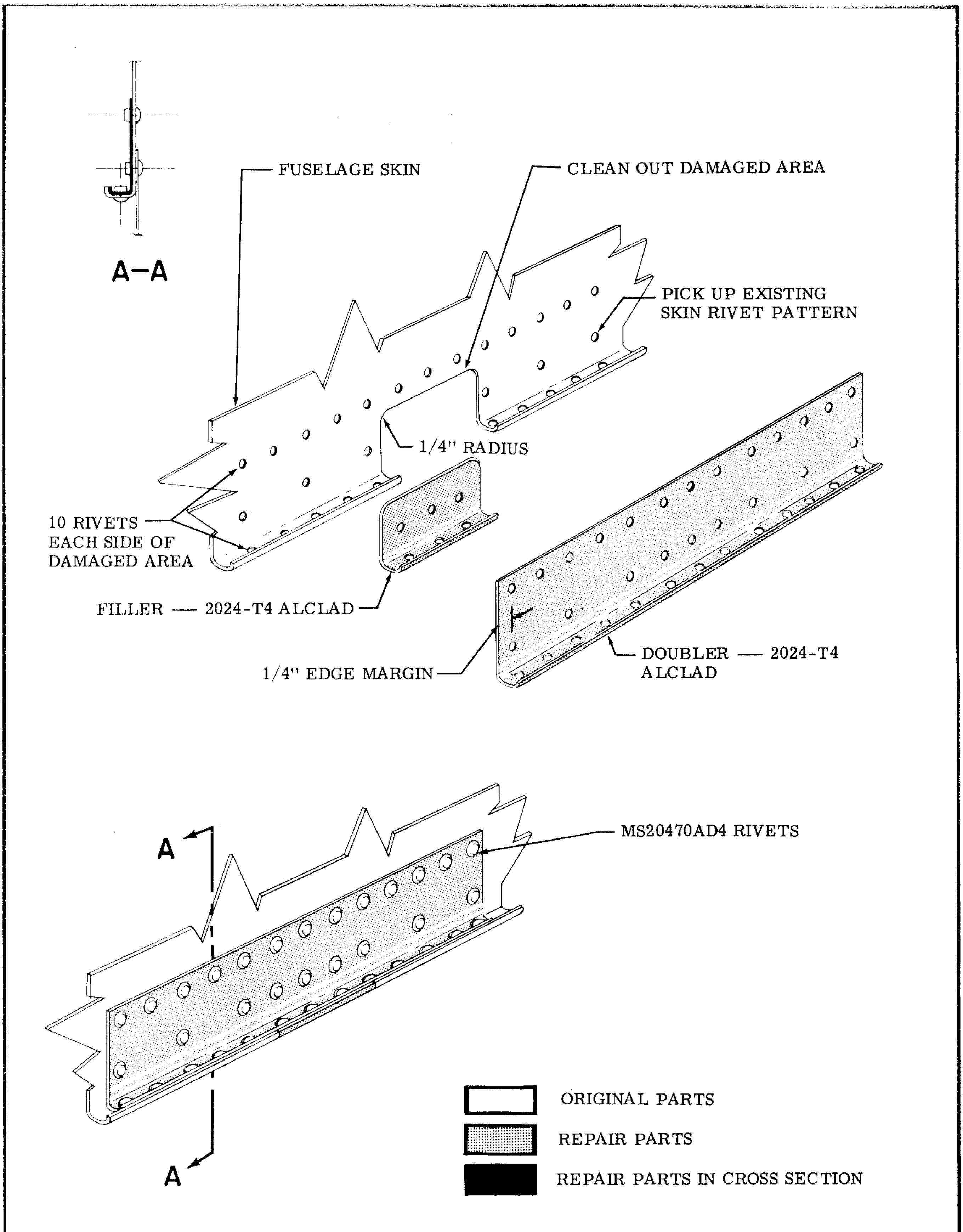


Figure 18-4. Skin Repair (Sheet 6 of 6)

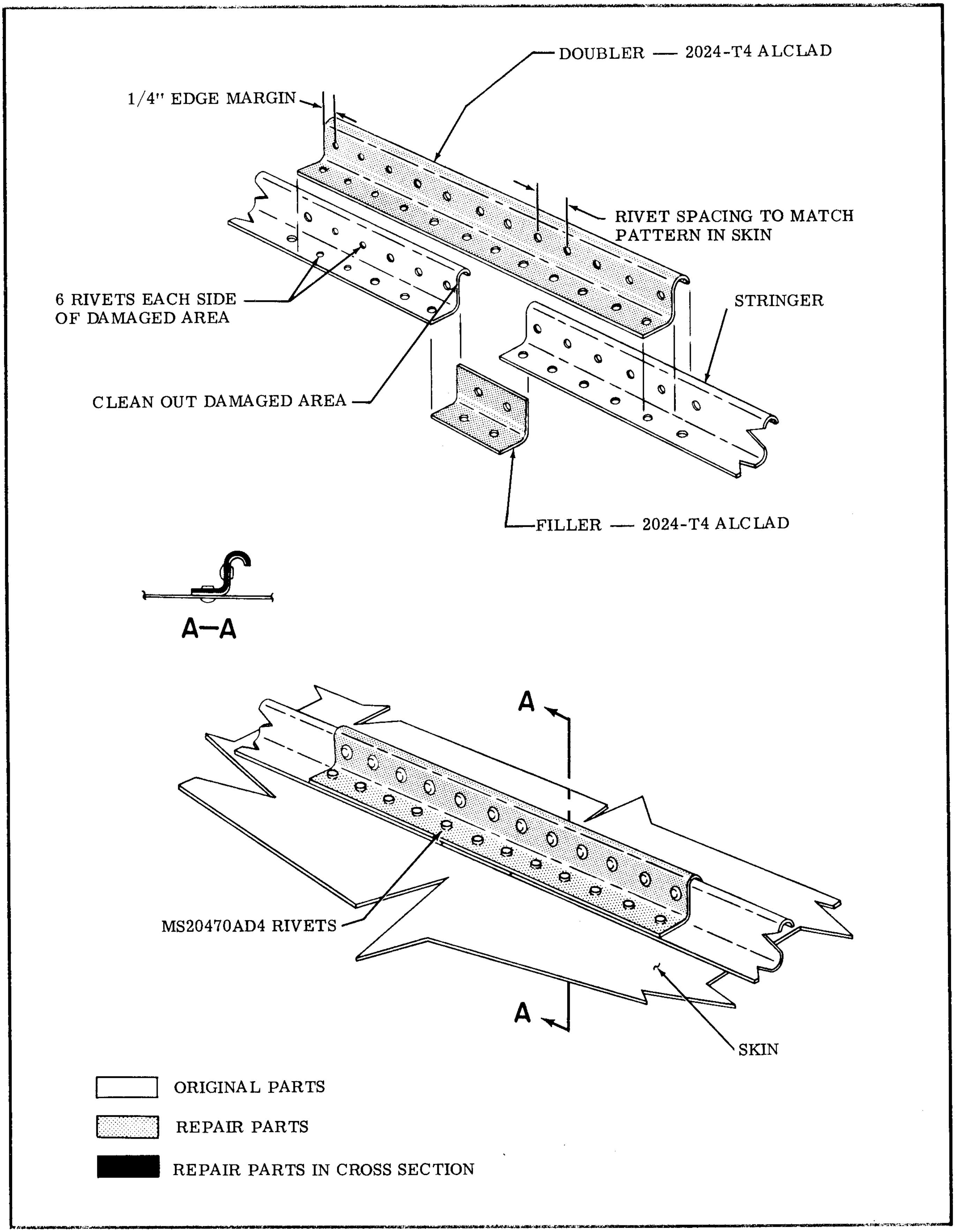


Figure 18-5. Stringer and Channel Repair (Sheet 1 of 4)

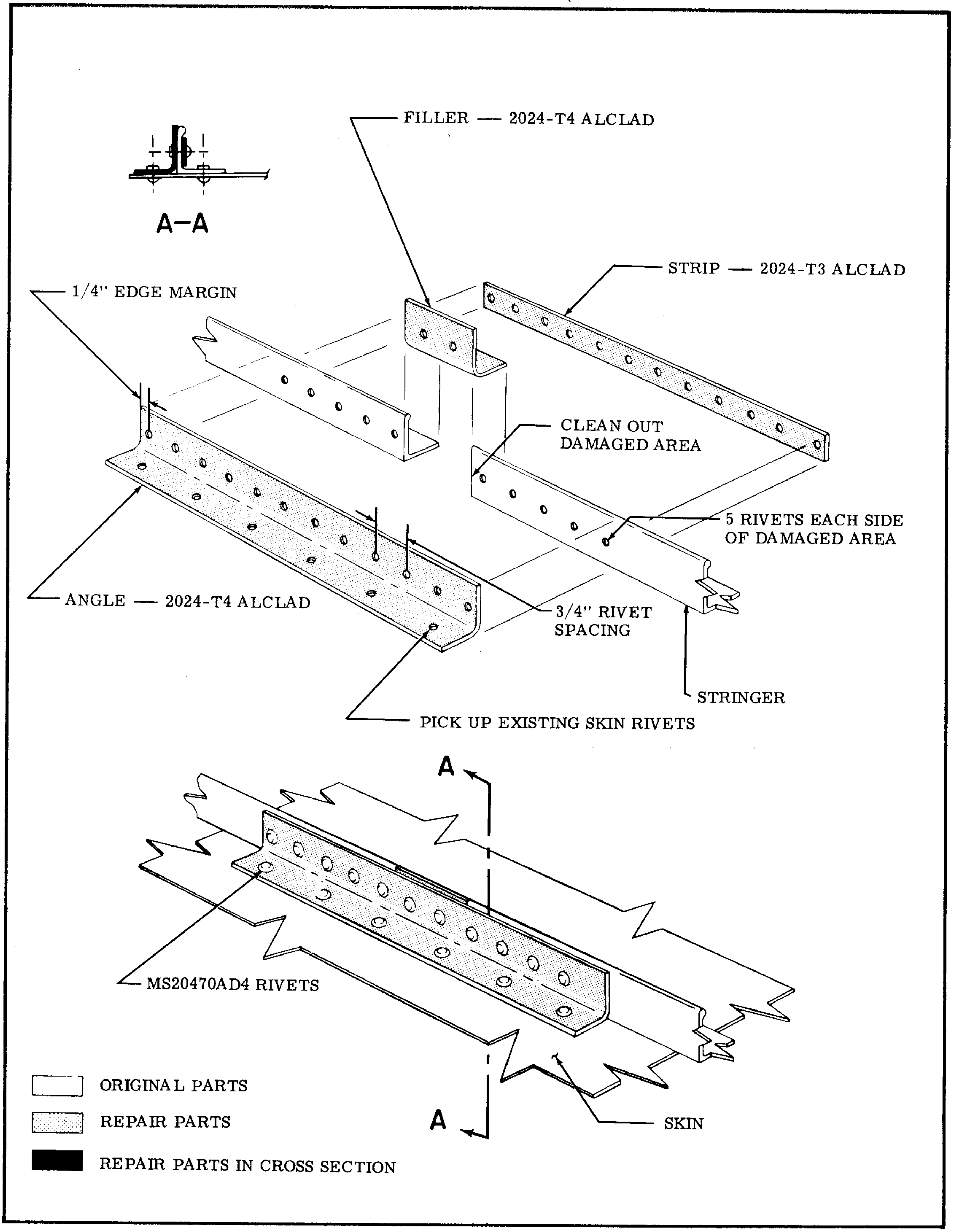


Figure 18-5. Stringer and Channel Repair (Sheet 2 of 4)

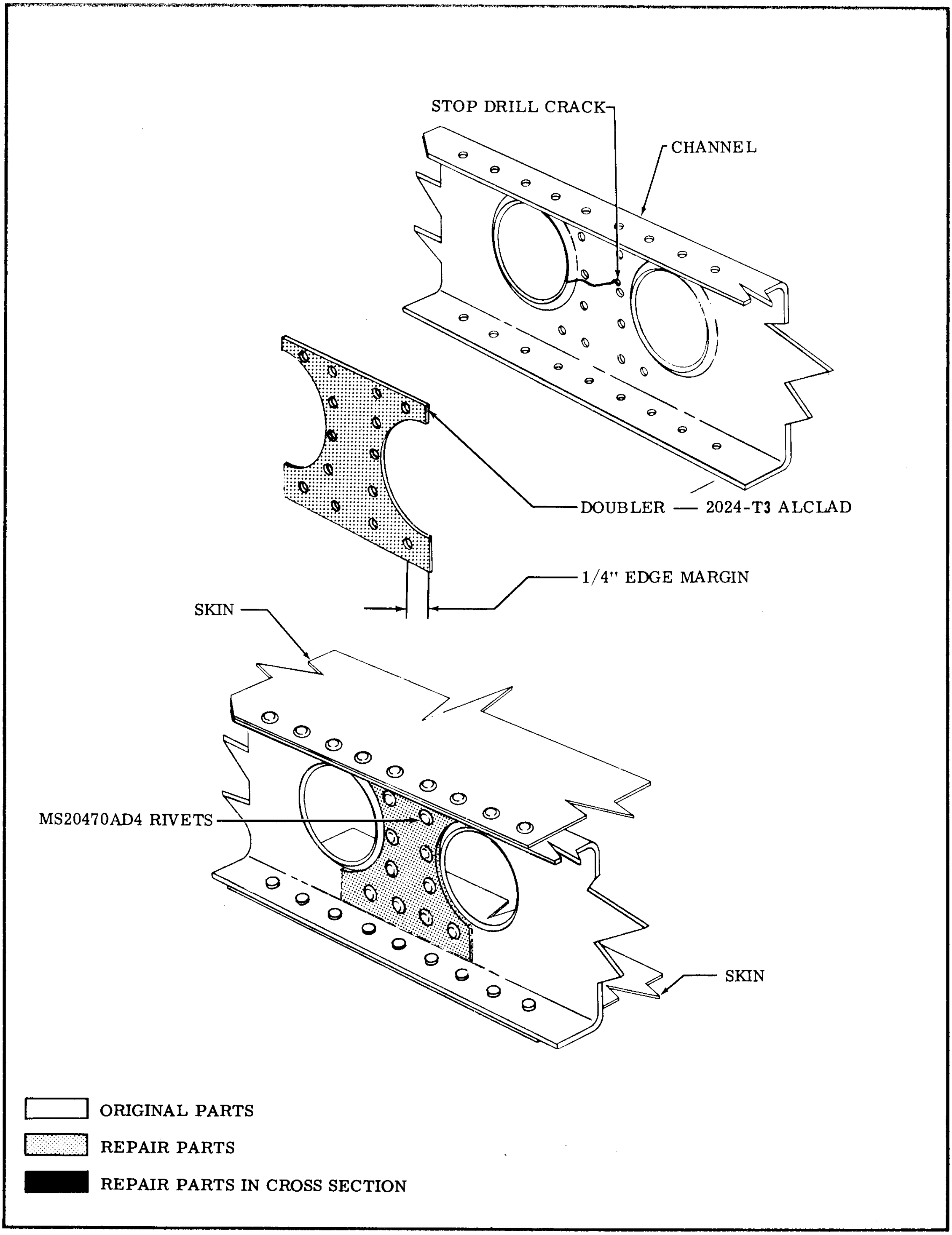


Figure 18-5. Stringer and Channel Repair (Sheet 3 of 4)

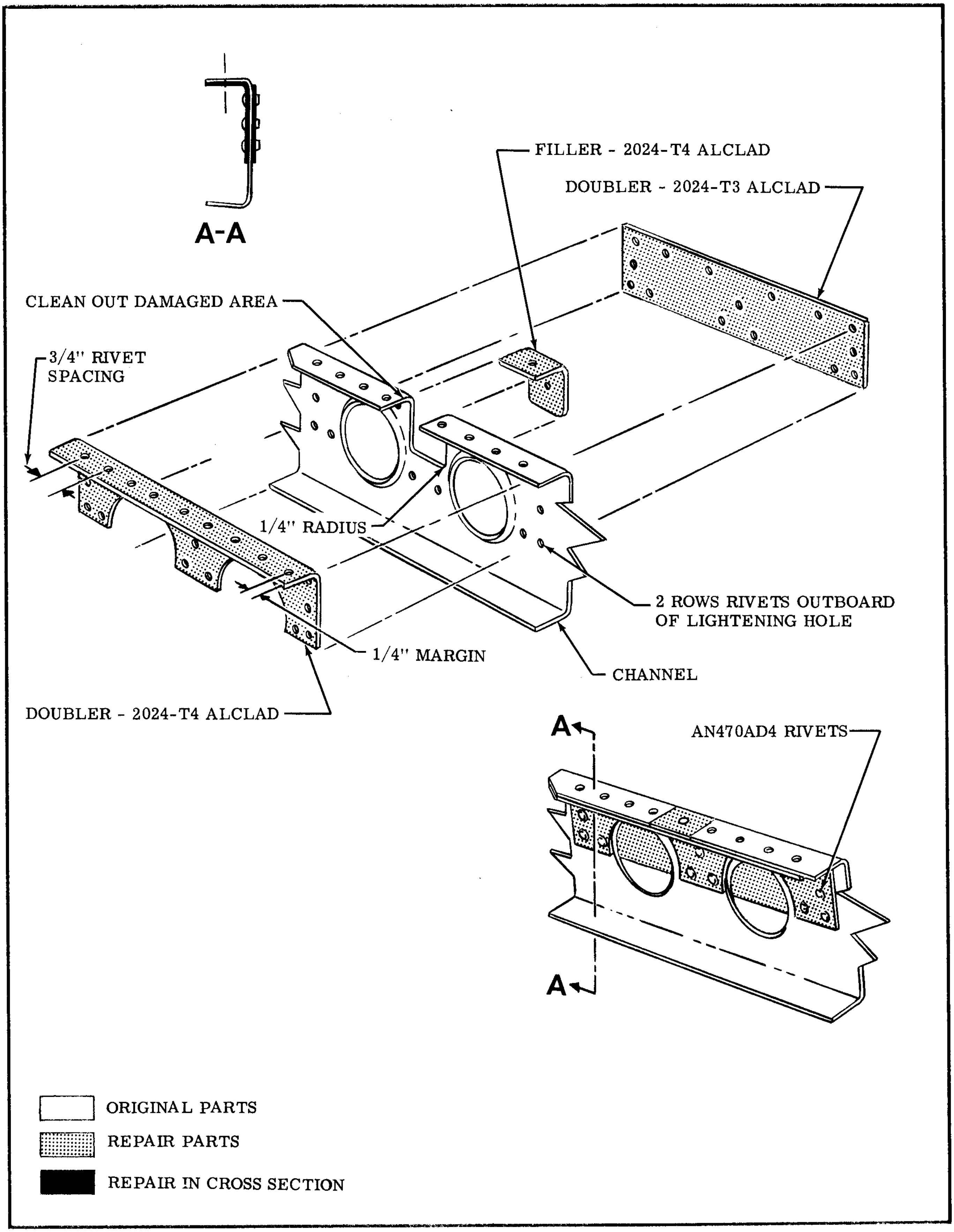


Figure 18-5. Stringer and Channel Repair (Sheet 4 of 4)

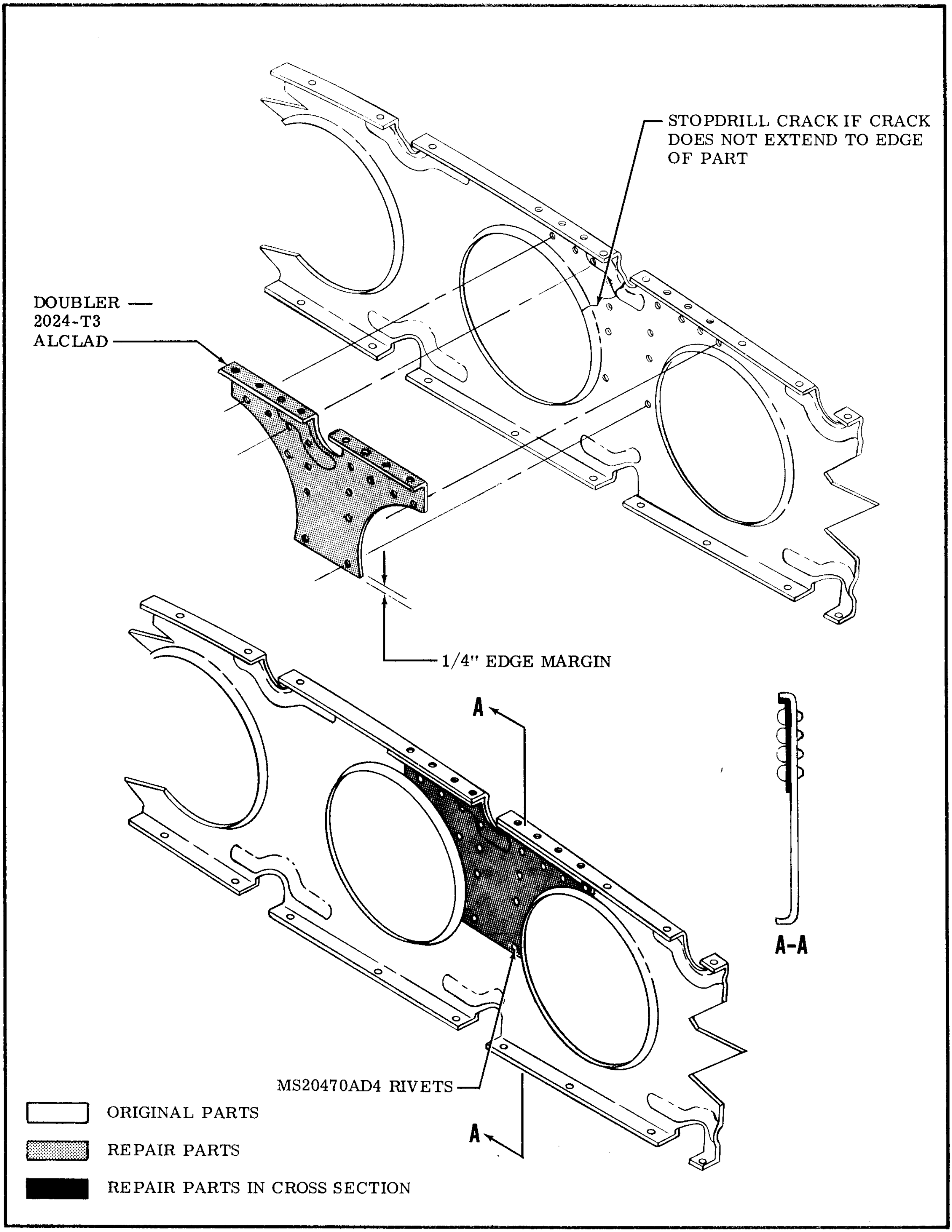


Figure 18-6. Rib Repair (Sheet 1 of 2)

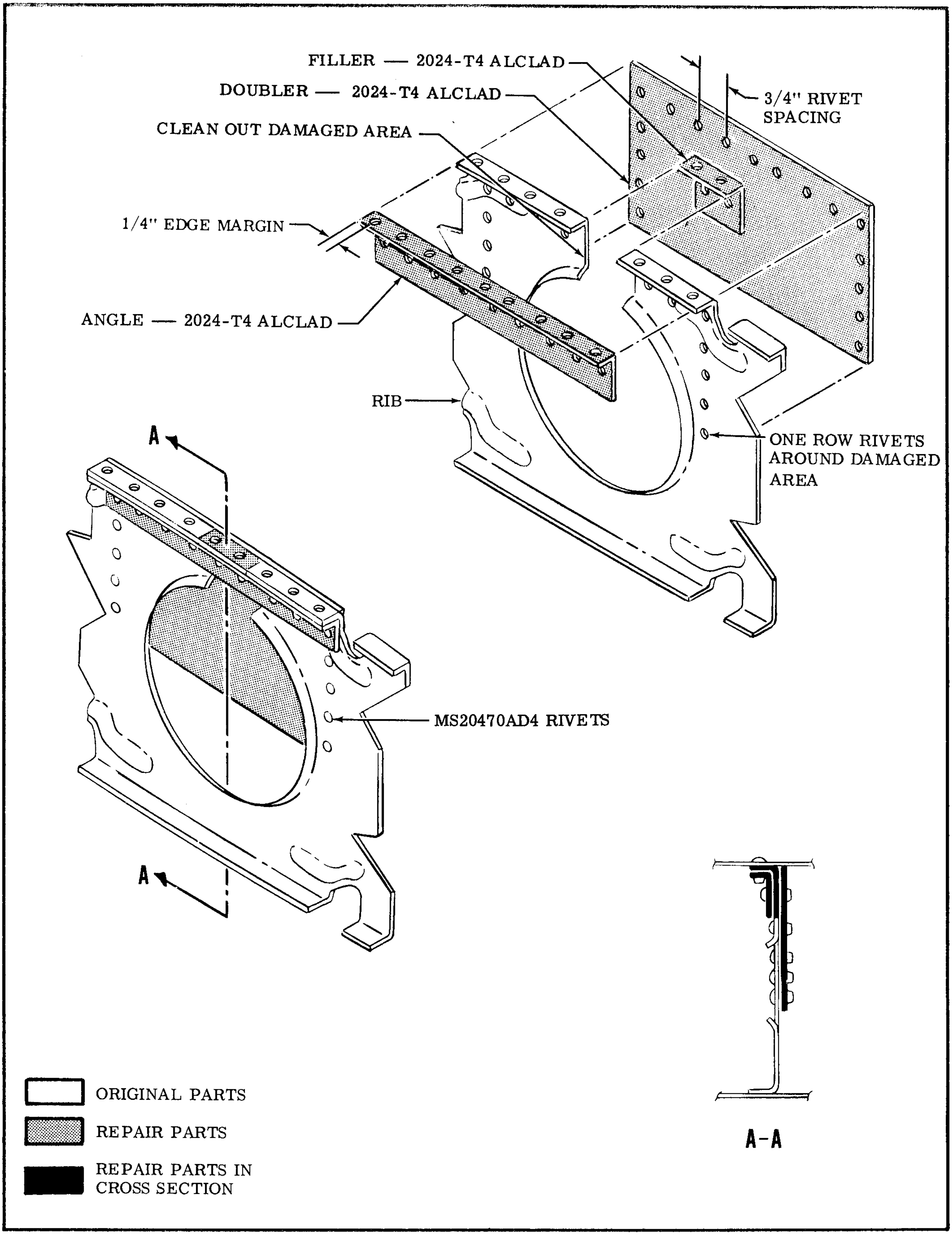
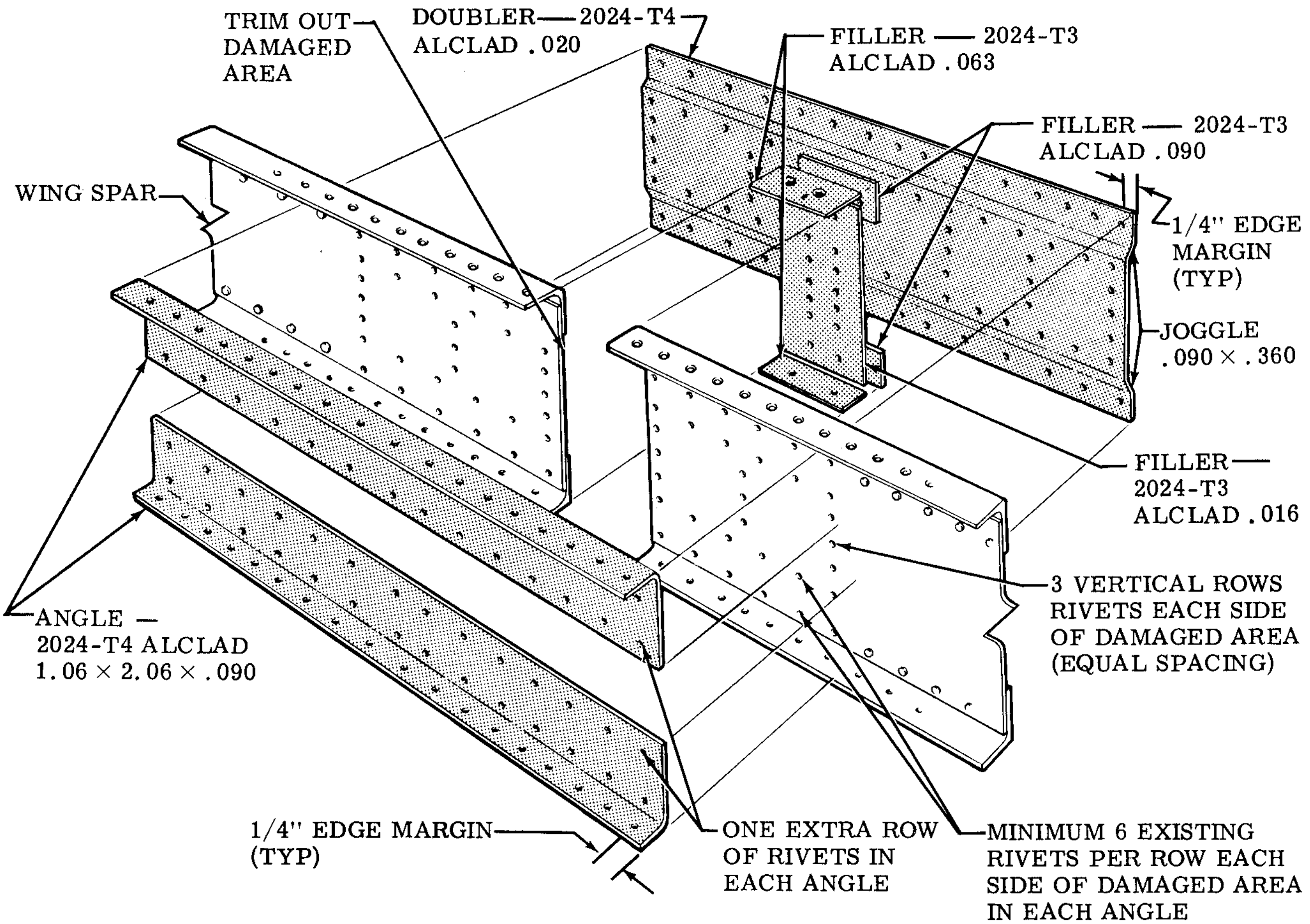
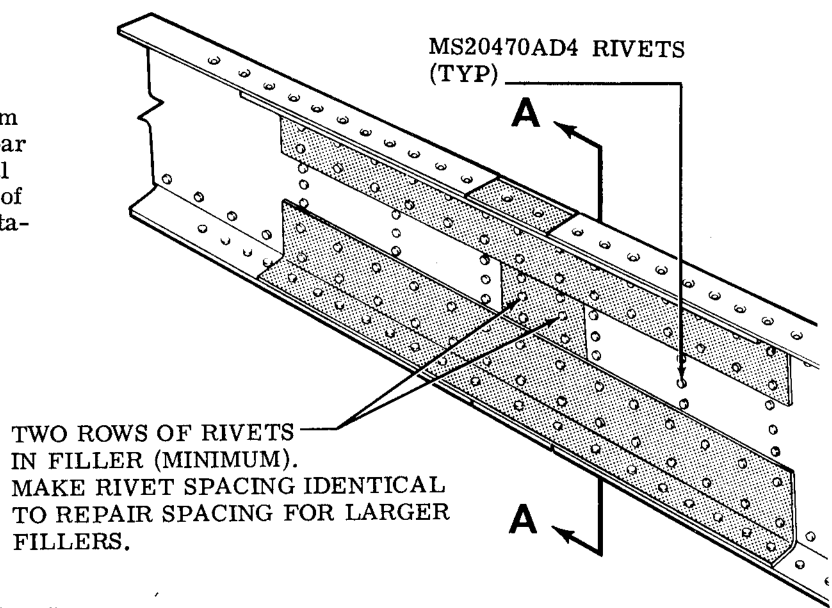


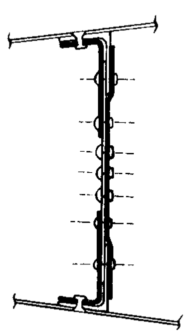
Figure 18-6. Rib Repair (Sheet 2 of 2)



NOTE

This repair applies to the main spar from station 146 outboard, and the fuel bay spar outboard of station 84. Factory approval of proposed repairs is required inboard of station 146 on main spar or inboard of station 84 on fuel bay spars.





A—A

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

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.
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.

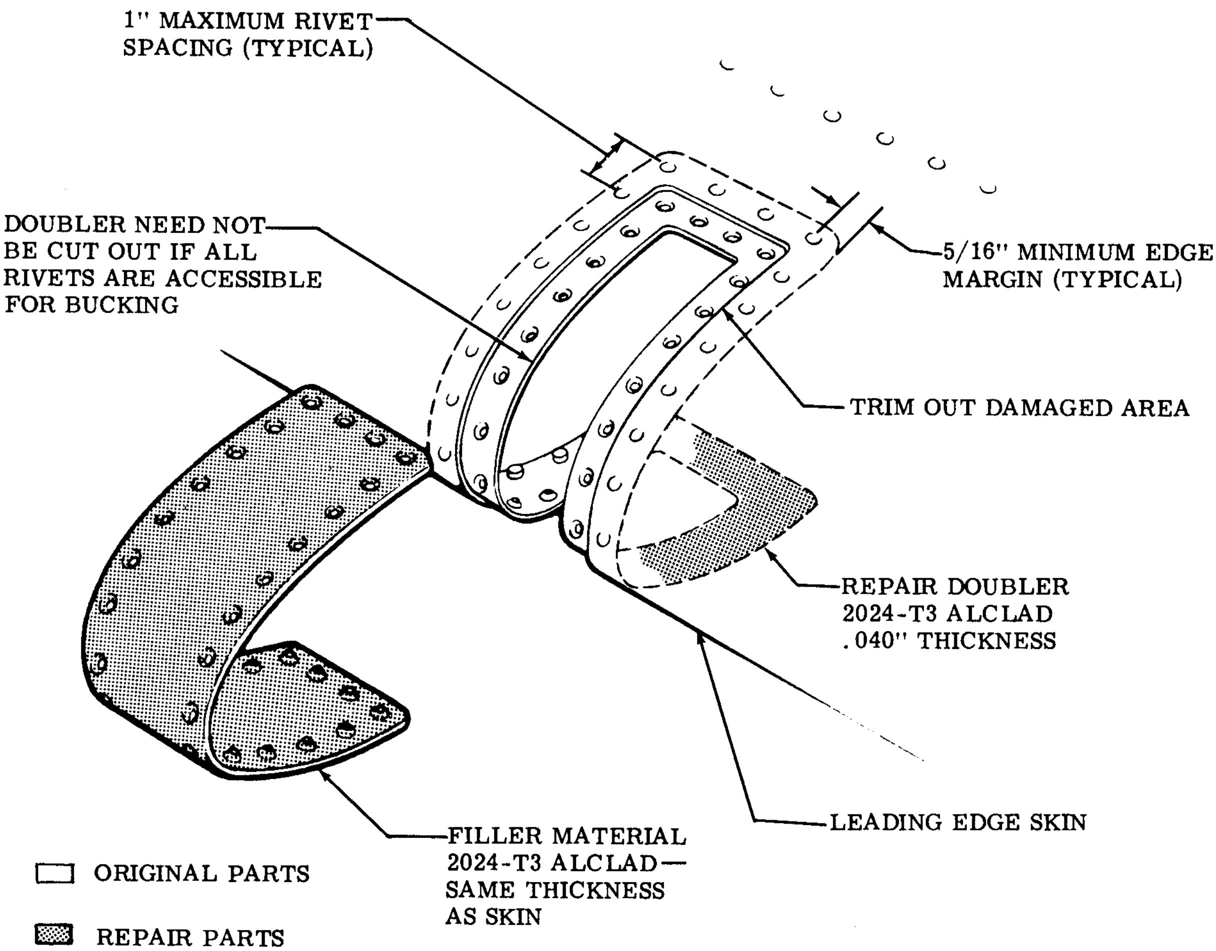


Figure 18-8. Leading Edge Repair

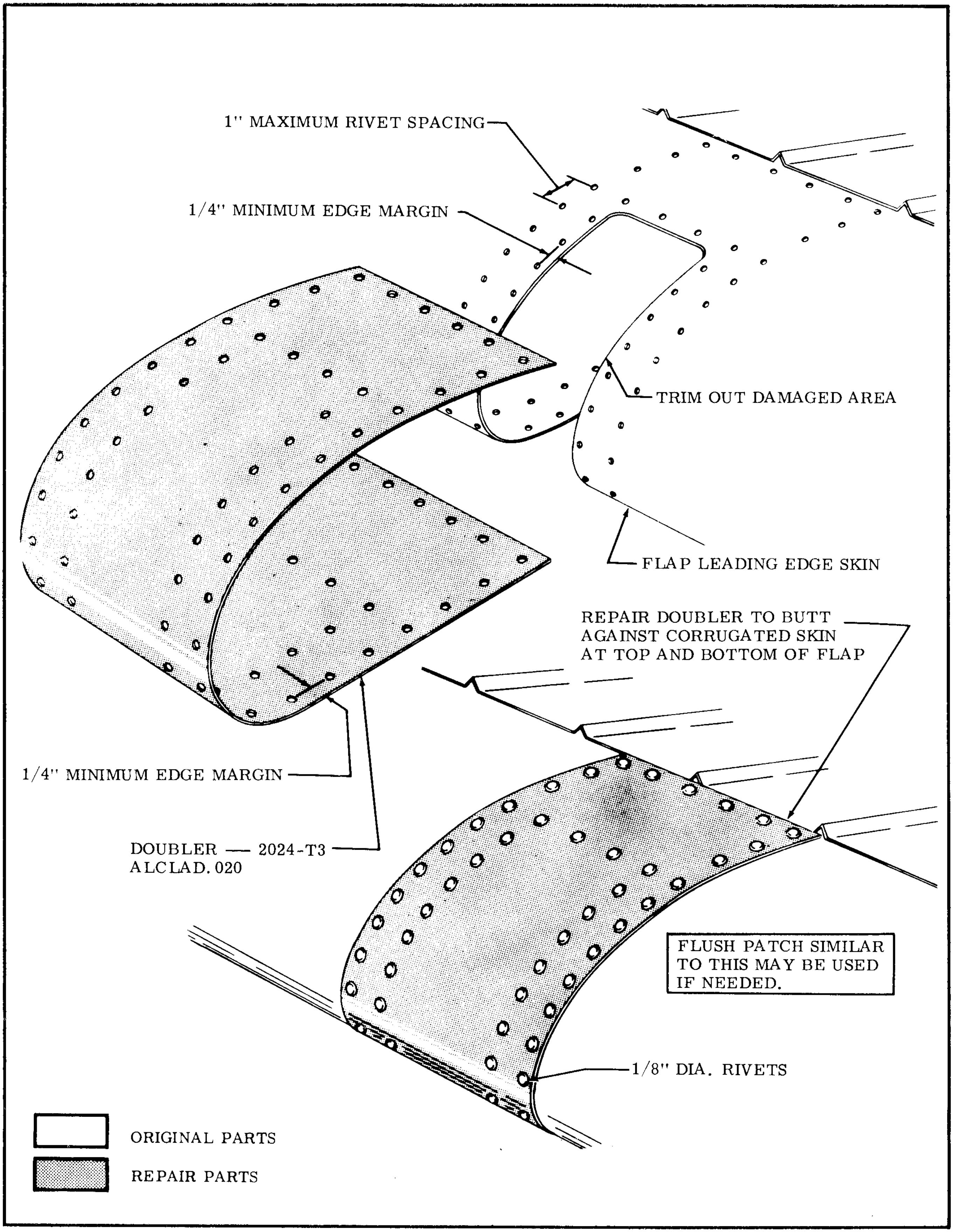
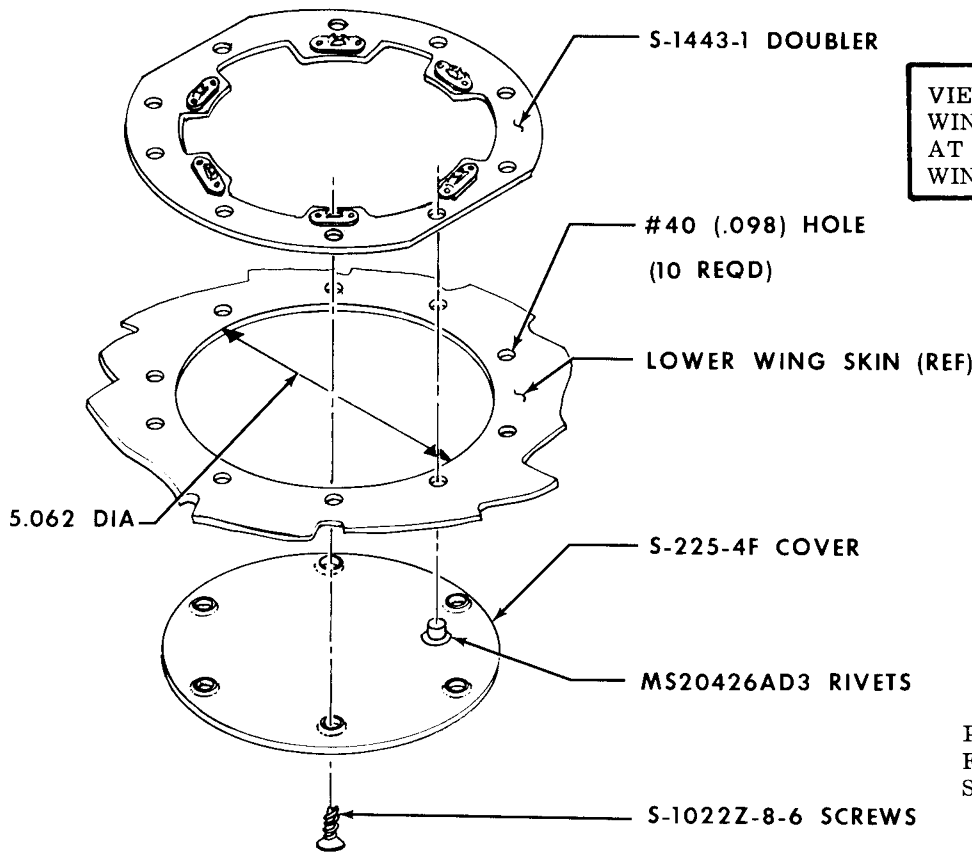


Figure 18-9. Flap Leading Edge Repair

CAUTION

REFER TO PARAGRAPH 18-41 BEFORE INSTALLING ON THE WING.



VIEWED FROM INSIDE WING LOOKING DOWN AT TOP OF LOWER WING SKIN.

NOTE

PARTS ARE AVAILABLE FROM THE CESSNA SERVICE PARTS CENTER.

a. Establish exact location for inspection cover and inscribe centerlines.

b. Determine position of doubler on wing skin and center over centerlines. Mark the ten rivet hole locations and drill to size shown.

c. Cutout access hole, using dimension shown.

d. Flex doubler and insert through access hole and rivet in place.

e. Position cover and secure, using screws as shown.

Figure 18-10. Access Hole Installation

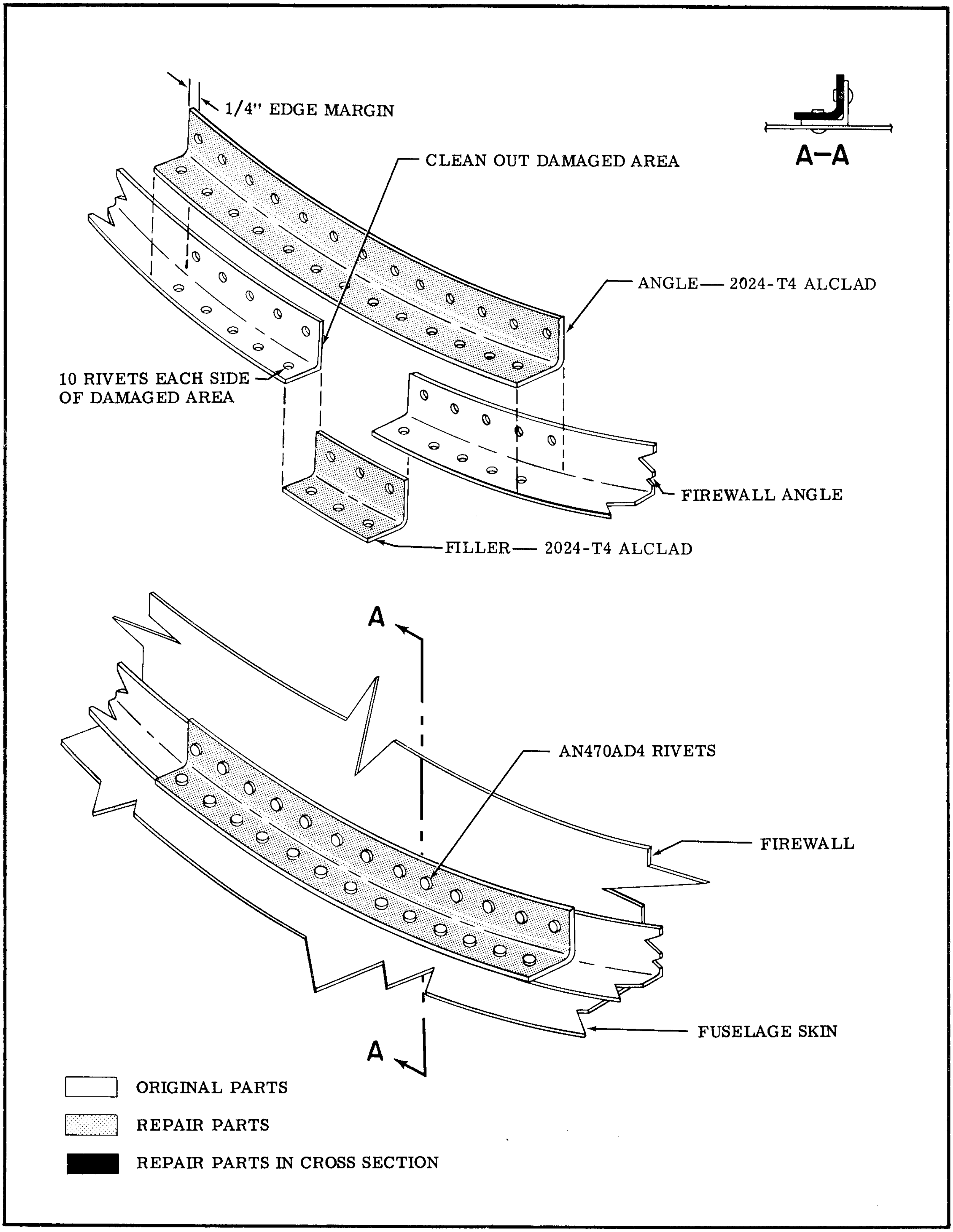


Figure 18-11. Firewall Angle Repair

This page intentionally left blank.

SECTION 19

EXTERIOR PAINTING

TABLE OF CONTENTS

NOTE

This Section contains standard factory materials listing and area of application. For paint number and color, refer to Aircraft Trim Plate and Parts Catalog. In all cases determine the type of paint on the aircraft as some types of paint are not compatible. Materials may be obtained from the Cessna Service Parts Center.

MATERIAL	NO TYPE	AREA OF APPLICATION
PAINT	EPOXY	Used on nose gear fairing thru 1969 Models.
	ACRYLIC LACQUER	Used on aircraft exterior thru 1977 Models.
PRIMER	EX-TR-7 With T-ER-Activator	Used with acrylic lacquer.
	P60G2 With R7K46 Activator	Used with acrylic lacquer.
	54-2385 and 5400	Used with epoxy paint.
THINNER	T-8402A	Used to thin acrylic lacquer and for burndown.
	T-3871	Used with epoxy paint (Du Pont).
	T-6487	Used with epoxy paint (Enmar).
SOLVENT	Methyl Ethyl Deytone (MEK)	Used to clean aircraft exterior prior to priming.

NOTE

Do not paint Pitot Tube, Gas Caps or Antenna Covers which were not painted at the factory.

THRU SERIAL 17702672

CAUTION

When stripping aircraft of paint, use caution to avoid stripper coming in contact with ABS parts. Clean ABS parts with soap and water and/or Naphtha. Do not use strong solvents such as Xylol, Toluol, or Lacquer Thinners. Once clean exterior ABS parts are ready for the acrylic laquer topcoat. Do not wash prime ABS parts.

19-1. PAINTING OF FORMED ABS PLASTIC PARTS. The following procedures outline some basic steps which are useful during touchup or painting of formed ABS plastic parts.

19-2. INTERIOR PARTS (finish coat of lacquer).

a. Painting of spare parts.

1. Insure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or lacquer thinner since prolonged exposure can soften or embrittle ABS.

2. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to insure adhesion.

b. Touch up of previously painted parts.

1. Light sanding is acceptable to remove scratches and repair the surface but care must be exercised to maintain the surface texture or grain.

2. Insure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or lacquer thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to insure adhesion.

NOTE

Lacquer paints can be successfully spotted in.

19-3. EXTERIOR PARTS (acrylic topcoat).

a. Painting of spare parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Insure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or lacquer thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned with appropriate acrylic thinner and applied as a wet coat to insure adhesion.

b. Touch up of previously painted parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Insure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or lacquer thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a compatible primer - surfacer and sealer.

4. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned and applied as a wet coat to insure adhesion.

NOTE

Acrylic topcoats can be successfully spotted in.

19-4. EXTERIOR PARTS (Epoxy or Polyurethane topcoat).

a. Painting of spare parts and touch up of painted parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Insure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or lacquer thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a primer compatible with Epoxy or Polyurethane topcoat.

4. After the part is thoroughly dry it is ready for the topcoat.

NOTE

Epoxy or Polyurethane topcoats cannot be successfully spotted in - finish should be applied in areas with natural breaks such as skin laps or stripe lines.

When painting interior and exterior polycarbonate parts, or where the part material is questionable, a "barrier primer" should be applied prior to the enamel, lacquer, epoxy or polyurethane topcoat.

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 P60G2	Used to prime aircraft for Imron Enamel
REDUCER THINNER	IMRON Y8485S Reducer	Used to thin Imron Enamel
	Catalyst Reducer R7K44	Used to reduce P60G2

NOTE

Do not paint pitot tube, gas caps, or aileron gap seals. Also do not paint antenna covers which were not painted at the factory.

REQUIRED MATERIALS

MATERIAL	NO/TYPE	AREA OF APPLICATION
STRIPPER	Strypeeze Stripper	Used to strip primer overspray
CLEANER	DX 440 Wax and Grease Remover	Used to clean aircraft exterior
	Imperial Cleaner	Used to remove grease, bug stains, etc.
	Klad Polish	Used to clean aluminum finish
	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

19-5. 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.

19-6. CLEAN UP.

a. Inspect airplane for any surface defects, such as dents or unsatisfactory previous repairs, and correct according to Paragraph 19-13.

b. Wipe excess sealer from around windows and skin laps. Mask windows, ABS parts, and any 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.

When an airplane has paint or zinc chromate overspray on the exterior. stripper may be used to remove the overspray. The stripped 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.

19-7. PRE-PRIMING.

a. For all standard aircraft, P60G2 primer shall be mixed one part primer to one and one half parts R7K44 catalyst by volume. Mix only in stainless steel or lined containers. After mixing, allow primer to set for thirty minutes before spraying. Pot life of the mixed primer is six hours. All mixed material should be discarded if not used within this time. Pot pressure during spray operation should be approximately 10 ±1 psi. Air pressure should be 40 to 50 psi at the gun. Blow loose contaminant off the airplane with a jet of clean, dry air. Cover the flap tracks, nose gear strut tube, wheels, and shimmy dampener rod ends. ABS parts and other pre-primed parts do not receive wash primer.

WARNING

AIRCRAFT SHOULD BE GROUNDED PRIOR TO PAINTING TO PREVENT STATIC ELECTRICITY BUILD-UP AND DISCHARGE.

19-8. 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.

19-9. PREPAINTING.

a. On standard aircraft mix the required amount of Imron with Imron 192S Activator in a 3 to 1 ratio. Mix thoroughly (no induction time required before spraying). Imron shall be thinned with Y8485S Imron Reducer to obtain a spraying viscosity of 18 to 22 seconds on a No. 2 Zahn Cup. Viscosity should be checked after 4 hours and adjusted 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.

19-10. PAINTING ALL-OVER WHITE OR COLOR.

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. Films in excess of 3.0 mils are not desirable.

19-11. 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 sand paper. Course paper will leave sand marks which will decrease gloss and depth of gloss of the finish. The use of power sanders should be held to a minimum, 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 Enflex III base coat will be Enflex III, and on Imron base coat will be Imron Enamel. Mix as outlined in paragraph 19-9.

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.

19-12. TOUCH-UP.

When necessary to touch up or refinish an area, the defect should be sanded with #400 and followed by #600 sand paper. Avoid, if possible, sanding through the primer. If the primer is penetrated over an area 1/2 inch square or larger, repriming is necessary. 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 DX440 Wax and Grease Remover or Imperial Cleaner. 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 stripper must be removed before refinishing.

19-13. 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.

NOTE

Application of a top coat thickness in excess of 5.0 mils, requires a control surface balance check.

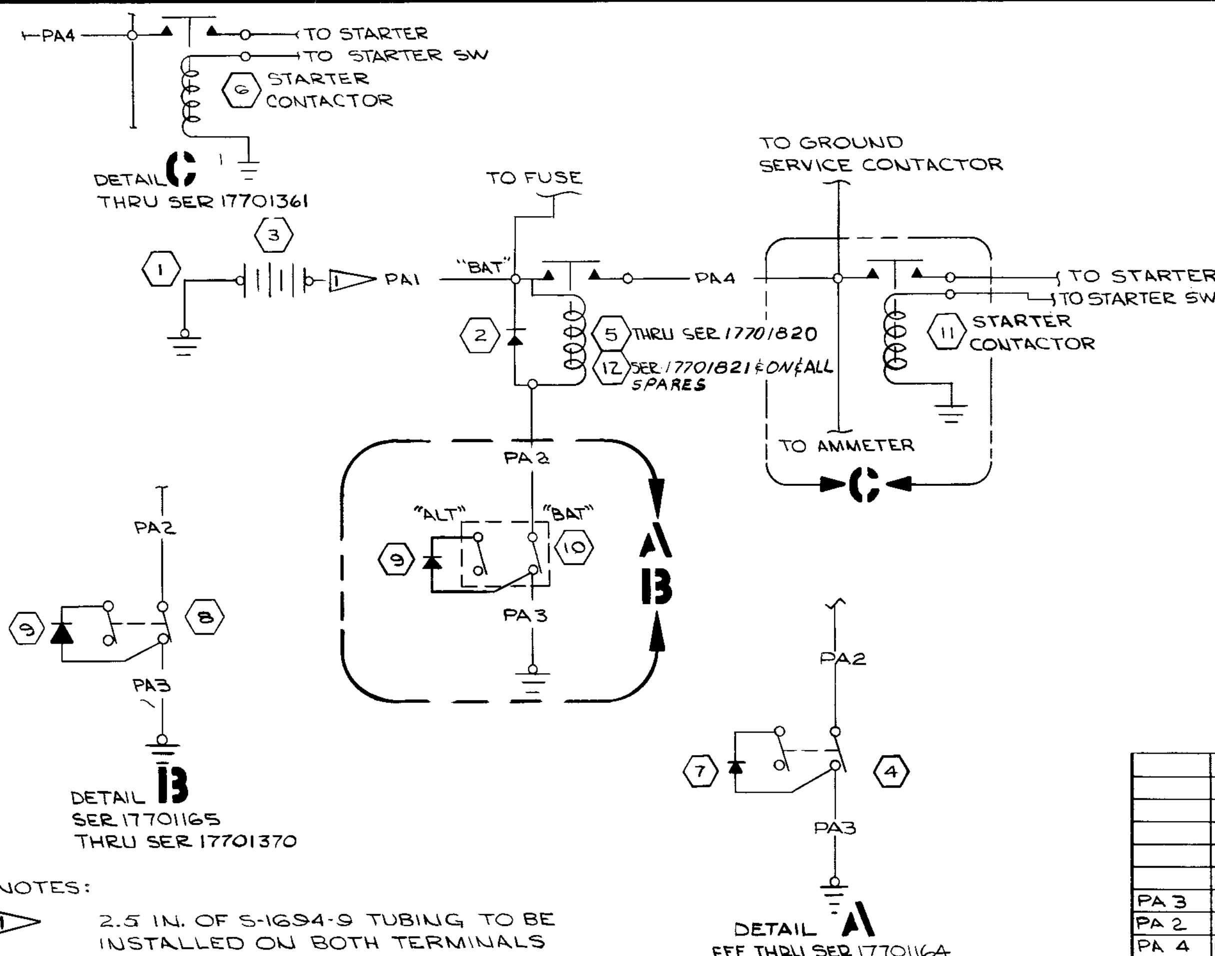
SHOP NOTES:

This page intentionally left blank.

SECTION 20

WIRING DIAGRAMS

TABLE OF CONTENTS



NOTES:

1. 2.5 IN. OF S-1694-9 TUBING TO BE INSTALLED ON BOTH TERMINALS OF PA-1.
2. SER 17700001 THRU SER 17701164
3. SER 17701165 & ON

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD NOTE 1 AND 0770719-1 (SR5172) IX	8-5-67 RCA	YAK HRW
B	BY REV: 0412007-1 WAS 0412007-9 IN EQUIPMENT TABLE	RLY 1-16-68	RLL DET VRS TM
C	BY REV: ADD DETAIL A, 0770719-2 & S-1844-1-1; SER OUT 0770728-1 & S-1159-1-1. ED&RR 02351 (SR5440) IX	JDH 4-19-68	GKI MDS DET HRW VRS TM
D	BY REV: ADD SER TO PA 2 & PA 3 ADD NOTE 2 & 3 (SR5440) IX	JWH 6/13/68	MDS DET HRW VRS TM
E	BY REV: SER OUT S-1844-1-1; SER IN S-1994-1-1; ADD DETAIL B ED&RR 10489 (SR6020) IX	DLB 4-22-69	RLY MDS DET HRW VRS TM
F	BY REV: ADD DETAIL C, S-1991-1 & SR. ED&RR 10473 (SR6222)	MDS 5-23-69	RLY MDS RF DET HRW
G	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 6-16-72	LKW PATK RF HRW
H	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	RLY HRW RF

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
PA 3	18		8	S-1493-1	S-1367-1-8	3	
PA 2	18		170	S-1367-1-10	S-1493-1	3	
PA 4	1/0	S-1563-1/0-9	168	S-1564-1/0-31	S-1564-1/0-31		
3	18		8	S-1367-1-8	S-1367-1-8	2	
2	18		170	S-1367-1-10	S-1367-1-8	2	
PA 1	2	S-1562-2-9	12	S-1367-7-13	S-1367-7-13		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
12	S-1579-2	CONTACTOR
11	S-1991-1	CONTACTOR
10	S-1994-1-1	SWITCH
9	0770719-2	DIODE ASSY
8	S-1844-1-1	SWITCH
7	0770719-1	DIODE ASSY
6	S-1673-1	CONTACTOR
5	S-1579-1	CONTACTOR
4	S-1159-1-1	MASTER SWITCH
3	0712605-1	BATTERY, 33A-H
2	0770728-1	DIODE ASSY
1	0412007-1	GROUND STRAP

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-15-67
GROUP	H. Wise	1-31-67
DRAWN	R.C. ATTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-3-67
PROJECT	Ted Moody	2-1-67
APPD	REM	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

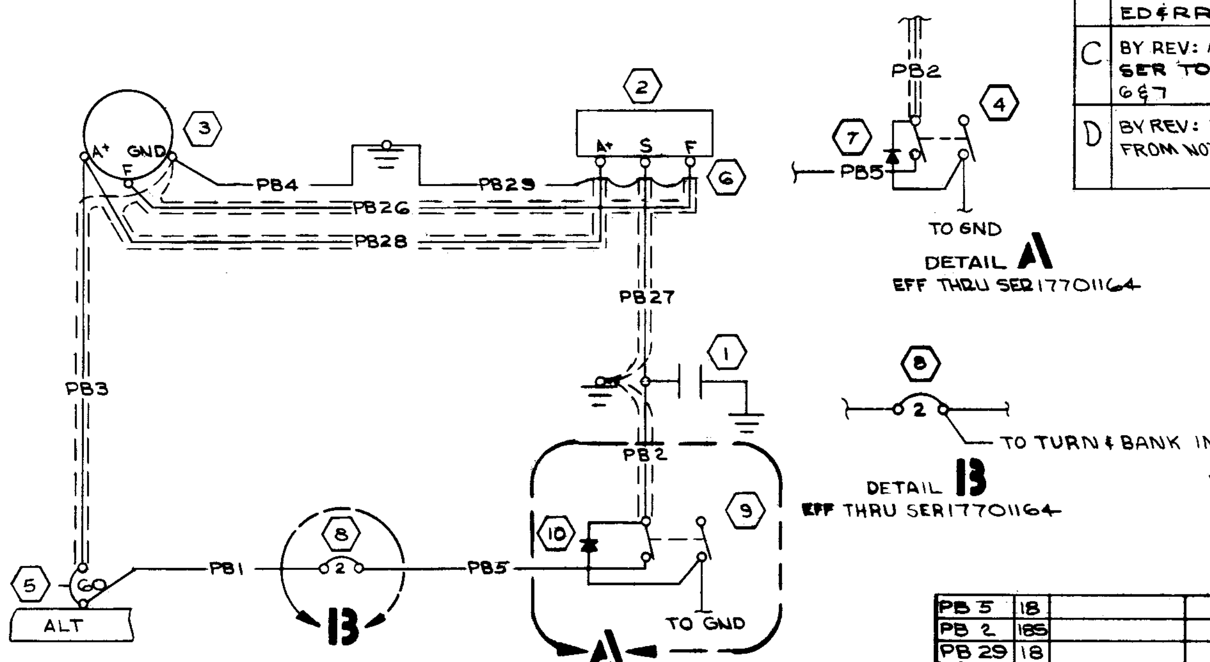
TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE (SR5172) IX PAGE: 4.1

FORM NO. 80-215

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	PB4 WAS 18GA (SR5172) XI	VRS 8/2/67	YAK RH TM HFW
B	BY REV: ADD DETAIL A, S-1844-1-1 & 0770719-2; SEROUT 0770719-2 & S-1159-1-1. ED&RR 02351 (SR5440) IX	JDH 4-19-68	GKI MDS DET HFW VRS TM
C	BY REV: ADD DETAIL B; ADD SER TO PB 2 & PB5; ADD NOTE 6 & 7 (SR5440) IX	LES 6-12-68	MDS DET HFW VRS TM
D	BY REV: DELETED S-1367-4-12 FROM NOTE 1 & ADD S-1943-1. (SR6043)	BPC 12/5/68	JWH TM HFW DET



INACTIVE: EFF SER 177-0001 THRU SER (SR6020)
ED&RR 10489 DLB 4-22-69 RLY HFW VRS MDS DET TM

PB 5	18			S-1367-1-8	S-1493-1	◁7	
PB 2	18S			S-1493-1	◁3	◁7	
PB 29	18			S-1367-2-12	◁5		
28	18S			◁4	◁5		
27	18S			◁3	◁5		
PB 26	18S			◁2	◁5		
PB 5	18			S-1367-1-8	S-1367-1-6	◁6	
4	10			S-1367-3-10	S-1367-3-12		
3	8S			◁1	S-1367-4-10		
2	18S			S-1367-1-6	◁3	◁6	
PB 1	18			S-1367-1-8	S-1367-1-8		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

NOTES:

1. S-1943-1 FOR CENTER CONDUCTOR
   S-1367-3-10 FOR SHIELDING
2. S-1367-1-10 FOR CENTER CONDUCTOR
   S-1367-2-10 FOR SHIELDING
3. S-1367-1-6 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING
4. S-1367-1-12 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING
5. AMP TERMINAL 42281-2 ON CONDUCTOR. AMP TERMINAL 2-323931-2 ON SHIELD & GROUNDING WIRE.
6. SER 17700001 TO SER 17701164
7. SER 17701165 & ON

ITEM NO.	PART NO.	DESCRIPTION
10	0770719-2	DIODE ASSY
9	S-1844-1-1	SWITCH
8	CA-2	CKT BKR (73803)
7	0770719-1	DIODE ASSY
6	CGAB-10A730-A	HOUSING (88690)
5	S-1596-60	CIRCUIT BREAKER
4	S-1159-1-1	MASTER SWITCH
3	C611501-0101	ALTERNATOR ASSY
2	C611001-0101	REGULATOR ASSY
1	0770038-2	FILTER

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wise	1-31-67
DRAWN	R.C. ARTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-7-67
PROJECT	Lod Moody	2-1-67
APPD.	R.Em	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

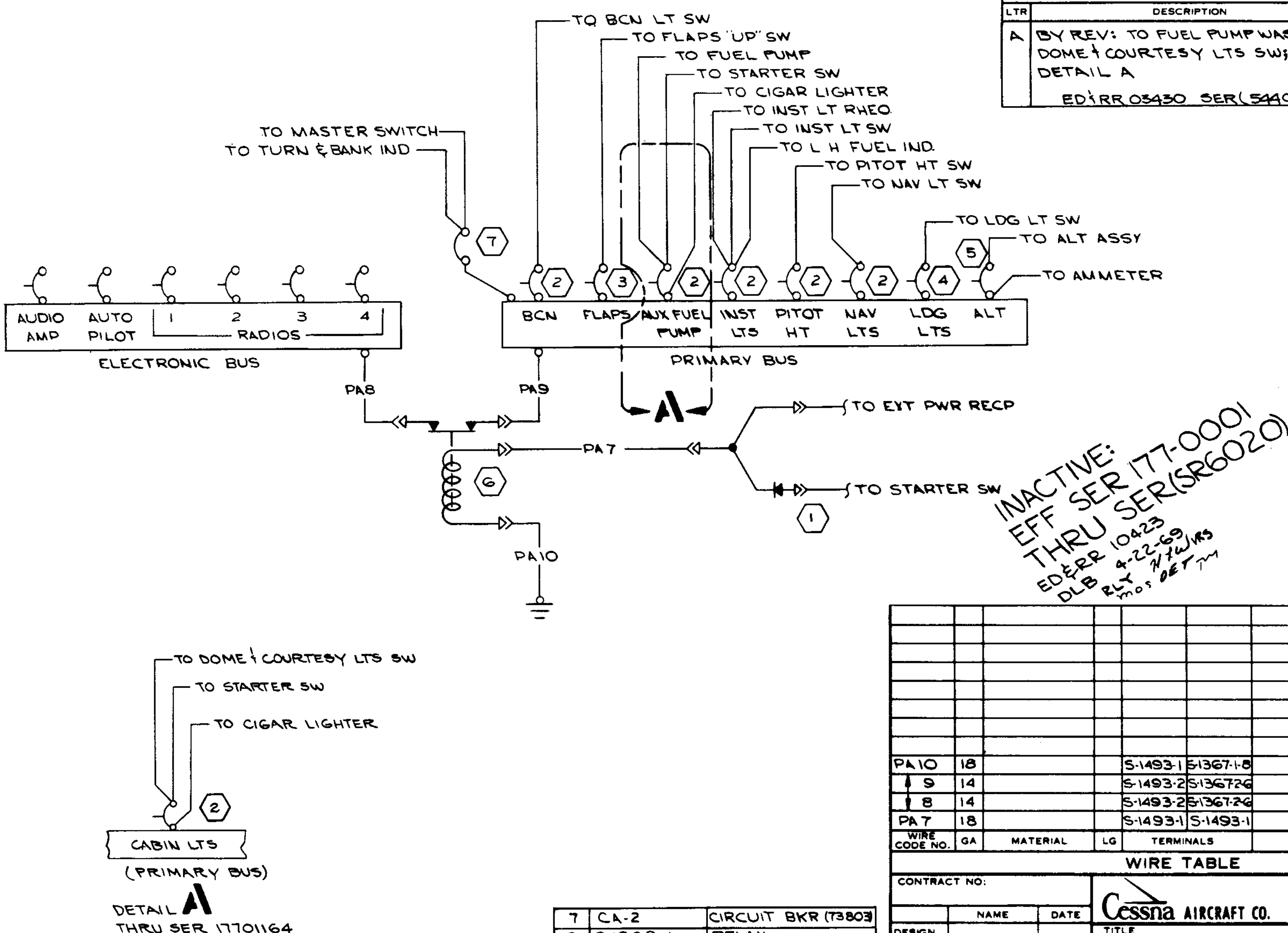
TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SUPERSEDED BY P4.5 | SCALE: NONE | (SR5172) XI | PAGE: 4.2

FORM NO. 80-215

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: TO FUEL PUMP WAS TO DOME & COURTESY LTS SW; ADDED DETAIL A ED & RR 03430 SER(5440)	FER 7-31-68	GH MDS DET WWH ARS TM



INACTIVE:
EFF SER 177-0001
THRU SER(SR6020)
ED & RR 10423
DLB 4-22-69
RLY H7W/RS
mos DET TM

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
PA 10	18			S-1493-1	S-1367-1-8		
9	14			S-1493-2	S-1367-2-6		
8	14			S-1493-2	S-1367-2-6		
PA 7	18			S-1493-1	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	CA-2	CIRCUIT BKR (T3803)
6	S-1668-1	RELAY
5	S-1596-60	CIRCUIT BREAKER
4	S-1360-20	CIRCUIT BREAKER
3	S-1360-15	CIRCUIT BREAKER
2	S-1360-10	CIRCUIT BREAKER
1	1570043-1	DIODE ASSY

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	1-31-67
DRAWN	R C AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-?-67
PROJECT	Ted Moody	2-1-67
APPD.	REM	3-6-67

SUPERSEDED BY: P 4.6

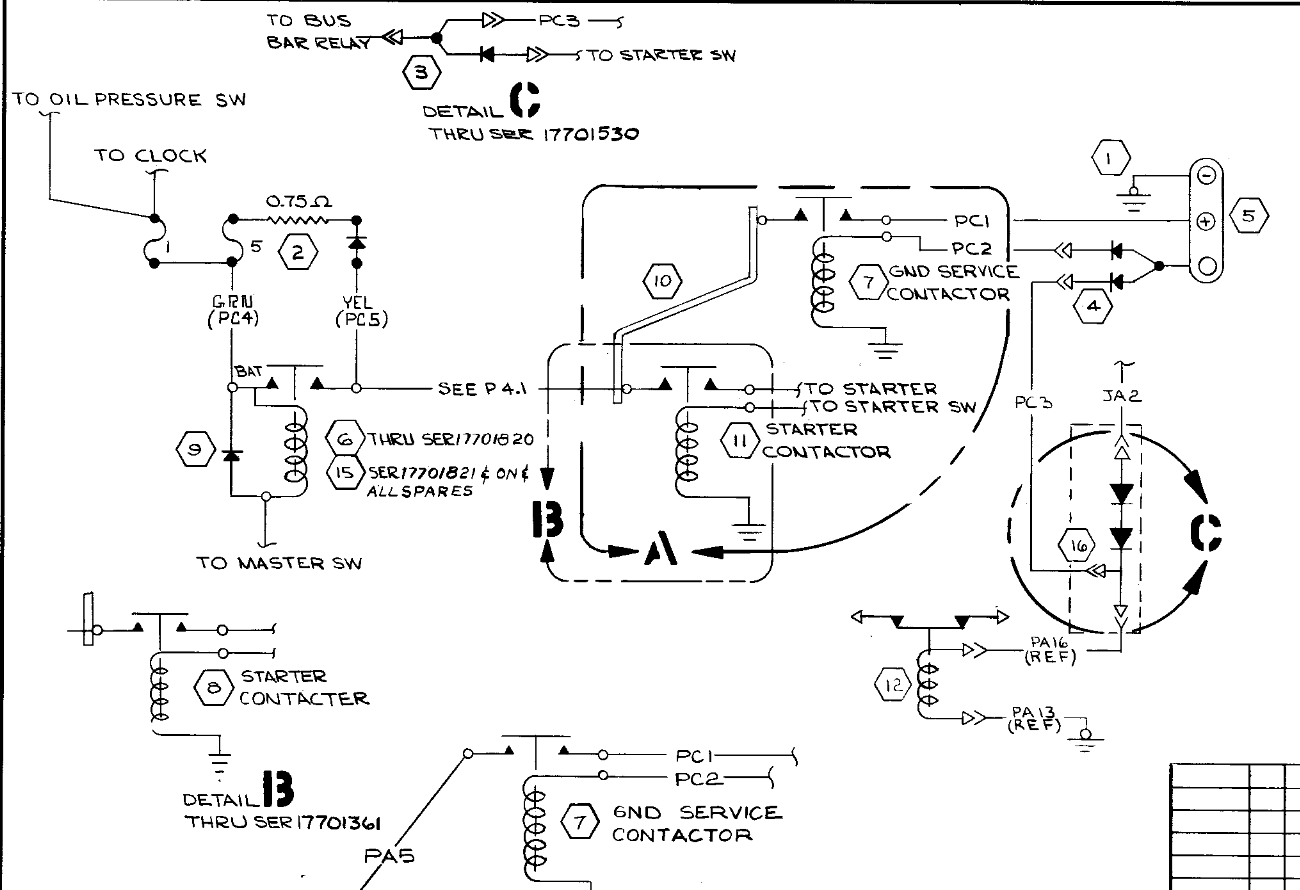
Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

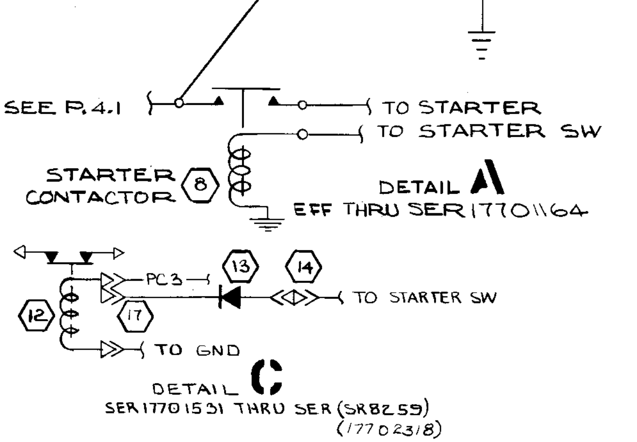
TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE (SR5172)IX PAGE: 4.3

FORM NO. 80-215





REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAIL A & 1770010-2 SER OUT PA5 ED & RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET HJW VRS
B	BY REV: ADD DETAIL B, S-1991-1 & SR ED & RR 10473 (SR6222)	MDS 5-23-69	RLY MDS RF DET HJW
C	BY REV: ADD DETAIL C, S-2064-1, 0770719-2, S-1917-1 & SR ED & RR 10034 (SR6361) IX	RLY 5-11-70	LKW RLY HJW RF
D	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201) IX	BPH 6-16-72	LKW HJW RF
E	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-4-73	RH HJW RF
F	BY REV: YEL (PC5) WAS PC5 GRN PC4 WAS PC4; LG 18/PC4 & PC5 WAS 12 (MER 177E0040) (SR 7605) IX	JEF 5-13-74 BRF	JLO JRS
G	BY REV: LG 100 WAS 94/PC3 (NOW SHOP PRACTICE) (MER-0183)	MEM 6-28-74	DLP JRS
H	BY REV: ADD PA16 (REF); 1570043-9 WAS 0770719-2; DELETE S-2064-1; (SR8259)	RS 5-23-75	JRS KAL
J	BY REV: ADD DETAIL "C" (SR8259)	RS 6-16-75	RLY JRS

17	S-2023-1	ADAPTER
16	1570043-9	DIODE BOARD ASSY
15	S-1579-2	CONTACTOR
14	S-2064-1	CONNECTOR
13	0770719-2	DIODE ASSY
12	S-1917-1	RELAY
11	S-1991-1	CONTACTOR
10	1770010-2	BUS BAR
9	0770728-1	DIODE ASSY
8	S-1673-1	CONTACTOR
7	S-1660-1	CONTACTOR
6	S-1579-1	CONTACTOR
5	AN2552-3A	RECEPTACLE
4	1570043-3	DIODE ASSY
3	1570043-1	DIODE ASSY
2	0712031-3	FUSE & DIODE ASSY
1	0312155-10	GND STRAP
ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

YEL (PC5)	18		18	S-1367-1-13	SOLDER	
GRN (PC4)	18		18	S-1367-1-13	SOLDER	
3	18		100	S-1493-1	S-1493-1	
2	18		8	S-1367-1-10	S-1493-1	
PC1	2	S-1562-2-9	7	S-1367-7-14	S-1367-7-13	
PA5	2	S-1562-2-9		S-1367-7-13	S-1367-7-13	THRU SER 17701164
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-16-67
GROUP	H. Wise	1-31-67
DRAWN	R C AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Moody	2-1-67
APPD	REM	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — GROUND SERVICE RECEPTACLE (OPT.)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

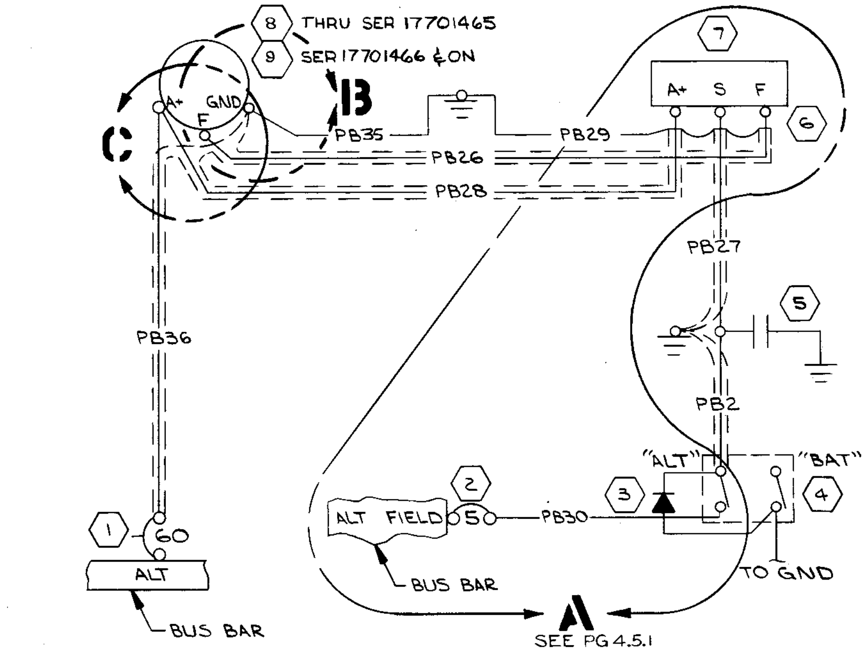
SCALE: NONE (SR5172) IX PAGE: 4.4

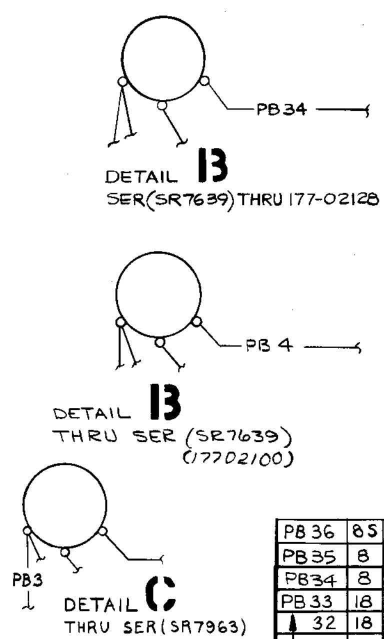
(17700001)

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD
J	BY REV: SER OUT PB3 & SER IN PB36, ADD DETAIL "C" (SR 7963)	TMS 1-30-75	

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C611501-0101 & SER IN C611501-0102 ED&RR10607 (SR6292)	RAINES 10/22/69	RF
B	BY REV ADD: DETAIL A; S-2135-1 LIGHT ASSY; C593001-0101 OVERVOLTAGE SENSOR; WIRES PB31, PB32 & PB33 S-1943-2 WAS S-1943-1 (SR6785) IX	WDA 6-1-71	RF
C	BY REV: REPLACED S-1370-1 TERM WITH S-1635-1 TERM ON PB31 & PB32. ADDED S-1637-1 & S-1637-2 TO EQUIP TABLE. ADD TVA-1315 CAPACITOR TO F/D & E/T. SER 17701690 & ON	VRS 1-4-72	RF
D	BY REV: S-1360-5L WAS S-1360-5 S-1360-60L WAS S-1360-60, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RF
E	BY REV: SER OUT C611001-0101, SER IN C611001-0102, ADD DETAIL "B" & PB34 (SR7624) (SR7639)	RAM 7-31-73	RF
F	BY REV: ADD 30/PB33; 12 WAS 8/PB27; S-1367-1-12 WAS S-1367-2-12/PB29. (NOW SHOP PRACTICE) (MER177-0169)	MEM 5-21-74	
G	BY REV: SER IN PB35, SER OUT PB34 SER(177-02128) MER 177E0105	BRF 6-19-74	
H	BY REV: ADD C6611001-0201; DELETE C6611001-0101 & C6611001-0102 (SR 7905)	MEM 8-21-74	





05-242-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
PB 36	8S		77	1.	S-1367-4-10		SER(SR7963) & ON
PB35	8	S-1562-8-9		S-1943-2	S-1367-4-12		SER 177-0218 & ON
PB34	8	S-1562-8-9	10	S-1943-3	S-1367-4-12		SER(SR7639) THRU 177-02127
PB 33	18		30	S-1370-1	S-1493-1		SER 17701634 & ON
32	18		70	S-1635-1	42281-2	(00779)	SER 17701634 & ON
31	18		53	S-1367-1-6	S-1635-1		SER 17701634 & ON
30	18		45	S-1367-1-8	S-1493-1		THRU SER 17701633
29	18		4	S-1367-1-12	5.		
28	18S		62	4.	5.		
27	18S		12	3.	5.		
26	18S		63	2.	5.		
4	10		10	S-1367-3-10	S-1367-3-12		THRU SER 17702100
3	8S		118	1.	S-1367-4-10		THRU SER(SR 7963)
PB2	18S		29	S-1493-1	3.		

WIRE TABLE

NOTES:

1. S-1943-2 FOR CENTER CONDUCTOR
   S-1367-3-10 FOR SHIELDING
2. S-1367-1-10 FOR CENTER CONDUCTOR
   S-1367-2-10 FOR SHIELDING
3. S-1367-1-6 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING
4. S-1367-1-12 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING
5. AMP TERMINAL 42281-2(00779) ON CONDUCTOR
   AMP TERMINAL 2-323931-2(00779) ON SHIELD & GROUNDING WIRE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
14	TVA-1315	CAPACITOR	56289
13	S-1637-2	HOUSING-SOCKET	
12	S-1637-1	HOUSING-PIN	
11	S-2135-1	LIGHT ASSY	
10	C593001-0101	OVERVOLTAGE SENSOR	
9	C611501-0102	ALTERNATOR ASSY	
8	C611501-0101	ALTERNATOR ASSY	
7	C611001-0201	REGULATOR ASSY	
6	C6AB-10A730-A	HOUSING	88690
5	0770038-2	FILTER	
4	S-1994-1-1	SWITCH	
3	0770719-2	DIODE ASSY	
2	S-1360-5L	CIRCUIT BREAKER	
1	S-1596-60L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 4.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V SIPES	4/1/69
GROUP	H. Wise	5-2-69
DRAWN	D.L.BURKE	4-22-69
CHECK	R.YOUNGERS	4-23-69
STRESS	TULLIS	5-2-69
PROJ	Ted Moody	5-3-69
APPD		4-30-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM

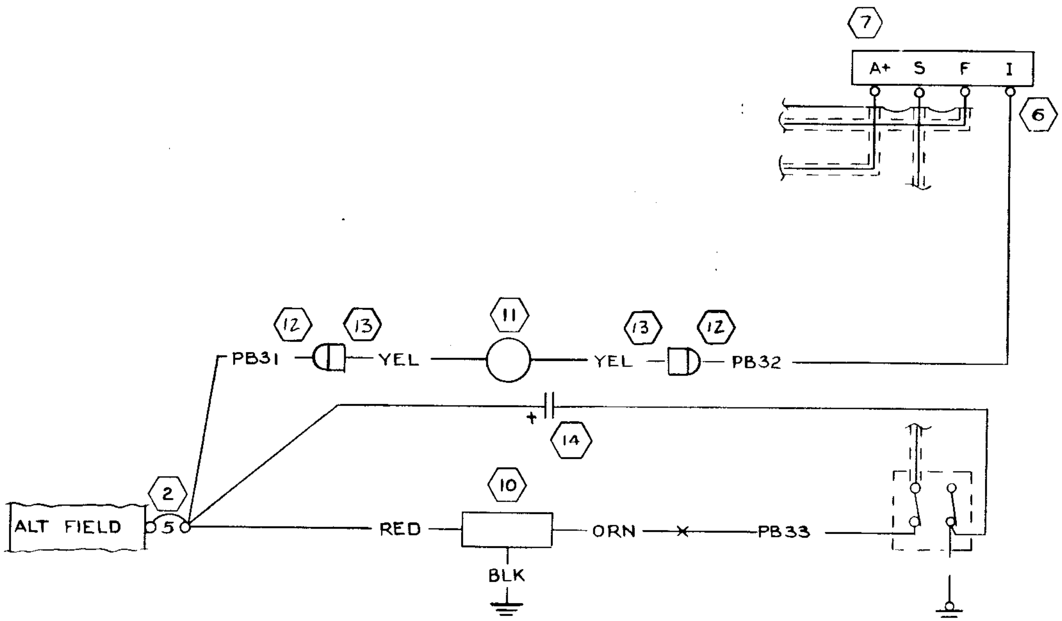
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | 177 | PAGE: 4.5

FORM NO. 80-215B

ED&RR 10423 (SR6020) IX
ED&RR 10489

REVISION			
LET	DESCRIPTION	DATE	APPD
H	SEE PG 4.5 FOR REV		



DETAIL A
SER 17701634 & ON

05-242-0905

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		
GROUP	H. Wue	6-1-71
DRAWN	ACKERSON	6-1-71
CHECK	L.K. WHITE	6-15-71
STRESS		
PROJ	[illegible]	6-20-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

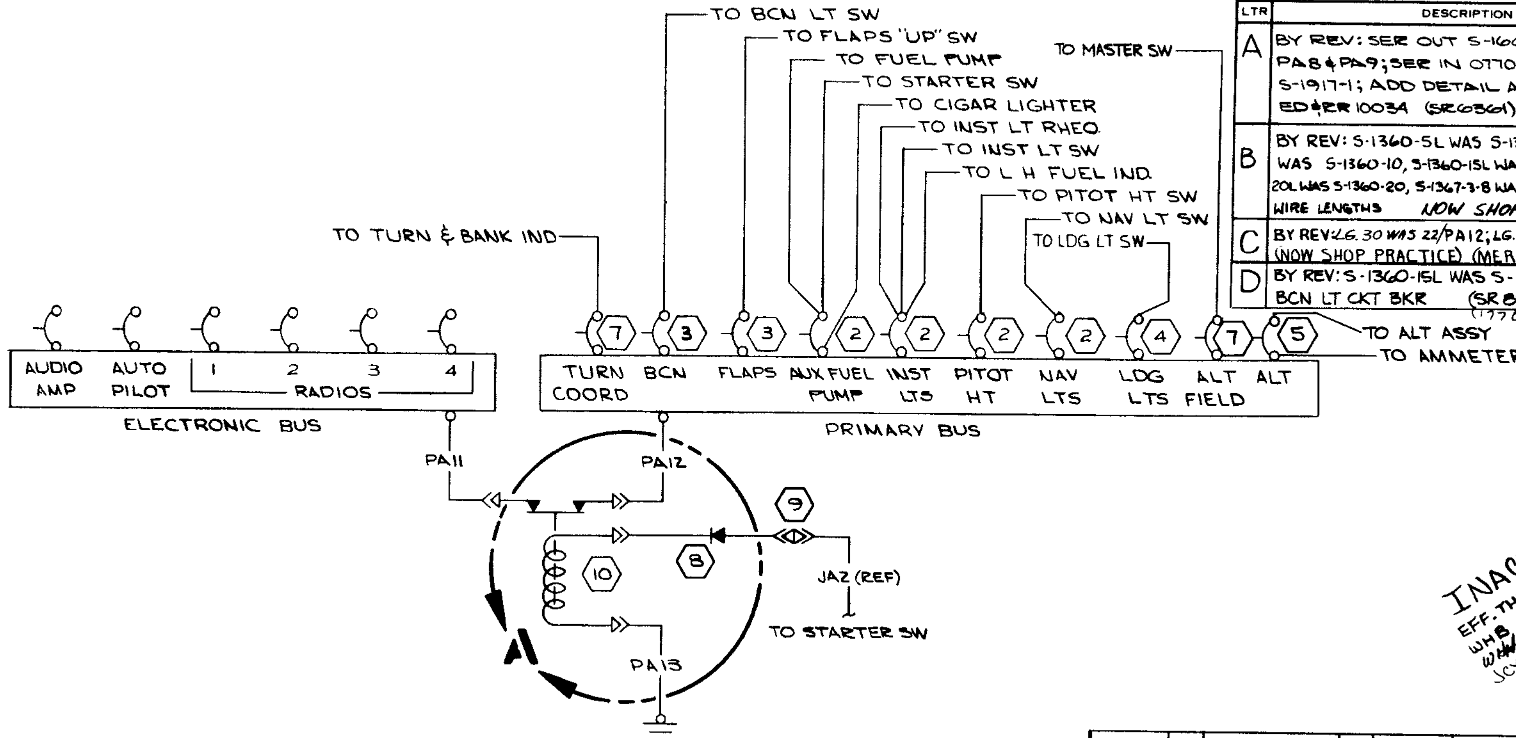
TITLE
WIRING DIAGRAM —
ALTERNATOR SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE | 177 | PAGE: 4.5.1

FORM NO. 80-2158

LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: SER OUT S-1668-1, 1570043-1, PA8 & PA9; SER IN 0770719-2, S-2064-1 & S-1917-1; ADD DETAIL A ED & RR 10034 (SR6361) IX	RLY 5-11-70	RF
B	BY REV: S-1360-5L WAS S-1360-5, S-1360-10L WAS S-1360-10, S-1360-15L WAS S-1360-15, S-1360-20L WAS S-1360-20, S-1367-3-8 WAS S-1367-3-6, ADD WIRE LENGTHS NOW SHOP PRACTICE	JCY 3-7-73	RLY DKM RF
C	BY REV: LG. 30 WAS 22/PA12; LG. 24 WAS 18/PA13 (NOW SHOP PRACTICE) (MER 177-0170)	MEM 5-15-74	JRS
D	BY REV: S-1360-15L WAS S-1360-10L AT BCN LT CKT BKR (SR8260) (17702286)	BAH 5-13-75	KA

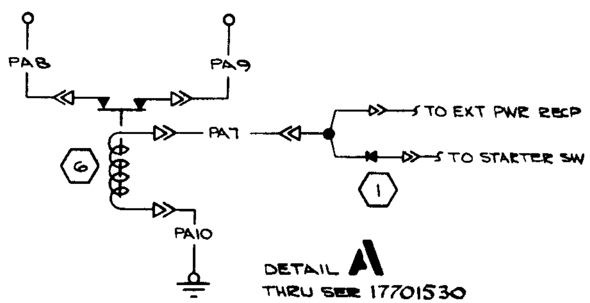


INACTIVE
EFF. THRU SER (SR7905) (17702348)
WHB 1-8-75
JCY

05-242-0905

PA13	18		24	S-1493-1	S-1367-1-12		SER 17701531 & ON
PA12	12		30	S-1493-3	S-1367-3-8		SER 17701531 & ON
PA11	12		20	S-1493-3	S-1367-3-8		SER 17701531 & ON
PA10	18		18	S-1493-1	S-1367-1-8		THRU SER 17701530
9	14		22	S-1493-2	S-1367-2-6		THRU SER 17701530
8	14		20	S-1493-2	S-1367-2-6		THRU SER 17701530
PA7	18		6	S-1493-1	S-1493-1		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE



ITEM NO.	PART NO.	DESCRIPTION
10	S-1917-1	RELAY
9	S-2064-1	CONNECTOR
8	0770719-2	DIODE ASSY
7	S-1360-5L	CIRCUIT BKR
6	S-1668-1	RELAY
5	S-1596-60L	CIRCUIT BREAKER
4	S-1360-20L	CIRCUIT BREAKER
3	S-1360-15L	CIRCUIT BREAKER
2	S-1360-10L	CIRCUIT BREAKER
1	1570043-1	DIODE ASSY

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V SIPES	4/1/69
GROUP	R. Wise	5-2-69
DRAWN	D.L. BURKE	4-22-69
CHECK	R. YOUNGERS	4-23-69
STRESS	TULLIS	5-2-69
PROJECT		
APPD		4-30-69

SUPERSEDES: 4.3

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | 177 | PAGE: 4.6

FORM NO. 80-215

ED & RR 10423 (SR6020) IX

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD PA14 & PA15; DELETE PA12. (SR7905)	BAH 2-25-75	KAL
B	BY REV: S-1360-15L WAS S-1360-10L AT BCN LT CKT BKR (SR7905)	BAH 5-13-75	KAL
C	BY REV: ADD PA16; 1570043 WAS 0770719 DELETE S-2064-1 (SR8259)	RS 5-23-75	KAL
D	BY REV: ADD DETAIL "A", 0770719, S-2064-1 & S-2023-1 (SR8259)	RS 6-16-75	

05-242-0905

ITEM NO.	PART NO.	DESCRIPTION
12	S-2023-1	ADAPTER
11	1570043	DIODE BOARD ASSY
10	1770020	BUS BAR
9	2070028	BUS BAR
8	S-1917-1	RELAY
7	S-2064-1	CONNECTOR
6	0770719	DIODE ASSY
5	S-1360-20L	CIRUIT BREAKER
4	S-1360-15L	
3	S-1596-60L	
2	S-1360-10L	
1	S-1360-5L	CIRUIT BREAKER

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
PA16	18			S-1493-1	S-1493-1		SER 17702319 & ON
PA15	14			S-1367-4-6	S-1367-4-6		
PA14	12			S-1493-3	S-1367-4-6	(OPT)	
PA11	12		20	S-1493-3	S-1367-3-8	(OPT)	
PA13	18		24	S-1493-1	S-1367-1-12	(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: 1770001 Pg 4.6

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	M. L. Stamm	1-20-75
GROUP	W. H. Harden	1-21-75
DRAWN	W. BALKE	1-8-75
CHECK	S. Youel	1-17-75
STRESS		
PROJ	SHACKELFORD	1-21-75
APPD	KAL	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

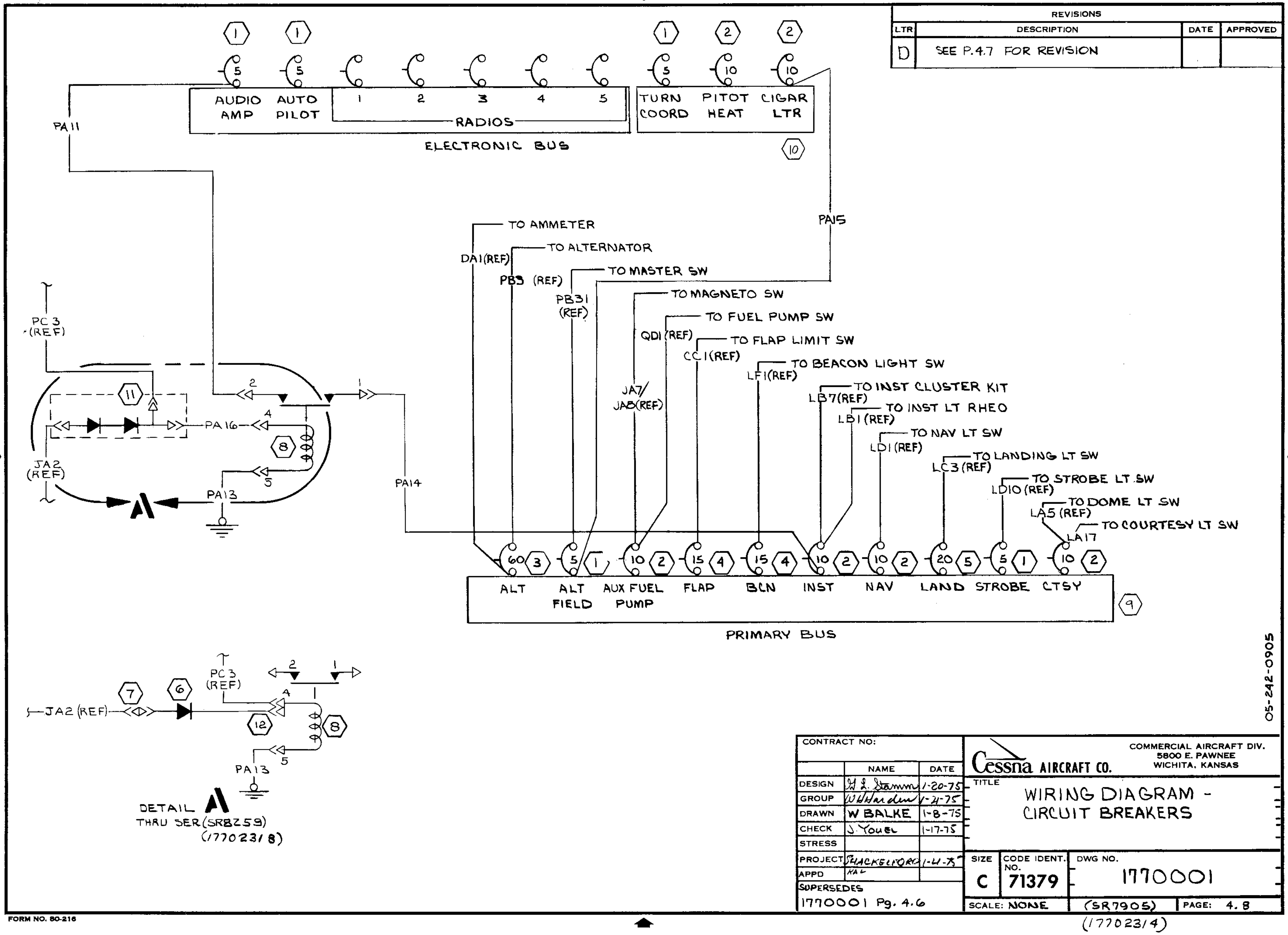
TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

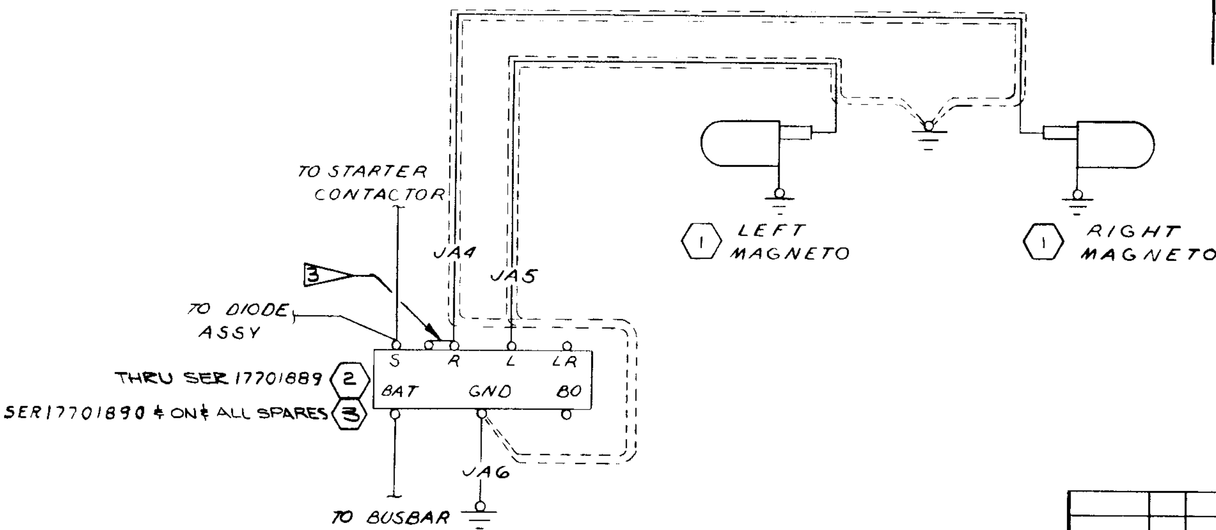
SCALE: NONE (SR7905) PAGE: 4.7

(1770231/4)

FORM NO. 80-215B


REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
D | SEE P.4.7 FOR REVISION
AUDIO AMP
AUTO PILOT
1 2 3 4 5
RADIOS
TURN COORD
PITOT HEAT
CIGAR LTR
ELECTRONIC BUS
PA11
PA15
TO AMMETER
DA1(REF)
TO ALTERNATOR
PB3 (REF)
TO MASTER SW
PB31 (REF)
TO MAGNETO SW
TO FUEL PUMP SW
QD1 (REF)
TO FLAP LIMIT SW
CC1(REF)
TO BEACON LIGHT SW
LF1(REF)
JA7/ JA8(REF)
TO INST CLUSTER KIT
LB7(REF)
TO INST LT RHEO
LB1(REF)
TO NAV LT SW
LD1 (REF)
TO LANDING LT SW
LC3 (REF)
TO STROBE LT SW
LD10 (REF)
TO DOME LT SW
LA5 (REF)
TO COURTESY LT SW
LA17
PC3 (REF)
JA2 (REF)
PA16
PA13
PA14
ALT
ALT FIELD
AUX FUEL PUMP
FLAP
BCN
INST
NAV
LAND
STROBE
CTSY
PRIMARY BUS
JA2 (REF)
PC3 (REF)
PA13
DETAIL A
THRU SER (SR8259)
(177023/8)
05-242-0905
CONTRACT NO:
NAME | DATE
DESIGN | G. L. Stamm | 1-20-75
GROUP | W.H.Harden | 1-21-75
DRAWN | W BALKE | 1-8-75
CHECK | J. Youel | 1-17-75
STRESS
PROJECT | Shackelford | 1-21-75
APPD | KAL
SUPERSEDES
1770001 Pg. 4.6
Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS
TITLE
WIRING DIAGRAM - CIRCUIT BREAKERS
SIZE C
CODE IDENT. NO. 71379
DWG NO. 1770001
SCALE: NONE
(SR7905)
PAGE: 4.8
FORM NO. 80-216
(177023/4)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD NOTE 3; C292501-0101 WAS S-1406-1 (SR5172) IX	8-5-67 RCA	RCA YAK HW
B	BY REV: SER OUT C292501-0101; SER IN C292501-0105 (SR7126)	RLY 3-1-72	HW RF
C	BY REV: SER OUT S-1367-1-8 & S-1367-2-8 IN NOTE 2; ADD "THIS TERM. VENDOR SUPPLIED" & SER IN NOTE 2; SER 17701774	DLP 1-9-73	RLY HRW RF
D	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	RLY HRW RF



INACTIVE
EFF THRU SER 17701773
GLW 2-19-73
HRW
RLY RF

NOTES:

1. S-1367-1-6 FOR CENTER CONDUCTOR.
   S-1367-2-6 FOR SHIELDING
2. S-1367-1-8 FOR CENTER CONDUCTOR.
   THRU SER 17701773
   S-1367-2-8 FOR SHIELDING.
   THRU SER 17701773
   THIS TERMINAL VENDOR SUPPLIED.
   SER 17701774 & ON
3. INSTALL SHORTING BAR (VENDOR FURNISHED) BETWEEN TERMINAL "R" & UNMARKED ADJACENT TERMINAL

ITEM NO.	PART NO.	DESCRIPTION
3	C292501-0105	IGNITION SWITCH
2	C292501-0101	STARTER SWITCH
1	4051	MAGNETO (09033)

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
JA6	18		8	S-1367-1-6	S-1367-1-6		
JA5	18S		53	1	2		
JA4	18S		45	1	2		

WIRE TABLE

CONTRACT NO:	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wire	1-31-67
DRAWN	J. R CONLEY	2-22-67
CHECK	YAKSIIAW	3-4-67
STRESS	Hutchison	2-9-67
PROJECT	Ed Moody	2-1-67
APPD	REm	3-6-67

SUPERSEDED BY PG 5.1.1

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — MAGNETO SYSTEM

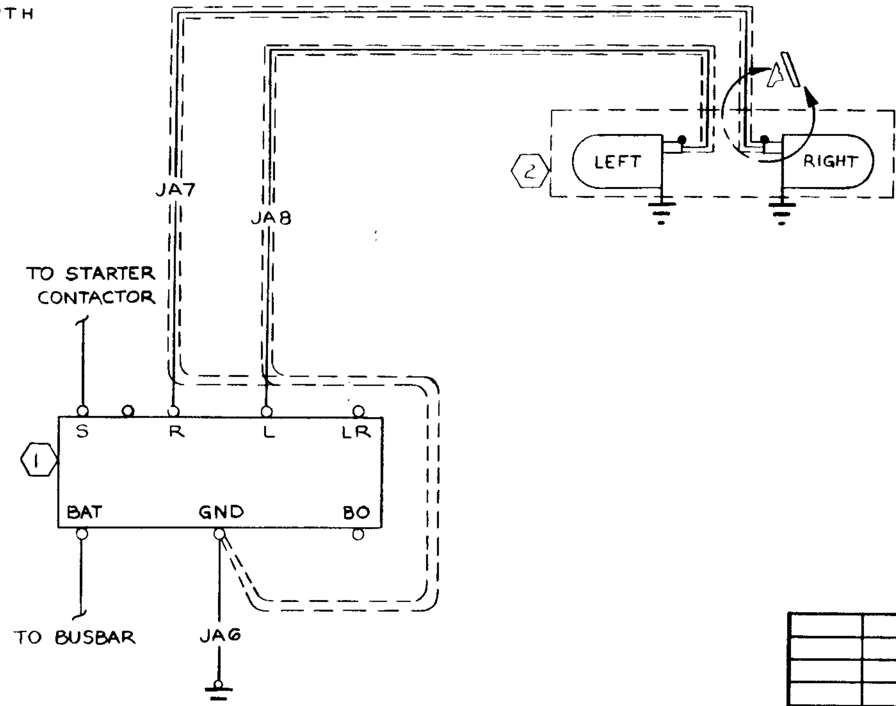
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

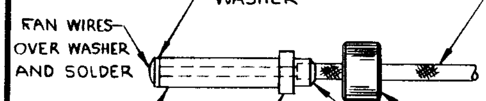
SCALE: NONE | (SR5172) IX | PAGE: 5.1

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-4-73	ELY 7/10 BF
B	BY REV: ADD WIRE LENGTHS 45 & 53 (NOW SHOP PRACTICE) (MER 177-0170)	MEM 5-16-74	JLO JRB

NOTES:
1. S-1367-1-6 FOR CENTER CONDUCTOR
S-1367-2-6 FOR SHIELDING
2. TERMINALS SUPPLIED WITH ENGINE.





DETAIL A
(TYP INSTL FOR RH & LH MAGNETO)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
JA8	18S	S1461	53	1	2		
JA7	18S	S1461	45	1	2		
JA6	18		8	S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
2	D4LN-2021	MAGNETO	(77820)
1	C292501-0105	IGNITION 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: PAGE 5.1
SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H Wise	2-19-73
DRAWN	G WOOD	2-19-73
CHECK	R. YOUNGERS	2-21-73
STRESS		
PROJ	G Fife	2-22-73
APPD		
OTHER		

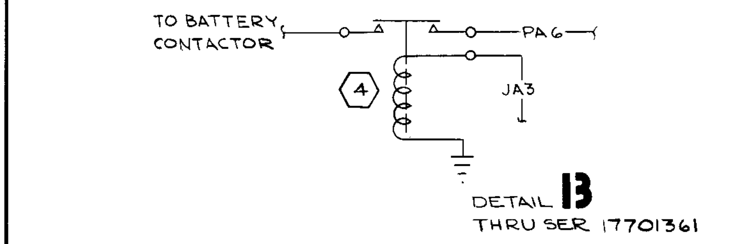
Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — MAGNETO SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001
SCALE: NONE | 177 | PAGE: 5.1.1

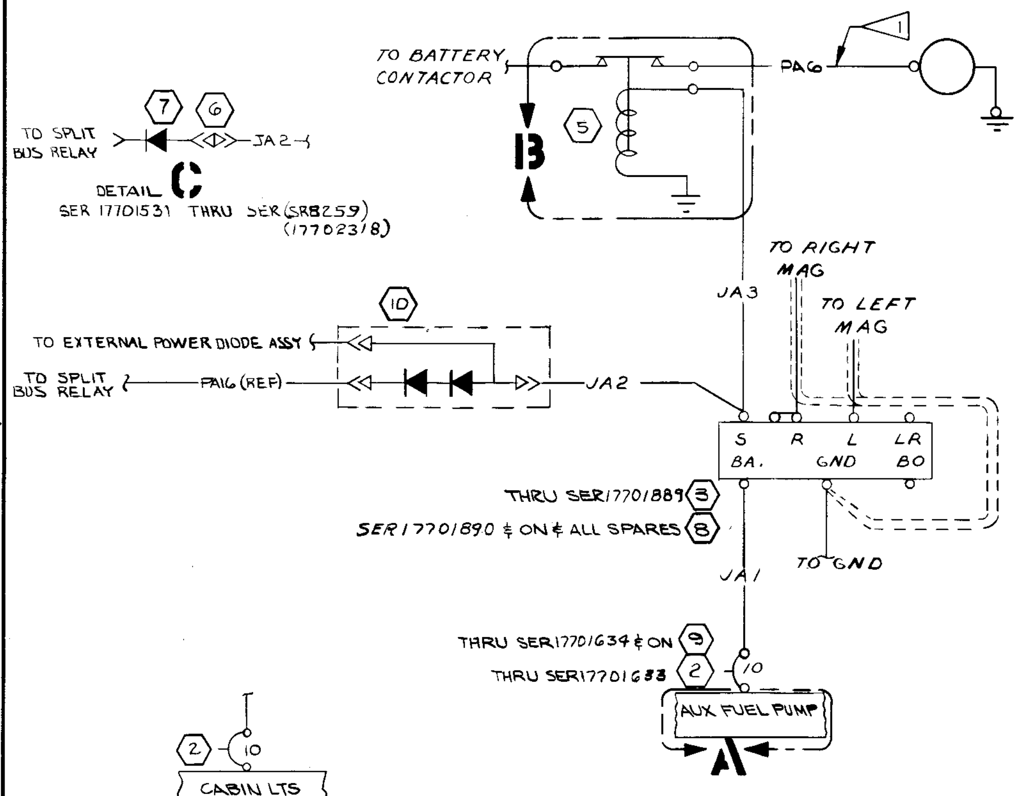
FORM NO. 80-215B

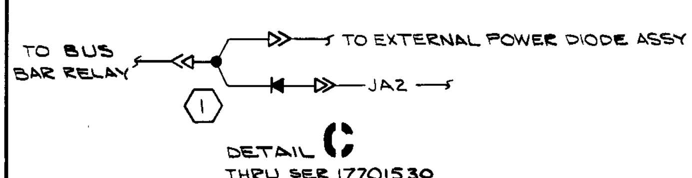
(SR7526) 17701774 & ON



NOTES:

1. APPLY A 16" LENGTH OF ALPHA 92194 HEAT SHRINK SLEEVING NO. FIT-7.50 TO S-1367-1-13 TERMINAL END OF CABLE BEFORE APPLYING WIRE TERMINAL.





REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: C292501-0101 WAS S-1401-1, ADD TO DOME LT SW & TO COURTESY LT (SR5172) IX	8-5-67 RCA	JAK NFW
B	BY REV: ADDED DETAIL "A" ED & RR 03430 SER 17701164 IX	FER 7-31-68	GKI MDS DET WH NRS RW
C	BY REV: ADD DETAIL "B", S-1991-1 & SR ED & RR 10473 (SR6222)	MDS 5-23-69	RLY MDS DET NFW RF
D	BY REV: SER OUT 1570043-1; SER IN 0770719-2 & S-2064-1; ADD DETAIL C ED & RR 10034 (SR6361) IX	RLY 5-11-70	WW RLY NFW RF
E	BY REV: SER OUT C292501-0101, SER IN C292501-0105; SER OUT S-1360-10; SER IN S-1360-10L (SR7126), (SR6785) IX (REF)	RLY 3-1-72	WW NFW RF
F	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	RLY NLW RF
G	BY REV: LG 39 WAS 37/JA2 (NOW SHOP PRACTICE) (MER 177-0170)	MEM 5-16-74	DLO JRS
H	BY REV: ADD NOTE 1 (NOW SHOP PRACTICE) (MER-0183)	MEM 6-28-74	JCY JRS
J	BY REV: DELETE "TO DOME LT SW" & TO COURTESY LT"; ADD DETAIL "C" & PA16 (REF) (NOW SHOP PRACTICE) (SR8259)	RJP 6-17-75	RAM JRS

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
PA6	2	S1562-2-9	32	S-1367-7-13	S-1367-7-14	
JA3	18		44	S-1367-1-6	S-1367-1-10	
JA2	18		39	S-1367-1-6	S-1493-1	
JA1	18		38	S-1367-1-6	S-1367-1-6	

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	1570043	DIODE BOARD ASSY
9	S-1360-10L	CIRCUIT BREAKER
8	C292501-0105	IGNITION SWITCH
7	0770719-2	DIODE ASSY
6	S-2064-1	CONNECTOR
5	S-1991-1	CONTACTOR
4	S-1673-1	STARTER CONTACTOR
3	C292501-0101	STARTER SWITCH
2	S-1360-10	CIRCUIT BKR
1	1570043-1	DIODE ASSY

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wise	1-31-67
DRAWN	J.R. CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	[illegible]	2-1-67
APPD	[illegible]	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — STARTER

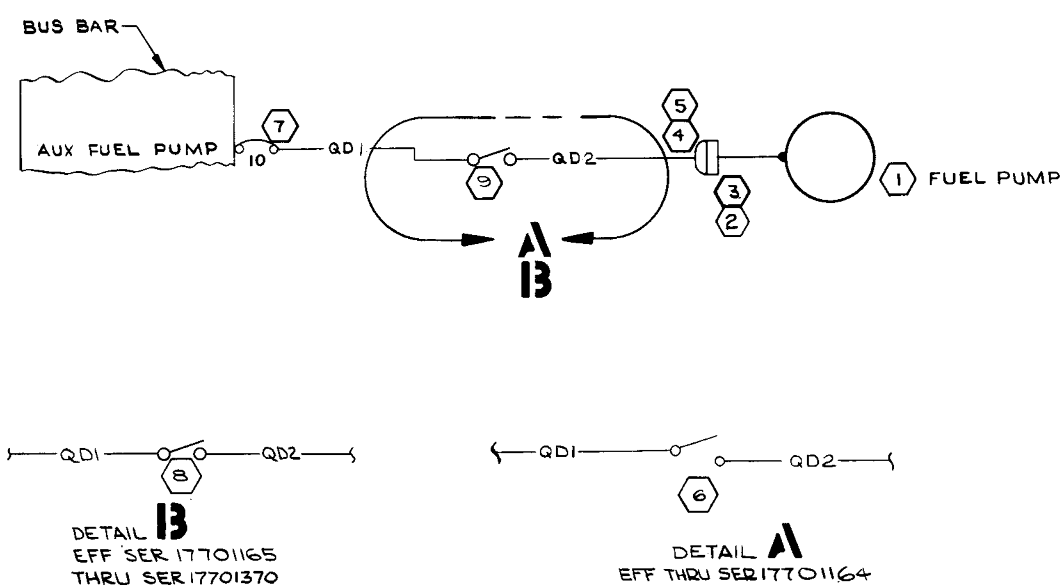
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE (SR5172) IX PAGE: 6.1

(1770001)

FORM NO. 80-215

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAIL A & S-1845-1-1, SER OUT S-1158-2-2. ED & RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET HFW VRS TM
B	BY REV: ADD SER TO QD1 & QD2, ADD NOTE 1 & 2 (SR5440) IX	JWH 6-14-68	MDS TM DET HFW VRS
C	BY REV: SER OUT S-1845-1-1; SER IN S-1845-1-2; ADD DETAIL B ED & RR 10489 (SR6020) IX	DLB 4-22-68	RLY MDS DET HFW TM VRS
D	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	RLY HFW RF
E	BY REV: S-1635-1 WAS SOLDER/QD2 (NOW SHOP PRACTICE) (MER 177-0170)	MEM 5-16-74	DLO JRB WB



NOTES:

1. SER 17700001 TO SER 17701164
2. SER 17701165 & ON

ITEM NO.	PART NO.	DESCRIPTION
9	S-1845-1-2	SWITCH
8	S-1845-1-1	SWITCH
7	S-1360-10	CKT BKR
6	S-1158-2-2	SWITCH
5	S-1637-2	HOUSING-PLUG
4	S-1635-1	PIN
3	S-1637-1	HOUSING-CAP
2	S-1636-1	SOCKET
1	1216012-1	PUMP

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
QD-2	18		35	S-1493-1	S-1635-1	2	
QD1	18		37	S-1367-1-6	S-1493-1	2	
QD2	18		35	S-1367-1-6	S-1635-1	1	
QD1	18		37	S-1367-1-8	S-1367-1-6	1	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	5/24/67
GROUP	H. Wied	5-24-67
DRAWN	R LAURIE	5-8-67
CHECK	YAKSHAW	5-9-67
STRESS	[illegible]	5-23-67
PROJECT	Ted Moody	5-24-67
APPD	[illegible]	5-14-67
SUPERSEDES		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — FUEL PUMP

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | (SR5172) IX | PAGE: 7.1

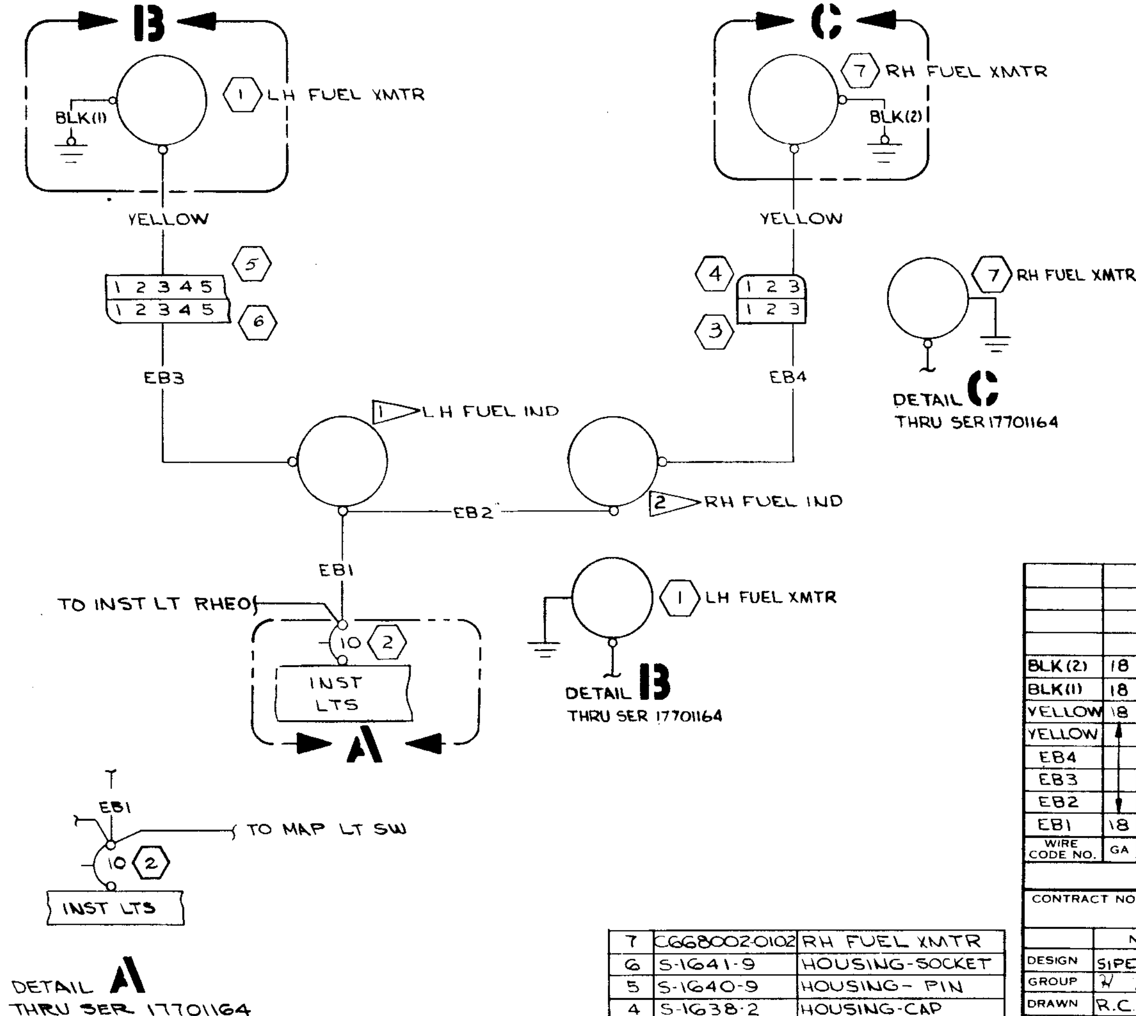
(17700001)

FORM NO. 80-215

NOTES:

1. PART OF C669504-0101 INST. CLUSTER

2. PART OF C669505-0101 INST CLUSTER



INACTIVE: EFF THRU SER 17702123 4-5-74
RAM

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: C668002-0101 & C668002-0102 WAS 0523557-1, ADD TO MAP LT SW & TO INST LT RHEO. (SR5172) IX	8-5-67 RCA	
B	BY REV: ADDED DETAIL A; ITEMS IN FIELD 6 WAS 5, 5 WAS 6, 3 WAS 4, & 4 WAS 3 ED & RR 03430 (SR 5440) IX	FER 7-31-68	MDS
C	BY REV: ADDED DETAIL B & C ED & RR10194 SER17701165	SDP 10/14/68	JWH MDS
D	BY REV: S-1360-10L WAS S-1360-10, ADD WIRE LENGTH NOW SHOP PRACTICE	SY 3-7-73	DKM RF
E	BY REV: INTERCHANGED ITEM 5 & 6 IN FLD OF DWG; EB3 TERM S-1636-1 WAS S-1635-1, YEL TERM S-1635-1 WAS S-1636-1 "NOW SHOP PRACTICE" SER 17700001	MRL 6-15-73	DKM RF

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (2)	18	18-0	20	S-1367-1-10	S-1367-1-10		
BLK (1)	18	18-0	20	S-1367-1-10	S-1367-1-10		
YELLOW	18	18-4	50	S-1635-1	S-1367-1-10		
YELLOW		18-4	50	S-1635-1	S-1367-1-10		
EB4			210	S-1367-1-10	S-1636-1		
EB3			210	S-1367-1-10	S-1636-1		
EB2			14	S-1367-1-10	S-1367-1-10		
EB1	18		38	S-1367-1-10	S-1367-1-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	C668002-0102	RH FUEL XMTR
6	S-1641-9	HOUSING-SOCKET
5	S-1640-9	HOUSING-PIN
4	S-1638-2	HOUSING-CAP
3	S-1638-1	HOUSING-PLUG
2	S-1360-10L	CIRCUIT BREAKER
1	C668002-0101	LH FUEL XMTR

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H Wine	1-31-67
DRAWN	R.C. AXTELL	2-22-67
CHECK	JAKSHAW	3-4-67
STRESS		
PROJECT		2-1-67
APPD		3-6-67

SUPERSEDES:

SUPERSEDED BY: P.8.8.0

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — FUEL GAGE & TRANSMITTER

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

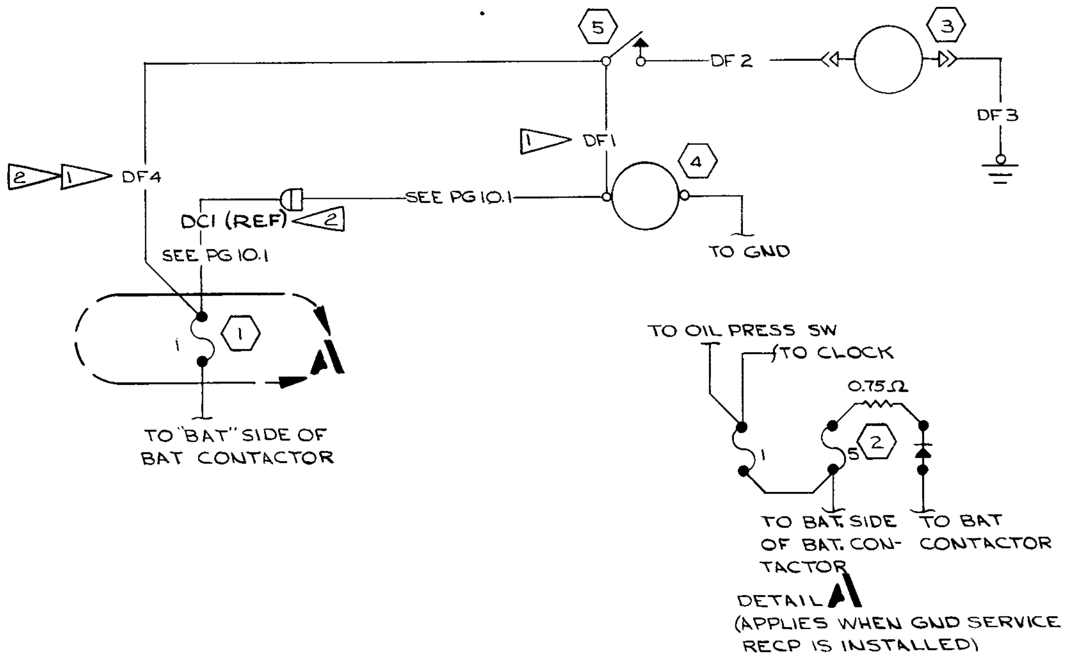
SCALE: NONE | SER17700001 & ON | PAGE: 8.1

FORM NO. 80215

NOTES:

1. DF1 IS INSTALLED WITH OPT HOURMETER WHEN CLOCK IS INSTALLED.
2. DO NOT INSTALL DF4 WHEN DC1 IS INSTALLED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: DELETED DF4 IS INSTALLED WHEN OPT CLOCK IS NOT INSTALLED FROM NOTE 1, ADDED STD TO DF4, & OPT TO TITLE (SR5172) IX	8-5-67 RCA	RCM YAK WRW
B	BY REV: ADD NOTE 2 & DC1 (REF) ED&RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET HAW VRS
C	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 3-15-73	RLY HLW RF



WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
DF4 (2)	18		235	SOLDER	S-1367-1-6	STD	
DF3	18		20	S-1493-1	S-1367-1-8		
DF2	18		45	S-1367-1-6	S-1493-1		
DF1 (1)	18		50	S-1367-1-6	S-1367-1-6		

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	S-1711-1	OIL PRESS SW
4	S-1317N1	CLOCK
3	C664501-0101	HOURMETER
2	0712031-3	FUSE & DIODE ASSY
1	0712031-2	FUSE MTG ASSY

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wise	1-31-67
DRAWN	R.C. AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Ted Moody	2-1-67
APPD	R.Em	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HOURMETER (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | (SR5172) IX | PAGE: 8.2

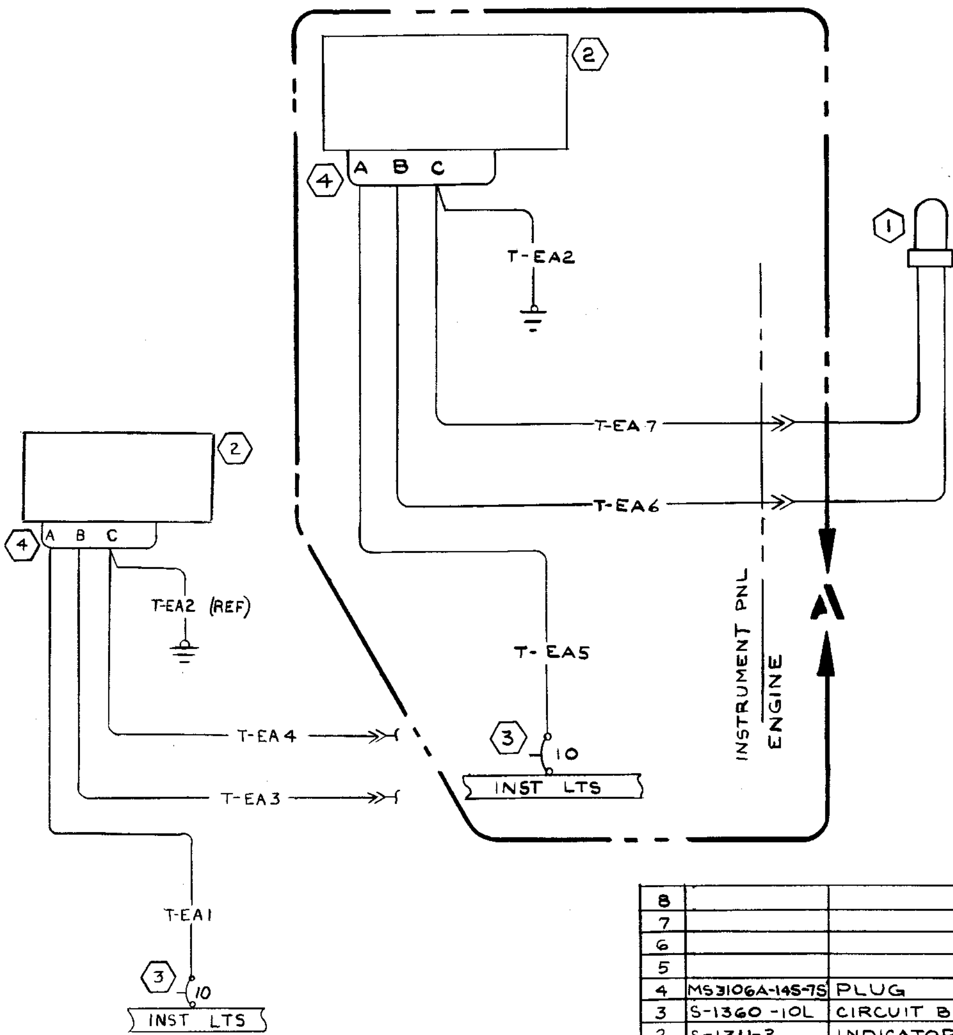
FORM NO. 80-215

R

NOTES:

1. BURNDY YZ14-H FURNISHED WITH ITEM 1 0550209-1.

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1360-10L WAS S-1360-10, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	
B	BY REV: S-1311-3 WAS S-1311N1 (NOW SHOP PRACTICE) MER 177-0171	MEM 5-17-74	
C	BY REV: SER OUT: EA1, EA3, & EA4 WIRING; SER IN: EA5, EA6, & EA7 WIRING; ADD: DETAIL A; SER (SR 7905) IX	CJH 11-6-74	



DETAIL A
THRU SER (SR 7905)(17702348)

05 242 0905

EA 7	18			1	SOLDER		SER 17702349 & ON
EA 6	18			1	SOLDER		SER 17702349 & ON
EA 5	18			S-1367-1-8	SOLDER		SER 17702349 & ON
EA4	18		143	1	SOLDER		THRU SER 17702348
EA3	18		143	1	SOLDER		THRU SER 17702348
EA2	18		18	SOLDER	S-1367-1-8		
EA1	18		25	S-1367-1-8	SOLDER		THRU SER 17702348
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
8			
7			
6			
5			
4	MS3106A-14S-7S	PLUG	
3	S-1360-10L	CIRCUIT BKR	
2	S-1311-3	INDICATOR	
1	0550209-1	PROBE-CARB AIR TEMP	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	6/29/67
GROUP	H. Wise	7-8-67
DRAWN	SIPES VR	6/29/67
CHECK	YAKSHAW	6-29-67
STRESS		7-5-67
PROJECT	Ted Moody	7-7-67
APPD		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

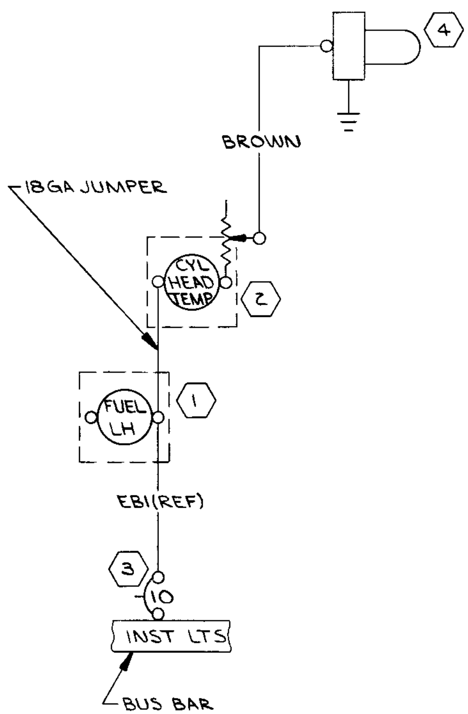
TITLE
WIRING DIAGRAM — CARBURETOR AIR TEMPERATURE (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE (SR 5172) IX PAGE: 8.3

FORM NO. 80-215A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1360-10L WAS S-1360-10 S-1367-1-8 WAS S1367-2-8, S-1367-1-4 WAS S-1367-2-4, 20GA WAS 18GA, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RLY DXM H/W RF



INACTIVE:
EFF THRU SER 17702123
RAM 4-5-74
MTM
JRS

NOTES:

1. PART NO. 110691, (12984)

BROWN	20	1	90	S-1367-1-8	S-1367-1-4	
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	S-1372-1	SENDING UNIT	
3	S-1360-10L	CIRCUIT BKR	
2	C669509-0102	INST CLUSTER	
1	C669504-0101	INST CLUSTER	

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: P. 8.6.0

CONTRACT NO:

	NAME	DATE
DESIGN	V SIPES	4/2/69
GROUP	H. Wise	5-2-69
DRAWN	D.L. BURKE	4-22-69
CHECK	R. YOUNGERS	4-23-69
STRESS	TULLIS	5-2-69
PROJ	J. d Moody	5-3-69
APPD	McElwaney	4-30-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — CYLINDER HEAD TEMP

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001
SCALE: NONE	177	PAGE: 8.4

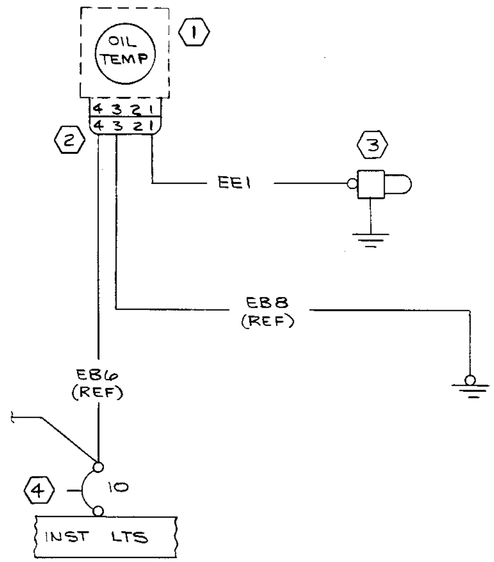
FORM NO. 80-215B

ED&RR 10503 (SR6020)IX

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: MIL-W-81044/12-18-9 WAS 110691/NOTE 1 (SR7874)	RJP	

NOTES:

1. PART NO. MIL-W-81044/12-18-9



EE1	18	1.		S-1635-1	S-1367-1-10	
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
4	S-1360-10L	CIRCUIT BREAKER
3	C669520-0105	TRANSDUCER
2	S-1638-4	HOUSING-CAP
1	C669516-0103	INST CLUSTER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. Stamm	4-18-74
GROUP	[illegible]	4-17-74
DRAWN	MERRICK	4-5-74
CHECK	M. MORIARTY	4-17-74
STRESS		
PROJ	N. Shackelford	4-24-74
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — OIL TEMPERATURE

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

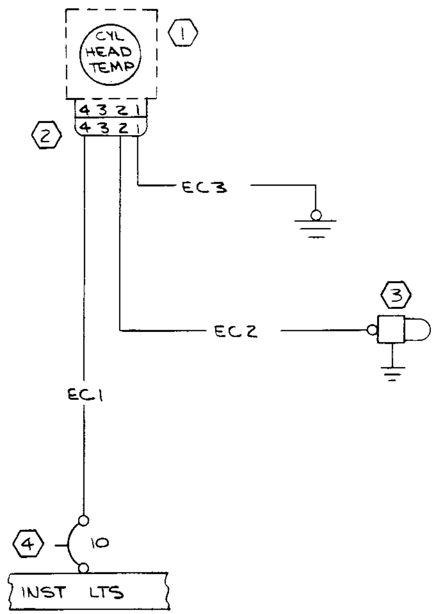
SCALE: NONE (SR7874) PAGE: 8.5.0

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: MIL-W-81044/12-18-9 WAS 110691/NOTE 1; (SR7874)	RJP 6-17-74	[illegible]
B	BY REV: ADD NOTE 2; DELETE NOTE 1 (NOW SHOP PACTICE)	[illegible] 1-29-76	[illegible]

NOTES:

1. ~~[illegible]~~
2. MATERIAL IS ALPHA 5857-7 (VENDOR CODE 92194) OR BELDEN 83009-1 (VENDOR CODE 70903)



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
EC3	18			S-1635-1	S-1367-1-8		
EC2	18	2		S-1635-1	S-1367-1-4	1	
EC1	18			S-1367-1-6	S-1635-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	S-1360-10L	CIRCUIT BREAKER	
3	C669520-0103	TRANSDUCER	
2	S-1638-4	HOUSING-CAP	
1	C669517-0101	INST CLUSTER	

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. 8.4

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	[illegible]	4-18-74
GROUP	[illegible]	4-17-74
DRAWN	MERRICK	4-5-74
CHECK	M. MORIARTY	4-17-74
STRESS		
PROJ	W. Shackelford	4-24-74
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — CYLINDER HEAD TEMPERATURE

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | (SR7874) | PAGE: 8.6.0

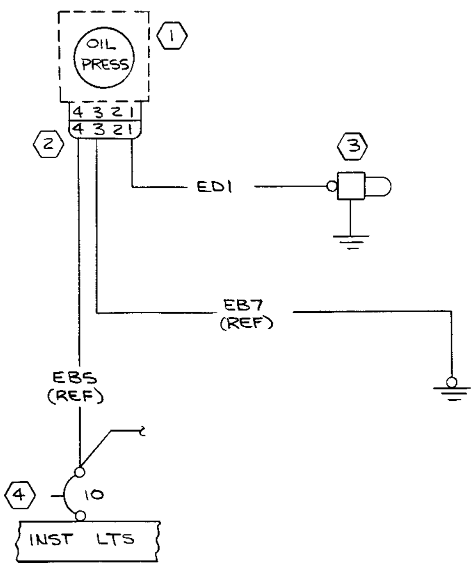
(17702124)

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: MIL-W-81044/12-18-9 WAS 110691/NOTE 1; (SR7874)	RJP	

NOTES:

1. PART NO. MIL-W-81044/12-18-9



ED1	18	1.		S-1635-1	S-1367-1-10	
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	S-1360-10L	CIRCUIT BREAKER	
3	C669520-0104	TRANSDUCER	
2	S-1638-4	HOUSING-CAP	
1	C669515-0103	INST CLUSTER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. Stamm	4-18-74
GROUP	J. Trandfeld	4-17-74
DRAWN	MERRICK	4-5-74
CHECK	M. MORIARTY	4-17-74
STRESS		
PROJ	W. Shockelford	4-24-74
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

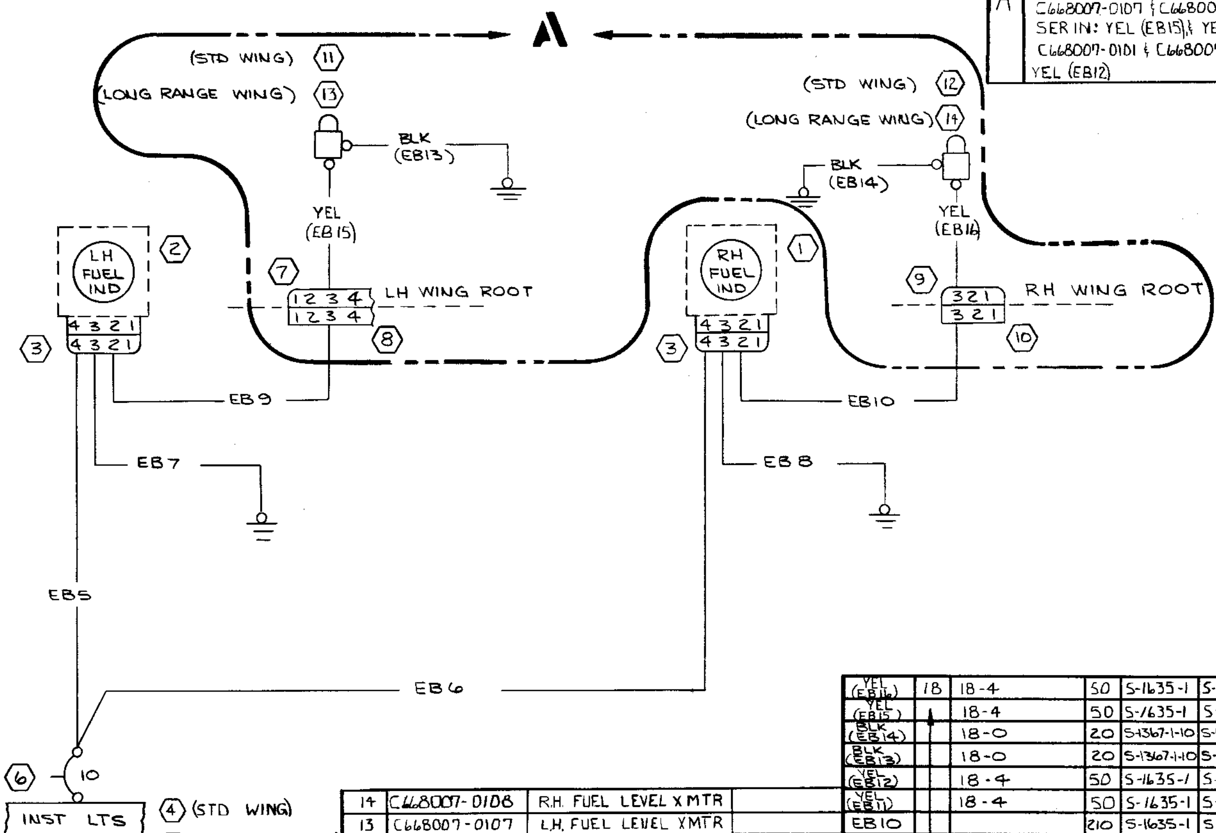
WIRING DIAGRAM — OIL PRESSURE

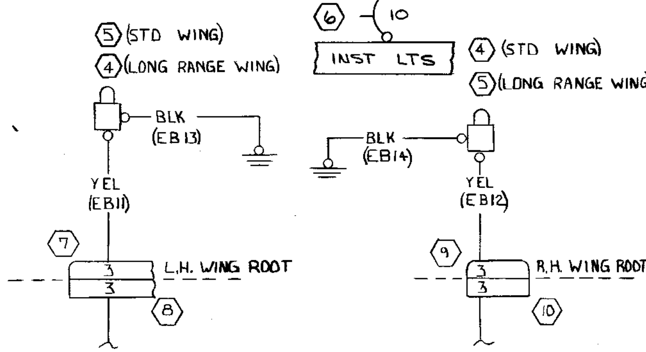
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE (SR7874) PAGE: 8.7.0

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD C668007-0105, C668007-0106, C668007-0107 & C668007-0108, DETAIL A; SER IN: YEL (EB15) & YEL (EB16); SER OUT: C668007-0101 & C668007-0102, YEL (EB11) & YEL (EB12) (SER)(SR8048)	CTH 9-18-74	





DETAIL A
THRU SER (SR8048)(17702165)

ITEM NO.	PART NO.	DESCRIPTION
14	C668007-0108	R.H. FUEL LEVEL XMTR
13	C668007-0107	L.H. FUEL LEVEL XMTR
12	C668007-0106	XMTR FUEL LEVEL
11	C668007-0105	XMTR FUEL LEVEL
10	S-1638-1	HOUSING - PLUG
9	S-1638-2	HOUSING - CAP
8	S-1641-9	HOUSING - SOCKET
7	S-1640-9	HOUSING - PIN
6	S-1360-10L	CIRCUIT BREAKER
5	C668007-0101	XMTR - FUEL LEVEL
4	C668007-0102	XMTR - FUEL LEVEL
3	S-1638-4	HOUSING - CAP
2	C669515-0103	INST CLUSTER
1	C669516-0103	INST CLUSTER

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
YEL (EB16)	18	18-4	50	S-1635-1	S-1493-1		SER 17702166 & ON
YEL (EB15)		18-4	50	S-1635-1	S-1493-1		SER 17702166 & ON
BLK (EB14)		18-0	20	S-1367-1-10	S-1367-1-10		
BLK (EB13)		18-0	20	S-1367-1-10	S-1367-1-10		
YEL (EB12)		18-4	50	S-1635-1	S-1367-1-10		THRU SER 17702165
YEL (EB11)		18-4	50	S-1635-1	S-1367-1-10		THRU SER 17702165
EB10			210	S-1635-1	S-1636-1		
EB9			210	S-1635-1	S-1636-1		
EB8				S-1635-1	S-1367-1-8		
EB7				S-1635-1	S-1367-1-8		
EB6				S-1635-1	S-1367-1-6		
EB5	18		38	S-1635-1	S-1367-1-6		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 8.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. Stamm	4-18-74
GROUP	J. Greenfield	4-17-74
DRAWN	MERRICK	4-5-74
CHECK	M. MORIARTY	4-17-74
STRESS		
PROJ	W. Shackelford	4-24-74
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

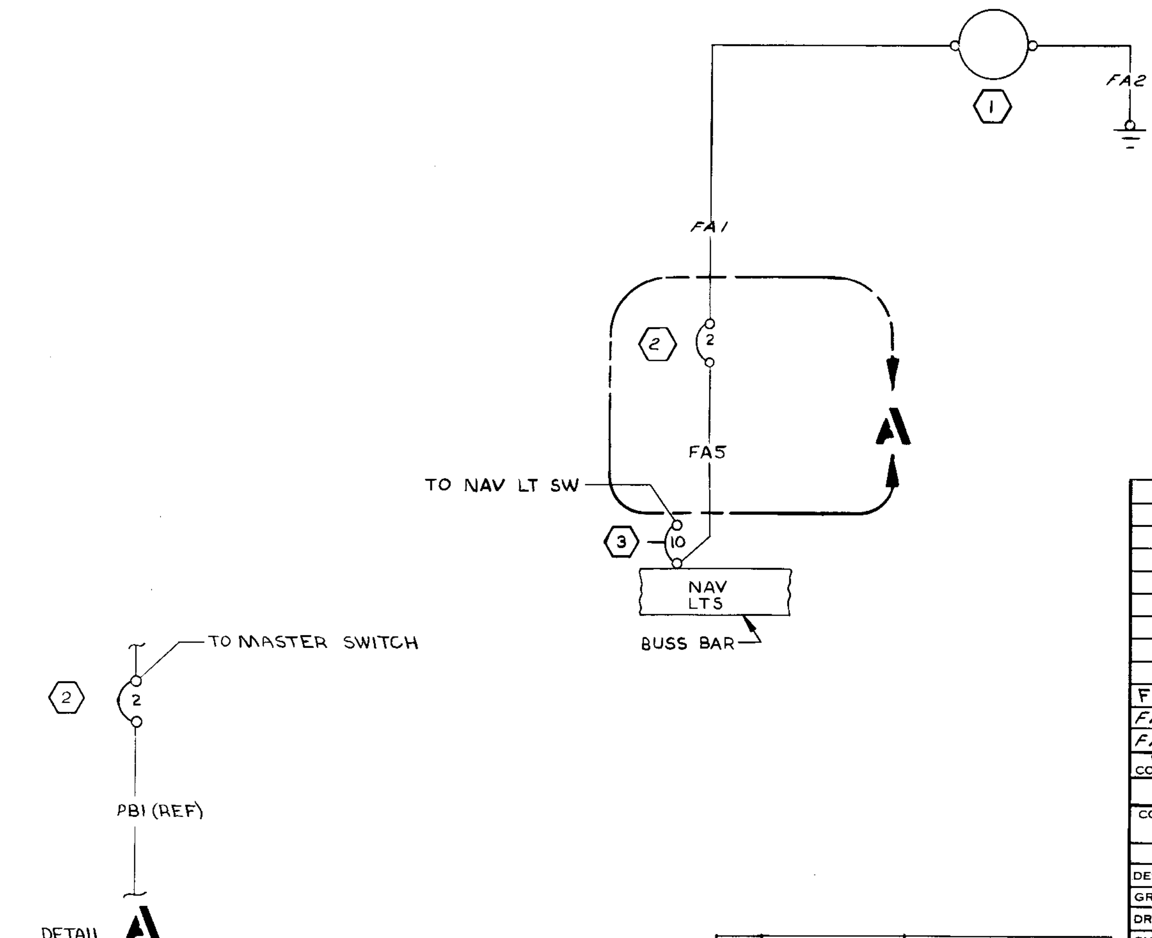
TITLE
WIRING DIAGRAM — FUEL GAGE & TRANSMITTER

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE (SR7874) PAGE: 8.8.0

FORM NO. 80-215B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAIL A & ITEM 3; FA5 WAS PB1(REF); DELETE WIRE "TO MASTER SWITCH". ED&RR 02375 (SR5440) IX	LES 6-13-68	MDS DET HZW VRS



EFF THRU SER17701164

INACTIVE: EFF SER 177-0001 THRU SER(SR6020)
ED&RR 10423
DLB 4-22-69
RLY HZW
MDS DET

FA5	18			S-1367-1-6	S-1367-1-8		
FA2	18			S-1367-1-8	S-1367-1-8		
FA1	18			S-1367-1-6	S-1367-1-8		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	S-1360-10	CKT BKR
2	CA2	CKT BKR (73803)
1	S-1413N-1	TURN & BANK INDICATOR

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V SIPES	8/3/66
GROUP	H. Wise	1-31-67
DRAWN	J.R. CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Ted Mady	2-1-67
APPD.	REm	3-6-67

SUPERSEDED BY: P 9.4

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — TURN & BANK

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

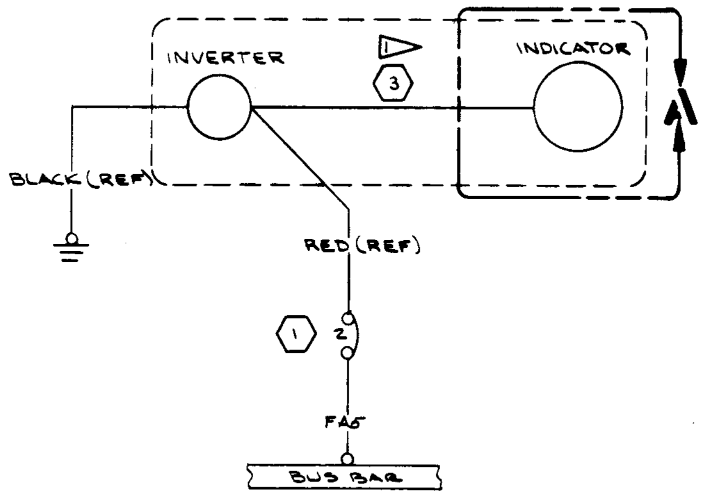
SCALE: NONE (SR 5172) IX PAGE: 9.1

FORM NO. 80-215

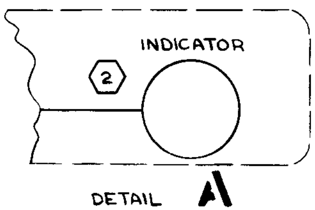
NOTES:

1. TURN COORDINATOR INDICATOR INCLUDES ALL WIRES AND CABLES BETWEEN INVERTER, INDICATOR AND CIRCUIT BREAKER.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: C661003 0201 WAS C661002-0104. (SR5172) IX	7-15-67 RCA	
B	BY REV: ADD DETAIL A & ITEM 3. FA5 WAS PB1(REF) ED&RR 02376 (SR5440) IX	LES 6-12-68	MDS DET VRS
C	BY REV: 2904-1 WAS C661003-0501; INACTIVATE DWG ED&RR 10423 (SR6020) IX	DLB 4-22-69	RLY MDS DET



INACTIVE: EFF SER 177-0001 THRU SER (SR6020)
ED&RR 10423
DLB 4-22-69
RLY MDS DET



DETAIL A
EFF THRU SER 17701164

ITEM NO.	PART NO.	DESCRIPTION
3	2904-1	TURN COORDINATOR (2774)
2	C661003-0201	TURN COORDINATOR
1	CA-2	CKT BKR (73803)

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
FA5	18			S-1367-1-8	S-1367-1-6		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	5/20/67
GROUP	H. Wise	5-25-67
DRAWN	HARRIS	5/22/67
CHECK	YAKSHAW	5-23-67
STRESS		5-25-67
PROJECT		5-25-67
APPD		5-24-67

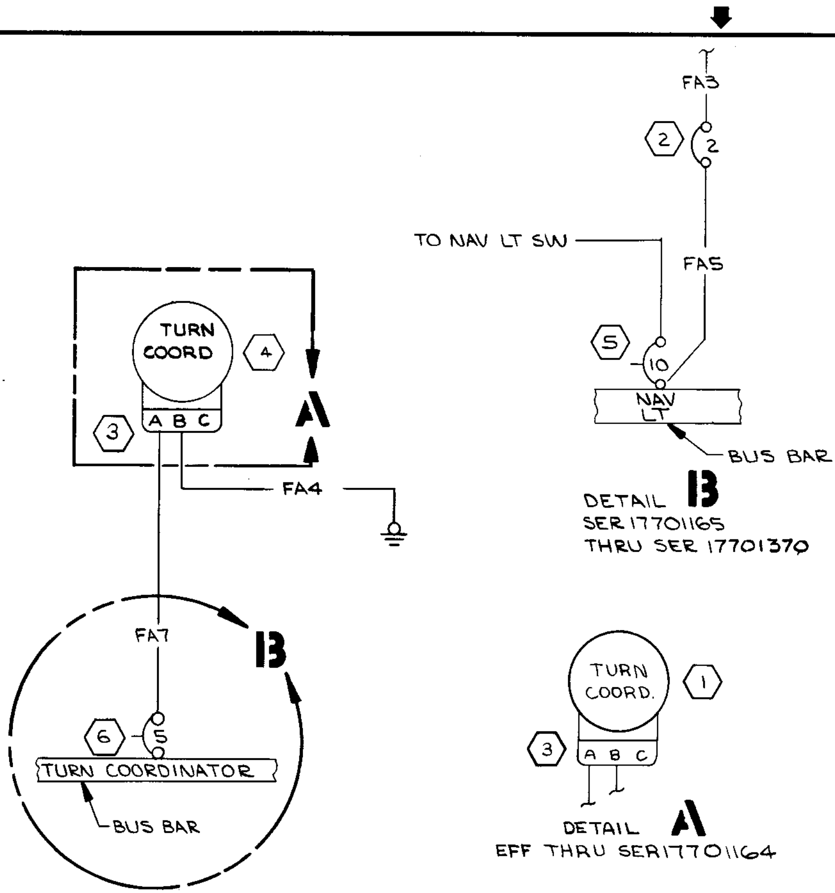
SUPERSEDED BY: P 9.5

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BRITTAIN WING LEVELER (OPT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE | (SR5172) IX | PAGE: 9.2



REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADDED DETAIL A, ITEMS 4 & 5; FA5 WAS PB1 (REF) ED&RR02376 (SR5440) IX	LES 6-12-68	MDS DET HLW VRS
B	BY REV: ADD DETAIL LETTER "A" TO FIELD OF DWG. ED&RR 14001	MDS 7-19-68	GKI MDS DET
C	BY REV: ADD DETAIL B, FA7 & S-1360-5; SER OUT FA3 & FA-5 ED & RR 10423 (SR6020) IX	DLB 4-22-69	RLY MDS DET HLW
D	BY REV: S-1360-5L WAS S-1360-5, S-1360-10L WAS S-1360-10, S-1367-1-8 PER FA4 WAS S-1367-1-14 ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RLY DRM HLW RF

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
FA7	18		48	S-1367-1-8	SOLDER		SER 17701371 & ON
FA5	18		30	S-1367-1-6	S-1367-1-8		THRU SER 17701370
FA4	18		25	S-1367-1-8	SOLDER		
FA3	18			S-1367-1-8	SOLDER		THRU SER 17701370

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	S-1360-5L	CIRCUIT BKR	
5	S-1360-10L	CIRCUIT BREAKER	
4	C661003-0501	TURN COORDINATOR	
3	MS3106A10SL3S	CONNECTOR	
2	CA-2	CIRCUIT BREAKER	(80602)
1	C661003-0201	TURN COORDINATOR	

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	COOK	9-13-67
GROUP	H. Wise	9-13-67
DRAWN	Harris	9-8-67
CHECK	LAURIE	9-9-67
STRESS	[illegible]	9-11-67
PROJECT	[illegible]	9-14-67
APPD	R.E. Moore	9-9-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — TURN COORDINATOR (OPT)

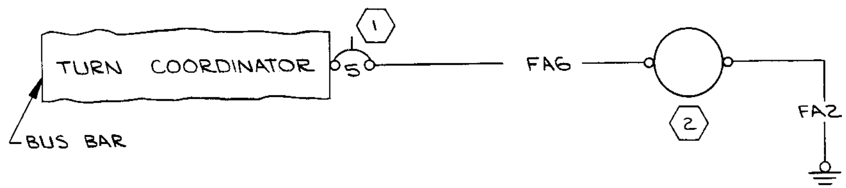
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | 177 | PAGE: 9.3

FORM NO. 80-215A

(SR5172) IX

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1360-5L WAS S-1360-5, S-1367-1-8 WAS S-1367-1-6, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RF



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
FA6	18		48	S-1367-1-8	S-1367-1-8	
FA2	18		25	S-1367-1-8	S-1367-1-8	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
2	S-1413N-1	TURN & BANK IND
1	S-1360-5L	CKT BKR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 9.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	4/20/67
GROUP	H. Wise	5-2-69
DRAWN	D.L.BURKE	4-22-69
CHECK	R.YOUNGERS	4-23-69
STRESS	TULLIS	5-2-69
PROJ	J. Moody	5-3-69
APPD	M. Rooney	4-30-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — TURN & BANK

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | 177 | PAGE: 9.4

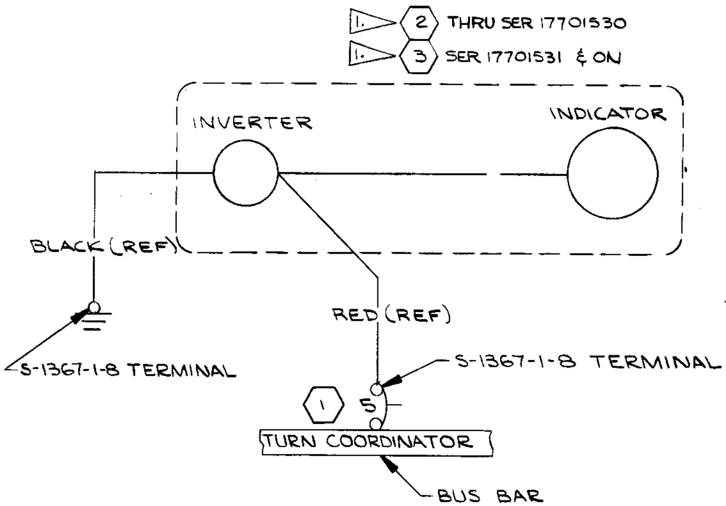
FORM NO. 80-215B

ED & RR 10423 (SR6020) IX

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: S-1360-5L WAS S-1360-5 SER OUT 2904-1, SER IN C661003-0601 NOW SHOP PRACTICE SER 17701531	JCY 3-13-73	RLY DKM HKW RF

NOTES:

1. TURN COORDINATOR INDICATOR INCLUDES ALL WIRES AND CABLES BETWEEN INVERTER, INDICATOR AND CIRCUIT BREAKER.



INACTIVE: EFF THRU SER (SR7555)(17702053) 5-16-73
DLP GDA
HKW
RF

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	C661003-0601	TURN COORDINATOR
2	2904-1	TURN COORD (27747)
1	S-1360-5L	CKT BKR

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V SAPES	4/2/69
GROUP	H. Wise	5-2-69
DRAWN	D.L.BURKE	4-22-69
CHECK	R.YOUNGERS	4-23-69
STRESS	TULLIS	5-2-69
PROJECT	Ted Woody	5-1-69
APPD	M. Oskvarek	4-30-69
SUPERSEDES:	P 9.2	

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BRITTAIN WING LEVELER (OPT)

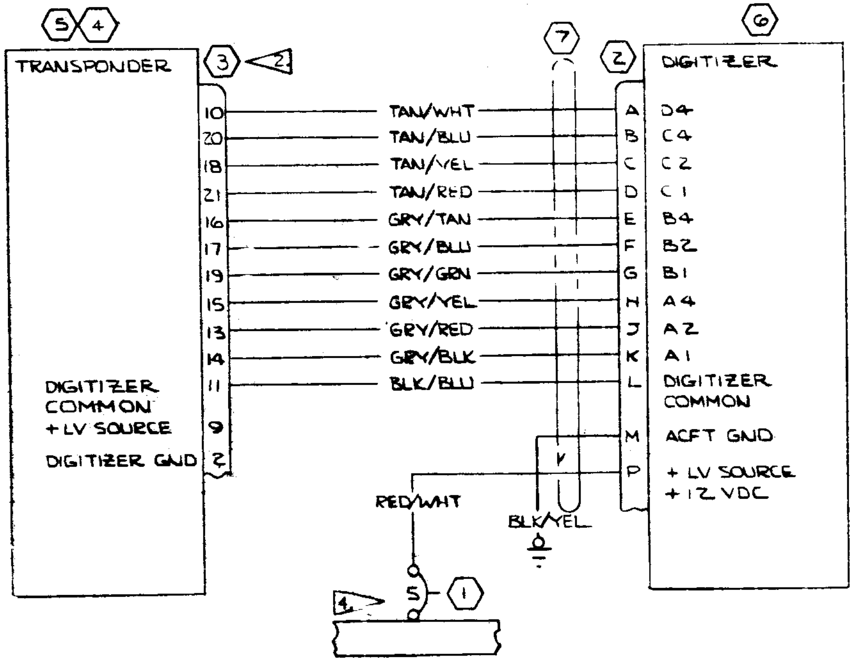
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE 177 PAGE: 9.5

FORM NO. 80-215

ED&RR 10423 (SR6020) IX

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD NOTE NO 4; DELETE TURN COORDINATOR FROM BUS BAR. (SR 7692)	M.E.M 3-5-74	DLO RF
B	BY REV: ADD RT-459A (SR 8335)	DLP 12-15-75	



NOTES:

1. FOR WIRE & WIRE TERMINALS REFER TO 1270625 PAGE 9.7
2. TRANSPONDER CONNECTOR HOUSING IS PART OF TRANSPONDER CABLE ASSY
3. FOR WIRING DIAGRAM OF 300 & 400 TRANSPONDER REFER TO 3920143
4. ATTACH BOTH TRANSPONDER AND ENCODING ALTIMETER TO THE NO. 4 CIRCUIT BREAKER.

ITEM NO.	PART NO.	DESCRIPTION	
7	1570312-3	CABLE ASSY	
6	EA-401A	ALT DIGITIZER	
5	RT-359A	TRANSPONDER	
4	RT-459A	TRANSPONDER	
3	S-2189-1	CONNECTOR	
2	42816	CONNECTOR	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	D. Hinden	11-11-73
DRAWN	DL OLLER	11-9-73
CHECK	J. YOUEL	11-9-73
STRESS		
PROJ	[illegible]	11-9-73
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

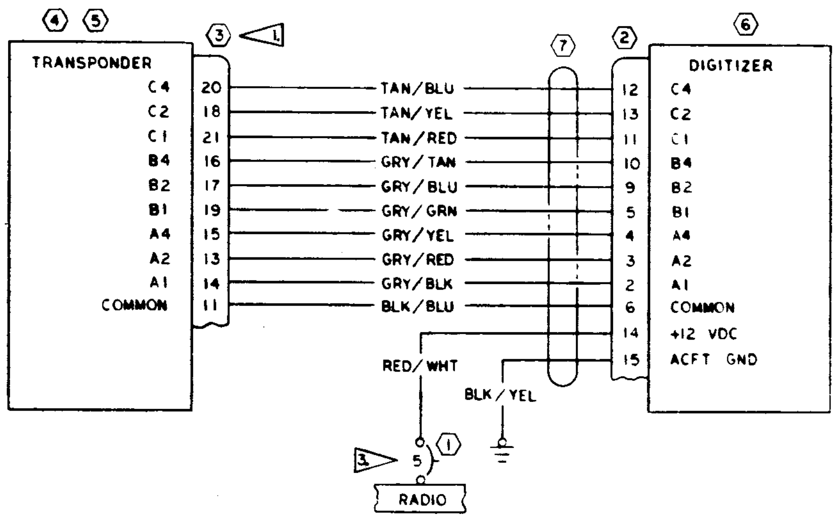
TITLE
WIRING DIAGRAM — ENCODING ALTIMETER

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE (SR 7692) PAGE: 9.6

FORM NO. 80-2198

REVISION			
LET	DESCRIPTION	DATE	APPD



NOTES:

1. TRANSPONDER CONNECTOR HOUSING IS PART OF TRANSPONDER CABLE ASSY
2. FOR WIRING DIAGRAM OF 300 & 400 TRANSPONDER REFER TO 3920168
3. ATTACH BOTH TRANSPONDER AND ENCODING ALTIMETER TO THE NO. 4 CIRCUIT BREAKER

ITEM NO.	PART NO.	DESCRIPTION	
7	0470404	CABLE ASSY	
6	C744001-0101	ALT DIGITIZER	
5	RT-459A	TRANSPONDER	
4	RT-359A	TRANSPONDER	
3	S-2189-1	CONNECTOR	
2	DA-15S	CONNECTOR	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
TAN/BLU	22	22-10-6		S-2190-1	SOLDER		
TAN/YEL		22-10-4					
TAN/RED		22-10-2					
GRY/TAN		22-8-10					
GRY/BLU		22-8-6					
GRY/GRN		22-8-5					
GRY/YEL		22-6-4					
GRY/RED		22-8-2					
GRY/BLK		22-8-0					
BLK/BLU		22-0-6		S-2190-1			
BLK/YEL		22-0-4		S-1367-1-6			
RED/WHT	22	22-2-9		S-1367-1-6	SOLDER		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	4-23-76
GROUP	W.H. Harden	5-5-76
DRAWN	R. KLEIN	4-22-76
CHECK	Youel	4-22-76
STRESS		
PROJ	J.A. MOORE	5-6-76
APPD	J.R.S.	5-5-76
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BLIND ENCODER
177

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE | SER (SR 6490) | PAGE: 9.7

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

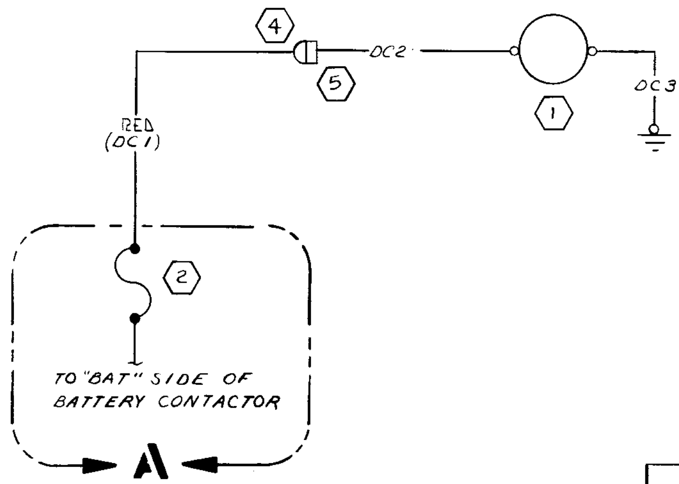
SUPERSEDED BY:

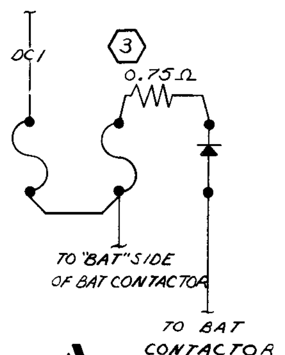
FORM NO. 80-2198

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: S-1317N2 WAS S-1317N1; ADD (OPT) TO TITLE, ADD STD TO DC1 (SR5172) IX	8-5-67 RCA	REM /AK
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	HRW RF
C	BY REV: ADD WIRE COLOR, RED(DC1) WAS DC1, S-1637-1, S-1637-2, ~~S-1636-1/DC2~~, & S-1635-1/RED(DC1) DELETE NOTES 2 & 3, LG18 WAS 10/ RED(DC1) (MER 177E0040)(SR 7605) IX	JEF 5-13-74 BRF	DLO JRS

NOTES:

1. WHEN CLOCK ONLY IS INSTALLED USE 0712031-2; WHEN CLOCK & GROUND SERVICE RECEPTACLE ARE BOTH INSTALLED USE 0712031-3.
2. ~~S-1635-1 PIN~~ ~~S-1637-1 HOUSING~~
3. ~~S-1636-1 SOCKET~~ ~~S-1637-2 HOUSING~~





DETAIL A
(APPLIES WHEN GROUND SERVICE RECEPTACLE IS INSTALLED)

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
DC3	18		15	S-1367-6	S-1367-8		
DC2	18		162	S-1636-1	S-1367-6		
RED (DC1)	18		18	SOLDER	S-1635-1	STD	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	S-1637-2	HOUSING
4	S-1637-1	HOUSING
3	0712031-3	FUSE & DIODE ASSY
2	0712031-2	FUSE MTG ASSY
1	S-1317N2	CLOCK

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wire	1-31-67
DRAWN	J R CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Ed Moody	2-1-67
APPD	Ron	3-6-67

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

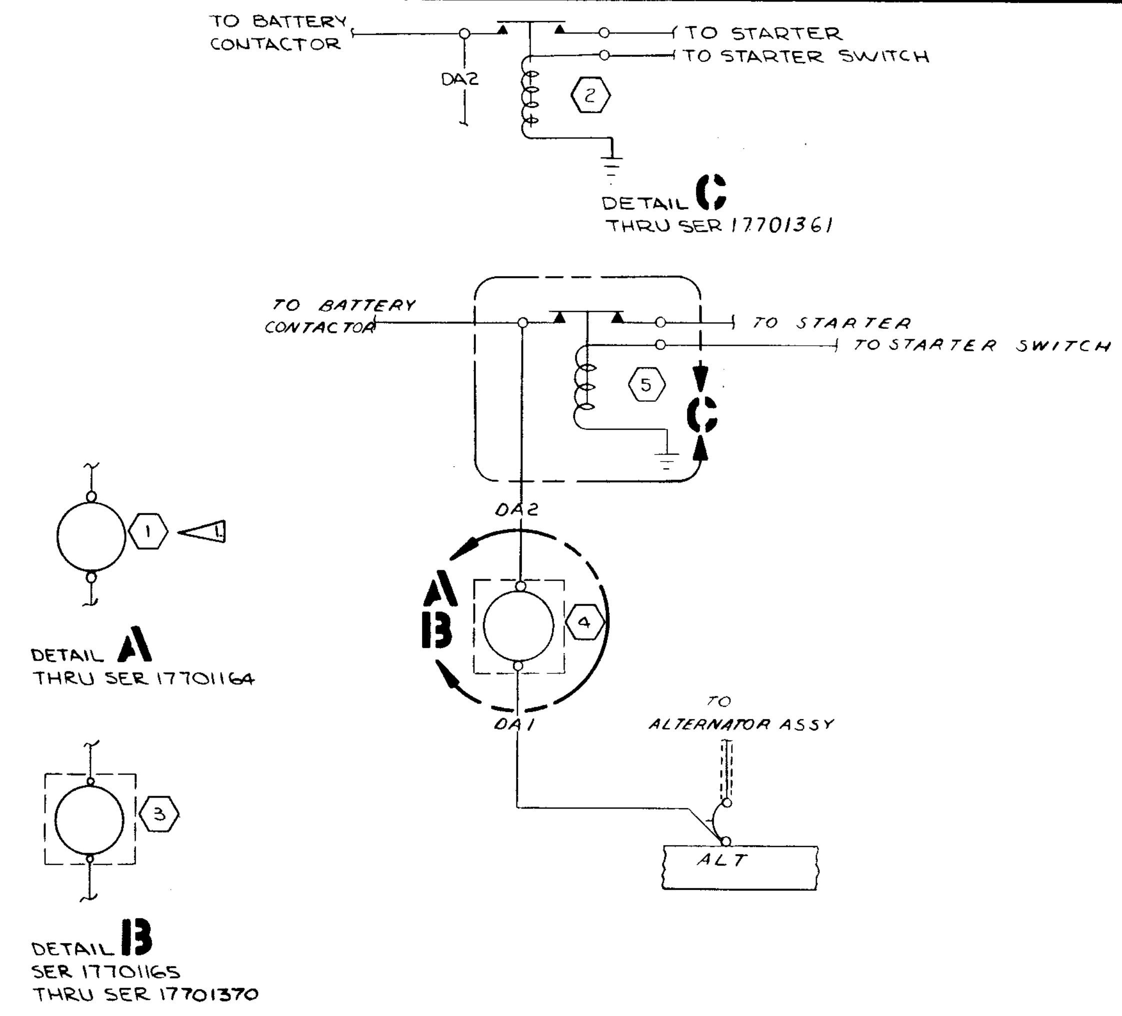
TITLE WIRING DIAGRAM — CLOCK (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | (SR 5172) IX | PAGE: 10.1

(1770001)

FORM NO. 80-215



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAILS A & B ED & RR 10503 (SR6020)IX	DLB 4-22-68	RLY MOS DET V/W
B	BY REV: ADD DETAIL C, S-1991-1 & SR. ED & RR 10473 (SR 6222)	MDS 5-23-69	RLY MOS DET V&W RF
C	BY REV: S-1320-5 SUPERSEDES S-1320-1 FOR ALL SPARES (SR7120)	RLY 2-28-72	V/W RF
D	BY REV: S-1367-4-14 WAS S-1367-4-13 PER DA2, ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	RLY V&W RF

INACTIVE!
EFF THRU SER 17702123
RAM 4-5-74
MTW

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
DA2	8	S-1562-8-9	44	S-1367-4-10	S-1367-4-14		
DA1	8	S-1562-8-9	40	S-1367-4-10	S-1367-4-10		

WIRE TABLE

NOTES:

1. S-1320-5 SUPERSEDES S-1320-1 FOR ALL SPARES

ITEM NO.	PART NO.	DESCRIPTION
6	S-1320-5	AMMETER
5	S-1991-1	CONTACTOR
4	C669509-0102	INST CLUSTER
3	C669508-0101	INST CLUSTER
2	S-1673-1	STARTER CONTACTOR
1	S-1320-1	AMMETER

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V SIPES	1-31-67
GROUP	H. Wise	1-31-67
DRAWN	J.R. CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	[illegible]	[illegible]
PROJECT	[illegible]	2-1-67
APPD	R.V.M.	3-6-67

SUPERSEDES:
SUPERSEDED BY: P.10.3

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

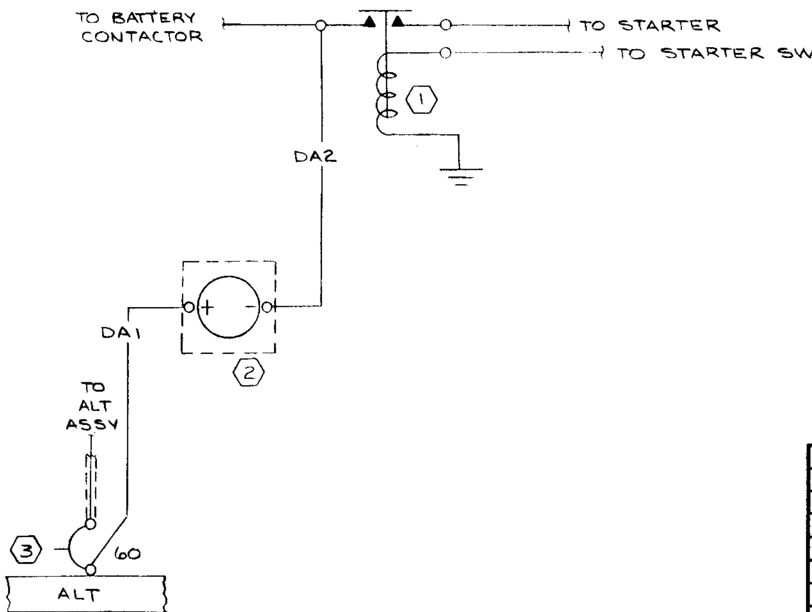
TITLE
WIRING DIAGRAM — AMMETER

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: NONE (SR 5172)IX PAGE: 10.2

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
DA2	8	S-1562-8-9	44	S-1367-4-10	S-1367-4-13		
DA1	8	S-1562-8-9	40	S-1367-4-10	S-1367-4-10		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
3	S-1596-60L	CIRCUIT BREAKER	
2	C669517-0101	INST CLUSTER	
1	S-1991-1	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: P. 10.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. Stamm	4-18-74
GROUP	J. Stanford	4-17-74
DRAWN	MERRICK	4-5-74
CHECK	M. MORIARTY	4-17-74
STRESS		
PROJ	W. Shackelford	4-24-74
APPD		
OTHER		

Cessna. AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — AMMETER

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE (SR7874) PAGE: 10.3

177

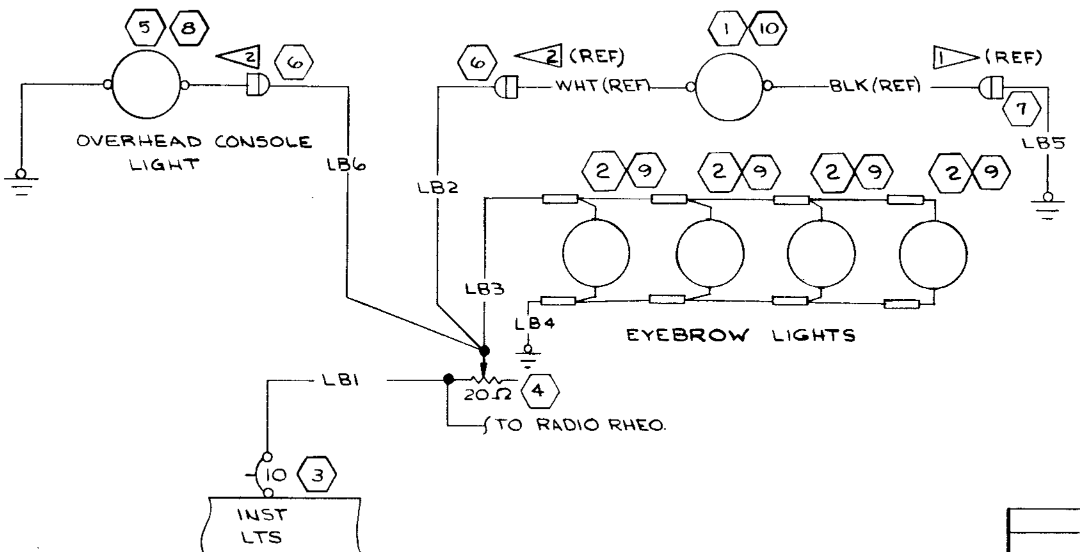
FORM NO. 80-2158

NOTES:

1. S-1637-1 HOUSING-CAP
S-1635-2 PIN

2. S-1637-2 HOUSING-PLUG
S-1636-2 SOCKET

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD 0513208-1 & LB6 (SR5172) IX	JWH	YAK RIM RH NEW
B	BY REV: ADD S-1370-2 TO LB3 & LB4 (WAS SOLDER) (SR5172) IX	10-2-67 VRS	RRS RH TM NEW
C	BY REV: C660501-0101 WAS 0113068-2 S-1635-2 WAS NOTE 1 (LB2 & LB6) S-1636-2 WAS NOTE 2 (LB5); ADD S-1637-1, S-1637-2, NO. 94, S-1901-1 & S-1894-1, S-1880-2 WAS XR 6085, S-1910-2 WAS 23-288, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	NEW DKM RF



INACTIVE: EFF THRU SER (SR17702153) 10-11-73 DLP NEW RF

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LB6	18		250	S-1635-2	SOLDER		
LB5	18		6	S-1636-2	S-1367-1-8		
LB4	18		20	S-1370-2	S-1367-1-8		
LB3	18		30	SOLDER	S-1370-2		
LB2	18		250	SOLDER	S-1635-2		
LB1	18		35	S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	S-1894-1	LAMP
9	S-1901-1	LAMP
8	NO. 94	LAMP
7	S-1637-2	HOUSING - PLUG
6	S-1637-1	HOUSING - PIN
5	0513208-1	SOCKET
4	S-1880-2	RHEOSTAT (ISES)
3	S-1360-10L	CIRCUIT BREAKER
2	S-1910-2	LIGHT ASSY (95263)
1	C660501-0101	COMPASS LT

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-31-67
GROUP	H. Will	1-31-67
DRAWN	R.C. AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	[illegible]	3-2-67
PROJECT	[illegible]	6-1-67
APPD	ZEM	3-6-67

SUPERSEDED BY PG 11.10.0 & 11.10.1

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

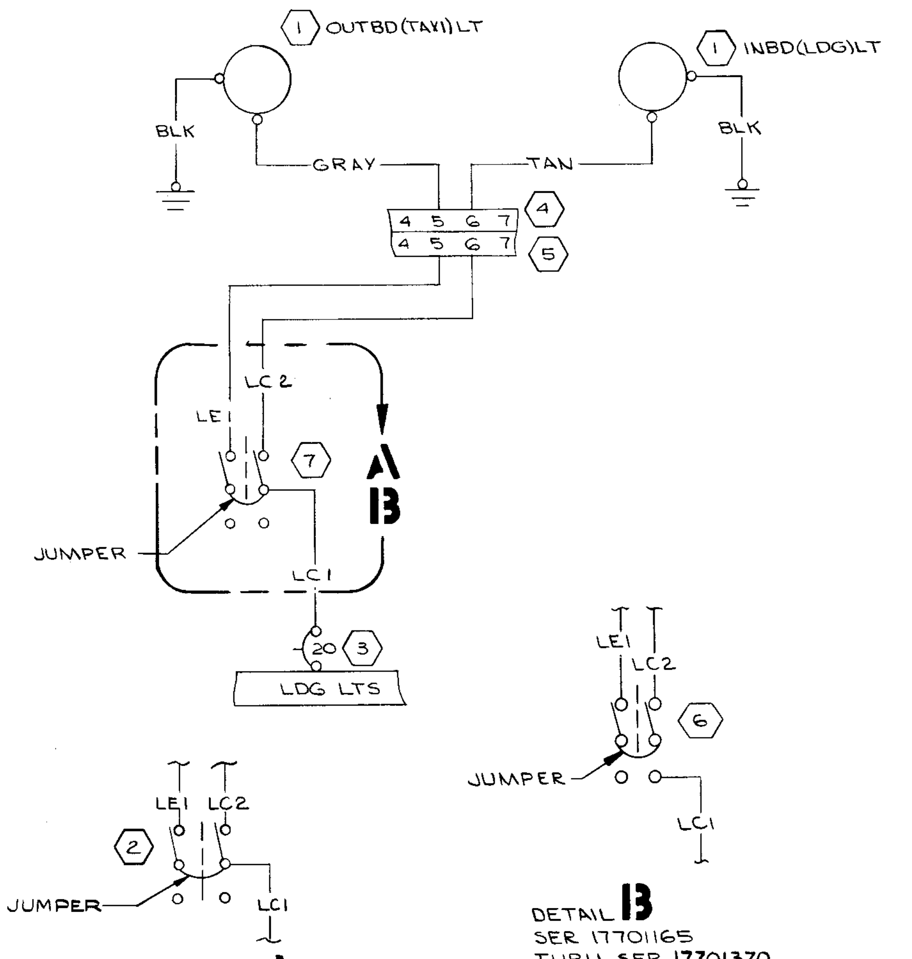
TITLE
WIRING DIAGRAM — INSTRUMENT LIGHTS

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | (SR5172) IX | PAGE: 11.1

FORM NO. 80-215

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: S-1160-1-3 WAS S-1160-2-1 (SR5172) IX	8-5-67 RCA	YAK HLW
B	BY REV: ADD DETAIL A & S-1846-1-1; SER OUT S-1160-1-3 ED&RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET HLW VRS
C	BY REV: ADD SER TO LC1, LC2 & LE1, ADD NOTES 1 & 2 (SR5440) IX	JWH 6-13-68	MDS DET HLW VRS
D	BY REV: SER OUT S-1846-1-1; SER IN S-1846-1-3; ADD DETAIL B ED&RR 10489 (SR6020) IX	DLB 4-22-69	RLY MDS DET HLW VRS



DETAIL B
SER 17701165
THRU SER 17701370

DETAIL A
EFF THRU SER 17701164

INACTIVE:
EFF SER 177-0001
THRU SER 17701530
RLY 1-21-70 ED&RR 10872
JWH
RLY
HLW
PEP

NOTES:

1 SER 17700001 TO SER 17701164

2 SER 17701165 & ON

LE1	14			S-1493-2	S-1636-2		2
LC2	14			S-1493-2	S-1636-2		2
LC1	14			S-1367-2-6	S-1493-1		2
BLACK	16	16-0		S-1367-2-8	S-1367-2-8	STD	
BLACK	16	16-0		S-1367-2-8	S-1367-2-8		
TAN	14	14-10		S-1635-2	S-1367-2-8		
GRAY		14-8		S-1635-2	S-1367-2-8		
LE1				S-1367-2-6	S-1636-2		1
LC2				S-1367-2-6	S-1636-2		1
LC1	14			S-1367-2-6	S-1367-2-6	STD	1
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	S-1846-1-3	SWITCH
6	S-1846-1-1	SWITCH
5	S-1641-9	HOUSING-PLUG
4	S-1640-9	HOUSING-CAP
3	S-1360-20	CIRCUIT BREAKER
2	S-1160-1-3	LDG LT SW
1	1221059-4	LT ASSY

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-31-67
GROUP	H. Wise	1-31-67
DRAWN	R.C. Axtell	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchinson	3-9-67
PROJECT	Moody	2-1-67
APPD	RFM	3-6-67

SUPERSEDED BY: P11.2.1

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
LANDING & TAXI LIGHTS
(OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

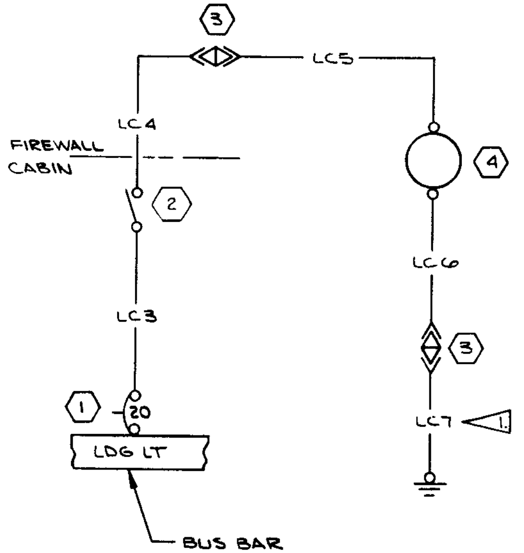
SCALE: NONE | 177 | PAGE: 11.2.0

SER 177-0001 & ON

FORM NO. 80-215

NOTES :

1. GROUND AT VOLTAGE REGULATOR ON FIREWALL



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1493-2 WAS S-1635-2 & S-1636-2, S-1360-20 WAS S-1360-10, 4522 WAS 4537; ADD S-2064-1; DELETE S-1637-1 & S-1637-2; ADD NOTE 1 ED & RR 10996 (SR6361) IX	RLY 4-27-70	LKW RLY HAW VRS RF
B	BY REV: S-1493-3 WAS S-1493-2, S-1367-3-X WAS S-1367-2-X & 12 GA WAS 14 GA ED & RR 10098 (SR6361) IX	RLY 7-20-70	LKW RLY HW RF
C	BY REV: SER OUTS S-1845-1-2, SER IN S-2160-5, S-1367-3-12 WAS S-1367-3-8, ADD WIRE LENGTH (SR7305) IX	JCY 3-7-73	RLY HW DKM RF
D	BY REV: DELETE S-2160-5 & SERIALS; INACTIVATE DWG IX (SR7305) (REF)	DLD 10-26-73	JCY HW RF

INACTIVE: EFF THRU SER 17701973 10-26-73
DLD JCY HW WLT RF

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
LC7	12		35	S-1493-3	S-1367-3-12	
LC6	12		46	S-1367-3-8	S-1493-3	
LC5	12		46	S-1493-3	S-1367-3-8	
LC4	12		57	S-1493-3	S-1493-3	
LC3	12		30	S-1367-3-6	S-1493-3	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
4	4522	LAMP	(24446)
3	S-2064-1	CONNECTOR	
2	S-1845-1-2	SWITCH	
1	S-1360-20	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: P 11.2.0

SUPERSEDED BY: P 11.2.3

CONTRACT NO:

	NAME	DATE
DESIGN	W Cook	1-23-70
GROUP	H. Wise	1-22-70
DRAWN	R.YOUNGERS	1-21-70
CHECK	HARRIS	1-21-70
STRESS		
PROJ	P.E. PARKER	1-23-70
APPD	R.YOUNGERS	1-22-70
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING LIGHT

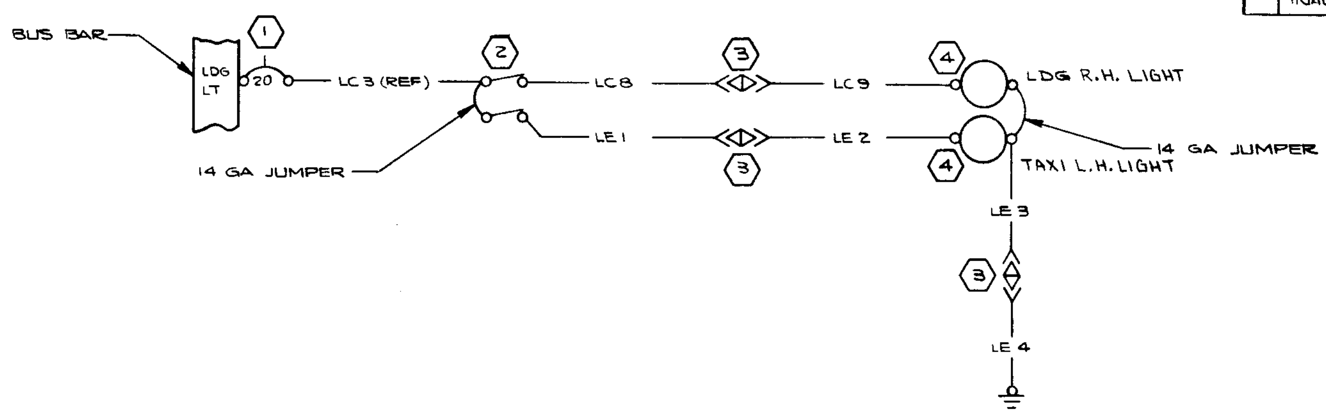
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | 177 | PAGE: 11.2.1

FORM NO. 80-215B

(SR6361) IX ED & RR 10872

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT S-1846-1-2 SER IN S-2160-4 (SR 7305)α	JCY 3-7-73	RLY DKM HJW RF
B	BY REV: ADD WIRE LENGTHS	BAH 8-16-73	RLY HKW RF
C	BY REV: ADD L.H. & R.H. LIGHT (NOW SHOP PRACTICE)	TDN 10-8-73	HKW RF
D	BY REV: DELETE S-2160-5 & SERIALS INACTIVATE DWG (SR7305)(REF)	JLO 10-26-73	JCY HRW RF



INACTIVE: EFF THRU SER 17701973 10-26-73
JLO JCY HRW NLT RJF

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
LE 4	14		90	S-1493-3	S-1367-2-8		
LE 3	14		90	↑	S 1367-2-8		
LE 2	14		60		S-1367-2-8		
LE 1	14		70		S-1493-3		
LC 9	14		60	↓	S-1367-2-8		
LC 8	14		70	S-1493-3	S-1493-3		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	GE 4509	LAMP	
3	S-2064-1	CONNECTOR	
2	S-1846-1-2	SWITCH	
1	S-1360-20L	CKT BKR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: P 11.2.3

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wiel	10-10-72
DRAWN	PAPE	10-9-72
CHECK	R. YOUNGERS	10-9-72
STRESS		
PROJ	R. Fife	10-12-72
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

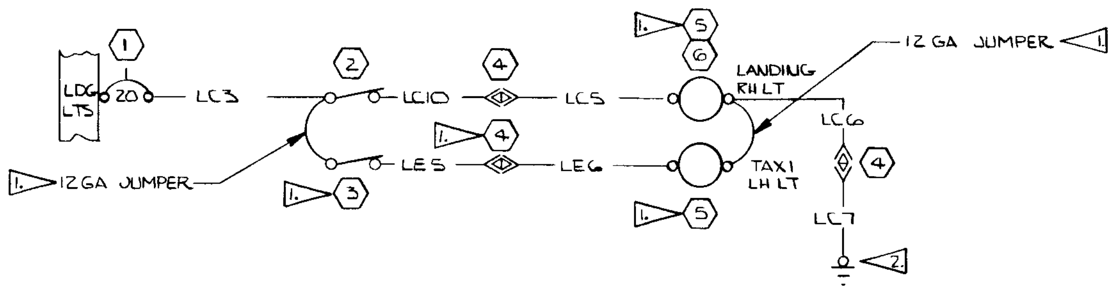
TITLE **WIRING DIAGRAM — DUAL LANDING LIGHT (OPT)**

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | 177 | PAGE: 11.2.2

FORM NO. 80-215B

(SR7316)IX



NOTES:

1. THESE ITEMS REQIRED ONLY AS PART OF THE OPTIONAL DUAL LANDING LIGHTS

2. GROUND AT VOLTAGE REGULATOR ON FIREWALL

ITEM NO.	PART NO.	DESCRIPTION	
6	4522	LAMP	
5	GE5409	LAMP	
4	S-2064-1	CONNECTOR	
3	S-1846-1-2	SWITCH	
2	S-2160-5	SWITCH	
1	S-1360-20L	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LC10	12		70	S-1493-3	S-1493-3		
LE6	12		46	S-1493-3	S-1367-3-8	1.	
LE5	12		70		S-1493-3	1.	
LC7	12		35		S-1367-3-12		
LC6	12		46		S-1367-3-8		
LC5	12		46		S-1367-3-8		
LC3	12		70	S-1493-3	S-1637-3-6		

WIRE TABLE

REVISION			
LET	DESCRIPTION	DATE	APPD

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 11.2.1 & P 11.2.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	10-27-73
DRAWN	DL OLLER	10-26-73
CHECK	J. YOUEL	10-26-73
STRESS	TRUNECEK	10-30-73
PROJ	R. Fife	10-31-73
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING LIGHT & TAXI LIGHT — (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE | 177 | PAGE: 11.2.3

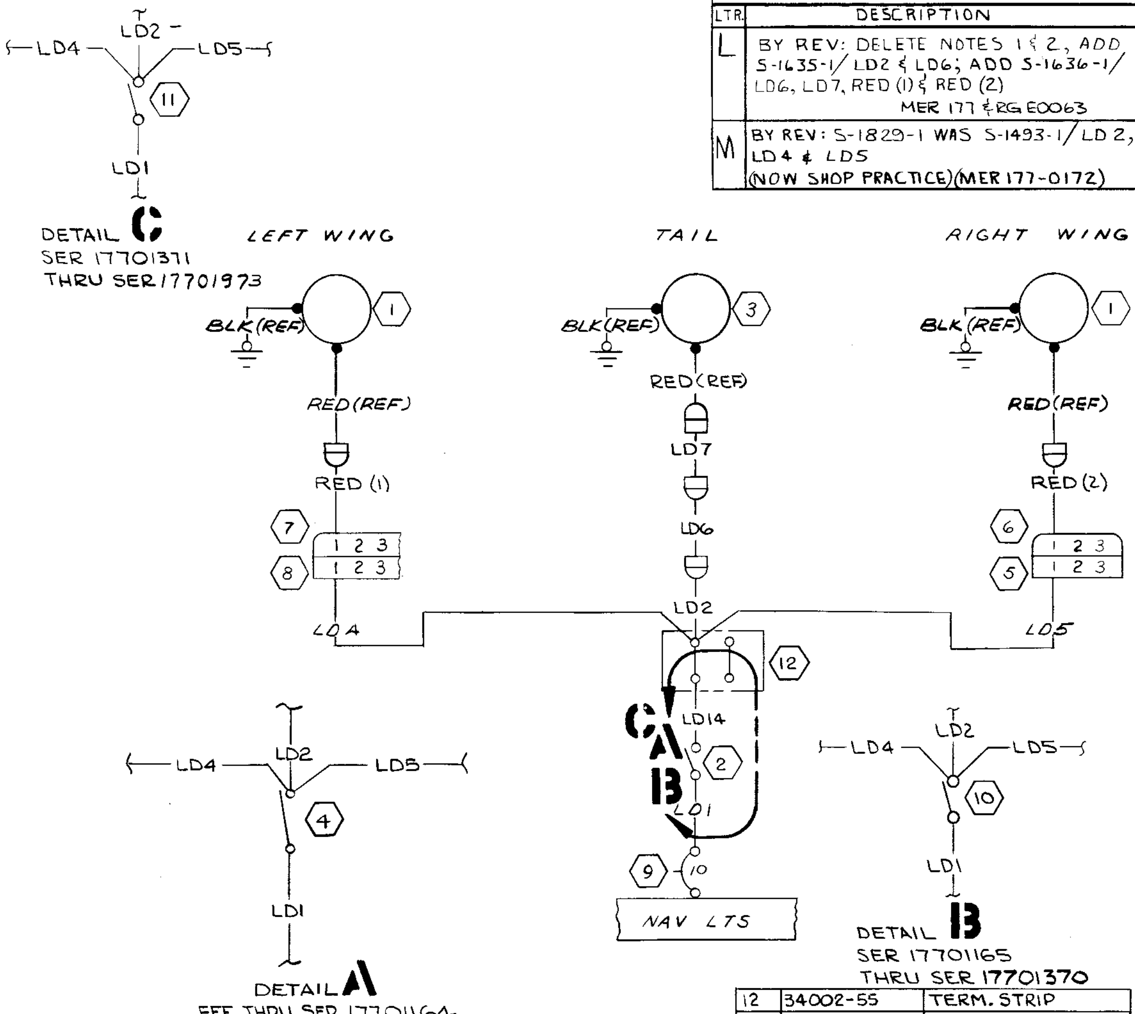
FORM NO. 80-215B

SER 17701974

LTR	DESCRIPTION	DATE	APPROVED
L	BY REV: DELETE NOTES 1 & 2, ADD S-1635-1/LD2 & LD6; ADD S-1636-1/LD6, LD7, RED (1) & RED (2) MER 177 & RG E0063	M.E.M. 2-12-74	DLP JRS RF
M	BY REV: S-1829-1 WAS S-1493-1/LD2, LD4 & LD5 (NOW SHOP PRACTICE)(MER 177-0172)	MEM 5-17-74	DLO JRS WDS

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD LD7 (SR5172)	8-2-67 RSV	JAK REM RH HLW
B	BY REV: C622001-0202 WAS 0423006 (-21 & -22); C622001-0401 WAS 0433006 -7, ITEM 1 WAS ITEM 2; ADD LD8 & LD9; DELETE ALL BLK & RED WIRES FROM WIRE TABLE. ED&RR 01163 & 01332 (SR5631)	RCC 12-6-67	RLL DET JB HLW
C	BY REV: RED WIRE WAS LD8 & RED WIRE WAS LD9 ED&RR 01999	RLY 4-2-68	GKI MDS DET HLW TM
D	BY REV: ADD DETAIL A & S-1845-1-1 SER OUT S-1158-2-2. ED&RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET HLW VRS TM
E	BY REV: ADD SERIAL TO LD1, LD2, LD4, LD5, ADD NOTE 3 & 4 (SR 5440) IX	JWH 6-13-68	MDS DET HLW VRS TM
F	BY REV: SER OUT S-1845-1-1; SER IN S-1845-1-2; ADD DETAIL B ED&RR 10489 (SR6020) IX	DLB 4-22-69	RLY MDS TM DET HLW VRS
G	BY REV: "RED (REF)" WAS LD3 NOW SHOP PRACTICE	DLP 10-9-72	RLY HLW RF
H	BY REV: SER OUT S-1845-1-2 SER IN S-2160-1, ADD LD14 & 34002-55, S-1360-10L WAS S-1360-10, ADD WIRE LENGTH (SR 7305) IX	JCY 3-7-73	RLY DKM HLW RF
J	BY REV: ADD WIRE LENGTHS	BAH 8-16-73	RLY HLW RF
K	BY REV: S-1636-1/LD7 WAS S-1635-1; S-1637-2/LD7 WAS S-1637-1 (NOW SHOP PRACTICE)	DLO 10-1-73	HLW RF



NOTES:

1. S-1635-1 / PIN; S-1637-1 / HOUSING
2. S-1636-1 / SOCKET; S-1637-2 / HOUSING
3. SER 17700001 TO SER 17701164
4. SER 17701165 & ON

ITEM NO.	PART NO.	DESCRIPTION
12	34002-55	TERM. STRIP
11	S-1845-1-2	SWITCH
10	S-1845-1-1	SWITCH
9	S-1360-10L	CIRCUIT BKR
8	S-1641-9	HOUSING-PLUG
7	S-1640-9	HOUSING-CAP
6	S-1638-2	HOUSING-CAP
5	S-1638-1	HOUSING-PLUG
4	S-1158-2-2	SWITCH
3	C622001-0401	LT INSTL - TAIL
2	S-2160-1	SWITCH
1	C622001-0202	LT INSTL - WING

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LD 4	18		190	S-1829-1	S-1636-2		4
LD 5	18		215	S-1829-1	S-1636-2		4
LD 2	18		20	S-1829-1	S-1635-1		4
LD 1	18		33	S-1367-1-6	S-1493-1		4
RED(2)	18	-18-2	220	S-1635-2	S-1636-1		
RED(1)	18	-18-2	220	S-1635-2	S-1636-1		
LD7	18		90	S-1636-1	S-1636-1		
LD6	18		285	S-1636-1	S-1635-1		
LD5	18		215	S-1367-1-6	S-1636-2		3
LD4	18		190	S-1367-1-6	S-1636-2		3
LD14	18		6	S-1493-1	S-1829-1		SER 17701974 & ON
LD2	18		20	S-1367-1-6	S-1635-1		3
LD1	18		33	S-1367-1-6	S-1367-1-6		3

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-16-67
GROUP	H. Wike	1-31-67
DRAWN	J. R. CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutch	3-9-67
PROJECT		2-1-67
APPD	REM	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — NAVIGATION LIGHTS

SIZE: C | CODE IDENT. NO.: 71379 | DWG NO.: 1770001

SCALE: NONE | (SR5172) IX | PAGE: 11.3

.FORM NO. 80-215

NOTES:

1. VENDOR FURNISHED GROUND WIRE TO USE S-1367-1-8 TERMINAL, HOT WIRE TO USE S-1636-2 TERMINAL.
2. DOME LT ASSOCIATED SWITCH AND WIRES ARE STANDARD

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
H	BY REV: ADD RED (1), BLK (1), NOTE 1 & WIRE LENGTHS; 0413138-1 WAS 1713070-1; S-1636-2 WAS S-1635-2/LA19 & LA20 (NOW SHOP PRACTICE) (MER 177-0173)	MEM 5-21-74	
K	BY REV: CTSY LT BUS WAS AUX FUEL PUMP BUS, REMOVED BATT. START. WIRE (SR7905)	WHB 1-9-75	
L	BY REV: ADD P6 11.4.1	RLY 6-12-75	

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: 7-01 WAS 0413181-1, ADD NOTE 2 & TO BAT. ON STARTER SW (SR5172) IX	8-5-67 RCA	YAK
B	BY REV: ADD S-1637-1 HOUSING & S-1635-2 PIN TO LA2 WAS S-1367-4, ADD 1 TO W/T (SR5172) IX	10-2-67 VRS	RRS
C	BY REV: ADD DETAIL A & S-1831-1; SER OUT 0713029. ED & RR 02351 (SR5440) IX	JDH 4-22-68	GKI MDS DET VRS
D	BY REV: ADDED DETAIL B; IN FIELD OF DWG ITEM 7 WAS 8, 8 WAS 7, 5 WAS 6, 6 WAS 7 ED & RR 03430 (SR 5440) IX	FER 7-31-68	GKI MDS DET
E	BY REV: S-1360-10L WAS S-1360-10, ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RLY DKM RF
F	BY REV: INTERCHANGED ITEM 7 & 8 IN FLD OF DWG; LA3 TERM S-1636-1 WAS S-1635, GREEN TERM S-1635-1 WAS S-1636 "NOW SHOP PRACTICE" (SR5172)(REF)	MRL 6-15-73	DKM RF
G	BY REV: S-1831-1 WAS 0713029 PER DOME LT; S-1830-1 WAS S-1367-1-4 /LA5 & LA6; GRN(LA22) & GRN(LA23) WAS GRN; SER OUT LA1, LA2, LA3 & LA4; SER IN LA17, LA18, LA19, LA20 & LA21; SER OUT 0713029 PER COURTESY LTS; SER IN S-1831-1; ADD S-1637-1 & S-1637-2 (SR7630)	JLO 7-24-73	DLP RF

05-242-0905

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LA21	18		170	SEE LA18	S-1635-2		SER 17701978 & ON
LA20	18		40	SEE LA18	S-1636-2		
LA19	18		65	SEE LA18	S-1636-2		
LA18	18		6	S-1370-2	S-1830-1		
LA17	18		220	S-1830-1	S-1367-1-6		SER 17701978 & ON
GREEN (LA22)	18	18-5	20	S-1635-1	S-1635-2	(STD)	
GREEN (LA23)	18	18-5	20	S-1635-2	S-1635-2	(STD)	
LA6	18			S-1830-1	S-1635-2		
LA5	18		195	S-1367-1-6	S-1830-1		
LA4	18		65	S-1367-1-4	S-1636-1		THRU SER 17701977
LA3	18		40	S-1367-1-4	S-1636-1		THRU SER 17701977
LA2	18		270	S-1367-1-4	S-1635-2		THRU SER 17701977
LA1	18		220	S-1367-1-6	S-1367-1-4		THRU SER 17701977

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
12	S-1637-2	HOUSING
11	S-1637-1	HOUSING
10	S-1831-1	SWITCH
9	0413138-1	SOCKET
8	S-1641-9	HOUSING-SOCKET
7	S-1640-9	HOUSING-PIN
6	S-1638-2	HOUSING-CAP
5	S-1638-1	HOUSING-PLUG
4	S-1360-10L	CIRCUIT BREAKER
3	0713029	SWITCH
2	7-01	SOCKET (95263)
1	1221103-1	LIGHT INSTL.

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
RED (1)	18		30	SOLDER	S-1636-2	
BLK (1)	18		30	SOLDER	S-1367-1-8	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1/31/67
GROUP	H. Wire	1-31-67
DRAWN	RC AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Lee Moody	2-1-67
APPD		3-6-67

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — DOME & COURTESY LIGHTS (OPT)

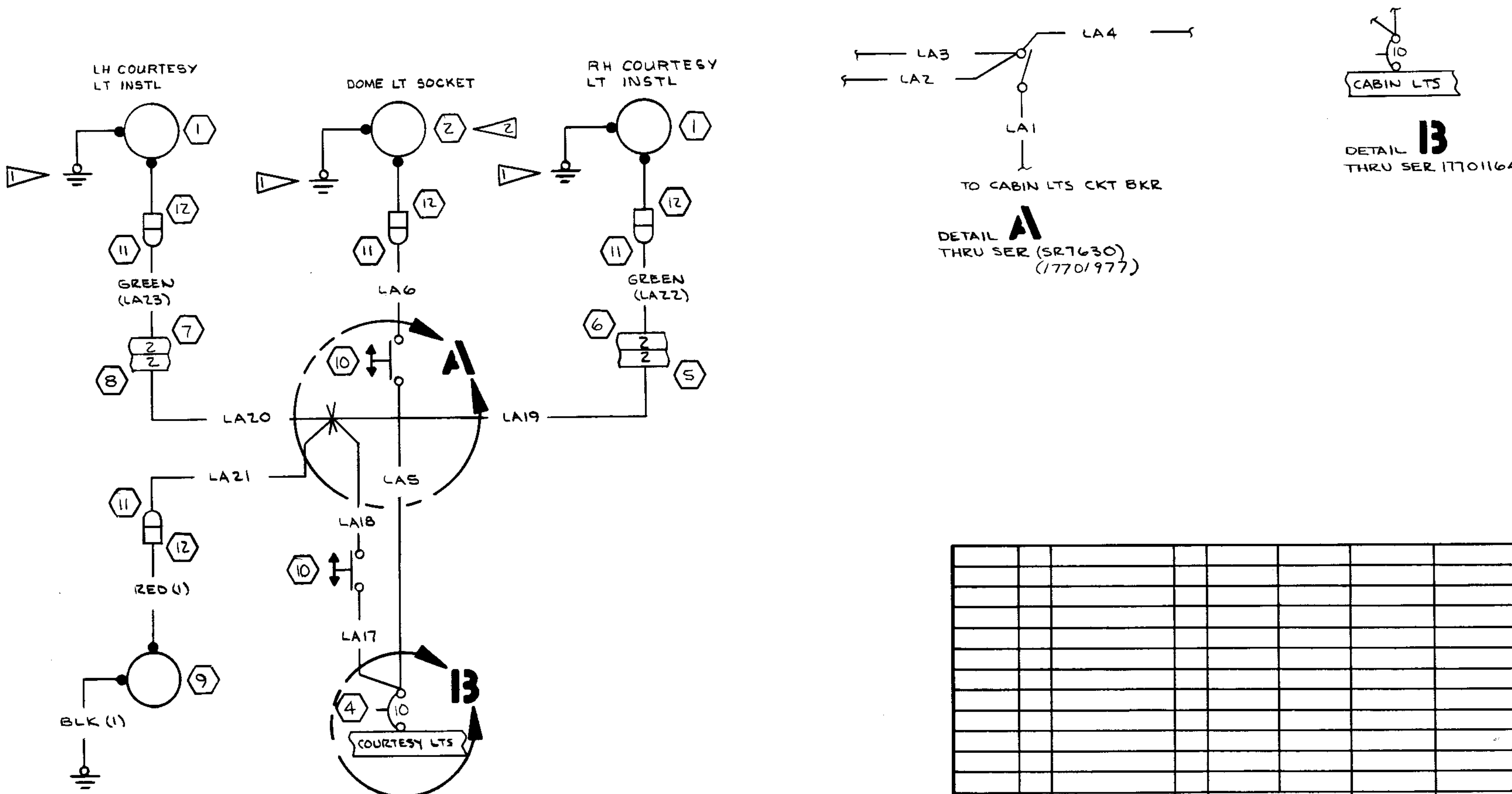
SIZE: C | CODE IDENT. NO.: 71379 | DWG NO.: 1770001

SCALE: NONE | (SR5172) IX | PAGE: 114.0

(1770001)

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD
L	REFER TO PAGE 11.4.0 FOR REV		



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	G. L. Stamm	6-27-75
GROUP	W H Garden	6-26-75
DRAWN	R. YOUNGERS	6-12-75
CHECK		
STRESS		
PROJ	PLHEDRICK	7-1-75
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — DOME & COURTESY LIGHTS (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

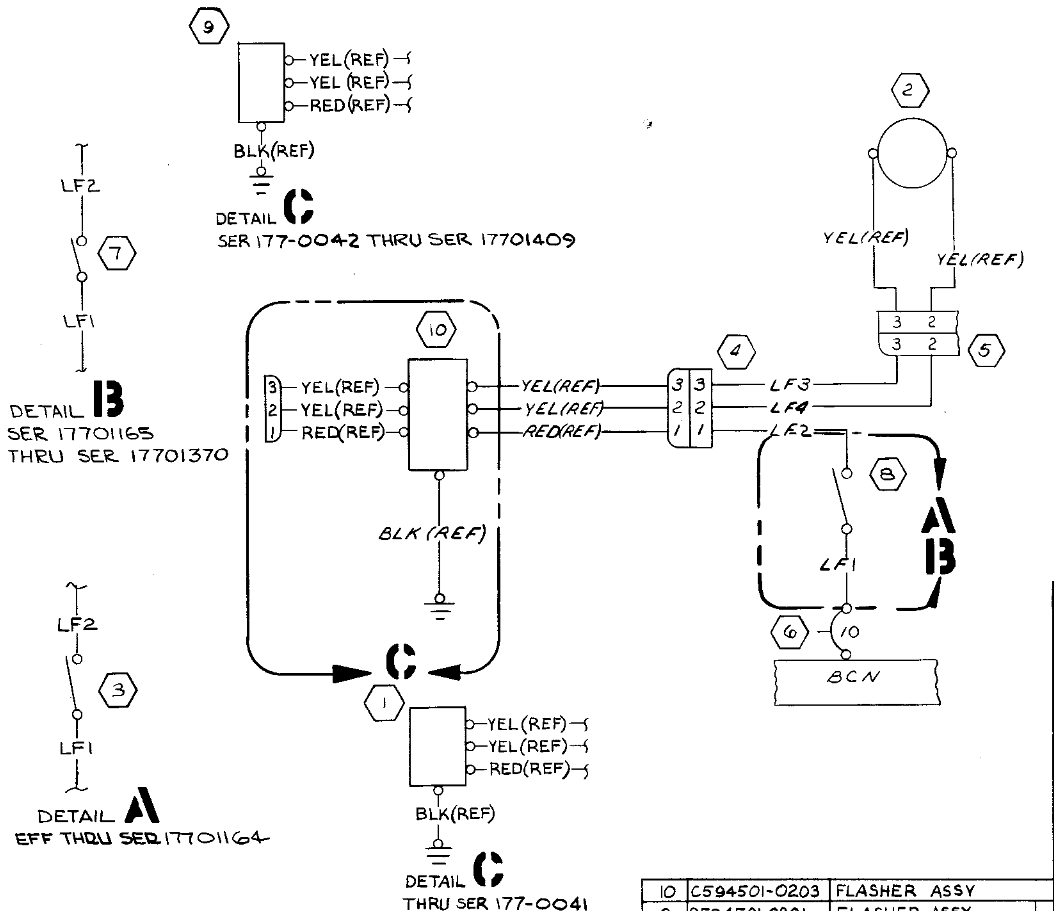
SCALE: NONE PAGE: 11.4.1

FORM NO. 80-215B

This page intentionally left blank.

NOTES:

1. SER 17700001 TO SER 17701164
2. SER 17701165 & ON



INACTIVE:
EFF SER17700001
THRU SER(SR7005)
RLY 6-14-72
LKW
HRW
DKM
RF

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAIL A & S-1845-1-1. SER OUT S-1158-2-2. ED&RR 02351 (SR5440) IX	JDH 5-1-68	GKI MDS DET HRW VRS TM
B	BY REV: ADD SER LF1 & LF2 & NOTE 1&2 (SR5440) IX	JWH 6-13-68	MDS HRW DET TM VRS
C	BY REV: SER OUT S-1845-1-1; SER IN S-1845-1-2; ADD DETAIL B ED&RR 10489 (SR6020) IX	DLB 4-22-69	RLY TM MDS DET HRW VRS
D	BY REV: ADD DETAIL C & C594501-0203; SER IN C594501-0201; SER OUT C594501-0201 ED&RR 10538 (SR6264); (SR5412)	PGP 7-23-69	RLY RF MDS DET HRW VRS
E	BY REV: C621001-0106 WAS C621001-0103	DLP 1-17-73	BY HRW RF
F	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-4-73	BY HRW RF

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
LF 2	16			S-1493-2	S-1636-2	2
LF 1	16		30	S-1367-2-6	S-1493-2	2
LF4	16		65	S-1636-2	S-1635-2	
LF3	16		65	S-1636-2	S-1635-2	
LF2	16			S-1367-2-6	S-1636-2	1
LF1	16		30	S-1367-2-6	S-1367-2-6	1

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
10	C594501-0203	FLASHER ASSY
9	C594501-0201	FLASHER ASSY
8	S-1845-1-2	SWITCH
7	S-1845-1-1	SWITCH
6	S-1360-10	CIRCUIT BKR
5	S-1638-2	HOUSING-CAP
4	S-1638-1	HOUSING-PLUG
3	S-1158-2-2	SWITCH
2	C621001-0106	BEACON LT ASSY
1	C594501-0101	FLASHER ASSY

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-31-67
GROUP	H. Wise	1-31-67
DRAWN	J.R.CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-7-67
PROJECT	Ted Moody	2-1-67
APPD	ZGM	3-6-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON

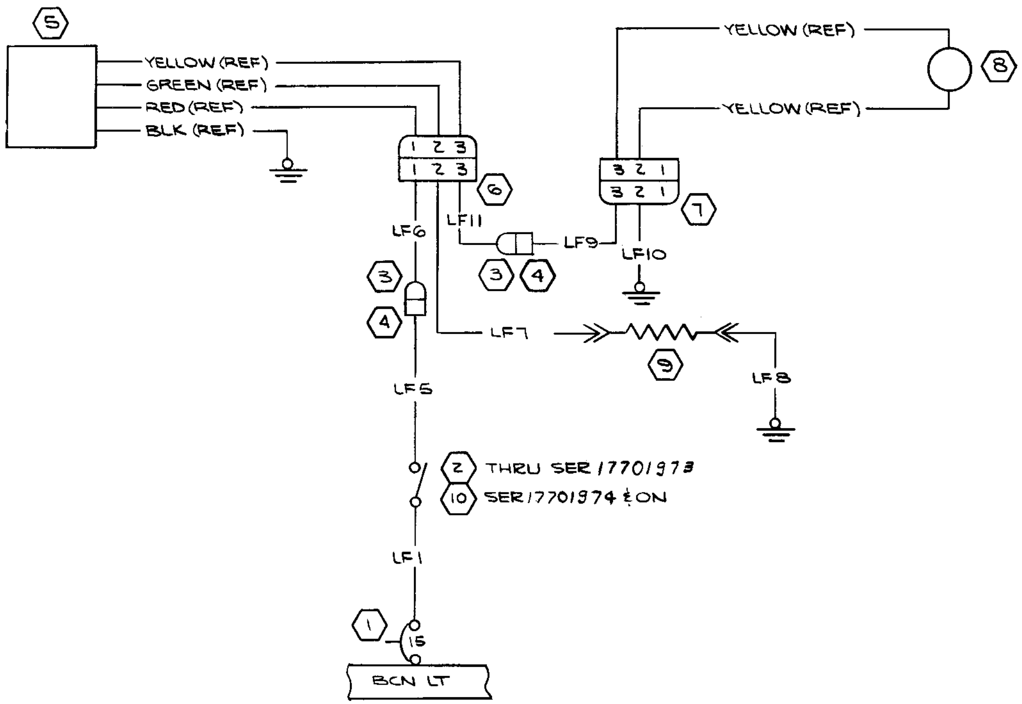
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE (SR5172) IX PAGE: 11.5

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C621001-0106 WAS C621001-0103; ADD S-2160-1 & SER; SER OUT S-1845-1-2 (SR7305) IX	DLP 1-10-73	RF
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-4-73	RF
C	BY REV: ADD LF11, S-1637-1 & S-1637-2 (NOW SHOP PRACTICE) (M ER 0329)	BLA 10-14-74	
D	BY REV: S-1360-15L WAS S-1360-10L (SR8260)	BAH 5-13-75	KAL

(1770228C)



LF11	16		24	S-1636-2	S-1635-2		
LF10	16			S-1635-2	S-1367-2-8		
LF9	16			S-1636-2	S-1635-2		
LF8	16			S-1493-2	S-1367-2-8		
LF7	16			S-1636-2	S-1493-2		
LF6	16			S-1635-2	S-1636-2		
LF5	16		291	S-1493-2	S-1636-2		
LF1	16		30	S-1367-2-6	S-1493-2		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

10	S-2160-1	SWITCH	
9	OR95-1.5	RESISTOR (83777)	
8	C621001-0106	LIGHT ASSY	
7	S-1638-2	HOUSING	
6	S-1638-1	HOUSING	
5	C594502-0101	FLASHER ASSY	
4	S-1637-2	HOUSING	
3	S-1637-1	HOUSING	
2	S-1845-1-2	SWITCH	
1	S-1360-15L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P11.5

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wiel	6-22-72
DRAWN	R. YOUNGERS	6-14-72
CHECK	WHITE	6-19-72
STRESS	DK McCosh	6-23-72
PROJ	F. Fife	6-27-72
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON

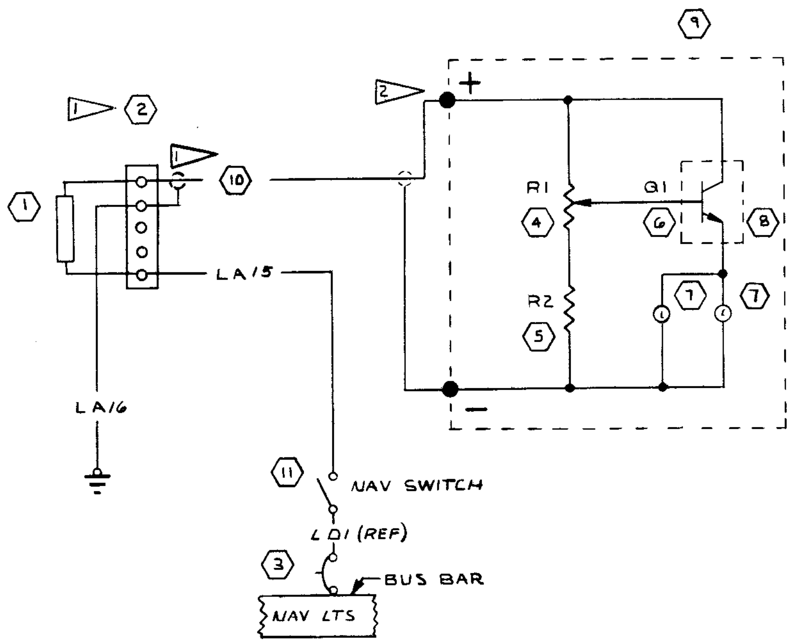
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE | 177 | PAGE: 11.5.1

FORM NO. 80-215B

(SR7005) IX

CHG LET	REVISION	BY DATE	CHK APPD
A	BY REV: 329636 WAS NOTE 1 / LA-15 & LA-16; INACT DWG	DLP 2-25-70	



INACTIVE:
EFF SER 177-0001
THRU SER 17701530
2-12-70
EDRR 10857
DLP JDH

NOTES:

1. TERMINATE RETRACTILE CABLE AT TERMINAL BLOCK END WITH AMP 320733 TERMINAL ON CENTER CONDUCTOR AND WITH 329036 TERMINAL ON BRAID SHIELD. SOLDER CABLE TO CIRCUIT BOARD AS SHOWN
2. WARNING: FAILURE TO OBSERVE POLARITY SHOWN ON THIS DIAGRAM WILL RESULT IN IMMEDIATE FAILURE OF 2N2270 TRANSISTOR ON THE CIRCUIT BOARD ASSY

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
11	S-1158-2-2	SWITCH	
10	8499	RETRACTILE CORD	70903
9	1570142-3	MAP LIGHT ASSY	
8	NF-205	HEAT SINK	05820
7	2160D	LAMP	29996
6	2N2270	TRANSISTOR	49671
5	3.0K ½W 5%	RESISTOR	
4	SH6992	POTENTIOMETER	71450
3	S-1360-10	CIRCUIT BKR	
2	S-171	TERMINAL BOARD	
1	1570141-1	FUSE ASSY	

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
LA16	18			S-1367-1-6	329636	
LA15	18			S-1367-1-6	329636	

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	J WEDEL	7-10-67
GROUP	H. Wise	7-12-67
CHECK	YAKSHAW	8-30-67
PROJ		7-13-67

TITLE: WIRING DIAGRAM— MAP LIGHT, CONTROL WHEEL (OPT)

Cessna

DWG NO: 1770001

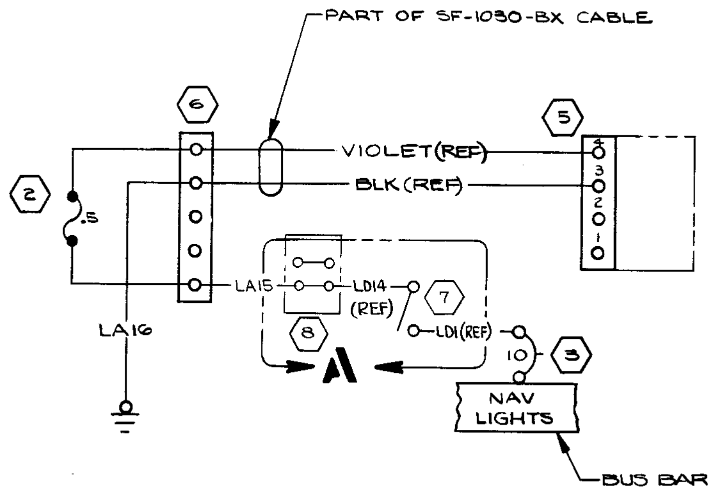
SUPERSEDED BY: | SUPERSEDES: | MODEL: 177 | REV: | PAGE: 11.7.0

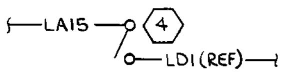
FORM NO. 20-1614

NOTES:

1. VENDOR IS AMP INC (00779)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SF-1030-BX WAS 8409, VIOLET WAS RED, 351-11-05-001 WAS 5-171 ED#RR 10097 (SR6361) IX	JDH 6-26-70	
B	BY REV: SER OUT S-1845-1-2, SER IN S-2160-1; ADD LD14 (REF) & 34002-55, LA15 & LA16 20GA WAS 18GA, S-1360-10L WAS S-1360-10 ADD NOTE 1 & WIRE LENGTH NOW SHOP PRACTICE (SR7305) IX	JCY 3-7-73	RF





DETAIL A
EFF THRU SER 17701973

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
LA16	20		8	S-1493-1	329636	1	
LA15	20		4	S-1493-1	329636	1	

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
8	34002-55	TERM. BLOCK	
7	S-2160-1	SWITCH	
6	351-11-05-001	TERM. BLOCK	(71785)
5	520-4	TERM. BLOCK	(75382)
4	S-1845-1-2	SWITCH	
3	S-1360-10L	CIRCUIT BKR	
2	1570141-1	FUSE ASSY	
1	0570088-1	MAPLIGHT 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 11.7.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	J HENSHAW	2-27-70
GROUP	H. Wise	2-27-70
DRAWN	PAPE	2-12-70
CHECK	L.K. WHITE	2-25-70
STRESS		
PROJ	G. Fife	2-27-70
APPD	R YOUNGERS	2-27-70
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — MAPLIGHT-CONTROL WHEEL

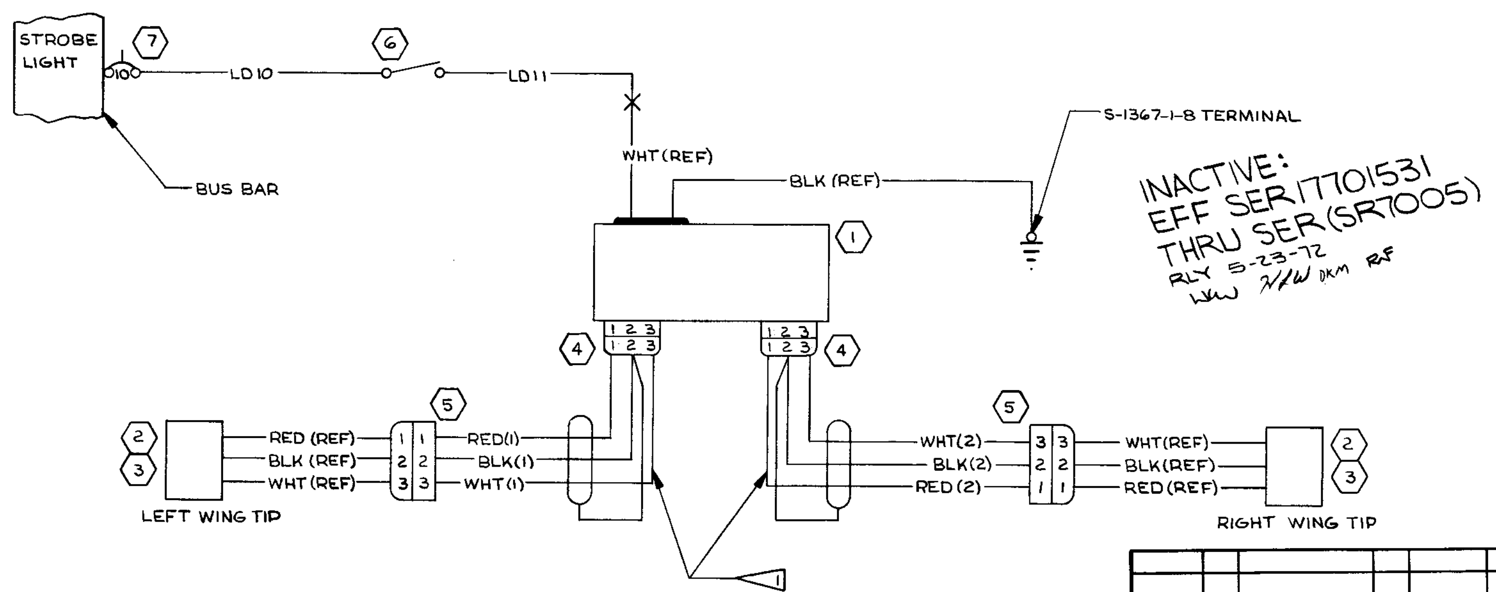
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE 177 PAGE: 11.7.1

FORM NO. 80-215B

EDRR 10857 (SR6361) IX

LET	DESCRIPTION	DATE	APPD
A	BY REV: C622004-0103 WAS C622004-0101 ED&RR 10149 (NOW SHOP PRACTICE)	RLY 8-21-70	LWW RLY HLW VRS RF
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 3-15-73	BY HLW RF



INACTIVE:
EFF SER 17701531
THRU SER (SR7005)
RLY 5-23-72
LWW HLW DKM RF

NOTES:

1. THREE CONDUCTOR CABLE, BELDEN (70903) PART NO. 8770 OR EQUIVILANT TO BE USED

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
WHT(2)	18	1	216	S-1635-2	S-1636-2		
BLK(2)	18		216				
RED(2)	18		216				
WHT(1)	18		216				
BLK(1)	18		216				
RED(1)	18	1	216	S-1635-1	S-1636-2		
LD 11	20		210	S-1370-1	S-1493-1		
LD 10	20		32	S-1367-1-8	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	S-1360-10	CKT BKR
6	S-1845-1-1	SWITCH
5	S-1638-1	HOUSING
4	S-1638-2	HOUSING
3	C622003-0102	LENS
2	C622003-0101	LIGHT UNIT
1	C622004-0103	POWER SUPPLY

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: P 11.9.1

CONTRACT NO:

	NAME	DATE
DESIGN	HENSHAW	10-27-69
GROUP	H. Wiee	10-27-69
DRAWN	J. D. RAINES	10/22/69
CHECK	HARRIS	10-23-69
STRESS		
PROJ	R. Fife	10-30-69
APPD	M. Sweeney	10-23-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
WING TIP STROBE LIGHT

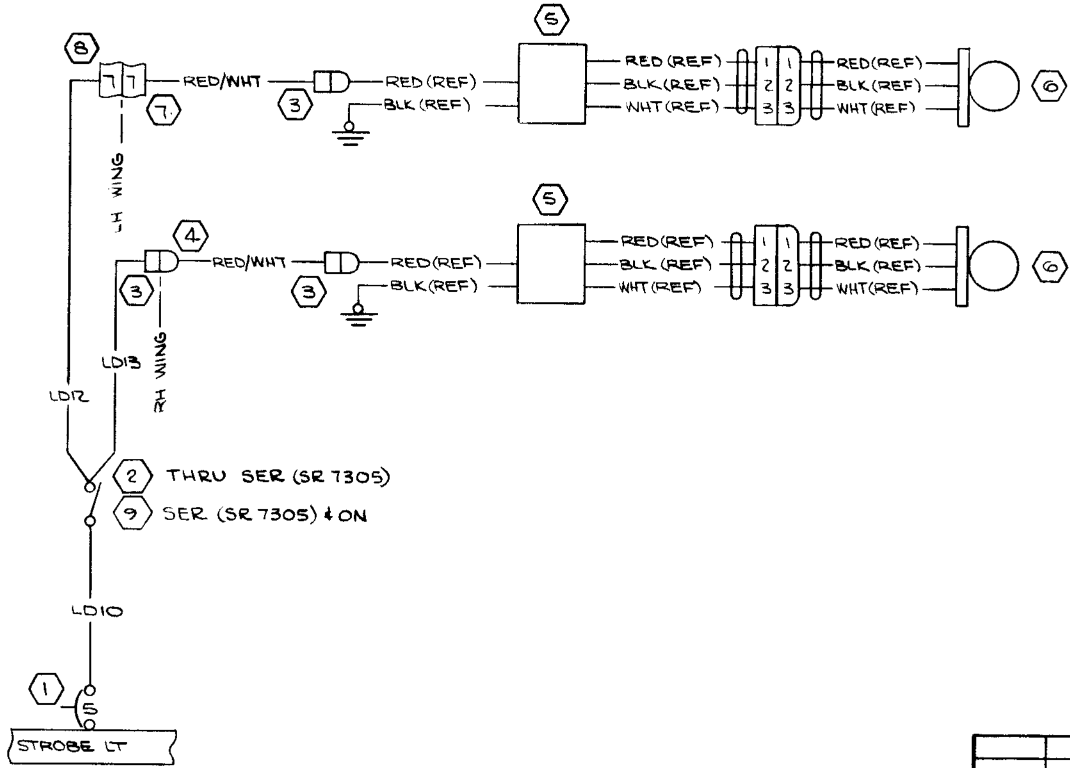
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1770001

SCALE: NONE | 177 | PAGE: 11.9

ED & RR 10776 (SR6361)

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT S-1845-1-2 SER IN S-2160-1, ADD WIRE LENGTH	JCY 3-7-73	RE
B	BY REV: S-1493-2 WAS S-1493-1/LD13; "SEE LD13" WAS S-1493-1/LD12 (NOW SHOP PRACTICE)(MER 177-0174)	MEM 5-17-74	



ITEM NO.	PART NO.	DESCRIPTION
9	S-2160-1	SWITCH
8	S-1641-9	HOUSING
7	S-1640-9	HOUSING
6	C622006-0101	LAMP ASSY
5	C622007-0101	POWER SUPPLY
4	S-1637-1	HOUSING
3	S-1637-2	HOUSING
2	S-1845-1-2	SWITCH
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
RED/WHT	18		216	S-1635-1	S-1636-1		
LD13	18		188	S-1493-2	S-1636-1		
LD12	18		204	SEE LD13	S-1636-1		
LD10	20		30	S-1367-6	S-1493-1		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P11.9

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	5-24-72
DRAWN	R. YOUNGER	5-23-72
CHECK	WHITE	5-24-72
STRESS	DK McCord	5-25-72
PROJ	R. Fife	6-2-72
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	1770001

SCALE: NONE 177 PAGE: 11.9.1

FORM NO. 80-215B

(SR7005) IX

NOTES:

1. WHEN POST LIGHTS ARE INSTALLED LB11 IS DELETED & LB28 MATES WITH LB27. LB15 IS DELETED & LB16 CONNECTS TO COMPASS LIGHT
2. INSTALL S-1635-1 TERMINAL ON VENDOR FURNISHED WIRE
3. INSTALL S-1367-1-8 TERMINAL ON VENDOR FURNISHED WIRE
4. POST LIGHT AND WIRES ARE ONLY REQUIRED WHEN BACK UP ALTIMETER IS INSTALLED IN GLOVEBOX

REVISION

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD LB28; DELETE LB16 & 1270479-6; REVISE NOTE 1; LB8(REF) WAS LB8 & LB12(REF) WAS LB12 (SR7605) IX	DLO 12-12-73	JCY JRS LDB RF
B	BY REV: ADD YEL(REF) WIRE, LB33, 1270479-8 & WIRE LENGTHS (MER 177-0175) (SR7605)(REF)	MEM 6-14-74	DLO JAP JRS WAS
C	BY REV: LB38 WAS LB33; ADD DETAIL A (MER 177-E0289) (SER 17702149)	JEG 7/16/74	JCY JRS JAP WAS
D	BY REV: ADD 18 GA JUMPER; LB8 WAS LB8(REF) & LB12 WAS LB12(REF)(SR7605)(REF)	RJP 8-19-74	JCY JRS WAS
E	BY REV: ADD 1213379-6, LB36, LB37, AND NOTE 4; S-1635-3 WAS S1635-1/LB28 SER17702149	CJH 9-30-74	JCY JRS JAP WAS
F	BY REV: REVISED DETAIL "A" & SER; ADD 34003-55; S-2000B270J WAS 27 OHM 1/2 W (SR7905) IX	RJP 1-13-75	JCY WHH JRS KAL WAS
G	BY REV: REMOVE EYEBROW LTS, 18 GA JUMPER(6), LB4 & LB13 FROM DET. "A"; ADD EYEBROW LTS, 18 GA JUMPER(6), LB4 & LB13 TO STD CONFIGURATION; 53 WAS S-1901-1; 1213319 WAS S-1910-2; 34003-55-3410 WAS 34003-55(SR7905)	BAH 2-17-75	JCY WHH JRS KAL WAS

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
17	34003-55-3410	TERM BOARD	
16	1213379	POST LIGHT	4
15	1270479	LIGHT ASSY	
14	C660501-0101	COMPASS LIGHT	
13	NO. 94	LAMP	
12	0513208	SOCKET	
11	S-1637-1	HOUSING - PIN	
10	S-1637-2	HOUSING - SOCKET	
9	1213319-14	LIGHT ASSY	
8	53	LAMP	
7	34002-55	TERM BOARD	
6	S-2000B270J	RESISTOR	
5	S-1904-3	POT ASSY	
4	S-1360-10L	CIRCUIT BREAKER	
3	S-1640-6	HOUSING - PIN	
2	S-1641-6	HOUSING - SOCKET	
1	1570166	DIMMING ASSY	

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LB37	22			S-1636-1	S-1367-1-8	4	SER 17702149 THRU 17702348
LB38	18		24	S-1829-1	S-1370-1		SER 17702149 & ON
LB28	18		20	S-1635-3	S-1635-1	1.	
LB17	18		20	S-1370-1	S-1367-1-8		
LB36	22			SEE LB28	S-1635-1	4	SER 17702149 THRU 17702348
LB15	18		250	S-1829-1	S-1370-1	1.	
LB14	18		250	S-1829-1	S-1636-1		
LB13	18		35	S-1370-1	S-1829-1		
LB12	18			S-1635-1	S-1829-1		
LB11	18		30	S-1635-1	S-1829-1	1.	
LB10	18		60	S-1635-1	SOLDER		
LB9	18		60	S-1635-1	SOLDER		
LB8	18		250	S-1635-1	SOLDER		
LB7	18		43	SEE LB10	S-1367-1-6		
LB4	18		20	S-1367-1-8	S-1370-1		

05-242-0905

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

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	10-12-73
DRAWN	DL OLLER	10-11-73
CHECK	PAPE	10-12-73
STRESS		
PROJ	G R Fife	10-12-73
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — INSTRUMENT LIGHTS

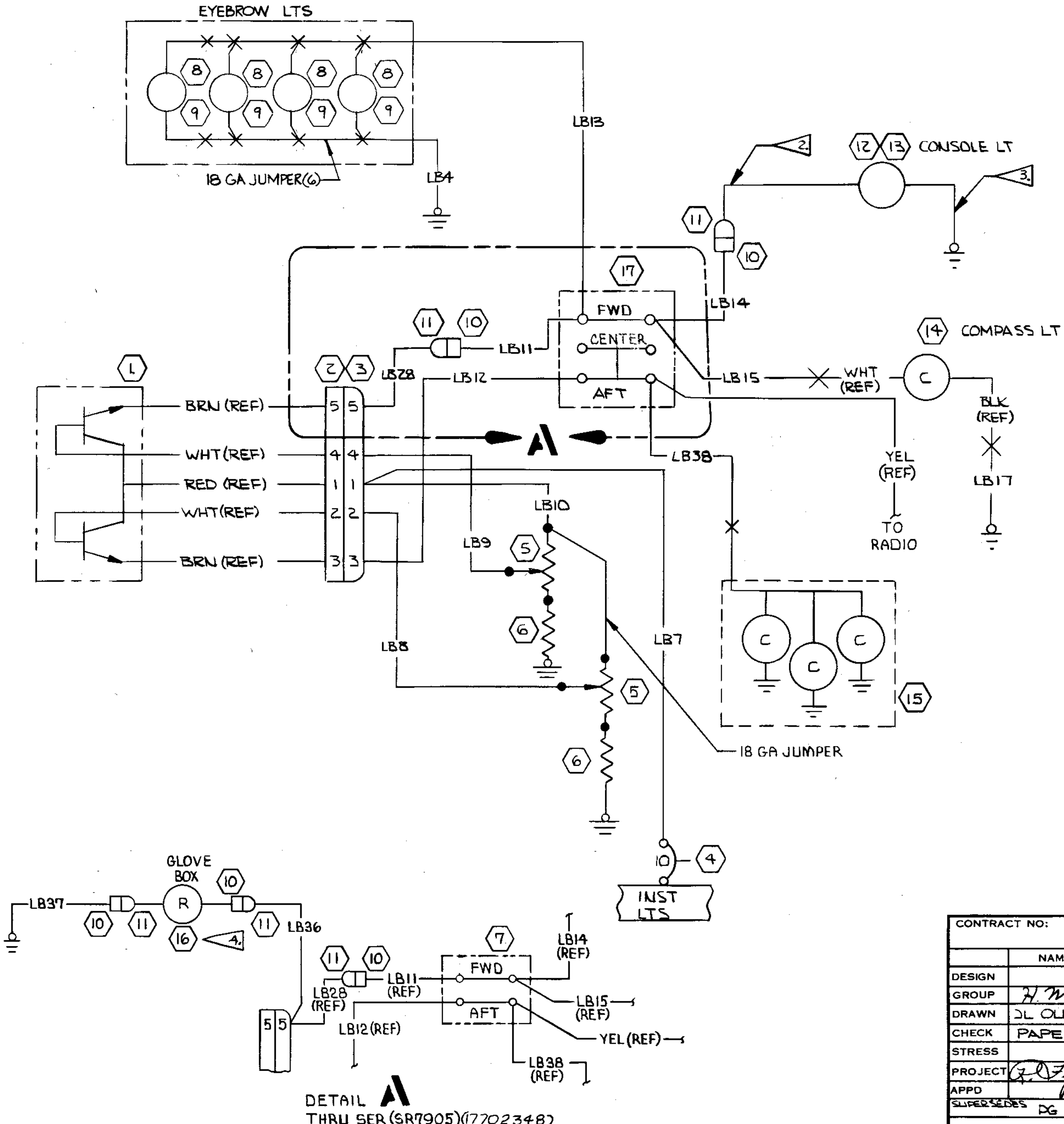
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE | 177 | PAGE: 11.10.0

FORM NO. 80-215B

(SR7605) IX

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
G	SEE PAGE 11.10.0 FOR REVISION		



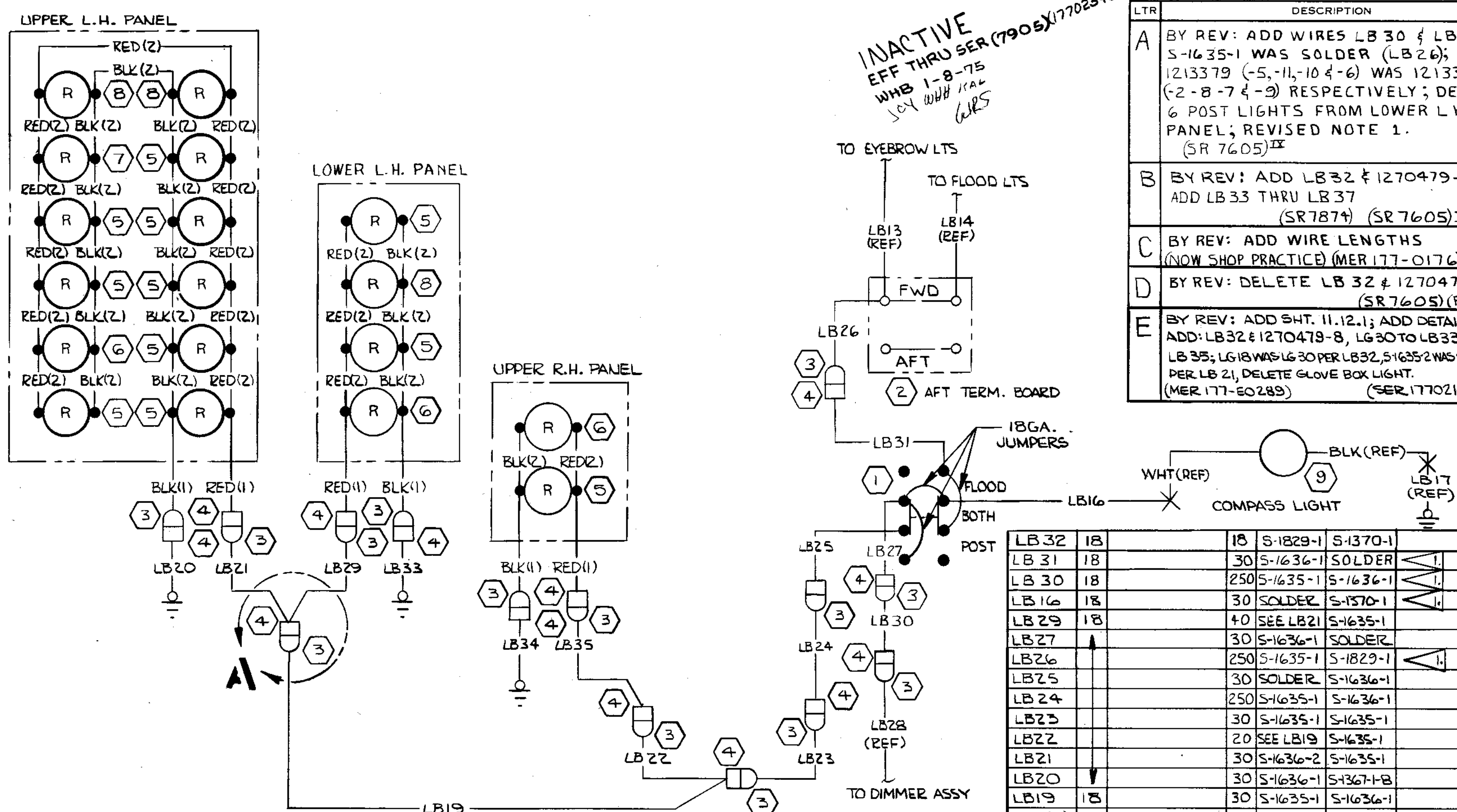
05 242 0905

CONTRACT NO:			Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS
	NAME	DATE	TITLE
DESIGN			WIRING DIAGRAM – INSTRUMENT LIGHTS
GROUP	H. Wise	10-12-73	
DRAWN	DL OLLER	10-11-73	
CHECK	PAPE	10-12-73	
STRESS			
PROJECT	F. Fife	10-12-73	SIZE C · CODE IDENT. NO. 71379 · DWG NO. 1770001
APPD			
SUPERSEDES	PG 11.1		SCALE: NONE · 177 · PAGE: 11.10.1

FORM NO. 80-216

(SR7605) II

INACTIVE
EFF THRU SER (7905)(17702348)
WHB 1-8-75



05-242-0905

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD WIRES LB 30 & LB 31; S-1635-1 WAS SOLDER (LB26); 1213379 (-5, -11, -10 & -6) WAS 1213379 (-2 -8 -7 & -9) RESPECTIVELY; DELETED 6 POST LIGHTS FROM LOWER L H PANEL; REVISED NOTE 1. (SR 7605) IX	MEM 2-26-74	JCY LDB JRS RF
B	BY REV: ADD LB32 & 1270479-6 ADD LB 33 THRU LB 37 (SR7874) (SR 7605) IX	RAM MEM 4-16-74	MTM JRS WRS
C	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE) (MER 177-0176)	MEM 5-21-74	DLO JRS WRS
D	BY REV: DELETE LB 32 & 1270479-6 (SR7605) (REF)	MEM 6-14-74	DLO JRS WRS
E	BY REV: ADD SHT. 11.12.1; ADD DETAIL "A"; ADD: LB32 & 1270479-8, LG30 TO LB33, LB34 LB35; LG18 WAS LG 30 PER LB32, S-1635-2 WAS S-1635-1 PER LB 21, DELETE GLOVE BOX LIGHT. (MER 177-E0289) (SER 17702149)	JEG 7/17/74	JCY JRS WRS

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LB32	18		18	S-1829-1	S-1370-1		THRU SER 17702148
LB 31	18		30	S-1636-1	SOLDER	1.	
LB 30	18		250	S-1635-1	S-1636-1	1.	
LB16	18		30	SOLDER	S-1370-1	1.	
LB29	18		40	SEE LB21	S-1635-1		
LB27			30	S-1636-1	SOLDER		
LB26			250	S-1635-1	S-1829-1	1.	
LB25			30	SOLDER	S-1636-1		
LB24			250	S-1635-1	S-1636-1		
LB23			30	S-1635-1	S-1635-1		
LB22			20	SEE LB19	S-1635-1		
LB21			30	S-1636-2	S-1635-1		
LB20			30	S-1636-1	S-1367-1-8		
LB19	18		30	S-1635-1	S-1636-1		
BLK (2)	22	-22-0		SOLDER	SOLDER		
BLK (1)		-22-0		SOLDER	S-1635-1		
RED (2)		-22-2		SOLDER	SOLDER		
RED (1)	22	-22-2		S-1636-1	SOLDER		

WIRE TABLE

CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
LB 35	18		30	S-1636-1	S-1635-1	
LB 34	18		30	S-1636-1	S-1367-1-8	
LB 33	18		30	S-1636-1	S-1367-1-8	

NOTES:

1. WHEN POST LIGHTS ARE INSTALLED DELETE LB11 & LB15. CONNECT LB30 TO LB28. LB26 CONNECTS FROM TERM. BOARD TO LB31 TO SWITCH & LB16 CONNECTS TO COMPASS LIGHT.

ITEM NO.	PART NO.	DESCRIPTION
~~10~~	~~1270479-8~~	~~LIGHT ASSY~~
9	CG6OSO1-0101	COMPASS LIGHT
8	1213379-5	POST LIGHT ASSY
7	1213379-11	POST LIGHT ASSY
6	1213379-10	POST LIGHT ASSY
5	1213379-6	POST LIGHT ASSY
4	S-1637-2	HOUSING
3	S-1637-1	HOUSING
2	34002-55	TERM. BOARD
1	S-1501-1	SWITCH

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	J. Sandfeld	12-14-73
DRAWN	DL OLLER	12-12-73
CHECK	J. YOUEL	12-13-73
STRESS		
PROJECT	G. Fife	12-18-73
APPD		
SUPERSEDES	PG. 11.11.0	
SUPERSEDED BY		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — POST LIGHTING (OPTIONAL)

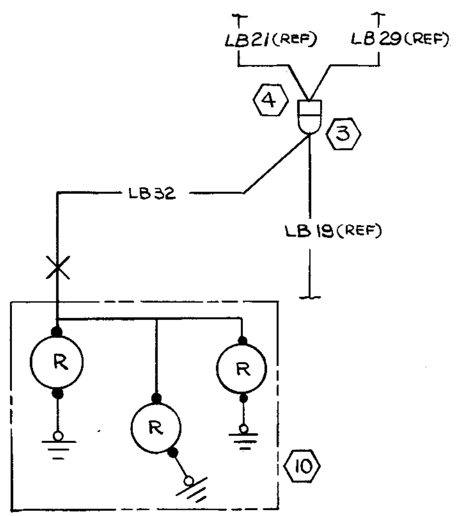
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001

SCALE: NONE | 177 | PAGE: 11.12.0

FORM NO. 80-215

(SR7605) IX

REVISION			
LET	DESCRIPTION	DATE	APPD
E	SEE PAGE 11.12.0 FOR REVISION		



DETAIL A
THRU SER 17702148

05 029 1026

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		
DRAWN	J Geese	7-16-74
CHECK		
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
PAWNEE DIVISION
5800 E. PAWNEE
WICHITA, KANSAS

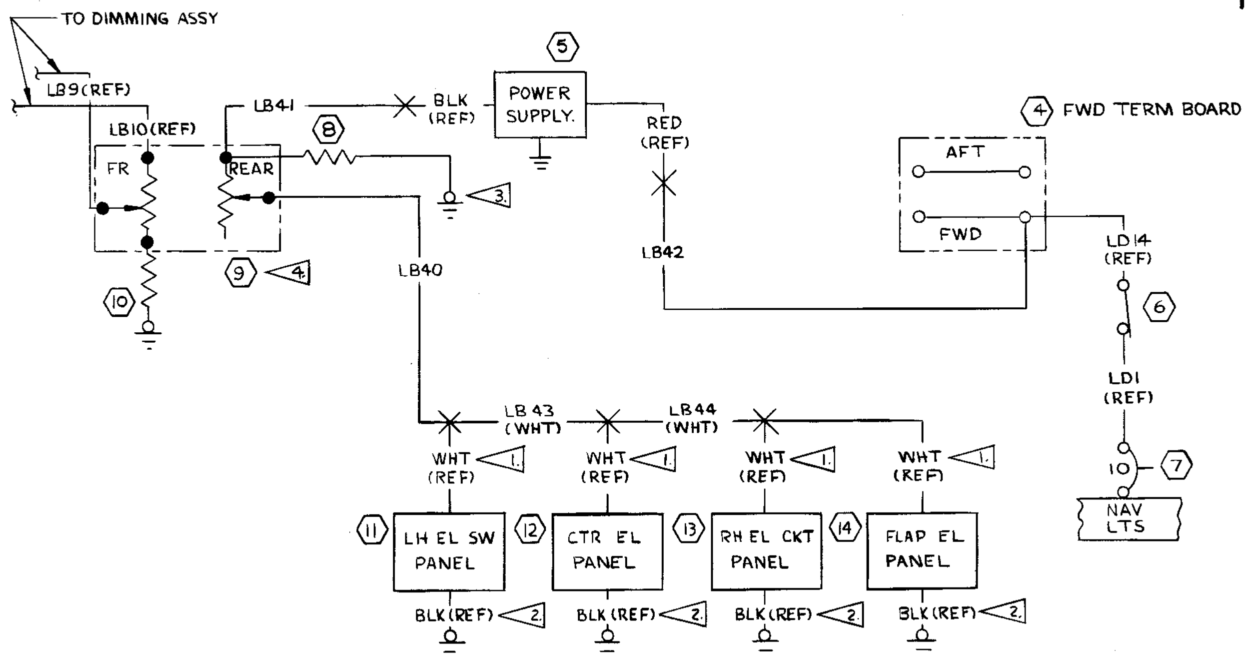
TITLE
WIRING DIAGRAM — POST LIGHTING (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001
SCALE: NONE	177	PAGE: 11.12.1

FORM NO. 80-216A

(SR7605) IX

REVISION			
LET	DESCRIPTION	DATE	APPD



05 242 0905

NOTES:

1. THESE WIRES ARE VENDOR FURNISHED
2. TERMINATE VENDOR FURNISHED WIRE WITH S-1637-1-8
3. THIS END OF RESISTOR TERMINATED WITH S-1367-1-14 TERMINAL & INSTALLED ON SHAFT OF TANDEM POT ASSY. DUE TO HEAT DISSIPATION, RESISTORS MUST BE KEPT FROM WIRE BUNDLE.
4. WHEN ELECTRO LUMINESCENT PANELS ARE INSTALLED S-2091-1 POT ASSY REPLACES S-1904-3 POT ASSY

ITEM NO.	PART NO.	DESCRIPTION	
15	S-1904-3	POT ASSY	
14	2013153-3	EL PANEL-FLAP	
13	2013162-1	EL PANEL-RH	
12	2013162-4	EL PANEL-CTR	
11	2013162-3	EL PANEL-LH	
10	S-2000B270J	RESISTOR	
9	S-2091-1	POT ASSY	
8	VAL-5-6000	RESISTOR	
7	S-1360-10L	CIRCUIT BREAKER	
6	S-2160-1	SWITCH	
5	C613001-0201	POWER SUPPLY	
4	34002-55	TERM BOARD	
3	S-1640-6	HOUSING	
2	S-1641-6	HOUSING	
1	1570166-1	DIMMING ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS	
LB42	18			S-1829-1	S-1370-1		
LB41	18			SOLDER	S-1370-1		
WHT LB44	18	-18-9		S-1370-1	SEE LB42		
WHT LB43	18	-18-9		SEE LB40	S-1370-1		
LB40	22			SOLDER	S-1370-1		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	H. Stamm	11-15-74
GROUP	J R S...	11-15-74
DRAWN	G. WHITSON	11-12-74
CHECK	J. Youel	11-15-74
STRESS		
PROJ	Shackelford	11-15-74
APPD	JAP	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — ELECTRO LUMINESCENT PANEL (OPTIONAL)

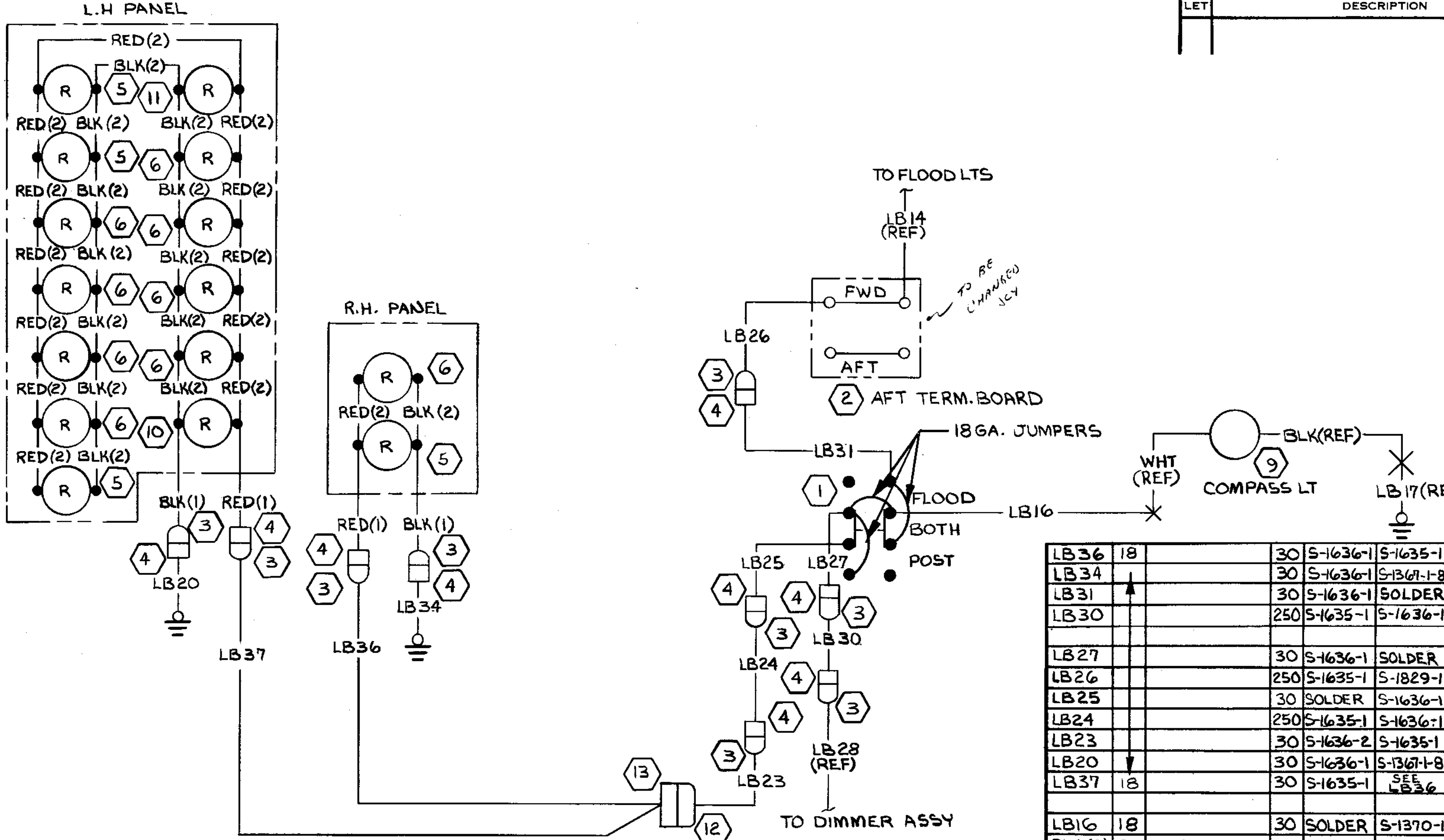
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE 177 PAGE: 11.13.0

FORM NO. 80-215B

(SR 7905)

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LB36	18		30	S-1636-1	S-1635-1		
LB34	↑		30	S-1636-1	S-1367-1-8		
LB31			30	S-1636-1	SOLDER		
LB30			250	S-1635-1	S-1636-1		
LB27			30	S-1636-1	SOLDER		
LB26			250	S-1635-1	S-1829-1		
LB25			30	SOLDER	S-1636-1		
LB24			250	S-1635-1	S-1636-1		
LB23			30	S-1636-2	S-1635-1		
LB20	↓		30	S-1636-1	S-1367-1-8		
LB37	18		30	S-1635-1	SEE LB36		
LB16	18		30	SOLDER	S-1370-1		
BLK (2)	22	-22-0		SOLDER	SOLDER		
BLK (1)	↑	-22-0		SOLDER	S-1635-1		
RED (2)	↓	-22-2		SOLDER	SOLDER		
RED (1)	22	-22-2		S-1636-1	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
11	1270479-8	POST LIGHT ASSY	
9	C660501-0101	COMPASS LIGHT	
8	1213379-5	POST LIGHT ASSY	
7	1213379-11	POST LIGHT ASSY	
6	1213379-10	POST LIGHT ASSY	
5	1213379-6	POST LIGHT ASSY	
4	S-1637-2	HOUSING	
3	S-1637-1	HOUSING	
2	34002-55	TERM. BOARD	
1	S-1501-1	SWITCH	

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
13	S-2035-2	HOUSING	
12	S-2035-1	HOUSING	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1770001 P 11.12.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. L. Stamm	1-20-75
GROUP	W. H. Harlin	1-21-75
DRAWN	W. BALKE	1-3-75
CHECK	J. Youel	1-17-75
STRESS		
PROJ	Shackelford	1-21-75
APPD	KAL	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — POST LIGHTING (OPTIONAL)

SIZE: C | CODE IDENT. NO.: 71379 | DWG NO: 1770001

SCALE: NONE | (SR 7905) | PAGE: 11.14

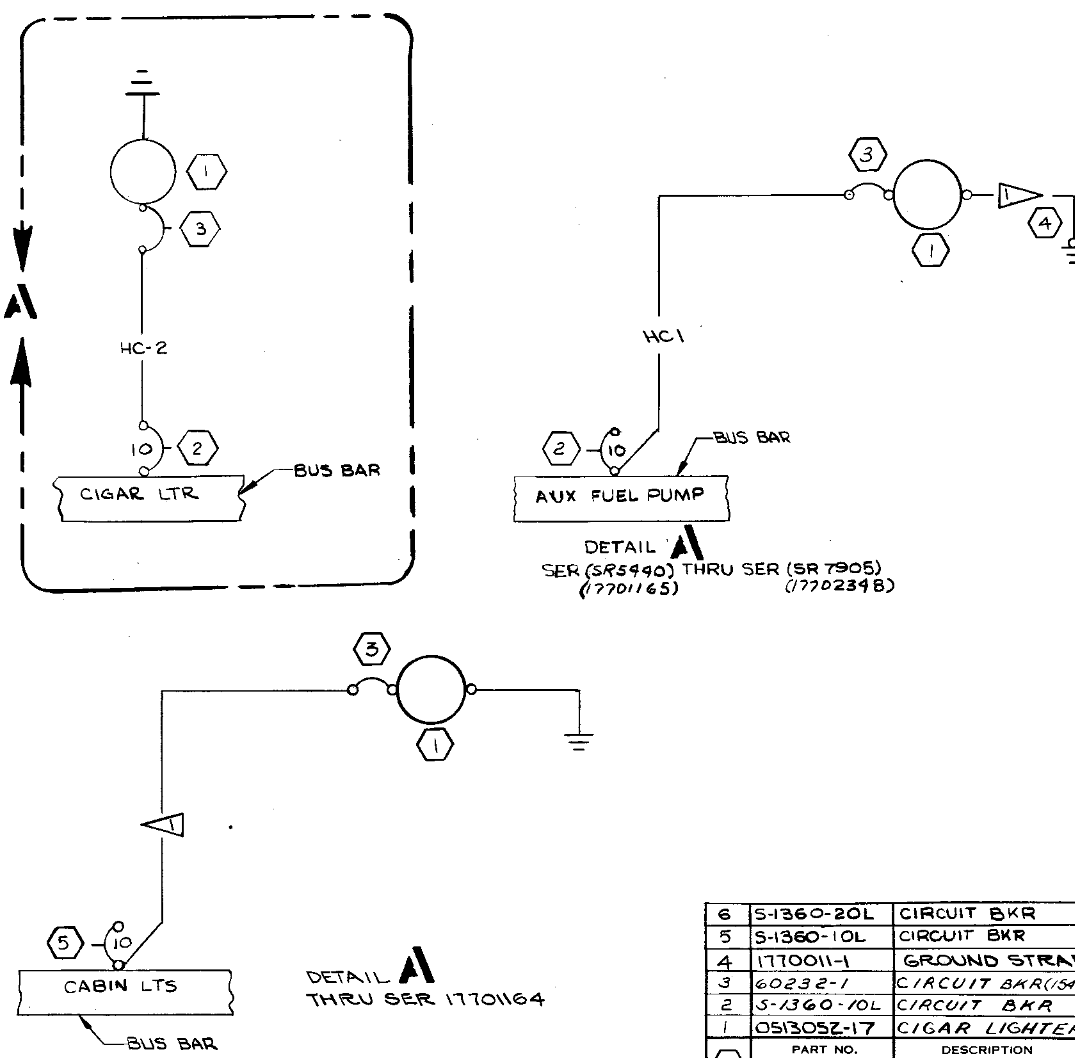
FORM NO. 80-215B

NOTES:

1. WIRE IS SUPPLIED WITH THE LIGHTER. SHORTEN & TERMINATE WITH AN S-1367-2-2 TERMINAL

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADDED DETAIL A; HC1 WAS FLAG NOTE 1; MOVED FLAG 1 TO GROUND WIRE; ADD ITEM 4 TO FIELD & EQUIP TABLE ED&RR03430 SR(5440)	FER 8-1-68	GKI MDS DET WHH VRS
B	BY REV: S-1360-10L WAS S-1360-10, 16GA WAS 18GA ADD WIRE LENGTH NOW SHOP PRACTICE	JCY 3-7-73	RF
C	BY REV: 051305Z-17 WAS S-1734-1 (NOW SHOP PRACTICE)	JLO 4-11-73	RF
D	BY REV: SER IN HC2 & S-1360-20L & SER OUT HC1 (SR7905)(MER E0320)	BLA 10-30-74	



HC 2	16			S-1367-2-6	S-1367-2-8	SER 17702349 & ON
HC1	16		30	S-1367-2	S-1367-2	THRU SER 17702349
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
6	S-1360-20L	CIRCUIT BKR
5	S-1360-10L	CIRCUIT BKR
4	1770011-1	GROUND STRAP
3	60232-1	CIRCUIT BKR(15472)
2	S-1360-10L	CIRCUIT BKR
1	051305Z-17	CIGAR LIGHTER

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	1-31-67
DRAWN	J.A. CONLEY	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT		2-1-67
APPD	TEM	3-6-67

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — CIGAR LIGHTER

SIZE C CODE IDENT. NO. 71379 DWG NO. 1770001

SCALE: NONE (SR5172) IX PAGE: 13.1

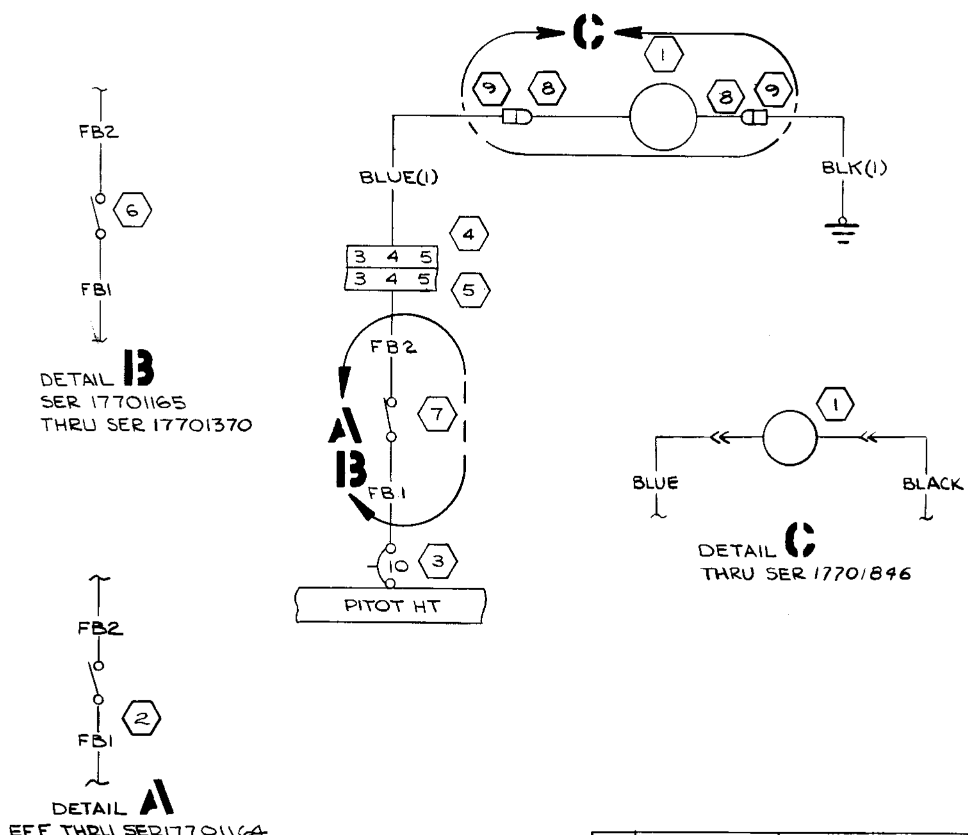
05-242-0905

FORM NO. 80-215

NOTES:

1. SER 17700001 TO SER 17701164
2. SER 17701165 & ON

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD DETAIL A & S-1845-1-1; SER OUT S-1158-2-2 ED & RR 02351 (SR 5440) IX	JDH 5-1-68	GKI MDS DET NRW VRS TM
B	BY REV: ADD SER TO FB1 & FB2 & NOTE 1 & 2 (SR 5440) IX	JWH 6-13-68	MDS NRW DET VRS TM
C	BY REV: SER OUT S-1845-1-1; SER IN S-1845-1-2; ADD DETAIL B ED & RR 10489 (SR6020) IX	DLB 4-22-69	RLY MDS TM DET NRW VRS
D	BY REV: SER OUT BLU & BLK; SER IN BLU (1) & BLK (1) ADD DETAIL "C" & SER (SR 7320) IX	JCY 11-6-72	RLY NRW RF
E	BY REV: S-1360-10L WAS S-1360-10, S-2160-1 WAS S-1845-1-2, ADD WIRE LENGTH NOW SHOP PRACTICE (SR 7303) IX	JCY 3-13-73	RLY NRW DKM RF



9	S-1637-2	HOUSING-PLUG
8	S-1637-1	HOUSING-CAP
7	S2160-1	SWITCH
6	S-1845-1-1	SWITCH
5	S-1641-9	HOUSING-PLUG
4	S-1640-9	HOUSING-CAP
3	S-1360-10L	CIRCUIT BREAKER
2	S-1158-2-2	SWITCH
1	1720099-1	PITOT INSTL
ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

BLK (1)	18	-18-0	6	S-1636-2	S-1367-1-8		SER 17701897 & ON
BLU (1)	18	-18-6	130	S-1635-2	S-1636-2		SER 17701897 & ON
FB2	18		197	S-1493-1	S-1636-2		2
FB1	18		35	S-1367-1-6	S-1493-1		2
BLK	18	18-0	6	S-1369-1	S-1367-1-8		THRU SER 17701896
BLUE	22	22-6	130	S-1635-2	S-1369-1	STD	THRU SER 17701896
FB2	18		197	S-1367-1-6	S-1636-2	STD	1
FB1	18		35	S-1367-1-6	S-1367-1-6		1
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	1-31-67
GROUP	H. Wise	1-31-67
DRAWN	RC AXTELL	2-22-67
CHECK	YAKSHAW	3-4-67
STRESS	Hutchison	3-9-67
PROJECT	Ted Moody	2-1-67
APPD	REM	3-6-67

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — PITOT HEAT (OPT)

SIZE: C | CODE IDENT. NO.: 71379 | DWG NO.: 1770001

SCALE: NONE | (SR5172) IX | PAGE: 13.2

(17700001)

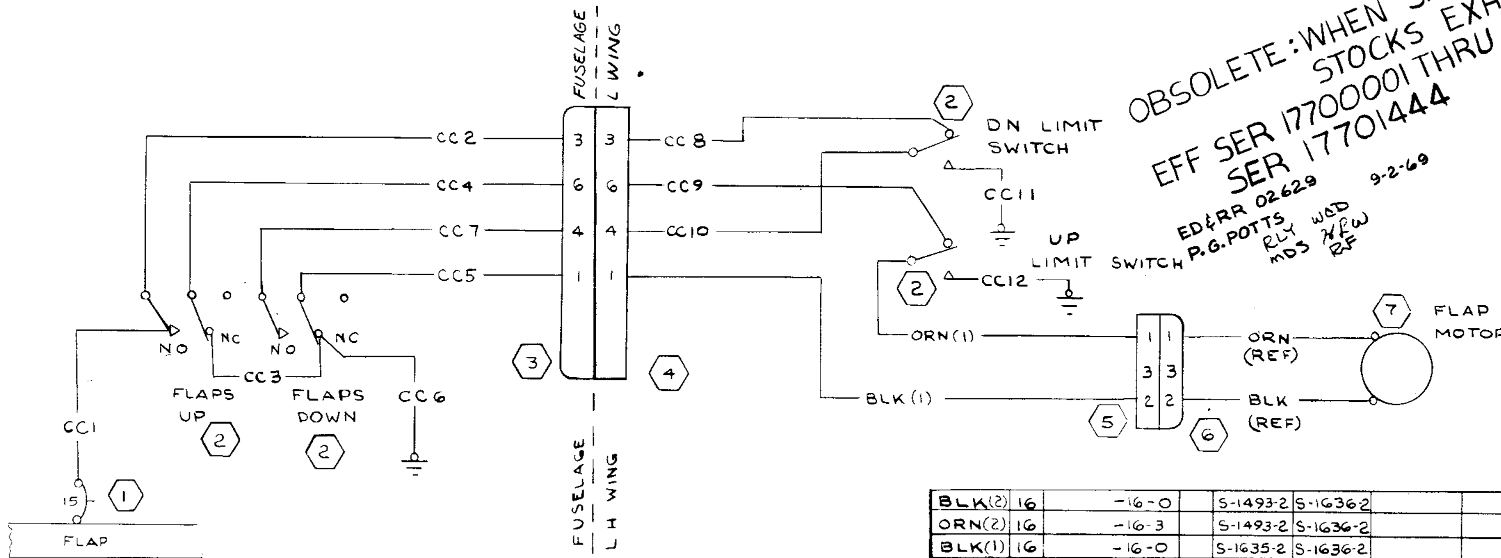
FORM NO. 80-215

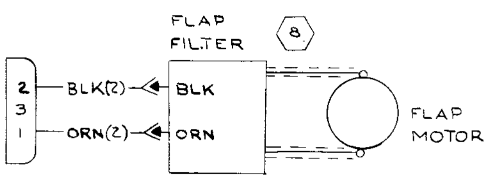
REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:

1. WIRES T-CC1, T-CC3, T-CC4, T-CC5 & T-CC6 ARE THE SAME AS USED ON PAGE 14.1.
2. DETAIL A TO BE INSTALLED IN CONJUNCTION WITH DWG 1770000 PAGE 6.4.0.

OBSOLETE: WHEN SPARES STOCKS EXHAUSTED
EFF SER 17700001 THRU SER 17701444
ED&RR 02629 9-2-69
P.G. POTTS RLY WED HFW MDS RF





DETAIL "A"
OPTIONAL WIRING USED WHEN RADIO IS INSTALLED

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
8	C301001-0209	ACTUATOR ASSY	
7	C301001-0203	ACTUATOR ASSY	
6	S-1638-2	HOUSING - CAP	
5	S-1638-1	HOUSING - PLUG	
4	S-1641-6	HOUSING - SOCKET	
3	S-1640-6	HOUSING - PIN	
2	E33-10K	SWITCH	01963
1	S-1360-15	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(2)	16	-16-0		S-1493-2	S-1636-2		
ORN(2)	16	-16-3		S-1493-2	S-1636-2		
BLK(1)	16	-16-0		S-1635-2	S-1636-2		
ORN(1)	16	-16-3		S-1635-2	S-1636-2		
T-CC12	16			S-1367-1-4	S-1367-1-8		
T-CC11	16			S-1367-1-4	S-1367-2-8		
T-CC10	16			S-1636-2	S-1367-1-4		
T-CC9	16			S-1635-2	S-1367-1-4		
T-CC8	16			S-1635-2	S-1367-1-4		
T-CC7	16			S-1367-1-4	S-1636-2		
T-CC6	16			S-1367-1-4	S-1367-2-8		
T-CC5	16			S-1367-1-4	S-1636-2		
T-CC4	16			S-1367-1-4	S-1636-2		
T-CC3	16			S-1367-1-4	S-1367-1-4		
T-CC2	16			S-1367-1-4	S-1636-2		
T-CC1	16			S-1367-2-8	S-1367-1-4		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1770001 PG 14.1
SUPERSEDED BY: P 14.1.2

CONTRACT NO:

	NAME	DATE
DESIGN	SIPES VR	8/2/67
GROUP	H. Wise	8-2-67
DRAWN	SIPES VR	8/2/67
CHECK	LAURIE	9-12-67
STRESS	[illegible]	9-14-67
PROJECT	[illegible]	[illegible]
APPD		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLAP SYSTEM

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1770001

SCALE: SR 5172 IX PAGE: 14.1.1

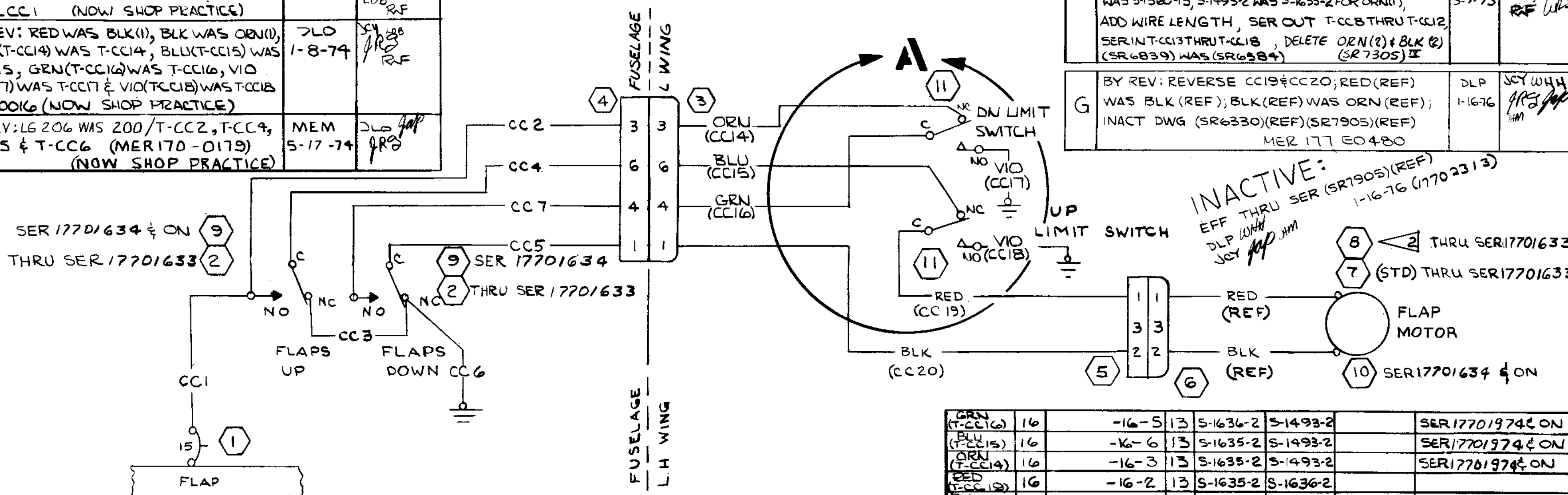
FORM NO. 80-215A

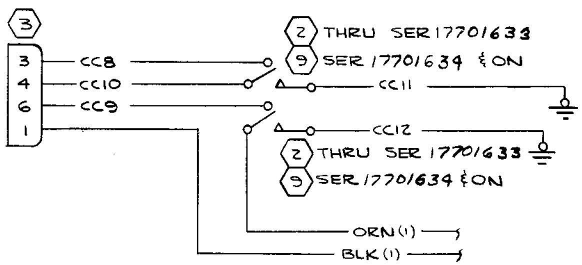
REVISION			
LET	DESCRIPTION	DATE	APPD
C	BY REV: S-1906-1 AT INSTRUMENT PANEL WAS S-1906-2; ADD DETAIL "A" & SER (SR7305) IX	DLP 6-22-73	RLY HLW RF
D	BY REV: S-1637-2-4 WAS S-1637-1-4 CC2 THRU CC7 & S-1367-2-8 WAS S-1367-1-8 PER CC1 (NOW SHOP PRACTICE)	DLO 11-9-73	JCY WHH LDB RF
E	BY REV: RED WAS BLK(1), BLK WAS ORN(1), ORN(T-CC14) WAS T-CC14, BLU(T-CC15) WAS T-CC15, GRN(T-CC16) WAS T-CC16, VIO (T-CC17) WAS T-CC17 & VIO(T-CC18) WAS T-CC18 MER E0016 (NOW SHOP PRACTICE)	DLO 1-8-74	JCY JRS RF
F	BY REV: LG 206 WAS 200/T-CC2, T-CC4, T-CC5 & T-CC6 (MER 170-0179) (NOW SHOP PRACTICE)	MEM 5-17-74	DLO JRS

NOTES:
1. WIRES T-CC1, T-CC3, T-CC4, T-CC5 & T-CC6 ARE THE SAME AS USED ON PAGE 14.1.

2 OPTIONAL WITH RADIOS

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER IN S-1906-1; SER OUT E33-10K; ADD C301002-0201 ED & RR 10203 (SR6839)	MH 9-4-70	HLW LKW RF
B	BY REV: SER OUT S-1906-1, SER IN S-1906-2, S-1360-15L WAS S-1360-15, S-1493-2 WAS S-1635-2 FOR ORN(1), ADD WIRE LENGTH, SER OUT T-CC8 THRU T-CC12, SER IN T-CC13 THRU T-CC18, DELETE ORN(2) & BLK(2) (SR6839) WAS (SR6584) (SR7305) IX	JCY 3-7-73	RLY HLW DKM RF
G	BY REV: REVERSE CC19 & CC20; RED(REF) WAS BLK (REF); BLK(REF) WAS ORN (REF); INACT DWG (SR6330)(REF)(SR7905)(REF) MER 177 E0480	DLP 1-16-76	JCY WHH JRS





DETAIL A
THRU SER 17701973

WIRE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
ORN (1)	16	-16-3	13	S-1635-1	S-1636-2	THRU SER 17701973
BLK (1)	16	-16-2	13	S-1493-2	S-1636-2	THRU SER 17701973
VIO T-CC18	16	-16-7	19	S-1493-2	S-1367-2-8	SER 17701974 & ON
VIO T-CC17	16	-16-7	19	S-1493-2	S-1367-2-8	SER 17701974 & ON

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
11	S-1906-2	SWITCH	
10	C301002-0201	ACTUATOR ASSY	
9	S-1906-1	SWITCH	
8	C301001-0702	ACTUATOR ASSY	
7	C301001-0205	ACTUATOR ASSY	
6	S-1638-2	HOUSING - CAP	
5	S-1638-1	HOUSING - PLUG	
4	S-1641-6	HOUSING - SOCKET	
3	S-1640-6	HOUSING - PIN	
2	E33-10K	SWITCH	01963
1	S-1360-15L	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
GRN (T-CC16)	16	-16-5	13	S-1636-2	S-1493-2		SER 17701974 & ON
BLU (T-CC15)	16	-16-6	13	S-1635-2	S-1493-2		SER 17701974 & ON
ORN (T-CC14)	16	-16-3	13	S-1635-2	S-1493-2		SER 17701974 & ON
RED (T-CC19)	16	-16-2	13	S-1635-2	S-1636-2		
BLK (T-CC20)	16	-16-0	13	S-1493-2	S-1636-2		
T-CC12	16		10		S-1367-1-8		THRU SER 17701973
T-CC11	16		10		S-1367-2-8		
T-CC10	16		20	S-1636-2			
T-CC9	16		14	S-1635-2	S-1493-2		
T-CC8	16		20	S-1635-2	S-1493-2		THRU SER 17701973
T-CC7	16		206	S-1367-2-4	S-1636-2		
T-CC6	16		14	S-1367-2-4	S-1367-2-8		
T-CC5	16		206	S-1367-2-4	S-1636-2		
T-CC4	16		206	S-1367-2-4	S-1636-2		
T-CC3	16		4	S-1367-2-4	S-1367-2-4		
T-CC2	16		206	S-1367-2-4	S-1636-2		
T-CC1	16		11	S-1367-2-8	S-1367-2-4		

WIRE TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1770001 PG 14.1.1
SUPERSEDED BY: P 14.5

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H Wise	9-13-69
DRAWN	P.G. POTTS	9-2-69
CHECK	R.L. YOUNGERS	9-2-69
STRESS		
PROJECT		9-17-69
APPD	SWANEY	9-5-69

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

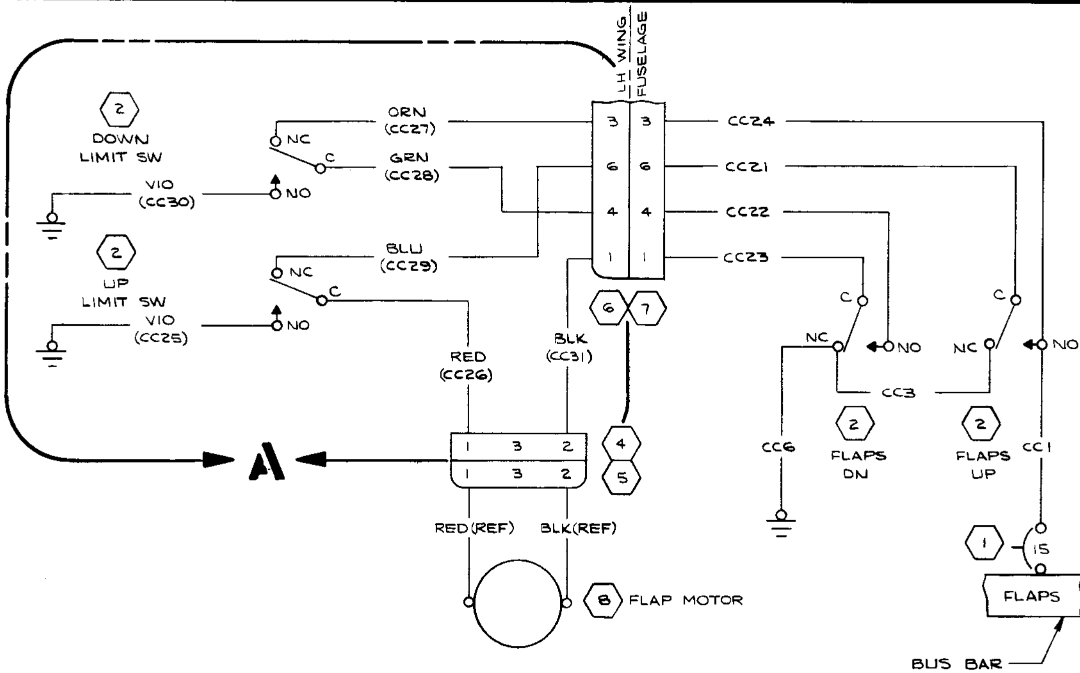
TITLE
WIRING DIAGRAM — FLAP SYSTEM

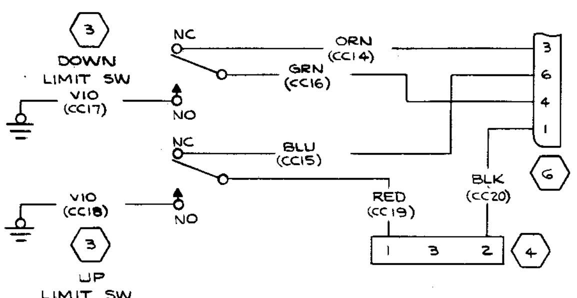
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 1770001
SCALE: NONE | (SR6330) | PAGE: 14.1.2

(17701445)

FORM NO. 80-215A

REVISION			
LET	DESCRIPTION	DATE	APPD





DETAIL A
THRU SER 17702380

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (TW-CC31)	16	-16-0	13	S-1635-2	S-1636-2	SER	17702381 & ON
VIO (TW-CC30)	↑	-16-7	19	S-1367-2-8	S-1367-2-4		↑
BLU (TW-CC29)		-16-6	13	S-1635-2	S-1367-2-4		
GRN (TW-CC28)		-16-5	13	S-1635-2	S-1367-2-4		
ORN (TW-CC27)		-16-3	13	S-1635-2	S-1367-2-4		
RED (TW-CC26)		-16-2	13	S-1367-2-4	S-1636-2		↓
VIO (TW-CC25)		-16-7	19	S-1367-2-8	S-1367-2-4	SER	17702381 & ON
TW-CC24			140	S-1636-2	S-1367-2-4		
TW-CC23			140	S-1636-2	S-1367-2-4		
TW-CC22			140	S-1636-2	S-1367-2-4		
TW-CC21			140	S-1636-2	S-1367-2-4		
RED (T-CC19)		-16-2	13	S-1635-2	S-1493-2	THRU	SER 17702380
VIO (T-CC18)		-16-7	19	S-1493-2	S-1367-2-8		↑
VIO (T-CC17)		-16-7	19	S-1493-2	S-1367-2-8		
GRN (T-CC16)		-16-5	13	S-1635-2	S-1493-2		
BLU (T-CC15)		-16-6	13	S-1635-2	S-1493-2		
ORN (T-CC14)		-16-3	13	S-1635-2	S-1493-2		↓
BLK (T-CC20)		-16-0	13	S-1635-2	S-1636-2	THRU	SER 17702380
TW-CC6			14	S-1367-2-4	S-1367-2-8		
TW-CC3	↓		4	S-1367-2-4	S-1367-2-4		
TW-CC1	16		14	S-1367-2-6	S-1367-2-4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
8	C301002-0201	ACTUATOR ASSY	
7	S-1641-6	HOUSING	
6	S-1640-6	HOUSING	
5	S-1638-2	HOUSING	
4	S-1638-1	HOUSING	
3	S-1906-2	SWITCH	
2	S-1906-1	SWITCH	
1	S-1360-15L	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 14.1.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	G. STAMM	1-22-76
GROUP	W H Harden	2-28-76
DRAWN	PAPE	1-16-76
CHECK	YOUEL	1-19-76
STRESS		
PROJ	J.H. MOORE	3-9-76
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLAP SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1770001

SCALE: NONE 177 PAGE: 14.5

(SR7905)(REF)
(17023/4)

FORM NO. 80-215B