CESSNA™ 180/185 Series & AGcarryall
1969 thru 1976 Service Manual
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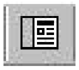
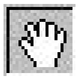
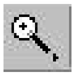
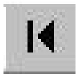
TOOLBAR HELP

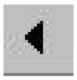
 The **Print** button allows you to print any specific page(s).

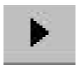
 The **Show/Hide Navigation Pane** button opens or closes the lefthand column of bookmarks or thumbnails. Click on this button and the Actual Size or Fit Width button to enlarge text for reading.

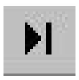
 The **Hand** tool enables you to move a single document page on the screen when the page does not fit within the main window. Drag the hand tool in the direction you want to move the page. A pointing hand indicates a hyperlink is present at that location.

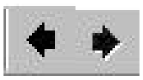
 The **Zoom** tool magnifies and reduces the page display. The “+” zooms in. To view the “-“ and zoom out, choose the Zoom tool and hold down the Ctrl key. Click on the hand tool and the Actual Size button to exit and resize the page.

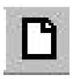
 The **First Page** button moves the document to the first page.

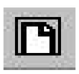
 **Previous Page** – moves you back one page in the document.

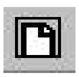
 **Next Page** – moves you forward one page in the document.

 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.

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CUSTOMER CARE

SKYWAGON
180/185 SERIES
&
AGcarryall
1969 THRU 1976
SERVICE MANUAL

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Insert changed pages into basic publication. Destroy superseded pages.

15 SEPTEMBER 1972

CHANGE 4 1 OCTOBER 1975

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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 396, CONSISTING OF THE FOLLOWING:

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*Title	4
*A	4
*i thru ii	4
iii	0
iv Blank	0
1-1	0
*1-2 thru 1-3	4
1-4	0
1-5	3
1-6 Blank	3
*2-1	4
2-2 thru 2-3	3
*2-4	4
2-5 thru 2-6	3
*2-7 thru 2-10	4
*2-10A	4
*2-10B Blank	4
2-11	1
*2-12 thru 2-15	4
2-16 thru 2-21	1
*2-22	4
3-1	1
*3-2 thru 3-4	4
3-5 thru 3-6	3
3-6A	3
*3-6B	4
3-7	3
3-8	0
*3-9 thru 3-10	4
*3-10A	4
*3-10B Blank	4
*3-11 thru 3-13	4
3-14 thru 3-15	0
3-16	3
*3-17	4
3-18	3
*3-19	4
3-20	3
*4-1	4
4-2 thru 4-3	1
*4-4	4
4-5	3
4-6	1
5-1	3
5-2 thru 5-3	0
*5-4	4
*5-4A	4
5-4B	3
5-5	1
5-6 thru 5-8	0
*5-9	4
5-10	0
5-11	3
5-12 thru 5-16	0
5-17	1
*5-18	4
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6-2	0
6-3	1
6-4	0
6-4A	1
6-5B Blank	1
6-5	1
6-6 thru 6-7	0
6-8 Blank	0
7-1 thru 7-2	0
7-3	1
7-4 thru 7-5	0
7-6	0
8-1 thru 8-2	0
*8-3	4
8-4	0
8-5	1
8-6	0
9-1 thru 9-2	0
9-3	1
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*9-4A	4
*9-4B Blank	4
*9-5	4
9-6	1
9-7	0
*9-8	4
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10-3 thru 10-4	1
10-5	0
*10-6	4
10-7	0
10-8 Blank	0
11-1	1
11-2 thru 11-3	0
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11-5 thru 11-8	1
11-8A	1
11-8B Blank	1
*11-9 thru 11-10	4
11-11 thru 11-18	0
*11-19	4
11-20 thru 11-21	0
*11-22	4
11-23	1
11-24	0
11-25 thru 11-28	1
*11-29	4
11-30	1
*11A-1	4
11A-2	1
11A-3 thru 11A-4	0
11A-5 thru 11A-6	3
11A-7	0
*11A-8	4
11A-9 thru 11A-14	0
11A-15	1
*11A-16 thru 11A-19	4
11A-20	0
*11A-21 thru 11A-23	4
11A-24	1
*12-1	4
12-2	1
12-3	3
12-4	0
12-5	1
12-6 thru 12-7 (Deleted)	1
12-8 thru 12-9	3
12-10	1
12-11 thru 12-12	0
*12-13	4
12-14	0
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12-15	1
12-16	0
12-17	3
12-18	1
12-19	3
12-20	1
12-21	0
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12-23	0
*12-24 thru 12-26	4
13-1	0
13-2	1
13-3 thru 13-4	0
13-5	3
13-6	0
14-1	3
14-2	0
*14-3	4
14-4	1
14-5 thru 14-7	0
14-8 thru 14-11	3
14-12 Blank	3
15-1 thru 15-2	1
15-3 thru 15-4	3
15-5	0
15-6	3
15-7	0
*15-8 thru 15-9	4
15-10 thru 15-11	0
15-12	3
15-12A thru 15-12B	3
15-13	3
15-14	0
15-15 thru 15-16	1
15-17 thru 15-20	0
15-21 thru 15-22	1
*15-22A	4
*15-22B Blank	4
*15-23	4
15-24 thru 15-26	0
15-27 thru 15-28	1
*16-1	4
16-2	0
*16-3 thru 16-4	4
*16-4A	4
*16-4B Blank	4
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16-6	1
16-7 thru 16-9	0
16-10	1
16-11 thru 16-12	0
16-13 thru 16-14	1
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*16-18A	4
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16-19	0
16-20 thru 16-21	1
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16-24	1
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16-26 thru 16-28	0
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*17-1 thru 17-2	4
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17-4	0
17-5	3
17-6	0
*17-7	4
17-8 thru 17-11	0
17-12	3
17-13 thru 17-29	0
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17-31 thru 17-33	0
17-34 Blank	0
18-1	3
18-2 Blank	3
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19-2	0
19-3	1
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19-9 thru 19-10	1
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19-12	3
19-13 thru 19-14	1
*19-15	4
19-16 thru 19-18	1
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19-20	1
19-21	3
19-22	1
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19-24A	3
19-24B Blank	3
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19-27	1
*19-28 thru 19-30	4
19-31 thru 19-33	1
19-34	3
19-35 thru 19-39	1
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19-42	1
*19-43	4
19-44	3
*20-1	4
20-2 thru 20-8	1
*20-9 thru 20-10	4
*20-10A	4
*20-10B Blank	4
20-11	1
*20-12	4
20-13	3
20-14	2

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.

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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 differentiat between versions of the same basic model. The following table provides a listing of popular name, model number, and serial.

POPULAR NAME	MODEL YEAR	MODEL	SERIALS BEGINNING	SERIALS ENDING
SKYWAGON - 180	1969	180H	18051994	18052103
	1970	180H	18052104	18052175
	1971	180H	18052176	18052221
	1972	180H	18052222	18052284
	1973	180J	18052285	18052384
	1974	180J	18052385	18052500
	1975	180J	18052501	18052620
180 - SKYWAGON	1976	180J	18052621	
180 - SKYWAGON				
SKYWAGON - 185	1969	A185E	185-1448	185-1599
	1970	A185E	18501600	18501819
	1971	A185E	18501820	18501934
	1972	A185E	18501935	18502090
	1973	A185F	18502091	18502310
	1974	A185F	18502311	18502565
	1975	A185F	18502566	18502838
185 - SKYWAGON	1976	A185F	18502839	
185 - SKYWAGON				
AGcarryall	1972	A185E	18501935	18502090
	1973	A185F	18502091	18502310
	1974	A185F	18502311	18502565
	1975	A185F	18502566	18502838
	1976	A185F	18502839	

SECTION 1

GENERAL DESCRIPTION

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1-1. GENERAL DESCRIPTION.

1-2. MODEL 180-SERIES.

1-3. DESCRIPTION. The Cessna Model 180-Series aircraft, described in this manual, are single-engine, high-wing, strut-braced monoplanes of all-metal, semimonocoque construction. These aircraft are equipped with conventional tailwheel-type landing gear and a six-cylinder, horizontally opposed, air-cooled Continental engine, driving an all-metal, constant speed propeller. The aircraft may be equipped with a pilot seat only, pilot and copilot seats only, pilot and copilot seats, two single-place center seats and one two-place rear seat of fold-away design, or pilot and copilot seats and one two-place rear seat, including a utility shelf.

1-4. MODEL A185-SERIES.

1-5. DESCRIPTION. The Cessna Model A185-Series aircraft, described in this manual, are single-engine, high-wing, strut-braced monoplanes of all-metal, semimonocoque construction. These aircraft are equipped with conventional tailwheel-type landing gear and a six-cylinder, horizontally opposed, air-cooled Continental engine, driving an all-metal, constant speed propeller. These aircraft may be equipped with a pilot seat only, pilot and copilot seats only, pilot and copilot seats, two single-place center seats and one two-place rear seat of fold-away design, or pilot and copilot seats and one two-place rear seat, including a utility shelf.

1-6. AGcarryall.

1-7. DESCRIPTION. The AGcarryall is identical to the Skywagon 185 except that the following items are added as standard equipment. Wire cutters are installed on each main landing gear spring and in front of the windshield on the aircraft centerline. A cable deflector is attached to the top of the windshield wire cutter and extends to bracketry on top of the vertical fin. A copilot seat and dual controls with stowable rudder pedals are provided. The aircraft has additional corrosion-proofing. Large 8.00-6, 6-ply rated main wheel tires are installed. Fueling steps and assist handles are mounted on the forward fuselage, and steps are mounted on the wing struts to aid in refueling the aircraft. Inboard fuel fillers are added when long range fuel tanks are installed. Special exterior styling distinguishes this model as an agricultural spray aircraft. The aircraft is equipped with a Sorensen Spray System. Once installed, all of the described equipment (with the exception of spray booms on the spray system) may be left on the aircraft, regardless of the category being flown.

1-8. 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 tire pressures, tire sizes and load distribution may result in some dimensions that are considerably different from those listed.

1-9. STATIONS. A station diagram is shown in figure 1-2 to assist in locating equipment where a written description is inadequate or impractical.

1-10. 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 values are stipulated. They are not to be used for checking tightness of installed parts during service.

MODELS 180H & 180J

GROSS WEIGHT	2800 lb	
FUEL CAPACITY		
Standard Wing (Total)	65 gal.	When not modified by Cessna Single-Engine Service Letter SE75-7 and prior to 18052364.
Standard Wing (Usable)	60 gal.	
Long-Range Wing (Total)	84 gal.	
Long-Range Wing (Usable)	79 gal.	
Standard Wing (Total)	61 gal.	When modified by Cessna Single-Engine Service Letter SE75-7 and beginning with 18052364.
Standard Wing (Usable)	58 gal.	
Long-Range Wing (Total)	80 gal.	
Long-Range Wing (Usable)	74 gal.	
OIL CAPACITY		
(Without External Filter)	12 qt	
(With External Filter)	13 qt	
ENGINE MODEL	CONTINENTAL O-470 Series	
PROPELLER (Constant Speed)	82" McCAULEY	
MAIN WHEEL TIRES (Standard)	6.00 x 6, 6-ply rating	
Pressure	30 psi	
MAIN WHEEL TIRES (Optional)	8.00 x 6, 6-ply rating	
Pressure	23 psi	
TAILWHEEL TIRE	8.00 x 2.80, 4-ply rating	
Pressure	55 psi to 65 psi (maximum) * * *	
WHEEL ALIGNMENT		
Camber	4° to 6°	
Toe-In	0" to .12"	
AILERON TRAVEL		
Up	20° ± 2°	
Down	14° ± 2°	
WING FLAP TRAVEL (Manually-Operated)	✸	
RUDDER TRAVEL (Measured parallel to Water Line or Perpendicular to Hinge Line)		
Right	24° ± 1°	
Left	24° ± 1°	
STABILIZER TRAVEL		
Up	0° 45'±15'	
Down	8° 45' ±15'	
ELEVATOR TRAVEL (With Stabilizer Full Down)		
Up	25° ± 1°	
Down	23° ± 1°	
PRINCIPAL DIMENSIONS		
Wing Span (Plain Tip)	36' -2"	
Wing Span (Conical-Camber Tip)	35' -10"	
Length	25'-9" (Thru 18052620) 25'-7-1/2" Beginning with 18052621)	
Fin Height (Flashing Beacon Installed on Fin)	7' -9"	
Track Width	7' -8"	
Tail Span	10' -10"	
BATTERY LOCATION	Aft of Baggage Compartment	

✸ 40° (Thru 1972 Models)
10°, +2° -1°; 20°, +2° -1°; 32°, +2° -1°; 40°, +0° -2° (Beginning with 1973 Models)

* * * 55 psi to 65 psi maximum (2300 lb to 2800 lb normal operating loads).

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

MODELS A185E, A185F & AGcarryall

GROSS WEIGHT	3350	
FUEL CAPACITY		
Standard Wing (Total)	65 gal.	When not modified by Cessna Single-Engine Service Letter SE75-7 and Prior to 18502263
Standard Wing (Usable)		
ON/OFF Valve System	62 gal.	
SELECTOR Valve System	59 gal.	
Long-Range Wing (Total)	84 gal.	
Long-Range Wing (Usable)		
ON/OFF Valve System	81 gal.	
SELECTOR Valve System	78 gal.	
Standard Wing (ON/OFF Valve System) Total	61 gal.	When modified by Cessna Single-Engine Service Letter SE75-7 and Beginning with 18502263
Standard Wing (ON/OFF Valve System Usable	58 gal.	
Standard Wing (SELECTOR Valve System)Total	61 gal.	
Standard Wing (SELECTOR Valve System Usuable	58 gal.	
Long Range System (Total)	80 gal.	
Long Range System (Usable)	74 gal.	
OIL CAPACITY		
(Without External Filter)	12 qt	
(With External Filter)	13 qt	
ENGINE MODEL	CONTINENTAL IO-520 Series	
PROPELLER (Constant Speed)	82" McCAULEY	
MAIN WHEEL TIRES (Standard)	6.00 x 6, 6-ply rating	
Pressure	35 psi	
MAIN WHEEL TIRES (Optional)	8.00 x 6, 6-ply rating	
Pressure	26 psi	
TAILWHEEL TIRE	8.00 x 2.80, 4-ply rating	
Pressure	*55 psi to 70 psi (maximum)	
WHEEL ALIGNMENT		
Camber	4° to 6°	
Toe-In	0" to .12"	
AILERON TRAVEL		
Up	20° ± 2°	
Down	14° ± 2°	
WING FLAP TRAVEL (Manually-Operated)	✱	
RUDDER TRAVEL (Measured parallel to Water Line or Perpendicular to Hinge Line)		
Right	24°, +0° -1°	
Left	24°, +0° -1°	
STABILIZER TRAVEL		
Up	0° 45', +45' -15'	
Down	8° 30' ±15'	
ELEVATOR TRAVEL (With Stabilizer Full Down)		
Up	25° ± 1°	
Down	23° ± 1°	
ELEVATOR TRAVEL (With Stabilizer Up)		
Up	29° 40' ±2°	
Down	17° 40' ±1°	
PRINCIPAL DIMENSIONS		
Wing Span (Plain Tip)	36' -2"	
Wing Span (Conical-Camber Tip)	35' -10"	
Length (Thru 18502838)	25' -9"	
(Beginning with 18502839)	25'-7-1/2"	
Fin Height (Flashing Beacon Installed on Fin)	7' -9"	
Track Width	7' -8"	
Tail Span	10' -10"	
BATTERY LOCATION	Aft of Baggage Compartment	

✱ 10°, 20°, 32°, 38°, +2° -1° (Thru 1972 Models)
10°, +2° -1°; 20°, +2° -1°; 32°, +2° -1°; 40°, +0° -2° (Beginning with 1973 Models)

*55 psi to 65 psi maximum (2300 to 3350 lb normal operating loads).

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

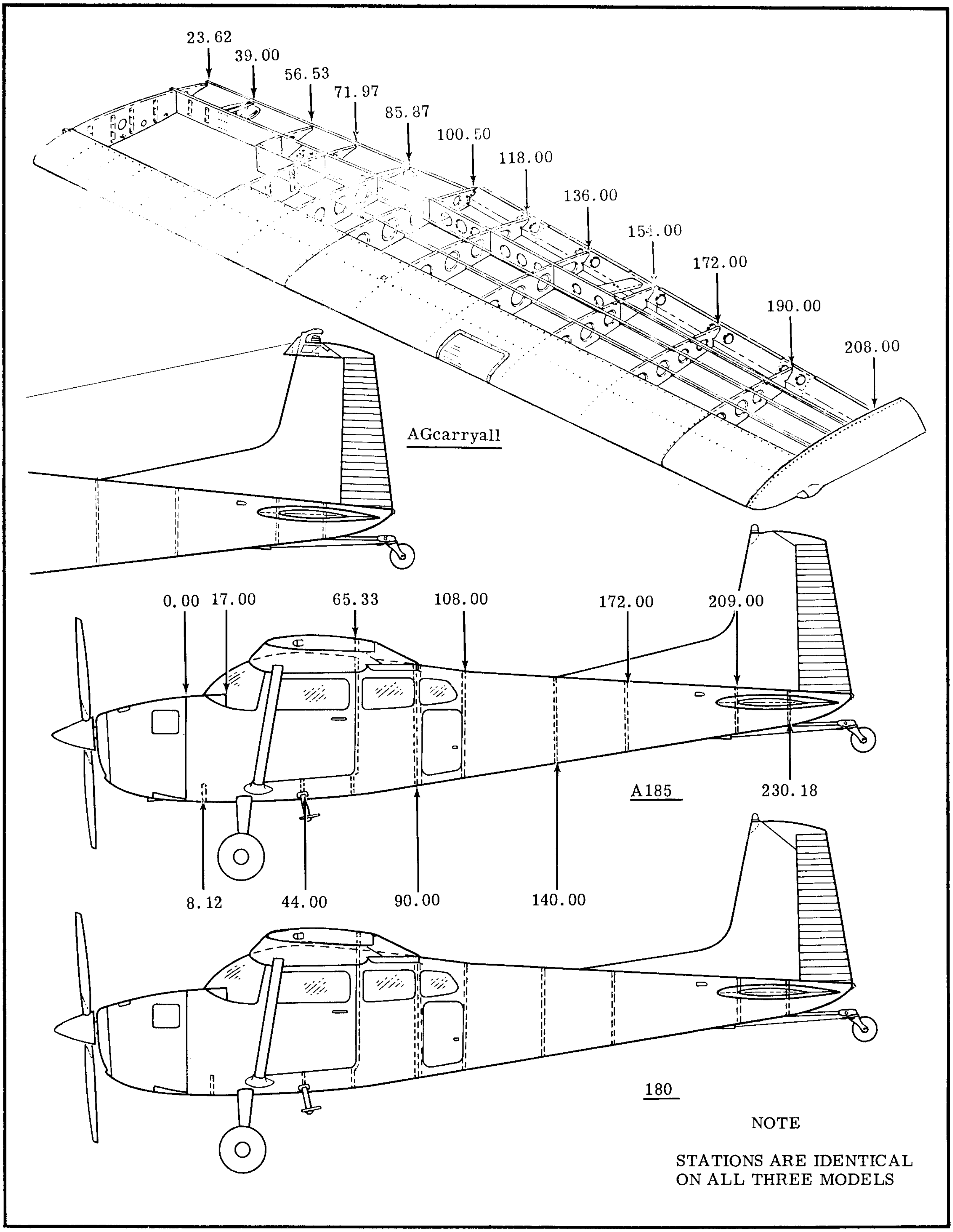

Figure 1-2. Reference Stations

RECOMMENDED NUT TORQUES

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

FINE THREAD SERIES

TAP SIZE	TENSION TORQUE STD (NOTE 1)	TENSION TORQUE ALT (NOTE 2)	SHEAR TORQUE STD (NOTE 3)	SHEAR TORQUE ALT (NOTE 2)
8-36	12-15		7-9	
10-32	20-25	20-28	12-15	12-19
1/4-28	50-70	50-75	30-40	30-48
5/16-24	100-140	100-150	60-85	60-106
3/8-24	160-190	160-260	95-110	95-170
7/16-20	450-500	450-560	270-300	270-390
1/2-20	480-690	480-730	290-410	290-500
9/16-18	800-1000	800-1070	480-600	480-750
5/8-18	1100-1300	1100-1600	660-780	660-1060
3/4-16	2300-2500	2300-3350	1300-1500	1300-2200
7/8-14	2500-3000	2500-4650	1500-1800	1500-2900
1-14	3700-5500	3700-6650	2200-3300	2200-4400
1-1/8-12	5000-7000	5000-10000	3000-4200	3000-6300
1-1/4-12	9000-11000	9000-16700	5400-6600	5400-10000

COARSE THREAD SERIES

TAP SIZE	TENSION (NOTE 4)		SHEAR (NOTE 5)	
8-32	12-15		7-9	
10-24	20-25		12-15	
1/4-20	40-50		25-30	
5/16-18	80-90		48-55	
3/8-16	160-185		95-100	
7/16-14	235-255		140-155	
1/2-13	400-480		240-290	
9/16-12	500-700		300-420	
5/8-11	700-900		420-540	
3/4-10	1150-1600		700-950	
7/8-9	2200-3000		1300-1800	
1-8	3700-5000		2200-3000	
1-1/8-8	5500-6500		3300-4000	
1-1/4-8	6500-8000		4000-5000	

NOTES

1. Covers AN310, AN315, AN345, AN363, MS20365, MS21042, MS21044, MS21045 and MS21046.
2. When using AN310 or AN320 castellated nuts where alignment between the bolt and cotter pin slots is not reached using normal torque values, use alternate torque values or replace the nut.
3. Covers AN316, AN320, MS20364 and MS21245.
4. Covers AN363, MS20365, MS21042, MS21043, MS21044, MS21045 and MS21046.
5. Covers AN340.

CAUTION

DO NOT REUSE SELF-LOCKING NUTS.

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

Figure 1-3. Torque Values

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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 using wing struts and landing gear struts as push points. Steering may be accomplished by using the steerable tailwheel and pivoting the aircraft about the main wheels.

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

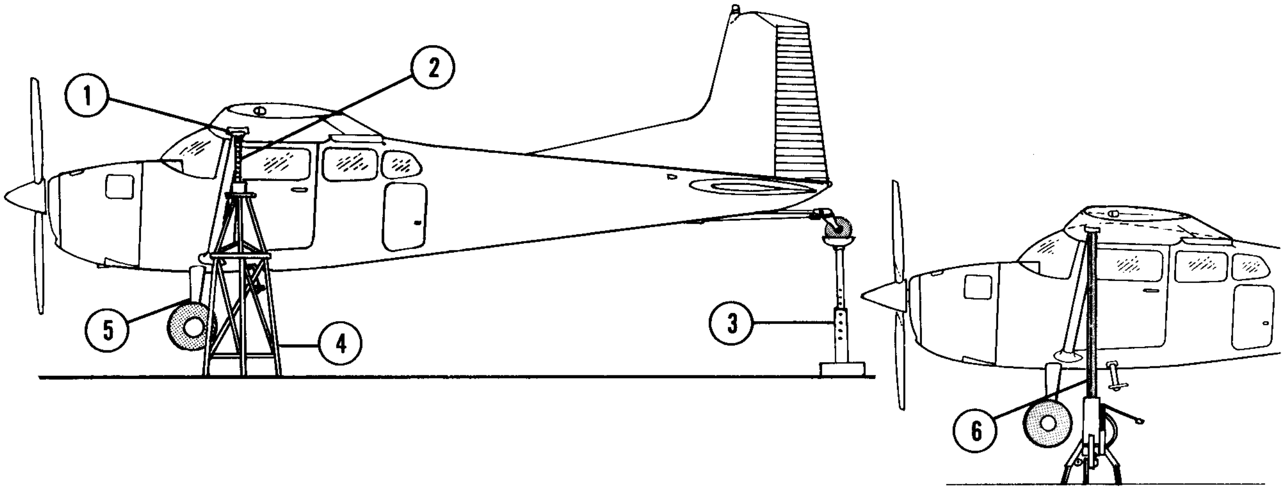
2-4. JACKING. Refer to figure 2-1 for jacking procedures.

CAUTION

When using the universal jack point, 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 universal jack points is not recommended.

2-5. LEVELING. For longitudinal and laterally leveling corresponding points on lower surfaces of both upper door sills are used.

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



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	Universal tail stand	Any tail stand of capable capacity
4	Cessna #SE-576 (41-1/2" high)	Universal jack stand (FOR USE WITH ITEM 2)
5	Cessna #10004-98	Jack Point. (SEE NOTE 5)
6	#2-170 Basic Jack	Closed height: 69-1/2 inches; extended height: 92" (Insert slide tube extension into basic jack)

NOTES

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

2. Place a suitable stand under the tailwheel to raise the tail until aircraft is approximately level before jacking the wings.

3. Be sure tail stand weighs enough to keep tail down and under all conditions that it is strong enough to support any weight that might be placed on it.

4. Operate jacks evenly until desired height is reached.

5. Refer to paragraph 2-3 for procedures for lifting the aircraft with a sling attached at each upper engine mount at the firewall.

CAUTION

When using universal jack point (P/N 10004-98) 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 universal jack points is not recommended.

6. Jacking one wing is not recommended due to landing gear flexibility. However, if adequate precautions against slipping are taken, it is permissible.

Figure 2-1. Jacking Details

2-7. TIE-DOWN. Aircraft tie down should be accomplished in anticipation of high winds as follows:

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

b. Tie down tail through tie-down ring at the tailgear.

c. Install external surface control locks as necessary, if required.

d. Install control lock on pilot's control column if available; if control lock is not available, tie pilot's control wheel back with front seat belt.

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 Preventive Aircraft Engine Oil (Military Specification MIL-C-6529, Type II Rust Ban). This engine oil is a blend of aviation grade straight mineral oil and a cprrosion preventive compound. This engine oil should be used for the first 25 hours of engine operation. Refer to paragraph 2-20 for oil changes during the first 50 hours of engine operation.

During the 30 day non-operational storage or the first 25 hours of intermittent engine operation, the propeller shall be rotated through five revolutions every seventh day, without running the engine. If the aircraft is stored outside, tie it down in accordance with paragraph 2-7. 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.

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, clean oil screens and change external oil filter element. Service engine with correct grade and quantity of engine oil. Refer to figure 2-3 and paragraph 2-20 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 cells with correct grade of gasoline.

b. Clean and wax aircraft thoroughly.

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

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

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

NOTE

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

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

NOTE

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

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

NOTE

The preservative oil must be Lubricating Oil - Contact and Volatile, Corrosion Inhibited, MIL-L-46002, Grade 1, or equivalent. The following oils are approved for spraying by Teledyne Continental Motors: Nucle Oil 105-Daubert Chemicals Co., 4700 So. Central Ave., Chicago, Illinois; Petratect VA-Pennsylvania Refining Co., Butler, Pennsylvania, and Ferro-Gard 1009G-Ranco Laboratories, Inc., 3617 Brownsville Road, Pittsburgh, Pennsylvania.

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

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

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

k. Install spark plugs and connect spark plug leads.

l. Apply preservative oil to the engine interior by spraying approximately two ounces of the preservative oil through the oil filler tube.
m. Seal all engine openings exposed to the atmosphere, using suitable plugs or non-hygroscopic tape. Attach a red streamer at each point that a plug or tape is installed.
n. If the aircraft is to be stored outside, perform the procedures outlined in paragraph 2-7. In addition, the pitot tube, static source vents, air vents, openings in the engine cowling, and other similar openings should have protective covers installed to prevent entry of foreign material.
o. Attach a warning placard to the propeller to the effect that the propeller shall not be moved while the engine is in storage.

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

NOTE

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

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

2-12. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedures to return the aircraft to service.
a. Remove aircraft from blocks. Check tires for proper inflation.
b. Check and install battery.
c. Check that oil sump has proper grade and quantity of engine oil.
d. Service induction air filter and remove warning placard from propeller.
e. Remove materials used to cover openings.
f. Remove spark plugs from engine.
g. While spark plugs are removed, rotate propeller several revolutuins to clear excess rust preventive oil from cylinders.
h. Clean, gap and install spark plugs. Torque plugs to the value specified in Section 11 or 11A; connect spark plug leads.
screen, if necessary. Check fuel cells and fuel lines for moisture and sediment. Drain enough fuel to eliminate moisture and sediment.
j. Perform a thorough pre-flight inspection, then start and warm-up engine.

2-13. 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 in accordance with procedures outlined in paragraph 2-20. Close drain valve or install drain plug.
b. Fill oil sump to normal operating capacity with corrosion preventive mixture recommended in the following note. Thoroughly mix and preheat the preventive to a minimum of 221°F at the time it is added to the engine.

NOTE

Corrosion preventive mixture consists of one part compound MIL-C-6529C, Type I, mixed with three parts new lubricating oil of the grade recommended for service. Continental Motors Corporation recommends Cosmoline No. 1223, supplied by E. F. Houghton & Co., 305 W. LeHigh Avenue, Philadelphia, Pa. During all spraying operations, corrosion preventive mixture is preheated to 221° to 250°F.

c. Immediately after filling the oil sump with a corrosion preventive mixture, fly the aircraft for a period of time not to exceed a maximum of 30 minutes.
d. After flight, with engine operating at 1200 to 1500 rpm, and induction air filter removed, spray corrosion preventive mixture into induction airbox, at the rate of one-half gallon per minute. Spray until heavy black smoke comes from exhaust stack. Then increase the spray until engine is stopped.

CAUTION

Spraying the mixture too fast can cause a hydrostatic lock.

e. Do not rotate propeller after completing step "d."
f. Remove all spark plugs and spray corrosion preventive mixture, which has been preheated to 221° to 240°F., into all spark plug holes to thoroughly cover interior surfaces of cylinders.
g. Install spark plugs or solid plugs into the lower spark plug holes and install dehydrator plugs in the upper spark plug holes. Be sure that dehydrator plugs are blue in color when installed.
h. Cover spark plug lead terminals with shipping plugs (AN4060-1), or other suitable covers.
i. With throttle in full open position, place a bag of desiccant in the induction air intake and seal opening with moisture resistant paper and tape.
j. Place a bag of desiccant in the exhaust tailpipe and seal openings with moisture resistant tape.
k. Seal cold air inlet to the heater muff with moisture resistant tape.
l. Seal engine breather tube by inserting a protex plug in the breather hose and clamping in place.
m. Seal all other engine openings exposed to atmosphere, using suitable plugs or non-hygroscopic tape.

NOTE

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

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

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 60 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 protex plugs have changed color in one half of the cylinders, all desiccant material in the engine should be replaced with new material.
d. Respray the cylinder interiors with corrosion preventive mixture every 6 months.

NOTE

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

2-15. RETURNING AIRCRAFT TO SERVICE. After indefinite storage, use the following procedure to return the aircraft to service.
a. Remove aircraft from blocks. Check tires for correct inflation.
b. Check and install battery.
c. Remove all materials used to seal and cover openings.
d. Remove warning placards posted at throttle and propeller.
e. Remove and clean engine oil screen, then reinstall and safety. On aircraft equipped with an external oil filter, install new filter element.
f. Remove oil sump drain plug or open drain valve and drain sump. Install or close drain valve and safety.
g. Service and install the induction air filter.

NOTE

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

h. Remove protex plugs and spark plugs or plugs installed in spark plug holes. Rotate propeller several revolutions by hand to clear corrosion preventive mixture from cylinders.
i. Clean, gap and install spark plugs. Torque spark plugs to 330±30 lb-in and connect leads.
j. Check fuel strainer. Remove and clean filter screen. Check fuel cells and fuel lines for moisture and sediment. Drain enough fuel to eliminate moisture and sediment.
k. Perform a thorough pre-flight inspection, then start and warm-up engine.
l. Thoroughly clean and test-fly aircraft.

2-16. SERVICING.

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

2-18. FUEL. Fuel cells should be filled immediately after flight to lessen moisture condensation. Cell capacities are listed in figure 1-1. Recommended fuel grade is shown in figure 2-2.

2-19. FUEL DRAINS. Fuel drains are located at various points in the fuel system to provide for drainage of water and sediment. These aircraft are equipped with a fuel strainer drain which may be operated by a control located adjacent to the engine oil dipstick. For location of other drain points, refer to Section 12. Remove drain plugs or valves and open strainer drain at the intervals specified in figure 2-2 to drain water and sediment from the fuel system. Also, during daily inspection of the fuel strainer, if any water is found in the strainer, there is a possibility that wing fuel cell sumps, lines and accumulator tank might contain water. Therefore, all drain plugs/valves should be removed and all water drained from the system. To activate drain valve for fuel sampling, place cup up to valve and depress valve with rod protruding from cup. (Refer to figure 12-3.)

2-20. ENGINE OIL. Check engine lubricating oil with the dipstick five to ten minutes after the engine has been stopped. The aircraft should be in as near a level position as possible when checking the engine oil, so that a true reading is obtained. Engine oil should be drained while the engine is still hot, and the nose of the aircraft should be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump. Engine oil should be changed every six months, even though less than the specified hours have accumulated. Reduce these intervals for prolonged operations in dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered, which cause sludging conditions. Always change oil and clean oil screens whenever oil on the dipstick appears dirty. Ashless dispersant oil, conforming to Continental Motors Specification No. MHS-24A, shall be used in these engines. Multi-viscosity oil may be used to extend the operating temperature range, improve cold engine starting and lubrication of the engine during the critical warm-up period, thus permitting flight through wider ranges of climate change without the necessity of changing oil. The multi-viscosity grades are recommended for aircraft engines subjected to wide variations in ambient air temperatures when cold starting of the engine must be accomplished at temperatures below 30°F.

NOTE

New or newly overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. The aircraft is delivered from Cessna with straight mineral oil (MIL-C-6529, Type II, RUST BAN). If oil must be added during the first 25 hours, use only aviation grade straight mineral oil conforming to Specification MIL-6082. After the first 25 hours of operation, drain engine oil sump and clean both the oil suction strainer and the oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with straight mineral oil and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

When changing engine oil, remove and clean oil screens, or install a new filter element on aircraft equipped with an external oil filter. An oil quick-drain valve may be installed. This valve provides a quick and cleaner method of draining the engine oil. This valve is installed in the oil drain port of the oil sump. To drain the oil, proceed as follows:

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

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

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

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

e. Remove and clean oil screen.

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

NOTE

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

2-21. ENGINE INDUCTION AIR FILTER. The induction air filter keeps dust and dirt from entering the induction system. The value of maintaining the air filter in a good clean condition can never be overstressed. More engine wear is caused through the use of a dirty or damaged air filter than is generally believed. The frequency with which the filter should be removed, inspected, and cleaned will be determined primarily by aircraft operating conditions. A good general rule however, is to remove, inspect, and clean the filter at least every 50 hours of engine operating time and more frequently if warranted by operating conditions. Some operators prefer to hold spare induction air filters at their home base of operation so that a clean filter is always readily available for use. Under extremely dusty conditions, daily servicing of the filter is recommended. These aircraft use a dry, paper-media filter. To service the dry type filter, proceed as follows:

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

NOTE

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

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

CAUTION

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

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

NOTE

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

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 install new filter if filter is damaged.
f. Install filter. Be sure gasket on aft face of filter is in good condition.

2-22. VACUUM SYSTEM FILTER. These aircraft are equipped with a central air filter to keep dust and dirt from entering the vacuum-operated flight instruments. Filter should be changed every 500 hours of operation and whenever suction gage reading drops below 4.6 inches of mercury. The system should not be operated at any time without a filter, nor are the lines to be left open when performing maintenance on the vacuum system, as minute particles of dust or other foreign materials may enter the open lines and will severely damage the delicate gyro instruments.

2-23. BATTERY servicing involves adding distilled water to maintain the electrolyte even with the horizontal baffle plate at the bottom of filler holes, checking the battery cable connections, and neutralizing and cleaning off any spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and water to neutralize electrolyte or corrosion. Follow with a thorough flushing with water. Brighten cables and terminals with a wire brush, then coat with petroleum jelly before connecting. The battery box also should be checked and cleaned if any corrosion is noticed. Distilled water, not acid or "rejuvenators," should be used to maintain electrolyte level. Check the battery every 50 hours (or at least every 30 days), oftener in hot weather. See Section 17 for detailed battery replacement and testing.

2-24. TIRES should be maintained at the air pressures specified in the charts in Section 1. When checking tire pressure, examine tire for wear, cuts, bruises, and slippage. Remove oil and grease with soap and water.

NOTE

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

2-25. HYDRAULIC BRAKE SYSTEM. The system should be checked and the brake master cylinders refilled with fluid at least every 200 hours of operation. The system should be bled of entrapped air whenever there is a spongy response to the brake pedals.

2-26. CASTERING AXLE. Check and refill if required per Section 5, at each 100-hour inspection.

2-27. OXYGEN CYLINDER. Refer to Section 14.

2-28. FACE MASKS. Refer to Section 14.

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

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

CAUTION

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

2-32. PLASTIC TRIM. The instrument panel, plastic trim, plastic control wheels, 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 2-27, must never be used since they soften and craze the plastic.

2-33. 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.

2-34. PAINTED SURFACES. The painted exterior surfaces of the aircraft, under normal conditions, require a minimum of polishing or buffing. Approximately 15 days are required for acrylic or lacquer paint to cure completely and approximately 90 days are required for vinyl paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the aircraft. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by an experienced painter. Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which 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 airplane may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings and tail and on the engine nose cap will help reduce the abrasion encountered in these areas.

2-35. ENGINE COMPARTMENT. Cleaning is essential to minimize any danger of fire, and for proper inspection of components. The engine and engine compartment may be washed down with a suitable solvent, then dried thoroughly.

CAUTION

Particular care should be given to electrical equipment before cleaning. Solvent should not be allowed to enter magnetos, starters, alternators, voltage regulators, and the like. Hence, these components should be protected before saturating the engine with solvent. Any oil, fuel, and air openings on the engine and accessories should be covered before washing the engine with solvent. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

2-36. UPHOLSTERY AND INTERIOR. Cleaning prolongs the life of upholstery fabrics and interior trim. To clean the interior:

a. Empty the ash trays.

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

c. Wipe leather, Royalite, and plastic surfaces with a damp cloth.

d. Soiled upholstery fabrics and carpeting 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 backing materials.

f. Scrape off sticky materials with a dull knife, then spot clean the area.

2-37. PROPELLERS. Wipe propellers occasionally with an oily cloth to clean off grass and bug stains. In salt water areas, this will assist in corrosion-proofing the propeller.

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

2-39. LUBRICATION.

2-40. Lubrication requirements are shown in the Lubrication Chart (figure 2-3). Before adding grease to grease fittings, wipe off all dirt. Lubricate until new grease appears around parts being lubricated, and wipe off excess grease. The following paragraphs supplement this figure by adding details.

2-41. RUDDER TRIM WHEEL THREADS. Spray the rudder trim wheel threads with Electrofilm Lubri-Bond "A" which is available in aerosol spray cans.

2-42. TACHOMETER DRIVE SHAFT. Refer to Section 15 for lubrication.

2-43. WHEEL BEARING LUBRICATION. It is recommended that nose and main wheel bearings be cleaned and repacked at the first 100-hour inspection and at each 500-hour inspection thereafter. If more than the usual number of take-off and landings are made, extensive taxiing is required, or the airplane is operated in dusty areas or under seacoast conditions, it is recommended that cleaning and lubrication of wheel bearings be accomplished at each 100-hour inspection.

2-44. CASTERING AXLE. Lubricate pivot pin during assembly. Also lubricate the pivot pin through the grease fittings after assembly and at each 100-hour inspection.

2-45. 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 selector valve OFF, remove carburetor drain plug and clean off any sealant present on the end of the plug or in the threads on the plug.

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

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

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

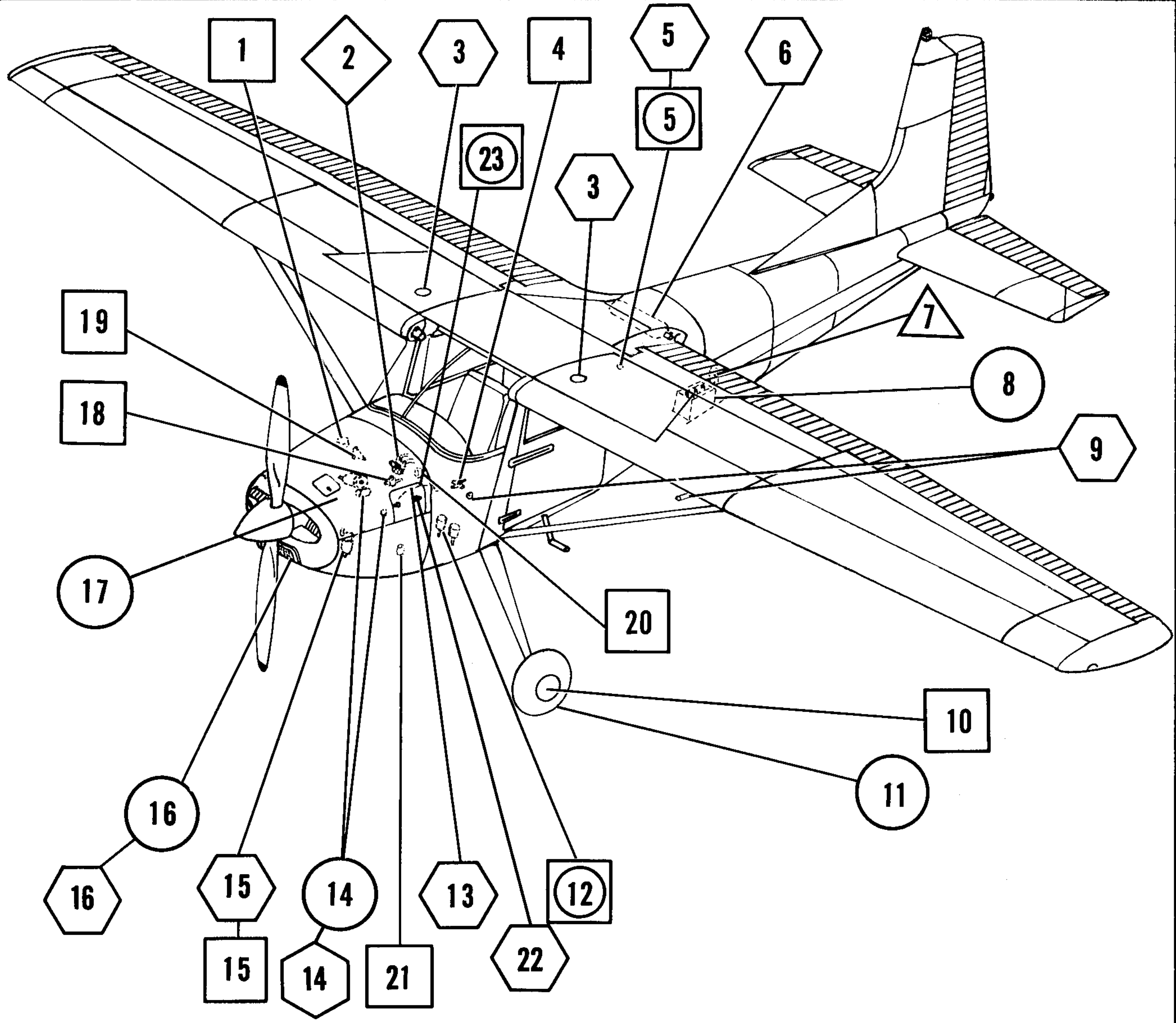
e. Install drain plug as follows:

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

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

3. Tighten and safety drain plug.

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



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

RECOMMENDED FUEL:

ENGINE MODEL O-470-Series CONTINENTAL

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

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

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

RECOMMENDED FUEL (Cont).

ENGINE MODEL IO-520-Series CONTINENTAL

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

FUEL: 1. MINIMUM: 100/130 Aviation Grade
2. ALTERNATE:
a. 115/145 Aviation Grade (with lead content limited to a maximum of 4.6 cc Tetraethyl lead per gallon).

RECOMMENDED ENGINE OIL:

ENGINE MODEL O-470-Series CONTINENTAL

AVIATION GRADE:

ABOVE	40° F	SAE 50
BELOW	40° F	SAE 30

Aviation Grade ashless dispersant oil, conforming to Continental Motors Specification MHS-24 and all revisions and supplements thereto, must be used except as noted in paragraph 2-20. Refer to Continental Aircraft Engine Service Bulletin M75-2 and any superseding bulletins, revisions or supplements thereto, for further recommendations.

ENGINE MODEL IO-520-Series CONTINENTAL

AVIATION GRADE:

ABOVE	40° F	SAE 50
BELOW	40° F	SAE 30

Aviation Grade ashless dispersant oil, conforming to Continental Motors Specification MHS-24 and all revisions and supplements thereto, must be used except as noted in paragraph 2-20. Refer to Continental Aircraft Engine Service Bulletin M75-2 and any superseding bulletins, revisions or supplements thereto, for further recommendations.

SHOP NOTES:

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

DAILY

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

5 FUEL CELL DRAINS
Drain off any water and sediment before first flight of the day.

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

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

13 OIL DIPSTICK
Check on preflight. Add oil as necessary. Refer to paragraph 2-20 for details.

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

16 INDUCTION AIR FILTER
Inspect and service under dusty conditions. Refer to paragraph 2-21 for details.

6 OXYGEN CYLINDERS
Check for anticipated requirements before each oxygen flight. Refer to Section 14 for details.

FIRST 25 HOURS

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

50 HOURS

11 TIRES
Maintain correct tire pressure as listed in figure 1-1. Also refer to paragraph 2-24.

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

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

14 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.

17 SPARK PLUGS
Remove, clean and re-gap all spark plugs. Refer to Section 11 or 11A for details.

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

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100 HOURS

1 FUEL/AIR CONTROL UNIT SCREEN

Remove and clean screen in bottom of fuel/air control unit on fuel-injected engines. then reinstall and safety screen.

15 FUEL STRAINER

Disassemble and clean strainer bowl and screen.

19 VACUUM SYSTEM OIL SEPARATOR

Remove, flush with solvent, and dry with compressed air.

VACUUM RELIEF VALVE FILTER SCREEN

Remove, flush with solvent, and dry with compressed air.

20 ALTERNATOR SUPPORT BRACKET

Check alternator support bracket for security and cracking. (Refer to Service Letter SE71-42.)

21 CARBURETOR DRAIN PLUG

Refer to paragraph 2-45 for servicing procedures.

10 CASTERING AXLE

Check and refill if required. Refer to Section 5.

200 HOURS

23 VACUUM RELIEF VALVE FILTER

Change each 1000 hours or to coincide with engine overhauls.

5 FUEL CELL SUMP DRAINS

Drain off any water or sediment.

12 BRAKE MASTER CYLINDERS

Check fluid level and refill as required with hydraulic fluid. Refer to paragraph 2-25 for details.

500 HOURS

2 VACUUM SYSTEM CENTRAL AIR FILTER

Replace every 500 hours.

AS REQUIRED

7 GROUND SERVICE RECEPTACLE

Connect to 12-volt, DC, negative-ground power unit for cold weather starting and lengthy ground maintenance of the aircraft's electrical equipment with the exception of electronic equipment. Master switch should be turned on before connecting a generator type or battery type external power source. Refer to Section 16.

The ground power receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is connected correctly to the aircraft.

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

FREQUENCY (HOURS)

50 | 100 | 500

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

METHOD OF APPLICATION

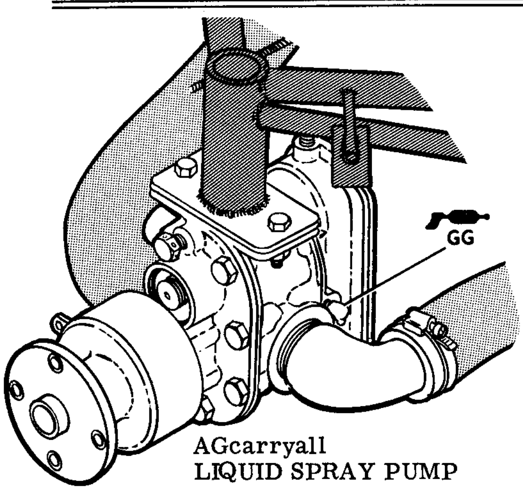
HAND | GREASE GUN | OIL CAN | SYRINGE (FOR POWDERED GRAPHITE)

NOTE

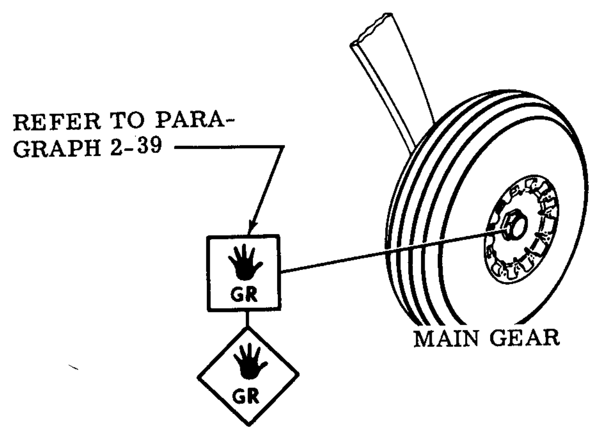
The military specifications listed are not mandatory, but are intended as guides in choosing satisfactory materials. Products of most reputable manufacturers meet or exceed these specifications.

LUBRICANTS

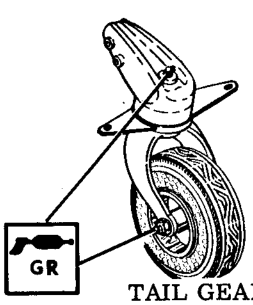
PG	SS-G-659A	POWDERED GRAPHITE
GR	MIL-G-81322A	GENERAL PURPOSE GREASE
GH	MIL-G-23827A	AIRCRAFT AND INSTRUMENT GREASE
GL	MIL-G-21164C	HIGH AND LOW TEMPERATURE GREASE
OG	MIL-L-7870A.	GENERAL PURPOSE OIL
PL	VV-P-236	PETROLATUM
GS	MIL-S-8660	DOW CORNING DC4
GG		MARFAX #2 (TEXACO)



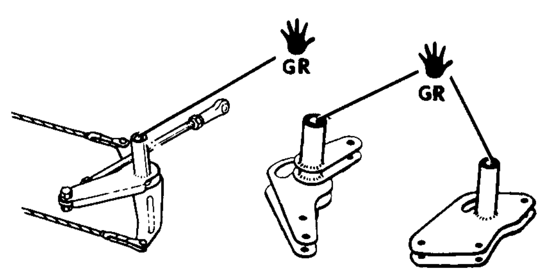
AGcarryall
LIQUID SPRAY PUMP



WHEEL BEARINGS



TAIL GEAR



AILERON AND WING
FLAP BELLCRANK
NEEDLE BEARINGS

LUBRICATION

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

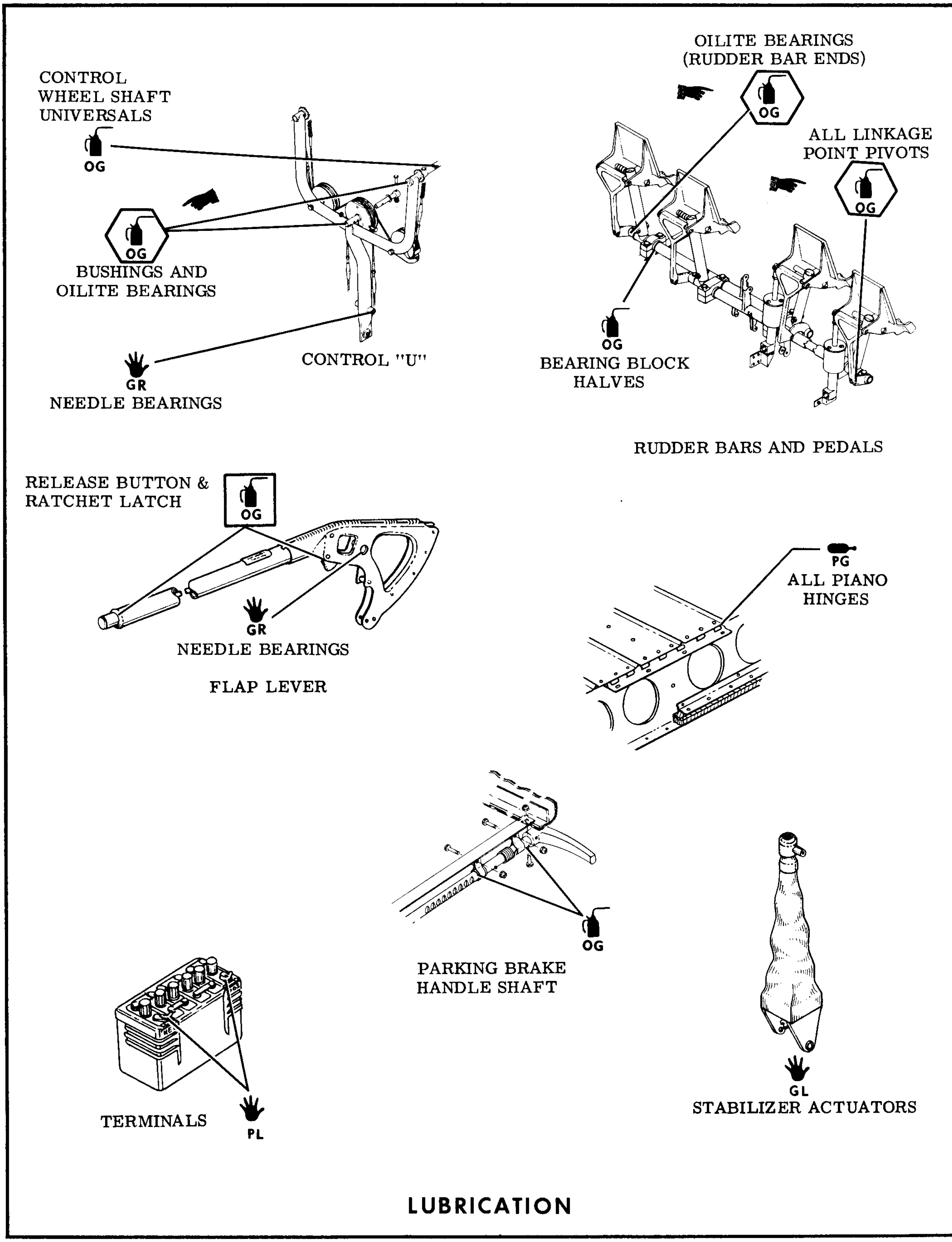
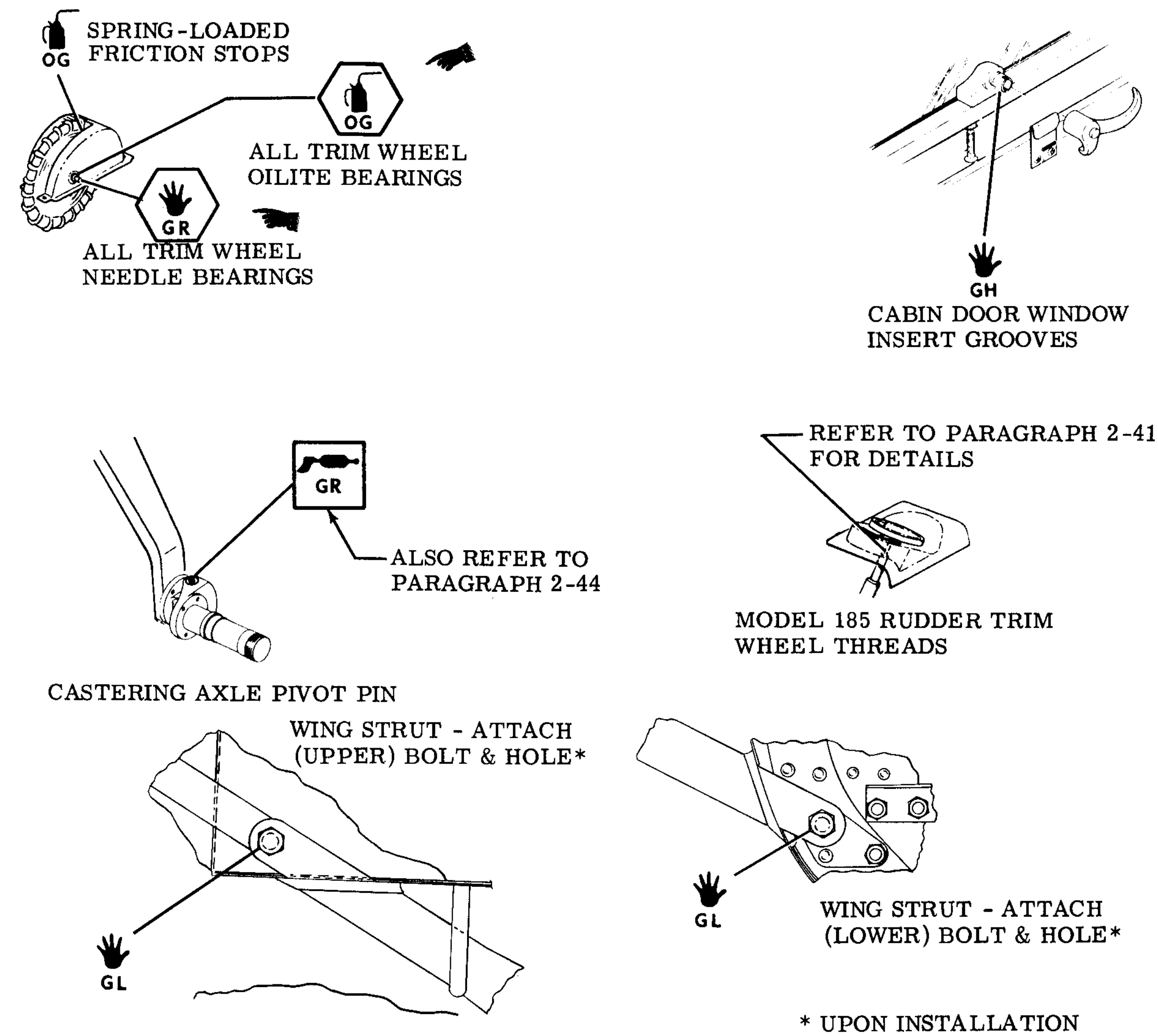


Figure 2-3. Lubrication (Sheet 2 of 3)



NOTES

Sealed bearings require no lubrication.

McCauley propellers are lubricated at overhaul and require no other 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.

LUBRICATION

Figure 2-3. 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 not of any discrepancies or abnormalities:

1. Engine temperatures and pressures.
2. Static rpm. (Also refer to Section 11 or 11A of this Manual.)
3. Magneto drop. (Also refer to Section 11 or 11A 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

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
PROPELLER.				
1. Spinner	●			
2. Spinner bulkhead			●	
3. Blades	●			
4. Bolts and/or nuts			●	
5. Hub			●	
6. Governor and control			●	
ENGINE COMPARTMENT.				
Check for evidence of oil and fuel leaks, then clean entire engine and compartment, if needed, prior to inspection.				
1. Engine oil, screen, filler cap, dipstick, drain plug and external filter element	●			1
2. Oil cooler		●		
3. Induction air filter	●			2
4. Induction airbox, air valves, doors and controls		●		
5. Cold and hot air hoses			●	
6. Engine baffles	●			
7. Cylinders, rocker box covers and push rod housings		●		
8. Crankcase, oil sump, accessory section and front crankshaft seal		●		
9. Hoses, metal lines and fittings	●			3
10. Intake and exhaust systems	●			4
11. Ignition harness		●		
12. Spark plugs		●		
13. Compression check			●	
14. Crankcase and vacuum system breather lines			●	
15. Electrical wiring		●		
16. Vacuum pump and oil separator		●		
17. Vacuum relief valve filter			●	5
18. Engine controls and linkage	●			6
19. Engine shock mounts, 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 rings				7
25. Voltage regulator mounting and electrical leads		●		
26. Magnetos (externally) and electrical connections		●		
27. Magneto timing				8
28. Carburetor and drain plug (Refer to paragraph 2-45)		●		
29. Firewall			●	
30. Fuel injection fuel-air control unit, fuel pump, fuel manifold valve, fuel lines and nozzles		●		
31. Fuel-air control unit screen		●		
32. Alternator support bracket for security (Also refer to Service Letter SE71-42.)		●		
FUEL SYSTEM.				
1. Fuel strainer, drain valve and control	●			
2. Fuel strainer screen and bowl		●		
3. Fuel cell vents, caps and placards	●			
4. Fuel cells, sump drains and fuel line drains			●	
5. Drain fuel and check cell interior, attachment and outlet screens				5
6. Fuel vent valves			●	
7. Fuel vent line drains			●	
8. Fuel shut-off valve and placards	●			
9. Fuel quantity gage and transmitter units		●		
10. Fuel selector valve and placards	●			
11. Electric fuel pump, throttle switch and electrical connections	●			
12. Engine primer		●		
13. Vapor return line and check valve			●	
LANDING GEAR				
1. Main gear wheels	●			

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
2. Main gear spring strut	●			
3. Main and tail gear wheel bearings				9
4. Brake fluid, lines and hoses, brake assemblies and master cylinders			●	
5. Parking brake system			●	
6. Tailwheel steering, cables and spring tube			●	
7. Tailwheel friction check (Refer to Section 5)			●	
AIRFRAME.				
1. Aircraft exterior	●			
2. Aircraft structure		●		
3. Windows, windshield, doors and seals	●			
4. Seat belts and shoulder harnesses	●			
5. Seat stops, seat rails, upholstery, structure and mounting			●	
6. Control "U" bearings, sprockets, pulleys, cables, chains and turnbuckles			●	
7. Instrument and markings	●			
8. Magnetic compass compensation				5
9. Instrument wiring and plumbing			●	
10. Instrument panel, decals and labeling		●		
11. Heating and ventilating systems and controls	●			
12. Lines, hoses, wires and control cables			●	
13. Electrical horns, lights, switches and circuit breakers	●			
14. Exterior lights	●			
15. Pitot and static systems			●	
16. Stall warning sensing unit and pitot and stall warning heaters			●	
17. Radios and radio controls	●			
18. Antennas and cables			●	
19. Battery, battery box and battery cables	●			
20. Battery electrolyte				10
21. Oxygen system			●	
22. Oxygen supply, masks and hoses	●			11

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
23. Emergency locator transmitter		●		12

CONTROL SYSTEMS

In addition to the items listed below, alwasy 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, cableguards, turnbuckles and fairleads			●	
2. Chains, terminals, sprockets and chain guards			●	
3. Trim control wheel, indicator and actuator	●			
4. Travel stops			●	
5. Decals and labeling			●	
6. Flap control lever latch, flap rollers and tracks	●			
7. Elevator downspring system	●			
8. Rudder pedal assemblies and linkage			●	
9. Skins (external) of control surfaces and tabs	●			
10. Internal structure of control surfaces			●	
11. Balance weight attachment			●	

SPECIAL INSPECTION ITEMS

1 First 25 hours: (refill with straight mineral oil and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil. Change oil 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 six months.

2 Clean filters per paragraph 2-21. Replace as required.

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

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

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

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

7 Each 500 hours

8 Refer to Section 11 or 11A for magneto timing procedures.

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

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

11 Inspect masks, hose and fittings for condition, routing and support. Test operate and check for leaks.

12 Refer to Section 16 of this Manual.

NOTE

A high-time inspection is merely a 100-hour inspection with the addition of an engine overhaul. Continental Motors Corporation Inc. recommends overhaul at 1500 hours for the O-470 series engines and overhaul at 1500 hours for the IO-520 series engines, except as stipulated in Continental aircraft engine Service Bulletin #M74-20 and supplements thereto. At the time of overhaul, engine accessories should be overhauled.

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

SECTION 3

FUSELAGE

TABLE OF CONTENTS

3-1. FUSELAGE.

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

3-3. DESCRIPTION. The windshield is a single-piece acrylic plastic panel set in sealing strips and held by formed retainer strips riveted to the fuselage. Presstite No. 579.6 sealing compound used in conjunction with a felt strip is applied to all edges of the windshield. If desired, EC-1202 tape, which is available in different widths and thicknesses, can be used as a sealant at all edges of the windshield.

3-4. REMOVAL.

a. Remove screws and attaching parts at windshield centerstrip.

b. Drill out all rivets securing retainer strip at front of windshield.

c. Remove wing fairings over windshield edges.

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

3-5. INSTALLATION.

a. Apply felt strip and sealing compound or sealing tape to all edges of windshield to prevent leaks.

b. Reverse steps listed in preceding paragraph for installation.

c. When installing a new windshield, check the 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 an upper corner and gradually working windshield into position is recommended.

NOTE

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

3-6. WINDOWS. (Refer to figures 3-2 and 3-3.)

3-7. DESCRIPTION. The windows are classified into two types which are movable and fixed. All windows are acrylic plastic.

3-8. MOVABLE. Movable windows, hinged at the

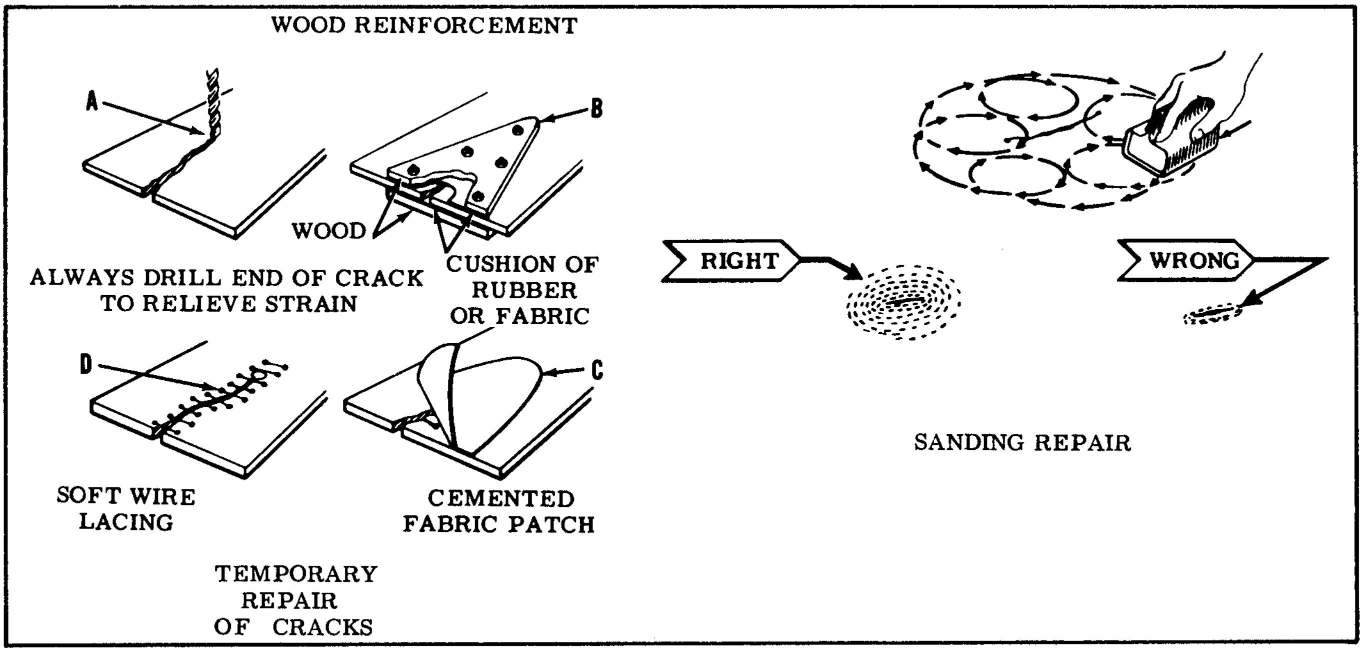


Figure 3-1. Repair of Windshields and Windows

top, are installed in the cabin doors. The window assemblies may be removed by pulling the hinge pins and disconnecting the window stops. To remove the frame from the plastic panel, drill out the blind rivets at the frame splice. When replacing the plastic panel in a frame, make sure that the sealing strip, current production models use an extruded rubber channel, and an adequate coating of Presstite No. 579.6 sealing compound is used around all edges of the plastic panel.

3-9. FIXED. Fixed windows are mounted in sealing strips and sealing compound and are held in place by various retainer strips. Beginning with 1974 models thicker windows with new retainers are installed. Rubber extruded channel is used around all edges of the window. Presstite 579.6 Sealer (Presstite Engr. Co., St. Louis, Mo.) or equivalent is used to moisture seal under outside crimped area. To replace the side windows, remove upholstery and trim panels, then drill out rivets as necessary to remove the retainer strips.

3-9A. OPTIONAL FIXED DOOR WINDOW.

3-9B. DESCRIPTION.

Beginning with 1974 models an optional cabin door may be installed with a fixed window installed in the lower section of the door. This window is installed with a one piece retainer and a rubber channel around the edges of the window glass.

3-9C. REMOVAL AND INSTALLATION.

1. Remove door handle, latch plate and upholstery.
2. Remove the rivets common to the (4) tie-channels that support the window retainer and remove the rivets common to the retainer from the outside skin and remove window.
3. Install by reversing the procedure, seal around the edge of the window with 579.6 sealer (Presstite Engr. Co., St, Louis Mo.) or equivalent. Fill the void between rubber seal and edge of retainer (Item 27) before positioning the window assembly in the door.

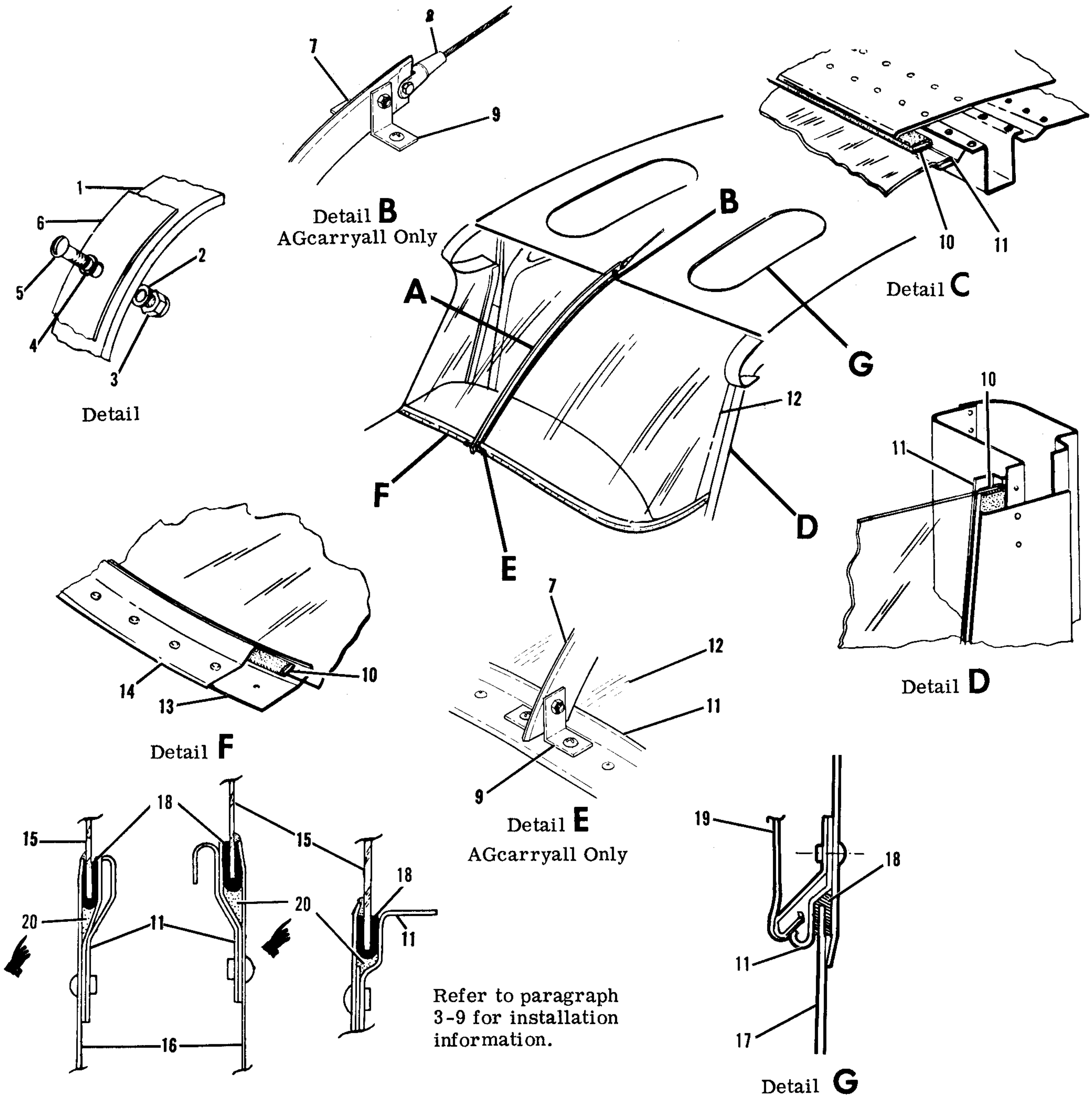
3-10. CLEANING. (Refer to Section 2.)

3-11. 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 the wax to a high polish by rubbing lightly with a clean, dry flannel cloth.

3-12. REPAIRS. Damaged window panels and windshield may be removed and replaced if the damage is extensive. However, certain repairs as prescribed in the following paragraphs can be made successfully without removing the damaged part from the 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 the repair would be likely to affect the 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.

3-13. 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 the surface around the scratch with a circular motion, keeping the abrasive constantly wet with clean water to prevent scratching the surface further. Use minimum pressure and cover an area large enough to prevent the formation of "bull's-eyes" or other optical distortions.



TYPICAL METHODS OF RETAINING FIXED WINDOWS

BEGINNING WITH AIRCRAFT SERIAL 18052385 AND 18502311

NOTE

Presstite 579.6 Sealer should be applied to all edges of windshield and windows before installation.

1. Inner Centerstrip
2. Washer
3. Nut
4. Washer
5. Screw
6. Outer Centerstrip
7. Wire Cutter
8. Deflector Cable
9. Bracket
10. Felt Seal
11. Retainer Strip
12. Windshield
13. Inner Retainer Strip
14. Outer Retainer Strip
15. Window
16. Fuselage Skin
17. Skylight
18. Rubber Channel
19. Upholstery
20. Sealer

Figure 3-2. Windshield and Fixed Window Installation

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

d. Apply fresh tallow or buffing compound to a motor-driven buffing wheel. Hold the wheel against the 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 it will require a considerably longer period of time to attain the same result as produced by a buffing wheel.

e. When buffing is finished, wash the area thoroughly and dry it with a soft flannel cloth. Allow the surface to cool and inspect the area to determine if full transparency has been restored. Then 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 the wax has hardened, dissipate this charge by rubbing the surface with a slightly damp chamois. This will also remove the 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.

3-14. CRACKS. (Refer to figure 3-1.)

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

b. Temporary repairs to flat surfaces can be effected by placing a thin strip of wood over each side of the surface and then 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.

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

3-15. CABIN DOORS. (Refer to figure 3-3.)

3-16. REMOVAL AND INSTALLATION. Removal of cabin doors is accomplished by removing the screws which attach the hinges and door stop or by removing the hinge pins attaching the door and door stop. If the permanent hinge pins are removed from the door hinges, they may be replaced by clevis pins secured with cotter pins or new hinge pins may be installed and "spin-bradded." When fitting a new door, some trimming of the door skin at the edges and some forming of the door edges with a soft mallet may be necessary to achieve a good fit. Beginning with 1974 models an optional cabin door may be installed that has a fixed window in the lower section of the door as well as a movable bubble window. This window has (2) latch locks installed. The movable window is installed in the same frame as the flat window. Removal is the same as for removal of the flat window. Refer to paragraph 3-9C for the removal of the lower window. Other components of the door are the same as the solid door except for structure difference (Refer to figure 3-3, sheet 2).

3-17. ADJUSTMENT. The cabin door should be adjusted so the skin fairs as nearly flush with the fuselage skin as possible.

NOTE

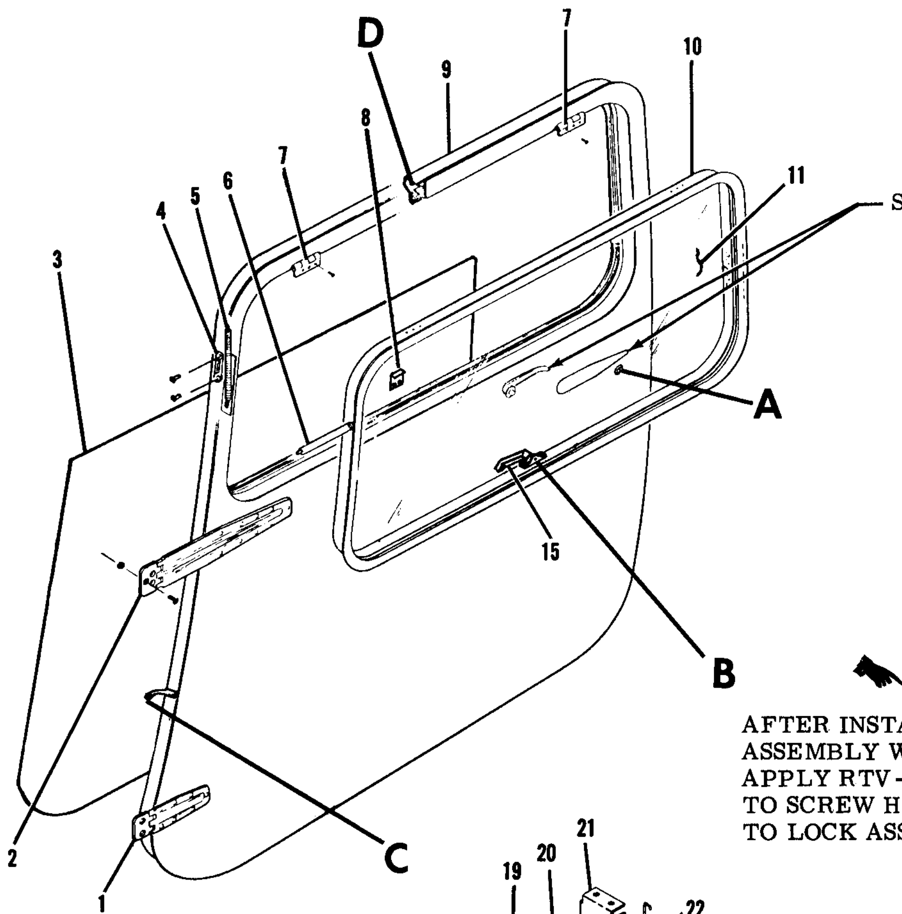
Maximum allowable mismatch is .10 inch with door closed but not locked.

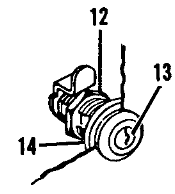
Slots at the latch plate permit repositioning of the striker plate. Depth of latch engagement may be changed by adding or removing washers or shims between the striker plate and the doorpost.

3-18. WEATHERSTRIP. A weatherstrip is cemented around all edges of the door. New weatherstrip may be applied after mating surfaces of weatherstrip and door are clean, dry and free from oil or grease. Apply a thin, even coat of adhesive to each surface and allow to dry until tacky before pressing strip in place. Minnesota Mining and Manufacturing Co. No. EC-880 cement is recommended.

3-19. CABIN DOOR LATCHES. (Refer to figure 3-4.)

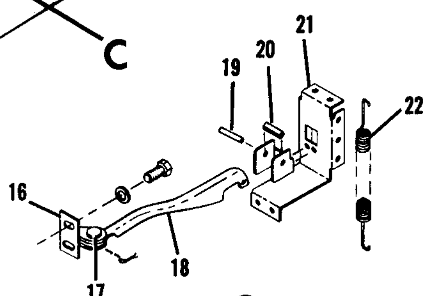
3-20. DESCRIPTION. The cabin door latch is a push-pull bolt type, utilizing a rotary clutch for positive bolt engagement. As the door is closed, teeth on the underside of the bolt engage the gear teeth on the clutch. The clutch gear rotates in one direction only and holds the door until the handle is moved to the LOCK position, driving the bolt into the slot.



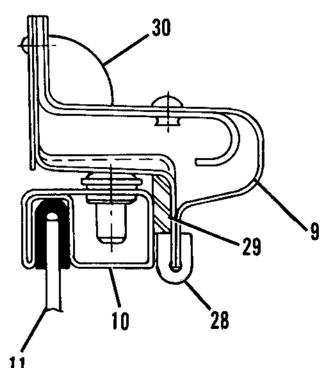


Detail A

NOTE
AFTER INSTALLING CAM TO LOCK ASSEMBLY WITH SCREW AND WASHER APPLY RTV-102 SILICONE SEALANT TO SCREW HEAD TO SECURE SCREW TO LOCK ASSEMBLY.



Detail C



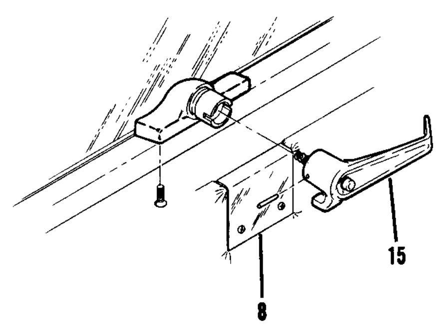
Detail D

BEGINNING WITH SERIAL 18052341 AND 18502218

Note

Refer to Section 18 before painting area contacted by nylon seal.

STANDARD DOOR INSTALLATION

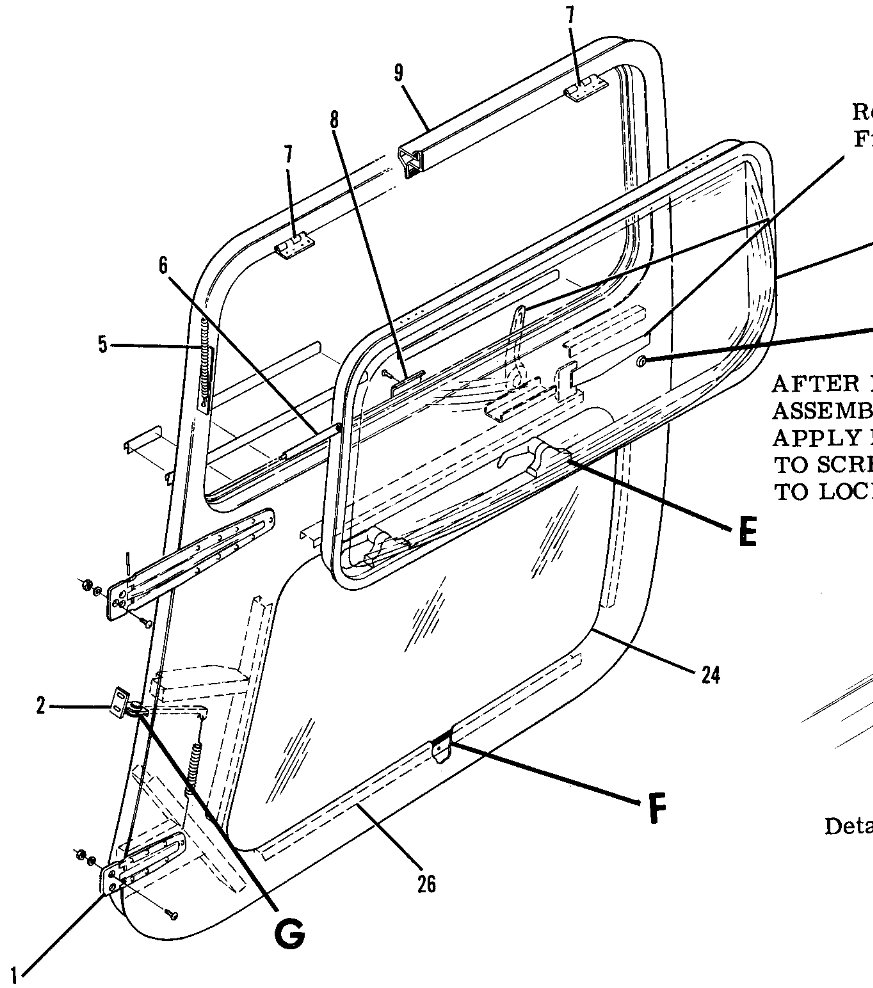


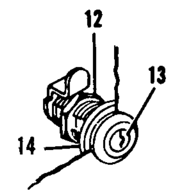
ROTATED 180°

Detail B

1. Lower Hinge	11. Window	21. Bracket
2. Upper Hinge	12. Nut	22. Spring
3. Upholstery Panel	13. Lock Assembly	23. Bubble Movable Window
4. Wedge	14. Washer	24. Lower Fixed Window
5. Spring	15. Latch Handle	25. Window Seal
6. Window Stop	16. Hinge	26. Tie Channel
7. Window Hinge	17. Pin	27. Window Retainer
8. Latch Plate	18. Door Stop Arm	28. Nylon Trim Seal
9. Cabin Door	19. Roll Pin	29. Movable Window Seal
10. Window Frame	20. Spacer	30. Cabin Door Seal

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

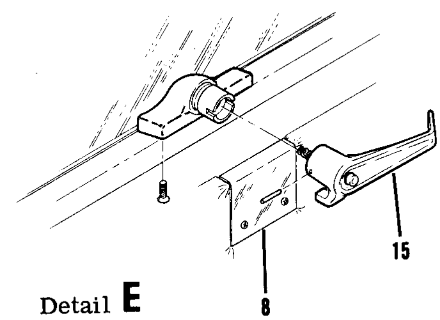




Detail **D**

NOTE

AFTER INSTALLING CAM TO LOCK ASSEMBLY WITH SCREW AND WASHER APPLY RTV-102 SILICONE SEALANT TO SCREW HEAD TO SECURE SCREW TO LOCK ASSEMBLY.

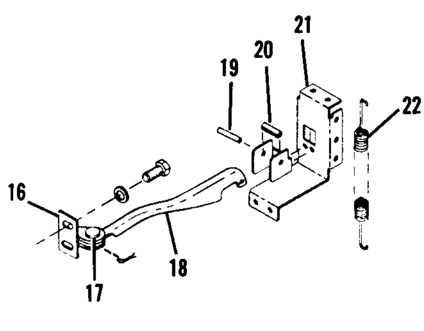


Detail **E**

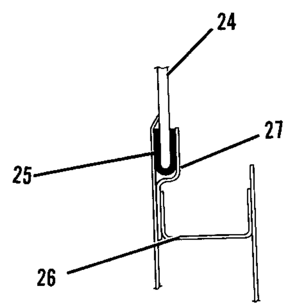
ROTATED 180°

Note

Movable window may be either flat or bubble configuration. Dual locks are required on bubble window only.



Detail **G**



Detail **F**

ROTATED 180°

OPTIONAL INSTALLATION
BEGINNING WITH 18052385
AND 18502311

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

3-21. ADJUSTMENT. Adjustment of latch or clutch cover is afforded by oversize and/or slotted holes. This adjustment ensures sufficient gear-to-bolt engagement and proper alignment. Bolt extension (Item 2) can be adjusted by the following procedure.

1. Loosen the (4) bolts item (29) sufficient to move base plate aft in the slotted holes to extend the bolt and forward to retract the bolt.

CAUTION

Close the door carefully after adjustment and check clearance of bolt and door jamb and latch clutch.

NOTE

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

3-22. LOCK. In addition to interior locks, a cylinder and key type lock is installed on the left door. If the lock is to be replaced, the new one may be modified to accept the original key. This is desirable, as the same key is used for the ignition switch and the cabin door lock. After removing the old lock from the 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.

3-23. INDEXING INSIDE HANDLE. (Refer to figure 3-4.) When the inside door handle is removed, it must be installed in relation to position of bolt (2) which is spring-loaded to CLOSE position. The following procedure may be used:

a. Detail A.
 1. Temporarily install handle (12) on shaft assembly (18) approximately vertical.
 2. Move handle (12) back and forth until handle centers in spring-loaded position.
 3. Without rotating shaft assembly (18), remove handle and install spring (9) and escutcheon (10).
 4. Install handle (12) in vertical position and install clip (13).
 5. Ensure bolt (2) clears doorpost and teeth engage clutch gear (27) when handle (12) is in CLOSE position.
b. Detail B.
 1. Complete steps 1 and 2 as outlined in step "a."
 2. Without rotating shaft assembly (18), remove handle and install spring (19) and nylon washer (14).
 3. Install handle (12) to align with CLOSE position on upholstery panel (15) and install clip (13).
 4. Complete step "5" as outlined in step "a."

3-24. BAGGAGE DOOR. (Refer to figure 3-5.)

3-25. REMOVAL AND INSTALLATION.

a. Remove inside latch handle knob and pull-handle from upholstery panel. (THRU AIRCRAFT 18052176 AND 18501833).
b. Disconnect door chain at door.
c. Remove buttons securing upholstery panel and remove panel.
d. Remove bolts, nuts and washers securing hinges to door or remove hinge pins as desired.
e. Reverse the preceding steps for installation.

3-25A. STRETCHER. (Refer to figure 3-5A.)

3-25B. DESCRIPTION. A portable stretcher may be installed in the aircraft. The foot of the stretcher is attached to the copilot seat rail and the head end rests on the rear seat. The patient and the stretcher are secured with the copilot's seat belts and the rear seat belts. The stretcher can be used only with an aircraft that has a six place seating arrangement.

3-25C. REMOVAL AND INSTALLATION.

a. Remove the copilot's seat and the right hand center seat.
b. Remove the right hand cabin door by removing the hinge pins.
c. Pass the stretcher thru the cabin door, head end first. Rotate the stretcher until the head end rests on the right hand rear seat.
d. Engage the legs at the foot of the stretcher with the copilot seat rails and secure locking pin on the inboard leg.
e. Secure the head end of the stretcher with the aft seat belt.
f. Reinstall the right hand cabin door.
g. For removal of the stretcher, reverse the preceding steps.

3-26. LITTER DOOR. (Refer to figure 3-6.)

3-27. DESCRIPTION. A litter door may be installed on the left side of the aircraft, immediately aft of the baggage door. When the baggage door and the litter door are opened, a single opening is available through the side of the fuselage to permit loading of a stretcher without removing the cabin door. When closed and latched, the forward part of the litter door becomes a structural member of the fuselage. The aircraft should NOT be flown until the litter door and baggage door are both closed and latched.

3-28. REMOVAL AND INSTALLATION.

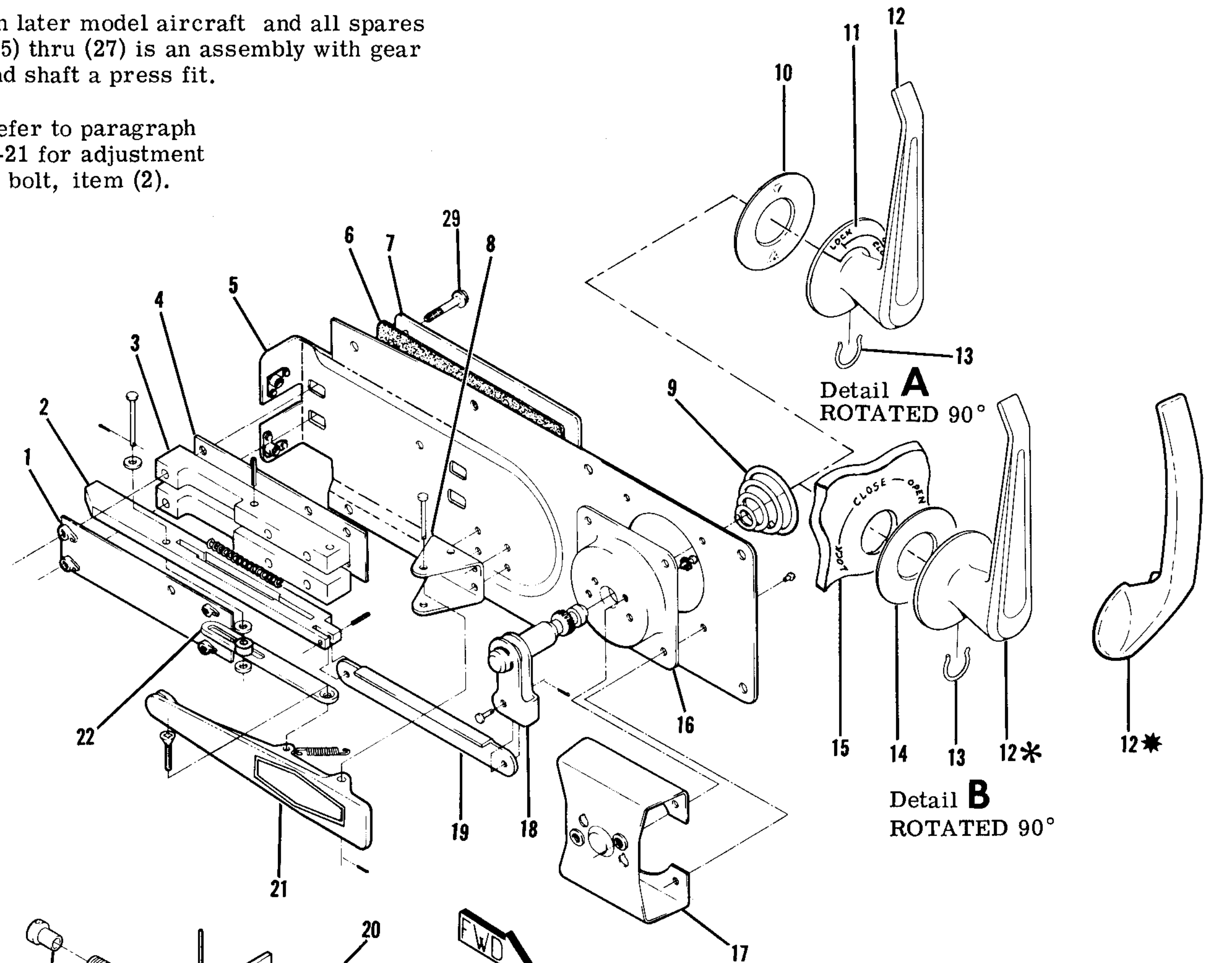
a. Disconnect latch lock pins at forward end of door.
b. With door open, disconnect door support assembly.
c. Remove piano hinge pin and lift off door.
d. Reverse the preceding steps for installation.

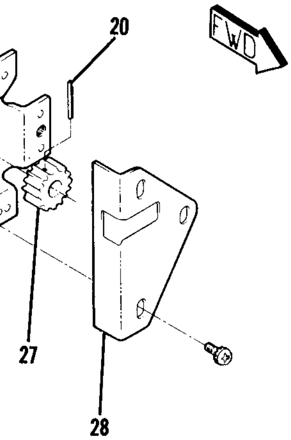
NOTE

- On early model aircraft gear (27) and gear shaft (25) are pinned.
- On later model aircraft and all spares (25) thru (27) is an assembly with gear and shaft a press fit.
- Refer to paragraph 3-21 for adjustment of bolt, item (2).

A THRU SERIALS 18052103 AND 18501599

B BEGINNING WITH SERIALS 18052104 AND 18501600





CABIN DOOR
ROTARY CLUTCH

✱THRU 18052284 AND 18502090

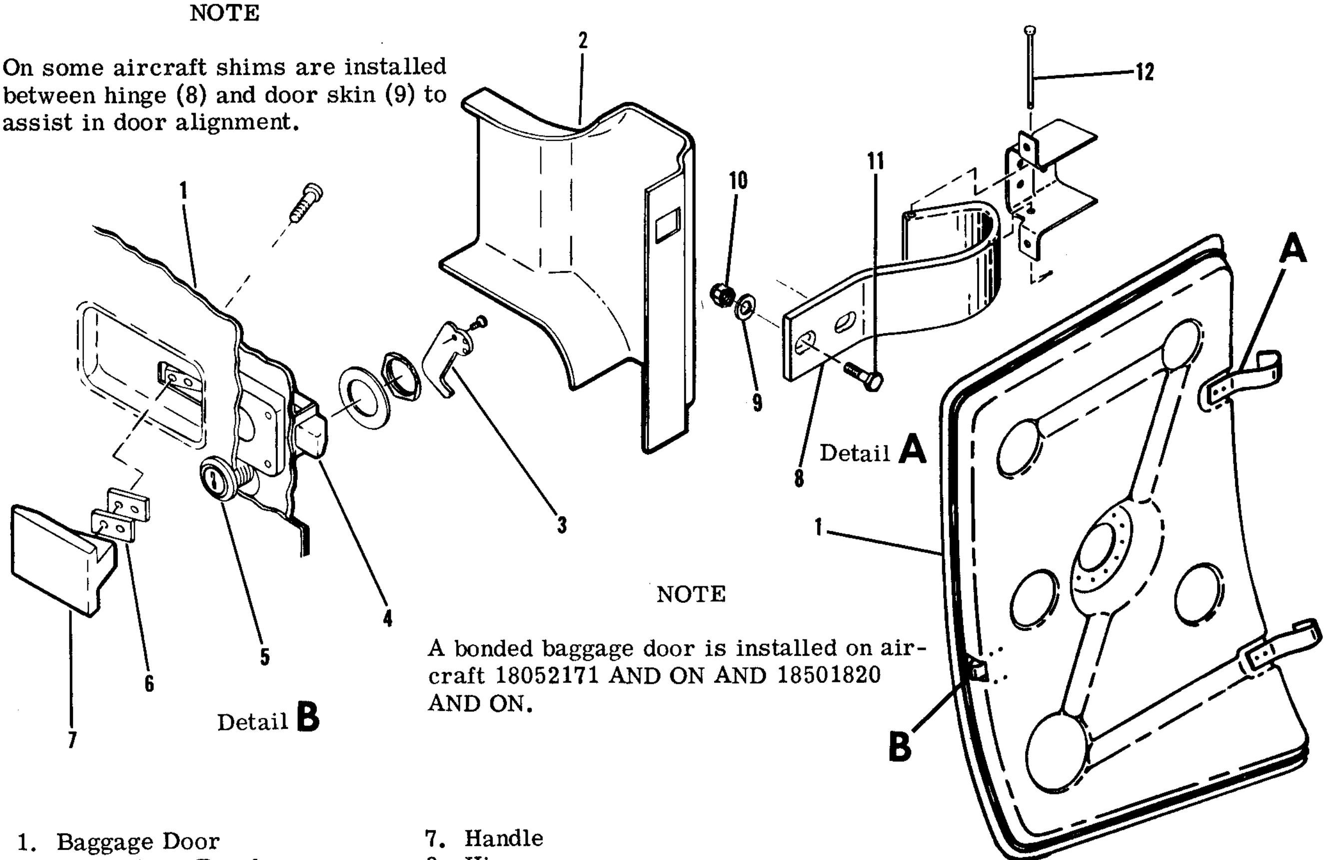
✱BEGINNING WITH 18052285 AND 18502091

1. Top Bolt Guide
2. Bolt
3. Side Bolt Guide
4. Base Bolt Guide
5. Latch Base Plate
6. Abrasive Pad
7. Lockplate
8. Bracket
9. Spring
10. Escutcheon
11. Placard
12. Inside Handle
13. Clip
14. Nylon Washer
15. Upholstery Panel
16. Bracket
17. Bracket
18. Shaft Assembly
19. Bolt Push Rod
20. Pin
21. Outside Handle
22. Pull Bar
23. Shaft Base
24. Spring
25. Gear Shaft
26. Housing
27. Gear
28. Cover
29. Adjustment Bolts (4)

Figure 3-4. Cabin Door Latch and Rotary Clutch

NOTE

On some aircraft shims are installed between hinge (8) and door skin (9) to assist in door alignment.



NOTE

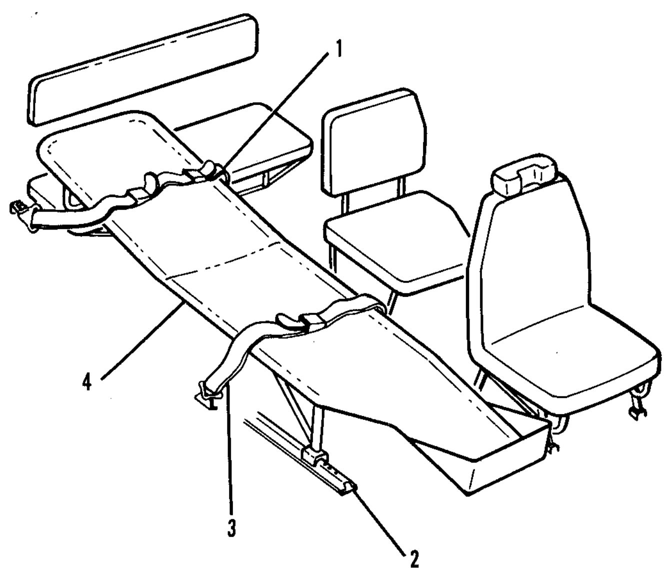
A bonded baggage door is installed on aircraft 18052171 AND ON AND 18501820 AND ON.

1. Baggage Door
2. Upholstery Panel
3. Cam
4. Latch Assembly'
5. Lock
6. Shim
7. Handle
8. Hinge
9. Washer
10. Nut
11. Bolt
12. Clevis Pin

NOTE

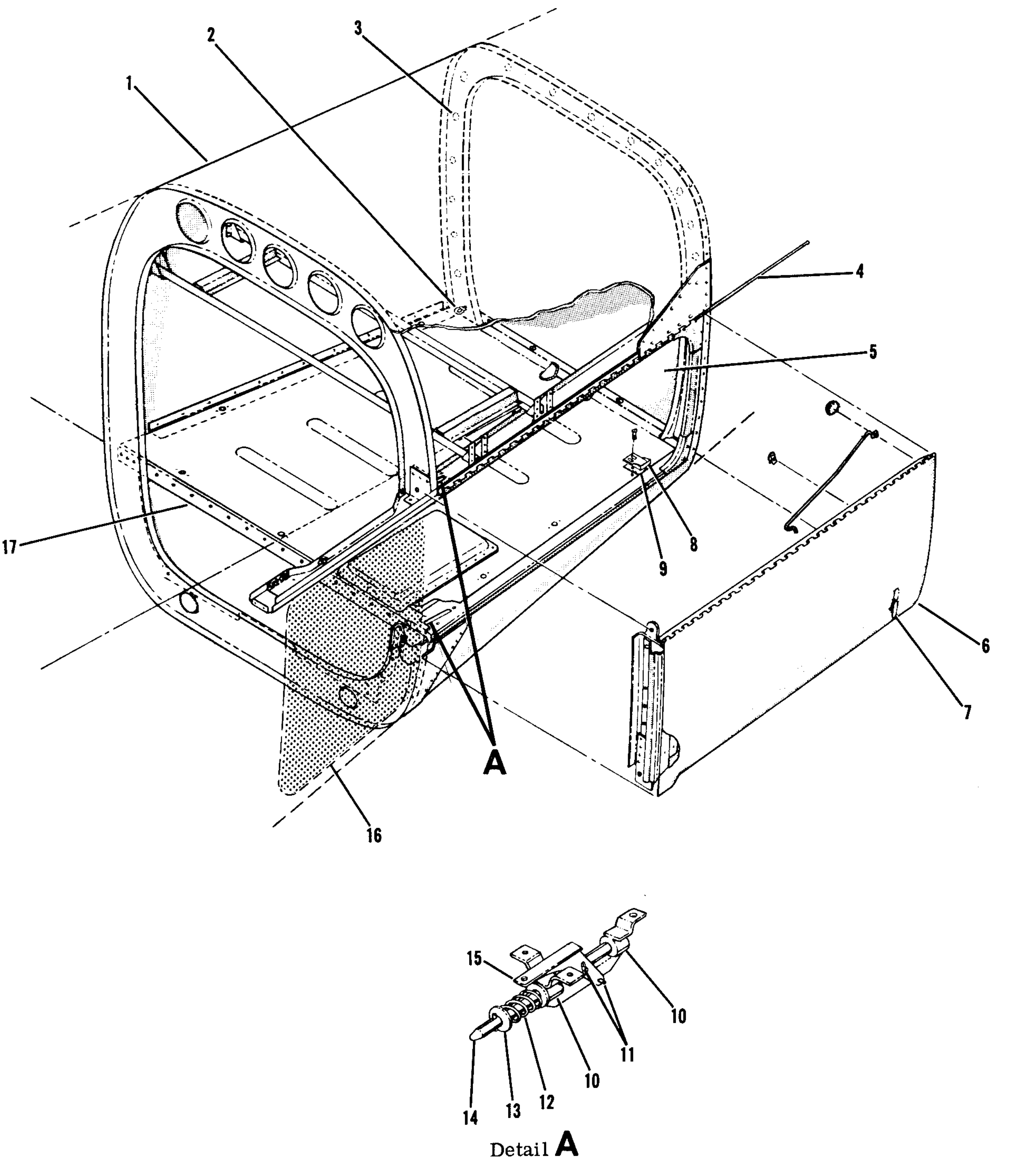
Forming of flanges is not permissible on the bonded door, as forming of the flanges could cause damage to the bonded area.

Figure 3-5. Baggage Door



1. Aft Seat Belt
2. Copilot's Seat Rail
3. Copilot's Seat Belt
4. Stretcher

Figure 3-5A. Stretcher Installation



1. Fuselage Structure
2. Eyebolt
3. Stud and Eyelet
4. Hinge Pin
5. Canvas Panel
6. Litter Door
7. Outside Latch
8. Striker Plate
9. Shim
10. Bolt Guide
11. Roll Pin
12. Spring
13. Washer
14. Bolt
15. Handle
16. Baggage Door Opening
17. Floor Pan

Figure 3-6. Litter Door

3-29. SEATS. (Refer to figure 3-7.)

3-30. PILOT AND COPILOT.
a. RECLINING BACK. (Standard pilot/Optional copilot.)
b. VERTICAL ADJUST/RECLINING BACK. (Optional 1969.)
c. ARTICULATING RECLINE/VERTICAL ADJUST. (Optional beginning with 1970.)

3-31. DESCRIPTION. These seats are manually-operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-32. 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 the preceding steps for installation. Ensure all seat stops are reinstalled.

WARNING

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

3-33. CENTER.
a. INDIVIDUAL.
b. TWO-PLACE.

3-34. DESCRIPTION. These seats are rigidly attached to the cabin structure. The individual seat is equipped with hand-removable eyebolts and quick-detachable type backs to assist in seat removal. The two-place seat has an manually adjustable three position seat back and beginning with serials 18052621 and 18502839 has four quick-release type latches to aid in seat removal and individual reclining backs.

3-35. REMOVAL AND INSTALLATION.
a. Remove bolts securing seat to cabin structure.
b. Lift seat out.
c. Reverse the preceding steps for installation.

3-36. AUXILIARY.
a. FOLD-UP.

3-37. DESCRIPTION. These seats are rigidly attached to the cabin structure and thru serials 18052620 and 18502838 have no adjustment provisions. Beginning with serials 18052621 and 18502839 auxiliary seats have a two-position seat bottom height adjustment. The seat structure is mounted on hinge brackets with pivot bolts thus allowing the seat to be pivoted upward to provide more baggage area.

3-38. REMOVAL AND INSTALLATION.
a. Remove bolts securing seat structure to hinge brackets.
b. Unsnap seat back from aft cabin wall.
c. Lift seat out.
d. Reverse the preceding steps for installation.

3-39. REPAIR OF SEAT STRUCTURE. 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 the heat-treatment of the frame structure. Figure 3-8 outlines instructions for replacing defective cams on reclining bench-type seat backs.

3-40. 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 the removal of each item to facilitate its replacement later.

3-41. 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 the material beneath the retainer strips are the only tools required for most trim work. Use industrial rubber cement to hold soundproofing mats and fabric edges in place. Refer to Section 17 for thermo-plastic repairs.

3-42. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound deadener compound applied to the inner surfaces of the skin in most areas of the cabin and baggage compartment. All soundproofing material should be replaced in its original position any time it is removed. A soundproofing panel is placed in the gap between the wing and fuselage and held in place by the wing root fairing.

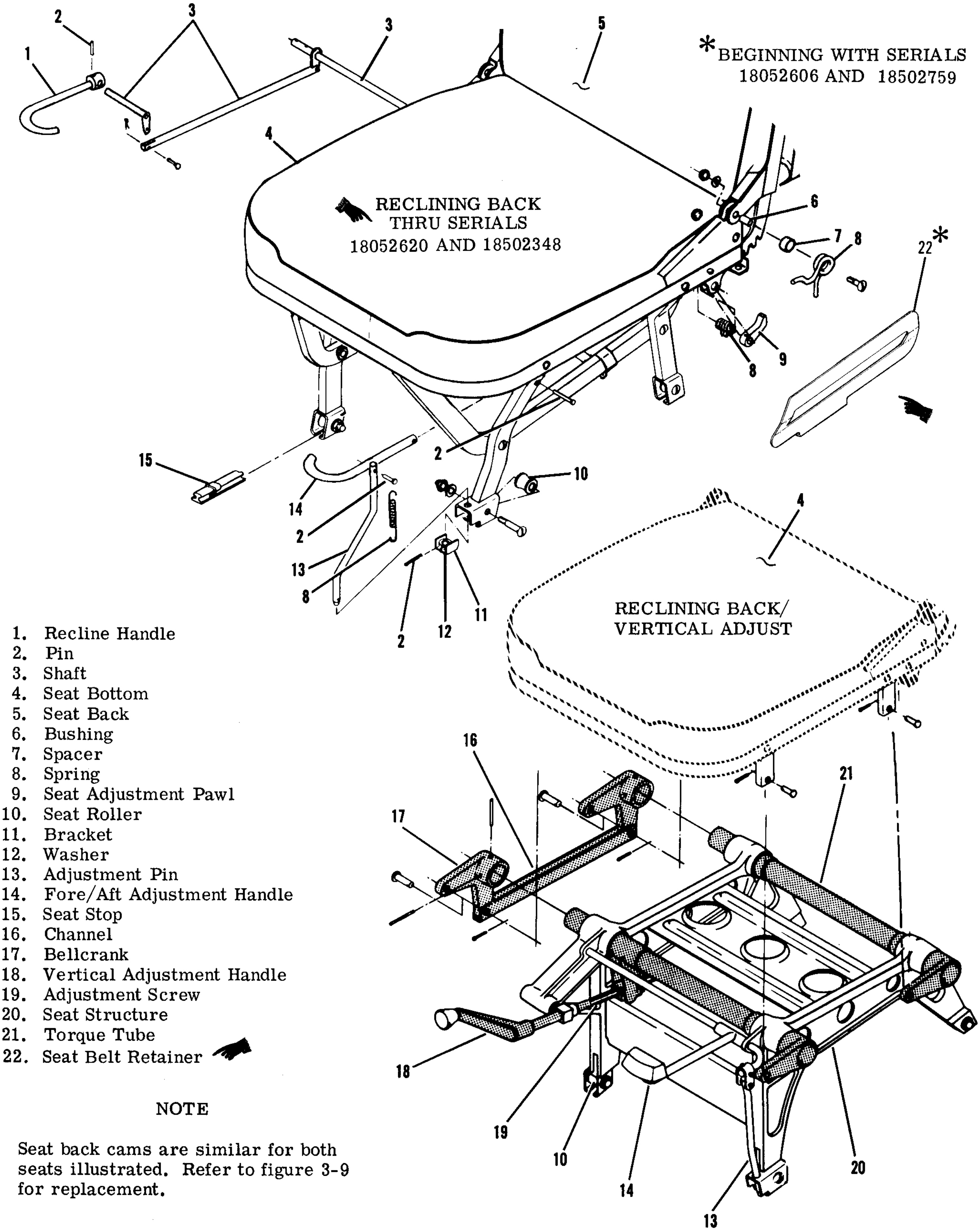
3-43. CABIN HEADLINER. (Refer to figure 3-9.)

3-44. REMOVAL.
a. Remove sun visors, all inside finish strips and plates, door post upper shields, front spar trim shield, dome light console and any other visible retainers securing the headliner.
b. Work edges of headliner free from metal teeth which hold the fabric.
c. Starting at front of headliner, work headliner down, removing screws through metal tabs which hold the wire bows to the cabin top. Pry loose outer ends of bows from the retainers above doors. Detach each bow in succession.

NOTE

Always work from front to rear when removing the headliner.

d. Remove the headliner assembly and bows from the aircraft.



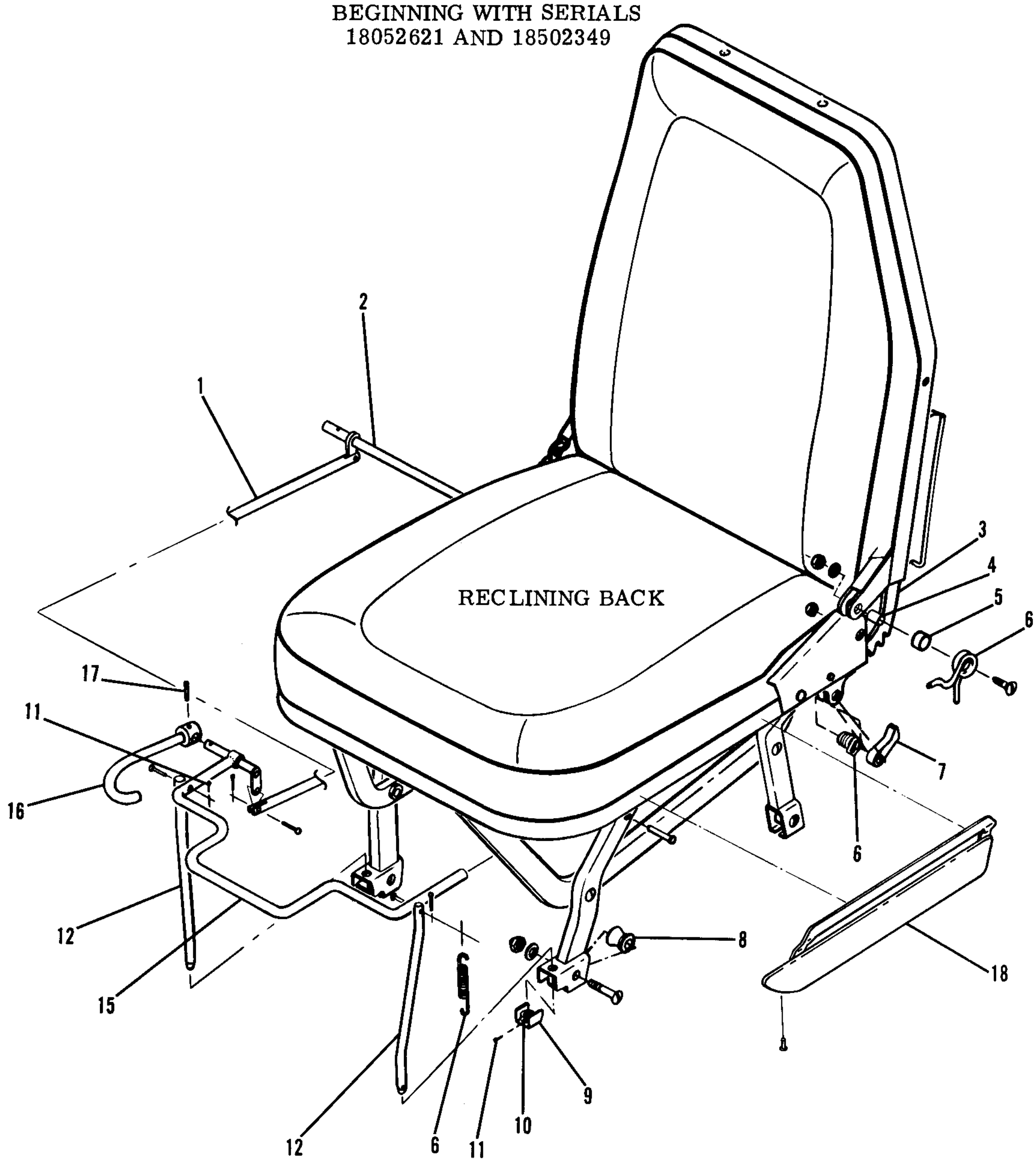
1. Recline Handle
2. Pin
3. Shaft
4. Seat Bottom
5. Seat Back
6. Bushing
7. Spacer
8. Spring
9. Seat Adjustment Pawl
10. Seat Roller
11. Bracket
12. Washer
13. Adjustment Pin
14. Fore/Aft Adjustment Handle
15. Seat Stop
16. Channel
17. Bellcrank
18. Vertical Adjustment Handle
19. Adjustment Screw
20. Seat Structure
21. Torque Tube
22. Seat Belt Retainer

NOTE

Seat back cams are similar for both seats illustrated. Refer to figure 3-9 for replacement.

Figure 3-7. Seat Installation (Sheet 1 of 5)

PILOT AND COPILOT
(STANDARD)
BEGINNING WITH SERIALS
18052621 AND 18502349



NOTE

Refer to figure 3-8 for seat back cam replacement.

1. Link Seat Back Adjust
2. Torque Tube
3. Seat Back Adjustment Cam
4. Bushing
5. Spacer
6. Spring
7. Seat Adjustment Pawl
8. Roller
9. Bracket
10. Washer
11. Pin
12. Adjustment Pin
13. Seat Stop
14. Seat Rail
15. Fore/Aft Adjustment Handle
16. Recline Handle
17. Roll Pin
18. Seat Belt Retainer

Figure 3-7. Seat Installation (Sheet 2 of 5)

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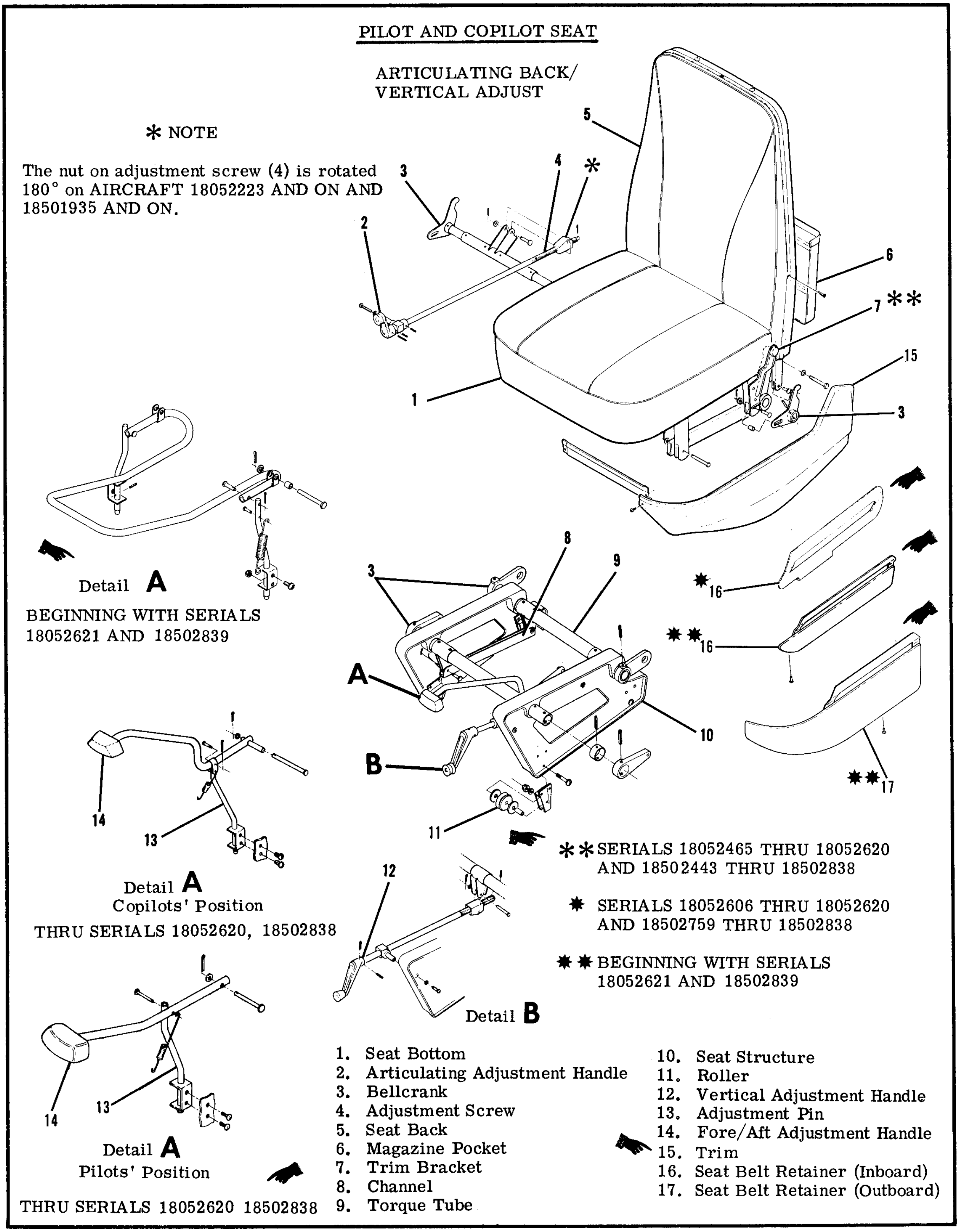
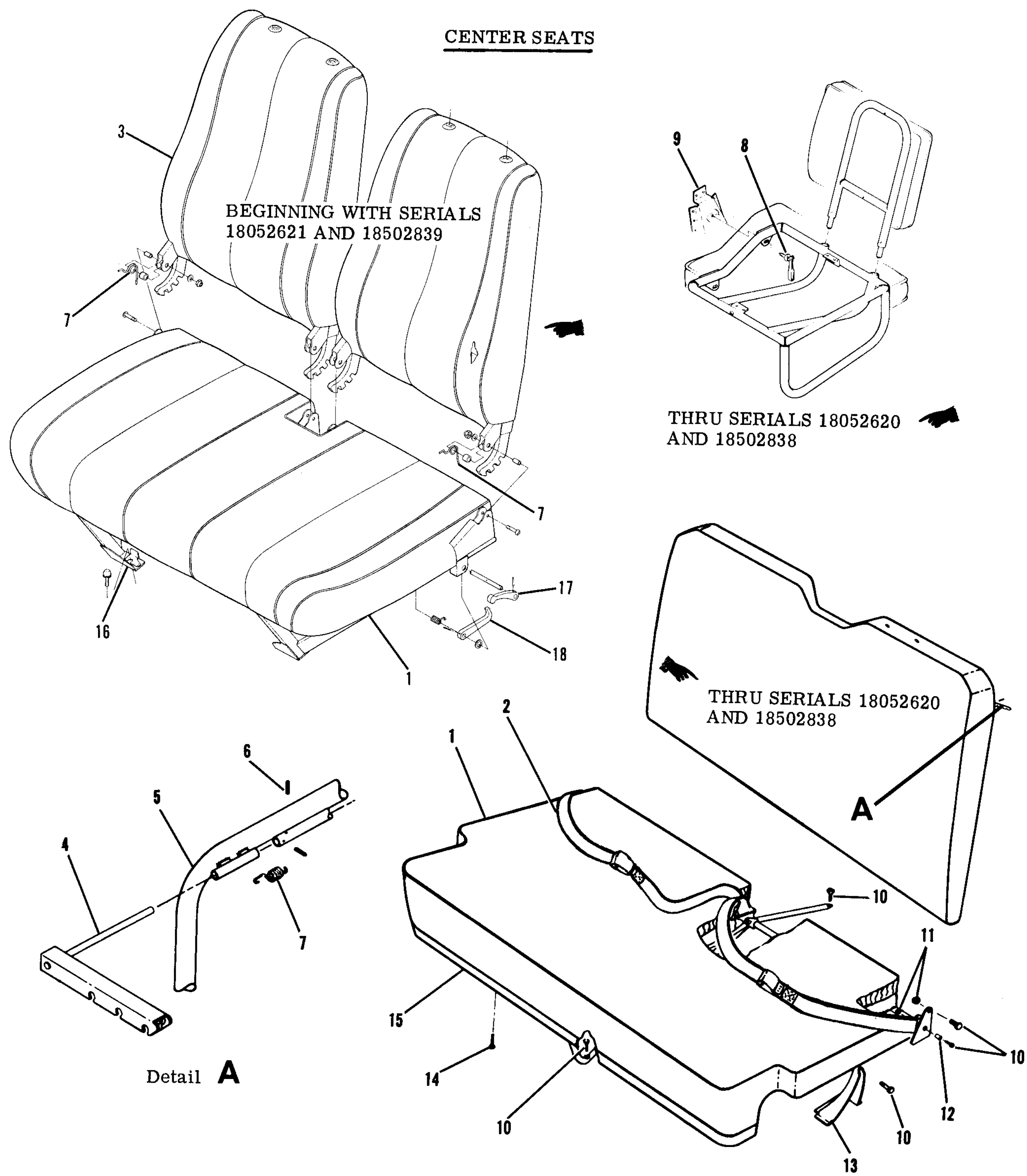


Figure 3-7. Seat Installation (Sheet 3 of 5)



1. Seat Bottom
2. Safety Belt
3. Seat Back
4. Latch
5. Seat Back Frame
6. Roll Pin
7. Spring
8. Eyebolt
9. Bracket
10. Bolt
11. Nut
12. Spacer
13. Support
14. Screw
15. Upholstery Retainer
16. Quick-Release Latch
17. Recline Handle
18. Pawl

Figure 3-7. Seat Installation (Sheet 4 of 5)

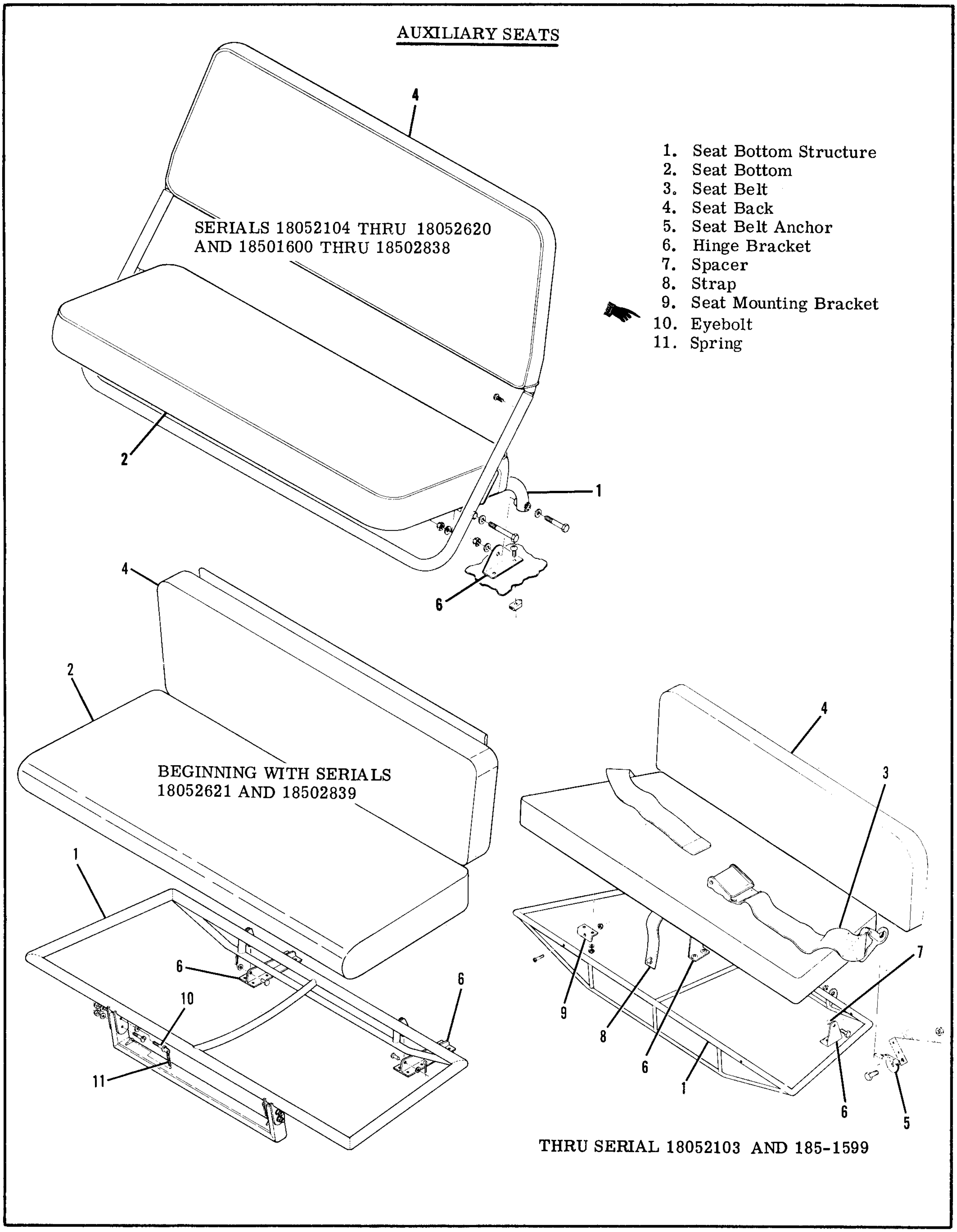
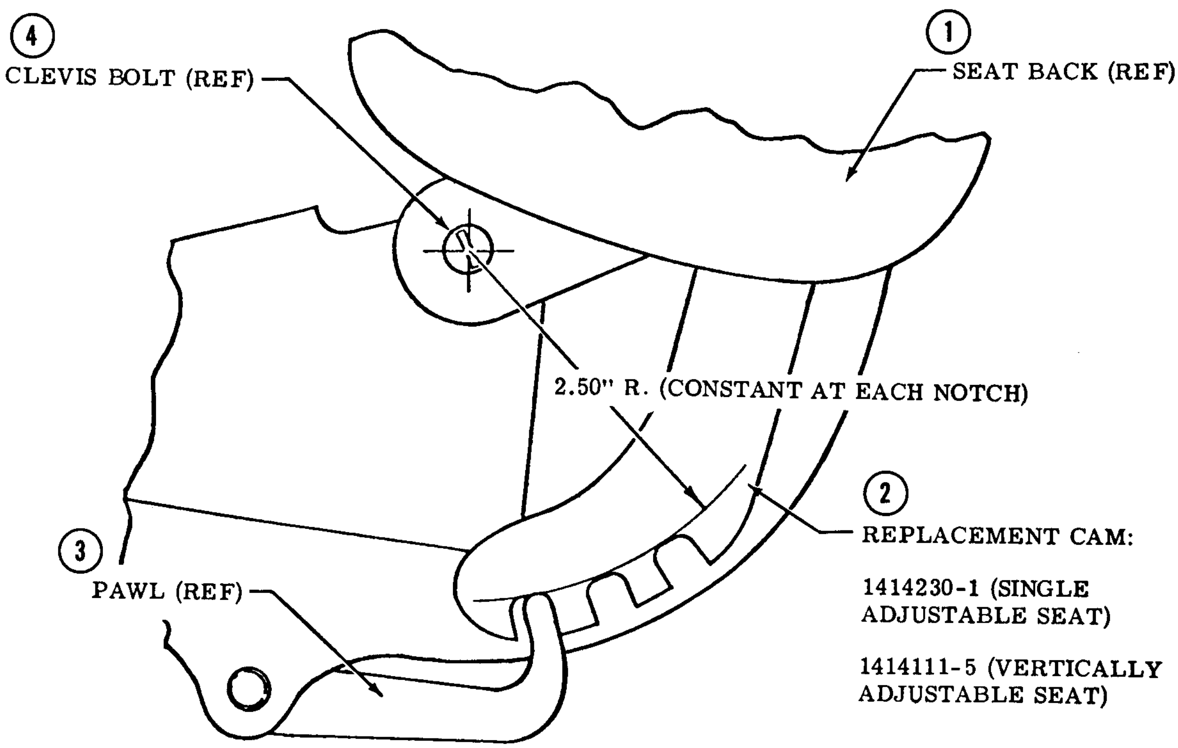


Figure 3-7. Seat Installation (Sheet 5 of 5)



REPLACEMENT PROCEDURE:

a. Remove seat from aircraft.

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

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

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

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

f. Reinstall upholstery, upholstery panels and seat.

Figure 3-8. Reclining Seat Cam Replacement

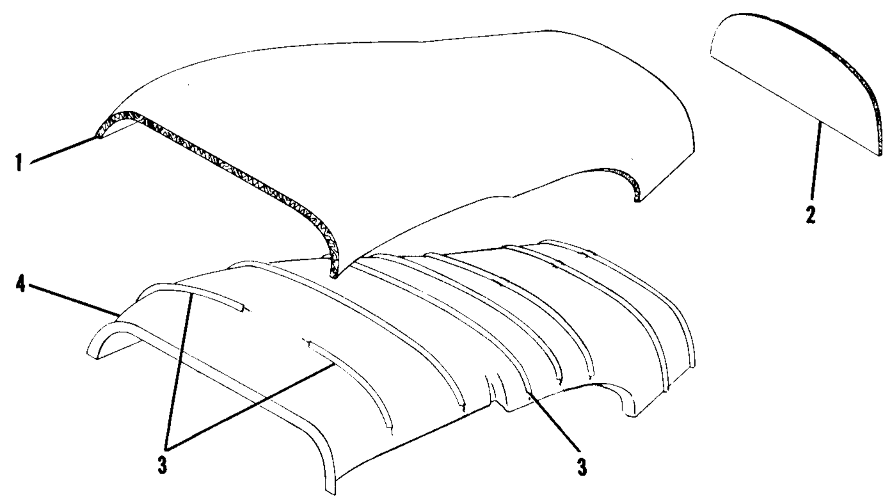


Figure 3-9. Cabin Headliner

NOTE

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

e. Remove the spun glass soundproofing panels.

NOTE

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

3-45. INSTALLATION.

a. Before installation, check all items concealed by headliner for security. Use wide cloth tape to secure loose wires to fuselage and to seal openings in wing roots. Straighten tabs bent during removal of headliner.
b. Apply cement to inside of skin in areas where soundproofing panels are not supported by wire bows and press soundproofing in place.
c. Insert wire bows into headliner seams and secure rearmost edges of headliner after positioning the two bows at the rear of headliner. Stretch material along edges to ensure it is properly centered, but do not stretch enough to destroy the ceiling contours or distort the wire bows. Secure edges of headliner with metal teeth or rubber cement.
d. Work headliner forward, installing each wire bow in place with tabs. Wedge ends of wire bows into retainer strips. Stretch headliner just taut enough to avoid wrinkles and maintain a smooth contour.
e. When all bows are in place and fabric edges are secured, trim off excess fabric and reinstall all items removed.

3-46. UPHOLSTERY SIDE PANELS. Removal of upholstery side panels is accomplished by removing seats for access, then removing parts attaching the panels. Remove screws, retaining strips, arm rests and ash trays as required to free the various panels. Automotive type spring clips attach most door panels. A dull putty knife makes an excellent tool for prying loose the clips. When installing upholstery side panels, do not over-tighten sheet metal screws. Larger screws may be used in enlarged holes as long as the area behind the hole is checked for electrical wiring, fuel lines and other components which might be damaged by using a longer screw.

3-47. WINDLACE (DOOR SEAL). To furnish an ornamental edging for the door opening and to provide additional sealing, a windlace is installed between the upholstery panels or trim panels and the doorpost structure. The windlace is held in place by sheet metal screws.

3-48. SAFETY BELTS. Safety belts should be replaced if they are frayed or cut, latches are defective or stitching is broken. Attaching parts should be replaced if excessively worn or defective. Some safety belts are attached to the fuselage and others to the seats. Aft belt attachment fittings are also used as cargo tie-downs after unsnapping the quick-release type end fittings.

NOTE

When installing front seat safety belt fittings, it is important that the correct attaching parts be used. A large washer (AN970-3) or a plate is used as a reinforcement under the floorboard at each front safety belt fitting. The

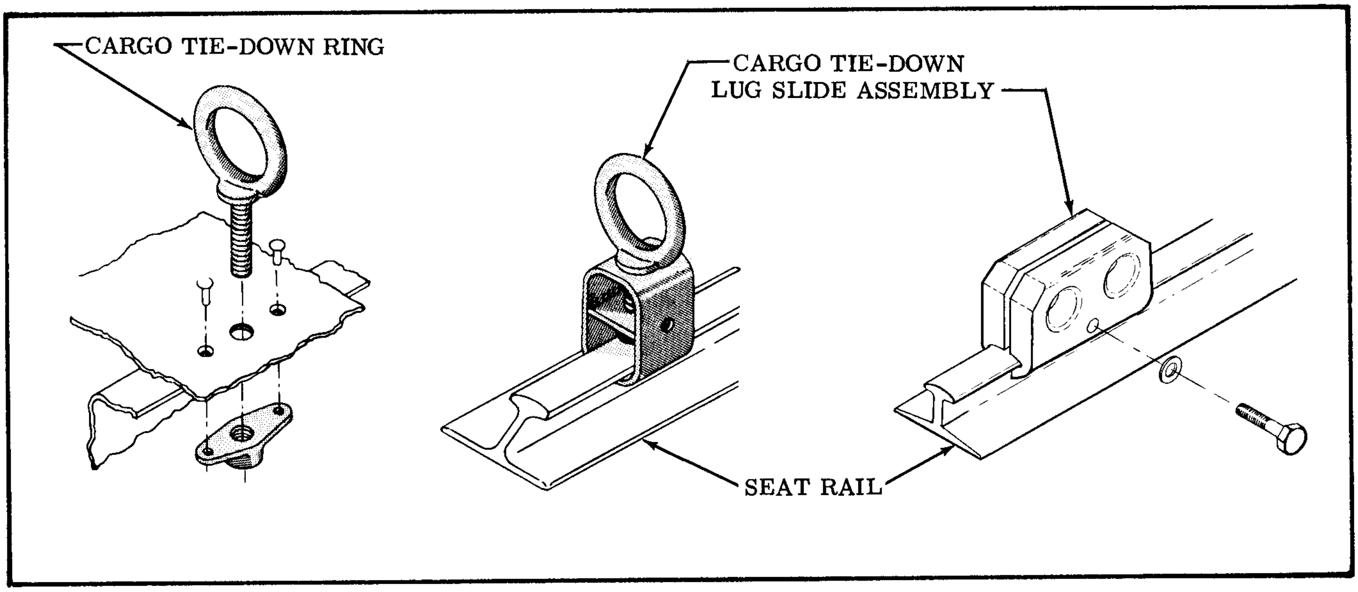


Figure 3-10. Cargo Tie-Downs

large washer is used between the forward nut and the underside of the floorboard.

3-49. SHOULDER HARNESS. Individual shoulder harnesses may be installed for each seat except auxiliary. Each harness is connected to a hook bolted to the upper fuselage structure and to the seat belt buckle. Component parts should be replaced as outlined in preceding paragraph. Beginning with aircraft 18052490 and 18502601, an inertia reel installation is offered. Refer to figure 3-12, sheet 2, for installation.

3-50. CARGO TIE-DOWNS. Cargo tie-downs are used to ensure that baggage cannot enter seating area during flight. Methods of attaching tie-downs are illustrated in figure 3-10. The eyebolt and nutplate can be located at various points, including cabin walls, floor and aft baggage compartment wall. The sliding tie-down lug also utilizes the eyebolt and attaches to a seat rail.

3-51. CARGO PACK. (MODEL 185.)

3-52. REMOVAL. Cargo pack removal is accomplished by positioning a support under the cargo pack and removing attaching screws.

3-53. INSTALLATION. Prior to positioning pack under the aircraft, inspect all rivnuts in bottom of fuselage for obstructions.

a. Move pack into position under aircraft. Raise aft end of pack and place a support under it.

b. Raise forward end of pack and align the two forward holes in pack rim with the two front rivnuts. Install two screws to support forward end of pack.

NOTE

Install lock washers and flat washers under heads of all pack attaching screws.

c. Raise aft end of pack and install all attaching screws.

3-54. COWL FLAP BAFFLES AND CONTROL EXTENSIONS. (Refer to figure 3-12.)

3-55. REMOVAL.

a. Disconnect cowl flap controls (1) from flaps and take off all four baffles (3) by removing screws (2).

b. Remove each clevis (8) and barrel (11) from control ends and install clevis (12) on each control end. Intentionally leave control longer than necessary.

c. Put cowl flap control lever in "OPEN" position and connect control ends to cowl flaps but do not secure at this time. Move control lever to "CLOSED" position and measure gap between cowl flaps and fuselage skin. Open cowl flaps, disconnect control ends from cowl flaps and shorten each control by turning clevis to the distance measured on each flap. Connect control end to each cowl flap temporarily and repeat above procedure until each cowl flap fairs in "CLOSED" position. Attach control ends to cowl flaps securely and tighten jam nuts against clevis ends. Operate cowl flap control lever several times to check cowl flap operation.

3-56. INSTALLATION.

a. Disconnect control (1) from each cowl flap and remove clevis (12) from each control end.

b. Leave jam nut (13) on control ends. Install clevis (8) into barrel (11) and install barrel on each control end (1). Do not tighten jam nut (13) or attach clevis (8) to cowl flaps at this time.

c. Position a baffle (3) along side of cowl flap so that holes in baffle are aligned over nut plates in cowl flap; secure with screws (2). Repeat for remaining three baffles.

NOTE

Each baffle is designed for installation on a specific cowl flap. Determine the correct baffle for each flap before installation. Note

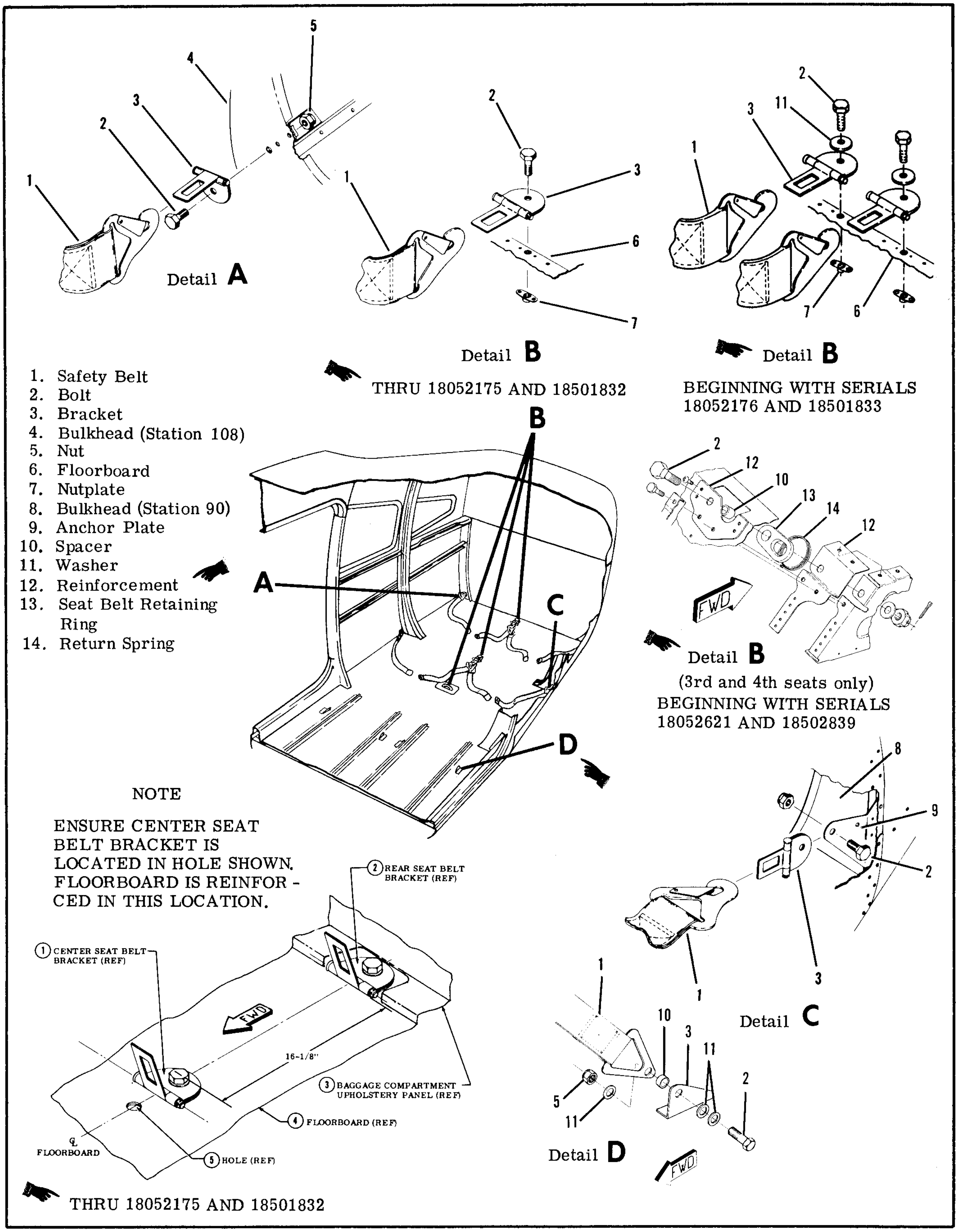


Figure 3-11. Safety Belt and Cargo Tie-Downs

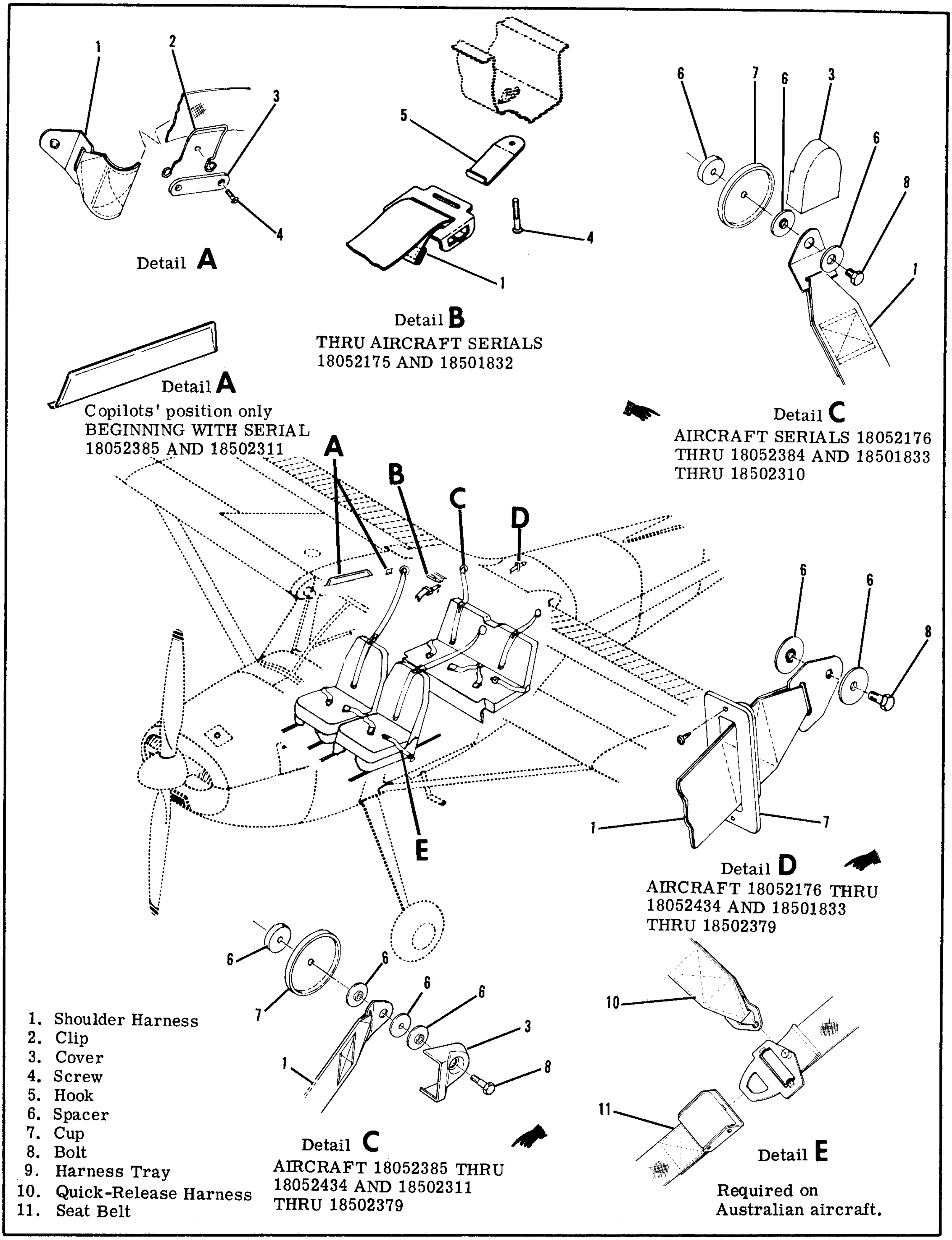


Figure 3-12. Shoulder Harness Installation(Sheet 1 of 2)

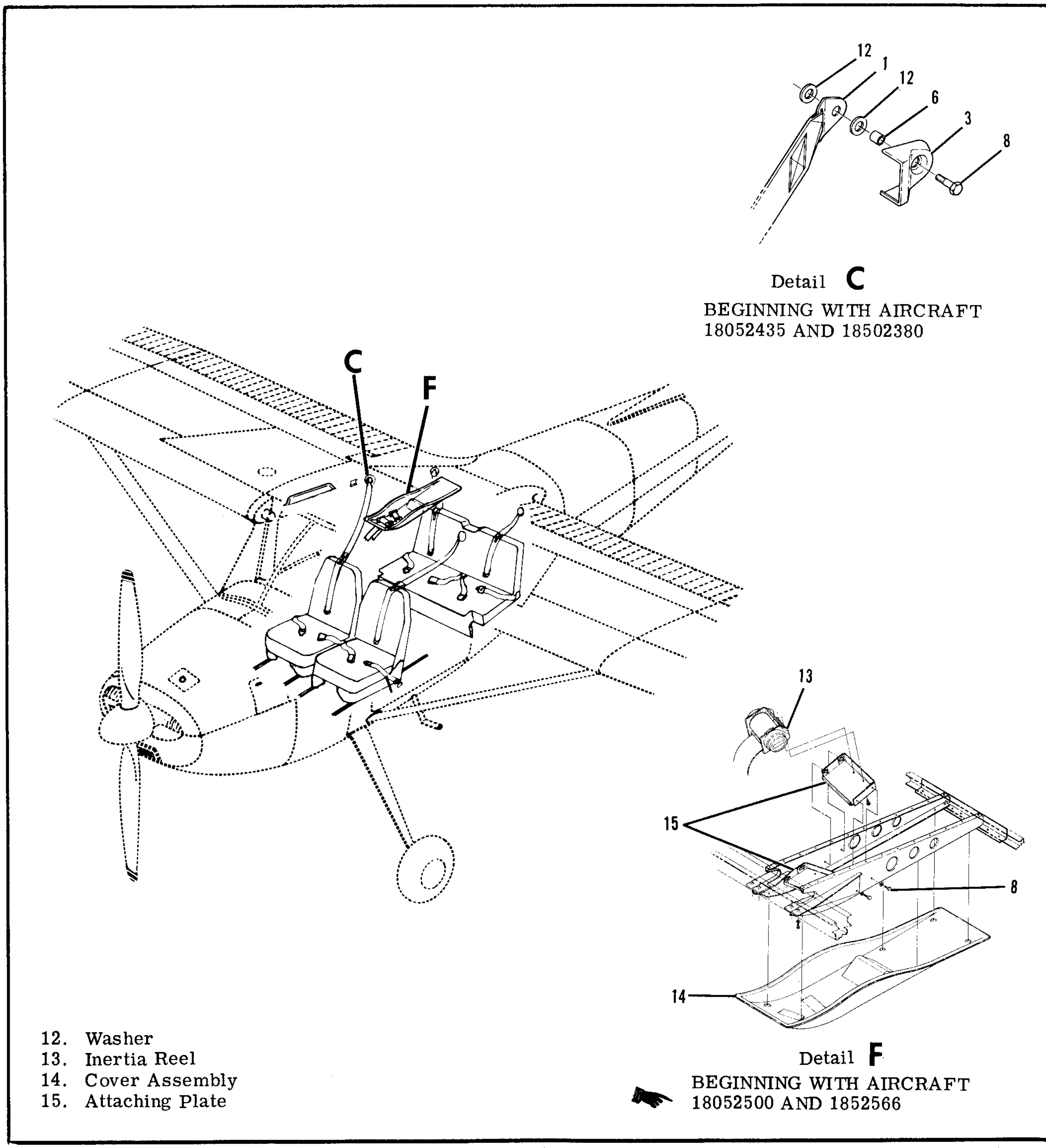
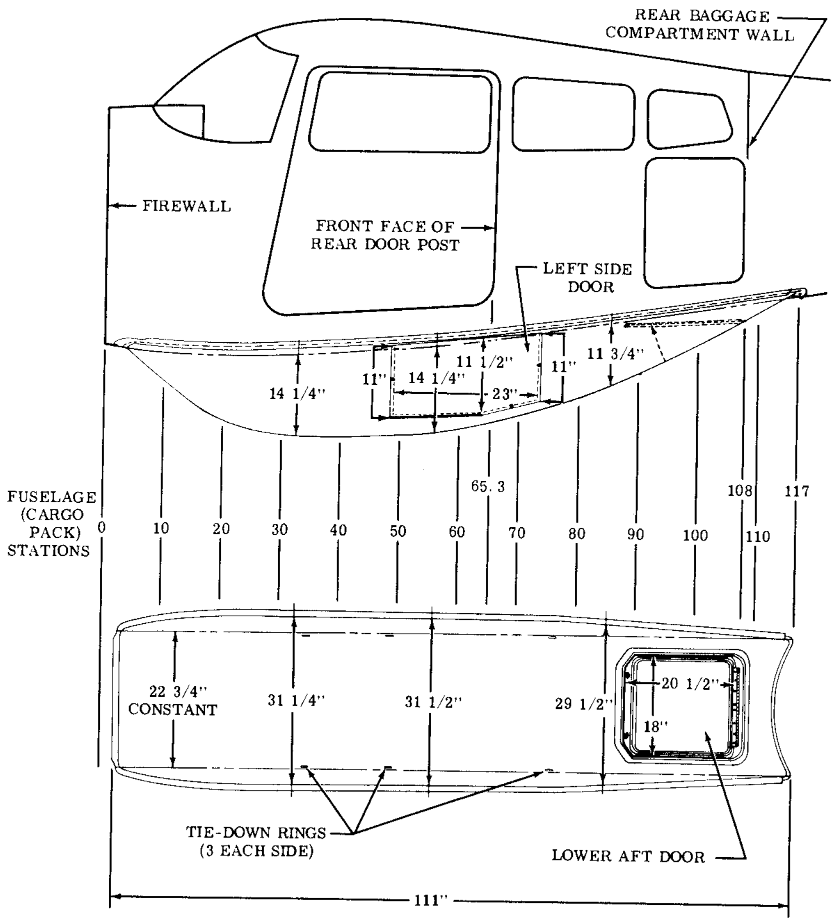


Figure 3-12. Shoulder Harness Installation(Sheet 2 of 2)

that the flanges on the baffles are turned toward the inside of each cowl flap opening.

d. Connect cowl flaps to control ends. Make sure cowl flap control lever is in "CLOSED" position; then adjust barrels on control ends so that cowl flaps are 16° ± 1° open (or 3 3/4" ± 1/8" measured from lower outboard corner of cowl flap to mating point on fuselage). Set jam nuts tightly against barrels and safety wire each clevis to each barrel to maintain specified setting.



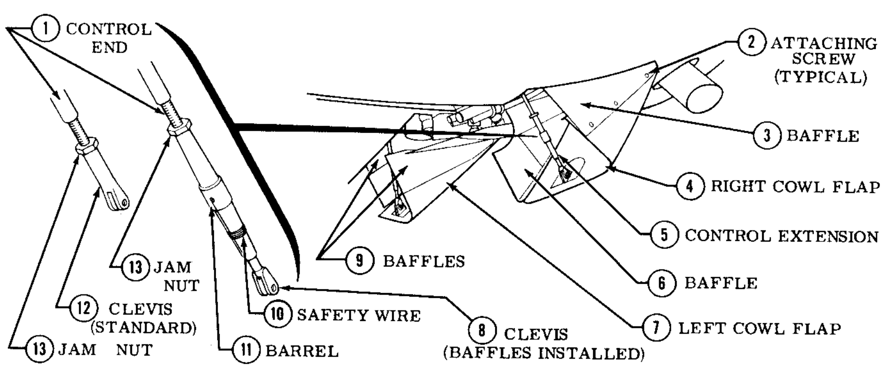


Figure 3-13. Model 185 Cargo Pack and Cowl Flap Extensions

SECTION 4

WINGS AND EMPENNAGE

TABLE OF CONTENTS Page

4-1. WINGS AND EMPENNAGE.

4-2. WINGS. (Refer to 4-1.)

4-3. DESCRIPTION. Each all-metal wing panel is a semicantilever, semimonocoque type, with two main spars and suitable ribs for attachment of the wing skin. Skin panels are riveted to ribs, spars and stringers to complete the structure. An all-metal, piano-hinged aileron, a flap, and a detachable wing tip, constructed of ABS, mounted on each wing assembly. A single rubberized fuel cell is mounted between the wing spars at the inboard end of each wing. Beginning with 1976 models, fuel tank bay covers are of bonded construction. Thru 1972 models the leading edge of the left wing may be equipped with landing and taxi lights, beginning ith 1973 models the landing and taxi lights are mounted in the lower cowl. Colored navigation/strobe 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 root fairings and fairing plates.
b. Remove all wing inspection plates.
c. Drain fuel from cell of wing being removed.
d. AGcarryall only, disconnect spray boom as necessary to avoid damage when wing is removed.
e. Disconnect:
   1. Electrical wires at wing root disconnects.
   2. Fuel lines at wing root. (Observe precautions outlines in Section 12).
   3. Pitot line (left wing only) at wing root.
   4. Cabin ventilation hose at wing root.
   5. Wing leveler vacuum tube, if installed, at wing root.
f. Relieve tension on aileron cables by loosening turnbuckles, then disconnect cables at aileron bellcranks.
e. Relieve tension on flap cables at rear doorpost by loosening turnbuckles, then disconnect cables at flap bellcranks.

NOTE

To ease rerouting the cables, a guide wire may be attached to each cable before it is pulled free of the wing. Disconnect the cable and leave the guide wire routed through the wing. It may be attached for reinstallation and used to pull the cables into place.

h. Support wing at outboard end and disconnect strut at the wing fitting. Tie strut up with wire to prevent it from swinging down and straining strut-to-fuselage fitting.
i. Remove screws securing lower strut fairing and slide fairing up the strut. The strut then may be lowered without damage.
j. Place a padded stand under opposite wing from the one being removed to support the wing.

NOTE

The flap must be taped in the streamlined position during wing removal to prevent damage, since the flap will swing freely.

k. Mark position of the wing attachment eccentric bushings (refer to figure 4-1). These bushings are used to adjust wing angle-of-incidence to correct wing heaviness.
l. Remove nuts, washers, bushings and bolts attaching wing spars to fuselage fittings.

NOTE

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

m. Remove wing and lay on padded stands similar to the type shown in Section 17.

4-5. REPAIR. A damaged wing panel may be repaired in accordance with instructions outlined in Section 17. 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 and install bolts, bushings, washers and nuts attaching wing spars to fuselage

fittings. Make sure eccentric bushings are positioned as marked.
b. Install bolts, spacers and nuts to secure upper and lower ends of wing strut to wing fuselage fittings.
c. Route flap and aileron cables, using guide wires. (Refer to note in paragraph 4-4).
d. Connect:
1. Electrical wires at wing root disconnects.
2. Fuel lines at wing root. (Observe precautions outlined in Section 12.
3. Pitot line (if left wing is being installed).
4. Cabin ventilation hose at wing root.
5. Wing leveler vacuum tube, if installed, at wing root.
e. Rig aileron system (Refer to Section 6).
f. Rig flap system (Refer to Section 7).
g. Refuel wing cell and check for leaks. (Observe precautions outlined in Section 12).
h. Check operation of wing tip, landing and taxi lights.
i. Check operation of fuel quantity indicator.

NOTE

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

j. Install wing root fairings.
k. Install all wing inspection plates, interior panels and upholstery.
l. AGcarryall, install spray boom.

4-7. ADJUSTMENT (CORRECTING "WING-HEAVY" CONDITION.) (Refer to 4-1.) If considerable control wheel pressure is required to keep the wings level in normal flight, a "wing-heavy" condition exits.
a. Remove wing fairing strip on the wing-heavy side of the aircraft.
b. Loosen nut (7) and rotate bushings (5) simultaneously until the bushings are positioned with the thick side of the eccentrics up. This will lower the trailing edge of the wing and decrease wing-heaviness by increasing angle-of-incidence of the wing.

CAUTION

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

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

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

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

4-10. REMOVAL AND INSTALLATION.
a. Remove screws from strut fairing and slide fairing along strut.
b. Remove fuselage and wing inspection plates at strut junction points.
c. Support wing securely, then remove nut and bolt securing strut to fuselage.
d. Remove nut, bolt and spacer attaching strut to wing, then remove strut from aircraft.
e. Reverse preceding steps to install strut.

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

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

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

4-14. REMOVAL. The fin may be removed without first removing the rudder. However, for access and ease of handling, the rudder may be removed following procedures outlined in Section 9.
a. Remove fairings on either side of fin.
b. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads.
c. Disconnect rudder cables if rudder has not been removed.

NOTE

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

d. Remove screws attaching dorsal to fuselage.
e. Run stabilizer trim full down for access to fin attach bolts.
f. Remove bolts attaching fin front and rear spars to fuselage and remove fin.

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

4-16. INSTALLATION. Reverse the procedures outlined in paragraph 4-14 to install the vertical fin. Be sure to check and reset rudder travel if any stop bolts were removed or disturbed.

4-17. HORIZONTAL STABILIZER.

NOTE

The horizontal stabilizer is adjustable to provide the longitudinal trim afforded by the elevator trim tab of other models. Refer to

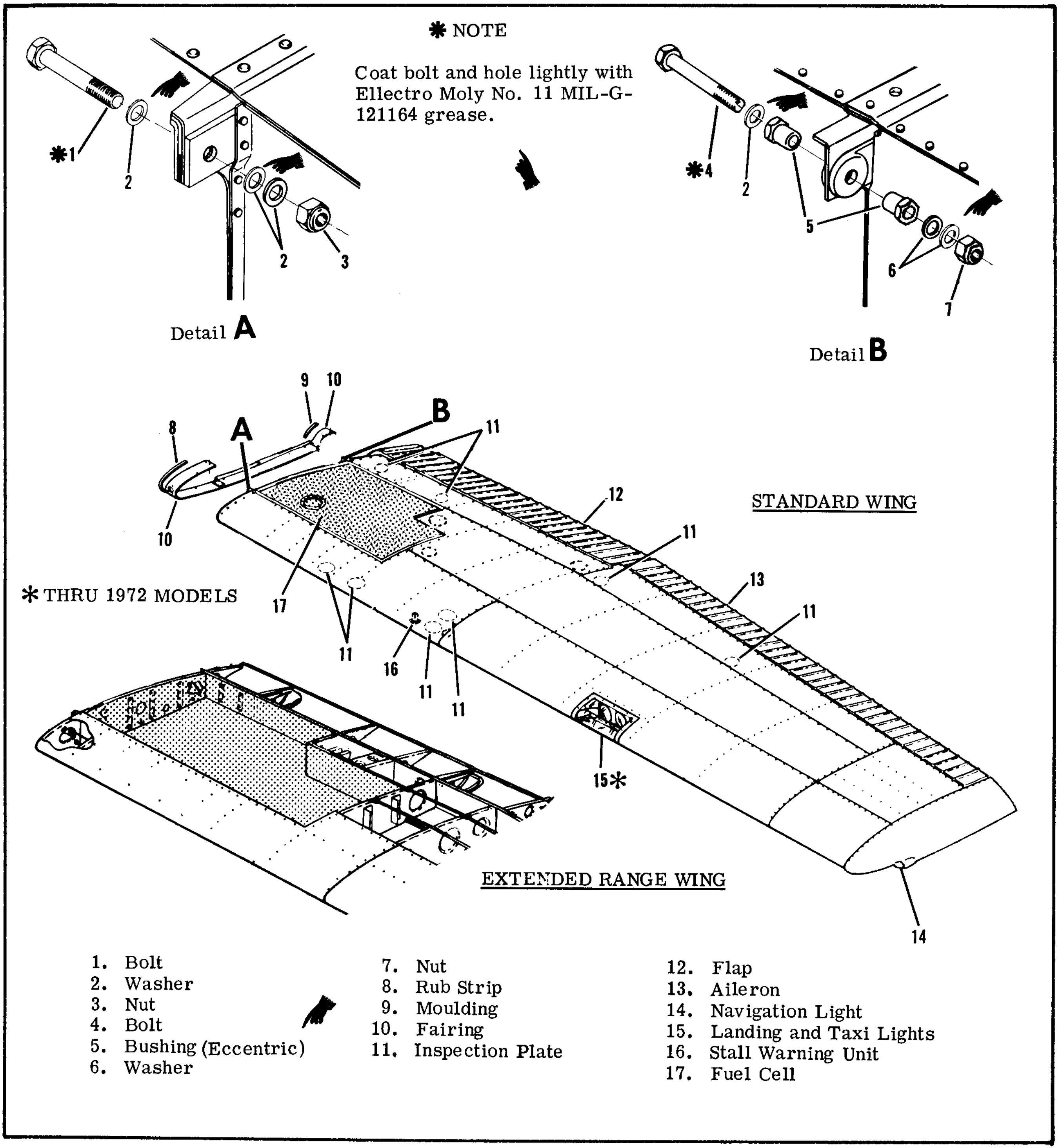


Figure 4-1. Wing Installation

Section 10 for information concerning adjustable stabilizers.

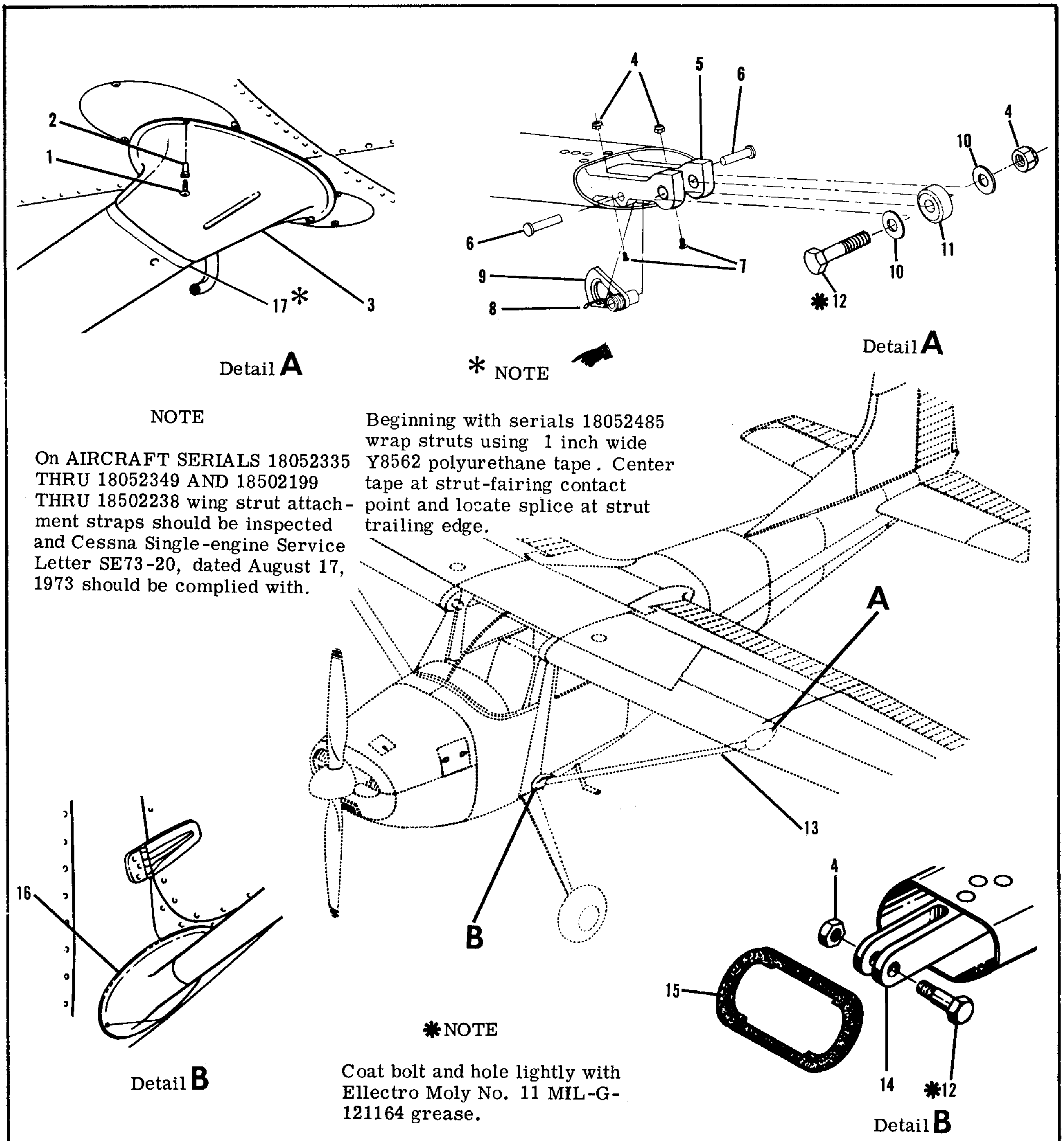
4-18. DESCRIPTION. The horizontal stabilizers are primarily of all-metal construction consisting of ribs and spars covered with skin. Stabilizer tips are of ABS construction. A formed metal leading edge is riveted to the assembly to complete the structure.

4-19. REMOVAL AND INSTALLATION.

NOTE

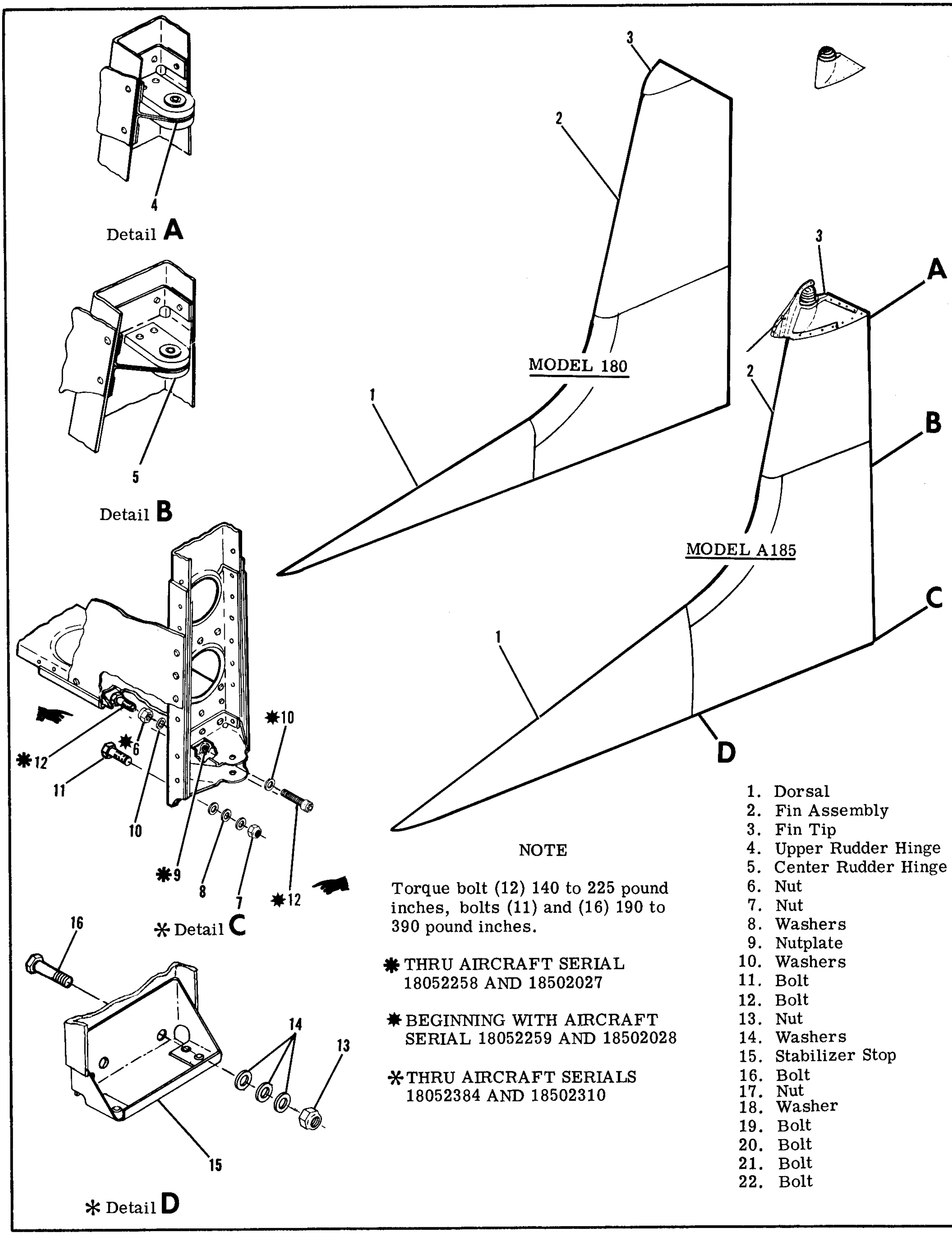
For removal and installation of stabilizer, refer to applicable instructions in Section 10.

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



1. Screw
2. Rivnut
3. Upper Fairing
4. Nut
5. Upper Strut Fitting
6. Pin
7. Screw
8. Spring
9. Mooring Ring
10. Washer
11. Spacer
12. Bolt
13. Strut
14. Lower Strut Fitting
15. Seal (Upper and Lower)
16. Lower Fairing
17. Polyurethane Tape

Figure 4-2. Wing Strut Installation



NOTE

Torque bolt (12) 140 to 225 pound inches, bolts (11) and (16) 190 to 390 pound inches.

* THRU AIRCRAFT SERIAL 18052258 AND 18502027

* BEGINNING WITH AIRCRAFT SERIAL 18052259 AND 18502028

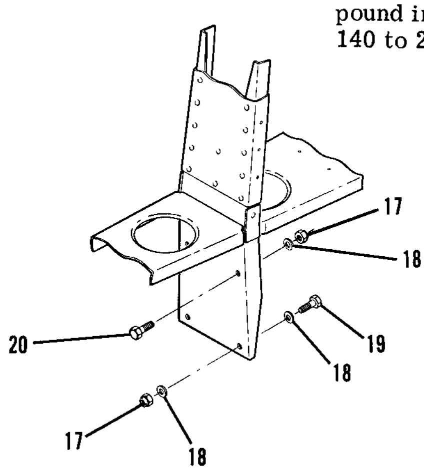
* THRU AIRCRAFT SERIALS 18052384 AND 18502310

1. Dorsal
2. Fin Assembly
3. Fin Tip
4. Upper Rudder Hinge
5. Center Rudder Hinge
6. Nut
7. Nut
8. Washers
9. Nutplate
10. Washers
11. Bolt
12. Bolt
13. Nut
14. Washers
15. Stabilizer Stop
16. Bolt
17. Nut
18. Washer
19. Bolt
20. Bolt
21. Bolt
22. Bolt

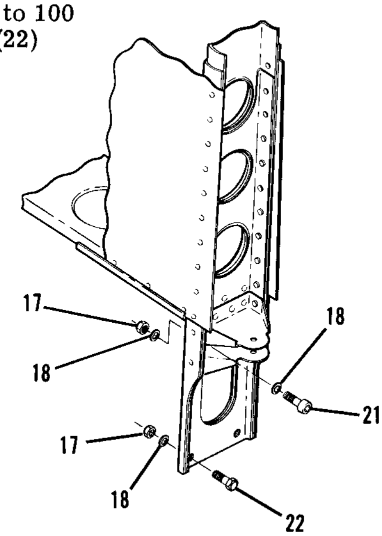
Figure 4-3 Vertical Fin Installation (Sheet 1 of 2)

NOTE

Torque bolts (19) and (20) 70 to 100 pound inches, bolts (21) and (22) 140 to 225 pound inches.



Detail **D**



Detail **C**

BEGINNING WITH AIRCRAFT SERIALS 18052385 AND 18502311

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

SHOP NOTES:

SECTION 5

LANDING GEAR AND BRAKES

TABLE OF CONTENTS

5-1. LANDING GEAR.

5-2. DESCRIPTION. The Models 180 and 185-Series aircraft are equipped with conventional landing gear, consisting of spring-steel main gear struts and a tapered, tubular tailwheel strut. The tailwheel is steerable with the rudder pedals up to a maximum pedal deflection, after which it becomes free-swiveling. A tailwheel lock is incorporated on the Model 185-Series, which permits steering of approximately 2.5° each side of neutral while the lock is engaged. Tube-type tires are standard equipment. The AG-carryall-Series aircraft are equipped with 8.00-6, 6-ply rated main wheel tires and wire cutters installed on each main landing gear spring as standard equipment.

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 shimming at inboard end of spring.	Install shims as required. Refer to paragraph 5-6 for limitations.
	Bent axles.	Replace axles.
WHEEL BOUNCE EVIDENT EVEN ON SMOOTH SURFACE.	Out of balance condition.	Check in accordance with paragraph 5-28.
TIRES WEAR EXCESSIVELY.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align in accordance with paragraph 5-27.
	Landing gear spring excessively sprung.	Remove and replace.
	Incorrect shimming at inboard end of spring.	Install shims as required. Refer to paragraph 5-6 for limitations.
	Bent axles.	Replace axles.
	Dragging brakes.	Refer to paragraph 5-46.
	Wheel bearings too tight.	Adjust properly.

5-4. MAIN LANDING GEAR.

5-5. REMOVAL.

NOTE

Shims and wedges are used to attach the main landing gear spring at the fuselage outboard structure. The spring is attached to the fuselage inboard structure with a bolt which passes through a hole in the end of the spring.

a. Remove floorboard access cover over spring to be removed.
b. Remove screws and slide external fairing and seal downaround spring.
c. Hoist or jack aircraft in accordance with instructions outlined in Section 2.
d. Disconnect brake line at wheel and drain hydraulic fluid.
e. Disconnect brake line at fuselage fitting and cap or plug all open lines and fittings.
f. Remove attaching bolts and pry shims and wedges out of fuselage.
g. Remove nut, washer and bolt attaching inboard end of landing gear spring and pull entire gear out of fuselage.

NOTE

Note shims placed under inboard end of spring strut. Mark shims to be sure they are replaced correctly at installation.

5-6. INSTALLATION.

a. Slide seal and external fairing plate over upper end of landing gear spring.
b. Slide gear spring into place and work shims in position under inboard end of spring.

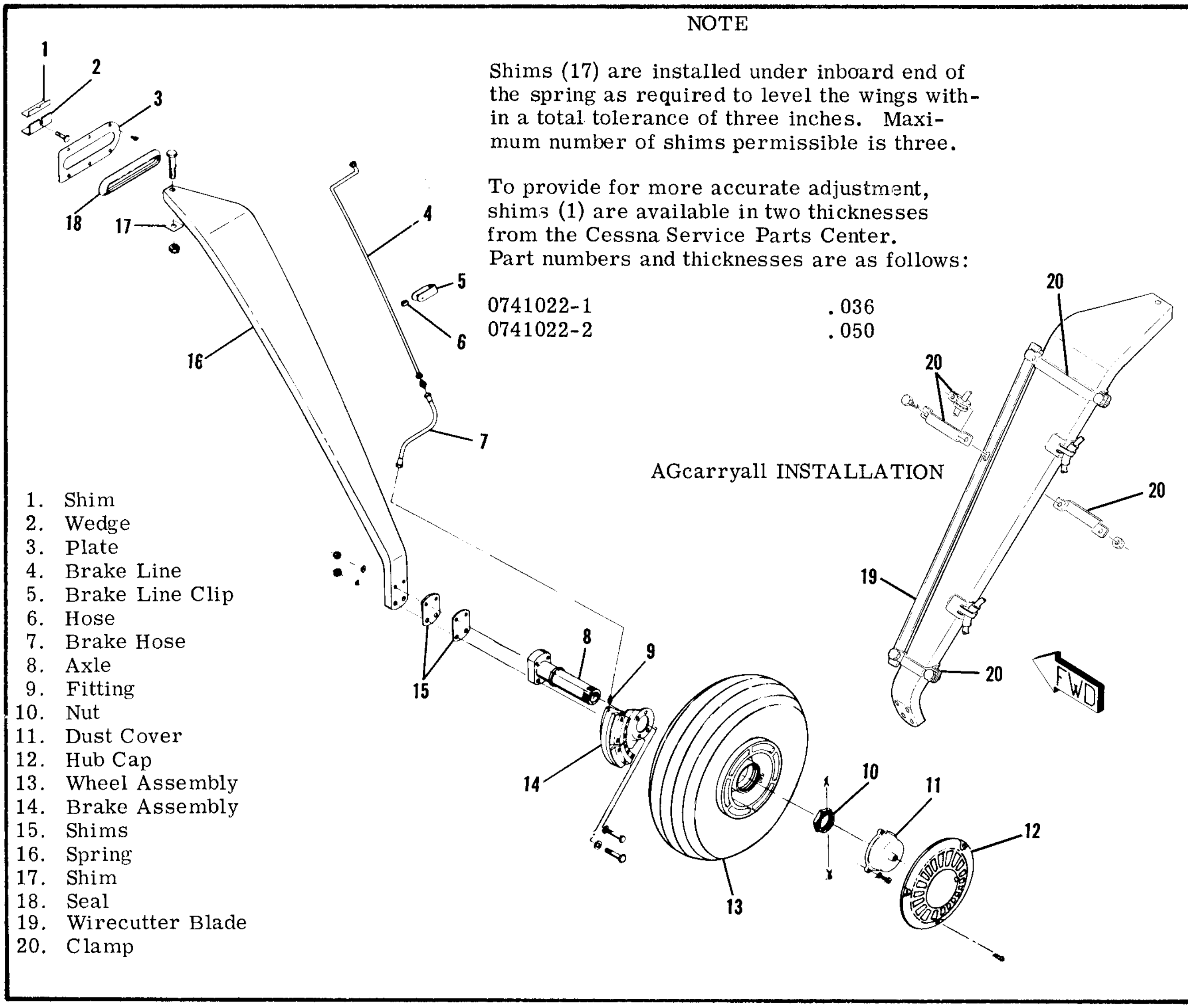


Figure 5-1. Main Landing Gear

c. Install bolt, washer and nut to secure inboard end of spring.

NOTE

Shims are installed under inboard end of spring strut as required to level the wings within a total tolerance of three inches. Maximum number of shims permissible is three.

d. Tap shims and wedges in place and install attaching bolts. (Avoid excessive pounding of wedges to prevent deforming supporting structure.)
e. Lower aircraft to ground.
f. Connect brake lines and bleed brakes.
g. Install parts removed for access.

5-7. WIRE CUTTERS. Wire cutter blades are installed on the forward edge of the landing gear struts on Model 185 AGcarryall aircraft.

5-8. REMOVAL AND INSTALLATION. (Refer to figure 5-1.)

NOTE

It is not necessary to remove the wire cutter blades to remove the main landing gear struts.

a. Remove bolts, washers and nuts attaching clamp halves.
b. Remove cutter blades.
c. Reverse preceding steps for installation.

5-9. MAIN WHEEL AND AXLE.

5-10. REMOVAL. (Refer to figure 5-1.)
a. Hoist or jack aircraft in accordance with instructions outlined in Section 2.
b. Disconnect, drain and cap or plug hydraulic brake line at brake cylinder.
c. Remove wheel as outlined in paragraph 5-13.

d. Remove nuts and bolts securing axle and brake components to spring strut.

NOTE

Note number and position of wheel alignment shims (15). Mark shims or tape them together carefully so they will be installed in exactly the same position to ensure that wheel alignment is not disturbed.

e. Remove axle and brake components.

5-11. INSTALLATION. (Refer to figure 5-1.)
a. Secure axle and brake components to strut (16).

NOTE

Ensure that wheel alignment shims (15) are installed in positions in which they were removed.

b. Install wheel assembly in accordance with instructions outlined in paragraph 5-17.
c. Connect brake line at cylinder.
d. Fill and bleed brake system.

5-12. MAIN WHEELS.

5-13. REMOVAL.

NOTE

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

a. Hoist aircraft or jack wheel in accordance with instructions outlined in Section 2.
b. Remove hub cap.
c. Remove dust cover to expose axle nut.
d. Remove cotter pins and axle nut.
e. Remove bolts and washers securing back plates (reference items 22, figure 5-10); remove back plates.
f. Pull wheel from axle. Bearing cone and grease seals will be removed during disassembly.

5-14. DISASSEMBLY. (Cleveland) (Figure 5-10.)

WARNING

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

a. Deflate tire and break tire beads loose.
b. Remove thru-bolts and separate wheel halves.
c. Remove tire, tube and brake disc.
d. Remove snap ring, grease seal felt, grease seal rings and bearing cones from both wheel halves.

NOTE

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

5-15. INSPECTION AND REPAIR. (Cleveland).
a. Clean all metal parts and grease seal felts in solvent and dry thoroughly.
b. Inspect wheel halves for cracks. Cracked wheel halves must be replaced. Sand out nicks, gouges and corroded areas. Where protective coating has been removed, area should be cleaned thoroughly, primed with zinc chromate primer and painted with aluminum lacquer.
c. Inspect brake disc. If excessively warped or scored, or worn to a thickness of 0.340 - inch, the brake disc should be replaced with a new part. Sand smooth small nicks and scratches.
d. Bearing cups and cones should be inspected carefully for damage and discoloration. After cleaning, repack bearing cones with clean bearing grease before installation in the wheel.

5-16. ASSEMBLY. (Cleveland). (figure 5-10.)
a. Insert thru-bolts through brake disc and position in the inner wheel half, using bolts to guide the disc. Assure that disc is bottomed in wheel half.
b. Position tire and tube in outboard wheel half. Inflation valve should be in hole in wheel half.
c. Place other wheel half in position, applying a light force to bring the wheel halves together.
d. Maintaining this light force, assemble a washer and nut on one thru-bolt and tighten snugly.
e. Assemble remaining nuts and washers on thru-bolts and torque to values specified in figure 5-1A.

CAUTION

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

f. Clean and pack bearing cones with clean wheel bearing grease. (Refer to figure 2-3 and paragraph 2-42.)
g. Assemble bearing cones, grease seal rings and grease seal felts into both wheel halves and secure with snap ring.
h. Inflate tire to seat tire beads, then adjust to correct pressure.

5-16A. MAIN WHEEL DISASSEMBLY (McCauley 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 screws attaching hub caps.
c. Remove thru-bolts and nuts and washers.

LANDING GEAR WHEEL THRU-BOLT/NUT TORQUE VALUES					
MAIN GEAR	WHEEL NUMBER	SIZE	MANUFACTURER	THRU-BOLT/ NUT TORQUE	RIM
X	C163001-0301	6.00x6	CLEVELAND	150 lb-in	ALUMINUM
X	C163001-0302	6.00x6	CLEVELAND	150 lb-in	ALUMINUM
X	C163002-0102	6.00x6	MC CAULEY	90-100 lb-in	ALUMINUM
X	C163002-0104	6.00x6	MC CAULEY	90-100 lb-in	ALUMINUM
X	C163004-0101	6.00x6	MC CAULEY	190-200 lb-in	ALUMINUM

Figure 5-1A. Landing Gear Wheel Thru-Bolt Nut Torque Values

d. Remove brake disc.
e. Separate wheel flanges from wheel hub. Retain spacers on each side of wheel hub.
f. Remove wheel hub from tire.
g. Remove retainer rings and remove grease seal retainers, grease seal felts and bearing cones.

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.

5-16B. MAIN WHEEL INSPECTION AND REPAIR. (McCauley Wheel.)
a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.
b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hub shall be discarded and new parts installed. Sand out smooth nicks, gouges and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.
c. If excessively warped or scored, or worn to a thickness of 0.190-inch, brake disc should be replaced with a new part. Sand smooth small nicks and scratches.
d. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease (refer to Section 2) before installing in the wheel hub.

5-16C. MAIN WHEEL REASSEMBLY. (McCauley 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 with washer under head of thru-bolt, insert bolt through brake disc, wheel flange and wheel hub.
c. Place spacer and wheel flange on outboard side of wheel hub with valve inflation stem through cutout in wheel flange.
d. Install washers and nut on thru-bolts.

CAUTION

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

e. Tighten thru-bolts evenly and torque to values specified in figure 5-1A.
f. Clean and pack bearing cones with clean aircraft wheel bearing grease.
g. Assemble bearing cones, grease seal felts and retainers into wheel hub.
h. Inflate tire to seat tire beads, then adjust to correct tire pressure. Refer to Section 1 for correct tire pressure.

5-16D. LANDING GEAR WHEEL THRU-BOLT NUT TORQUE VALUES. (Refer to figure 5-1A.) During assembly of the main wheel, the thru-bolt nuts and cap screws should be tightened evenly and torqued to the values stipulated in figure 5-1A. To facilitate identification of wheel manufacturers, solid wheels are manufactured by Cleveland Aircraft Products Co., and webbed wheels are manufactured by McCauley Industrial Corporation. Cleveland wheels are also identified by having two wheel halves as shown in figure 5-10 (Sheet 1 of 2). McCauley wheels are identified by having two wheel flanges and a hub as shown in figure 5-10 (Sheet 2 of 2).

5-17. INSTALLATION.
a. Place wheel on axle.

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

c. Install dust cover.

d. Position and secure back plates with bolts and washers.

e. Install hub cap.

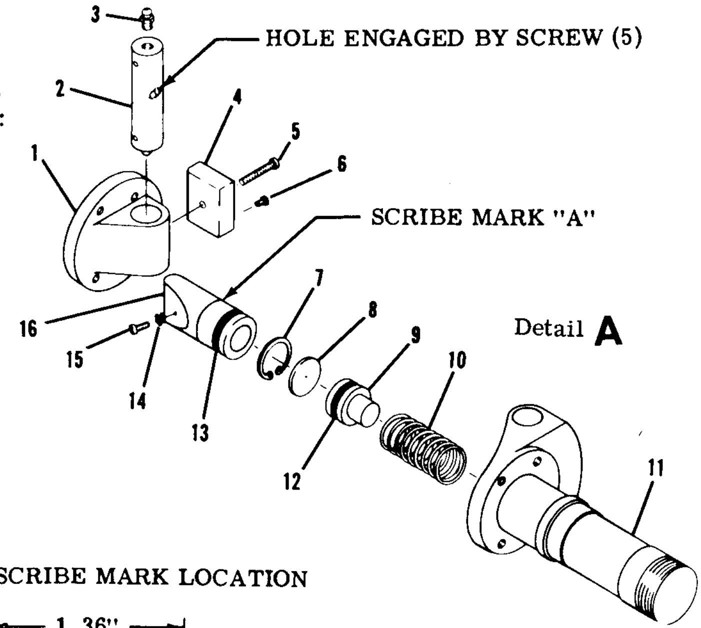
5-18. MAIN LANDING GEAR CASTERING AXLES. (Refer to figure 5-2.)

5-19. DESCRIPTION. Optional castering axles may be installed on the main landing gear. In the event of

SHOP NOTES:

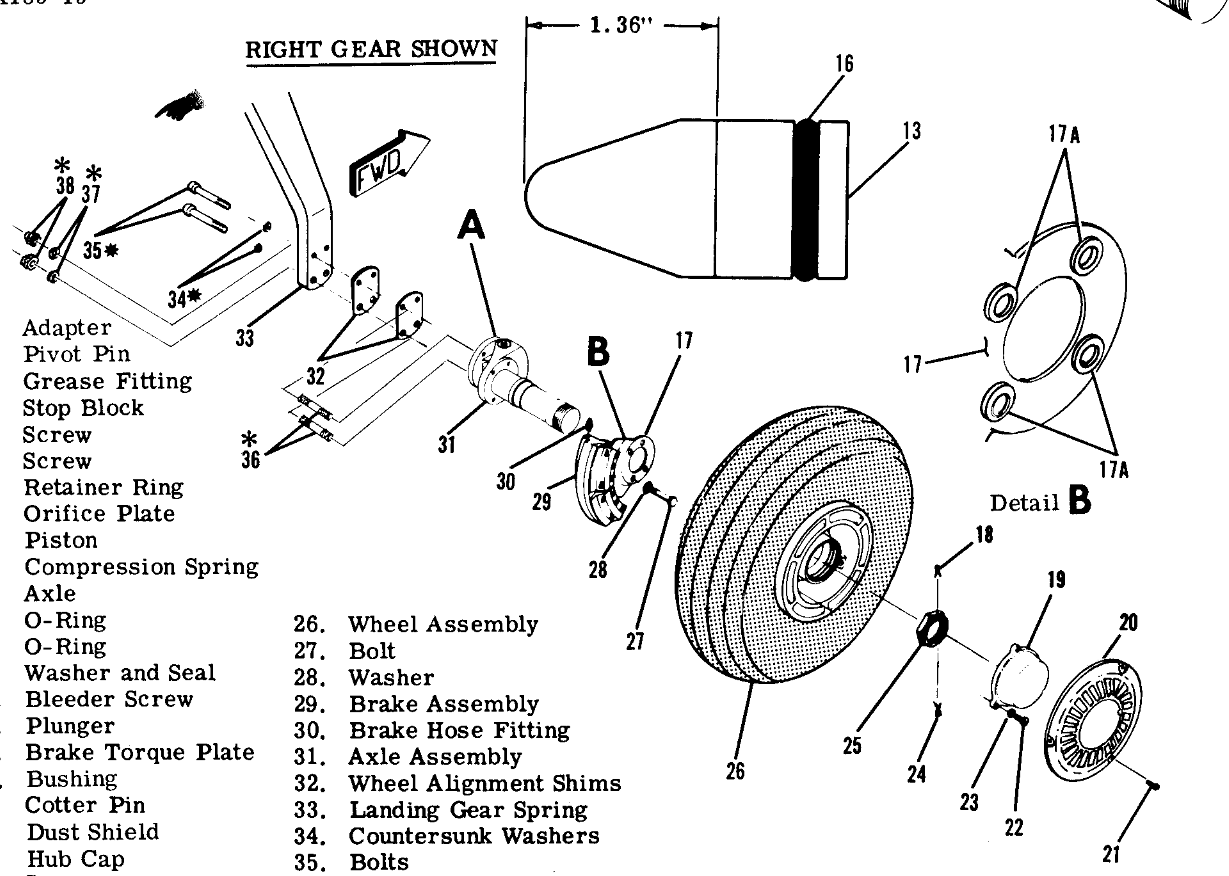
NOTE

Service Kit SK185-15, available from the Cessna Service Parts Center, installs studs (36), washers (37) and nuts (38) and deletes washers (34) and bolts (35). This kit is effective for the following aircraft: 185-0603, 185-0604, 185-0605, 185-0608 thru 185-0611 and 185-0613 thru 18502129. Beginning with 18502130, studs, washers and nuts will be installed on all production aircraft. The studs and bolts are interchangeable and all service parts will be studs, washers and nuts. Bolts and washers are no longer available.



* AIRCRAFT BEGINNING WITH 18502130 AND AIRCRAFT MODIFIED PER SK185-15

✱ AIRCRAFT THRU 18502129 NOT MODIFIED PER SK185-15



1. Adapter
2. Pivot Pin
3. Grease Fitting
4. Stop Block
5. Screw
6. Screw
7. Retainer Ring
8. Orifice Plate
9. Piston
10. Compression Spring
11. Axle
12. O-Ring
13. O-Ring
14. Washer and Seal
15. Bleeder Screw
16. Plunger
17. Brake Torque Plate
17A. Bushing
18. Cotter Pin
19. Dust Shield
20. Hub Cap
21. Screw
22. Screw
23. Washer
24. Cotter Pin
25. Axle Nut
26. Wheel Assembly
27. Bolt
28. Washer
29. Brake Assembly
30. Brake Hose Fitting
31. Axle Assembly
32. Wheel Alignment Shims
33. Landing Gear Spring
34. Countersunk Washers
35. Bolts
36. Studs
37. Washers
38. Nuts

NOTE

Bolts (27) are safety wired in pairs.

Figure 5-2. Cessna Castering Axle

improper drift correction at touchdown, the castering axles permit the main wheel on the downwind side of the aircraft to momentarily swivel outboard to align with the drifting ground track of the aircraft. However, the opposite (upwind) wheel is incapable of swiveling inboard, and it scrubs lightly until the drifting motion has ceased. The net effect is to minimize the lurching action at touchdown caused by the sideward drift and to restore the intended ground track during the landing roll. During normal taxi, the castering axles will not swivel. The axle is essentially a spring-loaded, fluid-filled, orifice-dampened cylinder.

5-20. REMOVAL.
a. Remove wheel from axle and pull floating brake assembly from brake torque plate.
b. Remove bolts and washers securing axle assembly to landing gear spring strut.

NOTE

Note number and position of wheel alignment shims. Tape them together so that they may be installed in exactly the same positions.

5-21. DISASSEMBLY. (Refer to figure 5-2.)
a. Remove screw (5) securing stop block (4) and pivot pin (2).
b. Deflect axle and remove stop block (4).
c. Using a soft punch, drive out pivot pin (2) and pull axle assembly from adapter (1).
d. Remove bleeder screw (15), washer and seal (14) and plunger (16).
e. Remove internal retainer ring (7), orifice plate (8), piston (9) and compression spring (10).
f. Remove bolts and washers to remove brake torque plate (17).

NOTE

Note relative position of torque plate to facilitate assembly.

5-22. CLEANING, INSPECTION, REPAIR AND LUBRICATION.
a. Clean all parts in solvent (Fed. Spec. P-S-661, or equivalent) and dry thoroughly. Make sure the small hole in the orifice plate and the bleeder passage in the plunger are not restricted.
b. Inspect parts for excessive wear, cracks, nicks, dents, scratches, scoring, and other obvious defects.
c. Repair, other than dressing out minor external nicks, dents, and scratches, is limited to replacement of defective parts.
d. Lubricate pivot pin with MIL-G-81322A grease during assembly. Also, lubricate pin through the grease fittings after assembly.

5-23. ASSEMBLY. (Refer to figure 5-2.) Since either too much or insufficient hydraulic fluid will reduce the efficiency of the castering axle, it is important that the following procedure be used.

NOTE

Because of the very small hole in the orifice plate, it is essential that internal parts be clean. Only clean hydraulic fluid should be used to lubricate the plunger (16), orifice plate (8), piston (9), spring (10), O-rings (12 and 13) and the inner bore of axle (11) during assembly.

a. Install new O-rings (12 and 13) on piston (9) and plunger (16).
b. Position spring (10) on piston (9), and insert into axle (11), spring first.
c. Place orifice plate (8) against piston (9). Using a brass or aluminum rod, press the assembly into the axle, compressing spring (10) until retainer ring (7) can be installed.

NOTE

Be sure retainer ring seats properly in its groove.

d. With open end of axle (11) up, fill to the top with MIL-H-5606 hydraulic fluid.
e. With bleeder screw (15) removed, slowly slide plunger (16) into axle (11) until all air has been expelled and fluid starts to flow from bleeder hole.
f. Continue forcing plunger slowly into axle until scribe mark "a" is flush with axle surface. Install washer and seal (14) and bleeder screw (15). Tighten bleeder screw while maintaining plunger position.

NOTE

Scribe mark "A" is used during assembly and refilling. The mark indicates the correct amount of hydraulic fluid in the unit.

g. Lubricate pivot pin (2) with MIL-G-81322A grease and assemble adapter (1) to axle (11) with pivot pin.

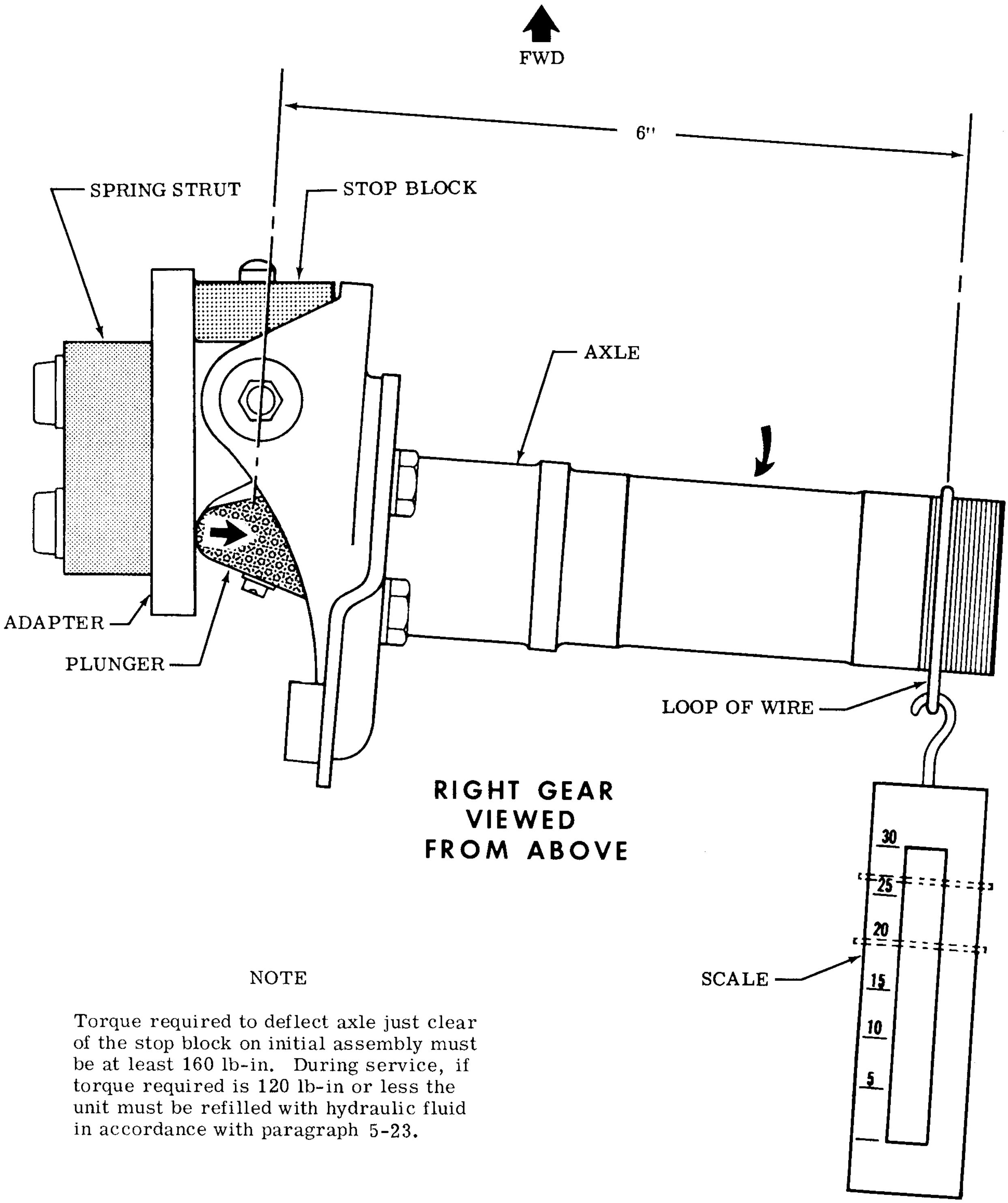
NOTE

Be sure to align hole for screw properly.

h. Deflect axle, forcing plunger into the axle, until stop block (4) can be installed. Beveled edge of stop block must be inboard for clearance.

i. Tighten screws (5 and 6) and safety screw heads together.
j. Attach brake torque plate (17) to axle with washers (28) and bolts (27), positioning torque plate as noted during disassembly. Tighten bolts (27) and safety wire bolt heads in pairs.

5-24. INSTALLATION. (Refer to figure 5-2.)
a. Place wheel alignment shims (32) between spring strut (33) and axle assembly (31).



NOTE

Torque required to deflect axle just clear of the stop block on initial assembly must be at least 160 lb-in. During service, if torque required is 120 lb-in or less the unit must be refilled with hydraulic fluid in accordance with paragraph 5-23.

Figure 5-3. Castering Axle Torque Measurement

NOTE

Be sure wheel alignment shims are installed in exactly the same positions from which they were removed.

b. Install countersunk washers (34) and bolts (35).

NOTE

AN960-516, -516L, -616 and -616L washers are to be added between the countersunk washers and spring strut as required to make bolts flush with outboard flat surface of adapter (1).

c. Perform a functional check in accordance with the following paragraph.
d. Position floating brake assembly on torque plate and install wheel and brake assembly.

5-25. FUNCTIONAL CHECK.
a. Measure torque required to deflect axle just clear of stop block as shown in figure 5-3. During assembly, torque required should not be less than 160 lb-in. On aircraft in service, torque required should be more than 120 lb-in. Failure to meet these requirements indicates a weak or broken compression spring or insufficient hydraulic fluid in the unit.
b. Operate axle rapidly through its full range of travel and check for hydraulic leaks. Defective O-rings or a scored inner bore of the axle are the usual causes of leakage.
c. Check that castering travel is 25° minimum. Too much hydraulic fluid will restrict travel, and not enough will cause too little axle torque as measured in figure 5-3.
d. Deflect axle to the full castered position, then let it snap back. The plunger should remain in contact with the adapter. Failure to maintain contact indicates a weak or broken compression spring, or insufficient hydraulic fluid.

5-26. CHECKING FLUID QUANTITY ON AIRCRAFT IN SERVICE. (Refer to figure 5-3.)

NOTE

The quantity of fluid is determined by checking the torque required to deflect the axle just clear of the stop block.

a. Using universal jack point, jack one wheel clear of the ground.
b. Remove wheel and measure torque required to deflect axle just clear of stop block, as shown in figure 5-3. If torque required is 120 lb-in. or less, hydraulic fluid must be added.
c. To add fluid, proceed as follows:
1. Remove wheel and axle assembly in accordance with paragraph 5-20.
2. With stop block removed, remove pivot pin and pull axle from adapter.
3. Remove bleeder screw, washer and seal and plunger.
4. With open end of axle up, fill to the top with MIL-H-5606 hydraulic fluid.
5. Install a new O-ring on plunger and lubricate with hydraulic fluid.
6. With bleeder screw removed, slowly slide plunger into axle until all air has been expelled and fluid starts to flow from bleeder hole.
7. Continue forcing plunger slowly into axle until scribe mark "A" is flush with axle surface. Install bleeder screw, washer and seal, and tighten bleeder screw while maintaining this position.

NOTE

Scribe mark "A" is used during assembly and refilling. It indicates the correct amount of hydraulic fluid in the unit.

8. Lubricate pin with MIL-G-81322A grease and assemble adapter to axle with pivot pin. Be sure to align hole for screw properly.
9. Deflect axle, forcing plunger into axle until stop block can be installed. Beveled edge of stop block must be inboard for clearance. Tighten screws and safety to each other.
10. Reinstall wheel and axle assembly in accordance with paragraph 5-23.
d. Lower wheel to ground and remove jack.

5-27. MAIN WHEEL ALIGNMENT. Correct main wheel alignment is obtained through the use of tapered shims between the flange of the axle and the spring strut. Refer to figure 5-4, sheet 1 for procedures to follow to obtain wheel alignment. Wheel alignment shim part numbers and the correction imposed on the wheels by the various shims are listed on sheet 2 of figure 5-4.

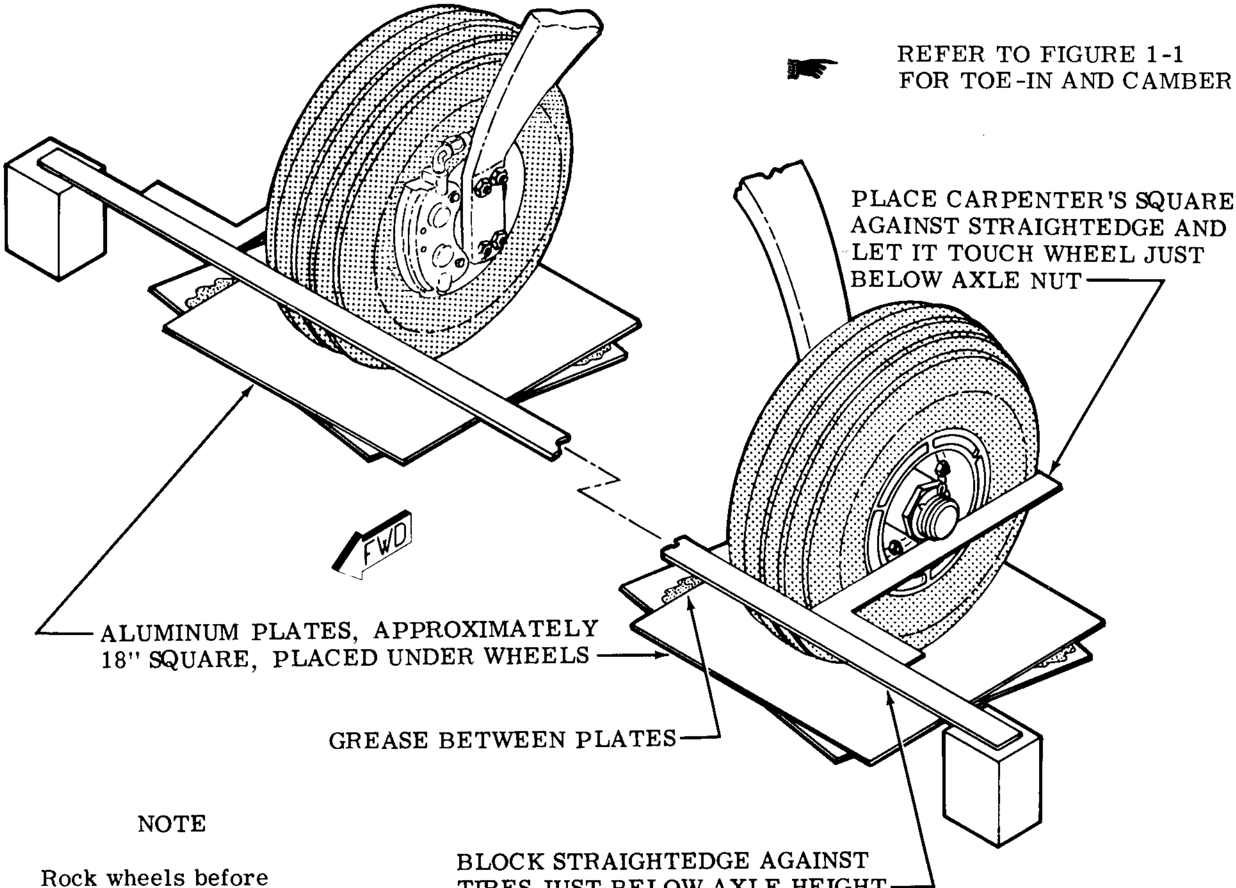
NOTE

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

5-28. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The lightweight point of the tire is marked with a red dot on the tire sidewall, and the heavy weight point of the tube is marked with a contrasting color line (usually near the valve stem). When installing a new tire and tube, 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.

5-29. TAIL GEAR.

5-30. DESCRIPTION. The tail gear is comprised of a steerable tailwheel mounted on a tubular spring strut. The spring strut is mounted in rubber bushings to cushion vibration. The tailwheel is steerable, in response to rudder pedal actuation, through an arc of 24° each side of neutral, and is free-swiveling beyond this travel. Model 185-Series aircraft are equipped with a tailwheel locking system, operated

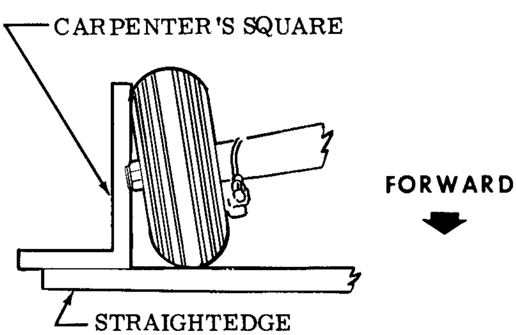


NOTE

Rock wheels before checking wheel alignment.

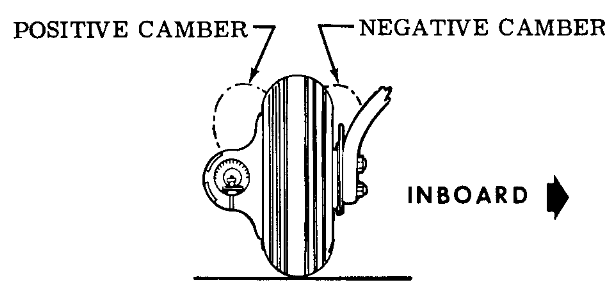
TOP VIEW OF TOE-IN CHECK

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 5-4. Main Wheel Alignment (Sheet 1 of 2)

SHIM PART NO.	POSITION OF THICKEST CORNER OF SHIM	CORRECTION IMPOSED ON WHEEL			
		TOE-IN	TOE-OUT	POS. CAMBER	NEG. CAMBER
0541111-2	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .25" ---- .11"	.11" ---- .25" ----	2°56' 2°17' ---- ----	---- ---- 2°17' 2°56'
0441139-5	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .12" ---- .10"	.10" ---- .12" ----	0°30' 0°5' ---- ----	---- ---- 0°5' 0°30'
0441139-6	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .25" ---- .20"	.20" ---- .25" ----	1°0' 0°10' ---- ----	---- ---- 0°10' 1°0'

Figure 5-4. Main Wheel Alignment (Sheet 2 of 2)

by a control lever in the cabin. When the tailwheel is locked, it is still steerable approximately 2.5° each side of neutral. The locking lug is spring-loaded to the disengaged position.

5-31. REMOVAL AND INSTALLATION. (Refer to figure 5-5.)

a. Place a suitable padded stand under an aft fuselage bulkhead to raise the tail gear off the ground.
b. Disconnect steering cables from tail gear.
c. On the Model 185-Series, disconnect tailwheel lock control from the tail gear spring and tailwheel locking yoks.
d. Remove fuselage stinger.
e. Remove cotter pins and clevis pins securing tube to spring fitting.
f. Tap tube out through the spring fitting and pull tailwheel spring aft, out of hose which is cemented to a mounting structure in the fuselage.
g. Reverse the preceding steps to install tail gear.

NOTE

Replace hose and rubber bushings if deteriorated. Inspect and replace spring and attaching parts as required.

h. Refer to paragraph 5-40 for procedures to follow while rigging the tailwheel locking system on Model 185-Series aircraft.

5-32. TAILWHEEL.

5-33. DESCRIPTION. Tailwheel tire sizes and pressures are listed in figure 1-1. Servicing procedures and lubrication intervals are specified in Section 2.

5-34. REMOVAL AND INSTALLATION. (Refer to figure 5-6.)

a. Place a suitable padded stand under an aft fuselage bulkhead to raise the tailwheel off the ground.
b. Noting position of washers, lockwashers and spacers, remove cotter pin and axle nut and pull axle bolt out of fork to remove tailwheel.

NOTE

After removal of the tailwheel, the steering mechanism and Model 185-Series tailwheel locking system may be disassembled and parts replaced as necessary.

c. Reverse preceding steps to install the tailwheel.
d. When assembling steering mechanism and fork, tighten castellated nut (item 23, figure 5-6) as outlined in paragraph 5-42.
e. Tighten axle nut until a slight bearing drag is obvious when the tailwheel is rotated. Back off nut to nearest castellation and install cotter pin.

5-35. DISASSEMBLY OF TAILWHEEL. (Refer to figure 5-7.)

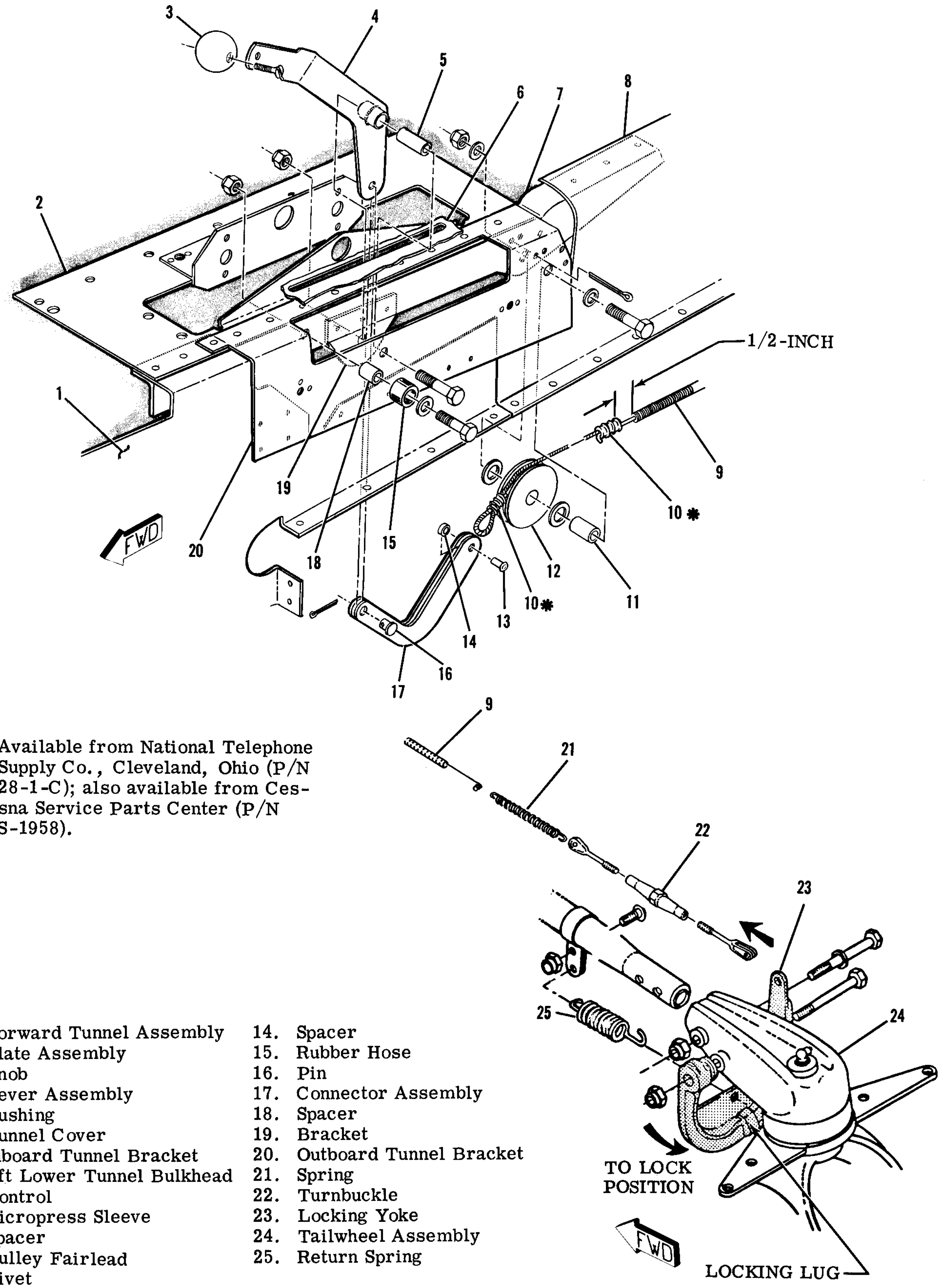
a. After removing tailwheel, deflate tire by removing valve core.

NOTE

Grease seals, retainers and bearing cones need not be removed to remove a tire, although their removal for cleaning and lubrication is recommended.

b. Remove bolts fastening wheel halves together, then separate wheel halves.
c. Remove tire, tube and gasket between wheel halves.

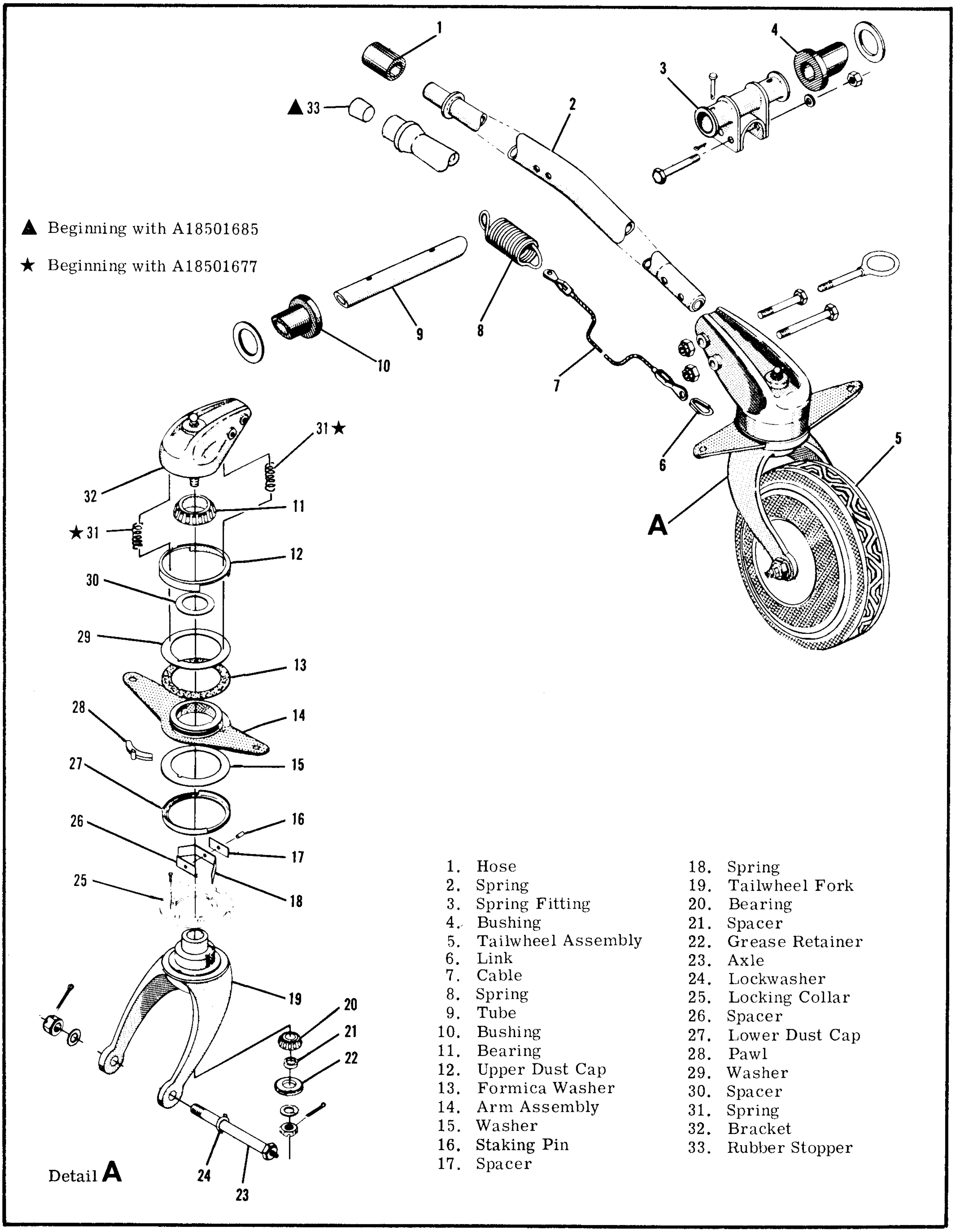
5-36. CLEANING AND LUBRICATION. Wash all metal parts and seals in solvent and dry with compressed air. Remove felt seals from service if, after normal cleaning, they are embedded with foreign matter, the felt is not pliable or the material is broken or does not retain the shape necessary to



✱ Available from National Telephone Supply Co., Cleveland, Ohio (P/N 28-1-C); also available from Cessna Service Parts Center (P/N S-1958).

1. Forward Tunnel Assembly
2. Plate Assembly
3. Knob
4. Lever Assembly
5. Bushing
6. Tunnel Cover
7. Inboard Tunnel Bracket
8. Aft Lower Tunnel Bulkhead
9. Control
10. Nicropress Sleeve
11. Spacer
12. Pulley Fairlead
13. Rivet
14. Spacer
15. Rubber Hose
16. Pin
17. Connector Assembly
18. Spacer
19. Bracket
20. Outboard Tunnel Bracket
21. Spring
22. Turnbuckle
23. Locking Yoke
24. Tailwheel Assembly
25. Return Spring

Figure 5-5. Tailwheel Locking System



1. Hose
2. Spring
3. Spring Fitting
4. Bushing
5. Tailwheel Assembly
6. Link
7. Cable
8. Spring
9. Tube
10. Bushing
11. Bearing
12. Upper Dust Cap
13. Formica Washer
14. Arm Assembly
15. Washer
16. Staking Pin
17. Spacer
18. Spring
19. Tailwheel Fork
20. Bearing
21. Spacer
22. Grease Retainer
23. Axle
24. Lockwasher
25. Locking Collar
26. Spacer
27. Lower Dust Cap
28. Pawl
29. Washer
30. Spacer
31. Spring
32. Bracket
33. Rubber Stopper

Figure 5-6. Tail Gear

afford proper sealing. Pack all bearing cones with MIL-G-81322A grease. Oil the seals with a light machine oil prior to installation.

5-37. ASSEMBLY OF TAILWHEEL. (Refer to figure 5-7.) Reverse the procedures outlined in paragraph 5-35 to assemble the tailwheel.

NOTE

Bearing cups may be replaced as outlined in paragraph 5-14.

5-38. TAILWHEEL LOCKING SYSTEM. (Model 185-Series).

5-39. DESCRIPTION. A tailwheel lock is incorporated on the Model 185-Series, which permits steering of approximately 2.5° each side of neutral while the lock is engaged. The system is manually controlled and is operated by a control in the cabin.

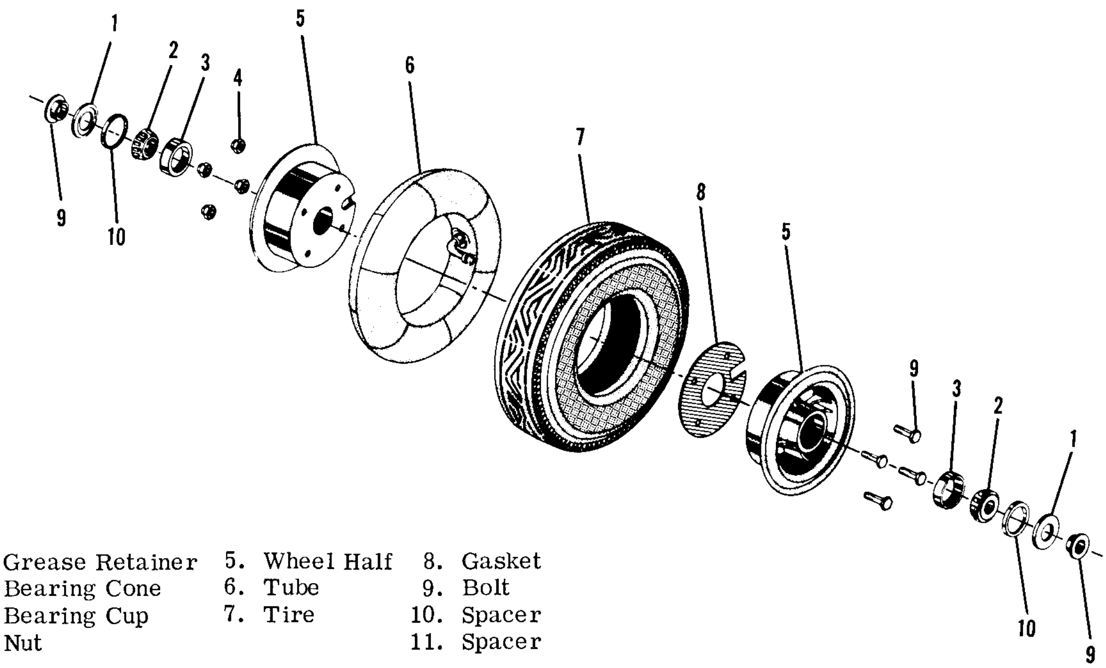
5-40. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE TAILWHEEL SHIMMY.	Improper rigging.	Rig per paragraph 5-42.
	Nut fastening steering mechanism to fork improperly tightened.	Tighten per paragraph 5-43.
	Incorrect tire pressure.	Inflate to correct pressure.

NOTE

The 10-inch tires are more susceptible to shimmy than the 8-inch tire. If desired, the 10-inch tire and tube may be replaced with the 8-inch tire and tube. Either size will fit the wheel assembly.

SHOP NOTES:



1. Grease Retainer
2. Bearing Cone
3. Bearing Cup
4. Nut
5. Wheel Half
6. Tube
7. Tire
8. Gasket
9. Bolt
10. Spacer
11. Spacer

Figure 5-7. Tailwheel Assembly

5-41. REMOVAL AND INSTALLATION. The tailwheel locking system is illustrated in figure 5-5. The figure may be used as a guide for removal and installation of system components. Refer to the following paragraph for tailwheel locking system rigging procedures.

5-42. RIGGING. (Refer to figure 5-5.)

a. With control lever (22) in the unlocked position, check that there is .50-inch clearance between forward end of control casing (8) and Nicopress sleeve (10) as shown in the figure. Shift casing in clamps as necessary to obtain proper clearance.

b. With control lever still in unlocked position, adjust turnbuckle (16) so that locking lug, on locking yoke (17), is not engaged with slot in tailwheel assembly (18).

c. Move control lever to locked position and check that locking lug is positively engaged with slot in tailwheel assembly.

d. Safety wire turnbuckle (16).

5-43. TAILWHEEL FRICTION CHECK. At the first four 25-hour inspections and at each 100-hour inspection thereafter, perform the following friction check.

a. Place a suitable padded stand under an aft fuselage bulkhead to raise tailwheel off the ground.

b. Disconnect steering cables. Ensure that the Model 185-Series tailwheel locking system is disengaged.

c. Using a spring scale hooked into a steering cable attach hole, measure friction required to pivot tailwheel fork. Force required should be 5 to 6 pounds (approximately 23 to 28 pound-inches of torque). This applies to 8 inch as well as 10 inch tailwheels. Adjustment of friction is provided by the castellated nut shown in figure 5-6, which fastens steering mechanism to fork. Be sure to install cotter pin after adjusting castellated nut.

5-44. BRAKE SYSTEMS.

5-45. DESCRIPTION. The hydraulic brake system consists of two brake master cylinders, brake lines connecting each master cylinder to its wheel brake cylinder, and the single-disc type brake assemblies, located on each main landing gear.

5-46. 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 shown in figure 5-8.
	Restriction in hydraulic lines or restriction in compensating port in master brake cylinders.	Drain brake lines and clean 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.

5-47. BRAKE MASTER CYLINDERS.

5-48. DESCRIPTION. The brake master cylinders, located just forward of the pilot's rudder pedals, are actuated by applying toe pressure on the rudder pedals. A small reservoir is incorporated with each master cylinder to supply it with fluid. When dual brakes are installed, mechanical linkage permits the copilot's pedals to operate the master cylinders.

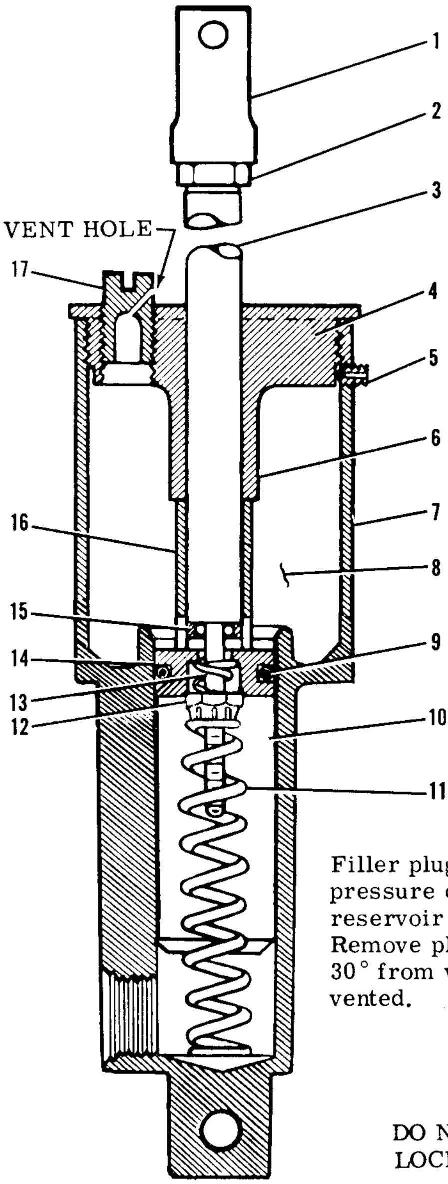
5-49. REMOVAL.

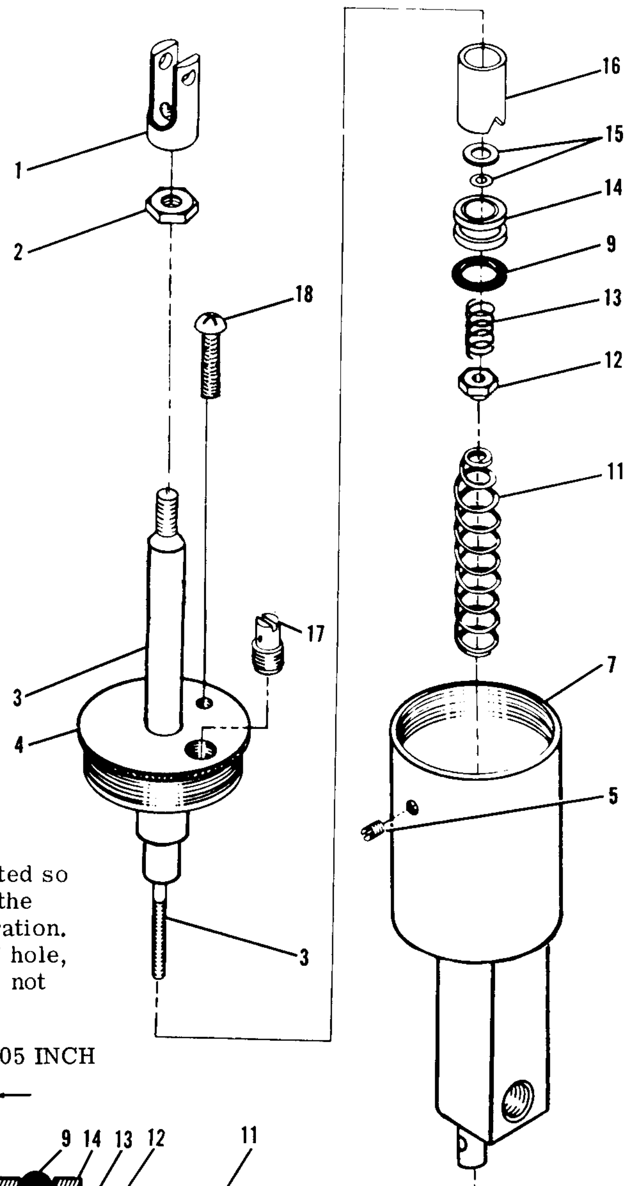
a. Drain hydraulic fluid from brake system.
b. Remove front seats and rudder bar shield to gain access to master cylinders.
c. Disconnect parking brake linkage and master cylinders from rudder pedals.
d. Disconnect master cylinders at bottom attachment point.
e. Disconnect hydraulic hoses from master cylinders; remove cylinders.
f. Plug and cap hydraulic fittings, lines and hoses to prevent entry of foreign materials.

5-50. REPAIR. (Refer to figure 5-8.) Refer to the figure as a guide during disassembly and assembly of the brake master cylinders. Repair is limited to replacement of parts, cleaning and adjustment. Use clean hydraulic fluid as a lubricant during assembly of the cylinders.

5-51. INSTALLATION.

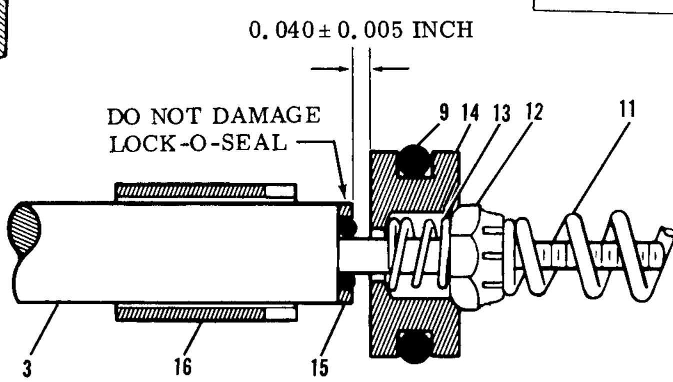
a. Reverse the steps outlined in paragraph 5-49 to





NOTE

Filler plug (17) must be vented so pressure cannot build up in the reservoir during brake operation. Remove plug and drill 1/16" hole, 30° from vertical, if plug is not vented.



ASSEMBLY OF PISTON

1. Clevis
2. Jamb 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 5-8. Brake Master Cylinder

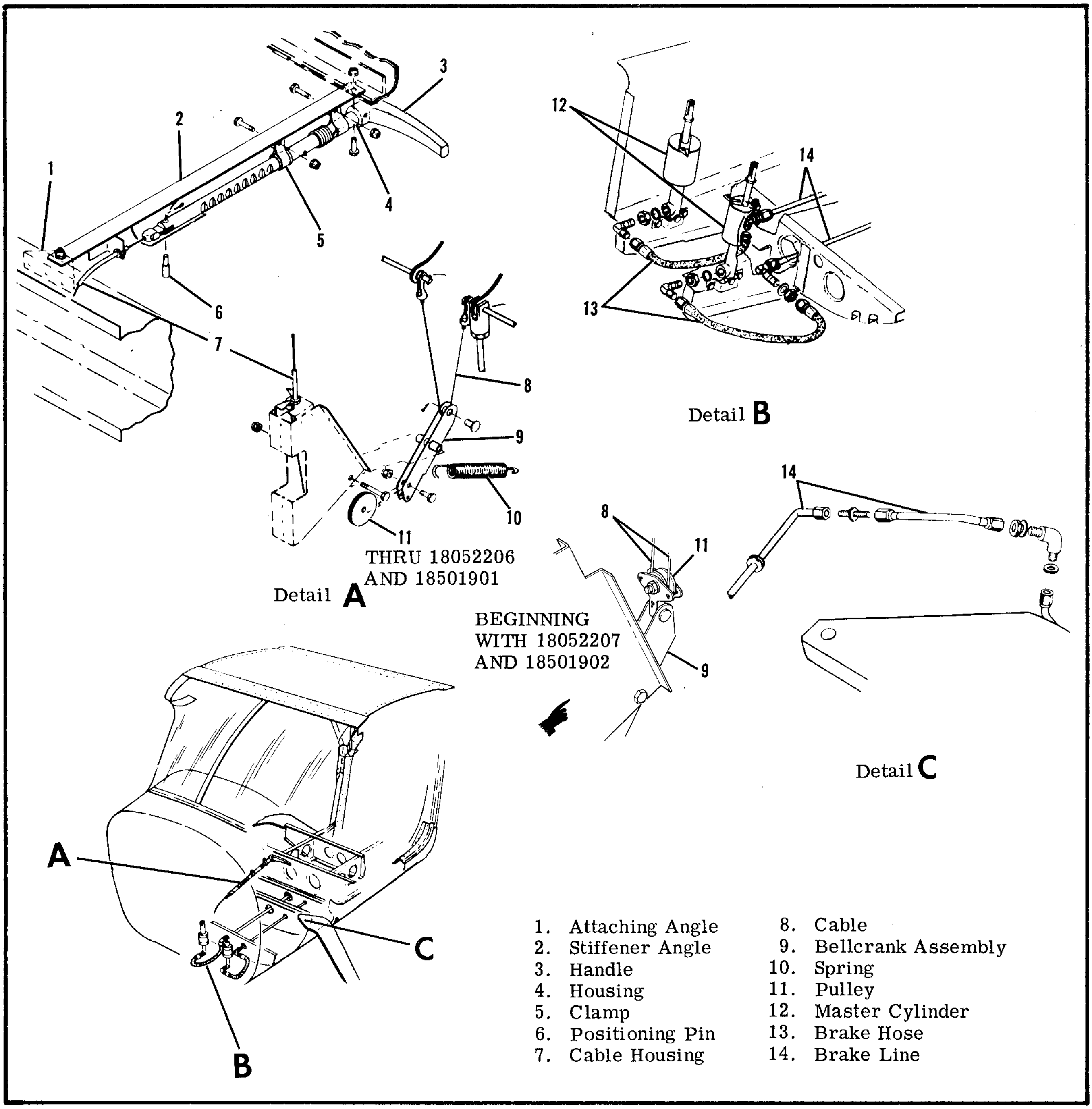


Figure 5-9. Brake System

install the brake master cylinders.

b. After cylinders are installed, fill and bleed brake system.

5-52. HYDRAULIC BRAKE LINES.

5-53. DESCRIPTION. Hydraulic brake lines are of rigid aluminum tubing, except for flexible hose used at the master cylinders and at the wheel brake assemblies. A separate line is used to connect master cylinder to its corresponding wheel brake cylinder. Brake lines are 3/16-inch aluminum lines and brake hoses are small automotive-type brake hoses.

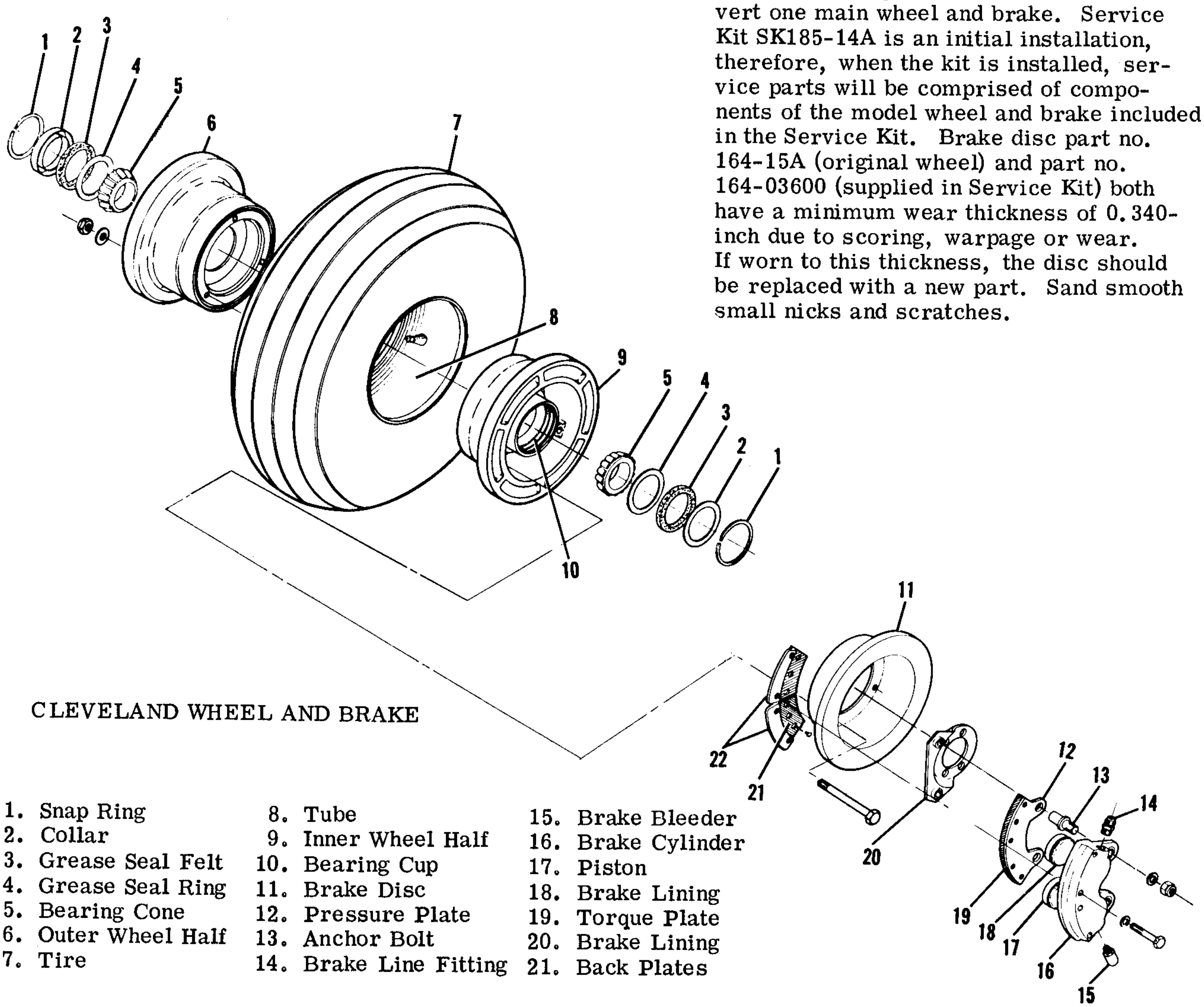
5-54. REMOVAL AND INSTALLATION. After draining, removal and installation of brake lines and hoses can be accomplished with common tools. All fittings are conventional. If a lubricant is needed during assembly, use clean hydraulic fluid of the type used in the system. If galling is encountered, use Petrolatum on male threads only, omitting the first two threads. After installation, fill and bleed the brake system.

5-55. WHEEL BRAKES. (Refer to figure 5-10.)

5-56. DESCRIPTION. A single-disc type brake is

NOTE

For Serials 18051775 thru 18051993, 185-0513 thru 185-0653 and 185-1150 thru 185-1447, available from the Cessna Service Parts Center, which converts the original wheel and brake assembly to an improved configuration. This kit will convert one main wheel and brake. Service Kit SK185-14A is an initial installation, therefore, when the kit is installed, service parts will be comprised of components of the model wheel and brake included in the Service Kit. Brake disc part no. 164-15A (original wheel) and part no. 164-03600 (supplied in Service Kit) both have a minimum wear thickness of 0.340-inch due to scoring, warpage or wear. If worn to this thickness, the disc should be replaced with a new part. Sand smooth small nicks and scratches.



CLEVELAND WHEEL AND BRAKE

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

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

used at each main wheel. The disc is affixed to the wheel, while the brake assembly floats laterally on anchor bolts, which extend through a stationary torque plate, held by the axle bolts.

5-57. REMOVAL.

a. Disconnect and drain brake hose. Protect hose and fitting from dirt.

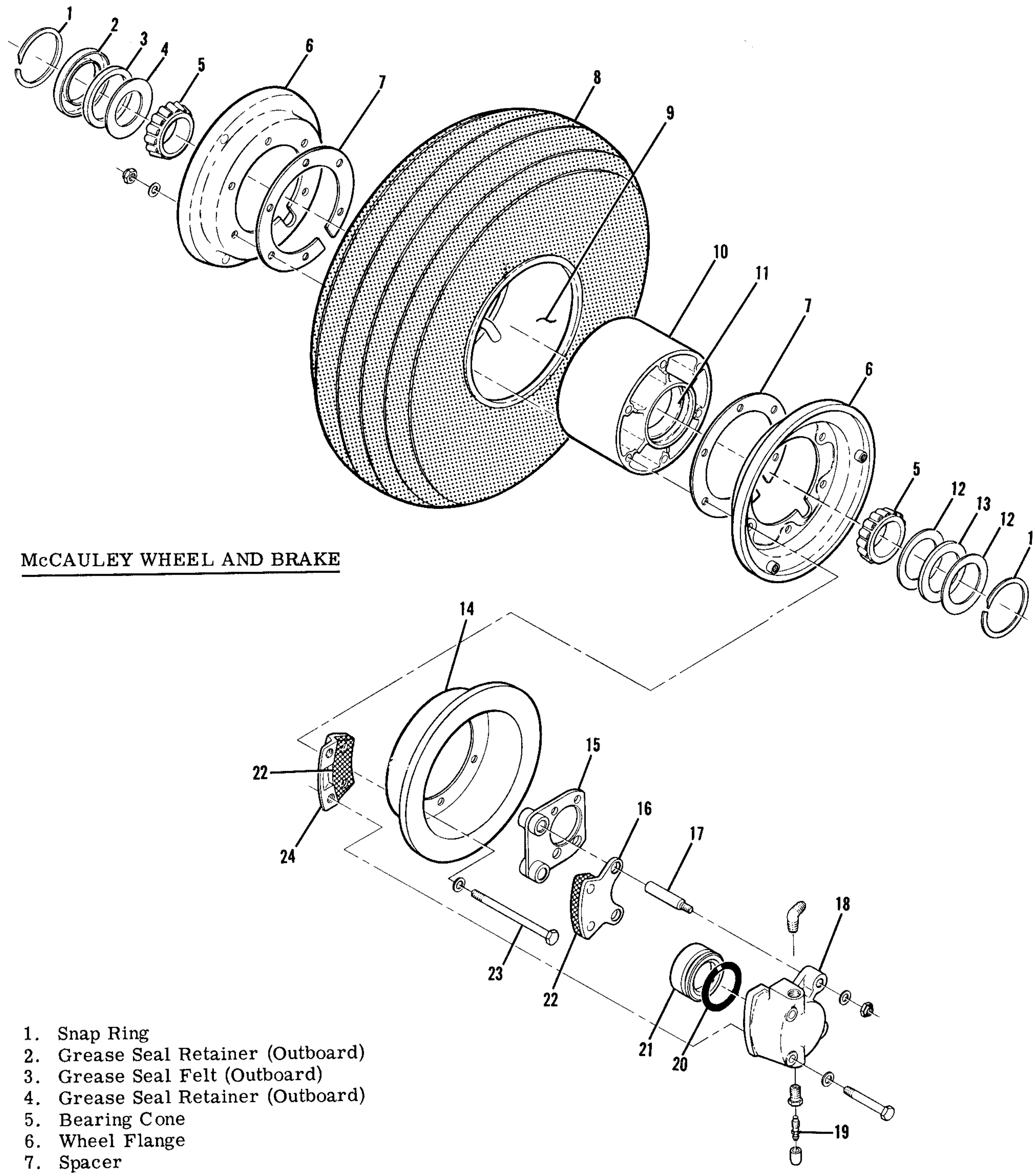
b. Remove back plate.

c. Pull brake assembly out of torque plate to remove.

NOTE

To remove torque plate, the wheel and axle must be removed. The brake disc is removed as the wheel is disassembled.

5-58. DISASSEMBLY. (Refer to figure 5-10.) Details of the wheel brake assemblies are shown in the figure, which may be used as a guide during disassembly.



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. 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. Brake Cylinder
19. Bleeder Valve
20. O-Ring (Piston)
21. Brake Piston
22. Brake Lining
23. Thru-Bolt
24. Back Plate

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

NOTE

Use of compressed air applied to the brake line fitting is permissible when removing the piston from brake cylinder.

5-59. CLEANING, INSPECTION AND REPAIR.

a. Clean all parts except brake linings and O-rings in dry cleaning solution and dry thoroughly.

b. O-rings are usually replaced at each overhaul. If their re-use is necessary, they should be wiped with a clean oiled cloth and inspected for damage.

NOTE

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

c. Check brake linings for deterioration and maximum permissible wear. (Refer to applicable paragraph.)

d. Inspect brake cylinder bore for scoring. A scored cylinder may leak or cause rapid O-ring wear. A scored cylinder should be replaced.

e. If the anchor bolts are nicked or gouged, they should be sanded smooth to prevent binding with the pressure plate or torque plate. When the anchor bolts are replaced, they should be pressed out. New bolts can be installed by tapping them into place with a soft hammer.

5-60. ASSEMBLY. Lubricate parts with the type of hydraulic fluid used in the system and assembly components with care to prevent damage to O-rings. Use figure 5-10 as a guide during assembly.

5-61. INSTALLATION.

NOTE

If the torque plate was removed, install as the wheel and axle are installed in accordance with paragraph 5-11. If the brake disc was removed, install as the wheel is assembled in accordance with paragraph 5-16.

a. Place brake assembly in position, sliding anchor bolts into torque plate.

b. Install back plate.

c. Fill and bleed brake system.

5-62. CHECKING BRAKE LININGS. Brake linings should be replaced when they are worn to a minimum thickness of 3/32-inch. Visually compare a 3/32-inch strip of material or the shank end of a 3/32-inch drill bit held adjacent to each lining to measure the thickness of the lining.

5-63. INSTALLING BRAKE LININGS.

a. Remove bolts, washers and back plate.

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

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

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

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

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

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

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

i. Position pressure plate on anchor bolts and install brake cylinder, sliding anchor bolts into the torque plate.

j. Install back plate with bolts and washers. Safety the bolts, except where self-locking bolts are used.

5-64. BRAKE SYSTEM BLEEDING. Standard bleeding, with a clean hydraulic pressure source connected to the wheel cylinder bleeder fitting, is recommended.

a. Remove master cylinder filler plug and screw a flexible hose with a suitable fitting into the filler hole. Immerse the free end of the hose in a can containing enough hydraulic fluid to cover the end of the hose.

b. Connect a clean hydraulic pressure source such as a hydraulic hand pump to the bleeder valve on the lower end of the wheel cylinder.

NOTE

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

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

d. Remove hose from master cylinder and replace filler plug.

5-65. PARKING BRAKE SYSTEM.

5-66. DESCRIPTION. The parking brake system is comprised of a handle and ratchet mechanism connected by a cable to linkage at the master cylinders. Pulling out on the handle depresses both master cylinder piston rods and the ratchet locks the handle in this position until the handle is turned and released.

5-67. REMOVAL AND INSTALLATION. (Refer to figure 5-9.) Use the figure as a guide during removal and installation of system components.

SECTION 6

AILERON CONTROL SYSTEM

TABLE OF CONTENTS Page

6-1. AILERON CONTROL SYSTEM.

6-2. DESCRIPTION. The aileron control system consists of push-pull rods, bellcranks, cables, pulleys, sprockets and roller chains, all of which, link the control wheels to the ailerons. A control "U" interconnects the control wheels to the aileron cables.

6-3. TROUBLE SHOOTING.

NOTE

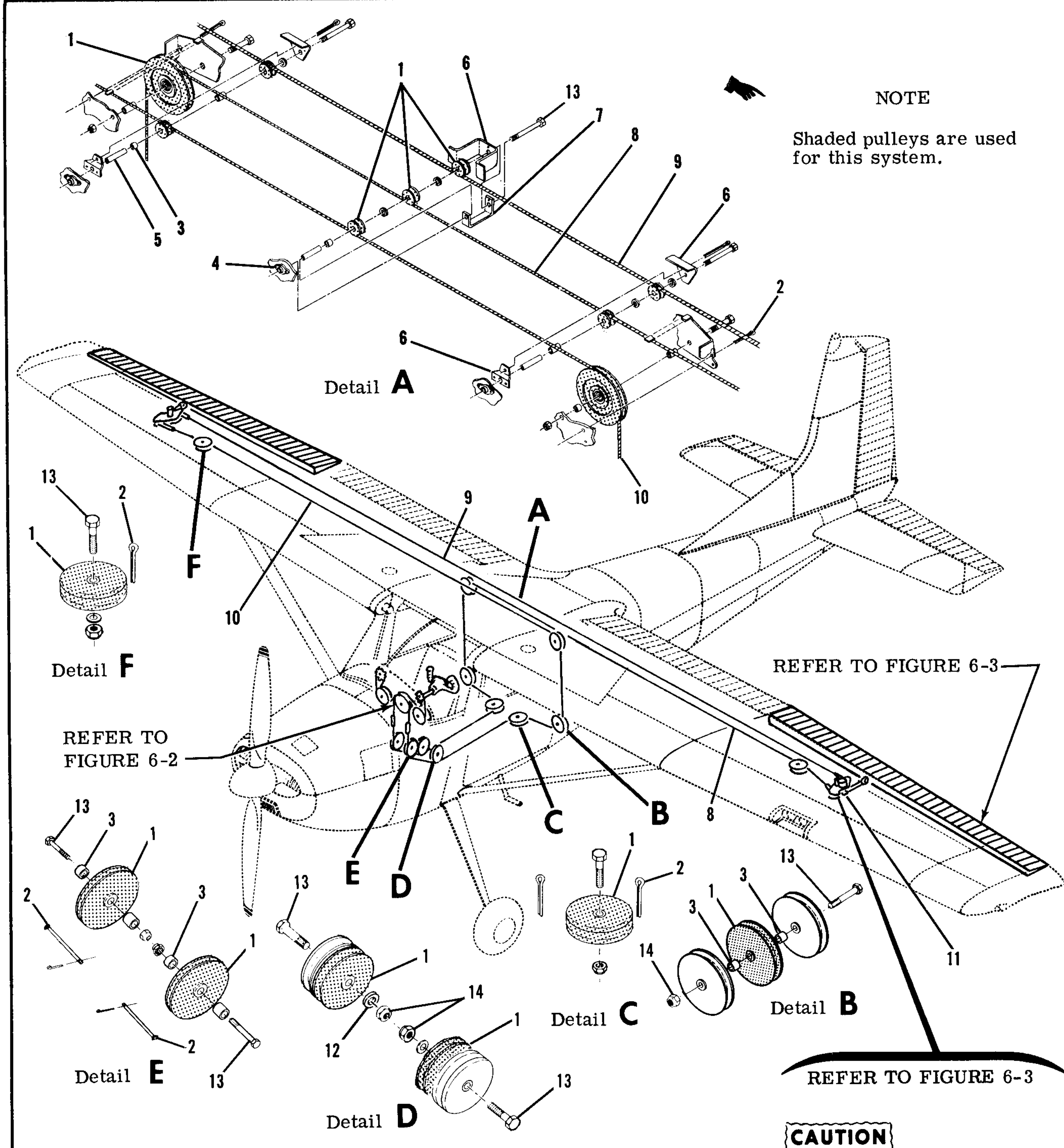
Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 6-17.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION IN CONTROL WHEELS.	Loose control cables.	Check cables with tensiometer. Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Check visually. Replace defective parts, install cables correctly.
	Sprung bellcrank.	Check visually. Replace bellcrank.
	Loose chains on control "U".	Check and adjust chains to proper tension.

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Check cables with tensiometer. Adjust cables to proper tension.
	Pulleys binding or cable off.	Check visually. Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Check visually. Replace defective bellcrank.
	Defective U-joints.	Check visually. Replace defective U-joints.
	Clevis bolts in system too tight.	Loosen, then tighten properly and safety.
	Chain binding with sprocket.	Check visually. Replace defective parts.
	Rusty chain.	Check visually. Replace rusty chain.
	Chains on control "U" too tight.	Check and adjust chains to proper tension.
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of chains or cables.	Refer to paragraph 6-17.
	Improper adjustment of aileron push-pull rods.	Refer to paragraph 6-17.
DUAL CONTROL WHEELS NOT COORDINATED.	Chains improperly adjusted.	Refer to paragraph 6-17.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Refer to paragraph 6-17.
	Worn bellcrank stop bushings or bellcrank slots.	Check visually. Replace defective parts.

SHOP NOTES:



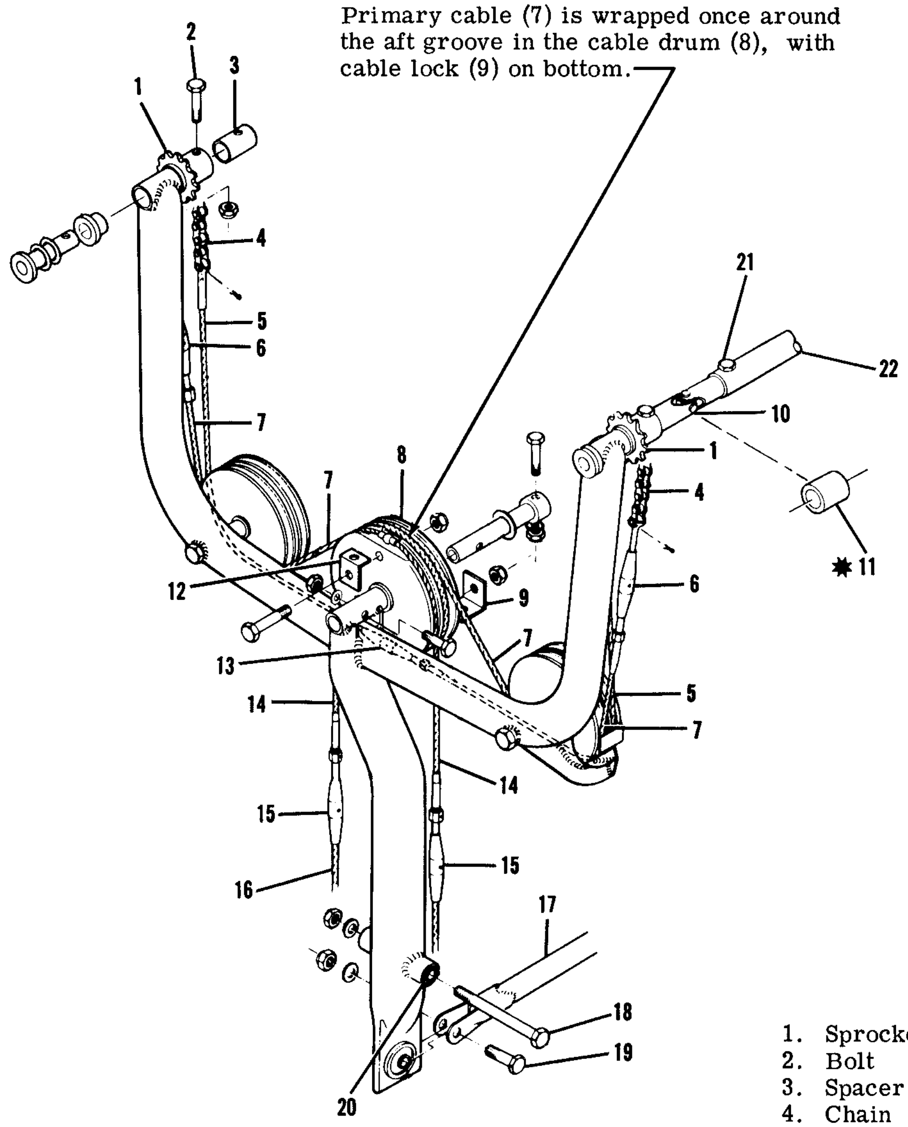
CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

1. Pulley
2. Cable Guard
3. Spacer
4. Nutplate
5. Bushing
6. Guide Pulley Bracket
7. Cable Guard
8. Cable (LH Direct)
9. Cable (Carry-Thru)
10. Cable (RH Direct)
11. Bellcrank
12. Washer
13. Bolt
14. Nut

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

Figure 6-1. Aileron Control System



1. Sprocket
2. Bolt
3. Spacer
4. Chain
5. Secondary Cable
6. Turnbuckle (Primary Cable)
7. Primary Cable
8. Cable Drum
9. Primary Cable Lock
10. Universal Joint
11. Boot
12. Transition Cable Lock
13. Turnbuckle (Secondary Cable)
14. Transition Cable
15. Turnbuckle (Direct Cable)
16. Aileron Direct Cable
17. Elevator Push-Pull Tube
18. Bolt
19. Bolt
20. Bushing
21. Bolt
22. Control Wheel Tube

NOTES

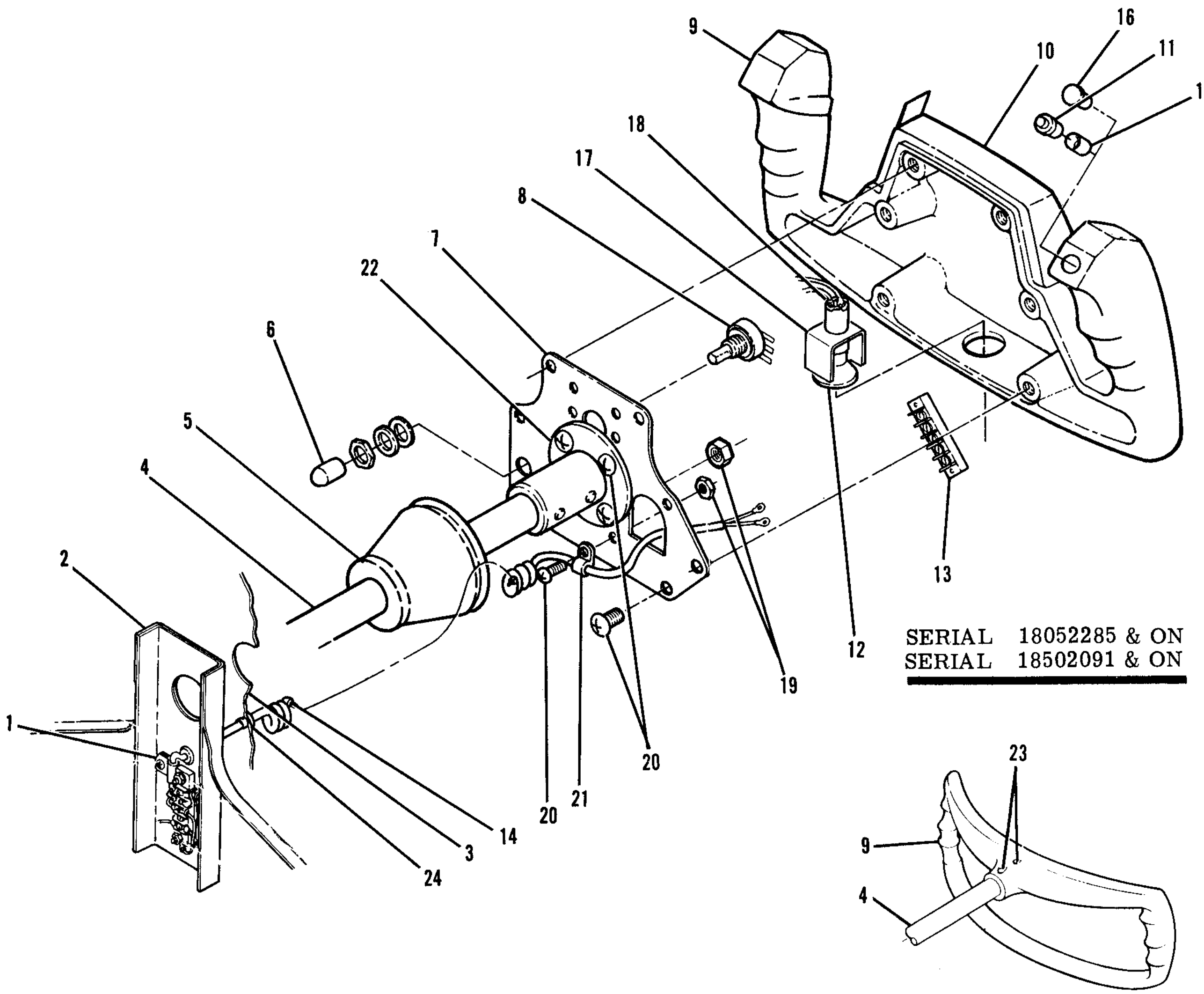
Transition cable (14) is installed in forward groove of cable drum (8) with cable lock (12) on top.

Install cable drum (8) with wide groove aft.

When dual controls are installed, spacer (3) is replaced with a universal joint to which the right control wheel tube attaches.

✱ Beginning with aircraft serials 18052090 and 18501571

Figure 6-2. Control "U" Installation



1. Terminal Block
2. Stationary Panel Assembly
3. Panel Cover
4. Tube
5. Cover
6. Rubber Cover
7. Plate
8. Map Light Rheostat
9. Control Wheel
10. Pad
11. Mike Switch
12. Lamp (Map Light)
13. Terminal Block
14. Cable
15. Insulator
16. Plug
17. Bracket-Socket
18. Socket
19. Nut
20. Screw
21. Clamp
22. Adapter
23. Rivet
24. Bushing

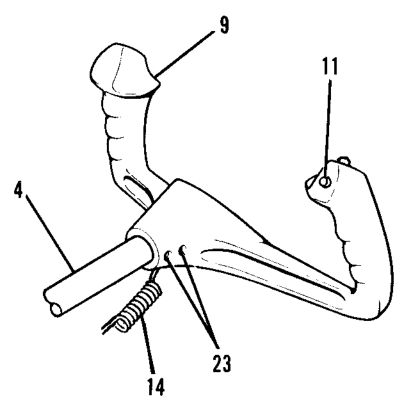


Figure 6-2A Control Wheel Installation.

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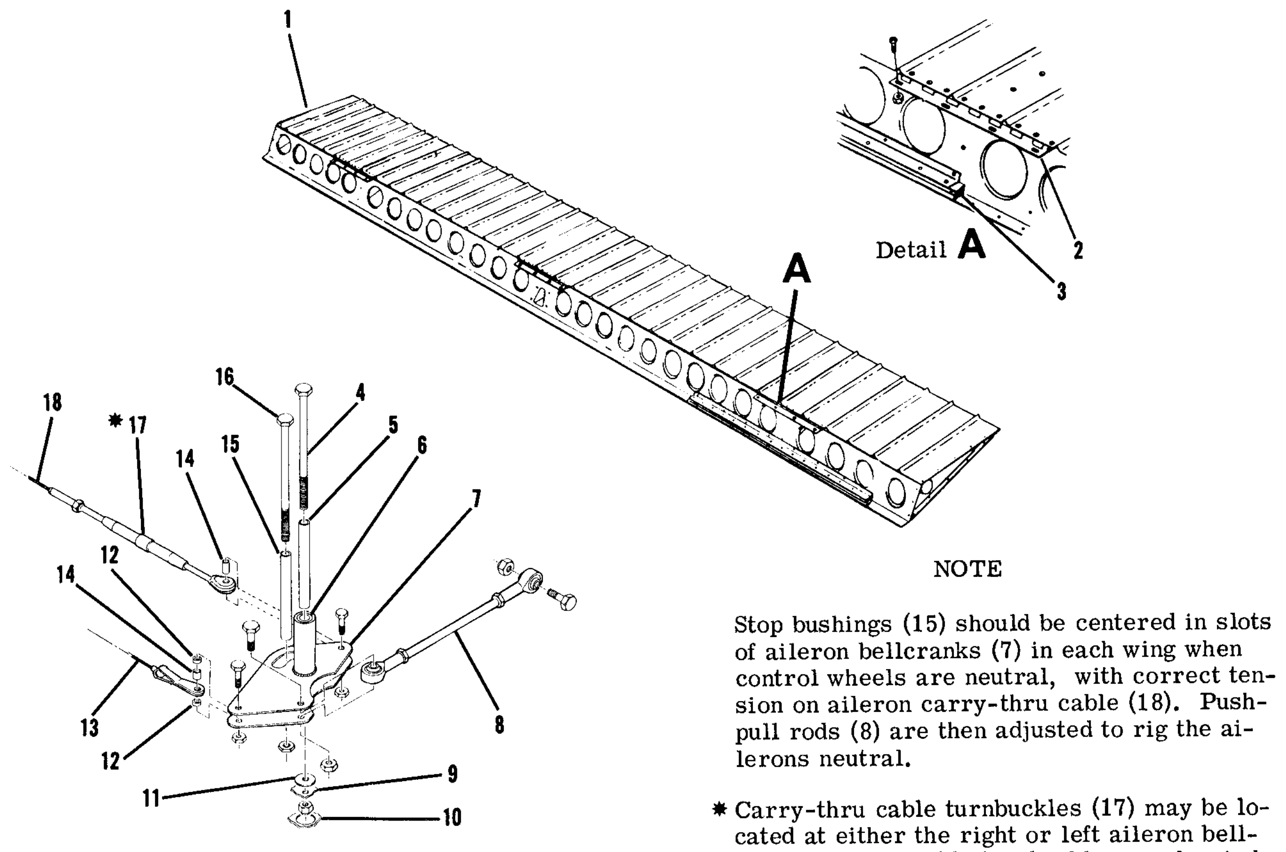


1. Aileron
2. Hinge
3. Balance Weight
4. Pivot Bolt
5. Bushing
6. Needle Bearing
7. Bellcrank
8. Push-Pull Rod
9. Channel
10. Lower Wing Skin
11. Brass Washer
12. Spacer
13. Direct Cable
14. Bushing
15. Bushing
16. Bolt
17. Turnbuckle
18. Carry-Thru Cable

NOTE

Stop bushings (15) should be centered in slots of aileron bellcranks (7) in each wing when control wheels are neutral, with correct tension on aileron carry-thru cable (18). Push-pull rods (8) are then adjusted to rig the ailerons neutral.

* Carry-thru cable turnbuckles (17) may be located at either the right or left aileron bellcrank. Direct cable turnbuckles are located at the control "U".

NOTE

Refer to Section 2 and Service Letter SE71-27 for aileron balance weight inspection.

Figure 6-3. Aileron and Bellcrank Installation

6-4. CONTROL "U". (Refer to figure 6-2.) The control "U" transforms rotation of the control wheels into pulling motion on the aileron cables by means of sprockets and chains. The "U" is pivoted at its lower end to operate the elevator control system.

6-5. REMOVAL AND INSTALLATION.

a. Remove control "U" shield and tunnel cover.

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

c. Remove bolt (19) securing elevator push-pull tube (17) to control "U" and remove pivot bolt (18).

d. Remove safety wire and disconnect turnbuckles (15).

e. Remove bolts (21) attaching control wheel tubes to universal joints (10) and remove control "U".

f. Reverse the preceding steps for reinstallation. Rig aileron system in accordance with paragraph 6-17. Rig elevator system, if necessary, in accordance with Section 8 and reinstall all items removed for access.

6-6. REPAIR. Repair consists of replacing worn, damaged or defective shafts, bearings and other components. Lubricate control "U" as outlined in Section 2.

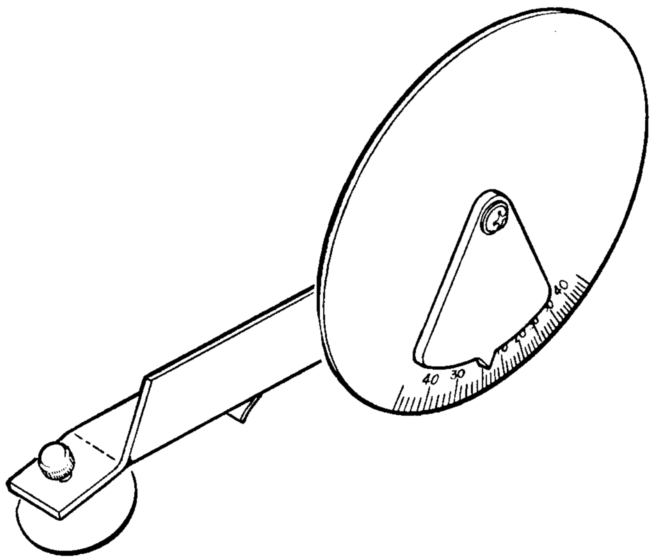
6-6A CONTROL WHEEL. (Refer to figure 6-2A)

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

6-7. AILERON BELLCRANK. (Refer to figure 6-3.)

6-8. REMOVAL.

a. Remove access cover inboard of each bellcrank on underside of wing.



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

Figure 6-4. Inclinometer For Measuring Control Surface Travel

b. Relieve control cable tension by loosening turnbuckle barrel (17).
c. Disconnect control cables (13 and 18) from bellcrank (7). Retain all spacers (12) and bushings (14).
d. Disconnect aileron push-pull rod (8) at bellcrank (7).
e. Remove nuts, washers and bolts securing bellcrank stop bushing (15) and bellcrank to wing structure.
f. Remove bellcrank through access opening, using care that bushing (5) is not dropped from bellcrank.

NOTE

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

6-9. 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.

6-10. INSTALLATION.
a. Place bushing (5) and stop-bushing (15) in bellcrank (7) and position bellcrank in wing.
b. Install brass washers (11) between lower end of bellcrank and wing channel (9) to shim out excess clearance.
c. Install bellcrank pivot bolt (4), washers and nut.
d. Position bellcrank stop-bushing (15) and install attaching bolt (16), washers and nut.
e. Connect aileron cables to bellcrank.
f. Rig aileron system in accordance with paragraph 6-17 and reinstall all items removed for access.

6-11. AILERONS. (Refer to figure 6-3.)

6-12. REMOVAL.
a. Disconnect push-pull rod (8) at aileron (1).
b. Remove screws and nuts attaching aileron hinges (2) to trailing edge of wing.
c. Using care, pull aileron out and down to slide hinges from under wing skin and auxiliary spar reinforcements.

6-13. REPAIR. Aileron repair may be accomplished in accordance with instructions outlined in Section 17. Before installation, ensure balance weights and hinges are securely attached.

6-14. INSTALLATION.
a. Position aileron hinges (2) between skin and auxiliary spar reinforcements and install screws and nuts attaching hinges to trailing edge of wing.
b. Attach push-pull rod (8) to aileron.

NOTE

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

c. Check aileron travel and alignment, rig if necessary, in accordance with paragraph 6-17.

NOTE

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

6-15. CABLES AND PULLEYS. (Refer to figure 6-1.)

6-16. REMOVAL AND INSTALLATION.

a. Remove access covers, wing root fairings, headliner and upholstery as required for access.

b. Disconnect cables from aileron bellcranks and remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to 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.

c. Reverse the preceding steps for reinstallation.

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

e. Re-rig aileron system in accordance with paragraph 6-17, safety turnbuckles and reinstall all items removed for access.

6-17. RIGGING. (Refer to figure 6-2.)

a. Check that primary control cable (7) is in aft groove of cable drum (8) and wrapped once around drum. The primary cable lock (9) is installed at bottom of the drum and transition cable lock (12) is installed at top.

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

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

1. Loosening primary cable turnbuckles (6) and tightening secondary cable turnbuckle (13) at center of control "U" will move the inboard sides of both control wheels down.

2. Tightening either primary control cable turnbuckle (6) and loosening secondary cable turnbuckle (13) at center of control "U" will move outboard side of applicable control wheel down.

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

e. Adjust direct cable turnbuckles (15) below the control "U" and the single carry-thru turnbuckle (index 17, figure 6-3) at the aileron bellcrank so that the bellcrank stop bushings (index 15, figure 6-3) are centered in both bellcrank slots with 40±10 pounds tension on the aileron carry-thru cable (index 18, figure 6-3). Disregard the tension on direct cables.

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

g. Safety all turnbuckles, remove bar from control wheels, check ailerons for correct travel as specified in figure 1-1 and reinstall all items removed for access.

NOTE

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

WARNING

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

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SECTION 7

WING FLAP CONTROL SYSTEM

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

7-2. DESCRIPTION. The wing flap control system is comprised of push-pull rods, bellcranks, pulleys and cables, all of which, link the flaps to the manually-operated lever mounted between the pilot's and copilot's seat. A latch and ratchet mechanism locks the flaps in various degrees of extension.

7-3. OPERATIONAL CHECK.

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

b. Retract flaps and check for full up position. Mount an inclinometer on one flap and set to 0°.

NOTE

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

c. Extend flaps and check for full down position with inclinometer. Refer to figure 1-1 for flap travel.

d. Remove bellcrank access plates and attempt to rock bellcrank to check for bearing play on both wings.

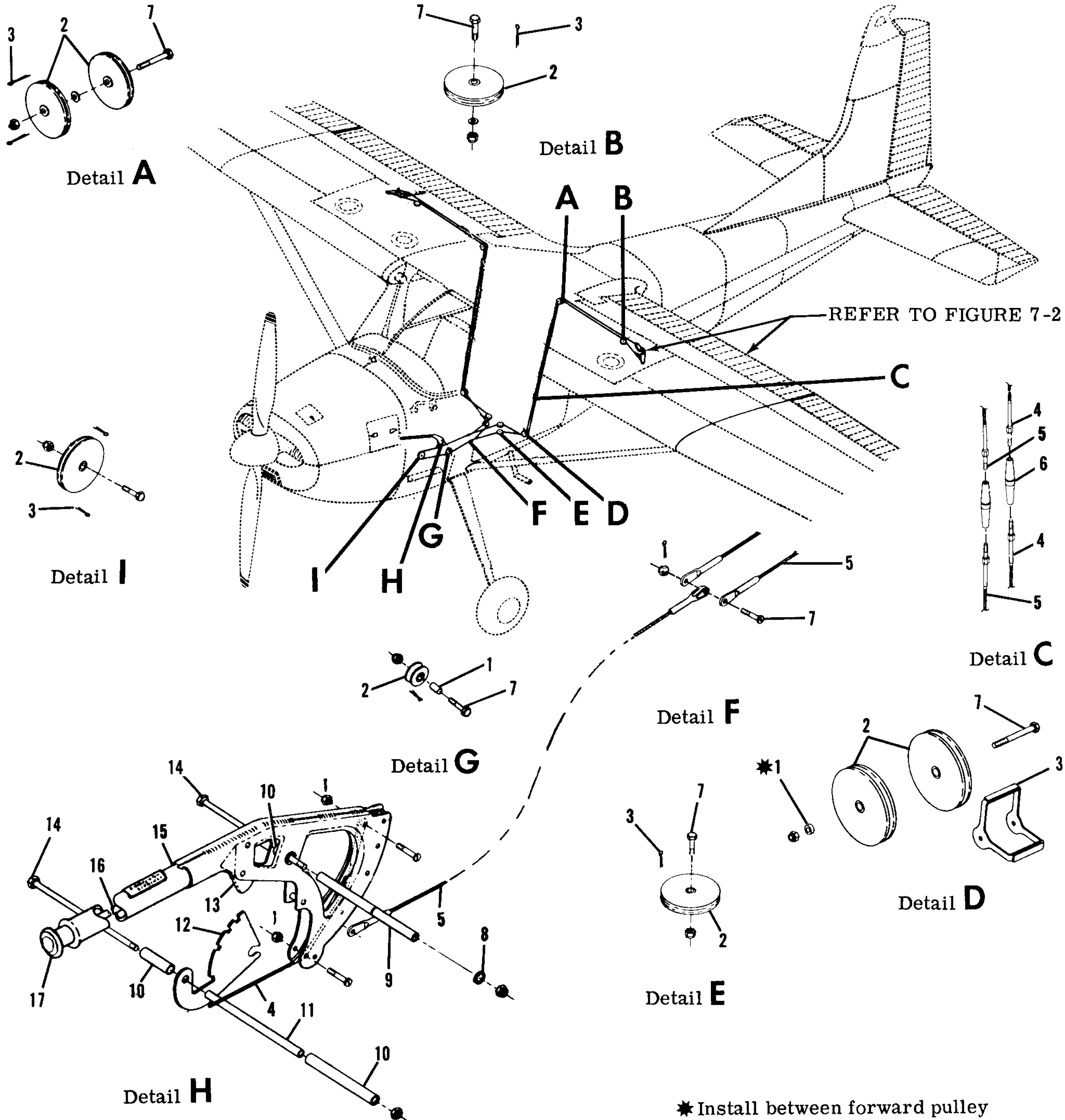
e. Inspect flap rollers and tracks for evidence of excessive wear and defective parts.

7-4. TROUBLE SHOOTING.

NOTE

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

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO EXTEND.	Disconnected or broken direct cable.	Open tunnel access cover aft of lever and visually inspect cables. Connect or replace cable.
ONE FLAP FAILS TO LOWER.	Disconnected or broken direct cable to malfunctioning flap.	Open bellcrank access plate and check cable tension. Connect or replace cable.
BOTH FLAPS FAIL TO RETRACT.	Disconnected or broken retract cable.	Open tunnel access forward of lever and visually inspect cable. Connect or replace cable.
BINDING IN SYSTEM AS FLAPS ARE RAISED AND LOWERED.	Cables not riding on pulleys.	Open access plates and visually inspect. Route cables correctly over pulleys.
	Bind in bellcrank.	Lubricate bearings or replace bellcrank.
	Broken or binding pulleys.	Open access plates and visually inspect. Replace defective pulleys.
	Frayed cable.	Open access plates and visually inspect. Replace defective cable.
	Flaps binding on tracks.	Visually inspect. Replace defective parts.
	Flap lever binding.	Check lever bearings and ratchet. Replace defective parts.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Rig system in accordance with paragraph 7-16.
RELEASE BUTTON STICKS.	Release mechanism needs lubrication.	Lubricate in accordance with Section 2.



✱ Install between forward pulley and cable guard.

1. Spacer	10. Spacer
2. Pulley	11. Bushing
3. Cable Guard	12. Flap Lever Ratchet
4. Retract Cable	13. Latch
5. Direct Cable	14. Bolt
6. Turnbuckle	15. Flap Lever
7. Bolt	16. Latch Rod
8. Snap Ring	17. Release Button
9. Bushing	18. Push-Pull Rod

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

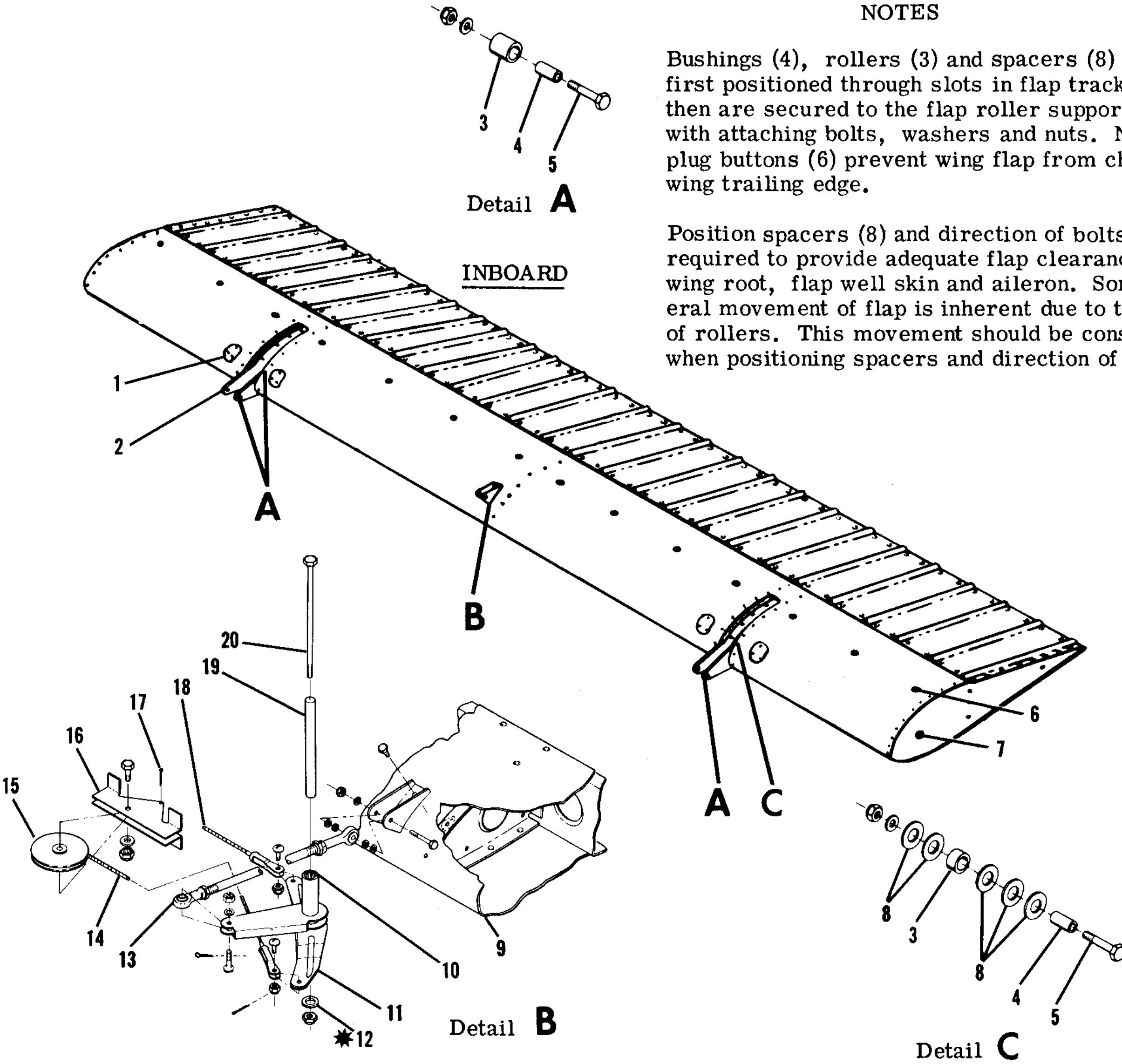
CABLE TENSION:
30 LBS ± 10 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 7-1. Wing Flap Control System

NOTES

Bushings (4), rollers (3) and spacers (8) are first positioned through slots in flap tracks, then are secured to the flap roller supports (2) with attaching bolts, washers and nuts. Nylon plug buttons (6) prevent wing flap from chafing wing trailing edge.

Position spacers (8) and direction of bolts (5) as required to provide adequate flap clearance at wing root, flap well skin and aileron. Some lateral movement of flap is inherent due to the width of rollers. This movement should be considered when positioning spacers and direction of bolts.



✱Install between bellcrank (11) and wing channel.

1. Access Plate
2. Flap Support
3. Roller Assembly
4. Bushing
5. Bolt
6. Nylon Plug Button
7. Plug Button
8. Spacer
9. Flap Assembly
10. Needle Bearing
11. Bellcrank
12. Brass Washer
13. Push-Pull Rod
14. Left Direct Cable
15. Pulley
16. Bracket
17. Cable Guard
18. Left Retract Cable
19. Bushing
20. Pivot Bolt

Figure 7-2. Wing Flap and Bellcrank Installation

7-5. FLAP LEVER ASSEMBLY.

7-6. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)

a. Remove front seats, tunnel upholstery, rear door post royalite and access plates as necessary to gain access to flap handle attachments.

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

c. Remove bolts (7) securing cables to lever assembly.

d. Remove cable guards and pulleys as necessary.

e. Remove pivot bolt (14) and bushing (9), then carefully work lever assembly out of tunnel structure.

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

7-7. REPAIR. Repair consists of replacement of defective bushings, spacers, ratchet mechanism and associated hardware. The placard on the lever should be replaced if it becomes illegible.

7-8. FLAP BELLCRANKS.

7-9. REMOVAL AND INSTALLATION. (Refer to figure 7-2.)

a. Remove access plate from lower wing skin adjacent to bellcrank (11).

b. Remove rear doorpost royalite.

c. Lower flaps to full down position.

d. Remove safety wire and relieve cable tension at turnbuckles (index 6, figure 7-1.)

e. Disconnect cables (14 and 18) at bellcrank (11).

f. Disconnect push-pull rod (13) at bellcrank (11).

g. Remove pivot bolt (20) and carefully work bellcrank out through access opening, using care not to drop bushing (19).

NOTE

Brass washers (12) may be used as shims between lower end of bellcrank (11) and wing channel. Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings.

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

7-10. REPAIR. Repair is limited to replacement of needle bearings and bushings. Cracked, bent or excessively worn bellcranks should be replaced.

7-11. FLAPS.

7-12. REMOVAL AND INSTALLATION. (Refer to figure 7-2.)

a. Lower flaps to full down position.

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

c. Disconnect push-pull rod (13) at flap.

d. Remove bolt (5) at each aft flap track, pull flap aft and remove bolt at each forward flap track. As the flap is removed from wing, all rollers, bushings and spacers will fall free. Retain these for reinstallation.

e. Reverse the preceding steps for reinstallation. If the push-pull rod (13) adjustment was not disturbed, re-rigging should not be necessary. Rig system, if necessary, in accordance with paragraph 7-16.

7-13. REPAIR. Repair may be accomplished in accordance with instructions outlined in Section 17.

7-14. CABLES AND PULLEYS.

7-15. REMOVAL AND INSTALLATION. (Refer to figure 7-1.)

a. Remove access plates, wing root fairings and upholstery as required for access.

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

c. Disconnect cables from bellcranks and remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

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

d. Reverse the preceding steps for reinstallation.

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

f. Re-rig system in accordance with paragraph 7-16, safety turnbuckles and reinstall all items removed for access.

7-16. RIGGING. (Refer to figure 7-1.)

NOTE

Before completing the following procedure, relieve tension on turnbuckles (6). DO NOT DISCONNECT TURNBUCKLES.

a. Lower flaps to full DOWN position.

b. Disconnect push-pull rods (18), adjust rods to 8.83±.12" between centers of rod ends, tighten jam nuts and reinstall.

c. Place control lever (15) in the fully retracted position and tighten retract cables evenly to 30±10 lbs tension. Place control lever (15) in the full down position and tighten direct cables evenly to 30±10 lbs tension.

d. Perform an operational checkout as outlined in paragraph 7-3, check that all jam nuts are tight, all turnbuckles are safetied and reinstall all items removed for access.

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SECTION 8

ELEVATOR CONTROL SYSTEM

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8-1. ELEVATOR CONTROL SYSTEM.

8-2. DESCRIPTION. The elevators are operated through fore-and-aft movement of the pilot or co-pilot control wheels. The system is comprised of the control "U", elevator push-pull tubes, bell-cranks, cables and pulleys. An elevator down spring is connected between the stabilizer and elevator push-pull tube.

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 8-13.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.	Forward or aft end of push-pull tube disconnected.	Check visually. Attach push-pull tube correctly.
	Cables disconnected.	Check visually. Attach cables correctly.

8-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM.	Defective forward or aft bellcrank or bellcrank pivot bearing.	Move to check for play or binding. Replace defective bellcrank or pivot bearing.
	Cables slack.	Check and adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Check visually. Route cables correctly over pulleys.
	Nylon grommet on instrument panel binding.	Disconnect universal joint and check binding at panel. Replace defective grommet.
	Clevis bolts too tight.	Check bolt binding. Readjust or replace binding parts.
	Defective elevator hinges.	Move elevators by hand, checking hinges. Replace defective hinges.
	Lubrication needed.	Lubricate in accordance with Section 2.
	Defective pulleys or cable guards.	Check visually. Replace defective parts and install guards properly.
	Defective control "U" pivot bearings.	Disconnect parts and check that control pivots freely. Replace defective bearings.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Travel stops incorrectly set.	Rig system in accordance with paragraph 8-13.
	Cables tightened unevenly.	Rig system in accordance with paragraph 8-13.
	Forward bellcrank travel stop bolt adjusted incorrectly.	Rig system in accordance with paragraph 8-13.
	Interference at firewall or instrument panel.	Check visually. Rig system in accordance with paragraph 8-13.

8-4. CONTROL "U". Removal, installation and repair of control "U" may be accomplished as outlined in Section 6.

8-5. ELEVATORS.

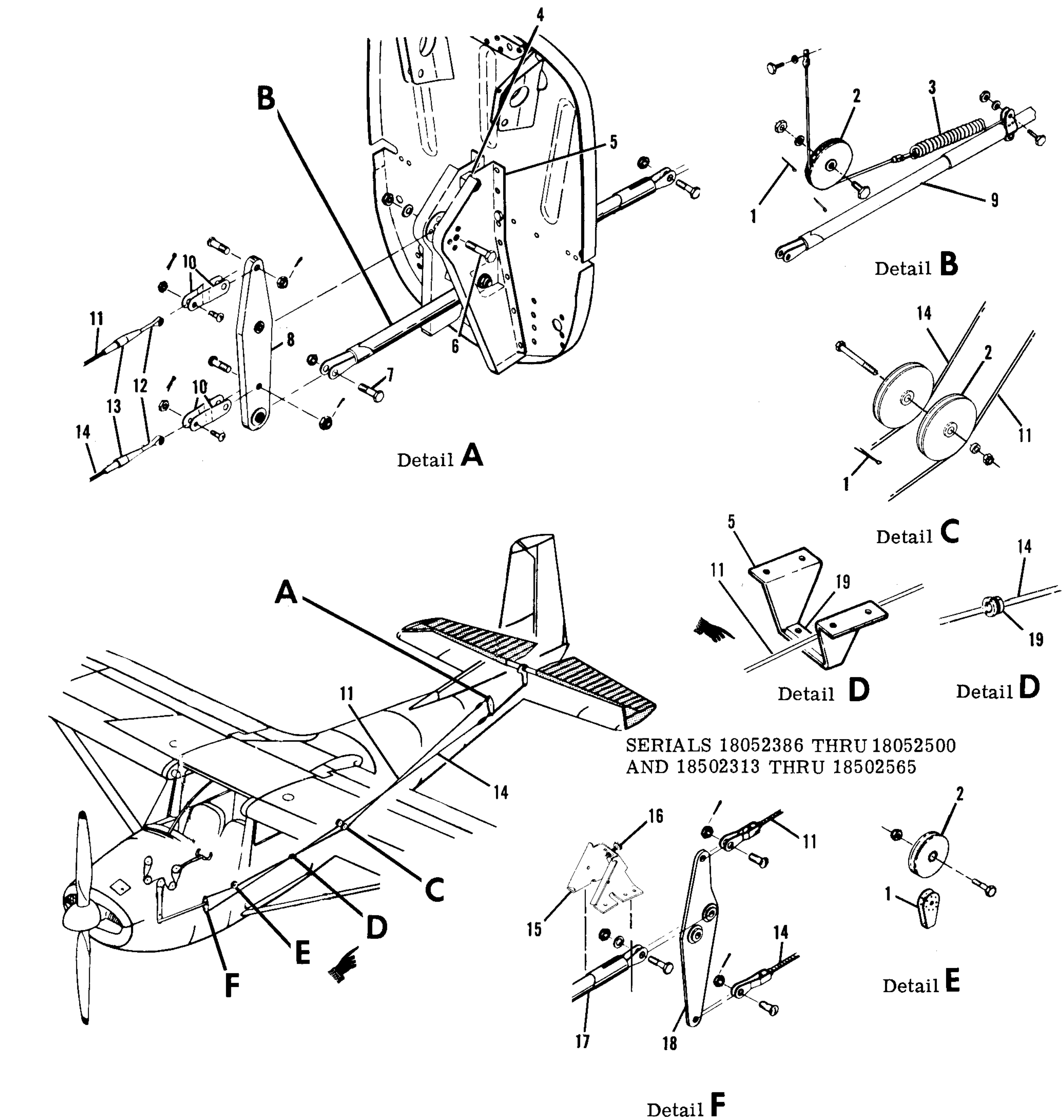
8-6. REMOVAL AND INSTALLATION. (Refer to figure 8-2.)

a. Remove screws securing stinger, disconnect tail light wire and remove stinger from aircraft.
b. Remove bolts (7) attaching elevator torque tubes (2) to arm (3).
c. Remove bolts (5) and remove elevators.
d. Reverse the preceding steps for reinstallation. Rig elevator system, if necessary, in accordance with paragraph 8-13.

8-7. BELLCRANKS.

8-8. REMOVAL AND INSTALLATION.

a. REAR. (Refer to figure 8-1.)
   1. Remove access plate on tailcone below bellcrank (8).
   2. Remove safety wire and relieve cable tension at turnbuckles (13).
   3. Disconnect turnbuckle eyes (12) from bellcrank links (10).



1. Cable Guard
2. Pulley
3. Elevator Down Spring
4. Bellcrank Stop
5. Bracket
6. Pivot Bolt
7. Bolt
8. Rear Bellcrank
9. Push-Pull Tube
10. Link
11. UP Cable
12. Turnbuckle Eye
13. Turnbuckle
14. DOWN Cable
15. Bracket
16. Bellcrank Stop
17. Push-Pull Tube
18. Forward Bellcrank
19. Fairlead

CAUTION

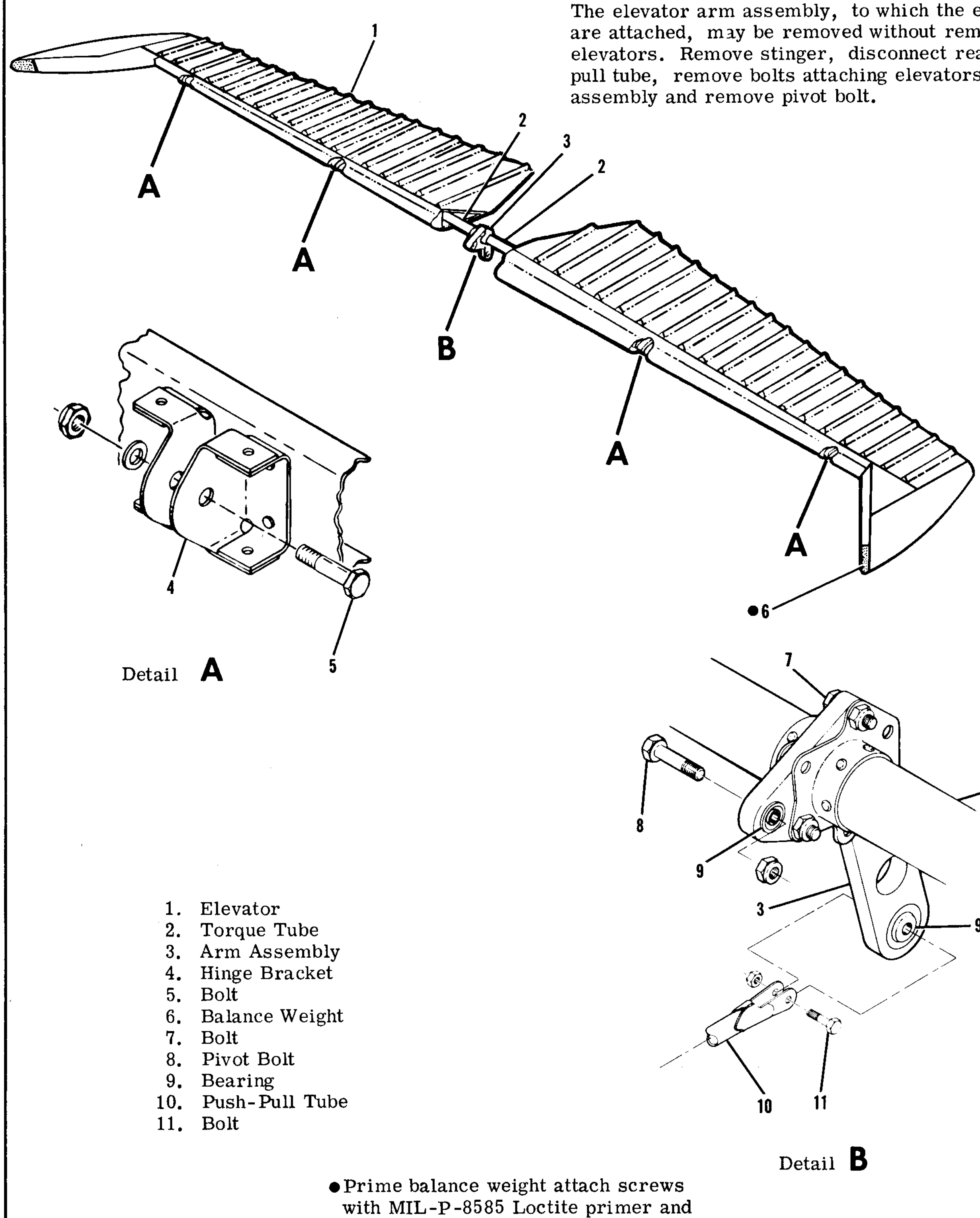
MAINTAIN PROPER CONTROL CABLE TENSION.

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

Figure 8-1. Elevator Control System

NOTE

The elevator arm assembly, to which the elevators are attached, may be removed without removing the elevators. Remove stinger, disconnect rear push-pull tube, remove bolts attaching elevators to arm assembly and remove pivot bolt.



1. Elevator
2. Torque Tube
3. Arm Assembly
4. Hinge Bracket
5. Bolt
6. Balance Weight
7. Bolt
8. Pivot Bolt
9. Bearing
10. Push-Pull Tube
11. Bolt

● Prime balance weight attach screws with MIL-P-8585 Loctite primer and seal with MIL-S-22473 Loctite sealer to retain screws beginning with aircraft serials 18052243 and 18501988.

Figure 8-2. Elevator Installation

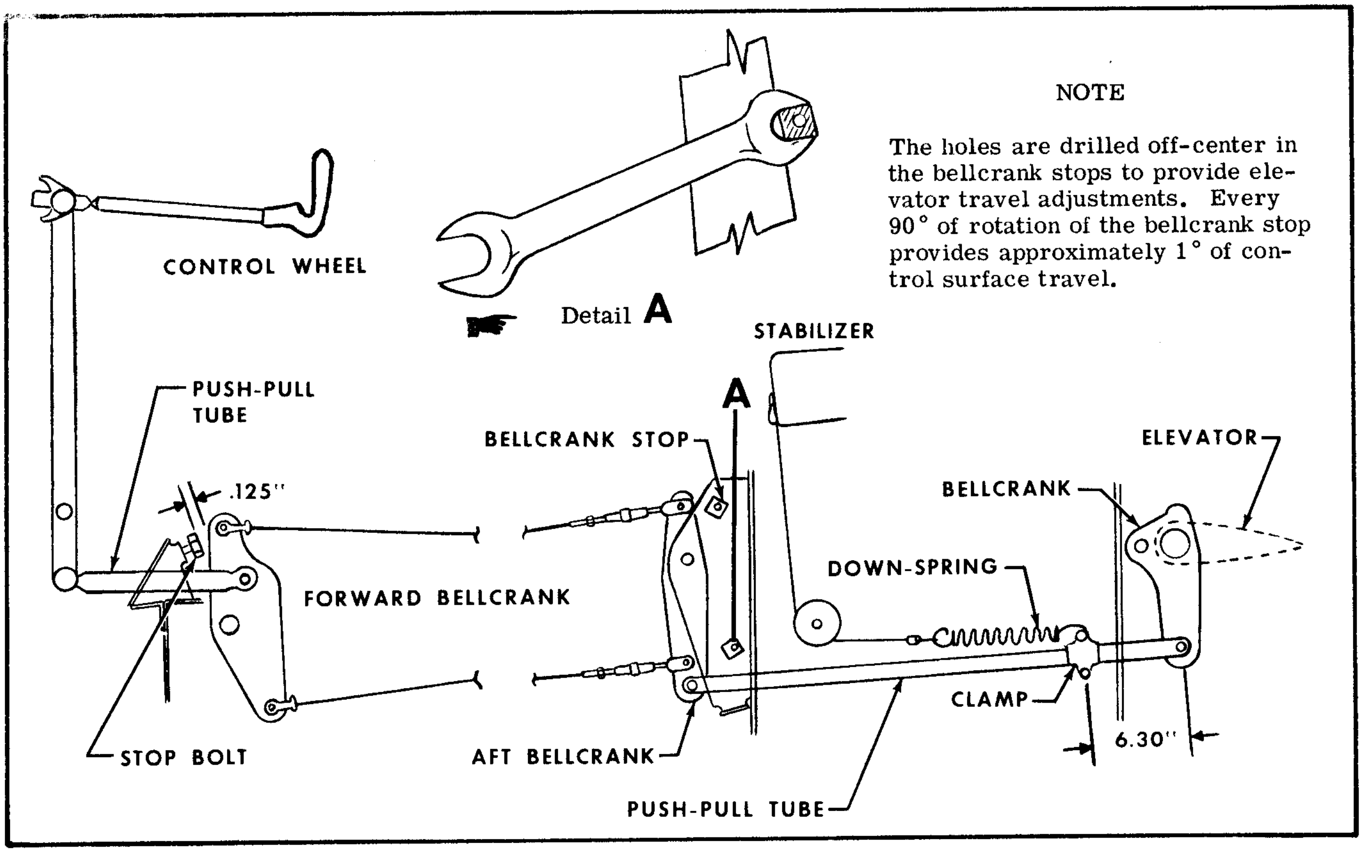


Figure 8-3. Rigging Elevator System

4. Disconnect push-pull tube (9) at bellcrank (8).

NOTE

The down spring need not be disconnected if care is used when disconnecting the push-pull tube (9).

5. Remove pivot bolt (6) securing bellcrank (8) to supporting brackets (5) and remove bellcrank through access opening.

6. Reverse the preceding steps for reinstallation. Rig elevators in accordance with paragraph 8-13, safety turnbuckles and reinstall all items removed for access.

b. FORWARD. (Refer to figure 8-1.)

1. Remove front seats, tunnel cover plate and access plate on underside of fuselage adjacent to bellcrank (18).

2. Remove access plate on tailcone below bellcrank (8).

3. Remove safety wire and relieve cable tension at turnbuckles (13).

4. Disconnect cables (11 and 14) at bellcrank (18).

5. Disconnect push-pull tube (17) at bellcrank (18).

6. Remove bellcrank pivot bolt and carefully work bellcrank out of aircraft.

7. Reverse the preceding steps for reinstallation. Rig elevators in accordance with paragraph 8-13, safety turnbuckles and reinstall all items removed for access.

8-9. ARM ASSEMBLY.

8-10. REMOVAL AND INSTALLATION. (Refer to figure 8-2.)

a. Remove screws securing stinger, disconnect tail light wire and remove stinger from aircraft.

b. Remove bolt (11) securing push-pull tube (10) to arm (3).

c. Remove bolts (7) securing elevator torque tubes (2) to arm (3).

d. Remove pivot bolt (8) and slide arm assembly from between elevator torque tubes (2).

e. Reverse the preceding steps for reinstallation. Rig system, if necessary, in accordance with paragraph 8-13.

8-11. CABLES AND PULLEYS.

8-12. REMOVAL AND INSTALLATION. (Refer to figure 8-1.)

a. Remove seats, upholstery and access plates as necessary.

b. Remove safety wire, relieve cable tension and disconnect turnbuckles (13).

c. Disconnect cables (11 and 14) at both bellcranks (8 and 18).
d. Remove cable guards, pulleys and fairleads as necessary to work cables free of aircraft.

NOTE

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

e. Reverse the preceding steps for reinstallation. After cables are routed in position, install pulleys, cable guards and fairleads. Ensure cables are positioned in pulley grooves before installing guards.
f. Rig elevators in accordance with paragraph 8-13, safety turnbuckles and reinstall all items removed for access.

8-13. RIGGING. (Refer to figure 8-3.)

NOTE

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

Two elevator bellcrank stops are attached to the rear elevator bellcrank support brackets. These stops are drilled off center and may be rotated to any of four positions to adjust elevator travel. Each 90 degree rotation of stop changes elevator travel approximately one degree.

a. With horizontal stabilizer leading edge FULL DOWN, set elevator stops to obtain travel specified in figure 1-1.

NOTE

An additional stop bolt is located at the forward bellcrank. Adjust this stop for 1/8 inch clearance from forward bellcrank, while rear bellcrank is against rear UP stop. The purpose of this additional stop bolt is to furnish a positive stop, so that excessive back pressure on the control wheel will not stretch cables and allow instrument panel to be contacted by the control "U."

b. Tighten cables to tension specified in figure 8-1. Adjust turnbuckles so the control "U" does not contact instrument panel in the FULL UP position or firewall in the FULL DOWN position.
c. With the horizontal stabilator leading edge FULL DOWN, rig the elevator down spring such that it does not induce any load on the elevator push-pull tube until the elevators pass through the 0° (streamlined position), relative to the horizontal stabilizer. Position clamp in the approximate position indicated in figure 8-3.
d. Check that all safeties are installed, all parts are secure and reinstall all parts removed for access.

WARNING

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

SECTION 9

RUDDER AND RUDDER TRIM CONTROL SYSTEMS

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9-1. RUDDER AND RUDDER TRIM CONTROL SYSTEMS. (Refer to figures 9-1 and 9-3.)

9-2. DESCRIPTION. The rudder control system consists of individual rudder pedal assemblies with return springs, rudder, rudder bellcrank, cables and pulleys. The rudder trim control system consists of a trim wheel, located on top of the tunnel and a trim bungee attached to the left rudder bar. Rotating the trim wheel compresses a bungee spring which exerts force on the rudder bar. Tailwheel steering is controlled by cables and bellcranks attached to the rudder control cables. Stowable rudder pedals may be provided at the copilot's position.

9-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 9-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Check cables visually. Connect or replace cables.
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Check tension with tensiometer. Adjust cable tension.
	Cables not riding properly on pulleys.	Check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Check visually. Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Lubricate in accordance with Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding, replace bearing blocks.
	Defective rudder hinge bushings or bellcrank bearings.	Replace defective bushings or bearings.
	Clevis bolts too tight.	Readjust to eliminate binding.
	Rudder trim bungee binding.	Disconnect bungee from rudder bar and check for binding. Replace defective bungee.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Check tension with tensiometer. Adjust cable tension.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 9-11.
FALSE READING ON TRIM POSITION INDICATOR.	Incorrect rigging.	Rig in accordance with paragraph 9-11.
	Worn, bent or disconnected linkage.	Check visually. Repair or replace as necessary.
HARD OR SLUGGISH OPERATION OF TRIM WHEEL.	Worn, bent or binding linkage.	Check visually. Repair or replace as necessary.
	Incorrect cable tension.	Check and readjust cable tension.
FULL TRIM TRAVEL NOT OBTAINED.	Incorrect rigging of trim system.	Rig in accordance with paragraph 9-11.

9-4. RUDDER PEDAL ASSEMBLIES. (Refer to figure 9-2.)

9-5. REMOVAL AND INSTALLATION.
a. Remove seats, carpeting, shields and soundproofing from rudder pedal and tunnel areas as necessary.
b. Disconnect master cylinders (16) and parking brake cables at pilot's rudder pedals.
c. Remove all rudder pedals (14) and all brake links (17).
d. Disconnect stowable rudder pedal controls (1), if installed.
e. Remove access plate from underside of tailcone below turnbuckles (index 2, figure 9-1), remove safety wire and relieve cable tension.
f. Disconnect cables from rudder bar arms (15).
g. Disconnect return springs (4) from rudder bar arms (15) on aircraft NOT equipped with rudder trim control system.
h. Disconnect carry-thru cable (index 9, figure 9-3) and trim bungee (index 13, figure 9-3) from rudder bar arms on aircraft equipped WITH rudder trim control system.
i. Remove bolts securing bearing blocks (8) and work bar assemblies out of aircraft.

NOTE

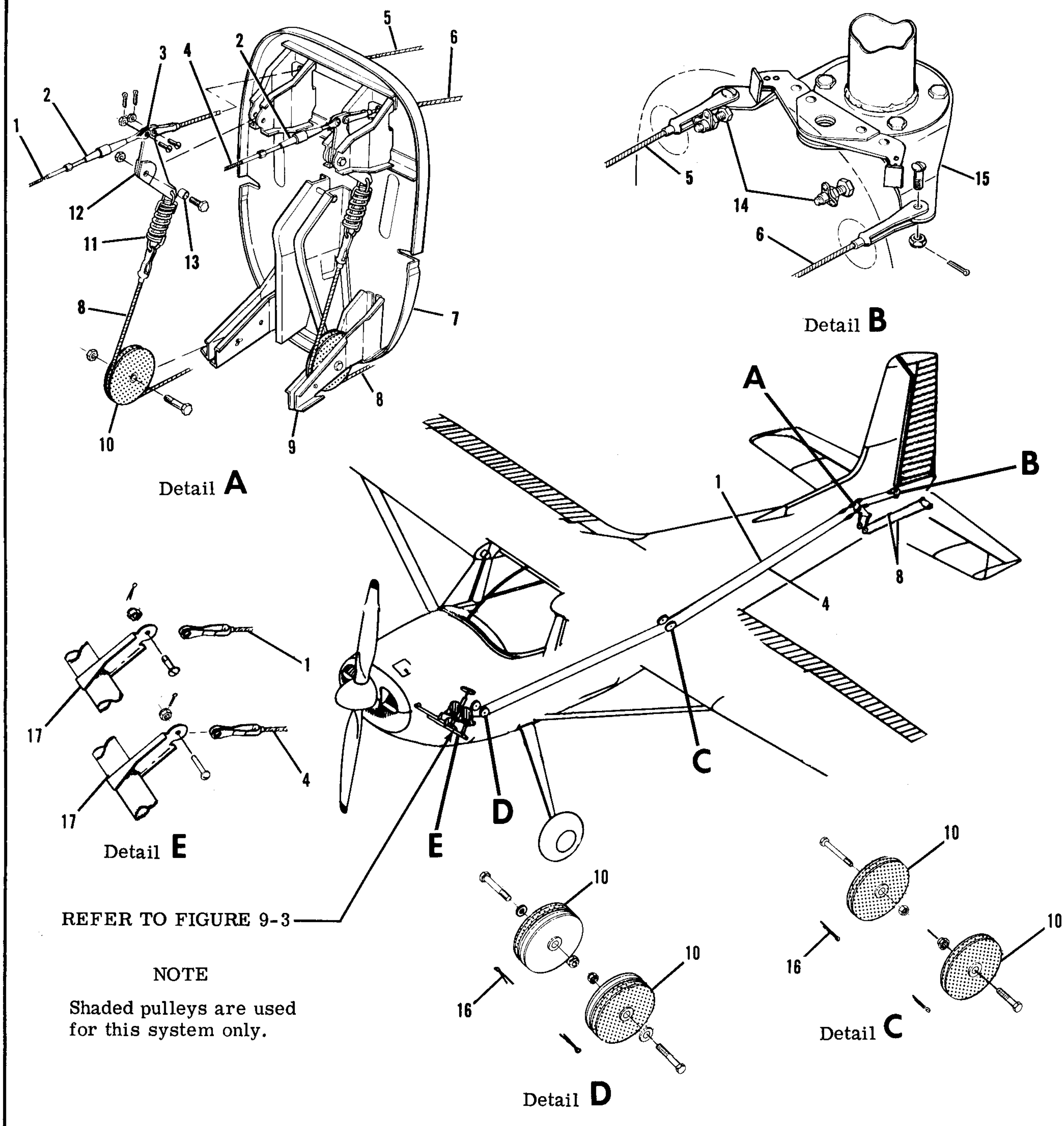
The two inboard bearing blocks contain clearance holes for the rudder bars at one end and a bearing hole at the other. Tag these bearing blocks for reference on reinstallation.

j. Reverse the preceding steps for reinstallation. Lubricate rudder bar assemblies as outlined in Section 2. Rig system in accordance with paragraph 9-11, safety turnbuckles and reinstall all items removed for access.

9-6. RUDDERS.

9-7. REMOVAL AND INSTALLATION. (Refer to figure 9-1.)
a. Remove tailcone access plate from below turnbuckles (2).
b. Remove screws securing stinger, disconnect tail light wire and remove stinger.
c. Remove safety wire and relieve cable tension at turnbuckles (2).
d. Disconnect control cables (5 and 6) at bellcrank (15).
e. With rudder supported, remove bolts (index 1, figure 9-4) at hinge brackets, then carefully remove rudder.
f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-11, safety turnbuckles and reinstall all items removed for access.

9-8. REPAIR. Repair of the rudder may be accomplished as outlined in Section 17.



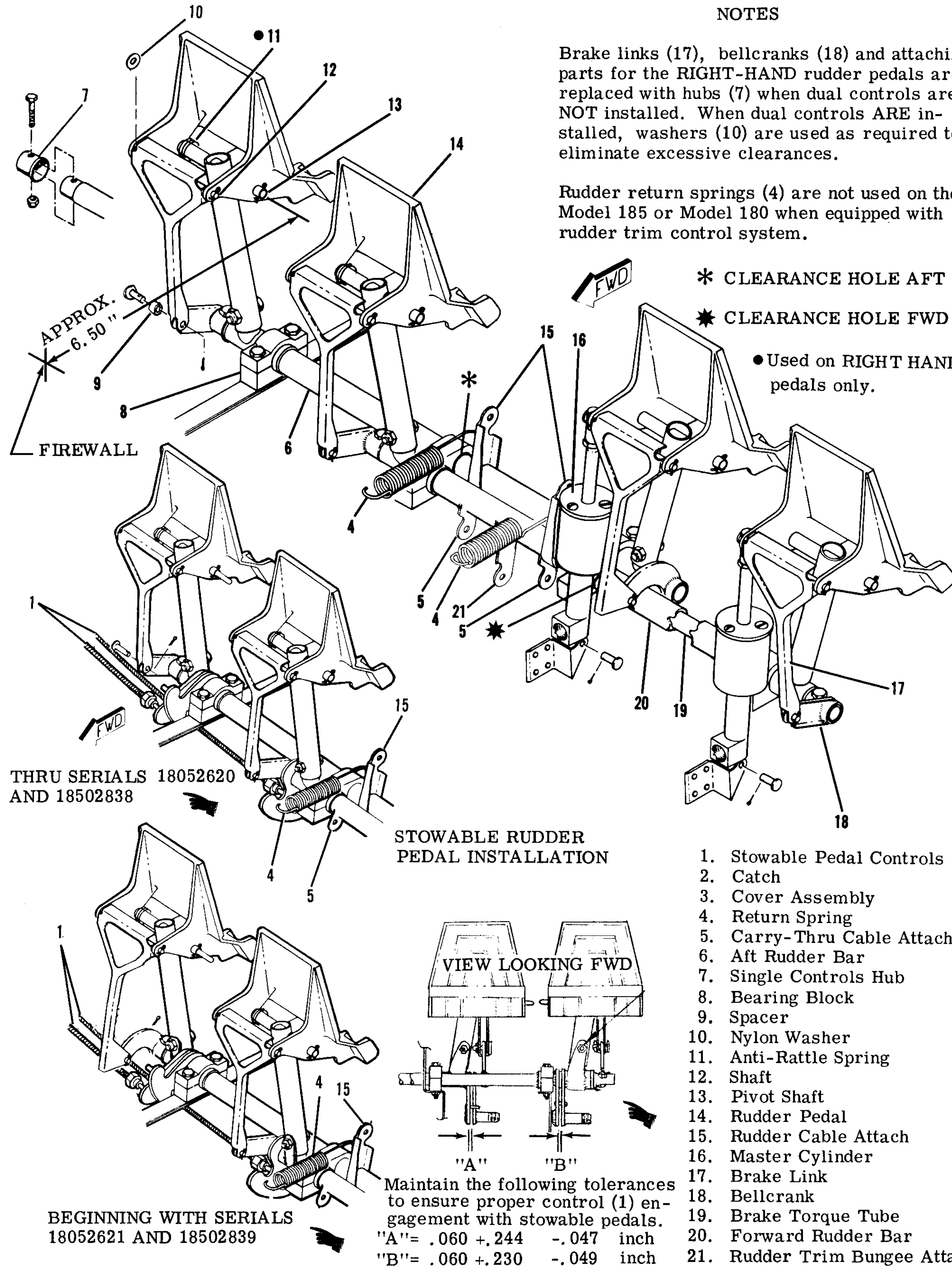
1. Right Forward Cable
2. Turnbuckle
3. Fork
4. Left Forward Cable
5. Right Aft Cable
6. Left Aft Cable
7. Bulkhead
8. Tailwheel Steering Cable
9. Bracket
10. Pulley
11. Spring
12. Bellcrank
13. Bushing
14. Rudder Travel Stop
15. Bellcrank
16. Cable Guard
17. Rudder Bar

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
AT AVERAGE TEMPERATURE FOR THE AREA.
30 ± 10 LBS ON ALL MODEL 185 AIRCRAFT
75 ± 10 LBS ON ALL MODEL 180 AIRCRAFT
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 9-1. Rudder Control System



NOTES

Brake links (17), bellcranks (18) and attaching parts for the RIGHT-HAND rudder pedals are replaced with hubs (7) when dual controls are NOT installed. When dual controls ARE installed, washers (10) are used as required to eliminate excessive clearances.

Rudder return springs (4) are not used on the Model 185 or Model 180 when equipped with rudder trim control system.

✻ CLEARANCE HOLE AFT

✸ CLEARANCE HOLE FWD

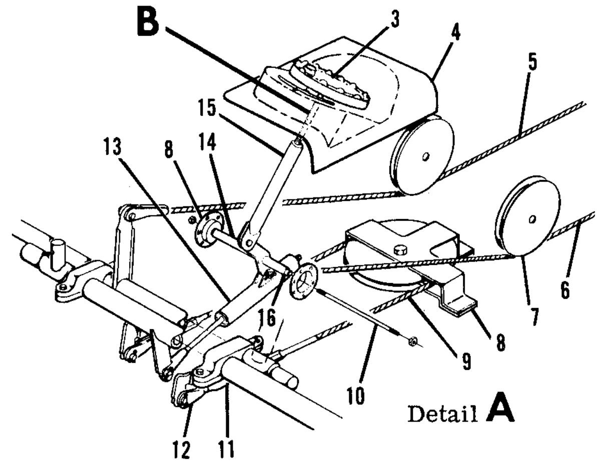
● Used on RIGHT HAND pedals only.

Maintain the following tolerances to ensure proper control (1) engagement with stowable pedals.
"A"= .060 +.244 -.047 inch
"B"= .060 +.230 -.049 inch

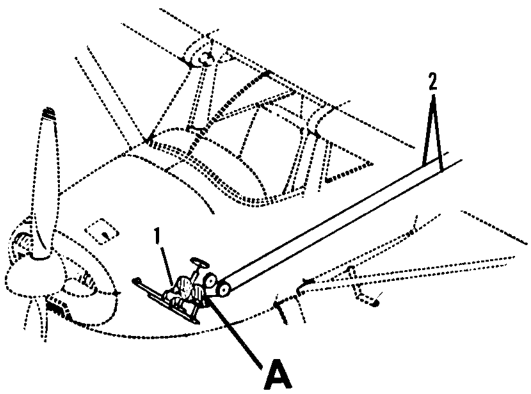
1. Stowable Pedal Controls
2. Catch
3. Cover Assembly
4. Return Spring
5. Carry-Thru Cable Attach
6. Aft Rudder Bar
7. Single Controls Hub
8. Bearing Block
9. Spacer
10. Nylon Washer
11. Anti-Rattle Spring
12. Shaft
13. Pivot Shaft
14. Rudder Pedal
15. Rudder Cable Attach
16. Master Cylinder
17. Brake Link
18. Bellcrank
19. Brake Torque Tube
20. Forward Rudder Bar
21. Rudder Trim Bungee Attach

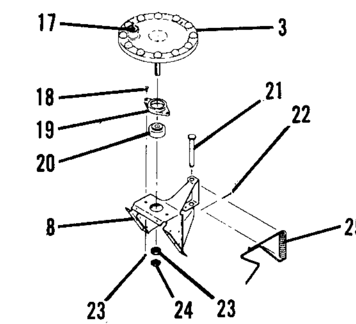
Figure 9-2. Rudder Pedal Installation

1. Rudder Pedal Assembly
2. Rudder Cables
3. Trim Wheel Assembly
4. Cover
5. Right Forward Cable
6. Left Forward Cable
7. Pulley
8. Bracket
9. Carry-Thru Cable
10. Tie Rod
11. Turnbuckle On RH Only
12. Fork
13. Trim Bungee



Detail A

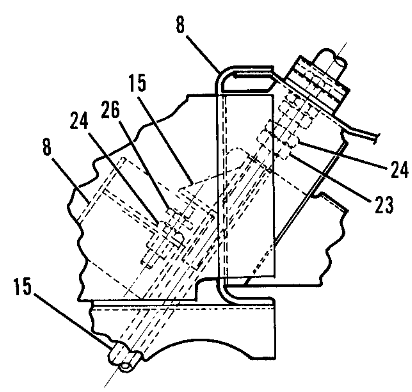




Detail B

THRU SERIALS 18052419
AND 18502365

14. Shaft Assembly
15. Link Assembly
16. Spacer
17. Knob
18. Bolt
19. Cap
20. Bearing
21. Pin
22. Pin Cotter
23. Nut-UP Stop
24. Jamnut
25. Arm
26. Bolt-DOWN stop



Detail B

BEGINNING WITH SERIAL
18052420 AND 18502366

Figure 9-3. Rudder Trim Control System

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9-9. CABLES AND PULLEYS.

9-10. REMOVAL AND INSTALLATION. (Refer to figure 9-1.)

a. FORWARD CABLES.

1. Remove seats, access plates and upholstery as required for access in cabin area.

2. Remove access plate from tailcone below bellcranks (12).

3. Remove safety wire and relieve cable tension at turnbuckles (2).

4. Disconnect cables (1 and 4) at rudder bar arms and at bellcranks (12).

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

NOTE

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

6. Reverse the preceding steps for reinstallation.

7. After cables are routed in position, install pulleys and cable guards. Ensure cables are in pulley grooves before installing guards. Rig system in accordance with paragraph 9-11, safety turnbuckles and reinstall all items removed for access.

b. AFT CABLES

1. Remove screws securing stinger, disconnect tail light wire and remove stinger from aircraft.

2. Complete steps 2 and 3 of subparagraph "a."

3. Disconnect cables (5 and 6) at bellcranks (12).

4. Disconnect cables (5 and 6) at bellcrank (15).

5. Complete "NOTE" in step 5 of subparagraph "a."

6. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-11, safety turnbuckles and reinstall all items removed for access.

c. TAILWHEEL STEERING CABLES.

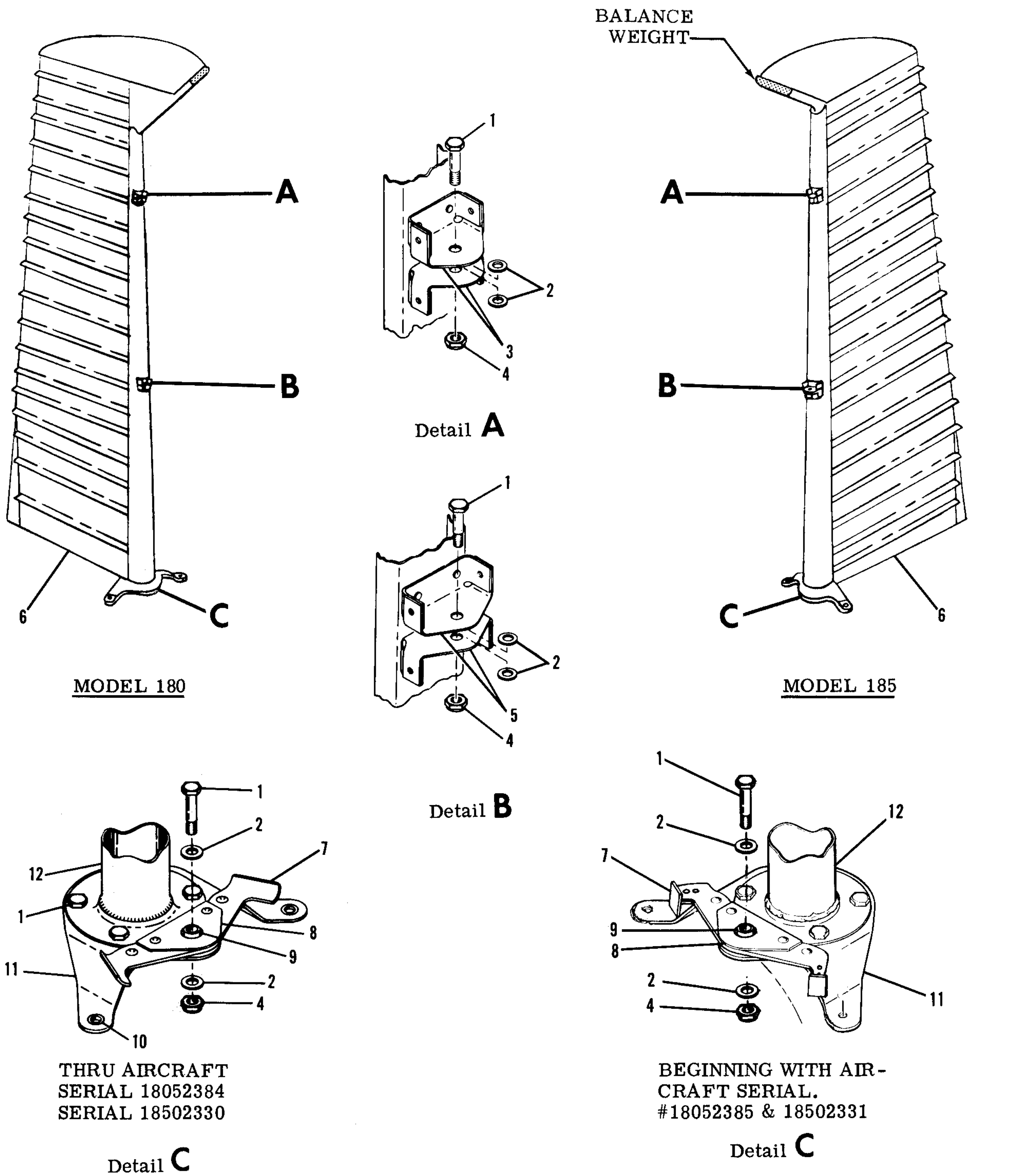
1. Complete step 2 of subparagraph "a."

2. Disconnect cables (8) at springs (11).

3. Remove cable guards and pulleys as necessary to ease removal of cables.

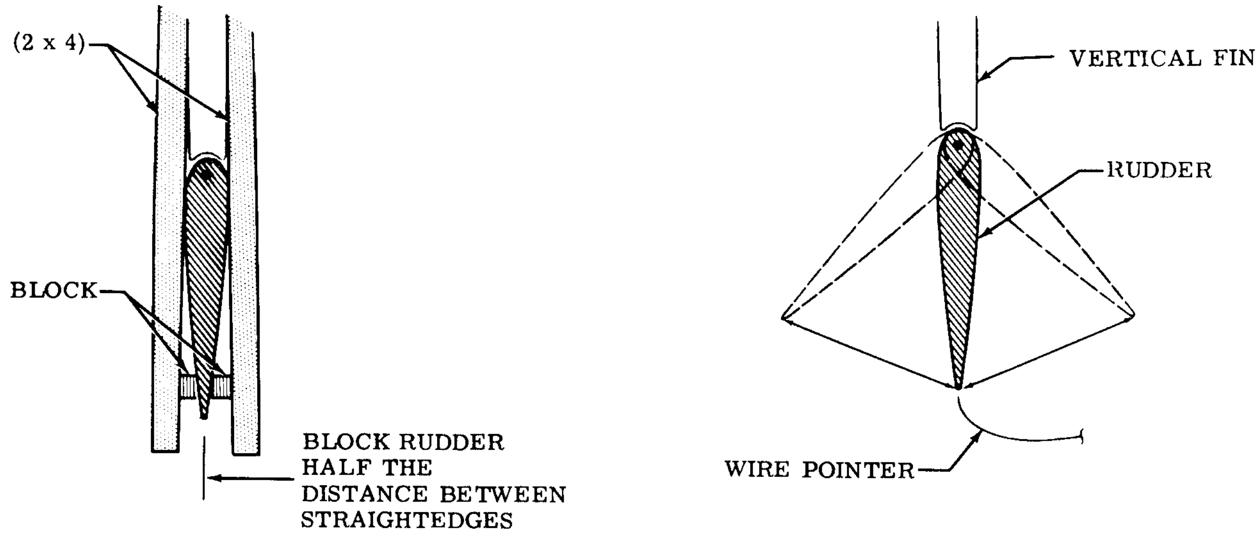
4. Disconnect cables (8) at tailwheel bellcrank and work cables out of tailcone openings.

SHOP NOTES:



1. Bolt
2. Washer
3. Upper Hinge
4. Nut
5. Center Hinge
6. Rudder Assembly
7. Rudder Stop
8. Bearing Retainer
9. Bearing
10. Bushing
11. Rudder Bellcrank
12. Torque Tube

Figure 9-4. Rudder Assemblies



ESTABLISHING NEUTRAL POSITION OF RUDDER

MEASURING RUDDER TRAVEL

1. Establish neutral position of rudder by clamping straightedge (such as wooden 2x4) 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 (Disregard the fixed trim tab).
3. Using a 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 7.49 and 7.81 inches.

Figure 9-5. Checking Rudder Travel

5. Reverse the preceding steps for reinstallation. Install pulleys and cable guards. Ensure cables are in pulley grooves before installing guards and reinstall all items removed for access.

9-11. RIGGING.

a. MODEL 180 WITHOUT RUDDER TRIM CONTROL SYSTEM.

1. (Refer to figure 9-1.) Remove access plate from underside of tailcone below turnbuckles (2).
2. Remove screws securing stinger, disconnect tail light wire and remove stinger from aircraft.
3. Disconnect tailwheel steering cables (8) at tailwheel bellcrank.
4. Remove safety wire and relieve cable tension at turnbuckles (2).
5. Adjust travel stop bolts (14) to obtain degree of travel specified in figure 1-1. Figure 9-5 illustrates one method of checking travel.
6. Clamp the pilot's rudder pedals (to each other) in the neutral position.

7. Adjust turnbuckles (2) evenly to 75±10 lbs tension while maintaining a rudder offset of 1° to the right (5/16 inch at lower trailing edge of rudder).

8. (Refer to figure 9-2.) After completion of step 7, the rudder pedal pivot shafts (13) should be approximately 6.50 inches from the firewall.

NOTE

Because of the thickness of insulation and material on the firewall, it is recommended that a piece of 1/16 inch welding rod be ground to a sharp point and notched 6.50 inches from the point. Pierce the material on the firewall and use the notch to measure the dimension.

9. Remove clamps from rudder pedals, safety turnbuckles, reconnect tailwheel steering cables and reinstall all items removed for access.

WARNING

Be sure rudder moves in the correct direction when operated by the rudder pedals.

b. MODEL 185 AND 180 WITH RUDDER TRIM CONTROL SYSTEM.

1. Complete steps 1 thru 6 of subparagraph "a."
2. (Refer to figure 9-3.) Remove access plate from underside of fuselage below trim bungee (13).
3. Disconnect trim bungee (13) from rudder bar arm.
4. Adjust turnbuckles (index 2, figure 9-1) and turnbuckle (11) evenly to 30 ± 10 lbs tension on the Model 185 and 75 ± 10 lbs tension on the Model 180 while maintaining a rudder offset of 1° to the right (5/16 inch at lower trailing edge of rudder).

c. THRU AIRCRAFT SERIALS 18052419 AND 18502365.

1. The rudder will maintain a rudder offset 2° right (0.65 inches at lower trailing edge of rudder). Place pointer follower in center spiral groove on trim wheel and bend pointer to center mark on cover. Rotate trim wheel left 4.75 turns and set DOWN stop bolt. Then rotate trim wheel back to the right 9.50 turns and set UP stop nut.
2. (Refer to figure 9-2.) After completion of step b4, the rudder pedal pivot shafts (13) should be approximately 6.50 inches from the firewall.

NOTE

Because of the thickness of insulation and material on the firewall, it is recommended that a piece of 1/16 inch welding rod be ground to a sharp point and notched 6.50 inches from the point. Pierce the material on the firewall and use the notch to measure the dimension.

3. (Refer to figure 9-3.) Rotate the trim control wheel (3) until the clevis on the lower end of trim bungee (13) aligns EXACTLY with the mounting hole in the rudder bar arm and install.
4. Check position of trim position indicator. If the indicator is not neutral, remove cover (4), remove clevis pin securing indicator, reposition indicator to the neutral position, then reinstall clevis pin and cover.
5. Complete step 9 of subparagraph "a."

d. BEGINNING WITH SERIALS 18052420 AND 18502366. (Refer to figure 9-3.)

1. With rudder offset 2° right (0.65 inches at lower trailing edge of rudder), turn rudder trim wheel (3) left or right until bungee assembly (13) is unloaded. This is the neutral trim position.
2. From neutral position, rotate trim wheel right 4.75 turns and set upper stop nut (23) to bottom out on top of link assembly (15). Tighten jam nut against stop nut.
3. With trim wheel rotated full right against upper stop, position rudder trim indicator arm (25) in outermost groove of trim wheel.
4. Rotate trim to the left until trim indicator arm bottoms out on the inside groove of the trim wheel (approximately 9.50 turns). Move trim back to the right one half turn and set lower stop bolt (26) to contact flange of link assembly (15). Tighten jam nut.
5. Reposition trim wheel to unload bungee (13) and check indicator arm for "NEUTRAL" position.

NOTE

If indicator arm does not indicate NEUTRAL trim position with bungee unloaded, the indicator arm wire can be bent accordingly, but do not reposition indicator arm in trim wheel grooves.

6. Complete step 9 of subparagraph "a".

SHOP NOTES:

SECTION 10

STABILIZER TRIM CONTROL SYSTEM

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10-1. STABILIZER TRIM CONTROL SYSTEM.

10-2. DESCRIPTION. The entire stabilizer may be trimmed to meet different speed and load conditions. Rotating the trim wheel, mounted in the tunnel to the left of the flap control lever, operates the stabilizer through a system of roller chains, cables and screw-jack actuators. The trim wheel is equipped with a pointer which indicates nose attitude of the aircraft. This sytem provides longitudinal trim afforded by the elevator trim tab on other models.

10-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart, it may be necessary to re-rig system. Refer to paragraph 10-13.

TROUBLE	PROBABLE CAUSE	REMEDY
FALSE READING ON STABILIZER POSITION INDICATOR.	Pointer distorted or bent.	Check visually. Straighten or replace pointer.
	Trim wheel mechanism improperly rigged.	Refer to paragraph 10-13.
	Stabilizer actuators out of adjustment.	Refer to paragraph 10-13.
	Sprocket retaining roll pin or trim wheel sprocket sheared.	Check for lost motion of trim wheel. Replace sheared pin.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HARD OR SLUGGISH MOTION OF TRIM WHEEL MECHANISM.	Bearings of trim wheel axle binding.	Check bearing condition. Lubricate or replace as necessary.
	Actuators binding.	Remove and check actuators. individually. Clean, lubricate repair or replace actuators as necessary.
	Incorrect cable tension.	Check with tensiometer. Adjust tension as required.
	Cables or chains not riding properly on pulleys or sprockets.	Check visually. Route cables and chains correctly.
	Warped or bent stabilizer.	Check visually. Repair or replace stabilizer.
	Rusty chain.	Check visually. Replace chain.
	Bent sprocket shaft.	Visually check motion. Replace shaft.
STABILIZER FAILS TO REACH FULL TRAVEL LIMITS.	Improper screw-jack adjustment.	Refer to paragraph 10-13.
	Incorrect trim wheel mechanism adjustment.	Refer to paragraph 10-13.
	Excessive slack in control cables.	Check with tensiometer. Adjust tension as required.
STABILIZER DOES NOT RESPOND TO TRIM WHEEL MOVEMENT.	Broken chain or cable.	Check visually. Replace chain or cable.
	Sprocket retaining roll pin on trim wheel or actuator assembly sheared.	With chain removed, attempt to turn sprocket by hand on shaft. Replace sheared pin.

10-4. STABILIZER.

10-5. REMOVAL AND INSTALLATION. (Refer to figure 10-2.)

a. Remove all tail group fairings and access plates as required.

b. Remove stinger, rudder, elevators and fin.

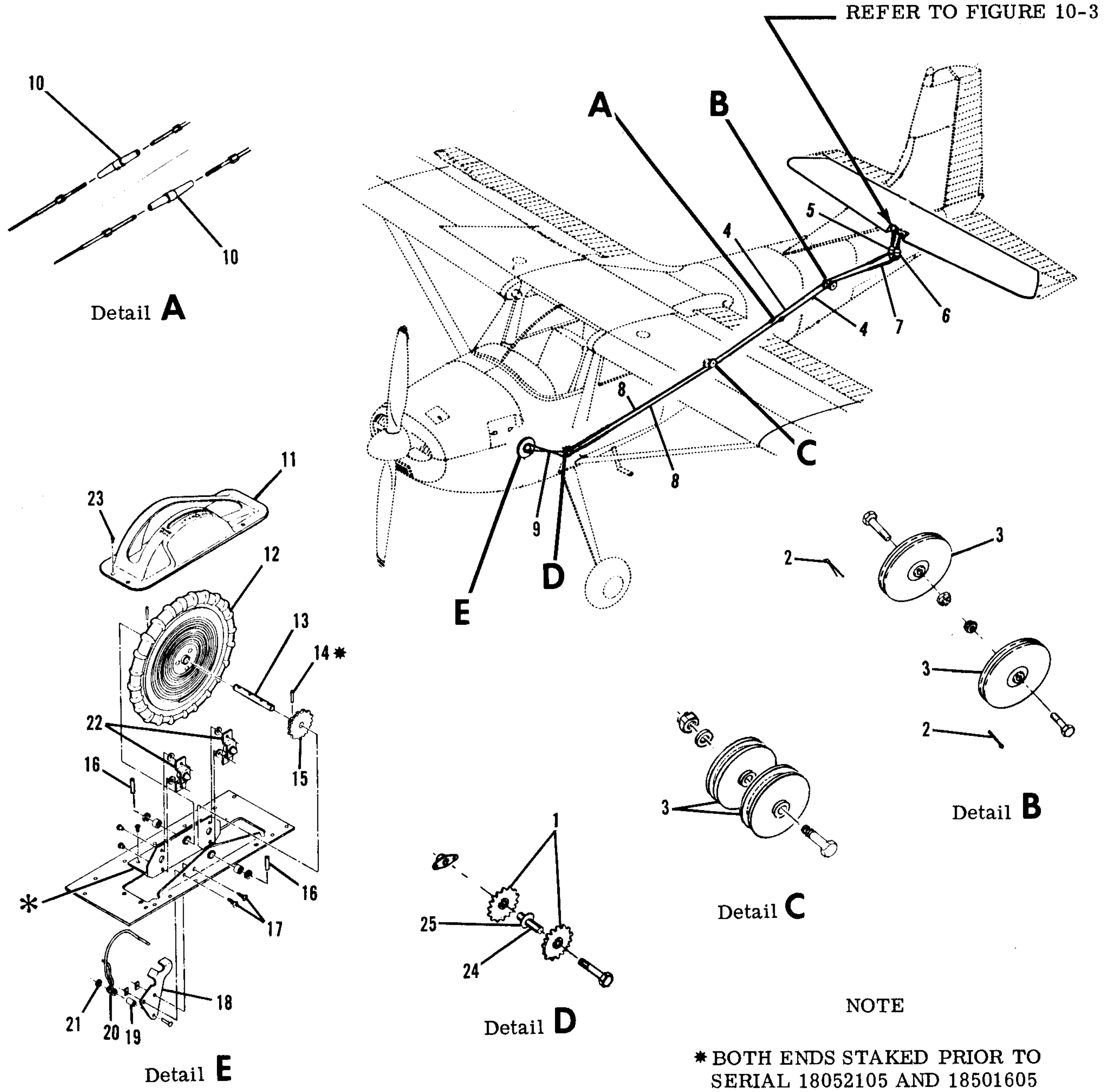
c. Remove bolt (14) and attaching hardware.

d. Remove bolts (12) securing actuators (9 and 10) to brackets (7).

NOTE

To eliminate the necessity of re-rigging stabilizer travel after reinstallation, do not disturb actuator setting. Install a 3/8 inch drill rod through both actuators to maintain settings.

e. Reverse the preceding steps for reinstallation. Refer to applicable sections for rigging of the rudder, elevator and stabilizer control systems. Rig the stabilizer control system FIRST in accordance with paragraph 10-13.



1. Sprocket
2. Cable Guard
3. Pulley
4. Aft Cable
5. RH Actuator
6. LH Actuator
7. Aft Chain
8. Forward Cable
9. Forward Chain
10. Turnbuckle
11. Trim Wheel Cover
12. Trim Wheel
13. Shaft
14. Roll Pin
15. Sprocket
16. Roll Pin
17. Screw
18. Chain Guard
19. Bushing
20. Indicator
21. Collar
22. Friction Catch
23. Screw
24. Bushing
25. Washer

NOTE

✱ BOTH ENDS STAKED PRIOR TO SERIAL 18052105 AND 18501605 BOTH ENDS SAFETY WIRED 18052105 AND 18501605 AND ON

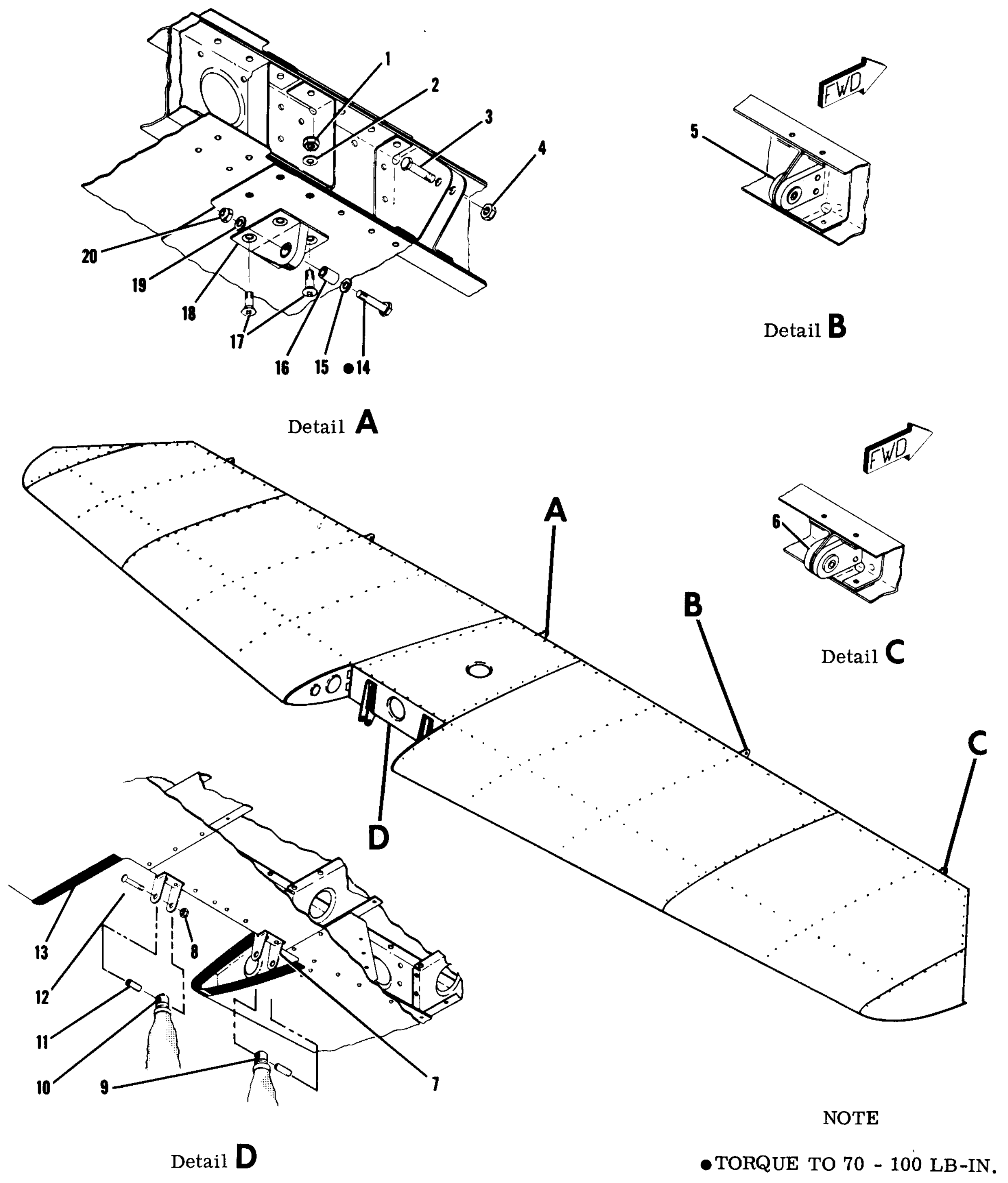
✻ Use a maximum of 2 shims to bring shaft assembly (13) plumb with aircraft centerline.

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
20 LBS ± 2.5 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 10-1. Stabilizer Trim Control System

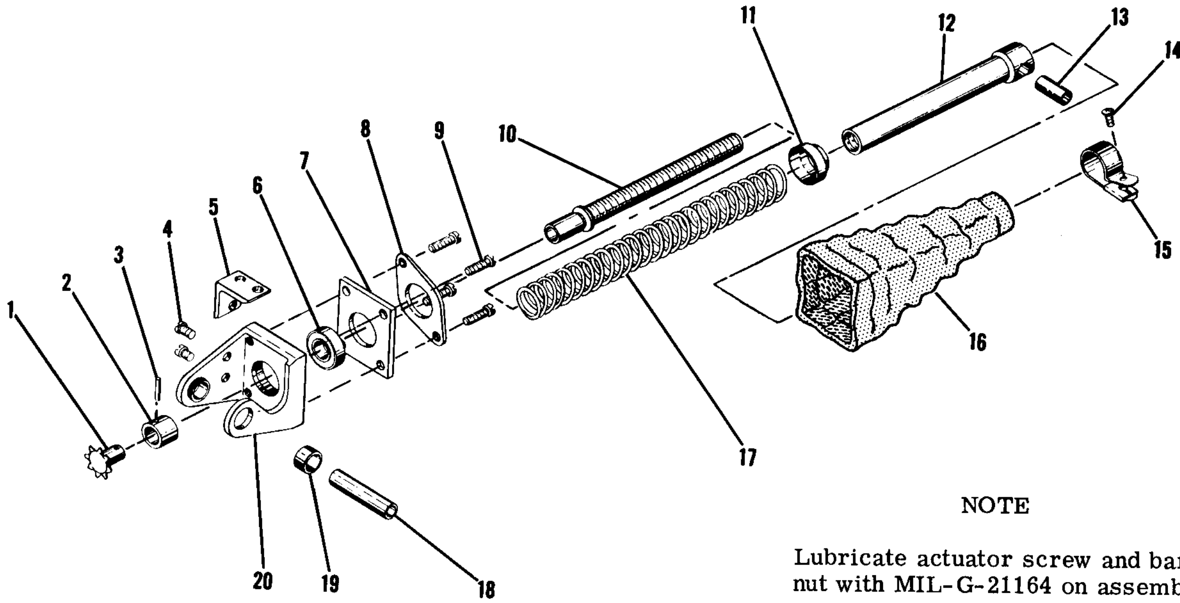


NOTE

●TORQUE TO 70 - 100 LB-IN.

1. Nut
2. Washer
3. Bolt
4. Nut
5. Inboard Elevator Hinge
6. Outboard Elevator Hinge
7. Forward Attach Bracket
8. Nut
9. Right Stabilizer Actuator
10. Left Stabilizer Actuator
11. Eccentric Bushing
12. Bolt
13. Rubber Molding
14. Bolt
15. Washer
16. Bushing
17. Screw
18. Stabilizer Hinge
19. Washer
20. Nut

Figure 10-2. Stabilizer



1. Sprocket
2. Retainer
3. Roll Pin
4. Screw
5. Chain Guard
6. Bearing
7. Retainer Cap
8. Retainer Plate
9. Screw
10. Actuator Screw
11. Collar
12. Barrel Nut
13. Eccentric Bushing
14. Screw
15. Clamp
16. Boot
17. Spring
18. Bushing
19. Bushing
20. Hinge Assembly

Figure 10-3. Stabilizer Screw-jack Actuator

10-6. ACTUATORS, CHAINS, CABLES AND PULLEYS.

10-7. REMOVAL AND INSTALLATION. (Refer to figure 10-1.)

NOTE

The chain guards on the screw-jack actuators make it necessary to remove the actuators, chains and cables as an assembly.

a. Remove rear baggage compartment wall.
b. Remove safety wire and relieve cable tension at turnbuckles (10).
c. Remove stabilizer as outlined in paragraph 10-5.
d. Remove cable guards and pulleys as necessary to work cables free of aircraft as the actuators are removed.
e. Remove bolts securing actuators to fuselage structure and remove actuators, chains and cables as an assembly.
f. Reverse the preceding steps for reinstallation. Refer to applicable sections for rigging of the rudder, elevator and stabilizer control systems. Rig the stabilizer control system FIRST in accordance with paragraph 10-13, safety turnbuckles and reinstall all items removed for access.

10-8. TRIM CONTROL WHEEL.

10-9. REMOVAL AND INSTALLATION. (Refer to figure 10-1.)

NOTE

The right half of the trim wheel bearing support bracket contains friction catches which prevent the trim wheel from creeping.

a. Remove rear baggage compartment wall.
b. Remove safety wire and relieve cable tension at turnbuckles (10).
c. Remove screws (23) securing trim wheel cover (11) and remove cover.
d. Remove screws securing right bearing support bracket.
e. Remove roll pins (16) and washers at ends of trim wheel shaft.
f. Remove trim wheel, disengaging chain from sprocket (15) as wheel is removed.

NOTE

Removal of sprocket or shaft from trim wheel assembly is not recommended except for replacement of parts.

g. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-13, safety turnbuckles and reinstall all items removed for access.

10-10. ACTUATOR OVERHAUL. (Actuator removed from aircraft.) (Refer to figure 10-3.)

10-11. DISASSEMBLY.

a. Remove clamp (15).
b. Remove boot (16) from actuator assembly. The boot is cemented to hinge assembly (20). Use care to prevent damage when removing boot.
c. Unscrew and remove barrel nut (12) from actuator screw (10). Barrel nut is under a slight spring load.
d. Remove collar (11) and spring (17) from actuator screw (10).
e. Remove screws (9) attaching retainer plate (8) and retainer cap (7) to hinge assembly (20). Remove retainer plate and cap.
f. Remove screws (4) attaching chain guard (5) to hinge assembly (20). Remove chain guard and chain.
g. Remove bushing (18) and eccentric bushing (13).
h. Remove roll pin (3) and remove sprocket (1) and retainer (2) from actuator screw (10).
i. Using a rubber mallet, lightly tap actuator screw (10) out of bearing (6).
j. If necessary, bearing (6) may be removed by pressing it out of hinge assembly (20).
k. Bushings (19) are a press fit. Removal of these bushings is not recommended except for replacement.

10-12. REPAIR AND REASSEMBLY.

a. Wash all parts thoroughly in solvent (Stoddard or equivalent). Inspect all parts for cleanliness, cracks, chips, scratches, pitting and excessive wear. Replace all parts that are unserviceable.
b. If bearing (6) is being replaced, press bearing into hinge assembly (20) until bearing seats against shoulder in hinge assembly.
c. Insert actuator screw (10) into bearing (6).

NOTE

Actuator screw (10) and barrel nut (12) are lapped together. When replacing either or both of these units, they must be lapped with a fine lapping compound until screw can be rotated smoothly in barrel nut. After lapping, thoroughly clean screw barrel nut to remove all traces of lapping compound.

d. Install retainer (2) and sprocket (1) on actuator screw (10) so that roll pin holes in each part are aligned and install roll pin (3).
e. Position retainer cap (7) and retainer plate (8) on hinge assembly (20) and install screws (9). Safety wire screws (9) in pairs.

NOTE

When installing retainer plate (8), position plate so that its hole flange faces away from hinge assembly (20). This flange acts as a guide for spring (17).

f. Install collar (11) and spring (17) on barrel nut (12) so that tapered end of spring fits inside of collar.
g. Lubricate threads of actuator screw and barrel nut with MIL-G-21164 grease and install spring (17), collar (11) and barrel nut (12) over actuator screw (10). Spring fits over flange on retainer plate (8). Compress spring so that barrel nut can be started on threads of actuator screw. Rotate barrel nut all the way down on screw assembly.
h. Temporarily install chain guard (5). Chain guard will have to be removed when chain is installed.
i. Slide boot (16) over actuator assembly until small end of boot fits over collar (11). Secure small end of boot to collar (11) with clamp (15).
j. Pull large end of boot away from square area of hinge assembly and fold last one inch of boot back so that inner surface is exposed.
k. Thoroughly clean exposed inner surface of boot and mating surface of hinge with solvent (Stoddard or equivalent).

NOTE

Surfaces must be absolutely free from all dirt and grease before applying cement.

l. Apply a thin, even coat of EC-880, Minnesota Mining Co., adhesive (or equivalent) to boot and hinge mating surfaces.
m. When surfaces become tacky and will not transfer when touched, slip boot over hinge assembly and press to ensure a good bond.
n. Position bushings (13) and (18) as shown in figure 10-3 and safety wire in place.

10-13. RIGGING. (Refer to figure 10-1.)

NOTE

If an actuator or rear chain and cable is to be replaced, remove stabilizer as outlined in paragraph 10-5. Install actuator and chain assembly as outlined in paragraph 10-7.

a. Disconnect stabilizer trim cable turnbuckles (10).
b. Remove trim wheel cover.
c. Rotate trim wheel to full forward position with indicator pointer at NOSE DOWN position.
d. Disengage chain from sprockets (1) and position chain so that three links of chain are aft of the left sprocket. Ensure chain is threaded from bottom side of left sprocket (1) to top side of trim wheel sprocket (15) then back ot bottom of right sprocket (1). Tape or block chain so that chain and trim wheel will remain in this position.
e. Remove access covers and fairings from tail group.
f. Pull trim cables to raise leading edge of stabilizer as high as possible.
g. Remove bolts attaching actuators to stabilizer and raise leading edge of stabilizer to its full limit of travel (against up-stop bracket). Block stabilizer to hold it against the up-stop bracket.
h. Connect aft trim cables to forward cables and tighten turnbuckles equally to obtain the cable tension specified in figure 10-1. As cables are being connected, rotate actuator barrel nuts as required

to prevent interference with the stabilizer. Safety turnbuckles.

NOTE

As aft cables are connected and tightened, do not allow the stabilizer trim control wheel to be moved.

i. With cables at correct tension, rotate actuator barrel nuts to align with holes in brackets on stabilizer.

NOTE

Eccentric bushings in actuator barrel nuts may be rotated to permit installation of attaching bolts with minimum of interference. Do not deflect or warp stabilizer to install bolts.

j. Install stabilizer attaching bolts.

k. Remove blocks placed under stabilizer. Remove tape or block at forward chain sprocket.

l. Rotate trim wheel and check stabilizer for full range of travel.

m. As stabilizer contacts up-stop, check that pointer indicates NOSE DOWN attitude.

n. Check that turnbuckles are safetied and all cable and chain guards are installed, then install all parts removed for access.

WARNING

Be sure that stabilizer moves in the correct direction when operated by the stabilizer trim control wheel.

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SECTION 11

ENGINE

(SKYWAGON-180)

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11-1. ENGINE COWLING.

11-2. DESCRIPTION. The engine cowling is divided into two major removable sections. These sections are fastened together and to the fuselage with quick-release fasteners, allowing the removal of either section individually. Controllable cowl flaps are attached to the trailing edge of the lower cowl section to aid in controlling the engine temperature. The upper cowling section has two access doors, one at the upper front provides access to the oil filler neck and one at the left aft side provides access to the oil dipstick and remote strainer drain control. Beginning with the 1973 model year, cowl-mounted landing and taxi lights are mounted in the lower cowling nose cap.

11-3. REMOVAL AND INSTALLATION.

a. Disconnect cowl flap control clevises at cowl flaps.
b. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the upper and lower segments.
c. Release the quick-release fasteners on the left aft access door.
d. Disconnect the landing and taxi light wires at quick-disconnects.
e. Disconnect air induction duct on lower cowl segment at airbox and carefully remove cowling.
f. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct air flow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards.

11-4. CLEANING AND INSPECTION. Wipe the inner surfaces of the cowling segments with a clean cloth saturated with cleaning solvent (Stoddard or equivalent). If the inside surface of the cowling is coated heavily with oil or dirt, allow solvent to soak until foreign material can be removed. Wash painted surfaces of the cowling with a solution of mild soap and water and rinse thoroughly. After washing, a coat of wax may be applied to the painted surfaces to prolong paint life. After cleaning, inspect cowling for dents, cracks, loose rivets and spot welds. Repair all defects to prevent spread of damage.

11-5. REPAIR. If cowling skins are extensively damaged, new complete sections of the cowling should be installed. Standard insert-type patches may be used for repair if repair parts are formed to fit contour of cowling. Small cracks may be stop-drilled and small dents straightened if they are reinforced on the inner surface with a doubler of the same material as the cowling skin. Damaged reinforcement angles should be replaced with new parts. Due to their small size, new reinforcement angles are easier to install than to repair the damaged part.

11-6. COWL FLAPS.

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

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

a. Place cowl flap control lever (5) in the OPEN position.
b. Disconnect cowl flap control clevises (12) from cowl flaps (13).
c. Remove safety wire securing hinge pins to cowl flaps, pull pins from hinges and remove flaps.
d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 11-9.

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

a. Disconnect cowl flap control clevises (12) from cowl flaps (13).
b. Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.
c. Place cowl flap control lever (5) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (7) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (6) to position control lever in bottom slot of the plate (2).
d. With the control lever in CLOSED position, hold one cowl flap closed, streamlined with trailing edge of lower cowl. Adjust clevis (12) on the control to hold cowl flap in this position and install pin.

NOTE

If the lower control clevis (12) cannot be adjusted far enough to streamline flap and still maintain sufficient thread engagement, loosen the lower control housing clamp (14) and slide housing in clamp as necessary. Be sure threads are visible in inspection holes (11).

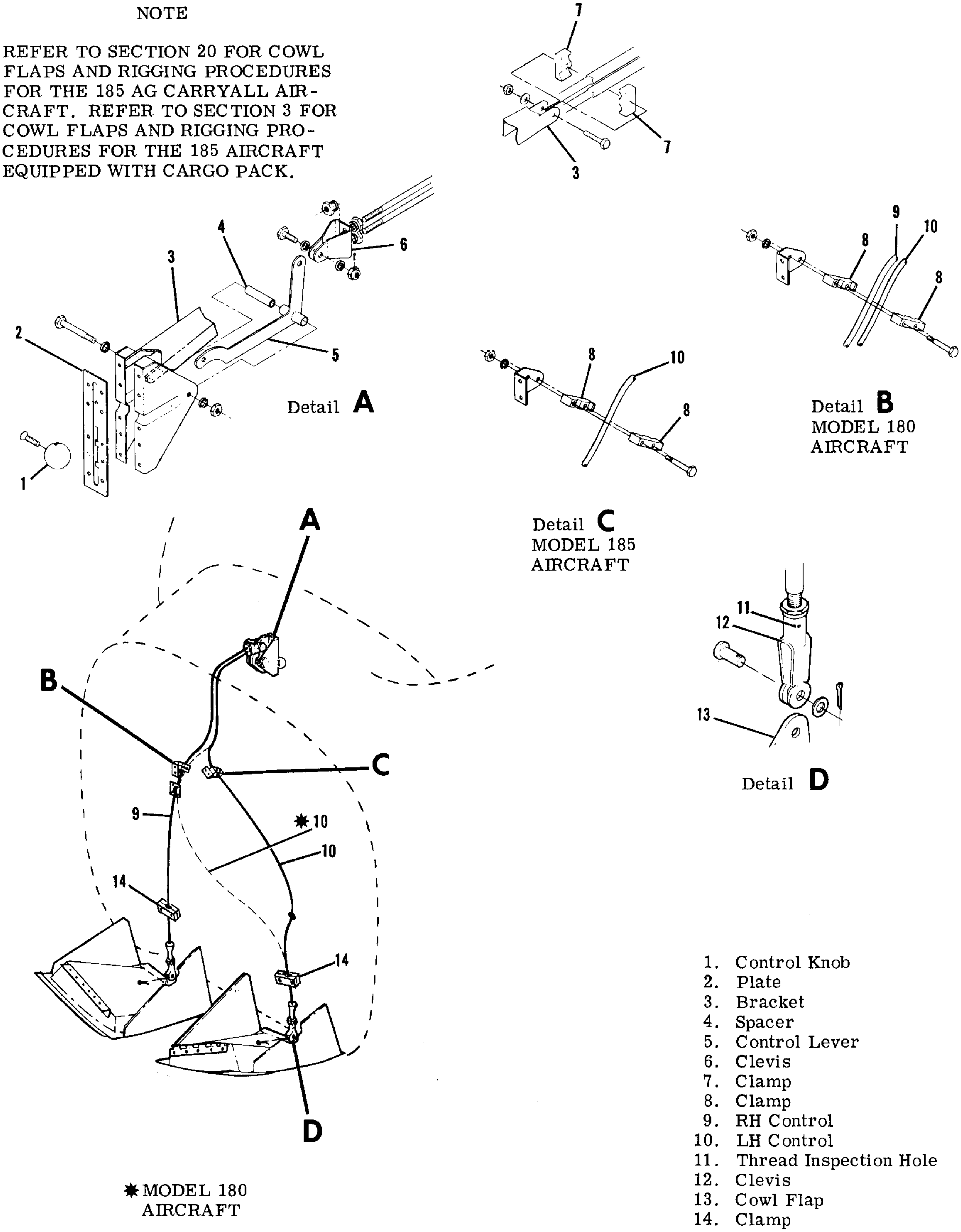
e. Repeat the preceding step for the opposite cowl flap.
f. When the cowl flaps are lowered, they should be open $16° +2° -1°$.

11-10. ENGINE.

11-11. DESCRIPTION. An air cooled, wet-sump, six-cylinder, horizontally-opposed, direct-drive, carburetor, Continental O-470 series engine driving a constant-speed propeller is used to power the aircraft. The cylinders, numbered from rear to front are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as numbers 2, 4 and 6. Refer to paragraph 11-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Service Parts Center.

NOTE

REFER TO SECTION 20 FOR COWL FLAPS AND RIGGING PROCEDURES FOR THE 185 AG CARRYALL AIRCRAFT. REFER TO SECTION 3 FOR COWL FLAPS AND RIGGING PROCEDURES FOR THE 185 AIRCRAFT EQUIPPED WITH CARGO PACK.



1. Control Knob
2. Plate
3. Bracket
4. Spacer
5. Control Lever
6. Clevis
7. Clamp
8. Clamp
9. RH Control
10. LH Control
11. Thread Inspection Hole
12. Clevis
13. Cowl Flap
14. Clamp

Figure 11-1. Cowl Flap Installation

11-12. ENGINE DATA.

Aircraft Series	Skywagon - 180	Skywagon - 180
MODEL (Continental)	O-470-R	O-470-S
Rated Horsepower at RPM	230 at 2600	230 at 2600
Number of Cylinders	6 Horizontally-Opposed	6-Horizontally-Opposed
Displacement	470 Cubic Inches	470 Cubic Inches
Bore	5.00 Inches	5.00 Inches
Stroke	4.00 Inches	4.00 Inches
Compression Ratio	7.00:1	7.00:1
Magnetos	Slick No. 662	Slick No. 662
Right Magneto	Fires 22° BTC, Lower Left, Upper Right	Fires 22° BTC, Lower Left, Upper Right
Left Magneto	Fires 22° BTC, Upper Left, Lower Right	Fires 22° BTC, Upper Left, Lower Right
Firing Order	1-6-3-2-5-4	1-6-3-2-5-4
Spark Plugs	18 MM (Refer to current Continental active factory approved spark plug chart.)	18 MM (Refer to current Continental active factory approved spark plug chart.)
Torque	330 ± 30 LB-IN.	330 # 30 LB-IN.
Carburetor (Marvel-Schebler)	MA-4-5	MA-4-5
Tachometer	Mechanical Drive	Mechanical Drive
Oil Sump Capacity	12 U.S. Quarts	12 U.S. Quarts
With External Filter	13 U.S. Quarts	13 U.S. Quarts
Oil Pressure (PSI)		
Normal	30-60	30-60
Minimum Idling	10	10
Maximum (Cold Oil Starting)	100	100
Connection Location	Between No. 2 and No. 4 Cyl.	Between No. 2 and No. 4 Cyl.
Oil Temperature		
Normal Operating	Within Green Arc	Within Green Arc
Maximum	Red Line (225°F.)	Red Line (240°F)
Probe location	Below Oil Cooler	Below Oil Cooler
Cylinder Head Temperature		
Normal Operating	Within Green Arc	Within Green Arc
Maximum	Red Line (460°F.)	Red Line (460°F.)
Probe Location	Lower side of Number 1 Cylinder	Lower side of Number 1 Cylinder THRU 18052500 and Number 3 Cylinder BEGINNING WITH 18052501.
Direction of Crankshaft Rotation (Viewed from Rear)	Clockwise	Clockwise
Dry Weight-With Accessories	438 LB (Weight is approximate and will vary with optional accessories installed.)	438 LB (Weight is approximate and will vary with optional accessories installed.)

NOTE

The O-470-S engine is interchangeabil with the O-470-R engine on aircraft serials 18052285 THRU 18052500. Refer to Cessna Single-engine Service Letter SE75-2 Dated January 17, 1975.

11-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE WILL NOT START.	Improper use of starting procedure.	Review starting procedure. Refer to Owner's Manual.
	Fuel tanks empty.	Visually inspect 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 11-89.
	Engine flooded.	Refer to paragraph 11-89.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines, strainer and carburetor.
	Defective aircraft fuel system.	Refer to Section 12.
	Fuel contamination.	Drain all fuel and flush out fuel system. Clean all screens, fuel lines, strainer and carburetor.
	Defective ignition system.	Refer to paragraph 11-67.
	Defective magneto switch or grounded magneto leads.	Check continuity. Repair or replace switch or leads.
	Spark plugs fouled.	Remove, clean and regap plugs. Test harness cables to persistently fouled plugs. Replace if defective.
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.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE (Cont.)	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 11-67.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine).	Refer to paragraph 11-89.
	Induction air leaks.	Check visually. Correct the cause of leaks.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Leaking float valve or float level set too high.	Perform an idle mixture check. Attempt to remove any rich indication with the idle mixture adjustment. If the rich indication cannot be removed, the float valve is leaking or the float level is set too high. Replace defective parts, reset float level.
	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Propeller control set in high pitch position (low rpm).	Use low pitch (high rpm) position for all ground operation.
	Defective fuel system.	Refer to Section 12.
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER.	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 11-67.
	Defective or badly adjusted accelerating pump in carburetor.	Check setting of accelerating pump linkage and adjust as necessary.
	Float level set too low.	Check and reset float level.

11-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER (Cont).	Defective carburetor.	If engine will start when primed but stops when priming is discontinued, with mixture control in full RICH position, the carburetor is defective. Repair or replace carburetor.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Restricted carburetor air filter.	Check visually. Clean in accordance with Section 2.
	Cracked engine mount.	Inspect and repair or replace mount as required.
	Defective mounting bushings.	Inspect and install new bushings as required.
	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) position for all ground operations.
	Fuel contamination.	Check all screens in fuel system. Drain all fuel and flush out system. Clean all screens, lines, strainer and carburetor.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Check that idle cut-off stop on carburetor is contacted. Replace worn linkage. Rig properly.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, it is defective. Repair or replace primer.
	Defective carburetor.	Repair or replace carburetor.

11-13A. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static RPM run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. It should be within 50 RPM of 2575 RPM.

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

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

NOTE

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

2. Check carburetor heat control (carburetor equipped engines) for proper rigging. If partially open it would cause a slight power loss. On fuel injected engines check operation of alternate air door spring or magnetic lock to make sure door will remain closed in normal operation.
3. Check magneto timing, spark plugs and ignition harness for settings and conditions.
4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.
5. Check condition of induction air filter. Clean if required.
6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

SHOP NOTES:

11-14. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft with the engine mount attached to the firewall.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Place fuel shut-off valve in the OFF position.
c. Remove engine cowling in accordance with paragraph 11-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine mount or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 13. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
i. Disconnect throttle and mixture controls at carburetor. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect propeller governor control at governor. Note EXACT position, size and number of attaching washers for reference on reinstallation. Remove clamps attaching control to engine and pull control aft clear of engine.
k. Disconnect all hot and cold air flexible ducts and remove.
l. Remove exhaust system in accordance with paragraph 11-85.
m. Remove carburetor airbox in accordance with paragraph 11-53.
n. Disconnect fuel strainer drain remote control.
o. 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-disconnects.
   6. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.
p. Disconnect lines and hoses as follows:
   1. Disconnect vacuum hose at vacuum pump.
   2. Disconnect oil breather and vacuum system oil separator vent lines where secured to the engine.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

   3. Disconnect oil temperature bulb below cooler.
   4. Disconnect primer line at firewall fitting.
   5. Disconnect fuel supply hose at fuel strainer.
   6. Disconnect oil pressure line at firewall fitting.
   7. Disconnect manifold pressure line at firewall.
q. 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.
r. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mount pads.

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s. Remove bolts attaching engine to engine mount pads 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.

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

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

CAUTION

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

11-16. ACCESSORIES REMOVAL. Removal of engine accessories for overhaul or for engine replacement involves stripping the engine of parts, accessories and components to reduce it to the bare engine. During the removal process, removed items should be examined carefully and defective parts should be tagged for repair or replacement with new components.

NOTE

Items easily confused with similar items should be tagged to provide a means of identification when being installed on a new engine. All openings exposed by the removal of an item should be closed by installing a suitable cover or cap over the opening. This will prevent entry of foreign material. If suitable covers are not available, tape may be used to cover the openings.

11-17. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.

a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.

b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.

c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness, damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.

d. Inspect for color bleaching of the end fittings or severe discoloration of the hoses.

NOTE

Avoid excessive flexing and sharp bends when examining hoses for stiffness.

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

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

11-18. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lockwashers, nuts, gaskets and rubber connections should be new parts.

11-19. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point near the engine mount.

b. Install engine shock-mount pads and bonding straps as illustrated in figure 11-2.

c. Carefully lower engine slowly into place on the engine mount. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mount pads.

NOTE

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

d. Install engine mount bolts, washers and nuts, then remove the hoist. Torque bolts to 450-500 lb-in.

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

f. Install carburetor airbox in accordance with paragraph 11-53, connect and rig carburetor heat control in accordance with paragraph 11-75.

NOTE

Throughout the aircraft fuel system, from the fuel cells to the carburator, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin). MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricator or to seal a leaking connection. Apply sparingly to male threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other froeign material cannot enter the system.

g. Connect lines and hoses as follows:
   1. Connect manifold pressure line at firewall fitting.
   2. Connect oil pressure line at firewall fitting.
   3. Connect fuel supply hose at fuel strainer.
   4. Connect primer line at firewall fitting.
   5. Connect oil temperature bulb below cooler.
   6. Connect oil breather and vacuum system oil separator vent lines where secured to the engine.
   7. Connect vacuum hose at vacuum pump.
h. Connect wires and cables as follows:
   1. Connect electrical wires and wire shielding ground at alternator.
   2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

   3. Connect starter electrical cable at starter.
   4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Torque housing attach nut to 100 lb-in.
   5. Connect exhaust gas temperature wires at quick-disconnects.
   6. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.
i. Connect fuel strainer drain remote control.
j. Install exhaust system in accordance with paragraph 11-85.
k. Connect all hot and cold air flexible ducts.
l. Install propeller and spinner in accordance with instructions outlined in Section 13.
m. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

n. Clean and install induction air filter in accordance with Section 2.
o. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.
p. Check all switches are in the OFF position and connect battery cables.
q. Rig engine controls in accordance with paragraphs 11-73, 11-74, 11-75 and 11-76.
r. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
s. Install engine cowling in accordance with paragraph 11-3. Rig cowl flaps in accordance with paragraph 11-9.
t. Perform an engine run-up and make final adjustments on the engine controls.

11-20. FLEXIBLE FLUID HOSES.

11-21. LEAK TEST.
a. After each 50 hours of engine operation, all flexible fluid hoses in the engine compartment should be checked for leaks as follows:
   1. Examine the exterior of hoses for evidence of leakage or wetness.
   2. Hoses found leaking should be replaced.
   3. Refer to paragraph 11-17 for detailed inspection procedures for flexible hoses.

11-22. REPLACEMENT.
a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.
b. Provide as large a bend radius as possible.
c. Hoses should have a minimum of one-half inch clearance from other lines, ducts, hoses or surrounding objects or be butterfly clamped to them.
d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.
e. Refer to AC 43.13-1, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

11-23. ENGINE BAFFLES.

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

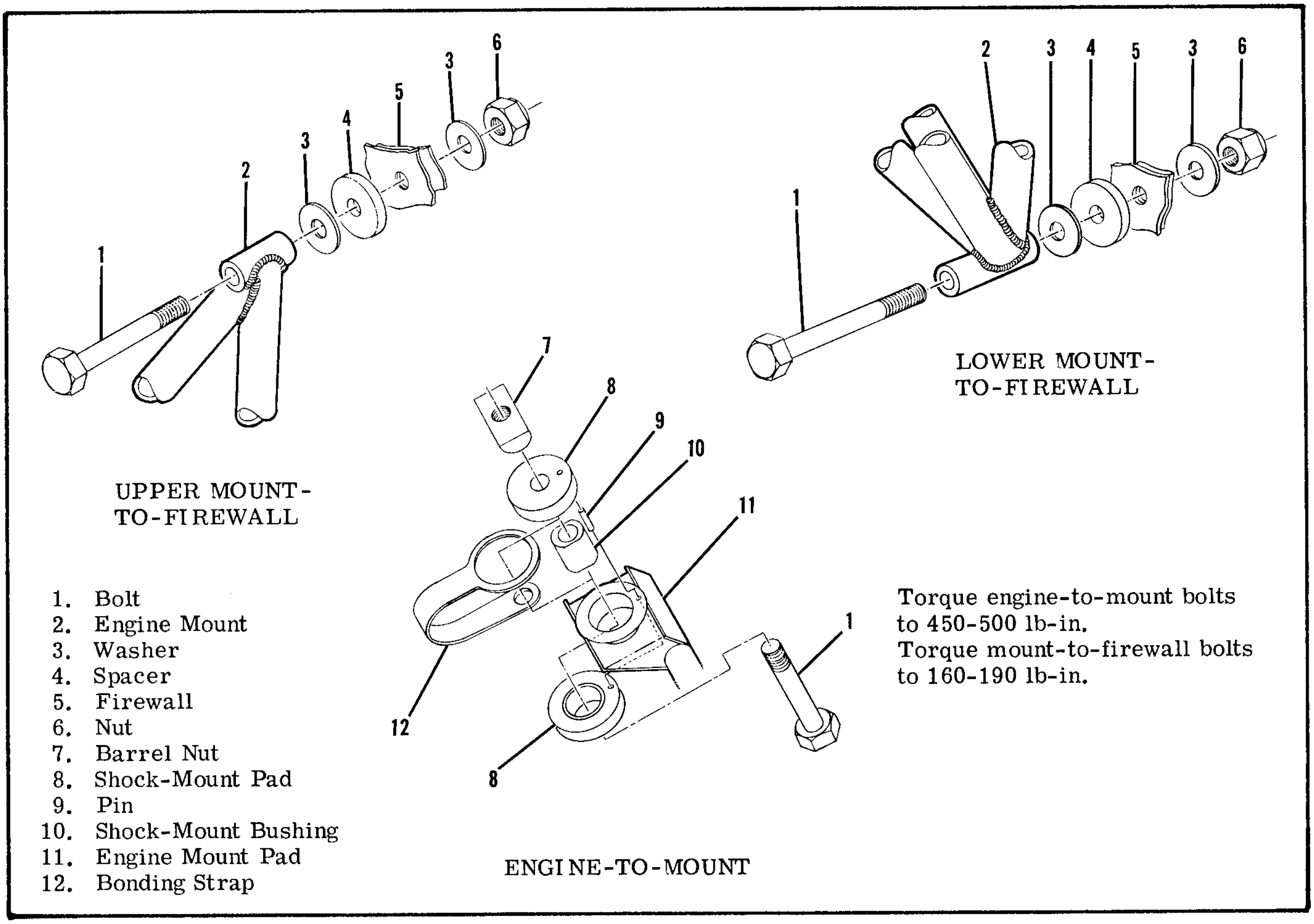


Figure 11-2. Engine Mount Details

Inspect baffles for cracks in the metal and for loose and/or torn seals. Repair or replace any defective parts.

11-26. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any replaced baffles and seals are installed correctly and that they seal to direct the airflow in the correct direction. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

11-27. REPAIR. Repair of an individual segment of engine baffle is generally impractical, since, due to the small size and formed shape of the part, replacement is usually more economical. However, small cracks may be stop-drilled and a reinforcing doubler installed. Other repairs may be made as long as strength and cooling requirements are met. Replace sealing strips if they do not seal properly.

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

11-29. DESCRIPTION. The engine mount is composed of sections of steel tubing welded together and reinforced with gussets. The mount is fastened to the fuselage at four points. The engine is attached to the engine mount with shock-mount assemblies which absorb engine vibrations. Each engine mount pad has a small hole for a locating pin which serves as a locating dowel for the engine shock-mounts.

11-30. REMOVAL AND INSTALLATION.

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

b. Remove bolts from upper and lower mount-to-fuselage structure and carefully remove engine mount.

c. Reverse the preceding steps for reinstallation. Torque bolts to 160-190 lb-in. Reinstall engine in accordance with paragraph 11-19.

11-31. REPAIR. Repair of the engine mount shall be performed carefully as outlined in Section 17. The mount shall be painted with heat-resistant black enamel after welding or whenever the original finish has been removed. This will prevent corrosion.

11-32. ENGINE SHOCK-MOUNT PADS. (Refer to figure 11-2.) The bonded rubber and metal shock-mounts are designed to reduce transmission of engine vibrations to the airframe. The rubber pads should be wiped clean with a clean dry cloth.

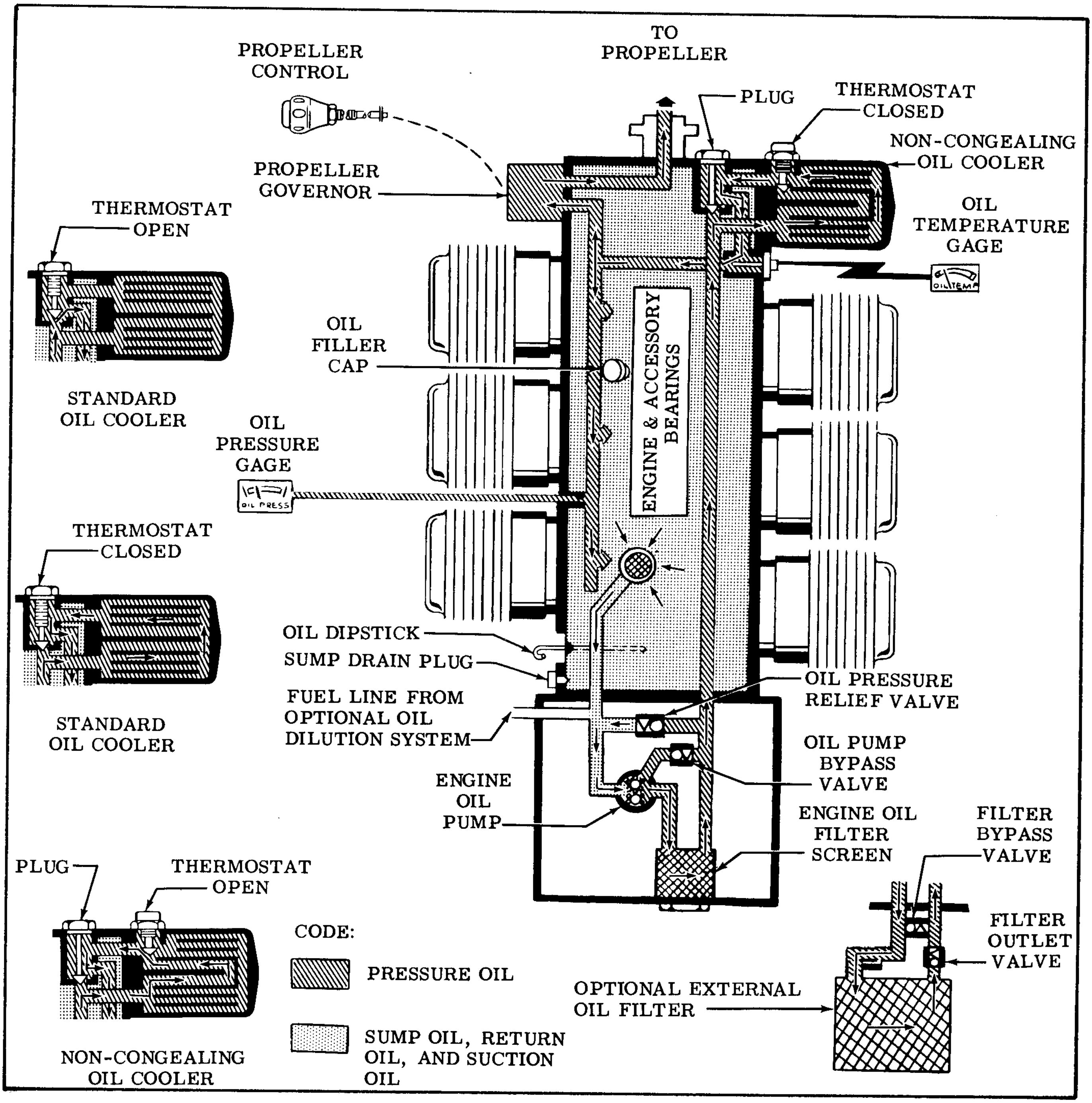


Figure 11-3. Engine Oil System Schematic

NOTE

Do not clean the rubber pads and dampener assembly with any type of cleaning solvent.

Inspect the metal parts for cracks and excessive wear due to aging and deterioration. Inspect the rubber pads for separation between the pad and metal backing, swelling, cracking or a pronounced set of the pad. Install new parts for all parts that show evidence of wear or damage.

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

11-34. DESCRIPTION. A wet-sump, pressure-lubricating oil system is employed in the engine. Oil under pressure from the oil pump is fed through drilled crankcase passages which supply oil to the crankshaft main bearings and camshaft bearings. Connecting rod bearings are pressure-lubricated through internal passages in the crankshaft. Valve mechanisms are lubricated through the hollow push-rods, which are supplied with oil from the crankcase oil passages. The propeller is supplied oil, boosted by the governor through the forward end of the crankshaft. Oil is returned by gravity to the engine oil sump. Cylinder walls and piston pins are spray-lubricated by oil escaping from connecting rod bearings. The engine is equipped with an oil cooler and a thermostat valve to regulate engine oil temperature. A pressure relief valve is installed to maintain proper oil pressure at higher engine speeds. Removable oil filter screens are provided within the oil system. An external, replaceable element oil filter is available as optional equipment. The engine may also be equipped with a non-congealing oil cooler.

11-35. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken, disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Dirty oil screens.	Remove and clean oil screens.

11-35. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective. Replace bulb.
	Oil cooler thermostatic bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Attempt to drain cooler. Inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 rpm to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. Replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

11-35. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (Cont.)	Secondary effect of low oil pressure.	Observe oil pressure gage for low indication. Determine and correct reason for low oil pressure.
	Oil congealed in cooler.	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	Replace.
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

11-36. FULL-FLOW OIL FILTER.

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

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

NOTE

Filter element replacement kits are available from the Cessna Service Parts Center.

a. Remove engine cowling in accordance with paragraph 11-3.
b. Remove both safety wires from filter can and unscrew hollow stud (1) to detach filter assembly from adapter (10) as a unit. Remove filter assembly from aircraft and discard gasket (9). Oil will drain from filter as assembly is removed from adapter.
c. Press downward on hollow stud (1) to remove from filter element (5) and can (4). Discard metal gasket (2) on stud (1).
d. Lift lid (7) off filter can (4) and discard lower gasket (6).
e. Pull filter element (5) out of filter can (4).

NOTE

Before discarding removed filter element (5), remove the outer perforated paper cover; using a sharp knife, cut through the folds of the filter element at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. In new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by impacting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

f. Wash lid (7), hollow stud (1) and filter can (4) in solvent and dry with compressed air.

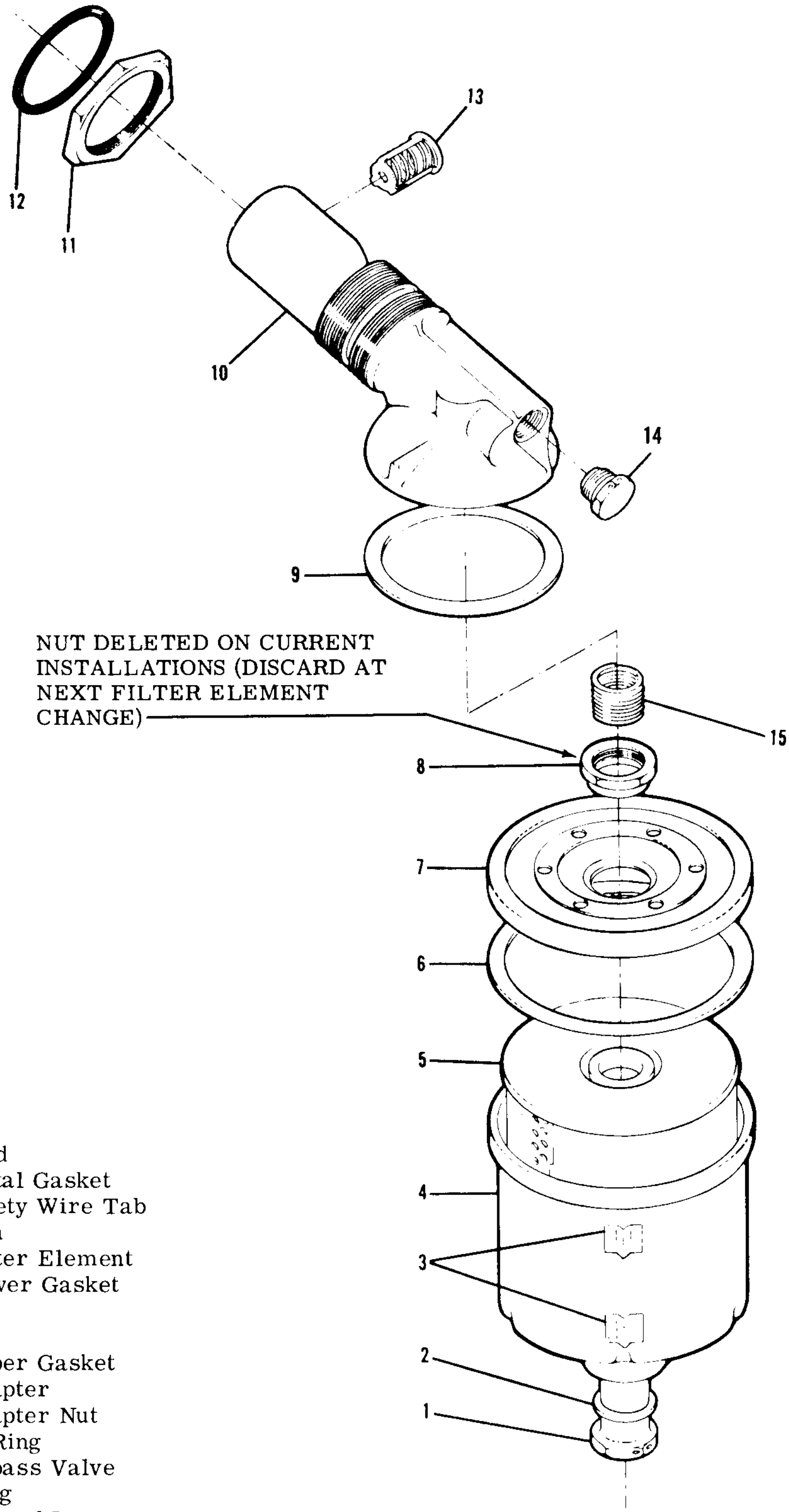
NOTES

When installing a new filter element (5), it is important that all gaskets are clean, lubricated and positioned properly, and that the correct amount of torque is applied to the hollow stud (1). If the stud is under-torqued, oil leakage will occur. If the stud is over-torqued, the filter can might possibly be deformed, again causing oil leakage.

- Lubricate all rubber grommets in the new filter element, lid gaskets and metal gasket with clean engine oil or general purpose grease before installation. Dry gaskets may cause false torque readings, again resulting in oil leakage.

NOTE

Do NOT substitute automotive gaskets for any gaskets used in this assembly. Use only approved gaskets listed in the Parts Catalogs.



1. Stud
2. Metal Gasket
3. Safety Wire Tab
4. Can
5. Filter Element
6. Lower Gasket
7. Lid
8. Nut
9. Upper Gasket
10. Adapter
11. Adapter Nut
12. O-Ring
13. Bypass Valve
14. Plug
15. Thread Insert

Figure 11-4. Full-Flow Oil Filter

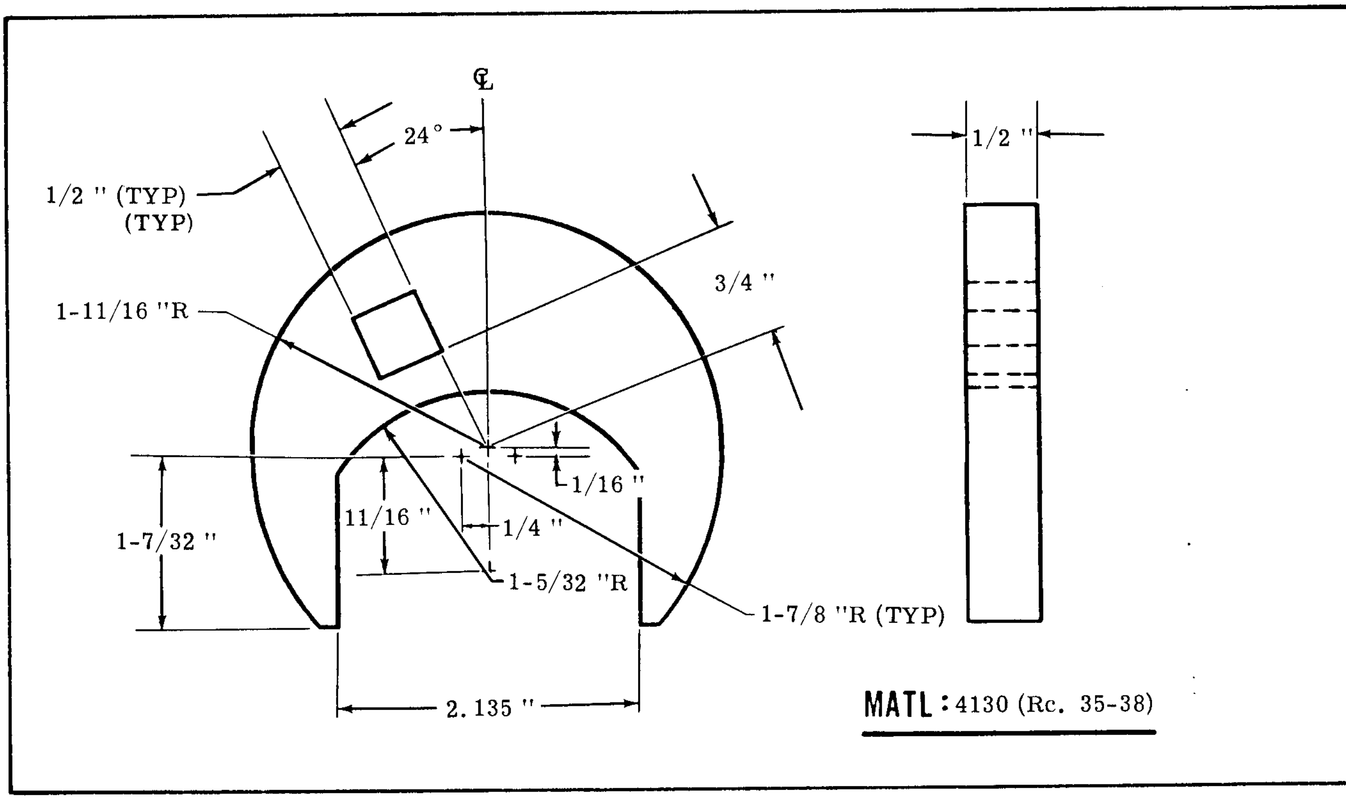


Figure 11-5. Oil Filter Adapter Wrench Fabrication

- Before assembly, place a straightedge across bottom of filter can. Check for distortion or out-of-flat condition greater than 0.010 inch. Install a new filter can if either of these conditions exist.

- After installing a new gasket on lid, turn lid over. If gaskets falls, try a different gasket and repeat test. If this gasket falls off, install a new lid.

g. Inspect the adapter gasket seat for gouges, deep scratches, wrench marks and mutilation. If any of these conditions are found, install a new adapter.
h. Place a new filter element (5) in can (4) and insert the hollow stud (1) with a new metal gasket (2) in place, through the filter can and element.
i. Position a new gasket (6) inside flange of lid (7) and place lid in position on filter can.
j. With new gasket (9) on face of lid, install filter can assembly on adapter (10). While holding filter can to prevent turning, tighten hollow stud (1) and torque to 20-25 lb-ft (240-300 lb-in), using a torque wrench.
k. Install all parts removed for access and service the engine with the proper grade and quantity of engine oil. One additional quart of oil is required each time the filter element is changed.
l. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.
m. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).
n. Check to make sure filter can has not been making contact with any adjacent parts due to engine torque.
o. While engine is still warm, recheck torque on hollow stud (1) then safety stud to lower tab (3) on filter can and safety adapter (10) to upper tab on filter can.

11-39. FILTER ADAPTER.

11-40. REMOVAL. (Refer to figure 11-4.)
a. Remove filter assembly in accordance with paragraph 11-38.

NOTE

A special wrench adapter for adapter nut (11) (Part No. SE-709) is available from the Cessna Service Parts Center, or one may be fabricated as shown in figure 11-5. Remove any engine accessory that interferes with removal of the adapter.

b. Note angular position of adapter (10), then remove safety wire and loosen adapter nut (11).
c. Unscrew adapter and remove from engine. Discard adapter O-ring (12).

11-41. DISASSEMBLY, INSPECTION AND REASSEMBLY. Figure 11-4 shows the relative position of the internal parts of the filter adapter and may be used as a guide during installation of parts. The bypass valve is to be installed as a complete unit, with the valve being staked three places. The heli-coil type insert (15) in the adapter may be replaced, although special tools are required. Follow instructions of the tool manufacturer for their use. Inspect threads on adapter and in engine for damage. Clean adapter in solvent and dry with compressed air. Ascertain that all passages in the adapter are open and free of foreign material. Also, check that bypass valve is seated properly.

11-42. INSTALLATION.

a. Assemble adapter nut (11) and new O-ring (12) on adapter (10) in sequence illustrated in figure 11-4.

b. Lubricate O-ring on adapter with clean engine oil. Tighten adapter nut until O-ring is centered in its groove on the adapter.

c. Apply anti-seize compound sparingly to the adapter threads, then simultaneously screw adapter and adapter nut into engine until O-ring seats against engine boss without turning adapter nut (11). Rotate adapter to approximate angular position noted during removal. Do not tighten adapter nut at this time.

d. Temporarily install filter assembly on adapter, and position so adequate clearance with adjacent parts is attained. Maintaining this position of the adapter, tighten adapter nut to 50-60 lb-ft (600-700 lb-in) and safety. Use a torque wrench, extension and adapter as necessary when tightening adapter nut.

e. Using new gaskets, install filter assembly as outlined in paragraph 11-38. Be sure to service the engine oil system.

11-43. OIL COOLER.

11-44. DESCRIPTION. A non-congealing oil cooler may be installed on the aircraft. The cooler is mounted on the right forward side of the engine crankcase directly in front of number five cylinder and has no external oil lines. Ram air passes through the oil cooler and is discharged into the engine compartment. Oil circulating through the engine is allowed to circulate continuously through warm-up passages to prevent the oil from congealing when operating in low temperatures. On the standard and non-congealing oil coolers, as the oil increases to a certain temperature, the thermostat valve closes, causing the oil to be routed to all of the cooler passages for cooling. Oil returning to the engine from the cooler is routed through the internally drilled oil passages.

11-45. ENGINE FUEL SYSTEM.

11-46. DESCRIPTION. The engine is equipped with a carburetor mounted at the lower side of the engine. The carburetor is of the plain-tube fixed-jet type and has such features as an enclosed accelerating pump mechanism, simplified fuel passages to prevent vapor locking, idle cut-off to prevent starting of the engine accidentally and manual mixture control for leaning. For overhaul and repair of the carburetor, refer to the manufacturer's overhaul and repair manual.

11-47. CARBURETOR.

11-48. REMOVAL AND INSTALLATION.

a. Place fuel shut-off valve in the OFF position.

b. Remove engine cowling in accordance with paragraph 11-3.

c. Drain fuel from strainer and lines with strainer drain control.

d. Remove airbox in accordance with paragraph 11-53.

e. Disconnect throttle and mixture controls at carburetor. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.

f. Disconnect and cap or plug fuel line at carburetor.

g. Remove safety wire, nuts and washers attaching carburetor to intake manifold and remove carburetor and mounting gasket.

h. Reverse the preceding steps for reinstallation. Use new gaskets when installing carburetor. Rig controls in accordance with paragraphs 11-73, 11-74 and 11-75. Check carburetor throttle arm to idle stop arm attachment for security and proper safetying at each normal engine inspection in accordance with figure 11-8.

11-49. IDLE SPEED AND MIXTURE ADJUSTMENTS. Idle speed and mixture adjustment should be accomplished after the engine has been warmed up. Since idle rpm may be affected by idle mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture correctly.

a. Set the throttle stop screw to obtain 600±25 rpm, with throttle control pulled full out against idle stop.

NOTE

> Engine idle speed may vary among different engines. An engine should idle smoothly, without excessive vibration and the idle speed should be high enough to maintain idling oil pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

b. Advance throttle to increase engine speed to 1000 rpm.

c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.

d. Adjust mixture adjusting screw at upper end of carburetor intake throat to obtain a slight and momentary gain of 25 rpm maximum at 1000 rpm engine speed as mixture control is moved from full IN (RICH) toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.

e. If mixture is set too LEAN, engine speed will stop immediately, thus requiring a richer mixture. Turn adjusting screw OUT (counterclockwise) for a richer mixture.

f. If mixture is set too RICH, engine speed will increase above 25 rpm, thus requiring a leaner mixture. Turn adjusting screw IN (clockwise) for a leaner mixture.

NOTE

After each adjustment to the idle mixture, run engine up to approximately 2000 rpm to clear engine of excess fuel to obtain a correct idle speed.

11-50. INDUCTION AIR SYSTEM.

11-51. DESCRIPTION. Ram air enters the induction air system through a filter at the front of the lower cowling and is ducted to the airbox at the carburetor. From the induction airbox the filtered air is directed to the inlet of the carburetor, mounted on the lower side of the engine, through the carburetor, where fuel is mixed with the air, to the intake manifold. From the intake manifold, the fuel-air mixture is distributed to each cylinder by separate intake pipes. The intake pipes are attached to the manifold with hoses and clamps and to the cylinder with a four bolt flange sealed with a gasket. A butterfly valve, located in the airbox, may be operated manually from the cabin to permit the selection of either cold or heated air. When the induction air door is closed, heated air is drawn from a shroud on the left exhaust stack assembly.

11-52. AIRBOX.

11-53. REMOVAL AND INSTALLATION.
a. Remove engine cowling in accordance with paragraph 11-3.
b. Disconnect flexible duct from left side of airbox.
c. Disconnect boot from forward end of airbox.
d. Disconnect carburetor heat control at arm on right side of airbox and remove clamp securing control to airbox.
e. Remove mounting bolt safety wire, remove bolts and gasket, remove the breather line mounting strap and carefully remove airbox.
f. Reverse the preceding steps for reinstallation. Rig carburetor heat control in accordance with paragraph 11-75.

11-54. CLEANING AND INSPECTION. Clean metal parts of the induction air box with Stoddard solvent or equivalent. Inspect for cracks, dents, loose rivets, etc. Minor cracks may be stop-drilled. In case of continued or severe cracking, replace air box. Inspect gaskets and install new gaskets, if damaged. Check manually-operated air door for ease of operation and proper rigging.

11-55. INDUCTION AIR FILTER.

11-56. DESCRIPTION. An induction air filter, mounted at the induction air inlet on the front of the lower cowling, removes dust particles from the ram air entering the engine.

11-57. REMOVAL AND INSTALLATION.
a. Release quick-disconnect fasteners securing filter assembly.
b. Lift filter out of nose cap.
c. Reverse the preceding steps for reinstallation.

11-58. CLEANING AND INSPECTION. Clean and inspect filter in accordance with instructions in Section 2.

NOTE

If air filter gasket becomes loose bond with EC-1300L or equivalent.

11-59. IGNITION SYSTEM.

11-60. 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.

SHOP NOTES:

11-61. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 11-67.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 11-67.
ENGINE WILL NOT IDLE OR RUN PROPERLY (Cont).	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.

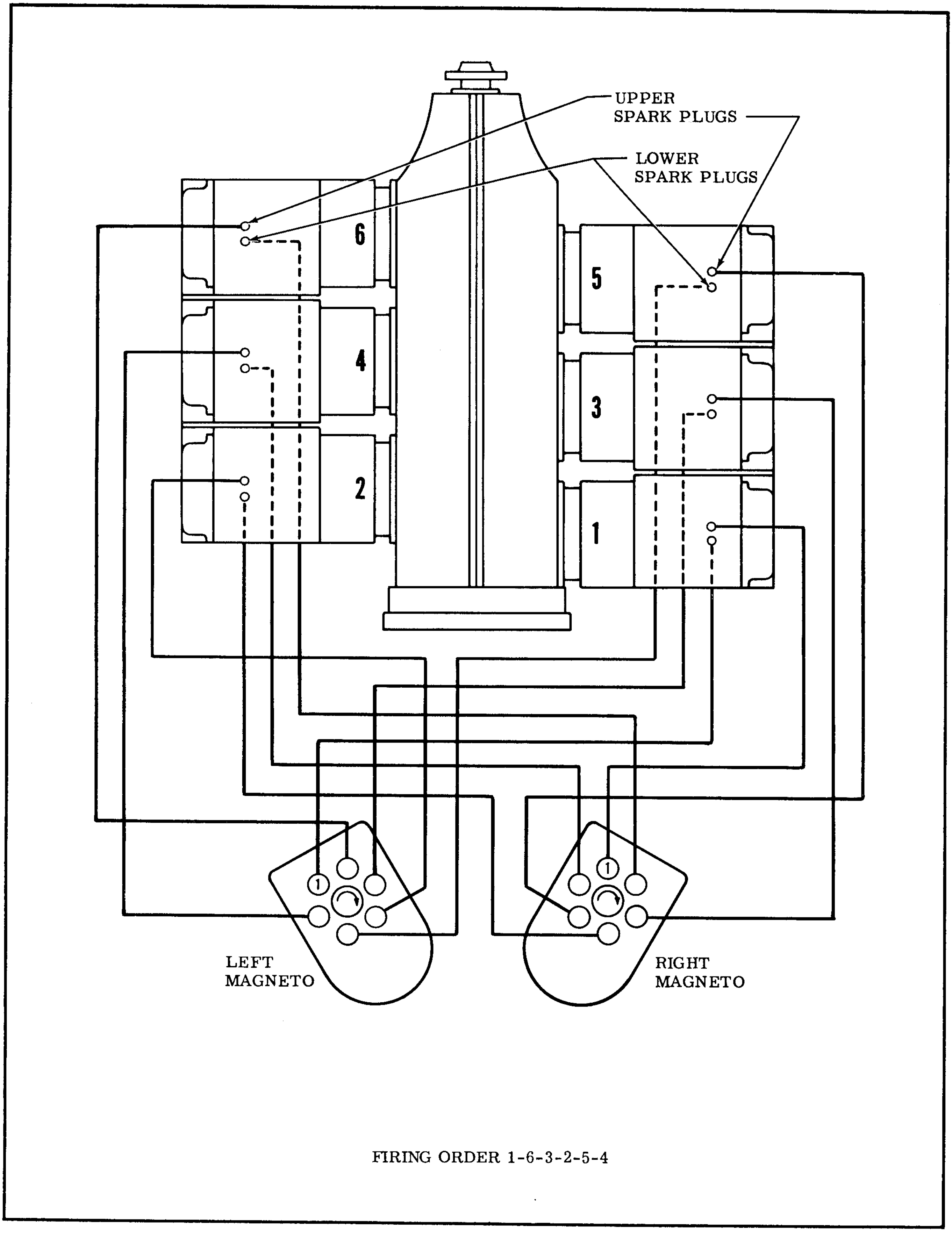


Figure 11-6. Ignition Schematic

11-62. MAGNETOS.

11-63. DESCRIPTION. The magnetos contain a conventional two-pole rotating magnet (rotor), mounted in ball bearings. Driven by the engine through an impulse coupling at one end, the rotor shaft operates the breaker points at the other end of the shaft. The nylon rotor gear drives a nylon distributor gear which transfers high tension current from the wedge-mounted coil to the proper outlet in the distributor block. A coaxial capacitor is mounted in the distributor block housing to serve as the condenser as well as a radio noise suppressor. Both nylon gears are provided with timing marks for clockwise or counterclockwise rotation. The distributor gear and distributor block have timing marks, visible through the air vent holes, for timing to the engine. A timing hole is provided in the bottom of the magneto adjacent to the magneto flange. A timing pin or 6-penny nail can be inserted through this timing hole into the mating hole in the rotor shaft to lock the magneto approximately in the proper firing position. The breaker assembly is accessible only after removing the screws fastening the magneto halves together and disconnecting the capacitor slip terminal. Do not separate magneto halves while it is installed on the engine.

11-64. REMOVAL.

a. Remove engine cowling in accordance with paragraph 11-3.

b. Tag for identification and remove high tension wires from the magneto being removed.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Remove the high tension wires from magneto or disconnect spark plug leads from the spark plugs to prevent accidental firing.

c. Disconnect switch wire from condenser terminal at magneto. Tag wire for identification so it may be installed correctly.

d. Rotate propeller in direction of normal rotation until No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate the installation of a replacement magneto, it is good practice to position the crankshaft at the advanced firing angle for No. 1 cylinder during step "d." Any standard timing device or method can be used, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

e. Remove magneto retainer clamps, nuts and washers and pull magneto from crankcase mounting pad.

NOTE

As the magneto is removed from its mounting, be sure that the drive coupling rubber bushing and retainer do not become dislodged from the gear hub and fall into the engine.

NOTE

For inspection of impluse coupling on aircraft serials 18051775 THRU 18052469 and 18500513 THRU 18502460, refer to Cessna Single-engine Service Letter SE74-21, dated September 27, 1974.

11-65. INTERNAL TIMING.

a. Whenever the gear on the rotor shaft or the cam (which also serves as the key for the gear) has been removed, be sure that the gear and cam are installed so the timing mark on the gear aligns with the "O" etched on the rotor shaft.

b. When replacing breaker assembly or adjusting contact breaker points, place a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. Adjusting contact breaker points so they are just starting to open in this position will give the correct point setting. Temporarily assemble the magneto halves and capacitor slip terminal and use a timing light to check that the timing marks, visible through the ventilation plug holes are approximately aligned.

NOTE

The side of the magneto with the manufacturer's insignia has a red timing mark and the side opposite to the insignia has a black timing mark viewed through the vent plug holes. The distributor gear also has a red timing mark and a black timing mark. These marks are used for reference only when installing magneto on the engine. Do not place red and black lines together on the same side.

c. Whenever the large distributor gear and rotor gear have been disengaged, they must be engaged with their timing marks aligned for correct rotation. Align the timing mark on the rotor gear with the "RH" on the distributor gear. Care must be taken to keep these two gears meshed in this position until the magneto halves are assembled.

11-66. INSTALLATION AND TIMING TO ENGINE. The magneto MUST be installed with its timing marks correctly aligned, with the number one cylinder on its compression stroke and with number one piston at its advanced firing position. Refer to paragraph 11-12 for the advanced firing position of number one piston.

WARNING

The magneto is grounded through the ignition switch, therefore, any time the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, remove the high tension wires from the magneto or disconnect all spark plug leads to prevent accidental firing of the engine.

To locate the compression stroke of number one cylinder, remove the lower spark plugs from each cylinder except number one cylinder. Remove the top plug from number one cylinder. Place thumb of one hand over the number one cylinder spark plug hole and rotate the crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is obtained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one cylinder may be obtained by use of a timing disc and pointer, Timrite, protractor and piston locating gage or external engine timing marks alignment.

NOTE

External engine timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the crankshaft is turned in its normal direction of rotation. After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushings into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with the chamfered edges facing toward the front of the engine.

a. Turn the magneto shaft until the timing marks visible through the ventilation plug holes are aligned (red-to-red or black-to-black) and insert a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. This locks the magneto approximately in the firing position while installing on the engine.

NOTE

If the magneto drive gear was disengaged during magneto removal, hold the magneto in the horizontal position it will occupy when installed, make certain that the drive gear coupling slot is aligned with the magneto coupling lugs. If it is not aligned, pull the magneto drive gear out of mesh with its drive gear and rotate it to the aligned angle, then push it back into mesh. DO NOT WITHDRAW THE MAGNETO DRIVE GEAR FROM ITS OIL SEAL.

b. After magneto gasket is in place, position the magneto on the engine and secure, then remove the timing pin from the magneto. Be sure to remove this pin before turning the propeller.
c. Connect a timing light to the capacitor terminal at the front of the magneto and to a good ground.
d. Turn propeller back a few degrees (opposite of normal rotation) to close the contact points.

NOTE

Do not turn the propeller back far enough to engage the impulse coupling or the propeller will have to be turned in normal direction of rotation until the impulse coupling releases, then backed up to slightly before the firing position.

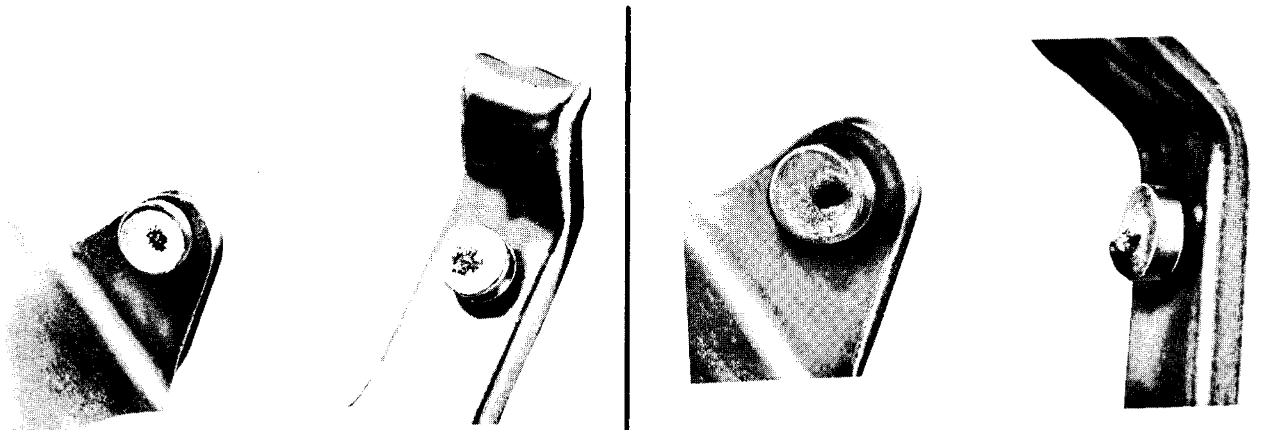
e. Slowly advance the propeller in the normal direction of rotation until the timing light indicates the contact points breaking. Magneto mounting clamps may be loosened so that the magneto may be shifted to break the points at the correct firing position.
f. Tighten magneto mounting nuts and recheck timing.
g. Repeat steps "a" through "f" for the other magneto.
h. After both magnetos have been timed, check synchronization of both magnetos. Magnetos must fire at the same time.
i. Remove timing devices from magneto and engine.
j. Connect spark plug leads to their correct magneto outlets.

NOTE

The No. 1 magneto outlet is the one closest to the ventilation plug on the side of the magneto having the manufacturer's insignia. The magneto fires at each successive outlet in clockwise direction. Connect No. 1 magneto outlet to No. 1 cylinder spark plug lead, No. 2 outlet to the next cylinder to fire, etc. Engine firing order is listed in paragraph 11-12.

k. Connect toggle switch (primary) lead to the capacitor terminal on the magneto.
l. Inspect magneto installation and install engine cowling in accordance with paragraph 11-3.

11-67. MAINTENANCE. At the first 25-hour inspection and at each 100-hour inspection thereafter, the breaker compartment should be inspected. Magneto-to-engine timing should be checked at the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour inspection. If timing is 22° (plus zero, minus 2°),



THESE CONTACT POINTS ARE USABLE | THESE CONTACT POINTS NEED REPLACEMENT

Figure 11-7. Magneto Contact Breaker Points

internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine. In the event the magneto internal timing marks are off more than plus or minus five degrees when the breaker points open to fire number one cylinder, remove the magneto and check the magneto internal timing. Whenever the magneto halves are separated the breaker point assembly should always be checked. As long as internal timing and magneto-to-engine timing are within the preceding tolerances, it is recommended that the magneto be checked internally only at 500 hour intervals. It is normal for contact points to burn and the cam to wear a comparable amount so the magneto will remain in time within itself. This is accomplished by having a good area making contact on the surface between the points and the correct amount of spring pressure on the cam. The area on the points should be twenty-five percent of the area making contact. The spring pressure at the cam should be 10.5 to 12.5 ounces. When the contact points burn, the area becomes irregular, which is not detrimental to the operation of the points unless metal transfer is too great which will cause the engine to misfire. Figure 11-7 illustrates good and bad contact points. A small dent will appear on the nylon insulator between the cam follower and the breaker bar. This is normal and does not require replacement.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble definitely is associated with a magneto, use the following to help disclose the source of trouble without overhauling the magneto.

a. Moisture Check.

1. Remove magneto from engine and remove screws securing the magneto halves together, disconnect capacitor slip terminal and remove distributor. Inspect for moisture.

2. Check distributor gear finger and carbon brush for moisture.

3. Check breaker point assembly for moisture, especially on the surfaces of the breaker points.

4. If any moisture is evident in the preceding places, wipe with a soft, dry, clean, lint-free cloth.

b. Breaker Compartment Check.

1. Check all parts of the breaker point assembly for security.

2. Check breaker point surfaces for evidence of excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard-finish paper. If breaker point assembly is defective, install a new assembly. Make no attempt to stone or dress the breaker points. Clean new breaker points with clean, unleaded gasoline and hard-finish paper before installing.

3. Check capacitor mounting bracket for cracks or looseness.

4. Check the carbon brush on the distributor gear for excessive wear. The brush must extend a minimum of 1/32 inch beyond the end of the gear shaft. The spring which the carbon brush contacts should be bent out approximately 20 degrees from vertical, since spring pressure on the brush holds the distributor gear shaft against the thrust bearing in the distributor cap.

5. Oil the bearings at each end of the distributor gear shaft with a drop of SAE 20 oil. Wipe excess oil from parts.

6. Make sure internal timing is correct and reassemble magneto. Install and properly time magneto to engine.

11-68. MAGNETO CHECK. Advanced timing settings in some cases, is the result of the erroneous practice of bumping magnetos up in timing in order to reduce RPM drop on single ignition. NEVER ADVANCE TIMING BEYOND SPECIFICATIONS IN ORDER TO REDUCE RPM DROP. Too much importance is being attached to RPM drop on single ignition. RPM drop on single ignition is a natural characteristic of dual ignition design. The purpose of the following magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, etc. In fact, absence of RPM drop should be cause for suspicion that the magneto timing has been bumped up and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

a. Start and run engine until the oil and cylinder head temperature is in the normal operating range.

b. Place the propeller control in the full low pitch (high rpm) position.

c. Advance engine speed to 1700 rpm.

d. Turn the ignition switch to the "R" position and note the rpm drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

e. Turn the switch to the "L" position and note the rpm drop, then return the switch to the "BOTH" position.

f. The rpm drop should not exceed 150 rpm on either magneto or show greater than 50 rpm differential between magnetos. A smooth rpm drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp rpm drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, rpm checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of rpm drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

11-69. SPARK PLUGS. Two spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug service life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

At each 100-hour inspection, remove, clean, inspect and regap all spark plugs. Install lower spark plugs in upper portion of cylinders and install upper spark plugs in lower portion of cylinders. Since deterioration of lower spark plugs is usually more rapid than that of the upper spark plugs, rotating helps prolong spark plug life.

11-70. ENGINE CONTROLS.

11-71. DESCRIPTION. The throttle, mixture, propeller and carburetor heat controls are of the push-pull type. The propeller and mixture controls are equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller and mixture controls also have a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. The carburetor heat control has no locking device.

NOTE

Some controls have intricate parts that will fall out and possibly be lost if the control is pulled from the housing while it is disconnected.

11-72. RIGGING. When adjusting any engine control, it is important to check that the control slides smoothly throughout its full travel, that it locks securely if equipped with a locking device and the arm or lever which it operates moves through its full arc of travel.

CAUTION

Some engine controls have a small retaining ring brazed (or attached with epoxy resin) near the threaded end (engine end) of the control. The purpose of these retaining rings is to prevent inadvertent withdrawal of and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

- Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

11-73. THROTTLE CONTROL.

NOTE

Before rigging throttle control shown in figure 11-8, check that staked connection (4) between rigid conduit (2) and flexible conduit (3) is secure. If any indication of looseness or breakage is apparent, replace the throttle control before continuing with the rigging procedure.

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

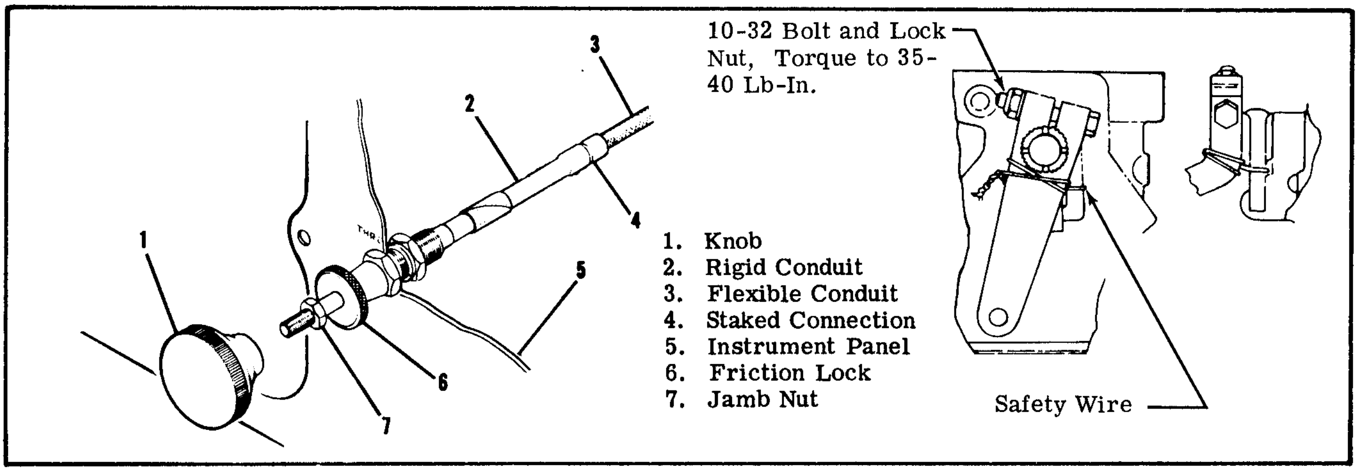


Figure 11-8. Throttle Control and Throttle Arm to Idle Stop Attachment

will prevent bottoming and possible damage to the staked connection.

c. Disconnect throttle control at the carburetor throttle arm, push throttle control in until jam nut hits friction lock (6) while the friction lock is loose, then pull control out approximately 1/8 inch for cushion. Note position of large washer at carburetor end of control. Install washer in same position when connecting control to arm.

d. Tighten friction lock (6), being careful not to change position of the throttle.

e. Move throttle arm on carburetor to full open, adjust rod end at end of throttle control to fit and connect to arm on carburetor.

f. Release friction lock and check full travel of arm on carburetor. If further adjustment is required, make all adjustment at the carburetor end of control. DO NOT change jam nut (7) setting.

g. Tighten rod end locknuts at carburetor end of control. Be sure to maintain sufficient thread engagement between rod end and control.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the throttle control.

11-74. MIXTURE CONTROL.

a. Push mixture control full in, then pull it out approximately 1/8 inch for cushion.

b. Loosen clamp securing the control to the engine.

c. Shift control housing in the clamp so that the mixture arm on the carburetor is in the full open position (RICH). Tighten the clamp in this position.

d. Unlock and pull mixture control full out. Check that idle mixture arm on carburetor is full closed (IDLE CUT-OFF).

e. Check that the bolt and nut at the mixture arm on carburetor secures the control wire and that the bolt will swivel in the arm.

f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.

g. When installing a new control, it may be necessary to shorten the wire and/or control housing.

h. The mixture arm on the carburetor must contact the stops in each direction, and the control should have approximately 1/8 inch cushion when pushed in.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.

11-75. CARBURETOR HEAT CONTROL.

a. Loosen clamp securing the control to the bracket on the airbox.

b. Push control full in, then pull it out approximately 1/8 inch from panel for cushion.

c. Shift control housing in its clamp so that the valve in the airbox is seated in the full open position. Tighten clamp in this position.

d. Pull out on the control and check that the air valve inside the airbox seats in the opposite direction.

e. Check that bolt and nut on the air valve lever secures the control wire and that the bolt will swivel in the lever.

f. Bend the wire tip 90 degrees to prevent it from being withdrawn if the attaching nut should become loose.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the carburetor heat control.

11-76. PROPELLER CONTROL. Refer to Section 13.

11-77. STARTING SYSTEM.

11-78. DESCRIPTION. The automatically-engaged starting system employs an electrical starter motor mounted to a 90-degree adapter. A solenoid is activated by the ignition switch on the instrument panel When the solenoid is activated, its contacts close and electrical current energizes the motor. Initial rotation of the motor engages the starter through an overrunning clutch in the starter adapter, which incorporates worm reduction gears. The starter motor is located just aft of the right rear cylinder.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

11-79. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity. Install new switch or wires.
	Defective starter motor.	Check electrical power to motor. Repair or replace starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective overrunning clutch or drive.	Check visually. Install new starter adapter.
	Starter motor shaft broken.	Check visually. Install new starter motor.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Check visually. Install new cable.
	Loose or dirty connections.	Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Check visually. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion.	Remove and inspect. Replace starter drive.
	Worn or broken teeth on crankshaft gears.	Check visually. Replace crankshaft gear.

11-80. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new brushes). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding operations.

11-81. STARTER MOTOR.

11-82. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 11-3.

CAUTION

When disconnecting starter electrical cable, do not permit terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

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

c. Disconnect electrical cable at starter motor.

d. Remove nuts and washers securing motor to starter adapter and remove motor. Refer to engine manufacturer's overhaul manual for adapter removal.

e. Reverse the preceding steps for reinstallation. Install a new O-ring seal on motor, then install motor. Be sure motor drive engages with the adapter drive when installing.

11-83. EXHAUST SYSTEM.

11-84. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, for the left and right bank of cylinders. Each cylinder has a riser pipe attached to the exhaust port. The three risers at each bank of cylinders are joined together into a collector pipe forming an exhaust stack assembly. The center riser on each bank is detachable, but the front and aft risers are welded to the collector pipe. Each exhaust stack assembly connects to the muffler beneath the engine. The muffler is enclosed in a shroud which captures exhaust heat which is used to heat the cabin. The tailpipe is welded to the muffler. A shroud is attached to the left exhaust stack to provide heated air for the carburetor heat source.

11-85. REMOVAL AND INSTALLATION. (Refer to figure 11-9.)

a. Remove engine cowling in accordance with paragraph 11-3.

b. Disconnect ducts from heater shroud on muffler assembly.

c. Disconnect duct from shroud on left exhaust stack assembly.

d. Remove nuts, bolts and clamps attaching stack assemblies to the muffler.

e. Loosen nuts attaching exhaust stacks to the cylinders and remove muffler assembly.

f. Remove nuts attaching exhaust stack assemblies to the cylinders and remove exhaust stacks and gaskets.

g. Reverse the preceding steps for reinstallation. Install a new copper-asbestos gasket between each riser and its mounting pad on each cylinder, regardless of apparent condition of those removed. Torque exhaust stack nuts at cylinders to 100-110 pound-inches.

11-86. INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 100 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of engine power. To inspect the engine exhaust system, proceed as follows:

a. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visible; in accordance with paragraph 11-3.

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits to surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

b. After visual inspection, an air leak check should be made on the exhaust system as follows:

1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

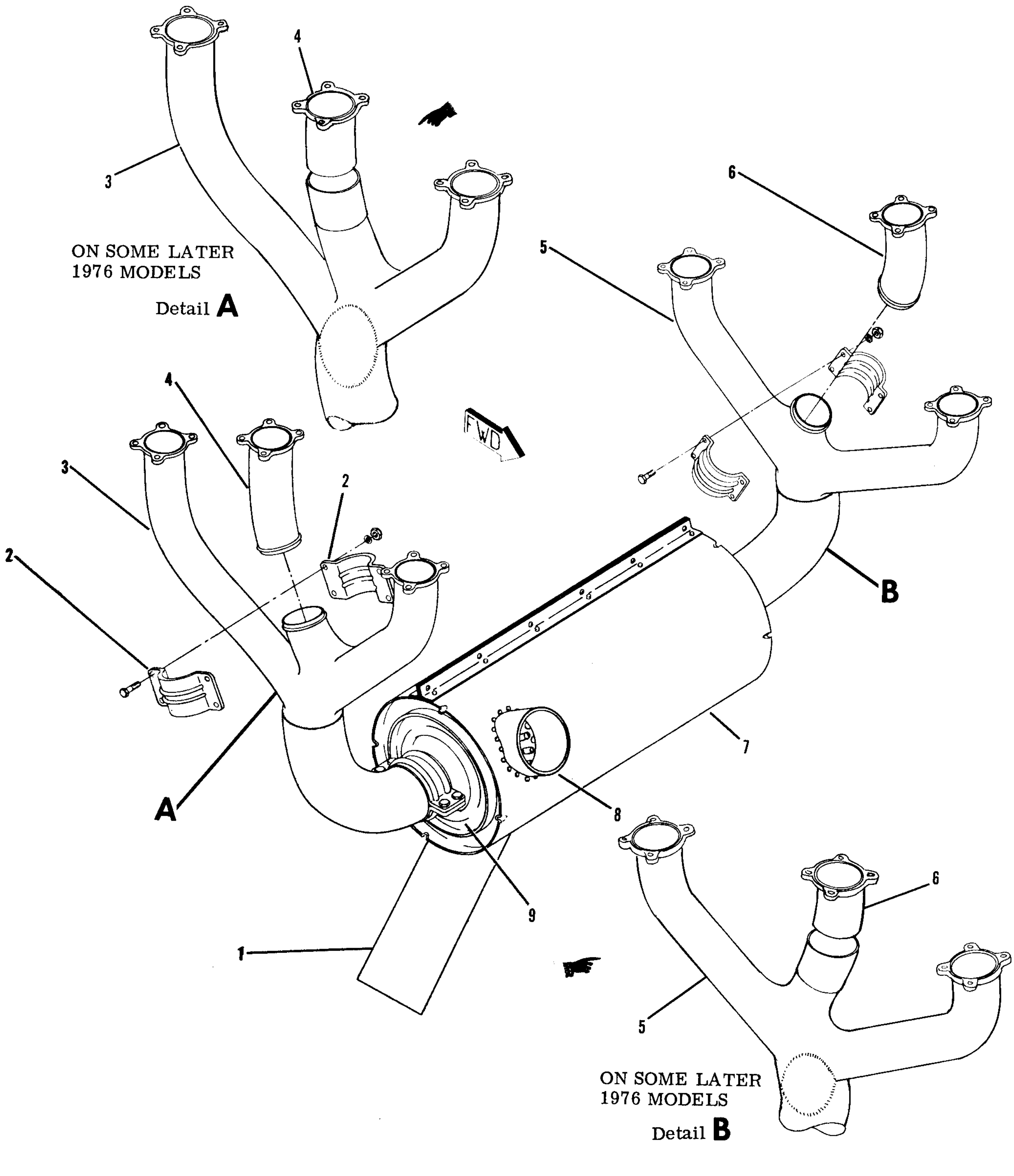
NOTE

The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually be feel, or by using a soap and water solution and watching for bubbles. All joints should be free of air leaks.

c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.

1. Remove exhaust stacks and muffler in accordance with paragraph 11-85.



1. Tailpipe
2. Clamp Half
3. Right Stack
4. Right Riser
5. Left Stack
6. Left Riser
7. Shroud
8. Cabin Heat Inlet
9. Muffler

Figure 11-9. Exhaust System

2. Remove shrouds.
3. Use rubber expansion plugs to seal opening.
4. Using a manometer or gage, apply approximately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.
5. It is recommended that exhaust stacks found defective be replaced before the next flight.

d. After installation of exhaust system components perform the inspection in step "b" of this paragraph to ascertain there are no leaks at the joints of the system.

11-87. EXTREME WEATHER MAINTENANCE.

11-88. COLD WEATHER. Cold weather starting will be made easier by the installation of an oil dilution system, an engine primer system and a ground service receptacle. The primer system is manually-operated from the cabin. Fuel is supplied by a line from the fuel strainer to the plunger. Operating the primer forces fuel to the engine. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 11-92 for use of the external power receptacle.

The following may also be used to assist engine starting in extreme cold weather. After the last flight of the day, drain the engine oil into a clean container so the oil can be preheated. Cover the engine to prevent ice or snow from collecting inside the cowling. When preparing the aircraft for flight or engine runup after these conditions have been followed, preheat the drained engine oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the engine oil, gasoline may be mixed with the heated oil in a ratio of 1 part gasoline to 12 parts engine oil before pouring into the engine oil sump. If the free air temperature is below minus 29°C (-20°F), the engine compartment should be preheated by a ground heater. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull propeller through several revolutions by hand before attempting to start the engine.

CAUTION

Due to the desludging effect of the diluted oil, engine operation should be observed closely during the initial warm-up of the engine. Engines that have considerable amount of operational hours accumulated since their last dilution period may be seriously affected by the dilution process. This will be caused by the diluted oil dislodging sludge and carbon deposits within the engine. This residue will collect in the oil sump and possibly clog the screened inlet to the oil sump. Small deposits may actually enter the oil sump and be trapped by the main oil filter screen. Partial or complete loss of engine lubrication may result from either condition. If these conditions are anticipated after oil dilution, the engine should be run for several minutes at normal operating temperatures and then stopped and inspected for evidence of sludge and carbon deposits in the oil sump and oil filter screen. Future occurrence of this condition can be prevented by diluting the oil prior to each engine oil change. This will also prevent the accumulation of the sludge and carbon deposits.

11-89. HOT WEATHER. Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhaust are caused by over-priming or flooding. This situation is more apt to develop in hot weather or when the engine is hot. If it occurs, repeat the starting routine with the throttle approximately one-half OPEN and the mixture control in IDLE CUT-OFF. As the engine fires, move the mixture control to full RICH and decrease the throttle to desired idling speed.

Engine mis-starts characterized by sufficient power to disengage the starter but dying after 3 to 5 revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting routine with additional priming.

CAUTION

Never operate the starting motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods will shorten the life of the starter motor.

11-90. SEACOAST AND HUMID AREAS. In salt water areas special care should be taken to keep the engine, accessories and airframe clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

11-91. DUSTY AREAS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating in high dust conditions, service the induction air filter daily as outlined in Section 2. Also change engine oil and lubricate airframe items more often than specified.

11-92. GROUND SERVICE RECEPTACLE. With the ground service receptacle installed, the use of an external power source is recommended for cold weather starting, low battery starting and lengthy maintenance of the aircraft electrical system. Refer to Section 16 for additional information.

11-93. HAND-CRANKING. A normal hand-cranking procedure may be used to start the engine.

SECTION 11A
ENGINE
(SKYWAGON-185)

TABLE OF CONTENTS

SHOP NOTES:

11A-1. ENGINE COWLING. Refer to paragraph 11-1.

11A-2. DESCRIPTION. Refer to paragraph 11-2.

11A-3. REMOVAL AND INSTALLATION.

a. Disconnect cowl flap control clevises at cowl flaps.

b. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the upper and lower segments.

c. Release the quick-release fasteners on the left aft access door.

d. (BEGINNING WITH AIRCRAFT SERIAL 18502091.) Disconnect the landing and taxi light wires at quick-disconnects.

e. (THRU AIRCRAFT SERIAL 18502007.) Disconnect air induction duct on lower cowl segment at airbox and remove cowling.

f. (BEGINNING WITH AIRCRAFT SERIAL 18502008.) Loosen clamp securing air induction duct to adapter on lower cowl segment and remove cowling.

g. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct airflow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards.

11A-4. CLEANING AND INSPECTION. Refer to paragraph 11-4.

11A-5. REPAIR. Refer to paragraph 11-5.

11A-6. COWL FLAPS. Refer to paragraph 11-6.

11A-7. DESCRIPTION. Refer to paragraph 11-7.

11A-8. REMOVAL AND INSTALLATION. Refer to paragraph 11-8.

11A-9. RIGGING. Refer to paragraph 11-9.

11A-10. ENGINE.

11A-11. DESCRIPTION. The fuel-injected engine is an air-cooled, horizontally-opposed, direct-drive, six-cylinder Continental IO-520 series engine driving a constant-speed, all-metal propeller. The cylinders, numbered from rear to front, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as numbers 2, 4 and 6. For repair and overhaul of the engine, accessories and propeller, refer to the applicable publication issued by the manufacturer of these items. These publications are available from the Cessna Service Parts Center.

11A-12. ENGINE DATA.

Aircraft Series	Skywagon-185
Model (Continental)	IO-520-D
BHP Maximum for Take-Off	300
(5 Minutes) at RPM	2850
BHP Maximum Except Take-Off	285
RPM (Max. Continuous)	2700
Number of Cylinders	6-Horizontally-Opposed
Displacement	520 Cubic Inches
Bore	5.25 Inches
Stroke	4.00 Inches
Compression Ratio	8.5:1
Magnetos	Slick No. 662
Right Magneto	Fires 22° BTC, Lower Left, Upper Right
Left Magneto	Fires 22° BTC, Upper Left, Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18 MM (Refer to current Continental active factory approved spark plug chart.)
Torque	330 ± 30 LB-IN.
Fuel Metering System	Continental Fuel Injection
Unmetered Fuel Pressure	9.0 to 11.0 PSI at 600 RPM 31.0 to 33.0 PSI at 2850 RPM
Tachometer	Mechanical Drive
Oil Sump Capacity	12 U. S. Quarts
With External Filter	13 U. S. Quarts
Oil Pressure (PSI)	
Normal	30 - 60
Minimum Idling	10
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cyl.
Oil Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (225°F.)
Probe Location	Below Oil Cooler
Cylinder Head Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (460°F.)
Probe Location	Lower side of Number 1 Cylinder
Direction of Crankshaft Rotation (Viewed from Rear)	Clockwise
Dry Weight-With Accessories	474 LB (Weight is approximate and will vary with optional accessories installed.)

11A-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Improper use of starting procedure.	Review starting procedure. Refer to Owner's Manual.
	Defective aircraft fuel system.	Refer to Section 12.
	Spark plugs fouled.	Remove and clean. Check gaps and insulators. Use new gaskets. Check cables to persistently fouled plugs.
	Defective magneto switch or grounded magneto leads.	Check continuity, repair or replace switch or leads.
	Defective ignition system.	Refer to paragraph 11-67.
	Excessive induction air leaks.	Check visually. Correct cause of air leaks.
	Dirty screen in fuel control unit or defective fuel control unit.	Check screen visually. Check fuel flow through control unit. Replace defective fuel control unit.
	Defective electric fuel pump.	Refer to Section 12.
	Defective fuel manifold valve or dirty screen.	Check fuel flow through valve. Remove and clean. Replace if defective.
	Clogged fuel injection lines or discharge nozzles.	Check fuel through lines and nozzles. Clean lines and nozzles. Replace if defective.
	Fuel pump not permitting fuel from auxiliary pump to bypass.	Check fuel flow through engine-driven fuel pump. Replace engine-driven pump.
	Vaporized fuel in system.	Refer to paragraph 11A-106.
	Fuel tanks empty.	Visually inspect tanks. Fill with proper grade and quantity of gasoline.
	Fuel contamination or water in fuel system.	Open fuel strainer drain and check for water. Drain all fuel and flush out fuel system. Clean all screens, fuel lines, strainer, etc.
	Mixture control in the IDLE CUT-OFF position.	Move control to the full RICH position.
	Engine flooded.	Refer to paragraph 11A-106.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE.	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 11A-52.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines and strainer.
	Defective ignition system.	Refer to paragraph 11-67.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 11A-106.
	Induction air leaks.	Check visually. Correct the cause of leaks.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Dirty screen in fuel control unit or defective fuel control unit,	Check screen visually. Check fuel flow through control unit. Clecn screen. Replace fuel control unit if defective.
	Defective manifold valve or clogged screen.	Check fuel flow through valve. Replace if defective. Clean screen.
	Defective engine-driven fuel pump.	If engine continues to run with electric pump turned on, but stops when it is turned off, the engine-driven pump is defective. Replace pump.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Propeller control set in high pitch position (low rpm).	Use low pitch (high rpm) position for all ground operation.
	Defective aircraft fuel system.	Refer to Section 12.
	Restricted fuel injection lines or discharge nozzles.	Check fuel flow through lines and nozzles. Clean lines and nozzles. Replace if defective.
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER.	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) for all ground operations.
	Restriction in aircraft fuel system.	Refer to Section 12.
	Restriction in fuel injection system.	Clean system. Replace any defective units.

11A-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER. (Cont.)	Engine-driven fuel pump pressure improperly adjusted.	Refer to paragraph 11A-67.
	Worn or improperly rigged throttle or mixture control.	Check visually. Rig properly. Replace worn linkage.
	Spark plugs fouled or improperly gapped.	Clean and regap. Replace if defective.
	Defective ignition system.	Refer to paragraph 11-67.
	Defective engine.	Check compression. Listen for unusual noises. Engine repair is required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Rig properly. Replace worn linkage. Refer to paragraph 11A-92.
	Defective or dirty manifold valve.	Operate electric fuel pump and check that no fuel flows through manifold valve with mixture control in IDLE CUT-OFF. Remove and clean. Replace if defective.
	Fuel leakage through primer.	Repair or replace primer.
	Auxiliary fuel pump ON.	Turn to OFF position.
	Defective fuel control unit.	If none of the preceding causes corrects the problem, the control unit is probably at fault. Replace control unit.

11A-13A. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static RPM run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. It should be within 50 RPM of 2790 RPM.

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be preformed to determine a possible deficiency.

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

NOTE

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

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

3. Check magneto timing, spark plugs and ignition harness for settings and conditions.

4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.

5. Check condition of induction air filter. Clean if required.

6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

11A-14. REMOVAL. If the 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 routing and location of wires, cables, lines, hoses and controls will vary between models and optional equipment installed, however, the following general procedure may be followed.

NOTE

Identify each item as it is disconnected to aid in replacement. Plug or cap all disconnected lines, hoses and fittings to prevent entry of foreign material.

a. Place all cabin switches and fuel shut-off valve in the OFF position.
b. Remove engine cowling in accordance with paragraph 11A-3.
c. Open battery circuit by disconnecting battery cables. Insulate cable terminals as a safety precaution.
d. Drain fuel strainer and lines with strainer drain control.

NOTE

The engine may be removed from the aircraft with or without the engine mount attached. The reason for the engine removal should be the governing factor as to the manner it is to be removed and at which point the controls should be disconnected.

e. Drain the engine oil sump and oil cooler.
f. Remove spinner and propeller in accordance with Section 13. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
g. Disconnect hot and cold air flexible hoses and remove.
h. Remove muffler and exhaust stacks in accordance with paragraph 11-85, if engine is to be removed from engine mount.

NOTE

During the following steps remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine mount or attached brackets. Omit any of the following items which are not present on a particular engine installation.

i. (THRU AIRCRAFT SERIAL 18502007.) Disconnect throttle and mixture control at airbox bellcranks. Note EXACT position, size and number of attaching washers.
j. (BEGINNING WITH AIRCRAFT SERIAL 185-02008.) Disconnect engine controls at throttle and mixture control arms. Note EXACT position, size and number of attaching washers.
k. Pull throttle and mixture controls free of engine and engine mount, using care not to damage them by bending too sharply.
l. Disconnect propeller control at governor. Pull control aft clear of engine.
m. Disconnect wires and cables as follows:
1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

2. Disconnect starter electrical cable at starter.
3. Disconnect cylinder head temperature wire at probe.
4. Disconnect electrical wires and wire shielding ground at alternator.
5. Disconnect exhaust gas temperature wires at quick-disconnects.
6. 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.

7. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.

n. Disconnect lines and hoses as follows:
1. Disconnect vacuum hose at vacuum pump.
2. Disconnect oil breather and vacuum system oil separator vent lines where secured to the engine.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

3. Disconnect oil temperature bulb below cooler.
4. Disconnect primer line at firewall fitting.
5. Disconnect fuel supply hose at fuel strainer.
6. Disconnect oil pressure line at firewall fitting.
7. Disconnect manifold pressure line at firewall.
8. Disconnect vapor return hose at firewall.
9. Disconnect fuel pressure hose at firewall.

o. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.

p. Attach a hoist to the lifting lug on top of the engine and take up engine weight on hoist.

q. Carefully check the engine again to ensure all hoses, lines, wires, cables and clamps are disconnected or removed which would interfere with the engine removal.

r. If the engine is to be removed from the engine mount, remove induction airbox, remove bolts attaching engine to mount, slowly hoist engine and pull it forward balancing the engine by hand and carefully guide the disconnected components out from the engine assembly, then remove the shock-mount assemblies and bonding straps.

11A-15. CLEANING. Refer to paragraph 11-15.

11A-16. ACCESSORIES REMOVAL. Refer to paragraph 11-16.

11A-17. INSPECTION. Refer to paragraph 11-17.

11A-18. BUILD-UP. Refer to paragraph 11-18.

11A-19. INSTALLATION. Before installing the engine on the aircraft, install any items that were removed after the engine was removed from the aircraft or airframe.

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. If engine was removed from engine-mount, hoist engine assembly to a point near the mount, route controls, lines and hoses in place as the engine is positioned near the mount. Install shock-mounts and bonding straps as illustrated in figure 11A-1. Install engine-mount bolts and torque bolts to the torque values shown in figure 11A-1.

b. If engine was removed with engine-mount attached, hoist engine assembly to a point near the firewall, route controls, lines and hoses in place as the engine is positioned near the firewall. Install mount bolts and associated hardware as illustrated in figure 11A-1 and torque bolts to torque values shown in figure 11A-1.

c. Remove hoist.

d. (THRU AIRCRAFT SERIAL 18502007.) Route throttle and mixture controls to airbox bellcranks and secure controls in position with clamps. Rig in accordance with paragraphs 11A-91 and 11A-92 respectively.

e. (BEGINNING WITH AIRCRAFT SERIAL 185-02008.) Route controls to throttle and mixture arms, secure controls to position bracket and safety wire controls in position. Rig in accordance with paragraphs 11A-91 and 11A-92 respectively.

f. (THRU AIRCRAFT SERIAL 18502007.) If engine was removed from engine mount, install induction airbox in accordance with paragraph 11A-71.

g. (BEGINNING WITH AIRCRAFT SERIAL 185-02008.) If engine was removed from engine mount, install induction air flexible duct to throttle body and secure duct with clamp.

h. Route propeller governor control to governor and secure control in position with clamps. Rig in accordance with Section 13.

NOTE

Throughout the aircraft fuel system, from the fuel cells to the engine-driven fuel pump, use NS-40 (RAS-4) (Snap-On-Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread 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.

i. Connect lines and hoses as follows:

1. Connect oil temperature bulb below oil cooler.
2. Connect oil pressure hose at firewall.
3. Connect primer line at firewall.
4. Connect fuel hose at fuel strainer.
5. Connect manifold pressure line at firewall.
6. Connect fuel pressure hose at firewall.
7. Connect fuel vapor return hose at firewall.
8. Connect vacuum hose at vacuum pump.
9. Connect oil breather and vacuum system oil separator vent lines where secured to the engine.
10. Install all clamps attaching hoses to engine, engine mount or brackets.

j. Connect wires and cables as follows:

1. Connect cylinder head temperature wire to probe at lower side of cylinder.
2. Connect electrical wires and wire shielding ground at alternator.
3. Connect tachometer drive shaft at adapter on engine. Tighten drive shaft attaching nut to 100 lb-in.

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.

4. Connect starter electrical cable at starter.
5. Install all clamps attaching wires and cables to engine, engine-mount or brackets.

k. Install exhaust stacks, muffler and shrouds in accordance with paragraph 11-85.

l. Install hot and cold air flexible hoses.

m. Install propeller and spinner in accordance with instructions outlined in Section 13.

n. Make a magneto switch ground-out and continuity check and connect magneto switch wires.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

o. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.

p. Make sure all switches are in the OFF position and connect battery cables.

q. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.

r. Install engine cowling in accordance with paragraph 11A-3.

s. Clean and install air filter.

t. Perform an engine run-up and make final adjustments on engine controls.

11A-20. PIVOTING ENGINE FOR MAINTENANCE. Access to the engine components and accessories on the back of the engine may be gained by swinging the engine forward and downward, pivoting about the lower engine mount bolts at the lugs protruding through the firewall. Attach a suitable hoist to the hoisting lug on top of the engine and take-up engine weight with the hoist.

NOTE

The working space needed will determine just how many items will have to be disconnected before the engine can be pivoted away from the firewall. A very small space may require that only a few items be disconnected or unclamped. A larger working space will require most of the items listed in paragraph 11A-14 to be disconnected. Always be sure that lines, hoses, electrical wires and controls are not stretched or broken. Cap or plug all disconnected lines, hoses and fittings.

After disconnecting and/or unclamping items to permit swinging the engine down as much as needed, remove the bolts from the engine mount upper attachment points and loosen the pivot bolts at the bottom of the engine mount. Slowly lower the hoist, watching for any additional items that may need to be disconnected or unfastened. The induction airbox will have to be removed for maximum access on aircraft prior to serial number 18502008.

11A-21. FLEXIBLE FLUID HOSES.

11A-22. 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. Operate the auxiliary fuel pump in the high position.
3. Examine the exterior of hoses for evidence of leakage or wetness.
4. Hoses found leaking should be replaced.
5. After pressure testing fuel hoses, allow sufficient time for excess fuel to drain overboard from the engine manifold before attempting an engine start.
6. Refer to paragraph 11-17 for detailed inspection procedures for flexible hoses.

11A-23. REPLACEMENT. Refer to paragraph 11-22.

11A-24. ENGINE BAFFLES. Refer to paragraph 11-23.

11A-25. DESCRIPTION. Refer to paragraph 11-24.

11A-26. CLEANING AND INSPECTION. Refer to paragraph 11-25.

11A-27. REMOVAL AND INSTALLATION. Refer to paragraph 11-26.

11A-28. REPAIR. Refer to paragraph 11-27.

11A-29. ENGINE MOUNT. Refer to paragraph 11-27.

11A-30. DESCRIPTION. The engine mount is comprised of sections of tubing welded together and reinforced with welded gussets. The purpose of the mount is to support the engine and attach it to the airframe. Each engine mount pad has a small hole for a locating pin which serves as a locating dowel for the engine shock-mounts.

11A-31. REMOVAL AND INSTALLATION.

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

b. Remove bolts from upper and lower mount-to-fuselage structure and carefully remove engine mount.

c. Reverse the preceding steps for reinstallation. Torque bolts to 160-190 lb-in. Reinstall engine in accordance with paragraph 11A-19.

11A-32. REPAIR. Refer to paragraph 11-31.

11A-33. ENGINE SHOCK-MOUNT PADS. (Refer to figure 11A-1.) The bonded rubber and metal shock-mounts are designed to reduce transmission of engine vibrations to the airframe. The rubber pads should be wiped clean with a clean dry cloth.

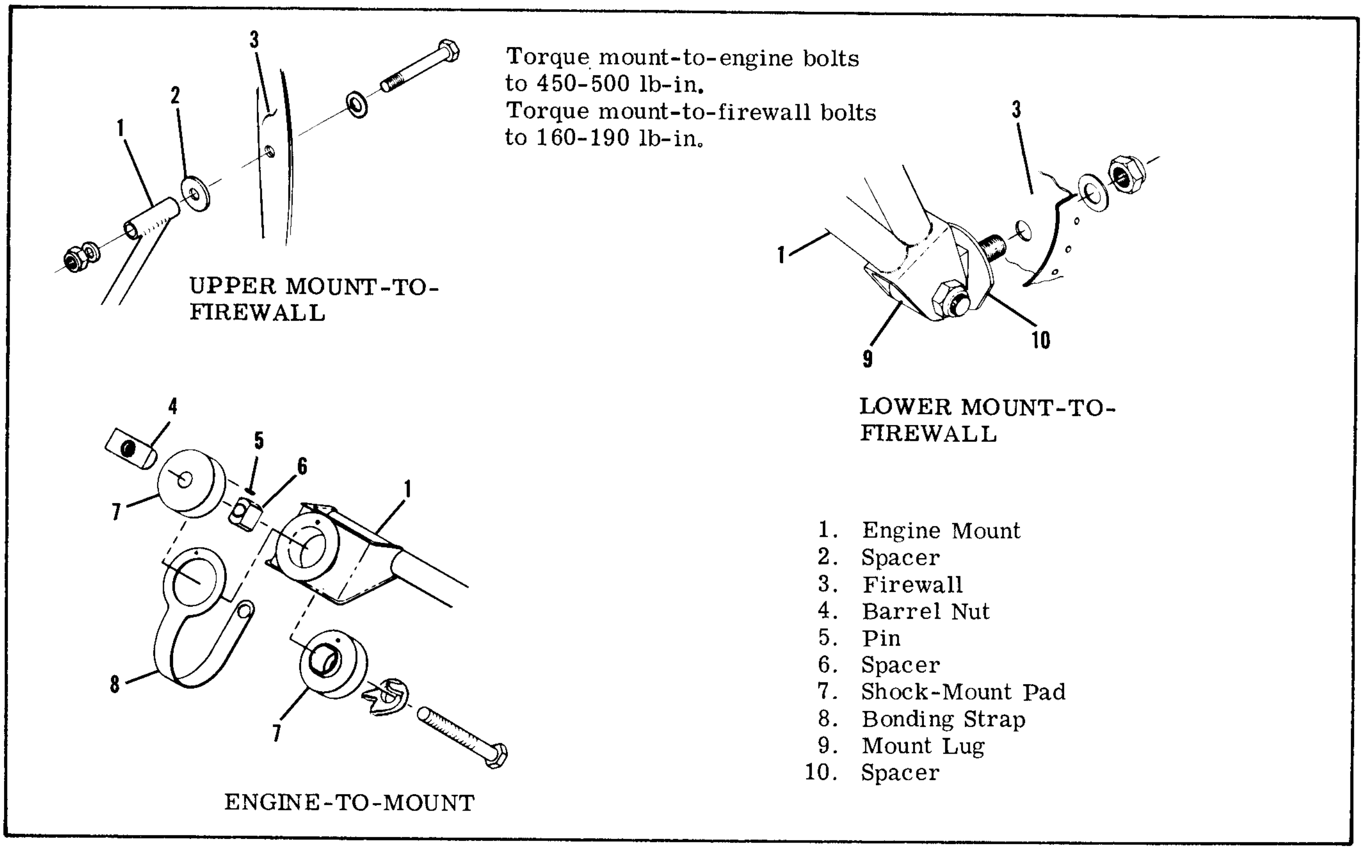


Figure 11A-1. Engine Mount Details

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.

11A-34. ENGINE OIL SYSTEM. Refer to paragraph 11-33.

11A-35. DESCRIPTION. Refer to paragraph 11-34.

11A-36. TROUBLE SHOOTING. Refer to paragraph 11-35.

11A-37. FULL-FLOW OIL FILTER. Refer to paragraph 11-36.

11A-38. DESCRIPTION. Refer to paragraph 11-37.

11A-39. REMOVAL AND INSTALLATION. Refer to paragraph 11-38.

11A-40. FILTER ADAPTER. Refer to paragraph 11-39.

11A-41. REMOVAL. Refer to paragraph 11-40.

11A-42. DISASSEMBLY, INSPECTION AND REASSEMBLY. Refer to paragraph 11-41.

11A-43. INSTALLATION. Refer to paragraph 11-42.

11A-44. OIL COOLER. Refer to paragraph 11-43.

11A-45. DESCRIPTION. Refer to paragraph 11-44.

11A-46. ENGINE FUEL SYSTEM.

11A-47. DESCRIPTION. The fuel injection system is a low pressure system of injecting fuel into the intake valve port of each cylinder. It is a multi-nozzle, continuous-flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a fuel flow indicator are provided for leaning at any combination of altitude and power setting. The fuel flow indicator is calibrated in gallons per hour and indicates approximately the gallons of fuel consumed per hour. The continuous-flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine-driven fuel pump.

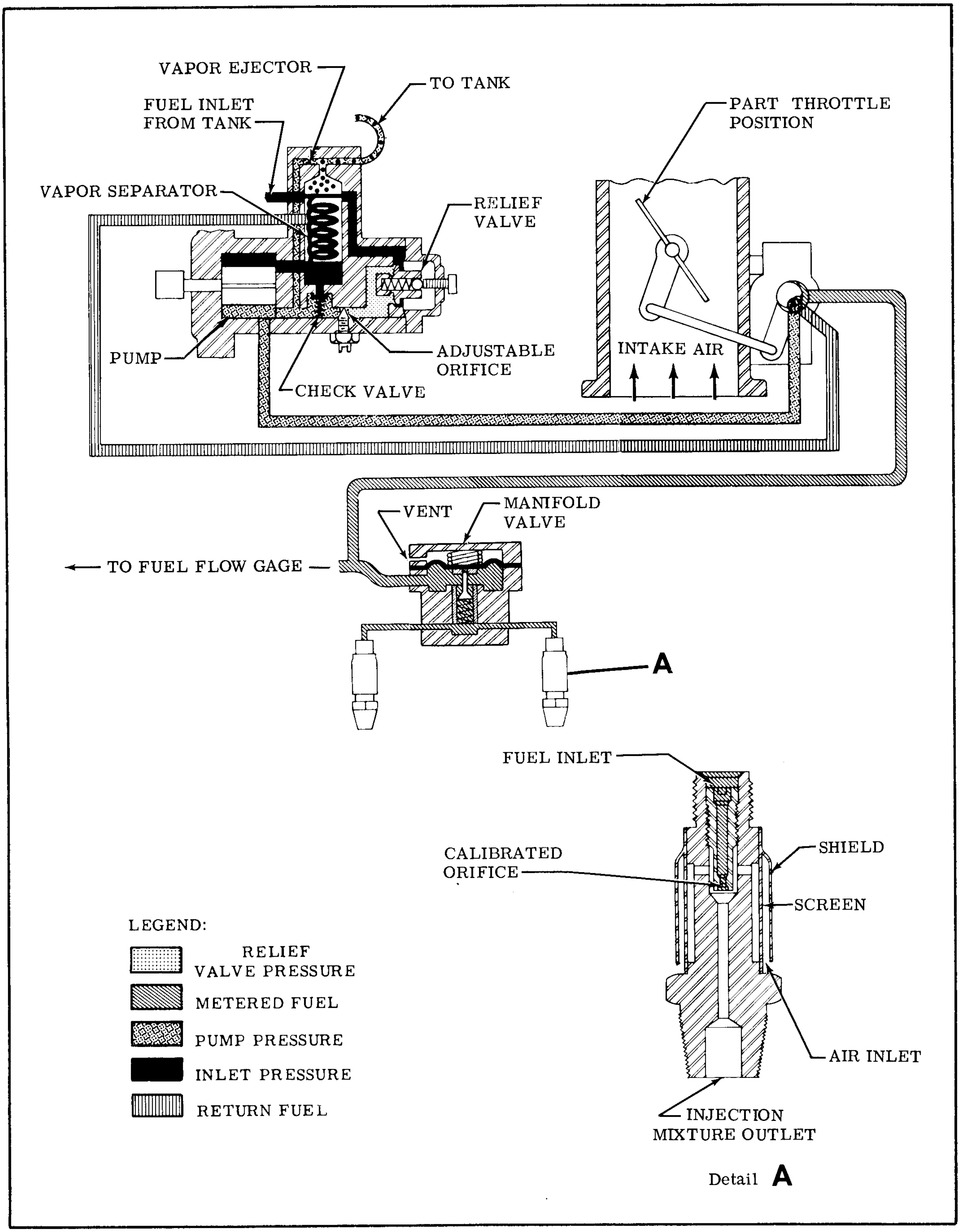


Figure 11A-2. Fuel Injection Schematic

NOTE

Throughout the aircraft fuel system, from the fuel cells to the engine-driven fuel pump, 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. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel soluble lubricant, such as engine lubricating oil, on the fitting threads. Do not use any other form of thread compound on the injection system fittings.

11A-48. FUEL-AIR CONTROL UNIT.

11A-49. DESCRIPTION. This unit occupies the position ordinarily used for a carburetor, at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control elements in this unit, one for air and two for fuel. One of the fuel control elements is for fuel mixture and the other is for fuel metering. Fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls this fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions airflow to fuel flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. The fuel control portion of the fuel-air control unit is enclosed in a shroud and is blast-air cooled to help prevent vapor lock.

11A-50. REMOVAL AND INSTALLATION.

a. Place all cockpit switches and fuel shut-off valve in the OFF position.
b. Remove cowling in accordance with paragraph 11A-3.
c. (THRU AIRCRAFT SERIAL 18502007.) Remove induction airbox in accordance with paragraph 11A-71.
d. (BEGINNING WITH AIRCRAFT SERIAL 185-02008.) Disconnect engine controls at throttle and mixture control arms.

NOTE

Cap all disconnected hoses, lines and fittings.

e. The three fuel lines which attach to the fuel control unit are routed inside flexible tubing to help cool the fuel. Loosen tubing clamps at the control unit and slide tubing back to gain access to the fuel line fittings.
f. Disconnect fuel lines at control unit.
g. Loosen hose clamps which secure the control unit to the right and left intake manifolds.
h. Remove control unit.
i. Cover the open ends of the intake manifold piping to prevent entry of foreign matter.
j. Reverse the preceding steps for reinstallation. Use new gaskets when installing control unit. Rig throttle and mixture controls in accordance with paragraphs 11A-91 and 11A-92 respectively. Rig throttle-operated microswitch in accordance with Section 12.

11A-51. CLEANING AND INSPECTION.

a. Check control connection, levers and linkage for security, safetying and for lost motion due to wear.
b. Remove the fuel screen assembly and clean in solvent (Stoddard or equivalent). Reinstall and safety.
c. Check the air control body for cracks and control unit for overall condition.

11A-52. ADJUSTMENTS. Refer to figure 11A-3. The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. The idle mixture adjustment is the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. Idle speed and mixture adjustment should be accomplished after the engine has been warmed up. Since idle rpm may be affected by idle mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture correctly.

a. Set the throttle stop screw to obtain 600 ± 25 rpm, with throttle control pulled full out against idle stop.

NOTE

Engine idle speed may vary among different engines. An engine should idle smoothly, without excessive vibration and the idle speed should be high enough to maintain idling oil pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

b. Advance throttle to increase engine speed to 1000 rpm.
c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.
d. Adjust mixture adjusting nut to obtain a slight and momentary gain of 25 rpm maximum at 1000 rpm engine speed as mixture control is moved from full IN (RICH) toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.
e. If mixture is set too LEAN, engine speed will drop immediately, thus requiring a richer mixture. Tighten adjusting nut (clockwise) for a richer mixture.
f. If mixture is set too RICH, engine speed will increase above 25 rpm, thus requiring a leaner mixture. Back off adjusting nut (counterclockwise) for a leaner mixture.

NOTE

After each adjustment to the idle mixture, run engine up to approximately 2000 rpm to clear engine of excess fuel to obtain a correct idle speed.

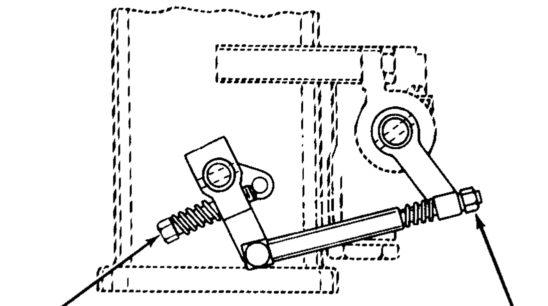


Figure 11A-3. Idle Speed and Idle Mixture Adjustments

11A-53. FUEL MANIFOLD VALVE (FUEL DISTRIBUTOR).

11A-54. DESCRIPTION. Metered fuel flows to the fuel manifold valve, which provides a central point for distributing fuel to the individual cylinders. An internal diaphragm, operated by fuel pressure, raises or lowers a plunger to open and close the individual cylinder supply ports simultaneously. A needle valve in the plunger ensures that the plunger fully opens the outlet ports before fuel flow starts and closes the ports simultaneously for positive engine shut-down. A fine-mesh screen is included in the fuel manifold valve.

NOTE

The fuel manifold valves are supplied in two flow ranges. When replacing a valve assembly, be sure the replacement valve has the same suffix letter as the one stamped on the cover of the valve removed.

11A-55. REMOVAL.

NOTE

Cap all disconnected lines, hoses and fittings.

a. Disconnect all fuel and fuel injection lines at the fuel manifold.
b. Remove bolts which secure fuel manifold and remove manifold.

11A-56. CLEANING.
a. Remove manifold valve from engine in accordance with paragraph 11A-55 and remove safety wire from cover attaching screws.
b. Hold the top cover down against internal spring until all four cover attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below cover.
c. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

If the valve attached to the diaphragm is stuck in the bore of the body, grasp the center nut, rotate and lift at the same time to work gently out of the body.

CAUTION

Do not attempt to remove needle or spring from inside plunger valve. Removal of these items will disturb the calibration of the valve.

d. Using clean gasoline, flush out the chamber below the screen.
e. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.

The filter screen is a tight fit in the body and may be damaged if removal is attempted. It should be removed only if a new screen is to be installed.

f. Clean diaphragm, valve and top cover in the same manner. Be sure the vent hole in the top cover is open and clean.
g. Carefully replace diaphragm and valve. Check that valve works freely in body bore.
h. Position diaphragm so that horizontal hole in plunger valve is 90 degrees from the fuel inlet port in the valve body.
i. Place upper spring in position on diaphragm.
j. Place cover in position so that vent hole in cover is 90 degrees from inlet port in valve body. Install cover attaching screws and tighten to 20±1 lb-in. Install safety wire on cover screws.
k. Install fuel manifold valve assembly on engine in accordance with paragraph 11A-57 and reconnect all lines and hoses to valve.
l. Inspect installation and install cowling.

11A-57. INSTALLATION.

a. Secure the fuel manifold to the crankcase with the two crankcase bolts.

b. Connect the fuel lines and the six fuel injection lines. Inspect completed installation and install cowling.

11A-58. FUEL DISCHARGE NOZZLES.

11A-59. DESCRIPTION. From the fuel manifold valve, individual, identical size and length fuel lines carry metered fuel to the fuel discharge nozzles located in the cylinder heads. The outlet of each nozzle is directed into the intake port of each cylinder. The nozzle body contains a drilled central passage with a counterbore at each end. The lower end is used as a chamber for fuel-air mixture before the spray leaves the nozzle. The upper bore contains an orifice for calibrating the nozzles. Near the top, radial holes connect the upper counterbore with the outside of the nozzle body for air admission. These radial holes enter the counterbore above the orifice and draw outside air through a cylindrical screen fitted over the nozzle body. This screen prevents dirt and foreign material from entering the nozzle. A press-fit shield is mounted on the nozzle body and extends over the greater part of the filter screen, leaving a small opening at the bottom of the shield. This provides an air bleed into the nozzle which aids in vaporizing the fuel by breaking the high vacuum in the intake manifold at idle rpm and keeps the fuel lines filled. The nozzles are calibrated in several ranges. All nozzles furnished for one engine are the same range and are identified by a number and a suffix letter stamped on the flat portion of the nozzle body. When replacing a fuel discharge nozzle be sure it is of the same calibrated range as the rest of the nozzles in the engine. When a complete set of nozzles is being installed, the number must be the same as the one removed, but the suffix letters may be different, as long as they are the same for all nozzles being installed on a particular engine.

11A-60. REMOVAL.

NOTE

Plug or cap all disconnected lines and fittings.

a. Disconnect the fuel injection lines at the fuel discharge nozzles. Remove nozzles with a 1/2 inch deep well socket wrench.

11A-61. CLEANING AND INSPECTION. To clean nozzles, immerse in clean solvent and use compressed air to dry them. When cleaning, direct air through the nozzle in the direction opposite of normal fuel flow. Do not remove the nozzle shield or distort it in any way. Do not use a wire or other metal object to clean the orifice or metering jet. After cleaning, check the shield height from the hex portion of the nozzle. The bottom of the shield should be approximately 1/16 inch above the hex portion of the nozzle.

11A-62. INSTALLATION.

a. Install nozzles in the cylinders and tighten to a torque value of 60 to 80 lb-in.

b. Connect the fuel lines at discharge nozzles.

c. Check installation for crimped lines, loose fittings, etc.

11A-63. FUEL INJECTION PUMP.

11A-64. DESCRIPTION. The fuel pump is a positive-displacement, rotating vane type, connected to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the pump vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line, where it is returned to the aircraft fuel system. Since the pump is engine-driven, changes in engine speed affects total pump flow proportionally. A check valve allows the auxiliary fuel pump pressure to bypass the engine-driven fuel pump for starting, or in the event of engine-driven fuel pump failure. The pump supplies more fuel than is required by the engine; therefore, a spring-loaded, diaphragm type relief valve is provided, with an adjustable orifice installed in the fuel passage to the relief valve to maintain desired fuel pressure for engine power setting. The adjustable orifice allows the exact desired pressure setting at full throttle. The fuel pump is equipped with a manual mixture control to provide positive mixture control throughout the range required by the injection system. This control limits output of the pump from full rich to idle cut-off. Non-adjustable mechanical stops are located at these positions. The fuel pump is ram-air cooled to help prevent high fuel temperatures. The ram air is picked up at the upper left engine baffle and directed through a flexible tube to the fuel pump shroud. The fuel supply and return lines from the fuel pump to the control unit are routed inside flexible tubes to help prevent vaporized fuel at these points.

11A-65. REMOVAL.

a. Place full shut-off valve in OFF position and mixture control in IDLE CUT-OFF position.

b. Remove cowling in accordance with paragraph 11A-3.

c. Loosen the clamps and slide the flexible tubes free of the horns on the fuel pump shroud to gain access to the fuel lines.

d. Remove the alternator drive belt.

e. Tag and disconnect all lines and fittings attached to the fuel pump.

NOTE

Plug or cap all disconnected lines, hoses and fittings.

f. Remove the shroud surrounding the fuel pump.

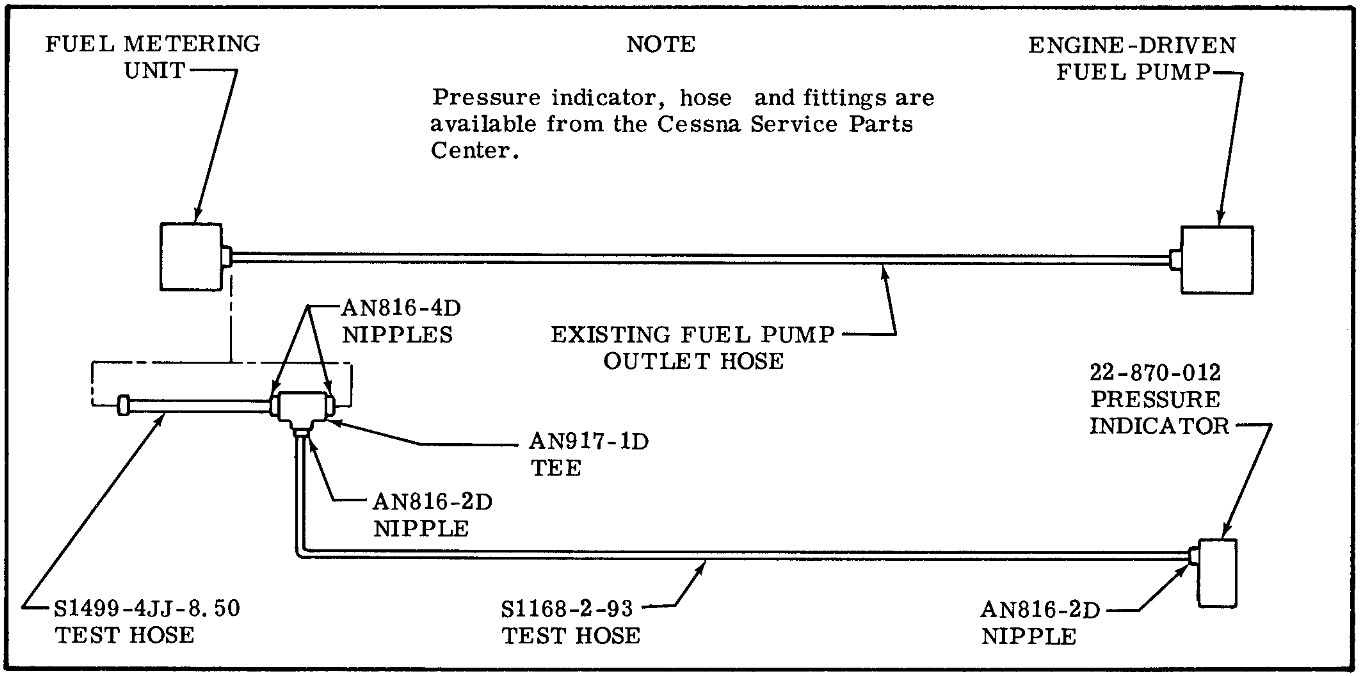


Figure 11A-4. Fuel Injection Pump Adjustment Test Harness

g. Remove the nuts and washers attaching the fuel pump to the engine.
h. Remove fuel pump and gasket.

WARNING

Residual fuel draining from lines and hose constitutes a fire hazard. Use caution to prevent accumulation of fuel when lines or hoses are disconnected.

i. If a replacement pump is not being installed immediately, a temporary cover should be installed on the fuel pump mount pad.

11A-66. INSTALLATION.
a. Position a new gasket and fuel pump on the mounting studs with fuel pump inlet to the left. Be sure pump drive aligns with drive in the engine.
b. Secure pump to engine with plain washers, internal tooth lock washers and nuts. Tighten nuts evenly.
c. Install cooling shroud on fuel pump.
d. Install all fittings and connect all lines.
e. Install the flexible ram air tube on the air horn of the fuel pump shroud and install clamp.
f. Replace the alternator drive belt and tighten the nuts on the adjusting arm so that the drive belt has proper tension. Refer to Section 16.
g. Inspect completed installation.

11A-67. ADJUSTMENT. The full rich performance of the fuel injection system is controlled by manual adjustment of the air throttle, fuel mixture and pump pressure at idle and only by pump pressure at full throttle. To make full rich adjustments, proceed as follows:

a. Remove engine cowling in accordance with paragraph 11A-3.

NOTE

Inspect the slot-headed adjustable orifice needle valve (located just below the fuel pump inlet fitting) to see if it is epoxy sealed or safety wired to the brass nut. If the needle valve is epoxy sealed, Continental Aircraft Engine Service Bulletin No. 70-10 must be complied with before calibration of the unit can be performed.

b. Disconnect the engine-driven fuel pump outlet fitting or the fuel metering unit inlet fitting and "tee" the test gage into the fuel injection system as illustrated in figure 11A-4.

NOTE

Cessna Service Kit No. SK320-2 provides a test gage, lines and fittings for connecting the test gage into the system to perform accurate calibration of the engine-driven fuel pump.

c. The test gage MUST be vented to atmosphere and MUST be held as near to the level of the engine-driven fuel pump as possible.

NOTE

The test gage should be checked for accuracy at least every 90 days or anytime an error is suspected. The tachometer accuracy should also be determined prior to making any adjustments to the pump.

d. Start engine and warm-up thoroughly. Set mixture control to full rich position and propeller control full forward (low pitch, high rpm).
e. Adjust engine idle speed to 600 ± 25 rpm and check test gage for 9-11 PSI. Refer to figure 11A-3 for idle mixture adjustment.

NOTE

Do not adjust idle mixture until idle pump pressure is obtained.

WARNING

DO NOT make fuel pump pressure adjustments while engine is operating.

f. If the pump pressure is not 9 to 11 PSI, stop engine and turn the fuel pump relief valve adjustment, on the centerline of the fuel pump clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.
g. Maintaining idle pump pressure and idle RPM, obtain correct idle mixture in accordance with paragraph 11A-52.
h. Completion of the preceding steps have provided:
1. Correct idle pump pressure.
2. Correct fuel flow.
3. Correct fuel metering cam to throttle plate orientation.
i. Advance to full throttle and maximum rated engine speed with the mixture control in full rich position and propeller control in full forward (low pitch, high rpm).
j. Check test gage for 31 to 33 PSI. If pressure is incorrect, stop engine and adjust pressure by loosening locknut and turning the slotheaded needle valve located just below the fuel pump inlet fitting clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

NOTE

If at static run-up, rated RPM cannot be achieved at full throttle, adjust pump pressure slightly below limits making certain the correct pressures are obtained when rated RPM is achieved during take-off roll.

k. After correct pressures are obtained, safety adjustable orifice and orifice locknut.
l. Remove test equipment, run engine to check for leaks and install cowling.

11A-67A. RIGGING THROTTLE-OPERATED MICRO-SWITCH. Refer to Section 12.

11A-67B. AUXILIARY ELECTRIC FUEL PUMP FLOW RATE ADJUSTMENT. Refer to Section 12.

11A-68. INDUCTION AIR SYSTEM.

11A-69. DESCRIPTION. Ram air enters the induction air system through a filter at the front of the lower cowling. Thru aircraft serial 18502007 this air is ducted to the airbox at the fuel-air control unit. A spring-loaded alternate air door is incorporated in the airbox and will open by engine suction if the air filter should become clogged. This permits unfiltered induction air to be drawn from within the engine compartment. Beginning with aircraft serial 18502008 the induction air is ducted to the fuel-air control unit through an adapter which is mounted on the lower cowl assembly. A spring-loaded alternate air door is incorporated in the adapter and will open by engine suction if the air filter should become clogged. This permits unfiltered induction air to be drawn from within the engine compartment.

11A-70. AIRBOX. (THRU AIRCRAFT SERIAL 18502007.)

11A-71. REMOVAL AND INSTALLATION.
a. Remove cowling in accordance with paragraph 11A-3.
b. Disconnect throttle and mixture controls at airbox bellcranks.
c. Disconnect electrical wiring at throttle operated micro-switch and tape terminals as a safety precaution.
d. Disconnect drain line at airbox.
e. Remove safety wire from mounting bolts, remove bolts securing airbox to fuel-air control unit and remove airbox and gasket.
f. Reverse the preceding steps for reinstallation. Use a new gasket each time removal is necessary.
g. Rig throttle and mixture controls in accordance with paragraphs 11A-91 and 11A-92 respectively.
h. Connect and adjust throttle-operated auxiliary fuel pump microswitch in accordance with Section 12.

11A-72. CLEANING AND INSPECTION. Thru aircraft serial 18502007 clean metal parts of the induction airbox with Stoddard solvent or equivalent. Inspect for cracks, dents, loose rivets, etc. Minor cracks may be stop-drilled. In case of continued or severe cracking, replace airbox. Inspect gaskets and install new gaskets, if damaged. Inspect alternate spring-loaded door for freedom of operation and complete closing. Beginning with aircraft serial 18502008 use the preceding cleaning and inspection procedures applied to the adapter assembly instead of the airbox. Check alternate air door for ease of operation and complete closing.

11A-73. INDUCTION AIR FILTER. Refer to paragraph 11-55.

11A-74. DESCRIPTION. Refer to paragraph 11-56.

11A-75. REMOVAL AND INSTALLATION. Refer to paragraph 11-57.

11A-76. CLEANING AND INSPECTION. Refer to Section 2.

11A-77. IGNITION SYSTEM. Refer to paragraph 11-59.

11A-78. DESCRIPTION. Refer to paragraph 11-60.

11A-79. TROUBLE SHOOTING. Refer to paragraph 11-61.

11A-80. MAGNETOS. Refer to paragraph 11-62.

11A-81. DESCRIPTION. Refer to paragraph 11-63.

11A-82. REMOVAL. Refer to paragraph 11-64.

11A-83. INTERNAL TIMING. Refer to paragraph 11-65.

11A-84. INSTALLATION AND TIMING TO ENGINE. Refer to paragraph 11-66.

11A-85. MAINTENANCE. Refer to paragraph 11-67.

11A-86. MAGNETO CHECK. Refer to paragraph 11-68.

11A-87. SPARK PLUGS. Refer to paragraph 11-69.

11A-88. ENGINE CONTROLS.

11A-89. DESCRIPTION. The throttle mixture and propeller controls are of the push-pull type. The propeller and mixture controls are equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller and mixture controls also have a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. The aircraft does not have a manual induction air control. The alternate air source is automatic. If the air filter should become clogged, suction from the engine will open a spring-loaded door in the induction airbox. This permits the induction air to be drawn from within the engine compartment. This induction air is unfiltered air. Inspect alternate air spring-loaded door for freedom of operation and complete closing. On some aircraft, an additional locknut was installed in back of the existing locknut at the engine end of all throttle and propeller controls that contain rod ends.

NOTE

Some controls have intricate parts that will fall out and possibly be lost if the control is pulled from the housing while the control is disconnected.

11A-90. RIGGING. (Refer to figure 11A-5.) When adjusting any engine control, it is important to check that the control slides smoothly throughout its full range of travel, that it locks securely if equipped with a locking device and the arm or lever which it operates moves through its full arc of travel.

CAUTION

Some engine controls have a small retaining ring brazed (or attached with epoxy resin) near the threaded end (engine end) of the control. The purpose of these retaining rings is to prevent inadvertent withdrawal of and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

- Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

11A-91. THROTTLE CONTROL.

a. (THRU AIRCRAFT SERIALS 18502007 AND 18502026 THRU 18502027.)

CAUTION

Whenever throttle control is disconnected at the engine, pay particular attention to the EXACT position, size and number of attaching bolts, spacers and washers. Be sure to install attaching parts as noted when reconnecting controls.

1. (Refer to figure 11A-5, sheets 1 and 2.) Disconnect throttle control (19) rod end from bellcrank (4) on airbox (13).
2. Disconnect throttle control rod assembly (21) from control arm (20) on throttle body.
3. Adjust throttle control rod assembly (21) to its shortest length and reconnect rod to arm (20) on throttle body.

NOTE

Check that staked connection on the throttle control between rigid conduit and flexible conduit is secure. If any indication of looseness or breakage is apparent, install new throttle control before continuing rigging procedure.

4. (Refer to figure 11-8.) Pull throttle control out (IDLE CUT-OFF position) and remove knob (1).
5. Screw jam nut (7) all the way down (clockwise) and install throttle knob (1). Screw knob securely against jam nut. Do not back jam nut out. This will prevent bottoming and possible damage to the staked connection (4).
6. With the friction lock (6) loose, push throttle control IN until jam nut (7) contacts friction lock.
7. Pull throttle control out approximately 1/8 inch from friction lock (6) for cushion.
8. Tighten friction lock, using care not to change position of throttle control.

9. (Refer to figure 11A-5, sheets 1 and 2.) Move throttle arm (20) to full OPEN position (against stop), adjust rod end on throttle control (19) to align with bellcrank (4) and install attaching bolt and washers.

10. Release friction lock and check for full travel in both directions of throttle arm (20). If further adjustment is required, make all adjustments at the rod ends on the throttle rod (21) and throttle control (19). Additional adjustment may be obtained by loosening the housing clamp on the engine and shifting the control housing in the clamp. DO NOT change the jam nut setting.

11. Tighten all jam nuts and ensure sufficient threads are engaged in rod ends. Adjust auxiliary fuel pump switch in accordance with Section 12.

NOTE

The result of rigging, in all cases, is the throttle control must be rigged so that the control arm (20) on the throttle body contacts the mechanical stops in both directions, that the throttle control has approximately 1/8-inch cushion when in full OPEN position and that the small retaining ring at the engine end of the control just clears the end of control housing when the idle stop is reached.

b. (AIRCRAFT SERIALS 18502008 THRU 18502025 AND 18502028 AND ON.)

CAUTION

Whenever throttle control is disconnected at the engine, pay particular attention to the EXACT position, size and number of attaching bolts, spacers and washers. Be sure to install attaching parts as noted when reconnecting controls.

1. (Refer to figure 11A-5, sheets 3 and 4.) Disconnect throttle control (19) rod end from arm (20).

NOTE

Check that staked connection between rigid conduit and flexible conduit is secure. If any indication of looseness or breakage is apparent, install new throttle control before continuing rigging procedure.

2. (Refer to figure 11-8.) Pull throttle control out (IDLE CUT-OFF position) and remove knob (1).

3. Screw jam nut (7) all the way down (clockwise) and install throttle knob (1). Screw knob securely against jam nut. Do not back jam nut out. This will prevent bottoming and possible damage to the staked connection (4).

4. With the friction lock (6) loose, push throttle control IN until jam nut (7) contacts friction lock.

5. Pull throttle control out approximately 1/8-inch from friction lock (6) for cushion.

6. Tighten friction lock, using care not to change position of throttle control.

7. Be sure control (19) is attached to the bracket properly and that safety wire/reatiner is installed.

8. Move control arm (20) on throttle body to full OPEN position (against stop), adjust throttle control (19) rod end to align with arm (20) and install attaching bolt and washers.

9. Release friction lock, pull throttle lever aft and check that control arm (20) contacts stop at idle position.

10. Check that sufficient threads are engaged in throttle control (19) rod end and tighten jam nut. Adjust auxiliary fuel pump switch in accordance with Section 12.

NOTE

The result of rigging, in all cases, is the throttle control must be rigged so that the control arm (17) on the throttle body contacts the mechanical stops in both directions, that the throttle lever has approximately 1/8-inch cushion when in full OPEN position and that the small retaining ring at the engine end of the control just clears the end of control housing when the idle stop is reached.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the throttle control.

11A-92. MIXTURE CONTROL.

a. (THRU AIRCRAFT SERIALS 18502007 AND 18502026 THRU 18502027.)

CAUTION

Whenever mixture control is disconnected at the engine, pay particular attention to the EXACT position, size and number of attaching bolts, spacers and washers. Be sure to install attaching parts as noted when reconnecting controls.

1. (Refer to figure 11A-5, sheets 1 and 2.) Disconnect mixture control (18) rod end from bellcrank (3) on airbox (13).

2. Disconnect mixture control rod assembly (17) from control arm (15).

3. Adjust rod assembly (17) to dimensions shown in VIEW A-A with mixture arm (15) in IDLE CUT-OFF position and connect rod assembly (17) to control arm. (Refer to sheets 1 and 2 for VIEW A-A depending on serial numbers.)

4. Position mixture arm (15) in full RICH position, adjust mixture control (18) rod end to align with bellcrank (3) and install attaching bolt and washers.

5. The mixture arm (15) must contact the stops in each direction and the control (18) should have approximately 1/8 inch cushion when pushed full in (RICH).

6. If further adjustment is required, make all adjustments at the rod ends on the mixture rod (17) and mixture control (18). Additional adjustment may be obtained by loosening the housing clamp on the engine and shifting the control housing in the clamp.

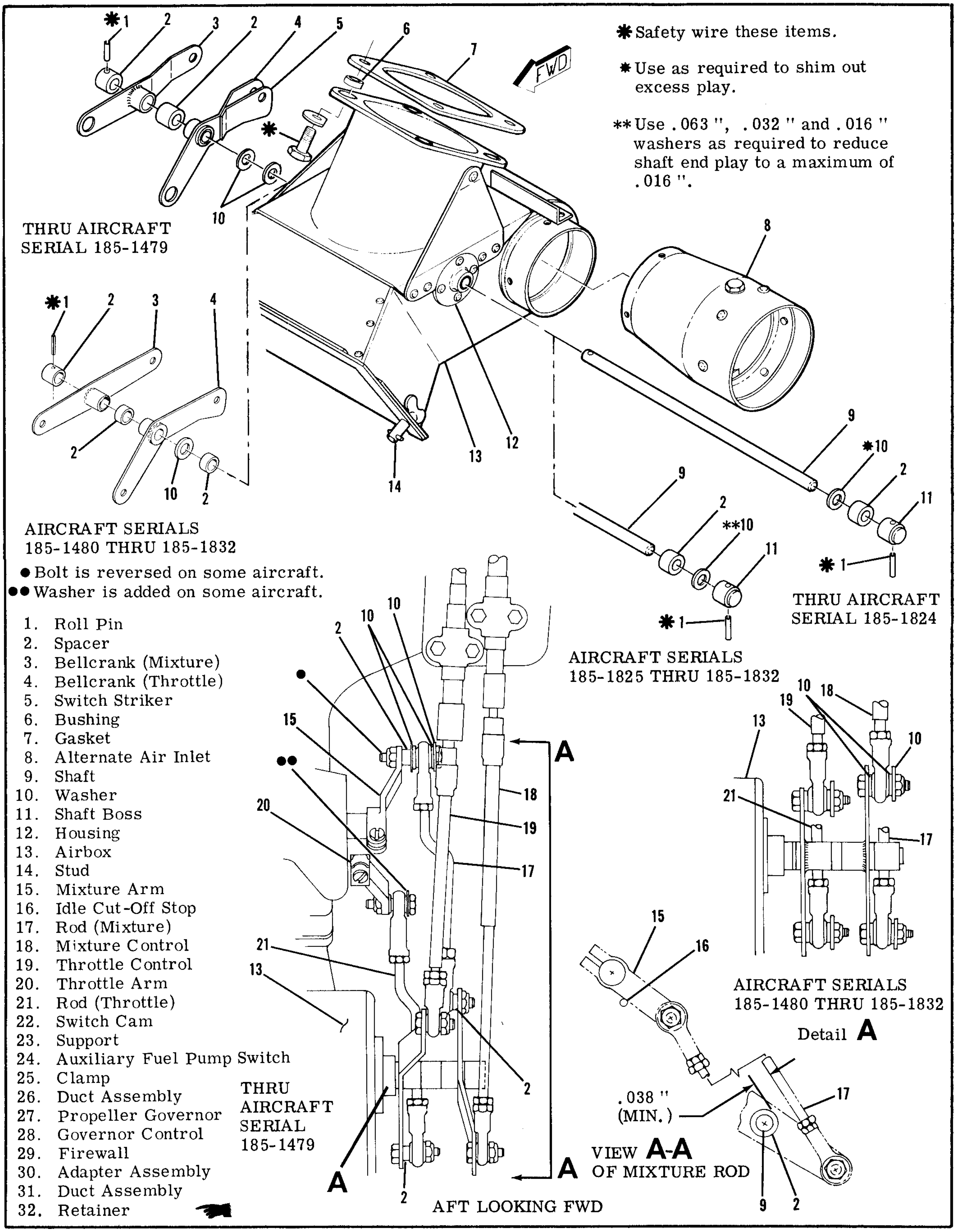


Figure 11A-5. Engine Controls (Sheet 1 of 4)

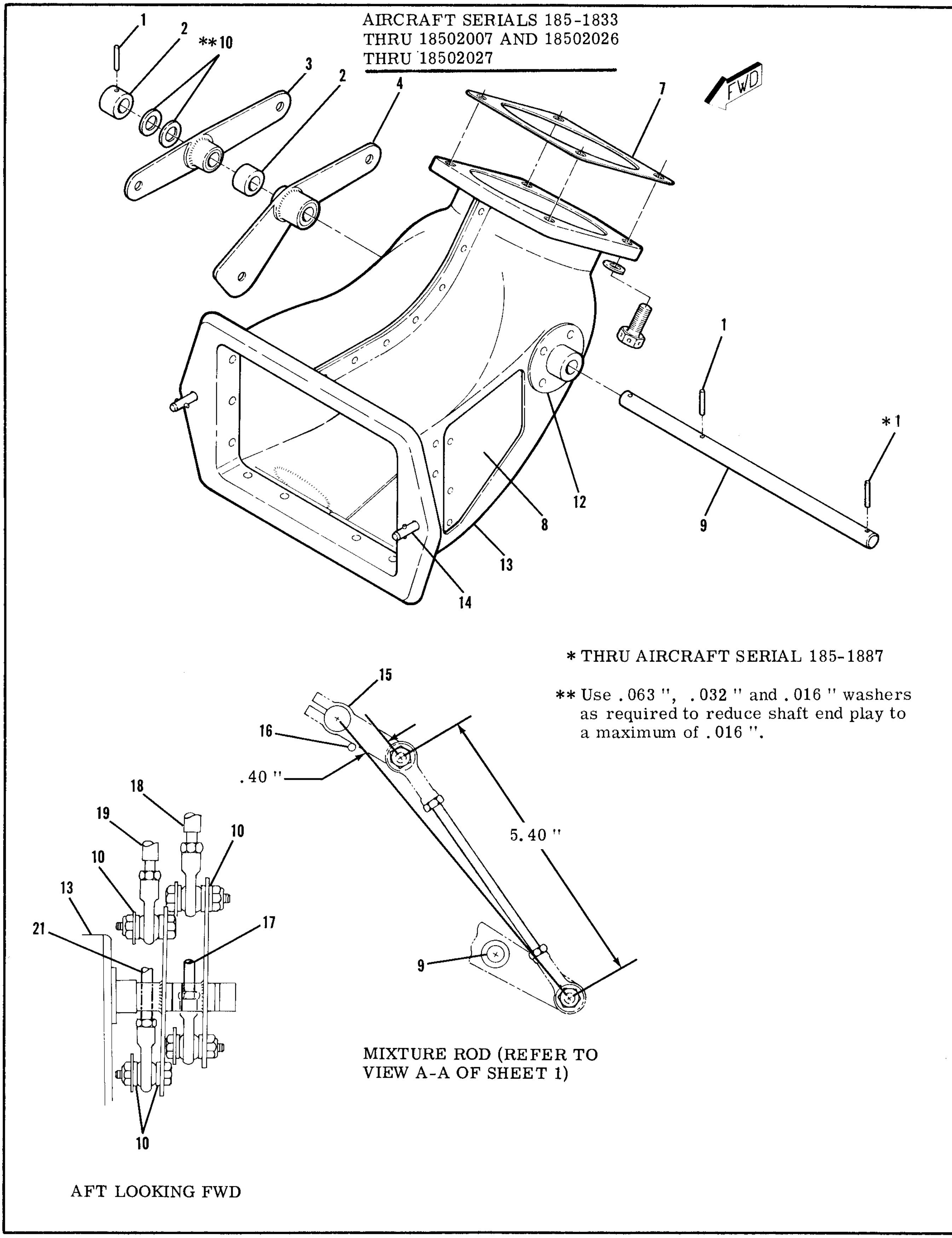
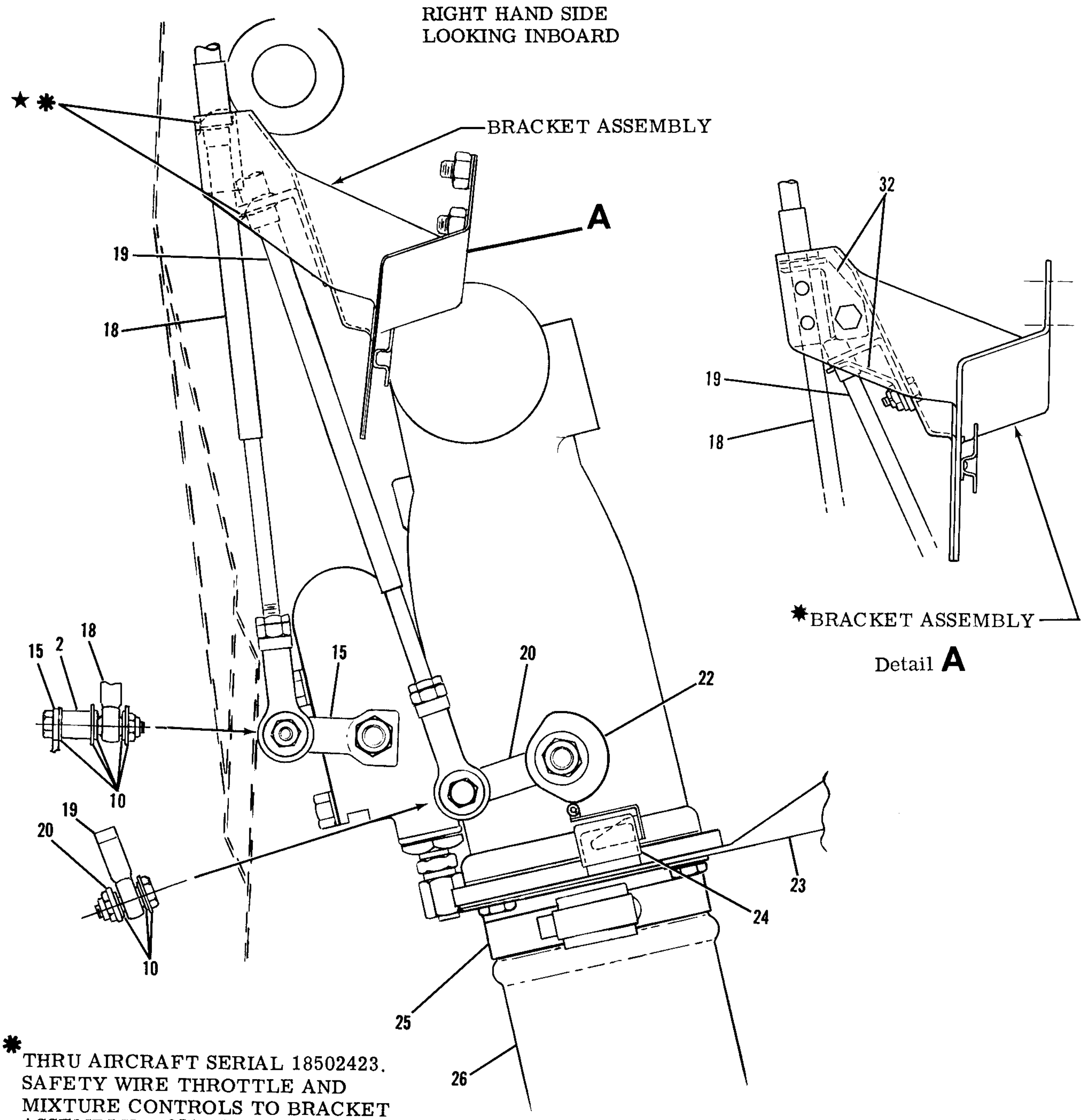


Figure 11A-5. Engine Controls (Sheet 2 of 4)

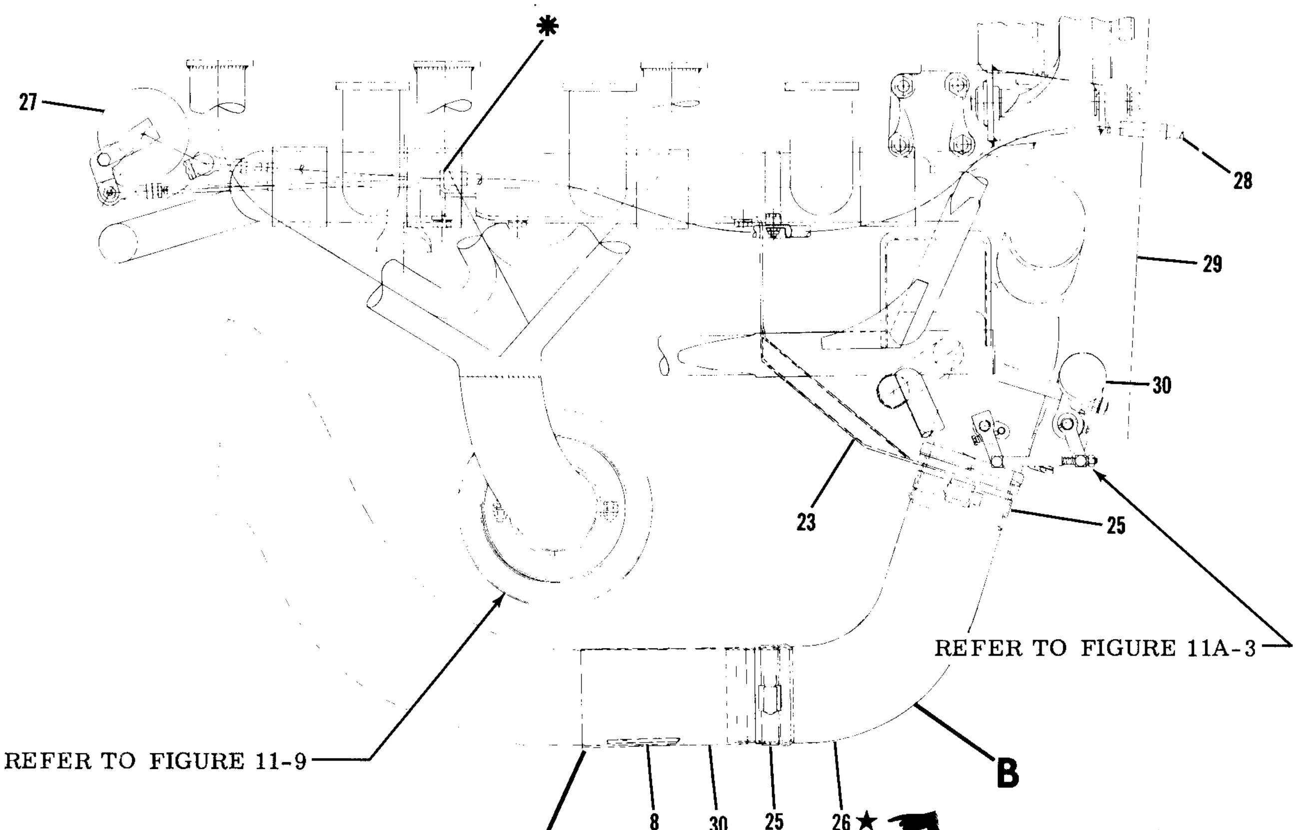


✱THRU AIRCRAFT SERIAL 18502423. SAFETY WIRE THROTTLE AND MIXTURE CONTROLS TO BRACKET ASSEMBLY, .051 SAFETY WIRE.

★On aircraft serials 18502008 THRU 18502025 and 18502028 THRU 185-02419, at the 100 hour inspection, if the safety wire is found broken or deteriorated, refer to Cessna Single-engine Service Letters SE74-20, dated September 20, 1974 and SE75-9, dated April 25, 1975.

✱BEGINNING WITH AIRCRAFT SERIAL 18502424 and when modified per Cessna Single-engine Service Letter SE74-20/SE75-9.

Figure 11A-5. Engine Controls (Sheet 3 of 4)

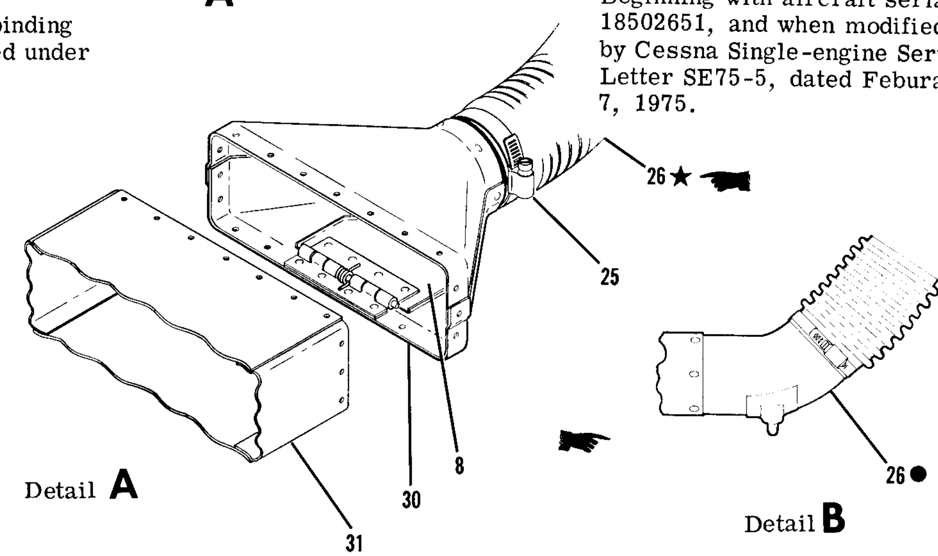


★ NOTE

Reinforcing wire and binding cord must be positioned under clamps.

● NOTE

Beginning with aircraft serial 18502651, and when modified by Cessna Single-engine Service Letter SE75-5, dated Feburary 7, 1975.



AIRCRAFT SERIALS 18502008
THRU 18502025 AND 18502028
AND ON

Figure 11A-5. Engine Controls (Sheet 4 of 4)

7. Tighten all jam nuts and ensure sufficient threads are engaged in rod ends.

NOTE

The result of rigging, in all cases, is the mixture control must be rigged so that the control arm (15) contacts the stops in both directions, that the mixture control has approximately 1/8-inch cushion when pushed full IN and that the small retaining ring at the engine end of the control just clears the end of control housing when the idle cut-off stop is reached.

b. (AIRCRAFT SERIALS 18502008 THRU 18502025 AND 18502028 AND ON.)

CAUTION

Whenever mixture control is disconnected at the engine, pay particular attention to the EXACT position, size and number of attaching bolts, spacers and washers. Be sure to install attaching parts as noted when reconnecting controls.

1. (Refer to figure 11A-5, sheets 3 and 4.) Disconnect mixture control (18) rod end from control arm (15).
2. In the cockpit, push mixture control IN, unlock and pull control OUT approximately 1/8-inch for cushion.
3. Be sure control (18) is attached to the bracket properly and that safety wire/retainer is installed.
4. Place control arm (15) against the FULL RICH stop, adjust mixture control (18) rod end to align with arm and install attaching bolt and washers.
5. Unlock and pull mixture control OUT and check that control arm (15) is against IDLE CUT-OFF stop.
6. Check that sufficient threads are engaged in mixture control (18) rod end and tighten jam nut.

NOTE

The result of rigging, in all cases, is the mixture control must be rigged so that the control arm (15) contacts the stops in both directions, that the mixture control has approximately 1/8-inch cushion when pushed full IN and that the small retaining ring at the engine end of the control just clears the end of control housing when the idle cut-off stop is reached.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.

11A-93. PROPELLER CONTROL. Refer to Section 13.

11A-94. STARTING SYSTEM. Refer to paragraph 11-77.

11A-95. DESCRIPTION. Refer to paragraph 11-78.

11A-96. TROUBLE SHOOTING. Refer to paragraph 11-79.

11A-97. PRIMARY MAINTENANCE. Refer to paragraph 11-80.

11A-98. STARTER MOTOR. Refer to paragraph 11-81.

11A-99. REMOVAL AND INSTALLATION. Refer to paragraph 11-82.

11A-100. EXHAUST SYSTEM. Refer to paragraph 11-83.

11A-101. DESCRIPTION. Refer to paragraph 11-84.

11A-102. REMOVAL AND INSTALLATION. Refer to paragraph 11-85.

11A-103. INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 100 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of optimum turbocharger efficiency and engine power. To inspect the engine exhaust system, proceed as follows:

a. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visually inspected.

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

b. After visual inspection, an air leak check should be made on the exhaust system as follows:

1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

NOTE

The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually by feel, or by using a soap and water solution and watching for bubbles. All joints should be free of air leaks with the exception of the waste gate bearings which will show some bubbling. Also, some bubbles will appear at the joint of the turbocharger turbine and compressor bearing housing.

c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.

1. Remove exhaust stack assemblies.
2. Use rubber expansion plugs to seal openings.
3. Using a manometer or gage, apply approximately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.
4. It is recommended that exhaust stacks found defective be replaced before the next flight.

d. After installation of exhaust system components perform the inspection in step "b" of this paragraph to ascertain there are no leaks at the joints of the system.

11A-104. EXTREME WEATHER MAINTENANCE. Refer to paragraph 11-87.

11A-105. COLD WEATHER. Refer to paragraph 11-88.

11A-106. HOT WEATHER. Engine starting in hot weather or with a hot engine is sometimes hampered by vapor formation in the fuel lines. To purge the vapor, move the mixture control to full rich, open throttle 1-1/2 inches and prime with the auxiliary fuel pump switch in the EMERGENCY position until the fuel flow indicator reads 4-6 gal/hr. Then shut off the fuel pump switch and engage the starter. As the flooded mixture becomes progressively leaner, reaching a combustible mixture, the engine will start. If the engine tends to die, turn the auxiliary fuel pump switch momentarily to EMERGENCY at appropriate intervals until vapor is fully cleared and the engine runs smoothly.

CAUTION

If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals.

11A-107. SEACOAST AND HUMID AREAS. Refer to paragraph 11-90.

11A-108. DUSTY AREAS. Refer to paragraph 11-91.

11A-109. GROUND SERVICE RECEPTACLE. Refer to paragraph 11-92.

11A-110. HAND CRANKING. Refer to paragraph 11-93.

SHOP NOTES:

SECTION 12

FUEL SYSTEMS

TABLE OF CONTENTS Page

NOTE

This section is divided into two parts. Part 1 covers the Skywagon Model 180-Series aircraft, which is equipped with a carburetor engine. Part 2 covers the Skywagon Model A185-Series aircraft, which is equipped with a fuel-injected engine. Part 1 contains information which is also applicable to aircraft described in Part 2. To avoid repetition of information, the reader is referred back to this information in Part 1.

PART 1

12-1. SKYWAGON 180 FUEL SYSTEM.

12-2. DESCRIPTION. Fuel flows by gravity from front and rear outlets in each fuel cell through lines down the front and rear cabin door posts on both sides of the aircraft. These lines connect to tees below the floorboard. From each tee, a single line carries fuel through a fuel tank selector valve, to the fuel strainer. Fuel flows from the strainer to the carburetor inlet.

12-3. PRECAUTIONS

NOTE

There are certain general precautions and rules concerning the fuel system which should be observed when performing the operations and procedures in this section. These are as follows:

a. During all fueling, defueling, tank purging, and tank repairing or disassembly, ground the aircraft to a suitable ground stake.

b. Residual fuel draining from lines and hoses constitutes a fire hazard. Use caution to prevent the accumulation of fuel when lines or hoses are disconnected.

c. Cap open lines and cover connections to prevent thread damage and the entrance of foreign matter.

NOTE

Throughout the aircraft fuel system, from the cells to the carburetor, use NS-40 (RAS-4) (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite-Petrolatum) or equivalent compound as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

12-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FUEL TO CARBURETOR.	Fuel selector valve not turned on.	Turn valve on.
	Fuel cells empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Inlet elbow or inlet screen in carburetor plugged.	Clean and/or replace.
	Fuel cell outlet screens plugged.	Remove and clean screens and flush out fuel cells.
	Defective fuel selector valve.	Remove and repair or replace valve.
	Plugged fuel strainer.	Remove and clean strainer and screen.
	Plugged fuel line.	Clean out or replace fuel line.
FUEL STARVATION AFTER STARTING.	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Plugged fuel vent.	Correct per applicable paragraph in this section.
	Water in fuel.	Drain fuel cell sumps, fuel lines, and fuel strainer.
NO FUEL QUANTITY INDICATION.	Fuel cells empty.	Service with proper grade and amount of fuel.
	Defective or open circuit	Reset or replace circuit breaker.
	Open circuit or loose connections.	Tighten connections. Repair or replace wiring.
	Defective fuel quantity indicator or transmitter.	Replace defective indicator or transmitter.

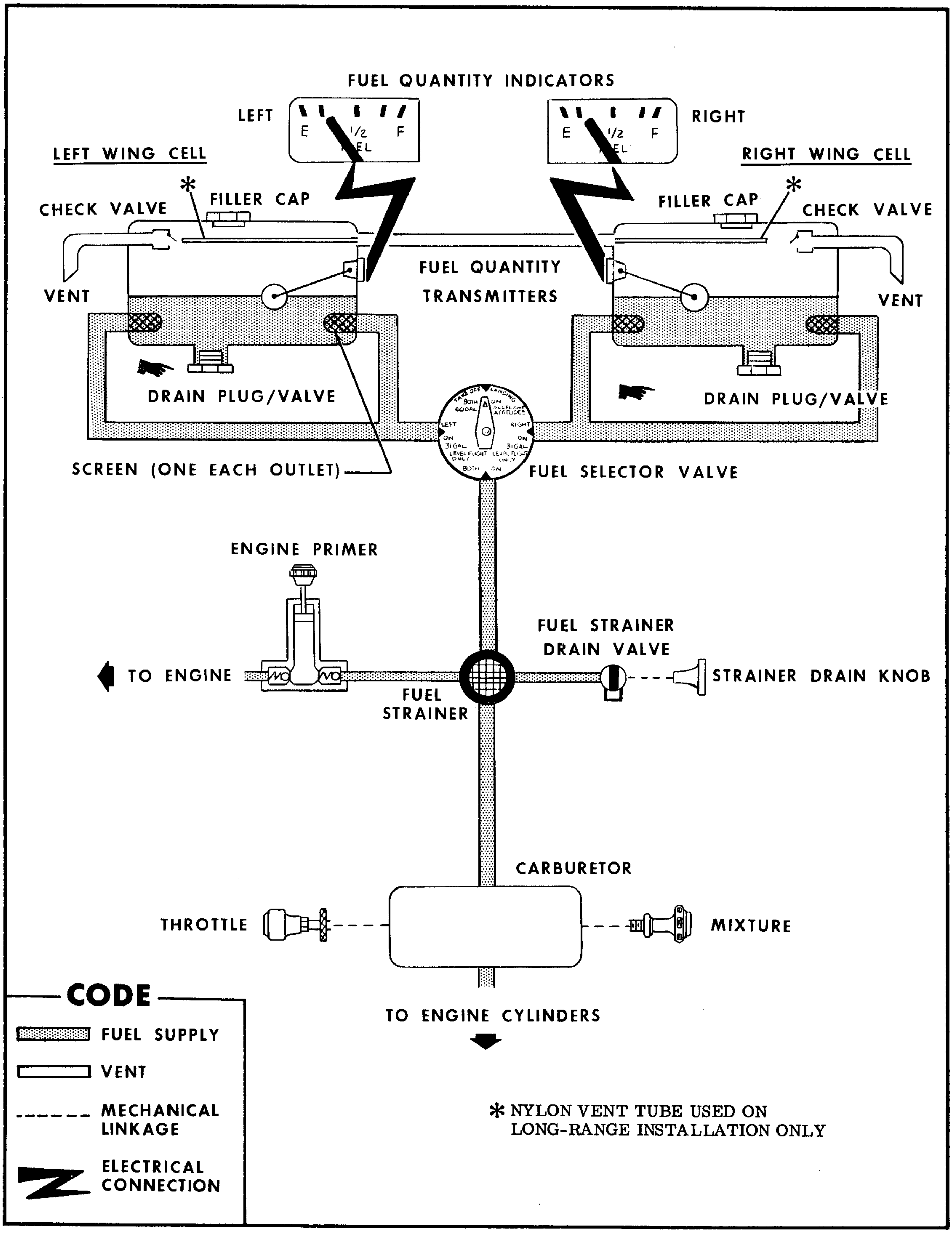
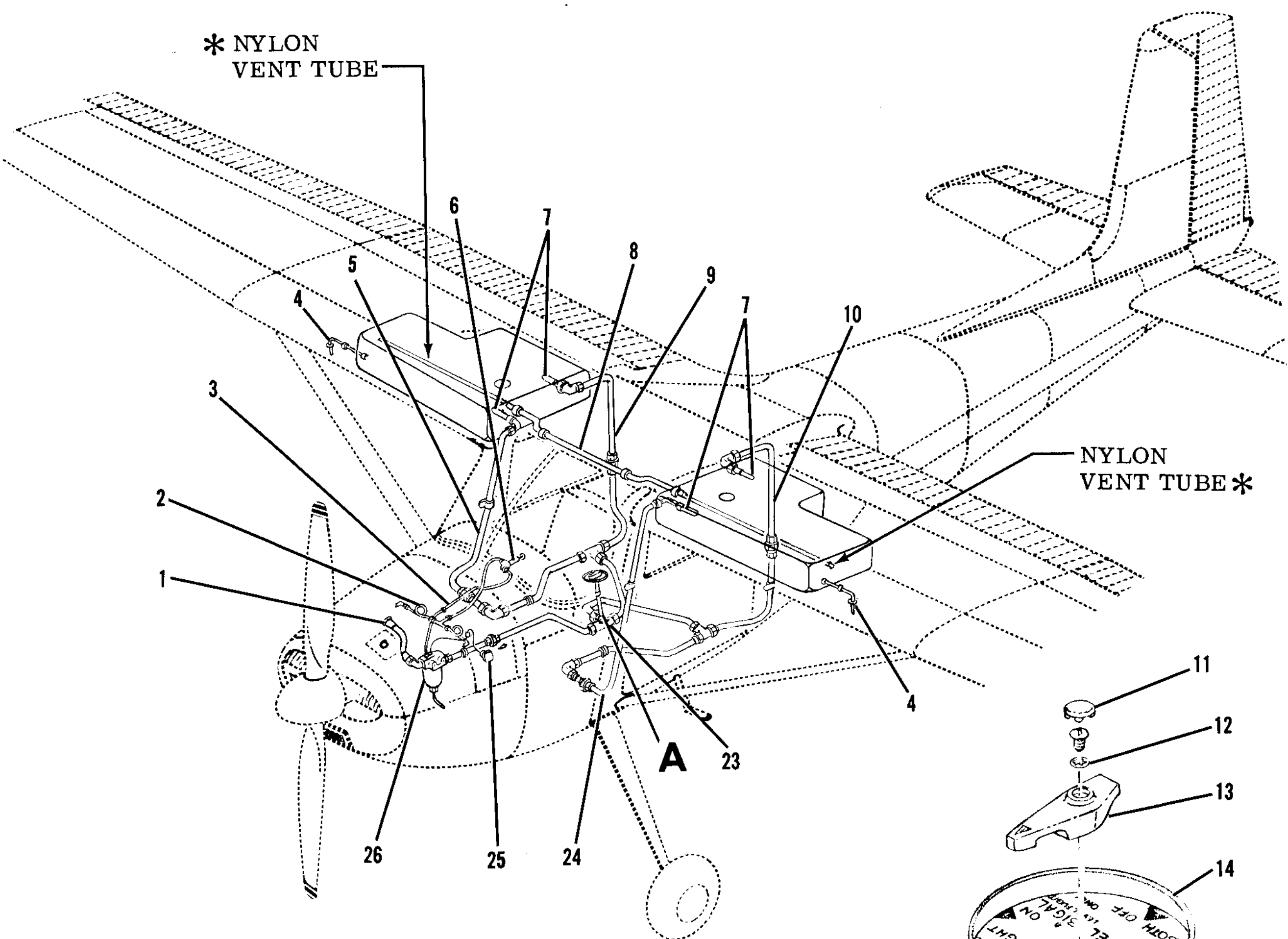


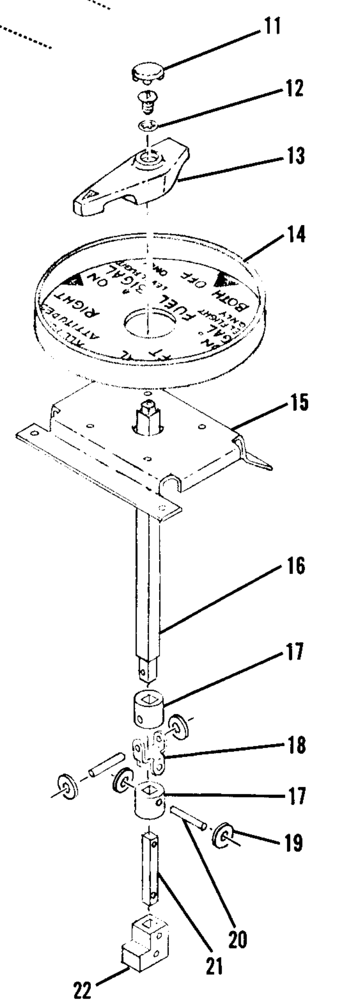
Figure 12-1. Fuel System Schematic



* LONG-RANGE INSTALLATIONS ONLY

NOTE

All fuel hoses should be replaced at engine overhaul or after 5 years, whichever comes first.



Detail **A**

1. Hose (Strainer to Engine)
2. Primer Line (Tee to Engine)
3. Primer Line (Primer to Tee)
4. Fuel Cell Vent Line
5. Forward Right Fuel Line
6. Primer
7. Screen
8. Vent Line (Crossover)
9. Aft Right Fuel Line
10. Aft Left Fuel Line
11. Cap
12. Washer
13. Handle
14. Cup
15. Bracket
16. Upper Shaft
17. Pivot
18. Spacer
19. Washer
20. Pin
21. Washer
22. Housing
23. Selector Valve
24. Forward Left Fuel Line
25. Strainer Drain Control
26. Fuel Strainer

Figure 12-2. Fuel System

12-5. FUEL CELLS. (RUBBERIZED.)

12-6. DESCRIPTION. Rubberized, bladder-type fuel cells are installed in the inboard bay of each wing panel. These cells are secured by fasteners to prevent collapse of the flexible cells.

12-7. GENERAL PRECAUTIONS. When storing, inspecting or handling rubberized, bladder-type fuel cells, the following precautions should be adhered to:

a. Fold cells as smoothly and lightly as possible with a minimum number of folds. Place protective wadding between folds.

b. Wrap cell in moisture-proof paper and place in a suitable container. Do not crowd cell in container. Use wadding to prevent movement.

c. Stack boxed cells to allow access to oldest cells first. Do not allow stacks to crush bottom boxes. Leave cells in boxes until used.

d. Storage area must be cool, +30°F to +85°, and free of exposure to sunlight, dirt and damage.

e. Used cells must be cleaned with soap and warm water prior to storage. Dry and package as outlined in the preceding steps.

f. Do not carry cells by fittings. Maintain original cell contours or folds when refolding for boxing.

12-8. FUEL CELL REMOVAL.

a. Drain fuel from applicable cell.

NOTE

Prior to removal of cell, drain fuel, purge with fresh air, and swab out to remove all traces of fuel.

b. Remove wing root fairings and disconnect fuel lines at wing root.

c. Remove clamps from forward and aft fuel cell bosses at wing root and carefully work fuel strainers and lines from cell bosses.

d. Disconnect electrical lead and ground strap from fuel quantity transmitter and carefully work transmitter from fuel cell and wing rib.

e. Remove screws attaching drain adapter to lower surface of wing.

f. Remove clamps attaching crossover vent line to fuel cells and work vent line out of cell being removed. In aircraft equipped with long-range cells, remove vent extension tube from inside cell. Vent extension tube is attached to the crossover vent bars on the cell.

g. Remove fuel filler adapter and gaskets by removing screws attaching adapter to wing and fuel cell. On aircraft equipped with long-range cells, remove cover plate and gaskets, and remove nylon vent tube from inside cell.

h. Working the rough filler neck opening, loosen snap fasteners. Tilt snap fasteners slightly when pulling cell free, to prevent tearing rubber.

i. Collapse and carefully fold cell for removal, then work cell out of fuel bay through filler opening in upper wing surface. Use care when removing to prevent damage to cell.

j. Unfold cell and remove fittings, snap fasteners and fuel sump drain adapter.

12-9. FUEL CELL REPAIR.

NOTE

For fuel cell repair information, refer to Cessna Service News Letter dated August 28, 1970. For minor repair, a fuel cell repair kit is available from Goodyear, complete with required materials and instructions.

12-10. Deleted.

12-11. Deleted.

12-12. Deleted.

12-13. Deleted.

12-14. Deleted.

12-15. Deleted.

12-16. FUEL CELL INSTALLATION.

a. Cell compartment must be thoroughly cleaned of all filings, trimmings, loose washers, bolts, nuts, etc.

b. All sharp edges of cell compartment must be rounded off and protective tape applied over any other sharp edges and protruding rivets.

c. Inspect cell compartment just prior to installation of a cell for conditions noted in the preceding steps.

d. Install fuel drain adapter and snap fasteners.

e. Check to ensure cell is warm enough to be flexible and fold as necessary to fit through fuel cell access opening.

f. Place cell in compartment, develop it out to full size and attach fasteners, then reverse procedure outlined in the preceding paragraph for installation. Install all new gaskets when installing cell.

g. On aircraft equipped with long-range cells, install nylon vent tube inside cell, inserting tube through four hangers in top of cell. If a replacement cell is being installed, use nylon vent tube removed from old cell or order tube from applicable Parts Catalog.

h. When tightening screw-type clamps, apply a maximum of 20 pound-inches torque to clamp screws. No oil is to be applied to fittings prior to installation.

i. When installing filler adapter, cover plate and fuel quantity transmitter to the wing and fuel cell, tighten attaching screws evenly. The sealing or compression surfaces must be assembled when absolutely dry (NO SEALING PASTE IS TO BE USED).

j. After installation has been completed, cell should be inspected for final fit within compartment, making certain that cell is extended out to the structure and no corners are folded in.

k. The final inspection, prior to closing the cell, should be a close check to ensure that cell is free of foreign matter such as lint, dust, oil or any installation equipment. If a cell is not thoroughly clean, it should be cleaned with a lint-free cloth, soaked in water, alcohol or kerosene. NO OTHER SOLVENT SHALL BE USED.

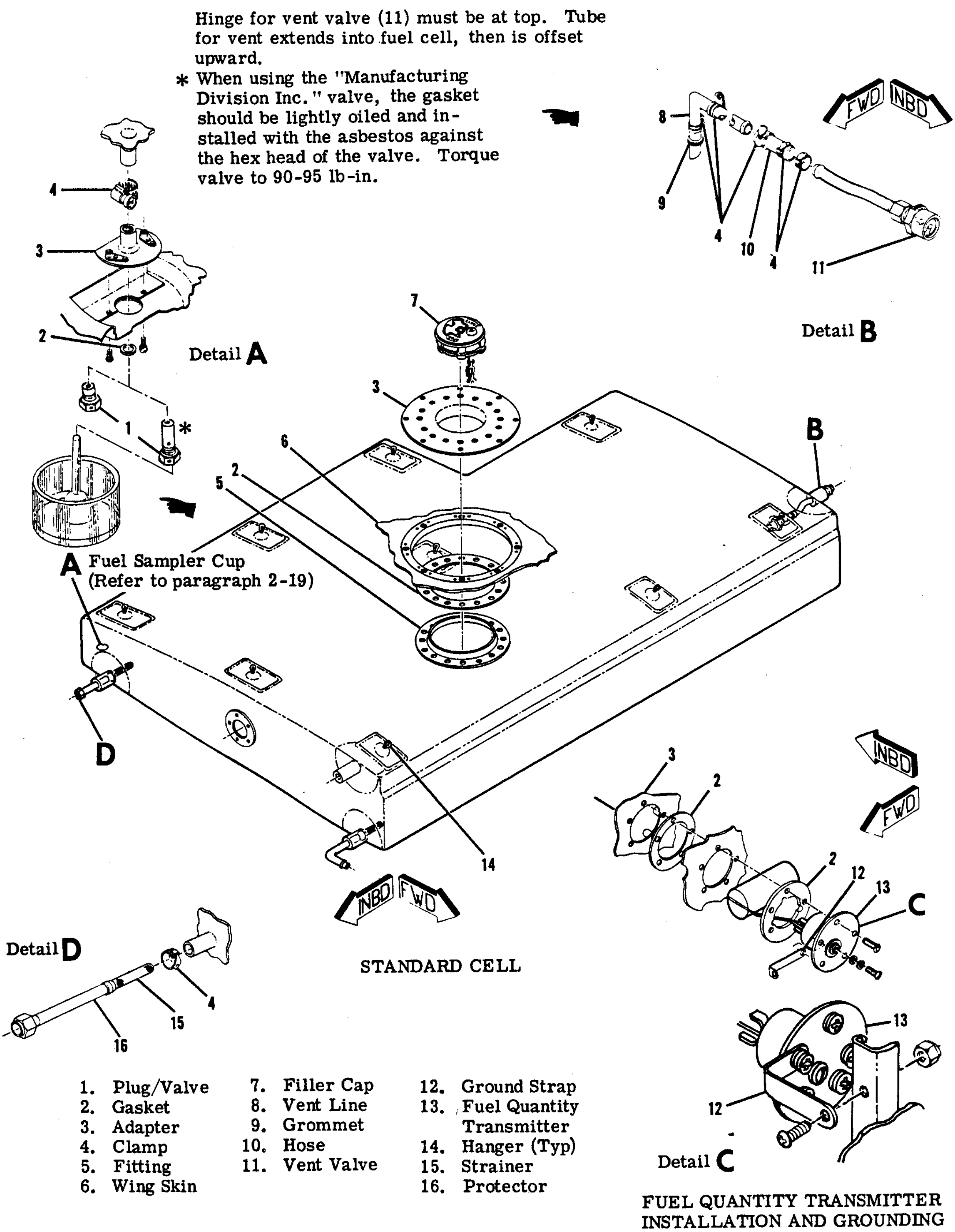
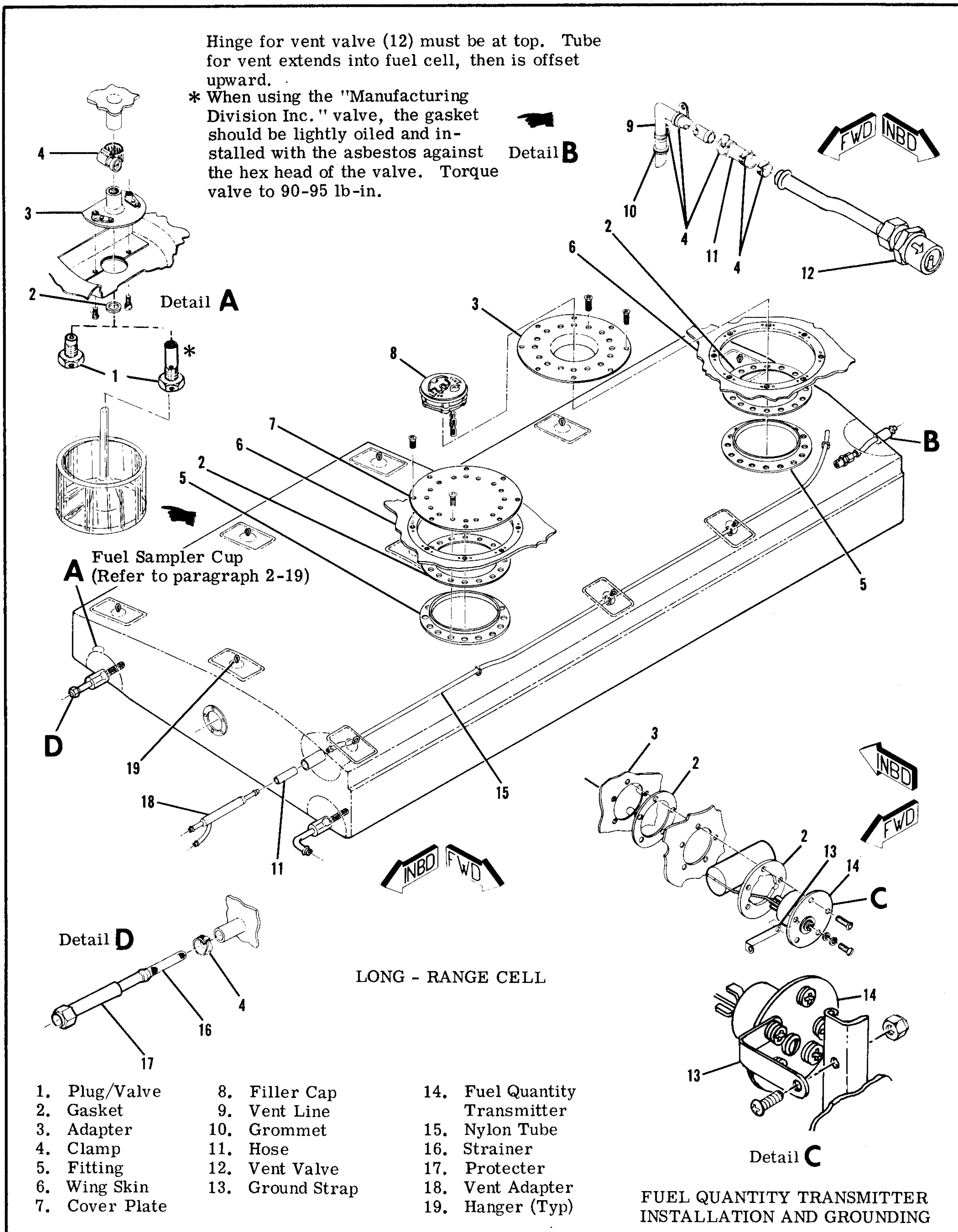


Figure 12-3. Fuel Cell Installation (Sheet 1 of 2)



Hinge for vent valve (12) must be at top. Tube for vent extends into fuel cell, then is offset upward.

* When using the "Manufacturing Division Inc." valve, the gasket should be lightly oiled and installed with the asbestos against the hex head of the valve. Torque valve to 90-95 lb-in.

1. Plug/Valve
2. Gasket
3. Adapter
4. Clamp
5. Fitting
6. Wing Skin
7. Cover Plate
8. Filler Cap
9. Vent Line
10. Grommet
11. Hose
12. Vent Valve
13. Ground Strap
14. Fuel Quantity Transmitter
15. Nylon Tube
16. Strainer
17. Protecter
18. Vent Adapter
19. Hanger (Typ)

Figure 12-3. Fuel Cell Installation (Sheet 2 of 2)

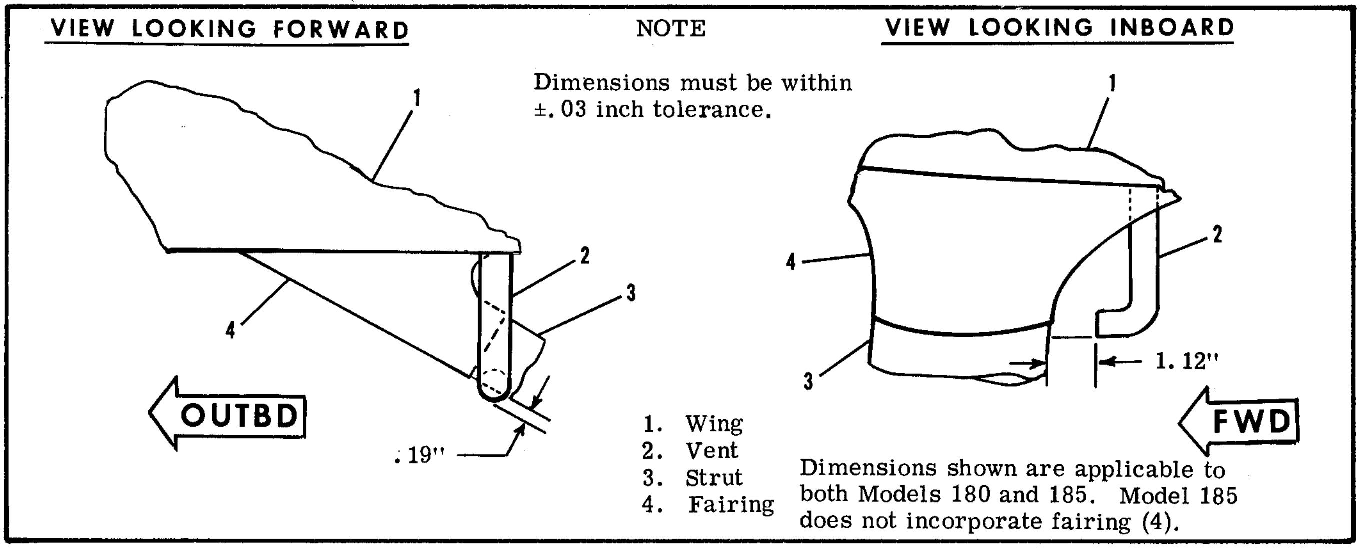


Figure 12-4. Fuel Vent Location

NOTE

Throughout the aircraft fuel system, from the cells to the carburetor or engine-driven fuel pump, use NS-40 (RAS-4) (Snap-On Tools Corp, Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite-Petrolatum) or equivalent compound as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system.

12-17. FUEL QUANTITY TRANSMITTERS.

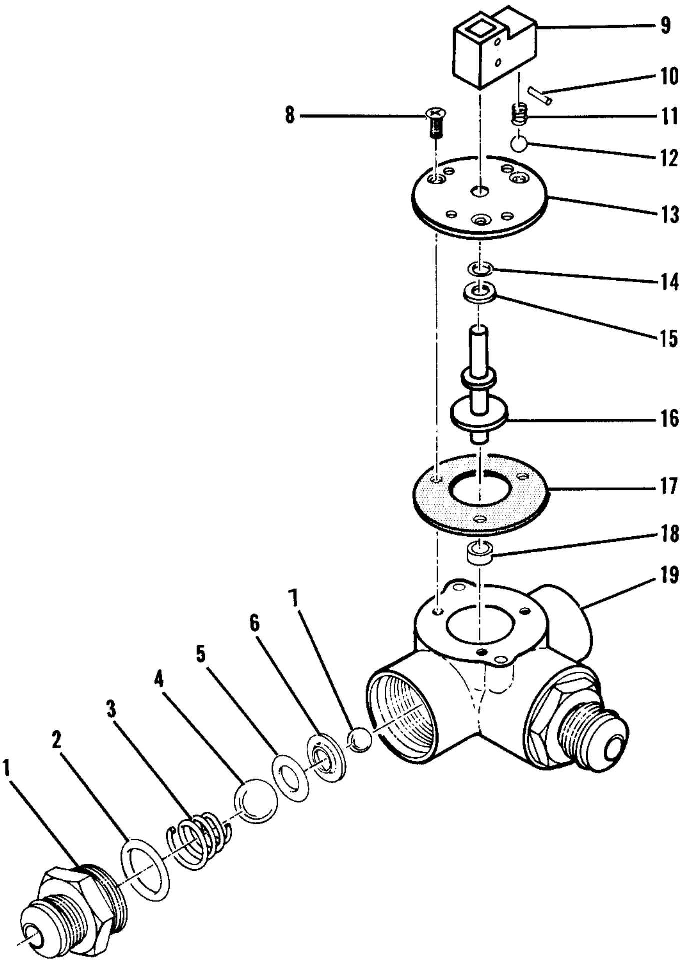
12-18. DESCRIPTION. Two fuel quantity indicators, located in a cluster on the instrument panel are actuated individually by an electric fuel quantity transmitter installed in each fuel cell. The transmitters consist of a float attached to a pivoted rod, one end of which is a rheostat wiper. The vertical 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.

12-19. REMOVAL AND INSTALLATION. Refer to Section 15 for removal and installation of the fuel quantity transmitter.

12-20. FUEL VENTS.

12-21. DESCRIPTION. A vent line is installed in the outboard end of each fuel cell. The vent line extends overboard down through the lower wing skin. The inboard end of the vent line extends into the fuel cell, then is offset downward from the cell upper surface. A vent valve is installed on the inboard end of the vent line inside the fuel cell, and a crossover line connects the cells together. On aircraft equipped with long-range cells, a nylon vent tube is attached to the crossover line at the inboard end of each cell. This vent tube extends into the fuel cell, and is suspended by hangers in the top of the cell.

12-22. CHECKING FUEL VENT. Field experience has demonstrated that fuel vents can become plugged, with possible fuel starvation of the engine, or collapse of fuel cells. Also, the bleed hole in the vent valve assembly could possible become plugged, allowing pressure from expanding fuel to pressurize the cells. The following procedure may be used to check the vent and bleed hole in the valve assembly.



1. Nipple	8. Screw	14. Retainer
2. O-Ring	9. Housing	15. Washer
3. Spring	10. Roll Pin	16. Cam
4. Ball	11. Spring	17. Gasket
5. O-Ring	12. Ball	18. Bushing
6. Retainer	13. Cover	19. Body
7. Ball		

Figure 12-5. Fuel Selector Valve

a. Attach a rubber tube to end of vent line under the wing.

b. Plug vent on opposite wing from one being tested.

c. Blow into rubber tube to pressurize cell. If air can be blown into fuel cell, vent line is open.

d. After fuel cell is slightly pressurized, insert end of tube into a container full of water and watch for a continuous stream of bubbles which indicates that bleed hole in valve assembly is open and relieving pressure.

e. Repeat procedure for opposite fuel cell.

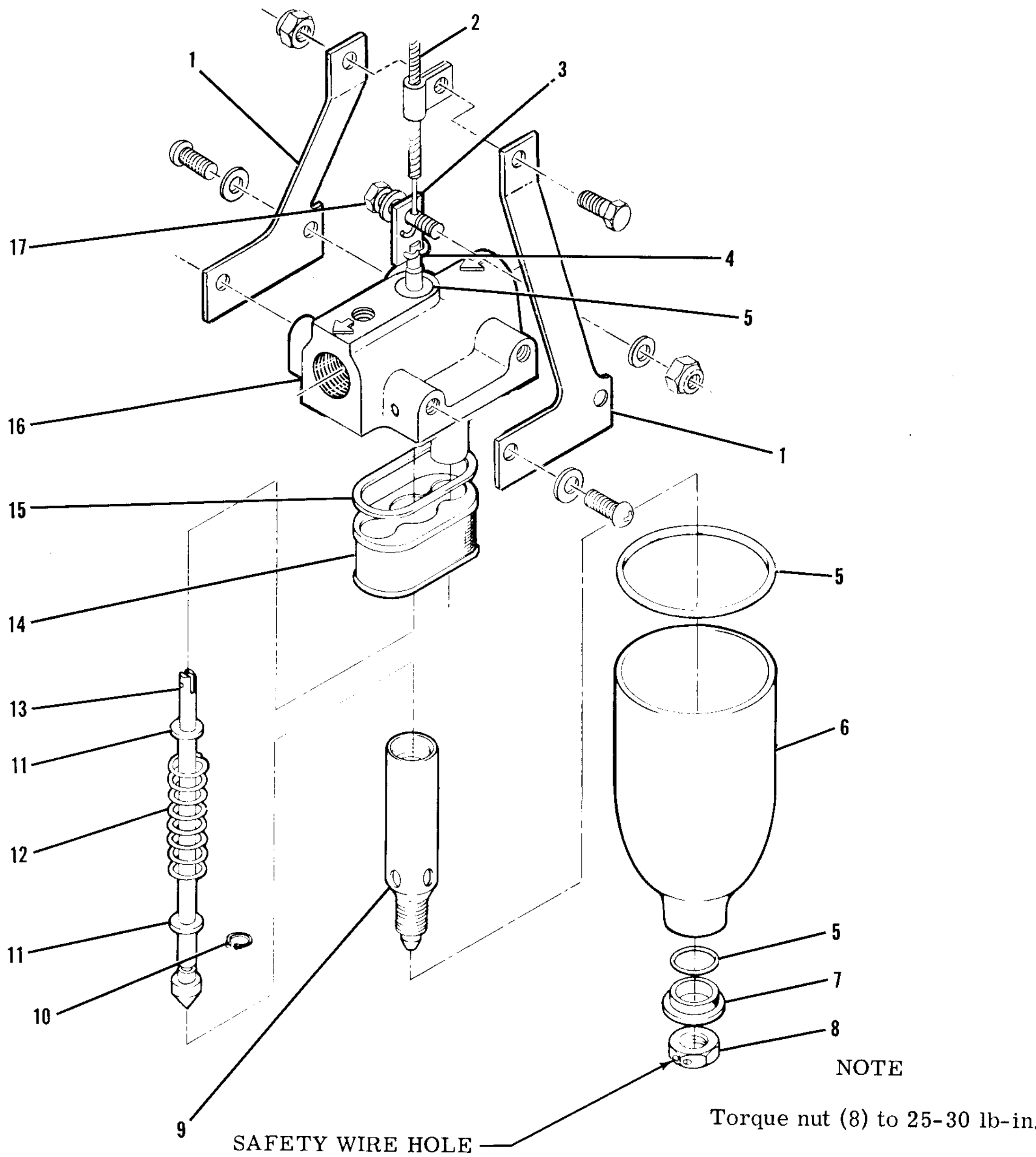
NOTE

Remember that a plugged vent or bleed hole can cause either fuel starvation and collapsing of fuel cells or the pressurizing of the cells by fuel expansion.

f. Any fuel vent found plugged or restricted must be corrected prior to returning the aircraft to service.

NOTE

The fuel vent line protruding beneath the wing near the wing strut must be correctly aligned to avoid possible icing of the vent tube. Dimensions are shown in figure 12-4.



1. Bracket
2. Strainer Drain Control
3. Plate
4. Cotter Pin
5. O-Ring
6. Bowl
7. Step Washer
8. Nut
9. Standpipe
10. Snap Ring
11. Washer
12. Spring
13. Plunger
14. Filter
15. Gasket
16. Top Assembly
17. Clamp Bolt

Figure 12-6. Fuel Strainer

12-23. FUEL SELECTOR VALVE.

12-24. DESCRIPTION. A four-position fuel selector valve is mounted beneath the floorboard between the pilot and copilot. The fuel selector handle protrudes through the tunnel cover. The fuel selector handle positions are "RIGHT TANK," LEFT TANK," "BOTH TANKS," and "OFF." Rotation of the valve handle actuates an attached cam which, during its rotation, lifts a microphoned steel ball from an O-ring seat, allowing fuel to flow. Further rotation reseats the ball, stopping fuel flow.

12-25. REMOVAL AND INSTALLATION.

a. Completely drain all fuel from fuel cells, fuel strainer, fuel lines and selector valve.

b. Remove tunnel cover rectangular access plate and access plate on bottom of fuselage adjacent to

selector valve.
c. Disconnect and cap or plug all fuel lines at selector valve.
d. Disconnect handle shaft from valve.
e. Remove screws attaching valve to structure, and remove valve.
f. Reverse preceding steps to install selector valve.

NOTE

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

12-26. REPAIR. Fuel selector valve repair consists of replacement of seals, springs, balls, and other detail parts. Figure 12-5 shows the proper relationship of parts and may be used as a guide during selector valve disassembly and assembly.

12-27. FUEL STRAINER.

12-28. DESCRIPTION. A fuel strainer is mounted on the forward side of the firewall, in the engine compartment. The strainer is equipped with a drain valve control which is accessible through the oil dipstick access door in the upper engine cowl.

12-29. FUEL STRAINER REMOVAL.
a. Turn off fuel selector valve, and drain strainer.
b. Disconnect and cap lines and hoses at strainer.
c. Disconnect strainer drain control at strainer.
d. Remove mounting bolts, and remove strainer.

12-30. DISASSEMBLY, ASSEMBLY, AND INSTALLATION. (See figure 12-6.)
a. Remove drain tube, safety wire, nut and washer at bottom of filter bowl, and remove bowl.
b. Carefully unscrew standpipe, and remove.
c. Remove filter screen and gasket. Wash filter screen and bowl with solvent (Federal Specification P-S-661, or requivalent) and dry with compressed air.
d. Using a new gasket between filter screen and top assembly, install screen and standpipe. Tighten standpipe only finger tight.
e. Using all new O-rings, install bowl. Note that stepwasher at bottom of bowl is installed so that step seats against O-ring. Connect drain tube.
f. Install strainer by reversing procedures outlined in paragraph 12-29.
g. Turn on fuel selector valve, close strainer drain, and check for leaks. Check for proper operation of strainer drain control.
h. Safety wire bottom nut to top assembly. Wire must have right-hand wraps, at least 45 degrees.

12-31. PRIMER SYSTEMS.

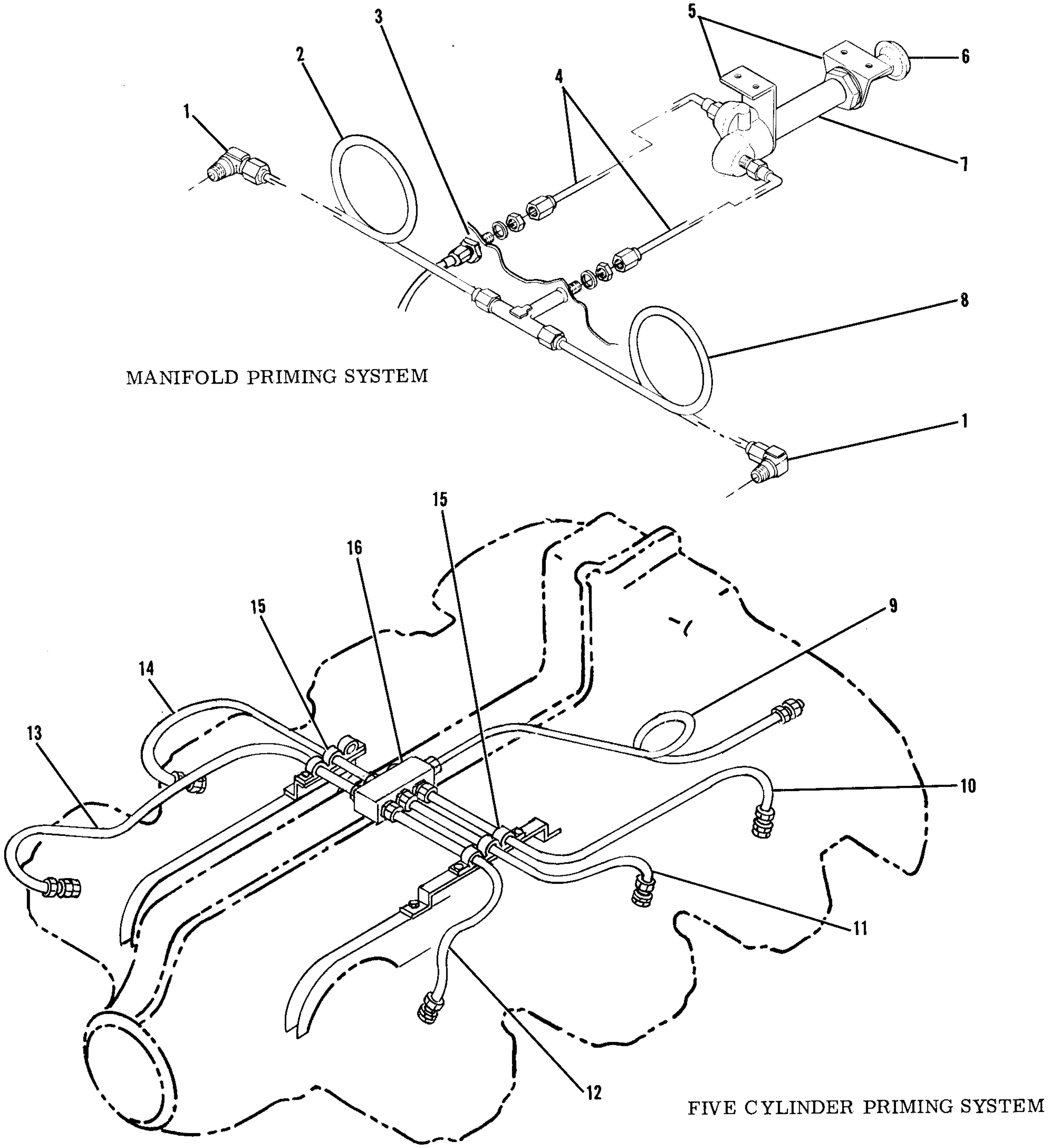
12-32. DESCRIPTION. A manually-operated primer pump is located at the instrument panel. Fuel is supplied by a line from the fuel strainer to the plunger-type primer. Operating the primer forces fuel to the engine. Primer system installations are shown in figure 12-7. Replacement of the primer is accomplished by disconnecting the fuel lines at the primer, and removing the primer from the instrument panel. Before installing a primer, check it for correct pumping action and positive fuel shut-off in the locked position. Primer lines should be replaced when crushed or broken and should be properly clamped to prevent fatigue due to vibration and chafing.

12-32A. REFUELING PROVISIONS. (Refer to figure 5-7A.)

12-32B. DESCRIPTION. Fueling steps and assist handles are available for installation on Model 180 aircraft. Steps are mounted on the wing struts. These provisions are incorporated to aid in refueling the aircraft.

12-32C. REMOVAL AND INSTALLATION. (Refer to figure 5-7A.) The figure illustrates refueling provisions and may be used as a guide during removal and installation of components.

SHOP NOTES:



1. Priming Jet Elbow
2. Right Hand Primer Line
3. Union
4. Primer Line
5. Bracket
6. Primer Knob
7. Hand Primer
8. Left Hand Primer Line
9. Distributor-to-Baffle Line
10. No. 2 Cylinder Line
11. No. 4 Cylinder Line
12. No. 6 Cylinder Line
13. No. 5 Cylinder Line
14. No. 3 Cylinder Line
15. Clamp
16. Fuel Distributor

Figure 12-7. Fuel Primer Installations

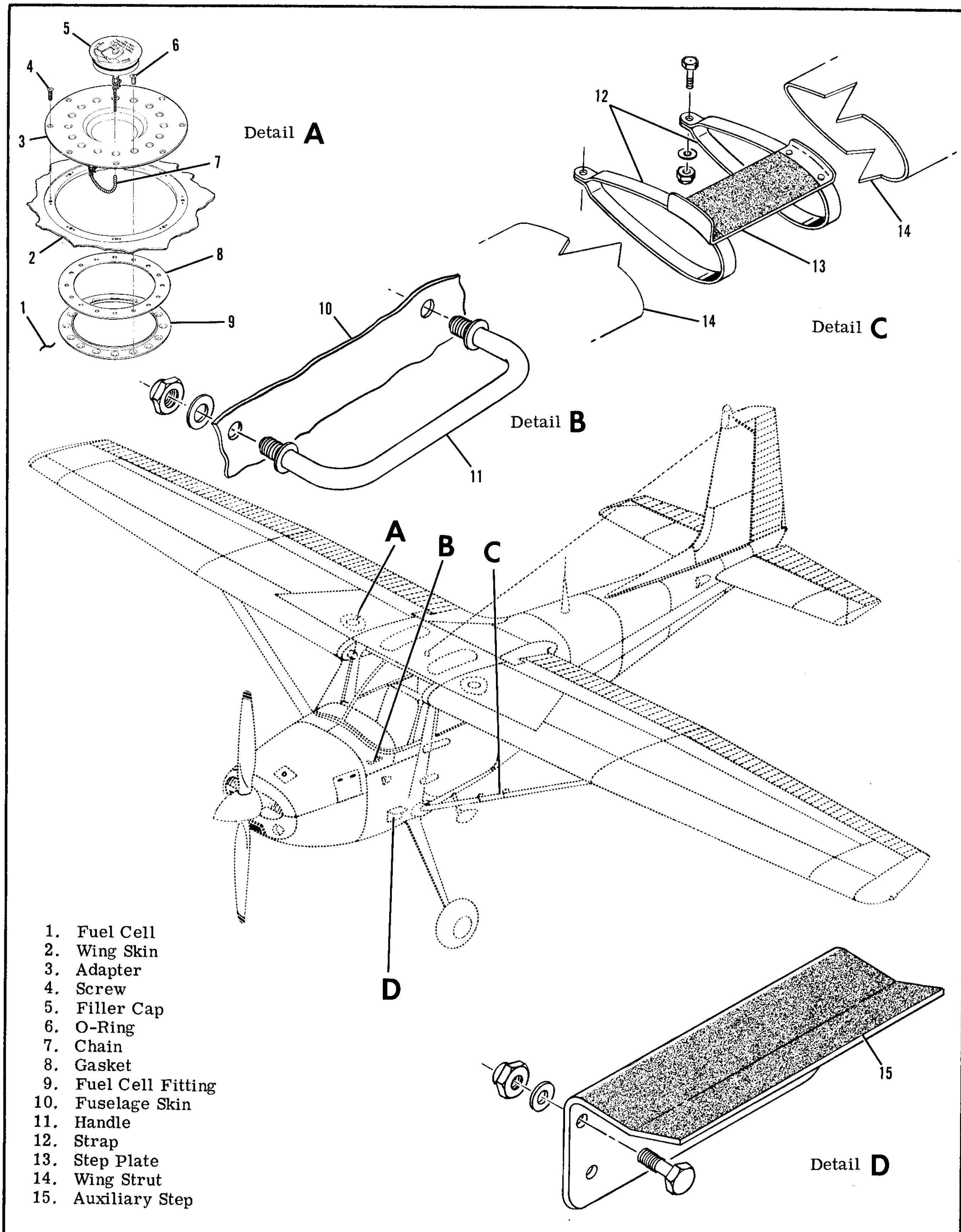


Figure 5-7A. Refueling Provisions (M0del 180)

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PART 2

12-33. SKYWAGON A185-SERIES FUEL SYSTEMS.

12-34. DESCRIPTION. Skywagon A185-Series aircraft are equipped with either a standard fuel system employing an ON-OFF shut-off valve, or an optional system utilizing a three-position fuel selector valve and an ON-OFF shut-off valve. On the standard system, fuel flows by gravity from front and rear outlets in each fuel cell through lines down the front and rear cabin door posts on both sides of the aircraft. These lines connect to tees below the floorboard. From each tee, a single line carries fuel through an accumulator tank, an ON-OFF valve, a fuel strainer, through an electric auxiliary fuel pump to the engine-driven fuel pump. A fuel line drain valve is located in the lowest point of the fuel supply lines on both sides of the aircraft. On the optional system, fuel flows by gravity from front and rear outlets in each fuel cell through lines down the front and rear cabin door posts on both sides of the aircraft. These lines connect to tees below the floorboard. From each tee, a single line carries fuel to a fuel selector valve. From the selector valve, a single line carries the fuel through an accumulator tank, an ON-OFF valve, a fuel strainer, through an electric auxiliary fuel pump, to the engine-driven fuel pump. A fuel line drain valve is located in the lowest point of the fuel supply lines on both sides of the aircraft.

12-35. PRECAUTIONS.

NOTE

There are certain general precautions and rules concerning the fuel system which should be observed when performing the operations and procedures in this section. These are as follows:

a. During all fueling, defueling, tank purging, and tank repairing or disassembly, ground the aircraft to a suitable ground stake.
b. Residual fuel draining from lines and hoses constitutes a fire hazard. Use caution to prevent the accumulation of fuel when lines or hoses are disconnected.
c. Cap open lines and cover connections to prevent thread damage and the entrance of foreign matter.

NOTE

Throughout the aircraft fuel system, from the cells to the engine-driven fuel pump, use NS-40 (RAS-4) (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread compound, Antiseize, Graphite-Petrolatum) or equivalent compound as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel soluble lubricant, such as engine lubricating oil, on fitting threads. Do not use any other form of thread compound on the injection system.

12-36. TROUBLE SHOOTING.

NOTE

This trouble shooting chart should be used in conjunction with the trouble shooting chart in Section 11 and paragraph 12-4.

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 cells empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Defective fuel selector valve.	Remove and repair or replace selector valve.
	Plugged fuel strainer.	Clean strainer and screen.
	Defective check valve in electric fuel pump.	Repair or replace electric pump.
	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 or fuel injection system.	Refer to Section 11.
	Fuel vents plugged.	See paragraph 12-20.
	Water in fuel.	Drain fuel cell sumps, fuel lines, and fuel strainer.
NO FUEL FLOW WHEN ELECTRIC PUMP IS TURNED ON.	Defective fuel pump switch.	Replace defective switch.
	Defective throttle 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.
	Defective engine-driven fuel pump by-pass or defective fuel injection system.	Refer to Section 11.
NO FUEL QUANTITY INDICATION.	Fuel cells empty.	Service with proper grade and amount of fuel.

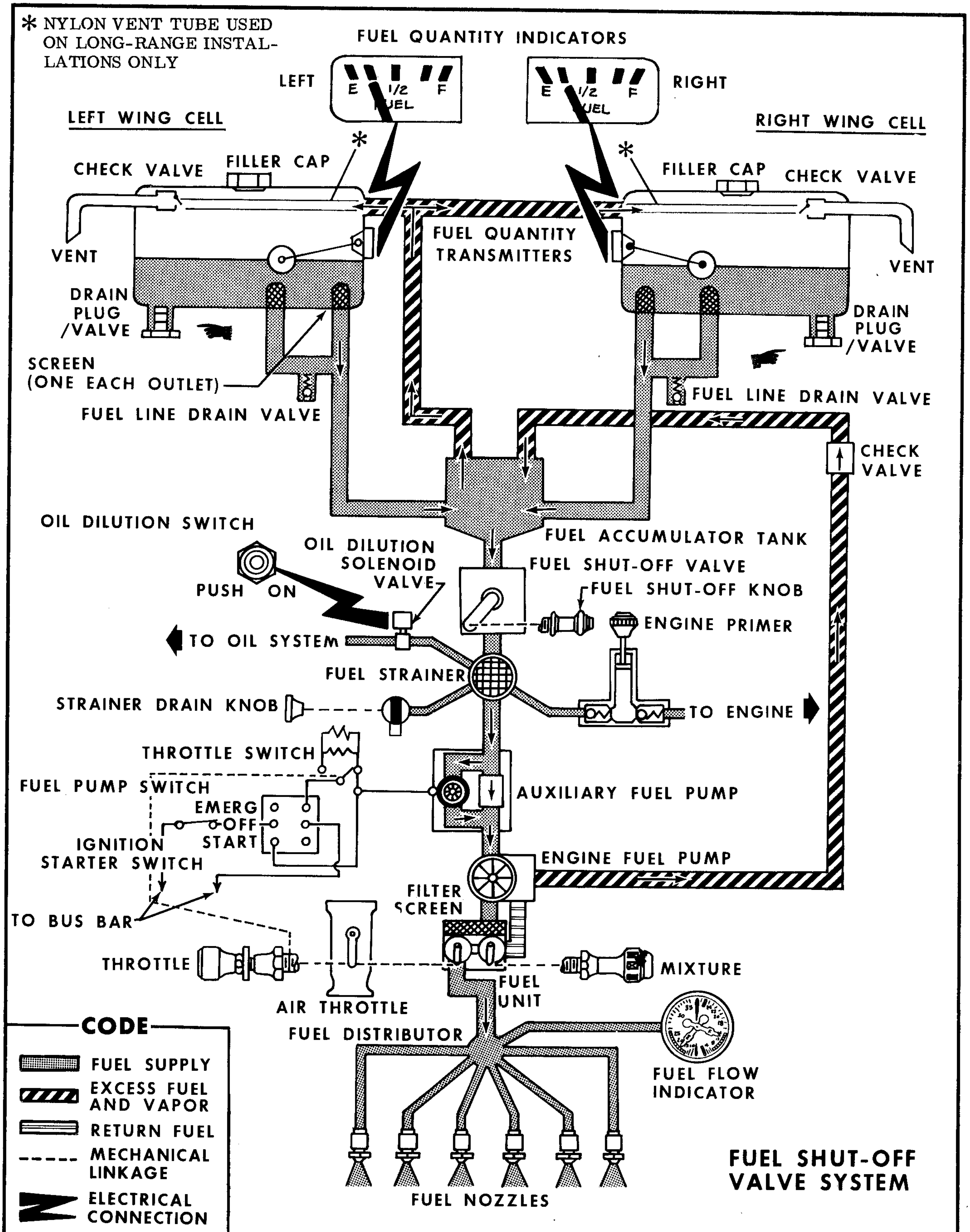
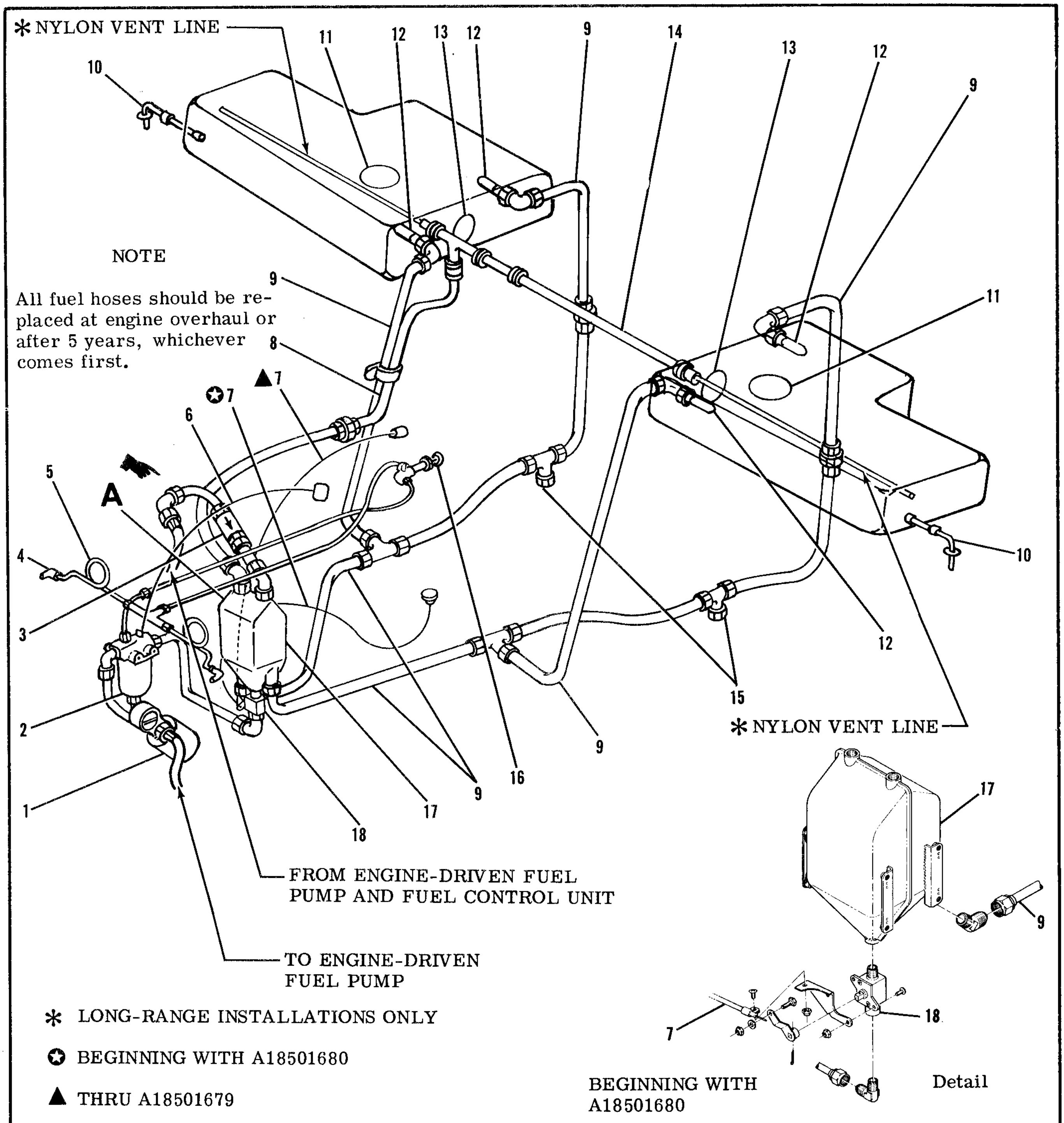


Figure 12-8. Fuel System Schematic



1. Electric Auxiliary Fuel Pump
2. Fuel Strainer
3. Check Valve
4. Priming Jet Elbow
5. Primer Line
6. Strainer Drain Control
7. Fuel Shut-Off Control
8. Fuel and Vapor Return Line
9. Fuel Supply Line
10. Vent Line
11. Fuel Filler Opening
12. Finger Strainer
13. Fuel Quantity Transmitter Opening
14. Vent Line (Crossover)
15. Fuel Line Drain Valve
16. Primer
17. Fuel Accumulator Tank
18. Fuel Shut-Off Valve

FUEL SHUT-OFF VALVE SYSTEM

Figure 12-9. Fuel System

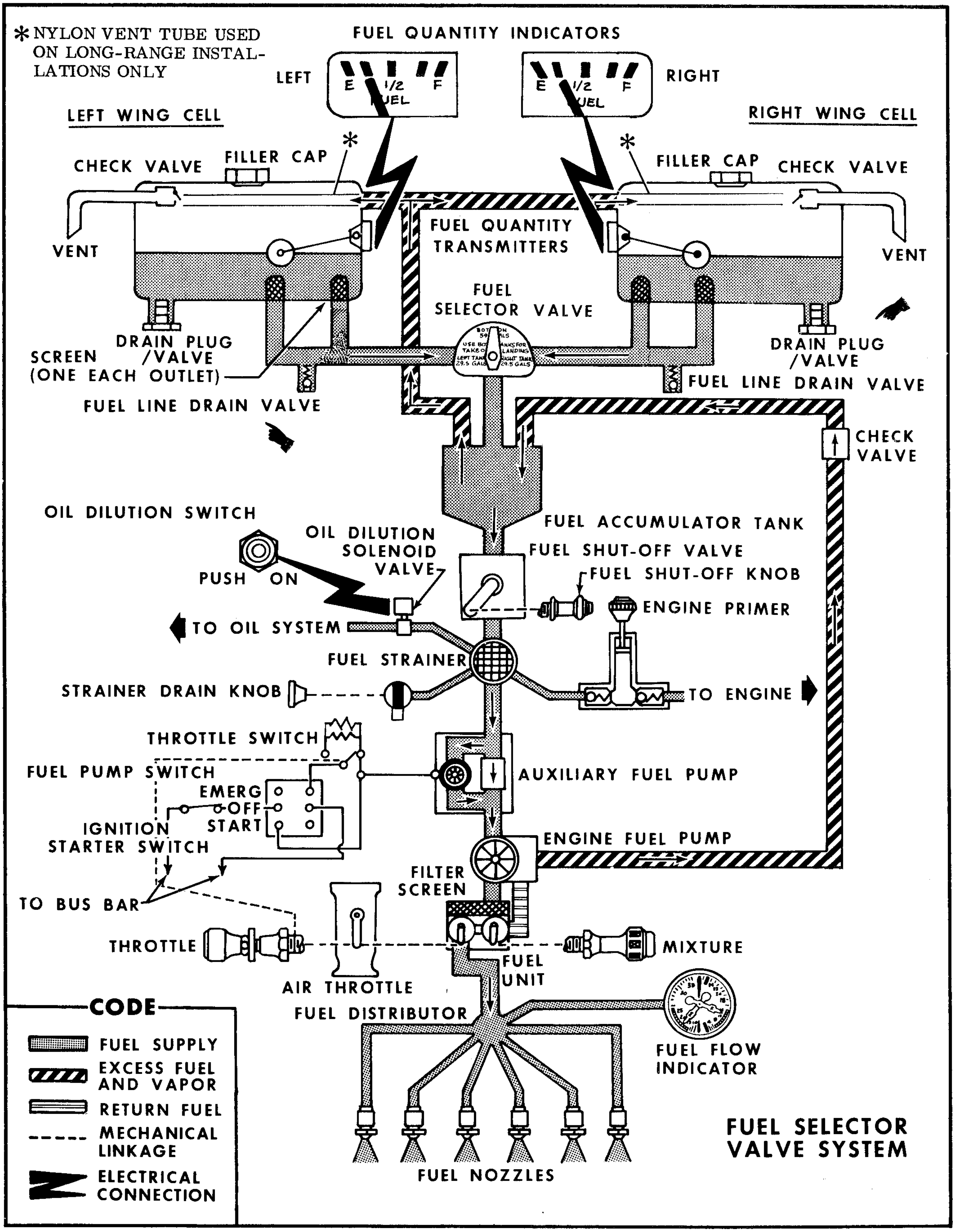
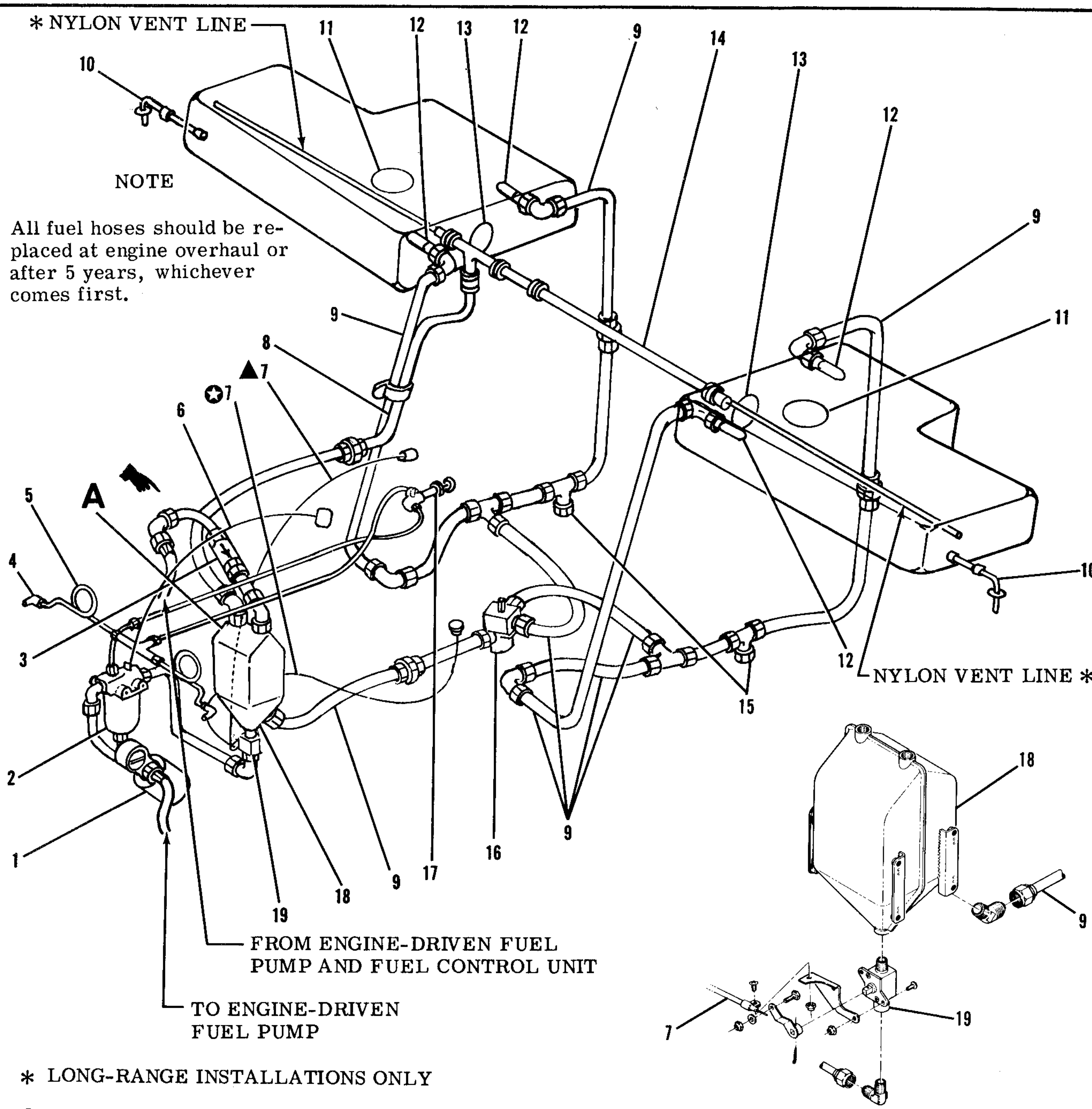


Figure 12-10. Fuel System Schematic



* LONG-RANGE INSTALLATIONS ONLY

✪ BEGINNING WITH A18501680

▲ THRU A18501679

Detail **A** BEGINNING WITH A18501680

1. Electric Auxiliary Fuel Pump
2. Fuel Strainer
3. Check Valve
4. Priming Jet Elbow
5. Primer Line
6. Strainer Drain Control
7. Fuel Shut-Off Control
8. Fuel and Vapor Return Line
9. Fuel Supply Line
10. Vent Line
11. Fuel Filler Opening
12. Finger Strainer
13. Fuel Quantity Transmitter Opening
14. Vent Line (Crossover)
15. Fuel Line Drain Valve
16. Selector Valve
17. Primer
18. Fuel Accumulator Tank
19. Fuel Shut-Off Valve

FUEL SELECTOR VALVE SYSTEM

Figure 12-11. Fuel System

12-37. FUEL CELLS.

12-38. The information contained in paragraphs 12-5 through 12-16 also applies to the Skywagon Model A185-Series.

12-39. FUEL ACCUMULATOR TANK. (See figures 12-9 and 12-11.)

12-40. DESCRIPTION. The fuel accumulator tank is mounted on the aft side of the firewall. In the standard fuel system, fuel from the wing fuel cells flows directly into the fuel accumulator tank. In the selector valve system, fuel flows from the wing fuel cells, through the selector valve, to the accumulator tank. Vapor and excess fuel from the engine-driven fuel pump and fuel control unit are returned to the wing fuel cells by way of the fuel accumulator tank.

12-41. REMOVAL.
a. Drain fuel from wing fuel cells and fuel strainer.
b. Remove tailwheel lock control knob.
c. Remove cover off stabilizer and rudder trim controls.
d. Peel up carpeting as required, and remove screws attaching tunnel cover, and remove cover. Cover will have to be worked over flap lever.
e. Collapse right hand rudder pedals, if installed.
f. Remove access plate in belly skin, immediately under accumulator tank.
g. Pull back control, and install control lock.
h. Disconnect arm of shut-off valve at the valve.

NOTE

Arm of shut-off valve will be more easily installed than the control wire due to limited working space.

i. Disconnect fuel lines at accumulator tank.
j. Remove four bolts attaching tank to tunnel walls.
k. Remove fuel accumulator tank.

12-42. INSTALLATION.
a. Reverse steps outlined in paragraph 12-41 to install accumulator tank.
b. If a new tank is to be installed, be sure to clock fittings in same position as those on tank being removed.
c. Close fuel strainer drain and refuel wing fuel cells.
d. Check system for fuel leaks and positive fuel shut-off with valve in OFF position.

12-43. FUEL QUANTITY TRANSMITTERS.

12-44. The information contained in paragraphs 12-17 through 12-19 also applies to the Skywagon Model A185-Series.

12-45. FUEL VENTS.

12-46. The information contained in paragraphs 12-20 through 12-22 and figure 12-4 also applies to the Skywagon A185-Series.

12-47. FUEL SHUT-OFF VALVE.

12-48. DESCRIPTION. An on-off type fuel valve is mounted on the bottom of the fuel accumulator tank at the firewall. A push-pull control mounted on the instrument panel operates the fuel shut-off valve. See figure 12-12.

12-49. REMOVAL.
a. Completely drain all fuel from wing fuel cells, fuel strainer, fuel lines, and shut-off valve.
b. Remove access plate from underside of fuselage below shut-off valve.
c. Remove pin attaching valve handle to valve and remove handle.
d. Disconnect and cap or plug fuel line at shut-off valve.
e. Screw valve from bottom of accumulator tank.

12-50. INSTALLATION.
a. Reverse steps outlined in paragraph 12-49 to install fuel shut-off valve.
b. Observe note in paragraph 12-35 when installing fuel lines and fittings.
c. Close fuel strainer drain and refuel wing fuel cells.
d. Check system for fuel leaks and positive fuel shut-off with valve in OFF position.

12-51. FUEL SELECTOR VALVE.

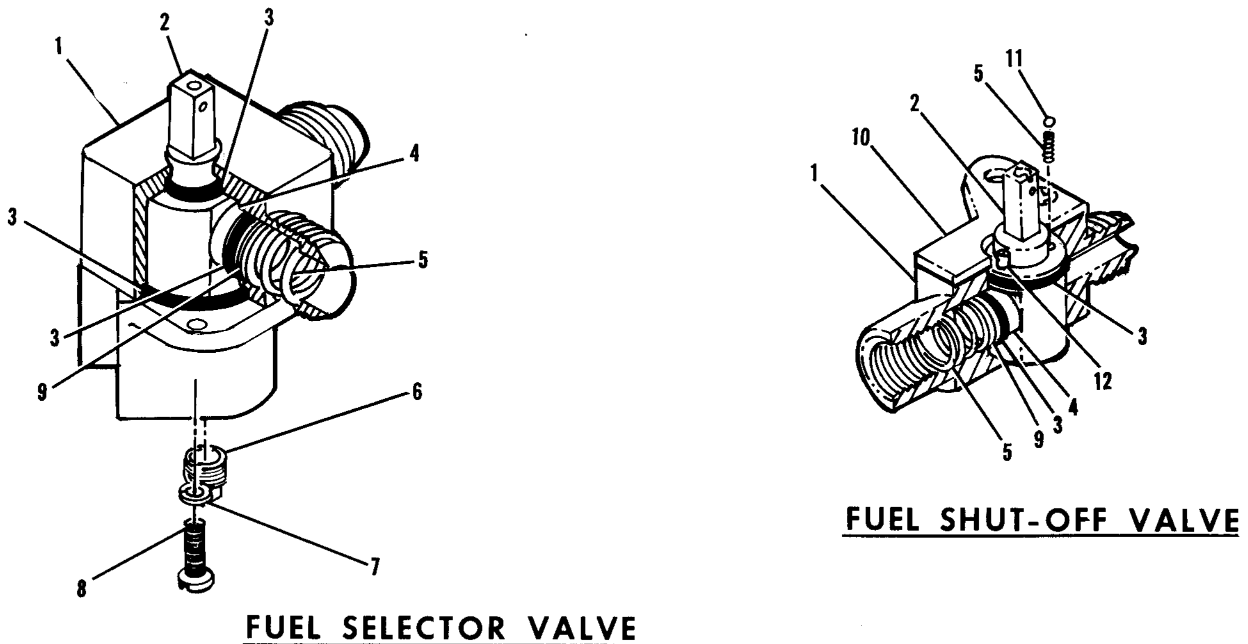
12-52. DESCRIPTION. A three-position fuel selector valve may be installed in the aft tunnel area between the pilot and copilot seats. This valve allows more positive fuel selection for more accurate fuel control. The fuel selector valve is used in conjunction with the fuel shut-off valve. See figure 12-12.

12-53. REMOVAL.
a. Completely drain all fuel from wing fuel cells, fuel strainer, fuel lines, fuel selector, and shut-off valve.
b. Remove fuel selector handle, tunnel cover rectangular access plate and access plate on bottom of fuselage adjacent to selector valve.
c. Disconnect and cap or plug all fuel lines at selector valve.
d. Remove screws attaching valve to structure and remove valve.

12-54. INSTALLATION.
a. Reverse steps outlined in paragraph 12-53 to install fuel selector valve.
b. Observe note in paragraph 12-35 when installing fuel lines and fittings.
c. Close fuel strainer drain and refuel wing fuel cells.
d. Start up engine.
e. Operate engine on each fuel cell position long enough to ensure the selector valve functions properly.

12-55. FUEL STRAINER.

12-56. The information contained in paragraphs 12-27 through 12-30 also applies to the Skywagon Model A185-Series.



1. Body
2. Rotor
3. O-Ring
4. Seal
5. Spring
6. Plug
7. Lockwasher
8. Screw
9. Washer
10. Cover
11. Ball
12. Roll Pin

Figure 12-12. Fuel Valves

12-57. PRIMER SYSTEMS.

12-58. DESCRIPTION. A manually-operated primer pump is located at the instrument panel. Fuel is supplied by a line from the fuel strainer to the plunger-type primer. Operating the primer forces fuel to the engine. The manifold priming system illustrated in figure 12-7 is applicable to the Skywagon Model A185-Series. Replacement of the primer is accomplished by disconnecting the fuel lines at the primer, and removing the primer from the instrument panel. Before installing a primer, check it for correct pumping action and positive fuel shut-off in the locked position. Primer lines should be replaced when crushed or broken and should be properly clamped to prevent fatigue due to vibration and chafing.

12-59. ELECTRIC AUXILIARY FUEL PUMP.

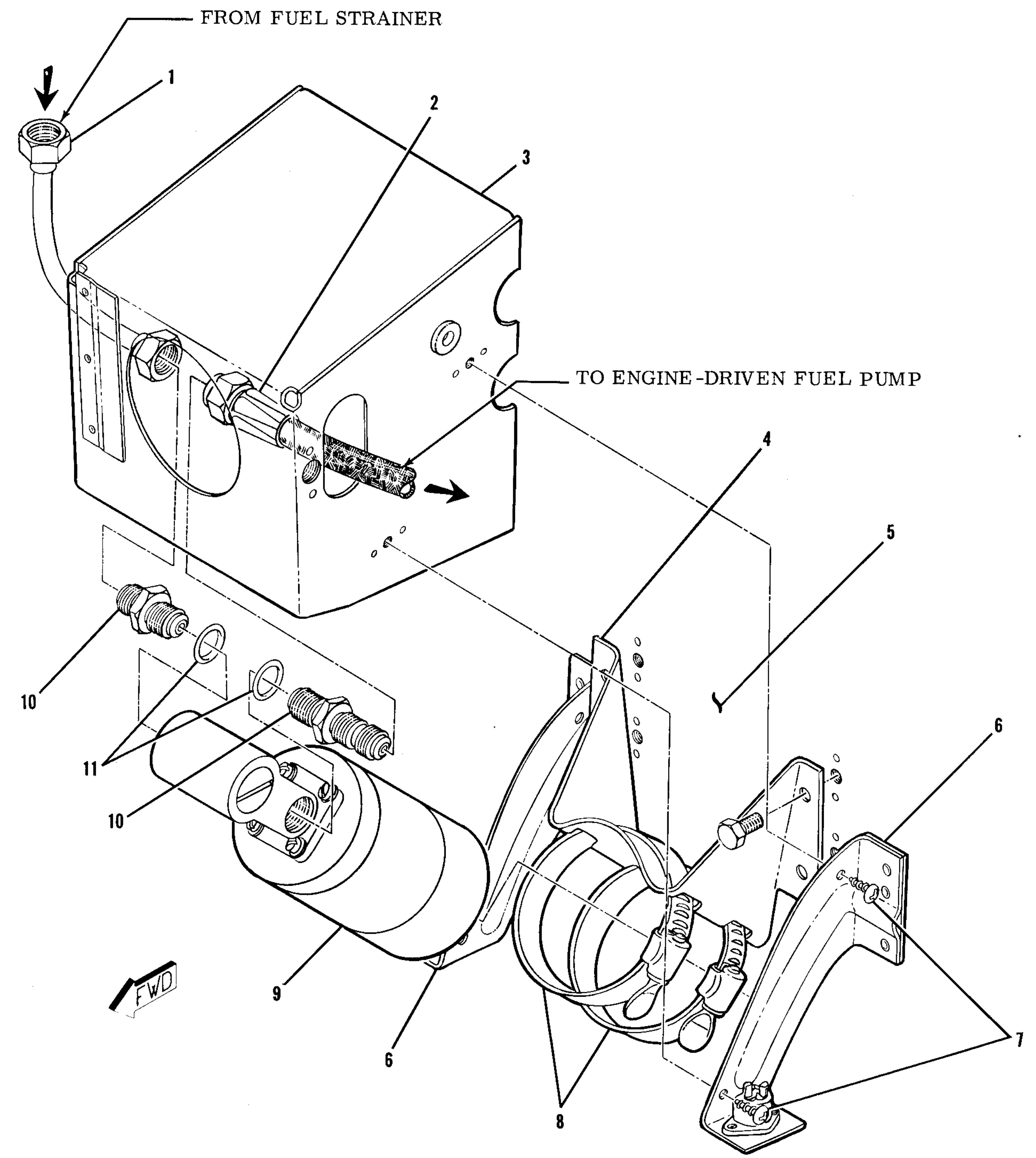
12-60. DESCRIPTION. Skywagon Model A185-Series aircraft are equipped with a 35 gallon-per-hour electric auxiliary fuel pump which supplies a pressure of 23-24 psi when powered by 14 vdc. The pump is mounted on the forward side of the firewall in the engine compartment, and is enclosed by a cooling shroud. An integral bypass and check valve permits fuel flow through the pump even when the pump is not operating, but permits reverse flow. A separate overboard drain line from the pump prevents entry of fuel into the electric motor, in the event of an internal leak.

12-61. ELECTRIC FUEL PUMP CIRCUIT. (Thru 18502090) (Refer to figures 12-8 and 12-10.) The electric auxiliary fuel pump supplies fuel flow for starting and for engine operation if the engine-driven fuel pump should fail. The pump is controlled by the auxiliary fuel pump switch, mounted on the left-hand stationary panel. The switch is a three-position toggle switch. The down position, labeled "START," is used for starting the engine. With the switch in this position and the ignition-starter switch turned to "START," the auxiliary fuel pump will operate at a low flow rate (providing proper fuel mixture for starting) as the engine is being turned over with the starter.

NOTE

> The auxiliary fuel pump will not operate in the "START" position until the ignition switch is turned to the "START" position.

The up position of the switch, entitled "EMER," is used for engine operation if the engine-driven pump should fail, or for vapor purging in extremely hot weather. When the switch is in this position, the pump operates at one of two flow rates, depending upon the setting of the throttle. With the throttle at a cruise setting, the pump is operating at maximum capacity, supplying sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the auxiliary fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these



1. Fuel Line
2. Fuel Hose
3. Pump Cooling Box
4. Pump Support Bracket
5. Firewall
6. Lower Cowl Support Bracket
7. Screws
8. Clamps
9. Electric Auxiliary Fuel Pump
10. Union
11. O-Rings

Figure 12-13. Auxiliary Electric Fuel Pump Installation periods of reduced engine speed. The auxiliary fuel pump is not to be turned on "EMER" during normal operation, because, with the engine-driven pump functioning, a fuel/air ratio considerably richer than the best power is produced. If fuel vapor is affecting engine operation, the vapor may be purged by turning the auxiliary pump switch to "EMER" and leaning the mixture as required to prevent excessively rich mixture. Successful vapor purging is evidenced by smooth engine operation and steady and normal fuel flow indications with the auxiliary fuel pump switch "OFF."

CAUTION

If the auxiliary fuel pump switch is accidentally turned to "EMER" (with master switch on) with the engine stopped, the intake manifolds will be flooded.

The center position of the auxiliary fuel pump switch is "OFF."

12-62. RIGGING THROTTLE-OPERATED MICROSWITCH. (Thru 18502090) Model A185 aircraft are equipped with a throttle-operated microswitch which slows down the electric fuel pump whenever the throttle is retarded while the electric pump is being used. The microswitch should slow down the pump as the throttle is retarded to approximately 16 inches of mercury manifold pressure.

a. Start engine and set throttle to obtain 16 inches of mercury manifold pressure. Carefully mark throttle position, then stop engine.

NOTE

The throttle may be maintained in this position if desired, because the engine may be stopped by use of the mixture control and ignition switch.

b. Loosen screws on the throttle microswitch (located on induction airbox) and adjust microswitch as required to cause the electric fuel pump to slow down as the throttle is retarded to the marked position. With master switch "ON," auxiliary fuel pump in "HIGH" or "EMERGENCY," and mixture control in "IDLE CUT-OFF," listen for change in sound of electric fuel pump as it slows down (16±1 inches of mercury).

12-63. ELECTRIC FUEL PUMP CIRCUIT. (18502091 thru 18502310). The fuel pump switch is a split-rocker type; the right half positions are "HI," "LO" and off and the left positions are "MAX HI" and off. The right half of the switch incorporates an intermediate "LO" position used for normal starting and a "HI" position (when the top of the switch is fully depressed) for vapor purging during hot engine starts. The "MAX HI" position of the left half of the switch is available for emergency high-power operation with an inoperative engine-driven fuel pump. If necessary, it also may be used to purge vapor in "heat soaked" fuel lines prior to starting a hot engine on the ground. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded "MAX HI" position. In the "MAX HI" position, an interlock within the switch automatically trips the right half of the switch to its "HI" position. When the spring-loaded left half of the switch is released, the right half will remain in the "HI" position until manually released to the off position. With the right half of the switch in the "LO" position, and the ignition-starter switch turned to "START," the auxiliary fuel pump will operate at a low flow rate (providing proper fuel mixture for starting) as the engine is being turned over with the starter.

NOTE

The auxiliary fuel pump will not operate in the "LO" position until the ignition switch is turned to "START."

With the right half of the switch in the "HI" position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump is operating at a high capacity to supply sufficient flow to maintain flight). When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. When the engine-driven fuel pump is functioning and the auxiliary fuel pump is turned on "HI," a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned.

12-64. RIGGING THROTTLE-OPERATED MICROSWITCH. (18502091 thru 18502565.)

NOTE

These settings must be established during ground run-up only. These values will not apply in flight.

a. With engine running, advance throttle to obtain over 20 inches of mercury manifold pressure.

b. Slowly retard throttle and mark 20 inches of mercury manifold pressure throttle position.

c. Stop engine and set throttle switch to actuate when passing from high throttle setting through the 20 inches of mercury manifold pressure mark.

12-65. AUXILIARY ELECTRIC FUEL PUMP RATE ADJUSTMENT. (ADJUSTMENT OF VARIABLE RESISTORS.) (18502091 thru 18502565).

a. Turn engine "OFF."

b. Place yellow rocker switch in "HIGH BOOST" position.

c. Apply 27.5 VDC applied to buss.

d. Place throttle to FULL THROTTLE position.

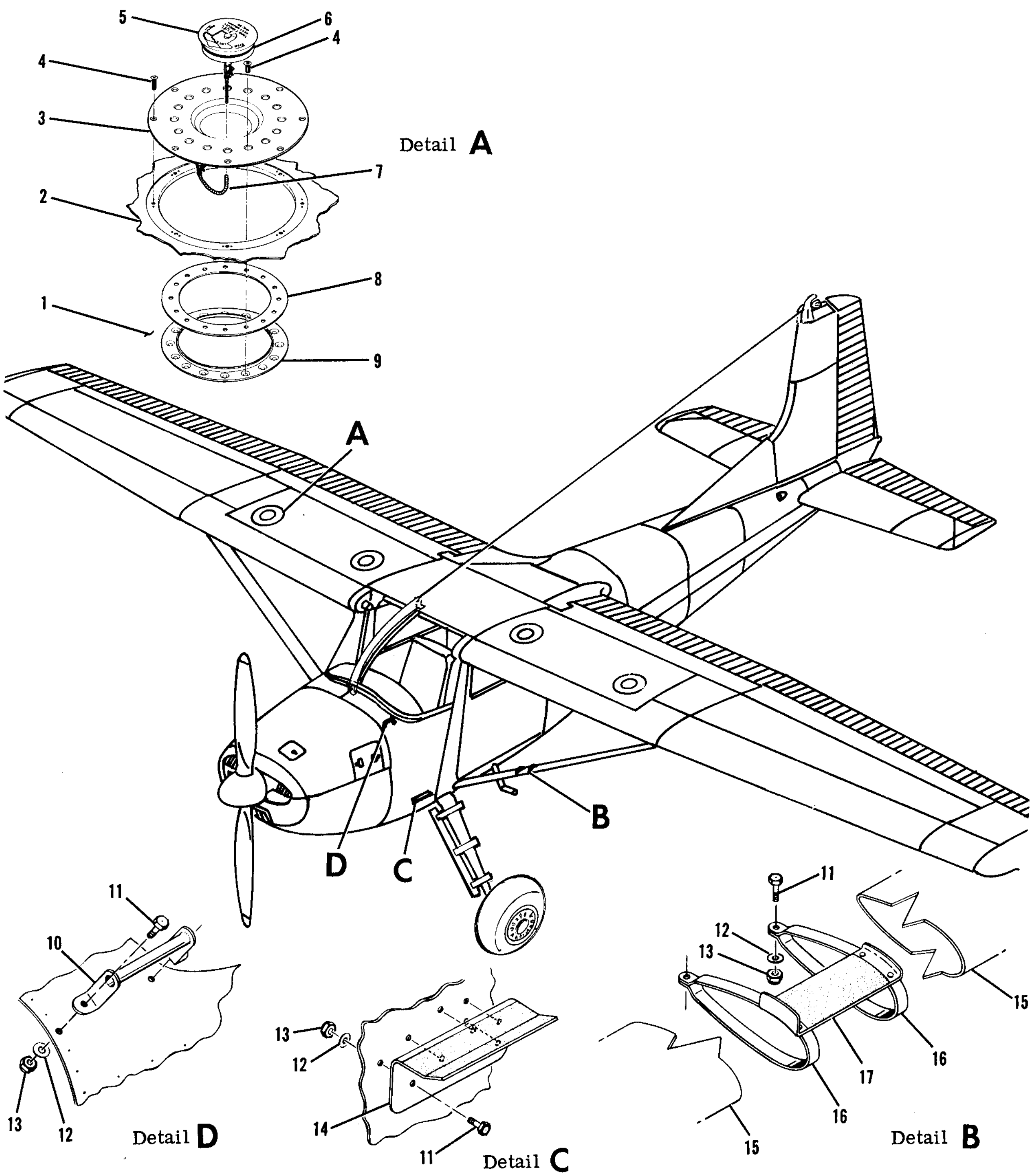
e. Adjust first resistor to produce 125 lb/hr indication on fuel flow meter.

f. Close throttle.

g. Adjust second resistor to produce 40 lb/hr indication on fuel flow meter.

NOTE

Resistors are in series when throttle is closed.



1. Fuel Cell
2. Wing Skin
3. Adapter
4. Screw
5. Filler Cap
6. O-Ring
7. Chain
8. Gasket
9. Fuel Cell Fitting
10. Handle
11. Bolt
12. Washer
13. Nut
14. Auxiliary Step
15. Wing Strut
16. Strap
17. Step Plate

Figure 12-14. Refueling Provisions (Model 185 AGcarryall)

12-66. ELECTRIC FUEL PUMP CIRCUIT. (Beginning with 18502311) The auxiliary fuel pump switch is a yellow and red split-rocker type switch. The yellow right half of the switch is labeled "START," and its upper "ON" position is used for normal starting and minor vapor purging during taxi. The red left half of the switch is labeled "EMERG," and its upper "HI" position is used in the event of an engine-driven fuel pump failure during take-off or high power operation. The "HI" position may also be used for extreme vapor purging. With the right half of the switch in the "ON" position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump operates at a high capacity to supply sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded "HI" position. In the "HI" position, an interlock within the switch automatically trips the right half of the switch to the "ON" position. When the spring-loaded left half of the switch is released, the right half will remain in the "ON" position until manually returned to the off position. When the engine-driven fuel pump is functioning and the auxiliary fuel pump is placed in the "ON" position, a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned. If the auxiliary fuel pump switch is accidentally placed in the "ON" position with the master switch on and the engine stopped, the intake manifolds will be flooded.

12-67. RIGGING THROTTLE-OPERATED MICRO-SWITCH. (Beginning with 18502566.)

NOTE

These settings must be established during ground run-up only. These values will not apply in flight.

a. With engine running, advance throttle to obtain over 20 inches of mercury manifold pressure.
b. Slowly retard throttle and mark 20 inches of mercury manifold pressure throttle position.
c. Stop engine and set throttle switch to actuate when passing from high throttle setting through the 20 inch manifold pressure mark.

12-68. AUXILIARY ELECTRIC FUEL PUMP RATE ADJUSTMENT. (ADJUSTMENT OF VARIABLE RESISTORS.) (Beginning with 18502566.)

NOTE

Adjust AMOR20-1.5 resistor (12V) to 0.5±.05 OHMS prior to installation. Adjust AMOR20-10 resistor (24V) to 6.2±.03 OHMS prior to installations.

a. The following adjustments are conducted with the engine stopped.
   1. Apply 13.75 VDC ±.25V (27.75 VDC±.25V) to the aircraft bus.
   2. Mixture: "FULL RICH."
   3. Throttle: "FULL OPEN."
   4. Turn yellow boost pump rocker switch to "ON."
b. Check metered fuel pressure/flow on ship's gage for a flow of 88-96 lb/hr (14.7-16.0 gal/hr). Adjust number one resisor if required.
c. Retard throttle slowly from "FULL OPEN" position until speed of the fuel pump can be audibly detected to change due to microswitch actuation.
d. Wait momentarily for fuel flow gage to respond. Metered fuel pressure/flow on ship's gage should read on the low end red line or approximately one red line width above. Adjust number two resistor identically if required.

12-69. MAX HIGH BOOST CHECK. To verify high position function, momentarily depress spring-loaded rocker and verify a noticeable increase in indicated fuel flow on the fuel flow gage.

12-70. REFUELING PROVISIONS.

12-71. DESCRIPTION. The Model 185 AGcarryall aircraft are equipped with fueling steps and assist handles, mounted on the forward fuselage. Steps are mounted on the wing struts. These provisions are incorporated to aid in refueling the aircraft.

12-72. REMOVAL AND INSTALLATION. (Refer to figure 12-14.) The figure illustrates refueling provisions and may be used as a guide during removal and installation of components.

SHOP NOTES:

SECTION 13

PROPELLERS AND PROPELLER GOVERNORS

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13-1. PROPELLERS.

13-2. DESCRIPTION. The aircraft is equipped with an all-metal, constant-speed, governor-regulated propeller. The constant-speed propeller is single-acting, in which engine oil pressure, boosted and regulated by the governor is used to obtain the correct blade pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the crankshaft. The amount and pressure of the oil supplied is controlled by the engine-driven governor. Increasing engine speed will cause oil to be admitted to the piston, thereby increasing the blade pitch. Conversely, decreasing engine speed will result in oil leaving the piston, thus decreasing the blade pitch. During the 1969 model year, a new threadless blade propeller is installed on the Model 180. With this type blades, the propeller balance weights are moved to a bracket on the propeller cylinder nearer the center line of the propeller. Figure 13-1 illustrates the different propellers used on the aircraft.

13-3. REPAIR. Metal propeller repair first involves evaluating the damage and determining whether the repair will be a major or minor one. Federal Aviation Regulations, Part 43 (FAR 43), and Federal Aviation Agency, Advisory Circular No. 43.13 (FAA AC No. 43.13), define major and minor repairs, alterations and who may accomplish them. When making repairs or alterations to a propeller FAR 43, FAA AC No. 43.13 and the propeller manufacturer's instructions must be observed.

13-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO CHANGE PITCH.	Governor control disconnected or broken.	Check visually. Connect or replace control.
	Governor not correct for propeller. (Sensing wrong.)	Check that correct governor is installed. Replace governor.
	Defective governor.	Refer to paragraph 13-9.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 13-9.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
STATIC RPM TOO HIGH OR TOO LOW.	Improper propeller governor adjustments.	Perform static RPM check. Refer to Section 11 and 11A for procedures
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 13-9.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to take-off after propeller has been reinstalled or has been idle for an extended period.
	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 13-9.

SHOP NOTES:

TROUBLE	PROBABLE CAUSE	REMEDY
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.	Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in figure 13-1.
OIL LEAKAGE AT ANY OTHER PLACE.	Defective seals, gaskets, threads, etc., or incorrect assembly.	Propeller repair or replacement is required.

13-5. REMOVAL. Refer to figure 13-1.

a. Remove spinner attaching screws and remove spinner (1), spinner support (2) and spacers (3). Retain spacers (3).

b. Remove cowling as required for access to mounting nuts (15).

c. Loosen all mounting nuts (15) approximately 1/4 inch and pull propeller (6) forward until stopped by nuts.

NOTE

As the propeller (6) is separated from the engine crankshaft flange, oil will drain from the propeller and engine cavities.

d. Remove all propeller mounting nuts (15) and pull propeller forward to remove from engine crankshaft (11).

e. If desired, the spinner bulkhead (12) can be removed by removing screws and nuts attaching lugs (13) to bulkhead. Note direction of lugs (13) and lug attaching screws.

13-6. INSTALLATION.

a. If the spinner bulkhead (12) was removed, position bulkhead so the propeller blades will emerge from the spinner (1) with ample clearance and install spinner bulkhead attaching lugs and screws.

CAUTION

Avoid scraping metal from bore of spinner bulkhead and wedging scrapings between engine flange and propeller. Trim the inside diameter of the bulkhead as necessary when installing a new spinner bulkhead.

b. Clean propeller hub cavity and mating surfaces of propeller and crankshaft.

c. Lightly lubricate a new O-ring (9) and the crankshaft pilot with clean engine oil and install the O-ring in the propeller hub.

d. Align propeller mounting studs and dowel pins with proper holes in engine crankshaft flange and slide propeller carefully over crankshaft pilot until mating surfaces of propeller and crankshaft flange are approximately 1/4 inch apart.

e. Install propeller attaching washers (14) and nuts (15) and work propeller aft as far as possible, then tighten nuts evenly and torque to 660-780 lb-in.

f. Install any spacers (3) used between spinner support and propeller cylinder, then install spinner support and spinner. The spacers are used as required to cause a snug fit between the spinner (1) and the spinner support (2).

13-7. PROPELLER GOVERNORS.

13-8. DESCRIPTION. The propeller governor is a single-acting, centrifugal type, which boosts oil pressure from the engine and directs it to the propeller where the oil is used to increase blade pitch. A single-acting governor uses oil pressure to effect a pitch change in one direction only; a pitch change in the opposite direction results from a combination of centrifugal twisting moment of rotating blades and compressed springs. Oil pressure is boosted in the governor by a gear type oil pump. A pilot valve, fly weight and speeder spring act together to open and close governor oil passages as required to maintain a constant engine speed.

NOTE

Outward physical appearance of specific governors is the same, but internal parts determine whether it uses oil pressure to increase or decrease blade pitch. The propellers used on these aircraft require governors which "sense" in a certain manner. "Sensing" is determined by the type pilot valve installed inside the governor. Since the basic governor may be set to "sense" oppositely, it is important to ascertain that the governor is correct for the propeller being used.

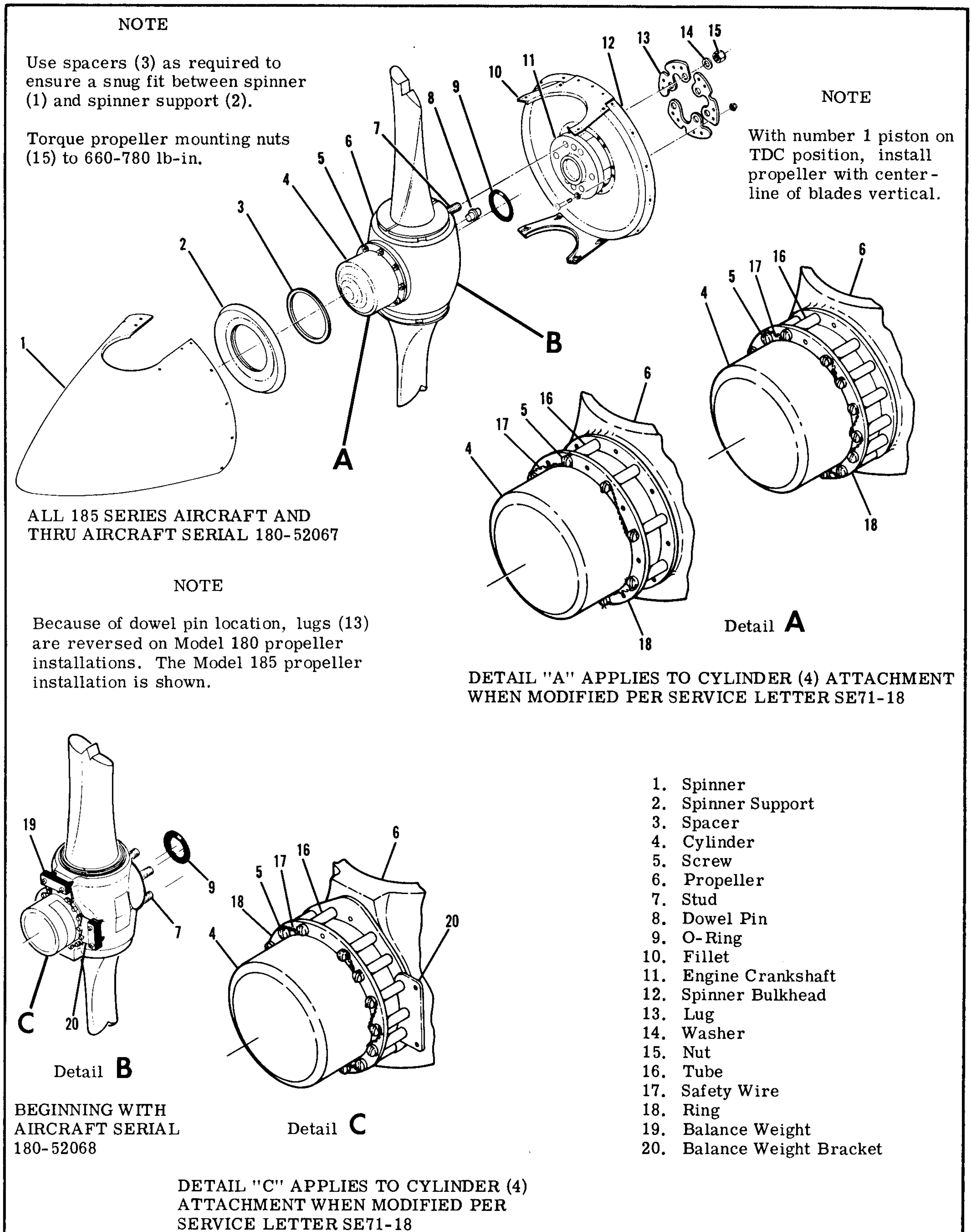

Figure 13-1. Propeller Installation

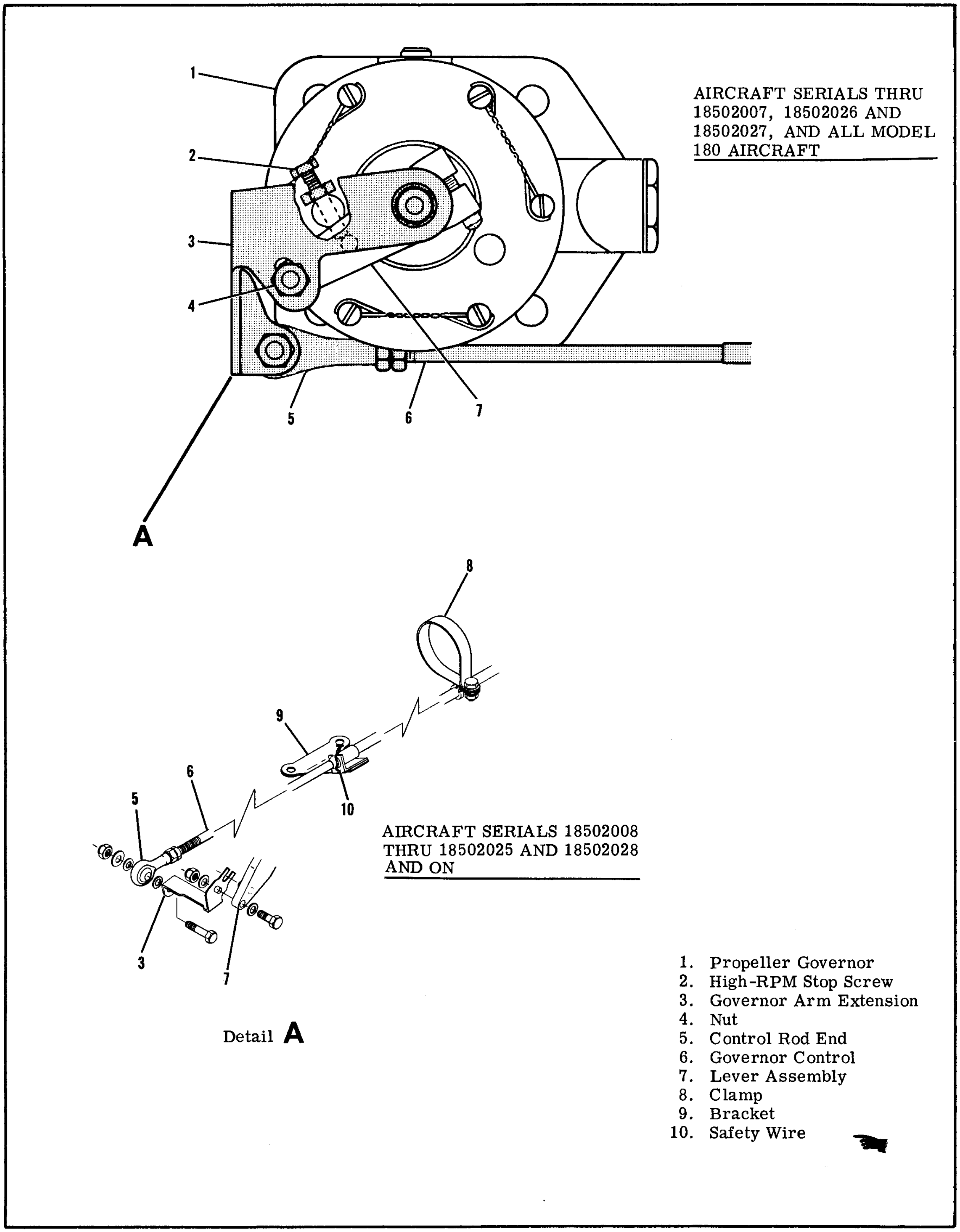

Figure 13-2. Governor and Control Adjustments

13-9. TROUBLE SHOOTING. When trouble shooting the propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault. Removal and replacement, rigging, high-speed stop adjustment, desludging and replacement of the governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classed as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

13-10. REMOVAL.
a. Remove cowling and engine baffles as required for access to governor.
b. Disconnect governor control from governor arm or extension arm.

NOTE

Note EXACT position of all washers so that washers may be installed in the same position on reinstallation.

c. Remove four sets of nuts and washers securing governor to engine and pull governor from mounting studs.
d. Remove gasket from between governor and engine mounting pad.

13-11. INSTALLATION.
a. Wipe governor and engine mounting pad clean.
b. Install a new gasket on the mounting studs. Install gasket with raised surface of the gasket screen toward the governor.
c. Position governor on mounting studs, aligning governor drive splines with splines in the engine and install mounting nuts and washers. Do not force spline engagement. Rotate engine crankshaft slightly and splines will engage smoothly when properly aligned.
d. Connect governor control to governor arm or arm extension and rig control as outlined in paragraph 13-13.
e. Reinstall all items removed for access.

13-12. HIGH-RPM STOP ADJUSTMENT.
a. Remove engine cowling and baffle as required for access.
b. Remove safety wire and loosen the high-speed stop screw locknut.
c. Turn the stop screw IN to decrease maximum rpm and OUT to increase maximum rpm. One full turn of the stop screw causes a change of approximately 25 rpm.
d. Tighten stop screw locknut and make propeller control linkage adjustment as necessary to maintain full travel.
e. Install baffle and cowling.
f. Test operate propeller and governor.

NOTE

It is possible for either the propeller low pitch (high-rpm) stop or the governor high-rpm stop to be the high-rpm limiting factor. It is desirable for the governor stop to limit the high-rpm at the maximum rated rpm for a particular aircraft. Due to climatic conditions, field elevation, low-pitch blade angle and other considerations, an engine may not reach rated rpm on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated rpm when airborne.

13-13. RIGGING PROPELLER GOVERNOR CONTROL.
a. Disconnect governor control from governor arm or extension arm.
b. Place propeller governor control, in cabin, full forward, then pull back approximately 1/8 inch and lock in this position. This will allow "cushion" to assure full contact of the governor arm with the governor high-rpm stop screw.
c. Place governor arm against high-rpm stop screw.
d. Loosen jam nuts and adjust control rod end until attaching holes align while governor arm is against high-rpm stop screw. Be sure to maintain sufficient thread engagement of the control and rod end. If necessary, shift control in the clamps to achieve this.
e. Attach rod end to the governor arm or arm extension. Be sure all washers are installed correctly.
f. Operate the control to see that the governor arm bottoms out against the low pitch stop and bottoms out against or a maximum of .12" from the high pitch stop on the governor before reaching the end of control cable travel.

NOTE

Some governors are equipped with an offset extension to the governor arm. The offset extension has an elongated slot to permit further adjustment. The preceding steps may still be used as an outline in the rigging procedure.

SECTION 14

UTILITY SYSTEMS

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14-1. UTILITY SYSTEMS.

14-2. HEATING SYSTEM.

14-3. DESCRIPTION. The heating system is comprised of the heat exchange section of the exhaust muffler, a shut-off valve, mounted on the right forward side of the firewall, a push-pull control on the instrument panel, outlets and flexible ducting connecting the system.

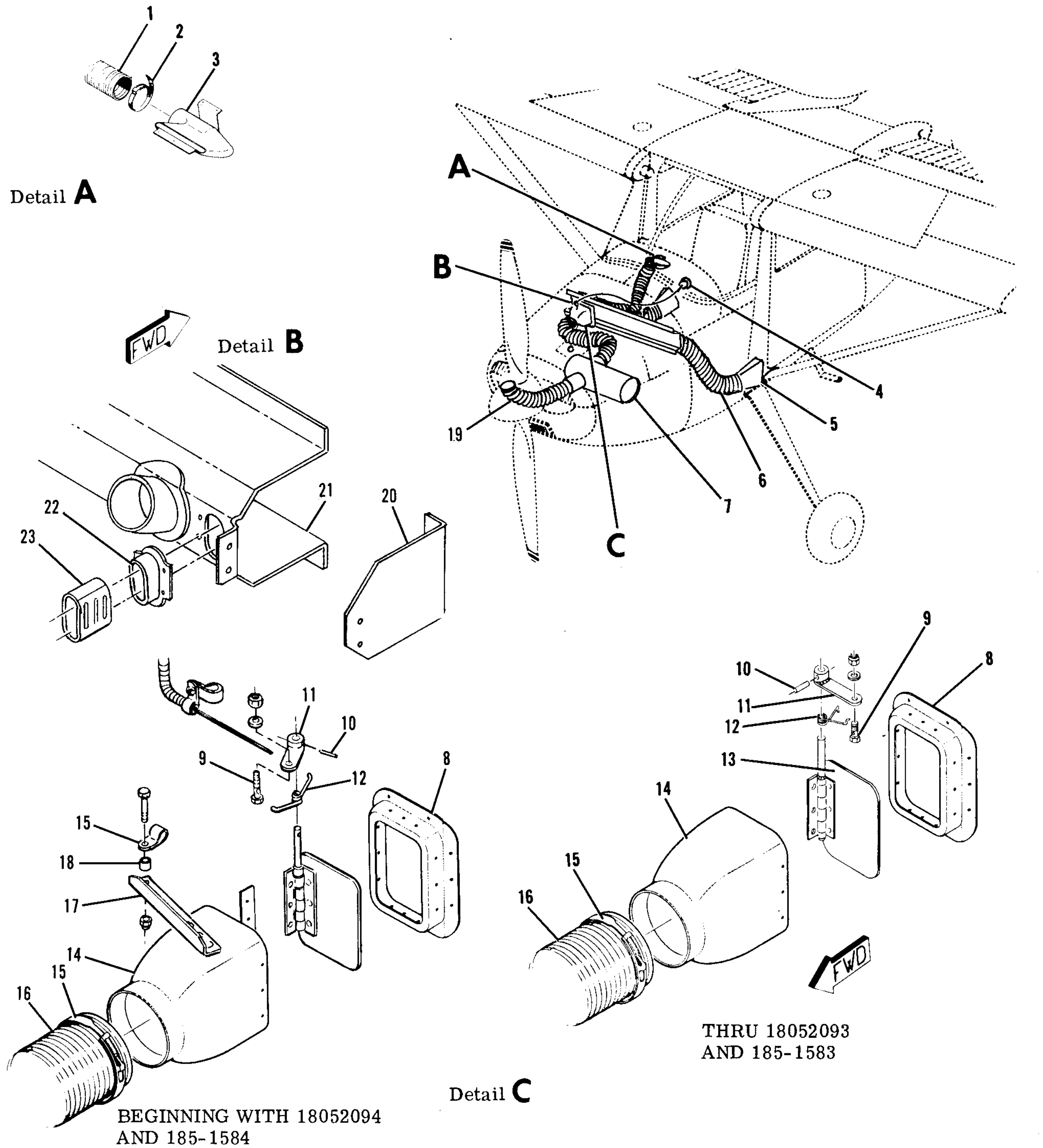
14-4. OPERATION. Ram air is ducted through an engine baffle inlet and the heat exchange of the exhaust muffler, to the shut-off valve at the firewall. The heated air flows from the shut-off valve into a duct across the aft side of the firewall, where it is distributed into the cabin. The shut-off valve, operated by a push-pull control labeled "CABIN HEAT," located on the instrument panel, regulates the volume of heated air entering the system. Pulling the control full out supplies maximum flow and pushing control in gradually decreases flow, shutting off flow completely when the control is pushed full in.

14-5. TROUBLE SHOOTING. Most of the operational troubles in the heating and defrosting systems are caused by sticking or binding valves and their controls, damaged air ducting or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. Damaged or broken parts must be repaired or replaced. When checking controls, ensure valves respond freely to control movement, that they move in the correct direction, that they move through their full range of travel and seal properly. Check that hose are properly secured and replace hose that are burned, frayed or crushed. If fumes are detected in the cabin, a thorough inspection of the exhaust system should be accomplished. Refer to Section 11 for this inspection. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in heater ducts across the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound.

14-6. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 may be used as a guide during removal, installation and repair of heating systems components. Burned, frayed or crushed hose must be replaced with new hose, cut to length and installed in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. Defective air valves must be repaired or replaced. Check for proper operation of valves and their controls after repair or replacement.

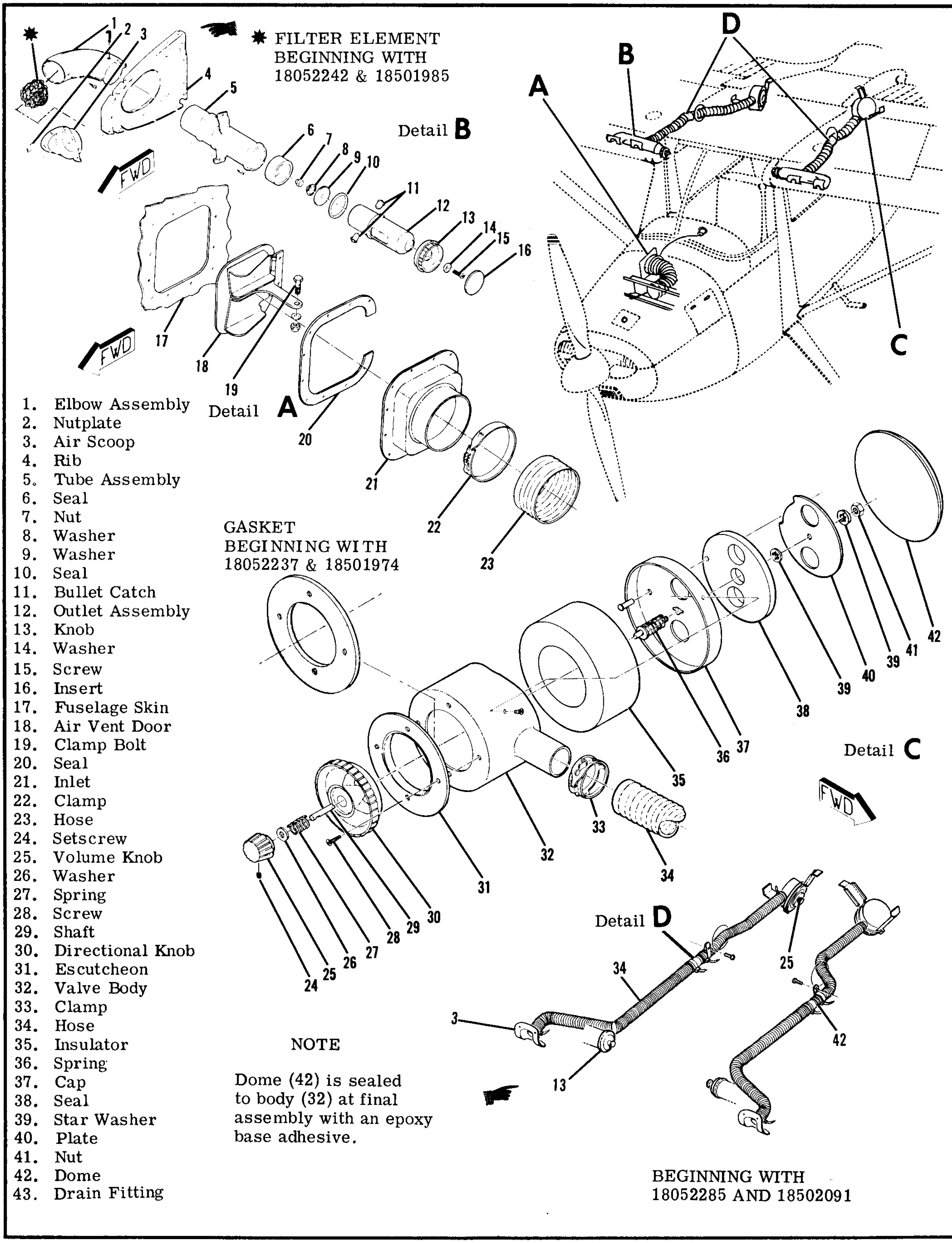
14-7. DEFROSTER SYSTEM.

14-8. DESCRIPTION. The defrosting system is comprised of a duct across the aft side of the firewall, a defroster outlet mounted on the cowl deck immediately aft of the windshield, and flexible ducting connecting the system.



1. Defroster Hose	9. Clamp Bolt	16. Heater Hose
2. Clamp	10. Roll Pin	17. Support
3. Defroster Nozzle	11. Control Arm	18. Spacer
4. Heater Control	12. Spring	19. Inlet Hose
5. Heater Outlet	13. Valve Plate Assembly	20. End Plate
6. Heater Duct	14. Body Assembly	21. Duct Assembly
7. Muffler	15. Clamp	22. Adapter
8. Valve Seat		23. Union

Figure 14-1. Heating and Defrosting System



1. Elbow Assembly
2. Nutplate
3. Air Scoop
4. Rib
5. Tube Assembly
6. Seal
7. Nut
8. Washer
9. Washer
10. Seal
11. Bullet Catch
12. Outlet Assembly
13. Knob
14. Washer
15. Screw
16. Insert
17. Fuselage Skin
18. Air Vent Door
19. Clamp Bolt
20. Seal
21. Inlet
22. Clamp
23. Hose
24. Setscrew
25. Volume Knob
26. Washer
27. Spring
28. Screw
29. Shaft
30. Directional Knob
31. Escutcheon
32. Valve Body
33. Clamp
34. Hose
35. Insulator
36. Spring
37. Cap
38. Seal
39. Star Washer
40. Plate
41. Nut
42. Dome
43. Drain Fitting

NOTE

Dome (42) is sealed to body (32) at final assembly with an epoxy base adhesive.

Figure 14-2. Ventilating 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 temperature and volume of this air is controlled by settings of the heater system control.

14-10. TROUBLE SHOOTING. Since the defrosting system depends upon proper operation of the heating system, refer to paragraph 14-5 for trouble shooting the defrosting system.

14-11. REMOVAL, INSTALLATION AND REPAIR. Figure 14-1 may be used as a guide during removal, installation and repair of defrosting system components. Cut hose to length and install in the original routing. Trim hose winding shorter than the hose to allow clamps to be fitted. A defective defroster outlet must be repaired or replaced.

14-12. VENTILATING SYSTEM.

14-13. DESCRIPTION. The ventilating system is comprised of two airscoops mounted in the inboard leading edge of each wing, a manually-adjustable ventilator installed on each side of the cabin near the upper corners of the windshield, two plenum chambers mounted in the rear cabin wing root areas, a fresh airscoop door on the right side of the fuselage just forward of the copilot seat, a control knob on the instrument panel and flexible ducting connecting the system.

14-14. OPERATION. Air received from scoops mounted in the inboard leading edges of the wings is ducted to adjustable ventilators mounted on each side of the cabin near the upper corners of the windshield. Rear seat ventilation is provided by plenum chambers mounted in the left and right cabin wing root areas. These plenum chambers receive ram air from the airscoops in the inboard leading edges of the wings. Each plenum chamber is equipped with a valve which meters the incoming cabin ventilation air. This provides a chamber for expansion of cabin air which greatly reduces inlet air noise. Forward cabin ventilation is provided by a fresh airscoop door mounted on the right side of the fuselage, just forward of the copilot seat. The scoop door is operated by a control in the instrument panel marked "CABIN AIR." Fresh air from the scoop door is routed to the duct across the aft side of the firewall, where it is distributed into the cabin. As long as the "CABIN HEAT" control is pushed in, no heated air can enter the firewall duct; therefore, when the "CABIN AIR" control is pulled out, only fresh air from the scoop will flow through the duct into the cabin. As the "CABIN HEAT" control is gradually pulled out, more and more heated air will blend with the fresh air from the scoop and be distributed into the cabin. Either one or both of the controls may be set at any position from full open to full closed.

14-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating system are caused by sticking or binding of the inlet scoop door or its control In most cases, controls can be freed by proper lubrication. Damaged or broken parts must be repaired or replaced. When checking the control, with the control in the full out position the scoop door should be open 18°. The Control can be adjusted by positioning the cable housing in the doubler and twisting the doubler to hold the new position. If a new cable assembly is installed bend the wire at a right angle after connecting in the door actuator clamp. Check that the door responds freely to control movement. Check that hose is properly secured and replace hose that is frayed or crushed.

14-16. REMOVAL, INSTALLATION AND REPAIR. Figure 14-2 may be used as a guide during removal, installation and repair of ventilating system components. A defective ventilator or scoop door must be repaired or replaced. Check for proper operation of ventilating controls after installation or repair.

SHOP NOTES:

14-17. OXYGEN SYSTEM.

WARNING

Under NO circumstances should the ON-OFF control on the oxygen regulator be turned to the "ON" position with the outlet (low pressure) ports open to atmosphere. Operation of these units in this manner will induce serious damage to the regulators and having the following results:

1. Loss of outlet set pressure.
2. Loss of oxygen flow through the regulator which will result in inadequate oxygen being fed through the aircraft system.
3. Internal leakage of oxygen through the regulator.

Opening of the control lever with the outlet ports open to atmosphere, results in an "overshoot" of the regulator metering device due to the extreme flow demand through the regulator. After overshooting, the metering poppet device goes into oscillation, creating serious damage to the poppet seat and diaphragm metering probe. This condition can occur even by turning the control lever on and then turning it quickly off.

A potential hazard exists to aircraft in the field where inexperienced personnel might remove the cylinder and regulator assembly from the aircraft and for some reason, attempt to turn the regulator to the "ON" position with the outlet ports open. Unfortunately, after the units have been improperly operated as noted, there is no outward appearance indicating that damage has occurred.

Testing these regulators should be accomplished only after installation in the aircraft, with the "downstream" low pressure line attached.

14-18. DESCRIPTION.

The system is comprised of an oxygen cylinder and regulator assembly, filler valve, pressure gage, pressure lines, outlets and mask assemblies. The oxygen cylinder is mounted aft of the baggage compartment. Locations of system components are shown in figure 14-3. The pilot's supply line is designed to receive a greater flow of oxygen than the passengers. The pilot's mask is equipped with a microphone, keyed by a switch button on the pilot's control wheel. The filler valve is located on the left side of the tailcone, just aft of the baggage door.

WARNING

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

14-19. MAINTENANCE PRECAUTIONS.

a. Working area, tools and hands must be clean.

b. Keep oil, grease, water, dirt, dust and all other foreign matter from system.

c. Keep all lines dry and capped until installed.

d. Use only MIL-T-5542 thread compound or teflon lubricating tape on threads of oxygen valves, tubing connectors, fittings and parts of assemblies which might, under any conditions, come in contact with oxygen. The thread compound must be applied sparingly and carefully to only the first three threads of the male fitting. No compound shall be used on aluminum flared fittings or on the coupling sleeves or on the outside of the tube flares. The teflon tape shall be used in accordance with the instructions listed following this step. Extreme care must be exercised to prevent contamination of the thread compound or teflon tape with oil, grease or other lubricants.

1. Lay tape on threads close to end of fitting: Clockwise on standard threads, opposite on left-hand threads.
2. Apply enough tension while winding so tape forms into thread grooves.
3. After wrap is complete, maintain tension and tear tape by pulling apart in direction it was applied. Resulted ragged end is the key to the tape staying in place. (If sheared or cut, tape may unwind.)
4. Press tape well into threads.
5. Make connections.

e. Fabrication of oxygen pressure lines is not recommended. Lines should be replaced by part numbers called out in the aircraft Parts Catalog.

f. Lines and fittings must be clean and dry. One of the following methods may be used.

1. Clean by degreasing with stabilized trichlorethylene, conforming to Federal Specifications O-T-634 or MIL-T-27602. These items can be obtained from American Mineral Spirits of Houston, Texas.

NOTE

Most air compressors are oil lubricated, and a minute amount of oil may be carried by the airstream. If only an oil lubricated air compressor is available, drying must be accomplished by heating at a temperature of 250° to 300°F for a suitable period.

NOTE

Cap lines at both ends immediately after drying to prevent contamination.

14-20. REPLACEMENT OF COMPONENTS.

Removal, disassembly, assembly and installation of system components may be accomplished while using figure 14-3 as a guide.

CAUTION

The pressure regulator, pressure gage and line and filler valve should be removed and replaced only by personnel familiar with high-pressure fittings. Observe the maintenance precautions listed in the preceding paragraph.

NOTE

Oxygen cylinder and regulator assemblies may not always be installed in the field exactly as illustrated in figure 14-3, which shows factory installation. Important points to remember are as follows.

a. Before removing cylinder, release low-pressure line by opening cabin outlets. Disconnect push-pull control cable, filler line, pressure gage line and outlet line from regulator. CAP ALL LINES IMMEDIATELY.
b. If it is necessary to replace filler valve O-rings, remove parts necessary for access to filler valve. Remove line from quick-disconnect valve at the regulator, then disconnect chain, but do not remove cap from filler valve. Remove screws securing valve and disconnect pressure line. Referring to applicable figure, cap pressure line and seat. Disassemble valve, replace O-rings and reassemble valve. Install filler valve by reversing procedures outlined in this step.
c. A cabin outlet is illustrated in figure 14-3. Repair kit, (part no. C166006-0108), available from the Cessna Service Parts Center, may be used for replacement of components of the outlet assembly.
d. To remove entire oxygen system, headliner must be lowered and soundproofing removed to expose lines. Refer to Section 3 for headliner removal.

14-21. OXYGEN CYLINDER GENERAL INFORMATION. The following information is permanently steel stamped on the shoulder, top head or neck of each oxygen cylinder:
a. Cylinder specification, followed by service pressure (e.g. "ICC-3AA1800" and "ICC-3HT1850" for standard and light weight cylinders respectively).

NOTE

Effective 1 January, 1970, all newly-manufactured cylinders are stamped "DOT" (Department of Transportation), rather than "ICC" (Interstate Commerce Commission). An example of the new designation would be: "DOT-3HT1850".

b. Cylinder serial number is stamped below or directly following cylinder specification. The symbol of the purchaser, user or maker, if registered with the Bureau of Explosives, may be located directly below or following the serial number. The cylinder serial number may be stamped in an alternate location on the cylinder top head.
c. Inspector's official mark near serial number.
d. Date of manufacture: This is the date of the first hydrostatic test (such as 4-69 for April 1969). The dash between the month and the year figures may be replaced with the mark of the testing or inspection agency (e.g. 4L69).
e. Hydrostatic test date: The dates of subsequent hydrostatic tests shall be steel stamped (month and year) directly below the original manufacture date. The dash between the month and year figures can be replaced with the mark of the testing agency.
f. A Cessna identification placard is located near the center of the cylinder body.
g. Halogen test stamp: "Halogen Tested", date of test (month, day and year) and inspector's mark appears directly underneath the Cessna identification placard.

14-22. OXYGEN CYLINDER SERVICE REQUIREMENTS.
a. Hydrostatic test requirements:
1. Standard weight (ICC or DOT-3AA1800) cylinders must be hydrostatically tested to 5/3 their working pressure every five years commencing with the date of the last hydrostatic test.
2. Light weight (ICC or DOT-3HT1850) cylinders must be hydrostatically tested to 5/3 their working pressure every three years commencing with the date of the last hydrostatic test.
b. Service life requirements:
1. Standard weight (ICC or DOT-3AA1800) cylinders have no age life limitations and may continue to be used until they fail hydrostatic test.
2. Light weight (ICC or DOT-3HT1850) cylinders must be retired from service after 12 years or 4,380 filling cycles after date of manufacture, whichever occurs first.

NOTE

These test periods and life limitations are established by the Interstate Commerce Commission Code of Federal Regulations, Title 49, Chapter 1, Para. 73.34.

14-23. OXYGEN CYLINDER INSPECTION REQUIREMENTS.
a. Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges and strap chafing.
b. Examine the neck of cylinder for cracks, distortion or damaged threads.
c. Check the cylinders to determine if markings are legible.
d. Check date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.
e. Inspect the cylinder mounting bracket, bracket hold-down bolts and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.
f. In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing, deformation or deterioration.

14-24. OXYGEN SYSTEM COMPONENT SERVICE REQUIREMENTS.
a. PRESSURE REGULATOR. The regulator shall be functionally tested every two years or 1,000 hours for aircraft operating under 15,000 ft. and one year for aircraft operating over 15,000 ft. The regulator shall be overhauled every five years ao at time of hydrostatic test.
b. FILLER VALVE. The valve shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.
c. QUICK-RELEASE COUPLING. The coupling

shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.

d. PRESSURE GAGE. The gage shall be checked for accuracy and overhauled by an FAA approved facility every five years.

e. OUTLETS. The outlets shall be disassembled and inspected and the sealing core replaced, regardless of condition, every five years.

14-25. OXYGEN SYSTEM COMPONENT INSPECTION REQUIREMENTS.

a. Examine all parts for cracks, nicks, damaged threads or other apparent damage.

b. Actuate regulator controls and valve to check for ease of operation.

c. Determine if the gage is functioning properly by observing the pressure build-up and the return to zero when the system oxygen is bled off.

d. Replace any oxygen line that is chafed, rusted, corroded, dented, cracked or kinked.

e. Check fittings for corrosion around the threaded area where lines are joined together. Pressurize the system and check for leaks.

14-26. MASKS AND HOSE.

a. Check oxygen masks for fabric cracks and rough face seals. If the mask is a full-faced model, inspect glass or plastic for cleanliness and state of repair.

b. Flex the mask hose gently over its entirety and check for evidence of deterioration or dirt.

c. Examine mask and hose storage compartment for cleanliness and general condition.

14-27. MAINTENANCE AND CLEANING.

a. Clean and disinfect mask assemblies after use, as appropriate.

NOTE

Use care to avoid damaging microphone assembly while cleaning and sterilizing.

b. Wash mask with a mild soap solution and rinse it with clear water.

c. To sterilize, swab mask thoroughly with a gauze or sponge soaked in a water/merthiolate solution. This solution should contain 1/5 teaspoon of merthiolate per one quart of water. Wipe the mask with a clean cloth and let air dry.

d. Observe that each mask breathing tube end is free of nicks and that the tube end will slip into the cabin oxygen receptacle with ease and will not leak.

e. If a mask assembly is defective (leaks, does not allow breathing or contains a defective microphone) it is advisable to return the mask assembly to the manufacturer or a repair station.

f. Replace hose if it shows evidence of deterioration.

g. Hose may be cleaned in the same manner as the mask.

14-28. SYSTEM PURGING. Whenever components have been removed and reinstalled or replaced, it is advisable to purge the system. Charge oxygen system in accordance with procedures outlined in paragraph 14-31. Plug masks into all outlets and turn the pilot's control to ON position and purge system by allowing oxygen to flow for at least 10 minutes. Smell oxygen flowing from outlets and continue to purge until system is odorless. Refill cylinders as required during and after purging.

14-29. FUNCTIONAL TESTING. Whenever the regulator and cylinder assembly has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

a. Fully charge oxygen system in accordance with procedures outlined in paragraph 14-31.

b. Disconnect line and fitting assembly from pilot's mask and line assembly. Insert outlet end of line and fitting assembly into cabin outlet and attach opposite end of line to a pressure gage (gage should be calibrated in one-pound increments from 0 to 100 PSI). Place control lever in ON position. Gage pressure should read 75±10 PSI.

c. Insert mask and line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, test gage pressure should still be 75±10 PSI.

d. Place oxygen control lever in OFF position and allow test gage pressure to fall to 0 PSI. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE

If pressures specified in the foregoing procedures are not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

e. Connect mask and line assemblies to each cabin outlet and check each mask for proper operation.

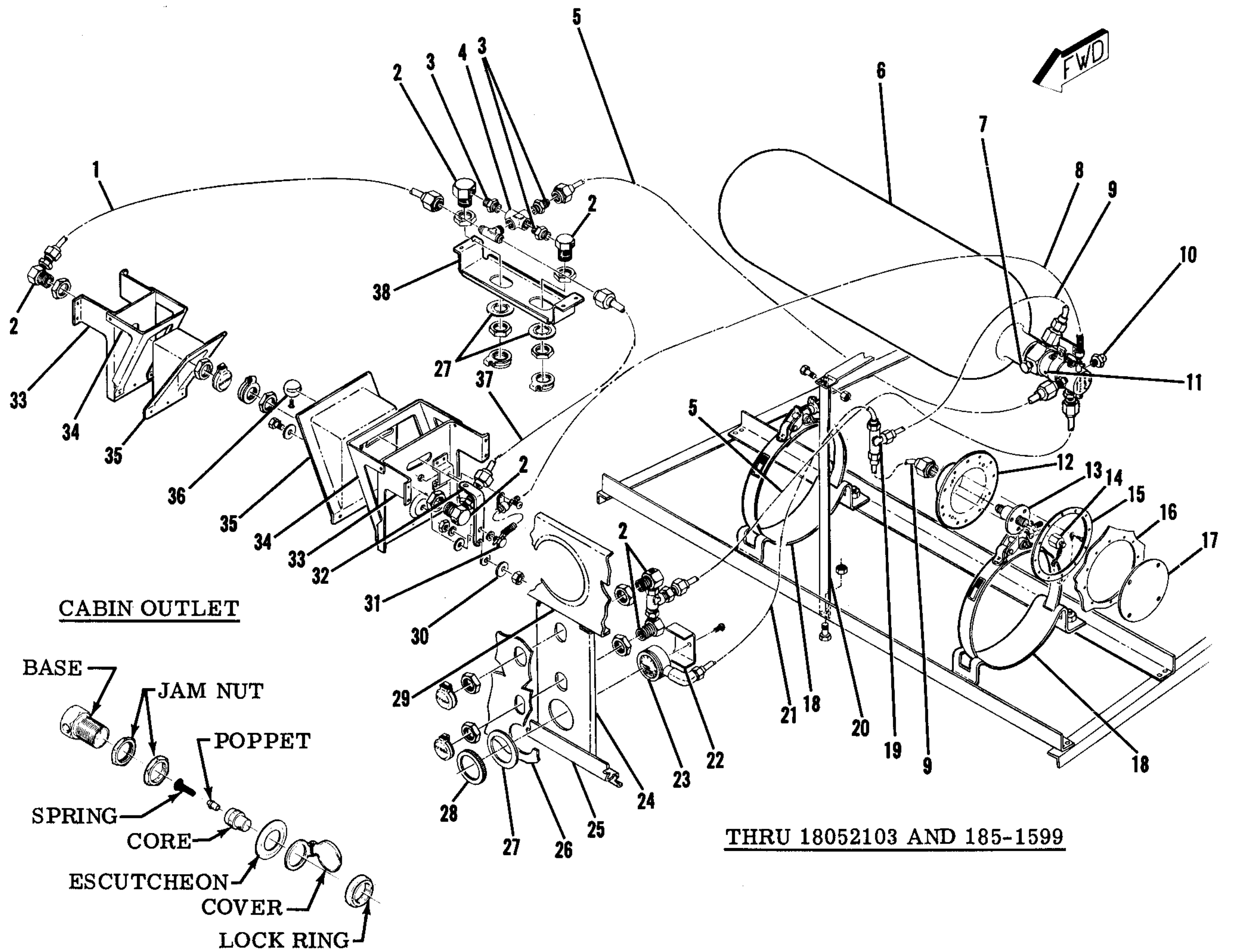
f. Check pilot's mask microphone and control wheel switch for proper operation. After checking, return all masks to mask case.

g. Recharge oxygen system in accordance with procedures outlined in paragraph 14-31.

14-30. SYSTEM LEAK TEST. When oxygen is being lost from a system through leakage, a sequence of steps may be necessary to locate the opening. Leakage may often be detected by listening for the distinct hissing of escaping gas. If this check proves negative, it will be necessary to soap-test all lines and connections with a castile soap and water solution or specially compounded leak-test material. Make the solution thick enough to adhere to the contours of the fittings. At the completion of the leakage test, remove all traces of the leak detector or soap and water solution.

CAUTION

Do not attempt to tighten any connections while the system is charged.



CAUTION

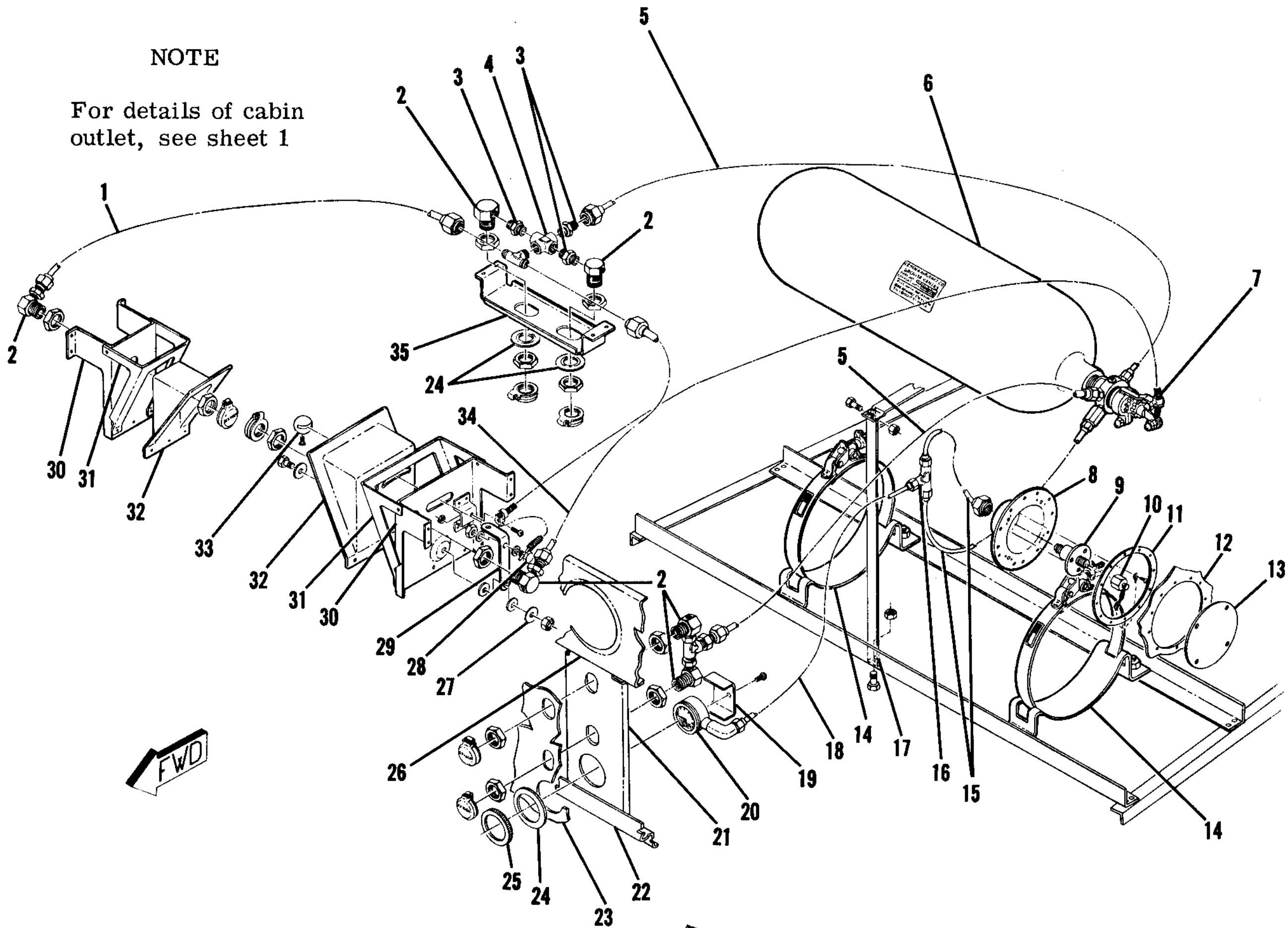
Vent hole (11) in the regulator body must not be covered by control clamp installed around regulator body. Low pressure relief valve (10) should not be removed except for replacement; it is installed in a specific port only. Although the other three ports are common to each other, the low pressure relief valve port is not. High pressure relief valve (7) should not be removed except for replacement. Although all other high pressure ports are common to each other, the thread size is different for the high pressure relief valve.

1. Copilot Supply Line
2. Outlet Assembly
3. Nipple
4. Cross
5. Supply Line
6. Cylinder-Regulator Assembly
7. High Pressure Relief Valve
8. Control
9. Filler Line
10. Low Pressure Relief Valve
11. Vent Hole
12. Adapter
13. Filler Valve
14. Cap and Chain Assembly
15. Spacer
16. Fuselage Skin
17. Cover
18. Mounting Bracket
19. Tee
20. Support
21. Gage Line
22. Bracket
23. Pressure Gage
24. Bracket
25. Support
26. Upholstery Panel
27. Escutcheon
28. Bezel
29. Bulkhead
30. Washer
31. Clamp Bolt
32. Arm
33. Bracket
34. Angle
35. Cover Plate
36. Knob
37. Pilot Supply Line
38. Bracket

Figure 14-3. Oxygen System (Sheet 1 of 3)

NOTE

For details of cabin outlet, see sheet 1



BEGINNING WITH 18052104 AND 18501600
THRU 18052500 AND 18502565

1. Copilot Supply Line
2. Outlet Assembly
3. Nipple
4. Cross
5. Supply Line
6. Cylinder-Regulator Assembly
7. Control
8. Adapter
9. Filler Valve
10. Cap and Chain Assembly
11. Spacer
12. Fuselage Skin
13. Cover
14. Mounting Bracket
15. Filler Line
16. Tee
17. Support
18. Gage Line
19. Bracket
20. Pressure Gage
21. Bracket
22. Support
23. Upholstery Panel
24. Escutcheon
25. Bezel
26. Bulkhead
27. Washer
28. Clamp Bolt
29. Arm
30. Bracket
31. Angle
32. Cover Plate
33. Knob
34. Pilot Supply Line
35. Bracket

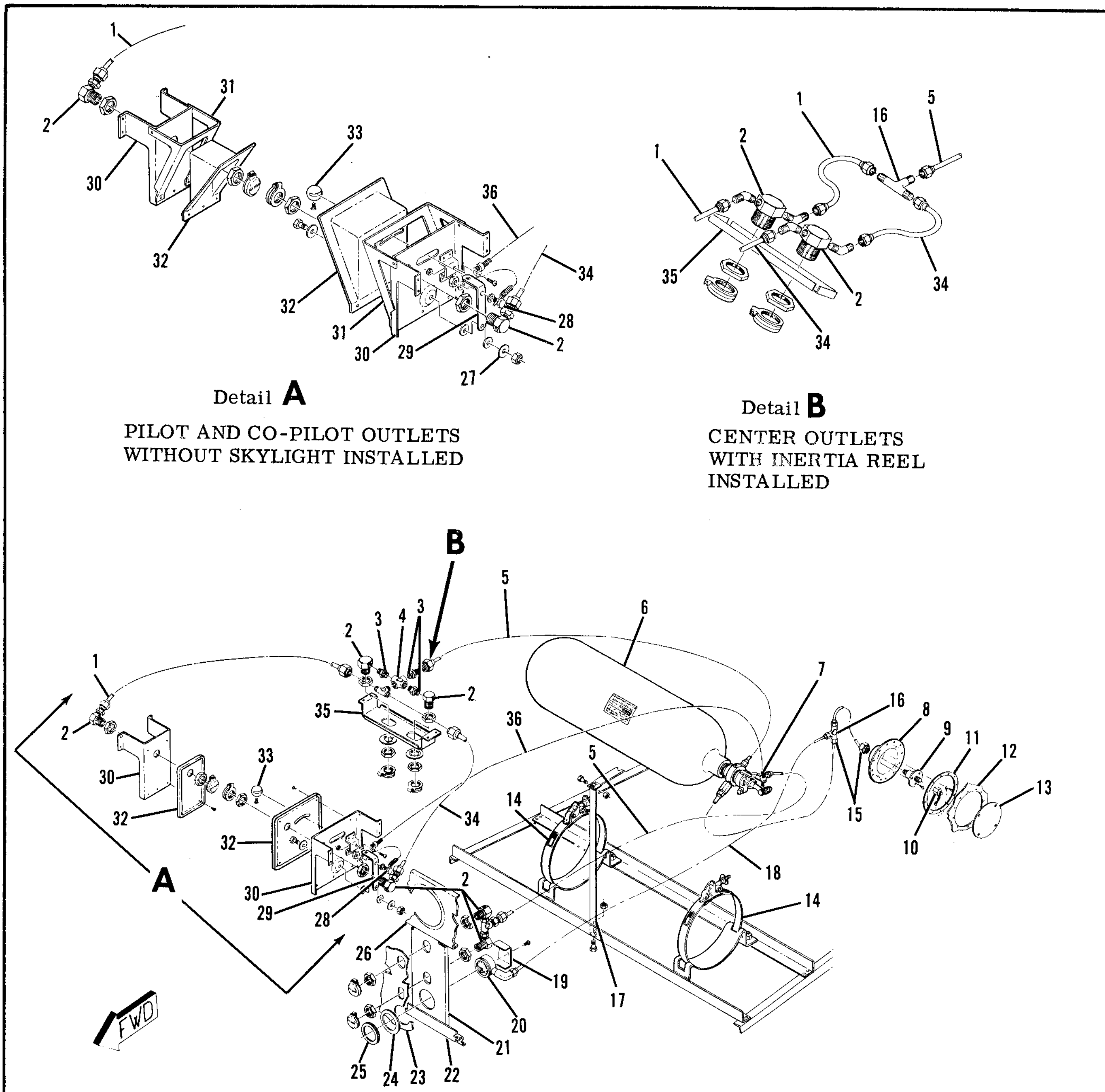
Figure 14-3. Oxygen System (Sheet 2 of 3)

WARNING

BE SURE TO GROUND AIRCRAFT AND GROUND SERVICING EQUIPMENT BEFORE CHARGING OXYGEN SYSTEM.

a. Do not attempt to charge oxygen cylinders if servicing equipment fittings or filler valve are corroded or contaminated. If in doubt, clean with stabilized trichlorethylene and let air dry. Do not allow solvent to enter any internal parts.

b. If cylinder is completely empty, do not charge, as the cylinder must then be removed, inspected and cleaned.



BEGINNING WITH 18052501 AND 18502566

1. Copilot Supply Line
2. Outlet Assembly
3. Nipple
4. Cross
5. Supply Line
6. Cylinder Regulator Assembly
7. Control
8. Adapter
9. Filler Valve
10. Cap and Chain Assembly
11. Spacer
12. Fuselage Skin
13. Cover
14. Mounting Bracket
15. Filler Line
16. Tee
17. Support
18. Gage Line
19. Bracket
20. Pressure Gage
21. Bracket
22. Support
23. Upholstery Panel
24. Escutcheon
25. Bezel
26. Bulkhead
27. Washer
28. Clamp Bolt
29. Arm
30. Bracket
31. Angle
32. Cover Plate
33. Knob
34. Pilot Supply Line
35. Bracket
36. Control Cable

NOTE
For details of cabin outlet, see sheet 1

Figure 14-3. Oxygen System (Sheet 3 of 3)

NOTE

Each interconnected series of oxygen cylinders is equipped with a single gage. The trailer type cascade may also be equipped with a nitrogen cylinder (shown reversed) for filling landing gear struts, accumulators, etc. Cylinders are not available for direct purchase, but are usually leased and refilled by a local compressed gas supplier.

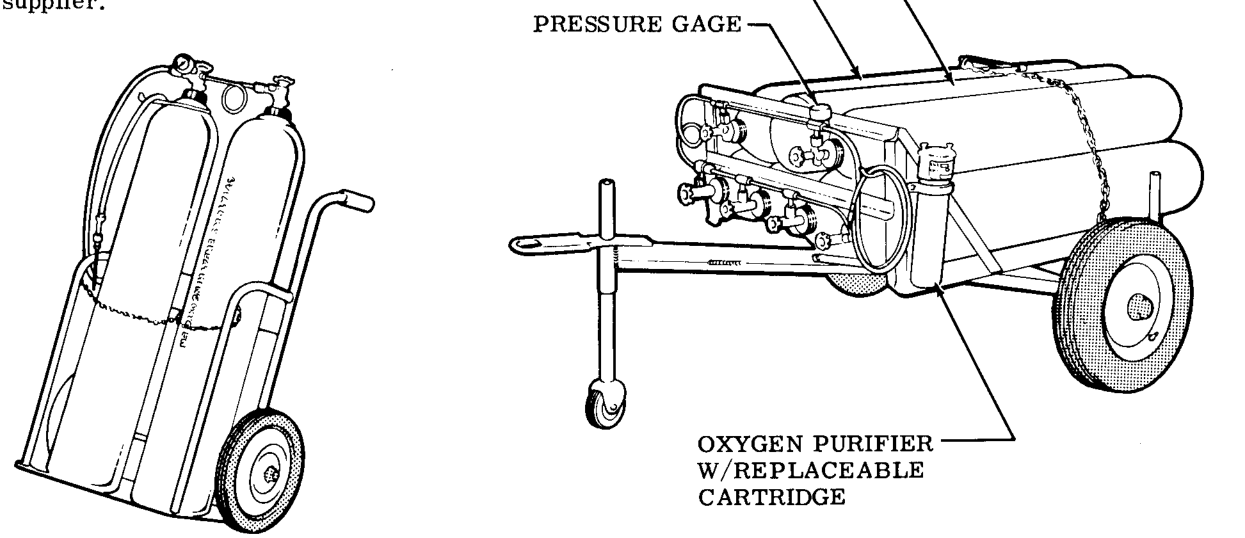


Figure 14-4. Portable Oxygen Cascades

14-31. SYSTEM CHARGING.

CAUTION

A cylinder which is completely empty may well be contaminated. The regulator and cylinder assembly must then be disassembled, inspected and cleaned by an FAA approved facility, before filling. Contamination, as used here, means dirt, dust or any other foreign material, as well as ordinary air in large quantities. If a gage line or filler line is disconnected and the fittings capped immediately, the cylinder will not become contaminated unless temperature variation has created a suction within the cylinder. Ordinary air contains water vapor which could condense and freeze. Since there are very small orifices in the system, it is very important that this condition not be allowed to occur.

c. Connect cylinder valve outlet or outside filler valve to manifold or portable oxygen cascade.

d. Slowly open valve on cascade cylinder or manifold with lowest pressure, as noted on pressure gage, allow pressure to equalize, then close cascade cylinder valve.

e. Repeat this procedure, using a progressively higher pressure cascade cylinder, until system has been charged to the pressure indicated in the chart immediately following step "f" of this paragraph.

f. Ambient temperature listed in the chart is the air temperature in the area where the system is to be charged. Filling pressure refers to the pressure to which aircraft cylinders should be filled. This table gives approximations only and assumes a rise in temperature of approximately 25°F. due to heat of compression. This table also assumes the aircraft cylinders will be filled as quickly as possible and that they will only be cooled by ambient air; no water bath or other means of cooling be used. Example: If ambient temperature is 70°F., fill aircraft cylinders to approximately 1,975 psi or as close to this pressure as the gage may read. Upon cooling, cylinders should have approximately 1,850 psi pressure.

TABLE OF FILLING PRESSURES

Ambient Temp. °F	Filling Press. psig	Ambient Temp. °F	Filling Press. psig
0	1650	50	1875
10	1700	60	1925
20	1725	70	1975
30	1775	80	2000
40	1825	90	2050

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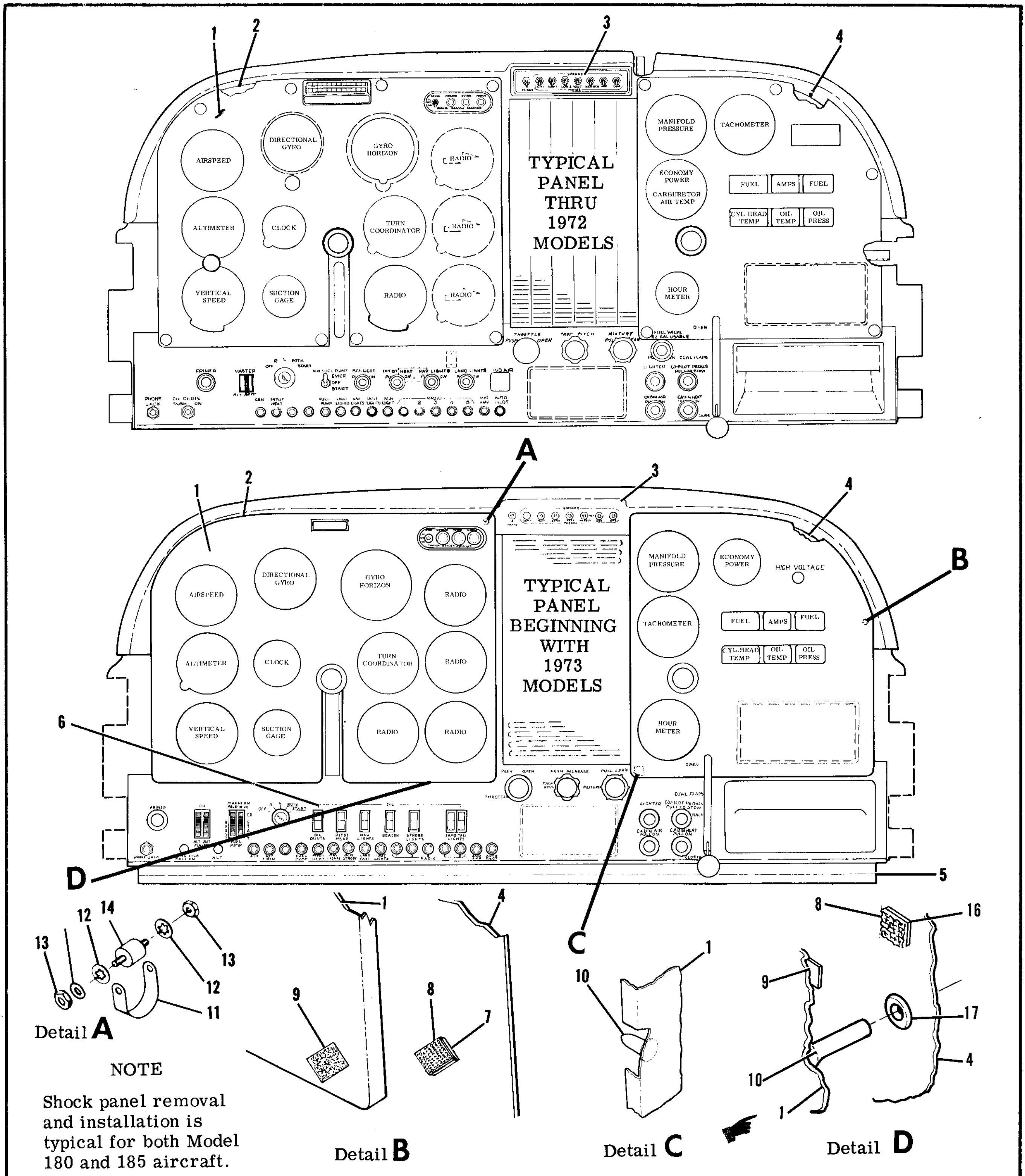
SECTION 15

INSTRUMENTS AND INSTRUMENT SYSTEMS

TABLE OF CONTENTS Page

15-1. GENERAL. This section describes typical instrument installations and the systems operating them, with emphasis on trouble shooting and corrective measures for the systems themselves. 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 that malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to the manufacturer for servicing. Our concern here is with preventive maintenance on the 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 the instrument technician should be called in. Some instruments, such as fuel quantity and oil pressure gages, are so simple and inexpensive that repairs usually will be more costly than a new instrument; on the other hand, aneroid and gyro instruments usually are well worth repairing. The words "replace instrument" in the text, therefore, should be taken only in the sense of physical replacement in the aircraft. Whether the replacement is to be with



NOTE

Shock panel removal and installation is typical for both Model 180 and 185 aircraft.

NOTE POSITION OF GROUND STRAP ON PANEL AND SEQUENCE OF ATTACHING PARTS WHEN REMOVING AND INSTALLING SHOCK PANEL

1. Decorative Cover
2. Shock Mounted Panel
3. Radio Switch Panel
4. Stationary Panel
5. Knee Pad
6. Circuit Breaker Panel
7. Shim
8. Hook (Velcro Fastener)
9. Pile (Velcro Fastener)
10. Pin
11. Ground Strap
12. Lock Washer
13. Nut
14. Shock Mount
15. Washer
16. Shim
17. Grommet

Figure 15-1. Instrument Panel

a new instrument, an exchange one or the original instrument is to be repaired must be decided on the basis of individual circumstances.

15-2. INSTRUMENT PANEL. (Refer to figure 15-1.)

15-3. DESCRIPTION. The instrument panel is made in two main sections; the stationary panel which carries switches, controls and instruments, such as fuel quantity, oil pressure and temperature gages, which are not sensitive to vibration; and the shock-mounted panel which carries the major flight instruments. Most of the instruments are screw-mounted on the backs of the shock-mounted panels, which in turn are covered with molded plastic decorative panels.

15-4. REMOVAL. Stationary instrument panels are secured to the engine mount stringers and a forward fuselage bulkhead and ordinarily are not considered removable. Shock-mounted panels are secured to the stationary panels by rubber shock mount assemblies.

a. To remove shock-mounted panel, thru 1972 model unscrew threaded buttons to remove decorative cover. On 1973 models, Velcro fasteners are used and beginning with 1974 models a combination of Velcro fasteners and guide pin, grommet arrangement are used. remove by gently pulling on the decorative panel.

b. Remove control knobs or lock nuts on panel which would interfere and pull off cover.

c. Remove nuts from shock-mount screws.

d. Tag and disconnect instrument plumbing and wiring and pull panel straight back.

e. Note combination of bolts, washers, ground straps and spacers used for correct installation when panel is reinstalled.

15-5. ADDING EXTRA SHOCK MOUNTS. Service life of instruments is directly related to adequate shock-mounting of panel. In some cases, particularly when additional instruments have been added in the field, the original shock mounts are inadequate to support the increased weight of panel. Installing additional shock mounts, when the instrument complement is increased, is a practical fix to prevent rapid deterioration of mounts at the original locations.

15-6. INSTALLATION.

a. To install the shock-mounted panel, set it in place in stationary panel, aligning shock mounts with holes in panel and install nuts on shock mount screws.

b. Replace instruments and connect wiring and plumbing as necessary, then position decorative cover.

c. Install any previously removed control knobs and lock nuts.

15-7. INSTRUMENTS. (Refer to figure15-1.)

15-8. REMOVAL. Most instruments are secured to panel with screws inserted through the panel face, under the decorative cover. To remove an instrument, remove decorative cover, disconnect plumbing or wiring to instrument concerned, remove retainer screws and take instrument out from behind, or in some cases from front of instrument panel. Instrument clusters are installed as units, secured by a screw on each end of cluster. Each cluster must be removed from panel to replace an individual gage. In all cases when an instrument is removed, lines or wires disconnected from it 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 they will not ground accidentally or short-circuit on another terminal.

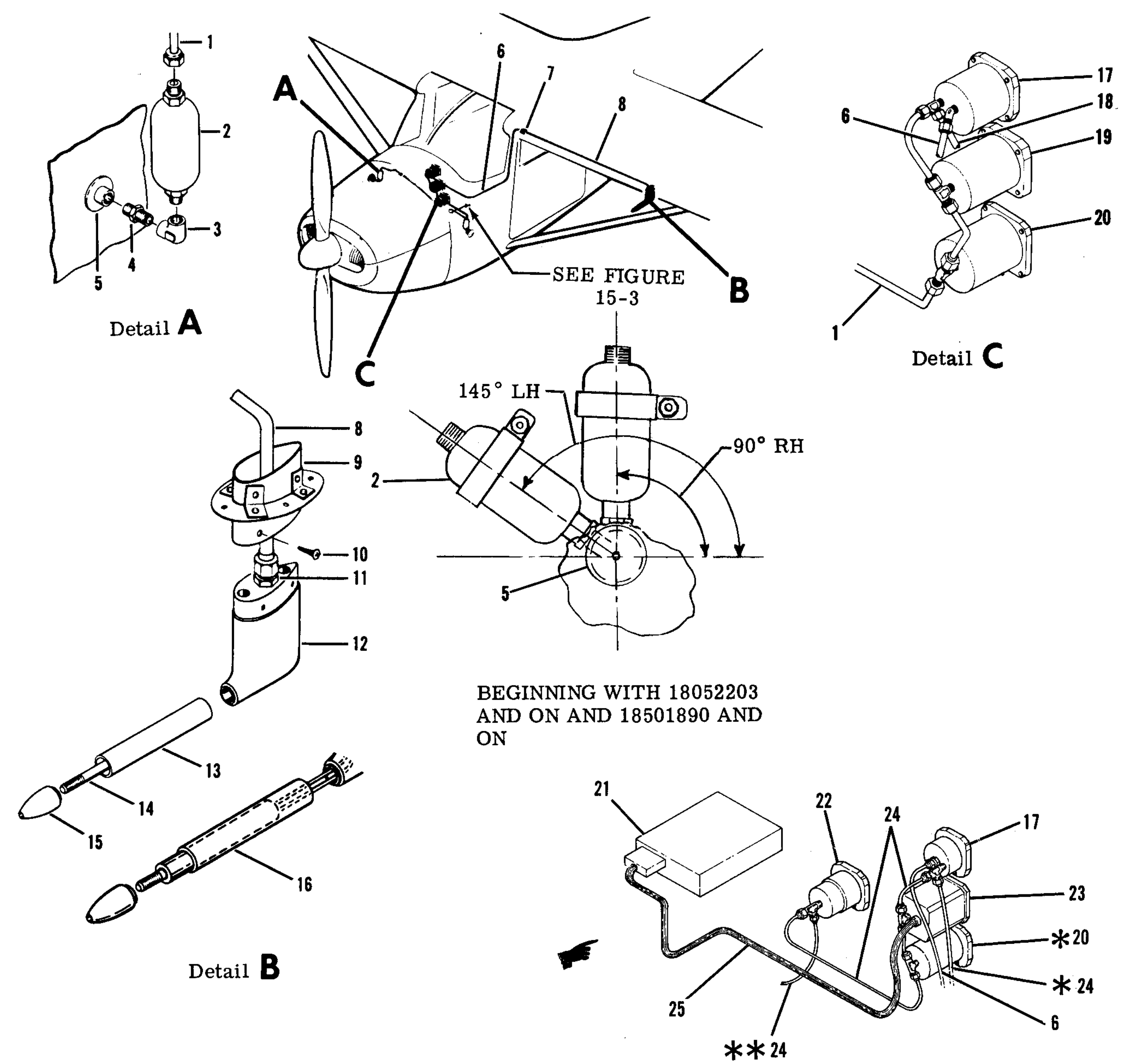
15-9. INSTALLATION. Generally, installation procedure is the reverse of the removal procedure. Make sure mounting screw nuts are tightened firmly, but do not overtighten them, particularly on instruments having plastic cases. The same rule generally applies to connecting plumbing and wiring. If thread lubricant or sealer is used on plumbing, it should be applied sparingly and only on male threads. When replacing an electrical gage in an instrument cluster assembly avoid bending the pointer or dial plate. Distortion of the dial or back plate could change calibration of the 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 the vertical speed indicator, altimeter and airspeed indicator to atmospheric pressure through plastic tubing connected to static ports. A static line sump is installed at each source button to collect condensation in the static system. An alternate static source may be installed on the aircraft 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 in the pitot mast. The heating element is controlled by a switch at the instrument panel and powered by the electrical system. Beginning with aircraft 18052468 and 18502456, 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. Figure 15-2 may be used as a guide for installation and removal of the encoding altimeter.

15-12. MAINTENANCE. Proper maintenance of the pitot and static system is essential for proper operation of the altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in the pitot system will result in false airspeed indications, while static system malfunctions will affect the readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the principal rules for pitot and static pressure 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 the static pressure system, assuming that the altimeter has been tested



NOTE

*VERTICAL SPEED INDICATOR IS OPTIONAL

OPTIONAL ENCODING ALTIMETER BEGINNING WITH 18052468 AND 18502456

1. Line (Right Sump to Tee)
2. Right Static Source Sump
3. Elbow
4. Nipple
5. Right Static Port
6. Line (Airspeed Indicator to Union in Wing)
7. Union
8. Line (Union to Pitot Tube)
9. Connector (Pitot Tube)
10. Screw
11. Nipple
12. Body (Pitot Mast)
13. Tube (Pitot Mast)
14. Stem (Pitot Mast)
15. Nose Fitting (Pitot Mast)
16. Heater Assembly
17. Airspeed Indicator
18. Line (Tee to Left Static Source Sump)
19. Altimeter
20. Vertical Speed Indicator
21. Transponder
22. Standby Altimeter
23. Encoding Altimeter
24. Static Line
25. Line (To Transponder)

* To L/H Static Source
** To R/H Static Source

Figure 15-2. Pitot and Static Systems

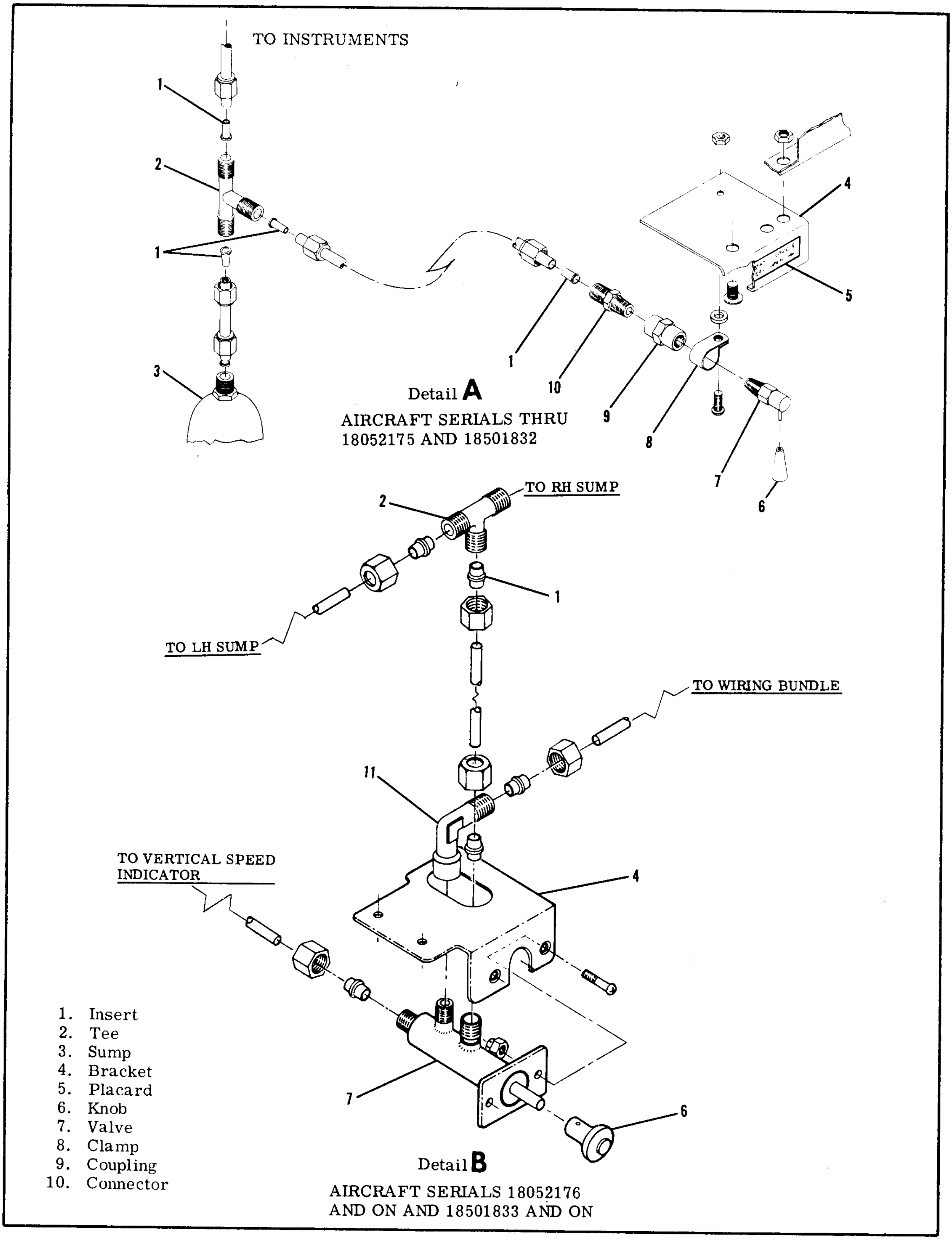


Figure 15-3. Alternate Static Air Source

and inspected in accordance with current Federal Aviation Regulations.

a. Ensure that static system is free from entrapped moisture and restrictions.

b. Ensure that no alterations or deformations of airframe surface have been made that would affect the relationship between air pressure in static pressure system and true ambient static air pressure for any flight configuration.

c. Seal off one static pressure source opening with plastic tape. This MUST be an air-tight seal.

d. Close static pressure alternate source valve, if installed.

e. Attach a source of suction to remaining static pressure source opening. Figure 15-5 shows one method of obtaining suction.

f. Slowly apply suction until altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed range of vertical speed indicator or airspeed indicator.

g. Cut off suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on altimeter.

h. If leakage rate is within tolerance, slowly release suction source, then remove tape used to seal static 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.

i. Disconnect static pressure lines from airspeed indicator and vertical speed indicator and use suitable fittings to connect lines together so that altimeter is the only instrument still connected into static pressure system.

j. Repeat leakage test to check whether static pressure system or the removed 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 the leakage.

k. Attach a source of positive pressure to static source opening. Figure 15-5 shows one method of obtaining positive pressure.

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected to static pressure system.

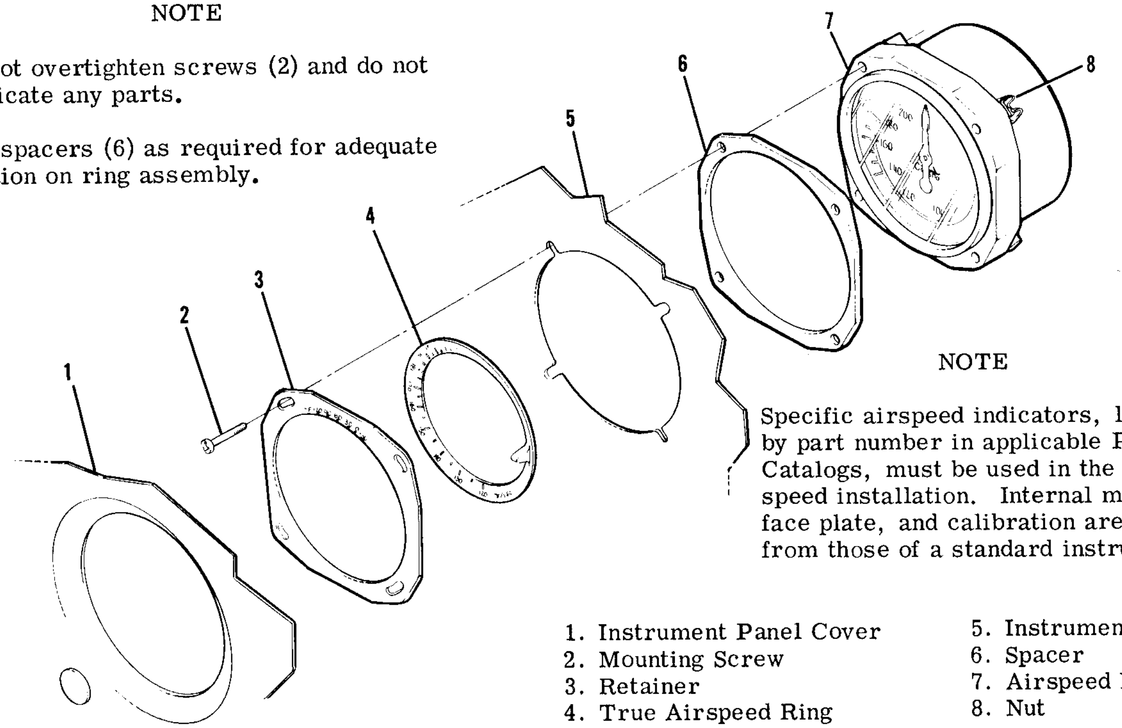
l. Slowly apply positive pressure until altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections, static pressure alternate source valve and static source flange with solution of mild soap and water, watching for bubbles to locate leaks.

SHOP NOTES:

NOTE

Do not overtighten screws (2) and do not lubricate any parts.

Use spacers (6) as required for adequate friction on ring assembly.



NOTE

Specific airspeed indicators, listed by part number in applicable Parts Catalogs, must be used in the true airspeed installation. Internal mechanism, face plate, and calibration are different from those of a standard instrument.

1. Instrument Panel Cover
2. Mounting Screw
3. Retainer
4. True Airspeed Ring
5. Instrument Panel
6. Spacer
7. Airspeed Indicator
8. Nut

Figure 15-4. True Airspeed Indicator

m. Tighten leaking connections. Repair or replace any parts found defective.

n. Reconnect airspeed indicator and vertical speed indicator into static pressure system and repeat leakage test per steps "c" thru "h."

15-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check pitot system for leaks, fasten a piece of rubber or plastic tubing over pitot tube, close opposite end of tubing and slowly roll up tube until airspeed indicator registers in cruise range. Secure tube and after a few minutes recheck airspeed indicator. Any leakage will have reduced the pressure in system, resulting in a lower airspeed indication. Slowly unroll tubing before removing it, so pressure is reduced gradually. Otherwise instrument may be damaged. If test reveals a leak in system, check all connections for tightness.

15-15. BLOWING OUT LINES. Although the pitot system is designed to drain down to the pitot tube opening, condensation may collect at other points in system and produce a partial obstruction. To clear line, disconnect at airspeed indicator and, using low pressure air, blow from indicator end of the line toward pitot tube.

CAUTION

Never blow through pitot or static lines toward instruments. Doing so may damage them.

Like the pitot lines, the static pressure lines must be kept clear and the connections tight. All models have static source sumps that collect moisture and keep the system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow line clear with low-pressure air.

NOTE

On aircraft equipped with alternate static source, use same procedure, opening alternate static source valve momentarily to clear its line, then close valve and clear remainder of system.

Check all static pressure line connections for tightness. If hoses or hose connections are used, check them for general condition and their clamps for security. Replace hoses which have cracked, hardened or show other signs of deterioration.

15-16. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 15-2.) To remove the pitot mast remove the four mounting screws on side of connector (9) and pull mast out of connector far enough to disconnect pitot line (8). Electrical connections to heater assembly (if installed) may be disconnected through wing access plate just inboard of mast. The pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Reinstallation 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 the cabin and right door. When replacing components of the pitot and static pressure systems, use anti-seize compound sparingly on male threads on both metal and plastic connections. Avoid excess compound which might enter lines. Tighten connections firmly, but aviod 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.
	Alternate static source valve open, Thru 1971 Models.	Check visually. Close for normal operation.

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 15-4 for removal and installation. Upon installation, before tightening mounting screws (2), calibrate instrument as follows: Rotate ring (4) until 120 mph on the adjustable ring aligns with 120 mph on the indicator. Holding this setting, move retainer (3) until 60°F aligns with zero pressure altitude, then tighten mounting screws (2) and replace decorative cover.

NOTE

Beginning with serials 18052621 and 18502839, 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.
	Alternate static source valve open, Thru 1971 Models.	Check visually. Close for normal operation.

15-20. TROUBLE SHOOTING--ALTIMETER

TROUBLE	PROBABLE CAUSE	REMEDY
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.
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.

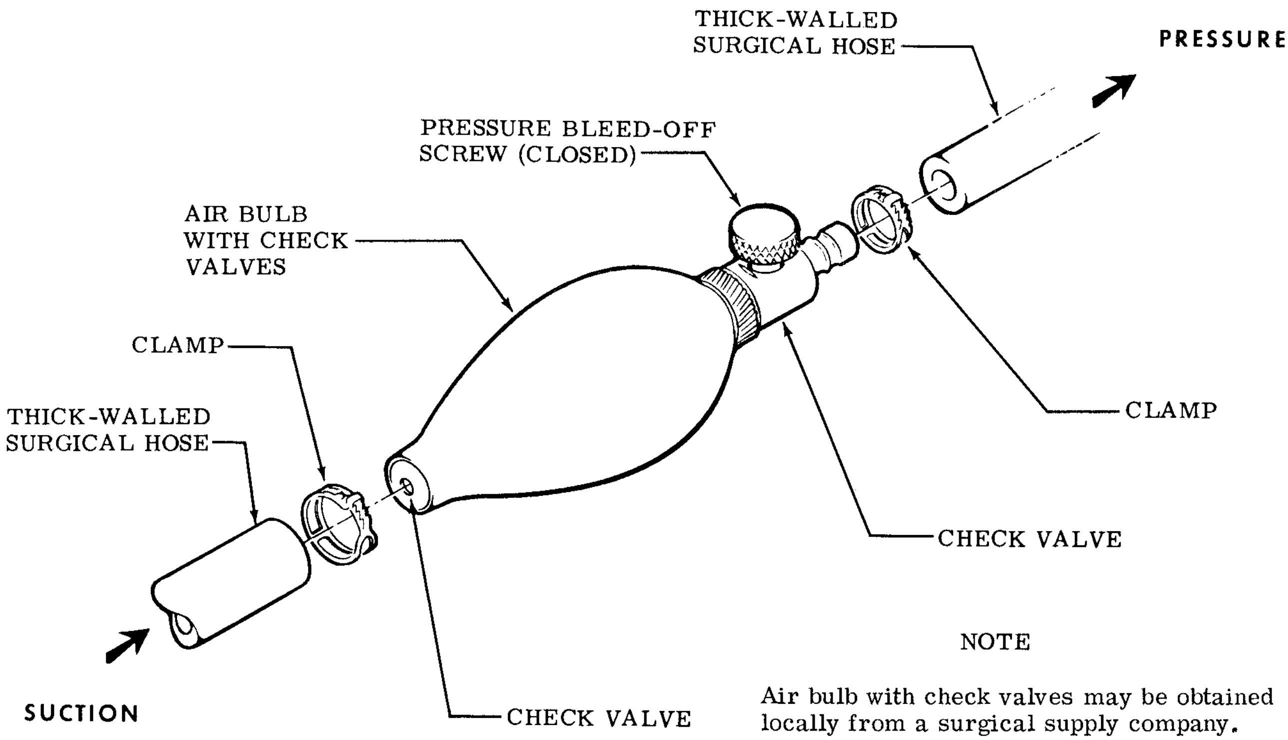
SHOP NOTES:

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.
	Static line broken.	Check line for damage, connections for security. Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Check line for obstructions. Blow out lines.
	Ruptured diaphragm.	Substitute known-good indicator and check reading. Replace instrument.
	Pointer off zero.	Reset pointer to zero. Reset pointer to zero.
POINTER OSCILLATES.	Partially plugged static line.	Check line for obstructions. Blow out lines.
	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."
	Blown fuse.	Check fuse. Replace fuse.
	Break in wiring.	Test for open circuit. Repair wiring.
	Heating element burned out.	Check resistance of heating element. Replace element.



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 15-5. Static System Test Equipment

15-23. VACUUM SYSTEM. (Refer to figure 15-6.)

15-24. DESCRIPTION. Through Aircraft Serial 180-52309 and 18502142 suction to operate the gyros is provided by an engine-driven vacuum pump, gear-driven through a spline-type coupling. The vacuum pump discharge air passes through an oil separator, where the oil, which passes through the pump for lubrication, is returned to the engine and the air is expelled overboard. Beginning with Aircraft Serial 18052310 and 18502143 a dry vacuum system is installed. This system utilizes a sealed bearing, engine-driven vacuum pump, which eliminates the oil separation components from the system. A discharge tube is connected to the pump to expell the air from the pump overboard. A suction relief valve is used to control system pressure and is connected between the pump inlet and the instruments. In the cabin, the vacuum line is routed from the gyro instruments to the relief valve at the firewall. A central air filtering system is utilized. Beginning with aircraft 18052310 and 18502142, a disposable type air filter is utilized and may be replaced as required. The reading of the suction gage indicates net difference in suction before and after air passes through a gyro. This differential pressure will gradually decrease as the central air filter becomes dirty, causing a lower reading on the suction gage.

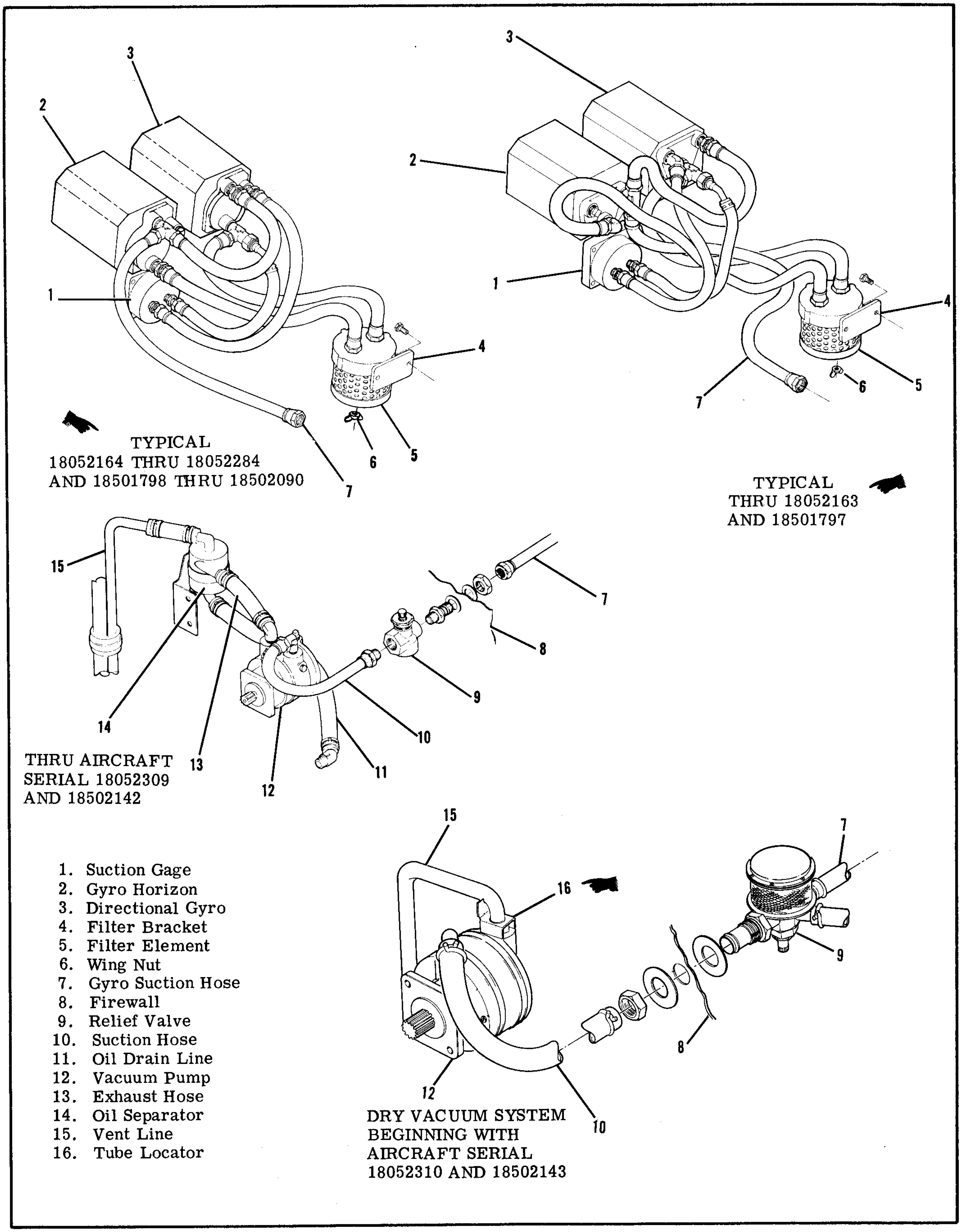
15-25. TROUBLE SHOOTING - VACUUM SYSTEM (WET SYSTEM).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS.	Gyros function normally-relief valve screen clogged, relief valve malfunction.	Check screen, than valve. Compare gage readings with new gage. Clean screen, reset valve. Replace gage.
NORMAL SUCTION GAGE READING, SLUGGISH OR ERRATIC GYRO RESPONSE.	Instrument air filters clogged.	Check operation with filters removed. Replace filters.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump, restriction in oil separator or 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 oil separator.
	Central air filter dirty.	Check operation with filter removed. 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.
OIL COMES OVER IN PUMP DISCHARGE LINE.	Oil seperator clogged, oil return line obstructed, excessive oil flow through pump.	Check oil seperator, return line. Check that pump oil return rate does not exceed 120 cc/hour (approx. 8 drops/minute), at 50 psi oil pressure. Clean oil separator is Stoddard solvent, blow dry. Blow out lines. If pump oil consumption is excessive, replace oil metering collar and pin in pump.

15-25A. TROUBLE SHOOTING - VACUUM SYSTEM (DRY SYSTEM).

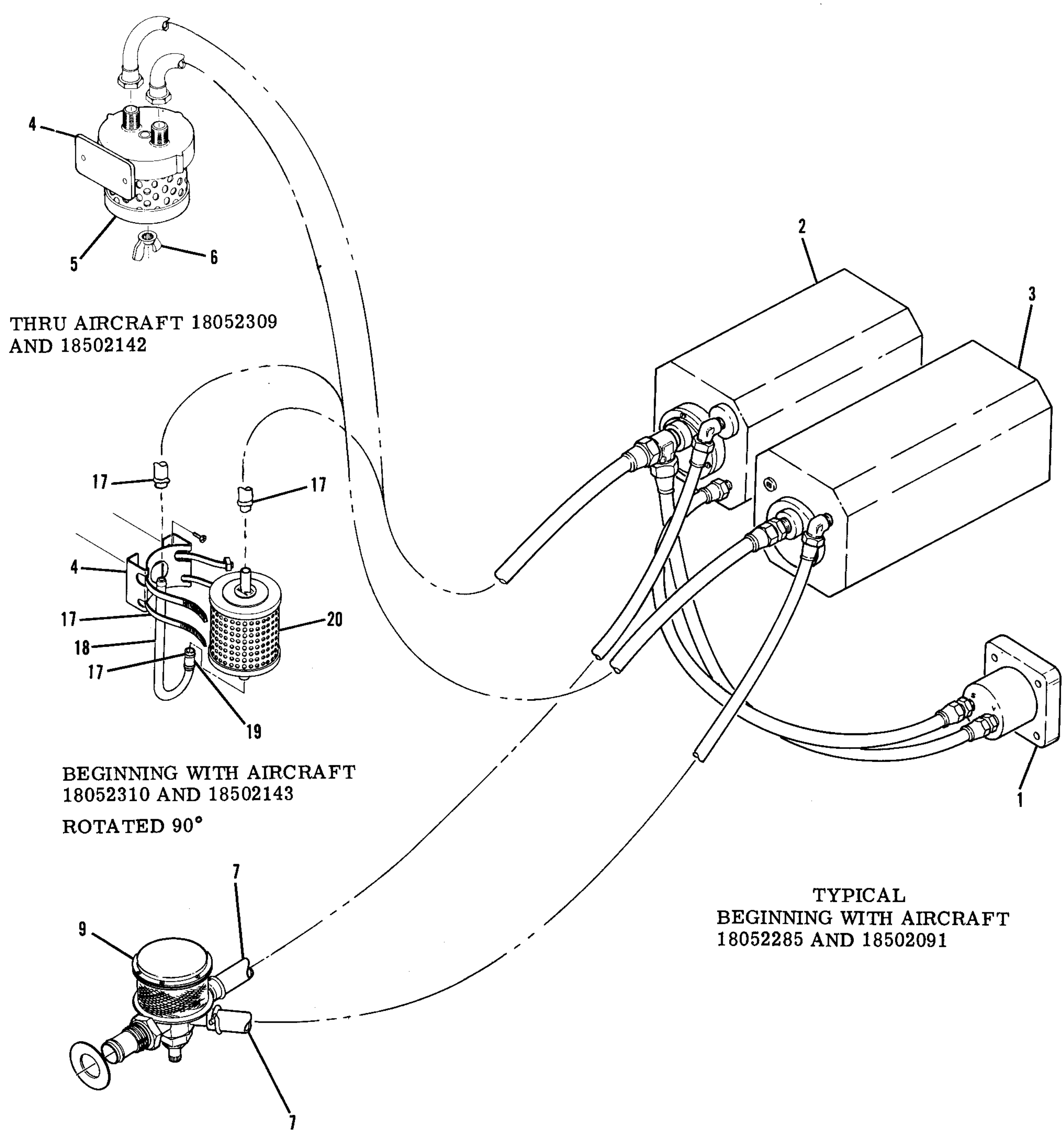
TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS.	Gyros function normally-relief valve screen clogged, relief valve malfunction.	Check screen, then valve. Compare gage readings with new gage. Clean screen, reset valve. Replace gage.
NORMAL SUCTION GAGE READING, SLUGGISH OR ERRATIC GYRO RESPONSE.	Instrument air filters clogged.	Check operation with filters removed. Replace filters.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Check lines for leaks, disconnect and test pump. Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Central air filter dirty.	Check operation with filter removed. 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.

SHOP NOTES:



1. Suction Gage
2. Gyro Horizon
3. Directional Gyro
4. Filter Bracket
5. Filter Element
6. Wing Nut
7. Gyro Suction Hose
8. Firewall
9. Relief Valve
10. Suction Hose
11. Oil Drain Line
12. Vacuum Pump
13. Exhaust Hose
14. Oil Separator
15. Vent Line
16. Tube Locator

Figure 15-6. Engine- Driven Vacuum System(Sheet 1 of 2)



17. Sta-Strap
18. U-Tube
19. Connecting Hose
20. Disposable Filter Element

Figure 15-6. Engine-Driven Vacuum System(Sheet 2 of 2)

15-26. 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.
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.

15-26. TROUBLE SHOOTING--GYROS. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Substitute known-good gyro and check indication. Replace instrument.

15-27. TROUBLE SHOOTING - VACUUM PUMP (Wet System)

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
	Oil separator clogged, oil return line obstructed, excessive oil flow through pump.	Clean oil separator with Stoddard solvent, then blow dry. Blow out lines. If pump oil consumption is excessive, replace oil metering pin in pump.
HIGH SUCTION.	Suction relief valve screen clogged.	Clean or replace screen.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

15-27A. TROUBLE SHOOTING -- VACUUM PUMP (Dry System)

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged pump drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve screen clogged.	Clean or replace screen.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

SHOP NOTES:

15-28. REMOVAL AND INSTALLATION OF COMPONENTS. Through Aircraft Serial 18052309 and 18502142 . The various components of the vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. When replacing a vacuum system component, ensure connections are made correctly. Use thread lubricant sparingly and only on male threads. Avoid over-tightening connections. Before reinstalling a vacuum pump, probe oil passages in pump and engine, to make sure they are open. Place mounting pad gasket in position over studs and ensure it does not block oil passages. Coat pump drive splines lightly with a high-temperature grease such as Dow Silicone #30 (Dow-Corning Co., Midland, Mich.). After installing pump, before connecting plumbing, start engine and hold a piece of paper over pump discharge to check for proper lubrication. Proper oil flow through pump is one to four fluid ounces per hour.

15-28A. REMOVAL AND INSTALLATION. Beginning with 18052310 and 18502143 the various components of the vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. Cap open lines and fitting to prevent dirt from entering the system. When replacing a vacuum system component, ensure connections are made correctly. Use no lubricants on any components when assembling a dry vacuum system. Avoid over-tightening connections. Before installing the vacuum pump, place mounting pad gasket in position over studs. Be sure all lines and fittings are open and caps are removed.

15-29. CLEANING. Low pressure, dry compressed air should be used in cleaning vacuum system components. The suction relief valve should be washed with Stoddard solvent then dried with low-pressure air. Refer to Section 2 for central air filter. Check hose for collapsed inner liners as well as external damage.

CAUTION

Never apply compressed air to lines or components installed in aircraft. The excessive pressures will damage gyros. If an obstructed line is to be blown out, disconnect at both ends and blow from instrument panel out.

15-30. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches of mercury is desirable for gyro instruments. However, a range of 4.6 to 5.4 inches of mercury is acceptable. To adjust the relief valve, remove control air filter, run engine to 2200 rpm on the ground and adjust relief valve to 5.3 ± .1 inches of mercury.

CAUTION

Do not exceed maximum engine temperature.

Be sure filter element is clean before installing. If reading drops noticeably, install new filter element.

15-31. ENGINE INDICATORS.

15-32. TACHOMETER.

15-33. DESCRIPTION. The tachometer used is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the drive-shaft. To function properly, the shaft housing must be free of kinks, dents and sharp bends. There should be no bend on a radius shorter than six inches, and no bend within three inches of either terminal. If a tachometer is noisy or the pointer oscillates, check cable housing for kinks, sharp bends and damage. Disconnect cable at the 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).

15-34. MANIFOLD PRESSURE GAGE. (MODEL 180)

15-35. DESCRIPTION. The manifold pressure gage is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury; thus, with engine stopped or at sudden full throttle and maximum rpm, it will register approximately the ambient barometric pressure.

SHOP NOTES:

15-36. TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Blow out line.
JERKY MOVEMENT OF POINTER.	Excessive internal friction.	Replace instrument.
	Rocker shaft screws tight.	Replace instrument.
	Link springs too tight.	Replace instrument.
	Dirty pivot bearings.	Replace instrument.
	Defective mechanism.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
SLUGGISH OPERATION OF POINTER.	Foreign matter in line.	Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
EXCESSIVE POINTER VIBRATION.	Tight rocker pivot bearings.	Replace instrument.
	Excessive vibration.	Tighten mounting screws.
IMPROPER CALIBRATION.	Faulty mechanism.	Replace instrument.
NO POINTER MOVEMENT.	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Repair or replace damaged line.

SHOP NOTES:

15-37. CYLINDER HEAD TEMPERATURE GAGE.

15-38. DESCRIPTION. The temperature bulb regulates electrical power through the cylinder head temperature gage. The gage and bulb require little or no maintenance other than cleaning, making sure lead is properly supported and all connections are clean, tight and properly insulated. A potentiometer is installed on the gage for calibration purposes.

NOTE

A Cylinder Head Temperature Gage Calibration Unit, SK182-43 is available and may be ordered through the Cessna Service Parts Center.

15-39. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	No current to circuit.	Repair electrical circuit.
	Defective gage, bulb or circuit.	Repair or replace defective items.
GAGE FLUCTUATES RAPIDLY.	Loose or broken wire permitting alternate make and break of gage circuit.	Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE.	High voltage.	Check "A" terminal.
	Gage off calibration.	Recalibrate or replace gage.
GAGE READS TOO LOW ON SCALE.	Low voltage.	Check voltage supply and "D" terminal.
	Gage off calibration.	Recalibrate or replace gage.
GAGE READS OFF SCALE AT HIGH END.	Break in bulb.	Replace bulb.
	Break in bulb lead.	Replace bulb.
	Internal break in gage.	Replace gage.
OBVIOUSLY INCORRECT READING.	Defective gage mechanism.	Replace gage.
	Incorrect calibration.	Recalibrate.

15-40. OIL PRESSURE GAGE.

15-41. DESCRIPTION. The Bourdon tube-type oil pressure gage is a direct-reading instrument, operated by a pressure pickup line connected to the engine main oil gallery. The oil pressure line from the instrument to the engine should be filled with kerosene, especially during cold weather operation, to attain an immediate oil indication.

SHOP NOTES:

15-42. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Check line for obstructions. Clean line.
	Pressure line broken.	Check line for leaks and damage. Repair or replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on staff.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Check line for obstructions. Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Check line for leaks and damage. Repair or replace damaged line.

15-43. OIL TEMPERATURE GAGE.

15-44. DESCRIPTION. The oil temperature gage is a Bourdon-type pressure instrument connected by armored capillary tubing to a temperature bulb in the engine. The temperature bulb, capillary tube and gage are filled with fluid and sealed. Expansion and contraction of the fluid in the bulb with temperature changes operates the gage. Checking the 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 the capillary, making the gage inoperative.

15-45. CARBURETOR AIR TEMPERATURE GAGE.

15-46. DESCRIPTION. The carburetor air temperature gage is of the resistance-bridge type, in which changes in the electrical resistance of the element in the sensing bulb, are indicated by a meter, calibrated for temperature. The system requires power from the 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 the possibility of instrument error introduced by poor electrical bonds in the airframe.

15-47. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE POINTER STAYS OFF LOW END OF SCALE.	Circuit breaker out.	Check visually. Reset breaker.
	Master switch "OFF" or switch defective.	Check switch "ON." Replace defective switch.
	Broken or grounded leads between gage and sensing unit.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE POINTER GOES OFF HIGH END OF SCALE.	Broken or grounded lead.	Check circuit wiring. Repair or replace defective wiring.
	Defective gage or sensing unit.	Substitute known-good gage or sensing unit. Replace gage or sensing unit.
GAGE OPERATES INTER-MITTENTLY.	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.
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.

15-48. FUEL QUANTITY INDICATING SYSTEM.

15-49. DESCRIPTION. The magnetic type fuel quantity indicators are used in conjunction with a float-operated variable-resistance transmitter in each fuel 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.

15-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO INDICATE.	No power to indicator or transmitter. (Pointer stays below E.)	Check circuit breaker, inspect for open circuit. Reset breaker. repair or replace defective wire.
	Grounded wire. (Pointer stays above F.)	Check for partial ground between transmitter and gage. Repair or replace defective wire.
	Low voltage.	Check voltage at indicator. Correct voltage.
	Defective indicator.	Substitute known-good indicator. Replace indicator.
OFF CALIBRATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Defective transmitter.	Substitute known-good transmitter. Recalibrate or replace.
	Low or high voltage.	Check voltage at indicator. Correct voltage.
STICKY OR SLUGGISH INDICATOR OPERATION.	Defective indicator.	Substitute known-good indicator. Replace indicator.
	Low voltage.	Check voltage at indicator. Correct voltag
ERRATIC READINGS.	Loose or broken wiring on indicator or transmitter.	Inspect circuit wiring. Repair or replace defective wire.
	Defective indicator or transmitter.	Substitute known-good component. Replace indicator or transmitter.
	Defective master switch.	Replace switch.

15-51. TRANSMITTER CALIBRATION. Chances of the transmitter calibration changing in normal service is remote, however, it is possible that the float arm or float arm stops may become bent if the transmitter is removed from the cell. Transmitter calibration is obtained by adjusting float travel. Float travel is limited by float arm stops.

WARNING

Use extreme caution while working with electrical components of fuel system. The possibility of electrical sparks around an "empty" fuel cell creates a hazardous situation.

Before installing transmitter, attach electrical wires and place master switch in ON position. Allow float arm to rest against lower float arm stop and read indicator. The pointer should be on E (empty) position. Adjust lower stop with float arm against stop so that pointer indicator is on E (empty). Raise float until arm is against upper stop and adjust stop to permit indicator pointer to be on F (full).

15-51A. REMOVAL AND INSTALLATION.

a. Drain fuel from cell. (Observe precautions in Section 12, Paragraph 12-3.)
b. Remove wing root fairing.
c. Disconnect electrical lead and ground strap from transmitter.
d. Remove screws through transmitter and wing root rib, and carefully work transmitter from fuel cell and wing rib. DO NOT BEND FLOAT ARM.
e. Install transmitter by reversing preceding steps. No gasket paste should be used.
f. Fill fuel cell. Check for leaks and correct fuel quantity indication.

15-52. FUEL FLOW INDICATOR. (MODEL 185)

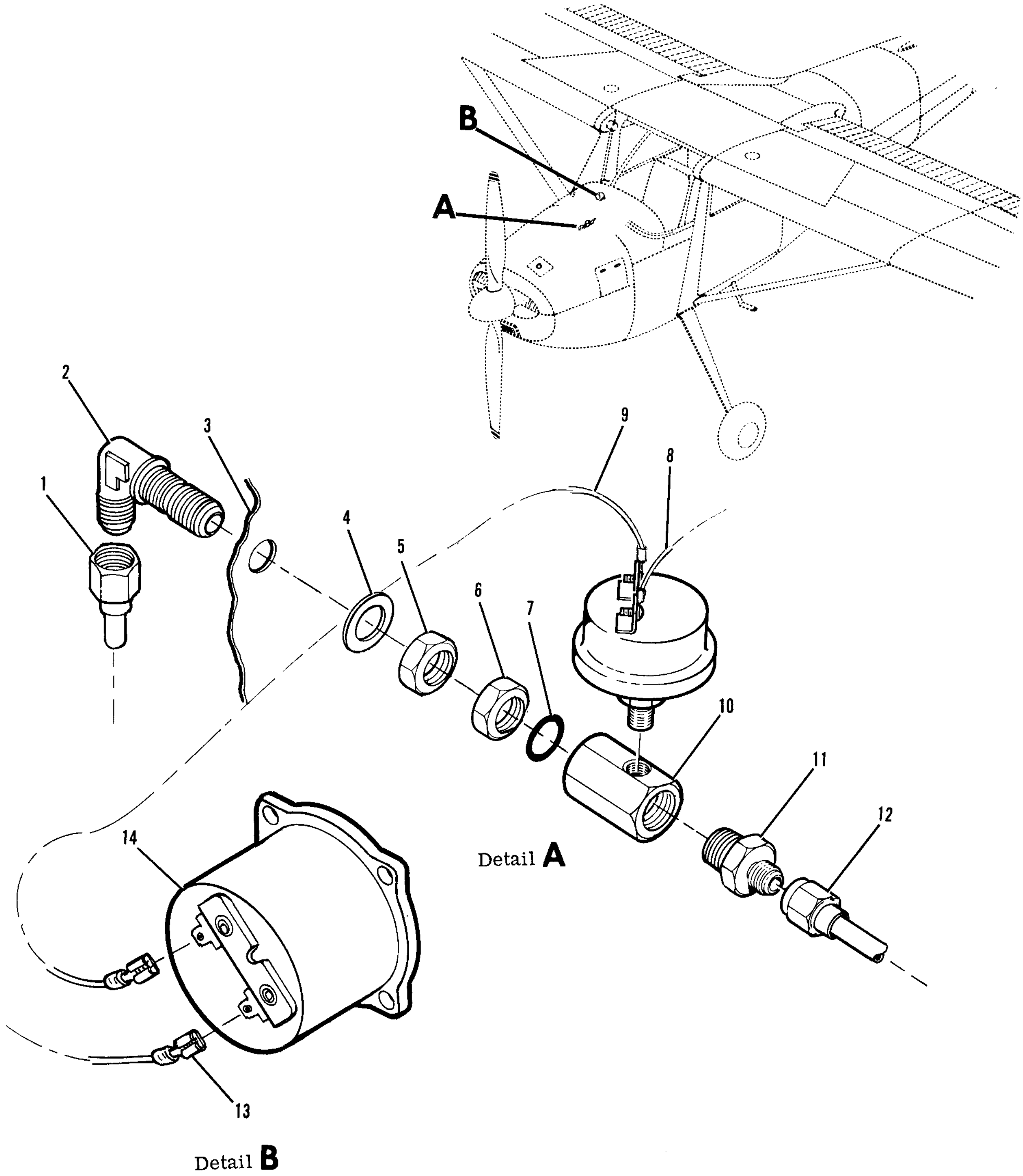
15-53. DESCRIPTION. The manifold pressure and fuel flow indicators are in one instrument case. However, each instrument operates independently. The manifold pressure gage is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury. The fuel flow indicator is a pressure instrument calibrated in gallons per hour, indicating approximate gallons of fuel metered per hour to the engine. Pressure for operating the indicator is obtained through a hose from the fuel manifold valve.

15-53. TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
DOES NOT REGISTER.	Pressure line clogged.	Blow out line.
	Pressure line broken.	Repair or replace damaged line.
	Fractured bellows or damaged mechanism.	Replace instrument.
	Clogged snubber orifice.	Replace instrument.
	Pointer loose on staff.	Replace instrument.
POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Blow out line.
	Clogged snubber orifice.	Replace instrument.
	Damaged bellows or mechanism.	Replace instrument.
INCORRECT OR ERRATIC READING.	Damaged or dirty mechanism.	Replace instrument.
	Pointer bent, rubbing on dial or glass.	Replace instrument.
	Leak or partial obstruction in pressure or vent line.	Blow out dirty line, repair or tighten loose connections.

15-55. HOURMETER.

15-56. DESCRIPTION. The hourmeter is electrically operated and is actuated by a pressure switch in the oil pressure gage line. Electrical power is supplied through a one-amp fuse from the electrical clock circuit, and therefore will operate independent of the master switch.



1. Oil Pressure Line
2. Elbow
3. Firewall
4. Washer
5. Nut
6. O-Ring
7. Wire (To Hourmeter)
8. Wire (To Clock Circuit)
9. Pressure Switch
10. Adaptor
11. Nipple
12. Line (To Oil Pressure Gage)
13. Wire (To Ground)
14. Hourmeter

Figure 6A. Hourmeter Installation

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15-57. ECONOMY MIXTURE INDICATOR.

15-58. DESCRIPTION. The economy mixture indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 75% power. Exhaust gas temperature (EGT) varies with the ratio of fuel-to-air mixture entering the engine cylinders. Refer to Owner's Manual for operating procedure of system.

15-59. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	Defective gage, probe or circuit.	Repair or replace defective part.
INCORRECT READING.	Indicator needs calibrating.	Calibrate indicator in accordance with paragraph 15-60.
FLUCTUATING READING.	Loose, frayed or broken lead, permitting alternate make and break of circuit.	Tighten connections and repair or replace defective leads.

15-60. CALIBRATION. A potentiometer adjustment screw is provided behind the plastic cap at the back of the instrument for calibration. This adjustment screw is used to position the pointer over the reference increment line (4/5 of scale) at peak EGT. Establish 75% power in level flight, then carefully lean the mixture to peak EGT. After the pointer has peaked, using the adjustment screw, position pointer over reference increment line (4/5 of scale).

NOTE

This setting will provide relative temperature indications for normal cruise power settings within range of the instrument.

Turning the screw clockwise increases the meter reading and counterclockwise decreases the meter reading. There is a stop in each direction and damage can occur if too much torque is applied against stops. Approximately 600°F total adjustment is provided. The adjustable yellow pointer on the face of the instrument is a reference pointer only.

15-61. REMOVAL AND INSTALLATION. Removal of the indicator is accomplished by removing the mounting screws and disconnecting the leads. Tag leads to facilitate installation. The thermocouple probe is secured to the exhaust stack with a clamp. When installing probe, tighten clamp to 45 pound-inches and safety as required.

15-62. MAGNETIC COMPASS.

15-63. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from the front of the case. The compass is internally lighted, controlled by the panel lights rheostat. No maintenance is required on the compass except an occasional check on a compass rose and replacement of the lamp.

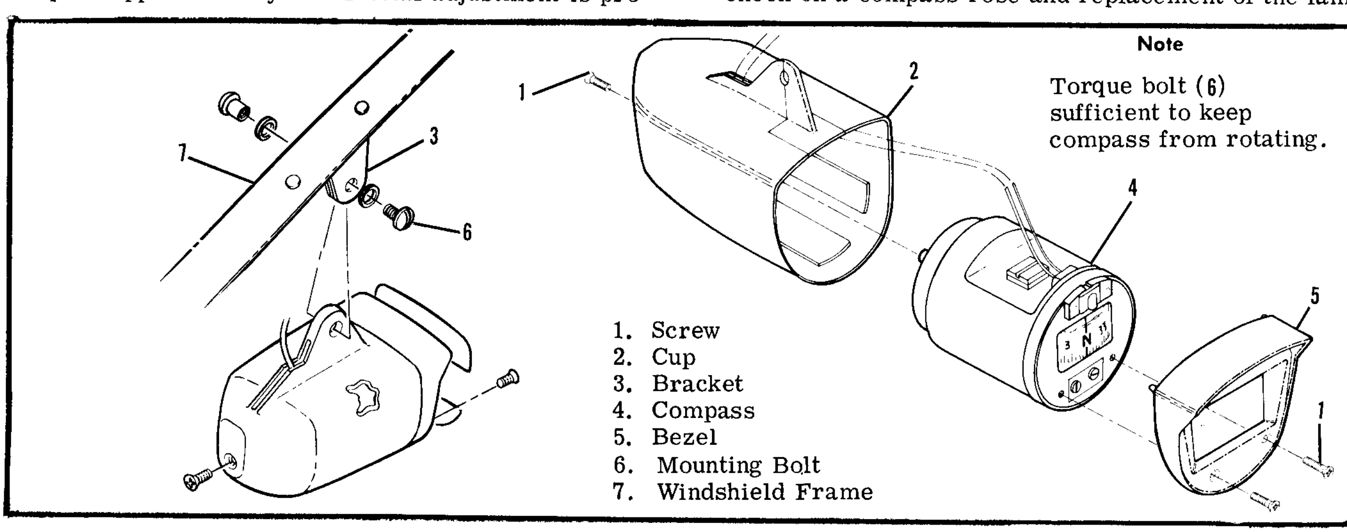


Figure 6B. Magnetic Compass Installation.

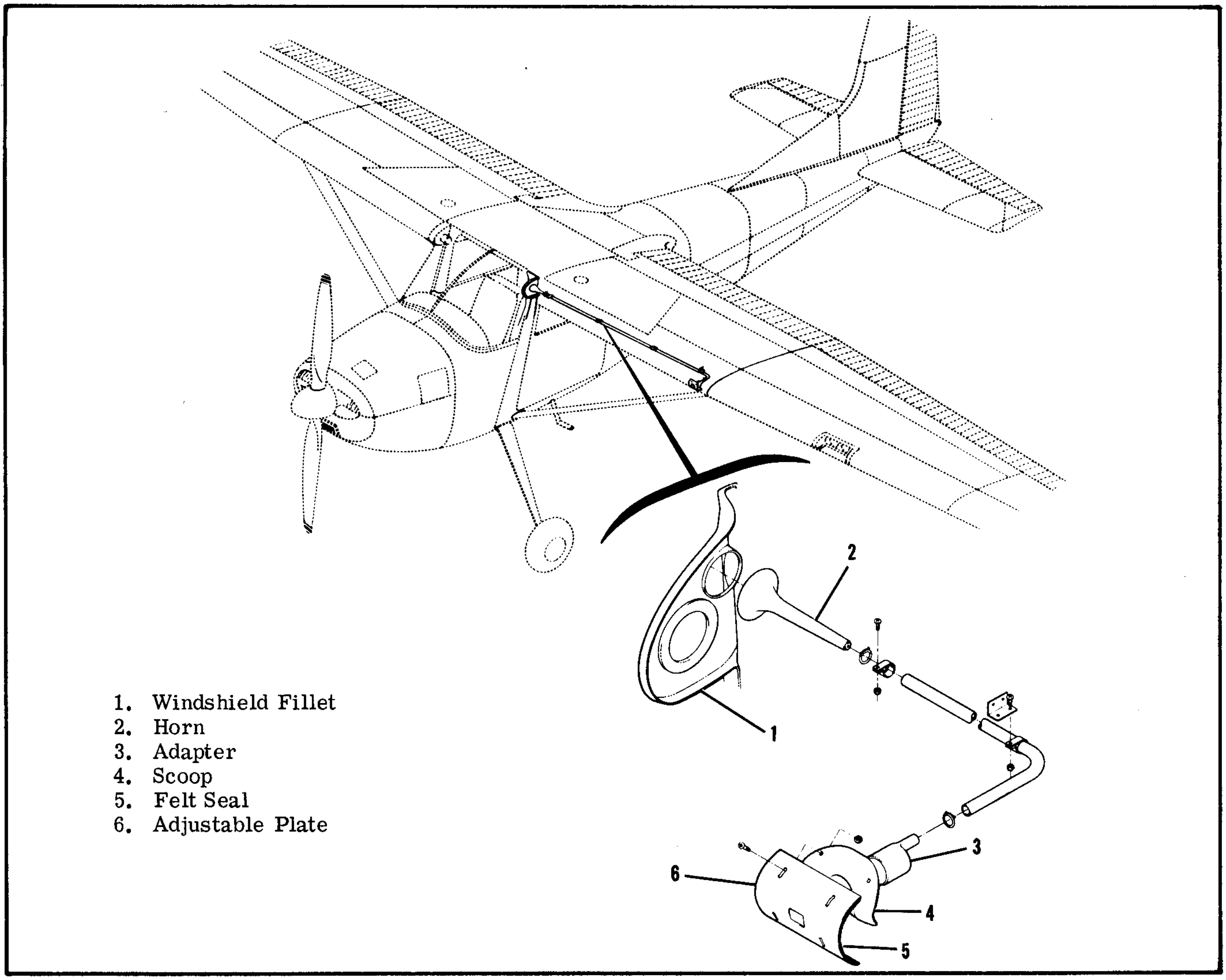


Figure 15-7. Pneumatic Stall Warning System

15-64. PNEUMATIC STALL WARNING HORN. (Refer to figure 15-7.)

15-65. DESCRIPTION. The system is composed of an adjustable plate on the left wing leading edge, connected to a reed type horn by means of plastic tubing. The horn is actuated approximately 5 to 10 miles per hour above stalling speed as a negative air pressure area at wing leading edge causes a reverse flow of air through horn. By moving adjustable plate (6) up, actuation of horn will occur at a higher speed and moving plate down causes actuation to occur at a slower speed. Center adjustable plate opening in wing leading edge upon installation, then flight test aircraft, observing horn actuation during stall. Readjust plate to obtain desired 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 (6) with a clean cloth, such as a handkerchief and apply a slight suction by mouth to draw air through horn.

15-66. TURN-AND-SLIP INDICATOR.

15-67. 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. Its circuit is protected by a automatically-resetting circuit breaker.

15-68. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Check circuit breaker.	Check wiring for continuity, check voltage at indicator. Replace circuit breaker. If circuit breaker still opens replace instrument.
	Master switch "OFF" or switch defective.	Check switch "ON." Replace defective switch.
	Broken or grounded lead to indicator.	Check circuit wiring. Repair or replace defective wiring.
	Indicator not grounded.	Check ground wire. Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Check voltage at indicator. Correct voltage.
NOISY GYRO.	High voltage.	Check voltage at indicator. Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

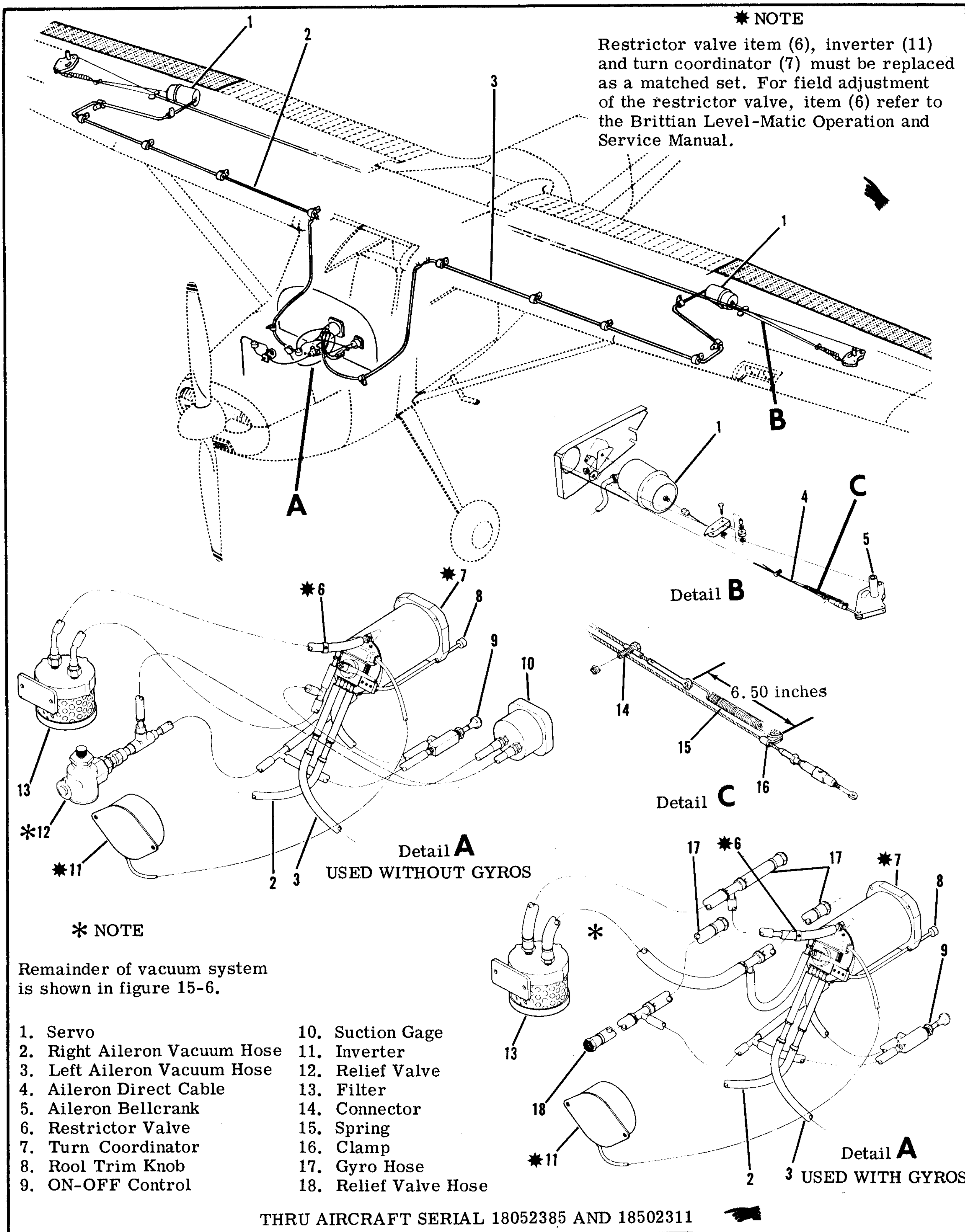
15-69. TURN COORDINATOR.

15-70. 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.

15-71. 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.

SHOP NOTES:



✱ NOTE

Restrictor valve item (6), inverter (11) and turn coordinator (7) must be replaced as a matched set. For field adjustment of the restrictor valve, item (6) refer to the Brittian Level-Matic Operation and Service Manual.

✱ NOTE

Remainder of vacuum system is shown in figure 15-6.

1. Servo
2. Right Aileron Vacuum Hose
3. Left Aileron Vacuum Hose
4. Aileron Direct Cable
5. Aileron Bellcrank
6. Restrictor Valve
7. Turn Coordinator
8. Rool Trim Knob
9. ON-OFF Control
10. Suction Gage
11. Inverter
12. Relief Valve
13. Filter
14. Connector
15. Spring
16. Clamp
17. Gyro Hose
18. Relief Valve Hose

THRU AIRCRAFT SERIAL 18052385 AND 18502311

Figure 15-8. Wing Leveler Control System

15-72. ELECTRIC CLOCK.

15-73. DESCRIPTION. The electric clock operates on 12 volts and requires a one-amp fuse in the circuit which is located adjacent to the battery box. The clock's electrical circuit is separated from the aircraft electrical system and will operate when master switch is OFF.

15-74. WING LEVELER. (Refer to figure 15-8) (Through aircraft serial 18052385 and 18502311)

15-75. DESCRIPTION. The wing leveler control system, consisting of a turn coordinator (6), pneumatic servos (1), connecting cables (4) and hose (2 and 3) 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 the ailerons for longitudinal stability. Manual control of system is afforded by the roll trim knob (7). 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 (8) controls the vacuum supply to the distributor valve, but does not affect the electrically operated turn coordinator gyro. Installation of wing leveler does not change vacuum relief valve (17) settings. Refer to appropriate publication issued by the manufacturer for trouble shooting procedures.

15-76. RIGGING.

a. Loosen connector (10) and clamp (12).
b. Move aileron to full up position.
c. Move clamp (12) outboard until spring (11) is extended to 6.50 inches from hole in cable to hole in clamp and tighten screw and nut.

NOTE

After completion of step "c", servo seal should be taut but not stretched.

d. Move connector (10) outboard until sleeve makes contact with servo cable end, then back off approximately .06 inch and torque connector to 70-90 pound-inches.

SHOP NOTES:

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 14-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.

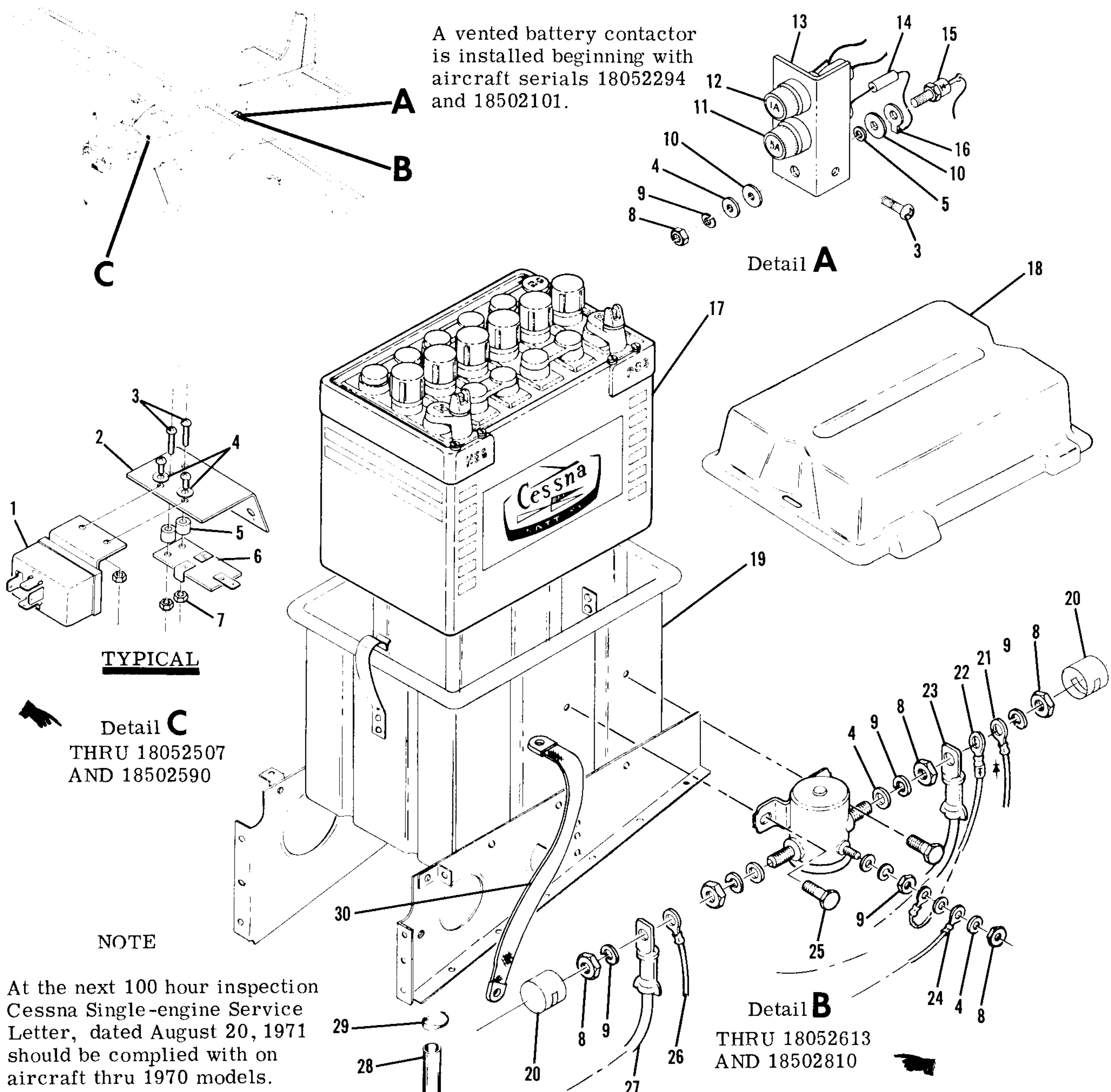
16-12. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed, the ammeter will show the full alternator output. When the battery is fully charged and cruise is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

16-13. BATTERY POWER SYSTEM.

16-14. BATTERY.

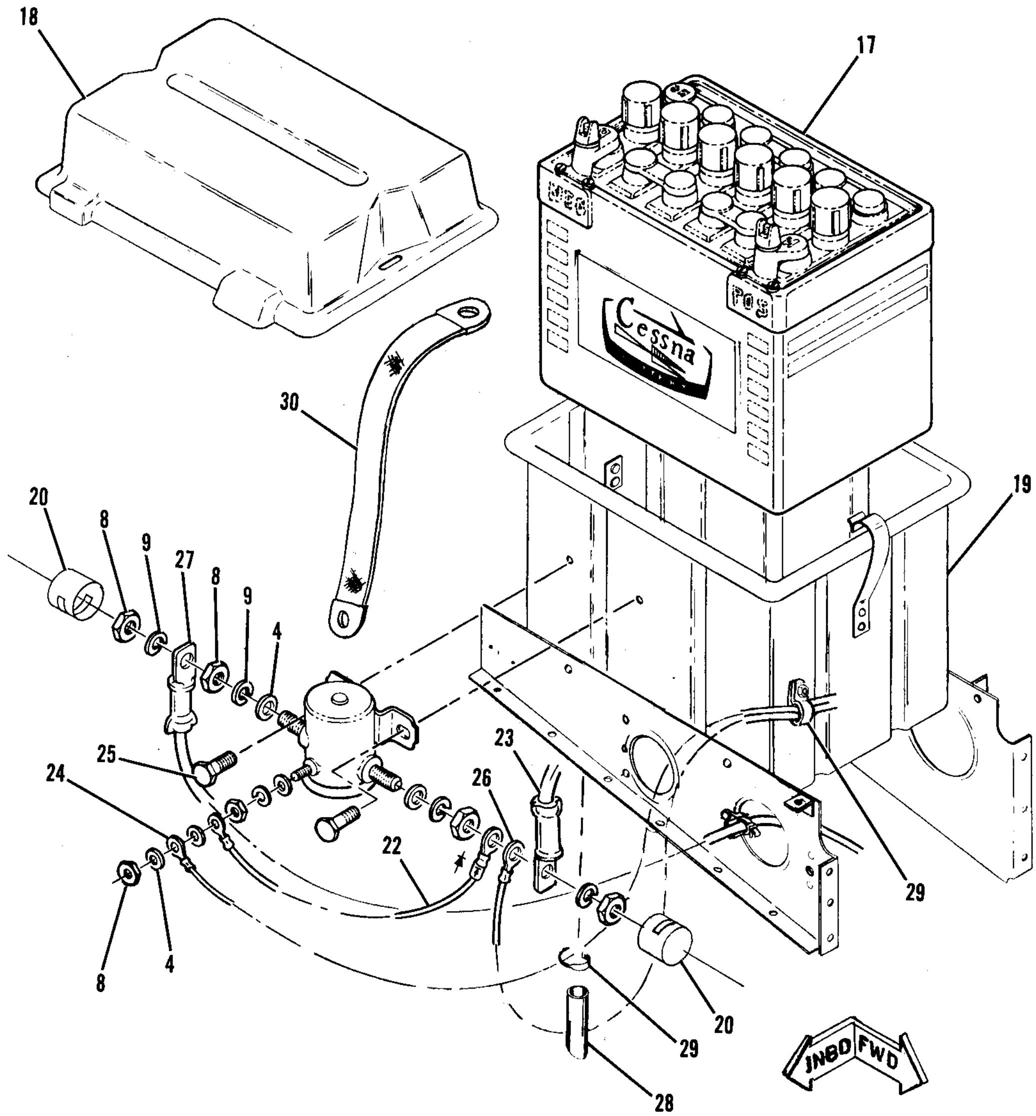
16-15. DESCRIPTION. The aircraft is equipped with a 12-volt battery with an approximate 33 ampere-hour capacity, The battery is mounted in the tailcone and is equipped with non-spill filler caps.

SHOP NOTES:



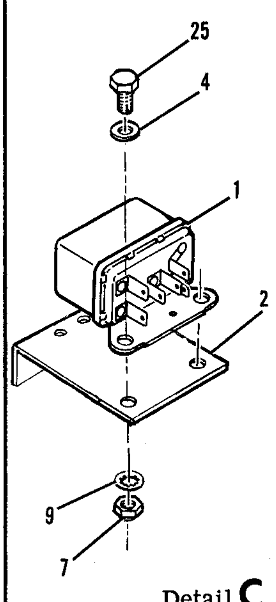
1. Split Bus Power Relay
2. Bracket - Relay Mounting
3. Screw
4. Washer
5. Spacer
6. Diode Board
7. Locknut
8. Nut
9. Lockwasher
10. Insulating Washer
11. Fuse - Battery Contactor Closing Circuit
12. Fuse - Clock
13. Bracket - Fuse Mounting
14. Resistor
15. Diode
16. Solder Terminal
17. Battery
18. Battery Box Lid
19. Battery Box
20. Nylon Cover
21. Wire to Clock and Battery Contactor Closing Circuit Fuses
22. Diode Wire
23. Positive Battery Cable
24. Master Switch Wire
25. Bolt
26. Wire to Battery Contactor Closing Circuit
27. External Power Cable
28. Battery Drain Tube
29. Clamp
30. Negative Ground Strap

Figure 16-1. Battery and Electrical Equipment Installation (Sheet 1 of 2)



Detail **B**

BEGINNING WITH 18052614
AND 18502811



Detail **C**

BEGINNING WITH 18052508
AND 18502591

Figure 16-1. Battery and Electrical Equipment Installation (Sheet 2 of 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.
	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

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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.

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.

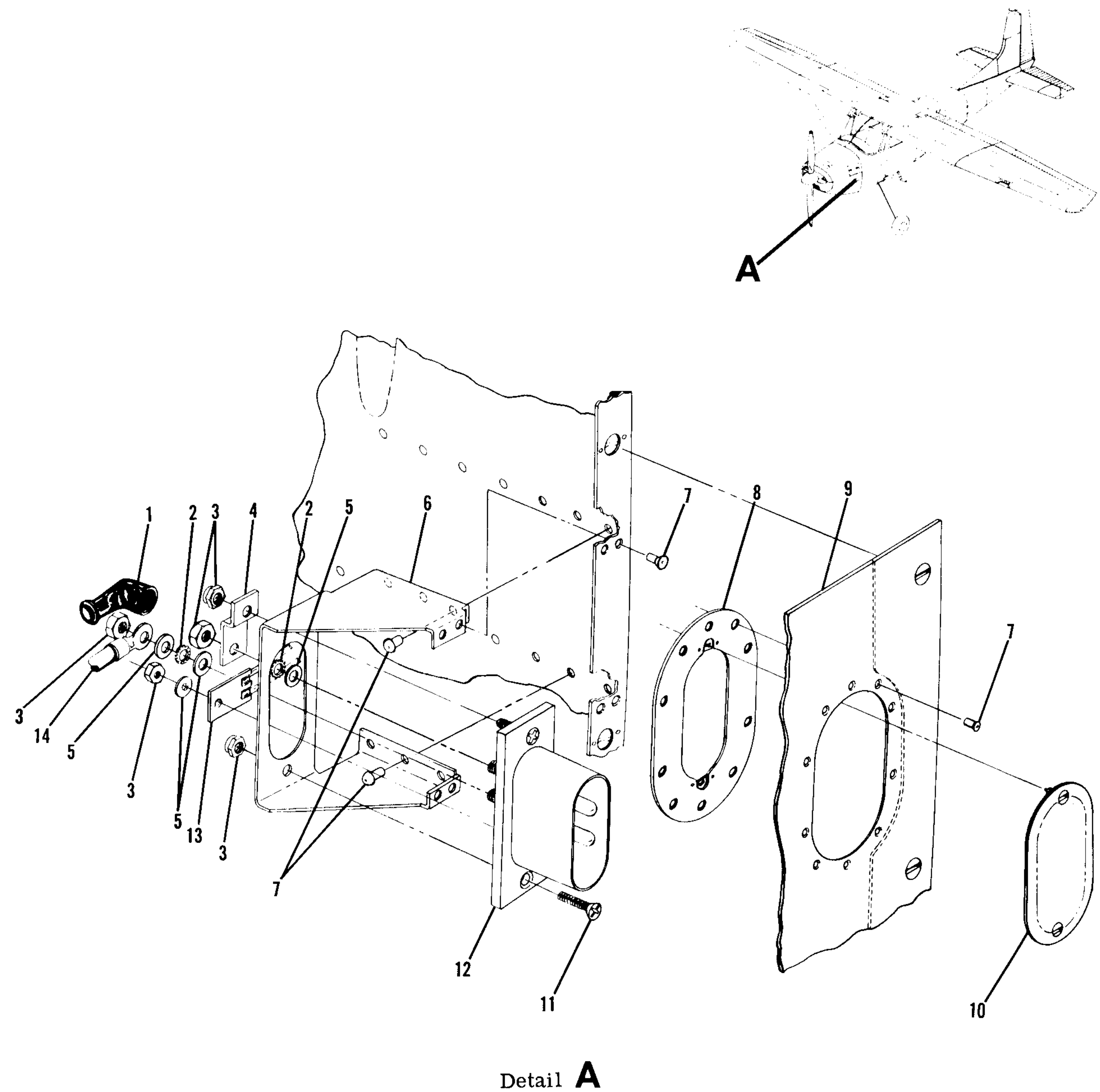
16-30. DESCRIPTION. This circuit consists of a 5-amp fuse, a resistor and a diode mounted on a bracket adjacent to the battery box. This serves to shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor 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.



1. Nipple
2. Lock Washer
3. Nut
4. Ground Strap
5. Washer
6. Bracket Assembly
7. Rivet
8. Doubler Assembly
9. Cowl
10. Door Assembly
11. Screw
12. Receptacle
13. Diode Board
14. Power Cable

Figure 16-2. Ground Service Receptacle Installation

NOTE

When using ground power to start the aircraft, close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field in the event that the battery is completely dead.

CAUTION

Failure to observe polarity when connecting an external power source directly to the battery or directly to the battery side of the battery contactor, will damage the diodes in the alternator and other semiconductor devices in the aircraft.

WARNING

External power receptacle must be functionally checked after wiring, or after replacement of components of the external power or split bus systems. Incorrect wiring or malfunctioned components can cause immediate engagement of starter when ground service plug is inserted.

16-33. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	Check wiring to, and condition of diode mounted on the split bus relay bracket adjacent to the magneto switch. Correct wiring. Replace diode board assembly.
GROUND POWER WILL NOT CRANK ENGINE.	Ground service connector wired incorrectly.	1. Check for voltage at all three terminals of external power contactor with ground power connected and master switch off. If voltage is present on input and coil terminals but not on the output terminal, proceed to step 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals, check wiring between contactor and bus.
		2. Check for voltage at small terminal of ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.
	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.

16-33. TROUBLE SHOOTING. (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE. (Cont).	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

16-34. 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.

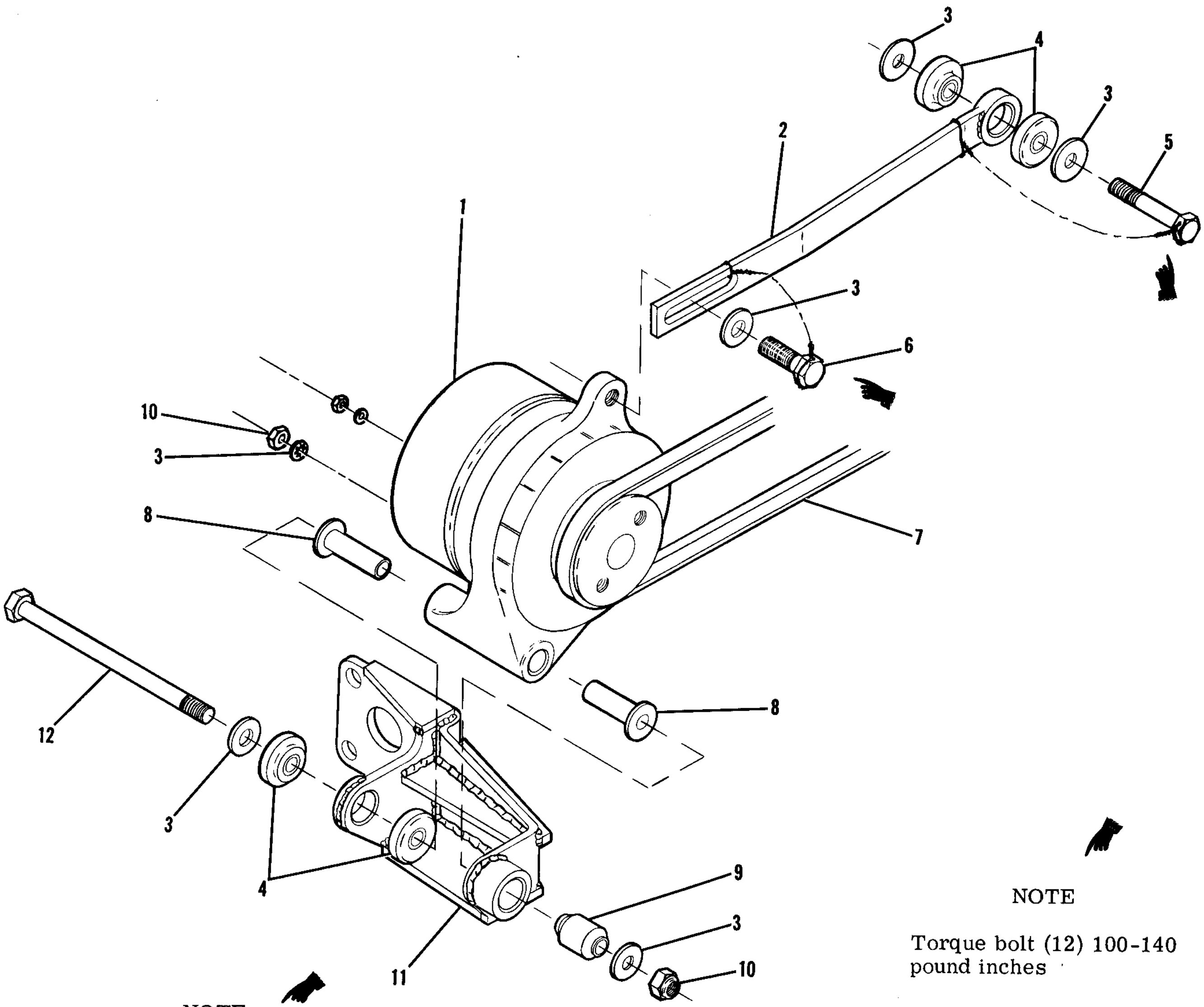
16-38. DESCRIPTION. The 60-ampere alternators used on these aircraft are three-phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 14-volts at 60-amperes continuous output. The moving center part of the alternator (rotor) consists of an axial winding with radial 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.

CAUTION

The alternator is very susceptible to reverse polarity current because of the silicon diodes. The diodes, having a very high resistance to reverse current flow, are used without any cutout relay such as used on a generator system. The alternator diodes are arranged with thier cathodes connected to the aircraft bus bar which is positive and no back current will flow. If the polarity of the battery is reversed the diodes will offer no resistance to the current flow. The current rating of the diodes is exceeded and diode failure may result.

SHOP NOTES:



NOTE

Torque bolt (12) 100-140 pound inches

NOTE

When replacement of the alternator support bracket is required refer to Cessna Single-engine Service Letter SE71-42, dated, December 10, 1971.

1. Alternator
2. Adjusting Arm
3. Washer
4. Rubber Bushing
5. Bolt
6. Upper Adjusting Bolt
7. Drive Belt
8. Bushing
9. Bonded Mount
10. Nut
11. Support Assembly
12. Lower Mounting Bolt

WARNING

On models manufactured prior to mid 1971 should alternator thru-bolt loosening or breaking occur, Cessna Service Letter SE71-40 dated November 24, 1971 should be complied with. On models manufactured after mid 1971 a new high strength thru-bolt and a K shaped retainer are installed. Torque bolts 45 to 55 pound-inches.

Figure 16-3. Alternator Installation

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 on page 16-10. 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.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with voltage vs temperature chart on page 16-13. Observe ship's ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.
OVER-VOLTAGE WARNING LIGHT ON.	Regulator faulty or improperly adjusted. Faulty sensor switch.	1. With engine running turn off and on battery portion of the master switch. If the light stays on shut down engine then turn on the "BAT and "ALT" portions of the master switch. Check for voltage at the "S" terminal of the voltage regulator. If voltage is present adjust or replace regulator. If voltage is not present check master switch and wiring for short or open condition. If wiring and switch are normal replace sensor.

16-40. REMOVAL AND INSTALLATION. (Refer to figure 16-4.)

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

Adjust belt tension to obtain 3/8" deflection when applying 12 pounds of pressure to the belt.

—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. Thru 1972 models a 2-amp automatic resetting circuit breaker located on the back of the instrument panel is provided to protect the alternator field circuit. Beginning with 1973 models a manually-resettable circuit breaker located on the switch panel is provided to protect the alternator field circuit.

16-42. ALTERNATOR VOLTAGE REGULATOR.

16-43. DESCRIPTION. The alternator voltage regulator contains two relays. The field relay is actuated by the aircraft master switch and connects the regulator to the battery. The voltage limiter 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, the 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 air temperature on the temperature and bus voltage chart.

Beginning with 18052413 and 18502341 a solid state voltage regulator is installed. The Voltage Limiter relay in this regulator is replaced by a circuit board. The regulator is a remove and replace item and not repairable. The regulator may be adjusted by removing the cover and adjusting the potentiometer either up or down.

TEMPERATURE	BUS VOLTAGE
60 - 74°F.	13.8 - 14.1
75 - 90°F.	13.7 - 14.0
91 - 100°F	13.6 - 13.9

The voltage regulator is adjustable but adjustment on the airplane is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/ Parts Manual.

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.

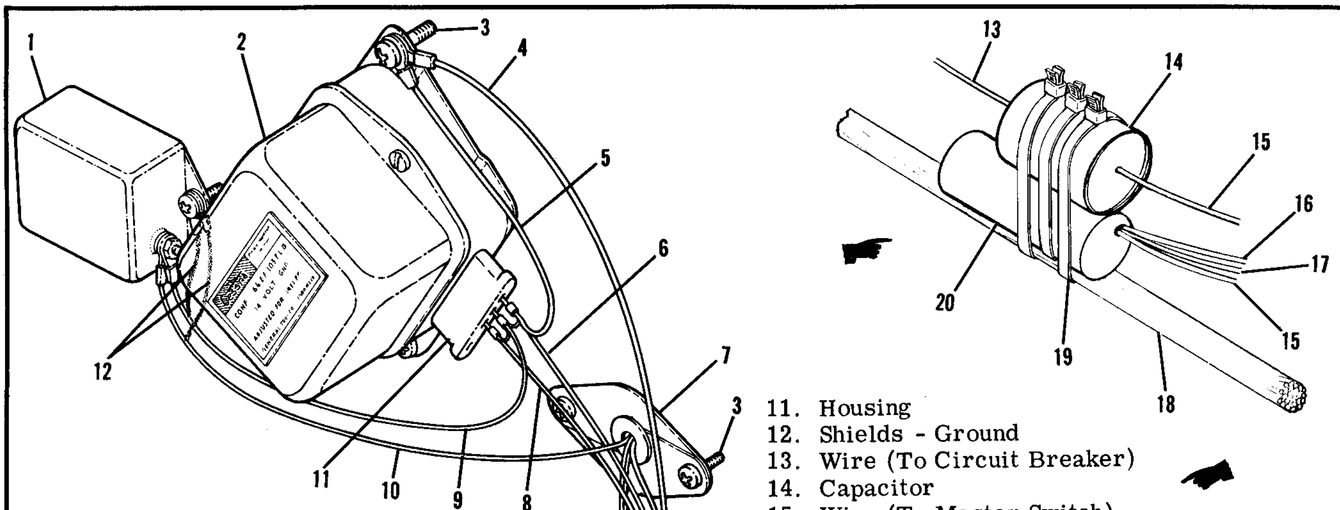
b. Remove the connector plug from the regulator.

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. Tne 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 serials 18052232 and 18501964, 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.



11. Housing
12. Shields - Ground
13. Wire (To Circuit Breaker)
14. Capacitor
15. Wire (To Master Switch)
16. Wire (To Circuit Breaker)
17. Wire (Ground)
18. Wire Bundle
19. Sta-strap
20. Sensor (Over-Voltage)

1. Filter - Radio Noise
2. Voltage Regulator
3. Screw
4. Wire to Alternator Ground
5. Wire Shields to Ground
6. Wire to Alternator "F"
7. Firewall Shield
8. Wire to Alternator "A+"
9. Wire to Filter
10. Wire to Master Switch

Figure 16-4. Voltage Regulator and Over-Voltage Sensor 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 1973 models & on, snap-in type rocker switches are introduced. These switches have a design feature which permits them to snap into the panel from the panel side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

16-50. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	5. Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.

TROUBLE	PROBABLE CAUSE	REMEDY
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. THRU 1972 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS.	Circuit breaker open.	Inspect. Reset.
	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.

WARNING

The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS. Cont.	Open circuit breaker. Cont.	2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies, one at a time. If circuit breaker opens on one strobe power supply, replace strobe power supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not open proceed to step 4.
		3. Check aircraft wiring. Repair or replace as necessary.
		4. Inspect strobe power supply ground wire for contact with wing structure.

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.

TROUBLE	PROBABLE CAUSE	REMEDY
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	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.

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DOME LIGHT TROUBLE Cont.	Defective wiring Cont.	3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with ohmmeter or new lamp. Replace lamp.
	Defective switch.	5. Check for voltage at dome light with master and dome light switch on. Should read battery voltage. Replace switch.
INSTRUMENT LIGHTS WILL NOT LIGHT. (THRU 1973 MODELS).	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Defective rheostat.	4. Check voltage at instrument light with master switch on. Should read battery voltage with rheostat turned full clockwise and voltage should decrease as rheostat is turned counterclockwise. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Lamp burned out.	5. Test lamp with ohmmeter or new lamp. Replace lamp.

SHOP NOTES:

16-50. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT (1974 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 (1974 MODELS & ON.	Open resistor wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replces defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT.	Nav light switch turned off.	1. Nav light switch has to be ON befor 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 1972 MODELS.)

16-52. DESCRIPTION. The landing and taxie lights are mounted in the leading edge of the left wing. a clear plastic cover provides weather protection for the lamps. The landing light 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 on the instrument panel.

16-53. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)
a. Remove the screws securing the landing light window assembly (1) and remove window.
b. Remove attaching screws (6) from the bracket assembly and remove the bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws (2). If readjustment is required refer to figure 16-5.

16-54. ADJUSTMENT. Refer to figure 16-5 for adjustment of the landing and taxi lights.

16-55. LANDING AND TAXI LIGHTS. (BEGINNING WITH 1973 MODELS.)

16-56. DESCRIPTION. Beginning with 1973 models the landing and taxi lights are mounted in the lower half of the engine cowl nose cap. The right hand lamp is used for taxi and both lamps are used for landing. Lights are controlled by two rocker type switches located on the instrument panel. Thru 1973 models the light switches operate independent of each other, beginning with 1974 models a diode is installed between the switches so that the taxi light switch operates only the taxi light but the landing light switch operates both landing and taxi light. The system is protected by a 20 amp circuit breaker on the circuit breaker panel.

16-57. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)
a. Remove lower cowl and disconnect wires from landing and taxi lamps.
b. Remove screws (7) securing brackets (6) to plates (2) and remove lamps.
c. To reinstall reverse this procedure.

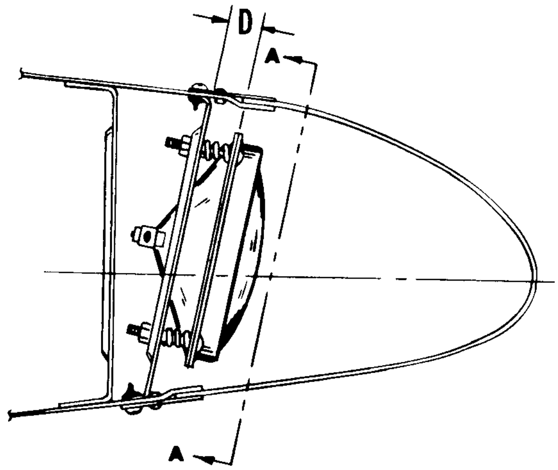
16-58. ADJUSTMENT. Lamp assemblies are solid mounted, should further adjustment be desired a maximum of two washers may be added between plate (3) and support (2). Refer to figure 16-5.

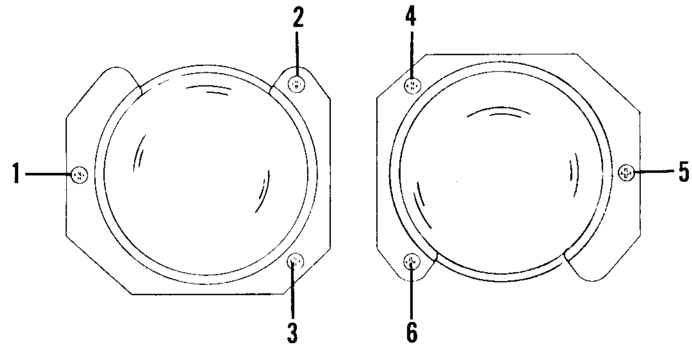
CAUTION

Should removal of the cowling be desired to make adjustments, ensure the landing and taxi light wiring is disconnected before removing the bottom cowling.

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.

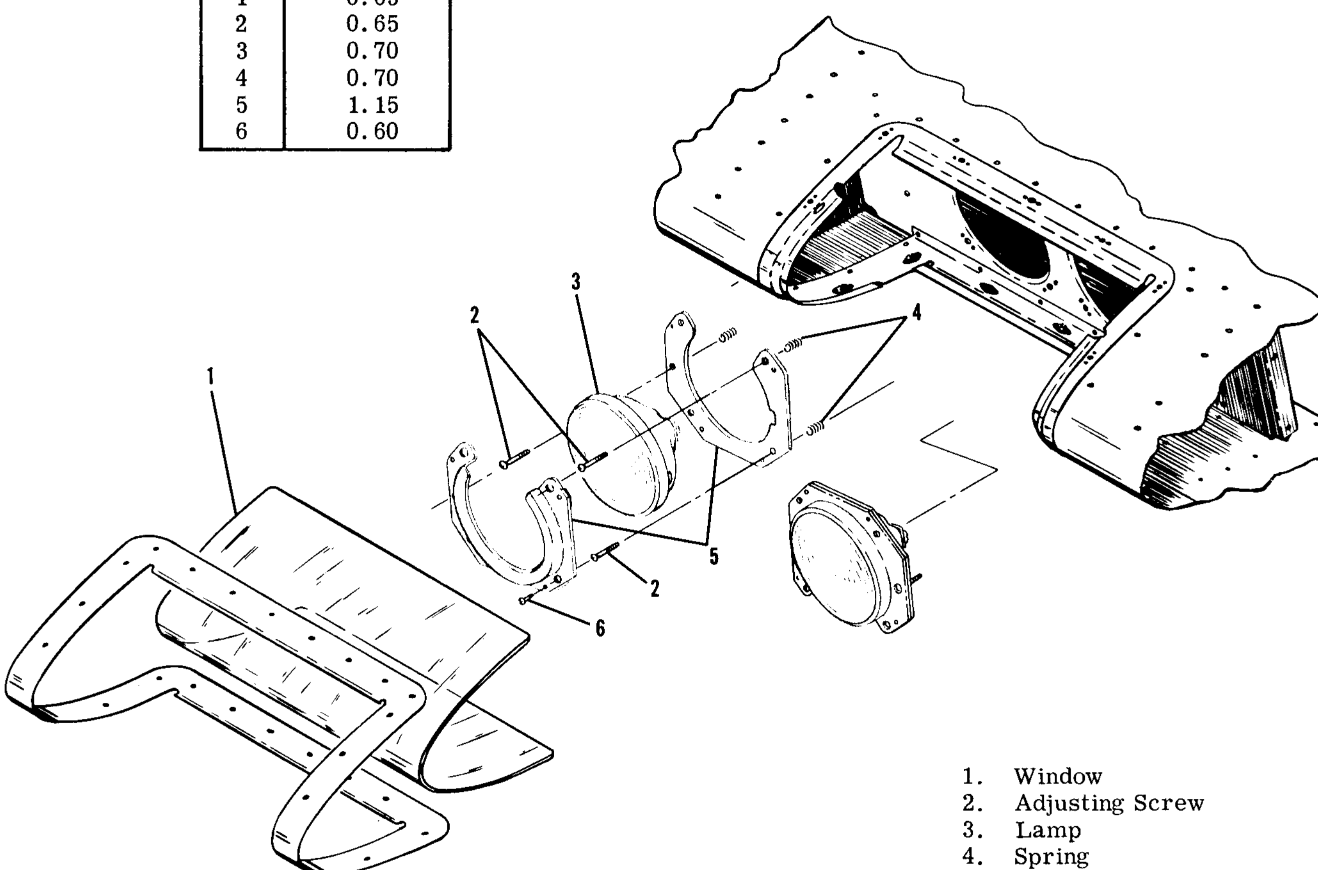




VIEW A-A

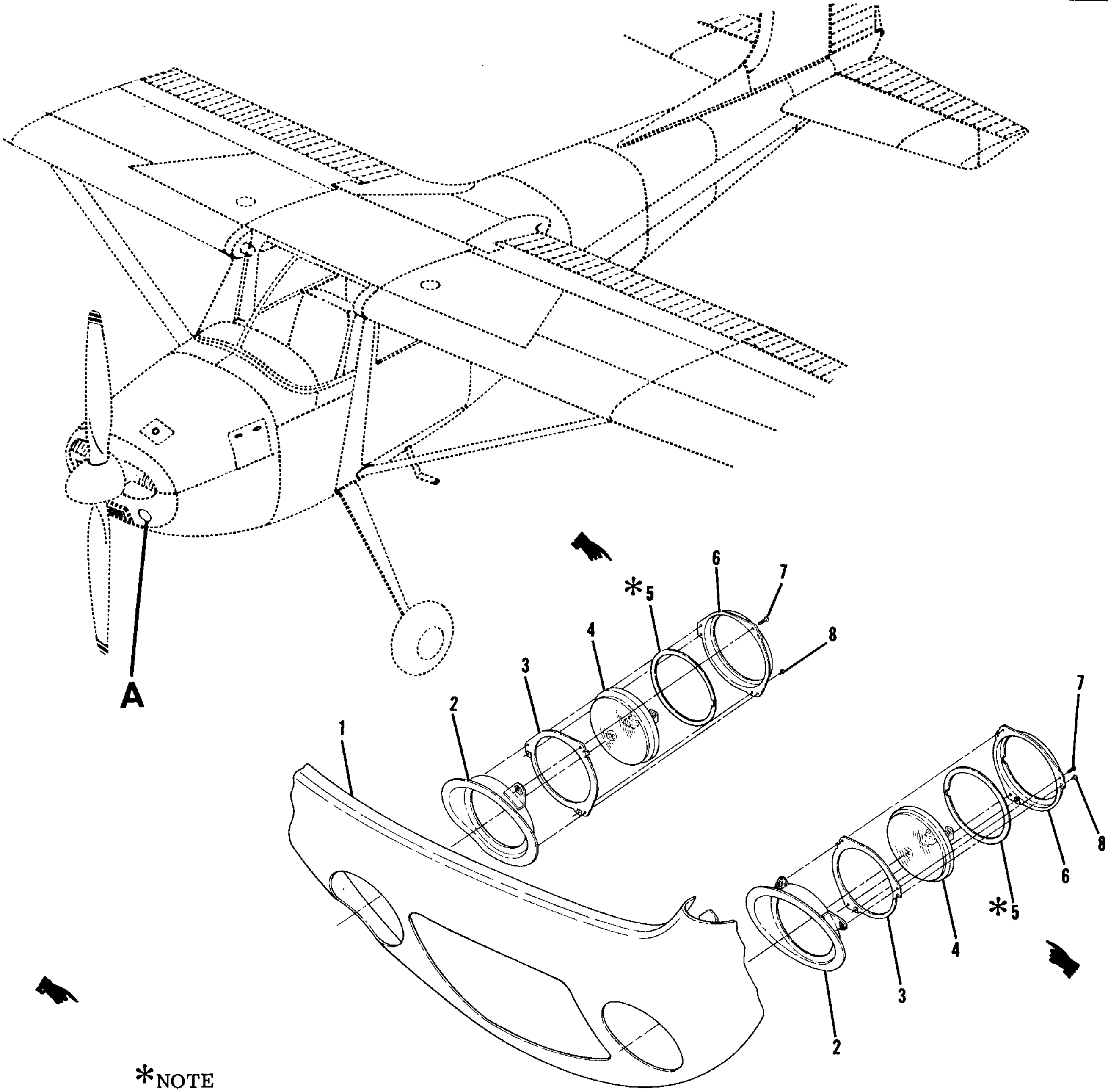
D I M E N S I O N   D

NO.	DIM. "D"
1	0.65
2	0.65
3	0.70
4	0.70
5	1.15
6	0.60



1. Window
2. Adjusting Screw
3. Lamp
4. Spring
5. Bracket
6. Screw

Figure 16-5. Landing and Taxi Light Installation (Sheet 1 of 2)



Detail **A**

*NOTE

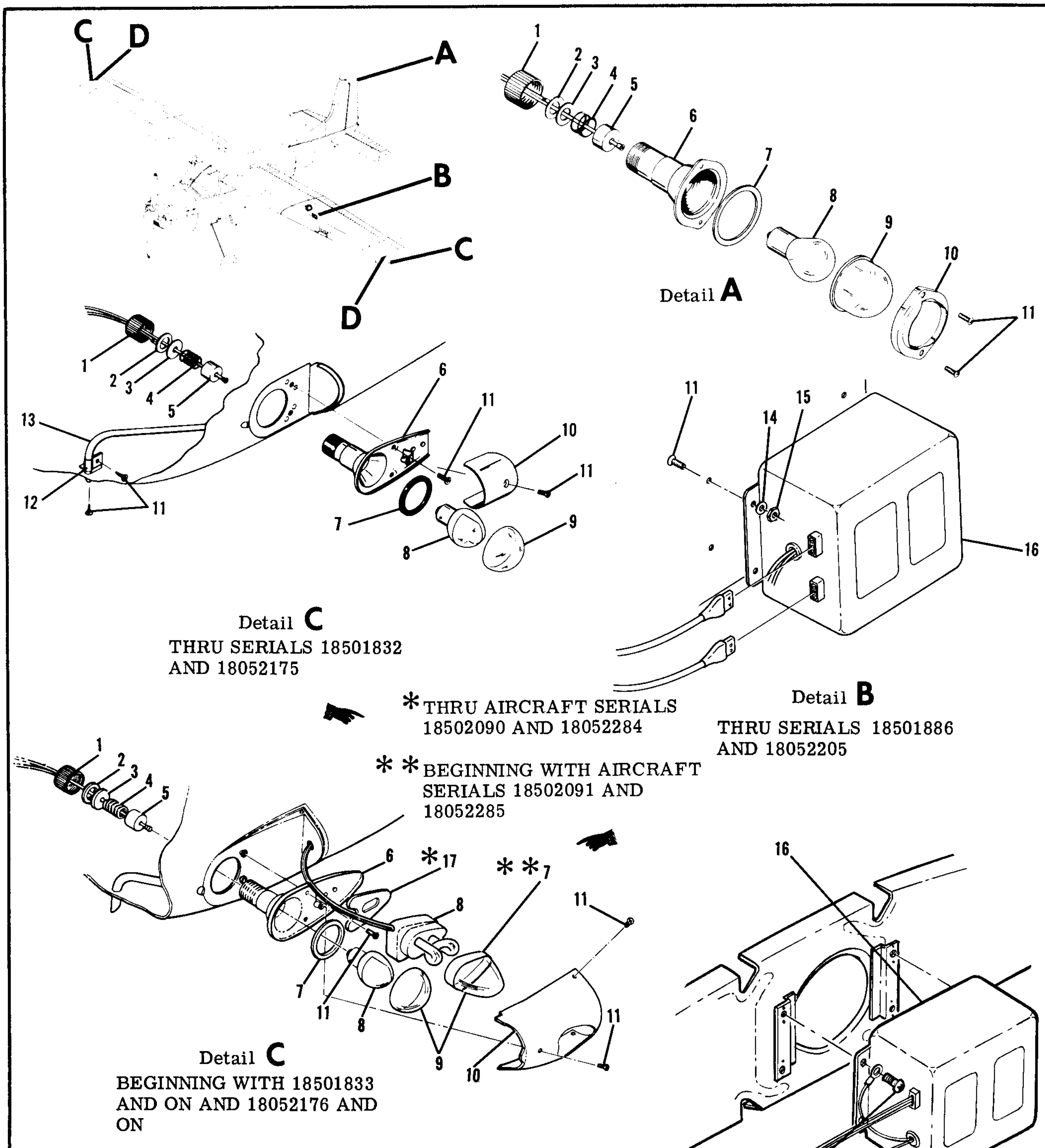
A minimum of one gasket and a maximum of two may be installed to secure lamp

NOTE

A maximum of two washers may be added between plate (3) and support (2) for adjustment.

1. Nose Cap
2. Support
3. Plate
4. Lamp
5. Gasket
6. Bracket
7. Machine Screw
8. Tinnerman Screw

Figure 16-5. Landing and Taxi Light Installation (Sheet 2 of 2)



1. Cap
2. Grounding Washer
3. Insulating Washer
4. Spring
5. Insulator
6. Lamp Socket
7. Gasket
8. Lamp
9. Lens
10. Lens Retainer
11. Screw
12. Clamp
13. Detector
14. Washer
15. Nut
16. Power Supply
17. Spacer

Figure 16-6. Navigation Light Installation

16-61. REMOVAL AND INSTALLATION. For removal and installation of navigation lights, refer to figure 16-6.

16-62. FLASHING BEACON LIGHT.

16-63. DESCRIPTION. The flashing beacon light is attached to the, ABS constructed, vertical fin tip. The flashing beacon is an iodine-vapor lamp electrically switched by a solid-state flasher assembly. The flasher assembly is located on the lower, aft, vertical fin rib. The switching frequency of the flasher assembly operates the light at approximately 45 flashes per minute. Thru aircraft serials 18052313 and 18502146 a 100 watt 12 volt lamp was utilized, beginning with 18052314 and 18502147 a 125 watt 12 volt lamp is installed.

16-64. REMOVAL AND INSTALLATION. For removal and installation of the flashing beacon light, refer to figure 16-7.

16-65. ANTI-COLLISION STROBE LIGHTS.

16-66. DESCRIPTION. A white strobe light is installed on each tip and lights are vibration resistant and operate on the principle of a capacitor discharge into a xenon tube, producing an extremely high intensity flash.

16-66A. OPERATIONAL REQUIREMENTS.

WARNING

The capacitors in the strobe light power supplies must be reformed if not used for a period of six (6) months. The following procedure must be used.

Connect the power supply, red wire to plus, black to ground to 6 volt DC source. Do Not connect strobe tube. Turn on 6 volt supply. Note current draw after one minute. If less than 1 ampere, continue operation for 24 hours. Turn off DC power source. Then connect to the proper voltage, 12 volt. Connect tube to output of strobe power supply and allow to operate, flashing, for 15 minutes. Remove strobe tube. Operating power supply at 12 volts, note the current drain after one minute. If less than 0.5 amperes, operate for 6 hours. If current draw is greater than 0.5 amperes, reject the unit.

16-67. REMOVAL AND INSTALLATION. Refer to figure 16-6 as a guide for removal and installation of the anti-collision strobe light components.

WARNING

This anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

16-68. INSTRUMENT LIGHTING.

16-69. DESCRIPTION. The instrument flood light is mounted in the overhead console. The assembly consists of a red lens and a single bulb that is controlled by a dimming rheostat mounted on the right side of the overhead console.

16-70. REMOVAL AND INSTALLATION. For removal and installation of instrument panel lights, refer to figuer 16-8.

16-70A. POST LIGHTING.

16-70B. DESCRIPTION. Individual post lighting may be installed as optional equipment to provide for nonglare instrument lighting. The post light consists of a cap and a clear lamp assembly with a tinted lens. The lights are mounted on the instrument panel decorative covers above each instrument. A post light is also mounted on the instrument panel knee pad beginning with aircraft serial 18052331 and 18502185 thru 18502299, 18502301 and on. The intensity of the post lights is controlled by the instrument light dimming rheostat located on the overhead console. Power to the lamps is provided through the instrument light switch located on the instrument panel through 1973 models and on the overhead console beginning with 1974 models.

16-70C. REMOVAL AND INSTALLATION. For removal and installation of the instrument post lamps, slide the cap and the lens assembly from the base. Slide the lamp from the socket and replace.

16-71. DOME LIGHT.

16-72. DESCRIPTION. The dome light is mounted in the overhead console. It consists of a frosted lens and a single bulb controlled by a switch located in the center of the console.

16-73. REMOVAL AND INSTALLATION. For removal and installation of dome light, refer to figure 16-8.

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 located on the right side of the overhead console. The radio dial lights are controlled by the radio dial light rheostat located on the left side of the overhead console.

16-75A. TRANSISTORIZED LIGHT DIMMING.

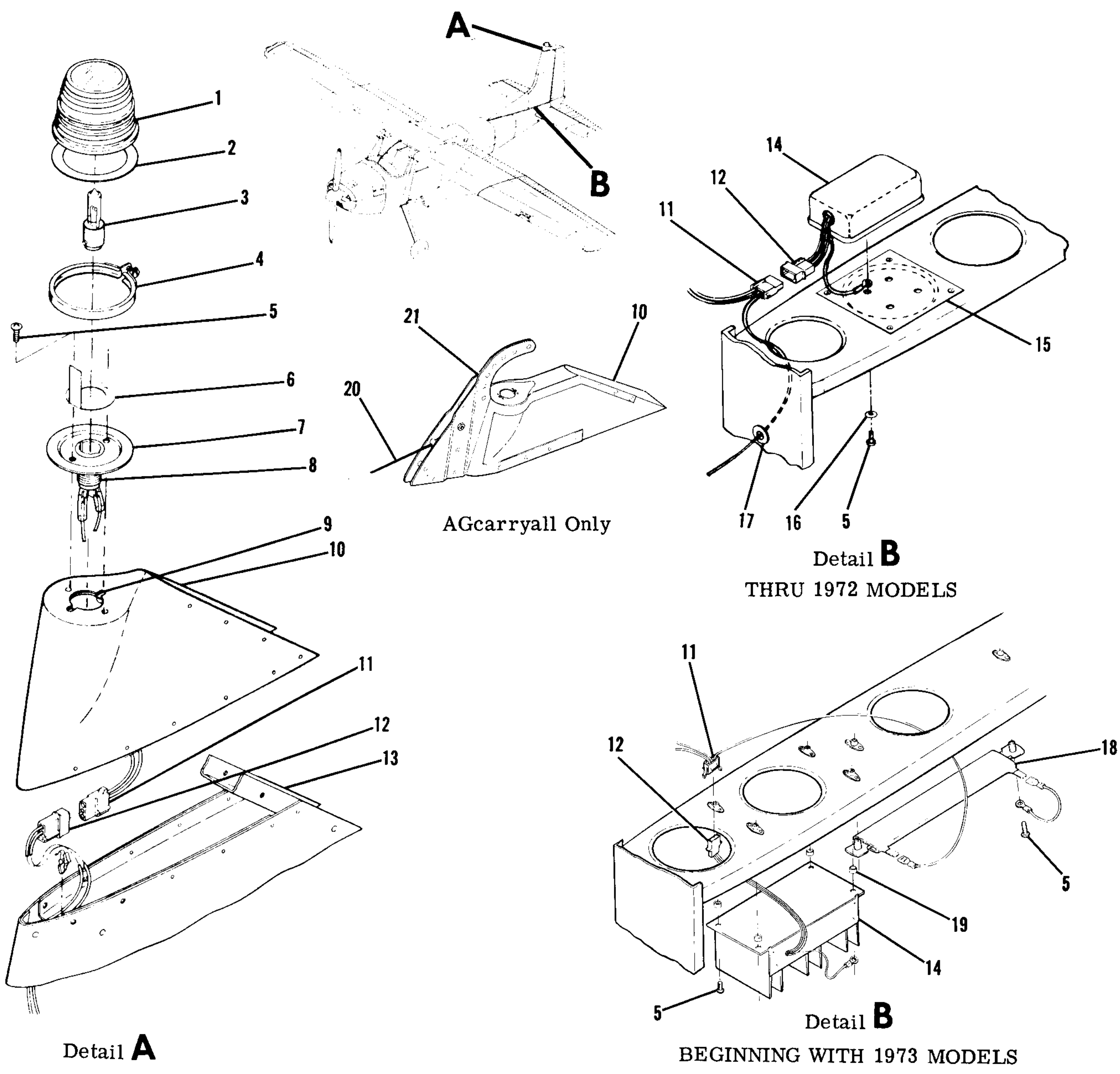
16-75B. DESCRIPTION. A remotely located two-circuit, transistorized dimmer is installed, as standard equipment, to control the instrument panel lighting, beginning with 1974 models. The dimming assembly is located above the left hand door. Light dimming is controlled by two rheostats located on the overhead console. The left hand rheostat controls radio lighting and the right hand rheostat controls the instrument cluster lights, compass light, and instrument flood/post lights depending on the position of the selector switch, also located on the overhead console.

16-75C. REMOVAL AND INSTALLATION. Refer to figure 16-8B for removal and installation of the transistorized dimming assembly.

16-76. COURTESY LIGHTING.

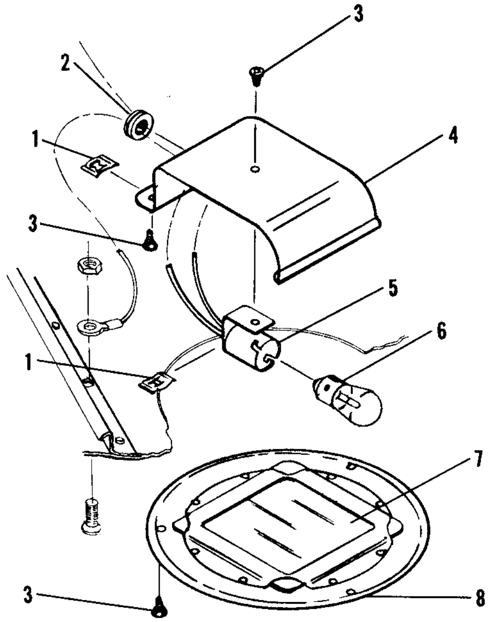
16-77. DESCRIPTION. A courtesy light is located on the underside of each wing. The switch to operate the lights is located on the left hand doorpost thru 1973 models, and on the overhead console beginning with 1974 models.

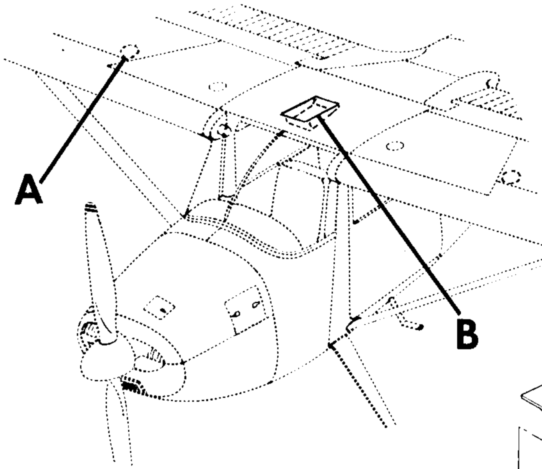
16-78. REMOVAL AND INSTALLATION. For removal and installation of courtesy lights, refer to figure 16-8.



1. Dome
2. Gasket
3. Lamp
4. Clamp Assembly
5. Screw
6. Baffle
7. Plate-Mounting
8. Socket
9. Nut Plate
10. Tip Assembly - Fin
11. Housing - Plug
12. Housing - Cap
13. Fin Assembly
14. Flasher Assembly
15. Plate
16. Washer
17. Grommet
18. Resistor
19. Spacer
20. Cable Assembly
21. Wire Deflector

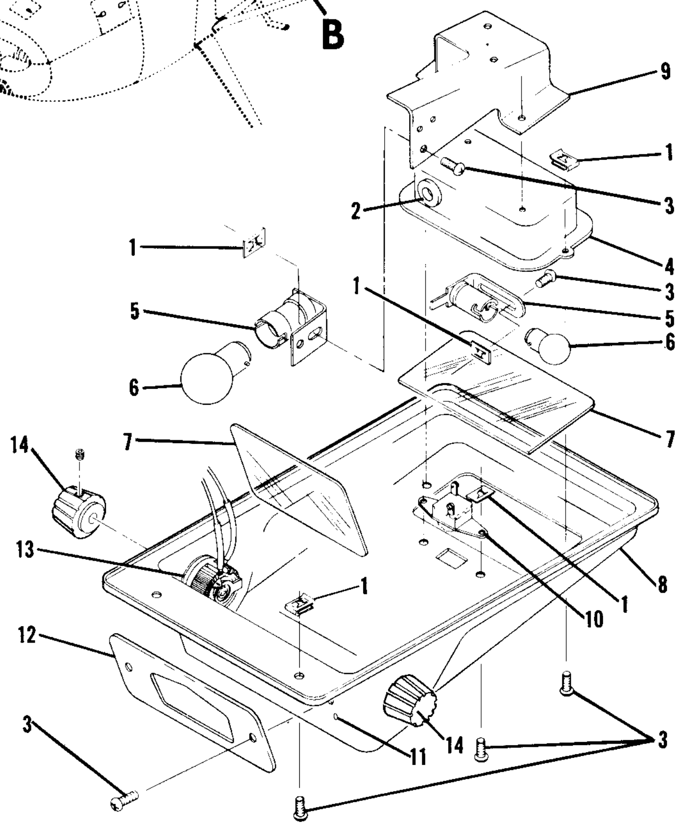
Figure 16-7. Flashing Beacon Light Installation





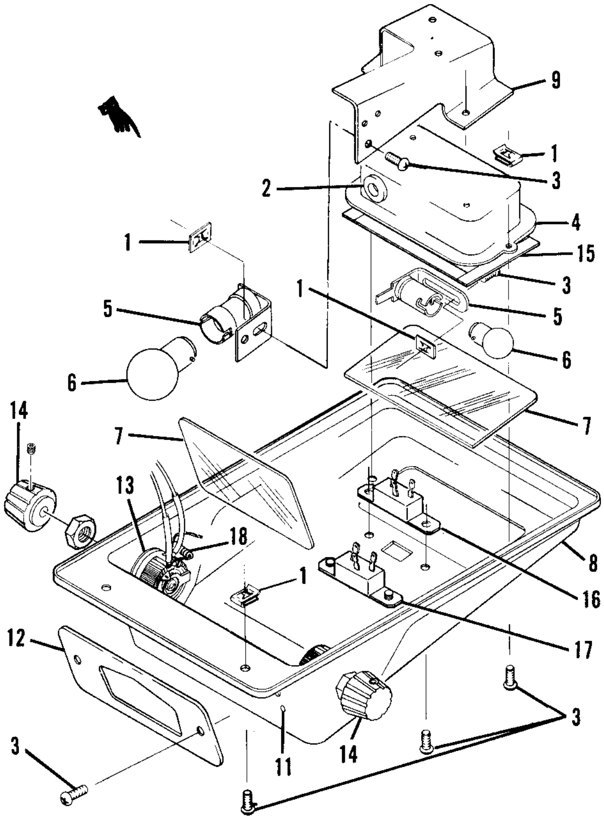
COURTESY LIGHT INSTALLATION

Detail A



THRU 18052384 & 18502310

Detail B

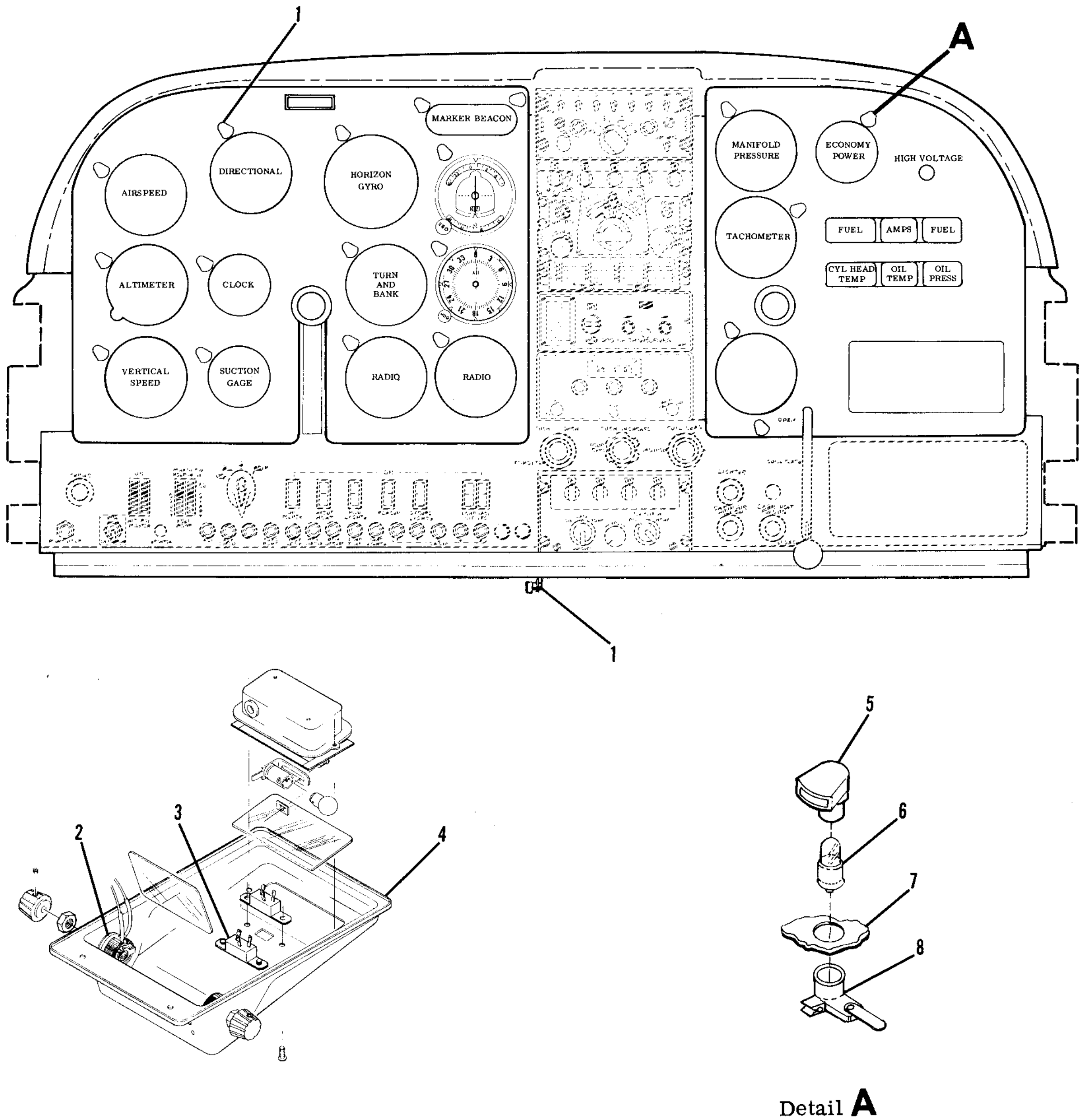


BEGINNING WITH 18052385 & 18502311

Detail B

1. Tinnerman Nut
2. Grommet
3. Screw
4. Reflector
5. Socket
6. Bulb
7. Lens
8. Cover
9. Bracket
10. Switch
11. Nutplate
12. Shield
13. Rheostat
14. Knob
15. Gasket
16. Switch (Dome & Courtesy)
17. Switch (Post & Flood)
18. Resistor (270 Ohm)

Figure 16-8. Instrument, Dome and Courtesy Light Installation



1. Post Light
2. Dimming Rheostat
3. Switch
4. Overhead Console
5. Cap
6. Lamp
7. Decorative Cover
8. Socket

Figure 16-8A. Post Light Installation (Optional)

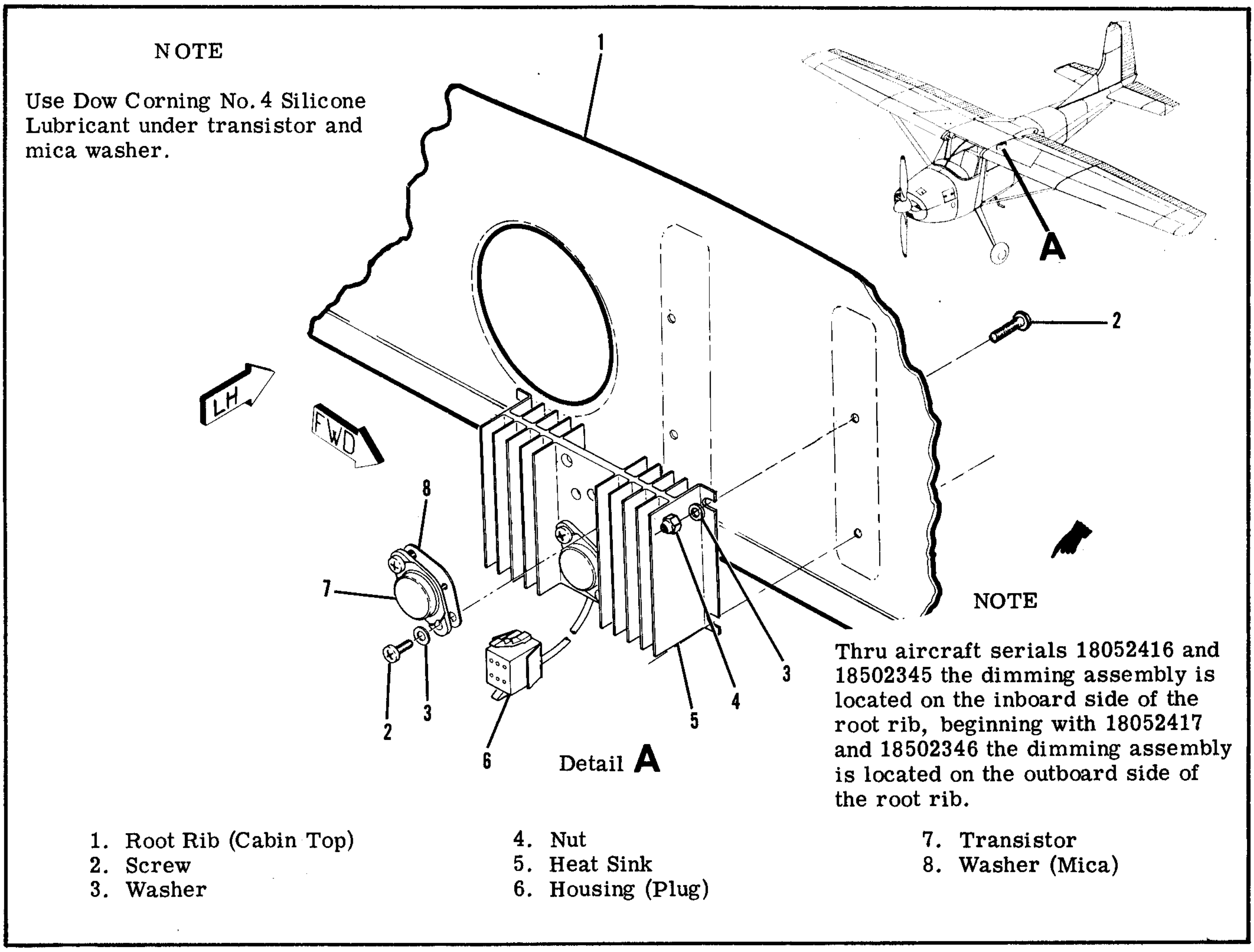


Figure 16-8B. Transistorized Light Dimming

SHOP NOTES:

16-79. CONTROL WHEEL MAP LIGHT.

16-80. DESCRIPTION. An optional control wheel map light is available on the 180 and 185 models. The light is mounted on the underside of the control wheel and light intensity is controlled by a thumb operated rheostat. For dimming, the rheostat should be turned clockwise.

CAUTION

Thru 1972 aircraft only, failure to observe polarity shown on wiring diagram 11.16 will result in immediate failure of the transistor on the map light circuit board assembly.

16-81. REMOVAL AND INSTALLATION. (Thru 1972 models).

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 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.

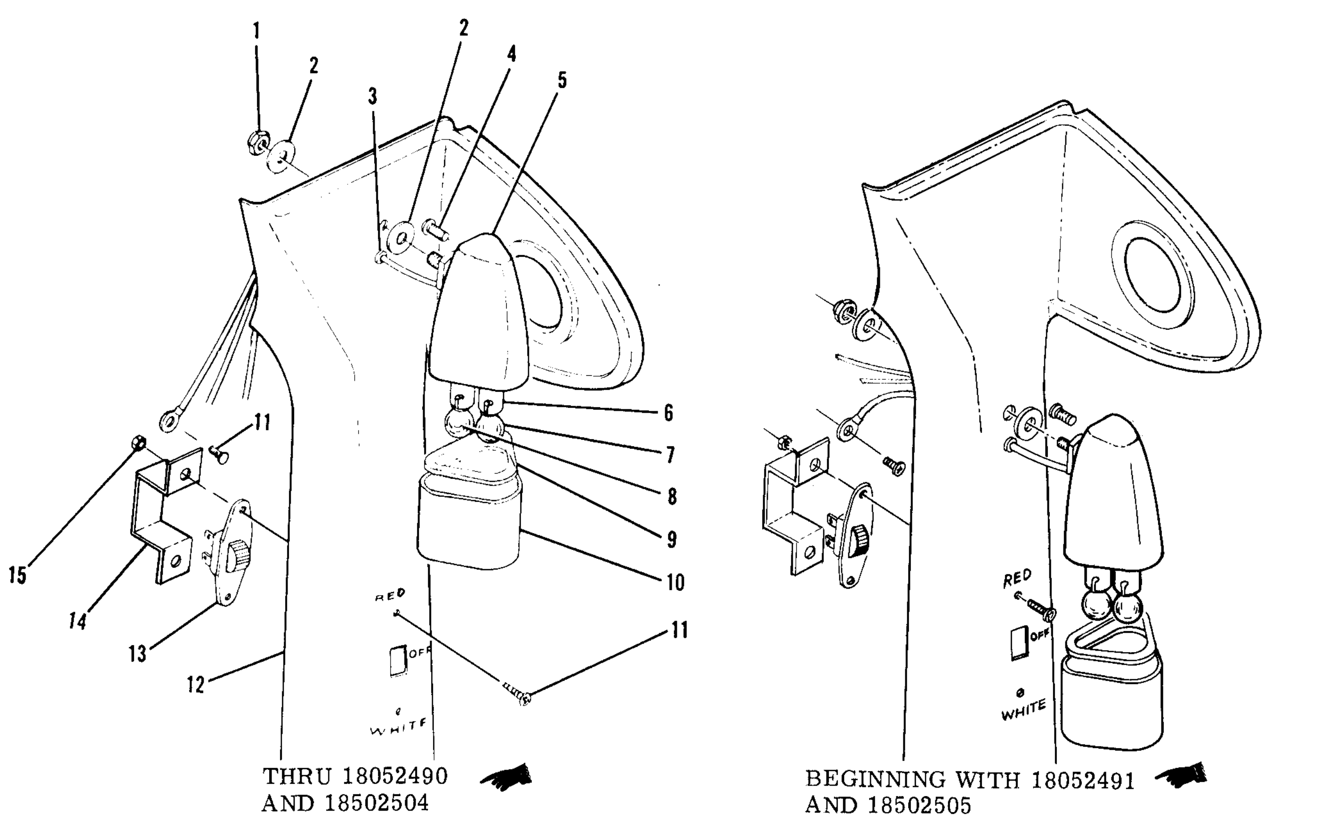
16-82. REMOVAL AND INSTALLATION. (BEGINNING WITH 1973 MODELS.) Refer to figure 16-10. To remove, push upward on the lamp and turn. The lamp and reflector is replaced as a unit.

16-83. PITOT HEATER.

16-84. DESCRIPTION. An electrical heater unit may be installed on the pitot tube. 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. Refer to figure 16-11.

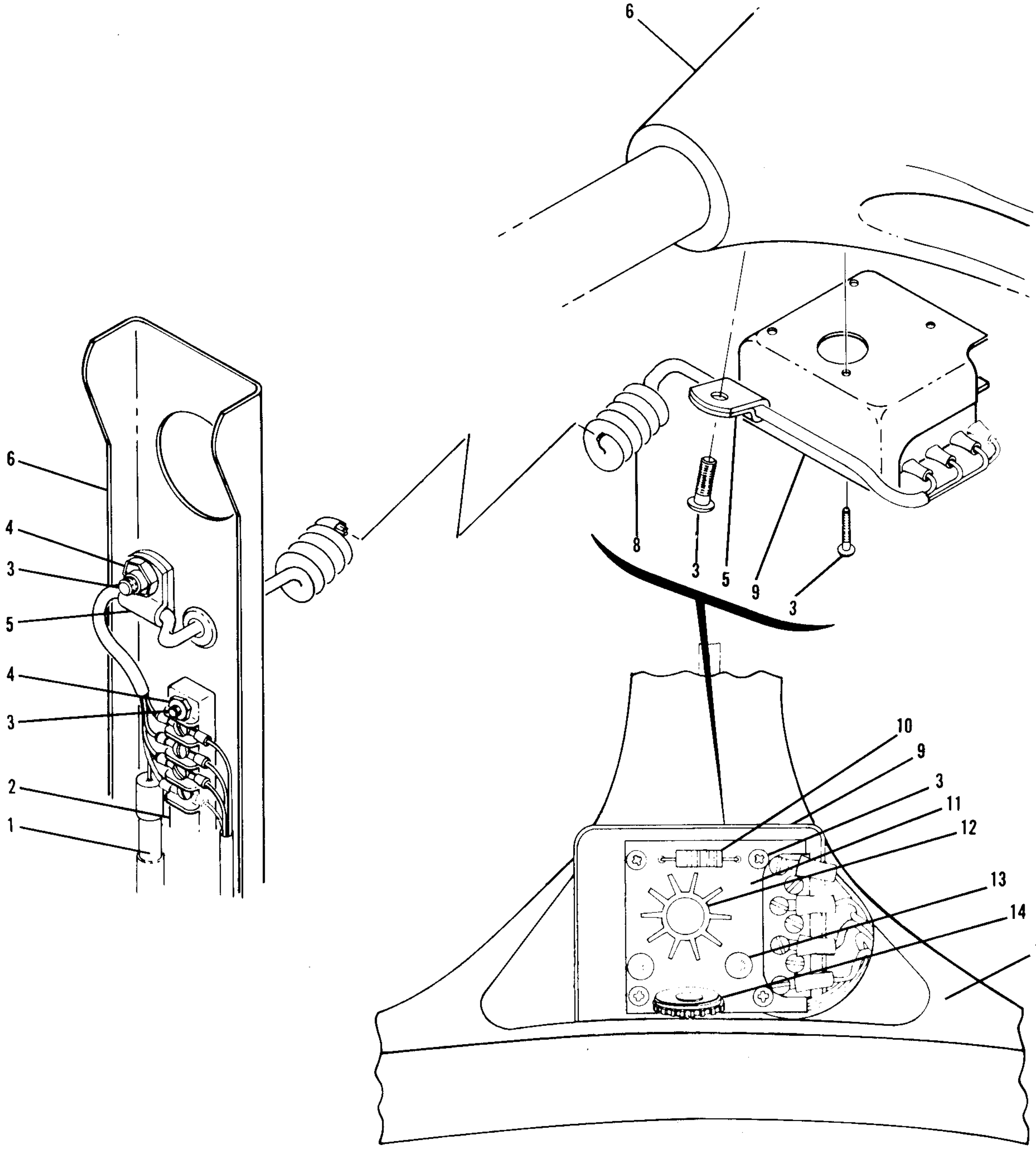
16-85. CIGAR LIGHTER.

16-86. DESCRIPTION. The cigar lighter (located on the instrument panel) is equipped with a thermal-actuated circuit breaker which is attached to the rear of the cigar lighter. The circuit breaker will open if the lighter becomes jammed in the socket or held in position too long. The circuit breaker may be reset by inserting a small probe into the .078 diameter



1. Nut
2. Washer
3. Grommet
4. Adjustment Screw
5. Maplight Assembly
6. Socket Assembly
7. Lamp
8. Red Lamp
9. Lens
10. Hood
11. Screw
12. Front Doorpost Shield
13. Maplight Switch
14. Cover
15. Nut

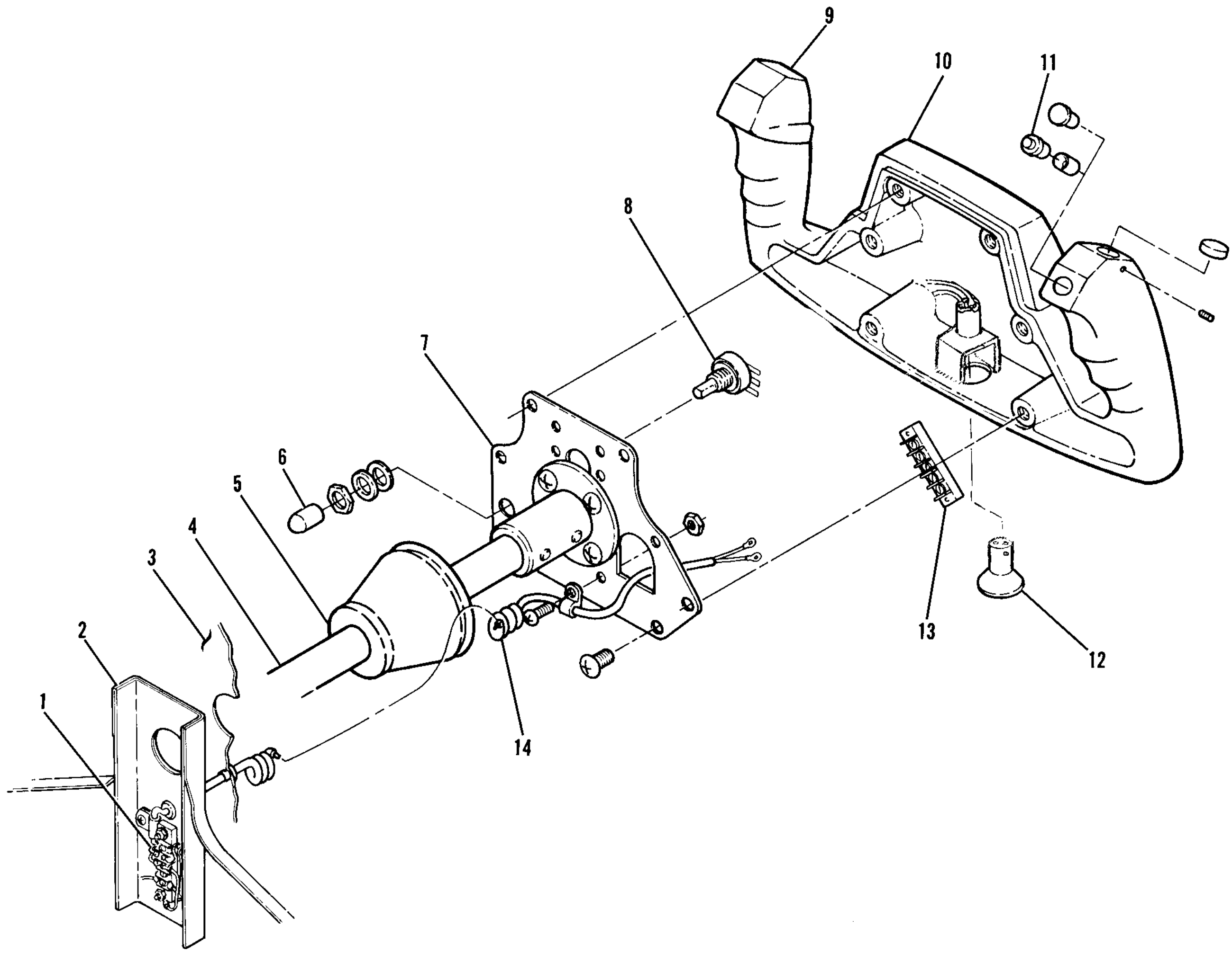
Figure 16-9. Map Light Installation



THRU 1972 MODELS

1. 1/2 Amp - Fuse Assembly
2. Terminal Block
3. Screw
4. Nut
5. Clamp
6. Stationary Panel Assembly
7. Control Wheel Assembly
8. Cable Assembly
9. Shield
10. Resistor
11. Circuit Board
12. Diode
13. Light
14. Rheostat

Figure 16-10. Control Wheel Map Light Installation (Sheet 1 of 2)



BEGINNING WITH 1973 MODELS

1. Terminal Block
2. Stationary Panel Assembly
3. Panel Cover
4. Tube
5. Cover
6. Rubber Cover
7. Plate
8. Map Light Rheostat
9. Control Wheel
10. Pad
11. Mike Switch
12. Lamp (Map Light)
13. Terminal Block
14. Cable

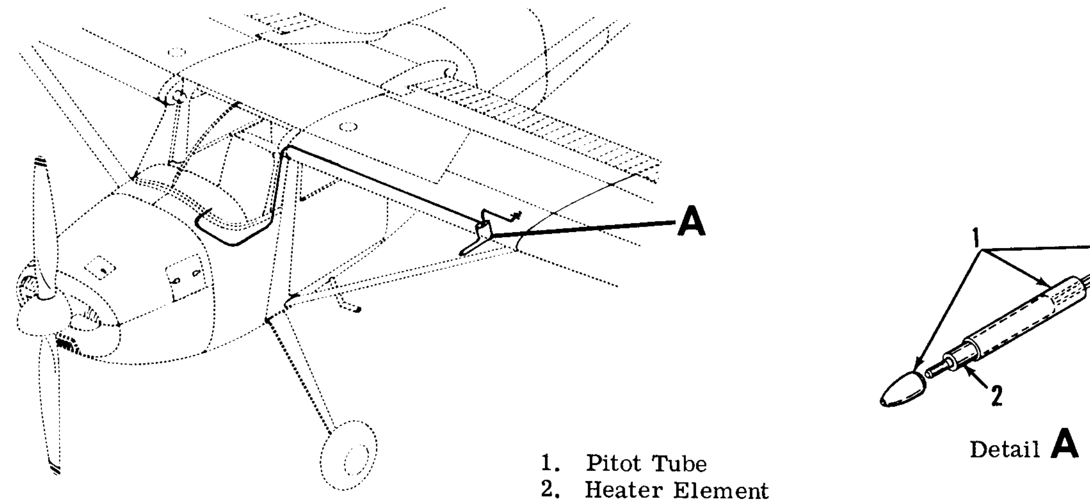
Figure 16-10. Control Wheel Map Light Installation (Sheet 2 of 2) hole in the back of the circuit breaker and pushing lightly until a click is heard.

CAUTION

Make sure the master switch is "OFF" before inserting probe into the circuit breaker on cigar lighter to reset.

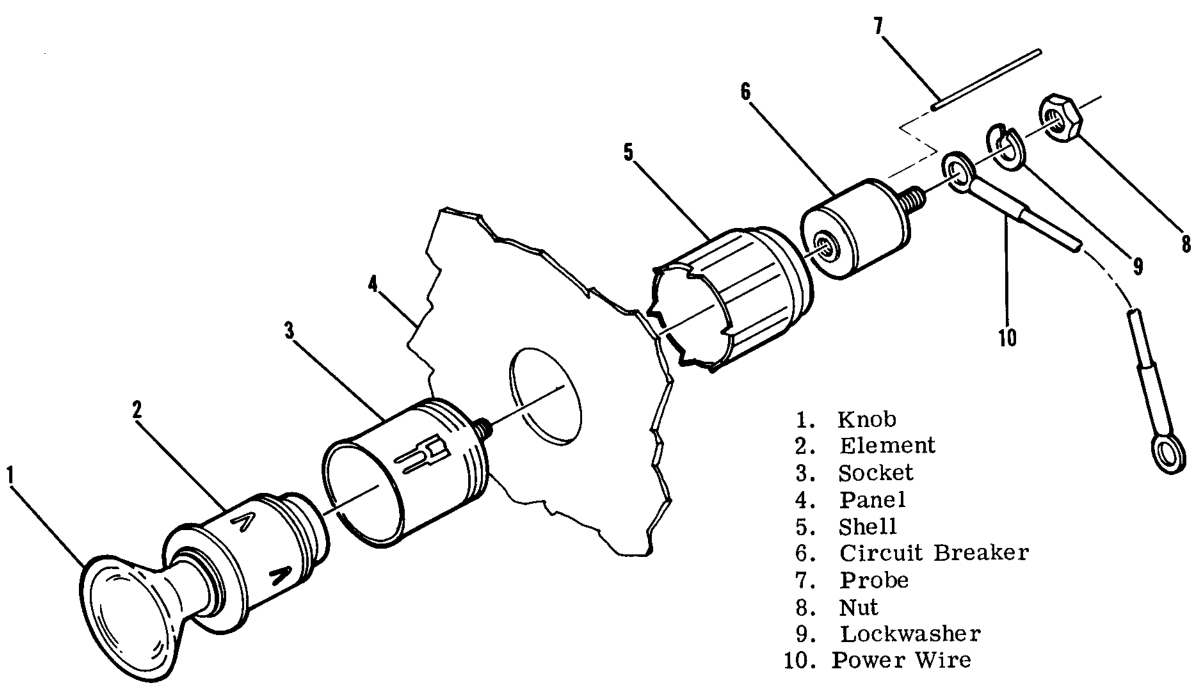
16-87. REMOVAL AND INSTALLATION. (Refer to figure 16-12.)

a. Ensure that the master switch is "OFF."
b. Remove cigar lighter element.
c. Disconnect wire on back of lighter.
d. Remove shell that screws on socket back of panel.
e. The socket will then be free for removal.
f. To install a cigar lighter, reverse this procedure.



1. Pitot Tube
2. Heater Element

Figure 16-11. Pitot Heater Installation



1. Knob
2. Element
3. Socket
4. Panel
5. Shell
6. Circuit Breaker
7. Probe
8. Nut
9. Lockwasher
10. Power Wire

Figure 16-12. Cigar Lighter Installation

16-88. EMERGENCY LOCATOR TRANSMITTER.

16-89. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The C589510-0209 transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The C589510-0211 transmitter used for Canadian registry, operates on 121.5 only. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a 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.

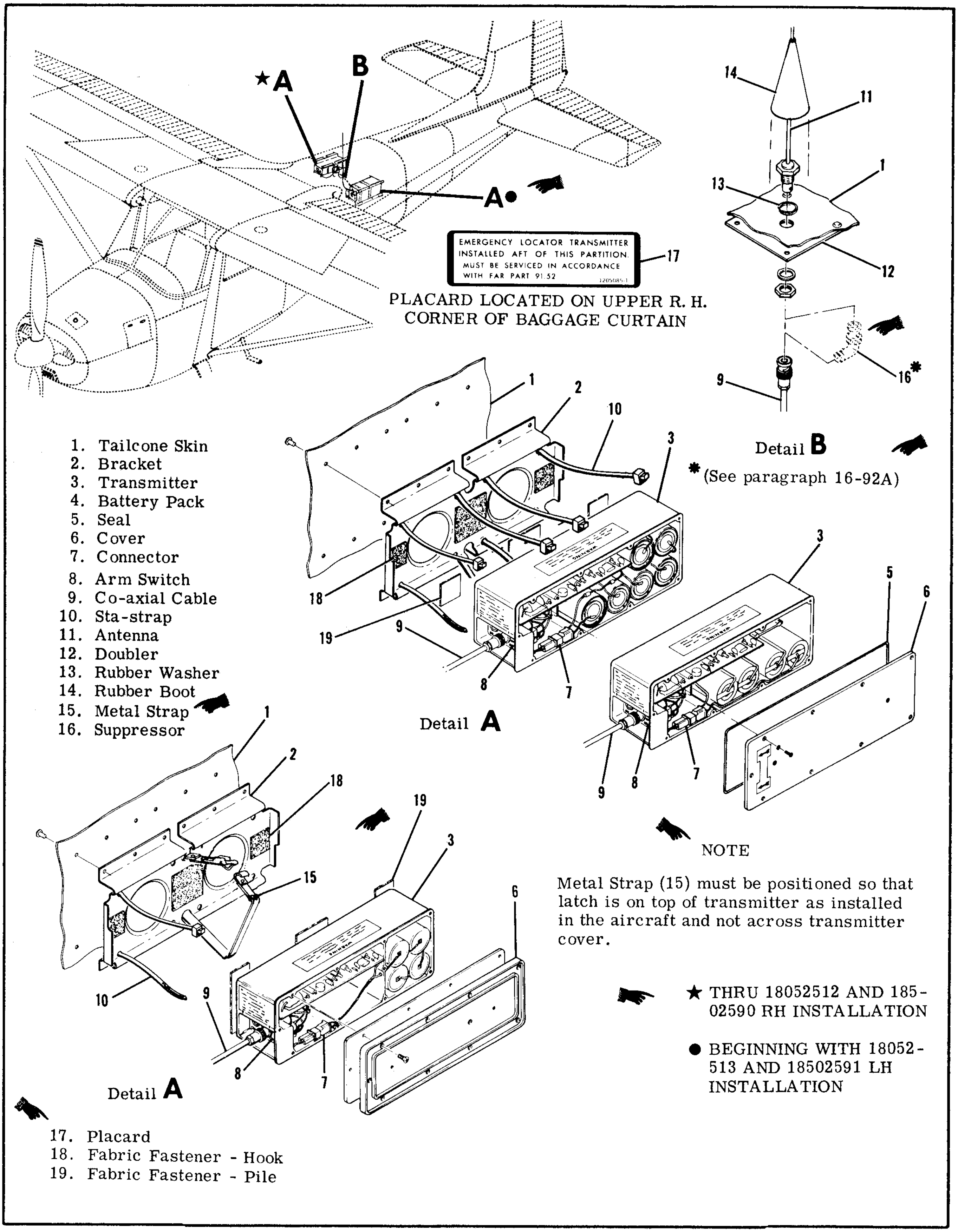


Figure 16-13. Emergency Locator Transmitter Installation

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 16-13.)

a. Remove 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 16-13.)

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 16-13.

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.

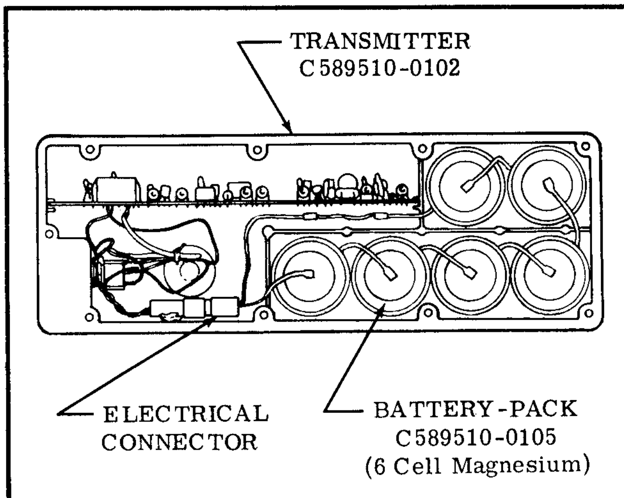


Figure 16-14. Magnesium 6 Cell Battery-Pack Installation

16-94. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 16-15.)

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 16-95.
e. Connect the electrical connector as shown in figure 16-15.

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.

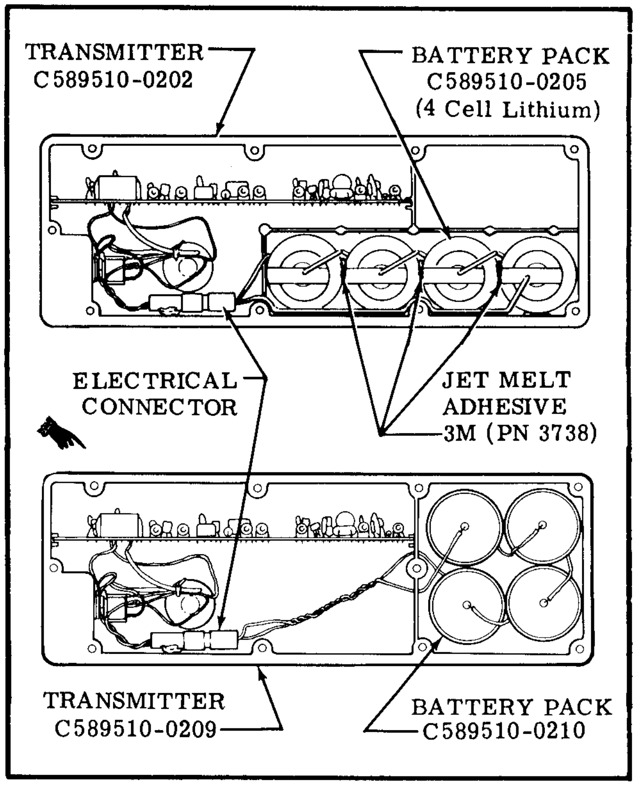


Figure 16-15. Lithium 4 Cell Battery Pack Installations

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 ANALSIS CHART

ALL MODELS

STANDARD EQUIPMENT (Running Load)	AMPS REQD 1969	1970	1971	1972	1973	1974	1975	1976
Battery Contactor	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Cylinder Head Temperature Indicator	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Flashing Beacon (Standard on 185 Only	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Fuel Indicators	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Instrument Lights	1.4	1.4	1.4	1.4	1.4	1.7	1.7	1.7
Position Lights	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
OPTIONAL EQUIPMENT (RUNNING LOAD)								
Post Lights	—	—	—	—	—	—	1.28	1.28
Heated-Pitot	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
Carburetor Air Temp	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Cessna 200A Navomatic (Type AF-295A)	—	—	—	—	—	2.0	2.0	2.0
Cessna 200A Navomatic (Type AF-295B)	—	—	—	—	—	—	2.0	2.0
Cessna 300 ADF (Type R-521B)	1.6	1.6	1.6	—	—	—	—	—
Cessna 300 ADF (Type R-546A)	—	—	—	1.0	1.0	1.0	1.0	1.0
Cessna 300 ADF (Type R-546E)	—	—	—	1.0	1.0	1.0	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B) . . .	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cessna 300 Nav/Com (90 Channel-Type RT-517R)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-508A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-308C)	—	—	—	—	—	1.5	1.5	1.5
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)	—	—	—	—	1.9	1.9	1.9	1.9
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	—	—	—	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-328C)	—	—	—	—	—	1.5	—	—
Cessna 300 Nav/Com (720 Channel-Type RT-328D)	—	—	—	—	—	—	1.5	1.5
Cessna 300 Transceiver (Type RT-524A)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Cessna 300 HF Transceiver (PT10-A)	5.0	5.0	5.0	5.0	5.0	5.0	—	—
Cessna 300 Transponder (Type KT-75R)	1.5	1.5	1.5	1.5	—	—	—	—
Cessna 300 Transponder (Type KT-76 & KT-78) .	—	—	—	1.3	1.3	—	—	—
Cessna 300 Transponder (Type RT-359A)	—	—	—	—	—	1.0	1.0	1.0
Cessna 300 Navomatic (Type AF-512C)	2.0	2.0	2.0	—	—	—	—	—
Cessna 300 Navomatic (Type AF-512D)	—	—	—	2.0	—	—	—	—
Cessna 300 Navomatic (Type AF-394A)	—	—	—	—	2.0	2.0	—	—
Cessna 300 Navomatic (Type AF-395A)	—	—	—	—	—	—	2.0	2.0
Cessna 300 DME (Type KN-60B)	3.0	3.0	3.0	—	—	—	—	—
Cessna 300 DME (Type KN-60C)	—	—	—	3.0	3.0	3.0	—	—
Cessna 400 ADF (Type R-324A)	2.0	2.0	2.0	—	—	—	—	—
Cessna 400 ADF (Type R-346A)	—	—	—	1.0	1.0	1.0	—	—
Cessna 400 ADF (Type R-446A)	—	—	—	—	—	—	1.3	1.3
Cessna 400 Glideslope (Type R-543B)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cessna 400 Glideslope (Type R-443A)	—	—	—	—	0.4	—	—	—
Cessna 400 Glideslope (Type R-443B)	—	—	—	—	—	0.4	0.4	0.4
Cessna 400 Nav/Com (Type RT-522A)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cessna 400 Nav/Com (Type RT-422A)	—	—	—	—	2.5	2.5	—	—
Cessna 400 Nav/Com (Type RT-428A)	—	—	—	—	—	—	1.5	1.5
Cessna 400 Transceiver (Type RT-532A)	1.5	1.5	1.5	1.5	—	—	—	—
Cessna 400 Transceiver (Type RT-432A)	—	—	—	—	1.4	1.4	—	—
Cessna 400 Transponder (Type RT-506A)	3.0	3.0	3.0	3.0	3.0	—	—	—
Cessna 400 Transponder (Type RT-459A)	—	—	—	—	—	1.0	1.0	1.0
Cessna EA-401A Encoding Altimeter	—	—	—	—	—	—	.065	.065
Sunair SSB Transceiver (Type ASB-125)	—	—	—	—	—	—	5.0	5.0
Pantronics HF Transceiver (PT10-A)	—	—	—	—	—	—	5.0	5.0
King DME (KN-60C)	—	—	—	—	—	—	3.0	3.0
Flashing Beacon	7.0	7.0	7.0	7.0	7.0	7.0	7.0	1.0

ELECTRICAL LOAD ANALSIS CHART

ALL MODELS

OPTIONAL EQUIPMENT (RUNNING LOAD) (CONT)	AMPS REQD 1969	1970	1971	1972	1973	1974	1975
Narco Mark 12A Nav/Com	4.6	—	—	—	—	—	—
Narco Mark 12B Nav/Com with VOA-40 or VOA-50	4.6	4.6	4.6	—	—	—	—
Narco UGR-2 Glideslope Receiver	0.23	0.23	0.23	—	—	—	—
Brittain Wing Leveler	0.32	0.32	0.32	0.32	0.32	—	—
Turn Coordinator	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD							
Cigarette Lighter	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Clock	†	†	†	†	†	†	†
Courtesy and Dome Lights	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Landing Lights	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Map Light	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Oil Dilution	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Auxiliary Fuel Pump	3.0	3.0	3.0	3.0	3.0	3.0	3.0

†Negligible

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SECTION 17

STRUCTURAL REPAIR

TABLE OF CONTENTS

17-1. STRUCTURAL REPAIR.

17-2. REPAIR CRITERIA.

17-3. 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 Regulations, Part 43. Consult the factory when in doubt about a repair not specifically mentioned here.

17-4. EQUIPMENT AND TOOLS.

17-5. Locally fabricated equipment and tools may be used for all but major repairs of structure. It is recommended that special jigs, available from the factory, be used for major repair of the fuselage and wings. These jigs are precision equipment, designed to ensure accurate alignment of these airframe components.

17-6. CONTROL BALANCING FIXTURES are used for determining the static balance moment of the control surface assemblies. They may be fabricated locally, following instructions in figure 17-3.

17-7. SUPPORT STANDS are used to hold a fuselage or wing when they are removed. Plans for local fabrication of support stands are contained in figure 17-1.

17-8. FUSELAGE REPAIR JIGS are obtained from the factory. This jig is a sturdy, versatile fixture used to hold an entire fuselage, and locates the firewall, wing and landing gear attach points. The jig is ideal for assembling new parts in repair of a badly damaged fuselage.

17-9. WING JIGS are also obtainable from the factory. This jig serves as a holding fixture during extensive repair of a damaged wing, and locates the root rib, leading edge, and tip rib of the wing.

17-10. WING ANGLE-OF-INCIDENCE AND WING TWIST.

17-11. The following chart lists wing angle-of-incidence and wing twist. Wings have a constant angle from the root to the strut fitting station. All twist in the wing panel is between the strut fitting station and the tip rib. The amount of twist between these points is the difference between the angle-of-incidence at the root and the angle-of-incidence at the tip.

WING
THRU 18052284 AND 18502090
Angle-of-incidence, Root . . . . +1°30'
Angle-of-incidence, Tip . . . . -1°30'
Wing twist (Washout) . . . . 3°
BEGINNING WITH 18052285 AND 18502091
(Camber lift leading edge)
Angle-of-incidence, Root . . . . +47'
Angle-of-incidence, Tip . . . . -2°50'
Wing twist (Washout) . . . . 3°37'

17-12. REPAIR MATERIALS.

17-13. Thickness of 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 is made from 2024 aluminum alloy, heat treated to a -T3, -T4, or -T42 condition. If the type of material cannot be readily 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 it is 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 a 2024-T42 condition after forming. The repair material used in making a repair must equal the gage 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 and wing tips, and the dorsal and fin intersection fairing) are fabricated from the thermo-formed plastic or glass fiber constructed materials.

17-14. WING.

17-15. Semicantilever type wings employing semimonocoque type structure are used on the Model 180 and 185-Series aircraft. Basically, the internal structure consists of built-up front and rear spar assemblies, a formed auxiliary spar assembly and formed sheet metal nose, intermediate, and trailing edge ribs. Stressed skin, riveted to the rib and spar assemblies, completes the rigid structure. Access openings (hand holes with removable cover plates) are located in the underside of the wing between the wing root and tip sections. These openings afford access to aileron bellcranks, flap bellcranks, electrical wiring, strut attach fittings, aileron control cable pulleys, and control cable disconnect points.

17-16. WING SKIN.

17-17. NEGLIGIBLE DAMAGE. Any smooth dents in the wing skin that are free from cracks, abrasions and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep, sharp dents, which after trimming or stop-drilling, can be enclosed by a two-inch circlt, can be considered negligible if the damaged area is at least one diameter of the enclosed circle away from all existing rivet lines and material edges. Stop-drilling is considered a temporary repair, and a permanent repair should be made as soon as practicable.

17-18. REPAIRABLE DAMAGE. Figure 17-4 illustrates typical repairs to be employed in patching metal 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 side of the hole should lie span-wise or chord-wise. A circular patch may also be used. If the patch is in an area where flush rivets are used, make a flush patch type of repair; if in an area where flush rivets are not used, make an overlapping type of repair. Where optimum appearance and airflow are desired, the flush patch may be used. Careful workmanship will eliminate gaps at butt-joints; however, an epoxy type filler may be used at such joints.

17-19. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a skin is badly damaged, repair should be made by replacing an entire skin panel, from one structural member to the next. Repair seams should be made to lie along existing structural members and each seam should 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 should be copied. If the repair ends at a structural member where no seam is used, enough repair panel should be used to allow an extra row of staggered rivets, with sufficient edge margin, to be installed.

17-20. WING STRINGERS.

17-21. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-22. REPAIRABLE DAMAGE. Figure 17-5 illustrates a typical wing stringer repair. Two such repairs may be used to splice a new section of stringer material in position, without the filler material.

17-23. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a stringer is so badly damaged that more than one section must be spliced, replacement is recommended.

17-24. WING AUXILIARY SPARS.

17-25. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-26. REPAIRABLE DAMAGE. Figure 17-8 illustrates a typical auxiliary spar repair.

17-27. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If damage to an auxiliary spar would require a repair which could not be made between adjacent ribs, the auxiliary spar should be replaced.

17-28. WING RIBS.

17-29. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-30. REPAIRABLE DAMAGE. Figure 17-6 illustrates typical wing rib repairs.

17-31. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Leading and trailing edge ribs that are extensively damaged should be replaced. However, due to the necessity of unfastening an excessive amount of skin in order to replace the rib, they should be repaired if practicable. Center ribs, between the front and rear spar, should always be repaired if practicable.

17-32. WING SPARS.

17-33. NEGLIGIBLE DAMAGE. Due to the stresses which wing spars encounter, very little damage can be considered negligible. All cracks, stress wrinkles, deep scratches, and sharp dents must be repaired. Smooth dents, light scratches, and abrasion may be considered negligible.

17-34. REPAIRABLE DAMAGE. Figure 17-7 illustrates typical spar repairs. It is often practical to cut repair pieces from service parts listed in the Parts Catalog. Service Kits are available for certain types of spar repairs.

17-35. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Damage so extensive that repair is not practicable requires replacement of a complete wing spar. Also refer to paragraph 17-2.

17-36. WING LEADING EDGES.

17-37. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-38. REPAIRABLE DAMAGE. Wing skin repairs, outlined in paragraph 17-18, may be used to repair leading edge skins, although the flush-type patches should be used. To facilitate repair, extra access holes may be installed in locations noted in figure 17-12. If the damage would require a repair which could not be made between adjacent ribs, refer to the following paragraph.

17-39. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Where extreme damage has occurred, complete leading edge skin panels should be replaced. Extra access holes may be installed (refer to figure 17-12) to facilitate replacement.

17-40. BONDED LEADING EDGES REPAIR.

17-41. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-42. REPAIRABLE DAMAGE. (Refer to figure 17-10.) Cut out damaged area, as shown, to the edge of undamaged ribs. Using a corresponding section from a new leading edge skin, overlap ribs and secure to wing using rivet pattern as shown in the figure.

17-43. AILERONS.

17-44. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-45. REPAIRABLE DAMAGE. Figure 17-4 may be used as a guide to repair damage to flat surface between corrugations, when damaged area includes corrugations refer to figure 17-11. It is recommended that material used for repair be cut from spare parts of the same guage and corrugation spacing. Following repair the aileron must be balanced. Refer to paragraph 17-46 for balancing. If damage would require a repair which could not be made between adjacent ribs, refer to paragraph 17-35.

17-46. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If damage to the aileron would require a repair which could not be made between adjacent ribs, complete skin panels should be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the aileron assembly is recommended. After repair and/or repainting, balance in accordance with instructions outlined in figure 17-3.

17-47. WING FLAPS.

17-48. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-49. REPAIRABLE DAMAGE. Flap repairs should be similar to aileron repair discussed in paragraph 17-45 with the exception of the leading edge. A flap leading edge repair is illustrated in figure 17-9. If an overlapping patch is to be used, be sure it will not interfere with the wing during flap operation.

17-50. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damage would require a repair which could not be made between adjacent ribs, complete skin panels should be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the flap assembly is recommended.

17-51. ELEVATORS AND RUDDER.

17-52. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17. The exception to negligible damage on the elevator surface is the front spar, where a crack appearing in the web at hinge fittings or in the tip which supports the overhanging balance weight, is not considered negligible. Cracks in the overhanging tip rib in the area at the front spar intersection with the web of the rib, also cannot be considered negligible.

17-53. REPAIRABLE DAMAGE. Skin patches illustrated in figure 17-4 may be used to repair skin damage between corrugations. For skin damage which includes corrugations refer to figure 17-11. Following repair the elevator/rudder must be balanced. Refer to figure 17-3 for balancing. If damage would require a repair which could not be made between adjacent ribs, see paragraph 17-54.

17-54. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which would not be made between adjacent ribs, complete skin panels should be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the entire assembly is recommended. After repair and/or repainting, balance in accordance with instructions outlined in figure 17-3.

17-55. FIN AND STABILIZER.

17-56. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17.

17-57. REPAIRABLE DAMAGE. Skin patches illustrated in figure 17-4 may be used to repair skin damage. Access to dorsal area of the fin may be gained by removing dorsal skin and horizontal closing rib at the bottom of the fin. Access to internal fin structure is best gained by removing skin-attaching rivets on one side of the rear spar and ribs, and prying back the skin. Access to stabilizer structure may be gained by removing skin-attaching rivets on one side of the rear spar and ribs, and springing back the skin. If the damaged area would require a repair which could not be made between adjacent ribs, or a repair would be located in an area with compound curves, see the following paragraph.

17-58. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, or if the repair would be located in an area with compound curves, complete skin panels should be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where damage is extensive, replacement of the entire assembly is recommended.

17-59. FUSELAGE.

17-60. The fuselage is of semi-monocoque construction, consisting of formed bulkheads, longitudinal stringers, reinforcing channels and skin panels.

17-61. NEGLIGIBLE DAMAGE. Refer to paragraph 17-17. Mild corrosion appearing upon alclad surfaces does not necessarily indicate initial failure of the base metal. However, corrosion of all types should be carefully considered, and approved remedial action should be taken. Small cans appear in the skin structure of all metal airplanes. It is strongly recommended however, that wrinkles which appear to have originated from other sources, or which do not follow the general appearance of the remainder of the skin panels, be thoroughly investigated. Except in the landing gear bulkhead areas, wrinkles occurring over stringers which disappear when the rivet pattern is removed, may be considered negligible. However, the stringer rivet holes may not align perfectly with the skin holes because of a permanent "set" in the stringer. If this is apparent, replacement of the stringer will usually restore the original strength characteristics of the area.

NOTE

> Wrinkles occurring in the skin of the main landing gear bulkhead areas should not be considered negligible. The skin panel should be opened sufficiently to permit a thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

Wrinkles occurring in open areas which disappear when the rivets at the edge of the sheet are removed, or a wrinkle which is hand-removable, may often be repaired by the addition of a 1/2 x 1/2 x .060-inch 2024-T4 extruded angle, riveted over the wrinkle and extended to within 1/16 to 1/8 inch of the nearest structural members. Rivet pattern should be identical to the existing manufactured seam at the edge of the sheet.

17-62. REPAIRABLE DAMAGE. Fuselage skin repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 17-18. Stringers, formed skin flanges, bulkhead channeld, and similar parts may be repaired as shown in figure 17-5.

17-63. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Fuselage skin major repairs may be accomplished in the same manner as the wing repairs outlined in paragraph 17-19. Damaged fittings should be replaced. Seat rails serve as structural parts of the fuselage, and should be replaced if damaged.

17-64. BULKHEADS.

17-65. LANDING GEAR BULKHEADS. Since these bulkheads are highly stressed members, irregularly formed to provide clearance for control cables, fuel lines, etc., the patch type repairs will be, for the most part, impractical. Minor damage, consisting of small nicks or scratches, may be repaired by dressing out the damaged area, or by replacement of rivets. Any other such damage should be repaired by replacing the landing gear support assembly as an aligned unit.

17-66. 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 should be examined, and all support forgings should be checked for cracks, using a dye penetrant and proper magnification. Bulkheads in the damaged area should be checked for alignment, and deformation of the bulkhead webs should be determined with the aid of a straightedge. Damaged support structure, buckled floorboards and skins, and damaged or questionable forgings should be replaced.

17-67. 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. NAS464P* 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.

17-68. FIREALL DAMAGE may be repaired by removing the damaged material and splicing in a new section of material. The new portion should be lapped over the old material, sealed with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound, and secured with stainless steel rivets. Damaged or deformed angles and stiffeners may be repaired as shown in figure 17-13, or they may be replaced. A severely damaged firewall should be replaced as a unit.

17-69. ENGINE MOUNT.

17-70. 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.

17-71. GENERAL CONSIDERATIONS. All welding on the engine mount should 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.

17-72. 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 should be replaced.

17-73. 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 should be replaced.

17-74. BAFFLES should ordinarily be replaced if damaged or cracked. However, small plate reinforcements riveted to the baffle will often prove satisfactory, both to the strength and cooling requirements of the unit.

17-75. ENGINE COWLING.

17-76. REPAIR OF COWLING SKINS. If extensively damaged, complete sections of cowling should be replaced. Standard insert-type skin patches, however, may be used if repair parts are formed to fit. Small cracks may be stop-drilled, and dents straightened, if they are reinforced on the inner side with a doubler of the same material.

17-77. REPAIR OF REINFORCED ANGLES. Cowl reinforcement angles, if damaged, should be replaced. Due to their small size, they are easier to replace than to repair.

17-78. REPAIR OF ABS COMPONENTS.

17-79. Rezolin Repair Kit Number 404 may be obtained from Cessna Service Parts Center for repair of ABS components.

17-80. REPAIR OF GLASSFIBER-CONSTRUCTED COMPONENTS.

17-81. Glass fiber-constructed components on the aircraft may be repaired as stipulated in instructions furnished in Service Kit SK182-12. Observe the resin manufacturer's recommendations concerning mixing and application of the resin. Epoxy resins are preferable for making repairs, since epoxy compounds are usually more stable and predictable than polyester and, in addition, give better adhesion.

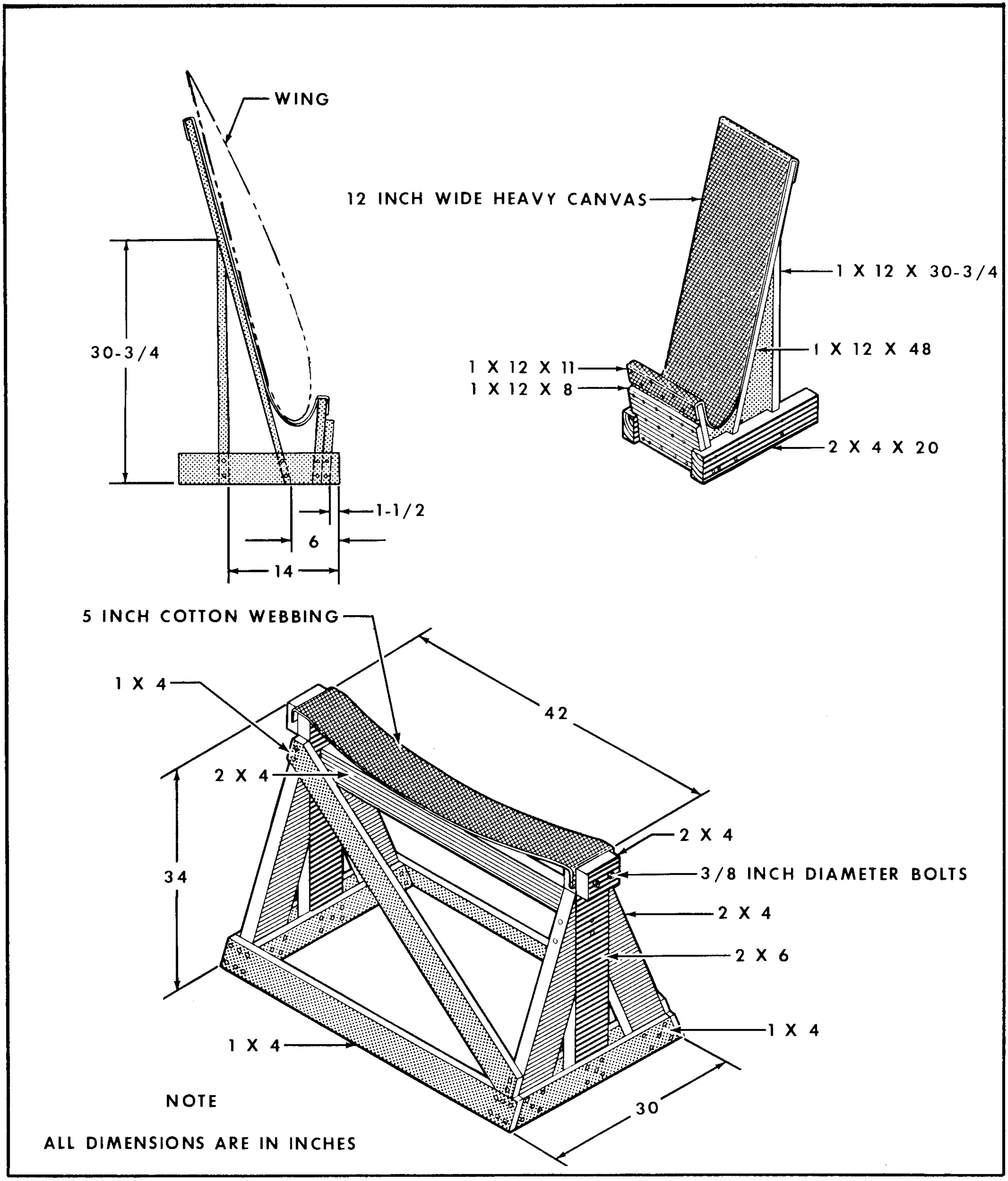
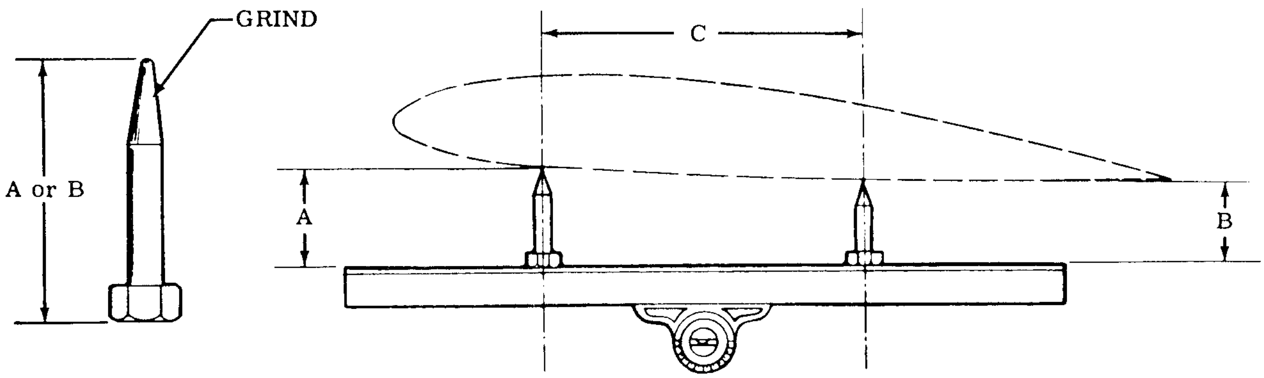


Figure 17-1. Wing and Fuselage Support Stands



MODEL	A	B	C	WING STATION
180	2.00 2.00 .59	1.00 1.00 1.00	29.50 29.50 24.00	39.00 100.50 207.00
A185	2.00 2.00 .59	1.00 1.00 1.00	29.50 29.50 24.00	39.00 100.50 207.00

ALL WING TWIST OCCURS BETWEEN STA. 100.50
AND STA. 207.00.
(Refer to paragraph 17-11 for angle of incidence).

MEASURING WING TWIST.

If damage has occurred to a wing, it is advisable to check the twist. The following method can be used with a minimum of equipment, which includes a straightedge (32" minimum length of angle, or equivalent), three modified bolts, and a protractor head with level.

1. Check applicable dimension for bolt length (A or B).
2. Grind bolt shanks to a rounded point as illustrated, checking length periodically.
3. Tape two bolts to straightedge according to dimension C.
4. Locate inboard wing station to be checked and make a pencil mark approximately one-half inch aft of the lateral row of rivets in the wing leading edge spar flange.
5. Holding straightedge parallel to the wing station, (staying as clear as possible from "cans") place shorter bolt on pencil mark and set protractor head against lower edge of straightedge.
6. Set bubble in level to center and lock protractor to hold this reading.
7. Omitting step 6, repeat procedure for each wing station, using dimensions specified in chart. Check to see that protractor bubble is still centered.
8. Proper twist is present in wing if protractor readings are the same (parallel).

Figure 17-2. Checking Wing Twist

BALANCING PROCEDURES

1. Balance control surfaces in an enclosed draft free area.

2. Control surface to be balanced must be in the final flight configuration, painted (if applicable) trim tabs installed, and all foreign matter removed from inside control surface.

3. If control surface is to be painted remove all existing paint prior to repainting and rebalancing. Good workmanship and standard repair practices should not result in excessive additional balance weight.

4. Place balancing mandrels (detail B) on a table or other suitable FLAT, LEVELED surface. Mandrels must be placed at 90° to the hinge line of the control surface.

5. On control surfaces with the piano type hinges, insert inboard and outboard hinges into slotted ends of the balancing mandrels, making sure that balancing mandrels are 90° to the hinge line. On control surfaces with the bearing type hinge point, bolts or pins are inserted through the attaching brackets, then placed on the knife edges of the mandrels as illustrated in (detail H).

6. AILERONS.

   a.

      (1) Block up the trailing edge of the aileron until a spirit-level protractor placed on the front face of the aileron spar at W.S. 154.00 (± 6.00), (detail E), indicates 57° 10', (detail D).

      (2) ALTERNATE METHOD:
      Measure the vertical distance from the aileron hinge point to the leveled surface. Subtract 1.80 inches, then block up trailing edge of the aileron to this measurement.

   b. With the aileron blocked in position place the balancing beam (detail A) at W.S. 154.00, (90° to the hinge line), and adjust the trailing edge support on the balancing beam (detail D) until the beam is level. If the aileron has not been disturbed during this operation, the beam is now parallel to the aileron chord line at W.S. 154.00 (detail D).

NOTE

The above procedure must be performed with care. Small angular discrepancies will produce large balancing errors.

   c. Remove balancing beam and balance the beam by itself at the knife edges by adding washers as shown, (detail C).

   d. Place the balancing beam on the aileron in its original position, then remove the blocks from beneath the trailing edge.

   e. Place the sliding weight (detail D) on the forward end of the balancing beam, moving it along the beam until the beam is again level. A small, lightweight, spirit-level may be used for this purpose provided it is symmetrical about its bubble reference and this reference is placed on the beam directly over the aileron hinge line (detail D).

   f. If aileron is correctly balanced, the position of the sliding weight with respect to the aileron hinge line, will produce a moment about the hinge line somewhere within the underbalance tolerance listed in the chart on (Sheet 5 of 5).

   g. If modification of the aileron balance weight is necessary to correct an out-of-tolerance condition, the balance weight can be lightened by drilling out part of the weight on the inboard end. The weight can be increased by a reasonable amount by ordering additional weight and gang channel listed in the applicable Parts Catalog, and installing next to the inboard weight the minimum amount necessary for correct balance. The minimum amount that must be installed, however, must contain at least two attaching rivets. If this minimum amount results in an over-balanced condition, the new weight and/or old weights can be lightened.

Figure 17-3. Control Surface Balancing (Sheet 1 of 5)

7. RUDDER AND ELEVATORS.

a. With the rudder/elevator set upon a FLAT, LEVELED surface, block up the trailing edge until a center line through the attaching bolt and the trailing edge is equal distance from the leveling surface (detail H).

b. Place the balancing beam (detail A) on the rudder/elevator near the center attaching bracket, (90° to the hinge line). Adjust the trailing edge support on the balancing beam (detail H) until the beam is level. If the rudder/elevator has not been disturbed during this operation, the beam is now parallel to the chord line of the rudder/elevator.

NOTE

The above procedure must be performed with care. Small angular discrepancies will produce large balancing errors.

c. Mark position of the balancing beam, then remove and balance the beam by itself at the knife edges by adding washers as shown in (detail C).

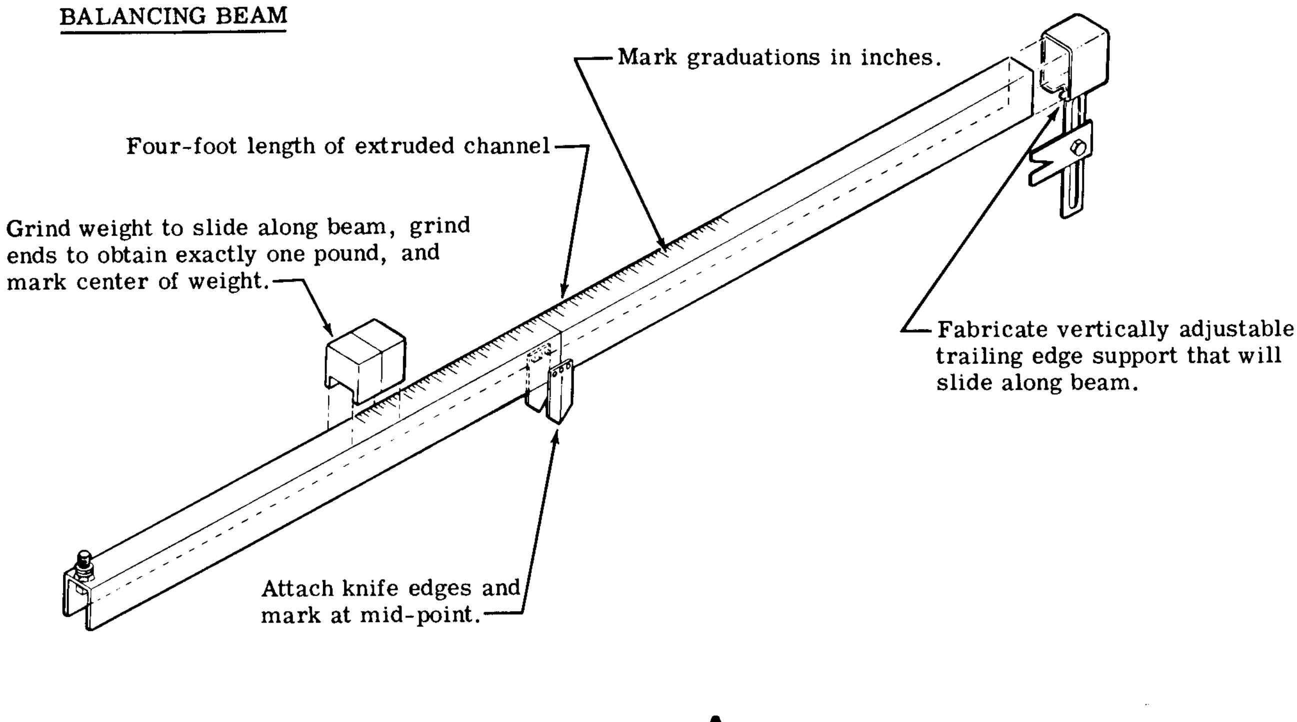
d. Place the balancing beam on the rudder/elevator in its original position, then remove the block from beneath the trailing edge.

e. Place the sliding weight (detail H) on the forward end of the balance beam, move it along the beam until the beam is again level. A small, lightweight, spirit-level may be used for this purpose provided it is symmetrical about its bubble reference and this reference is placed on the beam directly over the rudder/elevator hinge line (detail H).

f. If the rudder/elevator is correctly balanced, the position of the sliding weight with respect to the rudder/elevator hinge line, will produce a moment about the hinge line somewhere within the underbalance tolerance listed in the chart on (Sheet 5 of 5).

g. If modification of the rudder/elevator balance weight is necessary to correct an out-of-balance condition, the balance weight can be lightened by drilling out part of the weight. The weight can be increased by fusing bar stock solder to the weight after removal from rudder/elevator.

BALANCING BEAM



Detail **A**

Figure 17-3. Control Surface Balancing (Sheet 2 of 5)

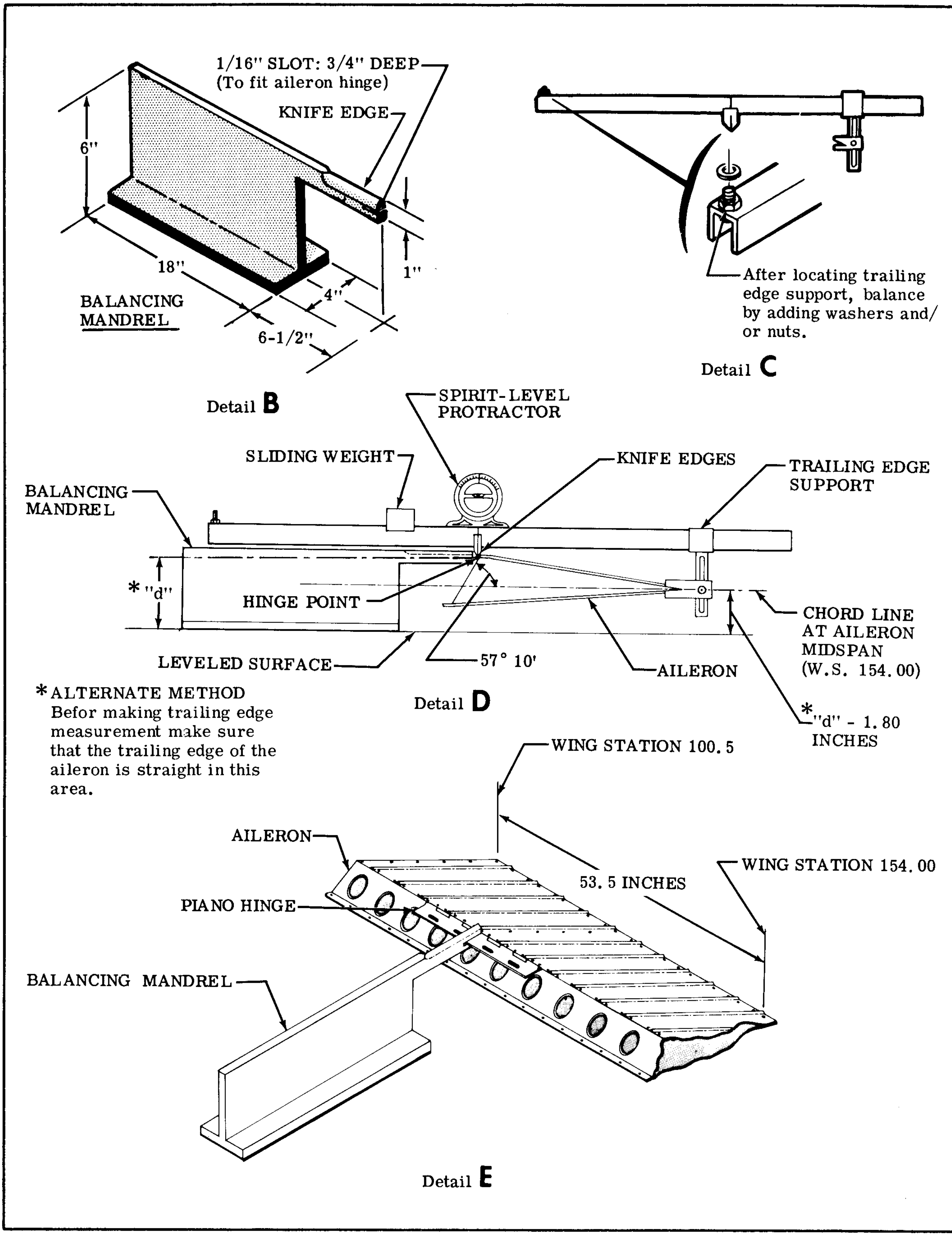


Figure 17-3. Control Surface Balancing (Sheet 3 of 5)

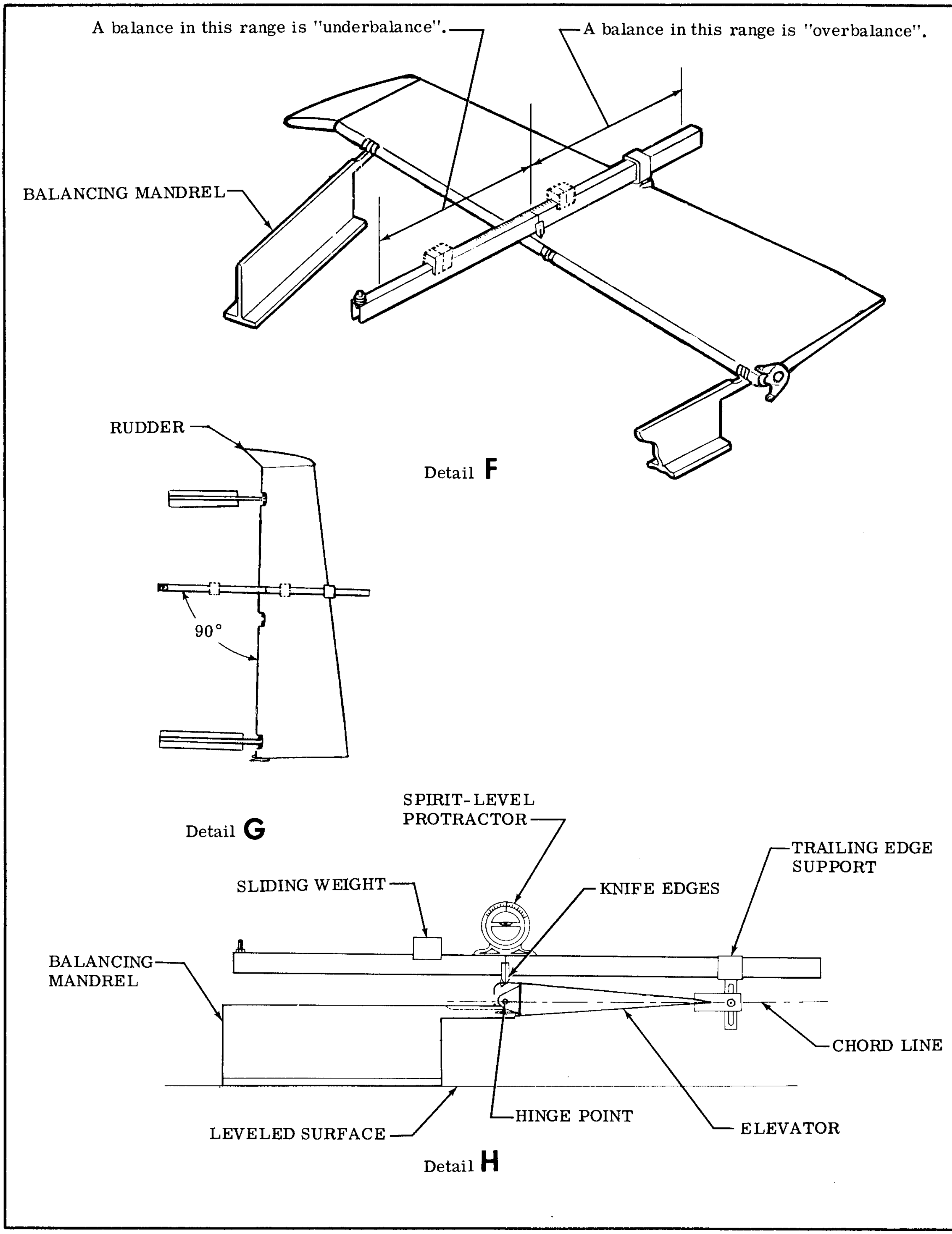


Figure 17-3. Control Surface Balancing (Sheet 4 of 5)

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.

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 following chart applies to 180/A185 and AGcarryall except as indicated.

CONTROL: AILERON

	UNPAINTED (Inch-Pounds) without corrosion proofing	UNPAINTED (Inch-Pounds) with corrosion proofing	PAINTED (Inch-Pounds) with or without corrosion proofing
	BALANCE LIMITS	BALANCE LIMITS	BALANCE LIMITS
THRU 1972	0.0 to + 2.60	0.0 to + 3.60	0.0 to + 4.30
BEGINNING WITH 1973	0.0 to + 2.60	0.0 to + 4.00	0.0 to + 6.10

CONTROL: RUDDER

		UNPAINTED (Inch-Pounds) without corrosion proofing	UNPAINTED (Inch-Pounds) with corrosion proofing	PAINTED (Inch-Pounds) with or without corrosion proofing
		BALANCE LIMITS	BALANCE LIMITS	BALANCE LIMITS
180 THRU 1974		0.0 to + 2.0	0.0 to + 4.4	0.0 to + 7.3
180 SERIES BEGINNING WITH 1975	Landplane	0.0 to + 2.0	0.0 to + 4.4	0.0 to + 7.3
	Floatplane	0.0 to + 13.75	0.0 to + 15.90	0.0 to + 19.20
A185 THRU 1972		0.0 to + 13.75		0.0 to + 16.18
A185 SERIES BEGINNING WITH 1973		0.0 to + 13.75	0.0 to + 15.90	0.0 to + 19.20

CONTROL: RIGHT ELEVATOR

	UNPAINTED (Inch-Pounds) without corrosion proofing	UNPAINTED (Inch-Pounds) with corrosion proofing	PAINTED (Inch-Pounds) with or without corrosion proofing
	BALANCE LIMITS	BALANCE LIMITS	BALANCE LIMITS
	0.0 to + 16.50	0.0 to + 18.60	0.0 to + 22.00

CONTROL: LEFT ELEVATOR

	UNPAINTED (Inch-Pounds) without corrosion proofing	UNPAINTED (Inch-Pounds) with corrosion proofing	PAINTED (Inch-Pounds) with or without corrosion proofing
	BALANCE LIMITS	BALANCE LIMITS	BALANCE LIMITS
	0.0 to + 16.50	0.0 to + 18.60	0.0 to + 22.00

Figure 17-3. Control Surface Balancing (Sheet 5 of 5)

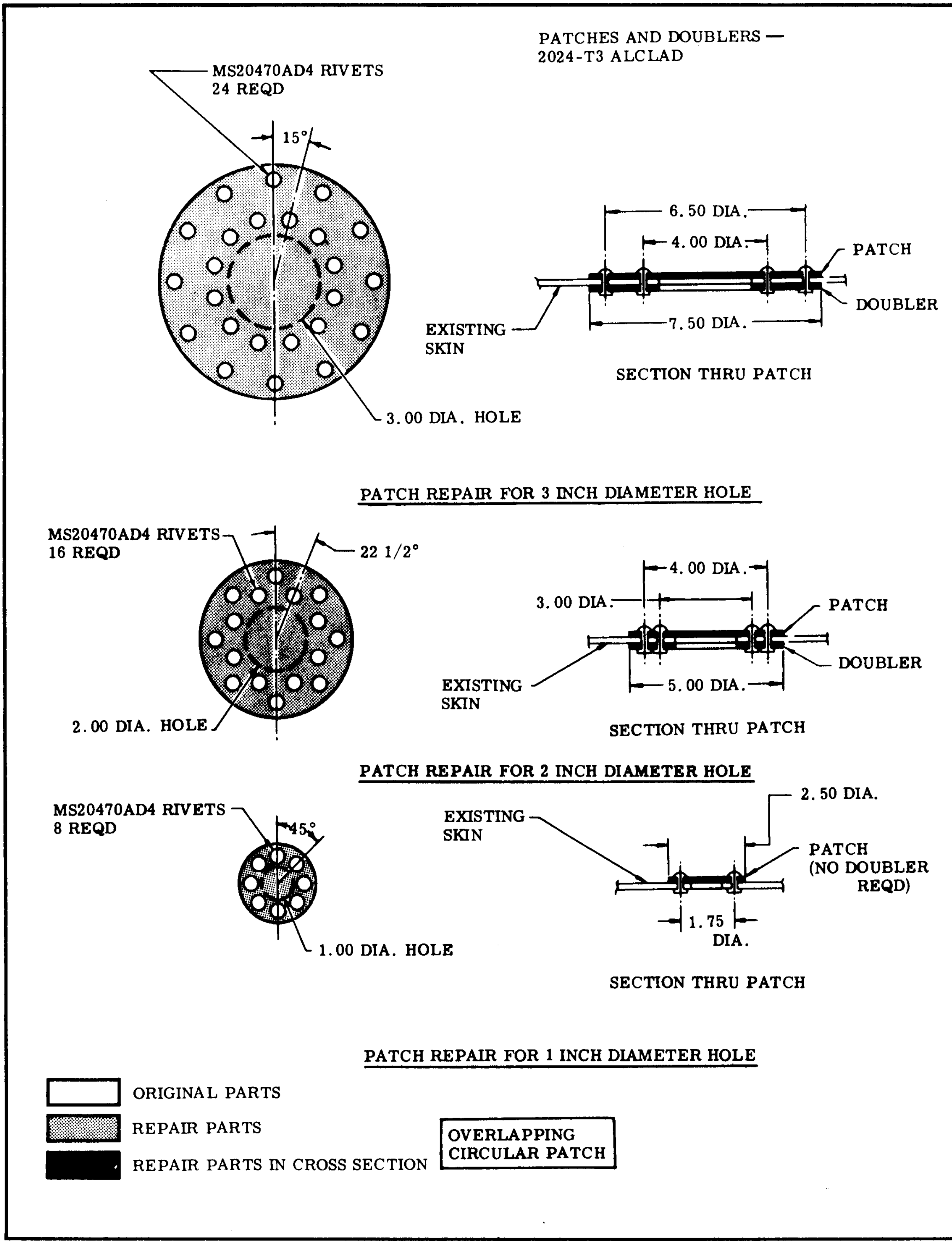
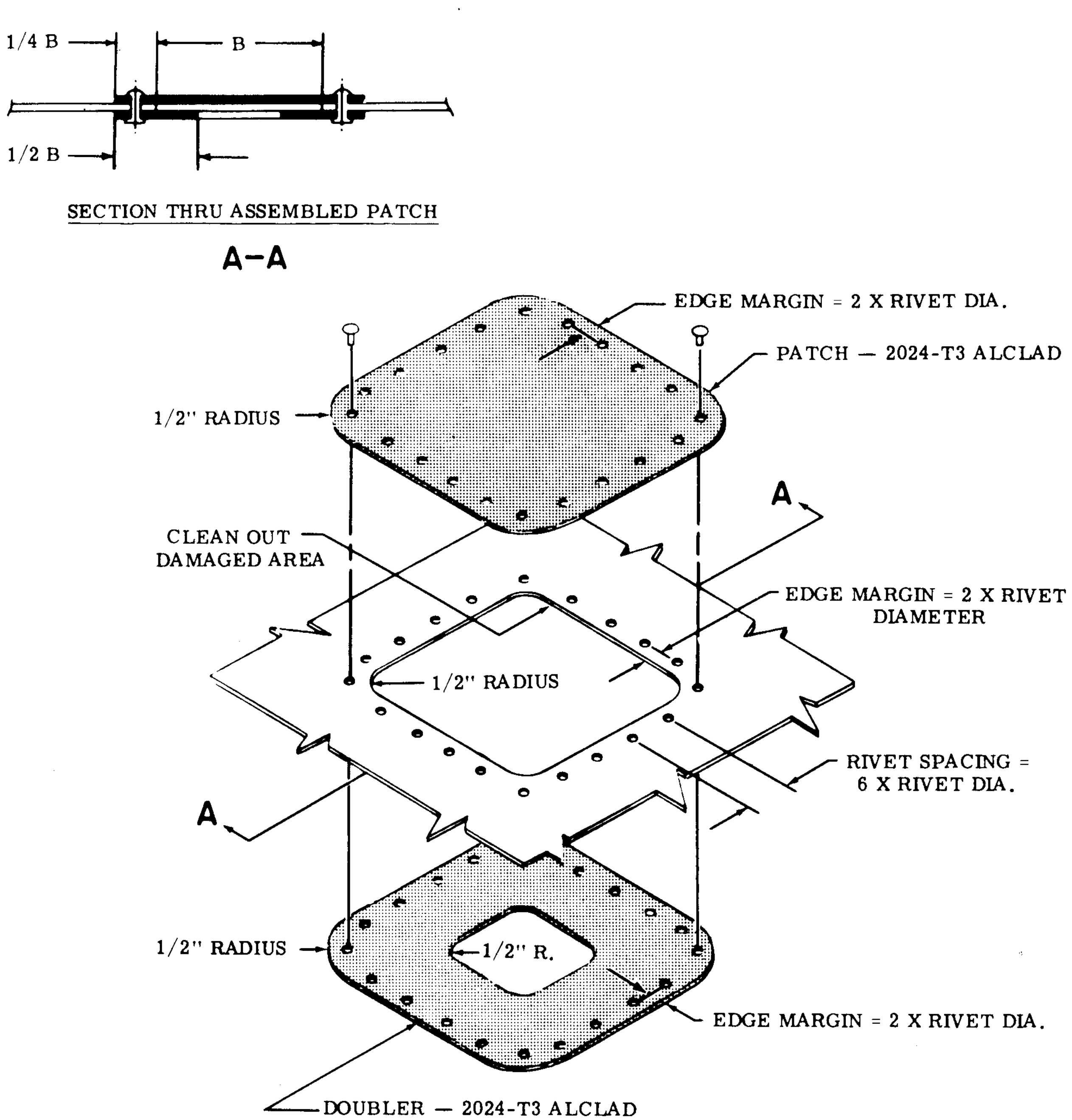


Figure 17-4. Skin Repair (Sheet 1 of 6)



OVERLAPPING RECTANGULAR PATCH

RIVET TABLE

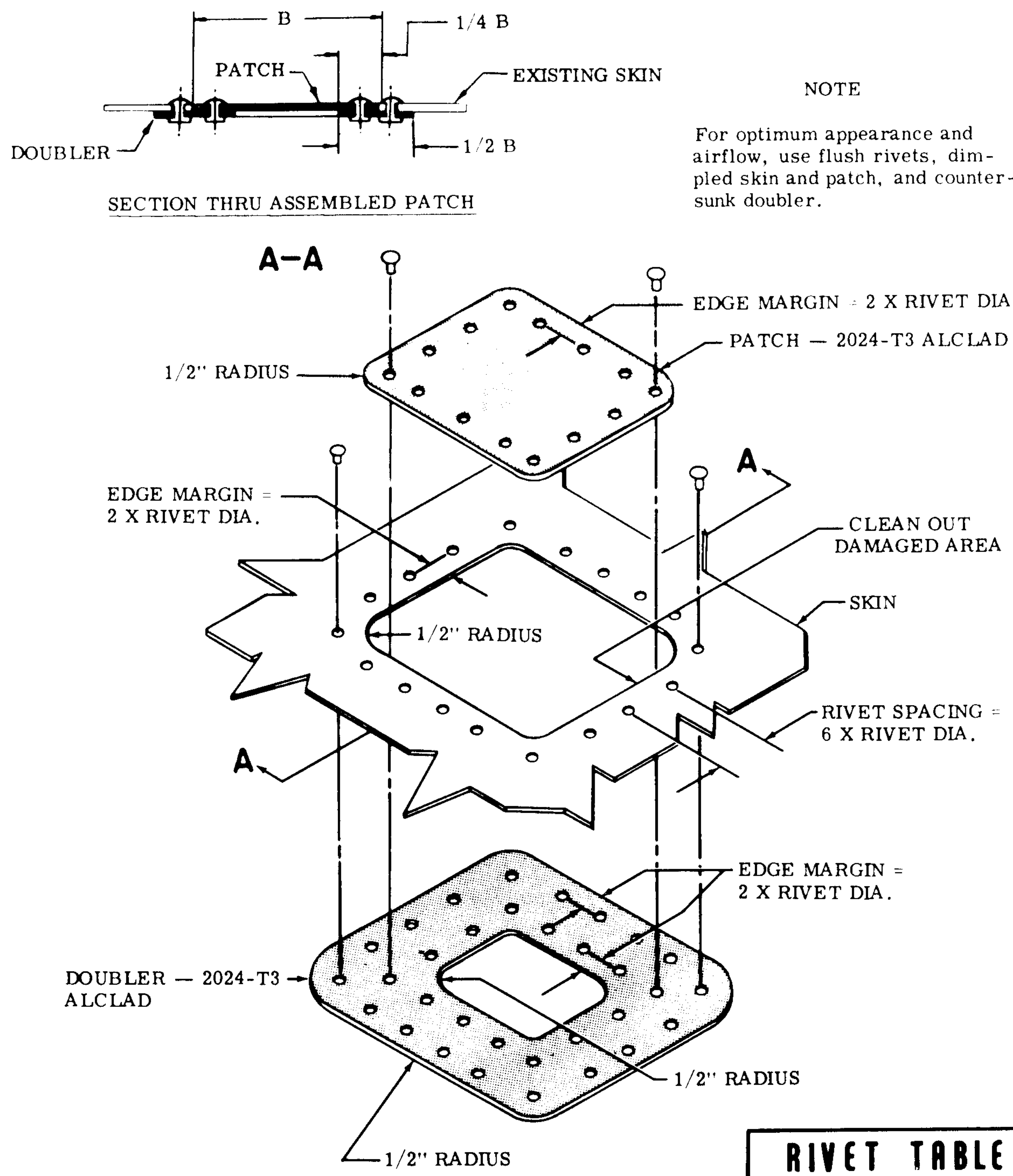
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 17-4. Skin Repair (Sheet 2 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

FLUSH RECTANGULAR PATCH (CIRCULAR FLUSH PATCH IS SIMILAR)

ORIGINAL PARTS

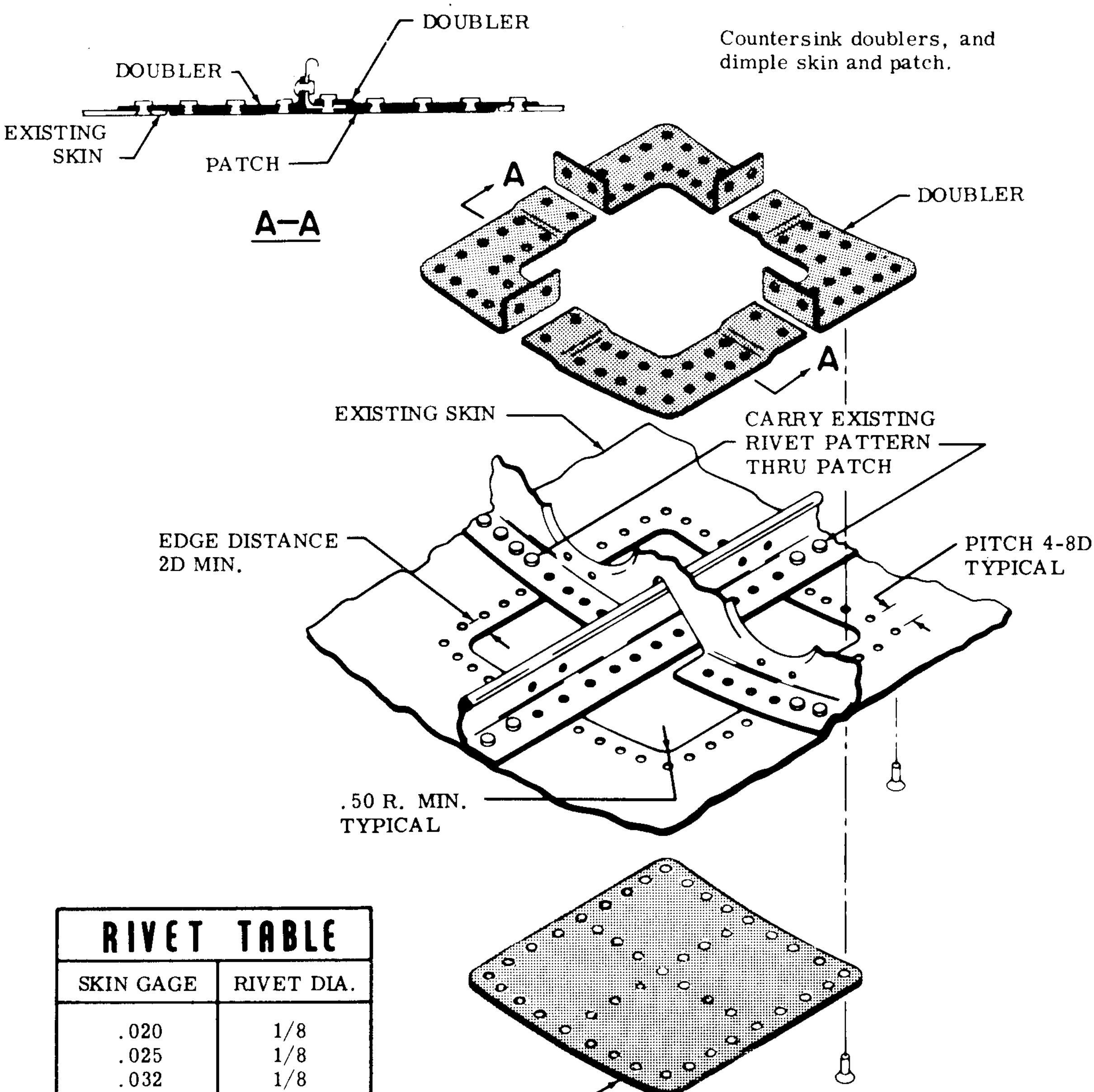
REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 17-4. 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

NOTE

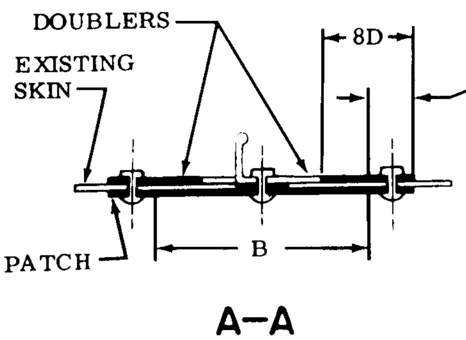
This procedure is not recommended in areas where stringers are riveted to bulkheads.

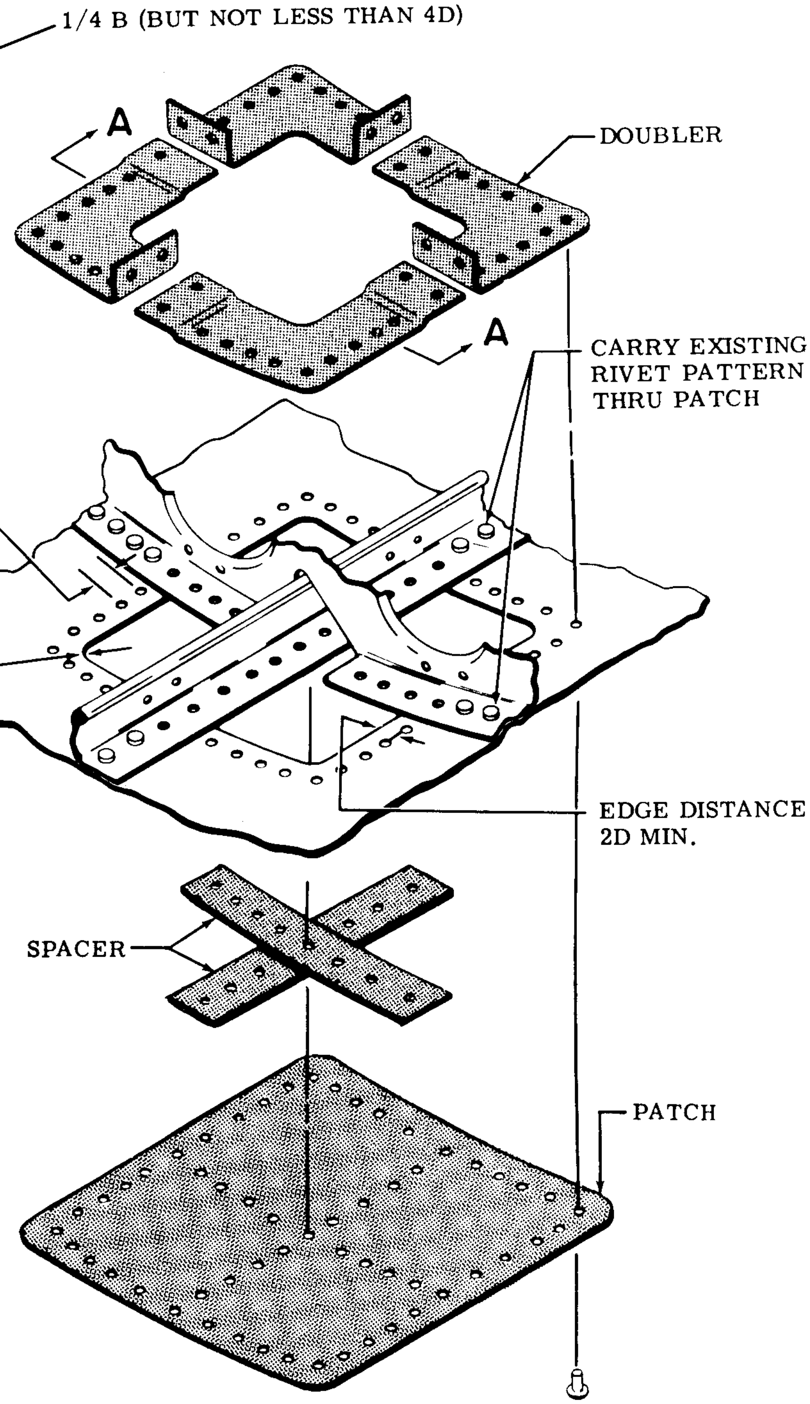
ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 17-4. Skin Repair (Sheet 4 of 6)





RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

OVERLAPPING PATCH AT STRINGER/BULKHEAD INTERSECTION

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 17-4. Skin Repair (Sheet 5 of 6)

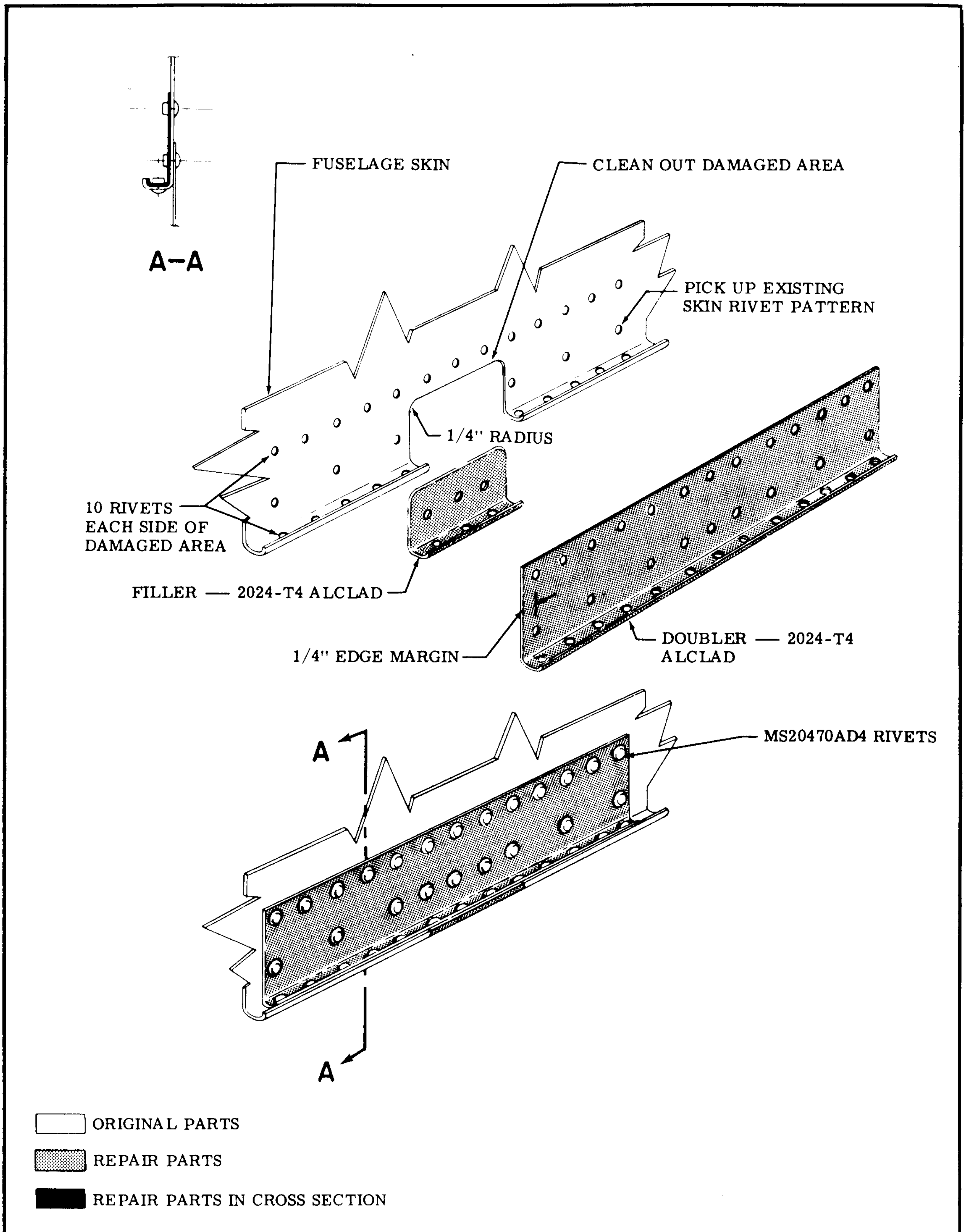


Figure 17-4. Skin Repair (Sheet 6 of 6)

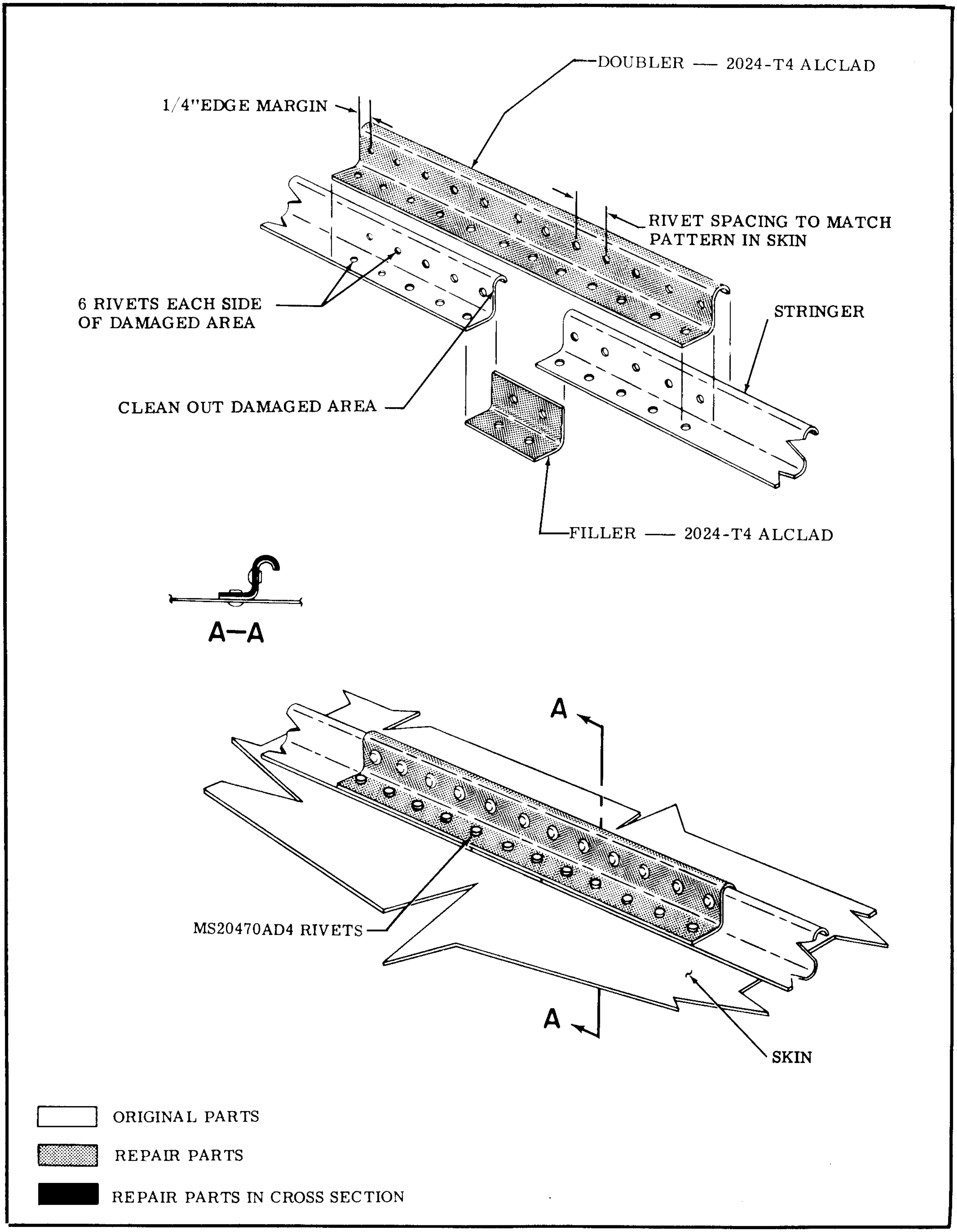


Figure 17-5. Stringer and Channel Repair (Sheet 1 of 4)

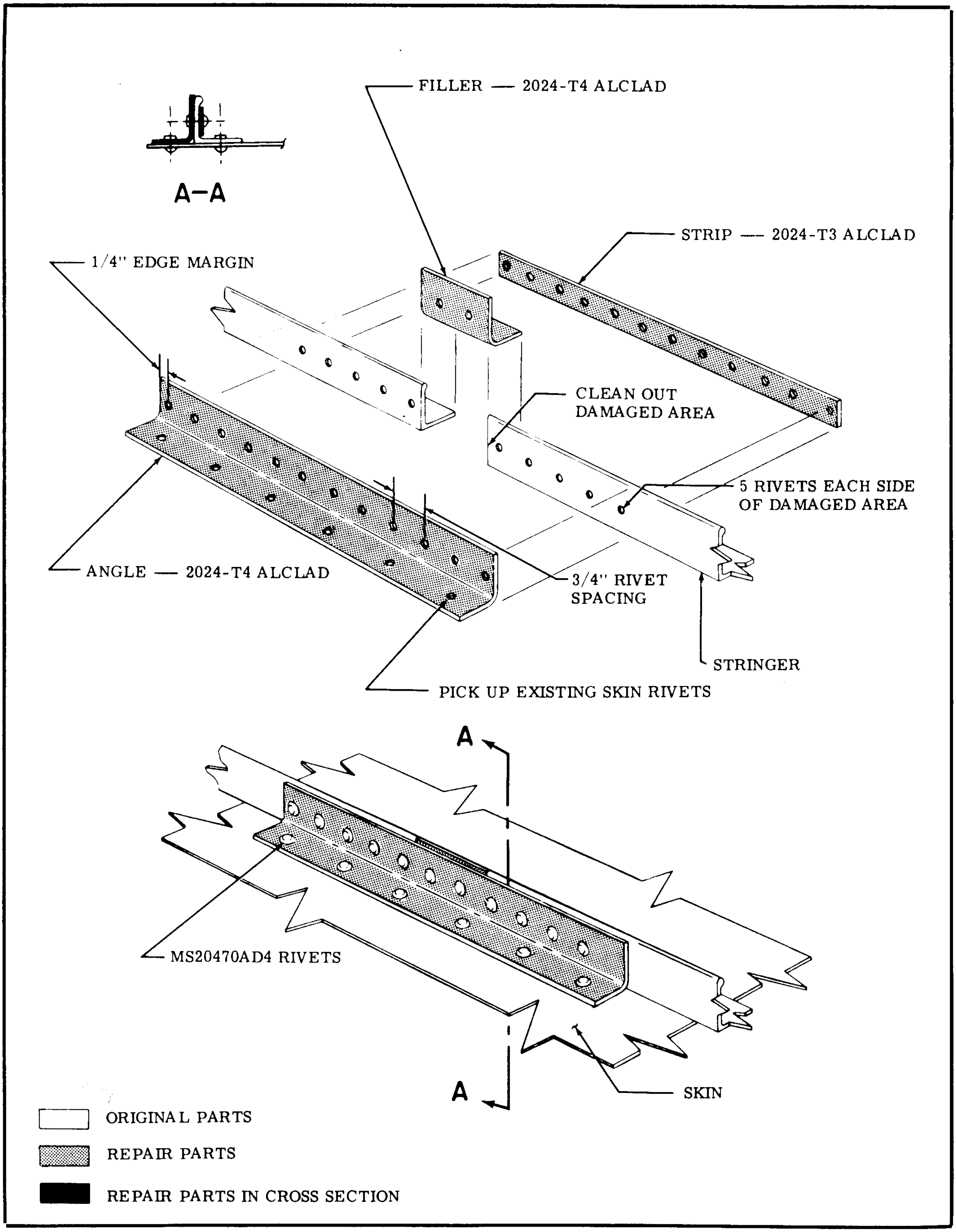


Figure 17-5. Stringer and Channel Repair (Sheet 2 of 4)

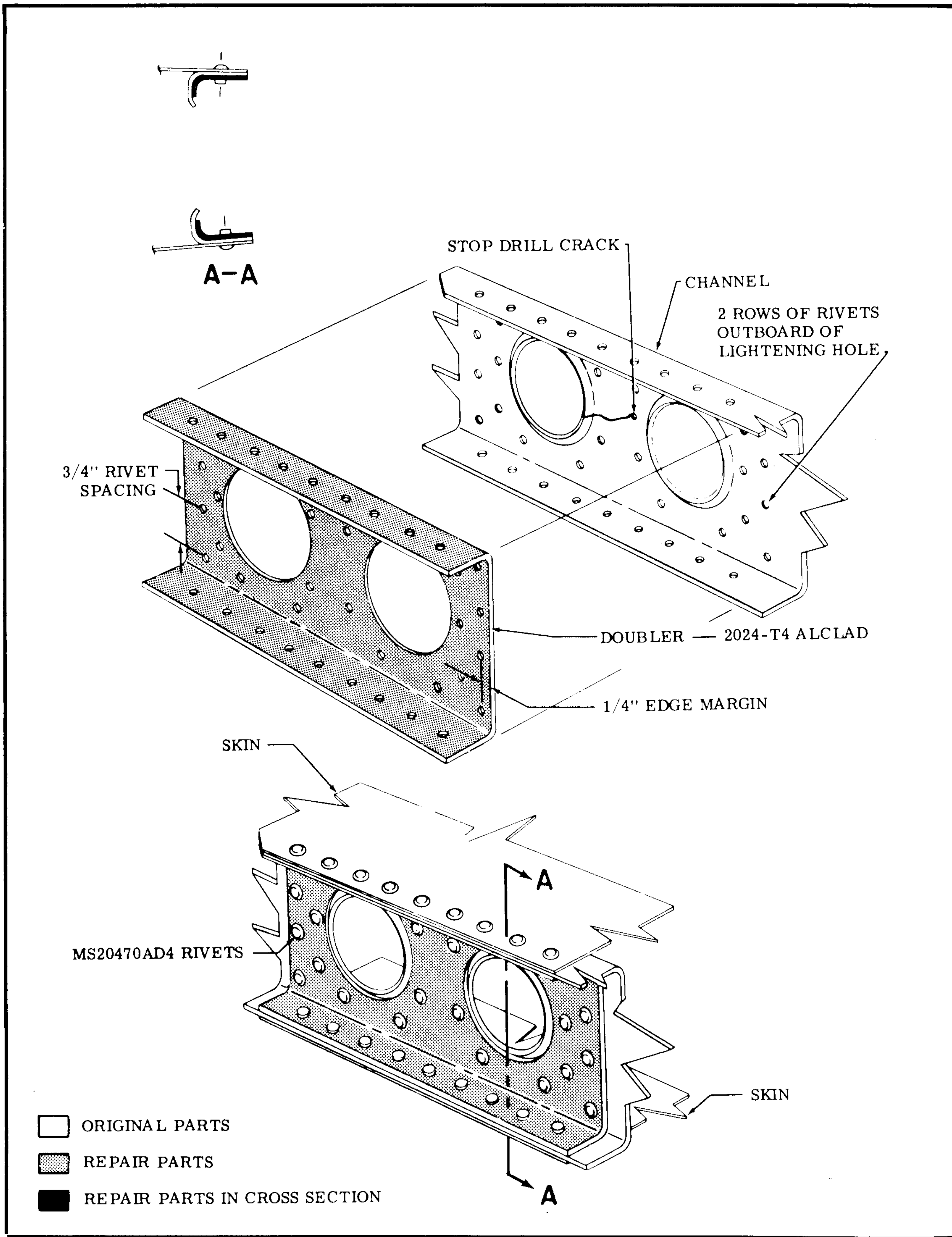


Figure 17-5. Stringer and Channel Repair (Sheet 3 of 4)

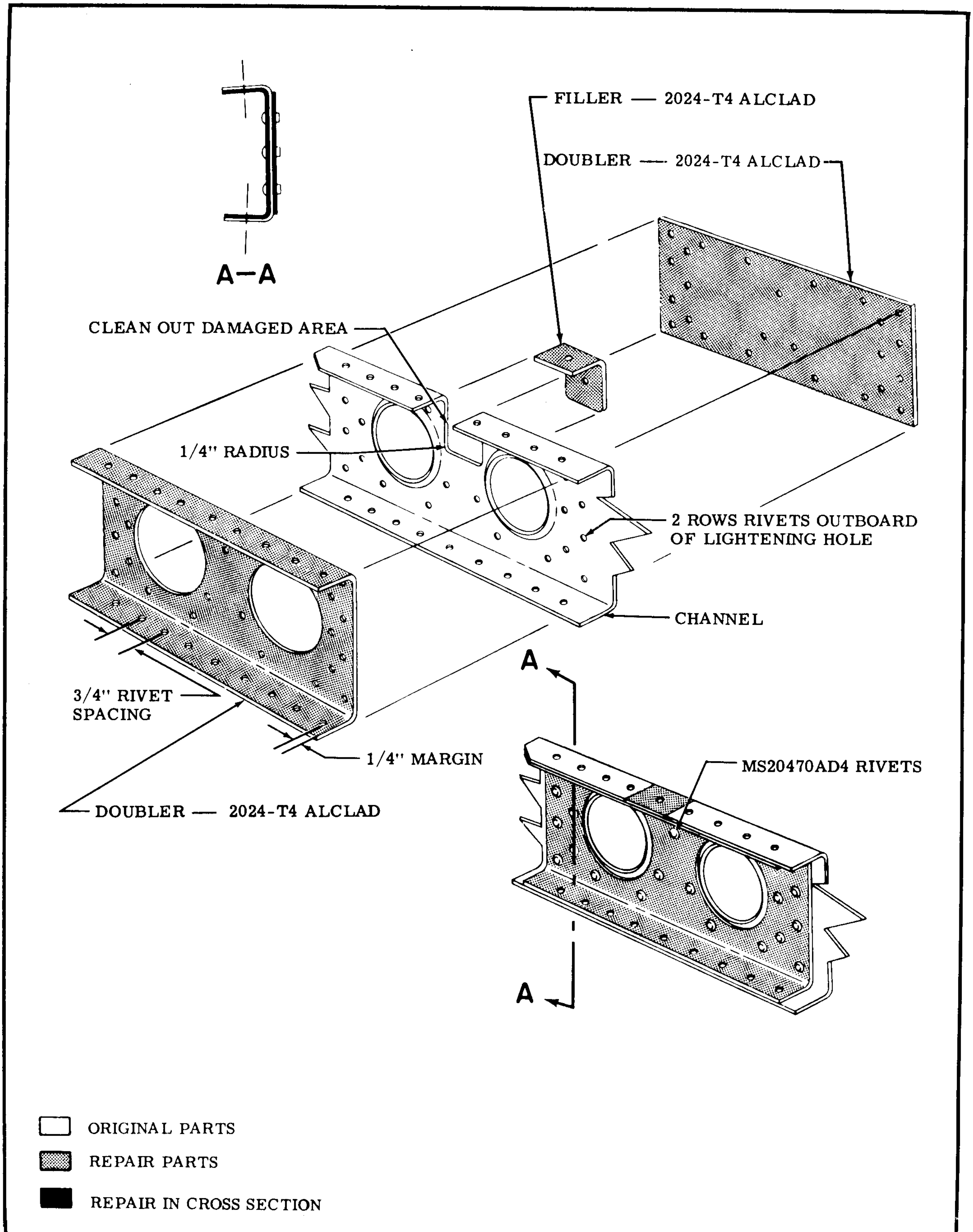


Figure 17-5. Stringer and Channel Repair (Sheet 4 of 4)

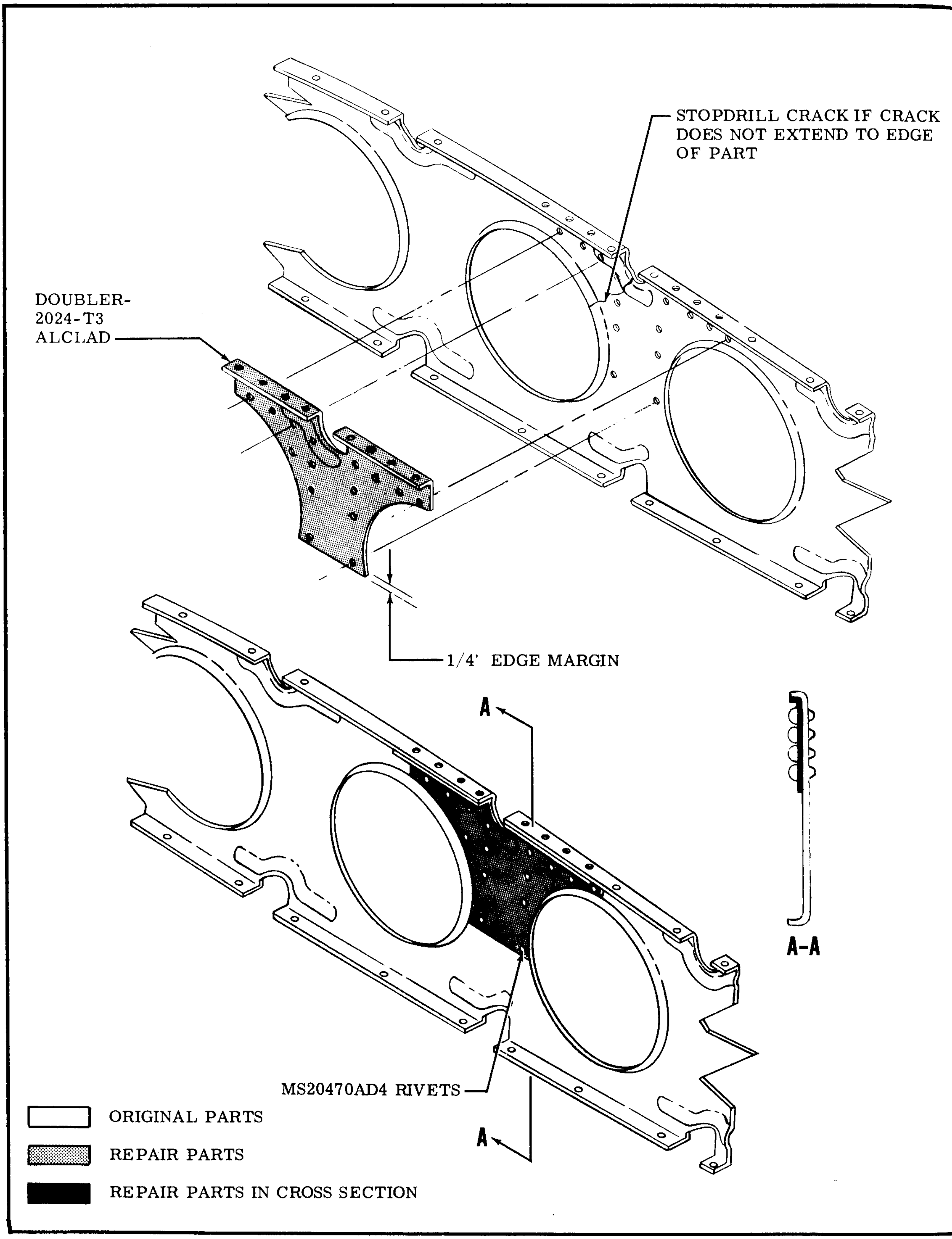


Figure 17-6. Rib Repair (Sheet 1 of 2)

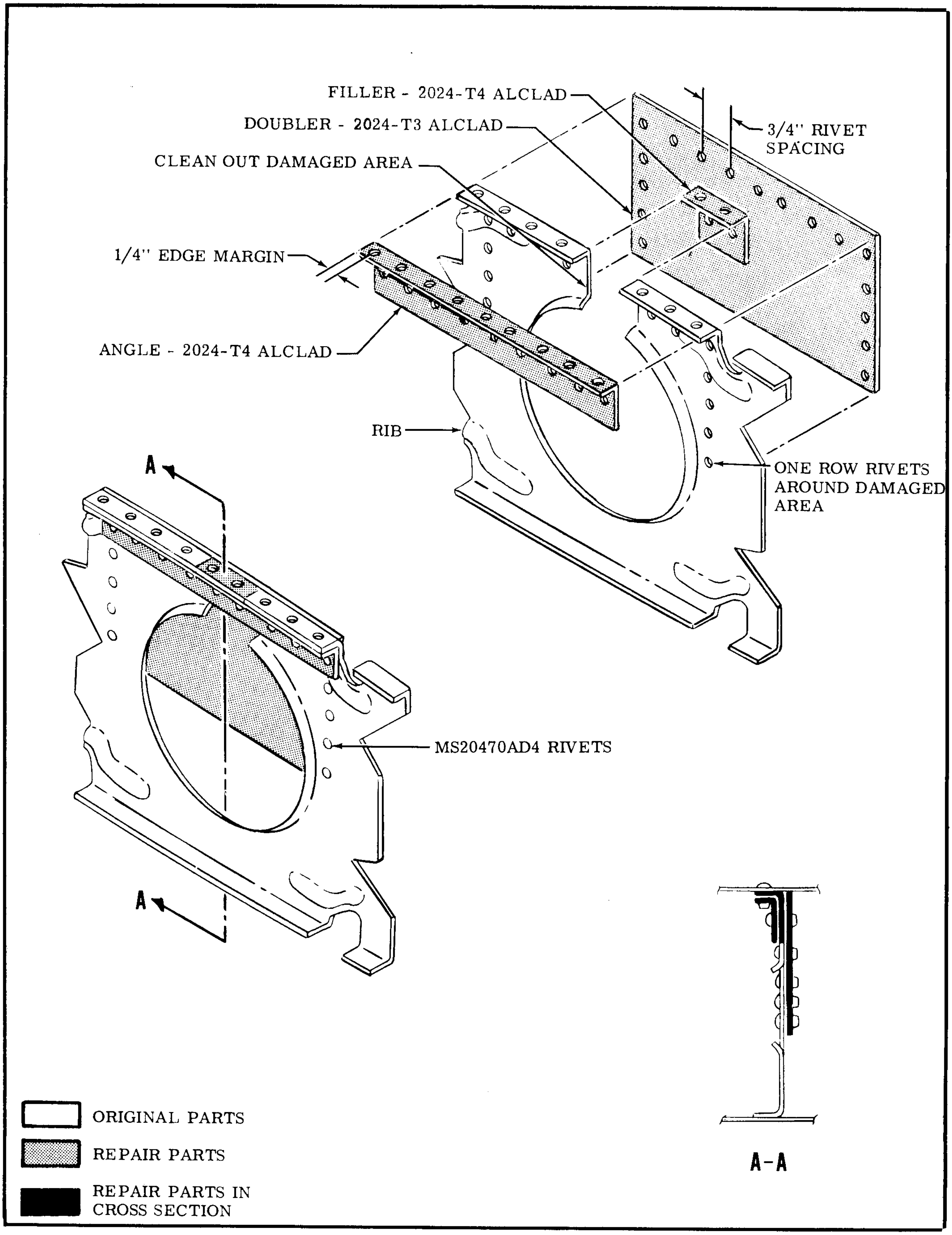


Figure 17-6. Rib Repair (Sheet 2 of 2)

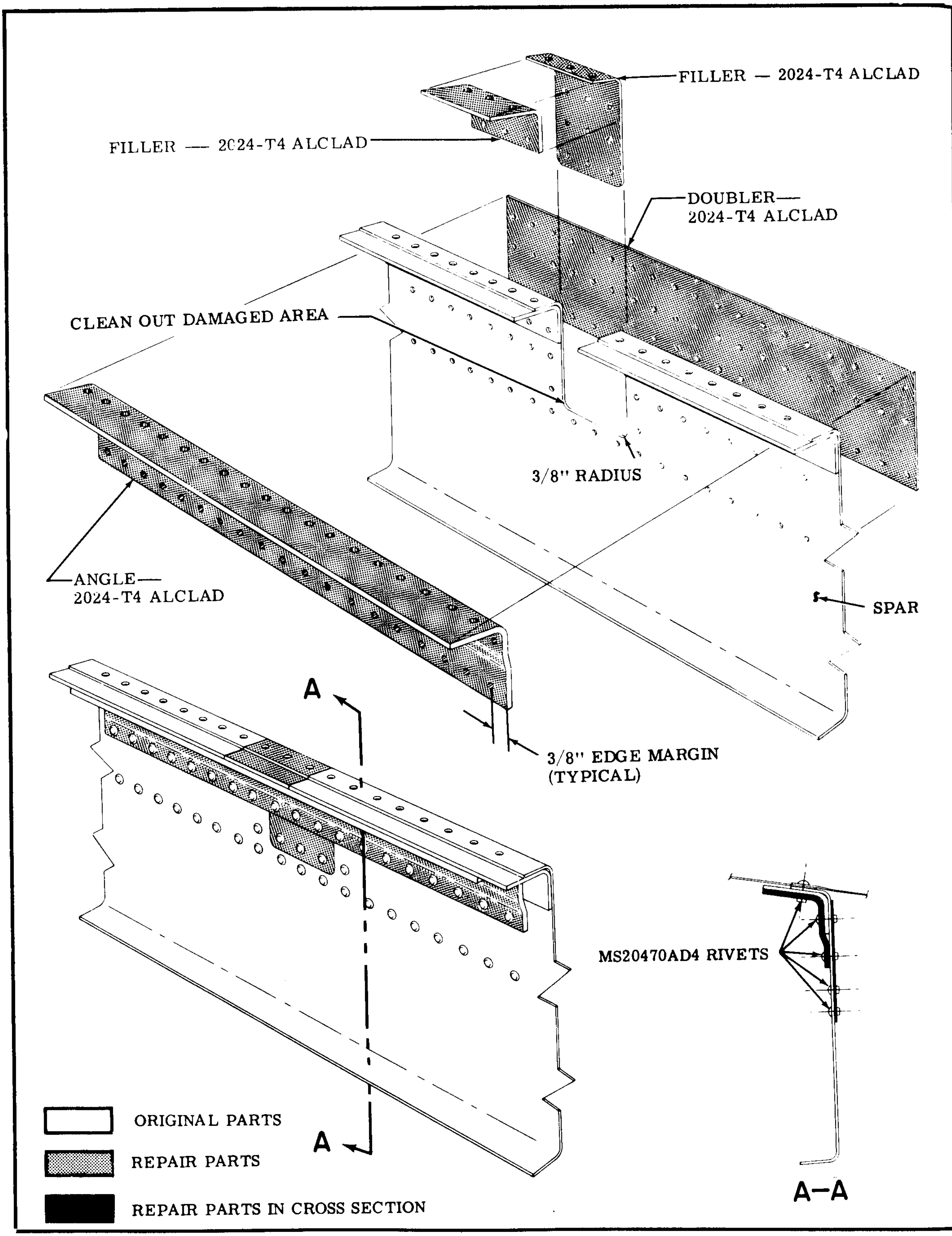


Figure 17-7. Rib Spar Repair (Sheet 1 of 3)

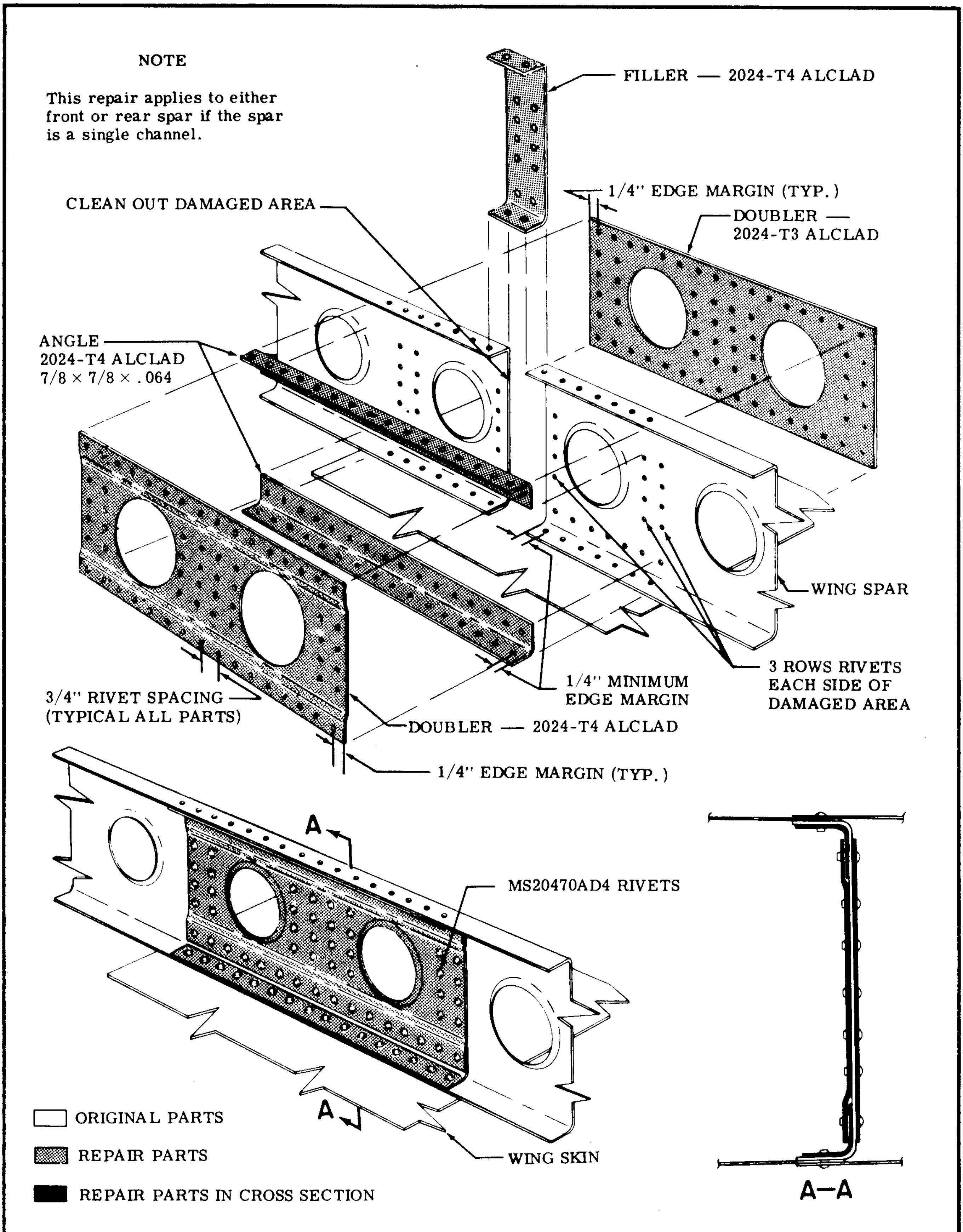


Figure 17-7. Rib Spar Repair (Sheet 2 of 3)

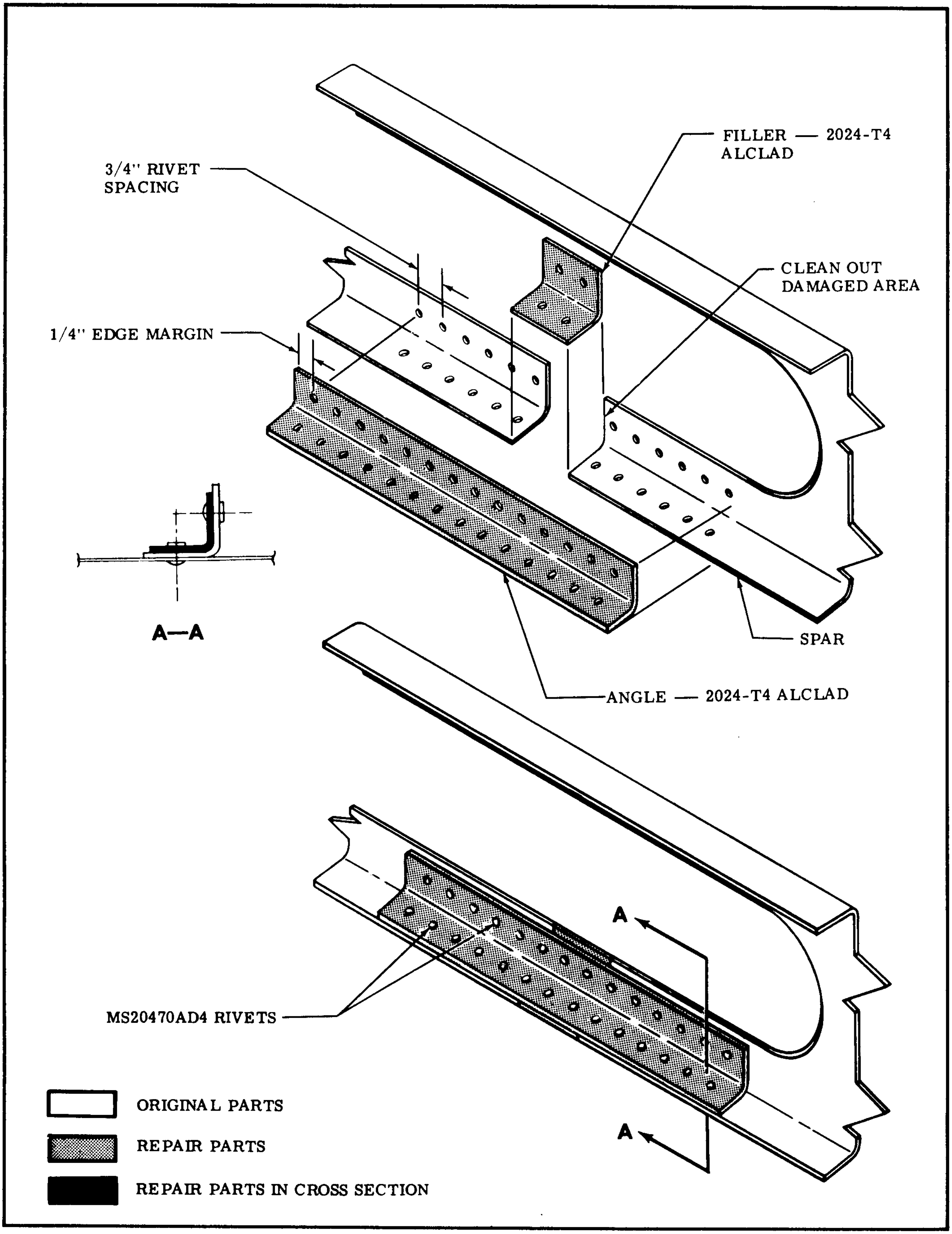


Figure 17-7. Rib Spar Repair (Sheet 3 of 3)

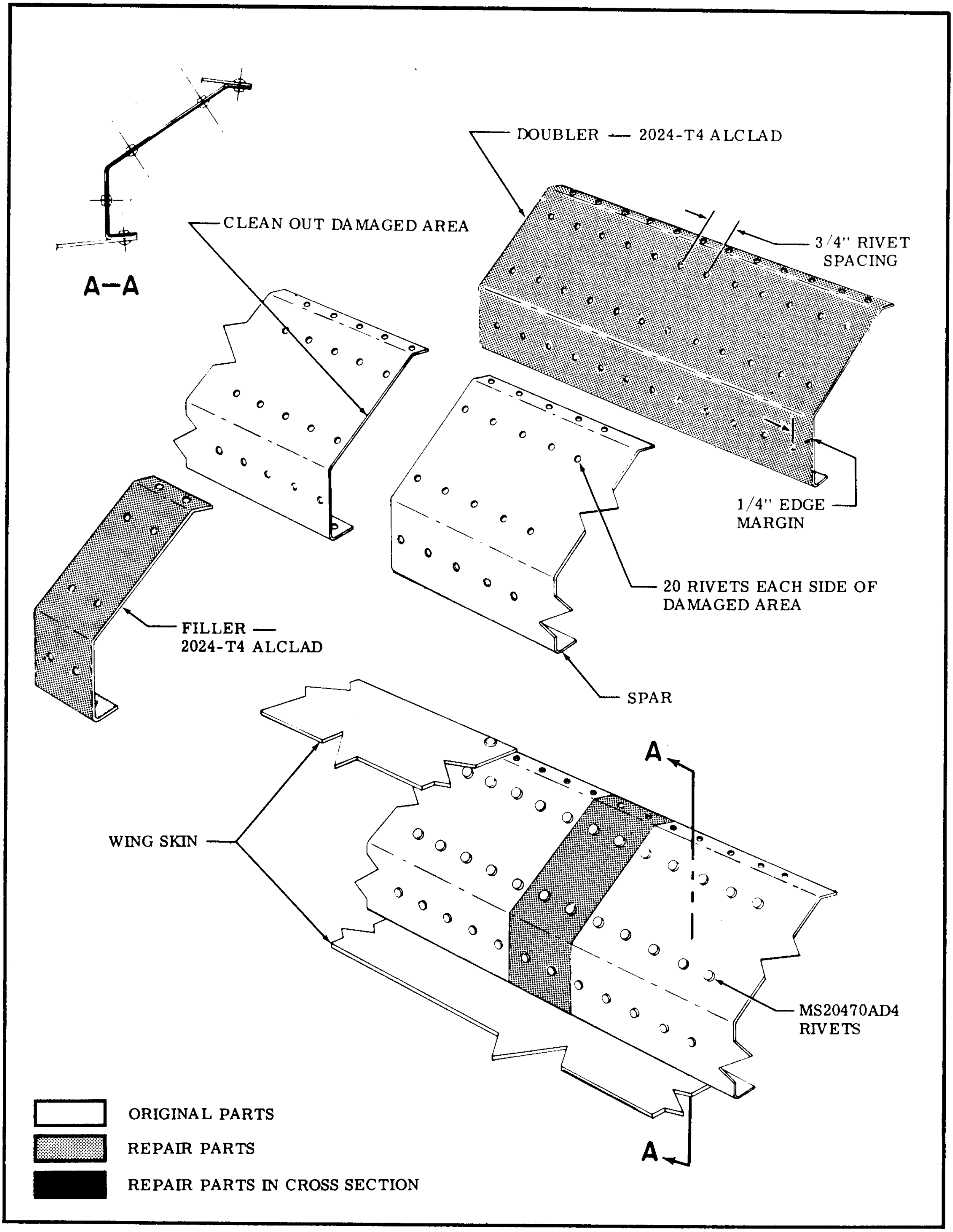


Figure 17-8. Auxiliary Spar Repair

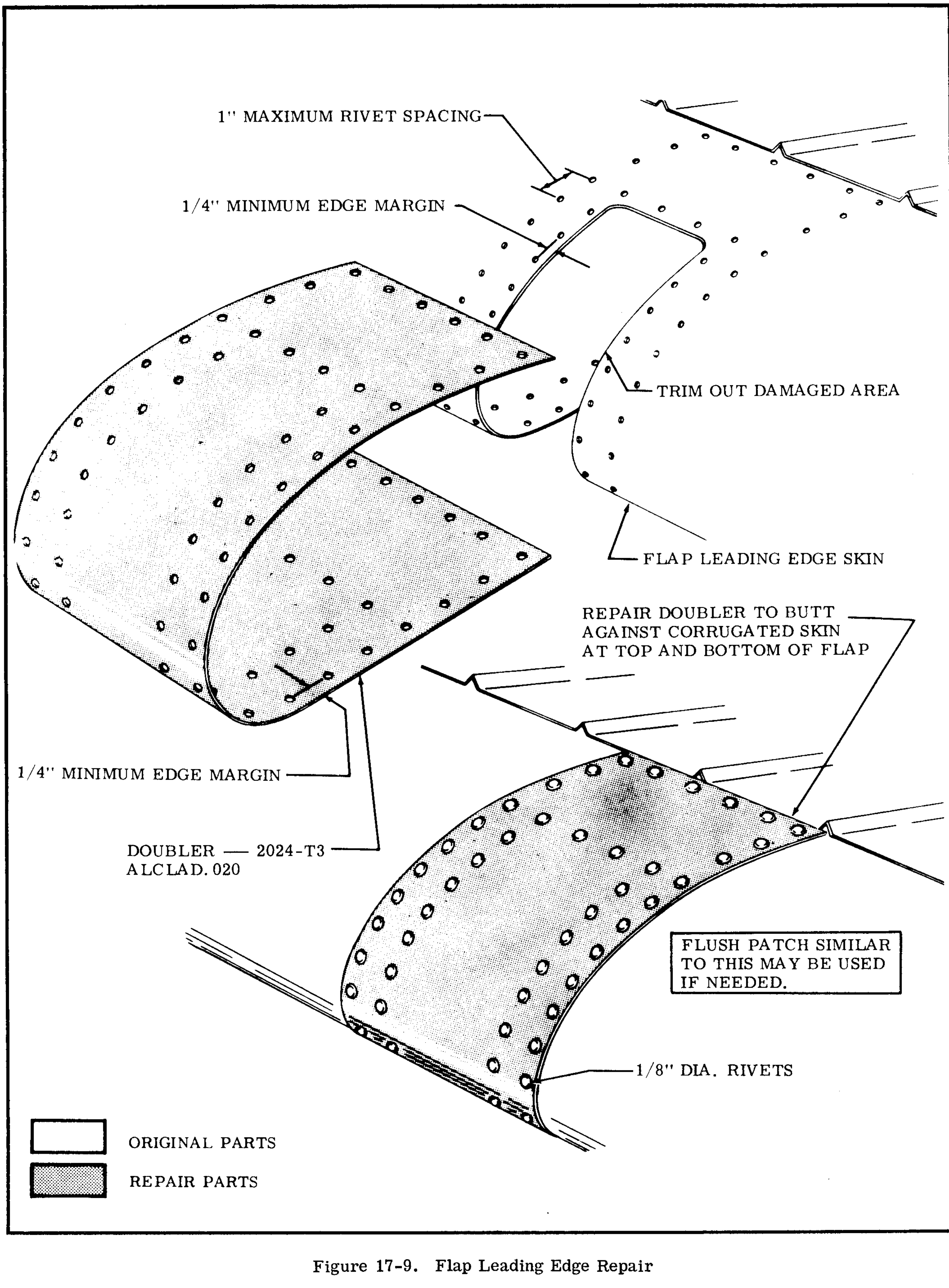
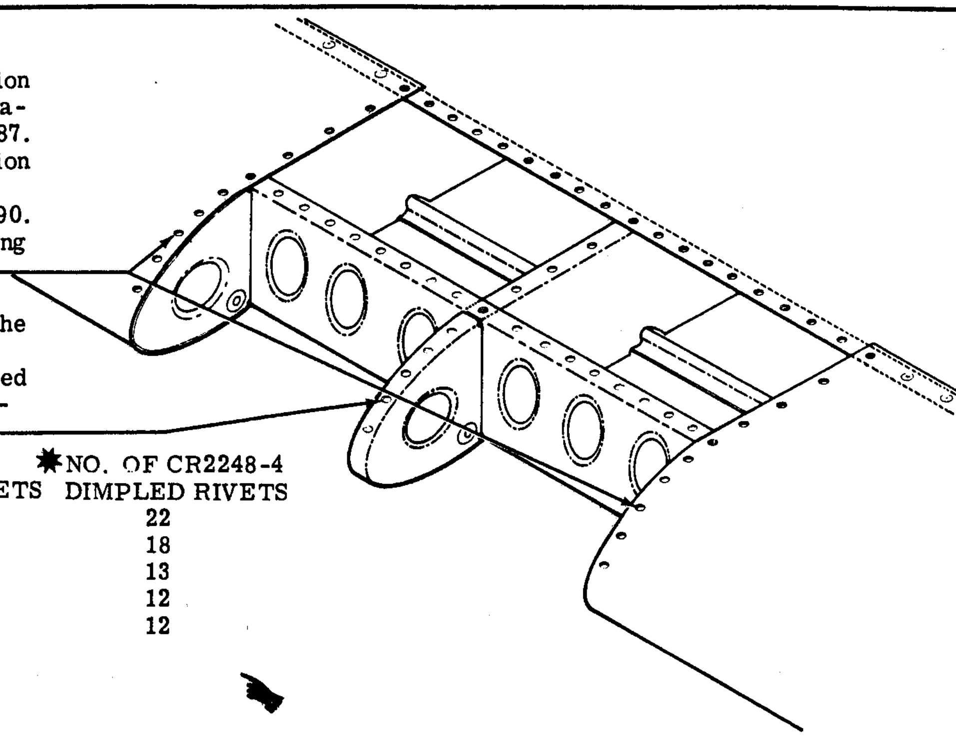


Figure 17-9. Flap Leading Edge Repair

NOTES

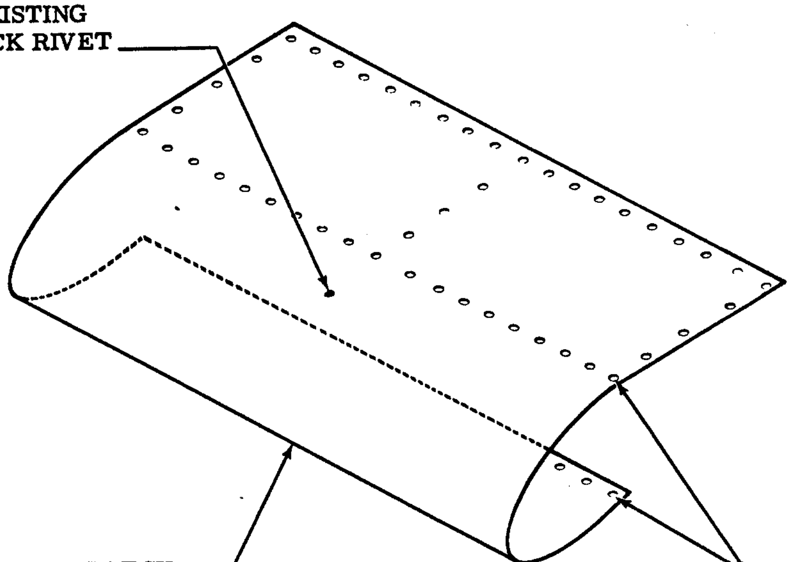
Use rivet pattern at wing station 23.62 for repair from wing station 23.62 to wing station 85.87. Use rivet pattern at wing station 100.00 for lap splice patterns from wing station 100.00 to 190.00. Refer to figure 1-2 for wing stations.

Use rivet spacing similar to the pattern at wing station 100.00 with the number of BB4 dimpled rivets at leading edge ribs between lap splices as shown:



STATION	✱NO. OF BB4 RIVETS	✱NO. OF CR2248-4 DIMPLED RIVETS
118	18	22
136	15	18
154	11	13
172	10	12
190	10	12

✱NO. OF CR2249-4 RIVETS
27
23
17
15
15



TYPICAL LEADING EDGE SECTION

✱ NOTE

The Bulbed Cherrylock rivets listed may be substituted for BB4 dimpled rivets in inaccessible areas, provided the number of rivets installed is increased proportionately. Blind rivets should not be installed in the wing spar.

Figure 17-10. Bonded Leading Edge Repair

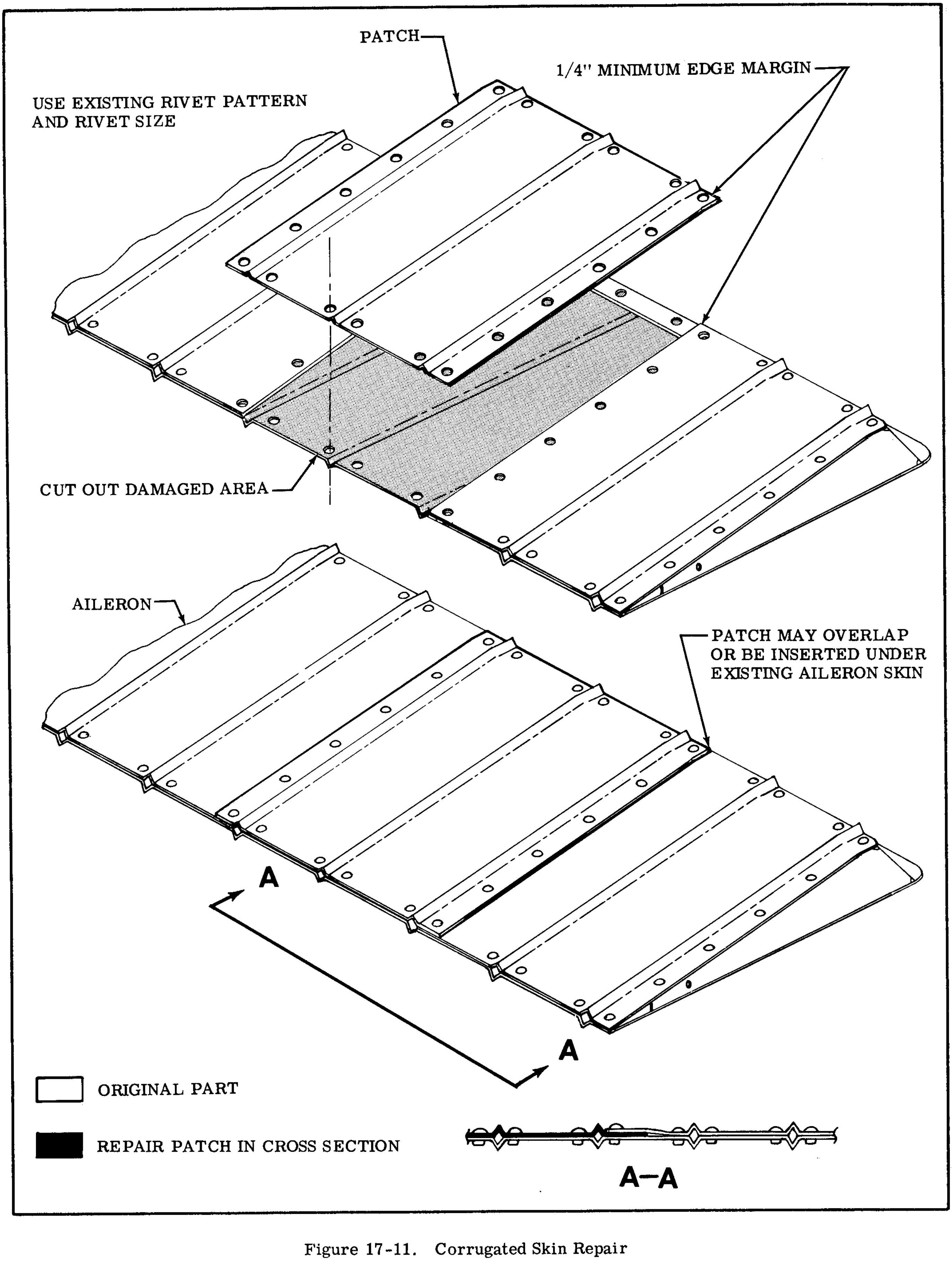
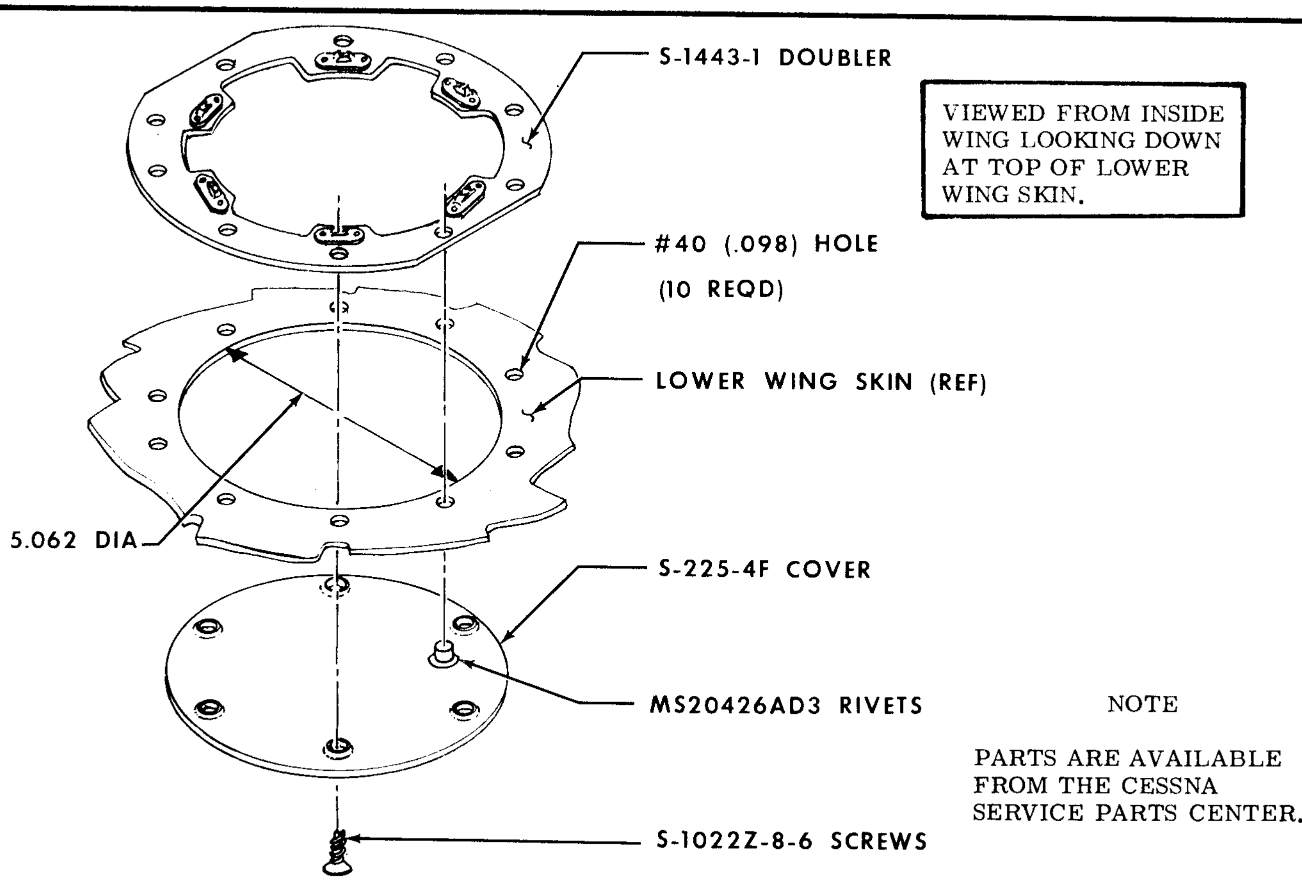


Figure 17-11. Corrugated Skin Repair



PRECAUTIONS

1. Add the minimum number of access holes necessary.
2. Any circular or rectangular access hole which is used with approved optional equipment installations may be added in lieu of the access hole illustrated.
3. Use landing light installations instead of adding access holes where possible. Do not add access holes at outboard end of wing; remove wing tip instead.
4. Do not add an access hole in the same bay where one is already located.
5. Locate new access holes near the center of a bay (spanwise).
6. Locate new access holes forward of the front spars as close to the front spar as practicable.
7. Locate new access holes aft of the front spar between the first and second stringers aft of the spar. When installing the doubler, rotate it so the two straight edges are closest to the stringers.
8. Alternate bays, with new access holes staggered forward and aft of the front spar, are preferable.
9. A maximum of five new access holes in each wing is permissible; if more are required, contact the Cessna Service Department.
10. When a complete leading edge skin is being replaced, the wing should be supported in such a manner so that wing alignment is maintained.

a. Establish exact location for inspection cover and inscribe centerlines.

b. Determine position of doubler on wing skin and center over centerlines. Mark the ten rivet hole locations and drill to size shown.

c. Cutout access hole, using dimension shown.

d. Flex doubler and insert through access hole, and rivet in place.

e. Position cover and secure, using screws as shown.

Figure 17-12. Access Hole Installation

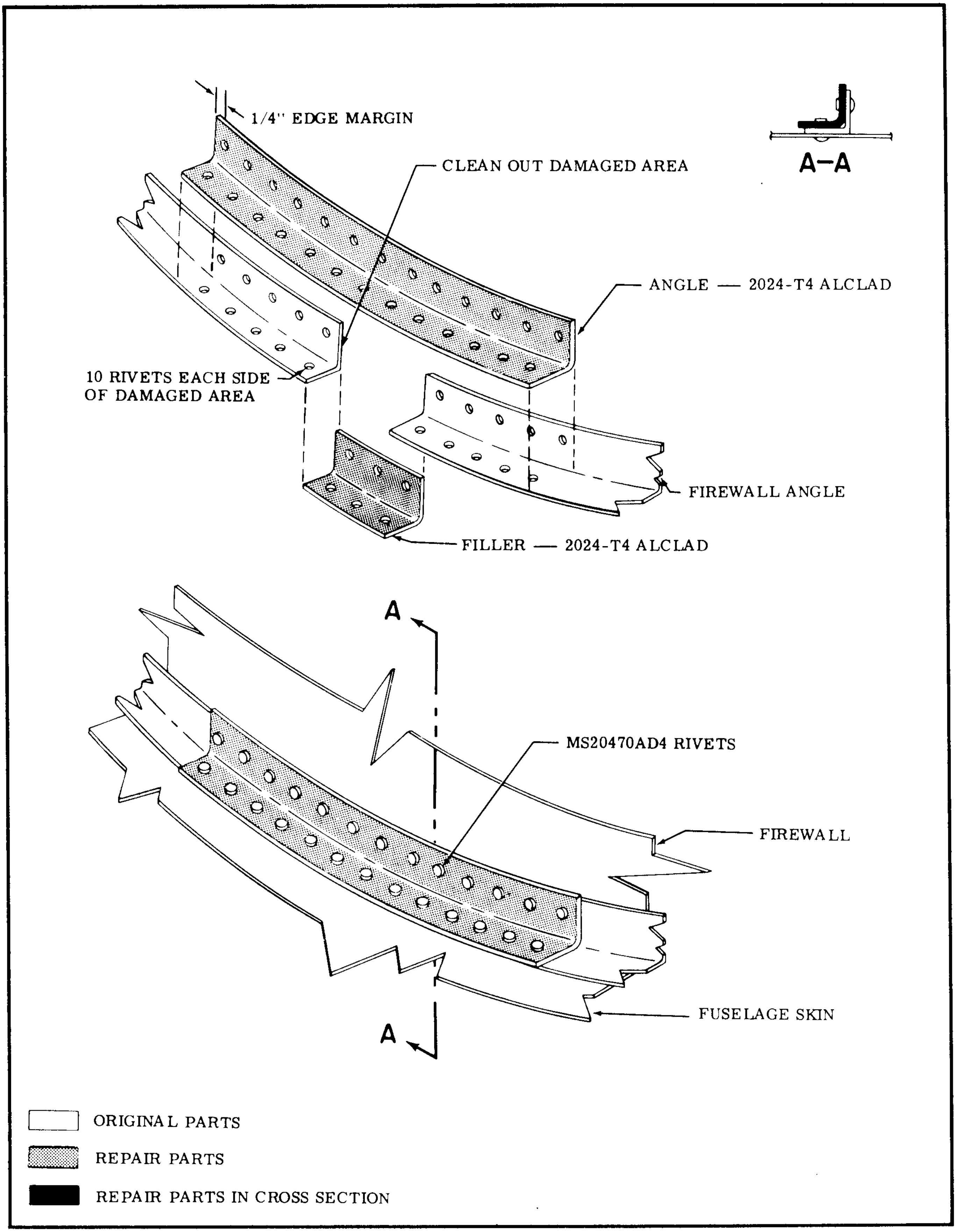


Figure 17-13. Firewall Angle Repair

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SECTION 18

EXTERIOR PAINTING

NOTE

This section contains standard factory materials listing and area of application. For paint number and color, refer to Aircraft Trim Plate and Parts Catalog. In all cases determine the type of paint on the aircraft as some types of paint are not compatible. Materials may be obtained from the Cessna Service Parts Center.

MATERIAL	NO/TYPE	SKYWAGON 180	SKYWAGON 185	AGcarryall	AREA OF APPLICATION
PAINT	ACRYLIC LACQUER	X	X	X	Used on aircraft exterior.
PAINT	POLY URETHANE			X	Used on aircraft exterior.
PAINT	VINYL	X	X	X	Used on cabin door window frame when vinyl pinch welt is installed beginning with 18052341 and 18502218.
PRIMER	WASH PRIMER 818-012			X	Used with poly urethane paint.
PRIMER	EPOXY PRIMER			X	Used with poly urethane paint.
PRIMER	ER-7 WITH ER-4 ACTIVATOR	X	X	X	Used with acrylic lacquer.
PRIMER	P60G2 WITH R7K46 ACTIVATOR	X	X	X	Used with acrylic lacquer.
THINNER	T8402	X	X	X	Used to thin acrylic lacquer and for burndown.
THINNER	86T-10399			X	Used to thin poly urethane paint.
SOLVENT	#2 SOLVENT	X	X	X	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.

CAUTION

When stripping aircraft of paint, use caution to avoid stripper coming in contact with ABS parts.

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SECTION 19

WIRING DIAGRAMS

TABLE OF CONTENTS

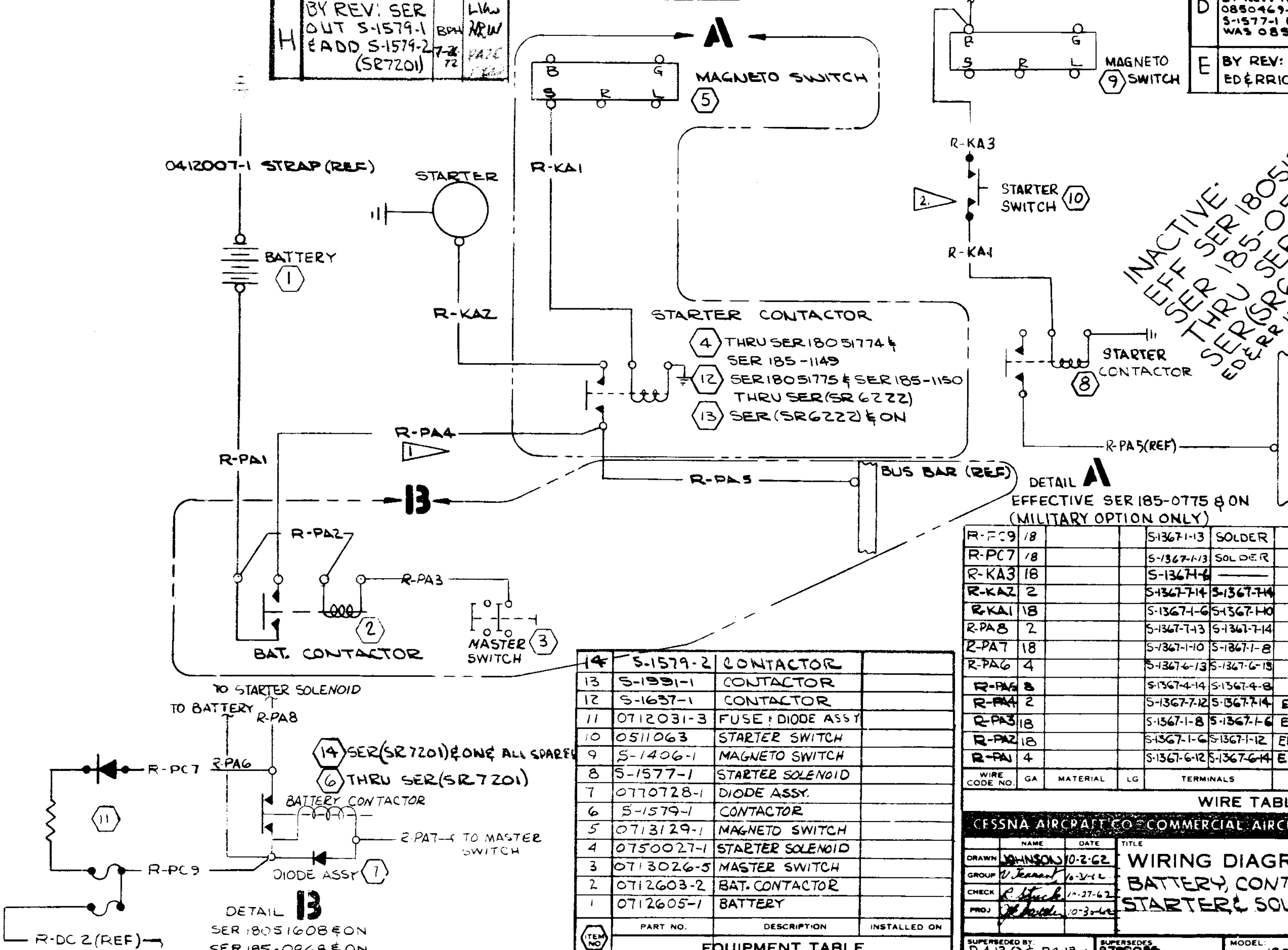
WIRING DIAGRAMS Page

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
F	BY REV: DELETE SER FROM R-PA5 IN WIRE TABLE	DLB 5-6-69	HW REP
G	BY REV: SER OUT 0750027-1; ADD S-1673-1, S-1991-1 & SER'S ED&RR 10475 (SR6222)	MDS 5-23-69	RLS mos HW REP
H	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 7-26-72	LHW HRW

NOTES: (SER 18051241) & ON (SER 185-0559) & ON

1. PLACE 0713003 FAIRLEAD ON R-PA4 OR R-PA8 BATTERY CABLE BEFORE BOTH ENDS ARE TERMINATED
2. REMOVE S-1367-1-10 AND SOLDER TO SWITCH.

CHG LET	REVISION	BY / DATE	CHK / APPD
A	ADD DETAIL A. MILITARY OPTION & R-KA3	WC 6-17-64	RPE DKM
B	ADDED EQUIP. TABLE, DETAIL B, ADDED R-PA6, R-PA7 & R-PA8; ADDED LIMITING SERIALS TO W/T	J.J.B 1-28-65	CCN DKM
C	ADD 0712031-3 FUSE & DIODE ASSY. R-PC9 & R-PC7	D&W 1-5-67	YAK DKM
D	BY REV: R-PC9 WAS R-PC5, 0850469-1 WAS 0850469-3 S-1577-1 EFF SERIAL 185-1251 & WAS 0850469-3	C.G. 6-7-67	YAK REM
E	BY REV: R-DC2 WAS R-PC6 ED&RR10016 (SR5438)(SR5439)	EGY 8-5-68	GEI MEL DGK



ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
14	S-1579-2	CONTACTOR	
13	S-1991-1	CONTACTOR	
12	S-1637-1	CONTACTOR	
11	0712031-3	FUSE & DIODE ASSY	
10	0511063	STARTER SWITCH	
9	S-1406-1	MAGNETO SWITCH	
8	S-1577-1	STARTER SOLENOID	
7	0770728-1	DIODE ASSY.	
6	S-1579-1	CONTACTOR	
5	0713129-1	MAGNETO SWITCH	
4	0750027-1	STARTER SOLENOID	
3	0713026-5	MASTER SWITCH	
2	0712603-2	BAT. CONTACTOR	
1	0712605-1	BATTERY	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-PC9	18			S-1367-1-13	SOLDER		
R-PC7	18			S-1367-1-13	SOLDER		
R-KA3	18			S-1367-1-6	———		
R-KA2	2			S-1367-7-14	S-1367-7-14		
R-KA1	18			S-1367-1-6	S-1367-1-10		
R-PA8	2			S-1367-7-13	S-1367-7-14		SER 18051608 & ON SER 185-0968 & ON
R-PA7	18			S-1367-1-10	S-1367-1-8		SER 18051608 & ON SER 185-0968 & ON
R-PA6	4			S-1367-6-13	S-1367-6-13		SER 18051608 & ON SER 185-0968 & ON
R-PA5	8			S-1367-4-14	S-1367-4-8		
R-PA4	2			S-1367-7-12	S-1367-7-14	EFF THRU	SER 18051607 SER 185-0967
R-PA3	18			S-1367-1-8	S-1367-1-6	EFF THRU	SER 18051607 SER 185-0967
R-PA2	18			S-1367-1-6	S-1367-1-12	EFF THRU	SER 18051607 SER 185-0967
R-PA1	4			S-1367-6-12	S-1367-6-14	EFF THRU	SER 18051607 SER 185-0967

WIRE TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

	NAME	DATE
DRAWN	JOHNSON	10-2-62
GROUP	V. Jeannot	10-3-62
CHECK	C. Stuck	11-27-62
PROJ	J. Fateh	10-30-62

TITLE: WIRING DIAGRAM — BATTERY, CONTACTOR, STARTER & SOLENOID

Cessna.

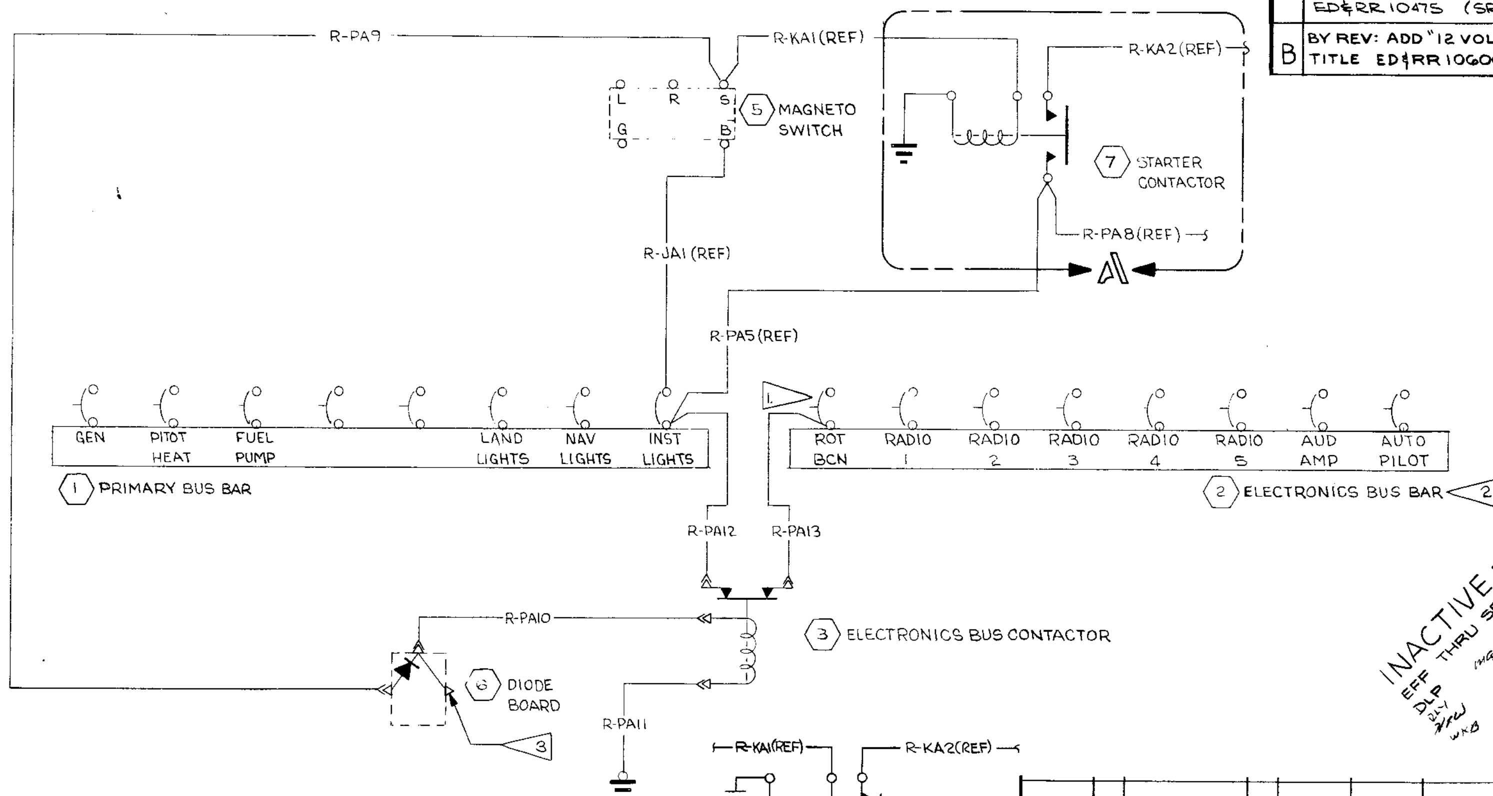
DWG NO: 0700092

SUPERSEDED BY: P 4.13.0 & P4.13.1 | SUPERSEDES: 0700085 0700093 | MODEL: 180-185 | REV: H | PAGE: 4.1

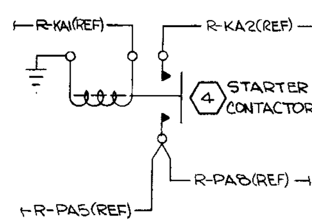
FORM NO. 80-161

SER 18051775 & ON
SER 185-1150 & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: S-1673-1 WAS 0750027-1; ADD DETAIL A, S-1991-1 & SR. ED & RR 10475 (SR6222)	MDS 5-23-69	RLY MDS GRG 7/1W PE
B	BY REV: ADD "12 VOLT" TO TITLE ED & RR 10606	MARIO 7/31/69	RLY MDS GRG HFW PEJ



INACTIVE: EFF THRU SER 18052284 & 18502090 (REF) 6-3-73 DLP MGR RLY HFW WKB



DETAIL
THRU SER 18052073 &
185-1534

NOTES:

1. WHEN ROTATING BEACON IS THE ONLY EQUIPMENT CONNECTING AT THE ELECTRONICS BUS BAR, WIRE R-PA13 WILL CONNECT DIRECTLY TO THE ROTATING BEACON CIRCUIT BREAKER AND THE ELECTRONICS BUS BAR WILL BE DELETED.
2. UNUSED PORTION OF ELECTRONICS BUS BAR WILL BE TRIMMED .38 INBOARD OF LAST CIRCUIT BREAKER INSTALLED.
3. THIS TERMINAL CONNECTS TO OPTIONAL GROUND SERVICE RECEPTACLE.

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
7	S-1991-1	CONTACTOR	
6	1570043-1	DIODE BOARD ASSY	
5	0713129-1	MAGNETO SWITCH	
4	S-1673-1	CONTACTOR	
3	S-1668-1	RELAY	
2	0770104-1	BUS BAR	
1	0770104-2	BUS BAR	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-PA13	14			S-1367-2-6	S-1493-2		OPTIONAL (180)
R-PA12	14			S-1367-2-6	S-1493-2		
R-PA11	18			S-1367-1-8	S-1493-1		
R-PA10	18			S-1493-1	S-1493-1		
R-PA9	18			S-1367-1-10	S-1493-1		

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	11-18-65
GROUP	H Wise	11-19-65
CHECK	R. Stuck	11-20-65
PROJ	H. Sattler	11-24-65

TITLE: WIRING DIAGRAM—SPLIT BUS BAR, 12 VOLT

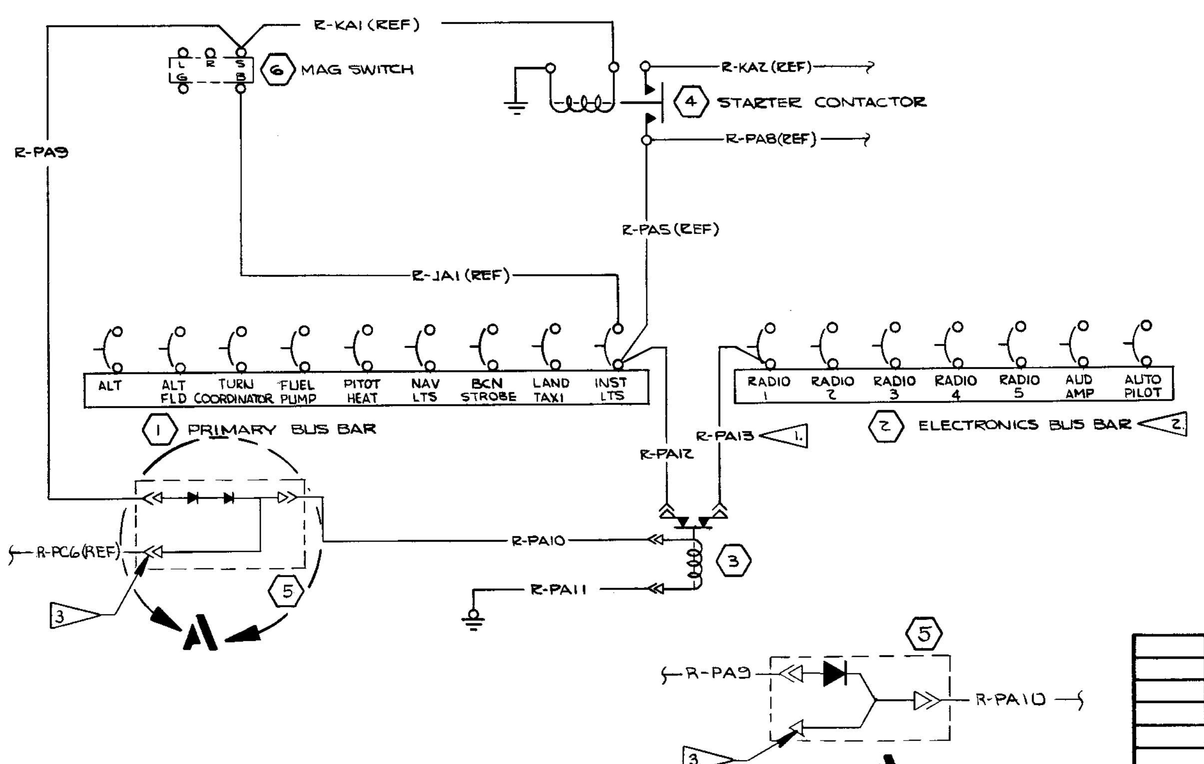
Cessna

DWG NO: 0700092

SUPERSEDED BY: 4.8.3 | SUPERSEDES: | MODEL: 180-185 | REV: B | PAGE: 4.8.0

FORM NO 80-161A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD TURN COORDINATOR TO 0770104-4 (SR7692)	DLO 11-9-73	JCY MGR WKB
B	BY REV: S-1917-1 WAS S-1668-1; (SR8095)	CJH 10-25-74	JCY AC JRB
C	BY REV: ADD PC6 (REF) & DETAIL "A" (SR8259)	RS 6-11-75	JCY



DETAIL A
THUR SER (SR8259)
ON LATER 1976 MODELS

NOTES:

1. WHEN NO RADIO EQUIPMENT IS INSTALLED, TAPE TERMINAL OF R-PA13 WIRE & TIE INTO WIRE BUNDLE & DELETE ELECTRONICS BUS BAR
2. TRIM UNUSED PORTION OF ELECTRONICS BUS BAR .38 INBD OF LAST CKT BKR INSTALLED
3. THIS TERMINAL CONNECTS TO OPTIONAL GROUND SERVICE RECEPTACLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-PA13	14			S-1367-2-6	S-1493-2		
R-PA12	14			S-1367-2-6	S-1493-2		
R-PA11	18			S-1367-1-8	S-1493-1		
R-PA10	18			S-1493-1	S-1493-1		
R-PA9	18			S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	C292501-0105	MAG SWITCH	
5	1570043	DIODE BOARD ASSY	
4	S-1991-1	CONTACTOR	
3	S-1917-1	RELAY	
2	0770104-3	BUS BAR	
1	0770104-4	BUS BAR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 4.8.0

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wiel	6-6-73
DRAWN	PAPE	6-3-73
CHECK	ZYOUNGERS	6-5-73
STRESS		
PROJ	Bergman	6-8-73
APPD	MGR	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — SPLIT BUS BAR, 12 VOLT

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

SCALE: NONE (SR7058) (SR7059) (REF) PAGE: 4.8.3

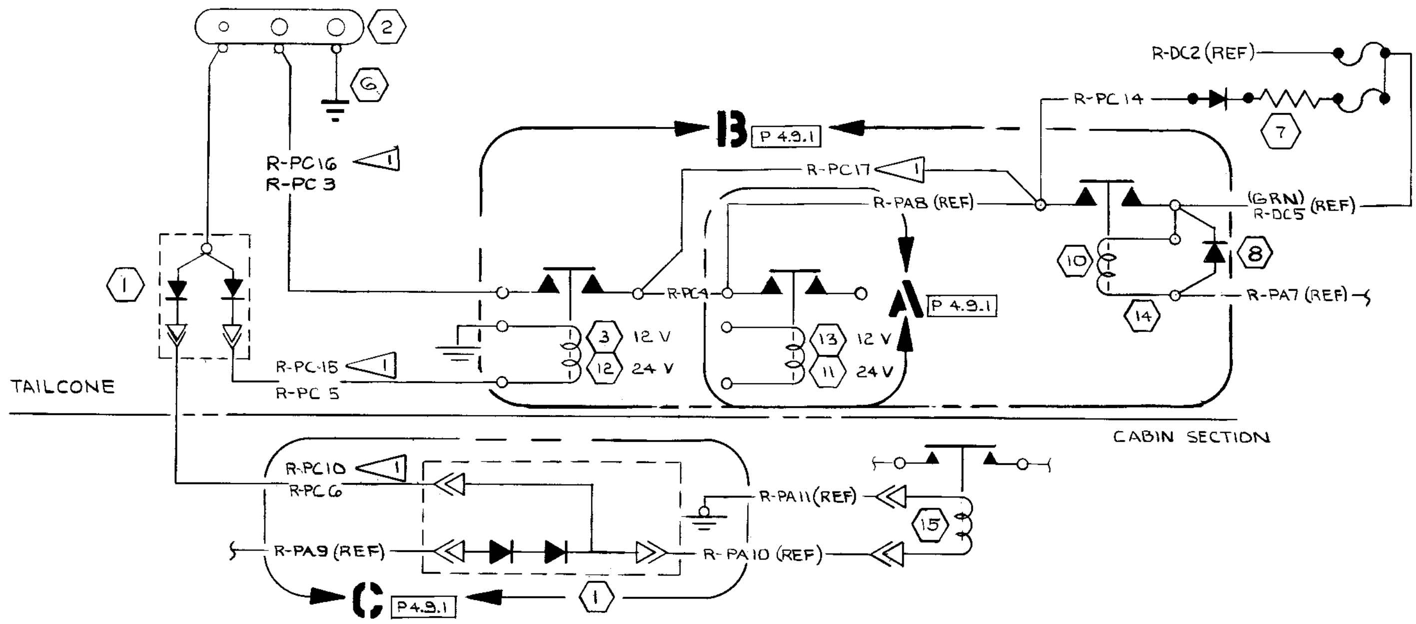
FORM NO. 80-215B

NOTE:
(SER 185-1150) & ON
(SER 18051775) & ON

1 THESE WIRES FOR USE WITH FLOAT PLANE PROVISIONS ONLY.

CHG LET	REVISION	BY DATE	CHK APPD
A	R-PA8 (REF) WAS R-PA6 (REF); S-1673-1 WAS S-1579-1	WC 3-11-66	
B	BY REV: ADD S-1579-1, 0770728-1, 0712031-3, R-PA6, R-PC9, R-DC2 (REF) & R-PA7 (REF)	JWH 5/2/67	YAK
C	BY REV: R-DC5 (REF) WAS R-PC9; R-PC7 (REF) WAS R-PA6; OBSOLETE R-PC9 & R-PA6 ED & RR 10016 (SR5438)(SR5439) IX	EGY 8-5-68	GKL MDS RJW DGK
D	BY REV: ADD DETAIL A, S-1991-1 & SR. ED & RR 10475 (SR6222)	MDS 5-23-69	RLY MDS GRG
E	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 6-16-72	WW
F	BY REV: ADD NOTE 1, R-PC10, R-PC11, R-PC12, R-PC13; R-PC7 WAS R-PC7 (REF); R-PC5 WAS GRN (R-DC5) (SR 7668) II (SR 7667) II	JEF BRF 5-22-74	
G	BY REV: ADD DETAIL "B", PC14 PC15, PC16, PC17; SER OUT PC11, PC7, PC12, PC13 (SR8160)	BLA 1-15-75	JCY
H	BY REV: ADD S-1917-1, PA11 (REF) & DETAIL "C" (SR8259)	RS 6-11-75	JCY

DETAIL "C" ON LATER 1976 MODELS



68-127-0191

R-PC17	2			S-1493-1	S-1493-1	1	SER (SR8160) & ON
R-PC16	2			S-1367-7-14	S-1367-7-13	1	SER (SR8160) & ON
R-PC15	18			S-1493-1	S-1367-1-10	1	SER (SR8160) & ON
R-PC14	18			S-1367-1-13	SOLDER		SER (SR8160) & ON
R-PC13	2			S-1367-7-14	S-1367-7-13	1	THRU SER (SR8160)
R-PC12	18			S-1493-1	S-1367-1-10		THRU SER (SR8160)
R-PC11				S-1367-7-14	S-1367-7-14		THRU SER (SR8160)
R-PC10	18			S-1493-1	S-1493-1	1	
YEL (12-PC7)	18		18	S-1367-1-13	SOLDER		THRU SER (SR8160)
R-PC9	18			S-1493-1	SOLDER		OBSOLETE-NEVER USED
R-PA6	4			S-1367-6-13	SOLDER		OBSOLETE-NEVER USED
R-PC6	18			S-1493-1	S-1493-1		STANDARD
R-PC5	18			S-1493-1	S-1367-1-10	0700170	
R-PC4	2			S-1367-7-13	S-1367-7-14	0700170	
R-PC3	2			S-1367-7-14	S-1367-7-13	0700170	
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		N/A	SERIALS

WIRE TABLE

15	S-1917-1	RELAY	
14	S-1579-2	CONTACTOR	
13	S-1991-1	CONTACTOR	12V ACFT ONLY
12	S-1577-1	CONTACTOR	24V ACFT ONLY
11	S-1577-1	CONTACTOR	24V ACFT ONLY
10	S-1580-1	CONTACTOR	24V ACFT ONLY
9	S-1579-1	CONTACTOR	12V ACFT ONLY
8	0770728-1	DIODE ASSY	
7	0712031-3	FUSE & DIODE ASSY	
6	0312155-10	GROUND STRAP	
5	S-1673-1	CONTACTOR	12V ACFT ONLY
4	1570043	DIODE BOARD	
3	S-1660-1	CONTACTOR	12V ACFT ONLY
2	AN2552-3A	RECEPTACLE	
1	1570043	DIODE BOARD	
ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON

EQUIPMENT TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W. COOK	12-1-65
GROUP	H. Wind	1-4-66
CHECK	R. Stuck	1-4-66
PROJ	J. Sattler	1-6-66

TITLE: WIRING DIAGRAM — EXTERNAL POWER RECEPTACLE (OPT)

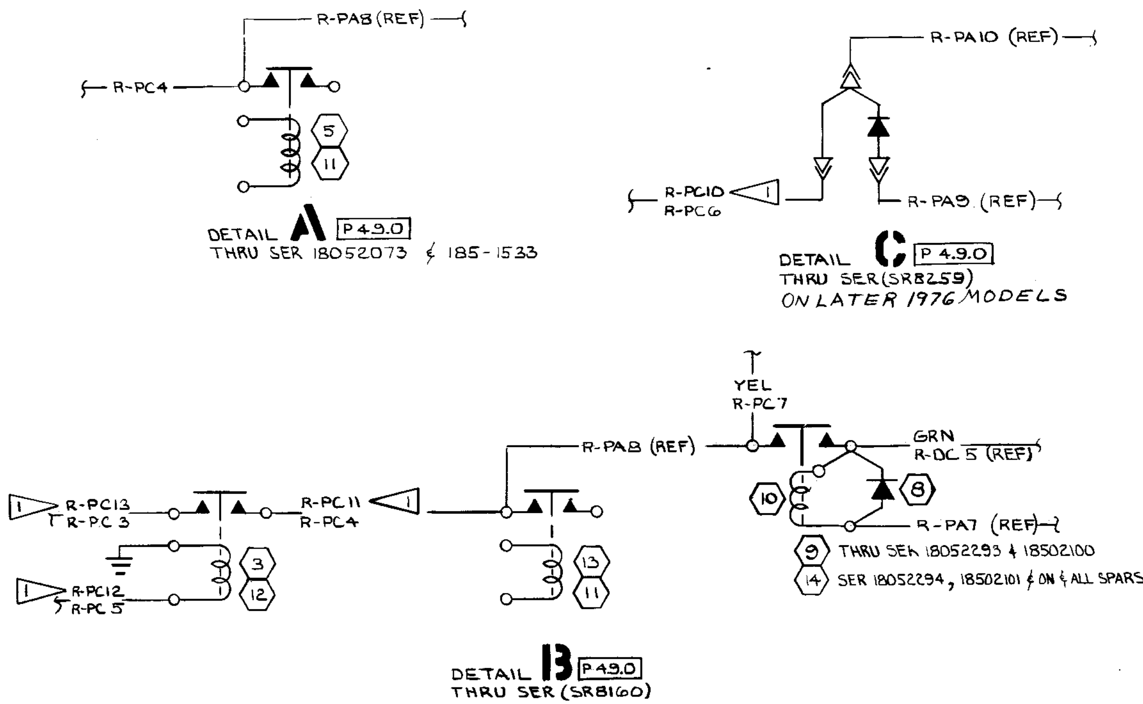
Cessna

DWG NO: 0700092

SUPERSEDED BY:
SUPERSEDES: 0700092, PP.4.3
MODEL: 180-185
REV: E
PAGE: 4.9.0

FORM NO. 80-161A

REVISION			
LET	DESCRIPTION	DATE	APPD
H	SEE P4.9.0 FOR REVISION		



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		
DRAWN	R SWANSON	6-11-75
CHECK	J. YOUEL	6-18-75
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

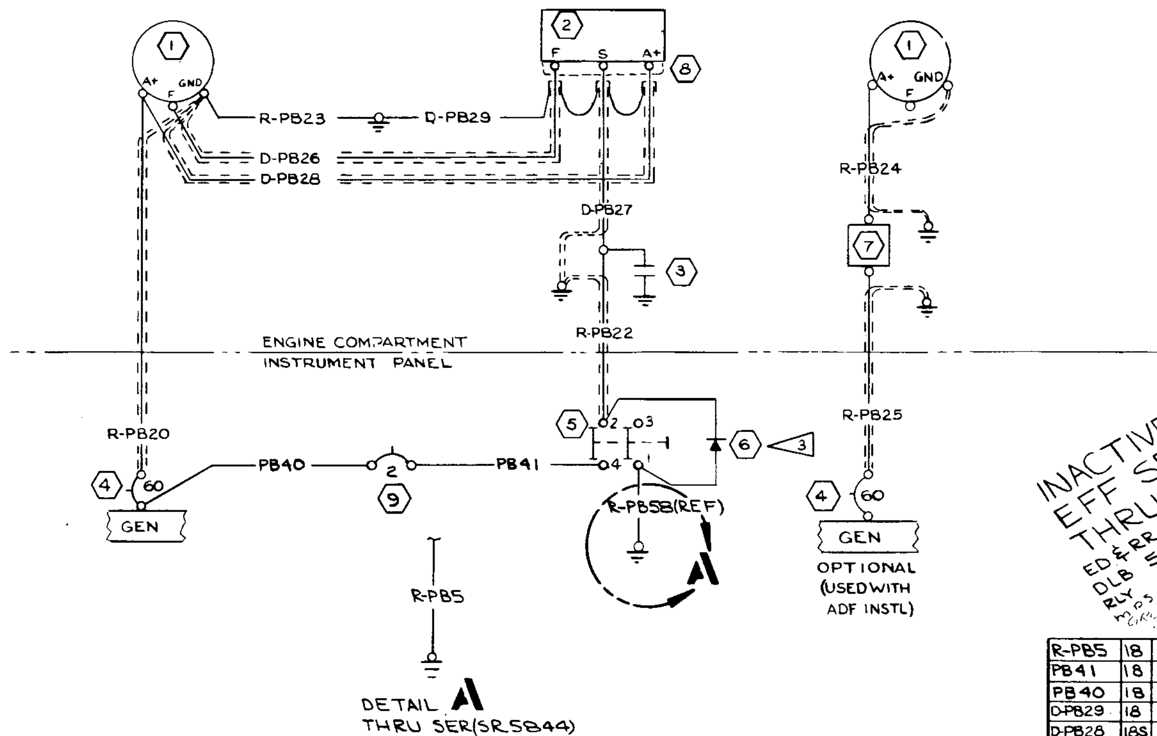
TITLE
WIRING DIAGRAM — EXTERNAL POWER RECEPTACLE (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

SCALE: NONE | 180 - 185 | PAGE: 4.9.1

FORM NO. 80-215B

CHG LET	REVISION	BY DATE	CHK APPD
A	BY REV: DELETED S-1367-4-12 FROM R-PB20 & ADD S-1993-1 (SR6095)	BPC 12/5/68	JWH
B	BY REV: ADD DETAIL A; INACTIVATE DWG; R-PB5 WAS PB5(REF); ADD R-PB5 ED&RR 10490 (SR6008)(SR6009)	DLB 5-5-69	RLY



INACTIVE: EFF SER 1805176 & SER 185-1301 THRU SER 18052103 & 185-1599
ED & RR 10490
DLB 5-6-69

NOTES:

1. AMP TERMINAL 42281-2 ON CONDUCTOR. AMP TERMINAL 2-323931-2 ON SHIELD & GROUNDING WIRE.
2. 8 GAUGE SHIELDED WIRE MATERIAL PER S-1534-8-9.
3. OBSERVE POLARITY SYMBOL ON DIODE WHEN INSTALLING ON SWITCH TERMINALS OR DIODE WILL FAIL WHEN SYSTEM IS ENERGIZED.
4. "D" PREFIX IS USED ON THESE WIRES INSTEAD OF "R" BECAUSE WIRES ARE THE SAME AS THOSE USED IN MODEL 182. THIS DWG. IS SCHEMATICALLY IDENTICAL TO 0770610 PAGE 4.7

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
9	CA2	CKT BKR (B0602)	
8	C6AB-10A750-A	HOUSING (ECWS)	
7	S-1629-1	NOISE FILTER	
6	0770719-1	DIODE ASSY	
5	0713026-5	SWITCH-MASTER	
4	S-1596-60	CIRCUIT BREAKER	
3	0770038-2	FILTER	
2	C611001-0101	REGULATOR	
1	C611501-0101	ALTERNATOR ASSY	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
R-PB5	18			S-1367-1-8	S-1367-1-14	
PB41	18			S-1367-1-8	S-1367-1-8	
PB40	18			S-1367-1-10	S-1367-1-8	
D-PB29	18	4		S-1367-1-12	1	
D-PB28	18S			S-1367-1-12 S-1367-2-10		
D-PB27	18S			S-1367-1-8 S-1367-2-8		
D-PB26	18S	4		S-1367-1-10 S-1367-2-10	1	
R-PB25	8S	2		S-1367-4-10 S-1367-3-8	S-1367-4-10	
R-PB24	8S	2		S-1367-4-12 S-1367-3-10	S-1367-4-10 S-1367-3-8	
R-PB23	10			S-1367-3-10	S-1367-3-10	
R-PB22	18S			S-1367-1-8	S-1367-1-6 S-1367-3-8	
R-PB20	8S	2		S-1993-1 S-1367-3-10	S-1367-4-10	

WIRE TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

	NAME	DATE
DRAWN	C. GARCIA	7-31-67
GROUP	H. Wise	7-27-67
CHECK	R. LAURIE	8-7-67
PROJ		8-8-67

TITLE: WIRING DIAGRAM—ALTERNATOR SYSTEM, 60 AMP, 12 VOLT

Cessna.

DWG NO: 0700092

SUPERSEDED BY: P 4.14 | SUPERSEDES: 0700092 PG 4.10 | MODEL: 180-185 | REV: B | PAGE: 4.12

FORM NO 88-161A

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NOTES:

1. PLACE 0713003 FAIRLEAD ON R-PA8 BEFORE BOTH ENDS ARE TERMINATED
2. REMOVE S-1367-1-10 AND SOLDER TO SWITCH

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1991-1 WAS 0750027-1 ED & RR 10475 (SR 6222)	MDS 5-23-69	RLY MDS HLW
B	BY REV: SER OUT S-1579-2 & ADD S-1579-2 (SR7201)	BPH 6-16-72	LW HLW
C	BY REV: PA7 WAS PA9, DA2 (REF) WAS PA5; OBSOLETE PA5, REMOVE PC7 & PC9 NOW SHOP PRACTICE	DLP 6-3-73	HLW MSR WKB
D	BY REV: ADD WIRE COLORS YEL(R-PC7)(REF), GRN(R-DC5)(REF) (SR7667) IX (SR7668) IX	JEF BRF 5-22-74	DLO JRS
E	BY REV: SER IN PA9; SER OUT PA7; (SR8160)	BLA 1-15-75	JCY WHH JRS

14	S-1579-2	CONTACTOR	
13	MHJ 4002	STARTER	
12	0412007-1	STRAP	
11	0770719-2	DIODE ASSY	
10	S-1994-1-1	SWITCH	
9	S-1579-1	CONTACTOR	
8	S-1577-1	STARTER SOLENOID	
7	S-1406-1	MAGNETO SWITCH	
6	0770728-1	DIODE ASSY	
5	S-1991-1	STARTER SOLENOID	
4	C292501-0105	MAGNETO SWITCH	
3	0712605-1	BATTERY	
2			
1	0511063	SWITCH	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-PA9	18			S-1367-1-6	S-1493-1		SER 18052614, 18502811 & ON
R-KA3	18			S-1367-1-6	SOLDER		
R-KA2	2			S-1367-7-14	S-1367-7-14		
R-KA1	18			S-1367-1-6	S-1367-1-10		
R-PA7	18			S-1367-1-6	S-1493-1		THRU SER 18052613 & 18502810
R-PA8	2			S-1367-7-13	S-1367-7-14		
R-PA6	4			S-1367-6-13	S-1367-6-13		
R-PA5	8			S-1367-4-14	S-1367-4-8		OBSOLETE NEVER USED

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 4.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	5-12-69
DRAWN	D.L. BURKE	5-6-69
CHECK	R. YOUNGERS	5-7-69
STRESS	G. Guthrie	5-1-69
PROJ		5-12-69
APPD	M. Sweeney	5-8-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

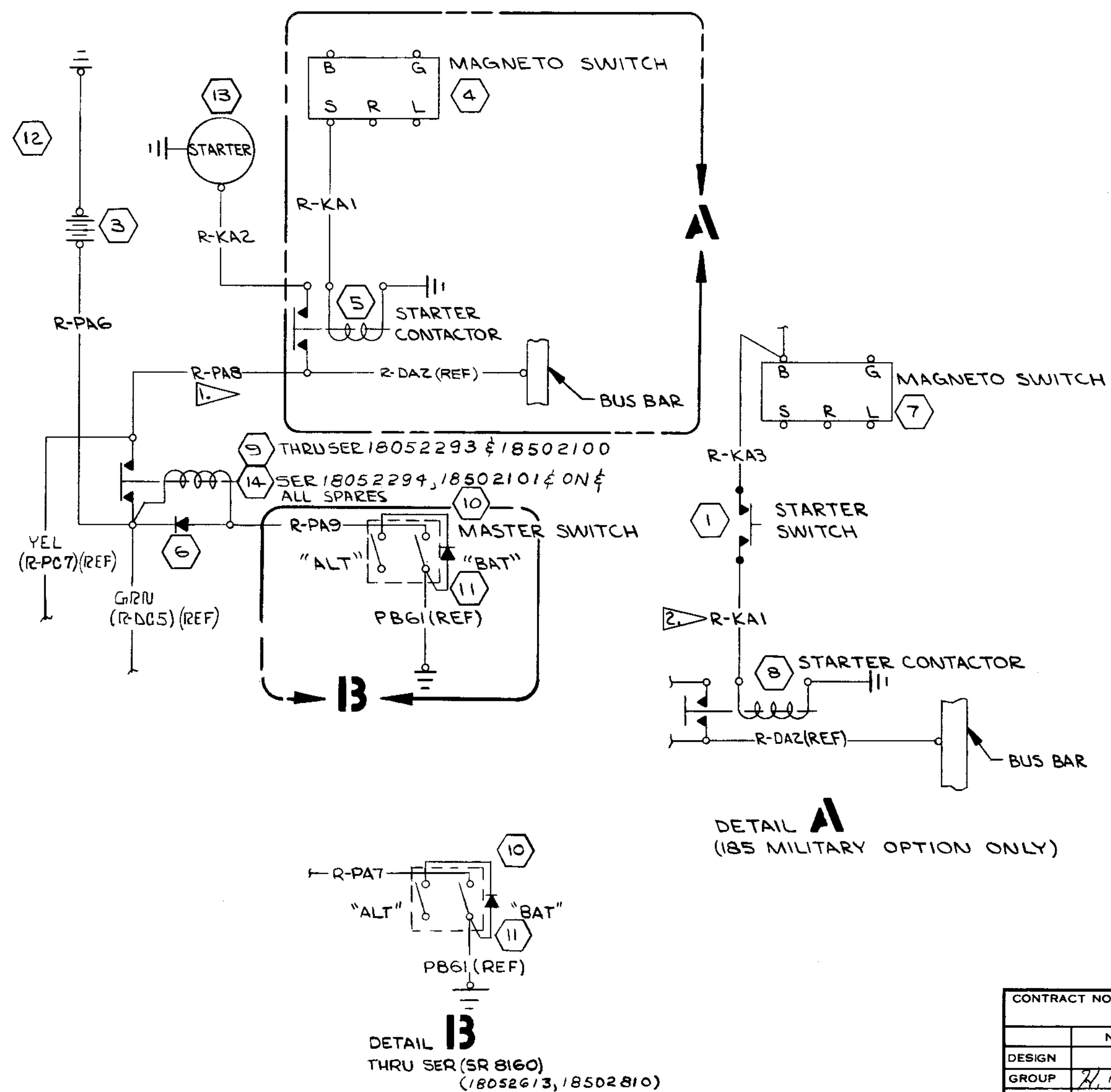
SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | 180 & 185 | PAGE: 4.13.0

FORM NO. 80-215B

ED & RR 10490 (SR6008) IX (SR6009) IX

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
E	FOR REVISION SEE SHT 4.13.0		



CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	H. Wise	5-12-69
DRAWN	D.L.BURKE	5-6-69
CHECK	R.YOUNGERS	5-7-69
STRESS	G. Guthrie	5-7-69
PROJECT	P. Parker	5-12-69
APPD	M. Loaney	5-8-69
SUPERSEDES:	P 4.1	
SUPERSEDED BY:		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

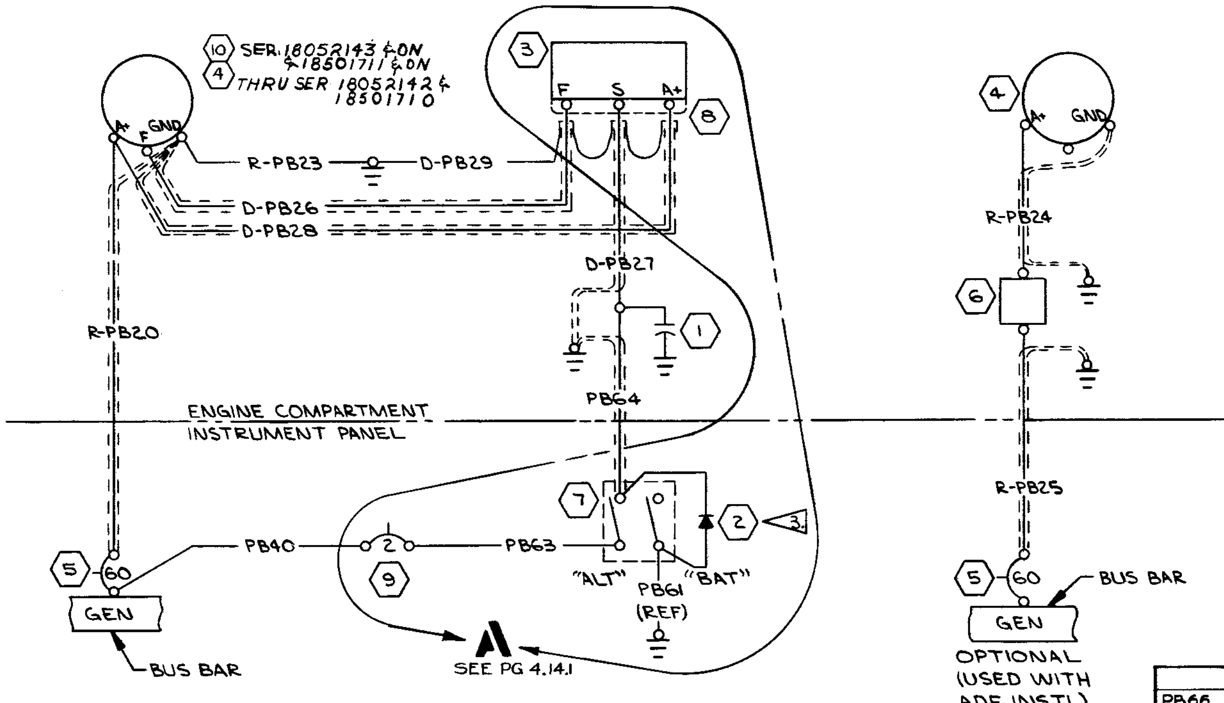
TITLE WIRING DIAGRAM - BATTERY CIRCUIT

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0700092
SCALE: NONE	180 & 185	PAGE: 4.13.1

ED&RR 10490 (SR6008) IX (SR6009) IX

FORM NO. 80-216

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C611501-0101 SER IN C611501-0102 ED & RR 10614 (SR6292)	J.D.R. 10/22/69	
B	BY REV: SER IN C593001-0101 OVER-VOLTAGE SENSOR & S-2135-1 LIGHT ASSY. ADDED DETAIL A ON PG 4.14.1, PB 65 & PB66; SER OUT PB63 (SR6763, SR6764) IX	6-21-71	
C	BY REV: REPLACED S-1370-1 TERM WITH S-1635-1 TERM ON PB65 & PB66 WIRES. ADDED S-1637-1 & S-1637-2 TO EQUIPT TABLE. ADD TVA-1315 TO E/T & F/D SER (18052232 & 18501964) & ON	1-6-72 VRS 1-10-72	



INACTIVE EFF THRU SER 18052284 & 18502090 9-5-72

PB66	18			S-1635-1	42281-2	(00779)	
PB65	18			S-1367-1-8	S-1635-1		SER(SR6763 & 6764) & ON
PB64	18S			4	S-1493-1		
PB63	18			S-1367-1-8	S-1493-1		THRU 18052221 & 18501934
PB40	18			S-1367-1-10	S-1367-1-8		
D-PB29	18			S-1367-1-12	1		
D-PB28	18S			5			
D-PB27	18S			6			
D-PB26	18S			7	1		
R-PB25	8S	2		8	S-1367-4-10		
R-PB24	8S	2		9	8		
R-PB23	10			S-1367-3-10	S-1367-3-10		
R-PB20	8S	2		10	S-1367-4-10		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

NOTES:

1. AMP TERMINAL 42281-2(00779) ON CONDUCTOR. AMP TERMINAL 2-323931-2(00779) ON SHIELD & GROUNDING WIRE
2. 8 GAUGE SHIELDED WIRE MATERIAL PER S-1534-8-9
3. OBSERVE POLARITY SYMBOL ON DIODE WHEN INSTALLING ON SWITCH TERMINALS OR DIODE WILL FAIL WHEN SYSTEM IS ENERGIZED
4. S-1367-1-6 & S-1367-3-8
5. S-1367-1-12 & S-1367-2-10
6. S-1367-1-6 & S-1367-2-8
7. S-1367-1-10 & S-1367-2-10
8. S-1367-4-10 & S-1367-3-8
9. S-1367-4-12 & S-1367-3-10
10. S-1367-3-10 & S-1943-2

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
15	TVA-1315	CAPACITOR	56289
14	S-1637-2	HOUSING-SOCKET	
13	S-1637-1	HOUSING-PIN	
12	S-2135-1	LIGHT ASSY	
11	C593001-0101	OVERVOLTAGE SENSOR	
10	C611501-0102	ALTERNATOR ASSY	
9	CA2	CIRCUIT BKR	80602
8	C6AB-10A730-A	HOUSING	88690
7	S-1994-1-1	SWITCH	
6	S-1629-1	NOISE FILTER	
5	S-1596-60	CIRCUIT BKR	
4	C611501-0101	ALTERNATOR ASSY	
3	C611001-0101	REGULATOR	
2	0770719-2	DIODE ASSY	
1	0770038-2	CONDENSER	

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 4.12

SUPERSEDED BY: 0700092 PG 4.17

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Mino	5-12-69
DRAWN	D.L. BURKE	5-6-69
CHECK	R. YOUNGERS	5-7-69
STRESS	G. Guthrie	5-9-69
PROJ		5-13-69
APPD		5-8-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM, 60 AMP, 12 VOLT

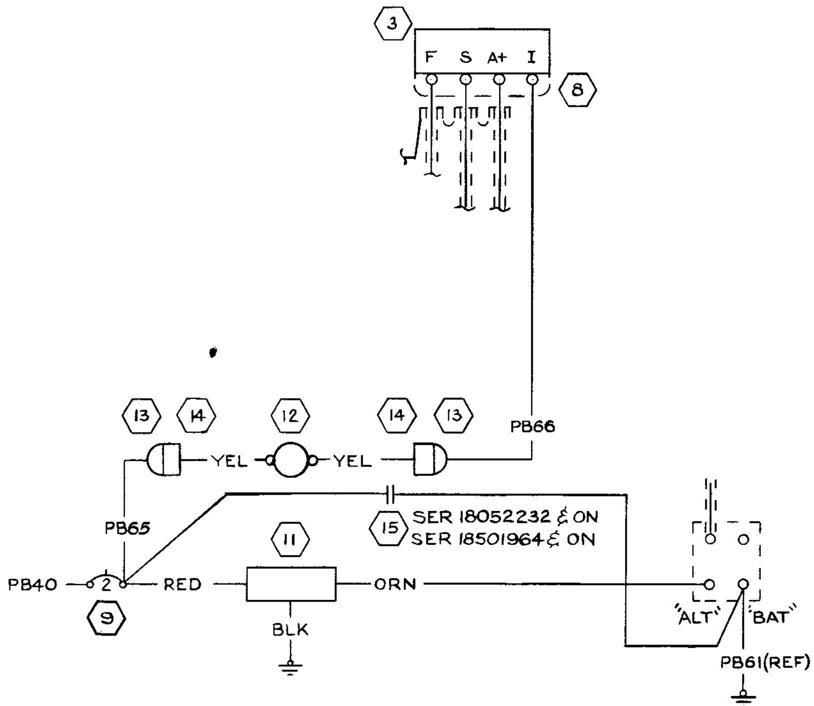
SIZE: C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | 180 & 185 | PAGE: 4.14

ED & RR 10490 (SR6008), (SR6009) IX

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
C	SEE PG 4.14 FOR REV.		



DETAIL A
SEE PG 4.14
SER 18052222, 18501935 & ON

INACTIVE
EFF THRU SER 18052284 & 18502090
9-5-72
RCA MR
RAY
HRW WKB

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: 0700092 PG4.17

CONTRACT NO:

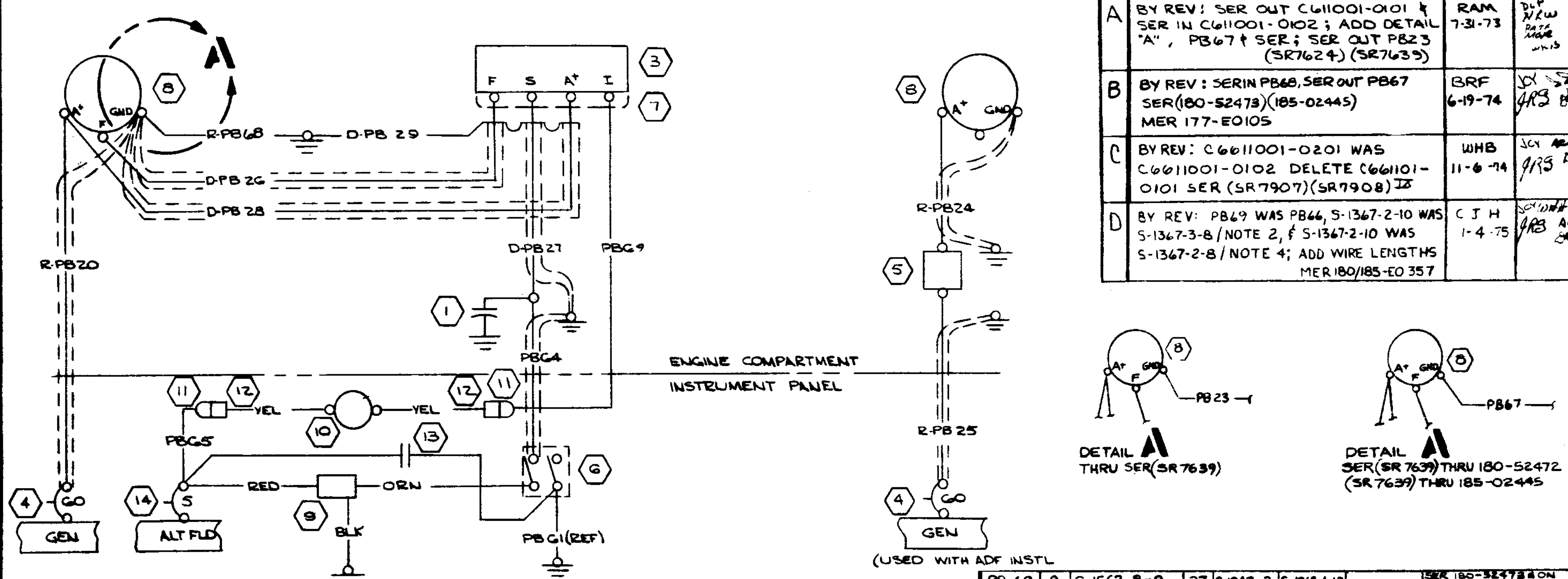
	NAME	DATE
DESIGN		
GROUP	H. Wise	6-29-71
DRAWN	ACKERSON	6-21-71
CHECK	L.K. WHITE	6-30-71
STRESS		
PROJ	R. Parker	6-30-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM, 60 AMP, 12 VOLT

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

SCALE: NONE | 180 & 185 | PAGE: 4.14.1



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C611001-0101 & SER IN C611001-0102; ADD DETAIL "A", PB67 & SER; SER OUT PB23 (SR7624) (SR7639)	RAM 7-31-73	DLP NKW
B	BY REV: SERIN PB68, SER OUT PB67 SER(180-52473)(185-02445) MER 177-E0105	BRF 6-19-74	JCY JRS
C	BY REV: C6611001-0201 WAS C6611001-0102 DELETE C661101-0101 SER (SR7907)(SR7908)	WHB 11-6-74	JCY JRS
D	BY REV: PB69 WAS PB66, S-1367-2-10 WAS S-1367-3-8 / NOTE 2, & S-1367-2-10 WAS S-1367-2-8 / NOTE 4; ADD WIRE LENGTHS MER 180/185-E0 357	C J H 1-4-75	JCY JRS AC

NOTES:

1. AMP TERMINAL 42281-2 (00779) ON CONDUCTOR. AMP TERMINAL 2-323931-2 (00779) ON SHIELD & GROUNDING WIRE
2. WIRE TERMINALS ARE S-1367-1-6 & S-1367-2-10
3. WIRE TERMINALS ARE S-1367-1-12 & S-1367-2-10
4. WIRE TERMINALS ARE S-1367-1-6 & S-1367-2-10
5. WIRE TERMINALS ARE S-1367-1-10 & S-1367-2-10
6. WIRE TERMINALS ARE S-1367-4-10 & S-1367-3-8
7. WIRE TERMINALS ARE S-1367-4-12 & S-1367-3-10
8. WIRE TERMINALS ARE S-1367-3-10 & S-1493-2

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
PB 68	8	S-1562-8-9	23	S-1943-2	S-1367-4-12		SER 180-52473 & ON SER 185-02445 & ON
PB67	8	S-1562-8-9		S-1943-3	S-1367-4-12		SER(SR7639) THRU 180-52472 SER(SR7639) THRU 185-02445
PBG9	18		75	S-1635-1	42281-2	(00779)	
PBG5	18			S-1367-1-8	S-1635-1		
PBG4	18S		36	2	S-1493-1		
D-PB29	18		8	S-1367-1-12	1		
D-PB28	18S		23	3			
D-PB27	18S		10	4			
D-PB26	18S		23	5	1		
R-PB25	8S	S-1534-8-9	36	6	S-1367-4-10		
R-PB24	8S	S-1534-8-9	18	7	8		
R-PB23	10			S-1367-3-10	S-1367-3-10		THRU SER (SR7639)
R-PB20	8S	S-1534-8-9	45	8	S-1367-4-10		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
14	S-1360-5L	CIRCUIT BKR
13	TVA-1315	CAPACITOR
12	S-1637-2	HOUSING SOCKET
11	S-1637-1	HOUSING PIN
10	S-2135-1	LIGHT ASSY
9	C593001-0101	OVERVOLTAGE SENSOR
8	C611501-0102	ALTERNATOR ASSY
7	CGAB-10A730-A	HOUSING
6	S-1994-1-1	SWITCH
5	S-1629-1	NOISE FILTER
4	S-1596-60	CIRCUIT BKR
3	C611001-0102	REGULATOR
2		
1	0770038-2	CONDENSER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX-CESSNA SPEC. NO.
S-XXX OR CMXXXX-CESSNA STD. NO.

SUPERSEDES: 0700092 PG4.19 & 4.19.1
SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	9-11-72
GROUP	H. Wiles	9-11-72
DRAWN	RCAXTELL	9-1-72
CHECK	EYOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	MGR	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM, 60 AMP 12 VOLT

SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

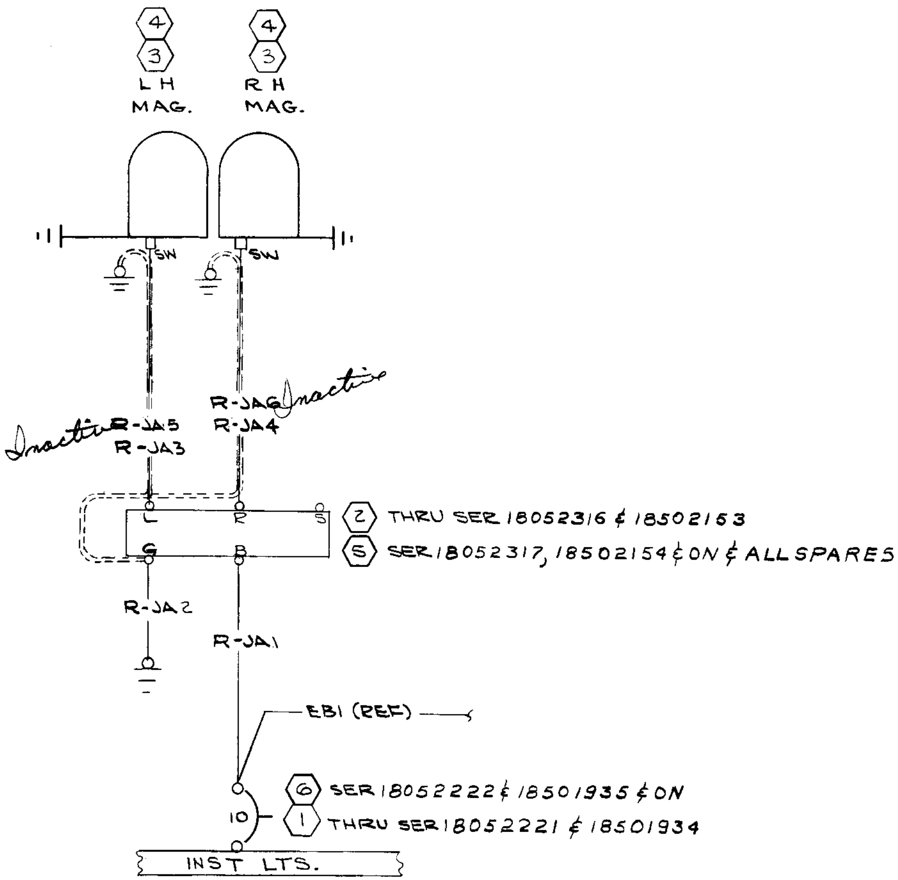
SCALE: NONE | (SR7058)(SR7059) | PAGE: 4.17

FORM NO. 80-4188

SER 18051241 & ON
SER 185-0559 & ON

NOTES:
1. ~~WIRES FLAGGED THUS ARE REQUIRED ONLY WHEN OPTIONAL RADIOS ARE INSTALLED IN MODEL 180.~~

CHG LET	REVISION	BY / DATE	CHK / APPD
A	INACTIVATED R-JA3 & R-JA4 & ADDED 180 REQUIREMENT FOR R-JA5 & R-JA6 (SR4042)	MG 4-2-63	RRS DKM
B	REMOVED INACTIVE FROM R-JA3 & R-JA4 WIRES; ADDED ▷ & R-JA7 & R-JA8; INACTIVATED R-JA5 & R-JA6; ADDED WIRE LENGTHS TO W/T & P/N TO E/T	WJR 2-16-65	RRS DKM NLW
C	CHANGED DOUBLE SHIELDED WIRE TO SINGLE SHIELD ON JA3, JA4, JA7 & JA8	WRC 11-16-65	RRS NLW
D	BY REV: C292501-0101 WAS 0713129-1; SER OUT C292501-0101; SER IN C292501-0105; SER OUT S-1360-10, SER IN S-1360-10L (SR7126), (SR6763)V (SR6764)V (REF)	RLY 3-1-72	LKW NLW
E	BY REV: OBSOLETE WIRES R-JA7 AND R-JA8; DELETE NOTE 1, NOW SHOP PRACTICE. (M.E.R. 180-E0070)	M.M. 2/11/74	DLP JRS MGK RWS WKB



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		USED ON	SERIALS
R-JA8							OBSOLETE NEVER USED
R-JA7							OBSOLETE NEVER USED
R-JA6	18DS		73	S-1367-1-6 S-1367-2-6	S-1367-1-10 S-1367-2-10	185	INACTIVE SER 185-0777 & ON
R-JA5	18DS		73	S-1367-1-6 S-1367-2-6	S-1367-1-10 S-1367-2-10	185	INACTIVE SER 185-0777 & ON
R-JA4	18S		59	S-1367-1-6 S-1367-2-6	S-1367-1-10 S-1367-2-10	180	
R-JA3	18S		58	S-1367-1-6 S-1367-2-6	S-1367-1-10 S-1367-2-10	180	
R-JA2	18		5	S-1367-1-6	S-1367-1-8	185-180	
R-JA1	18		18	S-1367-1-10	COMMON TO EB1	185-180	

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
6	S-1360-10L	CIRCUIT BKR	
5	C292501-0105	IGNITION SWITCH	
4	BENDEX	MAGNETO (180)	
3	SLICK	MAGNETO (185)	
2	C292501-0101	MAG SWITCH	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	JOHNSON	9/27/62
GROUP	V. Tennant	10-3-62
CHECK	R. Stuck	10-27-62
PROJ	J. R. Sattler	10-30-62

TITLE: WIRING DIAGRAM — MAGNETO

Cessna.

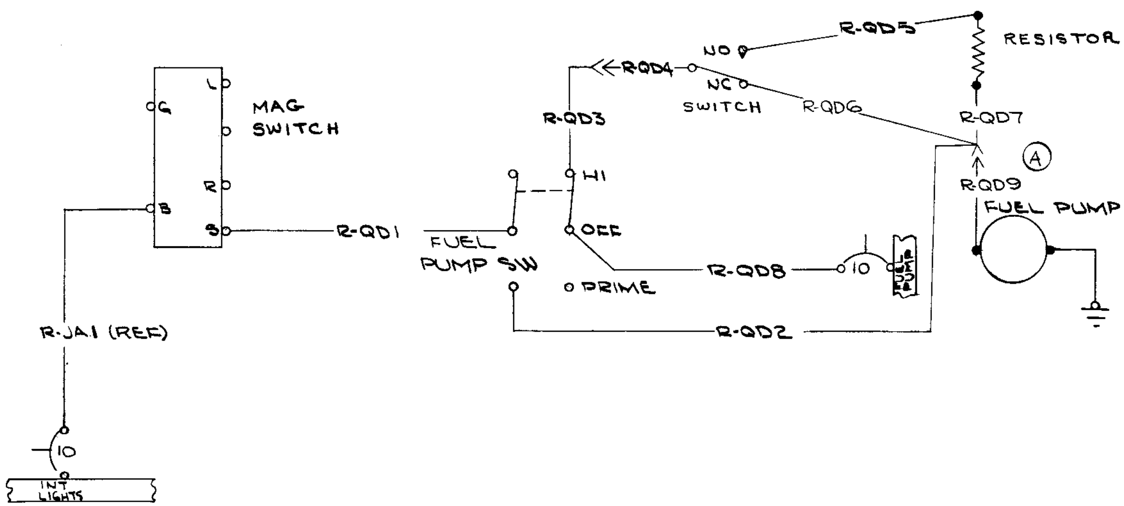
DWG NO: 0700092

SUPERSEDED BY:
SUPERSEDES: 0700039 0700086
MODEL: 180-185
REV: E
PAGE: 5.1

FORM NO. 80-161

SER 18051241 & ON
SER 185-0559 & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	ADDED R-QD9 & TERMINALS TO R-QD2 & R-QD6	GJ 11/19-62	RRS



INACTIVE EFF THRU SER 18052284 & 18502030
9-5-72
RCA
RLY MGR
HRW
UKA

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-QD9	18			S-341-2	——		
R-QD8	18			S-1367-1-8	S-1367-1-6		
R-QD7	18			——	S-341-1		
R-QD6	18			S-1367-1-4	COMMON TO R-QD7		
R-QD5	18			S-1367-1-4	——		
R-QD4	18			S-1367-1-4	S-1370-1		
R-QD3	18			S-1367-1-6	S-1370-1		
R-QD2	18			S-1367-1-6	COMMON TO R-QD7		
R-QD1	18			S-1367-1-6	S-1367-1-6		

WIRE TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	JOHNSON	10/4/62
GROUP	V. Tennant	10-31-62
CHECK	R. Stuck	10-27-62
PROJ	J. Keith	10-30-62

TITLE: WIRING DIAGRAM — FUEL PUMP

Cessna.

DWG NO: 0700092

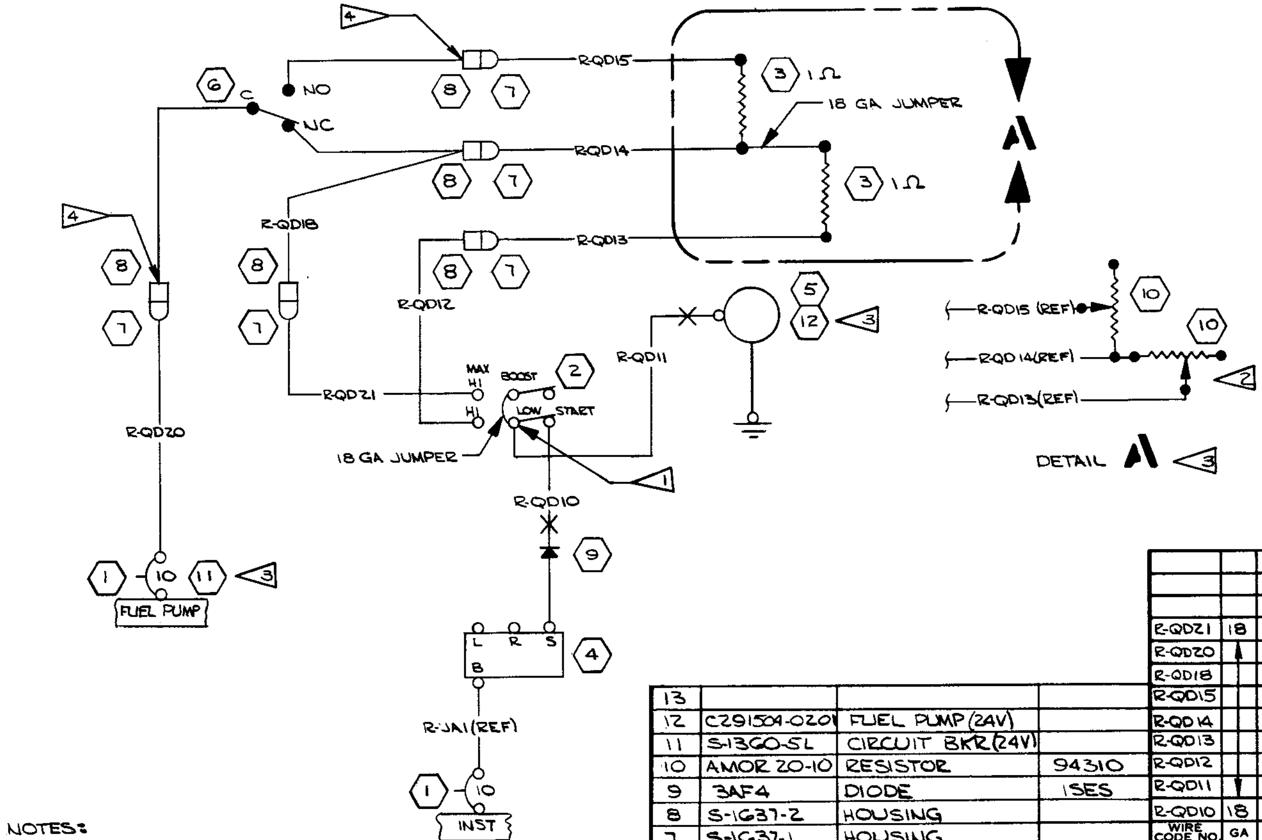
ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON

EQUIPMENT TABLE

SUPERSEDED BY: 0700092 PG 7.1.1
SUPERSEDES: 0700085
MODEL: 185
REV: A
PAGE: 7.1

FORM NO. 80-161

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE R-QD16, R-QD17 & R-QD19; S-1636-2/R-QD18 WAS S-1367-1-4; 12SE1-3 WAS 12S01063; ADD NOTE 4 NOW SHOP PRACTICE	DLP 6-3-73	BY NAW WKB



INACTIVE: EFF THRU SER 18052383 & 18502310 6-18-73 DLP MGR BY NAW WKB

NOTES:

1. INSTALL S-2023-1 ADAPTER
2. PLACE YELLOW ROCKER SWITCH IN HIGH BOOST POSITION. ADJUST RESISTORS WITH ENGINE OFF & 27.5V DC APPLIED TO BUS. OPEN TO FULL THROTTLE & ADJUST 1ST RESISTOR TO PRODUCE 125 LBS/HR INDICATION ON FUEL FLOW METER. ADJUST 2ND RESISTOR WITH THROTTLE CLOSED TO PRODUCE 40 LBS/HR INDICATION ON FUEL FLOW METER. RESISTORS ARE IN SERIES WHEN THROTTLE IS CLOSED.
3. USED WITH 24V 185 ONLY
4. INSTALL S-1636-1 TERMINAL ON VENDOR FURNISHED LEADS AS INDICATED

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
13			
12	C291504-0201	FUEL PUMP (24V)	
11	S-1360-5L	CIRCUIT BKR (24V)	
10	AMOR 20-10	RESISTOR	94310
9	3AF4	DIODE	1SES
8	S-1637-2	HOUSING	
7	S-1637-1	HOUSING	
6	12SE1-3	SWITCH	
5	C291504-0101	FUEL PUMP (12V)	
4	C292501-0105	SWITCH	
3	MZ-0020-3AV	RESISTOR	94310
2	S-2055-1-1	SWITCH	
1	S-1360-10L	CIRCUIT BKR	

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
R-QD21	18			S-1635-1	S-1493-1	
R-QD20				S-1367-1-6	S-1635-1	
R-QD18				S-1636-1	S-1636-2	
R-QD15				S-1635-1	SOLDER	
R-QD14				S-1635-1	SOLDER	
R-QD13				SOLDER	S-1635-1	
R-QD12				S-1636-1	S-1493-1	
R-QD11				S-1493-1	S-1370-1	
R-QD10	18			S-1493-1	S-1370-1	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0700092 PG 7.1

SUPERSEDED BY: P 7.1.2

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	9-11-72
GROUP	H. Wise	9-11-72
DRAWN	R CAXTELL	9-5-72
CHECK	R. YOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	MGR	
OTHER		

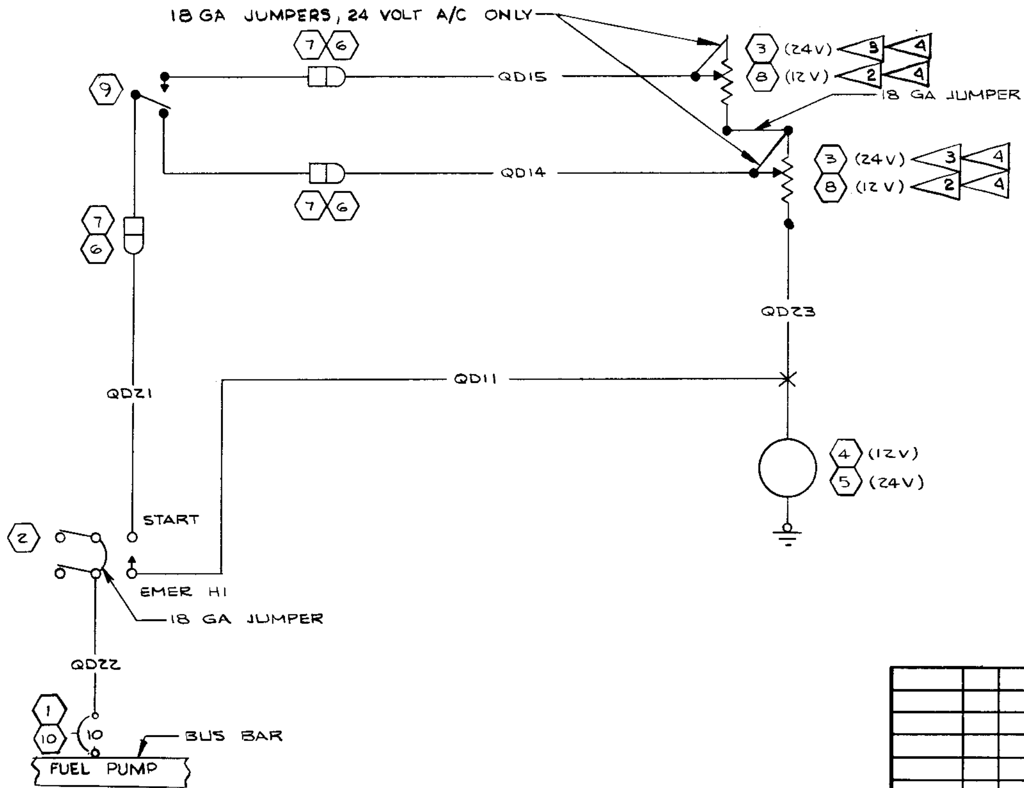
Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — FUEL PUMP SYSTEM

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | (SE1058) IX | PAGE: 7.1.1

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE NOTE 1; ADD NOTES 2, 3 & 4; ADD JUMPERS FOR AMOR-20-10 RESISTOR (SR 8082)	BLA 11-26-74	JRS



NOTES:

1. ~~PLACE YELLOW ROCKER SWITCH IN HIGH BOOST POSITION. ADJUST RESISTORS WITH BUS VOLTAGE APPLIED. OPEN TO FULL THROTTLE & ADJUST 1ST RESISTOR TO PRODUCT 125 LB/HR INDICATION ON FUEL FLOW METER. ADJUST 2ND RESISTOR WITH THROTTLE CLOSED TO PRODUCE 40 LB/HR INDICATION ON FUEL FLOW METER. RESISTORS ARE IN SERIES WHEN THROTTLE IS CLOSED.~~

2. ADJUST AMOR-20-1.5 TO 0.5±.05 OHMS PRIOR TO INSTALLATION

3. ADJUST AMOR-20-10 TO 6.2±.05 OHMS PRIOR TO INSTALLATION

4. READJUST RESISTOR AS REQUIRED AFTER INSTALLATION TO COMPLY WITH FUEL FLOW REQUIREMENTS PER CES 1243

ITEM NO.	PART NO.	DESCRIPTION	
10	S-1360-5L	CKT BKR (24V)	
9	12SE1-3	SWITCH	
8	AMOR-20-1.5	RESISTOR (12V)	
7	S-1637-2	HOUSING	
6	S-1637-1	HOUSING	
5	C291504-0201	FUEL PUMP (24V)	
4	C291504-0101	FUEL PUMP (12V)	
3	AMOR-20-10	RESISTOR (24V)	
2	S-1846-3-2	SWITCH	
1	S-1360-10L	CKT BKR (12V)	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
R-QD23	18			SOLDER	SEE QD11		
R-QD22	↑			S-1367-1-6	S-1493-1		
R-QD21				S-1493-1	S-1635-1		
R-QD15				SOLDER	S-1635-1		
R-QD14	↓			SOLDER	S-1635-1		
R-QD11	18			S-1493-1	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: P 7.1.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	6-18-73
DRAWN	PAPE	6-18-73
CHECK	R. YOUNGERS	6-18-73
STRESS		
PROJ	Bergman	6-19-73
APPD	M&K	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FUEL PUMP SYSTEM

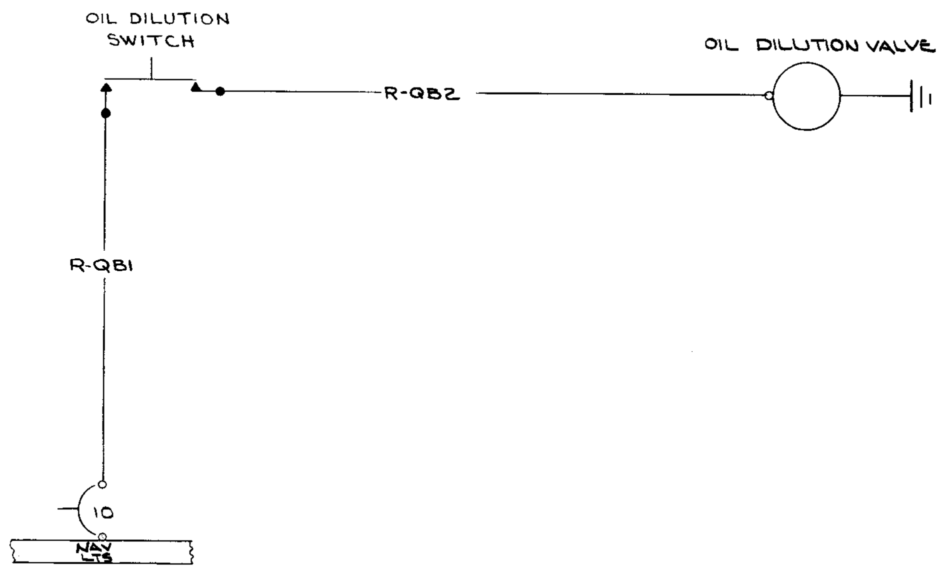
SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | (SR7401) | PAGE: 7.1.2

FORM NO. 80-215B

SER 18051241 & ON
SER 185-0559 & ON

CHG LET	REVISION	BY / DATE	CHK / APPD



INACTIVE
EFF THRU SER 18052284 & 1850290
9-5-72
RCA
RLY
HHW
WKB

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		N/A	SERIALS
R-QB2	18			S-1367-1-10	———		
R-QB1	18			S-1367-1-8	———		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	INSTALLED ON

EQUIPMENT TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	Johnson	10/9/62
GROUP	V. Tennant	10-31-62
CHECK	R. Stuck	10-27-62
PROJ	J.R. Settle	10-30-62

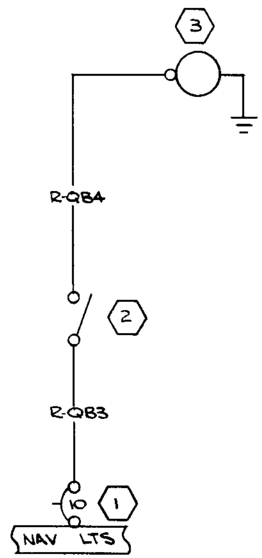
TITLE: WIRING DIAGRAM — OIL DILUTION VALVE (OPT)

Cessna.

DWG NO. 0700092

SUPERSEDED BY:	SUPERSEDES:	MODEL:	REV:	PAGE:
0700092 PG 7.2.1	~~0700079~~ ~~0700085~~	180-185		7.2

FORM NO. 80-161



REVISION			
LET	DESCRIPTION	DATE	APPD

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
R-QB4	18			S-1493-1	S-1367-10		
R-QB3	18			S-1367-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
3	AN4078-1	VALVE	
2	S-2160-3	SWITCH	
1	S-1360-10L	CIRCUIT 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: 0700092 PG 7.2

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	9-11-72
GROUP	H. Wise	9-11-72
DRAWN	R CAXTELL	9-5-72
CHECK	R. YOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	AGR	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — OIL DILUTION VALVE

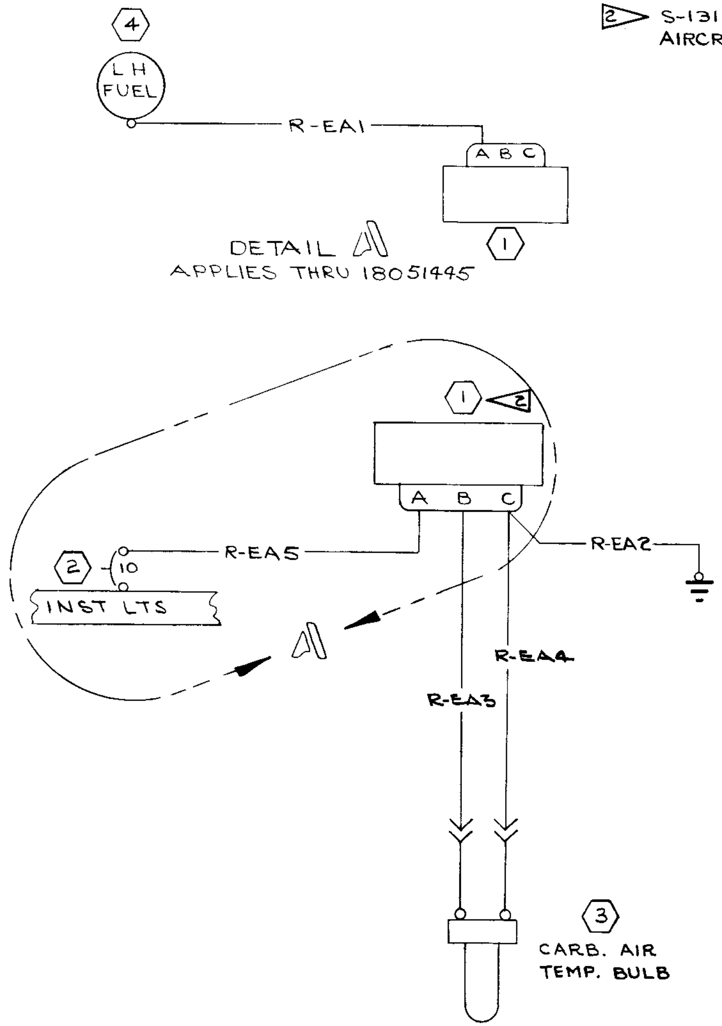
SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE (S21058)(S27059) IV PAGE: 7.2.1

FORM NO. 80-215B

NOTE:
1. TERMINALS FURNISHED WITH CARBURETOR AIR TEMP BULB
2. S-1311-2 GAGE USED ON 24V AIRCRAFT.

CHG LET	REVISION	BY DATE	CHK APPD
A	ADD LIMITING SERIALS TO R-EA1 ADDED SOLDER CONNECTION AT PLUG END OF R-EA3 & R-EA4 WIRES; ADD R-EA5; ADD WIRE LENGTH TO W/T & P/N TO E/T	WJR 2-19-65	
B	BY REV: ADD NOTE 2	C.G. 6-7-67	



R-EA5	18			SOLDER	S-1367-1-6		18051446 & ON
R-EA4	18		140	SOLDER	4214-H	1	
R-EA3	18		140	SOLDER	4214-H	1	
R-EA2	18		17	S-1367-1-8	SOLDER		
R-EA1	18		14	S-1367-1-10	SOLDER		THRU 18051445
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
4	C669502-0103	INST CLUSTER	
3	0550209-1	BULB-CARB AIR	
2	S-1360-10	CIRCUIT BREAKER	
2 1	S-1311-1	GAGE	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

	NAME	DATE
DRAWN	JOHNSON	10/26/62
GROUP	V. Tennant	10-31-62
CHECK	P. Stuck	10-29-62
PROJ	W. Settle	10-30-62

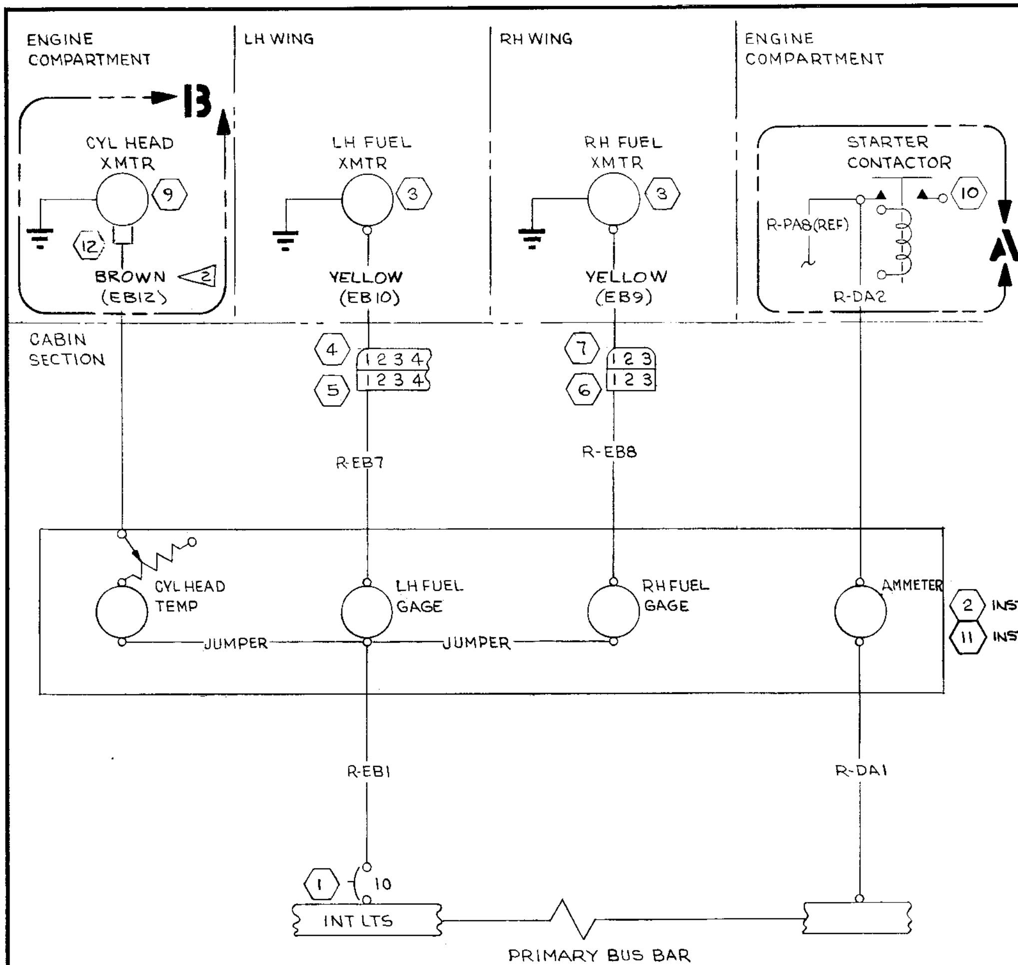
TITLE: WIRING DIAGRAM — CARBURETOR AIR TEMP (OPT)

Cessna.

DWG NO: 0700092

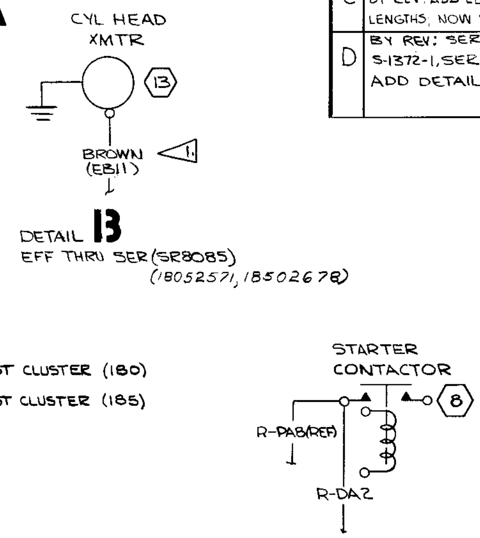
SUPERSEDED BY:
SUPERSEDES: 0700039
MODEL: 180
REV: B
PAGE: 8.3

FORM NO. 80-161



IX SER 18051775 & ON
SER 185-1150 & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: S-1673-1 WAS 0750027-1; ADD DETAIL A, S-1991-1 & SR ED & RR 10475 (SR6222)	MDS 5-23-68	RLY MDS GRG
B	BY REV: ADD C669502-0202; C669502-0201 WAS C669502-0103 ED & RR 10888	RLY 1-21-70	JWH RLY PEP
C	BY REV: ADD EB9, EB10, EB11 & WIRE LENGTHS, NOW SHOP PRACTICE	RAM 6-3-73	
D	BY REV: SER OUT EB11 & S-1372-1, SER IN EB12 & S 1372-2, ADD DETAIL "B", NOTE 2 (SR8085)	RAM 11-12-74	JCY AC



DETAIL B
EFF THRU SER (SR8085)
(18052571, 18502678)

DETAIL A
THRU SER 18052074 & 185-1534

NOTES:

1. PART NO. 11069-1 (PRSO), COLOR; BROWN.

2. CRIMP S-1636-5 TERMINAL AROUND WIRE INSULATION, BEND .25 OF STRIPPED WIRE BACK OVER CRIMP AND SOLDER PER CES 1040. USE MOLEX HT-1719-C CRIMPING TOOL ONLY

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
13	S-1372-1	BULB, CYL HD TEMP	
12	S-1637-4	HOUSING-PLUG	
11	C669502-0202	INSTRUMENT CLUSTER	
10	S-1991-1	CONTACTOR	
9	S-1372-2	BULB, CYL HEAD TEMP	
8	S-1673-1	STARTER CONTACTOR	
7	S-1638-2	HOUSING-CAP	
6	S-1638-1	HOUSING-PLUG	
5	S-1641-9	HOUSING-SOCKET	
4	S-1640-9	HOUSING-PIN	
3	0726110-1	XMTR-FUEL LEVEL	
2	C669502-0201	INSTRUMENT CLUSTER	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BRN (EB12)	18	-18-4	50	S-1367-1-8	S-1636-5	2	SER (SR8085) & ON
BROWN (R-EB11)	18	1	50	S-1367-1-8	S-1367-1-4		THRU SER (SR8085)
YELLOW (R-EB10)	18	S-1460-18-4	20	S-1635-2	S-1367-1-10		
YELLOW (R-EB9)	18	S-1460-18-4	20	S-1635-2	S-1367-1-10		
R-EB8	18		73	S-1367-1-10	S-1636-2		
R-EB7	18		106	S-1367-1-10	S-1636-2		
R-EB1	18		32	S-1367-1-10	S-1367-2-6		
R-DA2	8		24	S-1367-4-10	S-1367-4-14		
R-DA1	8		23	S-1367-4-6	S-1367-4-10		

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	1-4-66
GROUP	H. Wire	1-4-66
CHECK	R. Stuck	1-5-66
PROJ	[illegible]	1-7-66

TITLE: WIRING DIAGRAM— FUEL GAGE XMTR & INDICATORS -12V

Cessna

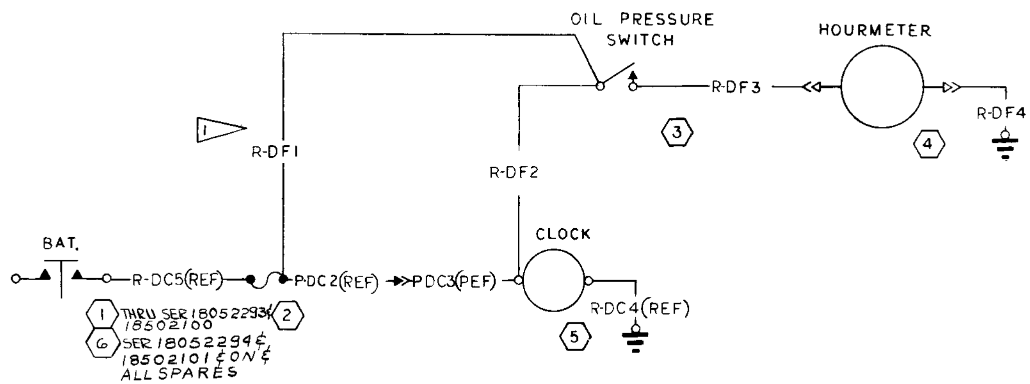
DWG NO: 0700092

SUPERSEDED BY: | SUPERSEDES: 0700092, PP 8.2.1 | MODEL: 180-185 | REV: C | PAGE: 8.6

FORM NO. 80-161A

SER 18051866 ¢ ON IX
SER 185-1272 ¢ ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SE7201)	BPH 6-16-72	LKW NRW



NOTE:
1. WIRING DIAGRAM SHOWN IS FOR USE WHEN AN OPTIONAL ELECTRIC CLOCK IS INSTALLED. WHEN ELECTRIC CLOCK IS NOT INSTALLED WIRE R-DF1 CONNECTS PRESSURE SWITCH TO FUSEHOLDER. INSTALL S-1091-1 FUSE AND S-1690-22 FUSEHOLDER.

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-DF4	18			S-1493-1	S-1367-1-8		
R-DF3	18			S-1493-1	S-1367-1-6		
R-DF2	18			S-1367-1-6	S-1367-1-6		
R-DF1	18			S-1367-1-6	SOLDER		

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
6	S-1579-2	CONTACTOR	
5	S-1317N1	CLOCK	
4	C664501-0101	HOURMETER	
3	S-1711-1	OIL PRESSURE SW.	
2	S-1091-1	FUSE	
1	S-1579-1	BAT. CONTACTOR	

CESSNA AIRCRAFT CO COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

	NAME	DATE
DRAWN	Wedel	9-23-66
GROUP	H. Wiel	9-27-66
CHECK	R. Stuck	9-28-66
PROJ	J.R. Sutton	9-29-66

TITLE: WIRING DIAGRAM—HOURMETER (OPT)

Cessna

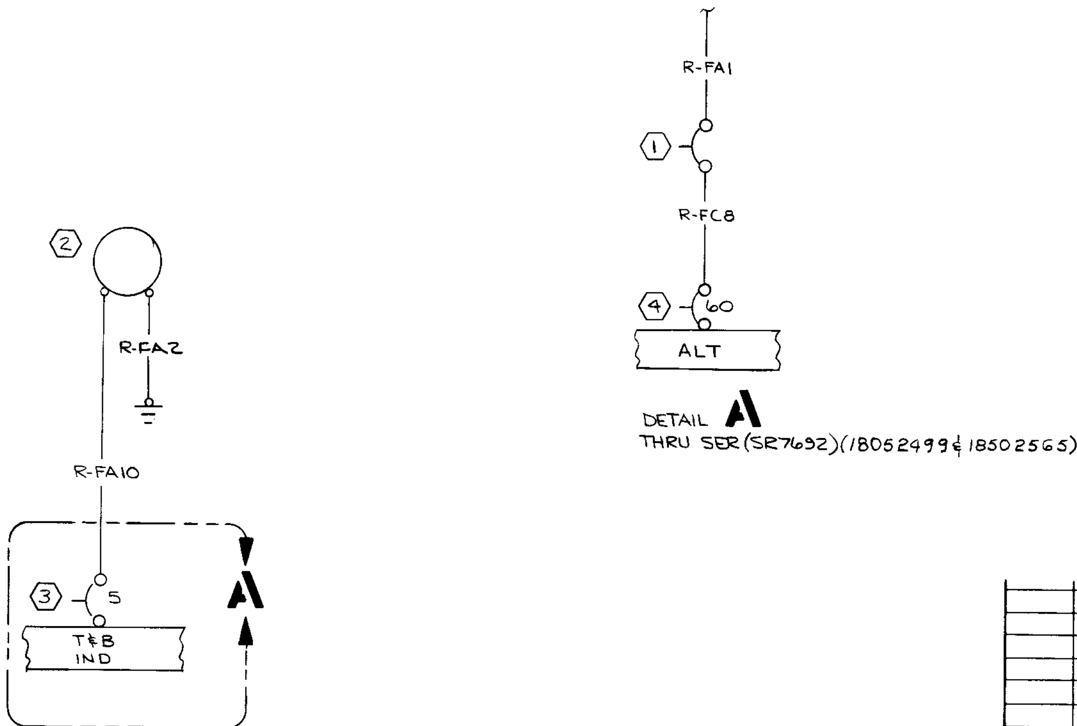
DWG NO: 0700092

SUPERSEDED BY: | SUPERSEDES: | MODEL: 180-185 | REV: A | PAGE: 8.7

FORM NO 80-161A

(SER 18051241) & ON
(SER 185-0559) & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD 12 VOLT SYSTEM TO TITLE	CG 6-7-67	YAK HLW
B	BY REV: ADD R-FC8 (NOW SHOP PRACTICE)	JLO 8-18-73	HTW
C	BY REV: ADD S-1360-5L & DETAIL A (SR7692)	RAM 11-16-73	JCY WHH WKB



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-FA10	18			S-1367-1-6	S-1367-1-8		SER 18052500 & 18502566 & ON
R-FC8	18			S-1367-1-10	S-1367-1-6		THRU 18052499 & 18502565
R-FA2	18			S-1367-1-14	S-1367-1-8		
R-FA1	18			S-1367-1-8	S-1367-1-8		THRU 18052499 & 18502565

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
4	S-1596-60L	CKT BKR	
3	S-1360-5L	CKT BKR	
2	S-1413-2	T&B INDICATOR	
1	CA2	CKT BKR	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	JOHNSON	10/10/62
GROUP	V. Tennant	10-31-62
CHECK	R. Stuck	10-26-62
PROJ	J. Sattler	10-30-62

TITLE: WIRING DIAGRAM — T&B INDICATOR 12 VOLT SYSTEM (OPT)

Cessna.

DWG NO: 0700092

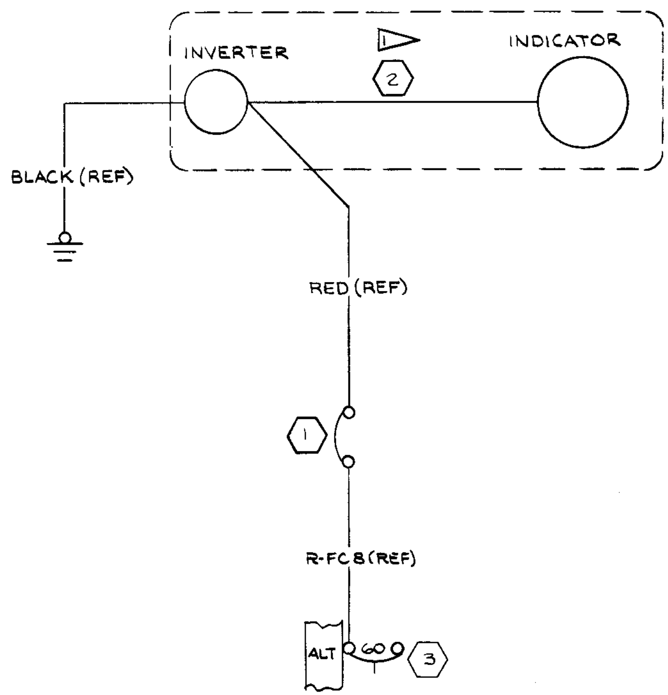
SUPERSEDED BY:
SUPERSEDES: 0700089 0700085
MODEL: 180-185
REV: A
PAGE: 9.1

FORM NO. 80-161

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: ADD FC-8 (REF), S1596-60L (REF) INACTIVATE DWG (SR7400) & (SR7401) (NOW SHOP PRAC.)	JLO 8-21-73	RLY MGR WKW

NOTES:

1. TURN COORINATOR INDICATOR INCLUDES ALL WIRES AND CABLES BETWEEN INVERTER INDICATOR AND CIRCUIT BREAKER.



INACTIVE
EFF THRU SER 18052384 & 18502310
8-21-73
JLO MGR
RLY WKB

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
3	S1596-60L	CKT BKR
2	C661003-0401	TURN COORDINATOR
1	CA2	CKT BKR (73803)

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wiro	5-25-67
DRAWN	HARRIS	5/22/67
CHECK	YAKSHAW	5-23-67
STRESS	aug	5-25-67
PROJECT	M Seller	5-5-67
APPD	Rcm	5-24-67

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BRITTAIN WING LEVELER (OPT)

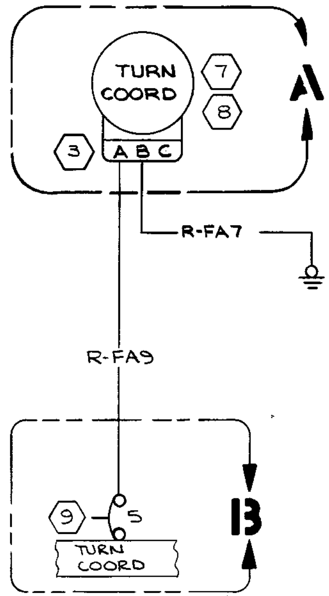
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0700092

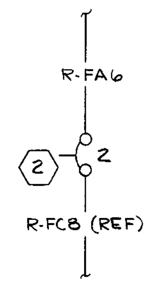
SCALE: NONE | PAGE: 9.4

SER 18051876 & ON IX
SER 185-1301 & ON

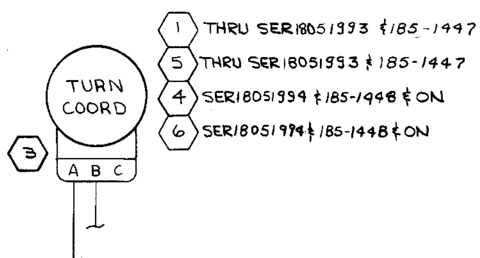
FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A & ITEM 4. ED&RR 02376 (SR5438)&(SR5439) IX	LES 6-12-68	GKI MDS RRW HJW DGK
B	BY REV: ADD DETAIL B & S-1360-5L, C661003-0202, C661003-0502, C661003-0504, C661003-0505, FA9 & SER; ADD WIRE LENGTH (SR7692)	RAM 11-16-73	JCY MGR WHW WKB





DETAIL B
THRU SER (SR7692)(18052499 & 18502565)



DETAIL A
THRU SER (SR6879)(18052221 & 18501934)

9	S-1360-5L	CIRCUIT BREAKER	
8	C661003-0505	TURN COORDINATOR	24V
7	C661003-0504	TURN COORDINATOR	12V
6	C661003-0502	TURN COORDINATOR	24V
5	C661003-0202	TURN COORDINATOR	24V
4	C661003-0501	TURN COORDINATOR	12V
3	MS3106A10SL3S	CONNECTOR	
2	CA-2	CIRCUIT BREAKER	(80602)
1	C661003-0201	TURN COORDINATOR	12V
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-FA9	18			S-1367-1-6	SOLDER		SER18052500 & 18502566 & ON
R-FA7	18		23	S-1367-1-14	SOLDER		
R-FA6	18		45	S-1367-1-8	SOLDER		THRU SER18052499 & 18502565

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	H. Wiel	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)

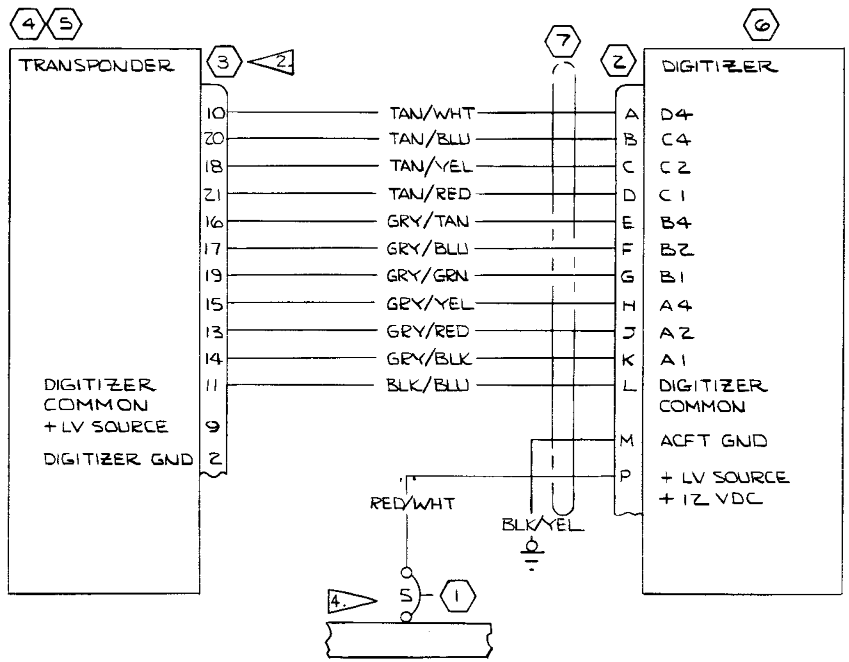
SIZE C | CODE IDENT. NO. 71379 | DWG NO. 0700092

SCALE: NONE | 180 & 185 | PAGE: 9.5

FORM NO. 80-215A

(SER 18051876) & ON
(SER 185-1301) & ON

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD NOTE NO. 4; DELETE TURN COORDINATOR FROM BUS BAR. (SR 7692)	MEM 3-5-74	



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 TRANPONDER 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	W H Harden	11-12-73
DRAWN	DL OLLER	11-9-73
CHECK	J. YOUEL	11-9-73
STRESS		
PROJ	B[illegible]	11-21-73
APPD	MGR	
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	0700092

SCALE: NONE (SR7692) PAGE: 9.6

FORM NO. 80-215B

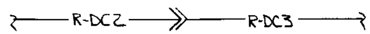
(SER 18051206 & ON (SER 185-0541 & ON
(SER 18051241 & ON (SER 185-0559 & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD DETAIL A, R-DC5 & SERIALS. SERIALIZED OUT R-DC1. SER 18051608 & SER 185-0968	LPB 1-8-65	
B	BY REV: ADD S-1580-1 EFF AT SERIAL 185-1251 & ON	C.G. 6-7-67	
C	BY REV: S-1317N2 WAS S-1317N1 ED & RR 10441	FER 4-4-69	
D	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 6-16-72	
E	BY REV: ADD WIRE LENGTHS; SER OUT R-DC2 & R-DC3; SER IN R-DC6 & R-DC7; ADD DETAIL "B" (SR7400) & (SR7401)	DLO 5-23-73	WKB
F	BY REV: ADD WIRE COLOR RED (R-DC6) WAS R-DC6, GRN (R-DC5) WAS R-DC5, LG 18/GRN (R-DC5) & RED (R-DC6) WAS 17 & 6 (SR 7667) (SR 7668)	JEF BRF 5-22-74	DLO

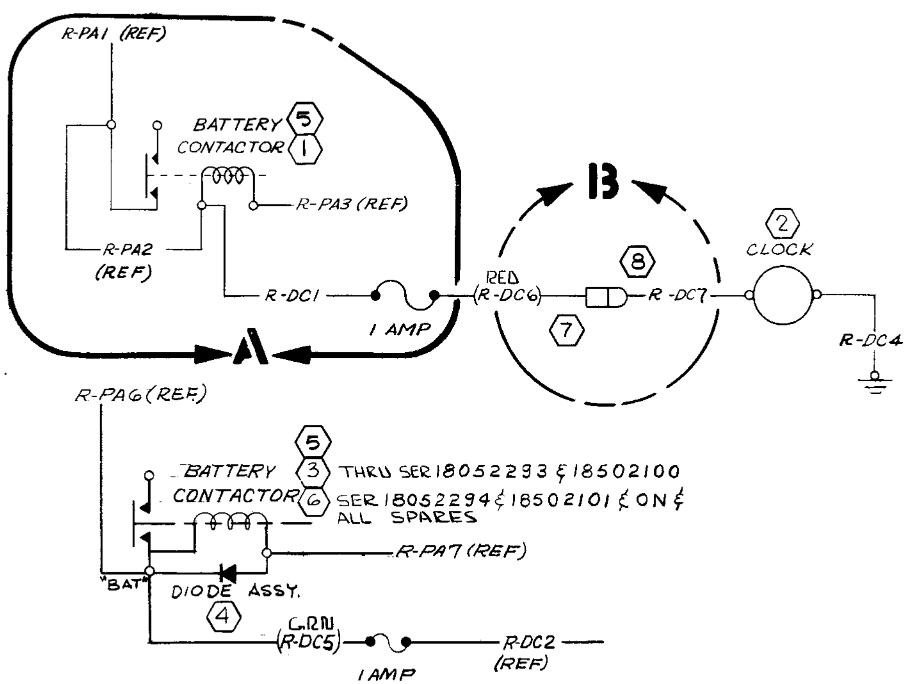
NOTES:

1. 0850469-1 CONTACTOR REPLACES 0712603-2 ON 24 VOLT AIRCRAFT.

2. S1580-1 BATTERY CONTACTOR REPLACES 0850469-1 BATTERY CONTACTOR AT SERIAL 185-1251 & ON, ON 24 VOLT AIRCRAFT. ITEM 3 IS APPLICABLE TO 12 VOLT SYSTEMS ONLY.



DETAIL B
EFF THRU SER 18052384 & 18502310



DETAIL A
EFF. SERIAL 18051608 & ON
EFF. SERIAL 185-0968 & ON

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
8	S-1637-1	HOUSING	
7	S-1637-2	HOUSING	
6	S-1579-2	CONTACTOR	
5	S-1580-1	CONTACTOR	24 VOLT
4	0770728-1	DIODE ASSY	
3	S-1579-1	CONTACTOR	12 VOLT
2	S-1317N2	CLOCK	
1	0712603-2	CONTACTOR	12 VOLT

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-DC7	18		172	S-1367-1-6	S-1635-2		SER 18052385, 18502311 & ON
RED (R-DC6)	18		18	SOLDER	S-1636-2		STANDARD SER 18052385 18502311 & ON
GRN (R-DC5)	18		18	S-1367-1-13	SOLDER		SER 18051608 & ON SER 185-0968 & ON
R-DC4	18		17	S-1367-1-8	S-1367-1-6		
R-DC3	18		172	S-341-2	S-1367-1-6		THRU SER 18052384 & 18502310
R-DC2	18		6	S-341-2	SOLDER		STANDARD THRU SER 18052384 & 18502310
R-DC1	18		11	S-1367-1-6	SOLDER		EFF THRU SER 18051608 EFF THRU SER 185-0968

WIRE TABLE

CESSNA AIRCRAFT CO. COMMERCIAL AIRCRAFT DIVISION WICHITA KANSAS

	NAME	DATE
DRAWN	SPRIGGS	10-9-62
GROUP	V. Jensen	10-31-62
CHECK	R. Stuck	10-27-62
PROJ	J. Hettler	10-30-62

TITLE: WIRING DIAGRAM — CLOCK (OPT)

Cessna.

DWG NO: 0700092

SUPERSEDED BY: | SUPERSEDES: | MODEL: 180-185 | REV: E | PAGE: 10.1

FORM NO. 80-161

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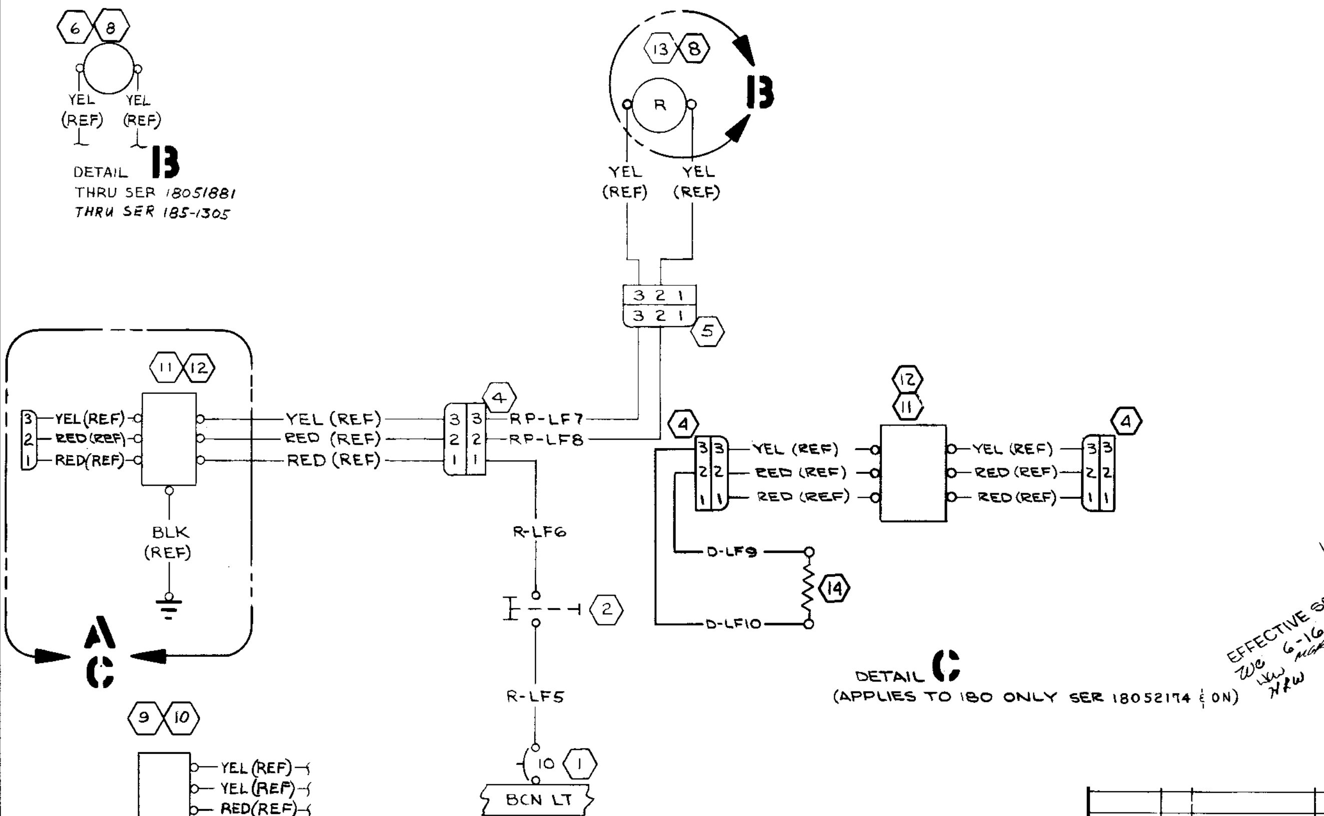
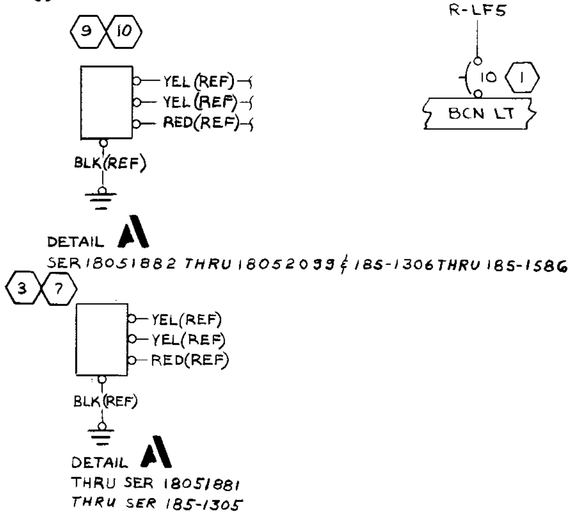


INACTIVE
EFFECTIVE SER 18051775 & 18501150 THRU SER 18052284 & 18502091
WO 6-16-72



CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD C594501-0103 & C621001-0103 FOR 24 VOLT SYSTEM	C.G. 7-7-67	
B	BY REV: ADD DETAIL A & B; C621001-0102 WAS C6201001-0103; ADD C594501-0201, C594501-0202, C594501-0203, C594501-0204 & C621001-0103 TO EQUIPMENT TABLE. ED&RR 10539 (SR6264), (SR5307), (SR5412) ED&RR 10539 (SR6264); (SR5307), (SR5412)	PGP 7-23-69	RLY
C	BY REV: ADD DETAIL C, D-LF9, D-LF10 & ZR-075-11.5; RED(REF)/PIN 2 WAS YEL(REF)/PIN 2 ED&RR 10881 (SR6265)	RLY 3-5-70	
D	BY REV: C621001-0106 WAS C621001-0103	DLP 1-17-73	

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
14	ZR-075-11.5	RESISTOR	(83777)
13	C621001-0106	LIGHT ASSY	12 VOLT
12	C594501-0204	FLASHER ASSY	24 VOLT
11	C594501-0203	FLASHER ASSY	12 VOLT
10	C594501-0202	FLASHER ASSY	24 VOLT
9	C594501-0201	FLASHER ASSY	12 VOLT
8	C621001-0102	LIGHT ASSY	24 VOLT
7	C594501-0102	FLASHER ASSY	24 VOLT
6	C621001-0101	LIGHT ASSY	12 VOLT
5	S-1638-2	HOUSING-CAP	
4	S-1638-1	HOUSING-PLUG	
3	C594501-0101	FLASHER ASSY	12 VOLT
2	0713026-4	SWITCH ASSY	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS	TERMINALS		SERIALS
D-LF10	16			S-1636-2	S-1493-2		SER 1805217 & ON
D-LF9	16			S-1636-2	S-1493-2		SER 1805217 & ON
RP-LF8	16			S-1636-2	S-1635-2		THRU SER 1805216
RP-LF7	16			S-1636-2	S-1635-2		THRU SER 1805216
R-LF6	16			S-1367-2-8	S-1636-2		
R-LF5	16			S-1367-2-6	S-1367-2-8	(OPT) 180	

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	RIDDER	12-4-65
GROUP		1-4-66
CHECK		1-4-66
PROJ		1-6-66

TITLE: WIRING DIAGRAM — FLASHING BEACON LIGHT

Cessna

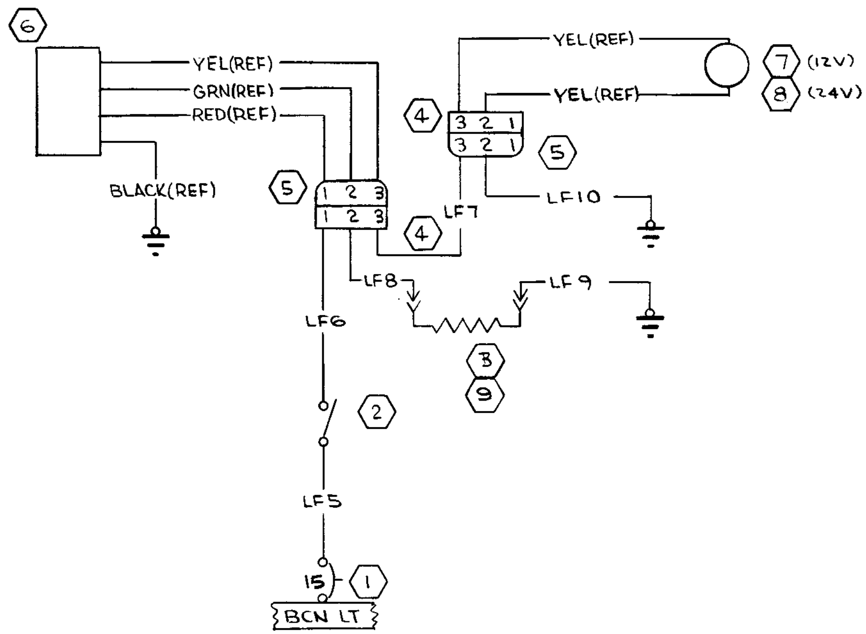
DWG NO: 0700092

SUPERSEDED BY: P 11.3.2 | SUPERSEDES: 0700092 PAGE 11.3 | MODEL: 180 & 185 | REV: D | PAGE: 11.3.1

FORM NO 50-161A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C621001-0106 WAS C621001-0103	DLP 1-10-73	
B	BY REV: ON LF5 & LF6 CHANGE TO 14 GA WIRE WAS 16 GA; S-1360-15L WAS S-1360-10L (SR8260)	BAH 5-13-75	AC

(18052609/8502768 & ON)



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
LF10	16			S-1635-2	S-1367-2-6		
LF9	16			S-1493-2	S-1367-2-6		
LF8	16			S-1493-2	S-1636-2		
LF7	16			S-1635-2	S-1636-2		
LF6	14			S-1493-2	S-1635-2		
LF5	14			S-1367-2-6	S-1493-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9	OR95-6	RESISTOR (83777)	(24V)
8	C621001-0102	LIGHT ASSY	(24V)
7	C621001-0106	LIGHT ASSY	(12V)
6	C594502-0101	FLASHER ASSY	
5	S-1638-2	HOUSING-CAP	
4	S-1638-1	HOUSING-PLUG	
3	OR95-1.5	RESISTOR (83777)	(12V)
2		SWITCH	
1	S-1360-15L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 11.3.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	COOK	6-16-72
GROUP	H. Wise	6-22-72
DRAWN	COOK	6-16-72
CHECK	WHITE	6-19-72
STRESS		
PROJ	P. Parker	6-24-72
APPD		6-23-72
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — LIGHT—FLASHING BEACON

SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | 180-185 | PAGE: 11.3.2

FORM NO. 80-215B

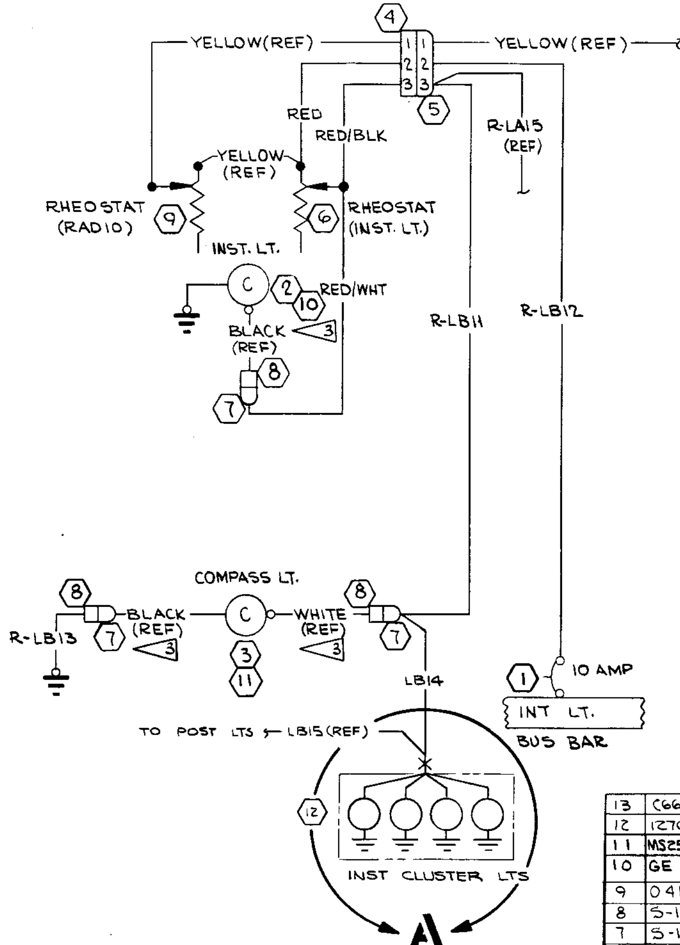
(SR7058) (SR7059)

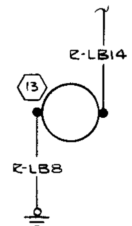
NOTES;

(SER 18051608 THRU 18051774)
(SER 185-0968 THRU 185-1149)

1. INSTALL S-1635-1 PIN ON BLACK WIRE OF COMPASS AND S-1636-1 SOCKET ON WHITE WIRE OF COMPASS.
2. INSTALL S-1636-2 SOCKET ON BLACK WIRE OF INSTRUMENT LIGHT.
3. WIRES FURNISHED BY VENDOR.
4. ALL WIRE MATERIAL PER S-1460

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD MS25237-327 & GE 308 FOR 24 VOLT SYSTEM	CG 6-7-67	WAK
B	BY REV: S-1880-2 WAS XR6085; ADD 1270479, LB14, DETAIL "A" & SER; INACT DWG (SR7400)(SR7401) IX	DLP 6-5-73	





DETAIL A
THRU SER 18051875, SER 185-1300

INACTIVE: EFF THRU SER 18052384 & 18502310 IX 6-5-73 DLP

13	C669502-0103	INST CLUSTER	
12	1270479-1	LIGHT ASSY	
11	MS25237-327	LAMP	24 VOLT
10	GE 308	LAMP (24446)	24 VOLT
9	0413126-5	RHEOSTAT	
8	S-1637-2	HOUSING-PLUG	
7	S-1637-1	HOUSING-CAP	
6	S-1880-2	RHEOSTAT	
5	S-1638-2	HOUSING-CAP	
4	S-1638-1	HOUSING-PLUG	
3	0713068-2	COMPASS LT.	12 VOLT
2	0511481-9	INSTRUMENT LT.	12 VOLT
1	S-1360-10	CIRCUIT BREAKER	
ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON

EQUIPMENT TABLE

R-LB8	20		10	SOLDER	S-1367-1-8		
R-LB14	18			SEE LB11			
R-LB13	18			S-1367-1-14	S-1636-2		
R-LB12	18			S-1367-1-6	S-1635-2		
R-LB11	18			S-1635-3	S-1635-3		
RED	18	-18-2		SOLDER	S-1636-2		
RED/BLK	18	-18-2-0		SOLDER	S-1636-2		
RED/WHT	18	-18-2-9		S-1635-2	SOLDER		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

4 WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	BLISS	5-28-65
GROUP	H. Wire	6-15-65
CHECK	R. Stick	7-26-65
PROJ	W. Sutth	7-30-65

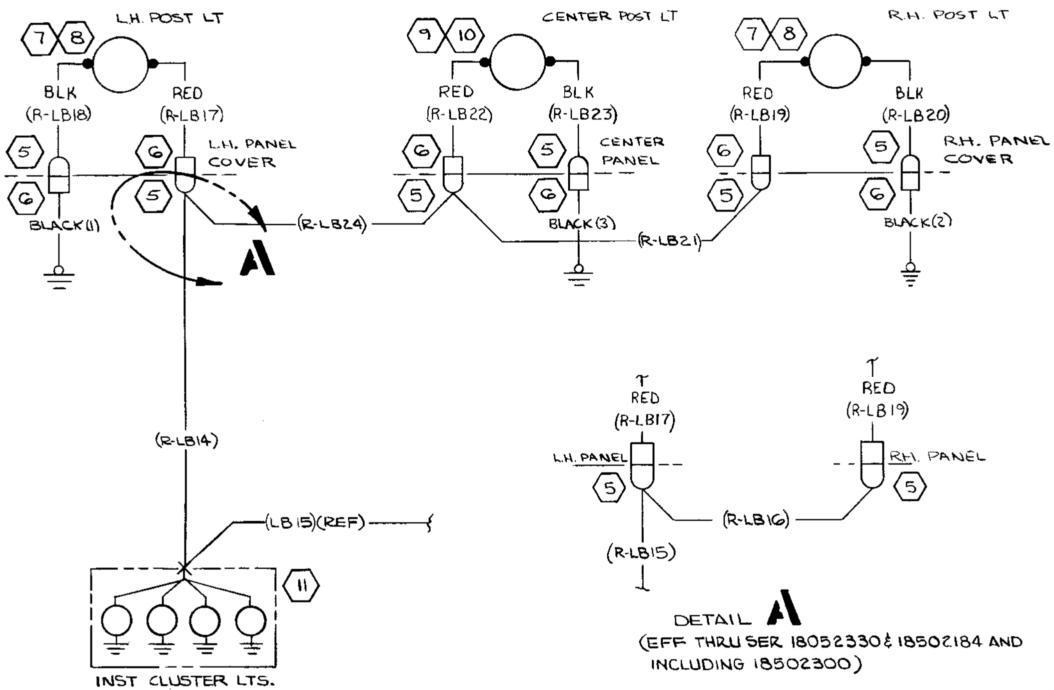
TITLE: WIRING DIAGRAM— COMPASS & INSTRUMENT LIGHTS

Cessna

DWG NO: 0700092

SUPERSEDED BY: P 11.4.3 | SUPERSEDES: 0700092 PG 11.4 | MODEL: 180-185 | REV: A | PAGE: 11.4.1

FORM NO 80-1614



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL A, LB21 THRU LB24, BLACK (3), S-1899-6G AND S-1899-8G. SER (SR7470) & ON	LCW 1-9-73	RLY MGR PATE WKB
B	BY REV: DELETE 0413126-5, S-1880-2, S-1638-1, S-1638-2, LB14 & S-1636-2/LB15; ADD 1270479-1	DLP 6-3-73	RLY HLW WKB MGR
C	BY REV: LB14 WAS LB15, LB15 WAS LB14 (NOW SHOP PRACTICE) MER EO 234 EO 247	JEG 6-21-74	DLO JRB
D	BY REV: ADD BLK/R-LB18, R-LB20, & R-LB23, RED/R-LB17, R-LB22, & R-LB19; MER 180/185 EO323	CJH 1-4-75	JCY WHH JRB AC

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BLACK(3)	18	-18-0		S-1636-2	S-1367-1-8		SER 18052331, 18502185 THRU 18502299 & 18502301 & ON
BLACK(2)	↑	-18-0		S-1636-2	S-1367-1-8		
BLACK(1)		-18-0		S-1636-2	S-1367-1-8		
R-LB24				SEE LB15	SEE LB21		SER 18052331, 18502185, THRU 18502299 & 18502301 & ON
BLK (R-LB23)		-18-0	25	S-1635-1	SOLDER		
RED (R-LB22)		-18-2	25	S-1636-1	SOLDER		
R-LB21				S-1635-3	S-1635-1		SER 18052331, 18502185 THRU 18502299 & 18502301 & ON
BLK (R-LB20)		-18-0	25	SOLDER	S-1635-2		
RED (R-LB19)		-18-2	25	S-1636-2	SOLDER		
BLK (R-LB18)		-18-0	25	SOLDER	S-1635-2		
RED (R-LB17)	↓	-18-2	25	S-1636-2	SOLDER		
R-LB16	18			S-1635-2	SHARE TERM WITH R-LB15		THRU SER 18052330 & 18502184 AND INCLUDING 18502300
R-LB14	18			S-1635-3	S-1635-3		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
11	1270479-1	LIGHT ASSY
10	S-1899-8G	LIGHT ASSY (28V)
9	S-1899-6G	LIGHT ASSY (14V)
8	1513837-2	LIGHT ASSY (28V)
7	1213379-1	LIGHT ASSY (14V)
6	S-1637-2	HOUSING-PLUG
5	S-1637-1	HOUSING-CAP
4	MS 25237-327	LAMP (24V)
3	0713068-2	COMPASS LT (12V)
2		
1		

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. Wise	10-28-72
DRAWN	RCAYTELL	10-27-72
CHECK	R. YOUNGERS	10-27-72
STRESS	J.P. VanDyke	10-31-72
PROJ	Bergman	11-2-72
APPD	MGR	
OTHER		

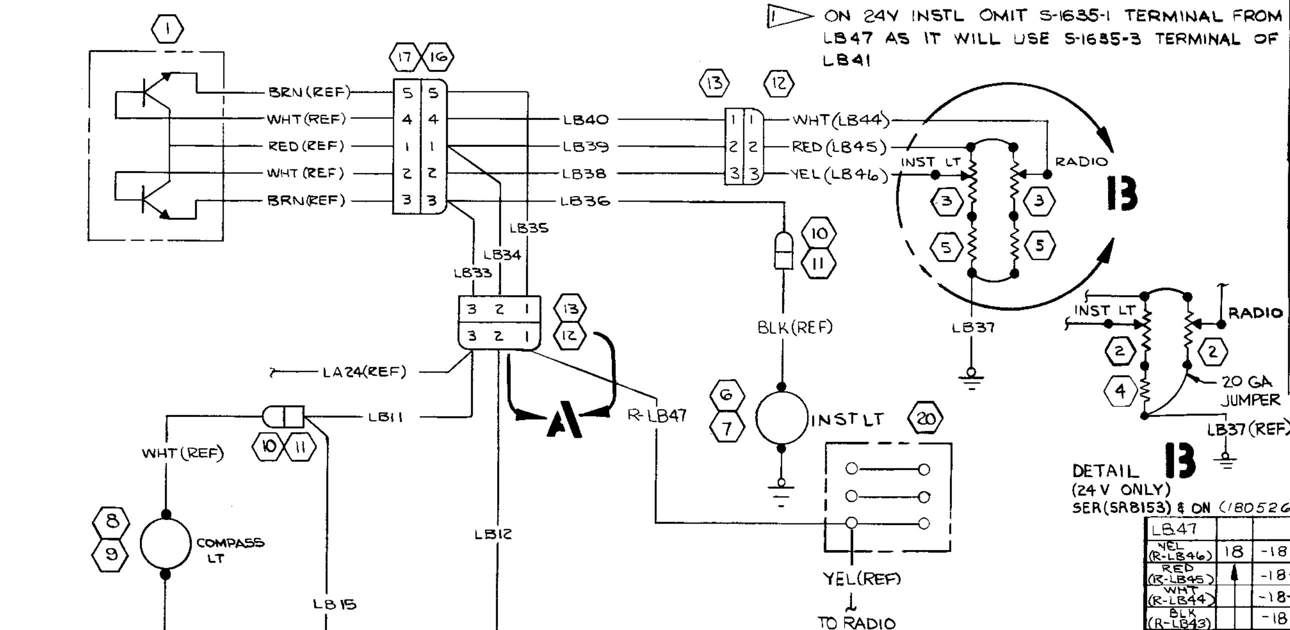
Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — POST LIGHTING

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

SCALE: NONE | SR7058 (SR7059) IX (REF) | PAGE: 11.4.2

FORM NO. 80-215B

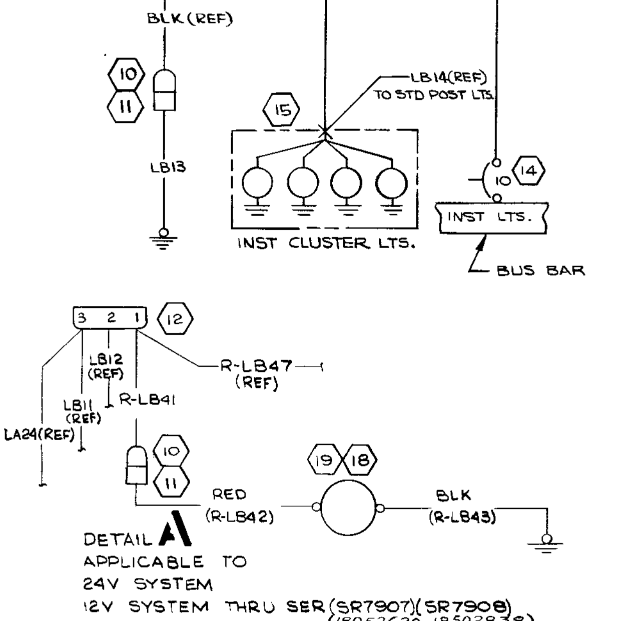


NOTES:

1. ON 24V INSTL OMIT S-1635-1 TERMINAL FROM LB47 AS IT WILL USE S-1635-3 TERMINAL OF LB41

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: LA24 (REF) WAS LA15 (REF); ADD LB41, LB42, LB43, 1213379 & 1513837 (SR7588)(SR7400)(SR7401) IX	DLP 7-21-73	
B	BY REV: ADD LB44, LB45 & LB46; S-1636-2 WAS SOLDER PER LB38, LB39 & LB40 (SR7400) IX (SR7401) IX	RAM 9-28-73	
C	BY REV: LB14 (REF) WAS LB15 (REF) & LB15 WAS LB14. (NOW SHOP PRACTICE) MER E0234, E0247	JEG 6-20-74	
D	BY REV: RED (LB42) WAS LB42, BLK (LB43) WAS LB43; MER180/185E0234 (NOW SHOP PRACTICE)	RJP 8-26-74	
E	BY REV: S-2000B270J WAS 270 OHM ½W; ADD LB47 & 34003-55 (SR7907)(SR7908) MER 180/185 E0394	CJH 1-4-75	
F	BY REV: ADD DETAIL "A" & NOTE 1; S-163-1 WAS SEE LB41/LB47 (SR7908)(SR7907) ADD DETAIL "B" (SR8153)	BLA 3-28-75 BAH	

08 267 0905



ITEM NO.	PART NO.	DESCRIPTION	
20	34003-55	TERM BLOCK	
19	1513837	POST LT ASSY	(24V)
18	1213379	POST LT ASSY	(12V)
17	S-1641-6	HOUSING	
16	S-1640-6	HOUSING	
15	1270479	LIGHT ASSY	
14	S-1360-10L	CKT BKR	
13	S-1638-1	HOUSING	
12	S-1638-2	HOUSING	
11	S-1637-2	HOUSING	
10	S-1637-1	HOUSING	
9	MS25237-327	LAMP	(24V)
8	0713068	COMPASS LT	(12V)
7	GE 308	LAMP	(24V)
6	0511481	INSTRUMENT LIGHT	(12V)
5	S-2000B270J	RESISTOR	(12V)
4	VAL3 (200Ω)	RESISTOR	(24V)
3	S-1904-3	POT ASSY	(12V)
2	S-1904-2	POT ASSY	(24V)
1	1570166-1	DIMMING ASSY	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
LB47				S-1635-1	S-1829-1		SER (SR7907)(SR7908) & ON
YEL (R-LB46)	18	-18-4		S-1635-2	SOLDER		
RED (R-LB45)		-18-2		S-1635-2	SOLDER		
WHT (R-LB44)		-18-9		S-1635-2	SOLDER		
BLK (R-LB43)		-18-0		SOLDER	S-1367-1-4		
RED (R-LB42)		-18-2		S-1636-1	SOLDER		
R-LB41				S-1635-3	S-1635-1		
R-LB15				SEE LB11	S-1370-1		
R-LB40				S-1635-2	S-1636-2		
R-LB39				S-1635-2	S-1636-2		
R-LB38				S-1635-2	S-1636-2		
R-LB37				SOLDER	S-1367-1-4		
R-LB36				S-1635-2	SEE LB33		
R-LB35				S-1636-2	S-1635-2		
R-LB34				SEE LB39	S-1636-2		
R-LB33				S-1635-2	S-1636-2		
R-LB12				S-1367-1-6	S-1635-2		
R-LB11	18			S-1635-3	S-1635-3		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	6-7-73
DRAWN	PAPE	6-3-73
CHECK	R. YOUNGERS	6-5-73
STRESS		
PROJ	Bergman	6-7-73
APPD		
OTHER		

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 11.4.1

SUPERSEDED BY:

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

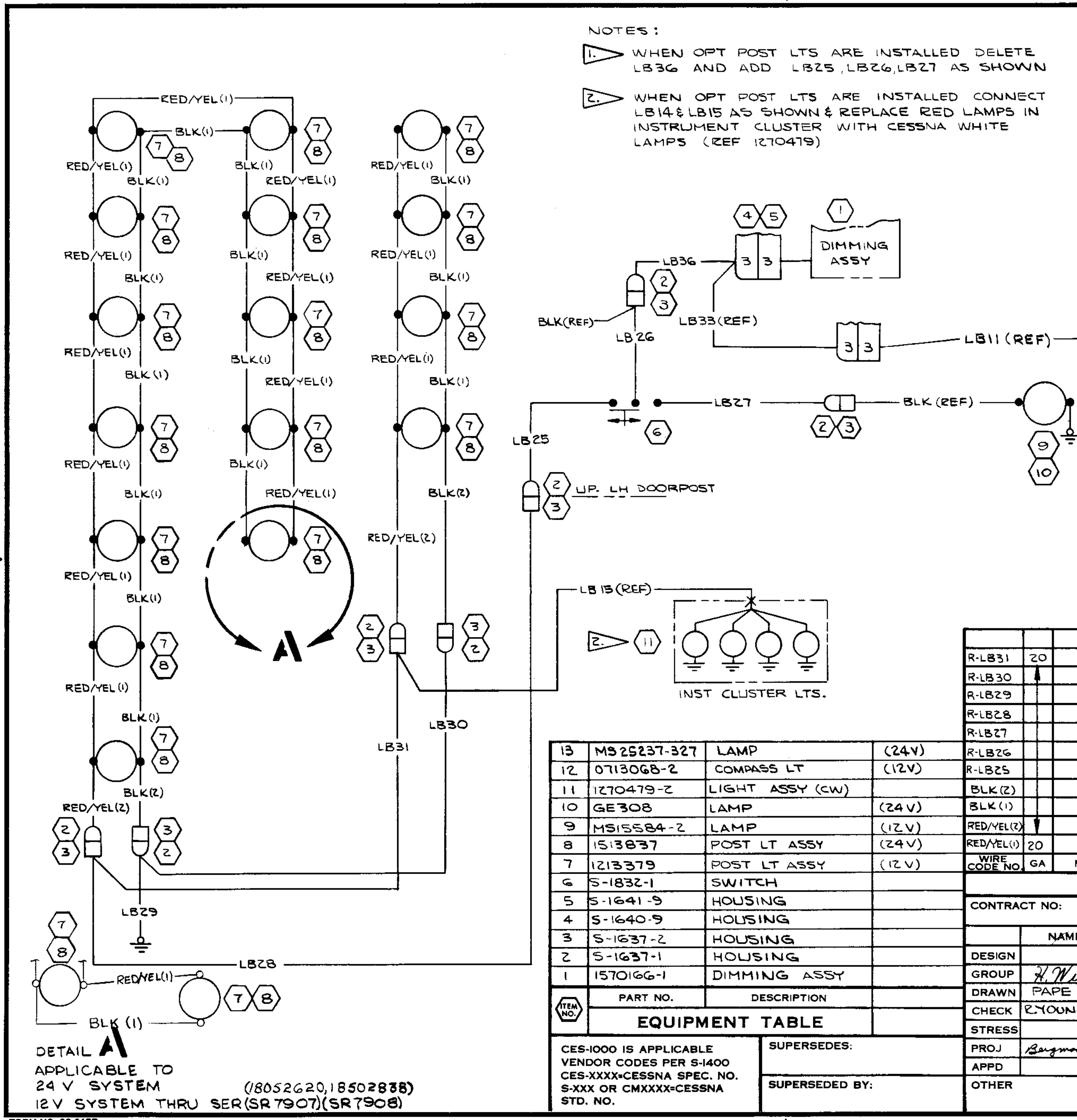
TITLE
WIRING DIAGRAM — COMPASS & INSTRUMENT LIGHTS

SIZE: C | CODE IDENT. NO.: 71379 | DWG NO: 0700092

SCALE: NONE | 180-185 | PAGE: 11.4.3

(SR7400)(SR7401) IX

FORM NO. 80-215B



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD 1 POST LT TO LH PANEL & WIRES (SR7588)(SR7400)IX(SR7401)IX	DLP 7-21-73	
B	BY REV: ADD LB33(REF), S1637-2, LB11(REF) S-1637-1 &-2 (2 PLACES) LB14(REF), LB24(REF) LB17(REF), WHT(REF), 1513837 & MS15584-2, 0713068-2 & MS25237-327, CHANGE NOTE 2 TO INCLUDE LB15, LB15(REF) WAS LB14(REF) (NOW SHOP PRACTICE) MER EO 234, EO247	JEG 6-20-74	
C	BY REV: LB15 TERMINATED AT LB31 WAS TERMINATED AT LB30 (NOW SHOP PRACTICE)	WB 11-6-74	JCY AC
D	BY REV: ADD DETAIL "A" (SR7907)(SR7908)	BLA 3-10-75	JCY WHH AC

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
13	MS25237-327	LAMP	(24V)
12	0713068-2	COMPASS LT	(12V)
11	1270479-2	LIGHT ASSY (CW)	
10	GE308	LAMP	(24V)
9	MS15584-2	LAMP	(12V)
8	1513837	POST LT ASSY	(24V)
7	1213379	POST LT ASSY	(12V)
6	S-1832-1	SWITCH	
5	S-1641-9	HOUSING	
4	S-1640-9	HOUSING	
3	S-1637-2	HOUSING	
2	S-1637-1	HOUSING	
1	1570166-1	DIMMING ASSY	

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-LB31	20			SEE LB28	S-1636-1		
R-LB30				SEE LB29	S-1635-2		
R-LB29				S-1635-2	S-1367-1-6		
R-LB28				S-1636-2	S-1636-1		
R-LB27				SOLDER	S-1635-1		
R-LB26				S-1636-1	SOLDER		
R-LB25				SOLDER	S-1635-1		
BLK(2)				SOLDER	S-1636-1		
BLK(1)				SOLDER	SOLDER		
RED/YEL(2)				S-1635-2	SOLDER		
RED/YEL(1)	20			SOLDER	SOLDER		

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. Wise	6-5-73
DRAWN	PAPE	6-3-73
CHECK	E. YOUNGERS	6-5-73
STRESS		
PROJ	Bergman	6-6-73
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — POST LIGHTING (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

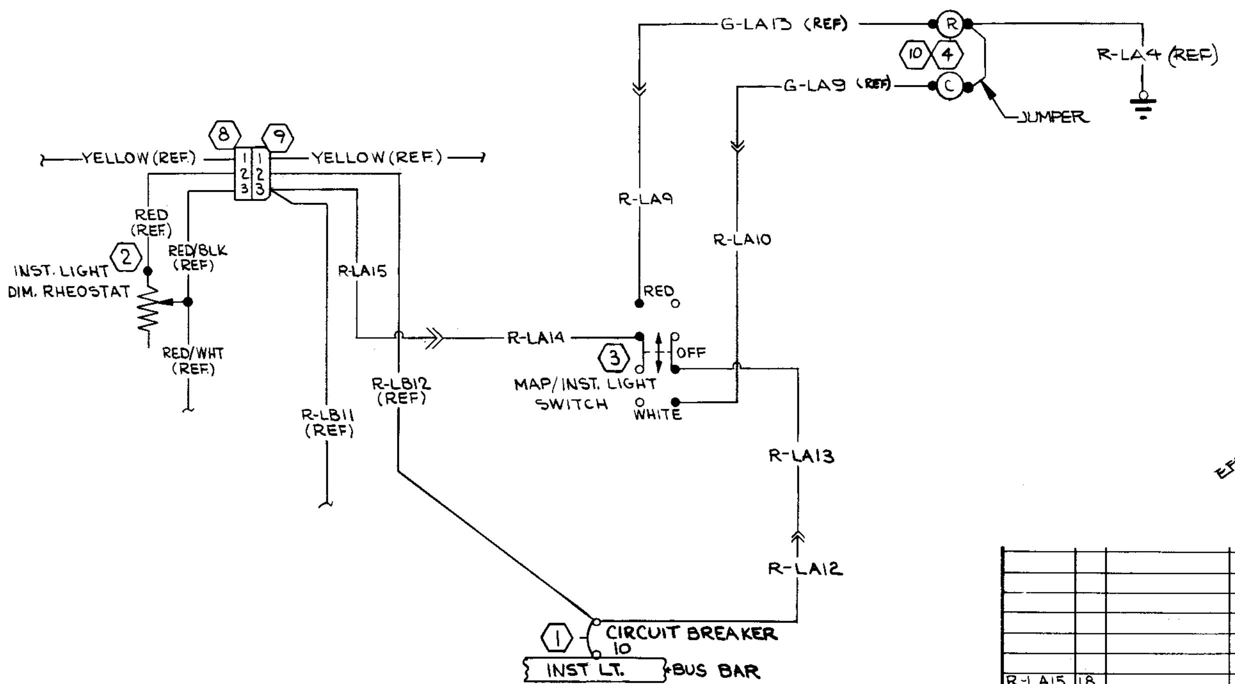
SCALE: NONE | 180-185 | PAGE: 11.4.4

FORM NO. 80-215B

(SR7400)(SR7401) IX

(SER 18051608 THRU 18051774)
(SEE 186-0968 THRU 185-1149)

CHG LET	REVISION	BY DATE	CHK APPD
A	BY REV: ADD 1470089-13 FOR 24 VOLT SYSTEM	CG 6-7-67	
B	BY REV: ADD WIRE LENGTHS NOW SHOP PRACTICE INACT DWG (SR7400)(SR7401)IX	DLO 5-22-73	RLY WKB



INACTIVE:
EFF THRU SER 18052384 IX 18502310 IX
DLO 5-22-73
RLY
WKB

R-LA15	18		60	S-1635-3	S-341-2		
R-LA14	18		6	S-341-2	SOLDER		
R-LA13	18		6	S-341-2	SOLDER		
R-LA12	18		45	S-1367-1-6	S-341-2		
R-LA10	18		6	SOLDER	S-341-2		
R-LA9	18		6	SOLDER	S-341-2		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

10	1470089-13	LIGHT ASSY	24 VOLT
9	S-1638-2	HOUSING-CAP	
8	S-1638-1	HOUSING-PLUG	
7	S-1637-2	HOUSING-PLUG	
6	S-1637-1	HOUSING-CAP	
5			
4	1470089-14	LIGHT ASSY	12 VOLT
3	S-1501-1	SWITCH	
2	S-1880-2	RHEOSTAT (TRTA)	
1	S-1360-10	CIRCUIT BREAKER	
ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON

EQUIPMENT TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	BLISS	6-23-65
GROUP	V. Wine	8-12-65
CHECK	R. Stuck	8-12-65
PROJ	[illegible]	8-14-65

TITLE: WIRING DIAGRAM— MAP LIGHT (OPTIONAL)

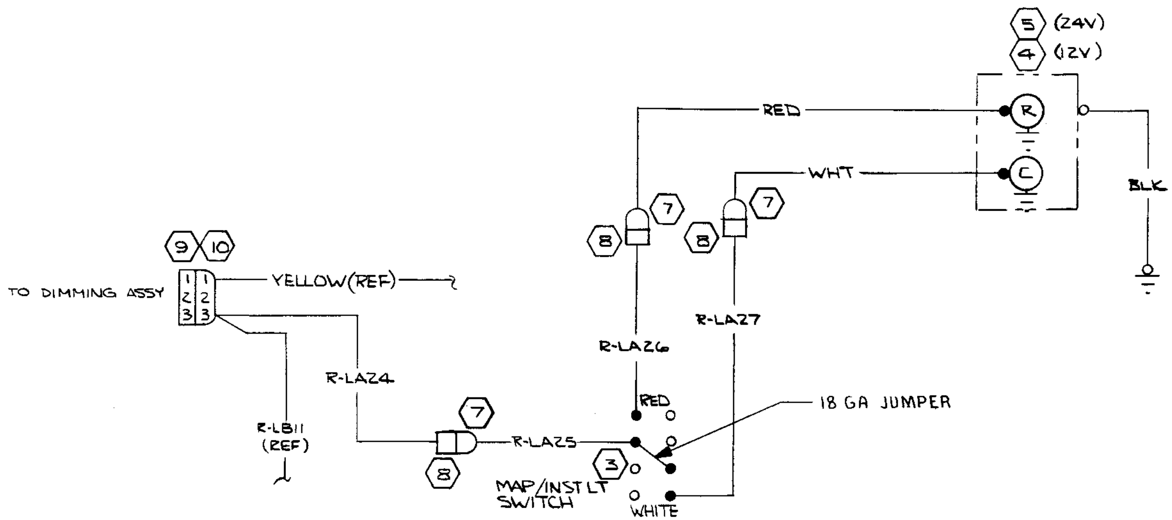
Cessna®

DWG NO: 0700092

SUPERSEDED BY: 0700092 PG 11.11.1 | SUPERSEDES: 0700092 PG. 11.11 | MODEL: 180-185 | REV: A | PAGE: 11.11.1

FORM NO. 88-161A

LET	DESCRIPTION	DATE	APPD
REVISION			
A	BY REV: DELETED WIRES R-LA23 & R-LA22 ADD: 18GA JUMPER WIRE (SR 7400)(REF) & (SR7401)(REF)	8-15-73 MWJ	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK	18	-18-0		S-1367-1-10	S-1367-1-8		
WHT		-18-9		SOLDER	S-1635-2		
RED		-18-2		SOLDER	S-1635-2		
R-LA27				SOLDER	S-1636-2		
R-LA26				SOLDER	S-1636-2		
R-LA25				S-1635-2	SOLDER		
R-LA24	18			S-1635-3	S-1636-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
10	S-1638-2	HOUSING	
9	S-1638-1	HOUSING	
8	S-1637-2	HOUSING	
7	S-1637-1	HOUSING	
6			
5	1470089-13	LIGHT ASSY	
4	1470089-14	LIGHT ASSY	
3	S-1501-1	SWITCH	
2	S-1880-2	REOSTAT (TRTA)	
1			

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0700092 PG 11.11.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	6-5-73
DRAWN	J L OLLER	5-29-73
CHECK	R. YOUNGERS	5-29-73
STRESS		
PROJ	Bergman	6-6-73
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE **WIRING DIAGRAM — MAP LIGHT (OPT)**

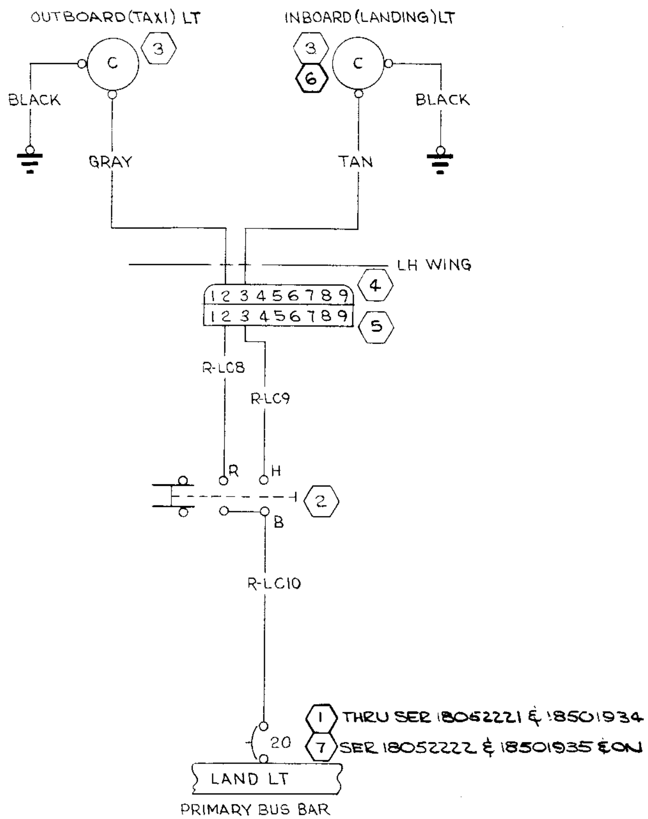
SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092

SCALE: NONE | SR7400 & SR7401 | PAGE: 11.11.2

FORM NO. 80-215B

(SER 18051775) & ON
(SER 185-1155) & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD 0842215-9 FOR 24 VOLT SYSTEM	CG 6-7-67	YAK
B	BY REV: INACT. DWG; ADD S-1360-20L & SER; SER OUT S-1360-10 (SR7058)(SR7059) IX	RCA 9-5-72	HLW MGR WKB



INACTIVE
EFF THRU SER 18052284 & 18502090
9-5-72
RCA MGR
HLW WKB

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
7	S-1360-20L	CIRCUIT BKR	
6	0842215-9	LIGHT	24 VOLT
5	S-1641-9	HOUSING-SOCKET	
4	S-1640-9	HOUSING-PIN	
3	0523118-1	LIGHT	12 VOLT
2	0713035	SWITCH ASSY	
1	S-1360-20	CIRCUIT BREAKER	

EQUIPM[illegible]T TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BLACK	16	S-1460-16-0		S-1367-2-8	S-1367-2-8		STD
BLACK	16	S-1460-16-0		S-1367-2-8	S-1367-2-8		STD
TAN	14	S-1460-14-10		S-1635-2	S-1367-2-8		STD
GRAY	14	S-1460-14-8		S-1635-2	S-1367-2-8		STD
R-LC9	14			S-1367-2-8	S-1636-2		STD
R-LC8	14			S-1367-2-8	S-1636-2		
R-LC10	14			S-1367-2-6	S-1367-2-8		

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	1-4-66
GROUP	H. Wise	1-4-66
CHECK	R. Stuck	1-4-66
PROJ	JR Settle	1-6-66

TITLE: WIRING DIAGRAM— LANDING & TAXI LIGHTS (OPT)

Cessna

DWG NO: 0700092

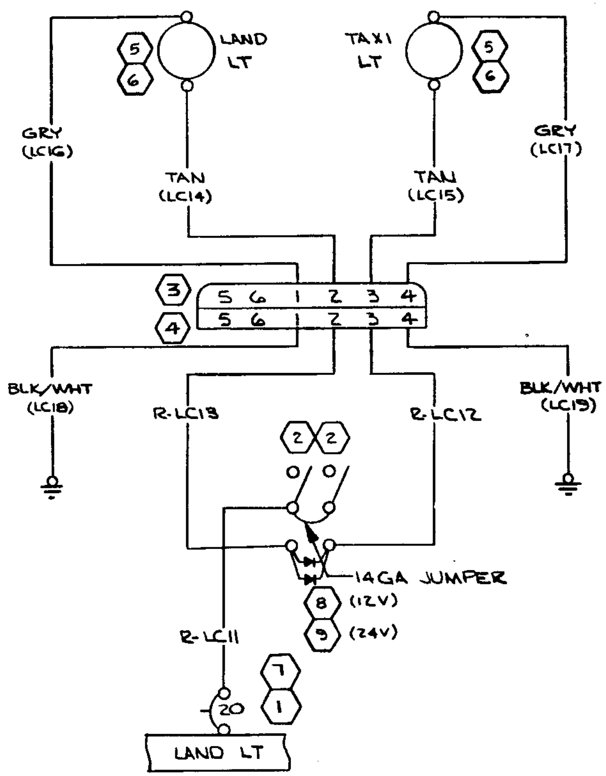
SUPERSEDED BY: 0700092 PG 11.12.1 | SUPERSEDES: 0700092 PP 11.2 | MODEL: 180-185 | REV: B | PAGE: 11.12

FORM NO. 80-161A

NOTES:

1 ~~WIRES TO BE FABRICATED FROM COLOR CODED MATERIAL~~

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE 14 GA JUMPER; ADD LC18 & LC19 & WIRE LENGTHS; DELETE "OPT" FROM TITLE & NOTE 1 NOW SHOP PRACTICE	DLP 6-3-73	NLW WKB
B	BY REV: ADD 1270082-1 & 1270082-2 (SR740)(SR7401) IX	DLP 6-18-73	NRW MAR WKB
C	BY REV: S-1640-6 WAS S-1637-1 (4) & S-1641-6 WAS S-1637-2 (4) (NOW SHOP PRACTICE)	DLO 11-10-73	WNF MAR WKB



BLK/WHT (R-LC19)	14	-14-0-9	65	S-1635-2	S-1367-2-8		
BLK/WHT (R-LC18)	14	-14-0-9	65	S-1635-2	S-1367-2-8		
GREY (R-LC17)	14	-14-8	68	S-1367-2-8	S-1636-2		
GREY (R-LC16)	14	-14-8	45	S-1367-2-8	S-1636-2		
TAN (R-LC15)	14	-14-10	68	S-1367-2-8	S-1636-2		
TAN (R-LC14)	14	-14-10	45	S-1367-2-8	S-1636-2		
R-LC13	14		65	S-1493-2	S-1635-2		
R-LC12	14		65	S-1493-2	S-1635-2		
R-LC11	14		10	S-1367-2-6	S-1493-2		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

9	1270082-1	DIODE ASSY (24V)	
8	1270082-2	DIODE ASSY (12V)	
7	S-1360-10L	CIRCUIT BKR (24V)	
6	4509	LAMP (12V)	24446
5	4591	LAMP (24V)	24446
4	S-1641-6	HOUSING	
3	S-1640-6	HOUSING	
2	S-2160-1	SWITCH	
1	S-1360-20L	CIRCUIT BKR (12V)	
ITEM NO.	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0700092 PG 11.12

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	9-11-72
GROUP	H. Wise	9-11-72
DRAWN	RCAntell	9-1-72
CHECK	R YOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	MR	
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

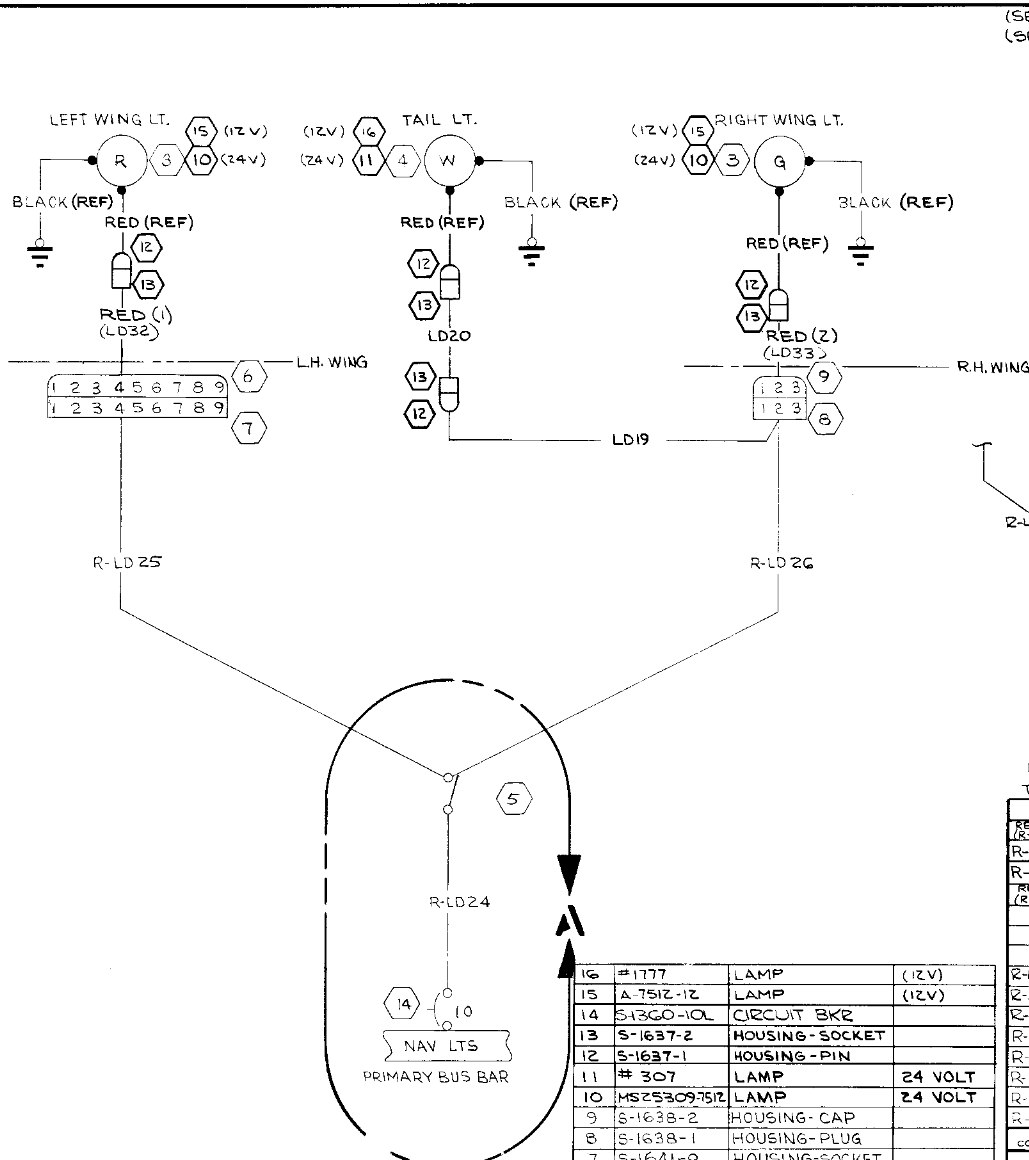
TITLE

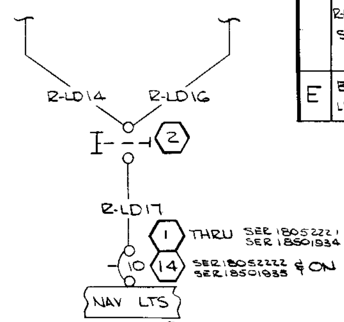
WIRING DIAGRAM — LANDING & TAXI LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	0700092

SCALE: NONE | SR7058/SR7059 II | PAGE: 11.12.1

FORM NO. 80-2158





DETAIL A
THRU SER 18052284 & 18502090

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD AN3122-1524 & MS35478-305 FOR 24 VOLT SYSTEM	CG 6-7-67	YAK
B	BY REV: C622001-0102 WAS 0423006-21 & -22, C622001-0102 WAS 0433006-7 ITEM 3 WAS ITEM 5 R-LD19 WAS R-LD15 & R-LD20 WAS R-LD7; ADD R-LD18, R-LD21 S-1637-1, S-1637-2; DELETE 3 RED WIRES & 3 BLACK WIRES ED&RR 01163 ED&RR 01335	RCC 1-6-67	RLL DGK
C	BY REV: RED WIRE WAS LD18 & RED WIRE WAS LD21 ED&RR 01999	RLY 4-2-68	GKI MDS
D	BY REV: ADD R-LD24, R-LD25, R-LD26, DETAIL A & S-2160-1; SER OUT R-LD14, R-LD16 & R-LD17; ADD S-1360-10L & SER & SER OUT S-1360-10 (SR7058) (SR7059) IX	RCA 9-1-72	WKB
E	BY REV: ADD LD32, LD33 & WIRE LENGTHS; NOW SHOP PRACTICE	RAM 6-3-73	WKB

ITEM NO.	PART NO.	DESCRIPTION	INSTALLED ON
16	#1777	LAMP	(12V)
15	A-7512-12	LAMP	(12V)
14	S-1360-10L	CIRCUIT BKR	
13	S-1637-2	HOUSING-SOCKET	
12	S-1637-1	HOUSING-PIN	
11	# 307	LAMP	24 VOLT
10	MS25309-7512	LAMP	24 VOLT
9	S-1638-2	HOUSING-CAP	
8	S-1638-1	HOUSING-PLUG	
7	S-1641-9	HOUSING-SOCKET	
6	S-1640-9	HOUSING-PIN	
5	S-2160-1	SWITCH	
4	C622001-0102	TAIL LIGHT ASSY	
3	C622001-0202	WING LIGHT	
2	0713026-4	SWITCH ASSY	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
RED (2) (R-LD33)	18	-18-2	214	S-1635-2	S-1636-1		
R-LD20	18			S-1636-1	S-1636-1		
R-LD19	18			S-1637-1	COMMON TERM TO R-LD16		
RED (1) (R-LD32)	18	-18-2	214	S-1635-2	S-1636-1		
R-LD26	18		79	COMM TERM WITH R-LD25	S-1636-2		SER 18052285 & 18502091 & ON
R-LD25	18		64	S-1493-1	S-1636-2		SER 18052285 & 18502091 & ON
R-LD24	18		6	S-1367-1-6	S-1493-1		SER 18052285 & 18502091 & ON
R-LD16	18		79	S-1367-1-8	S-1636-2		THRU SER 18052284 & 18502090
R-LD15	18	THRU (SER 18051911) THRU (SER 185-1340)	246	S-341-2	COMMON TERM TO R-LD16		
R-LD14	18		64	S-1367-1-8	S-1636-2		THRU SER 18052284 & 18502090
R-LD7	18	THRU (SER 18051911) THRU (SER 185-1340)	20	S-341-2	SOLDER		
R-LD17	18		9	S-1367-1-6	S-1367-1-8		THRU SER 18052284 & 18502090

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	12-1-65
GROUP	H. Wise	1-4-66
CHECK	R. Stuck	1-4-66
PROJ	[illegible]	1-6-66

TITLE: WIRING DIAGRAM— WING AND TAIL LIGHTS

Cessna®

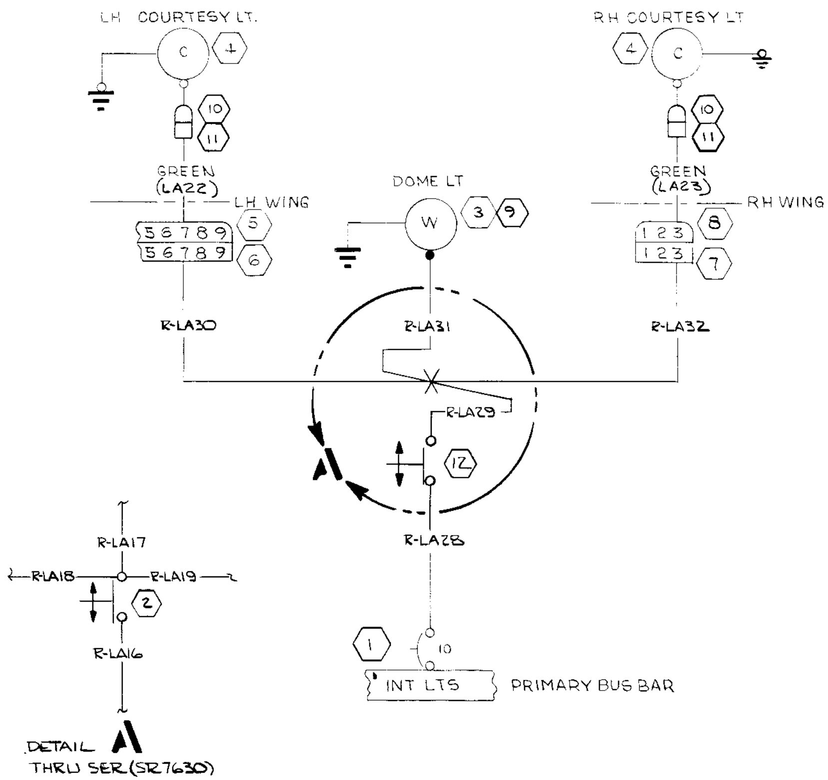
DWG NO: 0700092

SUPERSEDED BY:
SUPERSEDES: 0700092 PP11.6
MODEL: 180-185
REV: E
PAGE: 11.13

FORM NO. 80-161A

(SER 18051775) & ON
(SER 185-1150) & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: ADD MS25231-313 FOR 24 VOLT SYSTEM	C.G. 6-7-67	YAK
B	BY REV: ADD S-1637-1 S-1637-2, LA22, LA23 & SER; SER OUT GREEN (SR7400)(SR7401) IX	DLP 6-3-73	WKB
C	BY REV: ADD DETAIL "A" & S1831-1; SER OUT R-LA16, R-LA17, R-LA18 & R-LA19; SER IN R-LA28, R-LA29, R-LA30, R-LA31 & R-LA32 (SR7630)	DLO 7-24-73	WKB



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-LA32	18			SEE R-LA29	S-1636-2		SER (SR7630) & ON
R-LA31	18			SEE R-LA29	SOLDER		
R-LA30	18			SEE R-LA29	S-1636-2		
R-LA29	18			S-1370-2	S-1830-1		
R-LA28	18			S-1830-1	S-1367-1-6		SER (SR7630) & ON
GREEN (R-LA23)	18	-18-5	125	S-1635-2	S-1636-2		SER 18052385 & 18502311 & ON
GREEN (R-LA22)	18	-18-5	125	S-1635-2	S-1636-2		SER 18052385 & 18502311 & ON
GREEN	18	S-1460-18-5	125	S-1635-2	S-341-2		THRU SER 18052384 & 18502310
R-LA19	18		60	S-1367-1-6	S-1636-2		THRU SER (SR7630)
R-LA18	18		60	S-1367-1-6	S-1636-2		
R-LA17	18		6	S-1367-1-6	SOLDER		
R-LA16	18		102	COMMON TO WIRE R-LB12	S-1367-1-6		THRU SER (SR7630)

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
12	S-1831-1	SWITCH	
11	S-1637-2	HOUSING	
10	S-1637-1	HOUSING	
9	MS25231-313	LAMP	24 VOLT
8	S-1638-2	HOUSING-CAP	
7	S-1638-1	HOUSING-PLUG	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	0700615-5	COURTESY LIGHT INSTL	
3	0413142-5	DOME LIGHT	12 VOLT
2	0713029	SWITCH	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	12-1-65
GROUP	H. Wire	1-4-66
CHECK	R. Stuck	1-4-65
PROJ	J. Sattler	1-6-66

TITLE: WIRING DIAGRAM—COURTESY & DOME LIGHTS

Cessna®

DWG NO: 0700092

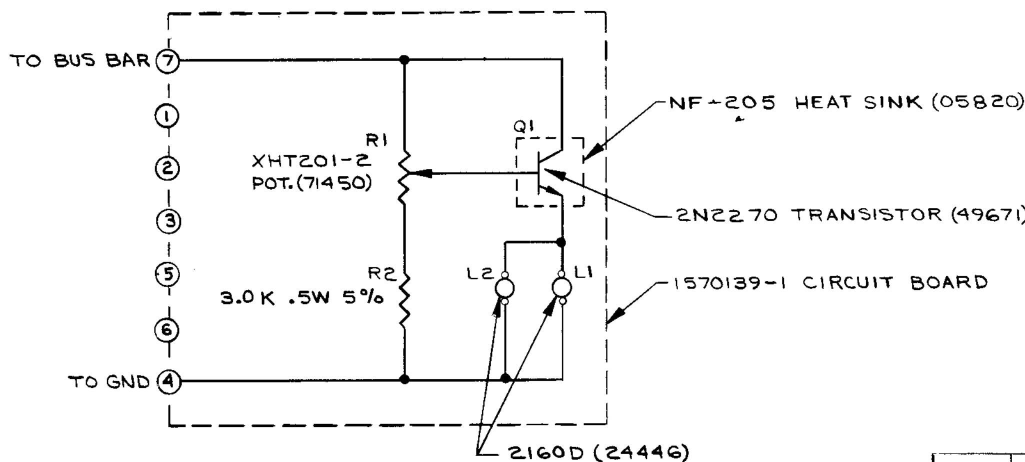
SUPERSEDED BY: | SUPERSEDES: 0700092, PP11.7, 11.8 | MODEL: 180-185 | REV: C | PAGE: 11.14

FORM NO. 80-161A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

NOTES:

1. ALL MATERIALS DEFINED ON THIS DRAWING ARE FOR REFERENCE AND TECHNICAL USE ONLY



WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	J Wedel	7-28-67
GROUP	H. Wise	7-27-67
DRAWN	C. GARCIA	9-19-67
CHECK	R. STUCK	9-19-67
STRESS		9-19-67
PROJECT	D.G Kollar	9-19-67
APPD	R.C. Moore	9-19-67

SUPERSEDES: 12337-794

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

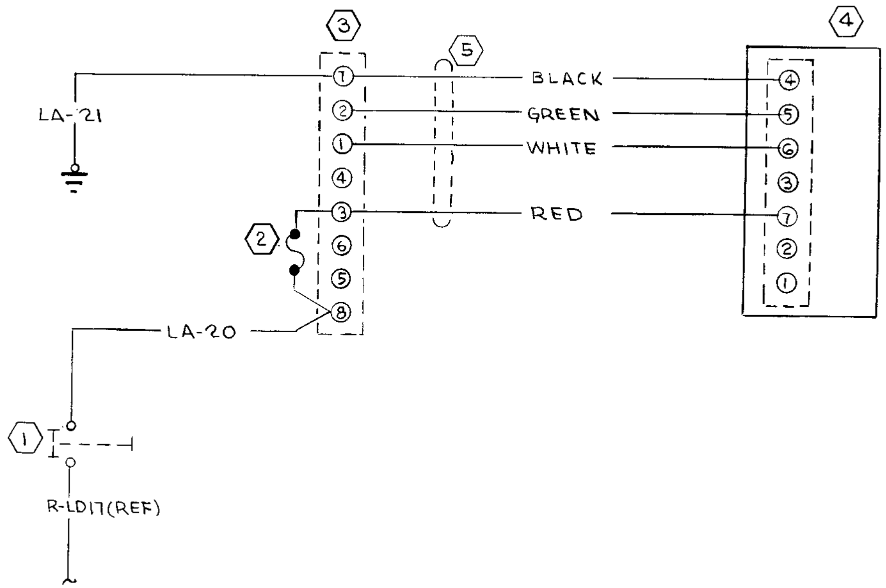
TITLE: WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL (12 VOLT)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0700092

SCALE: NONE PAGE: 11.15

FORM NO. 80-215

REVISION			
LET	DESCRIPTION	DATE	APPD



NOTES;

1 CORRECT POLARITY MUST BE OBSERVED. OTHERWISE, PERMANENT DAMAGE TO COMPONENTS ON 1570142-2 WILL OCCUR.

2. THESE WIRES PART OF 8409 CABLE.

3. PART NO. 320733, VENDOR CODE 00779.

4. PART NO. 329636, VENDOR CODE 00779.

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
RED				3	3		
WHITE				3	3		
GREEN				3	3		
BLACK				3	3		
LA-21	20			S1367-1-8	4		
LA-20	20			S1367-1-8	4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
5	8409	CABLE	(70903)
4	1570142-2	LIGHT ASSY	
3	8-171	TERMINAL STRIP	(71785)
2	1570141-1	FUSE ASSY	
1	0713035	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	8-29-67
GROUP	H. Wise	8-31-67
DRAWN	Harris	8-29-67
CHECK	YAKSHAW	8-30-67
STRESS	[illegible]	8-31-67
PROJECT	[illegible]	8-31-67
APPD	R.E. Moore	8-29-67

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL (OPT)

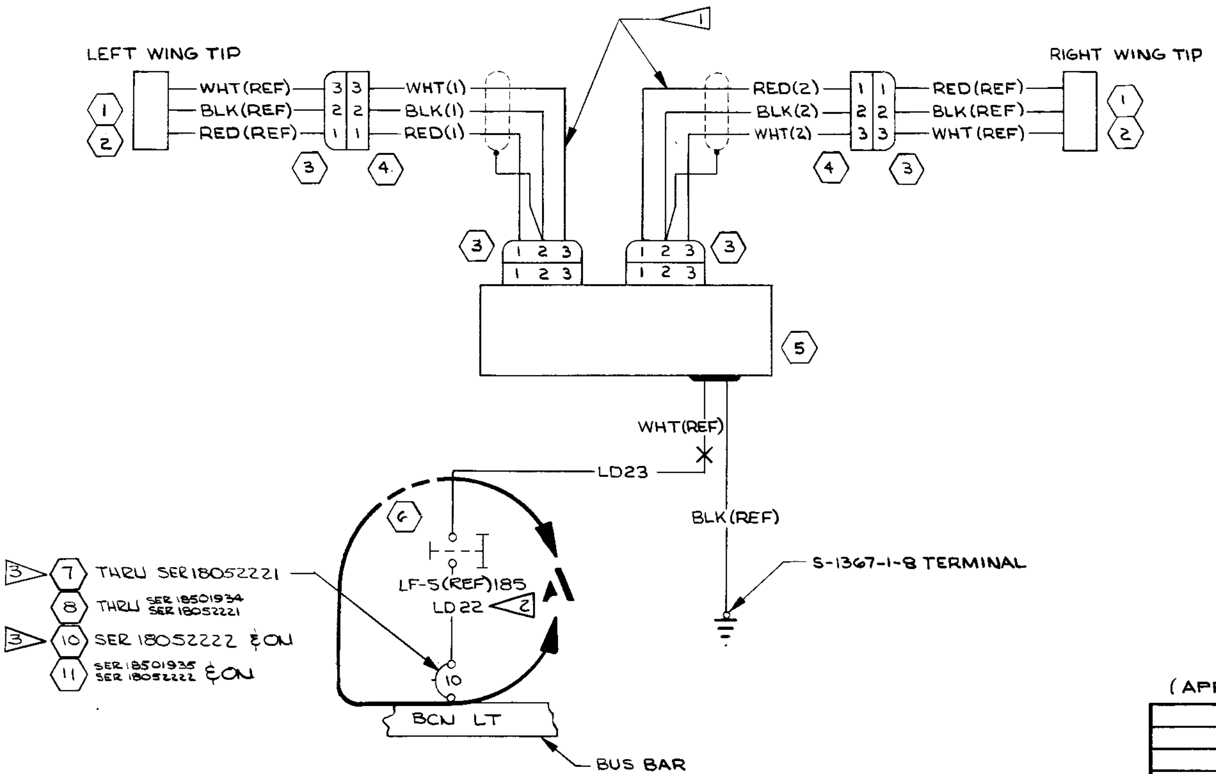
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	0700092

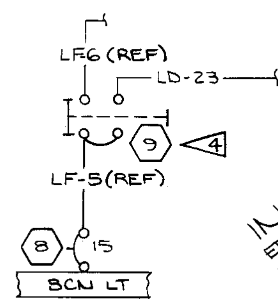
SCALE: NONE | 180 & 185 | PAGE: 11.16

(SER 18051876) & ON
(SER 185-1301) & ON

FORM NO. 80-215A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: (SR6600) WAS (SR6358) & (SR6359) SR6600	RLY 5-14-70	RD RLY HRW JDH
B	BY REV: ADD DETAIL "A", SER, NOTES 2,3 & 4, S-1360-15, 0713035, & SER; 18GA WAS 20 GA/LD22 & LD23, & C622004-0103 WAS C622004-0101 ED & RR 10087 & 10068 (SR6600)	JDH 8-21-70	LFW RLY VRS HRW
C	BY REV: ADD S-1360-10L & SER & S-1360-15L & SER; SER OUT S-1360-10 & S-1360-15; INACTIVATE DWG (SR7058) (SR7059) II	RCA 9-1-72	RLY HRW MGR WKB





DETAIL A
(APPLIES WHEN FLASHING BCN INSTL'D)

INACTIVE EFF THRU SER 18052284 & 18502090 9-1-72 RCA RLY HRW MGR WKB

NOTES:

1. THREE CONDUCTOR CABLE, BELDEN (70903) PART NO. 8770 OR EQUIVALENT TO BE USED
2. NOT REQUIRED ON 180 OR 185 WHEN FLASHING BCN IS INSTALLED
3. S-1360-10 (-10L) CKT BKT REQUIRED ON 180, S1360-15 (-15L) REQUIRED ON 180 WHEN FLASHING BCN IS INSTALLED
4. 0713026-4 SWITCH USED ON 180 ONLY WHEN FLASHING BCN NOT INSTALLED. 0713035 SWITCH USED ON 180 & 185 WITH FLASHING BCN

ITEM NO.	PART NO.	DESCRIPTION	
11	S-1360-15L	CIRCUIT BKR	
10	S-1360-10L	CIRCUIT BKR	
9	0713035	SWITCH	
8	S-1360-15	CKT BKR	3
7	S-1360-10	CKT BKR	3
6	0713026-4	SWITCH	4
5	C622004-0103	POWER SUPPLY	
4	S-1638-1	PLUG	
3	S-1638-2	CAP	
2	C622003-0104	LENS	
1	C622003-0101	LIGHT	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
WHT(2)	18	1		S-1635-2	S-1636-2	
BLK(2)	18	1				
RED(2)	18	1				
WHT(1)	18	1				
BLK(1)	18	1				
RED(1)	18	1		S-1635-2	S-1636-2	
LD22	18			S-1367-1-8	S-1493-1	
LD23	18			S-1370-1	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:

SUPERSEDED BY: 0700092 PG 11.17.1

CONTRACT NO:

	NAME	DATE
DESIGN	Cook	12-29-69
GROUP	H. Wise	12-23-69
DRAWN	J. D. RAINES	12/22/69
CHECK	HARRIS	12-23-69
STRESS		
PROJ	F. Parker	1-2-70
APPD	R. YOUNGERS	12-23-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

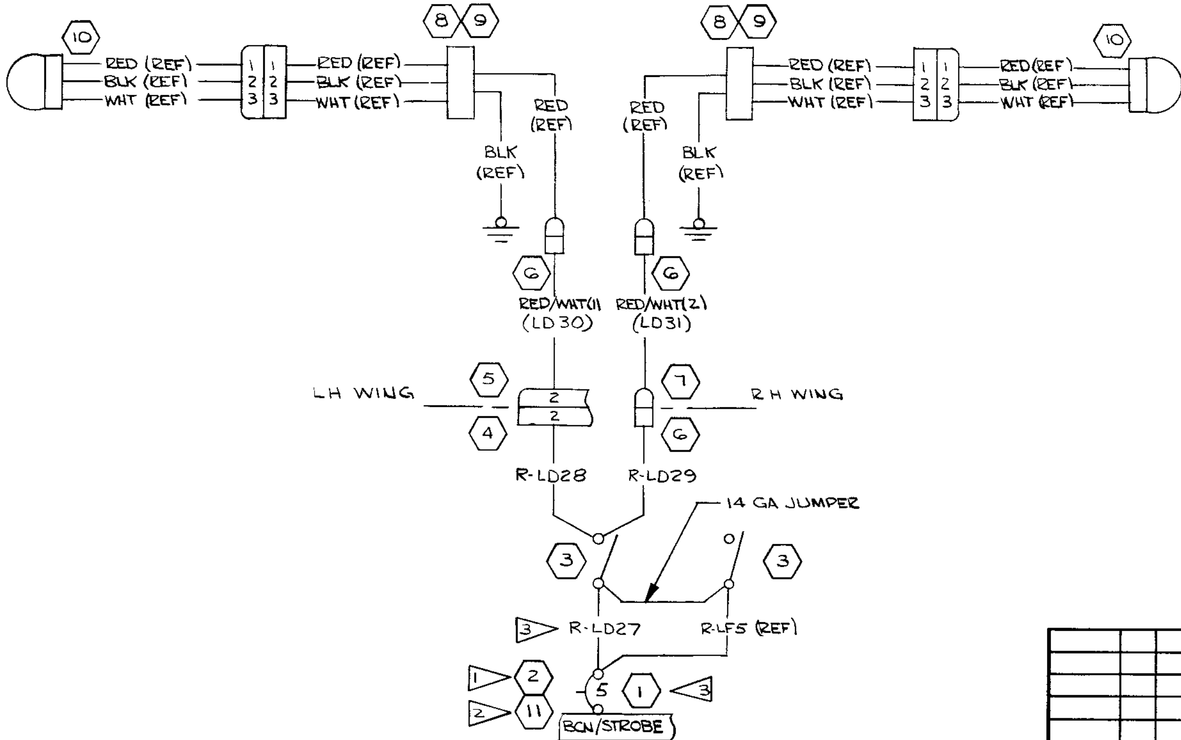
TITLE
WIRING DIAGRAM — WING TIP STROBE LIGHT

SIZE C | CODE IDENT. NO. 71379 | DWG NO 0700092
SCALE: NONE | 180 & 185 | PAGE: 11.17

FORM NO. 80-215B

ED & RR 10842 (SR6600)

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD LD30, LD31 & WIRE LENGTHS; LD27 WAS LD24, LD28 WAS LD25, & LD29 WAS LD26	RAM 6-3-73	HRW WKB
B	BY REV: IN NOTE 1, S-1360-20L WAS S-1360-15L. (SR 8260)	BAH 5-13-75	RAM AC



NOTES

1. S-1360-20L CIRCUIT BKR TO BE USED ON THE 180 WHEN INSTALLED WITH FLASHING BEACON & ON THE 12V 185.
2. S-1360-10L CIRCUIT BKR TO BE USED ON THE 24V 185
3. THESE ITEMS TO BE USED ON THE 180 WHEN INSTALLED WITHOUT FLASHING BEACON ONLY

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED/WHT(2) (R-LD31)	18	-18-2-9	216	S-1636-2	S-1635-2		
RED/WHT(1) (R-LD30)	18	-18-2-9	216	S-1636-2	S-1635-2		
R-LD29	18		79	S-1493-2	S-1636-2		
R-LD28	18		64	S-1493-2	S-1636-2		
R-LD27	18		6	S-1367-2-6	S-1493-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
11	S-1360-10L	CIRCUIT BKR	
10	CG22006-0101	LAMP	
9	CG22007-0103	PWR SUPPLY (24V)	
8	CG22007-0101	PWR SUPPLY (12V)	
7	S-1637-1	HOUSING	
6	S-1637-2	HOUSING	
5	S-1640-9	HOUSING	
4	S-1641-9	HOUSING	
3	S-2160-1	SWITCH	
2	S-1360-15L	CIRCUIT BKR	
1	S-1360-5L	CIRCUIT 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: 0700092 PG 11.17

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W COOK	9-11-72
GROUP	H. Wise	9-11-72
DRAWN	R CAXTELL	9-5-72
CHECK	R. YOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	MGR	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPT)

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 0700092

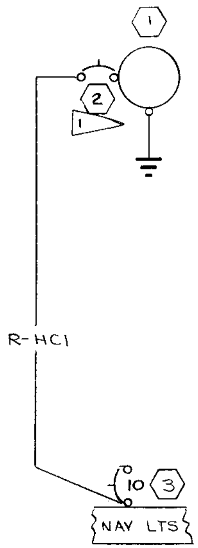
SCALE: NONE (SR7058) (SR7059) PAGE: 11.17.1

FORM NO. 80-215B

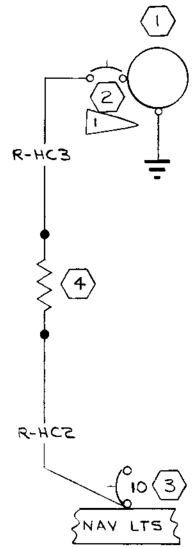
IX (SER 18051608 & ON)
(SER 185-0968 & ON)

NOTES:
1 CIRCUIT BREAKER IS RESET BY INSERTING A PROBE INTO THE 5/64 HOLE IN BREAKER FACE AND PUSHING LIGHTLY UNTIL A CLICK IS HEARD.

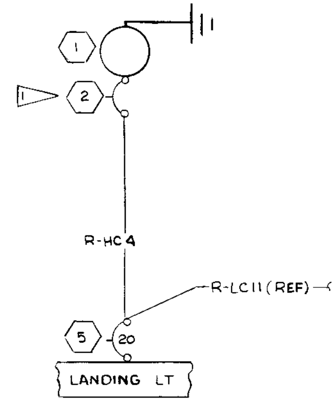
CHG LET	REVISION	BY / DATE	CHK / APPD
A	BY REV: SER IN R-HC4, R-HC5, & S-1360-20; SER OUT R-HC1, R-HC2, (SR7907)IX(SR7908)IX(MER EO 320)	BLA 10-7-74	JCY JRG AC



THRU SER (SR7907)(SR7908)
(18052620, 18502838)

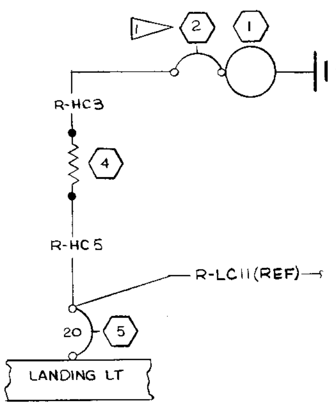


VIEW APPLIES TO 24V SYSTEM ONLY
THRU SER (SR7908)
(18502838)



SER (SR7907)(SR7908) & ON
(18052621, 18502839)

08-267-0905



24 VOLT SYSTEM
SER (SR7908) & ON
(18502839)

ITEM NO.	PART NO.	DESCRIPTION	INSTALLED ON
5	S-1360-20L	CIRCUIT BREAKER	
4	IDI 760	RESISTOR (OM)	
3	S-1360-10L	CIRCUIT BREAKER	
2	60232-1	CIRCUIT BREAKER	(CUE)
1	0513052-3	LIGHTER ASSY	

EQUIPMENT TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
R-HC5	16			S-1367-2-6	SOLDER	24 V	SER (SR7908) & ON
R-HC4	16			S-1367-2-6	S-1367-2-8		SER (SR7907)(SR7908) & ON
R-HC3	16			SOLDER	S-1367-2-8	(24V SYSTEM ONLY)	
R-HC2	16			S-1367-2-6	SOLDER	(24V SYSTEM ONLY)	THRU SER (SR7908)
R-HC1	16			S-1367-2-6	S-1367-2-8		THRU SER (SR7907)(SR7908)

WIRE TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	RIDDER	2-19-65
GROUP	H&W	3-22-65
CHECK	E. Stuck	3-22-65
PROJ	R. Sattler	3-22-65

TITLE: WIRING DIAGRAM— CIGAR LIGHTER

Cessna®

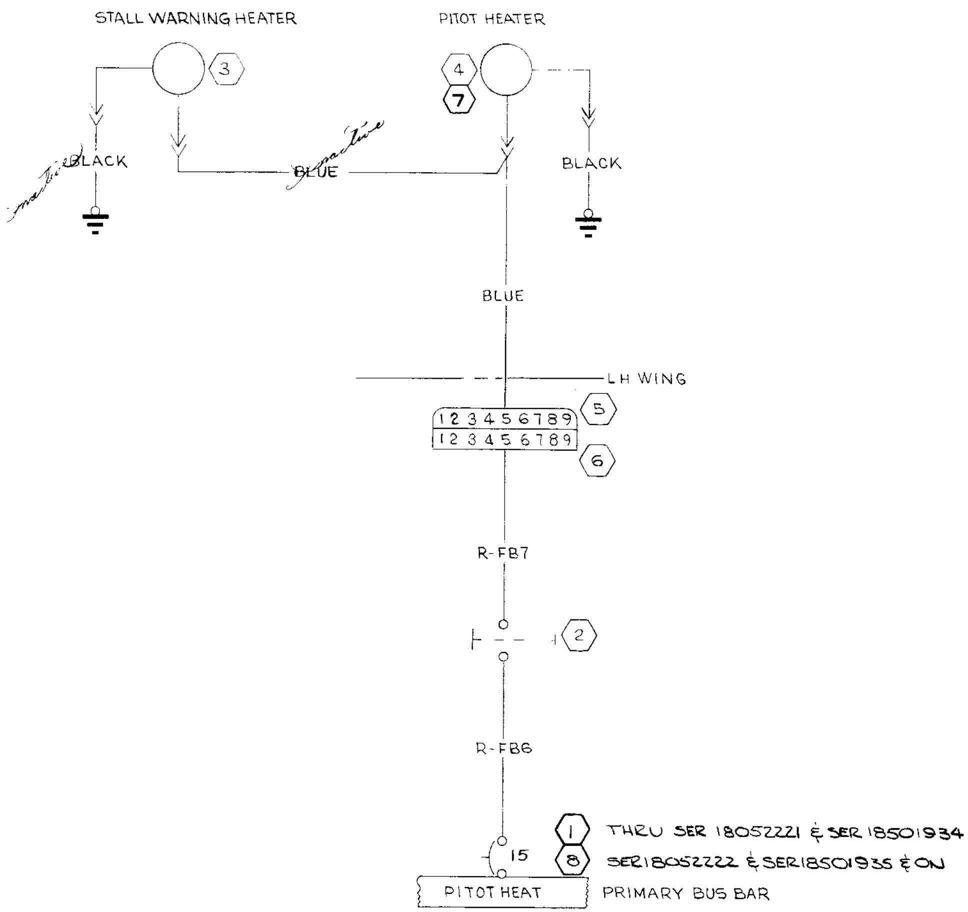
DWG NO: 0700092

SUPERSEDED BY: | SUPERSEDES: 0700092 PAGE 13.1 | MODEL: 180 & 185 | REV: | PAGE: 13.1.1

FORM NO. 80-161A

(SER 18051775) & ON
(SER 185-1150) & ON

CHG LET	REVISION	BY / DATE	CHK / APPD
A	S-1360-15 WAS S-1360-10 (SER 18051778) & ON, (SER 185-1153) ON	GLW 7-25-66	HLW
B	BY REV: ADD 0721105-9 FOR 24 VOLT SYSTEM; INACTIVATED BLACK & BLUE WIRES	C.G. 8-5-67	HLW
C	BY REV: ADD S-1360-15L & SER; SER OUT S-1360-15; INACTIVATE DRAWING (SR7058)(SR7059) IX	RCA 9-1-72	RLY HLW MCR WKB



INACTIVE
EFF THRU SER 18052284 & 18502090
9-1-72
RCA MCR
RLY HLW WKB

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
BLACK	18	S-1460-18-0		S-341-2	S-1367-1-8		
BLACK	18	S-1460-18-0		S-341-2	S-1367-1-8	INACT EFF	THRU SER 18051884 & ON SER 185-1198 & ON
BLUE	16	S-1460-16-6		S-341-2	COMMON TO BLUE (BELOW)	INACT EFF	THRU SER 18051824 & ON SER 185-1198 & ON
BLUE	16	S-1460-16-6		S-1635-2	S-341-2		STD
R-FB7	16			S-1367-2-8	S-1636-2		STD
R-FB6	16			S-1367-2-6	S-1367-2-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
8	S-1360-15L	CIRCUIT BKR	
7	0721105-9	PITOT HEATER	24 VOLT
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	0721105-5	PITOT HEATER	12 VOLT
3	0511062-5	STALL WARN. HEATER	12 VOLT
2	0713026-4	SWITCH ASSY	
1	S-1360-15	CIRCUIT BREAKER	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	1-4-66
GROUP	H Wise	1-4-66
CHECK	R. Stuck	1-4-66
PROJ	G.P. Settle	1-6-66

TITLE: WIRING DIAGRAM— PITOT AND STALL WARNING HEAT (OPT)

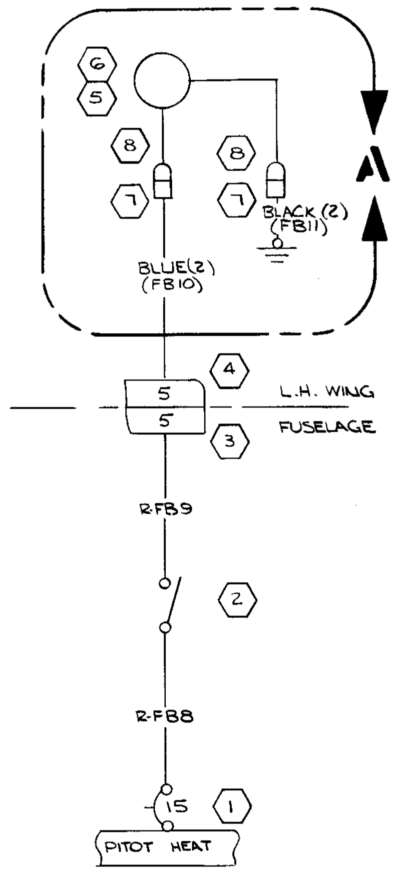
Cessna®

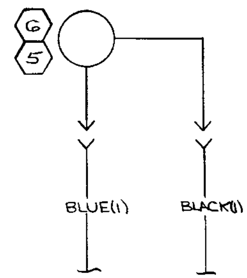
DWG NO: 0700092

SUPERSEDED BY:	SUPERSEDES:	MODEL:	REV:	PAGE:
0700092 PG 13.3.1	0700092, PP 13.2	180-185	C	13.3

FORM NO. 80-161A

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD FB10, FB11 & WIRE LENGTHS NOW SHOP PRACTICE	RAM 6-3-73	RLY HRW WKB
B	BY REV: 16 GA WIRE WAS 18 GA & CHANGE TERMINALS FOR COMPATIBLITY (NOW SHOP PRACTICE)	BLA 1-16-74	JCY WHH JRS





DETAIL A
THRU SER 18052319 & 18502157

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLACK(2) (R-FB11)	16	-16-0	7	S-1636-2	S-1367-2-8		SER 18052320 & 18502158 & ON
BLUE(2) (R-FB10)	16	-16-6	58	S-1635-2	S-1636-2		SER 18052320 & 18502158 & ON
BLACK(1)	18	-18-0	7	S-341-1	S-1367-2-8		THRU SER 18052319 & 18502157
BLUE(1)	18	-18-6	58	S-1635-2	S-341-1		THRU SER 18052319 & 18502157
R-FB9	16		62	S-1493-2	S-1636-2		
R-FB8	16		6	S-1367-2-6	S-1493-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
8	S-1637-1	HOUSING - CAP
7	S-1637-2	HOUSING-PLUG
6	0721105-9	PITOT HEATER (24V)
5	0721105-5	PITOT HEATER (12V)
4	S-1640-9	HOUSING
3	S-1641-9	HOUSING
2	S-2160-1	SWITCH
1	S-1360-15L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 0700092 PG 13.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	W Cook	9-11-72
GROUP	H. Wise	9-11-72
DRAWN	R.CAXTELL	9-5-72
CHECK	R.YOUNGERS	9-9-72
STRESS		
PROJ	Bergman	9-12-72
APPD	MGR	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — PITOT HEAT

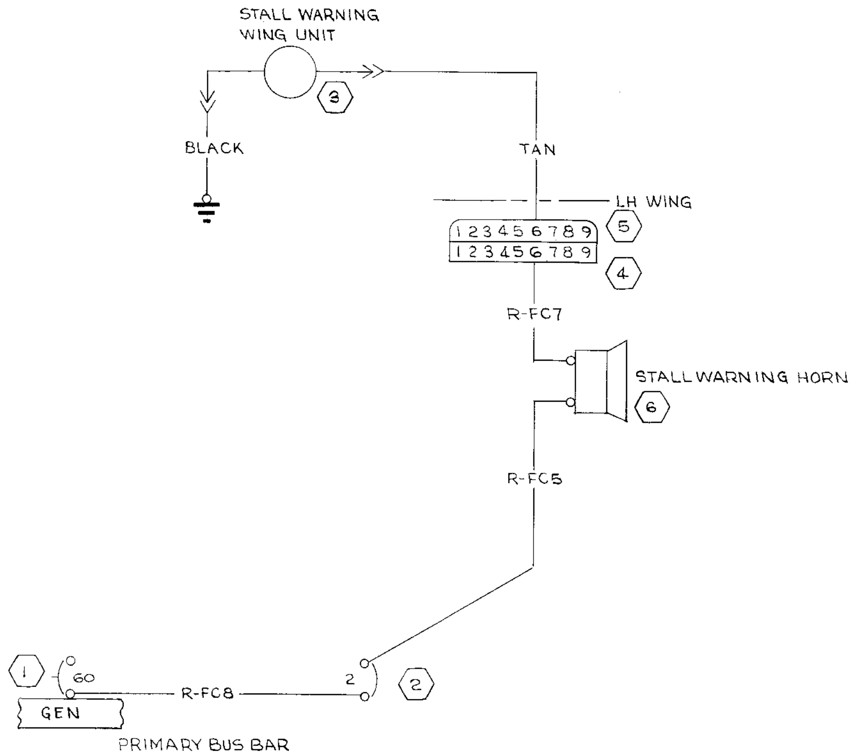
SIZE: C
CODE IDENT. NO. 71379
DWG NO 0700092

SCALE: NONE
(SR7058)(SR7059)IV
PAGE: 13.3.1

FORM NO. 80-215B

IX (SR4922)(SR4923)

CHG LET	REVISION	BY / DATE	CHK / APPD



INACTIVE:
EFF THRU SER (SR5117) (REF)
6-3-73
(1805/823 & 185-11976
185-1200)
DLP
2-7
HEW
WKB

BLACK	18	S-1460-18-0		S-341-2	S-1367-1-8		
TAN	18	S-1460-18-10		S-1635-2	S-341-2		
R-FC7	18			S-1367-1-6	S-1636-2		
R-FC8	18			S-1367-1-10	S-1367-1-6		
R-FC5	18		6	S-1367-1-6	S-1367-1-8		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	INSTALLED ON
6	S-1407-6	HORN ASSY	
5	S-1641-9	HOUSING-SOCKET	
4	S-1640-9	HOUSING-PIN	
3	0511062-4	STALL WARN.WING UNIT	
2	CA-2	CIRCUIT BREAKER	(MTCC)
1	S-1596-60	CIRCUIT BREAKER	

EQUIPMENT TABLE

CESSNA AIRCRAFT CO., COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

	NAME	DATE
DRAWN	W COOK	12-1-65
GROUP	H. Wise	1-4-66
CHECK	R. Stuck	1-5-66
PROJ	J. Sattler	1-6-66

TITLE: WIRING DIAGRAM— STALL WARNING HORN & XMTR

Cessna®

DWG NO: 0700092

SUPERSEDED BY: | SUPERSEDES: 0700092, PP 15.1 | MODEL: 180-185 | REV: | PAGE: 15.2

FORM NO. 80-1614

SECTION 20

DISPERSAL SYSTEMS

TABLE OF CONTENTS

WARNING

PLEASE OBSERVE PRECAUTIONS OUTLINED ON SHEET 2

20-1. DISPERSAL SYSTEMS. (Refer to figure 20-1.)

20-2. DESCRIPTION. The spray system is a self-contained, jettisonable, liquid dispersal system with a capacity of 151 gallons. The system is comprised of a streamlined, externally-mounted tank, liquid strainer, fan-driven spray pump, variable spray valve, wing-supported spray booms with changeable nozzles and appropriate controls for spray operations, liquid dumping and emergency tank jettisoning.

20-3. OPERATION. Liquid leaves the spray tank through an opening in the forward end of the tank and passes through a strainer. The liquid is then picked up by the fan-driven spray pump (when it is operating) and routed to the variable spray valve. If the spray valve control handle is pulled to the aft position (no spray output), the liquid is recirculated to the tank and promotes continual mixing of the tank contents. If the control handle is moved to the forward position, liquid enters the spray booms and is discharged through the nozzles. A small suck-back tube connecting the variable spray valve and the strainer allows material to drain back from the booms, preventing material from dripping from the nozzles.

20-4. SPRAY TANK.

20-5. DESCRIPTION. A streamlined, externally-mounted tank with a capacity of 151 gallons, is mounted under the belly of the AGcarryall aircraft. The tank is filled through an extended filler neck on the right side of the aircraft. A large vented filler cap seals the filler opening. When installing the cap, position it so that the vent scoop faces aft and down.

NOTE

If the vent is positioned to face forward, the tank could be pressurized excessively and cause siphoning of liquid from the tank vent tube on the left side of the tank.

A clear plastic tube on the right side of the tank serves as a sight gage of tank contents and is useful when filling the tank. If desired, the user may apply capacity markings on the side of the tank adjacent to the tube for later convenience when filling to a prescribed amount. Careful filling from a 5-gallon container will readily provide known quantity levels which can be labeled on the tank.

20-6. REMOVAL AND INSTALLATION.

a. Drain tank.
b. Refill with water and flush tank.
c. Disconnect all hose connections, controls and fairings; pull emergency tank release control and dump control from under tank.
d. Support tank and pull emergency tank release lever on left forward side of aircraft.
e. Remove straps along lower fuselage.
f. Reinstall bolts removed for installing straps.
g. Reverse the preceding steps to install the tank.

20-7. SPRAY PUMP.

20-8. DESCRIPTION. A 1-1/4" positive suction, double gear pump is mounted immediately behind the fan hub, at the front of the spray unit.

20-9. REMOVAL AND INSTALLATION.

WARNING

It is anticipated that operators, pilots, and other personnel directly concerned with aerial application of dust or liquid chemicals will be thoroughly familiar with precautionary measures to be taken. The following information is provided primarily for maintenance personnel who may be totally unfamiliar with these chemicals, but are required to perform maintenance on agricultural aircraft.

1. Most agricultural chemicals are toxic. Some are highly toxic and may even be fatal if exposure is prolonged or concentrated, or medical treatment is delayed.

2. Chemical poisoning can occur by inhalation into the lungs, ingestion through the mouth, or absorption through the skin.

3. Wear rubber gloves, rubber boots, and protective clothing. Gloves should be in good condition, clean on the inside. Wear a cap. Long-sleeved coveralls, which protect most of the body, should be changed daily or more often if obviously contaminated. Do not permit contaminated clothing to be laundered by someone who is unaware of the hazard in handling. In close areas, wear an approved respirator or other breathing device.

4. Wash the airplane thoroughly, especially that part of the airplane where work is to be performed. DO NOT steam clean, since steam would create a chemical vapor that could be obsorbed or inhaled more easily. Drainage from water run-off must be into an area where poisoning cannot occur.

5. Have a place conveniently located with plenty of soap and water available. Wash frequently. Avoid scratching or placing hands near mouth, nose, ears, or eyes. Take a shower at least once a day.

6. Do not carry cigarettes in a pocket, since they can absorb toxic materials. Do not eat or smoke in the work area.

7. It is to your advantage to know exactly what chemical was last used in the disperal equipment. Additional information may then be obtained by contacting the County Agent or a chemical supply house.

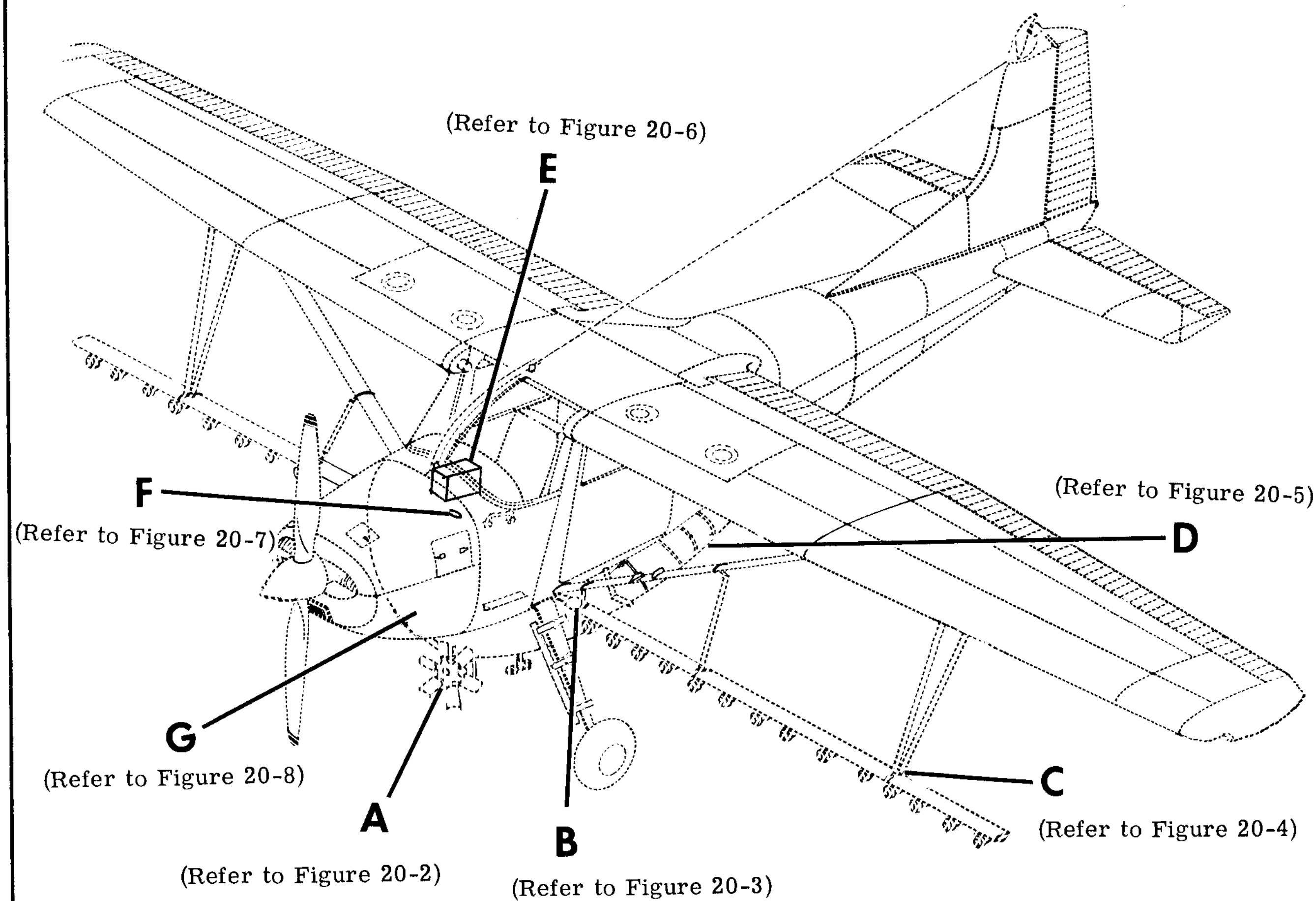


Figure 20-1. Spray System Component Location

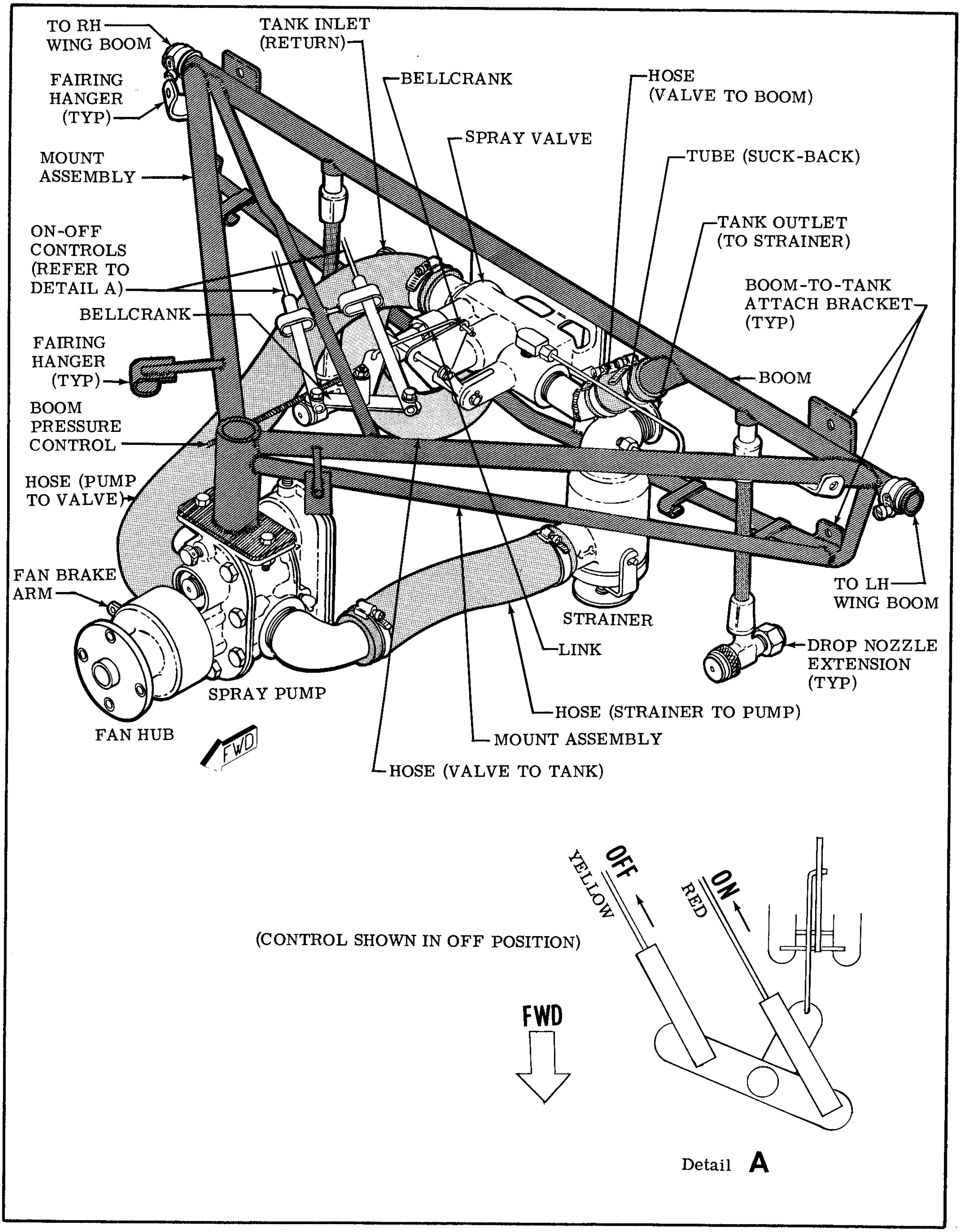
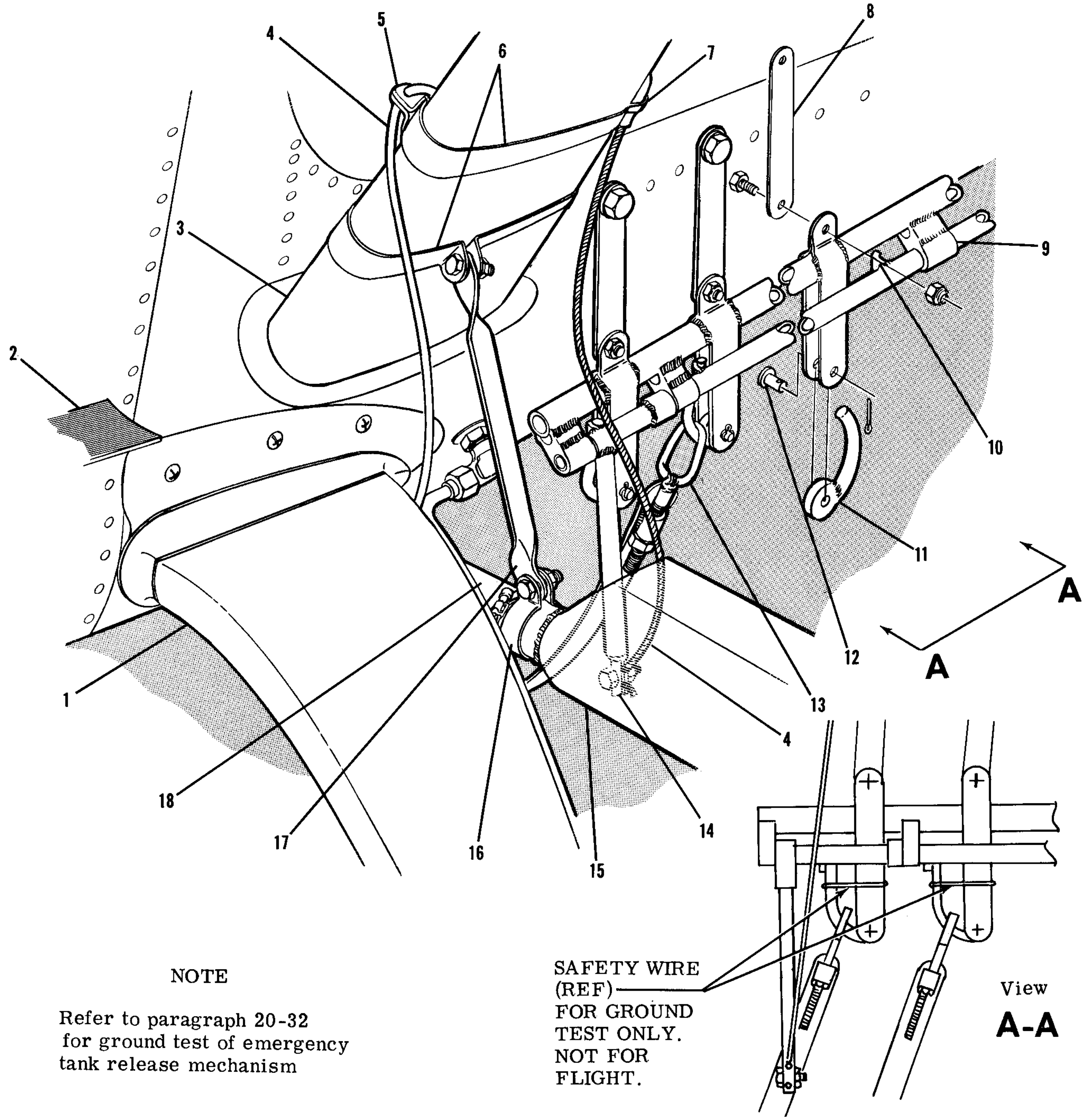


Figure 20-2. Pump, Strainer and Valve Installation

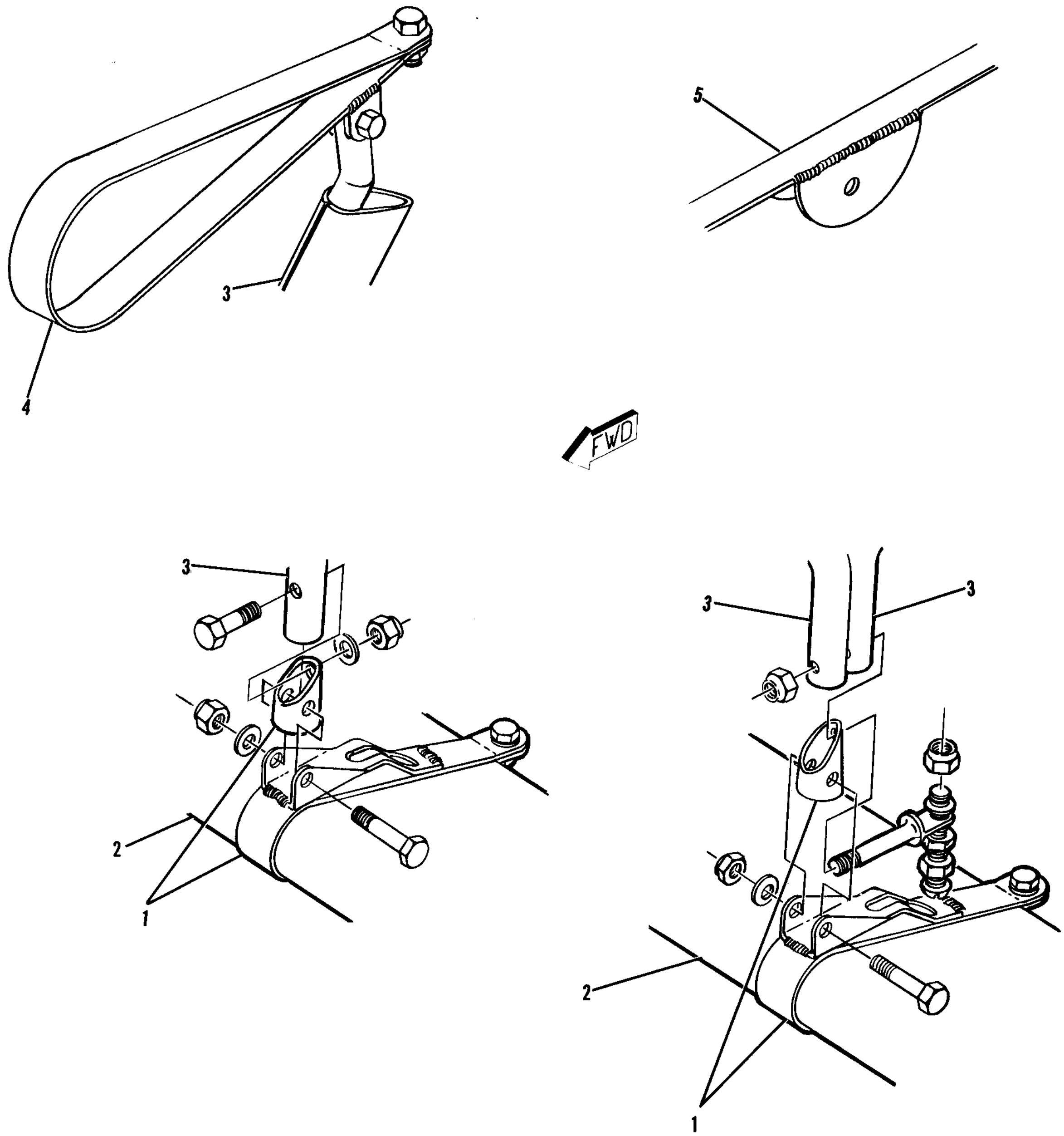


NOTE

Refer to paragraph 20-32 for ground test of emergency tank release mechanism

1. Landing Gear Strut
2. Refueling Step
3. Wing Strut
4. Emergency Tank Release Control
5. Leather Strap
6. Strut Clamp
7. Control Clamp
8. Strap
9. Emergency Tank Release Bar Mechanism
10. Tank Release Bar Tab
11. Toggle
12. Pin
13. Eye Bolt Assembly
14. Release Control Attach Tube
15. Wing Boom
16. Clamp
17. Strap (Spray Boom Hanger)
18. Hose

Figure 20-3. Emergency Tank Release Installation



1. Clamp Assembly
2. Spray Bar
3. Spray Bar Brace
4. Strut Clamp
5. Wing Strap

Figure 20-4. Spray Bar Clamping

a. Drain tank.
b. Remove hoses and clamping.
c. Disconnect fan brake control at fan brake arm.
d. Remove two bolts attaching pump to support assembly.

NOTE

Lubricate pump as required with MIL-G-21164 Moly Disulfide General Purpose Grease.

e. Reverse preceding steps to install pump.

20-10. STRAINER.

20-11. DESCRIPTION. A strainer with a removable screen is installed between the spray tank and the spray pump. The screen may be removed for inspection or cleaning without removing either the fairing or strainer. To remove the screen, first, drain tank, then loosen round compression bolt and rotate clamp from studs on strainer assembly, and remove cover and gasket. Check teflon gasket for deterioration and replace if required.

20-12. REMOVAL AND INSTALLATION.
a. Drain tank.
b. Disconnect strainer-to-pump hose at strainer.
c. Disconnect suck-back tube at strainer.
d. Disconnect nipple attaching strainer to tank; remove strainer.
e. Reverse preceding steps to install strainer.

20-13. SPRAY VALVE.

20-14. DESCRIPTION. A 1" inlet-outlet-bypass valve is installed between the spray pump and the boom inside the fairing, immediately forward of the spray tank. An adjustable boom pressure control is incorporated in the valve. Two additional controls are incorporated in the valve; as one port is opened, the other is closed, enabling material to either flow to the booms or back to the spray tank.

20-15. REMOVAL AND INSTALLATION.
a. Drain tank.
b. Remove fairings.
c. Disconnect hose routed from spray pump.
d. Disconnect return hose to tank.
e. Disconnect hose to boom.
f. Disconnect suck-back tube at valve.
g. Remove cotter pins securing link connecting bellcranks, and remove link.
h. Loosen clamp securing boom pressure control on pump support assembly adjacent to spray pump, and disconnect control.
i. Remove (4) bolts attaching valve to pump support structure.
j. Reverse preceding steps to install valve.

NOTE

Tank and pump support assembly may be removed as a unit.

20-16. SPRAY BARS (BOOMS).

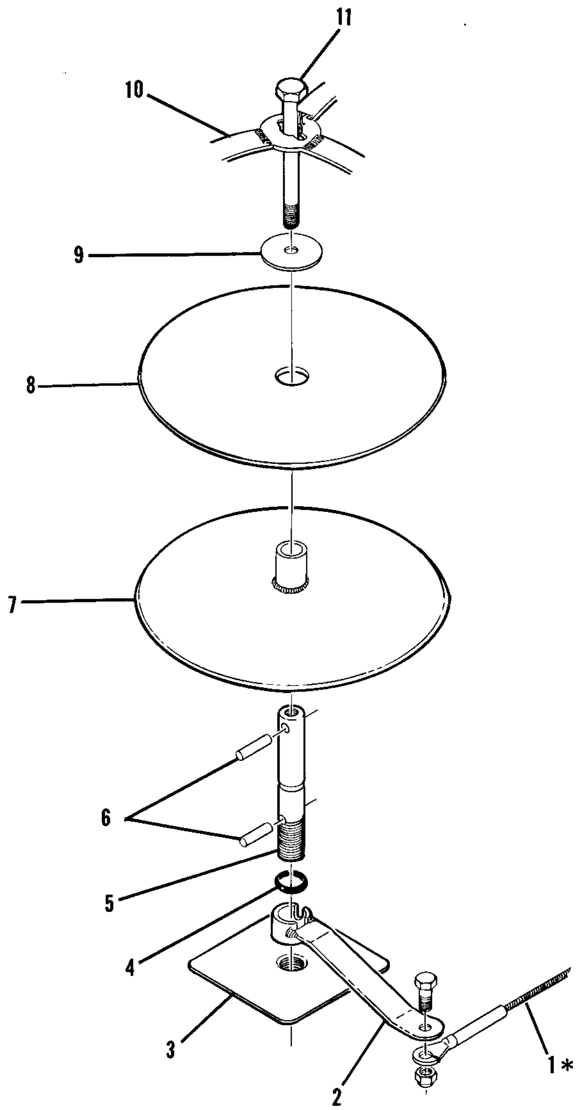
20-17. DESCRIPTION. (Refer to figure 20-4.) The spray bars carry material from the variable spray valve to the discharge nozzles. The spray bars are supported at the fuselage end by a brace attached to a clamp on the wing strut. A mid-wing support is also attached to a clamp on the wing strut. The outer end of the spray bar is attached to a strap which is wrapped around the outer wing by two spray bar braces.

20-18. REMOVAL AND INSTALLATION.
a. Support boom during removal to prevent bending and distortion of the spray bar or bracing when disconnected on one end.
b. Loosen inboard clamp securing spray bar hose connection to tank plumbing.
c. Disconnect top of inboard hanger strap from inboard strut. Replace bolt and nut and leave strut clamp on aircraft.
d. Disconnect top of middle boom brace from outboard strut clamp.
e. Disconnect top of both outboard spray bar braces (forward and aft) from wing strap.
f. With spray bar bracing disconnected, pull spray bar hose connection free from spray tank plumbing and remove spray bar and bracing from aircraft.
g. Plug or tape over exposed tank plumbing opening to prevent entry of foreign material.
h. Reverse preceding steps to install spray bars. If wing straps were also removed, care must be taken to ensure that protective lining is properly positioned under the strap to protect the painted surface. The straps should be tightened firmly, but not overly tight, or trailing edge skin can buckle. Electrical tape should be wrapped on the wing strut where strut clamps are to be reinstalled (if previously removed). The spray bars should be checked after installation to ensure that they are positioned with a slight angle-of-attack; in a neutral position, they may vibrate or flutter in flight.

20-19. SPRAY CONTROLS.

20-20. DESCRIPTION. Four spray system controls are contained in a control box, installed in the upper center of the instrument panel. A fifth control is located under the edge of the instrument panel, on the copilot's side, and is operated in the same manner as the parking brake.

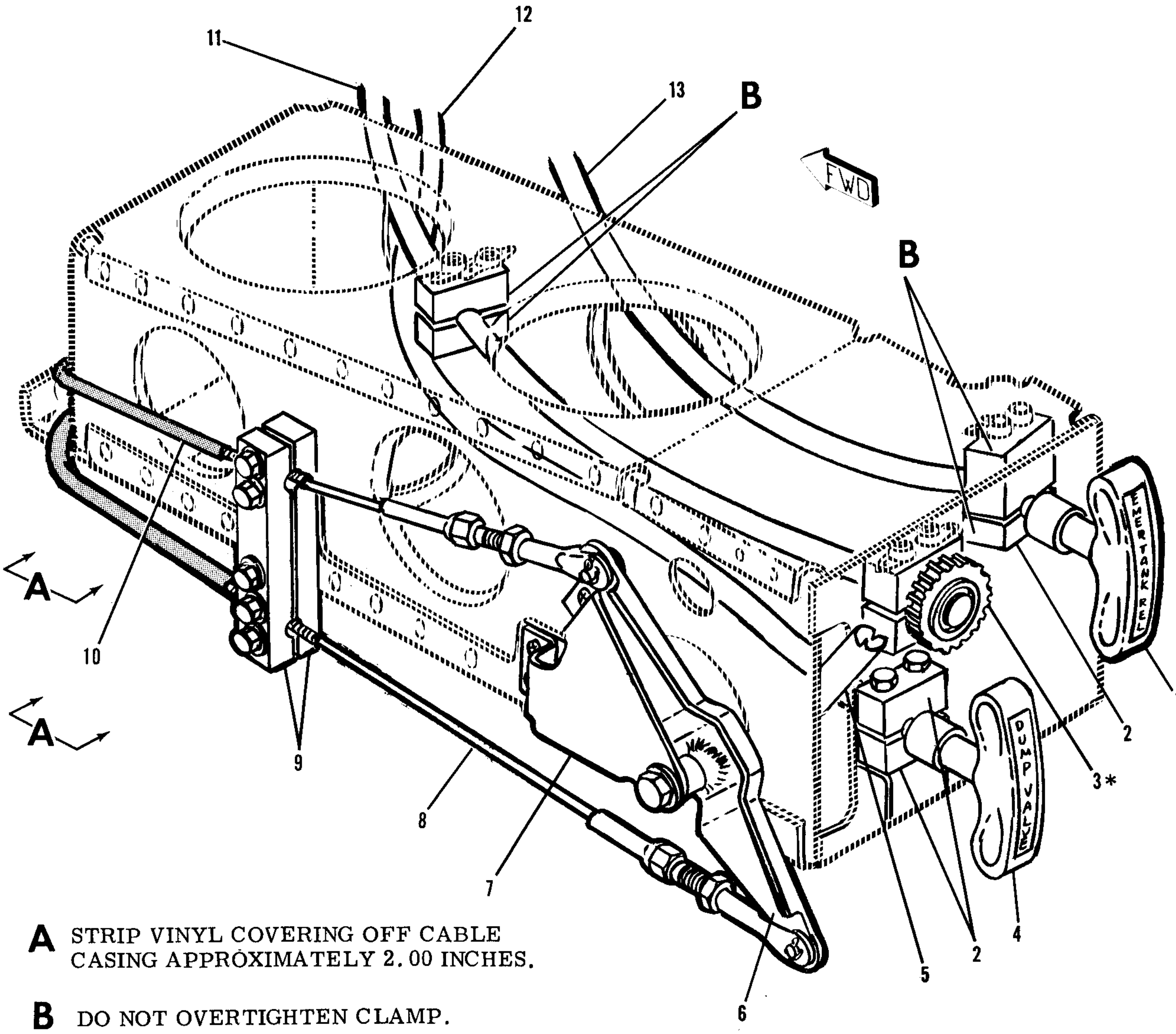
20-21. CONTROL BOX REMOVAL AND INSTALLATION. (Refer to figure 20-6.)
a. Disconnect ON-OFF control at bellcrank aft of spray pump.
b. Remove screws attaching plate, strap and clamp to boom pressure control and slide down over control to remove.
c. Disconnect emergency tank release control on left side of aircraft at control lever.
d. Disconnect dump valve control at under side of spray tank.
e. Disconnect clamping along routes of controls.
f. Break seal at opening on right side where controls route outside aircraft.
g. Pull controls free to aft side of firewall.
h. Remove upper screws attaching control box to stationary panel.



* Ensure that end of control (1) is slit, as shown, to enable control to break-away when pulled.

1. Dump Valve Control
2. Lever
3. Tension Nut
4. O-Ring
5. Torque Shaft
6. Pin
7. Cover
8. Gasket
9. Washer
10. Flange Assembly
11. Limit Bolt

Figure 20-5. Dump Valve Installation



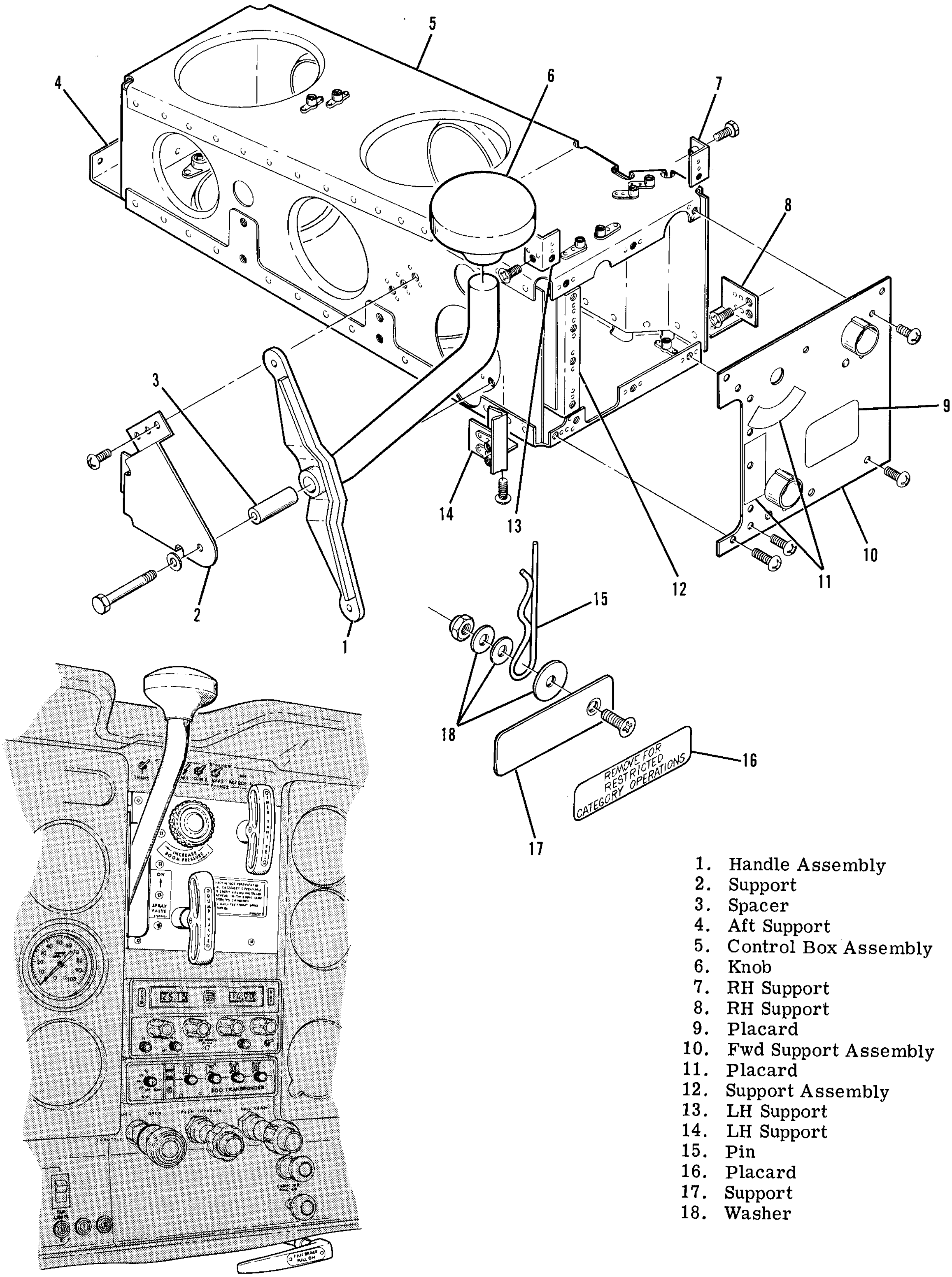
A STRIP VINYL COVERING OFF CABLE CASING APPROXIMATELY 2.00 INCHES.

B DO NOT OVERTIGHTEN CLAMP.

* Roll pin holding spray pressure control knob (3) is safetied. Re-safety upon installation.

1. Emergency Release Handle
2. Clamp
3. Spray Pressure Control Knob
4. Dump Valve Handle
5. On-Off Control Handle
6. Bellcrank
7. Support
8. Control Assembly "OFF" (Marked Yellow)
9. Clamp Half
10. Control Assembly "ON" (Marked Red)
11. Boom Pressure Control
12. Dump Valve Control
13. Emergency Release Control

Figure 20-6. Control Box Installation (Sheet 1 of 2)



1. Handle Assembly
2. Support
3. Spacer
4. Aft Support
5. Control Box Assembly
6. Knob
7. RH Support
8. RH Support
9. Placard
10. Fwd Support Assembly
11. Placard
12. Support Assembly
13. LH Support
14. LH Support
15. Pin
16. Placard
17. Support
18. Washer

Figure 20-6. Control Box Installation (Sheet 2 of 2)

i. Remove screws underneath control box.
j. Disconnect (3) Camlok fasteners attaching control box at firewall.
k. It may be necessary to remove bolt attaching ON-OFF control bellcrank to bracket on side of control box.
l. Pull control box aft out of stationary panel, pulling all controls attached to it.
m. Reverse preceding steps to install control box.

20-22. FAN BRAKE CONTROL. (Refer to figure 20-7.)

20-23. DESCRIPTION. The fan brake control, identified by a control handle, labeled "FAN BRAKE-PULL ON", is mounted under the edge of the instrument panel on the copilots' side, and is operated in the same manner as the parking brake. A cable and a spring connects the fan brake control, which is equipped with a stop to prevent damage to the spring, to a brake lever which actuates a mechanical brake aft of the spray pump fan. To apply the fan brake, pull the control handle out until it stops, and then rotate it 90° counterclockwise. To release the brake and allow the fan to operate freely, rotate the control handle clockwise until it releases and push it in.

CAUTION

Care should be taken not to allow spray pump fan to run without liquid in the system since this will destroy the pump bearings.

Refer to figure 20-7 for adjusting stop on fan brake control in cabin. Travel limits are determined from the amount of wear in the brake drum. When an adjustment is necessary, never exceed 1.50-inches deflection of the spring located on the fan brake.

20-24. SPRAY VALVE HANDLE. (Refer to figure 20-6.)

20-25. DESCRIPTION. The spray valve handle is tubular, has a urethane control knob attached, and extends from the left edge of the spray control panel in the upper center of the instrument panel. It is connected by a bellcrank and cables to the system spray valve and provides rapid two-position control of the valve. Pulling the handle full aft closes the valve, stopping the output to the booms. Liquid under pressure from the spray pump bypasses through the valve and is emptied back into the tank. When spray output is desired, push the spray valve handle full forward. The spray valve will open and liquid under pressure will be routed through the booms to the nozzles.

20-26. BOOM PRESSURE CONTROL KNOB AND PRESSURE GAGE. (Refer to figure 20-6.)

20-27. DESCRIPTION. The knurled knob located to the right of the spray valve handle adjusts boom pressure for the desired spray coverage. Turning the knob clockwise increases boom pressure by restricting the amount of liquid being bypassed through the spray valve. Turn the knob counterclockwise to decrease boom pressure. The spray pressure gage, mounted in an instrument cutout near the right edge of the pilot's side of the instrument panel, indicates the pressure in psi, being created in the spray system. The pressure will vary with spray run airspeed and boom pressure control setting.

20-28. DUMP VALVE RELEASE HANDLE. (Refer to figure 20-3.)

20-29. DESCRIPTION. The T-handle below and to the right of the spray valve handle is connected by a cable to the drain valve in the bottom of the tank and functions as a spray tank dump valve release. The dump valve is used primarily for flushing the tank and will empty a full tank in approximately one minute. It should be checked for proper operation at the beginning of the season and periodically thereafter.

20-30. EMERGENCY SPRAY TANK RELEASE HANDLE (Refer to figure 20-6.)

20-31. DESCRIPTION. A T-handle, located to the right side of the boom pressure control knob is connected by a cable to the spray tank release mechanism. A flagged safety pin is supplied and is to be installed during Normal Category operations, to prevent accidental release of the tank assembly, the safety pin must be removed during Restricted Category operation. The T-handle must be pushed full in for stowage and the release mechanism on the left side of the aircraft checked daily to be sure it is in the fully locked position. If an emergency arises requiring jettison of the spray tank, pull the handle sharply to the limit of the cable. Instantaneous jettisoning of the complete spray system (except cabin controls and spray booms) will result by pulling the tank release handle. The tank support mechanism will unlatch, control cables will disconnect, and all components, including a full spray tank, strainer, pump and spray valve, will fall free. Therefore, the release system should be checked regularly for proper installation and security, since it will only be used in a real emergency where increased climb-out performance is needed immediately to prevent an imminent collision with an obstacle.

20-32. EMERGENCY SPRAY TANK RELEASE MECHANISM TEST. (Refer to figure 20-3.)
a. After complete installation, safety wire six toggles (11) in the latched position as shown in view A-A. Ensure that safety wire is tightened just enough to prevent toggle from unlatching, but not tight enough to decrease the sliding friction between toggles and tank release bar tabs (10) when bar mechanism (9) is actuated.
b. While sitting in pilot's seat, pull emergency tank release T-handle using only one hand on the T-handle to see that tank release bar mechanism (9) is operating properly. If T-handle cannot be pulled with one hand, bend welded release bar tabs (10) that hold toggles (11) in the latched position to eliminate excessive friction.
c. Move tank release bar back to latched position, install safety pin and placard assembly in emergency tank release T-handle and remove safety wire from toggles (11).

20-33. EXTERIOR CARE. After agricultural spray-

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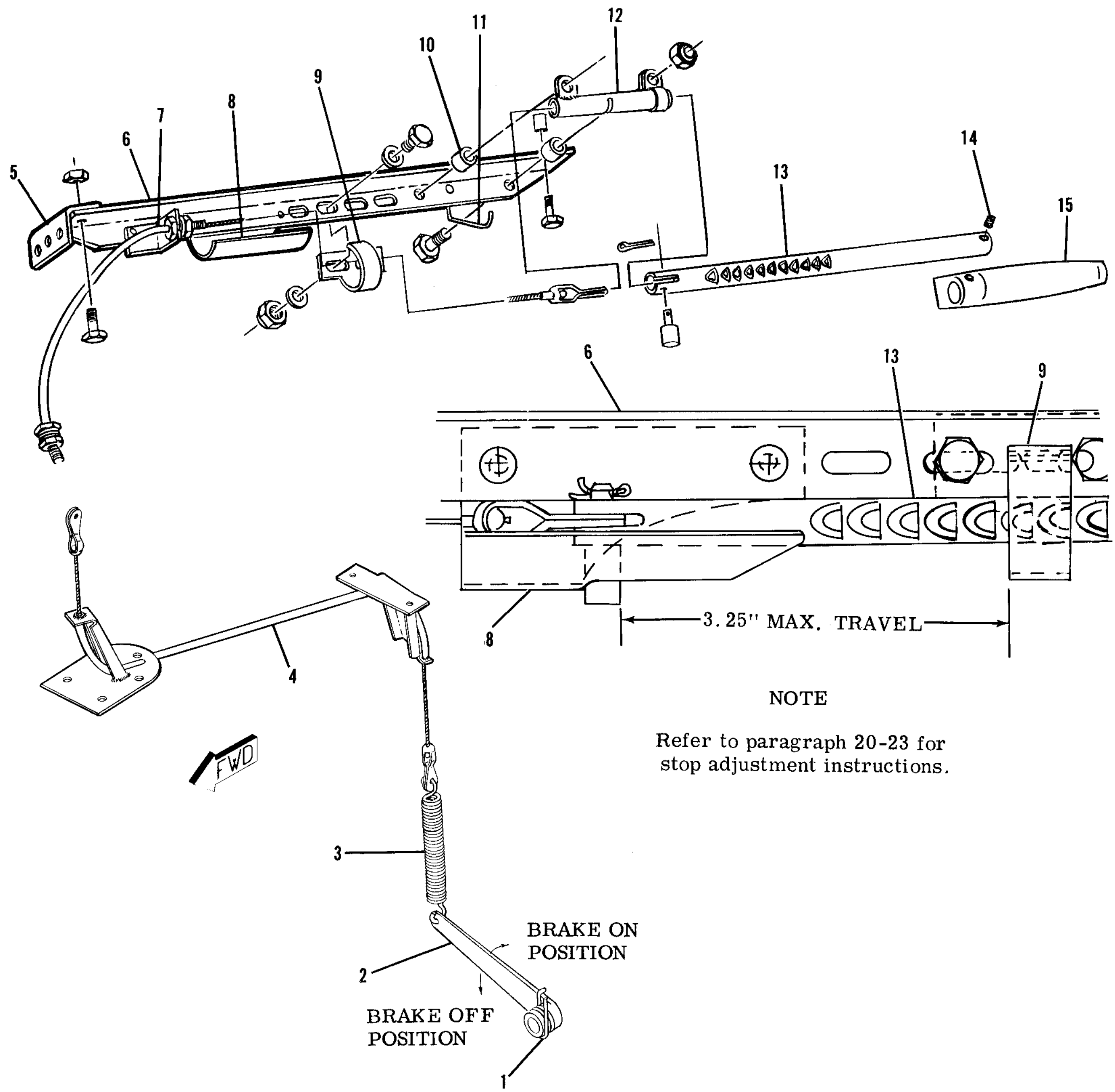

NOTE

Refer to paragraph 20-23 for stop adjustment instructions.

1. Spring
2. Fan Brake Arm
3. Spring
4. Cable Guide Assembly
5. Bracket
6. Angle
7. Tube Assembly
8. Positioning Rack
9. Stop
10. Spacer
11. Catch
12. Housing
13. Handle Tube
14. Set Screw
15. Handle

Figure 20-7. Fan Brake Control

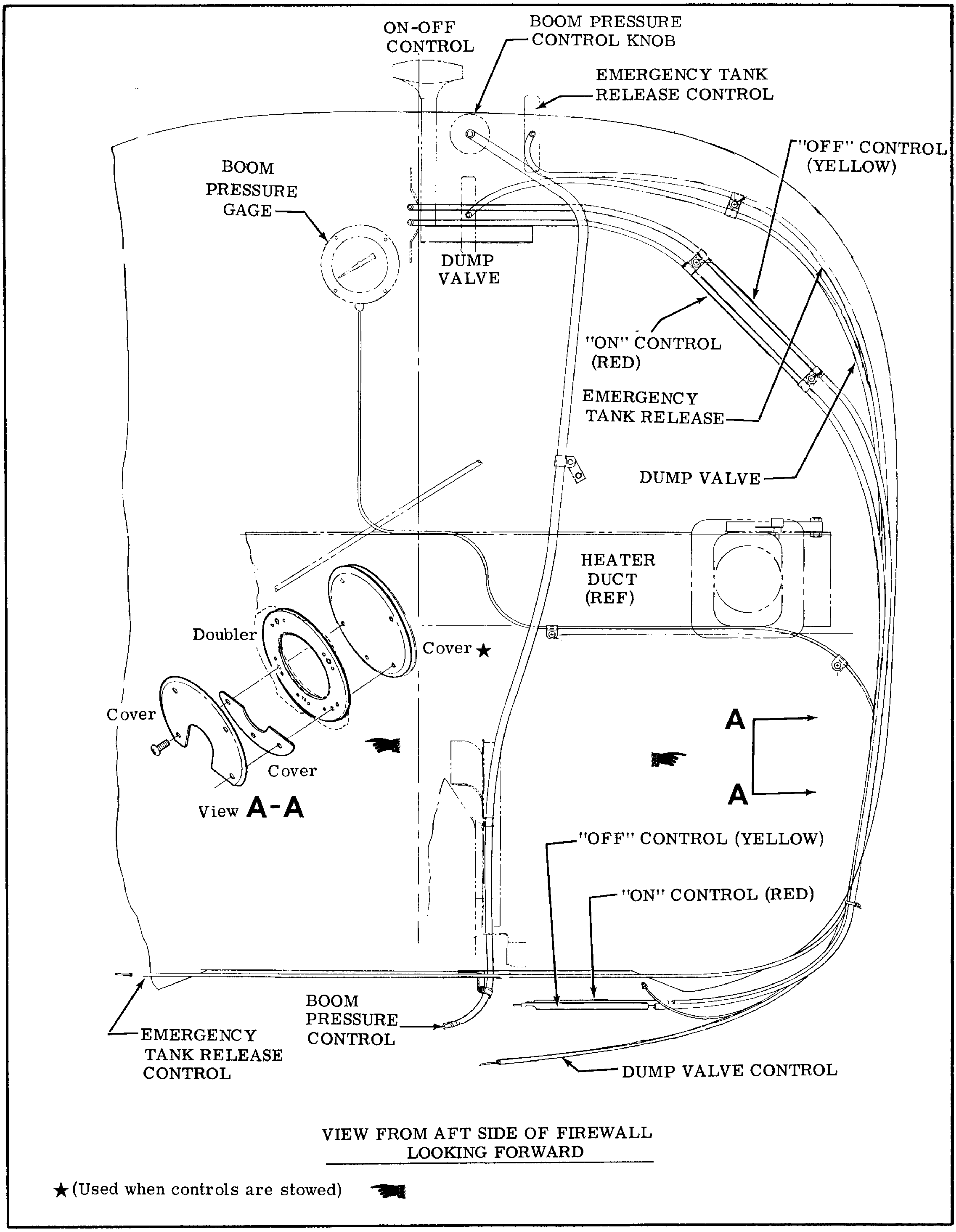

Figure 20-8. Control Routing

ing operations, daily hosing down of the aircraft is highly recommended. Cleaning reduces the possibility of corrosion and makes inspection and maintenance easier. Prior to cleaning the exterior, mask off all openings to prevent entry of water into the engine compartment or pitot and static systems. Wash the aircraft with cold or lukewarm water and mild soap. To remove stubborn oil and grease, use a cloth moistened with Stoddard solvent. A fine grade rubbing compound may be used to remove bugs and gasoline stains.

WARNING

DO NOT steam clean the aircraft after it has been used for agricultural spraying. Steam changes toxic spray into vapor which can be absorbed or inhaled.

Daily flushing of the spray tank with water and disassembly and cleaning of the liquid strainer is recommended. The liquid spray pump should be greased periodically with MARFAX #2 (TEXACO) grease or equivalent through grease fittings on the sides of the pump.

20-34. COWL FLAP BAFFLES AND CONTROL EXTENSIONS. (Refer to figure 20-9.)

20-35. REMOVAL.

a. Disconnect cowl flap controls (1) from flaps and remove all four baffles (3) by removing screws (2).

b. Remove each clevis (8) and barrel (11) from control ends and install clevis (12) on each control end. Intentionally leave control longer than necessary.

c. Put cowl flap control lever in "OPEN" position and connect control ends to cowl flaps but do not secure at this time. Move control lever to "CLOSED" position and measure gap between cowl flaps and fuselage skin. Open cowl flaps, disconnect control ends from cowl flaps, and shorten each control by turning clevis to the distance measured on each flap. Connect control end to each cowl flap temporarily and repeat preceding procedure until each cowl flap fairs in "CLOSED" position. Attach control ends to cowl flaps securely and tighten jam nuts against clevis ends. Operate cowl flap control lever several times to check cowl flap operation.

20-36. INSTALLATION.

a. Disconnect control (1) from each cowl flap and remove clevis (12) from each control end.

b. Leave jam nut (13) on control ends. Install clevis (8) into barrel (11) and install barrel on each control end (1). Do not tighten jam nut (13) or attach clevis (8) to cowl flaps at this time.

c. Position a baffle (3) along side of cowl flap so that holes in baffle are aligned over nutplates in cowl flap; secure with screws (2). Repeat for three remaining baffles.

NOTE

Each baffle is designed for installation on a specific cowl flap. Determine the correct baffle for each flap before installation. Note that the flanges on the baffles are turned toward the inside of each cowl flap opening.

d. Connect cowl flaps to control ends. Make sure cowl flap control lever is in "CLOSED" position; then adjust barrels on control ends so that cowl flaps are 16° ± 1° open (or 3-3/4" ± 1/8" measured from lower outboard corner of cowl flap to mating point on fuselage). Set jam nuts tightly against barrels and safety wire each clevis to each barrel to maintain specified setting.

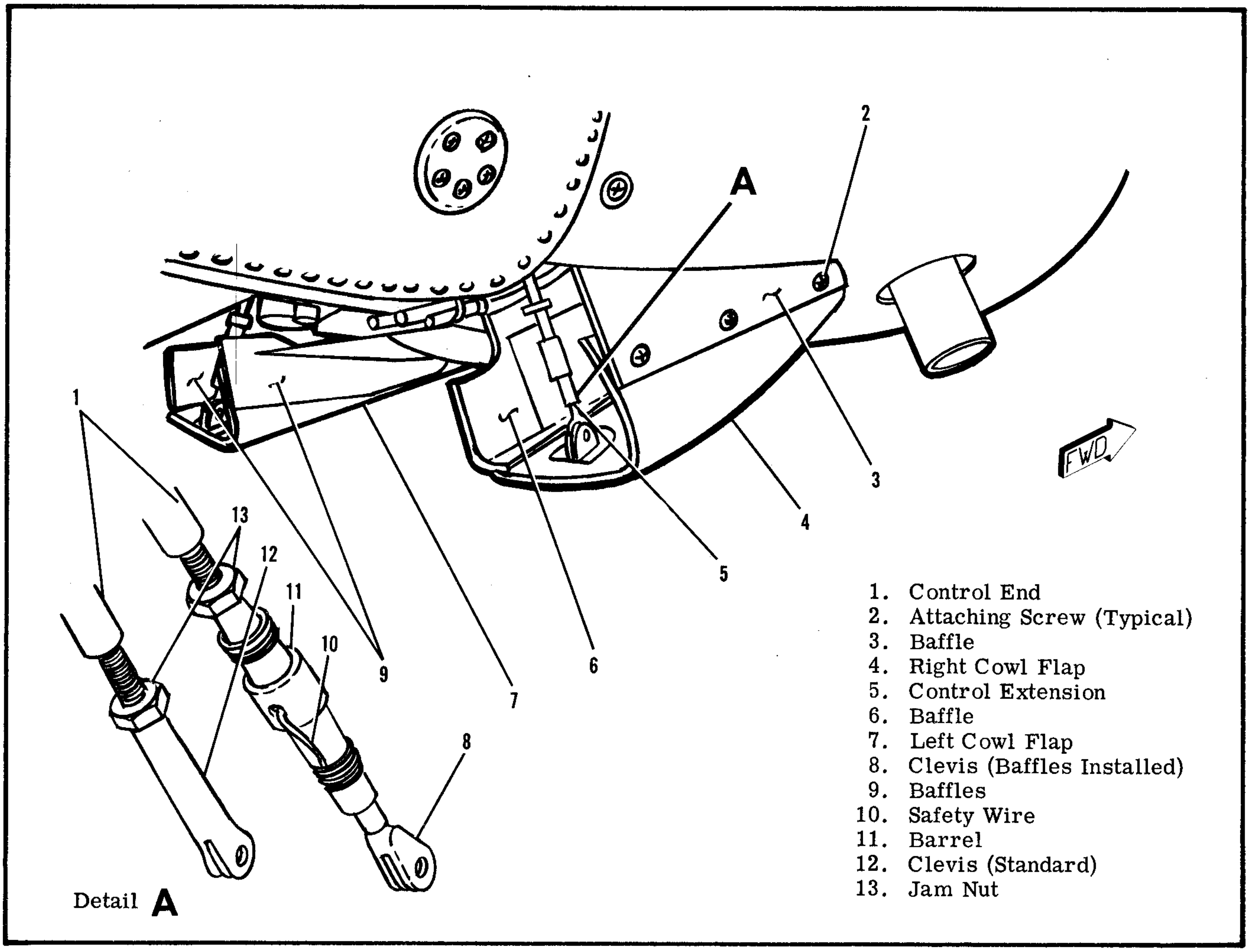

Figure 20-9. Cowl Flap Baffles and Control Extensions

SHOP NOTES: