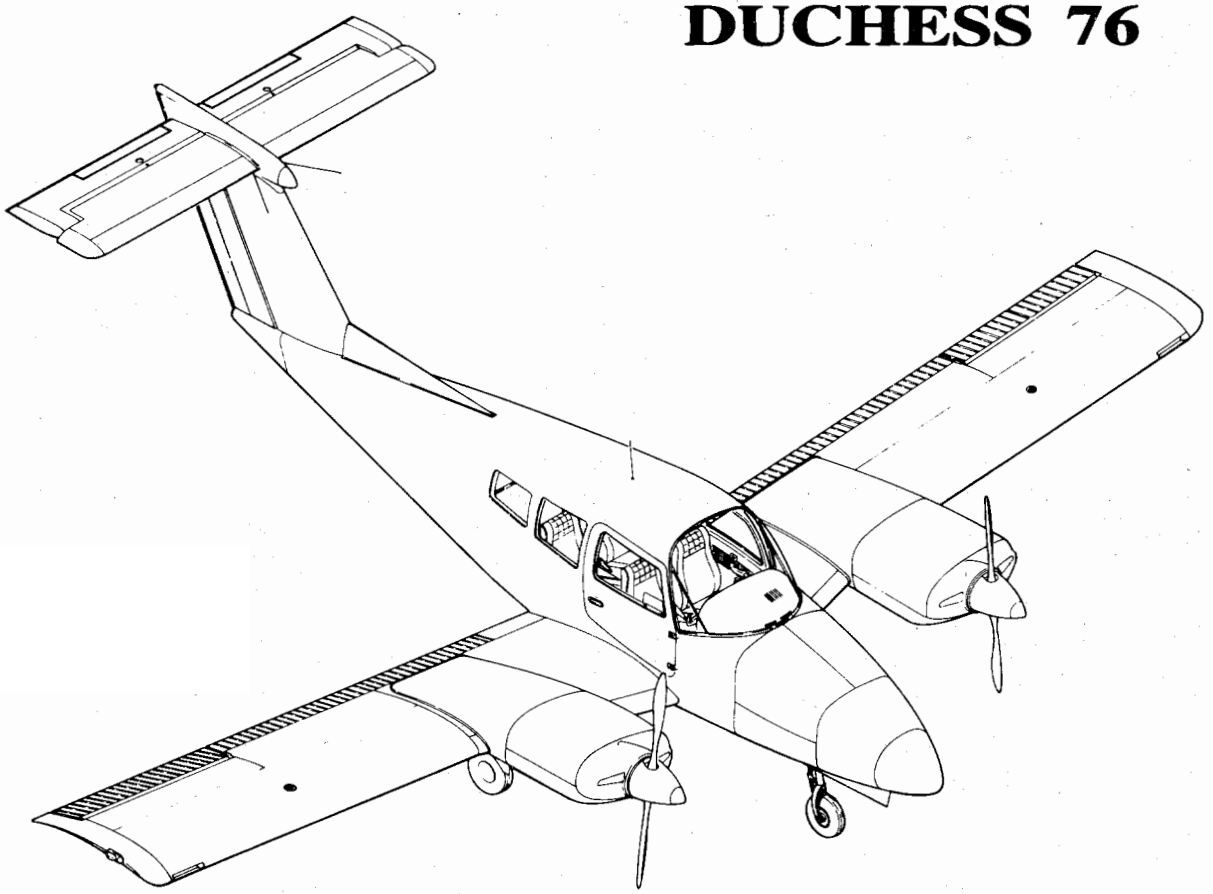
Beechcraft

DUCHESS 76



MAINTENANCE MANUAL

AIRPLANE SERIALS
(ME-1 AND AFTER)

P/N 105-590000-7
Issued: November 18, 1977

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Beechcraft
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LIST OF EFFECTIVE REVISIONS

Always destroy superseded pages when you insert revised pages.

Title Page ..... September 27, 1985
"A" Page A7

LOG OF REVISIONS

Part Number	Date	Chapters Affected
105-590000-7	November 18, 1977	Original
105-590000-7A1	February 16, 1979	INTRODUCTION 4, 5, 7, 10, 11, 12, 20, 21, 24, 27, 28, 32, 34, 36, 52, 53, 55, 57, 61, 71, 72, 77, 79, 80, 91
105-590000-7A2	August 10, 1979	INTRODUCTION 11, 12, 21, 24, 32, 33, 39, 74, 77, 80
105-590000-7A3	September 7, 1979	INTRODUCTION 5, 11, 12, 20, 25, 33, 52, 56
105-590000-7A4	September 19, 1980	INTRODUCTION 11, 25, 27
105-590000-7A5	March 15, 1982	INTRODUCTION 4, 5, 7, 12, 27, 32, 57, 61, 77, 78, 91
105-590000-7A6	June 20, 1985	INTRODUCTION 32
105-590000-7A7	September 27, 1985	INTRODUCTION 4, 5, 32

NOTE: A list of the effective pages will be found in the front of each chapter.

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98-36416C

Basic publications are assigned a part number which appears on the title page with the date of the issue. Subsequent revisions are identified by the addition of a revision code after the part number. A1 after a part number denotes the first revision to the basic publication, A2 the second, etc. Occasionally, it is necessary to completely reissue and reprint a publication for the purpose of obsoleting a previous issue and outstanding revisions thereto. As these replacement reissues are made, the code will also change to the next successive letter of the alphabet at each issue. For example, B for the first reissue, C for the second reissue, etc.

When ordering a handbook, give the basic number, and the reissue code when applicable, if a complete up-to-date publication is desired. Should only revision pages be required, give the basic number and revision code for the particular set of revision pages you desire.

INTRODUCTION

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
INTRODUCTION-EFFECTIVITY	1	Sep 27/85
INTRODUCTION	1	Jun 20/85
	2	Jun 20/85
	2A	Jun 20/85
	3	Feb 16/79
	4	Nov 18/77
	5	Mar 15/82
	6	Nov 18/77
	7	Sep 27/85
	8	Sep 27/85
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	27	Sep 27/85
	28	Sep 27/85
	29	Sep 27/85
	30	Sep 27/85
	31	Sep 27/85

"END"

INTRODUCTION

NOTE

Service Publication reissues or revisions are not automatically provided to the holders of this manual. For information on how to obtain reissues or revisions applicable to this manual, refer to the latest revision of BEECHCRAFT Service Bulletin No. 2001.

The BEECHCRAFT Duchess 76 Maintenance Manual is prepared in accordance with the GAMA (General Aviation Manufacturers Association) Specification No. 2 format. It also meets the intent of the requirements of the ATA Specification 100 (Air Transport Association of America) with respect to the arrangement and content of the System/Chapters within the designated chapter-numbering system. The Maintenance Manual is supplemented by the following publications: (1) The BEECHCRAFT Duchess 76 Parts Catalog, P/N 105-590000-9 (2) BEECHCRAFT Duchess 76 Wiring Diagram Manual, P/N 105-590000-15 (14-volt system, Airplane serials ME-1 thru ME-182) (3) BEECHCRAFT Duchess 76 Wiring Diagram Manual, P/N 105-590000-21 (28-volt system, Airplane serials ME-183 and after) (4) BEECHCRAFT Duchess 76 Continuous Care Inspection Guide P/N 105-590000-13 and the BEECHCRAFT Duchess 76 100 Hour Inspection Guide P/N 105-590000-11.

NOTICE

Beech Aircraft Corporation expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

It shall be the responsibility of the owner/operator to ensure that the latest revision of publications referenced in this manual are utilized during operation, servicing, and maintenance of the airplane.

CORRESPONDENCE

If a question should arise concerning the care of your airplane, it is important to include the airplane serial number in any correspondence. The serial number appears on the model designation placard (see Chapter 11 for placard location).

WARNING

Use only genuine BEECHCRAFT or BEECHCRAFT approved parts obtained from BEECHCRAFT approved sources, in connection with the maintenance and repair of Beech airplanes.

Genuine BEECHCRAFT parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in Beech airplane applications. Parts purchased from sources other than BEECHCRAFT, even though outwardly identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Salvaged airplane parts, reworked parts obtained from non-BEECHCRAFT approved sources, or parts, components, or structural assemblies, the service history of which is unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or have other hidden damage, not discernible through routine visual or usual nondestructive testing techniques. This may render the part, component or structural assembly, even though originally manufactured by BEECHCRAFT, unsuitable and unsafe for airplane use.

BEECHCRAFT expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-BEECHCRAFT approved parts.

ASSIGNMENT OF SUBJECT MATERIAL

The content of this publication is organized at four levels: Group, System/Chapter, Sub-System/Section, and Unit/Subject.

Group - Identified by different colored divider tabs. These are primary divisions of the manual that enable broad separation of content. Typical of this division is the separation between Airframe Systems and the Power Plant.

System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. The

systems are arranged more or less alphabetically rather than by precedence or importance. They are assigned a number, which becomes the first element of a standardized numbering system. Thus, the element "28" of the number 28-00-00 refers to the chapter "Fuel". Everything concerning the fuel system will be covered in this chapter.

Sub-System/Section - The major systems of an airplane are broken down into sub-systems. These sub-systems are identified by the second element of a standard numbering system. The number "40" of the number 28-40-00 is for the indicating portion of the fuel system.

Unit-Subject - The individual units within a subsystem may be identified by the third element of the standard numbering system, such as 28-40-01. This number is assigned by the manufacturer and may, or may not, be used and will vary in usage.

APPLICATION

Any publication conforming to the GAMA or ATA format will use the same basic numbering system. Thus,whether the manual be a BEECHCRAFT Duchess 76 Maintenance Manual, or a BEECHCRAFT Duchess 76 Wiring Diagram Manual, the person wishing information concerning the indicating portion of the fuel system, would refer to the System/Chapter Tab "28, Fuel". The table of contents in the front of this chapter will provide a list of sub-systems covered in this chapter.

For example:

28-00	General
28-10	Storage (Tanks, cells, necks, caps, instruments, etc.)
28-20	Distribution (Fuel lines, pumps, valves, controls, etc.)
28-30	Dump (If in-flight dumping system is installed, it would appear here.)
28-40	Indicating (Quantity, temperature, pressure, etc., does not include engine fuel flow or pressure.)

Carrying this example further, by turning to the Table of Contents for Chapter 28, the following information might be found within the list:

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
FUEL	28	
Indicating	28-40	
LH Fuel Quantity	28-41-01	1 thru 3

The material is arranged within the chapter in ascending numerical sequence. The Chapter-Section Subject number and page number are found at the lower outside corner of each page.

EFFECTIVITY

LOG OF EFFECTIVE REVISIONS

The Log of Effective Revisions following the title page of the manual lists the revisions currently effective for the manual.

AEROFICHE

The General Aircraft Manufacturers Association (GAMA) has developed a specification for microfiche reproduction of aircraft publications, for use by all GAMA Members. The GAMA microfiche specification has been registered as Aerofiche. All Duchess 76 Manuals (except Pilot's Operation Handbook, 100 Hour Inspection Guide and Continuing Care Inspection Guide) may be purchased in Aerofiche form. Address Aerofiche procurement requests to:

Commercial Product Support
Beech Aircraft Corp.
9709 E. Central
Wichita, Kansas 67201

ALPHABETICAL INDEX

An alphabetical index, which may be found beginning on page 7 of this Introduction, is also provided as an assistance in locating the desired information. The alphabetical index provides the chapter and sub-chapter in which any given information may be found. Reference to the Table of Contents in the front of the indicated chapter will provide the exact page on which the information can be found.

LIST OF EFFECTIVE PAGES

The list of Effective Pages following each Chapter Divider Tab, lists the issue date of each page that is effective for that chapter.

SYSTEM/CHAPTER INDEX GUIDE

The following System/Chapter, Sub-System/Section Index Guide is prepared in accordance with both ATA Specification No. 100 and GAMA Specification No. 2 for use with Maintenance Manuals, Parts Catalogs and Wiring Diagram Manuals. The following chapters are not applicable to this Maintenance Manual: 22, 23, 26, 29, 30, 31, 35, 37, 38, 49, 60, 70, 73, 75, 76, 78, 81, 83, and 95.

SYSTEM/ CHAPTER	SUB-SYSTEM/ SECTION	TITLE
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	4	**AIRWORTHINESS LIMITATIONS**
5	**TIME LIMITS/MAINTENANCE CHECKS**	
	10	Time Limits
	20	Scheduled Maintenance Checks
6		**DIMENSIONS AND AREAS**
7	**LIFTING AND SHORING**	
	00	General

8	**LEVELING AND WEIGHING**	
	00	General
9	**TOWING AND TAXIING**	
	00	General
10	**PARKING AND MOORING**	
	00	General
11	**REQUIRED PLACARDS**	
	00	General
	20	Exterior Placards and Markings
12	**SERVICING**	
	00	General
	10	Replenishing
	20	Scheduled Servicing
20	**STANDARD PRACTICES - AIRFRAME**	
	20	General
21	**ENVIRONMENTAL SYSTEMS**	
	00	General
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	40	Heating
24	**ELECTRICAL POWER**	
	30	DC Generation
	40	External Power
	50	Electrical Load Distribution
25	**EQUIPMENT/FURNISHINGS**	
	10	Flight Compartment
	20	Passenger Compartment
	60	Emergency
27	**FLIGHT CONTROLS**	
	00	General
	10	Aileron and Tab
	20	Rudder and Tab
	30	Elevator and Tab
	31	Stall Warning
	50	Flaps
	70	Gust Lock

28	**FUEL**	
	00	General
	10	Storage
	20	Distribution
	40	Indicating
32	**LANDING GEAR**	
	00	General
	10	Main Gear and Doors
	20	Nose Gear and Doors
	30	Extension and Retraction
	40	Wheels and Brakes
	50	Steering
	60	Position and Warning
33	**LIGHTS**	
	20	Interior
	40	Exterior
34	**NAVIGATION AND PITOT STATIC**	
	10	Flight Environment Data/Pitot Static
36	**PNEUMATIC**	
	00	General
39	**ELECTRIC/ELECTRONIC PANELS & MULTIPURPOSE PARTS**	
	00	General
	10	Instrument & Control Panels
	20	Electrical & Electronic Equipment Racks
51	**STRUCTURES**	
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52	**DOORS**	
	00	General
	10	Passenger/Crew Doors
	30	Cargo Doors
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	30	Plates/Skin
54	**NACELLES**	
	30	Plates/Skin

55	**STABILIZERS**	
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	20	Elevator
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	40	Rudder
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	20	Cabin
57	**WINGS**	
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	30	Plates/Skin
	40	Attach Fittings
	50	Flight Surfaces
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	20	Controlling
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72	**ENGINE**	
74	**IGNITION**	
	00	General
	20	Distribution
77	**ENGINE INDICATING**	
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	00	
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	00	General
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91	**CHARTS**	

SUPPLEMENTARY PUBLICATIONS

Following is a list of publications providing servicing and maintenance information on components of the BEECHCRAFT Duchess 76. Those publications available from the Parts and Service Operations, Beech Aircraft Corporation are listed in the current Publications Price List. Since a wide variety of radio equipment is available and because radio manufacturers normally supply parts and servicing manuals with each set, radio publications have not been included in the list. As publications on additional components become available, they will be added to this list of publications.

VENDOR PUBLICATIONS

ENGINE

Overhaul Manual Part Number 60294-7 for Avco Lycoming Aircraft Engines, Avco Lycoming Division, Williamsport, Pennsylvania 17701.

Parts Catalog Part Number PC106 for Avco Lycoming Aircraft Engines, Avco Lycoming Division, Williamsport, Pennsylvania 17701.

PROPELLER

Overhaul Instructions Manual Number 113-D for Hartzell Propellers, Hartzell Propeller Inc., Piqua, Ohio.

Propeller Owners Manual and Log Book, Part Number 115-H for Hartzell Propellers, Hartzell Propeller Inc., Piqua, Ohio.

MAGNETOS

Overhaul Instructions for Bendix D-2000 Series Magnetos, Form L-945, Electrical Components Division, Bendix Aviation Corporation, Sidney, New York 13838.

Installation, Operation and Maintenance Instructions for Bendix D-2000 Series Magnetos, Form L-945, Electrical Components Division, Bendix Aviation Corporation, Sidney, New York 13838.

HEATER

Maintenance Manual for the 87D12 Ignitor Assembly, Manual Part Number 93D00-1, Janitrol Aero Division, Midland-Ross Corporation, 4200 Surface Road, Columbus, Ohio 43216.

Maintenance Manual for the 07E94 Heater Assembly, Manual Part Number 09E15-1, Janitrol Aero Division, Midland-Ross Corporation, 4200 Surface Road, Columbus, Ohio 43216.

Maintenance Manual for the 07E95 Combustion Air Blower, Manual Part Number 09E16-1, Janitrol Aero Division, Midland-Ross Corporation, 4200 Surface Road, Columbus, Ohio 43216.

ALTERNATOR

Technical Data, Parts Lists for Prestolite Alternators, P/N OE-A1, Prestolite Co. P.O. Box 391, Toledo, Ohio.

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CHAPTER 4

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CHAPTER 4 - AIRWORTHINESS LIMITATIONS

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AIRWORTHINESS LIMITATIONS

NOTE

The Airworthiness Limitations and Inspection Procedures prescribed in this chapter are FAA approved.

The following Airworthiness Limitations related to fatigue life of the airplane structural components have been established with respect to the Model 76 airplane.

a. The safe life of the wing and carry-through structure is 20,000 hours; provided the mandatory Inspections in Chapter 57 are carried out.

b. Refer to MANDATORY INSPECTIONS, Chapter 57-00-00 for wing and carry-through structural limits and inspection procedures.

c. Compliance with the Engine Mount/Nacelle Channel portion of the MANDATORY INSPECTIONS in Chapter 57-00-00 necessitates the addition of inspection plates per Kit No. 76-4003-1S as specified in Service Bulletin No. 2018. If cracks are detected, repairs must be made per Kit No. 76-4002-1S.

Refer to LIMITATONS in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for a detailed delineation of the flight limitations of the airplane.

"END"

FAA APPROVED BY: Donald H Peters
DOA CE-2

CHAPTER 5

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TIME LIMITS - MAINTENANCE PRACTICES

The first overhaul or replacement must be performed not later than the recommended period. The condition of the item at the end of the first period can be used as a criteria for determining subsequent periods applicable to the individual airplane or fleet operation providing the operator has an approved monitoring system.

The time periods for inspections noted in this manual are based on average usage and average environmental conditions.

SPECIAL CONDITIONS CAUTIONARY NOTICE

Airplanes operated for Air Taxi or other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas, periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The recommended periods do not constitute a guarantee that the item will reach the period without malfunction as the aforementioned factors cannot be controlled by the manufacturer.

NOTE

On condition items are to be overhauled or replaced when inspection or performance of these items reveal a potentially unsafe or unserviceable condition.

NOTE

The date noted on the "STANDARD AIRWORTHINESS CERTIFICATE", FAA Form No. 8100-2, which is issued with each new airplane, is to be used as the basis for all TBO or replacement components listed in the following schedule.

OVERHAUL AND REPLACEMENT SCHEDULE

POWER PLANT

NOTE

A TBO (time between overhaul) recommendation is in no way to be construed as a warranty or engine life proration basis. The TBO recommendation is based on the projected time for most advantageous initial overhaul. The individual operator's experience may indicate a departure in either direction from the recommended TBO for the particular operation.

ITEM	*OVERHAUL OR REPLACE*
Engines	Refer to latest edition Avco-Lycoming SI 1009
Propellers	Refer to latest edition Hartzell Bulletin 61
Magnetos	At engine overhaul
Dry air pressure pumps	Every 1400 hours or on condition
All hoses	Hoses carrying flammable liquids; at engine overhaul or every 5 years, whichever occurs first.

FUEL SYSTEM

All hoses	Hoses carrying flammable liquids; at engine overhaul or every 5 years, whichever occurs first.

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	*OVERHAUL OR REPLACE*
ELECTRICAL SYSTEM	
Starter	At engine overhaul
Alternator	At engine overhaul
Battery (Emergency Locator Transmitter)	Per applicable regulations, or by date stamped on battery, whichever occurs first.
UTILITY SYSTEM	
Cabin heater	Refer to latest edition Janitrol Maintenance & Overhaul Manual 11D74 and applicable Airworthiness Directives.

NOTE

Refer to Chapter 4 for wing and carry through structure, structural life limits.

"END"

SCHEDULED MAINTENANCE CHECKS - MAINTENANCE PRACTICES

NOTE

Ascertain that all placards are in place and legible whenever the airplane has been repainted or touched up after repairs. Replace any placards that have been inadvertently defaced after such repainting or repairs.

NOTE

This inspection procedure meets the intent of FAR 91.169 and Part 43, Appendix D.

The owner or operator is primarily responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of the Federal Aviation Regulations. It is further the responsibility of the owner or operator to ensure that the airplane is inspected in conformity with the requirements of Parts 43 and 91 of the Federal Aviation Regulations. Beech Aircraft Corporation has prepared this inspection guide to assist the owner or operator in meeting the foregoing responsibilities. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgment of a certified airframe and power plant mechanic in the performance of his duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

The time periods for the inspections noted in this schedule are based on normal usage under average environmental conditions. Airplanes operated in extremely humid tropics, or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, lubrication, and/or lack of maintenance. Under these adverse conditions, perform periodic inspections in compliance with this guide at more frequent intervals until the owner or operator can set his own inspection periods based on the contingencies of field experience. A 100-hour inspection MUST be accomplished within each 12-month period for compliance with the Federal Aviation Regulations. To the extent that the airplane is operated in excess of 100 hours per year, Beech Aircraft Corporation strongly recommends that the airplane be inspected at 100-hour intervals rather than annually. The 100-hour interval between performance of the procedures specified herein should NEVER be exceeded by more than 10 hours, and then only if the additional time is required to reach a place where the inspection can be satisfactorily accomplished.

Complete inspection forms are available under Part Number 105-590000-11 or subsequent revisions.

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various chapters of the Maintenance Manual and the pertinent vendor publications. It is also recommended that reference be made to the applicable Maintenance Handbooks, Service Instructions, applicable FAA Regulations and Publications, and Vendor's Bulletins and vendor's specifications for torque values, clearances, settings, tolerances, and other requirements. It should further be verified that all interior and exterior placards are legible and in place during the inspection. In the final analysis, it is the responsibility of the owner or operator to ensure that the airframe and power plant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

NOTE

In addition to the inspections prescribed by this schedule, the altimeter instrument and static system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in FAR Parts 91.170 and 91.177 under Title 14 of the Code of Federal Regulations.

A. OPERATIONAL INSPECTION	Mech.	Insp.
1. STARTERS - Check for proper operation.		
2. ENGINE CONTROLS - With engines operating, check throttle, mixture, and propeller controls for freedom of movement, full travel, and proper friction lock.		
3. OIL PRESSURE AND TEMPERATURE - Check for proper pressure and temperature limits.		
4. FUEL PRESSURE GAGES - Check for proper operation.		
5. FUEL QUANTITY GAGES - Check for proper operation.		
6. CYLINDER HEAD TEMPERATURE - Check for proper operation and temperature.		
7. ALTERNATORS - Check for proper output.		
8. FUEL BOOST PUMPS - Check for proper operation.		
9. FUEL TANK SELECTORS - Check for proper operation.		
10. POWER CHECK (STATIC) - Determine that each engine is producing near maximum rpm and manifold pressure per the applicable Pilot's Operating Handbook with the prop in low pitch.		
11. IDLE RPM AND MIXTURE - Check for correct rpm and operation of the controls.		
12. PROPELLER GOVERNORS - Check for proper governor operation and feathering.		
13. PROPELLER FEATHERING - Check for proper operation.		
14. AILERON TABS - Check for proper attachment and adjustment.		
15. MAGNETOS - Check for proper operation.		
16. IGNITION/MAG SWITCH - Check for proper operation and attachment. Rotate the ignition switch through the OFF position to the extreme limit of its travel. If the engine stops firing, the switch is normal. If the engine continues to fire with the switch held in the past OFF position, refer to Bendix Service Bulletin No. 583 dated February 1976.		
17. BRAKES - Check for proper travel, ease of operation and proper release of the parking brake.		
18. IDLE CUTOFF - Check for proper operation.		
19. FLAPS - Check for full travel and noisy or erratic operation.		
20. ELECTRIC TRIM - Check for full travel and proper operation.		

A. OPERATIONAL INSPECTION (Cont'd)	Mech.	Insp.
21. GYROS - Check for erratic or noisy operation. Check instrument air pressure - 5.0 to 5.5 with engine operating at 2000 rpm.		
22. RADIOS - Check for proper operation.		
23. EMERGENCY LOCATOR TRANSMITTER - Check for proper operation. NOTE Tune radio to 121.5 MHz on VHF or 243 MHz on UHF, then turn the ELT switch ON and monitor for one signal. Turn the ELT switch OFF, then place in the ARM position. Tests must be conducted only in the first five minutes of any hour.		
24. HEAT AND VENTILATING SYSTEM - Check for proper operation in all modes.		
25. ALL LIGHTS - Check the operation of all cabin and instrument panel lights. Check switches, knobs, and circuit breakers for looseness and operation.		
26. PITOT HEAT - Check amperage drawn on ammeter and for proper heating of the unit.		
27. STALL WARNING (EACH WING) - Check for proper operation.		

B. POWER PLANT	L	R	
1. INDUCTION AIR FILTERS - Clean and inspect as described in Chapter 12-20-00 of the Maintenance Manual.			
2. INDUCTION AIR BOX - Clean and inspect for security, cracks, and obstructions.			
3. EXHAUST AND INDUCTION SYSTEMS - Check for cracks, leaks, security, and condition. Replace as required.			
4. MAGNETOS - Contact point clearance for the magneto right main breaker is .016 ± .004. The left main breaker is .016 ± .002. Points with deep pits or excessively burned areas must be discarded. Inspect the cam follower felt pad for proper lubrication, and clean the breaker compartment with a clean, dry cloth.			
5. SPARK PLUGS - Remove, clean, and inspect for condition.			
6. IGNITION HARNESS - Inspect for condition, security, and attachment.			
7. ENGINE CYLINDERS AND BAFFLES - Check for condition, cracks, and attachment.			

B. POWER PLANT (Cont'd)	Mech. L	Mech. R	Insp.
8. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for condition, attachment, fraying, and deterioration.			
9. PLUMBING - Inspect plumbing and associated equipment and accessories for condition, attachment, chafing, and evidence of leaking.			
10. ENGINE CONTROLS - Check controls and associated equipment for condition, attachment, alignment, rig, and proper clearance.			
11. ENGINE ACCESSORIES - Inspect all accessories for condition, attachment, and leakage.			
12. ENGINE MOUNTS - Inspect for condition and attachment.			
13. ALTERNATORS - Inspect attachment, condition, and proper belt tension.			
14. GENERATOR/ALTERNATOR MOUNTING BRACKET - Inspect bracket for condition and attaching bolts for proper security and tightness.			
15. FLEXIBLE AIR DUCTS (HOT AND COLD) - Inspect for condition, attachment, fraying and deterioration.			
16. DRAIN VALVES - Check for security, and evidence of leakage.			
17. OIL COOLER - Check cooler and plumbing for condition, attachment, and evidence of leakage.			
18. COWL FLAPS - Inspect condition, attachment, cracking, and proper operation.			
19. COWLING - Check adjustment of latches. Remove upper cowling and clean. Inspect for cracks and repair as necessary.			
20. PROPELLERS, SPINNERS, AND SPINNER BULKHEADS - Inspect for condition, attachment, cracking, damage, and operation.			
21. PROPELLER DOMES - Inspect for condition, attachment, leakage, and operation.			
22. ACCUMULATOR - Inspect for condition, attachment, operation, and evidence of leakage. Recharge as outlined in Chapter 61-20-00 of the Duchess 76 Maintenance Manual.			
C. REAR FUSELAGE AND EMPENNAGE			
1. SKIN - Inspect skin for condition, corrosion, and loose or missing reivets. If damage is found, check adjacent structure.			
2. STRUCTURE - Check for cracks, corrosion, loose rivets, and concealed damage.			

C. REAR FUSELAGE AND EMPENNAGE (Cont'd)	Mech.	Insp.
3. CABLES AND PULLEYS - Check control cables, pulleys and associated equipment for condition, attachment, alignment, clearance, fraying, corrosion, and proper operation.		
4. EMPENNAGE STRUCTURE - Check for cracks, corrosion, skin panels for distortion, loose rivets and/or concealed damage.		
5. EMPENNAGE SURFACES - Inspect skin for condition, corrosion, and loose or missing rivets. Check surfaces for proper attachment and freedom of movement. Check trim actuators and motors for proper operation, smoothness and attachment.		
6. RUDDER OPERATION - Check for proper travel, freedom of movement and attachment.		
7. ELEVATOR OPERATION - Check for proper travel, freedom of movement and attachment.		
8. TRIM TABS OPERATION - Check for smoothness and proper action.		
9. STATIC PORTS - Inspect and clean as necessary.		
10. PLUMBING AND WIRING - Inspect the plumbing for condition, attachment and evidence of leakage. Inspect wiring for condition, chafing, fraying, and attachment.		
11. AUTOPILOT (IF APPLICABLE) - Inspect and replace air filter if dirty. Check components for damaged cases, bent or broken pins of electrical connectors, damaged seals, poor solder connections, and damaged insulation on wiring. Check plumbing for condition and security of attachment.		
12. BATTERY - Inspect for corrosion, clean, tight connections and correct fluid level. Add distilled water as required. Inspect vents for obstructions		
13. SCUPPER DRAINS - Check that drain guards are open, facing aft, and drain holes are free from obstructions.		
14. NAVIGATION LIGHTS - Check for cracked or broken lens, and moisture.		
D. CABIN SECTION		
1. SKIN - Inspect skin for corrosion, condition and loose or missing rivets. If damage is found, check adjacent structure.		
2. STRUCTURE - Check for corrosion, cracks, loose or missing rivets, and concealed damage.		
3. CABLES AND PULLEYS - Check control cables, pulleys and associated equipment for fraying and corrosion, condition, attachment, alignment, clearance, and proper operation.		

D. CABIN SECTION (Cont'd)	Mech.	Insp.
4. FLAP ACTUATOR MOTOR - Inspect for condition and attachment. Lubricate as necessary.		
5. BRAKE SYSTEM - Check brake system components for leakage. Brake line plumbing for condition and attachment and brake pedals and linkage for condition and attachment.		
6. RUDDER PEDALS - Check rudder pedal condition, clearance, and atttaachment.		
7. CONTROL COLUMN - Check for condition, attachment, and operation. Check control lock for condition, positive locking, and alignment.		
8. INSTRUMENT PLUMBING AND WIRING - Inspect instrument plumbing for leakage, condition, and wiring for condition and attachment and/or chafing, fraying, etc.		
9. INSTRUMENTS AND INSTRUMENT PANEL - Inspect instrument panel, subpanels, placards and instruments for condition and attachment.		
10. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for condition, fraying, and attachment.		
11. WINDOWS AND DOORS - Inspect windows for scratches, crazing, cracking, and general condition. Inspect doors for security of attachment and latching mechanisms.		
12. SEATS AND SEAT BELTS - Inspect cabin seats and seat belts for fraying, proper operation, condition, and security of attachment; floorboard for condition and attachment.		
13. STATIC LINES - Inspect for security of attachment and drain by opening the alternate static air valve. The static system MUST be checked for leaks in accordance with the instructions in FAR 91.170 and 91.177, under Title 14, every 24 months.		
E. NOSE SECTION		
1. SKIN - Inspect skin for corrosion, condition and loose or missing rivets. If damage is found, check adjacent structure.		
2. STRUCTURE - Check for corrosion, cracks, loose or missing rivets, and concealed damage.		
3. HEATER FUEL SYSTEM - Check heater fuel plumbing and exhaust system for condition and heater drain line for obstructions.		
4. HEATER DUCTING AND WIRING - Inspect heater, heater components, and associated wiring and ducting for condition and attachment, and evidence of overheating.		
5. HEATER IRIS VALVE - Lubricate and check for proper operation of valve and heater cutoff switch		

E. NOSE SECTION (Cont'd)	Mech.	Insp.
6. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for condition, attachment, fraying, and loose connections.		
7. BRAKE RESERVOIR - Inspect for security of attachment and leakage. Inspect and fill brake reservoir as needed.		
8. INSTRUMENT AIR FILTER - Inspect for security of attachment and replace as necessary as described in Chapter 12-20-00 of the Maintenance Manual.		

F. WINGS	L	R	
1. SKIN - Inspect skin for corrosion, condition and loose or missing rivets. If damage is found, check adjacent structure.			
2. STRUCTURE - Check for corrosion, cracks, loose or missing rivets, and concealed damage. See Chapter 57 for mandatory and supplementary inspections.			
3. ACCESS DOORS - Inspect for proper fit attachment, and missing or damaged components.			
4. FLAPS - Inspect skin and structure for condition, corrosion, loose or missing rivets and excessive freeplay.			
5. AILERON AND TAB - Inspect skin and structure for condition, corrosion, and loose or missing rivets. Check for proper attachment, freedom of movement, and excessive freeplay.			
6. TAXI LIGHT - Check for proper operation, crazing of cover, cracked or broken lens and replace bulbs as necessary.			
7. LANDING LIGHT - Check for proper operation, crazing of cover, cracked or broken lens and replace bulbs as necessary.			
8. STROBE LIGHT - Check for proper operation, cracked or broken lens and replace flashtube as necessary.			
9. FUEL TANKS AND VENTS - Inspect fuel tank for leaks and vent for obstructions, condition, corrosion, and attachment.			
10. FUEL QUANTITY SENSORS - Check for attachment and leaks.			
11. PLUMBING AND HYDRAULIC LINES - Check for chafing, leakage or damage and proper attachment.			
12. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security, and attachment.			
13. CABLE, PULLEYS, AND BELL CRANKS - Inspect for condition, corrosion, fraying, attachment, alignment, clearance and proper operation.			

F. WINGS (Cont'd)	Mech. L	Mech. R	Insp.
14. WING BOLTS - Check wing bolts for proper torque at the first 100-hour inspection, as instructed in Chapter 57-00-00, and 100 hours after a wing bolt has been loosened and retorqued.			
G. NACELLES			
1. SKIN - Inspect skin for corrosion, condition and loose or missing rivets. If damage is found, check adjacent structure.			
2. STRUCTURE - Check for corrosion, cracks, loose or missing rivets, and concealed damage.			
3. ENGINE MOUNT NACELLE CHANNELS - Check for cracks, fretting, and corrosion in area of keels and keel flanges adjacent to the nut plate for attachment of the engine mount assembly.			
4. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security, and attachment			
5. PLUMBING - Check for chafing, leakage or damage and proper attachment			
6. FUEL PLUMBING - Check for chafing, leakage or damage and proper attachment			
7. BOOST PUMPS - Inspect for leakage, attachment, and condition			
8. FUEL SELECTOR VALVES - Inspect selector valve and control for condition and attachment. Inspect control for binding, freedom of movement and rig. Drain the valve			
9. FUEL STRAINERS (FUEL SELECTOR VALVE) - Inspect and clean the strainers as outlined in Chapter 28-00-00 of the Maintenance Manual			
H. MAIN GEAR AND BRAKES	L	R	
1. BRAKE LINING AND DISCS - Check brake discs, linings, and lines for wear, damage, corrosion and security of all units.			
2. WHEELS AND TIRES - Check wheels for condition and tires for wear, damage, condition, evidence of slippage, flat spots, and proper inflation.			
3. LANDING GEAR STRUT - Inspect the shock strut and components for condition, attachment, proper inflation and leakage. If signs of leakage are apparent, service as outlined in Chapter 12-20-00 of the Maintenance Manual.			
4. GEAR DOORS - Check condition, security and corrosion.			
5. HINGE BOLTS - Inspect for condition and security of attachment.			

I. NOSE GEAR	Mech.	Insp.
1. WHEEL AND TIRE - Check wheel for condition and tire for wear, damage, condition and proper inflation.		
2. LANDING GEAR STRUT - Inspect the shock strut and components for condition, attachment, proper inflation and leakage. If signs of leakage are apparent, service as outlined in Chapter 12-20-00 of the Maintenance Manual. Check for evidence of cracks around tow area and trunion.		
3. GEAR DOORS AND LINKAGE - Check condition, freeplay, and corrosion.		
4. SHIMMY DAMPENER - Inspect for condition and attachment. Service as necessary as outlined in Chapter 12-20-00 of the Maintenance Manual.		
5. STEERING MECHANISM - Inspect steering mechanism and linkage for condition, attachment, and correct adjustment. Check the steering bell crank for cracks, condition, and security.		
6. HINGE BOLTS - Inspect for condition and security of attachment.		

J. ★MAIN GEAR RETRACTION	L	R	
1. DOORS - Check door operation, fit, and fair.			
2. POSITION INDICATORS - Check for security of attachment, adjustment, wiring for breaks, condition of insulation, loose connections, and proper indication.			
3. WARNING HORN - Check for proper operation.			
4. MAIN ACTUATING CYLINDERS - Check for condition, attachment, noisy operation, leakage, and rigging.			
5. EMERGENCY EXTENSION - Check system for freedom of operation and positive engagement of the downlocks.			
6. GENERAL OPERATION - Check retraction system for proper operation of all components through at least two complete cycles; check for unusual noises or evidence of binding.			
7. HYDRAULIC PRESSURE SWITCH - Check for security, attachment, and proper operation.			
8. HYDRAULIC SYSTEM (GEAR UP) - Inspect for security, attachment, and leakage of all hydraulic lines. If signs of leakage are apparent, repair as outlined in Chapter 32 of the Maintenance Manual.			
9. HYDRAULIC SYSTEM (GEAR DOWN) - Inspect for security, attachment, and leakage of all hydraulic lines. If signs of leakage are apparent, repair as outlined in Chapter 32 of the Maintenance Manual.			
10. DOWNLIMIT SWITCH - Check for security, attachment, and proper adjustment.			

J. ★MAIN GEAR RETRACTION (Cont'd)	Mech. L	Mech. R	Insp.
11. DOWNLOCKS - Check the downlock indicator switch for security, attachment, and proper adjustment. Check locking mechanism for positive engagement in the extended position.			
★ Landing gear operational check should be made every 100 hours of airplane operation.			
K. ★NOSE GEAR RETRACTION			
1. DOORS - Check door operation, fit, fair, and rig.....			
2. POSITION INDICATOR - Check for security of attachment, adjustment, wiring for breaks, condition of insulation, loose connections, and proper indication.			
3. NOSE GEAR ACTUATING CYLINDER - Check for condition, attachment, noisy operation, leakage, and rigging.....			
4. DOWNLOCK - Check the downlock indicator switch for security, attachment, and proper adjustment. Check locking mechanism for positive engagement in the extended position.			
5. RETRACT CYLINDER - Check for condition, attachment, noisy operation, leakage, and rigging.....			
6. DOWNLIMIT SWITCH - Check for security, attachment, and proper adjustment.....			
★ Landing gear operation check should be made every 100 hours of airplane operation.			
L. GENERAL SERVICE ITEMS			
1. Airplane cleaned and serviced.			
2. Lubricate as necessary as outlined in the service chart in Chapter 12 of the Maintenance Manual.			
3. Engines inspected after ground run-up or flight test. Check for oil leaks, security and attachment of all components.			

"END"

CHAPTER 6

LIST OF PAGE EFFECTIVITY

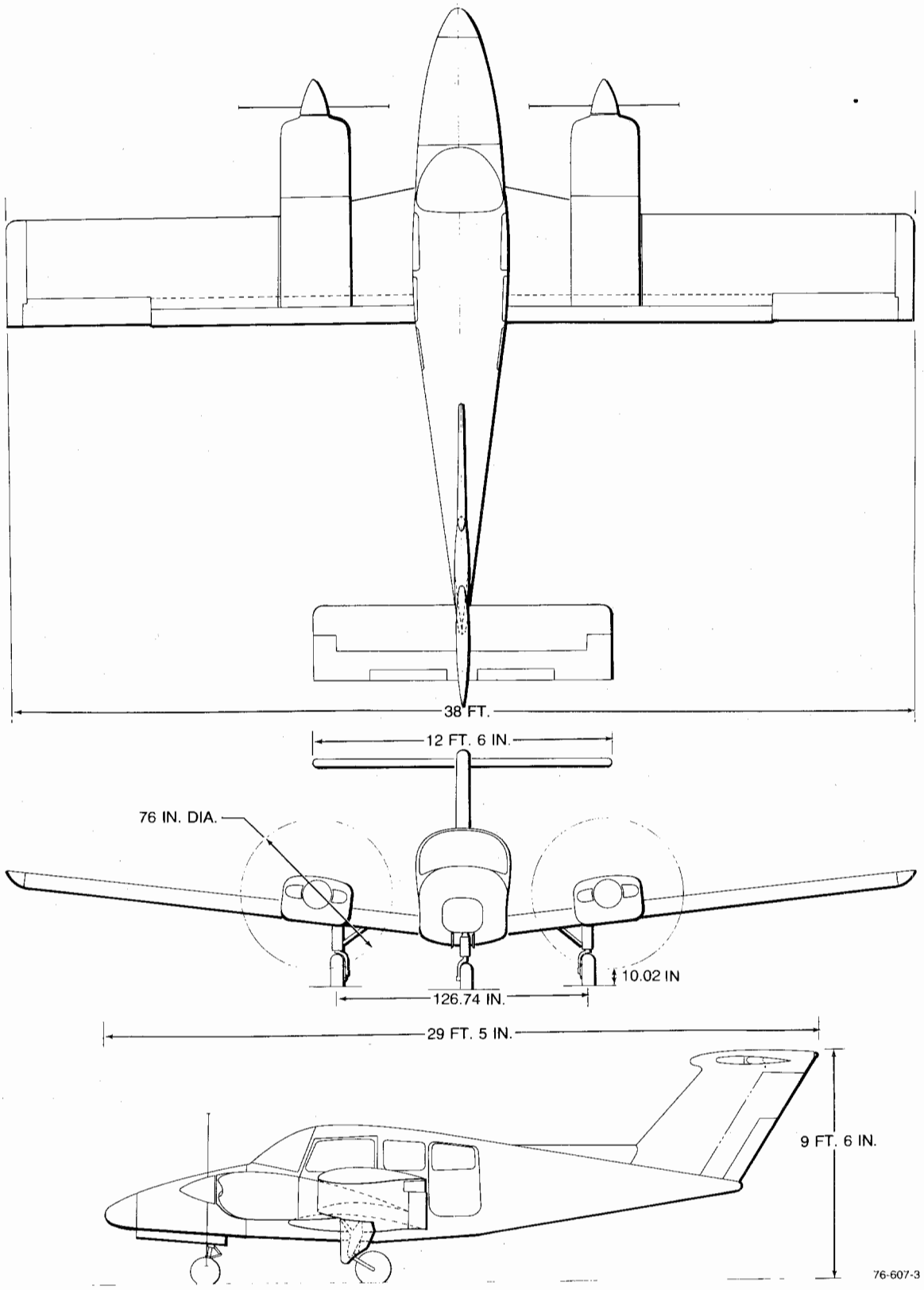
CHAPTER SECTION SUBJECT	PAGE	DATE
6 - EFFECTIVITY/CONTENTS	1	Nov 18/77
6-00-00	1	Nov 18/77

CHAPTER 6 - DIMENSIONS AND AREAS

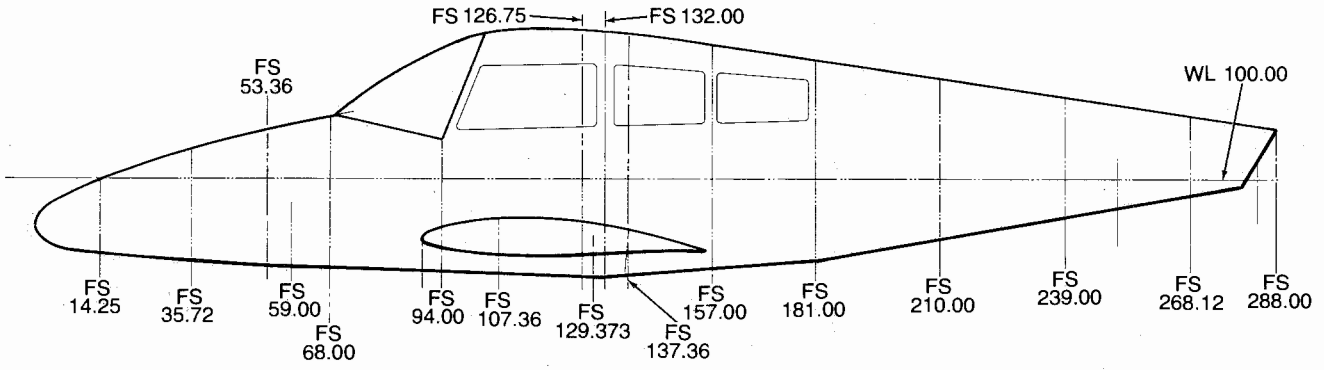
TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
DIMENSIONS AND AREAS	6-00-00	
Airplane Dimensions		1
Stations Diagram		2

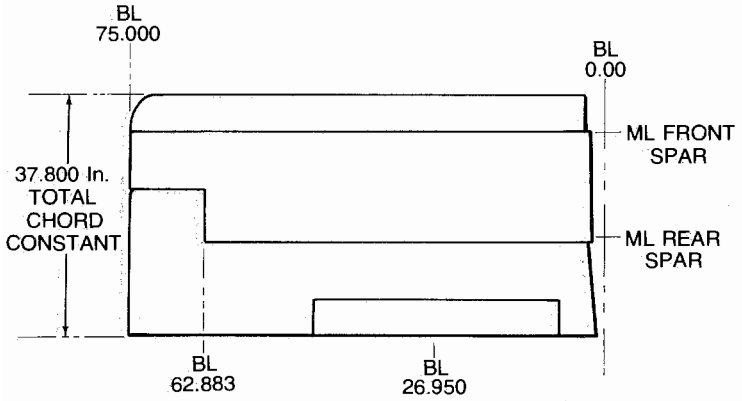
"END"



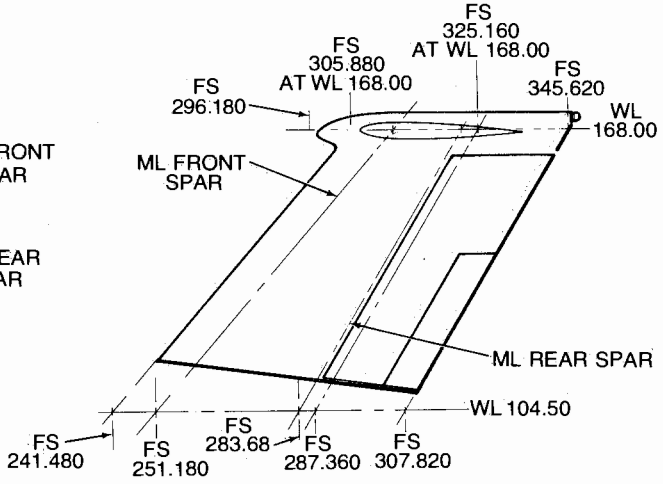
Airplane Dimensions
Figure 1



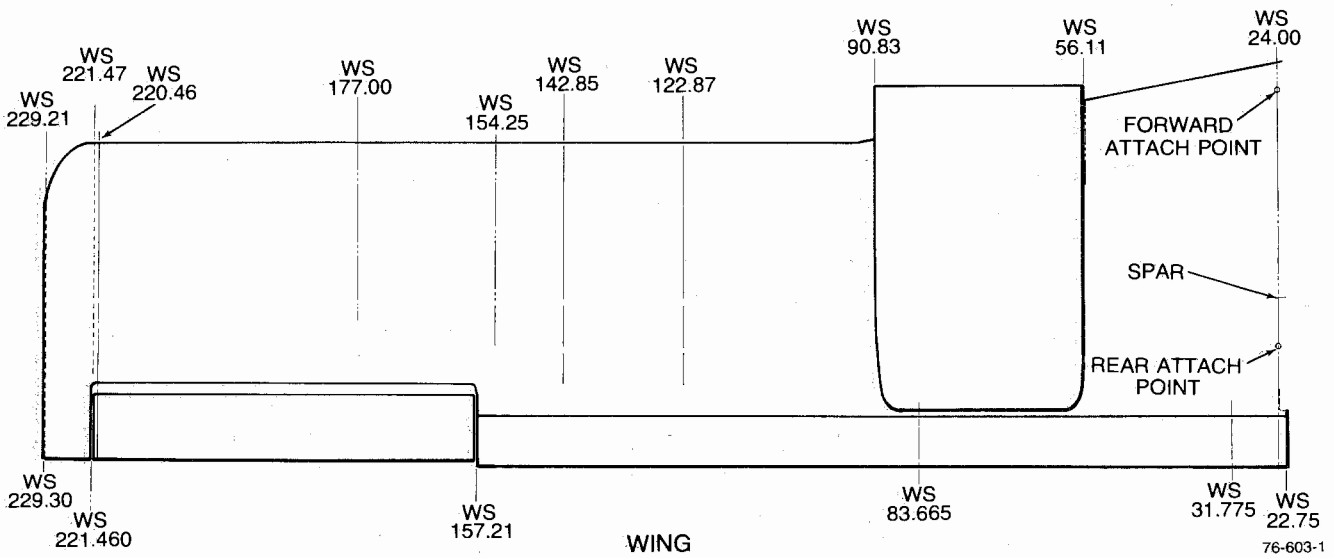
FUSELAGE



HORIZONTAL STABILIZER



VERTICAL STABILIZER



WING

Stations Diagram
Figure 2

"END"

CHAPTER 7

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
7-EFF/CONT	1	Mar 15/82
7-00-00	1	Mar 15/82
	2	Feb 16/79

CHAPTER 7 - LIFTING AND SHORING

TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
GENERAL	7-00-00	
Description and Operation		1
Hoisting		1
Jacking		1

"END"

GENERAL - DESCRIPTION AND OPERATION

HOISTING

NOTE

Hoisting is not recommended, but may be accomplished under emergency conditions.

Hoisting of the airplane may be accomplished as shown in Figure 3 by rigging a "belly strap" of four inch wide webbing at station 94.00, forward of the leading edge of the wing, and another one at station 157.00, just aft of the assist steps. A cable from each engine sling attachment point to the hoisting hook should be used to steady the airplane during the hoisting operation.

JACKING

CAUTION

The landing gear circuit breaker should be pulled and the emergency gear extension valve should be open to relieve pressure in the hydraulic system when work is to be accomplished on the landing gear system.

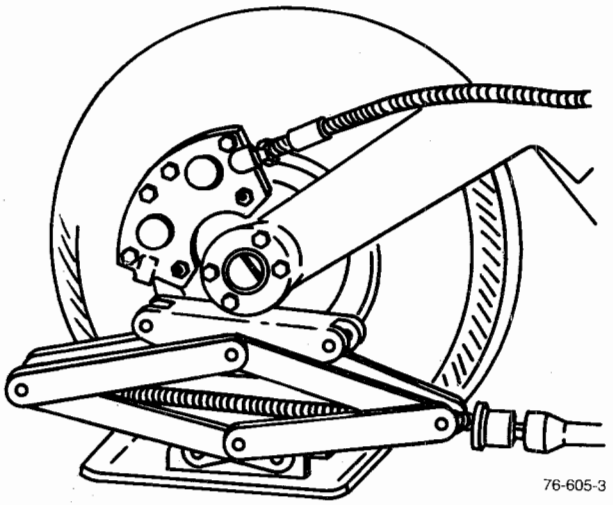
If so desired, a scissors jack under the wheel axle, as shown in Figure 1, may be used for removing a wheel and tire from an individual gear. To remove a landing gear without the aid of the jack pads, shown in Figure 2, raise the wing either by the scissors jack under the axle or by manual lifting (two or more persons placing their shoulders under the spar) and placing a contoured cradle under the wing for support. Remove the jack after the support is in place.

Jack pads are located inboard of the main gears only. Use of a tail stand, and the tail anchored to a ground tie-down or a weight of 450 lbs secured to the airplane tail tie-down ring, is required when jacking.

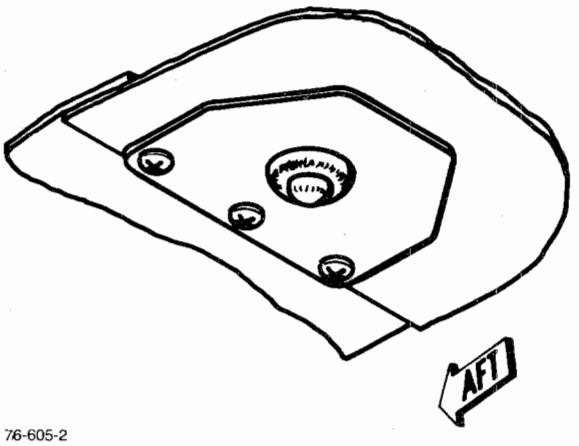
Whatever method of jacking is used, or for what purpose, the following precautions must be observed to avoid damaging the airplane:

a. NEVER raise the airplane higher than is necessary to accomplish the task.

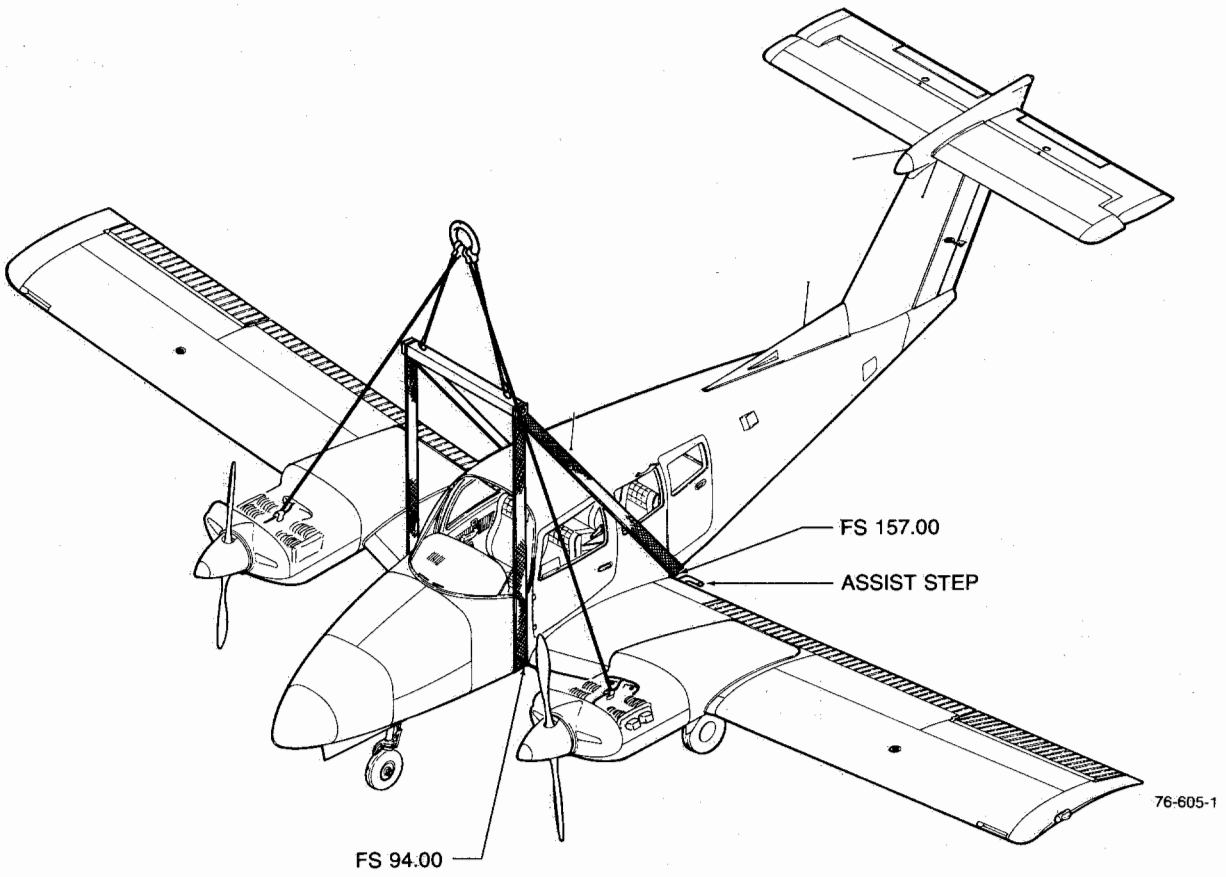
b. Use extreme CAUTION when entering or leaving the airplane while it is on jacks.



Use of Scissors Jack
Figure 1



Jack Pads
Figure 2



Hoisting
Figure 3

"END"

CHAPTER 8

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
8-EFFECTIVITY/CONTENTS	1	Nov 18/77
8-00-00	1	Nov 18/77

CHAPTER 8 - LEVELING AND WEIGHING

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GENERAL	8-00-00	
Maintenance Practices		1
Leveling		1

"END"

GENERAL - MAINTENANCE PRACTICES

LEVELING

Jack pads are located inboard of the main gears only. Use of a tail stand, and the tail anchord to a ground tie-down or secure a weight of 450 pounds to the airplane tail tie-down ring, is required when jacking.

Leveling the airplane may be accomplished as follows:

a. Position a bubble level on the baggage floorboard and approximately in line with the lateral and longitudinal axis of the airplane.

b. Adjust the jacks as necessary to level the airplane.

"END"

CHAPTER 9

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
9 - EFFECTIVITY/CONTENTS	1	Nov 18/77
9-00-00	1	Nov 18/77

CHAPTER 9 - TOWING AND TAXIING

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Maintenance Practices		1
Towing		1

"END"

GENERAL - MAINTENANCE PRACTICES

TOWING

CAUTION

When towing with a tug, observe the turn limits of the nose landing gear to prevent damage to the gear.

Attach the towbar to the nose landing gear towbar fitting It is recommended that someone ride in the Pilot's compartment to "standby" the brakes when the airplane is being moved

CAUTION

DO NOT push on the propeller or spinner or any of the control surfaces.

"END"

CHAPTER 10

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
10-EFFECTIVITY/CONTENTS	1	Feb 16/79
10-00-00	1	Feb 16/79
	2	Nov 18/77
	3	Nov 18/77
	4	Nov 18/77

CHAPTER 10 - PARKING AND MOORING

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Mooring		1
Control Lock		1
Storage		1
Flyable Storage - 7 to 30 Days		1
Preparation for Service		2
Temporary Storage - 31 to 90 Days		2
Preparation for Service		2
Indefinite Storage		2
Preparation for Service		4

"END"

GENERAL - MAINTENANCE PRACTICES

PARKING

The brakes are set for parking by pulling out the parking brake control and depressing the pilot's brake pedals to pressurize the system. Do not attempt to lock the parking brake by applying force to the parking brake handle; it controls a valve only, and cannot apply pressure to the master cylinders.

NOTE

Do not set the parking brake during low temperatures when an accumulation of moisture may cause the brake linings to freeze, or when they are hot from severe use.

MOORING

To moor the airplane, chock the wheels fore and aft, install the control lock and tie down the airplane with a nylon line or chain of sufficient strength at each mooring eye. Excessive overtightening of the rear line will result in a nose up attitude so that the wind will create higher lift on the wings. If bad weather is anticipated, it is advisable to nose the airplane into the wind.

CONTROL LOCK

The control lock assembly consists of a lock pin, C-shaped clamp and a warning flag. The lock pin is pushed through a hole in the control column bearing and control column. The C-shaped clamp hooks over the control column. The warning flag is placarded CONTROL LOCK REMOVE BEFORE TAKEOFF. The control lock assembly covers the ignition switch performing a safety feature by preventing engine start with the control lock installed. Install the control lock assembly in the following sequence:

a. Push the control column full forward and to the right 45° ± 5°.

b. Push the control column lock pin through the hole provided in the control column guide on the subpanel and into the hole in the underside of the control column tube assembly.

c. Ensure positive retention of the lock pin by positioning the hook over the control column.

STORAGE

The storage procedures are intended to protect the airplane from deterioration while it is not in use. The primary objectives of these measures are to prevent corrosion and damage from exposure to the elements. The three types of storage are:

a. Flyable storage - 7 to 30 days
b. Temporary Storage - 31 to 90 days
c. Indefinite Storage - 91 days and after

FLYABLE STORAGE - 7 to 30 DAYS

a. Mooring.

1. Place the airplane in a hangar.
2. If the airplane cannot be placed in a hangar, tie down securely at the three tie down points provided on the airplane. Do not use hemp or manila rope. It is recommended a tail support be used to compress the nose strut which will reduce the wing angle of attack. Attach a line to the nose gear.

b. Engine.

1. Operate the engine until the oil temperature reaches the normal range. Drain the oil supply from the sump as completely as possible and replace the drain plug.
2. Fill the sump to the full mark on the oil dipstick with MIL-C-6529 TYPE II oil (8, Chart 1, 91-00-00). This will mix with normal oil, is suitable as a lubricant and will provide protection against corrosion.
3. Run the engine at least five minutes at a speed between 1000 and 1200 rpm with the oil temperature and cylinder head temperature in the normal operating range.

WARNING

Before rotating the propeller blades, make certain magneto/start switches are OFF, throttles are in the CLOSED position, and mixture controls are in the IDLE CUT-OFF position. Always stand clear while turning the propellers.

4. Each seven days during flyable storage, the propellers shall be rotated by hand without running the engine. After rotating the engine six revolutions, stop the propeller 45° to 90° from it's previous position.
5. If at the end of thirty days the airplane will not be removed from storage, the engine shall be started and run. The preferred method will be to fly the airplane for thirty minutes. If flying the airplane is impractical, a ground run shall be made of thirty minutes duration, and up to but not exceeding normal oil temperatures.

c. Fuel Cells. Fill fuel cells to capacity to minimize fuel vapor.

d. Flight Control Surfaces. Lock flight control surfaces with internal locks.

e. Grounding. Static ground airplane securely and effectively.

f. Pitot Tube. Install pitot tube cover.

g. Windshield and Windows.

1. Close all windows.

2. It is recommended that covers be installed over the windshield and windows.

PREPARATION FOR SERVICE

a. Remove all covers, tape and control locks. Clean the airplane and give it a thorough inspection, particularly wheel wells, flaps and control openings.

b. Drain the MIL-C-6529 Type II oil (8, Chart 1, 91-00-00) after ground warm-up. Fill with engine oil (2, Chart 1, 91-00-00) before flight.

c. Preflight the airplane.

TEMPORARY STORAGE - 31 TO 90 DAYS

a. Mooring.

1. Place airplane in hangar.

2. If the airplane cannot be placed in a hangar, tie down securely at the three tiedown points provided on the airplane. Do not use hemp or manilla rope. It is recommended a tail support be used to compress the nose strut which will reduce the wing angle of attack. Attach a line to the nose gear.

b. Engine.

1. Operate the engine until the oil temperature reaches the normal range. Drain the oil supply from the sump as completely as possible and replace the drain plug.

2. Fill the sump to the full mark on the oil dipstick with MIL-C-6529 TYPE II oil (8, Chart 1, 91-00-00). This will mix with normal oil, is suitable as a lubricant and will provide protection against corrosion.

3. Run the engine at least five minutes at a speed between 1000 and 1200 rpm with the oil temperature and cylinder head temperature in the normal operating range.

4. Remove top and bottom spark plugs and atomize spray preservative oil (9, Chart 1, 91-00-00) through upper spark plug hole of each cylinder with the piston in the down position. Rotate crankshaft as each pair of cylinders is sprayed. Stop crankshaft with no piston at top position.

5. Re-spray each cylinder without rotating crankshaft. To thoroughly cover all surfaces of the cylinder interior, move the nozzle of the spray gun from the top to the bottom of the cylinder.

6. Reinstall spark plugs.

7. Apply preservative to the engine interior by spraying preservative oil (9, Chart 1, 91-00-00) (approximately 2 ounces) through the oil filler tube.

8. Seal all engine openings exposed to the atmosphere using suitable plugs, or non-hygroscopic tape, and attach red streamers at each point.

9. Affix a tag to the propeller in a conspicuous place with the following notation on the tag: "DO NOT TURN PROPELLER - ENGINE PRESERVED".

10. Seal the propeller blade spinner cutouts with tape.

c. Fuel Cells. Fill to capacity to minimize fuel vapor.

d. Flight Control Surfaces. Lock with internal locks.

e. Grounding. Static ground airplane securely and effectively.

f. Pitot Tube. Install cover.

g. Windshield and Windows.

1. Close all windows.

2. It is recommended, covers be installed over windshield and windows.

h. Airplane Batteries and ELT (Emergency Locator Transmitter) Battery.

1. Remove airplane batteries and ELT battery from the airplane and store in accordance with standard practices.

2. Clean battery box and battery cable terminals to neutralize any battery acid that may be present.

PREPARATION FOR SERVICE

a. Remove all covers, tape, tags and control locks. Clean the airplane and give it a thorough inspection, particularly wheel wells, flaps and control openings.

b. With bottom spark plugs removed, hand turn propeller several revolutions to clear excess preservative oil then reinstall plugs.

c. Drain the MIL-C-6529 TYPE II oil (8, Chart 1, 91-00-00) after ground warm-up. Install engine oil (2, Chart 1, 91-00-00) before flight.

d. Preflight the airplane and flight test.

INDEFINITE STORAGE

a. Mooring.

1. Place airplane in hangar.

2. If airplane cannot be placed in a hangar tie down securely at the three tiedown points provided on the airplane. Do not use hemp or manilla rope. It is recommended a tail support be used to compress the nose strut

which will reduce wing angle of attack. Attach a line to the nose gear

b. Engine

1. Operate the engine until the oil temperature reaches the normal range. Drain the oil supply from the sump as completely as possible and replace the drain plug.

2. Fill the sump with MIL-C-6529 TYPE II oil (8, Chart 1, 91-00-00).

3. Run the engine at least five minutes at a speed between 1000 and 1200 rpm with the oil temperature and cylinder head temperature in the normal operating range.

4. Remove top and bottom spark plugs and atomize spray preservative oil (9, Chart 1, 91-00-00) through upper spark plug hole of each cylinder with the piston in the down position. Rotate crankshaft as each pair of cylinders are sprayed. Stop crankshaft with no piston at the top position.

5. It is recommended the propellers be removed and the engines removed from the airplane. Each propeller shaft should be coated with preservative oil and wrapped with moisture proof material and tape.

6. Install protex plugs in each of the spark plug holes, making sure that each protex plug is blue in color when installed. Protect and support the spark plug leads with AN4060-1 protectors.

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

8. Seal engines breather by inserting a protex plug in the breather and clamping in place.

9. Wrap engines with moisture proof material and tape after desiccant bags have been installed.

10. Attach a red streamer to each place on the engine where bags of desiccant are placed. Attach red streamers outside of the sealed area with safety wire to prevent wicking of moisture into sealed area.

11. If the propellers have not been removed, affix a tag in a conspicuous place with the following notation: " DO NOT TURN PROPELLER-ENGINE PRESERVED."

12. The cylinder protex plugs shall be inspected weekly. The plugs should be changed as soon as their color indicates unsafe conditions of storage. If the dehydrator plugs have changed color in one-half or more of the cylinders, all desiccant material on the engine should be replaced.

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

c. Propellers.

1. Clean propellers to remove dirt, oil and bug accumulation. Use water and a soft brush.

2. Coat blades with preservative oil and wrap with moisture proof material and tape. If propellers have been removed, coat all parts with preservative oil, wrap with protective material to exclude dust, and then tape.

d. Grounding. Static ground airplane securely and effectively.

e. Seats. Install protective covers.

f. Fuel Cells.

1. Drain fuel cells.

g. Flight Control Surfaces.

1. Lubricate all flight control surfaces hinge pins, bearings, bell cranks, chains, control rods and quadrants, and coat lightly with corrosion preventive compound (10, Chart 1, 91-00-00).

2. Lock with internal locks.

h. Pitot Tube.

1. Apply a thin coating of grease, MIL-G-10924 (11, Chart 1, 91-00-00).

2. Install covers.

i. Windshield and Windows.

1. Close all windows.

2. Install covers over windshield and windows.

j. Landing Gear.

1. Clean the brakes and apply a coating of primer (12, Chart 1, 91-00-00) to the brake discs.

2. Touch up all spots where paint has been chipped from the wheels.

3. After mooring, cover or wrap the wheels with barrier material and secure with tape.

4. Check air pressure periodically and inflate as necessary.

5. It is advisable that unservicable tires be used for prolonged storage.

6. Coat the exposed surfaces of the shock strut pistons and nose gear shimmy dampener piston with preservative hydraulic fluid (13, Chart 1, 91-00-00) and protect with barrier material.

CAUTION

Do not apply corrosion preventative to the exposed surfaces of the landing gear strut piston or to the extended polished surfaces of the hydraulic cylinders.

k. Airplane Batteries and ELT (Emergency Locator Transmitter) Battery.

1. Remove airplane batteries and ELT battery from the airplane and store in accordance with standard practices.

2. Clean battery box and battery cable terminals to neutralize any battery acid that may be present.

l. Instrument Panel. Cover with barrier material and secure with tape.

m. Seats. Install protective covers.

n. Landing Lights. Cover with barrier material and secure with tape.

o. Stall Warning Unit.

1. Remove and store according to standard practices.

2. Tape connections.

p. Loose Tools and Equipment. Remove loose tools and equipment and store in a dry temperate room.

q. Airframe. Cover static ports and all openings with barrier material and secure with tape to exclude rain, sun and foreign matter.

r. Avionics. Clean and cover any equipment sensitive to dust or moisture and take any additional precautions recommended by the manufacturer of such equipment.

s. Hydraulic System. Fill the hydraulic reservoir to operational level and inspect the system for leaks, then repair as necessary prior to storage.

PREPARATION FOR SERVICE

a. Remove all covers, tapes, and tags from the airplane.

b. Remove the cylinder protex plugs and all paper tape, and dehydrating agent used to preserve engines.

c. Drain the MIL-C-6529 TYPE II oil (8, Chart 1, 91 00-00) after ground warm-up. Install engine oil (2, Chart 1, 91-00-00) before flight.

d. Rotate propellers to clear excess preservative oil from cylinders.

e. Reinstall the spark plugs and battery.

WARNING

Before rotation of propeller blades, ascertain magneto/start switches are OFF, throttles are in the CLOSED position, and mixture controls are in the IDLE CUT-OFF position. Always stand in the clear while turning propellers.

f. Rotate propellers by hand through all compressions of the engines to check for liquid lock. Reinstall cowling and start engines in the normal manner.

g. Give the airplane a thorough cleaning, visual inspection and flight test.

"END"

CHAPTER 11

LIST OF PAGE EFFECTIVITY

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11-EFFECTIVITY/CONTENTS	1	Sep 19/80
11-00-00	1	Sep 7/79
11-20-00	1	Feb 16/79
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	5	Sep 19/80
	6	Sep 19/80
	7	Sep 19/80

CHAPTER 11 - PLACARDS & MARKINGS

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EXTERIOR PLACARDS AND MARKINGS	11-20-00	
Exterior Maintenance Placards Locations		1

"END"

GENERAL - DESCRIPTION AND OPERATION

MODEL DESIGNATION PLACARD

The model designation placard is located on the RH side of the fuselage adjacent to the inboard end of the flap. The flaps must be lowered to observe the placard. The placard identifies the airplane by its model number and serial number. Should a question arise concerning the care of the airplane, it is important to include the airplane serial number in any correspondence to Beech Aircraft Corporation.

A non-interchangeable parts placard is located on the firewall in each engine compartment.

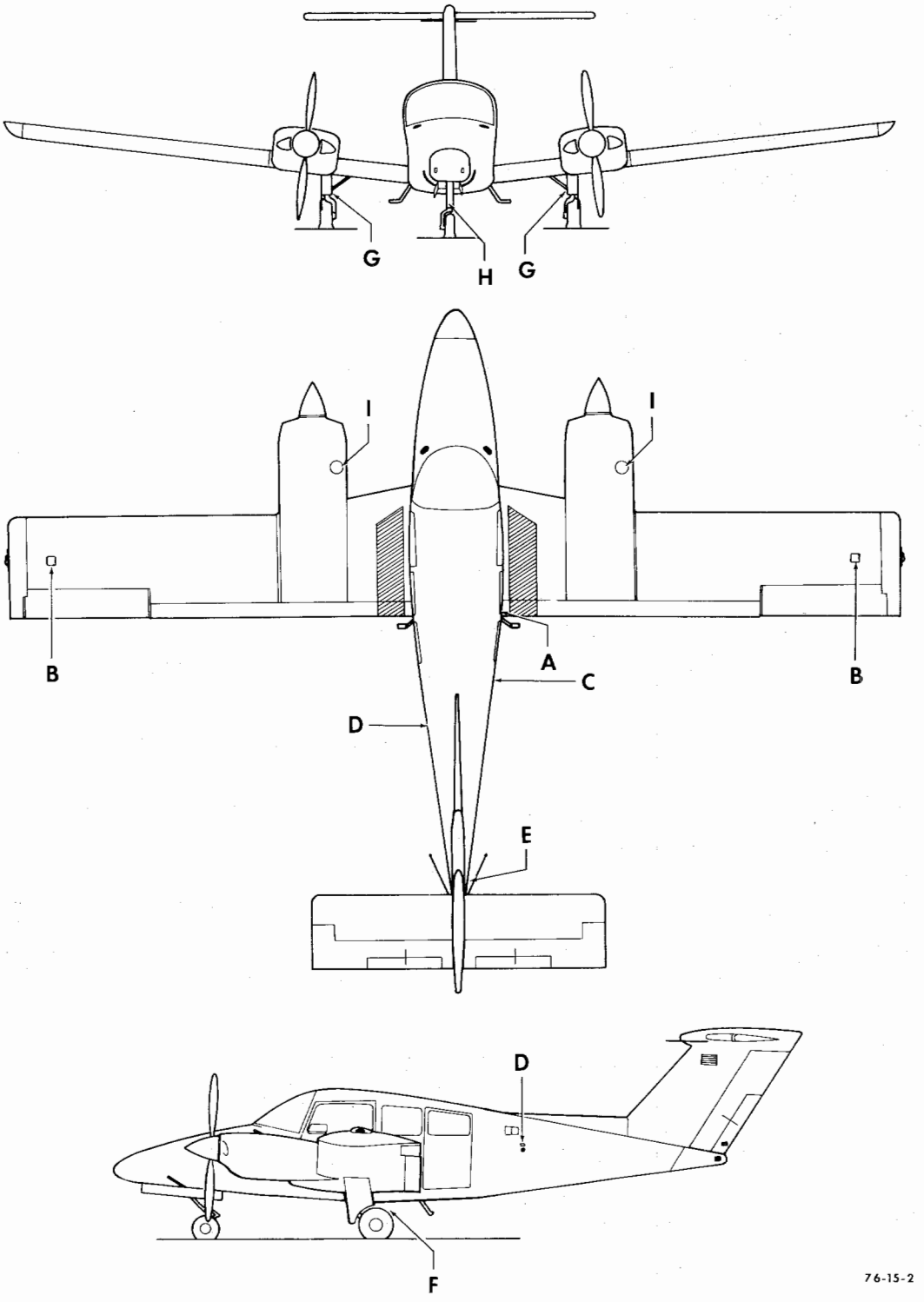
All required placards and markings are listed in Section II Limitations of the Duchess 76 Pilot's Operating Handbook.

Exterior Maintenance placards are shown in Chapter 11-20-00 in this Maintenance Manual.

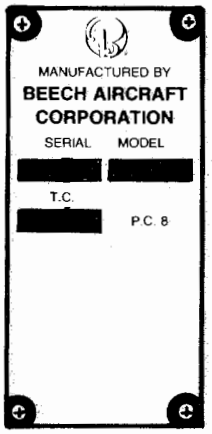
NOTE

Ascertain that all placards are in place and legible whenever the airplane has been repainted or touched up after repairs. Replace any placards that have been inadvertently defaced after such repainting or repairs.

"END"



Exterior Maintenance Placards Locations
Figure 1



THE MODEL DESIGNATION PLACARD IS LOCATED ON THE RH SIDE OF THE FUSELAGE ADJACENT TO THE INBOARD END OF THE FLAP.

Detail A

76-15-11

FUEL

USE 100/130 GRADE FUEL

FOR ALTERNATE FUELS SEE
PILOTS OPERATING MANUAL

CAPACITY 51.5 US GALLONS (50 USABLE)
WITH WINGS LEVEL
CAP. TO TAB BOTTOM 30 GAL. (28.5 USABLE)
CAP. TO MID MARK 40 GAL. (38.5 USABLE)

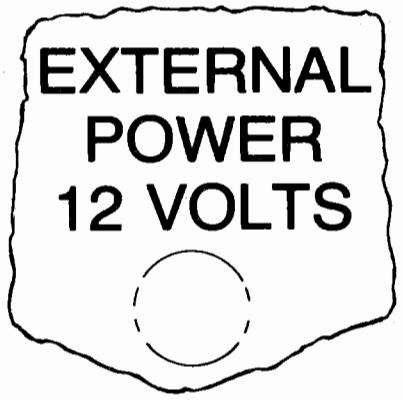
CAUTION

DO NOT FILL ABOVE FULL INDICATOR MARK

FUEL PLACARDS ARE LOCATED OUTBOARD, ADJACENT TO THE FUEL FILLER CAPS.

Detail B

76-15-3



LOCATED ON THE RH AFT FUSELAGE, JUST AFT OF THE CABIN.

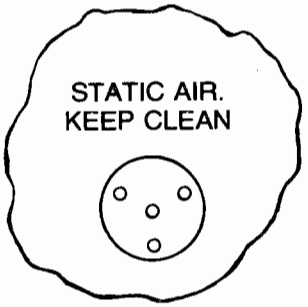
Detail C (ME-1 THRU ME-182)

76-15-4

LOCATED ON THE RH AFT FUSELAGE, JUST AFT OF THE CABIN.

Detail C (ME-183 AND AFTER)

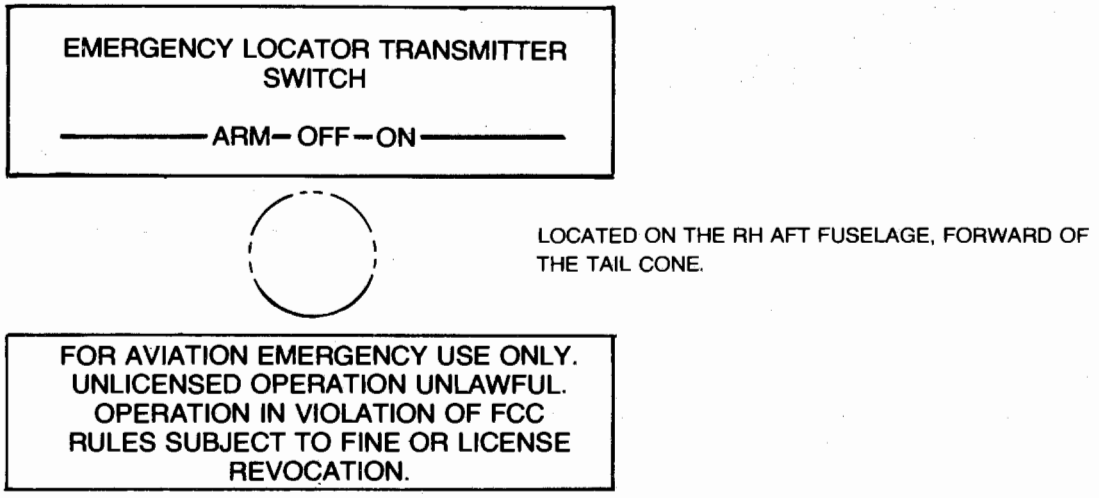
76-15-12



LOCATED ON THE LH AFT FUSELAGE, ADJACENT TO THE STATIC AIR BUTTON.

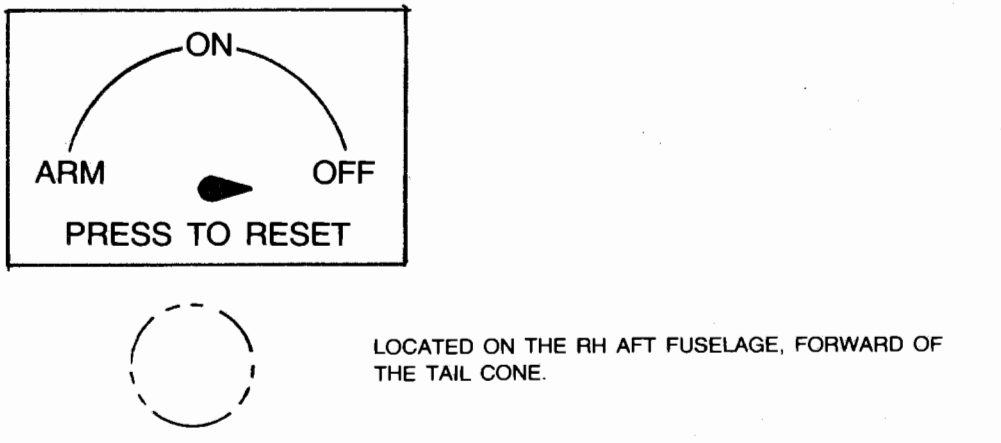
Detail D

76-15-5



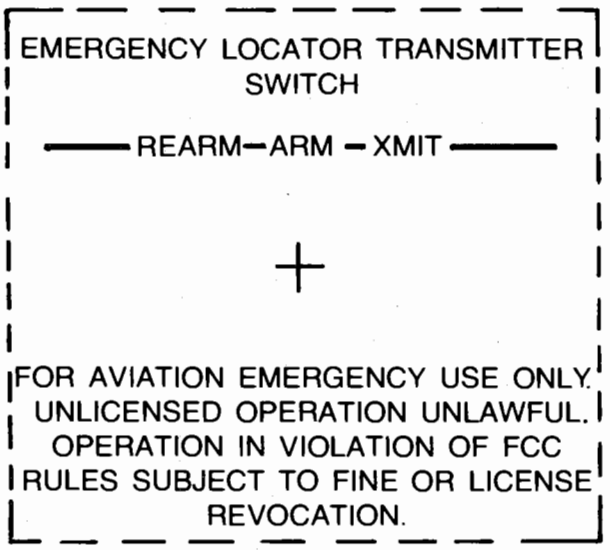
Detail E (ME-1 THRU ME-101 AND ME-340 THRU ME-359)

76-15-6



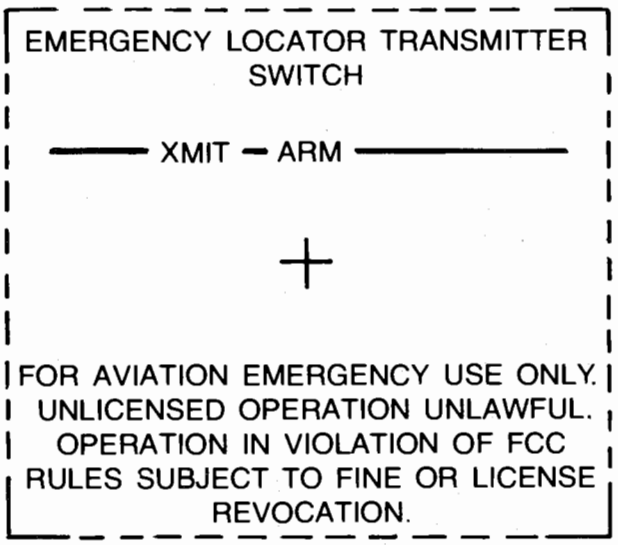
Detail E (ME-102 THRU ME-339)

76-15-13



LOCATED ON THE RH AFT FUSELAGE, FORWARD OF THE TAIL CONE.

Detail E (PRIOR TO ME-102 WITH KIT NO. 101-3039-1 INSTALLED) 76-15-16



LOCATED ON THE RH AFT FUSELAGE, FORWARD OF THE TAIL CONE.

Detail E (PRIOR TO ME-340 WITH KIT NO. 101-3046-1 INSTALLED AND ME-360 AND AFTER) 76-15-15

LOCATED IN THE UNDERBELLY OF THE FUSELAGE, BELOW AND AFT OF THE LH CABIN DOOR.

Detail F 76-15-7

OIL AIR STRUT

BEECH S.C.D. NO. 105-384001 [redacted]
BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS U.S.A.

INSTRUCTIONS

TO CHECK FLUID AND FILL

REMOVE VALVE CAP OPEN VALVE AND ALLOW STRUT TO FULLY COMPRESS WITH STRUT AT APPROX. ¼ INCH FROM COMPRESSED POSITION. REMOVE VALVE BODY ASSY AND FILL WITH HYDRAULIC FLUID CONFORMING TO INSTRUCTION MANUAL SPECIFICATIONS. SLOWLY CYCLE STRUT TO DISPLACE TRAPPED AIR. REPEAT UNTIL ADDITIONAL OIL CANNOT BE ADDED WITH STRUT EXTENDED. REPLACE VALVE BODY ASSY AND COMPLETELY COMPRESS TO EXPEL EXCESS AIR AND OIL.

FLUID VOLUME - 508 cc

WITH STRUT FULLY EXTENDED, CHARGE WITH DRY AIR TO 300 PSIG. THIS PRESSURE SHOULD KEEP STRUT INFLATED TO APPROXIMATELY 2 INCHES OF PISTON SHOWING WHEN AIRPLANE IS EMPTY EXCEPT FOR FULL FUEL AND OIL.

WARNING

RELEASE AIR IN STRUT BEFORE DISASSEMBLING

LOCATED ON EACH MAIN LANDING GEAR STRUT.

Detail G

76-15-8

Beechcraft

OIL AIR STRUT

PART NO. 105-820036-
BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS, USA

INSTRUCTIONS

TO CHECK FLUID AND FILL

REMOVE VALVE CAP, DEPRESS VALVE CORE AND ALLOW STRUT TO FULLY COMPRESS. THEN RAISE AND BLOCK STRUT ¼ INCH FROM COMPRESSED POSITION. REMOVE VALVE BODY ASSEMBLY AND FILL WITH HYDRAULIC OIL CONFORMING TO INSTRUCTION MANUAL SPECIFICATIONS. SLOWLY CYCLE STRUT TO DISPLACE TRAPPED AIR. REPEAT UNTIL ADDITIONAL OIL CANNOT BE ADDED. WITH STRUT EXTENDED, REPLACE VALVE BODY ASSY, DEPRESS VALVE CORE AND COMPLETELY COMPRESS STRUT TO RELEASE EXCESS AIR AND OIL.

WITH AIRPLANE EMPTY EXCEPT FOR FULL FUEL AND OIL KEEP STRUT INFLATED TO 4¼ INCHES OF PISTON SHOWING.

WARNING

RELEASE AIR IN STRUT BEFORE DISASSEMBLING

LOCATED ON THE NOSE LANDING GEAR STRUT.

Detail H

76-15-9

USE AVIATION GRADE STRAIGHT-MINERAL OIL FOR FIRST 50 HOURS OR UNTIL OIL CONSUMPTION STABILIZES

AVIATION GRADE ASHLESS-DISPERSANT OIL IS RECOMMENDED THEREAFTER

INSTALLED ON THE UNDERSIDE OF THE OIL FILLER DOOR ASSEMBLY. VISIBLE WHEN THE DOOR IS OPEN.

Detail I (ME-1 THRU ME-113) 76-15-10

INSTALLED ON THE UNDERSIDE OF THE OIL FILLER DOOR ASSEMBLY. VISIBLE WNEN THE DOOR IS OPEN.

Detail I (ME-114 AND AFTER) 76-15-14

"END"

CHAPTER 12

LIST OF PAGE EFFECTIVITY

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12-EFFECTIVITY	1	Mar 15/82
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12-00-00	1	Aug 10/79
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	2	Mar 15/82
12-20-00	1	Aug 10/79
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	3	Aug 10/79
	4	Sep 7/79
	5	Mar 15/82
	6	Nov 18/77
	7	Feb 16/79
	8	Nov 18/77
	9	Mar 15/82
	10	Mar 15/82
	11	Mar 15/82
	12	Mar 15/82
	13	Mar 15/82

"END"

CHAPTER 12 - SERVICING

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"END"

GENERAL - DESCRIPTION AND OPERATION

The information in this chapter pertains to general servicing procedures and maintenance practices used when servicing the various systems of the airplane. Detailed maintenance information pertaining to these systems will be found in the applicable chapters. For electrical wiring diagrams, refer to the BEECHCRAFT Duchess 76 Wiring Diagram Manual, P/N 105-590000-15 (14 volt system, Airplane serials ME-1 thru ME-182) or the BEECHCRAFT Duchess 76 Wiring Diagram Manual, P/N 105-590000-21 (28 volt system, Airplane serials ME-183 and after).

"END"

REPLENISHING - MAINTENANCE PRACTICES

FILLING THE FUEL TANKS

The fuel system consists of a leading edge bonded fuel tank in each wing, connected by a crossfeed system, which provides the airplane with a total fuel capacity of 103 gallons (100 gallons usable).

When filling the airplane fuel tanks, always observe the following:

a. Service the fuel tanks with 100 (Green) or 100LL (blue) minimum grade fuel (1, Chart 1, 91-00-00).
b. Make sure the airplane is statically grounded to the servicing unit.
c. Do not fill fuel tanks near open flame or within 100 feet of any open energized electrical equipment capable of producing sparks.
d. Do not insert the fuel nozzle more than 3 inches into the filler neck; to do so may cause damage to the fuel tank.

DRAINING THE FUEL TANKS

If defueling equipment is available, approximately one half of the fuel may be pumped from the tank by inserting the defueling hose through the filler opening. When fuel can no longer be pumped from the tank, place a suitable container under the drain, located outboard of each nacelle on the underside of each wing tank. Using a suitable tool, push up and turn to lock the drain open to complete the defueling operation. If defueling equipment is not available, the auxiliary fuel pumps may be used to pump the fuel out of the system by the following procedure:

a. Disconnect the fuel line at the firewall. In the RH nacelle, disconnect the outboard fuel line. In the LH nacelle, disconnect the inboard fuel line.
b. Attach a drain hose to the disconnected fuel line at the firewall.
c. Provide a suitable container for the fuel.
d. Apply external power to the electrical system.
e. Place the fuel selector valve, for the fuel tank from which the fuel is being pumped, in the ON position. Place the mixture lever in the IDLE CUT OFF position.
f. Energize the auxiliary fuel pump for the fuel tank, from which the fuel is being pumped, by placing the AUX FUEL PUMP (L or R) switch, located on the pilot's subpanel in the ON position.
g. When fuel is no longer pumped from the tank, provide a suitable container under the drain, located outboard of each nacelle, on the underside of the wing fuel tank.
h. Using a suitable tool, push up and turn to lock the drain open to complete the defueling operation.

ENGINE FUEL FILTERS AND SCREENS

Most fuel system malfunctions can be attributed to contaminated fuel. Inspecting and cleaning the fuel strainers should be considered to be of the utmost importance as a regular part of preventive maintenance.

Normally the fuel selector valve strainer should be cleaned and inspected every 100 hours of operation. However, the strainer should be inspected and cleaned at more frequent intervals depending on service conditions, fuel handling equipment and when operating in localities where there is an excessive amount of sand or dust.

Ordinarily, the fuel strainers in the fuel tank outlets should not require cleaning unless there is a definite indication of solid foreign material in the tanks, or the airplane has been stored for an extended period.

Open each of the eight snap drains daily to allow condensed moisture to drain from the system.

OIL SYSTEM

The engines are equipped with a wet sump, pressure type oil system. Each engine sump has a capacity of 8 quarts. Servicing the oil system is provided through access doors in the engine cowling. Due to the canted position of the engines, the dip sticks are calibrated for either right or left engines and are not interchangeable.

The oil should be changed every 100 hours and the oil filter should be changed every 50 hours, under normal operating conditions. The engines should be warmed to operating temperature to assure complete draining of the oil. The cowling should be removed from the engines for changing the oil and the oil filter. Check the used oil filter for metal particles as described under the heading OIL FILTER METAL PARTICLE CHECK in this Chapter.

The engine manufacturer recommends the use of ashless dispersant oil after the oil consumption has stabilized, or after the first 50 hours of operation. In order to promote faster ring seating and oil control, a straight mineral type oil conforming to MIL-L-6082C (SAE No. 30) may be used until the oil consumption has stabilized, not to exceed 50 hours of operation. Oil of seasonal viscosity, added to maintain the proper oil level, during this period must comply with MIL-L-6082C. An example of this oil is Mobil Oil Aero White Brand, grade 1065. After the oil consumption has stabilized or after the first 50 hours of operation, aviation grade ashless dispersant oil complying with MIL-L-22851 (2, Chart 1, 91-00-00) should be used.

CHANGING THE OIL FILTER

The oil filter should be replaced every 50 hours as follows:

a. Remove the engine cowling.
b. Loosen the spin-off oil filter and remove the filter. Check the oil filter for metal particles as described under the heading OIL FILTER METAL PARTICLE CHECK in this Chapter.
c. Coat the seal of the oil filter with clean engine oil.
d. Position the new oil filter on the engine mounting.
e. Tighten the filter to a torque of 18 to 20 foot-pounds.
f. Refill the engine with oil.
g. Install and secure the engine cowl.
h. Operate the engine and check for leaks.

CHANGING THE ENGINE OIL

The oil should be changed every 100 hours, under normal operating conditions, as follows:

a. The engine should be warmed to operating temperature to assure complete draining of the engine oil.
b. Remove the engine cowling.
c. Remove the engine oil drain plug.
d. After the engine oil is completely drained, install and safety the oil drain plug.
e. Refill the engine with oil.
f. Install and secure the engine cowl.
g. Operate the engine and check for leaks.

OIL FILTER METAL PARTICLE CHECK

To inspect the oil filter for metal particles, the Champion Tool P/N CT-470 may be used to cut the top of the can as follows:

a. Secure the filter can in a bench vise. When cutting open a female type filter P/N LW-13905 or LW-13906, use the adapter P/N CT-470-2. The male type filter LW-13215 or LW-13216 may be opened with the cutter by removing the adapter CT-470-2 from the rotating bushing.
b. Secure the cutter on the filter mounting plate. Tighten the knurled head screw until the cutter blade meets the filter metal can surface.
c. Rotate the cutter 360°, observing that the cutter blade is penetrating the metal can of the filter. Continue tightening the knurled head screw and rotating the cutter until the filter mounting plate is separated from the can.
d. Remove the element from the filter. Cut the filter material from the end caps.
e. Carefully unfold the element and inspect for metal particles trapped in the filter. A magnet should be used in addition to visual inspection.

HEATING SYSTEM

If the heater spark plug appears to be in good condition, except for a mild coating of oxide on the procelain and electrodes it may be cleaned and reused. Cleaning is accomplished with a conventional airplane type spark plug cleaner, except that it will be necessary to use two or more adapters in order to raise the long extension of the plug far enough out of the cleaner nozzle opening to provide an effective job. Plug the ceramic insert cavity at the terminal end of the plug with a piece of paper or cloth to keep out any of the cleaning sand. Wipe this cavity out thoroughly with a cloth, wet with trichlorethylene (31, Chart 1, 91-00-00). If, after cleaning the spark plug, the porcelain is white, and the electrode is not eroded, the spark plug gap may be set as follows: Insert a six inch scale (Figure 3, 21-40-00) with a sliding clip into the spark plug well until it touches the ground electrode welded inside the combustion head. Withdraw the scale and note the dimension between the sliding clip and the bottom of the spark plug gasket and determine the length of the spark plug positive electrode. The difference between the two measurements is the spark plug gap. The gap should be 5/32 to 3/16 (0.156 to 0.188) inch. If the plug gap must be adjusted, the ground electrode may be bent up or down by reaching through the spark plug hole with the appropriate shaped tool.

NOTE

If the heater spark plug fails to clean up properly and/or if the electrode is badly eroded, it should be replaced.

If a new heater spark plug is being installed, be sure to measure the gap. Do not bend the positive electrode. Torque the spark plug to 28 foot-pounds.

BRAKE SYSTEM

Brake system servicing is limited primarily to maintaining the hydraulic fluid level in the reservoir. The brake fluid reservoir is located on the LH, forward side of the forward cabin bulkhead and is accessible through the small access door on the large access door on the LH side of the nose compartment. Fill the reservoir with the MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00) to the FULL mark on the dipstick. Maintain fluid level between the FULL and ADD marks. Do not overfill.

"END"

SCHEDULED SERVICING - MAINTENANCE PRACTICES

TIRES

The main wheel tires are 6.00-6, 6 ply rating type III tube type, and the nose wheel tire is a 5.00-5, 6 ply rating type III tube type.

Inflate the tires to 38 psi. When installing a new nose wheel tire, ensure that there is .15 to .25 inch clearance between the fork and the inflated new tire. Maintaining the recommended tire inflation will help to avoid damage from landing shock and contact with sharp stones and ruts, and will minimize tread wear. When inflating tires, inspect them visually for cracks, breaks or evidence of internal damage. Damaged tires should be replaced.

NOTE

Beech Aircraft Corporation cannot recommend the use of recapped tires. Recapped tires have a tendency to swell as a result of the increased temperature generated during takeoff. Increased tire size can jeopardize proper function of the landing gear retract system, with the possibility of damage to the landing gear doors and retract mechanism.

BATTERY

One 12-volt 35-ampere-hour lead-acid battery is used (ME-1 thru ME-182). One 24-volt 15.5-ampere-hour lead-acid battery is used (ME-183 and after). An optional installation (ME-183 and after) provides two 12-volt 25-ampere-hour lead-acid batteries, electrically connected in series. The battery, or batteries, are installed directly aft of the baggage compartment and may be reached through the rear panel.

The battery, or batteries, should be checked regularly for fluid level, and distilled water added as required. Clean, tight connections should be maintained at all times. Battery vents should be checked periodically for obstructions and for proper protrusion (1 to 3 inches) from the skin line. Since either vent may serve as the intake, one vent chamfer should be forward and the other aft.

Refer to 24-30-00 for battery removal and cleaning instructions.

EXTERNAL POWER

To supply power for ground checks or to assist in starting, use only an external power source that is negatively grounded. The receptacle is located on the RH aft fuselage.

CAUTION

On 14-volt airplanes, the power pin for external power is connected directly to the battery and continually energized. Turn OFF battery and alternator switches and all electrical and avionics switches when connecting the auxiliary power unit plug. Assure correct polarity (negative ground) before connecting auxiliary power unit. Turn ON the battery switch before turning on the auxiliary power unit.

On 28-volt airplanes, a reverse polarity diode protection system is between the external power receptacle and the main bus. With external power applied, the bus is powered. Turn ON the battery switch only with all other switches including avionics switches OFF when connecting the auxiliary power unit. Assure correct polarity before connecting external power.

Observe the following precautions when connecting an external power source:

a. Remove the protective cover from the external power receptacle of the aiprlane.

b. Use only an auxiliary power source that is negatively grounded which has a voltage of 14.0 ± .2 vdc (ME-1 thru ME-182) or a voltage of 28.0 ± .2 vdc (ME-183 and after). If the polarity of the power source is unknown, determine the polarity with a voltmeter before connecting the unit to the airplane.

c. Before connecting an auxiliary power source, turn OFF all radio equipment and the alternator switch. For the 14-volt system (ME-1 thru ME-182), turn the battery switch OFF. For the 28-volt system (ME-183 and after), turn the battery switch ON.

d. Turn the auxiliary power source OFF prior to connecting the external power cable to the auxiliary power source. Connect the positive clamp of the cable to the positive terminal of the power source and the negative clamp to the negative terminal of the power source. (If a battery is used as the power source, connect the positive terminal of the cable to the positive terminal of the power source or battery. Isolate the negative cable clamp.)

e. Connect the external power cable into the external power receptacle. Turn the auxiliary power source ON. (If a battery is used as the power source, connect the negative cable clamp to the negative terminal of the power source or to a suitable ground point.)

f. For the 14-volt system (ME-1 thru ME-182) the battery switch must be ON to connect the auxiliary power source to the airplane bus.

Observe the following precautions when disconnecting an external power source:

a. Turn all electrical switches and the battery switch OFF.
b. Turn the auxiliary power source OFF. (If a battery has been used for a power source, disconnect the negative clamp of the external power cable and isolate it.)
c. Remove the external power cable from the airplane receptacle. Replace the protective cover in the external power receptacle.
d. Disconnect the external power cable from the auxiliary power source.

SHOCK STRUTS

The shock struts are filled with compressed air and MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00). The same procedure is used for servicing both main and nose shock struts. The shock strut may be serviced as follows:

a. Remove the air valve cap and depress the valve core to release the air pressure.

WARNING

Do not unscrew the air valve assembly until the air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

b. Remove the air valve assembly.
c. With the strut in the vertical position and approximately one fourth inch from fully compressed, fill with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00) until the fluid overflows.
d. Cycle the strut (full extension to compressed) and refill as described in step "c". Repeat until fluid cannot be added to the strut in the compressed position.

NOTE

Cycling of the shock strut is necessary to expel any trapped air within the strut housing.

e. Install the air valve assembly.
f. With the airplane on jacks, inflate the nose gear to 250 psig and the main gear to 300 psig or, with the airplane resting on the ground and the fuel tanks full: inflate the nose gear strut until four and one fourth inches of the piston is exposed and the main gear strut until two inches of the piston is exposed. Rock the airplane gently to prevent possible binding of the piston in the barrel while inflating with the airplane on the ground.

NOTE

The preferred method of inflation is with the airplane on jacks and set the pressure rather than trying to set strut extension. It is recommended that the nose strut inflation dimension and the tire inflation pressure be carefully adhered to. Properly inflated tires and struts reduce the possibility of ground damage occuring to the propellers. Exercise caution when taxiing over rough surfaces.

g. The shock strut piston must be clean. Remove foreign material by wiping the strut with a cloth dampened in hydraulic fluid (27, Chart 1, 91-00-00).

WARNING

NEVER FILL THE SHOCKS STRUTS WITH OXYGEN.

SHIMMY DAMPER

To check the fluid level in the shimmy damper, insert a wire of approximately 1/16-inch diameter through the hole in the disc at the end of the piston rod until it touches the bottom of the hole in the floating piston. Mark the wire, remove and measure the depth of insertion. Inserting the wire in the hole of the floating piston, rather than letting it rest against the face of the piston, will give a more accurate check.

NOTE

To determine if the wire is inserted in the hole of the floating piston, insert the wire several times, noting each insertion depth. When the wire is correctly inserted the depth length of the wire will be approximately 1/4 inch greater.

When the shimmy damper is full, the insertion depth is 2-3/8 inches. The empty reading is 3-1/16 inches. To add

MIL-H-5606 hydraulic fluid (27, Chart 1, 19-00-00), remove the shimmy damper and proceed as follows:

a. Remove the cotter pin, washer, and spring from the piston rod.

b. Remove the inertial snap ring, scraper ring and the end seal from the aft end of the barrel. (Opposite clevis end.)

c. Insert a 6/32 threaded rod into the floating piston and remove the piston, using extreme care when moving the O-ring seal of the floating piston past the drilled holes in the piston rod.

d. Push the piston rod to the clevis end and fill the barrel with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

e. Slowly actuate the piston rod, allowing the fluid to flow into the clevis end chamber, then return the piston to the clevis end of the barrel.

f. Refill the displaced fluid and replace the end seal, scraper ring and internal snap ring.

g. Fill the piston rod with fluid.

h. Reinstall the floating piston, spring, washer and cotter pin. Spread the cotter pin to allow clearance for the measuring wire. Reinstall shimmy damper.

INDUCTION AIR FILTER

The induction air filter should be removed, cleaned and inspected each 50 hours of service. Replacement is recommended at 300 hours for normal operation and more frequently, should conditions warrant. The filter should be cleaned in accordance with the instructions printed on the filter.

a. Remove the upper engine cowling to gain access to the induction air filter, located at the rear of each engine.

b. Remove the screws which secure the filter to the inlet and outlet ducts.

c. Remove the filter from the airplane.

NOTE

When reinstalling the induction air filter, observe the direction of air flow as marked on the filter.

d. Position the filter and install the screws to secure the filter to the inlet and outlet ducts.

e. Install the upper engine cowling.

INSTRUMENT AIR FILTER

A central filter for the instrument air system is a disposable unit and must be discarded and replaced at 300 to 500 hour intervals, or more often if conditions warrant.

a. Remove the nose compartment access panel and access plates on the nose compartment floor to gain access to the filter located below the floor on the LH side, forward of the bulkhead.

b. Remove the clamps at the inlet and outlet of the filter.

c. Remove the filter from the airplane.

d. Position the new filter, install the inlet and outlet hoses, and secure in place with clamps at the inlet and outlet of the filter.

e. Install access plates on the nose compartment floor and nose compartment access panel.

CLEANING AND WAXING THE AIRPLANE FINISH

NOTE

Urethane paint finishes are fully cured at the time of delivery.

Because wax seals the paint from the outside air, a new paint job should not be waxed for a period of 90 days to allow the paint to cure. Wash uncured painted surfaces with only cold or lukewarm (never hot) water and a mild non-detergent soap. Any rubbing of the painted surface should be done gently and held to a minimum to avoid cracking the paint film.

CAUTION

When washing the airplane with mild soap and water, use special care to avoid washing away grease from any lubricated area. After washing with solvent in the wheel well areas, lubricate all lubrication points. Premature wear of lubricated surfaces may result if the above precautions are not taken.

After the paint cures, a thorough waxing will protect painted and unpainted metal surfaces from a variety of highly corrosive elements. Flush loose dirt away first with clear water, then wash the airplane with a mild soap and water. Harsh, abrasive, or alkaline soaps or detergents should never be used. Use a soft cleaning cloth or chamois to prevent scratches when cleaning and polishing. Any good grade automobile wax may be used to preserve painted surfaces. To remove stubborn oil and grease, use a soft cloth dampened with naphtha. After cleaning with naphtha, the surface should be polished and rewaxed. Urethane paint should not be polished or waxed.

NOTE

Frequently inspect the underside of the wing and flaps in the area covered by the engine exhaust stream for fuel lead deposits. If such deposits are discovered, they should be removed immediately with a water and mild detergent solution and the surface rewaxed.

CLEANING PLASTIC WINDOWS

CAUTION

Do not scratch windows when cleaning. Do not use an ice scraper to remove ice from windows.

A commercial cleaning compound made specifically for acrylic plastic windows may be used. When using a commercial cleaner, follow the instructions on the container.

If a commercial cleaner is not available, the following instructions should be followed:

Cleaning of the acrylic plastic windows should never be attempted when dry. Use only clean water (an open bucket of water can collect sand/debris which could scratch windshields) and a mild soap for cleaning. Wash the windows with plenty of soap and water, using the palm of the hand to dislodge dirt and mud. Follow up with soapy water to remove grease or stains. Flush the surface with rinse water and rub slightly with a grit-free soft cloth, chamois or sponge. Stubborn grease or oil deposits are readily removed with aliphatic naphtha or hexane. Rinse with clear water.

CAUTION

Do not use thinner or aromatic abrasive cleaners to clean the windows as they will damage the surface of the plastic. Aliphatic naphtha and similar solvents are highly inflammable, and extreme care must be exercised when used.

CLEANING INTERIOR CABIN TRIM

Proper care and cleaning of the interior cabin trim (Noryl and Kydex plastics) is of primary importance to maintain a desirable appearance. Washing the interior cabin trim with a detergent soap and water, and brush scrubbing with a soft bristle brush, will dislodge most dirt. Rinse with clean water and wipe dry. Alcohol may be used to remove foreign material that is alcohol soluble.

CAUTION

The interior cabin trim can be easily contaminated if cleaned with methyl ethyl ketone, naphtha, Mufti standard solvent, gasoline, lacquer thinner and other types of thinners. Sharp edges or cuts on the edge of the interior cabin trim material may cause it to crack.

INTERIOR CLEANING

Frequently the seats, rug, upholstery panels and headlining should be vacuum-cleaned to remove as much surface dust as possible.

Experience has shown that commercial foam-type cleaners or "shampoos" can be used to condition the surface of rugs, carpets and upholstered materials. The upholstery is first vacuum-cleaned, then a solution of the cleaner is prepared by mixing a small amount in a bucket of water, and beating the mixture until a heavy foam is formed. Apply the foam uniformly over the surface to be cleaned with a brush, then remove the suds with a vacuum cleaner, or by wiping off with a brush or cloth. Since there is very little moisture in this foam, wetting of the fabric or retention of moisture in the warp does not occur. Unlacquered metal fittings and furnishings within the airplane can be cleaned with moist commercial metal polishes. Use a soft, clean rag for application; then polish to a brilliant gloss with a dry cloth. Protect the finish with a good grade of wax.

CLEANING UPHOLSTERY

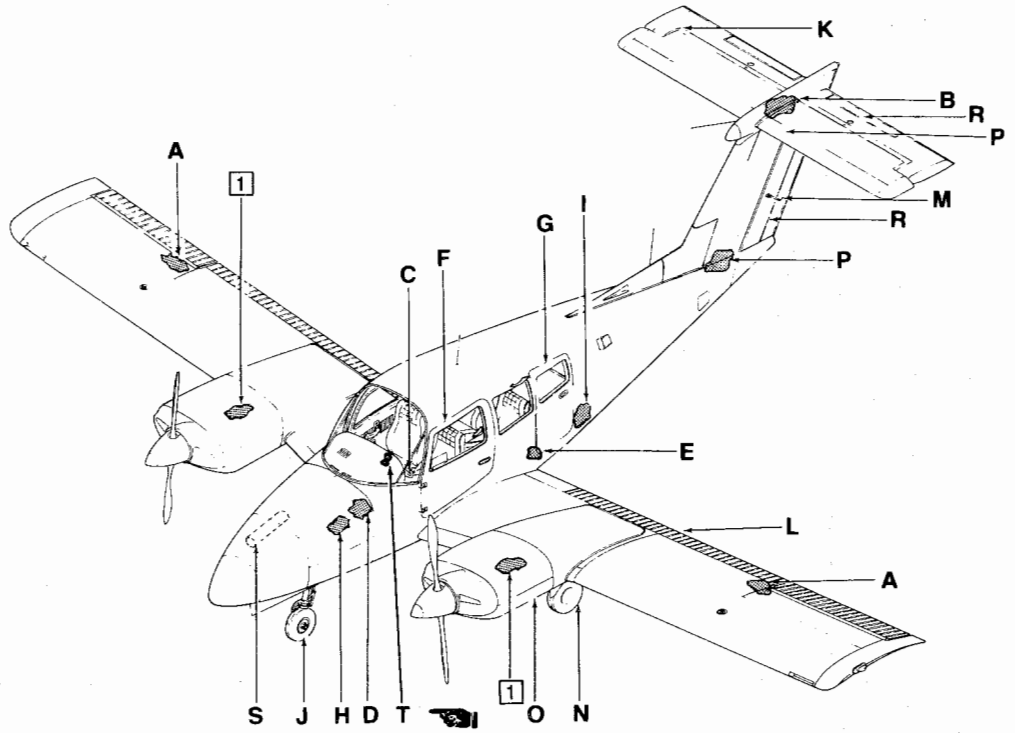
The most effective method of cleaning upholstery is directly dependent upon the type of upholstery involved. For instance, a fabric type upholstery that has been flame proofed should never be treated by the application of cleaners with a water base. The reason for this is that the natural capillary action of the water in the fabric will cause the salts from the flame proofing to rise to the surface, resulting in unsightly faded spots. The most effective way to clean fabric upholstery is as follows:

a. Brush the upholstery along the weave of the fabric with a stiff bristled brush, such as a nylon bristled fingernail brush.

b. Vacuum the entire surface to remove any salt residue or dirt stains.

c. Gently rub the upholstery along the weave of the fabric with a lint free cloth moistened with PD680 solvent (7, Chart 1, 91-00-00). Apply the solvent sparingly and do not reinstall the upholstery until completely dry.

☞ *INDICATES SITE OF CHANGE*



NOTE

( ) Indicates the number of points to be lubricated.

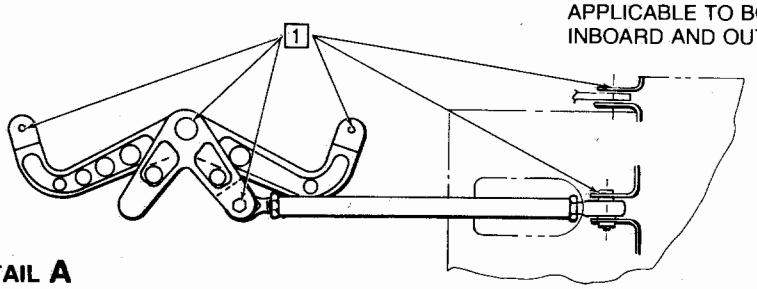
1. Lubricate all plain bearing bushings, all push-pull control housings and all flight control pulley bushings, as required, or every 500 hours with SAE 10W30 oil.
2. Exercise care when using MIL-G-23827 greases as they contain a rust preventative which will discolor painted surfaces.

INDEX	LOCATION	LUBRICANT	INTERVAL
1	Magneto cam follower felt (2)	10-86527 (35, Chart 1, 91-00-00)	As Required

76-604-3

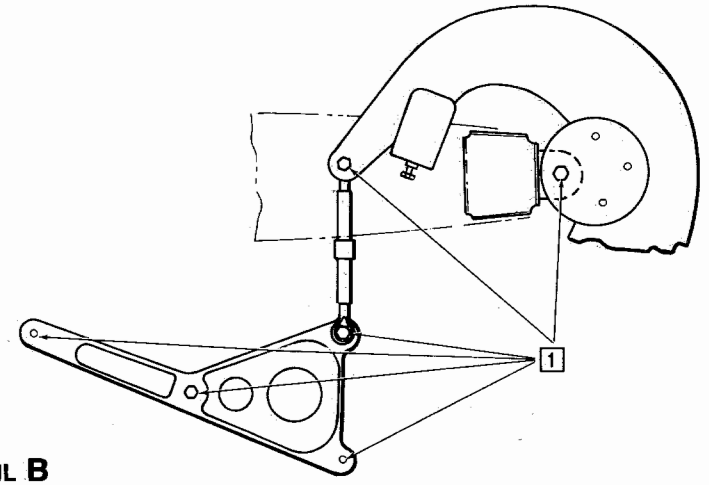
CHART 1 (Cont'd)
LUBRICATION SCHEDULE

APPLICABLE TO BOTH
INBOARD AND OUTBOARD HINGE



DETAIL A

INDEX	LOCATION	LUBRICANT	INTERVAL
	AILERON BELL CRANK AND PUSHROD		
1	Bell crank linkage (12)	SAE 10W30	100 Hours

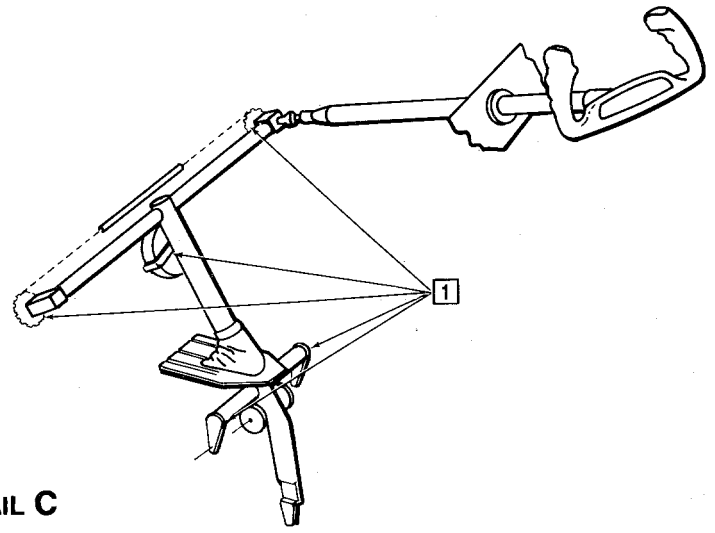


DETAIL B

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELEVATOR BELL CRANK, PUSHROD AND HORN		
1	Bell crank linkage (6)	SAE 10W30	100 Hours

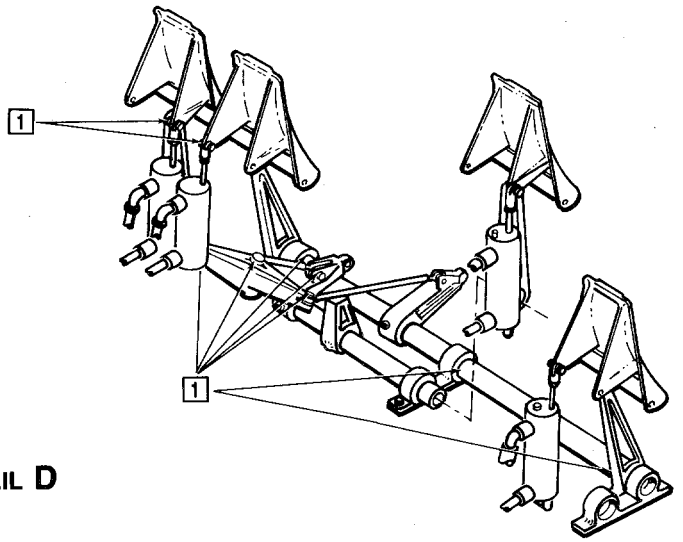
76-604-4

CHART 1 (Cont'd)
LUBRICATION SCHEDULE



DETAIL C

INDEX	LOCATION	LUBRICANT	INTERVAL
	CONTROL COLUMN		
1	Control Column Linkage (5)	SAE 10W30	1000 Hours

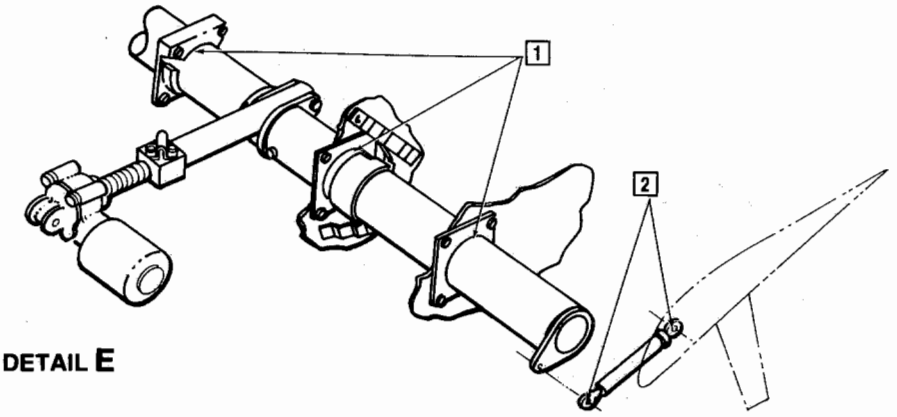


DETAIL D

INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER PEDAL ASSEMBLY		
1	Rudder Pedals and Linkage (18)	SAE 10W30	500 Hours

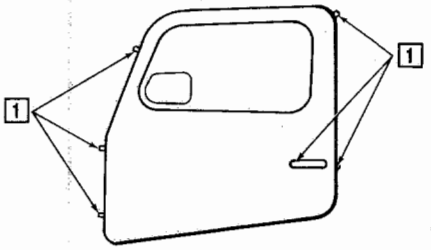
76-604-5

CHART 1 (Cont'd)
LUBRICATION SCHEDULE



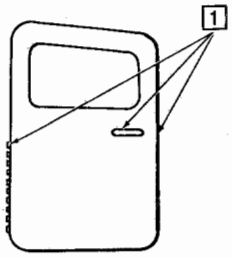
DETAIL E

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELECTRIC FLAP ACTUATOR ASSEMBLY		
1	Torque Shaft (3)	Silicone Spray No. 1325, 1329 or Equivalent (34, Chart 1, 91-00-00)	100 Hours
2	Actuator Rod Assembly (4)	SAE 10W30	100 Hours



DETAIL F

INDEX	LOCATION	LUBRICANT	INTERVAL
	CABIN DOOR		
1	Cabin Door Hinge and Latch Mechanism (12)	SAE 10W30	100 Hours

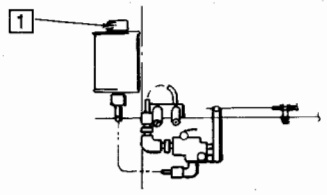


DETAIL G

INDEX	LOCATION	LUBRICANT	INTERVAL
	BAGGAGE DOOR		
1	Baggage Door Hinge and Latch Mechanism (3)	SAE 10W30	100 Hours

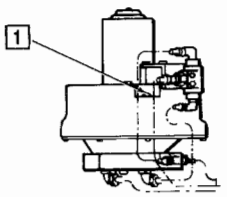
76-604-6

☞ *INDICATES SITE OF CHANGE*



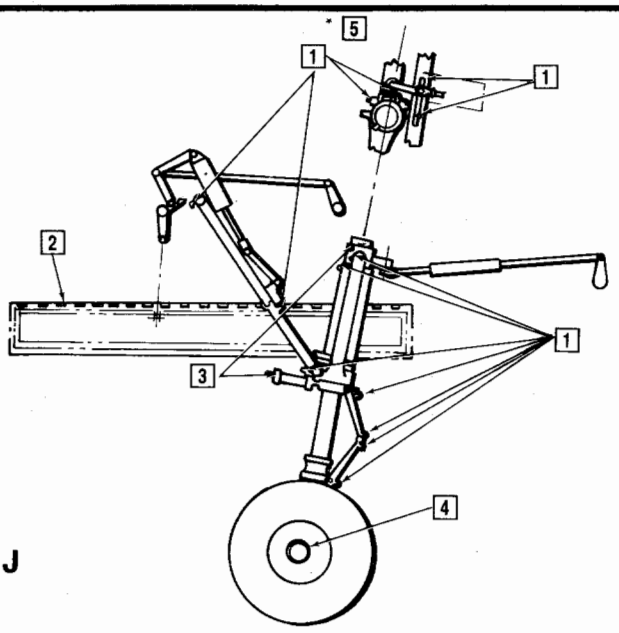
DETAIL H

INDEX	LOCATION		LUBRICANT	INTERVAL
	BRAKE RESERVOIR AND PARKING BRAKE VALVE			
1	Brake Reservoir	☞	MIL-H-5606	As Required



DETAIL I

INDEX	LOCATION		LUBRICANT	INTERVAL
	LANDING GEAR HYDRAULIC PUMP AND RESERVOIR			
1	Hydraulic Pump Reservoir	☞	MIL-H-5606	As Required



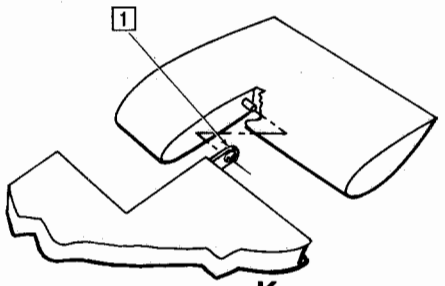
DETAIL J

INDEX	LOCATION	LUBRICANT	INTERVAL
	NOSE GEAR INSTALLATION AND DOORS		
1	Nose Landing Gear Linkage (13)	MIL-G-23827	25 Hours
2	Nose Gear Door Hinge	SAE 10W30	100 Hours
☞ 3	Shock Strut and Shimmy Damper (2)	MIL-H-5606	As Required
4	Wheel Bearing	MIL-G-81322	100 Hours
* 5	Nose Gear Steering Swivel	MIL-G-23827	25 Hours

* ME-80 and after, and prior airplane serials equipped with improved replacement part.

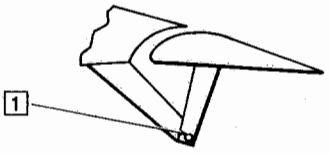
76-604-7

☞ *INDICATES SITE OF CHANGE*



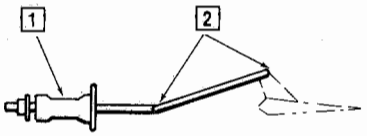
DETAIL K

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELEVATOR STABILIZER HINGE		
1	Hinge (2)	SAE 10W30	100 Hours



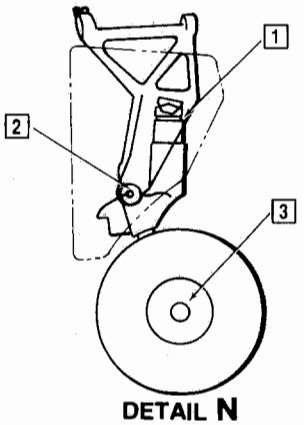
DETAIL L

INDEX	LOCATION	LUBRICANT	INTERVAL
	FLAP INSTALLATION		
1	Hinge (6)	SAE 10W30	100 Hours



DETAIL M

INDEX	LOCATION	LUBRICANT	INTERVAL
	RUDDER AND ELEVATOR TAB ACTUATOR		
1	Actuator	MIL-G-23827	1200 Hours
2	Actuator Rod Hinge (2)	SAE 10W30	100 Hours

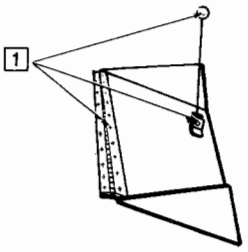


DETAIL N

INDEX	LOCATION	LUBRICANT	INTERVAL
	MAIN GEAR		
1	Shock Strut (2)	☞ MIL-H-5606	As Required
2	Lower Fork Attach Point (2)	MIL-G-23827	25 Hours
3	Wheel Hub (2)	MIL-G-81322	100 Hours

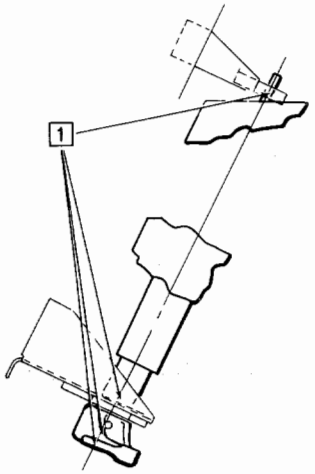
76-604-8

☞ *INDICATES SITE OF CHANGE*



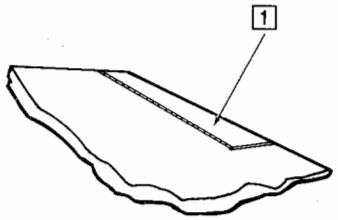
DETAIL O

INDEX	LOCATION	LUBRICANT	INTERVAL
	COWL FLAP		
1	Hinge and Attach Point(4)	SAE 10W30	100 Hours



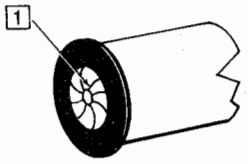
DETAIL P

INDEX	LOCATION	LUBRICANT	INTERVAL
	UPPER AND LOWER RUDDER INSTALLATION		
1	Attach points (4)	SAE 10W30	100 Hours



DETAIL R

INDEX	LOCATION	LUBRICANT	INTERVAL
	ELEVATOR AND RUDDER TAB HINGE		
1	Tab Hinges	Mix MIL-G-6711 Lubricant with Naphtha and apply with a brush.	100 Hours

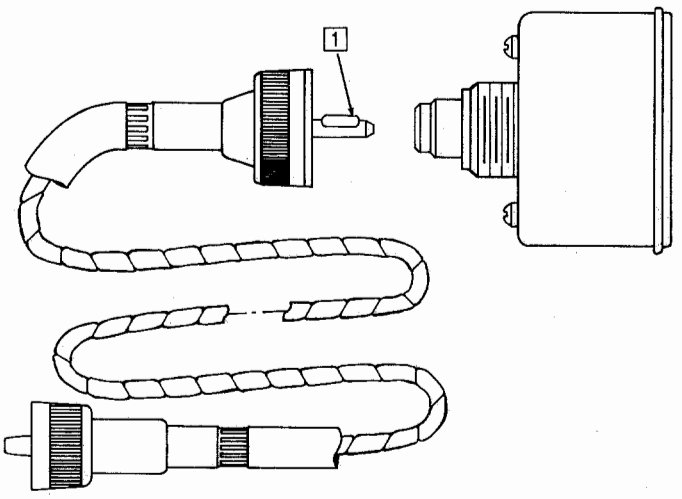


DETAIL S

INDEX	LOCATION	LUBRICANT	INTERVAL
	HEATER		
1	Heater Iris Valve	☞ Mix MIL-M-7866 lubricant with Naphtha and apply with a brush.	100 Hours or As Required

76-605-9

☞ *INDICATES SITE OF CHANGE*

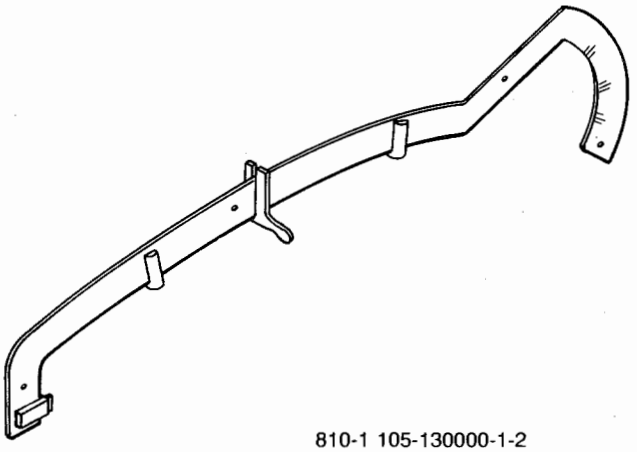


☞ **DETAIL T**

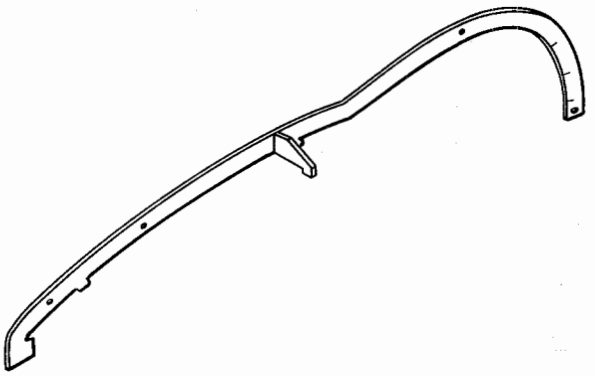
INDEX	LOCATION	LUBRICANT	INTERVAL
	TACHOMETER		
1	Cable	CD-2 General Purpose Lubricant	100 Hours

NOTE: See Chapter 77-00-00 for lubrication instructions

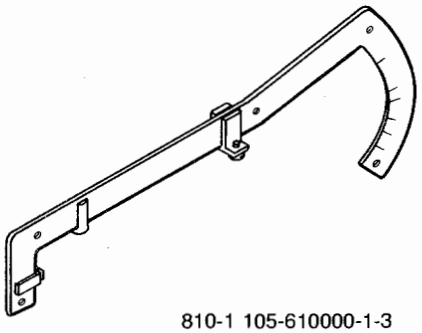
76-390-2



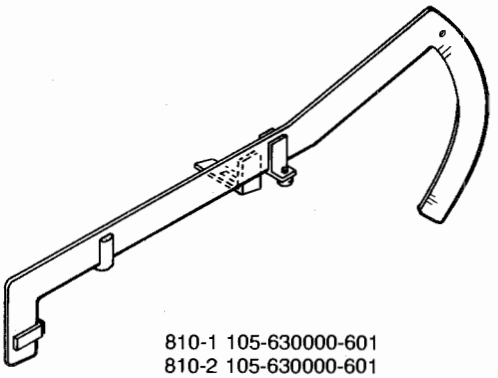
810-1 105-130000-1-2
AILERON TRAVEL GAGE



810 105-160000-1-2
FLAP TRAVEL GAGE



810-1 105-610000-1-3
ELEVATOR TRAVEL GAGE



810-1 105-630000-601
810-2 105-630000-601
RUDDER TRAVEL GAGE

76-17-2

Special Tools
Figure 1

"END"

CHAPTER 20

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CHAPTER 20 - STANDARD PRACTICES AIRFRAME

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STANDARD PRACTICES - AIRFRAME

TORQUE WRENCHES

When a torque wrench and adapter is used, (Figure 1), compensation must be made for the extra leverage gained. New indicator readings must be calculated before the wrench is used. To figure the desired lower readings which will actually give the torques specified, use the following formula:

$$\frac{\text{Orig. wrench length(L) x specified torque(T)}}{\text{length of wrench(L) + adapter(A)}} = \text{Desired reading (D)}$$

Example:

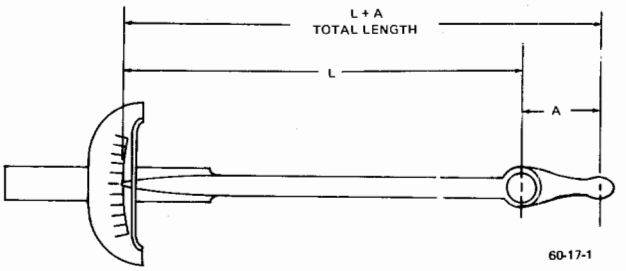
D	=	Desired reading
L	=	Length of torque wrench
A	=	Adapter length
T	=	Torque

D	=	?
L	=	33 inches
A	=	11 inches
T	=	5,000 inch-pounds

$$\frac{33 \times 5{,}000}{33 + 11} = \frac{165{,}000}{44} = 3{,}750 \text{ inch-pounds}$$

An acceptable method of checking the torque if a torque wrench is not available (Figure 2), is to attach a spring scale to a conventional flex or "T" handle inserted in an adapter. Force should be applied in a direction perpendicular to an imaginary line extending from the center of the bolt through the spring scale attaching point.

To calculate the force in pounds (scale reading) required to obtain the specified torque, divide the torque in inch-pounds by the distance in inches between the center of the bolt and the scale attaching point. For example, if the specified torque is 5,000 inch-pounds and the distance is 26 inches, a pull of 200 pounds must be applied. Bolts to be torqued must be clean and free of all lubricants; otherwise loss of normal friction allowed for establishing the torque values may result in overtorquing of the bolt.

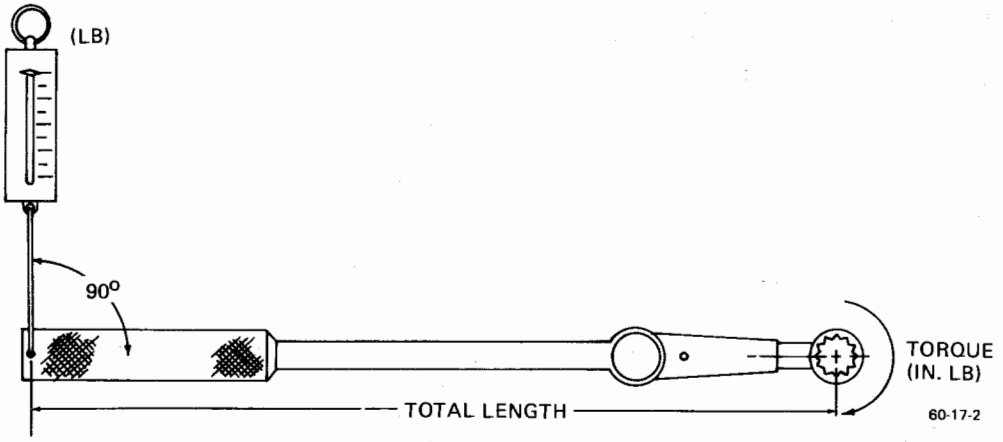


Torque Wrench and Adapter
Figure 1

When a torque wrench adapter is used, the length of the adapter must be added to the length of the flex or "T" handle wrench and a value calculated for that particular combination. The following is a typical example in finding a desired value:

Effective length of flex or "T" handle wrench	12 inches
Length of adapter	3 inches
Total length	15 inches
Desired torque on bolt	2,000 inch-pounds

$$\frac{2{,}000 \text{ inch-pounds}}{15 \text{ inches}} = 133.3 \text{ pounds (scale reading)}$$



Computing Torque with Spring Scale
Figure 2

AIRPLANE FINISH CARE

CLEANING AND WAXING THE AIRPLANE FINISH

NOTE

Urethane paint finishes are fully cured at the time of delivery.

Because the wax seals the paint from the outside air, a new paint job should not be waxed for a period of 90 days to allow the paint to cure. Wash uncured painted surfaces with only cold or lukewarm (never hot) water and a mild non-detergent soap. Any rubbing of the painted surface should be done gently and held to a minimum to avoid cracking the paint film.

CAUTION

When washing the airplane with mild soap and water, use special care to avoid washing away grease from any lubricated area. After washing with solvent in the wheel well areas, lubricate all lubrication points. Premature wear of lubricated surfaces may result if the above precautions are not taken.

After the paint cures, a thorough waxing will protect painted and unpainted metal surfaces from a variety of highly corrosive elements. Flush loose dirt away first with clear water, then wash the airplane with a mild soap and water. Harsh, abrasive, or alkaline soaps or detergents should never be used. Use a soft cleaning cloth or chamois to prevent scratches when cleaning and polishing. Any good grade automobile wax may be used to preserve painted surfaces. To remove stubborn oil and grease, use a soft cloth dampened with naphtha. After cleaning with naphtha, the surface should be rewaxed and polished.

NOTE

Frequently inspect the underside of the wing and flaps in the area covered by the engine exhaust stream for fuel lead deposits. If such deposits are discovered, they should be removed immediately with water and mild detergent solution and the surface rewaxed.

PLACARD REPLACEMENT

Ascertain that all placards are in place and legible whenever the airplane has been repainted or touched up after repairs. Replace any placards that have been inadvertently defaced after such repairs.

EXTERIOR FINISHES

The following list is included to be used as a reference should it become necessary to touch up or match exterior paint. Each paint is listed according to specific type.

NOTE

Ascertain that all placards are in place and legible whenever the airplane has been repainted or touched up after repairs. Replace any placards that have been inadvertently defaced after such repainting or repairs.

EXTERIOR PRIMERS

Exterior (Aluminum)	Ameron EX2016G Base Ameron T6070 Catalyst
Exterior (Magnesium)	Ameron Epoxy Primer
Urethane Acid Etch Wash (Exterior Surface)	Ameron EX2016G Base Ameron T6070 Catalyst
Urethane Intermediate Coat (Exterior Surface)	U.S. Paint 6165 Base U.S. Paint AA-92-C-4A Catalyst

LACQUER

(Exterior Colors)

Color	Part Number
Toreador Red	118684-49
Black	118684-55
Matterhorn White	118684-57
Sable Brown	118684-257
Marlin Blue	118684-545
Jade Mist Green	118684-547
Mesa Gold	118684-557
Really Red	118684-571
Aristo Blue	118684-623
Champagne Gold	118684-665
Citrus Green	118684-667
Beechwood Green	118684-669
Yellow Jacket	118684-671

URETHANE (MODIFIED)

(Exterior Colors)

Color	Part Number
Matterhorn White	118684-609
Black	118684-611
Sable Brown	118684-613
Marlin Blue	118684-615
Jade Mist Green	118684-617
Really Red	118684-619
Aristo Blue	118684-623

URETHANE (MODIFIED)

(Exterior Colors)

Color	Part Number
Mesa Gold	118684-627
Toreador Red	118684-631
Champagne Gold	118684-639
Beechwood Green	118684-647
Citrus Green	118684-661
Yellow Jacket	118684-663

Pre-cut paint patterns, numbers, and stripe patterns are available from Mid-America Marking Inc., 1720 S 151 West, Route 1, Goddard, Kansas 67052, or any other equivalent product may be used.

PAINTING ALUMINUM

LACQUER PAINT

PREPARATION OF AIRPLANE ALUMINUM EXTERIOR FOR PAINT

a. Mask windows with a double thickness of paper. Cover all openings where paint might enter the airplane.

b. Sand scratches and rough areas to improve smoothness.

c. Clean surfaces of airplane with solvent, (lacquer thinner or methyl ethyl ketone), to remove shop primer, exposed sealer and other shop soils.

d. Lightly roughen all scratches with nylon pad to ensure a satisfactory paint base.

e. Reclean the roughened surface with solvents to ensure removal of all hand prints and dirt.

APPLICATION OF EXTERIOR PAINT ON ALUMINUM SKINS

a. Prime surfaces with wash primer (14, Chart 1, 91-00-00). Mix only enough primer for use within an eight hour period. Primer mixed longer than eight hours must be discarded.

b. Apply one coat of wash primer. Keep air pressure at a minimum to prevent overspray.

NOTE

Temperature and humidity will effect drying time of the primer. It should dry at least 15 minutes before recoating the surface. Test surface with light fingernail pressure.

c. Proceed to prime with a wet coat of MIL-P-8585 zinc chromate primer (12, Chart 1, 91-00-00), thinned one part primer and two parts toluol (3, Chart 1, 91-00-00). A heavy hiding coat of this primer is not desired and will impair performance.

d. With a fine grit sandpaper (400 to 600) very lightly sand the zinc chromate primer surface and remove dust with a tacky rag.

e. The exterior surfaces are now ready for the color coat. Apply two color coats.

EXTERIOR PAINT TOUCH-UP REPAIR (LACQUER)

a. Mask around the skin containing the damaged area.

b. Remove any loose edges of paint by using a high tack adhesive tape around the edge of the damaged area.

c. Using a coarse sandpaper, fair the edge of the damaged area with the metal.

d. When the edge of the paint begins to "feather" into a smooth joint, use a fine grade of sandpaper to eliminate the sand scratches left by the coarse paper so that the finish will be perfectly smooth. Take care to avoid removing any more metal than is absolutely necessary.

e. Wash the sanded area with a solvent, such as naphtha or toluol (15, or 3, Chart 1, 91-00-00). Change the wash cloths used for this purpose frequently so that all the sanding dust will be picked up.

f. After the area to be touched up has been cleaned with solvent until all trace of discoloration is gone, apply a thin coat of pretreatment primer to the damaged area.

g. Spray two or three coats of the zinc chromate primer (12, Chart 1, 91-00-00) for a heavier than normal build-up.

h. After the primer has dried, sand the area being repaired with a medium fine sandpaper. Sand the edge of the repair area until the indentation, where the metal and the old paint meet, is gone. If necessary, apply additional primer until the junction of the paint and metal is no longer visible.

i. Spray on two thin topcoats of finish paint.

URETHANE PAINT

The need for an extremely hard finish for protection against sandblast during takeoff and landings led to the development of urethane coatings for airplanes. Urethane paint dries into a high gloss and retains color much better than standard finishes. It is unaffected by the chemicals in hydraulic fluids, deicer fluids and fuels and requires less care and maintenance than other finishes.

URETHANE PAINT REPAIR PROCEDURES

NOTE

The time normally required for urethane paint to cure must be extended at temperatures below 70°F. The paint will not cure at temperatures below 60°F.

Airplanes painted with urethane paints are finished with pretreatment (wash) primer, urethane primer and a topcoat of urethane enamel. The following procedures include cleaning, paint stripping, repaint preparation, priming, applying a urethane topcoat and an alternate method for small repairs not requiring paint stripping. Careful observation of these procedures should result in a smooth, hard, glossy finish with firm adhesion for maximum life.

STRIPPING AND CLEANING URETHANE PAINT

Because of their resistance to chemicals and solvents, urethane paints and primers require a special paint stripper. If a urethane stripper is not available, a good enamel stripper may be used. Removing the finish with such a substitute will require several applications while working the stripper in with a stiff brush or wooden scraper.

a. Mask around the edge of the skin or skins containing the damaged area. Use a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply urethane stripper as indicated by the manufacturer's direction. Try to stay approximately 1/8 inch away from the masking tape. This will necessitate a little more cleanup upon finishing, but will prevent damage to the finish on the next skin. The stripper will not attack aluminum during the stripping process and can be neutralized afterwards by rinsing the affected area with water.

WARNING

Urethane strippers usually contain acids that irritate or burn the skin. Wear rubber gloves and eye protection when using the stripper.

c. Rinse the area with water and dry.

d. Wash the stripped area carefully with a solvent such as methyl ethyl ketone or lacquer thinner. This will prevent tiny particles of loose paint from adhering to the stripped area.

e. Using a nylon scratch pad or aluminum wool dipped in clean water, clean the surface with a cleanser such as Bon Ami, Ajax, Comet cleaner, etc. A good scouring will leave the surface completely clean.

f. Thoroughly rinse with clean water and carefully dry the affected area. If the stripped area includes several joints or skin laps, let the airplane sit until all moisture has dried. This may be accelerated by blowing the skin laps and seams with compressed air. Wet masking should be replaced.

PRETREATMENT (WASH) PRIMER FOR URETHANE PAINT

An acid etching primer (24, Chart 1, 91-00-00) should be applied to improve adhesion of the finishing coats. A base primer (14, Chart 1, 91-00-00) and a catalyst (25, Chart 1, 91-00-00) are used in equal parts as a pretreatment wash primer at the factory.

a. Mix the primer in accordance with the manufacturers instructions.

b. Apply a thin coat of primer. It should be permitted to dry for at least an hour, but not over six hours, before the next coat of urethane paint is applied.

URETHANE PRIMER

a. Mix the urethane primer (26, Chart 1, 91-00-00) in accordance with the manufacturers instructions when preparing the primer.

NOTE

For the best results these directions must be followed carefully; for some manufacturers require that the primer be allowed to set for 1/2 hour after the catalyst and base have been mixed while others recommend immediate use after mixing.

b. Apply a coat of urethane primer with a spray gun using 35 to 40 psi of air pressure. A dappled appearance indicates that the coat is thin.

c. The primer should be permitted to dry approximately two hours at a temperature of 85° to 90°F at low humidity. When the primer can not be scratched with a fingernail or will not ballup with sandpapering, it is ready for the topcoat application.

d. If the initial primer coat is allowed to cure for more than 24 hours before the topcoat is applied, sand the primer coat slightly to roughen the surface and ensure adhesion. Wipe off the sanding dust with a cloth dampened with a solvent (such as lacquer thinner), then apply the topcoat.

URETHANE TOPCOAT APPLICATION

a. Mix the paint and catalyst as directed by the manufacturer.

b. Apply the topcoat with a spray gun at 35 to 45 psi of air pressure. Two coats are normally required to fully conceal the primer and build up the topcoat film for adequate service life and beauty. The urethane finish will normally cure to 85% of its full hardness in 24 hours at temperatures of 80°F or higher.

URETHANE TOUCH-UP REPAIR

a. Mask around the skin containing the damaged area.

b. Remove all loose edges of paint by using a high tack adhesive tape around the edge of the damaged area.

c. Using a coarse sandpaper, fair the edge of the damaged area.

d. When the edge of the paint begins to fair into a smooth joint, use a fine grade of sandpaper to eliminate the scratches left by the coarse paper. Take care to avoid removing any more metal than is absolutely necessary.

e. Wash the sanded area with a solvent, such as lacquer thinner or toluene. (Do not use methyl ethyl ketone as it will soften urethane paint.) Change the wash cloths used for this purpose often so that all the sanding dirt will be picked up.

f. After the area to be touched up has been cleaned with solvent until all traces of discoloration are gone, apply a thin coat of pretreatment primer to the damaged area.

NOTE

If a metal conversion coating such as iridite or alodine is used, the wash primer coating can be dispensed with. If the metal has not been treated with a metal conversion coating and no wash primer is available, carefully clean the surface to be touched up and apply urethane primer to the bare metal. This should produce a satisfactory undercoat for the repair area.

g. After the urethane primer has cured for 24 hours, sand the area under repair with medium fine sandpaper. Sand the edge of the repair area until the indentation where the metal and old paint meet is gone. If necessary, apply additional urethane primer until the juncture of old paint and metal is no longer visible.

h. Spray on two topcoats.

PAINTING MAGNESIUM

PAINT REMOVAL FROM MAGNESIUM SURFACES

a. Mask around the edge of the damaged area with a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply paint stripper (16, Chart 1, 91-00-00) to the skin under repair with a brush or non-atomizing gun.

WARNING

Stripping should be accomplished in a well ventilated area since prolonged exposure to high concentrates of vapor may irritate the eyes and lungs.

c. Allow the paint stripper to work for 20 to 30 minutes, then work the remaining paint loose with a bristle brush.

CAUTION

Never use a wire brush for it will damage the magnesium surface.

d. Remove the masking paper and wash the affected area thoroughly with water under high pressure. Remove all remanents of paint with lacquer thinner.

e. Sand the repaired area lightly, then apply BEECHCRAFT Dow Number 19 solution to prevent corrosion.

PAINTING MAGNESIUM SURFACES

a. Prepare the surface to be repainted as indicated under PAINT REMOVAL FROM MAGNESIUM SURFACES. Clean the affected area thoroughly with lacquer thinner or an equivalent solvent.

NOTE

Unprimed areas of magnesium castings are to be coated with MIL-M-3171 type 6 corrosion preventative compound (36, Chart 1, 91-00-00) unless these areas will come into contact with oil or grease after assembly. Any holes in the castings which will receive bushings or bearings shall be coated with wet unreduced zinc chormate primer or corrosive preventative compound at the time of installation.

b. Prime the affected area and apply either the lacquer or urethane topcoat if applicable.

NOTE

Do not apply wash primer to magnesium surfaces. Allow a minimum of four hours drying time between application of the primer and top coat.

SPECIAL PAINT PROCEDURES

PROPELLER BLADES

Paint the backs of the propeller blades with quick drying lacquer per MIL-E-5556, color No. 37038 per Federal Standard 595.

RUBBER SEALS

Apply one coat of a thoroughly dissolved solution of one part Oakite No. 6 and two parts water to all rubber surfaces that are to come into contact with metal or other rubber surfaces. Apply a thin coat of Dow Corning No. 7 after the finish topcoat is dry.

ENCLOSED AREAS SUBJECT TO HIGH HUMIDITY

Steel, aluminum or magnesium parts and assemblies which are enclosed and subject to high humidity should be protected against corrosion by coating with either epoxy primer, MIL-C-16173 corrosion preventative compound, light grease or heavy oil.

BATTERY BOX AND LID

Apply a minimum of three coats of vinyl paint to the interior of the battery box and lid in the following manner:

a. One coat of EX2016G wash primer.
b. One coat of intermediate vinyl paint.
c. One coat of finish vinyl paint.

NOTE

To ensure complete coverage, each coat must be of a different color and must completely hide the preceeding coat. The final coat shall be gray in color.

PAINT FREE AREAS

The following areas shall be kept free from paint:

a. Engine controls.
b. Flight control cables and chains.
c. Control pedals.
d. Exhaust manifolds and exhaust stacks.
e. Firewalls and wrought aluminum surfaces forward of the firewall.
f. Aluminum flexible conduit.
g. All tubing except unplated steel, which shall receive two coats of primer on the exterior, and except as noted for the interior of the engine compartment, and interiors where the color scheme must be maintained.
h. Interior of all fluid lines and instrument lines.
i. Chromium plated portions of the landing gear piston tubes.
j. Rubber and rubber like surfaces.
k. Electrical wiring, unless otherwise noted as a specific requirement.
l. Glide path antenna (if installed).
m. Pitot mast and static button.
n. Cabin door seal mating surfaces in fuselage.
o. Cabin door latch.
p. Air outlet "eyeballs".
q. Engine primer.
r. Stall warning vane.

INTERIOR FINISHES

The following list is to be used as a reference should it become necessary to touch up or match interior paint. Each paint is listed according to specific type.

INTERIOR PRIMERS

Interior (Aluminum)	MIL-P-8585
Interior (Magnesium)	MIL-P-23377

The following items are painted with Insignia Red, Enmar Munsell 5R-3.5/14 Baking Enamel.

a. Landing gear emergency operation handle.
b. Baggage door handle (LH) inside.

The following items are painted with Dull Black Lacquer 118684-133.

a. Unupholstered portion of seat structure.
b. Control column boot retaining plate.
c. Rudder pedal arms.
d. Elevator tab bracket.
e. Exposed portion of bulkheads.
f. Exposed area of tee column.
g. Lower RH upholstery retaining strip.

The following items are painted with Instrument Black, ANA color No. 514.

a. Compass.
b. Landing light well area.
c. Instrument faces and bezels.

The following items are painted with colors indicated.

COLOR	ITEM
Tan, 27SG-26814 Lacquer	Instrument Panel Center Section
Instrument Black ANA Color No. 514	Instrument Panel Lower Portion
Dull Black, 118684-565 Vinyl Paint	Fuel Selector Cover
	Spar Cover
Cloud Gray, 27H-54131 Lacquer	Windshield Brace Rods

The following items are painted with Wool Grosspoint Color No. 689 Black.

a. Firewall, Aft Face.
b. Frame FS 68.00, access door and lower frame aft face.

"END"

CHAPTER 21

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CHAPTER 21 - AIR CONDITIONING

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GENERAL - DESCRIPTION AND OPERATION

HEATER SYSTEM

The heater system consists of a 45,000 BTU per hour combustion air heater, located in the right hand side of the nose compartment. The heater is controlled by a HEATER switch on the LH subpanel and push-pull controls on the LH side panel. When the HEATER switch is placed in the ON position, with the CABIN AIR push-pull in the open position, the fuel solenoid, heater fuel pump, heater ignition, and combustion air blower, are energized. When the landing gear is down the ventilation air blower is also energized.

NOTE

The fuel solenoid is energized only if the duct thermostat, which controls the heater, requires a higher temperature.

Heat ducts are located on the lower cabin bulkhead at FS 68.00 and between the pilot and copilot chairs.

DEFROST SYSTEM

Air for defrosting the windshield is provided by the heater system. The system is activated when the HEATER switch is placed in the ON position and the CABIN AIR push-pull knob in the open position. Pulling the DEFROST PULL knob increases the quantity of defrost air.

VENTILATION SYSTEMS

Individual air outlets above each seat provide fresh air for the cabin. The cabin fresh air intake is located on the LH side of the dorsal fin. An optional fresh air blower for this system, located in the aft fuselage, is for ground operation and climb-out and should be shut off in cruise.

Two outlets on each side of the instrument panel also provide fresh air. Fresh air intakes for this system are located immediately forward of the windshield.

Additionally, fresh air enters through the heater and is ducted to outlets on the cabin bulkhead at FS 68.00 and between the pilot and copilot chairs. The air intake is located on the RH side of the nose compartment. The fresh air blower for this system is for ground operation only and will shut off when the landing gear is retracted.

"END"

VENTILATION SYSTEM - DESCRIPTION AND OPERATION

Fresh air is provided to the cabin by an air intake located on the LH side of the dorsal fin. The air is then ducted to individual outlets above each seat. The flow of air is controlled by rotation of these outlets. An optional fresh air blower for this system is located in the aft fuselage. The blower is controlled by a switch on the LH subpanel placarded CABIN AIR BLOWER. The blower is designed for ground operation and climbout and should be shut off in flight.

Fresh air is also provided through two outlets located on each side of the instrument panel. Fresh air for the instrument panel outlets enters two air vents located immediately forward of the windshield. Rotation of the outlets controls the flow of air.

Additionally, fresh air enters through the outlets on the lower cabin bulkhead and between the pilot and copilot chairs. A push-pull knob, located on the LH sidewall and placarded CABIN AIR PULL OFF, controls the amount of air entering through these outlets. Pushing in on the knob increases the quantity of air. The heater ventilation air blower is used with this fresh air system. The three-position switch on the LH subpanel placarded HEATER ON BLOWER ONLY OFF may be placed in the BLOWER ONLY position. The BLOWER ONLY position is for ground operations only and will shut off when the landing gear is retracted.

TROUBLESHOOTING
VENTILATION SYSTEM BLOWERS

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Aft CABIN AIR BLOWER fails to run.	a.	CABIN AIR BLOWER switch in the OFF position.	a.	Place CABIN AIR BLOWER switch in the ON position.
		b.	Circuit breaker open.	b.	Close circuit breaker.
		c.	Broken or loose wiring to the motor.	c.	Inspect and repair wiring.
		d.	Worn motor brushes.	d.	Replace motor brushes.
		e.	Motor burned out.	e.	Replace motor.
		f.	Faulty CABIN AIR BLOWER switch.	f.	Replace switch.
		g.	Poor blower motor ground.	g.	Obtain positive ground.
2.	Forward BLOWER ONLY fails to run.	a.	HEATER switch in the ON or OFF position.	a.	Place the HEATER in the BLOWER ONLY position.
		b.	Circuit breaker open.	b.	Close circuit breaker.
		c.	Broken or loose wiring to motor.	c.	Inspect and repair wiring.
		d.	Worn motor brushes.	d.	Replace motor brushes.
		e.	Blower wheel jammed.	e.	Remove and check the blower wheel and realign if necessary.

TROUBLESHOOTING
VENTILATION SYSTEM BLOWERS (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
2. Forward BLOWER ONLY fails to run. (Cont'd)	f. Motor burned out.	f. Replace motor.
	g. Faulty HEATER switch (on LH subpanel).	g. Replace switch.
	h. Faulty nose landing gear down and locked switch.	h. Replace switch or check grounding of switch.
	i. Faulty switch on air valve.	i. Replace switch.
	j. Air valve closed.	j. Open air valve.

VENTILATION SYSTEM - MAINTENANCE PRACTICES

AFT BLOWER REMOVAL

a. Gain access to the optional fresh air blower, located in the aft fuselage at FS 210.00, by removing the aft cabin panel at FS 181.00.

b. Loosen the clamps securing the inlet and outlet ducts to the blower assembly and disconnect the ducts from the blower assembly.

c. Disconnect the electrical wiring from the blower assembly.

d. Remove the nuts, washers, and bolts attaching the blower assembly and remove the blower assembly from the aft fuselage.

AFT BLOWER INSTALLATION

a. Install the bolts, washers, and nuts attaching the blower assembly in the aft fuselage.

b. Connect the electrical wiring to the blower assembly.

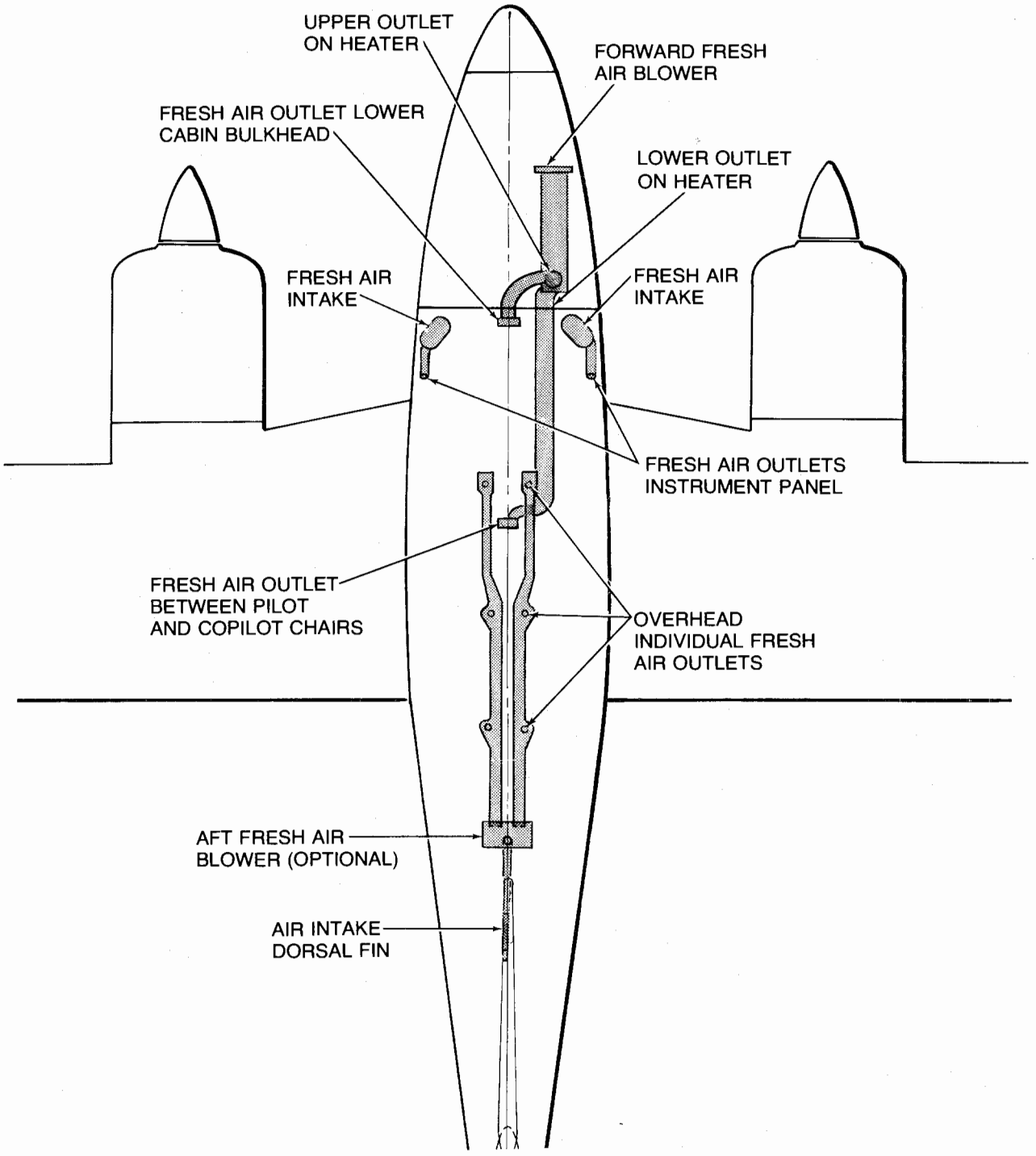
c. Connect the inlet and outlet ducts to the blower.

d. Install the clamps securing the inlet and outlet ducts to the blower.

e. Reinstall the panel at FS 181.00 which was removed to gain access to the aft fuselage.

100-HOUR INSPECTION

Distribution Ducts - Check cabin hot and cold air outlets for condition, obstructions and proper operation; check heating and cooling ducts for condition and attachment.



Ventilation Systems (ME-1 thru ME-282, ME-284 thru ME-287)
Figure 1

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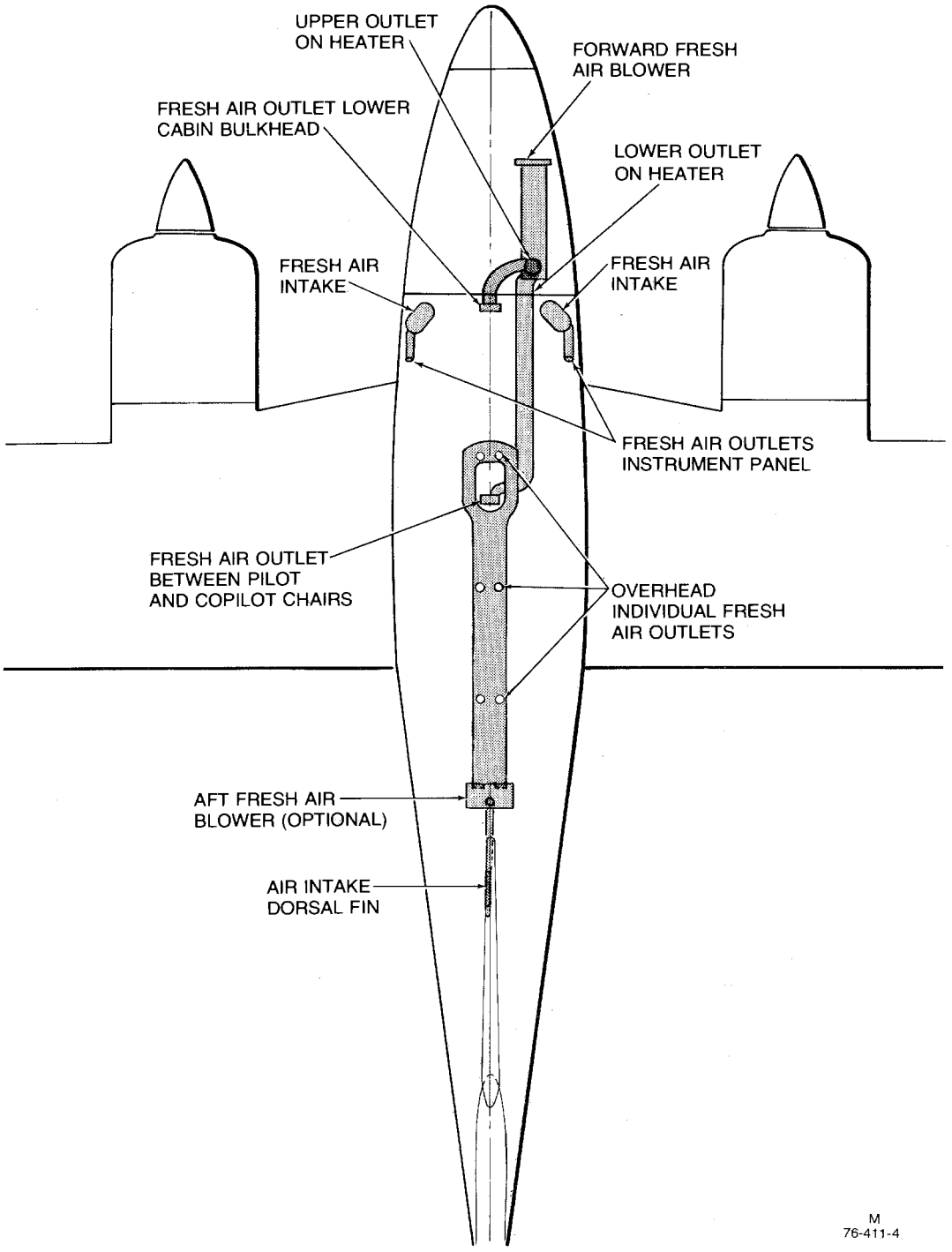


Ventilation Systems (ME-283, ME-288 and after)
Figure 2

"END"

HEATER AND DEFROST SYSTEM - DESCRIPTION AND OPERATION

The heater system consists of a 45,000 BTU per hour combustion air heater, control switch, push-pull knobs, heater circuit breaker, manual reset limit (overheat) switch combustion air blower, ventilation air blower and duct thermostat. The combustion air heater is located in the right hand side of the nose compartment, forward of FS 68.00, below the floor. A fuel line is routed from the fuel system in the RH wing, through a solenoid valve, to the heater fuel pump located under the heater, which provides fuel to the combustion chamber. The heater system is activated when the HEATER switch on the LH subpanel is placed in the ON position and the CABIN AIR control, on the LH side panel, is pushed in approximately halfway or more. A combustion air blower, located above the heater, circulates ambient air through the heater assembly. A defrost duct is routed from an upper aft outlet on the heater to the windshield for windshield defrosting. Additionally, a duct is routed from the upper aft outlet on the heater to a heat duct on the lower forward cabin bulkhead. A second duct is routed from the lower aft outlet on the heater, below the floorboards, to a louvered vent, facing aft, between the pilot and copilot chairs.

The manual reset limit (overheat) switch, located on the heater, shuts off the system until reset in case the discharge temperature reaches 300°F.

CAUTION

The entire system should be inspected and the malfunction determined and corrected before resetting the overheat switch.

The overheat switch is accessable through a round five inch inspection hole, located on the lower right hand side of the nose section, aft of the heater access plate.

HEATER AND DEFROST CONTROL SYSTEM

The push-pull defrost and heater controls are located on the LH side panel. The controls consist of a push-pull knob placarded DEFROST-PULL ON, push-pull knob placarded CABIN AIR -PULL OFF, and a push-pull knob placarded CABIN TEMP - PULL TO INCREASE. A three-position rocker switch, placarded HEATER - ON, BLOWER ONLY, OFF, is located on the LH subpanel. The circuit breaker for the heater system is located on the RH subpanel.

HEATER AND DEFROST CONTROL OPERATION

a. The three-position switch on the LH subpanel placarded HEATER - ON, BLOWER ONLY, OFF must be in the ON position when selecting warm air for defrosting the windshield or warming the cabin. The BLOWER ONLY position is for fresh air ground operation only and will shut off when the landing gear is retracted.

b. The push-pull knob, placarded DEFROST - PULL ON, controls defrosting the windshield. Pulling the knob increases the quantity of air for windshield defrosting.

c. The push-pull knob placarded CABIN AIR - PULL OFF controls the amount of air entering the cabin through the heater. Pulling the knob decreases the quantity of air for heater operation. Pulling the knob more than approximately one half closed deactivates the heater in order to prevent heater overtemp.

d. The push-pull knob, placarded CABIN TEMP - PULL TO INCREASE, controls the temperature of the air entering the cabin. Pulling the knob increases the temperature at which the duct thermostat switch opens (controlling the heater).

TROUBLESHOOTING
HEATER SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Heater fails to light.	a.	HEATER switch in the OFF or BLOWER ONLY position.	a.	Place HEATER switch in the ON position.
		b.	Circuit breaker open.	b.	Close circuit breaker.
		c.	Broken or loose wiring to air valve.	c.	Inspect and repair or replace.
		d.	Air valve microswitch closed or defective.	d.	Repair or replace.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Heater fails to light. (Cont'd)	e.	Air valve inoperative.	e.	Remove and check air valve. Replace if faulty.
		f.	Suction leak ahead of pump.	f.	Secure all fittings.
		g.	Insufficient fuel pressure.	g.	Low or no current to fuel pump. Check for operation of pump and remove for repairs if not operating.
		h.	Fuel pump operating but not building up sufficient pressure.	h.	Remove and repair or replace fuel pump.
		i.	Restriction in fuel nozzle orifice.	i.	Remove the nozzle and clean or replace nozzle.
		j.	Heater fuel solenoid in heater or in fuel line not operating.	j.	Remove and check solenoid. Replace if faulty.
		k.	Fuel lines clogged or broken.	k.	Inspect all lines and connections. It may be necessary to disconnect lines at various points to determine where the restriction is located.
		l.	Heater spark plug fouled or defective.	l.	Clean or replace.
		m.	Manual reset limit (overheat) switch open.	m.	Press reset button firmly and recheck to determine reason for switch opening.
		n.	Combustion air pressure switch open. (Defective switch or low combustion air blower output.)	n.	Check for low blower output due to low voltage and correct it. If switch is defective replace switch.
		o.	Duct thermostat switch open.	o.	Operate control to see if switch will come on. Replace switch if defective.
2.	Ventilation air blower fails to run.	a.	HEATER switch in the OFF position.	a.	Place HEATER in the ON position.
		b.	Broken or loose wiring to motor.	b.	Check and repair wiring.
		c.	Circuit breaker open.	c.	Close circuit breaker.
		d.	Worn motor brushes.	d.	Replace motor brushes.
		e.	Blower-wheel jammed.	e.	Remove and check the ventilation air blower wheel and realign if necessary.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
2.	Ventilation air blower fails to run. (Cont'd)	f.	Motor burned out.	f.	Remove blower assembly and remove motor.
		g.	Defective radio-noise filter.	g.	Replace filter.
		h.	Faulty nose landing gear down and locked switch.	h.	Replace switch.
3.	Combustion air blower fails to run.	a.	Faulty wiring to motor.	a.	Inspect and replace faulty wiring.
		b.	Poor ground connection.	b.	Tighten ground screw.
		c.	Worn motor brushes.	c.	Replace motor brushes.
		d.	Blower-wheel jammed. (Usually indicated by hot motor housing.)	d.	Overhaul the combustion air blower.
		e.	Defective radio-noise filter.	e.	Replace filter.
		f.	Faulty or burned-out motor.	f.	Remove combustion air motor for overhaul or replacement of motor.
4.	Heater fires but burns unsteadily.	a.	Insufficient fuel supply.	a.	Inspect fuel supply to heater including solenoid valve, fuel pump and fuel lines. Make all necessary repairs.
		b.	Spark plug partially fouled.	b.	Replace spark plug.
		c.	Loose primary connection at ignition assembly.	c.	Tighten the connection.
		d.	Combustion air blower speed fluctuates. (Can be caused by low voltage, loose blower wheel, worn brushes or motor.)	d.	Remove and overhaul the combustion air blower assembly as required or correct low voltage condition.
		e.	High-voltage leak in lead between ignition assembly and spark plug.	e.	Replace ignition assembly.
		f.	Inoperative ignition assembly.	f.	Replace ignition assembly.
		g.	Restriction in fuel nozzle orifice.	g.	Remove nozzle for cleaning or replacement.
		h.	Nozzle loose in retainer or improper spray angle.	h.	Tighten or replace the nozzle as required.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
5.	Heater starts then goes out.	a.	Lack of fuel at heater.	a.	Check fuel supply through all components from the tank to the heater. Make necessary corrections.
		b.	Inoperative or chattering combustion air pressure switch.	b.	Check, adjust, or replace switch.
		c.	Inoperative overheat switch.	c.	Check or replace switch.
		d.	Inoperative cycling switch.	d.	Adjust or replace the switch.
		e.	Low voltage.	e.	Check low voltage light.
6.	Heater fails to cycle (continues to burn).	a.	Fuel solenoid valve in heater stuck open.	a.	Remove and replace solenoid assembly.
		b.	Inoperative duct and cycling switch.	b.	Check and repair.
		c.	High speed, low altitude and cold ambient temperatures with the CABIN AIR knob pushed completely in.	c.	Pull the CABIN AIR knob slightly to partially reduce the air flow which will allow the heater to cycle.

NOTE

At high speed, low altitude and cold ambient temperatures with the CABIN AIR knob pushed completely in, the heater may fail to cycle. Pull the CABIN AIR knob slightly to partially reduce the air flow which will allow the heater to cycle.

HEATER AND DEFROST SYSTEM - MAINTENANCE PRACTICES

HEATER REMOVAL
(Figure 1)

Every 500 hours of heater operation, the heater should be removed from the airplane and disassembled. All parts should be thoroughly inspected, necessary repairs made and parts replaced.

a. Remove the nose compartment access panel, located on the lower right side of the nose, to gain access to the heater. The heater is located on the right hand side of the nose compartment, below the floor.

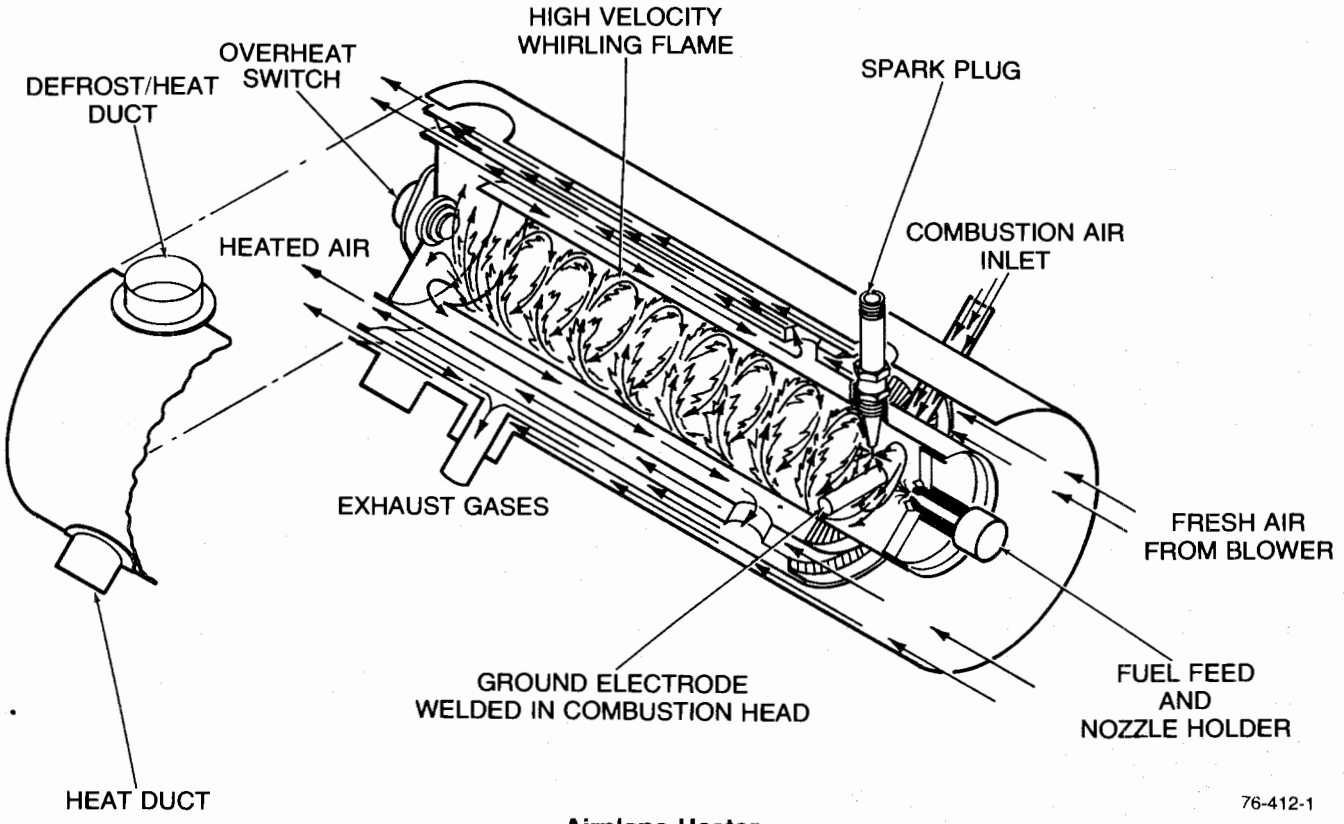
b. Loosen the clamp and disconnect the duct from the combustion air blower.

c. Tag the wires for identification and disconnect the wiring from the heater.

d. Disconnect the fuel drain from the heater assembly. Disconnect and cap the fuel inlet line from the heater fuel pump.

e. Remove the access panel on the upper LH side of the nose and remove the push-pull control for the iris valve, located near the top front of the heater. Remove the push-pull bracket assembly.

f. Remove access panel on bottom right of nose and loosen the clamp and disconnect the defrost/heat duct from the upper aft heater outlet (below the floor skin).



Airplane Heater
Figure 1

g. Remove the five inch diameter access panel, located on the bottom right side of the nose and loosen the clamp and disconnect the heat duct from the lower aft heater outlet.

h. Remove the nut, washer, and screw and remove the push-pull mount support at FS 59.00.

i. Remove the mounting clamp, located near the aft end of the heater.

j. Remove the heater from the nose compartment.

HEATER INSTALLATION
(Figure 1)

a. Position the heater in the nose compartment. Install and tighten the mounting clamp.

b. Install the push-pull mount support at FS 59.00 and install the screw, washer, and nut.

c. Install the heat duct and clamp to the lower aft heater outlet. Tighten the clamp.

d. Install the defrost/heat duct and clamp to the upper aft heater outlet. Tighten the clamp.

e. Install the push-pull support bracket.

f. Install the push-pull control for the iris valve, located near the top front of the heater. Check for proper travel.

g. Connect the fuel drain to the heater assembly. Connect the fuel inlet line to the heater fuel pump.

h. Install the wiring to the heater and remove the identification tags.

i. Install the duct and clamp from the combustion air blower and secure the clamps.

j. Install the nose compartment heater access panels.

COMBUSTION AIR BLOWER REMOVAL

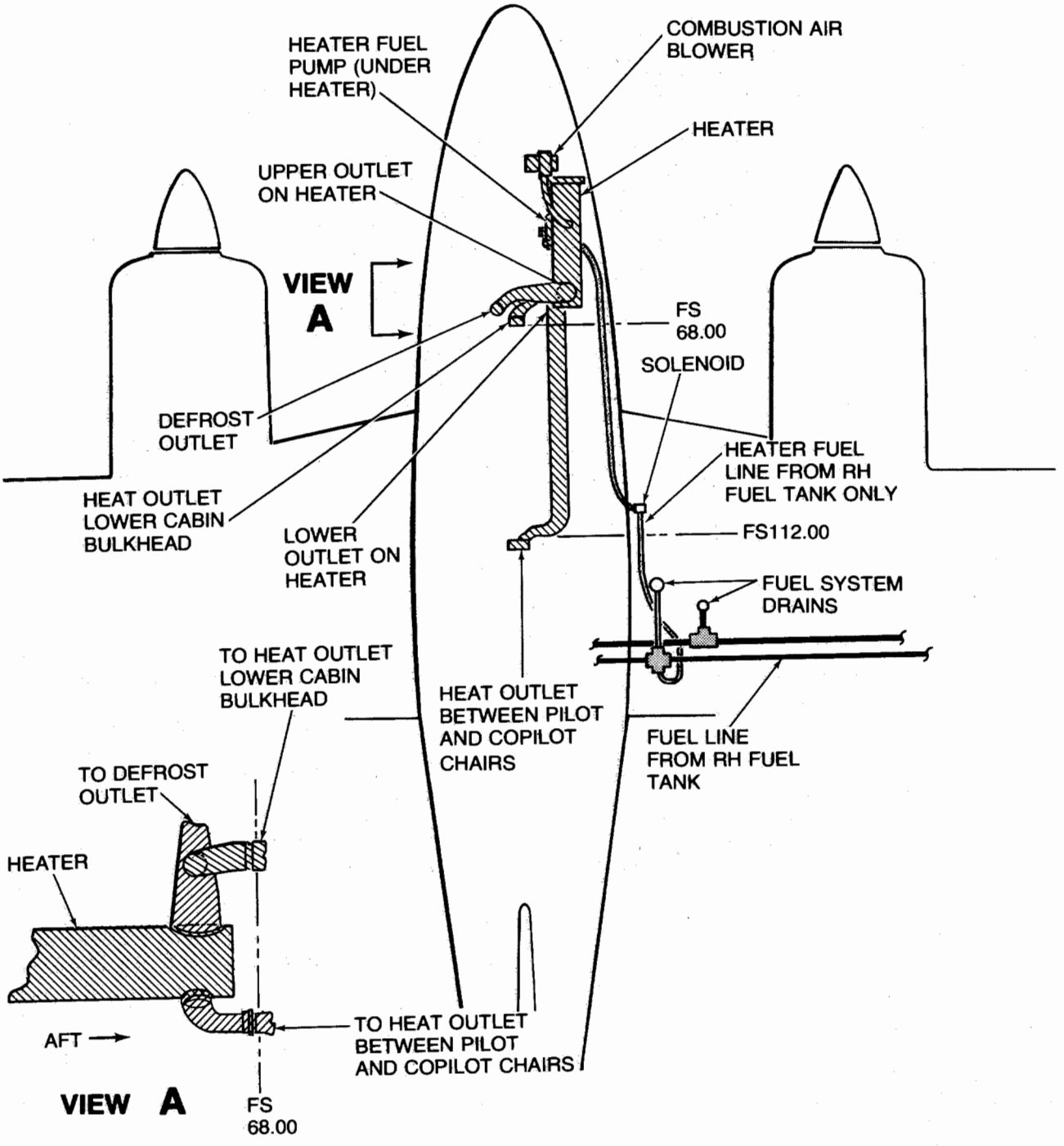
a. Remove the upper aft nose compartment access panel to gain access to the combustion air blower.

b. Tag the wires for identification and disconnect the wiring from the blower.

c. Loosen the clamps and disconnect the ducts on the combustion air blower.

d. Remove the attaching screws from the combustion air blower mounting bracket.

e. Remove the combustion air blower from the nose compartment.



Heater System
Figure 2

COMBUSTION AIR BLOWER INSTALLATION

a. Install the combustion air blower in the nose compartment. The intake adapter on the blower may be rotated to align with the duct.

b. Secure the combustion air blower and mounting bracket with the attaching screws.

c. Install the ducts and clamps on the blower and secure.

d. Install the wiring to the combustion air blower and remove the identification tags.

e. Install and secure the nose compartment combustion air blower access panel.

HEATER IGNITION
(Figure 1)

The controlled atomized spray from a specially designed spray nozzle, coupled with high-voltage spark plug ignition, ensures instant firing and continuous burning under all flight conditions. Heat is produced by burning a fuel-air mixture in the combustion chamber of the heater. Aviation gasoline is injected into the combustion chamber through the spray nozzle. The resulting cone-shaped fuel spray mixes with combustion air and is ignited by a spark from the spark plug. Electric current for ignition is supplied by an ignition unit which converts 14 volts (ME-1 thru ME-182) or 28 volts (ME-183 and after) to a high-voltage, oscillating current to provide a continuous spark across the spark plug gap. A shielded, high-voltage lead connects the ignition assembly to the spark plug. Combustion air enters the combustion chamber tangent to its surface and imparts a whirling or spinning action to the air. This produces a whirling flame that is stable and sustains combustion under the most adverse conditions because it is whirled around itself many times. Ignition is continuous and the combustion process is self-piloting. The burning gases travel the length of the combustion tube, flow around the outside of the inner tube, pass through cross-over passages into an outer radiating area, then travel the length of this surface and out the exhaust.

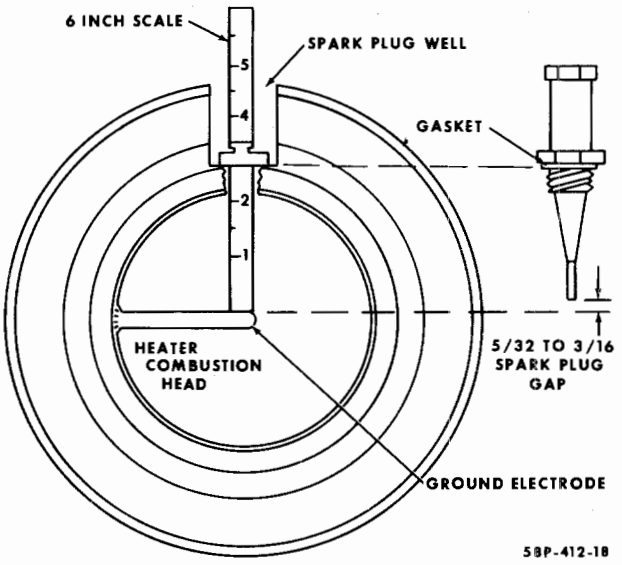
INSPECTION AND SERVICING (SPARK PLUG)
(Figure 3)

If the spark plug appears to be in good condition, except for a mild coating of oxide on the porcelain and electrodes, it may be cleaned and reused. Cleaning is accomplished with a conventional airplane type spark plug cleaner, except that it will be necessary to use two or more adapters in order to raise the long extension of the plug far enough out of the cleaner nozzle opening to provide an effective job. Plug the ceramic insert cavity at the terminal end of the plug with a piece of paper or cloth to keep out any of the cleaning sand. Wipe this cavity out thoroughly with a cloth, wet with 111 trichlorethane. If, after cleaning, the spark plug porcelain is white, and the electrode is not eroded, the spark plug gap may be set as follows. Insert a six inch scale with a sliding clip into the spark plug well until it touches the ground electrode welded inside the combustion head. Withdraw the scale and note the dimension between the sliding clip and the end of the scale. Place the scale against the bottom of the spark plug gasket and determine the length of the spark plug positive electrode. The difference between the two measurements is the spark plug gap. The gap should be 5/32 to 3/16 (0.156 to 0.188) inch. If the plug gap must be adjusted, the ground electrode may be bent up or down by reaching through the spark plug hole with the appropriate shaped tool.

NOTE

If the spark plug fails to clean up properly and/or if the electrode is badly eroded, it should be replaced.

If a new spark plug is being installed, be sure to measure the gap. Do not bend the positive electrode. Torque the spark plug to 28 foot-pounds.



Heater Spark Plug Gap
Figure 3

NOTE

The spark plug can be checked visually for sparking prior to installing the plug as follows: Disconnect the wire from the terminal on the heater wiring side of the terminal strip to de-energize the fuel solenoid valve. Connect the high-voltage lead temporarily and lay the spark plug on the heater jacket. Be sure that spark gap does not exceed 5/16 inch or high tension connections may be dangerous.

WARNING

Be sure to plug the spark plug hole in the heater to prevent any possibility of residual fuel blowing out and igniting. Do not touch the spark plug while energized because of dangerously high voltage.

HEATER FUEL PUMP REMOVAL

a. Remove the RH lower nose compartment access panel to gain access to the heater. The heater fuel pump is located below the heater.

b. Disconnect the fuel drain. Disconnect the fuel inlet and outlet lines from the heater fuel pump. Cap the fuel inlet line.

c. Remove the nuts, washers, and bolts attaching the heater fuel pump.

d. Remove the heater fuel pump from the nose compartment.

HEATER FUEL PUMP INSTALLATION

a. Install the heater fuel pump with the attaching bolts, washers, and nuts.

b. Connect the fuel drain. Connect the fuel inlet and outlet lines to the heater fuel pump.

c. Install the RH lower nose compartment access panels.

"END"

CHAPTER 24

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"END"

24-ELECTRICAL POWER

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"END"

DC GENERATION - DESCRIPTION AND OPERATION

ELECTRICAL SYSTEM

The 14-volt (ME-1 thru ME-182) airplane electrical system includes two 14.0-volt, 60-ampere alternators and one 12-volt 35-ampere-hour lead-acid battery. The 28-volt (ME-183 and after) airplane electrical system includes two 28.0 volt, 55-ampere alternators and one 24-volt 15.5 ampere-hour lead-acid battery. An optional installation (ME-183 and after) provides two 12-volt 25-ampere-hour lead-acid batteries, electrically connected in series. The airplane electrical system supplies dc power to the airplane. The battery supplies power for the airplane starter system and electrical system when the engines are not operating. The alternators provide the dc voltage to the electrical system during engine operation. An optional external power receptacle, located in the aft fuselage, is provided for the ground power unit when extended ground power operation or cold weather starts are required.

Electrical system repair methods used must be made in accordance with the Federal Aviation Agency's "Aircraft Inspection and Repair" manual AC 43.13-1A and the "Aircraft Alterations" manual AC 43.13-2. Any components replaced and any wire, cable, or terminals used in the maintenance of the electrical system must be of aircraft quality. Any solder-less terminals or splices used must be applied with tooling specified by the vendor.

TROUBLESHOOTING

ELECTRICAL SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
ALTERNATOR SYSTEM		
1. No alternator output or low charge is indicated.	a. Open circuit.	a. Check continuity of the circuit.
	b. Field circuit breaker tripped.	b. Check for short circuit and reset circuit breaker.
	c. Loose or improper connections.	c. Check wiring diagram for proper connections and tighten all connections.
	d. Open or short in rectifier (low output).	d. Replace alternator.
	e. Open or shorted field in alternator; defective rotor.	e. Test resistance of the field. Check field circuit connections; replace alternator, if necessary.
	f. Brushes not contacting slip-ring.	f. Clean brushes and holders with a lint-free dry cloth, replace weak springs.
	g. Worn or broken brushes.	g. Check brushes and replace if necessary.
	h. Open current limiter in output line.	h. Check for shorted alternator.
	i. Engine speed too low.	i. Increase engine rpm.
	j. Defective voltage regulator.	j. Replace voltage regulator.
	k. Defective loadmeter.	k. Replace loadmeter.
2. Noisy alternator.	a. Worn bearings.	a. Replace bearings.

TROUBLESHOOTING

ELECTRICAL SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
ALTERNATOR SYSTEM (Cont'd)		
2. Noisy alternator. (Cont'd)	b. Shorted rectifier (magnetic noise).	b. Replace rectifier.
	c. Bent or broken fan.	c. Replace fan.
	d. Loose rear housing or improperly installed stator.	d. Tighten rear housing or check stator for proper installation.
3. Loadmeter malfunction or lights flicker.	a. Loose connections in charging system or damaged wiring.	a. Check system, tighten or replace loose or damaged wiring or wiring connection.
	b. Worn brushes.	b. Check brushes and replace if necessary.
	c. Broken fuse in loadmeter circuit.	c. Check fuse and replace if necessary.
4. Arc marks on terminals.	a. Loose connections.	a. Clean and tighten connections.
VOLTAGE REGULATOR SYSTEM		
1. Low or no output voltage.	a. Excessive load.	a. Check load and reduce.
	b. Poor system connection.	b. Check system and tighten all connections.
	c. Voltage adjustment set too low.	c. Adjust the voltage regulator.
2. High output voltage.	a. Voltage adjustment set too high.	a. Adjust the voltage regulator.
	b. Field terminals have high resistance contact.	b. Clean and tighten terminals.
	c. Circuit breaker has high voltage drop.	c. Replace circuit breaker.
BATTERY SYSTEM		
1. With alternator OFF and the battery switch ON, no indication on the low voltage indicator.	a. Battery or batteries discharged or defective.	a. Recharge or replace the battery or batteries as necessary.
	b. Open circuit between battery and battery switch.	b. Check continuity.
	c. Open circuit between battery and power bus.	c. Isolate and repair as necessary.

TROUBLESHOOTING

ELECTRICAL SYSTEM

BATTERY SYSTEM (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	With alternator OFF and the battery switch ON, no indication on the low voltage indicator. (Cont'd)	d.	Battery switch defective.	d.	Check relay for operation and replace if necessary.
		e.	Defective battery relay.	e.	Check relay for operation and replace if necessary.
		f.	Light defective.	f.	Replace bulb.
		g.	Low voltage detector faulty.	g.	(ME-1 thru ME-182). Remove the instrument cluster and check the low voltage detector circuit for proper operation. Apply 14.0 volts to pins 1 (plus) and 2 (minus) and with a second power source apply 14.0 volts to pins 2 (minus) and 11 (plus). Reduce the second power source until the light comes on. The light should come on at 12.2 ± .1 volts. Replace low voltage detector components as necessary to comply with the above standards. (ME-183 and after) Remove the instrument cluster and check the low voltage detector circuit for proper operation. Apply 28.0 volts to pins 1 (plus) and 2 (minus) and with a second power source apply 28.0 volts to pins 2 (minus) and 11 (plus). Reduce the second power source until the light comes on. The light should come on at 23.75 ± .5 volts. Replace low voltage detector components as necessary to comply with the above standards.
2.	Low voltage indicator on with battery switch ON but battery will not power the load.	a.	Battery charge is low.	a.	Remove and recharge the battery or batteries as necessary.
		b.	Battery terminal loose or corroded.	b.	Clean terminal and tighten.
		c.	Open in feeder bus circuit.	c.	Isolate problem and correct.
3.	Power on with battery switch in the OFF position.	a.	Battery switch defective.	a.	Check switch for operation and replace if necessary.

TROUBLESHOOTING

ELECTRICAL SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*	
			BATTERY SYSTEM (Cont'd)			
3.	Power on with battery switch in the OFF position. (Cont'd).	b.	Battery relay contacts stuck.	b.	Check battery relay for operation and replace if necessary.	
			BATTERY			
1.	Battery will not hold its charge.	a.	Battery is worn out.	a.	Replace the battery or batteries.	■
2.	Battery will not come up to full charge.	a.	Charge rate set too low.	a.	Adjust voltage regulator.	
		b.	Defective voltage regulator.	b.	Replace voltage regulator.	
		c.	Battery is becoming depleted.	c.	Replace battery or batteries.	■
3.	Battery consumes water rapidly.	a.	Faulty battery.	a.	Replace battery or batteries.	■
		b.	Voltage regulator set too high.	b.	Adjust voltage regulator.	
		c.	Defective voltage regulator.	c.	Replace voltage regulator.	
4.	Electrolyte runs out of vent plugs.	a.	Electrolyte level too high.	a.	Remove excess electrolyte down to specified level.	
		b.	Excessive charging rate.	b.	Adjust voltage regulator on airplane.	
		c.	Vent caps loose or broken.	c.	Replace or tighten vent caps.	
5.	Battery low.	a.	Standing too long.	a.	Remove battery or batteries and recharge.	■
		b.	Equipment left on accidentally.	b.	Remove battery or batteries and recharge.	■
		c.	Short circuit or ground in wiring.	c.	Check wiring and correct malfunction, then remove battery or batteries and recharge.	■
6.	Compound on top of battery melts.	a.	Charge rate too high.	a.	Adjust voltage regulator.	
		b.	Defective voltage regulator.	b.	Replace voltage regulator.	
7.	Battery freezes.	a.	Battery discharged.	a.	Replace battery or batteries.	■

TROUBLESHOOTING

ELECTRICAL SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
BATTERY (Cont'd)		
7. Battery freezes. (Con't)	b. Water added in cold weather without charging the battery sufficiently afterward to thoroughly mix the water with electrolyte before letting stand.	b. Replace battery or batteries.
	c. Too low specific gravity of the electrolyte caused by improper filling.	c. Replace battery or batteries.

DC GENERATION - MAINTENANCE PRACTICES

ALTERNATOR REMOVAL

a. Turn battery switch OFF, disconnect the battery (located in the aft compartment), and ensure that the external ground power source is disconnected.

b. Gain access to the engine compartment.

c. Remove the nut, washer, and bolt and remove the support clamps from the alternator cooling duct and engine mount.

d. Remove the clamp attaching the cooling duct to the tube and shroud on the alternator and disconnect the cooling duct from the alternator.

e. Remove the terminal cover boots.

f. Tag and remove wiring from the alternator.

g. Loosen the bolt on the bracket and remove the alternator drive belt from the alternator drive pulley.

h. Remove the alternator attach bolts and remove the alternator.

ALTERNATOR INSTALLATION

a. Turn battery switch OFF, disconnect the battery, and ensure that the external ground power source is disconnected.

b. Ensure that the drive pulley retaining nut is torqued to 35-40 foot-pounds.

c. Place the alternator in the mounting position.

d. Install the alternator mounting hardware. Do not tighten completely. Install 105-910000-33 shims as required to obtain .004 maximum end clearance.

e. Place the drive pulley belt over the drive pulley and engine pulley and slide the alternator out until the belt is tight.

NOTE

Prior to torquing alternator mounting bolt, install 169-910017-43 laminated washers, as required, to maintain a minimum clearance of .004-inch between the alternator and bracket.

f. Torque the alternator mounting bolt to 100-140 inch-pounds.

g. Tighten the bolt on the slide bracket, so the belt will remain tight.

h. Check the belt tension as described in CHECKING ALTERNATOR BELT TENSION in this chapter.

i. Adjust the sliding bracket bolt until the torque in CHECKING ALTERNATOR BELT TENSION in this chapter is complied with. Tighten the belt and safety wire.

j. Install electrical wiring and remove identification tags.

k. Install terminal cover boots.

l. Position the alternator cooling duct on the tube and shroud on the alternator and install the attaching clamp.

m. Position the support clamps on the cooling duct and engine mount and install the bolt, washer, and nut.

n. Install engine cowling and close access panels.

CHECKING ALTERNATOR BELT TENSION

Check the alternator belt tension at the time of installation, again after 25 hours of operation, and at each 100 hours thereafter.

a. Apply a torque wrench to the nut that attaches the pulley to the alternator and turn it in a clockwise direction. Observe the torque shown on the wrench at the instant the pulley slips.

b. If the belt is new, the torque should be 11-13 foot-pounds. If the belt is used, the torque should be 7-9 foot-pounds.

VOLTAGE REGULATOR REMOVAL

a. Gain access to the nacelle compartment, aft of the firewall.

b. Locate the voltage regulator installed adjacent to the overvoltage relay and terminal strip and the alternator out circuit breaker.

c. Ensure that the battery switch is OFF, the battery is disconnected, and the external power source is disconnected.

d. Tag and remove wires from the voltage regulator.

e. Remove the voltage regulator attaching screws and remove the voltage regulator.

VOLTAGE REGULATOR INSTALLATION

a. Ensure that the battery switch is OFF, the battery is disconnected, and the external power source is disconnected.

b. Place the voltage regulator in position and secure with attaching screws.

c. Install electrical wires on the voltage regulator and remove tags.

d. Secure nacelle compartment access panels.

e. Reconnect the battery.

ALTERNATOR PARALLELING

Parallel the alternators using the following procedure:

a. Remove the access covers on top of both nacelles to gain access to the voltage regulators.

b. Remove the lead from the "PAR" terminal of the RH regulator and secure the free end of the lead so it cannot contact the airframe or other circuits.

c. With the LH alternator switch ON and the RH alternator switch OFF, start the LH engine and operate it at 1200 to 1500 RPM for 5 to 10 minutes with approximately a 30% load on the alternator. This will allow the alternator and regulator to warm up.

d. Measure the voltage on Bus # 1, (See Wiring Diagram Manual, Duchess 76, Section 24-51-01) on the back side of the circuit breaker sub-panel, using a precision voltmeter. Adjust the LH voltage regulator to bring this voltage to 14.0 ± .2 volts (ME-1 thru ME-182) or 28.0 ± .2 volts (ME-183 and after). Remove the voltmeter after making this adjustment.

e. Shut down the LH ENGINE. Connect a portable voltmeter between the "FIELD" terminals of the RH and LH regulators with the positive lead of the meter on the LH regulator. Set the meter on a scale of 30 volts or higher. Connect an alligator or other suitable type clip to the paralleling lead removed in Step "b" so the lead can be easily connected and disconnected to the "PAR" terminal of the regulator.

NOTE

A wire of at least 18 gage may be connected to the field terminal of the LH regulator and routed through the cabin to the RH nacelle. This will allow both meter connections to be made in the RH nacelle. Caution should be taken to ensure the wire cannot come in contact with the moving propeller. At no time should the wire or meter leads contact airframe ground as this will damage the regulators.

f. Restart the LH engine with both alternator switches ON. Apply approximately a 30% load on the system with the engine operating at 1200 to 1500 RPM, and observe the indication on the portable voltmeter. If a reverse indication (downscale) is obtained, the RH regulator voltage adjustment should be turned counterclockwise until a positive indication is obtained.

g. Adjust the RH regulator for the lowest voltage indication that can be obtained. Any reading less than 8 volts is acceptable. However, the lower the reading obtained, the more accurate the adjustment will be. The meter indication will not be steady, but the average indication should be as low as possible.

h. Connect the paralleling lead on the "PAR" terminal of the RH regulator. The meter reading should drop to a stable indication of 0.2 to 0.5 volts. Recheck the Bus #1 voltage as in Step "d" and reading the LH regulator if necessary. A final adjustment of the RH regulator should be made after a 5 to 10 minute warmup period of opening paralleling lead and adjusting as in Step "g".

i. Start both engines and operate them at the same RPM between 1200 and 1500 RPM. Apply enough load to the electrical system to indicate approximately 50% on both loadmeters. The loadmeter indication should remain nearly equal if the load is varied throughout the loadmeter range.

NOTE

It is possible that during very low load conditions, one alternator may drop off line. This does not necessarily indicate a malfunction, as the system may be operating below the threshold of the paralleling circuit. An increase in electrical load should clear this condition.

j. Shut down both engines, replace the snap plugs over the adjustment screws on both regulators, reinstall the paralleling lead on the RH regulator, and check all wires for security. Reinstall the nacelle access covers and any other covers or panels removed.

OVERVOLTAGE RELAY REMOVAL

a. Turn the battery switch to the OFF position, disconnect the battery, and ensure that the external ground power unit is disconnected.
b. Gain access to the nacelle compartment.
c. Locate the overvoltage relay and overvoltage terminal strip mounted adjacent to the alternator out circuit breaker and voltage regulator.
d. Tag and remove wires from the terminal strip.
e. Remove the overvoltage relay attaching screws, washer, and nuts. Remove the overvoltage relay.

NOTE

Accomplish Step "f" only if there is evidence of corrosion, damage, or positive contact is not being made.

f. Remove the terminal strip attaching screws, washers, and nuts and remove the terminal strip.

OVERVOLTAGE RELAY INSTALLATION

a. Turn the battery switch to the OFF position, disconnect the battery, and ensure that the external ground power unit is disconnected.
b. If required, place the terminal strip in position and secure with screws, washers, and nuts.
c. Place the overvoltage relay in position and secure with screws, washers, and nuts.
d. Connect the overvoltage wires to the terminal strip and remove tags.
e. Secure the nacelle compartment access panels.
f. Reconnect the battery to the airplane bus.

BATTERY MAINTENANCE PROGRAM

A systematic battery maintenance program should be established and carefully followed.

a. The batteries should be removed from the airplane for service.
b. A log of the services performed on each battery should be maintained.
c. The battery should be removed from the airplane and serviced after 100 flight hours or 30 days, whichever occurs first. If the ambient temperatures are above 90°F or the time between engine starts averages less than 30 minutes, the duty cycle should be reduced.
d. The log of battery services performed should be evaluated to determine the need to service the battery at the above recommended intervals or to extend the intervals if justified. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

BATTERY REMOVAL

a. Place the battery switch in the OFF position and ensure that the external power unit is disconnected.
b. Gain access to the aft fuselage, aft of FS 181.00 and remove the battery box lid.
c. Remove the negative battery cable from the battery.

CAUTION

Always remove the ground cable terminal first and install it last to prevent accidental short circuits.

d. Disconnect the positive cable from the battery and position it so it will not interfere with the removal of the battery.

NOTE

If the optional two 12-volt batteries (ME-183 and after) are used, remove the bus bar interconnect from the batteries.

e. Remove the battery or batteries from the airplane.

BATTERY INSTALLATION

a. Place the battery switch in the OFF position and ensure that the external ground power unit is disconnected.
b. Position the battery or batteries in the battery box.
c. Coat the battery terminals and cable terminals with a light coating of petroleum jelly.

CAUTION

If the positive battery terminal is not marked (+), POS, or painted red and the negative battery terminal is not marked (−), NEG, or painted black, use a voltmeter to determine the battery polarity before connecting the battery in the airplane. Reverse polarity will destroy the diodes and other electronic components in the electrical system.

d. Position the positive cable on the battery and secure.

e. Position the negative cable on the battery and secure.

NOTE

If the optional two 12-volt batteries (ME-183 and after) are used, install the bus bar interconnect between both batteries.

f. Remove any excess petroleum jelly from the terminals.

g. Position the battery box lid on the battery box and secure.

h. Secure the aft fuselage access panel.

BATTERY CLEANING

For peak performance, the battery or batteries must be kept clean and dry. If foreign materials are present in sufficient quantities, the resultant deposits may form conductive paths that permit a rapid discharge of the battery. To prevent the collection of such deposits, use the following steps in cleaning the battery after each 100 hours of service or every 30 days, whichever occurs first:

a. Remove the battery as described under the heading BATTERY REMOVAL in this chapter.

b. Ensure that the battery cell filler caps are in place and tight. Brush dirt off with a stiff bristle brush.

CAUTION

Never use a wire brush or brush with a metal construction for this purpose as short circuiting or other damage may result.

c. Scrub the battery with a solution of ammonia or bicarbonate of soda (one part of soda to a gallon of water). This will neutralize any electrolyte sprayed or spilled out.

CAUTION

Entrance of ammonia or soda solution into a battery cell will neutralize the cell electrolyte. Never use solvents to clean the battery, for these may damage the battery case.

d. Rinse the battery with clear water, then sponge off the excess water. Allow the battery to air-dry.

e. Wash the battery filler caps with clean hot water and no soap, then examine the vent holes in the battery filler caps to make sure they are clear.

f. Inspect the battery for cracks, holes, or burn spots. Replace if necessary.

g. Make sure that all battery hardware is clean and in good mechanical condition.

NOTE

If additional cleaning of the battery terminals and cable terminal is required, use a battery terminal cleaning tool and brighten up the terminals to ensure a good electrical connection.

BATTERY BOX CLEANING

The battery box is vented overboard to dispose of electrolyte and hydrogen gas fumes discharged during normal charging operation. To ensure the disposal of these fumes, the vent hose connections at the battery box should be checked frequently for obstructions. The battery box should be washed out thoroughly and dried each time the battery is removed and cleaned.

BATTERY SERVICING

The battery should be maintained in a fully charged state at all times and the electrolyte level checked at regular intervals. A clean fully charged battery will provide peak performance. Never add anything but distilled water when adjusting the electrolyte level of the battery. If electrolyte is added each time the level in the battery is low, a high concentration of electrolyte may cause dissolution of the plates. Under high temperature conditions, this may be indicated by the presence of black particles in the electrolyte of the affected cells.

NOTE

Do not fill the battery over one-half inch above the separators. Only lead-acid equipment should be used when servicing lead-acid type batteries.

ELECTRICAL SYSTEM OPERATIONAL CHECK

NOTE

This entire procedure should be read before beginning the operational check.

a. Proceed with the check list BEFORE STARTING as outlined in the Pilot's Operating Handbook.

b. The alternator out/undervoltage lights should be illuminated. If not, check:

1. Bulbs.
2. Alternator out circuit breaker located in the LH and RH aft nacelle.
3. Instrument cluster (swap the plugs on the back of the cluster if one lamp illuminates and one does not, to isolate the cluster circuits).

c. Proceed with the ENGINE STARTING check list as outlined in the Pilot's Operating Handbook.

d. Both alternator out/undervoltage lights should be extinguished. Loadmeters should initially indicate a high (greater than 50%) load which steadily decreases as the battey charges.

e. If either undervoltage light remains illuminated and the loadmeter indicates no load, check:

1. Alternator/regulator by installing the LH nacelle regulator in the RH nacelle and conversely.
2. Instrument cluster circuits (swap the plugs on the back of the cluster).

f. If the undervoltage light remains illuminated and the loadmeter indicates a load, check the cluster by swapping plugs.

g. If the loadmeter indicates no load and the undervoltage light is extinguished, check:

1. Loadmeter fuses on the back of the center pedestal.
2. Loadmeters by swapping plugs on the instrument cluster.

ALTERNATOR SELF-EXCITATION CHECK

The self-excitation function of each alternator is checked as follows:

a. Turn all electrical equipment and avionics OFF.

b. Turn the battery and alternator switches OFF.

c. Operate the LH engine at 1500 rpm.

d. Turn the LH alternator switch ON. The engine instruments should come on line and the RH undervoltage light should illuminate.

e. Turn the LH alternator switch OFF.

f. Repeat steps "d" and "e" at 1800 rpm and 2300 rpm.

g. If the alternator does not come on line at the lower rpm, but comes on line at the higher rpm, check the LH bus voltage at 1500 rpm (step "d").

h. If the bus voltage is approximately 1.3 volts or higher, the regulator is not turning on at the proper level, and should be replaced. If the voltage is less than approximately 1.0 volts, the alternator output is too low, and the alternator should be checked.

NOTE

This is a check to observe the self-excitation voltage of the alternator and the ability of the regulator to turn ON.

i. If the alternator comes on line at the lower rpm but not at the higher speeds, commutator eccentricity and brush bounce should be suspected. Perform a bus voltage check while repeating steps "d" and "e" at all three speeds. If the voltage is lower at higher speeds, the alternator should be removed and repaired.

j. Repeat the self-excitation check on the RH alternator. Voltage measurements should be taken on the RH bus.

k. Intermittent conditions, such as an alternator dropping and picking up load, should be cause to check security of all connections in the system. Particular attention should be paid to the security of the output loads (heavy wires) on the alternators at all terminal points and at the isolation diodes in the nacelles. Due to the heavy current capability of these wires, loose connections may cause arcing and charring of the wires and terminals.

"END"

EXTERNAL POWER - MAINTENANCE PRACTICES

EXTERNAL POWER

To supply power for ground checks or to assist in starting, use only an external power source that is negatively grounded. The receptacle is located on the RH aft fuselage.

CAUTION

On 14-volt airplanes, the power pin for external power is connected directly to the battery and continually energized. Turn OFF battery and alternator switches and all electrical and avionics switches when connecting the auxiliary power unit plug. Assure correct polarity (negative ground) before connecting auxiliary power unit. Turn ON the battery switch before turning on the auxiliary power unit.

On 28-volt airplanes, a reverse polarity diode protection system is between the external power receptacle and the main bus. With external power applied, the bus is powered. Turn ON the battery switch only with all other switches, including avionics switches OFF when connecting the auxiliary power unit. Assure correct polarity before connecting external power.

Observe the following precautions when connecting an external power source:

a. Remove the protective cover from the external power receptacle of the airplane.

b. Use only an auxiliary power source that is negatively grounded which has a voltage of 14.0 ± .2 vdc (ME-1 thru ME-182) or a voltage of 28.0 ± .2 vdc (ME-183 and after). If the polarity of the power source is unknown, determine the polarity with a voltmeter before connecting the unit to the airplane.

c. Before connecting an auxiliary power source, turn OFF all radio equipment and the alternator switch. For the 14-volt system (ME-1 thru ME-182), turn the battery switch OFF. For the 28-volt system (ME-183 and after), turn the battery switch ON.

d. Turn the auxiliary power source OFF prior to connecting the external power cable to the auxiliary power source. Connect the positive clamp of the cable to the positive terminal of the power source and the negative clamp to the negative terminal of the power source. (If the battery is used as the power source, connect the positive terminal of the cable to the positive terminal of the power source or battery. Isolate the negative cable clamp.)

e. Connect the external power cable into the external power receptacle. Turn the auxiliary power source ON. (If a battery is used as the power source, connect the negative cable clamp to the negative terminal of the power source or to a suitable ground point.)

f. For the 14-volt system (ME-1 thru ME-182) the battery switch must be ON to connect the auxiliary power source to the airplane bus.

Observe the following precautions when disconnecting an external power source:

a. Turn all electrical switches and the battery switch OFF.

b. Turn the auxiliary power source OFF. (If a battery has been used for a power source, disconnect the negative clamp of the external power cable and isolate it.)

c. Remove the external power cable from the airplane receptacle. Replace the protective cover in the external power receptacle.

d. Disconnect the external power cable from the auxiliary power source.

"END"

ELECTRICAL LOAD DISTRIBUTION - MAINTENANCE PRACTICES

ELECTRICAL UTILIZATION CHART

The following charts provide information pertaining to the capacity of the alternator for supplying the electrical load on the airplane while maintaining a full charge on the battery. To determine the total electrical load of the airplane, add the continuous load for standard equipment to the load of the optional equipment installed in the airplane (accessories and radio). The 14-volt system (ME-1 thru ME-182) is equipped with two 60-ampere alternators. The total output of both alternators shall not exceed 91% 109.2 amps of the total generating capacity. The 28-volt system (ME-183 and after) is equipped with two 55-ampere alternators. The total output of both alternators shall not exceed 91% 100.1 amps of the total generating capacity. When equipment functions at various times in different systems, the load per unit value listed in the chart represents the highest value required to operate that particular unit.

ELECTRICAL LOAD ANALYSIS

Maximum Continuous Load
(Electrical Equipment)

ITEM	NO. PER AIRPLANE	AMPS PER UNIT 14 VOLT	AMPS PER UNIT 28 VOLT	LOAD PER AIRPLANE (AMPS) 14 VOLT	LOAD PER AIRPLANE (AMPS) 28 VOLT
Instrument Post Lights	22	.08	.04	1.76	.88
Light Driver (Post Lights)	1	.07	.07	.07	.07
NAV Lights (Wings)	2	2.00	.93	4.00	1.86
NAV Light (Tail)	1	1.04	1.02	1.04	1.02
Magnetic Compass Light	1	.08	.04	.08	.04
Dome Light	1	.58	.30	.58	.30
Overhead Inst. Light (Map light)	2	.58	.30	1.16	.60
Light Driver (Overhead)	1	.07	.07	.07	.07
Strobe Light Power	1	8.00	4.00	8.00	4.00
Fuel Pump Heater	1	1.00	.60	1.00	.60
Auxiliary Fuel Pumps	2	1.00	.60	2.00	1.20
Heated Pitot Mast	1	6.55	4.60	6.55	4.60
Battery Relay	1	.72	.36	.72	.36
Battery Charge Current	1	3.00	3.00	3.00	3.00
Engine Cluster Panel	1	1.00	1.00	1.00	1.00
Flight Hour Meter	1	.48	.22	.48	.22
Turn Coordinator	1	.80	.40	.80	.40
Electric Clock	1	.012	.01	.012	.01
Flap Indicator	1	.02	.06	.02	.06
Fresh Air Blower	1	6.50	3.25	6.50	3.25
Heater	1	14.95	1.50	14.95	1.50
Voltage Regulator	2	3.00	3.00	6.00	6.00
		TOTAL CURRENT		59.792	31.04

Maximum Continuous Load
(Avionics Equipment)

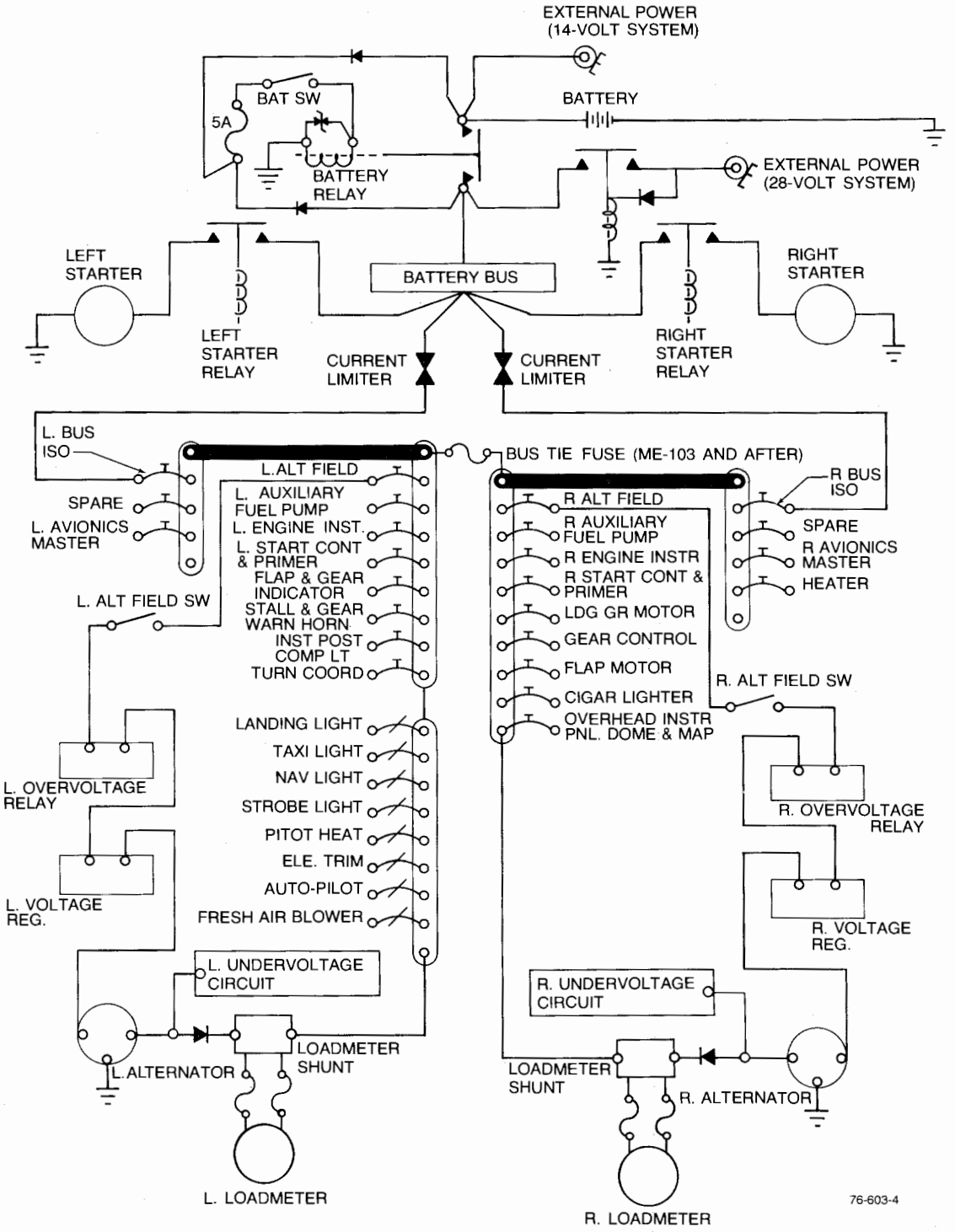
ITEM	NO. PER AIRPLANE	AMPS PER UNIT 14 VOLT	AMPS PER UNIT 28 VOLT	LOAD PER AIRPLANE (AMPS) 14 VOLT	LOAD PER AIRPLANE (AMPS) 28 VOLT
Transceiver		1.60 (R)	1.18 (R)	1.90 *	3.92
COMM/NAV	1	4.50 (T)	5.10 (T)		
Glideslope	1	.50	.51	.50	.51
Marker Beacon	1	.30	.30	.30	.30
Audio Control Amplifier	1	1.10	1.10	1.10	1.10
Transponder	1	1.50	1.80	.150	1.80
ADF System	1	1.54	1.16	1.54	1.16
DME	1	4.50	2.40	4.50	2.40
Encoding Altimeter	1	.35	.16	.35	.16
Autopilot	1	5.98	5.73	5.98	5.73
Yaw Damper	1	1.90	1.90	1.90	1.90
Compass System	1	.50	.50	.50	.50
		TOTAL CURRENT		20.07	19.48

*Current indicated is average current (Receiver and Transmitter).

Maximum Intermittent Load
(Electrical Equipment)

ITEM	NO. PER AIRPLANE	AMPS PER UNIT 14 VOLT	AMPS PER UNIT 28 VOLT	LOAD PER AIRPLANE (AMPS) 14 VOLT	LOAD PER AIRPLANE (AMPS) 28 VOLT
Stall Warning Horn	1	.40	.20	.40	.20
Landing Gear Horn	1	.40	.20	.40	.20
Flasher, Gear Horn	1	.04	.04	.04	.04
Cigarette Lighter	1	8.50	5.00	8.50	5.00
Starter Relay	2	3.0	.75	3.00 #	.75*#
Primer Solenoids	2	2.00	.25	2.00 #	.25 #
Flap Motor	1	15.00	10.00	15.00	10.00
Landing Gear Motor	1	35.00	22.00	35.00	22.00
Landing Gear Relays	2	.60	.36 #	.60 #	.36 #
Landing Gear Down and Lock Lights	3	.08	.04	.24	.12
Landing Gear Transient Light	1	.08	.04	.08	.04
Taxi Light	2	7.69	3.57	15.38	7.14
Landing Light	1	19.23	8.93	19.23	8.93
Elevator Trim (Elec.)	1	1.50		1.50	
Heater Vent Air Blower Motor	1	15.50	10.00	15.50	10.00
Heater Relay	1	.60	.36	.60	.36
Heater Solenoid	1	.50	.25	.50	.25
		TOTAL CURRENT		117.97	65.64

*Used only during starts.
#Only operates one at a time.



Electrical Load Distribution Schematic
Figure 1

"END"

CHAPTER 25

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25-60-00	1	Sep 19/80
	2	Sep 19/80

"END"

CHAPTER 25 - EQUIPMENT/FURNISHINGS

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"END"

FLIGHT COMPARTMENT - MAINTENANCE PRACTICES

PILOT AND COPILOT SEAT REMOVAL

a. Remove the seat stops at the aft end of the tracks.
b. Release the forward and aft adjustment locks.
c. Move the seat aft to the slots and lift the seat from the tracks.

PILOT AND COPILOT SEAT INSTALLATION

a. Insert the seat into the slots in the tracks.
b. Release the forward and aft adjustment lock and slide the seat into the desired position. Engage the lock making certain it holds the seat securely in place.
c. Reinstall the seat stops at the aft end of the tracks.

"END"

PASSENGER COMPARTMENT - MAINTENANCE PRACTICES

PASSENGER SEAT REMOVAL

a. Unsnap the buttons on the lower front of the seat.
b. Remove the seat cushion.
c. Lift the seat back straight up to remove.

PASSENGER SEAT INSTALLATION

a. Place the prongs on the bottom of the seat back into their respective slots while making certain the hooks on the back are engaged with their respective bolts.
b. Place the seat cushion in position and secure the snap buttons.

HEADLINER REMOVAL (ME-283, ME-288 and after)

a. Remove the three attaching screws and remove the sunvisor.
b. Remove the bolts and washers holding the "D" ring for the shoulder restraint strap.
c. Remove the six attaching screws and washers and lower the overhead console. Disconnect the electrical wiring from the overhead console. Tag and identify the electrical wiring. Remove the overhead console from the airplane.
d. Remove the attaching screws and remove the windshield frame.
e. Remove the attaching screws and carpeted sidewall panels.
f. Remove the attaching screws and remove the side upholstery panel, located aft of the RH cabin door, and the side upholstery panel located just aft of the LH cabin door.
g. Disconnect the door stops from the LH and RH cabin doors and the baggage door. Secure the doors in a completely open position.
h. Remove the screws, at the LH and RH side of the headliner, which attach the headliner and trim to the airplane. Above the LH and RH cabin doors, the headliner is held in place with velcro tape.
i. The headliner may be removed from the airplane through either the LH or RH cabin door.

HEADLINER INSTALLATION (ME-283, ME-288 and after)

a. Place the headliner in the airplane through either the LH or RH cabin door.
b. Slip aft end of headliner over fresh air duct flange that extends through hat shelf bulkhead.
c. Align and position the headliner. Above the LH and RH cabin doors, the headliner is held in place with velcro tape.
d. At the LH and RH side of the headliner, install the attaching screws which secure the headliner and trim to the airplane.
e. Install the side upholstery panel, located aft of the RH cabin door, and the side upholstery panel located just aft of the LH cabin door.
f. Install the carpeted sidewall panels, aft of the cabin doors at the LH and RH sides.
g. Position the windshield frame and install the attaching screws.
h. Connect the electrical wiring to the overhead console. Remove the identification tags from the electrical wiring.
i. Position the overhead console and install the six attaching washers and screws.
j. Position the sunvisor and install the three attaching screws.
k. Install the shoulder restraint "D" rings with bolt and spacers, both LH and RH. Be certain the "D" rings swivel freely.
l. Connect the door stops to the LH and RH cabin doors and baggage door.

"END"

EMERGENCY - DESCRIPTION AND OPERATION

EMERGENCY LOCATOR TRANSMITTER

The airplane is equipped with an emergency locator transmitter (ELT) to assist in the tracking and recovery of the airplane and crew in the event of a crash or emergency landing. Airplane serials ME-1 thru ME-339 are equipped with Collins/Communications Components ELTs. Narco ELTs are installed on airplane serials ME-340 and after and on prior airplanes equipped with Kit No. 101-3046-1. The ELT is mounted on the right side of the fuselage, aft of Fuselage Station 260.00. An access hole with a spring-loaded cover is installed adjacent to the transmitter to provide access for manual activation of the ELT. An antenna for the ELT is mounted on top of the fuselage, between Fuselage Stations 239.00 and 245.00.

The output frequencies of the ELT are 121.5 and 243.0 MHz, simultaneously. Range is approximately line of sight. The ARM-OFF-ON switch is located on the transmitter, and controls the operation of the set. The ON position turns the set on for testing and the ARM position actuates the set to operate automatically upon impact. A reset switch, located on the forward end of the transmitter, resets the transmitter to the ARM position in the event the impact switch is accidentally triggered. Airplane serials ME-1 thru ME-101 with Kit No. 101-3039-1 installed have a remote REARM-ARM-XMIT switch located adjacent to the ELT in the aft fuselage. The XMIT position turns the set on for testing and the ARM position actuates the set to operate automatically upon impact. The REARM position resets the transmitter to the ARM position in the event the impact switch is accidentally triggered. Airplane serials ME-340 and after and prior airplanes with Kit No. 101-3046-1 installed have a remote ARM-XMIT switch located adjacent to the ELT in the aft fuselage. The remote ARM-XMIT switch is a momentary switch that enables manual activation of the ELT for testing while the unit is in the airplane.

EMERGENCY - MAINTENANCE PRACTICES

EMERGENCY LOCATOR TRANSMITTER MAINTENANCE

Maintenance on the ELT is normally limited to replacing the battery. The battery must be replaced at fifty percent of its useful life, or any time the transmitter has been in use for more than one cumulative hour. The information on useful battery life and replacement is included in the data furnished with each ELT, and is usually placarded on the battery.

NOTE

Replacement batteries should be obtained only from ELT and airplane manufacturers or other acceptable suppliers, since the condition and useful life of over-the-counter batteries, such as those sold for portable radios, etc., are usually unknown.

NARCO BATTERY REPLACEMENT

a. Place the ARM-OFF-ON switch on the ELT in the OFF position.

b. Disconnect the antenna cable from the ELT. Disconnect the remote switch wiring from the terminals on the ELT.

c. Unlatch the mounting strap and remove the ELT from the airplane.

d. Remove the four screws attaching the control head to the battery casing and slide the control head and battery case apart.

e. Remove the old battery by disconnecting the battery terminals from the bottom of the transmitter PC board.

f. Connect the new battery terminals to the bottom of the transmitter PC board.

NOTE

Do not remove the sealant on the inside lip of the battery pack or a water tight seal will not be made when the unit is reassembled.

g. Slide the control head into the battery pack and install the four attaching screws.

h. Install the transmitter in the airplane and latch the mounting strap.

i. Connect the antenna cable and connect the remote switch wiring to the terminals on the ELT.

j. Press the RESET button and place the ARM-OFF-ON switch on the ELT in the ARM position.

k. A new replacement date must be marked on the outside of the transmitter. This date is 50% of the useful life of the battery as defiend by the battery manufacturer.

COLLINS/COMMUNICATIONS COMPONENTS CORPORATION BATTERY REPLACEMENT

a. Place the ARM-OFF-ON switch on the ELT in the OFF position.

b. Disconnect the antenna cable and the remote

switch wiring, if installed, and remove the ELT from the airplane.

c. Remove the screws which hold the mounting base on the transmitter and remove the base.

d. Remove the old battery and disconnect the electrical connector.

e. Connect a fresh battery and install it in the compartment.

f. Replace the base and screws.

g. Install the transmitter in the airplane and attach the antenna cable and remote switch wiring, if installed.

h. A new replacement date must be marked on the outside of the transmitter. This date is 50% of the useful life of the battery as defined by the battery manufacturer.

TESTING EMERGENCY LOCATOR TRANSMITTER

Generally, tests will be performed following maintenance or repair of ELTs, other than battery replacement, to determine their operational capability. Testing of the ELT, if improperly done, could trigger false alerts and create frequency jamming, and may interfere with the reception of a bonafide emergency transmission. Federal Communications Commission regulations require that this testing be performed in a screened or shielded test room, or in a test enclosure that will hole the self contained ELT unit with the antenna fully extended.

Operational testing of installed ELTs may be accomplished as follows:

NOTE

Tests should not be longer than three audio sweeps. One audio sweep may be defined as amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700 Hz, within the range 1600 to 300 Hz, and a sweep repetition rate between two and four Hz. Tests should be conducted only in the first five minutes of any hour. If the operational tests must be made at a time not included within the first five minutes after the hour, the tests should be coordinated with the nearest FAA tower or flight service station.

a. Turn COM-1 ON and tune to 121.5 MHz.

b. Turn COM 1 to the SPEAKER position.

c. Turn the ELT ARM-OFF-ON switch to ON and monitor ELT signal. On airplanes equipped with a remote switch, the switch may be momentarily flipped to the XMIT position and the ELT signal monitored.

NOTE

If there is no audible signal, the battery is probably disconnected or dead, assuming that the VHF transceiver is operational.

d. Place the ARM-OFF-ON switch on the ELT to the OFF position. If the remote switch is being utilized to test the unit, the switch should be released so it will return to the ARM position. The audio signal should disappear completely.

e. Place the ARM-OFF-ON switch on the ELT to the ARM position. There should be no audio signal present.

NOTE

If a signal is heard, the impact switch has probably been activated and should be reset.

f. Firmly press the reset switch on the front of the ELT and listen to ensure the audio signal disappears from COM-1.

"END"

CHAPTER 27

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"END"

GENERAL-DESCRIPTION AND OPERATION

CONTROL SURFACES

The flight controls, with the exception of the flaps, are conventional cable operated surfaces requiring no power assistance for normal control by the pilot or copilot. The elevator and rudder have cable operated, flight adjustable, trim tabs. The aileron control system is equipped with an aileron control trimmer which functions by applying tension on the aileron control cables to level the wings as needed. The flaps have an electrically powered actuator, controlled by a switch on the console.

EFFECT OF TEMPERATURE ON CABLE TENSION

Graphs, specifying the correct maximum and minimum cable tension permissible for the various controls, appear with the individual control system illustrations. The graph provides rigging limits at temperatures varying from 30°F to 110°F. The horizontal scale on the graphs designates the temperature in degrees F at which the control cables may be rigged, and the vertical scale designates the correct tension in pounds for each temperature reading.

"END"

AILERON-MAINTENANCE PRACTICES

AILERON REMOVAL (Figure 1)

a. Disconnect the aileron push-pull rod at the bell crank.

b. Support the aileron and remove the bolt from each hinge.

c. Pull the aileron straight away from the wing to avoid damage to adjacent areas.

AILERON INSTALLATION (Figure 1)

a. Determine the correct aileron to be installed on the appropriate wing. Position the aileron in the hinge brackets and install the hinge bolts. Safety the hinge bolts.

b. Connect the push-pull rod at the bell crank.

c. Rig the aileron control system as described under the heading RIGGING THE AILERON CONTROL SYSTEM in this Chapter.

d. Cycle the ailerons through full travel. Check for binding and/or obstruction.

AILERON CONTROL CABLE REMOVAL

a. Remove the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the pilot compartment floorboards.

b. Remove the access plates as necessary to gain access to the aileron cables and pulley brackets.

c. Remove all necessary cable retaining pins from the cable pulley brackets.

d. Disconnect the forward aileron cables from the chain and cable assembly at the connector brackets at the control column. Connect lead lines to both aileron cables.

e. Disconnect the aileron trimmer cables from the main aileron cables.

f. Disconnect the forward aileron cables from the outboard aileron cables at the turnbuckles in the cabin area. Identify and remove both forward cables.

g. Disconnect the balance cable at the turnbuckle in the cabin area. Disconnect the end of each balance cable from the aft side of the aileron bell cranks. Connect a lead line to one end of each cable and remove the cables.

h. Disconnect the outboard aileron cables from the forward side of the aileron bell cranks. Attach a lead line to one end of each cable and remove the cables.

AILERON CONTROL CABLE INSTALLATION

a. Connect the outboard aileron cables to the lead lines in each wing. Route the cables and disconnect the lead lines.

b. Connect the balance cables to the lead lines in each wing. Route the cables and disconnect the lead lines. Connect the balance cables at the turnbuckle in the cabin area.

c. Connect the balance cables to the aft side of the aileron bell cranks and the outboard aileron cables to the forward side of the aileron bell cranks.

d. Connect the forward cables to the chain and cable assembly and route them aft through the fuselage. Disconnect the lead lines. Connect the forward aileron cables to the outboard aileron cables at the turnbuckles in the cabin area.

e. Install all retaining pins in the pulley brackets.

f. Connect the aileron trimmer cables to the main aileron cables. Set tension to the minimum necessary to avoid slack.

g. Rig the aileron control system. See RIGGING THE AILERON CONTROL SYSTEM in this Chapter.

h. Install the wing access plates previously removed.

i. Install the floorboards. Install the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.

RIGGING THE AILERON CONTROL SYSTEM

a. Secure a straight edge across the horns of both control wheels. This will lock the control wheels in the neutral position.

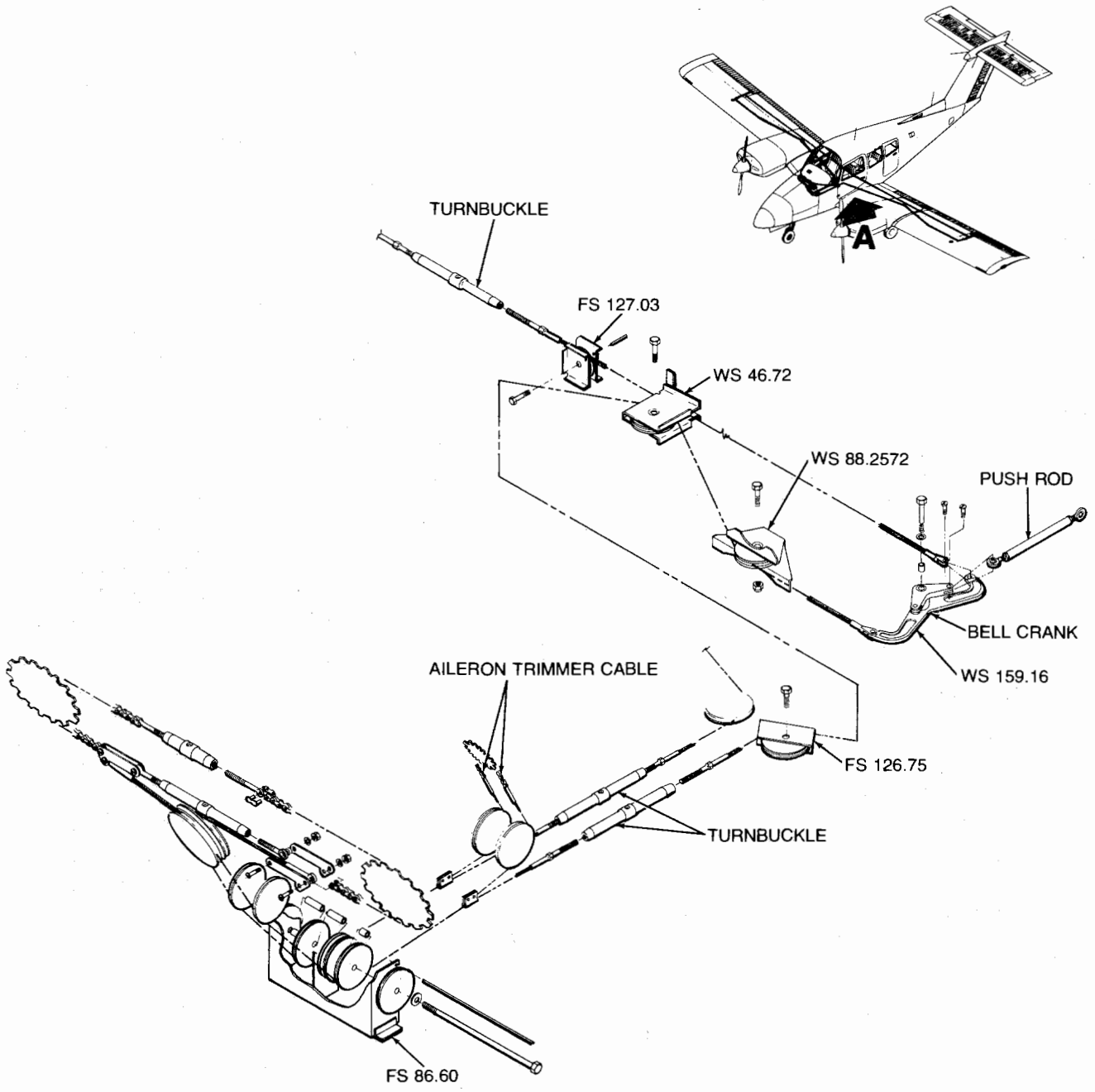
b. Remove the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the pilot compartment floorboards and the lower outboard access panels from the wings.

c. Adjust the turnbuckles so that a straight edge laid across the horn of the aileron bell crank is parallel to the adjacent wing rib.

d. Using the turnbuckle adjust cable tension as shown in Figure 2.

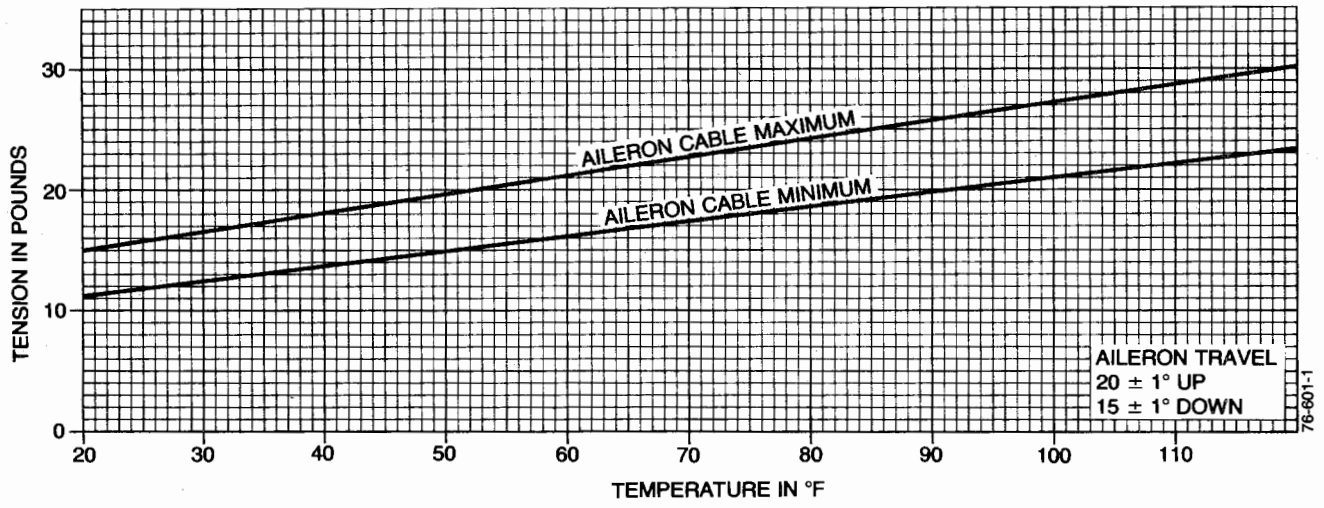
NOTE

Before rigging the aileron cables, adjust the tension on the chain bus on the control column to obtain .75" to 1.00" cable displacement with a four pound load.



VIEW A

Aileron Control System
Figure 1



Aileron Cable Tensions
Figure 2

e. Adjust the push-pull rod as necessary to bring the aileron to the neutral position.

NOTE

Place a bubble protractor lengthwise with the airplane centerline on the baggage compartment floor. Note the reading and move the protractor to the aileron upper skin. Move the aileron until it is positioned at an angle of 15° relative to the reference reading obtained on the baggage compartment floor. This will provide the neutral (0°) aileron setting. For example: (1) If the reading of the bubble on the baggage compartment floor indicates that the airplane is sitting 4° nose down, then the neutral setting for the aileron would be 11° trailing edge down, OR (2) if the reading obtained on the baggage compartment floor indicates 4° nose up, then the reading for aileron neutral would be 19° trailing edge down.

f. Remove the straight edge from the control wheels.

g. Check aileron travel with the bubble protractor and adjust the aileron bellcrank stops in the wing as necessary to obtain the proper limits, 20° up ± 1°, 15° down ± 1° from the neutral position.

h. Install the access panels, floorboards and the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.

WARNING

Check for correct direction of aileron travel by moving the control wheel. When the control wheel is turned to the left, the left aileron should move up, and the right aileron should move down. When the control wheel is turned to the right the right aileron should move up, and the left aileron should move down.

AILERON TRIM CABLE REMOVAL

a. Remove the upholstery cover from the pedestal.

b. Disconnect the aileron trim cable from the main aileron cable by removing the attaching clamps.

c. Remove the cable and chain from the trimmer sprocket.

AILERON TRIM CABLE INSTALLATION

a. With the trimmer centered and the ailerons in the neutral position, place the chain on the trimmer sprocket so that the ends of the chain are equidistant at the center line of the sprocket.

b. Thread the cable ends through the pulleys and attach them to the main aileron control cables using the attaching clamps.

c. Set the trim cable tension just tight enough to remove any slack from the cables.

AILERON CONTROL TRIMMER REMOVAL

a. Unscrew the two body halves by holding the clutch body housing (outer half) and turning the clutch body nut counterclockwise (LH thread).

b. Separate the two body halves by pulling out on the clutch body housing.

AILERON CONTROL TRIMMER INSTALLATION

a. Carefully insert the shaft through the felt seal into the hub bearing, being careful not to shear the felt seal.

NOTE

Ensure that the tangs of the drive shaft engage properly with the sprocket as the nut is being tightened and that the position indicator on the face of the unit is right side up as the shaft engages with the sprocket.

b. Screw the two halves of the unit together by holding the clutch body and turning the clutch body nut (LH thread). Hand tightening the two halves should be sufficient.

"END"

RUDDER AND TAB - MAINTENANCE PRACTICES

RUDDER REMOVAL
(Figure 1)

a. Remove the tail cone.
b. Disconnect the trim tab push-pull rod.
c. Disconnect the rudder cables from the rudder bell crank.
d. Remove the screws, washers and nuts which hold the lower hinge retaining plate in place. Slide the rudder out of the hinge bracket and remove the retaining plate.
e. Slide the rudder down and out of the upper hinge bracket and remove it from the airplane.

RUDDER INSTALLATION
(Figure 1)

a. Insert the upper rudder hinge pin into the hinge bracket on the vertical stabilizer.
b. Slide the rudder hinge retaining plate over the lower rudder hinge pin and insert the hinge pin and retainer plate into the lower hinge bracket on the vertical stabilizer. Secure with attaching screws, washers, and nuts. Check vertical free play of rudder (measure with feeler gage between top of retainer plate and torque tube). Free play should be between .015 and .050 inch, and may be adjusted by installing AN960-1616L washers, as required, between the retainer plate and bell crank.
c. Connect the rudder cables to the bell crank.
d. Connect the trim tab push-pull rod.
e. Rig the rudder control system as described in RIGGING THE RUDDER CONTROL SYSTEM in this Chapter.
f. Install the tail cone.
g. Cycle the rudder full travel left and right. Check for binding and/or obstruction.

RUDDER CONTROL CABLE REMOVAL

a. Remove the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the rear cabin seats and the aft cabin bulkhead. Remove the tail cone.
b. Remove access plates as necessary to gain access to the rudder cables and pulley brackets.
c. Remove all necessary cable retaining pins from the cable pulley brackets.
d. Disconnect the forward rudder cables from the aft rudder cables at the turnbuckles, aft of the cabin area.
e. Connect lead lines to the forward rudder cables. Identify and remove the cables.
f. Disconnect the aft rudder cables from the rudder bell crank.
g. Connect lead lines to the aft rudder cables. Identify and remove the cables.

RUDDER CONTROL CABLE INSTALLATION

a. Connect the aft rudder cables to the rudder bell crank. Route the cables forward and disconnect the lead lines.
b. Connect the forward rudder cables to the rudder pedals. Route the cables aft and disconnect the lead lines.
c. Connect the forward rudder cables to the aft rudder cables using the turnbuckles.
d. Install all retaining pins in the pulley brackets.
e. Rig the rudder control system. See RIGGING THE RUDDER CONTROL SYSTEM in this Chapter.
f. Install all access plates previously removed.
g. Install the tail cone, aft cabin bulkhead, rear cabin seats, and the pilot's and copilot's seats. See FLIGHT COMPARTMENT SEAT INSTALLATION in Chapter 25-00-00.

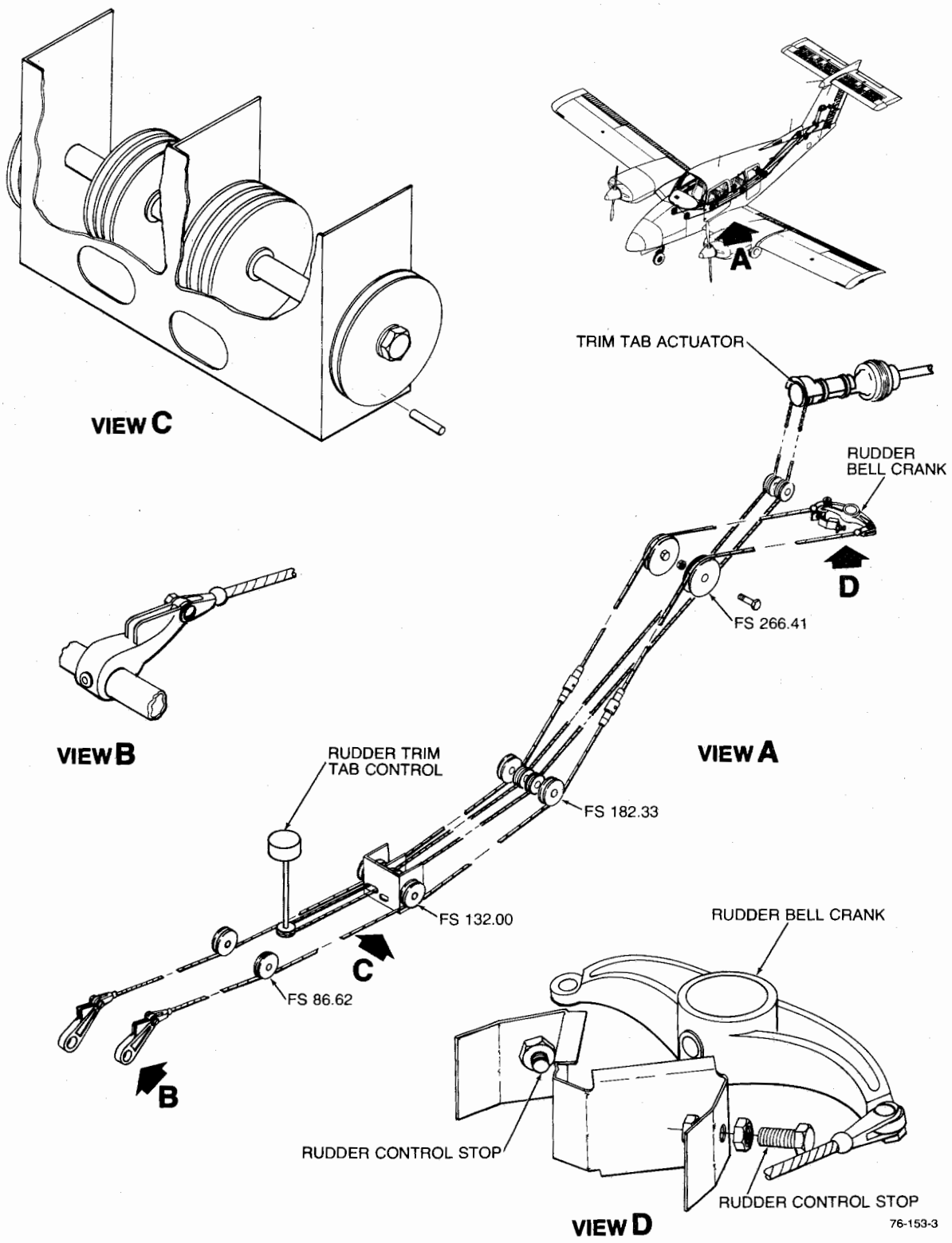
RIGGING THE RUDDER CONTROL SYSTEM

a. Remove the rear seats, aft cabin bulkhead, and the tail cone.
b. Align the rudder trim tab trailing edge with the rudder trailing edge using the rudder trim tab control. Locate the rudder neutral (0°) position. Mark it with tape or grease pencil on the tailcone directly below the lower aft corner of the rudder.

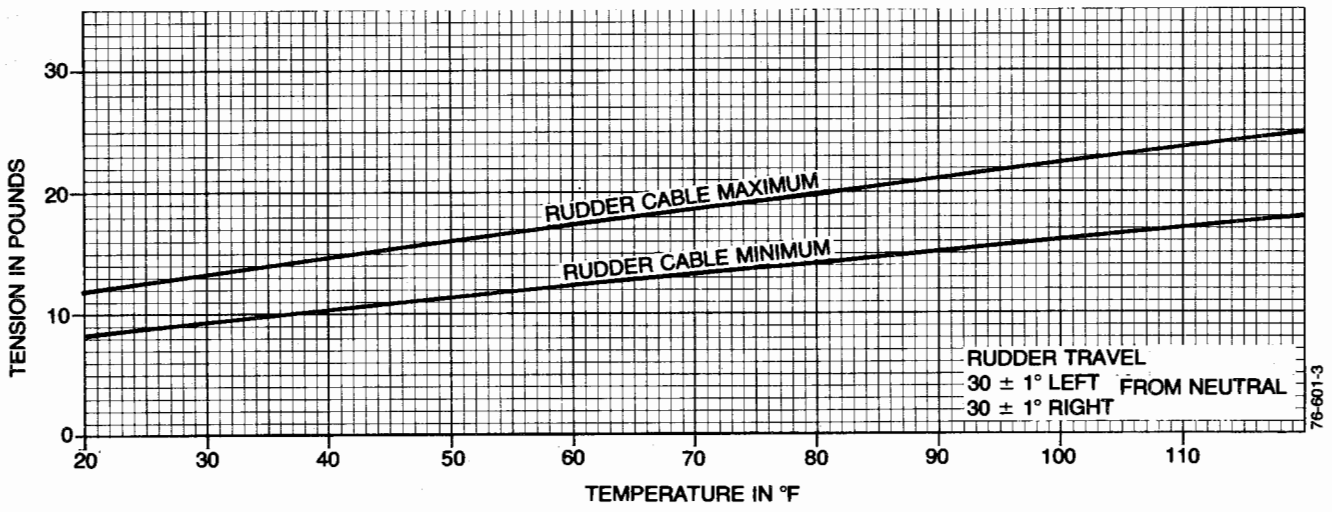
NOTE

A rudder centering tool can be made as shown in Figure 1A which can be used to determine the rudder (0°) neutral position. The tool may be used by sliding it between the tailcone and the rudder, forward between the vertical stabilizer skins until it comes to a full stop firmly against the rear spar of the vertical stabilizer. Position the aft lower tip of the rudder over the scribed line for the neutral (0°) position.

c. Clamp a straight edge across the aft face of both pilot's rudder pedals. This will bring the copilot's rudder pedals to the same neutral position as the pilot's.
d. Using the turnbuckles, adjust the cable length so that the rudder and rudder bell crank are in the neutral position.
e. Using the turnbuckles, adjust the cables to the correct tension. Refer to the temperature-cable tension charts. (See Figure 2.)



Rudder Control System
Figure 1



Rudder Cable Tension
Figure 2

f. Safety the turnbuckles.

g. Remove the straight edge from the rudder pedals and adjust the stops for the rudder bellcrank until the rudder has a travel of 30° ± 1° left and right of the centerline of the vertical stabilizer. A linear measurement of 9 3/8" ± 1/4" left and right of the neutral position will give the same travel dimension as with the travel board.

h. Install the tail cone, aft cabin bulkhead, and the rear seats. See FLIGHT COMPARTMENT SEAT INSTALLATION in Chapter 25-00-00.

i. Cycle the rudder through full travel left and right. Check for binding and/or obstruction.

RUDDER TRIM TAB CABLE REMOVAL

a. Remove the two access panels on the aft fuselage just below the vertical stabilizer.

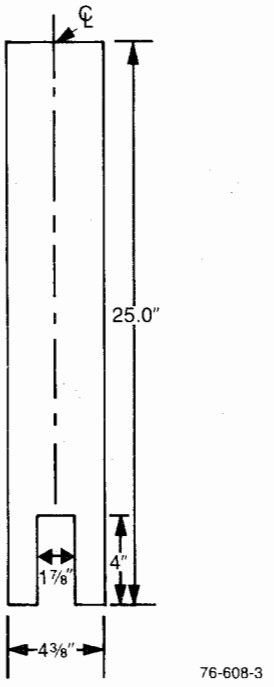
b. Remove the pilot's seat and left passenger's seat as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the left cabin floorboards and access panels, pedestal upholstery cover, the aft cabin bulkhead, and the access panel at the trim tab actuator on the left side of the vertical stabilizer.

c. Remove the cable retaining pins from the pulley brackets.

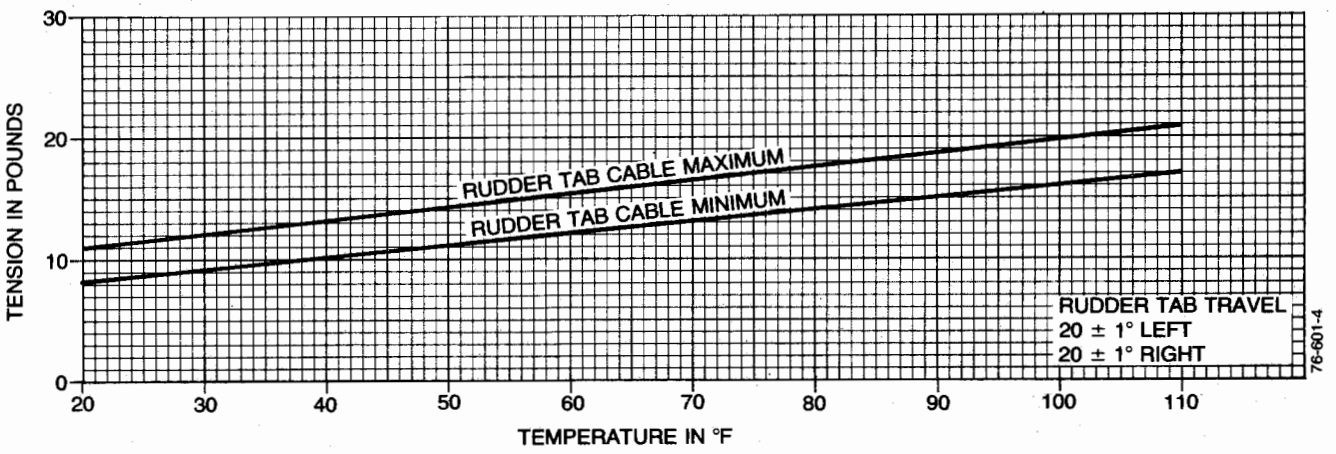
d. Disconnect the rudder trim tab cables, in the aft fuselage, at the turnbuckles and connect lead lines to the cables. Identify the lead lines for trim tab left and trim tab right movement to ensure correct cable installation.

e. Remove the forward rudder trim tab cable through the pilot's compartment.

f. Remove the rudder trim tab cable stops and disconnect the chain and cable assembly at the rudder trim tab actuator. Remove the aft chain and cable assembly.



Rudder Centering Tool
Figure 1A



Rudder Trim Tab Cable Tension
Figure 3

RUDDER TRIM TAB CABLE INSTALLATION

a. With the rudder trim tab in the neutral position, place the aft chain and cable assembly on the rudder trim tab actuator sprocket so that the ends of the chain are equidistant at the sprocket centerline.

b. Using the lead lines, route the aft chain and cable assembly down through the vertical stabilizer and forward into the aft fuselage. Disconnect the lead lines.

c. Place the rudder trim tab control wheel in the neutral position.

d. Place the forward chain on the trim control wheel sprocket by threading the cable ends between the guard and the sprocket. Ensure that the chain ends are equidistant from the sprocket centerline.

e. Using the lead lines route the forward cables aft and install all cable retaining pins in the pulley brackets. Disconnect the lead lines.

f. Install the cable stops and connect the cables to the turnbuckles in the aft fuselage. Rig the rudder trim tab control system as described in RUDDER TRIM TAB RIGGING in this Chapter.

g. Install the access panels on the aft fuselage and the access panel at the rudder trim tab actuator.

h. Install the aft cabin bulkhead, left cabin floorboards and access panels, pedestal upholstery cover, and the left passenger's and pilot's seats. See FLIGHT COMPARTMENT SEAT INSTALLATION in Chapter 25-00-00.

RUDDER TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel at the rudder trim tab actuator, on the left side of the vertical stabilizer.

b. Disconnect the push-pull rod at the rudder trim tab.

c. Remove the aft cabin bulkhead and disconnect the rudder trim tab cables at the turnbuckles.

d. Remove the chain from the sprocket of the actuator.

e. Remove the rudder as described under the heading RUDDER REMOVAL in this Chapter.

f. Remove the push-pull rod at the actuator.

g. Remove the attaching bolts and remove the trim tab actuator.

RUDDER TRIM TAB ACTUATOR INSTALLATION

a. Install the trim tab actuator using the two attaching bolts.

b. Connect the push-pull rod to the actuator using the attaching hardware.

c. Install the chain on the sprocket.

d. Connect the rudder trim tab cables at the turnbuckles in the aft fuselage area.

e. Install the rudder as described in RUDDER INSTALLATION in this Chapter.

f. Rig the rudder trim tab as described in RUDDER TRIM TAB RIGGING in this Chapter.

RUDDER TRIM TAB RIGGING

a. Remove the access panel at the trim tab actuator on the left side of the vertical stabilizer, the access panels on the left and right sides of the fuselage below the vertical stabilizer, and the aft cabin bulkhead.

b. Refer to RIGGING THE RUDDER CONTROL SYSTEM in this chapter to set the rudder and tab to the neutral position, and set the rudder trim tab indicator to zero degrees.

c. Set the rudder trim tab cable tension as described in Figure 3.

d. Adjust the rudder trim tab cable stops until the rudder trim tab has a travel of 20° ± 2° to both left and right of center. A linear measurement of 2 9/16 ± 1/8 inch at the trailing edge of the tab corresponds to 20° ± 2° tab deflection. Torque the tab stop bolts to 20 +3 -0 inch pounds.

e. Safety all turnbuckles and stops.

f. Check the rudder trim tab control and rudder trim tab surface for correct movement as indicated by the rudder trim tab indicator. When the rudder trim tab control is moved to the left, the rudder trim tab should move to the right.

g. Install the access panels on the left and right fuselage below the vertical stabilizer, the access panel at the trim tab actuator on the left side of the vertical stabilizer, and the aft cabin bulkhead.

CHECKING RUDDER TAB FREE PLAY

Visually inspect the rudder tab for any damage, security of hinge attach point, and for tightness of the actuating system. Inconsistencies should be corrected prior to checking the free play of the tab.

A check fixture (P/N 810 45-135030-9) or equivalent, a dial indicator, and a push-pull scale for applying accurate loading to the tab are required for making the inspection for free play of the tab.

a. Lock the control surface to prevent movement of the rudder. Set the rudder tab in the neutral position.

b. Tape the dial indicator check fixture to the rudder so that the dial indicator point is positioned on the top edge of the rudder tab at a point 7.90 inches aft of the hinge line measured along the top edge of the rudder tab.

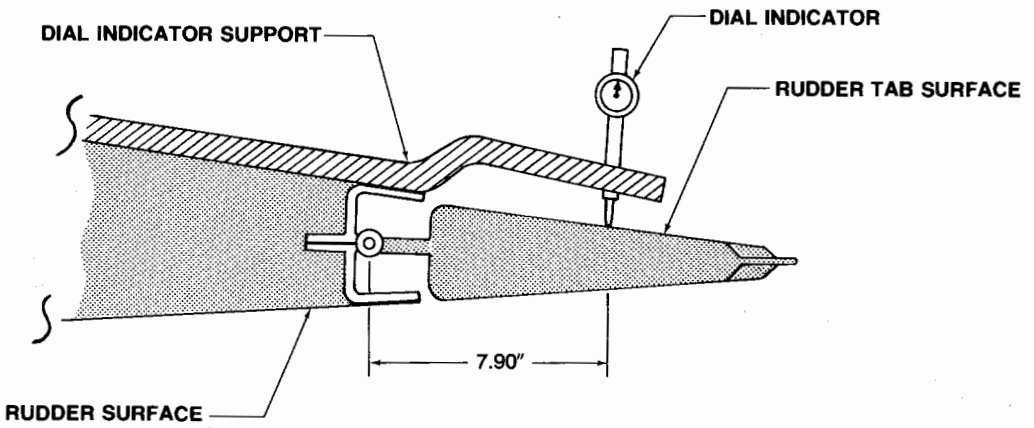
c. Apply a small piece of masking tape (for paint protection) 7.90 inches aft of the hinge line and close to the centerline of the tab actuator. This will be the point of pressure against the tab by the push-pull scale.

d. Apply another piece of tape in the corresponding position on the opposite side of the tab for the same purpose.

e. Zero the dial indicator at no load initially. Do not reset during the checking procedure.

f. With the push-pull scale at the point of the masking tape, apply 3-pound load to the right. Record the dial reading as "A".

g. Release half the load until a 1.5-pound load is obtained. Record the dial reading as "B".



Rudder Trim Tab Free Play Setup
Figure 4

h. Apply a full 3-pound load to the left at the masking tape on the opposite surface. Record the dial reading as "C".

i. Release half the load until a 1.5-pound load is obtained. Record the dial reading as "D".

j. Enter the recorded values on a copy of CHART 1 and proceed as follows:

1. Multiply "B" by 2 and record as "2B".
2. Subtract "A" from "2B" and record as "X".
3. Multiply "D" by 2 and record as "2D".
4. Subtract "C" from "2D" and record as "Y".
5. Add "X" and "Y" and record as "E".

NOTE

The results of "X" and "Y" can be negative numbers.

CHART 1
RUDDER TAB FREE PLAY LIMITS

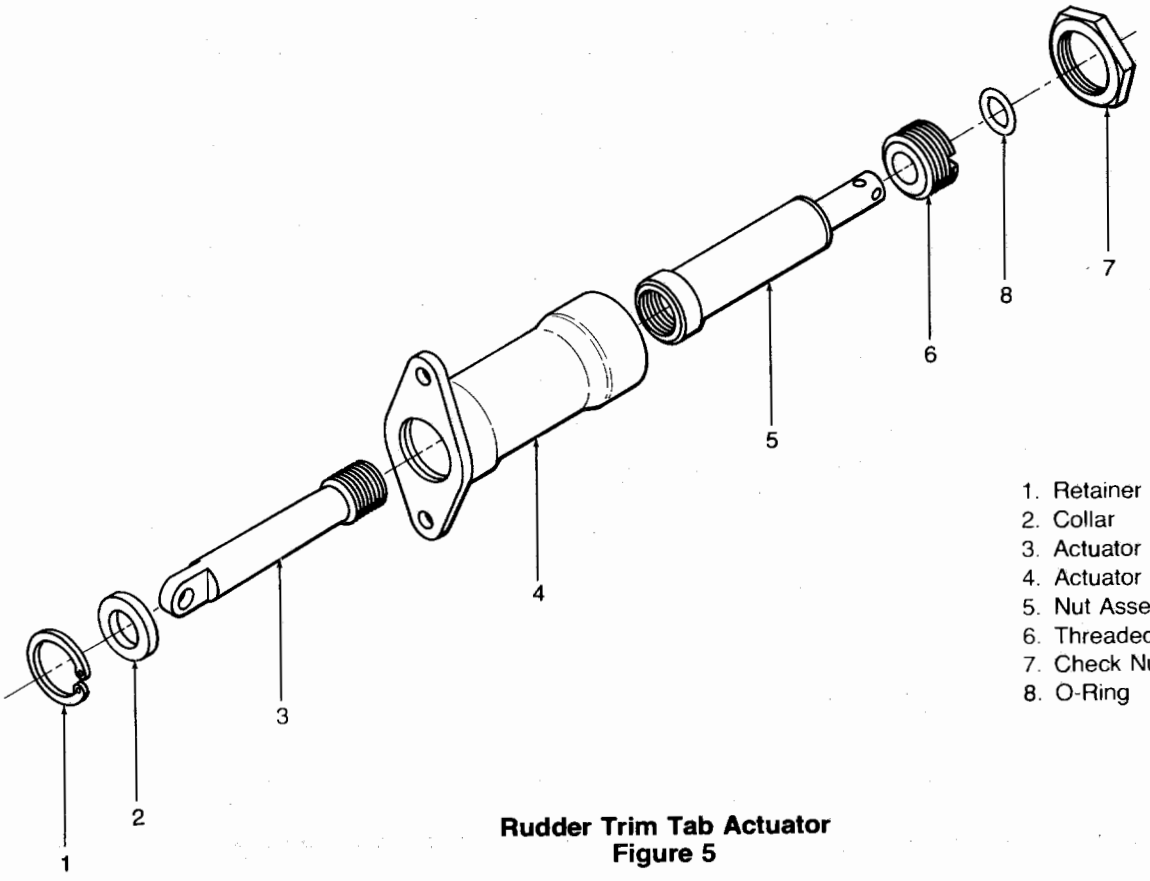
1.5-POUND READING	3-POUND READING
B _____	
2B _____	– A _____ = X _____
D _____	
2D _____	– C _____ = Y _____
X _____	+ Y _____ = E _____

(E = 0.135 inch maximum.)

RUDDER TRIM TAB ACTUATOR - OVERHAUL

RUDDER TRIM TAB ACTUATOR DISASSEMBLY (Figure 5)

a. Remove the retainer ring (1) from the actuator housing (4) and pull the collar (2) out of the actuator housing (4).



1. Retainer Ring
2. Collar
3. Actuator Screw
4. Actuator Housing
5. Nut Assembly
6. Threaded Bushing
7. Check Nut
8. O-Ring

76-153-4

Rudder Trim Tab Actuator
Figure 5

b. Remove the check nut (7), O-ring (8), and screw out the threaded bushing (6) from the actuator housing (4).

c. Remove the nut assembly (5) and the actuator screw (3) from the actuator housing (4).

RUDDER TRIM TAB ACTUATOR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (7, Chart 1, 91-00-00) and inspect for cracks, distortion, and excessive wear. Replace any parts showing evidence of distortion. Lubricate the actuator screw threads (3) and nut assembly (5) with MIL-G-23827 grease (17, Chart 1, 91-00-00) prior to assembly.

RUDDER TRIM TAB ACTUATOR ASSEMBLY

a. Install the nut assembly (5) and the actuator screw (3) in the actuator housing (4).

b. Install the collar (2) on the actuator screw (3), then install the retainer ring (1) in the actuator housing (4).

c. With a spanner wrench, screw th threaded bushing (6) into the actuator housing (4) until the end play of the nut assembly (5) is still free to rotate. Install a new O-ring (8).

d. Coat the check nut (7) with a light coating of oil (28, Chart 1, 91-00-00) and install the check nut (7) in the actuator housing (4).

e. Check for freedom of operation of the nut assembly (5) and actuator screw (3) throughout the full travel of the actuator screw (3).

f. Check the end play of the nut assembly (5) to the actuator housing (4) and the actuator screw (3) to the actuator housing (4) with 15 to 20 pounds load. The end play of the actuator screw (3) shall be .005 inch maximum. The end play of the nut assembly (5) shall be .0005 to .0015 inch.

"END"

ELEVATORS AND TAB - MAINTENANCE PRACTICES

ELEVATOR REMOVAL
(Figure 1)

a. Disconnect the push-pull rods from the elevator trim tabs.

b. Remove the bolts and nuts connecting the elevator halves to the elevator horn assembly.

c. Remove the hinge bolt connecting each elevator half to the horizontal stabilizer.

d. Remove the elevator halves from the airplane.

ELEVATOR INSTALLATION
(Figure 1)

a. Using the hinge bolt and horn attaching bolts, attach the elevator halves to the horizontal stabilizer and horn assembly. Check horizontal free play between the center bearing and elevator halves. Free play should be between .015 and .050 inch, and may be adjusted by installing AN960-4L washers on each side of the center bearing. Install an equal number of washers on each side of the bearing to preserve symmetry. Ensure that a castellated nut and cotter pin are installed on the hinge bolt.

b. Connect the push-pull rods to the elevator trim tabs.

c. Rig the elevator control system as described under the heading RIGGING THE ELEVATOR CONTROL SYSTEM in this Chapter.

d. Cycle the elevator through full travel up and down. Check for freedom of movement, binding, and/or obstructions.

ELEVATOR CABLE REMOVAL

a. Remove the pilot's and copilot's seats and the rear cabin seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL.

b. Remove the access plate on the bottom of the fuselage just aft of FS 68.00, the access plates in the cabin floor, and the aft cabin bulkhead.

c. Remove all necessary cable retaining pins from the pulley brackets.

d. Disconnect the elevator cables from the base of the control.

e. Disconnect the forward elevator cables from the aft elevator cables at the turnbuckles aft of the cabin area.

f. Connect lead lines to the forward elevator cables. Identify and remove the cables.

g. Disconnect the elevator down springs and aft elevator cables from the elevator bell crank.

h. Connect lead lines to the aft elevator cables. Identify and remove the cables.

ELEVATOR CABLE INSTALLATION

a. Connect the aft elevator cables and elevator down springs to the elevator bell crank. Route the cables forward and disconnect the lead lines.

b. Connect the forward elevator cables to the base of the control. Route the cables aft and disconnect the lead lines. Remove identification tags from the cables.

c. Connect the aft elevator cables to the forward elevator cables using the turnbuckles.

d. Install all retaining pins in the pulley brackets.

e. Rig the elevator control system as described under the heading RIGGING THE ELEVATOR CONTROL SYSTEM in this Chapter.

f. Install all access plates previously removed.

g. Install the pilot's and copilot's seats and the rear cabin seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION. Install the rear cabin bulkhead.

h. Check the elevator through full travel for freedom of movement and binding and/or obstructions.

RIGGING THE ELEVATOR CONTROL SYSTEM

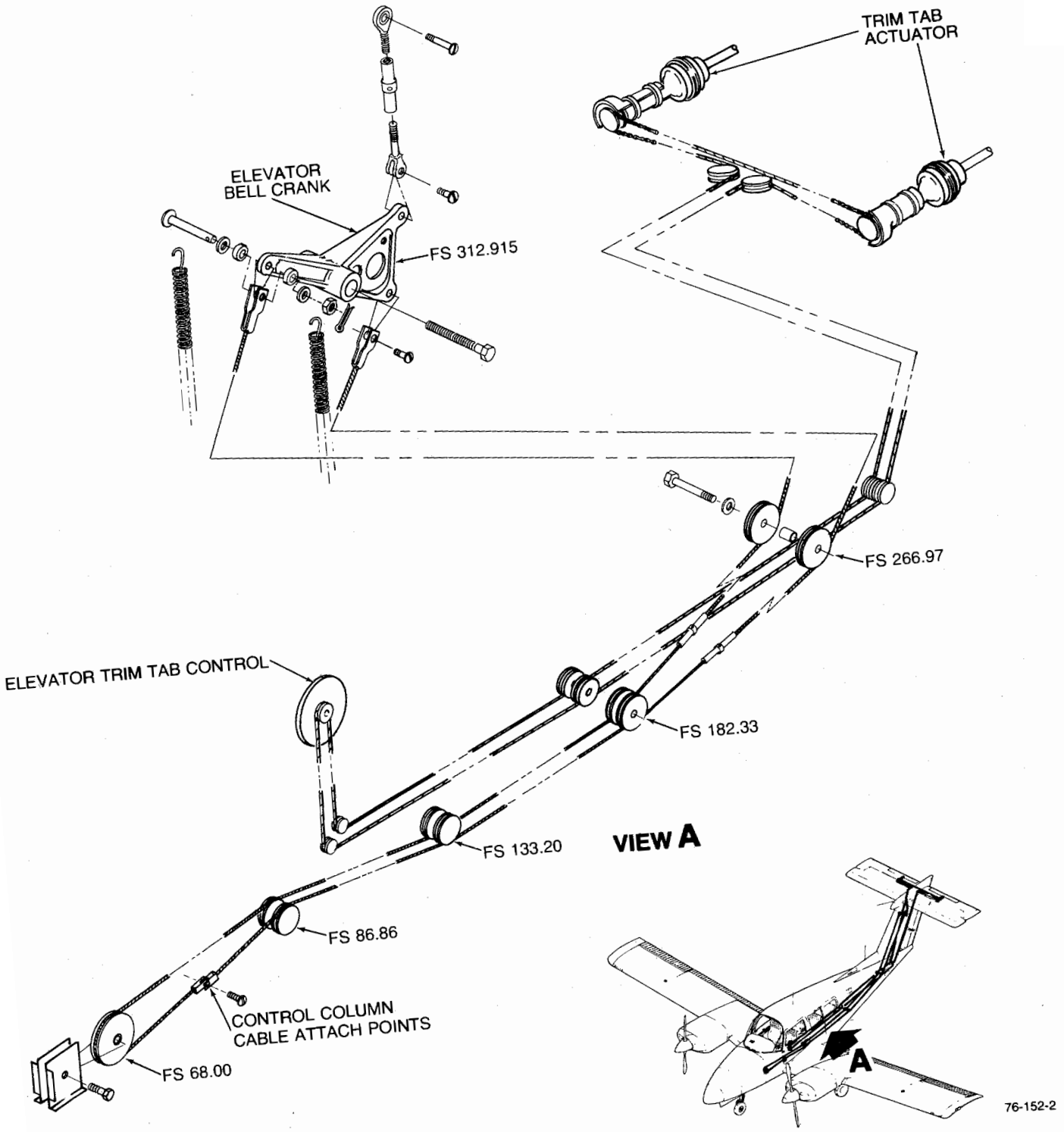
a. Remove the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the aft cabin bulkhead, and the two plugs located on each side of the vertical stabilizer, adjacent to the elevator bell crank. Remove the horizontal to vertical stabilizer fairing.

b. Cut a piece of one-inch by one-inch 90° extrusion 7.16 inches in length. Pull the control column to the full aft position and place the extrusion on top of the control column. Let the control column slide forward until the extrusion blocks further forward movement and rests between the column guide and the control wheel. Clamp the extrusion in place, taking care not to damage the control column or subpanel. This will lock the elevator control column in the neutral position.

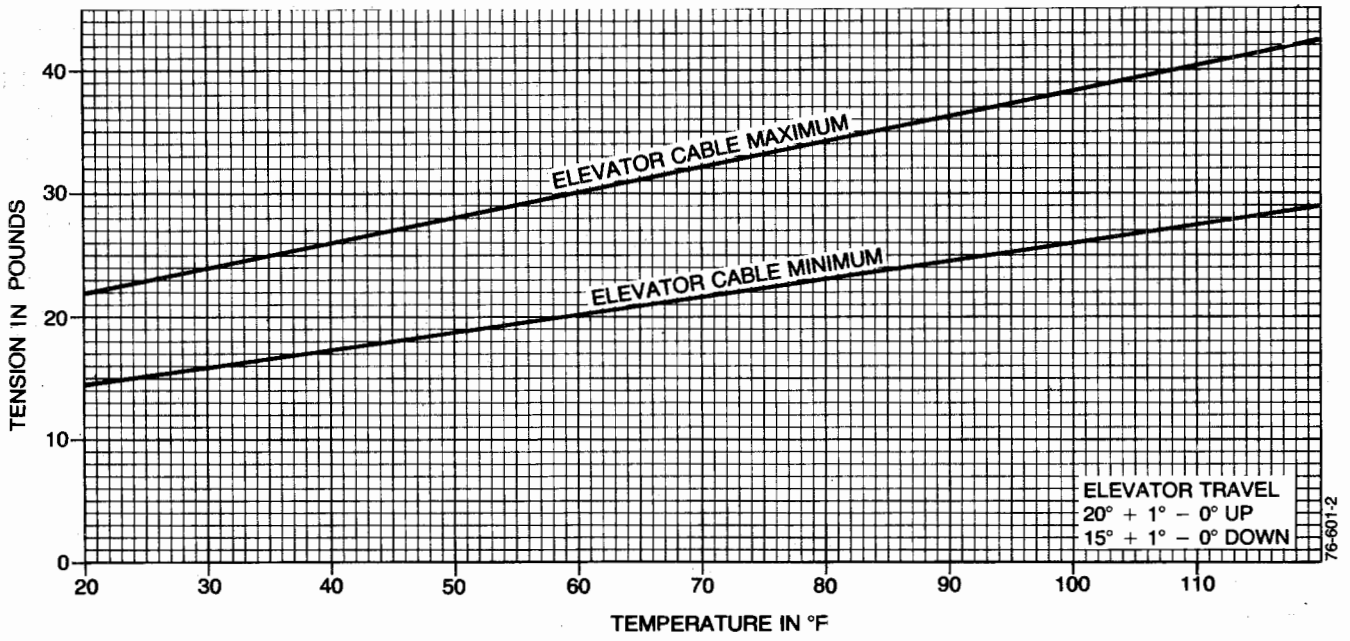
c. Loosen the turnbuckles on the elevator cables until the cables are slack.

d. Install the rig pin in the elevator bell crank.

e. Adjust the push-pull rod between the elevator bell crank and the elevator horn assembly as necessary to bring the elevator to the neutral position. The elevator neutral (0°) position is obtained when the upper elevator skin is at a 7° ± 1/2° angle down relative to the baggage compartment floor. Up and down travel will be relative to this neutral position.



Elevator Control System
Figure 1



Elevator Cable Tension
Figure 2

NOTE

A bubble protractor may be used in lieu of the travel board. Leveling of the airplane is not necessary when using either the travel board of the bubble protractor procedure. If the airplane is not levelled, a reference to the 0° (level) reading may be obtained by placing the bubble protractor on the baggage compartment floor and centering the bubble.

f. Using the turnbuckles, adjust the elevator cables to the proper tension as shown in Figure 2.

g. Remove the rig pin from the elevator bell crank, and the extrusion from the control column. Set the elevator travel stops for 20° + 1° −0° up and 15° + 1° −0° down travel.

h. Reinstall the horizontal to vertical stabilizer fairing, the two plugs located on each side of the vertical stabilizer and the aft cabin bulkhead.

i. Install the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.

ELEVATOR TRIM TAB CABLE REMOVAL

a. Remove the aft cabin bulkhead, the access panels on the aft fuselage below the vertical stabilizer, and the upholstered cover on the pedestal.

b. Remove the pilot's and copilot's seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL. Remove the pilots compartment floorboards.

c. Remove the cable retaining pins from the pulley brackets.

d. Disconnect the elevator trim tab cables, in the aft fuselage, at the turnbuckles. Identify the cables and connect lead lines to the cable ends.

e. Remove the access panels to the elevator trim tab actuator sprocket on the bottom of the horizontal stabilizer.

f. Remove the tab cable stops and disconnect the chain and cable assembly at the elevator trim tab actuator. Remove the aft chain and cable assembly.

g. Remove the forward cables through the pilot's compartment.

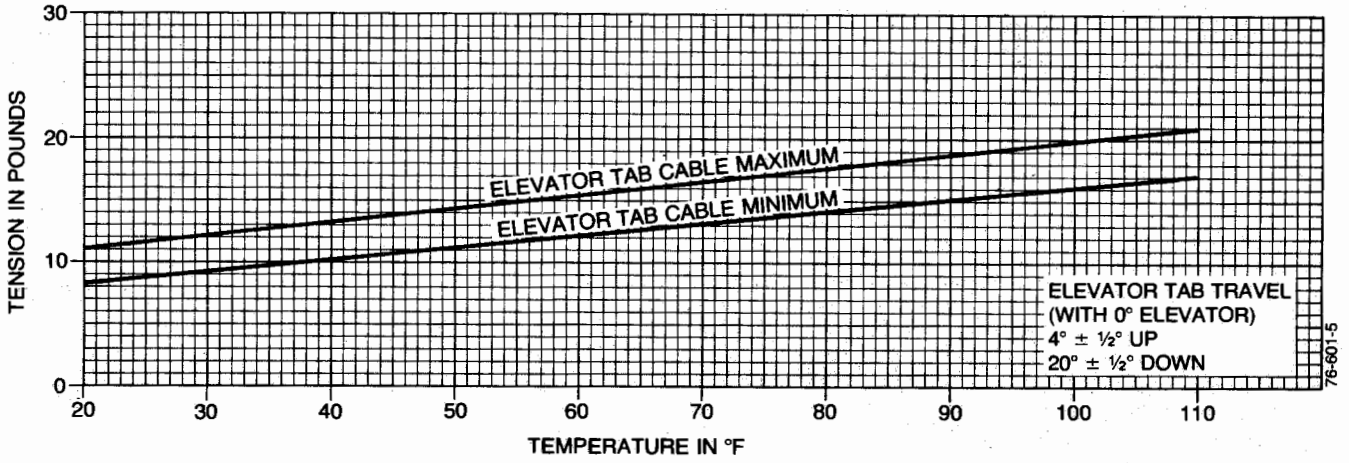
ELEVATOR TRIM TAB CABLE INSTALLATION

a. Place the elevator trim tab control wheel in the neutral position.

b. Place the chain on the sprocket so that the ends are equidistant at the centerline of the sprocket.

c. Route the forward cables aft and remove the lead lines.

d. With the elevator control tabs in the neutral position, place the aft chain and cable assembly on the



Elevator Trim Tab Cable Tension
Figure 3

elevator trim tab actuator sprockets so that the ends of the chains are equidistant at the sprocket centerlines.

e. Using the lead lines, route the chain and cable assembly inboard, down through the vertical stabilizer, and forward into the aft fuselage.

f. Install the cable retaining pins in the pulley brackets.

g. Install the cable stops and connect the cables to the turnbuckles in the aft fuselage. Rig the elevator trim tabs as described in ELEVATOR TRIM TAB RIGGING in this Chapter.

h. Install the aft cabin bulkhead, the access panels on the aft fuselage below the vertical stabilizer, the left cabin floorboards, and the pedestal upholstery cover. Install the left passenger's seat and the pilot's seat as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.

ELEVATOR TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel at the elevator trim tab actuator on the bottom of the horizontal stabilizer and the aft cabin bulkhead.

b. Remove the elevator as described in ELEVATOR REMOVAL in this Chapter.

c. Disconnect the elevator trim tab cables at the turnbuckles in the aft fuselage area.

d. Remove the chain and cable assembly from the elevator trim tab actuator sprocket.

e. Disconnect the push-pull rod at the actuator.

f. Remove the two attaching bolts and remove the elevator trim tab actuator.

ELEVATOR TRIM TAB ACTUATOR INSTALLATION

a. Install the elevator trim tab actuator in the horizontal stabilizer and secure it using the two attaching bolts.

b. Position the chain and cable assembly on the actuator sprocket so that the ends of the chain are equidistant at the sprocket center line.

c. Connect the elevator trim tab cables at the turnbuckles in the aft fuselage.

d. Install the elevator as described in ELEVATOR INSTALLATION in this Chapter.

e. Rig the elevator trim tab as described in ELEVATOR TRIM TAB RIGGING in this Chapter.

f. Install the access panel at the elevator trim tab actuator in the bottom of the horizontal stabilizer and the aft cabin bulkhead.

ELEVATOR TRIM TAB RIGGING

a. Remove the lower horizontal stabilizer skin access panels at the trim tab actuators, the baggage compartment aft bulkhead and the plugs at the elevator bellcrank on either side of the vertical stabilizer.

b. Refer to RIGGING THE ELEVATOR CONTROL SYSTEM to set the elevator to the neutral position, and insert the rig pin in the hole in the elevator bellcrank.

c. Rotate the elevator trim wheel full aft (nose up trim).

d. Locate the chain and cable assembly on the tab actuator sprockets so there are two links of chain travel remaining with the actuator fully retracted.

e. Disconnect the push-pull rods from the trim tabs and rotate the rods until the actuators are one-half turn from fully retracted.

f. Set the elevator trim tab cable tensions as shown in Figure 3.

g. On ME-1 thru ME-164, adjust the length of the push-pull rods until the trim tabs are at the 20° ± 1/2° down position on the travel board.

NOTE

If a bubble protractor on the upper skin of the tab is being used for rigging, adjust the rods until the tabs are at an angle of 27° ± 0° down with respect to the baggage compartment floor.

h. On ME-165 and after, adjust the turnbuckle between the tab actuators and one of the turnbuckles in the aft fuselage to compensate for any difference between the angle of the two tabs. A large difference in angle may require lifting the chain from one sprocket and turning the sprocket.

i. Set the trim tab cable stops to obtain a travel of 20° ± 1/2° down and 4° ± 1/2° up from the neutral position on the travel board.

j. Torque the stop bolts to 20 +3 -0 inch-pounds after proper tab travel has been established. The stops are located beneath the floorboard forward of the flap torque tube.

k. Check for proper operation and safety all turnbuckles and stops.

l. Check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim control is moved toward the nose-down position, the trim tab should move up.

m. Remove the rig pin from the elevator bell crank and install the two plugs on the vertical stabilizer just below the horizontal stabilizer. Install the access panels, at the elevator trim tab actuators, and the aft cabin bulkhead.

1.5-POUND READING	3-POUND READING			
B _____				
2B _____		− A _____	= X	___
D _____				
2D _____		− C _____	= Y	___
X _____		+ Y _____	= E	___

(E = 0.092 inch maximum)

CHART 1
ELEVATOR TAB FREE PLAY LIMITS

CHECKING ELEVATOR TAB FREE PLAY

Visually inspect the elevator tabs for any damage, security of hinge attach points, and for tightness of the actuating systems. Inconsistencies should be corrected prior to checking the free play of the tabs.

A check fixture (P/N 810 45-135030-9) or equivalent, a dial indicator, and a push-pull scale for applying accurate loading to the tabs are required to making the inspection for free play of the tabs.

a. Lock the control surface to prevent movement of the elevators. Set the elevator tabs in the neutral position.

b. Using shot bags and tape, affix the dial indicator check fixture so that the dial indicator point is positioned on the outboard edge of the elevator tab at a point 4.60 inches aft of the hinge line.

c. Apply a small piece of masking tape to the upper surface (for paint protection) 4.60 inches aft of the tab hinge line and along the centerline of the tab actuator. This will be the point of pressure against the tab by the push-pull scale.

d. Apply another piece of masking tape in the corresponding position on the bottom surface of the tab for the same purpose.

e. Zero the dial indicator at no load initially. Do not reset during the checking procedure.

f. With the push-pull scale at the point of the masking tape, apply 3-pound downward load. Record the dial reading as "A".

g. Release half the load until a 1.5-pound downward load is obtained. Record the dial reading as "B".

h. Apply a full 3-pound upward load at the masking tape on the bottom surface. Record the dial reading as "C".

i. Release half the load until a 1.5-pound upward load is obtained. Record the dial reading as "D".

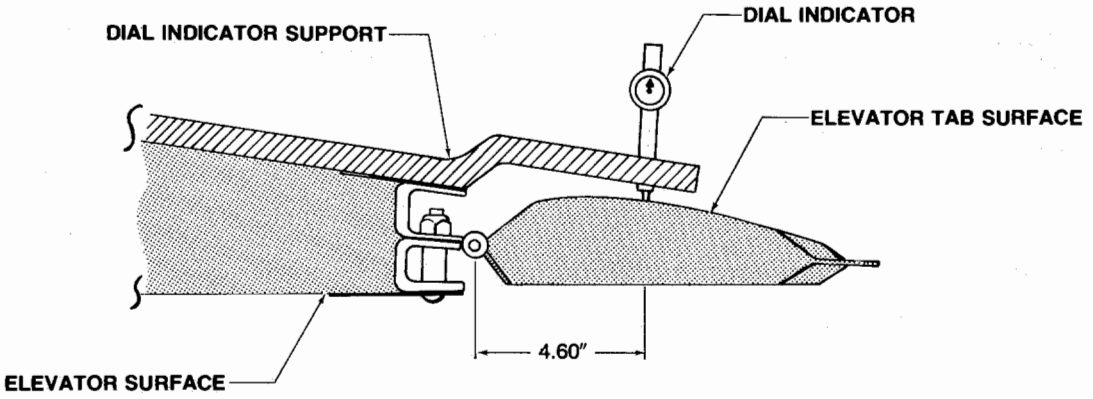
j. Enter the recorded values on a copy of CHART 1 and proceed as follows:

1. Multiply "B" by 2 and record as "2B".
2. Subtract "A" from "2B" and record as "X".
3. Multiply "D" by 2 and record as "2D".
4. Subtract "C" from "2D" and record as "Y".
5. Add "X" and "Y" and record as "E".

NOTE

The results of "X" and "Y" can be negative numbers.

k. Repeat steps "b" through "j" on the opposite elevator tab.



Elevator Trim Tab Free Play Setup
Figure 4

ELEVATOR TRIM TAB ACTUATOR - OVERHAUL

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY (Figure 5)

a. Remove the retainer ring (1) from the actuator housing (4) and pull the collar (2) out of the actuator housing (4).

b. Remove the check nut (7), O-ring (8), and screw out the threaded bushing (6) from the actuator housing (4).

c. Remove the nut assembly (5) and the actuator screw (3) from the actuator housing (4).

ELEVATOR TRIM TAB ACTUATOR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (7, Chart 1, 91-00-00) and inspect for cracks, distortion, and excessive wear. Replace any parts showing evidence of distortion. Lubricate the actuator screw threads (3) and nut assembly (5) with MIL-G-23827 grease (17, Chart 1, 91-00-00) prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY

a. Install the nut assembly (5) and the actuator screw (3) in the actuator housing (4).

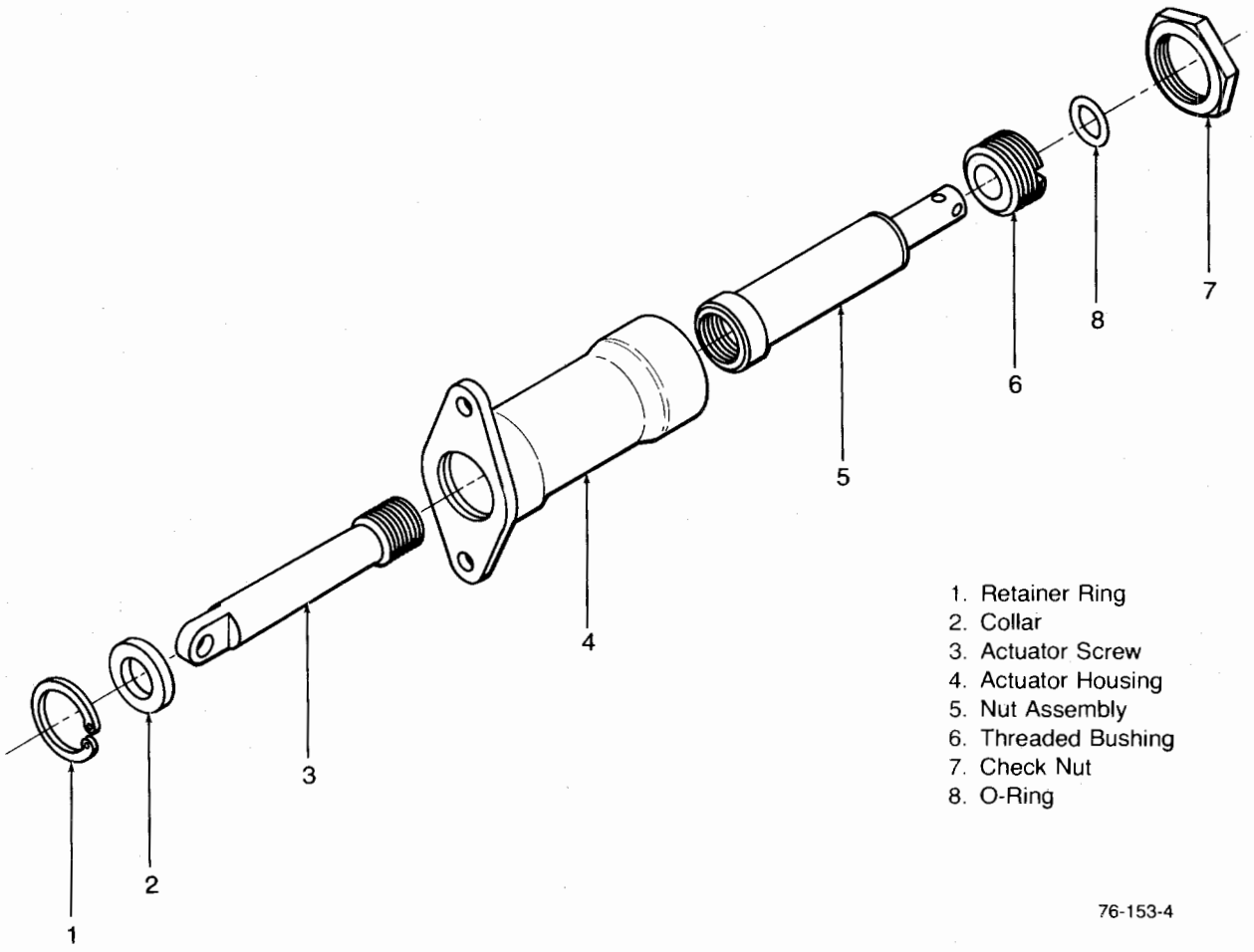
b. Install the collar (2) on the actuator screw (3), then install the retainer ring (1) in the actuator housing (4).

c. With a spanner wrench, screw the threaded bushing (6) into the actuator housing (4) until the end play of the nut assembly (5) is still free to rotate. Install a new O-ring (8).

d. Coat the check nut (7) with a light coating of oil (28, Chart 1, 91-00-00) and install the check nut (7) in the actuator housing (4).

e. Check for freedom of operation of the nut assembly (5) and actuator screw (3) throughout the full travel of the actuator screw (3).

f. Check the end play of the nut assembly (5) to the actuator housing (4) and the actuator screw (3) to the actuator housing (4) with 15 to 20 pounds load. The end play of the actuator screw (3) shall be .005 inch maximum. The end play of the nut assembly (5) shall be .0005 to .0015 inch.



Elevator Trim Tab Acutator
Figure 5

"END"

STALL WARNING - DESCRIPTION AND OPERATION

The stall warning system consists of a stall warning sense switch, mounted on the leading edge of each wing, a circuit breaker located on the right hand subpanel placarded STALL & GEAR WARN, and a stall warning horn, mounted in the overhead console.

When aerodynamic pressure on the stall warning detector switch indicates that a stall is imminent, the stall warning sense switch is actuated to complete the circuit to the stall warning horn. The stall warning detector switch senses the angle of attack and is triggered by reverse air flow.

The stall warning detector switch on the LH wing operates at flap settings between full up and 16° down while the stall warning detector switch on the RH wing operates between 16° down and full down flaps.

TROUBLESHOOTING
STALL WARNING SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Warning system inoperative.	a.	Warning circuit breaker tripped.	a.	If circuit breaker persists in tripping, check for grounded circuit.
		b.	Open circuit.	b.	Check for continuity.
		c.	Defective warning horn switch.	c.	Replace switch.
		d.	Defective warning horn.	d.	Replace horn.
2.	Horn continues to blow.	a.	Defective warning horn switch.	a.	Replace switch.
3.	Stall warning high or low with the flaps up.	a.	LH wing stall warning detector switch out of adjustment.	a.	Adjust the LH wing detector switch as described in this Chapter under the heading STALL WARNING INDICATING SYSTEM ADJUSTMENT.
4.	Stall warning high or low with the flaps down.	a.	RH wing stall warning detector switch out of adjustment.	a.	Adjust the RH wing detector switch as described in this Chapter under the heading STALL WARNING INDICATING SYSTEM ADJUSTMENT.

STALL WARNING - MAINTENANCE PRACTICES

STALL WARNING SWITCH REMOVAL

a. Remove the four screws attaching the detector switch to the leading edge of the wing.

b. Disconnect the electrical wires from the detector switch.

STALL WARNING SWITCH INSTALLATION

a. Connect the electrical wires to the detector switch.

b. Position the detector switch in the opening in the wing leading edge and install the four screws.

c. Adjust the detector as described in this Chapter under the heading STALL WARNING INDICATION SYSTEM ADJUSTMENT.

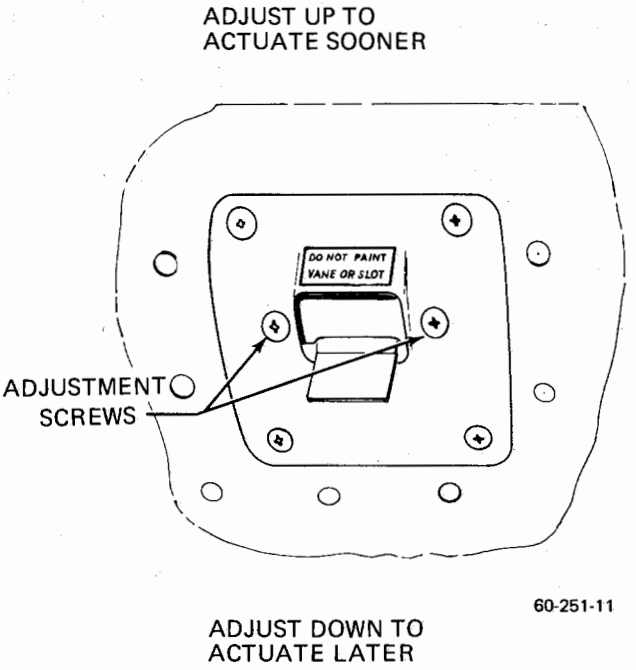
STALL WARNING INDICATING SYSTEM ADJUSTMENT
(Figure 1)

The stall warning switch is adjusted when the airplane is test flown at the factory. Should it require readjusting, proceed as follows:

Locate the switch installation on the under surface of the LH or RH wing leading edge and loosen the two phillips-head screws, one on either side of the vane. If the stall warning has been activating too early, pull the vane back and down. If the

stall warning has been activating too late, push the vane up and forward. Moving the vane with the phillips-head screws loosened moves the entire unit up or down inside the wing, causing the switch to be closed earlier or later. Retighten the screws after making each adjustment. NEVER TRY TO ADJUST THE SWITCH BY BENDING THE VANE.

As a rule of thumb, moving the vane 1/4 inch will change the time the stall warning actuates by about 5 mph of indicated air speed. The only way to test the accuracy of the setting is to fly the airplane into a stall, noting the speed at which the warning horn comes on and the speed at which the full stall occurs. To adjust the stall warning detector switch on the LH wing, the stall should be made with the landing gear up and the flap setting between full up and 16° down and power off. To adjust the stall warning detector switch on the RH wing, the stall should be made with the landing gear down and the flap setting between 16° down and full down flaps and power off. Prior to stalling, decelerate no faster than one mile per second. It may be necessary to make several alternate adjustments and test flights before the desired setting can be reached. The stall warning should actuate at 7 ± 1 mph ahead of the complete stall. The switch setting should be checked and adjusted as necessary whenever a wing or wing leading edge is replaced or extensively repaired, or if a new switch is installed. The switch should require no adjustment in normal service.



Stall Vane Adjustment
Figure 1

"END"

FLAPS - DESCRIPTION AND OPERATION

The flaps consist of a section of each wing driven by an actuator motor and jackscrew assembly. Power is sent to the flap motor when the flap switch is placed in either the "UP" or "DOWN" position. The flap motor drives the flap jackscrew assembly which in turn rotates the torque tubes, moving the flaps up or down. The movement of the torque tube also moves a position transmitter cam and micro switch cam located on the left torque tube. The flap position transmitter arm follows the curve of the position cam and causes the transmitter to send a signal to the flap indicator in the cockpit, showing the position of the flaps. The micro switch cam operates three micro switches, two of which limit flap travel up or down. The third micro switch actuates the gear warning horn when flap travel exceeds 16° down with the landing gear in the up position. There is an external up stop for each flap. The stop is installed just forward of the outboard flap hinges and when properly adjusted, exerts additional pressure in conjunction with the force applied by the internal stop on the flap torque tube and prevents the effects of vibration on the flap bearings and structure.

FLAPS - MAINTENANCE PRACTICES

FLAP REMOVAL

a. Disconnect the flap actuator rod assembly at the flap.

b. Remove the bolts from the flap hinge brackets and remove the flap.

FLAP INSTALLATION

a. Position the flap to the wing and install the bolts in the hinge brackets.

b. Connect the flap actuator rod assembly at the flap. Rerigging the flap is not necessary if the actuator rod assembly adjustment is unchanged.

FLAP ACTUATOR REMOVAL

a. Remove the right and left passenger seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL.

b. Remove the aft cabin floorboards and access panels.

c. Disconnect the actuator jackscrew from the torque shaft by removing the bolt and spacer at the aft end of the jackscrew.

d. Remove the attaching bolts and remove the flap actuator.

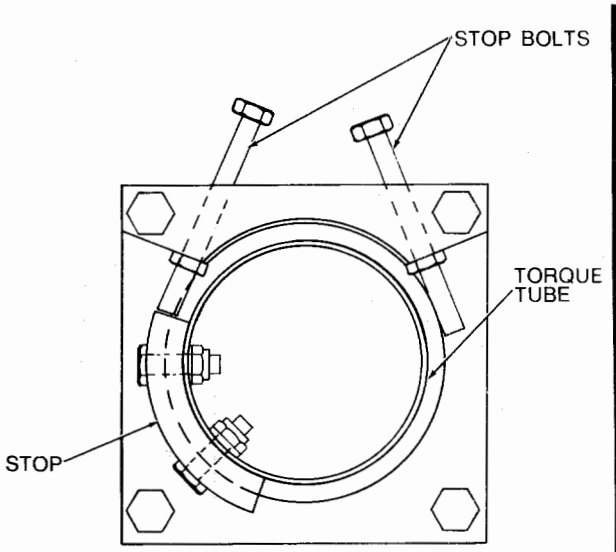
FLAP ACTUATOR INSTALLATION

a. Install the flap actuator and secure with the attaching bolts.

b. Connect the actuator jackscrew to the torque shaft with the original spacer and bolt.

c. Install the aft cabin floorboards and access panels.

d. Install the right and left passenger seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.



Flap Torque Tube
Figure 1

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RIGGING THE FLAPS

a. Remove the right and left passenger seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT REMOVAL.

b. Remove the aft cabin floorboards and access panels.

c. Adjust the flap torque tube stop bolts out of the way so the bolts cannot contact the cam on the torque shaft (see Figure 1).

d. Adjust the up limit switch to activate at the point where the top of the actuator tube on the jackscrew is flush with the top of the ears on the inboard ends of the two torque shaft halves as in Figure 2.

e. Adjust the linkages at the inboard ends of the flaps so that the flap is at 0° using the travel board.

NOTE

A bubble protractor may be used in lieu of a travel board. Leveling of the airplane is not necessary when using either the travel board or the bubble protractor procedure. If the airplane is not levelled, a reference to the 0° (level) reading may be obtained by placing the bubble protractor on the baggage compartment floor and centering the bubble. The upper skin of the flap should be 16° down from the level reading obtained on the baggage compartment floor.

f. Adjust the down limit switch to activate at the point where the flap is deflected 35° from the 0° setting obtained in Step "e."

g. Adjust the stop bolts on the flap torque shaft to just contact the cam on the torque tube when the limit switches have stopped flap movement at 0° and 35° respectively.

h. Adjust the external stops on the outboard flap hinges to make contact at the same time or slightly before the internal "UP" stop makes contact.

CAUTION

Do not allow the stop bolts to contact the cam before the limit switches activate to stop the flap motor in either direction, as this could overload the flap motor, and possibly cause the flaps not to actuate.

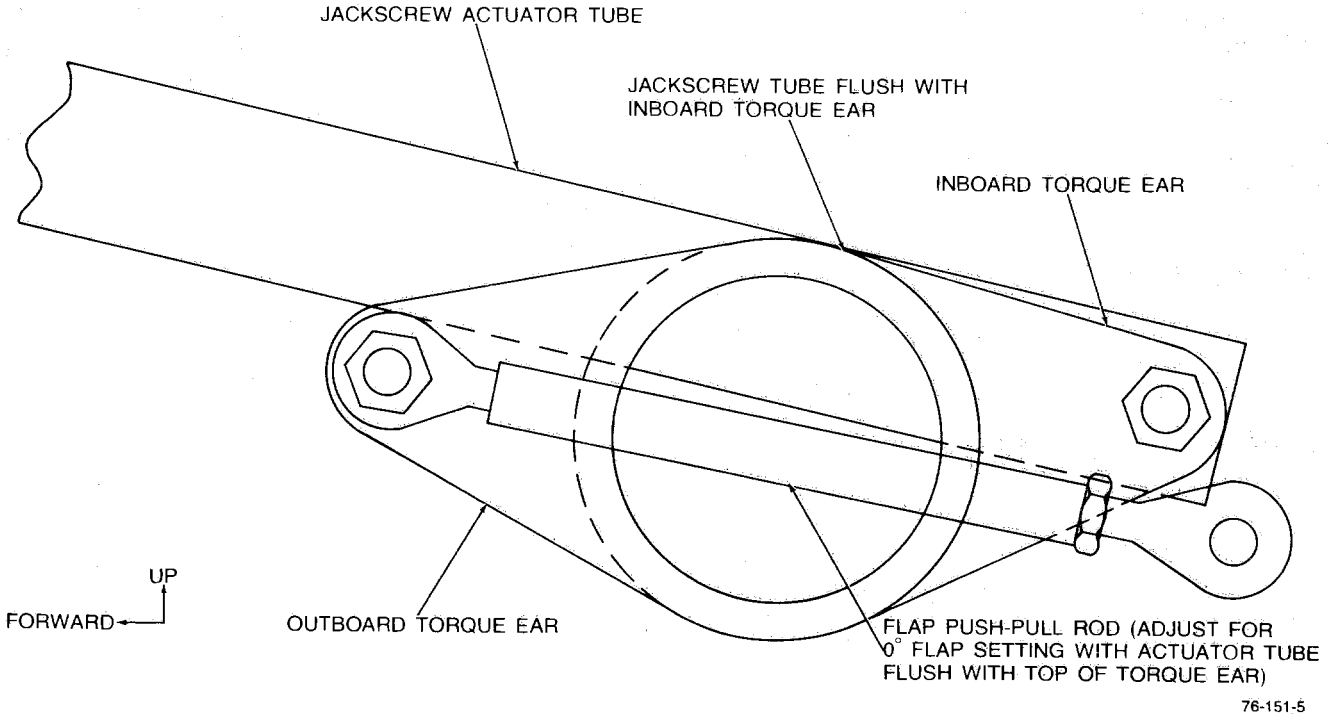
i. Adjust the landing gear warning switch to actuate at 16° ± 1° of flap deflection.

j. Check the flap indicator and adjust it by bending the transmitter cam and actuator arm to obtain correct readings. The indicator should be accurate at each point shown on the scale, and should move smoothly through its range as the flaps are extended or retracted. Do not bend the transmitter arm or cam to the point that the arm slips beyond or off the cam at the extremes of cam travel.

k. Safety all bolts and nuts and torque jam nuts as required.

l. Install the aft cabin floorboards and access panel.

m. Install the right and left passenger seats as described in Chapter 25-00-00 under the heading FLIGHT COMPARTMENT SEAT INSTALLATION.



Torque Shaft
Figure 2

"END"

GUST LOCK - MAINTENANCE PRACTICES

CONTROL LOCK

The control lock assembly consists of a throttle lock, lock pin, rudder lock, a C-shaped clamp, and a warning flag for the control column. The lock pin is pushed through a hole in the control column hanger. The C-shaped clamp hooks over the control column. The warning flag is placarded CONTROL LOCK - REMOVE BEFORE TAKEOFF. The control lock assembly covers the ignition switch and prevents starting of the engine or attempted take-off. Install the control lock assembly in the following sequence:

a. Pull the throttle and mixture control levers full aft and slide the throttle lock over the levers so that the open end of the lock is to the left.

b. Center the rudder pedals and insert the rudder lock in the slot at the bottom of both pedals.

c. Push the control column full forward and to the right $45^{\circ} \pm 5^{\circ}$.

d. Push the control column lock pin through the hole provided in the control column hanger and into the hole in the underside of the control column tube assembly.

e. Ensure positive retention of the lock pin by positioning the hook over the control column.

"END"

CHAPTER 28

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CHAPTER 28 - FUEL

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GENERAL - DESCRIPTION AND OPERATION

FUEL SYSTEM
(Figure 1)

The fuel system consists of a leading edge bonded fuel tank in each wing, connected by a crossfeed system, which provides the airplane with a total fuel capacity of 103 gallons (100 gallons usable). The vented fuel filler caps, one in each wing, are located outboard of each nacelle at WS 160.00. The fuel selector controls for each engine, located in the cabin fuselage forward of FS 94.00, are placarded OFF-CROSSFEED-ON for fuel management. Remote fuel controls in this console are attached to fuel selector valves in the nacelles for each engine. During normal operation, fuel is consumed from each wing fuel tank as indicated by the remote fuel selector handles in the cabin fuselage. Two fuel quantity indicators, on the engine instrument cluster assembly, indicate the amount of fuel in each fuel tank in each wing. The fuel tank in each wing is vented and equipped with a flame arrestor which protects the fuel system from ignition, through the vent system, should lightning strike the airplane. Two fuel quantity sensors, connected in series in each wing fuel tank, are located outboard of the nacelle at WS 94.00 and 151.00. Fuel pressure for each engine is supplied by engine-driven pumps.

AUXILIARY FUEL PUMPS

Electric auxiliary fuel pumps, for each engine, provide pressure for starting, taxiing, takeoff, landing, and emergency operation in case of engine-driven pump failure. Immediately after starting, the auxiliary fuel pumps should be turned OFF to test the engine-driven pumps. The auxiliary fuel pumps are controlled by the placarded L ON, R ON, AUX FUEL PUMP switches, located on the LH instrument subpanel.

FUEL CROSSFEED

The separate identical fuel supplies for each engine are interconnected by fuel crossfeed lines.

NOTE

Fuel crossfeed operations are used during emergency conditions in level flight only.

ENGINE PRIMING SYSTEM

Each engine is equiped with a three point fuel priming system. Magneto/push to prime switches control the priming system and are located on the LH instrument subpanel, for the LH and RH engines. Each switch is placarded OFF-R-L-BOTH-START and PUSH TO PRIME. The LH engine fuel pump will not prime the RH engine and conversely. The MASTER switch and electric FUEL PUMP (L or R) must be placed in the ON position. The PUSH TO PRIME switch may be actuated in either the BOTH or START position and pushed in to supply fuel to the No. 1, 2 and 4 cylinders for engine priming. For cold engine starts, normally 1 to 2 seconds of engine priming is required before starting. In cold ambient temperatures, 5 to 10 seconds of priming before starting is required. If necessary, the engine may be primed while starting by pushing in with the magneto/push to prime switch in the START position. A solenoid for each engine priming system is located behind the firewall, near the inboard side, in each nacelle.

FUEL SYSTEM DRAINS

The fuel system is equipped with a total of 8 drains, 4 drains per wing. A drain valve is located outboard of each nacelle on the underside of each wing tank. A drain is also provided for the selector valve, located in the outboard underside of each nacelle, behind the firewall. Two drains are located inboard of each main gear wheel well for draining crossfeed fuel lines.

The fuel selector valve drains are actuated by a manual "up" movement of .1 to .25 inch. All other fuel drains are flush valves and are opened by using the combination fuel drain tool and landing gear emergency tool.

TROUBLESHOOTING
FUEL SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Inaccurate fuel gauges.	a.	Fuel quantity sensor not electrically isolated from the fuel tank.	a.	Check for nylon inserts in bolt holes. Isolate sensor.
		b.	Wing has poor electrical bond (ground) to airframe.	b.	Install a ground wire directly from the wing to fuselage ground.

TROUBLESHOOTING
FUEL SYSTEM (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Inaccurate fuel gages. (Cont'd)	c.	Faulty fuel quantity sensor.	c.	Replace sensor.
		d.	Faulty fuel gage.	d.	Replace fuel gage.
		e.	Open circuit in wiring.	e.	Replace open wire.

GENERAL - MAINTENANCE PRACTICES

FUEL HANDLING PRACTICES

When filling the airplane fuel tanks, always observe the following:

a. Service the airplane fuel tanks with Grade 100 (green) or 100 LL (blue) minimum grade fuel (1, Chart 1, 91-00-00).

b. Be certain the airplane is statically grounded to the servicing unit.

c. Do not fill fuel tanks near an open flame or within 100 feet of any opened energized electrical euqipment capable of producing sparks.

CLEANING FUEL STRAINERS (SELECTOR VALVE)

Normally, the fuel selector valve fuel strainers, located in each nacelle, should be inspected and cleaned every 100 hours of operation. Clean the fuel strainers with clean PD680 Solvent (7, Chart 1, 91-00-00). However, the strainers should be inspected and cleaned at more frequent intervals depending on service conditions, fuel handling equipment and when operating in localities where there is an excessive amount of sand or dust. The fuel strainers may be removed as described in this Chapter under the heading FUEL STRAINER REMOVAL (SELECTOR VALVE)

AIRPLANE DEFUELING

If defueling equipment is available, defuel from the filler opening as much fuel as possible. When fuel can no longer be pumped from the airplane, provide a suitable container at the drain, located outboard of each nacelle on the underside of each wing tank. Using a suitable tool, push up and turn to lock the drain open to complete the defueling operation.

If defueling equipment is not available, the auxiliary fuel pumps may be used to pump the fuel out of the system. The following steps must be accomplished before energizing the pumps:

a. Apply external power to the electrical system.

b. Place the fuel selector valve in the ON position, on the fuel tank the fuel is being pumped from, and the mixture lever in IDLE CUT-OFF.

c. Disconnect the fuel line at the firewall. In the RH nacelle, disconnect the outboard fuel line. In the LH nacelle, disconnect the inboard fuel line.

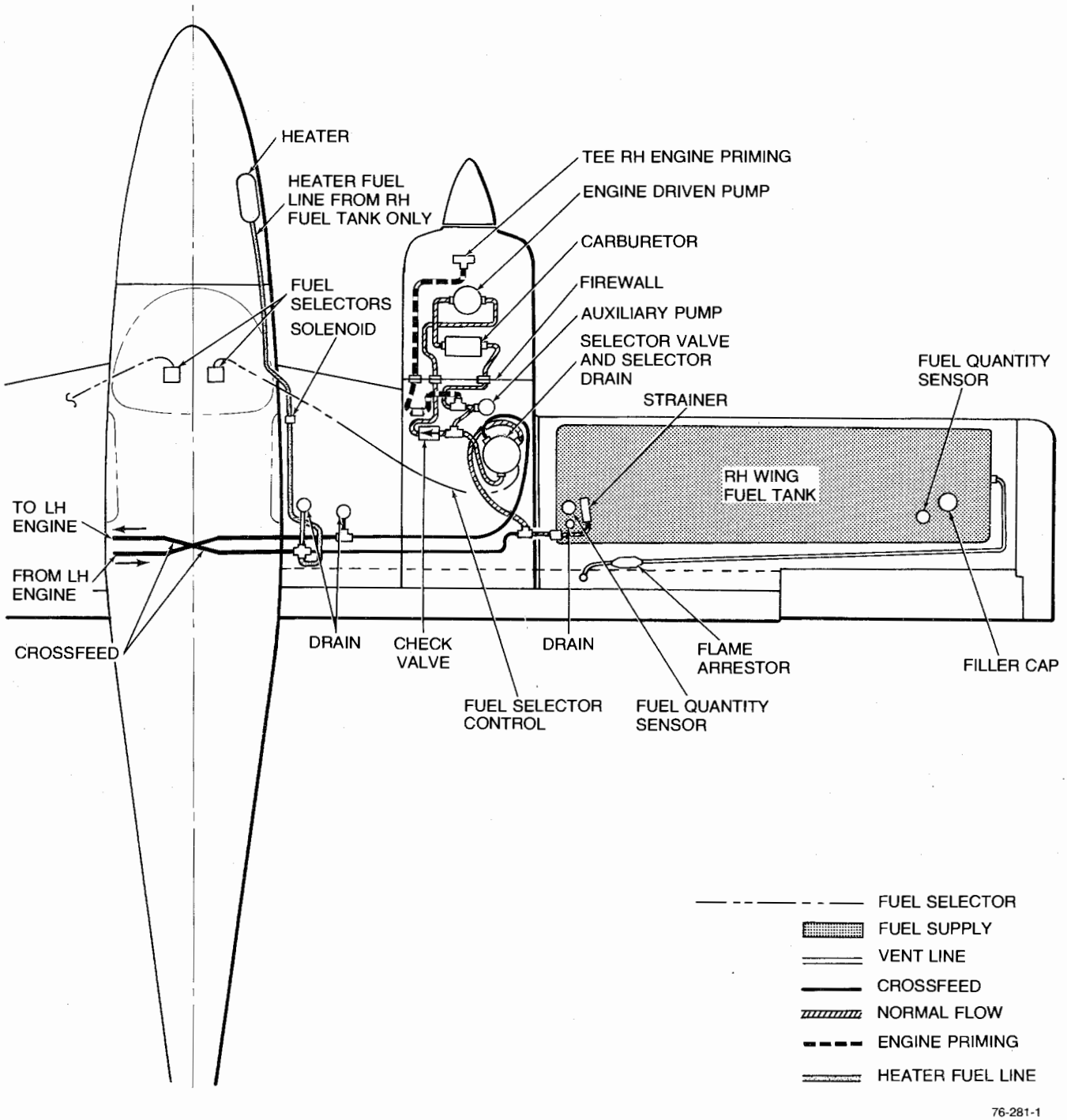
d. Attach a drain hose to the disconnected fuel line at the firewall.

e. Provide a suitable container for the fuel.

f. Energize the electric fuel pump, for the fuel tank the fuel is being pumped from, by placing the FUEL PUMP (L or R) switch, located on the pilots subpanel, in the ON position.

g. When fuel can no longer be pumped from the airplane, provide a suitable container at the drain, located outboard of each nacelle on the underside of each wing fuel tank.

h. Using a suitable tool, push up and turn to lock the drain open to complete the defueling operation.



Fuel System Schematic
Figure 1

"END"

STORAGE - MAINTENANCE PRACTICES

FUEL TANK LEAKAGE CHECK AND REPAIR
(Figure 1)

Many fuel system problems can be eliminated with periodic preventive maintenance. Leaks around fuel system fittings and lines may be prevented by being certain the fittings are properly tightened. Small leaks may be stopped by tightening the fittings. Check gaskets for signs of deterioration and evidence of leaks. Replace as necessary.

a. Be certain the vent lines are installed and plugged and fuel quantity transmitters are installed before pressure testing.

b. Pressure test the tank assembly to 1.50 + .25 - .00 psig for a period of 15 minutes with no drop in pressure.

c. If the fuel tank assembly fails to hold pressure, pressurize to 1.50 psig and check for leaks by applying a brush application of bubble fluid (21, Chart 1, 91-00-00) or equivalent.

d. Brush the solution over seams, rivet heads, bolt heads, etc., where leaks may occur. Leaks are indicated by bubbles or froth and shall be marked for repair.

e. After the leaks are marked, clean all bubble fluid from the surface.

SEALING REAR FUEL TANK CLOSURE

a. After the exact location of the leak has been determined and marked, drill out flush rivets in the rear tank closure on each side of the leak. Drill a hole through the skin only, evenly spaced between the flush rivets, using a No. 40 drill. Force sealer (22, Chart 1, 91-00-00) into the No. 40 hole until it comes out the existing rivet holes.

b. Immediately install the same size rivets in the holes where rivets were removed.

c. Allow a cure time of 24 hours. Sand and fill until smooth and repaint the repaired area. Maintain .250 inch E.D. with rivets.

d. Pressure test as outlined under FUEL TANK LEAKAGE CHECK AND REPAIR in steps "a", and "b".

SEALING INBOARD OR OUTBOARD FUEL TANK RIBS

a. After the exact location of the leak has been determined and marked, drill a No. 40 hole approximately 1 inch on each side of the leak and .45 inch from the rivet line toward the center of the fuel cell. This will position the No. 40 hole directly over the V-shaped groove in the rib.

CAUTION

Do not drill into the rib, only through the skin.

b. Force the sealer (22, Chart 1, 91-00-00) in one hole until it is forced out the hole on the opposite side of the leak.

c. Allow a cure time of 24 hours. Sand and fill until smooth and repaint the repaired area.

d. Pressure test as outlined under FUEL TANK LEAKAGE CHECK AND REPAIR in steps "a", and "b".

SEALING FUEL LEAKS IN THE FIRST BAY OUTBOARD OF INBOARD FUEL TANK RIB

NOTE

This repair is for the aft fuel cell closure when the leak is in an accessible area and applies to the area, aft of the fuel filler.

a. After the exact location of the leak has been determined, remove the inboard fuel quantity sensor as described in this Chapter under the heading FUEL QUANTITY SENSOR REMOVAL (INBOARD), and outlined in steps b, c, d, and e.

b. Working through the fuel quantity sensor mounting hole, leaks up to approximately 10 inches outboard of the inboard rib may be repaired.

c. Thoroughly clean the area of the leak with methyl ethyl ketone (23, Chart 1, 91-00-00) and a clean white cloth.

d. Apply sealer (22, Chart 1, 91-00-00) to the skin-to-false spar joint in the area of the leak.

e. Install the inboard fuel quantity sensor as described in this Chapter under the heading FUEL QUANTITY SENSOR INSTALLATION (INBOARD), and outlined in steps d, e, and f.

f. Allow a cure time of 24 hours.

g. Pressure test as outlined under FUEL TANK LEAKAGE CHECK AND REPAIR in steps "a", and "b".

NOTE

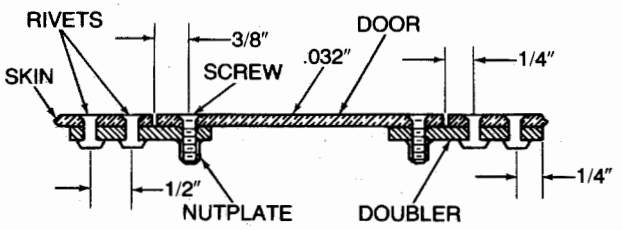
Repair of the Fuel Cell is permissible providing the damaged area is far enough from the rib to allow a doubler or plate to be installed. Holes cut to remove damaged area must be round or at least have generous radii. Should a stringer be damaged or fall within the repair area it must be bridged across and be attached to the repair.

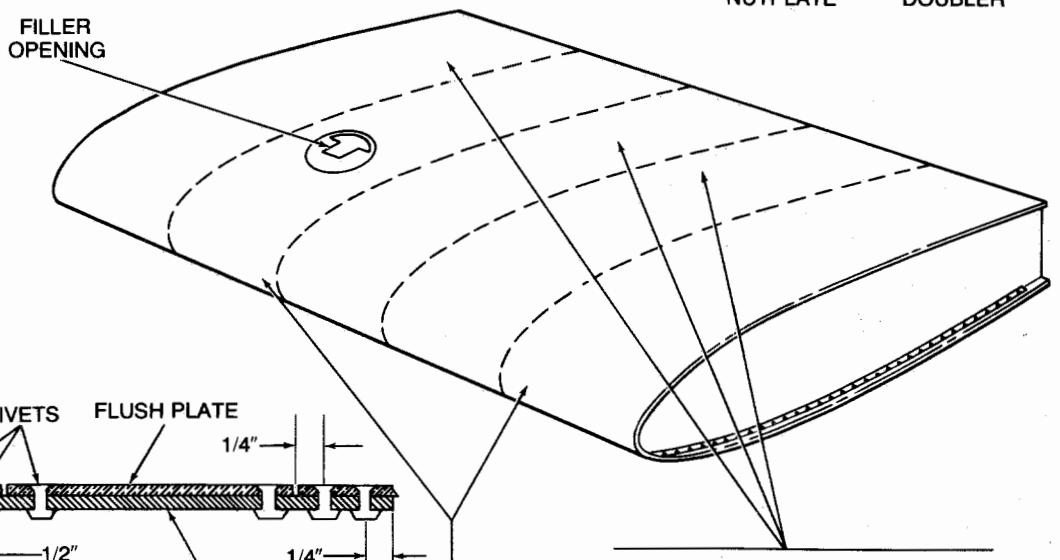
CAUTION

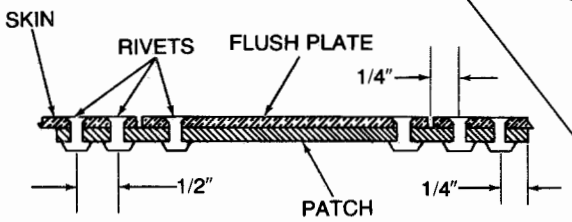
It must be realized the fuel cell is a highly stressed area; consequently, the repair structure must be of equal capability.

GENERAL INSTRUCTIONS

1. Seal edges of doubler or plate, rivet butts and nut plates with sealer (18 or 22, Chart 1, 91-00-00).
2. Fill the rivet heads, screw heads and patch/skin joints with White Streak (19, Chart 1, 91-00-00) or PR1220 (20, Chart 1, 91-00-00). Sand smooth and refinish.
3. Pressure test (not more than 1.50 psig) before applying filler to outer surface.







REPAIR OF ACCESSIBLE AREAS

1. Rivets - AN426AD4-5
   Patch material - .032 2024 T3 Aluminum ALCLAD
   Plate material - .032 2024 T3 Aluminum ALCLAD
2. Two rows rivets through patch and skin (patch plate to be on inner surface of cell. -- If the plate is too large for entry through access openings, use method for inaccessible area.)
3. Rivet E.D. 1/4" -- spacing 1/2" between rows and rivets.
4. Fit flush plate and secure with only enough rivets to prevent filler from cracking.

REPAIR OF INACCESSIBLE AREAS

1. Door material - .032 2024 T3 Aluminum ALCLAD.
   Doubler material - .051 2024 T3 Aluminum ALCLAD.
   Nut Plates - K1000-832 or equivalent.
   Screws - AN507-8R--length to be determined.
   Rivets - AN426AD3--for attaching nut plates.
   Rivets - AN426AD4--for attaching doubler.
   Sealer - EC1293 (18, Chart 1, 91-00-00).
2. Two rows rivets in doubler and skin--1/4" E.D., 1/2" E.D., between rows and rivets.
3. Single row of screws through doubler and door--3/8" E.D., 5/8" spacing. Dimple door and countersink doubler.
4. Doubler may be cut on one side only in order to place it on inside of cell. Cut side of doubler to be placed on inboard or outboard side of repair.

76-281-2

Fuel Tank Repair
Figure 1

"END"

DISTRIBUTION - MAINTENANCE PRACTICES

AUXILIARY FUEL PUMP REMOVAL

a. The auxiliary fuel pump is located behind the firewall, near the outboard side, in each nacelle.

b. Be certain the electrical power to the auxiliary fuel pump is OFF.

c. Disconnect the electrical leads to the auxiliary fuel pump.

d. Disconnect the inlet and outlet fuel lines from the pump.

e. Remove the nuts, washers, and bolts, attaching the auxiliary fuel pump.

f. Remove the auxiliary fuel pump from the airplane.

AUXILIARY FUEL PUMP INSTALLATION

a. Place the auxiliary fuel pump in position and install the attaching bolts, washers, and nuts.

b. Connect the inlet and outlet lines to the pump.

c. Install the electrical leads to the auxiliary fuel pump.

FUEL STRAINER REMOVAL (WING)

a. Remove the fuel quantity sensor at WS 94.00 as described in this Chapter under the heading FUEL QUANTITY SENSOR REMOVAL (INBOARD), in steps a through e.

b. Working through the fuel quantity sensor mounting hole, hold the "B" nut, inside the fuel tanks, on the fuel strainer in place and loosen the fuel line fitting, outside at the inboard fuel tank closure, to disconnect the fuel line from the fuel tank.

c. Working through the fuel quantity sensor mounting hole, remove the screw, washers, and clamp which secure the fuel strainer.

d. Remove the fuel strainer from the airplane.

e. Cover the open ports, where the fuel quantity sensor was removed and the fuel line disconnected, to prevent the entry of foreign material.

FUEL STRAINER INSTALLATION (WING)

a. Remove the protective covers from the fuel quantity sensor and fuel line openings.

b. Working through the fuel quantity sensor mounting hole, position the fuel strainer and secure with the clamp, washers, and screw. Two washers are installed between the clamp and clip.

c. Install a new O-ring on the fuel line fitting.

d. Working through the fuel quantity sensor mounting hole, hold the "B" nut inside the fuel tank on the fuel strainer in place and tighten the fuel line fitting, outside at the inboard fuel tank closure.

e. Install the fuel quantity sensor at WS 94.00 as described in this Chapter under the heading FUEL QUANTITY SENSOR INSTALLATION (INBOARD), steps d, e, and f.

FUEL SELECTOR VALVE REMOVAL (Figure 1)

a. Drain the fuel system as described in this Chapter under the heading AIRPLANE DEFUELING.

b. Remove the access cover on top of the nacelle and the access cover under the fuel selector valve to gain access to the fuel selector valve, located aft of the firewall near the outboard side, in each nacelle.

c. Remove the fuel selector control as described in this Chapter under the heading FUEL SELECTOR CONTROL REMOVAL.

d. Move the fuel selector valve arm to the OFF detent for the LH engine and to the ON detent for the RH engine to gain clearance for the fuel selector valve removal.

e. Remove the plumbing from the fuel selector valve.

f. Remove the screws and washers securing the selector valve to the mounting bracket.

FUEL SELECTOR VALVE INSTALLATION (Figure 1)

a. Place the selector valve arm in the OFF detent for the LH engine, ON detent for the RH engine and position the fuel selector valve and secure with the washers and screws. The LH valve position arm is FWD and the RH valve position arm AFT.

b. Install the plumbing to the fuel selector valve.

c. Install the fuel selector control as described in this Chapter under the heading FUEL SELECTOR CONTROL INSTALLATION.

d. Install the access covers on top of the nacelle and under the fuel selector valve.

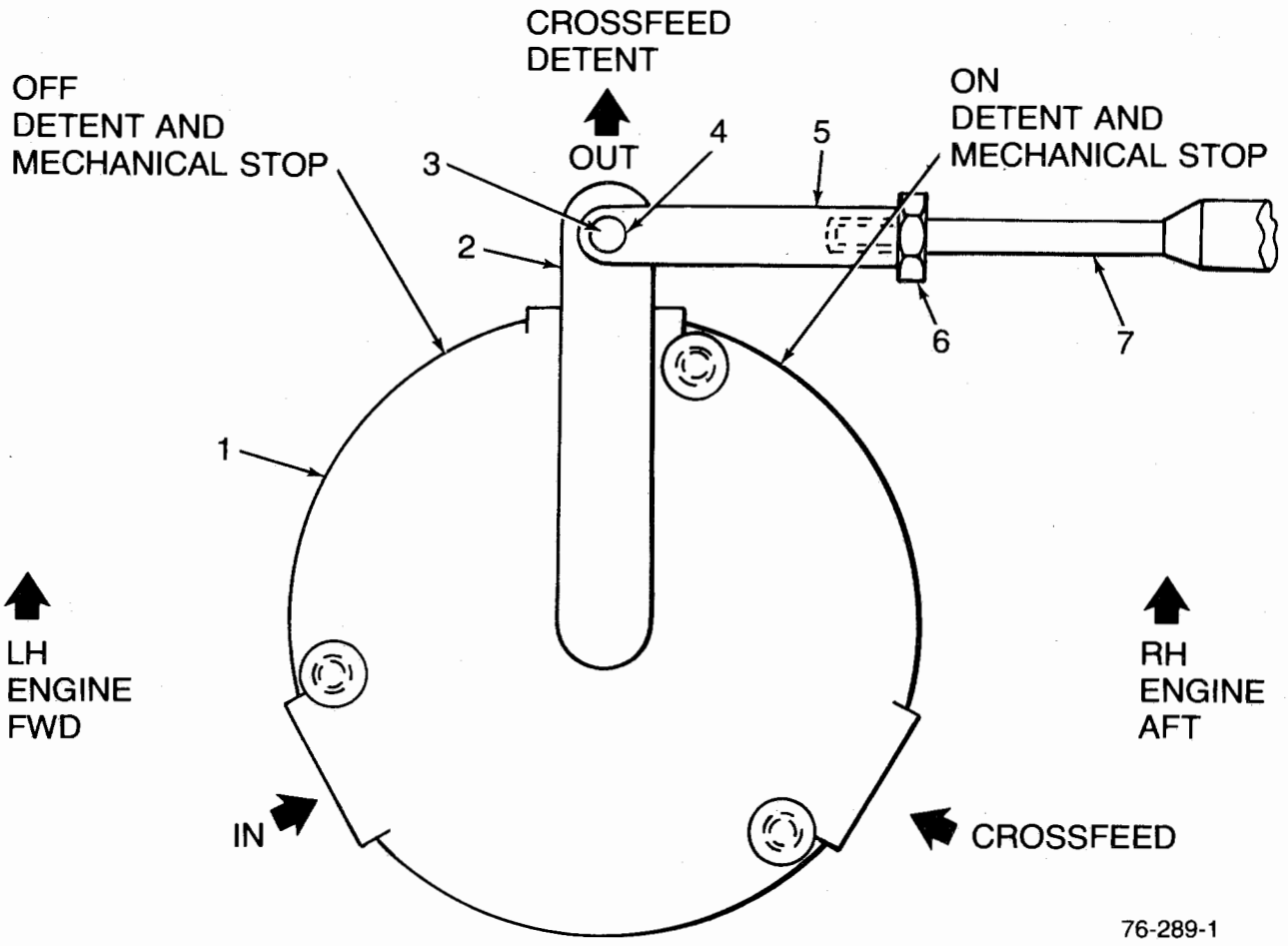
FUEL SELECTOR CONTROL REMOVAL

The fuel selector control is removed from the fuel selector valve, located aft of the firewall near the outboard side in each nacelle, as follows:

a. Position the fuel selector in the CROSSFEED position.

b. Remove the cotter pin from the clevis pin which attaches the fuel selector control to the fuel selector valve arm.

c. Remove the attaching clevis pin.



1. Fuel Selector Valve
2. Fuel Selector Valve arm
3. Clevis Pin (Install Head Up)
4. Cotter Pin
5. Clevis
6. Locknut
7. Control

Fuel Selector Valve
Figure 1

FUEL SELECTOR CONTROL INSTALLATION

a. Move the fuel selector valve arm to the CROSS-FEED position to align the clevis pin hole in the fuel selector valve arm with the clevis pin hole in the clevis on the control end. The fuel selector arm is forward on the LH engine and aft on the RH engine.

b. Install the clevis pin with the head up to attach the fuel selector valve arm and the control.

c. Install a new cotter pin to secure the clevis pin.

d. Check the locknut, located by the clevis on the control, for tightness.

CAUTION

Station a person in the pilots compartment to operate the fuel selector and an assistant at the nacelle to observe the fuel selector valve. Be certain the fuel selector and the fuel selector valve are installed properly and correspond in all detents. Operate the fuel selector through the OFF-CROSSFEED-ON detents several times checking for freedom of movement.

FUEL SELECTOR CONTROL ADJUSTMENT

a. Remove the fuel selector control as described in this Chapter under the heading FUEL SELECTOR CONTROL REMOVAL.

b. Loosen the locknut by the clevis on the control.

c. Rotate the clevis to lengthen or shorten as required.

d. Tighten the locknut.

e. Install the fuel selector control as described in this Chapter under the heading FUEL SELECTOR CONTROL INSTALLATION.

FLARED FITTINGS (Figure 2)

When installing flared fittings and hoses, make sure the threads are properly lubricated with VV-P-236 petrolatum (Chart 3, 91-00-00). When previously installed fittings are removed, they should be wiped clean and relubricated before they are reinstalled. Torque all fittings in accordance with (Chart 2, 91-00-00).

FUEL STRAINER REMOVAL (SELECTOR VALVE)

a. Remove the access cover on the bottom of the nacelle, under the fuel selector valve.

b. Remove the screws, and washers securing the fuel strainer mounting to the fuel selector valve.

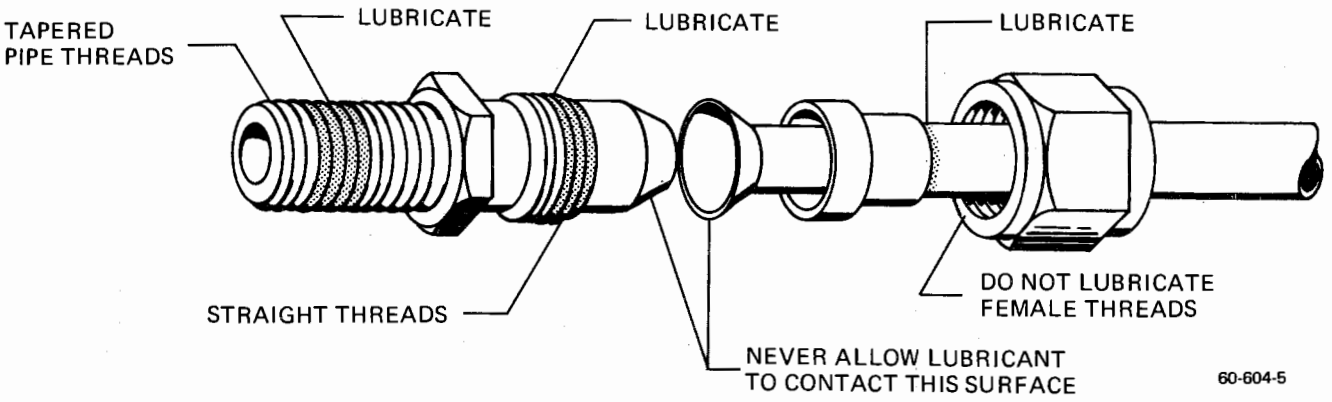
c. Remove the fuel strainer from the fuel strainer mounting.

FUEL STRAINER INSTALLATION (SELECTOR VALVE)

a. Install the fuel strainer in the fuel strainer mounting.

b. Position the fuel strainer mounting to the fuel selector valve and secure with the washers, and screws.

c. Install the access cover.



Lubrication of Flared Fittings
Figure 2

"END"

INDICATING - MAINTENANCE PRACTICES

FUEL QUANTITY SENSORS

Fuel quantity is measured by float type sensor units which transmit the fuel level to fuel quantity indicators, on the engine instrument cluster assembly, for each respective wing. The fuel tank in each wing is equipped with two fuel quantity sensors, connected in series and located outboard of the nacelle at WS 94.00 and 151.00.

FUEL QUANTITY SENSOR REMOVAL (OUTBOARD)

a. Drain the fuel system as described in this Chapter under the heading AIRPLANE DEFUELING.
b. Remove the access door at WS 151.00 to gain access to the fuel quantity sensor.
c. Disconnect electrical wiring at the sensor.
d. Remove the attaching bolts and seals.
e. Remove the fuel quantity sensor from the airplane.
f. Cover the open port, where the fuel quantity sensor was removed, to prevent the entry of foreign material.

FUEL QUANTITY SENSOR INSTALLATION (OUTBOARD)

a. Remove the protective cover from the fuel quantity sensor port at WS 151.00.
b. Be certain the surfaces of the fuel quantity sensor and mounting are clean.
c. Position the gasket and fuel sensor on the mounting.

CAUTION

The fuel quantity sensor must be electrically isolated from the fuel tank. Be certain the nylon inserts are inserted in the bolt holes.

d. Install the attaching seals and bolts.
e. Connect the electrical wiring to the fuel quantity sensor.
f. Install the access door at WS 151.00.

FUEL QUANTITY SENSOR REMOVAL (INBOARD)

a. Drain the fuel system as described in this Chapter under the heading AIRPLANE DEFUELING.
b. Remove the access door at WS 94.00 to gain access to the fuel quantity sensor.
c. Disconnect electrical wiring at the fuel sensor.
d. Remove the bolts and seals which attach the fuel quantity sensor mounting plate to the fuel tank.
e. Remove the mounting plate with the fuel quantity sensor attached.
f. Cover the open port, where the fuel quantity sensor mounting plate was removed, to prevent the entry of foreign material.
g. Remove the nuts, washers, bolts, and seals which attach the fuel quantity sensor to the mounting plate.
h. Remove the fuel quantity sensor and gasket from the mounting plate.

FUEL QUANTITY SENSOR INSTALLATION (INBOARD)

a. Be certain the surfaces of the fuel quantity sensor and mounting plate are clean.
b. Position the gasket and fuel quantity sensor on the mounting plate and install the attaching seals, bolts, washers, and nuts.
c. Remove the protective cover from the fuel quantity sensor mounting port at WS 94.00.
d. Position the fuel quantity sensor mounting plate to the fuel tank and install the attaching seals and bolts.
e. Connect the electrical wiring to the fuel quantity sensor.
f. Install the access door at WS 94.00.

"END"

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"END"

GENERAL - DESCRIPTION AND OPERATION

The retractable tricycle landing gear, uses shock absorbers on the main gear and an oleo strut on the nose gear for shock absorption. The nose gear is steerable through a spring loaded linkage connected to the rudder pedals. A hydraulic dampener on the nose wheel strut eliminates any tendency to shimmy. Toe brakes aid in steering the airplane.

The landing gears are controlled by a two position switch located just to the left of the engine controls. The switch handle must be pulled out of the safety detent before it can be moved to the opposite position.

The landing gear position indicator lights are located above the landing gear switch handle. Three green lights, one for each gear, are illuminated whenever the landing gears are down and locked. The red light illuminates any time one or all the landing gears are intransit or in any intermediate position when maximum pressure switch is activated. All the lights will be out when the gears are up. Pressing the individual lights will verify that the landing gear lights are operable. The intensity of the lamps can be controlled by turning the lens holders on each lamp.

A landing gear safety switch, located in the pitot system, will open the landing gear circuit to prevent inadvertent retraction of the gear at speeds less than 59 to 63 kts.

CAUTION

Never rely on the safety switch to keep the gear down during taxi or on takeoff or landing roll. Always check the position of the landing gear switch.

The landing gear circuit breakers are located on the right subpanel, one for the motor and one for the system control circuitry. Both circuit breakers are of the push to reset type and will pop out under overload conditions.

An electric motor-driven hydraulic pump unit, manifold and shuttle valve are located at F S 180.00. The two main gear cylinders are located at W S 47.52 in the left and right wing wheel wells. The nose gear cylinder is located aft of FS 35.72.

In the retract mode the electric motor, when viewed from the top, rotates the pump clockwise, forcing hydraulic fluid through the manifold to the retract side of the system. A pressure switch, located on the manifold, automatically shuts off the motor when system pressure reaches 1550 ± 100 psi. If the pressure drops to 1250 ± 100 psi during the retract mode the pressure switch will turn the motor on until pressure again reaches 1550 ± 100 psi. An uplock check valve, in the pump, retains this pressure to hold the gear in the retracted position. In the extend mode, the motor, when viewed from the top, rotates counterclockwise, forcing hydraulic fluid through the manifold and shuttle valve to the extend side of the system.

Main gear downlock is accomplished by overcenter travel of a spring-held side brace. Nose gear downlock is accomplished by overcenter travel of the drag link, and a mechanically actuated downlock. After the gears are down and locked, system pressure will bleed back to the reservoir, resulting in zero pressure. Downlimit switches, located on each gear, will allow the pump and motor assembly to continue running until all three gear assemblies are down and locked.

EMERGENCY LANDING GEAR EXTENSION SYSTEM

In the event of landing gear malfunction in flight, emergency extension of the gear is accomplished as follows:

a. Pull the landing gear circuit breakers.
b. Place the landing gear control switch in the DOWN position.
c. Using the tool provided with the airplane, turn the handle on the dump valve, located on the floor in front of the pilot's seat, 90° counterclockwise.

This allows hydraulic fluid from the retract side of the system to flow back into the manifold and reservoir. The dump valve releases pressure from the retract side of the system and allows the gear to free fall into the down and locked position.

THROTTLE WARNING SYSTEM

With the landing gear retracted, if the throttle is retarded below approximately 16-18 in. HG manifold pressure, the landing gear warning horn will sound.

NOTE

The landing gear warning horn sounds with a warbling tone to distinguish it from the stall warning horn.

TROUBLESHOOTING
LANDING GEAR CONTROL SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Landing gear hydraulic pump fails to shut off when gear is retracted.	a.	Pressure switch inoperative.	a.	Check electrical connections. Replace switch if necessary.
		b.	Pump worn out and will not build up pressure.	b.	Check pressure. Replace pump if necessary.
2.	Landing gear hydraulic pump fails to shut off after gear is extended.	a.	One or more downlimit switches open.	a.	Adjust or replace as necessary.
3.	Warning horn inoperative or malfunctioning.	a.	Open or grounded circuit.	a.	Check continuity.
		b.	Throttle switches inoperative or out of adjustment.	b.	Check and adjust as necessary.
		c.	Defective horn.	c.	Replace horn.
4.	Landing gear fails to retract.	a.	Safety switch not closing. Circuit breaker open. Pump inoperative.	a.	Replace and/or adjust as necessary.
		b.	Pressure switch stays open.	b.	Replace pressure switch.
		c.	Emergency extend valve open.	c.	Close valve.
5.	Landing gear fails to extend.	a.	Tripped circuit breaker.	a.	Reset circuit breaker.
		b.	Open circuit.	b.	Continuity check all wiring and electrical circuitry.
6.	Landing gear fails to retract or extend.	a.	Circuit breaker tripped.	a.	Reset circuit breaker.
		b.	Open or grounded electrical circuitry.	b.	Continuity check all electrical circuitry.
		c.	Hydraulic pump or motor inoperative.	c.	Replace hydraulic pump.
7.	Landing gear will not remain retracted.	a.	External hydraulic leak.	a.	Check for signs of hydraulic fluid and repair as necessary.
		b.	Internal hydraulic leak.	b.	Follow procedures outlined in BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION TEST.

"END"

MAIN GEAR AND DOORS - MAINTENANCE PRACTICES

WARNING

Anytime maintenance is performed on the landing gear system, as a safety precaution, jacks should be placed under the two jack points and a tail tie down used.

MAIN LANDING GEAR SHOCK ABSORBER

WARNING

Do not remove the air valve assembly until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

To check the fluid level in either main landing gear shock absorber, remove the valve cap, open the valve and allow the strut to fully compress.

a. With the strut at approximately 1/4 inch from the compressed position, remove the valve body assembly and fill with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

b. Slowly cycle the strut to displace trapped air. Repeat step "a" until additional oil cannot be added. Fluid volume, 508 cc.

c. With the strut extended, replace the valve body assembly and completely compress to expel excess air and oil.

d. With the strut fully extended, charge with dry air to 300 psig. This pressure should keep the strut inflated to approximately two inches of piston showing when the airplane is empty, except for full fuel and oil.

LUBRICATION

Lubricate the main wheel bearings and grease fittings as described under the heading LUBRICATION SCHEDULE in Chapter 12-20-00.

MAIN LANDING GEAR REMOVAL (Figure 1)

CAUTION

The landing gear circuit breaker should be pulled and the emergency gear extension valve should be open to relieve pressure in the hydraulic system when work is to be accomplished on the landing gear system.

a. Place the airplane on jacks.

b. Support the landing gear to prevent it from falling when disconnected from the airplane.

c. Cut the safety wire and remove the bolt and washers securing the landing gear door to the fork pivot pin.

d. Remove the nuts, washers, and bolts securing the landing gear door to the upper end of the housing.

e. Remove the landing gear door from the airplane.

f. Disconnect and immediately cap the brake line (13) at the top of the gear housing (1).

NOTE

When disconnecting the actuator, take care to retain the original adjustment at the rod end fitting (6) at the actuator.

g. Remove the cotter pin, nut (2), washers (3), and bolt (4), securing the actuator (5) to the gear housing (1).

h. Remove the nut (7), washers (8 and 9), bushing (10), and bolt (11), which attach the lower side brace to the gear housing (1).

i. Remove the eye bolt (30) from the fork (29) with the springs (12) connected. (Springs (12) consist of two springs, one inside the other.)

j. Remove the nut, washer, and bolt (26).

k. Remove the nuts (22), washers (27), and bolts (23), (two places).

l. Slide the sleeve (20) onto the pivot pin (21) and remove the sleeve and pivot pin together.

m. Remove the washers (25 and 24).

n. Remove the nut (14), washers (15, 16 and 17), bushings (18 and 31), and bolt (19) at the forward main gear attach point.

o. Lower the main gear assembly away from the airplane.

MAIN LANDING GEAR INSTALLATION (Figure 1)

a. Before installation of the main gear, insert the aft pivot pin (21) into the rear fitting and install the washer (24). Determine the maximum number of washers (25) that can be installed and still permit installation of the bolt (26) by placing the main gear assembly up into position.

b. Remove the washers (24 and 25) and pivot pin (21).

c. Position and support the main gear assembly and align the bolt holes.

d. At the forward main gear attach point, install the bolt (19) and bushing (31). Install the bushing (31) with the

countersink under the bolt head. Install the bushing (18).

e. Install the washers (17) with the coated side adjacent to the gear housing.

f. Install the washers (16) as required to provide .005 to .025 total clearance between the main gear and wing structure. A minimum of one washer (16) is required.

g. Install the washer (15) and nut (14).

h. Torque forward attach bolt of the main gear to 300 to 350 inch-pounds. It is permissible to torque the bolt head.

NOTE

To aid in aligning and installing the washers (24 and 25), hold the washers together.

i. At the rear main attach point, install the pivot pin (21) and sleeve (20) together. Install the washer (24) with the coated side adjacent to the gear housing. Use the maximum number of washers (25), as determined in step "a", that will permit installation of the bolt (26).

1. Gear Housing
2. Nut
3. Washer *
4. Bolt **
5. Actuator
6. Rod End Fitting
7. Nut
8. Washer
9. Washer ***
10. Bushing
11. Bolt
12. Spring
13. Brake Line
14. Nut
15. Washer
16. Washer
17. Washer ****
18. Bushing
19. Bolt
20. Sleeve
21. Pivot Pin
22. Nut
23. Bolt
24. Washer ****
25. Washer
26. Bolt
27. Washer
28. Shim
29. Fork
30. Eye Bolt
31. Bushing

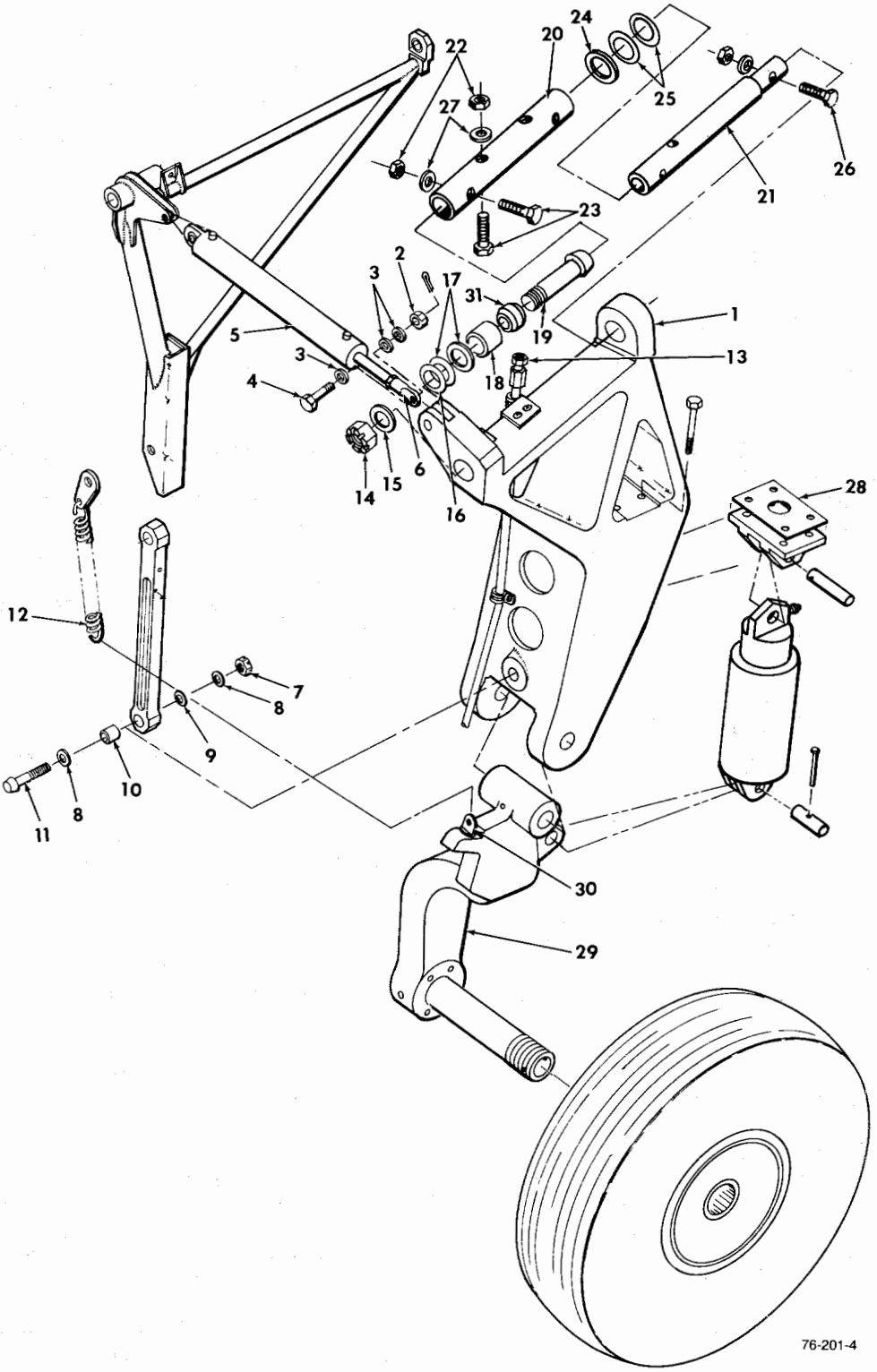
* Install washer three places: one under nut, and one either side of rod end.

** Install bolt head on the outboard side.

*** Install coated side of washer toward side brace.

**** Install coated side of washer adjacent to gear housing.

Main Landing Gear Installation
Figure 1 (Sheet 1 of 2)



Main Landing Gear Installation
Figure 1 (Sheet 2 of 2)

j. Install the bolt (26), washer and nut.

k. Slide the sleeve (20) forward to fit over the bolt head (19) and bushing (31).

NOTE

A drift pin may be inserted into the forward 3/8 inch hole in the sleeve (20) to aid in driving the sleeve over the bushing (31).

l. Align the bolt holes in the sleeve (20) and pivot pin (21) and install the bolts (23), washers (27), and nuts (22).

m. Connect the eye bolt (30), which is attached to the lower end of the downlock springs (12), to the fork (29).

n. Install the bushing (10), bolt (11), and washer (8) next to the bolt. Install the washer (9) with the coated side of the washer toward the side brace.

o. Install the washer (8) and nut (7). Torque the attach bolt at the lower side brace and strut to 300 to 350 inch-pounds.

p. To install the actuator (5) to the gear housing (1), gain access through the hole in the forward wheel well closure spar and install the bolt (4) with the bolt head at the outboard side. Install washers (3), three places: one each washer either side of the rod end (6), and one washer under the nut (2). Tighten the nut (2) and install the cotter pin.

q. Connect the brake line (13) at the top of the gear housing (1).

r. Position the landing gear door to the gear housing and install the bolts, washers, and nuts at the upper main gear/landing gear door attach point.

s. Install the bolt (with the grease fitting) securing the landing gear door to the fork pivot pin. Install the safety wire.

t. Bleed the brake system as described in Chapter 32-40-00 under the heading BLEEDING THE BRAKE SYSTEM.

NOTE

Add or remove the shim (28) as required to maintain proper centering of the landing gear in the wheel well opening.

u. Make a retraction check as outlined in Chapter 32-30-00 under the heading RIGGING THE LANDING GEAR.

MAIN LANDING GEAR DISASSEMBLY (Figure 2)

a. Place the shock absorber in a vertical position to prevent the hydraulic fluid from spilling when the air valve is removed.

WARNING

Do not remove the air valve assembly until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

b. Remove the air valve cap and open the valve by turning the valve clockwise to release the air pressure. Remove the air valve assembly.

c. Invert the shock absorber and drain out the hydraulic fluid.

d. Remove the screws from the clamps (1) and remove the clamps. Remove the tie securing the brake line (2) to the housing (3).

e. Remove the cotter pin, washers and flat head pins from the pins (4 and 5).

f. Remove the pins (4 and 5) to disconnect the shock absorber (6).

g. Remove the bolts (7), and washers to remove the shims (8) and connector (9).

h. Remove the cotter pin, washer, and flat head pin (12) from the pin (10).

i. Remove the pin (10) to disconnect the housing (3) from the fork (11).

MAIN LANDING GEAR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (7, Chart 1, 91-00-00). Inspect the castings for cracks, pitting, nicks, distortion and wear. Replace all damaged or worn parts. Replace all cotter pins.

MAIN LANDING GEAR ASSEMBLY (Figure 2)

a. Position the fork (11) in the housing (3). Install shims (40) on either or both sides of the fork attaching point to maintain a gap of .010 maximum.

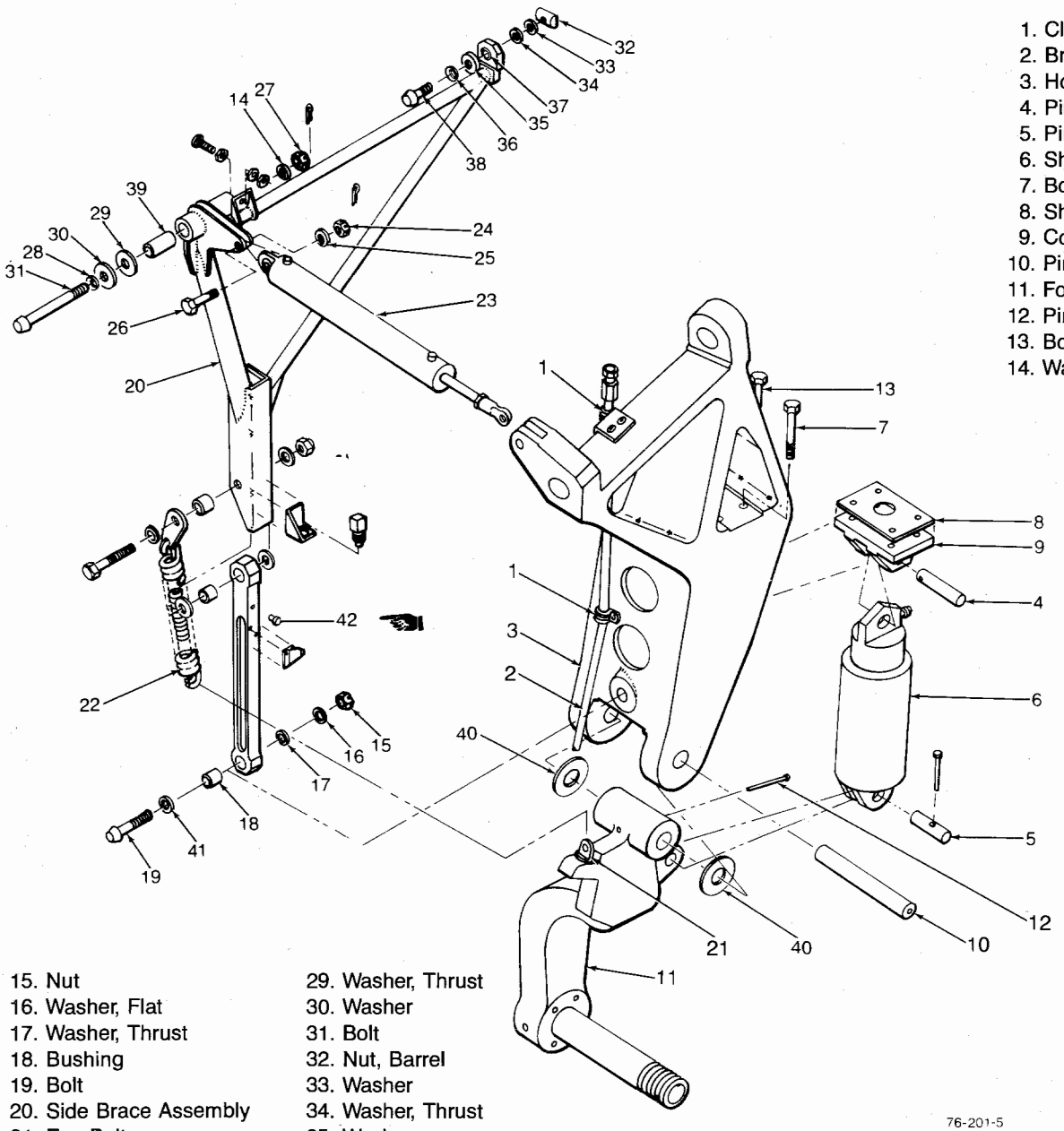
b. Install the pin (10), with the pin grease fitting on the side of the fork, opposite the wheel.

c. Install the flathead pin (12), washer, and cotter pin through the fork (11) and pin (10).

d. Assemble the connector (9) to the shock absorber (6) and install the pin (4) and attaching flathead pin, washer, and cotter pin.

e. Install the pin (5) and the attaching flathead pin. Install washers as required to hold the head of the pin in the spotface recess. Install the cotter pin.

f. Attach the connector (9) to the housing (3) using two shims (8) and the attaching washers and bolts (7 and 13).



1. Clamp
2. Brake Line
3. Housing
4. Pin
5. Pin
6. Shock Absorber
7. Bolt
8. Shim
9. Connector
10. Pin
11. Fork
12. Pin, Flathead
13. Bolt
14. Washer, Flat

15. Nut
16. Washer, Flat
17. Washer, Thrust
18. Bushing
19. Bolt
20. Side Brace Assembly
21. Eye Bolt
22. Spring
23. Actuator
24. Nut
25. Washer
26. Bolt
27. Nut
28. Washer, Countersunk
29. Washer, Thrust
30. Washer
31. Bolt
32. Nut, Barrel
33. Washer
34. Washer, Thrust
35. Washer
36. Washer, Countersunk
37. Bushing
38. Bolt
39. Bushing
40. Shim
41. Washer, Countersunk
42. Button Rest

Main Landing Gear Assembly
Figure 2

NOTE

If the landing gear assembly is to be reinstalled in the same airplane, replace the same number of shims as removed.

g. Position the brake line (2) in the clamps (1) (upper and lower) and install the screws securing the clamps (1) to the housing (3).

h. Position the brake line (2) and install the tie securing the brake line to the housing (3).

MAIN LANDING GEAR DOOR REMOVAL

a. Cut the safety wire, if installed, and remove the bolt and washers securing the landing gear door to the fork pivot pin.

b. Note the number and thickness of washers installed between the door and brackets on each of the upper attach screws, and remove the screws, nuts and washers securing the landing gear door to the upper portion of the landing gear housing.

c. Remove the landing gear door from the airplane.

MAIN LANDING GEAR DOOR INSTALLATION

a. Position the door to the gear housing and install the attach bolt with the grease fitting. Make sure the teflon lock on the bolt is in good condition, and use Loc-Tite 271 on the bolt. The bushing, washers and grommet should be installed on the bolt per Figure 3.

b. Assemble the forward upper bracket with rubber shims as required to take up space between the bracket and strut, and reinstall the screws, nuts, and washers of the same thickness and number as were removed with the door. If a new door is being installed, it will be necessary to locate the bracket on the strut and drill number 10 holes through the door to match the attach screw holes in the bracket halves.

c. Assemble the aft upper bracket on the strut with the clevis pin and cotter pin; and reinstall the screws, nuts, and washers of the same number and thickness as were removed with the door. If a new door is being installed, it will be necessary to locate the bracket on the strut and drill number 10 holes through the door to match the attach screw holes in the bracket halves.

d. With the airplane on jacks, retract the gear and adjust the main gear upstop so the landing gear door seals make firm contact with the wing skin at the lower end of the door without excessive flexing of the door at the lower attach bolt.

e. Adjust the number of washers between the door and upper brackets until the door seals make firm contact with the wing skin at the upper end of the door without excessive flexing of the door at the bracket attach points.

MAIN LANDING GEAR SIDE BRACE ASSEMBLY REMOVAL
(Figure 2)

CAUTION

Prior to jacking the airplane, ensure that an unbalanced condition does not exist. Fuel should be evenly distributed in the wings.

a. Place the airplane on jacks and a tail stand.

NOTE

The jack pads are located just inboard of each main landing gear.

b. Secure the tie-down ring to a ground tie-down or a weight of at least 450 pounds.

c. Pull the landing gear circuit breaker, and open the emergency landing gear extension valve.

NOTE

Opening the emergency landing gear extension valve will relieve any pressure which may develop while working on the system.

d. Cut the Ty-wraps which secure the landing gear limit switch wires to the side brace, and remove the limit switch from the side brace mounting bracket.

e. Remove the bolts (7 and 13) to disconnect the upper portion of the shock absorber (6) from the housing (3). Remove the shim (8).

f. Pull the upper portion of the shock absorber (6), with the connector (9) attached, away from the housing (3).

g. Remove the nut (15), washers (16, 41, and 17), bushing (18), and bolt (19), which attach the side brace assembly to the gear housing (3).

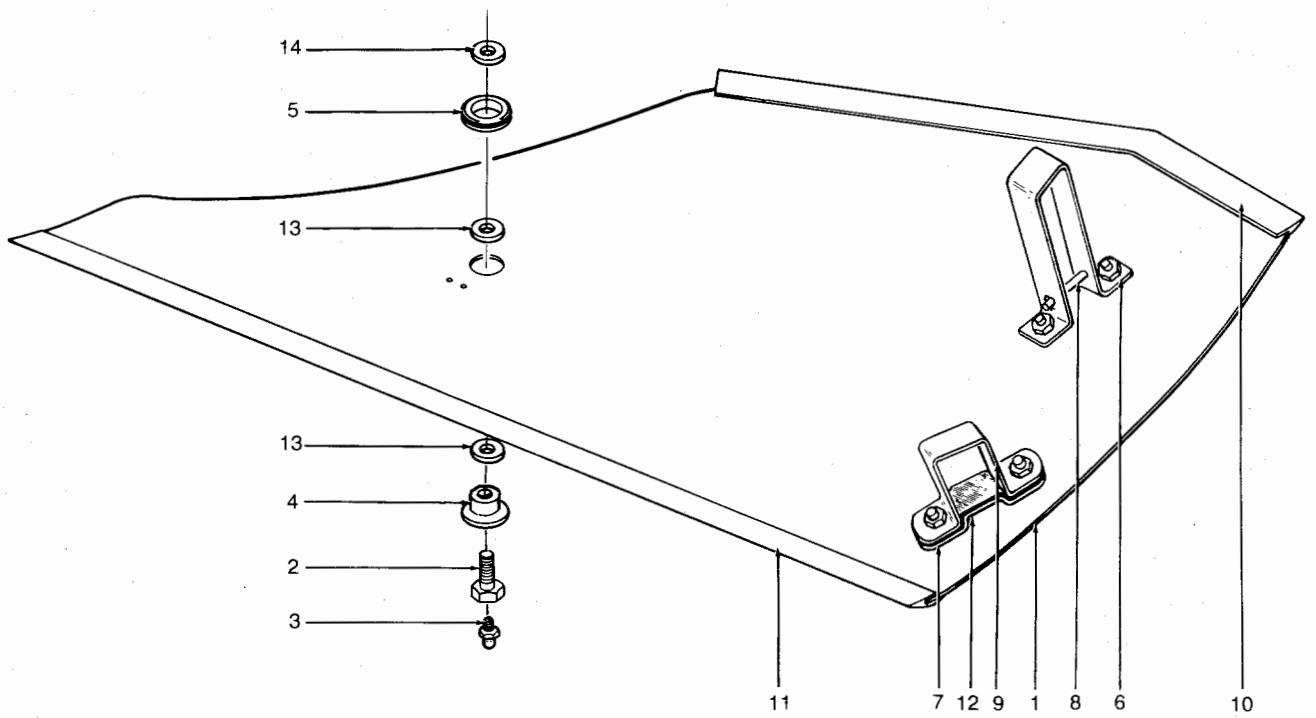
h. Remove the eye bolt (21) from the fork (11) with the springs (22) connected.

i. Disconnect the actuator (23) from the side brace (20) by removing the cotter pin, nut (24), washer (25), and bolt (26).

j. Support the side brace assembly and remove the cotter pin nut (27), washers (28, 29, 30, and 14), bolt (31), and bushing (39), from the side brace attach point.

k. Cut the safety wire and remove the barrel nut (32), washers (33, 34, 35) and countersunk washer (36), bushing (37) and bolt (38).

l. Lower the side brace assembly away from the airplane.



1. MAIN LANDING GEAR DOOR, BONDED ASSEMBLY
2. ATTACH BOLT (WITH TEFLON LOCK, INSTALL WITH LOCTITE 271 – DO NOT USE SAFETY WIRE)
3. GREASE FITTING
4. BUSHING, FLANGED
5. GROMMET
6. BRACKET, AFT
7. RUBBER SHIM (INSTALL BETWEEN BRACKET HALVES AS REQUIRED)
8. CLEVIS PIN (AFT BRACKET ONLY)
9. BRACKET HALF, FWD
10. SEAL, AFT
11. SEAL, FWD
12. BRACKET HALF, FWD
13. WASHER, NYLON
14. WASHER, SPACER

76-204-2

Main Landing Gear Door Installation
Figure 3

MAIN LANDING GEAR SIDE BRACE ASSEMBLY INSTALLATION
(Figure 2)

NOTE

The main landing gear side brace assembly should be checked per MAIN LANDING GEAR SIDE BRACE INSPECTION before installation on the airplane.

a. Carefully position and support the side brace assembly (20), align the bolt holes and install the bolt (38), washers (36 and 35), bushing (37), washers (34 and 33) on the rear side and the bolt (31), washers (28, 29, and 30) and bushing (39) on the forward side.

NOTE

Install the washers (29 and 34) with the coated side towards the side brace.

b. Add washers (30) on the front side and washers (33) on the rear side as necessary to obtain .005 to .025 total clearance or end play.

c. Install the nut (32). Torque the bolt (38) 160 to 200 inch-pounds and lock wire.

d. Install the flat washer (14) and the nut (27). Torque to 480 inch-pounds and tighten the nut to the next castellation to install the cotter pin. Washers P/N AN960-816 or AN960-816L may be added under the nut as required to allow engagement of the cotter pin with the nut castellation. Do not exceed 1100 inch-pounds torque.

e. Position the actuator (23), align the bolt holes with the side brace assembly (20) and install the bolt (26), washer (25), and nut (24). Tighten the nut (24) and install the cotter pin.

f. Install the eye bolt (21) to the fork (11) with the springs (22) connected.

g. Position the lower leg of the side brace assembly (20) to the attaching point on the housing (3) and install the bolt (19), washers (16 and 41), bushing (18), and washer (17) with the coated side towards the side brace.

h. Install the nut and torque to 300 to 350 inch-pounds.

i. Position the upper portion of the shock absorber (6) to the housing (3) and align the bolt holes of the connector (9) and housing (3).

j. Install a maximum of two shims (8) and install the bolts (7 and 13).

k. Break the side brace assembly from the fully locked position and install a .018 shim between the button rest (42) and the "A" frame assembly.

l. Install the downlimit switch and adjust to just actuate (turning the pump and in-transit light off) in this position. Remove the shim.

m. Install Ty-wraps to secure the downlimit switch wires to the side brace.

n. Check the landing gear rigging as indicated in MAIN GEAR RIGGING in 32-30-00.

o. Check that the landing gear circuit breaker is in, and that the emergency landing gear extension valve is closed.

p. Remove the airplane from jacks, remove the tail stand and unfasten the tail tie-down.

MAIN LANDING GEAR SIDE BRACE INSPECTION

a. Fabricate four metal blocks as shown in Figure 4 (if precision ground parallel bars are available, they may be used).

b. Remove the left main landing gear side brace assembly from the airplane as described in MAIN LANDING GEAR SIDE BRACE ASSEMBLY REMOVAL. Do not disassemble the lower brace from the "A" frame weld assembly.

c. Lay the side brace assembly on a flat surface as shown in Figure 5.

NOTE

If a machinist's surface table is not available, a piece of plate glass or a table which has been trued, using an accurate straight edge and accurate leveling device, may be used. Shims may be placed under the blocks as necessary to achieve a trued condition.

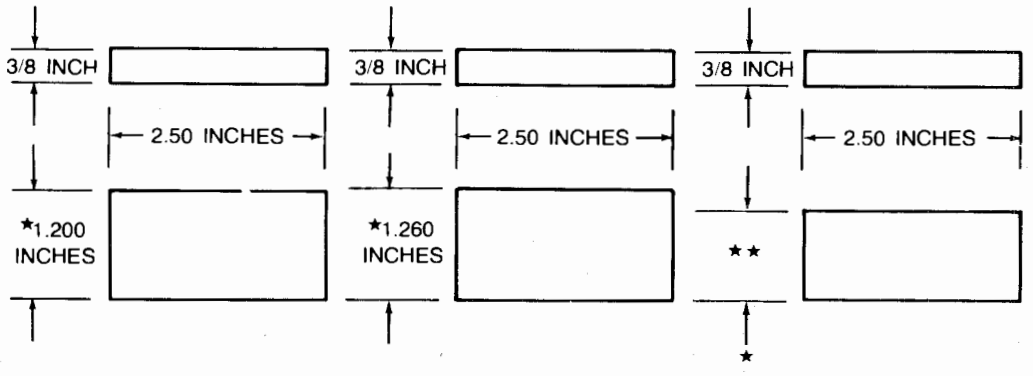
d. Insert the existing 3 NAS mounting bolts and bushings into the respective holes in the side brace assembly (See Figure 5).

e. Place the side brace assembly on the blocks as shown in Figure 5.

f. Rotate the spring pivot upward so it will not contact the table. Press downward on the knee section of the side brace assembly with a force of approximately 2 pounds, and measure the gap between the bushing and block C.

g. Pull upward lightly on the bushing of the knee joint (to remove freeplay), and measure the gap between the bushing and block C.

h. The gap between the bushing and block C should measure between .010 inch and .030 inch. If the gap exceeds this measurement, use a file to remove material (as required) from the inside of the "A" frame assembly where it contacts the button rest on the lower brace. (See Figure 6).



★ ± .003 INCH MUST BE MAINTAINED

★★ 1.00 inch (ME-1 through ME-333)

★★ 0.935 inch (ME-1 through ME-333, which have complied with BEECHCRAFT Service Instruction No. 1145; and ME-334 through ME-437)

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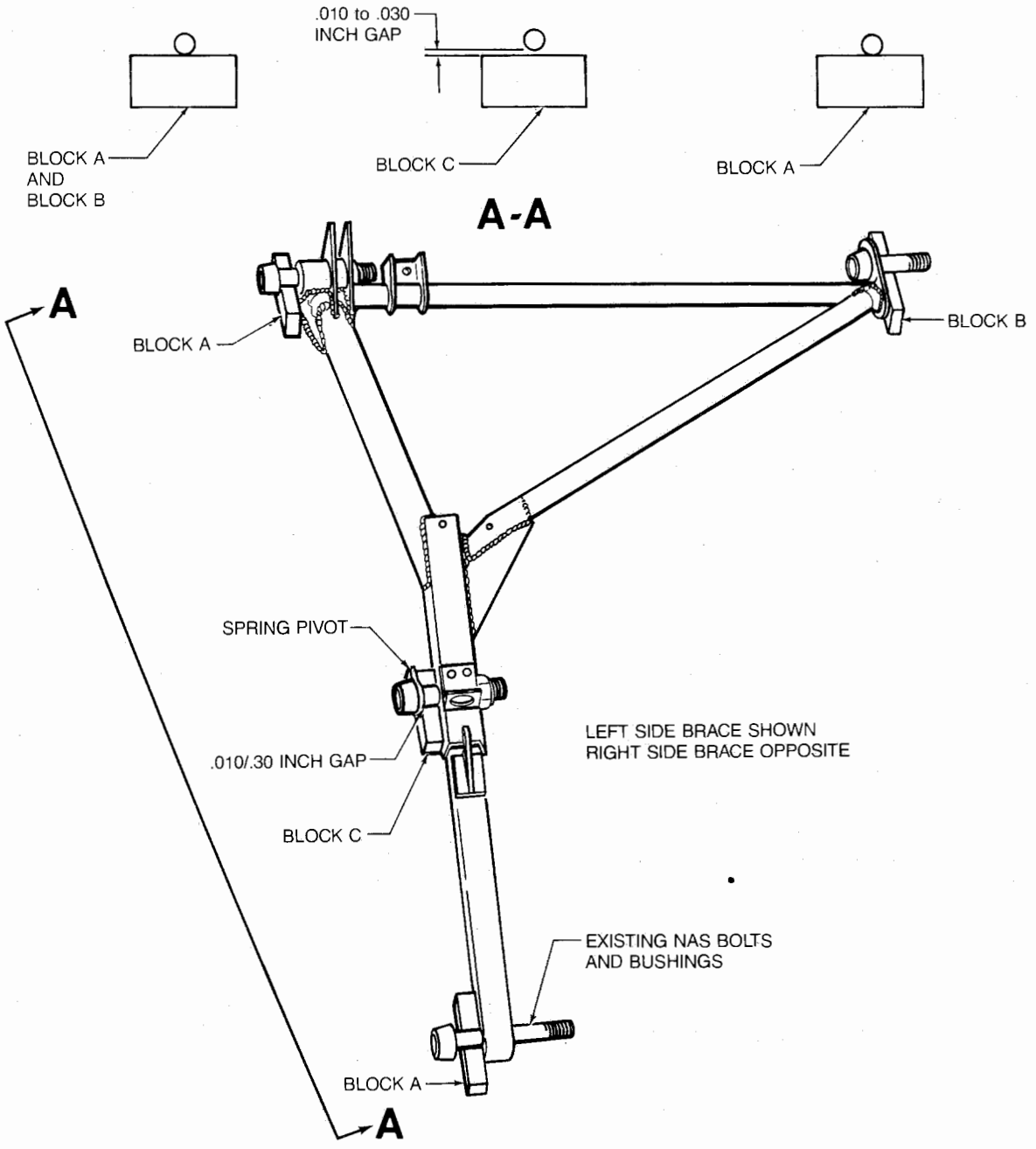
Side Brace Overcenter Check Blocks
Figure 4.

i. If the gap is less than the measurement indicated in Step "h", insert P/N AN960-416L washers (obtain locally) as required under the button rest. Repeat Step "h" as required.

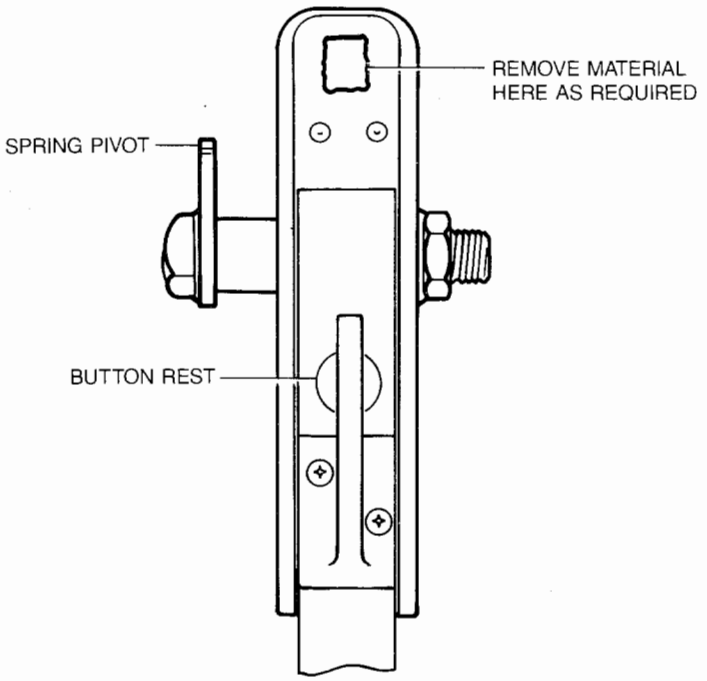
NOTE

Washers may be fabricated from laminated shim stock if required. The button rest is press fitted into the lower brace and may be removed with a drift punch.

j. Install the side brace assembly as instructed in MAIN LANDING GEAR SIDE BRACE ASSEMBLY INSTALLATION.



Side Brace Overcenter Inspection
Figure 5.



Side Brace Knee Joint
Figure 6.

"END"

NOSE GEAR - MAINTENANCE PRACTICES

WARNING

Anytime maintenance is performed on the landing gear system, as a safety precaution, jacks should be placed under the two jack points and a tail tie down used.

NOSE LANDING GEAR SHOCK ABSORBER

WARNING

Do not remove the air valve assembly until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

To check the fluid level in the nose landing gear shock absorber, deflate the strut by releasing the air through the valve and permit the strut to fully compress, then remove the filler valve.

a. With the strut in the vertical position and approximately 1/4 inch from fully compressed, fill with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

b. Fully extend and retract to remove excess air. Refill with hydraulic fluid as described in step "a". Repeat until additional fluid cannot be added with the strut in the compressed position.

c. With the strut extended, install the air valve assembly. Depress the valve core and completely compress to expel excess air and oil.

CAUTION

Do not inflate the strut when the strut is not extended since sudden extension or over-inflation of the strut may bend the torque knees.

d. Depress the valve core and completely extend the strut. While extended, inflate to 250 psig.

LUBRICATION

Lubricate the nose wheel bearings and grease fittings as described under the heading LUBRICATION SCHEDULE in Chapter 12-20-00.

NOSE LANDING GEAR REMOVAL (Figure 1)

When removing the nose landing gear, take care to retain the original adjustments at the rod end fittings to facilitate reassembly.

a. With the airplane on a jack, partially retract the landing gear to release the down lock hooks.

b. Disconnect the steering link at the eye bolt fitting at the top of the landing gear.

c. Disconnect the drag leg at the fitting on the nose gear brace assembly.

d. Remove the nose compartment access plates to gain access to the nose gear pivot bolts.

e. Remove the cotter pin (1), nut (2), washers (3 and 5), bushing (4), and bolt (6), securing the nose gear to the fuselage structure at both sides.

f. Lower the nose gear assembly away from the airplane.

NOSE LANDING GEAR INSTALLATION (Figure 1)

a. Carefully position the nose gear assembly against the nose wheel well structure.

b. Align the bolt holes and install the bushing (4), washers (3), washer (5), bolt (6), nut (2), and cotter pin (1).

NOTE

Use 100951S016YP washers (5), as required per side, to obtain total end clearance of .001 to .017.

c. Install the nose compartment access panels.

d. Connect the drag leg at the fitting on the nose gear brace assembly.

e. Connect the steering link at its eyebolt fitting at the top of the landing gear.

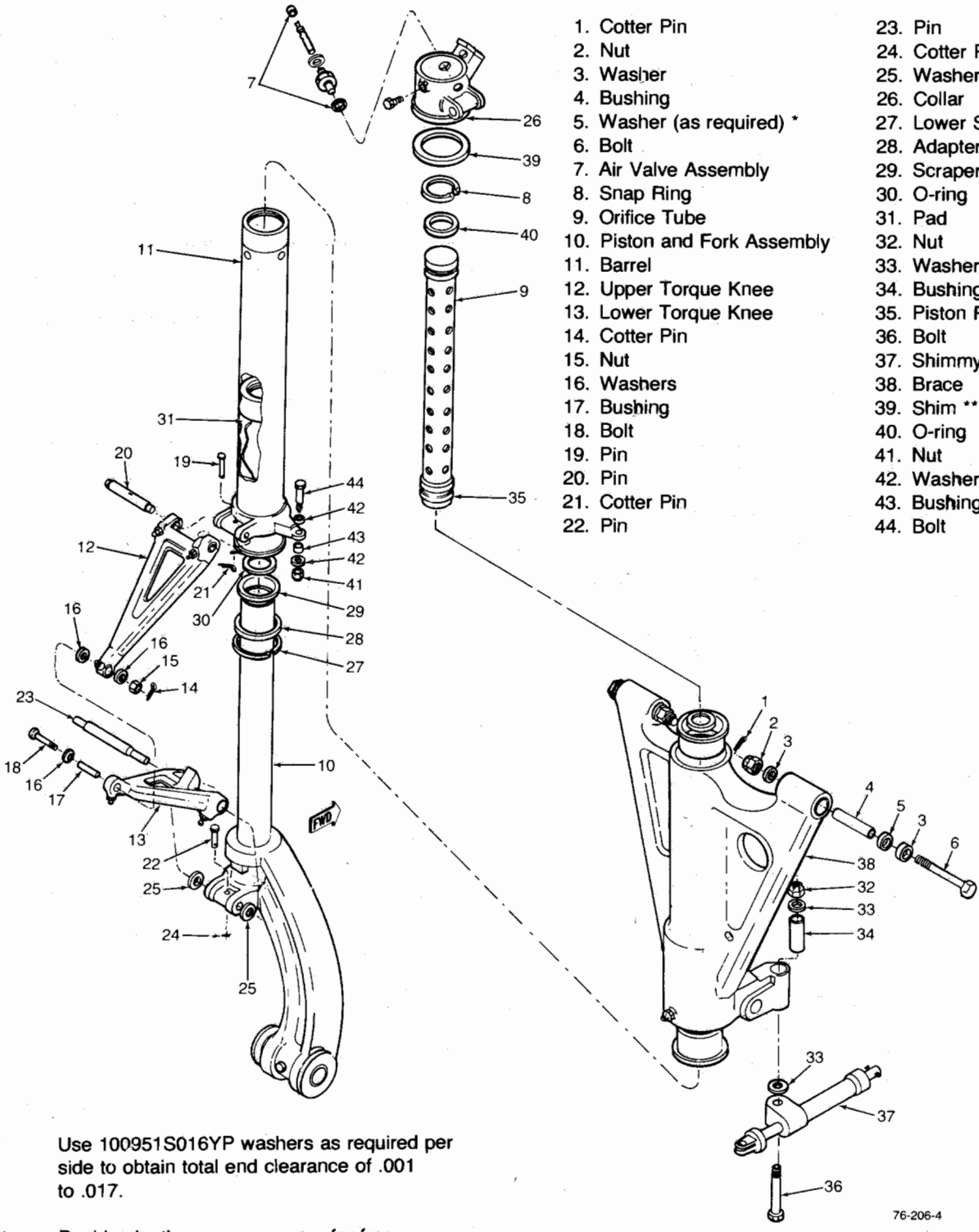
f. Cycle the landing gear and check for proper rigging and nose gear adjustment.

NOSE LANDING GEAR DISASSEMBLY (Figure 1)

WARNING

Do not remove the air valve assembly until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

a. Depress the valve core to deflate the strut and remove the air valve assembly (7).



1. Cotter Pin
2. Nut
3. Washer
4. Bushing
5. Washer (as required) *
6. Bolt
7. Air Valve Assembly
8. Snap Ring
9. Orifice Tube
10. Piston and Fork Assembly
11. Barrel
12. Upper Torque Knee
13. Lower Torque Knee
14. Cotter Pin
15. Nut
16. Washers
17. Bushing
18. Bolt
19. Pin
20. Pin
21. Cotter Pin
22. Pin
23. Pin
24. Cotter Pin
25. Washer
26. Collar
27. Lower Snap Ring
28. Adapter
29. Scraper
30. O-ring
31. Pad
32. Nut
33. Washer
34. Bushing
35. Piston Ring
36. Bolt
37. Shimmy Dampener
38. Brace
39. Shim **
40. O-ring
41. Nut
42. Washer
43. Bushing
44. Bolt

* Use 100951S016YP washers as required per side to obtain total end clearance of .001 to .017.

** Peel laminations as necessary for free operation. Maximum clearance .012.

Nose Gear Assembly
Figure 1

b. Remove the snap ring (8) retaining the orifice tube (9).

c. Retract the piston and fork assembly (10) to push the orifice tube (9) out of the top of the barrel (11).

d. Remove the orifice tube (9). Remove the O-ring (40).

e. Invert the strut and drain out the hydraulic fluid.

WARNING

Do not disconnect the torque knees (12 and 13) without first deflating the strut. The torque knees provide the extension stop for the lower shock absorber assembly and when disconnected, the piston is free to slide out of the barrel assembly.

f. Remove the cotter pin (14), nut (15), washers (16), bushing (17), and bolt (18).

g. Remove the cotter pin (21), and pins (19 and 20), to disconnect the upper torque knee (12).

h. Remove the cotter pin (24), pins (22 and 23), and washers (25), to disconnect the lower torque knee (13).

i. Slide the piston and fork assembly (10) out of the barrel (11). Remove the collar (26) and shim (39).

j. Remove the lower snap ring (27), scraper (29), and adapter (28).

k. Remove the O-ring (30) and remove the pad (31) from inside the barrel (11).

l. Remove the nut (32), washers (33), bushing (34), and bolt (36) attaching the shimmy dampener (37) to the brace (38).

m. Remove the nut (41), washers (42), bushing (43), and bolt (44), to disconnect the shimmy dampener (37) from the nose gear strut.

n. Pull the barrel (11) out of the brace (38).

NOSE LANDING GEAR CLEANING AND PARTS REPLACEMENT

Clean all parts with PD680 solvent (7, Chart 1, 91-00-00). Check all castings for cracks, and pitting, and finished surfaces for scoring, pitting, nicks, cracks, distortion and wear. Replace all damaged or worn parts. Replace all cotter pins, seals, backup rings, and O-rings.

For ease of reassembly, wipe off the cleaning solvent and apply hydraulic fluid (27, Chart 1, 91-00-00) to all friction surfaces.

CHART 1
MANUFACTURING TOLERANCES

Listed below are manufacturing tolerances which will aid in determining the extent of wear.

a.	Piston tube (10)	
	O.D.	1.749 + .0010 −.0005
	I.D.	1.484 ± .002
b.	Orifice tube head (9)	
	O.D.	1.446 to 1.449

NOSE LANDING GEAR ASSEMBLY (Figure 1)

a. Install the barrel (11) in the brace (38).

b. Position the shimmy dampener (37), and install the bushing (34), bolt (36), washers (33), and nut (32).

NOTE

Install the washers (33) above or below the boss, on the brace, to align the shimmy dampener with the lug on the barrel (11).

c. Install the bushing (43), bolt (44), washers (42), and nut (41) to connect the shimmy dampener (37).

d. Saturate the pad (31) with SAE No. 30 oil per MIL-L-2104 before installation. Install the pad (31) in the barrel (11) and install the new O-ring (30) in the bearing at the center of the barrel.

e. Install the adapter (28), scraper (29), and lower snap ring (27).

f. Slide the piston and fork assembly (10) into the barrel (11).

g. Connect the lower torque knee (13) with the pins (22 and 23), washers (25), and cotter pin (24).

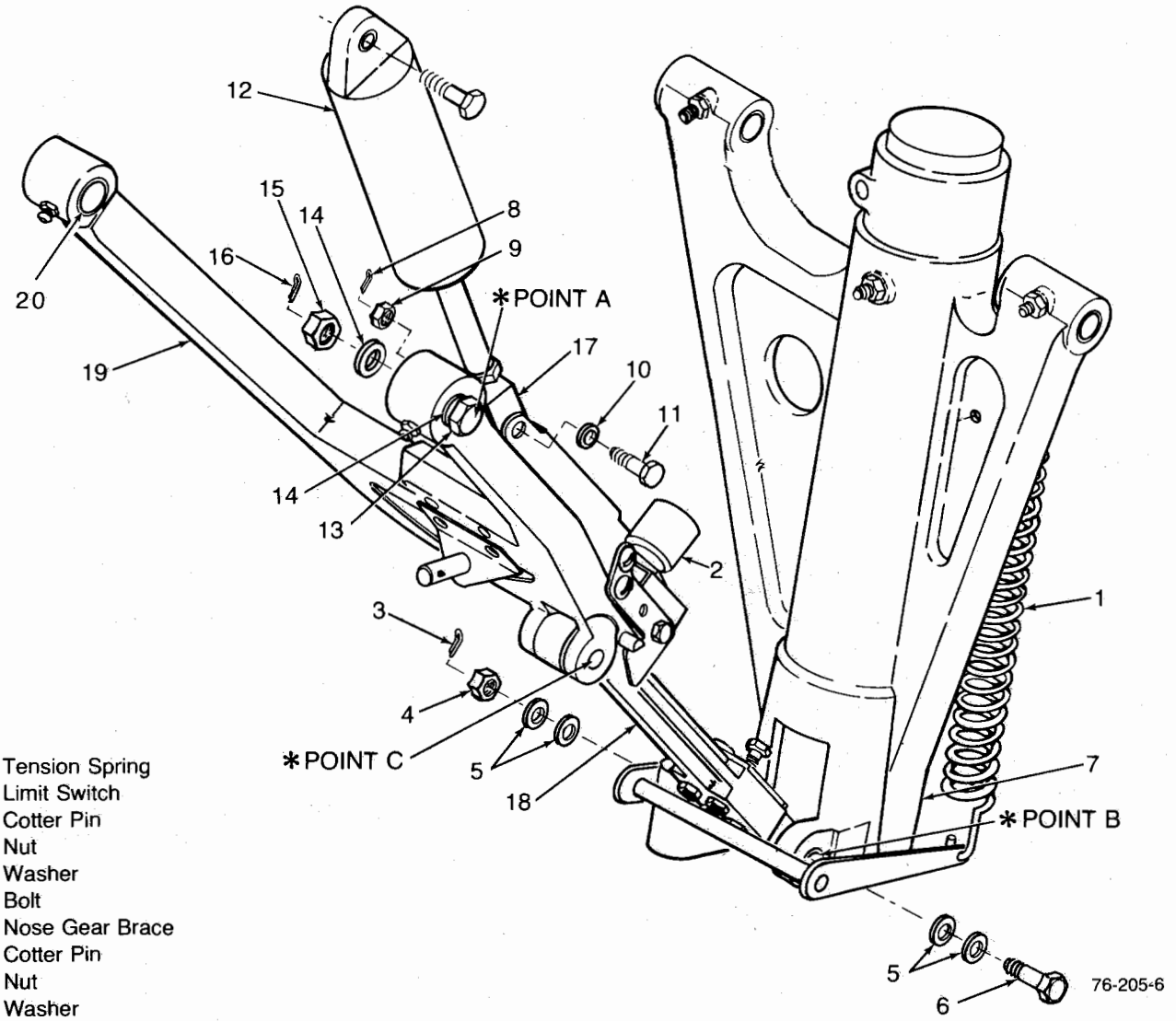
h. Connect the upper torque knee (12) with the pins (19 and 20) and the cotter pin (21).

i. Install the bushing (17), bolt (18), washers (16), nut (15), and cotter pin (14), to connect the upper and lower torque knees.

j. Install the new O-ring (40), and piston ring (35). Install the orifice tube (9) into the barrel (11).

k. Install the snap ring (8) to retain the orifice tube (9).

l. Install the shim (39).



1. Tension Spring
2. Limit Switch
3. Cotter Pin
4. Nut
5. Washer
6. Bolt
7. Nose Gear Brace
8. Cotter Pin
9. Nut
10. Washer
11. Bolt
12. Actuator
13. Bolt
14. Washer
15. Nut
16. Cotter Pin
17. Clevis
18. Lower Drag Leg
19. Upper Drag Brace
20. Grip Bushing

*WITH THE LOWER DRAG LEG (18) AND UPPER DRAG BRACE (19) CLOSED, POINT C MUST FALL .375 + .060 −.030 BELOW A STRAIGHT LINE BETWEEN POINTS A AND B.

Nose Gear Drag Brace Assembly
Figure 2

NOTE

Peel the laminations as necessary for free operation. Maximum clearance .012.

m. Install the collar (26) with two bolts and safety wire.

n. With the strut in the vertical position and approximately 1/4 inch from fully compressed, fill with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00) until overflow.

o. Fully extend and recompress. Refill with hydraulic fluid as described in step "n". Repeat until additional fluid cannot be added with the strut in the compressed position.

p. With the strut extended, install the air valve assembly (7). Depress the valve core and completely compress the strut to expel excess air and oil.

q. To leak test, inflate the strut to approximately 250 psi. Coat the cap and air valve with soap suds to test for leaks.

WARNING

As with all operations involving equipment under high pressure, exercise caution when performing the leak test; avoid the areas directly above and below the strut.

r. Release the air pressure, clean the soap suds off the strut with fresh water and wipe dry.

NOSE GEAR DRAG BRACE REMOVAL (Figure 2)

a. With the airplane on jacks, remove the tension springs (1). Partially retract the landing gear to release the downlock hooks.

b. Remove the clamps securing the wiring to the drag brace and remove the nose gear limit switch (2).

c. Remove the cotter pin (3), nut (4), washers (5), and bolt (6), which attach the nose gear drag brace assembly to the lower end of the nose gear brace (7).

NOTE

When disconnecting the actuator, take care to retain the original adjustment at the clevis fitting (17) at the actuator.

d. Remove the cotter pin (8), nut (9), washer (10), and bolt (11) to disconnect the actuator (12).

e. Remove the access panel in the nose compartment floor to gain access to the nose gear drag brace upper LH and RH attaching bolts.

f. Remove the cotter pin (16), nut (15), washers (14), bolt (13), and grip bushing (20), at the LH and RH side, to disconnect the nose gear drag brace from the airplane.

NOSE GEAR DRAG BRACE INSTALLATION (Figure 2)

a. Position the nose gear drag brace to the upper LH and upper RH attachment points and install the grip bushing (20), bolt (13), washer (14), nut (15), and cotter pin (16).

NOTE

Use AN960-616 and AN960-616L washers as required to obtain .001 to .034 total end play. Minimum of one .063 washer required two places.

b. Connect the actuator (12) by installing the bolt (11), washer (10), nut (9), and cotter pin (8).

c. Connect the drag brace assembly to the lower end of the nose gear brace (7), using the bolt (6), washers (5), nut (4), and cotter pin (3).

d. Install the nose gear limit switch (2) and the clamps securing the wiring to the drag brace.

e. Connect the nose gear tension springs (1) to the lower drag brace assembly.

NOSE GEAR DRAG BRACE DISASSEMBLY (Figure 3)

a. Remove the bolts (1), and washers (2), to remove the limit switch bracket (4) from the drag brace assembly.

b. Cut the safety wire and remove the jam nut (5), attaching the nose gear limit switch (3) to the limit switch bracket (4).

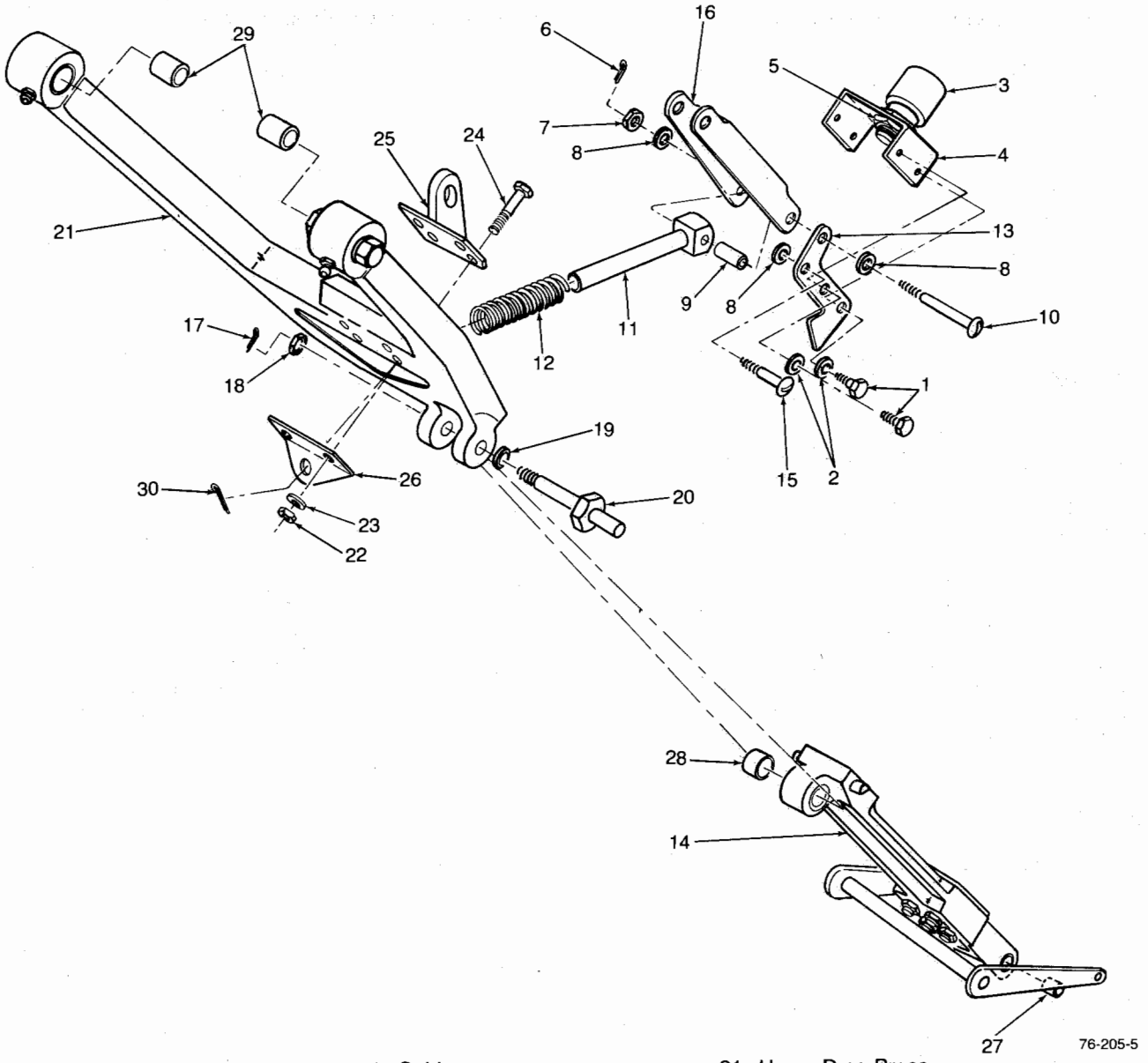
c. Remove the nut (22), washer (23), and bolt (24), and remove the lug (25), and bracket (26), from the upper drag brace (21).

d. Remove the cotter pin (6), nut (7), washers (8), spacer (9) and bolt (10) to disconnect the guide (11), spring (12), and link (16).

e. Remove the hook (13), from the lower drag leg (14), at each side, by removing the cotter pin, nut, washers, and bolt (15).

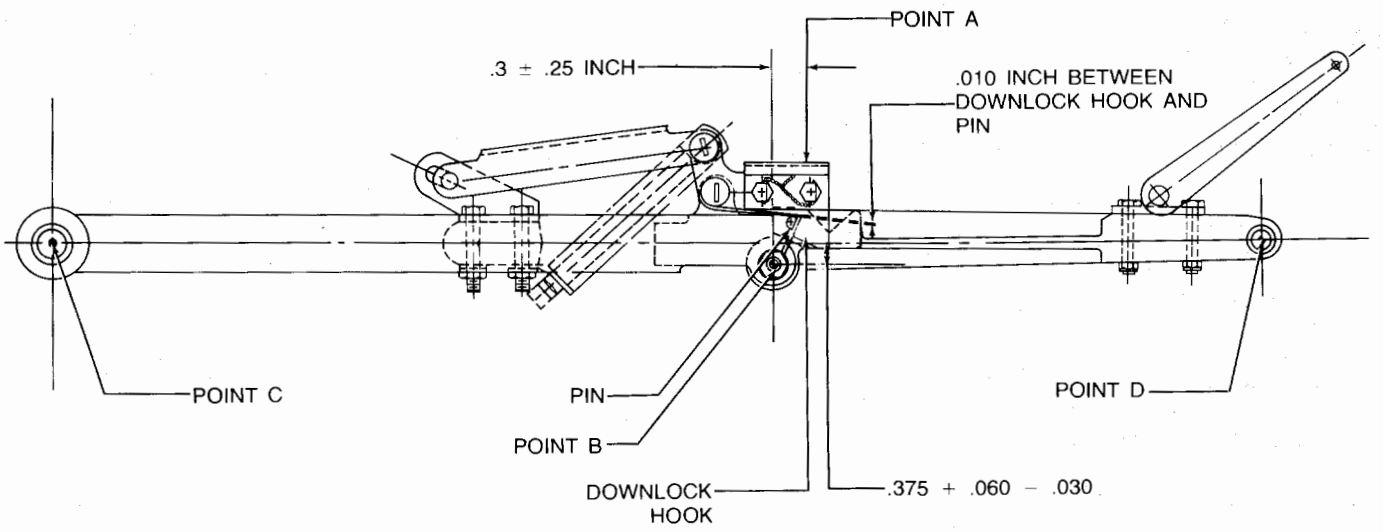
f. Remove the cotter pin (17), nut (18), washer (19), and pin (20), securing the lower drag leg (14), and upper drag brace (21).

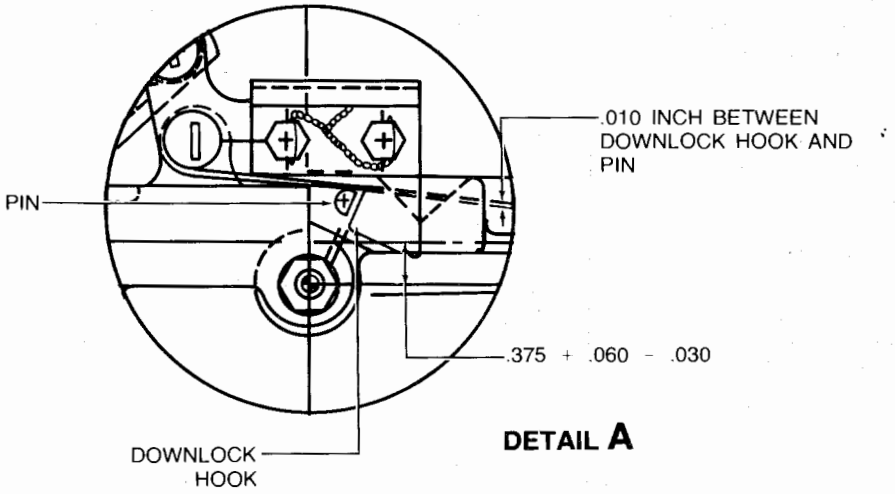
g. Compress the spring (12) to remove the cotter pin (30), bracket (26), and spring from the guide (11).



1. Bolt
2. Washer
3. Limit Switch
4. Limit Switch Bracket
5. Jam Nut
6. Cotter Pin
7. Nut
8. Washer
9. Spacer
10. Bolt
11. Guide
12. Spring
13. Hook
14. Lower Drag Leg
15. Bolt
16. Link
17. Cotter Pin
18. Nut
19. Washer
20. Pin
21. Upper Drag Brace
22. Nut
23. Washer
24. Bolt
25. Lug
26. Bracket
27. Bushing
28. Bushing
29. Bushing
30. Cotter Pin

Nose Gear Drag Brace Assembly
Figure 3 (1 of 2 sheets)





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Nose Gear Drag Brace Assembly
Figure 3 (1 of 2 sheets)

NOSE GEAR DRAG BRACE CLEANING AND PARTS REPLACEMENT
(Figure 3)

Clean all parts with PD680 solvent (7, Chart 1, 91-00-00). Inspect the lower drag leg (14) and upper drag brace (21) for cracks, nicks, and distortion, especially at the bushings and pivot points. Check for excessive wear in accordance with the manufacturing tolerances and wear limits designated in MANUFACTURING TOLERANCES in Chart 2. Replace all damaged or worn parts. Replace all cotter pins.

When replacing bushings, at the attachment lugs on the lower drag leg (14), or upper drag brace (22), install with locktite (28, Chart 1, 91-00-00).

NOSE GEAR DRAG BRACE ASSEMBLY
(Figure 3)

a. Assemble the guide (11), spring (12), bracket (26), and cotter pin (30).

b. Position the lower drag leg (14), and the upper drag brace (21), and secure with the pin (20), washer (19), nut (18), and cotter pin (17).

c. Position the hooks (13), on each side of the lower drag leg (14), and install the bolt (15), washers, nut, and cotter pin. Install one washer each between hooks and drag brace (21).

d. Position the spring guide (11), between the lugs on link (16), and secure with the bolt (10), spacer (9), washer (8), nut (7), and cotter pin (6).

e. Install the lug (25), and bracket (26), on the upper drag brace (21), with the bolts (24), washers (23), and nuts (22).

f. Attach the nose gear limit switch (3), to the limit switch bracket (4), with the jam nut (5), and safety wire.

g. Install the limit switch bracket (4), to the drag brace assembly with the bolt (1), and washer (2).

h. With the drag leg and brace assembly in the extended position, check for minimum clearance of .010 inch between the downlock hook and the pin on the lower drag leg.

i. With the leg assembly and brace assembly closed as shown in Figure 2, apply 5 pounds pressure downward at point C. The center of the bolt at point C should drop .375 + .060 - .030 inches below a line drawn from point A to point B.

CHART 2
MANUFACTURING TOLERANCES

Listed below are manufacturing tolerances which will aid in determining the extent of wear. Refer to the illustration, Nose Gear Brace Assembly, Figure 3, for index numbers.

a. Bushing (27)

O.D.	.5013 + .0000 - .0007
I.D.	.375 + .0015 - .0000

b. Bushing (28)

O.D.	.6265 + .0000 - .0008
I.D.	.500 + .0015 - .0000

c. Bushing (29)

O.D.	.6265 + .0000 - .0008
I.D.	.500 + .0015 - .0000

d. Upper Drag Brace (21) Attach Points (Upper)

Hole Diameter	.6265 - .6280

e. Lower Drag Leg (14) Attach Point (Lower)

Hole Diameter	.5013 - .5028

f. Lower Drag Leg (14) Attach Point for the Drag Brace/Drag Leg

NOSE GEAR ACTUATOR ADJUSTMENT

a. Adjust the cylinder with the landing gear extended and the downlock latched.

b. Extend the cylinder rod until the piston bottoms out in the cylinder and, while in this position, adjust the clevis so that the attaching bolt will barely install in the bottom end of the slot in the lift lug.

c. From this position, unscrew the clevis one full turn and torque the jam nut to retain.

d. Complete the installation of the bolt through the link, clevis, and lug.

NOSE GEAR SHIMMY DAMPER REMOVAL
(Figure 1)

a. Remove the nut (32), washers (33), bushing (34), and bolt (36), which attach the shimmy damper (37) to the brace (38).

b. Remove the nut (41), washers (42), bushing (43), and bolt (44), to disconnect the shimmy damper (37) from the nose gear strut.

NOSE GEAR SHIMMY DAMPER INSTALLATION
(Figure 1)

a. Position the shimmy damper (37), and install the bushing (34), bolt (36), washers (33), and nut (32). Install washers (33) above or below the boss on the casting as

necessary to align piston rod with the lug on the barrel.

b. Install the bushing (43), bolt (44), washers (42), and nut (41), to connect the shimmy damper (37).

c. Swivel the nose wheel to check the turning radius of the strut and for freedom of movement without binding or rough spots. Adjust the nose gear steering travel adjustment bolts to stop shimmy damper piston 1/32 inch to 1/4 inch from maximum travel in both directions.

NOSE GEAR SHIMMY DAMPER DISASSEMBLY (Figure 4)

a. Remove cotter pin (8), washer (7), internal retainer ring (1), and the piston scraper ring (2). Force the barrel end (3) out of the barrel by working the piston back and forth. Remove the O-rings (4) from the barrel end.

b. Remove all remaining hydraulic fluid from the shimmy dampener.

c. Remove the snap ring (5) and slide the piston rod (6) and attaching parts out of the barrel.

d. Remove the washer and compression spring (9).

e. Remove the floating pistion (10) with a 6-32 screw and remove the O-ring (11).

f. Insert a long 6-32 screw into the hole at the clevis end of the piston and engage the floating piston (12). Maintain tension on the floating piston while driving out the piston retaining pin (13).

g. Release the floating piston slowly and push it out the open end of the piston rod and remove the O-ring (14).

h. Remove the remaining compression spring (15) from the rod and slide the piston (16) off the piston rod. Remove the O-rings (17) from the piston and the O-rings (20) from the barrel end (18).

i. Remove the barrel end (18) and the scraper ring (19) from the piston rod.

NOSE GEAR SHIMMY DAMPER CLEANING AND PARTS REPLACEMENT

Clean all parts with cleaning solvent PD680 (7, Chart 1, 91-00-00). Check all parts for cracks, pitting, scoring, nicks, corrosion, distortion and wear. Chart 3 lists manufacturing tolerances to aid in determining the extent of wear. Replace all damaged and excessively worn parts. Replace all O-rings.

CAUTION

For replacement, use O-rings approved for use with mineral base hydraulic fluid.

Lubricate all parts with hydraulic fluid MIL-H-5606 (27, Chart 1, 91-00-00) prior to assembly.

CHART 3
MANUFACTURING TOLERANCES

a.	Barrel (21)		
	I.D.	(minimum)	.860 in.
		(maximum)	.862 in.
b.	Piston (16)		
	O.D.	(minimum)	.853 in.
		(maximum)	.857 in.
c.	Piston Rod (6)		
	O.D.	(minimum)	.3735 in.
		(maximum)	.3745 in.
	I.D.	(minimum)	.246 in.
		(maximum)	.250 in.
d.	Floating Piston (12)		
	O.D.	(minimum)	.235 in.
		(maximum)	.240 in.
e.	Barrel End (3)		
	O.D.	(minimum)	.853 in.
		(maximum)	.857 in.
	I.D.	(minimum)	.376 in.
		(maximum)	.377 in.

NOSE GEAR SHIMMY DAMPER ASSEMBLY (Figure 4)

a. Replace the O-rings (20) on the barrel end (18). Slide the scraper ring (19) and barrel end on the piston rod (6)

b. Replace the O-ring (14) on the forward floating piston (12) and insert the compression spring (15) and the floating piston into the piston rod (6). With a long 6-32 screw, engage the floating piston (12) and pull it toward the clevis end of the piston rod to compress the compression spring (15) until the piston retaining pin (13) can be inserted.

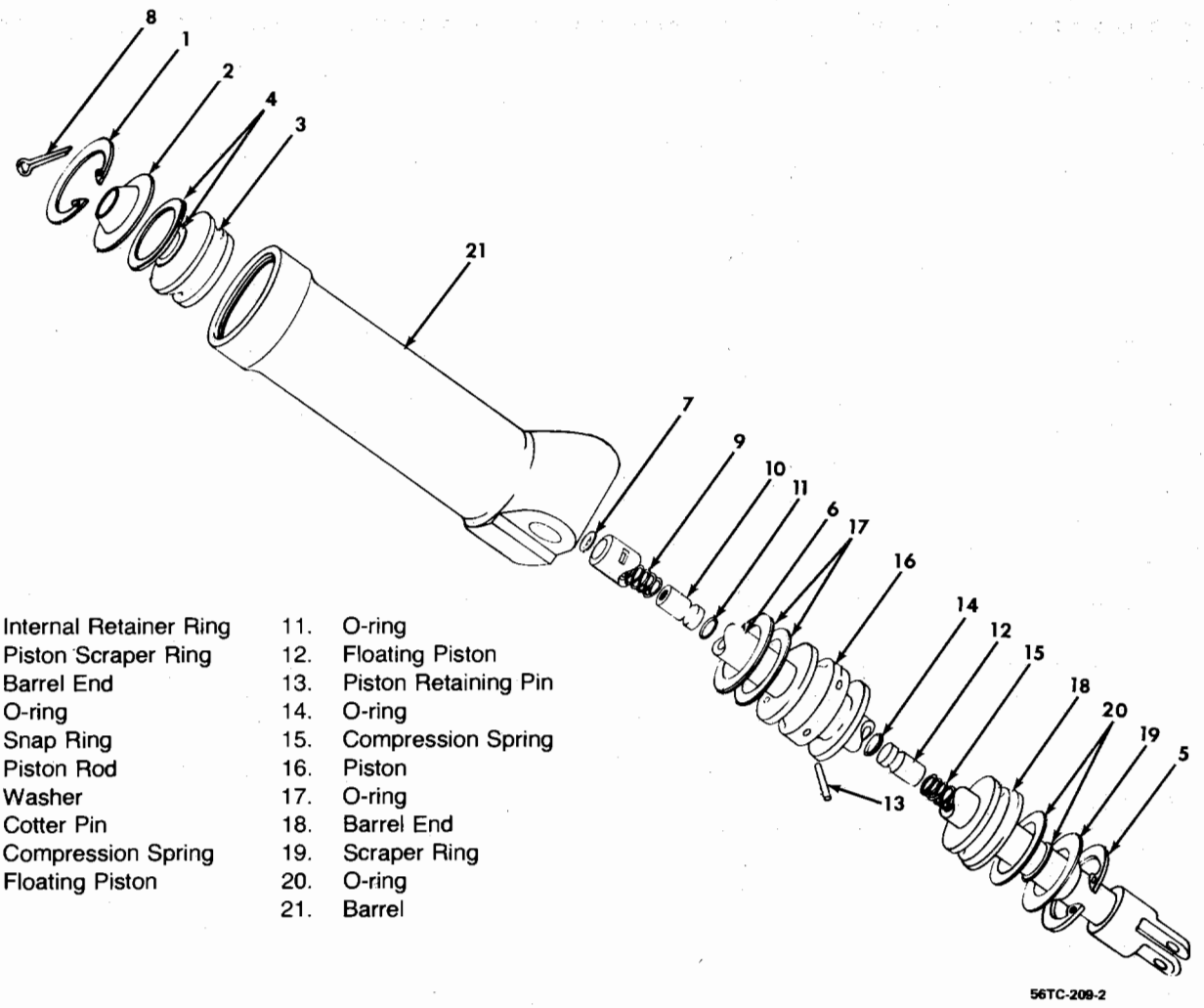
c. Place the piston (16) on the piston rod and insert the retaining pin. Replace the O-rings (17) on the damper piston.

d. Insert the piston rod assembly into the barrel (21) and place the snap ring (5) into position.

e. Place the damper in a vise with the open end up and fill the barrel and piston with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00). Work the piston rod up and down until bubbles stop appearing in the fluid, then refill the barrel and the piston rod.

f. Replace the O-rings in the other barrel end (3), and O-ring (11) on the floating piston (10) and insert the barrel end and the piston scraper ring (2) into the barrel (21) and secure them with the internal retainer ring (1).

g. Engage the floating piston (12) with the 6-32 long screw and pull forward. At the same time, insert the floating piston (10) and compression spring (9) and push



1. Internal Retainer Ring
2. Piston Scraper Ring
3. Barrel End
4. O-ring
5. Snap Ring
6. Piston Rod
7. Washer
8. Cotter Pin
9. Compression Spring
10. Floating Piston
11. O-ring
12. Floating Piston
13. Piston Retaining Pin
14. O-ring
15. Compression Spring
16. Piston
17. O-ring
18. Barrel End
19. Scraper Ring
20. O-ring
21. Barrel

Shimmy Damper
Figure 4

down. The piston will follow the fluid down and prevent the entry of air into the rod assembly. Secure the spring and piston with the washer (7) and the cotter pin (8). To check the fluid level in the shimmy damper, spread the postion of the cotter pin within the piston rod and insert a 1/16" diameter or less wire through the hole in the washer at the aft end of the piston rod until the wire touches the bottom of the hole in the floating piston. If the wire enters the piston rod over 2-3/8 inches, remove the floating piston and add MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

"END"

EXTENSION AND RETRACTION - MAINTENANCE PRACTICES

LUBRICATION

Lubricate the landing gear retract system as detailed in the Lubrication Chart in Chapter 12-20-00.

MAIN LANDING GEAR ACTUATOR CYLINDER REMOVAL

a. Place the airplane on jacks, using the jack pads and a support under the tail.

b. Remove the bolt at the inboard end of the drag link (side brace).

CAUTION

The landing gear circuit breaker should be pulled and the emergency gear extension valve should be open to relieve pressure in the hydraulic system when work is to be accomplished on the landing gear system.

c. Tag the hoses prior to disconnecting to ensure proper placement during installation. Disconnect the hydraulic hoses from the main gear actuator cylinder.

d. Remove the bolt at the outboard end of the actuator cylinder and remove the cylinder.

MAIN LANDING GEAR ACTUATOR CYLINDER INSTALLATION

a. Attach the cylinder to the inboard end of the drag link (side brace) using the attaching bolts, nut, and cotter pin.

b. Retract the cylinder rod until the piston bottoms out in the cylinder. While in this position adjust the rod end so that the bolt will insert through the rod end and landing gear housing casting. From this position, screw the rod end in two complete turns to shorten the rod and tighten the jam nut to retain this setting. Complete the installation of the bolt and nut through the rod end and landing gear casting.

c. Connect the hydraulic lines to the main gear actuator cylinder.

NOTE

Any time the hydraulic system is opened (line disconnected etc.) the system must be bled to purge any air from the system.

d. Bleed the hydraulic system as described in BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION CHECK in this chapter.

e. Remove the airplane from the jacks.

NOSE LANDING GEAR ACTUATOR CYLINDER REMOVAL

a. Place the airplane on jacks using the jack pads and a support under the tail.

b. Disconnect the hydraulic lines from the nose gear actuator cylinder. Tag the lines to ensure proper placement during installation.

NOTE

Any time the hydraulic system is opened (line disconnected, etc.) the system must be bled to purge any air from the system.

c. Remove the attaching bolts, washers and nuts, and remove the nose gear actuator cylinder from the airplane.

NOSE LANDING GEAR ACTUATOR CYLINDER INSTALLATION

a. Connect the cylinder end of the actuator to the bracket in the nose wheel well at F S 36.41 using the attaching bolt, nut, and washers and grip bushing.

b. With the gear extended and the downlock latched, extend the cylinder rod until the piston bottoms out in the cylinder. While in this position adjust the clevis so that the attaching bolt will barely install in the bottom end of the slot in the left lug. From this position, unscrew the clevis one full turn and torque the jam nut to retain. Complete installation of the bolt through the link, clevis, and lug.

c. Install the hydraulic lines on the actuator cylinder. Ensure that the lines are connected correctly.

NOTE

Any time the hydraulic system is opened (line disconnected, etc.) the system must be bled to purge any air from the system.

d. Bleed the hydraulic system as described in BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION CHECK in this chapter.

e. Remove the airplane from the jacks.

HYDRAULIC PUMP REMOVAL

a. Place the airplane on jacks, using the jack pads and a support under the tail.

b. Remove the aft cabin bulkhead.

NOTE

In order to minimize fluid spillage and air in the system, all lines and pump fittings should be capped immediately upon being disconnected.

NOTE

Any time the hydraulic system is opened (line disconnected, etc.) the system must be bled to purge any air from the system.

c. Tag the hydraulic lines prior to disconnecting to ensure correct installation. Disconnect the hydraulic lines from the pump.

d. Tag the electrical wires prior to disconnecting to ensure correct installation. Disconnect the ground wire from the airframe and break the two electrical wires at the splices.

e. Remove the bolts that secure the pump to the airplane.

f. Remove the hydraulic pump from the airplane.

HYDRAULIC PUMP INSTALLATION

a. Install the hydraulic pump in the airplane using the attaching bolts.

b. Splice the electrical wires together, taking care to connect the wires correctly.

c. Connect the ground wire to the airframe using the attaching nut and bolt.

NOTE

Any time the hydraulic system is opened (line disconnected etc.) the system must be bled to purge any air from the system.

d. Connect the hydraulic lines to the pump, taking care to place the lines correctly.

e. Bleed the hydraulic system as described in BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION TEST in this chapter.

f. Install the aft cabin bulkhead.

g. Remove the airplane from the jacks.

BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION TEST

a. Place the airplane on jacks, using the jack pads and a support under the tail.

b. Connect an external power supply to the airplane as described in Chapter 24-40-00 under the heading EXTERNAL POWER.

c. Install a test airspeed indicator at the pitot tube, or use the ship airspeed indicator.

d. Ensure that the emergency landing gear extension valve is in the CLOSED position and fill the pump reservoir with clean MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

e. Turn the BATTERY switch to ON.

f. Apply low pressure to the pitot tube until the airspeed indicator reads 59 to 63 kts and close the vent valve to maintain reading.

NOTE

The landing gear should cycle at this airspeed reading. If not, the gear down safety diaphragm switch is out of adjustment.

g. Cycle the landing gear through three complete cycles (one cycle consists of a retraction and extension).

h. With the landing gear in the UP position, place a support under the gear and crack the "B" nuts on the retract side of each main and nose gear retract cylinder and permit hydraulic fluid to escape until clear of air.

NOTE

It will be necessary during bleed operations to fill the pump assembly reservoir periodically. The pump will perform erratically if the fluid level is too low.

i. Retorque the "B" nuts at the cylinders.

j. Extend the landing gear and turn the BATTERY switch to OFF.

k. Install a 0 - 3000 PSI gauge in the gear retract line.

l. Turn the BATTERY switch to ON.

m. Retract the landing gear. The pressure reading on the gauge should be 1550 PSI ± 100 PSI. If not, the pressure switch is faulty and should be replaced or adjusted prior to proceeding.

1. Leave the gear retracted for approximately 45 minutes. Pressure should not bleed off. Failure to maintain pressure indicates a leak in the system.

NOTE

Changes in temperature, such as from opening a hangar door in winter, may cause pressure to rise or fall as much as 200 PSI.

2. If no leaks exist, proceed to step "n".

3. If pressure did not hold, check the system visually for any sign of hydraulic fluid around "B" nuts, fittings, actuator rods and end caps, or the emergency extend valve. Due to the fact that hydraulic fluid virtually does not compress, even slight wetness near a fitting or O-ring should make it suspect. Repair any leaking fittings as described under HYDRAULIC FITTING LEAK REPAIR PROCEDURE. Replace O-rings in any hydraulic cylinder showing signs of a leak, or replace the cylinder as necessary. Repeat step "m" "1".

4. After repairing any external leaks, if pressure still does not hold, isolate the pump from the system with a 0 - 3000 PSI gauge on the pump retract fitting. Put the gear switch in the UP position and check pump pressure for 1550 PSI ± 100 PSI. If pressure does not hold, and there are no external leaks, the pump retract check valve is leaking. The pump gear case assembly or the entire pump assembly must be replaced.

5. If the pump holds pressure, then isolate the nose and main gear actuator cylinders, and the emergency extend valve from the system, and pressure check the retract side of each component to 1550 PSI ± 100 PSI, using a hand hydraulic pump with a 0 - 3000 PSI gauge in the line. Repair or replace as necessary any leaking component, and repeat leak test. Reconnect all system components and repeat step "m" "1".

NOTE

If the emergency extend valve has been removed, the flow arrow on the valve MUST point outboard when reinstalling the valve, or damage to valve packing will result.

n. Extend the landing gear, turn the BATTERY switch to OFF, and remove the 0 - 3000 PSI gauge from the retract line.

o. Turn the BATTERY switch to ON and repeat steps "h" and "i".

p. With the landing gear extended, activate the gear motor by pushing up on either the right or left main gear drag brace knee until it is out of the over-center position.

NOTE

The pump will cycle on and remain on as long as the drag brace is held in this position.

q. Crack the "B" nut on the extend side of the main gear retract cylinders and the extend side of the nose gear retract cylinder and allow hydraulic fluid to bleed until clear.

r. Release the drag brace and the motor will stop operating.

s. After retorquing the "B" nuts, wipe them dry and check for extend system leaks by breaking either main gear side brace out of over-center position and allowing the pump to build up pressure in the system. Repair any leaking fittings as described under HYDRAULIC FITTING LEAK REPAIR PROCEDURE.

t. Fill the reservoir to within ⅜" to ½" of fill port with clean MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00). Cycle the landing gear six complete cycles and check the retract time.

NOTE

Filling above the recommended level may cause excess fluid to vent during emergency extension.

NOTE

If the landing gear does not retract in eleven seconds maximum, repeat the bleeding procedure in steps "h" and "i".

u. Remove the external power from the airplane.

v. Remove the airplane from the jacks.

HYDRAULIC FITTING LEAK REPAIR PROCEDURE

CAUTION

Restrict pressure to 1650 PSI unless one end of the main gear actuator is disconnected from the landing gear.

a. Ensure the hydraulic system pressure has been bled off.

b. Loosen the "B" nut(s) that are leaking and install an AP50A-4-¼ fitting seal (P/N of Airdrome).

c. Retorque to 40 inch-pounds minimum to 65 inch-pounds maximum.

NOTE

Excess torque to stop a leak is not permitted.

d. Repressureize the system with a hand pump and observe the "B" nut(s) that were leaking. If the "B" nut(s) still leak, complete the following steps "e" through "k".

e. Remove the hydraulic line with "B" nut(s) that continue to leak.

f. Replace any lines that have cracked flares - or cut flares off and reflare if the line has sufficient length.

g. Using emery cloth, polish flares to remove nicks and burrs on all reflared lines. All new or reworked lines must be cleaned with trichloroethane (31, Chart 1, 91-00-00) or methyl ethyl ketone (23, Chart 1, 91-00-00) before installation.

h. Drying may be accelerated using low pressure, clean, filtered air or nitrogen, per BB-N-411.

i. Reinstall the hydraulic lines and remove the identification tags.

j. If the repaired lines continue to leak, replace with new lines and fittings, repeating steps "f", "g", and "h".

NOTE

Anytime the hydraulic system is opened (line disconnected, etc.), the system must be bled to purge any air from the system as described in this Chapter under the heading BLEEDING THE HYDRAULIC SYSTEM AND RETRACTION TEST.

LANDING GEAR EMERGENCY EXTENSION SYSTEM

In the event that the normal actuation switch fails, emergency extension of the gear is accomplished by turning the handle on the dump valve, located on the floor in front of the pilot's seat, 90° counterclockwise. This provides a hydraulic bypass between the retract side and the extend side of the landing gear system and allows the gear to fall free into the down and locked position.

LANDING GEAR RIGGING

NOTE

Read the entire rigging procedure before attempting to rig the landing gear system. Physically locate each item as you read the procedure.

Repeated cycling of the landing gear may drain the battery, therefore, an auxiliary power unit is recommended.

Whenever the landing gear mechanism is removed or disconnected, the landing gear should be checked to see that the system is properly rigged.

CAUTION

After making an adjustment to the gear, operate the landing gear intermittently as the system nears the limits of the retraction/extension cycle to prevent damage due to overtravel.

CAUTION

Prior to jacking the airplane, ensure that an unbalanced condition does not exist. Fuel should be distributed evenly in both wings to prevent an unbalanced condition which could cause the airplane to be unstable while on jacks.

MAIN GEAR RIGGING

CAUTION

When rigging or adjusting ANY gear, be sure to jack the airplane insuring that ALL THREE wheels are off the floor.

a. Place the airplane on jacks. Allow adequate floor clearance for wheels during retraction or extension.

b. Ensure that the BATTERY and ALT switches are in the OFF position and that the landing gear circuit breaker is pulled.

c. Fully extend the gear and remove the necessary access panels. Open the emergency extend valve.

d. Remove the attaching bolt from the piston end of the main landing gear actuating cylinder.

e. Retract the cylinder rod until the piston bottoms out in the cylinder. Adjust the cylinder rod end so that the attaching bolt will insert through the rod end and gear housing casting.

f. Screw the rod end in two complete turns to shorten the rod. Torque the jam nut to secure the rod end in this position.

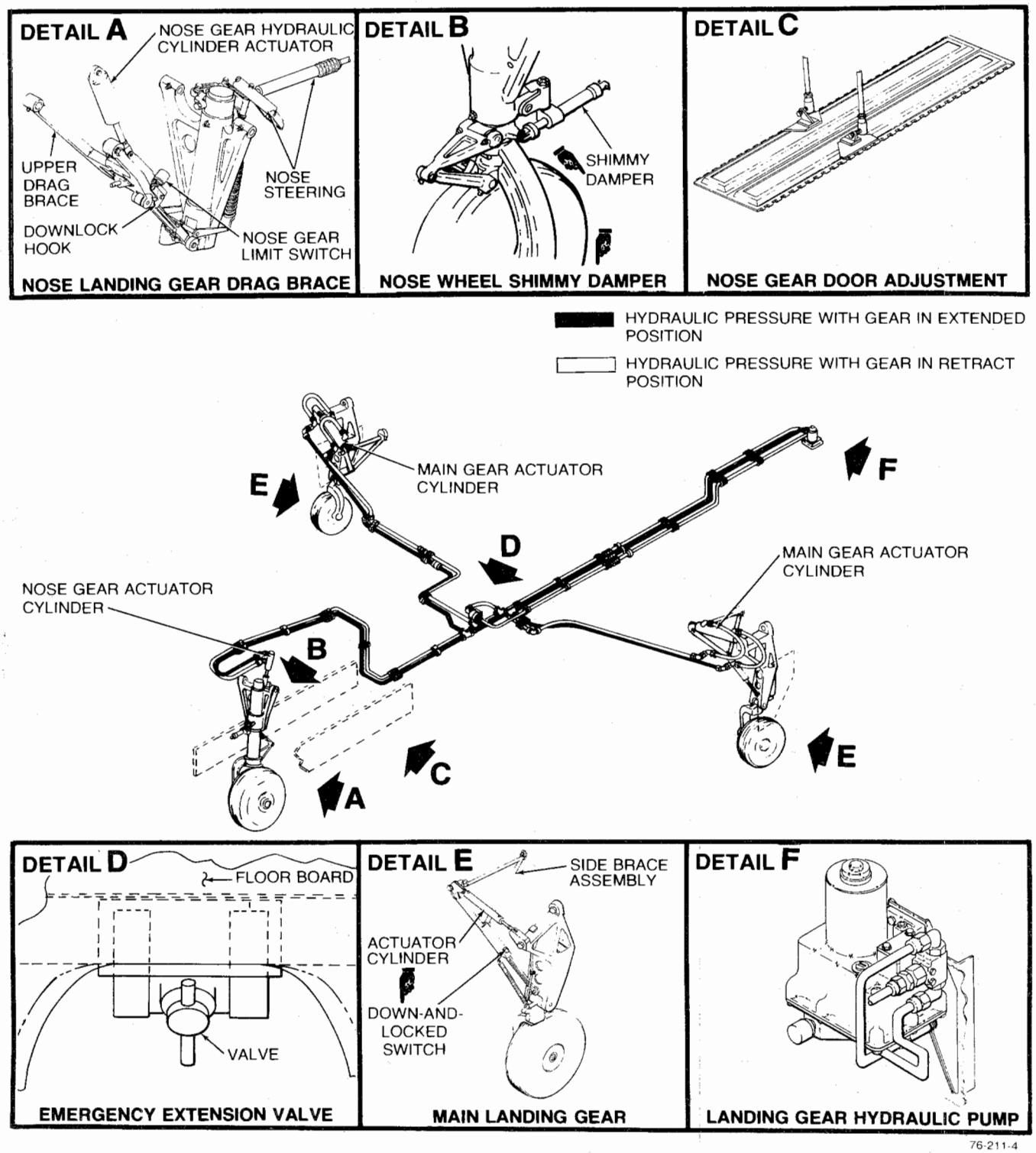
g. Complete the installation of the bolt through the rod end and gear housing casting.

h. Break the side brace from the fully locked position and move the main gear toward the retracted position while checking to see that the strut and wheel clear the adjacent components.

i. If the main gear is not centered in the wheel well add or delete, as necessary, a shim between the upper shock absorber mount and the housing assembly.

j. Close the emergency extend valve and retract the landing gear. Adjust the main gear upstop so the landing gear door seals make firm contact with the wing skin at the lower end of the door without excessive flexing of the door at the lower attach point.

☞ *INDICATES SITE OF CHANGE*



Landing Gear System
Figure 1

NOTE

The over-center travel of the side brace must be correct before proceeding. See MAIN LANDING GEAR SIDE BRACE INSPECTION.

k. With the battery switch on and the landing gear motor circuit breaker pulled, adjust the downlimits switches on the side brace of each main gear so that the red in-transit light is on with a .028" shim between the button rest on the lower drag leg and the underside of the upper drag leg. The green gear-down light should be on with a .018" shim installed. Turn off the battery switch and reset the landing gear motor breaker.

NOSE GEAR RIGGING

CAUTION

When rigging or adjusting ANY gear, be sure to jack the airplane insuring that ALL THREE wheels are off the floor.

a. Remove the attach bolt at the piston end of the nose gear actuating cylinder. Open the emergency extend valve.

b. Extend the cylinder rod until the piston bottoms out in the cylinder and while in this position adjust the clevis so that the attaching bolt will install snug in the bottom end of the slot in the lift lug.

c. Unscrew the clevis one full turn and torque the jam nut to secure the clevis in this position.

d. Complete the installation of the bolt through the link, clevis, and nut.

e. Disconnect both nose gear door push-pull rods at the nose gear doors.

f. Unlatch the downlock hooks and break the drag link from overcenter position and move the nose gear slowly toward the retracted position while checking to see that the strut clears adjacent components.

g. With the battery switch on and the landing gear motor breaker pulled, adjust the down-and-locked switch on the nose gear drag leg so the red in-transit light goes out and the green gear-down light comes on as the leading edge of the downlock hook passes the centerline of the downlock pin on either side of the drag brace knee.

h. Adjust the fore-and-aft pushrod in the nose gear door actuating mechanism so the pin on the left side of the drag brace knee engages the door actuating fork as the gear retracts. The rod should be adjusted so that the forward pivot arms move to within .200-.100 inch before the on-center position with the nose gear fully retracted. Closing the emergency extend valve and retracting the gear hydraulically will aid in this adjustment.

WARNING

Excessive lengthening of the rod causes the pin to engage the fork from below, pulling the forward pivot to an over center position. Excessive shortening of the rod also results in an overcenter position of the pivot. Either condition will subsequently cause the nose gear not to extend.

i. Adjust the nose gear door push-pull rods so that with the doors closed the bolt will slide in easily. Turn the rod end two full turns to shorten the rod and torque the jam nut to secure it in this position. Complete installation of the bolts.

j. Pressurize the pitot system so that the air speed indicator registers 75 knots IAS.

k. Turn the landing gear emergency extension valve to the CLOSED position and fill the reservoir with clean hydraulic fluid (27, Chart 1,91-0000).

l. Connect an external power source, turn the BATTERY and ALT switches ON and push in the landing gear circuit breaker.

m. Retract the gear and check for compression of the rubber upstop on the nose gear. Add aluminum shims under the upstop as required to obtain ¼ inch minimum compression.

n. Cycle the gear through extension and retraction. Ascertain that all adjustments have been properly made.

o. With the gear in the retracted position, turn the landing gear emergency extension valve to the OPEN position. Ensure that the gear extends to the down and locked position.

p. Close the landing gear emergency extension valve.

q. Replace all access panels and remove the airplane from jacks.

100-HOUR INSPECTION

RETRACT MECHANISM - Check the retraction system for proper operation of all components through at least two complete cycles. Check for unusual noises and evidence of binding.

DOORS AND LINKAGE - Check door operation, fit, rigging, and security.

POSITION INDICATORS - Check for security and adjustment of switches; wiring for breaks, condition of insulation, and loose connections.

WARNING HORN - Check for proper operation.

DOWNLOCKS - Check the downlock indicator switch for security and adjustment.

"END"

WHEELS AND BRAKES - DESCRIPTION AND OPERATION

MAIN WHEEL ASSEMBLIES

The airplane is equipped with Cleveland 6.00-6 main wheel assemblies.

The wheel consists of an inner and outer magnesium wheel half, and a brake disc assembly held together with bolts, washers, and nuts. The washers are used beneath the nuts and bolt heads to prevent galling and stress concentration.

Bearing cups, cone bearings and seals are installed in the hub area.

The wheel assemblies are secured to the axles with bushings, washers, nuts, and cotter pins.

NOSE WHEEL ASSEMBLY

The airplane is equipped with a Cleveland 5.00-5 nose wheel assembly and tube type tire. The wheel consists of an inner and outer wheel half, which are held together with bolts, washers, and nuts. Washers are used beneath the nuts and bolt heads to prevent galling and stress concentration.

Bearing cups, cone bearings and seals are installed in the hub area. Identification and instruction plates are installed on each outer wheel half.

The wheel assembly is secured to the axle with a bushing, washer, nut, and cotter pin.

TIRES

The main wheel tires on the airplane are 6.00-6, 6 ply rating, type III, tube type tires. (Replacement tube is 6.00-6.)

The nose wheel tire installed on the airplane is a 5.00-5, 6 ply rating, type III tube type tire.

CAUTION

Whenever a main landing gear wheel or tire is replaced or installed, the airplane should be placed on jacks and the gear retracted to insure adequate clearance between the tire and wheel well.

BRAKE ASSEMBLY

Cleveland brake assemblies are installed on the airplane. The brake assemblies are designed for use with MIL-H-5606 hydraulic fluid (27, Chart 1, 91-00-00).

The Cleveland brake contains one rotation brake disc (attached to and rotating with the wheel), two linings, a torque plate, and two pistons in the piston housing. Braking action occurs when hydraulic pressure is applied to the two small pistons in the piston housing which force the linings together, creating friction between the rotating disc and the stationary parts. The pistons are sealed against leakage with preformed packings. The brake assemblies are interchangeable between right and left by interchanging locations of bleeder and tubing fitting.

HYDRAULIC BRAKE SYSTEM

The dual hydraulic brakes are operated by depressing the tops of either the pilot's or copilot's rudder pedals. The depression of either set of pedals compresses the piston rod in the master cylinder attached to each pedal. The hydraulic pressure resulting from the movement of the pistons in the master cylinders is transmitted through flexible hoses and fixed aluminum tubing to the disc brake assemblies on the main landing gear wheels. This pressure forces the brake piston to press against the linings and discs of the brake assembly. To set the parking brakes, pull the control out and pump both toe pedals until solid resistance is felt. Push the control in to release the brakes.

NOTE

The wheel chocks should be installed and the parking brake left off if the airplane is to be left unattended. Changes in ambient temperature can cause the brakes to release or to exert excessive pressures.

TROUBLESHOOTING BRAKE SYSTEM

	INDICATION		*PROBABLE CAUSE*	*REMARKS*
1.	Solid pedal and no brakes.	a.	Brake lining worn beyond allowable limit.	
2.	Spongy brake.	a.	Air in system.	

TROUBLESHOOTING BRAKE SYSTEM (Cont'd)

	INDICATION		*PROBABLE CAUSE*		*REMARKS*
3.	Unable to hold pressure.	a.	Leak in brake system.	a.	Visually check entire system for evidence of leaks.
				b.	Check master cylinder seals; replace if scored.
4.	Parking brake will not hold.	a.	Air in system.		
		b.	Defective parking brake valve.		
5.	Brakes grab.	a.	Stones or foreign matter locking brake disc.		
		b.	Warped or bent disc.		

WHEELS AND BRAKES - MAINTENANCE PRACTICES

MAIN WHEEL AND TIRE

The wheel and tire assembly may be shipped from the factory completely assembled. The bearings should be packed with additional grease prior to installation.

MAIN LANDING GEAR WHEEL REMOVAL.

a. Place the airplane on jacks as described in Chapter 7.

b. Remove the brake assembly as described in BRAKE ASSEMBLY REMOVAL in this Chapter.

c. Remove the cotter pin, washer and axle nut.

d. Slide the wheel off the axle.

MAIN WHEEL DISASSEMBLY

a. Remove the wheel from the airplane as described in MAIN LANDING GEAR WHEEL REMOVAL in this Chapter.

b. Completely deflate the tire.

c. Break the beads away from the wheel flanges.

d. Remove the self locking nuts from the wheel bolts.

e. Separate the wheel halves and remove the tire and tube.

MAIN WHEEL INSPECTION

WARNING

Dry cleaning solutions are toxic and volatile. Use in a well ventilated area. Avoid contact with skin or clothing. Do not inhale the vapors.

a. Degrease all parts and dry thoroughly. A soft bristle brush may be used to remove hardened grease, dust, and dirt.

CAUTION

Do not spin bearings with compressed air. This will cause damage.

b. Visually inspect bearing cones for nicks, scratches, water staining, galling, heat discoloration, roller wear, cage damage, and cracks or distortion. Replace if damaged or worn.

c. Inspect the wheel bearing grease for contamination and solidification at each periodic maintenance inspection.

d. Inspect wheel halves for cracks, corrosion, and other damage. Cracked or badly corroded castings should be replaced. Small nicks, scratches, or pits can be blended out

using fine (400 grit) sandpaper.

e. Inspect the snap rings and grease seals for distortion and wear. Replace if damaged or deformed. Saturate grease seal felts (do not soak) with SAE 10 oil.

f. Inspect the bearing cups for looseness, scratches, pitting, corrosion, or evidence of overheating. Coat the cups with clean bearing grease (32, Chart 1, 91-00-00).

g. Inspect the brake disc assembly for cracks, excessive wear or scoring, rust and corrosion. Remove rust and blend out small nicks, using fine (400 grit) sandpaper. Brush coat with Dow 19 (36, Chart 1, 91-00-00). The brake disc should be replaced when its thickness measures 0.450 inch.

h. Inspect the wheel bolts for cracks, corrosion or other damage. Replace any cracked bolts.

MAIN WHEEL ASSEMBLY

a. Place the tube in the tire. Be sure to align the balance mark on the tire with the balance mark on the tube.

b. Place the tire and tube on one wheel half and join the two halves together. Be sure the tube is not pinched between the wheel halves.

c. Install the self-locking nuts on the wheel bolts and torque to 150 inch-pounds.

d. Inflate the tire. Check the valve stem for leaks.

e. Install the wheel on the airplane as described in MAIN LANDING GEAR WHEEL INSTALLATION.

MAIN LANDING GEAR WHEEL INSTALLATION

a. Inspect the wheel bearings. Pack the wheel bearings with grease (32, Chart 1, 91-00-00). Replace any damaged grease seals and be sure the grease seal retaining rings are in place before installing the wheel.

b. Slide the wheel on the axle and install the bushing, axle washers, and nut.

c. Install the brake assembly as described in BRAKE ASSEMBLY INSTALLATION in this Chapter.

d. Run the axle nut up until finger tight against the washer. Set the bearings by working the wheel on the axle and retightening the axle nut until all end play is removed from the bearings. With a wrench, advance the nut to the next available keying position and install the cotter pin.

NOSE WHEEL AND TIRE

The wheel and tire assembly may be shipped from the factory completely assembled. The bearings should be packed with additional grease prior to installation.

NOSE WHEEL REMOVAL

a. Place the airplane on jacks as described in Chapter 7.

b. Remove the cotter pin, nut, washer, and bushing.

c. Remove the nose wheel from the axle.

NOSE WHEEL DISASSEMBLY

a. Remove the wheel from the airplane as described in NOSE WHEEL REMOVAL in this Chapter.

b. Completely deflate the tire.

c. Break the beads away from the wheel flanges.

d. Remove the self locking nuts from the wheel bolts.

e. Separate the wheel halves and remove the tire and tube.

NOSE WHEEL INSPECTION

WARNING

Dry cleaning solutions are toxic and volatile. Use in a well ventilated area. Avoid contact with skin or clothing. Do not inhale the vapors.

a. Degrease all parts and dry thoroughly. A soft bristle brush may be used to remove hardened grease, dust, or dirt.

CAUTION

Do not spin bearings with compressed air. This will cause damage.

b. Visually inspect bearing cones for nicks, scratches, water staining, galling, heat discoloration, roller wear, cage damage, and cracks or distortion. Replace if defective or worn.

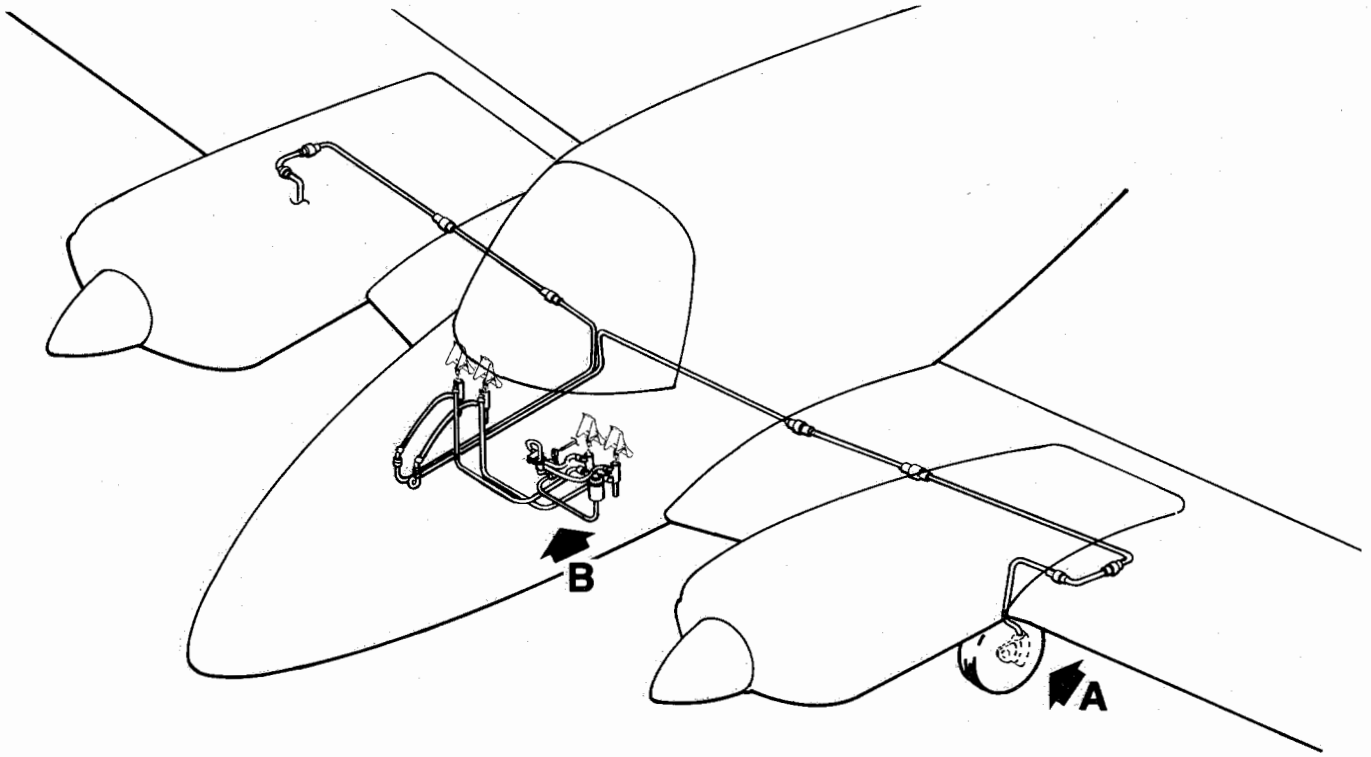
c. Inspect the wheel bearing grease for contamination and solidification at each periodic maintenance inspection.

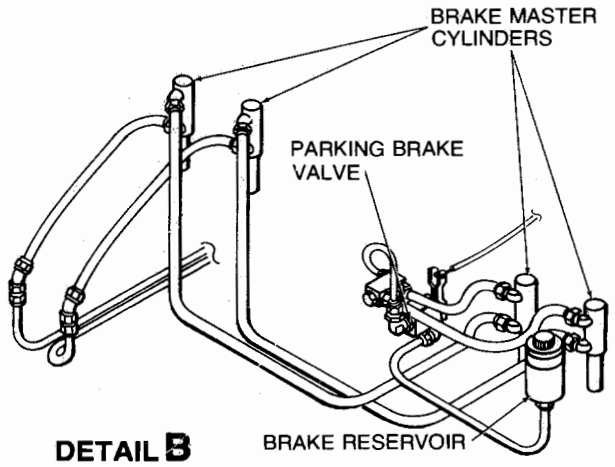
d. Inspect wheel halves for cracks, corrosion, and other damage. Cracked or badly corroded castings should be replaced. Small nicks, scratches, or pits can be blended out using fine (400 grit) sandpaper. Brush coat sanded areas with Dow 19 (36, Chart 1, 91-00-00).

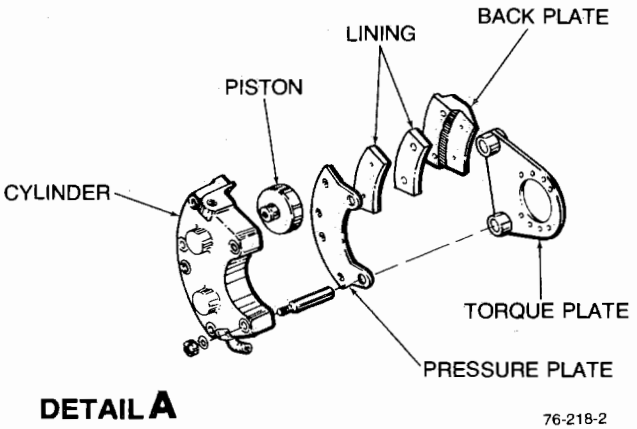
e. Inspect the snap rings and grease seals for distortion and wear. Replace if damaged or deformed. Saturate grease seal felts (do not soak) with SAE 10 oil.

f. Inspect the bearing cups for looseness, scratches, pitting, corrosion, or evidence of overheating. Coat the cups with clean bearing grease (32, Chart 1, 91-00-00).

g. Inspect the wheel bolts for cracks, corrosion, or other damage. Replace any cracked bolts.







Brake System Schematic
Figure 1

NOSE WHEEL ASSEMBLY

a. Place the tube in the tire. Be sure to align the balance mark on the tire with the balance mark on the tube.

b. Place the tire and tube on one wheel half and join the two halves together. Be sure the tube is not pinched between the wheel halves.

c. Install the self locking nuts on the wheel bolts and torque to 90 inch-pounds.

d. Inflate the tire.

e. Install the wheel on the airplane as described in NOSE WHEEL INSTALLATION in this Chapter.

NOSE WHEEL INSTALLATION

a. Visually check the nut and axle for burrs and rough threads.

b. Apply MIL-G-81322 grease (32, Chart 1, 91-00-00) to the threads and bearing surfaces.

c. Install the wheel and tire assembly with bushing, washer, and nut.

d. While rotating the wheel, torque the axle nut to 15 to 20 foot-pounds. Back off the nut, then retighten the nut finger tight. Using a wrench, tighten the nut to the next cotter pin location and install a new cotter pin.

e. Remove the airplane from jacks.

HYDRAULIC BRAKE SYSTEM

Brake system servicing is limited primarily to maintaining the hydraulic fluid level in the reservoir mounted on the upper LH corner of the aft bulkhead of the nose compartment. When the reservoir is low on fluid, add a sufficient quantity of hydraulic fluid (27, Chart 1, 91-00-00) to fill the reservoir. The only other requirements related to servicing involves the wheel brake assemblies themselves.

PARKING BRAKE ADJUSTMENT

a. Place the parking brake control in the OFF (valve open) position.

b. Loosen the set screw in the cable attach fitting and adjust the cable housing through the mounting block to obtain 1 1/2 inch travel between the cable housing and the cable attach fitting. The 1 1/2 inch clearance should be made with the parking brake valve lever in the OPEN position.

c. Tighten the mounting block, insert the cable in the cable attach fitting, tighten and safety wire the set screw in the attach fitting.

d. Test the parking brake adjustment by pulling the parking brake handle out and operating the brake pedals.

e. If the brake pedals are not solid, place the parking brake control in the OFF position and recheck the rigging.

f. Inspect the parking brake valve for hydraulic fluid loss.

PARKING BRAKE VALVE REMOVAL

a. Bleed the brake system of all hydraulic fluid.

b. Disconnect the parking brake cable from the parking brake valve by loosening the set screw and pulling the cable free of the cable attach fitting.

c. Disconnect and cap the hydraulic lines from the parking brake valve.

d. Remove the attach bolts, and remove the valve.

PARKING BRAKE VALVE INSTALLATION

a. Install the parking brake valve in the airplane using the attaching bolts.

b. Uncap and connect the hydraulic lines to the parking brake valve.

c. Fill the reservoir with hydraulic fluid (27, Chart 1, 91-00-00).

d. Bleed the brake system as described in BLEEDING THE BRAKE SYSTEM in this Chapter.

e. Insert the parking brake cable into the cable attach fitting and adjust the parking brake as described in PARKING BRAKE ADJUSTMENT in this Chapter.

BRAKE ASSEMBLY REMOVAL

a. Place the airplane on jacks.

b. Remove the bolts which attach the back plate and inner linings to the cylinder, then remove the back plate assembly.

c. Disconnect the brake hydraulic line, and remove the cylinder assembly by sliding the two guide pins out of the torque plate.

BRAKE ASSEMBLY INSPECTION

a. Clean all metal parts, insulators, and preformed packings with denatured alcohol. If packings are damaged or worn excessively, they should be replaced.

CAUTION

Gasoline and dry cleaning fluids are unsuitable as cleaning agents because they will damage packings.

b. Inspect the brake cylinder for cracks, nicks, corrosion, damaged threads, etc. Inspect inlet and outlet hydraulic ports for foreign contaminants. Examine the cylinder walls for scoring or excessive wear. Blend and polish light scratches in piston cavities with fine emery cloth (600 grit). Castings that are cracked or have damaged threads should be replaced.

c. Inspect the pistons for cracks, nicks, burrs, or excessive wear. Remove burrs and blend out nicks, using fine emery cloth (600 grit) and clean thoroughly.

d. Inspect the pressure plate assembly for cracks, damaged rivets, and excessive warpage. Replace if plate is cracked or severely deformed. Replace cracked or deformed rivets.

e. Inspect the brake cylinder bolts for cracks, and thread damage. Replace bolts that are cracked, bent or have damaged threads.

f. Inspect the brake linings for excessive edge chipping and surface deterioration. The linings should be replaced when worn to a thickness of .100 inch. The disc should be replaced when it measures .450 inch.

g. Inspect the torque plate for cracks, nicks, burrs, rust, and excessive wear in the bolt holes. Replace if the plate is cracked or severely deformed.

BRAKE ASSEMBLY INSTALLATION

a. Install the brake cylinder assembly by inserting the guide pins into the torque plate.

NOTE

If the torque plate has been removed it should be reinstalled so that the guide pin holes are positioned aft, and are centered above and below the horizontal centerline of the axle.

b. Install the back plate (inner lining) assembly, and torque the attaching bolts to 90 inch-pounds.

c. Connect the brake hydraulic line.

d. Bleed the brake system as described in BLEEDING THE BRAKE SYSTEM in this Chapter.

e. Remove the airplane from the jacks.

BRAKE MASTER CYLINDER REMOVAL

a. Remove the rudder pedal torque shaft cover.

b. Disconnect and cap the brake line at the cylinder.

c. Remove the master cylinder attaching bolts at the upper and lower end of the master cylinder. Remove the master cylinder assembly.

BRAKE MASTER CYLINDER INSTALLATION

a. Place the brake master cylinder in position on the rudder pedal and install the attaching bolts.

b. Connect the brake lines to the master cylinder.

c. Replace the rudder pedal torque shaft cover.

d. Bleed the brake system as described in BLEEDING THE BRAKE SYSTEM in this Chapter.

BLEEDING THE BRAKE SYSTEM

Brake system bleeding will be required whenever the system is opened at any point between the master cylinder and the wheel brake assembly, whenever the brakes become spongy in service, or whenever the parking brake will no longer hold. In the latter instance, the system should be further checked for leakage.

GRAVITY BLEEDING

a. Ensure that the reservoir is full prior to bleeding the brake system.

b. Open the bleed valves at the brake assemblies.

c. Depress the pilot's brake pedals slowly and smoothly to eliminate air trapped in the brake system.

d. Hold the brake in the depressed position and close the bleed valve at the brake assemblies.

e. Release the pilot's brake pedals.

f. Repeat steps "b", "c", "d", and "e" until no more air bubbles appear in the drained fluid.

g. Repeat steps "b", "c", "d", and "e" for the copilot's pedals until no more air bubbles appear in the drained fluid.

NOTE

The reservoir must be kept full during bleeding.

h. Tighten the bleed valve at the brake assemblies.

i. Check the brakes for proper operation.

PRESSURE BLEEDING

a. Connect hoses from a pressure pot to the bleeder openings on the brakes.

b. Use a spare reservoir cap with a hole drilled in the top and a vent tube soldered over the hole. Install an O-ring seal in the cap and add a length of plastic hose to the vent tube. With this cap in place, run the hose into a large, clean container.

c. Using 15 to 20 pounds of pressure, bleed the system until all air bubbles are gone from the draining fluid, pumping the brakes is not necessary.

d. Remove the special cap and replace with the original.

e. Disconnect the pressure pot and close the bleeder valves at the brake assemblies.

f. Check the brake operation.

"END"

STEERING - MAINTENANCE PRACTICES

The nose wheel should be parallel to the fore and aft center line of the airplane with the rudder pedals in the neutral position. Loosen the nose gear steering actuator arm at the aft end and screw the end fitting either in or out to make adjustment.

NOSE WHEEL TRAVEL STOP ADJUSTMENT

Adjust the nose gear steering travel adjustment bolts to stop the shimmy dampener piston 1/32 inch to 1/4 inch from maximum travel in both directions.

If adjustment is required, the following procedure is recommended:

a. Loosen the locknuts on the adjustment bolts so the shimmy dampener limits the amount the wheel may be turned.

b. Turn the nose wheel to the extreme left turn position; the adjustment bolts must be clear of the stops with the nose wheel in this position.

c. Place tape around the clevis end of the shimmy dampener piston rod 1/32 to 1/4 inch from the scraper ring.

d. Turn the locknut on the LH adjustment stop bolt so that the nose wheel is turned and the tape on the piston rod just contacts the scraper ring. Tighten the locknut securely.

e. Repeat steps "b", "c", and "d" above except turn the nose wheel to the extreme right, and place the tape on the end opposite the clevis.

100-HOUR INSPECTION

STEERING LINKAGE - Check nose steering mechanism for condition, security and correct adjustment.
NOSE GEAR STEERING - Check the steering bell crank for cracks, condition, and security.

"END"

POSITION AND WARNING - DESCRIPTION AND OPERATION

The Position and Warning System for the landing gear consists of three green and one red light located on the upper right side of the pilot's instrument panel; down and lock switches - one on each main gear side brace and one on the nose gear drag brace; a 16° down switch on the flap actuator tube at FS 145.323 and LBL 6.00; and air pressure switch in the pitot line aft of the left side of the pilot's instrument panel; a throttle switch located at the throttle arm on the carburetor, and a hydraulic pressure switch on the UP side of the hydraulic pump manifold.

The in-transit (INTRANS) light (red) is illuminated any time the gear is in-transit from either the up or down position. When the gear reaches the full limit of travel to the up position, the hydraulic pressure will build up to 1550 ± 100 psi and cause the pressure switch to break the circuit to the INTRANS light, causing the light to extinguish.

NOTE

There are no indicator lights for the up position.

When the gear reaches the down and locked position, the down and locked switch is actuated and the respective DOWN (green) indicator light will illuminate. Also, the INTRANS light will extinguish when all three gears are down and locked.

The air pressure switch is a safety device that prevents the gear from being retracted until an air speed of 59 to 63 kts per hour is obtained. The gear will not cycle to the retract position, even though the landing gear control switch may be in the UP position, until the air speed is obtained. This prevents inadvertent retraction of the gear while the airplane is on the ground.

The 16° down switch is to aid in the prevention of landing with the gear retracted. Lowering the flaps 16° or more will actuate the 16° flap switch which closes the circuit to the landing gear warning horn and warns the pilot not to attempt a landing because the gear is not extended.

The throttle switch, like the 16° down switch, is also an aid in the prevention of landing with the gear retracted. When the throttle is moved toward the closed position, it closes the throttle switch. This closes the circuit to the landing gear warning horn, notifying the pilot that the gear is not extended.

The throttle switch and 16° down switch use the same landing gear warning horn which sounds with a warbling tone to distinguish it from the stall warning horn.

POSITION AND WARNING - MAINTENANCE PRACTICES

LANDING GEAR POSITION SWITCH ADJUSTMENT

With the airplane on jacks and tail stand, the tail anchored and the gear fully extended and locked, perform the adjustment as follows:

a. Connect an auxiliary power source that is negatively grounded and has an output of 14.0 ± .2 vdc (ME-1 thru ME-182) or 28.0 ± .2 vdc (ME-183 and after) to the airplane external power receptacle.

b. Connect a low pressure air source to the pitot tube.

c. Adjust the switch on the nose gear so that the plunger compresses .05 to .125 inches beyond the audible click position.

d. Adjust the switch on each main gear so that the plunger compresses .05 to .125 inches beyond the audible click position when the side brace is extended and against the overcenter stop.

e. Apply the low pressure air to the pitot air system until 59 to 63 kts is indicated on the airspeed indicator.

f. Retract the gear and ascertain that the DOWN lights (green) on the instrument panel extinguish, and the INTRANS light (red) is illuminated. Check that the INTRANS light extinguishes when the gear is fully retracted.

NOTE

The INTRANS light switch is not adjustable. If the INTRANS switch does not function properly, the switch will have to be replaced.

g. Extend the gear.

h. Disconnect the auxiliary power and low pressure air.

i. Lower the jacks and remove the jacks and tail stand from beneath the airplane.

LANDING GEAR SAFETY SWITCH ADJUSTMENT

With the airplane on jacks and tail stand, the tail anchored and the gear fully extended and locked, perform the adjustment as follows:

a. Connect an auxiliary power source that is negatively grounded and has an output of 14.0 ± .2 vdc (ME-1 thru ME-182) or 28.0 ± .2 vdc (ME-183 and after) to the airplane external power receptacle.

b. Connect a low pressure air source to the pitot tube.

c. Place the landing gear position switch in the UP position. The gear should not retract.

d. Apply the low pressure air to the pitot air system until a reading of 59 to 63 kts is obtained on the airspeed indicator. The gear should retract.

e. If the switch does not actuate at the desired indicated air speed, adjust the switch accordingly. Repeat steps "c" and "d".

f. Extend the gear.

g. Disconnect the auxiliary power and low pressure air.

h. Lower the jacks, then remove the jacks and tail stand from beneath the airplane.

16° DOWN SWITCH ADJUSTMENT

With the airplane on jacks and tail stand, the tail anchored and the gear fully extended and locked, perform the adjustment as follows:

a. Connect an auxiliary power source that is negatively grounded and has an output of 14.0 ± .2 vdc (ME-1 thru ME-182) or 28.0 ± .2 vdc (ME-183 and after) to the external power receptacle.

b. Connect a low pressure air source to the pitot tube.

c. Lower the flaps 16° (use a protractor), and set the 16° down switch at this point. Retract the flaps.

d. Apply the low pressure air to the pitot air system until a reading of 59 to 63 kts is indicated on the airspeed indicator.

e. Retract the gear.

f. Lower the flaps 16° and ascertain that the warning horn operates.

g. Retract the flaps and extend the gear.

h. Disconnect the auxiliary power and the low pressure air from the airplane.

i. Lower the jacks, then remove the jacks and the tail stand from beneath the airplane.

LANDING GEAR THROTTLE WARNING HORN SWITCH ADJUSTMENT

a. With the airplane in flight, place the propeller control in low pitch and slowly retard the throttle control until 16 to 18 inches of manifold pressure is indicated.

b. Mark the position of the throttle controls.

c. After the airplane has landed, and with the engines shut off, position the throttle controls at the mark made in step "b".

d. Adjust the microswitches with the throttle in this position until the throttle cams "clicks" the switches closed.

e. Secure the microswitches in this position.

LANDING GEAR MOTOR TIME DELAY RELAY (ME-183 and after)

A time delay relay internally set for 30 seconds, has been incorporated into the electrical circuitry of the landing gear system to prevent continuous operation of the hydraulic pump in the event of a hydraulic gear malfunction. This relay de-energizes the gear up relay only. It can be reset by cycling the landing gear switch DOWN and then UP. In the event that the time delay relay time expires, the INTRANSIT LIGHT will remain illuminated.

TEST, LANDING GEAR MOTOR TIME DELAY RELAY (ME-183 and after)

a. Place the airplane on jacks with the proper airspeed and hydraulic dump valve in the open position.

b. Place the landing gear handle to the UP position and record the time from pump on to pump off to be a maximum of 30 ± 4 seconds, and the intransit light to be illuminated.

NOTE

If an External Power Supply is used, voltage transients from the supply may trip the relay, indicating an erroneous reading.

d. Place the gear select switch in the DOWN position.

e. Close the dump valve and recycle the landing gear noting proper operation.

"END"

CHAPTER 33

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33-40-00	1	Nov 18/77
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	4	Sep 7/79

"END"

CHAPTER 33 - LIGHTS

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"END"

INTERIOR - MAINTENANCE PRACTICES

INSTRUMENT POST LIGHT BULB REMOVAL

Individual post lights, located adjacent to the instruments on the instrument panel may have bulbs removed as follows:

a. Pull the light shield from the post light assembly.
b. Remove the bulb from the post light.

INSTRUMENT POST LIGHT BULB INSTALLATION

a. Install the bulb in the post light.
b. Insert the shield to the instrument post light assembly.

OVERHEAD CONSOLE CABIN LIGHT BULB REMOVAL (ME-1 thru ME-282, ME-284 thru ME-287)

a. Remove screws and washers from the cabin console to gain access to the two overhead light bulbs.
b. Depress bulb in the socket, rotate the bulb and remove.

OVERHEAD CONSOLE CABIN LIGHT BULB INSTALLATION (ME-1 thru ME-282, ME-284 thru ME-287)

a. Depress the bulb in the socket and rotate the bulb.
b. With the cabin overhead console in position, install the screws and washers to secure.

OVERHEAD CONSOLE CABIN LIGHT BULB REMOVAL (ME-283, ME-288 and after)

a. Remove screws and washers from the cabin console to gain access to the single overhead light bulb.
b. Depress bulb in the socket, rotate the bulb and remove.

OVERHEAD CONSOLE CABIN LIGHT BULB INSTALLATION (ME-283, ME-288 and after)

a. Depress the bulb in the socket and rotate the bulb.
b. With the cabin overhead console in position, install the screws and washers to secure.

OVERHEAD READING LIGHT REMOVAL (ME-283, ME-288 and after)

An overhead reading light is installed on the forward side of the overhead console and is removed as follows:

a. Remove the lens cover by grasping and pulling in a downward motion.
b. Depress bulb in the socket, rotate the bulb and remove.

OVERHEAD READING LIGHT INSTALLATION (ME-283, ME-288 and after)

a. Depress the bulb in the socket and rotate the bulb.
b. Align the lens cover with the light assembly and push upward to install.

"END"

EXTERIOR - DESCRIPTION AND OPERATION

STROBE LIGHTS

The pulsating strobe lights are mounted on each wing tip. The system is actuated by a circuit breaker switch mounted on the LH subpanel. The strobe lights are powered by a power supply unit, mounted adjacent to the battery on the RH side of the airplane aft of FS 192.50. A transistorized circuit in the power supply unit steps up the voltage of the airplane electrical system to the level (approximately 450 volts) required to operate the strobe lights. The stepped-up-voltage is stored in a capacitor until released to the strobe lights. The current from the power supply unit is conducted to the flashtube of the strobe light by a specially shielded power cable. A charge of high voltage electricity is momentarily released to a coil in the flashtube assembly. The coil further steps up the charge to a point where it ionizes the xenon gas in the flashtube. The high voltage stored in the capacitor then surges through the gas to produce the brilliant burst of light energy that characterizes the strobe light. When the capacitor voltage drops sufficiently, the lamp will go out while the capacitor begins recharging for the next cycle.

TROUBLESHOOTING
EXTERIOR LIGHTS

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
			STROBE LIGHTS		
1.	Lights inoperative.	a.	Circuit breaker tripped.	a.	Check for short circuit. Reset circuit breaker.
		b.	Loose connection.	b.	Check and tighten electrical connections.
		c.	Battery defective.	c.	Replace battery or use external power.
		d.	Power supply inoperative.	d.	Replace.
2.	One bulb does not light.	a.	Bulb burned out.	a.	Replace bulb.
		b.	Fixture not grounded.	b.	Check for good bonding between fixture and structure. Tighten mounting screws.
		c.	Loose connection.	c.	Check all connections in circuit.
		d.	Defective fixture or switch.	d.	Replace fixture or switch.
			TAIL NAVIGATION LIGHT, LANDING LIGHT AND TAXI LIGHTS		
1.	Lamp fails to light.	a.	Circuit breaker switch tripped.	a.	Check for short circuit. Reset circuit breaker.
		b.	Circuit breaker switch defective.	b.	Check continuity through switch. Replace if necessary.
		c.	Lamp burned out.	c.	Replace lamp.
		d.	Loose connection or defective.	d.	Tighten connections and check wire circuit continuity. Replace or repair wire if necessary.

EXTERIOR - MAINTENANCE PRACTICES

LIGHTS

POWER SUPPLY UNIT REMOVAL

WARNING

High voltage is involved in the circuit between the power supply and strobe light assemblies. Although a bleed-off resistor is incorporated in the power supply circuit, turn the control switch for the strobe lights OFF and allow at least 10 minutes to elapse prior to disconnecting the cables at the power supply or strobe light assemblies and before handling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

a. Remove the door in the rear panel of the baggage compartment.
b. Disconnect the electrical wiring to the power supply.
c. Remove the screws, washers, and nuts anchoring the module to the support structure.
d. Remove the power supply from the airplane.

POWER SUPPLY UNIT INSTALLATION

CAUTION

An incorrect hook-up of the wires in either the power input or between the strobe light assemblies and the power supply will cause a reversal of polarity that results in serious component damage and failure. Care must be taken to ensure that the red wire is connected to positive power and the black wire is connected to ground. The shields for the wing cables are grounded to the airplane structure. Refer to the WIRING DIAGRAM MANUAL P/N 105-590000-15 (14-volt system, ME-1 thru ME-182) or WIRING DIAGRAM MANUAL P/N 105-590000-21 (28-volt system, ME-183 and after) to ensure a correct hook-up of the components in the strobe light system.

a. Position the power supply unit in the airplane and secure with the screws, washers, and nuts.
b. Connect the electrical wiring to the power supply.
c. Install the door in the rear panel of the baggage compartment.

WING STROBE LIGHT REMOVAL

WARNING

High voltage is involved in the circuit between the power supply and strobe light assemblies. Although a bleed-off resistor is incorporated in the power supply circuit, turn the control switch for the strobe lights OFF and allow at least 10 minutes to elapse prior to disconnecting the cables at the power supply or strobe light assemblies and before handling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

a. Remove the nuts and washers securing the strobe light in place.
b. Lift out the strobe light assembly and disconnect the electrical wiring.
c. Remove the bonding jumper which is connected to the structure through a knife disconnect.
d. Disconnect the red + wire from the navigation light.
e. Disconnect the black wire from the navigation light at the knife disconnect.
f. Remove the NAV/strobe light assembly from the airplane.

WING STROBE LIGHT INSTALLATION

CAUTION

An incorrect hook-up of the wires in either the power input or between the strobe light assemblies and the power supply will cause a reversal of polarity that results in serious component damage and failure. Care must be taken to ensure that the red wire is connected to positive (+) power and the black wire is connected to ground. Wing cables use connectors at the power supply and the tip light. The shields for the wing cables are grounded to the airplane structure at the power supply. Refer to the WIRING DIAGRAM MANUAL P/N 105-590000-15 (14-volt system, ME-1 thru ME-182) or WIRING DIAGRAM MANUAL P/N 105-590000-21 (28-volt system, ME-183 and after) to ensure a correct hook-up of the components in the strobe light system.

a. Connect the bonding jumper, from the strobe light assembly to the airplane wing tip rib, by connecting the two halves of the knife type connection.

b. Connect the electrical wiring to the strobe light.

c. Position the strobe light and install the washer, and nut.

WING LANDING LIGHT REMOVAL

a. Remove the screws from the transparent shield retainer on the wing leading edge, at Wing Station 220.00, remove the retainer and transparent shield.

b. Remove the screws which secure the landing light bulb retainer and remove the retainer.

c. Disconnect the wiring from the bulb and remove the bulb from the airplane.

WING LANDING LIGHT INSTALLATION

a. Connect the wiring to the landing light bulb and position the bulb.

b. Install the retainer on the landing light bulb and secure with screws.

c. Install the transparent shield and retainer, secure with screws.

WING TAXI LIGHT REMOVAL

a. Remove the screws from the transparent shield retainer on the wing leading edge, at Wing Station 220.00, remove the retainer and shield.

b. Remove the screws from the taxi light bulb retainer and remove the retainer.

c. Disconnect the wiring from the bulb and remove the bulb from the airplane.

WING TAXI LIGHT INSTALLATION

a. Connect the wiring to the taxi light bulb and position the bulb.

b. Install the retainer on the taxi light bulb and secure with screws.

c. Install the transparent shield and retainer, secure with screws.

TAIL NAVIGATION LIGHT REMOVAL

a. Remove the retaining screws from the tail light, located at the upper tail cone tip.

b. Remove the bulb from the light assembly.

TAIL NAVIGATION LIGHT INSTALLATION

a. Install the bulb in the tail navigation light assembly.

b. Position the tail light assembly on the upper tail cone and secure with screws.

CHART 1

LAMP BULB REPLACEMENT

LOCATION	*BULB REPLACEMENT (ME-1 thru ME-182) (14 vdc)*	*BULB REPLACEMENT (ME-183 and after) (28 vdc)*
Post Lights	330	327
Compass Light	330	327
Cabin Dome Light	89-6CP	303-6CP *
Reading Light	----	303-6CP **
Taxi Lights	4595	4594
Landing Light	4313	4596
Tail Light	1777	1683
Landing Gear In-transit Lights	330	327

CHART 1

LAMP BULB REPLACEMENT (Cont'd)

LOCATION	*BULB REPLACEMENT (ME-1 thru ME-182) (14 vdc)*	*BULB REPLACEMENT (ME-183 and after) (28 vdc)*
Overhead Instrument Panel Lights (Two)	89	303 *
Overhead Instrument Panel Light (One)	----	303 **
Engine Instrument Cluster Light	266	267
Wing Tip Lights	A7512-12	A7512-24
NAV/Strobe Light, Wing LH	30-1265-1 (Flashtube 55-0221-3)	30-1265-3 (Flashtube 55-0221-3)
NAV/Strobe Light, Wing RH	30-1265-2 (Flashtube 55-0221-3)	30-1265-4 (Flashtube 55-0221-3)
Engine Instrument Post Lights	330	327
Landing Gear Down and Locked Lights	330	327

* ME-183 thru ME-282, ME-284 thru ME-287

** ME-283, ME-288 and after

"END"

CHAPTER 34

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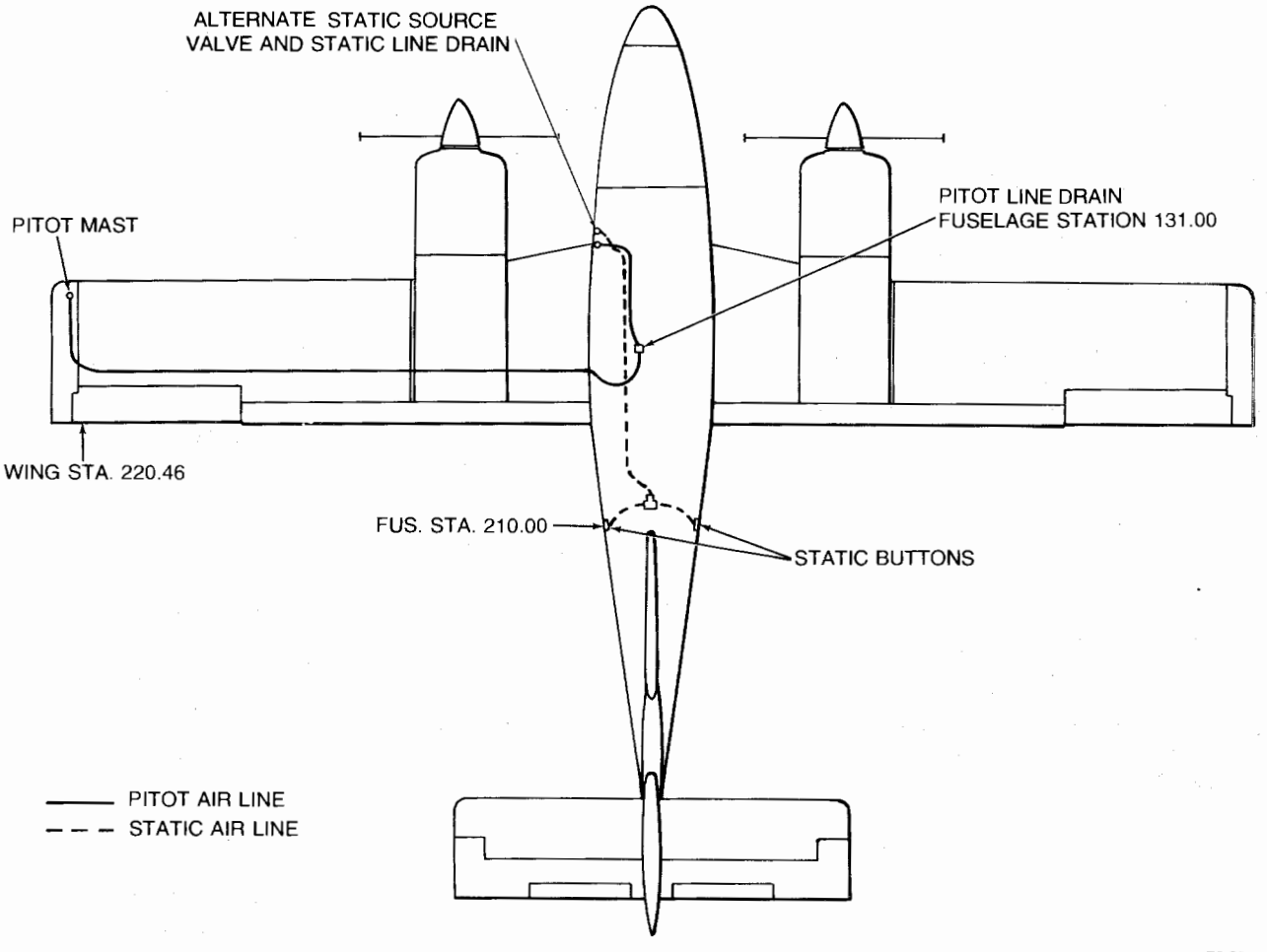
"END"

FLIGHT ENVIRONMENT DATA - DESCRIPTION AND OPERATION

PITOT AND STATIC PRESSURE SYSTEM

The pitot and static pressure provides a source of impact pressure and static air for operation of the instruments. The pitot portion of the system includes the pitot mast, tubing between the mast, airspeed indicator and, if the optional heated pitot is used, the wiring connecting the heating element of the mast into the electrical system. The impact pressure entering the pitot mast, located outboard on the underside of the left wing, is transmitted through tubing to the airspeed indicator on the instrument panel. The optional heating element in the mast prevents the pitot opening from becoming clogged with ice, which would cause the airspeed indicator to register erroneous readings. For drainage of water from rain or condensation, remove the access door in the underbelly which will expose the union at the low point of the system at Fuselage Station 131.00. Disconnect the lines and allow to drain.

The static portion of the system includes a single static port on each side of the fuselage, immediately forward of the tail section at Fuselage Station 210.00. Lines connect the static ports to the instruments in the instrument panel. The static lines are routed from the static ports, on each side of the fuselage, to a union at the top center of the fuselage at Fuselage Station 210.00. A single static line from the union is routed over to the left side of the fuselage and forward along the fuselage to the Rate-of-Climb indicator, Altimeter, and Airspeed indicator on the instrument panel. Draining the static line is accomplished by opening the alternate static air source valve, which is located on the left side panel forward of the door frame and below the instrument panel.



Wing Pitot and Static Pressure System
Figure 1

TROUBLESHOOTING

PITOT AND STATIC PRESSURE SYSTEM

	INDICATION		*PROBABLE CAUSE*		*REMARKS*
1.	Heating element inoperative.	a.	Defective switch.		
		b.	Grounded or open circuit.	b.	Check for continuity.
		c.	Defective heating element in pitot head.		
2.	Circuit breaker keeps tripping.	a.	Grounded wire.		
3.	Instruments inoperative or erratic in operation.	a.	Lines clogged.	a.	Disconnect the pitot line under the access door at FS 131.00. Open the alternate static air source valve on the left forward side panel. Allow the lines to drain. Disconnect the lines at the instruments and blow out the lines with low air pressure.
		b.	Line leaks.	b.	Check lines for loose connections at all connection points.

PITOT AND STATIC SYSTEM - MAINTENANCE PRACTICES

PITOT SYSTEM PRESSURE TEST

a. Connect a low pressure air source, equipped with an on-off valve, to the pitot mast.

b. Apply pressure SLOWLY until the airspeed indicator registers 90 percent of its maximum reading, then turn the valve off.

NOTE

As an alternate method should the equipment noted above not be available, clamp a rubber tube over the pitot head inlet so that the connection is airtight. Crimp the end of the tube and roll it up SLOWLY until the airspeed indicator registers 90 percent of its maximum reading.

CAUTION

To avoid rupturing the diaphragm of the airspeed indicator, apply pressure slowly and do not build up excessive pressure in the line.

c. If the system retains the pressure required to maintain the reading just obtained for a period of five minutes, there are no leaks in the pitot lines. If airspeed indicator reading declines, check the system for leaky hoses and loose connections.

CAUTION

Release pressure SLOWLY to avoid damaging the airspeed indicator.

INSPECTING PITOT SYSTEM HOSES

After the pitot system is checked for leaks, inspect the hoses for signs of deterioration, particularly at bends and at the connection points to the pitot mast and airspeed indicator. Hoses that are cracked or hardened should be replaced with a rubber hose conforming to Military Specification MIL-H-5593. Any time a hose is replaced, repeat the preceding pressure check.

STATIC SYSTEM CHECKS

The amount of attention required by the static system depends largely on operating conditions. Foreign matter is most likely to accumulate in the static ports and lines during times of high humidity, excessive precipitation, and dry, dusty weather; consequently, the system should be checked fre-

quently under such circumstances. Perform this check as follows:

a. Disconnect the line at the airspeed indicator and blow LOW pressure through the lines to the static ports. Cover each static port separately during this procedure to ensure that each line is clear, since even one clogged port causes instrument error.

CAUTION

Never blow air through the line toward the instrument panel, for to do so may seriously damage the instruments. When blowing back through the line from the instrument panel, make sure that the instrument lines have been disconnected so no pressure can reach the instruments.

b. Drain the static air line by opening the alternate static air source valve, located on the left side panel, forward of the door frame and below the instrument panel.

NOTE

Erratic instrument readings may result if wax or polish is applied to the static air buttons. Clean the static air buttons periodically with a cleaning solution to ensure that no film has formed on them.

SPECIAL FAR INSPECTIONS AND LEAK TEST

The static system should be checked for leaks in accordance with the instructions in Federal Aviation Regulation 91.170. The altimeter instrument and static system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in Parts FAR 91.170 and 91.177 under Title 14 of the code of Federal Regulations.

CAUTION

To avoid damaging the airspeed indicators, the indicators should be removed from the system and the lines capped or an equal pressure should be applied to the pitot side of the indicators while testing the system for leakage.

OUTSIDE AIR TEMPERATURE GAGE

The outside air temperature gage is mounted in the windshield. The pointer registers on a dial calibrated in degrees over a range of − 70°F to + 150°F, − 50°C to + 60°C.

REMOVAL OF THE OUTSIDE AIR TEMPERATURE GAGE

CAUTION

Tape the gage to the windshield molding or have an assistant hold the gage to prevent it from falling.

a. Remove the sunshield, boss and washers from the stem.
b. When removing the gage, use care to avoid damaging the stem.

INSPECTION OF THE OUTSIDE AIR TEMPERATURE GAGE

Inspect the sunshield for dents, plugged openings and any misalignment that would allow contact with the stem. Inspect the nut and stem base for stripped or damaged threads. Inspect rubber washers for peeling, cracking, and resiliency. Inspect the index markings on the gage for legibility. Inspect the pointer for chipped or peeling paint. Replace defective parts.

INSTALLATION OF THE OUTSIDE AIR TEMPERATURE GAGE

a. Install the mounting washer, boss, and gage into the windshield.

CAUTION

Tape the gage to the windshield molding or have an assistant hold the gage to prevent it from falling.

b. Install the outer washers and boss.
c. Install the sunshield.

"END"

CHAPTER 36

LIST OF PAGE EFFECTIVITY

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36-EFFECTIVITY/CONTENTS	1	Feb 16/79
36-00-00	1	Feb 16/79
	2	Nov 18/77

CHAPTER 36 - PNEUMATIC

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SUBJECT	CHAPTER SECTION SUBJECT	PAGE
GENERAL	36-00-00	
Description and Operation		1
Instrument Air System		1
Troubleshooting		1
Instrument Air System		1

"END"

GENERAL - DESCRIPTION AND OPERATION

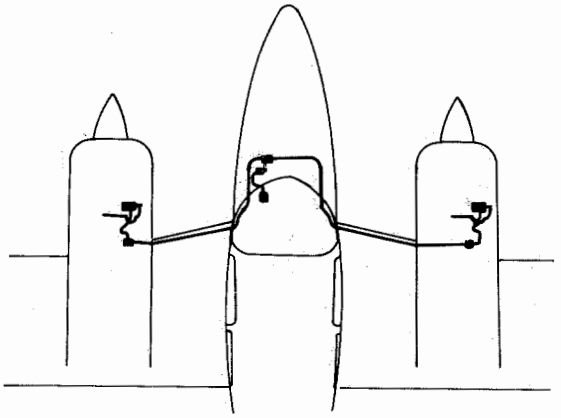
INSTRUMENT AIR SYSTEM

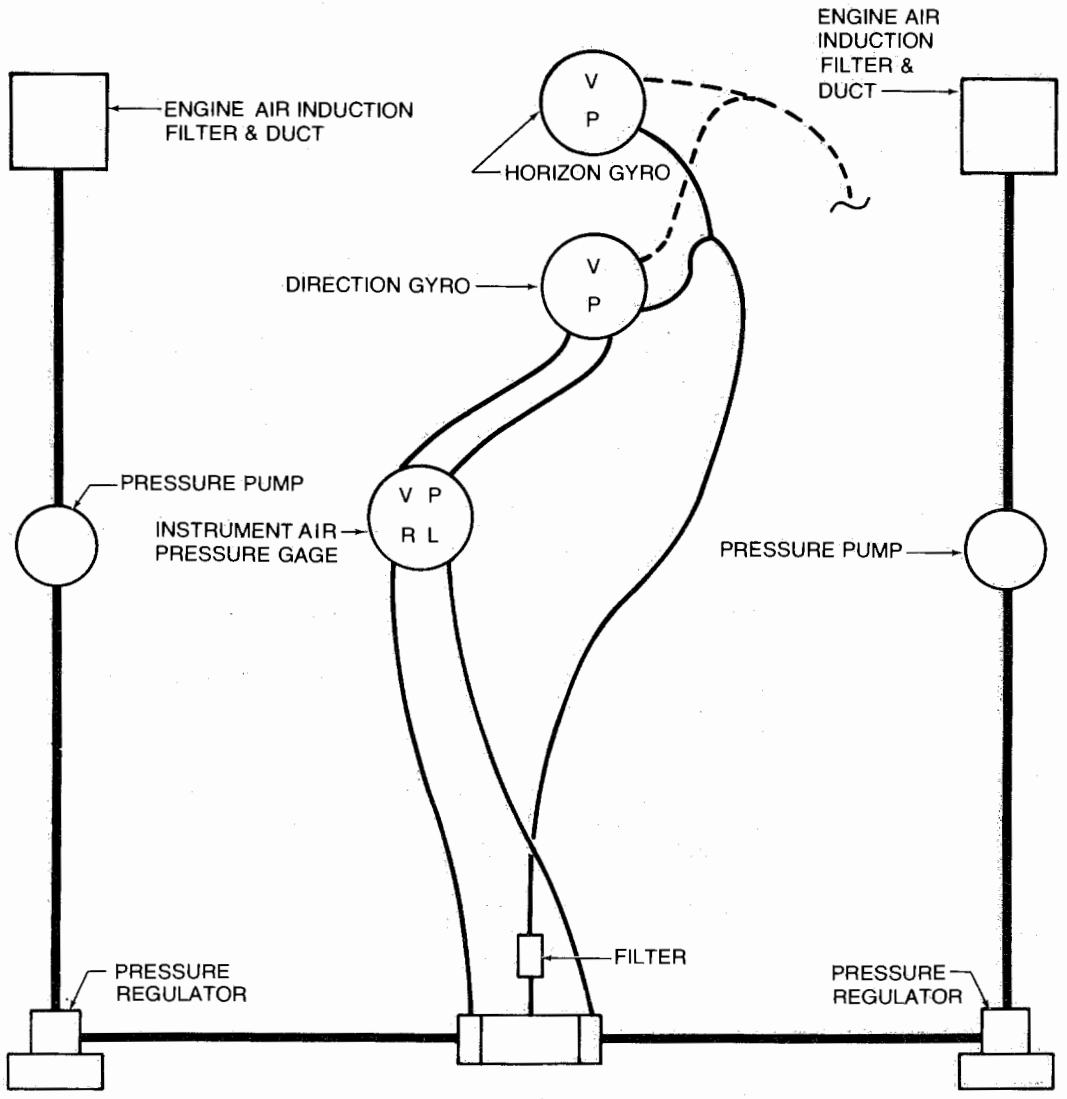
The instrument air system is supplied with air from an engine-driven pressure pump which is located on the engine accessory drive pad of each engine. Air is drawn from the engine air induction duct just aft of the air intake filter and pumped to the pressure regulator (located aft of the firewall) where it is regulated to 5.0 to 5.5 in. hg (inches of mercury) with the engine operating at 2000 rpm. From the pressure regulator, the air is directed to a manifold where it is distributed through a filter to the horizon and directional gyros. Two check valves are located in the manifold which will isolate a failed system.

The air pressure is monitored by an instrument air pressure gage located on the upper right of the lower left subpanel. A source failure (pressure pump malfunction) is indicated by the protrusion of two red buttons marked "L" and "R" which are located on the lower face of the pressure indicator.

TROUBLESHOOTING
INSTRUMENT AIR SYSTEM

	INDICATION		*PROBABLE CAUSE*		*REMARKS*
1.	Zero indication on instrument gage. Pump out recess buttons recessed.	a.	Hole in gyro plumbing, line plugged, filter plugged or plumbing disconnected between manifold and gyros.	a.	Inspect plumbing, replace or connect lines or replace filter as necessary.
		b.	Defective instrument pressure gage.	b.	Replace gage.
		c.	Defective gyro horizon or direction gyro.	c.	Inspect instrument and replace or repair as necessary.
2.	Pump out recess button(s) extended.	a.	Defective pump(s).	a.	Replace pump(s).
		b.	Line plugged between pump and manifold.	b.	Clean lines as necessary.
		c.	Defective regulator.	c.	Replace regulator.
		d.	Hole in line or line disconnected between pump and manifold.	d.	Inspect lines and replace as necessary.
		e.	Hole in line, line disconnected or plugged line between manifold and pressure indicator.	e.	Inspect lines and clean or replace as necessary.
3.	Pump out recess button recessed with respective engine not operating.	a.	Leaky valve within the manifold.	a.	Replace manifold.





Instrument Air System
Figure 1

"END"

CHAPTER 39

LIST OF PAGE EFFECTIVITY

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39-EFFECTIVITY	1	Aug 10/79
39-CONTENTS	1	Nov 18/77
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39-10-00	1	Nov 18/77
	2	Aug 10/79
	3	Aug 10/79
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	10	Aug 10/79

"END"

CHAPTER 39 - ELECTRICAL PANELS & PARTS

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Installation of Flight Instruments		1
Removal of Radio and Avionics Panel		1
Installation of Radio and Avionics Panel		1
Removal of Engine Instrument Cluster Panel		1
Installation of Engine Instrument Cluster Panel		1
Left Subpanel		2
Switches		2
Lights		2
Circuit Breaker Switch		2
Right Subpanel		3
Circuit Breakers		3
Switch		3
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Nacelles (Forward of the Main Spar) - Airplane Zones 522 and 622		4
Area Between the Cabin Bulkhead and the Instrument Panel near the Center of the Cabin - Airplane Zone 231/232		6
Aft Fuselage - Airplane Zone 310		8

"END"

GENERAL - DESCRIPTION AND OPERATION

The instrument panel is divided into five groupings. (1) The flight instrument panel, containing those instruments necessary to sustain flight. (2) The engine instrument panel which contains instruments that indicate the different monitoring systems of the engines. (3) The radio and avionics panel (optional) contains all applicable radio and avionics controls. (4) The left subpanel contains switches and circuit breaker switches. (5) The right subpanel contains circuit breakers. Coverage of the instrument panel and major electrical and electronic component locations is provided in the following pages.

"END"

INSTRUMENT AND CONTROL PANELS - MAINTENANCE PRACTICES

REMOVAL OF FLIGHT INSTRUMENTS

a. Remove the glareshield.
b. Disconnect the plumbing and/or electrical connections from the flight instruments.
c. Disconnect and remove any post lights.
d. Remove the mounting screws securing the instrument to the panel section.
e. Remove the instrument.

INSTALLATION OF FLIGHT INSTRUMENTS

a. Place the instrument in the proper position in the panel.
b. Secure the instrument to the panel with the attaching screws.
c. Connect the post lights as necessary.
d. Connect the plumbing and/or electrical connections to the flight instruments.
e. Press the glareshield into place.

REMOVAL OF THE RADIO AND AVIONICS PANEL

a. Remove the glareshield.
b. Tag and disconnect all harnesses and mechanical drives, if installed, from the individual units to permit removal of the radio and avionics panel.
c. Remove the individual units from the radio and avionics panel as required.

INSTALLATION OF THE RADIO AND AVIONICS PANEL

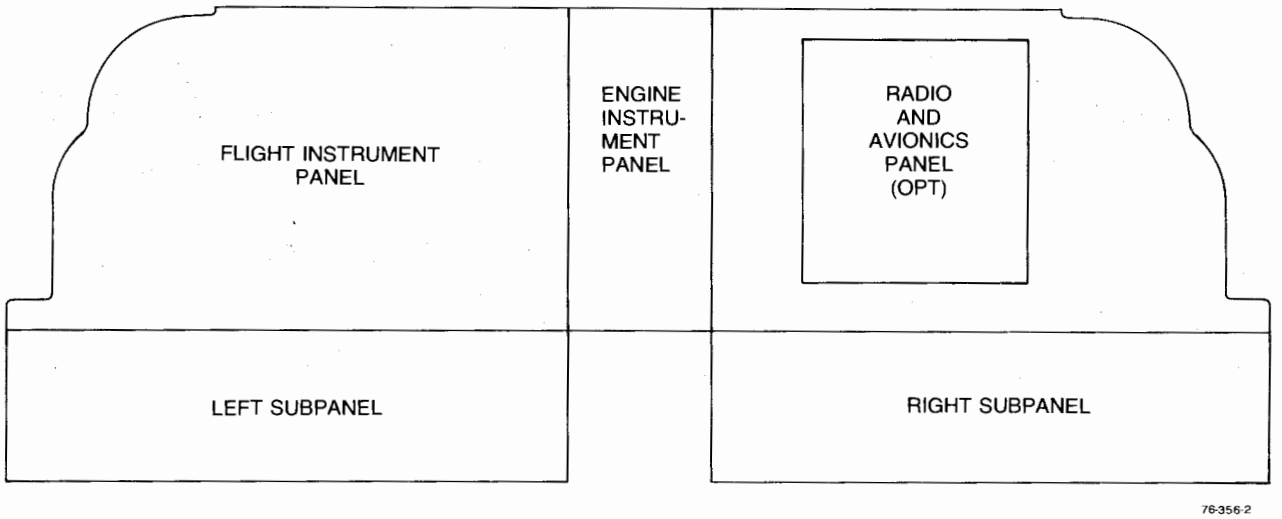
a. Ensure that all radio and avionics equipment is installed in the radio and avionics panel.
b. Place the radio and avionics panel in position and secure with screws.
c. Remove the identification tags and install the harnesses and mechanical drives, if required, to the individual units of the radio and avionics panel.
d. Press the glareshield into place.

REMOVAL OF THE ENGINE INSTRUMENT CLUSTER PANEL

a. Disconnect the two harness connectors on the back of the engine instrument cluster.
b. Remove the six screws securing the instrument cluster to the instrument panel. Support the cluster assembly while removing the screws to prevent dropping it.
c. Remove the cluster from the panel.
d. For removing of individual instruments from the engine instrument cluster panel, refer to Chapter 77.

INSTALLATION OF THE ENGINE INSTRUMENT CLUSTER PANEL

a. Place the engine instrument cluster panel in the proper position in the instrument panel.
b. Secure the instrument cluster to the instrument panel with the six screws.



Instrument and Control Panel
Figure 1

CAUTION

If replacement of the screws is required, use screws of the same length as the original screws to avoid internal damage to the instrument cluster.

c. Connect the two engine harness connectors to the back of the instrument cluster. Be sure that the left and right connectors are connected in their respective places.

LEFT SUBPANEL

Access to the individually mounted switches and circuit breaker switches is obtained from the underside of the instrument panel. Before starting any removal or installation procedures, ensure that the battery switch is in the OFF position, the battery is disconnected, and that the external ground power unit is disconnected. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate reinstallation of the components. The following electrical components are located on the left subpanel. The numbers in parentheses ( ) correspond to the reference designators identifying the component in the Wiring Diagram Manual.

SWITCHES

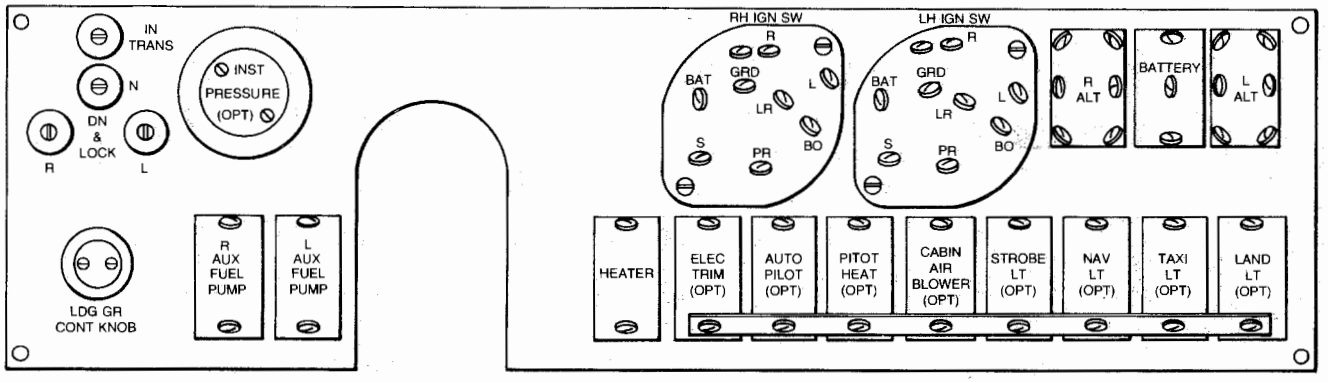
Left Alternator Switch (S113)
Battery Master Switch (S116)
Right Alternator Switch (S114)
Left Ignition/Start/Prime Switch (S110)
Right Ignition/Start/Prime Switch (S111)
Landing Gear Control Switch (S101)
Right Aux Fuel Pump Switch (S119)
Left Aux Fuel Pump Switch (S117)
Heater Switch (S126)

LIGHTS

Landing Gear In Transit Light (DS113)
Nose Landing Gear Down and Locked Light (DS105)
Left Main Landing Gear Down and Locked Light (DS104)
Right Main Landing Gear Down and Locked Light (DS106)

CIRCUIT BREAKER SWITCH

Optional Electric Trim Circuit Breaker (CB105)
Optional Auto Pilot Circuit Breaker (CB130)
Optional Pitot Heat Circuit Breaker (CB100)
Optional Cabin Air Blower Circuit Breaker (CB112)
Optional Strobe Light Circuit Breaker (CB101)
Optional Navigation Light Circuit Breaker (CB102)
Optional Taxi Light Circuit Breaker (CB103)
Optional Landing Light Circuit Breaker (CB104)



76-395-1

Left Subpanel
Figure 2

RIGHT SUBPANEL

Access to the individually mounted circuit breakers is obtained from the underside of the instrument panel. Before starting any removal or installation procedures, ensure that the battery switch is in the OFF position, the battery is disconnected, and that the external ground power unit is disconnected. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate reinstallation of the components.

The following electrical components are located on the right subpanel. The numbers in parentheses ( ) correspond to the reference designators identifying the component in the Wiring Diagram Manual.

CIRCUIT BREAKERS

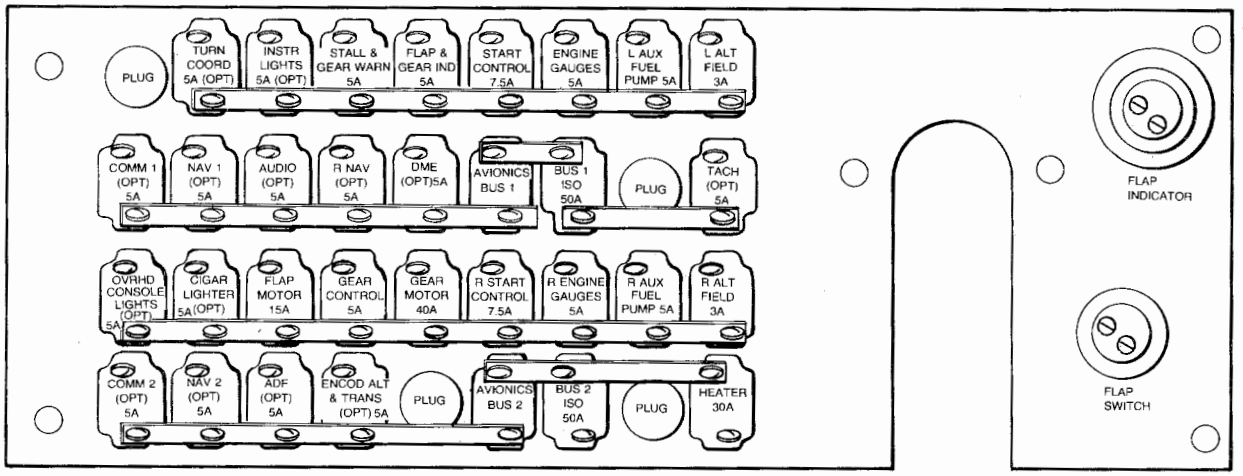
Turn Coordinator (CB118)
Instrument Cluster, Panel, Post, and Magnetic Compass Lights (CB129)
Stall and Gear Warning Horn (CB117)
Left Start Control and Primer (CB114)
Flap and Gear Indicator (CB109)
Left Engine Instrument (CB111)
Left Aux Fuel Pump (CB121)
Left Alternator Field (CB123)
Communication 1 (CB131)
Navigations 1 (CB133)
Audio Marker Beacon (CB135)
Area Navigation (CB138)
DME (CB137)
Left Bus Isolation (CB127)
Overhead Instrument Panel, Dome, and Map Lights (CB113)
Landing Gear Control (CB106)
Landing Gear Motor (CB107)
Cigarette Lighter (CB116)
Flap Motor (CB108)
Right Start Control and Primer (CB142)
Right Engine Instruments (CB110)
Right Aux Fuel Pump (CB122)
Right Alternator Field (CB124)
Communication 2 (CB132)
Navigation 2 (CB134)
ADF (CB136)
Encode Altimeter and Transponder (CB139)
Right Alternator Bus Isolation (CB128)
Combustion Heater (CB143)
Tachometer (CB145) ME-140 and after

SWITCH

Flap Control (S121)

INDICATOR

Flap Position (M100)



76-395-2

Right Subpanel
Figure 3

"END"

ELECTRICAL AND ELECTRONIC EQUIPMENT RACKS - MAINTENANCE PRACTICES

The circuit diagrams and the accompanying equipment lists in the Wiring Diagram Manual identify each electrical component with a reference designator. Further, the equipment list identifies the area in which the component is installed by a zone number. The airplane zoning diagram, which is repeated in Figure 1, shows the various zones of the airplane. The lists of components, and the illustrations showing their installation on the following pages, identify these components by the reference designator, shown in parenthesis ( ), assigned each component in the Wiring Diagram Manual.

COMPONENT LOCATION ZONES

( ) INDICATES RIGHT SIDE

100 RADOME AND AREAS BELOW FLOOR

110	Nose Cone
131	Below Nose Compartment
140	FWD Cabin BHD to FWD Spar
150	FWD Spar to Main Spar
160	AFT of Main Spar

200 FORWARD FUSELAGE

210	Nose Compartment
221 (222)	FWD Cabin Bulkhead (Attached to or Accessible from Cabin)
231 (232)	FWD Cabin BHD to Instrument Panel
240	Instrument Panel
251 (252)	Cabin (Floor to Headliner)
253	Headliner Area
270	Forward Spar
280	Main Spar

300 AFT FUSELAGE AND EMPENNAGE

310	AFT Fuselage
320	Dorsal Fin
330	Vertical Stabilizer
340	Rudder
345	Rudder Tab
351 (352)	Horizontal Stabilizer
361 (362)	Elevator
363 (364)	Elevator Tab
370	Tail Cone

410 (420) ENGINE AND ENGINE COMPARTMENT

500 (600) WING AND CONTROL SURFACES

510 (610)	Wing Leading Edge (INBD of Nacelle)
511 (611)	Wing (FWD of Main Spar, INBD of Nacelle)
512 (612)	Wing (AFT of Main Spar INBD of Nacelle)
521 (621)	Firewall
522 (622)	Nacelle (FWD of Main Spar)
523 (623)	Nacelle (AFT of Main Spar)
530 (630)	Wing Leading Edge (OUTBD of Nacelle)
531 (631)	Wing (FWD of Main Spar, OUTBD of Nacelle)
532 (632)	Wing (AFT of Main Spar, OUTBD of Nacelle)
540 (640)	Flap
541 (641)	Aileron
550 (650)	Wing Tip

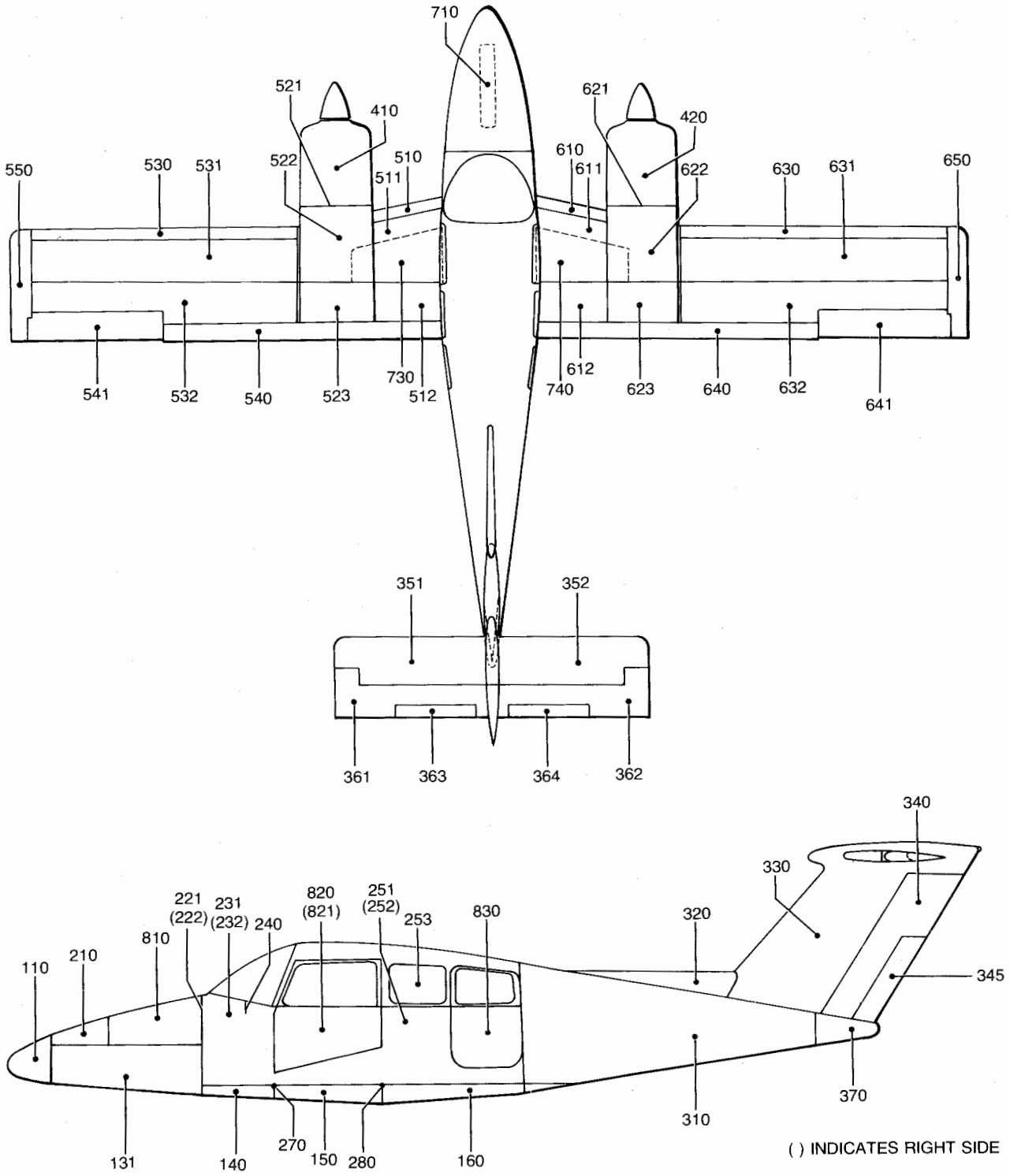
700 GEAR DOORS AND WHEEL WEELS

710	Nose Landing Gear
730 (740)	Main Landing Gear

800 DOORS

810	Nose Compartment Door
820 (821)	Cabin Entry Door
830	Baggage Door

Airplane Zoning Diagram (Sheet 1 of 2)
Figure 1



76-356-3

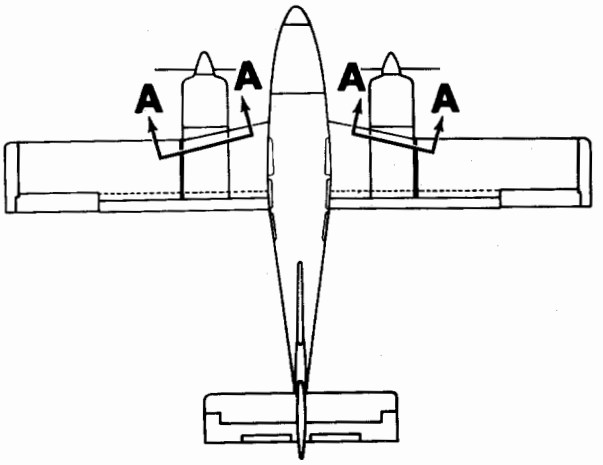
Airplane Zoning Diagram (Sheet 2 of 2)
Figure 1

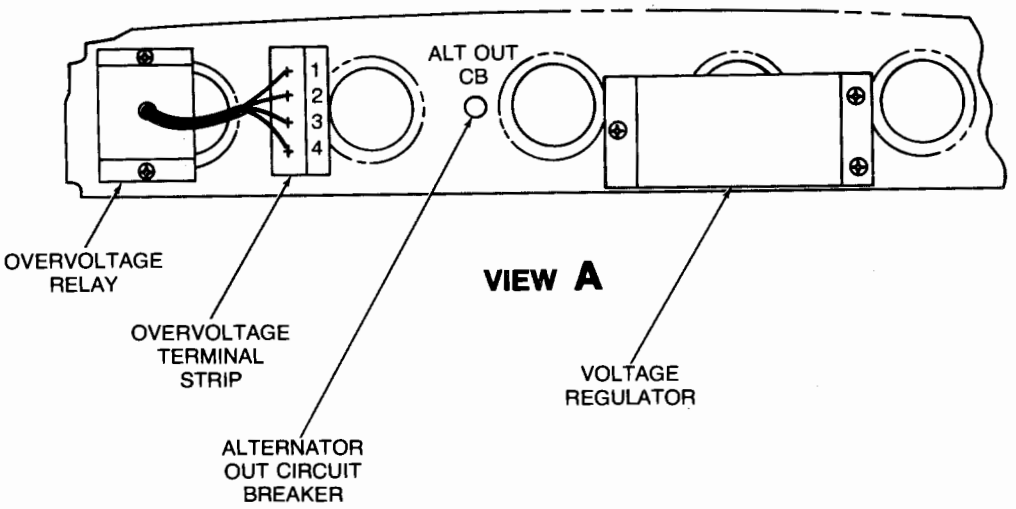
NACELLES (FORWARD OF THE MAIN SPAR) - AIRPLANE ZONES 522 AND 622
Figure 2

The following components are mounted in the left and right nacelles.

Overvoltage Relay (K107 and K108)
Overvoltage Terminal Strip (TB101 and TB102)
Alternator Out Circuit Breaker (CB125 and CB126)
Voltage Regulator (VR100 and VR101)

For maintenance coverage of the overvoltage relay, overvoltage terminal strip, and voltage regulator, refer to Chapter 24 of this Maintenance Manual.





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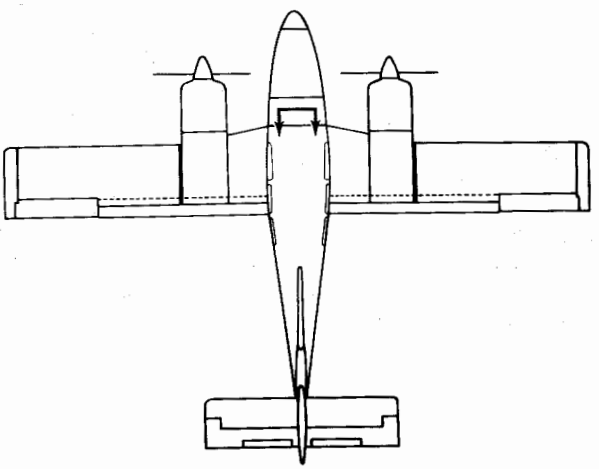
Nacelles (Forward of The Main Spar) - Zones 552 and 622
Figure 2

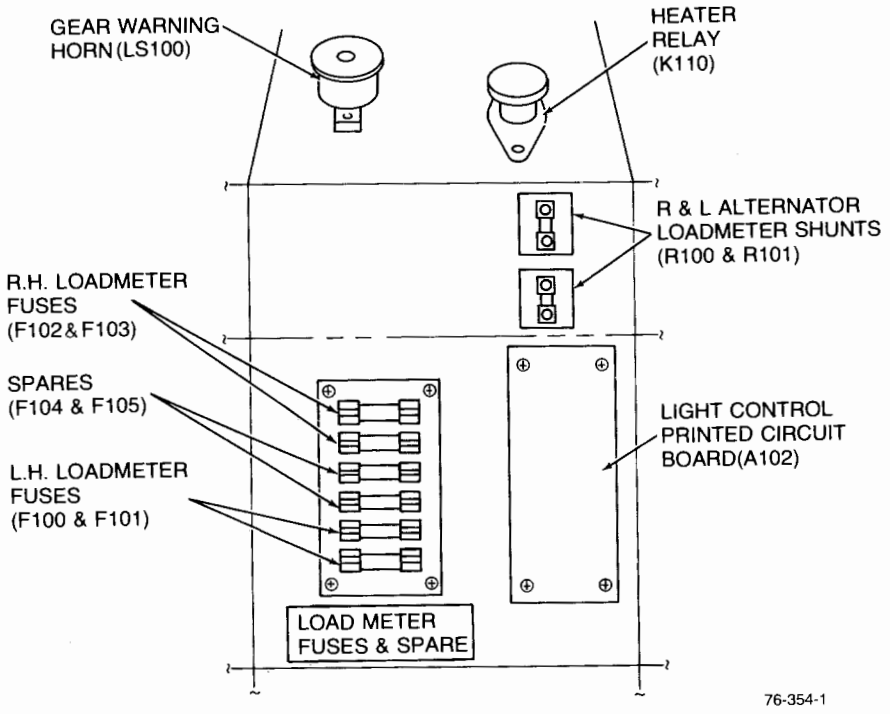
AREA BETWEEN THE CABIN BULKHEAD AND THE INSTRUMENT PANEL NEAR THE CENTER OF THE CABIN - AIRPLANE ZONE 231/232
Figure 3

The electrical components located in airplane zone 231/232 are individually mounted with screws or bolts. Prior to performing any maintenance on these components ensure that the battery switch is OFF, the battery is disconnected, and the external power source is disconnected. When removing these components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

The following components are located at airplane zone 231/232.

Fuses, Two Right Hand Alternator Loadmeter (F102 and F103)
Fuses, Two Spare (F104 and F105)
Fuses, Two Left Hand Alternator Loadmeter (F100 and F101)
Relay, Heater (K110)
Shunt, Right and Left Alternator Loadmeter (R100 and R101)
Printed Circuit Board, Light Control (A102)
Horn, Landing Gear Warning (LS100)





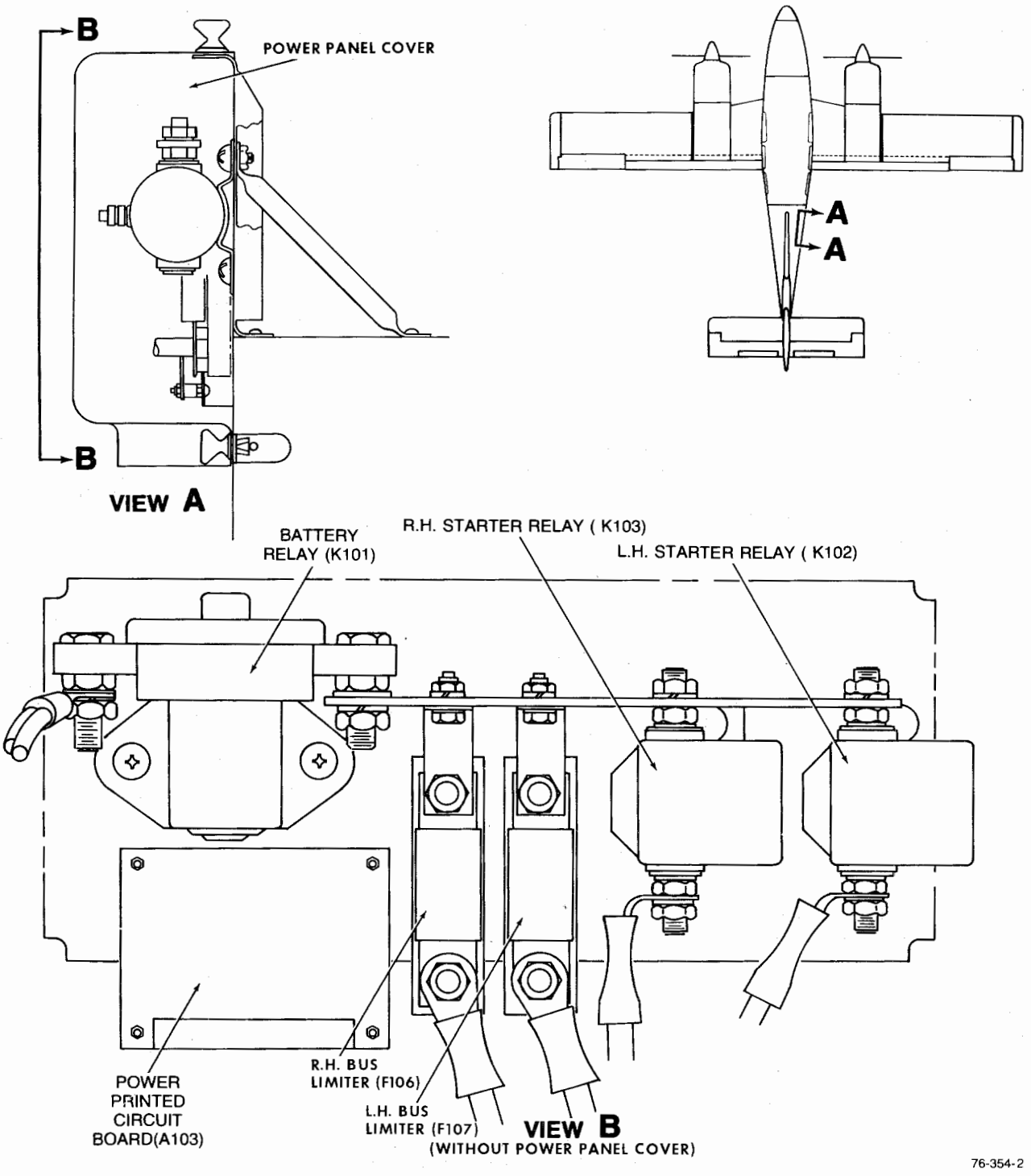
Electrical Components Located in Airplane Zone 231
Figure 3

AFT FUSELAGE - AIRPLANE ZONE 310
(Figure 4)

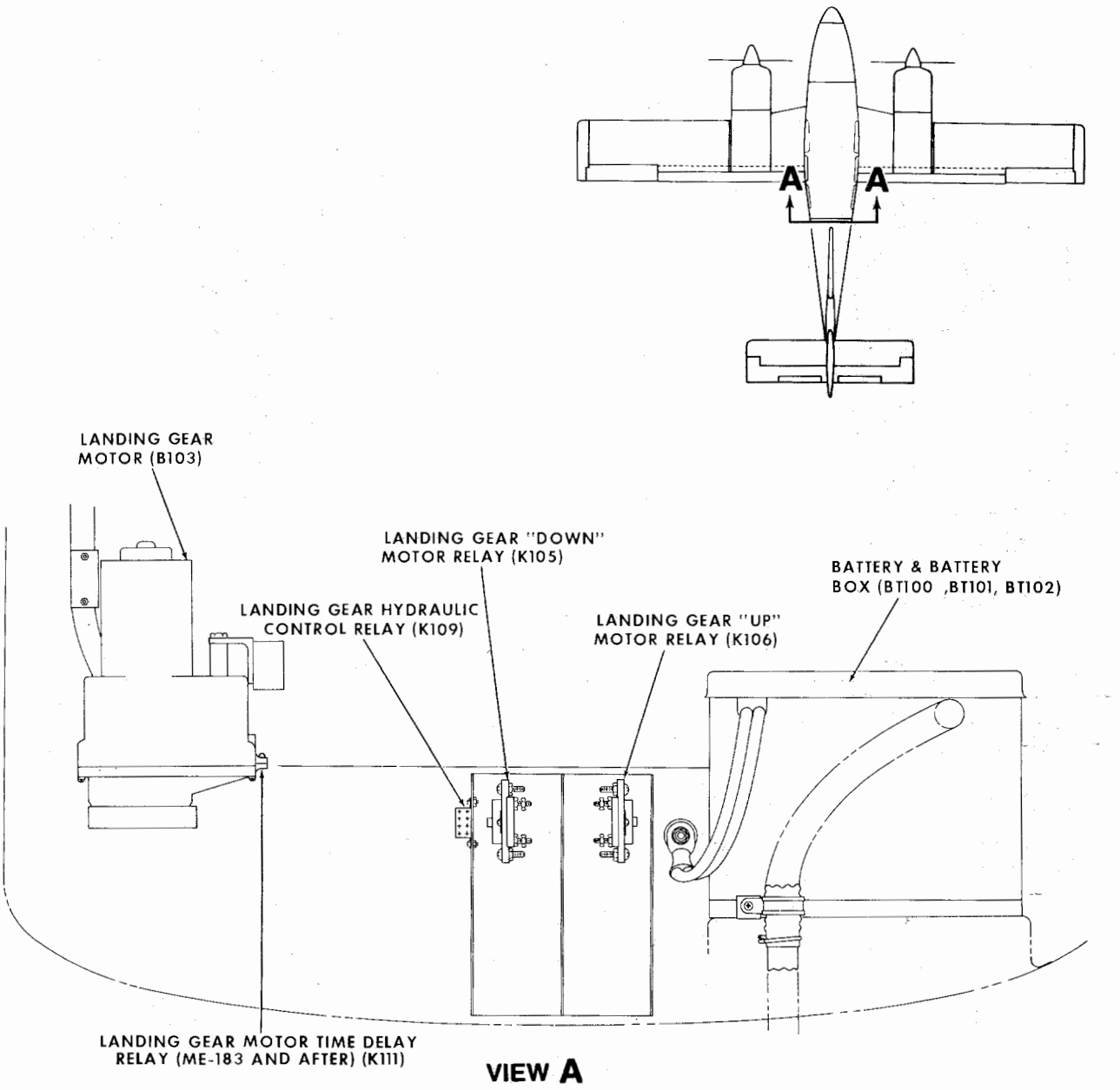
The electrical components located in airplane zone 310, just aft of FS 181.00, are individually mounted with screws or bolts. Prior to performing any maintenance on these components, ensure that the battery switch is OFF, the battery is disconnected, and the external power source is disconnected. When removing these components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

The following components are located in airplane zone 310.

Motor, Landing Gear (B103)
Relay, Landing Gear Hydraulic Control (K109)
Relay, Landing Gear "Down" Motor (K105)
Relay, Landing Gear "Up" Motor (K106)
Battery (1) 12V (ME-1 thru ME-182) (BT100)
Battery (1) 24V (ME-183 and after) (BT100)
Battery (2) 12V (ME-183 and after) (BT101 and BT102)
Printed Circuit Board, Power (A103)
Relay, Battery (K101)
Limiter, Right Hand Bus (F106)
Limiter, Left Hand Bus (F107)
Relay, Right Hand Starter (K103)
Relay, Left Hand Starter (K102)
Relay, Time Delay, Landing Gear Motor (ME-183 and after) (K111)



Aft Fuselage - Airplane Zone 310
Figure 4 (Sheet 1 of 2)



Aft Fuselage - Airplane Zone 310
Figure 4 (Sheet 2 of 2)

"END"

CHAPTER 51

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
51 - EFFECTIVITY/CONTENTS	1	Nov 18/77
51-00-00	1	Nov 18/77

CHAPTER 51 - STRUCTURES

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Structural Repair		1
Repair of Fiberglass Components		1

"END"

GENERAL - DESCRIPTION AND OPERATION

The airplane is of semimonocoque construction. Although the wing carry-through structure is an integral part of the fuselage, the wings may be removed at the attach points inboard of the nacelles. Two doors provide access to the flight compartment. One is located on the left hand and one on the right hand side of the fuselage between Fuselage Stations 94.00 and 132.00. A large baggage door on the left side of the fuselage allows loading of luggage and cargo. Individual forward facing passenger seats are provided.

GENERAL - MAINTENANCE PRACTICES

STRUCTURAL REPAIR

In general, structural repair methods used on the airplane may be in accordance with AC 43.13-1A AIRCRAFT INSPECTION AND REPAIR MANUAL and AC 43.13-2 AIRCRAFT ALTERATIONS MANUAL. Never make a skin replacement or patch from a material thinner than the original skin. Patches should be of the next thicker material. The following considerations are recommended in addition to AC 43.13-1A AIRCRAFT INSPECTION AND REPAIR MANUAL and AC 43.13-2 AIRCRAFT ALTERATIONS MANUAL for repair of the airplane.

a. All lap joints, including patches, must have at least two staggered rows of rivets.

b. All repair material must be free of any defects such as nicks, scratches, etc., which can cause stress rises.

c. Never dimple a structural member by driving the rivet head into the part.

d. Do not countersink deeper than 75% of the material thickness.

REPAIR OF FIBERGLASS COMPONENTS

a. Large holes and cracks require that the damaged area be cut out and trimmed just beyond the area of damage. If the parts are painted, remove the paint and sand that portion of the part extending at least 2 inches beyond the cutout.

b. Prepare 3 patches of laminated glass cloth, such as Trevano, Uniglass, or their equivalent. Cut the first patch to the dimensions of the sanded area, the second patch 1/2-inch smaller than the first, and the third patch 1/2-inch smaller than the second.

c. Prepare the MIL-R-7575 resin (6, Chart 1, 91-00-00) for the patch in accordance with the manufacturer's instructions. Make sure that your hands are free of oil, grease, and dirt when handling the resin.

d. Apply an even coat of resin to the sanded area. Impregnate all three laminated glass cloth patches by laying the patches on clean waxed paper and working the resin through the fabric with a 2-inch brush.

e. Place the large patch over the cutout area, working out all bubbles and wrinkles. If the patch starts to sag, place a support behind the repair area. Coat the support with automobile wax or waxed paper to prevent the resin from adhering to the support. Work out all air bubbles and wrinkles while installing the second patch over the first. Install the third patch over the second in the same manner.

f. Brush the repaired area with an even coat of resin. After the patches have cured for 24 hours at temperatures between 23°C (75°F) and 66°C (150°F), blend the patch into the contour of the part with fine sandpaper. Paint the repair to match the rest of the part.

"END"

CHAPTER 52

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
52-EFFECTIVITY	1	Sep 7/79
52-CONTENTS	1	Nov 18/77
52-00-00	1	Nov 18/77
52-10-00	1	Sep 7/79
52-30-00	1	Nov 18/77

"END"

CHAPTER 52 - DOORS

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LH Aft Baggage Door		1
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Cabin Door Removal		1
Cabin Door Installation		1
Cabin Door Latch Rigging		1
CARGO	52-30-00	
Maintenance Practices		1
Baggage Door Removal		1
Baggage Door Installation		1

"END"

GENERAL - DESCRIPTION AND OPERATION

LH AND RH CABIN DOORS

The airplane is provided with two doors which provide access to the flight compartment. One door is located on the left hand and one on the right hand side of the fuselage between Fuselage Stations 94.00 and 132.00. Each door is hinged to the Fuselage at two points at Fuselage Station 94.00. A door stop is located on the forward, bottom edge of each door.

Each cabin door is provided with an upper and lower latch that engage latch plates in the door sill of the fuselage. The lower latch is located directly aft of the outside door handle. The upper latch is located at the top of each door at Fuselage Station 130.00. One cable is routed from the inside door handle, at Fuselage Station 121.00, to a bell crank assembly and the outside door handle at Fuselage Station 129.00. Another cable is routed from the bell crank assembly to the upper latch.

This system of cables and the bell crank assembly controls movement of the upper and lower latch when actuated by either the inside or outside door handles. Turnbuckles, attached to the cables, allow adjustments to be made.

LH AFT BAGGAGE DOOR

A large baggage door on the left side of the fuselage, allows entrance for passengers and loading of luggage and cargo. The door, located between Fuselage Station's 157.00 and 181.00, is hinged at the forward edge on the lower half. Because of the contour of the side of the fuselage, the upper portion is not hinged. A hook on the upper half of the forward edge of the door engage's a hook plate in the door sill of the fuselage as the door is being closed, securing the top of the door. A door stop is located on the forward bottom edge of the door. The inside and outside door handles, located at Fuselage Station 177.00, control the latch situated directly aft of the door handles.

"END"

PASSENGER/CREW DOORS - MAINTENANCE PRACTICES

CABIN DOOR REMOVAL

a. Open the door and remove the door stop from the bottom of the door.

b. Remove the side upholstery panel just forward of the door to gain access to the eyebolt nuts.

c. While supporting the door, remove the eyebolt nuts and washers.

d. Remove the door by pulling the door and eyebolts free from the door frame.

CABIN DOOR INSTALLATION

a. Place the door in position while sliding the eyebolts through the door frame.

b. While supporting the door, install washers P/N AN960PD516L or AN960PD516 as required to make the door contour match the door opening contour.

c. Install the nuts and tighten. The bolt must have a minimum of two threads extended through the outside of the nut after the washers are added.

d. Attach the door stop to the bottom of the door.

e. Check the door closing and make adjustment, if required, to the latching mechanism to obtain proper closure. Refer to CABIN DOOR LATCH RIGGING, as described in this chapter.

CABIN DOOR LATCH RIGGING

a. Remove the remote (inside) door handle, arm rest upholstery panel and window trim (ME-1 thru ME-282, ME-284 thru ME-287). Remove the remote (inside) door handle and upholstery panel (ME-283, ME-288 and after).

b. Adjust the remote (upper) latch by adjusting the turnbuckle to shorten or lengthen the cable that attaches the latch assembly to the bell crank.

c. Adjust the turnbuckle on the cable attaching the remote door handle assembly to the bell crank so that both the remote and lower latches release when the remote handle is operated to the open position.

d. Check both latches to ascertain that both protrude into their respective striker plates, providing proper closure and security.

e. Check that both latches release when the outside handle is operated to the open position.

f. It is permissible to shim as required to maintain clearance between the striker and door pan. Shim build up not to exceed .06 thick. The shim width and length shall be made the same size as the contact area of the striker to the mounting surface.

g. It is also permissible to shim as required to ensure that the support makes contact with the door sill. Shim material shall be made the same width and length of the support.

h. Install the upholstery panel, window trim, arm rest and door handle (ME-1 thru ME-282, ME-284 thru ME-287). Install the upholstery panel and door handle (ME-283, ME-288 and after).

"END"

CARGO DOORS - MAINTENANCE PRACTICES

BAGGAGE DOOR REMOVAL

a. Open the door and remove the door stop from the bottom of the door.

b. Support the door and pull the hinge pin from the door hinge.

c. Remove the door.

BAGGAGE DOOR INSTALLATION

a. While holding the door in place, and with hinge halves mated, insert the hinge pin into the door hinge.

b. Connect the door stop to the bottom of the door.

c. Check the door closing and make adjustment to the striker plate, if required, to obtain proper closure.

"END"

CHAPTER 53

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
53-EFFECTIVITY/CONTENTS	1	Feb 16/79
53-30-00	1	Feb 16/79
	2	Feb 16/79
	3	Nov 18/77
	4	Nov 18/77
	5	Nov 18/77
	6	Nov 18/77

CHAPTER 53 - FUSELAGE

TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
PLATES/SKIN	53-30-00	
Maintenance Practices		1
Fuselage, Horizontal and Vertical Stabilizer Access Openings		1
Fuselage Skin Thickness		4

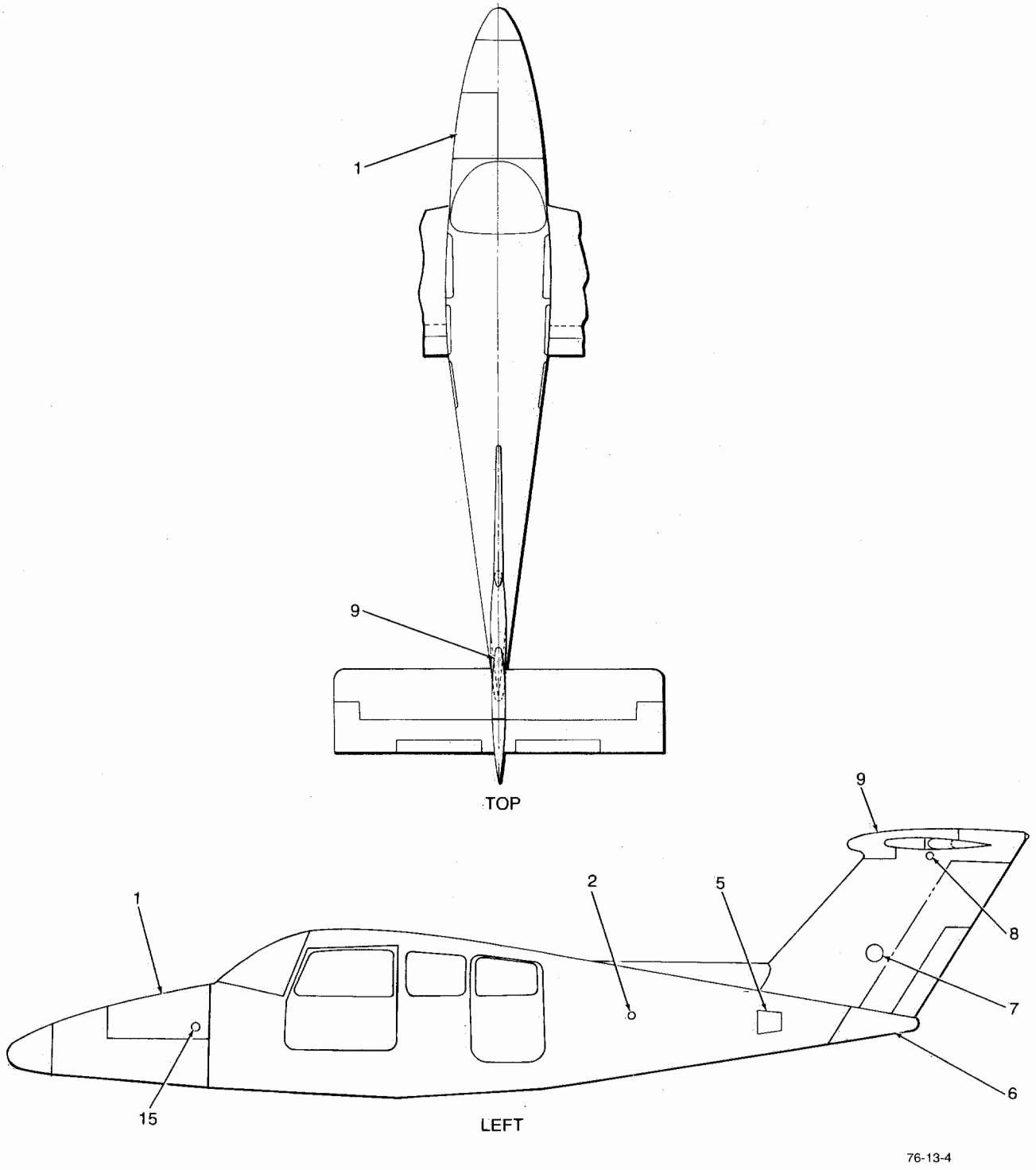
"END"

PLATES/SKIN - MAINTENANCE PRACTICES

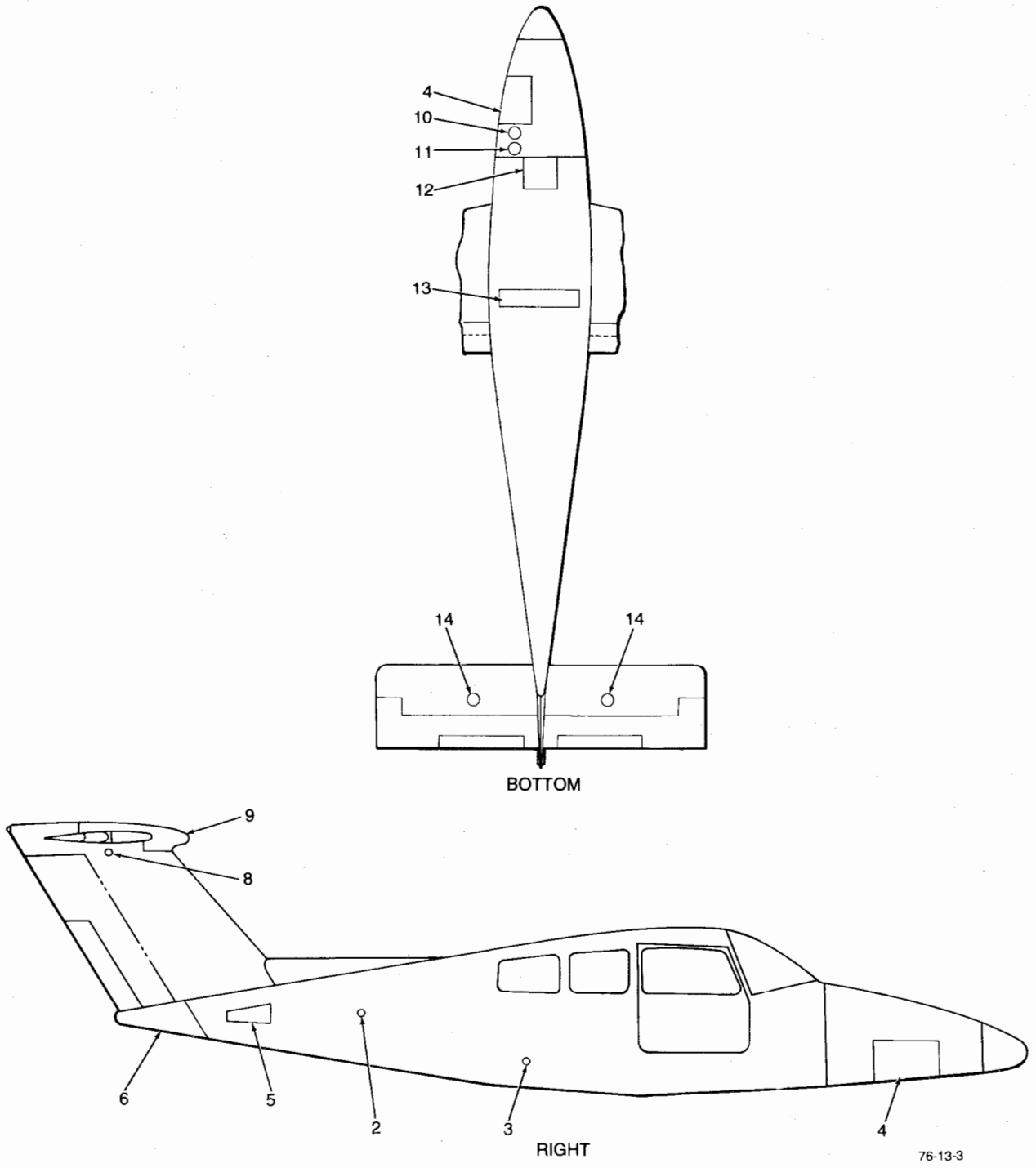
FUSELAGE, HORIZONTAL, AND VERTICAL STABILIZER ACCESS OPENINGS

1. Panel to instrument plumbing, forward chain bus system, and avionics wiring.
2. Static air inlet
3. External power receptacle
4. Airplane heater assembly
5. Emergency locator transmitter and elevator and rudder cables
6. Rudder bell crank
7. Rudder trim tab actuator
8. Elevator bell crank
9. Horizontal stabilizer installation
10. Heater exhaust
11. Heater plumbing and overheat reset
12. Control column base and elevator control cable connection
13. Spar splice and pitot drain
14. Elevator trim tab actuators
15. Brake fluid reservoir

Fuselage Access Openings
Figure 1 (Sheet 1 of 3)



Fuselage Access Openings
Figure 1 (Sheet 2 of 3)

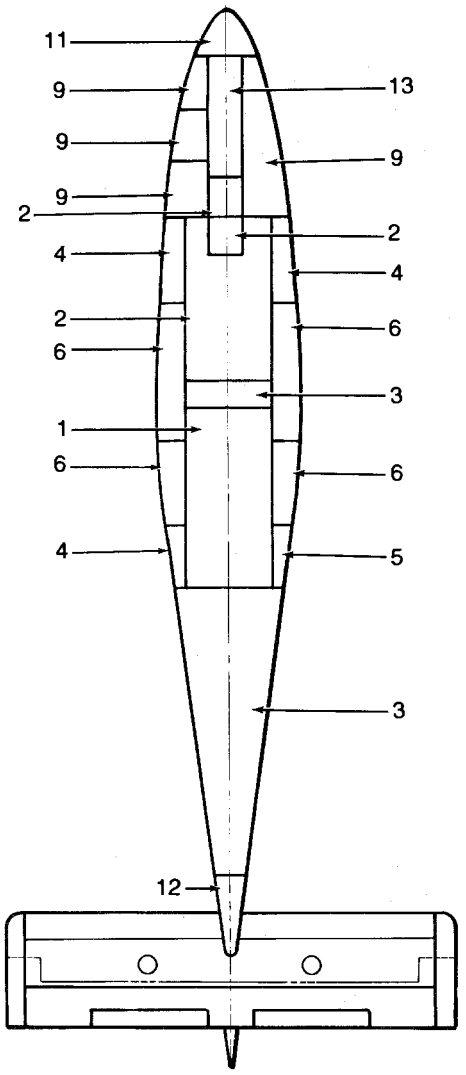


Fuselage Access Openings
Figure 1 (Sheet 3 of 3)

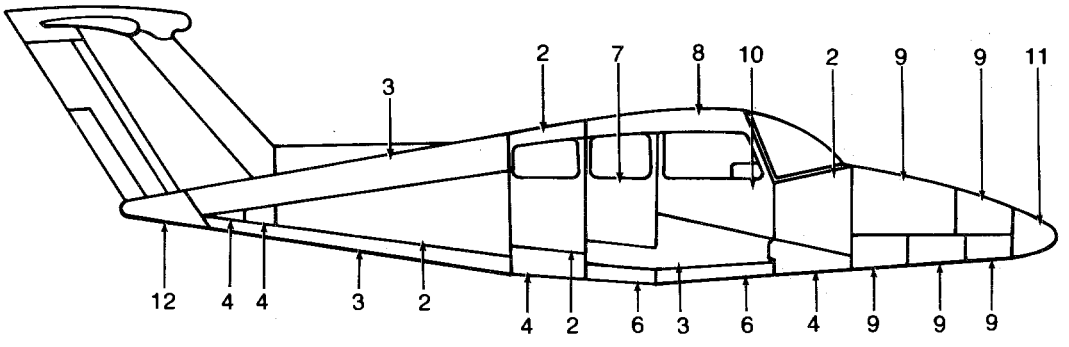
FUSELAGE SKIN THICKNESS

NUMBER	*MATERIAL*	*THICKNESS IN INCHES*
1.	2024-T3	.020
2.	2024-T3	.025
3.	2024-T3	.032
4.	2024-T3	.040
5.	2024-T3	.050
6.	2024-T3	.063
7.	6061-T4	.032
8.	6061-T6	.032
9.	6061-T62	.025
10.	6062-T62	.032
11.	181 Cloth and Polyester Resin (See Parts Catalog)	
12.	Thermoplastic Sheet (See Parts Catalog)	
13.	Laminated Honeycomb (See Parts Catalog)	

Fuselage Skin Thickness
Figure 2 (Sheet 1 of 3)



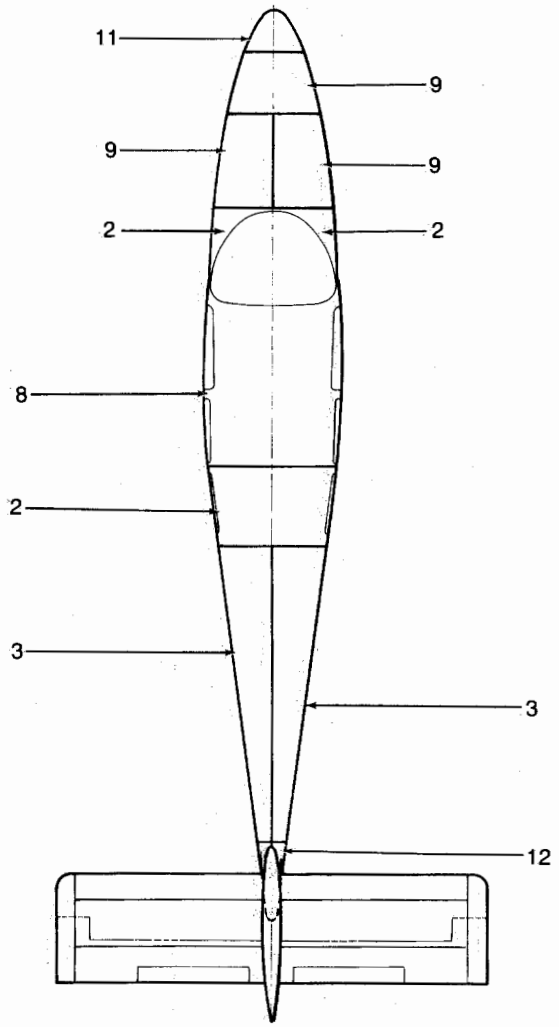
BOTTOM VIEW



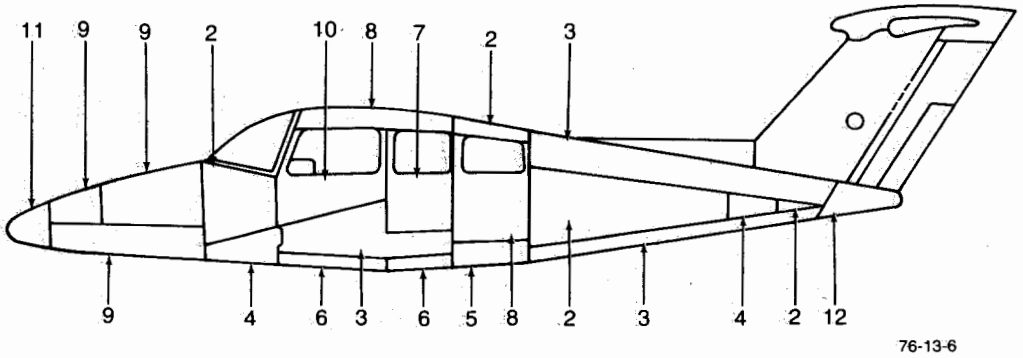
76-13-5

RIGHT VIEW

Fuselage Skin Thickness
Figure 2 (Sheet 2 of 3)



TOP VIEW



LEFT VIEW

Fuselage Skin Thickness
Figure 2 (Sheet 3 of 3)

"END"

CHAPTER 54

LIST OF PAGE EFFECTIVITY

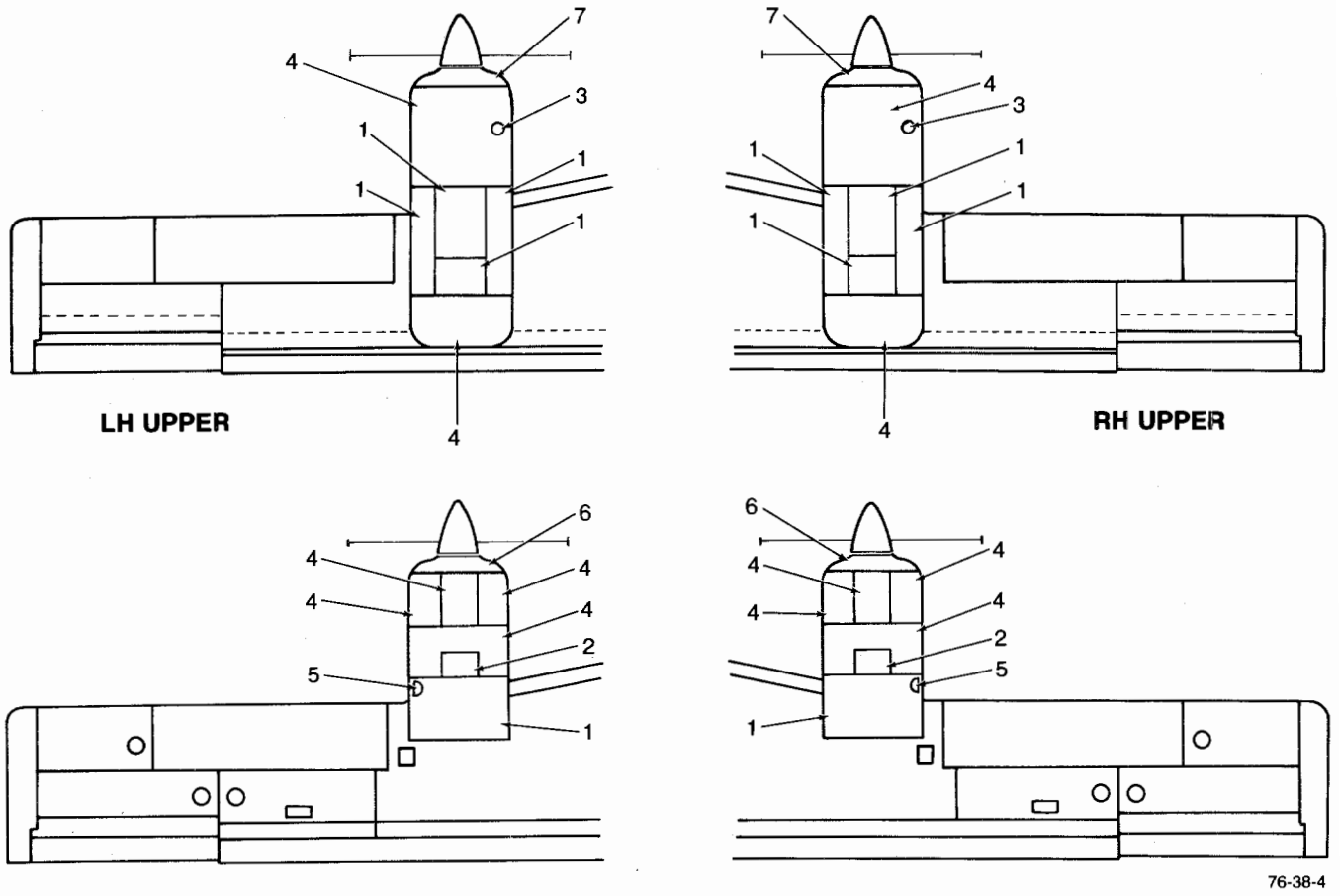
CHAPTER SECTION SUBJECT	PAGE	DATE
54-EFFECTIVITY/CONTENTS	1	Nov 18/77
54-30-00	1	Nov 18/77

CHAPTER 54 - NACELLES

TABLE OF CONTENTS

SUBJECT	CHAPTER SECTION SUBJECT	PAGE
PLATES/SKINS	54-30-00	
Maintenance Practices		1
Nacelle Skin Thickness		1

"END"



PLATES/SKINS - MAINTENANCE PRACTICES

NACELLE SKIN THICKNESS

NUMBER	*MATERIAL*	*THICKNESS IN INCHES*
1.	2024-T4	.020
2.	6061-T6	.012
3.	6061-T6	.032
4.	6061-T42	.020
5.	6061-T42	.032
6.	6061-T42	.040
7.	181 Cloth and Polyester Resin (See Parts Catalog)	

Nacelle Skin Thickness
Figure 1

"END"

CHAPTER 55

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
55-EFFECTIVITY	1	Feb 16/79
55-CONTENTS	1	Nov 18/77
55-00-00	1	Nov 18/77
	2	Nov 18/77
	3	Nov 18/77
55-10-00	1	Nov 18/77
55-20-00	1	Nov 18/77
	2	Feb 16/79
	3	Nov 18/77
55-30-00	1	Nov 18/77
55-40-00	1	Feb 16/79
	2	Feb 16/79

"END"

CHAPTER 55 - STABILIZERS

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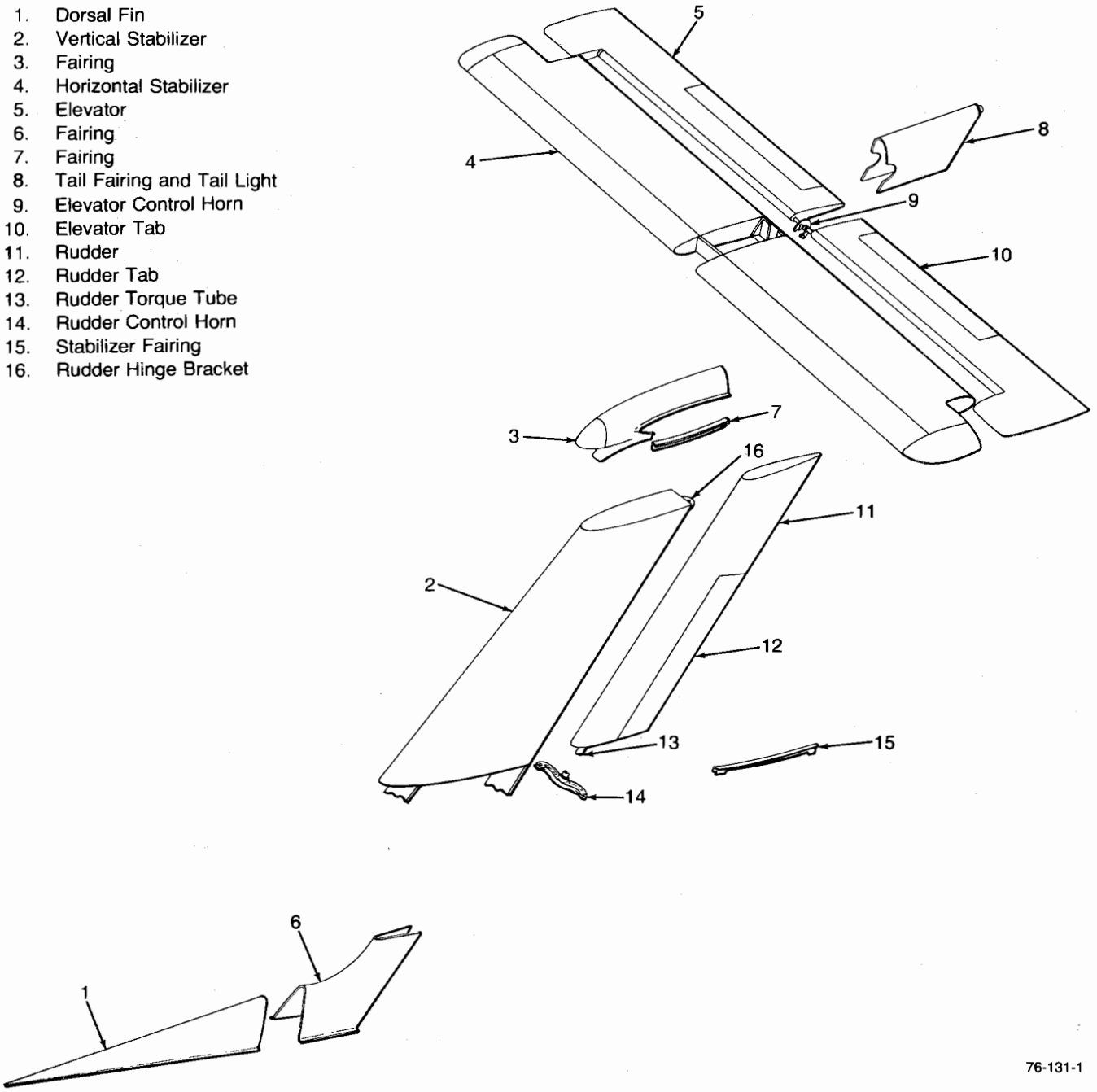
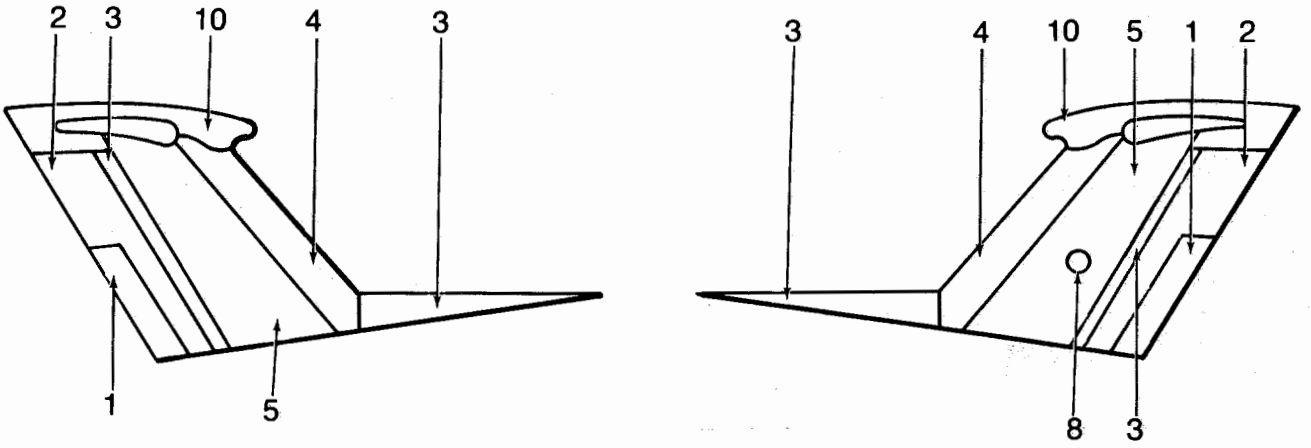
Figure 1		1
Empennage Skin Thickness		2
HORIZONTAL STABILIZERS	55-10-00	
Maintenance Practices		1
Horizontal Stabilizer Removal		1
Horizontal Stabilizer Installation		1
ELEVATOR	55-20-00	
Maintenance Practices		1
Balancing the Elevator		1
Checking Balance		1
Check Balance by Force Measurement		1
Balancing Procedure Force Measurement Method		1
Check Balance by Counter Balancing		1
Equipment Required to Perform Check Balancing by Counter Balancing		1
Balancing Procedure Counter Balancing Method		3
VERTICAL STABILIZER	55-30-00	
Maintenance Practices		1
Vertical Stabilizer Removal		1
Vertical Stabilizer Installation		1
RUDDER	55-40-00	
Balancing the Rudder		1
Checking Balance		1
Check Balance by Force Measurement		1
Balancing Procedure Force Measurement Method		1

"END"

1. Dorsal Fin
2. Vertical Stabilizer
3. Fairing
4. Horizontal Stabilizer
5. Elevator
6. Fairing
7. Fairing
8. Tail Fairing and Tail Light
9. Elevator Control Horn
10. Elevator Tab
11. Rudder
12. Rudder Tab
13. Rudder Torque Tube
14. Rudder Control Horn
15. Stabilizer Fairing
16. Rudder Hinge Bracket



Empennage
Figure 1



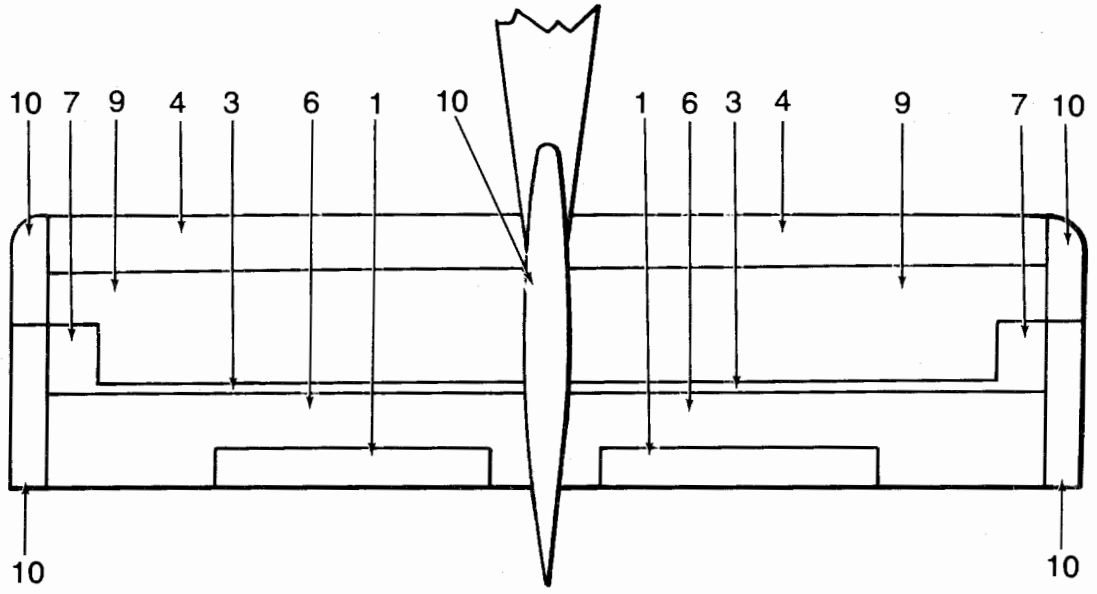
76-131-2

RIGHT VIEW

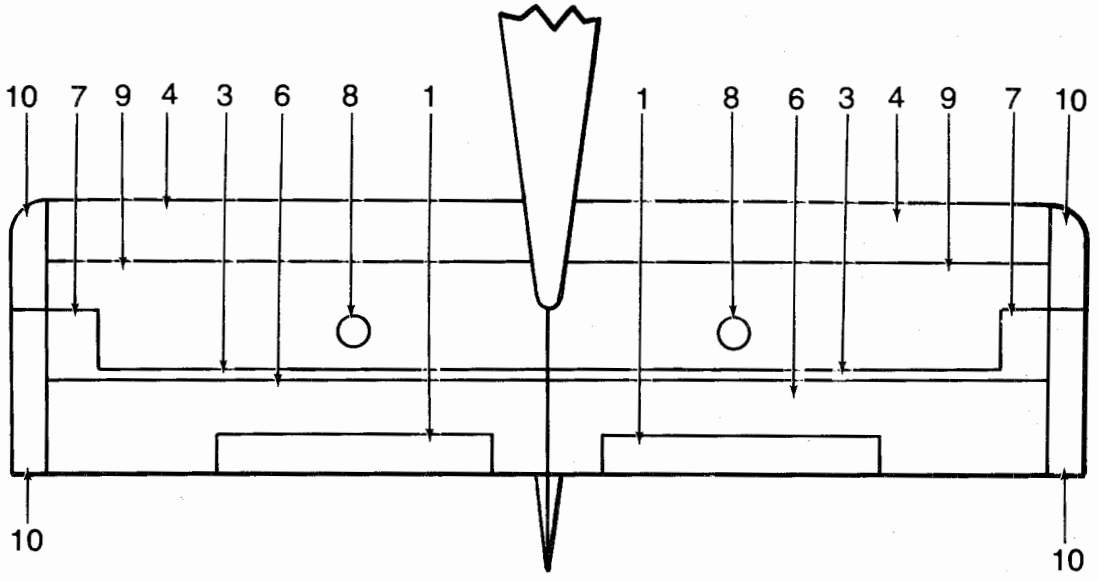
LEFT VIEW

NUMBER	*MATERIAL*	*THICKNESS IN INCHES*
1.	2024-T3	.010
2.	2024-T3	.012
3.	2024-T3	.016
4.	2024-T3	.020
5.	2024-T3	.025
6.	2024-T81	.012
7.	2024-T81	.020
8.	6061-T6	.025
9.	6061-T62	.016
10.	.090 P.V.C. Plastic Sheet (See Parts Catalog)	

Empennage Skin Thickness
Figure 2 (Sheet 1 of 2)



TOP VIEW



76-131-3

BOTTOM VIEW

Empennage Skin Thickness
Figure 2 (Sheet 2 of 2)

"END"

HORIZONTAL STABILIZERS - MAINTENANCE PRACTICES

HORIZONTAL STABILIZER REMOVAL

a. Remove the lock bolts, screws and rivets which attach the fairing at the LH and RH sides of the horizontal and vertical stabilizer intersection.

b. Remove access plates as necessary from the vertical and horizontal stabilizers.

c. Disconnect the elevator bell cranks.

d. Remove the elevators as described in Chapter 27-30-00 under the heading ELEVATOR REMOVAL.

e. Remove the screws attaching the bullet fairing at the forward vertical and horizontal stabilizer intersection.

f. Disconnect the wiring to the upper tail fairing navigation light and remove the fairing.

g. Disconnect the LH and RH elevator trim tab cables from the turnbuckles in the horizontal stabilizer assembly. Remove the cables from the pulleys and secure to prevent the cables from falling into the vertical stabilizer.

h. Remove the bolts which attach the horizontal stabilizer to the vertical stabilizer.

NOTE

When removing the bolts, carefully remove the shims from between the horizontal and vertical stabilizer attach points so they will not be inadvertently dropped into the vertical stabilizer.

j. Remove the horizontal stabilizer assembly from the airplane.

HORIZONTAL STABILIZER INSTALLATION

a. Position the horizontal stabilizer on the vertical stabilizer and install the bolts which attach the horizontal stabilizer to the airplane.

NOTE

The shims called out for the bolts in the following steps, may be installed, peeled, or omitted as required to ensure that a gap of not more than .020 exists, between vertical stabilizer spars and bulkheads; horizontal stabilizer spars and fittings, before tightening bolts. MAXIMUM shim thickness at each joint to be .062.

b. At the front spar, install shims P/N 105-600013-1, four bolts (head forward), eight washers, and four nuts. Torque bolts 100-140 inch-pounds.

c. At the rear spar, install shim P/N 105-600013-3. In the center holes, install the bolts (head forward), washers, and nuts.

d. In the outer holes of the rear spar, install the bolts (head forward), washers, and nuts. Torque bolts 100-140 inch-pounds.

e. Install the rivets, screws and lock bolts which attach the fairing at the LH and RH sides of the horizontal and vertical stabilizer intersection.

f. Position the elevators and install the bolts, washers, and nuts in the elevator actuator horn. Torque the bolts 40-60 inch-pounds.

g. In the remaining hole, through the horizontal stabilizer, install the bolt, washers (one between the end of the elevator and one between the bearing on the horizontal stabilizer). Install the nut and cotter pin. Torque the bolt 40 to 50 inch-pounds. It is permissible to tighten the bolt to 60 inch-pounds if cotter pin holes do not line up.

CAUTION

DO NOT loosen the nut to align cotter pin holes. If torque requirements cannot be met, add or remove washers as required to comply with torque requirements.

h. Route the trim tab cables over the pulleys and into the LH and RH horizontal stabilizers and connect them to the turnbuckles.

i. Rig the elevators and elevator trim tabs as described in Chapter 27-30-00 under the heading ELEVATOR AND TAB.

j. Connect the wiring to the tail navigation light and install the bullet fairing and upper tail fairing.

k. Install the access plates to complete the horizontal stabilizer installation.

"END"

ELEVATOR - MAINTENANCE PRACTICES

BALANCING THE ELEVATOR
(Figure 1)

After any repainting or repair, the finished surface should be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The completed elevator assembly, including paint, tab (at neutral), tab push rod, and static wicks if installed is NOT to be less than 10.00 inch-pounds or exceed 11.30 inch-pounds tail-heavy. The static moment is the total unbalanced weight of the elevator control surface multiplied by the perpendicular distance from its hinge center line to the center of gravity, when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced elevator control surface is 0.00 lb. A tail-heavy surface exhibits static underbalance. A nose-heavy surface exhibits static overbalance.

CHECKING BALANCE

The elevator balance must be checked in a draft free area with the elevator completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, tab push rod, static wicks, and hinge plate bolt must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, they can be categorized under the following two headings:

a. Actual Force Measurement - Measurement of the force applied by the elevator surface on a single support at a known distance from the center line of the hinge.

b. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the elevator assembly.

CHECK BALANCE BY FORCE MEASUREMENT

The equipment required to perform the check balance by force measurement is as follows:

a. A stand with knife edge supports as illustrated in Figure 1. The knife edges should be in the same horizontal plane.

b. A certified beam balance calibrated in units of .01 lb. or less. The balance should have a flat weighing platform and its capacity should equal tare plus 2.0 lbs. minimum.

c. A support spindle similar to the illustration and levelling blocks, as required. (Blocks + spindle = tare).

d. A straight edge, ruler which measures to .01 inch and a spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

Locate the chord line by placing a straight edge at the inboard end of the elevator so that one end is aligned with the center of the torque tube and the other end is centered on the trailing edge. Mark the chord line by grease pencil or other means on the rib. Remove the straight edge. Fit the correct size bolt in the center hinge plate and mount the elevator on the knife edges. Ensure that it is free to rotate about the hinge line. Support the trailing edge behind the center hinge point with a spindle resting on a levelled beam balance platform as illustrated. The spindle must be vertical throughout the balancing procedure. Hold a spirit level against the marked chord line and level it by extending or contracting the spindle, or by using blocks and shims under the spindle. Measure the perpendicular distance from the hinge center line to the point supported by the spindle. Ensure that the spirit level and rule are removed from the surface and read the reaction on the beam balance. Calculate the static underbalance moment "M" from the formula:

M = D(R-T) inch-pounds where,
D = Perpendicular distance from the hinge centerline to the spindle point (inches).
R = Reaction (Pounds) read from the beam balance.
T = Tare, i.e. spindle plus leveling blocks or shims on the scale platform (Pounds).

EXAMPLE

D is 13.00 inches, R is 1.83 lb. and T = 1.00 lb.
M = 13.00 (1.83 - 1.00); M = 10.79 inch-pounds
M is within the range which is satisfactory.
If M is not within the prescribed range, refer to step "i" under BALANCING PROCEDURE COUNTER BALANCING METHOD.

CHECK BALANCE BY COUNTER BALANCING

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING BY COUNTER BALANCING

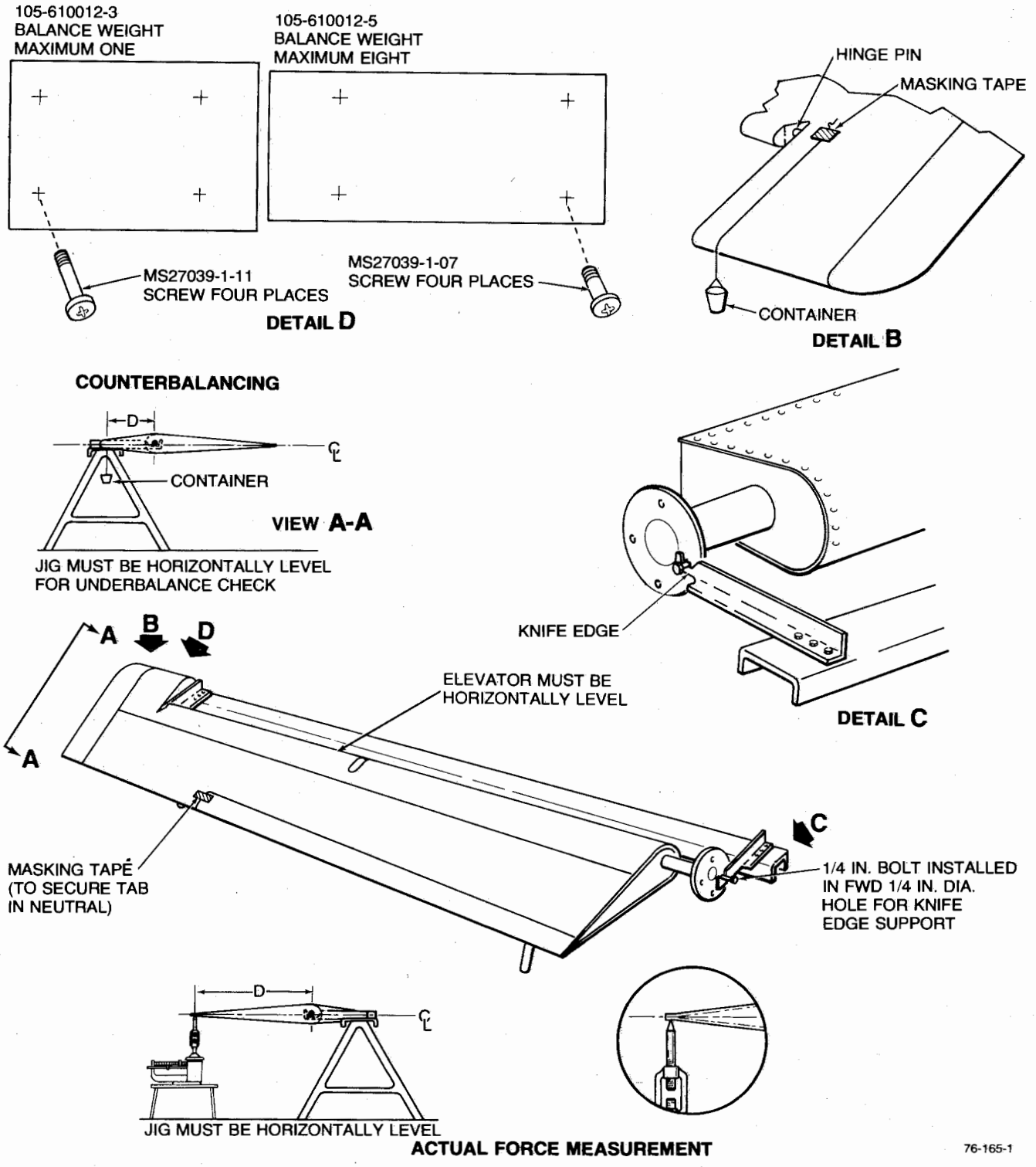
a. A stand with knife edge supports as illustrated in Figure 1. The knife edges must be in the same horizontal plane.

b. A paper cup or similar light weight container.

c. Approximately 2 pounds of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler which measures to .01 inch and a spirit level.



Balancing the Elevator
Figure 1

BALANCING PROCEDURE COUNTER BALANCING METHOD

a. Locate the chord line by placing a straight edge at the inboard end of the elevator assembly so that one end is on the hinge center line and the other end is centered on the trailing edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Secure the trim tab in its neutral position with a small piece of masking tape.

c. Fit the correct size bolt in the inboard hinge plate and mount the elevator on the knife edge supports. Ascertain that the elevator is free to rotate about the hinge line.

d. To determine if balance weights should be added or removed, use a short length of small diameter string secured to the surface with a small piece of masking tape and a paper cup hanging vertically as illustrated in Figure 1. If the balance is slightly nose-down, suspend the paper cup from a point near the center of the elevator trailing edge. If the balance is slightly taildown, suspend the paper cup near the inboard end of the balance weight assembly on the elevator leading edge.

e. Add small quantities of lead shot to the cup until the elevator balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.

f. The distance "D" must be perpendicular to the hinge line. Measure "D" from the hinge line to the suspension point of the cup.

g. Remove the cup, contents, and string, then weigh them.

NOTE

Since any weighing error is magnified by the distance "D" weighing is most important and must be done carefully on scales that are certified for accuracy to .01 pound or less.

h. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by "W".
2. The over or underbalance moment is designated by "M".
3. M = W x D
4. The following is a typical example of a balancing calculation: Assume the elevator is underbalance (tail-heavy) and the paper cup was suspended from the horn. If the elevator balances with the chord line level at "W = 1.10 pound" and "D = 9.52 inches", then . . .

M = 1.10 x 9.52

M = 10.47 inch-pounds. In this instance, "M" is within the required static balance range and is therefore acceptable.

The completed elevator assembly, including paint, tab (at neutral), tab push rod, and static wicks if installed is NOT to be less than 10.00 inch-pounds or exceed 11.30 inch-pounds tail-heavy. If the static balance does not comply, balance weights P/N 105-610012-3 or 105-610012-5 may be added or removed from the outboard end leading edge of the elevator assembly.

NOTE

A maximum of eight P/N 105-610012-5 or one P/N 105-610012-3 balance weights may be added to each elevator to meet the manufacturers prescribed limits.

P/N 105-610012-3 and 105-610012-5 balance weights are attached with screws.

Approximate moment change for 105-610012-3 is 10.10 inch-pounds and 105-610012-5 is 0.05 inch-pounds.

"END"

VERTICAL STABILIZER - MAINTENANCE PRACTICES

VERTICAL STABILIZER REMOVAL

a. Remove the rudder as described in Chapter 27-20-00 under the heading RUDDER REMOVAL.

b. Remove the elevators and horizontal stabilizer as described in this Chapter under the heading HORIZONTAL STABILIZER REMOVAL.

c. Drill out the rivets and remove the screws which attach the short aft dorsal fin section to the main dorsal fin assembly and the aft fuselage. Remove the aft dorsal fin from the airplane.

d. Drill out the rivets and remove the reinforcing angle on each side of the vertical stabilizer.

e. Remove the vertical stabilizer attaching bolts from the main and rear spars and remove the shims.

f. Carefully lift the vertical stabilizer assembly from the fuselage.

VERTICAL STABILIZER INSTALLATION

a. Position the vertical stabilizer on the aft fuselage and install the attaching bolts through the main and rear spars.

NOTE

The shims called out for the bolts in the following steps, may be installed, peeled, or omitted as required to ensure that a gap of not more than .020 exists, between vertical stabilizer spars and bulkheads; horizontal stabilizer spars and fittings, before tightening bolts. MAXIMUM shim thickness at each joint to be .062.

b. At the front spar (lower), install one shim P/N 105-600013-5, bolts (head forward), washers, and nuts.

c. At the front spar, above the shim just installed, install one shim P/N 105-600013-7, bolts (head forward), washers, and nuts.

d. Torque the bolts just installed, 100-140 inch-pounds.

e. At the rear spar (lower), install one shim P/N 105-600013-9. Install bolts (head forward), washers, and nuts.

f. At the rear spar, above the shim just installed, install one shim P/N 105-600013-11. Install bolts (head forward), washers, and nuts.

g. Torque the bolts just installed, 100-140 inch-pounds.

h. Install screws and rivet the aft dorsal fin section to the main dorsal fin and aft fuselage.

i. Position the reinforcing angle on each side of the vertical stabilizer and secure with rivets.

j. Install the horizontal stabilizer and elevators as described in this Chapter under the heading HORIZONTAL STABILIZER INSTALLATION.

k. Install the rudder as described in Chapter 27-20-00 under the heading RUDDER INSTALLATION.

"END"

RUDDER - MAINTENANCE PRACTICES

BALANCING THE RUDDER (Figure 1)

After any repainting or repair, the finished surface must be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The completed rudder assembly including paint, bell crank, tab, and push rod is NOT to be less than 36.00 inch-pounds or exceed 39.00 inch-pounds tail-heavy. The static moment of the rudder is determined by multiplying the unbalanced weight of the rudder assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced rudder assembly is 0.00 inch-pounds. Tail heaviness indicates static underbalance while nose heaviness indicates static overbalance.

CHECKING BALANCE

The rudder balance must be checked in a draft free area with the rudder completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, tab rod, static wicks if required and bell crank must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, the following method is recommended:

a. Actual Force Measurement - Measurement of the force applied by the rudder surface on a single support at a known distance from the center line of the hinge.

CHECK BALANCE BY FORCE MEASUREMENT

The equipment required to perform the check balance by force measurement is as follows:

a. A stand with knife edge supports as illustrated in Figure 1. The knife edges and center line of the torque tube should be in the same horizontal plane.

b. A certified beam balance calibrated in units of .01 lb. or less. The balance should have a flat weighing platform and its capacity should equal tare plus 2.5 lbs. minimum.

c. A support spindle similar to the illustration and leveling blocks as required. (Blocks + spindle = tare.)

d. A straight edge, ruler which measures to .01 inch and a spirit level.

e. A balance plug machined to provide a hinge point.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

Locate the chord line by placing a straight edge at the inboard end of the rudder so that one end is aligned with the center of the torque tube and the other end is centered on the trailing edge. Mark the chord line by grease pencil or other means on the rib. Remove the straight edge.

Mount the rudder on the knife edges. Ensure that it is free to rotate about the hinge line. Support the trailing edge behind the center hinge point with a spindle resting on a leveled beam balance platform as illustrated. The spindle must be vertical throughout the balancing procedure. Hold a spirit level against the marked chord line and level it by extending or contracting the spindle, or by using blocks and shims under the spindle. Measure the perpendicular distance from the hinge center line to the point supported by the spindle. Ensure that the spirit level and rule are removed from the surface and read the reaction on the beam balance. Calculate the static underbalance moment "M" from the formulas:

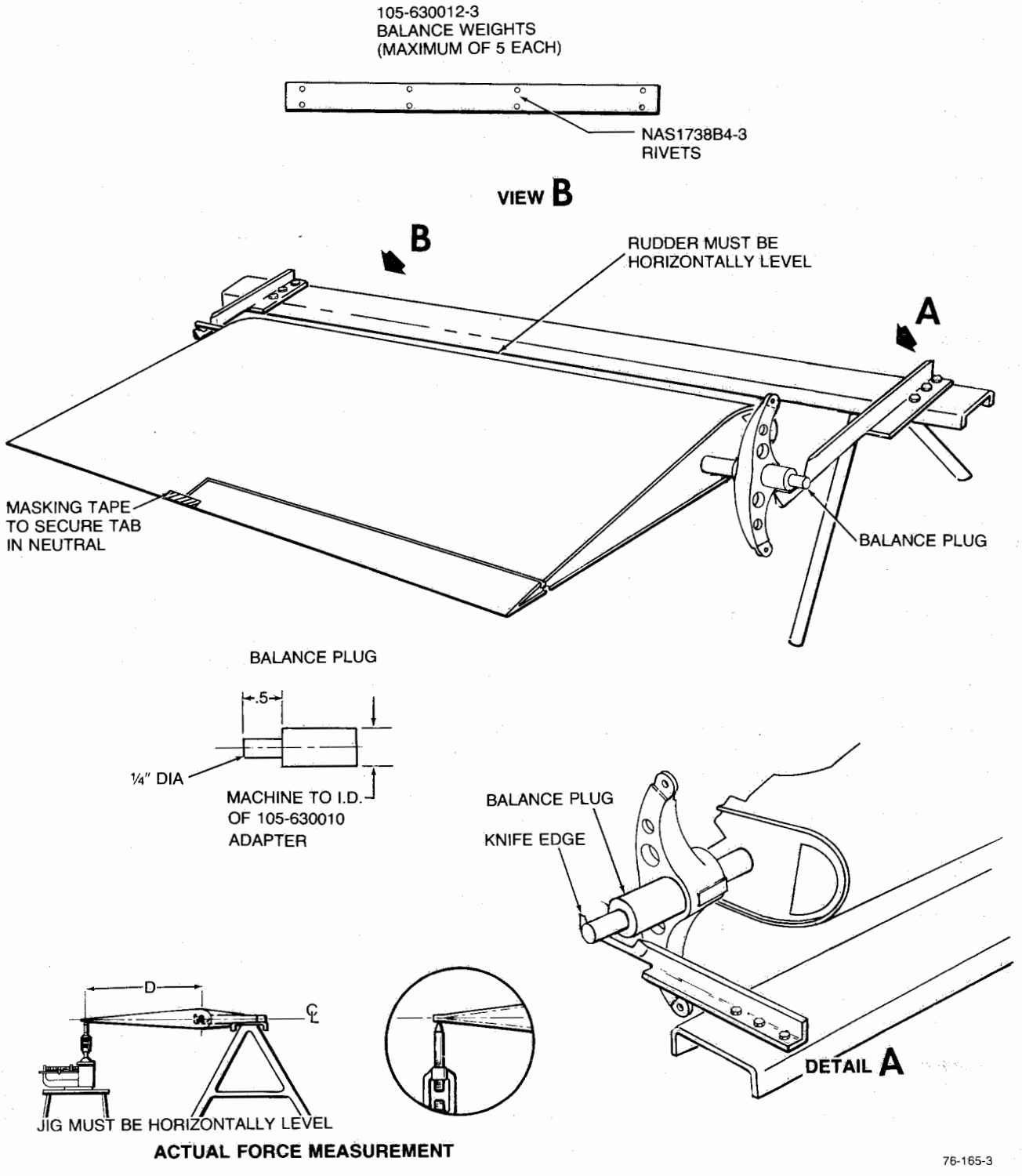
M = D(R-T) inch-pounds where,
D = Perpendicular distance from the hinge center line to the spindle point (inches).
R = Reaction (Pounds) read from the beam balance.
T = Tare, i.e. spindle plus leveling blocks or shims on the scale platform (Pounds).

EXAMPLE

D is 17.20 inches, R = 3.19 lb. and T is 1.00 lb.
M = 17.20 (3.19 - 1.00); M = 37.67 inch-pounds.
M is within the range which is satisfactory.
If M is not within the prescribed range, add or remove 105-630012-3 balance weights.

The completed rudder assembly including paint, static wicks if required, bell crank, tab, and tab push rod is NOT to be less than 36.00 inch-pounds or exceed 39.00 inch-pounds tail-heavy. If the static balance does not comply, balance weights 105-630012-3 (maximum of 5 each) may be added or removed from the upper leading edge of the rudder with rivets.

Approximate moment change for 105-630012-3 is 1.15 inch-pounds each (5.75 inch-pounds maximum).



Balancing the Rudder
Figure 1

"END"

CHAPTER 56

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56-20-00	1	Nov 18/77

CHAPTER 56 - WINDOWS

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GENERAL - MAINTENANCE PRACTICES

CLEANING PLASTIC WINDOWS

A commercial cleaning compound made specifically for acrylic plastic windows may be used. When using a commercial cleaner follow the instructions on the container.

If a commercial cleaner is not available, these instructions should be followed:

Cleaning of the acrylic plastic windows should never be attempted when dry. Use only clean water (an open bucket of water can collect sand/debris which could scratch windshields) and a mild soap for cleaning. Wash the windows carefully with plenty of soap and water, using the palm of the hand to dislodge dirt and mud. Follow up with soapy water to remove grease or stains. Flush the surface with rinse water, and dry with a soft grit-free absorbent cloth. Stubborn grease or oil deposits are readily removed with aliphatic naphtha or hexane. Rinse with clean, clear water.

CAUTION

Do not use thinner or aromatic abrasive cleaners to clean the windows as they will damage the surface of the plastic. Aliphatic naphtha and similar solvents are highly inflammable, and extreme care must be exercised when used.

"END"

FLIGHT COMPARTMENT - MAINTENANCE PRACTICES

WINDSHIELD REMOVAL

a. Remove compass, glareshield, upholstery trim, etc., around the windshield, and the outside air temperature indicator.

NOTE

Place a cloth over the instrument panel as a protection from falling rivets, etc.

b. Drill out all rivets which secure the windshield in place and remove the eight AN525-8R9 screws on each side of the windshield frame. Disconnect the speaker if connected to the frame.

c. Loosen the windshield by slowly working a thin, beveled edge, phenolic strip all the way around the windshield frame and the fuselage. Avoid bending or damage to the airframe skin.

d. Remove the windshield from the fuselage.

WINDSHIELD INSTALLATION

a. Remove all existing bonding material from the fuselage, and clean the new windshield frame with toluol (3, Chart 1, 91-00-00).

b. Trim the frame edges of the new windshield as necessary for proper fit.

c. Position the windshield to the fuselage. Maintain approximately 1/16 inch clearance between the glass and the upper fuselage frame at Fuselage Station 94.00 on the inside of the cabin.

d. Trim the glass as necessary to provide proper seating of the frame against the fuselage structure.

e. Apply firm pressure on the outside of the windshield and back-drill through the existing holes in the fuselage. A No. 30 hole finder used on the lower front windshield frame will facilitate drilling. Install a Cleco fastener in each hole after back-drilling. If necessary, 1/8 inch rivets may be replaced by 5/32 inch rivets where a hole has been elongated.

f. After the windshield, frame has been drilled and fitted, remove the windshield and deburr.

g. Determine final fit of the windshield by repositioning to the fuselage.

h. Remove the windshield. Clean the contact of the windshield frame with a clean white cloth and apply a liberal amount of EC 1792 sealer (4, Chart 1, 91-00-00) to the windshield frame.

i. Reinstall the windshield and rivet as soon as possible to the airplane.

NOTE

Allow 24 hours curing time before the windshield frame is cleaned and painted.

j. Reinstall the outside air temperature indicator, compass, glareshield, upholstery trim, etc.

FORWARD LH WINDOW REMOVAL

a. Remove the storm window as described under the heading STORM WINDOW REMOVAL in this section.

b. Remove the inside door handle, upholstery panel and (ME-1 thru ME-282, ME-284 thru ME-287) the molding around the window.

c. The window is sealed to the skin and may be removed by applying heat and then inserting a sharp instrument, such as a knife blade, between the pane and the skin.

d. Drill and deburr a No. 20 hole through the edge of the glass and the fuselage skin, centered in the forward edge and aft edge.

CAUTION

Avoid damage to the exterior of the door, such as nicks and creases when removing the window.

e. If the storm window is to be used on the new window, remove the two screws, washers and nuts which secure the storm window latch plate and remove the latch plate.

FORWARD LH WINDOW INSTALLATION

a. Remove all existing bonding material from the door skin, where the old window was removed, using toluol (3, Chart 1, 91-00-00), being careful not to damage exterior paint.

b. Place the window in position and mark the areas where material must be removed to obtain a proper fit.

c. Remove the window and trim off excess material as determined in step "b" in this procedure.

d. Clean the contact edges of the window with a clean white cloth.

e. Apply, in liberal amounts, a mixture of 160 grams of EP 711 1/2 sealer (5, Chart 1, 91-00-00) to the inside skin of the window area.

f. Place the window in position and install the upholstery panel, door handle (ME-1 thru ME-282, ME-284 thru ME-287) the molding around the window.

g. Wait until the sealer has sufficiently cured before installing the storm window.

h. If the storm window from the old window is to be used, install the two screws, washers and nuts which secure the storm window latch plate to the forward left hand window.

i. Place the storm window in position and install the hinge pin.

STORM WINDOW REMOVAL

a. Unlatch the storm window and remove the hinge pin.

b. Remove window.

STORM WINDOW INSTALLATION

a. Place the storm window in position.

b. Install hinge pin.

FORWARD RH WINDOW REMOVAL

a. Remove the inside door handle, upholstery panel and (ME-1 thru ME-282, ME-284 thru ME-287) the molding around the window.

b. The window is sealed to the skin and may be removed by applying heat and then inserting a sharp instrument, such as a knife blade, between the pane and the skin.

c. Drill and burr a No. 20 hole through the edge of the glass and the fuselage skin, centered in the forward edge and aft edge.

CAUTION

Avoid damage to the exterior skin of the door, such as nicks and creases, when removing the window.

FORWARD RH WINDOW INSTALLATION

a. Remove all existing bonding material from the door skin, where the old window was removed, using toluol (3, Chart 1, 91-00-00).

b. Place the window in position and mark the areas where material must be removed to obtain a proper fit.

c. Remove the window and trim off excess material as determined in step "b" in this procedure.

d. Clean the contact edges of the window with a clean white cloth.

e. Apply, in liberal amounts, a mixture of 160 grams of EP 711 1/2 sealer (5, Chart 1, 91-00-00) to the inside skin of the window area.

f. Place the window in position and install a screw, washer and nut and install the upholstery panel, door handle and (ME-1 thru ME-282, ME-284 thru ME-287) the molding around the window.

"END"

CABIN - MAINTENANCE PRACTICES

CABIN WINDOW REMOVAL

a. When removing the left hand second window or right hand second and third window, remove the attach screws which are installed through the fuselage skin and window. Note the hole location for the attach screws.

b. Cabin windows are sealed to the fuselage skin and may be removed by applying heat and then inserting a sharp instrument, such as a knife blade, between the pane and the skin.

CAUTION

Avoid damage to the exterior skin, such as nicks and creases, when performing the above operation.

CABIN WINDOW INSTALLATION

a. Remove all existing bonding material from the fuselage skin with toluol (3, Chart 1, 91-00-00).

b. To install the left hand second window or right hand second and third window, drill and burr three matching evenly spaced No. 20 holes in each edge of the glass and the fuselage skin.

c. Clean the contact edges of the window with a clean white cloth.

d. Apply, in liberal amounts, a mixture of 160 grams of EP 711 1/2 sealer (5, Chart 1, 91-00-00) to the inside skin of the window area.

e. Position the glass to the inside skin of the window opening and install a screw, washer and nut in each of the holes.

f. Fill the remaining open holes and, after the hole filler has cured sufficiently, sand the filler smooth.

g. Clean and repaint the area.

"END"

CHAPTER 57

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	5	Mar 15/82
	6	Mar 15/82
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	2	Nov 18/77
57-40-00	1	Nov 18/77
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CHAPTER 57 - WINGS

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GENERAL - DESCRIPTION AND OPERATION

The all metal wing group consists of the front and rear spars, leading edge, wing tips, flaps, ailerons, and fuel tank. The wing tips, flaps, and ailerons are readily removable. The forward wing attaching point is located at Fuselage Station 93.73 while the rear wing attaching point is located at Fuselage Station 137.36. The LH and RH wing spars are joined with splice plates on the upper and lower spar caps.

GENERAL - MAINTENANCE PRACTICES

WING TIP REMOVAL

a. Remove the screws attaching the wing tip to the wing.

b. Disconnect the electrical leads to the navigation light and to the strobe light (if installed).

WING TIP INSTALLATION

a. Attach the electrical leads to the navigation light and strobe light (if installed). Ensure that a good ground connection is obtained.

b. Position the wing tip on the wing and install the attaching screws.

WING REMOVAL
(Figure 1)

a. Drain and purge the fuel system as described in Chapter 28-00-00 under the heading AIRPLANE DEFUELING.

b. Remove the pilot and copilot seats as described in Chapter 25-10-00 under the heading PILOT AND COPILOT SEAT REMOVAL.

c. Remove the passenger seat as described in CHAPTER 25-20-00 under the heading PASSENGER SEAT REMOVAL.

d. Remove the cabin floorboards.

e. Remove the spar cover between front and rear seats.

f. Remove the belly access door at Fuselage Station 132.00.

g. Remove the fuselage upholstery panel, located immediately above the cabin floor.

h. Remove the access panels located under the rear seat area.

i. Before removing a wing, a suitable cradle must be provided for the fuselage. The recommended cradling points are located at Fuselage Stations 68.00 and 181.00.

j. Place a wing stand under the wing that is not being removed and place a stand under the tail.

k. To disconnect the aileron cables, remove the safety wire, release the tension and disconnect the aileron cables at the turnbuckles.

NOTE

Before disconnecting the flap, check the locknuts on the rod ends of the two push-pull rods, flap to torque tube, for tightness. If the rod ends are allowed to turn, it will be necessary to adjust the flap travel when the flaps are reinstalled.

l. With the flaps in the neutral position, disconnect the flap actuating push rod assembly (at the flap end of the push rod) and remove the flap.

m. Place a shop towel under the brake line union located inboard of the fuselage skin at the root rib. Disconnect the brake line and immediately cap the line and the fitting.

n. Disconnect and cap the landing gear hydraulic lines located adjacent to the brake line.

o. (Left hand wing only) disconnect the pitot line at the union located inboard of the wing root.

p. Disconnect the fuel lines at the wing root and the crossfeed fuel lines aft of the main spar. Gain access through the wheel well and spar for the crossfeed fittings inside the wing. (Right hand wing only) disconnect the heater fuel line by gaining access through the forward wheel well spar.

q. Disconnect and secure all electrical wiring routed to the wing.

r. Disconnect the fuel selector control in the nacelle as described in Chapter 28-20-00 under the heading FUEL SELECTOR CONTROL REMOVAL. Remove the leading edge fairing located between the fuselage and engine nacelle. Disconnect the electrical harness, pressure lines, and tach cable.

NOTE

Before loosening any wing mounting bolts, cradle the wing being removed. Be certain the fuselage is properly cradled, a tail stand is provided and a wing stand is placed under the wing that is not being removed. The hoist sling is not recommended for use other than in emergency conditions.

s. Remove the Huck and NAS bolts securing the spar splice plates and the wing spar together. A special collar splitter, P/N 42-10 may be used to shear the aluminum collars and allow the Huck bolts to be driven out. Next, remove the attaching bolts from the fore and aft wing attaching lugs.

CAUTION

Care should be taken not to elongate the holes when driving the Huck bolts out. Avoid sharp nicks and gouges.

NOTE

If a collar splitter is not available, AN 960-816L washers may be slipped over the Huck collar, and the collars split with a chisel. The chisel should be used in the direction perpendicular to the wing spar.

t. Remove the bolts in the wing attach lug fitting, located immediately forward and aft of the spar.

u. Pull the wings straight away from the fuselage, constantly checking to make sure that no electrical wiring, cables or lines are caught in the fuselage.

WING DISASSEMBLY

a. Be certain the wing is supported on a suitable cradle.

b. Remove the screws attaching the wing tip to the wing.

c. Remove the aileron, wing flap, and other equipment as required by the work to be performed.

WING REASSEMBLY

a. Install all equipment removed in wing disassembly.

b. Install the wing flap and aileron.

c. Install the screws attaching the wing tip to the wing.

WING INSTALLATION
(Figure 1)

a. Clean all fuselage-to-wing mating surfaces with solvent (7, Chart 1, 91-00-00) and blow dry with compressed air.

WARNING

Before installation of the attaching bolts, inspect the forward and aft wing attachment lugs for existence of grip bushings.

b. Position the wing to the fuselage. Make certain there are no lines or electrical wiring caught between the wing and fuselage.

c. Install the bolt, washers (2 required) and nut at the aft wing attaching point. Torque 10-20 inch-pounds. Install the pin.

d. Install the bolt, bushing, washer and nut at the forward attaching point. Torque 100-120 inch-pounds.

e. Position the upper wing spar splice plate on the upper wing spar and install the bolt and collar through the four mounting holes on each end of the wing spar upper splice plate.

f. Bolts and collars go in the remaining holes in the upper splice plate.

g. Position the lower wing spar splice plate on the lower wing spar and install the bolts, washers (under bolt heads and under nuts) and nuts in the mounting holes on each end of the lower spar and splice plate. Torque 50-70 inch-pounds.

h. Install, in the holes second from each end, the bolts, washers (under bolt heads and under nuts) and nuts in the lower spar and splice plate. Torque 100-140 inch-pounds.

i. Install, in the holes third from each end, the bolts, washers (under bolt head and under nut) and nuts in the lower spar and splice plate. Torque 100-140 inch-pounds.

j. Install, in the remaining holes of the lower spar and splice plate, the bolts, washers (under bolt head and under nut) and nuts. Torque 100-140 inch-pounds.

k. Connect the electrical wiring to the wing.

NOTE

Electrical wiring not having quick disconnects requires permanent splices. Make splices per best shop practice.

l. Connect fuel lines at the wing root and crossfeed fuel lines aft of the main spar. (Right hand wing only) Connect the heater fuel line in the wing.

m. (Left hand wing only) connect the pitot line at the union located inboard of the wing root. Check pitot system as outlined in PITOT SYSTEM PRESSURE TEST in Chapter 34-10-00.

n. Connect the landing gear hydraulic lines located inboard of the fuselage skin at the root rib.

o. Connect the brake line located adjacent to the hydraulic lines.

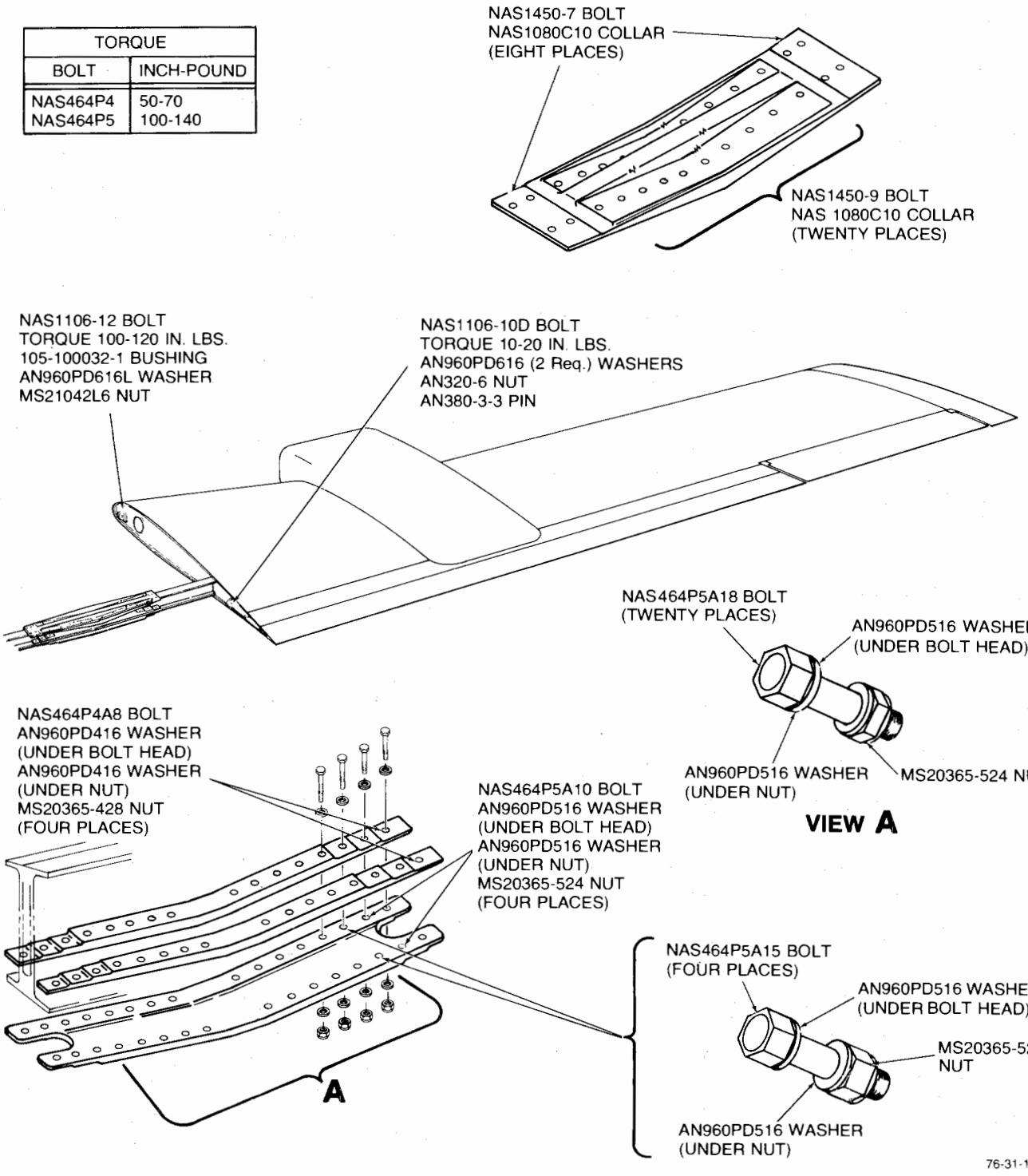
p. Bleed the brake system as described in Chapter 32-40-00 under the heading BRAKE SYSTEM BLEEDING.

q. Install the flap on the wing and check the locknuts on the rod assembly for tightness.

r. Route and connect the aileron cables at the turnbuckles.

s. Rig the aileron control cables as described in Chapter 27-10-00 under the heading RIGGING THE AILERON CONTROL SYSTEM.

TORQUE	
BOLT	INCH-POUND
NAS464P4 NAS464P5	50-70 100-140



Wing Installation
Figure 1

t. Connect the fuel selector control to the fuel selector valve in the nacelle as described in Chapter 28-20-00 under the heading FUEL SELECTOR CONTROL INSTALLATION. Install the leading edge fairing, located between the fuselage and engine nacelle.

u. Install the access panels located under the rear seat area.

v. Install the fuselage access panel to the wing, located immediately above the cabin floor. Install the access panels in the wheel well.

w. Install the belly access door at Fuselage Station 132.00.

x. Install the spar cover between the front and rear seats.

y. Install the cabin floorboards.

z. Install the passenger seat as described in Chapter 25-20-00 under the heading PASSENGER SEAT REMOVAL.

aa. Install the pilot and copilot seats as described in Chapter 25-10-00 under the heading PILOT AND COPILOT SEAT INSTALLATION.

ADJUSTING THE WING

After a wing is reinstalled or repaired, flight tests may show one wing to be chronically heavy. This condition may be corrected using the following procedures:

a. Rig the flap on the light wing.

b. Flight test the airplane. If the same wing is still heavy, proceed with step "c" only as a last resort, since it will create drag on the airplane.

c. Rig the flap down on the heavy wing.

d. Check stall warning system for proper operation.

e. Check all wing electrical systems for proper operation.

f. Check all engine systems for proper operation.

g. Check landing gears for proper operation.

STALL WARNING

After wing adjustment is complete, check the stall warning system. A stall warning sense switch is located on the leading edge of both wings. For adjustments of this switch, refer to Chapter 27-31-00 under the heading STALL WARNING INDICATING SYSTEM ADJUSTMENT.

100-HOUR INSPECTION

WINGS

SKIN - Inspect for condition and loose or missing rivets. If damage is found, check the adjacent structure.

STRUCTURE - Check for cracks, warpage, buckling, loose rivets and concealed damage.

ACCESS DOORS AND PANELS - Check for proper fit and security.

WING BOLTS - Check the wing bolts for proper torque at the first 100-hour inspection and 100 hours after a wing bolt has been loosened and retorqued.

CARRY-THROUGH STRUCTURE

SKIN - Inspect for condition and loose or missing rivets. If damage is found, check the adjacent structure.

STRUCTURE - Check for cracks, warpage, buckling, and concealed damage.

ACCESS DOORS AND PANELS - Check for proper fit and security.

WING SPAR - Check for corrosion.

MANDATORY INSPECTIONS

The Model 76 Wing and Carry Through Structure has a maximum service life of 20,000 hours; however, periodic minor repairs or replacement of various structural components are required in order to assure maximum safety. The inspections called for in this chapter are the end result of extensive tests undertaken by BEECH AIRCRAFT. The goal of these tests and subsequent inspections is to ensure the highest standards of safety for the airplane. If a damaged area is located during the inspection process, inspect all surrounding structure to asertain if any resultant damage has been transmitted to surrounding structural components.

Any repair or replacement of structural components that may be required over the life of the airplane structure must be in compliance with the AIRCRAFT INSPECTION and REPAIR MANUAL (AC43.13-1A) and the AIRCRAFT ALTERATIONS MANUAL (AC43.12-2).

Remove the seats, carpets, floorboards, and all inspection covers in the areas which are to be scrutinized. Perform the inspections as shown in Chart 1.

MANDATORY INSPECTION SCHEDULE
CHART 1

LOCATION	PART NUMBER	INITIAL INSPECTION	SUBSEQUENT INSPECTION
Fuselage Shear Fitting W.S. 21.0 F.S. 94.0 (DETAIL AA, Figure 1)	105-420011-5 (Left) 105-420011-6 (Right)	2500 hours	Every 800 hours or once per year; whichever comes first.
Engine Mount/Nacelle Channels (4 Left, 4 Right) (DETAIL BB, Figure 1)	105-980000-21 Upper Outbd (L/R) 105-980000-19 Lower Outbd (L/R) 105-980000-23 Upper Inbd (L/R) 105-980000-25 Lower Inbd (L/R)	1000 hours	Every 100 hours or once per year; whichever comes first.
Root Rib (fwd of rear spar) W.S. 24.0, F.S. 137.5 (DETAIL CC, Figure 1)	105-100015-17 (Left) 105-100015-18 (Right)	6500 hours	Every 800 hours or once per year, whichever comes first.
Rib (fwd. of rear spar) W.S. 31.6, F.S. 137.5 (DETAIL DD, Figure 1)	169-110000-533 (Left) 169-110000-534 (Right)	6500 hours	Every 800 hours or once per year, whichever comes first.
Rear Spar (Inboard) of W.S. 47.5) (DETAIL EE, Figure 1)	105-110011-1 (Left) 105-110011-2 (Right)	6500 hours	Every 800 hours or once per year, whichever comes first.

Mandatory Retirement 20,000 hours U.S.A.

The inspections called out in Chart 1 are mandatory and must be performed at the specified time intervals. The additional inspections, while not having a specific time table, may be performed in conjunction with the mandatory inspections.

a. In the area of the fuselage, check the following items:

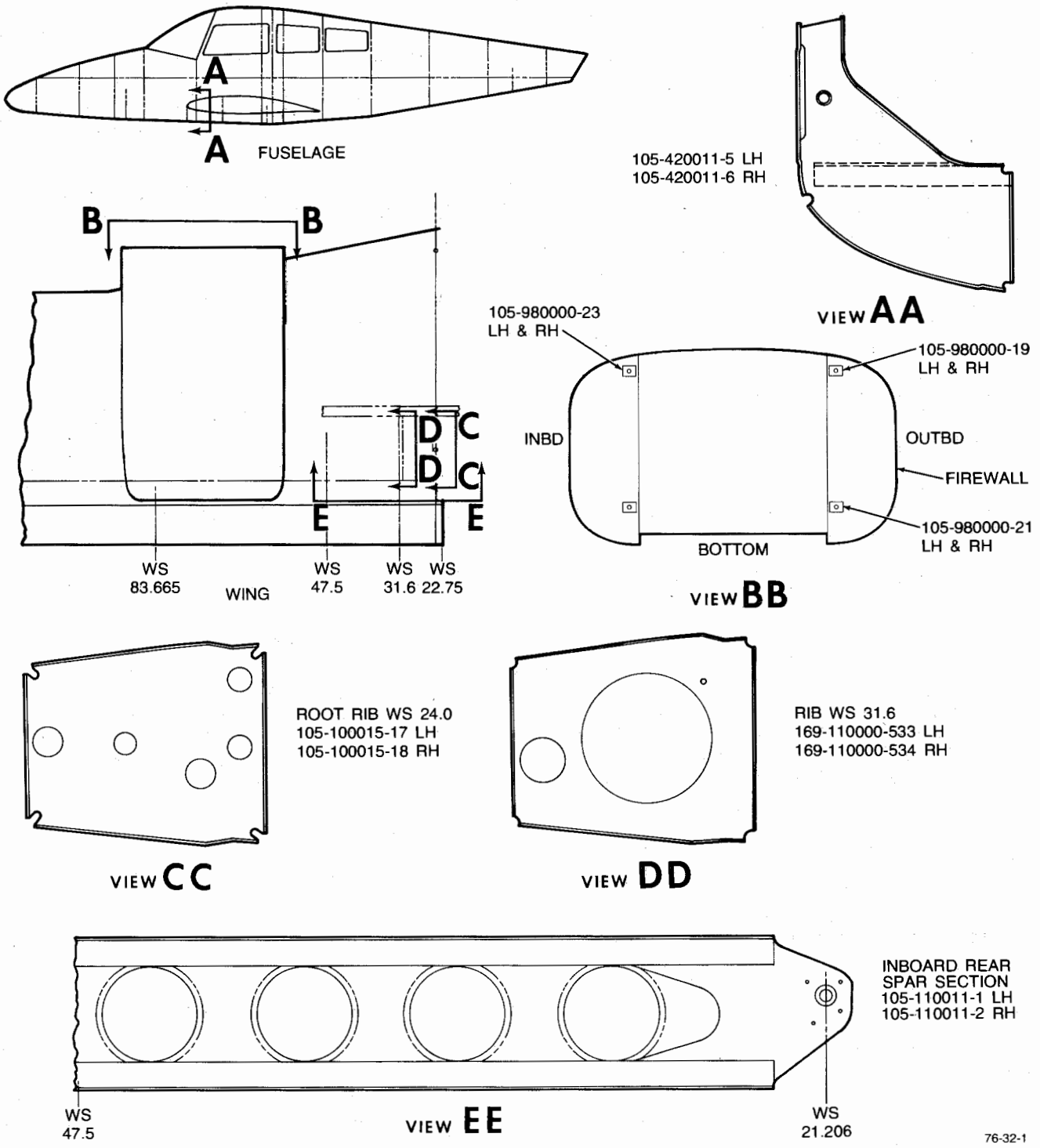
1. Check the skin for cracks around the wing attach cutouts.
2. Check all subfloor structural components in the area of the wing attach points for cracks, distortions, and loose or damaged rivets.

b. In the wing area conduct the following inspections:

1. Check the upper and lower wing skin panels for cracks and damaged or loose rivets.
2. Check the leading edge ribs (inboard of the nacelles) for cracks and distortions.
3. Check the leading edge for cracks; check all screws to ensure security of attachment.
4. Check the trailing edge fairing for cracks, distortions, and loose or damaged rivets.

c. Conduct the following inspections on the nacelles:

1. Check the firewalls for cracks, distortions and loose or damaged rivets.
2. Check the structural components aft of the firewalls for cracks, highly stressed areas and loose or damaged rivets.
3. Check the engine mount truss and associated hardware for cracks.
4. Check the nacelle trough and other structural components subjected to extreme heat for cracks and signs of stress.



Areas of Inspection
Figure 1

"END"

MAIN FRAME - MAINTENANCE PRACTICES

REPAIR OF BONDED "HONEYCOMB" PANELS

CAUTION

All damage to face sheets or "honeycomb" core should be checked to ascertain whether repair or replacement is in order. Cracks or deep scratches are not to exceed two (2) inches in length. When both the skin and "honeycomb" core are damaged, the area of damage is not to exceed two (2) inches in diameter. In all cases: The damage cannot be a structural factor, it will be a minimum of three (3) inches from the adjacent structure, and only one (1) repair per panel can be made.

GENERAL METHODS FOR REPAIRING BONDED ASSEMBLIES

NOTE

Dings or dents which do not cause adverse aerodynamic effects on the airplane do not require repair. Dings and dents can be filled with "White Streak" Sealer (19, Chart 1, 91-00-00) and faired to the contour of the skin.

a. Roughen the faying surfaces of parts to be bonded with 400 grit sandpaper.

b. Clean surfaces with methyl ethyl ketone (23, Chart 1, 91-00-00) to remove residue and any primer.

c. Apply Degreasing Primer (37, Chart 1, 91-00-00). Dry a minimum of five minutes and wipe clean with a clean white cloth.

d. Bond with Metal Adhesive (39, Chart 1, 91-00-00) using contact to 10 psi bond pressure and one or two layers of Positioning Fabric (scrim cloth) (38, Chart 1, 91-00-00) in bond line. (Positioning Fabric is used only for metal-to-metal bond.)

e. Cure at 175° to 195° F for two hours.

NOTE

Heat lamp should be kept at least 12 to 14 inches from bonding surfaces to keep adhesive from boiling.

f. Bevel the edges of any nonfaying surface to form a smooth contour to the skin. Caution should be exercised not to sand into and/or through the skin.

Repair of Cracks or Deep Scratches (Figure 1)

a. Drill stop holes at each end of the crack and round off rough edges to prevent further cracking.

b. Fabricate a patch the same thickness as the skin from the same material. Patch should overlap damaged area one (1) inch.

c. Follow the steps outlined in GENERAL METHODS FOR REPAIRING BONDED ASSEMBLIES.

REPAIR OF DAMAGE TO FACE SHEETS AND CORE (FIGURE 2)

a. Remove all damaged skin by cutting a circular hole.

b. Remove parts of core that are badly damaged. Core that is slightly damaged may remain, provided a clear passage to the opposite skin is open in each cell.

c. Flush area with naphtha or methyl ethyl ketone (23, Chart 1, 91-00-00) and dry thoroughly with heat (not to exceed 150° F) or warm blown air. Caution should be used not to get naphtha or methyl ethyl ketone (23, Chart 1, 91-00-00) on core area.

d. Prepare a core plug the same density as the original core and the same diameter as the cutout hole.

e. Fabricate a reinforcement plate and same diameter as the core plug and of the same material and thickness as the face sheet.

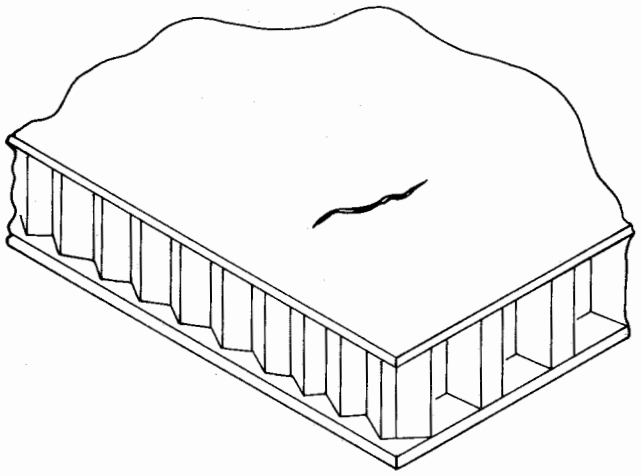
f. Bond the reinforcement plate to the core plug using the steps outlined in GENERAL METHODS FOR REPAIRING BONDED ASSEMBLIES.

g. Insert the plug and plate into the hole making sure that they are flush with the outer surface of the face sheet. No allowance need be made for glue line when measuring thickness of plug and plate.

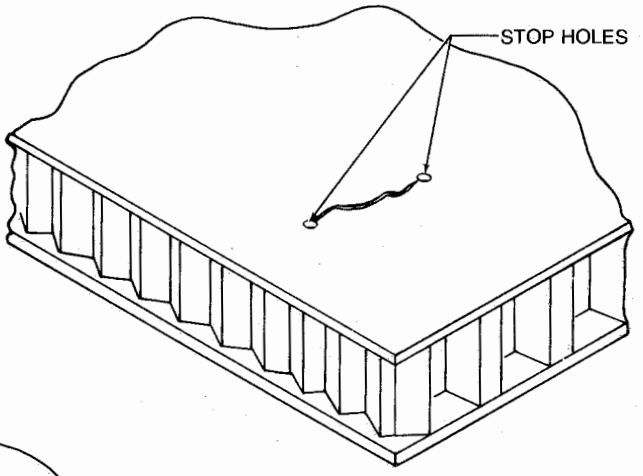
h. Fabricate a patch from the same material as face sheet (but one (1) gauge thicker) large enough to overlap the damaged area one (1) inch.

i. Bond the outer patch to the reinforcement plate and core plug using the steps outlined in GENERAL METHODS FOR REPAIRING BONDED ASSEMBLIES.

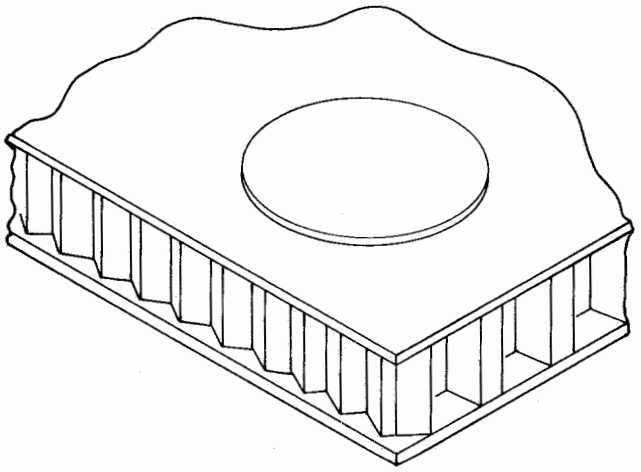
j. Bond the outer patch, reinforcement plate and core in the cutout hole using the steps outlined in GENERAL METHODS FOR REPAIRING BONDED ASSEMBLIES. Be sure to apply a film of adhesive to all core surfaces.



(A) DEEP SCRATCH OR CRACK



(B) DRILL STOP HOLES AT EACH END OF SCRATCH OR CRACK AND ROUND OFF ROUGH EDGES.



(C) APPLY OVERLAP PATCH. 1 INCH OVERLAP

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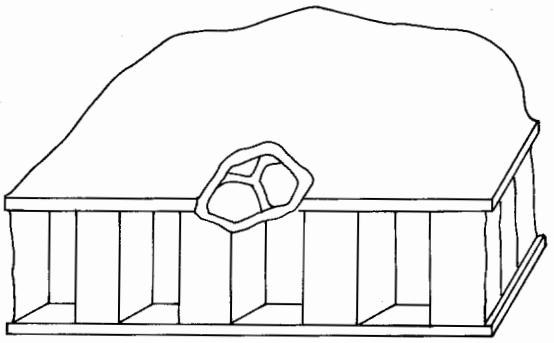
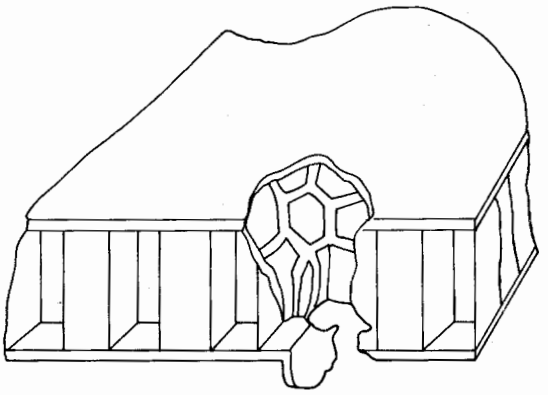
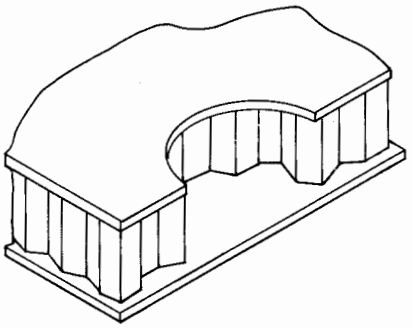
Repair of Cracks or Deep Scratches
Figure 1



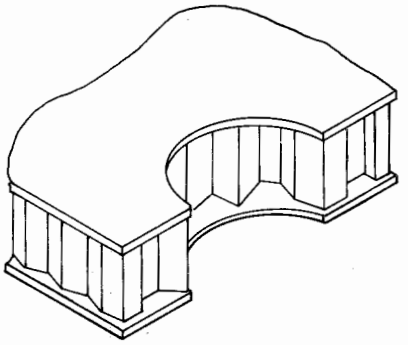
DAMAGE TO FACE AND CORE



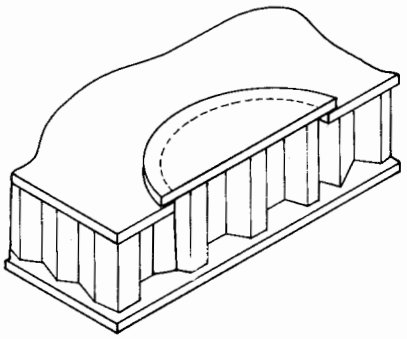
DAMAGE TO BOTH FACES
AND CORE



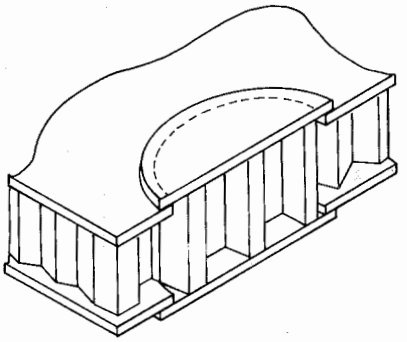
REMOVE DAMAGED FACE SHEET
AND CORE



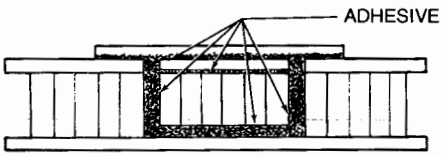
REMOVE ALL DAMAGED SKIN
AND CORE



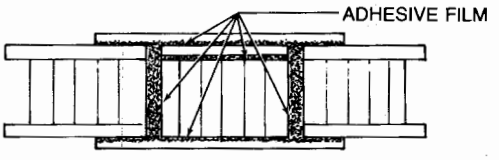
POSITION CORE, REINFORCEMENT
PLATE AND PATCH PLATE



POSITION CORE, REINFORCEMENT
PLATE AND PATCH PLATE



SECTION THROUGH REPAIR



SECTION THROUGH REPAIR

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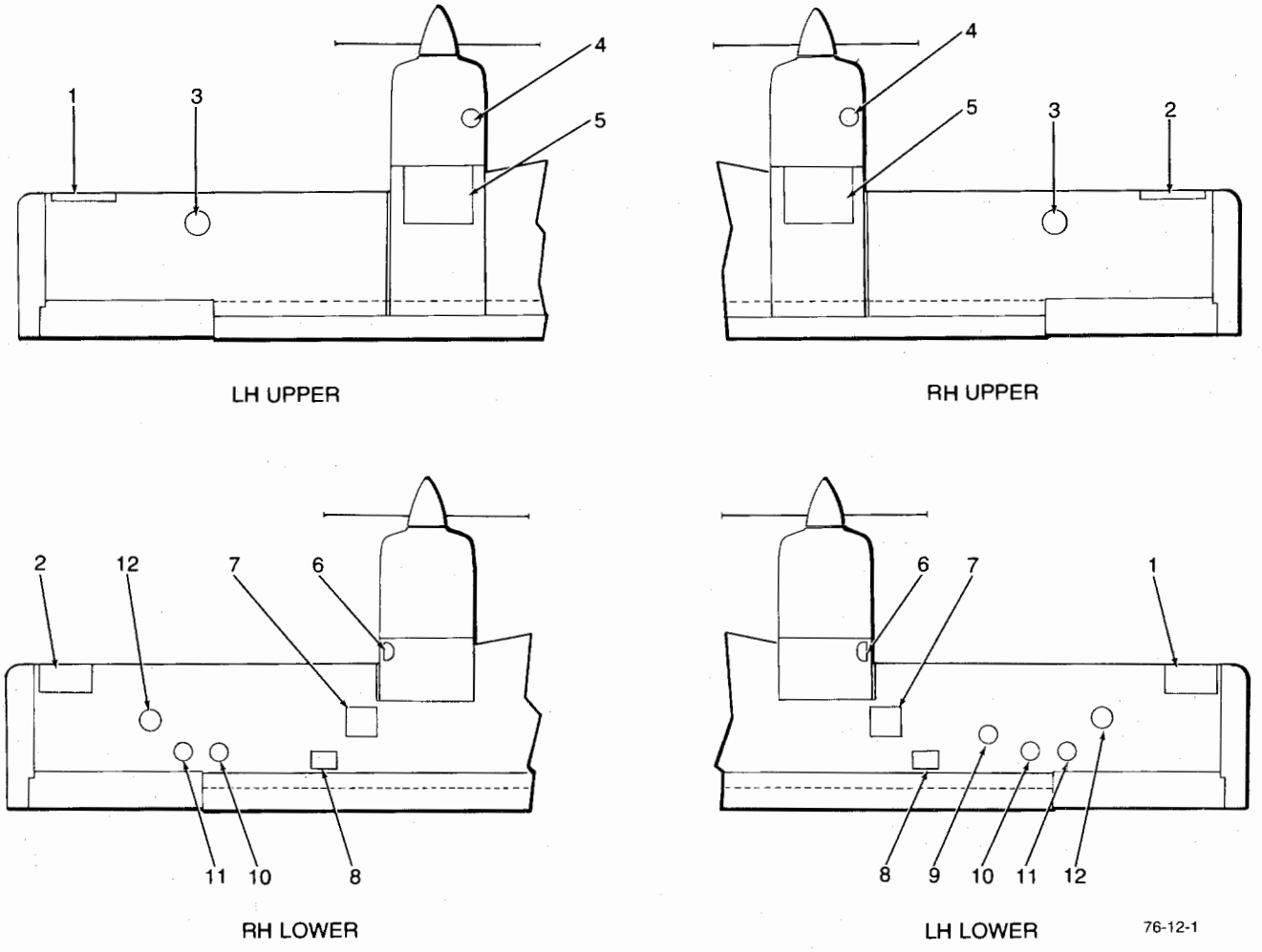
Repair of Damage to Face Sheet and Core
Figure 2

"END"

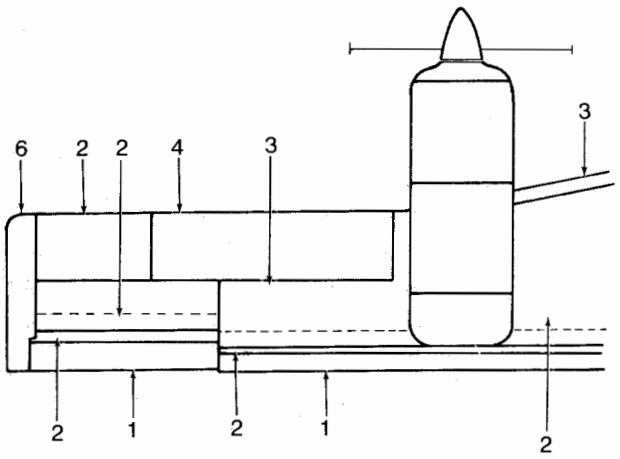


PLATES/SKIN - MAINTENANCE PRACTICES

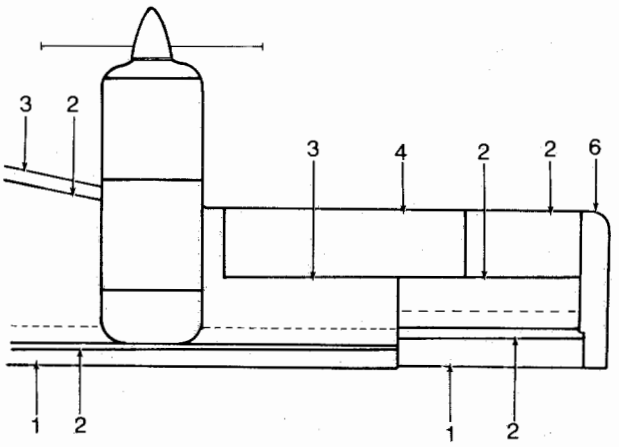
WING ACCESS OPENINGS

1. Landing light
2. Taxi light
3. Fuel filler opening
4. Oil level indicator
5. Nacelle electrical and fuel access
6. Fuel selector valve strainer
7. Inboard fuel quantity transducer
8. Flame arrester access
9. Autopilot roll servo (LH only)
10. Outboard fuel quantity transmitter
11. Aileron bell crank
12. Fuel vent access

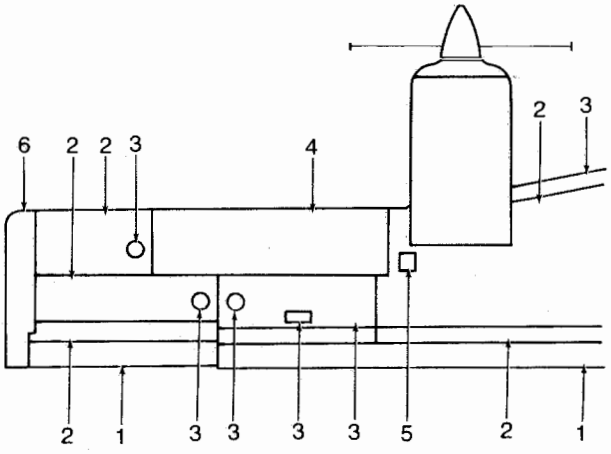
Wing Access Openings
Figure 1



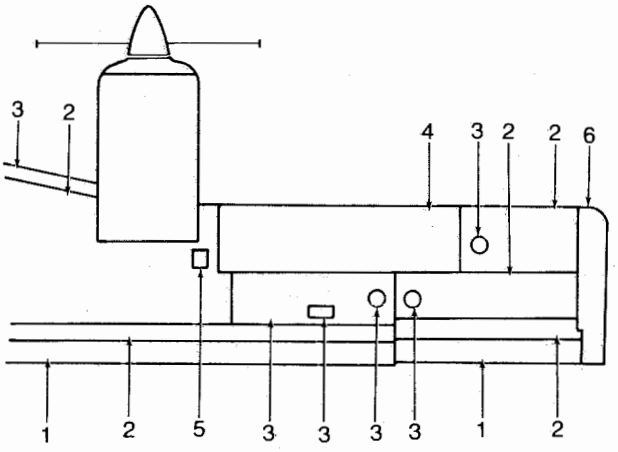
LH UPPER



RH UPPER



RH LOWER



LH LOWER

76-12-2

WING SKIN THICKNESS

NUMBER	*MATERIAL*	*THICKNESS IN INCHES*
1.	2024-T3	.016
2.	2024-T3	.020
3.	2024-T3	.025
4.	2024-T3	.032
5.	2024-T3	.063
6.	Thermoplastic Sheet (See Parts Catalog)	

Wing Skin Thickness
Figure 2

"END"

ATTACH FITTINGS - MAINTENANCE PRACTICES

The major fittings in each wing are the supporting structures adjacent to the attachment points for the flap actuator, flap tracks and flap, aileron hinge brackets and hinges, main landing gear support brace and landing gear doors, and the engine mount. Minor fittings include brackets to support cable pulleys, bell cranks, and similar components. If the landing gear hinge bolt fittings are cracked or if the spar is warped or buckled, replacement is necessary.

"END"

BALANCING CONTROL SURFACES - MAINTENANCE PRACTICES

BALANCING THE AILERON (Figure 1)

After any repainting or repair, the finished surface must be check balanced to ensure that its static moment about the hinge line is within the prescribed limits. The painted aileron assembly must be nose-heavy by 0.00 to 2.00 inch-pounds. The static moment of the aileron is determined by multiplying the unbalanced weight of the aileron assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced control surface is 0.00 inch-pounds. A tail-heavy surface exhibits static underbalance. A nose-heavy surface exhibits static overbalance.

CHECKING BALANCE

The aileron balance must be checked in a draft free area with the aileron completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, static wicks, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, they can be categorized under the following two headings:

a. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the aileron assembly.

b. Actual Force Measurement - Measurement of the force applied by the aileron surface on a single support at a known distance from the center line of the hinge.

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING

a. A stand with knife edge supports as illustrated in Figure 1. The knife edges must be in the same horizontal plane.

b. A paper cup or similar light weight container.

c. Approximately 1 pound of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler which measure to .01 inch, and a spirit level.

BALANCING PROCEDURE

COUNTERBALANCING METHOD

a. Locate the chord line by placing a straight edge at the inboard end of the aileron assembly so that one end is on the trailing edge and the other end is centered on the leading edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Fit the correct size bolts in the hinge brackets and mount the aileron on the knife edge supports. Ascertain that the aileron is free to rotate about the hinge line.

c. To determine if weight should be added or removed, suspend a paper cup from a point near the center of the aileron trailing edge. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 1. The cup must be free to hang vertically.

d. Add small quantities of lead shot to the cup until the aileron balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.

e. The distance "D" must be perpendicular to the hinge line. Measure "D" from the hinge line to the suspension point of the cup.

f. Remove the cup, contents, and string, then weigh them.

NOTE

Since any weighing error is magnified by the distance "D", weighing is most important and must be done carefully on scales that are certified for accuracy to .01 pound or less.

g. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by "W".

2. The distance between the centerline of the hinge and the suspension point of the cup is designated by "D".

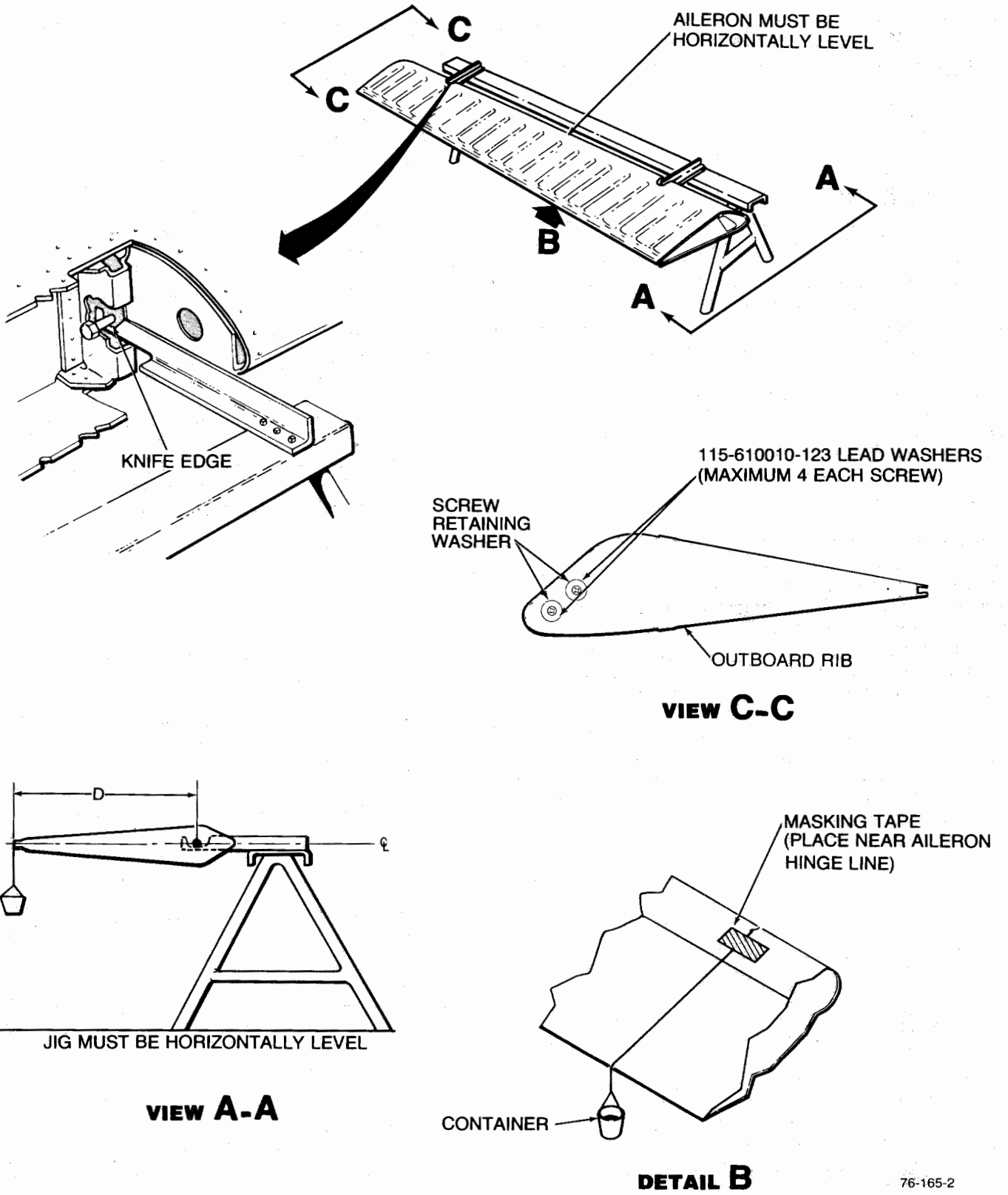
3. The over or underbalance moment is designated by "M".

4. M = W x D

5. The following is a typical example of a balancing calculation: Assume the aileron is overbalance (nose-heavy) and the paper cup was suspended from the trailing edge. Assume that the aileron balances with the chord line level at "W" = .15 poind" and "D" = 10.00 inches", then . . .

M = .15 x 10.00

M = 1.50 inch-pounds. The product of "W" x "D". In this instance, "M" is within the required static balance range and is therefore acceptable.



Balancing the Aileron
Figure 1

h. The painted aileron assembly must be nose-heavy by 0.00 to 2.00 inch-pounds. The center of gravity of the aileron is forward of the hinge center line causing the surface to be nose-heavy. Proper aileron balance is obtained by adding or removing lead washers that are secured with two screws to the rib on the outboard end of the aileron.

NOTE

Lead washers (0.044-0.045 lb. ea.) may be used to a maximum of 4 each at each screw. The lead washer is retained with an AN970-3 washer under each screw. The two screws and AN970-3 washers must be installed at all times.

CHART 1

MOMENT ADJUSTMENT

No. of Washers	*Approximate Weight*	*Approximate Moment Change*	
		Aft Location	*Fwd Location*
1	0.045	0.11	0.16
2	0.090	0.22	0.31
3	0.135	0.38	0.47
4	0.180	0.48	0.62

Balance adjustment range 0.11 inch-pounds for one weight to 1.10 inch-pounds for eight weights.

"END"

CHAPTER 61

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
61-EFFECTIVITY/CONTENTS	1	Mar 15/82
61-10-00	1	Feb 16/79
	2	Mar 15/82
	3	Mar 15/82
61-20-00	1	Feb 16/79
	2	Nov 18/77

CHAPTER 61 - PROPELLERS

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Propeller Governor Adjustment		1
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Low RPM Adjustment		1
Unfeathering Accumulator Removal		1
Unfeathering Accumulator Installation		1

"END"

PROPELLER - DESCRIPTION AND OPERATION

PROPELLERS

The propellers on the airplane are Hartzell two bladed, full feathering, constant speed, air dome propellers. The right propeller is an HC-M2YR-2CLEUF/FJC7666A, while the left propeller is an HC-M2YR-2CEUF/FC7666A. The design of the propellers are the same, except they track in opposite directions. The right propeller rotates in the counterclockwise direction, while the left propeller rotates in the clockwise direction. The propellers are not interchangeable. Centrifugal force from the propeller counterweights, assisted by air pressure and spring in the propeller dome moves the blades to high pitch, while engine oil pressure moves the blades to low pitch. The propeller hub area and the air dome are enclosed by a spinner and bulkhead assembly.

PROPELLER - MAINTENANCE PRACTICES

PROPELLER BLADE BEARING LUBRICATION

a. Remove the propeller spinner dome and cap.
b. Remove the safety wire and covers from the grease fittings.
c. Remove one grease fitting from each blade.
d. Lubricate the blade bearings with MIL-G-23827 grease (17, Chart 1, 91-00-00) by placing the grease gun fitting on the remaining fittings on each blade. Fill until the grease is visible in the hole where the opposite fitting was removed.
e. Clean the excess grease from the propeller, reinstall the grease fittings, covers, and safety wire on each blade.
f. Reinstall the propeller spinner dome and cap.

PROPELLER REMOVAL

a. Remove the spinner dome cap retaining screws and remove the spinner dome cap.
b. Remove the spinner dome retaining screws and remove the spinner dome.
c. Remove the nose bug.
d. Remove the lower engine cowling.

NOTE

The lower nose bug is removed to prevent oil from collecting in the bottom of the cowling during the propeller removal.

e. Remove the safety wire from the six propeller attach studs.
f. Remove the propeller by evenly unscrewing the six stud assemblies.

NOTE

Do not remove the hex nuts and roll pins from the stud assemblies.

CAUTION

Do not damage the threads on the mounting studs.

NOTE

Use clean rags to plug the center of the engine crankshaft and propeller hub to prevent foreign material contaminating the engine or the propeller.

PROPELLER INSTALLATION

CAUTION

Check the propeller identification plate before installing the new propeller. The left propeller is an HC-M2YR-2CEUF/FC7666A while the right propeller is an HC-M2YR-2CLEUF/FJC7666A. The propellers are NOT interchangeable.

a. Clean the propeller and engine flanges, removing any possible nicks which would prevent the proper mating of the surfaces.

NOTE

Before installation of the propeller, replace and lubricate the O-ring that is installed in the circular groove of the propeller hub with engine oil (2, Chart 1, 91-00-00).

b. Install the O-ring in the groove of the propeller hub.
c. Install the propeller shaft.

NOTE

When installing the propeller, place the No. 1 cylinder on top center and install the propeller in the one o'clock - seven o'clock position when facing the airplane.

d. Snug the six stud assemblies down evenly in a diagonal pattern. Torque the stud assemblies in a diagonal pattern to 60-70 foot-pounds and safety.

e. Install the lower engine cowling.

f. Install the upper nose bug.

g. Install the spinner dome. Torque spinner bolts to 32 foot-pounds.

h. Service the propeller air dome cylinder with dry air or nitrogen to a correct pressure as follows:

70°F to 100°F	41 ± 1 psi
40°F to 70°F	38 ± 1 psi
0°F to 40°F	36 ± 1 psi
−30°F to 0°F	33 ± 1 psi

j. Install the spinner dome cap.

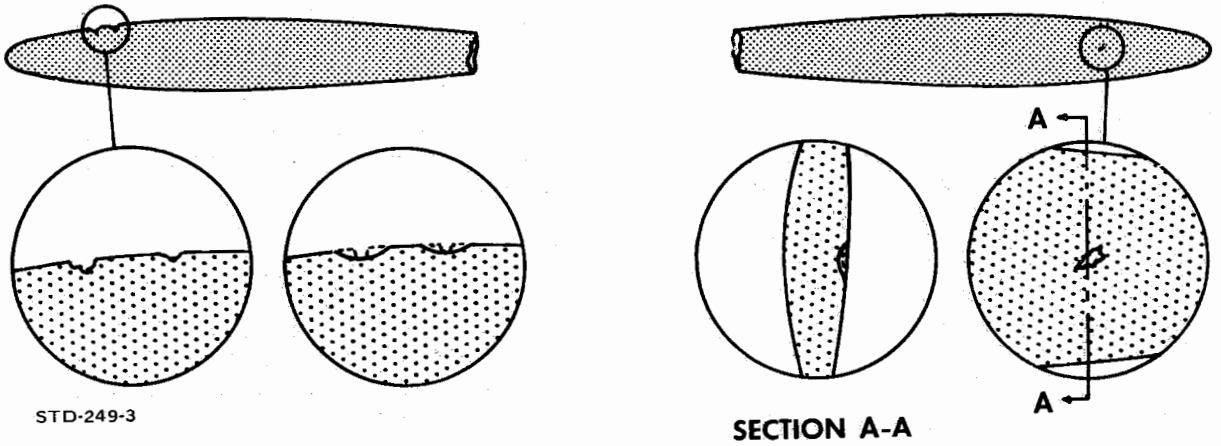
MINOR PROPELLER BLADE REPAIR

(Figure 1)

Minor nicks, dents, and gouges may be dressed out by approved line personnel. Bend any nicks or gouges into the leading edge with smooth curves and generous radii as shown in Figure 1. Reanodize reworked area by the chormic acid process only.

NOTE

The propeller blade may be shortened a maximum of 1 inch, minimum propeller diameter is 74 inches.



Minor Propeller Blade Repair
Figure 1

PROPELLER SPINNER

To avoid the possibility of a dome becoming loose or cracking, special care must be given to proper alignment of the spinner shell with the low pitch stop check nut and the spinner bulkhead. The check nut is designed with a step to allow the proper forward alignment.

REMOVAL OF THE PROPELLER SPINNER

a. Remove propeller spinner cap retaining screws and spinner cap.
b. Remove safety wire securing front check nut.
c. Remove front check nut.
d. Remove propeller spinner mounting screws and washers.
e. Remove hub attaching nuts.
f. Lift off propeller spinner shell.

INSTALLATION OF THE PROPELLER SPINNER

NOTE

Replacement of parts of a spinner is not recommended. The spinner should be replaced only as a complete assembly.

a. Install dome shell over the propeller assembly; align the inside of the dome shell with the stepped check nut.
b. Start the second check nut into place. Tighten only enough to remove all forward and aft slack movement.
c. Insure that the spinner shell mounting screw hole is aligned with the hole in the spinner bulkhead. If these two holes are not in alignment, adjustment of the bulkhead will be necessary.

NOTE

If misalignment of the bulkhead and shell is observed, the following procedure must be used to insure a tension preloading of the spinner assembly after completion of installation:

1. The only acceptable misalignment will be when the bulkhead screw hole is aft (toward engine) of the spinner screw hole by one half of a hole. In this case, a light forward pressure on the bulkhead will allow alignment.

2. If proper alignment cannot be achieved, the bulkhead must be moved aft. Install AN960-616L washers between the hub and bulkhead or between the hub spacer and bulkhead. Use only enough washers to achieve a tension preloading of the spinner assembly.

d. After proper alignment has been achieved, torque the hub bolts to 20-22 foot-pounds. Install all spinner mounting screws with fiber washers. Torque the forward check nut to 15-20 foot-pounds and safety with a .030 steel wire.
e. Install spinner cap using the mounting screw (and washers, if necessary). Check screw length to insure that it will not make contact with the cylinder when in place.

"END"

CONTROLLING - DESCRIPTION AND OPERATION

The airplanes propeller rpm is controlled by the engine-driven propeller governor which regulates hydraulic oil pressure to the hub. The propeller controls, on the control console, allow the pilot to select the governor's rpm range. Springs and dome air pressure, aided by counterweights, move the blades to high pitch. Engine oil under governor-boosted pressure moves the blades to the high rpm (low pitch) position.

The propellers should be cycled occasionally during cold weather operation. This will help maintain warm oil in the propeller hubs so that the oil will not congeal.

CONTROLLING - MAINTENANCE PRACTICES

PROPELLER GOVERNOR REMOVAL

a. Ensure that the control levers are in the unfeathered (low pitch) position.
b. Remove the engine cowling.
c. Romove the hardware that attaches the adjusting rod end to the governor.
d. Disconnect the oil line from the governor.
e. Plug oil line and port to prevent contamination of the oil supply.
f. Remove the governor attaching hardware and remove the governor.
g. Cover the engine adapter.

PROPELLER GOVERNOR INSTALLATION

a. Remove the cover from the engine adapter, wipe the engine adapter clean and install a new governor mounting gasket.
b. Install the governor on the engine adapter and secure with attaching hardware. Torque to 110-150 inch-pounds.
c. Remove the plugs from the oil line and port in the governor and connect the oil line to the governor.
d. Install the hardware that attaches the adjusting rod end to the governor.

PROPELLER GOVERNOR ADJUSTMENT

HIGH RPM ADJUSTMENT

The high rpm adjustment must be checked while the airplane is in flight. Observe the takeoff rpm to see if it exceeds the redline figure. If excessive rpm is observed, land the airplane and adjust the high rpm screw inward to reduce the redline figure. The high rpm adjustment screw is located at the aft end of the governor. One complete revolution of the screw reduces the propeller rpm by approximately 25-30 revolutions.

LOW RPM ADJUSTMENT

The low rpm adjustment is made on the ground. To make the adjustment, pull the propeller levers back against the spring stop. Slowly move the throttle control levers forward until the propeller rpm stabilizes. Observe the rpm reading. If the rpm varies from the specified low rpm setting of 2000 ± 25 rpm, the low rpm setting must be adjusted. The low rpm adjustment is made on the spring adjustment screws which are located behind the instrument panel. To increase the setting, move the spring stop forward.

UNFEATHERING ACCUMULATOR REMOVAL

a. After removing the upper cowling from the engine, locate the unfeathering accumulator on the center, upper channel, forward side of the engine firewall.

CAUTION

The system has approximately 300 psi of pressure with the propeller in full-feather position.

b. Check the propeller control lever for unfeathering (low pitch) position, to release the accumulator pressure.
c. Disconnect the oil hose between the governor to the accumulator at the accumulator elbow fitting.
d. Remove the bolts securing the accumulator to the firewall and remove the accumulator.

UNFEATHERING ACCUMULATOR INSTALLATION

NOTE

The accumulators are usually shipped with a charge of 75 to 85 psi.

a. Check the accumulator for 75 psi pressure. If charging is required, bleed off all pressure and recharge with nitrogen or dry air to 75 psi.

b. Install the accumulator on the upper channel of the firewall and secure with the attaching bolts.

c. Attach the oil hose from the governor to the accumulator elbow fitting and torque. Refer to Chart 2, 91-00-00.

"END"

CHAPTER 71

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CHAPTER 71 - POWER PLANT

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POWER PLANT - DESCRIPTION AND OPERATION

The airplane is equipped with one O-360A1G6D engine on the left side and one LO-360A1G6D engine on the right side. Both engines are manufactured by AVCO Lycoming. The right engine cranks in the counterclockwise direction, while the left engine cranks in the clockwise direction. The engines are not interchangable. Both engines are rated at 180 hp at 2700 rpm. It is recommended that grade 100 (green) or 100LL (blue) minimum grade aviation fuel be used. The oil sump capacity of each engine is 8 quarts. For overhaul of the engines, refer to P/N 60294-7 Overhaul Manual, AVCO Lycoming Division, Williamsport, Penn.

TROUBLESHOOTING THE ENGINE

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Failure of engine to start.	a.	Lack of fuel.	a.	Check fuel system for leaks. Fill fuel cells. Clean dirty lines, strainers or fuel valves, etc.
		b.	Overpriming.	b.	Unload engine by standard clearing procedure.
		c.	Improper starting procedure.	c.	Restart per recommended starting procedure.
		d.	Ignition system malfunction.	d.	Isolate cause and correct.
		e.	Induction system leak.	e.	Tighten or replace loose or damaged hose connections.
2.	High fuel pressure.	a.	Air leak in fuel pump pressure line.	a.	Drain line. Replace line if damaged.
3.	Low fuel pressure.	a.	Restricted mixture control travel.	a.	Check mixture control for full travel. Adjust as necessary. Replace defective parts.
		b.	Clogged fuel filter or fuel lines.	b.	Check fuel lines for restrictions. Clean fuel filters. Replace damaged parts.
		c.	Fuel vent system defective.	c.	Tighten fuel vent system connections, replace defective parts.
		d.	Air leak in fuel pump pressure line.	d.	Locate leak and correct.
4.	Failure of engine to idle properly.	a.	Mixture levers set for lean mixture.	a.	Use FULL RICH mixture lever setting for ground operation.
		b.	Incorrect idle adjustment at engine.	b.	Adjust idle speed at the engine.
		c.	Incorrect idle mixture adjustment at engine.	c.	Adjust idle mixture at engine.
		d.	Induction system leak.	d.	Tighten or replace loose or damaged hose connections.

TROUBLESHOOTING THE ENGINE (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
4.	Failure of engine to idle properly. (Cont'd)	e.	Uneven cylinder compression.	e.	Check compression, condition of piston rings and valve seats.
		f.	Fouled spark plugs.	f.	Clean and gap or replace spark plugs.
5.	Low power and uneven running.	a.	Restrictions in air intake passages.	a.	Check passages and remove restrictions.
		b.	Throttle and mixture controls out of adjustment.	b.	Check and adjust idle mixture and idle speed at engine.
		c.	Exhaust system leaks.	c.	Locate and correct.
		d.	Defective spark plugs.	d.	Clean and gap or replace.
		e.	Improper fuel.	e.	Drain fuel and clean fuel strainers. Fill cells with recommended grade of fuel.
		f.	Magneto breaker points not working properly.	f.	Clean points, check timing.
		g.	Defective ignition wires.	g.	Check wires with tester, replace defective wires.
6.	Failure to develop full power.	a.	Induction system leaks.	a.	Isolate leak and repair.
		b.	Throttle lever out-of-adjustment.	b.	Check throttle linkage travel.
		c.	Improper fuel flow.	c.	Check throttle linkage travel.
		d.	Restriction in air intake passage.	d.	Isolate restriction and remove.
		e.	Improper fuel.	e.	Drain fuel from the airplane. Clean fuel strainers and service the airplane with the proper fuel.
7.	Low oil pressure.	a.	Insufficient oil.	a.	Add recommended engine oil as required.
		b.	Oil viscosity too low for prevailing ambient temperature.	b.	Drain and refill with recommended oil of proper viscosity.
		c.	Foam in oil due to presence of alkaline solids in system.	c.	Drain and refill with oil. (It may be necessary to flush the system if the presence of alkaline solids is due to a previous cleaning with alkaline solids.)
		d.	Defective oil pressure pump.	d.	Replace pump.

TROUBLESHOOTING THE ENGINE (Cont'd)

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
7.	Low oil pressure. (Cont'd)	e.	Malfunctioning pressure gage or transmitter.	e.	Check gage and transmitter. Clean plumbing. Replace if required.
		f.	Clogged oil filter.	f.	Replace oil filter.
8.	High oil temperature indication.	a.	Low oil supply.	a.	Add recommended oil as required.
		b.	Cooler air passages clogged.	b.	Clean thoroughly.
		c.	Cooler core plugged.	c.	Remove cooler and flush thoroughly.
		d.	Thermostat damaged or held open by solid matter.	d.	Remove, clean valve, and seat. If still inoperative, replace.
		e.	Oil viscosity too high for prevailing ambient temperature.	e.	Drain oil and change oil filter. Refill with recommended oil of proper viscosity.
		f.	Prolonged ground operation.	f.	Limit ground operation to a minimum.
		g.	Malfunctioning gage or transmitter.	g.	Check wiring. Check transmitter. Check gage. Replace defective parts.
9.	Excessive oil consumption.	a.	Low grade oil.	a.	Fill with recommended oil.
		b.	Failing or failed bearings.	b.	Check sump for metal particles.
		c.	Worn piston rings.	c.	Install new rings.
		d.	Incorrect installation of piston rings.	d.	Install new rings.

POWER PLANT - MAINTENANCE PRACTICES

ENGINE REMOVAL

CAUTION

Care should be taken when removing and installing the engine that no dirt or foreign objects, be allowed to enter the induction system. Be careful not to damage duct work when removing and installing the engine.

a. Check that the ignition switches are in the OFF position.

WARNING

To be safe, treat all magnetos as hot whenever the ground lead is disconnected. To ground the magneto, disconnect the ignition switch lead wire at the capacitor and ground the capacitor pole. If this is impractical, remove the ignition harness on the magneto or disconnect the spark plug leads.

b. Remove the engine cowling. (Refer to Chapter 71-10-00.)

c. Remove the propeller. (Refer to Chapter 61-10-00.)

d. Disconnect all plumbing at the firewall. Be sure to cap all open lines and fittings.

CAUTION

Place the fuel selector valve handle in the ON position to relieve all pressure in the fuel line from the firewall to the fuel pump.

e. Disconnect and identify all electrical wiring at the firewall.

f. Disconnect and identify all engine controls.

g. Place a wing stand under the opposite wing and support under the tail.

h. Attach an engine hoist to the engine.

i. Remove the slack from the hoisting cable and remove the bolts that attach the engine to its mounts.

j. Remove the engine and place in a suitable work stand.

ENGINE BUILD-UP

Engine build-up consists of the removal of accessories and equipment from the old engine and installing them on the new engine.

CAUTION

When removing any parts from either engine, it is vitally important to check the part numbers of propellers, engines, engine components, and engine accessories to ensure the correct component is installed on the proper engine.

Refer to the Lycoming Engine Overhaul Manual P/N 60294-7 for proper torque values.

NOTE

Tag or identify all hoses, bolts, washers, nuts, electrical connectors, and note harness clamp locations for reinstallation on the new engine. Cap all open hoses and engine ports to prevent contamination.

NOTE

Torque engine shock mounts (Lord Mfg. Co.) bolts to 475 ± 25 inch-pounds.

ENGINE INSTALLATION

CAUTION

Check the engine identification plate before installing the new engine. The left engine is an O-360A1G6D while the LO-360A1G6D, with the letter "L" painted on the front and the starter ring painted, is installed on the right. The letter "L" designation indicates left rotation. Be certain the correct engine is installed in the proper wing. The engines are NOT interchangeable.

a. Observe the WARNINGS and CAUTIONS as noted in ENGINE REMOVAL.

b. Position the engine hoist and attach the hoisting sling to the engine.

c. Move the hoist into position in front of the firewall, align the bolt holes of the engine mount and those of the firewall. Install the engine mount bolts and torque to 325 + 0 − 25 inch-pounds.

NOTE

If the engine mount bolt nuts are replaced, use a magnet to ensure thay are steel.

d. Disconnect the hoisting sling and move the hoist clear of the airplane.

e. Connect all electrical wiring at the firewall.

f. Connect all plumbing at the firewall, and all ducting.

g. Connect and adjust all engine controls. (Refer to Chapter 61-20-00 and Chapter 71-00-00.)

h. Install the propeller. (Refer to Chapter 61-10-00.)

i. Install the engine cowling. (Refer to Chapter 71-10-00.)

j. Perform an engine run-up and complete final adjustments.

NOTE

If a new or newly overhauled engine has been installed, the engine fuel and oil system must be depreserved and serviced. (Refer to Chapter 12-10-00.)

GROUND RUNNING AND WARM-UP

a. Head the airplane into the wind.

b. Operate the engines on the ground with the propeller blades set at the minimum angle (high rpm) setting.

c. Maintain the cylinder head temperature between 200°F and 500°F. Never allow the cylinder head temperature to exceed 500°F.

d. Extended periods of idling at low rpm may result in fouled spark plugs.

e. The mixture controls should remain in the FULL RICH position unless leaning is required during the checkout.

f. Use a throttle setting of 600 rpm for engine warm-up.

NOTE

An oil pressure indication of 25 psi should be noted within 30 seconds. If no pressure is noted within the specified time, stop the engine and investigate the cause. Normal oil pressure at cruise rpm should be 60 - 90 psi, 25 psi at idle and (starting and warm-up) 100 psi maximum.

IDLE SPEED AND MIXTURE ADJUSTMENT

a. Warm-up the engine.

b. Perform magneto drop-off check as described in Chapter 74-10-00. If drop-off is normal, proceed with idle adjustment.

c. Slowly retard the throttle lever to the idle position. The tachometer should indicate 600 rpm (normal idle setting). To adjust, turn the idle adjusting screw at the throttle lever stop until the desired rpm is reached.

d. When the idle speed is stabilized, move the mixture control lever with a smooth, steady pull into the IDLE CUT-OFF position. Observe the tachometer for any change during the leaning out process.

CAUTION

Return the mixture control to the FULL RICH position before the rpm can drop to a point where the engine cuts out.

An increase of more than 50 rpm while "leaning out" indicates an excessively rich mixture. An immediate decrease in rpm (if not proceeded by a momentary increase) indicates the mixture is too lean. If a rise of less than 50 rpm during the "leaning out" is indicated the idle mixture is set correctly.

e. If it is indicated that the mixture is either too lean or too rich, turn the idle mixture adjustment screw one or two notches in the direction necessary for proper adjustment.

f. Check this setting by repeating the preceding steps.

g. Each time the adjustment is changed, the engine should be run up to 2000 rpm to clear the engine before checking the idle or mixture settings.

h. Recheck idle speed as stated in step "c". Make final idle speed adjustment as necessary.

OIL PRESSURE ADJUSTMENT

The oil pressure can be adjusted by adding STD-425 washers (maximum of nine washers can be added) under the cap until the correct oil pressure is reached.

NOTE

Normal oil pressure at cruise rpm should be 60-90 psi, 25 psi at idle and (starting and warm-up) 100 psi maximum.

"END"

COWLING - MAINTENANCE PRACTICES

COWLING REMOVAL

a. Remove cowling access panels.

CAUTION

Support the lower cowling with blocks before removing the attaching screws.

b. Remove screws that attach cowling to the nose bug and aft attaching point and remove the cowling.

COWLING INSTALLATION

a. Place cowling in position. Support lower cowling until installation is completed.

b. Secure upper and lower cowling with the attaching screws at the nose bug and at the aft attachment point.

c. Install and secure cowling access panels.

"END"

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CHAPTER 72 - ENGINE

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NOTE

Refer to the Lycoming Aircraft Engine Overhaul Manual, P/N 60294-7, for detailed information on the above subjects.

CAUTION

As viewed from the pilot's seat, the left engine rotates clockwise and the right engine rotates counterclockwise. Because of the counter-rotating engines, the propellers, engines, and many of the engine components and accessories ARE NOT interchangeable. It is imperative that when replacement of engine components and accessories becomes necessary, all part numbers be verified to ensure that the proper part has been obtained for replacement. Incorrect part replacement may result in extensive damage to the engine. The left rotation engine (RH wing) is identified on the engine data plate by the LO-360A1G6 designation with the letter "L" painted on the front and the starter ring painted. The letter "L" designation indicates left rotation. Be certain the correct engine is installed in the proper wing. The right rotation engine (LH wing) is identified on the engine data plate by the O-360A1G6D.

"END"

CHAPTER 74

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CHAPTER 74 - IGNITION

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"END"

IGNITION SYSTEM - DESCRIPTION AND OPERATION

The right engine is equipped with a Bendix D4RN-2021 dual magneto, while the left engine is equipped with a Bendix D4LN-2021 dual magneto. The magnetos are not interchangeable. Each magneto incorporates an impulse coupler. At low engine cranking speeds, the impulse coupler automatically retards the magneto to fire at the desired firing speed. The spring action of the impulse coupler releases, to spin the rotating magnet and produces the spark to fire the engine. After the engine starts, the impulse coupler flyweights do not engage due to centrifugal action. The impulse coupler then acts as a straight drive and the magnetos fire at the normal firing position of the engine.

The combination ignition, starter, and primer switch has five positions.

OFF - the magneto is inoperative

R - the right main breaker functions of the magneto are operative, the left main breaker functions are inoperative.

L - the left main breaker functions of the magneto are operative, the right main breaker functions are inoperative.

BOTH - both main breaker functions of the magneto are operative.

PRESS-TO-PRIME - pressing in on the switch actuates the primer solenoid and primes the engines with fuel prior to starting.

START - the starter is operating, rotating the impulse coupler which allows current to flow through the magneto left breaker function while the magneto right breaker function is grounded.

The switch is spring loaded from the START to BOTH and from the depressed primer position to the normal operating position.

TROUBLESHOOTING
IGNITION SYSTEM

	INDICATION		*PROBABLE CAUSE*		*REMARKS*
1.	Hard starting.	a.	Magneto improperly timed to engine.	a.	Time magneto to engine.
		b.	Magneto breaker points are not set properly.	b.	Set points.
		c.	Impulse coupling inoperative or late.	c.	Remove access cover and check impulse coupling action.
2.	Engine roughness.	a.	Bad spark plugs.	a.	Install new spark plugs.
		b.	Fouled spark plug electrodes or incorrect gap.	b.	Clean and gap spark plugs.
		c.	Defective spark plug leads.	c.	Check plug leads for continuity and break down and replace as necessary.
		d.	Worn magneto contacts.	d.	Check contacts for excessive burning, pits, and distortion. Replace if necessary.
3.	Magneto Check out-of-limits.	a.	Magneto improperly timed to engine.	a.	Time magneto to engine.
		b.	Magneto breaker points are not set properly.	b.	Set points.

TROUBLESHOOTING
IGNITION SYSTEM (Cont'd)

	INDICATION		*PROBABLE CAUSE*		*REMARKS*
3.	Magneto Check out-of-limits. (Cont'd)	c.	Worn magneto contacts.	c.	Check contacts for excessive burning, pits, and distortion. Replace if necessary.
		d.	Bad spark plugs.	d.	Install new spark plugs.
		e.	Defective spark plug leads.	e.	Check plug leads for continuity and breakdown. Replace as necessary.
		f.	Spark plug electrodes fouled or incorrect gap.	f.	Clean and gap spark plugs.

IGNITION SYSTEM - MAINTENANCE PRACTICES

MAGNETO DROP-OFF CHECK

The drop-off check is accomplished by switching the magneto switch from BOTH to either the RIGHT or LEFT position and noting any loss or variance in rpm.

a. Thoroughly warm-up the engine and set the propeller control in low pitch. Place the mixture control in FULL RICH.

b. Set the throttle to produce 2200 rpm.

c. Note the amount of rpm differential between the left main breaker function and the right main breaker function of each magneto as the magneto switch is turned from BOTH to L and back to BOTH and then to the R position and back to BOTH. Normal drop-off is 100 rpm. Drop-off should not exceed 175 rpm. The difference between the two magneto functions operated individually should not exceed 50 rpm.

MAGNETO BREAKER POINT ADJUSTMENT

The magneto ignition system should be checked after the first 50 hours of operation and every 100 hours thereafter. Contact point clearance for the magneto right main breaker is .016 ± .004, left main breaker is .016±.002. Points with deep pits or with excessively burned areas should be discarded. Inspect cam follower felt pad for proper lubrication, and clean the breaker compartment with a clean dry cloth.

MAGNETO REMOVAL

a. Ensure that the battery switch is off and that the external power source is disconnected.

b. Remove the magneto cover. Note the position of the cover (High tension leads are an integral part of mag cover.)

c. Remove the magneto wires from the engine spark plugs. Note the position of each wire.

d. Loosen the clamps that secure the magneto to the engine and remove the magneto.

MAGNETO INSTALLATION AND MAGNETO-TO-ENGINE TIMING

CAUTION

Before installing the new magneto, check the identification plate for the proper part number. D4RN-2021 magneto should be installed on the right engine, while a D4LN-2021 magneto should be installed on the left engine. The magnetos are NOT interchangeable.

a. Place the engine in the No. 1 advance firing position as directed by the Lycoming Overhaul Manual P/N 60294-7.

b. Install a new mounting gasket on the magneto flange.

WARNING

Do not attach harness spark plug ends to the spark plugs until all magneto-to-engine timing procedures and magneto-to-switch connections are entirely completed.

c. Remove engine-to-magneto drive gear train backlash by turning engine magneto drive as far as possible in direction opposite to normal rotation.

d. Remove the timing window plug from the most convenient side of the magneto housing and the plug from the rotor viewing location in the center of the housing.

e. Turn the rotating magnet drive shaft in the normal direction of magneto rotation until the painted tooth of the large distributor gear is centered in the timing hole.

f. Observe that the built in pointer just ahead of the rotor viewing window aligns with the R or L mark on the rotor depending on whether the magneto is of right or left rotation as specified on the magneto nameplate.

g. With the magneto in the position as described in step "f", install the magneto on the engine and loosely clamp in position.

h. Attach a battery operated timing light with two lights as follows: attach the power lead of the timing light to the left switch adapter lead of the magneto; attach the power lead of the timing light to the right switch adapter lead of the magneto; and attach the ground lead of the timing light to the magneto housing.

NOTE

An internal timing tolerance is allowed when adjusting the two main breakers. Therefore, one of the main breakers may open slightly before the other. Magneto-to-engine timing should be accomplished using the first main breaker to open as the reference point when the engine is in the firing position for the No. 1 cylinder. This will ensure that ignition created by either spark plug will not occur prior to the desired engine firing point.

i. If both timing lights are on, indicating breaker contacts are closed, proceed to step "l". If either or both lights are off proceed with steps "j" or "k" and then to step "l".

j. Right hand rotation magnetos. Turn the entire magneto to the left until both timing lights are on.

k. Left hand rotation magnetos. Turn the entire magneto to the right until both timing lights are on.

l. Rotate the entire magneto (right hand rotation to the right, left hand rotation to the left) until one of the timing lights just goes off. Then evenly tighten the magneto mounting clamps.

m. Back the engine up approximately 10° and then carefully "bump" the engine forward, while observing the timing lights. At the No. 1 cylinder firing position, the same timing light as described in step "l" should go off. Continue turning the engine in its normal direction of rotation until the other timing light goes off. This should not be more than 3 engine degrees later than the first light.

n. Repeat steps "i" through "m" until the conditions are described in step "m" are obtained.

o. Complete tightening of the magneto securing clamps.

p. Recheck timing once more and if satisfactory disconnect timing light and adapter leads from the magneto.

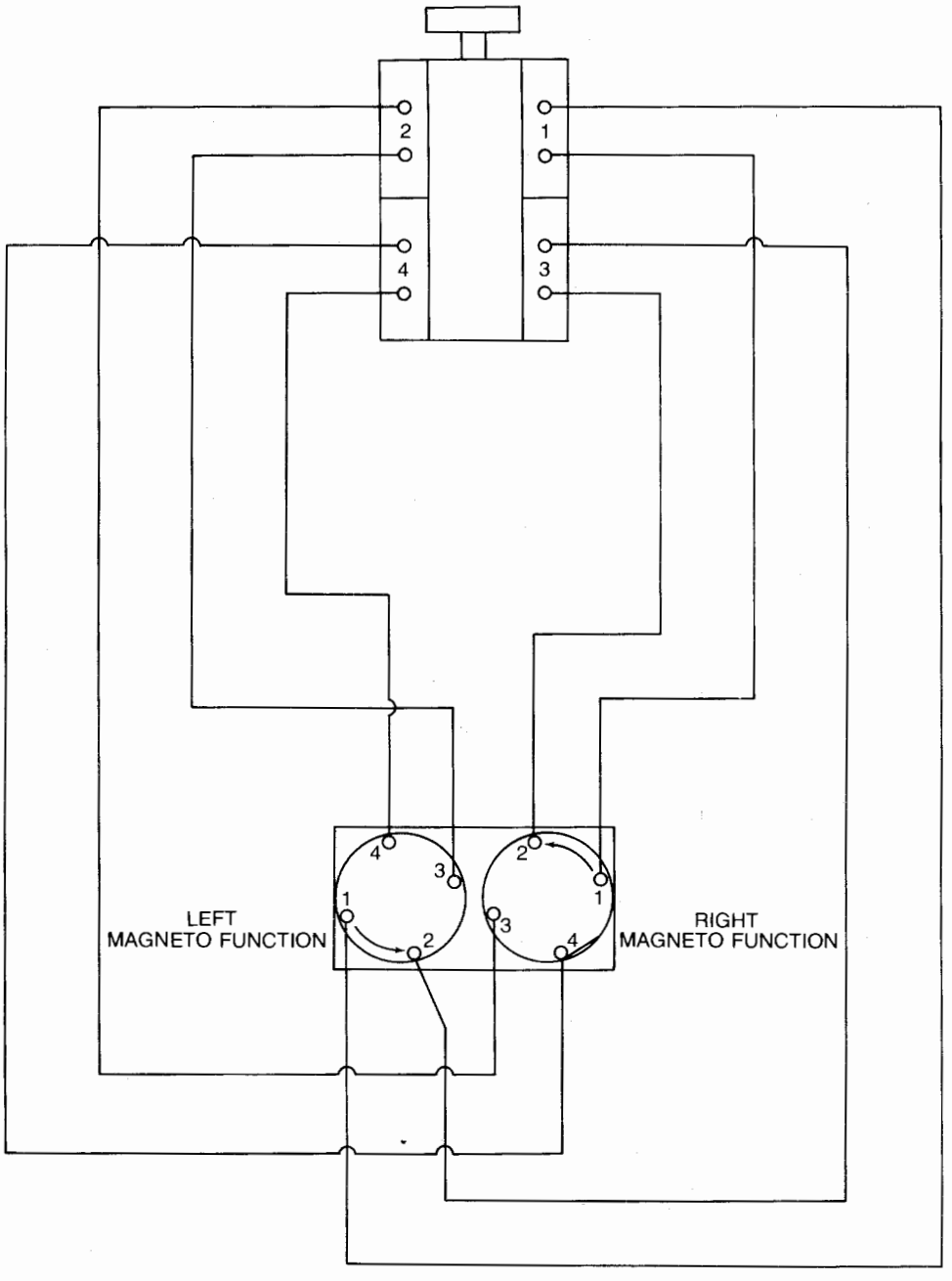
q. Install plugs in the timing inspection holes of the magneto and torque to 12 - 15 inch pounds.

r. Install the magneto cover to the magneto and spark plugs of the engine. Refer to the Wiring Diagram Manual, P/N 105-590000-15 (14-volt system, ME-1 thru ME-182) or P/N 105-590000-21 (28-volt system, ME-183 and after) for a schematic of the proper electrical installation.

"END"

DISTRIBUTION - MAINTENANCE PRACTICES (Figures 1 and 2)

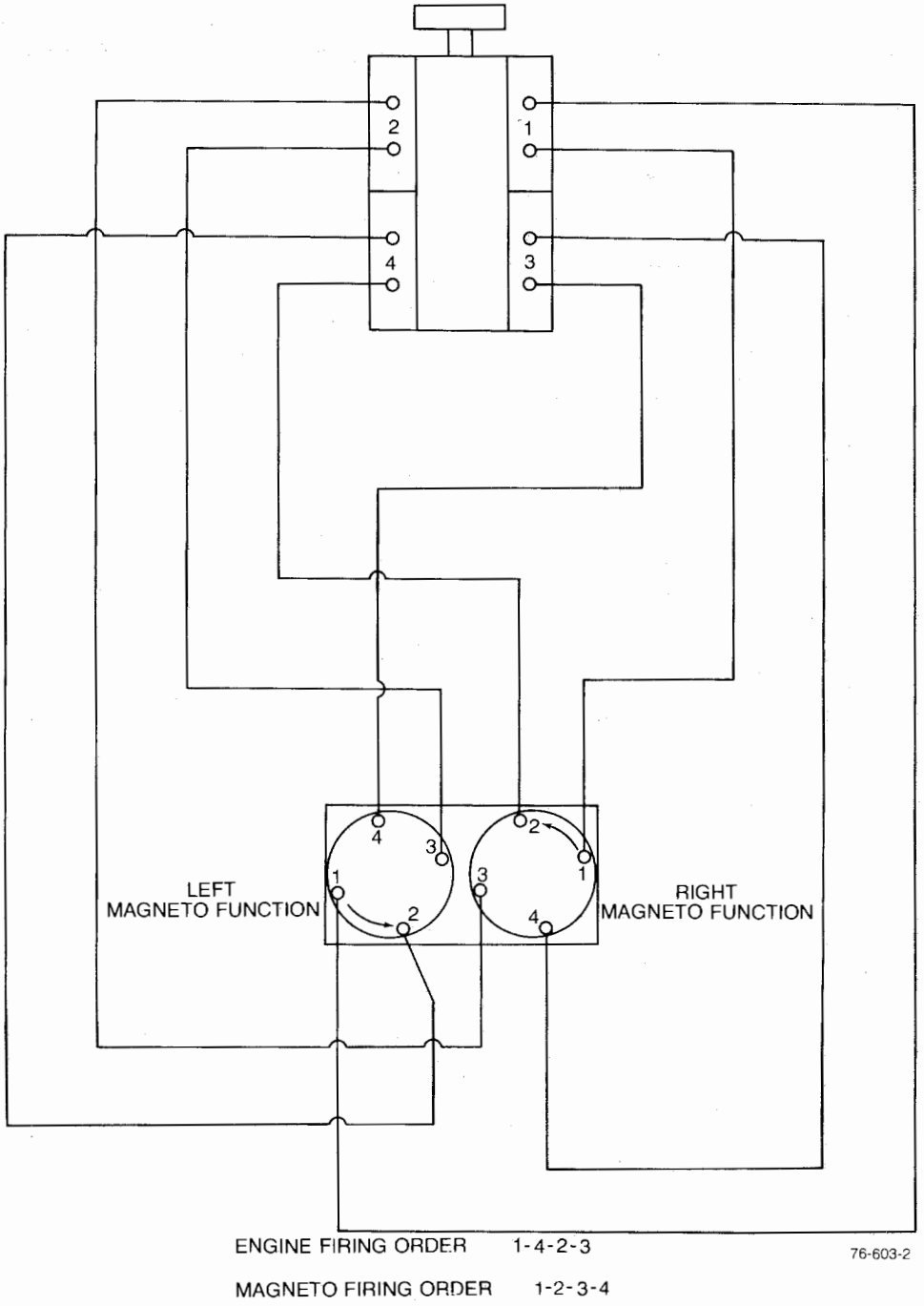
In the event that an ignition harness or an individual lead is to be replaced, consult the Magneto Wire Routing Diagram, Figures 1 and 2, to be sure that the harness is correctly installed. Mark locations of clamps and clips to be certain that replacement is clamped at the correct locations. For engine firing order and magneto firing order refer to Figures 1 and 2.



ENGINE FIRING ORDER 1-3-2-4

MAGNETO FIRING ORDER 1-2-3-4

LH Engine Magneto Wire Routing Diagram
Figure 1



RH Engine Magneto Wire Routing Diagram
Figure 2

"END"

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CHAPTER 77 - ENGINE INDICATING

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"END"

GENERAL - DESCRIPTION AND OPERATION

MANIFOLD PRESSURE INDICATOR

The manifold pressure indicator is a dual indicator with sense lines routed to each engine. A flexible line connects the pressure source from each engine to the firewall. The firewall fitting is connected to the instrument with solid tubing. A union is provided at the inboard wing leading edge to facilitate wing removal.

TACHOMETER (STANDARD)
(ME-1 and after)

A mechanically-driven tachometer is provided for each engine. Although the cable is lubricated at assembly by the manufacturer, it should be lubricated every 100 hours. If the mechanism does not operate properly, the cable should be inspected and lubricated, or if necessary, replaced.

To remove a cable, disconnect the casing nut from the tachometer and remove the cable by pulling it out of the casing. If the cable is broken, the lower section of the cable can be pulled out after disconnecting the casing nut at the drive end.

Check the removed cable for worn spots and kinks which indicate a lack of lubrication or sharp bends in the casing. If the cable is kinked, the casing must be examined for breaks or distortion due to sharp bends. Replace kinked cables and broken or distorted casings. A casing bend radius of not less than five inches must be maintained at bends.

When installing or lubricating a new cable, spread a thin layer of CD 2 grease (30, Chart 1, 91-00-00) over the lower two-thirds of the cable. The cable should then be installed with a rotating motion, which will spread the lubricant over the entire length of the cable. DO NOT OVER LUBRICATE.

TACHOMETER (OPTIONAL)
(ME-140 and after)

The optional electric dual needle tachometer is located near the middle RH side of the pilot's instrument panel. The dual needles on the tachometer are identified "L" for the LH engine and "R" for the RH engine. The tachometer is electrically connected to a sensor, mounted on the starter bendix case on each engine.

ENGINE INSTRUMENT CLUSTER

The instruments for monitoring the fuel quantity, fuel pressure, oil pressure, oil temperature, cylinder temperature and alternator loads are contained in the engine instrument cluster. This cluster is mounted in the center of the instrument panel. The instruments all utilize D'Arsonval movements and each has the necessary shunt and series resistances and the protective circuitry mounted on a printed circuit board as an integral portion of each instrument module. Each instrument module is mounted on a base, or parent, printed circuit board which provides the electrical connections to the instrument module.

The instrument cluster contains circuitry for monitoring the alternator output and illuminating an "UNDER" voltage light when the alternator is not on the line. An "OVER" voltage light is connected to each overvoltage relay to indicate actuation of the overvoltage relay. A press to test switch is provided to test the "UNDER" voltage lamps, "OVER" voltage lamps and the low voltage sensing circuitry.

Potentiometers, accessible from the back of the cluster case, are provided for setting the empty and the full positions of the fuel quantity indicators and for zeroing the fuel pressure indicators.

Each instrument, with the exception of the loadmeters, is supplied with voltage from the airplane bus. This voltage is regulated to a constant value within the instrument cluster assembly. The indication of each instrument, other than the loadmeters, is controlled by the variations of resistance of the transmitter or transducer in the indicator circuit. The loadmeters are connected across the shunt in the output of each alternator. This indication is presented as a percent of the total rated output of each alternator.

Two harness connectors on the back of the instrument cluster assembly connect the instruments to the respective engine transmitter or transducers. Separate voltage sources are provided for the left instruments and for the right instruments.

The illumination of the instruments is provided by six lamps secured to the inner surface of the cluster assembly mask. The illumination voltage of the cluster lamps is supplied from a 5 ampere circuit breaker in the right subpanel through the left engine harness connector. The illumination level of the lamps is varied by the instrument light dimming circuit and is controlled by a rheostat on the instrument panel.

GENERAL - MAINTENANCE PRACTICES

INSTRUMENT CLUSTER

In the event a malfunction of an instrument is suspected, the engine harness connectors on the back of the cluster assembly should be switched to verify that the malfunction is in the instrument cluster. If the malfunction persists in the same instrument, that instrument should be replaced. If, however, the malfunction changes sides, the circuit and circuit components would then be suspect and should be repaired or replaced, as required.

NOTE

The instrument illumination would be inoperative when the connectors are switched, as this circuit receives power through the left engine harness connector.

REMOVAL OF THE ENGINE INSTRUMENT CLUSTER

The engine instrument cluster may be removed from the instrument panel in the following suggested manner:

a. Disconnect the two harness connectors on the back of the engine instrument cluster assembly.
b. Remove the six screws securing the instrument cluster to the instrument panel. Support the cluster assembly while removing the screws to prevent dropping it.
c. Remove the cluster assembly from the instrument panel.

INSTALLATION OF THE ENGINE INSTRUMENT CLUSTER

The engine instrument cluster may be installed in the instrument panel in the following suggested manner:

a. Place the engine instrument cluster in its position on the forward side of the instrument panel.
b. Secure the instrument cluster to the instrument panel with the six screws taken out during removal.

CAUTION

If replacement of the screws is required, use screws of the same length as the original screws to avoid internal damage to the instrument cluster.

c. Connect the two engine harness connectors to the back of the instrument cluster. Be sure that the left and right connectors are connected in their respective places.

REPLACEMENT OF AN INSTRUMENT IN THE INSTRUMENT CLUSTER

An instrument may be removed and replaced in the following suggested manner:

a. Remove the instrument cluster assembly as described in this Chapter under the heading REMOVAL OF THE ENGINE INSTRUMENT CLUSTER.
b. Remove the screws securing the cluster in the case.There are two screws through the lower end of the case and two screws through either side of the case. Do not remove the screws through the instrument mask.
c. Carefully lift the mask and the instrument cluster from the case. Observe caution to prevent applying excessive force to the mask, instruments, printed circuit boards or to the internal wire connections.
d. Support the cluster and remove the three screws securing the instrument module to be replaced to the parent printed circuit board. Carefully slip the instrument module from between the mask and the parent printed circuit board.
e. Carefully position the replacement instrument module on the parent printed circuit board. Secure the instrument module using the three screws removed in the preceding step.
f. Install the instrument cluster as described in this Chapter under the heading INSTALLATION OF THE ENGINE INSTRUMENT CLUSTER.

CALIBRATION OF ENGINE INSTRUMENT CLUSTER

Normally calibration of the instruments in the engine instrment cluster is not required and is not recommended, except during replacement of the fuel quantity indicators or the fuel pressure indicators.

ADJUSTMENT OF THE FUEL QUANTITY INDICATORS

When the fuel quantity indicators have been replaced, the "Z" and "S" potentiometers should be adjusted as required, for correct empty and full readings. These adjustments may be made in the following suggested procedure:

a. Completely drain the fuel from the side of the airplane which is to have the fuel quantity indicator adjusted. Refer to AIRPLANE DEFUELING in Chapter 28 of this manual.

CAUTION

Never attempt to adjust the zero of the fuel quantity indicator unless the fuel has been completely drained from the system. To do so, will require complete draining and recalibration of the fuel quantity indicator.

b. Level the airplane as described in Chapter 8 under the heading LEVELING. If the airplane was not level when defueled in step "a", complete the defueling operation prior to proceeding with the adjustment.

c. Turn the battery switch ON (if the battery is not fully charged, an external power source should be used to provide a bus voltage of 14.0 ± .2 vdc (ME-1 thru ME-182) or a voltage of 28.0 ± .2 vdc (ME-183 and after).

d. Hand hold the instrument cluster assembly and connect the harness connectors to the instrument cluster assembly. Be sure to connect the correct connector to the correct side of the cluster assembly. See Figure 1.

e. Use a screwdriver of appropriate size to turn the "Z" potentiometer, as required, to center the pointer on the "E" mark of the fuel quantity indicator dial.

f. Remove the power from the airplane and completely fill the fuel tanks.

g. Turn the battery switch ON and adjust the "S" potentiometer, as required, to center the pointer on the "F" mark of the dial.

h. Remove the power from the airplane and install the instrument cluster in the instrument panel.

ADJUSTMENT OF THE FUEL PRESSURE INDICATOR

When a new fuel pressure indicator is installed in the engine instrument cluster, or when a new fuel pressure transducer is installed, it may be necessary to set the zero pressure reading to compensate for circuit component differences. This may be accomplished in the following suggested manner:

a. Hand hold the instrument cluster assembly and connect the harness connectors to the instrument cluster assembly. Be sure to connect the correct connector to the correct side of the cluster assembly. See Figure 1.

b. Turn the battery switch ON. (If the battery is not fully charged, an external power source should be used to provide a bus voltage of 14.0 ± .2 vdc (ME-1 thru ME-182) or a voltage of 28.0 ± .2 vdc (ME-183 and after).

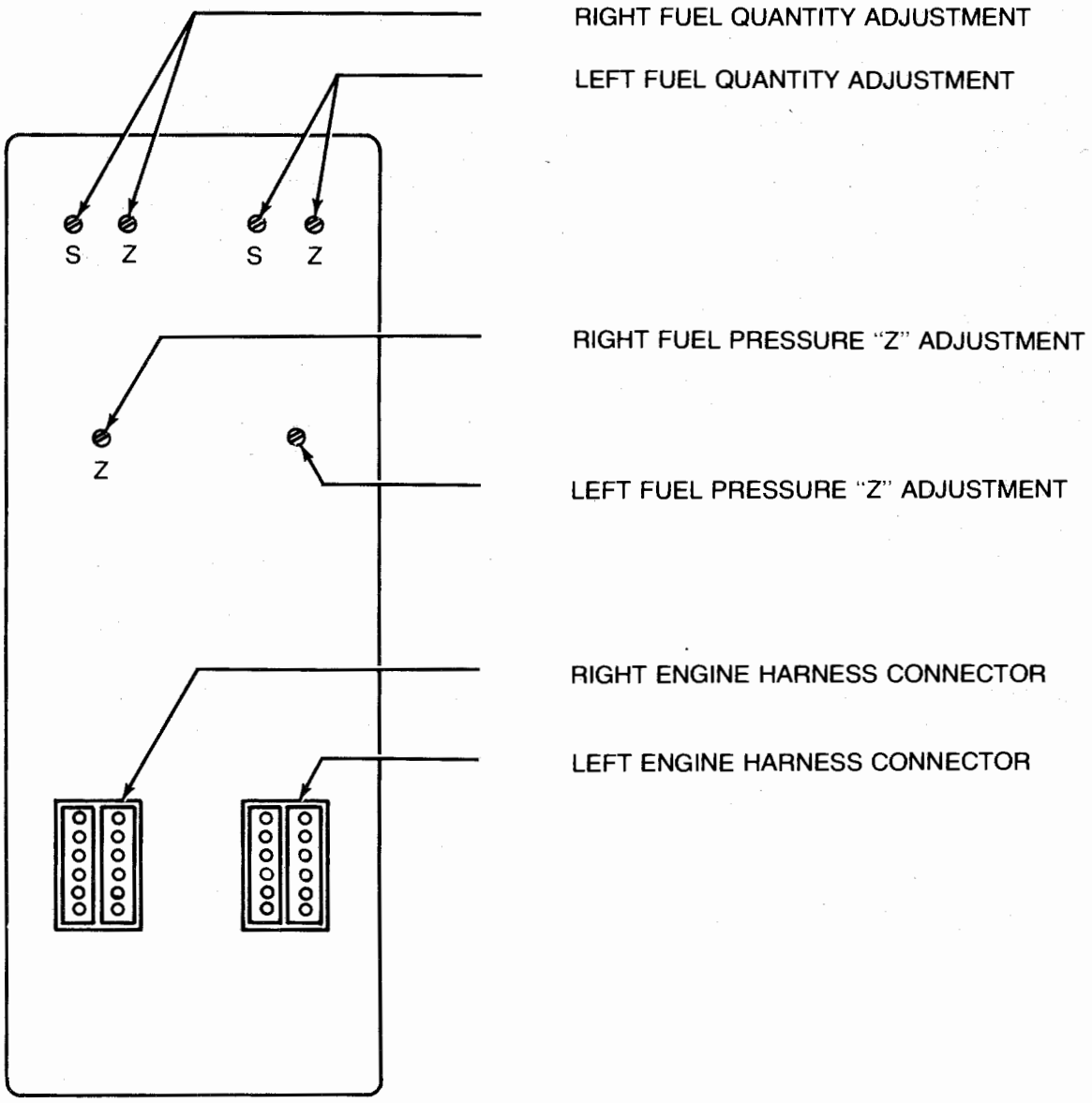
NOTE

This adjustment must be made without the engine operating or without the fuel boost pump turned on.

c. Use a screwdriver of appropriate size to turn the "Z" potentiometer, as required, to center the pointer of the fuel pressure indicator on the calibration dot on the dial. This calibration dot is located below the ".5" position of the dial.

d. Remove the power from the airplane.

e. Install the engine instrument cluster in the instrument panel.



Back of the Engine Instrument Cluster
Figure 1

"END"

CHAPTER 78

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
78-EFFECTIVITY/CONTENTS	1	Mar 15/82
78-00-00	1	Mar 15/82

CHAPTER 78 - MUFFLER

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GENERAL	78-00-00	
Maintenance Practices		1
Removal of Muffler Assembly		1
Installation of Muffler Assembly		1

"END"

GENERAL - MAINTENANCE PRACTICES

REMOVAL OF MUFFLER ASSEMBLY

a. Remove upper and lower cowlings.

b. Remove carburetor heat hose from muffler core assembly.

c. Loosen all spring attachment bolts located on ball joints to insure minimal tension on ball joints.

d. Remove engine exhaust mount nuts.

e. Lift out complete muffler assembly as a unit.

INSTALLATION OF MUFFLER ASSEMBLY

a. To insure minimal tension on ball joints, loosen all spring attachment bolts.

NOTE

Discard all used gaskets, replace with new.

b. Position exhaust flanges flush with engine exhaust gaskets, then finger tighten exhaust stud nuts.

c. Work core assembly to insure minimal stress on ball joints.

d. Tighten all ball joint spring attachment bolts until compressed to .51 + .00 - .03. If nut bottoms out on bolt, AN960C10 washers may be added under bolt head to obtain proper spring compression. Install cotter pins furnished with exhaust assembly.

e. Torque engine exhaust mount nuts to 160 to 180 inch-pounds.

"END"

CHAPTER 79

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
79-EFFECTIVITY/CONTENTS	1	Feb 16/79
79-00-00	1	Feb 16/79
	2	Nov 18/77
	3	Nov 18/77

CHAPTER 79 - OIL

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Description and Operation		1
Maintenance Practices		1
Oil System		1
Break-In Engine Oil		1
Oil Filter Removal		1
Oil Filter Installation		1
Oil Cooler Removal		1
Oil Cooler Installation		1
Recommended Oil Grades for Engines		1
Approved Engine Oils		2

"END"

GENERAL - DESCRIPTION AND OPERATION

The oil system operating temperatures are controlled by an automatic thermostat bypass control. The bypass control will limit oil flow through the cooler when operating temperatuares are below normal and will permit the oil to bypass the cooler, should it become clogged.

GENERAL - MAINTENANCE PRACTICES

OIL SYSTEM

CAUTION

Any time the oil system has been contaminated by metal, the oil cooler must be replaced and the system flushed to prevent engine damage.

Servicing the engine oil system primarily involves maintaining the oil at the proper level and changing the oil and filter at the recommended intervals. Under normal operating conditions, the recommended number of operating hours between oil changes is 100 hours. When operating under adverse weather conditions, the oil should be changed more frequently. The engines should be warmed up to operating temperature to assure complete draining of the oil. The engine oil drain plugs are secured with lock wire.

BREAK-IN ENGINE OIL

Engine oil used until oil consumption has stabilized, or up to but not to exceed the first 50 hours, must comply with MIL-L-6082C, straight mineral type (SAE No. 30). Example: Mobil Oil Aero White Band grade 1065. Oil added to maintain the proper oil level during this period must comply with MIL-L-6082C straight mineral oil of seasonal viscosity. After the oil consumption has stabilized or after the first 50 hours of operation, aviation grade ashless dispersant oil, complying with MIL-L-22851, is recommended.

OIL FILTER REMOVAL

The oil filter should be replaced every 50 hours of operation.

a. Remove the engine cowl to gain access to the engine oil filter.
b. Loosen the spin-off oil filter and remove the filter.
c. Check the oil filter for metal particles.

OIL FILTER INSTALLATION

a. Coat the spin-on oil filter seal with engine oil.
b. Position the new oil filter on the engine mounting.
c. Torque the spin-on oil filter 18-20 foot-pounds.
d. Secure the engine cowl.

OIL COOLER REMOVAL

a. Remove the engine cowl and place a suitable drip pan under the engine to catch oil spillage.
b. Identify the inlet and outlet lines near the oil cooler.
c. Remove the inlet and outlet hose assemblies from the oil cooler.
d. Remove the screws, washers, and nuts which secure the oil cooler to the air duct and support flanges and remove the oil cooler from the airplane.

OIL COOLER INSTALLATION

a. Position the oil cooler on the support flanges.
b. Install the screws, washers, and nuts at the lower forward support flange.
c. Install washers, and bolts to the nutplates at the lower aft support flange.
d. Install the air duct to the oil cooler with screws, washers, and nuts.
e. Connect the inlet and outlet hose assemblies to the oil cooler.
f. Fill the engine with the correct amount and type of oil as specified in this Chapter under the heading APPROVED ENGINE OILS.
g. Start the engine and run-up until operating oil pressure is obtained, then shut-down the engine.
h. Check for oil leaks where the inlet and outlet hoses are connected to the oil cooler.
i. If oil leaks are evident, repair and repeat steps f., g., and h.
j. If no leaks are found, reinstall the engine cowl.

RECOMMENDED OIL GRADES FOR ENGINES

AVERAGE AMBIENT AIR TEMPERATURE	MIL-L-6082C GRADES	MIL-L-22851 ASHLESS DISPERSANT GRADES
Above 60°F	SAE 50	SAE 40 or SAE 50
30°F to 90°F	SAE 40	SAE 40
0°F to 70°F	SAE 30	SAE 40 or SAE 20W30
Below 10°F	SAE 20	SAE 20W30

APPROVED ENGINE OILS

COMPANY	*BRAND IDENTIFICATION*
Delta Petroleum Company Incorporated	*Global Concentrate A
Enjay Chemical Company	*Paranox 160 and 165
Mobil Oil Corporation	RT-451, RM-173E, RM-180E
Shell Oil Company	*Shell Concentrate A Code 60068
	*Aeroshell W 120
	*Aeroshell W 80
Texaco Incorporated	*TX-6309 *Aircraft Engine Oil Premium AD120 *Aircraft Engine Oil Premium AD80
American Oil and Supply Company	*PQ Aviation Lubricant 753
Chevron Oil Company	*Chevron Aero Oil Grade 120
Humble Oil and Refining Company	*Esso Aviation Oil E-120 *Enco Aviation Oil E-120 *Esso Aviation Oil A-100 *Enco Aviation Oil A-100 *Esso Aviation Oil E-80 *Enco Aviation Oil E-80
Standard Oil Company of California	*Chevron Aero Oil Grade 120
Castrol Oils, Incorporated	**Castrolaero 113, Grade 1065 **Castrolaero 117, Grade 1100
Champlin Oil and Refining Company	**Grade 1065 **Grade 1100
Chevron Oil Company	**Chevron Aviation Oil 65 **Grade 1100
Continental Oil Company	**Conoco Aero Oil 1065 **Conoco Aero Oil 1100
Mobil Oil Corporation	**Avrex 101/1065 **Avrex 101/1100
Phillips Petroleum Company	**Phillips 66 Aviation Engine Oil, Grade 1065 **Phillips 66 Aviation Engine Oil Grade 1100

APPROVED ENGINE OILS (Cont'd)

COMPANY	*BRAND IDENTIFICATION*
Shell Oil Company	**AEROSHELL Oil 65 **AEROSHELL Oil 100

*Ashless Dispersant Oils

**Straight Mineral Oils

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the specifications in this publication. The brand names are listed for ready reference and are not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

"END"

CHAPTER 80

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
80-EFFECTIVITY/CONTENTS	1	Aug 10/79
80-10-00	1	Aug 10/79
	2	Aug 10/79

CHAPTER 80 - STARTING

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CRANKING	80-10-00	
Description and Operation		1
Troubleshooting		1
Maintenance Practices		2
Starter Lubrication		2
Starter Removal		2
Starter Installation		2
Starter Brushes		2

"END"

CRANKING - DESCRIPTION AND OPERATION

The airplane is equipped with two 12-volt starters (ME-1 thru ME-182) or two 24-volt starters (ME-183 and after) which engages with the accessory drive gear. The starters are located on the top forward end of each engine.

When the ignition switch is placed in the START position, current is supplied by the battery bus which energizes the applicable starter relay providing current to the starter.

NOTE

For proper airplane starting procedures, refer to the applicable Pilot's Operators Handbook.

TROUBLESHOOTING

STARTER SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Both starters inoperative.	a.	Circuit breaker tripped in starter switch circuit.	a.	Reset circuit breaker.
		b.	Starter relay inoperative.	b.	Check continuity of starter system.
		c.	Low battery.	c.	Test battery. If low, replace or start with external power.
		d.	Loose connections or open circuit between the battery and starter.	d.	Check connections and continuity. Isolate trouble and repair.
2.	One starter inoperative.	a.	Starter relay inoperative.	a.	Check for proper connections and continuity at the relay terminals. If circuit is complete and relay is still inoperative, replace relay.
		b.	Poor ground at starter.	b.	Test continuity from armature lead to ground. Repair if necessary.
		c.	Open circuit.	c.	Check continuity to starter.
		d.	Defective starting motor.	d.	Check brushes, springs for condition of commutator; replace if necessary.

CRANKING - MAINTENANCE PRACTICES

STARTER LUBRICATION

No lubrication is required on the starter motor except at the time of overhaul. Refer to Prestolite Technical Data Manual P/N OE-A1 for overhaul servicing.

CAUTION

Do not clean the starter in any degreasing tank or grease dissolving solvents.

STARTER REMOVAL

a. Gain access to the starter through the upper cowling.

b. Tag and disconnect the electrical wiring from the starter.

c. Remove the attaching hardware from the mounting bracket, and remove the starter.

STARTER INSTALLATION

CAUTION

Before installing a new starter, check the identification placard to ensure that the correct starter is being installed. For the 14-volt system (ME-1 thru ME-182) the P/N MZ4216 or LW10556 starter is to be installed on the right hand engine, while the P/N MZ4218 or LW14207 starter is to be installed on the left hand engine. For the 28-volt system (ME-183 and after) the P/N MHB4014 starter is to be installed on the right hand engine, while the P/N MHB4016 starter is to be installed on the left hand engine.

a. Place the starter in the mounting position.

b. Install the attaching hardware and torque the nuts to 110-150 inch-pounds.

c. Connect the electrical wiring to the starter and remove tags from the wiring.

d. Start the engine in accordance with the applicable Pilot's Operating Handbook and check starter for proper operation.

STARTER BRUSHES

The starter brushes must be replaced when they have worn down to a length of 1/4-inch or less. Proper brush spring tension is 32 to 40 ounces. Measure the brush spring tension with a spring scale hooked under the spring at the brush and the reading is taken when the spring leaves the brush.

"END"

CHAPTER 91

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
91-EFFECTIVITY/CONTENTS	1	Mar 15/82
91-00-00	1	Feb 16/79
	2	Nov 18/77
	3	Nov 18/77
	4	Nov 18/77
	5	Feb 16/79
	6	Mar 15/82
	7	Mar 15/82
	8	Feb 16/79

CHAPTER 91 - CHARTS & WIRING DIAGRAM

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Chart 2 - Flare Fitting Torque Chart		8
Chart 3 - Thread Lubricants		8

"END"

CHART 1
CONSUMABLE MATERIALS

Only the basic number of each Military Specification is included in the Consumable Materials Chart. No attempt has been made to update the basic number with the letter suffix that designates the current issues of the various specifications.

Vendors listed as meeting Federal and Military Specifications are provided as reference only and are not specifically recommended by Beech Aircraft Corporation. Any product conforming to the specification may be used.

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
1.	Fuel, Engine	Aviation Gasoline, grade 100 (green) or 100 LL (blue)		
2.	Oil, Engine	MIL-L-22851	*Global Concentrate A	Delta Petroleum Company., Inc., P.O. Box 10397 Jefferson, La. 70181
			*Paranox 160 and 165	Enjay Chemical Company P.O. Box 2180, Houston, Texas 77001
			*RT-451, RM-173E, RM-180E	Mobil Oil Corporation, Shoreham Building, Washington, D.C. 20005
			*Shell Concentrate A - Code 60068	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
			*Aeroshell W120	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
			*TX-6309	Texaco Incorporated, 135 East 42nd St., New York, N.Y. 10017
			*Aircraft Engine Oil Premium AD120	Texaco Incorporated, 135 East 42nd St., New York, N.Y. 10017
			*Aircraft Engine Oil Premium AD80	Texaco Incorporated, 135 East 42nd St., New York, N.Y. 10017
			*PQ Aviation Lubricant 753	American Oil and Supply Company, 239 Wilson Ave., Newark, N.J. 07105
			*Chevron Aero Oil Grade 120	Chevron Oil Company 225 Bush Street, San Francisco, Calif. 94104

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
2.	Oil, Engine (Cont'd)	MIL-L-22851	*Esso Aviation Oil W-120	Humble Oil and Refining Company, P. O. Box 2180, Houston, Texas 77001
			*Enco Aviation Oil E-120	Humble Oil and Refining Company, P.O. Box 2180, Houston, Texas 77001
			*Esso Aviation Oil A-100	Humble Oil and Refining Company, P.O. Box 2180 Houston, Texas 77001
			*Enco Aviation Oil A-100	Humble Oil and Refining Company, P.O. Box 2180, Houston, Texas 77001
			*Esso Aviation Oil E-80	Humble Oil and Refining Company, P.O. Box 2180, Houston, Texas 77001
			*Enco Aviation Oil E-80	Humble Oil and Refining Company, P.O. Box 2180, Houston, Texas 77001
			*Chevron Aero Oil Grade 120	Standard Oil Company of California, 225 Bush Street, San Francisco, California 94104
		MIL-L-6082C	**Castrolaero 113, Grade 1065	Castrol Oil Canada Ltd., P.O. Box 3, New Toronto Postal Station Toronto, Ontario
			**Castrolaero 117, Grade 1100	Castrol Oil Canada Ltd., P.O. Box 3, New Toronto Postal Station Toronto, Ontario
			**Grade 1065	Champlin Oil and Refining Company, P.O. Box 552, Enid, Oklahoma 73701
			**Grade 1100	Champlin Oil and Refining Company, P.O. Box 552, Enid, Oklahoma 73701
			**Chevron Aviation Oil 65	Chevron Oil Company, 225 Bush Street, San Francisco, Calif. 94104

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
2.	Oil, Engine (Cont'd)	MIL-L-6082C	**Grade 1100	Chevron Oil Company 225 Bush Street, San Francisco, Calif. 94104
			**Conoco Aero Oil 1065	Continental Oil Company, Ponca City, Oklahoma
			**Conoco Aero Oil 1100	Continental Oil Company, Ponca City, Oklahoma
			**Avrex 101/1065	Mobil Oil Corporation, Shoreham Building, Washington, D.C. 20005
			**Avrex 101/1100	Mobil Oil Corporation, Shoreham Building, Washington, D.C. 20005
			**Phillips 66 Aviation Engine Oil, Grade 1065	Phillips Petroleum Co., Bartlesville, Oklahoma 74003
			**Phillips 66 Aviation Engine Oil, Grade 1100	Phillips Petroleum Co., Bartlesville, Oklahoma 74003
			**Aeroshell Oil 65	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
			**Aeroshell Oil 100	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
3.	Toluol (Toluene)	TT-T-548		
4.	Sealer		EC-1792	Minnesota Mining and Manufacturing Co., 3M Center, St. Paul, Minnesota 55101
5.	Sealer		EP711B 1/2	Coast Pro-Seal and Manufacturing Co., 1507 Grande Vista Ave., Los Angeles, California
6.	Resin	MIL-R-7575	Laminac 4116	American Cyanamid Co., Wallingford, Connecticut

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
7.	Solvent	PD-680	Stoddard Solvents (Mineral Spirits)	
8.	Corrosion Preventive Compound	MIL-C-6529	Anti-Corrode No. 205	Cities Service Oil Co., 60 Wall Tower, New York, N.Y.
			Rust-Foil No. 652-2	Franklin Oil and Gas Co., Bedford, Ohio
			Kendex No. 7038	Kendall Refining Company, 1177 Kendall Ave., Bradford, Pennsylvania 16701
9.	Preservative Oil	MIL-L-46002, Grade 1	Nucle Oil 105	Daubert Chemical Co., 4700 S. Central Avenue, Chicago, Illinois 60638
			Protect VA	Pennsylvania Refining Co., Butler, Pennsylvania
			Ferro-Gard 1009-G	Ranco Laboratories Inc., 3617 Brownsville Road, Pittsburgh, Pennsylvania
10.	Corrosion Preventive Compound	MIL-C-16173	Braycote 103	Bray Oil Company, 1925 Marianna St., Los Angeles, California 90032
11.	Grease	MIL-G-10924	Shell A and A Grease	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
			Code 5542-C	Southwest Grease & Oil Co., 220 W. Waterman St., Wichita, Kansas 67202
			PED-3355	Standard Oil Company of California, 225 Bush Street, San Francisco, California 94104
12.	Zinc Chromate Primer	MIL-P-8585		
13.	Preservative Hydraulic Fluid	MIL-H-6083	Avrex 904	Mobil Oil Corporation 150 E. 42nd St., New York, N.Y. 10017

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	SPECIFICATION	PRODUCT	VENDOR
14.	Wash Primer		EX2016G	Ameron Industrial Coatings Division P.O. Box 2153 Wichita, Kansas 67201
15.	Naphtha	TT-N-548		
16.	Paint Stripper		Turco 4260	Turco Products Inc., 26400 S. Main, Los Angeles, California 90646
17.	Lubricating Grease (Aircraft & Instrument, High and Low Temperature)	MIL-G-23827	Supermil Grease No. A72832	American Oil Company, 910 S. Michigan Ave., Chicago, Illinois
			Royco 27A	Royal Lubricants Co., River Road, P.O. Box 95, Hanover, N.J. 07936
			Aeroshell Grease 7	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
18.	Sealer		EC1293	Minnesota Mining and Manufacturing Co., 3M Center, St. Paul, Minnesota 55101
19.	Sealer		White Streak	Plastics Division, Dynatron Corporation, Atlanta, Georgia
20.	Sealer		PR1220 Part A & B	REN Plastics Inc., 5656 South Cedar St., Lansing, Michigan
21.	Bubble Fluid		Turco Car Shampoo	Turco Products Inc., 26400 S. Main, Los Angeles, California 90646
22.	Sealer		890 Pro-Seal	Coast Pro-Seal and Manufacturing Co., 1507 Grande Vista Ave., Los Angeles, California
23.	Methyl Ethyl Ketone	TT-M-261		
24.	Acid Etching Primer	MIL-C-8514		

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
25.	Vinyl Thinner		T607 Vinyl Primer	Ameron Industrial Coatings Division P.O. Box 2153 Wichita, Kansas 67201
26	Urethane Primer		AA92	Sherwin-Williams, 101 Prospect Ave., Cleveland, Ohio 44127
27.	Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Co., 3344 Medford Street, Los Angeles, California 90063
			PED 3565	Standard Oil of California, 225 Bush Street, San Francisco, California 94104
28.	Oil		Aeroshell 7A	Shell Oil Company, 50 West 50th St., New York, N.Y. 10020
29.	Thread Locking Compound		Loctite BRG Mount No. 601	Loctite Corporation, 705 N. Mountain Road, Newington, Connecticut 06111
30.	Grease		CD2	Alemite Division, Stewart Warner Corp., 1856 Diversey Pkwy., Chicago, Ill. 60614
31.	Trichloroethane	MIL-T-81533		Vulcan Materials Co., Chemicals Division, 6200 S. Ridge Road, Wichita, Kansas 67231
32.	Grease (Hi-Temp)	MIL-G-81322	Mobilgrease 28	Mobil Oil Corporation, Shoreham Building, Washington, D.C. 20005
33.	Lubricant, Powdered Graphite	**MIL-G-6711 (Superseded by MIL-M-7866, Item 40)**		GP-38 National Carbon Co., New York, N.Y.
34.	Lubricant, Krylon Heavy Duty		Silicon Spray No. 1325, No. 1329 or equivalent	Borden Inc., Chemical Division/Krylon Dept., Ford & Washington Box 390 Norriston, Pa. 19404

CHART 1
CONSUMABLE MATERIALS (Cont'd)

	MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
35.	Lubricant, Felt		10-86527	Bendix Electrical Components Division, Sidney, New York
36.	Corrosion Preventive Compound	MIL-M-3171	Dow No. 19	Dow Chemical Corp. S. Saginaw Rd. Midland, Mich. 48640
37.	Degreasing Primer		EC 3911	Minnesota Mining & Mfg. Co., 900 Bush Avenue St. Paul, Minnesota
38.	Positioning Fabric		AF 3306	Minnesota Mining & Mfg. Co., 900 Bush Avenue St. Paul, Minnesota
39.	Metal Adhesive		EA 9309	Hysol Division, Dexter Corp. Division Headquarters & Main Plant Olean, New York 14760
40.	Molybdenum Disulfide Powder	MIL-M-7866	Molykote Z	Haskel Engineering and Supply Co., 100 E. Graham Place Burbank, CA 91502

* Ashless Dispersant Oils
** Straight Mineral Oils

CHART 2
FLARE FITTING TORQUE CHART

TORQUE – INCH-POUND

TUBING OD INCHES	ALUMINUM - ALLOY TUBING FLARE AND10061 or AND10078		STEEL TUBING FLARE AND10061		HOSE END FITTING AND HOSE ASSEMBLIES	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8	---	---	---	---	---	---
3/16	---	---	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	700	1150
1-1/4	600	900	---	---	---	---
1-1/2	600	900	---	---	---	---
1-3/4	---	---	---	---	---	---
2	---	---	---	---	---	---

INSTALLATION OF FLARED FITTINGS

When installing flare fittings, make sure they are properly lubricated in accordance with Chart 3, 91-00-00. Torque the fittings in accordance with Chart 2 above. Do not overtorque.

CHART 3
THREAD LUBRICANTS

The vendor product appearing in this chart has been selected at random to help field personnel determine products conforming to the specifications listed in this publication. The brand name is listed for ready reference and is not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

SYSTEM	*MATERIAL*	*SPECIFICATION*	*VENDOR PRODUCT*
Fuel	Petrolatum	VV-P-236	

"END"