Raytheon Aircraft

BEECH BARON®

Pressurized

58P & 58PA

(TJ-3 and After)

Turbocharged

58TC & 58TCA

(TK-1 and After)

Maintenance Manual

NOTE: This manual was formerly called the Beechcraft Baron 58P & 58PA/Baron 58TC & 58TCA Maintenance Manual.

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NOTE

Where Beech Aircraft Corporation is referred to in this publication, it will be taken to read Raytheon Aircraft Company.

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Member of GAMA

General Aviation Manufacturers Association

Raytheon Aircraft

BEECH BARON 58P AND 58TC MAINTENANCE MANUAL

Record of Revisions

Rev. No.	Date Inserted	By	Rev. No.	Date Inserted	By	Rev. No.	Date Inserted	By
A23	11/17/97	ATP/KS						
A24	1/9/02	ATP/ RCL						
A25	8/21/02	ATP VDR						

When a revision is inserted, the revision number, the date the revision is inserted into the manual, and the initials of the person(s) inserting the revision should be recorded on this page.

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BEECH BARON 58P AND 58TC MAINTENANCE MANUAL

LIST OF EFFECTIVE REVISIONS

Always destroy superseded pages when you insert revised pages.

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"Logo" Page ....

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102-590000-5	April 1, 1975	Original
102-590000-5A1	October 3, 1975	Introduction, 7, 12, 20, 21, 24, 27, 28, 32, 33, 36, 39, 52, 53, 57, 61, 71, 77, 91
102-590000-5A2	January 9, 1976	Introduction, 5, 6, 12, 20, 21, 24, 27, 28, 30, 32, 33, 34, 35, 36, 39, 51, 52, 53, 55, 56, 57, 71, 74, 80, 81, 91, Insp
102-590000-5A3	September 24, 1976	25
102-590000-5A4	November 30, 1976	Introduction, 5, 6, 10, 12, 21, 24, 27, 28, 32, 33, 34, 36, 52, 54, 61, 91
102-590000-5A5	November 11, 1977	5, 27
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102-590000-5A7	November 30, 1978	Introduction, 5, 7, 11, 12, 20, 21, 22, 24, 25, 27, 28, 32, 33, 35, 36, 51, 61, 71, 74, 77, 91
102-590000-5A8	March 23, 1979	Introduction, 21, 28, 61, 71, 81
102-590000-5A9	May 25, 1979	28, 61

NOTE: A List of Effective pages will be in the front of each chapter.

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 issues. For example, B for the first reissue, C for the second, 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.

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Always destroy superseded pages when you insert revised pages.

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102-590000-5A10	October 26, 1979	Introduction, 5, 11, 12, 20, 27, 35
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LOG OF TEMPORARY REVISIONS

Revision No.	Revision Date	Subject	Revision Incorporated
5-1	Oct 31/97	Revised landing gear and actuator overhaul and replacement schedule in Chapter 5-10-00.	A24
27-2	Nov 15/93	Revised FLAP DRIVE CABLE CONNECTION in Chapter 27-50-00.	A24
32-1	Jul 16/99	Add LANDING GEAR WARNING TEST to Chapter 32-60-00.	A24

NOTE: Insert this Log of Temporary Revisions after the Record of Revisions page. Previous Log of Temporary Revisions may be discarded.

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BEECH BARON 58P AND 58TC MAINTENANCE MANUAL

P/N 102-590000-5A, REVISION A25, JUNE 28/02

HIGHLIGHTS

The chapters which have been revised are listed below with the Highlights of each change. Remove the affected pages and insert the A25 revision in accordance with the attached Instruction Page. Enter the revision number and the date inserted on the Record of Revisions page of this manual. The Highlight Page may be retained with the manual for future reference.

Chapter/Section	Description of Change
Introduction	Added new chapter 5-50-00 to Index Guide. Added additional data and revised supplier publications data.
5-10-00	Propeller overhaul data now refers to supplier data. Added data on engine baffle seals and instrument air manifold check valve,
5-20-00	Changed FAA references to Title 14 Code of Federal Regulations (14 CFR) references. Added requirement to check instrument air. Added requirement to check cylinder baffles and seals. Added reference to Service Instruction during fuel cell inspection. Added Flapper Valve Inspection. Added reference to Service Bulletin for window inspection. Added inspection of control column U-joint roll pins. Added inspection of nose and main gear torque knees. Lightning strike inspection moved to new Chapter 5-50-00.
5-50-00	Added new chapter for Unscheduled Maintenace Inspections.

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REVISION 102-590000-5A25
to the
BEECH BARON 58P AND 58TC MAINTENANCE MANUAL
P/N 102-590000-5 (ISSUED: APRIL 1, 1975)

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NOTE - These instruction pages may be discarded after the above revision has been properly incorporated into the Maintenance Manual.

INTRODUCTION

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INTRODUCTION

NOTE

Neither reissues nor revisions are automatically provided to the holder of this manual. For information on how to obtain reissues or revisions applicable to this manual, refer to the latest revision of the Raytheon Aircraft Company Service Bulletin No. 2001.

The Beech Baron 58P/Baron 58TC 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. This maintenance manual is supplemented by the following publications:

NOTE

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

- The Beech Baron 58P/Baron 58TC Wiring Diagram Manual P/N 102-590000-23
- The Beech Baron 58TC Wiring Diagram Manual P/N 106-590000-13 or 106-590000-23
- The Beech Baron 58P Wiring Diagram Manual P/N 102-590000-59
- The Beech Baron 58P and Baron 58TC Beech Manufactured Components Maintenance Manual P/N 102-590000-21
- The Beech Baron 58P and Baron 58TC Parts Catalog P/N 102-590000-7

NOTE

This manual provides maintenance coverage for the Baron 58P (airplane serials TJ-3 and After) and the Baron 58TC (airplane serials TK-1 and After). Subjects which refer to only the Baron 58P or Baron 58TC airplanes will be designated by the airplane serials. Subjects which refer to both the Baron 58P and Baron 58TC airplanes will not be serialized.

NOTE

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

WARNING

Use only parts obtained from sources approved by Raytheon Aircraft Company, in connection with the maintenance and repair of Raytheon Aircraft Company airplanes.

Genuine Raytheon Aircraft Company parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in Raytheon Aircraft Company air-

plane applications. Parts purchased from sources other than those approved by Raytheon Aircraft Company, 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 sources not approved by the Raytheon Aircraft Company 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 the Raytheon Aircraft Company, unsuitable and unsafe for airplane use.

Raytheon Aircraft Company expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of parts not approved by the Raytheon Aircraft Company.

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. Refer to Chapter 11 for placard location.

ASSIGNMENT OF SUBJECT MATERIAL

The content of this publication is organized into four levels. The four levels are:

GROUP -

Identified by different colored divider tabs. These are the 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 the standardized numbering system. Thus, the element "28" of the number 28-40-01 refers to the chapter "FUEL". Everything concerning the fuel system will be covered in this chapter.

SUBSYSTEM/SECTION -

The major systems/chapters of an airplane are broken down into sub-systems. These subsystems are identified by the second element of the standard numbering system. The element "40" of the number 28-40-01 concerns itself with the indicating section of the fuel system.

UNIT/SUBJECT - The individual units within a subsystem/section may be identified by the third element of the standard numbering system. The element "01" of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and may or may not be used.

APPLICATION

Any publication conforming to the GAMA or ATA format will use the same basic numbering system. Thus, whether the manual is Beech Baron 58P/Baron 58TC Maintenance Manual, a Beech King Air 90 Overhaul Manual, or a Wiring Diagram Manual for a Beech Baron 58P/Baron 58TC, the person wishing information concerning the indication 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 subsystems covered in this chapter. For example, the fuel system chapter with a full index would contain:

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.)

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.

TITLE PAGE

A Title page is located at the beginning of each volume and provides the part number of the manual, the chapters contained in each volume and lists all aircraft models pertaining to this manual and their respective serial numbers. Information throughout this manual is applicable to all serial numbers listed on the title page except where specifically stated.

LIST OF EFFECTIVE REVISIONS

The List of Effective Revisions ("A") page following the title page of the manual lists the revisions currently effective for the manual.

RECORD OF REVISIONS PAGE

A Record of Revisions page is provided following the List of Effective Revisions ("A") page. When a revision is inserted, the revision number, the date the revision is inserted into the manual, and the initials of the person(s) inserting the revision should be recorded on this page.

LOG OF TEMPORARY REVISIONS PAGE

A Log of Temporary Revisions page is provided following the Record of Revisions page. The Log of Temporary Revisions page provides a history of each temporary revision, including the revision number which incorporated the temporary revision into the manual.

RECORD OF TEMPORARY REVISIONS PAGE

A Record of Temporary Revisions page is provided following the Record of Revisions Page. When a temporary revision is inserted or removed from this manual, the appropriate information should be recorded on this page.

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.

TEMPORARY REVISIONS

Temporary revisions are issued to provide maintenance information in the interim between revisions. Each temporary revision is issued by the chapter number to which it applies followed by a sequential number in the order of publication (Temporary Revisions 12-1, 12-2, etc.). Temporary revisions are printed on yellow paper and are to be placed in the maintenance manual in accordance with the instructions provided on each page included in the revision. The information in the temporary revision will be included in the next revision of the manual.

REVISED TEXT

That portion of text which has been revised by the addition of, or a change in, information is denoted by a solid revision bar adjacent to the textual column as shown in the margin of this paragraph. Each page may or may not have revision bars. The revision number and date printed on the bottom of each page indicates when and by what revision the text on that page was changed. Each page will ONLY show revision bars for text changed by the current revision. There will not be a revision bar if text was deleted from the page.

REVISED ILLUSTRATIONS

Revised art may be identified by a revision bar printed on the side of the page for major changes or by the following pointing hand symbol for minor changes.

☞

WARNINGS, CAUTIONS AND NOTES

- WARNING - Brings attention to an operating procedure, inspection, repair or maintenance practices, which if not correctly followed, could result in personal injury or loss of life.
- CAUTION - Brings attention to an operating procedure, inspection, repair or maintenance condition, which if not strictly observed, could result in damage or destruction of equipment.
- NOTE - Brings attention to an operating procedure, inspection, repair or maintenance condition, which is essential to highlight.

SCHEMATIC DIAGRAMS

Schematic diagrams are illustrated with the following conditions:

- Airplane is on the ground.
- All doors are closed and locked.
- Electrical power is not applied to the airplane.

A note will be shown on the schematic diagram if the above conditions are not present. An example would be: NOTE - Airplane shown with power applied and entrance door open.

Contacts on connectors that are identified with lower case letters will be shown by an underlined letter or a letter with an asterisk (A*).

SUPPLEMENTARY PUBLICATIONS

Additional publications are listed in the current Publications Price List CD Rom (P/N 994-32808). For information on these publications contact the Technical Manual Distribution Center (TMDC) at 1-800-796-2665, fax (316) 676-4824 or E-mail TMDC@Raytheon.com.

Since a wide variety of avionic components and equipment is available and because avionics manufacturers normally supply parts and servicing manuals with each set/component, the avionic publications are not included in the Publications Price List. The manufacturer of the equipment should be contacted when additional parts or servicing information is required.

Following is a list of publications providing servicing and maintenance information on components of the Baron 58P/ Baron 58TC.

SUPPLIER PUBLICATIONS

ENGINE

NOTE

The following engine manuals are not available through Raytheon Aircraft Company. Please order all publications for the engine from Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

Overhaul Manual Form X-30042 Continental TSIO-520 Series Aircraft Engines, Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

Parts Catalog Form X-30043A, Continental TSIO-520 Series Aircraft Engines, Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

Operator's Handbook Form X-30505, Continental TSIO-520L Aircraft Engines, Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

Tips On Engine Care, Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

ALTERNATORS

Overhaul Manual Form X30531 Continental-Crittenden 100 Ampere Alternator, Teledyne Continental Motors, Aircraft Products, Mobile, Alabama.

PROPELLER

Overhaul Instructions 117D for Hartzell Propellers, Hartzell Propeller, Inc., Piqua, Ohio.

Owner's Manual 115F for Hartzell Propellers, Hartzell Propeller, Inc., Piqua, Ohio.

Maintenance Handbook for Constant Speed Hydraulic Propeller Governor Type CSSA, Number 33092, Woodward Governor Company, Rockford, Illinois.

Test Specifications for Small Airplane Governors and Accumulators, Number TSP-197, Woodward Governor Company, Rockford, Illinois.

Spinner Assembly Maintenance Instruction Guide, Dated June, 1974, Hartzell Propeller, Inc, Piqua, Ohio.

Propeller Synchronizer for Light Twin Engine Aircraft, Number 33117, Woodward Governor Company, Rockford, Illinois.

Woodward Type 11 Engine Synchrophaser Installation Manual Bulletin 33171, Woodward Governor Company, Rockford, Illinois.

FUEL INJECTION

Operation and Service Manual for RSA-7DA1 Fuel Injection System, Form 15-596, Bendix Corporation, South Bend, Indiana.

MAGNETOS

Overhaul Instructions for Bendix S-1200 Series Magnetos Form L-609X, Scintilla Division, Bendix Aviation Corporation, Sidney, New York.

Service Parts List for Bendix S-1200 Magnetos, Form L608, Scintilla Division, Bendix Aviation Corporation, Sidney, New York.

AIR CONDITIONER COMPRESSOR

Service Manual, I.D. 160717, Abacus Air Conditioning Compressor Models 506-508, Abacus International, Dallas, Texas.

Service Manual, I.D. SD-5, Sankyo Air Conditioning Compressor Models SD-505 thru SD-510, Sankyo International Inc., Dallas, Texas.

FUEL CELLS

Uniroyal Handbook, Recommended Handling and Storage Procedures for Bladder Type Fuel and Oil Cells, P/N FC1473-73, Uniroyal Inc., Mishawaka, Indiana.

Goodyear Manual, Fuel Cell Repair, P/N AP 368, Goodyear Aerospace Corporation, Engineered Fabrics Division, Rockmart, Georgia 30153.

AUTOPILOT

Automatic Flight Systems AK424 and AK424/FD, FAA Approved Bulletin No. 547, Edo-Aire Mitchell, Mineral Wells, Texas.

PROPELLER DEICING

Installation Manual, Electrothermal Propeller Deicing System, Report No. 70-04-700C, B. F. Goodrich Company, Akron, Ohio.

Installation Manual, Electrically Heated Propeller Deicers, Report No 59-728J, B. F. Goodrich Company, Akron,Ohio.

Maintenance Manual, Electrothermal Propeller Deicing Systems, Report No. 68-04-712C, B. F. Goodrich Company, Akron, Ohio.

Overhaul Manual, Brush Block Assemblies for Electrothermal Propeller Deicing Systems, Report No 68-04-714I, B. F. Goodrich Company, Akron, Ohio.

PRESSURIZATION (TJ-3 AND AFTER)

Operation and Maintenance Instructions, Report No. 4-267, AiResearch Manufacturing Division, Los Angeles, California.

HEATER (TJ-3 AND AFTER)

Maintenance Manual for the 87D24-2 Igniter Assembly, Manual No. 93D00-1, Janitrol Division of Midland-Ross Corporation, Columbus, Ohio.

Operation and Maintenance Instructions, Report No. 4-267, Dated: Dec 15, 1975, AiResearch Manufacturing Division, Los Angeles, California.

Maintenance Manual for 82D20 and 07E02-1 Heater Assembly, Manual No. 94D84-1, Janitrol Division of Midland-Ross Corporation, Columbus, Ohio.

Maintenance Manual for the C241-500BD Blower, Dynamic Air Engineering, Santa Ana, California.

Maintenance Manual for the EM605-1 Centrifugal Blower, Electro Mech, Inc, Wichita, Kansas.

HEATER (TK- 1 AND AFTER)

Maintenance Manual for the 82D18 Combustion Air Blower, Manual No. 94D85-1, Janitrol Division of Midland-Ross Corporation, Columbus, Ohio.

EMERGENCY LOCATOR TRANSMITTER

Operating Instructions for Model CIR-10( ) Emergency Locator Transmitter System, Transmitter P/N TR7O-17, Collins/Communications Components Corporation, Costa Mesa, California.

Operating Instructions for Model CIR-11( ) Emergency Locator Transmitter System, Transmitter P/N TR7O-13, Collins/Communications Components Corporation, Costa Mesa, California.

Owners Manual, Installation and Pilot's Guide P/N 03716-0602 for the Narco ELT 10 Emergency Locator Transmitter, Narco Avionics, Division of Narco Scientific Industries, Fort Washington, Pennsylvania.

SUPPLEMENTARY BEECH PUBLICATIONS

98-34998 Maintenance Instructions for Goodrich Wheel, Brake and Tire Assembly.

98-35061 Servicing and Maintenance Instructions for the Nose Wheel Assembly.

98-35798A Maintenance Information and Illustrated Parts Breakdown for Landing Gear Motor Part No. 96-380022.

32-31-24 Component Maintenance Manual with Illustrated Parts List for Landing Gear Motor Part No. 96-380022-5.

98-37515D Safety Information Booklet

SYSTEM/CHAPTER INDEX GUIDE

The following System/Chapter, Subsystem/Section Index Guide is prepared in accordance with both GAMA Specification No. 2 and ATA Specification No. 100 for use with maintenance manuals, parts catalogs and wiring diagram manuals. The following chapters are not applicable to this maintenance manual: 23, 26, 29, 31, 37, 38, 49, 60, 70, 75, 76, 78 and 83.

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05

TIME LIMITS/
MAINTENANCE
CHECKS

CHAPTER 5 - TIME LIMITS/MAINTENANCE CHECKS

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	202	Jun 28/02
	203	Jun 28/02
	204	Jun 28/02
	205	Jun 28/02
	206	Jun 28/02
5-20-00	201	Jun 28/02
	202	Jun 28/02
	203	Jun 28/02
	204	Jun 28/02
	205	Jun 28/02
	206	Jun 28/02
	207	Jun 28/02
	208	Jun 28/02
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	211	Jun 28/02
	212	Jun 28/02
	213	Jun 28/02
	214	Jun 28/02
	215	Jun 28/02
	216	Jun 28/02
	217	Jun 28/02
	218	Jun 28/02
5-50-00	201	Jun 28/02
	202	Jun 28/02
	203	Jun 28/02
	204	Jun 28/02

LIST OF PAGE EFFECTIVITY (CONTINUED)

CHAPTER-SECTION-SUBJECT	PAGE	DATE
	205	Jun 28/02
	206	Jun 28/02
	207	Jun 28/02
	208	Jun 28/02
	209	Jun 28/02
	210	Jun 28/02
	211	Jun 28/02

OVERHAUL AND REPLACEMENT

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 criterion for determining subsequent periods applicable to the individual airplane or fleet operation, provided 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.

NOTE

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

SPECIAL CONDITIONS CAUTIONARY NOTICE

WARNING

Prior to performing maintenance on an engine or the airframe, ALWAYS pull the starter control circuit breakers and the Landing Gear circuit breaker. This will kill power to the starter control and Landing Gear Control relay.

Airplanes operated for Air Taxi, or other than normal operations, 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 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.

An engine cycle is defined as the period of time from the initial start to shutdown of the engine. This encompasses start-up, increase to full or partial power (as required during a flight regime) and back to complete engine shutdown. Normal operation results in the number of landings being equivalent to engine cycles.

OVERHAUL AND REPLACEMENT SCHEDULE

NOTE

All items not listed are to be overhauled or replaced "On Condition". "On Condition" items are to be overhauled or replaced if inspection reveals a potentially unsafe or unserviceable condition, if they are worn, inoperative, inaccurate, intermittent and not repairable through normal maintenance. Primarily items that are calender, cycle or hour limited are included in the following list.

CHART 1
OVERHAUL AND REPLACEMENT SCHEDULE

ITEM	OVERHAUL OR REPLACE
LANDING GEAR	
Main Gear	On Condition (Leaking or collapsed struts that cannot be corrected by seal replacement will constitute the "On Condition" requirement. Any pitting, corrosion, cracking, distortion or visible wear noted during the replacement will also constitute the requirement for an overhaul.)
Nose Gear	On Condition (Leaking or collapsed struts that cannot be corrected by seal replacement will constitute the "On Condition" requirement. Any pitting, corrosion, cracking, distortion or visible wear noted during the replacement will also constitute the requirement for an overhaul.)
Actuator Assembly	Gray and green colored actuators every 2,000 hours.
	White colored actuators every 4,000 hours.
Retract Motor	Every 2,000 hours
Retract Motor Brushes	Every 500 hours or On Condition
Shimmy Damper	On Condition
Wheels and Tires	On Condition
Brake Assembly	On Condition
Brake Lining	On Condition
Master Cylinder	On Condition
Shuttle Valve Assembly	On Condition
Parking Brake Valve	On Condition
All Hoses	On Condition

CHART 1
OVERHAUL AND REPLACEMENT SCHEDULE (CONTINUED)

ITEM	OVERHAUL OR REPLACE
POWER PLANT	

NOTE

A TBO (time between overhaul) recommendation is 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
Engine driven fuel pump	At engine overhaul
Engine (TSIO-520-L or TSIO-520-LB)	Every 1,400 hours
Engine (TSIO-520-WB)	Every 1,600 hours
Engine Controls	On Condition
Engine vibration isolator mounts	On Condition
Exhaust system	On Condition
Oil cooler	On Condition (Replace when contaminated.)
Propeller (Hartzell)	Refer to the latest revision of Hartzell Service Letter 61 for TBO.
Propeller (McCauley)	Refer to the latest revision of McCauley Service Bulletin 137 for TBO.
Propeller controls	On Condition
Propeller governor	At engine overhaul or On Condition
Air intake filter	Every 500 hours or one year, whichever occurs first.
Dry air pressure pump	Refer to Airborne Replacement Schedule SI 300-16.
Turbocharger & Wastegate	At engine overhaul or On Condition
All Hoses	Hoses carrying flammable liquids (at engine overhaul or 5 years from date of delivery, whichever occurs first). All other hoses - On Condition.
Engine baffle seals	On condition or every 10 years.
FUEL SYSTEM	
Fuel cells	On Condition
Nacelle fuel quantity transmitter	On Condition
Fuel cell drain valve	On Condition
Fuel system check valves	On Condition
Fuel selector valve	Inspect every 100 hours. Overhaul at engine overhaul.

CHART 1
OVERHAUL AND REPLACEMENT SCHEDULE (CONTINUED)

ITEM	OVERHAUL OR REPLACE
FUEL SYSTEM (Continued)	
Fuel boost pump	On Condition
Float valve	On Condition
Hose carrying flammable liquid	Replace when condition warrants, not to exceed engine overhaul or 5 years from date of delivery, whichever occurs first.
All other hoses	On Condition
INSTRUMENTS	
Turn and bank indicator	On Condition
Altimeter	Every 24 months per FAA directive
Directional gyro	On Condition
Gyro horizon	On Condition
Dry air pressure gage	On Condition
Cabin altitude controller	On Condition
Manifold pressure gage	On Condition
Airspeed indicator	On Condition
Cabin climb gage	On Condition
Cabin altitude and pressure differential indicator	On Condition
Rate-of-climb indicator	On Condition
Fuel flow gage	On Condition
Tachometer	On Condition
Flap position indicator	On Condition
Free air temperature indicator	On Condition
Air pump inline filter	Every 300 hours and/or when the pressure pump is replaced.
Air pump inlet filter	Annually or every 300 hours.
Hoses	On Condition
Turbine inlet temperature gage	On Condition
Instrument Air Manifold Check Valve	On condition or after 10 years, whichever occurs first.

CHART 1
OVERHAUL AND REPLACEMENT SCHEDULE (CONTINUED)

ITEM	OVERHAUL OR REPLACE
ELECTRICAL SYSTEM	
Landing gear dynamic brake relay	On Condition
Battery master relay	On Condition
Paralleling relay	On Condition
All other relays	On Condition
Voltage regulators	On Condition
Heater vibrators	On Condition
Starter	Inspect at engine overhaul. Overhaul or replace On Condition.
Starter relay	On Condition
Alternator	On Condition
Battery (Emergency Locator Transmitter)	Replace at 50% of useful life (as stated on battery) or any time transmitter is used more than one cumulative hour.
UTILITY SYSTEM	
Cabin heater	Every 1,000 heater hours or when pressure decay test requirements cannot be met.
Heater ignitor and plug	On Condition
Heater fuel pump	On Condition
Heater fuel spray nozzle	Replace at heater overhaul
Heater fuel shut-off valve	On Condition
Combustion blower	On Condition
Combustion blower brushes	On Condition
Vent blower	On Condition
Vent blower brushes	On Condition
Evaporator blower	On Condition
Evaporator blower brushes	Replace at heater overhaul
Oxygen regulator	Every 2,000 hours or 48 months, whichever occurs first.
Oxygen cylinder (3HT)	Hydrostatically test every 3 years; replace every 24 years or 4,380 refills (ICC regulation).
Oxygen cylinder (3A or 3AA)	Hydrostatically test every 5 years; no replacement duration.
Outflow valve	Perform functional test every 500 hours

CHART 1
OVERHAUL AND REPLACEMENT SCHEDULE (CONTINUED)

ITEM	OVERHAUL OR REPLACE
UTILITY SYSTEM (Continued)	
Safety valve	Perform functional test every 500 hours
FLAPS AND FLIGHT CONTROL	
Flight controls	On Condition
Aileron tab actuator	On Condition
Elevator tab actuator	On Condition
Rudder tab actuator	On Condition
Flap motor and drives	Every 2,000 hours
Flap gearbox	Every 2,000 hours
Flap actuators	Every 2,000 hours
Flap flexible shaft	Every 2,000 hours
MISCELLANEOUS	
Wing Bolts	Replace 10 years after the initial inspection. Refer to Chapter 57.

SCHEDULED MAINTENANCE CHECKS - MAINTENANCE PRACTICES

The owner or operator is responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of Title 14 of the Code of Federal Regulations (14 CFR). It is further the responsibility of the owner or operator to ensure that the airplane is inspected in conformity with the requirements covered in 14 CFR Parts 43.15 and 91.409 (f) (3). These 14 CFR Parts cover the requirements concerning the Inspection Guide. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgement 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.

SPECIAL CONDITIONS CAUTIONARY NOTICE

The time periods for the inspections noted in this schedule are based on normal usage under average environmental conditions. Airplanes operated in humid tropics, or in 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.

NOTE

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

This inspection program in accordance with 14 CFR Parts 43 and 91 consist of, but is not limited to, inspection items listed in the Inspection Guide, any applicable Airworthiness Directives issued against the airframe or any equipment installed therein and conformity to Type Certificate Data Sheet as applicable.

Material contained in this guide, including the inspection intervals, may be changed at any time by the owner/operator, with prior notification and approval of the local FAA General Aviation District Office, when warranted by service experience or engineering recommendations. Information contained herein is applicable to all Baron 58P and 58TC series airplanes except where differences are indicated by serial effectivity.

While the inspection guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various sections of this shop manual and the pertinent supplier publications. It is also recommended that reference be made to the applicable Maintenance Handbooks, Service Instructions, Raytheon Aircraft Company Service Bulletins, applicable FAA Regulations and Publications, suppliers bulletins and specifications for torque values, clearances, settings, tolerances, and other requirements. In the final analysis, it is the responsibility of the owner/operator to ensure the airframe and power plant mechanic inspecting the airplane has access to previously noted documents as well as to this inspection guide.

NOTE

Any time an airplane is repainted or touched up, inspect all placards and decals to assure they are not covered with paint, are easily readable, and are securely attached. Replace any placards that have been inadvertently defaced or removed.

In addition to the inspections prescribed by this schedule, the altimeter system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in 14 CFR Parts 91.411, and 91.413.

A complete inspection of the airplane must be accomplished within each 12-month period for compliance with the Title 14 Code of Federal Regulations. The time periods for inspections stated in this inspection guide 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. However, the additional time used must be deducted from the next inspection time. If 10 hours were used to reach the inspection facility, the next inspection would be due in 90 hours for the next 100-hour inspection with no extension allowed.

NOTE

An airplane must receive a complete 100-hour, annual, or complete continuing care inspection every 12 months regardless of the hours flown. The inspections completed during a 12-month period can be deleted from the items to be inspected. Rubber goods such as fuel lines are recommended to be changed at five year periods regardless of airplane time.

Additional publications are listed in the current Publications Price List CD Rom (P/N 994-32808). For information on these publications contact the Technical Manual Distribution Center (TMDC) at 1-800-796-2665, fax (316) 676-4824 or E-mail TMDC@Raytheon.com.

All electrical systems operational inspections are to be made using an external power source capable of delivering and maintaining 28.25 volts ± 0.25 volts.

Raytheon Aircraft Company issues service information for the benefit of owners and operators in the form of two classes of Service Bulletins. MANDATORY (Red Border) Service Bulletins are changes, inspections or modifications that could affect safety. The factory considers compliance with these Service Bulletins mandatory. OPTIONAL (No Border) Service Bulletins cover changes, modifications, improvements or inspections which may benefit the owner. Due to the wide range of information covered by the OPTIONAL Service Bulletin, each owner or operator is responsible for conducting a thorough review of each OPTIONAL Service Bulletin to determine if compliance is required based on the applicability of the OPTIONAL Service Bulletin to their particular set of operating conditions. It is the responsibility of the owner or operator to ensure that all Raytheon Aircraft Company Service Bulletins which are pertinent to their particular operation are complied with.

WARNING

During the performance of this inspection the airplane will be placed on three-point jacks. Ensure the landing gear is down and locked before removing the airplane from the jacks.

100-HOUR INSPECTION

A. OPERATIONAL INSPECTION	MECH		INSP
	L	R	
1. STARTERS - Check for proper operation, unusual noises and dragging. Check starter energized light (if installed) and/or loadmeter to ensure starter disengagement when the starter switch is released.			
2. CYLINDER HEAD TEMPERATURE - Check for proper operation, temperature and fluctuations.			
3. ALTERNATOR - Check the output.			
4. PROPELLER OPERATION - Cycle propeller and check for proper rpm drop and smoothness of operation.			
5. PROPELLER SYNCHRONIZER OR SYNCHROPHASER - Check for proper operation.			
6. PROPELLER DEICER - Check for proper operation and amperage drawn on ammeter.			
7. OIL PRESSURE AND TEMPERATURE - Check for proper pressure, temperature limits and unusual fluctuations.			
8. MAGNETOS - Check the performance of the magneto by performing the MAGNETO DROP-OFF CHECK specified in the applicable Pilot's Operating Handbook.			
9. POWER CHECK - Check as outlined in the applicable Pilot's Operating Handbook.			
10. ALL ENGINE CONTROLS - With the engine running, check for proper operational limits, engine response and rigging. Check friction locks for proper operation.			
11. PROPELLER GOVERNORS - Check for proper governor operation and feathering.			
12. AIR CONDITIONER - Operate the air conditioner and verify that the air scoop moves to the ground position when turned on and returns to the retracted position when turned off. Check for proper operation and unusual noise.			
13. FLIGHT INSTRUMENTS - Check for condition and proper operation. Check gages for proper reading.			
14. GYRO INSTRUMENTS - Check for erratic or noisy operation.			
15. DEICER (Surface) - Check for proper operation and cycling.			
16. IDLE RPM AND MIXTURE SETTINGS - Check for both proper rpm and mixture settings. Check controls for freedom of operation.			

100-HOUR INSPECTION (CONTINUED)

A. OPERATIONAL INSPECTION *(Continued)*	**MECH**		**INSP**
	L	**R**	
17. IGNITION SWITCH - Rotate the ignition switch through the OFF position to the extreme limit of switch travel; if the engine stops firing, the switch is normal. If the engine continues to run with the switch held in the past OFF position, it is an indication that one magneto is still "hot" or ungrounded. When the switch is released from the past OFF position, it should automatically return to normal OFF and the engine should stop running. However, any ignition switch exhibiting this abnormal condition should be replaced.			
18. IDLE CUT-OFF - Check for proper operation and freedom of movement.			
19. HEATING AND VENTILATING SYSTEM - Check for proper operation, heat and airflow output. Check controls for freedom of operation.			
20. PRESSURIZATION SYSTEM (TJ-3 and After) - Check for proper operation.			
21. FUEL QUANTITY AND FUEL FLOW GAGES - Check for proper operation and unusual fluctuations.			
22. FUEL BOOST PUMPS - Check for proper operation.			
23. FUEL TANK SELECTOR - Check for proper operation and feel for positive detent and proper placarding.			
24. ALL LIGHTS - Check for condition, attachment, cracked or broken lenses. Check switches, knobs and circuit breakers for looseness and operation.			
25. STALL WARNING SYSTEM - Check for proper operation.			
26. RADIO OPERATION - Check for proper operation, security of switches and knobs.			
27. FLAPS - Check for noisy operation, full travel and proper indication.			
28. PITOT HEAT - Check for proper heating of the unit.			
29. BRAKES - Check for condition and wear, ease of operation and proper release of the parking brake. Check for unusual brake chatter.			
30. EMERGENCY LOCATOR TRANSMITTER - Check for proper operation. Tune radio to 121.5 MHz on VHF or 243 MHz on UHF, then turn ELT switch to ON and monitor for one signal. Turn ELT switch OFF, then place in ARM position.			
31. OXYGEN SYSTEM - Functionally check the oxygen system for proper operation. Check the oxygen bottle shutoff valve for proper operation. **NOTE -** The oxygen bottle and valves on TJ-3 thru TJ-85, except TJ-82, are located in the cabin section. The oxygen bottle and valves on TK-1 thru TK-84 are located in the nose baggage compartment. The oxygen bottle and valves on TJ-82, TJ-86 and After, and TK-85 and After are located in the rear fuselage.			
32. SWITCHES, CIRCUIT BREAKERS - Check for proper operation.			

100-HOUR INSPECTION (CONTINUED)

A. OPERATIONAL INSPECTION *(Continued)*	MECH		INSP
	L	R	
33. FLIGHT CONTROLS, TRIM CONTROLS AND TRIM INDICATOR - Check freedom of movement and proper operation through full travel with and without flaps extended. Check electric trim controls for operation.			
34. INSTRUMENT AIR - Check for proper operation of the instrument air system by operating one engine at a time and verifying that the instrument air gage indications are proper and that the source fail indicators on the gages properly indicate source failure on the side of the inoperative engine.			
B. POWER PLANT			
NOTE - After the first 25 hours of engine operating time, a new, remanufactured, or newly overhauled engine should be given a 100-hour inspection including draining and renewing of oil.			
1. COWL FLAPS - Check for travel, deformation and security. Inspect for cracks.			
2. COWLING - Check for condition and security. Remove the upper and lower cowling and clean. Inspect for cracks.			
3. SPARK PLUGS - Clean, inspect, regap, test and replace as necessary. Tighten spark plugs to proper torque and check ignition harness condition and for proper attachment.			
4. COMPRESSION - Perform differential compression test.			
5. PLUMBING - Inspect plumbing and associated accessories for condition (such as cracks and fraying) and attachment. Check plumbing clearance and secure against possible chafing.			
6. ENGINE OIL SUMP - Check for cracks, leaks, proper fluid level, deformation and security.			
7. OIL VAPOR SEPARATOR - Check for security of all lines.			
8. OIL DIPSTICK - Check the dipstick for rust and general condition. Inspect the dipstick tabs for security and that the tabs are not bent.			
9. OIL SUMP DRAINS AND FILTERS - Check for proper torque after installation.			
10. DRAIN PLUGS - Check for leaks and security.			
11. OIL COOLER - Check oil cooler, lines and fittings for condition, security, chafing and leaks.			
12. PROPELLER AND MOUNTING BOLTS - Check for condition and security. Check the tip of the blades for evidence of lightning strikes. If there is evidence of lightning strikes, consult the propeller manufacturer, the engine manufacturer and Raytheon Aircraft Company. Inspect the blades for cracks, dents, nicks, scratches, erosion, corrosion, security and movement in the hub.			
13. PROPELLER SPINNER - Check for deformation, security and cracks.			

100-HOUR INSPECTION (CONTINUED)

B. POWER PLANT *(Continued)*	**MECH**		**INSP**
	L	**R**	
14. PROPELLER HUB - Check for cracks, excessively leaking seals and condition. Check propeller dome pressure.			
15. PROPELLER ACCUMULATOR - Check for proper operation.			
16. ALTERNATOR - Remove and disassemble the alternator as necessary to inspect the rotor shaft bearings for condition and replace if necessary. Refer to Beech Service Bulletin 0546-359 Rev II or subsequent.			
17. STARTER - Check for condition, attachment and chafed or loose wires.			
18. MAGNETOS - Check contact points for proper clearance. Points with deep pits or excessively burned areas must be discarded. Inspect the cam follower felt pad for proper lubrication and clean the compartment with a clean, dry cloth. Check timing. Check distributor block for cracks or signs of crossfiring or carbon tracking.			
19. IGNITION HARNESS - Inspect for fraying and attachment.			
20. CYLINDERS AND BAFFLES - Check cylinders and exhaust manifold for obvious leaks, security and cracks, check baffles and baffle seals for cracks, condition, security and proper sealing of engine compartment. Check cylinders for broken cooling fins and loose or missing base nuts.			
21. EXHAUST SYSTEM - Check for deformation, security, cracks, leaks, loose or missing nuts and clamps. Check for thin wall condition which may occur due to normal internal erosion on stacks which have long service time.			
22. FIREWALL - Check for wrinkles, damage or cracks. Check all electrical and control access holes for proper sealing.			
23. HOSE AND DUCTS - Check all fuel, oil and air hose or duct for leakage, cracks, deterioration and damage. Check fittings for security.			
24. ENGINE ACCESSORIES - Check for condition, security and leaks. Check wiring, hoses and tubes for chafing, security and leaks.			
25. ENGINE MOUNTS - Check for cracks, corrosion and security. Inspect rubber cushions, mount bolts and nuts, and grounding straps for condition and security.			
26. PROPELLER GOVERNOR - Check for leaks and control arm for security.			
27. ENGINE CONTROLS - Check controls and associated equipment for condition, attachment, alignment and rigging. Remove the cable connecting bolts and check for wear each 300 hours.			
28. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for fraying and attachment.			
29. PRESSURE PUMP INTAKE FILTER - Foam rubber type, clean every 100 hours; cartridge type, replace every 300 hours or as needed. Check for security.			

100-HOUR INSPECTION (CONTINUED)

B. POWER PLANT *(Continued)*	MECH		INSP
	L	R	
30. AIR CONDITIONER COMPRESSOR - Check for security and attachment. Check belt for tension and worn or frayed condition.			
31. INDUCTION AIR FILTER - Check for condition, cleanliness and security.			
32. INDUCTION SYSTEM AND ALTERNATE AIR - Check flexible air ducts for delamination of the inner lining. Check the alternate air valve for blockage, security, cracks, operation and wear.			
33. FUEL INJECTION CONTROL VALVE - Clean the screen and check for damage. Install screen and check for leaks.			
34. FUEL INJECTION SYSTEM - Inspect all fuel injection components, lines and fittings for evidence of fuel leaks, fraying and cracking.			
35. TURBOCHARGERS AND AIR OIL SEPARATORS - Inspect the turbocharger system for oil leaks and exhaust leaks. Check the compressor wheel for nicks and cracks. Check linkages for security and proper operation.			
36. INSTRUMENT AIR PRESSURE SYSTEM FILTERS - Check or replace each filter as outlined under the heading SERVICING in Chapter 36-00-00 of this Maintenance Manual.			
37. ELECTRIC PROPELLER DEICER - Check for service damage to the deicer heaters, brush rods, springs and brushes. Check the lead strap and all other clamps, connectors and wiring for electrical soundness. Check the slip rings for roughness, cracks, burned or discolored areas and for deposits of oil, grease or dirt. Check for security and attachment of all components. Check deicer boots for wrinkles, loose or torn areas.			
C. NACELLES			
1. NACELLE SKIN - Check for deformation and obvious damage or cracks. Check for loose or missing rivets.			
2. NACELLE STRUCTURE - Check for cracks and deformation. Check for loose or missing rivets and concealed damage.			
3. PNEUMATIC PRESSURE REGULATORS - Check for condition, security and attachment.			
4. AIR CONDITIONER CONDENSER - Check for condition and attachment.			
D. WINGS AND CARRY-THROUGH STRUCTURE			
1. SKIN - Check for deformation and obvious damage. Check for cracks, loose or missing rivets. If damage is found, check adjacent structure. Check for indications of hard landing or excessive flight loading.			
2. STRUCTURE - Check for cracks, deformation and concealed damage. Check for loose or missing rivets.			
3. ACCESS DOORS AND PANELS - Inspect for cracks, proper fit and attachment.			

100-HOUR INSPECTION (CONTINUED)

D. WINGS AND CARRY-THROUGH STRUCTURE *(Continued)*	**MECH**		**INSP**
	L	**R**	
4. CONTROL CABLE SEALS (TJ-3 and After) - Check for condition, security, cleanliness and lubrication.			
5. CABLES, PULLEYS AND TURNBUCKLES - Check the wing flight control components, cables and pulleys. Replace control system components (push rods, turnbuckles, end fittings, castings, etc.) that have bulges, splits, bends, or cracks. Check control cables, pulleys, and associated equipment for condition, attachment, alignment, clearance, and proper operation. Replace cables that have broken strands or evidence of corrosion. Check cables for proper tension.			
6. AILERONS - Check for condition and security. Check for cracks, loose or missing rivets and freedom of movement. Check hinge bearings and brackets for condition, push-pull rods for security and rod ends for corrosion.			
7. FUEL CELLS AND VENTS - Inspect fuel cells for leakage and vent lines for security as outlined in Chapter 28-10-00 of this Maintenance Manual. Refer to Service Instruction Number 0632-280.			
8. PLUMBING - Check for leakage, chafing, condition and security.			
9. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security and attachment.			
10. FLAP LIMIT SWITCHES - Check for condition, security and freedom of operation.			
11. FLAPS AND ACTUATORS - Check for condition, security, binding or chafing of actuator cables. Check flap skin and structure for cracks, loose or missing rivets. Check roller bearings and tracks for condition. Check stop area for condition and damage.			
12. FLAP POSITION TRANSMITTER - Check for security and operation.			
13. DRAIN HOLES - Check the drain holes in the left and right upper wing attach fittings to assure that they are open and free of obstruction.			
14. WING SPAR CAP - Inspect the wing spar cap for corrosion as outlined in Chapter 57-00-00 of this Maintenance Manual.			
15. WING BOLTS - Check wing bolts for proper torque at the first 100-hour inspection and at the first 100-hour inspection after each reinstallation of the wing attach bolts. Refer to Chapter 57-00-00 of this Maintenance Manual for wing bolt, nut and fitting inspection criterion and frequency.			
16. PITOT TUBE AND STALL WARNING VANE - Check for condition and obstructions.			
17. AILERON TRIM TAB - Check for attachment and freedom of movement.			
18. FUEL QUANTITY TRANSMITTER - Check for attachment and electrical connection.			

100-HOUR INSPECTION (CONTINUED)

D. WINGS AND CARRY-THROUGH STRUCTURE *(Continued)*	MECH		INSP
	L	R	
19. NAVIGATION LIGHTS - Check for cracked or broken lenses and replace bulbs as necessary.			
20. LANDING LIGHTS - Check for security and operation. Replace lens and bulbs as necessary.			
21. FUEL BOOST PUMPS AND FUEL LINES - Check for condition, security and leaks. Check lines for signs of chafing or cracks.			
22. FUEL SELECTOR VALVE - Check for security, operation and leakage.			
23. FUEL STRAINERS - Inspect and clean as outlined under the heading ENGINE FUEL FILTERS AND SCREENS in Chapter 12-10-00 of this Maintenance Manual.			
24. Perform the INBOARD LEADING EDGE BAFFLED FUEL CELL - FLAPPER VALVE INSPECTION procedure. Refer to Chapter 28-10-00.			

E. CABIN AND BAGGAGE COMPARTMENT	MECH	INSP
1. SKIN - Inspect skins for deformation, cracks and loose or missing rivets. If damage is found, check adjacent structure.		
2. STRUCTURE - Check for cracks and deformation. Check for loose or missing rivets and concealed damage.		
3. CONTROL CABLE SEALS (TJ-3 and After) - Check for condition, security, cleanliness and lubrication.		
4. CABLES AND PULLEYS - Check the flight control components, cables and pulleys. Replace control system components (push rods, turnbuckles, end fittings, castings, etc.) that have bulges, splits, bends, or cracks. Check control cables, pulleys, and associated equipment for condition, attachment, alignment, clearance and proper operation. Replace cables that have broken strands or evidence of corrosion. Check cables for proper tension.		
5. LANDING GEAR GEARBOX AND ACTUATING LINKAGE - Check for leakage, wear, condition and attachment. Check for unusual noise. Remove the oil filler plug and check oil level by engaging and turning the emergency handcrank 1/2 turn to determine that oil is being picked up on the worm gear. The oil level should be maintained no more than necessary to cover 1/2 of the diameter of the worm gear. Install oil filler plug.		
6. PRESSURIZATION CONTROL VALVES (TJ-3 and After) - Clean the cabin pressurization controller filter and orifice each 100 hours of operation and the safety valve filter and orifice each 500 hours of operation. Perform a functional test of the outflow and safety valves every 500 hours of operation as outlined in Chapter 21-30-00 of this Maintenance Manual.		
7. FLAP MOTOR AND SHAFTS - Check for condition, security and wear at all points. Check cable housing for security and check jam nuts for tightness.		

100-HOUR INSPECTION (CONTINUED)

E. CABIN AND BAGGAGE COMPARTMENT *(Continued)*	**MECH**	**INSP**
8. BRAKE MASTER CYLINDER AND PARKING BRAKE VALVE - Check for condition, security and leaks. Check lines for signs of chafing or cracks.		
9. RUDDER PEDALS - Check for freedom of movement. Check cables, push/pull rods, bellcranks, pulleys, turnbuckles, fairleads, for proper routing, condition and security. Check rudder pedal fore and aft positions for wear. Check locks and pins to ensure positive lock.		
10. CONTROL COLUMN, TRIM CONTROL AND INDICATOR (Electric and Manual) - Check for freedom of movement. Inspect pulleys, sprockets, bearings, actuators, chains and turnbuckles for condition, security and operation. Check trim indicator for proper indication.		
11. ENGINE CONTROLS - Check for ease of operation through full travel. Check friction locks for proper operation.		
12. ELECTRICAL WIRING AND EQUIPMENT - Check for condition, security and signs of chafing.		
13. PLUMBING - Check all plumbing and connections for security, leakage and general condition.		
14. WINDOWS AND DOORS - Inspect windows for scratches, crazing and general condition. Refer to Chapter 56-00-00 of this Maintenance Manual for detailed inspection procedures (TJ-3 and After). Check doors for condition and attachment. Check latching mechanism for proper engagement and ease of operation. On TJ-3 and After, check the forward cabin door pressurization system for leaks and proper operation. Refer to Service Bulletin 2693 and check door handles.		
15. INSTRUMENTS AND INSTRUMENT PANEL - Inspect instrument panel, subpanels, placards and instruments for condition and attachment. Check all knobs for security. Inspect shock mounts, ground straps for cracks and security.		
16. SEATS, SEAT BELTS AND SHOULDER HARNESSES - Inspect cabin seats, seat belts and shoulder harnesses for proper operation, condition and security of attachment. Inspect floorboards for condition and seat attachment. Check for operation of the seat stops.		
17. OXYGEN - Check the oxygen masks for cleanliness and stowage. On airplane serials TJ-3 thru TJ-85, except TJ-82, inspect the oxygen cylinder and valves for condition and security of attachment. Check the valves for proper operation.		
18. AIR CONDITIONER EVAPORATOR - Check for condition and security.		
19. VENTILATING SYSTEM - Check all fresh air and heat outlet vents for proper movement and operation.		
20. FUEL SELECTOR VALVE - Inspect for security, freedom of movement, proper detent feel and condition. Check for proper placarding.		
21. FILTERS - Replace individual instrument air filters.		

100-HOUR INSPECTION (CONTINUED)

E. CABIN AND BAGGAGE COMPARTMENT *(Continued)*	MECH	INSP
22. EMERGENCY EXIT HATCH (TK-1 and After) - Check the emergency release handle and latch assembly for proper operation. Check that the hatch moves out freely. Check the complete hatch assembly for condition and all moving parts for proper operation. With the hatch installed, check for proper latching and seal. Safety the emergency exit with 0.020 inch diameter copper wire after opening.		
23. STATIC SYSTEM - Check and drain water from the static lines.		
24. CONTROL COLUMN (TJ-436, TJ-444 and After; TK-147 and TK-151) - Inspect the control column U-joint roll pins and ensure they are not backing out.		
F. 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. RADAR ANTENNA COVER - Check the fiberglass for security, attachment and cracks.		
4. BATTERY - Inspect for clean, tight connections and correct fluid level. Add distilled water as required. Inspect vent hose at battery box for obstructions. The battery box should be washed out thoroughly and dried each time the battery is removed and cleaned.		
5. BRAKE FLUID RESERVOIR - Check reservoir for security, attachment, open vent, proper fluid level and for leaks.		
6. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for condition, fraying, and attachment.		
7. HEATER FUEL SYSTEM - Check lines for connection and chafing.		
8. HEATER DUCTING AND WIRING - Check security and chafing.		
9. OXYGEN (TK-1 thru TK-84) - Inspect the oxygen cylinder and valves for condition and security of attachment. Check the valves for proper operation.		
10. BAGGAGE DOOR - Check for condition and proper latching.		
G. REAR FUSELAGE AND EMPENNAGE		
1. SKIN - Check for deformation, cracks and obvious damage. Check for loose or missing rivets. If damage is found, check adjacent structure.		
2. STRUCTURE - Inspect the two most aft bulkheads for cracks, distortion, loose rivets or other obvious damage.		
3. CONTROL CABLE SEALS (TJ-3 and After) - Check for condition, security, cleanliness and lubrication.		

100-HOUR INSPECTION (CONTINUED)

G. REAR FUSELAGE AND EMPENNAGE *(Continued)*	MECH	INSP
4. CABLES, PULLEYS AND TURNBUCKLES - Check the elevator and rudder flight control components, cables and pulleys. Replace control system components (push rods, turnbuckles, end fittings, castings, etc.) that have bulges, splits, bends, or cracks. Check control cables, pulleys, and associated equipment for condition, attachment, alignment, clearance, and proper operation. Replace cables that have broken strands or evidence of corrosion. Check cables for proper tension.		
5. CONTROL SURFACES - Check for deformation, cracks and security. Check for loose or missing rivets. Check for freedom of movement and travel limits. Check for security of hinges and bond cable.		
6. TRIM TABS AND ACTUATORS - Check for security and wear. Check allowable free play as outlined in Chapter 27 of this Maintenance Manual. Check hinges and trim tab actuator for security and wear. Check trim tabs for cracks and control rods for attachment. Lubricate the trim tab hinges as outlined in Chapter 12-20-00 of this Maintenance Manual.		
7. STATIC PORTS - Check for obstruction and clean as necessary.		
8. PLUMBING - Check for leakage, cracks, chafing, condition and security.		
9. ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security and attachment.		
10. STATIC LINES - Check condition of static lines and drain.		
11. ASSIST STEP - Inspect for condition and attachment.		
12. ANTENNAS - Check for condition and security.		
13. SCUPPER DRAINS - Check that the drain guards are open facing aft and drain holes are free from obstruction.		
14. AFT BULKHEADS (F.S. 257.6 and F.S. 271.92; TJ-3 thru TJ-141, TK-1 thru TK-68) - Inspect for possible cracks in the bulkheads at the horizontal stabilizer stub spars. Refer to Beech Service Instruction No. 0990, Rev. 1 or subsequent for specific instructions.		
15. OXYGEN (TJ-82, TJ-86 and After, and TK-85 and After) - Inspect the oxygen cylinder and valves for condition and security of attachment. Check the valves for proper operation.		

H. MAIN GEAR AND BRAKES	MECH		INSP
	L	R	
1. BRAKES, LINES, LINING AND DISCS - Check for condition, wear and security. Check lines for chafing and signs of leakage or cracks. Check discs for wear or warping. Check brake discs for cracks.			
2. WHEELS AND TIRES - Check wheels for cracks and tires for wear, damage, condition and proper inflation. Check wheel bearings for condition and wear.			

100-HOUR INSPECTION (CONTINUED)

H. MAIN GEAR AND BRAKES *(Continued)*	MECH		INSP
	L	R	
3. ACTUATOR GEARBOX, MOTOR AND SWITCHES - Check for leakage, condition and security.			
4. LANDING GEAR STRUTS - Inspect the shock struts and components for cracks, attachment, corrosion, proper inflation and evidence of leakage.			
5. ACTUATING LINKAGE - Check for wear and cracks at attach points. Check for condition and security.			
6. GEAR DOORS AND LINKAGE - Check doors for damage and cracks to the structure and skins. Check linkage for wear and cracks at the attach points. Check for condition and security. Determine that all clevis retaining pins are in place and secured with cotter pins.			
7. STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the struts as outlined in Chapter 12-20-00 of this Maintenance Manual.			
8. STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks and security of attachment.			
9. LANDING GEAR TORQUE KNEES - Inspect for cracks, attachment and corrosion. Aircraft without Kit No. 58-8003-1 installed inspect in accordance with the directions provided in Service Bulletin Number 2147.			

I. NOSE GEAR	MECH	INSP
1. WHEEL AND TIRE - Check wheel for cracks and tire for wear, damage, condition and proper inflation. Check wheel bearings for condition and wear.		
2. LANDING GEAR STRUT - Inspect the shock strut and components for cracks, attachment, proper inflation and evidence of leakage.		
3. ACTUATING LINKAGE - Check for wear at attach points. Check for cracks and security.		
4. GEAR DOORS AND LINKAGE - Check doors for damage and cracks to the structure and skins. Check linkage for wear and cracks at the attach points. Check for condition and security.		
5. NOSE GEAR STEERING LINKAGE - Inspect linkages for tightness, condition and security. Check linkage boots for condition.		
6. SHIMMY DAMPER - Check for condition and attachment. Check attach points for cracks. Check fluid level as outlined in Chapter 12-20-00 of this Maintenance Manual.		
7. STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the strut as outlined in Chapter 12-20-00 of this Maintenance Manual.		
8. STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks, corrosion and security of attachment.		
9. TAXI LIGHT - Check for security and operation. Check for a cracked light and replace if necessary.		

100-HOUR INSPECTION (CONTINUED)

I. NOSE GEAR *(Continued)*	MECH	INSP
10. LANDING GEAR TORQUE KNEES - Inspect for cracks, attachment and corrosion. Aircraft without Kit No. 58-8003-3 installed inspect in accordance with the directions provided in Service Bulletin Number 2147.		
J. LANDING GEAR OPERATION		
CAUTION - *Under no circumstances should the landing gear be operated electrically while the handcrank is engaged. In the event of such an operation, a teardown and magnetic inspection should be performed for damage to engagement slot in worm shaft.* **NOTE** - Since the battery voltage is not sufficient to properly cycle the landing gear for this inspection, use only an external power source capable of delivering and maintaining 28.25 ± 0.25 VDC, to the airplane's electrical system throughout the extension and retraction cycles when performing the landing gear retraction inspection. For more specific information which may be necessary to accomplish the following items, refer to Chapter 32-30-00 in this Maintenance Manual.		
1. LANDING GEAR ACTUATOR ASSEMBLY - With the airplane on jacks and the retraction cycle started enough to break the downlock tension, apply a sharp load by hand in an aft direction against the nose gear strut. If this causes the main gear wheels to move approximately 1/2 to 1 inch, it is a good indication that the gear actuator assembly needs overhaul and/or adjustment.		
2. DOORS - Check door operation, fit and fair. Check for unusual noise.		
3. GENERAL OPERATION - Place the airplane on jacks and cycle the landing gear while checking to ascertain that the position light switches operate in conjunction with the landing gear position.		
4. VISUAL INDICATOR - Inspect for proper adjustment and operation.		
5. POSITION LIGHTS - Check for security, adjustment, wiring for breaks, condition of insulation, loose connections and proper indication.		
6. EMERGENCY EXTENSION - Check system for freedom of operation and positive engagement of the downlocks. Check for unusual noise. With the spar cover installed, check for proper engagement of the emergency extension handle and proper system operation.		
7. LIMIT SWITCH RIGGING - Check for security and proper adjustment of the limit switches. Refer to Chapter 32-30-00 in this Maintenance Manual for correct landing gear gearbox internal clearance.		
8. DYNAMIC BRAKING ACTION - Verify proper operation of dynamic brake relay.		
9. WARNING HORN - Check for proper operation.		
10. UPLOCK CABLE TENSION - Check uplock cable mechanism for condition and security. Check uplock cable for proper tension and for possible fraying.		

100-HOUR INSPECTION (CONTINUED)

J. LANDING GEAR OPERATION *(Continued)*	MECH	INSP
NOTE - Downlock tension should be checked at the first 100-hour inspection and every 200 hours thereafter.		
11. DOWNLOCK TENSION (MAIN GEAR) - Check for proper deflection force on the main gear knee joints.		
12. DOWNLOCK TENSION (NOSE GEAR) - Check the downlock tension on the nose gear as outlined in Chapter 32-30-00 of this Maintenance Manual.		
13. UPLOCK ROLLERS - Check condition and clearance of uplock rollers per Chapter 32-30-00 and lubricate as outlined in Chapter 12-20-00 of this Maintenance Manual. Check for binding.		
14. SAFETY SWITCH - Check for security, proper rig and operation.		
15. NOSE GEAR UP TENSION - Check the up tension on the nose gear per Chapter 32-30-00 of this Maintenance Manual.		
16. NOSE GEAR STEERING - Check for condition and security.		
K. GENERAL		
1. Airplane cleaned and serviced.		
2. Airplane lubricated, after cleaning, as outlined in Chapter 12-20-00 of this Maintenance Manual and Beech Safety Communique No. 57 dated June 3, 1981.		
3. Inspect all placards to assure that they are easily readable and securely attached.		
4. Assure that all Airworthiness Directives, Beech Service Bulletins and previously issued Service Instructions are reviewed and complied with as required.		
For a complete or annual inspection of the airplane, all items on the airplane that are noted in this guide should be inspected.		

SPECIAL INSPECTIONS

PROPELLER DEICER SYSTEM INSPECTION

The various components of the propeller deicer system should be inspected every 50 hours for the appearance of defects. The following inspection may provide a means of detecting and correcting such defects before they render the deicer system inoperative.

ELECTRIC PROPELLER DEICER (50-HOUR GUIDE)

a. Lock the brakes and operate the engines at near takeoff power. Turn the deicer system switch ON and observe the ammeter for at least 2 minutes. If the ammeter needle does not rest within the shaded band (except for a flicker that may occur when the step switch of the timer cycles) refer to the troubleshooting chart in Chapter 30-60-00 for the probable sources of trouble.

NOTE

Timers with electronic stepping circuits may not "flick" noticeably between cycles.

WARNING

Before moving the propeller, make certain that the ignition switch is OFF and that the engine has cooled completely. There is always some danger of a cylinder firing when a propeller is moved.

CAUTION

When following the instructions of step "b", move the propeller back and forth to prevent arcing between the brushes and the slip ring.

b. With the engine shut down, turn the deicer switch ON and feel the deicer boots on the propeller for the proper sequence of the heating elements. The presence of local hot spots indicates damage to the heating elements, which should be repaired before more serious damage develops.

c. Remove the spinner dome and open all access doors pertaining to the wiring and components of the deicer system. Turn the deicer switch ON and station an assistant in the pilot's compartment to observe the system ammeter. Flex all accessible wiring, particularly the lead straps, leads from the slip ring assembly, and the firewall electrical connectors and their wiring. Any movement of the ammeter, other than the cycling flicker that may occur when the step switch of the timer cycles, indicates a short or open circuit that must be located and corrected.

d. To extend the life of the lead strap between the hub clamp and clip, reposition the bend at least 1/2 inch from the existing location of the bend.

e. Check for damaged springs, and worn or damaged brushes.

ELECTRIC PROPELLER DEICER (100-HOUR GUIDE)

a. Check for radio noise or compass interference by operating the engines at near takeoff power with the radio gear turned ON. If, under these conditions, noise or interference occurs when the deicer systems switch is turned ON and disappears when the switch is OFF, refer to the troubleshooting chart for the probable source of trouble.

b. Check all clamps, clips, mountings, electrical connections, and connectors for tightness and electrical soundness. Check also for loose, broken, or missing safety wire.

c. Closely check deicer boots for wrinkles, loose, or torn areas, particularly around the outboard end and at the point where the strap passes under the hub clamp. Look for abrasions or cuts along the leading edge of the flat or thrust face. If the heater element wires are exposed in the damaged areas or if the rubber is found to be tacky, swollen, or deteriorated (as from contact with oil or solvent fluids), replace the boot.

d. Check that the hub clamps are tight. Inspect for cracks or other damage. Check to see that the cushioning material is not missing or damaged in the area under the hub clamp or on the edge of the spinner dome. Manually operate the propeller from low pitch to high pitch while checking that the deicer lead straps do not come under tension.

e. Check the slip rings for gouges, roughened surfaces, cracks, burned or discolored areas, and for deposits of oil, grease, or dirt. Clean greasy or contaminated slip rings with solvent (15, Chart 207, 91-00-00). After such cleaning, a run-in time of five hours of engine operation must be allowed before the deicer system is turned on.

f. If uneven wear or wobble is detected, check the alignment of the slip rings to the propeller shaft with a dial indicator. While turning the propeller to check the slip ring alignment, push in on the propeller to eliminate play in the propeller thrust bearing. If the runout over 360 degrees of rotation is over 0.005 inch, or if over any 4 inch arc it exceeds 0.002 inch, refer to step "h".

g. Examine the brush mounting brackets and housing for cracks, deformation, or other indications of damage. Check for tight connections and that the leads are not chafed or binding.

h. Check to see that each brush rides on its slip ring over 360 degrees of rotation. If the brush is not properly aligned, raise or lower the brush block to the proper position. If the brushes ride both high and low with respect to the slip rings in 360 degrees of rotation, the slip ring is eccentrically mounted and the shaft clamp or slip ring must be replaced.

i. Check for proper spacing between the brush block and slip rings. If this distance is not within the specified limits, loosen the mounting screws and reposition them in the elongated holes until the block is properly positioned. If necessary, shims can be added between the thrust bearing plate and mounting bracket until the brush is properly located.

j. Estimate the contact angle of the brush block in relation to the slip rings. If this angle is not approximately 2 degrees, loosen the mounting bolts and reposition the brush block until the proper angle exists between the brush block and slip rings. It should be noted that the spacing established in step "i" must also be maintained after proper contact angle is obtained.

WARNING

Before moving the propeller, make certain that the ignition switch is OFF and that the engine has cooled completely. There is always some danger of a cylinder firing when the propeller is moved.

CAUTION

While following the instructions of step "k", move the propeller back and forth to prevent arcing between the brushes and the slip ring.

k. With the deicer system operating and a man in the pilot's compartment observing the ammeter, visually inspect and physically flex the wiring from the brush block to each component of the deicer system and to the airplane power supply. Jumps of the ammeter needle, other than the momentary flicker that may occur when the step switch of the timer cycles, indicate loose or broken wiring in the area under examination at the moment. In such instances, continue to flex the wiring in the area that first indicated trouble while checking the continuity through the individual wires of the affected harness until the source of trouble is located. Use the applicable Wiring Diagram Manual to trace the circuitry of the deicer system.

NOSE LANDING GEAR CORROSION INSPECTION (1200-HOUR)

The various components of the nose landing gear should be inspected every 1200 hours for the appearance of corrosion. The following inspection provides a means of detecting corrosion:

a. Remove the nose landing gear as instructed in Chapter 32-20-00.

b. Disassemble the nose landing gear as instructed in the Baron 58P Beech Manufactured Components Maintenance Manual.

c. Wash all existing corrosion preventive compound and grease from all nose landing gear parts using solvent (20, Chart 207, 91-00-00). Visually inspect each part for corrosion, especially noting the inside of the nose landing gear brace barrel and the nose gear brace arm bushings.

NOTE

If the wall thickness of the nose gear brace barrel is less than 0.090 inch, it must be replaced. Refer to the Baron 58P Beech Manufactured Components Maintenance Manual for the bearing tolerances. Any bearings found to be out of tolerance should be replaced.

d. Plug one end of the nose gear brace barrel and pour corrosion preventive compound (43, Chart 207, 91-00-00) into the barrel. Tilt and rotate the barrel until all of the interior is coated, the pour out the excess compound.

e. Reassemble the nose landing gear as instructed in the Baron 58P Beech Manufactured Components Maintenance Manual.

f. Install the nose landing gear as instructed in Chapter 32-20-00.

g. Lubricate the nose landing gear according to Chapter 32-20-00.

UNSCHEDULED MAINTENANCE CHECKS - MAINTENANCE PRACTICES

This subchapter is assembled in chart form to allow a technician to perform checks for damage after operating the airplane in conditions which could require unscheduled maintenance. Specific conditions, such as lightning strikes, turbulent air penetration or hard landings, etc., are included. Inspection instructions are included for each of the conditions listed.

UNSCHEDULED MAINTENANCE CHECKS

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
WHEN OPERATING IN AREAS OF HIGH DUST CONTENT		
1. Nose Landing Gear Shock Strut	Clean off and wipe dry exposed polished surfaces.	Routine
2. Instrument Air Filters	Replace instrument line supply filters at or before 100 hours under extremely dusty conditions.	As noted
CAUTION *Disconnect the autopilot barometric altitude sensor line before applying reverse air pressure to pitot and static lines to prevent damage to the barometric altitude sensor.*		
3. Pitot and Static Lines	Check for obstructions by applying reverse air pressure (not to exceed 20 psi.) to the ends of the pitot and static lines disconnected from the instruments.	100 Hours or as required
4. Environmental Air Filter.	Inspect for obstruction of air flow. Replace if necessary.	As required.
WHEN OPERATING IN AREAS OF HIGH HUMIDITY		
1. Floor Structure	Check structure under the floor for corrosion by removing a floor panel and inspecting structure, especially channel sections.	At a scheduled inspection, but not more than 6 months apart.
2. Aft Cabin	Remove aft cabin access covers and check for corrosion, especially aft of bulkhead points.	At a scheduled inspection, but not more than 6 months apart.
3. Wing	Remove wing access covers and check for corrosion.	At a scheduled inspection, but not more than 6 months apart.
4. Empennage	Remove aft fuselage access covers and check for corrosion.	At a scheduled inspection, but not more than 6 months apart.
OPERATING FROM VERY SOFT OR UNUSUAL TERRAIN		
1. Tires	Visually check for cuts, wear, deterioration and inflation.	Routine

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
OPERATING FROM VERY SOFT OR UNUSUAL TERRAIN (*Continued*)		
2. Main Landing Gear		
a. Struts	Check strut inflation as noted in Chapter 32-10-00.	Routine
b. Wheels	Remove and clean; inspect for abrasions, cracks and chipped rims, bearings for wear, corrosion, fretting and bluing; check seals for distortion, deterioration, proper fit, security and obvious damage	Every 100 hours and/or annually.
c. Brake Units	Check cylinders and associated lines for obvious damage and leaks.	Routine
	Check for evidence of overheating.	Every 100 hours and/or annually.
	Check discs for scoring, distortion, damaged plating and evidence of overheating.	Every 100 hours
d. Shock Strut	Check surfaces for cleanliness, free from oil or grease deterioration. Check strut inflation as noted in Chapter 12.	Every 100 hours and/or annually.
	Clean exposed surface of shock strut piston with clean cloth moistened with hydraulic fluid.	
e. Wheel Wells	Clean foreign material (dirt, etc.) from wheel wells. Inspect supports between main and aft spars in upper wheel well and the lift leg attach bracket at the main spar for deformation, cracks, etc.	As required
3. Nose Landing Gear		
a. Wheel	Visually check for obvious damage.	Routine
	Remove and clean. Inspect for abrasions, cracks and chipped rims, bearings for wear, corrosion, fretting and bluing; check seals for distortion, deterioration, proper fit and security.	Every 100 hours
b. Shock Strut	Check for obvious damage and leaks. Clean exposed surface of shock strut piston with clean cloth moistened with hydraulic fluid. Check strut inflation as noted in Chapter 32-20-00.	Routine
	Check for correct extension as noted.	Every 100 hours
	Thoroughly clean and inspect for leaks, damage and security. Service as necessary.	Every 100 hours
c. Fork Assembly	Check for cleanliness and obvious damage.	Routine

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
OPERATING FROM VERY SOFT OR UNUSUAL TERRAIN (*Continued*)		
d. Nose Wheel Steering	Check for obvious damage, associated rods and connections for damage.	Every 100 hours
e. Actuator Linkage	Check for excessive play, safety and security.	Every 100 hours
INSPECTION AFTER HARD LANDING		
1. General Appearance	This inspection should be carried out after a hard landing and before the airplane is certified as ready for further flight. The inspections are conducted at two levels. The first level consists of determining if any external damage has occurred and looking for evidence of internal structural failure. The second level is concerned with a more detailed inspection of any damage areas which were indicated in the findings of the first level inspection. If it is determined by the first level inspection that there is no damage to the airplane, it is not necessary to proceed to the second level inspection.	After hard landing
FIRST LEVEL		
WARNING Even though "wrinkles" in the wing or fuselage skin surface may be slight enough to be considered as negligible, a close inspection of the internal supporting structure may reveal serious damage.		
2. Landing Gear	Inspect tires for excessive wear, splits in the tread, bottoming out or folding over the side walls.	After hard landing
	Check the wheels for flat spots or cracked castings.	
	Check shock struts and attachment lugs for cracks Inspect hydraulic brake lines for leaks.	
	Inspect downlock, drag link and gear door retract linkage for damage.	
	Inspect landing gear.	
	Inspect lift leg attach bracket at the main spar for deformation, cracks, etc.	
	Inspect areas around landing gear attach points.	

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
	INSPECTION AFTER HARD LANDING *(Continued)*	
2. Landing Gear *(continued)*	Raytheon Aircraft Company recommends that airplanes having experienced severe, or hard landings or other abnormal landing incidents which may have placed undue stress on the landing gears, are to be inspected within the first 100 service hours after such hard landing and at each 600 service hours thereafter.	
	Airplanes having received repairs in this area, upon Raytheon Aircraft Company recommendations, are exempt from this inspection except in the event of a future hard or abnormal landing incident.	
3. Nacelles	Inspect external skin surfaces for distortion, loose or missing rivets.	After hard landing
	Check cowling attachment fittings for alignment or damage.	
	Inspect engine control cables for smooth operation and check plumbing and wiring for security and attachment.	
	Inspect engine support mounts for cracks or structural failure. Check tips of propellers for damage.	
	Check propeller spinner and backplate for evidence of interference with cowling.	
	Inspect wheel well structure for damage or cracks. Check area surrounding the landing gear attachment points.	
4. Wing Center Section	Check wing attachment fittings for cracks - dye check inspection.	After hard landing
	Inspect plumbing, wiring and actuator for damage and security of attachment.	
	Check keel, front and rear spar on the lower side of fuselage for damage and alignment.	
5. Wings	Inspect external wing surface skin for cracks, abnormal wrinkles and loose or missing rivets.	After hard landing
	Inspect internal structure and fuel cells through access panels.	
	Inspect plumbing and wiring for security of attachment.	

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER HARD LANDING (*Continued*)		
6. Fuselage Nose Section	Check external skin surface for cracks, abnormal wrinkles and loose or missing rivets.	
	Check wheel well structure and area surrounding gear attach point for damage.	
	Inspect avionics, radar antenna, wiring and plumbing for security and attachment.	
7. Fuselage Center Section	Inspect external skin surface for cracks, abnormal wrinkles and loose or missing rivets.	After hard landing
	Inspect around cabin windows for structural cracks.	
8. Fuselage Aft Section	Check external skin surface the entire length for cracks, abnormal wrinkles and loose or missing rivets.	After hard landing
	Inspect empennage and control surfaces for freedom of movement.	
SECOND LEVEL		
NOTE Because shock loading may be transmitted along one structural member to another, carefully inspect the surrounding and supporting structure in any damaged area found in the first level inspection		
9. Landing Gear	Place the airplane on jacks and check shock strut for free up and down movement.	After hard landing
	Disassemble and examine wheels for cracks or distortion.	
	Visually inspect axle with 10-power glass. If suspect, dye check or magnaflux.	
	Remove and replace or magnaflux the landing gear attach bolts, check bolt holes for cracks or elongation.	
	Remove and replace or magnaflux drag link bolts and supports.	
	Make landing gear retraction test.	
10. Nacelles	If tips of propeller have been damaged, refer to the Engine Maintenance Manual for engine inspection procedure for propeller strike.	After hard landing
	Inspect areas surrounding the engine mounts.	

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER HARD LANDING (*Continued*)		
10. Nacelles (*Continued*)	Check the internal structure of the wheel well for cracks or damage.	After hard landing
	Test plumbing and wiring for proper operation.	
11. Wing Center Section	Remove floorboards and access plates and inspect the front and rear spar and keel structure for evidence of deformation or structural failure.	After hard landing
	Test plumbing, wiring, flaps, control cables, pulley mounts and any other system found in this area for proper operation.	
12. Wings	Test plumbing and wiring for proper operation.	After hard landing
	Inspect fuel cells and lines for leakage and damage.	
13. Fuselage Nose Section	Remove baggage compartment floorboards and inspect the keel structure and supporting members for damage.	After hard landing
	Inspect wheel well structure and surrounding areas for signs of structural failure.	
	Test avionics, radar antenna, plumbing and wiring for proper operation.	
14. Fuselage Center and Aft Section	Examine stringers, frames and side walls for deformation or structural failure.	After hard landing
	Test plumbing and wiring for proper operation.	
	Inspect heating and air conditioning ducts for damage.	
	Examine the control cables and pulley mountings and check for clearance from structure at pass-through locations. Ensure a smooth operation.	
REPAIR OF DAMAGE		
Due to the variety and degree of structural damage which may be involved, the best repair or replacement procedure must be based on the findings of the individual airplane. If the hard landing inspection indicates that serious structural damage has occurred, contact the Customer Support Department, Raytheon Aircraft Company, Wichita Kansas, 67201 for assistance.		
LOG BOOK ENTRY		
Following a hard landing inspection, an entry covering the extent of inspection, the damage and the repair (if applicable) must be noted in the airplane permanent records.		

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER ENCOUNTERING TURBULENT AIR		
1. General Appearance	This inspection should be carried out after the airplane has been subjected to high G loading while flying through turbulent air and before the airplane is returned to service. The inspection is conducted on two levels. The first level consists of determining if any external damage has occurred and looking for evidence of internal structural failure. The second level is concerned with a more detailed inspection of damaged areas which were indicated in the findings of the first level inspection. If it is determined by the first inspection that there is no damage to the airplane, it is not necessary to proceed to the second level inspection.	After encountering turbulent air
FIRST LEVEL		
WARNING Even though "wrinkles" in the wing or fuselage skin surface may be slight enough to be considered as negligible, a close inspection of the internal supporting structure may reveal serious damage. Determine that the airframe components (nacelles, wings, fuselage and empennage) are in their normal configuration.		
2. Wing Center Section	Inspect the external skin surface (upper and lower) for cracks, wrinkles and loose or missing rivets.	After encountering turbulent air
	Inspect plumbing, wiring and actuators for damage and security of attachment.	
	Check the keel and the front and rear spar on the lower side of the fuselage for damage and alignment	
3. Nacelles	Inspect the external skin surfaces for wrinkles and loose or missing rivets.	After encountering turbulent air
	Check cowling attachment fittings for alignment or damage.	
	Inspect the engine support mounts for cracks, deformation or structural failure.	
	Inspect engine control cables for smooth operation and check plumbing and wiring for security and attachment.	

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER ENCOUNTERING TURBULENT AIR *(Continued)*		
3. Nacelles *(Continued)*	Inspect structure in wheel well for damage or cracks.	After encountering turbulent air
4. Wings	Inspect the top and bottom wing surface for cracks, wrinkles and loose or missing rivets.	After encountering turbulent air
	Inspect aileron, aileron tab and flaps for wrinkles or cracks.	
	Inspect Internal structure and fuel cells through access panel openings.	
	Inspect plumbing and wiring for security of attachment.	
5. Fuselage Nose Section	Check external skin surface for cracks, wrinkles and loose or missing rivets.	After encountering turbulent air
	Inspect area forward of windshield for evidence of structural deformation or failure.	
	Inspect avionics, antenna and components for security and attachment.	
6. Fuselage Center Section	Inspect external skin surface for cracks, wrinkles and loose or missing rivets.	After encountering turbulent air
7. Fuselage Aft Section	Inspect the entire length of the external skin surface for cracks, stress wrinkles and loose or missing rivets.	After encountering turbulent air
	Check the empennage surfaces for damage and freedom of movement. Inspect for skin wrinkles at the juncture of the fuselage and empennage. Check controls for freedom of movement.	
SECOND LEVEL		
NOTE Because G loading may be transmitted along one structural member to another, carefully inspect the surrounding and supporting structure in any damaged area found in the first level inspection.		
8. Wing Center Section	Remove floorboards and access panels and inspect the front and rear spar and keel structure for evidence of deformation or structural failure.	After encountering turbulent air
	Operational test plumbing, wiring, flaps, control cables, pulley mounts and any other system found in this area.	
9. Nacelles	Inspect areas surrounding the engine mounts.	After encountering turbulent air

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER ENCOUNTERING TURBULENT AIR *(Continued)*		
9. Nacelles *(Continued)*	Inspect internal structure for cracks or damage.	After encountering turbulent air
	Operational test plumbing and wiring.	
10. Wings	If there is evidence of damage to the fuel cells or fuel lines, remove the cells and inspect the fuel cell liners and liner support structure.	After encountering turbulent air
	Operational test the plumbing and wiring, flap actuator, aileron and tab mounting.	
11. Fuselage Nose Section	Remove the floorboards and inspect the keel structure and supporting members for damage.	After encountering turbulent air
	Examine any fixed equipment for loose, broken or cracked mountings.	
	Operational test the avionics, radar antenna, plumbing and wiring.	
12. Fuselage Center and Aft Section	Examine stringers, frames and sidewalls for deformation or structural failure.	After encountering turbulent air
	Examine heating and air conditioning ducts for damage.	
	Operational test plumbing and wiring.	
	Examine the control cables, pulley mountings and the cable clearance at areas the cables pass through the structures. Ensure a smooth, normal operation.	
13. Empennage	Inspect elevator push rods, torque tubes and bellcrank for damage.	After encountering turbulent air
	Inspect the attachment of the vertical stabilizer spars to the top of the fuselage for evidence of damage.	
	Inspect skin surfaces for condition and loose or missing rivets.	
	Check structure for cracks, loose or missing rivets and/or concealed damage.	
	Check rudder for freedom of movement and attachment.	
	Check elevator for freedom of movement and attachment.	

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER ENCOUNTERING TURBULENT AIR *(Continued)*		
13. Empennage *(Continued)*	Check trim tab actuators for smoothness of operation and attachment. Check the wiring of the electrical trim tab actuator for connection, security of attachment and condition. Check the electrical trim tab actuator for full travel and security of attachment.	After encountering turbulent air
REPAIR OF DAMAGE		
Due to the variety and degree of structural damage which may be involved, the best repair or replacement procedure must be based on the findings of the individual airplane. If the turbulent air inspection indicates that serious structural damage has occurred, contact the Customer Support Department, Raytheon Aircraft Company, Wichita Kansas, 67201 for assistance.		
LOG BOOK ENTRY		
Following a turbulent air inspection, an entry covering the extent of inspection, the damage and the repair (if applicable) must be noted in the airplane permanent records.		
INSPECTION AFTER LIGHTNING STRIKE		
1. Propeller	At times, the difficulty is not in inspecting the airplane, but in determining if a strike has taken place. Most times, an exit location will show which has caused damage to the components. The entry point is most often the propeller. A darkened area in the propeller tip may be noticeable after a lightning strike. A 3- to 5-power magnifier will show slag at the bottom of a "nick" in the propeller blade. If a strike is suspected, inspect deep nicks in the blade. Damage after a lightning strike should be corrected utilizing the applicable propeller manufacturer procedure. Blade overhaul must be accomplished by a certified propeller mechanic.	After lightning strike
	Whenever the propeller has been struck by light-After lightning strike, the propeller governors must be replaced or overhauled. Refer to Woodward Service Bulletin 33574 or subsequent revision.	
2. Engine	Inspect as instructed in the appropriate Engine Maintenance Manual. Refer to TCM SB M88-9.	After lightning strike

UNSCHEDULED MAINTENANCE CHECKS (CONTINUED)

ITEM	INSPECTION REQUIREMENT	INSPECTION INTERVAL
INSPECTION AFTER LIGHTNING STRIKE *(Continued)*		
3. Fuselage Empennage and Wing Surfaces	Carefully inspect the exterior of the airplane. Evidence of a strike will usually appear as a burned hole or as a series of burned holes in metallic surfaces. Plastic parts may be delaminated and/or deformed due to high internal pressures. Normally two or more points will be found, the entry and the exit points. Antennas are frequently an entry point of lightning and should be carefully inspected for evidence of arcing, sooting or pitting.	After lightning strike
	From point of entry, the strike usually spreads aft in a series of small holes or burn marks. After points of entry and exit are found, the structure between these points should be carefully inspected. Attention should be given to hinges and hinge pins for possible pitting. Cables, pulleys, bearings, bolts and all bonding jumpers in the area should be inspected for possible damage. Antennas and electrical and electronic equipment should be visually checked for damage and functionally checked for operation. If the strike was near the fuel vent, all plumbing should be carefully inspected for damage. Steel components may exhibit magnetism and require degaussing so as not to affect compass systems.	
ENGINE INSPECTION AFTER SUDDEN STOPPAGE		
1. Engine	Inspect as instructed in the appropriate Engine Maintenance Manual.	After sudden engine stoppage
2. Propeller Governor	The propeller governors should be overhauled or replaced as instructed in the suppliers manual.	After sudden engine stoppage
3. Propeller	Whenever the engine has a sudden stoppage, the propeller must be overhauled or replaced.	After sudden engine stoppage

CHAPTER

06

DIMENSIONS AND AREAS

CHAPTER 6

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6-EFFECTIVITY/CONTENTS	1	Nov 30/76
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CHAPTER 6 - DIMENSIONS AND AREAS

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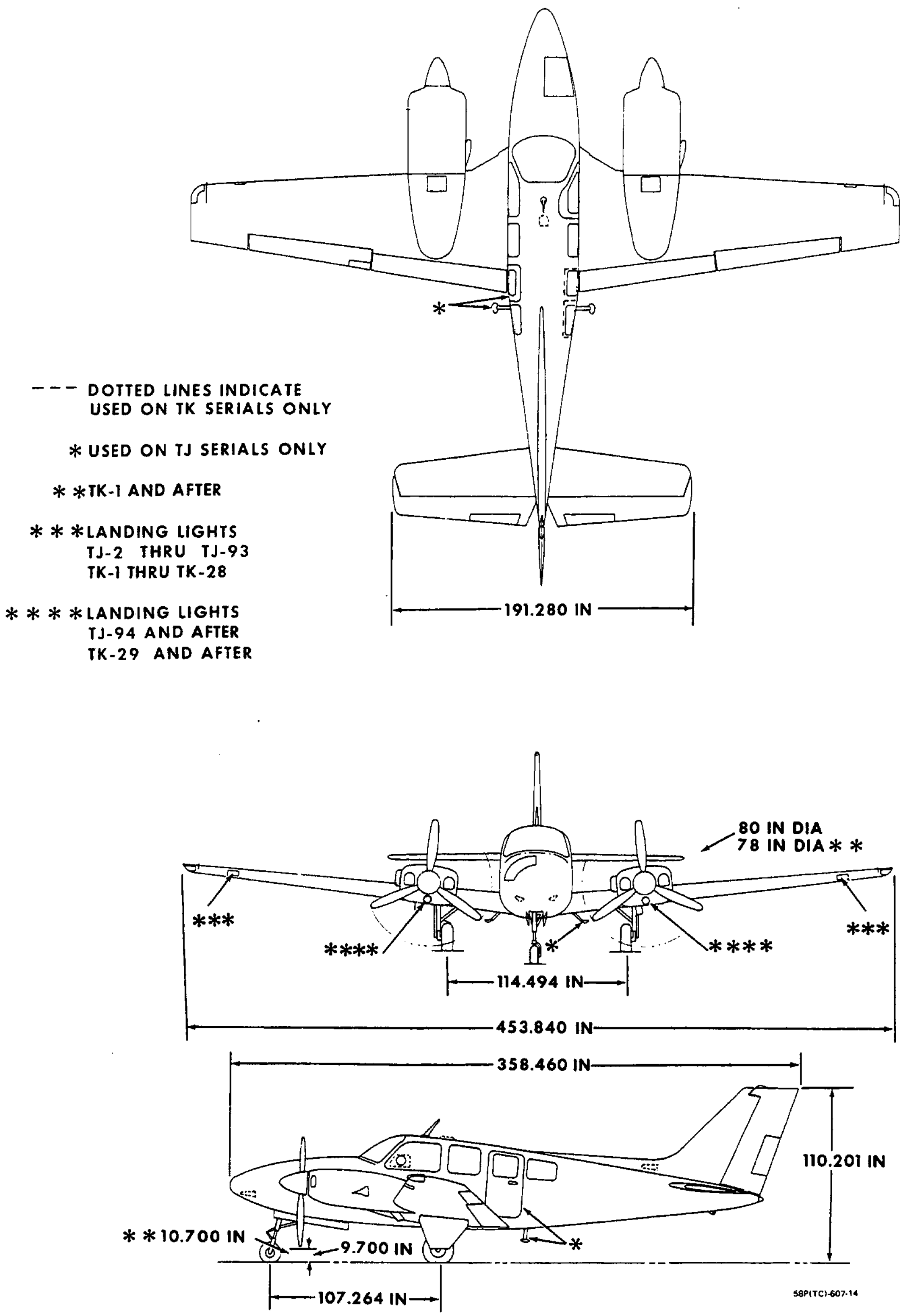
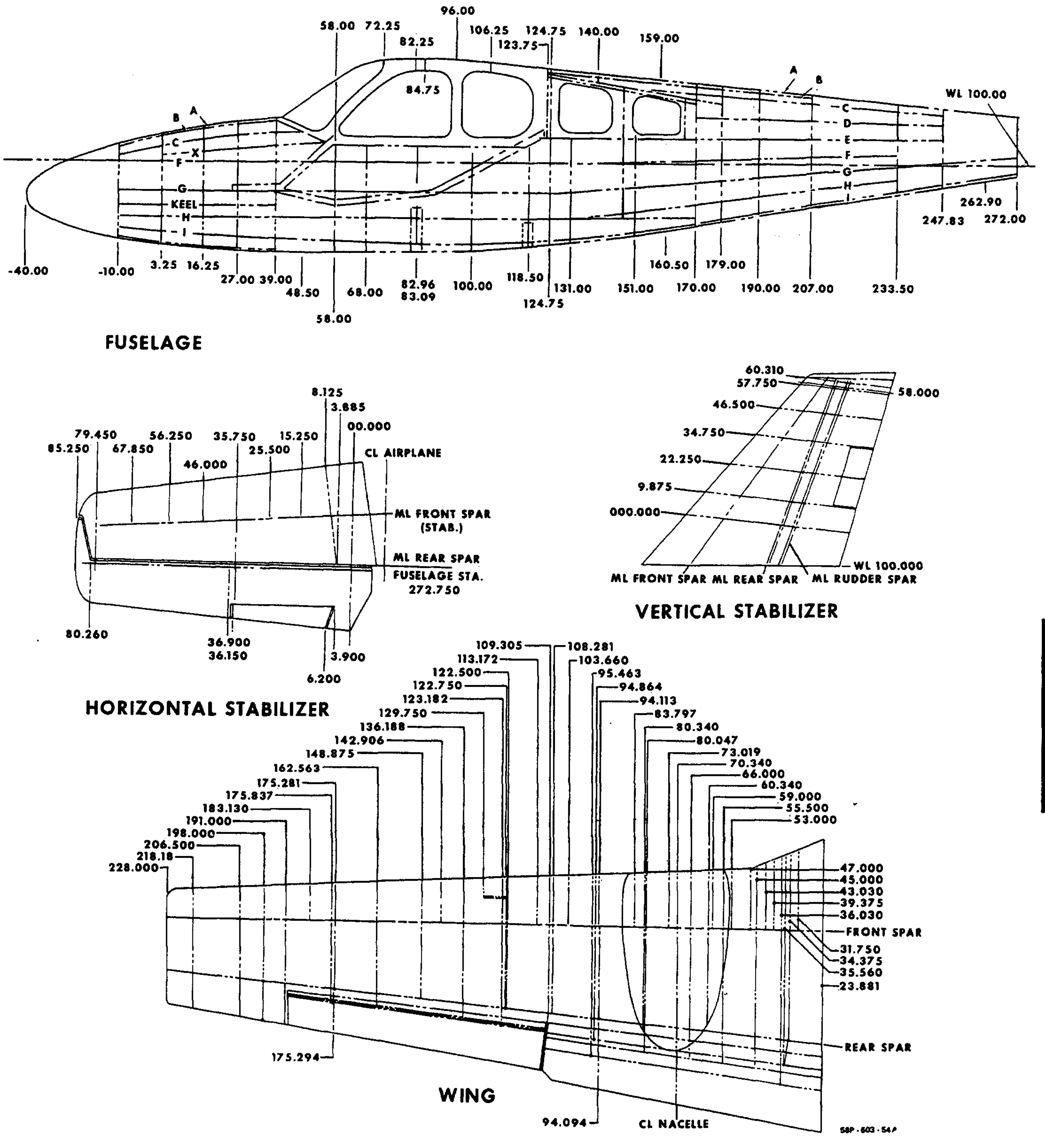


Aircraft Dimensions
Figure 1



Stations Diagram
Figure 2

"END"

CHAPTER

07

LIFTING AND SHORING

CHAPTER 7 - LIFTING AND SHORING

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CHAPTER 7

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7-EFFECTIVITY	1	May 22/87
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"END"

LIFTING AND SHORING - MAINTENANCE PRACTICES

JACKING

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 the jacks. Older versions of the Bonanza three point jack, which do not have a movable aft jacking adapter attach point, should not be used to jack Baron airplanes.

Jacking the airplane should only be accomplished with an enclosed building or hangar. Should it become necessary to jack the airplane in the open for any reason, the airplane should be secured to the jack. If tripod jacks are to be used, only one jack should be utilized at a time. For safety of personnel and the airplane, wind velocity in any direction must be considered prior to jacking the airplane in the open.

JACKING WITH MODEL 300 JACK (EQUIPPED WITH TRONAIR EXTENSION KIT)

Jacking procedures for a Model 300 jack equipped with a Tronair Extension Kit P/N 4013 are as follows:

WARNING

Do not exceed the structural limitations of the Model 300 jack. It is recommended that no airplane weighing over 5000 pounds be jacked on the Danair/Tronair Model 300 jack, and that a similar limitation be observed on older models of this jack. Make sure the safety bar is engaged at any time the airplane is raised on the jack. Do not move any airplane on a Model 300 jack.

a. Place a suitable weight on the tray at the rear of the jack extension - 500 pounds is recommended.

b. Screw the rear jack fitting or eyebolt adapter completely into the rear jack point.

c. Position the jack under the airplane up against the two forward jack points, and position the rear clevis plate for attachment of the rear fitting/eyebolt adapter.

d. Install the safety pin in the rear jack point fitting/eyebolt and clevis.

WARNING

The rear jackpoint eyebolt safety pin must be installed to reduce the possibility of the airplane nosing over on the jack.

CAUTION

Do not attach the rear support arm on the jack extension to the tail of the airplane at this time. Damage to the airplane and the jack could result if the jack is raised or lowered with the jack extension rear support arm attached to the tail of the airplane.

e. Raise the jack to the desired height and install the jack safety lock.

f. Attach the rear support arm to the tie down fitting in the tail of the airplane, securing the sliding tube to assure a stable attach point.

g. To lower the jack, disconnect the jack extension rear support arm from the airplane before removing the jack safety lock.

CAUTION

Never raise or lower the jack with the jack extension rear support arm attached to the airplane.

h. Remove the aft jack point fitting/eyebolt after removal of the Model 300 jack from under the airplane.

JACKING WITH MODEL 300 JACK (WITHOUT A TRONAIR EXTENSION KIT)

Jacking procedures for a Model 300 jack which has not been equipped with a Tronair Extension Kit:

WARNING

Do not exceed the structural limitations of the Model 300 jack. It is recommended that no airplane weighing over 5000 pounds be jacked on the Danair/Tronair Model 300 jack, and that a similar limitation be observed on older models of this jack. Make sure the safety bar is engaged at any time the airplane is raised on the jack. Do not move any airplane on a Model 300 jack.

a. Make sure a suitable weight is available to anchor the tail of the airplane to be jacked. The use of a tail tiedown device with suitable weight - 500 pounds - such as P/N 35-590021 embedded in a movable concrete filled barrel or equivalent.

b. Screw the rear jack fitting or eyebolt adapter completely into the rear jack point.

c. Position the jack under the airplane up against the two forward jack points, and position the rear clevis plate for attachment of the rear fitting/eyebolt adapter.

d. Install the safety pin in the rear jack point fitting/eyebolt and clevis.

WARNING

The rear jack point eyebolt safety pin must be installed to reduce the possibility of the airplane nosing over on the jack.

CAUTION

Do not attach the rear support weight to the tail of the airplane at this time.

e. Raise the jack to the desired height and install the jack safety lock.

f. Attach the rear support tube to the tiedown fitting in the tail of the airplane. Secure the adjustable sliding tube to assure a stable point for the airplane.

g. To lower the jack, disconnect the rear support tube from the airplane before removing the jack safety lock.

CAUTION

Never raise or lower an airplane on a Model 300 jack with a rear support tube/weight assembly attached.

h. Remove the aft jack point fitting/eyebolt after removal of the Model 300 jack from under the airplane.

JACKING WITH (2) TRIPOD JACKS, TRONAIR MODEL 100 OR EQUIVALENT

a. Attach a suitable weight to anchor the tail of the airplane to be jacked. P/N 35-590021 embedded in a movable concrete filled barrel or equivalent may be used.

b. Position the two tripod jacks under the forward jack points. Assure proper clearance from all movable components such as gear assemblies and gear doors.

c. Simultaneously jack both jacks to assure a level jacking action until the required clearance is obtained for normal gear operation of both the nose and main gears.

d. Make sure the jack safety locks are engaged immediately after jacking.

e. To lower the airplane, disengage the jack safety locks and simultaneously lower both jacks.

f. Remove the rear weight assembly after removing the two tripod jacks and before moving the airplane.

"END"

CHAPTER

08

LEVELING AND WEIGHING

CHAPTER 8

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CHAPTER 8 - LEVELING AND WEIGHING

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"END"

GENERAL - MAINTENANCE PRACTICES

LEVELING

The aircraft may be leveled longitudinally as follows:

a. Remove the phillips head screw from the upper level point, located just aft of the cabin door.

b. Install a screw, approximately three inches long, in the upper level point nutplate.

c. Attach a cord and plumb bob to the outboard end of the screw installed in step "b".

d. Inflate or deflate the nose gear shock strut as necessary to pass the cord through the center of a second level point directly below.

NOTE

Suspending the plumb bob in a can of light engine oil will assist in stabilizing it.

Lateral leveling is accomplished by placing a bubble level on the rear spar and deflating the tire or shock strut on the high side of the aircraft to center the bubble.

"END"

CHAPTER

09

TOWING AND TAXIING

CHAPTER 9 - TOWING AND TAXIING

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9-EFFECTIVITY	1	May 22/87
9-CONTENTS	1	May 22/87
9-00-00	201	May 22/87

"END"

TOWING AND TAXIING - MAINTENANCE PRACTICES

GROUND HANDLING

Exercise care in ground handling of the airplane to avoid unnecessary damage. The following procedures are provided to reduce the possibility of ground damage.

TOWING

Attach the hand towbar to the two lugs on the nose gear lower torque knee.

CAUTION

Do not push on propeller or control surfaces. Do not place any weight on the horizontal stabilizers to raise the nose wheel off the ground. When towing, observe turn limits to prevent damage to the nose gear. When removing the tow bar, use care to avoid damaging the grease fittings. DO NOT attempt to tow the airplane backward by the tail tiedown lug.

CAUTION

Never tow or taxi with a flat strut. Even brief towing or taxiing with a deflated strut can cause severe damage.

"END"

CHAPTER

10

PARKING, MOORING, STORAGE, RTN TO SVC.

CHAPTER 10

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CHAPTER 10 - PARKING AND MOORING

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Preparation for Service		201
Temporary Storage - 31 to 90 Days		201
Preparation for Service		202
Indefinite Storage		202
Preparation for Service		203

"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 brake master cylinders.

MOORING

Three mooring eyes are provided; one in each wing and one on the lower aft fuselage. To moore the airplane, chock the wheels fore and aft, install the control lock and tie down the aircraft with a nylon line or chain of sufficient strength at each mooring eye. Avoid overtightening the rear line, which pulls the nose up so that wind will create higher lift on the wings. If bad weather is anticipated, it is advisable to nose the airplane into the wind.

NOTE

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

"END"

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 to

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 (3, Chart 207, 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 and cylinder temperatures.

c. Fuel Cells. Fill fuel cells to capacity to minimize fuel vapor and protect cell inner liners.

d. Flight Control Surfaces. Lock flight control surfaces with internal and external locks.
e. Grounding. Static ground airplane securely and effectively.
f. Pitot Tubes. Install pitot tube covers.
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. If the engines have a total time of more than 25 hours, the MIL-C-6529 oil (3, Chart 207, 91-00-00) shall be drained after a ground warm-up. Fill with engine oil (2, Chart 207, 91-00-00) before flight. It should be noted that MIL-C-6529 TYPE II oil (3, Chart 207, 91-00-00) is the TCM (Teledyne Continental Motors) recommended break-in oil for the first 25 hours of 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 attach. 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 (3, Chart 207, 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 (54, Chart 207, 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 (54, Chart 207, 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 and protect cell inner liners.

d. Flight Control Surfaces. Lock with internal and external locks.

e. Grounding. Static ground airplane securely and effectively.

f. Pitot Tubes. Install covers.

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. If the engines have a total time of more than 25 hours, the MIL-C-6529 oil (3, Chart 207, 91-00-00) shall be drained after a ground warm-up. Install engine oil (2, Chart 207, 91-00-00) before flight. It should be noted that MIL-C-6529 oil is the TCM recommended break-in oil for the first 25 hours of 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 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 with MIL-C-6529 TYPE II oil (3, Chart 207, 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 (54, Chart 207, 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 by inserting and clamping in palce.

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 cylindres, 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.
2. Flush, spray or rub a thin coating of light engine oil on inner liners of all fuel cells which have contained gasoline.
3. After 24 hours remove cells and store according to standard practices. Do not remove or handle fuel cells until 24 hours after oil has been applied.

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 (43, Chart 207, 91-00-00).
2. Lock with internal and external locks.

h. Pitot Tubes.

1. Apply a thin coating of grease, MIL-G-10924 (55, Chart 207, 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 (26, Chart 207, 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 (56, Chart 207, 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. Wing Flap Tracks and Rollers.

1. Coat with corrosion preventive compound (43, Chart 207, 91-00-00).
2. Place flaps in retracted position.

l. 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.

m. Instrument Panel. Cover with barrier material and secure with tape.
n. Seats. Install protective covers.
o. Landing Lights. Cover with barrier material and secure with tape.
p. Stall Warning Unit.

1. Remove and store according to standard practices.
2. Tape connections.

q. Loose Tools and Equipment. Remove loose tools and equipment and store in a dry temperate room.
r. Airframe. Cover static ports and all openings with barrier material and secure with tape to exclude rain, sun and foreign matter.
s. Avionics. Clean and cover any equipment sensitive to dust or moisture and take any additional precautions recommended by the manufacturer of such equipment.
t. 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 If the engines have a total time of more than 25 hours, the MIL-C-6529 oil (3, Chart 207, 91-00-00) shall be drained after a ground warm-up. Install engine oil (2, Chart 207, 91-00-00) before flight. It should be noted that MIL-C-6529 oil is the TCM recommended break-in oil for the first 25 hours of flight.

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

e. Reinstall the spark plugs, battery and rotate propellers by hand through all compressions of the engines to check for liquid lock. Reinstall cowling and start engines in the normal manner.

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

"END"

CHAPTER

11

PLACARDS AND MARKINGS

CHAPTER 11

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CHAPTER 11 - PLACARDS & MARKINGS

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EXTERIOR PLACARDS AND MARKINGS		
Description and Operation	11-20-00	1

"END"

GENERAL - DESCRIPTION AND OPERATION

FAA REQUIRED PLACARDS AND MARKINGS

NOTE

Any time an airplane is repainted, inspect all placards to assure that they are not covered with paint, are easily readable, and are securely attached.

All required interior placards and markings are listed in the Limitations of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. Refer to Section II of the applicable Pilot's Operating Handbook for these placards and markings.

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 placard identifies the airplane by its model number and serial number. Should a question arise concerning the care of this airplane, it is important to include the airplane serial number in any correspondence to Beech Aircraft Corporation.

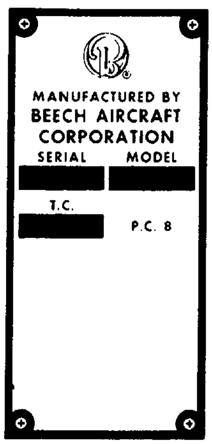
"END"

EXTERIOR PLACARDS AND MARKINGS - DESCRIPTION AND OPERATION

Shown in this Chapter are exterior placards and markings, which are essential for good maintenance practices, followed by location description of each.

STATIC AIR.
KEEP CLEAN

Located on the right aft fuselage adjacent to the static air button.

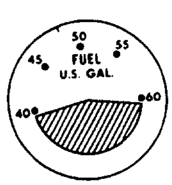


The model designation placard is located on the RH fuselage adjacent to the inboard end of the flap.

TIE DOWN

(3 Places)
Located adjacent to the tie downs on the lower side of each wing and on the tail.

FUEL SIGHT GAGE



(2 Places)
Located adjacent to fuel sight gage on top of each wing.

OIL

Located on the outside of each oil filler door on the top of each nacelle.

STATIC
DRAINS

Located adjacent to the static drains in the belly of the fuselage below the aft cabin door.

LEVEL POINT

Located on the right side of the fuselage at FS 151.00 (2 places).

OIL
USE SAE 50 ABOVE 40° F
USE SAE 30 BELOW 40° F

Installed on the underside of the oil filler door assembly, visible when the door is open.

CAUTION
MAGNETO IS NOT INTERNALLY GROUNDED. CONSULT OWNERS MANUAL BEFORE DISCONNECT-ING.

(4 Places)
Inboard and outboard cowl door.
Visible when the cowl doors are open.

FUEL STRAINER
DRAIN DAILY

(2 Places)
RH and LH bottom nacelles

58P-600-18

FUEL CELL SUMP
DRAIN DAILY

(4 Places)
2 places on the bottom of each center section.

IMPORTANT
INSTALL DOOR
LINK ROD BOLT
WITH HEAD AFT.

(2 Places)
On outboard of root rib in each wheelwell.

EMERGENCY LOCATOR TRANSMITTER
SWITCH

XMIT-ARM

FOR AVIATION EMERGENCY USE ONLY.
UNLICENSED OPERATION UNLAWFUL.
OPERATION IN VIOLATION OF FCC
RULES SUBJECT TO FINE OR LICENSE
REVOCATION.

Located on the RH fuselage just forward and below the RH elevator (TJ-3 thru TJ-271, TK-1 thru TK-121).

EMERGENCY LOCATOR TRANSMITTER
SWITCH

ARM—OFF—ON

FOR AVIATION EMERGENCY USE ONLY.
UNLICENSED OPERATION UNLAWFUL.
OPERATION IN VIOLATION OF FCC
RULES SUBJECT TO FINE OR LICENSE
REVOCATION.

Located on the RH fuselage just forward and below the RH elevator (TJ-272 and after, TK-122 and after and earlier airplanes equipped with Kit No. 101-3046-1).

EMERGENCY LOCATOR TRANSMITTER
SWITCH

REARM•ARM•XMIT

FOR AVIATION EMERGENCY USE ONLY.
UNLICENSED OPERATION UNLAWFUL.
OPERATION IN VIOLATION OF FCC
RULES SUBJECT TO FINE OR LICENSE
REVOCATION.

Located on the RH fuselage just forward and below the RH elevator (Airplanes equipped with Kit No. 101-3039-1).

JACK PAD

JACK ATTACH POINT

CAUTION
DO NOT PLACE AIRCRAFT ON JACKS
WITH UNBALANCED LEFT TO RIGHT
FUEL LOADS

Located adjacent to the main wheelwells.

PUSH BUTTON
AND TURN HANDLE
TO OPEN

Located adjacent to the door handle on the forward cabin door.

58P-600-16

Beechcraft®
OIL AIR STRUT
PART NO. 60-810012-14
BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS, U.S.A.

INSTRUCTIONS
TO CHECK FLUID AND FILL

REMOVE VALVE CAP, DEPRESS VALVE CORE AND ALLOW STRUT TO FULLY COMPRESS. REMOVE VALVE BODY ASSEMBLY AND FILL WITH HYDRAULIC OIL CONFORMING TO INSTRUCTION MANUAL SPECIFICATIONS. SLOWLY CYCLE STRUT. REPEAT UNTIL ADDITIONAL OIL CAN NOT BE ADDED. REPLACE VALVE BODY.
WITH AIRPLANE EMPTY EXCEPT FOR FULL FUEL AND OIL KEEP STRUT INFLATED TO 3 INCHES OF PISTON SHOWING.

WARNING
RELEASE AIR IN STRUT BEFORE DISASSEMBLING

Located on each main landing gear strut.

Beechcraft®
OIL AIR STRUT
PART NO. 60-820020-1
BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS, USA

INSTRUCTIONS
TO CHECK FLUID AND FILL

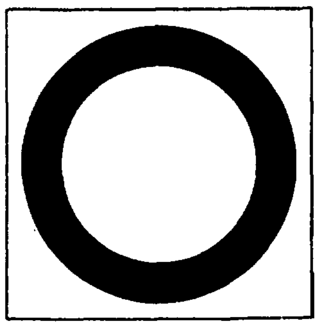
REMOVE VALVE CAP, DEPRESS VALVE CORE AND ALLOW STRUT TO FULLY COMPRESS. REMOVE VALVE BODY ASSEMBLY AND FILL WITH HYDRAULIC OIL CONFORMING TO INSTRUCTION MANUAL SPECIFICATIONS. SLOWLY EXTEND AND COMPLETELY COMPRESS STRUT TO RELEASE EXCESS AIR AND OIL. REPEAT UNTIL NO MORE OIL CAN BE ADDED.
WITH AIRPLANE EMPTY EXCEPT FOR FULL FUEL AND OIL KEEP STRUT INFLATED TO 3 1/2 TO 3 3/4 INCHES OF PISTON SHOWING.

WARNING
RELEASE AIR IN STRUT BEFORE DISASSEMBLING

BUILT UNDER ONE OR MORE OF THE FOLLOWING BEECH PATENTS: 2368137, 2412885, OR 2470616; OTHER PATENTS PENDING. 96-820032

Located on the nose landing gear strut.

FUEL
DEPRESS FLAPPER
CHECK QUANTITY & SECURE CAP



FUEL
98.0 US GAL CAPACITY
(95.0 US GAL USABLE)

FUEL
DEPRESS FLAPPER
CHECK QUANTITY & SECURE CAP
CAUTION
DO NOT INSERT FUEL NOZZLE MORE THAN 3" INTO TANK
USE 100/130 OCTANE FUEL ONLY

USE #38680 FUEL FILLER CAP ONLY THIS LOCATION
FASTEN LANYARD TO BOLT IN ANTI-SIPHON ASSY
DO NOT USE METAL "CLOTHESPIN"

CAUTION
DO NOT INSERT FUEL NOZZLE MORE THAN 3" INTO TANK

- INTERCONNECTED TANKS -
CHECK OUTBD FUEL LEVEL FIRST

USE 100/130 OCTANE FUEL ONLY

FUEL
86 US GAL.
(83 USABLE)

FUEL
86 US GAL.
(83 USABLE)
CAUTION
DO NOT FILL ABOVE "FULL" INDICATOR MARK

Typical fuel placards located on the top of each wing adjacent to the fuel filler caps.

58P-600-17

IMPORTANT
INSTALL UPLOCK CABLE ATTACH BOLT WITH HEAD AFT

USE ONLY 60-810082-3 SHEAR PIN WITH THIS ROD ASSEMBLY

HEAT TREATED ASSEMBLY

(2 Places)
Visible through the main wheelwell and are located on the retract rods on the right and left sides.

TURN LEVER AND HANDLE TO OPEN

Located adjacent to the door handle on the aft cabin door.

CAUTION
BE SURE ALL ELECTRICAL POWER IS OFF BEFORE REMOVAL OR INSTALLATION OF THIS ACCESS COVER

Located on the top of the left nacelle.

EXTERNAL POWER 24 VOLT

Located on the outboard of the left nacelle.

58P-15-9

Located on the left wing near the four wing attach bolts, and on the right wing near the two lower attach bolts. Also located on the right fuselage near the two upper wing attach bolts.

NOTICE
WING BOLTS ARE LUBRICATED SEE MAINTENANCE MANUAL FOR CORRECT TORQUE VALUES

33-15-27

Effective at Serials TJ-350 and after, TK-140 and after.

"END"

CHAPTER

12

SERVICING

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 overhaul procedures for components of a system refer to the BEECHCRAFT Baron 58P/Baron 58TC Manufactured Components Maintenance Manual, P/N 102-590000-21A3 or subsequent. For electrical wiring diagrams refer to the BEECHCRAFT Baron 58P/Baron 58TC Wiring Diagram Manual, P/N 102-590000-23C1 or subsequent. For airplane serials TK-57 and after, refer to the BEECHCRAFT Baron 58TC Wiring Diagram Manual, P/N 102-590000-13 or subsequent.

"END"

REPLENISHING - MAINTENANCE PRACTICES

FILLING THE FUEL CELLS

CAUTION

When inserting or removing the fuel nozzle, use extreme care to prevent the fuel hose from rubbing against the deicer boot. Also, do not allow fuel to contact the deicer boot.

The fuel system installation consists of an inboard leading edge fuel cell, box section fuel cell and an outboard leading edge fuel cell in each wing. On airplane serials TJ-24 and after, an optional wet wing tip may be installed. The fuel cells in each wing are interconnected in order to make all of the usable fuel from each wing available to its engine when the fuel selector valve is turned ON. A fuel sight gage is provided outboard of the nacelle on the top of each wing. The interconnecting fuel cells are serviced through the single filler in each wing or the filler in each of the optional wet wing tips, providing single point filling for each side. The combined capacity of the standard system is 172 gallons, 166 gallons usable. The combined capacity of the optional system is 196 gallons, 190 usable.

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

a. Service the fuel cells with 100/130 octane fuel, or if not available, use 115/145 octane fuel (1, Chart 202, 12-20-00.

b. Make sure the airplane is statically grounded to the servicing unit.

c. Do not fill fuel cells 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 rubber fuel cell.

DRAINING THE FUEL SYSTEM

To ensure that all fuel is removed from the system, the fuel should be drained through the boost pumps. To expedite the defueling operation, the boost 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 airplane electrical system.

b. Place the fuel selector valve in the "ON" position and the mixture lever in "IDLE CUT-OFF".

c. Remove the filler caps to vent the system.

d. Disconnect the fuel line at the firewall and attach a drain hose. Provide a suitable container for the fuel.

e. Energize the boost pumps.

f. When fuel is no longer pumped from the airplane open the sump drains to complete the defueling operation.

ENGINE FUEL FILTERS AND SCREENS

Most fuel injection 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 strainers should be inspected and cleaned every 100 hours. 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.

Open each of the seven snap-type fuel drains daily to allow condensed moisture to drain from the system.

NOTE

If the cells are to remain unfilled for 10 days or more, apply a thin coating of light engine oil to the inside surface of the cell to prevent deterioration and cracking.

OIL SYSTEM

The engines are equipped with a wet sump, pressure type, oil system. Each engine sump has a capacity of 12 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 and oil filter should be changed every 50 hours under normal operating conditions. The oil drain is accessible through the cowl flap opening and the oil filter is accessible through the LH cowl access door. The engines should be warmed to operating temperature to assure complete draining of the oil. Also, remove the lower oil line at the bottom of the turbocharger air/oil separator to completely drain the oil system.

The engine manufacturer recommends the use of ashless dispersant oil. In order to promote faster ring seating and oil control, a straight mineral oil may be used for the first change period or until oil consumption stabilizes. Dispersant oils must meet Teledyne Continental Motors Corporation Specifications MHS-24A (2, Chart 202, 12-20-00).

Moisture that may have condensed and settled in the oil sump should be drained occasionally by opening the oil drain plug and allowing a small amount of oil to escape. This is particularly important in winter when the moisture will collect rapidly and may freeze.

CHANGING THE OIL FILTER

The oil filter should be replaced every 50 hours as described in OIL FILTER REMOVAL.

OIL FILTER REMOVAL

a. Gain access to the oil filter through the LH engine cowl access opening.

b. Loosen the spin-off filter and remove filter.

OIL FILTER INSTALLATION

a. Position the new filter on the engine mounting.

b. Torque the oil filter to 15-18 foot-pounds.

c. Secure the engine cowling access panels.

AIR CONDITIONING SYSTEM

Servicing the air conditioning system consists of periodically checking the refrigerant level, checking compressor oil level, checking the compressor belt tension, and changing the system air filter. Recharge the system as outlined under CHARGING THE AIR CONDITIONING SYSTEM whenever the refrigerant level is low, air has entered the system, or components carrying refrigerant are replaced. Refrigerant leaks may be detected by inspection with a flameless leak detector.

CHARGING THE AIR CONDITIONING SYSTEM

When working on a refrigerant air cooling system, observe the following special servicing precautions:

a. Remember, this is a high presssure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

b. Whenever a line is disconnected, purge the entire system with a vacuum pump operating at the 125 micron level.

c. Use only refrigerant (17, Chart 202, 12-20-00); other refrigerants, particularly those containing methyl chloride, will cause rapid deterioration of the aluminum compressor components. When servicing the system with refrigerant, avoid smoking or working near an open flame. Refrigerant passing over an open flame will produce a highly toxic phosgene gas.

d. Hook the service unit to the connections located under the copilot's seat. When charging a completely purged system, charge with 53 to 56 ounces of refrigerant (TJ-3 and after) or 48 ounces of

(TJ-3 and after) or 48 ounces of refrigerant (TK-1 and after). After charging, the sight glass should be observed for bubbles or a milky appearance caused by an insufficient refrigerant level. If it is necessary to add refrigerant to a partially charged system, add refrigerant slowly until a satisfactory condition is observed through the sight glass; then add an additional 1/4 to 1/2 pound of refrigerant.

CHECKING COMPRESSOR OIL LEVEL

NOTE

New compressors are delivered with 7 ounces of oil. Charge the system with an additional 6-8 ounces of oil (TJ-3 and after) or 4-5 ounces of oil (TK-1 and after) when installing a new compressor.

The air conditioner compressor oil level should be checked by a qualified air conditioner service man if the refrigerant charge is lost (evidenced by oil loss). The air conditioner system requires 13-15 ounces of 500 viscosity oil (TJ-3 and after) or 11-12 ounces of 500 viscosity oil (TK-1 and after)(18, Chart 202, 12-20-00) to maintain 4 ounces in the compressor.

Check the compressor oil level as follows:

a. Fabricate a dipstick by bending a wire to a 90° angle so that 1-1/2 inches of the wire will insert into the compressor.

b. Paint the dipstick with a flat black paint. Allow sufficient time for the paint to dry.

c. Start the engines in accordance with the applicable Pilot's Operating Manual and run the air conditioning system for 15 minutes with the engines running at low rpm to allow oil to accumulate in the compressor. Observe the engine operating limitations as noted in the applicable Pilot's Operating Manual. Shut down the engine in accordance with the applicable Pilot's Operating Manual.

d. Relieve the air conditioner system pressure by loosening the compressor filler plug just enough to bleed off pressure slowly.

e. After the system pressure is relieved, remove the oil filler plug.

f. Insert the dipstick through the oil filler port, slowly rotate the clutch shaft until the dipstick will insert to the bottom of the compressor.

g. Withdraw the dipstick, oil should register on the dipstick between 3/8 to 1-1/4 inches below the filler port. Add oil as necessary, refer to Chart 201, CHECKING COMPRESSOR OIL LEVEL.

NOTE

If 4 ounces of oil has to be added, proceed with steps "h" through "i" and then repeat the entire procedure beginning with step "c". If the compressor will not hold the entire system as described in step "h" and charge the system with the remainder of the oil at the service port beneath the copilot's seat.

h. Install the oil filler plug with O-ring and secure plug.

NOTE

Make sure that the O-ring is not twisted and that no dirt or particles are on the O-ring seat. The plug should be snug. Do not overtighten the plug.

i. Charge the air conditioning system as noted in CHARGING THE AIR CONDITIONING SYSTEM.

j. Check the area around the filler plug for leaks. If leaks exist, do not overtighten the filler plug. Remove the plug as noted in step "d" and install a new O-ring. Secure the plug and recharge the system as noted in steps "h" and "i".

CHART 201
CHECKING COMPRESSOR OIL LEVEL

Oil Level Below Filler Port (In.)	Oil To Be Added (Oz.)
1.25 to 1.40	4.0
1.40 to 1.50	8.0

COMPRESSOR BELT TENSION ADJUSTMENT

When installing a new belt, the idler pulley bracket bolt should be adjusted so that a tension reading of 110 to 120 pounds belt tension (as shown on a V-belt tension gage) is obtained.

After 36 to 48 hours operating time, a new belt will stretch to its normal operating length. The belt tension should be checked at this time and adjusted (by torquing the adjustment bolt on the idler pulley bracket) so that a belt tension gage, placed at a point midway between the idler pulley and the compressor will register a belt tension of 70 to 90 pounds. If no gage is available, adjust until the belt registers 0.13 inch deflection when a 6.38 pound load is applied. After adjusting the belt tension, be sure the belt has ample clearance on all sides.

PRESSURIZATION SYSTEM (TJ-3 AND AFTER)

CLEANING THE OUTFLOW AND SAFETY VALVE FILTERS AND SEATS

The outflow and safety valve filters and seats must be cleaned every 100 hours. The outflow and safety valve filters are to be replaced every 500 hours. For cleaning and replacement instructions, refer to AiResearch Operation and Maintenance Instructions Manual, Report No. 4-267.

HEATING SYSTEM

If the spark plug appears to be in good condition, except for a light 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 facilitate cleaning. Plug the ceramic insert cavity at the terminal end of the plug with a piece paper or cloth to keep out any of the cleaning sand. Wipe this cavity out thoroughly with a cloth, wet with trichlorethylene. 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 202, 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 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.

The heater backfire trap filter should be vacuum cleaned at approximately every 25 hours of heater operation.

BRAKE SYSTEM

Brake system servicing is limited primarily to maintaining the hydraulic fluid level in the reservoir. The brake fluid reservoir is accessible through the forward baggage door. Fill the hydraulic fluid reservoir with MIL-H-5606 hydraulic fluid (13, Chart 202, 12-20-00) to the full mark on the dipstick. Maintain fluid level between "full" and "add" marks. Do not overfill.

OXYGEN SYSTEM

CAUTION

All persons handling and servicing oxygen systems should review proper precautions to be observed during servicing. FAA Advisory

Circular 43.13-1A contains the necessary information.

The oxygen system consists of a supply cylinder, with the regulator mounted on the top of the cylinder, a push-pull control knob, a supply pressure gage and oxygen outlets.

To charge the oxygen system, gain access to the oxygen supply cylinder. (The cylinder is located beneath the pilot's seat on TJ-3 through TJ-85, except TJ-82, and on TJ-82 and TJ-86 and after, in the aft fuselage. On TK-1 thru TK-84, the cylinder is located in the nose baggage compartment; on TK-85 and after, it is located in the aft fuselage.) Connect the oxygen recharge service cart to the service port of the regulator.

WARNING

Keep fires, cigarettes and sparks away when outlets are in use. Inspect the filler connection for cleanliness before attaching it to the filler port. Keep tools, hands and components clean, as fire or explosion may occur when pure oxygen under pressure comes in contact with organic material such as grease or oil.

When filling the oxygen system, use only MIL-O-27210 Aviator's Breathing Oxygen(19, Chart 207, 91-00-00). To prevent overheating, fill the oxygen system slowly by adjusting the recharging rate with the pressure regulating valve on the cart. The oxygen cylinder should be filled to a pressure of 1800 ±50 psi at a temperature of 70°F, increased by 3.5 psi for each degree above 70°F, or decreased by 3.5 psi for each degree below 70°F. When the oxygen system is properly charged, disconnect the hose from the filler port and replace the protective cap. If at any time, in the process of servicing or purging the system or replacing the oxygen cylinder, it becomes necessary to disconnet a fitting, the threads should be treated with MIL-T-27730 tetrafluorethylene tape (Chart 201, 12-20-00). The system should then be checked for leaks with MIL-L-25567 leak testing compound (14, Chart 207, 91-00-00). After testing, if no leaks are found, wipe the sytem clean and dry.

WARNING

Do not use oxygen intended for medical purposes, or such industrial use as welding. Such oxygen may contain moisture that could freeze the valves and lines of the oxygen system.

"END"

SCHEDULED SERVICING - MAINTENANCE PRACTICES

TIRES

The main wheel tires are 19.5 x 6.75-8, 10 ply rated, tube type. The nose wheel tire is a 5 x 5.00, 6 ply, tube type.

Inflate the nose wheel tire to 47-50 psi, and the main wheel tires to 76-82 psi, if necessary to comply with runway landing restrictions, main gear tire pressure may be reduced to 65 psi. Maintaining recommeded 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.

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.

While Beech Aircraft Corporation cannot recommend recaped tires, tires retreaded by an FAA approved repair station with a specialized service limitation rating for TSO-C62c may be used.

EXTERNAL POWER

The airplane electrical system is protected against damage from reverse polarity by a relay and diodes in the external power circuit. The external power receptacle is located just inboard of the left engine nacelle. The external power receptacle is designed for a standard AN type plug. To supply power for ground checks and for ground power unit assist engine starts, a ground power unit capable of supplying a continuous load of 300 amperes at 24-30 volts is required. Use of an inadequate ground power unit can cause voltage below the drop-out voltage of the starter relay, resulting in relay chatter and welded contacts. By the same token, a maximum continuous load in excess of 350 amperes will damage the external power relay and power cables of the airplane. Observe the following precautions when using an external power source:

a. Use only an auxiliary power source that is negatively grounded. If the polarity of the power is unknown, determine the polarity with a voltmeter before connecting the unit to the airplane.

b. Before connecting the external power unit, turn OFF all radio equipment and alternator switches, but leave the battery master switch ON to protect transistorized equipment against transient voltage spikes.

CAUTION

When the battery switch is turned off for extended ground power operation, place an external battery in parallel with the output of the external power unit before operating any transistorized avionics equipment.

c. If the ground power unit does not have a standard AN plug, check the polarity of the plug. The positive lead from the ground power unit must connect to the center post, the negative lead must connect to the front post and positive voltage of 24-28 vdc must be applied to the small polarizing pin of the airplane's external power receptacle.

BATTERY

Two 25 ampere-hour, 12-volt, lead-acid batteries connected in series are installed in the airplane, supplying a total system capacity of 24 volts. Access to the lead-acid batteries is obtained by removing the battery box cover in the floor of the forward baggage compartment. The battery box is vented overboard to dispose of the electrolyte and hydrogen gas fumes discharged during normal charging operation.

CAUTION

The use of an external ground power source is recommended for ground operation requiring battery drain and starting the airplane during cold weather.

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

a. The battery should be removed from the airplane for servicing.

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 exceed the intervals if justified. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

DEICE BOOTS

Since the deicer boots and related components operate on clean air supplied from the pressure manifold, little is required in the form of servicing the system. The boot surface should be checked for engine oil after servicing the airplane and at the end of each flight. Oil found on the boot surface should be removed. This can be accomplished by the use of a neutral soap and water solution. Care should be exercised to avoid scrubbing the surface of the boot as this will tend to remove the special conductive surfacing.

NOTE

Because the deicer boots are made of soft flexible stock, care must be exercised against dragging gasoline hoses over them or resting ladders or platforms against the surface of the boots.

SHOCK STRUTS

CAUTION

Never tow or taxi with a flat strut. Even brief towing or taxiing with a deflated strut can cause severe damage.

The shock struts are filled with compressed air and MIL-H-5606 hydraulic fluid (13, Chart 202, 12-20-00). The same procedure is used for servicing both the 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.

CAUTION

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 personel or property damage.

b. Remove the air valve assembly. Compress the strut and fill, through the air valve assembly hole, with MIL-H-5606 hydraulic fluid (13, Chart 202, 12-20-00) (approximately one pint) until the fluid overflows.

c. Cycle the strut (full extension to compressed) and refill. Repeat until fluid cannot be added to the strut in the compressed position.

NOTE

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

d. Install the air valve assembly.

e. With the airplane resting on the ground and the fuel cells full; inflate the nose gear strut until 4.31 inches of the piston is exposed. Rock the airplane gently to prevent possible binding of the piston in the barrel while inflating.

NOTE

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 occurring to the propellers. Exercise caution when taxiing over rough surfaces.

f. The shock strut piston must be clean. Remove foreign material by wiping the strut with a cloth dampened in hydraulic fluid.

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 length will be approximately 1/4 inch greater.

When the shimmy damper is full, the insertion depth is 2-3/16 inches. The empty reading is 3-1/16 inches. To add MIL-H-5606 hydraulic fluid (13, Chart 202, 12-20-00), remove the shimmy damper and proceed as follows:

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

b. Remove the internal 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. (13, Chart 202, 12-20-00).

e. Slowly actuate the piston rod, allowing the fluid to flow into the clevis and 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 the shimmy damper.

PROPELLER BLADE BEARING LUBRICATION

NOTE

Although McCauley propellers require no lubrication between overhauls, Hartzell propellers require periodic lubrication as follows:

a. Remove the propeller spinner.

b. Remove the safety wire and covers from the grease zerks.

c. Remove one zerk from each blade.

d. Lubricate by placing the grease gun fitting on one zerk of each blade and filling until the grease is visible from the zerk opening on the opposite side of the blade.

e. Clean the excess grease from the propeller, install the grease zerks, covers and safety wire on each blade.

f. Reinstall the spinner

PROPELLER SERVICING POINTS (HARTZELL)

NOTE

It is recommended that airplanes not equipped with the feather-assist spring assembly be modified to add the spring backup kit in accordance with the Hartzell Propeller Overhaul Instruction Handbook, Manual 117D or subsequent. This kit should be installed at the earliest convenient time of the owner, but no later than the next 1400 hour overhaul. Propellers not having the feather-assist spring are PHC-J3YF-2F/FC8468-6R and PHC-J3YF-2F/FC7663DR.

a. Remove the access cap from the propeller spinner to expose the filler valve.

b. On airplane serials TJ-3 through TJ-443, except TJ436, with PHC-J3YF/FC8468-6R propeller assemblies, charge the propeller air dome cylinder with dry air or nitrogen to 100 ±2 psi at 70°F.

NOTE

Increase the pressure an additional 2 psi for every 10 degrees increase in temperature; similarly, for every 10 degrees drop in temperature, reduce the pressure by 2 psi.

c. On airplane serials TJ-3 through TJ-443, except TJ-436 with PHC-J3YF-2UF/FC8468-6R propeller assemblies, charge the air dome as follows:

70°F to 100°F	66 ±2 psi
40°F to 70°F	62 ±2psi
0°F to 40°F	58 ±2 psi
-30°F to 0°F	53 ±2 psi

d. On airplane serials TJ-46, TJ-55, TJ-83, TJ-85 through TJ-443 except TJ-436, TK-1 through TK-153 except TK-147 with PHC-J3YF-2F/FC7663DR propeller assemblies, fill to 80 ±2 psi at 70°F.

NOTE

Increase the pressure an additional 2 psi for every 10 degrees increase in temperature; similarly, for every 10 degrees drop in temperature, reduce the pressure by 2 psi/

e. On airplane serials TJ-46, TJ-55, TJ-83, TJ-85 through TJ-436, TK-1 through TK-150 except TK-147 with PHC-J3YF-2UF/FC7663DR propeller assemblies, charge the air dome as follows:

70°F to 100°F	41 ±2 psi
40°F to 70°F	38 ±2 psi
0°F to 40°F	36 ±2 psi
-30°F to 0°F	33 ±2 psi

PROPELLER ACCUMULATOR

The propeller accumulators are located on the lower rear section of each engine. The accumulator should be inspected every 100 hours and charged with dry air or nitrogen 100 ±5 psi at 70°F. Increase the pressure an additional 2 psi for every 10 degrees of increase in temperature; similarly for every 10 degrees of drop in temperature, reduce the pressure by 2 psi. If a unit will not hold 70% of its normal charge from one inspection to the next, it should be replaced.

INDUCTION AIR FILTER

The induction air filter should be inspected for foreign matter at least once during each 50-hour operating period and cleaned as noted by the manufacturer's instructions on the filter. Replace the induction air filters every 500 hours or one year, whichever occurs first.

ROTON LOCKS (Figure 201)

Usually, Roton locks will not need servicing. If there is a grinding and binding in the lock as the seat reclines or the return action becomes jerky, a little grease properly applied as follows should improve the operation.

a. Apply grease (30, Chart 202, 12-20-00) to the threads as shown in Figure 201.

b. Compress the spring guide and counterbalance spring approximately one inch.

c. Remove the retaining ring.

d. Relax pressure on the spring guide and counterbalance spring slowly until the spring is fully extended.

e. Remove the lock from the fixture and remove the spring guide, counterbalance spring and spring guide tube.

f. Apply a small quantity of grease to the completely extended thrust screw.

g. Reassemble the lock. For service other than lubrication, return the Roton lock to the manufacturer.

CLEANING AND WAXING THE AIRPLANE FINISH

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.

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 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.

NOTE

Frequently inspect the underside of the wing and flaps in the area covered by the engine turbocharger 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.

The plastic windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash the windows carefully with plenty of soap and water. Use the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used only for the purpose of carrying water to the surface of the window. After washing, rinse the window thoroughly with running water and dry it with a clean, moist chamois. Do not rub the plastic window with a dry cloth, because this will cause an electrostatic charge which attracts dust.

Remove oil and grease with a cloth moistened with kerosene, aliphatic naphtha or hexane, then rinse the window with clear water.

CAUTION

Never use gasoline, benzene, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner, or glass cleaner with a base of these materials, for such materials will soften the plastic and may cause crazing. Aliphatic naphtha and similar solvents are highly flammable and extreme care must be exercised when using these chemicals.

If it is desirable to use a commercial cleaner to clean the plastic windows, use only cleaners that are approved by Beech Aircraft Corporation. There are several cleaners available commercially that state that they are approved for use on acrylic surfaces. However, it has been discovered that some of these cleaners cause acrylic plastic to craze. Therefore, only the following products are approved as cleaners for acrylic plastic windows: Federal Specification P-P-560, Part No. 403D (66, Chart 207, 91-00-00), Parks Anti-Static Plastic Polish (66, Chart 207, 91-00-00) and Meguiar's MGH-10 (66, Chart 207, 91-00-00). Follow the directions on the container.

After washing plastic windows with soap and water, wax them with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratches. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Never use a power buffer, as the heat generated by the buffing pad may soften the plastic.

If the windows were cleaned with one of the three commercial cleaners mentioned previously, it will not be necessary to apply wax. Each of these cleaners contains wax, as well as cleaning agents.

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, naphtan, Mufti standard solvent, gasoline, laquer thinner and other types of thinners. Sharp edges or cuts on the edge of the interior cabin trim material may cause it to crack.

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:

NOTE

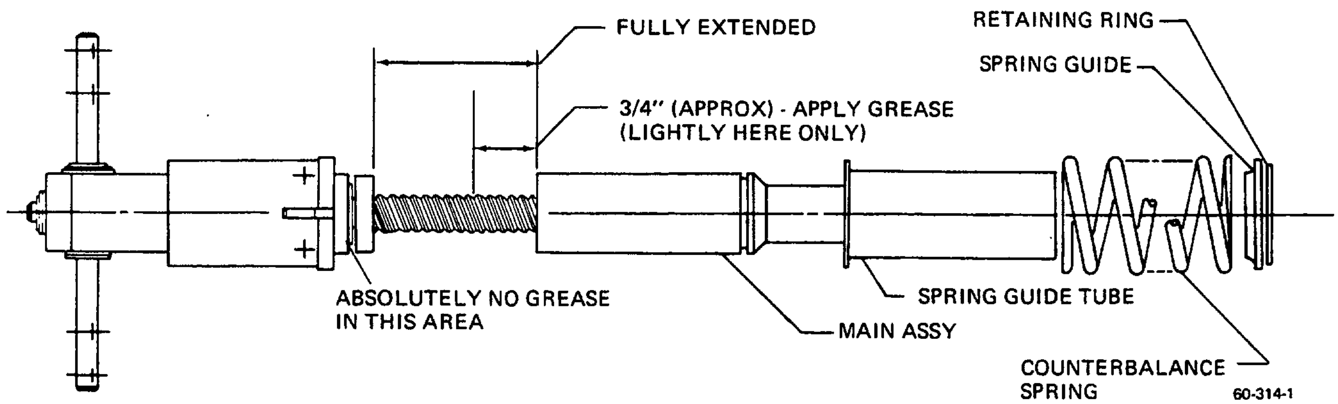
The manufacturers of wool and wool blended upholstery fabrics recommend that these materials be dry cleaned.

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 (15, Chart 202, 12-20-00). Apply the solvent sparingly and do not reinstall the upholstery until completely dry.

Leather upholstery should be kept waxed for maximum protection. For cleaning, a nonabrasive, chemically neutral, nonreactive, emulsion type cleaner of cream-like consistency is recommended. Dilute the cleaner with water, and apply it over the dirty surface with a sponge or soft cloth (use a gentle wiping motion; do not scrub). The solution should not be allowed to stand, but should be wiped off before drying.



Roton Lock
Figure 201

CHART 201
THREAD LUBRICANTS

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the specifications listed 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.

SYSTEM	*MATERIAL*	*SPECIFICATION*	*VENDOR PRODUCTS*
Fuel	Petrolatum	VV-P-236	
Oil, Manifold Pressure, Air Pressure	Lubricating Grease (Gasoline and Oil Resistant)	MIL-G-6032	L-237, Lehigh Chemical Co. Chestertown, Maryland Rockwell 950, Rockwell Mfg. Pittsburgh, Pa. Royco 32, Royal Lubricants Co. Hanover, New Jersey
Deicer, Static Pitot	Anti-Seize, White Lead Base	TT-A-580	Armite Product, Armite Laboratories, Los Angeles, California
Brakes	Hydraulic Fluid or Anti-Seize, White Lead Base	MIL-H-5606 or TT-A-580	
Air Conditioner	Anti-Seize, Graphite Petrolatum or Anti-Seize, White Lead Base	MIL-T-5544 or TT-A-580	
Oxygen, High Pressure Side	Tape, Tetrafluorethylene	MIL-T-27730	Permacel Tape Corp., New Brunswick, New Jersey
Turbocharger Inlet Probe	Anti-Seize Compound	MIL-A-907D	Anti-Seize Compound C5A, Fel-Pro Inc. 7450 McCormick Skokie, Illinois

CHART 202
CONSUMABLE MATERIALS

CONSUMABLE MATERIALS CHART

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; consequently, any product conforming to the specification listed may be used. The products listed below have been tested and approved for aviation usage by Beech Aircraft Corporation, or by the vendor, or by compliance with the applicable specifications. Other products that are locally procurable which conform to the requirements of the applicable Military Specification may be used even though not specifically included herein.

It is the responsibility of the operator/user to determine the current revision of the applicable Military Specification prior to usage of that item. This determination may be made by contacting the vendor of a specific item.

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
1.	Fuel, Engine	Grade 100LL (blue) if not available, use grade 100 (green) or 115/145 (purple)		
2.	Oil, Engine	TCM MHS-24B	Grade 40, Castrolaero AD Grade 50, Castrolaero AD	Castrol Oil Canada, Ltd., P.O. Box 3, New Toronto Postal Station, Toronto, Canada
			Conoco Aero S (SAE 10W30)	Continental Oil Co. Ponca City, Okla.
			Esso and Enco Aviation Oil, Series E65, E80, E100 and E120	Humble Oil and Refining Co., P.O. Box 2180 Houston, Texas
			Phillips 66 Aviation Oil Type A	Phillips Petroleum Co., Bartlesville, Okla.
			Aeroshell Oil W, Grades 120, 100, 80 and 65	Shell Oil Co., 50 West 50th St., New York, New York
			Pennzoil Aircraft Engine Oil, Heavy Dispersant, Grades 30, 40, 50	Pennzoil Company
			Mobil Aero Oil 65, 80, 100 and 120	Mobil Oil Corporation, Shoreham Building, Washington, D.C.
			Texaco Aircraft Engine Oil Premium AD, Grades 65, 80 and 100	Texaco, Inc. 135 E. 42nd St. New York, N.Y.
			Sinclair Avoil 20W-40	Sinclair Refining Co. 500 Fifth Ave. New York, N.Y.

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
2.	Oil, Engine (Cont'd)		B/P Aero Oil D65/80	BP Oil Corp.
			Delta-Avoil Oil	Delta Petroleum Co., Inc., P.O. Box 10397, Jefferson, Louisiana
			Quaker State AD Aviation Engine Oil Grades 20W/30, 40 and 50	Quaker State Oil and Refining Corp.
			Union Engine Oil HD Grades 80 and 100	Union Oil Company of California
3.	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 Co., Bradford, Pa.
4.	Lubricating Oil	MIL-L-6081	Gulflite Turbojet Oil No. 1010	Gulf Oil Corp., Pittsburg, Pa.
			Aeroshell No. 3-1286	Shell Oil Co., 50 West 50th Street, New York, N.Y.
			Jet Engine Oil No. 1010	Texaco Inc., 135 East 42nd Street New York, N.Y.
5.	Lubricating Oil	SAE 20 or SAE 10W30		
6.	Graphite Grease Petrolatum	MIL-T-5544T		
7.	Lubricating Oil (Gear)	MIL-L-6086 Grade M	Trojan Gear Oil No. 6086M	Cities Service Oil Co. 60 Wall Tower New York, N.Y.
			Aeroshell Fluid 5M	Shell Oil Co. 50 West 50th Street New York, N.Y.
			L-1195	Sinclair Refining Co. 500 Fifth Avenue New York, N.Y.
8.	Lubricating Grease	Molykote G		

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
9.	Grease, Aircraft, General Purpose, Wide Temperature Range	MIL-G-81322	Mobilgrease 28	Mobil Oil Corporation Shoreham Building Washington, D.C.
			Aeroshell Grease 22	Shell Oil Company 50 West 50th Street New York, N.Y.
			Royco 22S	Royal Lubricants Co. River Road Hanover, New Jersey
10.	Lubricating Grease (Gear)		Mobil Compound G.G. or Mobil 636	Mobil Oil Corporation Shoreham Building Washington, D.C.
11.	Lubricating Grease (Aircraft and Instrument, High and Low Temperature)	MIL-G-23827	Supermill Grease No. A72832	American Oil Co. 910 South Michigan Ave. Chicago, Ill.
			Royco 27A	Royal Lubricants Co. River Road, P.O. Box 95 Hanover, N.J.
			Aeroshell Grease 7	Shell Oil Co. 50 West 50th Street New York, N.Y.
12.	Lubricant, Molybdenum Disulfide Powder	MIL-M-7866	Molykote Z	Wilco Co. Wichita, Kansas
			Molykote Z	Standard Oil of Kentucky
			Molykote Z	Haskell Engineering and Supply Company 100 East Graham Place Burbank, California
			Moly-Paul No. 4	K. S. Paul Products Ltd. Nobel Road London, England
13.	Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Co. Los Angeles, California
			PED 3565	Standard Oil of Calif. 225 Bush Street San Francisco, Calif.

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
14.	Oxygen - System Leak Testing Compound	MIL-L-25567		
15.	Solvent	PD680		
16.	Lubricating Oil	SAE-10		
17.	Air Conditioner Refrigerant	R-12	Racon 12	Racon Inc., Wichita KS
			Genetron 12	Allied Chemical Specialty Div., Morristown, NJ
			Freon 12	Dupont Inc., Freon Products Div., Wilmington, DE
18.	Oil (Air Conditioner Compressor)	500 Viscosity	Suniso No. 5	Virginia Chemical and Smelting Co. West Norfolk, VA
			Texaco Capella E	Texaco Inc., 135 East 42nd Street, New York, NY
19.	Aviator's Breathing Oxygen	MIL-O-27210		
20.	Naphtha	TT-N-95		
21.	Methyl Ethyl Ketone	TT-M-261		
22.	Toluol (Toluene)	TT-T-548		
23.	Paint Remover		Turco No. 4260	Turco Products Inc., Los Angeles, CA
24.	Epoxy Primer		Ameron Epoxy Primer	Ameron Industrial Coatings Div., P.O. Box 2153, Wichita, KS
25.	Wash Primer		EX2016G	Ameron Industrial Coatings Div., P.O. Box 2153, Wichita, KS
26.	Zinc Chromate Primer	MIL-P-8585		

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
27.	Rubber Hose	MIL-H-5593		
28.	Oil, Engine Preservative	MIL-L-21260		
29.	Propeller Grease	Hartzell DG Grease		Hartzell Propeller, Inc. Piqua, Ohio
30.	Lubricating Grease		Anco Andok-B	Humble Oil Co. Houston, Texas
31.	Solvent		CRC-2-26	Corrosion Reaction Consultants Limekim Pike Dresher, Pa.
32.	Adhesive		EC1300L	Minneosta Mining and Manufacturing Co. 3M Center, St. Paul, Minnesota
33.	Sealer		EC801	Minnesota Mining and Manufacturing Co. 3M Center, St. Paul, Minnesota
34.	Lubricating Grease		Aeroshell 7A	Shell Oil Co. 50 West 50th Street New York, N.Y.
35.	Urethane Primer			U.S. Paint Lacquer and Chemical Co. 1501 N. Belmont Wichita, Kansas
36.	Thread Locking Compound		Loctite Sealant, Grade A	Loctite Corp. 705 N. Mountain Road Newington, Conn.
37.	Penetrating Oil		Mouse Milk	Worldwide Aircraft Filters Corp. 1685 Abram Ct. San Leandro, Calif.
			Kano Kroil	Kano Laboratories Inc. Nashville, Tennessee
38.	Lubricating Grease		Aeroshell Grease 5	Shell Oil Co. 50 West 50th Street New York, N.Y.
39.	Cement		A56B	B.F. Goodrich Co. Akron, Ohio

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATONS*	*PRODUCT*	*VENDOR*
40.	Primer		Locquic "N"	Locktite Corp. 705 N. Mountain Road Newington, Conn.
41.	Cleaner		Turco Metal-glo No. 3	Turco Products Inc. Los Angeles, Calif.
42.	Paint Stripper		Turco 4260	Turco Products Inc. Los Angeles, Calif.
43.	Corrosion Preventative Compound	MIL-C-16173	Braycote 103	Bray Oil Co. Los Angeles, California
44.	Cement		Bostic 1008	United Shoe Machinery Corp., B.B. Division 748 Memorial Drive Cambridge, Mass.
45.	Cement		Bostic 1024	United Shoe Machinery Corp., B.B. Division 748 Memorial Drive Cambridge, Mass.
46.	Trichloroethane	MIL-T-81533		Vulcan Materials Co. Chemicals Division 6200 South Ridge Road Wichita, Kansas
47.	Icex			B. F. Goodrich Akron, Ohio
48.	Anti-Icer Fluid	TT-I-735 (Replaces MIL-F-5566)		Anti-Icer Fluid Sherwood and Co. Wichita, Kansas
49.	Resin	MIL-R-7575	Laminac 4116	American Cyanamid Co., Wallingford, Connecticut
50.	Naphtha	TT-N-95		
51.	Sealer		RTV-108	General Electric Corp. Waterford, New York
52.	Stripper Solution		Oakite M-3	Oakite Products, Inc. 22 Thames St. New York, New York
53.	Spray Adhesive		#77	Minnesota Mining and Manufacturing Co. St. Paul, Minnesota

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
54.	Preservative Oil	MIL-L-46002 Grade 1	Nucle Oil 105	Daubert Chemical Co. 4700 S. Central Avenue Chicago, Illinois
			Protect VA	Pennsylvania Refining Co. Butler, Pennsylvania
			Ferro-Gard 1009-G	Ranco Laboratories, Inc. 3617 Brownsville Road Pittsburgh, Pennsylvania
55.	Grease	MIL-G-10924		
56.	Preservative Hydraulic Fluid	MIL-H-6083	Avrex 904	Mobil Oil Corporation 150 E. 42nd St. New York, New York
			Royco 783C	Royal Lubricants Co. River Road Hanover, New Jersey
57.	Adhesive, Acrylic		PS-30	Cadillac Plastic & Chemical Co. Detroit, Michigan
58.	Adhesive/Sealant		RTV732	Dow Corning Corporation Midland, Michigan 48640
59.	.0030-inch Thick 2-inch Wide Vinyl Film Tape		No. 474	Minnesota Mining and Manufacturing Co., 3M Center St. Paul, Minnesota
60.	Sealant		Presstite No. 576	Presstite-Keystone Engineering Company, 3900 Chateau Ave., St. Louis, Missouri
61.	Sealant		Presstite No. 176	Presstite-Keystone Engineering Company, 3900 Chateau Ave., St. Louis, Missouri
62.	Tape, Anti-Sieze, Tetrafluoroethylene with dispenser (1 inch)	MIL-T-27730		Johnson & Johnson Inc., Permacel Division, U.S. Highway 1, New Brunswick, New Jersey 08901
63.	Adhesive		Dapcotac 3300	"D" Aircraft Products Company, 1191 Hawk Circle Anaheim, CA

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
64.	Tape, Mylar (3/4 inch)		Mylar Mystic No. 733	Minnesota Mining and Manufacturing Co., 3M Center St. Paul, Minnesota
65.	Plexiglas Scratch Remover			Micro-Mesh Cushioned Abrasives Micro-Surface Finishing Products Wilton, Iowa 52778
				Polysand Cushioned Abrasives Fredrick B. Anthon Enterprizes U.S. Distributor: Cope Plastics Godfrey, Illinois 62035
66.	Plexiglas Polish and Cleaner	Federal Specification P-P-560	Part No. 403D	Permatex Company Kansas City, Kansas
			Anti-Static Plastic Polish	Park Chemical Company Detroit, Michigan
			MGH-10	Mirror Bright Polish Company Irvine, California
67.	Lubricating Grease (Gear) (Alternate for Landing Gear Actuator)	MIL-L-10324 (Superceded by MIL-L-2105, Grade 75W, Item #68)		
68.	Lubricating Oil, Gear, Sub Zero	MIL-L-2105 Grade 75W	101-380016-1	BEECHCRAFT Aero or Aviation Centers and International Distributors and Dealers
			Oliofiat W 75/M	Fiat Lubricant S.p.A. Via Santena, 1 10029 Villastellone (Torino) Italy
			Gulf Gearlube HT SAE 75W-90	Gulf Oil Canada Limited Research & Development 2489 North Sheridan Way Sheridan Park, Ontario L5K 1A8
			Shell Oil S.8643	Shell International Petroleum Company Limited Shell Centre Dept. MKF/32 London S.E. 1, England

CHART 202 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
69.	Coating	MIL-C-5541	Alodine 1200, 1200S or 1201	Amchem Products Inc.,300 Brookside Ave., Ambler, PA 19002
70.	Adhesive/sealant		RTV-737	Dow Corning Corp., Midland, MI 48640

NOTES

1.If grade 100LL (blue is not available, grade 100 (green) or 115/145 octane (purple) may be used.

2.Precautions should be taken when using MIL-G-23827 and MIL-B-81322 grease, since these greases contain chemicals harmful to painted surfaces.

CHART 203
SERVICING

ITEM	LOCATION	SERVICE WITH	INTERVAL
Check			
Engine Oil Level	Cowl access opening (2)	T.C.M. Spec. MHS-24B	Preflight
Battery Electrolyte	Fwd baggage compartment (1)	Distilled water	Every 25 hours
Air Conditioner Compressor Oil Level	See Chapter 21 for location and special instructions	Suniso No. 5 or Texaco Capella E, 500 Viscosity Oil	As Required
Air Conditioner Refrigerant	See Chapter 21 for locations and special instructions	Refrigerant No. 12	As Required
Propeller Air Dome	Access cap on prepeller spinner (2)	Dry air or nitrogen	Every 100 hours
Propeller Accumulator	Lower rear of engine (2)	Dry air or nitrogen	Every 100 hours
Air Pump Intake Filter	Fwd of aft engine baffle(2)	Refer to Chapter 26	Every 100 hours
Pressure System Inline Air Filter	Aft of engine firewall in upper nacelle (2)	Refer to Chapter 36	Every 100 hours

CHART 203
SERVICING (Cont'd)

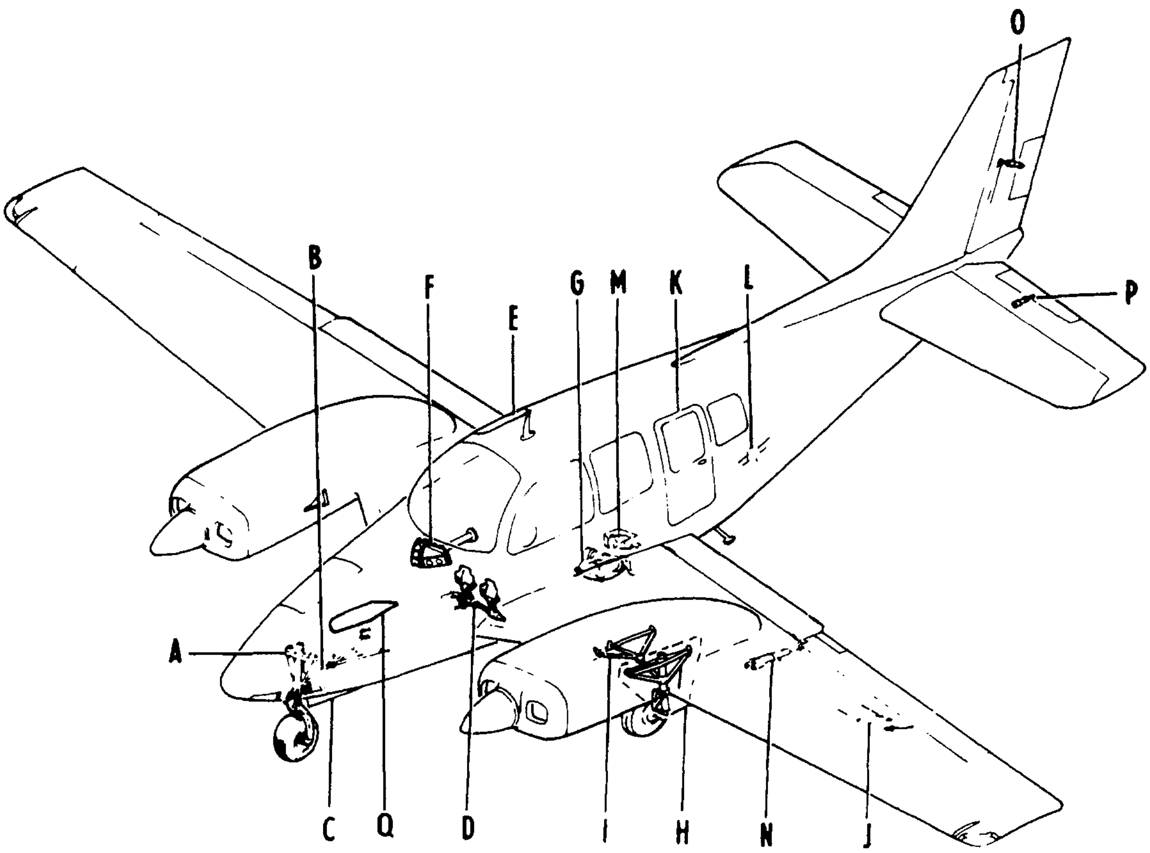
ITEM	LOCATION	SERVICE WITH	INTERVAL
Change			
Engine Oil	Cowl flap opening (2)	T.C.M. Spec. MHS-24B	Every 50 hours
Engine Oil Filter	LH cowling door (2)		Every 50 hours
Clean			
Heater Backfire Filter trap	Fwd baggage compartment (1)	Vacuum	Every 25 hours of heater operation
Induction Air Filter	LH cowl door (2)	Clean per instructions on filter	Every 50 hours
Fuel Strainers	Wheel wells (2)	Clean with solvent and blow dry with air pressure	Every 100 hours
Cabin Altitude Outflow Control Valve Filter (TJ-3 and after)	Control console (1)	Clean with solvent and blow dry with air pressure	Every 100 hours
Static Air Button	Aft fuselage skin (4)	Clean with solvent and blow dry with air pressure	Every 100 hours
Outflow Safety Valves(TJ-3 and after)	Aft pressure bulkhead (2)	Clean per AiResearch Manual, Report No. 4-267	Every 100 hours

CHART 203 (Cont'd)
SERVICING

ITEM	*LOCATION*	*SERVICE*	*INTERVALS*
Heater Fuel Pump Filter	Fwd baggage compartment (1)	Clean with solvent and blow dry with compressed air.	Every 100 hrs. of heater operation
Servo Fuel Filter	Fuel control unit (2)	Clean with solvent and blow dry with compressed air.	Every 100 hrs.
Evaporator Blower Filter (TJ-2 and after)	Aft pressure bulkhead (1)	Backblow with compressed air.	Every 100 hrs.
Evaporator Blower Filter (TK-1 and after)	Fwd bulkhead (1)	Backblow with compressed air.	Every 100 hrs.
Heater Fuel Supply Strainer	LH wing stub (1)	Clean with solvent and blow dry with compressed air.	Every 100 hrs. of heater operation.
Drain			
Fuel Sump Drain	Lower wing surface (2)		Preflight
Fuel Strainer Drain	Lower wing surface (2)		Preflight
Fuel Tank Drain	Lower wing surface (2)		Preflight
Static Drain	Fuselage exterior, below aft cabin door		Every 100 hrs.
Replace			
Pressure System Inline Air Filter	Aft of engine firewall in upper nacelle (2)		Every 500 hrs.
Air Pump Intake Filter	Forward side of aft engine baffle (2)		Every 300 to 500 hrs.
Induction Air Filter	LH cowl door (2)		Every 500 hrs.
Cabin Altitude Outflow Control Valve Filter (TJ-2 and after)	Control console (1)		On condition
Safety Valve (TJ-2 and after)	Aft pressure bulkhead (2)		Every 500 hrs.
Electric Trim Tab Actuator Motor Brushes	Aft fuselage (1)		Every 1000 hrs.
Evaporator Blower Filter (TJ-2 and after)	Aft pressure bulkhead (1)		When discolored or at 500 hours.
Evaporator Blower Filter (TK-1 and after)	Fwd bulkhead (1)		When discolored or at 500 hours.
Service			
Brake Fluid Reservoir	Forward baggage compartment (1)	MIL-H-5606 hydraulic fluid	As Required
Oxygen Cylinder	Under pilot's seat (1) (TJ-2 thru TJ-85, except TJ-82) Fwd baggage compartment (1) (TK-1 thru TK-84) Aft fuselage (1) (TJ-82, TJ-86 and after; TK-85 and after)	MIL-O-27210 aviators breathing oxygen	As Required
Main and Nose Landing Gear Struts	Top of each strut (3)	MIL-H-5606 hydraulic fluid and dry air or nitrogen	Every 100 hrs.

( ) Indicates number of points to be serviced.

CHART 204
LUBRICATION SCHEDULE



NOTE

Precaution should be taken when using MIL-G-23827 and MIL-G-81322, since these greases contain chemicals harmful to painted surfaces.

MIL-G-23827 grease is recommended for use in lubricating the blade bearings in the Hartzell Propeller. This grease will ensure against a possible freeze up of the pitch change mechanism when prolonged flights are made at altitudes where the ambient temperature is below -20°C. Lubricate at 100 hour inspection.

( ) Indicates the number of points to be lubricated.

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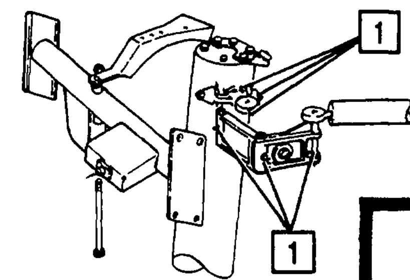
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

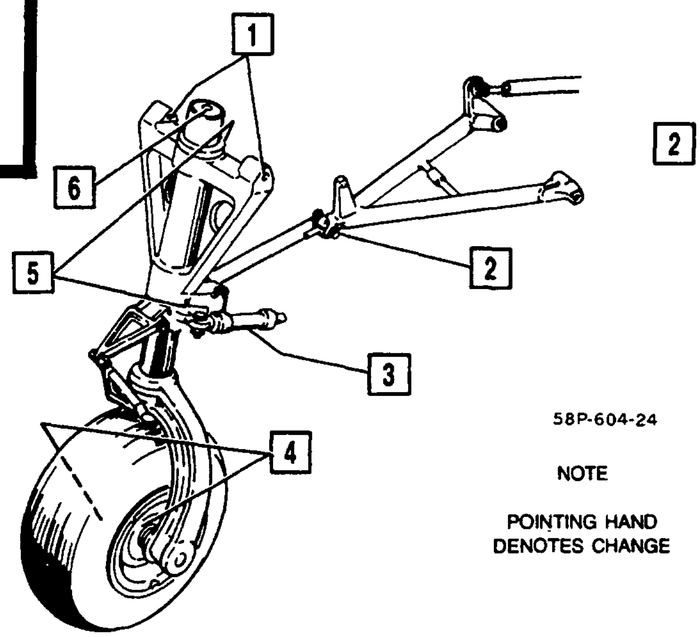
INDEX	LOCATION	LUBRICANT	INTERVAL
	NOSE WHEEL STEERING	DETAIL A	
1	Nose wheel well (6)	MIL-G-81322	100 hrs

NOTE

On flush type lubrication fittings, use an Alemite Midget Flush Nozzle, P/N 314150.



DETAIL A



* Clean the nose wheel bearings and repack with either Aeroshell Grease No. 5 (preferred) or MIL-G-81322. Do not intermix as these greases are not compatible.

NOTE

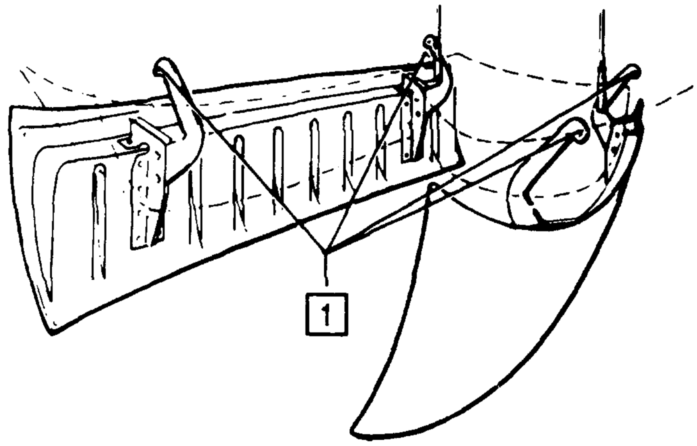
POINTING HAND DENOTES CHANGE

DETAIL B

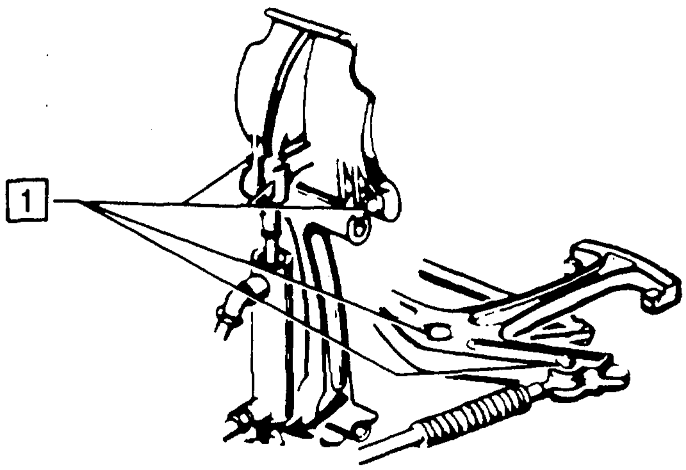
INDEX	LOCATION	LUBRICANT	INTERVAL
	NOSE GEAR RETRACT	DETAIL B	
1	Nose gear lubrication fittings (2)	MIL-G-81322	100 hrs
2	Nose gear retract rods (3)	MIL-G-81322	100 hrs
3	Shimmy Damper (1)	MIL-H-5606	AR
4	* Nose wheel bearings (2)	Aeroshell Grease No. 5 (preferred) or MIL-G-81322	100 hrs
5	Nose gear swivel fittings (2)	MIL-G-81322	100 hrs
6	Nose shock strut (1)	MIL-H-5606	100 hrs

CHART 204 (Cont'd)
LUBRICATION SCHEDULE

ITEM	LOCATION	LUBRICATION	INTERVAL
	NOSE LANDING DOORS — DETAIL C		
1	Landing gear door hinges (4)	SAE 20 or SAE 10W30	100 hrs



DETAIL C



DETAIL D

ITEM	LOCATION	LUBRICANT	INTERVAL
	RUDDER PEDALS — DETAIL D		
1	Rudder pedal linkage (8)	SAE 20 or SAE 10W30	100 hrs

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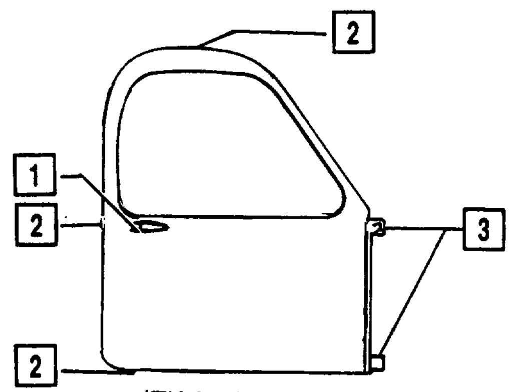
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

ITEM	LOCATION FORWARD CABIN DOOR	LUBRICATION DETAIL E	INTERVAL
	(TK-1 AND AFTER)		
1	Fwd cabin door handle (1)	SAE 20 or SAE 10W30	100 hrs.
2	Fwd cabin door latch (3)	SAE 20 or SAE 10W30	100 hrs.
3	Forward cabin door hinges (2)	SAE 20 or SAE 10W30	100 hrs.

NOTE

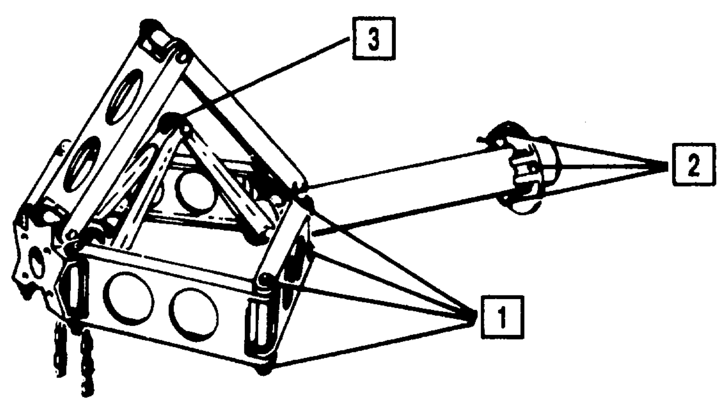
Forward cabin door hinges and latches (TJ-3 and after) do not require lubrication.



NOTE

POINTING HAND DENOTES CHANGE

DETAIL E



DETAIL F

(TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150)

ITEM	LOCATION CONTROL COLUMN	LUBRICANT DETAIL F	INTERVAL
1	Control column linkage (18)	SAE 20 or SAE 10W30	100 hrs
2	Control column head (3)	SAE 20 or SAE 10W30	100 hrs
3	Control column torque knee (6)	SAE 20 or SAE 10W30	100 hrs

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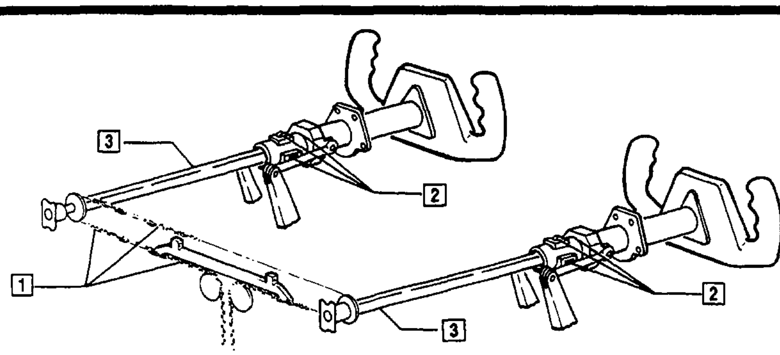
CHART 204 (Cont'd)
LUBRICATION SCHEUDLE



DETAIL F
(TJ-436, TJ-444 and after, TK-147 and TK-151 and after)

INDEX	LOCATION	POINTS ( )	LUBRICANT	INTERVAL
	CONTROL COLUMN			
1	Control column chains	(4)	SAE20 or 10W30 Oil	100 hrs
2	Ball bearings	(10)	MIL-L-7870 Oil	100 hrs
3 *	Torque shafts	(2)	MEK Solvent	100 hrs

* Wipe full length of square shafts with MEK, these surfaces to remain dry and free of oil.

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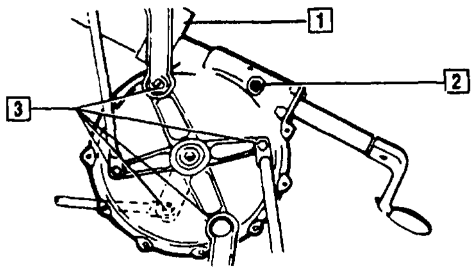
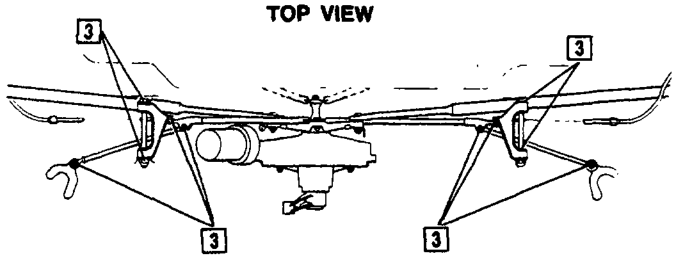
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION LANDING GEAR ACTUATOR	LUBRICANT DETAIL G	INTERVAL
1	Landing gear motor gear box (1)	MIL-G-81322	600 hrs
2	†Landing gear actuator gear box (1)	Mobil Compound GG or MIL-L-10324 or Mobil 636 MIL-L-2105	300 hrs
3	*Landing gear system retract arms (15)	SAE 10W30 75W SAE 10W30	100 hrs



TOP VIEW



SIDE VIEW

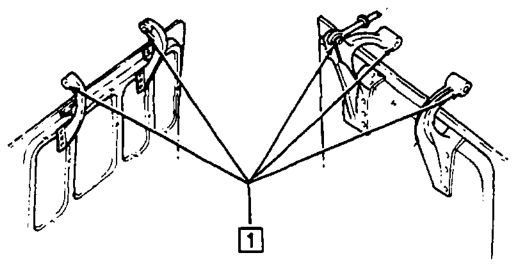
NOTE

POINTING HAND DENOTES CHANGE

DETAIL G

*Nose gear retract arm is located beneath the gear box.

†When properly filled, the oil level on a dip stick inserted through the filler hole will be approximately 1/4 inch.



DETAIL H

ITEM	LOCATION MAIN LANDING GEAR DOORS	LUBRICANT DETAIL H	INTERVAL
1	Main landing gear door hinges (10)	SAE 20 or SAE 10W30	100 hrs

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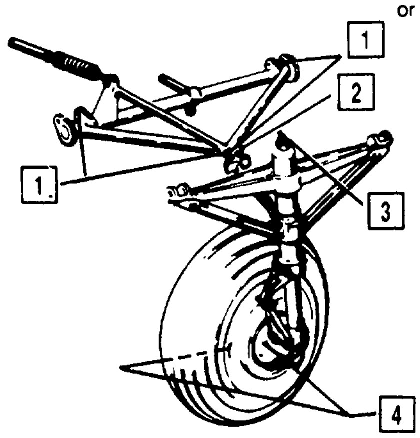
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

ITEM	LOCATION MAIN LANDING GEAR	LUBRICATION DETAIL I	INTERVAL
1	Retract rod fittings (8)	MIL-G-81322	100 hrs
2	Uplock rollers (2)	MIL-G-23827	100 hrs
3	Main shock struts	MIL-H-5606	100 hrs
4	* Main wheel bearing (4)	☛ Aeroshell Grease No. 5 (preferred) or MIL-G-81322	100 hrs

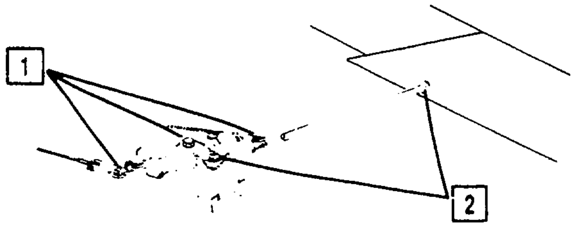


* Clean the main wheel bearings and repack with either Aeroshell Grease No. 5 (preferred) or MIL-G-81322. Do not intermix as these greases are not compatible.

NOTE

POINTING HAND DENOTES CHANGE

DETAIL I



DETAIL J

ITEM	LOCATION AILERON BELL CRANKS	LUBRICATION DETAIL J	INTERVAL
1	Aileron bell cranks (6)	SAE 20 or SAE 10W30	100 hrs
2	†Aileron push pull rod ends (4)	SAE 20 or SAE 10W30	100 hrs

† If aileron push pull rod assembly is removed, clean and lubricate rod end using MIL-G-23827. Rotate rod end eye ball to assure adequate lubrication coverage. Check aileron rigging after reinstallation of rod end assembly.

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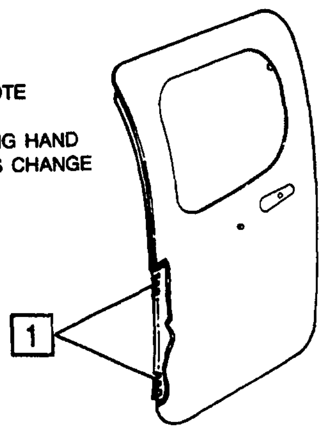
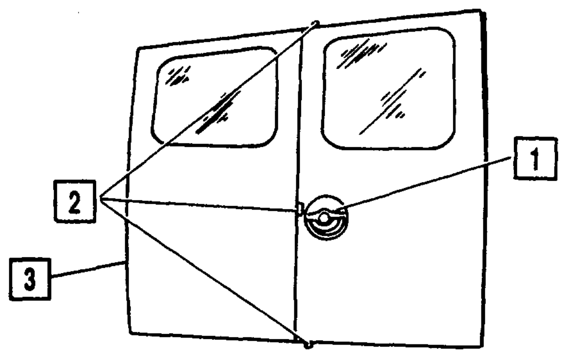
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

ITEM	LOCATION	LUBRICATION	INTERVAL
	AFT CABIN DOOR	DETAIL K	
1	(TJ-3 AND AFTER)		
	Aft cabin door hinges (2)	SAE 20 or SAE 10W30	100 hrs
1	(TK-1 AND AFTER)		
	Utility door handle (1)	SAE 20 or SAE 10W30	100 hrs
2	Utility door latches (3)	SAE 20 or SAE 10W30	100 hrs
3	Utility door hinges (2)	* MIL-M-7866	100 hrs

NOTE

POINTING HAND DENOTES CHANGE

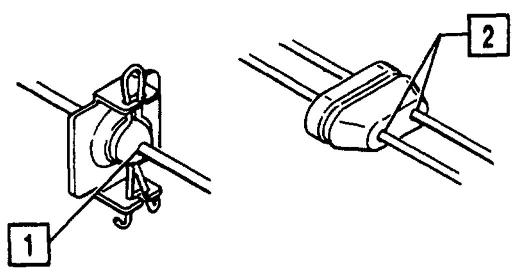




(TK-1 AND AFTER)

DETAIL K (TJ-3 AND AFTER)

* Mix MIL-M-7866 with naphtha and apply with brush.



DETAIL L

ITEM	LOCATION	LUBRICATION	INTERVAL
	CABLE PRESSURE SEALS	DETAIL L	
	(TJ-3 AND AFTER)		
1	Control cable pressure seals (8)	MIL-G-23827	1000 hrs
	(TJ-3 AND AFTER)		
2	Trim tab cable pressure seals (3)	MIL-G-23827	1000 hrs
	(TJ-3 AND AFTER)		

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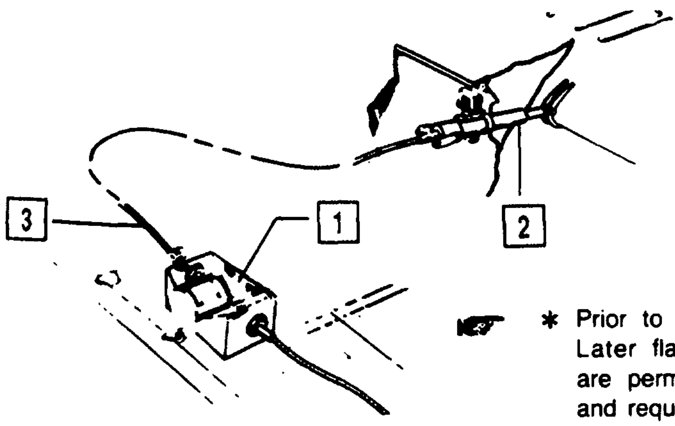
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

ITEM	LOCATION	LUBRICATION	INTERVAL
	FLAP ACTUATOR DETAIL M		
1	* Flap motor gear box (1)	MIL-G-23827	600 hrs
2	Flap actuator (2)	MIL-L-2105C Grade 75	1000 hrs
3	Flap flexible drive shaft (1) (Inside cable housing)	MIL-G-23827	900 hrs

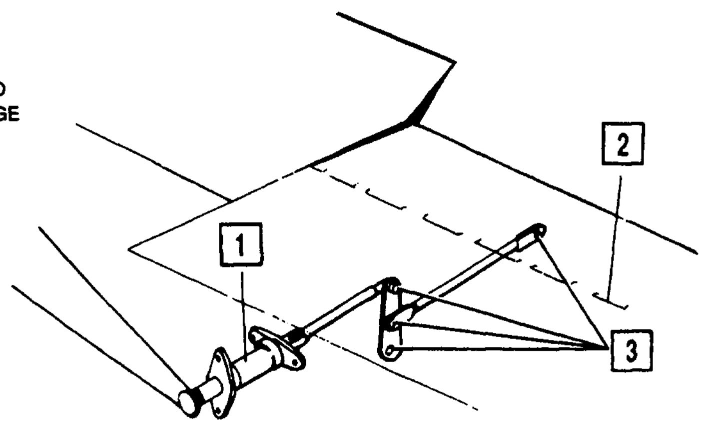


* Prior to TJ-107 and TK-43. Later flap motor gearboxes are permanently lubricated and require no maintenance.

DETAIL M

NOTE

POINTING HAND DENOTES CHANGE



DETAIL N

ITEM	LOCATION	LUBRICATION	INTERVAL
	AILERON TRIM TAB DETAIL N		
1	Aileron trim tab actuator (1)	MIL-G-23827	900 hrs or 5 years whichever occurs first.
2	Aileron trim tab hinge (1)	VV-L-800A	100 hrs
3	Aileron trim tab actuator linkage	VV-L-800A	100 hrs

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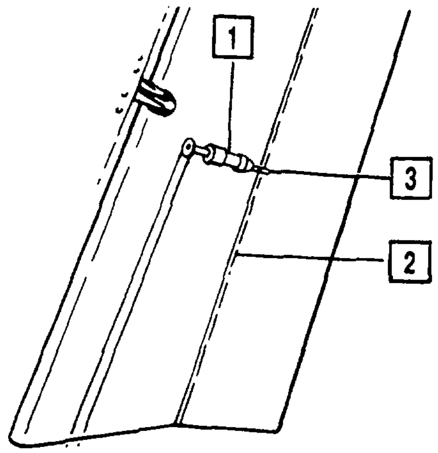
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

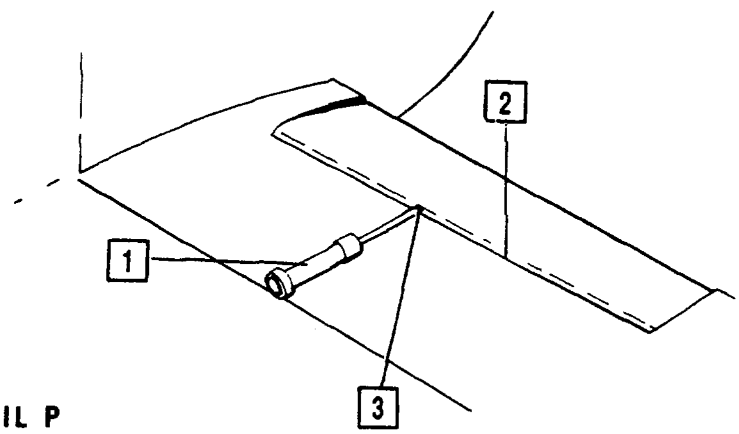
INDEX	LOCATION RUDDER TRIM DETAIL O	LUBRICANT	INTERVAL
1	Rudder trim tab actuator (1)	MIL-G-23827	900 hrs or 5 years whichever occurs first
2	Rudder trim tab hinge (1)	VV-L-800A	100 hrs
3	Rudder trim tab actuator rod	VV-L-800A	100 hrs



NOTE

POINTING HAND DENOTES CHANGE

DETAIL O



DETAIL P

INDEX	LOCATION ELEVATOR TRIM DETAIL P	LUBRICANT	INTERVAL
1	Elevator trim tab actuator (2)	MIL-G-23827	900 hrs or 5 years whichever occurs first
2	Elevator trim tab hinge (2)	VV-L-800A	100 hrs
3	Elevator trim tab actuator	VV-L-800A	100 hrs

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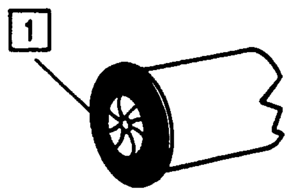
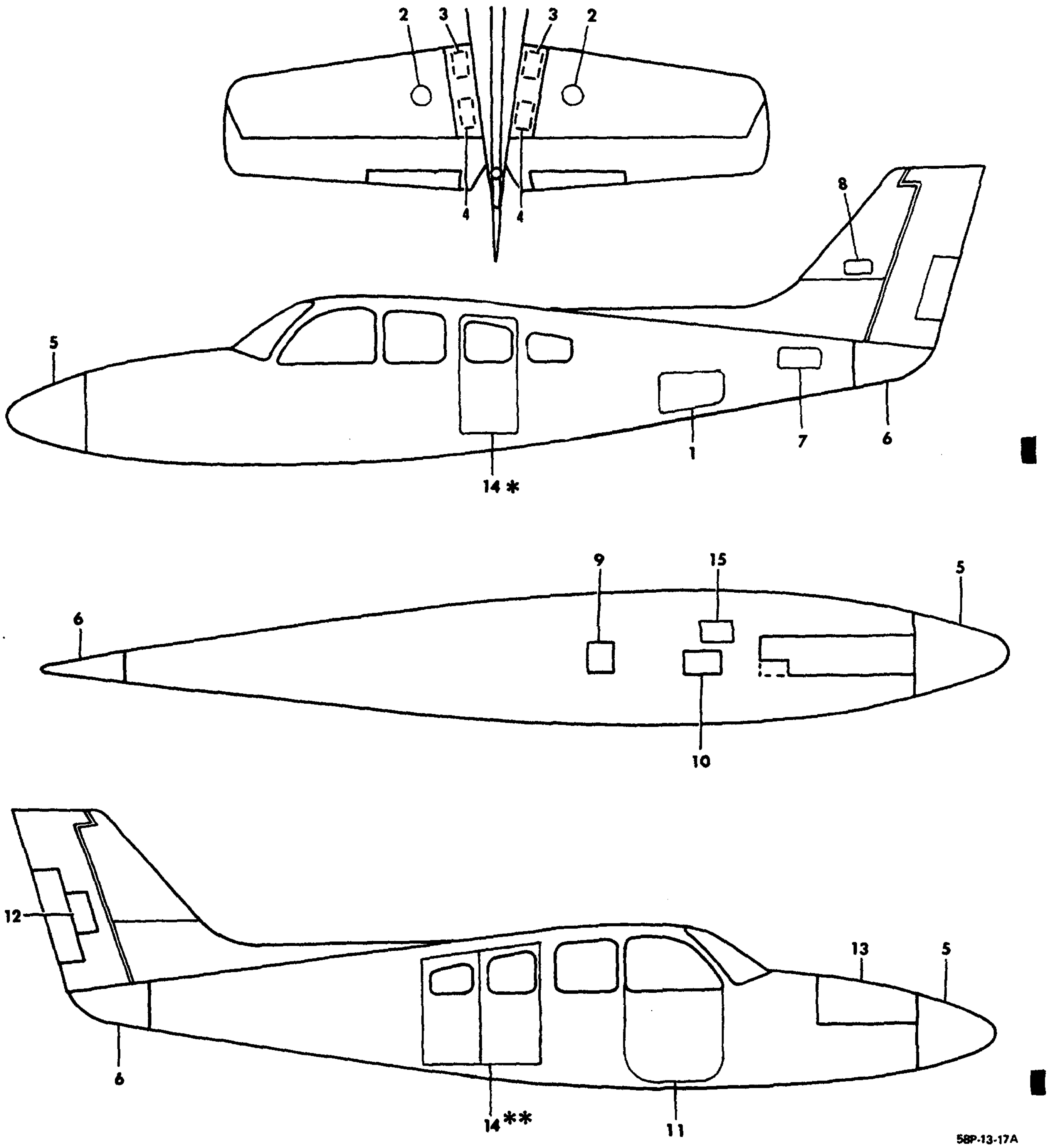
CHART 204 (Cont'd)
LUBRICATION SCHEDULE

INDEX	LOCATION HEATER DETAIL Q (TK-1 AND AFTER)	LUBRICANT	INTERVAL
1	Heater Iris Valve (1)	Mix MIL-M-7866 lubricant with Naphtha and apply with a brush.	As Required



DETAIL Q

58P-604-75

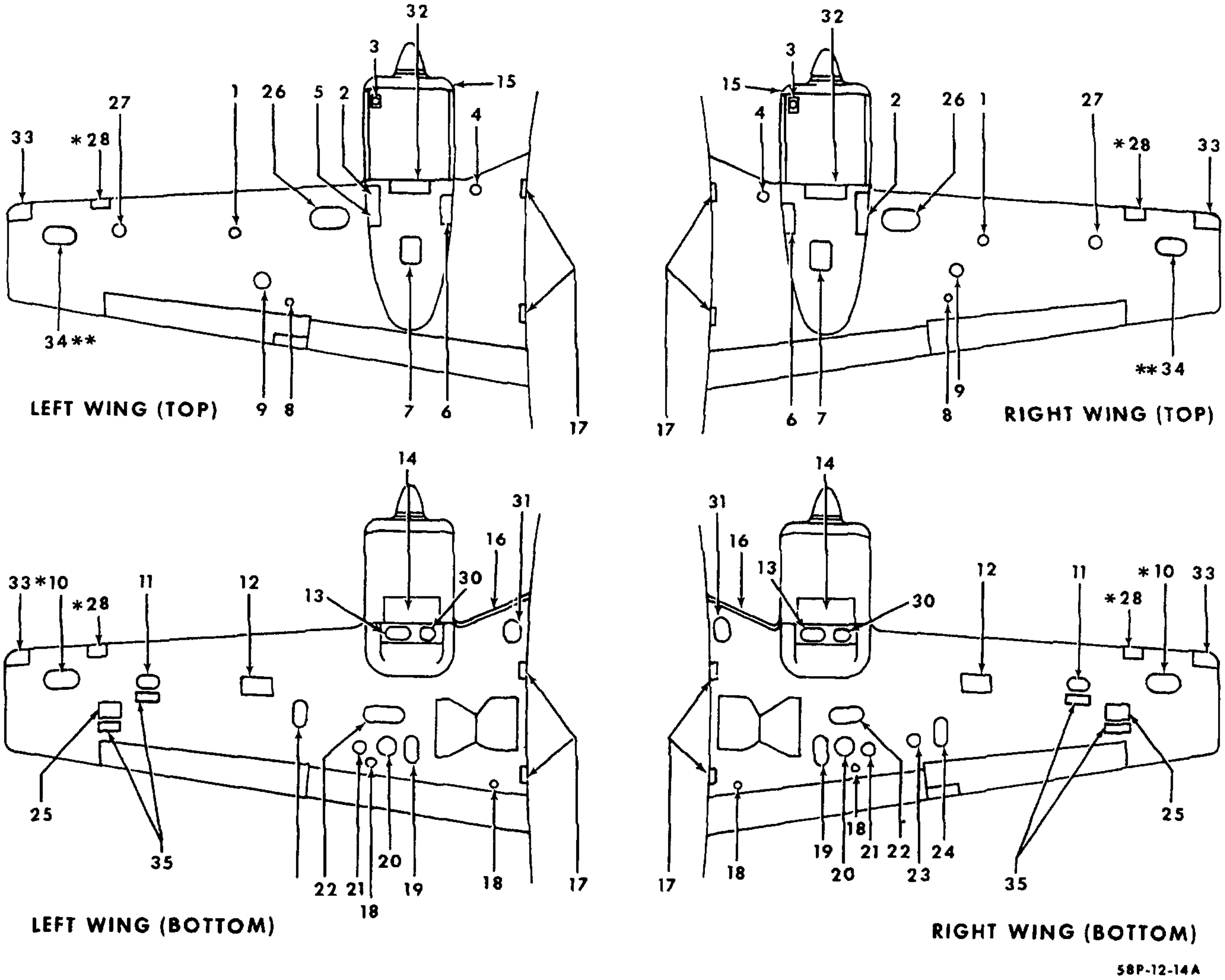


Fuselage Access Openings (Sheet 1 of 2)
Figure 202

1. Emergency Transmitter Locator, Pulley Cables and Yaw Dampener
2. Elevator Trim Tab Actuator Sprocket
3. Elevator Tab Cables
4. Horizontal Stabilizer Mounting Bolts
5. Nose Cone
6. Tail Cone
7. Elevator Bell Crank, Elevator Down Spring, Turnbuckles and Cable Inspection
8. Wiring Inspection
9. Landing Gear Actuator
10. Control Cable Pulleys and Nose Gear Retract Idler Arm
11. Passenger Door
12. Rudder Tab Actuator
13. Nose Baggage Door
14. Cabin Door
15. Nose Gear Retract Idler Arm

*TJ-2 and after
**TK-1 and after

Fuselage Access Openings (Sheet 2 of 2)
Figure 202

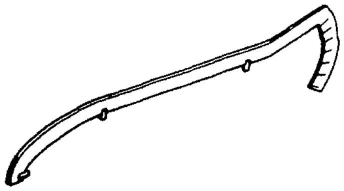


Wing Access Openings (Sheet 1 of 2)
Figure 203

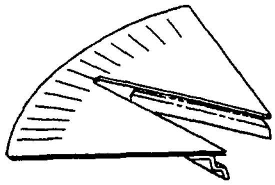
1. Fuel Transmitter
2. External Power Relay, Alternate Air
3. Oil Level Indicator Access
4. Fuel Transmitter
5. Wing Ice Light (Left Hand Only)
6. Nacelle Inspection Plate and Access to Engine Plumbing
7. Pressure Switch Valve and Air Filter
8. Aileron Bell Crank
9. Fuel Cell Transmitter
10. Wing Tip Spar Fitting and Float Valve Assembly*
11. Fuel Cell and Siphon Break Valve
12. Fuel Cell Access
13. Firewall Terminal Bus (Starter Relay Left Hand Only)
14. Cowl Flap
15. Removable Nose Cap
16. Wing Leading Edge Cap
17. Wing Mounting Bolts
18. Flap Access
19. Aileron Cable and Pulley Inspection
20. Aileron Cable Inspection
21. Aileron Cable Pulley
22. Fuel Tank Inspection
23. Aileron Cable, Sprocket, Chain and Fuel Line Inspection
24. Aileron Tab Actuator and Pulley
25. Wing Tip Access
26. Fuel Cell Access
27. Fuel Filler Opening
28. Landing Light*
29. Aileron Cable and Pulley
30. Landing Gear Attach Bolts
31. Fuel Boost Pump
32. Nacelle Access
33. Navigation Light
34. Wing Tip Access**
35. Fuel Lines

*Prior to TJ-24
**Optional TJ-24 and after, and TK-1 and after

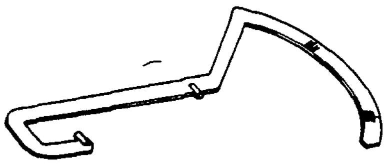
Wing Access Openings (Sheet 2 of 2)
Figure 203



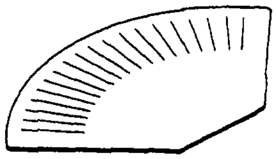
810-1 3513502578LH
810-1 3513502579RH
AILERON TRAVEL GAGE



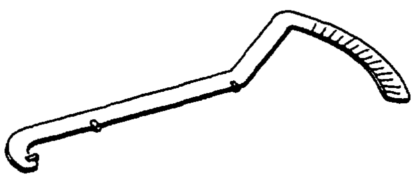
50-590090
AILERON TAB TRAVEL GAGE



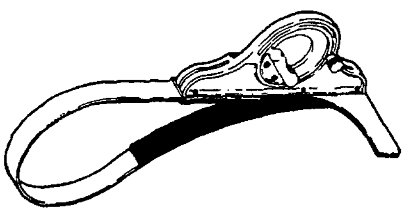
810 96524000
RUDDER TRAVEL GAGE



810 96-630000-1
RUDDER TAB TRAVEL GAGE



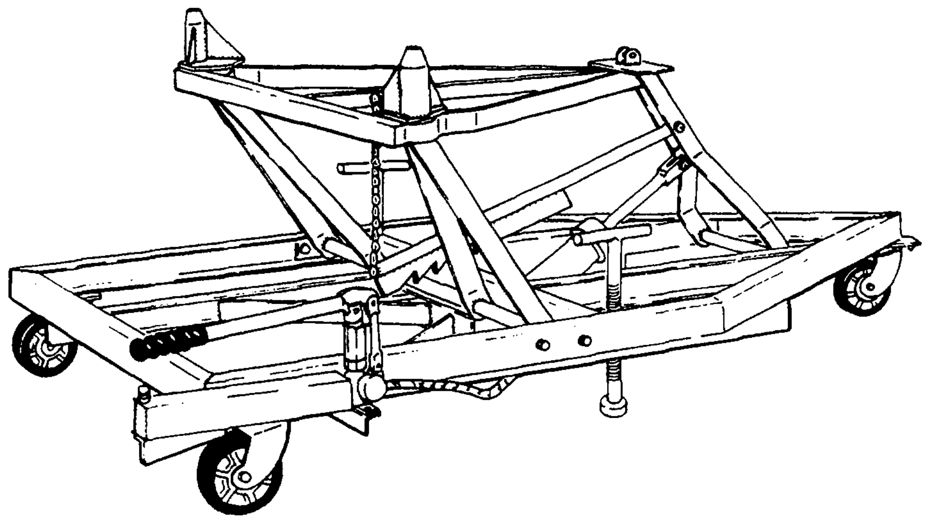
810-1 95524000RH
810-1 95524000LH
ELEVATOR AND ELEVATOR TAB TRAVEL GAGE



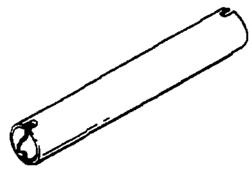
810-2 96-524000
FLAP TRAVEL GAGE

58P-17-14

Special Tools (Sheet 1 of 4)
Figure 204



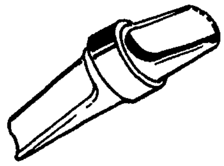
MODEL 300-100 SERVICE JACK



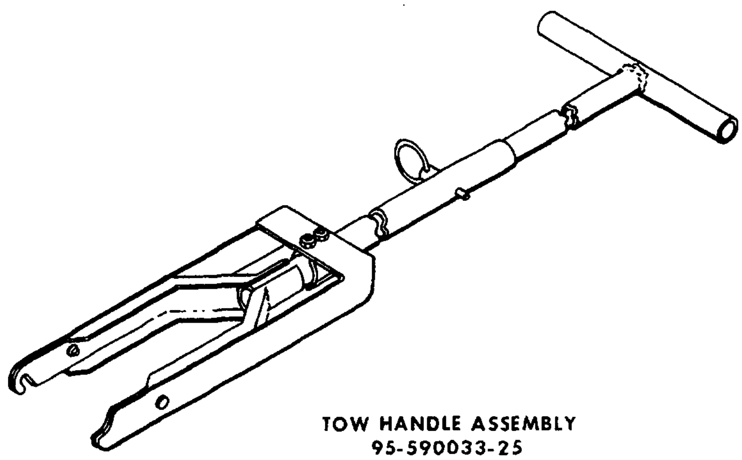
101-590020-1 FUEL SUMP DRAIN WRENCH

58P 17 15A

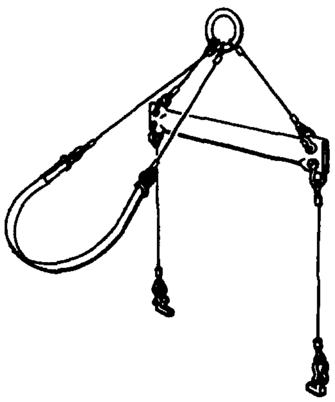
Special Tools (Sheet 2 of 4)
Figure 204



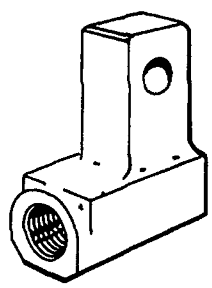
MAIN WHEEL JACK ADAPTER
35-590006



TOW HANDLE ASSEMBLY
95-590033-25



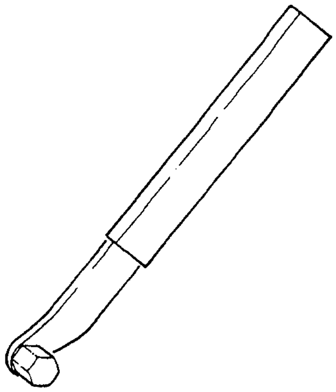
HOISTING SLING
95-590016-1



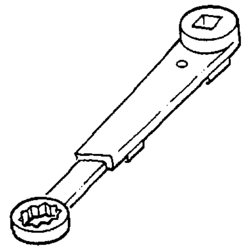
HOISTING SLING ADAPTER
95-590017
95-590017-1

58P-17-16

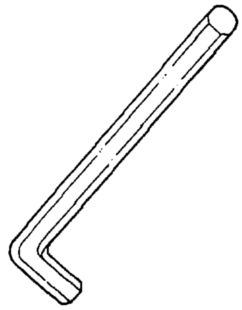
Special Tools (Sheet 3 of 4)
Figure 204



TS1222-3
TS1222-4



50-590014

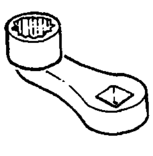


TS1222-5

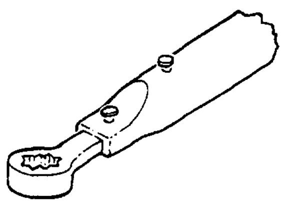
TS1222-3	LOWER FORWARD WING BOLT WRENCH
50-590014	LOWER FORWARD WING NUT TORQUE WRENCH ADAPTER
TS1222-3	UPPER FORWARD WING BOLT WRENCH
or	(5/8 inch hex)
TS1222-4	(9/16 inch hex)
or	
TS1222-5	(9/16 inch hex)
TS1176-10	UPPER FORWARD WING NUT TORQUE WRENCH ADAPTER
TK1817-922-4	LOWER AFT WING BOLT WRENCH
TS1176-10	LOWER AFT WING NUT TORQUE WRENCH ADAPTER
TS1222-4	UPPER AFT WING BOLT WRENCH
or	
TS1222-5	
TS1176-8	UPPER AFT WING NUT TORQUE WRENCH ADAPTER
D922 102-910001	ALTERNATOR DRIVE GEAR WRENCH

NOTE

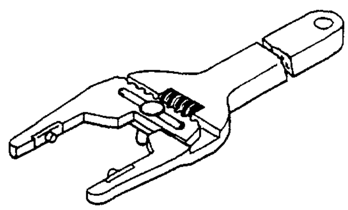
POINTING HAND DENOTES CHANGE



TS1176-8
TS1176-10



TK1817 922-4



D922 102-910001

58P-17-17

Special Tools (Sheet 4 of 4)
Figure 204

"END"

UNSCHEDULED SERVICING

DEICING AND ANTI-ICING AIRPLANES ON THE GROUND

Deicing is the removal of ice, frost and snow from the airplane's exterior after it has formed. Anti-icing is a means of keeping the surface clear of subsequent accumulations of ice, snow and frost.

Snow and ice on an airplane will seriously affect its performance. Ice formations on the wing, even a smooth covering of it, will change the contour of the wing, producing an increase in drag and a reduction in effective lift coefficient. Frost or frozen snow may present an even greater hazard since the surface texture is rough and will seriously disrupt the smooth flow of air across the wing.

SNOW REMOVAL

The best way to remove snow is to brush it off with a squeegee, soft brush or mop. Exercise care so as not to damage any components that may be attached to the outside of the airplane, such as antennas, vents, stall warning devices, etc. Remove loose snow from the fuselage before heating the airplane interior; otherwise, at low temperatures, the snow may melt and refreeze to build up a considerable depth of ice. Never attempt to chip or break frozen snow from the airplane. If the airplane has been hangared and snow is falling, coat the airplane surfaces with an anti-icing solution: snow falling on the warm surface will have a tendency to melt, then refreeze.

After snow has been removed from the airplane, inspect the airplane for evidence of residual snow, particularly in the area of control surface gaps and in the hinge areas. Carefully inspect the static ports for evidence of obstruction. Check the exterior of the airplane for damage to external components that may have occurred during the snow removal operations.

Control surfaces should be moved to ascertain that they have full and free movement. The landing gear mechanism, doors, wheel wells, uplocks and microswitches should be checked for ice deposits that may impair function.

When the airplane is hangared to melt snow, any melted snow may freeze again if the airplane is subsequently moved into freezing temperatures. Any measures taken to remove frozen deposits while the airplane is on the ground must also prevent the possible refreezing of the liquid.

Following snow removal, should freezing precipitation continue, the airplane surface should be treated for anti-icing.

FROST REMOVAL

Heavy frost that cannot be removed by wiping with a gloved hand or soft towel must be removed by placing the airplane in a warm hangar or by the application of a deicing fluid.

After removal of all frost from the airplane exterior, check all external components for damage that may have occurred during frost removal.

ICE REMOVAL

Moderate or heavy ice and residual snow deposits should be removed with a deicing fluid. No attempt should be made to remove ice deposits or break an ice bond by force.

After completing the deicing process, the airplane should be inspected to ensure that its condition is satisfactory for flight. All external surface should be examined for residual ice or snow, particularly in the vicinity of control gaps and hinges. Static ports should be carefully inspected for any signs of obstruction.

Control surfaces should be moved to ascertain that they have full and free movement. The landing gear mechanism, doors, wheel wells, uplocks and microswitches should be checked for ice deposits that may impair function.

When the airplane is hangared to melt ice, any melted ice may freeze again if the airplane is subsequently moved into freezing temperatures. Any measures taken to remove frozen deposits while the airplane is on the ground must also prevent the possible refreezing of the liquid.

Following ice removal, should freezing precipitation continue, the airplane surface should be treated for anti-icing.

DEICING AND ANTI-ICING FLUIDS

While aircraft deicing fluids may be available from a number of manufacturers, Beech Aircraft Corporation has investigated the products from only two manufactureres: Union Carbide Chemicals Company and DOW Chemical U.S.A. Beech Aircraft Corporation cannot accept responsibility for damage to the airplane finish, windows, rubber seals, etc. resulting from the use of deicing fluids produced by any other manufacturers.

The UCAR Aircraft Deicing Fluid produced by Union Carbide and DOW Aircraft Deicing Fluid 146AR were chosen according to the following specifics:

- Should be noncorrosive
- Should not deteriorate rubber, painted surfaces, or plastics
- Should have a high flash point
- Should be nontoxic
- Should have good self-wetting and anti-foaming characteristics

These deicing fluids are a specially inhibited, glycol based solution and leave a fairly tough viscous coating on the surface. Each drop is capable of absorbing at least its own weight of water. As moisture is absorbed, it becomes soluble with the deicing fluid. While the fluid remains liquid, snow and ice will not adhere to it. This protection will remain until the fluid becomes overly diluted by falling snow or freezing rain.

The following precautions should be taken when using deicing and anti-icing fluids:

- Do not permit glycol solution to come in contact with the skin. It may cause serious frostbite.
- If the solution is spilled on gloves or clothing, remove immediately. Rapid evaporation of the solution can lower temperature of material and destroy insulating qualities.
- Avoid contact with skin or eyes.
- Stay on the windward side during application. Prolonged exposure to heavy concentrations of glycol vapors are to be avoided.
- Don't let solution contact bearings. It may dilute the lubricant.
- Avoid applying the solution on windows because it may reduce visibility.
- Take care when walking on surfaces that are coated with glycol. The mixture leaves a slippery film that is hazardous to walk upon.
- Take precautions to keep the solution from entering air ducts or cabin heater and ventilator ducts, because of toxic fumes entering the cabin or cockpit during taxi or takeoff.

DEICING AND ANTI-ICING FLUID APPLICATION

Aircraft deicing fluids may be used diluted or undiluted according to manufacturers recommendations for deicing. For anti-icing purposes, the fluids should always be used undiluted. Deicing fluids may be applied either heated or unheated.

General recommendations for deicing and anti-icing treatments may be summarized as follows:

1. Cold application of deicing fluid can be achieved with normal apray equipment, operating at about 60-80 psig air pressure.
2. Hot application should be carried out with temperature of 180-200°F.
3. Remove as much heavy snow as possible before applying deicing fluids.
4. A stream or spray of fluid should be sufficiently coarse to float away loose pieces of ice.
5. Anti-icing of ice-free airplanes does not require heated fluid. In such

cases, the deicing fluid should not be diluted in order to obtain maximum efficiently per pound of applied fluid.

6. Should one system of application be desired for both deicing and anti-icing treatment, the use of hot, concentrated fluid may be a logical compromise.

NOTE

As temperature decreases, the viscosity of deicing fluid increases; therefore, deicing fluids should not be stored outside and unheated during cold weather.

Any standard spray apparatus may be used to apply deicing fluids. The spray should be fine and applied in a fan-shaped pattern. If a sprayer is not available, deicing fluid may be brushed or painted onto the airplane's surface.

CAUTION

Inhalation of glycol mists, aerosols, or high concentration of heated vapors may pose a hazard to humans. Thus, workers should apply deicing fluid only in well vantilated areas, and should avoid inhaling vapors or mists. If adequate ventilation, designed to keep mists or vapors below harmful levels is not present, workers should wear approved respiratory protective devices.

DEICING AND ANTI-ICING FLUID SPILLS

Glycol based deicing fluids are biodegradable in water. Only gross contamination of slow moving or restricted bodies of water would be likely to cause any serious environmental impact. Typical field-use concentrations of deicing fluids, particularly when diluted by snow, ice or water, should cause little or no injury to most broadleaf plants, grasses perennial ground cover or woody plants.

Minor leaks or spills of deicing fluid in storage areas should be soaked up with an absorbent material, such as sawdust, vermiculite, and all-purpose commercial oil absorbent, or sand. Carefully shovel the absorbent/deicing fluid into an appropriate container for disposal.

Spilled, leaked, or contaminated deicing fluid should be disposed of in strict compliance with all applicable federal, state, and local regulations and ordinances.

"END"

CHAPTER

20

STANDARD PRACTICES (AIRFRAME)

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

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CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

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	204	Oct 26/79
	205	Oct 26/79
	206	Oct 26/79

WARNING

Any maintenance requiring the disconnection and reconnection of flight control cables, plumbing, electrical connectors or wiring requires identification of each side of the component being disconnected to facilitate correct reassembly. At or prior to disassembly, components should color coded, tagged or properly identified in a way that it will be obvious how to correctly reconnect the components. After reconnection of any component, remove all identification tags. Check all associated systems for correct function prior to returning the airplane to service.

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:

$$\frac{\text{Original wrench length x specified torque}}{\text{length of wrench + adapter}} = \text{Desired reading}$$

Example:	D	=	Desired Reading
	L	=	Length of torques wrench
	A	=	Adapter Length
	T	=	Torque
	D	=	?
	L	=	33 inches
	A	=	11 inches
	T	=	5,000 inch-pounds

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

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 25 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.

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 s typical example in finding a desired value.

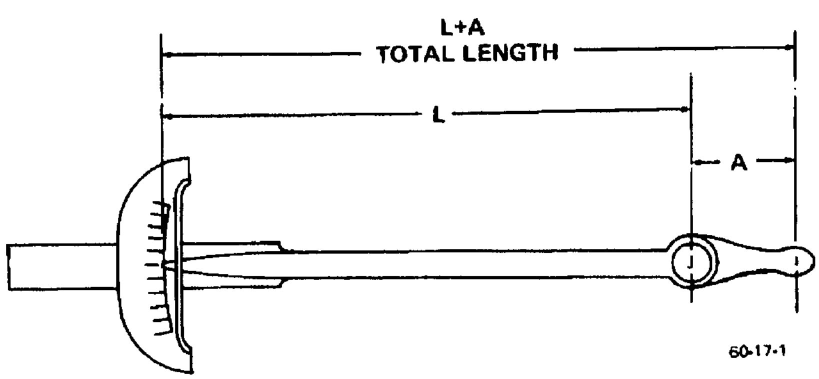
Effective length of flex of "T" handle wrench............12 inches

Length of adapter............3 inches

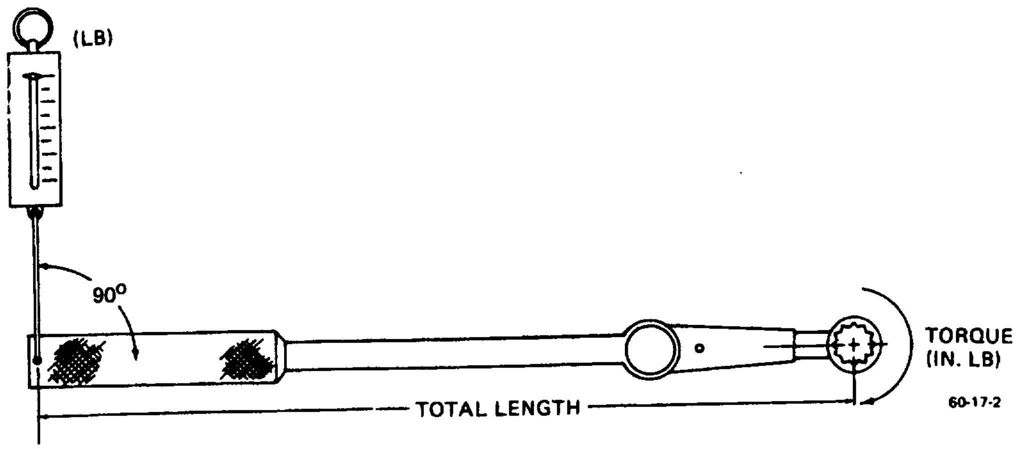
Total length............15 inches

Desired torque on bolt............2,000 inch-pounds

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



Torque Wrench and Adapter
Figure 1



Computing Torque with Spring Scale
Figure 2

AIRPLANE FINISH CARE

NOTE

Any time an airplane is repainted, inspect all placards to assure that they are not covered with paint, are easily readable, and are securely attached.

CLEANING AND WAXING THE AIRPLANE FINISH

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.

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 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 turbocharger 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.

EXTERIOR AND INTERIOR FINISHES

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

EXTERIOR AND INTERIOR PRIMERS

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

ENAMEL

(Exterior Colors)

Shamrock Green	118684-9
Castle Tan	118684-19
Toreador Red	118684-27
Matterhorn White	118684-31
Black	118684-33
Champagne Gold	118684-39
Sable Brown	118684-223
Peacock Turquoise	118684-333
Sahara Tan	118684-337
Antique Gold	118684-341
Beechwood Green	118684-345
Marlin Blue	118684-349
Bahama Blue	118684-351
Pavonne Blue	118684-353
Jade Mist Green	118684-359
Gamma Gray	118684-497
Really Red	118684-499
Vendetta Red	118684-501
Bristol Blue	118684-503
Crater Blue	118684-505
Bright Gold	118684-507
Calypso Orange	118684-509
Mesa Gold	118684-511
Mandarin Orange	118684-513
Citrus Green	118684-515
Olive Green	118684-517
Yellow Jacket	118684-519

URETHANE

(Exterior Colors)

Shamrock Green	118684-307
Castle Tan	118684-312
Toreador Red	118684-316
Matterhorn White	118684-318
Black	118684-319

URETHANE (Cont'd)

Sable Brown	118684-320
Champagne Gold	118684-323
Marlin Blue	118684-393
Bahama Blue	118684-395
Pavonne Blue	118684-397
Jade Mist Green	118684-403
Peacock Turquoise	118684-407
Sahara Tan	118684-411
Antique Gold	118684-415
Beechwood Green	118684-419
Gamma Gray	118684-521
Really Red	118684-523
Vendetta Red	118684-525
Bristol Blue	118684-527
Crater Blue	118684-529
Bright Gold	118684-531
Calypso Orange	118684-533
Mesa Gold	118684-535
Mandarin Orange	118684-537
Citrus Green	118684-539
Olive Green	118684-541
Yellow Jacket	118684-543

LACQUER

(Interior Colors)

Black	118684-133
Chairman Gold	118684-479
Chairman Red	118684-481
Chairman Blue	118684-483
Chairman Olive	118684-485
Executive Brown	118684-487
Parchment	118684-489
Red Antique	118684-491
Walnut	118684-493
Blue Antique	118684-494
Rawhide	118684-495
New Bronze	118684-567
Castle Tan	118684-569
Lemon Yellow	118684-573
Crater Blue	118684-583
Citrus Green	118684-585
Orange Tex	118684-599

ENAMEL

(Interior Colors)

Insignia Red	Ameron 94-509 (Baking Enamel)
Instrument Black	Color No. 514 per ANA Bul. No. 157
Black	Ameron 94-515 (Baking Enamel)

Short cut masking jobs for your paint department are possible when you use pre-cut paint patterns and numbers. Stripe and numeral patterns are available from Mid-America Marking Inc., 1720 S. 151 Street W., Rt. 1, Goddard, KS 67052, or any other equivalent product may be used. Current listings include 4, 12 and 20 inch Call Numbers and Letters. Time can be saved when using these patterns and a much neater final paint job can be expected.

PAINTING ALUMINUM

ENAMEL 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 insure a satisfactory paint base.

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

APPLICATION OF EXTERIOR PAINT ON ALUMINUM SKINS

a. Prime surfaces with wash primer (25, Chart 207, 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 affect 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 (26, Chart 207, 91-00-00), thinned one part primer and two parts toluol (22, Chart 207, 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 tack rag.

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

EXTERIOR PAINT TOUCH-UP REPAIR (ENAMEL)

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 (20 or 22, Chart 207, 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 (26, Chart 207, 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 it is 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.

CAUTION

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 that conforms to MIL-C-8514 should be applied to improve adhesion of the finishing coats. EX2016G base and T6070 catalyst (products of Ameron Industrial Coatings Division, Wichita, Kansas) are used in equal parts as a pretreatment wash primer at the factory.

a. Mix the primer in accordance with the manufacturer's 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 two parts of the 6165 primer base to one part AA-92-C-4A catalyst (products of U.S. Paint Company, Wichita, Kansas) for intermediate 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 not 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 (42, Chart 207, 91-00-00) to the skin under repair with a brush or non-atomizing gun.

CAUTION

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 remnants of paint with lacquer thinner.

e. Sand the repaired area lightly, then apply BEECHCRAFT Dow Treatment 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-C-16173 corrosion preventative compound (43, Chart 207, 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 chromate primer or corrosive preventative compound at the time of installation.

b. Prime the affected area and apply either the enamel 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 enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

LANDING LIGHTS

Paint the landing light wells, excluding the ribs at the inboard and outboard ends, the spar and attaching angles, with quick drying enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

NOSE RADOME

Apply Andrew Brow's P-900 sanding surfacer as required to obtain a smooth surface for painting. Sand with #320 sandpaper.

NOTE

No glass fiber shall be exposed as the result of sanding. Do not repair with plastic materials having metal particles suspension.

Apply an elastomeric rain erosion coating to the base of the radome and extending four to six inches upward and feathering out. Spray with only one coat of primer and maximum of two topcoats of non-metallic pigmented paint.

SURFACES SUSCEPTIBLE TO MUD AND SPRAY

Apply one coat of white epoxy paint to the following areas:

a. Main and nose landing gear wheel wells.
b. Interior surface of landing gear doors.
c. Main and nose landing gear assemblies.

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 insure complete coverage, each coat must be of a different color and must completely hide the preceding 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, with the following exception:
   1. Aluminum parts attached directly to the firewall shall be primed and painted in detail.
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.
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 sill and upper latch.

The following items are painted with Insignia Red, Ameron 94-509 Baking Enamel on all Baron 58P aircraft.

a. Fuel selector handle.
b. Landing gear emergency operation handle.
c. Control lock assembly except the portion of the pin which extends into the control column.
d. Lock assembly, rudder pedal safety and chain.

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

a. Console cover.
b. Elevator tab drum shield.
c. Upper and lower center console.
d. Engine control levers.
e. Nose gear indicator bezel.
f. Instrument faces and bezels.
g. Radio.
h. Bendix ignition switch handles.
i. Instrument panel cutout covers.

Apply Aluminum Lacquer to all sound deadener material above the baggage compartment floor in the forward baggage compartment.

"END"

CHAPTER

21

AIR CONDITIONING

CHAPTER 21 - AIR CONDITIONING

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"END"

GENERAL - DESCRIPTION AND OPERATION

PRESSURIZATION SYSTEM (TJ-3 and after)

Pressurized air for the cabin is taken from the turbocharger compressor of each engine and reduced to a controlled flow by a restrictor in the line called a sonic nozzle. The air then passes through a firewall shutoff valve, through an intercooler, and into the cabin through one way check valves located beneath the pilot and copilot floorboards. The intercooler reduces the heat acquired by the air during pressurization with a flow of ram air from a scoop at the top of each engine nacelle. After the air enters the pressure vessel it is drawn into the conditioning plenums where it is heated or cooled according to the selected system.

A safety valve/dump solenoid and an outflow valve are located on the aft pressure bulkhead. The pressurization controller on the pedestal pneumatically regulates the outflow valve to maintain the selected cabin altitude. The safety valve/dump solenoid is connected to the pressure dump switch, and to the landing gear safety switch. If either of these switches is closed, the safety valve/dump solenoid will open and the cabin will depressurize.

The pressurization system controls consist of a cabin climb indicator, door seal inflate-deflate switch, the cabin altitude controller, a PRESS-TO-TEST switch, a PRESSURIZATION/DUMP switch and the cabin differential pressure gage. Pressurization from the engines may be shut off by pulling the pressurization air controls (push-pull controls) located on the pilot's subpanel placarded CABIN PRESS AIR SHUTOFF-PULL CLOSED. This closes the firewall shutoff valve and dumps the pressurized air into the engine compartment.

The cabin altitude controller is located on the pedestal above the cabin climb indicator and the cabin differential pressure gage. The cabin altitude is maintained with the control anywhere from zero pressure to the maximum differential pressure of 3.75 psi on TJ-3 thru TJ-168, except TJ-153 or 3.9 psi on TJ-153 and TJ-169 and after.

The controller is rotated until the desired cabin altitude for flight is obtained. Any selected cabin altitude will be maintained during the flight provided the cabin pressure is at or below the maximum differential pressure. The rate control knob, located adjacent to the cabin altitude controller, will regulate the rate at which cabin pressure ascends or descends to the selected altitude. If the cabin reaches the maximum differential of 3.75 psi on TJ-3 thru TJ-168, except TJ-153, or 3.9 psi on TJ-153 and TJ-169 and after, and the airplane is still climbing, the cabin altitude will climb with the airplane.

FORWARD CABIN DOOR SEAL PRESSURIZATION SYSTEM (TJ-3 and after)

The forward cabin door on the airplane is equipped with an inflatable door seal. The door seal pressure system provides air pressure to inflate the forward cabin door seal and is controlled by the DOOR SEAL-INFL-DEFL switch on the pressurization console. When the DOOR SEAL switch is placed in the INFL position, an electrical signal is relayed to the door seal pump to provide air to pressurize the door seal pressure tank. When the pressure in the tank reaches the required pressure, the pressure tank solenoid closes and seals off the pump allowing the pressure tank to provide the pressure needed to pressurize the door seal. With the pump air sealed off, the pressure tank solenoid sends an electrical signal to the control unit which removes the electrical power to the pressure pump causing it to stop.

The inflatable door seal is deflated automatically when the door is opened. When the door is opened, the automatic deflate switch in the door frame is actuated (overriding the DOOR SEAL switch in the INFL position) which causes the door seal solenoid valve to release the pressure from the door seal.

The emergency door deflate valve is located in the door adjacent to the hook assembly. When the door handle is in the EMERGENCY DOOR SEAL DEFLATE position, the hook assembly actuates the cam follower of the emergency door deflate valve which dumps the air pressure in the door seal.

STANDBY DOOR SEAL PRESSURE SYSTEM (TJ-3 and after)

The standby door seal pressure system operates off of the DOOR SEAL STANDBY switch located on the left subpanel. Air is supplied by an engine-driven pressure pump mounted on the accessory drive pad on each engine. The air is drawn through an air filter, located on top of the engine, to the pressure pump and then routed to the pressure manifold through a dual pressure relief valve and air filter. The air is then routed to the forward cabin door seal standby pressure regulator and door seal. The system is controlled by the DOOR SEAL STANDBY switch, located on the control console adjacent to the pressurization controls. The inflatable door seal is deflated automatically when the door is opened. When the door is open, the automatic deflate switch in the door frame is actuated (overriding the DOOR SEAL-INFL-DEFL switch in the INFL position) which causes the door seal solenoid valve to release the pressure from the door seal.

AIR CONDITIONING SYSTEM

The air conditioning system has a capacity of 16,000 BTU per hour and consists of a forward evaporator module located under the pilot's seat; an aft evaporator module recessed into the aft pressure bulkhead between the outflow and safety valve; a belt driven rotary type compressor in the left engine accessory section; a condenser in the left nacelle; and nacelle doors to introduce prop blast and ram air. Each evaporator module incorporates a blower.

The system is controlled by two switches on the left subpanel; a two position switch placarded, AIR COND - PRESS AIR COOL and a three position blower switch placarded HI-OFF-LO; and two pressure sensing switches.

The air intake scoops on top of each nacelle automatically open when the PRESS AIR COOL switch is in the A/C position. On the ground the air scoops open to approximately 3-1/2 inches. In flight the air intake scoops open to approximately 1-3/4 inches. The air intake scoop actuator switches are preset with no adjustment required.

Air passes through an air-to-air heat exchanger located in each engine nacelle, and is ducted to the evaporators. Air on the forward evaporator on TJ-3 and after is ducted under the floorboards and exits on the lower side of the pedestal and pilot's and copilot's outlets. On TK-1 and after, the forward evaporator is located forward of the bulkhead at FS 39.00. Air from the aft evaporator exits into the overhead duct and is available to each occupant through eyeball sockets.

HEATER SYSTEM

A 35,000 BTU per hour combustion heater is located in the nose baggage compartment along the forward pressure bulkhead (TJ-3 thru TJ-228 except TJ-210). On TJ-210 and TJ-229 and after, the heater is located beneath the floorboard of the nose baggage compartment. The heater on TK-1 and after is located in the forward part of the nose baggage compartment. The combustion heater operates in conjunction with a recirculation duct, vent blower and combustion air blower.

The CABIN HEAT switch, located on the pilot's subpanel energizes the fuel pump, heater ignition, combustion air blower, and LO vent blower. The HI mode of the vent blower can be selected with the adjacent blower switch if desired. Two thermo switches are installed as part of the heater assembly. A push-pull control on the lower left pilot's subpanel controls a variable thermo-switch (duct-stat) to obtain the desired cycling temperature. The cycling switch maintains a discharge temperature of 185°F in case of duct-stat malfunction.

The manually resettable overtemp switch, located on the heater, shuts off the system until reset in case the discharge temperature reaches 300°F.

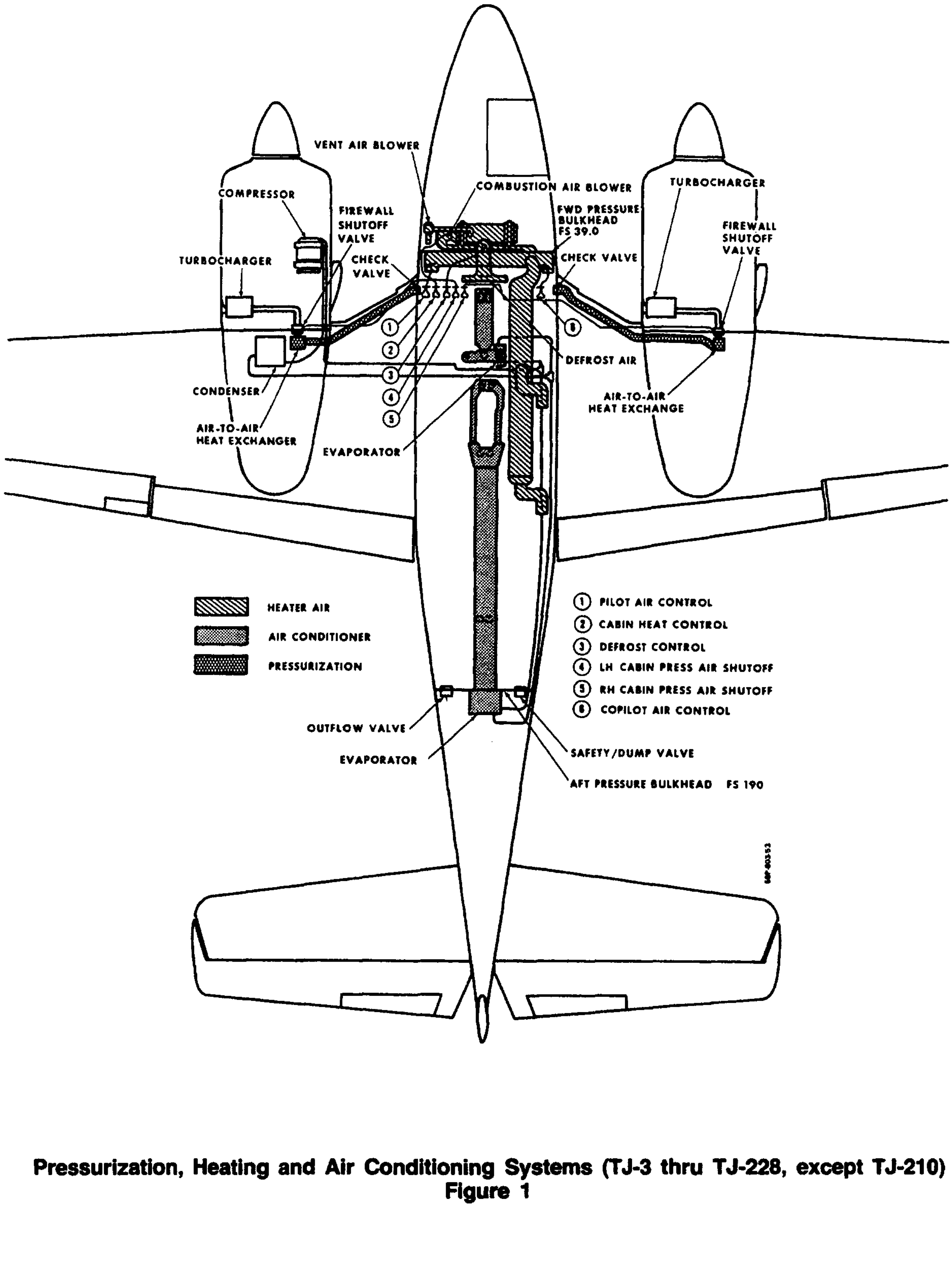
CAUTION

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

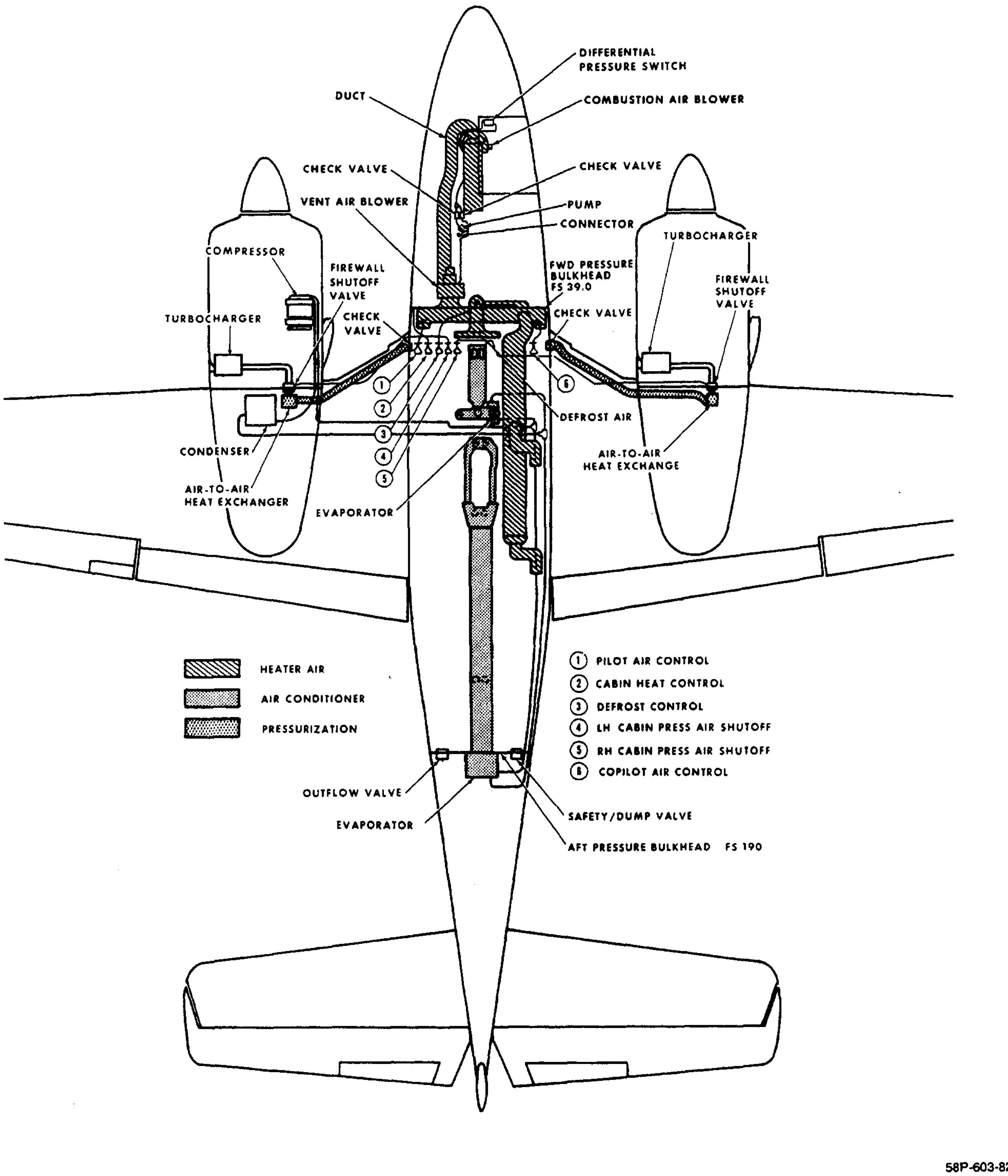
VENTILATION SYSTEM

Ventilation to the cabin is normally supplied by 4-5 lbs per minute of fresh air from each turbocharger. Ventilation from this source is adequate with one firewall air supply valve closed. If for any reason both firewall valves are closed, the pressurization switch should be placed in the DUMP (off) position to allow vent flow from the aft fuselage.

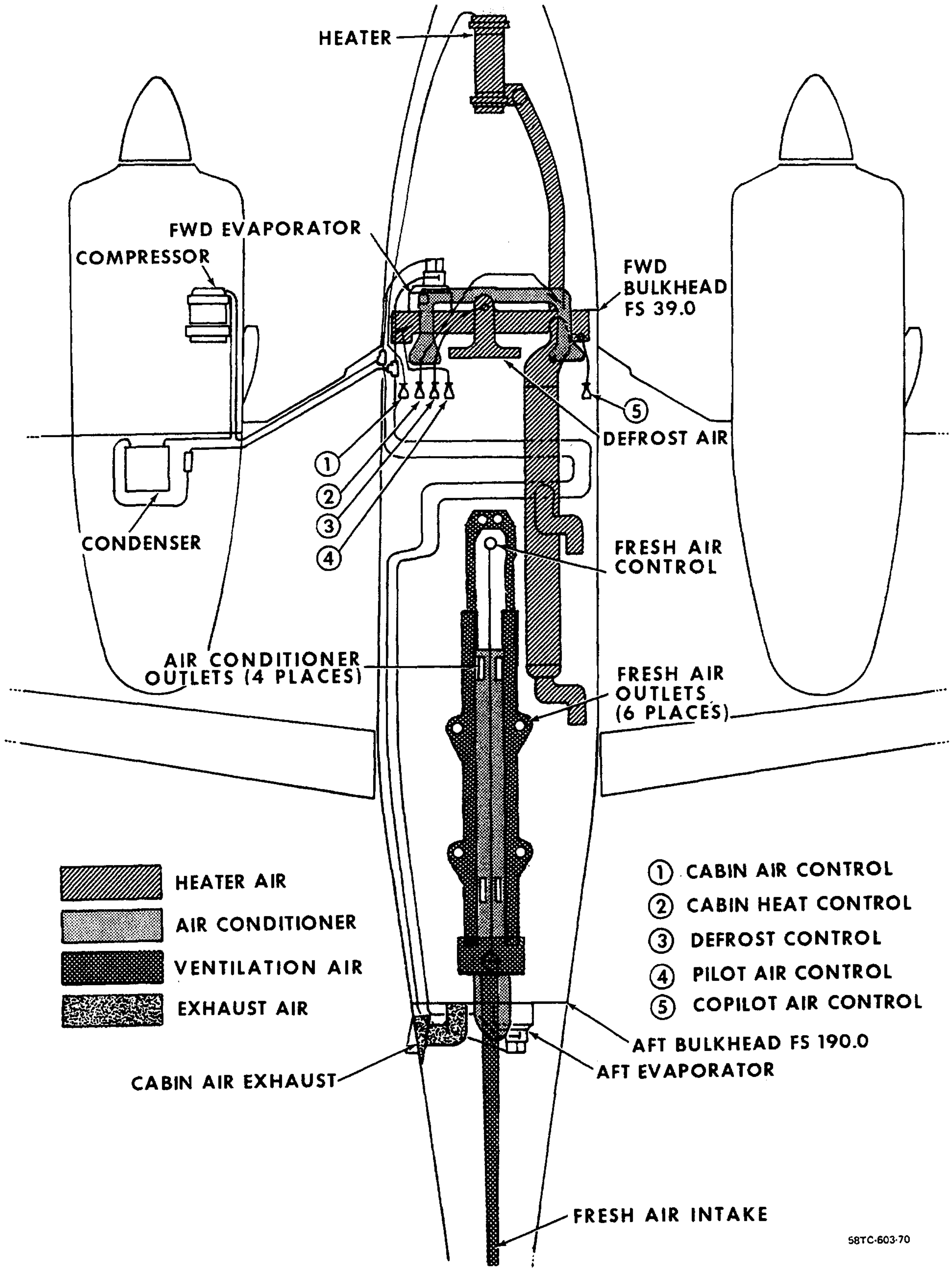
If smoke clearance is desired, in addition to the above, the door seal pressure should be dumped to allow more than normal ventilation air flow.



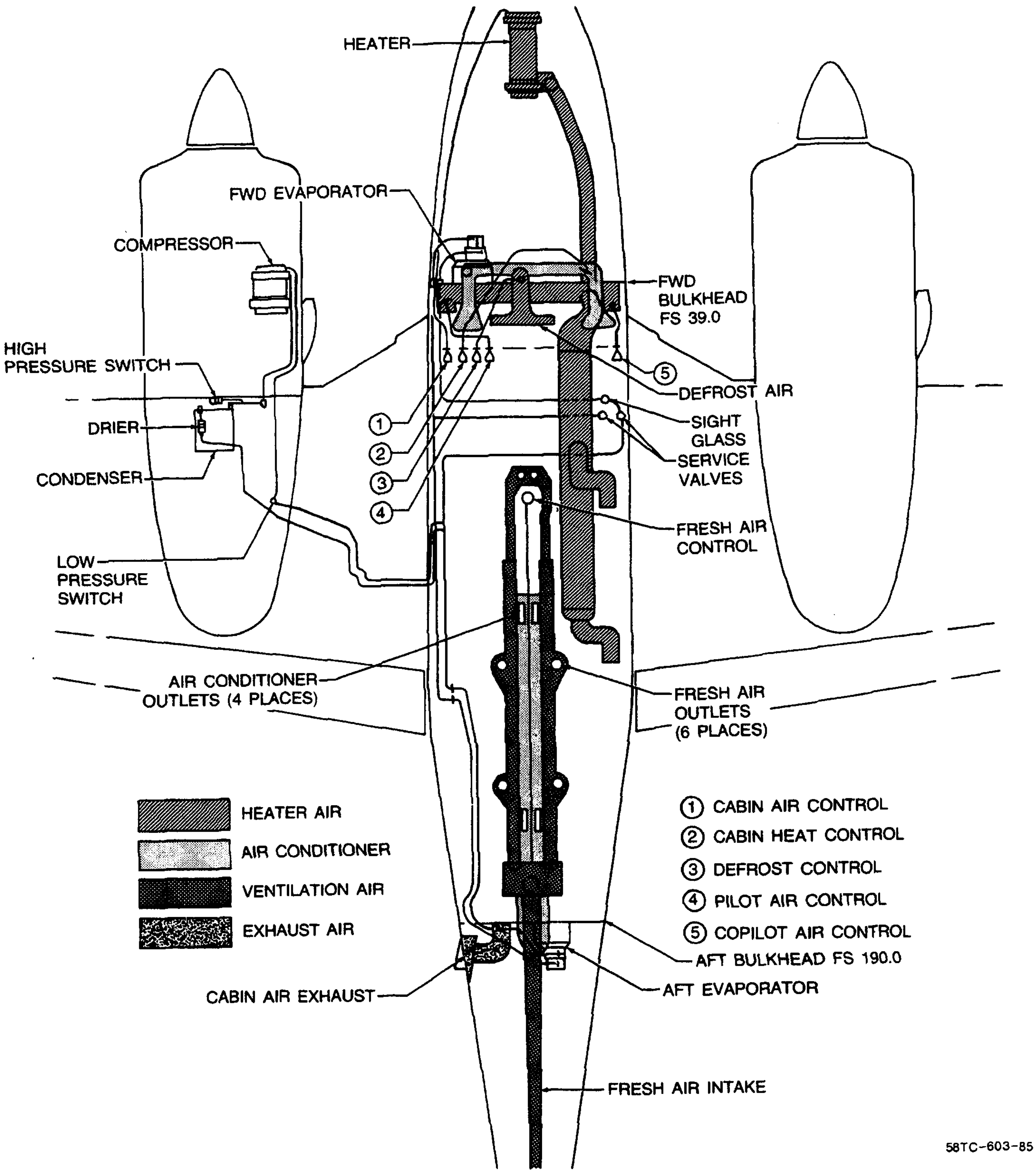
Pressurization, Heating and Air Conditioning Systems (TJ-3 thru TJ-228, except TJ-210)
Figure 1



Pressurization, Heating and Air Conditioning System (TJ-210, TJ-229 and after)
Figure 2



Heating and Air Conditioning System (TK-1 thru TK-70 except TK-68)
Figure 3



Heating and Air Conditioning System (TK-68, TK-71 and after)
Figure 4

"END"

COMPRESSION - DESCRIPTION AND OPERATION (TJ-3 and after)

Pressurized air for the cabin is supplied by the turbocharger compressor. In operation, engine exhaust gas passing over the turbine wheel causes the turbocharger compressor to rotate. Ambient ram air, supplied through the cowl door, is filtered and routed to the compressor where it is compressed and delivered to the heat exchanger through a sonic nozzle, for limiting maximum flow. Cabin pressure is maintained at 3.65 ± .10 psi, on TJ-3 thru TJ-168, except TJ-153 and 3.8 ± .10 psi on TJ-153 and TJ-169 and after, by control of the outflow and safety valve. A pressurization air heat exchanger, located in each nacelle, is used for temperature control of pressurization air before it enters the cabin.

"END"

COMPRESSION - MAINTENANCE PRACTICES (TJ-3 and after)

HEAT EXCHANGER REMOVAL

a. To gain access to the heat exchanger remove the access panel in the upper aft portion of the nacelle.

b. Disconnect ducts from the heat exchanger.

c. Remove attaching hardware and remove heat exchanger.

HEAT EXCHANGER INSTALLATION

a. Place the heat exchanger in position.

b. Secure heat exchanger by installing attaching hardware.

c. Seal reliefs and coil faying surfaces of baffles with EC 1020 compound (Chart 205, Chapter 91-00-00).

d. Install ducts on heat exchanger and secure.

e. Install access panel and secure.

HEAT EXCHANGER CONTROL RIGGING

The heat exchanger is controlled manually through the CABIN PRESS AIR SHUTOFF push-pull control knob. Check heat exchanger for proper operation. If heat exchanger fails to operate, adjust the control wire at the firewall shutoff valve.

FIREWALL SHUTOFF VALVE

During normal flight operations, the CABIN PRESS AIR SHUTOFF push-pull control knobs are pushed against the lower LH subpanel. This will allow maximum airflow to enter the cabin. In the event of a fire inside the engine cowl, immediately pull the red handled control out to the stop. This will shut off the air flow from the inoperable engine. A check valve located just inside the cabin will prevent complete loss of cabin pressurization.

This control is preset at the factory and should not need any further adjustment.

"END"

DISTRIBUTION - MAINTENANCE PRACTICES (TJ-3 and after)

The functional diagrams in Chapter 21-00-00 provide a detailed layout of distribution system utilized by the airplane.

100-HOUR INSPECTION

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

"END"

PRESSURIZATION CONTROL - DESCRIPTION AND OPERATION (TJ-3 and after)

Cabin altitude is selected and controlled by the pressurization controller, located on the control console.

The controller has an aneroid bellows-controlled valve to allow a calibrated amount of air flow to the control diaphragm of the differential control.

An auxiliary volume tank, connected to the controller, provides additional volume to the rate pressure chamber in the controller and allows for greater accuracy of the cabin rate-of-change control.

PRESSUZIATION SYSTEM OPERATIONAL CHARACTERISTICS

a. Power Changes - Normal application of power from a standing start of taxiing will produce a momentary fluctuation of the pressure level. A momentary fluctuation of 1,000 fpm (read on the cabin rate-of-climb indicator) is normal and should provide little or no passenger discomfort. This variation is minimized by slower application of power. More rapid application of power will cause a higher momentary fluctuation and is also considered normal.

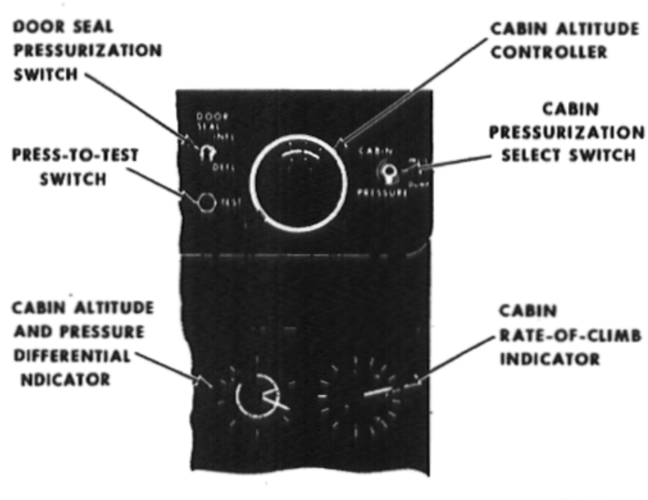
b. Lift Off - As the airplane leaves the ground a momentary cabin pressure fluctuation of as high as 1,000 fpm is considered normal and again will rarely produce passenger discomfort.

c. Altitude Control - As the airplane reaches and climbs through the pre-set altitude, the cabin rate-of-climb will slowly come to a zero point. As the cabin altitude and the selected altitude begin to come together (at the pre-set altitude), a pressure fluctuation may be noticed (1,000 fpm is normal). Stabilization of the two altitudes within 500 feet of each other can be expected until maximum differential pressure is reached.

d. Maximum Differential Pressure - As the cabin leaves the isobaric altitude control and goes on maximum differential pressure control, it will make an adjustment and a fluctuation of 500 fpm may be noted before it stabilizes to the normal rate-of-climb of the airplane. Again, little or no passenger discomfort should be experienced.

e. Power Reductions - A sudden power reduction or loss of power on one engine below 20 in. Hg MP will cause a change in engine pressurization air flow. Therefore, cabin pressure will be affected and cabin pressure fluctuation will be experienced. A fluctuation of 2000 fpm is normal under these conditions.

f. Pressurization at Minimum Power - A maximum differential pressure (3.75 psi on TJ-3 thru TJ-168, except TJ-153 or 3.9 on TJ-153 and TJ-169 and after) may be expected at any throttle setting of 23 in. Hg MP or above on both engines or during single engine operation with the operating engine at recommended cruise power or above, at an altitude of 20,000 feet or above. A recommended practice is, prior to take-off, set the controller to cruise altitude plus 500 feet. By doing this the controller does not have to be reset in flight and a smooth comfortable pressurized flight can be expected. Before descent, the controller should be set to 1,000 feet above the altitude of the landing destination.



Pressurization Controls
Figure 1

CABIN ALTITUDE CONTROLLER

Cabin altitude is maintained by the cabin altitude controller with the control anywhere from zero pressure to maximum differential of 3.75 psi on TJ-3 thru TJ-168, except TJ-153 or 3.9 psi on TJ-153 and TJ-169 and after. The controller is rotated until the desired cabin altitude for flight is at the index mark. Any selected cabin altitude will be maintained during the flight provided the cabin pressure is at or below the maximum differential pressure. If the cabin reaches the maximum differential of 3.75 psi on TJ-3 thru TJ-168, except TJ-153 or 3.9 psi on TJ-153 and TJ-169 and after and the airplane is still climbing, the cabin altitude will climb with the airplane. If a cabin altitude change is required in flight it can be accomplished by selecting the new cabin altitude. The rate of change, both increase or decrease in pressure, will be in accordance with the setting of the rate knob.

OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID

An outflow valve and safety valve/dump solenoid are located on the forward side of the aft pressure bulkhead. The outflow valve regulates cabin pressure up to maximum differential pressure of 3.75 psi on TJ-3 thru TJ-168, except TJ-153, or 3.9 psi on TJ-153 and TJ-169 and after.

A diaphragm in the valve, controlled by the cabin altitude control, closes to the position necessary to maintain the selected pressure. This maintains the selected cabin altitude up to maximum differential pressure. The differential control feature of the valve maintains the cabin pressure at maximum differential pressure (3.75 psi on TJ-3 thru TJ-168, except TJ-153, or 3.9 psi on TJ-153 and TJ-169 and after) only. The differential control utilizes a diaphragm that applies pressure against a spring-loaded needle valve. When cabin pressure reaches maximum differential pressure, the diaphragm pushes against the needle valve, allowing cabin air to bleed off into the tail section. As cabin air bleeds off, the diaphragm allows the needle valve to return to its normal position; thus the diaphragm modulates the needle valve between the open and closed position to maintain maximum differential pressure. The safety valve/dump solenoid is the same as the outflow valve, however it controls differential pressure only. When the airplane touches down, a solenoid valve will energize applying vacuum to the control chamber of the safety valve and dump the cabin pressure overboard. The solenoid valve is located on the right side of the aft pressure bulkhead at FS 190.00 between the cabin pressurization safety valve and the aft air conditioner evaporator module.

The secondary function of this solenoid is to eliminate pressurization fluctuation during ground run-up and flight when the airplane is unpressurized.

When energized, the solenoid valve allows vacuum to be applied to the control diaphragm which holds it in the open position allowing cabin pressure to freely dump overboard. The solenoid valve is energized when the manual dump switch is in the dump position or any time the airplane is on the ground. The vacuum source is an ejector, located aft of the forward pressure bulkhead.

PRESSURIZATION TEST SWITCH

A pressurization press-to-test switch is located on the control console. The momentary press-to-test switch de-energizes the solenoid valve so the pressurization system can be checked during ground run-up. Pressurization ground check may be accomplished as follows:

a. Place the manual dump switch in the pressure position and the firewall shut-off valves in the open position. Set the controller below field elevation.

b. Run the engines at 2,000 rpm and press the press-to-test switch.

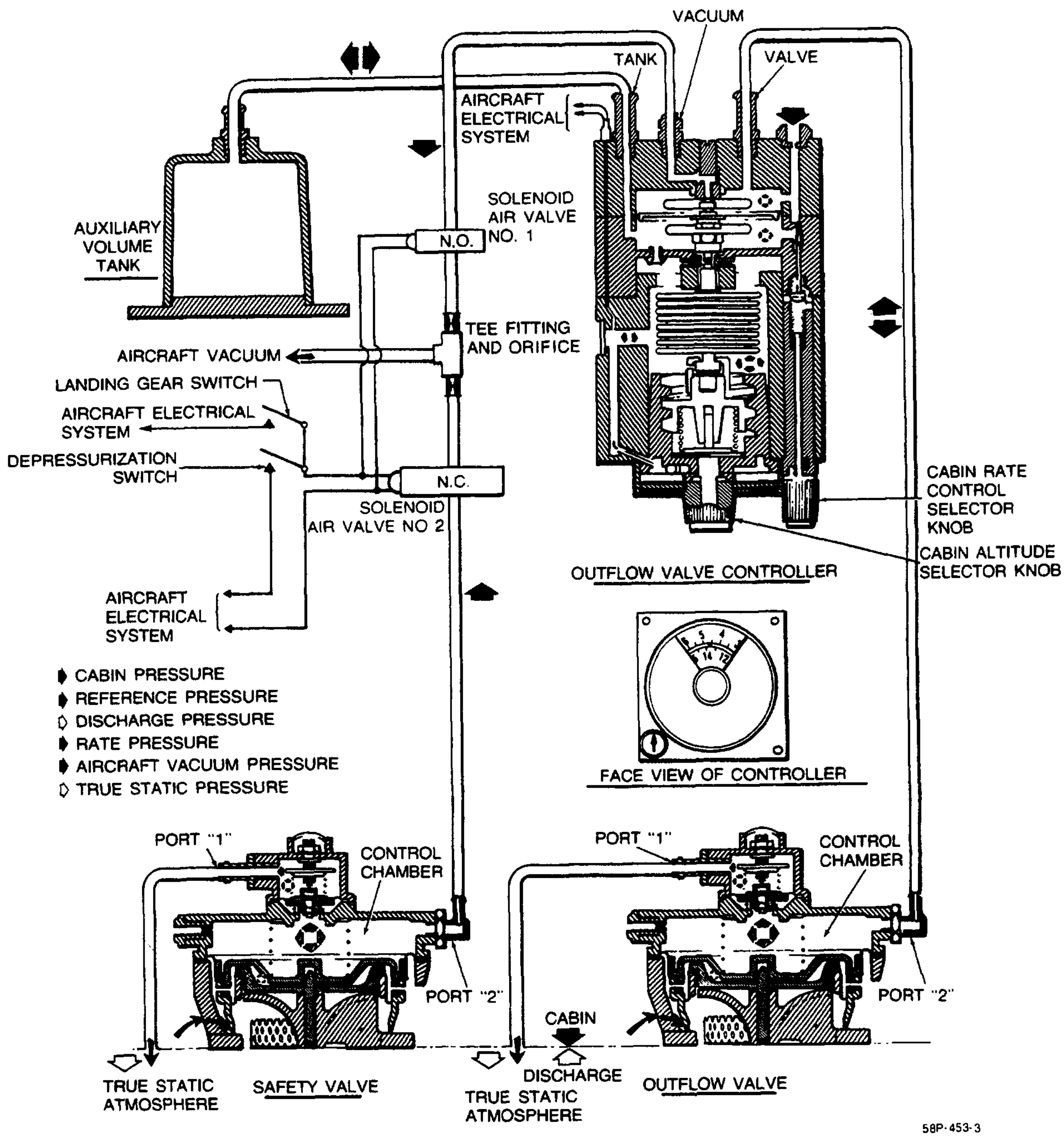
c. A momentary indication of descent in cabin altitude on the cabin rate-of-climb indicator shows that the system will pressurize.

NOTE

It is recommended that high strength webbing (P/N 102-000402-D939 or equivalent) be used to encompass fuselage doors and windows for safety of personnel during ground pressurization operation by external pressurization blower.

EJECTOR

The ejector is located on the right sidewall just aft of FS 39.00. Air from the pressure manifold passes through the larger side of the ejector creating a vacuum on the smaller side of the ejector. The vacuum lines connect to the pressurization controller and to the dump solenoid valve.



Cabin Pressure Control System Schematic
Figure 2

TROUBLESHOOTING
PRESSURIZATION SYSTEM (TJ-3 and after)

TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1. Unable to pressurize.	a.	Cabin altitude controller inoperative.	a.	Check by performing PRESSURIZATION TEST.
	b.	Outflow valve inoperative.	b.	Check by performing PRESSURIZATION TEST.
	c.	Dump valve solenoid stuck in open position.	c.	Cycle pressurization system circuit breaker, check for operation of solenoid; replace if inoperative.
	d.	Shutoff solenoid in cabin controller supply line stuck in closed position.	d.	Cycle pressurization system circuit breaker, check for operation of solenoid; replace if inoperative.
	e.	Outflow valve control line restricted.	e.	Check for restrictions; repair or replace.
	f.	Outflow valve and safety valve seats dirty.	f.	Clean the valve seats with a lint-free cloth moistened with isopropyl alcohol.
	g.	Firewall shutoff valves pulled closed.	g.	Open valves.
	h.	Hole in flex ducts from engine.	h.	Inspect and repair or replace as required.
	i.	Excessive pressure leaks in cabin (door, seal, etc.)	i.	Check cabin for leaks; repair as required.
2. No pressure indication on ground.	a.	Pressurization system switch inoperative.	a.	Replace switch.
	b.	Rate-of-climb indicator inoperative.	b.	Replace indicator.
	c.	Manifold pressure too low during check.	c.	Increase manifold pressure to a minimum of 20 in. Hg.
3. Maximum cabin differential pressure exceeds 3.75 psi on TJ-3 thru TJ-168, except TJ-153 or 3.9 psi on TJ-153 and TJ-169 and after.	a.	Cabin altitude and differential pressure indicator inoperative.	a.	Replace indicator.
	b.	Safety valve and outflow valve out of adjustment.	b.	Replace valves.
	c.	True static air vent tubes loose or damaged.	c.	Inspect lines and fittings; tighten or replace as required.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (TJ-3 and after) (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
4. Cabin pressure slow to respond to change in selected cabin altitude.	a. Cabin pressurization control supply line or the outflow valve control line kinked or restricted.	a. Inspect lines and fittings; repair or replace as required.
	b. Cabin pressurization controller filter restricted.	b. Clean filter.
5. Cabin altitude higher than selected altitude.	a. Cabin altitude controller out of adjustment.	a. Replace controller.
	b. Cabin altitude indicator inoperative.	b. Replace indicator.
	c. Cabin pressurization controller inoperative.	c. Replace controller.
	d. Cabin pressurization controller filter restricted.	d. Clean filter.
	e. Outflow valve control line kinked or restricted.	e. Inspect, repair as necessary.
6. Cabin altitude lower than selected altitude. (Not exceeding maximum differential pressure).	a. Cabin pressurization controller out of adjustment.	a. Replace controller.
	b. Cabin altitude controller supply line or outflow valve control line leaks.	b. Inspect, repair or replace as required.
	c. Cabin altitude indicator inoperative.	c. Replace indicator.
7. Cabin pressure fluctuation.	a. Valve seats dirty.	a. Clean the valve seats with a lint-free cloth moistened with isopropyl alcohol.
8. Cabin pressurization system circuit breaker tripped.	a. Dump valve solenoid shorted.	a. Locate cause, repair or replace defective component, reset circuit breaker.
	b. Shutoff solenoid in cabin pressurization controller shorted.	b. Locate cause, repair or replace defective component, reset circuit breaker.
	c. Pressurization system circuit shorted.	c. Locate cause, repair or replace defective component, reset circuit breaker.

TROUBLESHOOTING
PRESSURIZATION SYSTEM (TJ-3 and after) (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
9. Airplane pressurizes on ground.	a. Landing gear safety switch inoperative or improperly rigged.	a. Replace or adjust the RH landing gear safety switch.
	b. Open circuit in cabin pressurization circuit.	b. Locate cause, repair or replace defective component.

"END"

PRESSURIZATION CONTROLS - MAINTENANCE PRACTICES (TJ-3 and after)

OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID REMOVAL

a. Remove the upholstery panels from the forward side of the aft pressure bulkhead making the valves accessible.

b. Loosen and remove all necessary plumbing from the valve. Cap open plumbing to keep shop soil, dirt and foreign objects from entering.

c. Remove the access door on the lower LH fuselage, just aft of the rear pressure bulkhead.

d. Station a man inside the aft fuselage to remove the attaching bolts and remove the valve.

OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID INSTALLATION

a. Station a man inside the aft fuselage to position the valve and install the attaching bolts. Torque the attaching bolts to 5 ± 1 inch-pounds.

NOTE

When reinstalling the existing valve or installing a new valve, the existing mounting gaskets and seals must be discarded and the applicable new gaskets and attaching parts (if required) must be installed. Use water only as a lubricant on EVA tubing being installed over beaded tubing or fittings.

b. Install the access door on the LH fuselage.

c. Remove the dust caps and install the plumbing to the valve. Earlier serials use flared fittings, while the later serials equipped with the plastic outflow valves use a beaded tube fitting and clamps to secure the plumbing.

d. Install the upholstery panels.

OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID ADJUSTMENT

The outflow valve and safety valve/dump solenoid are preset at the factory and should require no further adjustment. Any time the valve seal is broken the WARRANTY (6 months in duration) is VOIDED.

NOTE

Plastic (Lexan) valves are not adjustable.

CLEANING THE CABIN OUTFLOW CONTROL VALVE, SAFETY VALVE, FILTERS AND SEATS

The outflow and safety valve filters and seats must be cleaned every 100 hours. The outflow and safety valve filters are to be replaced every 500 hours. For cleaning and replacement instructions refer to AiResearch Operation and Maintenance Instructions Manual, Report No. 4-267.

FUNCTIONAL TEST OF OUTFLOW VALVE AND SAFETY VALVE

OUTFLOW VALVE FLIGHT CHECK (TJ-3 and after)

a. While the airplane is in flight ensure that the cabin pressure can be maintained at ½ psid (pounds per square inch differential) less than maximum differential (3.75 psi on TJ-3 thru TJ-168, except TJ-153 and 3.9 psi on TJ-153 and TJ-169 and after).

b. If the cabin pressure cannot be maintained at ½ psid below the maximum differential and goes to maximum differential, the outflow valve must be replaced. Refer to OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID REMOVAL and OUTFLOW VALVE AND SAFETY VALVE/DUMP SOLENOID INSTALLATION in this chapter for removal and installation procedures of the outflow valve.

SAFETY VALVE GROUND CHECK (TJ-3 and after)

a. Connect a regulated cabin pressurization test unit to the airplane as instructed in Chapter 21-30-00. (Do not pressurize at this time.)

b. Working through the access opening behind the aft pressure bulkhead, locate the line that connects the dump solenoid valve to the safety valve and disconnect the line from the solenoid valve.

c. Connect a regulated vacuum source to the line which was disconnected from the solenoid valve. (Do not apply vacuum at this time.)

d. Pressurize the cabin to 3 psid.

e. Slowly apply regulated vacuum to the safety valve. If the valve opens before the vacuum reaches 4 inches Hg indication on the test unit, the valve is operating satisfactorily. If more than 4 inches Hg are required to open the safety valve, the valve must be replaced.

CABIN ALTITUDE CONTROLLER REMOVAL

a. Remove the attaching screws at the control console.

b. Loosen and remove plumbing from the controller. Cap open plumbing to keep shop soil, dirt and foreign objects from entering.

c. Remove the controller.

CABIN ALTITUDE CONTROLLER INSTALLATION

a. Remove plumbing cap and install plumbing to controller.

b. Position the controller in the subpanel.

c. Install the attaching screws at the control console.

PRESELECT SOLENOID REMOVAL

a. Gain access to the preselect solenoid through the nose baggage door and remove the equipment screen in the aft baggage compartment.

b. Locate the preselect solenoid on the right hand line going to the controller.

c. Note the position of the preselect solenoid to facilitate reinstallation.

d. Remove the preselect solenoid support clamp by removing the attaching screws.

e. Disconnect the tubes from both ends of the preselect solenoid. Remove the preselect solenoid. Cap pressurization lines to prevent dirt, oil or other objects from entering.

PRESELECT SOLENOID INSTALLATION

a. Remove caps from the pressurization plumbing and position the preselect solenoid so that the flow is indicated toward the cabin altitude controller.

b. Connect the tubes at both ends of the preselect solenoid.

c. Secure the preselect solenoid support clamp with the attaching screws.

d. Secure all access panels removed.

e. Perform the PRESSURIZATION TEST PROCEDURE to ensure that the system operates properly.

PRESSURIZATION TEST PROCEDURE

The following tests should be accomplished anytime maintenance on the system is performed.

a. Remove the upholstery panels from the forward side of the aft bulkhead to gain access to the outflow valve and safety valve/dump solenoid.

b. With an airflow to the cabin of 130 ± 20 standard cubic feet per minute (scfm), determine that the safety/dump valve and outflow valve regulates the cabin differential pressure at 3.55 to 3.75 psi on TJ-3 thru TJ-168, except TJ-153 and 3.7 to 3.9 on TJ-153 and TJ-169 and after. Test each valve by capping off the atmosphere ports of the opposite valve, since the valves are preset at the same differential pressure.

c. A check of the controller and the outflow valve must be made in the airplane during flight. Compare airplane altitude with cabin altitude setting, using a sensitive altimeter. The isobaric control scale is to agree with the cabin altimeter within ± 500 feet.

d. The complete airplane shall be tested for air leakage. The leakage rate of the cabin, including all ducts and valves downstream from the turbocharger, shall not exceed 40 scfm of air at a cabin pressure differential of 3.65 ± .10 psi on TJ-3 thru TJ-168, except TJ-153 and 3.8 ± .10 psi on TJ-153 and TJ-169 and after during the test, air pressure must be supplied to the forward door seal plumbing and maintained between 12 to 17 psi.

EJECTOR REMOVAL

a. Remove upholstery on the right side wall aft of FS 39.00 to gain access to the ejector.

b. Remove hoses and clamps from the ejector. Install dust caps on the hoses and ejector openings to prevent contamination.

c. Remove the ejector attaching screws and remove the ejector.

EJECTOR INSTALLATION

a. Place ejector in position and secure with attaching screws.

NOTE

Ensure that the longer end of the pressure line connection is pointing forward toward the overboard dump.

b. Remove dust caps from the hoses and ejector and install the hoses to the ejector and secure with clamps.

c. Install upholstery panels and secure.

CABIN PRESSURIZATION LEAKAGE TEST (TJ-3 and after) (Figure 1)

Test equipment is available for ground testing the cabin for pressurization leaks and for troubleshooting the pressurization system. Such equipment must be capable of delivering 4.50 psi of air at 80 cubic feet per minute and must be protected by a complete safety system to prevent damage to the airplane. The test unit listed in the following paragraph consists of an electric motor and blower assembly, a dry air filter, a flowmeter, a cabin pressure gage, and a large relief valve to protect the pressure vessel of the airplane.

NOTE

It should be noted that the test unit to be used must be set at the psi of pressurization for which the airplane is designed if the safety system of the test unit is to fulfill its function.

The units listed in the following paragraph, TEST EQUIPMENT, also include a pneumatic air system that delivers from zero to 30 pounds of air at 25 cubic feet per minute for checking the deicer boot system, pressure instruments, and door seals.

TEST EQUIPMENT (TJ-3 and after)

The following pressurization test units, or their equivalent, may be utilized for the cabin pressurization leakage test.

a. Cabin Pressurization Test Unit: Manufactured by Kitco Tool and Die Inc., 21 Water Street, Mill Hall, PA. 17751.

1. Model 1200 - for domestic use.
2. Model 1300 - for export use.

NOTE

The test equipment hoses, furnished with the test unit, may be connected in only one (either), or both nacelles. The TEST EQUIPMENT text and Figure 201 illustrates the test equipment hoses connected in both nacelles.

b. Use low pressure hose, 2 1/2 inches in diameter, to connect the PRESSURIZING AIR fitting of the test unit to the flexible ducts, forward of the LH and RH firewalls.

c. Two pieces of 1/4-inch high pressure hose are used to connect the PNEUMATIC AIR fitting on the test unit to the aluminum fitting on the forward side of the firewall.

d. High pressure hose (3/8 inch in diameter) of sufficient length to connect the cabin atmosphere fitting (located on the aft side of the aft pressure bulkhead) to the INSTRUMENT AIR or CABIN PRESSURE fitting on the test unit.

e. Tee or Y-shaped fittings and clamps to connect the hoses are described in steps "b" through "d".

f. High strength webbing (P/N 102-000402-D939 or equivalent) to encompass fuselage doors and windows for safety of testing personnel during performance of test.

TEST PROCEDURE (TJ-3 and after)

a. Gain access to the outflow and safety valves at the aft pressure bulkhead. Remove the control port tubing from both the outflow and safety valves.

b. Connect a 1/4-inch back pressure hose between the safety valve atmosphere vent fitting on the aft bulkhead and an air supply capable of maintaining a 4.50 psi air supply.

NOTE

Ensure that all windows and doors are closed and securely latched.

WARNING

Personnel who work under pressurized conditions must be carefully chosen. Pressurization may prove dangerous to personnel which are overweight, have heart or respiratory disorders, ear infection, or are not emotionally stable.

c. Place the webbing (P/N 102-000402-D939 or equivalent) in position over the pressure vessel (doors and windows).

d. Connect a 2-1/2 inch air supply/hose between the test unit (PRESSURIZING AIR fitting) and the flexible ducts, forward of the LH and RH firewall.

e. Connect the PNEUMATIC AIR fitting on the test unit to the aluminum fitting on the forward side of the firewall.

NOTE

Ensure that all connections are secure at the airplane and at the test unit. Ensure that all "T" and/or "Y" fittings are secure.

CAUTION

Do not attempt to inflate the door seal with the RH forward door open.

f. Apply air to pressurize the door seal and maintain a pressure of 12 to 12.5 psi.

g. Slowly open the air valve to pressurize the cabin. Monitor the RATE-OF-CLIMB and CABIN PRESSURE indicators. The rate-of-climb should not exceed 1,000 feet per minute to a maximum of 25,000 feet. The cabin differential pressure shall not exceed 3.75 psi on TJ-3 thru

TJ-168, except TJ-153 and 3.9 psi on TJ-153 and TJ-169 and after as observed on the CABIN PRESSURE indicator.

NOTE

Ensure that the back pressure air is maintained at .7 psi above the cabin differential pressure on the CABIN PRESSURE indicator on the test unit.

h. Pressurize the cabin to a differential pressure of 3.00 ± .50. Allow five minutes for the cabin pressure to stabilize. After stabilization is established, check the cabin for excessive leakage. A 38 cubic feet per minute leakage is permissible. If the leakage is indicated at more than 38 cubic feet per minute isolate the cause and repair as described in the following paragraphs.

1. Check all connections to the pressure vessel, test unit, and the "T" and/or "Y" fittings in the test hoses to ensure that no leaks exist. Repair all leaks and repeat steps "f." through "h".

2. If leaks are suspect through the outflow or safety vales, depressurize the pressure vessel at a rate of 1,000 feet per minute, disconnect the back pressure hose at the safety valve and install a Leak Test - Valve (P/N 102-590020/939 or equivalent) on the atmosphere ports of the safety and outflow valves. Pressurize the pressure vessel per steps "f" through "h", allow the pressure to stabilize. Leakage through each valve shall not exceed .23 pound per minute (192 cubic feet per hour). Slight adjustment of the outflow and safety valve mounting screws may reduce the leakage rate considerably. If the outflow and/or safety valves are determined to be defective, replace as necessary. Perform the leak test described in steps "f" through "h".

3. Check the seal around the forward cabin door. If excessive leakage is detected around the forward cabin door, check to ensure that the door seal is inflated and the door is closed securely. If leakage continues, perform FORWARD CABIN DOOR LEAK TEST as described in Chapter 21-31-00. Repair any leaks found in the door seal and perform steps "a" through "h". If leakage is still indicated around the forward cabin door, rig the door in accordance with FORWARD CABIN DOOR RIGGING (TJ-3 AND AFTER) in Chapter 52-10-00. Perform leak test as described in steps "a" through "h".

4. Check the aft cabin door for leakage, if leakage is indicated, adjust the aft cabin door latch as described in AFT CABIN DOOR LATCH ADJUSTMENT (TJ-3 AND AFTER) in Chapter 52-10-00. If leakage still exists around the door, replace the aft cabin door seal as described in AFT CABIN DOOR SEAL REPLACEMENT (TJ-3 AND AFTER) in Chapter 52-10-00. Perform leak test as described in steps "a" through "h".

5. Check around the windows for leaks, remove and replace windows found to be defective.

NOTE

Ensure that the test unit is working properly and all gages are accurate.

6. Gain access to the points where the control cables, electrical wire bundles, plumbing, and landing gear retract rods enter the pressure vessel by removing the seats, floorboards, and upholstery. Fill the control cable pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00) and paint the control cables, through-out its full travel through the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Spread the electrical wire bundles apart and apply EC1239A½ sealant around each wire. After each wire is covered,wrap Scotch #33 vinyl around the wire bundle (butted against seal fitting) and inject EC1239A½ sealant in the notch of the seal fitting. Apply EC1239B½ sealant to all plumbing fittings at the pressure vessel. Ensure that the landing gear retract rods pressure boots are properly installed without damage. Perform the pressurization leak test as described in "a" through "h".

7. Remove all seats, floorboards, and upholstery panels. Check the complete pressure vessel for leaks. Isolate and repair all leaks. Repeat steps "a" through "h".

i. With the pressure leak test within tolerance, depressurize the pressure vessel and remove the safety net.

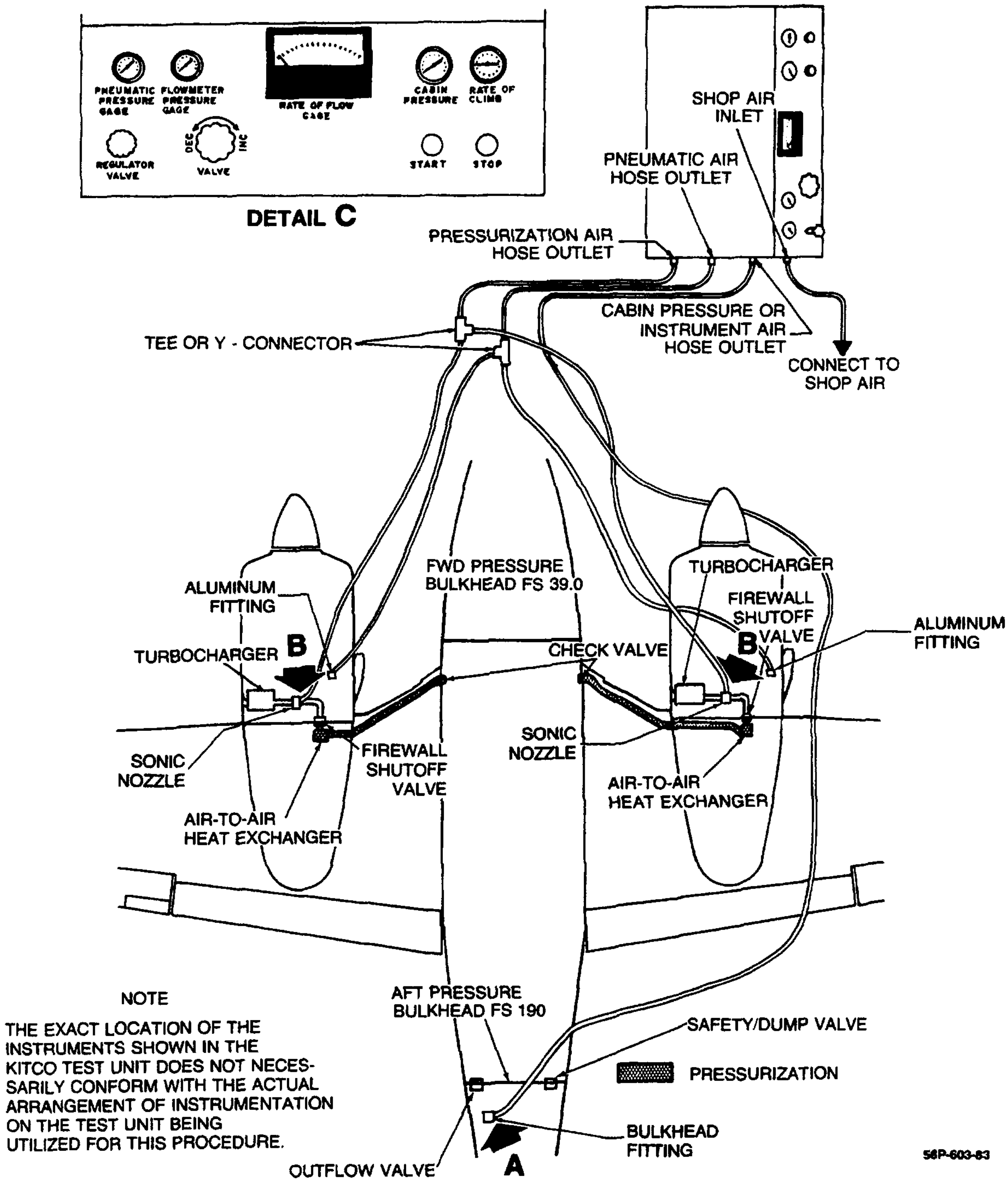
j. Remove all test hoses from the airplane and connect the hoses between the fuselage and the engines.

k. Install the control port tubing on each outflow and safety valve.

l. Connect the forward cabin door pressure tube to the forward cabin door pressure system.

m. Ensure that the back pressure test hose is removed from the atmosphere vent fitting of the safety valve (located on the aft side of the aft bulkhead).

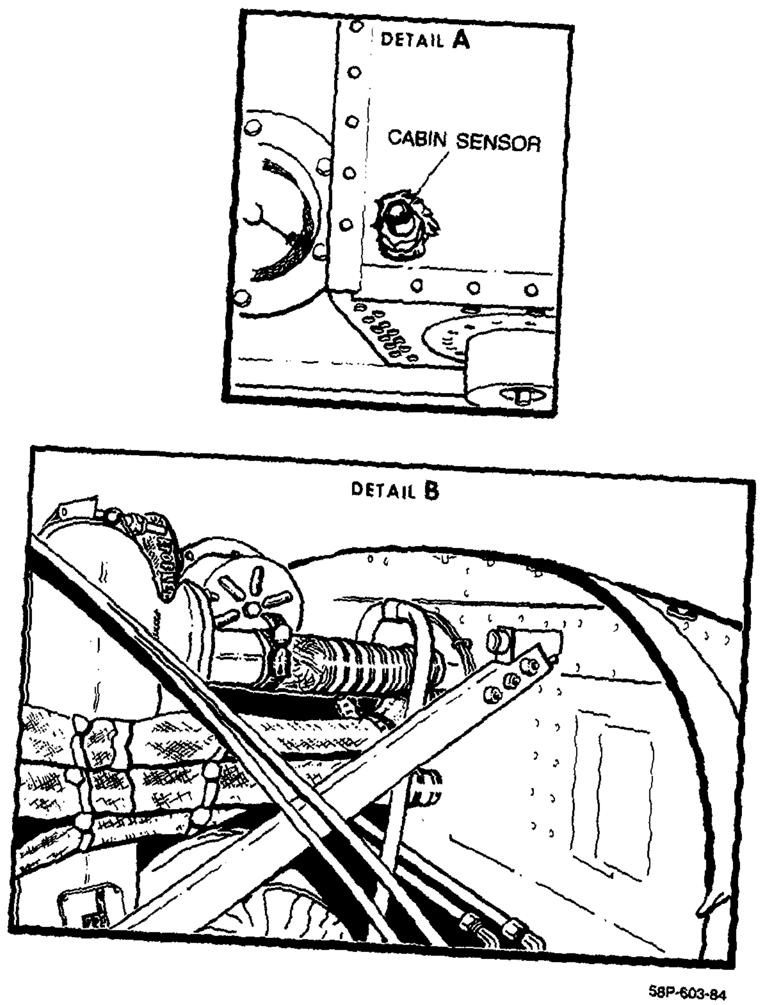
n. Install floorboards, upholstery panels, seats, and access panels which were removed during the test procedure.



NOTE

THE EXACT LOCATION OF THE INSTRUMENTS SHOWN IN THE KITCO TEST UNIT DOES NOT NECESSARILY CONFORM WITH THE ACTUAL ARRANGEMENT OF INSTRUMENTATION ON THE TEST UNIT BEING UTILIZED FOR THIS PROCEDURE.

Cabin Pressurization Test Hookup (Page 1 of 2)
Figure 201



Cabin Pressurization Test Hookup (Page 2 of 2)
Figure 202

DOOR SEAL PRESSURIZATION - DESCRIPTION AND OPERATION

DOOR SEAL PRESSURE SYSTEM (TJ-3 and after)

The door seal pressure system is designed to provide 12 psi air pressure to inflate the forward cabin door seal and is controlled by the DOOR SEAL-INFL-DEFL switch on the pressurization console. The DOOR SEAL switch is connected electrically to the door seal control unit, door seal pump and pressure tank solenoid. When the DOOR SEAL switch is placed in the INFL position, an electrical signal is relayed to the door seal pump to provide air to pressurize the door seal pressure tank. When the pressure in the tank reaches the required pressure, the pressure tank solenoid closes and seals off the pump allowing the pressure tank to provide the pressure needed to pressurize the door seal. With the pump air sealed off, the pressure tank solenoid sends an electrical signal to the control unit which removes the electrical power to the pressure pump causing it to stop. The pump may cycle on and off, but should remain off until the pressure is dumped and the door seal system is repressurized. Excessive cycling of the pump during normal operation is an indication of trouble. Should the door seal pressure system become disabled, the door seal control unit solenoid valve will close sealing off the entire system. The light on the instrument panel will illuminate, signaling the pilot to activate the standby door seal system.

The inflatable door seal is deflated automatically when the door is opened. When the door is opened, the automatic deflate switch in the door frame is actuated (overriding the DOOR SEAL switch in the INFL position) which causes the door seal solenoid valve to release the pressure from the door seal.

The emergency door deflate valve is located in the door adjacent to the hook assembly. When the door handle is in the EMERGENCY DOOR SEAL DEFLATE position, the hook assembly actuates the cam follower of the emergency door deflate valve which dumps the air pressure in the door seal (leave the handle in the EMERGENCY DOOR SEAL DEFLATE position for four seconds to allow the door seal to deflate completely).

Refer to Chapter 52-10-00 for maintenance instructions for the forward cabin door seal.

STANDBY DOOR SEAL PRESSURE SYSTEM (TJ-3 and after)

The standby door seal pressure system operates off of the DOOR SEAL STANDBY switch located on the left subpanel. Air is supplied by an engine-driven pressure pump mounted on the accessory drive pad on each engine. The air is drawn through an air filter, located on top of the engine, to the pressure pump and then routed to the pressure manifold through a dual pressure relief valve and air filter. The air is then routed to the forward cabin door seal standby pressure regulator and door seal. The forward cabin door seal standby pressure regulator incorporates a 12 psi pressure switch, solenoid and check valve to control door seal air pressure. The forward cabin door seal standby pressure regulator is set to provide a 12 to 14 psi air supply to the forward cabin door of the forward cabin door seal standby pressure regulator sends an electrical signal to the dual pressure relief valves. The dual pressure relief valve then releases more air into the system. When the air pressure passing through the forward cabin door seal standby pressure regulator reaches 14 psi the pressure switch portion electrically actuates the dual pressure relief valve to return to normal air. When the DOOR SEAL STANDBY switch is placed in the off position, the forward cabin door seal standby pressure regulator forces the air to dump overboard through the pressurization dump solenoid valve.

The pressure pumps, filters and dual pressure relief valves are part of the pneumatic system. Refer to Chapter 36-00-00 for maintenance instructions for these items.

"END"

TROUBLESHOOTING
FORWARD CABIN DOOR PRESSURE SYSTEM (TJ-3 AND AFTER)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Door seal will not pressurize.	a. Hole in door seal or line from pump, or line disconnected.	a. Inspect door seal and line for hole and properly connected lines. Replace as necessary. Refer to Chapter 52-20-00 for cabin door seal replacement.
	b. Pressure pump(s) malfunction.	b. Replace pump(s).
	c. Loose or broken wires.	c. Check electrical wires for condition. See Wiring Diagram Manual 102-590000-23.
	d. Defective forward cabin door pressure regulator.	d. Replace valve.
	e. Clogged or restriction in the lines or filters.	e. Inspect lines and filters for restrictions. Replace as necessary.
	f. Defective emergency door deflate valve.	f. Replace valve.
	g. Automatic deflate switch out of adjustment.	g. Adjust switch.
	h. Defective automatic deflate switch.	h. Replace switch.

"END"

DOOR SEAL PRESSURIZATION - MAINTENANCE PRACTICES

DOOR SEAL PUMP REMOVAL (TJ-3 thru TJ-228, except TJ-210)

a. Gain access to the door seal pump through the nose baggage compartment door.
b. Remove the floor panels aft of FS 27.00.
c. Tag and remove electrical wiring.
d. Remove pressure tubes and install dust caps in the tubing and the opening of the pump.
e. Remove attaching hardware and remove the pump.

DOOR SEAL PUMP INSTALLATION (TJ-3 thru TJ-228, except TJ-210)

a. Place the door seal pump in the proper position and secure with the attaching hardware.
b. Remove dust caps and install pressure tubes to the pump.
c. Remove tags and connect electrical wires to the pump.
d. Install floor panels in the nose baggage compartment. Close and secure the nose baggage compartment door.

DOOR SEAL PUMP REMOVAL (TJ-210, TJ-229 and after)

a. Gain access to the door seal pump through the large access door on the LH side of the tail section. The pump is mounted on the RH side of the airplane just aft of FS 233.50.
b. Tag and remove the electrical wiring.
c. Remove pressure tubes and install dust caps in the tubing and the opening of the pump.
d. Remove the screws and washers attaching the pump to the support bracket and remove the pump.

DOOR SEAL PUMP INSTALLATION (TJ-210, TJ-229 and after)

a. Place the door seal pump in the proper position and secure with the attaching hardware.
b. Remove dust caps and install pressure tubes to the pump.
c. Remove tags and connect electrical wires to the pump.
d. Close and secure the access door.

DOOR SEAL CONTROL UNIT REMOVAL (TJ-3 thru TJ-122)

a. Gain access to the door seal control unit through the nose baggage compartment door.
b. Locate the door seal control unit aft of FS 27.00 on the right side wall.
c. Tag and remove electrical wiring.
d. Remove pressure tubes from control unit and install dust caps on the tubes and openings of the control unit.
e. Remove attaching hardware and remove the control unit.

DOOR SEAL CONTROL UNIT INSTALLATION (TJ-3 thru TJ-122)

a. Place the door seal control unit in the proper position and secure with the attaching hardware.
b. Remove dust caps and install pressure tubes and secure.
c. Remove tags and install electrical wiring.
d. Close and secure the nose baggage door.

DOOR SEAL PRESSURE SWITCH REMOVAL (TJ-123 and after)

On TJ-123 and after, the door seal control valve is replaced by a door seal pressure switch and a check relief valve.

a. Gain access to the door seal pressure switch through the large access door on the LH side of the tail section. The pressure switch is located under the door seal pressure tank just aft of FS 190.00 on the RH side of the airplane.
b. Tag and disconnect the electrical wiring.
c. Unscrew the pressure switch from the cross that is connected to the tank assembly and remove the pressure switch.
d. Cap the opening in the cross to prevent dust or other foreign matter from entering.

DOOR SEAL PRESSURE SWITCH INSTALLATION (TJ-123 and after)

a. Remove the cap from the cross attached to the tank assembly.
b. Remove the tags and reconnect the electrical wiring to the pressure switch.
c. Wrap tape (62, Chart 207, 91-00-00) around the threads of the pressure switch and screw the switch into the cross.
d. Secure the access door.

CHECK-RELIEF VALVE REMOVAL (TJ-123 and after)

a. Gain access to the check-relief valve through the large access door on the LH side of the airplane. The check-relief valve is located under the door seal pressure tank on the RH side of the airplane just aft of F.S. 190.00

b. Unscrew the nuts from both ends of the check-relief valve and remove the valve.

c. Cap the open ends of both swivel tees where the nuts are attached to prevent foreign matter from entering.

CHECK-RELIEF VALVE INSTALLATION (TJ-123 and after)

a. Remove the caps from the ends of both swivel tees.

b. Place the check-relief valve in position and screw the nuts onto both ends of the valve.

PRESSURE TANK REMOVAL (TJ-3 thru TJ-228, except TJ-210)

a. Gain access to the pressure tank through the nose baggage compartment door.

b. Locate the pressure tank, aft of FS 10.00, and remove floorboard panels aft of the pressure tank.

c. Disconnect pressure tubing from the aft side of the tank. Install dust caps on tubing and tank opening.

d. Remove the attaching hardware from the top of the tank and remove the tank.

PRESSURE TANK INSTALLATION (TJ-3 thru TJ-228, except TJ-210)

a. Place the pressure tank in the proper position.

b. Install the attaching hardware and secure the tank.

c. Remove dust caps and connect pressure tubing to the tank.

d. Install the floorboard panels in the nose baggage compartment. Close and secure the nose baggage compartment door.

PRESSURE TANK REMOVAL (TJ-210, TJ-229 and after)

a. Gain access to the pressure tank thru the large access door on the LH side of the tail section. The tank is located just aft of FS 190.00 on the RH side of the airplane.

b. Remove the screws attaching the tank bracket to the airplane structure.

c. Disconnect the nipple from the tank and cap the nipple and the tank opening.

d. Remove the tank from the airplane.

PRESSURE TANK INSTALLATION (TJ-210, TJ-229 and after)

a. Place the tank in position and secure to the airplane structure with the attach screws.

b. Remove the caps from the tank opening and the nipple.

c. Wrap tape (62, Chart 207, 91-00-00) around the threads of the nipple and connect it to the tank.

d. Secure the access door.

DOOR SEAL AUTOMATIC DEFLATE SWITCH REMOVAL (TJ-3 and after)

a. Gain access to the automatic deflate switch by removing the upholstery panels at the aft edge of the door frame.

b. Tag and remove electrical wires.

NOTE

Ensure that the door is open, so that the switch actuator will not be damaged.

c. Remove attaching hardware and remove the automatic deflate switch.

DOOR SEAL AUTOMATIC DEFLATE SWITCH INSTALLATION (TJ-3 and after)

NOTE

Ensure that the door is open, so that the switch actuator will not be damaged.

a. Place the automatic deflate switch in the proper position and secure with attaching hardware.

b. Remove tags and connect electrical wires.

c. Adjust the automatic deflate switch as described in DOOR SEAL AUTOMATIC DEFLATE SWITCH ADJUSTMENT.

d. Conduct the PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00. Determine that the door seal is inflating. If not, adjust the automatic deflate switch as necessary.

e. Install upholstery panels.

DOOR SEAL AUTOMATIC DEFLATE SWITCH ADJUSTMENT (TJ-3 and after)

a. Gain access to the automatic deflate switch by removing the upholstery panels at the aft edge of the door frame.

b. Close and lock the forward cabin door.

c. Back the switch actuator off until the switch is not actuated.

d. Readjust the switch until it actuates.

e. Adjust switch overtravel to .03 inch at the tip of the actuator.

f. Install the cabin upholstery panels.

EMERGENCY DOOR DEFLATE VALVE REMOVAL (TJ-3 and after)

a. Remove the upholstery panel from the forward cabin door to gain access to the emergency door deflate valve.

b. Ensure that the door seal pressurization system is OFF and that the door seal is deflated.

c. Disconnect the tube assembly from the emergency door deflate valve. Cap the tube and valve openings, to prevent contaminants from entering the system.

d. Remove the attaching screws which hold the emergency door deflate valve in place and remove the valve.

EMERGENCY DOOR DEFLATE VALVE INSTALLATION (TJ-3 and after)

a. Place the emergency door deflate valve in position and install attaching screws. To facilitate adjustment, do not tighten screws.

b. Adjust the emergency door deflate valve as follows.

1. Place the door handle in the EMERGENCY DOOR SEAL DEFLATE position.

2. Slide the emergency door deflate valve aft until the cam follower of the valve makes contact with the cam plate of the hook assembly. Continue moving the valve aft until the cam follower is fully closed against the valve stem.

3. Tighten the emergency door valve attaching screws to hold the valve in the position as described in step "2".

c. Remove caps from the tube assembly and emergency door deflate valve and install the tube assembly on the emergency door deflate valve.

d. Install the upholstery panel on the forward cabin door.

STANDBY DOOR SEAL PRESSURE REGULATOR REMOVAL (TJ-3 and after)

a. The door seal pressure regulator is accessible from within the fuselage, aft of the pressure bulkhead (FS 39.00), on the right hand side of the pilot's compartment.

b. Disconnect the electrical connections. Remove the valve inlet and outlet hoses from the valve.

c. Remove the washers and screws, which hold the valve secure, and remove the valve.

STANDBY DOOR SEAL PRESSURE REGULATOR INSTALLATION (TJ-3 and after)

a. Position the door seal pressure regulator valve and secure with the washers and screws.

b. Install the inlet and outlet hoses on the valve and secure the hoses with the clamps.

c. Connect electrical wires to the regulator.

d. Conduct the PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

FORWARD CABIN DOOR SEAL LEAK TEST (TJ-3 and after)

a. Remove the door seal supply tube at the door seal regulator or at the door seal pressure tank.

b. Attach an air supply source to the door seal supply tube and pressurize the door seal system to 13 psig and allow to stabilize for 15 to 20 minutes prior to beginning check.

c. Isolate the door seal system from the air supply (volume of supply line shall not exceed ten cubic inches).

d. Pressure remaining in the system shall not be less than 12 psig after one-half hour for door seal installation only (TJ-3 thru TJ-168) or 11.5 psig after one-half hour for door seal and emergency deflate valve plumbing installation (TJ-169 and after).

e. If the leak rate exceeds the allowable in step "d", isolate the leak using an appropriate leak test solution to determine if the leak exists in either the door seal supply tube, the door tube or the door seal. Remove and replace as required.

"END"

HEATER - DESCRIPTION AND OPERATION

The heater system consists of a 35,000 BTU per hour combustion air heater, two control switches, one push-pull control knob, vent air blower, combustion air blower and three sensing elements.

The vent air blower circulates cabin air through the heater assembly and back to the cabin as heated air.

HEATER CONTROL SYSTEM

The heater controls are located on the LH subpanel. A two-position toggle switch placarded CABIN HEAT, a three-position toggle switch placarded BLOWERS, HTR and a push-pull knob placarded CABIN TEMP - PULL TO INCREASE.

HEATER OPERATION

a. When the CABIN HEAT switch is placed in the CABIN HEAT position, power is provided to the heater, combustion air blower and the low vent air blower circuit.

b. The BLOWER, HTR switch controls the vent air blower circuits, however, when the CABIN HEAT switch is in the CABIN HEAT position the low vent air blower circuit is automatically actuated.

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

"END"

TROUBLESHOOTING
HEATER SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Heater fails to light.	a. CABIN HEAT switch or circuit breaker off.	a. Turn on CABIN HEAT switch or close circuit breaker.
	b. Low voltage supply.	b. Check ALTERNATOR-OUT light.
	c. Suction leak ahead of pump.	c. Secure all fittings.
	d. Insufficient fuel pressure.	d. Low or no current to fuel pump. Check for operation of pump and remove for repairs if not operating.
	e. Fuel pump operating but not building up sufficient pressure.	e. Remove and repair or replace fuel pump.
	f. Restriction in fuel nozzle orifice.	f. Remove the nozzle and clean or replace it.
	g. Heater fuel solenoid not operating.	g. Remove and check solenoid. Replace if faulty.
	h. Fuel lines clogged or broken.	h. Inspect all lines and connections. It may be necessary to disconnect lines at various points to determine where the restriction is located.
	i. Ignition vibrator inoperative.	i. Replace vibrator; check for defective radio noise filter.
	j. Manual reset limit (overheat) switch open.	j. Press reset button firmly and recheck to determine reason for switch opening.
	k. Combustion air pressure switch open. (Defective switch or low combustion air blower output.)	k. Check for low blower output due to low voltage and correct it. If switch is defective, replace it.
	l. Cycling switch open.	l. Replace if defective.
	m. Duct thermostat switch open.	m. Operate control to see if switch will come on. Replace switch if defective.
2. Ventilation air blower fails to run.	a. CABIN HEAT switch OFF. Broken or loose wiring to motor.	a. Energize the CABIN HEAT switch. Check and repair wiring.
	b. Circuit breaker open.	b. Close circuit breaker.
	c. Worn motor brushes.	c. Replace motor brushes.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
2. Ventilation air blower fails to run. (Cont'd)	d. Blower wheel jammed.	d. Remove and check the ventilation air blower wheel and realign if necessary.
	e. Motor burned out.	e. Remove blower assembly and remove motor.
	f. Defective radio-noise filter.	f. Replace filter.
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. Faulty vibrator.	d. Replace the vibrator.
	e. Combustion air blower speed fluctuates. (Can be caused by low voltage, loose blower wheel, worn brushes or motor.)	e. Remove and overhaul the combustion air blower assembly as required or correct low voltage condition.
	f. High-voltage leak in lead between ignition assembly and spark plug.	f. Replace ignition assembly.
	g. Inoperative ignition assembly.	g. If vibrator is in good condition, replace ignition assembly only.
	h. Restriction in fuel nozzle orifice.	h. Remove nozzle for cleaning or replacement.

TROUBLESHOOTING
HEATER SYSTEM (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
4. Heater fires but burns unsteadily. (Cont'd)	i. Nozzle loose in retainer or improper spray angle.	i. Tighten or replace the nozzle as required.
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 ALTERNATOR-OUT light.
6. Heater fails to cycle.	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. Defective CABIN HEAT switch.	c. Replace the CABIN HEAT switch.

"END"

HEATING - MAINTENANCE PRACTICES

HEATER REMOVAL (TJ-3 and after)

The heater should be removed from the airplane and disassembled. All parts should be thoroughly inspected and necessary repairs and parts replacements made every 500 hours of operation.

The heater is removed as follows:

a. Remove the necessary nose baggage compartment access panels (TJ-3 thru TJ-228, except TJ-210), and floorboard (TJ-210, TJ-229 and after) to gain access to the heater.
b. Loosen the clamp and disconnect the duct from the combustion air blower.
c. Tag the wires and disconnect the wire harness from the heater.
d. Loosen the clamps around the fuel inlet line boot and slide the boot up the fuel line. Disconnect the fuel drain and the fuel line from the heater.
e. Loosen the clamp on the heater exhaust shroud (located under the heater).
f. Remove the clamps, located at each end of the heater.
g. Lift the heater up and out of the airplane.

HEATER IRIS VALVE LUBRICATION (TJ-3 and after)

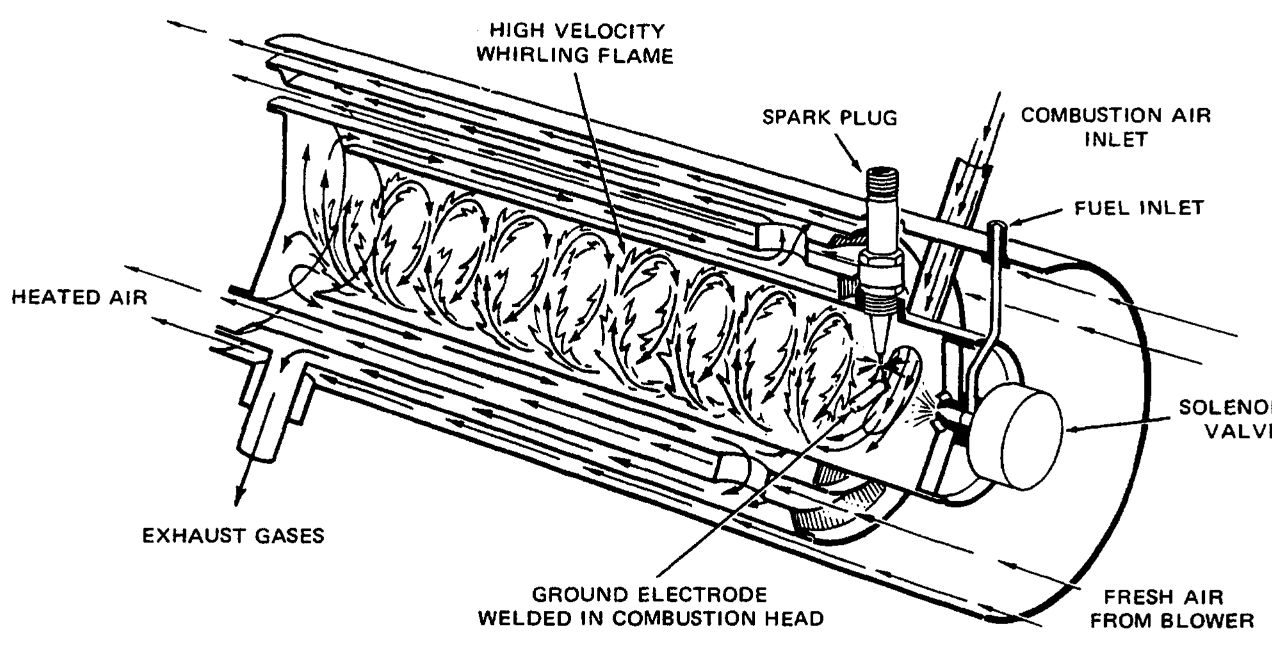
Lubricate the heater iris valve with MIL-M-7866 (12, Chart 207, 91-00-00) mixed with naphtha and apply with a brush as required to assure proper operation.

HEATER INSTALLATION (TJ-3 and after)

a. Position the heater in the airplane. Install mounting clamps and secure. Install fuel drain.
b. Position the clamp on the heater exhaust shroud located under the heater and secure and safety.
c. Install the fuel line to the heater. Slide the boot down the fuel line and secure the clamps around the boot.
d. Install the wire harness to the heater.
e. Connect the duct to the combustion air blower and secure the clamps.
f. Install the nose baggage compartment access panels (TJ-3 thru TJ-228 except TJ-210) and floorboard (TJ-210, TJ-229 and after).

COMBUSTION AIR BLOWER REMOVAL (TJ-3 and after)

a. Remove the necessary nose baggage compartment access panels (TJ-3 thru TJ-228 except TJ-210) and floorboard (TJ-210, TJ-229 and after).



Airplane Heater
Figure 201

b. Tag the wires and disconnect the wiring from the combustion air blower.

c. Loosen the clamp and disconnect the duct on the combustion air blower.

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

e. Remove the combustion air blower and mounting bracket from the airplane.

COMBUSTION AIR BLOWER INSTALLATION (TJ-3 and after)

a. Install the combustion air blower and mounting bracket in the airplane with the exhaust exit scarf on the aft side of the blower and secure with clamp.

b. Install the duct on the combustion air blower and secure with clamp.

c. Install the wiring to the combustion air blower.

d. Install and secure nose baggage compartment access panels (TJ-3 thru TJ-228 except TJ-210) and floorboard (TJ-210, TJ-229 and after).

HEATER REMOVAL (TK-1 and after)

a. Gain access to the heater through the nose baggage compartment door. Remove the radio shelf and baggage webbing as necessary to gain access to the heater.

b. Remove the nose cone attaching screws and nose cone.

c. Disconnect cabin air control from the iris valve. Tag and remove blower wiring and the igniter leads.

d. Remove the bolts attaching the iris valve to the heater and forward support.

e. Remove the screws and remove the forward support.

f. Remove the screws holding the exhaust assembly and remove the pipe.

g. Remove the combustion air duct from the heater.

h. Disconnect the fuel lines from the heater. Install dust caps on the fuel openings of the heater and fuel lines.

i. Disconnect and remove the heater drain lines.

j. Disconnect and remove the hot air duct from the heater.

k. Remove the aft clamp from around the heater.

l. Remove the screws from the upper and lower plates and remove the plates from the bulkhead.

m. Grasp the heater on the forward end and pull while rotating the heater to the right and left, as required, to clear the surrounding structure.

HEATER IRIS VALVE LUBRICATION (TK-1 AND AFTER)

Lubricate the heater iris valve with MIL-M-7866 (12, Chart 207, 91-00-00) mixed with naphtha and apply with a brush as required to assure proper operation.

HEATER INSTALLATION (TK-1 and after)

a. Hold the heater in the forward to aft position and insert the heater in the nose baggage compartment, rotating the heater right to left (as required) to clear the surrounding structure, aft end in first.

b. Position the upper and lower plates on the bulkhead and secure with the attaching screws.

c. Install the hot air duct on the heater and secure.

d. Position and secure the aft clamp around the heater.

e. Position and secure the heater drain lines.

f. Remove dust caps from the fuel lines and fuel line opening of the heater. Install and secure fuel lines to the heater.

g. Position and secure the combustion air duct to the heater.

h. Position the exhaust assembly and secure with the attaching screws.

i. Install the forward support clamp and secure with attaching screws.

j. Install the iris valve to the heater and forward support and secure with attaching bolts.

k. Remove tags from blower wiring and igniter leads and install wiring.

l. Attach cabin air control to iris valve. Rig cabin air control to open the iris valve when the control knob is pulled in the cabin.

m. Place the nose cone in position and secure with attaching screws.

n. Install radio equipment shelf and baggage webbing in the nose baggage compartment.

o. Close and secure the nose baggage compartment door.

COMBUSTION AIR BLOWER REMOVAL (TK-1 and after)

a. Gain access to the combustion air blower through the nose baggage door. Remove the radio shelf and baggage webbing.

b. Tag the wires and disconnect the wiring from the combustion air blower.

c. Loosen clamp and disconnect the duct on the combustion air blower.

d. Remove the combustion air blower mounting bracket from the airplane.

COMBUSTION AIR BLOWER INSTALLATION (TK-1 and after)

a. Place the combustion air blower and mounting bracket in position and secure with screws.

b. Install the duct on the combustion air blower and secure with clamp.

c. Remove tags from electrical wires and connect to the combustion air blower.

d. Install radio shelf and baggage webbing. Close and secure the nose compartment baggage door.

CLEANING THE HEATER

a. Cleaning the combustion chamber and radiator assembly can be accomplished using either of the two following methods:

1. Soak the combustion chamber and radiator assembly in a stripper solution made of one pound of Oakite (52, Chart 207, 91-00-00) or equivalent to each gallon of water. Soak for 10 hours. Maintain the stripper solution at a temperature between 190° to 210° F during the soak period. Flush the heater thoroughly with clean water and wipe dry at the end of the soak period.

2. Using a stainless steel brush or a sandblast cleaner to remove carbon build-up or other foreign matter from inside of the combustion chamber. After brushing or sandblasting be sure to remove all sand and loosened material.

CAUTION

Do not use an ordinary steel brush, as it will cause corrosion in the chamber and radiator.

b. Clean individual metal parts (except the combustion tube and jacket assembly and those parts containing electrical components) by immersing them in PD680 solvent (15, Chart 207, 91-00-00). Use a soft bristle brush to assist the cleaning process if foreign accumulations are stubborn to remove. Allow parts to dry thoroughly.

CAUTION

Do not attempt to buff or scrape off any deposits on the face of the spray nozzle. The face of the nozzle is very susceptible to damage from mishandling.

c. Wipe electrical components with a clean, dry cloth. If foreign material is difficult to remove, moisten the cloth with electrical contact cleaner. Clean all exterior surfaces of parts thouroughly.

d. Dust, etc., should be removed from switches by wiping with a clean cloth or blown off with compressed air.

HEATER IGNITION (Figure 201)

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 24 volts 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. Ventilating air passes through the heater between the jacket and combustion tube assembly outer surface and through an inner passage in the assembly. Consequently, ventilating air comes into contact with two or more heated, cylindrical surfaces.

VIBRATOR REMOVAL

a. Remove the nose baggage compartment access panels (TJ-3 thru TJ-228 except TJ-210) and floorboard (TJ-210, TJ-229 and after), to reach the ignition unit on the heater assembly.

NOTE

Measure the distance the vibrator protrudes out of the ignition assembly to determine when a new unit is inserted properly.

b. Grasp the vibrator and with a slight back and forth movement, pull it straight out of the ignition unit.

NOTE

For a friction grip, it may be necessary to use a piece of masking or friction tape around the exposed portion of the vibrator.

VIBRATOR INSTALLATION

a. To install a new vibrator, carefully rotate the new vibrator until the index marks are aligned and the connector pins on the vibrator can be felt entering the pin sockets in the vibrator socket, then press the vibrator fully and firmly into position.

b. Check the heater for operation and close all access openings.

INSPECTION AND SERVICING (SPARK PLUG) (Figure 202)

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.

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

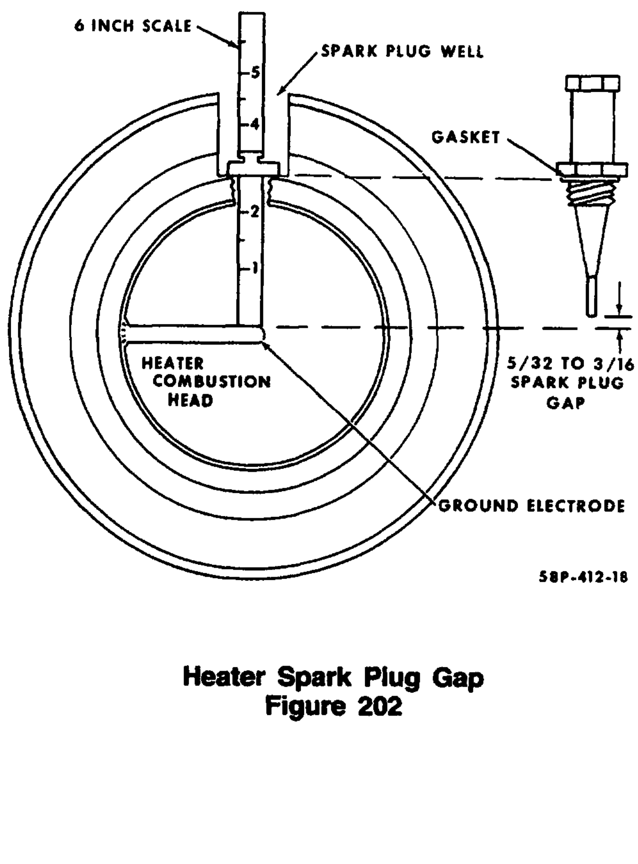
Be sure to plug the spark plug hole in the heater to prevent any possibility of residual fuel blowing out and igniting. Do not touch the spark plug while energized because of dangerously high voltage.

FUEL PUMP

An electrical fuel pump, located in the nose baggage compartment (TJ-3 thru TJ-228 except TJ-210) or under the floorboard of the nose baggage compartment (TJ-210, TJ-228 and after) provides fuel to the heater at a pressure of 7 psi. A solenoid operated fuel nozzle assembly acts as a remote shutoff for the heater, regardless of fuel inlet pressure variations.

CLEANING THE HEATER BACKFIRE FILTER TRAP

The heater backfire filter trap must be vacuum cleaned every 25 hours of heater operation.



Heater Spark Plug Gap
Figure 202

"END"

COOLING - DESCRIPTION AND OPERATION

The optional air conditioning system is a recirculating air cooling system. The system is controlled by two switches on the left subpanel and two pressure sensing switches.

The air conditioning system is controlled by the PRESS AIR COOL switch located on the left subpanel. With engines running and the PRESS AIR COOL switch in the A/C position, the air conditioning system is actuated. While on the ground the control circuit is wired through the RH landing gear safety switch which opens the air scoop on the top of the LH nacelle to allow more propeller blast air to the system. The control circuit is also wired through the LOW terminal of the A/C BLOWER switch, thus, when the PRESS AIR COOL switch is in the A/C position the forward and aft evaporator blowers come on in low operation. The A/C BLOWER switch, placarded HIGH, OFF and LOW, controls the forward and aft evaporator blowers operation.

On airplane serials TJ-3 through TJ-106, TK-1 through TK-67, TK-69, and TK-70 not equipped with Kit No. 102-5003-15, the high pressure switch will actuate, causing an open circuit to the compressor, when the pressure in the line reaches 375 ± 10 psi, which disables the compressor. The high pressure switch automatically resets itself to the normally closed position when the pressure falls to 250 psi, which reactuates the compressor. The low pressure switch, normally open, senses system pressure. The switch closes, actuating the compressor when line pressure exceeds 18 ± 2 psi. The low pressure will prevent damage to the air conditioner compressor should refrigerant and/or oil loss occur.

On airplane serials TJ-107 and after, TK-68, TK-70 and after, and prior airplane serials equipped with Kit No. 102-5003-15, the high pressure switch will disable the compressor when line pressure reaches 375 ± 10 psi and the low pressure switch will disable the compressor when line pressure falls to 18 ± 2 psi. When these extreme conditions exist, the appropriate switch is activated applying electrical power to ground, which blows a 5 amp fuse (located in the LH nacelle) disabling the compressor.

The air intake scoops on top of each nacelle automatically opens when the PRESS AIR COOL switch is in the A/C position. On the ground the air scoops open to approximately 3-1/2 inches. In flight the air intake scoops open to approximately 1-3/4 inches. The air intake scoop actuator switches are preset with no adjustment required.

The belt-driven compressor, which is coupled with a magnetic clutch, compresses the refrigerant to a high pressure, high temperature gas. This gas passes through the condenser where cooling air removes heat from the gases, condensing it to a liquid state. The liquid is then passed through the expansion valve where it is metered into the evaporator at a rate of 38 psig, which allows most of the liquid to return to a gas. The heat required for evaporation is absorbed from the cabin air passing over the evaporator coils. After passing through the evaporator, the refrigerant returns to the compressor at a reduced pressure.

"END"

TROUBLESHOOTING
AIR CONDITIONING SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Insufficient cooling.	a. Blower not functioning.	a. Repair.
	b. Obstructed or disconnected air duct.	b. Remove obstruction or repair.
	c. Compressor clutch or belt slipping.	c. Repair or adjust.
	d. Evaporator filter clogged.	d. Replace.
	e. Refrigerant level low.	e. Leak-test and recharge.
2. No cooling.	a. Blown fuse, loose connection.	a. Check connections, fuse, continuity.
	b. Blower not functioning.	b. Repair.
	c. Leak in system.	c. Leak-test and recharge.
	d. Compressor valves inoperative.	d. Repair or replace.
3. Excessive vibration of unit.	a. Overcharged.	a. Correct refrigerant charge.
	b. Air in system.	b. Purge and recharge system.
	c. Mount or compressor bolts loose.	c. Tighten.
	d. Drive pulley loose.	d. Tighten.
4. Noisy unit.	a. Compressor oil level low.	a. Add oil.
	b. Defective belt.	b. Replace.
	c. Low refrigerant level.	c. Add refrigerant.
	d. Fan hitting shroud.	d. Align and tighten shroud.
	e. Defective compressor.	e. Replace.
5. Hissing in evaporator module.	a. Low charge.	a. Add refrigerant.
6. Chatter or knock in evaporator module.	a. Defective expansion valve.	a. Replace.

TROUBLESHOOTING
AIR CONDITIONING SYSTEM (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
7. Belt slipping.	a. Loose.	a. Adjust.
	b. Overcharged.	b. Correct refrigerant level.
	c. Air in system.	c. Evacuate and recharge.
8. Excessive belt wear.	a. Pulleys not in line.	a. Align pulleys.
	b. Belt too tight.	b. Adjust or replace.
	c. Pulley groove wrong size.	c. Replace.
	d. Belt width wrong.	d. Replace.
9. Broken belt.	a. Check all causes above.	a. Replace.

"END"

COOLING - MAINTENANCE PRACTICES

NOTE

If the flare freon lines on the air conditioning system are removed, new Seco 7A washers of the proper size should be used when reinstalling the lines to ensure a good seal.

CHARGING THE AIR CONDITIONING SYSTEM

When working on a refrigerative air cooling system, observe the following special servicing precautions:

a. Remember, this is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

b. Whenever a line is disconnected, purge the entire system with a vacuum pump operating at the 125 micron level.

c. Use only refrigerant (17, Chart 207, 91-00-00); other refrigerants, particularly those containing methyl chloride, will cause rapid deterioration of the aluminum compressor components.

d. When servicing the system with refrigerant, avoid smoking or working near an open flame. Refrigerant passing over an open flame will produce a highly toxic phosgene gas.

e. Hook the service unit to the connections located under the copilot's seat. When charging a completely purged system, charge with 53 to 56 ounces of refrigerant (TJ-3 and after) or 48 ounces of refrigerant (TK-1 and after). After charging, the sight glass should be observed for bubbles or a milky appearance caused by an insufficient refrigerant level. If it is necessary to add refrigerant to a partially charged system, add refrigerant slowly until a satisfactory condition is observed through the sight glass; then add an additional 1/4 to 1/2 pound of refrigerant.

AIR CONDITIONING FUNCTIONAL TEST

With the engine running at 1000 rpm and the system on, observe the sight glass, if refrigerant appears milky or bubbles appear, charge the system as noted in CHARGING THE AIR CONDITIONING SYSTEM. Check the system for leaks using a flameless leak detector.

CHECKING COMPRESSOR OIL LEVEL

The air conditioner compressor oil level should be checked by a qualified air conditioner service man if the refrigerant charge is lost (evidenced by oil loss). The air conditioner system requires 13-15 ounces of 500 viscosity oil (TJ-3 and after) or 11-12 ounces of 500 viscosity oil (TK-1 and after) (18, Chart 202, 12-20-00) to maintain 4 ounces in the compressor.

NOTE

New compressors are delivered with 7 ounces of oil. Charge the system with an additional 6-8 ounces of oil (TJ-3 and after) or 4-5 ounces of oil (TK-1 and after) when installing a new compressor.

Check the compressor oil level as follows:

a. Fabricate a dipstick by bending a wire to a 90° angle so that 1-1/2 inches of the wire will insert into the compressor.

b. Paint the dipstick with a flat black paint. Allow sufficient time for paint to dry.

c. Start engines and run air conditioner in accordance with the Pilot's Operating Manual. Run air conditioning system for 15 minutes with the engines running at low rpm to allow oil to accumulate in the compressor. Observe engine operating limitations as noted in the applicable Pilot's Operating Manual. Shut down engines in accordance with the applicable Pilot's Operating Manual.

d. Relieve the air conditioner system pressure by loosening the compressor filler plug just enough to bleed off pressure slowly.

e. After the system pressure is relieved, remove the oil filler plug.

f. Insert dipstick through oil filler port, slowly rotate clutch shaft until the dipstick will insert to the bottom of the compressor.

g. Withdraw dipstick, oil should register on the dipstick between 3/8 to 1-1/4 inches below filler port. Add oil as necessary, refer to Chart 201, CHECKING COMPRESSOR OIL LEVEL.

NOTE

If 4 ounces of oil has to be added, proceed with steps "h" through "i" and then repeat the entire procedure beginning with step "c". If the compressor will not hold the entire amount of oil to be added, secure the system as described in step "h" and charge the system with the remainder of the oil at the service port beneath the copilot's seat.

h. Install the oil filler plug with O-ring and secure plug.

NOTE

Make sure that the O-ring is not twisted and that no dirt or particles are on the O-ring or seat. The plug should be snug. Do not over-tighten plug.

i. Charge the air conditioning system as noted in CHARGING THE AIR CONDITIONING SYSTEM.

j. Check area around filler plug for leaks. If leaks exist, do not over-tighten filler plug, remove plug as noted in steps "c" and "d" and install a new O-ring. Secure plug and recharge system as noted in steps "h" and "i".

CHART 201
CHECKING COMPRESSOR OIL LEVEL

Oil Level Below Filler Port (In.)	Oil To Be Added (Oz.)
1.25 to 1.4	4.0
1.40 to 1.5	8.0

COMPRESSOR BELT TENSION ADJUSTMENT

When installing a new belt, the idler pulley bracket bolt should be adjusted so that a torque reading of 110 to 120 pounds belt tension (as shown on a V-belt tension gage) is obtained. After 36 to 48 hours operating time, a new belt will stretch to its normal operating length. The belt tension should be checked at this time and adjusted (by torquing the adjustment bolt on the idler pulley bracket) so that a belt tension gage, placed at a point midway between the idler pulley and the compressor will register a belt tension of 70 to 90 pounds. If no gage is available, adjust until the belt registers 0.13 inch deflection when a 6.38 pound load is applied. After adjusting the belt tension, be sure the belt has ample clearance on all sides.

COMPRESSOR BELT REMOVAL

a. Remove the LH engine cowling to gain access to the compressor belt.

b. Loosen the adjustment bolt on the idler pulley bracket to remove tension on the compressor belt.

c. Remove the compressor belt.

COMPRESSOR BELT INSTALLATION

a. Install the compressor belt over the compressor pulley, idler pulley and drive pulley.

b. Tighten the adjustment bolt on the idler pulley bracket to increase tension on the compressor belt as stated in the COMPRESSOR BELT TENSION ADJUSTMENT in this Chapter.

c. Install the LH engine cowling.

CONDENSER BLOWER REMOVAL

a. Gain access to the condenser blower in the left hand nacelle.

b. Tag and disconnect the electrical wiring to the blower motor.

c. Remove the attaching hardware and remove the blower.

CONDENSER BLOWER INSTALLATION

a. Place the condenser blower in position.

b. Secure the blower by installing the attaching hardware.

c. Connect the electrical wiring to the blower motor.

d. Install access panels and secure.

CONDENSER REMOVAL

a. Gain access to the condenser in the LH aft nacelle.

b. Disconnect the fittings from the inlet and outlet lines.

c. Remove attaching hardware and remove the condenser.

CONDENSER INSTALLATION

a. Place the condenser in position.

b. Secure the condenser by installing the attaching hardware.

c. Install fittings at the inlet and outlet lines and secure.

d. Install and secure the access panels.

CONDENSER CONTROL RIGGING

Air does not pass through the condenser unless the airscoop door is open and the blower motor is actuated, thus the condenser is controlled by the electrical circuitry that controls the airscoop actuator and blower motor. Check the condenser, airscoop door, and blower for proper operation. If the airscoop door fails to open or the blower fails to actuate, check for an open circuit between the PRESS AIR COOL switch and the blower or airscoop door actuator.

COMPRESSOR REMOVAL

a. Gain access to the LH engine accessory section.

b. Remove electrical leads from compressor clutch terminals.

WARNING

The air conditioning system is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

c. Disconnect refrigerant lines at the compressor. Purge the system as noted in CHARGING THE AIR CONDITIONING SYSTEM in this Chapter. Cap refrigerant lines and compressor fittings.

d. Remove compressor belt as noted in COMPRESSOR BELT REMOVAL in this Chapter.

e. Remove the four compressor mounting bolts and nuts and remove compressor.

COMPRESSOR INSTALLATION

a. Position compressor on the mounting bracket and install the attaching bolts and nuts.

b. Install compressor belt as noted in COMPRESSOR BELT INSTALLATION in this Chapter.

c. Adjust belt tension as noted in COMPRESSOR BELT TENSION ADJUSTMENT in this Chapter.

d. Remove caps from lines and compressor and install lines to the fittings on the compressor.

e. Install the electrical leads to the magnetic clutch.

f. Service the system with oil as noted in CHECKING COMPRESSOR OIL LEVEL in this Chapter.

g. Charge the system with refrigerant as noted in CHARGING THE AIR CONDITIONING SYSTEM in this Chapter.

h. Install and secure access panels.

AFT EVAPORATOR BLOWER MODULE REMOVAL

a. Gain access to the aft side of the evaporator blower module through the large access opening on the left side of the aft fuselage.

b. Tag and remove the electrical wiring from the evaporator blower module.

WARNING

The air conditioning system is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

c. Remove the air conditioning hoses and ducts from the evaporator blower module.

d. Remove the evaporator blower attaching bolts and remove the evaporator blower module.

AFT EVAPORATOR BLOWER MODULE INSTALLATION

a. Place the aft evaporator blower module in position and secure with attaching bolts.

b. Remove tags from the electrical wiring and connect the wires to the evaporator blower module.

c. Connect the air conditioning system hoses and duct to the evaporator blower module.

d. Install and secure the access door on the left aft fuselage.

AFT EVAPORATOR BLOWER MODULE FILTER CLEANING (TJ-3 and after)

a. Locate the air outlet at the top of the bulkhead at FS 190.00. Remove the air outlet louvered molding plate.

b. Remove upholstery panels from the bulkhead at FS 190.00.

c. Using clean compressed air, back blow all dust, sand and other contaminants out of the filter.

d. Install the upholstery panels with the filter attached.

e. Install the air outlet louvered molding plate.

AFT EVAPORATOR BLOWER MODULE FILTER REPLACEMENT (TJ-3 and after)

a. Locate the air outlet at the top of the bulkhead at FS 190.00. Remove the air outlet louvered molding plate.

b. Remove the upholstery panels from the bulkhead at FS 190.00.

c. Remove the filter from the back of the upholstery panel.

d. Using No. 77 spray adhesive (53, Chart 207, 91-00-00), bond a new filter to the back of the upholstery panel.

e. Allow adhesive to dry and install the upholstery panel.

f. Install the air outlet louvered molding plate.

FORWARD EVAPORATOR BLOWER MODULE REMOVAL (TJ-3 and after)

a. Remove the pilot's and copilot's seats.

b. Remove the spar cover at FS 68.00.

c. Remove the air deflectors by removing the attaching screws.

WARNING

The air conditioning system is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

d. Remove the air conditioning hoses and ducts from the forward evaporator blower module.

e. Tag and remove electrical wiring.

f. Remove the attaching bolts and remove the evaporator blower module.

FORWARD EVAPORATOR BLOWER MODULE INSTALLATION (TJ-3 and after)

a. Place the forward evaporator blower module in position and secure with attaching bolts.

b. Remove tags from electrical wiring and connect wires to the forward evaporator blower module.

c. Install air conditioning system hoses and ducts on the forward evaporator blower module.

d. Install the air deflectors and secure with the attaching screws.

e. Install the spar cover.

f. Install the pilot's and copilot's seats.

FORWARD EVAPORATOR BLOWER MODULE REMOVAL (TK-1 and after)

a. Working from inside on the pilot's compartment, remove the wing nuts which secure the forward evaporator blower module filter and remove the filter.

b. Gain access to the forward evaporator blower module through the nose baggage compartment door.

c. Remove the equipment screen at the bottom of the nose baggage compartment.

WARNING

The air conditioning system is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

d. Remove the air conditioning system hoses and ducts from the forward evaporator blower.

e. Tag and remove electrical wiring.

f. Remove the evaporator blower module attaching hardware and remove the module.

FORWARD EVAPORATOR BLOWER MODULE INSTALLATION (TK-1 and after)

a. Place the forward evaporator module in position and secure with attaching screws.

b. Remove tags and install the electrical wiring on the forward evaporator blower module.

c. Connect the air conditioning system hoses and ducts to the forward evaporator blower module.

d. Install the equipment screen in the bottom of the nose baggage compartment.

e. Close and secure the nose baggage compartment door.

f. Working from inside the pilot's compartment, place the forward evaporator blower module filter in position and secure with wing nuts.

EVAPORATOR BLOWER MODULE FILTERS

Clean filters with compressed air every 100 hours of air conditioner operation and replace the filter whenever the filter material is discolored or at 500 hours air conditioner operation whichever occurs first.

"END"

CHAPTER

22

AUTO FLIGHT

CHAPTER 22

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CHAPTER 22 - AUTO FLIGHT

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GENERAL

AUTOPILOT

SPEED - ALTITUDE CORRECTION

AUTO THROTTLE

SYSTEM MONITOR

NOTE

Refer to the Edo-Aire Mitchell Automatic Flight Systems Bulletin No. 572 for maintenance information.

"END"

CHAPTER 23

COMMUNICATIONS

CHAPTER 23

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Static Wick Removal (TJ-388 and After, TK-146 and After)		201
Static Wick Installation (TJ-388 and After, TK-146 and After)		201

"END"

STATIC DISCHARGING - DESCRIPTION AND OPERATION

A static electrical charge may build up in the surface of the airplane while it is in flight. This electrical charge, if retained, can cause interference in radio and avionics equipment operation. Therefore, static wicks are installed on the trailing edges of the flight surfaces to aid in the dissipation of the electrical charge.

"END"

STATIC DISCHARGING - MAINTENANCE PRACTICES

On serials prior to TJ-388 and TK-146 the static wicks are installed with two on each wing tip, one on each elevator and one on the rudder. These seven static wicks are removed and installed in the same manner. At serials TJ-388 and after and TK-146 and after the static wicks are installed with three on each wing tip, three on each elevator, and three on the rudder. These fifteen static wicks are removed and installed in the same manner. The base of the later static wicks is riveted to the flight surface and need not be removed in normal service.

STATIC WICK REMOVAL (PRIOR TO TJ-388, PRIOR TO TK-146)

a. Remove the two screws and lock washers securing the wick to the surface.
b. Remove the wick from the surface.

STATIC WICK INSTALLATION (PRIOR TO TJ-388, PRIOR TO TK-146)

Clean around the static wick area by:

a. Removing all anodic film, grease, oil, paints, lacquer, metal finishes or other high resistance properties with Minnesota 3M No. 600 grit sandpaper, or equivalent. The mating surfaces must be smooth and contoured so that maximum surface area is in actual contact.
b. Wash down with Trico III and Alodine lightly prior to reinstallation.

NOTE

Dissimilar materials are not to be used in intimate contact unless suitably protected against electrolylic corrosion. Whenever it is necessary that any combination of such metals be assembled, an interposing material compatible to each should be used.

c. Install the wick, using the two screws and lock washers.
d. Refinish the surface area around the wick attachment point.

STATIC WICK REMOVAL (TJ-388 AND AFTER, TK-146 AND AFTER)

a. Unscrew the static wick from the base.
b. Remove the static wick and lock washer.

STATIC WICK INSTALLATION (TJ-388 AND AFTER, TK-146 AND AFTER)

The threads must be clean and free of grease, oil, and paint.

a. Install the static wick and lock washer.
b. Torque the static wick to 4.7 inch-pounds.

"END"

CHAPTER

24

ELECTRICAL POWER

CHAPTER 24 - ELECTRICAL POWER

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"END"

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	202	Jan 9/76
	203	Nov 30/78
	204	Nov 12/80
24-51-00	201	Nov 30/76

"END"

GENERAL - DESCRIPTION AND OPERATION

Direct current for the electrical systems of the airplane is supplied by two 12 volt 25 ampere hour lead-acid batteries and by two 24 volt, 50 ampere (100 ampere optional) alternators. Alternating current for the fuel flow indicator and the electroluminescent panel lights is supplied by their respective inverters.

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 with 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 airplane quality. Any solderless terminals or splices used must be applied with tooling specified by the vendor.

"END"

GENERAL - DESCRIPTION AND OPERATION

AC GENERATION

Since the major portion of the airplane instrumentation functions on dc power, the ac power requirements are confined to the fuel flow indicator and the electroluminescent panel lights. Each system includes an inverter which is designed to supply power to the system by converting 28 vdc to the required ac voltage of that system. The inverter for the fuel flow indicator is located in the inboard side of the right nacelle just forward of the main spar on airplane serials TJ-2 through TJ-90 and TK-1 through TK-26. On airplane serials TJ-91 through TJ-114, TJ-119 through TJ-125, TK-27 through TK-50, and TK-56 through TK-58 the inverter for the fuel flow indicator is located in the main compartment of the right nacelle on the outboard side. On airplane serials TJ-115 through TJ-118, TJ-126 and after, TK-51 through TK-55, and TK-59 and after the fuel flow inverter is not installed. The inverter for the electroluminescent panel lights is located on the left hand side of the fuselage at F.S. 58.00 and is accessible from within the fuselage. Power is supplied to each inverter when the battery master switch is placed in the on position.

"END"

GENERAL - DESCRIPTION AND OPERATION

DC GENERATION

The airplane electrical system includes two 24 volt, 50 ampere alternators (two optional, 28 volt, 100 ampere alternators) and one 24 volt, 17 ampere-hour, lead-acid battery or two 12 volt, 25 ampere-hour, lead-acid batteries which supply all the dc power to the airplane. The batteries supply power for the airplane starter system and electrical system when the engines are not operating. It also provides limited power to the optional alternate battery bus in cases of emergency. The alternators provide the dc voltage to the electrical system during engine operation.

An external power receptacle, located on the outboard side of the left engine nacelle, is provided for a ground power unit when extended ground power operation or cold weather starts are required.

"END"

TROUBLESHOOTING

ALTERNATOR SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. No alternator output or low charge is indicated	a. Open circuit.	a. Check continuity of the circuit.
	b. 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 shorted field circuit in alternator; defective rotor.	d. Test resistance of the field. Check field circuit connections; replace alternator if necessary.
	e. Brushes not contacting slip-rings.	e. Clean brushes and holders with a lint-free, dry cloth, replace weak springs.
	f. Worn or broken brushes.	f. Check brushes and replace if necessary.
	g. Open current limiter in output line.	g. Check for shorted alternator. (Alternator output will not normally be sufficient to burn out the current limiter.)
	h. Engine speed too low.	h. Increase engine rpm.
	i. Defective voltage regulator.	i. Replace voltage regulator.
	j. Defective loadmeter.	j. Replace loadmeter.
2. Noisy alternator.	a. Worn bearing.	a. Replace bearing.
	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.

TROUBLESHOOTING

ALTERNATOR SYSTEM (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
3. Loadmeter pointer or lights flicker.	a. Loose connections in charging system or damaged wiring harness.	a. Check system, tighten or replace loose or damaged wiring or wiring connections.
	b. Worn brushes.	b. Check brushes and replace if necessary.
4. Arc marks on terminals.	a. Loose connections.	a. Tighten connections.

"END"

DC GENERATION - MAINTENANCE PRACTICES

ALTERNATORS

The airplane electrical system includes two 50 ampere, 24 volt, gear-driven alternators as standard equipment (two 100 ampere, 28 volt, gear-driven alternators are optional). The alternators are controlled by two fully transistorized electronic voltage regulators. The alternator systems are separate, except for a mutual tie to the main battery bus and a single paralleling wire which connects the two voltage regulators together.

Individual alternator output is indicated by two loadmeters located in the center section of the instrument panel. Each loadmeter provides an indication of the output of the alternator as a percentage of the rated capacity of the alternator.

The circuit of each alternator contains an overvoltage sensor to protect the airplane systems from excessive voltages. Two warning lights placarded ALTERNATOR-L-R located on the left side of the instrument panel, will illuminate OUT whenever the respective alternator voltage drops 1.5 to 3.0 volts below bus voltage.

ALTERNATOR REMOVAL

a. Open the engine compartment door on the alternator side.
b. Remove the upper engine cowling.
c. Disconnect the electrical wiring from the alternator. Tag wiring to facilitate reinstallation.

CAUTION

Make sure the battery master switch is in the off position before removing the wires at the alternator. The output terminal of the alternator is connected directly to the battery through the battery master relay. To prevent accidental damage to the wiring harness and the alternator, the battery ground cable and all external ground power should be disconnected.

d. Remove lockwashers, washers and nuts securing the alternator to the engine.
e. Carefully remove the alternator from the engine pad.

CAUTION

Care must be taken when removing the alternator to prevent damage to the gear splines on the alternator.

ALTERNATOR INSTALLATION

CAUTION

Before installing the alternator, make sure the nut on the drive shaft of the alternator is tightened to a torque of 400 inch-pounds. If the castellations of the nut do not match the shaft tighten to the next castellation (do not torque more than 500 inch-pounds). Do not back the nut off, always tighten the nut. Safety the nut with the cotter pin through the castellation.

NOTE

The cotter pin must be installed and then trimmed. The portion bent toward the alternator housing must NOT touch the thrust washer when bent over the nut. The portion bent away from the alternator housing must NOT reach beyond the threads on the end of the shaft.

a. Position the alternator gasket and alternator on the engine pad. It may be necessary to turn the prop slightly, or remove the alternator and rotate the gear spline on the end of the alternator shaft in order to align the drive gear in the engine with the gear on the alternator.

WARNING

When working on a propeller, always make certain that the ignition switch is in the OFF position and the engine has cooled completely. To be safe, treat all magnetos as hot. To ground the magneto, disconnect the magneto switch wire at the capacitor and ground the capacitor pole. If this is impractical, remove the ignition harness distributor cap, or disconnect the spark plug leads. When moving a propeller, stand in the clear.

b. Install lockwashers, washers and nuts that secure the alternator to the engine pad. Torque the nuts to 155 to 175 inch-pounds.

c. Connect all electrical wiring.

CAUTION

Ensure that the alternator wiring is properly connected. Reverse polarity will destroy diodes in the electrical system. Never close the battery master switch until all wiring harness connections have been made and properly tightened. It should be remembered that the alternator is polarized everytime the master switch is turned on; therefore, any attempt to polarize the unit will only damage the voltage regulator and wiring harness.

d. Install the upper engine cowling.

e. Close the engine compartment door.

"END"

TROUBLESHOOTING

VOLTAGE REGULATOR SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Low or no output voltage.	a. Excessive load.	a. Check load and reduce.
	b. Poor system connections.	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.

"END"

DC GENERATION - MAINTENANCE PRACTICES

VOLTAGE REGULATOR

The output of each alternator is regulated by a fully transistorized electronic voltage regulator located on the aft side of the forward cabin bulkhead prior to TJ-134 and TK-71. The regulators are located below the front spar covers on TJ-134 and after and on TK-71 and after. Each voltage regulator is adjusted to 28.25 ± .25 vdc and will automatically adjust the alternator output to the required electrical load, including battery recharging. The two voltage regulators are connected together with a single wire between the PAR (paralleling) terminals. Thus through their respective internal paralleling circuits, the output of each alternator is maintained at a minimal difference.

VOLTAGE REGULATOR REMOVAL

a. Gain access to the voltage regulators.
b. Disconnect all electrical wiring and tag all wires to facilitate reinstallation.
c. Remove screws securing the voltage regulator to the bulkhead.
d. Remove the voltage regulator.

VOLTAGE REGULATOR INSTALLATION

a. Position the voltage regulator on the mounting bracket.
b. Secure the voltage regulator with the retaining screws.
c. Connect all electrical wiring.

CAUTION

Ensure that wires are installed as noted in the removal. This will prevent serious damage to the airplane components.

NOTE

After voltage regulator has been mounted in position and properly wired, perform the VOLTAGE REGULATOR ADJUSTMENT and the OVERVOLTAGE SENSOR CHECK.

VOLTAGE REGULATOR ADJUSTMENT AND PARALLELING (Figure 201)

The voltage regulators are preset to 28.25 ± .25 volts. Paralleling adjustment is not necessary unless inspection reveals a need for adjustment or when the loadmeters indicate unsatisfactory paralleling of the two alternators. The loadmeters should indicate that the alternators are sharing the load within 10% when each alternator is operating at 30% or more of its rated output.

NOTE

The alternators may not share an extremely light load equally.

The procedure for adjusting the voltage regulators described below is based on the principle of adjusting two equally warmed up voltage regulators to produce nearly the same voltage without the benefit of a paralleling or equalization circuit. This is the reason for making the balance adjustment with the PAR (paralleling) circuit disconnected, and it yields the maximum amount of automatic control range under operating conditions.

Each regulator is capable of nearly 1.0 volt of automatic control in the positive direction. This is in terms of the input voltage at the BUS terminal. Because of the high gain in the equalization circuit within the voltage regulator (exceeding 80:1), the field voltage difference of 5 to 8 volts which occurs when the PAR circuit is opened, corresponds to only a small percentage of the available automatic compensation range. Therefore, a near zero adjustment of the field voltage balance during the procedure with the PAR circuit open is not necessary but the adjustment should be as low as possible.

Since the voltage regulators are used in parallel output alternator systems, their final adjustment should be made in actual operation of the airplane system. These adjustments may be made while operating one engine only. The left engine has been selected to permit a completely safe access to both voltage regulators so that they may be adjusted while the engine is operating without danger of personal injury from the propeller.

WARNING

Do not operate the right engine.

The following steps should be used to adjust and parallel the voltage regulators:

CAUTION

During all tests and adjustments on the voltage regulators, make certain that the FIELD circuits, including any meter or test leads on these circuits, are always protected from accidental grounding to airplane structure and contact with other circuits. Even a momentary ground contact may permanently damage the voltage regulator.

a. Remove the wire marked PAR from the right voltage regulator. During voltage regulator adjustment, several operations of connecting and disconnecting the PAR circuit are required by the following steps. For convenience, a switch or a dependable clip connections may be attached to the wire to facilitate adjustment procedures.

NOTE

Opening the PAR circuit disables the balancing circuits of both voltage regulators, allowing them to operate independently for adjustment purposes. If this circuit touches any other circuit or the airplane structure, erroneous results will be obtained.

b. Start the left engine according to the ENGINE START procedures in the applicable Pilot's Operating Manual. Do not start the right engine.

c. Position the LT ALT switch in the on position. Check to make sure the RT ALT switch is in the off position.

d. Run the left engine for 5 to 10 minutes at an engine speed of 1200 rpm with a load current of 15 to 30 amperes (30% load reading as indicated on the left loadmeter, located in the center section of the instrument panel). This will allow the voltage regulator to obtain operating temperature. Do not use cruise or high rpm.

NOTE

Adjustment and paralleling should always be made with a substantial load on the airplane system. The voltage regulators require a certain amount of voltage at the field terminals (about 2 volts) in order for the paralleling action to become active. It is characteristic of this system that with very high rpm and very low loads, the paralleling action ceases and in the extreme case, one alternator may be entirely cut off.

e. Using a portable precision voltmeter (0-50 volt range ± 1% accuracy), connect the POSITIVE lead to the BUS terminal of the left voltage regulator and the NEGATIVE lead to the GND terminal of the left voltage regulator.

f. Remove the snap plug from the left voltage regulator adjustment hole and adjust the voltage to 28.25 ± .25 vdc. Replace the snap plug. Do not make any further adjustments on the left voltage regulator.

g. Shut down the left engine according to the ENGINE SHUT DOWN procedures in the applicable Pilot's Operating Manual. Ensure that the battery master switch is in the off position.

h. Connect a portable voltmeter (non-precision) such as the SIMPSON #260 or equivalent between the FIELD terminals of the left and right voltage regulators. Leave the existing wires in place. Connect the POSITIVE lead of the voltmeter to the left voltage regulator FIELD terminal and the NEGATIVE lead of the voltmeter to the right voltage regulator FIELD terminal. Use a 0-30 or 0-50 volt range initially.

NOTE

An electronic digital voltmeter is not recommended for the paralleling adjustment.

i. Restart the left engine according to the ENGINE START procedures in the applicable Pilot's Operating Manual.

j. Place the LT and RT ALT switches in the on positions.

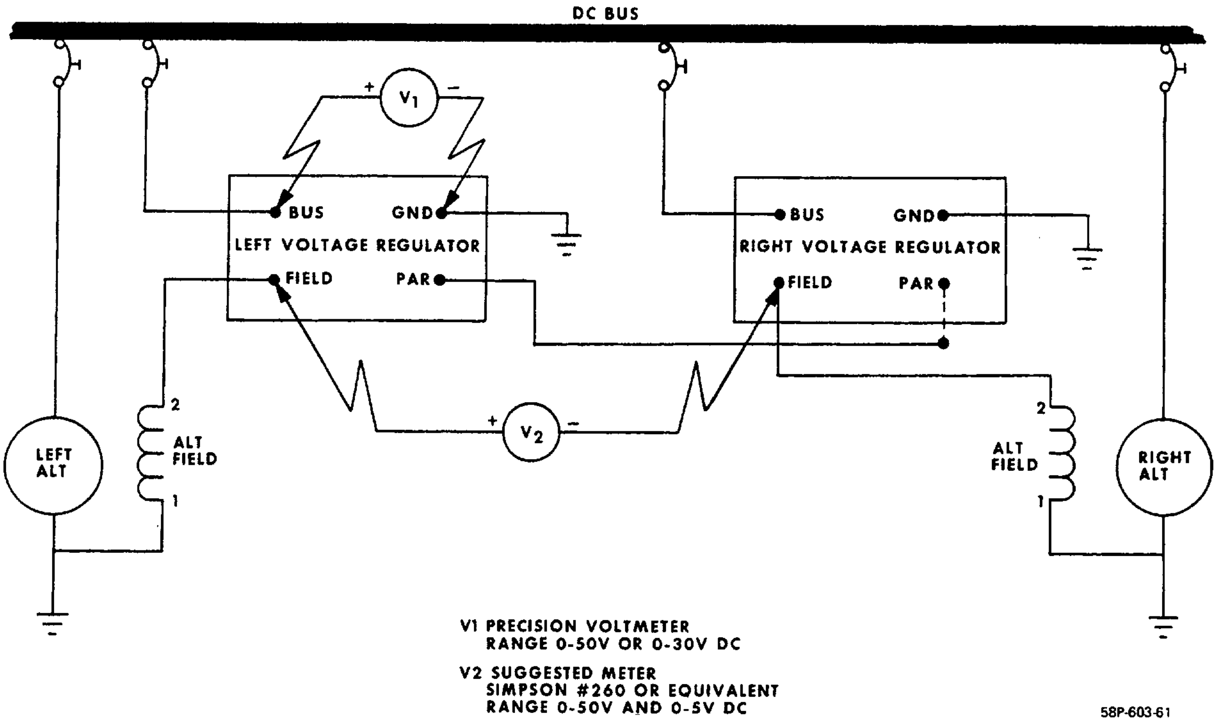
NOTE

The right engine is not operating.

k. Remove the snap plug from the right voltage regulator adjustment hole. Slowly rotate the right voltage regulator adjustment while observing the voltmeter connected between the FIELD terminals. If a reverse (downscale) reading is obtained with the meter polarity as specified, turning the right voltage regulator adjustment counterclockwise will bring the meter up scale. Slowly set the right voltage regulator adjustment to a point where the voltmeter will read a low value. Any reading from 0 to 8 volts is acceptable. A lower meter range such as 0-10 volts may be used for this adjustment.

NOTE

A stable reading should not be expected while the PAR circuit is open.



Test Setup For Voltage Regulator Adjustment
Figure 201

l. Reconnect the wire to join the PAR terminals of the two voltage regulators and observe that the voltmeter reading drops to a low value (0.2 to 0.5 volt) and it will be stable. Continue to operate the system in this manner for a period of 5 to 10 minutes to establish the initial warm up of the right voltage regulator and alternator system.

NOTE

The right engine is not operating. The left loadmeter should indicate a load of approximately 30% during the warm up of the right voltage regulator.

m. After the warm up period, disconnect the wire from the PAR terminal and recheck the reading on the voltmeter connected between the two FIELD terminals. Any value from 0 to 8 volts is acceptable. If readjustment is necessary, adjust the voltage regulator adjustment for a reading between 0 to 8 volts (the lower the reading the better).

NOTE

A stable reading should not be expected while the PAR circuit is open.

n. Replace the snap plug in the right voltage regulator.

o. Shut down the left engine according to the ENGINE SHUT DOWN procedures in the applicable Pilot's Operating Manual. Ensure that the battery master switch is in the off position.

p. Reconnect the PAR circuit wire, remove all test equipment and check all terminal screws for security.

q. Start the left and right engines according to the ENGINE START procedures in the applicable Pilot's Operating Manual.

r. Check both loadmeters in the center section of the instrument panel for near equal readings. The design tolerance of the loadmeters is ± 2% of full scale. (The readings will differ slightly due to the differences of the individual loadmeters.)

s. Shut down the left and right engines according to the ENGINE SHUT DOWN procedures in the applicable Pilot's Operating Manual.

OVERVOLTAGE SENSOR

Each alternator circuit contains an overvoltage sensor which monitors the output voltage from the positive terminal of the alternator. When the sensor detects an overvoltage condition, it energizes an overvoltage relay which opens the alternator field circuit and thus the alternator voltage is removed from the airplane bus. A warning light, located on the left hand instrument panel, will illuminate OUT, when the respective alternator is disconnected from the bus.

No attempt should be made to adjust the overvoltage sensors. They are preset at the factory to trip at a voltage of 32.00 ± .25 vdc. When the sensor is determined to be inoperative, it should be replaced.

OVERVOLTAGE SENSOR CHECK (Figure 202)

The overvoltage sensor should be checked at each 100 hour inspection or whenever the voltage regulators, alternators, overvoltage sensors or overvoltage relays have been replaced. The following procedures may be used to test the overvoltage sensors.

LEFT OVERVOLTAGE SENSOR

a. Remove left engine nacelle access door on top of the nacelle.

b. Disconnect the lead wire P59B16 at the diode heat sink.

c. Using a variable power supply capable of supplying 0-50 vdc, connect the positive lead of the power supply to the lead wire P59B16. Connect the negative lead of the power supply to airframe structure.

d. Using proper procedures, connect a precision voltmeter (± 1% accuracy) across the terminals of the power supply.

e. Turn on the battery master switch.

f. Press the PRESS TO TEST switch on the WARN LIGHT SYSTEM to check the ALTERNATOR-L-R OUT warning light.

g. Turn on the LT ALT switch. Monitor the L ALTERNATOR OUT light. It should not be illuminated.

h. Set the variable power supply at 28.25 vdc and turn on. Slowly increase the voltage from 28.25 to 33.00 vdc while monitoring the precision voltmeter and the L ALTERNATOR OUT warning light. The warning light should illuminate at 32.00 ± .25 vdc.

i. Reduce the variable voltage power supply to 28.25 vdc. The L ALTERNATOR OUT warning light should remain illuminated.

j. Turn off the LT ALT switch. The L ALTERNATOR OUT warning light should go out.

k. Turn on the LT ALT switch. The L ALTERNATOR OUT warning light should remain out.

l. Turn OFF the variable power supply, the LT ALT switch and the battery master switch. Remove all test equipment and reinstall the P59B16 lead wire.

RIGHT OVERVOLTAGE SENSOR

a. Remove right engine nacelle access door on top of the nacelle.

b. Disconnect the lead wire P59B16 at the diode on the heat sink.

c. Using a variable power supply capable of supplying 0-50 vdc connect the positive lead of the power supply to the lead wire P59B16. Connect the negative lead of the power supply to airframe structure.

d. Using proper procedures, connect a precision voltmeter (± 1% accuracy) across the terminals of the power supply.

e. Turn on the battery master switch.

f. Press the PRESS TO TEST switch on the WARN LIGHT SYSTEM to check the ALTERNATOR-L-R OUT warning light.

g. Turn on the RT ALT switch. Monitor the R ALTERNATOR OUT light. It should not be illuminated.

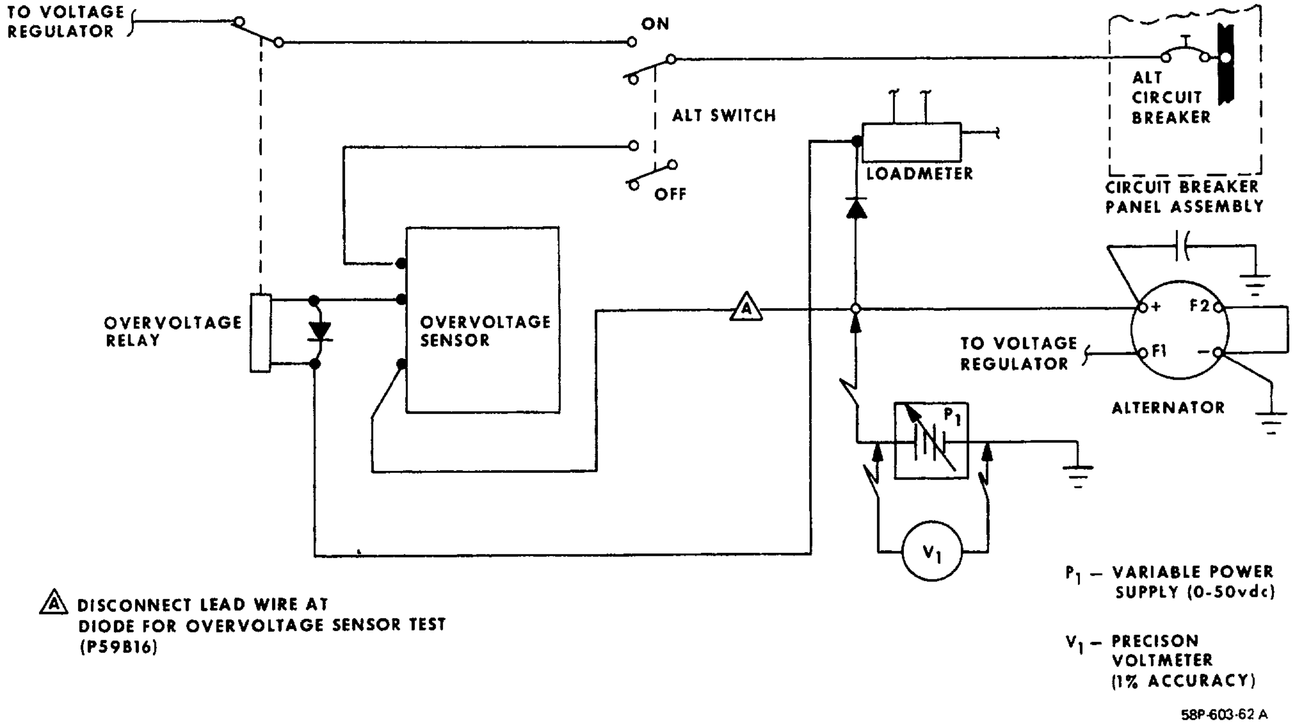
h. Set the power supply at 28.25 vdc and turn on. Slowly increase the voltage from 28.25 to 33.00 vdc while monitoring the precision voltmeter and the R ALTERNATOR OUT warning light. The warning light should illuminate at 32.00 ± .25 vdc.

i. Reduce the variable voltage power supply to 28.25 vdc. The R ALTERNATOR OUT warning light should remain illuminated.

j. Turn off the RT ALT switch. The R ALTERNATOR OUT warning light should go out.

k. Turn on the RT ALT switch. The R ALTERNATOR OUT warning light should remain out.

l. Turn off the variable voltage power supply, the RT ALT switch and the battery master switch. Remove all test equipment and reinstall the P59B16 lead wire.



Test Setup For Overvoltage Sensor Check
Figure 202

"END"

TROUBLESHOOTING

BATTERY SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. No power indicated with battery master switch on.	a. Battery discharged or defective.	a. Recharge or replace battery.
	b. Open circuit between battery and battery master switch.	b. Check continuity.
	c. Battery master switch defective.	c. Check switch for operation and replace if necessary.
	d. Defective battery relay.	d. Check relay for operation and replace if necessary.
2. Power on with battery master switch in off position.	a. Battery master switch defective.	a. Check switch for operation and replace if necessary.
	b. Battery relay contacts stuck.	b. Check battery relay for operation and replace if necessary.
	c. Battery master relay coil circuit shorted to structure between the battery master switch and relay coil.	c. Check circuit for short and repair as necessary.

TROUBLESHOOTING

BATTERY

1. Battery will not hold its charge.	a. Battery is worn out.	a. Replace battery.
2. Battery will not come up to full charge.	a. Charging rate set too low.	a. Adjust voltage regulator on airplane.
3. Battery consumes water rapidly.	a. Faulty battery.	a. Replace battery.
	b. Voltage regulator set too high.	b. Adjust voltage regulator on airplane.
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.

TROUBLESHOOTING

BATTERY (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
4. Electrolyte runs out of vent plugs. (Cont'd)	c. Vent caps loose or broken.	c. Replace or tighten vent caps.
5. Battery low.	a. Standing too long.	a. Remove battery and recharge.
	b. Equipment left on accidentally.	b. Remove battery and recharge.
	c. Short circuit or ground in wiring.	c. Check wiring and correct malfunction, then remove battery and recharge.
	d. Broken cell partition.	d. This is usually indicated by two or more adjacent cells running down continually, particularly, if left standing a few days. Replace battery.
6. Compound on top of battery melts.	a. Charging rate too high.	a. Adjust voltage regulator on airplane.
7. Cell connector melted in center.	a. Shorted or grounded cable causing direct full discharge of battery.	a. Check cables and repair malfunction. Replace battery.
8. Battery freezes.	a. Discharged.	a. Replace battery.
	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
	c. Too low specific gravity of the electrolyte caused by improper filling.	c. Replace battery.
9. Cracked cell jars.	a. Hold down loose.	a. Replace battery.
	b. Frozen battery.	b. Replace battery.

"END"

DC GENERATION - MAINTENANCE PRACTICES

BATTERY

Two 25 ampere-hour, 12 volt, lead-acid batteries connected in series are installed, supplying a total system capacity of 24 volts. Access to the lead-acid batteries is obtained by opening the forward baggage compartment door and removing the battery box cover in the floor of the compartment.

The batteries supply power for the starter system and the electrical systems when the engines are not operating. It also provides limited power to an alternate battery bus in cases of emergency. Baggage compartment lights and courtesy lights are operated directly from the battery.

The battery box is vented overboard to dispose of the electrolyte and hydrogen gas fumes discharged during the normal charging operation.

CAUTION

> The use of an external ground power source is recommended for ground operation requiring battery drain and starting the airplane during cold weather.

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 batteries 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. Open the forward baggage compartment door and remove the battery box cover in the floor of the compartment.
b. 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.

c. Disconnect the POSITIVE cable terminal and position it so it will not interfere with the removal of the batteries.
d. Remove the bus bar interconnect between both batteries.
e. Remove each battery from the airplane.

BATTERY INSTALLATION

a. Position the batteries in the battery box.
b. Coat the battery terminals and cable terminals with a light coating of petroleum jelly.
c. Position the POSITIVE cable terminal on the battery and secure.

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 systems.

d. Position the NEGATIVE cable terminal on the battery and secure.
e. Install bus bar interconnect between both batteries.
f. Remove any excess petroleum jelly from the terminals.
g. Position the battery box cover on the battery and secure.
h. Close the baggage compartment door.

BATTERY CLEANING

For peak performance, the 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 batteries. To prevent the collection of such deposits, use the following steps in cleaning the batteries after each 100 hours of service or every 30 days, whichever occurs first:

a. Remove the batteries as described in the section BATTERY REMOVAL.
b. Ensure that the battery cell filler caps are tight in place. 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 batteries 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 batteries, for these may damage the battery case.

d. Rinse the batteries with clear water, then sponge off the excess water. Allow the batteries 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 batteries hardware is clean and in good mechnical condition.

NOTE

If additional cleaning of the battery terminals and cable terminal is required, use a wire brush 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 batteries should be maintained in a fully charged state at all times and the electrolyte level checked at regular intervals. Clean fully charged batteries will provide peak performance. Never add anything but distilled water when adjusting the electrolyte level in the batteries. If electrolyte is added each time the level in the batteries are 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 batteries over one-half inch above the separators. Only lead-acid equipment should be used when servicing lead-acid type batteries.

RECHARGING BATTERIES USING AUXILIARY POWER

The following steps should be used in using auxilairy power to recharge the battery:

a. Place the battery master switch in the on position.
b. Place both alternator switches and all electrical and avionics equipment switches in the off positions.
c. Connect the auxiliary power unit to the external power receptacle.

CAUTION

Make certain that the battery switch is in the on position, all avionics and electrical switches are in the off positions and batteries are in the system before connecting an external power unit. This protects the electrical voltage regulators and associated electrical equipment from voltage transients (power fluctuations).

d. Set the output of the auxiliary power unit at 27.0 to 28.5 vdc.
e. Place the auxiliary power unit in the on position.

If the battery master relay will not close, the batteries must be removed from the airplane for recharging. Check the battery master relay control circuit for a malfunction.

"END"

LOW VOLTAGE DETECTOR - MAINTENANCE PRACTICES

LOW VOLTAGE DETECTOR

The airplane is equipped with a low voltage detector for each alternator. These detectors compare the alternator voltage to the airplane bus voltage. If the output of one alternator drops 1.5 to 3.0 volts below the bus voltage (with both alternators operating, the highest alternator voltage is bus voltage) the alternator OUT light will illuminate. If one alternator is not operating, the operating alternator voltage is compared to the bus voltage, (which is now battery voltage) and if the alternator voltage drops 1.5 to 3.0 volts below the bus voltage, the alternator OUT light will illuminate. The low voltage detectors are checked each time the battery is turned on with the alternator switch in the off position. When the low voltage detector is determined inoperative, it should be replaced. The warning lights are located in the left hand instrument panel.

"END"

EXTERNAL POWER - MAINTENANCE PRACTICES

The airplane electrical system is protected against damage from reverse polarity by a relay and diodes in the external power circuit. The external power receptacle is located just outboard of the left engine nacelle. The receptacle is designed for a standard AN type plug. To supply power for ground checks and for ground power unit assisted engine starts, a ground power unit capable of supplying a continuous load of 300 amperes at 24 to 30 volts is required. Use of an inadequate ground power unit can cause a voltage drop below the drop-out voltage of the starter relay, resulting in relay chatter and welded contacts. By the same token, a maximum continuous load in excess of 350 amperes will damage the external power relay and power cables of the airplane.

Observe the following precautions when using an external power source:

a. Use only an auxiliary power source that is negatively grounded. If the polarity of the power source is unknown, determine the polarity with a voltmeter before connecting the unit to the airplane.

b. Before connecting the external power unit, turn OFF all radio equipment and alternator switches, but leave the battery master switch on to protect transistorized equipment against transient voltage spikes.

CAUTION

When the battery switch is turned off for extended ground power operation, place an external battery in parallel with the output of the external power unit before operating any transistorized avionics equipment.

c. If the ground power unit does not have a standard AN plug, check the polarity of the plug. The positive lead from the ground power unit must connect to the center post, the negative lead must connect to the front post and a positive voltage of 24 to 28 vdc must be applied to the small polarizing pin of the airplane's external power receptacle.

"END"

ELECTRICAL LOAD DISTRIBUTION - MAINTENANCE PRACTICES

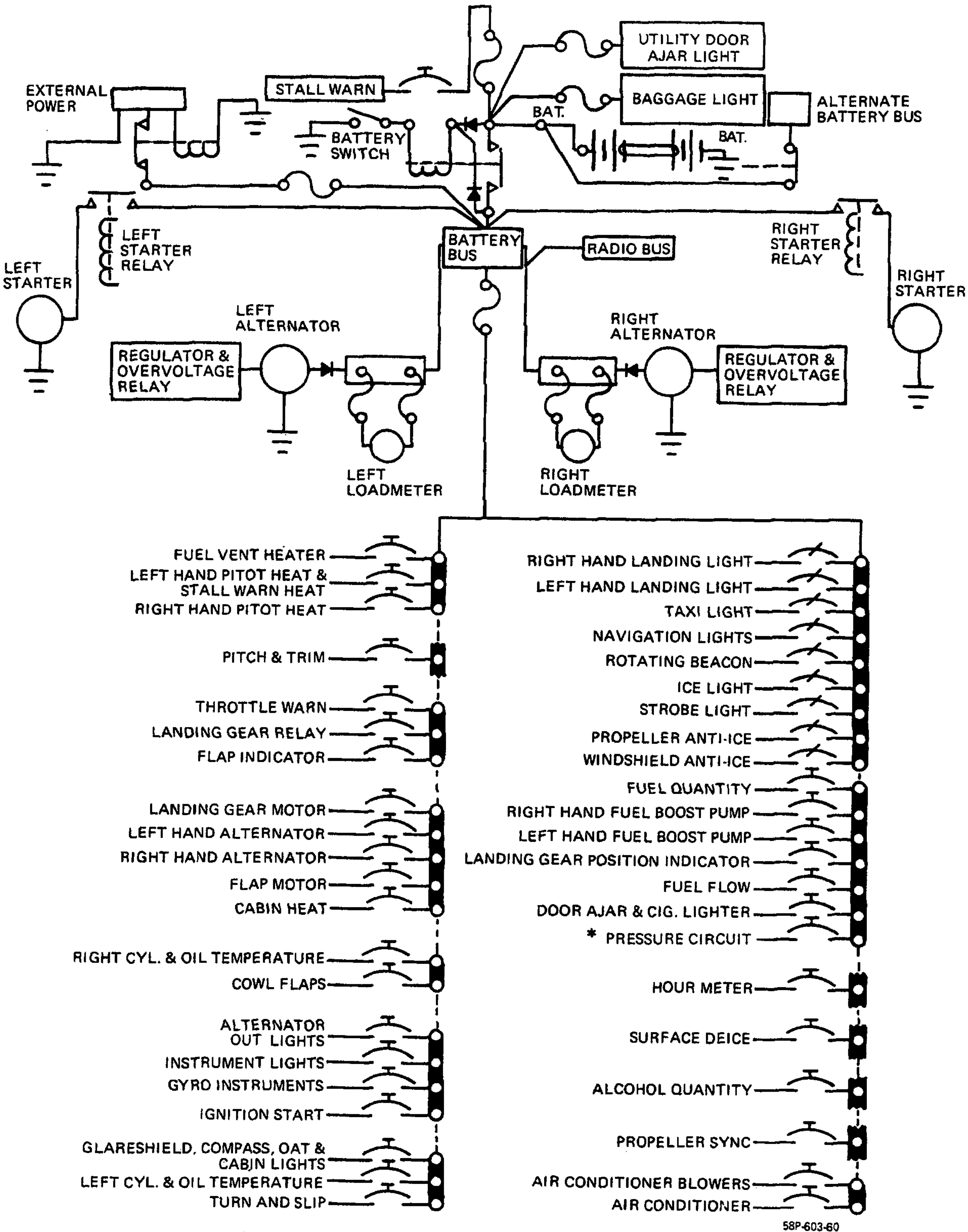
ELECTRICAL UTILIZATION CHART

The following chart provides 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). Since the airplane is equipped with two 24 volt, 50 ampere alternators, the total load shall not exceed 100 percent of the total generating capacity. When an item of 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 in the various systems in which it functions.

ELECTRICAL LOAD ANALYSIS

Start, Taxi, Takeoff Condition
Cold Ambient Temp. - Night - 30 Minutes

ITEM	NUMBER PER AIRPLANE	LOAD PER UNIT IN AMPS.	LOAD PER AIRPLANE IN AMPS.
Cowl Flap Actuator	2	1.00	2.00
Heater System	1	17.20	17.20
Fuel Vent Heaters	2	1.40	2.80
Fuel Flow System	1	.85	.85
Fuel Quantity Indicator	2	.01	.02
Cylinder Head and Oil Temperature Indicator	2	.80	1.60
Turn and Slip Indicator	1	.40	.40
Electroluminescent Panel Inverter	1	.25	.25
Battery Master Relay	1	.60	.60
Annunciator Dim Relays	4	.09	.36
Instrument Lights	All	2.40	2.40
Rotating Beacons	2	3.00	6.00
Navigation Lights	3	.85	2.55
Landing Gear Motor	1	20.00	20.00
Flap Motor	1	13.00	13.00
Fuel Boost Pump	2	5.00	10.00
Landing Lights	2	9.00	18.00
Avionics	All	30.00	30.00
Starter Relay	2	3.60	7.20
Starter Motor	2	200.00	400.00
Taxi Light	1	5.30	5.30
Cabin Lights (Pilot & Copilot)	2	.17	.34
Instrument Flood Lights	All	2.00	2.00
Stall Warning	1	.90	.90
Landing Gear Position Lights	3	.05	.15
Dynamic Brake Relay	1	1.00	1.00
Cigarette Lighter	1	6.20	6.20
Strobe Light System	1	3.50	3.50
Door Seal Solenoid (TJ-2 and after)	1	.22	.22
Air Conditioning System	1	11.94	11.94
Electric Elevator Trim	1	1.35	1.35
Dump Solenoid (TJ-2 and after)	1	.90	.90
Preselect Solenoid (TJ-2 and after)	1	.90	.90
Nacelle Scoop Actuator	2	1.00	2.00



* TJ-2 AND AFTER

Electrical Load Distribution Schematic
Figure 201

ELECTRICAL LOAD ANALYSIS

Flight Condition (One Hour, 30 Minutes In Icing)
Assumes Flight In Icing At Night with Normal Optional Equipment

ITEM	NUMBER PER AIRPLANE	LOAD PER UNIT IN AMPS.	LOAD PER AIRPLANE IN AMPS.
Cowl Flap Actuator	2	1.00	2.00
Heater System	1	17.20	17.20
Fuel Vent Heaters	2	1.40	2.80
Fuel Flow System	1	.85	.85
Fuel Quantity Indicator	2	.01	.02
Cylinder Head and Oil Temperature Indicator	2	.80	1.60
Turn and Slip Indicator	1	.40	.40
Electroluminescent Panel Inverter	1	.25	.25
Battery Master Relay	1	.60	.60
Annunciator Dim Relays	4	.09	.36
Instrument Lights	All	2.40	2.40
Rotating Beacons	2	3.00	6.00
Navigation Lights	3	.85	2.55
Landing Gear Motor	1	20.00	20.00
Flap Motor	1	13.00	13.00
Fuel Boost Pump	2	5.00	10.00
Landing Lights	2	9.00	18.00
Avionics	All	30.00	30.00
Starter Relay	2	3.60	7.20
Starter Motor	2	200.00	400.00
Taxi Light	1	5.30	5.30
Cabin Lights (Pilot & Copilot)	2	.17	.34
Instrument Flood Lights	All	2.00	2.00
Stall Warning	1	.90	.90
Landing Gear Position Lights	2	.08	.16
Dynamic Brake Relay	1	1.00	1.00
Cigarette Lighter	1	6.20	6.20
Strobe Light	2	1.75	3.50
Door Seal Solenoid (TJ-2 and after)	1	.22	.22
Air Conditioning System	1	11.94	11.94
Electric Elevator Trim	1	1.35	1.35
Dump Solenoid (TJ-2 and after)	1	.90	.90
Preselect Solenoid (TJ-2 and after)	1	.90	.90
Nacelle Scoop Actuator	2	1.00	2.00
Pitot Heat	1	4.00	4.00
Stall Warning Heater	1	1.80	1.80
Passenger Reading Lights	4	.30	1.20
Propeller Anti-Ice System	1	18.00	18.00

ELECTRICAL LOAD ANALYSIS (Cont'd)

Flight Condition (One Hour, 30 Minutes In Icing)
Assumes Flight In Icing At Night With Normal Optional Equipment

ITEM	NUMBER PER AIRPLANE	LOAD PER UNIT IN AMPS.	LOAD PER AIRPLANES IN AMPS.
Wing Ice Light	1	1.40	1.40
Windshield Anti-Ice System (alcohol)	1	.65	.65
Surface Deice	1	.45	.45
Starter Vibrator	2	2.00	4.00
Step Light	1	.30	.30
Nose Baggage Light	1	.67	.67
Copilot Map Light	1	.30	.30
Landing Gear Warning Horn	1	.90	.90
Prop Synchronizer	2	.50	1.00
Prop Synchrophaser	1	.50	.50
Alcohol Quantity	1	.25	.25

"END"

ELECTRICAL LOAD DISTRIBUTION - MAINTENANCE PRACTICES

ALTERNATE BATTERY BUS SYSTEM

The optional alternate battery bus provides electrical power directly from the batteries for any emergency situation requiring such action. Control of this system consists of one guarded switch mounted on the left side of the instrument panel.

To check the alternate battery bus system, use the following steps:

a. Remove the guard on the ALT BAT BUS switch by turning the cover as indicated.
b. Place the ALT BAT BUS switch in the ON position.
c. Place both alternator switches in the off or down position.
d. Place the normal BAT switch in the off or down position.

The following functions are provided from alternate battery bus power:

a. Electrical Gyros (if installed).
b. Turn and Slip Indicator.
c. Nav Lights.
d. Instrument Lights.
e. Cabin Lights.
f. Left Landing Light.
g. Audio.
h. Com I.
i. Nav I or Nav II.
j. Transponder.

NOTE

The standard battery installation will provide 30 minutes or more of operation, according to the number of the above loads used.

ELECTRICAL LOAD ANALYSIS

Alternate Battery Bus Only

ITEM	NUMBER PER AIRPLANE	LOAD PER UNIT IN AMPS.	LOAD PER AIRPLANE IN AMPS.
Avionics (Com I Nav I Audio and Transponder)	All	5.32	5.32
Turn and Slip Ind.	1	.40	.40
Cabin Lights	2	.17	.34
Navigation Light	1	1.20	1.20
Landing Lights	1	9.00	9.00
Instrument Lights	All	2.40	2.40

"END"

CHAPTER

25

EQUIPMENT/ FURNISHINGS

CHAPTER 25 - EQUIPMENT/FURNISHINGS

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	204	Mar 31/82
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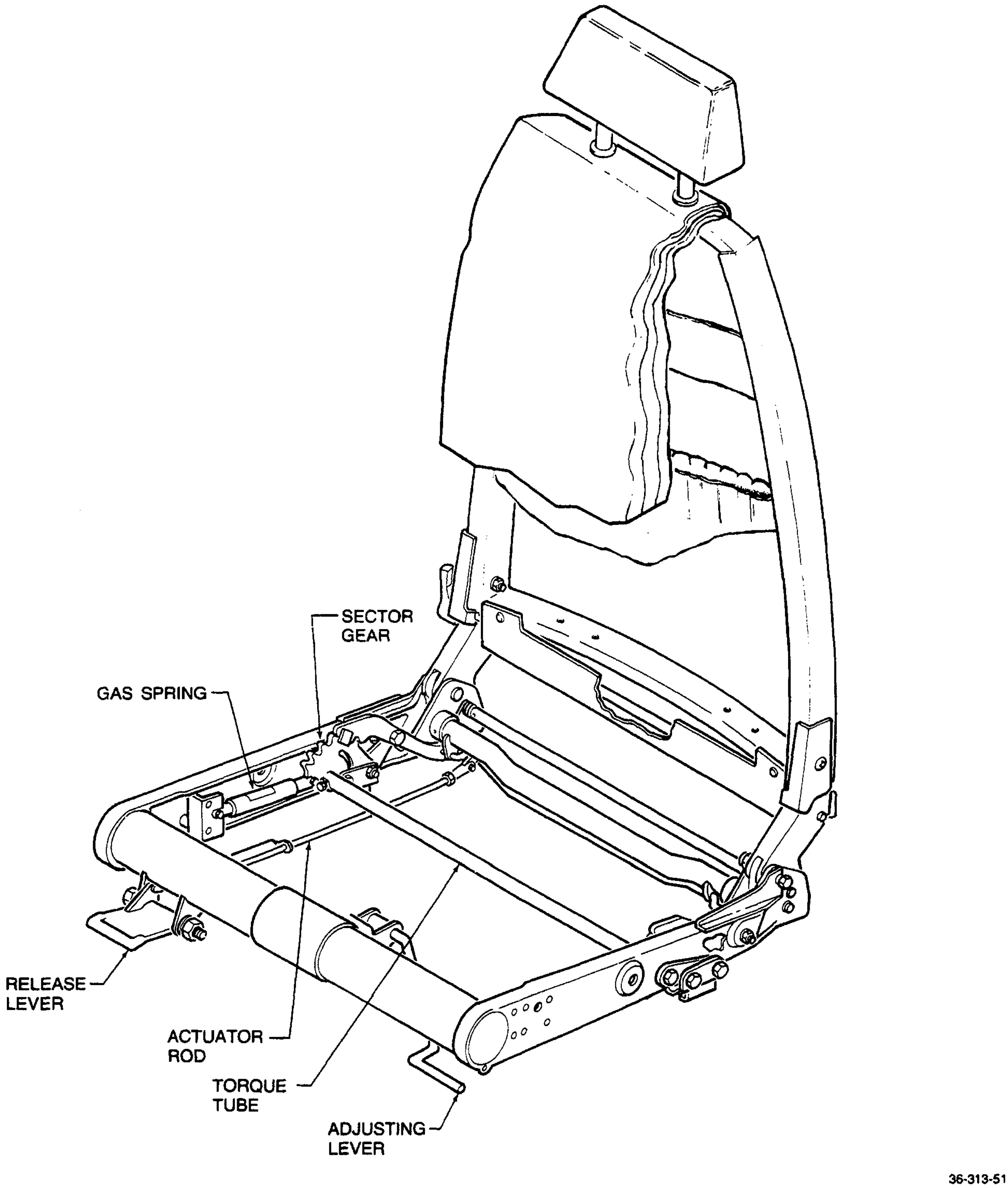
GENERAL - DESCRIPTION AND OPERATION

PILOT SEATING

Airplane serials TK-147, TK-151 and after, and TJ-436, TJ-444 and after are equipped with vertically adjusting seats in the crew compartment (copilot's seat is optional). The seat is raised and lowered by gas springs mounted underneath the seat. The seat is adjustable through a range of 1.3 inches for improved visibility and crew comfort. The raising and lowering action is initiated by pulling up on a release lever located on the front RH side of the seat. When the release lever is raised, two ratchet type camlocks are disengaged from sector gears attached to the gas springs mounted on each side underneath the seat, allowing the gas spring piston rods to extend or retract to raise or lower the seat. To raise the seat, the pilot's weight must be shifted forward. To lower the seat, the weight must be shifted to the rear to overcome the gas spring tension.



Vertically Adjusting Seat
Figure 1

"END"

GENERAL - MAINTENANCE PRACTICES

FLIGHT COMPARTMENT SEAT REMOVAL

a. Remove the seat stop or stops at the aft end of the seat tracks.

b. Release the fore and aft adjustment lock.

c. Move the seat aft until it clears the mounting tracks.

FLIGHT COMPARTMENT SEAT INSTALLATION

NOTE

If shims were installed in the seat support, they should be reinstalled in the same location from which they were removed to achieve proper seat locking engagement with the seat track.

a. Align the seat guide with the seat track. If shims were installed in the front center seat guide, they should be reinstalled in the same location as that from which they were removed.

b. Pull up on the fore and aft adjustment lever and slide the seat onto the seat track. Release the adjustment lever and ensure that the seat is securely in place.

c. If the lock pin does not align with the holes in the center seat track, it will be necessary to reposition the seat guides with shims. Use shims as needed to center the locking pin with the holes in the seat track.

NOTE

Shims (three inches long by .3 inch wide) may be fabricated from 0.016 6061 T6 sheet aluminum as shown in Figure 201. The shims are placed inside the seat guide and formed around the guide as shown in Figure 201.

d. Pull up on the fore and aft adjustment lever and slide the seat through the full travel of seat adjustment. Ensure that the locking pin has positive engagement in all holes of the seat track.

e. Reinstall the seat stops at the aft end of the seat track.

PASSENGER SEAT REMOVAL (THIRD AND FOURTH SEATS)

a. Release the fore and aft adjustment lock and move the seat forward against the stop.

b. Remove the seat stop from the aft end of the center track.

c. Release the fore and aft adjustment lock and move the seat aft until it clears the mounting tracks.

PASSENGER SEAT INSTALLATION (THIRD AND FOURTH SEATS)

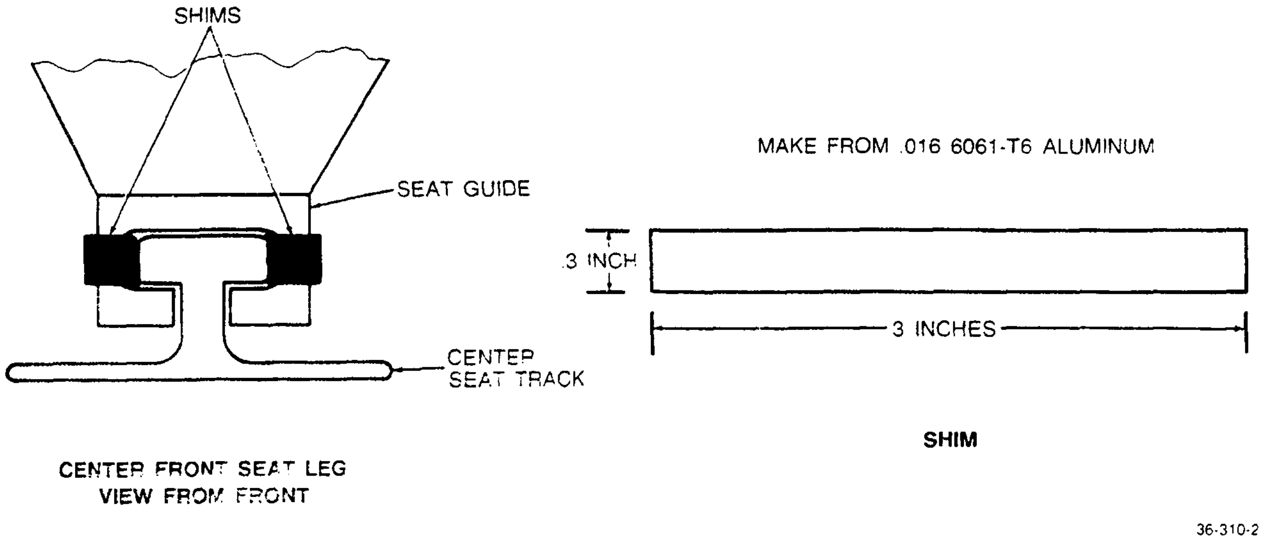
a. Place the seat in position and align the seat guides with the mounting track.

b. Release the fore and aft adjustment lock and slide the seat onto the mounting track. Engage the fore and aft lock and make certain the seat is securely in place.

c. Replace the seat stop on the aft end of the center lock.

SEAT BACK ADJUSTMENT

Seat back adjustment on airplane serials TK-1 through TK-106 and TK-109, TJ-3 through TJ-209, and TJ-211 through TJ-234 is controlled by a mechanical three-position stop or by a Roton lock. On airplane serials TK-107, TK-109 through TK-150 except TK-147, and serials TJ-210, TJ-235 through TJ-443 except TJ-436, seat back adjustment is controlled by a three-position mechanical stop or by a hydro lock. At serials TK-147, TK-151 and after, and TJ-436, TJ-444 and after, the pilot's seat is a vertically adjusting seat. The vertically adjusting seat is optional for the copilot. The vertically adjusting seats have a three-position mechanical back stop.



Shim Installation
Figure 201

PASSENGER SEAT REMOVAL (FIFTH AND SIXTH SEATS)

a. Raise the seat bottom up to release the tension on the seat back support rod.

b. Remove the seat back support rod from the mounting brackets and fold the seat back forward.

c. Remove the attaching bolts and seat.

PASSENGER SEAT INSTALLATION (FIFTH AND SIXTH SEAT)

a. Position the seat and secure in place with the attaching bolts.

b. Raise the seat bottom and insert the seat back support rod into the mounting brackets.

PASSENGER SEATS STOWAGE (FIFTH AND SIXTH SEATS)

The fifth and sixth seats may be folded either in a horizontal or vertical position to provide additional cargo space. This may be accomplished as follows:

VERTICAL POSITION

a. Fold the seat bottom up to a vertical position.

b. Fold the seat support into the retract position.

c. Position the seat against the rear bulkhead in a vertical position.

HORIZONTAL POSITION

a. Fold the seat support into the retract position and position the seat bottom on the floorboard.

b. Fold the seat back forward and position it on top of the seat bottom.

ROTON LOCKS (Figure 202)

Usually, Roton locks will need no service. If there is a grinding and binding in the lock as the seat reclines, or the return action becomes jerky, a little grease properly applied as follows should improve the operation:

a. Use only grease (30, Chart 207, 91-00-00) on the threads as shown in Figure 202. Too much grease or grease in the wrong place can cause improper operation.

b. Compress the spring guide and counterbalance spring approximately one inch.

c. Remove the retaining ring.

d. Relax pressure on the spring guide and counterbalance spring slowly until the spring is fully extended.

e. Remove the lock from the fixture and remove the spring guide, counterbalance spring, and spring guide tube.

f. Apply a small quantity of grease to the completely extended thrust screw (see Figure 202).

g. Reassemble the lock. For service other than lubrication, return the Roton lock to the manufacturer.

MODIFICATION OF THIRD AND FOURTH PASSENGER SEAT BACK SUPPORTS (TJ-3 THRU TJ-54)

Additional screws are to be installed in the seat back supports on the third and fourth cabin seats. Modification of the seat back support installation may be accomplished as follows:

a. Remove the third and fourth cabin seats from the airplane.

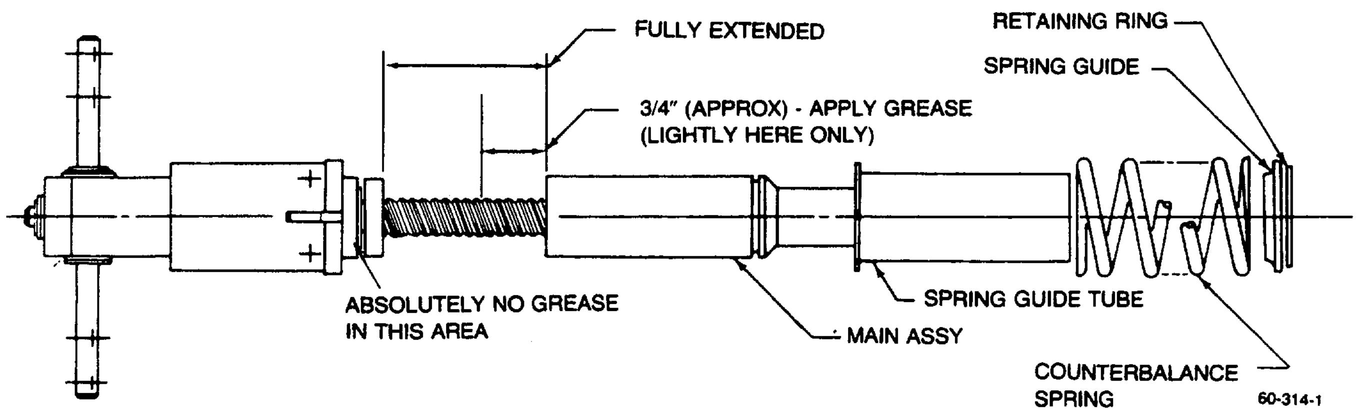
NOTE

The following steps are applicable to both seats:

b. Remove the seat back assembly from the seat.

c. Remove the plastic shell from the seat back assembly.

d. Disassemble the seat back locking mechanism from the seat back support assemblies.



ROTON LOCK
FIGURE 202

e. Remove the screws, washers and nuts which secure the support assemblies to the seat back frame assembly and remove the support assemblies.

f. Temporarily install an appropriate size and length screw, washer and nut in the screw hole in each support assembly to hold the assembly together. Mark and line drill a .156/.160-inch diameter hole through the complete support assembly as shown in the illustration.

g. Remove and discard the existing roll pin from the upper hole in the support assembly. Line drill or ream this hole to .193/.200-inch diameter. (See Figure 203).

h. Remove the screw, washer and nut which was temporarily installed in step "f".

i. Drill or ream the upper hole in the filler plates only to .256/.267-inch diameter. (See Figure 203).

j. Deburr all holes and reassemble the support assembly with a new MS171559 roll pin in the center hole.

k. Reinstall the support assembly in the seat back frame assembly with one each existing screw, washer and nut and one each new MS27039-1-21 screw, AN960D10 washer and MS21083N3 nut.

l. Reassemble the seat back locking mechanism to the support assemblies.

m. Reinstall the plastic shell on the seat back and reinstall the seat back assembly on the seat.

n. Reinstall the third and fourth seats in the airplane.

GLARESHIELD REMOVAL

a. Remove the attaching screws on both sides of the glareshield.

b. Pull up gently on the front of the glareshield and disconnect the wiring for the compass and the floodlights (TJ-3 thru TJ-168, TK-1 thru TK-84) or annunciator panel lights (TJ-169 and after, TK-85 and after) at the connectors.

c. Pull the glareshield away from the slide-on fasteners located in three places at the base of the windshield.

d. Disconnect the RH and LH glareshield air conditioning ducts from the main ducts at the clamps.

e. Disconnect the defroster duct from the main defroster duct tube at the clamp.

f. Remove the glareshield from the airplane.

GLARESHIELD INSTALLATION

a. Place the glareshield in the airplane and reconnect the electrical wiring for the compass and the flood lights (TJ-3 thru TJ-168, TK-1 thru TK-84) or annunciator panel lights (TJ-169 and after, TK-85 and after.)

b. Connect the defroster duct at the glareshield to the main defroster duct tube and secure with the duct clamp. Connect the RH and LH air conditioning ducts to the main air conditioning ducts and secure them with clamps.

c. Place the glareshield down in position making sure that it fits properly over the fasteners at the base of the windshield.

d. Secure the glareshield on both sides with the attach screws.

HEADLINER REMOVAL
(TJ-210, TJ-235 and after)

a. Remove the attaching screws from the sunvisors and remove the sunvisors.

b. Remove the glareshield as outlined in this chapter under GLARESHIELD REMOVAL.

c. Remove the screws securing the molding around the windshield and remove the molding.

d. Remove the coat hooks located on the upper window molding aft of the flight compartment seats.

e. Remove the snap-on cover over the front and rear shoulder harness inertial reels (located directly behind the flight compartment seats and in the aft baggage compartment). Remove the bolts attaching the inertial reels to the airplane structure.

f. Remove the aft garment hangers (located over the fifth and sixth seats and over the hat shelf on the headliner) by removing the attach screws.

g. Remove the webbing and hat shelf from the aft baggage compartment and then remove the clips that the webbing and hat shelf hook on.

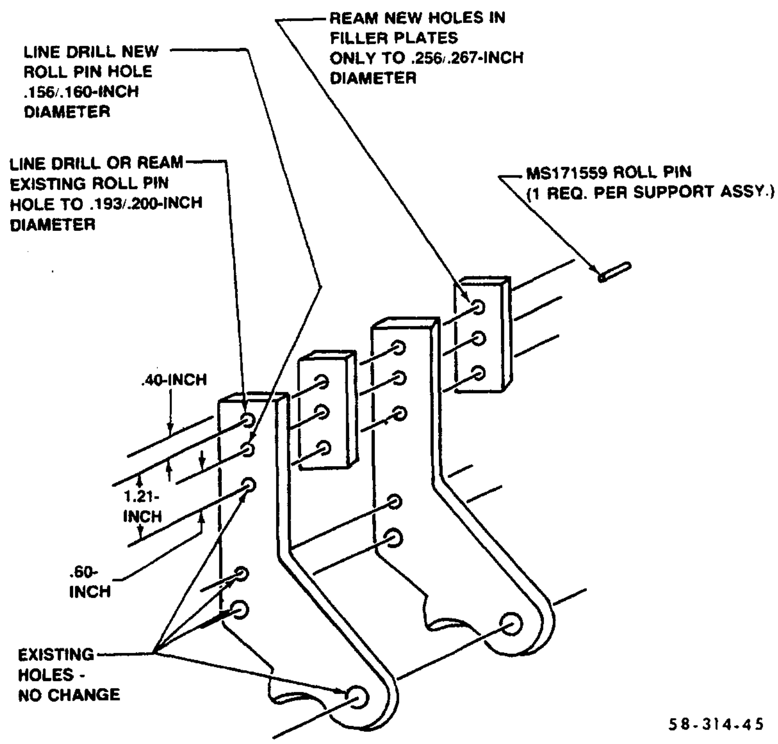
h. Pull the upholstery inserts from the molding. The inserts are located between the passenger compartment windows, below the passenger compartment windows, and in the aft baggage compartment.

i. Remove the attach screws from the window molding on the RH and LH sides of the airplane and remove the molding from the airplane.

j. Pull the outside of the RH headliner panel down gently away from the structure (velcro tape holds the headliner panel to the airplane structure). Pull the headliner panel away from the overhead console and remove from the airplane thru either the flight compartment door or the aft passenger door.

k. Pull the outside of the LH headliner panel down gently away from the structure (velcro tape holds the headliner panel to the airplane structure). Pull the headliner panel away from the overhead console and remove from the airplane thru either the flight compartment door or the aft passenger door.

l. Remove the attach screws from the aft section of the overhead console and lower the section down, then disconnect the electrical wiring at the connector. Remove the attach screws from the front section of the overhead console and lower the section down, then disconnect the electrical wiring at the connector. Tag and identify the wiring. Remove the complete console from the airplane.



SEAT BACK SUPPORT ASSEMBLY
FIGURE 203

HEADLINER INSTALLATION (TJ-210, TJ-235 AND AFTER)

a. Place the front section of the overhead console in position and connect the wiring at the connector. Place the section in position and secure with the attach screws.

b. Place the rear section of the overhead console in position and connect the wiring at the connector. Place the section on position and secure with the attach screws.

c. Place the LH headliner panel in the airplane and slide it into position in the console. Push the panel up to the structure making sure that it is in position and secure with the attach screws.

d. Place the RH headliner panel in the airplane and slide it into position in the console. Push the panel up to the structure making sure that it is in position and secure with the attach screws.

e. Place the window molding back in place on the RH and LH side of the airplane and secure with the attach screws.

f. Replace the upholstery inserts on the molding. The inserts are located between the passenger compartment windows and also below the passenger compartment windows. The inserts are held in place with velcro tape.

g. Install the mounting clips for the hat shelf and the baggage webbing. Secure the clips with the attach screws. Install the hat shelf and the baggage webbing.

h. Replace the aft garment hangers (located over the fifth and sixth seats and over the hat shelf on the headliner) and secure with the attach screws.

i. Reinstall the forward and aft shoulder harness inertial reels and secure with the attach bolt. Replace the snap-on cover over the inertial reels. The inertial reels are located behind the light compartment seats and aft of the fifth and sixth seats.

j. Replace the coat hooks on the upper window molding in the passenger compartment and secure with the attach screws.

k. Replace the windshield molding and secure with attach screws.

l. Install the glareshield as outlined in GLARESHIELD INSTALLATION in this chapter.

m. Replace the sunvisors and secure with the attach screws.

HEADLINER REMOVAL (TK-107, TK-108, TK-110 AND AFTER)

a. Remove the seats from the flight compartment as outlined in FLIGHT COMPARTMENT SEAT REMOVAL in this chapter.

b. Remove the webbing and hat shelf from the aft baggage compartment and then remove the clips that the webbing and hat shelf hook on.

c. Remove the snap-on cover over the rear shoulder harness inertial reel and remove the mounting bolt that attaches the inertial reel to the airplane. Pull the upholstery inserts from the molding on the RH and LH side and remove the molding attach screws.

d. Remove the screws attaching the aft garment hanger to the airplane and remove the aft garment hanger.

e. Remove the lower aft bulkhead closure. The closure is held in place by velcro fasteners.

f. Remove the tape (59, Chart 207, 91-00-00) (working thru the aft bulkhead closure) at the seam where the overhead air ducts join.

g. Remove the glareshield as outlined in this chapter under GLARESHIELD REMOVAL.

h. Remove the attach screws securing the molding around the windshield and remove the molding.

i. Remove the attach screws securing the trim above the flight compartment door and remove the trim.

j. Remove the coat hooks on the upper window molding, then pull the upholstery inserts from the molding. The inserts are located between the passenger compartment windows and below the passenger compartment windows.

k. Pull the snap-on covers from the pilot's and copilot's shoulder harness inertial reeks and remove the mounting bolt that attaches the reel to the airplane. Remove the reel from the airplane.

l. Remove the attach screws from the molding around the windows on the RH and LH side of the airplane. Remove the molding from the airplane.

m. Remove the screws attaching the overhead forward console to the headliner and pull down on the console and at the same time pull the console forward to disconnect the console air duct and the main air duct.

n. Disconnect the wiring from the console lights and tag and identify the wiring.

o. Remove the console from the airplane.

p. Gently pull down on the headliner to disconnect it from the velcro fasteners. The velcro tape is spaced evenly across the length of the headliner.

q. Disconnect the electrical wiring to the headliner lights. A connector is located above the pilot's window.

r. Remove the headliner thru the flight compartment door or the aft passenger door.

HEADLINER INSTALLATION (TK-107, TK-108, TK-110 AND AFTER)

a. Place the headliner in the airplane.

b. Place the headliner in position ensuring that the aft headliner air duct and the aft main air duct fit properly) and press on the areas where the velcro tape is located.

c. Connect the electrical wiring to the forward overhead console at the connector.

d. Place the forward overhead console in position making sure that the air ducts slide correctly into position. Seal the air duct seam with Pressite #575 (60, Chart 207, 91-00-00) or RTV 108 (51, Chart 207, 91-00-00).

e. Secure the console in place with the attach screws.

f. Replace the molding around the windows on the RH and LH side of the airplane and secure with the attach screws.

g. Replace the upholstery inserts (located between the passenger compartment windows and in the aft baggage compartment.

h. Replace the forward and aft coat hooks and secure with attach screws.

i. Replace the trim above the flight compartment door and secure with attach screws.

j. Reinstall the molding around the windshield and secure with attach screws.

k. Install the glareshield as outlined in GLARESHIELD INSTALLATION in this chapter.

l. Wrap tape (59, Chart 207, 91-00-00) (working thru the aft bulkhead closure) around the seam where the aft overhead air ducts join.

m. INstall the aft bulkhead closure. The closure is held in place with velcro fasteners.

n. Install the aft garment hanger in the airplane and secure with attach screws.

o. Install the RH and LH rear shoulder harness inertial reels and secure with the attach bolts, then replace the snap-on covers over the inertial reels.

p. Install the mounting clips for the baggage webbing and hat shelf and then mount the hat shelf and baggage webbing.

q. Install the RH and LH forward shoulder harness inertial reels and secure with the attach bolts, then replace the snap-on covers over the inertial reels.

r. Install the flight compartment seat as outlined in FLIGHT COMPARTMENT SEAT INSTALLATION in this chapter.

FUSELAGE - MAINTENANCE PRACTICES

FORWARD CARRY-THROUGH SPAR COVER REMOVAL

a. Remove the pilot and copilot seats.

b. Remove emergency landing gear crank cover from the spar cover.

c. On aft side of spar cover, pull back carpet and remove screws from spar cover.

d. Remove RH access cover.

e. From inside of RH access cover, loosen clamp and remove air duct from plenum and grill assembly.

f. Lift the spar cover and remove from froward spar.

FORWARD CARRY-THROUGH SPAR COVER INSTALLATION

CAUTION

Improper installation of the forward carry-through spar cover may interfere with the landing gear emergency hand crank operation. Ensure the landing gear hand crank will rotate without interference with the spar cover.

a. Center spar cover on the forward spar.

b. From inside of RH access cover, install air duct on plenum and grill assembly and tighten clamp.

c. Install RH access cover assembly.

d. On forward side of spar cover, install screws to secure forward end of spar cover and install carpet.

e. On aft side of spar cover, install screws to secure aft end of spar cover and install carpet.

f. Check emergency landing gear hand crank to ensure handle will rotate without interference with the forward carry-through spar cover.

g. Install emergency landing gear crank cover to spar cover.

h. Install the pilot and copilot seats.

EMERGENCY - DESCRIPTION AND OPERATION

EMERGENCY LOCATOR TRANSMITTER

Airplane serials TJ-3 and after, and TK-1 and after are equipped with an emergency locator transmitter (ELT) to assist in the tracking and recovery of any airplane and crew in the event of a crash, or if an emergency landing is necessitated. Airplane serials TJ-3 thru TJ-271 and TK-1 thru TK-121 are equipped with Collins/Communications Components Corporation ELT units. Narco ELT units are installed on airplane serials TJ-272 and after and TK-122 and after and earlier airplanes equipped with Kit No. 101-3046-1.

The ELT is mounted on the aft fuselage, on the RH side, at approximately F.S. 231.00. An antenna for the ELT is mounted on top of the fuselage under the vertical stabilizer at approximately F.S. 231.00. The output frequency of the ELT is 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 in the event the impact switch is accidentally triggered. Airplane serials TJ-3 thru TJ-271 and TK-1 thru TK-121 with Kit No. 101-3039-1 installed have a remote switch located on the RH side of the rear fuselage. The remote switch is placarded REARM-ARM-XMIT, and is accessible thru an access hole with a spring-loaded door located adjacent to the transmitter. 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 in the event the impact switch is accidentally triggered. Airplane serials TJ-272 and after, TK-122 and after, and earlier airplanes equipped with Kit No. 101-3046-1, have a remote switch installed on the RH side of the aft fuselage. The remote switch is placarded ARM-XMIT, and is accessible thru an access hole with a spring-loaded door located adjacent to the transmitter. An optional installation is available for the remote switch so that it may be installed in the instrument panel. The remote switch is a momentary switch and enables manual activation of the ELT for testing purposes while the unit is installed in the airplane.

"END"

EMERGENCY - MAINTENANCE PRACTICES

EMERGENCY LOCATOR TRANSMITTER MAINTENANCE

Maintenance on the ELT is normally limited to replacing the battery. The following is a list of the various conditions which warrant battery replacement.

a. Visual inspection shows signs of leakage, corrosion, or unsecure leads.

b. Elapsed replacement date noted on the battery case (this date represents 50% of the useful life of the battery).

NOTE

The useful life of the battery is the length of time which the battery may be stored without losing its ability to continuously operate the ELT for 48 hours.

c. After any emergency use.

d. After one cumulative hour of use.

e. After operation of unknown duration.

f. If transmitter is stored in an area where the temperature is normally above 38°C (100°F), the battery should be replaced every 12 months.

CAUTION

Avoid storage of batteries at temperatures in excess of 55°C (130°F).

The information of 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 aircraft manufacturers or other acceptable suppliers, since the condition and useful life of over-the-counter batteries, such as those sold for flashlights, portable redios, etc., are usually unknown.

CAUTION

The ELT switch should not be turned ON unless the ELT is connected to its associated antenna or a 50-ohm dummy load.

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, if installed, from the terminals on the ELT.

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

d. Extend the portable antenna.

CAUTION

Exercise extreme care in extending the portable antenna and the handling of the control head during the battery replacement in order to avoid damage to the antenna or the plastic tab on the upper end.

e. Remove the four screws attaching the control head to the battery casing and slide the control head and the battery case apart. The battery connection leads are approximately 3 inches long.

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 ELT unit is reassembled.

f. Disconnect the battery by unsnapping the battery terminals from the bottom of the transmiter PC board. Discard the old battery.

NOTE

Inspect for and properly treat any corrosion that may be indicated the area when the battery is replaced.

WARNING

DO NOT discard the battery in fire.

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

h. Using a stick, apply a bead of sealant (supplied with each battery pack) around the area of the control head which is joined with the battery case when reassembled.

NOTE

The sealant provides a watertight seal when the unit is assembled.

i. Insert the control head section into the battery case being careful not to pinch the wires and install the four attaching screws. Wipe any excess sealant from the outside of the unit.

NOTE

If the four screw holes do not line up, rotate the battery case 180° and reinsert.

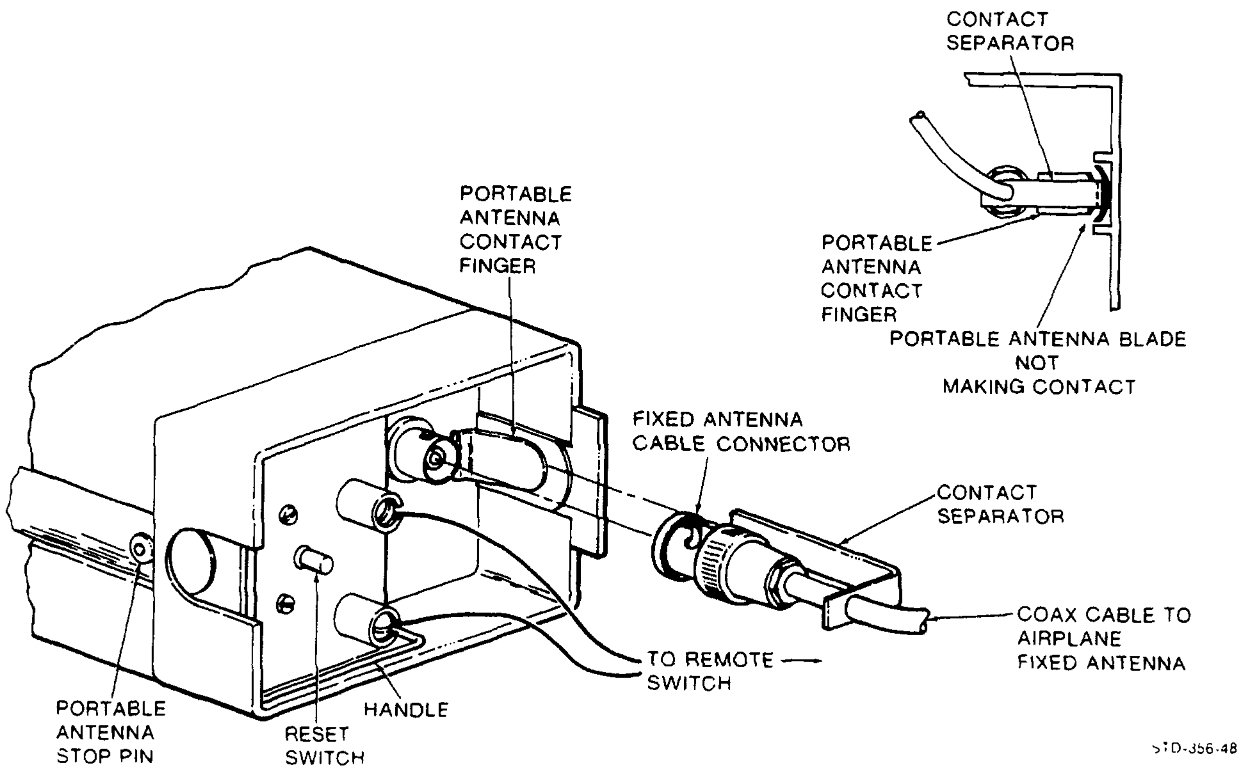
j. Stow the portable antenna.

CAUTION

Exercise extreme care in order to avoid damage to the antenna or the plastic tab on the upper end.

k. Install the transmitter in the airplane and secure the mounting strap.

l. Connect the fixed antenna cable to the ELT. Ensure that the (plastic) contact



Narco ELT
Figure 201

separator is inserted between the portable antenna contact and the portable antenna.

NOTE

With the contact separator not in place a very weak signal may be transmitted. This signal may be strong enough for a functional test but too weak for emergency use.

m. Connect the remote switch wiring, if installed, to the terminals on the ELT.

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

o. Ensure that the new replacement date is marked on the outside of the transmitter. This date is 50% of the useful life of the battery as defined 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. Discard the old battery.

WARNING

DO NOT discard the battery in fire.

NOTE

Inspect for and properly treat any corrosion that may be indicated in the area when the battery is replaced.

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. Ensure that the new replacement date is marked on the outside of the transmitter. This date is 50% of the useful life of the battery as defined by the battery manufacturer.

DORNE AND MARGOLIN BATTERY REPLACEMENT

a. Remove the aft upholstery panel (58TC airplanes). On 58P airplanes, remove the rear LH fuselage access opening.

b. Make certain the ELT is turned off.

c. Disconnect the antenna.

d. Disconnect the remote switch.

e. Remove the screws holding the ELT in place.

f. Remove the screws from the bottom of the ELT and remove the bottom.

g. Disconnect the battery and discard it.

NOTE

Inspect for and properly treat any corrosion that may be indicated in the area when the battery is replaced.

h. Connect the new battery.

i. Install the bottom of the ELT and the screws.

j. Install the ELT in the airplane and install the screws which hold it in place.

k. Connect the antenna and remote switch.

l. Install the aft upholstery panel (58TC airplanes. On 58P airplanes reinstall the rear LH fuselage access opening.

m. Test the ELT as indicated under TESTING EMERGENCY LOCATOR TRANSMITTER.

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 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 Comission regulations require that this testing be performed in a screened or shielded test room, or in a test enclosure that will hold the self contained ELT unit with the antenna fully extended.

CAUTION

The ELT switch should not be turned ON unless the ELT is connected to its associated antenna or a 50-ohm dummy load.

Operational testing of installed ELTs may be accomplished as follows:

NOTE

Tests should not be longer than three audio swweeps. 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 ON the VHF transceiver COMM-1 and tune the transceiver to 121.5 MHz.

b. Turn the COMM-1 audio switch to the SPEAKER position and place the volume control in the center of its range.

c. Turn the ELT ARM-OFF-ON switch to ON and monitor the ELT signal. On airplanes equipped with a remote switch (located on the aft fuselage on the RH side or on the instrument panel), the switch may be momentarily flipped to the XMIT position and the ELT signal monitored.

NOTE

A distinctive downward sweeping tone should have been heard from the monitoring receiver during the test. If the tone was heard, the ELT is functioning properly. If there was no audible tone, (assuming that the VHF transceiver is operational), the battery is probably disconnected, out-dated or discharged.

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 COMM-1.

"END"

CHAPTER

27

FLIGHT CONTROLS

CHAPTER 27 - FLIGHT CONTROLS

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RECORD OF TEMPORARY REVISIONS

REVISION NUMBER	DATE INSERTED	DATE REMOVED	REASON REMOVED	PAGE NUMBER
27-1	Dec 11/92	Nov 15/93	Temporary Revision 27-2	27-50-00 Page 204
27-2	Nov 15/93	Jan 9/02	Revision A24	27-50-00 Page 204

NOTE: Insert this Record of Temporary Revisions after the Chapter 27 divider tab.

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GENERAL - DESCRIPTION AND OPERATION

CONTROL SURFACES

All primary flight controls are cable operated conventional surfaces, and are manually controlled through cable-bell crank systems. Each system includes surface travel stops and linkage adjustments. The wing flaps and optional electric elevator trim tab are driven by electric motors.

The ailerons, elevators and rudder can be secured with a gust lock in the control area. Refer to GUST LOCK AND DAMPENER in this chapter for gust lock installation procedures.

Airplane serials TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150 are equipped with either a standard single "Throw-over" control arm or a dual control "T" column. On later airplanes, dual control columns are installed as standard equipment.

The rudder pedals are interconnected by linkage below the floor. The pedals are adjustable to two positions by pressing the spring-loaded lever on the side of the pedal. If brakes are not installed on the copilot's pedals, the same lever can be used to place the copilot's pedals against the floor.

Trim tabs are installed on each elevator, the rudder and the left aileron. The tabs are manually controlled through drum-cable systems, using jackscrew actuators. Tab position indicators are provided on or near the tab controls. The optional electric elevator trim tab is controlled by a switch in the outboard handle of the pilot's control wheel.

Positive stops on the primary flight control surfaces limit their travel. Travelling stops secured to the tab control cables limit trim tab movement. The correct routing of cables as shown in the applicable rigging illustrations will prevent crossing the cables and causing incorrect control surface movement after the cables are removed and reinstalled.

Refer to the applicable rigging procedures for details regarding chain and cable tension, control wheel movement and force, down spring force and system friction.

EFFECT OF TEMPERATURE UPON CABLE TENSION

Graphs specifying the correct maximum and minimum cable tension for the various controls appear on the individual control system rigging illustrations.

The graphs provide tension limits at temperatures from 30° to 110° Fahrenheit. The horizontal scale designates the temperature at which the control cables can be rigged, and the vertical scale designates the correct tension in pounds for each temperature reading.

"END"

AILERON AND TAB - MAINTENANCE PRACTICES

SINGLE CONTROL "THROW-OVER" COLUMN ARM REMOVAL

a. Remove the four screws that secure the retainer collar assembly to the control column housing.

b. Disconnect any electrical wiring. Tag wires to aid in reinstallation.

c. Pull the position pin and rotate the control column arm to a near vertical position. Slide the control column arm off the housing.

SINGLE CONTROL "THROW-OVER" COLUMN ARM INSTALLATION

a. Place the control column arm to a near vertical position, pull the position pin and slide the control column arm on the control column housing.

b. Attach all electrical wires.

c. Install the retainer collar and secure with four retaining screws.

SINGLE CONTROL "THROW-OVER" COLUMN ARM CHAIN RIGGING (Figure 201)

a. The control wheel must be in the position shown in Figure 201, prior to chain installation and rigging.

b. Position the sprocket at the base of the control arm so that the slot in the sprocket is parallel to the control arm.

c. Position the chains on the sprockets and center to obtain approximately 240° of the control wheel travel without interference of chain terminals with the sprockets.

CAUTION

For proper rigging it must be noted that the control column chain rigging uses two different chains. One chain is 10.75 inches long and the other chain is 10.25 inches long. The longer chain is positioned from center of the control arm over the control wheel sprocket and back to the center of the control arm. The shorter chain is positioned from the center of the control arm over the sprocket in the base of the control arm and back to the center of the control arm (See Figure 201).

d. To tighten the chain, adjust the turnbuckles to obtain a deflection of .19 to .38 inch. Ensure that the distance between the edge of the chain terminal and the edge of the turnbuckle nut does not exceed .15 inch maximum (See Figure 202, Detail A).

NOTE

If chain has been reinstalled, align yellow marks on the sprockets and chains.

e. Check for freedom of movement and install safety wire as illustrated in Figure 202, Detail A.

NOTE

After installing and rigging a new chain, make yellow timing marks on the chain and sprockets to indicate previous sprocket and chain positions for subsequent rigging procedures.

DUAL CONTROL "T" COLUMN ARM REMOVAL

a. Remove the four screws that secure the retainer collar assembly to the control column housing.

b. Disconnect any electrical wiring. Tag wires to facilitate reinstallation.

c. Rotate control wheels to the neutral position (level) and slide the control column arm off the control column housing.

DUAL CONTROL "T" COLUMN ARM INSTALLATION

a. Position the control wheels in the neutral position (level) and slide the control column arm on the control column housing.

b. Attach all electrical wires.

c. Install the retainer collar and secure with four retaining screws.

DUAL CONTROL "T" COLUMN ARM CHAIN RIGGING (Figure 202)

a. Position the control wheels in the neutral position (level).

b. Position the sprocket at the center of the control arm so that the slot in the sprocket is aligned perpendicular to the control arm.

c. Position the chains on the sprockets and center to obtain approximately 240° of control wheel travel without interference of chain terminals with the sprockets.

CAUTION

For proper rigging it must be noted that each arm of the dual control "T" column uses two different chains. One chain is 10.75 inches long and the other chain is 10.25 inches long. The longer chain is positioned from the center of the arm over the control wheel sprocket and back to the center of the arm. The shorter chain is positioned from the center of the arm over the center sprocket and back to the center of the arm (See Figure 202).

d. To tighten the chains, adjust the turnbuckles to obtain a deflection of .19 to .38 inch. Ensure that the distance between the edge of the chain terminal and the edge of the turnbuckle nut does not exceed .15 inch maximum (See Figure 202, Detail A).

NOTE

If chains have been reinstalled, align yellow marks on the sprockets and chains.

e. Check for freedom of movement and install safety wire as illustrated in Figure 202, Detail A.

NOTE

After installing and rigging a new chain, make yellow timing marks on the chains and sprockets to indicate previous sprocket and chain positions for subsequent rigging procedures.

DUAL CONTROL COLUMNS (Figure 203)

CONTROL COLUMN CHAIN REMOVAL (Figure 204)

a. Paint one tooth of each control column sprocket and its corresponding chain link to ensure correct alignment of the control wheels at installation.

b. Loosen the turnbuckles on the control column chain.

c. Remove the safety wire from the four bolts (two on each end) and remove the six bolts from the channel between the control columns.

d. Remove the channel from the airplane.

e. Disconnect the turnbuckles from the control column chain.

f. Remove the four connector links from the link assembly and remove the link assembly.

NOTE

If may be necessary to remove the stop before removing the link assembly.

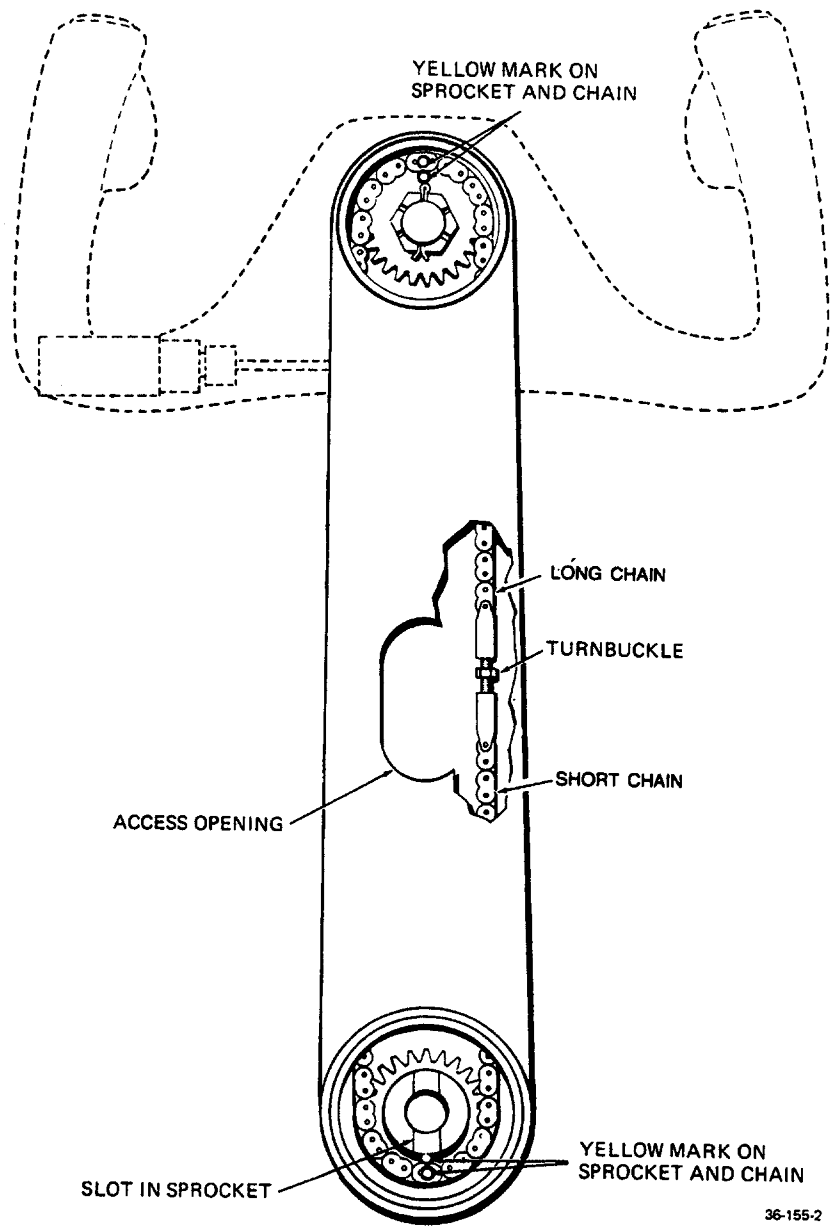
g. Slide the sprocket support assemblies aft over the U-joints and remove the chains from the control columns.

CONTROL COLUMN CHAIN INSTALLATION (Figure 204)

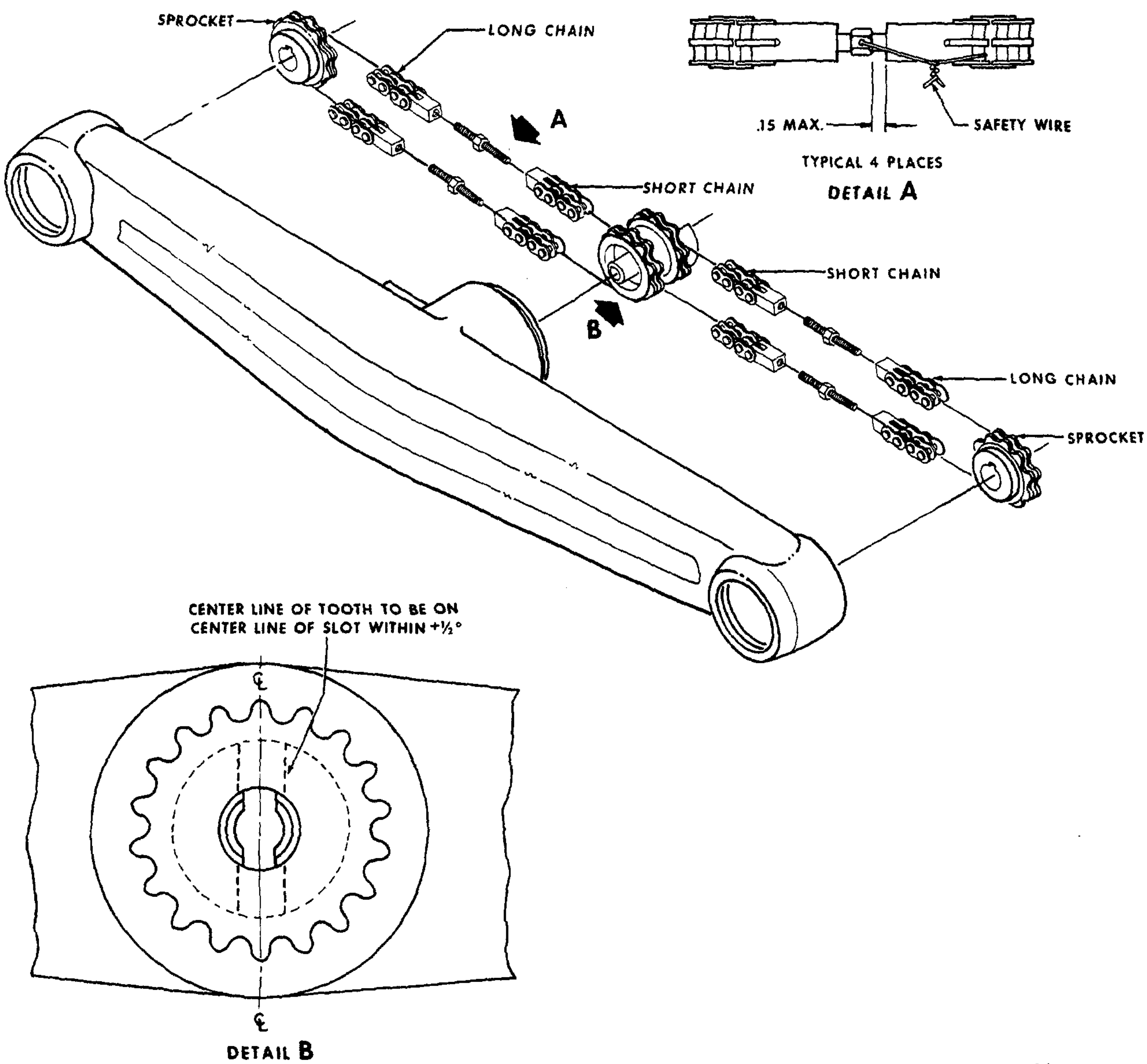
a. Install the chains over the control column sprockets. The painted marks on the chain must align with the corresponding marks on the sprockets.

b. Install the link assembly. Install the control column chain in the outboard holes of the link assembly.

c. Install the aileron chains in the inboard holes of the link assembly.

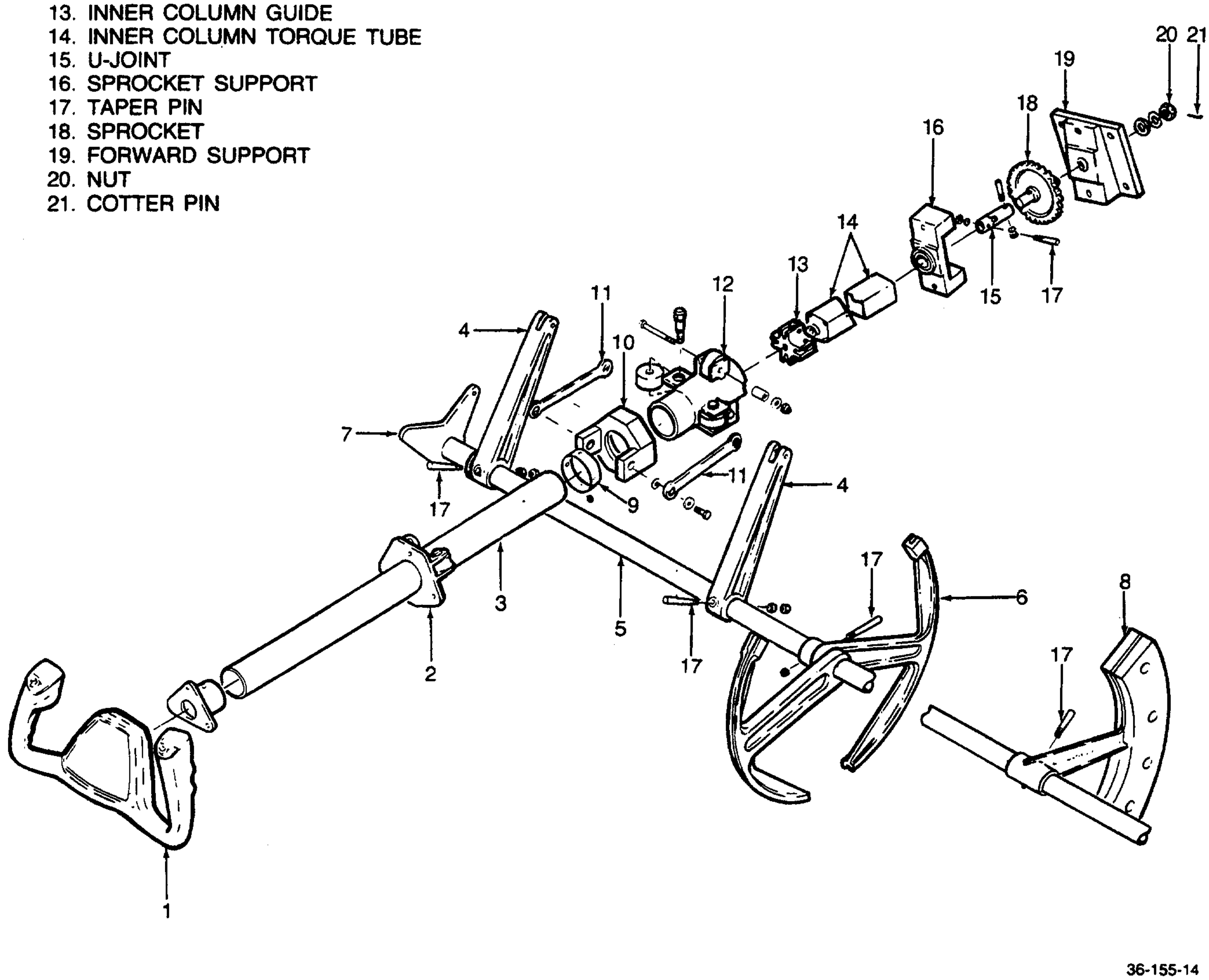


Single Control "Throw-Over" Column Arm Chain Rigging
Figure 201



Dual Control "T" Column Arm Chain Rigging
Figure 202

1. WHEEL
2. COLLAR ASSEMBLY
3. COLUMN TORQUE TUBE
4. ELEVATOR TORQUE ARM
5. ELEVATOR TORQUE TUBE
6. ELEVATOR BELLCRANK
7. ELEVATOR TORQUE TUBE SUPPORT
8. BOB WEIGHT ASSEMBLY
9. COLLAR
10. COLLAR ASSEMBLY
11. ELEVATOR PUSH ROD
12. CONNECTOR
13. INNER COLUMN GUIDE
14. INNER COLUMN TORQUE TUBE
15. U-JOINT
16. SPROCKET SUPPORT
17. TAPER PIN
18. SPROCKET
19. FORWARD SUPPORT
20. NUT
21. COTTER PIN



Dual Control Columns
Figure 203

NOTE

Make certain the connector links are installed correctly.

d. Install the stop if it was removed.
e. Connect the turnbuckles, but do not tighten them.
f. Slide the sprocket support assemblies forward and install the channel between the control columns. Safety wire the bolts.
g. Tighten the control column chains as described in CONTROL COLUMN CHAIN RIGGING.

WARNING

Check the ailerons for correct direction of movement. When the control wheel is moved to the left, the left aileron must move up and the right aileron must move down. When the control wheel is moved to the right, the right aileron must move up and the left aileron must move down.

CONTROL COLUMN CHAIN RIGGING
(Figure 204)

a. Rig neutral on the control wheels by securing a straight edge across the tops of both control wheels. The grips must be aligned within .06 inch.
b. The ends of the control column chain around the right sprocket must be equidistant, within one link, from the centerline of the sprocket.
c. The link assembly must be centered within .2 inch with respect to the stop.
d. Adjust the turnbuckles to obtain .19 to .31 inch deflection with vertical pressure of 1.5 to 2.5 pounds on the upper control column chain near the centerline of the airplane.
e Rig the aileron control system as described in RIGGING THE AILERON CONTROL SYSTEM.

AILERON REMOVAL

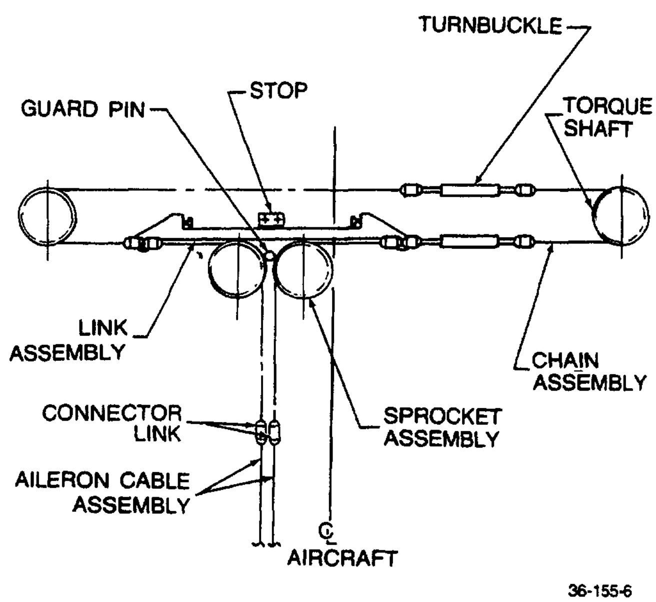
a. Disconnect the aileron tab push rod.
b. Support the aileron and remove the two attaching screws from the top and bottom of each hinge bracket.
c. Pull the aileron straight away from the wing to avoid damage to the attaching areas.
d. Remove the screws attaching the bonding cable to the aileron.

AILERON INSTALLATION

a. Attach the bonding cables to the aileron.
b. Place the aileron in position on the hinge brackets. Be sure the hinge bracket is in the proper place between the aileron skin and reinforcing structure.
c. Install the upper and lower hinge bracket screws.
d. Connect the aileron tab push rod.

AILERON CONTROL CABLE REMOVAL
(Figures 205 and 206)

a. Remove the pilot's and copilot's seat, and the floorboards in the pilot's compartment.
b. Remove the forward passenger seats and the floorboards between the main and rear spar.
c. Remove the access plates, as necessary to gain access to the aileron cables and pulley brackets, on the lower trailing edge of the wings.
d. Remove all necessary cable retaining pins from the cable pulley brackets. On TJ-3 and after, remove the pressure seals on each side of the fuselage.
e. Disconnect the forward aileron cables from the chain and cable assembly at the turnbuckles at the control column. Install lead lines to both aileron cables.
f. Paint one tooth of the control column sprocket and the corresponding link of the chain and cable assembly to ensure proper alignment at installation.
g. Disconnect the forward aileron cables and the forward outboard wing cable at the turnbuckles in each wing. Identify and remove both forward cables.



Dual Control Column Chain Rigging
Figure 204

h. Disconnect the balance cable at the turnbuckle in each wing. Connect a lead line to one end of the cable and remove the cable.

i. Disconnect the forward outboard, and the aft outboard cables at the bell crank in each wing. Identify and remove the cables.

AILERON CONTROL CABLE INSTALLATION

WARNING

On airplane serials TJ-436, TJ-444 and after, TK-147 and TK-151 and after, when replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color to coded parts of a different color.

a. Connect the forward outboard and the aft outboard cables to the bell crank in each wing. Route the cables inboard and disconnect the lead lines.

b. Route the balance cable through one wing, the fuselage, then through the opposite wing. Disconnect the lead line and connect the balance cable and the aft outboard cables to the turnbuckles in each wing.

c. Route one end of the aileron cables outboard in each wing, and the other end forward to the control column. Connect the cables to the turnbuckles at the forward outboard cable in each wing.

d. Position the chain and cable assembly on the control column sprocket. Ensure that painted link and the corresponding painted tooth are aligned.

e. Connect the chain and cable assembly to both aileron cables at the turnbuckles at the control column.

f. Install all retaining pins in the pulley brackets.

g. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00) and clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 grease (11, Chart 207, 91-00-00).

h. On TJ-3 and after, fill the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Install the seals.

i. Rig the aileron cables as described in AILERON CONTROL SYSTEM RIGGING.

j. Install the access plates on the lower trailing edge of the wings.

k. Install the floorboards and the forward passenger seats.

l. Install the floorboards and the pilot's and copilot's seats.

AILERON CONTROL SYSTEM RIGGING (TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150) (Figure 205)

NOTE

BEECHCRAFT recommends the use of the aileron travel gage shown in SPECIAL TOOLS (refer to Chapter 12-20-00). Locate the travel gage at wing station 122.75.

a. The contour of the aileron must align with the contour of the wing within 1/16 inch (.0625 inch) on either or both sides.

b. Check the aileron for lost motion at the midpoint of the trailing edge with the bell crank stationary. The maximum allowable lost motion is 1/16 inch (.0625 inch).

c. Place the left aileron bell crank parallel to the adjacent wing rib. The aileron is in neutral when the aileron trailing edge aligns with the trailing edge of the wing, and its inboard end is parallel with the outboard end of the flap. A horizontal misalignment of ± 3/16 inch is allowed between trailing edges of the aileron and wing. If the aileron is not in neutral, adjust the length of the aileron push-pull tube. Loosen the locknuts on both ends and turn the tube to shorten or lengthen. Tighten the locknuts. Repeat the procedure for the right aileron.

d. Place the control wheel in neutral by leveling the tops of the control wheel with a spirit level.

NOTE

The control wheel must be level in relation to the airplane. If the airplane is not level, make a corresponding change to the position of the control wheel using a spirit level protractor.

e. Adjust the turnbuckles in the wheel wells to bring the right and left ailerons to neutral.

f. Adjust the travel stops (primary stops) on both aileron bell cranks to obtain 19° to 21° deflection each direction.

g. Tighten the locknuts on both aileron bell crank stop bolts.

h. Rig the aileron cables to the tension shown in Figure 205. Use the turnbuckles in the wheel wells.

i. Be sure each aileron bell crank contacts its up stop at the same time the bell crank in the opposite wing contacts its down stop.

j. Check the control stop (secondary stop) in the control column for .12 to .18 inch clearance in each direction. If the clearance is not correct, recheck the entire aileron control system for correct chain and cable rigging.

NOTE

The control stop clearance provides a slight movement of the control wheel (a "cushion") after the travel stops on the aileron bell cranks make contact.

k. Recheck cable tension and safety wire the turnbuckles. Be sure that all locknuts are tight. Make sure that aileron movement corresponds correctly with the movement of the control wheel.

WARNING

Check the ailerons for correct direction of movement. When the control wheel is moved to the left, the left aileron must move up and the right aileron must move down. When the control wheel is moved to the right, the right aileron must move up and the left aileron must move down.

AILERON CONTROL SYSTEM RIGGING (TJ-436, TJ-444 and after, TK-147 and TK-151 and after) (Figure 206)

WARNING

When replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color with coded parts of a different color.

NOTE

BEECHCRAFT recommends the use of the aileron travel gage shown in SPECIAL TOOLS (refer to Chapter 12-20-00). Locate the travel gage at wing station 122.75.

a. The contour of the aileron must align with the contour of the wing within 1/16 inch (.0625 inch) on either or both sides.

b. Check the aileron for lost motion at the midpoint of the trailing edge with the bell crank stationary. The maximum allowable lost motion is 1/16 inch (.0625 inch).

c. Place the left aileron bell crank parallel to the adjacent wing rib. The aileron is in neutral when the aileron trailing edge aligns with the trailing edge of the wing, and its inboard end is parallel with the outboard end of the flap. A horizontal misalignment of ± 3/16 inch is allowed between the trailing edges of the aileron and wing. If the aileron is not in neutral, adjust the length of the aileron push-pull tube. Loosen the locknuts on both ends and turn the tube to shorten or lengthen. Tighten the locknuts. Repeat the procedure for the right aileron.

d. Secure a straight edge across the tops of both control wheels. Check the control columns for correct chain rigging. (Refer to CONTROL COLUMN CHAIN RIGGING).

e. Adjust the turnbuckles in the wheel wells to bring the right and left ailerons to neutral.

f. Remove the straight edge from the control wheels.

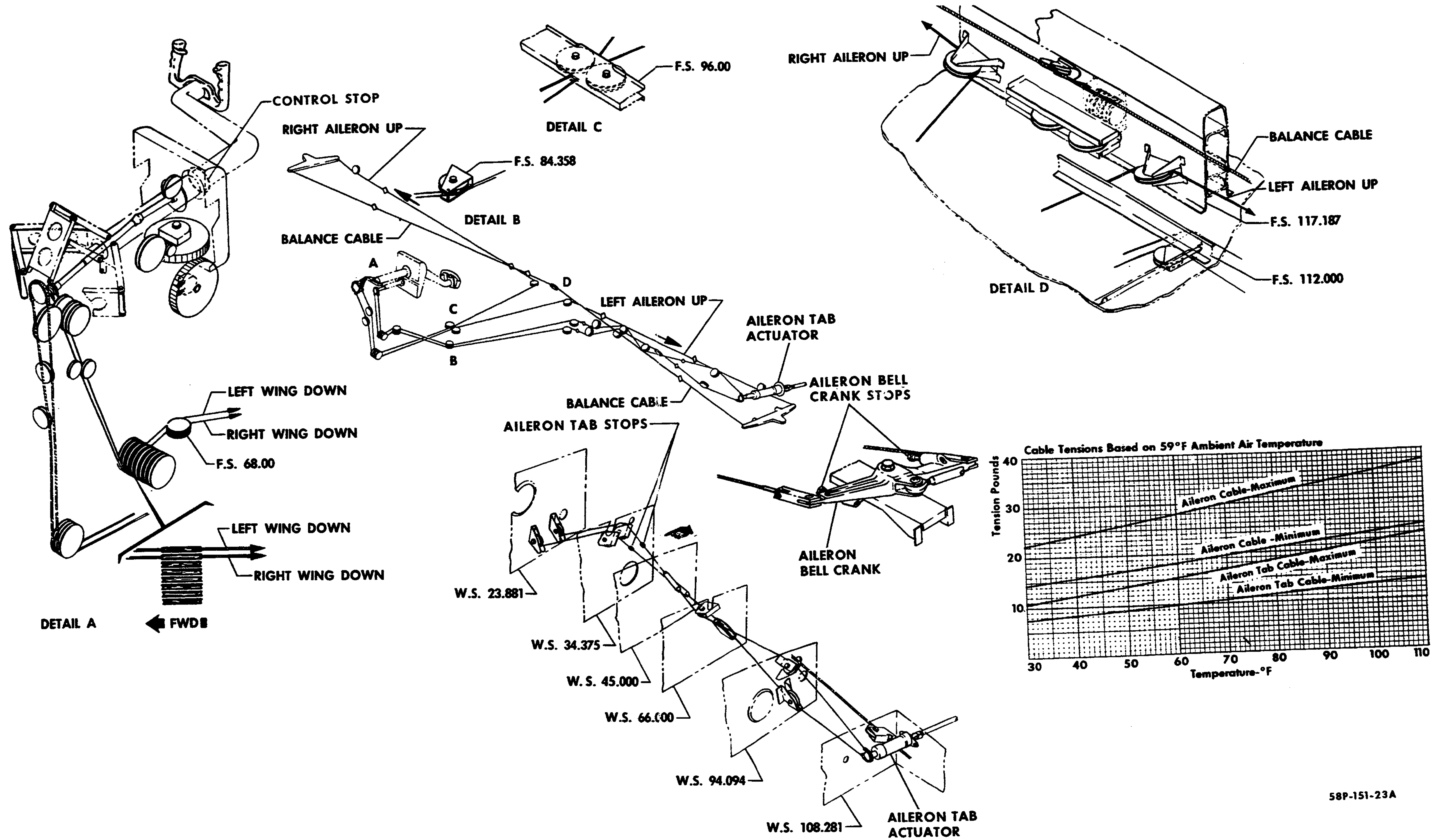
g. Adjust the travel stops (primary stops) on both aileron bell cranks to obtain 19° to 21° deflection each direction.

h. Tighten the locknuts on both aileron bell crank stop bolts.

i. Rig the aileron cables to the tension shown in Figure 206. Use the turnbuckles in the wheel wells.

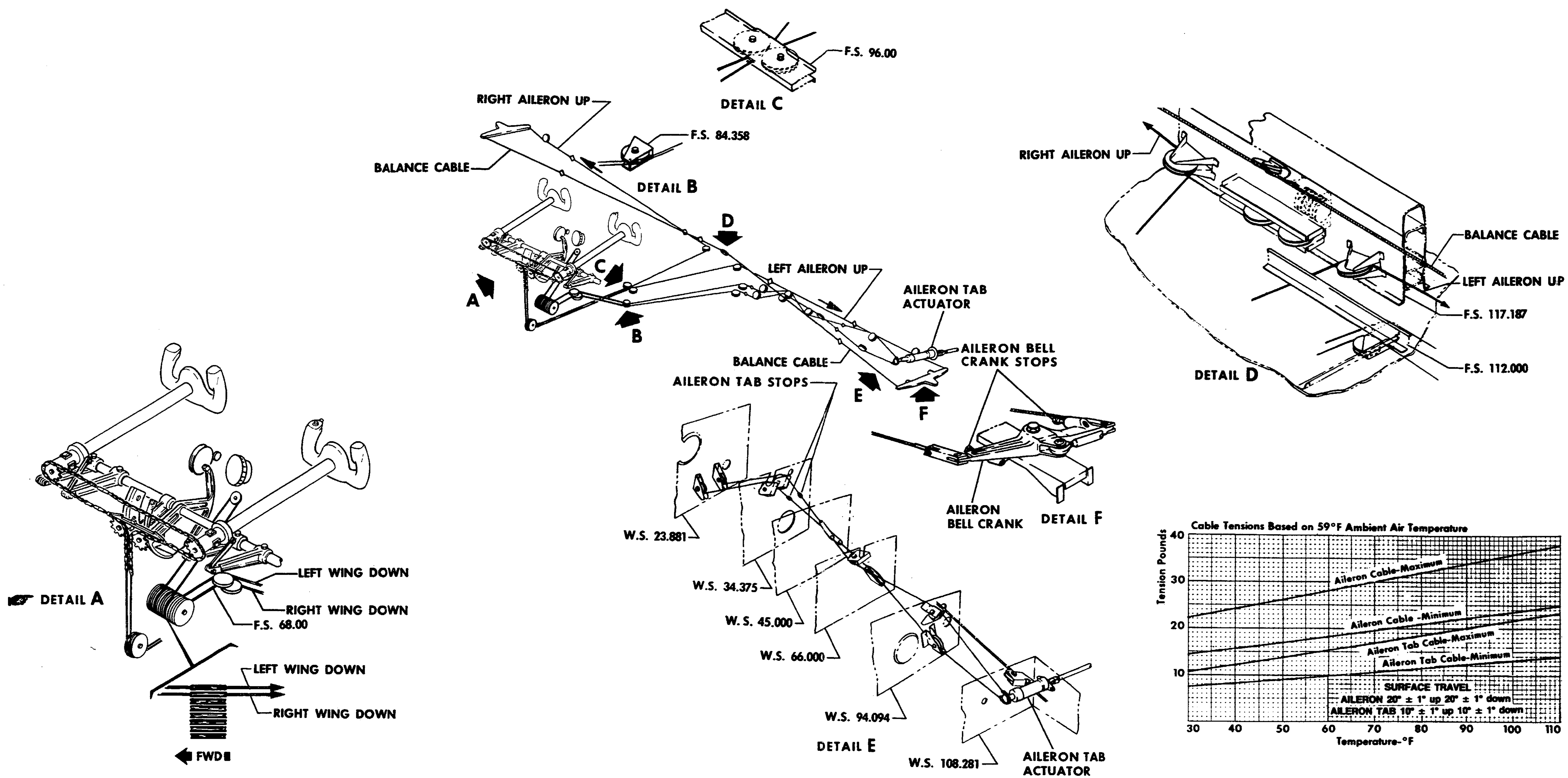
j. Be sure each aileron bell crank contacts its up stop at the same time the bell crank in the opposite wing contacts its down stop.

k. Adjust the secondary stop bolts on the link assembly at the forward end of the control column. Clearance between the stop and each stop bolt must be .06 to .12 inch with the ailerons at full travel each direction.



DENOTES AREA OF CHANGE

Rigging The Aileron Control System
Figure 205



DENOTES AREA OF CHANGE

58P-151-33

Rigging The Aileron Control System
Figure 206

l. Recheck cable tension and safety wire the turnbuckles. Be sure that all locknuts are tight.

m. With the aileron control system fully rigged, the torque required to move the control wheel 10° right and left of neutral must not be over 15 inch-pounds.

n. Make sure that aileron movement corresponds correctly with the movement of the control wheel.

WARNING

Check the ailerons for correct direction of movement. When the control wheel is moved to the left, the left aileron must move up and the right aileron must move down. When the control wheel is moved to the right, the right aileron must move up and the left aileron must move down.

AILERON TRIM TAB CABLE REMOVAL (Figures 205 and 206)

a. Remove the pilot's seat and the left floorboard.

b. Remove the lower forward upholstery panel on the left side of the pedestal.

c. Remove the forward left passenger seat and the floorboard.

d. Remove the necessary access plates to gain access to the trim tab cables, the actuator, and the cable pulley brackets.

e. Remove the cable retaining pins at the pulley brackets.

f. Disconnect the tab cables at the turnbuckles in the left wing. Identify and connect lead lines on the cable ends.

g. Remove the cable stops and (on TJ-3 and after) the pressure seals.

h. Remove the outboard cable from the actuator sprocket. Remove the cable through the actuator access opening.

i. Remove one chain link at the sprocket on the pedestal. Remove the cable through the pilot's compartment.

AILERON TRIM TAB CABLE INSTALLATION

a. Position the chain of the forward tab cable around the pedestal sprocket and install the chain link.

b. Route the cable ends aft in the fuselage and outboard into the left wing and disconnect the lead lines.

c. Position the chain of the outboard cable around the actuator sprocket and route the cable ends inboard.

d. Install the cable stops and connect the cables at the turnbuckles in the wing.

e. Install all cable retaining pins in the pulley brackets.

f. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00) and clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 grease (11, Chart 207, 91-00-00).

g. On TJ-3 and after, fill the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Install the seals.

h. Rig the aileron trim tab control system.

i. Install all access plates in the left wing.

j. Install the floorboard and the left forward passenger seat.

k. Install the floorboard and the pilot's seat.

l. Install the upholstery panel on the left side of the pedestal.

AILERON TRIM TAB RIGGING (Figures 205 and 206)

NOTE

BEECHCRAFT recommends the use of the aileron trim tab travel gage shown in SPECIAL TOOLS (refer to Chapter 12-20-00).

a. Place the aileron trim tab control in neutral position.

b. Place aileron in neutral position and connect trim tab to tab actuator.

c. By turning the sprocket on the actuator, adjust the trim tab to both extremes of travel; measure both settings and return the tab to the mid-point of the two extremes of travel. This will place the actuator in the neutral position.

d. If the trim tab is not in the neutral position, adjust push rod to place tab in neutral position.

e. Center the chain on the sprocket and tighten the cable.

f. Set the aileron tab stops to obtain a surface deflection of 10° ± 1° up and down.

g. Rig cable tension and adjust travel as noted in Figures 205 and 206.

h. Check trim tab travel, safety all turnbuckles and stops.

NOTE

After rigging the aileron and aileron tab control system check for correct movement of the control surfaces with respect to the movement of the controls. Since the aileron tab is a servo tab, every time the aileron moves down the tab should move up. If the aileron tab does not move in the proper direction, recheck rigging.

AILERON TRIM TAB ACTUATOR REMOVAL

a. Remove the access plates at the actuator and tab cable turnbuckles.
b. Disconnect the outboard cable at the turnbuckles in the wing.
c. Remove the outboard cable from the actuator sprocket.
d. Disconnect the actuator from the trim tab linkage.
e. Remove the bolts attaching the actuator to the wing structure. Remove the actuator.

AILERON TRIM TAB ACTUATOR INSTALLATION

a. Position the actuator against the wing structure and install the attaching bolts.
b. Connect the actuator to the tab linkage.
c. Install the outboard cable on the actuator sprocket.
d. Connect the cables at the turnbuckles in the wing.
e. Rig the aileron trim tab control system.
f. Install the access plates at the actuator and the tab cable turnbuckles.

AILERON TRIM TAB FREE PLAY INSPECTION

This check should be performed at least once a year to ensure that the trim tab free play falls within the prescribed limits.

A check fixture (P/N 45-135030-9/810) or equivalent as shown in Figure 207, 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. Securely lock the control surfaces to prevent movement of the ailerons. Set the aileron tab in the neutral position.
b. Using shot bags, affix the dial indicator check fixture so that the dial indicator point is 2.00 inches aft of the tab hinge line and on the outboard edge of the aileron tab.
c. Apply a small piece of masking tape (for paint protection) 4.00 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 masking tape, apply a full 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 201 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".

NOTE

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

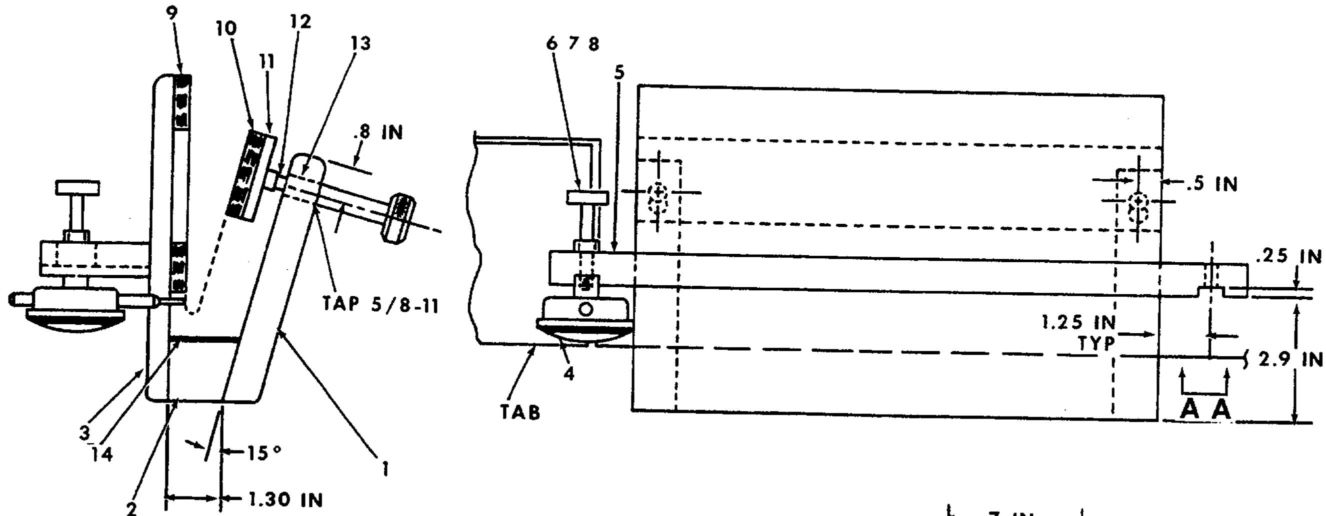
5. Add "X" and "Y" and record as "E".

CHART 201
AILERON TAB FREE PLAY LIMITS

1.5-POUND READING	*3-POUND READING*		
B ________			
2B ________	−A ________	=X ________	
D ________			
2D ________	−C ________	=Y ________	
X ________	+Y ________	=E ________	

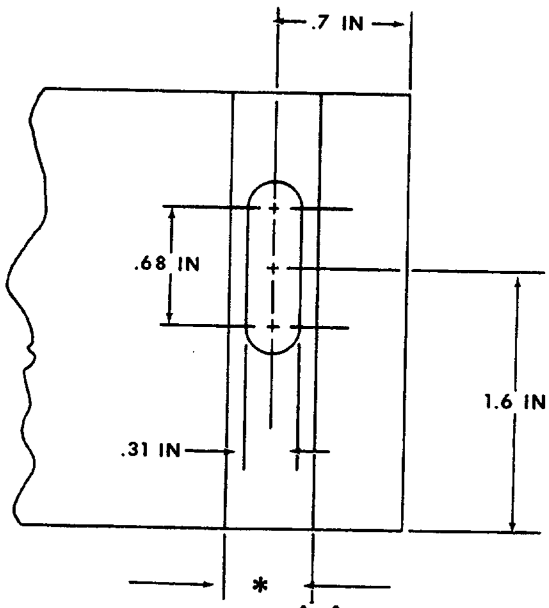
(E = 0.094 inch maximum).

k. If the free play exceeds 0.094 inch, inspect all components of the tab actuator system to determine the cause. All worn parts should be replaced.



ITEM NO.	QUANT.	DESCRIPTION
1	2	¾ x 1 x 6 aluminum or equiv.
2	2	1 x 1⅜ x 1¾ aluminum or equiv.
3	1	½ x 7½ x 10 aluminum or equiv.
4	1	C81Q Indicator**
5	1	¾ x 2½ x 14 aluminum or equiv.
6	1	¼ Dia. x 2 corrosion res. stl.
7	1	¼ Dia. x 1 corrosion res. stl.
8	1	¼-28 nut
9	1	⅜ x 5 x 10 rubber
10	1	⅜ x 2 x 10 rubber
11	1	¼ x 2 x 10 corrosion res. stl.
12	2	½ x 13 x 3 VLIER Torque screw
13	2	KN813 Keensert or tap ½ - 13
14	2	⅛ x 1 x ¾ rubber

**P/N of Federal Products Corp., Providence, R. I.



SECTION A A

* THIS GROOVE TO BE A SNUG FIT TO THE SCREW BRACKET ON THE DIAL INDICATOR

100-135-8

Fabricating Clamp for Aileron Tab Deflection
Figure 207

"END"

RUDDER AND TAB - MAINTENANCE PRACTICES

RUDDER REMOVAL

a. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

b. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

c. Disconnect the rotating beacon light wire.

d. Disconnect the rudder tab cables at the turnbuckles. Remove the tab cable retainer pins and fairlead.

e. Remove the four bolts securing the rudder torque tube and rudder tab pulley bracket to the rudder bell crank.

f. Remove the upper and lower hinge bolts. Disconnect the rudder bonding cables and remove the rudder.

RUDDER INSTALLATION

a. Align the holes in the rudder and vertical stabilizer hinges and install the attaching bolts. Torque the bolts to 15-25 inch-pounds and safety. Connect the rudder bonding cables.

b. Attach the rudder tab pulley bracket and rudder torque tube to the rudder bell crank with the four attaching bolts. Torque the bolts to 50-70 inch-pounds.

c. Connect the rudder tab cables at the turnbuckles and install the cable retainer pins and fairlead.

d. Rig the rudder tab cable system as described in RUDDER TRIM TAB RIGGING.

e. Connect the rotating beacon light wire.

f. Connect the tail navigation light wire and install the tail cone.

g. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

WARNING

Due to rudder imbalance, the airplane must not be flown with the rotating beacon light removed from the airplane.

RUDDER CABLE REMOVAL (Figures 201 and 202)

a. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

b. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

c. Remove the pilot's and copilot's seats and the floorboards in the pilot's compartment.

d. Remove the forward passenger seats and the floorboards between the main and rear spar.

e. Remove the access panel in the floorboard aft of the rear spar.

f. Remove the cable retaining pins from the pulley brackets and (on TJ-3 and after) the pressure seals from the rear pressure bulkhead.

g. Disconnect the rudder cables, in the aft fuselage at the turnbuckles and connect lead lines to the forward cables.

h. Disconnect the forward cables at the bell crank and remove the cables through the pilot's compartment.

i. Disconnect the aft rudder cables at the bell crank and remove the cables.

RUDDER CABLE INSTALLATION

WARNING

On airplane serials TJ-436, TJ-444 and after, TK-147 and TK-151 and after, when replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color to coded parts of a different color.

a. Route the rudder cables forward in the tail section and connect to the rudder bell crank.

b. Route the forward rudder cables aft from the pilot's compartment, connect the cables to the bell crank and disconnect the lead lines.

c. Install all cable retaining pins in the pulley brackets.

d. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00), clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 grease (11, Chart 207, 91-00-00).

e. On TJ-3 and after, fill the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Install the seals.

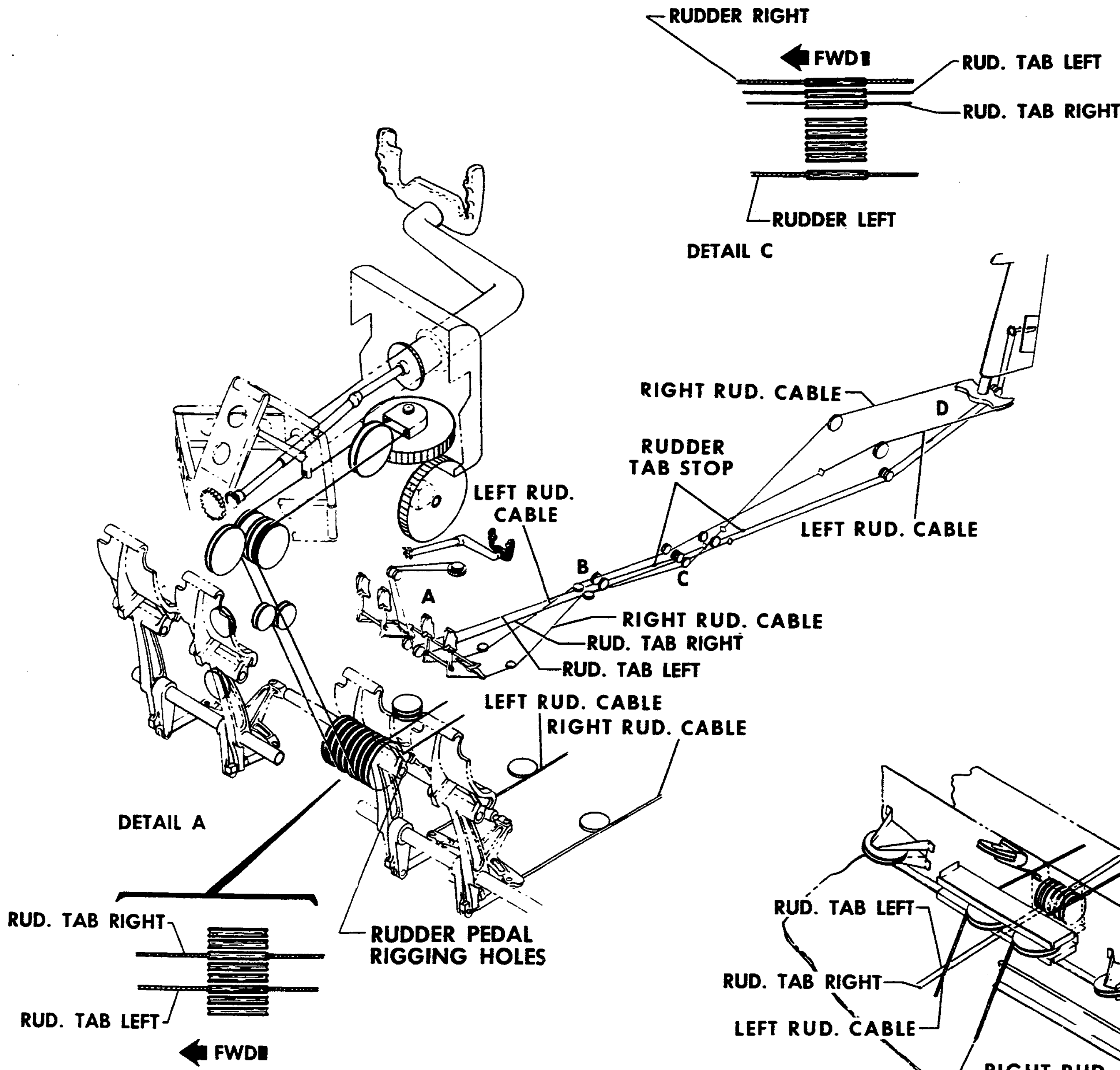
f. Connect the cables to the turnbuckles in the aft fuselage and rig the rudder cable system as described in RUDDER CONTROL SYSTEM RIGGING.

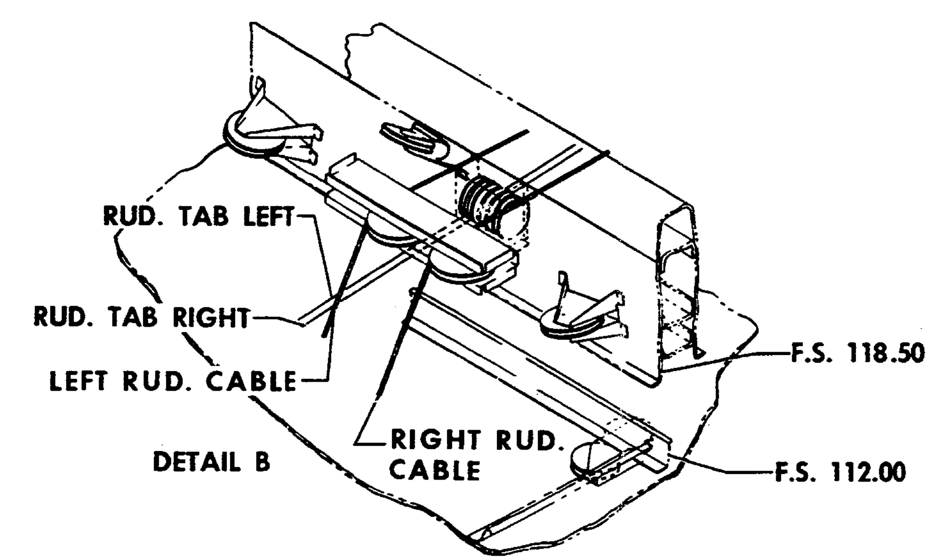
g. Install the aft floorboard access panel, the floorboards between the main and rear spar and the forward passenger seats.

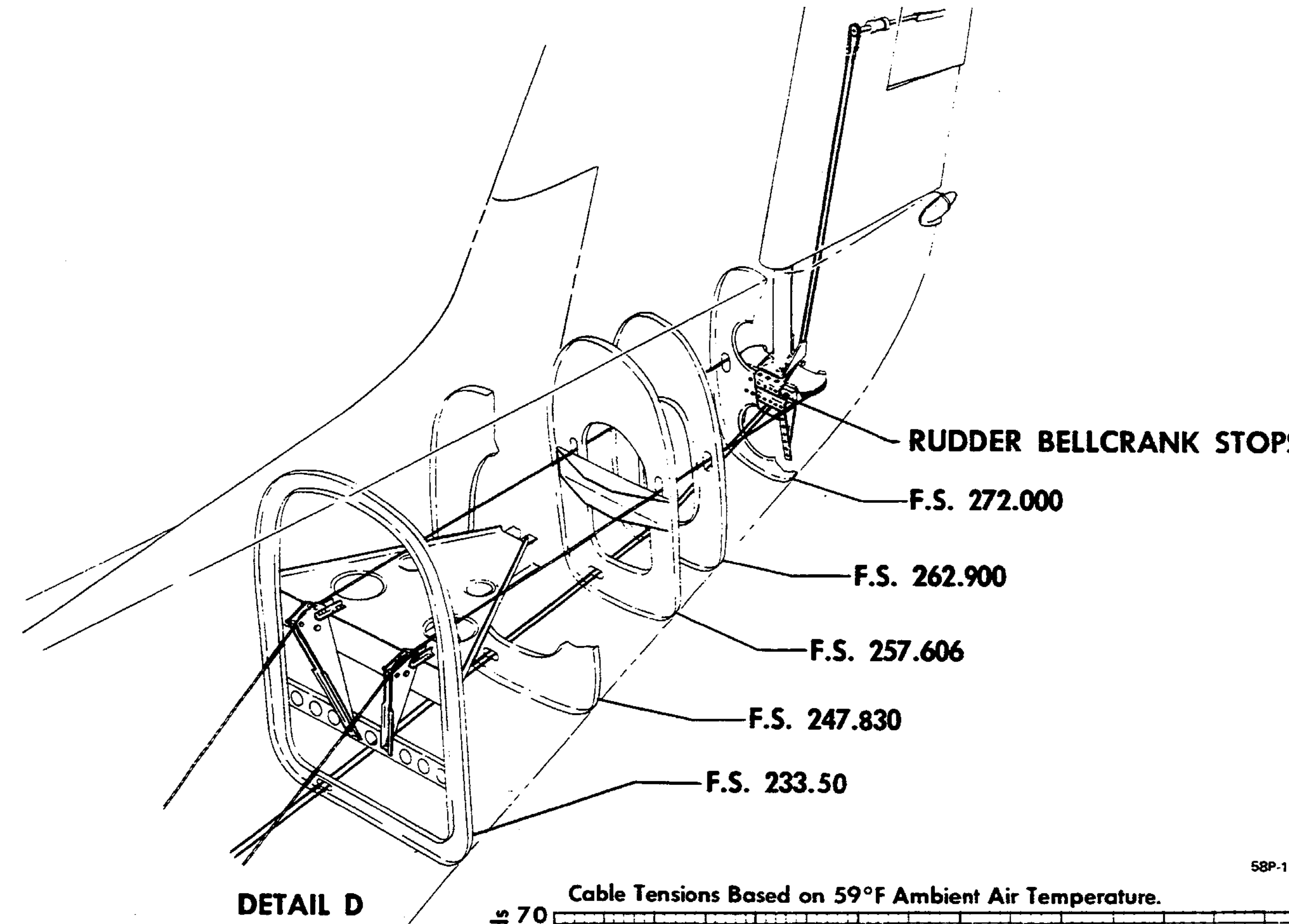
h. Install the floorboards in the pilot's compartment and install the pilot's and copilot's seats.

i. Connect the tail navigation light wire and install the tail cone.

j. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.







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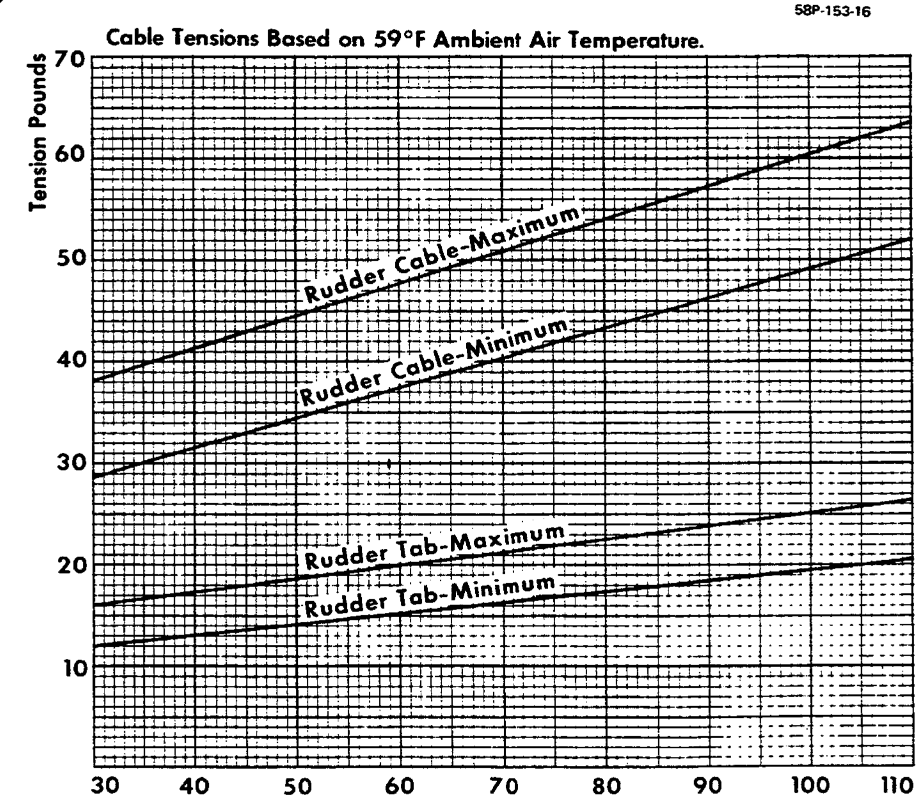
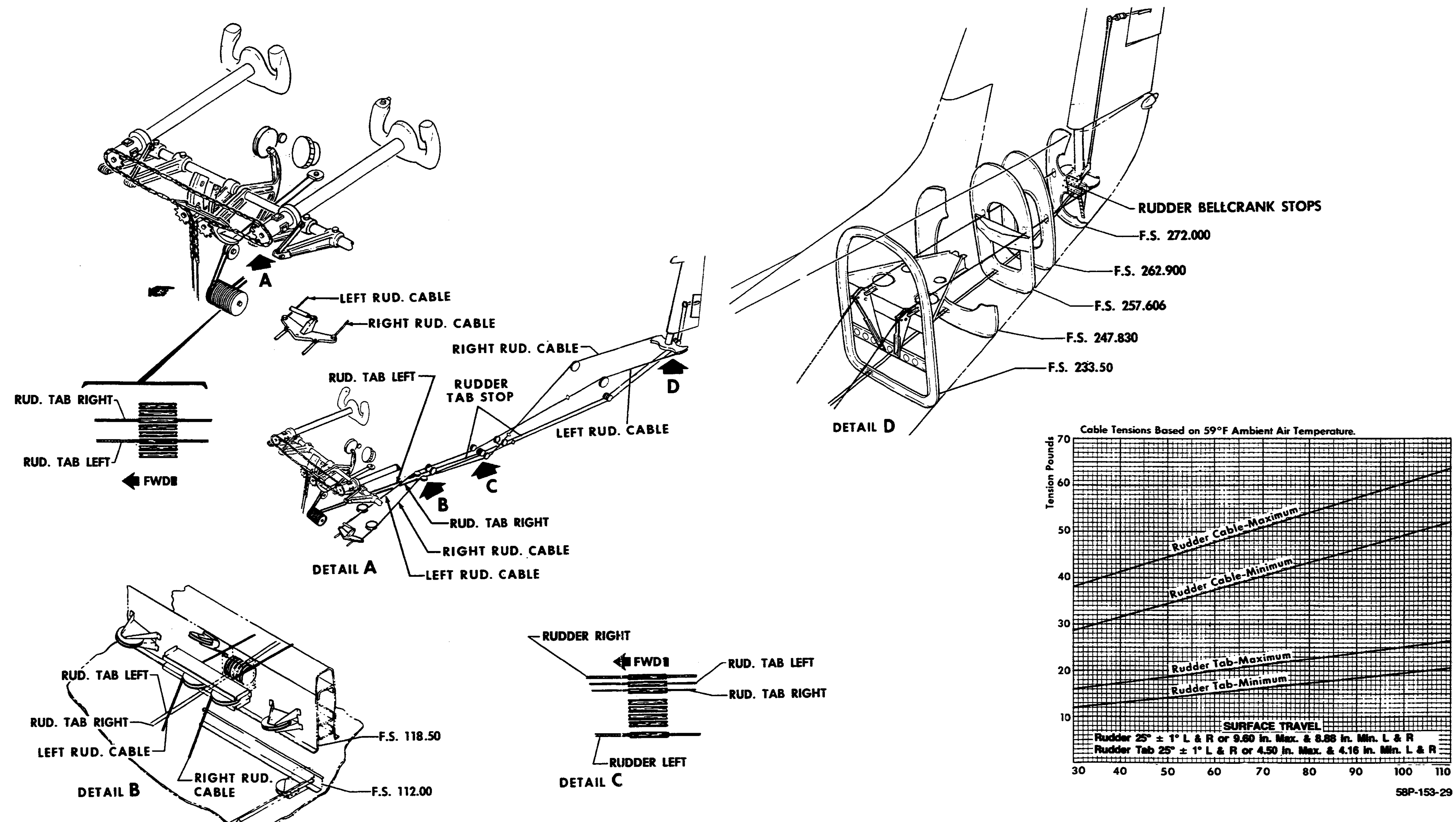


Rigging The Rudder Control System
Figure 201



DENOTES AREA OF CHANGE

Rigging The Rudder Control System
Figure 202

RUDDER CONTROL SYSTEM RIGGING (Figures 201 and 202)

WARNING

On airplane serials TJ-436, TJ-444 and after, TK-147 and TK-151 and after, when replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color to coded parts of a different color.

NOTE

BEECHCRAFT recommends the use of the rudder travel gage shown in SPECIAL TOOLS (refer to Chapter 12-20-00). Locate the travel gage on the left side of the rudder at station 9.9.

NOTE

To position the rudder pedals in the correct position for rigging, fabricate a tool from a steel block and two .43 inch diamter steel pins. The pins are parallel and located forward on the block at the spacing shown in Figure 203.

a. Detach the tail cone. Disconnect the tail navigation light and remove the tail cone.

b. Remove the access panel on the left side of the fuselage just forward of the horizontal stabilizer.

c. Release the rudder pedal adjusting levers and place all pedals in the aft position.

d. Install the rudder pedal rigging tool (Refer to Figure 203) in the holes in the pilots rudder pedals. The left rudder pedal must be .38 to .45 inch aft of the right rudder pedal.

NOTE

When rigging the tool is installed in the pilot's rudder pedals, the copilot's pedals are locked in the same position.

e. Place the rudder and rudder bell crank in the neutral position.

f. Rig the rudder cables to the tension shown in Figures 201 and 202.

g. Safety wire all turnbuckles.

h. Remove the rigging tool and adjust the rudder bell crank travel stops to obtain 24° to 26° rudder travel left and right of the centerline of the vertical stabilizer.

i. Make sure that rudder movement corresponds correctly with the movement of the rudder pedals.

WARNING

Check the rudder for correct direction of movement. When the left rudder pedal is depressed, the rudder must move to the left. When the right rudder pedal is depressed, the rudder must move to the right.

MEASURING RUDDER TRAVEL IN INCHES (Figure 204)

Measuring rudder travel when no travel gage is available may be accomplished by measuring the deflection in inches rather than degrees. Shown in Figure 204, are the distances that points on the rudder and rudder tab should travel from 0° to the extreme in each direction. Definite physical characteristics of the surface, such as the lower trailing edge corner, must be established before measuring rudder or rudder tab travel.

Lightly clamp two strips of material, such as 1/4 inch plywood, to the rudder trailing edge; extend them forward along the vertical stabilizer. Pull the free ends of the material in firmly against the skin contour to fair the rudder in the 0° position and mark the point on the tail cone corresponding to the bottom trailing edge corner of the rudder.

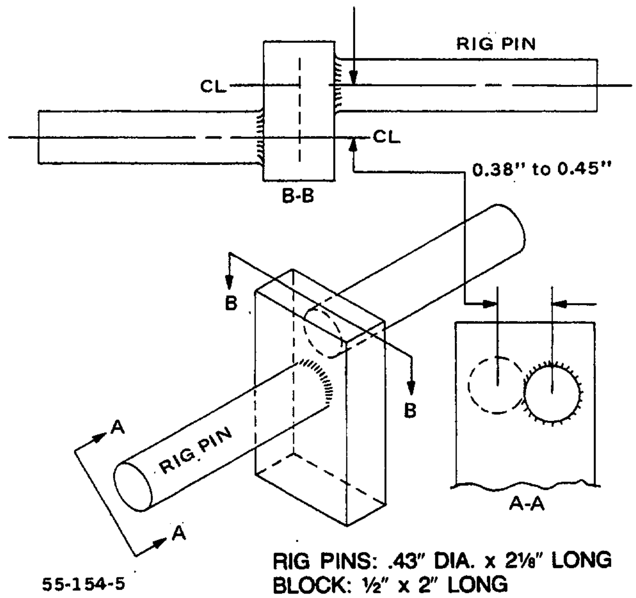
Figure 204 shows the point which is used to determine surface travel. All measurements given are for a straight line distance between the position of the surface at 0° and its position at maximum deflection.

RUDDER TRIM TAB CABLE REMOVAL (Figures 201 and 202)

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

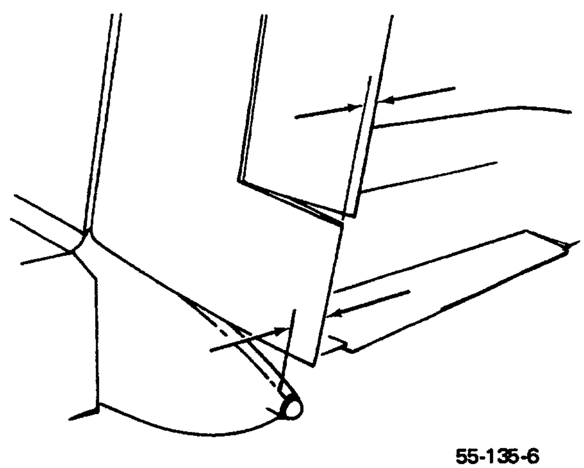
b. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

c. Remove the access panel to the rudder trim tab actuator located on the right side of the rudder.



Rudder Pedal Rigging Tool
Figure 203

SURFACE	DIRECTION	MAXIMUM	MINIMUM	MEASURING POINT
Rudder	R & L	9.60 (26°)	8.88 (24°)	Lower trailing edge corner
Rudder Tab	R & L	4.50 (26°)	4.16 (24°)	Lower trailing edge corner



Rudder And Rudder Tab Travel In Inches
Figure 204

d. Remove the pilot's seat and the left floorboard.

e. Remove both upholstery panels on the left side of the pedestal.

f. Remove the left passenger seat, the floorboard between the main and rear spar, and the access panel in the floorboard aft of the rear spar.

g. Remove the cable retaining pins from the pulley brackets and (on TJ-3 and after) the pressure seals from the rear pressure bulkhead.

h. Disconnect the rudder trim tab cables, in the aft fuselage, at the turnbuckles and connect lead lines to the forward cables. Identify the lead line for trim tab left and trim tab right movement to ensure proper cable rerouting.

i. Remove the taper pin from the forward universal and remove the attaching shaft and cable reel. Note and record the number of cable revolutions on the reel.

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

k. 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 TRIM TAB CABLE INSTALLATION (Figures 201 and 202)

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 within ± .20 inch.

b. Route the aft chain and cable assembly forward in the aft fuselage.

c. Place the rudder trim tab control wheel in the neutral position and wrap the forward cable around the reel the same number of revolutions as noted in the removal, maintaining the cable ends equidistant.

d. Install the attaching shaft, washer and reel; align the shaft with the forward universal and install the taper pin.

NOTE

When the rudder trim tab cable is disconnected at the pedestal, the tab wheel shall turn smoothly with very little resistance. Bearings not previously lubricated may be lubricated with MIL-L-6086 lubricating oil (7, Chart 207, 91-00-00). Lubricate shafts and thrust surfaces in all trim tab systems with MIL-G-23827 grease (11, Chart 207, 91-00-00) for friction reduction.

e. Route the forward cable end aft and install all cable retaining pins in the pulley brackets and disconnect the lead lines.

f. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00) to clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 grease (11, Chart 207, 91-00-00).

g. On TJ-3 and after fill the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Install the seals.

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

i. Install the access panel in the floorboard aft of the rear spar, the floorboard between the main and rear spar and the left passenger seat.

j. Install the upholstery panels on the left side of the pedestal.

k. Install the left floorboard and the pilot's seat.

l. Install the access panel at the rudder trim tab actuator.

m. Connect the tail navigation light wire and install the tail cone.

n. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

RUDDER TRIM TAB RIGGING (Figures 201 and 202)

NOTE

BEECHCRAFT recommends the use of the rudder trim tab travel gage shown in SPECIAL TOOLS (Refer to Chapter 12-20-00).

a. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

b. Disconnect the rudder trim tab from the rudder trim tab actuator.

c. Position the rudder in neutral and set the rudder trim tab indicator at zero degrees.

d. Rig the rudder trim tab cables to the proper tension as noted in Figures 201 and 202.

e. Position the rudder trim tab actuator screw at the midpoint of its travel.

f. Adjust the rudder trim tab actuator linkage until the rudder trim tab is in the neutral position with the chain centered on the actuator sprocket. Connect the rudder trim tab to the rudder trim tab actuator.

g. Adjust the rudder trim tab cable stops until the rudder trim tab has a travel of 24° to 26° to both the left and right.

NOTE

Both rudder trim tab cable stops are located on the outboard rudder trim tab cable. Rig the forward stop to bottom out at the fairlead at F S 151.00 and the aft stop at F S 185.00 with the surface deflection as noted in step "g".

h. Safety all turnbuckles and stops.

i. 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.

j. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

RUDDER TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel at the rudder trim tab actuator located on the right side of the rudder.

b. Detach the tail cone, disconnect the tail navigation light and remove the tail cone.

c. Disconnect the rudder trim tab cables at the turnbuckles located in the aft fuselage. Secure the forward rudder trim tab cables so that they do not unwind at the universal.

CAUTION

Do not damage the cables. Use a material such as phenolic to protect the cables.

d. Disconnect the rudder trim tab actuator at the rudder trim tab.

e. Remove the aft chain and cable assembly from the actuator sprocket.

f. Remove the bolt attaching the rudder trim tab actuator to the actuator hinge. Remove the actuator.

RUDDER TRIM TAB ACTUATOR INSTALLATION

a. Position the rudder trim tab actuator on the actuator hinge and install the attaching bolt.

b. Connect the rudder trim tab actuator to the rudder trim tab.

c. 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 within ± .20 inch.

d. Connect the rudder trim tab control cables to the turnbuckles located in the aft fuselage.

e. Rig the rudder trim tab control system as described in RUDDER TRIM TAB RIGGING.

f. Connect the tail navigation light wire and install the tail cone.

g. Install the access panel at the rudder trim tab actuator.

RUDDER TRIM TAB FREE PLAY INSPECTION

This check should be performed at least once a year to ensure that the trim tab free play falls within the prescribed limits.

A check fixture (P/N 45-135030-9/810) or equivalent as shown in Figure 205, a dial indicator, and a push-pull scale for applying accurate loading to the tab is required for making the inspection for free play of the tab.

a. Securely lock the control surfaces to prevent movement of the rudder. Set the rudder tab in the neutral position.

b. Using shot bags, affix the dial indicator check fixture so that the dial indicator point is 8.10 inches aft of the tab hinge line and on the outboard edge of the rudder tab.

c. Apply a small piece of masking tape (for paint protection) 9.5 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.

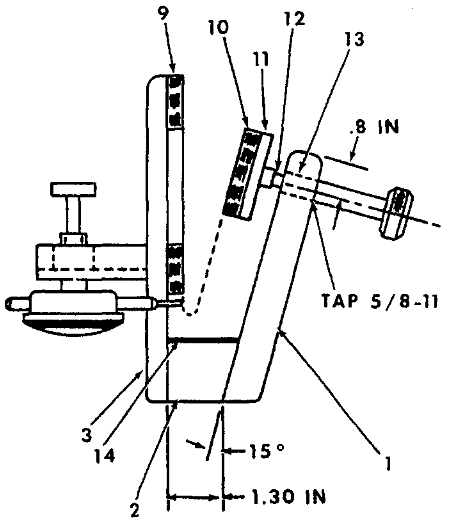
d. Apply another piece of masking tape in the corresponding position on the bottom surface of the tab for the same purpose.

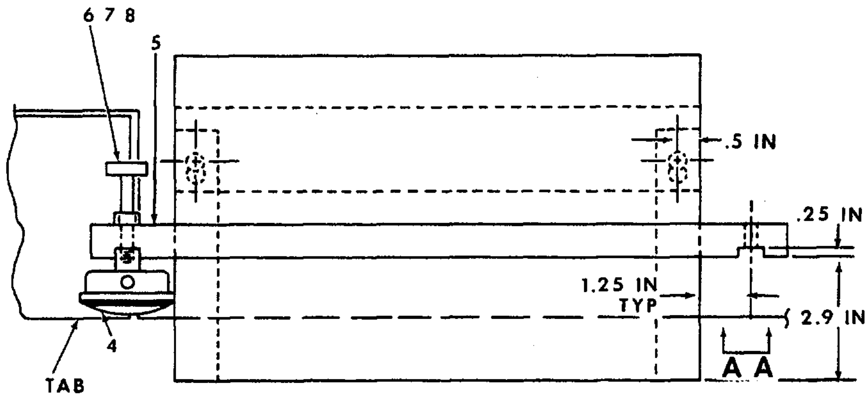
e. Zero the dial indicator at no load initially. Do not reset during the checking procedure.

f. With the push-pull scale at the point of masking tape, apply a full 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".

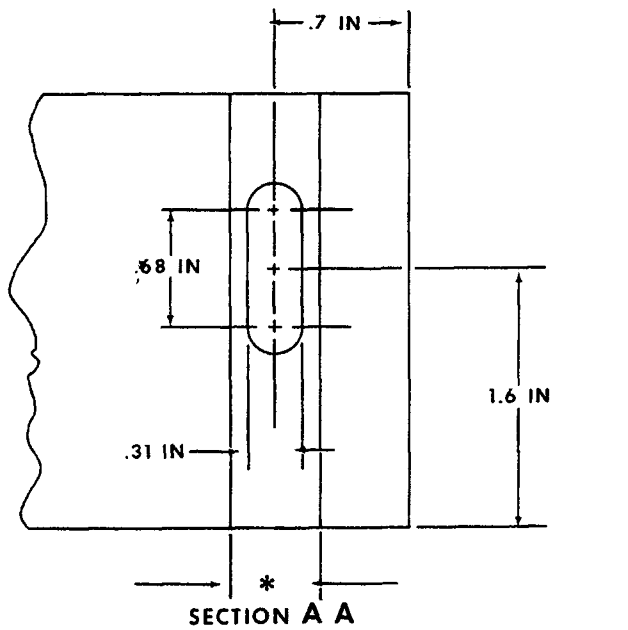
h. Apply a full 3-pound upward load at the masking tape on the bottom surface. Record the dial reading as "C".





ITEM NO.	QUANT.	DESCRIPTION
1	2	¾ x 1 x 6 aluminum or equiv.
2	2	1 x 1⅜ x 1¾ aluminum or equiv.
3	1	½ x 7½ x 10 aluminum or equiv.
4	1	C81Q Indicator**
5	1	¾ x 2½ x 14 aluminum or equiv.
6	1	¼ Dia. x 2 corrosion res. stl.
7	1	¼ Dia. x 1 corrosion res. stl.
8	1	¼-28 nut
9	1	⅜ x 5 x 10 rubber
10	1	⅜ x 2 x 10 rubber
11	1	¼ x 2 x 10 corrosion res. stl.
12	2	½ x 13 x 3 VLIER Torque screw
13	2	KN813 Keensert or tap ½ - 13
14	2	⅛ x 1 x ¾ rubber

**P/N of Federal Products Corp., Providence, R. I.



* THIS GROOVE TO BE A SNUG FIT TO THE SCREW BRACKET ON THE DIAL INDICATOR

100-135-8

Fabricating Clamp for Rudder Tab Deflection
Figure 205

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 201 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".

NOTE

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

5. Add "X" and "Y" and record as "E".

CHART 201
RUDDER TAB FREE PLAY LIMITS

1.5-POUND READING	*3-POUND READING*				
B ______					
2B ______	−A	______	=X	______	
D ______					
2D ______	−C	______	=Y	______	
X ______	+Y	______	=E	______	

(E = 0.090 inch maximum).

k. If the free play exceeds 0.090 inch, inspect all components of the tab actuator system to determine the cause. All worn parts should be replaced.

"END"

ELEVATOR AND TAB - MAINTENANCE PRACTICES

ELEVATOR REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.
b. Disconnect the elevator push-pull tubes from the elevator torque tube fittings.
c. Disconnect the elevator trim tab actuator rod from the elevator trim tab.
d. Disconnect the elevator bonding cables. Remove the hinge bolts and remove the elevator.

ELEVATOR INSTALLATION

a. Position the elevator on the horizontal stabilizer and install the center and outboard hinge bolts. Torque to 15-25 inch-pounds and safety. Connect the elevator bonding cables.
b. Install the bolt in the inboard end of the elevator torque tube fitting and torque to 50-70 inch-pounds.
c. Attach the elevator push-pull rods to the elevator torque tube fitting and torque the attaching bolt to 20-25 inch-pounds.
d. Attach the elevator trim tab actuator rod to the elevator trim tab.

NOTE

Check the elevator trim tab system for correct movement of the control surface with respect to the movement of the elevator trim tab control.

When the elevator trim tab control is moved toward the NOSE DOWN position, the elevator tab should move UP.

e. Connect the tail light wire and install the tail cone.

ELEVATOR CABLE REMOVAL (Figures 201 and 202)

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.
b. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.
c. Remove the pilot's and copilot's seats and the floorboards in the pilot's compartment.
d. Remove the forward passenger seats and the floorboards between the main and rear spar.
e. Remove the access panel in the floorboard aft of the rear spar.
f. Remove the cable retaining pins from the pulley brackets and (on TJ-3 and after) the pressure seals from the rear pressure bulkhead.
g. Disconnect the elevator cables, in the aft fuselage at the turnbuckles, and connect lead lines to the forward cables.
h. Disconnect the cables at the forward bell crank, identify both forward cables in relation to their attaching point on the bell crank. Remove the cables.
i. Disconnect the cables at the aft bell crank. Identify both aft cables in relation to their attaching point on the bell crank arms. Remove the cables.

ELEVATOR CABLE INSTALLATION (Figures 201 and 202)

WARNING

On airplane serials TJ-436, TJ-444 and after, TK-147 and TK-151 and after, when replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color to coded parts of a different color.

a. Route the aft elevator cables forward and connect to the applicable bell crank arms as noted during the removal.
b. Route the forward elevator cables aft, disconnect the lead lines, and connect the cables as noted during cable removal.
c. Install all cable retaining pins in all pulley brackets.
d. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00) and clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 (11, Chart 207, 91-00-00).
e. On TJ-3 and after, fill the pressure seals with MIL-G-23827 (11, Chart 207, 91-00-00). Install the seals.
f. Connect the cables to the turnbuckles in the aft fuselage and rig the cable system as described in ELEVATOR CONTROL SYSTEM RIGGING.
g. Install the aft floorboard access panel, the floorboards between the main and aft spar, and install the forward passenger seats.
h. Install the floorboards in the pilot's compartment and the pilot's and copilot's seats.

i. Connect the tail navigation light wire and install the tail cone.

j. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

ELEVATOR CONTROL SYSTEM RIGGING (TJ-3 through TJ-435, TJ-437 through TJ-443; TK-1 through TK-146, TK-148 through TK-150) (Figure 203)

NOTE

BEECHCRAFT recommends the use of the elevator travel gage shown in SPECIAL TOOLS (Refer to Chapter 12-20-00). Locate the travel gage at station 35.75.

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

c. Adjust the elevator bell crank DOWN stop so that the centerline of the bottom cable hook-up hole in the elevator bell crank is .80 inch from the aft bulkhead.

d. With the elevator cables disconnected, adjust the push-pull rods to obtain a surface travel of 15° ± 1° down.

e. With the elevator cables disconnected, adjust the elevator UP stop to obtain a surface travel of 20° ± 1° up.

f. Reconnect the elevator cables and rig the cable tension as noted in Figure 201, adjusting the cable so that the elevator bell crank DOWN stop comes into contact before the control column is in the full forward position.

NOTE

Tensiometer readings shall be taken on the top and bottom cables with the elevator in the DOWN position and the down-springs connected.

g. With the aft elevator stops set for correct travel, maintain .06 to .12 inch clearance at the UP elevator stop on the control column.

h. Watch the elevator movement to make sure that it correctly corresponds to the movement of the control column.

WARNING

Check the elevators for correct direction of movement. When the control wheel is moved forward, the elevators must move down. When the elevator is moved aft, the elevators must move up.

i. Connect the tail navigation light wire and install the tail cone.

j. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

k. With the elevator system fully installed (including autopilot and electric trim if required), the load and load resistance must fall within the following limits: Using a gage and pulling the control wheel aft, the load through neutral must be 32 to 35 pounds. Using a hand held gage and slowly returning the control wheel from the UP elevator position, the load resistance through neutral must be 19 to 33 pounds. The difference of the two readings must be 0 to 14 pounds (friction). All readings must be taken through the neutral position and in still air.

l. Maintain a minimum clearance of .06 inch between the control wheel adapters and the inner control column guide assemblies on the pilot's and copilot's control column torque tube assemblies at the full down position.

ELEVATOR TRIM TAB CABLE REMOVAL (Figure 201)

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

c. Remove the pilot's seat and the left floorboard.

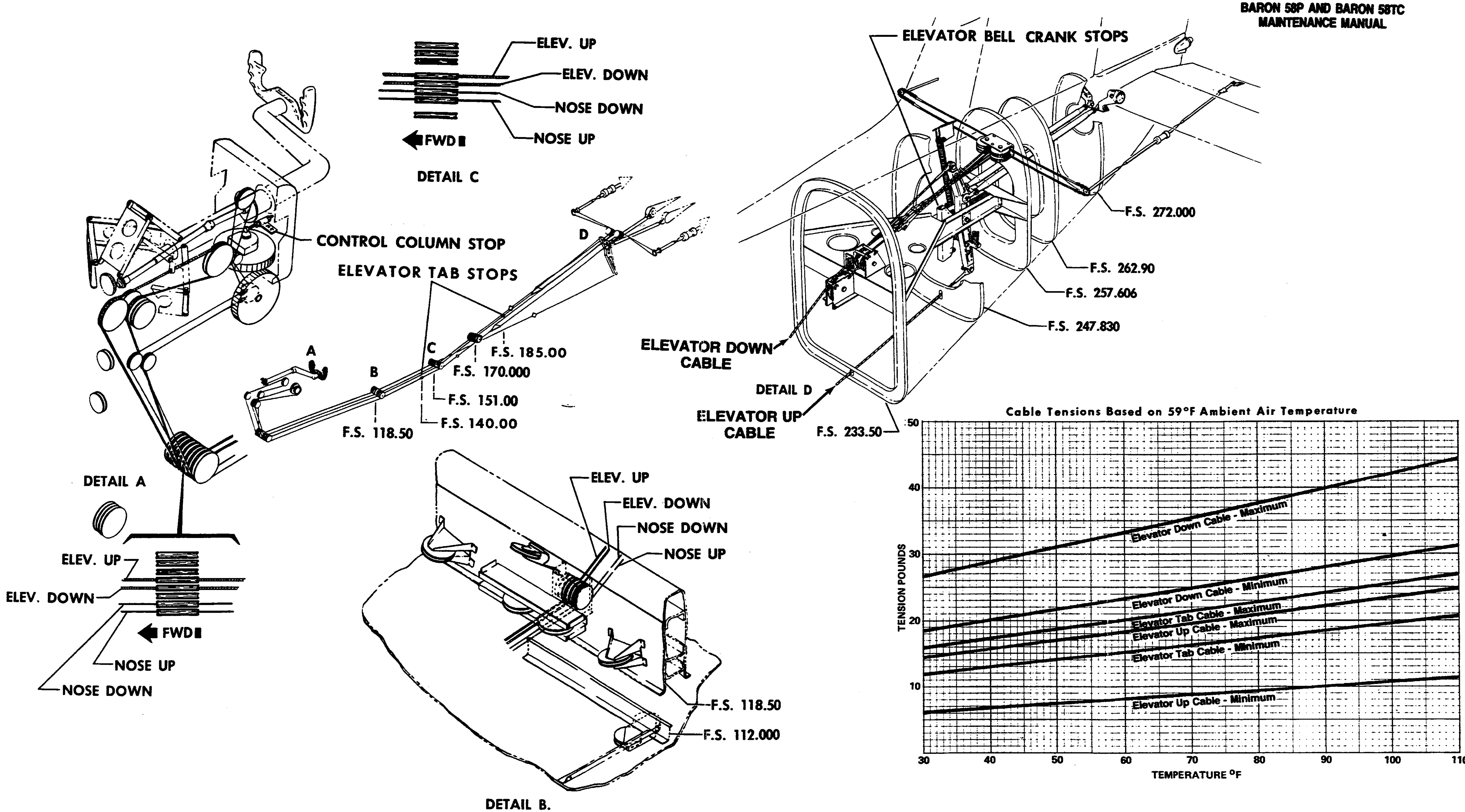
d. Remove both upholstery panels on the left side of the pedestal.

e. Remove the left passenger seat, the floorboard between the main and rear spar and the access panel in the floorboard aft of the rear spar.

f. Remove the cable retaining pins from the pulley brackets and (on TJ-3 and after) the pressure seals from the rear pressure bulkhead.

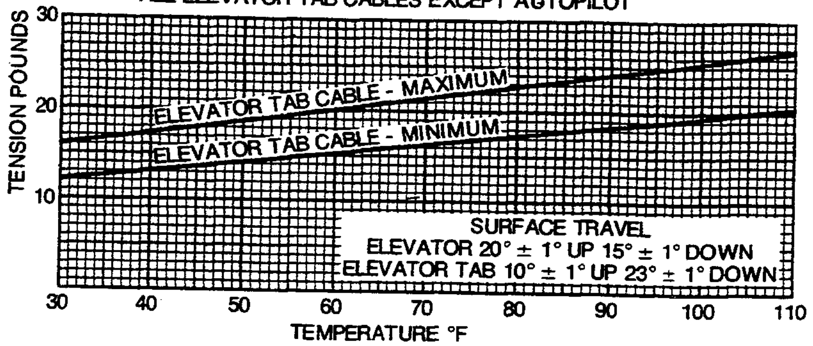
g. Disconnect the elevator trim tab cables, in the aft fuselage, at the turnbuckles. Identify the cable for trim tab up movement and connect lead lines to the cables.

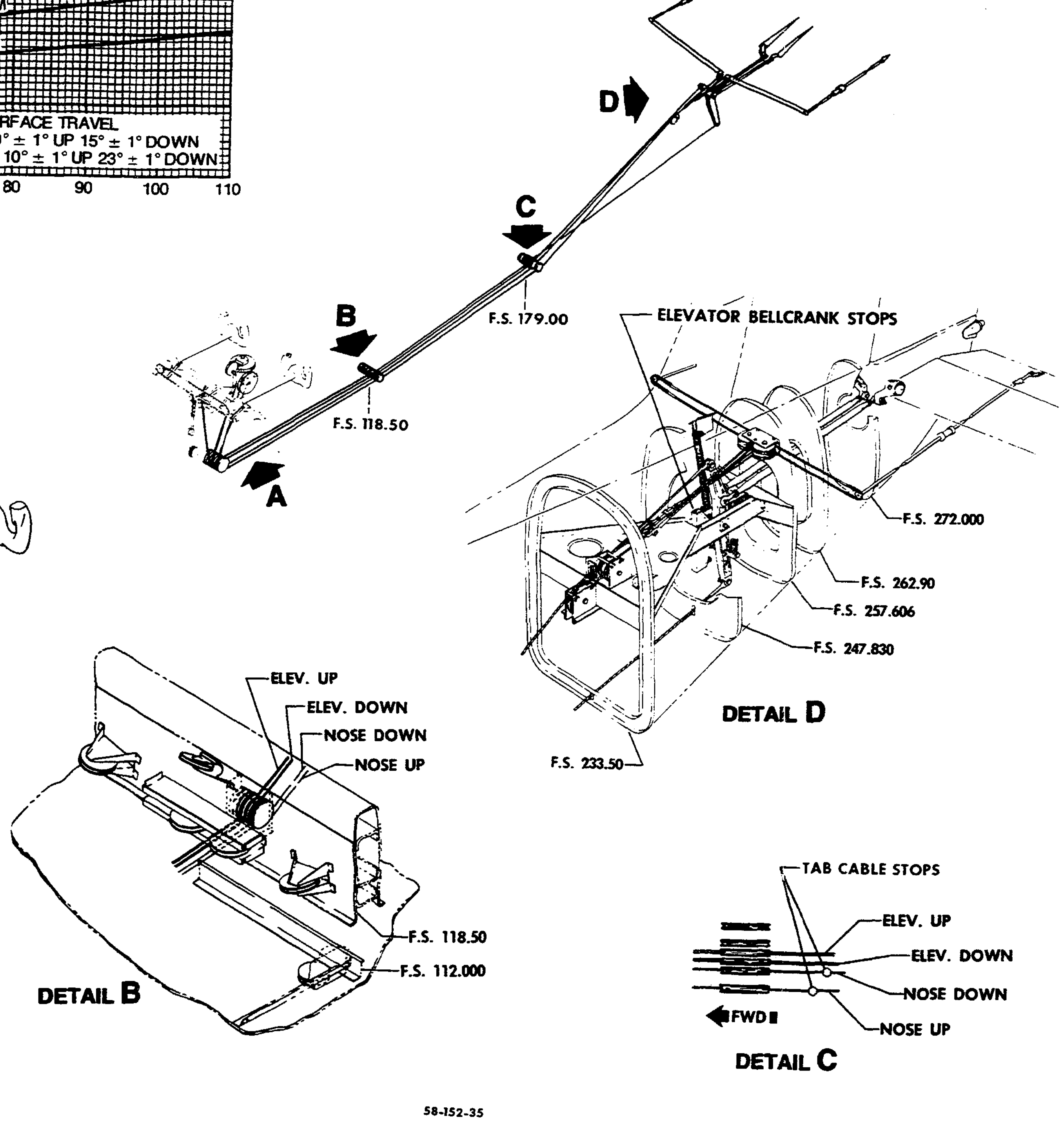
h. Remove the access panel to the elevator trim tab actuator sprocket located on the lower side of the horizontal stabilizer.

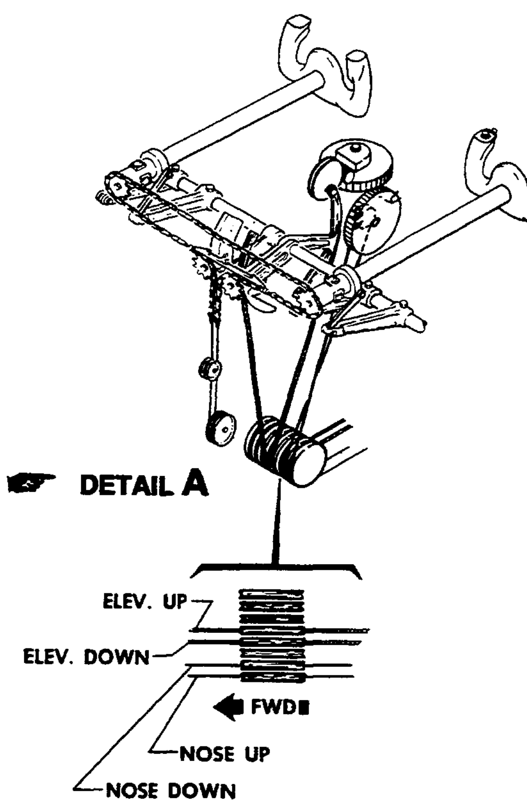


The Elevator Control System
Figure 201

TEMPERATURE CABLE TENSION GRAPH
ALL ELEVATOR TAB CABLES EXCEPT AUTOPILOT

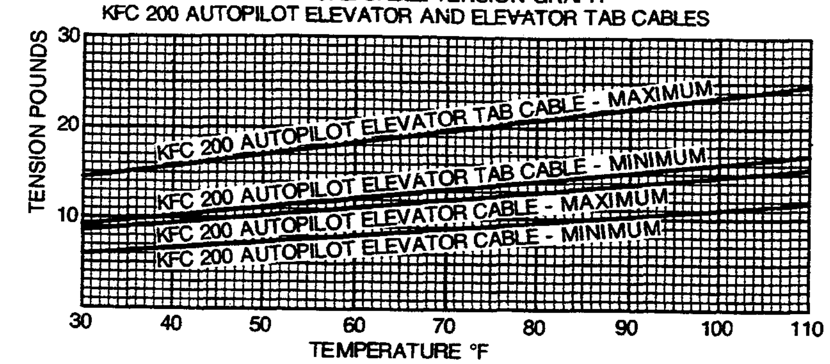




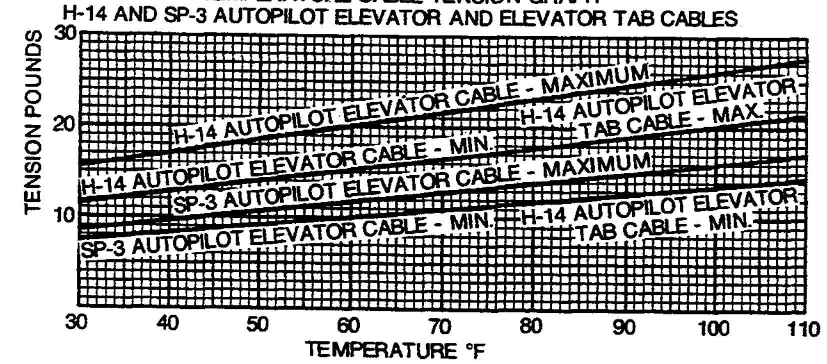


DENOTES AREA OF CHANGE

TEMPERATURE CABLE TENSION GRAPH
KFC 200 AUTOPILOT ELEVATOR AND ELEVATOR TAB CABLES

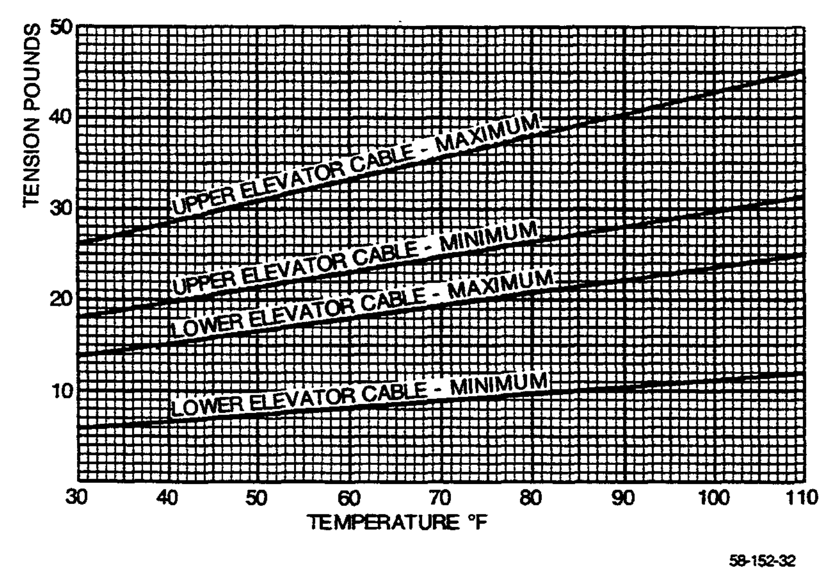


TEMPERATURE CABLE TENSION GRAPH
H-14 AND SP-3 AUTOPILOT ELEVATOR AND ELEVATOR TAB CABLES



NOTE: RIG AUTOPILOT CABLES AFTER CONTROL SYSTEM CABLES ARE RIGGED.

TEMPERATURE CABLE TENSION GRAPH



The Elevator Control System
Figure 202

i. 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.

j. Remove the bolt attaching the cable drum and sprocket to the lower pedestal. Note and record the number of cable revolutions on the reel.

k. Remove the cable through the pilot's compartment.

ELEVATOR TRIM TAB CABLE INSTALLATION (Figure 201)

a. Place the elevator trim tab control wheel in the neutral position and wrap the cable around the drum, the same number of revolutions noted during removal, maintaining the cable ends equidistant.

b. Position the cable drum and sprocket in the lower pedestal, with chain and sprocket teeth engaged, and install the attaching bolt. Route the forward cable aft and remove the lead lines.

NOTE

When the trim tab control cable is disconnected at the pedestal, the tab wheel shall turn smoothly with very little resistance. Bearings, not previously lubricated, may be lubricated with MIL-L-6086 oil (7, Chart 207, 91-00-00). Lubricate shafts and thrust surfaces with MIL-G-23827 grease (11, Chart 207, 91-00-00) for friction reduction.

c. With the elevator trim tab in the neutral position, place the aft chain and cable assembly on the elevator trim tab actuator sprocket so that the ends of the chain are equidistant at the sprocket centerline within ± .20 inch.

d. Route the chain and cable assembly inboard and forward in the aft fuselage.

e. Install all cable retaining pins in the pulley brackets.

f. On TJ-3 and after, use PD680 solvent (15, Chart 207, 91-00-00) and clean the cables for the length of travel through the pressure seals. Lubricate to one inch beyond the cleaned area with MIL-G-23827 grease (11, Chart 207, 91-00-00).

g. On TJ-3 and after, fill the pressure seals with MIL-G-23827 grease (11, Chart 207, 91-00-00). Install the seals.

h. Install the cable stops and connect the cables to the turnbuckles in the aft fuselage. Rig the elevator trim tab control system as described in ELEVATOR TRIM TAB RIGGING.

i. Install the access panel at the elevator trim tab actuator sprocket.

j. Install the access panel in the floorboard aft of the rear spar, the floorboard between the main and rear spar, and the left passenger seat.

k. Install the left floorboard and pilot's seat.

l. Install both upholstery panels on the pedestal.

m. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

n. Connect the tail navigation light wire and install the tail cone.

ELEVATOR CONTROL SYSTEM RIGGING (TJ-436, TJ-444 and after, TK-147, and TK-151 and after) (Figure 202)

WARNING

When replacing or installing control cables, bell cranks and other control system components, observe the color coding on all parts. DO NOT connect coded parts of one color to coded parts of a different color.

NOTE

BEECHCRAFT recommends the use of the elevator travel gage shown in SPECIAL TOOLS (Refer to Chapter 12-20-00). Locate the travel gage at station 35.75.

NOTE

To position the elevator in neutral, fabricate a tool from 5/16 inch diameter steel rod as shown in Figure 202.

a. Detach the tail cone. Disconnect the tail navigation light wire and remove the tail cone.

b. Remove the access panel on the left side of the fuselage just forward of the horizontal stabilizer.

c. Adjust the elevator bell crank DOWN stop so that the bottom cable attachment hole in the elevator bell crank is .80 inch from the aft bulkhead.

d. With the elevator cables disconnected, adjust the length of the elevator push-pull rods to obtain 14° to 16° down travel.

e. With the elevator cables disconnected, adjust the length of the elevator push-pull rods to obtain 19° to 21° up travel.

f. Set the elevator controls in neutral. To obtain neutral, insert the short end of the fabricated tool (see Figure 203) in the control column hanger. Move the control aft and insert the other end of the tool into the conrol shaft and torque tube.

g. Connect the elevator cables and rig the cable tension as shown in Figure 202.

NOTE

Tensiometer readings must be taken on the upper and lower elevator cables with the elevator in neutral.

h. Check the elevator movement to make sure that corresponds correctly with the control movement.

WARNING

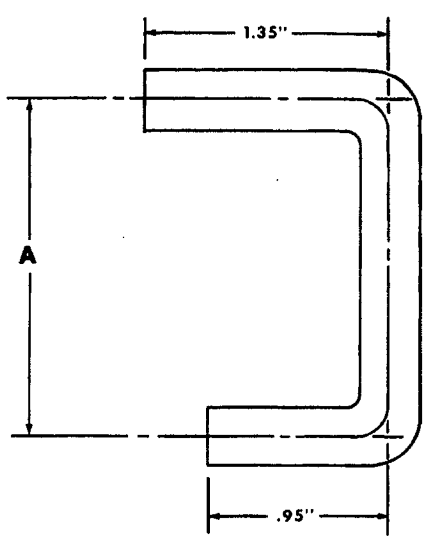
Check the elevators for correct direction of movement. When the control wheel is moved forward, the elevators must move down. When the control wheel is moved aft, the elevators must move up.

i. Connect the tail navigation light wire and install the tail cone.

j. Install the access panel on the left side of the fuselage.

k. With the elevator system fully installed (including autopilot and electric trim if required), the load and load resistance must fall within the following limits: Using a gage and pulling the control wheel aft, the load through neutral must be 25 to 29 pounds. Using a hand held gage and slowly returning the control wheel from the UP elevator position, the load resistance through neutral must be 20 to 24 pounds. The difference of the two readings must be 4 to 9 pounds (friction). All readings must be taken through the neutral position and in still air.

FABRICATE FROM 5/16 INCH DIAMETER STEEL ROD



AIRPLANE SERIAL NUMBER	DIMENSION A
TJ-3 through TJ-435 TJ-437 through TJ-443 TK-1 through TK-146 TK-148 through TK-150	1.75 inch
TJ-436 TJ-444 and after TK-147 TK-151 and after	2.50 inch

Elevator Neutral Rigging Tool
Figure 203

l. Maintain a minimum clearance of .06 inch between the control wheel adapters and the inner control column guide assemblies on the pilot's and copilot's control column torque tube assemblies at the full down position.

ELEVATOR TRIM TAB RIGGING

a. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

b. Remove the access panel on the lower side of the horizontal stabilizer at the elevator trim tab actuator sprocket.

c. Neutral elevator position may be obtained by inserting the short end of the fabricated tool (see Figure 203) into the control column hanger. Move the control column aft and insert the opposite end of the tool into the elevator shaft and matching holes in the aileron torque tube.

d. Set the travel indicator at 23° ± 1° down.

e. Disconnect and adjust the elevator trim tab actuator so that the tab actuator rod extends to 2/3 of its total travel.

f. Set the elevator trim tab to 23° ± 1° down and connect the push rod to the actuator rod.

g. Locate the chain on the elevator trim tab actuator sprocket so that three links are left on the bottom of the sprocket and tighten the cables. Rig the cable tension as noted in Figures 201 and 202.

h. Set the elevator trim tab cable stops to obtain a surface travel of 10° ± 1° up and 23° ± 1° down.

NOTE

The forward elevator trim tab cable stop is located on the outboard elevator trim tab cable and is rigged to bottom out at F.S. 140.00. The aft elevator trim tab cable stop is located on the inboard elevator trim tab cable and is rigged to bottom out on fairlead at F.S. 185.00. Surface travels to be noted as in step "h".

i. Check for proper operation and safety all turnbuckles and stops.

j. Install the access panel at the elevator trim tab actuator sprocket.

k. Install the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

NOTE

After rigging the elevator and elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim tab should move up.

ELEVATOR TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel near the trailing edge of the horizontal stabilizer to gain access to the elevator trim tab actuator.

b. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

c. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

d. Remove the access panel near the leading edge of the horizontal stabilizer to gain access to the elevator trim tab actuator sprocket.

e. Remove the elevator as outlined in Chapter 27-30-00 under the heading ELEVATOR REMOVAL.

f. Disconnect the elevator trim tab cables at the turnbuckles in the aft fuselage. Secure the forward elevator trim tab cables to prevent them from unwinding at the universal.

CAUTION

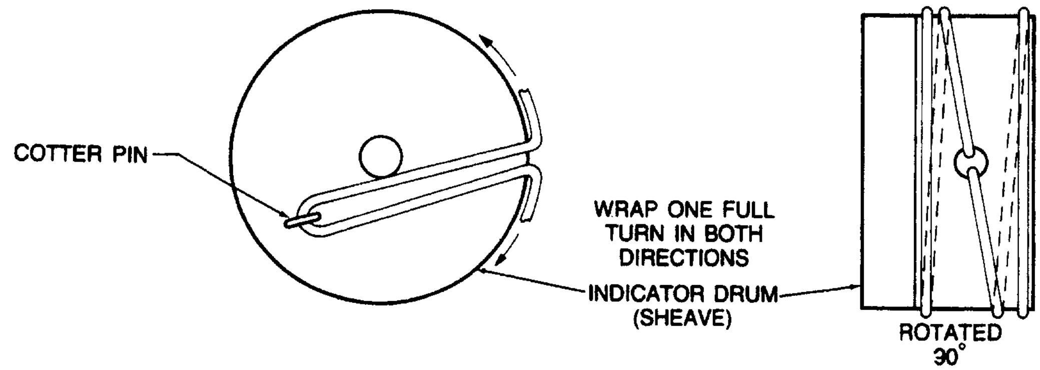
Do not damage the cables. Use a material such as phenolic to protect the cables.

g. Remove the chain and cable assembly from the elevator trim tab actuator sprocket.

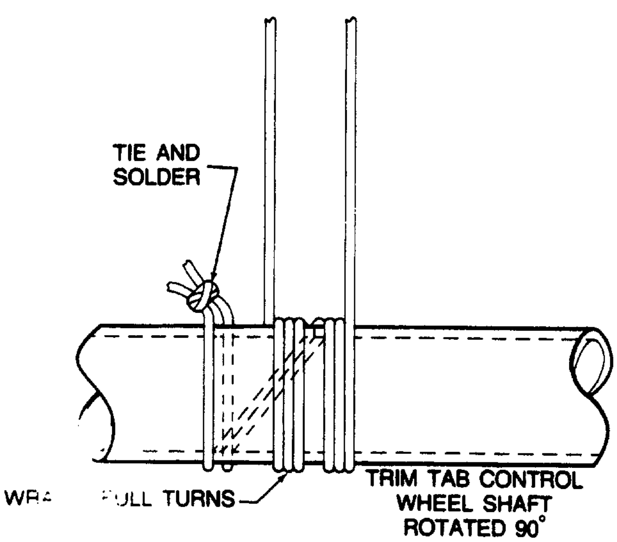
h. Remove the hardware attaching the elevator trim tab actuator to the horizontal stabilizer. Remove the actuator from the airplane.

NOTE

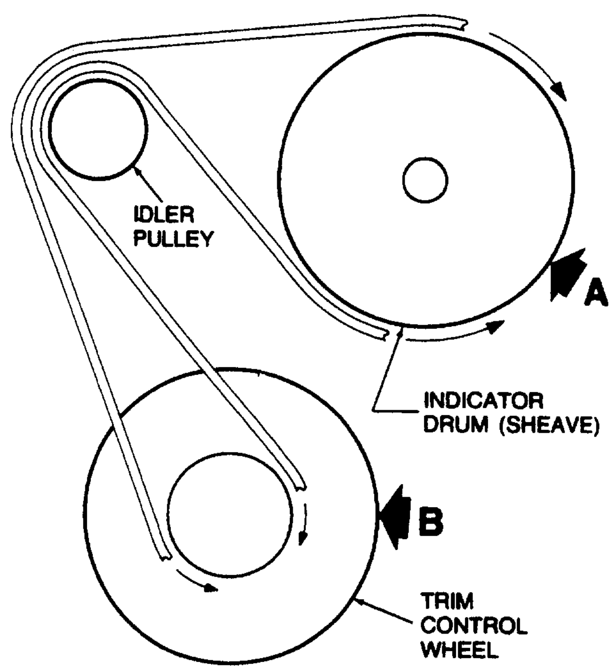
If the actuator is to be reinstalled, identify with a tag to ensure proper movement of the elevator tabs upon reinstallation of the actuators.



DETAIL **A**



DETAIL **B**



36-152-39

Elevator Trim Tab Indicator Cable Replacement
(TJ-3 through TJ-435, TJ-437 through TJ-433,
TK-1 through TK-146 and TK-148 through TK-150)
Figure 204

ELEVATOR TRIM TAB ACTUATOR INSTALLATION

WARNING

To ensure proper movement of the trim tabs, make sure that the left hand actuator is installed on the left hand horizontal stabilizer and the right hand actuator is installed on the right hand horizontal stabilizer.

a. Position the elevator trim tab actuator in the horizontal stabilizer and install the attaching hardware.

b. Position the chain and cable assembly on the actuator sprocket so that the ends of the chain are equidistant within ± .20 inch at the sprocket centerline.

c. Install the elevator as outlined in Chapter 27-30-00 under the heading ELEVATOR INSTALLATION.

d. Connect the elevator trim tab cables to the turnbuckles in the aft fuselage.

e. Remove material used to protect the cables.

f. Rig the elevator trim tab control system as outlined in Chapter 27-30-00 under the heading ELEVATOR TRIM TAB RIGGING.

NOTE

After rigging the elevator and elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim tab should move UP.

g. Install the access panel, located near the leading edge of the horizontal stabilizer.

h. Install the access panel, located near the trailing edge of the horizontal stabilizer.

i. Install the access panel on the left hand side of the fuselage, just forward of the horizontal stabilizer.

j. Connect the tail navigation light wire and install the tail cone.

ELEVATOR TRIM TAB INDICATOR CABLE REPLACEMENT (TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150)
(Figure 204)

a. The elevator trim tab control system must be correctly rigged and the elevator control in neutral.

b. Install the indicator cable through the head of the cotter pin on the side of the indicator drum. Bring both ends of the cable out through the hole in the indicator drum.

c. With the indicator set at 0° (neutral), both ends of the cable must be equal in length.

d. Wrap each end of the cable around the drum one full turn in opposite directions. The end that wraps to the right wraps clockwise around the drum. The end that wraps to the left wraps counter-clockwise around the drum, as viewed from the left side.

e. Route both ends of the cable over the idler pulleys down to the shaft on the trim tab control wheel.

f. With the indicator still at 0° (neutral), take the cable coming off the top of the indicator drum (wrapped counter-clockwise) down to the forward side of the control wheel shaft to the left of the hole.

g. Wrap the cable counter-clockwise (as viewed from the left) around the shaft toward the hole three full turns. Insert the cable through the holes and wrap the excess cable clockwise around the shaft.

h. Take the cable coming off the bottom of the indicator drum (wrapped clockwise) down to the aft side of the control wheel shaft to the right of the hole.

i. Wrap the cable clockwise (as viewed from the left) around the shaft toward the hole three full turns. Insert the cable through the holes and wrap the excess cable counter-clockwise around the shaft.

j. Twist the two cable ends together and solder with rosin core solder.

k. Check the tab control and dial to be sure that it moves freely from one stop to the other.

l. Check the tab travel and direction of movement to be sure that it corresponds to the movement of the control and indicator.

ELEVATOR TRIM TAB FREE PLAY INSPECTION

This check should be performed at least once a year to ensure that the trim tab free play falls within the prescribed limits.

A check fixture (P/N 45-135030-9/810) or equivalent as shown in Figure 205, a dial indicator, and a push-pull scale for applying accurate loading to the tabs are required for making the inspection for free play of the tabs.

a. Securely lock the control surfaces to prevent movement of the elevator. Set the elevator tab in the neutral position.

b. Using shot bags, affix the dial indicator check fixture so that the dial indicator point is 4.00 inches aft of the tab hinge line and on the outboard edge of the elevator tab.

c. Apply a small piece of masking tape (for paint protection) 4.50 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 masking tape, apply a full 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 201 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".

NOTE

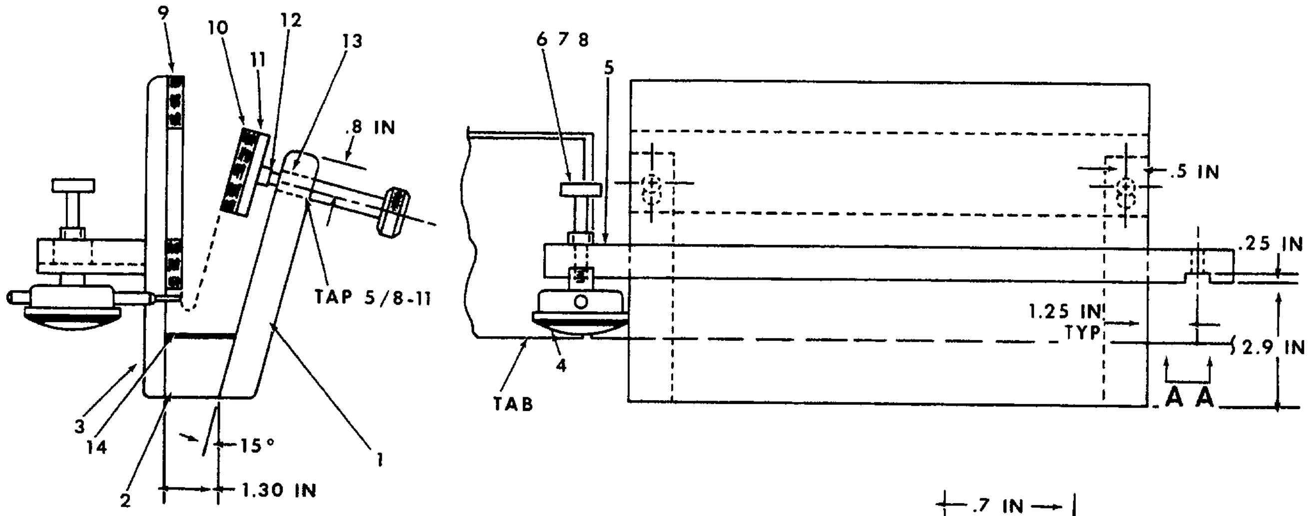
The results of "X" and "Y" can be negative numbers.

5. Add "X" and "Y" and record as "E".

CHART 201
ELEVATOR TAB FREE PLAY LIMITS

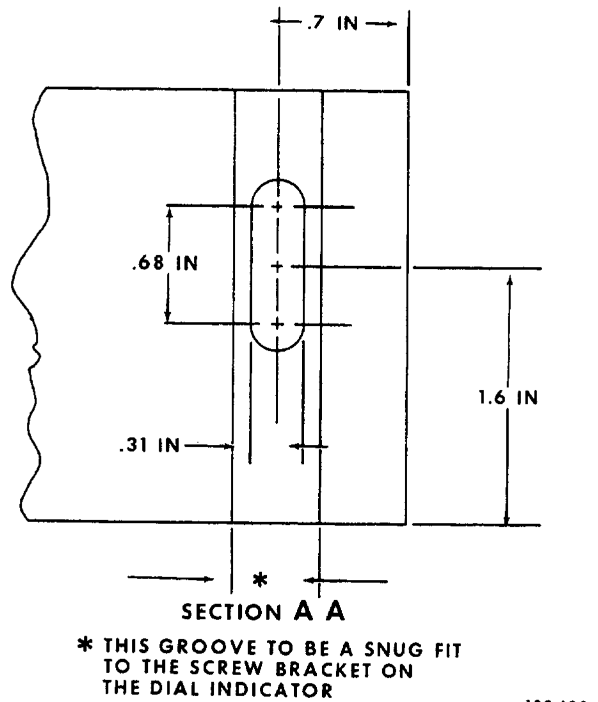
1.5-POUND READING	*3-POUND READING*	
B ________		
2B ________	−A ________	=X ________
D ________		
2D ________	−C ________	=Y ________
X ________	+Y ________	=E ________

(E = 0.084 inch maximum).



ITEM NO.	QUANT.	DESCRIPTION
1	2	3/4 x 1 x 6 aluminum or equiv.
2	2	1 x 1 3/8 x 1 3/4 aluminum or equiv.
3	1	1/2 x 7 1/2 x 10 aluminum or equiv.
4	1	C81Q Indicator**
5	1	3/4 x 2 1/2 x 14 aluminum or equiv.
6	1	1/4 Dia. x 2 corrosion res. stl.
7	1	1/4 Dia. x 1 corrosion res. stl.
8	1	1/4-28 nut
9	1	3/8 x 5 x 10 rubber
10	1	3/8 x 2 x 10 rubber
11	1	1/4 x 2 x 10 corrosion res. stl.
12	2	1/2 x 13 x 3 VLIER Torque screw
13	2	KN813 Keensert or tap 1/2 - 13
14	2	1/8 x 1 x 3/4 rubber

**P/N of Federal Products Corp., Providence, R. I.



Fabricating Clamp for Elevator Tab Deflection
Figure 205

k. If the free play exceeds 0.084 inch, inspect all components of the tab actuator system to determine the cause. All worn parts should be replaced.

l. If the elevator tab push rod attach holes in the tab horns are found to be worn, the trim tabs may be removed and the tab horn repaired as indicated in ELEVATOR TRIM TAB HORN REPAIR in lieu of replacing the complete tab assemblies.

NOTE

Elevators must be removed from the airplane and be checked for static balance after accomplishing the repair procedures described in ELEVATOR TRIM TAB HORN REPAIR.

m. Repeat steps "b." thru "l." for the opposite elevator.

ELEVATOR TRIM TAB HORN REPAIR

a. Carefully grind or spot face the brazed in bushing flush with the sides of the tab horn.

b. Drill and ream the existing hole to .4995/.5010-inch inside diameter.

c. Using a clean rag dampened with methyl ethyl ketone (21, Chart 207, 91-00-00), thoroughly clean the hole in the tab horn, the area around the hole and a new P/N 96-610026-1 bushing.

d. Scuff sand the contact surfaces of the bushing and the tab horn and clean the area thoroughly again as specified in step "c".

e. Wipe off the parts again with a clean rag before the solvent evaporates.

f. Apply a thin coat of adhesive, EC2216 (57, Chart 207, 91-00-00) or equivalent, to the contact surfaces of both the bushing and the tab horn.

g. Join the horn and bushing and clamp together (use care not to squeeze out all of the adhesive) until the adhesive has cured completely (approximately 24 hours).

h. Lubricate the new 104-524056-3 grip bushing with MIL-G-23827 grease (11, Chart 207, 91-00-00) and install the grip bushing in the tab horn bushing.

i. Reinstall the trim tab and lubricate all pivotal points with MIL-G-23827 grease (11, Chart 207, 91-00-00).

NOTE

If the rod end on the push rod assembly is worn, the push rod assembly should be replaced.

When connecting the tab push rod assembly to the tab horn, tighten the castellated nut against the rod end and turn the nut to the next castellation to install the cotter key. The grip bushing within the yoke of the rod end should not rotate.

ELECTRIC TRIM TAB ACTUATOR REMOVAL (OPTIONAL) (Figure 206)

a. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.

b. Disconnect the actuator wire harness at the disconnect splices.

c. Place a wood or sheet metal shim between the cable drum and the cable guard so the cable will not unwind.

d. Remove the fairlead mounted on the bulkhead aft of the actuator.

e. Disconnect the actuator cable at the turnbuckle first, then at the aft fitting.

f. Remove the three bolts securing the actuator to the bracket. Remove the actuator.

ELECTRIC TRIM TAB ACTUATOR INSTALLATION (OPTIONAL)

a. Position the actuator to the bracket and secure with the three attaching bolts.

b. Connect the actuator cable at the aft fitting and the turnbuckle.

c. Install the fairlead to the bulkhead aft of the actuator.

d. Remove the device used to keep the cable from unwinding.

e. Connect the actuator wire harness.

f. Rig the elevator trim tab control system according to the section labeled ELEVATOR TRIM TAB RIGGING.

NOTE

The electric trim tab rigging and cable tension are identical to the manually operated elevator trim tab.

g. Install the access panel to the left hand side of the fuselage just forward of the horizontal stabilizer.

ELECTRIC TRIM TAB CABLE INSTALLATION

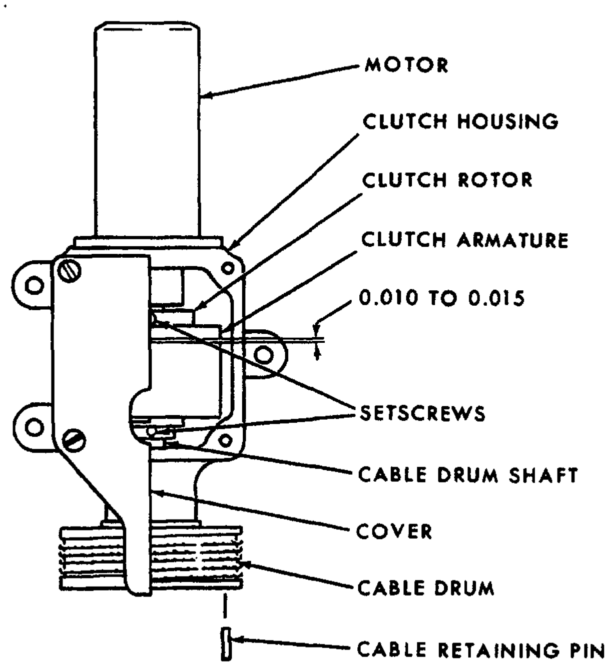
Note the position of the old cable on the cable drum in relation to the forward cable end fittings. Install the new cable in the same position. This will ensure adequate free cable on the drum in both directions to allow full travel of the cable stops. Check the cable travel as instructed in ELEVATOR TRIM TAB RIGGING

ELECTRIC TRIM TAB ACTUATOR MAGNETIC CLUTCH REMOVAL

a. Remove the lid from the clutch housing.
b. Loosen the set screw in the cluth rotor and armature hubs.
c. Remove the motor from the clutch housing.
d. Slide the cable drum and shaft assembly from the clutch housing.
e. Remove the clutch from the clutch housing.

ELECTRIC TRIM TAB ACTUATOR MAGNETIC CLUTCH INSTALLATION

a. Install the clutch in the clutch housing.
b. Slide the cable drum and shaft assembly into the clutch housing.
c. Install the motor in the clutch housing.
d. Tighten the clutch armature set screws until there is no visible end play in the cable drum shaft. Slide the clutch rotor on the motor shaft to obtain .010 to .015 inch clearance between the friction surfaces of the clutch before tightening the set screws. Stake both set screws.



Electric Trim Tab Actuator
Figure 206

CAUTION

With no visible end play in the cable drum shaft, the clutch faces must not make contact while the clutch is de-energized or damage to the clutch will result.

e. Replace the lid on the clutch housing.

ELECTRIC TRIM TAB ACTUATOR MAGNETIC CLUTCH TORQUE TEST

The following check should be performed any time the magnetic clutch is replaced.

a. Using a 28 vdc power source, connect the red electrical lead of the magnetic clutch to ground and the white electrical lead to the power source. Using a torque wrench, check that the clutch holds with 30 inch-pounds of torque applied at the actuator shaft.
b. If the static torque of the clutch is less than 30 inch-pounds, burn in the clutch as follows:

1. Find a metal plate of sufficient thickness for rigidity and large enough to fit in a vise with the actuator assembly attached. Anchor the plate in a vise and drill three holes in the plate to match the actuator mounting holes. Bolt the actuator to the plate.
2. Slot the end of a tube that will fit snugly into the .437 inch diameter hole in the end of the shaft on which the drum is mounted.
3. Insert the tube into the shaft until the slot engages the drum retaining pin.
4. Attach the free end of the tube to a slow speed (approximately 450 rpm) half-inch drill motor.
5. Remove the access plate from the clutch housing and blow the housing and clutch clean with clean dry air.
6. Using a regulated power source set at 14 to 16 vdc, connect the red electrical lead of the clutch to ground and the white electrical lead to the power source with alligator clips.
7. Start the drill motor and unclip the lead to the power source after 15 seconds. Let the clutch cool for approximately one minute before reattaching the lead for another 15 second interval. Repeat the foregoing sequence until the clutch will hold 30 inch-pounds of torque as indicated in step "a" then blow the clutch and housing clean with clean dry air.

CAUTION

Exceeding the 15 second burn-in periods may overheat and damage the magnetic clutch.

"END"

STALL WARNING - DESCRIPTION AND OPERATION

The stall warning system consists of a stall warning horn mounted forward of the instrument panel, a lift transducer, a lift transducer vane heater element, a face plate heater element on the leading edge of the left wing; a landing gear switch, a 5 ampere circuit breaker and a 5 ampere toggle type circuit breaker switch placarded PITOT HEAT LH, located on the pilot's subpanel, that controls the stall warning heating element.

When aerodynamic pressure on the lift transducer vane indicates that a stall is imminent, the transistor switch is actuated to complete the circuit to the stall warning horn. The lift transducer senses the angle of attack and is triggered by reverse air flow.

CAUTION

The heater element protects the lift transducer from ice, however a buildup of ice on the wing may disrupt the airflow and prevent the system from accurately indicating an incipient stall.

"END"

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.

"END"

STALL WARNING - MAINTENANCE PRACTICES

STALL WARNING INDICATOR REMOVAL

a. Remove the four screws attaching the doubler and indicator to the lower wing leading edge.

b. Disconnect electrical wires at the indicator and heater switches.

STALL WARNING INDICATOR INSTALLATION

a. Connect the electrical wires to the indicator and heater switches.

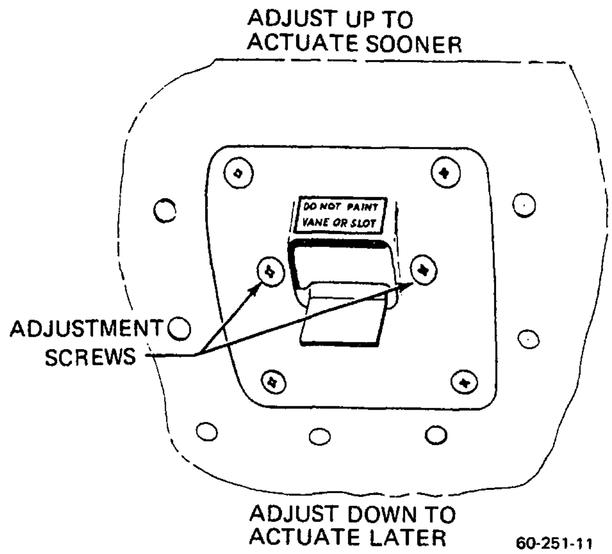
b. Position the indicator in the opening of the lower wing leading edge, install the doubler and the four screws.

c. Adjust the indicator. See STALL WARNING INDICATION SYSTEM ADJUSTMENT.

STALL WARNING INDICATING SYSTEM ADJUSTMENT (Figure 201)

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 left 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.



Stall Vane Adjustment
Figure 201

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. The stall should be made with the flaps and gear up 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.

"END"

FLAPS - DESCRIPTION AND OPERATION

The flaps are operated by an electric motor-driven gearbox on the forward side of the rear spar at the centerline of the airplane. The gearbox drives two flexible drive shafts, each connected to a jackscrew actuator at the flaps.

Limit switches, installed on the outboard side of the inboard flap track of the left wing panel, stop the flap travel at 0° (full up), 15° (approach) and 30° (full down), depending on the position of the flap control switch.

On airplanes with the single "throw-over" control or the dual "T" control, an adjustable flap position transmitter is installed near the flap actuator in the left wing. An instrument on the right hand side of the console provides a visual indication of the flap position. On airplanes with dual control columns, flap position is indicated by three lights to the left of the flap control switch. The lights indicate down, approach and in-transit positions. All lights are out when the flaps are up.

The flaps are connected electrically to the landing gear warning horn system through the flap down limit switch. Any time the flaps are fully down and the landing gear is retracted, an audible warning alerts the pilot.

"END"

FLAPS - MAINTENANCE PRACTICES

FLAP REMOVAL

a. Place the flap actuator switch in the NEUTRAL position and the main power switch in the OFF position.
b. Fully extend the flaps and remove the bolt from the flap actuating arm.
c. Remove the bonding cable from the flap tracks.
d. Remove the bolts from the flap track brackets and remove the flap.

FLAP INSTALLATION

a. Hold the flap in position and install the rollers and the bolts in the flap track bracket.
b. Connect the bonding cable in the flap tracks.
c. Install the bolt in the flap actuating arm.

NOTE

The contour of the flap must be within .0625 inch of the contour of the wing on either or both sides. The gap between the flap and the fuselage must be .375 + .125 - .1875. The gap between the flap and aileron must be .375 + .125 - .250.

FLAP TRACK ROLLER INSTALLATION

Install the flap track rollers (four rollers per flap and two rollers per track) in the flap track brackets with the flanges facing each other. Use only the wide flanged rollers in the aft locations.

FLAP CONTROL SYSTEM RIGGING (Figure 201)

The flap limit switches are mounted on a bracket and installed on the outboard side of the inboard flap track in the left wing panel. The limit switches, one for up, two for the approach position and one for the down travel, control the travel of the flaps by breaking the circuit to the flap motor at the extreme limits of selected travel. The switches are accessible by lowering the flaps.

The flap travel is adjusted by moving the limit switches. The left flap is rigged first and then the right flap is synchronized with it. Rig as follows:

NOTE

Rig the flaps under a simulated flight load to reduce overtravel to a minimum after the limit switches have been adjusted.

a. Adjust the up limit switch so the flap will stop approximately 3/32 inch from the forward portion of the slot on the inboard flap track.
b. Adjust the 14° limit (inboard) switch in its mounting slot until the flap is positioned at 14° to 14.5° after the flap has been actuated from the up to takeoff position (15° range). Adjust the 16° limit (outboard) switch in its mounting slot until the flap is positioned at 15.5° to 16° after the flap has been actuated from the down to takeoff position.
c. Adjust the down limit switch in its mounting slot until it actuates at 28° to 30° of flap travel.
d. Remove the bolt attaching the right actuator to the right flap.
e. Turn the jackscrew on the right actuator in or out to align the right flap with the left.
f. Install the bolt connecting the actuator to the flap.

CAUTION

If the flaps are removed for any reason, the flap actuator switch should be in the NEUTRAL position or the main power switch in the OFF position.

NOTE

After the flap is completely rigged, adjust the rubber bumper (flap down) installed on the flap and aileron dividing rib. Turn the adjusting screw in or out, as required, to take out play or stop vibration when the flap is in the up position. A distinct change in the sound of the flap motor near the completion of the flap up travel may indicate an excessive outward adjustment of the bumper.

g. Operate the flaps through full travel to ensure that the flaps contact the limit switches before they contact the rubber bumper.

FLAP FUNCTIONAL GROUND TEST

a. Connect a ground power unit (regulated at 28.25 ± .25 vdc) to the airplane.

b. Check flap motor amperage during down and up cycles (maximum 13.0 amps).

CAUTION

Avoid continuous operation of the flaps to prevent overheating of the motor.

NOTE

The flap motor amperage reading will vary from the down cycle to the up cycle.

c. If the amperage is exceeded during the up or down cycle, the system must be inspected for excessive friction, rough flap tracks or misrigging.

FLAP POSITION TRANSMITTER ADJUSTMENT (TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150) (Figure 201)

An adjustable flap position indicator transmitter is installed on the flap actuator in the left wing just forward of the rear spar.

a. Adjust the flap travel limit switches to provide the correct flap travel. (Refer to FLAP CONTROL SYSTEM RIGGING.)

b. Run the flaps down and check the pilot's compartment flap position indicator for 100% flaps. If full down flaps are not indicated, loosen the transmitter attachment bolts and adjust fore or aft or rotate slightly until the reading is correct, then tighten the transmitter attaching bolts.

c. Run the flaps up and check the indicator for up flaps reading.

FLAP ACTUATOR REMOVAL

a. Fully extend the flaps and disconnect the actuator from the flap.

b. Remove the access plate on the lower surface of the wing and uncouple the flexible drive shaft.

CAUTION

The housing of the flexible drive shaft to the flap actuator should not be twisted when removed.

c. Remove the mounting bolts and actuator from the wing bracket. Remove the bushings from the actuator.

FLAP ACTUATOR INSTALLATION

a. Position the actuator in the wing bracket and install the bushings and attaching bolts.

NOTE

The actuator must be installed with the vent hole up.

b. Couple the flexible drive shaft to the actuator.

NOTE

The housing of the flexible drive shaft to the flap actuator should not be twisted when installed.

c. Install the access plate on the lower surface of the wing.

d. Extend the actuator until the flap synchronizes with the opposite flap, then connect the actuator to the flap.

e. Check the rigging of the wing flap control system. (Refer to FLAP CONTROL SYSTEM RIGGING.)

f. If a new or overhauled actuator is installed, lift lightly on the flap trailing edge while running the flap through a complete extend-retract cycle. There should be no roughness or evidence of binding in the actuator.

FLAP GEARBOX AND MOTOR REMOVAL

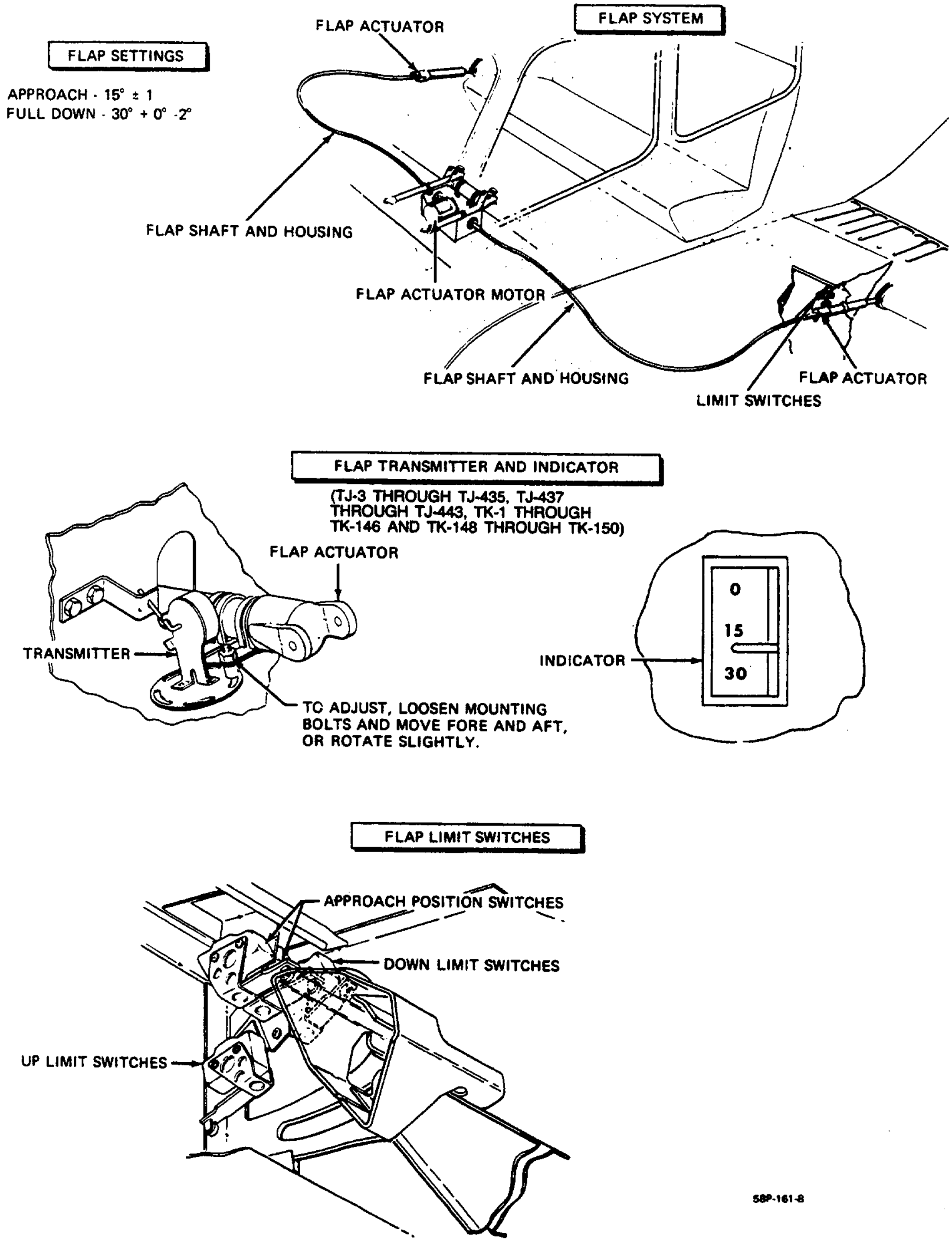
CAUTION

The flap motor used on airplane serials TJ-107 and after and TK-43 and after is NOT INTERCHANGEABLE with the flap motor used on earlier airplanes.

a. Remove the cabin front seats.

b. Remove the access cover.

c. With the flap motor control circuit breaker pulled, disconnect the electrical leads from the flap motor and identify with tags to facilitate reinstallation.



Flap System
Figure 201

d. Remove the drive shaft retainers on each side of the gearbox and disconnect both flexible drive shaft housings from the support brackets.

CAUTION

The housing of the flexible drive shaft to the flap actuator should not be twisted when removed.

e. Remove the safety wire and four retaining bolts attaching the flap gearbox and motor assembly to the support bracket.

f. Remove the flap gearbox and motor assembly from the aircraft.

FLAP GEARBOX AND MOTOR INSTALLATION

CAUTION

The flap motor used on airplane serials TJ-107 and after and TK-43 and after is NOT INTERCHANGEABLE with the flap motor used on earlier airplanes.

a. Position the flap gearbox and motor assembly against the support bracket. Align the four holes of the flap gearbox and motor assembly, support bracket and landing gear actuator support and install the four retaining bolts. Secure the bolts with safety wire.

b. Connect the flexible drive shafts to the gearbox and install the drive shaft retainers.

c. Connect both flexible drive shaft housings to the support bracket.

CAUTION

The housing of the flexible drive shaft to the flap actuator should not be twisted when installed.

d. Connect the electrical leads to the motor.

e. Install the cabin floor access panel.

f. Perform a FLAP FUNCTIONAL GROUND TEST.

"END"

FLAP DRIVE CABLE CONNECTION
Figure 202

Connect the LH and RH flap drive cables to the flap drive motor as follows, using the illustration for component locations.

a. Install the outboard nut and washer as far as it will go on the threaded portion of the flap cable.

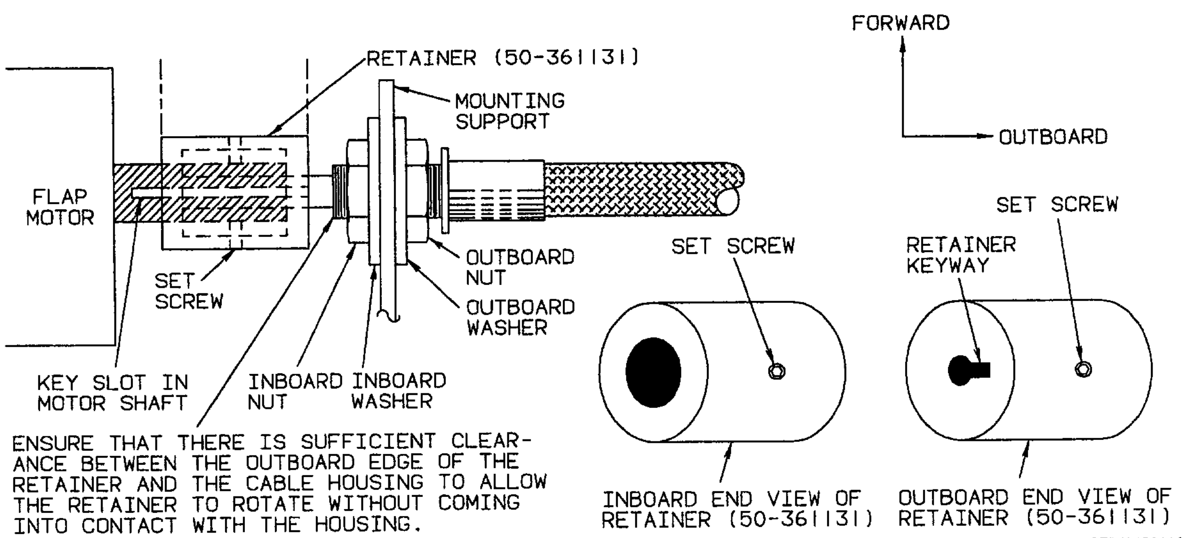
b. Insert the retainer through the mount support and onto the motor shaft as far as it will go. Align the retainer keyway with the key slot in the flap motor drive shaft and tighten one set screw temporarily.

c. While inserting the flap cable through the mount support, install the inboard washer and nut. Install the cable through the retainer and into the motor drive shaft until the keyway is just past the key slot in the retainer.

d. Loosen the set screw that was tightened in step b. Ensure that the retainer is still installed on the motor shaft as far as it will go and rotate the retainer 90°.

e. Keep inboard pressure on the retainer and tighten both retainer set screws.

f. Secure the flap drive cable to the mounting support by tightening the nuts. Tighten the inboard nut to ensure that there is sufficient clearance between the outboard edge of the retainer and the cable housing to allow the retainer to rotate without coming into contact with the cable housing. If threaded part of the cable housing is not long enough to install the two nuts and washers, using a die, add 5/8-24 UNEF threads until .88 inch threaded length is reached. Tighten the outboard nut against the mounting support.



Flap Drive Cable Connection
Figure 202

GUST LOCK AND DAMPENER - MAINTENANCE PRACTICES

If it is necessary to park the airplane outside for extended periods, install the control locks and tie down the airplane.

The control lock holds the throttles closed, the elevator 11° down and the aileron control wheel 12° right from neutral position. The throttle, elevator and aileron controls are locked by a locking pin that is inserted between the throttle levers through the control column hanger, the elevator shaft and matching holes in the aileron torque tube. A portion of the lock that is inserted between the throttle levers and through the control column hanger, prevent the throttles from being opened.

A rudder control locking pin, which joins and locks the pilot's rudder pedals, is attached to the control column lock by a cable. The pin is inserted in the holes at the top of the pilot's rudder pedal arms, where it is retained by spring tension.

CONTROL LOCK REMOVAL

NOTE

The control lock is designed to prevent damage to the control surfaces in high winds and to preclude taxiing or take-off with the control lock in place.

a. Remove the control locking pin which joins and locks the pilot's rudder pedals.

b. Remove the control lock from the elevator-aileron control and throttles.

c. Stow the control lock and preflight the airplane in accordance with the applicable Pilot's Operating Handbook.

CONTROL LOCK INSTALLATION

a. Shut-down the airplane in accordance with the applicable Pilot's Operating Handbook.

b. Close the throttles.

NOTE

Prior to installing the control lock, position the elevator in the 11° down position and the aileron 12° right from the neutral position. This is necessary to align the locking holes in the elevator control shaft and the aileron torque tube.

c. Install the control locking pin between the throttles through the control column hanger, elevator control and the aileron torque tube.

d. Route the cable and rudder lock around the right side of the control column and install the rudder lock by inserting the spring end of the lock onto the left hand pilot's rudder pedal arm. Neutralize the pedals and insert the opposite end of the locking pin in the other pedal arm by compressing the spring.

"END"

CHAPTER

28

FUEL

CHAPTER 28 - FUEL CELLS

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CHAPTER 28 - FUEL CELLS

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"END"

CHAPTER 28

LIST OF PAGE EFFECTIVITY

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	2	Nov 30/78
28-00-00	1	Jan 9/76
	2	Oct 6/83
	3	Oct 6/83
	201	Oct 6/83
28-10-00	201	Nov 30/78
	202	Apr 1/75
	203	Nov 30/78
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	205	Oct 3/75
	206	Mar 23/79
28-20-00	201	Oct 6/83
	202	Mar 23/79
	203	Mar 23/79
	204	Mar 23/79
28-40-00	201	Nov 30/76

"END"

GENERAL - DESCRIPTION AND OPERATION

FUEL CELLS

The fuel system installation consists of an inboard leading edge fuel cell, box section fuel cell and an outboard leading edge fuel cell in each wing. On airplane serials TJ-24 and after and TK-1 and after, an optional wet wing tip may be installed. The fuel cells in each wing are interconnected in order to make all of the usable fuel from each wing available to its engine when the fuel selector valve is turned ON. A fuel sight gage is provided outboard of the nacelle on the top of each wing. The interconnecting fuel cells are serviced through the single filler in each wing or the filler in each of the optional wet wing tips, providing single point filling for each side. The combined capacity of the standard system is 172 gallons, 166 gallons usable. The combined capacity of the optional system is 196 gallons, 190 usable.

FUEL CROSSFEED

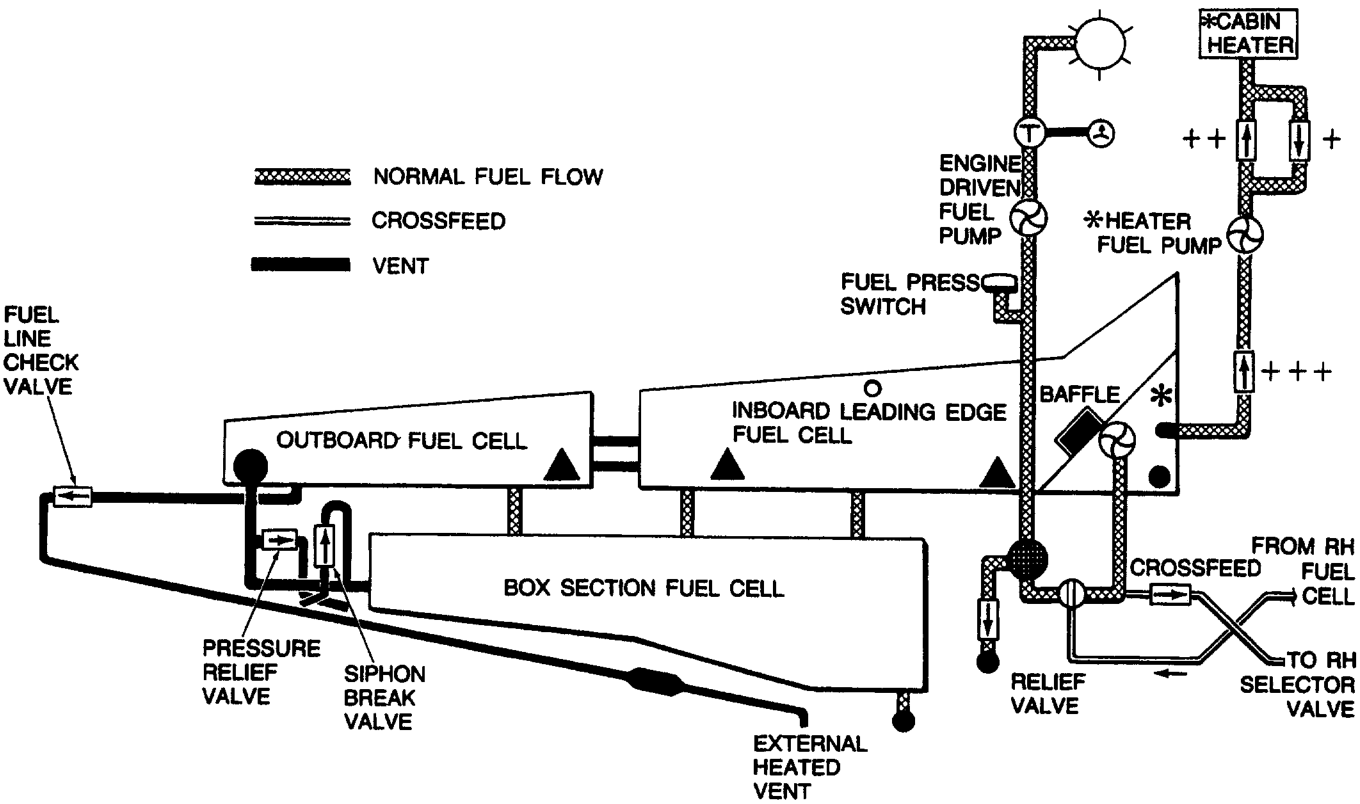
The separate identical fuel supplies for each engine are interconnected by crossfeed lines. During normal operation, each engine uses its own fuel pumps to draw fuel from its respective fuel tanks. However, on crossfeed operations, the entire usable supply of both wings can be consumed by either engine.

FUEL BOOST PUMPS

Submerged, cell-mounted fuel boost pumps are provided for each engine and are located in the inboard leading edge fuel cells. They are controlled by separate ON-OFF toggle switches on the pilot's subpanel.

FUEL CELL DRAINS

The fuel system is drained by six snap-type drains under the wings. A drain is located in each inboard leading edge fuel cell, box section fuel cell and fuel strainer.



* LEFT WING SYSTEM ONLY

FUEL STRAINER

FUEL MANIFOLD

FLAME ARRESTER

○ FUEL SIGHT GAGE (TJ-91 AND AFTER, TK-24 AND AFTER)

HEATER FUEL STRAINER

FUEL QUANTITY TRANSMITTER

FLAPPER VALVE

FUEL BOOST PUMP

FILLER CAP

\+ TJ-229 THRU TJ-301; TK-39 THRU TK-123 AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 55-5015-1S.

\+ + TJ-229 THRU TJ-301; TK-1 THRU TK-123

CHECK VALVE (ARROW INDICATES FLOW)

SELECTOR VALVE

DRAIN VALVE

FUEL FLOW TRANSMITTER/TRANSDUCER

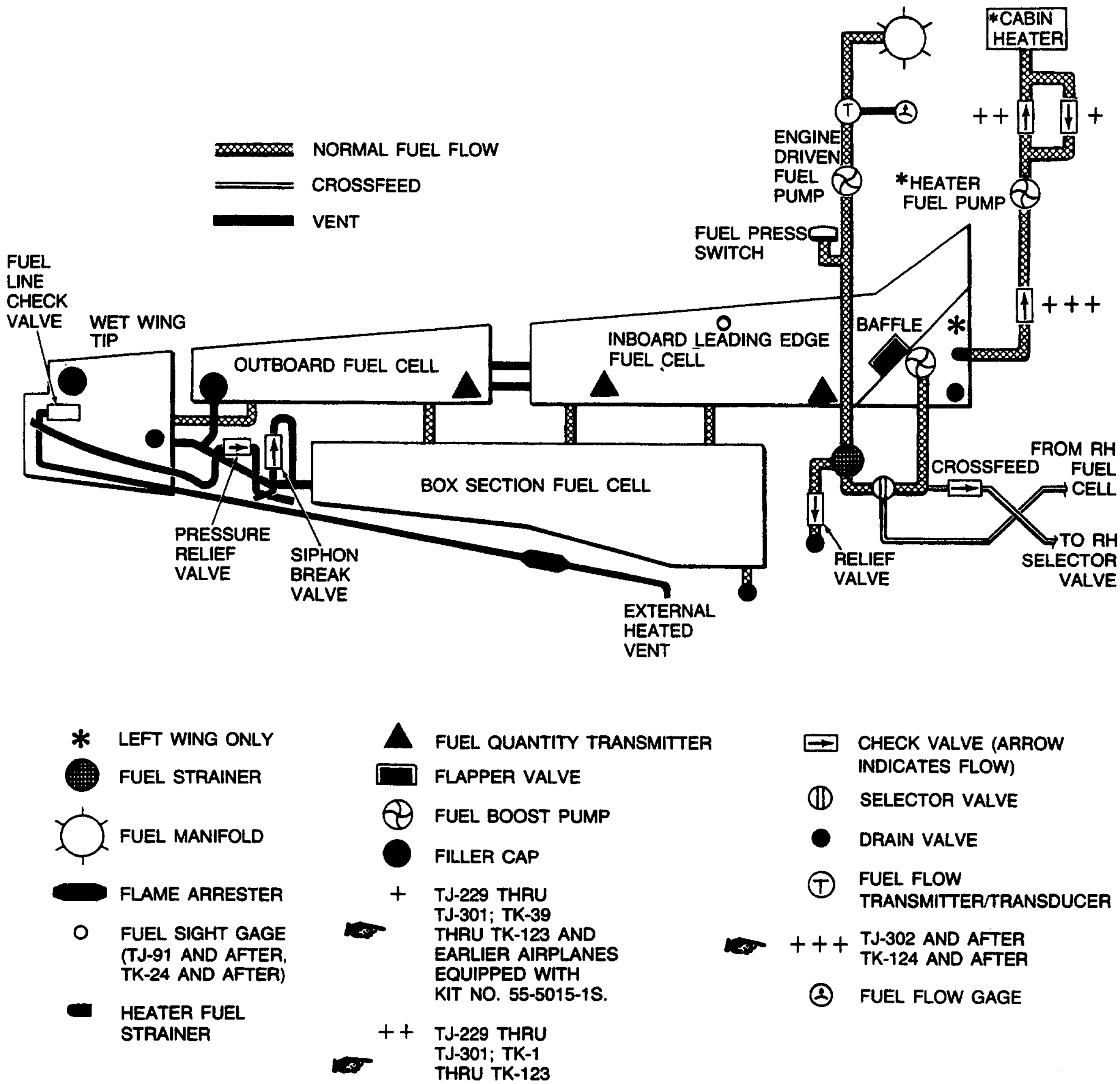
\+ + + TJ-302 AND AFTER TK-124 AND AFTER

FUEL FLOW GAGE

58P-603-55

DENOTES AREA OF CHANGE

Fuel System Schematic
Figure 1



DENOTES AREA OF CHANGE

58P-603-64

Optional Fuel System Schematic
Figure 2

"END"

GENERAL - MAINTENANCE PRACTICES

FUEL HANDLING PRACTICES

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

a. Service the fuel cells with 100/100LL octane fuel or if not available, use 115/145 octane fuel (1, Chart 207, 91-00-00).

CAUTION

When inserting or removing the fuel nozzle, use extreme care to prevent the fuel hose from rubbing against the deicer boot. Also, do not allow fuel to contact the deicer boot.

b. Make sure the airplane is statically grounded to the servicing unit.
c. Do not fill fuel cells near open flame or within 100 feet of any open energized electrical equipment capable of producing sparks.
d. Do not insert fuel nozzle more than 3 inches into the filler neck; to do so may cause damage to the rubber fuel cell.

Most fuel injection 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 strainers should be inspected and cleaned every 100 hours. 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.

Open each of the six snap-type fuel drains daily to allow condensed moisture to drain from the system.

NOTE

If the cells are to remain unfilled for 10 days or more, apply a thin coating of light engine oil to the inside surface of the cell to prevent deterioration and cracking.

AIRCRAFT DEFUELING

To ensure that all fuel is removed from the system, the fuel should be drained through the boost pumps. To expedite the defueling operation, the boost pumps may be used to pump the fuel out of the system. The following steps must be accomplished before energizing the pumps:

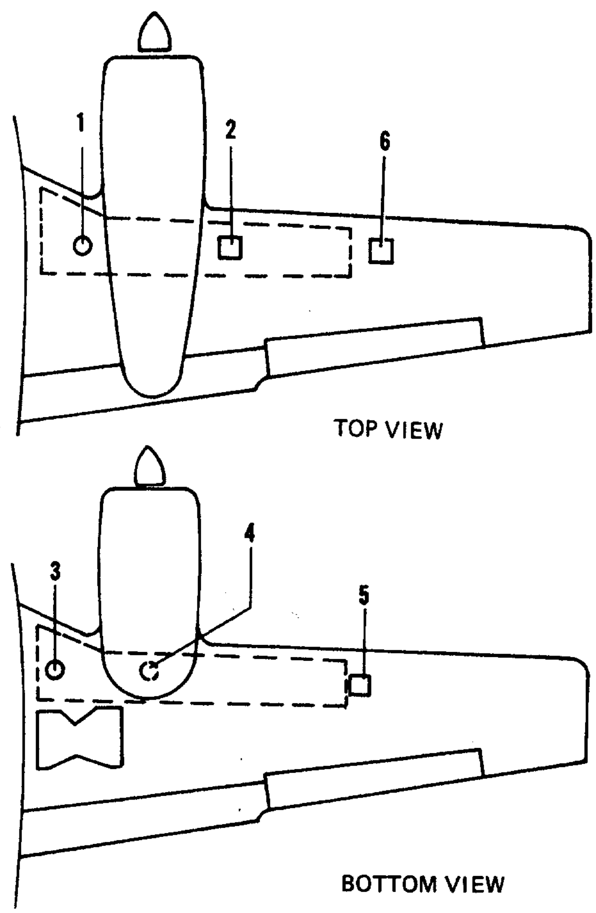
a. Apply external power to the airplane electrical system.
b. Place the fuel selector valve in the "ON" position and the mixture lever in "IDLE CUT-OFF".
c. Remove the filler caps to vent the system.
d. Disconnect the fuel line at the firewall and attach a drain hose. Provide a suitable container for the fuel.
e. Energize the boost pumps.
f. When fuel is no longer pumped from the airplane, open the sump drains to complete the defueling operation.

"END"

STORAGE - MAINTENANCE PRACTICES

INBOARD LEADING EDGE FUEL CELL REMOVAL
(Figure 201)

a. Drain and purge the fuel cell.



1. Access Plate and Transmitter
2. Fuel Cell Access and Transmitter
3. Fuel Pump
4. Fuel Cell Access Plate (Under Removable Aft Nacelle Section)
5. Fuel Cell Access Plate
6. Fuel Cell Access Plate

Inboard Leading Edge Fuel Cell Access Openings
Figure 201

b. Remove the inboard and outboard fuel transmitters. (Refer to 28-40-00.)
c. Remove the fuel boost pump. (Refer to 28-20-00.)
d. Remove the clamp and the fuel cell drain valve.

NOTE

A spacer is installed between the drain valve clamp and the fuel cell liner washer to prevent the drain valve from being pushed into the tank.

e. Remove the lower aft nacelle section and the fuel cell access plate (4).
f. Remove the internal inboard interconnect clamp.
g. Remove the outboard internal interconnect clamp through the fuel access opening (2).
h. Remove the fuel access plate (5).
i. Disconnect all fuel and vent plumbing.
j. Remove screws and bolts attaching the fuel cell outlet plate to the fuel cell.
k. Unsnap the fuel cell and remove the cell through the fuel access opening (2).

NOTE

Tape edge of fuel cell liner and access opening to prevent damage to the fuel cell.

NOTE

If the fuel cell is to be stored for a period of 10 days or longer, coat the inside of the cell with light engine oil to prevent cracking or deterioration.

INBOARD LEADING EDGE FUEL CELL INSTALLATION

CAUTION

Cell-cavities must be clean and free of any debris before installing a replacement cell.

NOTE

In cold weather, expose the fuel cell to a temperature of at least 60°F for a sufficient period of time to ensure flexibility during installation.

CAUTION

Exercise caution when installing baffled fuel cells to prevent damage to the flapper valve.

a. Carefully insert the fuel cell through the fuel cell access opening (2) and snap the cell in place.
b. Install the fuel cell outlet plate with screws and

bolts. Torque to 20 to 30 inch-pounds. Safety wire the bolts.

c. Connect all fuel and vent plumbing. Torque the rubber fuel fitting nipples to 25 ± 5 inch-pounds.

d. Install the outboard internal interconnect clamp through fuel access opening (2).

NOTE

Torque interconnect clamps to 25 ± 5 inch-pounds.

e. Install the inboard internal interconnect clamp.

f. Install the fuel cell access plate (4). Torque to 45 to 55 inch-pounds and safety wire.

g. Install the lower aft nacelle section.

h. Install the fuel cell drain valve and clamp.

i. Install the fuel boost pump. (Refer to 28-20-00.)

j. Install the inboard and outboard fuel transmitters. (Refer to 28-40-00.)

INBOARD LEADING EDGE BAFFLED FUEL CELL - FLAPPER VALVE INSPECTION

The airplane is equipped with baffled fuel cells. The flapper valves should be inspected periodically for freedom of operation and proper seating (Beech Aircraft recommends that the inspection be accomplished at each annual inspection). The inspection may be accomplished as follows:

a. Remove the fuel boost pump (refer to 28-20-00).

b. Open the zipper in the fuel cell baffle.

c. Locate the flapper valve in the lower aft portion of the baffle.

d. Move the flapper valve element through its full travel. There should be no binding and the element should seat flush against the valve plate.

e. If the flapper valve element binds and/or does not seat properly, the upper rear side of the element may be binding against the valve plate.

f. The flapper valve element may be relieved from binding by filing a small radius on the upper rear side of the element.

NOTE

A shop towel saturated with light oil may be placed directly below the flapper valve to absorb the phenolic dust during rework.

g. After determining that the flapper valve is functioning properly, thoroughly wipe the area in the vicinity of the flapper valve with an oil saturated shop towel.

h. Close the zipper in the main fuel cell baffle.

i. Clean the gasket contact areas on the fuel cell and the fuel boost pump.

j. Install the fuel boost pump (refer to 28-20-00).

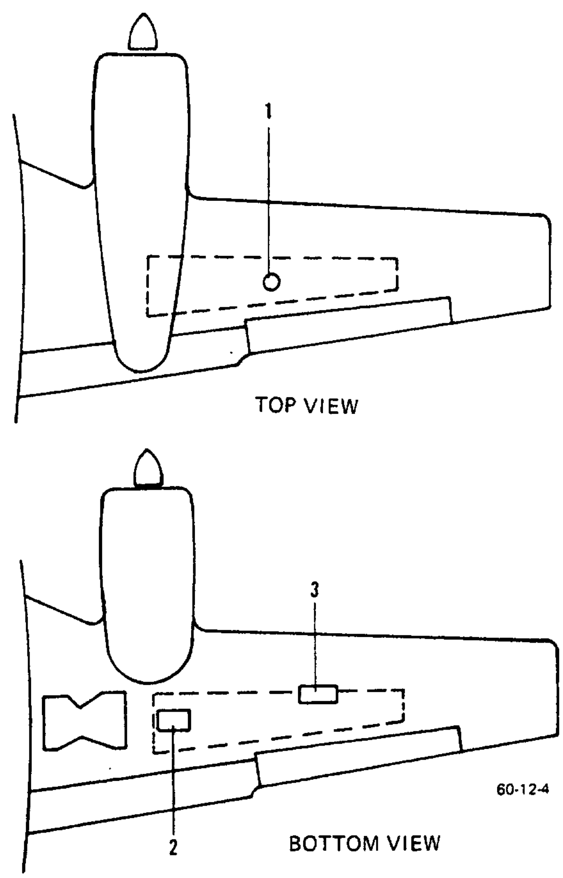
BOX SECTION FUEL CELL REMOVAL

(Figure 202)

a. Drain and purge the fuel cell.

b. Remove the access plate (1).

c. Remove the inboard (2) and outboard (3) access



1. Access Plate
2. Box Section Cell Inboard Access
3. Box Section Cell Outboard Access

Box Section Fuel Cell Access Openings
Figure 202

plates on the underside of the wing.

d. Remove the fuel cell plates and remove the internal fuel cell interconnect clamps.

NOTE

Beaded interconnects are incorporated in the fuel system so that fuel cells aft of the main spar can be attached without opening the leading edge cavities.

e. Disconnect the drain and vent plumbing.

f. Unsnap the fuel cell and remove it from the wing cavity through the outboard access opening (3).

NOTE

If the fuel cell is to be stored for a period of 10 days or longer, coat the inside of the cell with light engine oil to prevent cracking or deterioration.

BOX SECTION FUEL CELL INSTALLATION

CAUTION

Cell-cavities must be clean and free of any debris before installing a replacement cell.

NOTE

In cold weather, expose the fuel cell to a temperature of at least 60°F for a sufficient period of time to ensure flexibility during installation.

a. Carefully insert the fuel cell into the wing cavity through the outboard access opening (3), and snap in place.

b. Connect all fuel and vent plumbing. Torque the rubber fuel fitting nipples to 25 ± 5 inch-pounds.

c. Install the internal fuel cell interconnect clamps. Torque clamps to 25 ± 5 inch-pounds.

d. Install the inboard (2) and outboard (3) access plates on the underside of the wing. Torque access plate screws to 45 to 55 inch-pounds.

e. Install access plate (1).

OUTBOARD LEADING EDGE FUEL CELL REMOVAL (Figure 203)

a. Drain and purge the fuel cell.

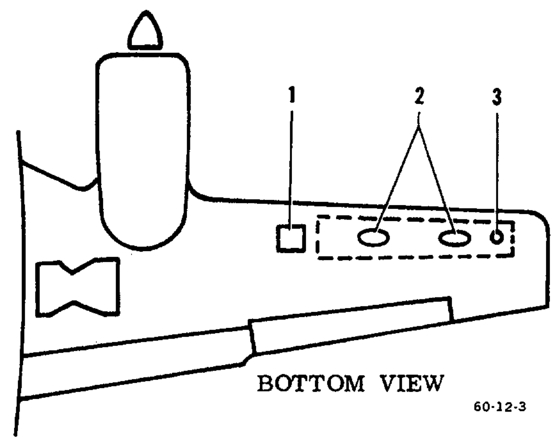
b. Remove filler neck access plate (3) and remove filler neck.

c. Remove the fuel cell access plates (2) and the fuel and vent plumbing access plate (1) on the underside of the wing.

d. Disconnect the fuel and vent plumbing.

e. Remove the internal fuel cell interconnect clamps.

f. Unsnap the fuel cell and remove it from the wing cavity through one of the access openings (2).



1. Fuel Plumbing Access
2. Fuel Cell Access
3. Filler Neck

Outboard Leading Edge Fuel Cell Access Openings
Figure 203

NOTE

Tape the edge of the access hole to protect the fuel cell during removal and installation. If the fuel cell is to be stored for a period of 10 days or longer, coat the inside of the cell with light engine oil to prevent cracking or deterioration.

OUTBOARD LEADING EDGE FUEL CELL INSTALLATION

CAUTION

Cell-cavities must be clean and free of any debris before installing a replacement cell.

NOTE

In cold weather, expose the fuel cell to a temperature of at least 60°F for a sufficient period of time to ensure flexibility during installation.

A new outboard leading edge fuel cell replacement contains an internal nipple which is covered by a web which is integral with the cell. Locate the nipple (12.12 inches inboard of the outboard end, on the aft side) and carefully cut out the web prior to installation.

a. Carefully insert the fuel cell into the wing cavity through access openings (2) and snap in place.

b. Connect all fuel and vent plumbing. Torque the rubber fuel fitting nipples to 25 ± 5 inch-pounds.

c. Install the internal fuel cell interconnect clamps. Torque clamps to 25 ± 5 inch-pounds.

d. Install the access plates (2) and plumbing access plate (1) on the under side of the wing. Torque the access plate screws to 45 to 55 inch- pounds.

e. Install filler neck and install filler access plate (3).

NOTE

Use sealer (3, Chart 205, 91-00-00) between the skin and the adapter flange when installing the filler neck.

WET WING TIP REMOVAL

a. Disconnect external power from the airplane. Place battery switches in the off position.

b. Defuel the airplane, to the point where fuel can not be seen from the inboard filler position.

c. Remove access plates from the outboard lower wing.

d. Remove deice boot from wing tip leading edge (if installed). (Refer to Chapter 30.)

e. Working through the access opening in the under side of the wing, loosen the clamps on the 3-inch fuel interconnect and vent lines.

f. Disconnect the electrical connections.

g. Support the wing tip. Using a 1/8-inch drill bit, drill out rivets along the connecting strap and remove the strap.

h. Remove the support angle screws at the juncture of the wing tip and wing front and rear spars. Remove the wing tip.

WET WING TIP INSTALLATION

a. Disconnect external power from the airplane. Place battery switches in the off position.

CAUTION

Support the wing tip on a platform which will give firm support but will allow some flexibility of movement of the wing tip to facilitate proper alignment. Protect the wing tip surface from scratches, dent and other damage during installation.

b. Support the wing tip in the proper position to attach to the wing. Connect the hoses from the wing to the 3-inch fuel interconnect and vent lines. Secure with clamps.

c. Connect electrical connections.

d. Move wing tip into position and secure support angles to the front and rear spars with screws.

e. Using MS20426AD3 rivets, rivet the connecting strap to both the wing and wing tip.

f. Install the deicer boots (if equipped). (Refer to Chapter 30.)

g. Install and secure access plates.

h. Pressurize the fuel system using 0.50 + 0.25 -0.00 psig. There should be no pressure loss in 15 minutes.

i. Fuel and restore electrical power to the airplane as required.

WET WING TIP LEAK TEST

CAUTION

Do not perform this test with the wing tip installed on the airplane.

a. Ensure that all repairs to the wet wing tip are completed and sealed.

b. Plug all possible outlets.

c. Connect a clean compressed and/or filtered air pressure source to the wing tip.

d. Apply 3.73 ± 0.25 psig to the wing tip. This pressure shall be maintained for 5 minutes.

e. If 3.73 ± 0.25 psig is not maintained for 5 minutes, maintain 3.73 ± 0.25 and apply leak detector compound MIL-L-25567 (14, Chart 207, 91-00-00) to the outside of the wet wing tip.

f. Mark all leaks as indicated by bubbles.

g. Depressurize the wet wing tip, locate and repair leaks. (See Figure 204.)

h. Repeat the pressurization test procedure and repair leaks until there is no leakage.

i. Rinse leak detector compound off wet wing tip with clean water and wipe dry with clean cloths.

j. Install wet wing tip on airplane per WET WING TIP INSTALLATION.

FUEL CELL LEAKAGE CHECK

Although the chemical test is more sensitive, either of the following test procedures may be used to detect leaks in the bladder cells.

a. Soapsuds Test.

1. Attach test plates to all fittings.
2. Inflate the cell with air to a pressure of 1/4 psi maximum.
3. Apply a soap and water solution to all repaired areas and any areas suspected of leakage. Bubbles will appear at any point where leakage occurs.

NOTE

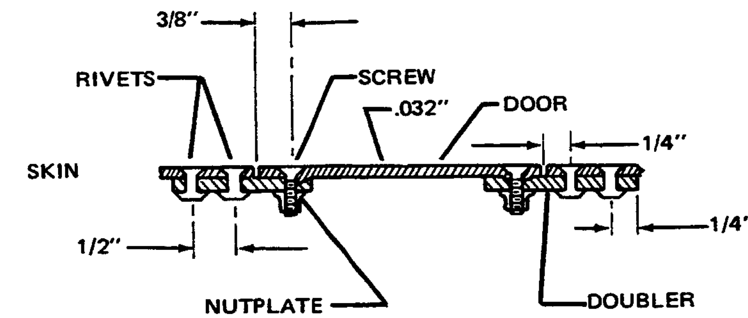
Repair of the wet wing tip is permissible providing the damaged area is far enough from the rib to allow a doubler or plate to be installed. Holes cut to remove damaged area must be round or at least have generous radii. Should a stringer be damaged or fall within the repair area it must be bridged across and be attached to the repair.

CAUTION

It must be realized the wet wing tip is a highly stressed area; consequently, the repair structure must be of equal capability.

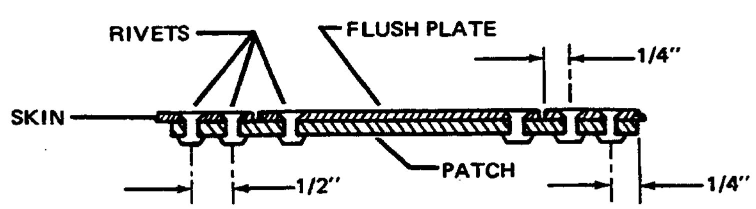
GENERAL INSTRUCTIONS

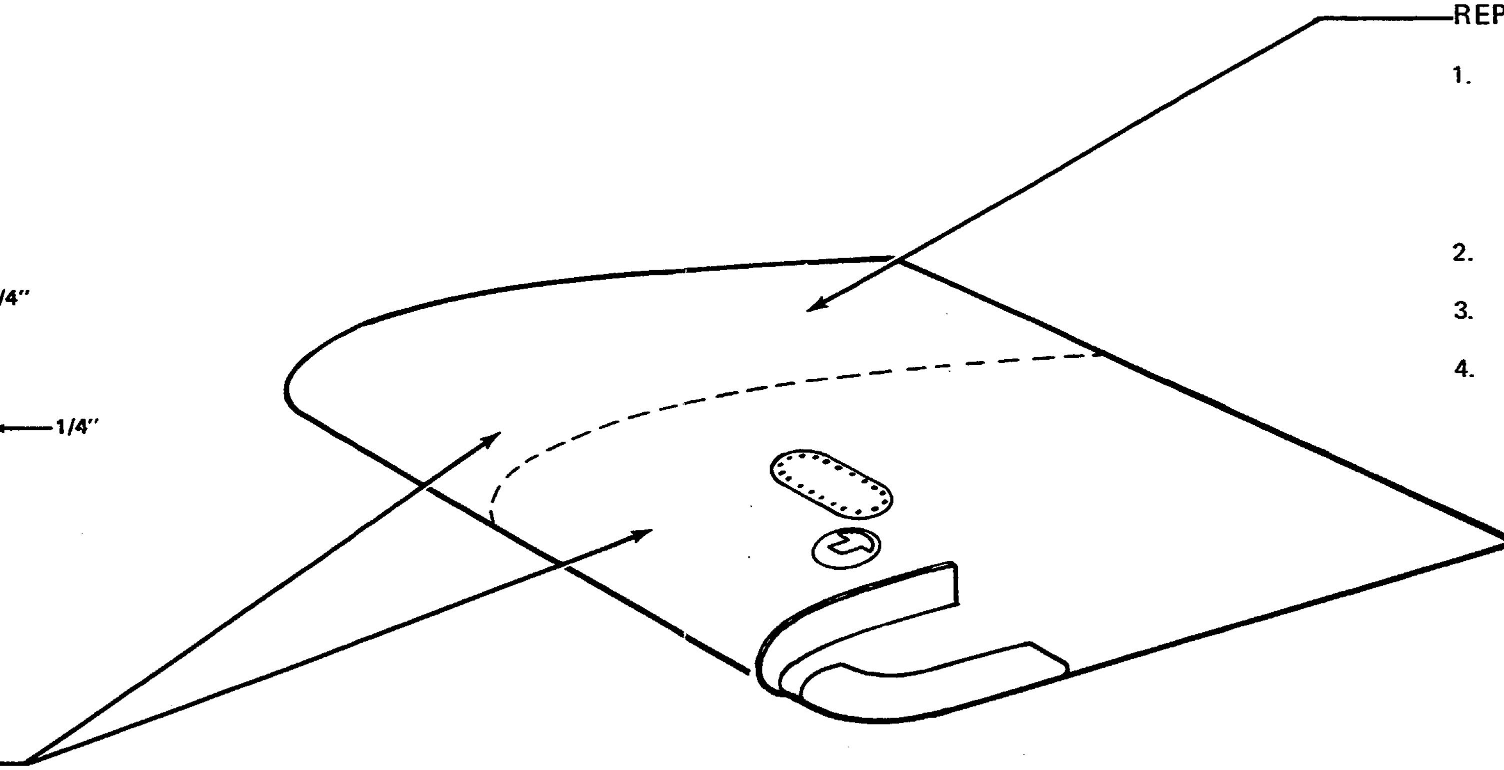
1. Seal edges of doubler or plate, rivet butts and nut plates with PR890 B-1/2 (13, Chart 205, 91-00-00) or ED 1675 B-1/2 (14, Chart 205, 91-00-00).
2. Fill the rivet heads, screw heads and the patch/skin joints with PR890 B-1/2 (13, Chart 205, 91-00-00) or EC 1675 B-1/2 (14, Chart 205, 91-00-00), sand smooth and refinish.
3. Pressure test (0.50 + 0.25 – 0.00 psig) before applying filler to outer surface.



REPAIR OF INACCESSIBLE AREAS

1. Door material – 0.32 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.
2. Two rows rivets in doubler and skin – 1/4" E.D., 1/2" spacing 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.





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.

58P-608-1

Minor Wet Wing Tip Repair
Figure 204

4. After test, remove all plates and wipe soap residue from the exterior of the cell.

b. Chemical Test

1. Attach test plates to all fitting openings except one.
2. Pour ammonia on the absorbent cloth in the ratio of 3 cc per cubic foot of cell capacity. Place the saturated cloth inside the cell and install the remaining test plate.
3. Make up a phenolphthalein solution as follows: add 40 grams phenolphthalein crystals to 1/2 gallon of ethyl alcohol, mix, then add 1/2 gallon of water.
4. Inflate the cell with air to a pressure of 1/4 psi maximum.
5. Soak a large white cloth in the phenolphthalein solution, then wring it out thoroughly and spread it smoothly on the outer surface of the cell. Press the cloth down to ensure detection of minute leaks.
6. Check the cloth for red spots which will indicate a leak. Mark any leaks found and move the cloth to a new location. Repeat this procedure until the entire exterior surface of the cell has been covered. If red spots appear on the cloth, they may be removed by resoaking the cloth in the solution.
7. The solution and test cloth are satisfactory only as long as they remain clean. Indicator solution that is not in immediate use should be stored in a closed container to prevent evaporation and deterioration.

After the test, remove all plates and test equipment. Allow the cell to air out.

NOTE

In conducting the tests outlined above, the cell need not be confined by a cage or jig, providing the 1/4 psi pressure is not exceeded.

FUEL CELL REPAIR

GOODYEAR FUEL CELLS

For repairs of Goodyear fuel cells, refer to Goodyear Fuel Cell Repair Manual AP-368, Vithane Fuel Cells.

UNIROYAL FUEL CELLS

For repair of Uniroyal fuel cells, refer to Uniroyal Handbook "Recommended Handling and Storage Procedures for Bladder Type Fuel and Oil Cells P/N FC1473-73".

"END"

DISTRIBUTION - MAINTENANCE PRACTICES

FUEL BOOST PUMP REMOVAL

a. Drain and purge the fuel system for the appropriate wing.

b. Make sure the electrical power to the boost pump is off.

c. Remove the pump access cover on the underside of the wing.

d. Disconnect the electrical leads to the pump.

e. Cut the safety wire from around the retaining bolts and remove the bolts.

f. Pull the pump down far enough to gain access to the pump outlet line.

g. Disconnect the outlet line and remove the pump.

FUEL BOOST PUMP INSTALLATION

a. Clean the gasket contact areas on the fuel cell and the fuel pump.

b. Connect the fuel outlet line to the fuel boost pump.

c. Using new gaskets, install the boost pump with the arrow on the base of the pump aligned with the decal located on the pump mounting bracket (see Figure 201). Torque the bolts to 45 to 55 inch-pounds and install safety wire.

d. Connect electrical leads to the pump.

e. Install the pump access plate on the underside of the wing.

ENGINE DRIVEN FUEL PUMP REMOVAL

a. Access to the engine-driven fuel pump is gained by removing the upper cowl.

b. The fuel pump is located at the rear, on the lower right side of the engine.

c. Disconnect the fuel inlet, fuel outlet, and drain plumbing from the pump. Remove the fuel pump heat shield.

d. Remove the pump retaining nuts and remove the pump.

ENGINE DRIVEN FUEL PUMP INSTALLATION

a. Install the fuel pump with arrow pointing aft to align with arrow on engine.

b. Connect fuel inlet, fuel outlet, and drain plumbing on the pump.

c. Install the fuel pump heat shield.

d. Install upper cowl.

ENGINE DRIVEN FUEL PUMP ADJUSTMENT

a. The fuel pump is located at the rear, on the lower right side of the engine. Access is gained by removing top cowl.

b. Install a fuel pressure gage capable of registering in excess of 55 psi, and a "T" fitting on the end of the fuel line running out from the fuel pump to the fuel servo.

c. Loosen the locknut of the adjusting screw located at the rear of the fuel pump.

d. Operate the engine with the boost pump off at 2600 rpm and set the adjusting screw on the fuel pump so that a reading of 45-55 psi is obtained.

e. Tighten the locknut on the adjusting screw.

f. Remove the fuel pressure gage and reinstall the fuel line on the fuel servo.

NOTE

The engine is equipped with a Bendix Fuel Injection System. The actual idle mixture adjustment is made by the lengthening (richening) or shortening (leaning) of the linkage between throttle lever and idle valve lever. When the linkage is adjusted to a longer length, a richer mixture is provided. When the linkage is shortened, a leaner mixture is provided. When the linkage is shortened, a leaner mixture is provided. In the event that the linkage must be removed to readjust the length, the idle valve screw should be loosened and the idle valve assembly pulled out slightly. This will prevent bending of the linkage stud by providing clearance between the body casting and lever. For detailed information, see the Bendix RSA-7A1 Manual, Form 15-596.

FUEL SELECTOR VALVE REMOVAL

a. Drain the fuel system.

b. Place the aircraft on jacks and partially retract the gear until the inboard main gear door is fully extended.

c. Remove the selector control cable. (Refer to FUEL SELECTOR VALVE CONTROL CABLE REMOVAL.)

d. Remove the fuel selector valve plumbing.

e. Remove the bolts securing the selector valve to the mounting bracket.

FUEL SELECTOR VALVE INSTALLATION

a. Position selector valve on the mounting bracket and install attaching bolts.

b. Lubricate threaded fittings with VV-P-236 petrolatum (Chart 208, 91-00-00).

c. Connect the fuel selector plumbing.

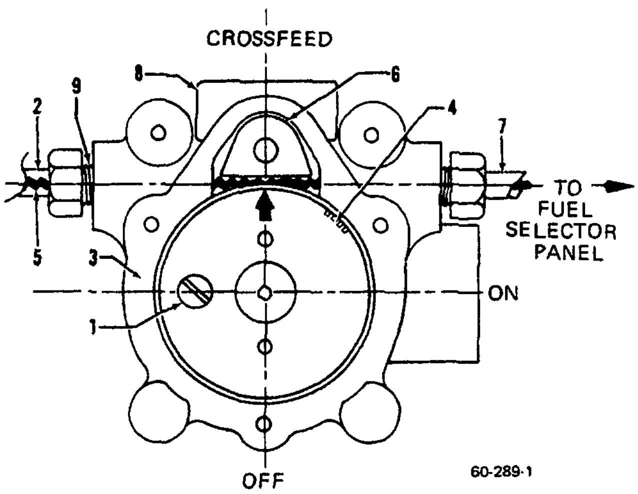
d. Install the selector control cable. (Refer to FUEL SELECTOR VALVE CONTROL CABLE INSTALLATION.)

e. Rig the selector control cable. (Refer to FUEL SELECTOR VALVE CONTROL CABLE RIGGING.)

FUEL SELECTOR VALVE CONTROL CABLE REMOVAL
(Figure 201)

a. Remove the cover plate (not shown), stop screw (1) and overtravel tube (2) from the valve gearbox (3) located in the wheel well.

b. The cable may be removed through the overtravel port by rotating the selector gear.



FUEL SELECTOR VALVE
(L. H. Shown, Cover Plate Removed)

1. Stop Screw
2. Over Travel Tube
3. Selector Valve Gearbox
4. Selector Gear
5. Control Cable
6. Slider
7. Cable Housing
8. Cross Feed Port
9. Over Travel Port

Fuel Selector Valve
Figure 201

FUEL SELECTOR VALVE CONTROL CABLE INSTALLATION

Refer to FUEL SELECTOR VALVE CONTROL CABLE RIGGING for installation procedures.

FUEL SELECTOR VALVE CONTROL CABLE RIGGING
(Figure 201 and 202)

To aid in the rigging procedure, a locally manufactured "rigging tool" (see Figure 202) may be constructed for turning the selector gear. Tubing of 1/4 to 3/8 inch diameter is used for the handle and 1/8 inch steel pins are used for the protrusions which contact the selector gear.

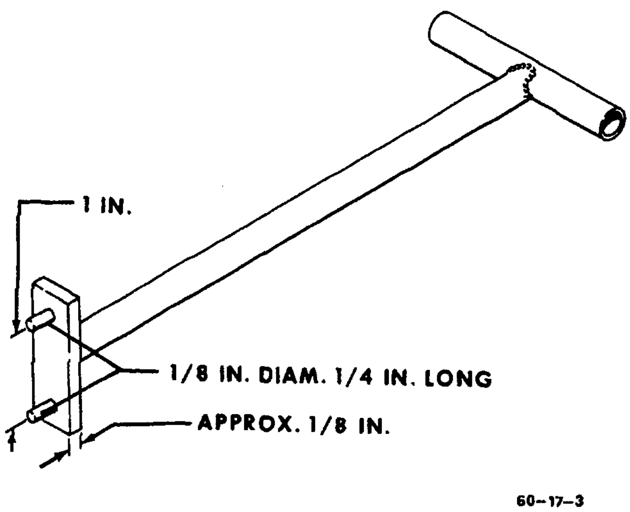
a. Remove the cover plate (not shown), stop screw (1) and overtravel tube (2) from the fuel selector valve gearbox (3) located in the wheel well. (See Figure 201.)

b. Using the rigging tool, set the selector gear (4) in the CROSSFEED position. The arrow on the selector gear should be positioned at the 12 o'clock position.

c. Set the selector handle pointer on the fuel selector panel 180° from the ON position and hold firmly in this position.

d. Insert the control cable (5) through the overtravel port and rotate the cable (LH thread) to engage two threads in the selector valve gear.

e. Rotate the selector gear 6-3/4 revolutions to feed the control cable through its housing up to the fuel selector panel gearbox in the pilot's compartment.



Rigging Tool
Figure 202

f. Screw the cable in (LH thread) until the cable end is 4.3 inches minimum to 4.5 inches maximum from the face of the overtravel port. It will be necessary to have someone hold the selector handle pointer in position until the control cable is engaged with the gears in the fuel selector panel.

g. Move the fuel selector handle pointer to the CROSSFEED position. The arrow on the selector gear should now be at the 12 o'clock position. The cable end should measure 2.7 inches minimum to 3.3 inches maximum from the overtravel port.

h. Install the stop screw and install and safety the overtravel tube. Place the selector handle in all positions to insure proper selection and operation.

i. Install and safety the cover plate. No lubricant is used on the fuel selector valve.

VENT LINE CHECK VALVE REMOVAL

a. Remove the two access plates on the lower side of the wing tip.

b. Loosen the clamps and disconnect the three vent lines from the check valve.

c. Loosen the clamp securing the check valve in position.

NOTE

Mark the position of the check valve in the clamp. The check valve must be reinstalled in the same position to enable the float to function properly.

d. Remove the check valve from the clamp.

VENT LINE CHECK VALVE INSTALLATION

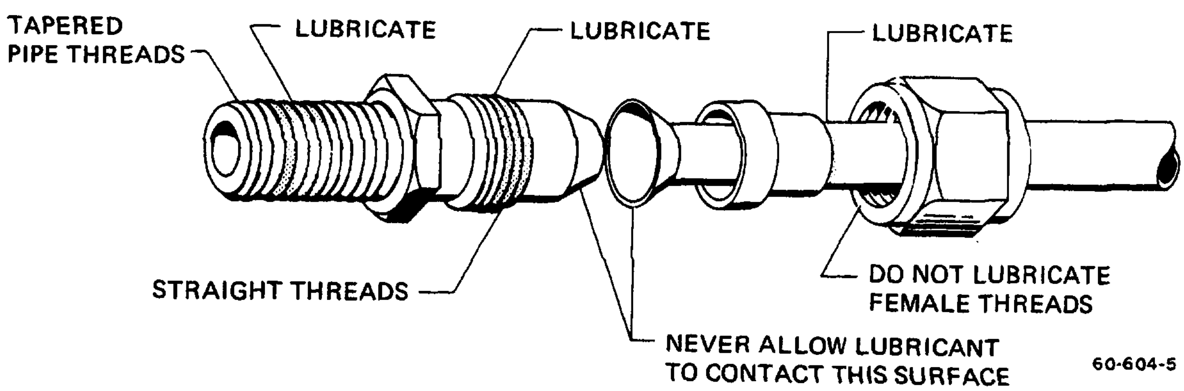
a. Position the check valve in the clamp in the same position as noted during removal. Torque the clamp to 25 ± 5 inch-pounds.

b. Connect the three vent lines to the check valve and torque the hose clamps to 25 ± 5 inch-pounds.

c. Install the two access plates on the lower side of the wing tip.

FLARED FITTINGS
(Figure 203)

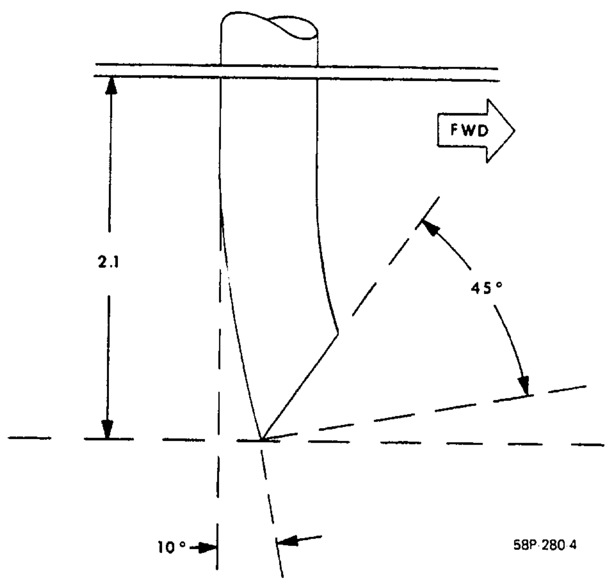
When installing flared fittings and hoses, make sure the threads are properly lubricated with VV-P-236 petrolatum (Chart 208, 91-00-00). When previously installed fittings are removed, they should be wiped clean and relubricated before they are reinstalled. Torque all fittings in accordance with (Chart 204, 91-00-00).



Lubrication of Flared Fittings
Figure 203

EXTERNAL FUEL CELL VENT LINE
(Figure 204)

The end of the fuel vent lines should extend 10 degrees forward from vertical for a distance of 2.1 inches below the lower surface of the wing. The end of the line is scarfed at a 45 degree angle facing forward to ensure a positive vent pressure. Any other configuration would create a negative pressure that would pull the air, or air and fuel from the fuel cell.



Fuel Vent Line
Figure 204

"END"

INDICATING - MAINTENANCE PRACTICES

FUEL QUANTITY INDICATORS

Fuel quantity is measured by float type transmitter units which transmit the common level indication to a single indicator for each respective wing. Two transmitters are located in each inboard leading edge wing cell, one outboard and one inboard. One transmitter is located in each outboard fuel cell.

FUEL TRANSMITTER REMOVAL

a. Remove fuel cell access plate. (See Figure 201 or 202, 28-10-00.)

b. Disconnect electrical wire at the transmitter.

c. Remove the bolts attaching the fuel transmitter to the fuel cell.

d. Cover the open fuel cell port to prevent entry of foreign materials.

FUEL TRANSMITTER INSTALLATION

a. Remove the cover from the fuel cell port. Clean the surfaces of the fuel cell and transmitter.

b. Install the fuel transmitter with a new gasket. Torque the attaching bolts to 25 ± 5 inch-pounds and safety wire.

c. Connect the electrical wire to the transmitter.

d. Install the fuel cell access plate.

"END"

CHAPTER

30

ICE AND RAIN PROTECTION

CHAPTER 30 - ICE AND RAIN PROTECTION

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"END"

ICE AND RAIN PROTECTION DESCRIPTION AND OPERATION

The airplane is equipped with heated pitot, heated stall warning, and heated fuel vents for ice protection equipment. In addition, an alternate static air source backs up the fuselage mounted static air source buttons. Other icing equipment offered includes: pneumatically operated surface deice boots, electrically heated propellers, windshield segment anti-ice, and automatic alternate engine air source.

"END"

AIRFOIL - DESCRIPTION AND OPERATION (Figures 1 and 2)

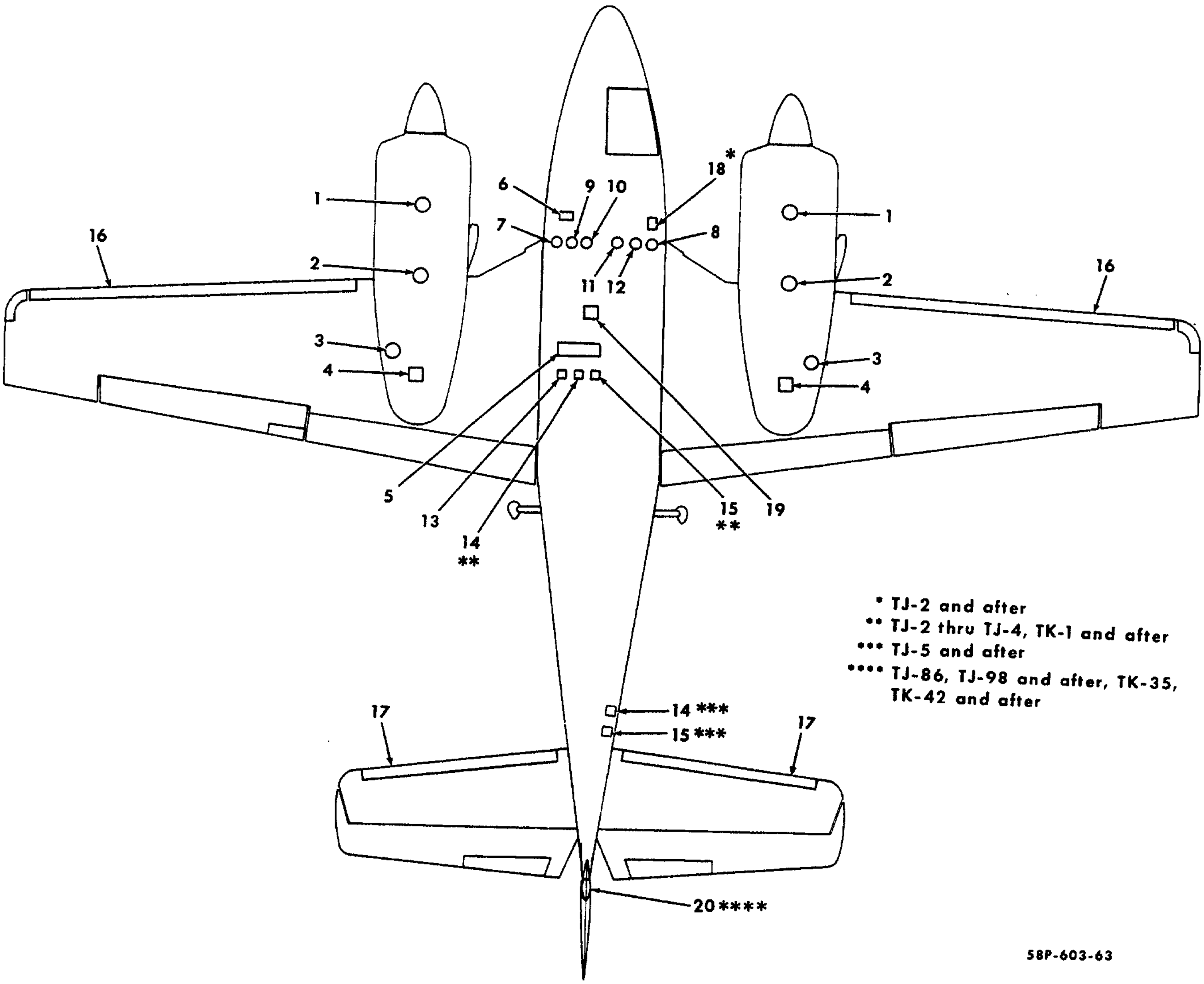
Deice boots on the wings and horizontal stabilizer are operated by engine-driven pump pressure. Airplanes TJ-86, TJ-98 and after, TK-35, and TK-42 and after are also equipped with a vertical stabilizer deice boot. Compressed air, after passing through the pressure regulators, goes to the distributor manifold. When the deice system is not in operation, a deice valve applies vacuum to the boots to deflate and hold the boots flat against the surface. Then, when the deice system is operated, the deice valve changes from vacuum to pressure and the boots inflate. After the cycle is completed the valve returns to vacuum hold down.

A three-position, spring-loaded switch, with a center OFF position, a down MAN position, and an up CYCLE position, controls the system. When the switch is in the CYCLE position, the deice boots inflate until a predetermined pressure is reached, then deflate automatically and return to the vacuum hold-down condition. The switch must be tripped for each complete cycle.

The pressure switch is set to provide 17 psi air supply to the deicer system. When the control switch is placed in the CYCLE position, the pressure switch sends an electrical signal to the dual pressure relief valves, located in each nacelle. The dual pressure relief valves then release more air into the system. The pressure relief valve provides a safety feature for the system. When air passing through this pressure relief valve reaches 19 psi, the pressure relief valve dumps the pressure from the system.

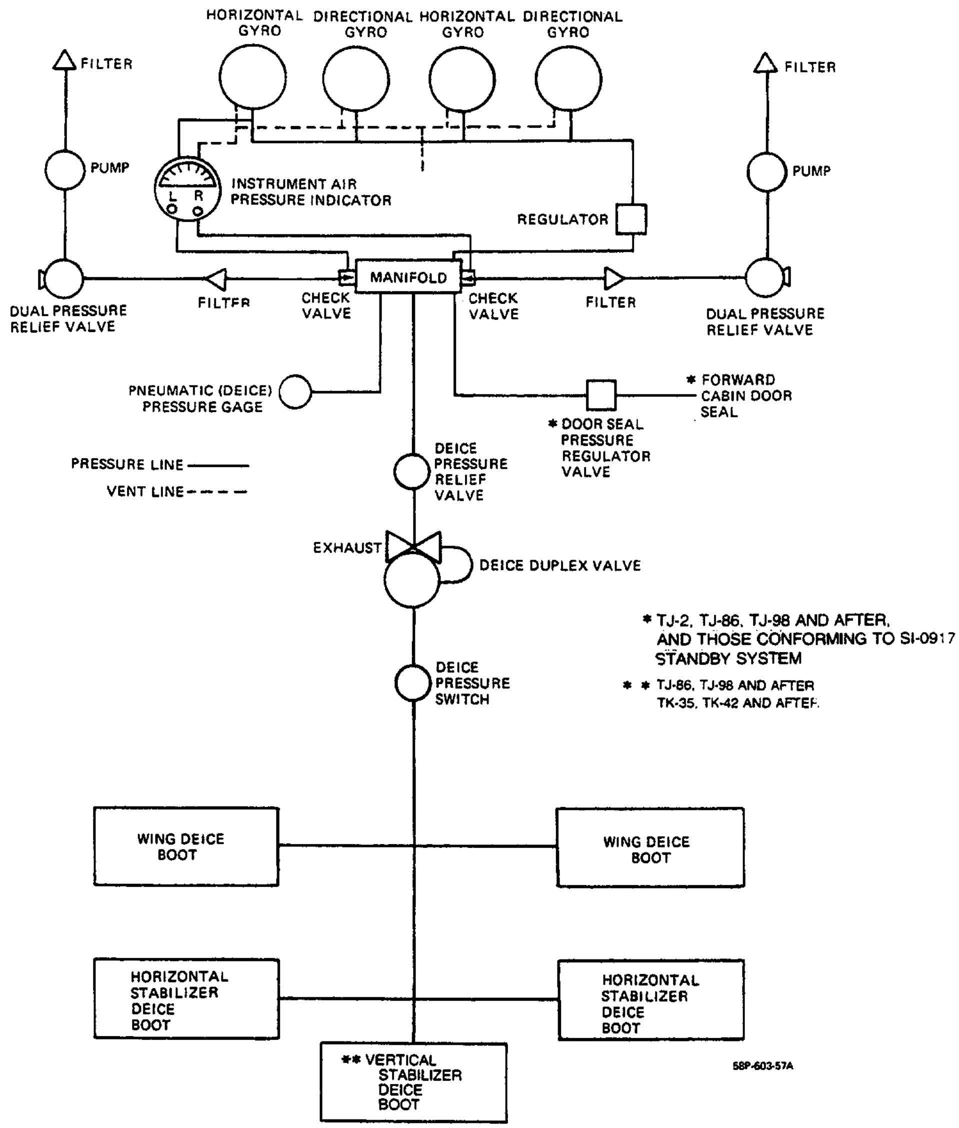
Deice boots are intended to remove ice after it has accumulated, rather than prevent its formation. If the rate of ice accumulation is slow, best results are obtained by leaving the system off until 1/2 to 1 inch of ice accumulates. Bridging can occur if the boots are actuated too early or too frequently.

A wing ice light, used to check for ice accumulation during night operation, is located on the outboard side of the left nacelle. The light switch is on the pilots subpanel.



1. Filter
2. Pressure Pump
3. Dual Pressure Relief Valve
4. Filter
5. Pressure Mainfold
6. Instrument Air Pressure Regulator
7. Instrument Air Pressure Gage
8. Pneumatic (Deice) Pressure Gage
9. Gyro Horizon
10. Directional Gyro
11. Gyro Horizon
12. Directional Gyro
13. Pressure Relief Valve
14. Deice Duplex Valve
15. Pressure Switch
16. Wing Deice Boot
17. Horizontal Stabilizer Deice Boot
18. Door Seal Pressure Regulator Valve
19. Deice Control
20. Vertical Stabilizer Deice Boot

Deice System Component Location
Figure 1



Airfoil Deice System Schematic
Figure 2

"END"

CHART 1
TROUBLESHOOTING AIRFOIL DEICER SYSTEM

The following troubleshooting procedures are based on the assumption that the engine-driven dry air pumps are operational.

TROUBLE	PROBABLE CAUSE	REMARKS
1. Deicer boots do not inflate (either or both engines operating at a minimum cruise RPM for a period of eight seconds).	a. Open circuit breaker.	a. Push deicer circuit breaker to reset.
	b. Loose electrical connection or broken wire.	b. Tighten or repair as required.
	c. Deice controller not functioning.	c. Replace deice controller.
	d. Pressure switch not functioning.	d. Replace pressure switch.
	e. Deicer boot punctured.	e. Repair as described in this chapter or replace.
	f. Deice duplex valve not functioning.	f. See steps 4 and 5.
	g. Piping lines kinked, blocked, or not connected.	g. Inspect and repair or replace as required.
	h. Leak in system.	h. Locate and repair.
2. Deicer boots inflate too slowly (either or both engines operating at minimum cruise RPM for a period of eight seconds).	a. Piping lines kinked, partially blocked, or not securely connected.	a. Inspect and repair or replace as required.
	b. Leak in system.	b. Locate and repair.
	c. Deicer boot punctured.	c. Repair as described in this chapter or replace.
	d. Deice duplex valve	d. See steps 4 and 5.

CHART 1
TROUBLESHOOTING AIRFOIL DEICER SYSTEM (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
3. Deicer boots deflate too slowly.	a. Piping lines kinked, partially blocked, or note securely connected.	a. Inspect and repair or replace as required.
	b. Exhaust port from deice duplex valve partially blocked.	b. Inspect and repair or replace as required.
	c. Deice duplex valve not operating properly.	c. Overhaul or replace.
	d. Electrical circuit malfunctioning.	d. See Wiring Diagram Manual, P/N 102-590000-23.
	e. Vacuum ejector on deice duplex valve plugged.	e. Remove obstruction or replace.

NOTE

The following items might aid in ascertaining whether or not the deice duplex valve is functioning properly.

TROUBLE	PROBABLE CAUSE	REMARKS
4. One or more boots do not inflate - with pressure gage at normal reading and timer cycling.	a. Defective wiring in external circuit or other units.	a. Check Wiring Diagram Manual P/N 102-590000-23 for proper connections. Check for broken wires or loose connections.
	b. Faulty deice duplex valve.	b. Replace deice duplex valve.
	c. Mechanical failure in deice duplex valve.	c. Disconnect lines at the outlet ports of the deice duplex valve and check valve operation with a gage. If trouble is not found in the deice duplex valve, inspect boots and lines for leaks or blockage.
	d. Piping lines kinked, blocked, or not connected.	d. Inspect and repair or replace as required.

CHART 1
TROUBLESHOOTING AIRFOIL DEICER SYSTEM (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
5. One or more boots inflate but do not deflate readily - with pressure gage at normal reading.	a. Defective boots.	a. Repair as described in this chapter or replace.
	b. Obstruction of lines.	b. Ensure exhaust port of deice duplex valve is discharging.
	c. Mechanical failure in deice duplex valve.	c. Ensure exhaust port is discharging; if not, replace deice duplex valve.

"END"

AIRFOIL DEICER - MAINTENANCE PRACTICES

SERVICING

Since the deicer boots and related components operate on clean air supplied from the pressure manifold, little is required in the form of servicing the system. The boots should be checked for engine oil after servicing and at the end of each flight; any oil found should be removed. This can be accomplished by the use of a neutral soap and water solution. Care should be exercised to avoid scrubbing the surface of the boot as this will tend to remove the special conductive surfacing.

CAUTION

Do not operate the deicer boots at temperatures below -40° F; operation at temperatures colder than this may result in permanent damage to the deicer boots.

NOTE

Because the deicer boots are made of soft flexible stock, care must be exercised against dragging gasoline hoses over them or resting ladders or platforms against the surface of the boots.

SURFACE DEICER BOOT REMOVAL

To loosen or remove an installed deicer boot use toluol (22, Chart 207, 91-00-00) to soften the "adhesion" line where the boot is joined to the metal surface. The solvent should be applied sparingly with a brush or trigger-type oil can with a spout. Slowly peel the boot back, allowing the solvent time to undercut the boot. Exercise care not to injure the boot during removal.

SURFACE DEICER BOOT INSTALLATION

PREPARATION OF METAL SURFACES

Solvent cleaning: The metal should be completely clean to prevent adhesion failure. Using a grease-free cloth dampened in TT-M-261 methyl ethyl ketone (21, Chart 207, 91-00-00), go over the area to be covered by the boot. Change the cloths frequently to avoid contaminating a previously cleaned area. Do not contaminate the clean supply of methyl ethyl ketone by dipping a used cloth into it. Repeat the process. Now, using a clean damp cloth and a clean dry cloth, go over the area again; use the dry cloth (following the damp cloth) to wipe the surface dry, rather than letting it air dry.

Chemical Cleaning: Follow the solvent cleaning with a grease-free cloth wetted with an acid cleaner (41, Chart 207, 91-00-00). Vigorously scrub surface.

CAUTION

Although the acid cleaner is a mild acid solution, protective rubber gloves should be worn and contact with the skin should be avoided.

After the acid cleaner has had one minute's contact, wipe dry with a clean cloth. Allow a minimum of one hour dry-time before applying cement. At the end of the dry-time, wipe the surface with a clean cloth and inspect the cloth for dirt. If dirt is present, reclean with methyl ethyl ketone; if not, cover the clean surface with paper until the cementing operations are begun.

PREPARATION OF RUBBER SURFACES

If the deicer boot has a smooth back finish, roughen it slightly with sandpaper before beginning the cleaning operation. Wet a clean cloth with toluol (22, Chart 207, 91-00-00) and carefully clean the rough back surface of the boot. Change cloths frequently to avoid contamination of the cleaned areas. Clean the boot a minimum of two times; if the area still seems dirty, reclean the surface in the same manner.

Application of Adhesive: The drying of the cement is a function of time and temperature, and the table below should be used as a shop guide when applying the cement:

Temperature °F	Minutes of Dry Time
Above 80	30
60-80	45
Below 60	60

Do not apply cement under dusty conditions or in high humidity (80% relative humidity or above). Prior to cementing, mask off the boot area on the metal surfaces, allowing 1/2 to 3/4-inch margin.

SPRAY COAT METHOD

If the adhesive is applied by spray, the first coat on the cleaned back surface of the boot and on the metal surface should dry a minimum of 30 minutes. The second cross coat on each surface should be allowed to dry a minimum of 30 minutes, preferably one hour.

BRUSH COAT METHOD

Apply an even brush coat of EC1300L adhesive (32, Chart 207, 91-00-00) to the cleaned back surface of the boot and the metal surface of the airplane. Allow a minimum of 30 minutes to dry. Apply a second coat to each surface in a smooth, even layer. Brushing in one area too long tends to soften the first coat and "rolling" and "balling up" will result. Allow the coating to thoroughly dry a minimum of 30 minutes, preferably one hour before installation. Excess drying time (not to exceed 7 days) is not critical as long as the surfaces are not contaminated. Remove tape before adhesive dries.

INSTALLATION OF THE BOOT

Using a chalk line, snap a line centrally located on the leading edge of the surface. Snap a line, centrally located cordwise, on the cemented side of the boot.

Securely attach hoses to the deicer connection, being careful to handle the boot section without getting finger marks on the adhesive. Using a lint-free cloth, heavily moistened (not dripping) with toluol (22, Chart 207, 91-00-00), reactivate the surface of the leading edge and boot about 3 inches on either side of the chalk line and around connections. Position the boot chalk line directly on the leading edge chalk line and hand roll the boot surface onto the leading edge. Moving along the centerline of the leading edge, continue reactivating the adhesive in strips 4 inches wide by 24 inches long. Avoid excessive rubbing of the adhesive surface as some of the adhesive may be removed. Hand roll the joined surfaces to ensure complete contact of the adhesive and elimination of air pockets. If the boot does not follow the chalk line on the leading edge, remove it slowly with a brush dipped in solvent methyl ethyl ketone (21, Chart 207,91-00-00) and reposition properly. Do NOT allow an excessive amount of solvent to contact boot or more adhesive must be applied. Continue the installation by activating the adhesive surfaces and rolling on the top and lower half of the boot in sequence. Use a narrow stitch roller between tubes to eliminate air entrapment. Applying pressure, roll the entire boot until all but 2 inches of the boot edge is attached. Move in a direction parallel with the inflatable tubes. To complete the installation, trim the boot with a sharp knife. Trim no closer to the inflatable tubes than .75 inch. Starting at the center line area, again apply pressure and roll the entire boot. Finally, roll the boot trailing edge with a steel stitcher roller.

CAUTION

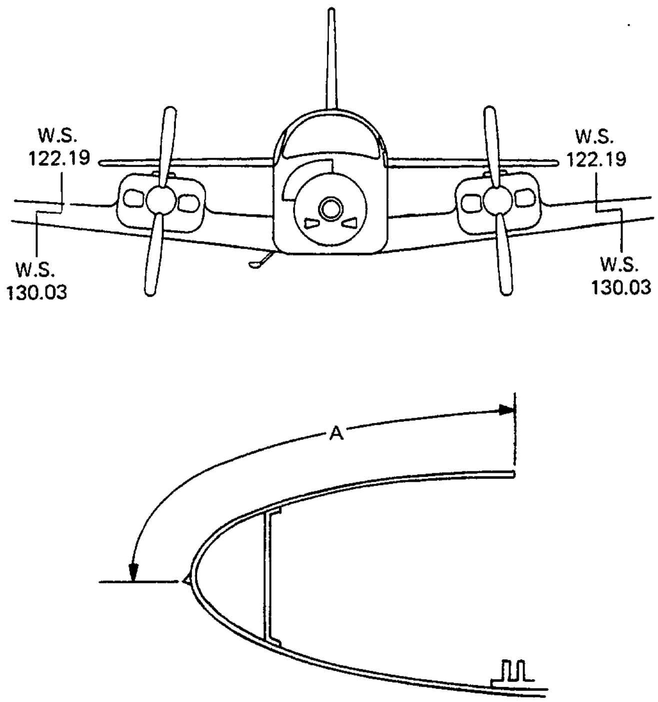
If an air pocket or blister is noted immediately after boot installation, the boot must be removed and reinstalled. DO NOT puncture with a hypodermic needle.

SEALING EDGES

Fair in all around cut edges and trailing edges of the boot with EC 801 sealer (33, Chart 207, 91-00-00) and cover all exposed adhesive. Never try to remove excess adhesive closer than 1/4 inch from the boot edge. After all adhesives and sealing compounds have dried and cured, remove masking tape and clean adjacent areas with a clean cloth dampened with methyl ethyl ketone (21, Chart 207, 91-00-00).

STALL STRIP INSTALLATION (RUBBER) (FIGURE 201)

a. The stall strips are each 7.84 inches long for the left and right wing. Locate the stall strips, with the inboard end, at wing station 122.19.



RIGHT WING	LEFT WING
DIMENSION "A" IS 15.62 AT WING STATION 122.19 AND 15.22 AT WING STATION 130.03	DIMENSION "A" IS 15.62 AT WING STATION 122.19 AND 15.22 AT WING STATION 130.03

58P-34-12

Stall Strip Installation
Figure 201

b. Clean boot surface thoroughly, removing all old cement. Mask off the area where the new strip is to be installed and wipe with TT-M-261 methyl ethyl ketone (21, Chart 207, 91-00-00).

c. Use either Bostic 1024 (45, Chart 207, 91-00-00) or Bostic 1008 (44, Chart 207, 91-00-00), both a two part cement, to join the stall strip to the deicer boot. Mix the Bostic 1024 in the following manner: 15 parts (by weight) of the base material with 1 part (by weight) of the accelerator. If the Bostic 1008 is used, mix as follows: 32 parts (by weight) of the base material with 1 part (by weight) of the accelerator.

d. Apply a coat to both the stall strip and the area to which it will be bonded. Allow to dry 10 to 15 minutes, then install the strip as shown in the illustration. The cement will set in about 6 hours.

e. When dry, coat the area with A56B cement (39, Chart 207, 91-00-00) to replace the conductivity of the boot.

RESURFACING DEICER BOOTS

Static electric charges, if allowed to accumulate, would eventually discharge through the boot to the metal skin beneath, causing static interference with radio equipment and possibly puncturing the rubber. Also, such static charges are a temporary fire hazard after each flight. To dissipate static electric charges, a thin coating of conductive cement is applied over the neoprene of the boot. From time to time it may be necessary to restore the conductivity to efficiently dissipate such charges. When resurfacing seems advisable, the principal factors involved are:

1. If the surfacing material has abraded.

2. If the surfacing has developed cracks.

3. If the conductivity is low.

The following procedures should be accomplished when resurfacing deicer boots.

a. Clean the deicer boots thoroughly with toluol (22, Chart 207, 91-00-00).

b. Roughen the entire surface of the boot with fine sandpaper.

c. Clean the surface again with a clean lint-free cloth moistened with toluol.

d. Apply masking tape beyond the upper and lower trailing edges, leaving a 1/4-inch gap of bare metal.

e. Brush one coat of Goodrich A56B cement (39, Chart 207, 91-00-00) on the boot, and allow it to dry at least one hour. Apply a second coat and allow it to dry at least four hours before operating the deicers. The airplane may be flown when the cement is dry.

NOTE

If A56B cement has aged three months or more, it may be necessary to dilute it with toluol to obtain the proper brushing consistency. Mix thoroughly, approximately five parts cement to one part toluol.

Icex (47, Chart 207, 91-00-00) may be applied to the boots to prevent ice from getting a strong adherance. It will not prevent or remove ice formations. If Icex is to be applied, clean deicer boot by wiping with a clean white cloth dampened with methyl ethyl ketone (21, Chart 207, 91-00-00). Wash boot with mild soap and water, rinse and let dry. Thin Icex 10% to 25% with trichloroethane (46, Chart 207, 91-00-00). Apply Icex by wiping boot with a clean white cloth saturated with Icex. Hand buff the boot with a clean soft cloth to obtain a smooth glossy surface. Reapply after 150 flight hours.

ADJUSTMENT

Adjustment of the pneumatic pressure system is performed by adjusting the various regulators as described in Chapter 36-00-00.

DEICE CONTROLLER REMOVAL

a. Gain access to the deice controller located on the forward side of the main spar carry-thru structure to the left of the airplane center line.

b. Disconnect the electrical connections.

c. Remove the screws and washers which hold the controller and remove the deice controller.

DEICE CONTROLLER INSTALLATION

a. Position the deice controller and secure with the four washers and screws.

b. Connect electrical connections.

DEICE DUPLEX VALVE REMOVAL (TJ-3 AND TJ-4, TK-1 AND AFTER)

a. Gain access to the deice duplex valve located under the LH floorboard between FS 91.55 and FS 100.00 to the left of the airplane centerline.

b. Disconnect the electrical connections.

c. Loosen the hose clamps on the three splice hoses and remove the three splice hoses from the deice duplex valve.

d. Remove the two nuts, screws, and washers and remove the deice duplex valve.

DEICE DUPLEX VALVE REMOVAL (TJ-5 AND AFTER)

a. Gain access to the deice duplex valve through the access door located on the left side aft fuselage. The deice duplex valve is located between FS 207.00 and FS 223.00 to the right of the airplane centerline in the tail section.

b. Disconnect the electrical connections.

c. Loosen the hose clamps on the splice hoses and remove the splice hoses from the valve.

d. Remove the nuts, screws, and washers and remove the valve.

DEICE DUPLEX VALVE INSTALLATION

a. Position the deice duplex valve and secure in place with the screws, washers and nuts.

b. Install the splice hoses and secure with the hose clamps, making certain the hoses and clamps are properly positioned.

c. Connect electrical connections.

PRESSURE SWITCH REMOVAL (TJ-3 AND TJ-4, TK-1 AND AFTER)

a. Gain access to the pressure switch located under the LH floorboard between FS 100.00 and FS 108.00, to the left of the airplane centerline. It faces aft and is connected to the deice duplex valve with a tube.

b. Disconnect the electrical connections.

c. Loosen the hose clamps on the inlet and outlet hoses and remove hoses from the pressure switch.

PRESSURE SWITCH REMOVAL (TJ-5 AND AFTER)

a. Gain access to the pressure switch through the access door located on the left side of the aft fuselage. The pressure switch is located between FS 207.00 and FS 233.00 to the right of the airplane centerline in the tail section.

b. Disconnect the electrical connections.

c. Loosen the hose clamps on the inlet and outlet hoses and remove hoses from the switch.

PRESSURE SWITCH INSTALLATION

a. Position the pressure switch and install the inlet and outlet hoses and secure with clamps.

b. Connect electrical connections.

PRESSURE RELIEF VALVE REMOVAL

a. Gain access to the pressure relief valve located under the LH floorboard between FS 91.55 and FS 100.00, to the left of the airplane centerline.

b. Loosen the hose clamps on the inlet and outlet hoses and remove the hoses.

c. Remove the pressure relief valve retaining nuts, screws and washers. Remove the pressure relief valve.

PRESSURE RELIEF VALVE INSTALLATION

a. Position the pressure relief valve and secure with the screws, washers and nuts.

b. Install the inlet and outlet hoses and secure with clamps.

COMPONENT REPLACEMENT

No maintenance on the preceding components is recommended. Repair or replacement of parts should be made through Beech Aircraft Corporation.

SURFACE DEICER BOOT REPAIRS

Minor scuffed areas on the boots normally require only restoring the conductive surface in the immediate area. However, if the entire surface ply has been removed, exposing the brown natural rubber underneath, or if the boot is cut, torn, ruptured, or a small blister is detected when the boot is inflated, it is necessary to patch the damage. B.F. Goodrich Repair Kit No. 74-451-C contains cold patches suitable for repairing damaged areas. A cold patch on a deicer boot, however, is a temporary, or emergency method of repair. Therefore, at the first opportunity, the boot should be removed and returned to the factory for a vulcanized repair. Cold patch repairs can be made by the following method:

a. Clean around the damage with a clean lint-free cloth moistened with toluol (22, Chart 207, 91-00-00) or uncontaminated nonleaded gasoline.

b. Select a patch which will extend at least five-eights inch beyond the damaged area in all directions.

NOTE

A locally manufactured buffing shield will assure a neater job. The shield can be fabricated from any thin sheet material,such as acetate, steel, etc., and can be long strips taped to the boot around the perimeter of the damaged area. Remove the buffing shield after the area has been buffed.

c. Buff the area around the damage with steel wool or fine sandpaper to remove the conductive coating and thoroughly roughen the exposed surface.

d. Wipe the buffed area with a clean lint-free cloth moistened with toluol (22, Chart 207, 91-00-00), or uncontaminated nonleaded gasoline, to remove all loose particles.

e. Brush one even coat of No. 4 cement (supplied in the repair kit) on the boot corresponding to the patch. Remove the backing from the patch and apply one coat of No. 4 cement to that surface of the patch.

f. Allow the cement to set until tacky.

g. Position the patch over the boot and make contact with one edge or the center of the patch. Work down the remainder of the patch carefully to avoid trapping air pockets. Roll the patch thoroughly, starting from the center and working to the edges. When damage is in the tube area, position the patch so the stretch is in the widthwise direction. If a small patch is cut from a larger patch, bevel the edges by cutting with the shears at an angle.

h. Allow the patch to set for ten to fifteen minutes, then wipe the patch and surrounding area with a clean lint-free cloth moistened with toluol or uncontaminated nonleaded gasoline.

i. Satisfactory adhesion of the patch will be reached in about four hours; however, the boot may be inflated to check the repair after a minimum of twenty five minutes.

j. Apply one light coat of A56B cement (39, Chart 207, 91-00-00) to the patched area, extending beyond the buffed area, to restore the conductive surface. Allow the cement to dry at least one hour and apply a second light coat. The airplane may be flown as soon as the cement is dry; however, do not operate the deicers until the cement has dried at least four hours.

NOTE

Loose surface ply in the tube area is usally an indication of the deicer starting to flex fail. This is detected as a small blister, under the surface ply, when the deicer is pressurized. If the blister is detected while still small, 1/4 to 3/8 inch diameter, and patched immediately as previously described, the service life of the deicer boot will be appreciably extended.

"END"

AIR INTAKES - DESCRIPTION AND OPERATION

The possibility of induction system icing is reduced by the non-icing characteristics of fuel injection engines and the automatic alternate air source. The only possible ice accumulation is impact ice at the ram air scoop and filter. Should the ram air scoop or filter become clogged with ice, a spring-loaded door on the firewall will open automatically, and the induction system will operate on alternate air. When operating on alternate air above the critical altitude, a reduction of manifold pressure will be noted.

"END"

PITOT AND STATIC - DESCRIPTION AND OPERATION

A standard pitot tube for the pilot's flight instruments is located immediately to the left of the nose gear doors. The optional pitot tube for the copilot's instruments is located to the right of the nose gear doors. Left and right pitot heat switches supply heat to the left and right pitot masts respectively, and are located on the pilot's left subpanel.

"END"

WINDOWS AND WINDSHIELD - DESCRIPTION AND OPERATION (Figure 1)

On airplanes TJ-9 thru TJ-85 and TJ-87 thru TJ-97, ice may be prevented from forming on the windshield by wetting the windshield surface with isopropyl alcohol anti-ice fluid. The fluid is supplied by a three gallon tank located under the nose baggage compartment floor. A supply line is routed directly aft to a pressure pump which provides the pressure for the windshield anti-ice. A line is routed from the pressure pump to the center of the fuselage in front of the windshield, where it connects to a discharge tube which runs along the lower edge of the pilot's windshield. The discharge tube is equipped with five orifices, which are equally spaced for diffusion of the anti-icing fluid. This system is designed to prevent the formation of ice and is controlled by a two position, ON-OFF circuit breaker switch located on the pilot's subpanel. An indicator on the right side of the instrument panel indicates the amount of fluid in the supply tank.

On airplanes TJ-86, TJ-98 and after, TK-35, and TK-42 and after, ice may be prevented by an electrical windshield heater.

The windshield heater is of a heater segment design. The windshield heater is approximately 9.6 x 11.5 inches and distributes approximately 430 watts of power over the heating area. The segment conforms to the contour of the windshield and is located to the left of the airplane centerline on airplane serials TJ-3 through TJ-122 except TJ-116, and TK-2 through TK-60. On airplane serials TJ-116, TJ-123 and after and TK-61 and after, the segment is installed on the airplane centerline.

The windshield heater is controlled by a 20-ampere toggle-type circuit breaker switch (placarded WSHLD), located on the left subpanel. With the switch on, 28- vdc power is applied to the windshield temperature controller, windshield heater relay and windshield heater. The temperature controller senses the temperature of the windshield heater. The temperature controller removes power from the system (de-energizing the relay) when the temperature of the windshield is between 100° to 110°F. When the windshield heater has cooled to a temperature of 90° to 100°F, power is applied to the system (energizing the relay), allowing the temperature to rise again. Thus the temperature controller maintains the temperature of the windshield heater between a temperature of 90° and 110°F.

CAUTION

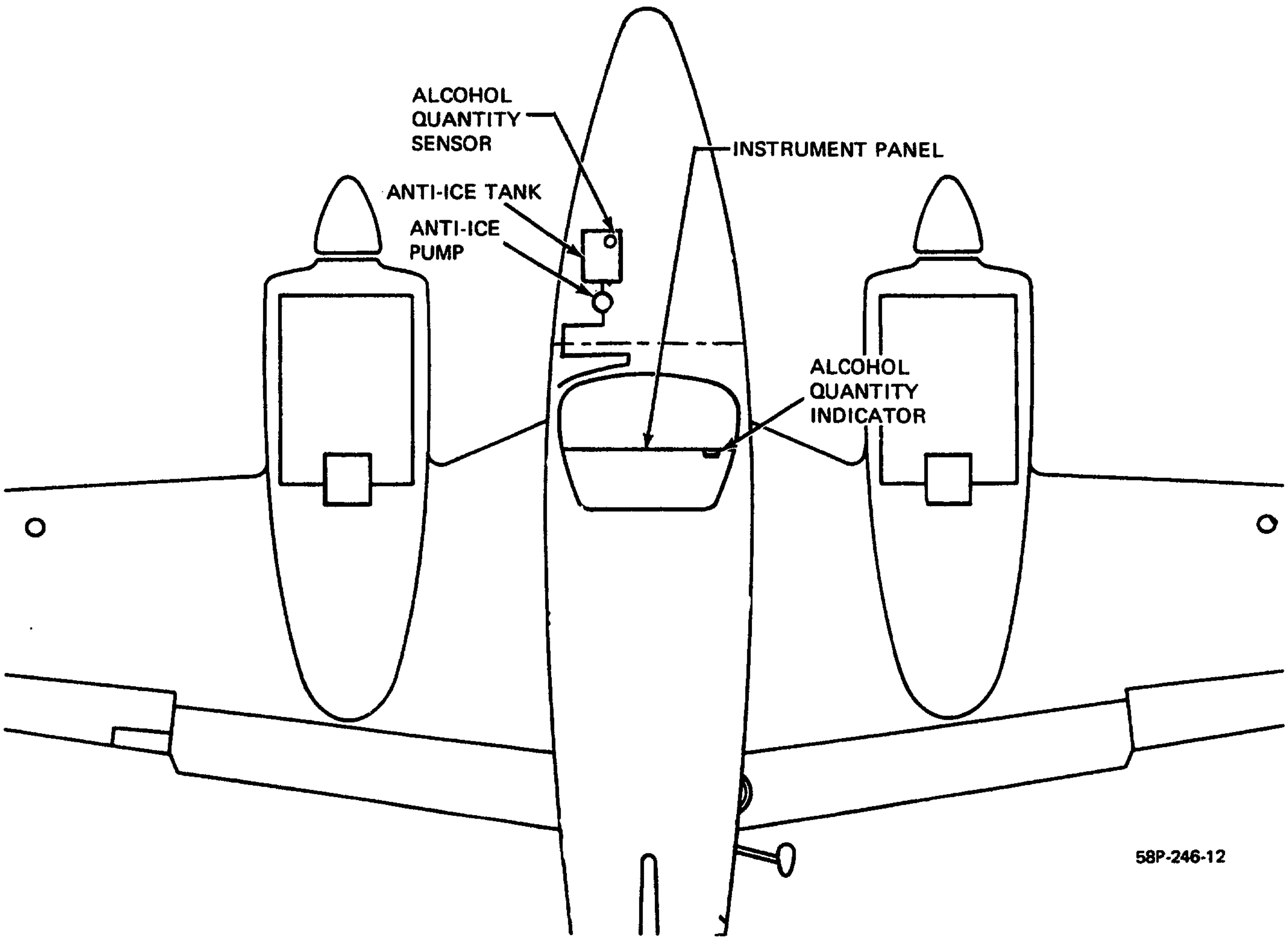
Ground operation of the windshield heater is limited to 10 minutes.

CAUTION

The magnetic compass is erratic when the windshield heater is in operation. If the directional gyro is to be reset, turn off the windshield heat for 15 seconds to allow a stable reading of the standby compass.

NOTE

Heat should be applied to the windshield before ice forms.



Windshield Anti-icer System (TJ-9 thru TJ-85, TJ-87 thru TJ-97)
Figure 1

"END"

CHART 1
TROUBLESHOOTING WINDSHIELD ANTI-ICING SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Anti-icing fluid will not discharge with the switch in the ON position.	a. Supply tank empty.	a. Fill tank (with isopropyl alcohol only).
	b. Clogged orifices in discharge tube.	b. Clean orifices.
	c. Open circuit breaker.	c. Push alcohol deice circuit breaker to reset.
	d. Loose electrical connection or broken wire.	d. Tighten or repair as required.
	e. Leak in system.	e. Locate and repair.
	f. Piping lines blocked, kinked or not connected.	f. Inspect and repair or replace as required.
	g. Clogged screen in bottom of anti-icing pump.	g. Clean screen; drain and flush tank.
	h. Anti-icing pump inoperative.	h. See steps "c" and "d".
	i. Switch faulty.	i. Replace switch.
2. One or more orifices will not discharge fluid.	a. Clogged orifices in dischage tube.	a. Clean orifices.
3. Anti-icing fluid being discharged is low on pressure.	a. Restricted orifices in discharge tube.	a. Clean orifices.
	b. Piping lines kinked, blocked or not securely connected.	b. Inspect and repair or replace as required.
	c. Leak in system.	c. Locate and repair.
	d. Clogged screen in bottom of anti-icing pump.	d. Clean screen, drain and flush tank.
	e. Defective anti-icing pump.	e. Replace pump.

CHART 2
TROUBLESHOOTING WINDSHIELD HEATER SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Windshield heater inoperative.	a. Loose connections or broken wires.	a. Check for loose connections. Check for continuity between components, isolate damage and repair.
	b. Defective WSHLD switch.	b. Replace switch.
	c. Windshield heater relay stuck in the open position.	c. Replace relay.
	d. Defective temperature controller.	d. Replace controller.
	e. Sensing element faulty.	e. Check for circuit continuity and replace windshield.
	f. Damaged heater circuit.	f. Replace windshield.
2. Windshield heater will not cycle off.	a. Defective temperature controller.	a. Replace controller.
	b. Windshield heater relay stuck in the closed position.	b. Replace relay.

"END"

WINDSHIELD ANTI-ICING - MAINTENANCE PRACTICES

SERVICING

The isopropyl alcohol used by the windshield anti-icing system is supplied by a three gallon tank located beneath the floor on the left side of the nose baggage compartment. The filler cap to the tank is accessible through a door in the nose compartment floor. The door is identified "Anti-icing fluid 3.0 U.S. Gal.". The supply line from the tank is routed directly aft to the pump that provides the pressure to operate the anti-icing system. A line goes from the anti-icing pump to the center of the fuselage, where it connects to the discharge tube that runs along the lower edge of the pilots windshield. The discharge tube has five orifices, equally spaced for effective diffusion of the anti-icing fluid (48, Chart 207, 91-00-00). This system is controlled by a two position, ON-OFF circuit breaker switch, which is located on the pilots subpanel. The amount of windshield anti-icing fluid available in the supply tank is indicated by a gage on the upper right corner of the instrument panel. When the control switch is actuated, power is supplied to the pump that supplies the flow of anti-icing fluid to the discharge tube at the pilots windshield. To ensure proper operation of the anti-icing system, observe the following maintenance precautions:

a. Since the orifices in the discharge tubes are quite small and may become clogged or restricted, the system should be periodically checked to ensure that proper fluid flow is maintained.

b. To prevent the orifices in the discharge tubes from becoming clogged or restricted, periodically clean the screen located at the bottom of the anti-icing pump and service the tank only with clean isopropyl alcohol (48, Chart 207, 91-00-00).

c. Drain and flush the supply tank twice a year.

ELECTRICALLY HEATED WINDSHIELD RESISTANCE CHECK

To check incorrect resistance or the presence of a short or open circuit in the heating elements of the windshield, the following procedure may be used:

a. With the windshield deicing system turned OFF, disconnect the leads to the heating element at the windshield heater relay and heater ground connection.

b. Using an ohmmeter, determine the resistance of the heating element by placing the leads of the ohmmeter across the heating element leads. The resistance should measure 1.69 ± .25 ohms.

c. Reconnect the leads of the heating element.

SENSING ELEMENT RESISTANCE CHECK (FIGURE 201)

The resistance of the sensing element of the windshield varies with temperature changes. The acceptable range of resistance values at various ambient temperatures are shown in Figure 201. The resistance of the sensing element may be checked as follows:

a. With the windshield deicing system turned OFF, disconnect the wire connected to one of the terminals of the sensing element.

b. Use an ohmmeter to determine the resistance of the sensing element.

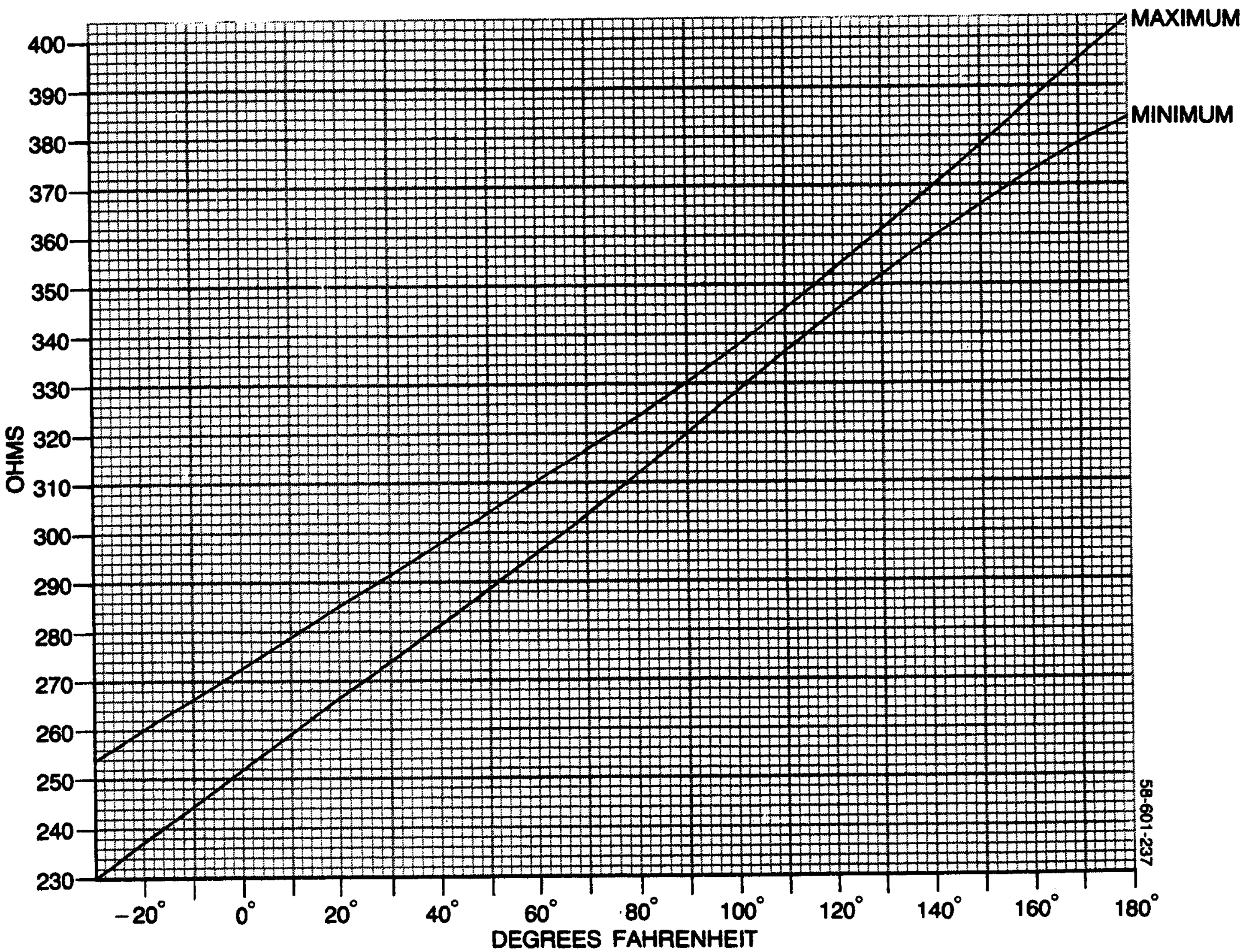
c. Determine the temperature of the windshield.

d. Determine if the resistance measured falls within the tolerance shown in Figure 201.

e. Reconnect the windshield sensing element wire.

ELECTRICALLY HEATED WINDSHIELD FUNCTIONAL TEST

After completing the preceding resistance checks, determine that the ambient temperature is 90°F or less and perform the following functional check:



Sensing Element Tolerance Check
Figure 201

CAUTION

Ground use of windshield heat is limited to 10 minutes to prevent damage to the windshield.

a. Place the windshield DEICE control siwtch in the ON position.

b. Determine that the windshield immediately begins to heat. Presence of heat may be determined by holding the hand against the heated portion of the windshield.

c. Place the windshield DEICE control switch in the OFF position.

WINDSHIELD HEATER REMOVAL

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15.)

a. Using masking tape, mask off an area on the windshield, approximately 14 inches long by 12-inches wide, above the windshield heater frame. On each side of the heater frame, apply masking tape along each edge the entire height of the frame and at least 6 inches out from the edge. This will help to prevent scratching the windshield when removing the windshield heater.

b. Working in the nose baggage compartment, tag and disconnect the windshield heater wiring from the windshield heater temperature control box.

c. Remove the two screws securing the wire cover.

d. Using a sharp-edge tool such as a putty knife or pocket knife, insert the tool under the edge of the wire cover. Loosen the bond of the sealant, either by cutting the sealant or by prying it loose. Be careful not to scratch the airplane finish, bend the wire cover or damage the wiring (see Figure 202).

e. Lift up the wire cover. Using a sharp-edged tool, pry or cut the sealant out of the inside of the wire cover. Be careful not to damage the wires.

f. Separate the wires from the wire cover.

g. Pull the wires up and out of the hole in the fuselage.

h. Remove the sealant from the hole in the bottom retainer where the wires pass through to the heater plate. Be careful not to damage the wires (see Figure 202).

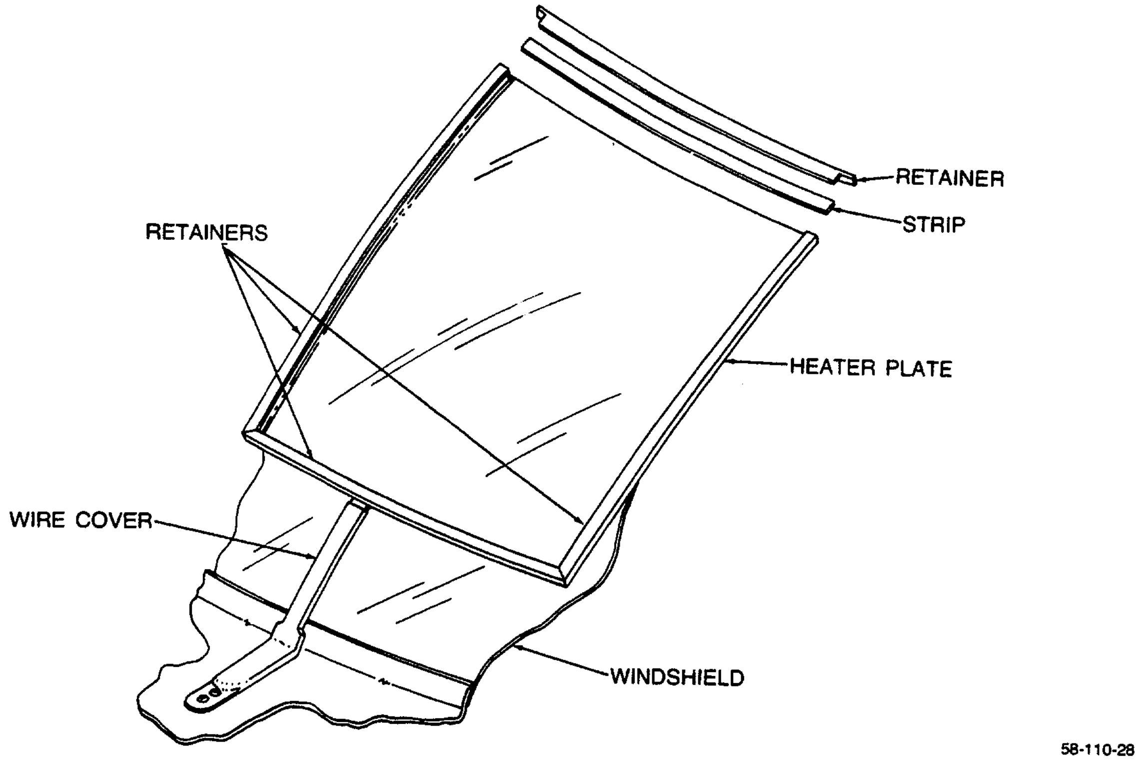
NOTE

If it is desired to retain the existing windshield heater plate for continued use, make a knife-like scraper out of Plexiglas or wood. Sharpen one edge and use this tool instead of the putty knife used in step "i". This tool will help prevent scratching the heater plate. Applying masking tape to the heater plate surface will further protect the surface from scratches.

i. Using a sharp-edged putty knife or similiar tool, scrape off the sealant around the perimeter of the windshield heater plate (see Figure 202).

j. It may be necessary to insert a sharp-edged tool between the heater plate and the retainers in order to completely loosen the bond of the sealant. If this is done, be careful not to pry on the side or bottom retainers, as they are likely to break. It is permissible to break the top retainer, as it should be replaced (see Figure 202).

k. Starting work at the top left corner of the windshield heater assembly, use a sharp putty knife to remove the top windshield heater plate retainer. Insert the edge of the putty knife between the windshield and the top retainer. Insertion depth should not exceed 1/8 inch (see Figure 203). Working along the entire length of the top retainer, pry off the retainer and discard it. Take care not to scratch the windshield.



Windshield Heater
Figure 202

CAUTION

If the putty knife is inserted too far between the windshield and the windshield heater retainer, damage may occur that could require replacement of the windshield.

l. After removal of the top retainer, insert a sharp tool between the top of the windshield heater plate and the windshield heater frame attachment strip which is bonded to the windshield. This is necessary in order to break the bond between these two parts (see Figure 203, Detail A). Be careful not to scratch the windshield.

m. Slide the heater plate up and out of the frame. If the existing heater plate is going to be used again, take care not to scratch it during removal.

WINDSHIELD HEATER INSTALLATION

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15.)

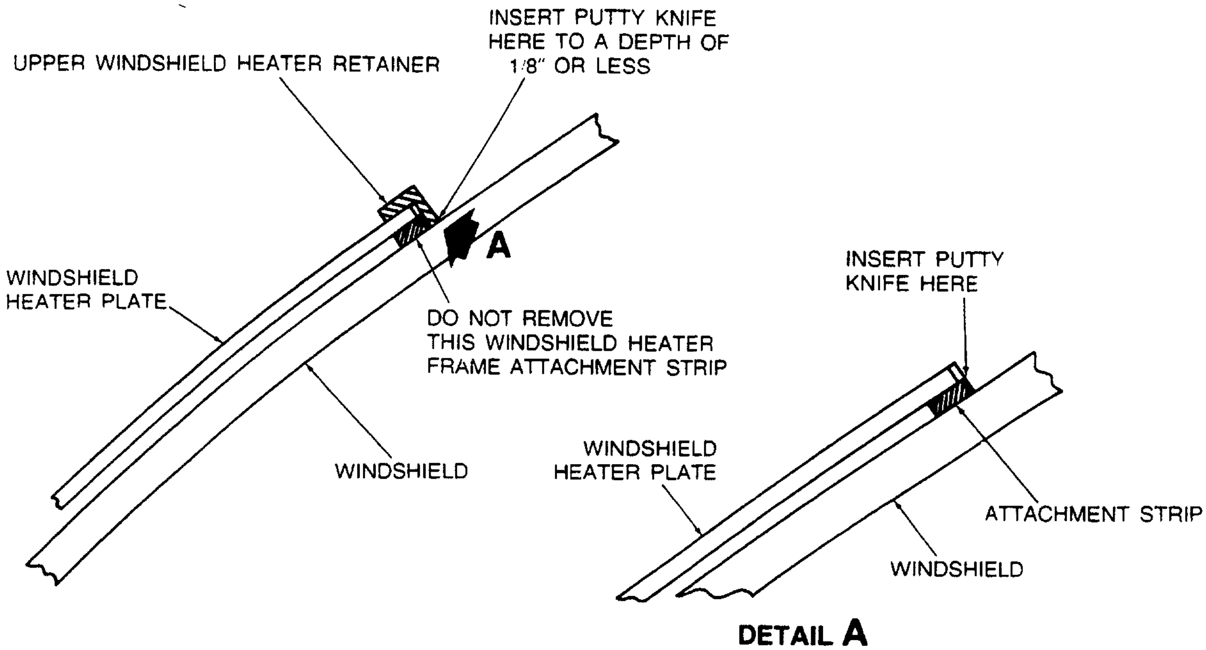
a. Carefully scuff sand any bonding material and sealant off of the top windshield heater frame attachment strip.

b. Make sure all sealant is scraped off of the heater retainers.

c. Clean the windshield and frame with naphtha (20, Chart 207, 91-00-00) and wipe dry with a clean white cloth.

d. Cut a piece of masking paper to the width of the heater plate and 2 or 3 inches longer than the plate.

e. Slide the paper down into the heater frame and tape down the top edge.



Windshield Heater Retainer Removal
Figure 203

This will help prevent the heater plate from being scratched during installation.

f. Slide the new windshield heater plate into the frame. Ensure that the wires are at the bottom. Guide the wires through the hole in the bottom retainer. Carefully remove the masking paper.

g. Lay the new top retainer onto the heater plate frame in the installed position. Trim the ends of the retainer to obtain a good fit. Apply Mylar tape (64, Chart 207, 91-00-00) to the windshield, parallel to and lightly touching the upper vertical surface of the retainer. This will prevent getting adhesive on portions of the windshield where adhesive is unwanted. Mylar tape is used because the adhesive will not stick to it.

CAUTION

Use adhesive and sealant sparingly to avoid runs.

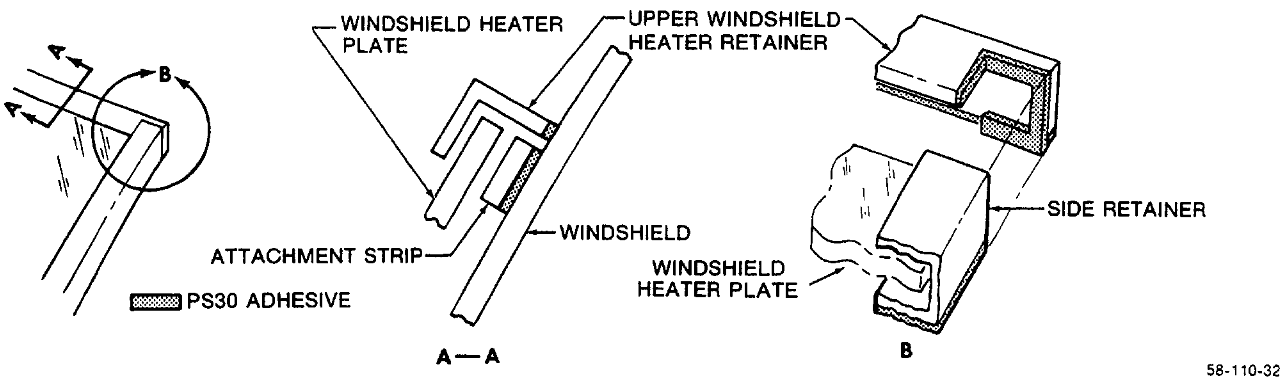
h. Brush on PS-30 (57, Chart 207, 91-00-00) adhesive per the instructions on the package. Apply adhesive to the attachment strip and the windshield where they meet and to the ends of the attachment strip where it meets the side retainer. (See Figure 203A.)

i. Apply adhesive to the bottom surface of the new top windshield heater retainer. Apply adhesive to the portions of the top retainer that butt up against the ends of the side retainers.

j. Place the new top heater retainer in the proper position. Secure the retainer in place with masking tape, and allow at least four hours for the adhesive to cure.

k. Insert the tip of the sealant applicator into the hole from the bottom retainer where the wires from the heater plate pass through. Squeeze enough RTV-737 sealant (70, Chart 207, 91-00-00) into the hole to ensure that no water can get up inside.

l. Lay the wire cover in it's installed position on the fuselage. Mark



Windshield Heater Retainer Installation
Figure 203A

the fuselage along the outer edges of the wire cover to show where the wires will lay in the installed position.

m. Remove the wire cover and apply sealant to the area between the pencil marks.

n. Apply sealant to the inside of the wire cover until it is approximately three-fourths full of sealant.

o. Lay the wires down onto the sealant that was applied to the fuselage. Insert the wires down into the hole in the fuselage and install the wire cover with the two screws.

p. If sealant does not squeeze out from underneath the wire cover, apply a bead of sealant around the bottom edge of the wire cover. Wipe off the excess sealant.

q. Remove the tape securing the top retainer. Remove the Mylar tape. Apply sealant around the perimeter of the windshield heater plate where the heater plate contacts the retainers. Apply sealant to the top two corners of the windshield heater frame and, if needed, to the bottom two corners. Be sure that any possible paths of moisture penetration have been sealed. Allow the sealant to cure.

r. Remove the tags and connect the electrical wiring to the windshield heater temperature control box.

s. Turn the power and WSHLD switch on, and place a hand on the windshield heater to make sure that the heater is operative.

t. If the windshield heater is found to be operative, turn WSHLD switch and power off. If the windshield heater is found to be inoperative, troubleshoot the system per the WINDSHIELD HEATER TROUBLESHOOTING CHART to isolate and correct the problem.

u. Remove all tape from the windshield.

WINDSHIELD HEATER CONTROLLER REMOVAL

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARILIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15.)

The windshield temperature controller is located in the nose baggage compartment just forward of FS 39.00.

a. Gain access to the controller through the nose baggage compartment door and locate the controller.

b. Tag and remove electrical wiring from the controller.

c. Remove the clip nuts, washers and screws which attach the controller to the mounting bracket and remove the controller.

WINDSHIELD HEATER TEMPERATURE CONTROLLER INSTALLATION

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15)

a. Position the controller on the mounting bracket and secure with screws, washers and clip nuts.

b. Remove tags and connect the electrical wiring to the controller.

c. Close and secure nose baggage compartment door.

WINDSHIELD HEATER RELAY REMOVAL

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15)

The windshield heater relay is located in the nose baggage compartment forward of FS 39.00 adjacent to the windshield heater temperature controller.

a. Gain access to the relay through the nose baggage compartment door and locate the windshield heater relay.

b. Tag and remove electrical wiring from the relay.

c. Remove the screws, nuts and washers that hold the relay in place and remove the relay.

WINDSHIELD HEATER RELAY INSTALLATION

(TJ-86, TJ-98 AND AFTER, TK-35, TK-42 AND AFTER AND EARLIER AIRPLANES EQUIPPED WITH KIT NO. 102-5004-1, -3, -5, -7, -13 or -15)

a. Place the relay in the proper position and secure with screws, washers and nuts.

b. Remove tags from the electrical wiring and connect electrical wiring to the relay.

c. Close the nose baggage compartment door and secure.

"END"

PROPELLERS - DESCRIPTION AND OPERATION (Figure 1)

ELECTRIC PROPELLER DEICING (PRIOR TO TK-139 , PRIOR TO TJ-349)

Propeller ice removal is accomplished by the electrically heated deice boots bonded to each propeller blade. The system uses the airplane's electrical power to heat portions of the deice boots in a sequence controlled by a timer. The system is controlled by an ON-OFF circuit breaker switch on the pilot's subpanel. When the system is turned on, the ammeter will register 14 to 18 amperes. A small momentary deflection of the ammeter needle may be noticed approximately every 34 seconds; this is due to the switching action of the timer and is an indication of normal operation. The system can be operated continuously in flight; it will function automatically until the switch is turned off. Propeller imbalance can be relieved by varying rpm. Increase rpm briefly, then return to the desired setting. Repeat if necessary.

CAUTION

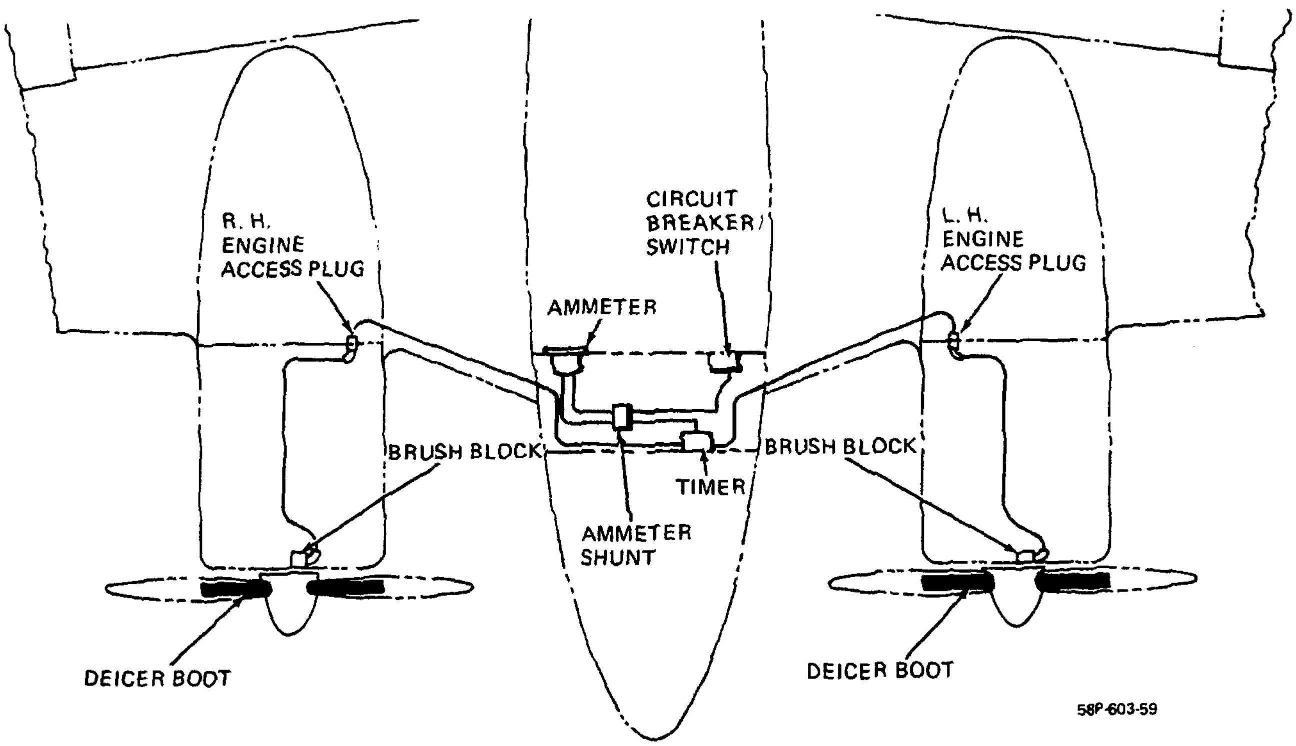
Do not operate the system with the engines inoperative.

ELECTRICAL PROPELLER DEICING (TK-139 AND AFTER , TJ-349 AND AFTER)

On airplanes TK-139 and after and TJ-349 and after, the electrothermal deice boots mounted on the propeller blades are electrically heated. Direct current for deice boot heating is supplied through a system of controls by two brushes which ride on dual slip rings mounted on the propeller assembly.

The brushes used on this installation are of the modular block type. The dual slip rings are supplied as an assembly. Maintenance of the modular brush blocks and slip ring assemblies are covered elsewhere in this chapter under respective headings.

Current for automatic operation of the deice timing control and the deice boots is supplied by a single 20-ampere circuit breaker switch located on the pilot's LH subpanel. When the circuit breaker/switch is placed in the ON position, the deice timer begins to run, initiating automatic cycling of electrical power to the deice boots. At intervals of approximately 90 seconds in duration, the timer alternately cycles power to the LH then RH propeller deice boots. Current for operation of the deice system is indicated by an ammeter located on the RH instrument panel.



Propeller Deicer System
Figure 1

"END"

PROPELLERS - TROUBLESHOOTING (PRIOR TO TK-139 AND TJ-349)

The ammeter of the deicer system can be used to indicate the general nature of most electrical problems. Consequently, it is recommended that troubleshooting be preceded by the ammeter test as outlined under ELECTRIC PROPELLER DEICER in Chapter 5-20-00 of this manual, and the HEAT TEST described in this chapter to determine which circuits are involved. A reading of two-thirds the normal amount of current is an indication that one of the circuits is open between the slip ring and deicer heater. If the ammeter registers excess current, the power lead is shorted to ground. It may be possible that the excess current has welded the timer contacts in one phase. Under these circumstances, the timer will either feed current to the welded contacts continuously or will not cycle. If the former is true, the heat test will show two phases heating simultaneously throughout three of the four phases. Unless the grounded power lead is located and corrected, any new timer that is installed may suffer the same internal damage during the first use of the system.

CHART 101
TROUBLESHOOTING PROP DEICE SYSTEM (PRIOR TO TK-139 AND TJ-349)

TROUBLE	PROBABLE CAUSE	REMARKS
1. Ammeter shows zero current (All 4 phases of the 2-minute 16-second cycle.)	a. Circuit breaker tripped.	a. Locate and correct short before resetting circuit breaker.
	b. Switch faulty.	b. If no voltage at switch output with voltage at switch input, replace the switch. If voltage is OK at switch output, go to step "d".
	c. No power from airplane.	c. If no voltage into switch, locate and correct open circuit.
	d. Ammeter faulty. (If some of all deicers heat with ammeter at zero, replace the ammeter.)	d. Test for voltage up to and out of ammeter. If low or zero output but proper input, replace ammeter. If no voltage to ammeter, locate and fix open between switch and ammeter.
	e. Open circuit between ammeter and timer.	e. Disconnect harness at timer and check voltage pin B (of harness) to ground. If none, locate and correct open circuit.

CHART 101
TROUBLESHOOTING PROP DEICE SYSTEM (PRIOR TO TK-139 AND TJ-349) (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
2.Ammeter shows normal current part of cycle, zero current rest of cycle.	a.Open in wiring between timer and firewall connector.	a.Refer to HEAT TEST in this chapter to find deicers not heating and test for voltage on that pin of firewall connector. If zero over 2 minutes, locate and fix open in wiring from timer to firewall.
	b.Open between firewall and deicer lead straps.	b.If voltage to firewall plug, try voltage at junction of deicer lead and slip ring lead. If no voltage, find and correct open in wiring to brush block, open within brush block, or no contact between brush and slip ring.
	c.No ground circuit, one engine.	c.If voltage at deicer leads, locate and fix open from deicer to ground.
3.Ammeter shows normal current part of cycle, low current rest of cycle.	a.Inner and outer deicers heating same phase.	a.Locate and repair incorrect connections.
	b.Open in deicer or slip ring assembly.	b.Disconnect deicer straps to check heater resistance. If resistance is within specified limits, locate and fix open in slip ring leads. If not, replace deicer with open circuit.
	c.High resistance in circuit with low current.	c.If not in contact between brush and slip ring (including ground brush), trace wiring to deicer and to timer to fix partially broken wire, loose or corroded connection.
4.Ammeter shows low current over entire cycle.	a.Airplane voltage low.	a.Check voltage into switch.
	b.Ammeter faulty.	b.Refer to step "1.d".
	c.High resistance up to timer.	c.Check for partially broken wire, loose or corroded connection in wiring from airplane supply to timer input.

CHART 101
TROUBLESHOOTING PROP DEICE SYSTEM (PRIOR TO TK-139 AND TJ-349) (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
5. Ammeter shows excess current over entire cycle.	a. Ammeter faulty.	a. Refer to step "1.d.".
	b. Ground between ammeter and timer.	b. Disconnect harness at timer and, with ohmmeter, check from pin B (of harness) to ground. If ground is indicated, locate and correct.
6. Ammeter shows normal current part of cycle, excess current rest of cycle.	a. Ground between timer and brush block.	a. Disconnect leads at brush block and check from power leads to ground with ohmmeter. If ground is indicated, locate and correct.
	b. Ground between brush block and deicers. (Excluding ground brush circuit.)	b. If no short exists at brush-slip ring contact, check for ground from slip ring lead to bare prop while flexing slip ring and deicer leads. If a ground is indicated, locate and correct.
	c. Short between two adjacent circuits.	c. Check for shorts or low resistance between circuits; if any, locate and correct.
	d. Timer faulty.	d. Test timer as indicated in DEICER TIMER CHECK in this chapter.
7. Ammeter does not "flick" each 34 seconds.	a. Timer ground open.	a. Disconnect harness at timer and check with ohmmeter from pin G (of harness) to ground. If no circuit, refer to Wiring Manual (P/N 102-590000-23) to fix open circuit.

NOTE

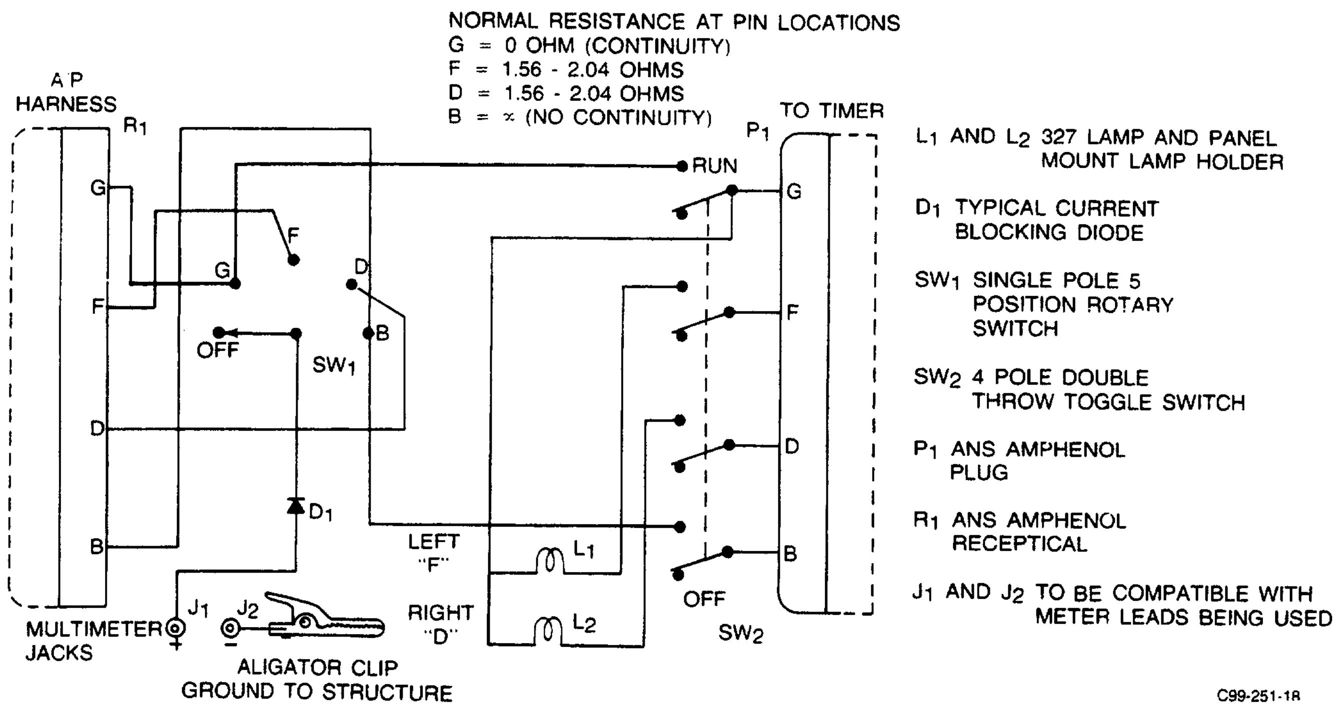
Timers with electronic stepping circuits may not "flick" noticeably between cycles.

CHART 101
TROUBLESHOOTING PROP DEICE SYSTEM (PRIOR TO TK-139 AND TJ-349) (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
	b. Timer contacts are welded (caused by short circuit in system).	b. Test timer as in DEICER TIMER CHECK in this chapter. If timer does not cycle with voltage at pin B, replace timer but be sure short circuit causing original problem has been located and corrected.
8. Ammeter flicks between 34 second phase periods.	a. Loose connection between aircraft power supply and timer input.	a. If trouble occurs over entire cycle, trace wiring from power source to timer input to locate and tighten loose connection.
	b. Loose or poor connection from timer to deicers.	b. If trouble occurs in part of cycle, find which deicers are affected and check for rough or dirty slip rings causing brush to "skip". If not this, trace circuits to locate and fix loose or poor connection. (If all deicers on one prop are affected, check the ground circuit.)
	c. Timer cycles erratically.	c. Test timer as indicated in DEICER TIMER CHECK in this chapter.
9. Radio noise or interference with deicers on.	a. Brushes "arcing".	a. Check brush alignment as outlined under ELECTRICAL PROPELLER DEICER in Chapter 5-20-00 of this manual. Look for rough or dirty slip rings. If this is the cause, clean, machine or replace slip ring assembly. Check for slip ring alignment.
	b. Loose connection.	b. Refer to step 8 above.
	c. Switch faulty.	c. Try jumper wire across switch. If radio noise disappears, replace the switch.
	d. Wiring located less than 8 inches from radio equipment wiring.	d. Replace at least 8 inches from input wiring to radio equipment.
10. Cycling sequence not correct.	a. Crossed connections.	a. Check Wiring Diagram Manual (P/N 102-590000-23) for improper connections.

CHART 101
TROUBLESHOOTING PROP DEICE SYSTEM (PRIOR TO TK-139 AND TJ-349) (Cont'd)

TROUBLE	PROBABLE CAUSE	REMARKS
11. Rapid brush wear or frequent breakage.	a. Brush block out of alignment.	a. Check brush alignment as outlined under ELECTRIC PROPELLER DEICER in Chapter 5-20-00 of this manual.
	b. Slip ring wobbles.	b. Check slip ring alignment with dial indicator.



Electrothermal Propeller Deice Test Unit
Figure 101

TROUBLESHOOTING ELECTROTHERMAL PROPELLER DEICE SYSTEM (TK-139 AND AFTER, TJ-349 AND AFTER)

Propeller deice ammeter reading outside the shaded area of the meter (14-18 amperes) is an indication that a fault may exist in the deice system. It should be noted, however, that current readings above or below the shaded areas of the deice ammeter may indicate an output voltage outside the normal operating range (28.25 ±.25 vdc) rather than a defect in the deice system itself. Excessively high operating voltage could conceivably damage the deice system and create a multiple fault condition; therefore, operation should not be instituted until the fault or faults have been corrected. Use of battery power alone, during operation of the deice system, should be avoided because the battery output voltage will be lower than normal operating voltage and may produce ammeter readings below the shaded area of the meter.

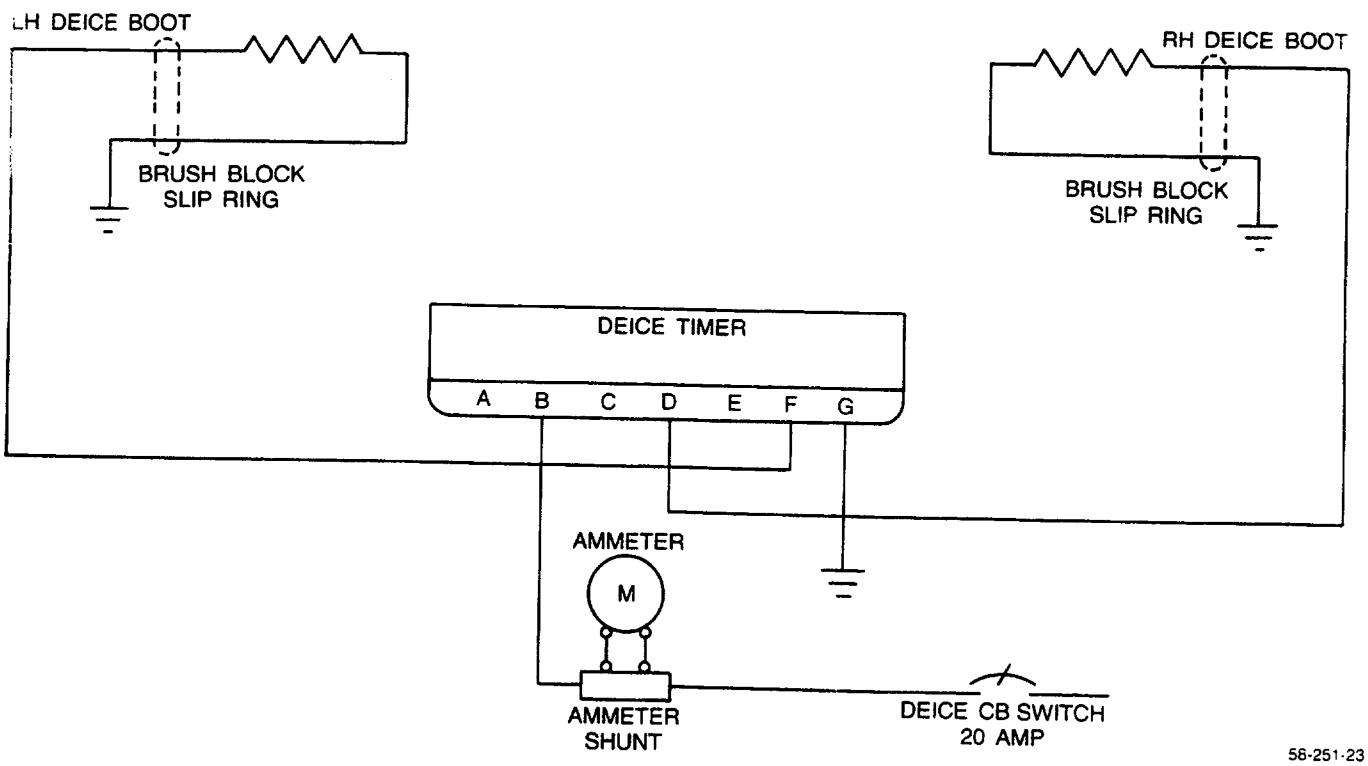
All resistance and continuity checks are made with the engines off, battery off and the timer disconnected. Resistance values specified in the troubleshooting chart may not be exact, as small variances may occur from one installation to another and will be subject to the accuracy of the particular resistance measuring instrument being used. For this reason it is recommended that a sensitive multimeter be used known to be accurate within ±1% (digital being preferred).

The test unit (Figure 101) was designed to be used in conjunction with these troubleshooting procedures and can be built with standard parts normally found in the shop. Operation and use of the test unit as outlined in the troubleshooting procedure makes it possible to positively check the timer in the airplane during system operation.

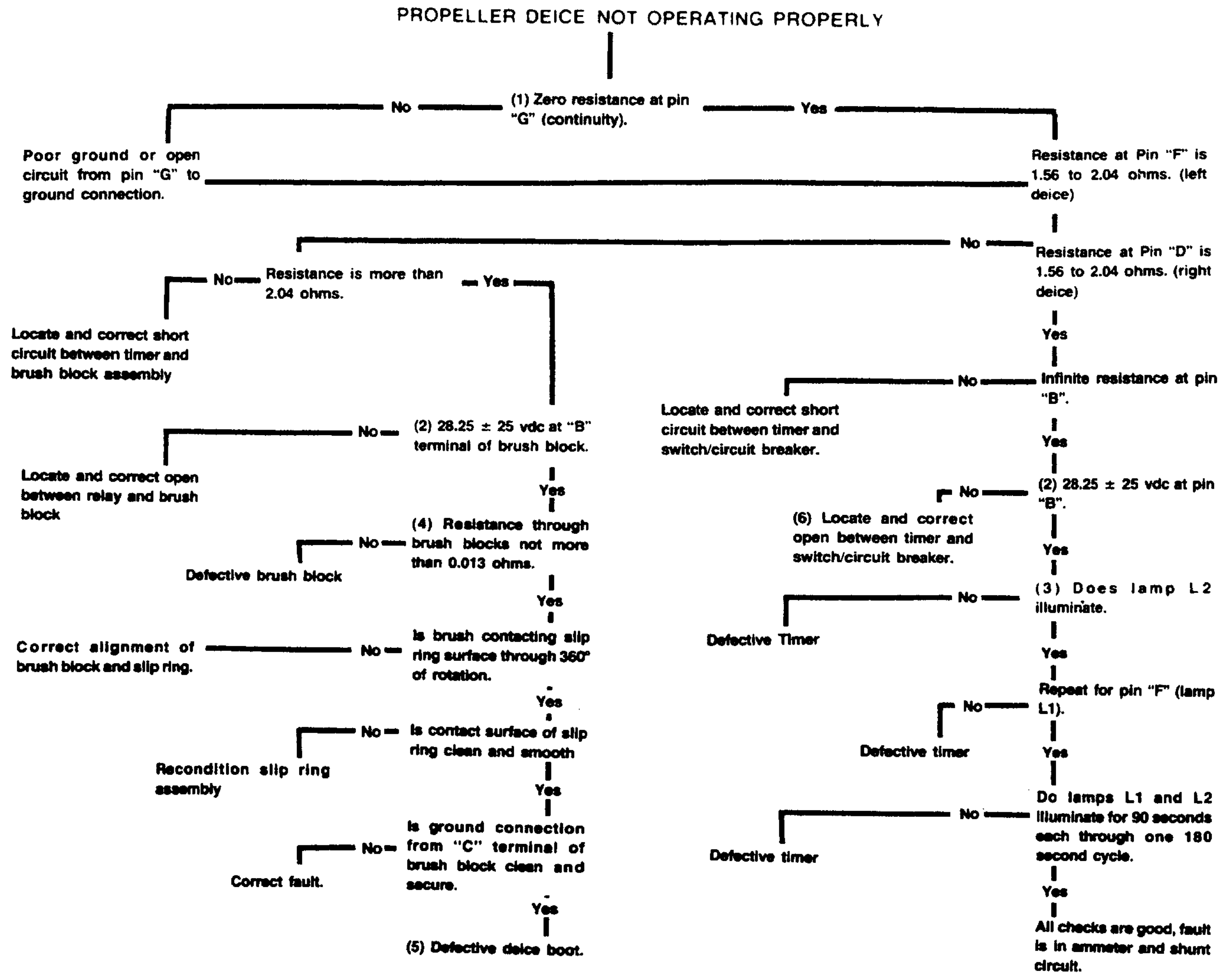
The troubleshooting chart which follows allows for an orderly flow of checks in a sequence consistent with the most convenient order of activity for the technician. The numbers in parenthesis, preceding some steps of the troubleshooting sequence, refer to notes found at the bottom of the chart. An electrothermal propeller deice control schematic (Figure 102) should be used for reference during system troubleshooting.

CAUTION

Propeller deice system must not be ground operated for extended periods of time as damage to the deice boots and pitting of the slip rings may occur.



Propeller Deice Control Schematic
Figure 102



(1) All resistance and continuity checks are made with the battery switch OFF and the timer disconnected (if using test unit in Figure 101, placing SW 2 in the OFF position will disconnect timer)

(2) Voltage measurements are made with the propeller deice switch/circuit breaker ON and an auxiliary power unit connected or at least one generator on the line. Deice ammeter readings will vary directly with voltage.

(3) Reconnect timer (if using test unit Figure 101, place SW 2 in run position) advance timer by turning automatic propeller deice switch/circuit breaker off then on again till lamp L2 illuminates. At no time during this check should both lamps (L1 and L2) be illuminated.

(4) Resistance is measured from face of brush block to terminal and must not exceed 0.013 ohms.

(5) Resistance measured through individual deiced boots should not exceed 5.9 ohm.

(6) Check switch/circuit breaker for continuity through switch in on position.

Troubleshooting Electrothermal Prop Deice (TK-139 and after, TJ-349 and after)
Figure 103

"END"

PROPELLER - MAINTENANCE PRACTICES

PROPELLER DEICER BOOT REMOVAL

a. Remove the propeller spinner.

b. Disconnect the deicer boot leads.

c. (This step not applicable to McCauley.) Remove the clip securing the lead strap to the spinner bulkhead and the clamp securing it to the propeller hub.

d. Use TT-M-261 methyl ethyl ketone (21, Chart 207, 91-00-00) or toluol (22, Chart 207, 91-00-00) to soften the adhesion line between the boot and the blade; loosen one corner of the boot sufficiently to grasp it with vise grip pliers or a similar tool.

CAUTION

Unless the boot being removed is to be scrapped, cushion the jaws of any pulling tool to prevent damaging the boot surface.

e. Apply a slow, steady pull on the boot to pull it off the propeller surface while continuing to use the solvent to soften the adhesive.

f. Remove the remaining adhesive from the boot and propeller blade with toluol or methyl ethyl ketone.

PROPELLER DEICER BOOT INSTALLATION (Figures 201 and 201A)

NOTE

If a new propeller is installed, the drying time of the EC1300L adhesive (32, Chart 207, 91-00-00) must be extended per B.F. Goodrich Service Bulletin No. E-75-51.

a. On B.F. Goodrich installations position the deicer boot on the propeller blade so that its centerline at the inboard end is adjacent to the split in the propeller blade clamp and 1 inch outboard of the clamp, and the centerline at the outboard end falls on the blade leading edge. Be sure the lead strap is in the proper position to be clamped to the blade retaining clamp.

NOTE

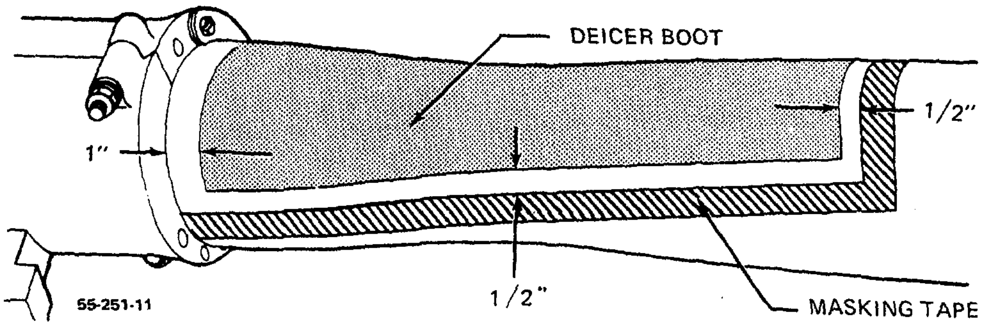
On McCauley installations place the centerline of the deicer boot on the leading edge of the propeller. For other McCauley installation dimensions refer to Figure 201A.

b. Mask off an area approximately 1/2 inch from the outer end and each side of the boot. (See Figure 201 or 201A.)

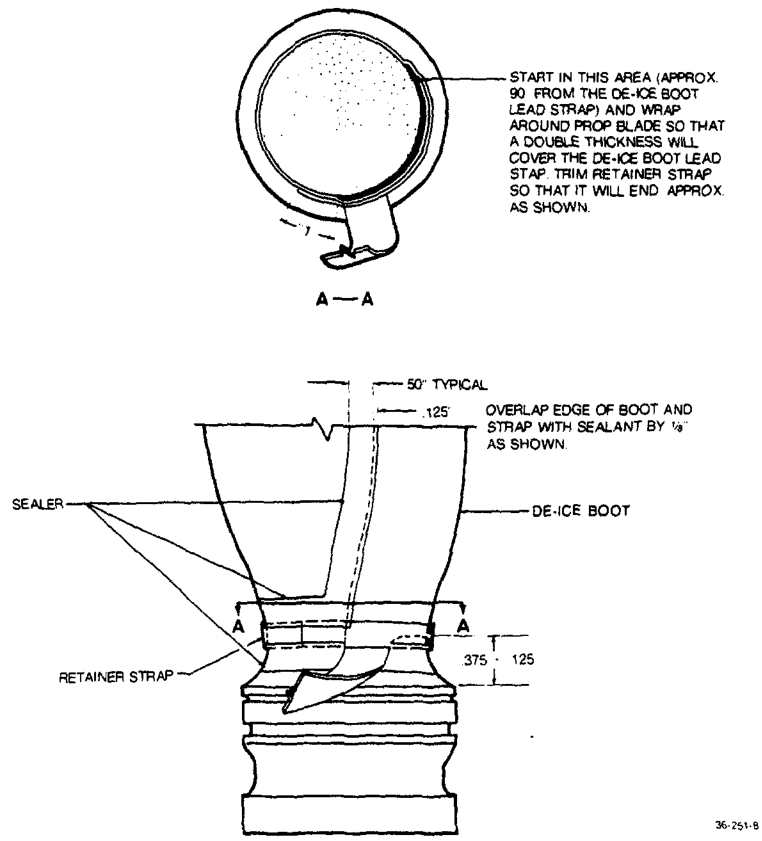
NOTE

On installations using rubber lead strap retainers, mark off an area approximately 1/2 inch from the area which will be occupied by the lead strap retainer strap (around the blade shank).

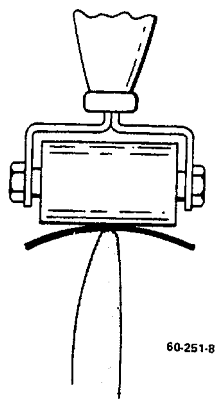
c. Remove the deicer boot and clean the blade in the masked area from the retaining clamp outboard. Clean the area thoroughly with TT-M-261 methyl ethyl ketone (21, Chart 207, 91-00-00) or toluol (22, Chart 207, 91-00-00). For final cleaning, wipe the solvent off quickly with a clean, dry, lint-free cloth to avoid leaving a film.



Deicer Boot Installation
Figure 201



Deicer Boot Installation (McCauley)
Figure 201A



Center Rolling
Figure 202

NOTE

If the blade is painted with lacquer, remove all paint within the masked off area. If the blade is painted with polyurethane, lightly sand within the masked off area, using 400-grit sand paper.

CAUTION

The metal and rubber parts must be thoroughly clean to assure maximum adhesion.

d. Moisten a clean cloth with methyl ethyl ketone or toluol (21 or 22, Chart 207, 91-00-00) and clean the unglazed surface of the deicer boot, changing the cloth frequently to avoid contamination of the clean area.

NOTE

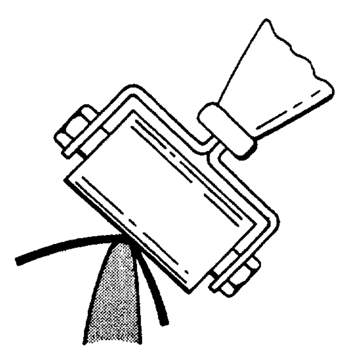
To prevent the edges of the deicer boots from curling while applying the cement, place masking tape around the edges of the glazed side of the boot. Remove the masking tape before installing the boot.

e. Thoroughly mix the EC 1300L cement (32, Chart 207, 91-00-00) and apply one even brush coat to the propeller blade. Allow the cement to dry for at least one hour at 40°F or above when the relative humidity is less than 75%, or two hours if the humidity is between 75% and 90%. Do not apply the cement if the relative humidity is higher than 90%.

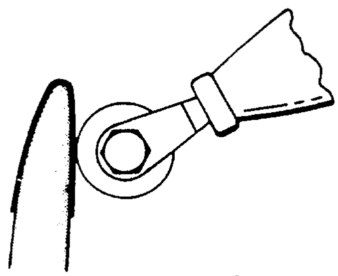
f. After allowing sufficient drying time, apply a second brush coat of cement to the propeller and one coat of cement to the unglazed surface of the deicer boot. Apply cement to the leadstrap as necessary to cement the strap to the propeller, up to the hub. Allow the cement to dry.

NOTE

When solvent is used to moisten the cement, methyl ethyl ketone (MEK) provides approximately 10 seconds for deicer installation, while toluol will provide approximately 40 seconds.



Side Rolling
Figure 203



60-251-10

Edge Rolling
Figure 204

g. Position the deicer boot on the propeller, starting 1 inch from the blade retaining clamp, making sure the lead strap is in position to clamp to the blade retaining clamp. Moisten the cement lightly with methyl ethyl ketone or toluol and tack the boot center line to the blade leading edge. If the center line of the boot deviates from the blade leading edge, apply MEK to soften the bond line (use a minimum amount of MEK) Remove slowly enough to allow the solvent to soften the cement, thus preventing removal of the cement coat or damage to the deicer boot. Avoid twisting, jerking or sharply bending the deicer boot. Allow the cement to dry before continuing to apply the boot. Reapply any cement that was pulled off. Roll firmly along the centerline of the boot with a rubber roller. (See Figure 202.)

CAUTION

Never use a metal or wooden roller for this purpose, for they would damage the heating elements in the deicer boot.

h. Gradually tilting the roller, work the boot carefully over each side of the blade contour. Avoid trapping air pockets under the boot. (See Figure 203.)

i. Roll outwardly from the center line to the edges of the boot. (See Figure 204.) If excess material at the edges tends to form puckers, work them out smoothly and carefully with the fingers.

j. Roll the tapered edges of the boot with a narrow steel stitcher roller.

k. Clean the blade with a clean cloth moistened with toluol (22, Chart 207, 91-00-00) or methyl ethyl ketone (21, Chart 207, 91-00-00). Be careful not to let solvent run into the edge of the boot.

l. Apply one even brush coat of sealer around the edges of the boot, allowing 1/16 to 1/8 inch overlap on the boot but extending to the masking tape. Use BFG 82-076-1 and -2 on B.F. Goodrich installations and Sunbrite 78-U-1003 enamel and U-1001-C catalyst on McCauley installations. Remove the masking tape after applying the cement to obtain a neat border.

m. Install the clamp securing the lead strap to the propeller blade retaining clamps.

NOTE

The rubber retainer strap should wrap around the blade shank over the inboard 1/4 inch of deicer boot on B.F. Goodrich or 1/2 inch on McCauley installations.

n. Connect the lead terminals and install the clip on the spinner bulkhead. There must be no slack between the terminal and the clip to assure enough slack between the clip and the clamp on the blade to allow full propeller travel.

CAUTION

After deicer boot installation, allow at least 12 hours for the EC 1300L Cement to dry before starting the engine, and 12 hours more before energizing the deicers.

DEICER TIMER CHECK (PRIOR TO TK-139, PRIOR TO TJ-349)

Experience in the field has indicated that often the timer is considered defective when the source of the trouble lies elsewhere. For this reason, the following test should be performed before the timer is removed as defective.

a. With the wiring harness disconnected at the timer and the deicer switch in the ON position, check the voltage from pin B of the harness plug to ground. If no voltage is present, the timer is NOT at fault; however, if system voltage is present at pin B, check the circuit from harness plug pin G to ground with an ohmmeter. If no circuit is indicated, the fault is in the ground lead rather than the timer. If ground connection is open, the timer step switch will not change position.

b. After the ground and power circuits have been checked, connect a jumper wire between pin B of the timer receptacle and terminal B of the connector plug and from pin G of the timer receptacle to ground. With the deicing system switch ON, check the voltage to ground from pin B of the timer. The voltmeter should indicate approximately 24 volts when the aircraft battery supply is being used. Next, check the dc voltage to ground from pins C, D, E, and F, the points at which the system voltage is impressed in sequence to cycle power to the propeller deicers. Each of the plugs should read 24 volts in the following sequence:

NOTE

The timer does not reposition itself to start at pin C when the system is turned off, but will begin its cycling at the same position in which it was when last turned off. Cycling will then proceed in the order of C, D, E, and F as before.

TIMING SEQUENCE	TIME ON	AREAS OF PROP DEICERS HEATED
Pin C	30 sec.	Right engine prop, Outb'd halves
Pin D	30 sec.	Right engine prop, Inb'd halves
Pin E	30 sec.	Left engine prop, Outb'd halves
Pin F	30 sec.	Left engine prop, Inb'd halves

After a voltage reading of 24 volts dc is obtained, hold the voltmeter probe on the pin until the voltage drops to zero before moving the probe on to the next pin in the sequence noted above. After the correctness of the cycling sequence has been established, turn the deicing system switch OFF at the beginning of one of the "on-time" periods and record the letter of the pin at which the voltage supply is present to facilitate performance of the Heat Test (prior to TK-139, prior to TJ-349).

DEICER TIMER CHECK (TK-139 AND AFTER, TJ-349 AND AFTER)

Experience in the field has indicated that often the timer is considered inoperable when the source of the trouble is elsewhere. For this reason, the following test should be performed before the timer is judged to be inoperable:

a. With the timer harness plug disconnected and the deicer switch in the ON position, check for voltage from pin B of the plug to ground. If no voltage is present, the timer is not defective; check the circuit breaker switch or the power supply. However, if system voltage is present at pin B, check the circuit from the harness to ground with an ohmmeter. If there is no continuity, the fault is in the ground circuit rather than the timer. If the ground circuit is open, the timer will not cycle.

b. After the ground and power circuits have been checked, connect a jumper wire between pin B of the timer receptacle and terminal B of the connector plug, and from pin G on the timer receptacle to ground. With the deicing system switch ON, check the voltage to ground from pin B of the timer. The voltmeter should indicate approximately 24 volts dc when the airplane battery supply is being used. Next, check the voltage to ground from pins D and F, the points at which the system voltage is impressed in sequence to cycle power to the LH and RH propeller deicers. The presence of 24 vdc system voltage should alternate at pins D and F for 90 seconds in duration as the timer cycles.

HEAT TEST (PRIOR TO TK-139, PRIOR TO TJ-349)

Before this test can be performed, the jumper wire installed for the timer test must be removed so that the connector plug can be replaced in the timer receptacle. Two men are required to perform this test, one in the pilot's compartment to monitor the ammeter while the other checks the deicer boots. The man in the pilot's compartment turns the deicer system circuit breaker/switch ON while the man outside feels the deicer boots to see if they are heating properly. The man in the pilot's compartment observes the ammeter for the proper readings (14 to 18 amperes) throughout the timing sequence. The ammeter needle should deflect every 30 seconds in response to the switching action of the timer. Each time this occurs, the man in the pilot's compartment must notify the man inspecting the propeller deicer boots so that the latter can change the position of his hands to check the proper heating sequence of the propeller deicer areas. If any irregularities are detected, a continuity check should be performed on the wiring from the timer to the brush block holders and the propeller deicer terminal connections.

HEAT TEST (TK-139 AND AFTER, TJ-349 AND AFTER)

Remove the jumper wires that were installed for the timer test and reconnect the timer receptacle. To perform this test, two people are required - one person in the flight compartment to operate the propeller deice switch and observe the propeller deice ammeter, the other on the ground checking the deice boots for proper heating. While the person in the flight compartment observes the ammeter for a reading of 14 to 18 amps, the person on the ground checks for a rise in heat on each propeller deice boot for approximately 90 seconds on each side. If either boot fails to heat, check the circuit between the timer and the propeller deice boot for continuity.

CAUTION

While following the instructions of the above "Heat Test" section, rotate the propeller back and forth to prevent arcing between the brushes and slip ring.

WARNING

Before moving the propeller, ensure that the ignition switch is OFF and that the engine has completely cooled, as there is always the danger of a cylinder firing when the propeller is moved.

CONTINUITY TEST (PRIOR TO TK-139, PRIOR TO TJ-349)

After removing the plug from the timer, use an ohmmeter to check continuity from:

a. Pin C of the plug to the outboard terminal of one prop boot on the right engine.

b. Pin D of the plug to the inboard terminal of one prop boot on the right engine.

c. Pin E of the plug to the outboard terminal of one prop boot on the left engine.

d. Pin F of the plug to the inboard terminal of one prop boot on the left engine.

e. Pin G of the plug to ground.

f. Ground terminal of one prop boot on the right engine to ground.

g. Ground terminal of one prop boot on the left engine to ground.

CONTINUITY TEST (TK-139 AND AFTER, TJ-349 AND AFTER)

After removing the plug from the timer, use an ohmmeter to check continuity from:

a. Pin D of the plug to the terminal of the propeller deice boot on the right engine.

b. Pin F of the plug to the terminal of the propeller deice boot on the left engine.

c. Pin G of the plug to ground.

d. Ground terminal of the propeller boot on the right engine to ground.

e. Ground terminal of the propeller boot on the left engine to ground.

BRUSH TO SLIP RING RESISTANCE TEST (PRIOR TO TK-139,PRIOR TO TJ-349)

To check for incorrect resistance or the presence of a short or open circuit at the brush-to-slip ring contact, disconnect the harness at the timer and check the resistance from each deicer circuit lead (pins C, D, E, and F of the harness plug) to ground with a low range ohmmeter. If the resultant readings are not 1.55 to 1.78 ohms, disconnect the deicer lead straps to measure heater resistance individually. Individual boot resistance should measure between 4.58 and 5.26 ohms. If the readings in the first check are not within the accepted limits but those in the second check are, the trouble is probably in the brush-to-slip ring area. If the readings in the second check are also off, the deicer concerned is damaged and must be replaced.

BRUSH BLOCK RESISTANCE CHECK

To check for an open circuit, a short, or high resistance in the brush block or brush module, measure the resitance from the face of the brush to its terminal stud with a low range ohmmeter. The probe contacting the brush should have a contact surface of 1/16 sq. inch minimum. If this resistance measures over 0.013 ohms, locate and repair the cause of excessive resistance. If the resistance is infinite, locate and correct the open circuit or ground, or else replace the brush. Check the resistance between the terminal studs and/or connector pins. This resistance should not be less than than .5 megohms after one minute. Use a tester having a 500 VDC. 1000 megohm capacity.

BRUSH REPLACEMENT (PRIOR TO TK-139, PRIOR TO TJ-349)

The propeller deicer brushes should be replaced when a minimum of 1/4 inch of brush material remains. It is good practice, however, to replace the brushes when 3/8 inch of the brush material still remains. Brush length may be determined by inserting a piece of safety wire into the holes at the back of the brush block assembly (Figure 205). When 1-5/16 inch dimension is measured, there is approximately 1/4 inch of brush material left. Replace the brushes as follows:

a. Disconnect the cannon plug and remove the brush assembly from the bracket. (See Figure 206.)

NOTE

Secure brushes in place before removing the brush assembly to prevent breaking reusable brushes during and after removal. (See Figure 207.)

b. Remove the screws attaching the cannon plug to the brush holder, then disassemble the brush holder by pulling the guide approximately 1/4 inch toward the cannon plug to disengage the pins.

c. Remove the plug, brushes, and springs from the brush holder, then slide the springs off the brushes.

d. Unsolder the wires from the brushes being replaced, noting which pin on the cannon plug they correspond to.

e. Solder both wires from the new brush to the appropriate pins on the plug, holding the "wicking" to 1/8 inch maximum.

f. Set the new springs in the holes of the larger block and insert the brush rods enough to partially compress the springs. Taking care against applying a side load on the brushes and against pinching or damaging the brush leads, slip the smaller block over the brushes and onto the larger block.

NOTE

When replacing brushes or brush retainer assemblies, always install new springs.

g. Install the cannon plug on the brush block with the attaching screws and washers. Note that the guide pin of the plug must be toward the brush support block and that the brush wires must not be crossed to assure proper deicer operation.

NOTE

Secure brushes in the brush holder to prevent breakage during assembly and installation. (See Figure 207.)

h. Check the amount of brush protrusion from the block. If the brushes protrude less than 7/16 inch, the brush leads should be untwisted to give more length. If this distance is more than 9/16 inch, the leads should be twisted to shorten the effective length until the brushes protrude from 7/16 to 9/16 inch. The brushes should then be checked for free sliding action. (See Figure 207.)

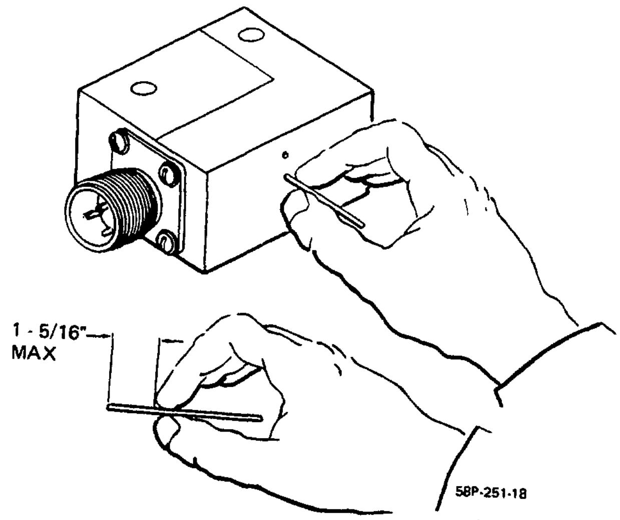
i. Place the brush block assembly on the mounting bracket and insert the mounting screws through both the block and bracket. (See Figure 207.)

j. Before installing the retainer nuts, make sure that the brushes are aligned with the slip rings such that the entire brush face contacts the copper rings. If the brushes do not align with the slip rings throughout the entire 360 degrees of slip ring rotation, install shims (P/N 1 E1157) between the brush holder and the mount until the brushes are properly aligned with the approximate center of the copper ring. (See Figure 207.)

k. Install the retaining washers and nuts, making certain that 1/16 ±1/32 inch is maintained between the brush block and slip ring surface. To prevent damage to the brushes, the brush block assembly should be angled in such a manner that the brushes contact the slip ring at an angle of approximately two degrees from perpendicular, as measured toward the direction of slip ring rotation. (See Figure 208.)

l. Connect and safety the cannon plug.

m. To preclude arcing caused by the rough surfaces of the new brushes, the engine should be operated for at least five hours before the deicer system is turned on. This does not apply to ground checks of the system performed while the engine is not running.



Determining Deicer Brush Wear
Figure 205

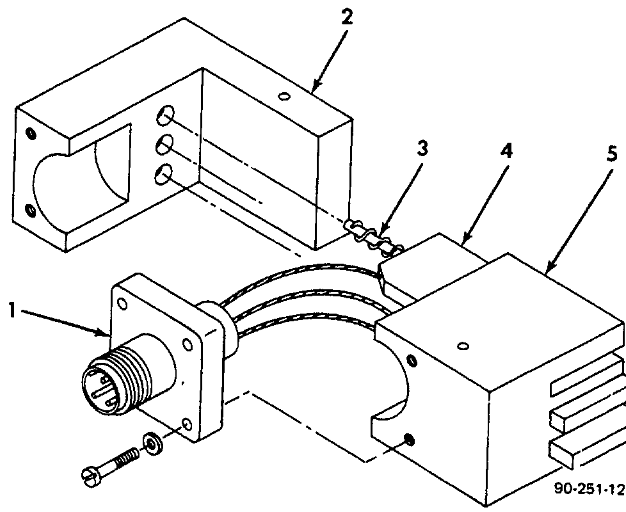
BRUSH REPLACEMENT (TK-139 THRU TK-150 EXCEPT TK-147, TJ-349 THRU TJ-443 EXCEPT TJ-436)

The modular brush assembly (P/N 3E2071) is made up of two modules (P/N 3E2011-1 and P/N 3E2011-2), each consisting of a plastic housing with an integral brush and spring. These modular units are stacked with a spacer and held together by screws to produce the modular brush assembly. When a brush wears out, the module containing it must be replaced since individual brush replacements are not available. Replace the entire brush module when only 3/8 inch of brush material remains.

NOTE

During measurement, only 1/16 inch of brush should protrude from the brush module, with this being the normal protrusion when the brush is installed on the airplane.

Brush wear is determined by inserting a pin into a hole in the back of the brush module as shown in Figure 205. On all modules having brushes with rods, the brush module should be replaced when the dimension shown in Figure 205 is 17/32



1. Cannon Plug
2. Support Block
3. Brush Spring
4. Brush
5. Guide Block

Propeller Deicer Brush Assembly
Figure 206

±1/32 inch. On all rodless brushes, the module should be replaced when this dimension is 1 7/64 ±1/32 inch. Use the following procedures when replacing the brushes:

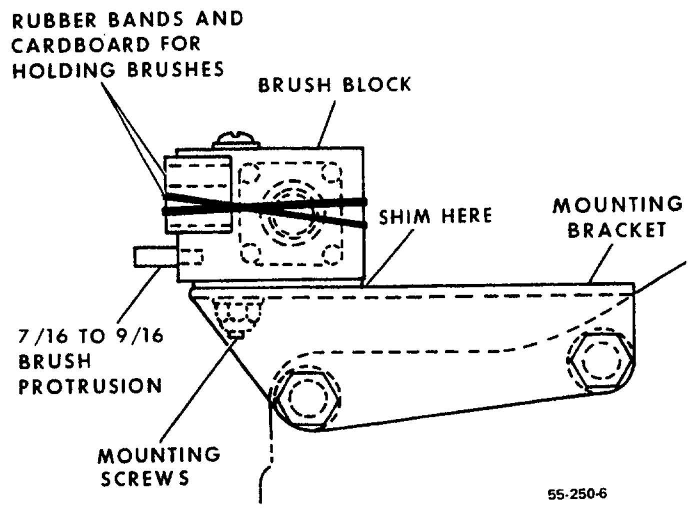
a. Disconnect the wire harness terminals at the modular unit terminals.

b. Remove the screws, nuts, and washers that secure the modular unit to the mounting bracket.

c. Remove the assembly retaining screws and separate the modules and spacers.

d. Replace each module with another of the same part number. (The part number is etched into the plastic housing.)

e. Restack the modules and spacers as they were unstacked in step "c". (Stacking arrangement may be changed if there is interference with any other engine or propeller component.)



Deicer Brush Block Assembly
Figure 207

f. Install the assembly screws so that the screw head fits in the recess of the spacer. Place the flat washer between the star washer and the modular housing and install the retaining nut. Ensure that the assembly is square before tightening.

g. Place the module brush assembly on the mounting bracket and insert the mounting screw through both the bracket and the brush block assembly. Place one washer under the head of the screw and one under the nut.

h. Before installing the retaining nuts, ensure that the brushes are aligned with the slip rings so that the entire face of the brush is in contact with the copper rings. If the brushes do not align with the slip rings throughout the entire 360 degree rotation of the slip ring, add or remove spacers (P/N 4E2218-3) between the modules until the brushes are properly aligned with the approximate center of the copper ring.

i. Install the retaining nut and washers, ensuring that 1/16 ± 1/32 inch is maintained between the brush module and the slip ring surface. To prevent damage to the brushes, the modular brush assembly should be angled so that the brushes contact the slip ring at an angle of approximately 2 degrees from perpendicular as measured toward the direction of slip ring rotation.

j. Reconnect the wire harness terminals to the modular unit terminals.

PROPELLER SLIP RING REMOVAL (PRIOR TO TK-151 EXCEPT TK-147, PRIOR TO TJ-444 EXCEPT TJ-436)

a. Remove the propeller as described in Chapter 61, PROPELLER REMOVAL.

b. Remove the six slip ring attach bolts and washers.

c. Remove the slip ring.

PROPELLER SLIP RING INSTALLATION (PRIOR TO TK-151 EXCEPT TK-147, PRIOR TO TJ-444 EXCEPT TJ-436)

a. Place the slip ring in place with AN936B416 star washers between the slip ring and the spinner bulkhead.

b. Torque the six slip ring attach bolts to approximately 25 inch-pounds being careful not to compress the star washers too much, which provides slip ring alignment adjustment.

c. Install the propeller as described in Chapter 61, PROPELLER INSTALLATION.

d. The slip rings may be properly aligned as described in SLIP RING ALIGNMENT in this Chapter.

SLIP RING ALIGNMENT (PRIOR TO TK-151 EXCEPT TK-147, PRIOR TO TJ-444 EXCEPT TJ-436)

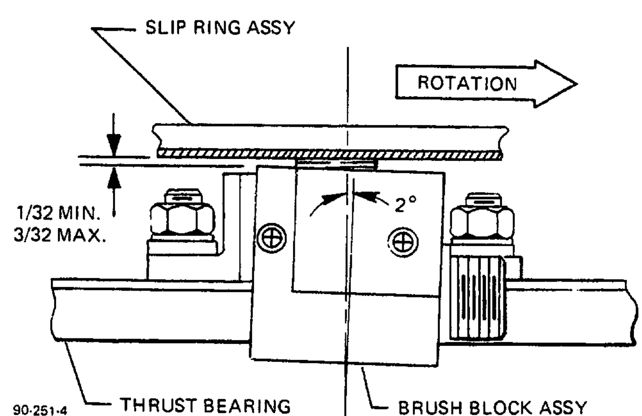
The slip rings are properly aligned when they run in a true plane relative to the brush block. This condition may be checked by attaching a dial indicator gage to the engine in such a manner that a reading of the slip ring wobble may be obtained. To avoid error in readings, rotate the slip rings slowly while pushing in on the propeller to take the play out of the thrust bearings. If the total run-out over 360 degrees of rotation exceeds 0.005 inch, the slip rings should be aligned as follows:

a. Approximately a 0.012 inch adjustment may be made to correct the slip ring wobble by varying the torque on the attachment bolts. Using the dial indicator to follow the points of maximum deviation, adjust the slip ring assembly to the prescribed run-out limits by varying the torque of the mounting bolts as required, within a range of 25 to 65 inch-pounds.

b. If more than 0.012 inch of adjustment is required for alignment, the slip ring assembly may be shimmed to within the prescribed limits for true running by the addition of AN960C416L washers on the mounting bolts between the slip ring assembly and the spinner bulkhead. If necessary, fabricate thinner shims to the AN960 size.

SLIP RING MACHINING (PRIOR TO TK-151 EXCEPT TK-147, PRIOR TO TJ-444 EXCEPT TJ-436)

Slip rings that may have roughened or damaged surfaces, but which are structurally sound, can be machined and restored to serviceability. Remove the slip ring assembly from the airplane and mount it in a lathe. Position it concentrically in the lathe, with not over 0.002 inch wobble or run-out over 360 degrees rotation. Take light cuts for a smooth finish and cut no deeper than required to remove surface damage. The contact surfaces of the three slip rings must be

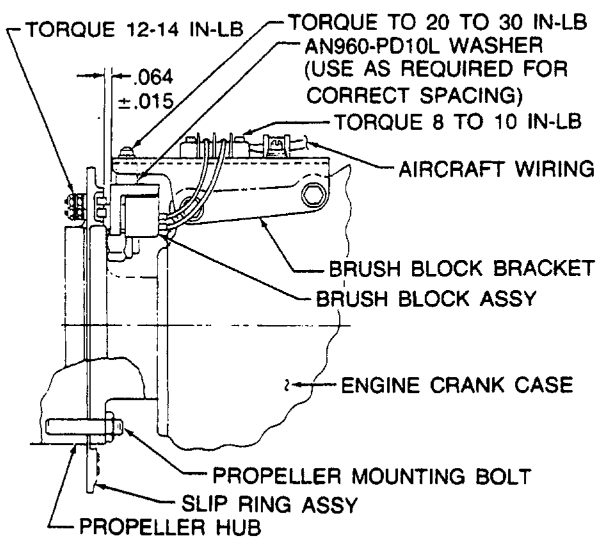


Propeller Deicer Brush Block Installation
Figure 208

parallel within 0.005 inch, and flat within 0.005 inch overall. Deviation from flat is not to exceed 0.002 inch over a 4 inch arc. If necessary, undercut the insulation between the slip rings to a depth of 0.020 to 0.030 inch below the contact surface of the slip rings. In this operation, width of the slip ring MUST NOT be reduced more than 0.005 inch. Contact surfaces of the slip rings must have a finish of 29.35 micro inches. Deburr the slip ring edges and reinstall in the airplane and align.

NOTE

If, in machining, the solder or braze connection on the underside of the slip ring is exposed, replacment of the slip ring assembly will be necessary.



Propeller Deicer Brush Module (McCauley)
Figure 209

BRUSH WEAR LIMITS (MCCAULEY) (TK-147, TK-151 AND AFTER) (TJ-436, TJ-444 AND AFTER)

The brushes may be checked for wear by one of the following methods:

ON THE AIRPLANE

a. Insert a stiff wire, such as a small paper clip, into the slot on the side of the brush block.

b. If it goes past the back of the brushes the brushes need replaced.

REMOVED FROM THE AIRPLANE

a. Insert a stiff wire, such as a small paper clip, into the slot on the side of the brush block past the back of the brushes (do not insert the wire too deep as a false reading will result).

b. Gently push the brushes into the brush block.

c. If any brush has .094 inch of brush or less remaining outside the brush block, that brush assembly needs replaced.

BRUSH REPLACEMENT (MCCAULEY) (TK-147, TK-151 AND AFTER) (TJ-436, TJ-444 AND AFTER) (Figure 211)

a. Remove the brush block from the engine as indicated in BRUSH BLOCK REMOVAL (McCauley) (TK-147, TK-151 and after) (TJ-436, TJ-444 and after).

b. Remove the two screws in the back of the brush block.

c. Pull the brush holder and brushes from the brush block. Discard the brush holder and brushes.

d. Replace the brushes and brush holder by first sliding the brushes into the slots of the brush block, then sliding the brush holder into place.

e. Install the two screws which hold the brushes in place. Torque the screws to 20 to 24 inch-pounds.

f. Push the brushes back into the brush block to ensure that they spring back freely.

g. If the brushes bind, loosen the screws and reposition the brush holder so the brushes ride freely in the slots. Torque the screws to 20 to 24 inch-pounds.

h. Install the brush block as indicated in BRUSH BLOCK INSTALLATION (McCauley) (TK-147, TK-151 and after) (TJ-436, TJ-444 and after)

BRUSH BLOCK REMOVAL (MCCAULEY) TK-147, TK-151 AND AFTER) (TJ-436, TJ-444 AND AFTER)

a. Disconnect the lead wire from the terminal strip.

b. Remove the brush block mounting screws and remove the brush block from the engine.

BRUSH BLOCK INSTALLATION (MCCAULEY) (TK-147, TK-151 AND AFTER) (TJ-436, TJ-444 AND AFTER)

a. Install the brush block on the engine with the two screws, but do not tighten the screws.

b. Add or remove shims (see Figure 209) to the brush block mounting screws until each entire brush is in contact with its slip ring throughout 360° of rotation.

c. Position the brush block on the mounting bracket so that the distance between the brush block and the face of the slip ring is .064 ±.015 inch.

d. Tighten the screws to a torque of 20 to 30 inch-pounds.

SLIP RING (MCCAULEY) (TK-147, TK-151 AND AFTER) (TJ-436, TJ-444 AND AFTER)

On these slip rings the mounting bolts can not be retorqued or shims added to correct wobble or nonconcentric rotation. Wear or slight wobble may be removed by machining.

NOTE

Friction from the brushes will cause a concave wear pattern on the slip rings. This does not necessitate replacement or machining unless rapid brush wear is encountered. When a new brush assembly is installed on slip rings with normal wear, the brushes will rapidly seat without degradation of operation or service life.

SLIP RING ALIGNMENT (MCCAULEY)

If a chattering or screeching is heard coming from the brush block/slip ring area, the probable cause is improper brush block slip ring alignment. A chattering or screeching detected while turning the propeller (in the normal direction of rotation) by hand should be corrected immediately. If the chattering or screeching is heard above idling engine noise, the problem is severe. Repositioning the brush block as indicated in Figure 209 should correct the problem.

SLIP RING OR BRUSH BLOCK CLEANING (MCCAULEY)

The slip ring and brush block may be cleaned with a clean cloth dampened with methyl ethyl ketone (MEK). Do not soak the brush block assembly with MEK.

SLIP RING MACHINING (MCCAULEY)

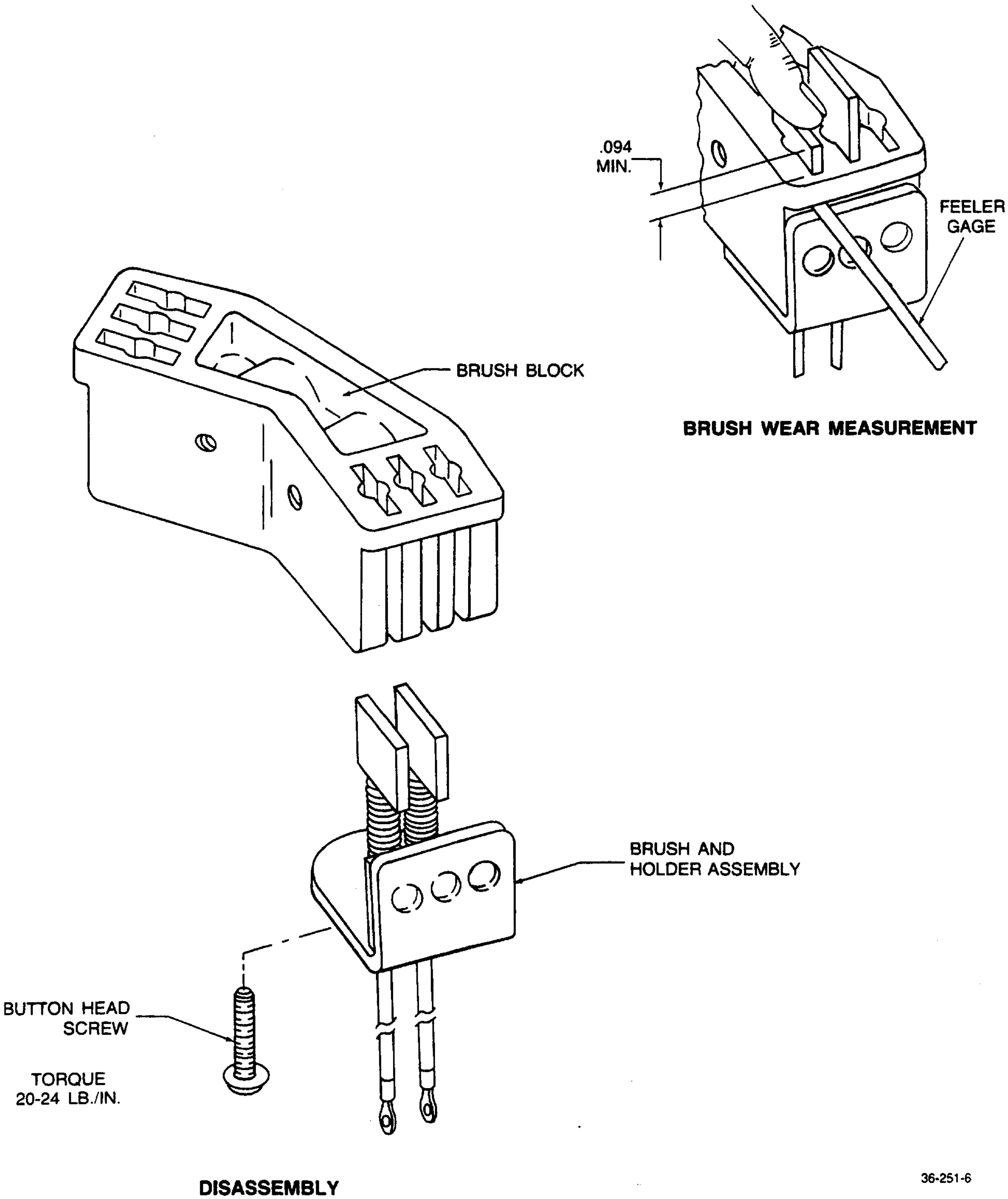
Structurally sound slip rings with surface damage may be machined to restore serviceability.

a. Clean the slip ring assembly with methyl ethyl ketone before machining.

b. Check the assembly mounting surface flatness. It must be flat within .005 inch overall.

c. Locate the assembly concentrically in a lathe so that there is no more than .002 inch wobble or run-out over 360° of rotation. The assembly should be fixed in the lathe in the same manner as it was attached to the propeller assembly. This will ensure that run-out held while machining the assembly will be trasnsfered when it is mounted on the propeller.

d. Take a light cut for a smooth finish (25 to 20 micro-inches) and cut no



Brush Block Assembly (McCauley)
Figure 210

deeper than required to remove the surface damage.

NOTE

The spindle speed should be 500 rpm or greater. If machine vibration is noted, it must be corrected. Machine vibration which is not corrected will result in a chattered finish. Feed rate is to be .002 inch or less with a final pass of .005 to .010 inch.

e. Ensure that the face surface of the slip rings are parallel and flat within .008 inch overall.

f. The slip ring holder face and the insulation around and between the slip rings must be undercut to .050 inch to .060 inch (Figure 211).

CAUTION

When undercutting the insulation between the slip rings, do not cut the inside diameter or the outside diameter of the slip rings more than .003 inch past the original diameters.

g. Debur the slip ring edges.

h. Polish the slip ring edges with crocus cloth to obtain a finish of 16 to 22 microinches.

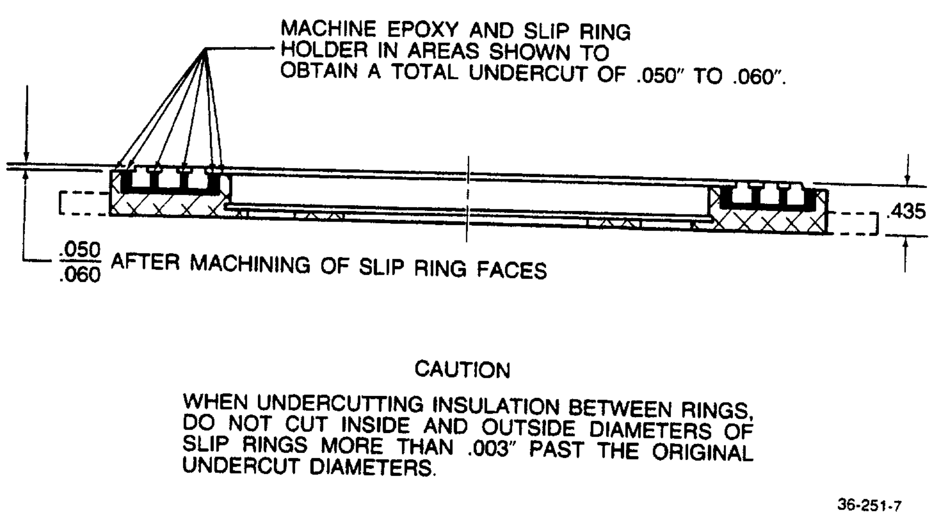
i. Check the electrical resistance between each ring and the holder and between each ring. The resistance should be a minimum of 50K ohms.

SLIP RING REMOVAL (MCCAULEY)

See PROPELLER REMOVAL (McCauley).

SLIP RING INSTALLATION (MCCAULEY)

See PROPELLER INSTALLATION (McCauley).



Slip Ring Machining (McCauley)
Figure 211

"END"

CHAPTER

32

LANDING GEAR

CHAPTER 32 - LANDING GEAR

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GENERAL - DESCRIPTION AND OPERATION

The landing gear is operated by a split-field series-wound motor and an actuator located under the cabin floorboards aft of the main spar. One field is used to drive the motor in each direction. To prevent overtravel of the landing gear, a dynamic braking relay simultaneously breaks the power circuit to the motor and makes a complete circuit through the armature and the unused field winding. The motor then acts as a generator and the resulting electrical load on the armature stops the landing gear almost instantly.

The landing gear motor is controlled by the gear extension switch located on the left hand side of the console. The larger upper arms and the lower arm of the actuator, in conjunction with rod assemblies and linkage, control extension and retraction of the main and nose landing gear. Rod assemblies attached to the smaller upper actuator arms operate the inboard main landing gear doors.

Landing gear limit switches, located adjacent to the actuator, limit the gear travel during the extend and retract cycle. These switches, when actuated, terminate the landing gear travel.

To prevent accidental landing gear retraction on the ground, a safety switch on the left main landing gear breaks the control circuit whenever the strut is compressed.

CAUTION

Never rely on the safety switch to keep the gear down while taxiing, landing, or on the takeoff roll. Always check the position of the landing gear switch.

The landing gear incorporates Beech air-oil type shock struts that are filled with both compressed air and hydraulic fluid. Their correct inflation should be assured before each flight.

MANUAL LANDING GEAR EXTENSION SYSTEM

In the event of landing gear malfunction in flight, the gear may be manually extended, but not retracted, by a hand crank at the rear of the pilot's seat.

WARNING

If the gear has been extended manually for emergency reasons, the airplane must be put on jacks and inspected before the gear controls are returned to their normal position.

THROTTLE WARNING SYSTEM

The throttle warning system provides the pilot with an audible warning that the landing gear is not down and locked when the flaps are fully extended and/or the throttle or throttles are retarded beyond the point necessary to sustain flight. The system is deactivated when the airplane is on the ground and the landing gear safety switch is activated.

The electrical components of the system are two micro-switches located in the pedestal, one flasher and one horn mounted on the forward bulkhead. These components are connected electrically to the landing gear downlock switches, flap downlimit switch and the landing gear safety switch.

"END"

TROUBLESHOOTING
LANDING GEAR ELECTRICAL SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Landing gear motor fails to shut off when gear is retracted.	a. Up limit switch out of adjustment.	a. Readjust switch.
	b. Defective switch.	b. Replace switch.
2. Landing gear fails to retract.	a. Safety switch not closing.	a. Readjust.
	b. Up limit switch remaining open.	b. Replace limit switch.
3. Landing gear motor fails to shut off when gear is extended.	a. Down limit switch does not open.	a. Readjust limit switch.
	b. Defective down limit switch.	b. Replace limit switch.
4. Landing gear actuator is hitting internal stops.	a. Limit switch out of adjustment.	a. Readjust limit switch.
	b. Dynamic brake switch defective.	b. Replace switch.
5. Warning horn in-operative or malfunctioning	a. Open or grounded circuit.	a. Check continuity.
	b. Throttle switches inoperative.	b. Check and adjust as necessary.
6. Landing gear fails to extend.	a. Tripped circuit breaker.	a. Reset circuit breaker.
	b. Down limit switches open.	b. Check down limit switch. With the gear retracted the down limit switch should be closed.
	c. Open circuit.	c. Run a continuity check on the down limit switch.
7. Landing gear will not retract or extend.	a. Bad electrical connections.	a. Run a continuity check from circuit breaker to switch. Inspect the dynamic brake relay.
	b. Landing gear motor not grounded.	b. Check motor ground.
	c. Defective control circuit.	c. Check items 1 through 3.

"END"

MAIN GEAR AND DOORS - MAINTENANCE PRACTICES

MAIN GEAR SHOCK ABSORBERS

To check the fluid level in the landing gear shock absorbers, deflate the strut by releasing the air through the valve and permit the strut to fully compress, then remove the filler valve.

WARNING

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

If the fluid level is low, add MIL-H-5606 or MIL-H-83282 hydraulic fluid (13, Chart 207, 91-00-00) until the fluid overflows slightly. Slowly cycle (compress and extend) the strut to expel any trapped air. Add fluid, as necessary, and install the filler valve.

With the aircraft resting on the ground and the fuel cells full, inflate the main strut until 3 inches of the piston is exposed. Rock the aircraft gently to prevent possible binding of the piston in the barrel when inflating.

CAUTION

Do not inflate the struts while the aircraft is on jacks, since sudden extension or over-inflation of the struts may bend the torque knee.

LUBRICATION

Lubricate the main wheel bearings and grease fittings as detailed in the Lubrication Chart, Chapter 12-20-00.

MAIN GEAR REMOVAL (Figure 201)

When removing the landing gear, take care to preserve the original adjustments at the rod end fittings to facilitate reassembly.

a. With the aircraft on a jack, retract the gear until the inboard landing gear door is in the fully open position.
b. Remove the outboard landing gear door from the landing gear strut.
c. Disconnect the inboard landing gear door actuating rod at the forward door hinge.
d. Unsnap the canvas cover and disconnect the uplock and downlock assemblies from the strut.
e. Open the brake cylinder bleed ports and pump all fluid from the system.
f. Disconnect the hydraulic line where the flexible hose couples to the tubing on the landing gear.
g. Disconnect the safety switch wire.
h. Remove the bolt attaching the lift leg to the strut.
i. Remove the access door in the lower surface of the wing leading edge for access to the forward hinge bolt retaining nut and remove the nut. The rear strut brace hinge bolt is accessible by lowering the flap.
j. Remove cotter pins and nuts (8), washers (5), bolts (2 and 3), washers (4 and 7), and bushings (6) from the front and rear spars (10 and 11).
k. Lower the main gear assembly away from the aircraft, being careful not to bend the skin at the wheel well edge.

MAIN GEAR INSTALLATION (Figure 201)

a. Carefully position the main gear assembly in place against the front and rear spars (10 and 11).
b. Align bolt holes and install bushing (6), bolts (2 and 3), washers (4, 5, and 7), and nuts (8). Torque to 250 to 400 inch-pounds. Install new cotter pins.

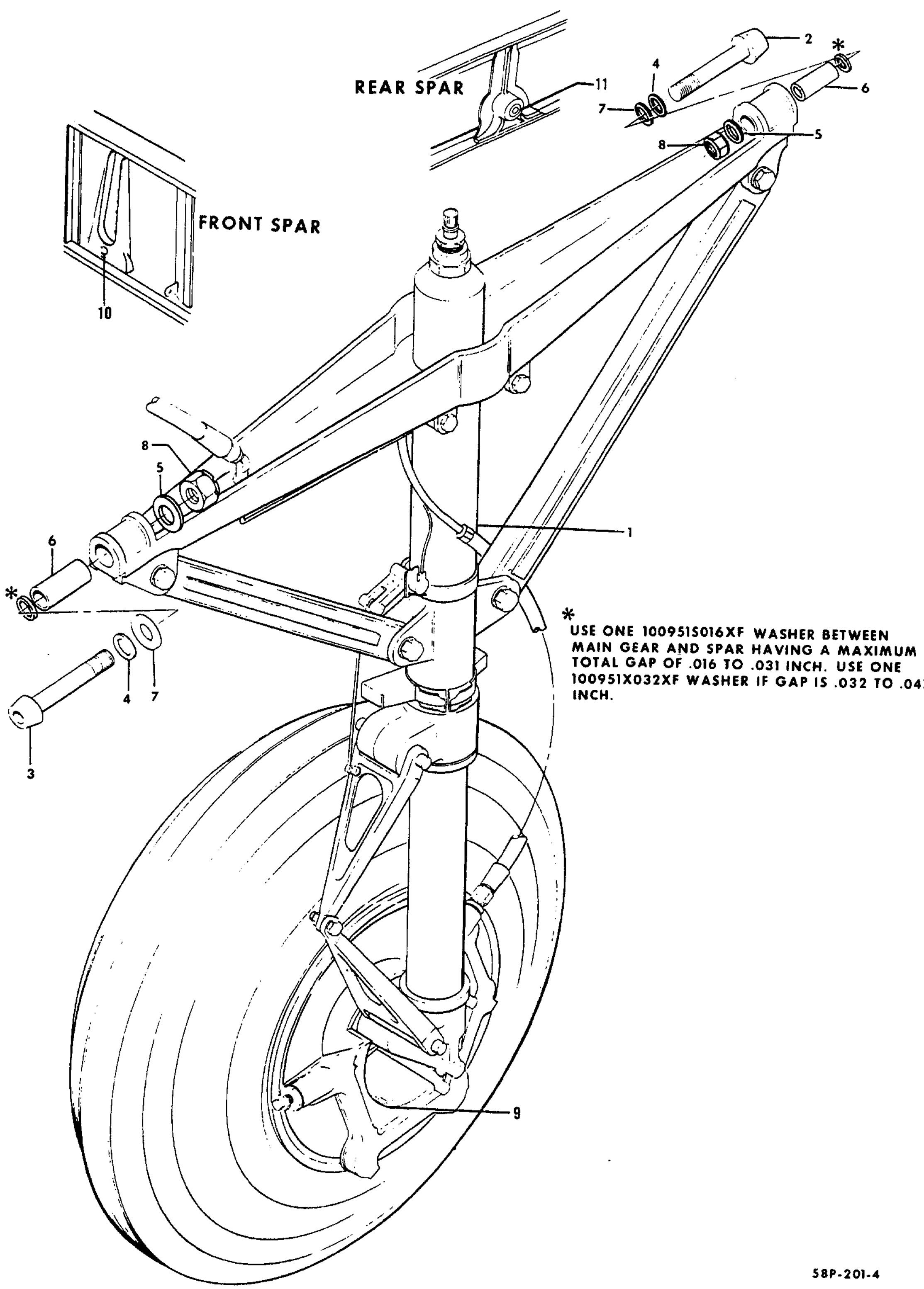
NOTE

Use one 100951SO16XF washer between main gear and spar having a maximum total gap of .016 to .031 inch. Use one 100951X032XF washer if gap is .032 to .047 inch.

c. Install the access door in the lower wing leading edge.
d. Install the bolt attaching the lift leg to the strut.
e. Connect landing gear safety switch wire.
f. Connect the brake hydraulic line.
g. Connect the uplock and downlock assemblies to the strut and snap the canvas cover in place.
h. Connect the inboard landing gear door actuating rod to the forward door hinge.
i. Install the outboard landing gear door to the landing gear strut.
j. Bleed the brake.
k. Operate the landing gear and check for proper rigging of the uplock and doors.

100-HOUR INSPECTION

ACTUATOR AND MOTOR - Check the actuator and motor for security, visible damage and condition. Check motor wiring for breaks and chafed or deteriorated



Main Gear Installation
Figure 201

insulation. Check all actuating rods for cracks, evidence of bending and security.

LANDING GEAR STRUT - Inspect the strut and attaching components for cracks, security, condition, and leakage at the air filler valve and piston area.

STRUT FLUID LEVEL - Inspect the strut for proper inflation. If leakage is detected, deflate the strut and check the fluid level.

"END"

NOSE GEAR AND DOORS - MAINTENANCE PRACTICES

NOSE GEAR SHOCK ABSORBER

To check the fluid level in the 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.

WARNING

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

If the fluid level is low, add MIL-H-5606 or MIL-H-83282 hydraulic fluid (13, Chart 207, 91-00-00) until the fluid overflows slightly. Slowly cycle (compress and extend) the strut to expel any trapped air. Add fluid, as necessary, and install the filler valve.

With the aircraft resting on the ground and the fuel cells full, inflate the nose strut until 4.31 inches of the piston is exposed. Rock the aircraft gently to prevent possible binding of the piston in the barrel when inflating.

CAUTION

Do not inflate the strut while the aircraft is on jacks, since sudden extension or over-inflation of the strut may bend the torque knees.

LUBRICATION

Lubricate the nose wheel bearings and grease fittings as detailed in the Lubrication Chart in Chapter 12-20-00.

NOSE GEAR REMOVAL (Figure 201)

When removing the nose gear, take care to retain the original adjustments at the rod end fittings to facilitate reassembly.

a. With the aircraft on a jack, partially retract the landing gear to relieve the load on the retract rod compression springs.
b. Disconnect the drag leg at its fitting on the nose gear brace assembly.
c. Disconnect the shimmy dampener at the nose gear.
d. Disconnect the steering mechanism at the nose gear.
e. Disconnect the landing light wiring.
f. Remove the nose baggage compartment flooring that covers the area on either side of the wheel well to gain access to the hinge bolts.
g. Remove cotter pins (6), nuts (5), washers (2 and 4), bolts (1), and bushings (3).
h. Lower the nose gear assembly from the nose wheel well.

NOSE GEAR INSTALLATION (Figure 201)

a. Carefully position the nose gear assembly against the nose wheel well structure.
b. Align bolt holes and install bushings (3), bolts (1), washers (2 and 4), nuts (5) and cotter pins (6).

NOTE

Use 100951S016YP washers (Maximum of two per side), to obtain total end play of .000 to .015-inch between the nose gear assembly and supports.

c. Install the nose baggage compartment flooring.
d. Connect the landing light wire.
e. Connect the drag leg on the nose gear brace assembly.
f. Connect the steering mechanism to the nose gear.
g. Check the shimmy dampener adjustment, then connect the shimmy dampener to the nose gear.
h. Operate the landing gear and check for proper rigging and nose gear adjustment. (Cycle the gear a minimum of six complete cycles.)

SHIMMY DAMPENER REMOVAL

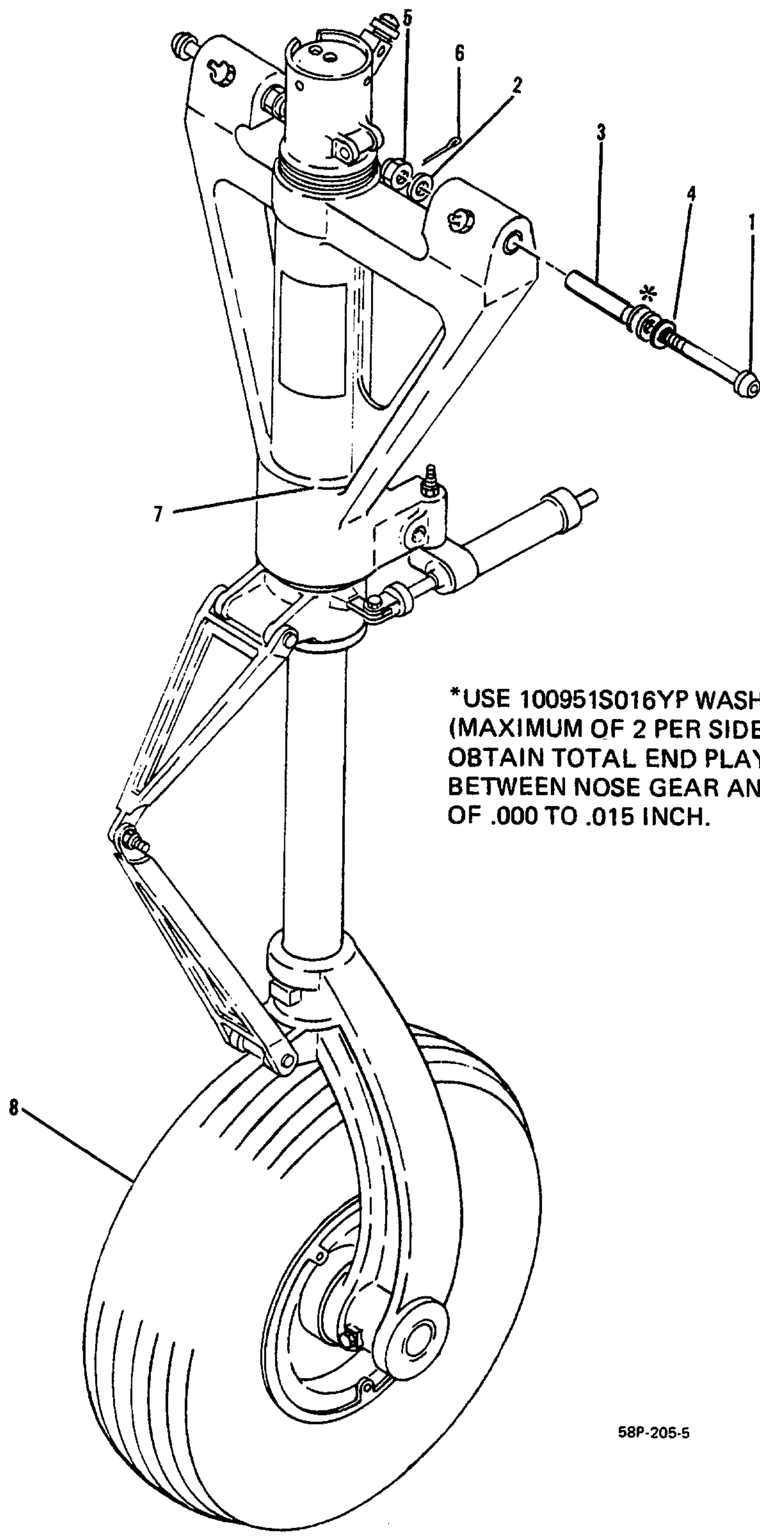
a. Remove bolt, washer and nut that attach the shimmy dampener to the nose gear strut housing.
b. Remove the bolt, washers, bushing and nut that attach the shimmy dampener to the nose gear brace.

SHIMMY DAMPENER INSTALLATION

NOTE

Install washers P/N 100951X031YN as required (maximum of six - minimum of one on each side) to align the shimmy dampener with the nose gear strut housing attachment point.

a. Position the shimmy dampener for installation and



*USE 100951S016YP WASHERS (MAXIMUM OF 2 PER SIDE) TO OBTAIN TOTAL END PLAY BETWEEN NOSE GEAR AND SUPPORTS OF .000 TO .015 INCH.

Nose Gear Installation
Figure 201

secure to the nose gear brace with bolt, washers (as required for alignment), bushing and nut.

b. Secure shimmy dampener to the nose gear strut with bolt, washers and nut.

c. Swivel the nose wheel to check the turning radius of the strut and for freedom of movement without binding or rough spots. Adjust nose wheel travel stops to stop shimmy dampener piston 1/32 inch minimum to 1/4 inch maximum from maximum travel in both directions.

100-HOUR INSPECTION

LANDING GEAR STRUT - Inspect the strut and attaching components for cracks, security, condition, and leakage at the air filler valve and piston area.

STRUT FLUID LEVEL -Inspect the strut for proper inflation. If leakage is detected, deflate the strut and check the fluid level.

"END"

EXTENSION AND RETRACTION MAINTENANCE PRACTICES

LUBRICATION

Lubricate the landing gear retract system as detailed in the Lubrication Chart in Chapter 12-20-00.

LANDING GEAR MOTOR AND ACTUATOR REMOVAL

When it is necessary to remove only the landing gear motor, accomplish steps "a", "b", "f", and "l".

a. Remove the cabin front seat.

b. Remove the carpet and access covers on top and directly behind the front carry through structure.

c. Disconnect the main landing gear retract rods at the actuator.

d. Disconnect the landing gear door retract rods at the actuator.

e. Remove the screws securing the landing gear limit switch assemblies to the actuator and move the switch assemblies aside to permit removal of the actuator.

f. Disconnect electrical wiring from the landing gear motor and the dynamic brake relay.

g. Remove the landing gear actuator access door on the bottom of the fuselage, and remove the nose gear actuator retract arm and linkage from the actuator.

h. Through the actuator access opening, remove the four nuts attaching the actuator to the fuselage structure.

i. Remove the landing gear actuator upper support retaining nut.

j. Remove the screws securing the upper support plate to its cross member.

k. Remove the landing gear actuator. The cross member may have to be moved upward to gain clearance, as the actuator is lifted, to clear its attaching studs.

l. Remove the three bolts attaching the landing gear motor to the actuator.

LANDING GEAR MOTOR AND ACTUATOR INSTALLATION

If only the landing gear motor has been removed, accomplish steps "a", "g". "i", and "k".

a. Install the three bolts attaching the landing gear motor to the actuator and secure with safety wire.

b. Position the actuator against the fuselage structure and install the four attaching bolts.

NOTE

Prior to installing the actuator nuts, apply thread locking compound (36, chart 207, 91-00-00) to the actuator stud threads.

c. Install the upper support plate to the cross member.

d. Install the actuator upper support retaining nut.

e. Secure the landing gear limit switch assemblies to the actuator.

f. Connect the main landing gear retract rods and door retract rods to the actuator.

g. Connect the electrical wiring to the landing gear motor and the dynamic brake relay.

h. Connect the nose landing gear rod and linkage to the actuator.

NOTE

When connecting the nose gear retract rod to the actuator, make certain the index mark on the arm and the actuator shaft coincide.

i. Check rigging of the landing gear system. When cycling the gear listen for unusual noises at the motor and actuator. Cycle the gear a minimum of six times.

j. Install the access covers, carpet and the front seat.

k. Install the access door on the bottom of the fuselage.

LANDING GEAR DYNAMIC BRAKE RELAY REMOVAL

a. Remove the cabin front seat.

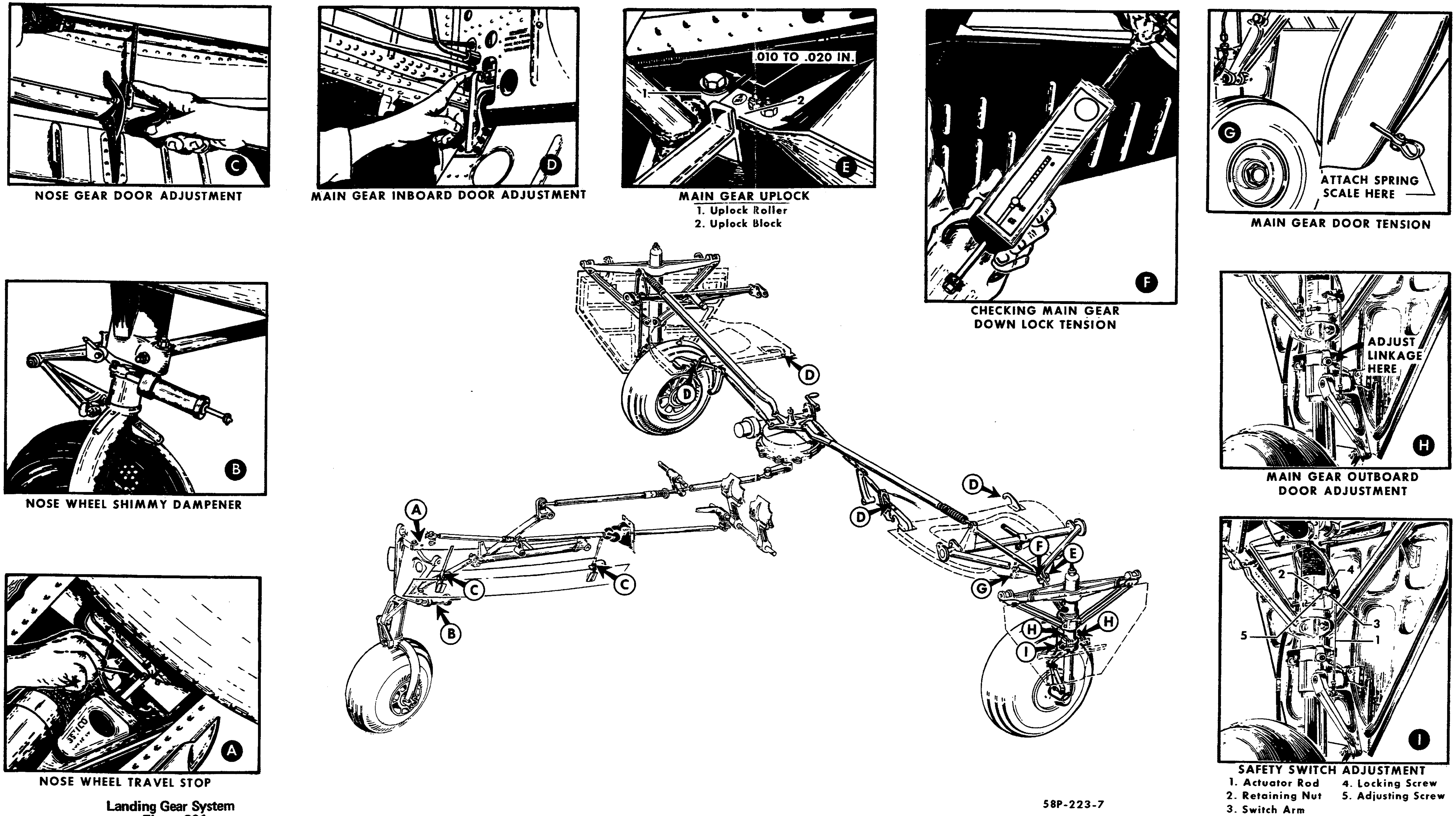
b. Remove the access cover on top and directly behind the forward carry through structure.

c. Disconnect the electrical wiring at the dynamic brake relay.

d. Remove the two attaching screws and the relay.

LANDING GEAR DYNAMIC BRAKE RELAY INSTALLATION

a. Install the dynamic brake relay with the two attaching screws



Landing Gear System
Figure 201

b. Connect the electrical wiring to the relay.

c. Install the access cover and the front seat.

d. Cycle the landing gear and check for proper braking action. The gear should stop almost instantly.

CAUTION

When landing gear is approaching its extreme of travel, intermittently actuate the landing gear switch to prevent damage to the wing and fuselage structure and the actuating rods, linkage and the landing gear components.

LANDING GEAR RIGGING (Figure 201)

NOTE

Read the entire rigging procedure before attempting to rig the landing gear system. Physically locate each item as you read the procedure through.

Battery voltage is not sufficient to properly cycle the landing gear during rigging. A 28.25 ± .25 volt auxiliary power unit capable of maintaining the initial setting within .25 volt during the extension and retraction cycles is recommended.

CAUTION

Excessive operation of the landing gear motor without proper cooling may cause damage to the motor. Allow 5 minutes cooling time after each extension and retraction cycle.

Whenever 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.

a. With the airplane on jacks, allow adequate floor clearance for wheels during retraction or extension.

CAUTION

Care should be taken to ensure that the main gear retract rods are not lengthened far enough to damage the inboard landing gear doors.

b. If it is determined that the entire landing gear is out of rig, take the following precautions to prevent damage to the gear and airplane. Lengthen the main and nose gear retract rods sufficiently to eliminate the danger of the main gear V-brace damaging the wing skin when the gear is retracted. Place the uplock block in the lower position.

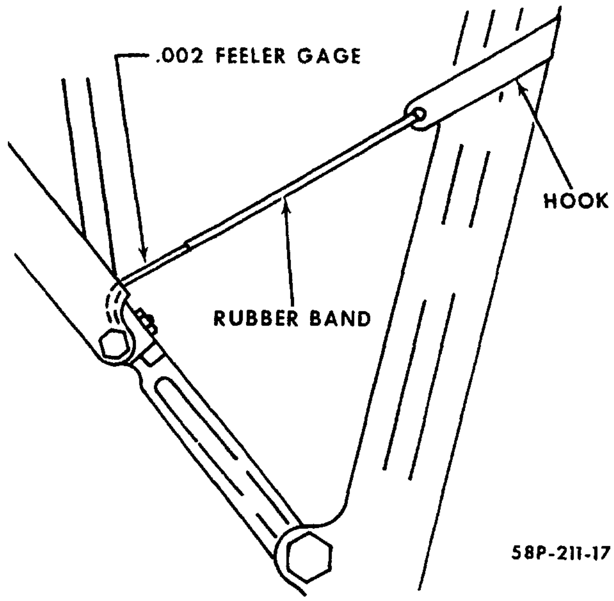
c. Disconnect the nose wheel door linkage. Secure the nose wheel door out of the way with tape. Disconnect the main wheel outboard door linkage at the strut. The inboard door linkage is disconnected by removing the retract linkage at the actuator arm. The linkage should be tied out of the way of the actuator arm.

d. Screw the stop bolts (on the main gear V-brace assembly) in until four or five threads are showing.

NOTE

The new actuators (used on serials TJ-382 and after, and TK-143 and after) may be installed on earlier airplanes as a spare. The new actuator may be identified by part number 95-810017-19 or by white epoxy paint on the upper actuator arm, and on the upper and lower actuator housing. At the same serials mentioned earlier, a new motor running slower in the retract cycle is installed. This motor may be installed on earlier actuators.

e. Retract the landing gear to its 2/3 up position, then stop and inch the gear the remaining distance to the



Main Gear Deflection
Figure 202

uplimit switch by intermittent operation of the landing gear relay circuit breaker. Check the emergency hand crank for 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 95-810017-19 actuators) free clockwise movement before the sector gear contacts the gearbox internal stop. If proper internal clearance is not obtained, adjust the landing gear uplimit switch. Locate the landing gear uplimit switch adjustment screw on the actuator arm and adjust the screw to stop the landing gear on its up cycle at the point where proper internal clearance is maintained.

CAUTION

The gearbox may be damaged if allowed to run full cycle into the internal stops. To preclude this possibility, the limit switches should initially be adjusted aft, for an early shut-down, if an out-of-adjustment condition is suspected.

NOTE

All adjustment and rigging of limit switches should be accomplished using an external power source adjusted to 28.25 ± .25 volt. Due to overtravel, the landing gear will not stop at the same position that the limit switches are actuated.

f. Extend the landing gear to its 2/3 down position, then stop and inch the gear the remaining distance to the downlimit switch by intermittent operation of the landing gear relay circuit breaker. Check the emergency hand crank for 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 95-810017-19 actuators) free counterclockwise movement before the sector gear contacts the gearbox stop. If proper internal clearance is not obtained, (TJ-2 thru TJ-101, and TK-1 through TK-142) adjust the downlimit switch by hand forming the switch actuator located on the upper arm of the landing gear actuator. Carefully hand form the switch actuator to stop the landing gear on its down cycle at the point where proper internal clearance is achieved. On TJ-102 and after, and TK-143 and after, locate the landing gear downlimit switch adjustment screw on the upper arm of the landing gear actuator, and adjust the screw to stop the landing gear on its down cycle at the point where proper internal clearance is achieved.

g. Extend and retract the gear two or three times to assure that the switches are correctly set. Check the hand crank each time to assure a free movement of 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 95-810017-19 actuators) free movement in each position to ensure proper adjustment.

WARNING

Do not operate the hand crank with the power on.

NOTE

Perform step "i" concurrently with step "h".

h. Adjust both the right and left main retract rods to maintain a minimum clearance of 0.12 inch between the knee joint of the V-brace and wing skin with the landing gear retracted. To determine V-brace and wing skin clearance, retract the landing gear and slide a 0.12 inch feeler gage between the landing gear knee joint V-brace lift leg and the top wing skin. The main gear should retract only far enough to clear the inboard door in addition to maintaining the minimum 0.12 inch clearance. To decrease the clearance between the knee and the top wing skin, shorten the retract rod.

i. Fabricate a spring feeler gage from a piece of metal 0.002 inch thick by 1/2 inch wide by 1-1/2 inches long, a rubber band and a hook made of a heavier piece of metal. (See Figure 202.) The rubber band must stretch tight enough to pull the 0.002 inch material from the torque knee contact surface when sufficient force is applied.

j. With the main landing gear fully extended and the downlock disconnected, check the main gear retract rod end spring for minimum compression of 0.08 inch. Insert the spring feeler gage fabricated in step "i", as shown in Figure 202, in the knee contact surface of the main gear lift leg. Apply a force, as shown in Detail "F" of Figure 201, using a push-pull scale. Apply the force until the torque knee contact surface of the lift leg releases the 0.002 spring feeler gage. The reading on the push-pull scale should be 55 to 65 pounds. To increase tension add washer P/N 100951S063XP (maximum of 6) as required, between spring and rod end. Check for a total minimum gap of 0.060 inch between the spring coils.

NOTE

If proper down tension cannot be established, install a new spring.

k. When the proper setting is obtained, leave the gears in the fully retracted position and screw the stop bolt down against the strut. To assure a firm setting, insert a 0.003 feeler gage under the bolt head and adjust the bolt until a firm, steady effort is required to pull the feeler gage out. With the feeler gage removed, screw the bolt 3/4 turn (counterclockwise, when viewing bolt head) from initial contact with no clearance. Tighten the locknut securely.

l. Install the inboard door retract rods at the actuator.

m. Connect the main gear inboard door linkage and the uplock cable, then retract the gear slowly and check for clearance between the door linkage and root rib and for proper operation of the uplock. Extend the gear to 3/4 down position and check for 0.50 inch minimum clearance between the tire and the inboard door with the slack removed from the door linkage. To provide attachment point for a spring scale when rigging the door tension, fabricate a hook which can be screwed into the hole provided in the inboard gear door. With the gear retracted, rig the inboard door linkage so that a force of 28 to 45 pounds is required to deflect the forward, outboard corner of the door 1/8 inch. With the gear extended, rig the inboard door linkage so that a force of 25 to 53 pounds is required to deflect the outboard corner of the door 1/8 inch. The doors are adjusted by disconnecting the linkage rods at the clevis fitting and screwing the rods in or out to vary their length. There shall be a clearance of 0.19 to 0.30 inch between the main landing gear axle and the inside surface of the inboard door, at its closest point, with the gear fully retracted.

NOTE

To measure the clearance between the main landing gear axle and the inside surface of the inboard door, place a 1/2 inch thickness or more of artists clay or equivalent on the axle. Place one thickness of paper over the clay to prevent the clay from sticking to the door. Retract the landing gear. Leave the gear in the fully retracted position long enough for the clay to remain in the flattened position then extend the gear. Remove the paper and measure the depth of the clay. The depth should be between 0.19 to 0.30 inch.

CAUTION

Install the main landing gear door push rod attaching bolt in the door linkage bracket with the head to rear. If installed wrong, the bolt may catch in the fuselage skin and root rib of the wing, causing damage to the landing gear retract mechanism or preventing the gear from retracting.

n. With the main landing gear fully extended and the downlock in the locked position, check the rollers for free movement of 0.01 to 0.02 inch between the roller and the downlock block. If this clearance is not obtained, loosen the block retaining bolts and adjust to proper clearance. Torque the bolts to 90 to 100 inch-pounds. Fully retract the main landing gear and repeat.

o. Fully extend the main landing gear and with the downlock in the locked position, check for a clearance of 0.03 to 0.10 inch between the inboard ends of the downlock spring and the downlock. Add or remove washers, P/N 10095DD040ZZ, as necessary to obtain this clearance.

NOTE

The uplock cable end must be attached to the uplock assembly with the bolt head pointing aft. This is necessary to maintain proper clearance throughout gear travel.

p. With the main landing gear fully extended and downlocks engaged, adjust downlock tension of 52-1/2 +

10-0 pounds using a tensiometer. The tension is adjusted at the outboard end of the cable. If sufficient adjustment is not obtained at the cable eye, additional adjustment may be made at No. 3 wing rib by moving the cable housing inboard or outboard.

q. Apply a light coat of thread locking compound (36, Chart 207, 91-00-00) on the cable clamp threads. Immediately after applying thread locking compound, install downlock cable and cable clamp on uplock cable. The cable clamp must maintain a clearance of 0.10 to 0.15 inch between the cable clamp and cable pulley. Torque cable clamp assembly to 80-90 inch-pounds. After 5-7 minutes retorque cable clamp assembly to 80-90 inch-pounds.

NOTE

Newer airplanes and airplanes that have had the cable assembly recently replaced utilize a cable assembly which does not require a cable clamp.

r. Fully retract the main landing gear and ensure that the uplock is in the locked position. On airplane serals TJ-3 thru TJ-101 and TK-1 and after, use a push-pull scale to apply a force of 52-62 pounds to the inboard portion of the uplock assembly. Check for a deflection of not more than .002 inch. On airplane serials TJ-102 and after, take a tensiometer reading on the uplock cable just inside the cabin. Rig the cable to a tension of 52-62 pounds.

s. Connect the outboard main gear door linkage and retract the gear slowly, checking to see that clearance is maintained between the door and gear. After checking to see that the door is not too tight, run the gear down and adjust the linkage as required. Continue this procedure until a snug, firm fit is obtained when the door is completely closed.

t. Swivel the nose wheel to check the turning radius of the strut and for freedom of movement without binding or rough spots. Adjust nose wheel travel stops to stop shimmy damper piston 1/32 inch minimum to 1/4 inch maximum from maximum travel in both directions.

NOTE

Fabricate a spring feeler gage using a heavy rubber band, a piece of metal material (0.12 inch thick x 1/2 inch wide x 3/4 inch long), and a piece of light weight material to form a hook. Drill a hole in the hook and in one end of the feeler gage (0.12 inch material). Cut the rubber band and thread one end into the hole of the feeler gage. Tie knots in the rubber band to secure it to the feeler gage. Thread the other end of the rubber band through the hole in the hook and secure.

u. With the gears extended in the full down position and the wheel clearing the floor, adjust the nose gear tension at the aft retract rod (shorten or lengthen) to obtain deflection force of 55 to 65 pounds or higher (providing the retract spring does not stack at any point during the full travel of the nose gear) at the union of the V-brace assembly and the drag leg assembly. The deflection force should be applied at the pivot point of this union in a plane perpendicular to the centerline between these assemblies. To obtain the above requirements, additional 100951DD064XM washers may be required at the forward end of the retract rod spring. Insert the 0.12 inch part of the spring feeler gage between the strut and the bumper and place the hook of the spring gage around nearby structure (stretching the rubber band). With the nose gear in the fully retracted position (strut against the feeler gage and bumper) and with the doors disconnected, a force of 30 to 35 pounds applied downward at the centerline of the tow pin shall be required to move the strut off of the bumper (indicated by the spring feeler gage releasing from its position from between the strut and bumper). With the nose gear in the fully retracted position (spring feeler gage between the strut and bumper and the hook portion around nearby structure) and both doors fully rigged, a force of 20 pounds minimum applied downward at the centerline of the tow pin shall be required to move the strut off of the spring feeler gage.

v. With the gears down, check the adjustment of the LH safety switch. Refer to the Landing Gear Illustration, Figure 201, while adjusting the switch.

CAUTION

Care should be taken when removing the switch actuator rod. Unnecessary or extreme movements may damage the interior of the switch rendering the switch useless.

1. Remove the safety switch actuator rod from the attaching bracket on the upper torque knee, then remove the retaining nut and switch arm from the switch shaft.
2. Jack the landing gear so the shock strut is compressed to 0.50 ± 0.12 inch from the extended position.
3. Connect the wire leads from the test light to pins inserted into the splices at wires number G2B20 and G20A20 (about 10 inches up from the safety switch).
4. Rotate the switch shaft clockwise until the test light comes on.
5. Remove the safety wire from the locking screw on the switch arm and back off the locking screw.

6. Install the switch arm on the switch shaft in a position parallel to the upper torque knee and adjust the actuating rod end to align with the attaching bracket on the torque knee. Install the actuating rod connecting bolt.

7. Position the shock strut to 0.87 ± 0.12 inch from the fully extended position and adjust the switch shaft counterclockwise at the adjusting screw until the light goes out. When satisfactory adjustment is obtained, tighten the locking screw and the retaining nut.

8. Recheck the landing gear travel to both dimensions described above before safety wiring and locking screw to the switch arm.

w. The landing gear position lights on the instrument panel are operated by the uplock and downlock switches on each gear.

MAIN GEAR: Adjust the downlock switch installed on the main gear so that the overtravel of the switch plunger is 0.050 to 0.125 inch after the actuation of the switch. Adjust the uplock switch (adjacent to the uplock hook) so that overtravel of the switch plunger is not greater than 0.015 inch after actuation of the switch. Check the instrument panel to be sure that the indicator lights correspond to gear position.

NOSE GEAR: Adjust the downlock switch installed on the nose gear drag brace so that the overtravel of the switch plunger is 0.050 to 0.125 inch after the actuation of the switch. Adjust the uplock switch (adjacent to the uplock hook) so that overtravel of the switch plunger is not greater than 0.015 inch after actuation of the switch. Check the instrument panel to be sure that the indicator lights correspond to gear position.

x. Recheck the limit switch adjustment and remove the airplane from the jack.

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, conditions of insulation and loose connections; indicators for proper indication.

WARNING HORN - Check for proper operation.

DOWNLOCKS - Check the main and nose gear deflection, the downlock switch for security and adjustment.

SAFETY SWITCH - Check for security and proper operation.

ACTUATOR - Check for unusual noises, binding and proper rigging.

LIMIT SWITCHES - Check for security and proper adjustments.

EMERGENCY EXTENSION - Check the system for freedom of operation and positive engagement of the downlocks.

"END"

WHEELS AND BRAKES - DESCRIPTION AND OPERATION

MAIN WHEEL ASSEMBLIES

The airplane is equipped with Goodrich 6.50 x 8 wheel assemblies.

The wheel consists of an inner and outer magnesium wheel half 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 Goodrich wheel assemblies are provided with balance weights.

Screws and safety wire retain sixteen torque keys in the slots of the flange area of the Goodrich inner wheel half. The torque keys retain the lugs of the brake disc which rotate with the wheel when the brake and wheel are mounted on the landing gear axle.

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 x 5 nose wheel assembly, tube type tire. The wheel consists of an inner and outer wheel half, which are shell molded magnesium castings. Both halves 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 inner 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 19.50 x 6.75 x 8, 10 ply tube type tires (replacement tube is 19.50 x 6.75 x 8).

The nose wheel tire installed on the airplane is a 5.00 x 5, 6 ply, tube type tire.

BRAKE ASSEMBLY

Goodrich brake assemblies are installed on the airplane. The brake assemblies are designed for use with MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) to withstand 550 to 600 psi operational pressure with zero psi back pressure.

The Goodrich brake contains one rotating brake disc, which is keyed to rotate with the wheel, two carrier linings, a torque plate and three piston insulators which are attached to the piston housing. Braking action occurs when hydraulic pressure is applied to the three small pistons in the piston housing which force the carrier linings together creating friction between the rotating disc and stationary parts. The pistons are sealed against leakage with preformed packings. The brake assemblies are interchangeable between right and left by changing the location of the bleeder adapter.

HYDRAULIC BRAKE SYSTEM

The hydraulic brake system is operated by depressing the pilot's rudder pedals which compresses the piston rods of the attached master cylinders. The hydraulic pressure resulting from the movement of the master cylinder pistons is transmitted through flexible hoses and fixed aluminum tubing to the brake disc assemblies mounted on each main landing gear. This pressure forces the brake pistons to press against the linings and discs of the brake assembly. Upon release of pressure against the pistons the brake discs will have a tendency to drag against the stationary liners. A parking brake valve is installed adjacent to the rudder pedals between the master cylinder and the wheel brake assemblies. After the pilot's pedals have been depressed to build up pressure in the brake lines, the parking brake valve is closed by pulling out the parking brake handle. This closes the valve and retains the pressure in the brake lines. The parking brake is released when the parking brake handle is pushed in and the pedals are depressed briefly to equalize the pressure on both sides of the valve, allowing it to open. The optional dual brake system provides the hydraulic braking action from the copilot's postition as well as the pilot's position. This is possible by the addition of a shuttle valve adjacent to each set of rudder pedals and two master cylinders at the copilot's postion. The shuttle valves permit the braking action to change from one position to the other.

"END"

TROUBLESHOOTING
BRAKE SYSTEM

TROUBLE	PROBABLE CAUSE	REMARKS
1. Solid pedal and no brakes.	a. Brake lining worn beyond allowable limit.	a. Replace lining.
2. Spongy brake.	a. Air in system.	a. Bleed brake systems.
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.	a. Bleed brake system.
	b. Defective parking brake valve.	b. Replace the valve.
5. Brakes grab.	a. Stones or foreign matter locking brake disc.	a. Clean brake disc and lining.
	b. Warped or bent disc.	b. Replace disc.

"END"

WHEELS AND BRAKES - MAINTENANCE PRACTICES

MAIN WHEEL AND TIRE

The wheel and tire assembly is shipped from the factory completely assembled. The bearings are packed with the proper grease and may be installed as received.

NOTE

Relubricate the bearings after extended storage. If this is necessary, refer to the Wheel and Brake Manual (P/N 98-34998) for instructions.

Install the main wheel and tire assembly on the axle as follows:

a. Visually check the nut and axle for burrs and rough threads.
b. Apply Aeroshell Grease 5 (38, Chart 207, 91-00-00) or MIL-G-81322 grease (9, Chart 207, 91-00-00) to the threads and all bearing surfaces.
c. Install the wheel and tire assembly with bushing, washer and nut.

NOTE

Make sure that the brake disc lugs engage the slots of the inner wheel half. Rotate the wheel while adjusting the axle nut to assure proper seating and check to see that there is no side motion.

d. While rotating the wheel, torque the axle nut to 15 to 20 foot-pounds. Back off the nut, then retighten finger tight Using a wrench tighten the nut to the next available cotter pin position and install a new cotter pin.

MAIN WHEEL INSPECTION

a. Inspect wheel half flanges for cracks and corrosion. Smooth minor abrasions, nicks and burrs with a fine file or emery cloth. Chemically treat and coat the surfaces as instructed in the Wheel and Brake Manual (P/N 98-34998).
b. Check for loose or missing bolts and nuts. Retighten or replace as necessary.

CAUTION

Wheels with loose or missing bolts should be removed from the airplane and dye penetrant inspected for cracks.

c. Inspect for excessively worn or loose torque keys.

NOSE WHEEL AND TIRE

The wheel and tire assembly is shipped from the factory completely assembled. The bearings are packed with the proper grease and may be installed as received.

NOTE

Relubricate the bearings after extended storage. If this is necessary, refer to the Wheel and Brake Manual (P/N 98-35061) for instructions.

Install the nose wheel and tire assembly on the axle as follows:

a. Visually check the nut and axle for burrs and rough threads.
b. Apply Aeroshell Grease 5 (38, Chart 207, 91-00-00) or MIL-G-81322 grease (38, Chart 207, 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.

NOSE WHEEL INSPECTION

a. Inspect wheel half flanges for cracks and corrosion. Smooth minor abrasions, nicks and burrs with a fine file or emery cloth. Chemically treat and coat the surfaces as instructed in the Wheel and Brake Manual (98-35061).
b. Check for loose or missing bolts. Retighten or replace as necessary.

CAUTION

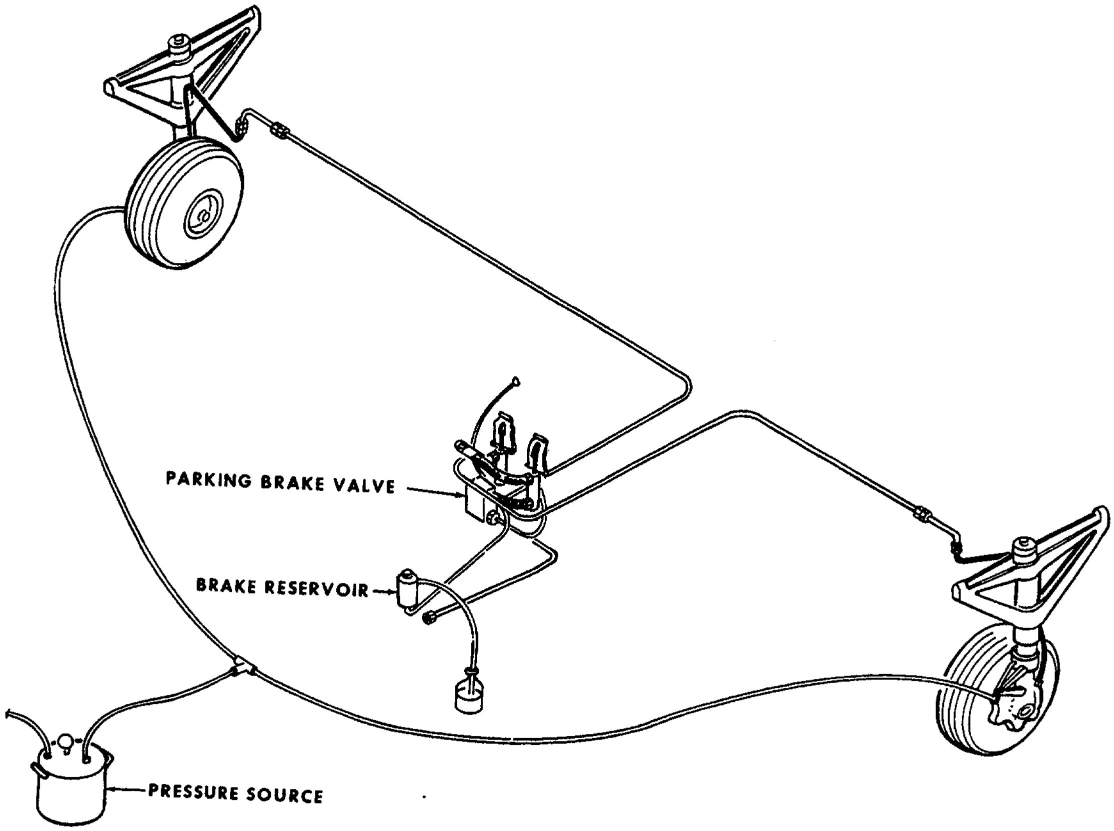
Wheels with loose or missing bolts should be removed from the airplane and dye penetrant inspected for cracks.

HYDRAULIC BRAKE SYSTEM

Brake system servicing is limited primarily to maintain the correct fluid level in the reservoir. (Refer to Chapter 12-20-00.) The other requirement related to servicing involves inspecting the wheel brake assemblies for wear.

BRAKE SYSTEM BLEEDING

Use only MIL-H-5606 or MIL-H-83282 hydraulic fluid (13, Chart 207, 91-00-00) in the brake lines and ensure that no dirt or foreign matter is allowed to get in the brake system. Dirt



Pressure Bleeding Brake System
Figure 201

can get under seals and cause leaks or clog the compensating valve and cause the brakes to lock.

Use either gravity flow or pressure bleeding to bleed brakes. Using either method, the parking brake lever and toe brake pedals must both be fully released to open the compensating port in the brake master cylinders.

If the brakes feel soft or "spongy" after bleeding operation, air may be trapped in the cylinders. Remove the brake and lay it on its side. Add brake fluid as needed through the bleed port and tap the brake lightly with a rubber hammer to dislodge any air bublles. When air bubbles no longer appear at the port, install the brake and repeat the bleeding procedure.

GRAVITY BLEEDING

The reservoir must be kept full during bleeding. The brake pedals should be operated slowly and smoothly to eliminate trapped air in the master cylinders. When no more air bubbles appear in the fluid drained from the bleeder plug, close the bleeder valve.

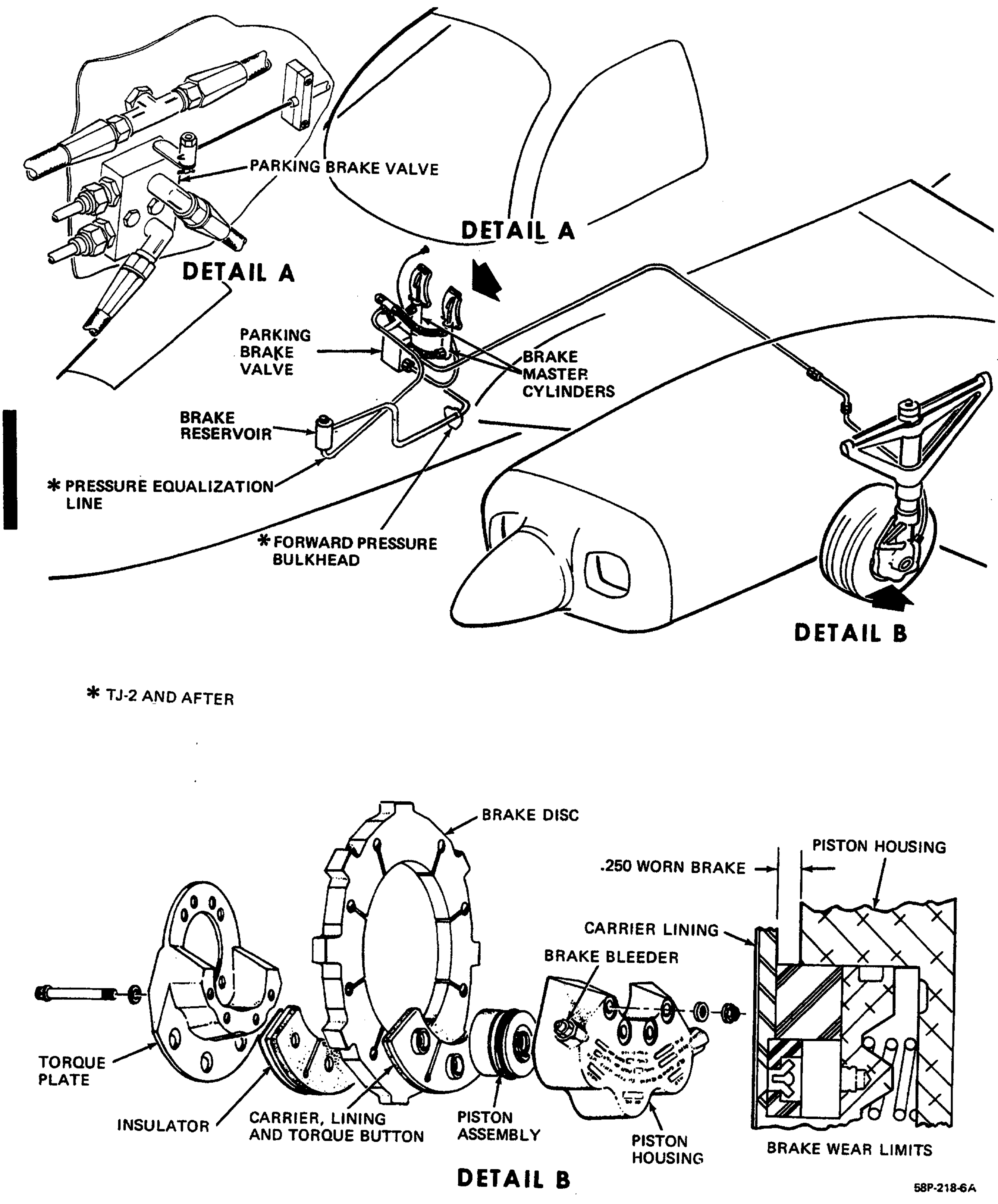
PRESSURE BLEEDING (Figure 201)

Connect the hoses from a pressure pot to the bleeder fitting on the brake and bleed the system from the wheel cylinder up. Disconnect the pressure equalization line at the upper end of the reservoir, attach a hose to it and put the other end of the hose in a large, clean container. Using not more than 30 pounds pressure, bleed the system until all air bubbles are gone from the draining fluid. Pumping the brake pedals is not necessary.

DUAL BRAKE SYSTEM BLEEDING

In airplanes having the optional dual brake system, the copilot's brake system is bled by closing the valve on the pressure pot and pumping the copilot's brake pedals to change the shuttle valve position. This causes hydraulic fluid to be routed through the copilot's system and this system should be bled as was the pilot's system.

After the pilot's and copilot's brakes have been bled, close the bleeder valve and repeat for other wheel.



Brake System
Figure 202

BRAKE ASSEMBLY REMOVAL (Figure 202)

a. Place the airplane on a jack.

b. Remove the cotter pin, wheel retaining nut, washer and bushing. Slide the wheel off the axle.

c. Disconnect the brake hydraulic line and cap the open line and port.

d. Remove the bolts securing the brake housing to the landing gear torque flange. Slide the brake off the axle.

BRAKE ASSEMBLY INSTALLATION

a. Slide the brake assembly onto the axle and install the bolts attaching the brake housing to the landing gear torque flange. Torque the bolts to 85 inch-pounds.

b. Connect the brake hydraulic line.

c. Clean and repack the wheel bearings with MIL-G-3545 grease (38,Chart 207, 91-00-00) and slide the wheel on the axle. Install the bushing, washer and wheel retaining nut.

d. Torque the axle nut to 15 to 20 foot-pounds while rotating the wheel to seat the bearings. Back off the nut and retighten with fingers to remove end play. Using a wrench, tighten the nut to the next available cotter pin position and install a new cotter pin.

e. Bleed the brake system.

BRAKE WEAR LIMITS (GOODRICH)

If a measurement of .250 inch or more is noted between the piston housing and carrier lining, the brake assembly requires a lining inspection. If the carrier and lining thickness is under .18 inch, the brake assembly should be overhauled in accordance with the Wheel and Brake Manual (P/N 98-34998).

BRAKE MASTER CYLINDER REMOVAL

a. Close the parking brake valve by placing the control in the ON POSITION.

b. Unsnap the floor mat and remove the floorboard section below the brake pedals.

c. Disconnect the two brake hydraulic lines at each master cylinder and mark the lines to assure correct reinstallation.

d. Remove the master cylinder attaching bolts and nuts and remove the master cylinder.

e. If new master cylinders are to be installed, note the positions of the master cylinder 45-degree elbow fittings.

BRAKE MASTER CYLINDER INSTALLATION

a. Install the master cylinder with attaching bolts and nuts.

b. Connect the two brake hydraulic lines at each master cylinder as noted during removal.

c. Install the floorboard and the floor mat.

d. Open the parking brake valve by placing the control in the OFF position.

e. Service the brake reservoir and bleed the brake system.

BRAKE MASTER CYLINDER LINKAGE ADJUSTMENT

The proper linkage arrangement will adjust the brake pedals to a straight upright position. This is considered the best adjustment since it will prevent the pedals from hitting the bulkhead in their extreme forward position. Linkage adjustment is obtained by removing the clevis from the rudder pedal and turning the clevis on or off the piston rod as required. After both pistons are adjusted to the same length, tighten the jam nuts.

PARKING BRAKE VALVE REMOVAL

a. Bleed the brake system of all hydraulic fluid.

b. Remove the floorboards forward of the pilot's and copilot's seats.

c. 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.

d. Disconnect and cap the hydraulic lines from the parking brake valve.

e. Remove the attach bolts, and remove the valve.

PARKING BRAKE VALVE INSTALLATION

a. Install the parking brake valve with the attaching bolts.

b. Connect the hydraulic lines to the valve.

c. Connect the parking brake cable to the valve by engaging the cable to the attach fitting and tightening the set screw.

d. Install the floorboards forward of the pilot's and copilot's seats.

e. Service the hydraulic reservoir and bleed the brake system.

PARKING BRAKE ADJUSTMENT

a. Place the parking brake control in the off (valve open) position.

b. Remove the floorboards forward of the pilot's seat.

c. 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 fittings. The 1-1/2 inch clearance should be made with the parking brake valve lever in the open position.

d. Tighten the mounting block, insert the cable in the cable attach fitting, tighten and safety wire the set screw in the attach fitting.

e. Test the parking brake adjustment by pulling the parking brake handle out and operating the brake pedals.

f. If the brake pedals are not solid, place the parking brake control in the off position and recheck the rigging.

g. Inspect the parking brake valve for hydraulic fluid loss.

100-HOUR INSPECTION

WHEELS AND TIRES

a. Visually inspect wheels for cracks, nicks and general condition.

b. Check the wheels for loose or missing parts.

c. Inspect tires for breaks, blisters and excessive wear.

d. Check tires for proper inflation as instructed in Chapter 12-20-00.

NOTE

In Service, the tire grows slightly due to shock loads during landing. Normally, this growth is balanced by tread wear so there is no increase in tire diameter.

NOTE

The use of recapped tires is not recommended by Beech Aircraft Corporation. The tires may pass the retraction test when first installed, however, recapped tires have a tendancy to swell after use and may cause malfunction of the retract system or damage to the landing gear doors.

BRAKES - Check brake discs, linings and lines for wear, corrosion and security; brake housings, valves and lines for leakage.

"END"

STEERING - MAINTENANCE PRACTICES

The nose wheel should be parallel to the fore and the aft center line of the airplane with the rudder pedals in the neutral position. Take the nose gear steering actuator arm loose at the back end and screw the end fitting either in or out to make the adjustment.

ADJUSTMENT

The travel stop must be adjusted so the nose wheel travel is stopped when the shimmy dampener is 1/32 to 1/4 inch from its maximum travel.

If adjustment is required the following procedure is recommended:

a. Loosen the lock nuts on the adjustment bolts so they clear the stops on the nose wheel straightener.

b. Turn the nose wheel to the extreme left turn position. The adjustment bolts must clear the stops with the nose wheel in this position.

c. Place tape around the aft end of the shimmy dampener piston rod 1/32 to 1/4 inch from the scraper ring.

d. Turn the lock nuts on the adjustment bolts so the nose wheel is turned and the tape on the piston rod just contacts the scraper ring. Tighten the lock nuts securely.

e. Turn the nose wheel to the extreme right, place the tape on the forward end of the piston rod and repeat step d.

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 - MAINTENANCE PRACTICES

LANDING GEAR LIMIT SWITCHES ADJUSTMENT

CAUTION

The gearbox maybe damaged if allowed to run full cycle into the internal stops. To preclude this possibility, the limit switches should initially be adjusted aft for an early shut-down if an out of adjustment condition is suspected.

a. Retract the landing gear to its 2/3 up position, then stop and inch the gear the remaining distance to the up limit switch by intermittent operation of the circuit breaker. Check the emergency hand crank for 1/8 to 1/4 turn free counterclockwise movement before the sector gear contacts the gearbox internal stop. If proper internal clearance is not obtained, adjust the landing gear up limit switch adjustment screw on the actuator arm and adjust the screw to stop the landing gear on its cycle at the point where proper internal clearance is maintained.

NOTE

All adjustment and rigging of limit switches should be accomplished using an external power source adjusted to bus voltage. Due to over-travel, the landing gear will not stop at the same position that the limit switch is actuated.

b. Extend the landing gear to its 2/3 down position then stop and inch the gear the remaining distance to the down limit switch by intermittent operation of the circuit breaker. Check the emergency hand crank for 1/8 to 1/4 turn free clockwise movement before the sector gear contacts the gearbox internal stops. If proper internal clearance is not obtained, adjust the landing gear down limit switch. Locate the landing gear limit switch adjustment screw on the actuator arm and adjust the screw to stop the landing gear on its down cycle at the point where proper internal clearance is maintained.

WARNING

Do not operate the hand crank with airplane power on.

c. Extend and retract the gear two or three times to assure that the switches are correctly set. Check the hand crank each time to insure proper adjustment.

LANDING GEAR SAFETY SWITCH ADJUSTMENT

With the landing gear down, check the adjustment of the safety switch. Refer to the Landing Gear Illustrations, Figure 201 in 32-30-00, while adjusting the switch.

a. Remove the safety switch actuator rod (1) from the attaching bracket on the upper torque knee, then remove the retaining nut (2) and switch arm (3) from the switch shaft.

b. Jack the landing gear so the shock strut is compressed to .50 ±.12 inch from the extend position.

c. Connect the wire leads from a test light to pins inserted into the splices at wire numbers 1 and 3 (about 10 inches up from the safety switch).

d. Rotate the safety shaft clockwise until the test light comes on.

e. Remove the safety wire from the locking screw (4) on the switch arm (3) and back off the locking screw (4).

f. Install the switch arm (3) on the switch shaft in a position parallel to the upper torque knee and adjust the actuating rod end (1) to align with the attaching bracket on the torque knee. Install the actuating rod connecting bolt.

g. Position the shock strut .87 ±.12 inch from the fully extended position and adjust the switch shaft counterclockwise at the adjusting screw (5) until the light goes out. When satisfactory adjustment is obtained, tightened the locking screw (4) and the retaining nut (2).

h. Recheck the landing gear travel to both dimensions described above before safety wiring the locking screw (4) to the switch arm.

LANDING GEAR WARNING TEST

a. Ensure the landing gear safety switch is properly adjusted as stated under LANDING GEAR SAFETY SWITCH ADJUSTMENT in the chapter.

b. Place the airplane on jacks.

c. Pull the LANDING GEAR MOTOR circuit breaker.

d. Apply electrical power to the airplane.

e. Disconnect the left safety switch operating arm at the torque link and position to simulate an on-ground position.

f. Place the landing gear switch in the gear-up position and check for audible warning horn.

g. Place the landing gear switch in the gear-down position.

h. Connect the left safety switch operating arm at the torque link.

NOTE

Step i is ONLY applicable on airplanes TJ-133 and after and TK-71 and after.

i. Repeat steps a through h with the right landing gear safety switch.

j. Remove electrical power from the airplane.

k. Push in the LANDING GEAR MOTOR circuit breaker,

l. Remove the airplane from jacks.

LANDING GEAR POSITION LIGHTS ADJUSTMENT

The landing gear position lights on the instrument panel are operated by the uplock and downlock switches on each gear.

Main Gear: Adjust the downlock switch (outboard side of the gear) so that the overtravel of the switch plunger is .050 to .125 inch after the switch actuates against the main gear V-brace. Adjust the uplock switch (inboard side of gear) so that the overtravel of the switch plunger is not greater than .015 inch after the switch actuates against the V-brace.

Nose Gear: Adjust the downlock switch installed on the nose gear so that the overtravel of the switch plunger is .050 to .125 inch after the actuation of the switch. Remove the wheel well access cover on the nose baggage compartment floor to gain access to the uplock switch. Adjust the uplock switch (adjacent to the uplock hook) so that the overtravel of the switch plunger is not greater than .015 inch after actuation of the switch. Check the instrument panel to be sure the indicator lights correspond to gear position.

LANDING GEAR WARNING HORN SYSTEM - THROTTLE SWITCH ADJUSTMENT

The throttle warning hom micro switch is located in the pedestal console and is actuated by the movement of the throttle. The micro switch cannot be accurately adjusted on the ground. The micro switch may be adjusted as follows:

a. With the airplane in flight, mark the throttle control at the console when the manifold pressure gage registers approximately 13 ±1 in Hg.

b. With the airplane on the ground, move the throttle until the mark on the control is aligned with the control console as accomplished in step a.

c. Adjust the micro switch until the cam clicks the switch closed with the throttle in the position indicated in the preceding step.

CHAPTER 33

LIGHTS

CHAPTER 33

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	201	Mar 21/80
	202	Mar 21/80
	203	Mar 21/80
	204	Oct 6/83
	205	Oct 6/83

CHAPTER 33 - LIGHTS

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"END"

GENERAL - DESCRIPTION AND OPERATION

HIGH INTENSITY LIGHTS

The high intensity light system greatly increases the visibility of the airplane to other airplanes during night flight by means of pulsating strobe lights mounted adjacent to the wing tip and tail lights. The system is actuated by a 10 ampere toggle type circuit breaker switch located on the LH subpanel. A control module for each strobe light and a master control unit is encased as one unit (strobe light power supply unit) located aft of F.S. 151 on the LH side of the airplane and attached to the lower fuselage structure. The power supply unit steps up voltage of the airplane system to the level required to ionize the xenon gas in the flashtubes. Each module contains a built-in flasher and the unit receiving input power acts as a master control unit.

"END"

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.
	LANDING LIGHTS, TAXI LIGHTS, AND TAIL LIGHT	
1. Lamp fails to light.	a. Circuit breaker tripped.	a. Check for short circuit. Reset circuit breaker.
	b. Lamp burned out.	b. Replace lamp.
	c. Loose connection or defective.	c. Tighten connections and check wire circuit continuity. Replace or repair wire if necessary.
	d. Circuit breaker switch defective.	d. Check continuity through switch. Replace if necessary.

"END"

EXTERIOR - MAINTENANCE PRACTICES

HIGH INTENSITY LIGHTS

POWER SUPPLY UNIT REMOVAL
(TJ-3 thru TJ-132; TK-1 thru TK-70, except TK-68)

a. Gain access to the strobe light power supply unit by pulling the carpet back in the aft passenger compartment and removing the floor panel. The strobe light power supply is located aft of F.S. 151.00 on the LH side of the airplane.

b. Disconnect the wiring from the strobe light power supply unit.

c. Remove the screws anchoring the power supply module to the support structure and remove the unit.

WARNING

Although a bleed-off resistor is incorporated in the power supply circuit, high voltage is involved in the circuit between the power supply and light assemblies; for this reason, turn the control switch for the strobe lights OFF and wait for at least 10 minutes to elapse before disconnecting the cables at the power supply or light assemblies and before handling or disassembling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

POWER SUPPLY UNIT INSTALLATION
(TJ-3 thru TJ-132; TK-1 thru TK-70, except TK-68)

a. Place the power supply module on the support structure and secure it in place with the attaching screws.

b. Connect the power supply module to the airplane wiring in accordance with the Wiring Diagram Manuals (P/N 102-590000-23D or subsequent and 106-590000-13 or subsequent).

CAUTION

Observe the precautions outlined under the heading STROBE LIGHT WIRING in this section when removing the power supply.

NOTE

On airplane serials TJ-80 and after and TK-41 and after, a harness wring-out and high potential test of 500 volts alternating current (vac) should be conducted on the strobe light harness in the wing and fuselage prior to connection of either the strobe light or strobe light power supply.

POWER SUPPLY UNIT REMOVAL
(TJ-133 and after; TK-68, TK-71 and after)

a. Gain access to the strobe light power supply thru the large access door located on the LH side of the fuselage between F.S. 180.00 and F.S. 207.00. The strobe light power supply unit is located on the RH side of the airplane between F.S. 215.00 and F.S. 223.00 on TJ-133 and after, and between F.S. 170.00 and F.S. 179.00 on TK-68 and TK-71 and after.

b. Disconnect the wiring from the strobe light power supply unit.

c. Remove the bolts, washers and nuts attaching the power supply unit to the support structure and remove the unit.

WARNING

Although a bleed-off resistor is incorporated in the power supply circuit, high voltage is involved in the circuit between the power supply unit and light assemblies; for this reason, turn the control switch for the strobe lights OFF and wait for at least 10 minutes to elapse before disconnecting the cables at the power supply or light assemblies and before handling or disassembling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

POWER SUPPLY UNIT INSTALLATION
(TJ-133 and after; TK-68, TK-71 and after)

a. Place the power supply module on the support structure and secure it in place with the attaching screws.

b. Connect the power supply module to the airplane wiring in accordance with the Wiring Diagram Manuals (P/N 102-590000-23D or subsequent and 106-590000-13 or subsequent).

CAUTION

Observe the precautions outlined under the heading STROBE LIGHT WIRING in this section when removing the power supply.

NOTE

On airplane serials TJ-80 and after and TK-41 and after, a harness wring-out and high potential test of 500 volts alternating current (vac) should be conducted on the strobe light harness in the wing and fuselage prior to connection of either the strobe light or strobe light power supply.

STROBE LIGHT WIRING

An incorrect hook-up of the wires at either the power input or between the strobe light assemblies and the power supply unit 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 to ground. Make sure that the red, white, and black wires are connected to pins "A", "B", and "C" of the connector respectively and that the connectors are properly assembled. The shield for the wing cables should be grounded to the airplane structure at the wing break and the shield for the tail light cables should be grounded to the airplane structure at the power supply.

WARNING

Although, a bleed-off resistor is incorporated in the power supply circuit, high voltage is involved in the circuit between the power supply and light assemblies. For this reason, turn the control switch for the strobe lights OFF and wait for at least 10 minutes to elapse before disconnecting the cables at the power supply or light assemblies and before handling or disassembling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

WING STROBE/NAVIGATION 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 screws attaching the transparent cover to the wing tip and remove the cover from the wing tip.

b. Detach the strobe light assembly from the wing tip by removing the allen head screws. Remove the screws securing the mounting bracket to the strobe light assembly.

c. Disconnect the electrical wiring from the strobe light assembly.

d. Remove the screws securing the end plates to the strobe light housing. Remove the end plate assemblies.

e. Slide the clear filter cover out of the channel on the strobe light housing assembly.

NOTE

Place a clean cloth around the flashtube to keep fingers from coming in contact with the glass.

f. Carefully remove the flashtube from the contact assembly.

g. To remove the navigation bulb, remove the screw from the navigation bulb retainer and remove the retainer.

h. Rotate the bulb counterclockwise to remove.

WING STROBE/NAVIGATION LIGHT INSTALLATION

CAUTION

Observe the precautions outlined under the heading STROBE LIGHT WIRING in this section.

NOTE

On airplane serials TJ-80 and after and TK-41 and after, a harness wring-out and high potential test of 500 volts alternating current (vac) should be conducted on the strobe light harness in the wing and fuselage prior to connection of either the strobe light or strobe light power supply.

a. Replace the flashtube if necessary.

NOTE

Place a clean cloth around the flashtube to keep fingers from coming in contact with the glass.

b. Reinstall the clear filter cover in the strobe light housing.

c. Install the end plate assemblies and mounting brackets on the strobe light housing and secure with the attach screws.

d. Reconnect the wiring and secure the strobe light assembly to the airplane with the allen head screws.
e. Replace the navigation bulb if necessary.
f. Replace the navigation bulb in the socket.
g. Place the bulb retainer in position and secure with the attach screw.
h. Reattach the transparent cover over the lights on the wing tip.

NOTE

Before installing the transparent cover on the wing tip, apply Presstite 176 sealer (61, Chart 207, 91-00-00) around the inside edge of the cover to ensure that moisture cannot enter the light compartment.

TAIL STROBE/NAVIGATION 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 screws securing the tail cone assembly to the airplane and remove the tail cone assembly. Remove the light shield from the tail cone assembly.
b. Disconnect the strobe/navigation light assembly from the airplane electrical system.
c. Rotate the navigation bulb counterclockwise and remove if it needs replaced.
d. Remove the flashtube assembly (if necessary) by removing the screws on the face of the strobe/navigation light assembly and pulling the light assembly out through the inside of the tail cone.

NOTE

Place a clean cloth around the flashtube to keep fingers from coming in contact with the glass.

TAIL STROBE/NAVIGATION LIGHT INSTALLATION

CAUTION

Observe the precautions outlined under the heading STROBE LIGHT WIRING in this section.

NOTE

On airplanes TJ-80 and after and TK-41 and after, a harness wring-out and high potential test of 500 volts alternating current (vac) should be conducted on the strobe light harness in the wing and fuselage prior to connection of either the strobe light or strobe light power supply.

a. Replace the flashtube assembly and secure it to the tail cone with the screws.
b. Replace the navigation bulb if necessary.
c. Reconnect the strobe/navigation light assembly to the airplane electrical system at the connectors.
d. Reinstall the transparent light shield over the tail strobe/navigation light and secure with the attach screws.
e. Reinstall the tail cone on the airplane and secure with the attach screws.

CHART 201
LAMP BULB REPLACEMENT

LOCATION	BULB PART NUMBER
Annunciator Panel Lights	327
Post Lights	327
Compass Light	327

CHART 201 (Cont'd)
LAMP BULB REPLACEMENT

LOCATION	BULB PART NUMBER
Glareshield Flood Lights	313
Map Light	1495
*Elevator Tab and Aileron Tab Lights	1819R
**Tab Position Indicator Lights	334
*Flap Position Indicator Light	158-100-5
**Flap Position Indicator Lights	MS525237-327
Landing Gear Visual Post Lights	356
Landing Gear Position Lights	327
Engine Instrument Post Lights	327
Reading Lights	303
Cabin Lights	1864
Step Lights	1495
Courtesy Light	30-0502-5
Nose Baggage Compartment Light	303
Cabin Altitude and Cabin Rate-of-Climb Lights (TJ-3 and after)	327
Navigation Lights (Wing)	7512
Rate Controller Light (TJ-3 and after)	83D90-1
Navigation Light (Tail)	1203
Rotating Beacon (Upper)	A-7079B-24
Rotating Beacon (Lower)	A-7079B-24
Ice Light	A-7079B-24
Landing Lights	4596
Taxi Light (TJ-3 thru TJ-168, TK-1 thru TK-54)	4626
(TJ-169 and after, TK-55 and after)	4596

CHART 201 (Cont'd)
LAMP BULB REPLACEMENT

Strobe/Navigation Light, Tail (TJ-3 thru TJ-184, TK-1 thru TK-56)	(flashtube) 31-1745 (nav bulb) 678
(TJ-185 and after, TK-57 and after)	(flashtube) 31-1745 or 203415 (nav bulb) 678 or 203529-2
Strobe Light, Wing (TJ-3 thru TJ-132, TK-1 and after)	(flashtube) 55-0221-1
(TK-133 and after)	(flashtube) 55-0221-1 or 202331

*TJ-3 through TJ-435, TJ-437 through TJ-443, TK-1 through TK-146 and TK-148 through TK-150.

**TJ-436, TJ-444 and after, TK-147 and TK-151 and after.

"END"

CHAPTER

34

NAVIGATION

CHAPTER 34

LIST OF PAGE EFFECTIVITY

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34-EFFECTIVITY/CONTENTS	1	Nov 30/76
34-00-00	1	Jan 9/76
34-10-00	1	Jan 9/76
	101	Jan 9/76
	201	Jan 9/76
	202	Nov 30/76

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Description and Operation		1
Troubleshooting		101
Pitot and Static Pressure System		101
Maintenance Practices		201
Pitot System Leak Test		201
Pitot System Hose Inspection		201
Static System Cleaning		201
Static System Leak Test		201

"END"

GENERAL - DESCRIPTION AND OPERATION

INSTRUMENT ACCESS

Engine instruments may be removed with the instrument panel in place. Pull the post-light shield straight off to provide clearance for the instruments. Loosen the retaining screw located below and to the left of the instrument, loosening the instrument retaining clamp. Sufficient wiring has been installed to enable you to pull the instrument out.

To gain access to the flight instruments, remove the screws attaching the panel and pull it out far enough to disconnect plumbing and wiring, freeing the panel for removal. For removal and installation of engine and flight instruments, refer to Chapter 39-10-00.

NOTE

To avoid marring the finish, wrap padding around the control columns just below the instrument panel.

To remove the glareshield, remove the screws attaching the glareshield to the instrument panel and carefully lift the glareshield. Disconnect the air duct and remove the glareshield. To reinstall the glareshield, reverse the procedure and secure with the existing velcro tape and screws.

INSTRUMENT OPERATION

The gyro instruments operate on filtered air provided by the pneumatic pressure system. Adjustment of the pneumatic pressure system is performed by adjusting the various regulators. The air speed indicator, altimeter, and rate-of-climb indicator operate on air provided by the pitot and static pressure system. (Refer to Chapter 34-10-00.)

An Overhaul and Replacement Schedule for instruments is found in Chapter 5-00-00.

"END"

FLIGHT ENVIRONMENT DATA-DESCRIPTION AND OPERATION

The pitot and static pressure system provides a source of ram and static air for instrument operation. Ram air enters the pitot tube, located in the nose section to the left side of the nose landing gear doors, and is routed to the pilot's airspeed indicator. The optional dual pitot system, provides a second pitot tube, located in the nose section to the right side of the nose landing gear doors, which provides ram air for the copilot's airspeed indicator. A heating element is installed in the pitot mast to prevent the mast from becoming obstructed by ice. Static air is taken from a static air port, located on each side of the aft fuselage. Static air is routed along the left side of the fuselage to the rate-of-climb indicator, altimeter, airspeed indicator and on TJ-2 and after only, to the cabin differential pressure gage. Should the normal outside static air ports become blocked, an alternate instrument air source is designed to provide a source of static pressure to the instruments from inside the tail section. An abnormal reading of the instruments supplied with static air could indicate a restriction in the outside static air ports. On TJ-2 and after, a guarded INSTRUMENT AIR toggle valve, located on the left forward side of the front spar cover is placarded, ALTERNATE-NORMAL. When it is required, select the ALTERNATE position. TK-1 and after is equipped with an EMERGENCY STATIC AIR SOURCE which is located on the lower left hand pilot sidewall and placarded NORMAL OFF, EMERGENCY ON position. On TJ-2 and after, the static air plumbing is drained through drain valves located on the exterior under the aft cabin door. The pitot system needs no drains because of the location of the components.

"END"

TROUBLESHOOTING
PITOT AND STATIC PRESSURE SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Heating element inoperative.	a. Defective switch.	a. Replace.
	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. Drain static air line plumbing. Disconnect lines at instruments and blow out with low pressure air.
	b. Line leaks.	b. Check lines for looseness at all connection points.

"END"

FLIGHT ENVIRONMENT DATA - MAINTENANCE PRACTICES (Figure 201)

PITOT SYSTEM LEAK TEST

A functional test of the pitot system can be made by using an observer in the cabin to watch the airspeed indicator while air pressure is built up by using a section of soft rubber tubing as follows:

a. Clamp the rubber tubing over the pitot mast inlet, making certain that the connection is air tight.
b. Crimp the end of the tubing and slowly roll it up until the airspeed indicator registers approximately 90% of its maximum reading.

CAUTION

To avoid rupturing the diaphragm of the airspeed indicator, roll up the rubber tubing slowly and do not build up excessive pressure in the line.

c. Secure the rolled up tubing so that it will hold the airspeed indicator reading.
d. If there is no decline in the reading after several minutes, there is no leak in the pitot system.
e. If a decline in the reading of the airspeed indicator is observed, check the pitot system plumbing for leaky hoses and loose connections.

CAUTION

Release the air pressure slowly by unrolling the rubber tubing; a sudden release of the air pressure may damage the airspeed indicator.

PITOT SYSTEM HOSE INSPECTION

After the pitot system is checked for leaks, inspect the hose sections for signs of deterioration. Check all polyethylene tubing for hardness or brittleness. Rubber hoses on which outer surfaces have checked or cracked, particularly at the bends or connecting points, or which have become hard, should be replaced. Replace the hose with MIL-H-5593 rubber hose (27, Chart 207, 91-00-00). When new hose is installed, recheck the system for leaks using the PITOT SYSTEM LEAK TEST procedure.

STATIC SYSTEM CLEANING

Blow low air pressure through the lines from the disconnected line at the airspeed indicator to the static ports. Cover each static port separately when blowing to insure that each line is clear. Instrument error or possible damage may result if even one port is clogged with dirt or foreign matter.

CAUTION

Never blow air through the line toward the instrument panel; to do so will seriously damage the instruments. When blowing back through the line from the instrument panel, make sure that no air is blown into the instruments.

NOTE

Wax or polish applied to the static air buttons can cause wrong instrument readings. The static air buttons should be cleaned periodically with a cleaning solvent to ensure that no film exists on them.

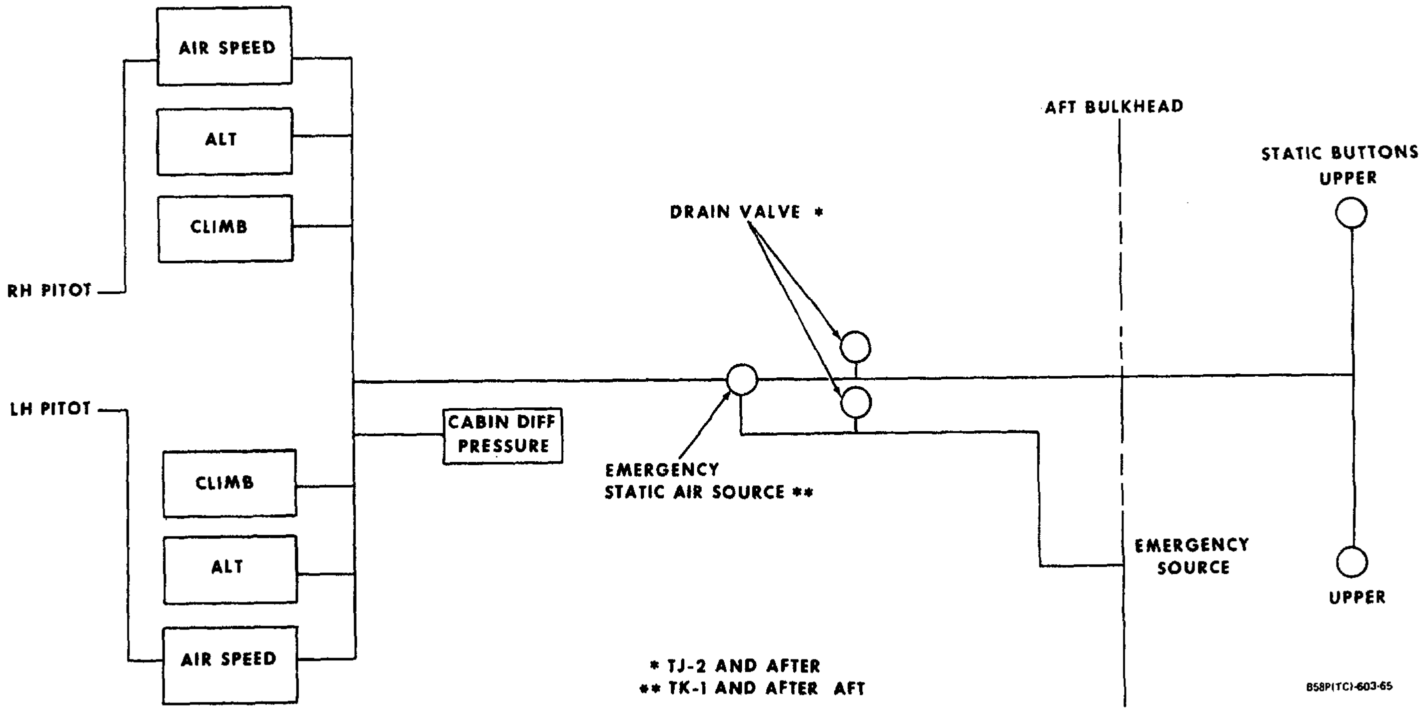
Drain the static air system on TJ-2 and after through the drain valves, located on the exterior under the aft cabin door. TK-1 and after, the static air system is drained at the EMERGENCY STATIC AIR SOURCE, located on the lower left hand pilot sidewall, and placarded NORMAL OFF, EMERGENCY ON. Place in the EMERGENCY ON position to drain the static air system.

STATIC SYSTEM LEAK TEST

The static system should be checked for leaks in accordance with the instructions in Federal Aviation Regulation 91.170.

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 leak testing the system.



Pitot and Static System Schematic
Figure 201

"END"

CHAPTER 35

OXYGEN

CHAPTER 35

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CHAPTER 35 - OXYGEN

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"END"

GENERAL - DESCRIPTION AND OPERATION

(TJ-2 AND AFTER)

Oxygen for emergency descent is supplied by a 15 cu. ft. cylinder located beneath the pilot's seat on TJ-2 thru TJ-85, except TJ-82, or in the aft fuselage between F.S. 233.50 and F.S. 247.63 on TJ-82 and TJ-86 and after. The cylinder is equipped with a filler valve and regulator attached to the cylinder opening. The cylinder is serviced through an access opening beneath the pilot's seat on TJ-2 thru TJ-85, except TJ-82, and through an access door on the LH side of the aft fuselage on TJ-82 and TJ-86 and after. The system is controlled by a push-pull control knob on the instrument panel. A gage, located adjacent to the pilot's oxygen outlet indicates the pressure at the cylinder. When the cylinder is full, the gage will indicate 1800 ± 50 psi at 70°F or an increase or decrease of 3.5 psi for each degree above or below 70°F. The system is a constant flow type and is provided with an emergency overboard vent which will release the oxygen from the cylinder should the pressure become excessive.

WARNING

Proper safety measures must be employed while oxygen system maintenance is being performed or a serious fire hazard will be created. Avoid making sparks and keep all burning cigarettes or fire away from the vicinity of oxygen. Make sure that your hands, tools, and clothing are clean, particularly with respect to oil or grease, for these will ignite upon contact with pure oxygen under pressure.

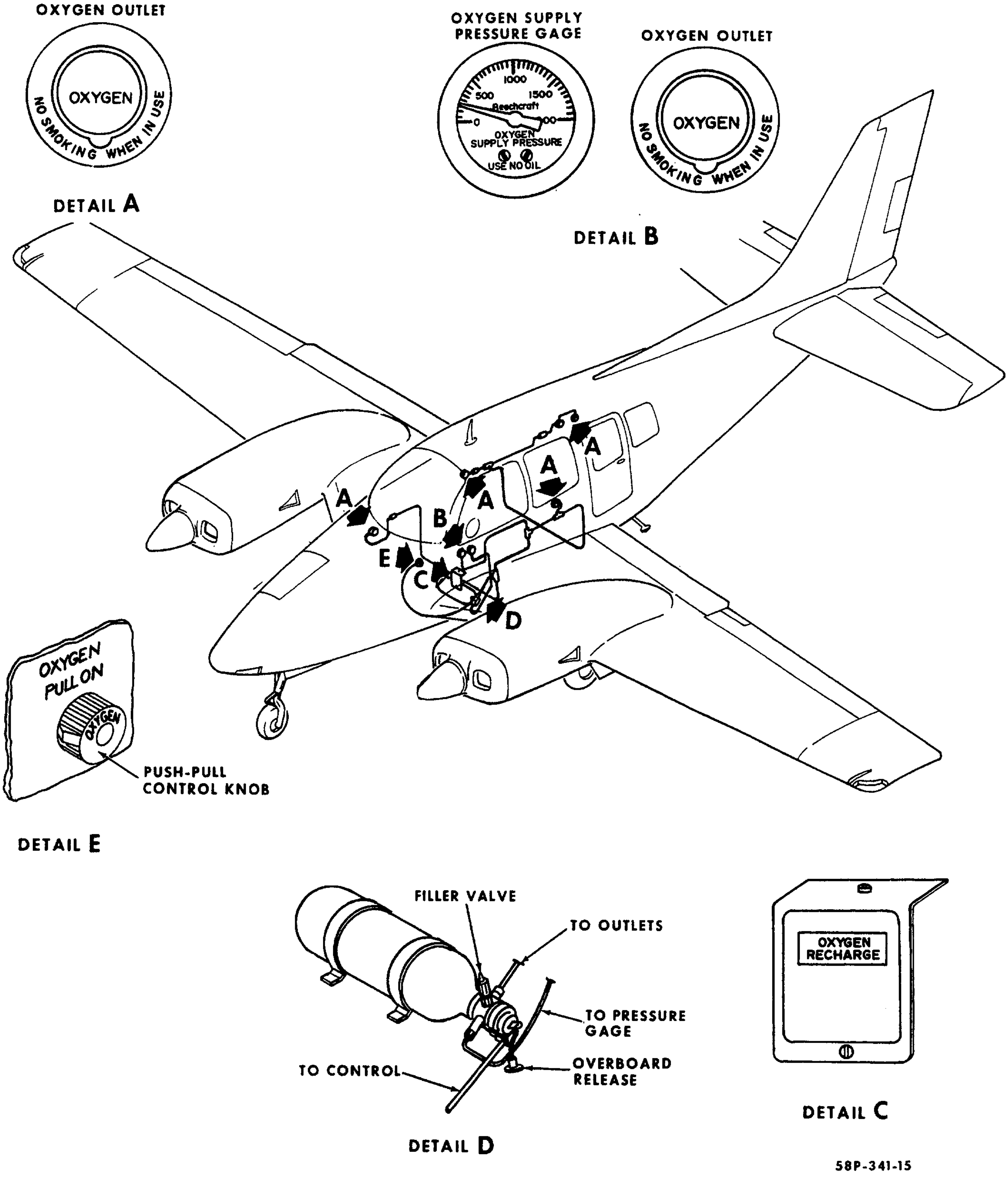
(TK-1 AND AFTER)

Oxygen for high altitude flight is supplied by a 49 cu. ft., 64 cu. ft., or 115 cu. ft. cylinder located between F.S. 27.00 and F.S. 39.00 on TK-1 thru TK-84. On TK-85 and after, oxygen is supplied by a 64 cu. ft. or 115 cu. ft. cylinder located in the aft fuselage between F.S. 195.00 and F.S. 240.00. The oxygen cylinder is equipped with a filler valve and regulator attached to the cylinder opening. The cylinder on TK-1 thru TK-84 is serviced through the nose baggage compartment at F.S. 27.00. The cylinder on TK-85 and after is serviced externally on the RH side of the aft fuselage between F.S. 207.00 and F.S. 233.50. The system is controlled by a push-pull control knob on the instrument subpanel. A gage, located adjacent to the pilot's oxygen outlet on TK-1 thru TK-84, indicates the pressure at the cylinder. On TK-85 and after pressure gages are located adjacent to the pilot's oxygen outlet and also adjacent to the oxygen filler valve in the aft fuselage. When the cylinder is full, the gage will indicate 1800 ± 50 psi at 70°F or an increase of 3.5 psi for each degree above 70°F or a decrease of 3.5 psi for each degree below 70°F.

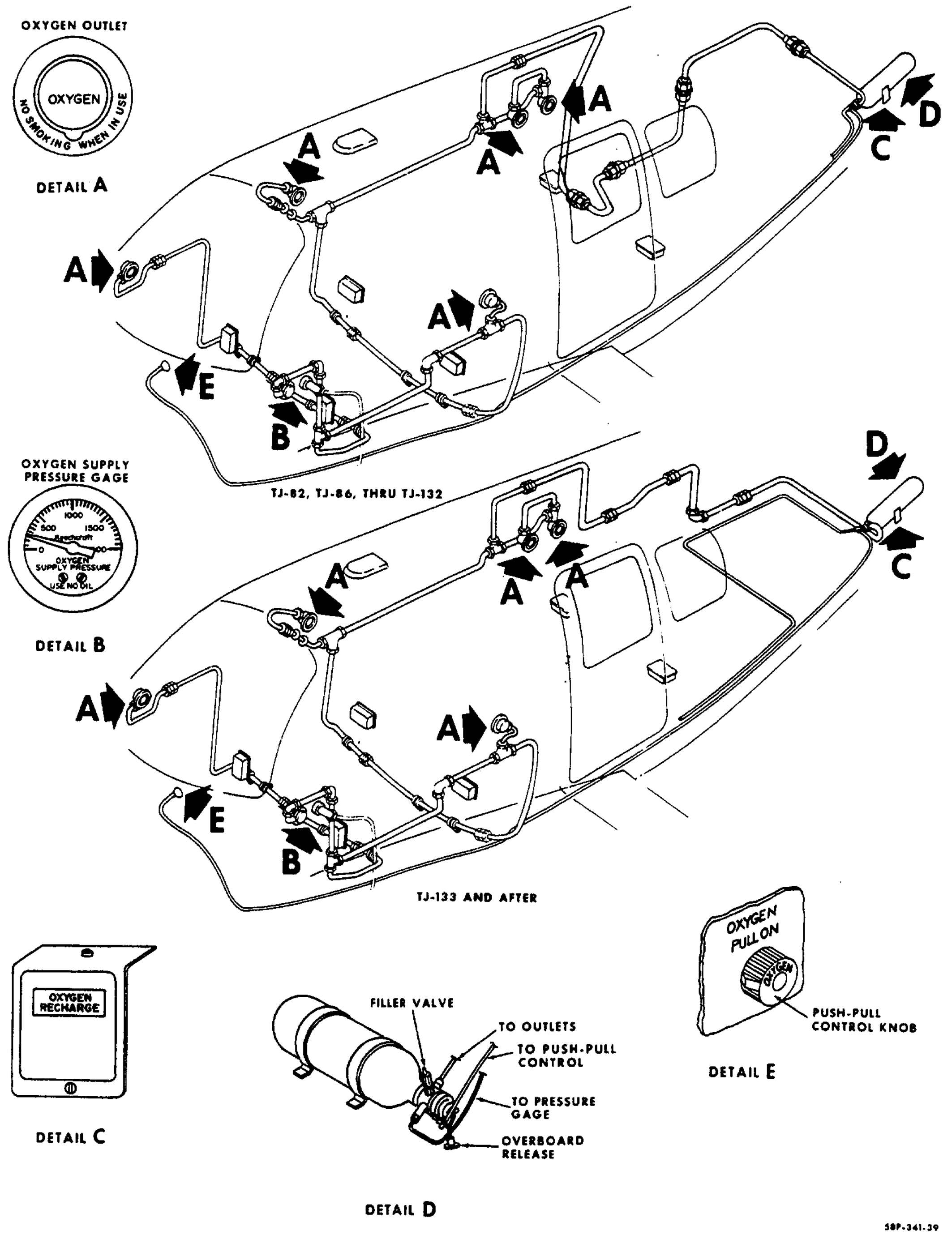
The system is altitude compensating through the mask. An emergency overboard vent will release the oxygen from the cylinder should the pressure become excessive.

WARNING

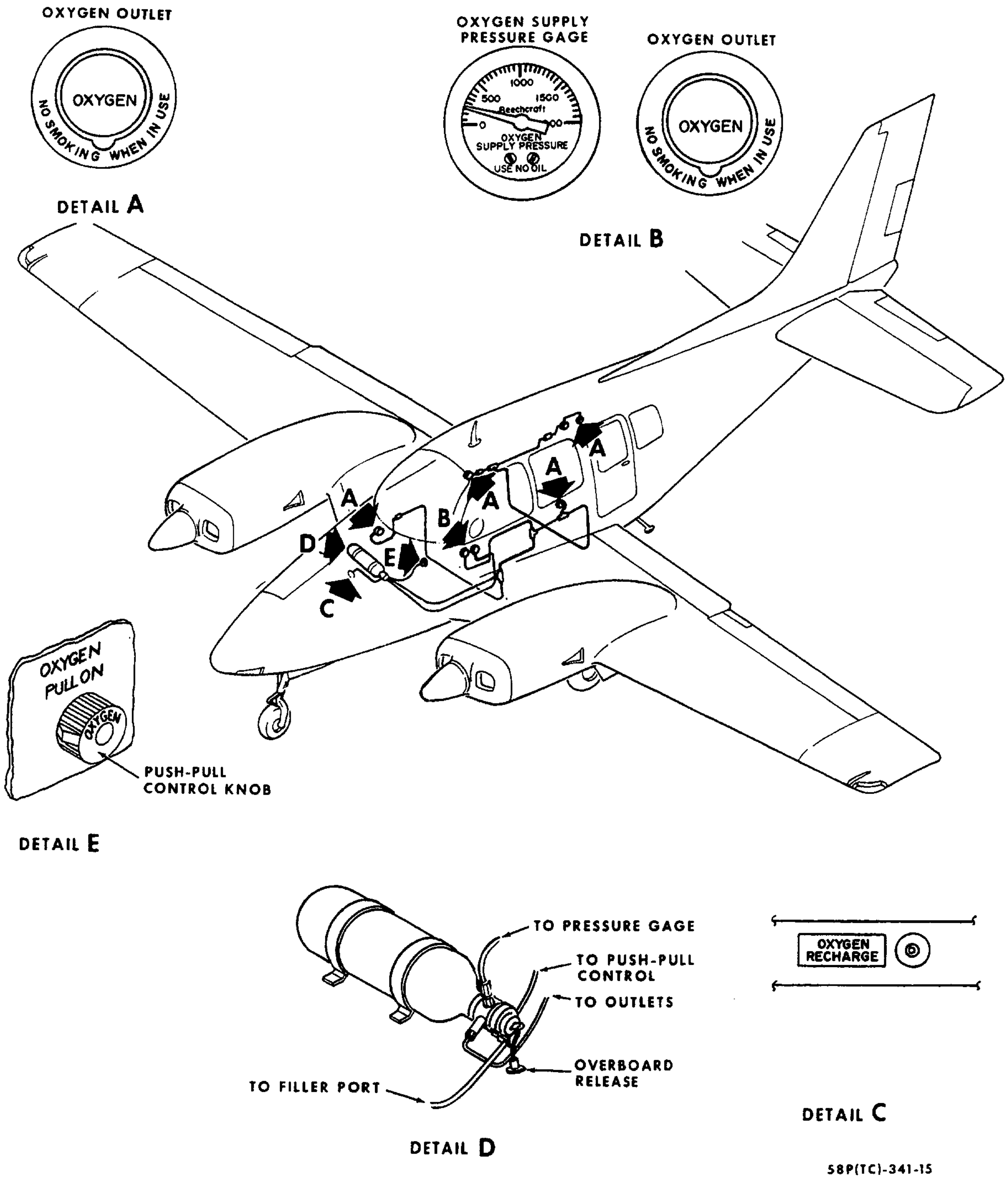
Proper safety measures must be employed while oxygen system maintenance is being performed or a serious fire hazard will be created. Avoid making sparks and keep all burning cigarettes or fire away from the vicinity of oxygen. Make sure that your hands, tools, and clothing are clean, particularly with respect to oil or grease, for these will ignite upon contact with pure oxygen under pressure.



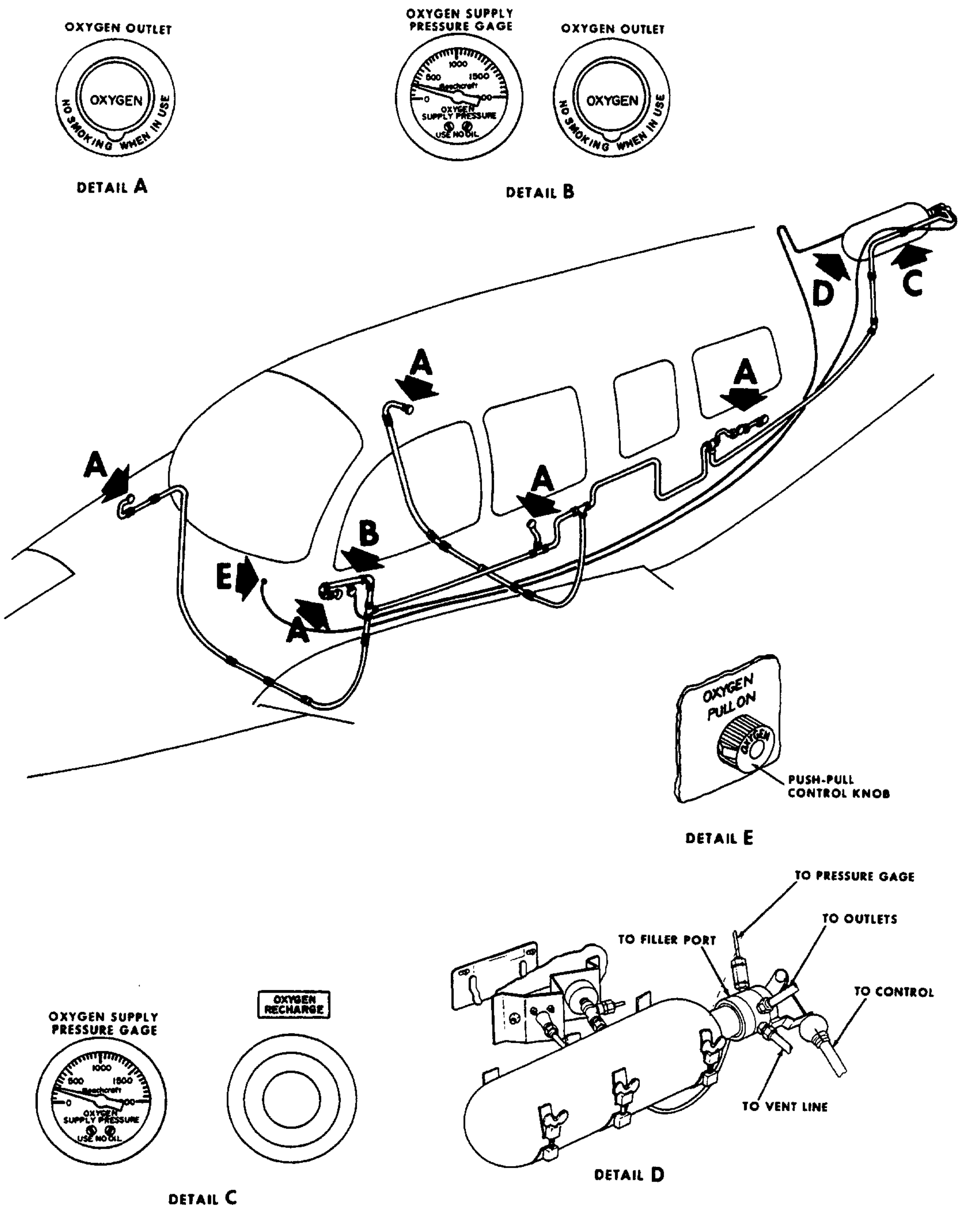
Oxygen System (TJ-2 thru TJ-85, except TJ-82)
Figure 1



Oxygen System (TJ-82, TJ-86 and after)
Figure 2



Oxygen System (TK-1 thru TK-84)
Figure 3



Oxygen System (TK-85 and after)
Figure 4

"END"

GENERAL - MAINTENANCE PRACTICES

CAUTION

All persons handling and servicing oxygen systems should review proper precautions to be observed during servicing. FAA Advisory Circular 43.13-1A contains the necessary information.

OXYGEN SYSTEM TEST PROCEDURES

Remove oxygen line from the low pressure vent port on the regulator and plug the line with an AN806-5D plug. Cap open regulator port with a clean plastic cap to prevent contamination of the regulator. Conduct the low pressure system leak test using a 70 ± 10 psi oxygen supply plugged into one of the cabin outlets and a test gage plugged into another outlet. Apply 70 ± 10 psi to the system, allow 2 minutes for the system to stabilize, remove oxygen supply. The drop in pressure after 15 minutes shall not exceed five psig. Remove temporary plug and ensure that the cylinder is charged to capacity. Conduct high pressure test using cylinder pressure. Using the supply gage on the pilot's side wall, note cylinder pressure. There shall be no pressure loss after 30 minutes. In case leakage exists apply MIL-L-25567 leak testing solution (14, Chart 207, 91-00-00) sparingly to suspected areas. After test, wipe clean and dry. Make necessary repairs and retest.

OXYGEN SYSTEM PURGING

Offensive odors may be removed from the oxygen system by purging. The system should also be purged any time the lines are left open and subject to contamination. Purging is accomplished by connecting a recharging cart into the system and permitting oxygen to flow through the lines and outlets until any offensive odors have been carried away. The following steps outline the procedures recommended for purging the oxygen system.

WARNING

Avoid making sparks and keep all burning cigarettes or fire away from the vicinity of the airplane when the outlets are in use. Inspect the filler connection for cleanliness before attaching it to the filler valve. Make sure that your hands, tools, and clothing are clean, particularly from grease and oil stains, for these contaminants will ignite upon contact with oxygen.

a. Gain access to the oxygen cylinder.

b. Connect a recharge cart to the filler valve. Set the cart pressure regulator to deliver 50 psi to the system.

c. Plug in an oxygen mask at each outlet in the cabin and pilot's compartment.

d. Open the cabin door and place the push-pull control knob in the pilot's compartment in the half open position.

e. Allow the system to purge for one hour.

If an offensive odor still lingers, continue purging the system for an additional hour. If such odors still remain, replace the supply cylinder. After the system has been adequately purged, remove the masks from the outlets, place the push-pull control knob in the closed position and service the system as described in Chapter 12-10-00.

OXYGEN CYLINDER REMOVAL

The oxygen supply cylinder for TJ-2 thru TJ-85, except TJ-82, is located beneath the pilot's seat and in TJ-82 and TJ-86 and after, is located in the aft fuselage. The oxygen supply cylinder for TK-1 thru TK-84 is located in the nose baggage compartment and in TK-85 and after, is located in the aft fuselage.

WARNING

Keep fire, cigarettes and sparks away from the vicinity of the oxygen cylinder. Oil and grease will ignite upon contact with oxygen under pressure.

a. Plug oxygen masks into all outlets, open cabin door and place the push-pull control knob in the full open position. Bleed off the oxygen in the supply cylinder and remove masks. Return control knob to the closed position.

b. On TJ-2 thru TJ-85, except TJ-82, remove the pilot's and copilot's seats and remove the spar cover. On TJ-82 and TJ-86 and after, open the large access door on the LH side of the aft fuselage.

c. On TK-1 thru TK-84, open the nose baggage compartment door and remove the equipment screen and supply cylinder cover. On TK-85 and after, open the large access door on the LH side of the aft fuselage.

CAUTION

When removing lines from the supply cylinder regulator, slowly open the fittings to relieve any pressure that may remain in the lines. After pressure is released, remove the lines.

d. Disconnect the pressure gage line, supply line, emergency overboard vent line and push-pull control knob connection from the pressure regulator. Note the position of each line to aid in reinstallation.

e. Cap the open lines and regulator openings with clean metal fittings.

f. Remove the cylinder retaining bolts and clamps and remove the supply cylinder with regulator attached.

OXYGEN CYLINDER INSTALLATION

a. Place a new cylinder with regulator attached in the mounting brackets and secure with retaining clamps and bolts.

b. Remove caps from lines and regulator and carefully inspect the lines and regulator fittings for cleanliness or the presence of foreign matter, which may contaminate the oxygen system.

c. Connect the pressure gage line, supply line and emergency overboard vent line to the regulator.

d. Connect the push-pull control knob to the regulator control arm.

e. Charge the supply cylinder to capacity, 1800 ± 50 psi at 70°F or an increase of 3.5 psi for each degree above 70°F or a decrease of 3.5 psi for each degree below 70°F.

f. Place the push-pull control knob in the open position. Plug an oxygen mask into the copilot's outlet and check for proper system operation.

g. Test the connections for leaks, using leak test solution (14, Chart 207, 91-00-00).

h. On TJ-2 thru TJ-85, except TJ-82, install the spar cover and pilot's and copilot's seats. On TJ-82 and TJ-86 and after, close the large access door on the LH side of the aft fuselage.

i. On TK-1 thru TK-84, install the supply cylinder cover and equipment screen. Close the nose compartment baggage door. On TK-85 and after, close the large access door on the LH side of the aft fuselage.

OXYGEN CYLINDER RETESTING

Light weight oxygen cylinders, stamped "3HT" on the side plate, must be hydrostatically tested every three years and the test data stamped on the cylinder. Regular weight oxygen cylinders, stamped "3A" or "3AA" must be hydrostatically tested every five years and stamped with retest data.

"END"

CHAPTER

36

PNEUMATIC

CHAPTER 36 - PNEUMATIC SYSTEM

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"END"

TROUBLESHOOTING
PNEUMATIC PRESSURE SYSTEM

INDICATION	*PROBABLE CAUSE*	*REMARKS*
	INSTRUMENT AIR SYSTEM	
1. Zero indication on instrument gage. Pump out recess buttons recessed.	a. Hole in plumbing, line plugged or plumbing disconnected between manifold and gage.	a. Inspect plumbing, replace or connect lines as necessary.
	b. Defective gage.	b. Replace gage.
	c. Defective gyro horizon or directional gyro.	c. Inspect instruments and replace or repair as necessary.
	d. Defective regulator.	d. Replace regulator.
2. Pump out recess button(s) extended.	a. Defective pump(s).	a. Replace pump(s).
	b. Filter or line plugged between pump and manifold.	b. Replace filter. Clean lines as necessary.
	c. Defective dual pressure relief valve.	c. Replace valve.
	d. Hole in line or line disconnected between pump and manifold.	d. Inspect lines, replace as necessary.
3. Frequent pump replacement.	a. Partially restricted pump intake or discharge line.	a. Replace the lines.
	b. Plugged or partially plugged inlet or inline filter.	b. Replace the filter(s).
4. No pressure at low rpm.	a. Oil in pump.	a. Replace hose.
5. Erratic air pressure.	a. Oil in pump.	a. Replace.
	b. Engine oil seal defective.	b. Replace.

TROUBLESHOOTING

STANDBY CABIN DOOR PRESSURE SYSTEM (TJ-2 AND AFTER)

INDICATION	*PROBABLE CAUSE*	*REMARKS*
1. Door seal will not pressurize.	a. Hole in door seal or line from pump, or line disconnected.	a. Inspect door seal and line for holes, and properly connected lines. Replace as necessary. Refer to Chapter 52-20-00, for cabin door seal replacement.
	b. Pressure pump(s) malfunction.	b. Replace pump(s).
	c. Loose or broken wires.	c. Check electrical wires for condition. See Wiring Diagram Manual 102-590000-23.
	d. Defective pressure regulator valve.	d. Replace valve.
	e. Clogged or restriction in the lines or filters.	e. Inspect lines and filters for restrictions. Replace as necessary.
	f. Defective dual pressure relief valve.	f. Replace valve.
	g. Automatic deflate switch out of adjustment.	g. Adjust switch.
	h. Defective automatic deflate switch.	h. Replace switch.

"END"

PNEUMATIC SYSTEM - MAINTENANCE PRACTICES

SERVICING

Inpurities and foreign matter are removed from the air by filters before entering the manifold. One filter is located on top of each engine, ahead of the pressure pump. These filters should be replaced annually or every 300 to 500 hours of service time depending upon operating conditions. The filter element must not be subjected to solvents and must be replaced if this occurs. Always reinstall the filter cover with the opening facing down. Another filter is located between each dual pressure relief valve and the manifold. The frequency of replacing these air filters will depend upon service conditions: however, they should be checked approximately every 100 hours of operation and replaced every 500 hours of operation, or sooner if conditions warrant. When operating in localities where there is a great amount of dust or sand in the air, the filters should be inspected and replaced at more frequent intervals. Under extreme dusty conditions, it may be necessary to inspect the filters daily. A clogged filter reduces air flow and slows up the rotor causing improper gyro indication due to a loss of gyroscopic inertia.

PRESSURE REGULATOR AND DUAL PRESSURE RELIEF VALVE ADJUSTMENTS

NOTE

Make certain the surface deice and door seal pressure systems are "off" when the following adjustments are being accomplished.

a. Gain access to the dual pressure relief valves through the access doors on the top of each aft nacelle.

b. Operate one engine at 2300 rpm and adjust the dual pressure relief valve for that engine to obtain a reading of 5.0 ±.5 psi on the pneumatic (deice) pressure gage. The pneumatic (deice) pressure gage is located on the upper right corner of the instrument panel.

c. Repeat the adjustment in step "b" on the opposite side of the airplane.

d. Locate the instrument air pressure regulator which is situated between the gyros and the pressure bulkhead (FS 39.0) on the left side of the pilot's compartment.

NOTE

Rotate the pressure regulator adjusting screw clockwise to increase pressure and counterclockwise to decrease pressure.

1. Loosen the check nut and rotate the adjusting screw on the regulator to obtain a reading of 5.0 +.1 -.2 inches of mercury on the instrument air pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the instrument air pressure indicator to read in the green arc with both engines operating at 1500 rpm.

e. After adjusting the instrument air pressure regulator, recheck the dual pressure relief valves, located in each nacelle. Operate each engine individually at 2300 rpm. If the pressure on the indicator has been affected by the adjustment of the air pressure regulator, the dual pressure relief valves should be readjusted to 5.0 ±.5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system should be checked for leaks and/or restrictions; the discrepancy repaired and the system readjusted.

f. With the deice switch ON, engines running at 2300 rpm, the deice pressure gage should read 19-20 psi.

g. Replace the access doors on the nacelles and secure.

PRESSURE PUMP REMOVAL

a. Gain access to the accessory section of the engine compartment.

b. Remove the pump inlet and outlet hoses from the pressure pump.

c. Remove the nuts from the pressure pump mounting studs and remove the pressure pump.

PRESSURE PUMP INSTALLATION

CAUTION

When installing a new pump, replace the inline filter and blow out the line between the filter and the pump. Make certain the inlet line to the pump is clean. If the inlet line to the pump contains foreign material, the new pump will ingest this material, which may destroy the new pump.

Never use an air pump which has been dropped or mishandled.

NOTE

Never jam or force the pump onto the engine mounting pad.

a. Position the pressure pump on the mounting studs and secure with nuts. Torque the nuts to 180-220 inch-pounds.

b. Install the pump inlet and outlet hoses on the pressure pump and secure.

c. Install and secure the engine cowling.

DUAL PRESSURE RELIEF VALVE REMOVAL

The dual pressure relief valves are accessible through the access doors, located on the top aft of both nacelles.

a. Disconnect the electrical connections.

b. Remove the valve inlet and outlet hoses from the valve.

c. Remove the screws and washers which hold the valve and remove the valve

DUAL PRESSURE RELIEF VALVE INSTALLATION

a. Position the dual pressure relief valve and secure with washers and screws.

b. Install the inlet and outlet hoses on the relief valve and secure with clamps.

c. Connect the electrical wires.

d. Replace the access door and secure.

AIR FILTER REMOVAL

The air filters (between the dual pressure relief valve and the manifold) are accessible through the access doors, located on the top aft of the LH and RH nacelles. The filter located on top of the engine is accessible by removing the LH and RH engine cowling.

a. Remove the air filter inlet and outlet hoses from the air filter.

b. Remove the clamp, screws and washers and remove the filter.

AIR FILTER INSTALLATION

a. Position the air filter and secure it with the clamp, washers and screws.

b. Install the inlet and outlet hoses on the filter and secure with clamps.

c. Replace the access door on the top aft of the nacelle and secure.

d. Install and secure the engine cowling.

DOOR SEAL STANDBY PRESSURE REGULATOR VALVE REMOVAL (TJ-3 AND AFTER)

The door seal pressure regulator valve is accessible from within the fuselage aft of the pressure bulkhead (FS 39.0) on the right hand side of the pilot's compartment.

a. Disconnect the electrical connections. Remove the valve inlet and outlet hoses from the valve.

b. Remove the washers and screws which hold the valve secure and remove the valve.

DOOR SEAL STANDBY PRESSURE REGULATOR VALVE INSTALLATION (TJ-3 AND AFTER)

a. Position the door seal pressure regulator valve and secure with washers and screws.

b. Install the inlet and outlet hoses on the valve and secure the hoses with clamps.

c. Connect the electrical wires to the regulator valve.

d. Conduct the PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

INSTRUMENT AIR PRESSURE REGULATOR REMOVAL

The instrument air pressure regulator is installed between the gyros and the pressure bulkhead (FS 39.0) on the left side of the pilot's compartment.

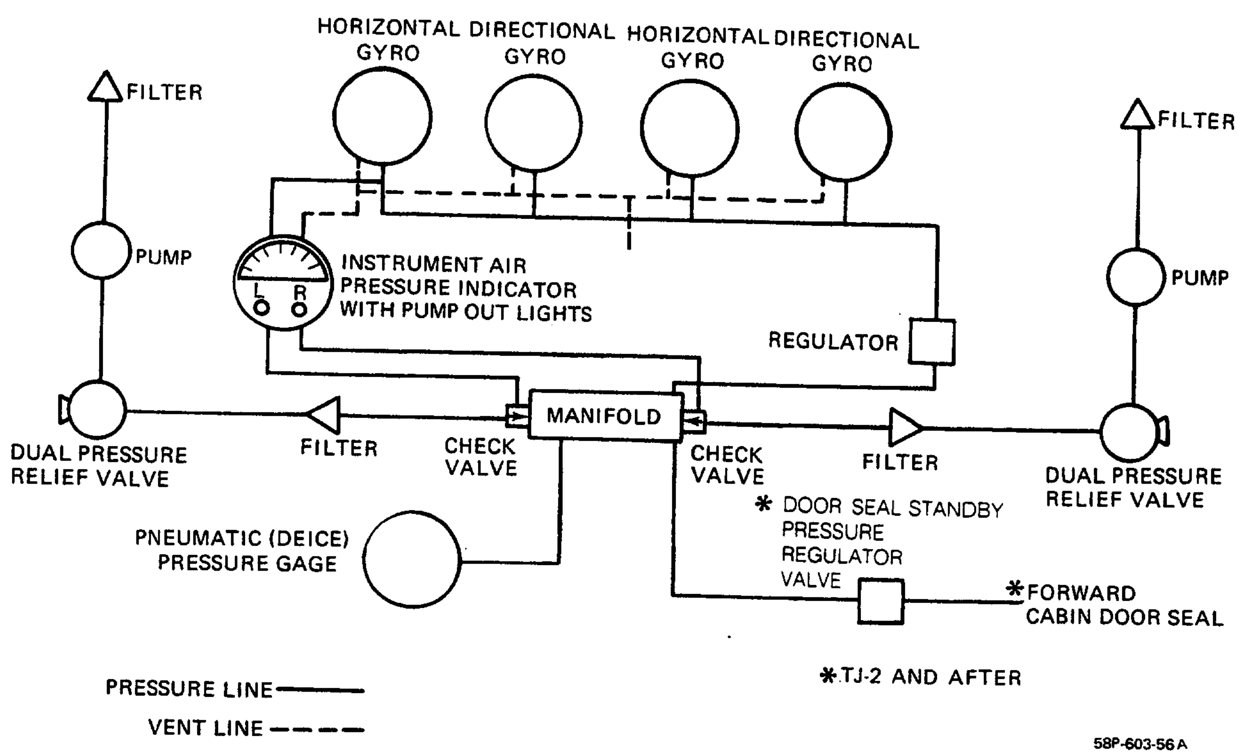
a. Identify the lines and remove the clamps and lines from the regulator.

b. Remove the instrument air pressure regulator.

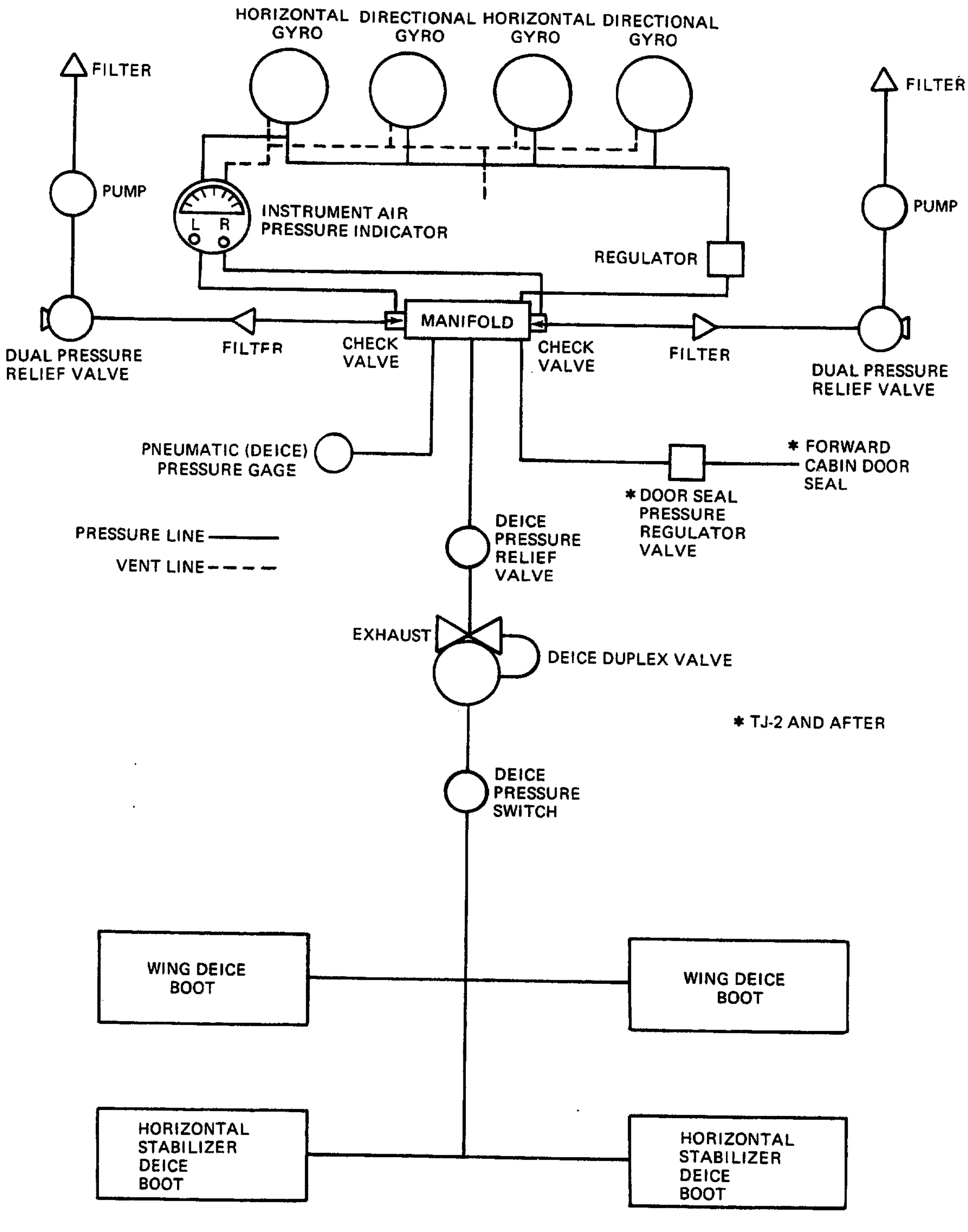
INSTRUMENT AIR PRESSURE REGULATOR INSTALLATION

a. Install the adapters on the regulator, making certain the insides are clean and free of foreign objects.

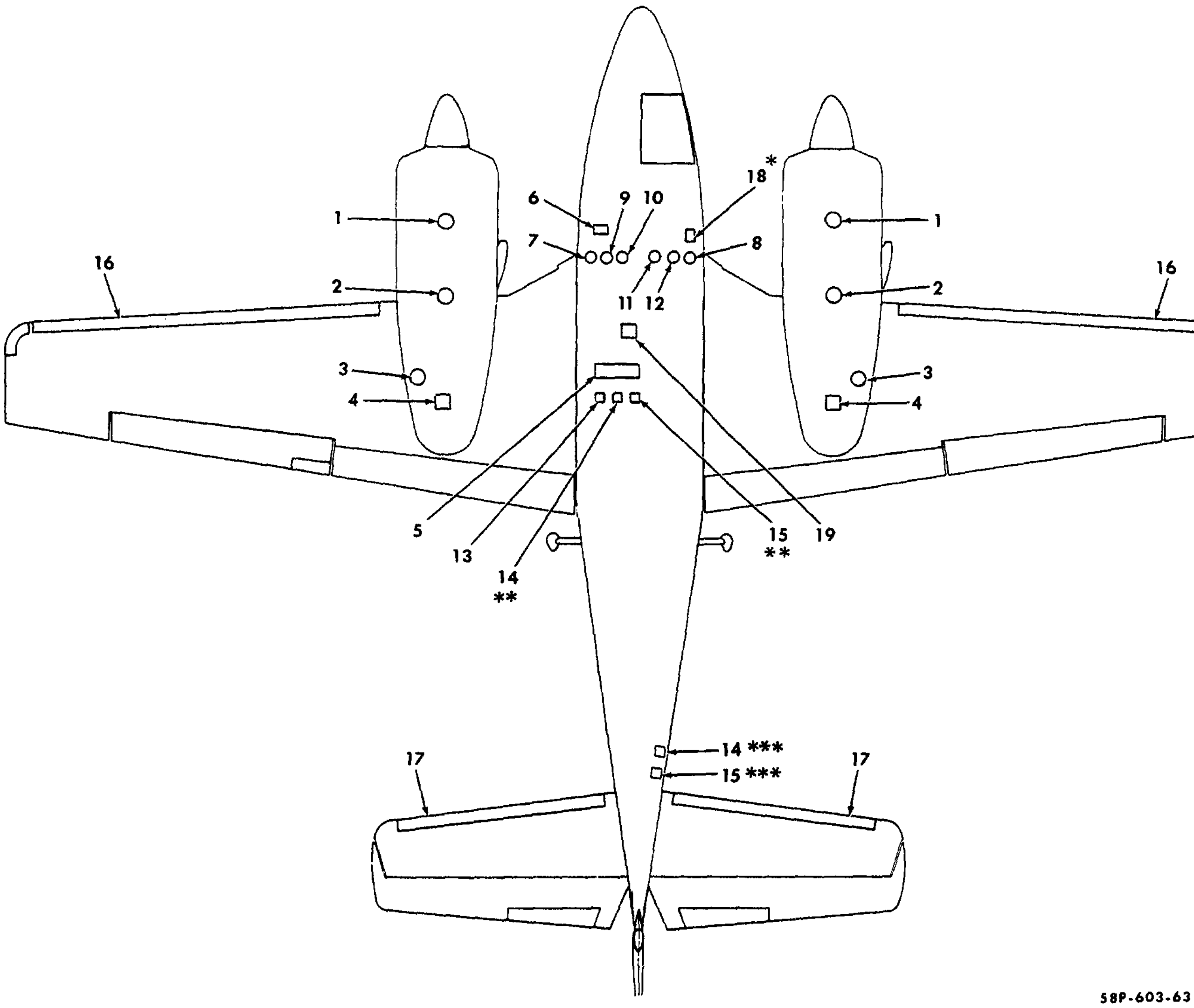
b. With the instrument air pressure regulator in position, attach clamps and lines in their proper locations.



Instrument Pressure System
Figure 201



Pressure System Schematic with Surface Deice Installation
Figure 202



1. Filter
2. Pressure Pump
3. Dual Pressure Relief Valve
4. Filter
5. Pressure Manifold
6. Instrument Air Pressure Regulator
7. Instrument Air Pressure Gage
8. Pneumatic (Deice) Pressure Gage
9. Gyro Horizon
10. Directional Gyro
11. Gyro Horizon
12. Directional Gyro
13. Pressure Relief Valve
14. Deice Duplex Valve
15. Pressure Switch
16. Wing Deice Boot
17. Horizontal Stabilizer Deice Boot
18. Door Seal Pressure Regulator Valve
19. Deice Controller

*TJ-2 and after
**TJ-2 thru TJ-4, TK-1 and after
***TJ-5 and after

Pressure System Component Location
Figure 203

"END"

CHAPTER 39

CHAPTER 39 - ELECTRICAL PANELS AND COMPONENTS

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GENERAL - DESCRIPTION AND OPERATION

The instrument panel on the airplane is divided into eight groupings. (1) The center panel is stationary and contains the engine instruments. Four groupings are located on the left side of the instrument panel. (2) A floating panel, located in the upper left corner of the instrument panel, contains the flight instruments. (3) The left panel, located just below the floating panel, contains the autopilot programmer (optional). Two subpanels are located below this fixed panel. (4) The upper left subpanel contains two rows of switches and circuit breaker switches; (5) the lower left subpanel contains the heater and air controls for cabin temperature and the parking brake.

The right side contains three groupings. (6) The avionics equipment panel contains all the communications and navigation equipment. (7) The stationary right panel contains various temperature indicators and the glove box. (8) An avionics subpanel, located just below the right panel, contains the circuit breakers for the avionics equipment.

Pictorial and description coverage of the instrument panel and of major electrical and electronic component locations is provided in the following pages. Pictorial and descriptive coverage of the Airplane Zones in which equipment is installed is provided to facilitate the location of the components.

"END"

INSTRUMENT AND CONTROL PANELS - MAINTENANCE PRACTICES

REMOVAL OF FLIGHT INSTRUMENTS

The following is a suggested procedure for removing the flight instruments:

a. Remove the screws attaching the glareshield to the instrument panel and carefully lift the glareshield.

b. Disconnect the air duct. Remove the glareshield.

c. Disconnect the plumbing and/or electrical connections from the flight instrument.

d. Disconnect and remove any post lamps.

e. Remove the mounting screws securing the instrument to the panel section.

f. Remove the instrument.

INSTALLATION OF FLIGHT INSTRUMENTS

a. Position the instrument in the panel section.

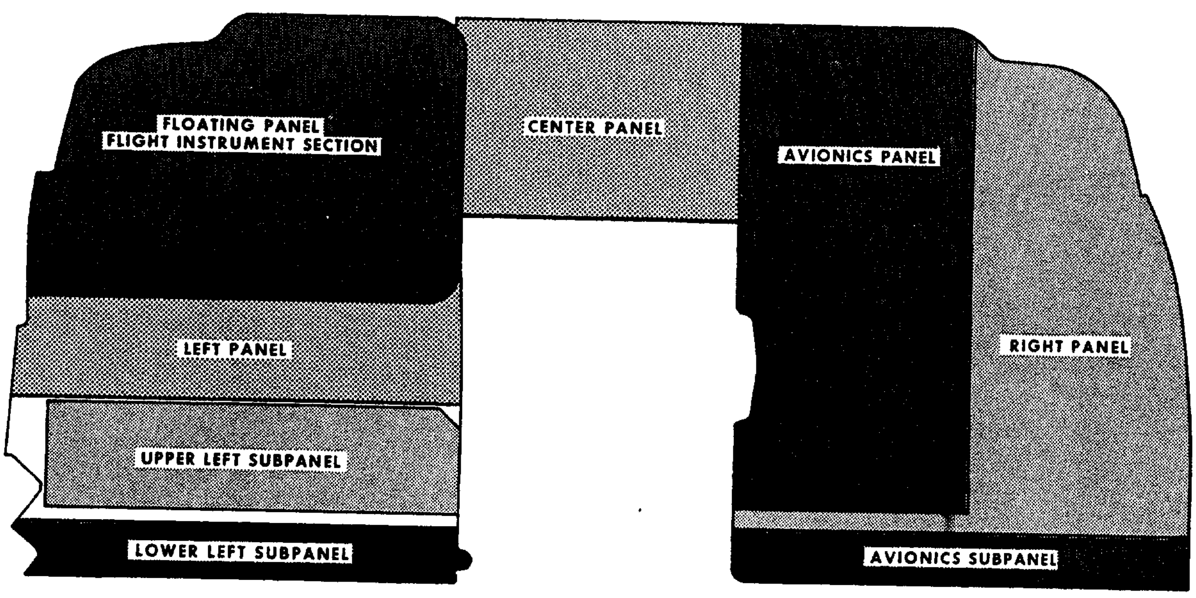
b. Secure the instrument to the panel with the attaching screws.

c. Reconnect any post lamps.

d. Connect the plumbing and/or electrical connections to the flight instruments.

e. Position the glareshield and connect the air duct to the glareshield.

f. Secure the glareshield with the existing Velcro tape and screws.



Instrument and Control Panel
Figure 201

AVIONICS EQUIPMENT PANEL

The avionics equipment installed in each airplane is customized to meet the requirements or preferences of the individual customer. Thus, a wide variation of installations is possible. Since the avionics harness and any mechnical drives that are installed must be securely tied and clamped to prevent chafing or interference with the flight controls, there is not sufficient length of avionics harness and mechnical drives to permit the removal of the avionics equipment panel prior to disconnecting the harness or mechnical drives. Due to the wide variation of installations possible, it will be necessary to inspect the installation to determine the required procedure to follow for the removal of the individual avionics unit or the avionics panel for maintenance. When it is necessary to disconnect the avionics harnesses and mechanical drives from the forward side of the unit, access to the connector may be gained by removing the glareshield and reaching the connector from the top of the instrument panel or by reaching up from below the instrument panel.

REMOVAL OF AN INDIVIDUAL AVIONICS UNIT

a. Inspect the units installed to determine the required procedure for removal. Determine if the entire panel must be removed or if only a single unit may be removed from the avionics panel to perform the necessary maintenance.

b. If required, remove the glareshield to gain access to the forward side of the avionics panel. Remove the screws attaching the glareshield to the panel. Carefully lift the glareshield and disconnect the air duct.

c. Disconnect the harness and, if any is installed, the mechanical drives from the unit.

NOTE

Some units must be removed from the panel prior to removing the harness connector from the dust cover which is mounted on the avionics panel.

d. Remove the unit from the avionics panel.

INSTALLATION OF AN INDIVIDUAL AVIONICS UNIT

a. Position the unit in the avionics equipment panel. Secure it in place.

b. Reconnect the avionics harness and any mechanical drives.

c. Reinstall the glareshield, using care to connect the air duct and carefully position the duct to prevent kinking. Secure the glareshield.

REMOVAL OF THE AVIONICS EQUIPMENT PANEL

a. Inspect the installation to determine the required procedure for removal of the panel.

b. Remove the screws securing the glareshield, carefully lift the glareshield and disconnect the air duct.

c. Disconnect all harnesses and mechanical drives, if installed, from the individual units to permit removal of the avionics panel.

NOTE

Some units must be removed from the panel prior to removing the harness connector from the dust cover which is mounted on the avionics panel.

INSTALLATION OF THE AVIONICS EQUIPMENT PANEL

a. Position the avionics panel in the instrument panel and secure it with the screws.

b. Reconnect all harness and any mechanical drives installed.

c. Reinstall the glareshield, using care to connect the air duct and carefully position the duct to prevent kinking. Secure the glareshield.

REMOVAL OF ENGINE INSTRUMENTS

The engine instruments are mounted in the center section of the instrument panel. These instruments may be removed by the following suggested procedure:

a. Remove the screws attaching the glareshield to the instrument panel and carefully lift the glareshield.

b. Disconnect the air duct and remove the glareshield.

c. Disconnect the plumbing and/or electrical connections from the engine instrument.

d. Disconnect and remove any post lamps.

e. Remove the mounting screws securing the instrument to the center section.

f. Remove the instrument for maintenance.

INSTALLATION OF ENGINE INSTRUMENTS

a. Position the instrument in the center section.

b. Secure the instrument to the section with the attaching screws.

c. Reconnect any post lamps.

d. Connect the plumbing and/or electrical connections to the engine instrument.

e. Position the glareshield and connect the air duct to the glareshield.

f. Secure the glareshield with the existing Velcro tape and screws.

UPPER LEFT SUBPANEL
(Figure 202)

Located in the middle of the left side of the instrument panel is a subpanel of two rows of individually mounted switches which control the main systems of the airplane.

Access to the individually mounted switches is obtained from the underside of the instrument panel or by removing the screws which secure the subpanel to the instrument panel. 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 upper left subpanel:

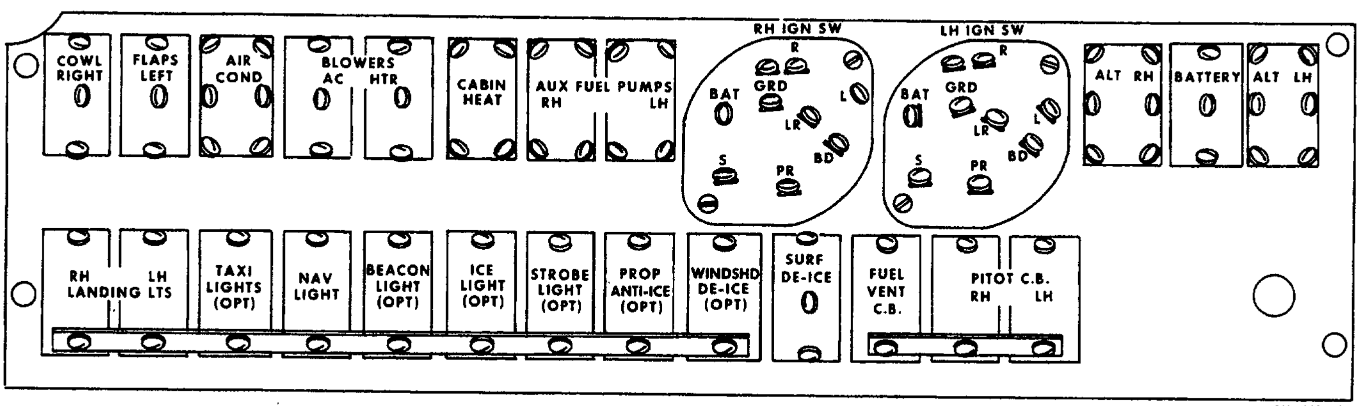
The numbers in parentheses ( ) correspond to the reference designators identifying the component in the BEECHCRAFT Baron 58P/Baron 58TC Wiring Diagram Manual.

CIRCUIT BREAKER SWITCHES

- Fuel Vent Heater (CB46)
- Ice Light (CB52)
- Landing Lights
  - Left (CB56)
  - Right (CB57)
- Nav Light (CB54)
- Pitot Heat
  - Left (CB44)
  - Right (CB45)
- Prop Anti-Ice (CB49)
- Rotating Beacon Light (CB53)
- Taxi Light (CB55)
- Windshield Deice (CB50)

SWITCHES

- Air Conditioner - Press Air Cool (S59)
- Air Conditioner Blower (S98)
- Alternators
  - Left (S54)
  - Right (S55)
- Fuel Boost Pumps
  - Left (S11)
  - Right (S12)
- Battery (S85)
- Cabin Heat (S30)
- Cowl Flaps
  - Left (S78)
  - Right (S79)
- Ignition
  - Left (S14)
  - Right (S15)
- Surface Deice (S13)



Upper Left Subpanel
Figure 202

CIRCUIT BREAKER SUBPANEL (Figure 203)

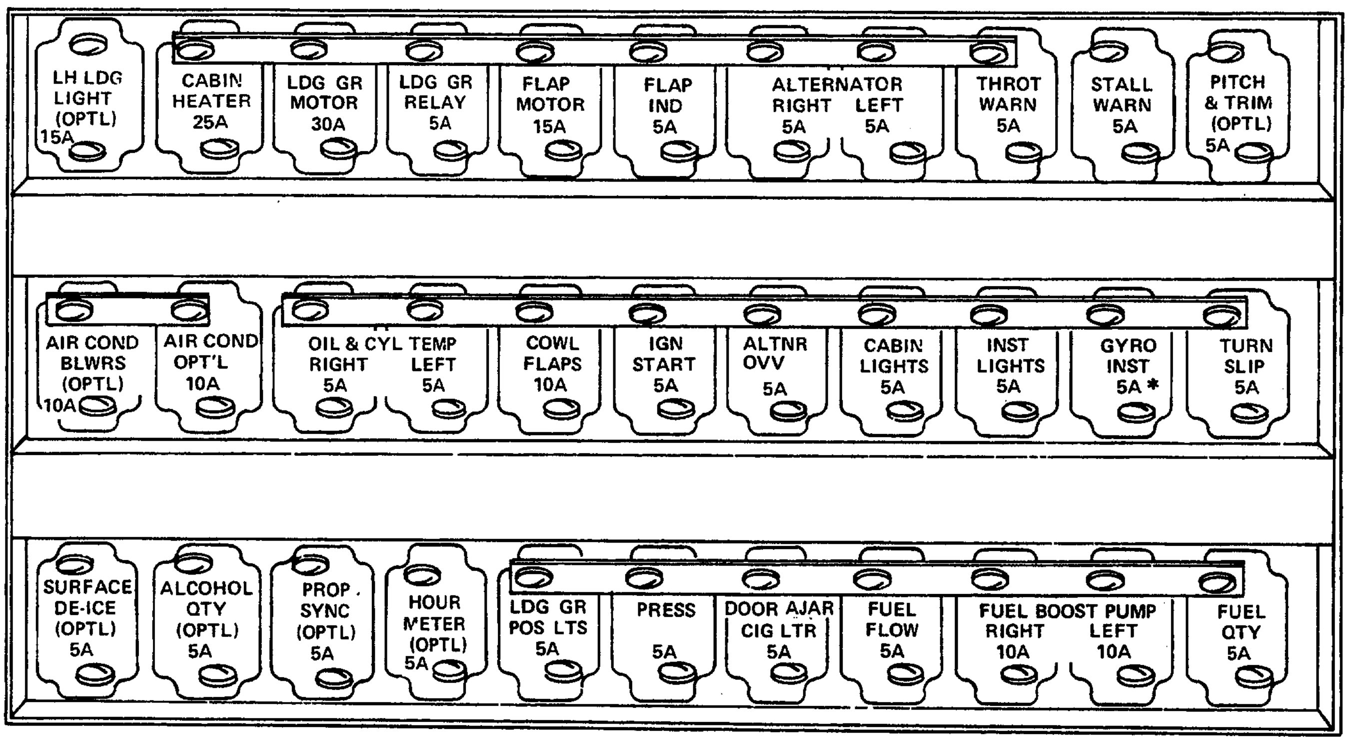
The circuit breaker subpanel is located on the left side of the cabin just aft of the instrument panel. It contains three rows of individually mounted circuit breakers. The rows are indented and at an angle to prevent inadvertent damage to the circuit breakers and to facilitate location of an individual circuit breaker.

For replacement, access to the circuit breakers is obtained by removing the screws attaching the subpanel to the cabin structure. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

The following electrical equipment is located on the circuit breaker subpanel:

The numbers in parentheses ( ) correspond to the reference designators identifying the component in the BEECHCRAFT Baron 58P/Baron 58TC Wiring Diagram Manual.

- Air Conditioner (CB115)
- Air Conditioner Blower (CB92)
- Alcohol Quantity (CB104)
- Alternator
  - Left (CB93)
  - Right (CB94)
- Alternator Over Volt (CB118)
- Auxiliary Fuel Pump
  - Left (CB99)
  - Right (CB100)
- Cabin Heater (CB95)
- Cabin Lights (CB108)
- Cowl Flaps (CB111)
- Door Ajar - Cigarette Lighter (CB96)
- Flaps Position Indicator (CB101)
- Flap Motor (CB98)
- Fuel Flow (CB116)
- Fuel Quantity (CB117)
- Gyro Instruments (CB91) TJ-2 thru TJ-45, TK-1 and after
- Hour Meter (CB103)
- Ignition Start (CB112)
- Instrument Lights (CB109)
- Landing Gear
  - Position Lights (CB119)
  - Motor (CB19)
  - Relay (CB105)
- Landing Light, Left (CB121)
- Oil and Cylinder Temperature
  - Left (CB114)
  - Right (CB113)
- Pitch and Trim (CB90)
- Pressure Circuit (CB110)
- Prop Sync (CB89)
- Throttle Warning (CB106)
- Turn and Slip (CB107)
- Stall Warning (CB97)
- Surface Deice (CB102)



* GYRO INST INSTALLED ON TJ-2 THRU TJ-45 AND TK-1 AND AFTER

Circuit Breaker Subpanel
Figure 203

"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 201, 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(132) Area Below Nose Compartment
140 Forward Cabin Bulkhead to Main Spar
150 Main Spar to Rear Spar
160 Aft of Rear Spar

200 FORWARD FUSELAGE

210 Nose Compartment
221(222) Forward Cabin Bulkhead (Attach to or Accessible from Forward Side)
231(232) Forward Cabin Bulkhead to Instrument Panel (Accessible from within Fuselage)
240 Instrument Panel and Subpanel
251(252) Cabin (Floor Line to Headliner)
253 Headliner Area
270 Main Spar Carry Through Structure
280 Rear Spar Carry Through Structure

300 AFT FUSELAGE AND EMPENNAGE

310 Aft Fuselage
320 Dorsal Fin
330 Vertical Stabilizer
340 Rudder
351(352) Horizontal Stabilizer
361(362) Elevator
370 Tail Cone

410 (420) ENGINES AND ENGINE COMPARTMENT

500 (600) WING AND CONTROL SURFACES

521(621) Nacelle, Forward of Main Spar
522(622) Nacelle, Aft of Main Spar
531(631) Wing, Inboard-Leading Edge
532(632) Wing, Inboard-Aft of Leading Edge
533(633) Flap
541(641) Wing, Outboard - Leading Edge
542(642) Wing, Outboard - Aft of Main Spar
543(643) Aileron
550(650) Wing Tip

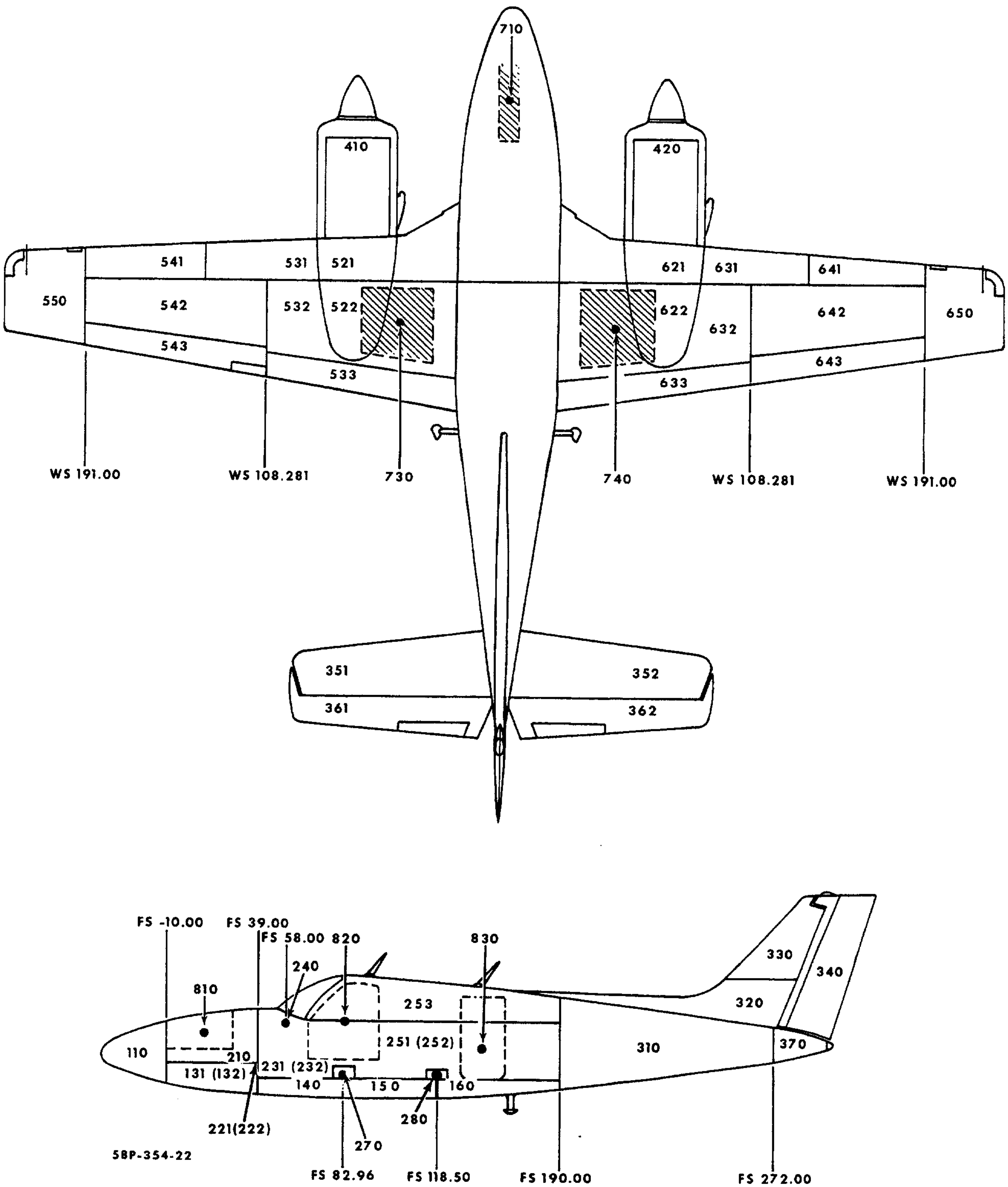
700 GEAR DOORS AND WHEELWELLS

710 Nose Landing Gear
730(740) Main Landing Gear

800 DOORS

810 Nose Baggage Door
820 Right Cabin Entry
830 Left Cabin Entry (TJ-2 and after)
Right Cabin Entry (TK-1 and after)

Airplane Zoning Diagram (Sheet 1 of 2)
Figure 201



Airplane Zoning Diagram (Sheet 2 of 2)
Figure 201

FORWARD CABIN BULKHEAD - AIRPLANE ZONES 231 and 232 (Figure 202)

Several electrical components are mounted on the forward cabin bulkhead. These components are located at the upper left and right hand sides of the bulkhead. The components are mounted individually with screws and nut plates. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

FORWARD UPPER LEFT CABIN BULKHEAD - ZONE 231 (Figure 202)

The following electrical equipment is mounted on the upper left portion of the forward cabin bulkhead:

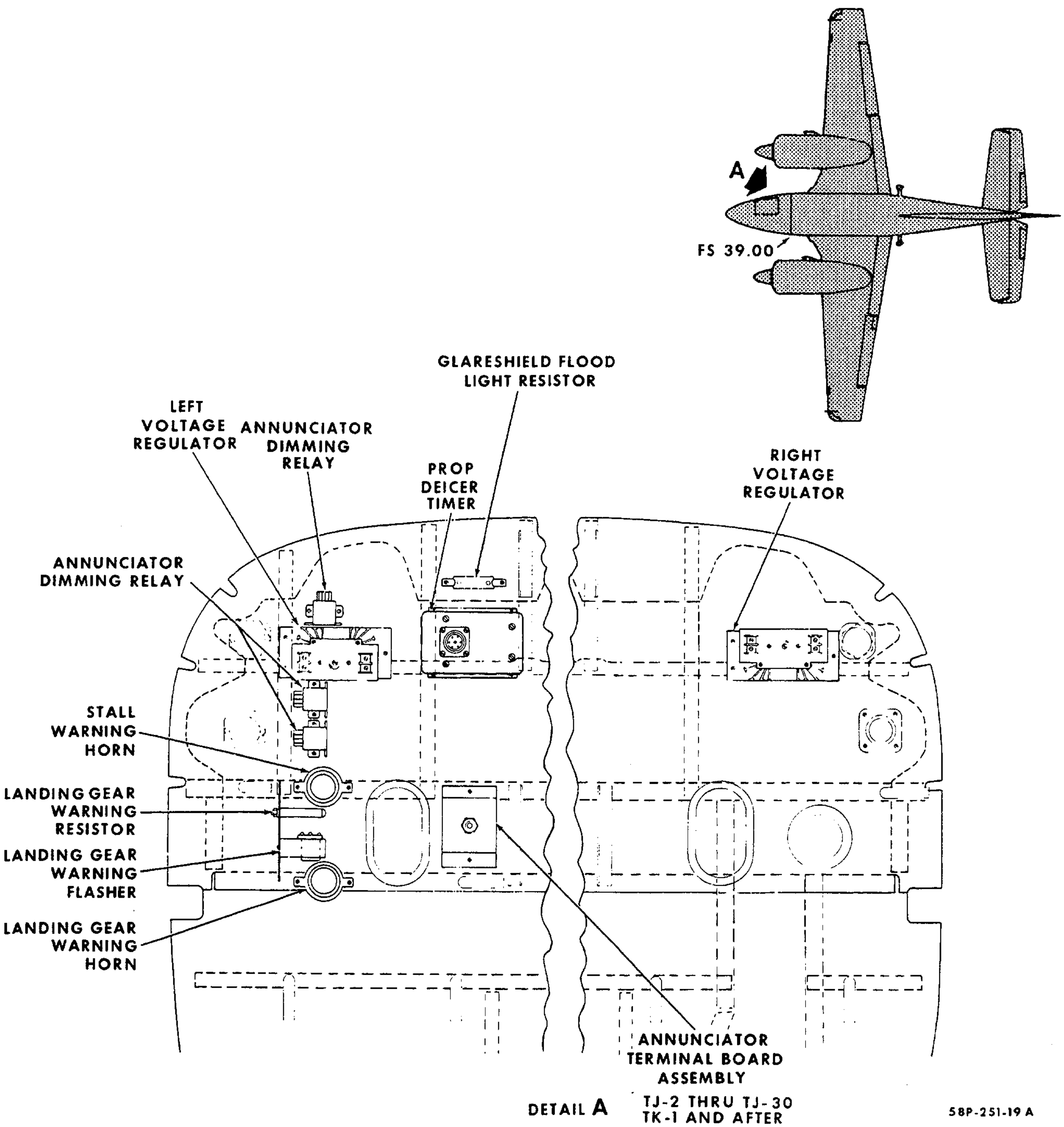
Annunciator Dimming Relay (K23)
Glareshield Flood Light Resistor (R31)
Landing Gear Terminal Board Assembly (A22) (TJ-2 thru TJ-30, TK-1 and after)
Landing Gear Warning
- Horn (LS11)
- Flasher (DS142)
- Resistor (R38)

Prop Deicer Shunt (R11)
Stall Warning Horn (LS12)
Voltage Regulator (VR16)

FORWARD UPPER RIGHT CABIN BULKHEAD - ZONE 232 (Figure 202)

The following electrical equipment is mounted on the upper right portion of the forward cabin bulkhead:

Voltage Regulator (VR17)



Forward Cabin Bulkhead
Figure 202

FUSELAGE AFT OF FORWARD CABIN BULKHEAD ZONES 231 and 150 (Figure 203)

Electrical components are located in two different areas aft of the forward cabin bulkhead. The components are mounted individually with screws. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

FUSELAGE LEFT SIDE – ZONE 231 (Figure 203)

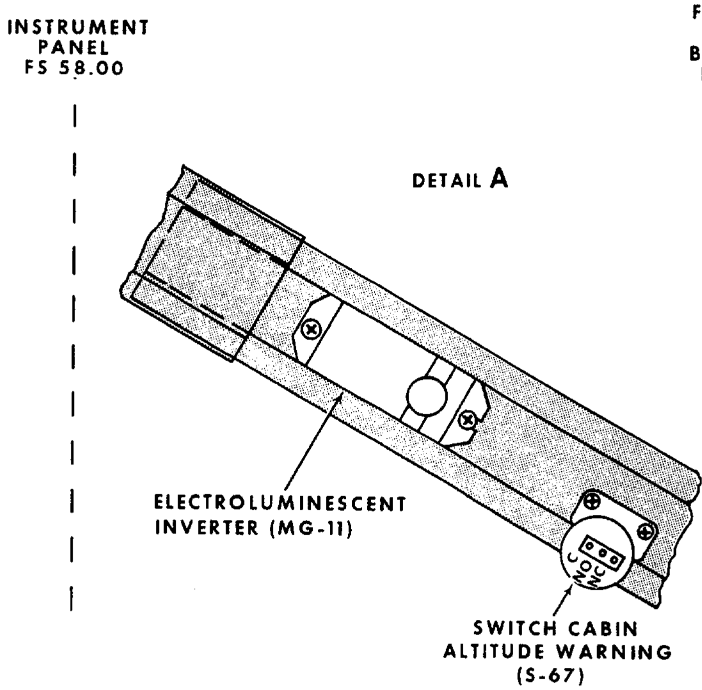
Airplane serials TJ-2 thru TJ-30, TK-1 and after, the following equipment is mounted on the left side of the fuselage between the instrument panel (F S 58.00) and the forward cabin bulkhead (F S 39.00):

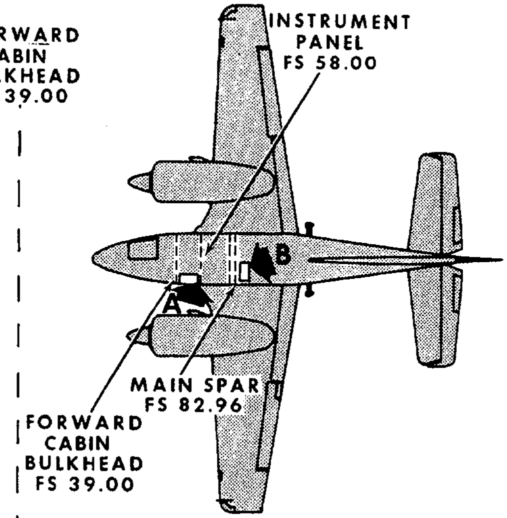
Inverter, Electroluminescent Lights (MG11), TJ-2 through TJ-34
Switch, Cabin Altitude Warning (S67)

FUSELAGE CABIN FLOOR - ZONE 150 (Figure 203)

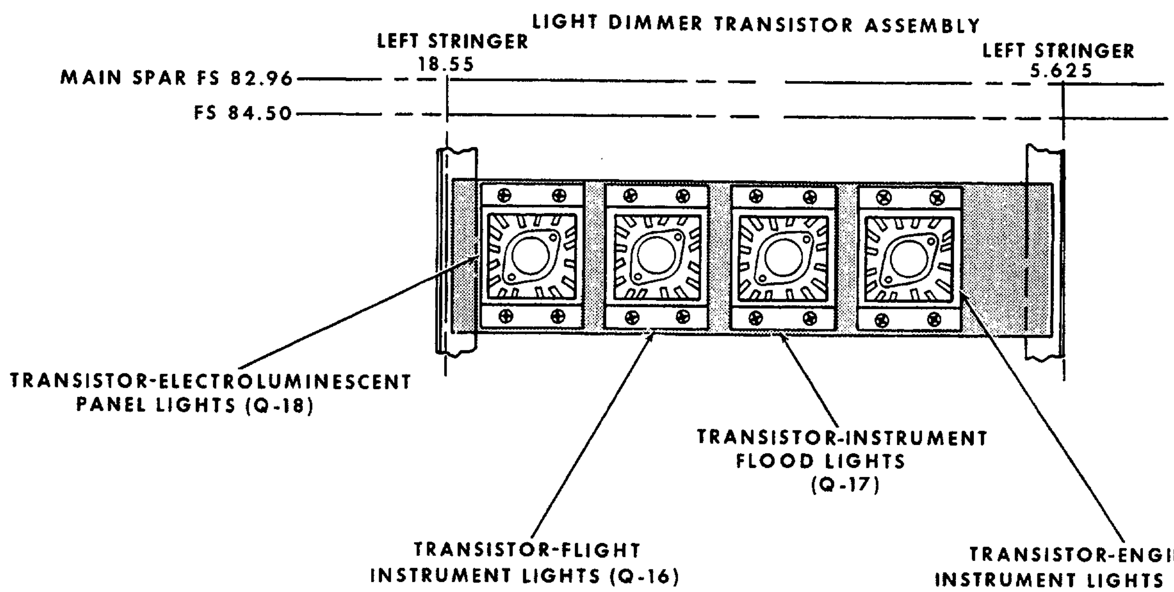
The following electrical components are located on the left side of the airplane under the floor just aft of the main spar:

Transistors
- Electroluminescent Panel Lights (Q18)
- Flight Instrument Lights (Q16)
- Instrument Lights (Q17)
- Engine Instrument Lights (Q15)





(TJ-2 THRU TJ-30, TK-1 AND AFTER)



58P-354-24

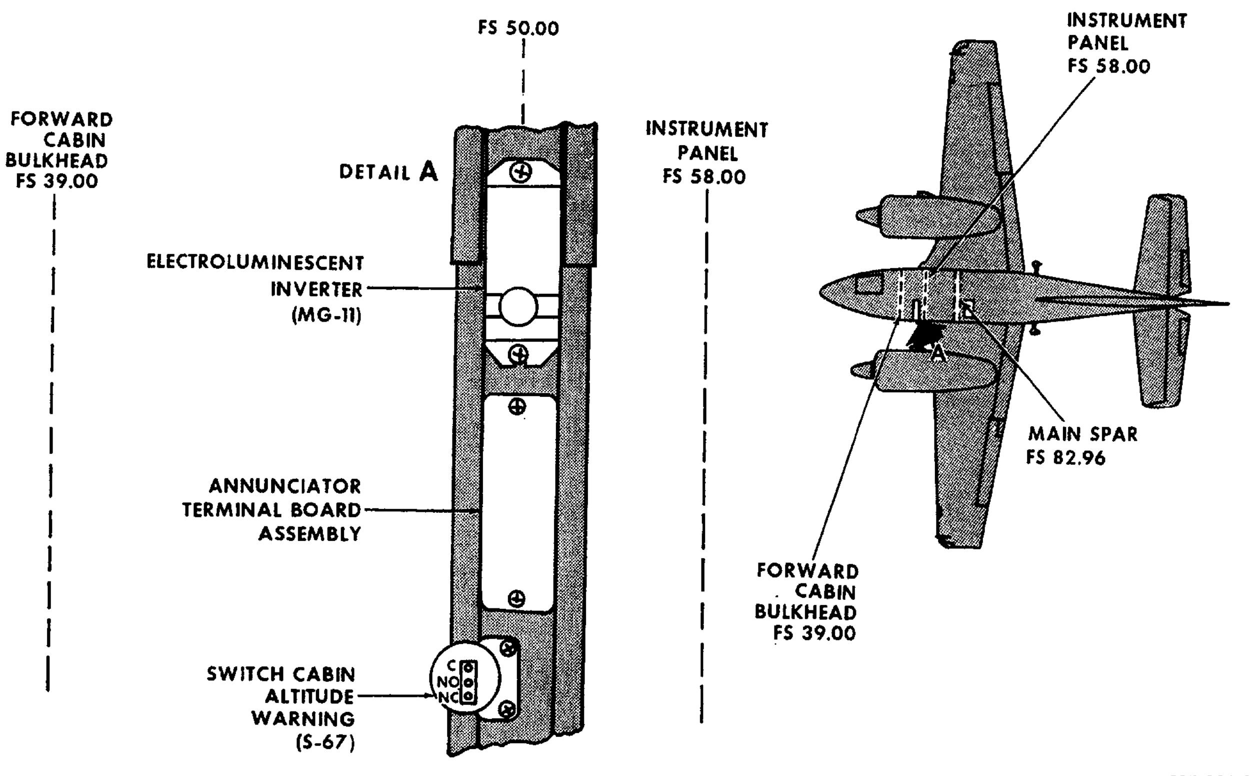
(TJ-2 AND AFTER, TK-1 AND AFTER)

Fuselage Aft of Forward Cabin Bulkhead
Figure 203

FUSELAGE LEFT SIDE - ZONE 231
(Figure 204)

Airplane serials TJ-31 and after, the following equipment is mounted on the left side of the fuselage, at FS 50.00, between the instrument panel (FS 58.00) and the forward cabin bulkhead (FS 39.00):

Inverter, Electroluminescent Lights (MG 11)
Annunciator Terminal Board Assembly
Switch, Cabin Altitude Warning (S 67)



Fuselage Aft of Forward Cabin Bulkhead (TJ-31 and after)
Figure 204

FUSELAGE NOSE COMPARTMENT - ZONES 131, 132 and 210 (Figure 205)

The electrical components located in the forward nose baggage compartment are mounted individually with screws and bolts. When removing any of the components for maintenance purposes, tag any wires removed to facilitate the reinstallation of the components.

FUSELAGE LEFT SIDE

The following equipment is mounted on the left side of the fuselage just opposite of the baggage compartment door above the baggage compartment floor:

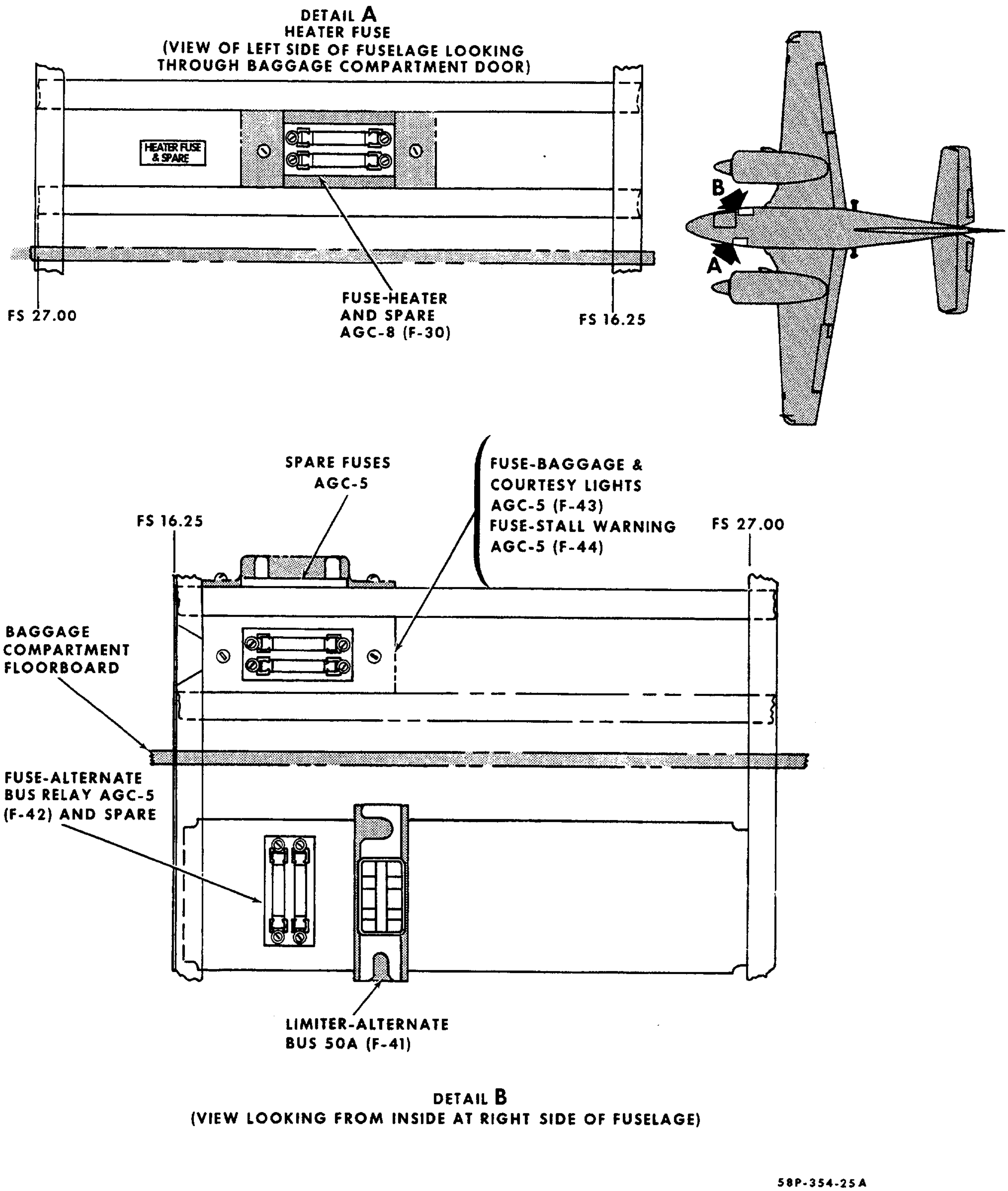
Fuse, Heater Overtemperature (F30)
Fuse, Spare

FUSELAGE RIGHT SIDE

The following equipment is mounted on the right side of the fuselage just aft of the baggage compartment door above or below the floorboard as indicated:

Above Floorboard
- Fuse, Baggage and Courtesy Lights (F42)
- Fuse, Stall Warning (F44)
- Fuse, Spare - Baggage and Courtesy Lights
- Fuse, Spare - Stall Warning

Below Floorboard
- Fuse, Alternate Bus Relay (F42)
- Fuse, Spare
- Limiter, Alternate Bus (F41)



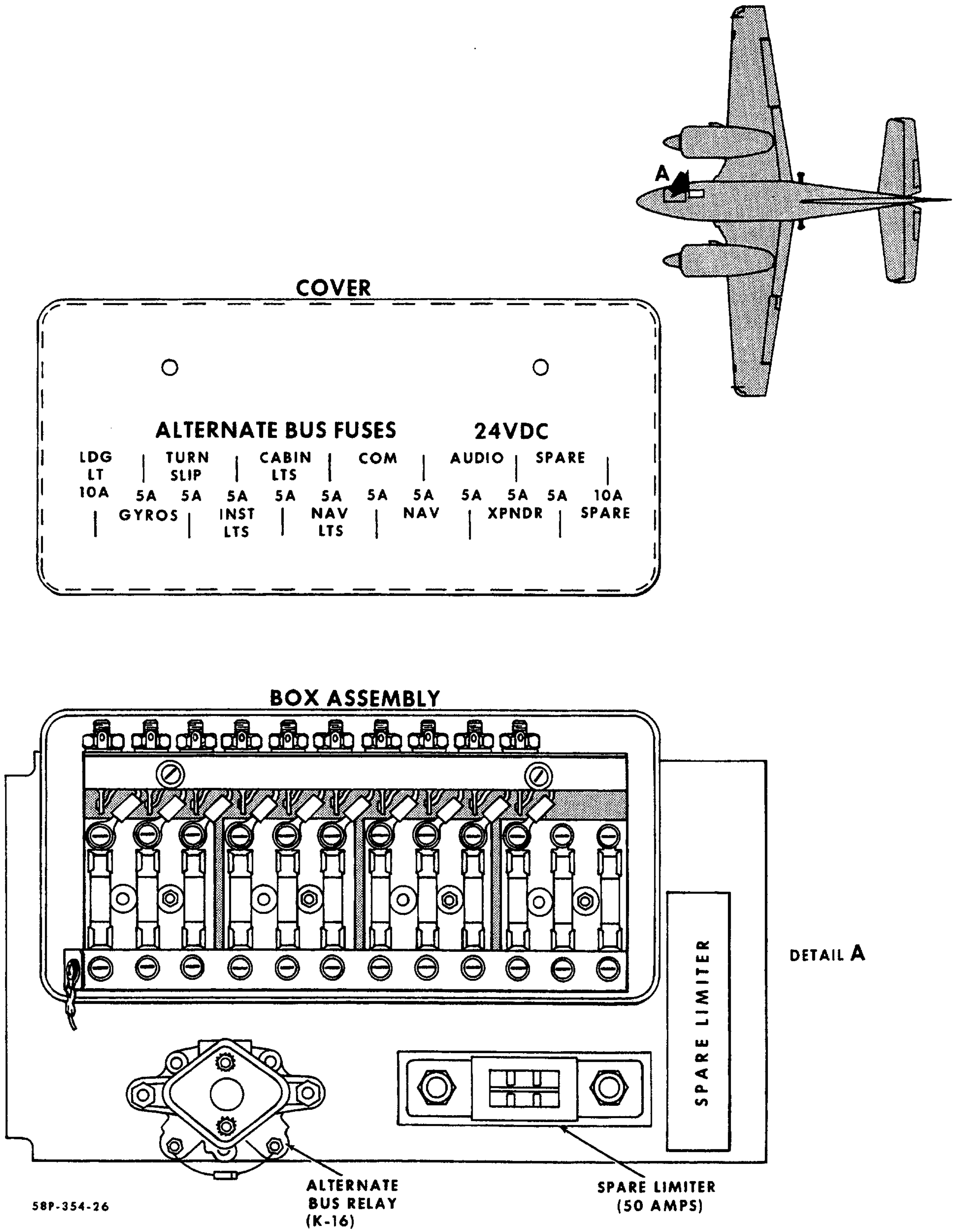
Fuselage Nose Compartment
Figure 205

NOSE COMPARTMENT - ALTERNATE BATTERY BUS - ZONE 132 (Figure 206)

The electrical components of the alternate battery bus are located on the forward baggage compartment below the floorboard. All components are attached with screws, bolts and nut plates. When removing any of the components for maintenance purposes, tag any wires removed to facilitate the reinstallation of the components.

The following equipment is located on the alternate battery bus:

Fuse, Landing Light (F31)
Fuse, Gyros (F32)
Fuse, Turn and Slip (F33)
Fuse, Instrument Lights (F34)
Fuse, Cabin Lights (F35)
Fuse, Nav Lights (F36)
Fuse, Comm (F37)
Fuse, Nav (F38)
Fuse, Audio (F39)
Fuse, Transponder (F40)
Fuse, Spare
Fuse, Spare
Relay, Alternate Battery Bus (K16)
Limiter, Spare



Alternate Battery Bus
Figure 206

NACELLES - ZONES 521 and 621 (Figure 207)

Several electrical components are mounted on the inboard sides of the left and right nacelles. They are mounted individually with screws, bolts and nuts. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

LEFT NACELLE - ZONE 521 (Figure 207)

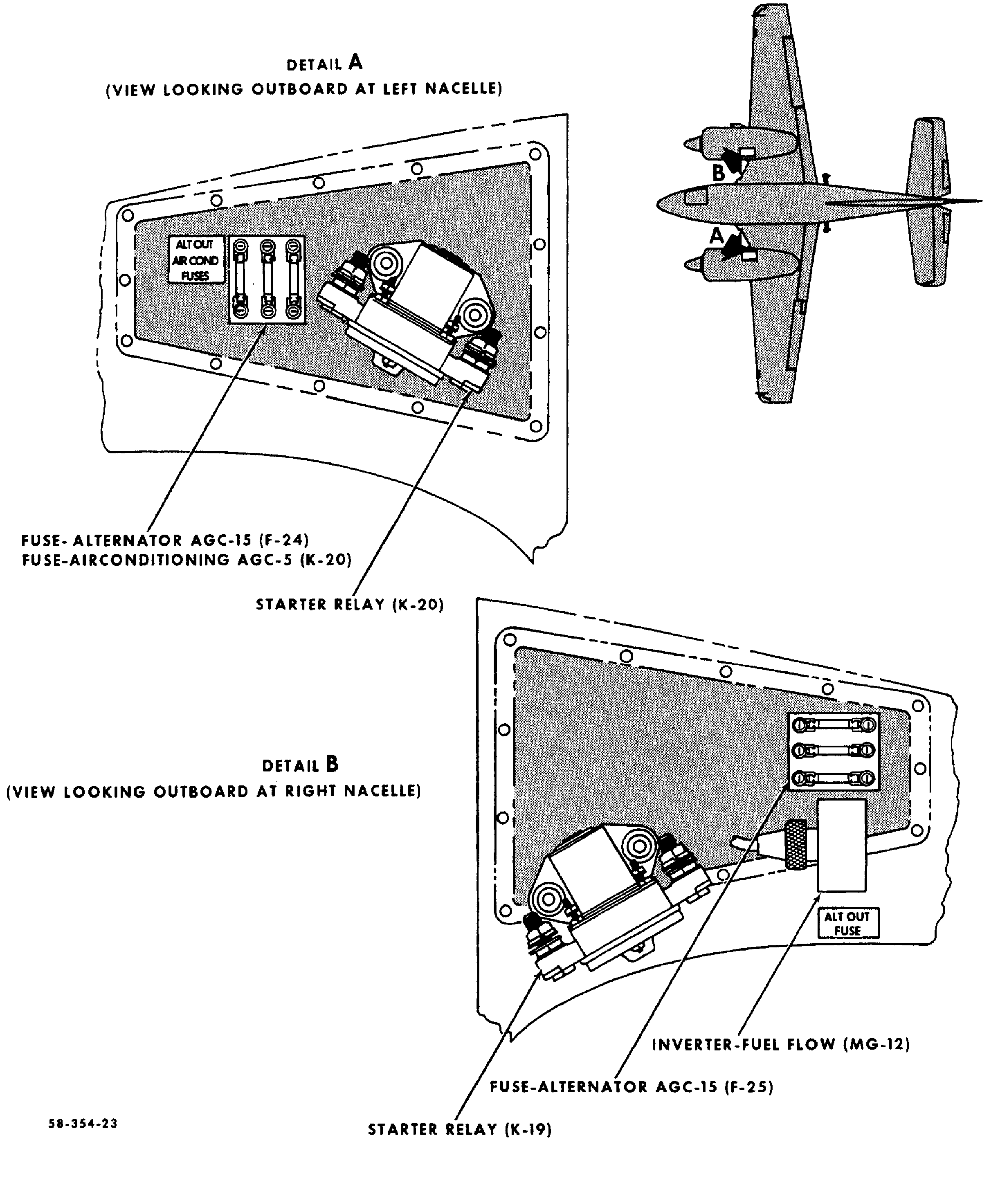
The following electrical equipment is mounted in the left nacelle and is accessible through an access panel:

- Alternator Over Voltage Relay (K24)
- Cabin Altitude Warning Light Dimming Relay (K22)
- Fuse, Alternator (F24)
- Fuse, Air Conditioning (F20)
- Fuse, Spare
- Loadmeter Shunt Fuses
  - Left
    1. (F28)
    2. (F29)
  - Right
    1. (F26)
    2. (F27)
- Low Voltage Detector
- Over Voltage Sensor
- Starter Relay (K20)

RIGHT NACELLE - ZONE 621 (Figure 207)

The following electrical equipment is mounted in the right nacelle and is accessible through an access panel:

- Alternator Over Volt Relay (K25)
- Fuse, Alternator (F25)
- Fuse, Spare
- Inverter, Fuel Flow (MG12)
- Limiter, Alternator
  - Left (F22)
  - Right (F23)
- Low Voltage Detector (A21)
- Over Voltage Sensor (A14)
- Shunt, Alternator
  - Left (R33)
  - Right (R34)
- Starter Relay (K19)



Nacelles
Figure 207

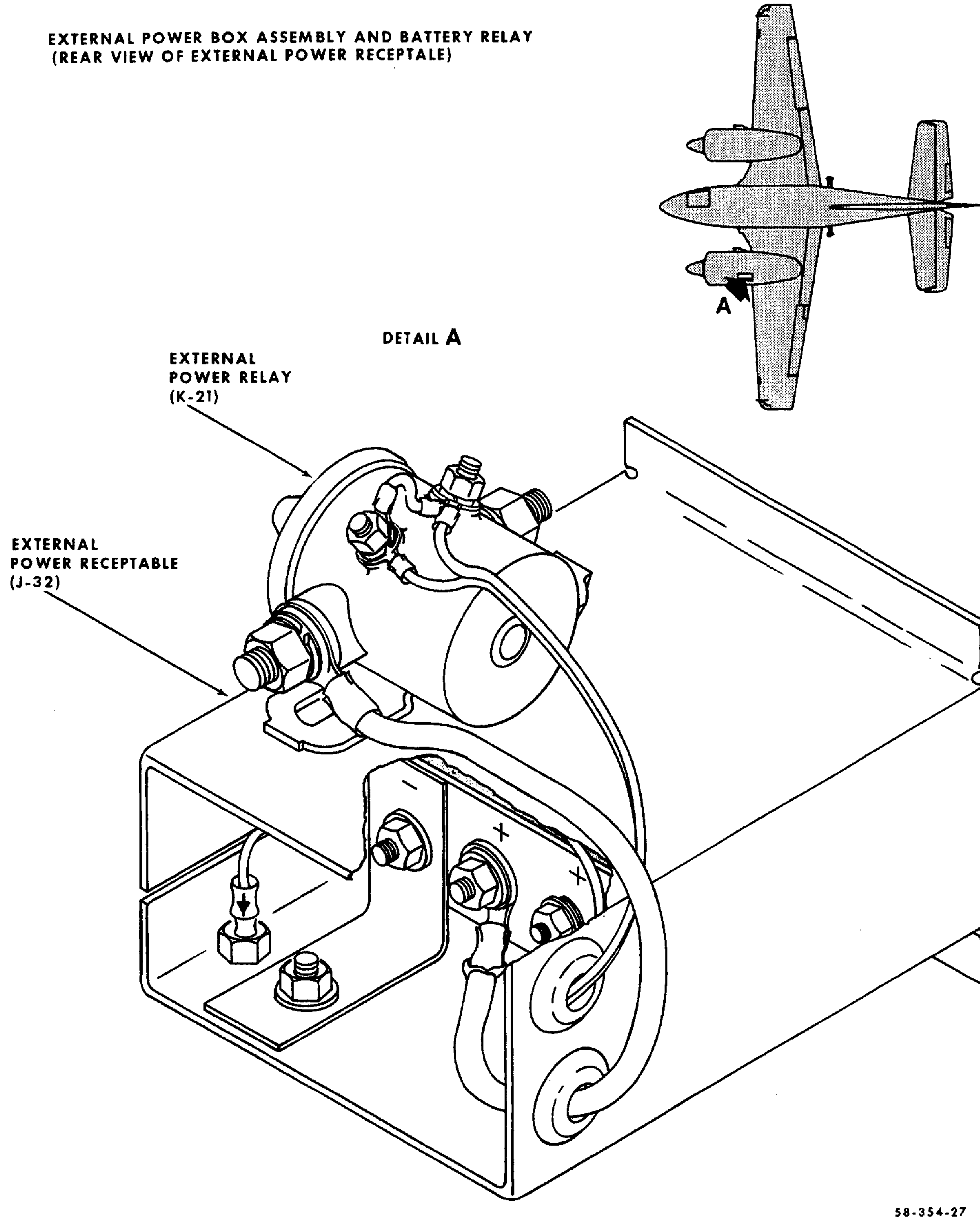
EXTERNAL POWER - ZONE 521
(Figure 208)

Electrical components of the external power system are mounted on the outboard side of the left nacelle. These components are mounted individually with screws and bolts. When removing any of the components for maintenance purposes, tag and identify any wires removed to facilitate the reinstallation of the components.

OUTBOARD SIDE OF THE LEFT NACELLE

The following electrical equipment is mounted on the outboard side of the left nacelle:

External Power Relay (K21)
External Power Receptacle (J32)



External Power
Figure 208

"END"

CHAPTER

51

STANDARD PRACTICES-STRUCTURES

CHAPTER 51

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CHAPTER 51 - STRUCTURES

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Repair of Fiberglass Components		201

"END"

GENERAL - DESCRIPTION AND OPERATION

(TJ-2 AND AFTER)

Being of semimonocoque construction, the fuselage is pressurized to the skin between pressure bulkheads at stations 39.00 and 190.00. All skin, bulkheads and structure points, plumbing and wiring connections passing through a pressure wall, access doors, windows and control cables are sealed to mimimize air leakage. Although the carry through structure is an intregral part of the fuselage, the wing panels may be removed at the attach points inboard of the nacelles. Individual passenger seats are provided, with the front seats installed facing aft.

(TK-1 AND AFTER)

The fuselage is of semimonocoque construction. Although the carry through structure is an integral part of the fuselage, the wing panels may be removed at the attach points inboard of the nacelles. Individual passenger seats are provided, with the front seats installed facing aft.

"END"

GENERAL - MAINTENANCE PRACTICES

STRUCTURAL REPAIR

WARNING

Drilling, modification, or any type of work which creates a break in the pressure vessel is considered the responsibility of the owner or facility performing the work. Obtaining approval of the work is therefore, their responsibility.

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 pressure vessel.

CAUTION

On TJ-2 and after, the pressurized area, all skins, formers, stringers, etc., are structural members and should be treated as such.

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.

e. All windows are constructed of stretched-modified acrylic plastic and are secured with Hi-Lok fasteners. The windows may be smoke or gold tinted. The windshield and right and left front cockpit windows are .250-inch thick. The cabin and door windows are .195-inch thick. Repair depth of this type of plastic is critical and, except for minor scratch removal, it is not recommended that repairs be made. Scratched, crazed or cracked windows should be inspected according to the procedures in Chapter 56.

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 (49, Chart 207, 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 air 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

DOORS

CHAPTER 52 - DOORS

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"END"

GENERAL - DESCRIPTION AND OPERATION

FORWARD CABIN ENTRANCE DOOR (TJ-2 and after)

The forward cabin entrance door is provided with seven hooks that engage into fittings around the perimeter of the door opening. A system of push-pull tubes and torque tubes actuates the hooks from the door handles. The inside door handle, located at F S 73.95, and the outside handle, located at F S 90.52, are interconnected by a push-pull tube. The two bottom door latching hook assemblies and the forward door edge hook assembly are actuated from an eccentric arm assembly on the shaft of the inside door handle. The remaining hooks, two on the aft edge of the door and two on the top edge of the door, are actuated by the eccentric arm assembly on the shaft of the outside door handle. When either handle is turned, all hooks are actuated because of the push-pull tube linking the two handles.

Also actuated from the eccentric arm assembly of the inside door handle is an over-center spring-loaded tube and arm assembly which is designed to create a positive action to move the latches into the fully latched or fully unlatched position.

Cam slots in the latch hook mechanisms guide the hook out over the hook fittings in the edge of the door opening and inward toward the door to pull the door edges firmly against the door seals. The shafts of the two bottom latch hook drive mechanisms are connected with a torque tube. A push-pull tube drives the forward latch mechanism from the eccentric arm assembly of the inside door handle, which in turn drives the lower aft latch assembly.

The eccentric arm assembly of the inside door handle also drives the upper forward latch mechanism through a push-pull rod and a torque tube. The push-pull rod transmits the energy to the forward portion of the door where an end clevis attaches to a cam plate and follower assembly. This assembly rotates the torque tube which, with the aid of a universal joint, transmits the energy directly into the side of the latch hook assembly. In this way, the movement of the door handle to actuate the latch hooks is transmitted around the expanse of the window glass.

Both latch hook mechanisms on the aft edge of the door are actuated by a push-pull tube connected to the inside door handle eccentric arm assembly.

The two upper latch hook mechanisms are actuated by: a push-pull tube from the inside door handle eccentric arm assembly, an arm assembly that converts the energy from a horizontal to a vertical plane, a push-pull cable-and-housing assembly, and a lever attached to the upper end of the cable to activate a push rod to the latch hook mechanism. The top latch hook mechanisms are linked together and act as a pair.

AFT CABIN DOOR (TJ-2 and after)

The aft cabin door provides an entryway into the aft cabin area. This door 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. Two pins on the upper half of the forward edge of the door slip into fittings in the door frame as the door is being closed, securing the top of the door. On the aft edge of the door and the bottom, four bayonet-type latch pins are actuated to lock the door by rotating the door handles. Since the top edge of the door is contoured to fit the fuselage, a solid door catch attached to the top edge of the door, flexing upward and outward with the force of pressurization to bind against a striker plate, is sufficient to secure the top edge of the door. Neither of these parts is actuated by the latching mechanism and they require no lubrication.

A shaft, near the middle of the door drives an eccentric plate. A push-pull rod from this eccentric plate drives another eccentric plate located a short distance from the bottom of the door. The upper eccentric plate is rotated by the cabin door handles and drives: the center and upper latch pins on the aft edge of the door, a push-pull rod which connects the upper and lower eccentric plates together, and the arm of the pressure safety lock diaphragm located just forward of the door handle. The lower eccentric plate drives: two push-pull rods for the two lower latch pins, and an over center spring loaded locking device.

The uppermost door latch pin at the top aft edge of the door is attached to a flexible cable into which is incorporated a nylon liner to reduce friction. The lower end of the cable is attached to the eccentric plate in the middle of the door. The flexible cable runs along the top of the door and back to the eccentric plate, thus providing transfer of energy around the expanse of the window to actuate the latch pin. The middle latch pin on the aft edge of the door is driven directly from the eccentric plate with a push-pull rod.

The remaining two latch pins, on the bottom center of the door and on the lower aft edge of the door, are driven directly from the lower eccentric plate through push-pull rods. The spring loaded over-center mechanism is attached directly to the lower eccentric plate and is designed to move the latch pins into the fully latched or unlatched position.

PRESSURIZATION SAFETY LOCK (TJ-3 and after)

To prevent inadvertent operation of the aft cabin door in flight, a pressurization safety lock device prevents operation of the door handle. The diaphragm is mounted just forward of the door handle. A slotted flange fits around the shaft of the diaphragm. With pressure inside the cabin, the shaft will only fit in the enlarged end of the slot, preventing movement of the handle. The diaphragm is provided with a pressure override knob which protrudes into the inside and outside of the cabin. Inside the cabin door, the pressure override is a red knob which is to be pulled before the handle is released to turn. On the outside of the cabin door, the pressure override is a small thumb button which must be pushed to release the handle. A spring within the diaphragm provides for resistance to hold the lock in position when the cabin is not pressurized. Action of the door handle to the locked position from inside the cabin can be verified by the placarding LOCKED which will move into a small window over the diaphragm when the door latching mechanisms are locked.

DOOR WINDOWS (TJ-3 and after)

Stretched-modified acrylic plastic is provided for both the cabin door windows and is an integral part of the load bearing (pressure) structure. The plastic is of the same type material as the other windows and is installed in the same manner. Repair of damaged windows, except for minor scratch removal, is not recommended. Scratched, crazed or cracked windows should be inspected according to the procedures in Chapter 56 of this manual.

FORWARD CABIN DOOR SEAL (TJ-3 and after)

The pressure pumps that provide pressure for the instruments and deice boots also provide pressure for the purpose of inflating the pressure seal around the forward cabin door. With the door in the closed and locked position, pressure from the pressure manifold is routed into the cabin door seal through the lower forward corner of the door. The seal inflates and presses outward against the frame of the door, thereby creating a positive seal for cabin pressure. For maintenance coverage of the pressure pumps, refer to Chapter 36-00-00. For coverage of the door seal pressure regulator and automatic deflate switch, refer to Chapter 21-31-00.

AFT CABIN DOOR SEAL (TJ-3 and after)

The aft cabin door is fitted with a resilient hollow seal, cushioned by filler material that holds it in the proper contour against the edge of the door. This seal is mounted on the door frame and, when the cabin is pressurized, is forced outward by cabin pressure to form a tight seal against the door.

DOOR AJAR WARNING SYSTEM (TJ-3 and after)

The RH DOOR AJAR and LH DOOR AJAR lights on the instrument panel indicate that the cabin doors are not properly closed, when illuminated. The door ajar circuit receives power from the DOOR AJAR-CIGARETTE LIGHTER, push-pull, 5-ampere circuit breaker located on the circuit breaker panel. One door ajar switch in each door closes completing the circuit to the door ajar lights when the doors or door is not properly closed.

CABIN ENTRANCE DOOR (TK-1 and after)

The cabin entrance door is provided with three latches that engage latch plates in the door sill of the fuselage. A system of push-pull tubes, and their attendant linkage, controls movement of the latches when actuated by either of the door handles. The inside and outside door handles are interconnected by a push-pull tube. The bottom latch on the aft side of the door is actuated through a tube connected to a bell crank operating off the push-pull tube connecting the door handles. The shaft for the inside door handle actuates the latch at the top of the door through a tube and cable assembly routed around the forward side of the window. The latch on the aft side of the door is controlled by linkage from the push-pull tube and outside door handle connected directly to the latch tongue.

CABIN UTILITY DOORS (TK-1 and after)

The utility door installation is a double door with each half hinged at the forward and aft edge of the door opening. The rear half of the door must be closed first. A latch on the forward edge of the door moves downward to a locked position to secure the hooks at the top and bottom of the door frame. Movement of the door handle rotates a bell crank to which the tubes that control movement of the upper and lower hooks are attached. The front half of the door cannot be fully closed until the latch of the aft door is latched and flush with the edge of the door frame. After the forward half of the door is closed, it can be latched from the outside by rotating the handle to the closed position. This handle rotates the shaft to which the bell crank is attached. A tube attached to one lobe of the bell crank transfers bell crank movement to engage or disengage the upper latch rod from the latch plate in the door sill. Another lobe of the bell crank controls movement of the latch tongue that engages the latch plate in the aft door. The remaining lobe of the bell crank transfers movement through a tube to the latch rod at the bottom of the door. A conventional handle on the inside of the door provides for opening or closing within the cabin.

"END"

PASSENGER/CREW - MAINTENANCE PRACTICES

FORWARD CABIN DOOR REMOVAL (TJ-2 and after)

a. Disconnect the cabin door stay from the bottom of the door.

b. Remove the two hinge pin retaining screws adjacent to the hinges. The upper hinge retaining pin is just below the upper hinge and the lower hinge retaining pin is just above the lower hinge.

c. Disconnect the pressure tube, that inflates the cabin seal, at the lower hinge.

d. Open the door wide and lift upward on the door to take the weight off the hinges.

e. Force the hinge pins out of the hinges and remove the door from the airplane.

FORWARD CABIN DOOR INSTALLATION (TJ-2 and after)

a. Hold the door in position so that the hinges align.

b. Install the bottom hinge pin first, the upper hinge pin last, then install the retaining screws, upper first, then lower.

c. Reconnect the pressure tube to the cabin seal at the lower hinge.

d. Reconnect the cabin door stay at the bottom of the door.

e. Close the door and check for fit. A tolerance of .03 to .06 inch is required around the edge of the door.

f. Perform PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

FORWARD CABIN DOOR RIGGING (TJ-2 and after)

NOTE

Check the position of the pressure seal against the door before re-rigging the latching mechanisms. If the door seal does not fit properly, the latches may not secure the door properly. Make changes as necessary before checking the door latches for rigging.

a. Remove the inside door handle and pressurization release lock knob.

b. Remove the upholstery panel from the door.

c. Close the door and rotate the handle to the locked position.

NOTE

Make certain the door is closed completely with no objects interfering with the fit.

d. On TJ-9 and after, rig the door hooks as described in steps "e" through "i", maintain the hook-striker clearances in the following chart.

NOTE

The hooks are numbered clockwise beginning with the lower forward hook. (See Figure 201 for adjustment points and hook locations.)

HOOK NUMBER	HOOK-STRIKER CLEARANCE
1	0.00 to 0.10 inch
2	0.00 to 0.06 inch
*3	0.00 to 0.06 inch
*4	0.00 to 0.06 inch
**5	0.00 to 0.10 inch
**6	0.00 to 0.10 inch
7	0.00 to 0.10 inch

*Hook-striker clearance for hooks No. 3 and No. 4 must be within 0.03 inch of each other.
**Hook-striker clearance for hooks No. 5 and No. 6 must be within 0.03 inch of each other.

e. Holding the door firmly shut, adjust the vertical push-pull rod in the center of the door until the two bottom hooks touch the striker plate bars. Secure the locknut.

f. Open the door and check for clearance of the hooks over the door sill as the door swings out.

NOTE

If the two bottom hooks drag on the door sill with the door handle rotated to the full open position, readjust the hooks slightly upward until sufficient clearance is obtained.

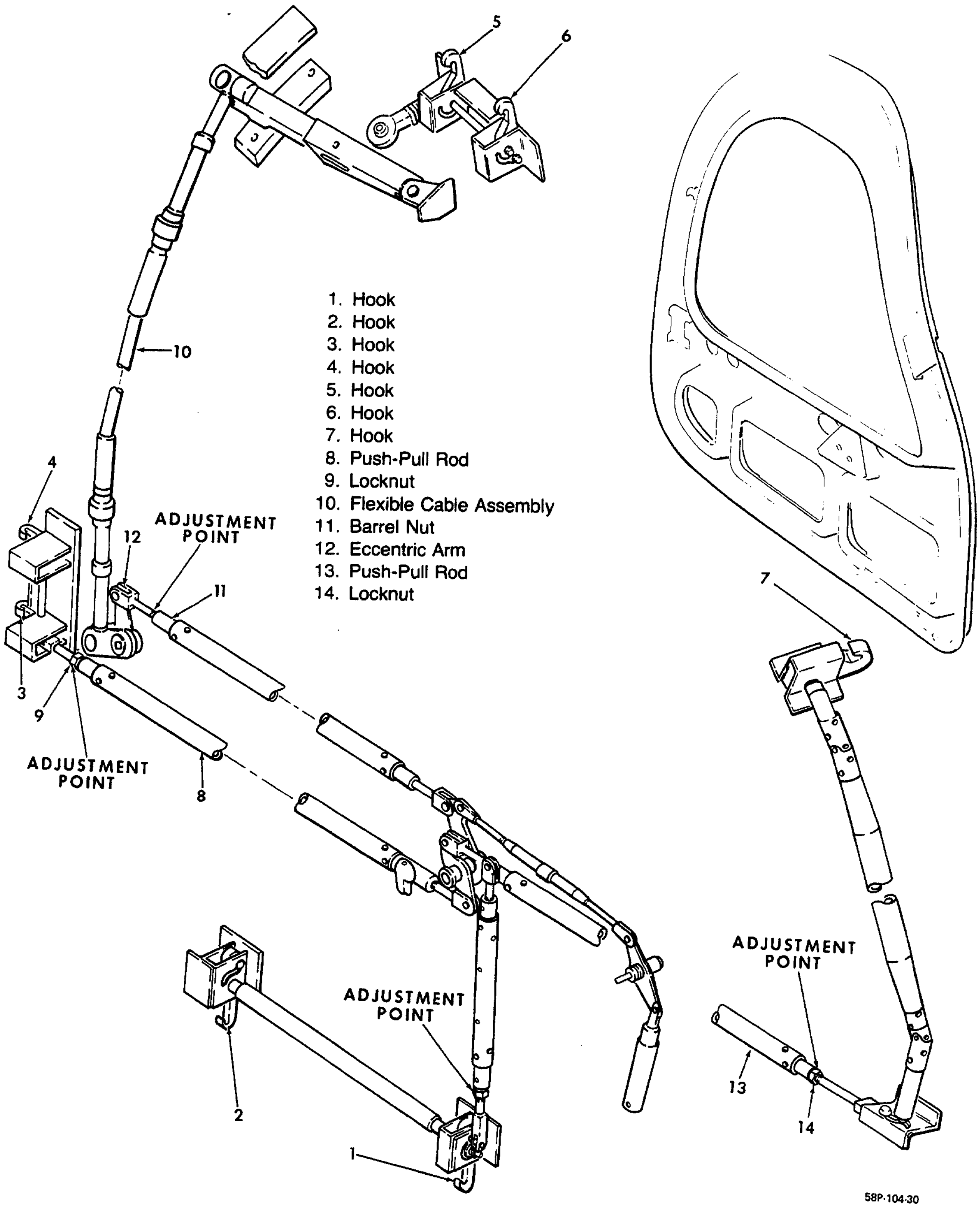
g. Locate the push-pull rod (8, Figure 201) that actuates the pair of hooks (3 and 4) on the aft edge of the door. With the door closed and locked, adjust the hooks until they touch the striker plate bars. Secure the locknut (9).

h. Locate the bottom end of the flexible cable assembly (10) that actuates the latch hooks (5 and 6) at the top of the door. Adjust the barrel nut (11) at the eccentric arm (12) to touch the latch plate bars.

i. The latch hook (7) on the forward side of the door is adjustable at the push-pull rod (13) below the forward corner of the door window. Adjust the rod in or out of the clevis to bring the hook (7) to touch the striker plate bar. Secure the locknut (14).

j. With all the latch hooks adjusted to touch the striker plate bars, recheck the door fit to make certain of a clearance of .03 to .06 inch between the door edge and frame.

k. Check to see that the door seal is within .12 inch of the door frame all around the door so that when the seal



1. Hook
2. Hook
3. Hook
4. Hook
5. Hook
6. Hook
7. Hook
8. Push-Pull Rod
9. Locknut
10. Flexible Cable Assembly
11. Barrel Nut
12. Eccentric Arm
13. Push-Pull Rod
14. Locknut

Forward Cabin Door Latching Mechanism (TJ-2 and after)
Figure 201

is inflated by pump pressure it will have good solid contact against the frame.

l. Reinstall the door upholstery and handles.

m. Check the outside door handle for ease of operation. The force required to open and close the outside door handle should not exceed 200 in. lbs. torque.

n. Check for pressure leaks during an engine runup by watching for cabin pressurization with the press-to-test switch on.

FORWARD CABIN DOOR SEAL REPLACEMENT (TJ-2 and after)

a. Disconnect the pressure tube from the old seal at the lower hinge and gently remove the old seal using toluol (22, Chart 207, 91-00-00) to loosen the rubber.

NOTE

> It is not necessary to remove the shims that retain the seal at the proper distance from the door frame.

b. Position the new seal around the edge of the door so that the seal will extend outward toward the door frame when the seal is inflated. Check for an expansion distance of .12 inch between the seal and the door frame.

c. Clean the door seal and edge of the door with toluol (22, Chart 207, 91-00-00) before applying RTV-732 adhesive (5, Chart 205, 91-00-00). The work life of the adhesive is 15 minutes. Fasten the seal in place immediately and work it back firmly against the shims and door edge.

d. Leave the door open and allow adhesive to cure for 24 hours. Dust the installation with soapstone. Reconnect the pressure tube at the lower hinge.

e. Check the seal for .12 inch clearance between the seal and the door. Check for pressure leaks during engine run up by watching for cabin pressure with the press-to-test switch on.

f. Perform PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

AFT CABIN DOOR REMOVAL (TJ-2 and after)

a. Disconnect the cabin door stay from the bottom of the door.

b. Remove the nut and washer from the loop at the top end of the hinge pin and pull the hinge pin out of the hinge.

c. Remove the door from the door frame.

AFT CABIN DOOR INSTALLATION (TJ-2 and after)

NOTE

> To maintain close tolerance for the door fit, install a new hinge pin whenever the door is reinstalled. The new pin can be fabricated from MS20253-2-1900 wire using the old pin as a pattern. The bevel at the bottom of the pin should extend upward from the point .15 inch. Lubricate with Molykote G grease (8, Chart 207, 91-00-00) before installing.

a. Hold the door in position and install the new hinge pin. Secure the loop end of the hinge pin with the washer and nut.

b. Recheck the tolerance at the door edge. Tolerance should be from .03 to .06 inch between the edge of the door and the frame.

c. Reattach the cabin door stay.

NOTE

> When the aft cabin door is installed properly there will be a slight indentation at the top contour of the door.

d. Perform PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

INSTALLING A NEW AFT CABIN DOOR (TJ-2 and after)

a. Remove the old door per instructions in AFT CABIN DOOR REMOVAL.

b. Check to see that the new door is lubricated with graphite grease petrolatum, MIL-T-5544 (6, Chart 207, 91-00-00) at the eccentric plates and shafts.

NOTE

> Do not lubricate the latch pins in the latch pin fittings. Nylon guides are provided inside the fittings and require no lubrication.

c. With Molykote G grease (8, Chart 207, 91-00-00) lubricate and install a new door hinge pin with the new door in place. Secure the pin by placing the loop in the end of the pin over the bolt above the top of the hinge half and reinstall the washer and nut.

NOTE

To maintain close tolerance for the door fit, install a new hinge pin whenever new door is installed. The new pin can be fabricated from MS20253-2-1900 wire using the old pin as a pattern. The bevel at the bottom of the pin should extend .15 inch upward from the point.

d. Check door fit and trim excess material as necessary to obtain .03 to .06 inch tolerance between the edge of the door and the frame.

NOTE

When the aft cabin door is installed properly there will be a slight indentation at the top contour of the door.

e. Remove the upholstery from the old door and reinstall it on the new door.
f. Reattach the cabin door stay.
g. Perform PRESSURIZATION TEST PROCEDURE as described in Chapter 21-30-00.

AFT CABIN DOOR LATCH ADJUSTMENT (TJ-2 AND AFTER)

To gain access to the aft cabin door adjustment points, remove the aft cabin door upholstery panels. Refer to Figure 202 for pictorial coverage of the adjustment points.

a. Before closing door, actuate the door handle to ensure free movement of all pins.
b. Retract the pins, then with the door in the near closed position, check that the pins line up with the holes in the striker plates.
c. Close the door and actuate the handle to the latched position. Monitor the movement of the latch pins.
d. During actuation of the handle, the full round portion of the center aft pin at WL 104.75 must enter the striker plate 0.06 to 0.12 inch before the full round portion of the upper aft pin at WL120.00 enters its striker plate.
e. With door closed and latched check amount of engagement of the upper pin into the striker plate. The full round portion of the pin must extend 0.30 inch minimum into the striker plate. Measurement taken along the centerline of the pin on the inboard side. Adjustment may be made where the flex cable attaches to the cable end (see Figure 202, for adjustment points). The threaded end of the flex cable must have a 0.25 inch minimum engagement in the cable end.
f. The aft upper pin must enter the striker plate freely with no evidence of binding.

AFT CABIN DOOR SEAL REPLACEMENT (TJ-2 AND AFTER)

a. Remove the screws from the four seal retainers and remove the seal retainers.
b. Carefully remove the old door seal by working it loose from the filler.

NOTE

The new door seal is to be installed against the existing filler, since it provides a cushion to hold the seal in the proper position. If the filler cushion is damaged, repair the damaged area with identical filler Pro-Seal 890B-4 (8, Chart 205, 91-00-00).

c. Place the new door seal in position against the filler cushion and reinstall the four seal retainers.
d. Check for proper fit of the seal against the door. If the installation is not leak proof, the conformity of the cushion can be changed as desired by the addition of Pro-Seal 890B-4 (8, Chart 205, 91-00-00) behind the door seal. Close the door and allow 24 hours for the new filler to cure.

NOTE

If new filler is used for additional cushion against the seal, dust the new seal with soapstone to prevent sticking.

AFT CABIN DOOR FLEX CABLE REPLACEMENT (TJ-2 AND AFTER)

a. Remove the door handle and upholstery panels from the inside of the door to gain access to the lower end of the flex cable.
b. Scrape the sealant away from the cable hole (where the cable enters the upper door).
c. Connect the upper end of the new flex cable to the lower end of the old flex cable using safety wire.
d. Scrape the sealant away from the cable end at the top of the door.
e. Carefully pull the new cable into position by pulling the old cable from the top.
f. Once the new cable is in place, remove the old cable from the top of the new cable and install the cable end and pin at the top of the flex cable.
g. Connect the bottom end of the flex cable to the door handle turnbuckle.
h. Rig the door in accordance with AFT CABIN DOOR ADJUSTMENT.

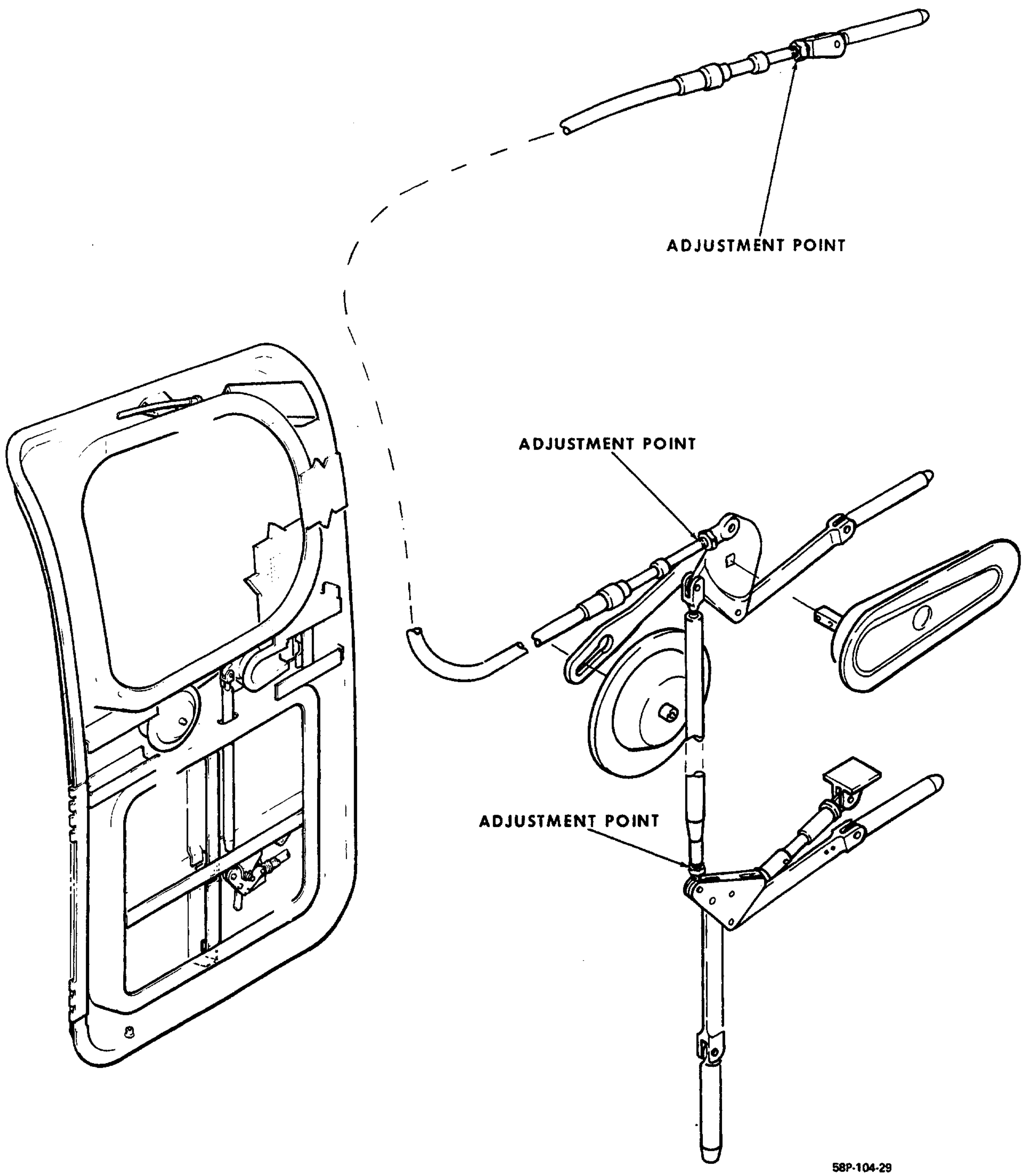
i. Apply sealant (10, Chart 205, 91-00-00) around the cable entry hole (where the cable enters the upper door from below) and at the top exit point in the upper door.

j. Install the upholstery panels and door handle on the inside of the door.

If the cable is broken inside the door, making it impossible to pull the new cable into place, drill out the rivets connecting the outer skin to the door frame and remove the fasteners that attach the window, door frame and outer skin. Physically route the new flex cable into place, install the outer skin and window, and complete steps "g" through "j".

CABIN DOOR REMOVAL (TK-1 AND AFTER) (Figures 203 and 204)

a. Remove the inboard door handle, the ash tray assembly and the arm rest.



Aft Cabin Door Latching Mechanism (TJ-2 and after)
Figure 202

NOTE

The attaching screws for the ash tray assembly are located behind the ash tray insert and the attaching screws for the arm rest are located behind the two car plugs on the inboard side of the arm rest.

b. Remove the attaching screws from the center upholstery panel. Lift the panel up and out.

c. Remove the attaching screws and release the snaps on the lower upholstery panel.

d. Remove the lower upholstery panel.

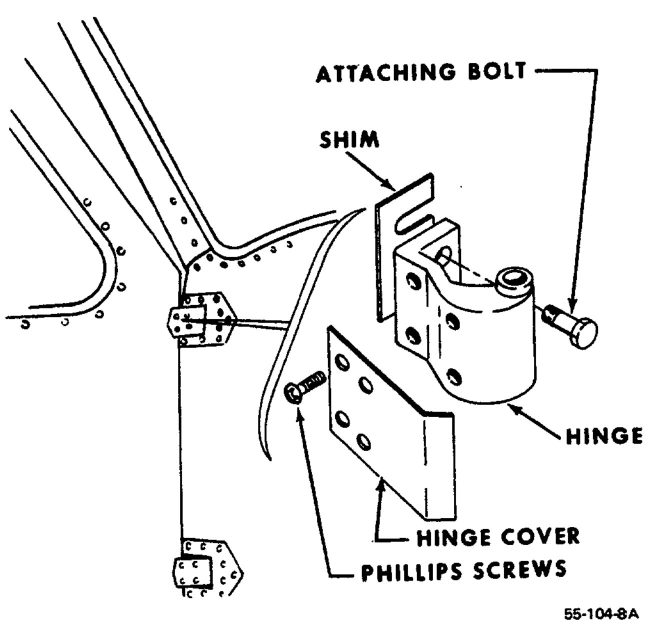
e. Remove the phillips screws from each hinge cover (see Figure 203).

f. With the door open insert a screw driver between the door stop and the bottom of the door. Slowly close the door while applying a downward pressure on the door stop until the stop is released from the door (see Figure 204).

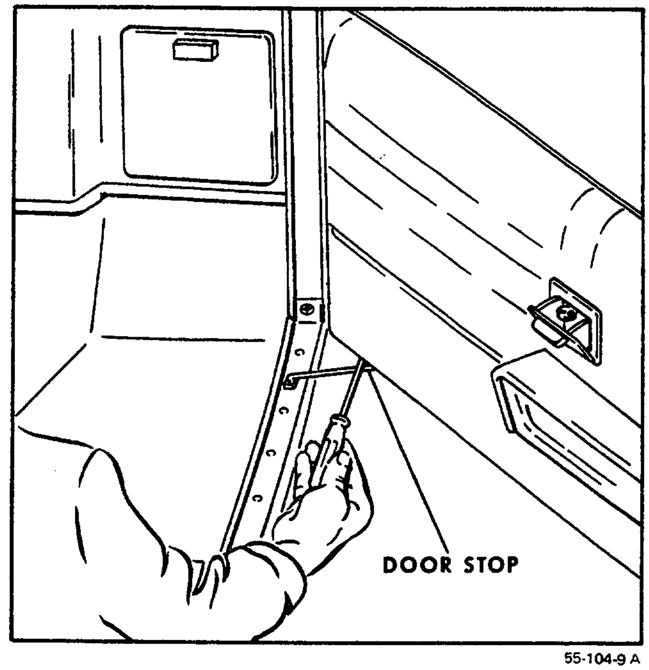
g. Remove the attaching bolts from each door hinge (see Figure 203).

NOTE

Shims have been installed between the hinges and the door to obtain a proper fit. The shims should be retained and the same number of shims installed under each hinge when the door is reinstalled.



Cabin Door Hinge
Figure 203



Cabin Door Stop
Figure 204

CABIN DOOR INSTALLATION (TK-1 and after) (Figures 203 and 204)

a. With the hinge shims located as they were upon removal, secure the hinges in place with the attaching bolts.

NOTE

The door may be adjusted up or down and forward or aft by sliding it on the hinges until the proper position is obtained. To obtain a proper fit inboard or outboard, in the door frame, relocate the shims to the inboard or outboard side of the hinges as required.

b. Secure the hinge covers in place over the hinges with the phillips screws.

c. Engage the free end of the stop rod in the stop guide on the bottom of the door.

d. Snap the lower upholstery in place and secure to the door with the attaching screws.

e. Install the center upholstery panel and secure in place with the attaching screws.

f. Install the inboard door handle, ash tray, and arm rest.

CABIN DOOR ADJUSTMENT (TK-1 and after)

a. Several adjustments are available to assure proper closing and sealing of the door. If the door does not close tightly or permits air leaks when completely closed, loosen the four retaining screws and move the latch tongue guide outboard to create additional tension on the latch tongue.

b. Air leaks around the upper portion of the door may be caused by improper adjustment of the upper door latch. This may be corrected by removing the small upholstery panel above the door window and adjusting the length of the upper latch control cable. Shorten the cable sufficiently, by screwing it into the latch terminal, to properly seal the door.

c. If the door does not open freely, the main door latch may not be retracting enough. This can be corrected by removing the upholstery panel below the door window and shortening the length of the connecting tube assembly.

UTILITY DOOR REMOVAL (TK-1 and after)

a. With the doors open, remove the clevis bolts-that attach the scissors door stop to each door sill.

b. Support the doors and remove the hinge pins by pulling straight up.

UTILITY DOOR INSTALLATION (TK-1 and after)

a. Mate the door hinge halves with those on the fuselage and insert the hinge pins.

b. Secure each scissors-type door stop to its respective door sill with the attaching clevis bolts.

UTILITY DOOR ADJUSTMENT (TK-1 and after)

If the utility door does not close properly or permits air leaks while completely closed, several adjustments may be made to assure proper sealing of the door. After determining the origin of the air leakage as to whether it is from around the forward half of the utility door or the aft half of the door, make the following adjustments as necessary:

ADJUSTMENT OF THE AFT HALF OF THE UTILITY DOOR (TK-1 and after)

a. Adjustments of the aft door may be performed by removing the upholstery paneling and shortening or lengthening the door latch connecting tube assembly.

NOTE

By shortening the connecting tube assemblies, the door will be pulled tighter against the door seal.

b. To adjust the length of the connecting tube assembly, remove the cotter key, washers and pin. Turn the pin eye "in" to shorten the tube assembly and turn the pin eye "out" to lengthen the tube assembly.

c. After the desired length has been set, install the pin, washers and cotter key.

d. Replace the upholstery paneling.

ADJUSTMENT OF THE FORWARD HALF OF THE UTILITY DOOR (TK-1 and after)

a. If the air leakage is around the forward half of the door, the necessary adjustments may be made at the door latch striker plate, located in the center of the rear door.

b. For a tighter fit, loosen the two phillips head screws and move the striker plate inboard.

UTILITY DOOR LATCH PIN ADJUSTMENT (TK-1 and after)

If the forward door does not open freely, the door latch pins may not be retracting enough. This may be corrected by the following adjustments:

a. Remove the upholstery paneling.

b. Remove the cotter keys, pins and washers.

c. Loosen the pin eye jam nut and turn the pin eye "in" to shorten the tube assemblies; turn the pin eye "out" to lengthen the tube assemblies.

d. After the desired length has been set, tighten the pin eye jam nut. Install the pins, washers and cotter keys.

e. Rotate the cam to adjust the latch mechanism in an overcenter position with the outside door handle and the latch in the closed (horizontal) position.

f. Replace the upholstery paneling.

"END"

DOOR WARNING - MAINTENANCE PRACTICES

FORWARD CABIN ENTRANCE DOOR AJAR SWITCH ADJUSTMENT

The door ajar switches will not normally require adjustment except when a new switch or new door is installed.

Adjust the forward cabin entrance door ajar switches as follows:

a. Remove cabin upholstery panels beneath the door at F S 73.9 and at the aft edge of the door at W L 107.3 to gain access to the switches.
b. Close and lock the forward cabin entrance door.
c. Back the switch adjustment off until the switch is not actuated.
d. Readjust the switch until it actuates.
e. Adjust switch overtravel to .03 inch at the tip of the actuator.
f. Install the cabin upholstery panels.

AFT CABIN DOOR AJAR SWITCH ADJUSTMENT (TJ-2 and after)

The door ajar switches will not normally require adjustment except when a new switch or new door is installed.

Adjust the aft cabin door ajar switches as follows:

a. Remove the cabin upholstery just aft of the aft cabin door.
b. Close and lock the aft cabin door.
c. Back the switch adjustment off until the switch is not actuated.
d. Readjust the switch until it actuates.
e. Adjust switch overtravel to .03 inch at the tip of the actuator.
f. Install the cabin upholstery panels.

DOOR AJAR SWITCH INSPECTION

Inspect each door ajar switch for proper operation and installation each 100 hours or when ever a new switch or new door is installed.

"END"

CHAPTER

53

FUSELAGE

CHAPTER 53

LIST OF PAGE EFFECTIVITY

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53-30-00	201	Jan 9/76
	202	Jan 9/76

CHAPTER 53 - FUSELAGE

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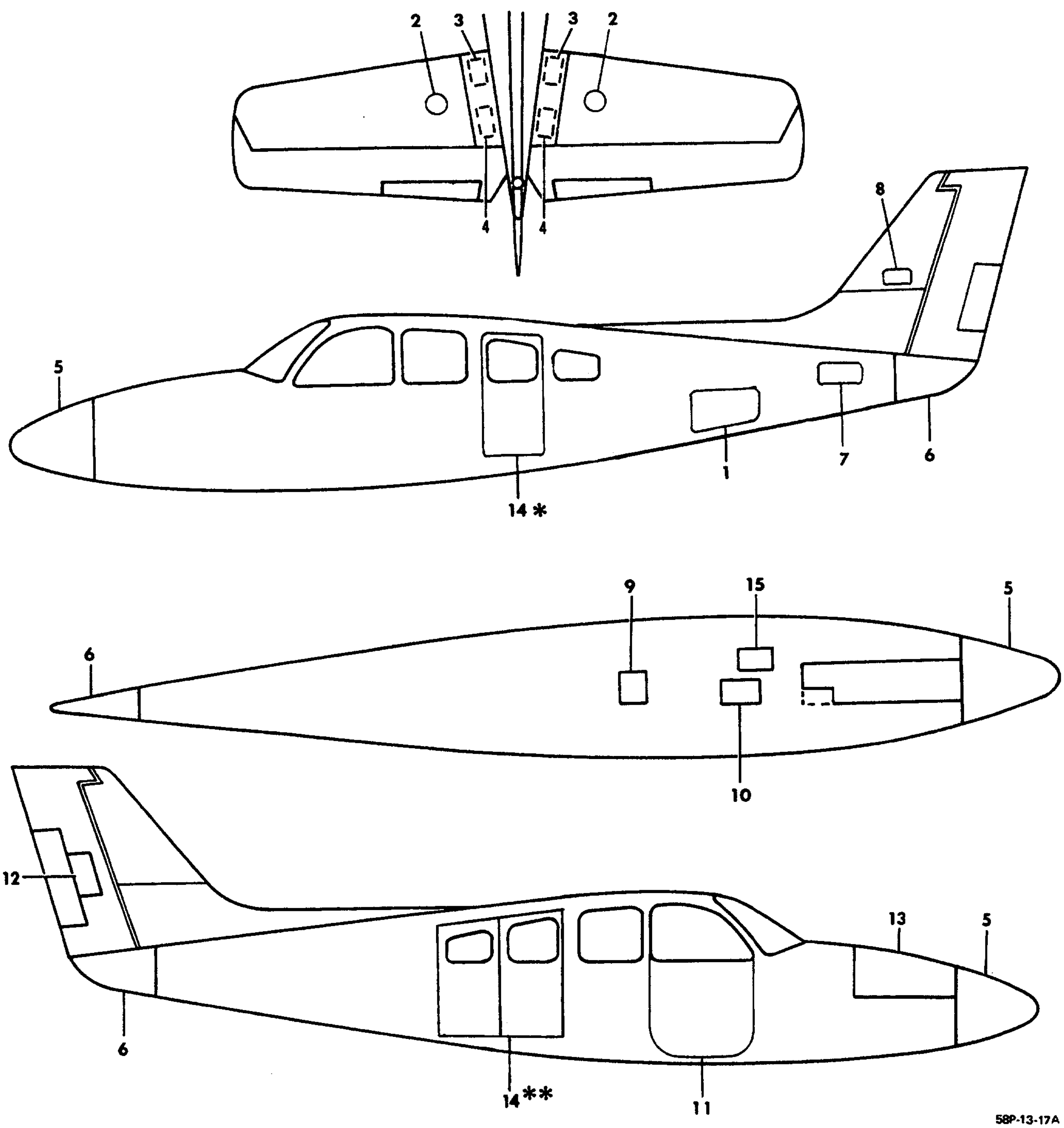
PLATES/SKIN	53-30-00	
Maintenance Practices		201
Fuselage Access Openings		201

"END"

PLATES/SKIN - MAINTENANCE PRACTICES

FUSELAGE ACCESS OPENINGS

The panels, plates and doors as shown in Figure 201, provides maintenance access to the components, plumbing and cables enclosed within the fuselage. When installed, they continue the aerodynamic lines of the fuselage with little increase of drag.



Fuselage Access Openings (Sheet 1 of 2)
Figure 201

1. Emergency Transmitter Locator, Pulley Cables and Yaw Dampener
2. Elevator Trim Tab Actuator Sprocket
3. Elevator Tab Cables
4. Horizontal Stabilizer Mounting Bolts
5. Nose Cone
6. Tail Cone
7. Elevator Bell Crank, Elevator Down Spring, Turbuckles and Cable Inspection
8. Wiring Inspection
9. Landing Gear Actuator
10. Control Cable Pulleys and Nose Gear Retract Idler Arm
11. Passenger Door
12. Rudder Tab Actuator
13. Nose Baggage Door
14. Cabin Door
15. Nose Gear Retract Idler Arm

* TJ-2 and after
** TK-1 and after

Fuselage Access Openings (Sheet 2 of 2)
Figure 201

"END"

CHAPTER

54

NACELLES PYLONS

CHAPTER 54

LIST OF PAGE EFFECTIVITY

CHAPTER SECTION SUBJECT	PAGE	DATE
54-EFFECTIVITY/CONTENTS	1	Nov 30/76
54-00-00	201	Nov 30/76

CHAPTER 54 - NACELLES/PYLONS

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Maintenance Practices		201
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"END"

NACELLES - MAINTENANCE PRACTICES

INSPECTION, CLEANING, AND PAINTING STEEL RIVETS IN THE NACELLE FIREWALL

a. Gain access to the forward side of the firewall by removing the engine cowling.

b. Inspect the steel rivets in the forward and aft side of the nacelle firewall for condition.

c. If rust is present on the steel rivets, remove the rust using sandpaper, metal wool or wire brush. Wash rivet heads with Naphtha (20, Chart 207, 91-00-00) and wipe dry with a clean cloth.

NOTE

The rivets must be thoroughly cleaned before the protective coatings are applied. Wipe the areas to be coated with a clean cloth until no residue can be removed.

d. Paint the rivet heads completely with epoxy-polyamide primer MIL-P-23377C.

e. If the rivets are rusted out or can not be cleaned effectively, drill out the steel rivets and install Monel rivets (MS20615-M4).

f. Install engine cowlings.

"END"

CHAPTER

55

STABILIZERS

CHAPTER 55 - STABILIZERS

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CHAPTER 55

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HORIZONTAL STABILIZER-MAINTENANCE PRACTICES

HORIZONTAL STABILIZER REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Remove the elevator.

d. Loosen the elevator trim tab cables at the turnbuckles just aft of the rear cabin bulkhead and disconnect them at the connection in the aft tail section. Remove the pulleys from the pulley brackets aft of the disconnect to free the cables.

e. Remove the stabilizer attaching bolts at the forward and rear spars.

f. Remove the stablizers.

HORIZONTAL STABILIZER INSTALLATION

a. Position the stabilizers on the fuselage and install the attaching bolts in the forward and rear spars.Torque the forward spar bolts to 200-225 inch-pounds dry and torque the rear spar bolts to 85-100 inch-pounds dry.

NOTE

Beeswax may be used on shanks of aft bolts to facilitate installation. All threads should be dry.

b. Route the tab cables back through the fuselage and connect the cables at the turnbuckles.

c. Install the elevator.

d. Connect the elevator tab actuator rods.

e. Rerig the trim tabs.

f. Replace access doors.

"END"

ELEVATOR - MAINTENANCE PRACTICES

ELEVATOR BALANCING (Figure 201)

Control surfaces ordinarily need not be rebalanced unless they are repainted, repaired or have parts replaced.

NOTE

When the elevator surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge.

After any painting or repair, the surface must be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The complete elevator assembly, painted or unpainted, including the control arm and the tab control rod must not exceed maximum underbalance (tail heavy) of 14.0 in. lbs.

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 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. 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 201. 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, rule and spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

a. 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.
b. Fit correct size bolts in the outboard and center hinge brackets and mount the elevator on the knife edges. Ensure that it is free to rotate about the hinge line.
c. Support the trailing edge behind the center hinge point with a spindle resting on a levelled beam balance platform as illustrated.

NOTE

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.

d. 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.
e. Calculate the static underbalance moment "M" from the formula:

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 levelling blocks or shims on the scale platform (Pounds).

EXAMPLE

D is 13.5 inches, R is 1.98 lb. and T = 1.00 lb.
M = 13.5 (1.98 - 1.00); M = 13.23 inch-pounds
M is within the range which is satisfactory.
If "M" is not within the prescribed range of a maximum underbalance of 14.0 inch-pounds, remove the elevator horn cover and add or remove solder to bring the elevator balance within required limits.

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 201. 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, and spirit level.

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 bolts in the hinge clevises 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 weight 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 the cup hanging vertically as illustrated in Figure 201. Slightly loosen the forward top screw on the elevator leading edge tip. Suspend a paper cup on the inboard side of the tip and wrap the string around the screw. Secure the string to the surface with a small piece of masking tape aft of the top forward screw and near the hinge center line as shown in Figure 201. The cup must be free to hang vertically.

CAUTION

Be certain the forward top screw on the elevator leading edge tip is secured after the elevator has been balanced.

e. Add small qualtities 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.

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

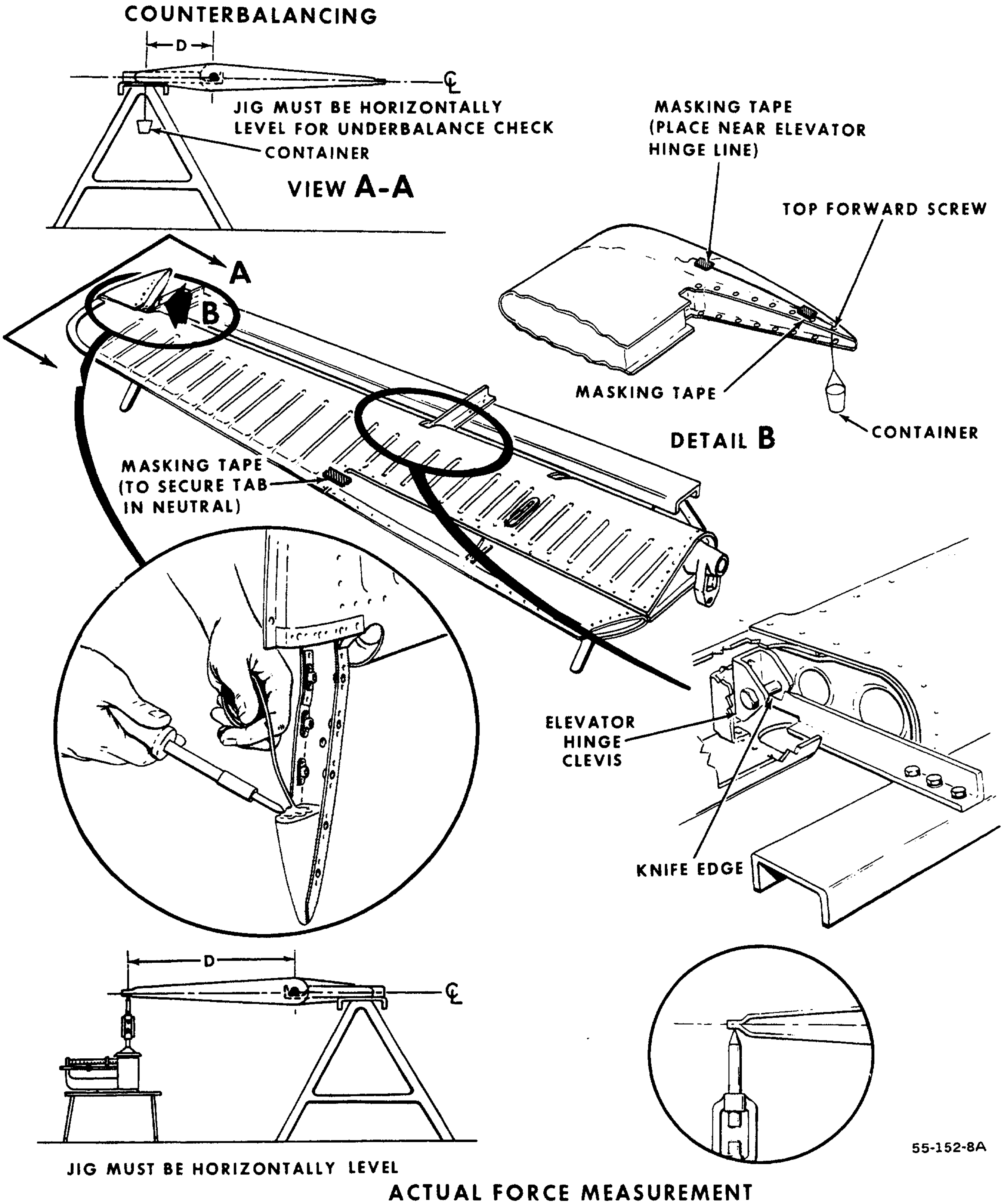
4. The following is a typical example of a balancing calculation: Assume the elevator is underbalance (tail-heavy) and the paper cup was suspended from the horn. If the elevator balances with the chord line level at "W = 0.98 pound" and "D = 13.5 inches", then . . .

M = 0.98 x 13.5

M = 13.23 inch-pounds

In this instance, "M" is within the required static balance range and is therefore acceptable.

If "M" is not within the prescribed range of a maximum underbalance of 14.0 inch-pounds, remove the elevator horn cover and add or remove solder to bring the elevator balance within required limits.



Balancing the Elevator
Figure 201

"END"

VERTICAL STABILIZER - MAINTENANCE PRACTICES

VERTICAL STABILIZER REMOVAL

a. Remove the tail section access doors on the left hand side of the aft fuselage.

b. Remove the rudder.

c. Remove the screws securing the fairings to the vertical stabilizer.

d. Remove the attaching bolts at the forward and rear spars and remove the stabilizer.

VERTICAL STABILIZER INSTALLATION

a. Position the vertical stabilizer and install the bolts at the forward and rear spars. Install the elevator center hinge bracket on the bottom of the rear spar. Torque the bolts to 160-190 inch-pounds.

b. Install the rudder.

c. Replace access doors.

"END"

RUDDER - MAINTENANCE PRACTICES

RUDDER BALANCING (Figure 201)

Control surfaces ordinarily need not be rebalanced unless they are repainted, repaired or have parts replaced.

NOTE

When the rudder is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge.

After any painting or repair, the surface must be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The complete rudder assembly, painted or unpainted including the control arm and with or without the bell crank attached, shall not exceed an underbalance (tail heavy) of a maximum of 4.5 inch-pounds. 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 0.0 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 push rod, 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. 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.

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 rudder 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 201. The knife edge should be in the same horizontal plant.

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 in Figure 201 and levelling blocks, as required. (Blocks + spindle = tare).

d. A straight edge, rule and spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

a. 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.

b. Remove the straight edge. Fit correct size bolts in the outboard and center hinge brackets and mount the rudder on the knife edges. Ensure that it is free to rotate about the hinge line.

c. Support the trailing edge behind the center hinge point with a spindle resting on a levelled beam balance platform as illustrated.

NOTE

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.

d. 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.

e. Calculate the static underbalance moment "M" from the formula:

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 levelling blocks or shims on the scale platform (Pounds).

EXAMPLE

D is 13.8 inches, R = 1.30 lb. and T is 1.00 lb.
M = 13.8 (1.30 - 1.00); M = 4.05 inch-pounds
M is within the range which is satisfactory.

If "M" is not within the prescribed range of a maximum underbalance of 4.5 inch-pounds, remove the rudder horn weight and add or remove solder to bring the rudder balance within required limits.

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 201. 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, and spirit level.

BALANCING PROCEDURE COUNTER BALANCING METHOD

a. Locate the chord line by placing a straight edge at the lower closure rib of the rudder so that one end is aligned with the center of the torque tube while 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 position in its neutral position with a small piece of masking tape.

c. Fit the correct size bolts in the hinge brackets and mount the rudder on the knife edge supports. Ascertain that the rudder is free to rotate about the hinge line.

d. To determine if weight should be added or removed, suspend a paper cup from a point near the center of the rudder trailing edge if the balance is nose down, or near the center of the leading edge if the balance is tail-down. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 201. The cup must be free to hang vertically.

e. Add small quantities of lead shot to the cup until the rudder balances with the chord line level. Check this by holding a 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.

h. Calculate the static balance as follows:

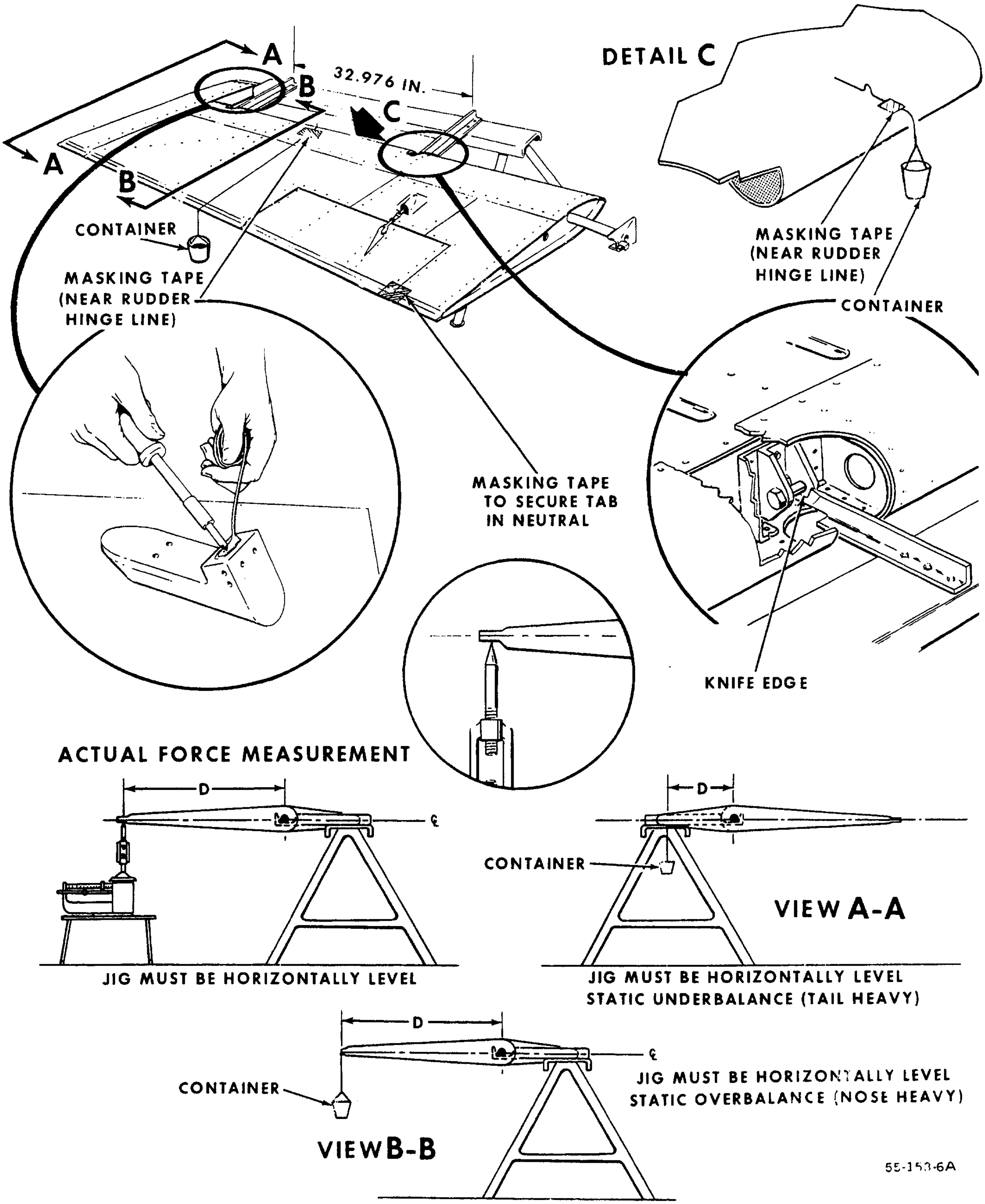
1. The weight of the cup and contents is designated by "W".
2. The over or underbalance moment is designated by "M".
3. M = W x D
4. The following is a typical example of a balancing calculation: Assume the rudder was slightly underbalance (tail-heavy) and the paper cup was suspended from the leading edge. If the rudder balances with the chord line level at "W = .30 pound" and "D = 13.5 inches", then . . .

M = .30 x 13.5

M = 4.05 inch-pounds.

In this instance, "M" is within the required static balance range and is therefore acceptable.

If "M" is not within the prescribed range of a maximum underbalance of 4.5 inch-pounds, remove the rudder horn weight and add or remove solder to bring the rudder balance within required limits.



Balancing the Rudder
Figure 201

"END"

CHAPTER 56

WINDOWS

CHAPTER 56 - WINDOWS

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"END"

GENERAL - DESCRIPTION AND OPERATION

The windshield and windows for TJ-3 and after are manufactured of tinted stretched-modified acrylic plastic. The windows are secured with Hi-Lok fasteners spaced evenly with a distance of .40 inch from the centerline of the fasteners to the edge of the plastic. The plastic is stretched before forming to a thickness of .250 inch for the windshield, right and left front cockpit windows, and .195 inch for the remaining cabin windows.

The windshield for TK-1 and after is manufactured of clear or tinted acrylic plastic of .250-inch thickness. The cabin windows may also be clear or tinted and are .125-inch thick. The windshield and windows are held in a frame which is riveted in place by MS20470AD4 rivets.

"END"

GENERAL - MAINTENANCE PRACTICES

CLEANING PLASTIC WINDOWS

The plastic windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash the windows carefully with plenty of soap and water. Use the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used only for the purpose of carrying water to the surface of the window. After washing, rinse the window thoroughly with running water and dry it with a clean, moist chamois. Do not rub the plastic window with a dry cloth, because this will cause an electrostatic charge which attracts dust.

Remove oil and grease with a cloth moistened with kerosene, aliphatic naphtha or hexane, then rinse the window with clear water.

CAUTION

Never use gasoline, bezene, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner, or glass cleaner with a base of these materials, for such materials will soften the plastic and may cause crazing. Aliphatic naphtha and similar solvents are highly flammable and extreme care must be exercised when using these chemicals.

If it is desirable to use a commerical cleaner to clean the plastic windows, use only cleaners that are approved by Beech Aircraft Corporation. There are several cleaners available commercially that state that they are approved for use on acrylic surfaces. However, it has been discovered that some of these cleaners cause acrylic plastic to craze. Therefore, only the following products are approved by Beech as cleaners for acrylic plastic windows: Federal Specification P-P-560, Part No. 403D (66, Chart 207, 91-00-00), Parks Anti-Static Plastic Polish (66, Chart 207, 91-00-00) and Meguiar's MGH-10 (66, Chart 207, 91-00-00). Follow the directions on the container.

After washing plastic windows with soap and water, wax them with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratches. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Never use a power buffer, as the heat generated by the buffing pad may soften the plastic.

If the windows were cleaned with one of the three commercial cleaners mentioned previously, it will not be necessary to apply wax. Each of these cleaners contains wax, as well as cleaning agents.

WINDSHIELD REMOVAL (TJ-3 and after)

a. Remove the molding inside the cabin to allow access to the Hi-Lok fasteners.

b. Remove the Hi-Lok fasteners and remove the windshield.

c. Remove the old sealer from the area of the windshield frame with toluol (22, Chart 207, 91-00-00).

WINDSHIELD INSTALLATION (TJ-3 and after)

a. Clean the contact edges of the windshield with a clean white cloth.

b. Clean the windshield frame with toluol (22, Chart 207, 91-00-00) to remove all the old sealer.

c. Apply PR1425 B-2 sealer (14, Chart 205, 91-00-00), with a sealant roller (Warner, #222 or #30, Carl Graham Co., Wichita, Kansas). Apply to a uniform thickness of approximately .007 inch to the windshield frame so that compression of the windshield against the frame will squeeze the sealer around the fasteners to the edge of the metal.

d. Carefully fit the windshield into place and install a new HL18PB70-5-7 fastener with washer at each corner (skin lap) and in the center install new HL18PB70-5-6 fasteners with washers to hold the windshield in that position.

e. Install the remainder of the new HL18PB70-5-6 fasteners and washers and draw the windshield down evenly.

f. After the windshield is installed, wipe off the excess filler, inside and out, with clean white rags.

NOTE

Looking through the edge of the windshield, ascertain that there are no voids in the sealant as the fasteners are secured. If any voids are evident, force additional sealant up into the area and wipe away any excess with clean white rags.

g. Reinstall the molding inside the cabin.

NOTE

Allow a curing time of 24 hours before pressurizing the cabin.

WINDSHIELD REMOVAL (TK-1 and after)

a. Remove the glareshield and outside air temperature gage (if installed).

b. Remove the attaching screws from the defroster duct and move the duct to clear the lower row of rivets on the windshield.

c. Remove the screws and spacers from the glareshield angles.

d. Remove the molding from around the inside of the windshield.

e. To facilitate reinstallation, mark the location of the molding clips.

f. Remove the rivets from around the windshield.

g. Remove the windshield. The one piece windshield is removed by moving it to the left.

NOTE

Due to the windshield being sealed, considerable effort may be required to break the windshield loose from the canopy section.

WINDSHIELD INSTALLATION (TK-1 and after)

a. Clean the sealer from the canopy section where the old windshield was removed using naphtha (50, Chart 207, 91-00-00).

b. Trim the tooling tabs from the windshield, place the windshield in position and mark the areas where material must be removed from the windshield to obtain a proper fit.

c. Remove the windshield and trim off excess material as determined in step "b".

d. Place the windshield in position and cleco in place using the pilot holes provided.

e. Back drill the windshield frame using the existing holes in the canopy section as a guide.

f. Remove the windshield, burr all holes and apply RTV-108 sealant (51, Chart 207, 91-00-00) to the windshield frame where it makes contact with the canopy section.

g. Place the windshield in position and cleco in place.

h. Using MS20470AD4 rivets, secure the windshield to the canopy section.

NOTE

When riveting the windshield in place, install the molding clips in the same locations as marked in step "e" of the windshield removal procedure.

i. Secure the glareshield angles in place with attaching screws, nuts and spacers.

j. Position the defroster duct and secure in place with the attaching screws.

k. Install the molding.

l. Install the glareshield and outside air temperature gage (if removed).

m. Clean and paint as necessary.

LH WINDOW REMOVAL (TJ-3 and after)

a. Remove the molding around the window to allow access to the Hi-Lok fasteners.

NOTE

New fasteners are required for installation, however the washers can be retained and used again.

b. Remove the Hi-Lok fasteners and remove the window. Remove the old sealer with toluol (22, Chart 207, 91-00-00).

LH WINDOW INSTALLATION (TJ-3 and after)

All cabin windows are installed using Hi-Lok fasteners. Predrilled replacement windows are available and only minor preparation is necessary before installation.

NOTE

If blank windows are used for replacement windows, the following procedures should be used for drilling holes:

1. Place the window in position against the skin (window should not contact any structure along edges.)
2. Insert a drill guide in the existing holes in the skin and drill No. 40 pilot holes thru the window.
3. Remove the window and, with special ground bits (see Figure 201 in Chapter 56-20-00) using the No. 40 pilot holes as a center, drill

halfway thru the window. Turn the window over and finish drilling the holes from the opposite side to prevent chipping of the window around the edge of the holes.

Installation of pre-drilled windows may be accomplished as follows:

a. Clean the edge of the window with a clean white cloth.

b. Apply PR1425 B-2 sealer (14, Chart 205, 91-00-00), with a sealant roller (Warner, #222 or #30, Carl Graham Co., Wichita, Kansas) to a uniform thickness of approximately .007 inch.

c. Install the window using enough new HL18PB70-5-5 fasteners spaced around the window to maintain alignment while the nuts are being installed.

d. Install the new HL18PB70-5-5 fasteners, with a washer under each nut, drawing the window down evenly all around the frame.

NOTE

Looking through the window, ascertain that there are no voids in the sealant as the fasteners are secured.

A uniform pad of sealant .007 inch thick will assure a good seal. If the plastic is too thick, the shanks of the fasteners may wobble in the holes as the cabin is pressurized.

e. Clean off any excess sealant with clean white rags and reinstall the molding.

STORM WINDOW LATCH REMOVAL (TJ-3 and after)

a. Using an Allen wrench in the end of the latch attaching bolts to prevent the bolts from turning, remove the nuts from the bolts.

b. Remove the latch.

NOTE

Care should be taken not to damage the attaching bolts or the plexiglass block to which the hinge attaches. If either of these are damaged beyond use, the entire window assembly must be replaced.

STORM WINDOW LATCH INSTALLATION (TJ-3 and after)

a. Position the latch on the storm window.

b. Using an Allen wrench in the end of the latch attaching bolts to prevent the bolts from turning, install the nuts on the bolts and secure.

STORM WINDOW HINGE REMOVAL (TJ-3 and after)

a. Loosen the two set screws in the plexiglass hinge block and punch the hinge pin out from one end.

b. Remove the hinge block.

NOTE

The hinge pin and the set screws are the only replaceable parts in the hinge. If either hinge block is damaged, the window assembly to which it is attached must be replaced.

STORM WINDOW HINGE INSTALLATION (TJ-3 and after)

a. Position the hinge block and install the hinge pin.

b. Secure the hinge pin and the set screws.

LH WINDOW REMOVAL (TK-1 and after)

a. Remove the upholstery panels as required to gain access to the window frame.

b. Remove the molding from around the inside of the window.

c. Remove the rivets from around the window.

d. Remove the window.

LH WINDOW INSTALLATION (TK-1 and after)

a. Clean the sealer from the canopy section where the old window was removed using naphtha (50, Chart 207, 91-00-00).

b. Place the window in position and mark the area where material must be removed to obtain a proper fit.

c. Remove the window and trim off the excess material as determined in step "b" and check for proper fit.

d. Burr all holes and apply sealer (51, Chart 207, 91-00-00) to an area approximately 1/2 inch wide on the canopy section where the old sealer was removed.

e. Place the window in position and cleco in place.

f. Using MS20470AD4 rivets, secure the window to the canopy section.

g. Install the molding.

h. If the new window does not have a storm window installed and the storm window from the old window is to be used, the following procedures are to be used.

1. Remove the storm window, hinges and latch plate from the old window.
2. With the hinges still attached to the storm window, fit the storm window to the new window.
3. Using the hinges as a guide, mark the new window for drilling the hinge attachment holes.
4. Install the storm window and hinges.
5. Place the latch striker plate to the new window so the latch will make proper contact to secure the storm window closed and mark window for drilling the plate attachment holes.
6. Install the striker plate.

NOTE

If air leaks around the storm window, replace the storm window seal.

STORM WINDOW REMOVAL (TK-1 and after)

a. Remove the two internally threaded hinge pins.

b. Remove windows.

STORM WINDOW INSTALLATION (TK-1 and after)

a. Install window.

b. Install the two internally threaded hinge pins.

DOOR WINDOW REMOVAL (TK-1 and after)

a. Remove the inboard door handle, ash tray and arm rest.

b. Remove the center upholstery panel.

c. Remove the molding around the inside of the window.

d. To facilitate reinstallation, mark the location of the molding clips.

e. Remove the rivets around the window.

f. Remove the window.

DOOR WINDOW INSTALLATION (TK-1 and after)

a. Clean the sealer from the door where the old window was removed using naphtha (50, Chart 207, 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".

d. Place the window in position and cleco in place using the two pilot holes on the aft side of the window frame.

NOTE

To eliminate the possibility of the door being warped, the door must be closed and latched when drilling the attaching holes and securing the window in place.

e. Back drill the window frame using the existing holes in the doors as a guide.

f. Remove the window, burr all holes and apply sealer, (51, Chart 207, 91-00-00) to an area approximately 1/2 inch wide on the door where the old sealer was removed.

g. Place the window in position and cleco in place.

h. Using MS20470AD4 rivets, secure the window to the door.

NOTE

When riveting the window in place, install the molding clips in the same locations as marked in step "d" of the window removal procedure.

i. Install the molding.

j. Clean the paint as necessary.

k. Reinstall the center upholstery panel.

l. Reinstall the inboard door handle, ash tray and arm rest.

CABIN WINDOW REMOVAL (TJ-3 and after)

a. Remove the molding around the window to allow access to the Hi-Lok fasteners.

NOTE

New Hi-Loks and collars (nuts) are required for installation; however, the existing washers may be acceptable for reuse.

b. Remove the Hi-Lok fasteners (see Figure 201) and remove the strap, spacer and window.

NOTE

Some earlier airplanes (prior to TJ-59) may not be equipped with a spacer and strap.

c. Remove the old sealer with toluol (22, Chart 207, 91-00-00).

CAUTION

Do not allow the toluol to contact any Plexiglas, as it may cause the plastic to soften or craze.

CABIN WINDOW INSTALLATION (EXCEPT MIDDLE LEFT) (TJ-3 and after)

NOTE

Middle cabin windows are located at fuselage station 106.

CAUTION

Plexiglas scratches very easily. During the entire window installation, be very careful with the window pane. Do not allow tools, rings, rough cloths or any other objects that might scratch the window to come into contact with the window.

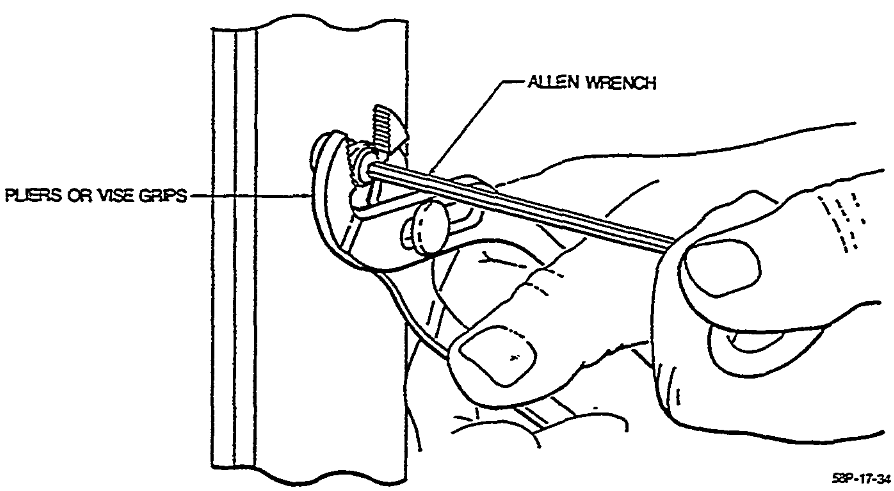
To facilitate installation of Hi-Lok fasteners, a power tool (Hi-Lok HLA2030) may be used to drive the nuts. At the proper torque, the hexagonal portion of the Hi-Lok nut will twist off, leaving only a smooth ribbed nut. Window installation instructions will provide information for proper shank length by providing specific fastener part numbers. Different length fasteners are required for different areas.

All cabin windows are installed using Hi-Lok fasteners. If the replacement window does not have fastener holes already drilled, the window must be drilled and installed according to the procedures listed below. If the replacement window has been pre-drilled, proceed to step "h." of this procedure.

a. Place the window in position against the skin. The window should not contact any structure along the edges, and there should be equal edge ovelap around the periphery of the window.

b. Have an assistant hold the window in this position from inside the airplane.

c. Working outside the aircraft, insert a drill bushing (Beech Part No. 102-5004-D406) in the existing holes in the skin at each corner of the window. Drill four No. 40 pilot holes through the window at each corner.



Removing Hi-Lok Fasteners
Figure 201

d. Remove the window. Using the No. 40 pilot holes as a center, drill half way through the window with a 102-5004-D701-1 (Beech part number) drill bit or with a special #10 drill bit fabricated according to the dimensions shown in Figure 202. Turn the window over and finish drilling the holes from the opposite side. Following this procedure will help prevent chipping of the window around the holes.

CAUTION

Use extreme care in drilling the Plexiglas windows. Do not force the drill bit, as the window may crack or chip.

e. Install the window using temporary fasteners in the four holes just drilled.
f. Using the drill bushing in the existing holes in the skin, drill No. 40 pilot holes in the remainder of the window.
g. Remove the window. Use one of the drill bits specified in step "d." to drill half way through the window. Turn the window over and finish drilling the holes from the opposite side. Do not force the drill bit.

NOTE

Before installing the window, burr all fastener holes.

h. Clean the edge of the window with a clean, soft flannel cloth.
i. Apply PR1425 B-2 sealer (14, Chart 205, 91-00-00) with a sealant roller (Warner #222 or #30, Carl Graham Co., Wichita, Kansas) to a uniform thickness of approximately .007 inch. The sealer can be applied to either the window or the fuselage skin.
j. Install the window using enough new HL18PB70-5-5 fasteners (HL18PB70-5-6 fasteners on the middle right side cabin window) spaced around the window to maintain alignment while the nuts are being installed.

NOTE

New Hi-Loks and collars (nuts) are required for installation; however, the existing washers may be acceptable for reuse.

k. Using a washer under each nut, install the new fasteners. Draw the window down evenly all the way around.

NOTE

As the fasteners are tightened, be sure that there are no voids in the sealer. A uniform pad of sealer .007-inch thick will assure a good seal. If the sealer is too thick, the shanks of the fasteners may wobble in the holes as the cabin is being pressurized.

l. Clean off any excess sealer with soft, clean white rags and reinstall the molding around the window.

CABIN WINDOW INSTALLATION (LEFT SIDE MIDDLE) (TJ-3 and after)

NOTE

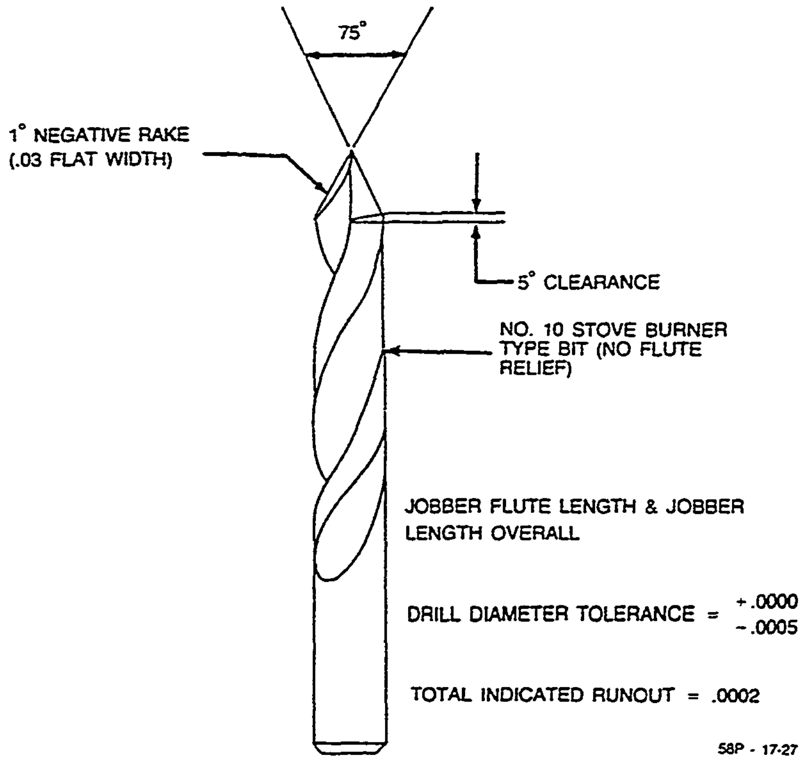
Middle cabin windows are located at fuselage station 106.

CAUTION

Plexiglas scratches very easily. During the entire window installation, be very careful with the window pane. Do not allow tools, rings, rough cloths or any other objects that might scratch the window to come into contact with the window.

To facilitate installation of Hi-Lok fasteners, a power tool (Hi-Lok HLA2030) may be used to drive the nuts. At the proper torque, the hexagonal portion of the Hi-Lok nut will twist off, leaving only a smooth ribbed nut. HL18PB70-5-6 Hi-Lok fasteners are used to install the middle left side cabin window. If the replacement window does not have fastener holes already drilled, the window must be drilled and installed according to the procedures listed below. If the replacement window has been pre-drilled, proceed to step "h." of this procedure.

a. Place the window in position against the skin. The window should not contact any structure along the edges, and there should be equal edge overlap around the periphery of the window.
b. Have an assistant hold the window in this position from inside the airplane.



Fabrication of Drill Bit for Acrylic Plastic
Figure 202

c. Working outside the aircraft, insert a 102-5004-D406 drill bushing (included in the 102-4008-1 or -3 left side middle cabin window installation kit) in the existing holes in the skin at the four locations indicated in Figure 203. Drill No. 40 pilot holes through the window with the 102-5004-D701 drill bit which is included in the kit.

d. Remove the window. Using the No. 40 pilot holes as a center, use the 102-5004-D701-1 drill bit or a special #10 drill bit fabricated according to the dimensions shown in Figure 202 to drill half way through the window. Turn the window over and finish drilling the holes from the opposite side. Following this procedure will help prevent chipping of the window around the holes.

CAUTION

Use extreme care in drilling the Plexiglas windows. Do not force the drill bit, as the window may crack or chip.

e. Install the window using temporary fasteners in the four holes just drilled.

f. Using the drill bushing in the existing holes in the skin, drill No. 40 pilot holes in the remainder of the window.

g. Remove the window. Use one of the drill bits specified in step "d." to drill half way through the window. Turn the window over and finish drilling the holes from the opposite side. Do not force the drill bit.

h. On airplanes that did not have a spacer and strap installed on the upper and aft portion of the window, insert a piece of metal (preferably stainless steel) between the fuselage skin and the upper longeron flange around the aft upper window opening. Trim off the flange of the upper longeron to allow for installation of the appropriate spacer (see Figure 204).

NOTE

The stainless steel between the skin and the longeron flange must be used to prevent damaging the skin while trimming the longeron flange.

i. Install the window with the four temporary fasteners located in the positions indicated in Figure 203.

j. Place the new spacer in it's installed position near the edge of the window pane (see Figure 203). Be sure to maintain .09-inch clearance between the edge of the window pane and the edge of the spacer (see Figure 205).

k. On airplanes that did not have a strap and spacer installed, drill .164/.168-inch holes through each end of the spacer and the middle of the spacer. Drill the holes from the inside through the spacer and the fuselage skin. Position the holes midway between the existing window fastener holes (see Figure 203). Hold the spacer in position by installing temporary fasteners in the three holes just drilled. Drill the remaining ten holes in the spacer and fuselage skin. Position the holes as indicated in Figures 203 and 205.

CAUTION

When drilling holes in the fuselage skin for attachment of the spacer, be sure to maintain adequate edge distance for all fasteners. Refer to Figure 205 for proper distance between existing window fastener holes and those holes to be drilled for spacer fasteners.

NOTE

On airplanes that did have a spacer and strap installed, drill and secure the spacer as directed in step "k."; however, the holes should be drilled from the outside, using the existing fastener holes as a guide.

l. After drilling the holes in the spacer, adjust the temporary fasteners so that they will continue to hold the spacer to the fuselage skin but will not protrude through the spacer.

m. Place the new strap in it's installed position covering the spacer and the edge of the window. Align the lower and forward edges of the strap with the lower and forward edges of the doubler which is bonded to the window.

n. Have an assistant hold the strap in the proper position. Working from the outside, use the existing fastener holes as a guide and drill 10 .164/.168-inch diameter holes in the area where the fasteners hold the spacer and strap to the fuselage skin. Secure the spacer and strap in position by installing three more temporary fasteners. Remove the temporary fasteners that were previously installed and drill the strap at these three locations.

o. Use the existing fastener holes as a guide, drill 16 .164/.168-inch diameter holes in the area where the fasteners hold the window and the strap to the fuselage skin.

p. Remove the window and strap. Clean the edge of the window with a clean, soft flannel cloth. Leave the spacer installed on the fuselage skin.

NOTE

Before final installation of the window, burr all holes.

q. Apply PR1425 B-2 sealer (14, Chart 205, 91-00-00) with a sealant roller (Warner #222 or #30, Carl Graham Co., Wichita, Kansas) to a uniform thickness of approximately .007 inch. The sealer can be applied to either the window or the fuselage skin. Do not apply sealer to the spacer or strap.

r. Install the window with the four temporary fasteners located in the positions indicated in Figure 203.

s. Install the strap with temporary fasteners.

t. Using a washer under each nut, install new HL18PB70-5-6 fasteners. Draw the window down evenly all the way around. After new fasteners have been installed in open holes, remove the temporary fasteners and replace them with new HL18PB70-5-6 fasteners.

NOTE

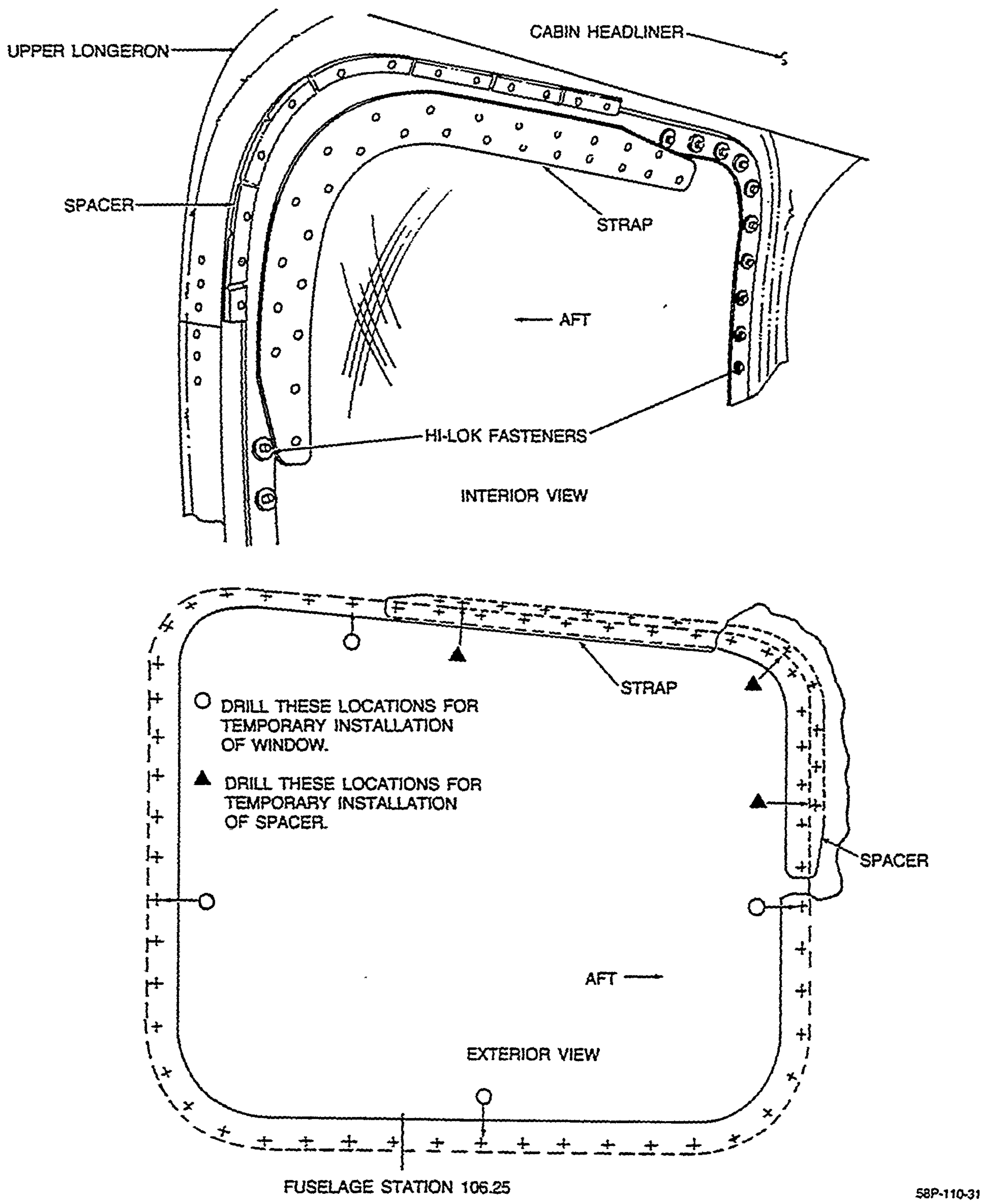
New Hi-Loks and collars (nuts) are required for installation; however, the existing washers may be acceptable for reuse. As the fasteners are tightened, be sure that there are no voids in the sealer. A uniform pad of sealer .007-inch thick will assure a good seal. If the sealer is too thick, the shanks of the fasteners may wobble in the holes as the cabin is pressurized.

u. Clean off any excess sealer with clean white rags and reinstall the molding around the window.

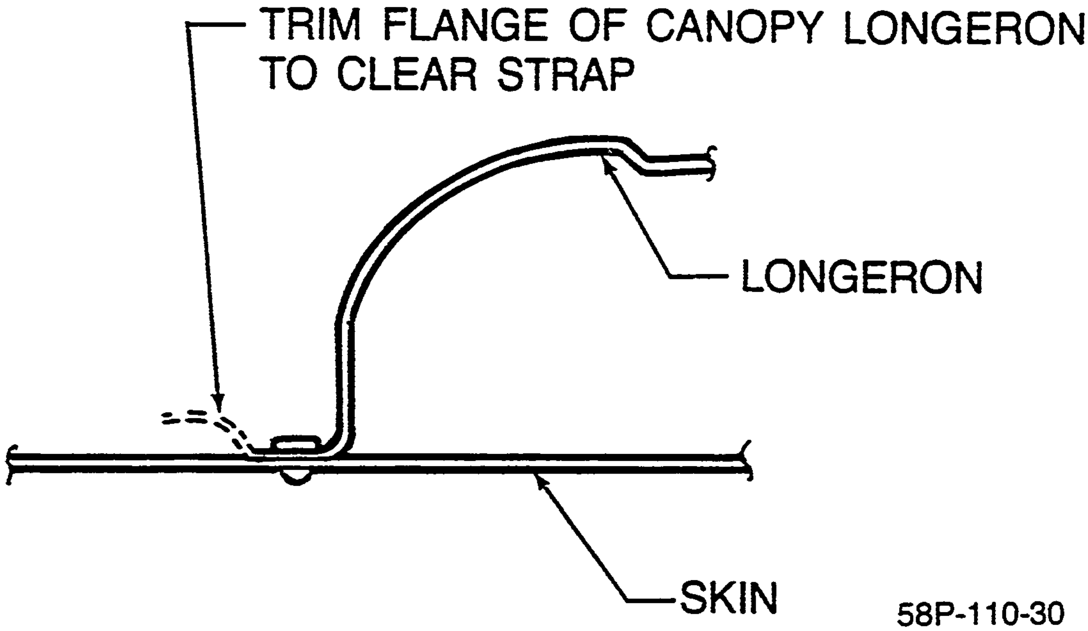
WINDOW INSPECTION PROCEDURES

TK-1 AND AFTER

Inspect windows for scratches, crazing, fissures and general condition.



Left Side Middle Cabin Window Installation
Figure 203



Trim Flange of Longeron
Figure 204

TJ-3 AND AFTER

Perform the following inspection at each annual inspection or at intervals of 300 hours, whichever comes first:

NOTE

The window inspection described in the following steps should be accomplished with the airplane in a darkened area, preferably at night. A good lighting source should be used with the light moved at various angles around the entire area of each window. Figure 206 illustrates an example of light placement.

a. Remove the window moldings and the inner windows if installed.

b. Inspect the windshield, cockpit side windows and all cabin windows. Using a low power (3x to 5x) magnifying glass, look through the window at various angles. Carefully inspect the areas around the Hi-Lok mounting fasteners for cracks, scratches, crazing and fissures (see Figure 206 and Figure 207).

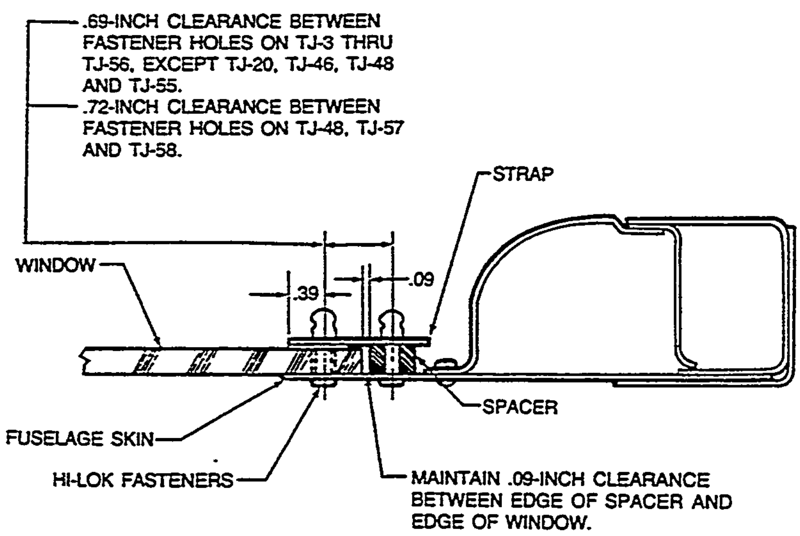
c. Windows with any crack must be replaced. Replacement is described in this chapter.

CAUTION

If window replacement is required and cannot be accomplished prior to the next flight of the airplane, a placard which states "PRESURIZATION FLIGHT PROHIBITED" must be installed next to the pressurization system controls. Only unpressurized flight can be permitted until affected windows are replaced.

d. Inspect the Hi-Lok mounting fasteners for proper installation. Check specifically for: 1) perpendicularity to the surface of the window with no gaps under the head or locking collar and 2) loose washers. If improperly installed fasteners are found, replace them.

Acrylic plastic windows that have minor scratches (such as those caused by rubbing of clothing against the window, grit, dust cloths or sponges) need not be replaced. These scratches can be polished out by following the procedures in WINDOW REPAIR - SCRATCH REMOVAL in this chapter.



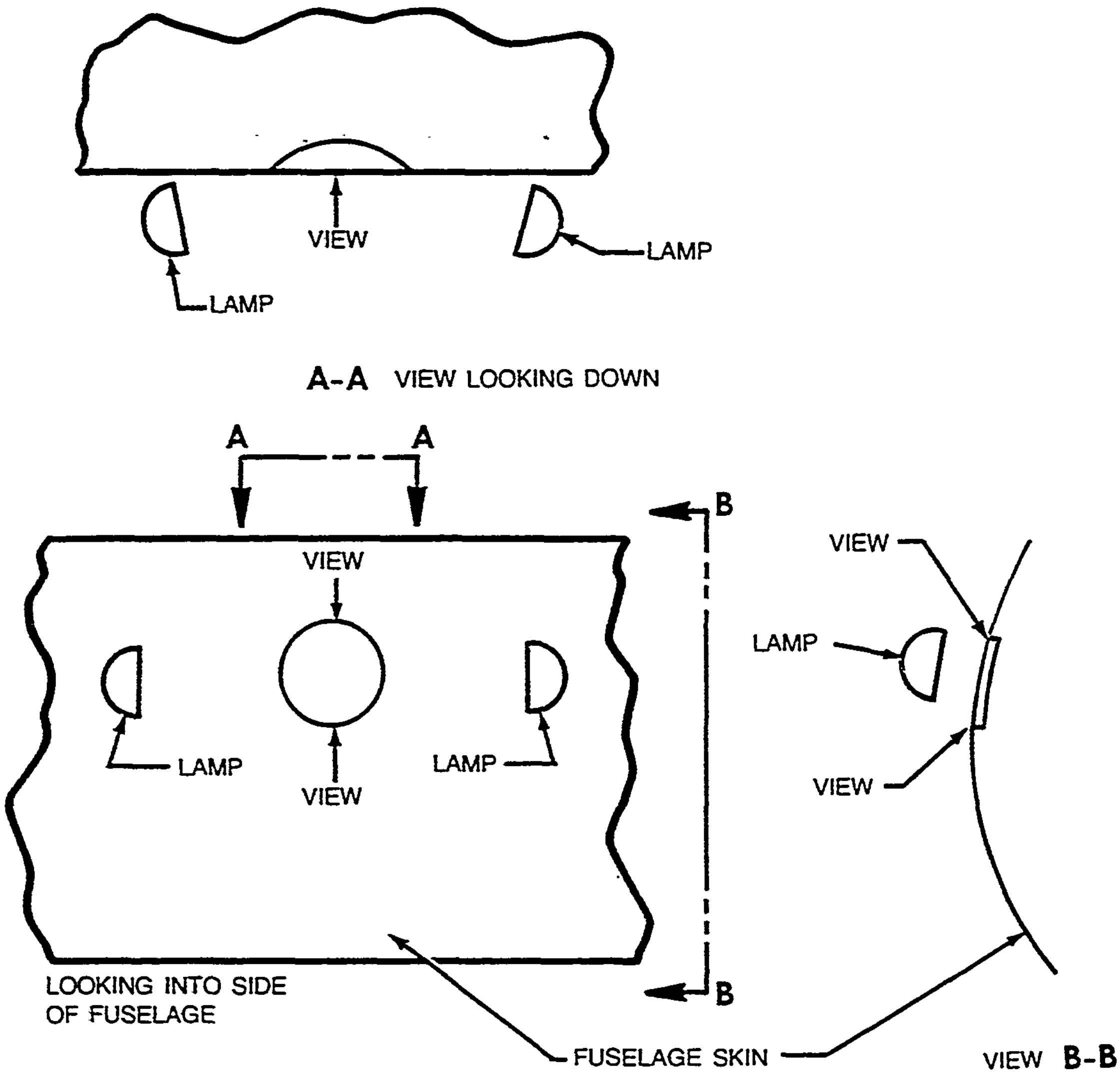
Spacer and Fastener Positioning
Figure 205

WINDOW REPAIR - SCRATCH REMOVAL

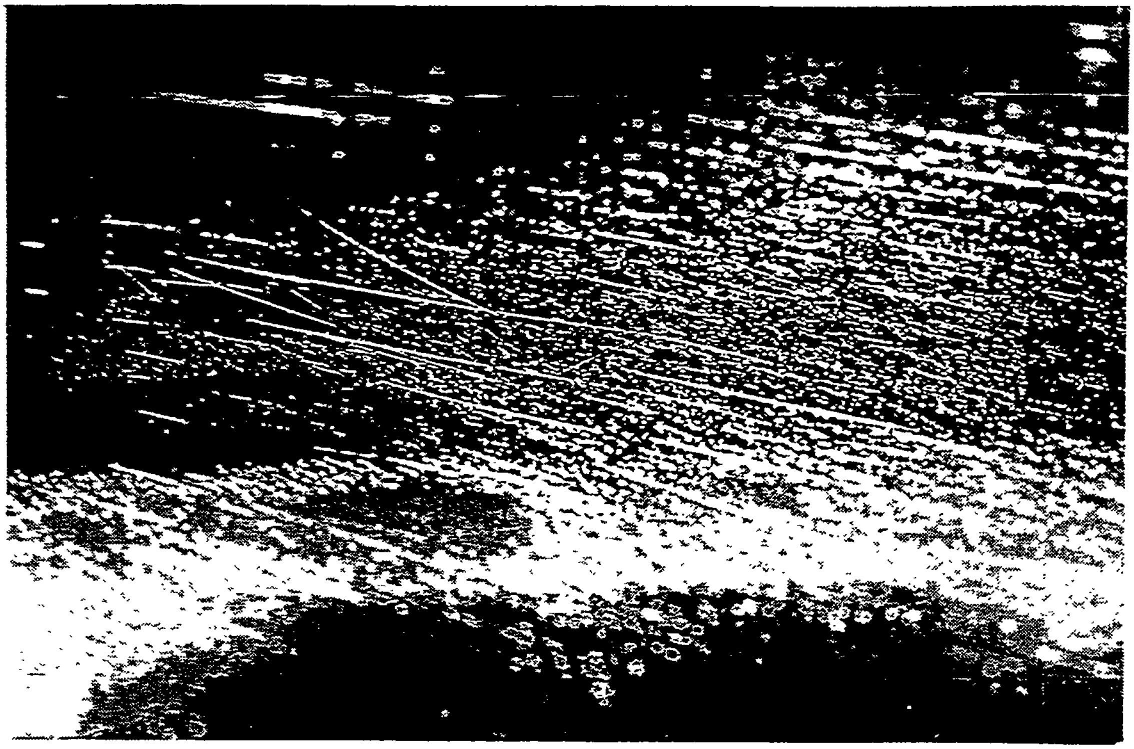
CAUTION

Windows which have been damaged by paint thinner, paint remover or other softening agents must be replaced. Do not attempt to repair this type of damage.

Minor crazing or scratches may be safely removed from the outer pane without weakening the window structurally. Such scratches should be polished out using products available from Micro-Mesh Cushioned Abrasives (65, Chart 207, 91-00-00) or Polysand Cushioned Abrasives (65, Chart 207, 91-00-00).



Viewing Angles and Light Placement for Window Inspection
Figure 206



Example of Crazing
Figure 207

"END"

CABIN - MAINTENANCE PRACTICES

CABIN WINDOW REMOVAL (TJ-3 and after)

a. Remove the molding around the window to allow access to the Hi-Lok fasteners.

NOTE

New fasteners are required for installation, however the washers can be retained and used again.

b. Remove the Hi-Lok fasteners and remove the window. Remove the old sealer with toluol (22, Chart 207, 91-00-00).

CABIN WINDOW INSTALLATION (TJ-3 and after)

All cabin windows are installed using Hi-Lok fasteners. Predrilled replacement windows are available and only minor preparation is necessary before installation.

NOTE

If blank windows are used for replacement windows, the following procedures should be used for drilling holes:

1. Place the window in position against the skin (window should not contact any structure along edges.)
2. Insert a drill guide in the existing holes in the skin and drill No. 40 pilot holes thru the window.
3. Remove the window and with special ground bits (see Figure 201), using the No. 40 pilot holes as a center, drill halfway thru the window. Turn the window over and finish drilling the holes from the opposite side to prevent chipping of the window around the edge of the holes.

Installation of pre-drilled windows may be accomplished as follows:

a. Clean the edge of the window with a clean white cloth.

b. Apply PR1425 B-2 sealer (14, Chart 205, 91-00-00), with a sealant roller (Warner, #222 or #30, Carl Graham Co., Wichita, Kansas) to a uniform thickness of approximately .007 inch.

c. Install the window using enough new HL18PB70-5-5 fasteners spaced around the window to maintain alignment while the nuts are being installed.

d. Install the new HL18PB70-5-5 fasteners, with a washer under each nut, drawing the window down evenly all around the frame.

NOTE

Looking through the window, ascertain that there are no voids in the sealant as the fasteners are secured.

A uniform pad of sealant .007 inch thick will assure a good seal. If the plastic is too thick, the shanks of the fasteners may wobble in the holes as the cabin is pressurized.

e. Clean off any excess sealant with clean white rags and reinstall the molding.

SECOND WINDOW REMOVAL (TK-1 and after)

a. Remove the emergency release pin.
b. Remove the hinge pin.
c. Remove the window.

SECOND WINDOW INSTALLATION (TK-1 and after)

a. Install window.
b. Install hinge pin.
c. Secure emergency release pin.

THIRD OR FOURTH WINDOW REMOVAL (TK-1 and after)

a. Remove the upholstery panels as required to gain access to the window frame.
b. Remove the molding from around the inside of the window.
c. To facilitate reinstallation, mark the location of the molding clips.
d. Remove the rivets from around the window.
e. Remove the window.

THIRD OR FOURTH WINDOW INSTALLATION (TK-1 and after)

a. Clean the sealer from the cabin section where the window was removed using naphtha (50, Chart 207, 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 the excess material as determined in step "b".

d. Place the window in position and cleco in place using the pilot holes provided.

e. Back drill the window frame using the existing holes in the back section as a guide.

f. Remove the window, burr all holes and apply sealer (51, Chart 207, 91-00-00) to an area approximately 1/2 inch wide on the canopy section where the old sealer was removed.

g. Using MS20470AD4 rivets, secure the window to the cabin section.

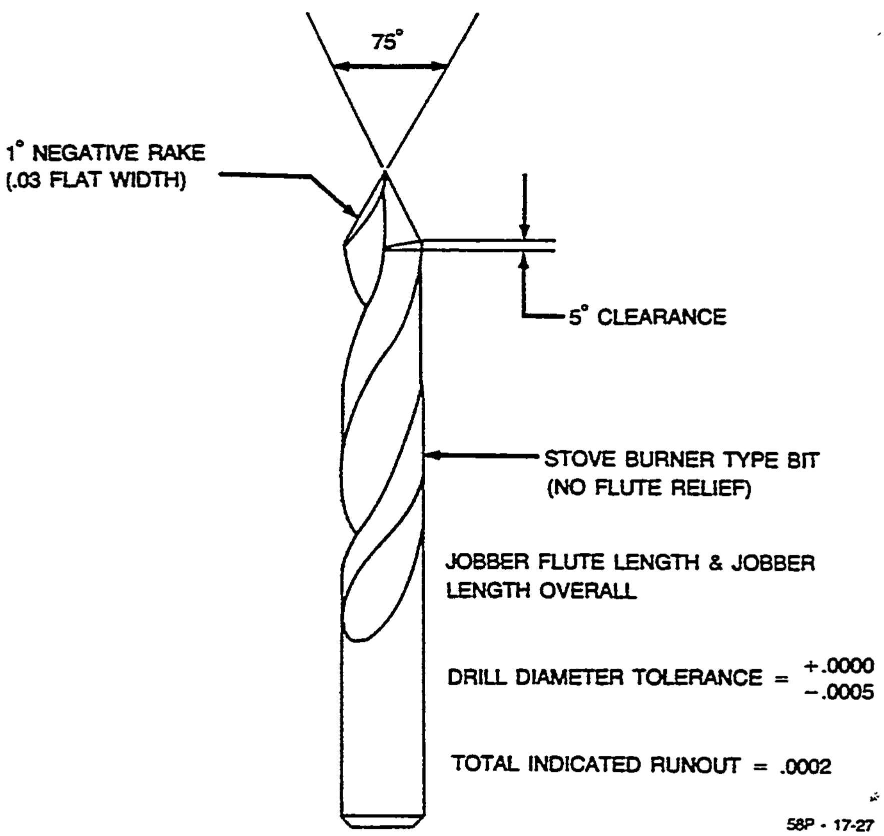
NOTE

When riveting the window in place, install the molding clips in the same location as described in step "c" of the window removal procedure.

h. Install the molding.

i. Clean and paint as necessary.

j. Reinstall the upholstery panels.



Acrylic Plastic Drill Bit Fabrication
Figure 201

"END"

CHAPTER 57

WINGS

CHAPTER 57 - WINGS

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CHAPTER 57

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"END"

GENERAL - DESCRIPTION AND OPERATION

The all-metal wing group consists of the fuselage carry-through structure, outboard wing panels, leading edge, wing tips, flaps, aileron and aileron trim tabs, and the integral fuel cells. The wing tips, flaps, ailerons, and fuel cells are readily removeable. To remove the wing assembly, engine removal is required.

CARRY - THROUGH STRUCTURE

The carry-through structure, to which the wing assemblies are attached, is riveted to the fuselage and forms an integral part thereof. The upper forward carry-through extruded spar cap is of clad 2024-T3 aluminum alloy, while the lower spar cap is of 2014-T6 aluminum alloy. A web of clad 2024-T3 aluminum alloy sheet encloses the area between both spar caps. The aft (one piece) extruded spar cap is of clad 2416-T6 aluminum alloy.

OUTBOARD WING

Two spars, their attaching ribs and skin, constitute the box beam construction used throughout the wing. The outer wing spars are of the same construction as the carry-through structure, except that a combination of clad 2014-T4 aluminum alloy extrusions are formed clad 2024-T4 aluminum alloy U-channel members comprise the main spar caps while those of the rear spar are composed of formed clad 2024-T3 and 2024-T4 aluminum alloy angles and clad 2024-T3 cap strips. The stamped ribs are formed stringers used throughout the wing are of clad 2024-T3 aluminum alloy. Clad 2024-T3 aluminum skin cover the entire wing. The wing tips are formed of clad 6061-T4 aluminum alloy sheets and are attached to the wing with screws. Two fuel cells are located in the leading edge, and a nacelle and box section cell is located between the main and rear spar in each wing assembly. Each fuel cell cavity is lined with clad 2024-T3 aluminum alloy sheet.

"END"

GENERAL - MAINTENANCE PRACTICES

WING TIP REMOVAL

NOTE

On airplanes equipped with pneumatic surface deicers, the deicer boot must be removed before the wing tip can be removed. Refer to Chapter 30-10-00 for deicer boot removal and installation.

a. Remove the rivets and the two screws (located at the trailing edge) attaching the tip to the wing.
b. Disconnect the electrical leads to the navigation light and to the landing light (if installed).

WING TIP INSTALLATION

a. Attach the electrical leads to the navigation light and the landing light (if installed).
b. Position the wing tip to the wing and install the attaching rivets and screws (2 located at trailing edge).

NOTE

Blind rivets are used in areas which are inaccessible to a bucking bar.

WING REMOVAL

a. Drain and purge all fuel cells.
b. Remove the wing mounting bolt access plates from the top and bottom of the wing.
c. Place the airplane on a three point jack and raise until the wheels are clear (see Chapter 7-00-00 for jacking instructions).
d. Place a stand under each wing and a tail stand under the aft portion of the fuselage. Remove the engine as instructed in Chapter 71-00-00.
e. Open the brake cylinder bleed ports and pump all fluid from the system.
f. Retract the landing gear until the inboard landing gear doors are fully open.
g. Disconnect the inboard door actuating rod from the control horn.
h. Disconnect the landing gear uplock cable at the inboard door idler arm in the cabin.
i. Disconnect the landing gear actuator rod from the V-brace in the wheel well.
j. Disconnect the aileron cables at the turnbuckle in the wheel well and remove the roll pins from the inboard aileron cable pulley brackets. Disconnect the aileron tab cables and aileron tab stops in the left wheel well.
k. Disconnect the hydraulic brake line at the inboard connection in the wheel well.
l. Disconnect fuel lines between the wing root rib and the fuselage.
m. Disconnect the flap drive shaft at the motor and remove the clamps attaching the shaft housing to the fuselage.
n. Remove the lower aft nacelle fairing assembly.
o. Remove the inboard nacelle fairing.
p. Remove the leading edge cover of the wing located between the fuselage and nacelle.
q. Remove the clamps securing the wiring bundles to the wing inboard leading edge. Disconnect wiring bundles at terminals located on the aft side of nacelle firewall.
r. Disconnect the wiring to the electrical components located in each side of the upper nacelle.
s. Disconnect and cap the plumbing between the wing root rib and the fuselage.

WARNING

The two air conditioner lines between the right wing root rib and the fuselage are high pressure lines. Before disconnecting the two lines, loosen the fitting just enough to bleed off pressure slowly.

t. Disconnect the flap wire bundle and safety switch wiring in the left wheel well. Disconnect the plumbing and electrical wiring (boost pump and fuel quantity transmitter) in each wheel well.
u. Remove the clamps securing engine controls to the leading edge.
v. Using a grease pencil, outline the position of the wing on the fuselage.

CAUTION

There should be no bolt binding during removal. Should binding occur, adjust the wing position until the bolts disengage freely. Do not screw or drive a bolt in or out of the fittings.

w. Remove the nuts and bolts from the fittings.
x. Remove the wing by pulling it straight away from the fuselage.

NOTE

Discard the soft aluminum washers installed between the upper wing attach fittings. Install new washers when the wing is reinstalled.

WING INSTALLATION

a. Using a nonmetallic brush and naptha or methyl ethyl ketone (20 or 21, Chart 207, 91-00-00), clean the wing attach fittings and hardware (bolts, washers, and nuts). Inspect the wing attach fittings and hardware as instructed under WING BOLT, NUT AND FITTING INSPECTION.

WARNING

Wing bolts that have reached their life limit (10 years after initial inspection) must not be reused (see Chart 202).

b. Coat the fitting bolt bores and bearing faces, bolts, washers, and nut with MIL-C-16173 Grade II corrosion preventive compound (43, Chart 207, 91-00-00).

c. Guide the flap shaft and landing gear retract rod into their respective positions.

d. Place the slide in the fuselage fitting at the leading edge attach point (see Figure 201D).

CAUTION

There should be no bolt binding during installation. Should binding occur, adjust the wing position until the bolts disengage freely. Do not screw or drive a bolt into or out of the fittings.

e. Align the wing and fuselage fittings, install the soft aluminum washers between the upper wing attach fittings, and insert the bolts into the fittings.

CAUTION

Bolts nuts and washers must be oriented as shown in the applicable illustration for each location (Figure 201, 201A, 201B, 201C, and 201D).

f. Start the nuts on the bolts. Rotate the wing trailing edge until the wing aligns with the outline drawn on the fuselage. After alignment is established, verify that the lower forward bolt is not binding in the bolt bore. If bolt binding is encountered, adjust the wing position until the bolt moves freely in the fittings.

g. Tighten the upper forward and aft nuts.

CAUTION

When torquing the wing nuts, assure that the wrenches do not bottom out on the wing fittings. Such an occurrance could cause false torque readings and damage to the fittings. After torquing the upper forward wing attach nut, remove the holding force from the wing cradle (if used) and torque the remaining three nuts.

h. Torque the nuts in the following order: upper forward, upper aft, lower forward and lower aft. When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper wet torque value computed as detailed in Chapter 20-00-00.

CAUTION

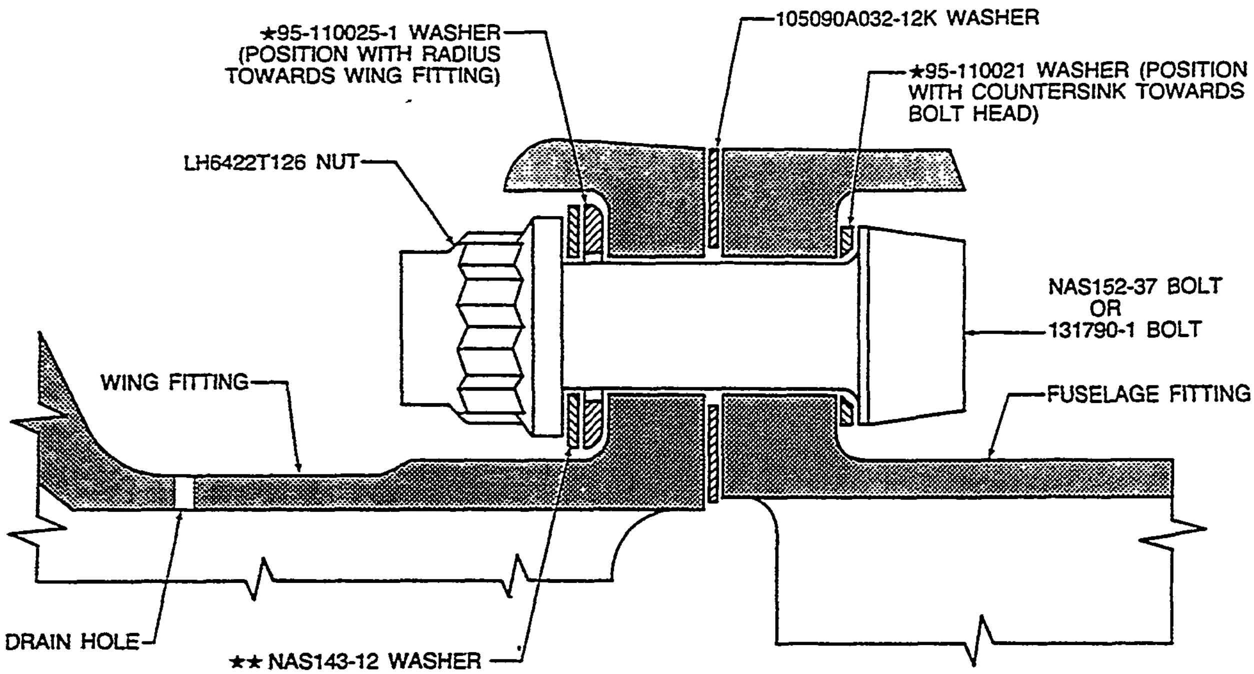
Before the lower aft nut is torqued, a slight gap may be evident between the fittings. This gap should not exceed a width of .060 inch. No gap should remain after the nut is torqued. Torque the wing attach bolts at the nut end. Do not rotate the bolt in the bolt bore.

i. Torque the leading edge attach point to the value shown in Figure 201D.

CAUTION

Do not lubricate the fittings or attach hardware at the leading edge attach point. The torque value shown in Figure 201D is applicable to dry hardware only.

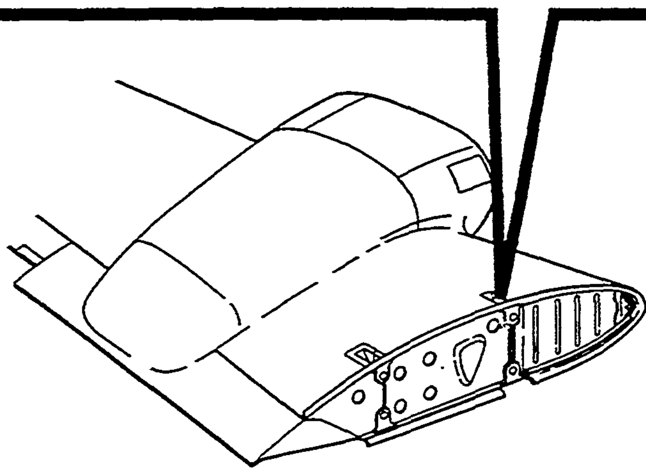
j. Reinstall the engine and connect engine controls.



WET BOLT TORQUE: 2480 TO 2600 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHERS, WING FITTING BOLT BORES, AND EXPOSED BOLT THREADS WITH MIL-C-16173, GRADE 2 CORROSION PREVENTIVE COMPOUND.

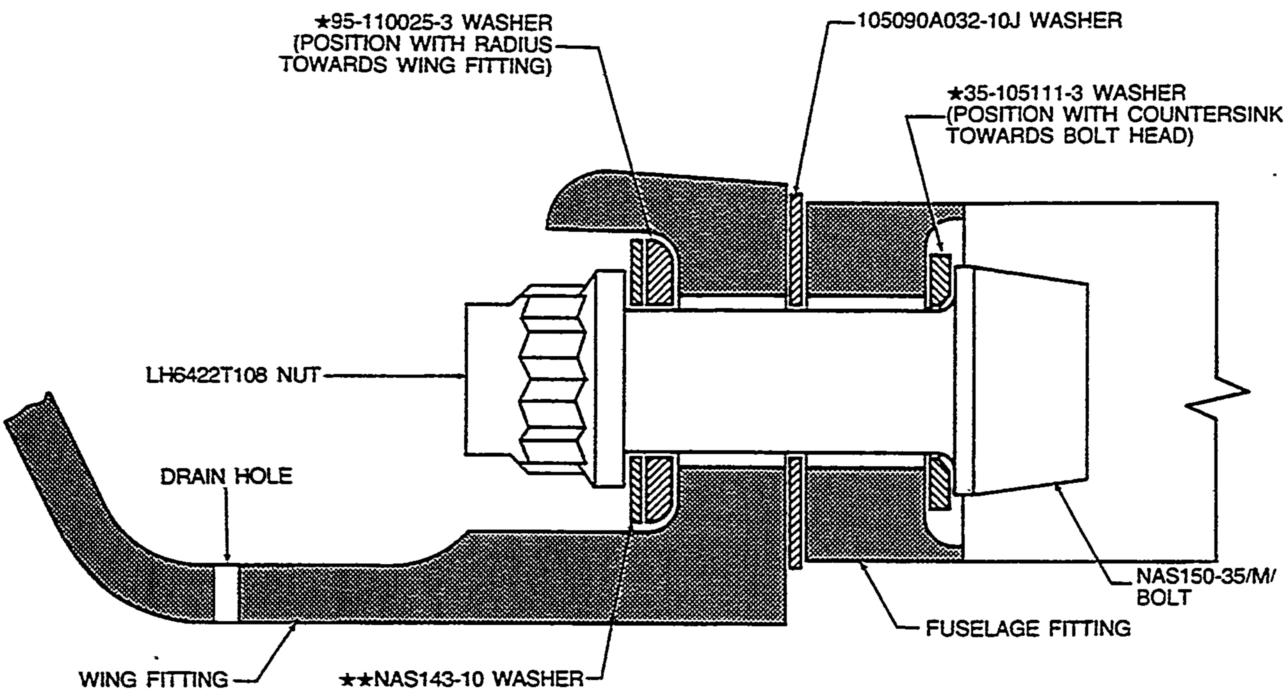
★CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★NAS143-12 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-1 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT.



58P-31-21

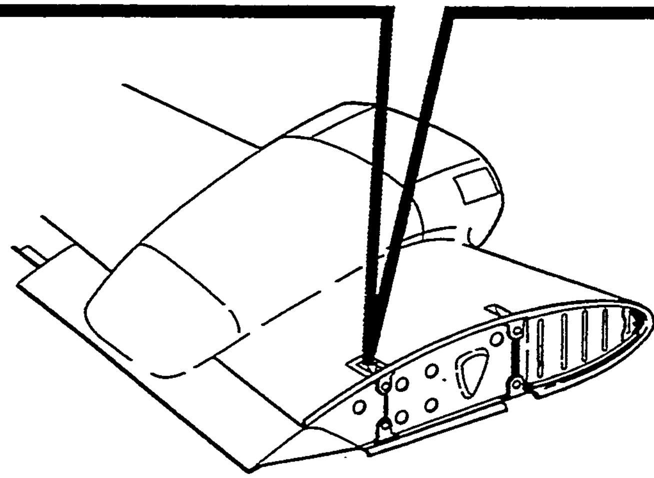
Upper Forward Wing Bolt Installation
Figure 201



WET BOLT TORQUE: 1180 TO 1300 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHERS, WING FITTING BOLT BORES, AND EXPOSED BOLT THREADS WITH MIL-C-16173, GRADE 2 CORROSION PREVENTIVE COMPOUND.

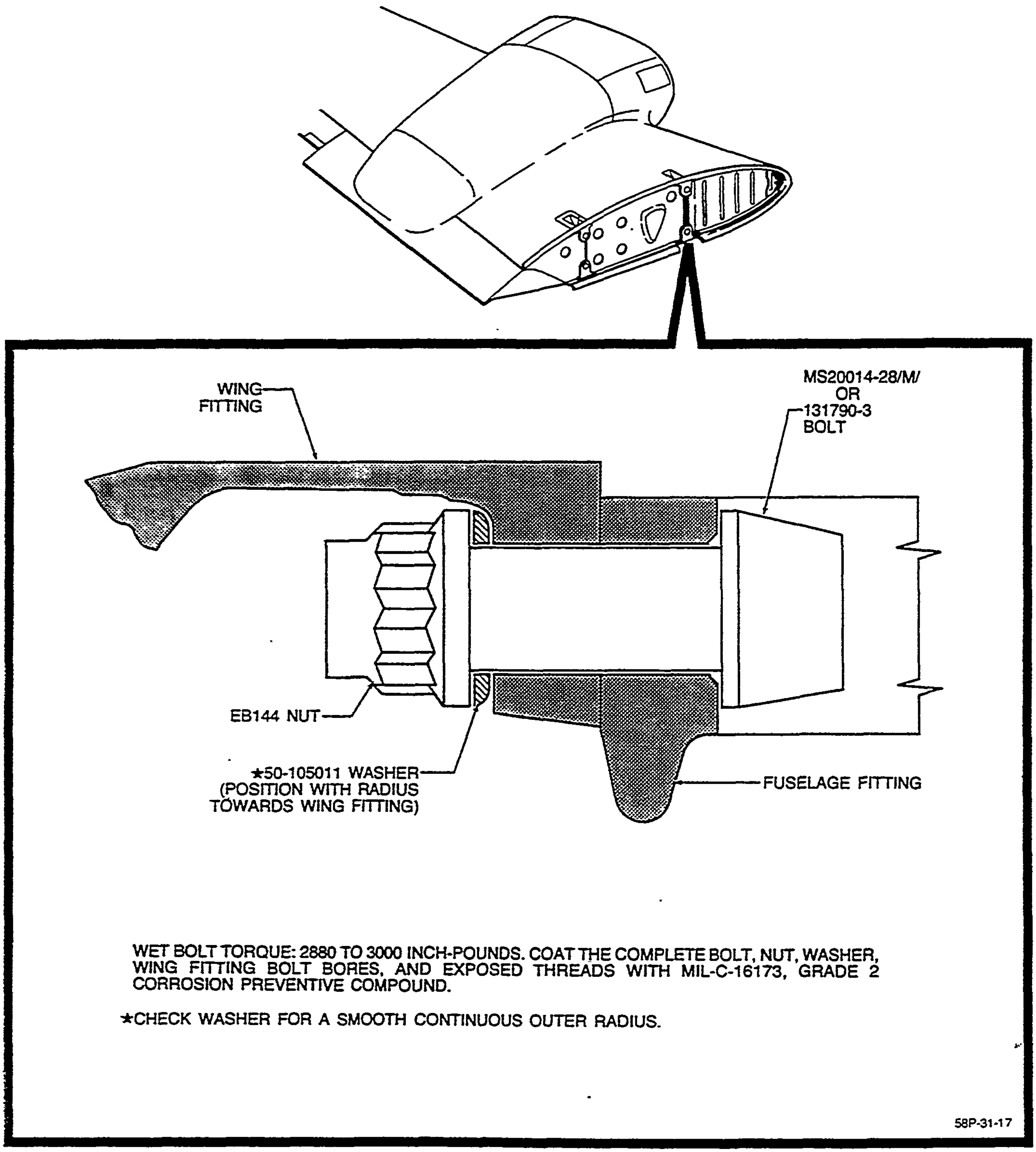
★ CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★ NAS143-10 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-3 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT.

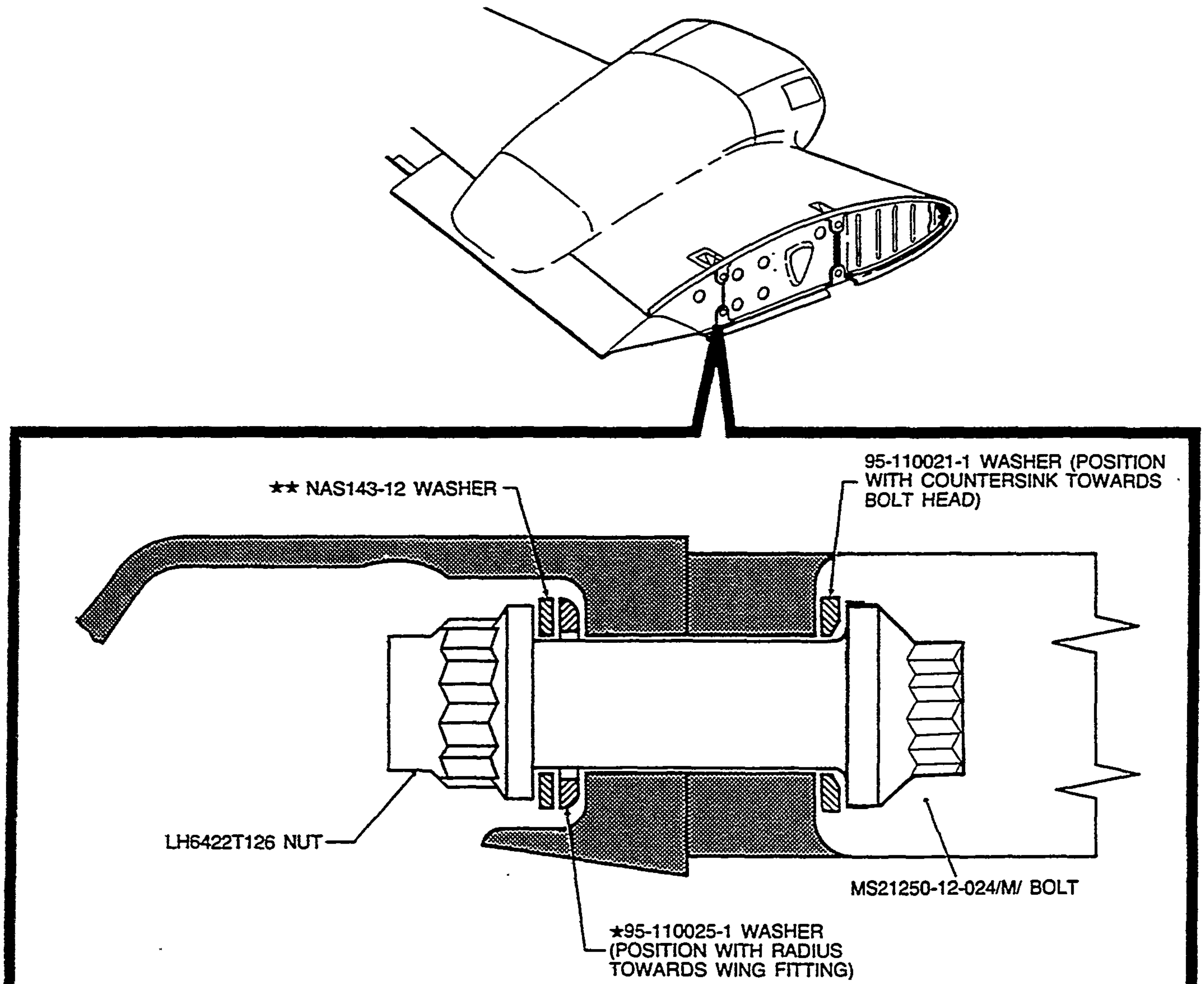


58P-31-14

Upper Aft Wing Bolt Installation
Figure 201A



Lower Forward Wing Bolt Installation
Figure 201B



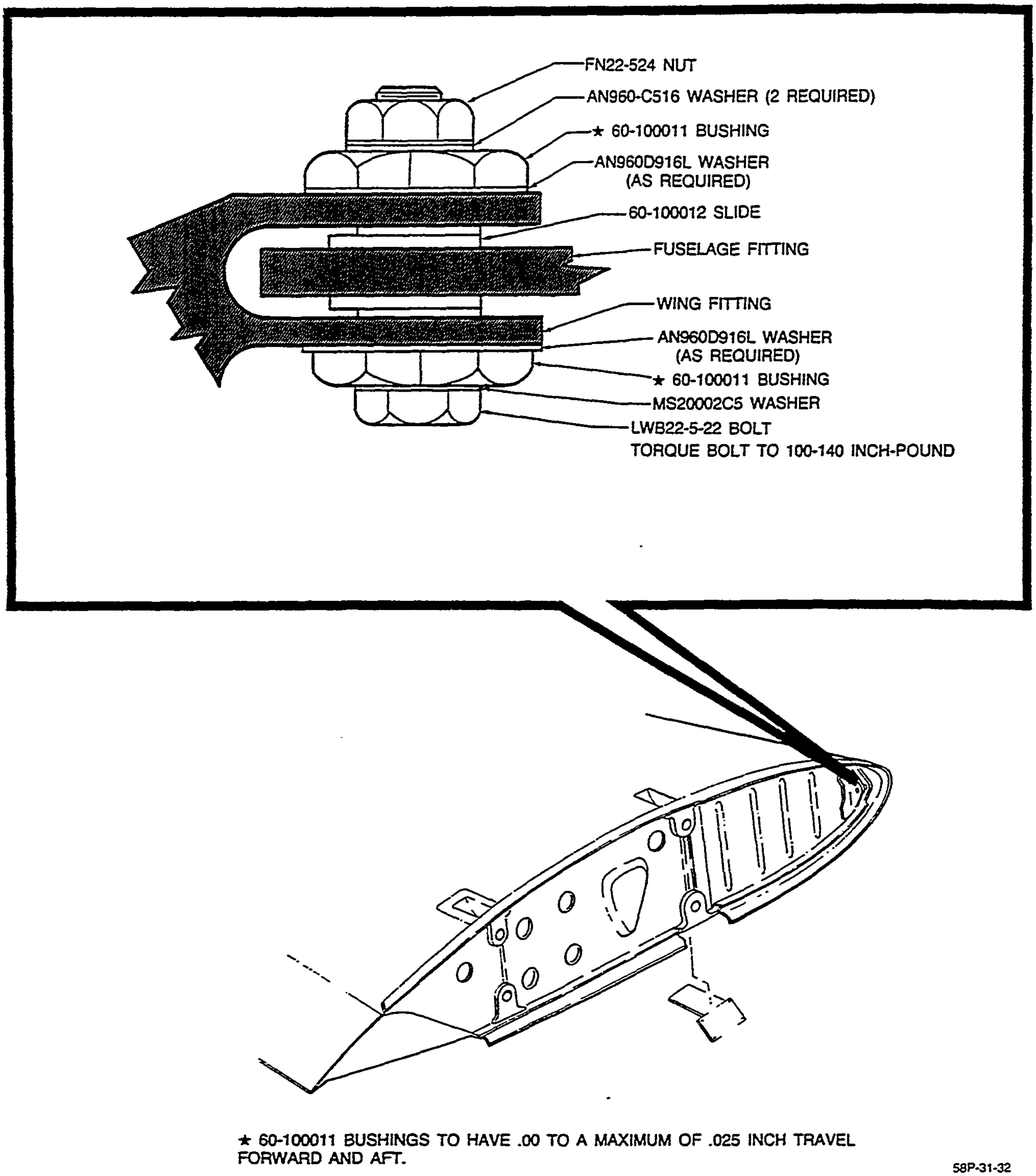
WET BOLT TORQUE: 2480 TO 2600 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHERS, WING FITTING BOLT BORES, AND EXPOSED BOLT THREADS WITH MIL-C-16173, GRADE 2 CORROSION PREVENTIVE COMPOUND.

★ CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★ NAS143-12 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-1 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT.

58P-31-30

Lower Aft Wing Bolt Installation
Figure 201C



Leading Edge Attach Point Bolt Installation
Figure 201D

Chart 201
Wing Bolt Wrenches And Torque Wrench Adapters

POSITION	BOLT PART NO.	WRENCH PART NO.	NUT PART NO.	TORQUE WRENCH ADAPTER NO.
Lower Forward	MS20014-28/M/ or 131790-3	TS1222-3	EB144	50-590014
Upper Forward	NAS152-37/M/ or 131790-1	TS1222-3	LH6422T-126	TS1176-10
		TS1222-4 or TS1222-5		
Lower Aft	MS21250-12 -024/M/	TK1817-922-4	LH6422T126	TS1176-10
Upper Aft	NAS150-35/M/	TS1222-4 or TS1222-5	LH6422T108	TS1176-8

k. Connect all electrical wiring to the engine, nacelle terminal, and the electrical components located in each side of the upper nacelle.

l. Connect the plumbing between the wing root rib and the fuselage.

NOTE

The air conditioning system must be recharged after wing installation.

m. Connect the flap wire bundle and plumbing in the aft wheel well.

n. Replace all clamps securing the wire bundle and engine controls to the leading edge.

o. Reinstall the lower aft nacelle, wing leading edge cover, nacelle fillets, and inboard nacelle fairing.

p. At the first scheduled inspection after the wing has been installed, check the attaching bolts for proper torque. Check the drain ports in the upper wing attach fittings to assure that they are open and free of obstruction.

ADJUSTING THE WING

After the wing has been reinstalled or repaired, flight tests may show the wing to be chronically heavy or light. This condition may be corrected by rotating the wing to lower the trailing edge of the heavy wing or to raise the trailing edge of the light wing. Occasionally a combination of adjusting both wings will be required. The aluminum washers between the upper fittings must be replaced each time the position of the wing is changed. The following steps should be observed when adjusting the wings:

a. Using a grease pencil, outline the position of the wing on the fuselage.

b. Place the airplane on a three point jack and raise until the wheels are clear. See Chapter 7-00-00 for jacking instructions. Place a suitable cradle under both wings and a tail stand under the aft portion of the fuselage.

c. Loosen the nuts on the lower wing attach bolts and remove the bolts and nuts from the upper wing attach fittings. Coat the bearing faces and bolt bores of the fittings, the bolts, washers, and nuts with MIL-C-16173 Grade II corrosion preventive compound (43, Chart 207, 91-00-00). Install new soft aluminum washers between the upper wing attach fittings. Install the bolts washers and nuts into the fittings.

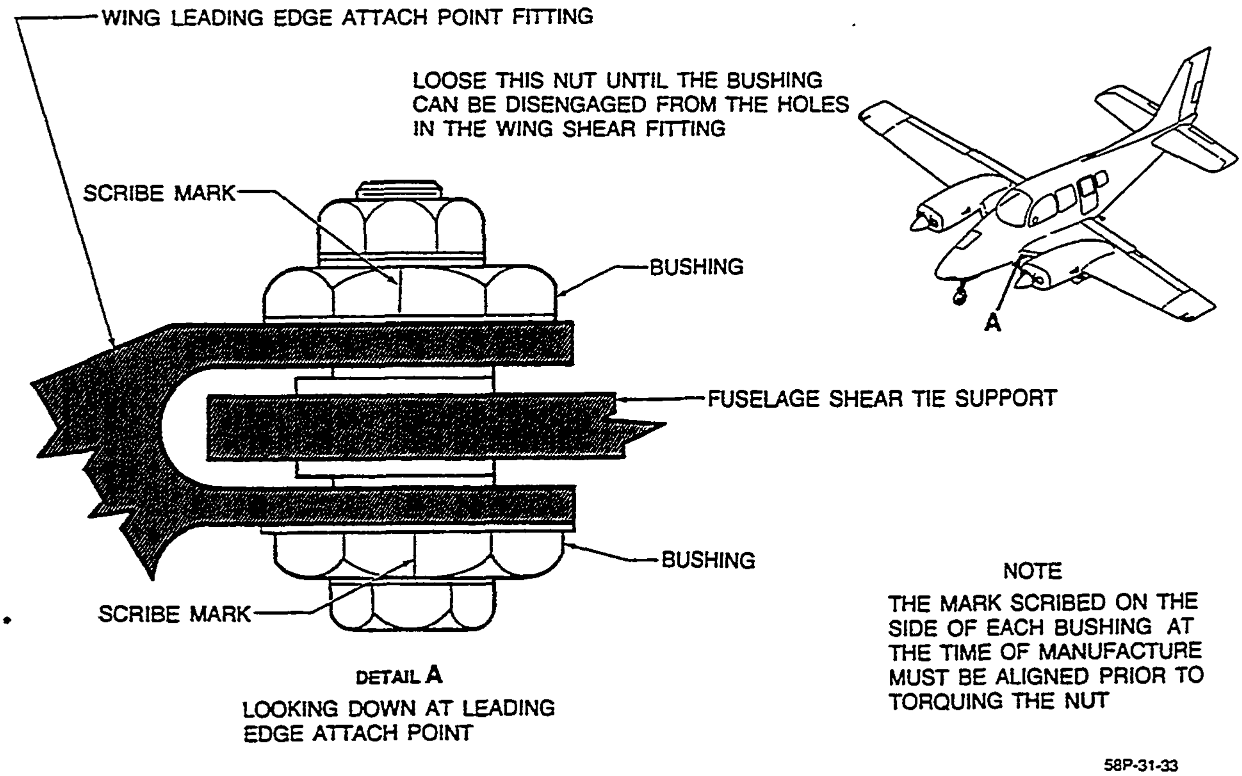
d. Loosen the nut at the leading edge attach point until the bushings can be disengaged from the holes (see Figure 201E).

e. Raise or lower the trailing edge as required and retorque the wing attach nuts in the following order: upper forward, upper aft, lower forward, and lower aft.

f. Torque each nut to the wet torque value shown in the appropriate illustration (Figure 201, 201A, 201B, and 201C). There should be no gap between the fittings after the last nut is torqued. Coat the exposed threads that protrude through the nuts with MIL-C-16173 Grade II corrosion preventive compound (43, Chart 207, 91-00-00).

NOTE

After torquing the upper wing attach nut, remove the holding force from the wing cradle prior to torquing the remaining nuts.

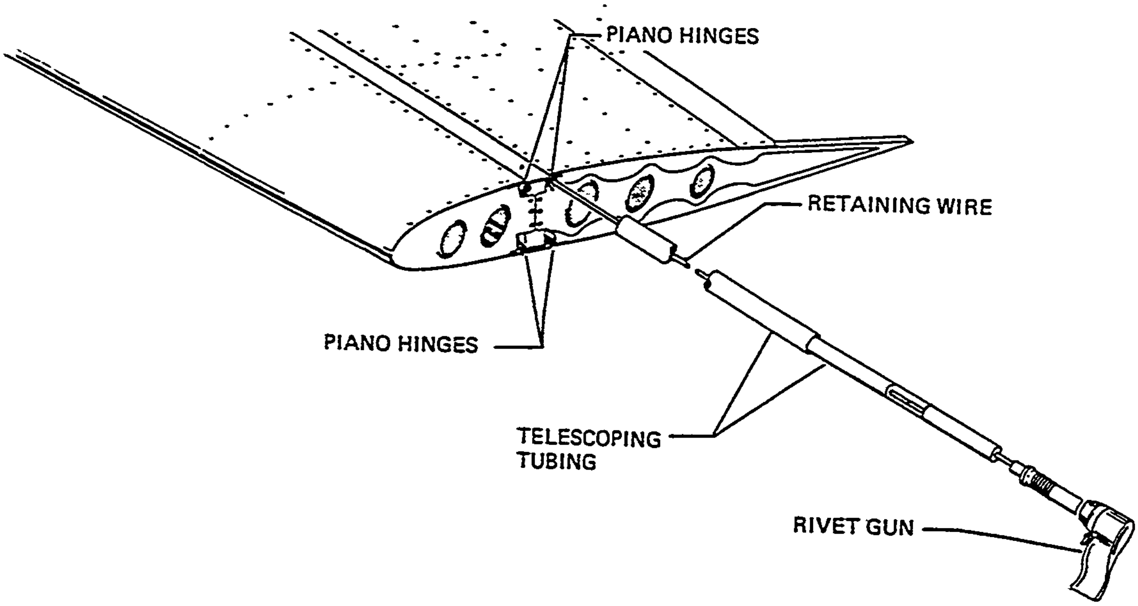


Leading Edge Attach Point
Figure 201E

g. Rotate the bushings at the leading edge attach point until they engage the attach fitting holes. The scribe marks on the side of each bushing must be aligned before the nut is torqued. Torque the nut to 100 to 140 inch-pounds (see Figure 201E).

h. After removing the wing and tail stands and the jack, test fly the airplane.

i. If after adjustment a heavy wing condition still exists, rig the flap down on the heavy wing by screwing the actuator out. Do this only as a last resort, since rigging the flap down will create additional drag on the airplane.



Wing Hinge Pin Installation
Figure 202

WING DISASSEMBLY

a. Support the wing on a suitable cradle.

b. Remove the wing tip, aileron, wing flap, fuel cells and other equipment as required by the work to be accomplished.

c. Remove the screws around the spar caps and the root ribs.

d. Vise-grip pliers may be used to remove the steel hinge pins. Remove the pins from the box section first, then the leading edge.

CAUTION

Do not attempt to spin the hinge pins out with a drill motor: the heating and expansion of the pin will cause the pin to seize in the hinge and break.

WING ASSEMBLY
(Figure 202)

a. Before assembling the spar to the wing sections, it is advisable to drive the hinge pins through the hinge sections to remove any burrs and foreign material.

b. Use a new hinge pin, liberally coated with graphite (29, Chart 207, 91-00-00).

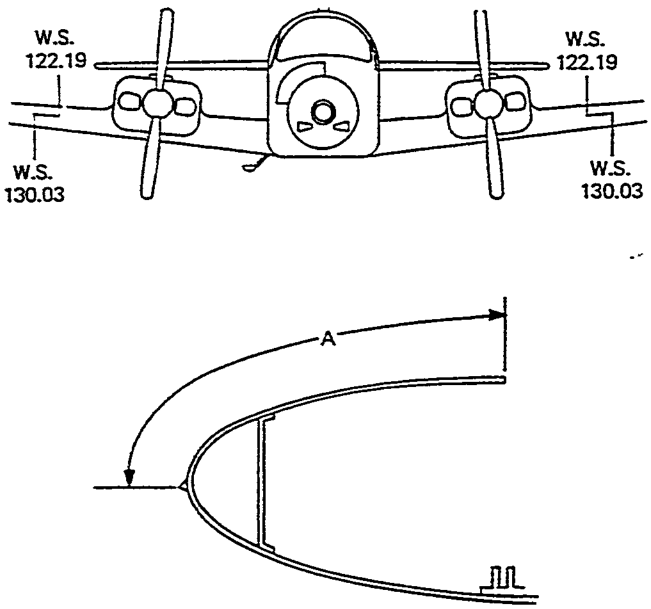
c. Position the spar on the leading edge and align the hinge sections.

d. Using a E-2, or equivalent size, rivet gun and the telescoping tube kit (P/N 35-588S), drive the hinge pin in until the tip is completely through the hinge but not against the wing attach fitting. The pin must be supported with the telescoping tubes during the driving operation. Start the pointed end of the pin in the hinge and support the pin with the longest tubes against the hinge, then drive the pin. Remove the tubes as necessary, until the pins are completely inserted. Trim the hinge pins as necessary to extend 4.90 inches beyond the end of the spar. Bend the end of pins 90° and form loop. Install retaining screws through loop and into nut plates.

NOTE

It is imperative the larger tube be held firmly against the hinge throughout the driving procedure in order to prevent the pin from kinking in the intervening space.

e. Install the box section in the same manner as the leading edge.



RIGHT WING	LEFT WING
DIMENSION "A" IS 15.62 AT WING STATION 122.19 AND 15.22 AT WING STATION 130.03	DIMENSION "A" IS 15.62 AT WING STATION 122.19 AND 15.22 AT WING STATION 130.03

58P-34-12

Stall Strip Installation
Figure 203

NOTE

If necessary, place a phenolic block against the spar and vibrate the spar with another rivet gun.

f. Install the screws around the spar caps and root ribs.

g. Install all components which had been removed.

METAL STALL STRIPS (Figure 203)

The stall strips installed on airplanes without wing deice boots are manufactured from aluminum alloy extrusion FED QQ-A-325 and riveted to the leading edge. Refer to Figure 203.

WING BOLT, NUT, AND FITTING INSPECTION

NOTE

Read this entire section before removing any wing bolt for inspection.

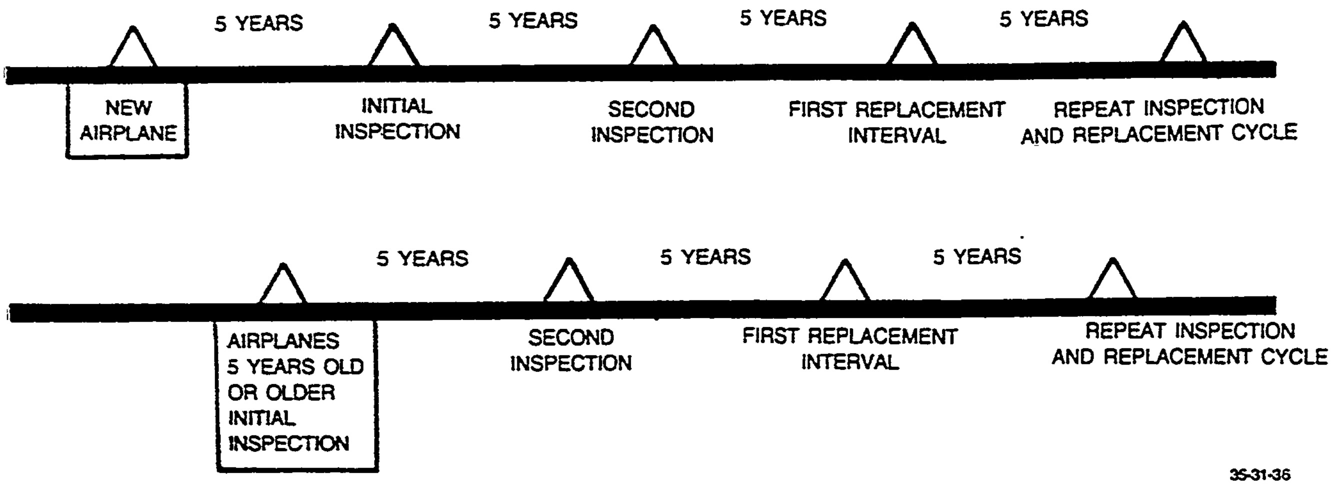
WARNING

The wing bolts installed in the 58P and 58TC series Barons that are five years old or older must be removed and inspected. If the bolts prove to be free of all damage, they may be reinstalled for an additional five year period. At the end of this period the bolts and nuts must again be removed and inspected. Ten years after the initial inspection, all wing bolts and nuts must be replaced with new hardware. Render unserviceable all components removed in compliance with Chart 202.

a. Before removing any wing bolt, draw an outline of the wing position on the fuselage with a grease pencil. If wing bolt binding is encountered and the wing must be shifted, the outline will be helpful in returning the wing to its original position.

CAUTION

There should be no wing bolt binding during removal or installation of the bolts. Do not screw or drive a bolt in or out of the fittings. If wing bolt binding is encountered, place the airplane on a three point jack and raise until the wheels are clear (see Chapter 7-00-00 for jacking instructions). Place a wing stand under each wing and a tail stand under the aft fuselage. Defuel the wing, loosen the remaining three bolts and rotate the wing until the binding bolt moves freely through the fittings. Replace the soft aluminum washers between the upper wing attach fittings and retorque the bolts as instructed under WING INSTALLATION. If bolt binding is not encountered and the wing has not shifted, replacement of the soft aluminum washers between the upper wing attach fittings is not necessary.



NOTE

The first inspection for airplanes five years old or older must be performed at the first scheduled inspection following the issue date of this revision (A18).

NOTE

At each replacement interval, all wing attach bolts, washers, and nuts must be replaced with new hardware.

Wing Bolt And Nut Inspection And Replacement Cycle
Chart 202

NOTE

Beech Aircraft Corporation supplies wing attach hardware that has been given an additional magnetic particle inspection since manufacture. These components may be identified by the green dye on the head of the bolt and on some portion of the nut.

WARNING

Use only the components specified in the applicable illustrations. DO NOT INSTALL THE BLACK P/N H20 NUTS, these nuts have been dry film lubricated with molybdenum disulfide. When MIL-C-16173 Grade II corrosion preventive compound is added to these nuts, the additional lubrication may cause improper preload in the bolt when it is torqued.

b. Starting at the lower wing attach point on each side, remove, inspect, and retorque one bolt at a time until the complete set of eight bolts and nuts have been inspected. Only the attach bolts at the forward and aft spar (excluding leading edge attach bolts) must comply with this inspection.

c. Using a nonmetallic brush, thoroughly clean the bolt, washers, and nut with naptha or methyl ethyl ketone (20 or 21, Chart 207, 91-00-00).

CAUTION

Assure that the radiused washers shown in Figures 201, 201A, 201B, and 201C have full and complete radii with no sharp edges that could damage the wing fittings.

d. If the bolts and nuts do not exceed the life limit

NOTICE

**WING BOLTS ARE LUBRICATED
SEE MAINTENANCE MANUAL
FOR CORRECT TORQUE VALUES**

WHEN THE CORROSION PREVENTIVE COMPOUND HAS BEEN APPLIED TO THE WING BOLTS, AFFIX THE ABOVE DECAL TO THE FOLLOWING LOCATIONS:

1. On the side of the fuselage immediately above the RH forward and aft wing bolt covers.
2. On the wing immediately forward of the LH forward and aft wing bolt covers.
3. On the wing immediately forward of the lower forward wing bolt covers on both sides.
4. On the wing immediately aft of the lower aft wing bolt covers on both sides.

**Lubricated Bolt Identification Placard Location
Figure 204**

shown in Chart 202, visually inspect each bolt and nut with a 10-power or stronger magnifying glass; inspect for corrosion, cracks, and mechanical damage. The cadmium plating may have areas that appear rubbed, discolored or polished. These areas are usually the result of prevailing installation procedures and are of no significance. A bolt should not be rejected because of cadmium plating deterioration; however, any component that is cracked, corroded or has mechanical damage must be replaced.

e. Using the magnetic particle inspection process described in this chapter, check each bolt for circumferential crack indications and each nut for longitudinal crack indications. If the bolts and nuts prove to be free of all damage (corrosion, cracks, and mechanical damage), they may be reused after demagnetization and cleaning.

f. Clean the fitting bolt bores with naptha or methyl ethyl ketone (20 or 21, Chart 207, 91-00-00). Do not strip the epoxy paint from this area. Inspect the surface condition of each fitting; focus special attention on the washer seat and bolt bore area. If scoring, corrosion pitting or washer impressions are discovered in this area, contact the Commercial Service Department of Beech Aircraft Corporation. If the fitting is satisfactory, coat the bolt bore and bearing faces of the fitting with alodine 1200, 1200S or 1201 (69, Chart 207, 91-00-00). Allow the coating to remain on the surface for approximately five minutes. When the time has elapsed, wash with water and blow dry (do not wipe dry). Paint the treated areas with zinc chromate primer (26, Chart 207, 91-00-00) and allow to dry.

g. Coat the bearing faces and bolt bores of the fittings, the complete bolt, washers, and nut with MIL-C-16173 Grade II corrosion preventive compound (43, Chart 207, 91-00-00).

h. Install the bolt washers, and nut into the fittings.

CAUTION

Ensure that the wing bolt wrenches do not bottom out on the fittings when torquing the nut. This could result in damage to the wing fittings and erroneous torque readings.

i. Torque the nut to the wet torque value shown in the appropriate illustration (Figure 201, 201A, 201B or 201C). When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper wet torque value computed as detailed in Chapter 20-00-00).

j. Coat the exposed threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (43, Chart 207, 91-00-00).

k. Check that the decal shown in Figure 204 is affixed to the appropriate locations on the airplane.

l. Check the drain ports in the upper wing attach fittings to assure that they are unobstructed.

m. At the first scheduled inspection after the wing bolts have been inspected or replaced, check for proper bolt torque.

MAGNETIC-PARTICLE INSPECTION

Magnetic-Particle Inspection is a method for locating surface and subsurface discontinuities in ferromagnetic materials (i.e. materials capable of being magnetized); consequently, nonferromagnetic materials (such as aluminum alloys, magnesium alloys, copper alloys, lead, titanium alloys, nickel base alloys and many stainless steel alloys) cannot be inspected by this method. Magnetic-Particle Inspection is based upon the principle that any discontinuities lying in a direction generally transverse to the direction of the magnetic field of the part magnetized for the test will cause a leakage field to be formed at and above the surface of the part. The presence of the leakage field denoting the discontinuity is detected by the use of finely divided ferromagnetic particles over the surface of the part. Some of the particles are magnetically gathered and held by the leakage field to form an outline indicating the location, size, shape and extent of the discontinuity. In general, magnetic particle inspection utilizes a variety of types of equipment for magnetization as well as several methods for application of ferromagnetic particles to the test part. Additionally, the ferromagnetic particles are available in a selection of colors (including fluorescent) and particle shapes. Magnetic particle inspections required by this manual can best be accomplished utilizing the "wet continuous method" on the standard wet horizontal type equipment with either visible or fluorescent magnetic particles suspended in a petroleum base vehicle (normally kerosene). Since magnetic particle indications are best obtained when the discontinuity lies in a direction transverse to the magnetic field, the following procedures are recommended for optimum detection of discontinuities in both bolts and nuts.

WARNING

Improper operation of the particle inspection, because of faulty equipment or untrained operators, can jeopardize the airworthiness of parts being tested. Minute electrical arc burns caused during inspection by improper operation of the test equipment can result in eventual failure of the part.

Bolts: Inspection of a bolt is accomplished by longitudinal magnetization in a multiturn low-fill factor coil (i.e. the inner diameter of the coil greatly exceeds the bolt diameter). For proper magnetization the bolt is positioned close to the coil inside wall with the bolt length perpendicular to the winding direction. The magnetic particle suspension is flowed on the bolt and the appropriate current is applied to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the ampere turn values listed in Chart 203 provide for optimum detection of discontinuities perpendicular to the bolt axis.

CHART 203
MAGNETIC-PARTICLE INSPECTION
(STEEL BOLTS)

BOLT DIAMETER	*TOTAL BOLT LENGTH INCLUDING HEAD TO NEAREST 1/4 INCH*	*AMPERE TURNS**
5/8 INCH	2 1/2 INCH	7900
5/8 INCH	2 3/4 INCH	7100

CHART 203 (CONT'D)
MAGNETIC-PARTICLE INSPECTION
(STEEL BOLTS)

BOLT DIAMETER	TOTAL BOLT LENGTH INCLUDING HEAD TO NEAREST 1/4 INCH	AMPERE TURNS
5/8 INCH	3 INCH	6600
3/4 INCH	3 INCH	7900
3/4 INCH	3 1/4 INCH	7400
3/4 INCH	3 1/2 INCH	6700
3/4 INCH	3 3/4 INCH	6300
7/8 INCH	3 1/2 INCH	7900
7/8 INCH	3 3/4 INCH	7400
7/8 INCH	4 INCH	6900
7/8 INCH	5 INCH	5500
1 INCH	5 INCH	6300

*Amperage requirement is the ampere turns value divided by the number of turns on the coil. For example: A 1-inch diameter x 5-inch long bolt tested on a 5-turn coil would require 6300 ÷ 5, or 1260 amps.

Nuts: Inspection of a nut is accomplished by circular magnetization on a central conductor (usually a copper rod) the approximate size of the nut inside diameter. For proper magnetization, the central conductor bar is inserted through the nut and the bar is positioned between the heads of the wet horizontal equipment. The magnetic particle suspension is flowed on the nut and the appropriate current is applied through the central conductor to achieve adequate field strenght. Using the described procedure, laboratory testing has indicated that the amperage values listed in Chart 204 provide for optimum detection of discontinuities parallel to the nut axis.

After magnetic particle inspection, the parts must be carefully demagnetized and cleaned of the ferromagnetic particles. Examine parts for any possible evidence of electric arc burn that may have occurred during the inspection.

CHART 204
MAGNETIC-PARTICLE INSPECTION
(STEEL NUTS)

NUT SIZE	*CENTRAL CONDUCTOR SIZE*	*AMPERAGE*
5/8 INCH	1/2 INCH	500 AMPS
3/4 INCH	5/8 INCH	600 AMPS
7/8 INCH	3/4 INCH	700 AMPS
1 INCH	7/8 INCH	800 AMPS

WING MAIN SPAR CAP VISUAL INSPECTION (Figure 205)

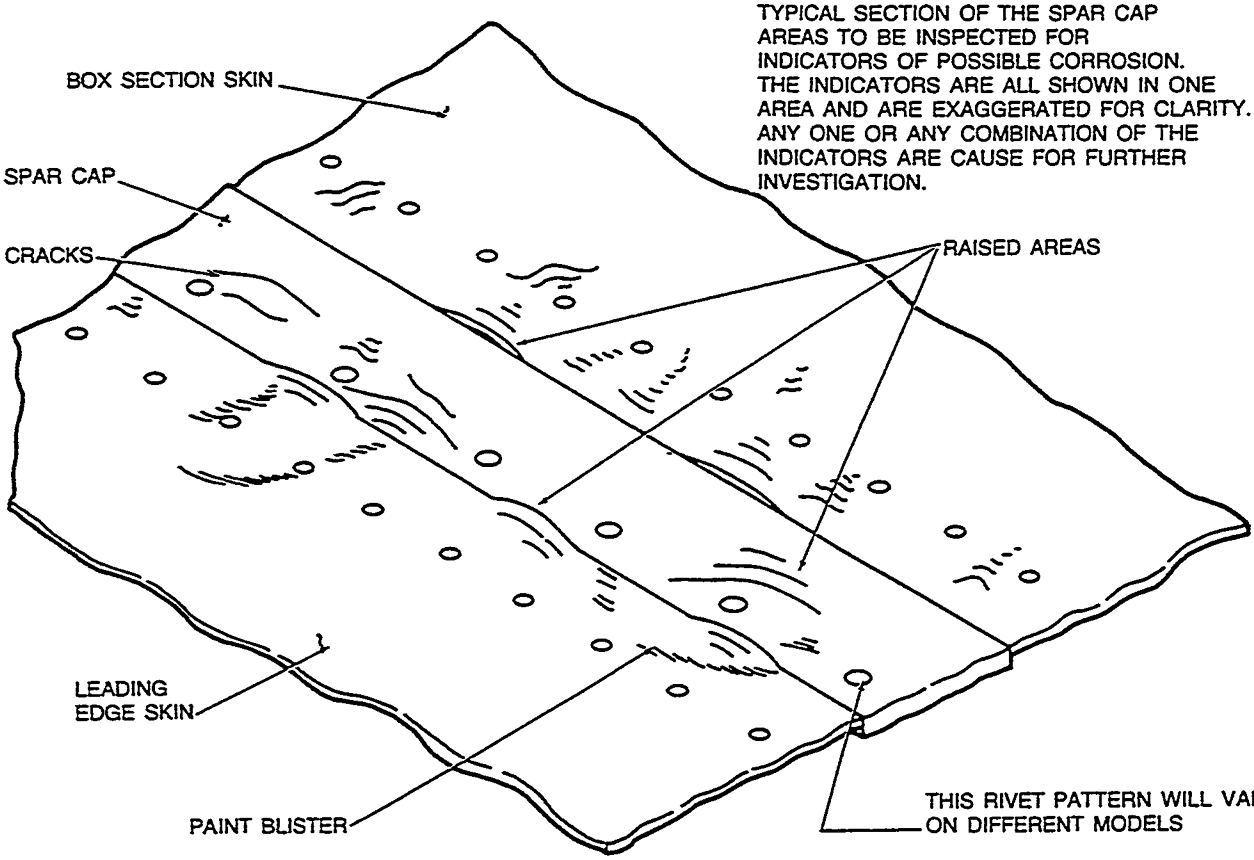
The wing spar cap must be inspected annually for corrosion.

WARNING

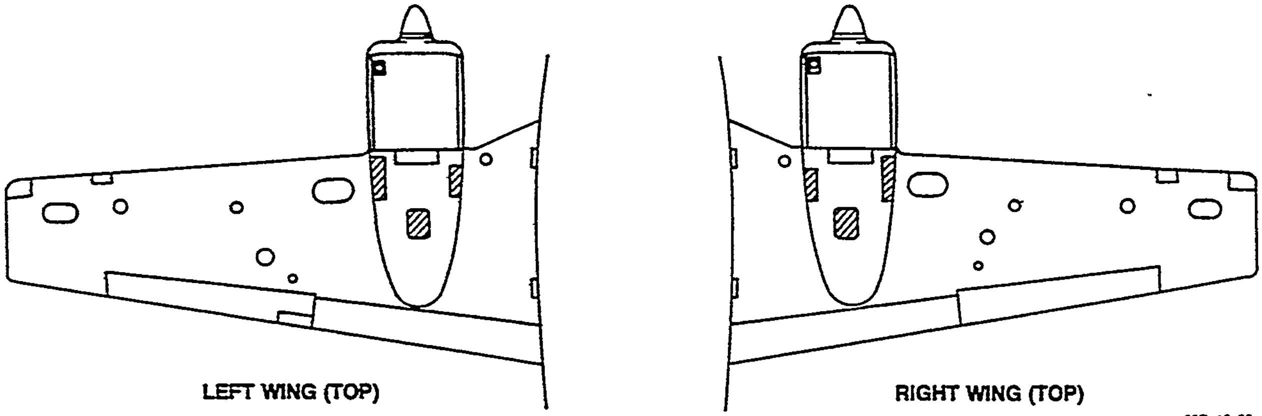
All areas of the wing main spar caps from the wing attach fitting to the outboard end of the spar cap must be inspected.

NOTE

Special emphasis should be placed on airplanes that have been operated or stored for extended periods (5 years or longer) in geographical locations where atmospheric conditions are highly conducive to corrosion.



Visual Spar Cap Inspection
Figure 205



Upper Spar Cap Access Panels
Figure 206

Inspection of the upper and lower spar caps should be accomplished in the following manner:

a. Examine the forward and aft sides of the spar cap where it meets the skin. If a whitish, salt-like, nonmetallic substance is noted in these areas, a thorough inspection must be performed to determine if corrosion has occured. Wax or paint trapped between the edge of the skin and the exposed section of the spar cap should not be misinterpreted as corrosion.

NOTE

To gain access to the upper spar caps in the nacelle area, remove the shaded panels shown in Figure 206.

b. Wash all exposed areas of the upper and lower spar caps.

c. Visually inspect all exposed areas of the upper and lower spar caps for irregularities, such as paint blisters, raised or uneven areas, and cracks. The exposed areas of the spar caps are extruded flat and irregularities could be an indication of corrosion. Thoroughly investigate all irregular areas to determine if any damage has occurred.

NOTE

Uneven or raised areas on the spar caps may be detected by sliding fingers over the surface, by moving a straight edge over the surface or by sighting down the length of the spar cap surface.

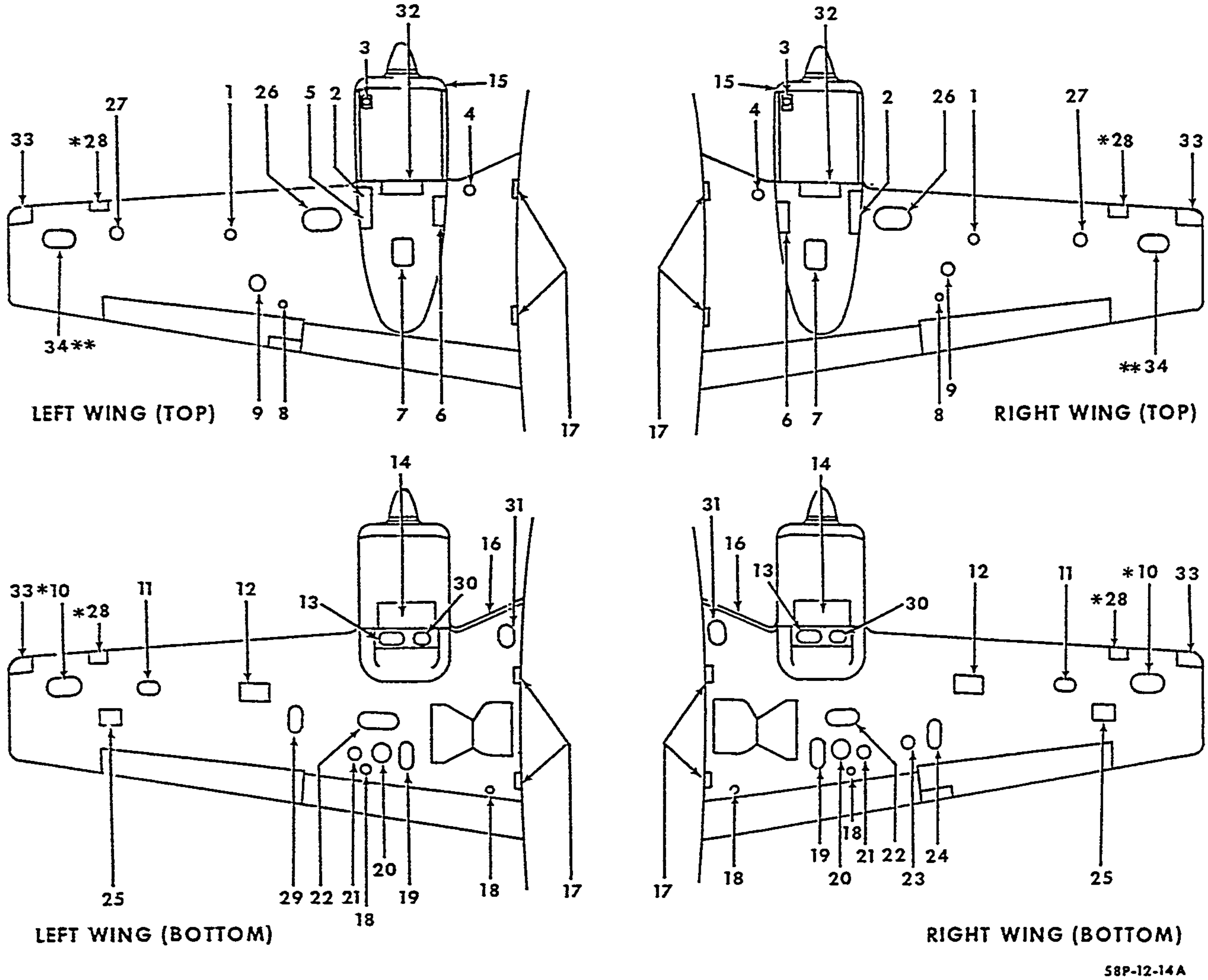
d. If unusual conditions are encountered that cannot be resolved locally, contact the Commercial Service Department of Beech Aircraft Corporation for evaluation and determination of any corrective action that may be required.

"END"

PLATES/SKIN-MAINTENANCE PRACTICES

WING ACCESS OPENINGS

The panels, plates and doors as shown in Figure 201, provides maintenance access to the components, plumbing and cables enclosed within the wing. When installed, they continue the aerodynamic lines of the wing with little increase of drag.



Wing Access Openings (Sheet 1 of 2)
Figure 201

1. Fuel Transmitter
2. External Power Relay, Alternate Air
3. Oil Level Indicator Access
4. Fuel Transmitter
5. Wing Ice Light (Left Hand Only)
6. Nacelle Inspection Plate and Access to Engine Plumbing
7. Pressure Switch Valve and Air Filter
8. Aileron Bell Crank
9. Fuel Cell Transmitter
10. Wing Tip Spar Fitting and Float Valve Assembly*
11. Fuel Cell and Siphon Break Valve
12. Fuel Cell Access
13. Firewall Terminal Bus (Starter Relay Left Hand Only)
14. Cowl Flap
15. Removable Nose Cap
16. Wing Leading Edge Cap
17. Wing Mounting Bolts
18. Flap Access
19. Aileron Cable and Pulley Inspection
20. Aileron Cable Inspection
21. Aileron Cable Pulley Access
22. Fuel Tank Access
23. Aileron Cable, Sprocket, Chain and Fuel Line Inspection
24. Aileron Tab Actuator and Pulley
25. Wing Tip Access
26. Fuel Cell Access
27. Fuel Filler Opening
28. Landing Light*
29. Aileron Cable and Pulley
30. Landing Gear Attach Bolts
31. Fuel Boost Pump
32. Nacelle Access
33. Navigation Light
34. Wing Tip Access**

*Prior to TJ-24
**Optional TJ-24 and after, TK-1 and after

Wing Access Openings (Sheet 2 of 2)
Figure 201

"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, the aileron hinge brackets and hinges, the 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. The main gear is bolted to heavy aluminum alloy fittings attached to the main and rear spar. The support brace is attached in the same manner. If the landing gear hinge bolt fittings are cracked, or if the spars are warped or buckled, replacement is necessary.

"END"

FLIGHT SURFACES - MAINTENANCE PRACTICES

AILERON BALANCING (Figure 201)

Control surfaces ordinarily need not be rebalanced unless they are repainted, repaired or have parts replaced.

NOTE

When the aileron surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge.

After any painting or repair, the surface must be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The left aileron assembly must be overbalanced (nose heavy) by 0.2 to 1.5 inch-pounds. The right aileron assembly must be overbalanced by 0.2 inch-pounds or more.

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, tab push rod, 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. 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.

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 aileron 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 201. 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 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, rule and spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

a. Locate the chord line at the inboard end of the surface by placing a straight edge at the inboard end so that one edge bisects the center of the hinge point and the trailing edge.

b. Mark the chord line.

c. Fit correct size bolts in the outboard and center hinge brackets and mount the elevator on the knife edges. Ensure that it is free to rotate about the hinge line.

d. Support the leading edge with a spindle resting on a levelled beam balance platform as illustrated.

NOTE

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.

e. 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.

f. Calculate the static underbalance moment "M" from the formula:

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 levelling blocks or shims on the scale platform (Pounds).

EXAMPLE

D is 11.5 inches, R is 1.12 lb. and T = 1.00 lb.
M - 11.5 (1.12 - 1.00); M = 1.38 inch-pounds M is within the range of both the left and right aileron and is therefore acceptable.

If the static balance is not satisfactory, pig lead weight may be added or removed to obtain static overbalance as illustrated in Figure 201.

CHECK BALANCE BY COUNTERBALANCE METHOD

The equipment required by counterbalancing is as follows:

a. A stand with knife edge supports as illustrated in Figure 201. 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, and 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. Secure the trim tab (LH only) in its neutral position with a small piece of masking tape.

c. 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.

d. To determine if the 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 201. The cup must be free to hang vertically.

e. 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.

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.

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

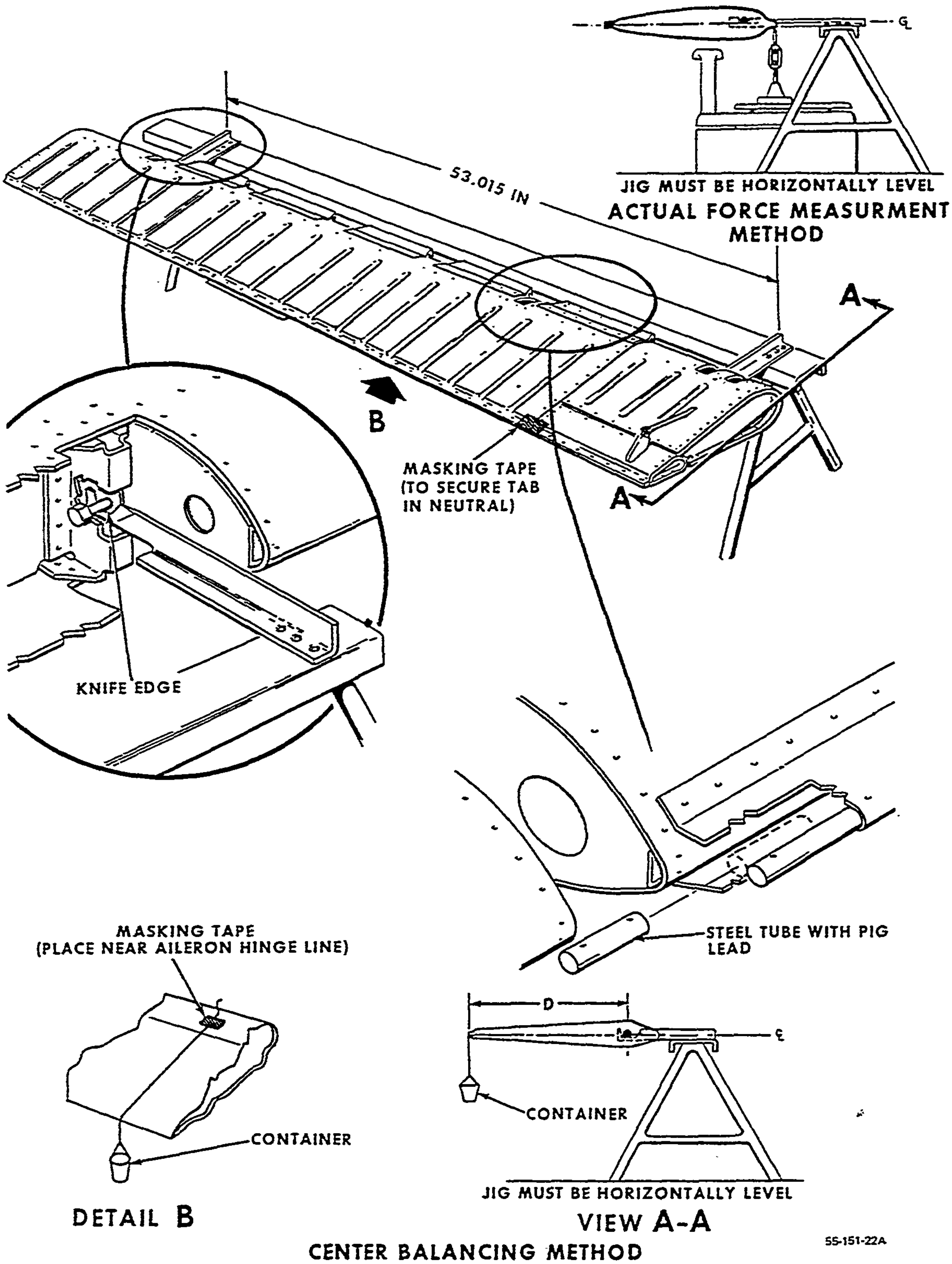
4. The following is a typical example of a balancing calculation: Assume the aileron is overbalanced (nose-heavy) and the paper cup was suspended from the trailing edge. Assume that the aileron balances with the chord line level at "W = .120 pound" and "D = 11.5 inches", then . . .

M = .12 x 11.5

M = 1.38 inch-pounds. The product of "W x D".

In this instance, "M" is within the required static balance range for both the left and right aileron and is therefore acceptable.

If the static balance is not acceptable, pig lead weight may be added or removed to obtain static overbalance as illustrated in Figure 201.



Balancing the Aileron
Figure 201

"END"

CHAPTER

61

PROPELLERS/ PROPULSORS

CHAPTER 61 - PROPELLERS

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"END"

CHAPTER 61

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"END"

PROPELLERS - DESCRIPTION AND OPERATION

HARTZELL

The propellers on TJ-3 and after (without dual-speed governors) are Hartzell PHC-J3YF/2F/FC8468/6R or PHC-J3YF/FC8468/6R three bladed, full feathering, constant speed, air dome propellers. The propellers on TJ-46, TJ-55, TJ-83, TJ-85 through TJ-443 except TJ-436 and TK-1 through TK-150 except TK-147 (equipped with dual-speed governors) are Hartzell PHC-J3YF-2F/FC7663DR or PHC-J3YF-2UF/FC7663DR three bladed, full feathering, constant speed, air dome propellers. Centrifugal force from the propeller counterweights, assisted by air pressure in the propeller dome moves the blades to high pitch. Engine oil under governor-boosted pressure moves the blades to low pitch. The propeller hub area and the air dome are enclosed by a spinner and bulkhead assembly.

MCCAULEY

The propellers on TJ-436, TJ-444 and after and TK-147, TK-151 and after are McCauley 3-blade full feathering, constant speed propellers. Spring force and couterweights are used to move the propeller toward high pitch or feather, while engine oil pressure (boosted by the governor pump) moves the propeller (controlled by the governor and prop control lever) toward low pitch. When a balance is reached between these two forces, the propeller will operate at a constant speed.

"END"

PROPELLER ASSEMBLY - MAINTENANCE PRACTICES

PROPELLER BLADE BEARING LUBRICATION (HARTZELL)

a. Remove the propeller spinner dome and cap.

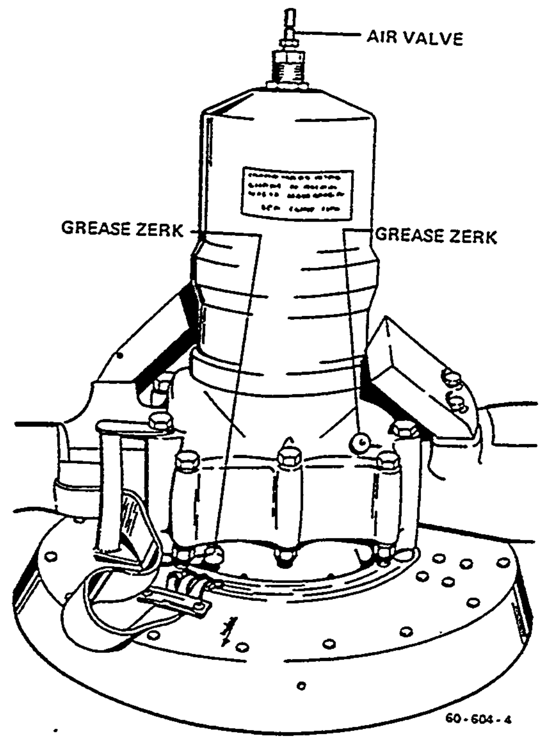
b. Remove the safety wire and covers from the grease zerks.

c. Remove one zerk from each blade.

d. Lubricate the blade bearings with MIL-G-23827 grease (11, Chart 207, 91-00-00) by placing the grease gun fitting on the remaining zerk on each blade. Fill until the grease is visible in the hole where the opposite zerk was removed.

e. Clean the excess grease from the propeller, reinstall the grease zerks, covers, and safety wire on each blade.

f. Reinstall the spinner dome and cap.



Hartzell Propeller Servicing Point
Figure 201

PROPELLER REMOVAL (HARTZELL)

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 upper engine cowling.

d. Remove the lower nose bug.

NOTE

The lower nose bug is removed to prevent oil from collecting in the bottom of the cowling during the propeller removal.

e. Clip and remove the safety wire from the six propeller attach studs and remove the self-locking hex nuts.

CAUTION

Do not remove the studs from the propeller.

f. Slowly pull the propeller forward until it comes loose from the shaft.

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.

g. To prevent damage to the deicer brushes, place a thin piece of cardboard over each set of brushes and secure with rubber bands.

PROPELLER INSTALLATION (HARTZELL)

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 207, 91-00-00).

b. Install the O-ring in the groove of the propeller hub.

c. Install the propeller on the propeller shaft.

NOTE

When installing the propeller, align the No. 1 propeller blade directly over the T/C mark on the crankshaft flange.

d. Install the six hex nuts in a diagonal pattern to 70-80 foot-pounds and safety.

e. Remove the rubber bands and thin strips of cardboard from the deicer brushes.

f. Install the lower nose bug.

g. Install the upper engine cowling.

h. Install the spinner dome.

NOTE

It is recommended that airplanes not equipped with the feather assist spring assembly be modified to add the spring backup kit in accordance with the Hartzell Propeller Overhaul Instruction Handbook, Manual 117D or subsequent. This kit should be installed at the earliest convenient time of the owner, but no later than the next 1400 hour overhaul. Propellers not having the feather assist spring are PHC-J3YF-2F/FC8468-6R and PHC-J3YF-2F/FC7663DR.

1. On airplanes TJ-3 through TJ-443 (except TJ-436) with PHC-J3YF-2F/FC8468-6R propeller assemblies, charge the propeller air dome cylinder with dry air or nitrogen to 100 ±2 psi at 70°F.

NOTE

Increase the pressure an additional 2 psi for every 10 degrees increase in temperature; similarly, for every 10 degrees drop in temperature, reduce the pressure by 2 psi.

2. On airplanes TJ-3 through TJ-443 (except TJ-436) with PHC-J3YF-2UF/FC8468-6R propeller assmblies, charge the air come as follows:

70°F to 100°F	66 ±2 psi
40°F to 70°F	62 ±2 psi
0°F to 40°F	58 ±2 psi
-30°F to 0°F	53 ±2 psi

3. On airplanes TJ-46, TJ-55, TJ-83, TJ-85 through TJ-443 (except TJ-436) and TK-1 through TK-150 (except TK-147) with PHC-J3YF-2F/FC7663DR propeller assemblies, fill to 80 ±2 psi at 70°F.

NOTE

Increase the pressure an additional 2 psi for every 10 degrees increase in temperature; similarly, for every 10 degrees drop in temperature, reduce the pressure by 2 psi.

4. On airplanes TJ-46, TJ-55, TJ-83,TJ-85 through TJ-443 (except TJ-436) and TK-1 through TK-150 (except TK-147) with PHC-J3YF-2UF/FC7663DR propeller assemblies, charge the air dome as follows:

70°F to 100°F	41 ±2 psi
40°F to 70°F	38 ±2 psi
0°F to 40°F	36 ±2 psi
-30°F to 0°F	33 ±2 psi

i. Install the spinner dome cap.

PROPELLER REMOVAL (MC CAULEY)

a. Remove the upper engine cowling.

b. Remove the lower engine nose bug.

c. Remove the propeller spinner.

d. If deicers are installed, secure the brushes in the brush block.

NOTE

Refer to Chapter 30-60-00.

e. Back off the 6 propeller attaching nuts approximately 1/4 inch.

f. Place a drain pan under the point of attachment between the propeller and the engine crankshaft, to catch draining engine oil.

g. Pull the propeller forward until stopped by the nuts.

h. Remove the nuts and pull the propeller forward removing it from the engine.

i. Remove the propeller deice slip ring (if installed).

j. Place clean rags into the engine and propeller oil cavities to prevent contamination with foreign objects.

PROPELLER INSTALLATION (MCCAULEY)

a. Clean the propeller and crankshaft mounting surfaces, including the bolts, bolt holes, crankshaft flange etc. Fine steel wool may be used, but all metal particles must be removed. The oil cavities of both the crankshaft and propeller must be clean.

CAUTION

Nicks, scratches, etc. particularly in the area of the O-ring, may cause oil leaks.

b. Install a new O-ring that is lightly lubricated with engine oil.

c. Lightly lubricate the crankshaft pilot with engine oil.

NOTE

All other surfaces should be clean and dry.

CAUTION

It is important that the propeller be seated against the crankshaft flange with a straight push. Rotating, cocking or wiggling may damage the O-ring or O-ring groove, resulting in oil leakage.

d. If applicable, install the deice slip ring.

e. Align the propeller mounting studs with the engine crankshaft flange and carefully slide the propeller over the crankshaft pilot until the mating surfaces are approximately 1/4 inch apart.

CAUTION

The attaching nuts may be reused if the break-away torque is at least 18 inch-pounds.

f. Install the attaching washers and nuts.

g. Push the propeller aft as far as possible.

h. Snug the attach nuts down evenly in a diagonal pattern.

i. Torque the attach nuts to 80-85 foot-pounds in a diagonal pattern.

j. Install the spinner as indicated under SPINNER INSTALLATION (McCauley).

k. If deicers are installed, release the brushes to ride on the slip rings.

NOTE

Refer to Chapter 30-60-00 and check that the brushes ride properly on the slip rings.

l. Install the nose bug and cowling.

SPINNER INSTALLATION (MCCAULEY)

a. Install and center the shims (spacers).

b. Install the plastic spinner shell support.

c. Position the spinner in place.

d. Lightly hold the spinner in while checking the bolt holes for a misalignment of approximately 3/64 of an inch.

NOTE

Add or remove shims to achieve 3/64 inch misalignment.

e. Pushing hard on the spinner, install four equally spaced screws and washers.

f. Relax the force on the spinner and install the remaining screws and washers.

PROPELLER ADJUSTMENT

For adjustment, service, overhaul and maintenance procedures, refer to the applicable FAA Approved Propeller Manual and/or Approved Propeller Overhaul Shop Manual. All pitch measurements are made at the 30 inch station and are as follows:

McCauley	Low Pitch	High Pitch
3 blade 3AF32C511-XG Hub 82NEA-4	16.1 ±.2°	82.5 ±.5°

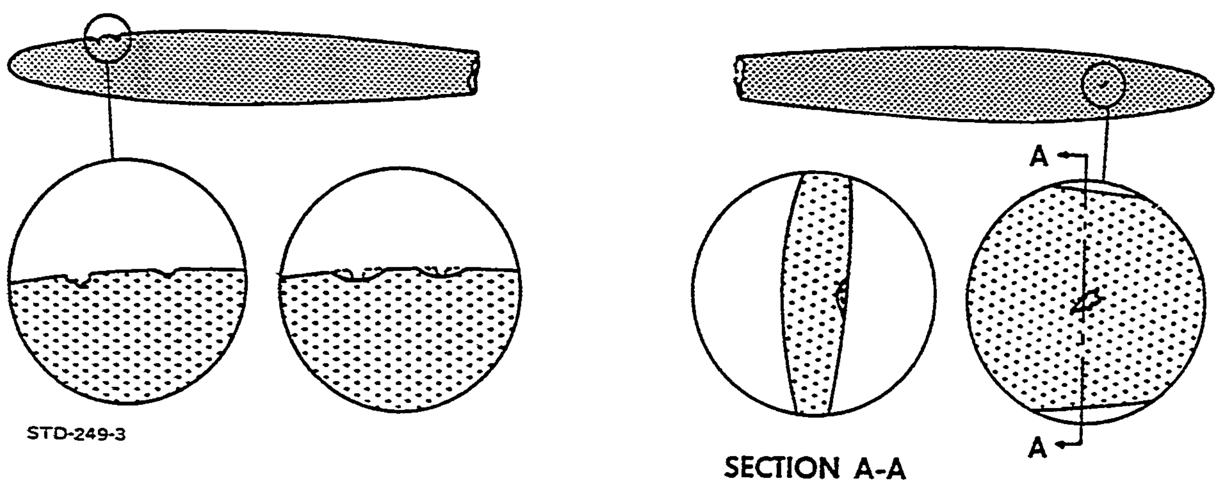
With or without deice boots.

MINOR PROPELLER BLADE REPAIR (Figure 202)

Minor nicks, dents, and gouges may be dressed out by approved line personel. Blend any nicks or gouges into the leading edge with smooth curves, and generous radii as shown in Figure 202. Reanodize reworked area by the chromic acid process only.

NOTE

The propeller blade may be shortened a maximum of 1/4 inch (minimum propeller diameter 79.5 inches, on airplanes having 80-inch diameter propellers) (minimum propeller diameter 77.5 inches on airplanes having 78 inch diameter propellers).



Minor Propeller Blade Repair
Figure 202

"END"

CONTROLLING - DESCRIPTION AND OPERATION

PROPELLER SYNCHRONIZER (Prior to TJ-317 and TK-134)

The optional propeller synchronizer automatically matches the rpm of the two engines. When the rpm of one engine changes, the other will automatically follow the change over a predetermined range. This limited range prevents either engine from losing more than a fixed amount of rpm in case the other engine is feathered while the propeller synchronizer remains ON.

A slotted disc in each governor passes a magnetic pick-up and an electric impulse is transmitted to a transistorized control box installed behind the pedestal. This control box measures the differences in the pulse rates and changes the governor speed settings by varying the coil voltage of each governor until the rpm of each engine is equal. The propeller synchronizer may be turned ON by a toggle switch located on the lower pedestal.

To operate the system, synchronize the propellers in the normal manner and turn the synchronizer ON. The propeller rpm of each engine will automatically adjust to the same rpm. To change rpm, adjust both propeller controls at the same time. This will keep the propeller rpm of each engine within the limited range of the synchronizer. If the synchronizer is ON and the propeller rpm will not synchronize, the propeller rpm is outside the synchronizer range. Turn the synchronizer OFF, readjust the rpm of each engine manually to equal rpm and turn the synchronizer ON.

DUAL-SPEED PROPELLER GOVERNORS TJ-2 thru TJ-168; TK-1 thru TK-84 (OPTIONAL) (Figure 1)

The dual-speed propeller governor system consists of a micro switch located in the pedestal, two pressure switches located behind the instrument panel, two reset lights on the instrument panel, two micro switches located on the governors and two propeller governors.

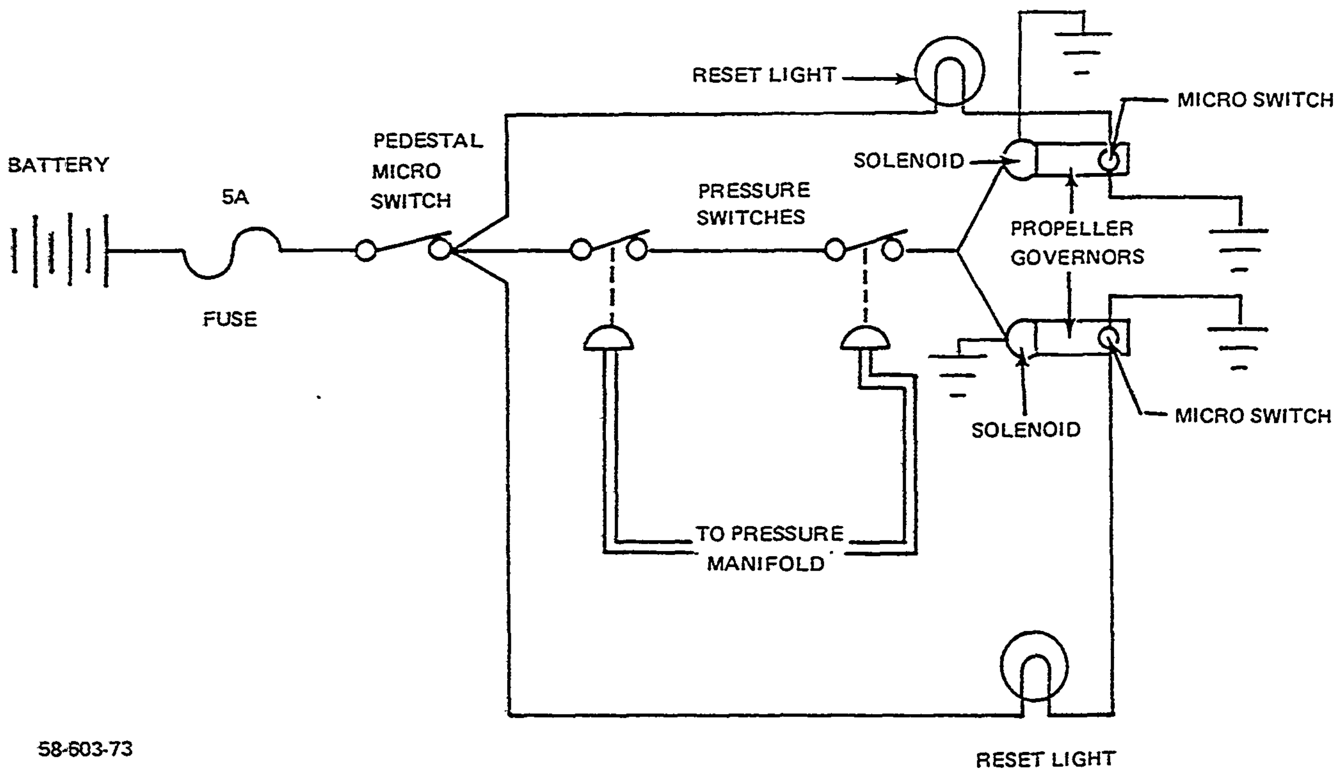
Electric power is supplied through the pedestal micro switch to the pressure switches and on to the two solenoids. With the solenoids electrically energized, the secondary governor arm is retarded, which governs the propeller speed at 2600 rpm. In the event of an engine failure or a power setting which will produce a 4 to 5 in. Hg difference in manifold pressure, one of the pressure switches will open, de-energizing both solenoids, which releases the secondary governor arm to increase propeller speed to 2700 rpm. When the secondary governor arm moves to the 2700 rpm position, it actuates the governor mounted micro switch, which provides ground to illuminate the reset lights on the instrument panel. A press-to-test switch is provided to test the reset lights for proper operation.

PROPELLER SYNCHROPHASER (TJ-317 and after, TK-134 and after)

The propeller synchrophaser automatically matches the rpm of both propellers, and maintains a pre-set phase angle relationship between the left and right engine firing orders: (when the number one cylinder of the left engine is at top dead center, the number two cylinder of the right engine is 20° before top dead center). The system's range of authority is limited to approximately 25 rpm. The synchrophaser will always speed-up the slower engine to match the rpm and firing order of the faster engine. Normal governor operation is unchanged but the synchrophaser will continuously monitor engine rpm and camshaft position, and adjust one governor as required.

A tach generator adapter (installed between the tach generator and the engine accessory tach drive pad) installed on each engine contains a magnetic pickup which transmitts an electric pulse to a transistorized control box (attached by hook and loop fabric to the aft side of the bulkhead in front of the copilot) once each revolution of the camshaft. The control box converts any pulse rate difference into correction commands, which are transmitted to the appropriate governor.

A toggle switch (placarded PROP SYNCH - ON - OFF) installed in the pedestal turns the system on. To operate the system, synchronize the propellers in the normal manner and turn the synchrophaser on. To change rpm, adjust both propellers at the same time. This will keep the setting within the limited range of the system. If the synchrophaser is on, but unable to match the propeller rpm, the system has reached its range limit. Turn the synchrophaser off, synchronize the propellers manually, then turn the synchrophaser on.



58-603-73

OPTIONAL DUAL-SPEED PROPELLER GOVERNOR SCHEMATIC
Figure 1

"END"

TROUBLESHOOTING
PROPELLER SYNCHRONIZER

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Synchronizer inoperative.		
a. Circuit breaker trips.	a. Short in airplane wiring.	a. Isolate and repair faulty component.
b. Intermittent readings on pins 1 & 3 or 1 & 5 (circuit breaker may also trip).	b. Intermittent short or open magnetic pickup in governor.	b. Repair or replace magnetic pickup.
c. Left governor pickup gives open or short circuit reading on pins 1 & 5.	c. Broken or grounded wire in magnetic pickup in governor.	c. Repair or replace magnetic pickup.
d. Right governor pickup gives an open or short reading on pins 1 & 3.	d. Broken or grounded wire in magnetic pickup in governor.	d. Repair or replace magnetic pickup.
e. Left governor coil gives an open or short reading on pins 6 & 7.	e. Broken or grounded wire in coil. Coil defective.	e. Repair or replace broken wire or replace governor.
f. Right governor coil gives an open or short reading on pins 4 & 7.	f. Broken or grounded wire in coil. Coil defective.	f. Repair or replace broken wire or replace governor.
g. Check control box fuse, may be blown.	g. Blown 24 ohm fuse.	g. Replace fuse and check for continuity.
h. Check Jones plug fuse and resistor, may be blown.	h. Both 5 amp fuse and 27 ohm resistor may be blown.	h. Isolate and repair faulty component.
i. Open circuit between pins 7 and 8.	i. Broken wire.	i. Repair or replace broken wire and check resistance between pins 7 and 8. Resistance should be 23 - 27 ohms.
j. Open circuit between pins 7, 4, and 6.	j. Broken wire.	j. Repair or replace broken wire and check resistance between pins 7, 4, and 6. Resistance should be 191 ohms.

2. Poor synchronization.		
a. Pickup voltage exceeds 3.0 volts at cruise rpm.	a. Insufficient pickup to flyweight head clearance.	a. Reset pickup to give specified voltage output. (See Woodward Governor Bulletin No. 33117.)
3. Oil leaks from magnetic pickup connection in governor body.	a. Defective O-ring between pick-up and lock nut.	a. Replace.
	b. Defective gasket under lock nut.	b. Replace.
	c. Nut loose.	c. Tighten to 25 inch-pounds.
	d. Defective pickup.	d. Replace pickup.

CAUTION

See Woodward Governor Bulletin No. 33117. Never turn pickup into flyweight head. Check voltage output.

TROUBLESHOOTING
OPTIONAL DUAL-SPEED GOVERNOR

TROUBLE	PROBABLE CAUSE	REMARKS
1. Governor reset lights will not come on when press-to-test switch is pressed.	a. Defective lights.	a. Replace lights.
	b. Defective switch.	b. Replace switch.
	c. Power to airplane is off.	c. Turn power on.
	d. Wiring shorted out between switch and lights.	d. Check for continuity and repair as necessary.
2. Manifold pressure gage indicates a 4 to 5 in. Hg differential but governor reset lights will come on.	a. Propeller levers are not in the high rpm position.	a. Place propeller levers in the high rpm position.
	b. Propeller governor mounted micro switch out of adjustment.	b. Adjust the propeller governor mounted micro switch.
	c. Defective manifold pressure gage.	c. Replace gage.
	d. Propeller governor high rpm out of adjustment.	d. Adjust propeller governor high rpm adjustment.
	e. Propeller governor malfunction.	e. Replace propeller governor.
	f. Short in wiring between lights and governor mounted micro switch.	f. Check for continuity and repair as necessary.
	g. Secondary governor arm binding.	g. Free secondary governor arm.
	h. Defective pressure switch.	h. Replace switch.
3. One propeller tachometer indicates 2700 rpm and the other propeller tachometer indicates 2600 rpm.	a. Defective solenoid.	a. Replace solenoid.
	b. Defective propeller governor.	b. Replace propeller governor.
	c. Governor high rpm out of adjustment.	c. Adjust or replace governor.
	d. Defective pressure switch.	d. Replace switch.
	e. Hole in pressure line.	e. Isolate damage and repair.

TROUBLESHOOTING
OPTIONAL DUAL-SPEED GOVERNOR (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
4. Both propeller tachometers indicate 2700 rpm.	a. Defective pedestal micro switch.	a. Replace switch.
	b. Pedestal micro switch out of adjustment.	b. Adjust or replace switch.
	c. Defective pressure switch.	c. Replace pressure switch.
	d. Defective propeller governor solenoids.	d. Replace solenoids.
	e. Propeller governor high rpm out of adjustment.	e. Adjust propeller governor high rpm.
	f. Blown fuse.	f. Replace fuse and isolate defective part causing power surge and replace defective part.
	g. Defective propeller tachometers.	g. Replace tachometers.
5. Governor reset lights come on and stay on. Propeller tachometer and engine manifold pressure gage readings are normal.	a. Wiring shorted out between propeller governor and pressure switches.	a. Isolate short and repair.
	b. Defective governor mounted micro switch.	b. Replace micro switch.
	c. Defective press-to-test switch.	c. Replace switch.
	d. Governor mounted micro switches out of adjustment.	d. Adjust or replace switch as necessary.
6. Governor reset lights come on and stay on. Propeller tachometer readings are normal, manifold pressure gage readings are falling.	a. Hole in pressure lines.	a. Isolate damage and repair.
	b. Defective manifold pressure gage.	b. Replace manifold pressure gage.

"END"

CONTROLLING - MAINTENANCE PRACTICES

PROPELLER GOVERNOR REMOVAL

a. Ensure the propellers are in the unfeathered (low pitch) position.
b. Remove the lower engine cowling.
c. Remove the engine baffling just forward of the propeller governor.
d. Remove the cotter pin, nut, washer and bolt attaching the adjusting rod end to the governor.
e. Disconnect all electrical wiring to the governor.

CAUTION

The magnetic pickup wires and the governor coil wires are not interchangeable. Tag and identify all electrical wires to facilitate reinstallation.

f. Disconnect the oil line from the governor.
g. Remove the four governor attaching hex nuts, remove the governor.
h. Cover the engine boss.

PROPELLER GOVERNOR INSTALLATION

a. Remove the cover from the engine boss; wipe the engine pad clean and install a new governor mounting pad gasket.

CAUTION

Make sure the gasket is placed on the engine mounting pad with the raised side of the screen up so that it will fit into the recess in the base of the governor.

b. Align the governor spline with the engine drive spline, and install the washers and hex nuts. Diagonally torque the nuts to 216 - 264 inch-pounds.
c. Connect the oil line to the governor.
d. Reconnect the electrical wires to the governor. These wires should have been properly identified during removal.
e. Install the bolt, washer, hex nut and cotter pin attaching the adjusting rod end to the governor.

NOTE

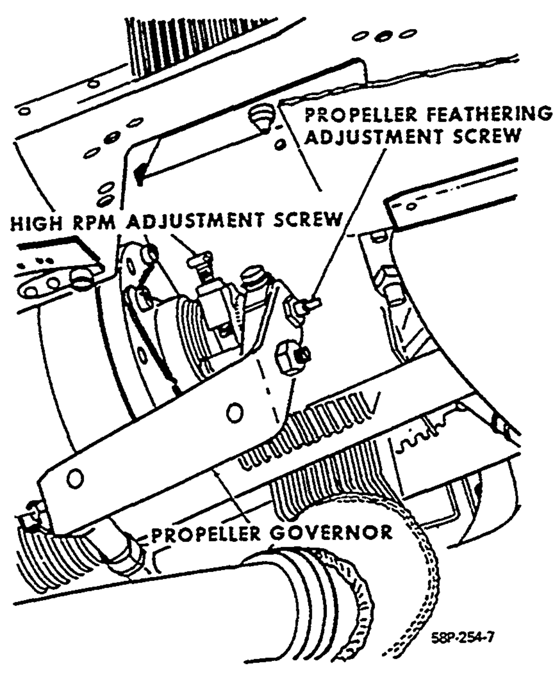
To ensure proper adjustment, do not turn the adjusting rod end when installing on the governor.

f. Install the engine baffling just forward of the propeller governor.
g. Install the lower engine cowling.

PROPELLER GOVERNOR ADJUSTMENT (Figure 201)

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 front of the governor (see Figure 201). One complete revolution of the screw reduces the propeller rpm by approximately 25-30 revolutions.



Propeller Governor Adjustment
Figure 201

PEDESTAL MICRO SWITCH ADJUSTMENT (INSTALLED WITH OPTIONAL DUAL-SPEED GOVERNOR)

The pedestal micro switch is actuated by the left propeller lever in the high rpm position. The pedestal micro switch cannot be accurately adjusted on the ground. The micro switch may be adjusted as follows:

a. With the airplane in flight and both propeller levers in the high rpm position, mark the position of the propeller levers when the propeller tachometer reads 2500 ± 50 rpm.

b. With the airplane on the ground move the left propeller lever to the marked position in step "a".

c. Adjust the pedestal micro switch open with the left propeller lever in the position indicated in the preceding step. The switch should close with the left propeller lever forward of this position.

PROPELLER GOVERNOR MICRO SWITCH ADJUSTMENT (INSTALLED WITH OPTIONAL DUAL-SPEED GOVERNOR) (FIGURE 201A)

a. Locate the micro switch on the lower left side of the governor. (See Figure 201A.)

b. Hook a volt-ohm meter across the micro switch leads.

c. Move the primary governor arm against the high rpm stop while holding the solenoid in the down position (2600 rpm).

d. Release solenoid to the up (2700 rpm) position while continuing to hold the primary governor arm against the high rpm stop. Observe the secondary governor arm movement to the 2700 rpm position. The switch should close showing an indication on the volt-ohm meter.

HIGH RPM ADJUSTMENT OF THE OPTIONAL DUAL-SPEED GOVERNOR

The high rpm adjustment must be checked while the airplane is in flight. Observe propeller rpm in straight and level flight with propeller in maximum rpm position. If the high rpm is more or less than 2600 rpm, adjust the high rpm adjusting screw on the propeller governor to obtain the 2600 rpm adjustment. To adjust the dual speed (2700 rpm) adjustment, observe the left propeller tachometer and propeller rpm reset lights on the instrument panel while retarding the right throttle lever until the lights come on. The left propeller tachometer should move to 2700 rpm. Note the rpm reading and repeat the high rpm (2700 rpm) adjustment for the right propeller governor. If the high rpm readings are not 2700 rpm adjust the secondary high rpm stop to allow the secondary governor arm to move to the 2700 rpm position.

PRESSURE SWITCH REMOVAL (INSTALLED WITH DUAL-SPEED GOVERNOR)

a. Locate the pressure switch behind the instrument panel.

b. Remove and tag electrical wiring.

c. Remove pressure hose from the pressure switch.

d. Remove pressure switch attaching hardware and remove switch.

PRESSURE SWITCH INSTALLATION (INSTALLED WITH DUAL-SPEED GOVERNOR)

a. Place pressure switch in the proper mounting position and secure with attaching hardware.

b. Install the pressure hose on the pressure switch.

c. Remove tags and install electrical wiring.

PROPELLER GOVERNOR MOUNTED MICRO SWITCH REMOVAL (INSTALLED WITH DUAL-SPEED GOVERNOR)

a. Remove nacelle access panels.

b. Gain access to the propeller governor and locate the micro switch mounted on the governor. (See Figure 201A.)

c. Remove and tag electrical wiring from the micro switch.

d. Remove the micro switch mounting hardware and remove the switch.

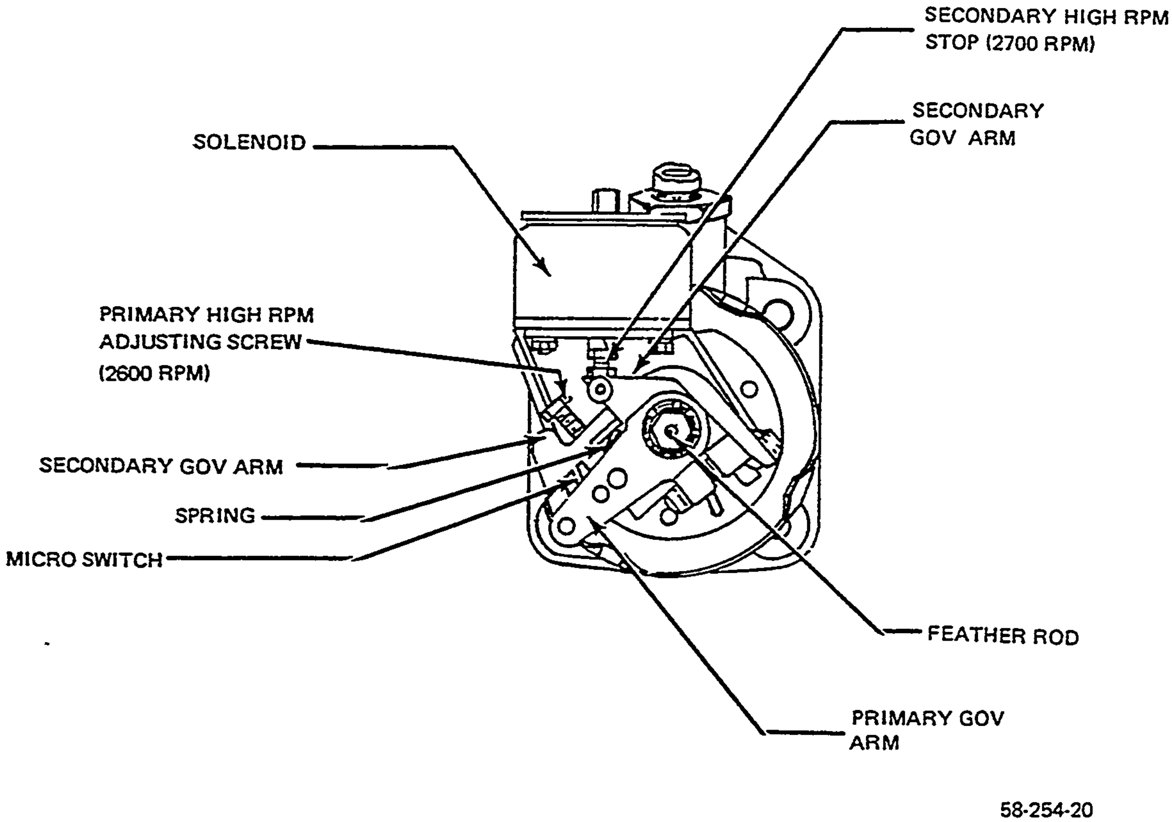
PROPELLER GOVERNOR MOUNTED MICRO SWITCH INSTALLATION (INSTALLED WITH DUAL-SPEED GOVERNOR)

a. Place the micro switch in the proper position.

b. Secure the micro switch in position with the mounting hardware.

c. Remove tags and install the electrical wires to the switch.

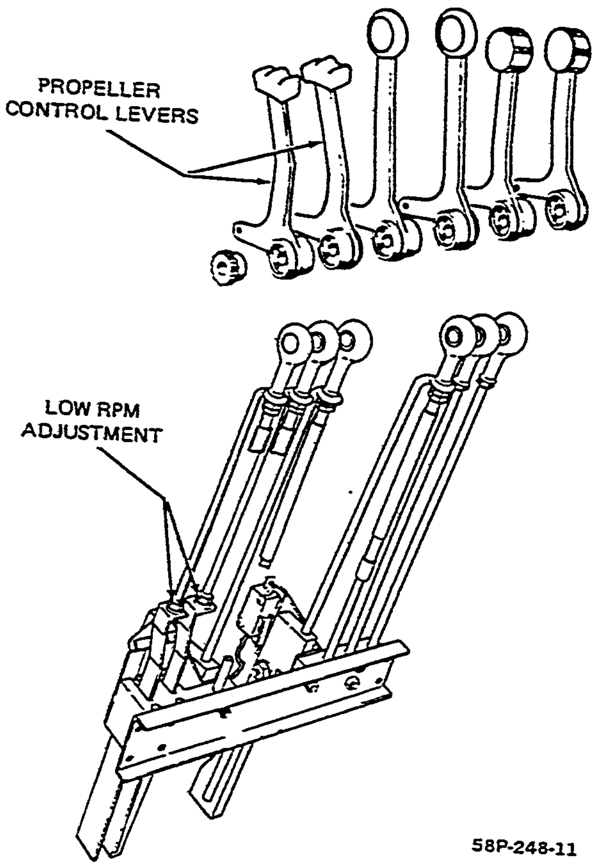
d. Secure nacelle access panels.



OPTIONAL DUAL-SPEED GOVERNOR
Figure 201A

LOW RPM ADJUSTMENT
(Figure 202)

The low rpm adjustment is made while the airplane is on the ground. To make this adjustment, pull the propeller levers back against the detent. 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 2050 ± 50 rpm, the low rpm setting must be adjusted. The low rpm adjustment is made on the detent rod which is located behind the instrument panel on the governor control linkage. To increase the setting, shorten the rod; to decrease the setting, lengthen the rod.



Propeller Low RPM Adjustment
Figure 202

FEATHERING ADJUSTMENT
(Figure 201)

To adjust the feathering action, pull the propeller control lever back through the detent and observe the point which the rpm setting begins to fall off sharply, then bring the propeller control lever back to low rpm. The point which propeller feathering starts should be at 1950 ± 25 rpm. If adjustment is required, turn the square-head screw on the end of the governor control shaft inward or outward to correct the setting. One revolution of the screw inward will lower the feathering rpm approximately 100 revolutions.

PROPELLER ADJUSTMENT

For High and Low pitch adjustments, service, overhaul and maintenance procedures, refer to the applicable manufacture's FAA Approved Propeller Manuals.

PROPELLER ACCUMULATOR REMOVAL

(For airplanes which are equipped with the unfeathering accumulator.)

a. Check the propeller control lever for the unfeathering (low pitch) position, to release accumulator pressure.

CAUTION

This system has approximately 300 psi of pressure with the propeller in the full-feather position.

b. Remove the lower engine cowling.
c. Remove the accumulator oil line from the forward end of the accumulator.
d. Remove the attach bolts and attach bracket from the accumulator and remove the accumulator from the heat shield and the airplane.

PROPELLER ACCUMULATOR INSTALLATION

a. Position the accumulator, heat shield and attach bracket and secure with the attach bolts.
b. Install the accumulator oil line on the forward end of the accumulator.
c. Charge the accumulator with dry compressed air or nitrogen to 125 psi at 70° F.

NOTE

Increase the pressure an additional 2 psi for every 10 degrees of increase in temperature; similarly, for every 10 degrees of drop in temperature, reduce the pressure by 2 psi.

d. Install the lower engine cowling.
e. Check the unfeathering accumulator for proper operation.

SYNCHRONIZER FUNCTIONAL TEST

Proper operation of the propeller synchronizer can be determined by the following method. Manually adjust the propeller control levers to equal rpm. Turn the propeller synchronizer ON. Slowly adjust, in small increments, either propeller governor, to increase or decrease rpm. The rpm should remain synchronized over a limited range predetermined by the synchronizer. Turn the synchronizer OFF and establish a maximum of 25 rpm difference between the engine rpm of the left and right engines. Turn the synchronizer ON and the rpm of both engines should synchronize.

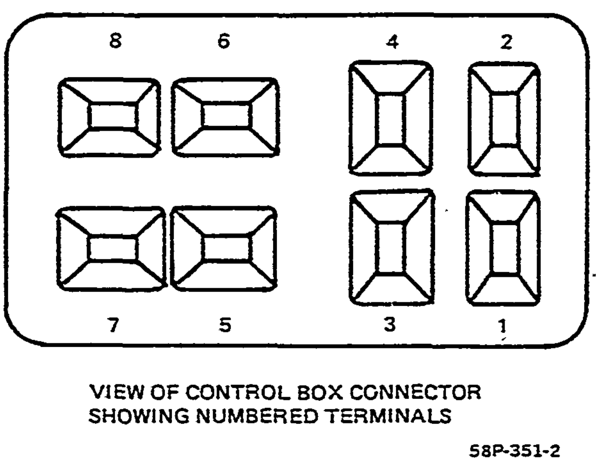
SYNCHRONIZER CHECKS

These checks will help locate the source of trouble should the synchronizer system malfunction. If no malfunctions are found among the units being tested, the transistorized control box is probably the source of trouble. An ohmmeter, voltmeter and oscilloscope are required to conduct the tests below.

SYNCHRONIZER WIRING CHECK

a. To eliminate the most obvious causes for malfunction, make sure that the airplane battery master switch is ON, that the propeller synchronizer circuit breaker is not tripped, and that the modified Jones plug receptacle is properly mated with the plug in the airplane electrical system.

b. Unplug the control box, turn the airplane master switch OFF, and pull the propeller synchronizer circuit breaker before proceeding further with these checks.



Synchronizer Plug
Figure 203

c. Complete the following resistance checks: (See Figure 203.)

CAUTION

Zero the ohmmeter and read on the X1 or X10 scale during the following checks. Do not use a probe greater than .045 inch in thickness. Insert and remove the probe carefully to avoid damaging the pin connectors.

NOTE

Readings may be 20 percent higher during heat soak following engine shutdown.

CHART 201
SYNCHRONIZER RESISTANCE

TEST BETWEEN RECEPTACLE NUMBERS	OHM METER READING
1 and airplane ground	0 - ohms
2 and airplane ground	open circuit
3 and airplane ground	52 - 68 ohms
4 and airplane ground	open circuit
5 and airplane ground	52 - 68 ohms
6 and airplane ground	open circuit
7 and airplane ground	open circuit
4 and 7	112 - 138 ohms
6 and 7	112 - 138 ohms
7 and 8	23 - 27 ohms

1. Check the resistance between pin 1 and airplane ground. The ohmmeter should indicate 0 ohms.
2. Check the resistance between pin 2 and airplane ground. The ohmmeter should indicate an open circuit.
3. Check the resistance between pin 3 and airplane ground. The ohmmeter should indicate 52 - 68 ohms.
4. Check the resistance between pin 4 and airplane ground. The ohmmeter should indicate an open circuit.
5. Check the resistance between pin 5 and airplane ground. The ohmmeter should indicate 52 - 68 ohms.
6. Check the resistance between pin 6 and

airplane ground. The ohmmeter should indicate an open circuit.

7. Check the resistance between pin 7 and airplane ground. The ohmmeter should indicate an open circuit.

8. Check the resistance between pins 4 and 7. The ohmmeter should indicate 112 - 138 ohms.

9. Check the resistance between pins 6 and 7. The ohmmeter should indicate 112 - 138 ohms.

10. Check the resistance between pins 7 and 8. The ohmmeter should indicate 23 - 27 ohms. The plug incorporates a resistor and a fuse between these pins.

d. Turn the airplane battery master switch ON and reset the propeller synchronizer circuit breaker, but leave the control box unplugged.

e. Using a dc voltmeter, check that the voltage between pin receptacles 1 and 2 is the same as the supply voltage, 28.25 ± .25 vdc, and the polarity of pin number 1 is negative while that of pin number 2 is positive.

f. Using an oscilloscope, check the voltage between pins 5 and 1 and 3 and 1. With the engine operating at cruise rpm, the oscilloscope should indicate 3.0 volts, peak to peak. The voltage should not read less than 2.0, peak to peak, at minimum cruise rpm nor more than 10.0 volts, peak to peak, at maximum cruise rpm.

NOTE

These readings are based on a magnetic pickup/toothed wheel clearance gap of approximately .005 inch. If adjustment is required, refer to the Woodward Test Specification SP-197 for adjustment procedures.

g. When the system is in compliance with the preceding check values, plug the control box into the synchronizer system and flight check.

FLIGHT CHECKS

a. Check the effect of rpm and/or power setting, particularly in the lower cruise range on synchronizer action. If operation at lower rpm resulted in improved synchronization, inspect the drives to the governors.

b. Reduce the electrical load and turn off the generator and all other electrical units, except the master switch, and synchronizer if synchronizing improves, abnormal voltage spikes on the airplane bus from some other electrical accessory may have been upsetting the synchronizer. Isolate the offending accessory and repair it. If the trouble lies in the control box, replace it.

SYNCHROPHASER FUNCTIONAL TEST

The rpm range of the synchrophaser may be checked in cruise by slowly moving either propeller control toward both high and low rpm until propellers are no longer synchronized.

Note the range of rpm over which one engine remains synchronized with the other engine. This is the limited range provided for safety and is the maximum speed adjustment range beyond which the one engine cannot be adjusted to the other.

During the function test, determine that the communications and navigation equipment is not affected by the synchrophaser. Check to determine that the synchrophaser is not affected by the operation of other electrical equipment.

SYNCHROPHASER CHECKS

These checks will help locate the source of trouble should the synchrophaser system malfunction. If no malfunctions are found among the units being tested, the transistorized control box is probably the source of trouble. An ohmmeter, voltmeter and oscilloscope are required to conduct the tests below.

SYNCHROPHASER WIRING TEST

CAUTION

Do not plug in control box until this test has been satisfactorily completed. Even with switch "OFF" the box could be seriously damaged.

a. Unplug the control box, turn the airplane battery master switch OFF, and pull the synchrophaser circuit breaker.

NOTE

If another accessory uses the same circuit breaker as the engine synchrophaser, that circuit should be disconnected while checking the resistance readings.

b. Make the following tests, using an ohmmeter on the X1 or X10 scale to the pin receptacles in the Jones plug. Resistance readings may be 20% higher during heat soak following shutdown.

NOTE

Observe the ohmmeter as you connect the pickups and coils to verify that wires 1, 5, 6, and 8 go to the left engine and wires 1, 3, 4, and 8 go to the right engine.

CHART 202
SYNCHROPHASER RESISTANCE

TEST BETWEEN RECEPTACLE NUMBERS	OHMMETER READING
1 and airplane ground	0 - Ohms
2 and airplane ground	open circuit
3 and airplane ground	52 - 68 ohms
4 and airplane ground	open circuit
5 and airplane ground	52 - 68 ohms
6 and airplane ground	open circuit
7 and airplane ground	open circuit
8 and airplane ground	open circuit
4 and 8	112 - 138 ohms
6 and 8	112 - 138 ohms

c. When the system meets all of the above test values, turn the master switch ON and reset the synchrophaser circuit breaker (control box must still be unplugged) and make the following voltage check.

TEST BETWEEN RECEPTACLE NUMBERS	VOLT METER READINGS
2 and 1	Same as supply voltage and polarity of Pin 2 must be positive & pin 1 negative

NOTE

When the system complies with the specification above, the control box may be connected.

d. If it becomes necessary to check the voltage output of the speed pickup, you will need an oscilloscope. The voltage between pins 5 & 1 and between pins 3 & 1 should be 3 volts A.C., peak to peak, at cruise rpm. The voltage should not be less than 2, peak to peak, at minimum cruise rpm, nor more than 10, peak to peak, at maximum cruise rpm. This requires a magnetic pickup target clearance gap of approximately .020 inch.

NOTE

The A.C. voltage is produced by one target. You will not be able to interpret the peak voltage with a typical R.M.S. reading voltmeter, such as a Simpson or Triplett.

100-HOUR INSPECTION

PROPELLER - Inspect the propeller for nicks, dents, cracks, evidence of leakage, condition and security.

AIR DOME - Check the propeller air dome for correct pressure.

DEICER BOOTS - Check the boots for hot spots, exposed heating element wires, tears and security to the blades.

SPINNER AND BULKHEAD - Check the spinner and bulkhead for nicks, dents, cracks, condition and security. Check deicer boot wires for security at the starter ring gear.

PROPELLER GOVERNORS - Inspect the governor for oil leakage, condition and security.

CONTROL LEVERS - Check levers for smooth and free movement and cushion. Check controls at the governor for security and full travel against the stops.

ACCUMULATOR - Inspect for oil leakage, condition and security. Check air pressure.

SYNCHRONIZER - Check all components of the system for condition and security. Any discrepancies noted during ground or flight should be isolated using the troubleshooting chart and the wiring check. Consult Woodward Governor Bulletins 33117, 33002A and SP197 for further detailed information.

"END"

CHAPTER

71

POWERPLANT

CHAPTER 71

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	103	Apr 1/75
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	201	Nov 30/78
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CHAPTER 71 - POWER PLANT

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"END"

GENERAL - DESCRIPTION AND OPERATION

TJ-2 AND AFTER

The airplane is equipped with Continental TSIO-520-L or LB engines, TJ-2 thru TJ-168, and Continental TSIO-520-WB engines, TJ-169 and after. The TSIO-520-L and LB engines are identical except that the TSIO-520-LB engine has an improved crankshaft, and other changes related to the improved crankshaft. The Continental TSIO-520-WB and LB engines are identical except that the TSIO-520-WB engine is certificated at a higher horsepower for both take-off and maximum continuous power.

The TSIO-520-L and LB engines are rated at 310 horsepower each at 2700 rpm and 38 in. Hg. An optional dual speed governor is available that reduces engine performance to 301 horsepower at 2600 rpm and 38 in. Hg. The governor system allows either engine to operate "under emergency single engine operation" at a rated horsepower of 310 at 2700 rpm and 38 in. Hg. The TSIO-520-WB engine is rated at 325 horsepower at 2700 rpm and 39.5 in. Hg.

The engines are turbocharged for high altitude performance to 25,000 feet. Each engine drives a three-bladed propeller. The propellers are constant speed, full feathering and hydraulically controlled.

The turbocharger provides compressor bleed air for the cabin pressure for passenger comfort through the flight envelope.

TK-1 AND AFTER

The airplane is equipped with Continental TSIO-520-L or LB engines, TK-1 thru TK-84, and Continental TSIO-520-WB engines, TK-85 and after. The TSIO-520-L and LB engines are identical except that the TSIO-520-LB engine has an improved crankshaft, and other changes related to the improved crankshaft. The Continental TSIO-520 WB and LB engines are identical except that the TSIO-520 WB engine is certificated at a higher horsepower for both take-off and maximum continuous power.

The TSIO-520-L and LB engines are rated at 310 horsepower each at 2700 rpm and 38 in. Hg. An optional dual speed governor is available that reduces engine performance to 301 horsepower at 2600 rpm and 38 in. Hg. The governor system allows either engine to operate "under emergency single engine operation" at a rated horsepower of 310 at 2700 rpm and 38 in. Hg. The TSIO-520-WB engine is rated at 325 horsepower at 2700 rpm and 39.5 in. Hg.

The engines are turbocharged for high altitude performance to 25,000 feet. Each engine drives a three-bladed propeller. The propellers are constant speed, full feathering and hydraulically controlled.

"END"

TROUBLESHOOTING ENGINE

NOTE

The troubleshooting chart is provided as a guide. Review all probable causes given, check other listings of trouble with similar symptoms. Items are presented in sequence of the approximate ease of checking, not necessarily in order of probability.

INDICATION	*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.
	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. 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 mixture adjustment at engine.	b. Adjust idle mixture at engine.
	c. Incorrect idle speed adjustment at engine.	c. Adjust idle speed at engine.
	d. Induction system leak.	d. Tighten or replace loose or damaged hose connections.
	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.
3. Low Power and Uneven Running.	a. Restrictions in air intake passages.	a. Check passages and remove restrictions.
	b. Throttle and mixture control out of adjustment.	b. Check and adjust idle mixture and idle speed at engine.

TROUBLESHOOTING ENGINE (Cont'd)

INDICATION	*PROBABLE CAUSE*	*REMARKS*
3. Low Power and Uneven Running. (Cont'd)	c. Exhaust system leakage.	c. Locate and correct.
	d. Defective spark plugs.	d. Clean and gap or replace spark plugs.
	e. Improper fuel.	e. Drain fuel and 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.
4. Failure of Engine to Develop Full Power.	a. Induction system leakage.	a. Tighten all connections, replace any defective parts.
	b. Throttle lever out of adjustment.	b. Check travel of throttle linkage.
	c. Improper fuel flow.	c. Check strainers and flow at fuel injector.
	d. Restriction in air intake passages.	d. Check passages and remove restrictions.
	e. Improper fuel.	e. Drain and refill cells with recommended grade.
5. 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 cooler core if presence of alkaline solids is due to a previous cleaning with alkaline materials.)
	d. Defective pressure pump.	d. Replace pump.
	e. Malfunctioning pressure gage.	e. Check gage. Clean plumbing. Replace if required.
	f. Weak or broken oil pressure valve spring.	f. Replace spring. Adjust pressure to 30-60 psi by adjusting screw.

TROUBLESHOOTING ENGINE (Cont'd)

INDICATION	*PROBABLE CAUSE*	*REMARKS*
5. Low Oil Pressure. (Cont'd)	g. Clogged oil filter.	g. Replace oil filter.
6. 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 in-operative, replace.
	e. Oil viscosity too high for prevailing ambient temperature.	e. Drain and refill with recommended oil of proper viscosity.
	f. Prolonged ground operation.	f. Limit ground operation to a minimum.
	g. Malfunctioning gage or bulb unit.	g. Check wiring. Check bulb unit. Check gage. Replace defective parts.
7. Excessive Oil Consumption.	a. Low grade of 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.
8. Low Fuel Pressure.	a. Restricted mixture control travel.	a. Check mixture control for full travel. Adjust as necessary. Replace damaged parts.
	b. Clogged fuel filter or fuel lines.	b. Check fuel lines for restrictions. Clean fuel filters. Replace defective parts.
	c. Fuel nozzle vent system defective.	c. Tighten fuel vent system connections, replace defect-ive parts.

TROUBLESHOOTING ENGINE (Cont'd)

INDICATION	*PROBABLE CAUSE*	*REMARKS*
8. Low Fuel Pressure (Cont'd)	d. Fuel control lever interference.	d. Check operation of throttle and for possible interference. Adjust as required for proper operation.
	e. Incorrect fuel injector pump adjustment and operation.	e. Check and adjust injector pump. Replace if defective.
	f. Defective fuel injector pump relief valve.	f. Replace pump.
	g. Air leak in fuel pump pressure line.	g. Locate leak and correct.
9. High Fuel Pressure.	a. Clogged or defective fuel nozzles.	a. Clean or replace fuel nozzles.
	b. Defective fuel manifold valve.	b. Replace fuel manifold valve.
	c. Defective relief valve operation in fuel injector.	c. Tighten fuel injector pump control line from turbocharger connections. Replace control line if damaged.
	d. Restricted recirculation passage in fuel injector pump.	d. Replace pump.
	e. Air leak in fuel pump pressure line.	e. Locate leak and correct.
10. Fluctuating Fuel Pressure.	a. Vapor in fuel system, excess fuel temperature.	a. Operate fuel boost pump and purge the system.
	b. Fuel gage line leak.	b. Tighten connections. Replace damaged line.
	c. Fuel in fuel gage line.	c. Drain line. Replace line if damaged.
11. White Smoke Exhaust.	a. Turbocharger choking.	a. Clean or change turbocharger.
	b. Oil forced through seal of turbine housing.	b. Replace seal or replace turbocharger.

"END"

GENERAL - MAINTENANCE PRACTICES

ENGINE REMOVAL

CAUTION

The engine induction air is supplied through a fiberglass duct located in the left hand section of the engine compartment. Care should be taken when removing or installing the engine that no dirt or foreign objects, be allowed to enter the induction system. Be careful not to damage the fiberglass ductwork attached to the firewall.

a. Check the magneto switches for "OFF" position.

WARNING

To be safe, treat all magnetos as hot whenever the ground lead is disconnected. To ground the magneto, disconnect the magneto switch lead wire at the capacitor and ground the capacitor pole. If this is impractical, remove the ignition harness distributor cap, or disconnect the spark plug leads.

b. Remove the upper and lower 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 all engine controls.
g. Place a wing stand under the opposite wing and a support under the tail.
h. Position the engine hoist and attach the hoisting sling to the three lifting eyes on the engine.
i. Remove the slack from the hoisting cable and remove the bolts that attach the engine mounts to the firewall.
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. Refer to the Continental Engine Overhaul Manual, X-30042 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 mount (isolators) bolts to 325 ± 25 inch-pounds.

ENGINE INSTALLATION

a. Observe the WARNING and CAUTION notes in ENGINE REMOVAL.
b. Position the engine hoist and attach the hoisting sling to the three lifting eyes on 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 ± 25 inch-pounds.

NOTE

If the engine mount bolt nuts are replaced, use a magnet to ensure they are steel.

f. Disconnect the hoisting sling and move the hoist clear of the airplane.
g. Connect all electrical wiring at the firewall.

NOTE

Fuel and oil line fittings which have B-nuts require special torque values. (Refer to Chart 201 of Chapter 91.)

h. Connect all plumbing at the firewall, and all ducting.
i. Connect and adjust all engine controls. (Refer to Chapter 61-20-00 and 71-00-00).
j. Install the propeller. (Refer to Chapter 61-10-00.)
k. Install the upper and lower engine cowling. (Refer to Chapter 71-10-00.)
l. 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 for Servicing.)

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 460°F. Never allow the cylinder head temperature to exceed 460°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 check-out.

f. Use a throttle setting of 1000 to 1500 rpm for engine warm-up.

NOTE

An oil pressure indication of 10 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 30-60 psi, 10 psi at idle and (cold oil) 100 psi maximum.

IDLE SPEED AND MIXTURE ADJUSTMENT

a. Start the engine and run at 1000 to 1500 rpm until the oil and cylinder head temperature gages read normal.

b. Perform MAGNETO DROP-OFF CHECK as described in Chapter 74-10-00. If magneto drop-off is normal, proceed with the idle adjustment.

c. Slowly retard the throttle lever to the idle position. The tachometer should indicate 650 rpm (normal idle setting). To adjust, turn the idle speed 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 in rpm while leaning out indicates the idle mixture is on the rich side of best power. An immediate decrease in rpm (if not proceded by a momentary increase) indicates that the idle mixture is on the lean side of best power. The desired idle setting is a compromise between one that is rich enough to provide a satisfactory acceleration under all conditions and lean enough to prevent spark plug fouling or rough operation. A rise of 25-50 rpm will usually satisfy both of these conditions.

e. Adjust the idle mixture by either lengthening or shortening the linkage between the throttle lever and idle valve lever. When the linkage is adjusted to a longer length, a richer mixture is provided. When the linkage is shortened, a leaner mixture is provided.

NOTE

In the event that the linkage must be removed to readjust the length, the idle valve screw should be loosened and the idle valve assembly pulled out slightly. This will prevent bending of the linkage stud by providing clearance between the body casting and lever. For major adjustments refer to Bendix Manual Form 15-596.

f. Each time an adjustment is changed, clear the engine by running it up to 2000 rpm before making mixture check.

g. Recheck idle speed as stated in step "c". Make final idle speed adjustment if necessary.

NOTE

If the setting does not remain stable, check the idle linkage; any looseness in this linkage will cause erratic idling. In all cases, allowance should be made for the effect of weather conditions upon idling adjustment.

OIL PRESSURE ADJUSTMENT

The oil pressure adjustment screw is part of the pressure relief valve located on the oil filter housing. Adjust the oil pressure to 30-60 psi, with the engine operating at cruise rpm and oil temperature in normal range.

"END"

COWLING - MAINTENANCE PRACTICES

COWLING REMOVAL

a. Remove cowl access panels.

b. Open cowl flap doors and remove pin, castellated nut, washer and bolt from the cowl flap actuator rod end.

CAUTION

Support the lower cowl with blocks before removing attaching screws.

c. Remove screws that attach cowling to nose bug and aft attaching point and remove cowling.

COWLING INSTALLATION

a. Place cowling in position. Support lower cowl until installation is completed.

b. Secure upper and lower cowl with screws at the nose bug and at the aft attaching point.

c. Attach cowl flap actuator rod end to cowl flap with bolt, washer, pin and castellated nut. Rig the cowl flap actuator as described in COWL FLAP ACTUATOR RIGGING in this Chapter.

d. Install and secure cowl access panels.

COWL FLAP ACTUATOR REMOVAL

a. With the cowl flap open, disconnect the cowl flap actuator rod end from cowl flap.

b. Remove the bolts from the cowl flap hinge and remove the cowl flap.

c. Tag and remove the electrical leads from the cowl flap actuator terminals.

d. Remove the pin, castellated nut, washer and bolt that attach the cowl flap actuator to the structural support and remove actuator.

COWL FLAP AND ACTUATOR INSTALLATION

a. Place the cowl flap actuator in position at the structural support and secure with bolt, washer, castellated nut and pin.

b. Connect the electrical leads to the cowl flap actuator terminals.

c. Place the cowl flap in position on the cowl flap hinge and secure with bolts.

d. Attach the cowl flap actuator to the cowl flap and rig as described in RIGGING THE COWL FLAP ACTUATOR in this Chapter.

RIGGING THE COWL FLAP ACTUATOR

a. Set the cowl flap actuator to 9.07 inches open (fully extended).

b. Attach the cowl flap actuator to the cowl flap with bolt, washer, pin and castellated nut.

c. Adjust the cowl flap actuator in the fully retracted position, the cowl flap shall be flush with the cowling, within 0.06 inch. With the actuator in the extended position, the upper edges of the cowl flap should be parallel to the cowling and just inside.

d. Operate the cowl flap. The cowl flap actuator should not bind or make contact with the cowl flap or structure through the entire range of movement.

"END"

CHAPTER

72

ENGINES

CHAPTER 72

LIST OF PAGE EFFECTIVITY

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CHAPTER 72 - ENGINE

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SUBJECT

GENERAL

FRONT SECTION

POWER SECTION

CYLINDER SECTION

TURBOCHARGER SECTION

LUBRICATION

NOTE

Refer to the Continental Engine Overhaul and Maintenance Manual, P/N X30042, for detailed information on the above subjects.

"END"

CHAPTER

73

ENGINE FUEL AND CONTROL

CHAPTER 73

LIST OF PAGE EFFECTIVITY

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73-EFFECTIVITY/CONTENTS	1	Oct 6/83
73-30-00	201	Oct 6/83

CHAPTER 73 - ENGINE FUEL AND CONTROL

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Maintenance Practices		201
Fuel flow Indicator		201
Transducer or Transmitter Removal		201
Transducer or Transmitter Installation		201

"END"

FUEL FLOW INDICATING - MAINTENANCE PRACTICES

FUEL FLOW INDICATOR

The fuel flow indicator is an aid to the pilot when leaning the engines during flight. The major components of the system are the transducer or transmitter and the indicator. The transducer or transmitter is located in the fuel line of each engine forward of the firewall. This device generates a signal that is directed to the fuel flow indicator. The fuel flow indicator gives a readout in gallons of fuel per hour. The indicator has dual pointers, one for each engine, and is located in the upper RH corner of the engine instruments cluster. The circuit breaker is located in the left subpanel.

TRANSDUCER OR TRANSMITTER REMOVAL

a. Remove top cowling.
b. Disconnect the electrical wiring at the connection.
c. Disconnect the two fuel lines from the transducer or transmitter by unscrewing the nuts securing the fuel lines to the transducer or transmitter. Cover the ends of the fuel lines to prevent contaminants from entering the fuel lines.
d. Cut the safety wire from the two clamps securing the transducer or transmitter to the mounting bracket and remove the two clamps. Remove the transducer or transmitter.

TRANSDUCER OR TRANSMITTER INSTALLATION

a. Position the transducer or transmitter in place on the mounting bracket and secure with the two clamps. Safety wire the clamps.
b. Uncap and reconnect the two fuel lines.
c. Connect the electrical wiring at the connection.
d. Close the engine cowl.

ENGINE DRIVEN FUEL PUMP REMOVAL, INSTALLATION AND ADJUSTMENT

Refer in this manual to Chapter 28-20-00, page 201 for instructions pertaining to these procedures.

"END"

CHAPTER

74

IGNITION

CHAPTER 74

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CHAPTER 74 - IGNITION

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Maintenance Practices		201
Magneto Drop-Off Check		201
Magneto Breaker Point Adjustment		201
Bendix Magneto Timing		201
DISTRIBUTION	74-20-00	
Maintenance Practices		201

"END"

GENERAL - DESCRIPTION AND OPERATION

Each engine is equipped with two Bendix S-1200 series magnetos. The left magneto incorporates a retard breaker and a main breaker. The right magneto has only the main breaker. A starting ignition vibrator supplies electrical current through the retard breaker of the left magneto, providing a retarded ignition for engine starting regardless of engine speed. The retard breaker is actuated by the same cam as the main breaker and are positioned so that its contacts open a predetermined number of degrees after the main breaker.

The combination ignition and starter switch has five positions:

OFF - both magnetos are not operating.

R - right magneto is operating, the left is inoperative.

L - left magneto is operating, the right is inoperative.

BOTH - both magnetos are operating.

START - the starter solenoid is operating, causing vibrator current to flow through the retard breaker of the left magneto while the right magneto is grounded to prevent advanced ignition.

Rotating the switch from START to BOTH, opens the ground on the right magneto, stops the current flow to the starter solenoid and vibrator stopping ignition through the retard breaker of the left magneto and permitting normal operation of both magnetos for engine operation.

"END"

TROUBLESHOOTING
IGNITION SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Hard starting.	a. Low voltage at vibrator input.	a. Measure voltage between vibrator terminal marked IN and the ground terminal while operating starter. A reading of at least 28.5 volts must be obtained.
	b. Inoperative or defective vibrator.	b. If voltage is adequate, listen for buzzing of vibrator during starting. If no buzzing is heard, either the vibrator is defective or the circuit from the output terminal on the vibrator to the left magneto retard breaker is open. Check both switch and retard circuits. Also check for good electrical ground.
	c. Retard breaker in left magneto not operating electrically. Engine may kick back during cranking due to advance timing of ignition.	c. Retard breaker may not be closing due to wrong adjustment, or may not be electrically connected in the circuit due to poor connection. Inspect retard points to see if they close. Check for proper contact at the switch and retard terminals of the left magneto and at the vibrator. Check wiring.
	d. Vibrator-magneto combination not "putting-out" electrically.	d. Turn engine in proper direction of rotation until retard breaker just opens on No. 1 cylinder position. Remove input connection from starter to prevent engine turning, and while holding No. 1 plug lead 5/16 inch from ground, energize vibrator by turning switch to start. Plug lead should throw a 5/16 inch spark. If spark is weak or missing try new vibrator. If this does not correct trouble remove magneto and check for improper internal timing or improperly meshed distributor gears.
	e. Magneto improperly timed to engine.	e. Check magneto-to-engine timing.
	f. Advance breaker out of adjustment.	f. Readjust breaker and check for correct gap tolerance.
	g. Retard points opening too late.	g. Check timing of retard points.

TROUBLESHOOTING
IGNITION SYSTEM (Cont'd)

INDICATION	*PROBABLE CAUSE*	*REMARKS*
2. Engine roughness.		a. Install new spark plugs. b. Check plug leads for continuity and breakdown. c. Check magneto breakers (main and retard) for burning or dirt.
3. Magneto rpm check is out of limits.		a. Check magneto-to-engine timing. b. Inspect breakers for proper opening. c. Check plugs and leads.

"END"

ELECTRICAL POWER SUPPLY - 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 2000 rpm.

c. Note the amount of rpm differential between the "LEFT" and "RIGHT" magnetos as the magneto switch is turned from "BOTH" to "LEFT" back to "BOTH" and then to the "RIGHT" position and back to "BOTH". Magneto drop should not exceed 150 rpm. The difference between the two magnetos operated individually should not exceed 50 rpm.

MAGNETO BREAKER POINT ADJUSTMENT

Magneto contact assemblies should be checked after the first 25 and 50 hours of operation and each 50 hours thereafter. Contact point clearances for the magnetos are .018 ± .006 for the retard points and .018 ± .001 for the conventional points. Points with deep pits or with excessively burned areas should be discarded. If necessary, points can be cleaned by using any hard finished paper. Inspect cam follower felt for proper lubrication, and clean the breaker compartment with a clean dry cloth.

BENDIX MAGNETO TIMING (S-1200 Series)

a. Check the magneto for proper rotation before replacing the magneto on the engine.

b. Remove the timing inspection plug from the top of the magneto and turn the magneto drive shaft in the direction of rotation until the timing mark on the distributor gear is approximately aligned with the mark on the distributor block. The magneto is now in the No. 1 cylinder firing position.

NOTE

The timing marks are for reference only. No adjustment of contact opening from these marks shall be used as an indication of proper internal timing. For internal timing of the magnetos refer to Bendix, Scintilla Division, manual Form L-609.

c. Position the engine piston in No. 1 cylinder (right rear cylinder) to the full advance position by covering the lower spark plug hole in No. 1 cylinder with the thumb and turning the crankshaft until pressure is felt on the thumb.

d. Remove the threaded plug in front of No. 6 cylinder (left front cylinder) and observe the timing mark on the alternator drive gear as the crankshaft is rotated slowly. When the mark on the gear is centered in the viewing hole, No. 1 piston is at the 20° BTC position.

e. Install the magneto on the engine and tighten the mounting bolts only enough to permit rotating the magneto for final timing.

f. Connect positive lead of a timing light to the switch terminal (capacitor stud) of the magneto and secure the ground lead to a suitable ground.

g. If the timing light is out, rotate the magneto housing in the direction of its magnet's rotation a few degrees beyond the point where the light comes on. Then slowly turn the magneto in the opposite direction until the light just goes out. Secure the magneto in this position and recheck the adjustment.

h. Disconnect the timing light from the magneto and make connections to the magneto's switch and retard terminals.

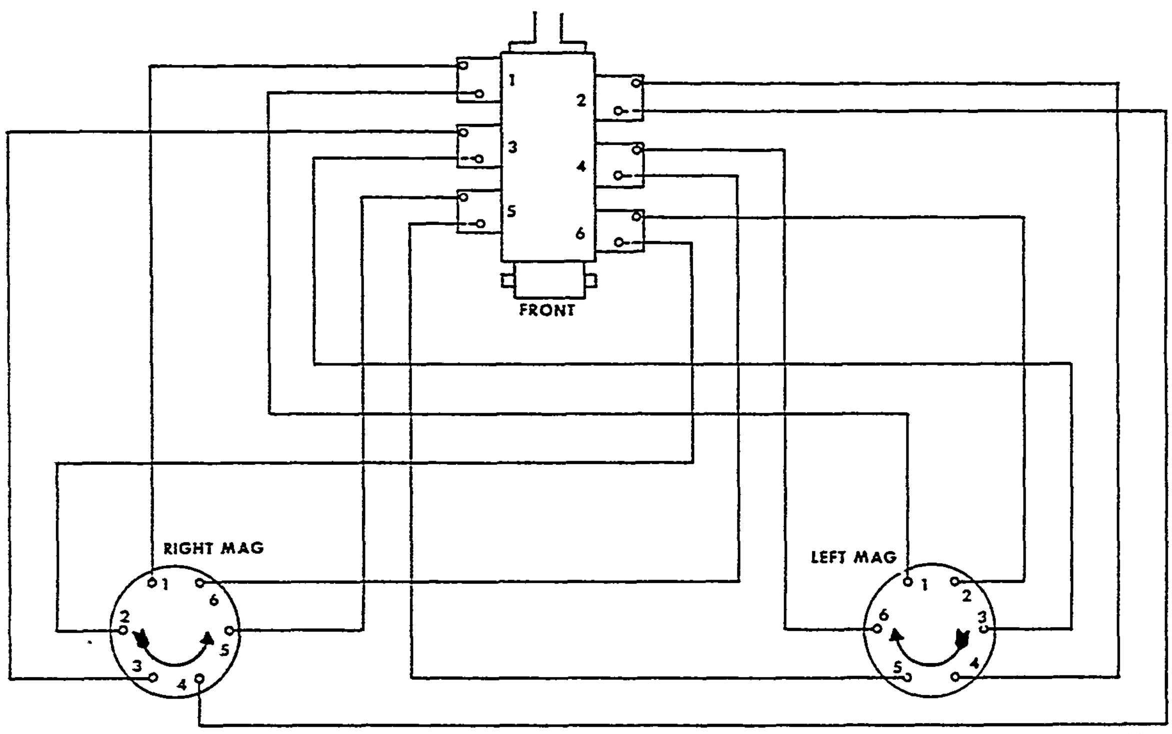
WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Disconnect the switch wire at the capacitor and ground the capacitor to a suitable ground, or disconnect the outlet plate from the magneto or the spark plug leads.

"END"

DISTRIBUTION - MAINTENANCE PRACTICES (Figure 201)

In the event that an ignition harness or an individual lead is to be replaced, consult the Magneto Wire Routing Diagram, Figure 201, to be sure that the harness is correctly installed. Mark locations of clamps and clips to be certain that the replacement is clamped at the correct locations. For engine firing order and magneto firing order refer to Figure 201.



ENGINE FIRING ORDER 1 6 3 2 5 4
MAGNETO FIRING ORDER 1 2 3 4 5 6

Magneto Wire Routing Diagram
Figure 201

"END"

CHAPTER

77

ENGINE INDICATING

CHAPTER 77

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TIT Indicator Calibration		201
ALCAL Calibration Unit		201

"END"

GENERAL - MAINTENANCE PRACTICES

TIT INDICATOR CALIBRATION
(Figure 201)

CAUTION

Damage to the turbocharger turbine blades, excessive turbine coking and excessive oil consumption may be caused by turbine inlet temperatures above 1650°F.

To prevent a turbine inlet over-temperature condition due to an inaccurate TIT indicator reading, the indicator should be checked every 100 hours and calibrated if required.

The following procedure may be used to check and calibrate the TIT indicator:

a. Remove the TIT probe from the turbocharger intake manifold on the RH engine. (Do not disconnect the wires from the probe.)

b. Using the AlCal test equipment, heat the probe to 1650°F.

c. If the TIT indicator reads 1650°F the indicator is properly calibrated. If the reading is not 1650°F the calibration screw on the face of the instrument should be adjusted to obtain this reading.

d. If the seal was broken on the calibration screw, reseal by applying a small amount of torque seal as shown in Figure 201.

e. Reinstall the probe in the turbocharger intake manifold.

f. Repeat the above procedure on the LH engine.

ALCAL CALIBRATION UNIT

The AlCal Calibration Unit (P/N 1004-1, Alcor Inc.) provides a simple and accurate method for checking and, if necessary recalibrating airplane piston engine EGT systems. If the red line temperature is exceeded by the TIT indicators, the calibration unit will quickly determine if the fault lies with the indication system or the engine. A BH6652 JetCal Calibration Unit with a BH7437-40 Heater Probe Assembly may also be used for calibration of the EGT system. The following method will accomplish the TIT calibration test:

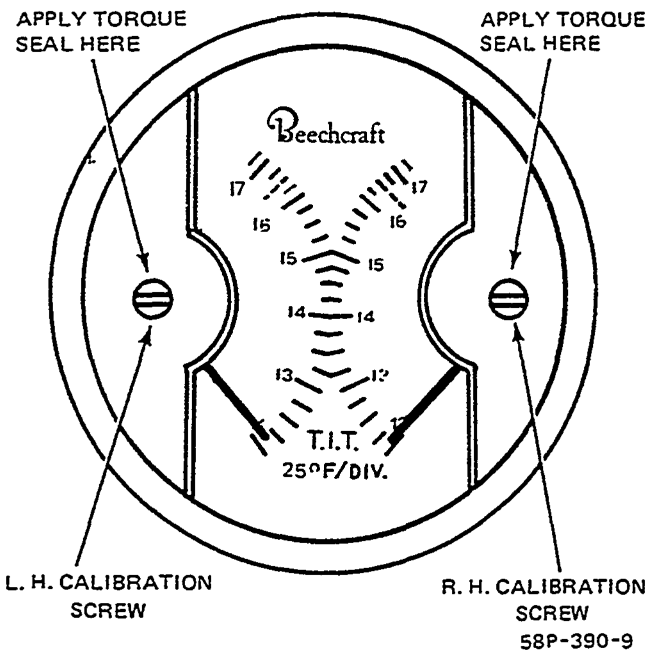
a. Light the AlCal unit and support it from the engine cowling.

b. Place the TIT thermocouple into the comparator port of the AlCal unit until it is touching the reference thermocouple.

c. Raise the heat of the AlCal unit until the temperature of 1650°F is indicated on the unit's reference meter.

d. Because both thermocouples are measuring the same temperature, the aircraft-installed TIT indicator should indicate the same red line temperature. If the indicator corresponding to the engine being tested does not register 1650°F refer to the adjustment procedure outlined under TIT INDICATOR CALIBRATION in this chapter.

e. Replace the TIT thermocouple in the turbocharger intake manifold. Lubricate the threads on the probe with MIL-A-907D anti-seize compound (Chart 208, 91-00-00).



TIT Indicator Calibration
Figure 201

"END"

CHAPTER

79

OIL

CHAPTER 79

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Oil Filter Installation		201
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"END"

GENERAL - DESCRIPTION AND OPERATION

The engines are equipped with a wet sump, pressure type, oil system. Each engine sump has a capacity of 12 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.

NOTE

After engine break-in period and at each oil change thereafter, it is recommended that only ashless oil be used. The oil in the engine when the airplane is delivered from the factory should be changed after 25 hours of engine operation.

"END"

GENERAL - MAINTENANCE PRACTICES

Under normal operating conditions, the recommended number of operating hours between oil changes is 50 hours. When operating under adverse weather conditions or continuous high power settings, the oil should be changed more frequently. The engines should be warmed up to operating temperature to assure complete draining of the oil. The oil may be drained by opening the drain valve on the bottom inboard side of the oil sump and by disconnecting the oil line at the bottom of the turbocharger air/oil separator to completely drain the system.

Moisture that may have condensed and settled in the oil sump should be drained by occasionally opening the oil drain valve and allowing a small amount of oil to escape. This is particularly important in winter, when the moisture will collect rapidly and may freeze.

The following oil grades are generally recommendations only, and will vary with individual circumstances.

RECOMMENDED OIL FOR ENGINES

Aviation Grade Oil	Average Ambient Air Temperature	Oil Inlet Temp. Desired Max.
SAE 50	Above 40°	170°F
SAE 30	Below 40°	170°F 225°F

During cold weather the oil sumps should be checked at pre-flight inspection to be sure that they are not blocked with ice.

OIL FILTER REMOVAL

The oil filter should be replaced every 50 hours.

a. Gain access to the oil filter through the engine cowl access openings.
b. Loosen the spin-off oil filter and remove filter.

OIL FILTER INSTALLATION

a. Position new filter on engine mounting.
b. Torque oil filter to 15-18 foot-pounds.
c. Secure engine cowling access panels.

CHART 201

APPROVED ENGINE OILS

COMPANY	*BRAND*
Castrol Limited (Australia)	Grade 40, Castrolaero AD, Type III Grade 50, Castrolaero AD, Type II
Continental Oil Company	*Conoco Aero S No. 65 (SAE 30) *Conoco Aero S No. 80 (SAE 40) Conoco Aero S SAE 10W30
Gulf Oil Company	*Gulfpride Aviation Series D
Humble Oil and Refining Co.	Esso Aviation and Enco Aviation in grades E65, E80 E100 and E120
Kendall Refining Company	*Kendall Aviation Oil Type D
Phillips Petroleum Company	Phillips 66 Aviation Oil Type A (replaces HD Aviation Oil)
Shell Oil Company	Aeroshell Oil W (in 4 grades) Grade 120 (Nominal SAE 60) Military Grade 1120 Grade 100 (Nominal SAE 50) Military Grade 1100 Grade 80 (Nominal SAE 40) Military Grade 1080 Grade 65 (Nominal SAE 20 or 30) Military Grade 1065
Pennzoil Company	Pennzoil Aircraft Engine Oil, Heavy Duty Dispersant, Grades 30, 40, 50
Socony-Mobil Oil Company	*Aero Red Band HD (SAE 50) *Aero Gray Band HD (SAE 40) *Aero White Band HD (SAE 30)
Socony-Mobil Oil Company	Mobil Aero Oil 65 Mobil Aero Oil 80 Mobil Aero Oil 100 Mobil Aero Oil 120
Standard Oil of California	*RPM Aviation Oil (Compounded)
Texaco, Inc.	Texaco Aircraft Engine Oil Premium AD, Grades 65, 80, 100 *Texaco Aircraft Engine Oil D100 *Texaco Aircraft Engine Oil D80
Sinclair Refining Co.	Sinclair Avoil 20W-40
B. P. Oil Corp.	B/P Aero Oil D65/80

CHART 201

APPROVED ENGINE OILS (Cont'd)

COMPANY	*BRAND*
Quaker State	Quaker State AD Aviation Engine Oil Grades 20W30, 40 and 50
Union Oil Company of California	Union Engine Oil HD Grades 80 and 100

*Designates ash residue type oils; the balance of the oils are ashless.

"END"

CHAPTER

80

STARTING

CHAPTER 80

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Starter Installation		201
Starter Brushes		201

"END"

GENERAL - DESCRIPTION AND OPERATION

The airplanes are equipped with 24-volt starters 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.

"END"

TROUBLESHOOTING
STARTER SYSTEM

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Both starters inoperative.	a. Circuit breaker tripped in starter switch circuit.	a. Reset.
	b. Starter relay inoperative.	b. Check continuity of starter system.
	c. Low batteries.	c. Test batteries. If low, replace or start with external power.
	d. Loose connections or open circuit between battery positive relay and left starter relay.	d. Check connections and continuity.
2. One starter inoperative.	a. Starter relay inoperative.	a. Check relay terminal connections and continuity of solenoid energizing circuit. If energizing circuit is closed and relay does not operate, 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, conditions of commutator; replace if necessary.

"END"

CRANKING - MAINTENANCE PRACTICES

STARTER LUBRICATION

No lubrication is required on the starting motor except at the time of overhaul. Bushings and armature shaft should be coated with a small amount of Delco-Remy Lubricant No. 1960954.

CAUTION

Do not clean the starter in any degreasing tank or grease dissolving solvents. Avoid excessive lubrication.

STARTER REMOVAL

a. Access to the starter may be gained through the right hand cowl door.
b. Disconnect the electrical wiring from the starter.
c. Remove the two "palnuts", hex nuts and washers from the mounting studs, and remove the starter.

STARTER INSTALLATION

a. Install a new "O" ring on the flange of the starter.
b. Position the starter on the mounting pad.
c. Install the attaching nuts and torque the nuts to 150-180 inch-pounds.
d. Secure the attaching nuts with "palnuts".
e. Connect the electrical wiring to the starter.
f. Start the engine to check for oil seepage at the mounting flange and check for proper operation.

STARTER BRUSHES

The starter brushes should slide freely in the holders and make full contact on the commutator. The brushes should be replaced when they have worn to 3/8 inch length. Proper brush spring tension with new brushes installed is 24 ounces. This tension is measured with a scale hooked under the brush spring near the brush and the reading taken just as the spring leaves the brush.

"END"

CHAPTER

81

TURBINES

CHAPTER 81

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"END"

GENERAL - DESCRIPTION AND OPERATION

TURBOCHARGER SYSTEM (Figure 1)

The turbocharger increases the power output and efficiency of the engine by supplying compressed air to the intake manifold. In operation, engine exhaust gas passing over the turbine wheel causes the turbocharger compressor mounted on the same shaft, to rotate. Ambient, ram air, supplied through the LH cowl door, is filtered and routed to the compressor where it is compressed and delivered to the engine. As the engine power increases, the flow of exhaust over the turbine wheel also increases, resulting in a proportionate increase in the speed of the rotating assembly and turbocharger output. On airplane serials TJ-2 and after, the compressed air from the turbocharger compressor is supplied to the cabin pressurization system through a sonic nozzle located on the intake housing, between the turbocharger compressor and throttle valve.

CONTROL SYSTEM

The turbocharger control system is automatic and functions continuously as engine power, speed and altitude are varied. The variable pressure controller, wastegate, wastegate actuator and engine oil are the principal components of the control system. The pressure controller senses compressor outlet pressure and regulates the oil pressure controlling the wastegate actuator position. The wastegate actuator is a hydraulic cylinder with spring force holding the wastegate poppet valve open. When oil pressure increases in the actuator, the spring force is overcome and the poppet valve closes, routing all exhaust gases through the turbocharger turbine. The variable pressure controller regulates the oil pressure in the actuator by means of an aneroid bellows which is sensitive to pressure changes at the induction manifold. The metering valve, which is connected to the bellows within the controller, is held closed by spring force and vacuum. As the induction manifold pressure increases, the force of the aneroid bellows causes the metering valve to open. The controller is regulated by a cam which is connected to the throttle valve. Through this linkage, the pressure setting of the controller is varied proportionally to the amount of power the pilot selects with the throttle. The control system prevents the engine from exceeding 38 in. Hg manifold pressure (TJ-2 thru TJ-168; TK-1 thru TK-84) or 39.5 in. Hg manifold pressure (TJ-169 and after; TK-85 and after); however, rapid movement of the throttle with low oil temperature or operation at low rpm with high manifold pressure may result in an overboost condition. An overboost condition may cause turbocharger surge, detonation or detuning of the engine counterweight system; any of which may cause serious engine damage.

OVERBOOST CONTROL

The engine incorporates a relief valve in the induction system which is set to relieve at approximately 43.5 in. Hg (See Figure 1.) This valve will open only in the event of a malfunction in the variable absolute pressure controller system.

CAUTION

To avoid exceeding the normal limits, particularly in cold weather, the last 1-1/2 inches of throttle travel should be applied slowly while observing the manifold pressure. Momentary overboost to the limits of the relief valve (43.5 in. Hg) will have no detrimental effect on the engine, but is indicative of a malfunctioning variable absolute pressure controller. If overboost is more than momentary, or occurs when engine oil temperatures are normal, the controller should be checked by an authorized facility.

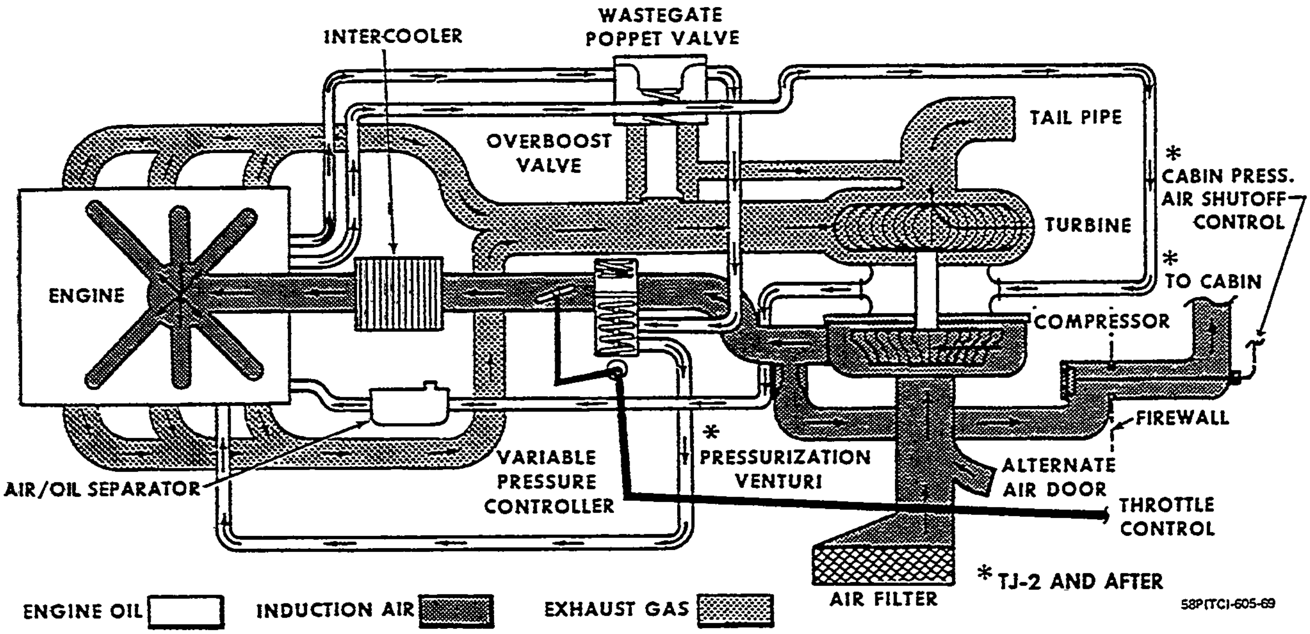
ENGINE AIR INDUCTION SYSTEM

Engine induction air is available as two sources, primary and alternate air. The primary air source is supplied through an intake duct, located on the engine LH cowl door, passes through an air filter, and then into the turbocharger.

NOTE

The air filter, located in the air box assembly, has a service life of 500 hours with periodic cleaning.

When the primary source of air is obstructed, the turbocharger forms a suction that opens the "Alternate Air Source" door and permits the required volume of air flow for normal engine performance. The alternate air door is located on the firewall behind the induction air box assembly.



Turbocharger Schematic
Figure 1

"END"

TROUBLESHOOTING
TURBOCHARGER

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
1. Excessive noise or vibration.	a. Improper bearing lubrication.	a. Supply required oil pressure. Clean or replace oil line. If trouble continues, remove turbocharger and return to approved overhaul station for overhaul or repair.
	b. Leak in engine intake or exhaust manifold.	b. Tighten loose connections, or replace manifold gaskets as necessary.
2. Engine will not deliver rated power.	a. Clogged manifold system.	a. Clean all ducting.
	b. Foreign material lodged in compressor impeller or turbine.	b. Remove turbocharger and return to approved overhaul station for overhaul or repair.
	c. Excessive dirt buildup in compressor.	c. Service engine induction air filter and check for leakage. Remove turbocharger and return to approved overhaul station for overhaul or repair.
	d. Leak in engine intake or exhaust manifold.	d. Tighten loose connections, or replace manifold gaskets as necessary.
	e. Rotating assembly bearing seizure.	e. Remove turbocharger and return to approved overhaul station for overhaul or repair.
	f. Restriction in oil lines to actuator and wastegate poppet valve.	f. Remove and clean lines.
	g. Oil pressure too low.	g. Tighten fittings, replace lines or hoses.
	h. Inlet orifice to actuator clogged.	h. Remove inlet line at actuator and clean orifice.
	i. Wastegate controller inoperative.	i. Replace unit.
	j. Wastegate butterfly not closing.	j. Low pressure, butterfly shaft binding.

TROUBLESHOOTING
TURBOCHARGER (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
2. Engine will not deliver rated power (Cont'd)	k. Impeller binding or frozen.	k. Remove turbocharger and return to approved overhaul station for overhaul or repair.
	l. Piston seal in actuator leaking.	l. Replace actuator or disassemble and replace packing.
3. Critical altitude lower than specified.	a. Controller not getting enough oil pressure to close by-pass valve.	a. Check pump outlet pressure, oil filters and lines for leaks or obstructions.
	b. Chips under metering valve in controller holding it open.	b. Replace controller.
	c. Metering jet in actuator plugged.	c. Remove actuator and clean jet.
	d. Actuator piston seal leaking excessively.	d. Clean cylinder and replace piston seal.
	e. Wastegate poppet valve sticking.	e. Clean and free action.
4. Engine surges or smokes.	a. Air in oil lines or actuator.	a. Bleed system.
	b. Control metering valve stem seal leaking oil into manifold.	b. Replace controller.
	c. Actuator to by-pass valve linkage binding.	c. Correct cause of binding.
	d. Clogged breather.	d. Check breather for restriction to air flow.

NOTE

Smoke would be normal if engine has idled for a prolonged period.

5. High deck pressure (compressor discharge pressure).	a. Controller metering valve not opening.	a. Replace controller.
	b. Exhaust by-pass valve sticking closed.	b. Shut-off valve in return line inoperative.
	c. Controller return line restricted.	c. Clean or replace line.

TROUBLESHOOTING
TURBOCHARGER (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*REMARKS*
5. High deck pressure (compressor discharge pressure) (Cont'd)	d. Wastegate actuator piston locked in closed position.	d. Disassemble actuator, check condition of piston and packing.

"END"

GENERAL - MAINTENANCE PRACTICES

INSTALLATION AND INITIAL RUN-IN OF TURBOCHARGER

Immediately prior to mounting the unit, prime the turbocharger lubrication system by inverting the turbocharger and filling the center housing with new, clean oil through the oil drain. Rotate the assembly by hand to coat the bearings and the thrust washer with oil.

Coat the threads of the attaching bolts or studs with high temperature thread lubricant. Connect the ducts and make sure all connections are air tight.

Flush oil through the oil supply line to assure the line is clean and unobstructed. Connect the oil supply line at the engine. To be sure that oil is being supplied to the turbocharger, crank the engine several revolutions until oil appears.

WARNING

Do not attempt to stop impeller after unit is rotating.

As soon as oil appears at the end of the oil inlet line, attach the line to the turbocharger.

Operate the engine at a load and listen for sounds of metallic contact from the turbocharger. If any such noise is apparent, shut down immediately and replace the unit.

For a list of approved turbocharger overhaul and repair facilities, refer to the BEECHCRAFT Baron 58P/Baron 58TC Manufactured Component Maintenance Manual P/N 102-590000-21.

RIGGING THE THROTTLE AND TURBOCHARGER PRESSURE CONTROLLER LINKAGE

a. Determine that the throttle lever moves freely from idle to full open throttle.

b. Adjust the pressure controller rod so that, with the pressure controller cam arm against the full boost stop (full forward position), the throttle lever is approximately .020 - .030 inch from the full throttle position.

VARIABLE PRESSURE CONTROLLER ADJUSTMENT

The variable pressure controller is mounted directly to the engine throttle valve casting.

Adjustment of the controller is made as follows:

a. Head the airplane into the wind. Set the brakes and chock the wheels.

b. Warm up the engine until the oil temperature reaches a minimum of 170°F.

c. Set the propeller control lever in the high rpm position. Slowly and smoothly apply the throttle until 38 in. Hg manifold pressure (TJ-2 thru TJ-168, except TJ-153 and TK-1 thru TK-84) or 39.5 in. Hg manifold pressure (TJ-153 and TJ-169 and after; TK-85 and after); or the full throttle position is reached.

CAUTION

Do not exceed 38 in. Hg manifold pressure (TJ-2 thru TJ-168, except TJ-153 and TK-1 thru TK-84) or 39.5 in. Hg manifold pressure (TJ-153 and TJ-169 and after; TK-85 and after).

d. If at the full throttle position the manifold pressure has not reached 38 in. Hg (TJ-2 thru TJ-168, except TJ-153 and TK-1 thru TK-84) or 39.5 in. Hg (TJ-153 and TJ-169 and after; TK-85 and after):

1. Slowly and smoothly shut down the engine.
2. Loosen the locknut on the adjusting screw that controls the clevis.
3. Turn the clevis control adjusting screw counterclockwise to increase the manifold pressure. (One full turn equals approximately 1 in. Hg manifold pressure.)
4. Retighten the locknut on the adjusting screw.

e. If the manifold pressure reaches 38 in. Hg (TJ-2 thru TJ-168, except TJ-153 and TK-1 thru TK-84) or 39.5 in. Hg (TJ-153 and TJ-169 and after; TK-85 and after), before obtaining full throttle:

1. Slowly and smoothly shut down the engine.
2. Loosen the locknut on the adjusting screw.
3. Turn the adjusting screw clockwise to decrease the manifold pressure. (One full turn equals

approximately 1 in. Hg manifold pressure.)

4. Retighten the locknut on the adjusting screw.

f. Repeat steps "b" through "e" until the manifold pressure at full throttle is 38 in. Hg (TJ-2 thru TJ-168; TK-1 thru TK-84) or 39.5 in. Hg (TJ-169 and after; TK-85 and after) with 170°F oil.

CAUTION

Do not exceed 38 in. Hg manifold pressure (TJ-2 thru TJ-168; TK-1 thru TK-84) or 39.5 in. Hg manifold pressure (TJ-169 and after; TK-85 and after).

"END"

CHAPTER

91

CHARTS

CHAPTER 91 - CHARTS

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"END"

CHAPTER 91

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	216	Oct 6/83
	217	Oct 6/83
	218	May 22/87
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	220	Oct 6/83

"END"

CHART 201

TABLE OF TORQUES

ENGINE MOUNTING

Engine Truss Bolts and Nuts (At Firewall)	350 to 390 in. lbs.
Engine Mount Bolts and Nuts	325 ± 25 in. lbs.

ENGINE COMPONENTS

Engine Spark Plugs	300 to 360 in. lbs.
Engine Spark Plug Lead Connections	25 in. lbs.
Engine Oil Filter	15 to 18 ft. lbs.
Air/Oil Separator Hose Assembly Fittings	360 to 570 in. lbs.
Oil Pressure Line Fittings	180 to 190 in. lbs.
Engine Driven Fuel Pump Hose Assembly Fittings	185 to 335 in. lbs.
Fuel Injector Line Nuts (at Manifold and Injectors)	40 to 45 in. lbs.

HORIZONTAL AND VERTICAL STABILIZER

All 5/16 - 24 bolts	100 to 140 in. lbs.
All 3/8 - 24 bolts	160 to 190 in. lbs.

WING MOUNTING

NOTE

Wing mounting bolt torque should be checked at the first airplane 100-hour inspection and 100 hours after each wing reinstallation, replacing a wing bolt(s), or adjusting the wing. If it is necessary to retorque the wing bolts at this time, the bolts should then be checked at the next 100-hour inspection. This check should continue at each 100-hour inspection until it is no longer necessary to retorque the bolts.

Leading Edge Wing Mounting Bolt .... 100 to 140 in. lbs.

	Dry Torques Prior to TJ-350 Prior to TK-140	Wet Torques TJ-350 and after TK-140 and after
Upper Forward Wing Mounting Bolt	3,000 to 4,000 in. lbs.	2480 to 2600 in. lbs
Upper Rear Wing Mounting Bolt	2,000 to 2,300 in. lbs.	1180 to 1300 in. lbs.
Lower Rear Wing Mounting Bolt	3,000 to 4,000 in. lbs.	2480 to 2600 in. lbs.
Lower Forward Wing Mounting Bolt	5,000 to 5,500 in. lbs.	2880 to 3000 in. lbs.

LANDING GEAR

Strut Connecting Arm Bolts	290 to 410 in. lbs.
Horizontal Brace Bolts	25 to 40 in. lbs.
Main Gear Axle Nut	15 to 20 ft. lbs.
Main Gear Hinge Bolts	250 to 400 in. lbs.

CHART 201 (Cont'd)
TABLE OF TORQUES

FUEL SYSTEM (Attaching Bolts For)

Filler Necks	45 to 55 in. lbs.
Leading Edge Fuel Cell Outlet Plate	20 to 30 in. lbs.
Transmitter	25 ± 5 in. lbs.
Fuel Boost Pump	45 to 55 in. lbs.
Access Plates	45 to 55 in. lbs.
Fuel Cell Interconnect Clamps	25 ± 5 in. lbs.
Rubber Fuel Nipple Clamps	25 ± 5 in. lbs.

HEATER SYSTEM

Spark Plug	28 ft. lbs.
Spark Plug High Voltage Lead	20 ft. lbs.

CHART 202

TORQUING FINE THREAD SERIES BOLTS LOADED IN SHEAR

NOTE

The following torque values may be used as a guide when specific torques are not called out within this manual.

	TORQUE LIMITS RECOMMENDED (INCH-POUNDS)		*MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)*	
SIZE	AN365 AND AN310 NUTS COLUMN 1	AN364 AND AN320 NUTS COLUMN 2	AN365 AND AN310 NUTS COLUMN 3	AN364 AND AN320 NUTS COLUMN 4
8-36	12-15	7-9	20	12
10-32	10-25	12-15	40	25
1/4 - 28	50-70	30-40	100	60
5/16 - 24	100-140	60-85	225	140
3/8 - 24	160-190	95-113	390	240
7/16 - 20	450-500	270-300	840	500
1/2 - 20	480-690	290-410	1100	660
9/16 - 18	800-1000	480-600	1600	960
5/8 - 18	1100-1300	660-780	2400	1400
3/4 - 16	2300-2500	1300-1500	5000	3000
7/8 - 14	2500-3000	1500-1800	7000	4200
1 - 14	3700-5500	2200-3300	10000	6000
1 - 1/8 - 12	5000-7000	3000-4200	15000	9000
1 - 1/4 - 12	9000-11000	5400-6600	25000	15000

NOTE

The above values apply to Class 3 threads, cadmium plated and non-lubricated.

CHART 203

TORQUING COARSE THREAD SERIES BOLTS LOADED IN SHEAR

SIZE	*TORQUE LIMITS RECOMMENDED (INCH-POUNDS)*		*MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)*	
	AN365 AND AN310 NUTS COLUMN 1	AN364 AND AN320 NUTS COLUMN 2	AN365 AND AN310 NUTS COLUMN 3	AN364 AND AN320 NUTS COLUMN 4
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4 - 20	40-50	25-30	75	45
5/16 - 18	80-90	48-55	160	100
3/8 - 16	160-185	95-110	275	170
7/16 - 14	235-255	140-155	475	280
1/2 - 13	400-480	240-290	880	520
9/16 - 12	500-700	300-420	1100	650
5/8 - 11	700-900	420-540	1500	900
3/4 - 10	1150-1600	700-950	2500	1500
7/8 - 9	2200-3000	1300-1800	4600	2700
1 - 8	3700-5000	2200-3000	7600	4500
1 - 1/8 - 8	5500-6500	3300-4000	12000	7200
1 - 1/4 - 8	6500-8000	4000-5000	16000	10000

NOTE

The above values apply to Class 3 threads, cadmium plated and non-lubricated.

CHART 204

FLARE FITTING TORQUE CHART

TORQUE – INCH-POUND

TUBING OD INCHES	*ALUMINUM - ALLOY AND TUBING FLARE 10061 AND/OR 10078*		*STEEL TUBING FLARE AND 10061*		*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 the male threads are properly lubricated in accordance with Chart 208. Torque the fittings in accordance with Chart 204 above. Do not overtorque.

CHART 205

SEALING MATERIALS

SEALING

Because TJ-3 and after are pressurized, sealing the skin and bulkhead seams, the windows, doors, etc., is of prime importance. Control cables and torque shafts have removable rubber seals. When structural repair or modifications occur which create a break in the pressure vessel, the repaired mating surfaces must be sealed with the proper sealer. All other components piercing the pressure vessel or attached to it must be sealed with the sealers described in Chart 205. To assure effective bonding of the sealers, be sure to clean all mating surfaces, mating parts and rubber seals thoroughly. For application and cleaning procedures refer to Chart 206. Item 12 and 13 are used for repair and maintenance of the optional wet wing tip on TJ-23 and after and TK-1 and after.

ITEM	*PRODUCT*	*VENDOR*
1.	EC612	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
2.	EC776	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
3.	Presstite 576	Presstite, Interchem Division, St. Louis, Missouri
4.	RTV-732	Dow Corning Corporation
5.	Elmers Glue	Borden Company
6.	Presstite 155	Presstite, Interchem Division, St. Louis, Missouri
7.	Pro Seal 890B-4	Coast Pro-Seal and Manufacturing Co., Los Angeles, California
8.	PR1221B-8	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
9.	EC1239B-1/2	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
10.	EC1239A-1/2	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
11.	EC1020	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
12.	Pro Seal 890B-1/2	Coast Pro-Seal and Manufacturing Co., Los Angeles, California
13.	EC1675B-1/2	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
14.	PR1425 B-2	Product Research Glendale, California

CHART 206

APPLICATION OF SEALING MATERIALS

APPLICATION	*MATERIAL*	*REMARKS*
Cleaning Metal Surfaces, Electrical Wiring and Wet Wing Tip	O-A-51, Acetone; *TT-M-261, Methyl Ethyl Ketone; *TT-N-95, Naphtha; TT-T-548, Toluol; O-T-620C, Trichloroethane; *No. 1 White Compound Rag	Prior to applying sealant, clean all metal or primer surfaces and electrical wiring with solvent and dry with clean compressed air or wipe with clean white cloth until dry.
Cleaning Plastic	TT-N-95, Naphtha; No. 1 White Compound Rag	Prior to applying sealant, clean with white cloth dampened with solvent. Immediately dry with a dry clean white cloth to absorb any wet solvent.
Cleaning Areas Contaminated With Oil or Grease Residues	EC3911 degreasing primer	Prior to applying sealant, clean with EC3911 degreasing primer and wipe clean.
Fillet Seal	Pro Seal 890B-4, PR1221B-8, or EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Apply sealant with a gun, 1/8 to 1/4 inch thick. Sealant is to be faired into the joint or seam and is to overlap adjoining structures 1/8 to 1/4 inch.
Coating Seal	EC776 or EC1239 A-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Apply sealant with brush, 5 to 15 millimeters, to completely cover area concerned, being sure to work it into all cracks, crevices and gaps. Stroke in two or three directions to ensure complete coverage. Overlap adjoining parts by 1/4 to 1 inch.
Injection Seal	EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Inject sealant with syringe or gun into one side of cavity or hole until it emerges from the other end of cavity.
Gap or Hole Seal	Pro Seal 890B-4, PR1221B-8, or EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Apply sealant with spatula or gun. Apply a 1/4 or 1/2 inch thick layer of sealant to completely cover the area, overlap the edges of the hole or gap by at least 1/4 inch.
	By Weight 1 part cork 3 parts sealant By Volumn 1 part cork 1 part sealant	Granulated cork (15 mesh) may be added to sealant to obtain a non-flowing paste.

*Wet wing tip (TJ-23 and after and TK-1 and after)

CHART 206 (Cont'd)

APPLICATION OF SEALING MATERIALS

APPLICATION	*MATERIAL*	*REMARKS*
Faying Surface Seal	Pro Seal 890B-4, PR1221B-8, or EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2 PR1425 B-2	Apply sealer with roller evenly and continuous without voids along the entire mating surfaces prior to assembly. Apply sufficient sealant so there will be a slight squeeze out evenly without voids along the entire mating surfaces. Fair the squeeze out back into joint. Faying fillet surface seal may be applied over faying surface seal prior to curing of faying surface sealant.
Faying Surface Fillet Seal	Pro Seal 890B-4, PR1221B-8 or EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Apply a 1/16 to 1/8 inch bead, continuous without voids, along the top of faying surface seal.
Unused Drill or Tooling Holes	Pro Seal 890B-4, EC1239B-1/2	Plug holes with appropriate soft rivet and apply a coat of sealer.
Pre-Assembly Fillet Seal	Pro Seal 890B-4, PR1221B-8 or EC1239B-1/2 *Pro Seal 890B-1/2 or *EC1675B-1/2	Apply enough sealant to fill area and to provide a slight squeeze out when the parts are assembled.
Window Seal	Pro Seal 890B-4	Apply with a bead of approximately 3/16 inch in height or sufficient sealant to fill around fasteners and to each edge of lapped surfaces.
Storm Window Screws Seal	Elmer's Glue	Apply sealant to screws prior to installation. Install screw while sealant is wet.
Plumbing Fittings Seal	Pro Seal 890B-4 or EC1239B-1/2	Apply to all plumbing fittings which pass through a pressure boundary.
Electrical Fittings Seal	Pro Seal 890B-4, or EC1239B-1/2	Wrap wire or cable bundle with Scotch #33 vinyl tape until even with seal fitting flange. Apply 3 to 4 layers of tape. Puncture a hole in tape and inject sealant. Allow to cure and remove tape.
	EC1239A-1/2	Spread the wires of large wire bundles apart and apply sealant around each wire. After each wire is covered, wrap Scotch #33 vinyl tape around wire bundle (butted against seal fitting) and inject sealant in notch of seal fitting. Apply fillet seal round seal fitting flange.
Cable Ball Seal	Presstite 576	Ball seals which do not seal themselves may be sealed by applying a bead of sealant between ball seal and forward lip of adaptor. Care should be taken not to apply sealant which will come in contact with cable.

CHART 206 (Cont'd)

APPLICATION OF SEALING MATERIALS

APPLICATION	*MATERIAL*	*REMARKS*
Rudder Pedal Cross Shaft Seal	Pro Seal 890B-4, EC1239A-1/2	Install rubber plug with Pro Seal 890B-4 sealant. Seal the cross shaft, with rubber plug inserted, by applying a coat of sealant. Seal all bolts which attach to cross shaft with a combination of fillet seal, faying surface seal and/or coating seal.
Heater Plenum Seal	RTV-732	All corner relief holes shall be sealed with hole seal and all skin laps shall be fillet sealed with RTV-732 (heat resistant sealant).
Removable Door and Plates Seal	Presstite 155	Apply sealant to one of the mating surfaces and wipe with clean cloth. Apply paste wax to the other mating surface and install door or plate.

*Wet wing tip (TJ-23 and after and TK-1 and after)

TERMS

Faying Surface Seal refers to a seal where the sealing material is applied between mating surfaces of two or more parts before assembly.

Faying Surface Fillet Seal refers to a seal where the sealant is applied on top of a faying surface seal at one of two edges of the sealing surface before assembly, providing a fillet seal when the parts are assembled.

Pre-Assembly Fillet Seal refers to a seal where a sealant is applied to the parts immediately before assembly when the parts do not butt together and form a gap, groove or void.

Fillet Seal refers to a seal where the sealant is applied into and over joints created by an installation of mismatched parts.

Coating Seal refers to a seal which completely covers rivets, nut plates, bolts or joints.

Injection Seal refers to a seal where sealant is applied in a gap or void by two or more adjoining parts in which one part overlaps another. Injection seals are also used to seal voids or gaps not sealed during assembly.

Gap or Hole Seal refers to a seal where sealant is applied to fill holes, gaps or voids that pass through the pressure boundries, caused by parts not butting together.

CHART 207

CONSUMABLE MATERIALS

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the specifications listed 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.

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
1.	Fuel, Engine	Grade 100LL (blue) if not available, use grade 100 (green) or 115/145 (purple)		
2.	Oil, Engine	TCM MHS-24B	Grade 40, Castrolaero AD Grade 50, Castrolaero AD	Castrol Limited Australia
			Conoco Aero S	Continental Oil Co. Ponca City, Okla.
			Gulfpride Aviation A.D.	Gulf Oil Co. Pittsburgh, Pa.
			Esso and Enco Aviation Oil, Series E65, E80, E100 and E120	Humble Oil and Refining Co., P.O. Box 2180 Houston, Texas
			Phillips 66 Aviation Oil Type A	Phillips Petroleum Co., Bartlesville, Okla.
			Aeroshell Oil W, Grades 120, 100, 80 and 65	Shell Oil Co., One Shell Plaza, Houston, Texas
			Pennzoil Aircraft Engine Oil, Heavy Dispersant, Grades 30, 40, 50	Pennzoil Company
			Mobil Aero Oil 65, 80, 100 and 120	
			Texaco Aircraft Engine Oil Premium AD, Grades 65, 80 and 100	Texaco, Inc. 135 E. 42nd St. New York, N. Y.
			Sinclair Avoil 20W-40	Sinclair Refining Co. 600 Fifth Ave. New York, N.Y.
			B/P Aero Oil D65/80	BP Oil Corp.
			Delta Avoil Oil	Delta Petroleum Co.

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
2.	Oil, Engine (Cont'd)	TMC MHS-24B		
			Quaker State AD Aviation Engine Oil Grades 20W/30, 40 and 50	Quaker State Oil and Refining Corp.
			Union Engine Oil HD Grades 80 and 100	Union Oil Company of California
3.	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 Co., Bradford, Pa.
4.	Lubricating Oil	MIL-L-6081	Gulflite Turbojet Oil No. 1010	Gulf Oil Corp., Pittsburgh, Pa.
			Aeroshell No. 3-1286	Shell Oil Co., 50 West 50th Street, New York, N.Y.
			Jet Engine Oil No. 1010	Texaco Inc., 135 East 42nd Street, New York, N.Y.
5.	Lubricating Oil	SAE 20 or SAE 10W30		
6.	Graphite Grease Petrolatum	MIL-T-5544T		
7.	Lubricating Oil (Gear)	MIL-L-6086 Grade M	Trojan Gear Oil No. 6086M	Cities Service Oil Co., 60 Wall Tower, New York, N.Y.
			Aeroshell Fluid 5M	Shell Oil Co., 50 West 50th Street, New York, N.Y.
			L-1195	Sinclair Refining Co., 500 Fifth Avenue, New York, N.Y.
8.	Lubricating Grease	Molykote G		

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
9.	Grease, Aircraft, General Purpose, Wide Temperature Range	MIL-G-81322	Mobilgrease 28	Mobil Oil Corporation, Shoreham Building, Washington, D.C.
			Aeroshell Grease 22	Shell Oil Company, 50 West 50th Street, New York, N.Y.
			Royco 22S	Royal Lubricants Co., River Road, Hanover, New Jersey
10.	Lubricating Grease (Gear)		Mobil Compound G.G. or Mobil 636	Mobil Oil Corporation, Shoreham Building, Washington, D.C.
11.	Lubricating Grease (Aircraft and Instrument, High and Low Temperature)	MIL-G-23827	Supermill Grease No. A72832	American Oil Co., 910 South Michigan Ave., Chicago, Ill.
			Royco 27A	Royal Lubricants Co., River Road, P.O. Box 95, Hanover, N.J.
			Aeroshell Grease 7	Shell Oil Co., 50 West 50th Street, New York, N.Y.
12.	Lubricant, Molybdenum Disulfide Powder	MIL-M-7866	Molykote Z	Wilco Co., Wichita, Kansas
			Molykote Z	Standard Oil of Kentucky
			Molykote Z	Haskell Engineering and Supply Company, 100 East Graham Place, Burbank, California
			Moly-Paul No. 4	K. S. Paul Products Ltd., Nobel Road, London, England
13.	Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Co., Los Angeles, California
			PED 3565	Standard Oil of Calif., 225 Bush Street, San Francisco, Calif.

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
14.	Oxygen - System Leak Testing Compound	MIL-L-25567		
15.	Solvent, Dry Cleaning or White Spirit	PD680 or British Specification 245		
16.	Lubricating Oil	SAE-10		
17.	Air Conditioner Refrigerant	R-12	Racon 12	Racon Inc., Wichita, KS
			Genetron 12	Allied Chemical Specialty Division, Morristown, NJ
			Freon 12	Dupont Inc., Freon Products Div., Wilmington, DE
18.	Oil (Air Conditioner Compressor)	500 Viscosity	Suniso No. 5	Virginia Chemical Smelting Co., West Norfolk, VA
			Texaco Capella E	Texaco Inc., 135 East 42nd Street, New York, NY
19.	Aviator's Breathing Oxygen	MIL-O-27210		
20.	Naphtha	TT-N-95		
21	Methyl Ethyl	TT-M-261		
22.	Toluol (Toluene)	TT-T-548		
23.	Paint Remover		Turco No. 4260	Turco Products Inc., Los Angeles, CA
24.	Epoxy Primer		Ameron Epoxy Primer	Ameron Industrial Coatings Division, P.O. Box 2153, Wichita, KS
25.	Wash Primer		EX2016G	Ameron Industrial Coatings Division, P.O.Box 2153, Wichita, KS

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
26.	Zinc Chromate Primer	MIL-P-8585		
27.	Rubber Hose	MIL-H-5593		
28.	Oil, Engine Preservative	MIL-L-21260		
29.	Propeller Grease	Hartzell DG Grease		Hartzell Propeller, Inc., Piqua, Ohio
30.	Lubricating Grease		Anco Andok-B	Humble Oil Co., Houston, Texas
31.	Solvent		CRC-2-26	Corrosion Reaction Consultants, Limekim Pike, Dresher, Pa.
32.	Adhesive		EC1300L	Minnesota Mining and Manufacturing Co., 3M Center, St. Paul, Minnesota
33.	Sealer		EC801	Minnesota Mining and Manufacturing Co., 3M Center, St. Paul, Minnesota
34.	Lubricating Grease		Aeroshell 7A	Shell Oil Co., 50 West 50th Street, New York, N.Y.
35.	Urethane Primer			U.S. Paint Lacquer and Chemical Co., 1501 N. Belmont, Wichita, Kansas
36.	Thread Locking Compound		Loctite Sealant, Grade A	Loctite Corp., 705 N. Mountain Road, Newington, Conn.
37.	Penetrating Oil		Mouse Milk	Worldwide Aircraft Filters Corp. 1685 Abram Ct., San Leandro, Calif.
			Kano Kroil	Kano Laboratories Inc., Nashville, Tennessee

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	*MATERIAL*	*SPECIFICATIONS*	*PRODUCT*	*VENDOR*
38.	Lubricating Grease		Aeroshell Grease 5	Shell Oil Co., 50 West 50th Street, New York, N.Y.
39.	Cement		A56B	B.F. Goodrich Co., Akron, Ohio
40.	Primer		Locquic "N"	Locktite Corp., 705 N. Mountain Road, Newington, Conn.
41.	Cleaner		Turco Metal-glo No. 3	Turco Products Inc., Los Angeles, Calif.
42.	Paint Stripper		Turco 4260	Turco Products Inc., Los Angeles, Calif.
43.	Corrosion Preventative Compound	MIL-C-16173 grade 2	Braycote 137	Bray Oil Co., 1925 N. Marianna Ave. Los Angeles, California 90032
44.	Cement		Bostic 1008	United Shoe Machinery Corp., B.B. Division, 748 Memorial Drive, Cambridge, Mass.
45.	Cement		Bostic 1024	United Shoe Machinery Corp., B.B. Division, 748 Memorial Drive, Cambridge, Mass.
46.	Trichloroethane	MIL-T-81533		Vulcan Materials Co., Chemicals Division, 6200 South Ridge Road, Wichita, Kansas
47.	Icex			B. F. Goodrich, Akron, Ohio
48.	Anti-Icer Fluid	TT-I-735 (Replaces MIL-F-5566)		Anti-Icer Fluid, Sherwood and Co., Wichita, Kansas
49.	Resin	MIL-R-7575	Laminac 4116	American Cyanamid Co., Wallingford, Connecticut
50.	Refer to Item 20			
51.	Sealer		RTV-108	General Electric Corp., Waterford, New York

CHART 207 (CONT'D)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
52.	Stripper Solution		Oakite M-3	Oakite Products, Inc., 50 Valley Road, Berkley Heights, New Jersey 07922
53.	Spray Adhesive		#77	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota
54.	Preservative Oil	MIL-L-46002 Grade 1	Nucle Oil 105	Daubert Chemical Co., 4700 S. Central Avenue, Chicago, Illinois
			Protect VA	Pennsylvania Refining Co., Butler, Pennsylvania
			Ferro-Gard 1009-G	Ranco Laboratories, Inc., 3617 Brownsville Road, Pittsburgh, Pennsylvania
55.	Grease	MIL-G-10924		
56.	Preservative Hydraulic Fluid	MIL-H-6083	Avrex 904	Mobil Oil Corporation, 150 E. 42nd St., New York, New York
			Royco 783C	Royal Lubricants Co., River Road, Hanover, New Jersey
57.	Adhesive, Acrylic		PS-30	Cadillac Plastic & Chemical Co., Detroit, Michigan
58.	Adhesive/Sealant		RTV732	Dow Corning Corporation, Midland, Michigan 48640
59.	.0030-inch Thick 2-inch Wide Vinyl Film Tape		No. 474	Minnesota Mining and Manufacturing Co., 3M Center, St. Paul, Minnesota
60.	Sealant		Presstite No. 576	Presstite-Keystone Engineering Company, 3900 Chateau Ave., St. Louis, Missouri

CHART 207 (CONT'D)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
61.	Sealant		Presstite No. 176	Presstite-Keystone Engineering Company, 3900 Chateau Ave., St. Louis, Missouri
62.	Tape, Anti-Seize, Tetrafluoroethylene with dispenser (1-inch)	MIL-T-27730		Johnson & Johnson Inc., Permacel Division, U.S. Highway 1, New Brunswick, New Jersey 08901
63.	Adhesive		Dapcotac 3300	"D" Aircraft Products Co., 1191 Hawk Circle, Anaheim, CA
64.	Tape, Mylar (3/4-inch)		Mylar Mystic No. 733	Minnesota Mining and Manufacturing Co., 3M Center St. Paul, Minnesota
65.	Plexiglas Scratch Remover			Micro-Mesh Cushioned Abrasives Micro-Surface Finishing Products Wilton, Iowa 52778
				Polysand Cushioned Abrasives Fredrick B. Anthon Enterprizes U.S. Distributor: Cope Plastics Godfrey, Illinois 62035
66.	Plexiglas Polish and Cleaner	Federal Specification P-P-560	Part No. 403D	Permatex Company Kansas City, Kansas
			Anti-Static Plastic Polish	Park Chemical Company Detroit, Michigan
			MGH-10	Mirror Bright Polish Co. Irvine, California
67.	Lubricating Grease (Gear) (Alternate for Landing Gear Actuator)	MIL-L-10324 (Superseded by MIL-L-2105, Grade 75W, Item #68)		
68.	Lubricating Oil, Gear, Sub Zero	MIL-L-2105 Grade 75 W	101-380016-1	BEECHCRAFT Aero or Aviation Centers and International Distributors and Dealers

CHART 207 (Cont'd)
CONSUMABLE MATERIALS

ITEM	MATERIAL	SPECIFICATIONS	PRODUCT	VENDOR
	Lubricating Oil, Gear, Sub Zero	MIL-L-2105	Gulf Gear Lube HT SAE 75W-90	Gulf Oil Canada, Limited, Development Dept., 2489 N Sheridan Way, Sheridan Park Ontario L5K 1A8
			Oliofiat W 75/M	Fiat Lubricant S.p.A., Via Santena,1 10029 Villastellone, (Torino) Italy
			Shell Oil S.8643	Shell International Petroleum Company Limited, Shell Centre Dept. MKF/32, London S.E.1, England
69	Coating	MIL-C-5541	Alodine 1200, 1200S or 1201	Amchem Products Inc., 300 Brookside Ave., Ambler, PA 19002
				Amchem Products Inc., Remont, CA
				Amchem Products Inc., St. Joseph, MO
70.	Adhesive/sealant		RTV-737	Dow Corning Corp., Midland, MI 48640

NOTES

1. If grade 100LL (blue) fuel is not available, grade 100 (green) or 115/145 octane (purple) may be used.

2. Precautions should be taken when using MIL-G-23827 and MIL-G-81322 grease, since these greases contain chemicals harmful to painted surfaces.

CHART 208

THREAD LUBRICANTS

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the specifications listed 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.

SYSTEM	*MATERIAL*	*SPECIFICATION*	*VENDOR PRODUCTS*
Fuel	Petrolatum	VV-P-236	
Oil, Manifold Pressure, Air Pressure	Lubricating Grease (Gasoline and Oil Resistant)	MIL-G-6032	L-237, Lehigh Chemical Co., Chestertown, Maryland Rockwell 950, Rockwell Mfg., Pittsburgh, Pa. Royco 32, Royal Lubricants Co., Hanover, New Jersey
Deicer, Static, Pitot	Anti-Seize, White Lead Base	TT-A-580	Armite Product, Armite Laboratories, Los Angeles, California
Brakes	Hydraulic Fluid or Anti-Seize, White Lead Base	MIL-H-5606 or TT-A-580	
Air Conditioner	Anti-Seize, Graphite Petrolatum or Anti-Seize, White Lead Base	MIL-T-5544 or TT-A-580	
Oxygen, High Pressure Side	Tape, Tetrafluoroethylene	MIL-T-27730	Permacel Tape Corp., New Brunswick, New Jersey
Turbocharger Inlet Probe	Anti-Seize Compound	MIL-A-907D	Anti-Seize Compound C5A, Fel-Pro Inc., 7450 McCormick, Skokie, Illinois

CHART 209

APPROVED ENGINE OILS

SPECIFICATION	PRODUCT	VENDOR
TCM MHS-24B	Grade 40, Castrolaero AD Grade 50, Castrolaero AD	Castrol Limited, Australia
	Conoco Aero S	Continental Oil Co., Ponca City, Okla.
	Gulfpride Aviation AD	Gulf Oil Co., Pittsburgh, Pa.
	Esso and Enco Aviation Oil, Series E65, E80, E100 and E120	Humble Oil and Refining Co., P. O. Box 2180, Houston, Texas
	Phillips 66 Aviation Oil Type A	Phillips Petroleum Co., Bartlesville, Okla.
	Aeroshell Oil W, Grades 120, 100, 80 and 65	Shell Oil Co., One Shell Plaza, Houston, Texas
	Pennzoil Aircraft Engine Oil, Heavy Dispersant, Grades 30, 40, 50	Pennzoil Company
	Mobil Aero Oil 65, 80, 100 and 120	
	Texaco Aircraft Engine Oil Premium AD, Grades 65, 80 and 100	Texaco, Inc., 135 E. 42nd St., New York, N. Y.
	Sinclair Avoil 20W-40	Sinclair Refining Co., 600 Fifth Ave., New York, N. Y.
	B/P Aero Oil D65/80	BP Oil Corp.
	Delta Avoil Oil	Delta Petroleum Co.
	Quaker State AD Aviation Engine Oil Grades 20W/30, /40 and /50	Quaker State Oil and Refining Corp.
	Union Engine Oil HD Grades 80 and 100	Union Oil Company of California

"END"